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Tim Elmo Feiten

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Anthony Chemero

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Reassessing von Uexküll's *Umwelt* in Embodied Cognition with Canguilhem, Merleau-Ponty, and Deleuze

Tim Elmo Feiten

University of Cincinnati

Kristopher Holland

University of Cincinnati

Anthony Chemero

University of Cincinnati

Jakob von Uexküll's (1864-1944) account of *Umwelt* has been proposed as a mediating concept to bridge the gap between ecological psychology's realism about environmental information and enactivism's emphasis on the organism's active role in constructing the meaningful world it inhabits. If successful, this move would constitute a significant step towards establishing a single ecological-enactive framework for cognitive science.¹ However, Uexküll's thought itself contains different perspectives that are in tension with each other, and the concept of *Umwelt* is developed in representationalist terms that conflict with the commitments of both enactivism and ecological psychology.² One central issue shared by all these approaches is the problem of how a living being *experiences* its environment. In this paper, we will look at Uexküll's reception in French philosophy and highlight the different ways in which the concept of *Umwelt* functions in the work of Georges Canguilhem, Maurice Merleau-Ponty, and Gilles Deleuze. This analysis helps to clarify different aspects of Uexküll's thought and the deeper philosophical implications of importing his concepts into embodied cognitive science. This paper is part of a recent trend in which enactivism engages with continental philosophy in a way that both deepens and transcends the traditional links to phenomenology, including most recently the thought of Georg W. F. Hegel

and Gilbert Simondon.³ However, no more than a brief outline and introduction to the potentials and challenges of this complex conceptual intersection can be given here. Our hope is that it serves to make more explicit the philosophical issues that are at stake for cognitive science in the question of experienced environments, while charting a useful course for future research.⁴

The different approaches to embodied cognition that have gained increasing popularity since the 1990s form a loose coalition of research projects and employ a daunting range of theoretical and philosophical resources, from robotics and dynamical systems theory to elements of Buddhist philosophy and phenomenology. This plurality of perspectives and conceptual toolsets accounts for the fecundity of embodiment as an approach to cognitive science, but in turn constitutes one of the central challenges for the unification of embodied cognition as one coherent paradigm that could hope to unseat classical cognitivism as the dominant framework for the scientific study of the mind.

From amongst the different tendencies labeled as 4EA—embodied, embedded, extended, enactive, and affective—, a sizeable portion of the field seems to have clustered around just two major perspectives: ecological psychology and enactivism. They share a strong emphasis on dynamical systems theory (DST) as a main mathematical tool for modelling the relevant material and cognitive processes, and both recognize phenomenology as an important precursor to their philosophical commitment to the scale of a living subject and its experience, as opposed to the abstract algorithmic approach of traditional symbol processing models.⁵ Despite the similarities between these two perspectives, they have until recently kept at a critical distance from each other.

Their mutual skepticism concerns the different emphasis each side puts on the two poles of an animal-environment system: ecological psychology⁶, and its subsequent development into radical embodied cognitive science⁷, is committed to explaining the cognitive behavior of agents as driven primarily by their environments. The objective features of the material world afford different actions to different agents, and this information about which features afford what to which agents is fully present in the physical properties of light, sound, and other modalities of perception.⁸ This way, ecological psychology has no need for an internal subject that generates meaning from stimuli, creating an internal representation of a world that is accessible only indirectly through a small set of fragmented impressions. Instead, perception is direct, the world is its own best model, and the privileged subject that Western thought inherited from Descartes and Kant is demoted to one of many coupled elements within a complex cognitive system that encompasses organisms and environment. The patterns of cognitive behavior and their change over time are explained as emergent phenomena and predicted via DST—as Gibson⁹ put it: behavior is regular, without being regulated.

In contrast, enactivism emphasizes how the behavior of an organism—and ultimately its very existence—is a self-organized process in service of continuously producing itself.¹⁰ A central source of the enactivist perspective is the theory of autopoiesis, which explains the continued existence of organisms over time as the ongoing self-production of a system of mutually constraining and enabling processes. The original formulation by Maturana and Varela¹¹ can be traced back to Kant's¹² account of the organism as a whole in which the parts all cause each other. But where Kant understood our ascription of purpose to a self-organizing system to be a merely a necessary conceptual tool in our understanding of living beings, enactivism treats the teleology of the organism as the central feature of its processual dynamics.¹³ The original formulation of autopoiesis was criticized as describing a system that is both too static and too strongly walled-off from its environment to provide an accurate description of living organisms¹⁴, but subsequent developments explain organismic self-production as a dialectical process of maintaining its boundary towards the exterior on the one hand and opening itself to the influx of material and energetic resources in order to fuel its processes on the other.¹⁵ With this reformulation, the environment plays a constitutive role in the process of self-organization, yet the explanatory emphasis still clearly lies on the organism itself. It is the organism as a living subject that actively opens itself to the environment, and it does so in order to get the resources needed to maintain its closure.

Despite both analyzing cognition on the level of the animal-environment system, and despite their shared rejection of classical cognitivism and its representationalist, dualist conception of the mind, enactivism and ecological psychology thus find themselves at odds over the question of which part takes primacy: the organism or its environment. Beyond the matter of explanatory emphasis, this contrast also expresses itself in terms of more metaphysical commitments and the respective qualms about the other side: ecological psychologists have been suspicious that enactivism's view of the subject constructing a meaningful world for its own perception and action might amount to solipsism¹⁶, while enactivists fear that ecological psychology reduces the study of mind to a mathematical description of externally observable behavior, to the exclusion of cognizing agents and their subjective experience.¹⁷

Recently, both sides have started to recognize the similarities and synergies between the two approaches to embodied cognition, with a shared desire to construct one single ecological-enactive approach that “promises perhaps the most complete alternative to cognitivism as a working metatheory for the study of minds.”¹⁸ Baggs and Chemero differentiate between the habitat of a species in which affordances are present as objective structures and the *Umwelt* of a single organism in which those structures become available to this particular subject. This move is meant to bridge the

gap between the realist environment of ecological psychology and the subject-centered perspective of enactivism, moving the term *Umwelt*, coined by Jakob von Uexküll, from the margins of cognitive science where it has been present for decades into a central role for the further development of embodied cognition. In contrast, Fultot and Turvey¹⁹ point out that *Umwelt* involves a commitment to representationalism and dualism that is anathema to embodied cognition and instead propose Uexküll's use of musical metaphors for the meaningful relationships between different organisms and their environment as a corollary of James J. Gibson's²⁰ account of this relation of reciprocity. However, Uexküll's appeal to melody and harmony as the modes in which meaning is present in living nature comes with its own philosophical backdrop and in order to do conceptual work, the underlying assumptions and arguments have to be made explicit.

Jakob von Uexküll (1864-1944) was a biologist who studied physiology and animal behavior and developed an idiosyncratic approach to the study of living beings that was heavily inflected by, and in turn influenced, philosophy. One of his central tenets was that organisms are not complex machines but living subjects, each of which inhabits its own phenomenal world called an *Umwelt*.²¹ The behavior of animals can be explained through the actions that are afforded to them by objects in their environment which are relevant to their skills and needs. In describing how perceptions and actions form *functional cycles* that regulate behavior, Uexküll anticipated central aspects of cybernetics. His thought was highly influential in ethology and ecology, and it inaugurated the field of biosemiotics.²² Today scholars in a wide range of fields read Uexküll, from cognitive science to animal studies and art theory.²³ Uexküll understood his work as an explicit continuation of Kant's account of the subject of experience, which he strove to deepen in terms of the role of the body for human subjectivity and amend by an account of animals as living subjects.²⁴

Uexküll's reception has been fraught with misreadings, many of which revolve around two questions:

Do *Umwelten* exist for individual animals or whole species?

Are *Umwelten* sets of elements selected from an objective material world, or are they mental constructions?

Since Uexküll, the term *Umwelt* has mostly been used to describe merely the set of all relevant elements in the environment of an animal, omitting Uexküll's central claim that each organism actively constructs its *Umwelt*.²⁵ Similarly, *Umwelt* is often used as if it concerns a whole species. Uexküll himself often wrote like this, especially in his early work *Umwelt und Innenwelt der Tiere*. Phrases like 'the *Umwelt* of a tick', refer to a kind of animal, not an individual, and this *Umwelt* is the environment of any and all ticks. Taken at face value, this reading is deflationary and omits the aspect of subjective

experience that is central for Uexküll's conception: Each living organism has its own *Umwelt*, hence there are as many worlds as there are living beings.

Each organism perceives only those stimuli which it is attuned to by the configuration of its sensory organs and nervous system. Some read this to involve merely the selection of a subset of all features of the physical environment. However, Uexküll claims that the *Umwelt* which a living subject perceives and acts on is the result of a semiotic process in which physical stimuli are converted by the nervous system into signs of location, time, and different qualities, which are then synthesized into objects and transposed outwards so as to enable the experience of a spatial world. This is the source for Fultot and Turvey's²⁶ misgivings, which are not unjustified. Uexküll's account of the subjective experience of animals is strongly grounded in Kant—albeit in an unorthodox way. Searching for the conditions of the possibility of perceiving three-dimensional space in the physiology of the semi-circular canals²⁷ would be quite alien to Kant, for whom space is a pure form of sensible intuition that we know *a priori*. For Kant, no empirical discovery about organic bodies can fully account for space, because our apperception of the bodies themselves is already spatial, thus the form has to be accounted for *before* any empirical discoveries can be made.²⁸ Uexküll may thus be too much of a Kantian for embodied cognition, but his thought is also too embodied for Kantian idealism.²⁹

The alternative that Fultot and Turvey present is attractive: Uexküll describes how the web of a spider forms a counterpoint with the body of the fly, even before they ever encounter each other. In order to explain the manifold ways in which complex structures and processes fit neatly into each other in nature, Uexküll invokes a picturesque metaphorical formation of melody, harmony, and symphony. The musical language sounds good to an ecological psychologist's ears, because they already work with a concept of resonance.³⁰ However, there are important aspects to keep in mind: Uexküll introduces the symphony of life to explain the appearance of design in nature without having to appeal to Darwinian evolution. Ecological psychology already has an account of how variation and natural selection lead to the attunement of organisms to specific affordances, and it is at least surprising to introduce a second account of meaning in nature that was originally meant to be an alternative explanation. Moreover, the musical metaphor is grounded in a thoroughly romanticist version of holism: Uexküll's central reference in *Bedeutungslehre*³¹ is to Goethe, whose work on morphology grounds this notion of an organization that realizes a meaningful plan according to a "biological archetype" and through a "process that is ideal rather than material."³² Beyond Goethe, Uexküll's musical theory of meaning also references Hans Driesch's neo-vitalist embryology.³³ For most of the 20th century, historians of science have largely shunned the influence of Kantianism, romanticism and vitalism on the morphogenesis of biology, based on the assumption that philosophies which clash with the hegemony of

analytical philosophy and reductive natural sciences can only have contributed negatively to the history of science. This dogma has been challenged and is beginning to crumble, opening up new areas of philosophical investigation that bear the potential for an actual philosophy of organismic life—a concern that has largely been crowded out by the identification of philosophy of biology with philosophy of evolutionary theory.

However, importing new concepts into the philosophy of cognitive science should be done with a full understanding of the assumptions that give them traction and the implications that go along with endorsing them. In the case of Uexküll, the history of his reception in France is particularly instructive, partly because Merleau-Ponty functions as its conceptual fulcrum and his thought is already firmly entrenched in the philosophy of embodied cognition. The most important figures in the francophone reception of Uexküll are Georges Canguilhem, Maurice Merleau-Ponty, and Gilles Deleuze. In the following sections we aim to show that their work often engages the same problems encountered by the ecological-enactive approach, that Uexküll's thought plays an important role at key junctures, and that the different philosophical perspectives of these thinkers allow us to reconceive existing theoretical problems in productive ways—but not without introducing new conceptual challenges of their own.

Georges Canguilhem and the Vital Normativity of *Umwelt*

As a philosopher of science and in particular through his critical analysis of medicine and biology, Georges Canguilhem had a deep influence on a whole generation of French intellectuals.³⁴ His conceptual history of *Umwelt* in “The Living and its Milieu”³⁵ introduced the term to a wide audience of francophone philosophers and his work on different forms of vitalism, organisms and machines, as well as his seminal work on pathology set the stage for the discussion in France of a range of topics that informed both Uexküll's own work and its subsequent developments in the work of other thinkers.

Canguilhem's reconceptualization of health and sickness in *The Normal and the Pathological*³⁶ advanced a trenchant critique of the dominant notions of pathology that classified individual organisms as pathological based on a numerical deviation from some preestablished norm defined by the average of a measured value. In contrast to this, Canguilhem developed a notion of health that is centered on the ability of the living organism to establish its own vital norms: “an organism's norm of life is furnished by the organism itself, contained in its existence.”³⁷ Vital norms are relations of meaning between the organism and its environment that determine the valence of perceived objects and events, as well as the cycles of action-perception that accord to them: “In this sense the organism is not thrown into an environment to which he must submit, but he structures his environment at the same time that he develops

his capacities as an organism.”³⁸ The setting of vital norms is not a conscious activity of the organism but a deeper, underlying mode of relating to itself and its environment that forms the basis of both experience and behavior. This process is the organism’s construction or enaction of its own *Umwelt*, and seen from this angle it appears to precede behavior and experience logically and/or temporally. However, there is in practice no abstract *Umwelt* that exists independently of action-perception, and the emergence of affordances in the subject’s experience is coupled in a circular manner with the organismic needs that precede it and the actions that resolve both the need and the valence of the object that is acted on.

Although the organism gives itself these vital norms, they are far from arbitrary. Instead, their form and content are constrained by the organism’s material environment and its metabolic needs. Pathology under this conception consists in the organism’s inability to set new vital norms for itself in accordance with a changed environment or a change in its own organization. This pathology is a kind of inflexibility, a rigidity of its vital norms that reduce the organism’s ability to adapt. Pathology is a reduction of the organism’s *Umwelt*. Health conversely consists in a greater range of possible vital norms that the organism can enact, an expansion of its *Umwelt*. An organism’s health and the richness of its *Umwelt* conform with the extent of its “needful freedom.”³⁹ The grounding of the phenomenal subject and the world it experiences in material organismic processes counters the charges of idealism that have been levelled against the strong Kantian version of *Umwelt* at least since Helmuth Plessner’s *Levels of Organic Life and the Human*⁴⁰ and against enactivism’s roots in autopoiesis.⁴¹ *Umwelten* are not the arbitrary mental inventions of abstract, disembodied subjects, they arise from the organismic activity of living organisms and are constrained by their metabolic needs and their material environment.

Canguilhem’s reception of Uexküll owes some of its potency to Kurt Goldstein’s discussion of *Umwelt* and pathology in *The Organism: A Holistic Approach to Biology Derived from Pathological Data in Man*.⁴² Indeed, Augustin Ostachuk deems it “probable that Canguilhem was first acquainted with Uexküll’s theories through Goldstein.”⁴³ Having treated many patients with nervous illnesses and deep trauma after the First World War, Goldstein was convinced that organismic health can only be assessed holistically, on the level of the living subject and its behavior in its environment. Despite his criticism of some aspects of Uexküll, Goldstein’s adoption of fundamental tenets of *Umwelt* thought proved critical for Uexküll’s reception by both Canguilhem and Merleau-Ponty. Importantly, Goldstein’s criticism of Uexküll is *not* that humans occupy a special position in (or outside of) nature that frees them from the constraints of *Umwelt*. This form of human exceptionalism was the common denominator of the reactions to Uexküll both in philosophical anthropology (most importantly Max Scheler and Helmuth Plessner) and its rival Martin Heidegger. In contrast, the French reception of

Uexküll by and large discussed the *Umwelten* of animals and humans on a continuum.⁴⁴ Canguilhem's emphasis on how an organism constitutes itself as a living subject and enacts its *Umwelt* at the same time wards off both charges of idealism and the temptation of making an exception for humans: Our cognition and behavior are aspects of our organismic activity just as they are for any other animal and the worlds of our experience arise from the same kind of material processes.

The two main take-aways for how *Umwelt* figures in contemporary debates at the interface of enactivism and ecological psychology are these: 1) an organism setting its own vital norms and enacting its *Umwelt* does not engender idealism and 2) there is no special exception for human animals and their *Umwelten*.

The Openness of *Umwelt* in Maurice Merleau-Ponty

Merleau-Ponty's phenomenological psychology is one of the most important sources for embodied cognition in general, and especially for enactivism.⁴⁵ Even though most of Merleau-Ponty's engagement with Uexküll takes place after his "ontological turn", references to the Estonian ethologist are already present in *The Structure of Behavior*.⁴⁶ But the influence of the *Umwelt* seems to reach even further back in the history of phenomenology. When Husserl develops his notion of *Lebenswelt* in his *Ideen zu einer reinen Phänomenologie und phänomenologischen Philosophie* (1913), he uses the term *Umwelt*.⁴⁷ Dermot Moran emphasizes the significance of "'the natural surrounding world' (*die natürliche Umwelt*), which eventually evolved into the notion of the 'life-world' (*Lebenswelt*) in Husserl's Freiburg era."⁴⁸ Although Moran suggests that this might show the influence of Uexküll on Husserl's thought, he does not investigate further. Similarly, Tønnessen et al. discuss Husserl's use of *Umwelt* as if it is identical with the Uexküllian concept, without making explicit arguments for this assumption.⁴⁹ This is a plausible assumption, but if it is true, it is also an important point about the history of phenomenology: Is this merely a strong conceptual affinity or did Uexküll's theory of animal experience significantly influence Husserl's inauguration of phenomenology as a philosophical program? The question cannot be answered here, but its importance is clear.

Throughout his writings, Merleau-Ponty's views are strongly influenced by Husserl, especially Husserl's distinction between *Körper* and *Leib*, and his concept of the *Ineinander*. In his later work, Merleau-Ponty moves from a phenomenological analysis of our conscious experience towards the development of an ontological account of nature, as being composed of what he called variably 'corporeality', 'flesh', or 'chiasm'.⁵⁰ His rethinking of the body is called a chiasm because it constitutes a "crossing-over [...] which combines subjective experience and objective existence" and highlights "the

ambiguous status of our bodies as both subject and object.”⁵¹ He thought that the “problems posed in [the *Phenomenology of Perception*] are insoluble because [he started] there from the ‘consciousness’-‘object’ distinction,”⁵² and attempted to bring the results of his earlier work to “ontological explication.”⁵³ Much of Merleau-Ponty’s late work is only available to us in the form of lecture transcripts, working notes, and unfinished manuscripts. However, the importance of Uexküll’s thought in it is clear. Indeed, his lectures include extensive comments on Uexküll’s writings. Especially the concept of *Umwelt* plays a crucial role in the discussion of “the subject-object question, the question of inter-subjectivity, the question of Nature.”⁵⁴

Throughout the “Working Notes” included in the texts published as *The Visible and the Invisible*, the openness of the *Umwelt* reappears like a refrain and is even offered as “[t]he true solution: *Offenheit of the Umwelt, Horizonhaftigkeit*. [sic]”⁵⁵.

It is the very structure of a horizon— but it is evident that this structure means nothing in the in itself— that it has meaning only in the *Umwelt* of a carnal subject, as *Offenheit*, as *Verborgenheit* of Being.⁵⁶

This use of *Umwelt* informs central aspects of Merleau-Ponty’s ontology: “This that-is-openness to things, with participation on their part, or which carries them in its circuit, is properly the flesh.”⁵⁷ The somewhat arcane formulations from the Working Notes are echoed more clearly in “Nature and Logos”: “We are not dealing here with two natures, [...] but with a double nature. The themes of the *Umwelt*, [...] of perception as true mobility (*Sichbewegen*), [...] all express the idea of corporeality as an entity with two faces or two ‘sides’. [...] The body proper embraces a philosophy of the flesh as the visibility of the invisible.”⁵⁸ It is worth pointing out that, decades later, Gibson mirrors Merleau-Ponty’s description in his initial discussion of what he calls ‘affordances’:

But, actually, an affordance is neither an objective property nor a subjective property; or it is both if you like. An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of the environment and a fact of behavior. It is both physical and psychical, yet neither. An affordance points both ways, to the environment and to the observer.⁵⁹

Just as Merleau-Ponty’s corporeality and Gibson’s affordances have double natures, Uexküll’s *Umwelt* also has two sides in its ethological and phenomenological facets. From the inside, it is the perspective of the subject experiencing its world, but from the outside it is the milieu of behavior observable by the scientist. “[T]his chiasm is the philosophical payoff of Merleau-Ponty’s interpretation of Uexküll’s work.”⁶⁰

At the end of his essay “Limits of Phenomenology,” Merleau-Ponty contrasts the view from nowhere with the embodied positionality of the phenomenal subject: When “I adopt the Copernican constitution of the world, I abandon my own standpoint, I pretend to be an absolute observer [...] and I come to consider the world as the pure object on an infinite reflection.”⁶¹ Merleau-Ponty contrasts to this the “type of being which our experience of the earth and the body reveals to us, [which] contains a philosophy of the world as *Offenheit der Umwelt*, in opposition to the ‘represented’ infinite of the classical sciences of nature.”⁶² The *Offenheit* of the *Umwelt* is non-finite, but at the same time is not infinite. Merleau-Ponty contrasts two notions of the non-finite: “*Offenheit* of the *Umwelt* and not *Unendlichkeit* [infinity] ----- [...] For me the infinity of Being that one can speak of is *operative*, militant finitude: the openness of the *Umwelt*.”⁶³ Just as Gibson’s work mirrors Merleau-Ponty’s discussion of the *Umwelt*, so too does Varela, Thompson, and Rosch’s recipe for enactivist cognitive science,⁶⁴ which must begin by rejecting the God’s-eye view of traditional scientific approaches, lest it fail to account for human experience.

In his excellent commentary on Merleau-Ponty’s use of Uexküll’s ideas, Pearson notes that:

Merleau-Ponty draws upon these revolutions in biology, as well as Uexküll’s work on the ethology of *Umwelten* which shows the extent to which the ‘environment’ is structured and mediated by the specific *Umwelt* of the organism, in order to dispel the idea that life is simply an ‘object’ for a ‘consciousness’. Such an insight, he claims, marks the point at which phenomenology breaks with idealism.⁶⁵

At this point the conceptual work necessary for an ecological-enactive approach to cognitive science overlaps with Merleau-Ponty’s project. If the nature of this break with idealism afforded by Merleau-Ponty’s discussion of the *Offenheit* of the *Umwelt* could be clarified and its logic rendered in the language of embodied cognition, it might take us some way towards reconciling ecological psychology and enactivist approaches in the cognitive sciences, both of which bear Merleau-Ponty’s influence. However, just as Merleau-Ponty’s late work is fragmentary and unfinished, our analysis so far only helps us to see what kind of conceptual work is necessary to ground an ecological-enactive paradigm—this work then still needs to be done.

Gilles Deleuze’s Spinozian-Uexküll harmony

After a long philosophical look at Baruch Spinoza (1632-1677) in his book *Spinoza: Practical Philosophy*, Gilles Deleuze (1925-1995) concludes: “*we are in the middle of Spinoza*.”⁶⁶ This claim needs unpacking. Deleuze refers to ‘we,’ as in all of us, moving in the *plane of immanence* (*plan d’immanence*). After

a Spinozian infused philosophy, we now must understand that our realities are shaped and continue in 'the middle' of an active world, and this 'world of immanence' should be the focus of any inquiries into life, giving up any false leads of transcendental philosophy. Indeed, the 'practical philosophy' of Spinoza will become the cornerstone of Deleuze's whole milieu, but not without invoking the work of Uexküll in that same text.

Before we get to Uexküll, it should be emphasized that Deleuze's treatment of Spinoza's 'practical philosophy' has gotten us in the middle of a bunch of Spinozian ideas concerning existence, nature, immanence, affect, mind and body parallelism, and more. It is as if Deleuze is *tuning* those instruments as a prelude to his own later philosophical enterprises – especially his collaborations with Félix Guattari (1930-1992). Furthermore, being in the middle of Spinoza is where Deleuze gets his nails for sealing the coffin of the Cartesian project. But an important methodological point should be realized here. While Deleuze does consider Spinoza the key thinker for his project, he does not create an orthodoxy of Spinozian ideas. Rather Deleuze's method is to use them as a set of openings for his own ideas to grow from. These ideas are like melodies which he recombines and builds into more complex harmonies. Deleuze builds a harmony of ideas by combining Spinoza and Uexküll into his description of experience in the world.

Deleuze's 'Spinoza moment' (or melody) is a key moment for his unravelling of the concept of experience. His Spinoza book is a dress rehearsal of thinking through Spinoza and, as he says, 'getting us in the middle.' Even if this thinking is far from the radical method and style of his collaboration with Félix Guattari in the two volume *Capitalism and Schizophrenia*, it is indeed the precursor to many points in the especially influential second volume, *A Thousand Plateaus*.

Deleuze's Uexküll moment perhaps offers a key to his thinking. While arriving at the end of the text, and seemingly an afterthought, Uexküll's work is cited and expanded upon by Deleuze in chapter six 'Spinoza and Us.'⁶⁷ In hindsight we now see this not as an afterthought, but as an opening – or a harmony added to his Spinozian melody. Furthermore, this Uexküll moment in *Spinoza: Practical Philosophy* is a few years later revisited in a very similar way in content and use in *A Thousand Plateaus*.⁶⁸ We should note that by the time of this second go round with Uexküll's work, Deleuze, now with Guattari, deploys those ideas within the context of his 'post-structuralist' (nomadologic and rhizomatic) project.

If at the end of the day Deleuze asks philosophy to work, to do, then we have an example of this not only in his putting to work of Spinoza, but in the same text in an encounter with Uexküll. These two thinkers form a harmony at the end of Deleuze's text on Spinoza that resonates in repetition when integrated into *A Thousand Plateaus*. Given the scope of this essay we will overemphasize Deleuze's integration of Uexküll's ideas into his

'Spinozian project', then see how the incorporation of Uexküll into his project leads to several new 'melodies' of thinking.

If Deleuze's project to rethink experience and the subject can be identified with anyone, it would be Spinoza. However, as we just noted, Uexküll should perhaps be elevated in our assessment of the Deleuzian / Deleuze-Guattarian project. As Felice Cimatti rightly notes: "...Deleuze and Guattari find in Uexküll the right tools to radically subvert Western metaphysics."⁶⁹ How does this integration of Spinozian ideas with Uexküll work? Let us start with Deleuze's important text on Spinoza, where he builds the case for 'being in the middle' of the Spinozian universe, and eventually add Uexküll, who completes the openings in theories of experience and the subject provided by Spinoza.

In *Spinoza: Practical Philosophy*, Deleuze argues that Spinozist ethics have "nothing to do with a morality" but constitute an ethology.⁷⁰ This view is developed by reading Spinoza through Uexküll and reading Uexküll through Spinoza. Like others before him, Deleuze affirms that Uexküll's ethological "approach is no less valid for us, for human beings, than for animals," but in radical departure from other readings of Uexküll, Deleuze uses the musical metaphor from *Bedeutungslehre* in order to mount an attack on the privileged place of the subject in our understanding of behavior.⁷¹ His reading of Uexküll as Spinozist takes the concept of *Umwelt* and follows it along a 'line of flight' to a place where it becomes other than itself. Remember that Deleuze is interested in the *Umwelt* as a biological world which bypasses the traditional subject-object or Cartesian divide. In addition, it helps explain what a body or organism *can do*. The plane of immanence is one of possibilities and this is the match he was looking for to describe his shaking of traditional western metaphysics.

More specifically Deleuze's 'line of flight' can be reconstructed thus: He moves from describing a single organism and its environment to the ways several organisms relate to each other: "It is no longer a matter of utilizations or captures, but of sociabilities and communities. How do individuals enter into composition with one another in order to form a higher individual, ad infinitum? How can a being take another being into its world, but while preserving or respecting the other's own relations and world?"⁷² These questions seem to offer two distinct, even contrary models of how organisms relate to each other. The latter is close to an orthodox view of *Umwelt* but amended by a notion of what we might call an 'ontologically respectful intersubjectivity.' The former presents unbridled organicism, with individuals being subsumed as mere parts into higher-level wholes in a series that only stops at Nature, "the fullest and most intense Individual."⁷³

Deleuze identifies this second step as the outcome of Uexküll's *Bedeutungslehre*: "Uexküll [...] is a Spinozist when first he defines the melodic lines or contrapuntal relations that correspond to each thing, and then

describes a symphony as an immanent higher unity."⁷⁴ It should be noted that this concept of a higher unity that assigns the individual organisms their place in an overarching structure of meaning is problematic when considered in light of Uexküll's organicist attack on liberal democracy in *Staatsbiologie* (1920), republished in 1933 under the Nazi regime, which implemented this "higher unity" in a deeply racist ethnic community and a totalitarian, genocidal state apparatus.⁷⁵

Leaving that aside, Deleuze affirms the primacy of what ecological psychology calls the animal-environment system in a language borrowed from Uexküll's musical metaphor and his adoption of Goethean morphology: "Every point has its counterpoints: the plant and the rain, the spider and the fly. So an animal, a thing, is never separable from its relations with the world."⁷⁶ This literary line of flight serves to move our thoughts to a new conception of *Umwelt* needed for Deleuze and Guattari's nomadological and rhizomatic project. That value here is to understand that Deleuze's Uexküll work with Spinoza creates a project which is connected to a contemporary dissolution of the Cartesian subject in embodied cognition.

Further evidence is visible in how Deleuze's Uexküll connects to Merleau-Ponty. Deleuze states: "The interior is only a selected exterior, and the exterior, a projected interior."⁷⁷ The way this statement is phrased is deeply related to both Uexküll and Merleau-Ponty. It echoes a point by Merleau-Ponty that has become a cornerstone of how enactivists conceive the animal-environment system: "The world is inseparable from the subject, but from a subject which is nothing but a project of the world, and the subject is inseparable from the world, but from a world which the subject itself projects."⁷⁸ The terms "selected" and "projected" take up the two main competing readings of Uexküll's *Umwelt* and link them in the form of a chiasm, a concept that takes on central importance in Merleau-Ponty's ontological work.

Returning to Deleuze's Spinozian-Uexküll harmony, we must state simply that putting Uexküll in the middle of Spinoza is an important development in Deleuze's thinking. It allows him to explore the biological plane of immanence (rather than transcendentalisms), overcome the subject-object Cartesian subject, and describe how bodies live and change in the world. This project's relation to embodied cognition comes from those trajectories and combinations which result in Deleuze proposing new descriptions of subjects and experience—establishing Uexküll as Spinozian, then making Uexküll Deleuzian. He does this by working out the importance of Uexküll's thought as an immanent philosophy, costing us any transcendent elements in philosophy. This creates new 'melodies' or variations from the fundamental ideas of a Spinozian-Uexküllian spine of thought.

Making Uexküll Deleuzian comes with consequences and compromises. The new ways to interpret Uexküll's ideas all relate back to Deleuze / Deleuze-Guattari's demand for immanence. As Deleuze puts it: "What is involved is no longer the affirmation of a single substance, but rather the laying out of a common plane of immanence on which all bodies, all minds, and all individuals are situated. This plane of immanence or consistency is a plan, but not in the sense of a mental design, a project, a program; it is a plan in the geometric sense: a section, an intersection, a diagram."⁷⁹ Or perhaps we can think of immanence as both a 'plan' and/or 'plane,' given the brilliant note regarding the translation from the French to English from Robert Hurley, the translator of Deleuze's Spinoza text, for situating the subject in experiences.

We will briefly look at three notions, or 'diagram' them, in order to see some ramifications for Deleuze's thought in the wake of Uexküll. First we will discuss an organicism that requires an immanent sense of existence (over transcendent qualities), then we will 'wade into autopoiesis', or the importance of immanent constructions of reality to configure how an organism 'maintains itself' in the plane of immanence, and finally suggest a post-phenomenological trajectory which triggers a 'phenomenological tick' when the subject is reconceived. These 'melodies' map nicely as starting points for seeing a deeper integration of, or better yet a 'transmutation', of Uexküll's ideas, making them Deleuzian.

What are the dangers of organicism and how does Deleuze deal with them? Organicism is a form of thinking that can lay a trap for transcendentalist thinking to re-emerge. The way Deleuze avoids the danger of organicism sliding into totalitarianism is through a differentiation between a transcendent and an immanent sense of the term *plan*. A transcendent plan gives genetic and structural guidance to the development of forms from the outside, such as "a design in the mind of a god, but also an evolution in the supposed depths of nature, or a society's organization of power."⁸⁰ In contrast, a plane of immanence is a "process of composition" that we perceive directly in "that which it makes perceptible to us." "There is no longer a subject, but only individuating affective states of an anonymous force."⁸¹ So Deleuze gets his new subject and plan/plane of immanence together with Uexküll's integration.

Deleuze's new subject generalizes the basis for ethological analysis: "A body can be anything; it can be an animal, a body of sounds, a mind or an idea; it can be a linguistic corpus, a social body, a collectivity."⁸² The individual organism is in danger not just of being swallowed by a totalitarian unity from above, but also of being dissolved into its component element and processes, into the "intensive states of an *anonymous force*."⁸³ Deleuze's plan/plane of immanence commences as the place for this new concept of subject. As Felice Cimatti states: "In order to avoid introducing any form of

transcendence into their onto-ethology, Deleuze and Guattari even give up on the unitary concept of ‘world,’ just as Uexküll teaches them to.”⁸⁴

One problem with this Deleuzian move is that Uexküll himself clearly relies on the transcendent sense of *Bauplan*—which in Uexküll’s case is not merely a morphogenetic blueprint, but something like a cosmic design schematic that informs all of life, including the ethology of organisms. When Deleuze writes that Goethe is not really a Spinozist because he “never ceased to link the plan to the organization of a Form and to the formation of a Subject,” it seems that Uexküll, outside of Deleuze’s idiosyncratic reading, has never done away with this link either.⁸⁵ The question then is how to develop an account of the organismic subject that opens it up to others without losing completely the specificity of the individual living subject and its experience as a level of analysis, which both ecological psychology and enactivism are grounded in.

Autopoiesis, or the description of how the processes making up a system interact to reproduce each other, regenerate their interrelations, and constitute the system as a material entity, is another possible link to Deleuze after Uexküll. As Cimatti confirms: “... the biologization of ontology means that any entity of the world is a body that is no longer taken into account as an ‘object’ of a certain type nor as a ‘thing’ that belongs to a specific abstract category. The body, each body, is nothing but its power to take part in connections with other bodies. In such an ontology, the ancient notion of ‘essence’ no longer plays any role.”⁸⁶ This network description matches directly with the Maturana & Varela hypothesis for *Autopoiesis and Cognition*.⁸⁷

However, Pearson already picked up on the potential links between Deleuze and enactivism twenty years ago. His observations and intuitions have turned out to be prescient insofar as some of the tensions he identifies between Deleuze’s view of organisms and the conception of autopoiesis developed by Varela and Maturana have since been resolved through the developments of enactivism.⁸⁸ Protevi likewise notes how Di Paolo’s emphasis on adaptivity closes part of the gap between original autopoiesis’ too static conception of the organism and Deleuze’s view of the organism as “that which life sets against itself in order to limit itself.”⁸⁹ We can conclude by giving credit to Deleuze for thoughts which are intimately related to autopoiesis, but without any more works from the thinker we have to see the eclipse of that trajectory by enactivism.

Deleuze can be called post-phenomenologist⁹⁰ precisely insofar as he decenters and dissolves the subject as the privileged locus of consciousness. As Cimatti corroborates: “Deleuze and Guattari generalize the case of the tick. The difference between the tick and humans, they argue, is not a difference based on their respective essences. It is rather a difference based on the capacity of passions only.”⁹¹ Perhaps we might say there is a ‘tick’ to

phenomenology when Deleuze introduced his new notion of the subject in experience. We have a different locus if one were to pursue a phenomenological investigation within the Deleuzian plane of immanence.

This creates a parallelism to some variants of 4E cognition and conversely raises the question of how those accounts that award no special importance to the organism over and above any other elements of a complex assemblage of processes, objects and entities are still able to provide an account of personal experience as it spans open the world of our every-day lives. "Deleuze contends that the 'opposition' between Bergson and phenomenology is a radical one in respect of the question of consciousness. [...] For Deleuze the nature of this opposition amounts to conceiving consciousness as immanent to matter, rather than bestowing upon it the privilege of a centered natural perception located in a subject."⁹² Conceived in explicit contrast to phenomenology, Deleuze shows a "concern to define a mode of philosophy that could think beyond the human condition."⁹³ The question for us is how far beyond the human this is. Uexküll's thought extends our view beyond the human towards all animals with nervous systems and, less explicitly, to all living beings. As Cimatti states: "In fact, the biological meaning is neither subjective nor objective, neither in the mind nor in the world. It cannot even be any of the two. Sensations are not internal signs of the objects of the world."⁹⁴ There seems to be a danger of expanding our account of mental phenomena so far that nothing can be excluded from this category in a principled way anymore.

In these integrated uses of Uexküll's thinking we get an application of ideas that Deleuze / Deleuze-Guattari sought in their philosophy. As Cimatti states: "Deleuze and Guattari do not simply read Uexküll as a biologist, but they fully grasp the wider ontological implications of his approach. According to them, biology is much more than the science of living organisms. What Deleuze and Guattari see in biology is a way to redefine ontology as a generalized ethology."⁹⁵ In this ethology we have successfully disintegrated the subject-object distinction and allowed for the assemblages to form without subjectivities, or human anthropocentric formations to infect this new non-subjective description of life in the world. The symphonies of nature are 'planned' or 'plane-d' with the melodies of immanence and the harmonies of interactions. "Whereas Uexküll gives us a biological theory of life, Deleuze and Guattari develop it and transform it into an onto-ethological theory of reality. In other words, they extend Uexküll's theory of biological 'meaning' to the entire reality, be it natural or artificial. In this sense, they chase Uexküll's original goal even more faithfully than him."⁹⁶ *Umwelt* then, was not simply a concept used by Deleuze / Deleuze-Guattari, but absorbed into the application of their thinking to redefine experience in general and formulated anew as a philosophy of immanence from which we can proceed into new realms of being 'animals' without transcendent baggage of 'human-ness.'

Uexküll in France and the Enactive-Ecological Approach

We have seen that there is a rich history of Uexküll reception within French philosophy and its engagements with living beings and their experience. On the topic of subjective experience, these discussions often orbit around phenomenology, sometimes approaching or even transgressing the limits of what can be called phenomenology, or what can be called a subject. Canguilhem, Merleau-Ponty, and Deleuze share a fascination with Uexküll's thought and deploy his concept of *Umwelt* in related ways to explore the experience of living beings. At the same time, their readings of Uexküll remain clearly distinct, and their relationships to phenomenology are quite different from each other. Canguilhem and Merleau-Ponty use Uexküll to think about the nature of life and mind, but according to Foucault do so from two sides of a separating line: "It is the line that separates a philosophy of experience, of sense and of subject and a philosophy of knowledge, of rationality and of concept. On the one hand, one network is that of Sartre and Merleau-Ponty; and then another is that of Cavailles, Bachelard and Canguilhem."⁹⁷ Deleuze's reception of Uexküll is strongly shaped by his reading of Spinoza, which can be understood as part of a larger conflict between French 20th century Spinozism and phenomenology.⁹⁸ Yet despite their different approaches to the study of experience, they each find in Uexküll's concept of *Umwelt* an important resource for their thought.

We can draw a valuable lesson from the heterogeneity of Uexküll's reception in France: The concept of *Umwelt* can be deployed in different ways that modulate the ways it functions in different systems of thought. This unusual degree in conceptual plasticity is both a challenge and a chance for the ecological-enactive approach. It is crucial to be explicit and precise about the exact philosophical commitments that any specific application of *Umwelt* entails. On the other hand, it is possible to use *Umwelt* in different ways that make it amenable to a variety of different philosophical projects. For the ecological-enactive approach, it is particularly interesting to note the ways in which Uexküll's thought is employed at crucial junctures to ward off dangers and enemies: *Umwelt* helps us defend—with Canguilhem and Merleau-Ponty—against idealism and human exceptionalism. At the same time, we also have to be on guard—with Deleuze—against Uexküll himself and the totalitarian threat of organicism mutating into a political and social nightmare.

To the degree that this epithet is justified, the French Uexküllians discussed here all grapple with the question of how to think about the living at the intersection of philosophy and the natural sciences. Like in Uexküll's work, philosophical concepts rooted in German idealist and romanticist thought often do the work of synthesizing scientific accounts of various biological phenomena and filling in some of the gaps. The project of aligning the enactive and ecological approaches within the philosophy of embodied

cognition is remarkably similar in some ways, but contains an added challenge: Uexküll's central notions are drawn not just from a kind of Kantian constructivism, but also from Goethe's *Naturphilosophie* and neo-vitalism, and especially the latter two are not immediately compatible with the existing paradigm(s) or episteme(s) of cognitive science. They are not merely marginal, but are not even available positions: both cognitivist orthodoxy and the variety embodied approaches challenging it are united in excluding them from the discussion.

The way to deal with this situation productively is first to stop treating the historical role of philosophy in biological thought as something shameful, but as a central and productive force of its development.⁹⁹ Vitalists did not suffer from some personal weakness for esotericism or an emotional inability to stomach the sober truth of materialism. Their reductionist contemporaries—more respectable as scientists to our historical gaze—often had real problems explaining certain phenomena of life, and their heirs still have them today. Canguilhem and Merleau-Ponty were both very interested in, and sympathetic towards, vitalism and their fascination with Uexküll's work was not unrelated to this. Once we stop treating the role of philosophy in the history of science as a series of youthful indiscretions, we can also begin to look for more naturalistic modern solutions to the same problems. The enactivist project of replacing Kant's *Naturzwecke* as a regulative ideal with a naturalistic account of organismic teleology is a good example of this kind of task. While the most popular accounts in philosophy of biology explain the appearance of purposive behavior by appeal to an organism's evolutionary history¹⁰⁰, enactivists grapple with the challenge of Kant's third *Critique* and seek to explain the emergence of immanent teleology from the complex dynamics of organismic closure.¹⁰¹

Performing a similar move for the concept of *Umwelt* could yield a new conception of environment that does the same philosophical job while also being compatible with the scientific ontologies of both ecological psychology and enactivism. To some degree, recent engagement with *Umwelt* by both ecological psychologists¹⁰² and enactivists¹⁰³ constitutes the beginning of this project. However, the role that Uexküll's thought plays in both approaches is still sometimes problematic and will require further development.¹⁰⁴ When Di Paolo states that "Umwelten have open horizons",¹⁰⁵ it is not quite clear how this enactivist reading meshes with Uexküll's own account. In a section devoted to the horizon, or "farthest plane"¹⁰⁶, Uexküll emphasizes how the horizon of each animal forms its *Umwelt* as a "soap bubble around them, closed on all sides, which closes off their visual space and in which everything visible for the subject is also enclosed"¹⁰⁷. Uexküll clearly speaks of closure, where Di Paolo and Merleau-Ponty speak of openness. For Di Paolo, *Umwelt* is open because it is "self-contradictory as well as unified", while Merleau-Ponty describes the openness of *Umwelt* as a "militant finitude"¹⁰⁸ in an equally contradictory manner. If contradiction is meant to function here in the

dialectical sense as part of an explanation, it will have to be embedded more firmly in the general account of dialectics as a method of cognitive science that is starting to take shape.¹⁰⁹

Like *Umwelt*, the musical theory of meaning that Uexküll outlined in *Bedeutungslehre* poses conceptual problems when we try to introduce it into the philosophy of embodied cognition¹¹⁰—and these problems are already familiar from the French reception of Uexküll. In his discussion of Merleau-Ponty's later work, Buchanan asks: "how can the cohesive relation, this 'prelogical bond' between living bodies and things, not be implicated in an organic or vitalist model that presupposes an all-encompassing unity that Merleau-Ponty ultimately does not wish to uphold?"¹¹¹ This is precisely the question that we need to ask when Turvey and Fultot employ Uexküll's *Bedeutungslehre*, so heavily inundated with Goethean holism, to characterize the meaningful fit in the relationships between animals and their environments in the ecological approach. Fultot and Turvey think that they can avoid these implications and Buchanan thinks the same of Merleau-Ponty's use of Uexküll's musical metaphor of meaning: "melody seems to swell up through living beings without any voluntary or determinist implications, nor [...] a higher reality [...] associated with pantheism or *Naturphilosophie*."¹¹² But it is not obvious how an Uexküllian account would function once it is shorn of its romanticist, holist, and vitalist underpinnings.

Interestingly, Shaun Gallagher has suggested that "enactivism involves not only a rethinking of the nature of mind and brain, but also a rethinking of the concept of nature itself."¹¹³ This is part of Gallagher's reading of enactivism as a philosophy of nature more than a scientific research project, a discussion in which holism also plays an important role. Holism is a problem for conducting experiments, but "in the context of a philosophy of nature meant to offer an encompassing view, holism is a strength rather than a practical complication."¹¹⁴ It will be interesting to see how the development of an ecological-enactive approach deals with this task of rethinking the concept of nature in a holistic manner. Enactivism has incorporated a sincere interest in continental philosophy from its beginnings and is continuously broadening the scope of its search for philosophical allies. In this, enactivism seems to parallel the realization in biophilosophy that we will not understand nature by limiting our investigation to one single, narrow way of doing philosophy.¹¹⁵ Along with a wider philosophical toolbox, these developments in the philosophy of embodied cognition also create the need for a careful translation of concepts between different domains.

Part of this work involves clarifying what exactly the philosophical role of *Umwelt* has been historically, and what it can be in the present debates within embodied cognition. We hope that this analysis of Uexküll's reception in France provides useful starting points for more research on the place of *Umwelt* at the intersection between biology, psychology, and phenomenology. Rather than provide simple answers, the intricate

connections we have begun to trace deepen our appreciation for the complexity of the problem, just as they provide us with new resources to address our challenge. If our analysis so far fails to yield ready-made recipes for applying one or another concept from continental philosophy to cognitive science, this is in accord with our conviction that the relocation of a concept from one philosophical milieu to another is a delicate process and requires slow and careful work to succeed. Just as Merleau-Ponty's late work remains unfinished, important conceptual work here still remains to be done.

In its search for a unified philosophical framework, the ecological-inactive approach encounters the same situation that Canguilhem, Merleau-Ponty, and Deleuze grappled with: The questions of what life and mind are reveal themselves to be deeply intertwined with the question of what the world is. It is here that Uexküll's thought is most useful to us today—not by providing answers, but by allowing us to address traditional philosophical problems in slightly different ways. With Uexküll we go on forays into the conceptual landscape, straying off the well-worn paths of inquiry to look for novel and strange questions in the underbrush.

¹ Edward Baggs and Anthony Chemero, "The Third Sense of Environment," *PsyArXiv* (2018). Edward Baggs and Anthony Chemero, "Radical embodiment in two directions," *Synthese* (2019).

² Martin Fultot and Michael Turvey, "Von Uexküll's Theory of Meaning and Gibson's Organism-Environment Reciprocity," *Ecological Psychology*, 31(4) (2019) : 289-315; Tim Elmo Feiten, "Mind after Uexküll: A Foray Into the Worlds of Ecological Psychologists and Enactivists," *Frontiers in Psychology* (2020).

³ Ezequiel A. Di Paolo, Elena Clare Cuffari, and Hanne De Jaegher, *Linguistic Bodies* (Cambridge, MA: The MIT Press, 2018). Emilien Derecienne, "Simondon and enaction: the articulation of life, subjectivity, and technics," *Adaptive Behavior* (2019). *The Embodied Mind* already uses continental philosophy to inform enactive cognitive science, exploring or suggesting links to a wide range of thinkers from Heidegger and Gadamer to Foucault. Francisco Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind* (Cambridge, MA: The MIT Press, 1991).

⁴ We are grateful to Nuhu Osman Attah and to two anonymous reviewers for their helpful comments. Their feedback improved our paper and any remaining shortcomings are our own.

⁵ Anthony Chemero, *Radical Embodied Cognitive Science* (Cambridge, MA: The MIT Press, 2009). Erik Rietveld, Damiaan Denys, and Maarten Van Westen, “Ecological-Enactive Cognition as engaging with a field of relevant affordances: The Skilled Intentionality Framework (SIF),” in *The Oxford Handbook of 4E Cognition*, eds. Albert Newen, Leon De Bruin, and Shaun Gallagher (Oxford: Oxford University Press, 2018).

⁶ James J. Gibson, *The Ecological Approach to Visual Perception* (Boston, MA: Houghton-Mifflin, 1979). Michael T. Turvey, Robert E. Shaw, Edward S. Reed, and William M. Mace, “Ecological laws of perceiving and acting: In reply to Fodor and Pylyshyn,” *Cognition*, 9(3) (1981): 237-304.

⁷ Chemero, *Radical Embodied Cognitive Science*.

⁸ Manuel Heras-Escribano, *The Philosophy of Affordances* (Cham, Switzerland: Palgrave Macmillan, 2019). Miguel Segundo-Ortin, Manuel Heras-Escribano, and Vicente Raja, “Ecological psychology is radical enough: A reply to radical enactivists,” *Philosophical Psychology*, 32(7) (2019): 1001-1023.

⁹ Gibson, *The Ecological Approach to Visual Perception*.

¹⁰ Varela, Thompson, and Rosch, *The Embodied Mind*. Evan Thompson, *Mind in Life: Biology, Phenomenology, and the Sciences of Mind* (Cambridge, MA: Harvard University Press, 2007).

¹¹ Francisco Varela and Humberto Maturana, *Autopoiesis and Cognition: The Realization of the Living* (Dordrecht: D. Reidel, 1980).

¹² Immanuel Kant, *Critique of Judgement*, trans. Werner Pluhar (Indianapolis, IN: Hackett, 1987).

¹³ Di Paolo, De Jaegher, and Cuffari, *Linguistic Bodies*, 99.

¹⁴ Rod Swenson, “Autocatakinetics, yes—autopoiesis, no: Steps towards a unified theory of evolutionary ordering,” *International Journal of General Systems*, 21(2) (1992): 207-228.

¹⁵ Ezequiel A. Di Paolo, Thomas Buhrmann, and Xabier E. Barandiaran, *Sensorimotor Life: An Enactive Proposal* (Oxford: Oxford University Press, 2017).

¹⁶ Swenson, “Autocatakinetics, yes—autopoiesis, no.”

¹⁷ Varela, Thompson, and Rosch, *The Embodied Mind*.

¹⁸ Baggs and Chemero, “Radical embodiment in two directions,” 11. See also Rietveld, Denys, and Van Westen, “Ecological-Enactive Cognition as engaging with a field of relevant affordances.”

- ¹⁹ Fultot and Turvey, “Von Uexküll’s Theory of Meaning and Gibson’s Organism-Environment Reciprocity,” 289-315.
- ²⁰ Gibson, *The Ecological Approach to Visual Perception*.
- ²¹ Jakob von Uexküll, *A Foray into the Worlds of Animals and Humans with A Theory of Meaning* (Minneapolis: University of Minnesota Press, 2010).
- ²² Amrine, Frederick, “The Music of the Organism: Uexküll, Merleau-Ponty, Zuckerkandl, and Deleuze as Goethean Ecologists in Search of a New Paradigm,” *Goethe Yearbook XXII* (2015): 47.
- ²³ Simon Penny, *Making Sense Cognition, Computing, Art, and Embodiment* (Cambridge, MA: The MIT Press, 2017).
- ²⁴ Jakob von Uexküll, *Theoretical Biology* (New York: Harcourt, Brace & Company, Inc., 1926), xv.
- ²⁵ Florian Mildenerberger and Bernd Herrmann, “Nachwort,” in *Uexküll, Klassische Texte der Wissenschaft*, eds. Florian Mildenerberger & Bernd Herrmann (Heidelberg: Springer, 2014), 264-5.
- ²⁶ Fultot and Turvey, “Von Uexküll’s Theory of Meaning and Gibson’s Organism-Environment Reciprocity.”
- ²⁷ von Uexküll, *A Foray*, 54-56; Jakob von Uexküll, *Bausteine zu einer biologischen Weltanschauung* (München: F. Bruckmann A.-G., 1913), 284-287.
- ²⁸ This is a rough simplification. An adequate discussion of Uexküll’s relationship to Kant would go far beyond the scope of this paper.
- ²⁹ Rudolf Langthaler, *Organismus und Umwelt: Die biologische Umweltlehre im Spiegel traditioneller Naturphilosophie* (Hildesheim: Georg Olms Verlag, 1992), 232-234.
- ³⁰ Vicente Raja, “A Theory of Resonance: Towards an Ecological Cognitive Architecture,” *Minds and Machines* 28, no. 1 (2018): 29-51.
- ³¹ von Uexküll, *A Foray*.
- ³² Amrine, “The Music of the Organism,” 50.
- ³³ von Uexküll, *A Foray*, 194.
- ³⁴ Michel Foucault, “Introduction,” in *The Normal and the Pathological*, Georges Canguilhem (New York: Zone Books, 1991), 7-24.
- ³⁵ Georges Canguilhem, “The Living and Its Milieu” in *Knowledge of Life* (New York: Fordham University Press, 2008), 98-120.
- ³⁶ Georges Canguilhem, *The Normal and the Pathological* (New York: Zone Books, 1991).
- ³⁷ Canguilhem, *The Normal and the Pathological*, 258.
- ³⁸ Canguilhem, *The Normal and the Pathological*, 284.

- ³⁹ Hans Jonas, *The Phenomenon of Life: Towards a Philosophical Biology* (Evanston, IL: Northwestern University Press, 2001), 80.
- ⁴⁰ Helmuth Plessner, *Levels of Organic Life and the Human: An Introduction to Philosophical Anthropology*, trans. Millay Hyatt (New York: Fordham University Press, 2019).
- ⁴¹ See Rod Swenson and Michael Turvey, “Thermodynamic reasons for perception-action cycles,” *Ecological Psychology*, 3(4) (1991): 317-348.
- ⁴² Kurt Goldstein, *The Organism: A Holistic Approach to Biology Derived from Pathological Data in Man* (New York: Zone Books, 1995).
- ⁴³ Augustin Ostachuk, “The organism and its Umwelt: A counterpoint between the theories of Uexküll, Goldstein, and Canguilhem,” in *Jakob von Uexküll and Philosophy: Life, Environments, Anthropology*, eds. Francesca Michelini & Kristian Köchy (New York: Routledge, 2019), 158.
- ⁴⁴ See also Carlo Brentari, *Jakob von Uexküll: The Discovery of the Umwelt between Biosemiotics and Theoretical Biology* (Dordrecht: Springer, 2015), 207-217.
- ⁴⁵ George Lakoff and Mark Johnson, *Philosophy in the Flesh* (New York: Basic Books, 1999). Varela, Thompson & Rosch, *The Embodied Mind*.
- ⁴⁶ Mark B. N. Hansen, “The Embryology of the (In)visible,” in *The Cambridge Companion to Merleau-Ponty*, eds. Taylor Carman and Mark B. N. Hansen (Cambridge: Cambridge University Press, 2005), 231. See also Brett Buchanan, *Onto-Ethologies: The Animal Environments of Uexküll, Heidegger, Merleau-Ponty, and Deleuze* (Albany, NY: State University of New York Press, 2008).
- ⁴⁷ In the second volume, Husserl writes: “As person, I am what I am (and each other person is what he is) as *subject of a surrounding world*”, using the term *Umwelt* in the German original. Edmund Husserl, *Ideas pertaining to a pure phenomenology and to a phenomenological philosophy: Second book*, Vol. 3 of the *Collected Works* (Dordrecht: Kluwer Academic Publishing: 1989), 195.
- ⁴⁸ Dermot Moran, “From the Natural Attitude to the Life-World,” in *Husserl’s Ideen*, eds. Lester Embree and Thomas Nenon (New York, NY: Springer, 2013), 111.
- ⁴⁹ Morten Tønnessen, Timo Maran, and Alexei Sharov, “Phenomenology and Biosemiotics,” *Biosemiotics* 11 (2018): 323-330.
- ⁵⁰ The following discussion is indebted to Buchanan’s discussion of Merleau-Ponty’s relationship to Uexküll.
- ⁵¹ Thomas Baldwin, “Introduction,” in *Maurice Merleau-Ponty: Basic Writings*, ed. Thomas Baldwin (New York: Routledge, 2004), 247-248.
- ⁵² Maurice Merleau-Ponty, *The Visible and the Invisible* (Evanston, IL: Northwestern University Press, 1968). See also Buchanan, *Onto-Ethologies*, 117.

- ⁵³ Merleau-Ponty, *The Visible and the Invisible*, 183.
- ⁵⁴ Merleau-Ponty, *The Visible and the Invisible*, 165.
- ⁵⁵ Merleau-Ponty, *The Visible and the Invisible*, 196.
- ⁵⁶ Merleau-Ponty, *The Visible and the Invisible*, 185.
- ⁵⁷ Maurice Merleau-Ponty, *Nature: Course Notes from the Collège de France* (Evanston, IL: Northwestern University Press, 2003), 223.
- ⁵⁸ Maurice Merleau-Ponty, "Nature and Logos," in *In Praise of Philosophy and Other Essays* (Evanston, IL: Northwestern University Press, 1988), 197.
- ⁵⁹ Gibson, *The Ecological Approach to Visual Perception*, 121.
- ⁶⁰ Hansen quoted in Buchanan, *Onto-Ethologies*, 133.
- ⁶¹ Maurice Merleau-Ponty, "Limits of Phenomenology" in *In Praise of Philosophy and Other Essays* (Evanston, IL: Northwestern University Press, 1988), 190.
- ⁶² Merleau-Ponty, "Limits of Phenomenology," 190-191.
- ⁶³ Merleau-Ponty, *The Visible and the Invisible*, 251.
- ⁶⁴ Varela, Thompson & Rosch, *The Embodied Mind*.
- ⁶⁵ Keith Ansell Pearson, *Germinal Life: The Difference and Repetition of Deleuze* (London: Routledge, 1999), 72.
- ⁶⁶ Gilles Deleuze, *Spinoza: Practical Philosophy* (San Francisco: City Lights Books, 1988), 122.
- ⁶⁷ Deleuze, *Spinoza*, 122.
- ⁶⁸ One will note after reading chapter six 'Spinoza and Us' of *Spinoza: Practical Philosophy*, and then *A Thousand Plateaus'* relevant sections concerning Uexküll's ideas, it is almost the same treatment.
- ⁶⁹ Felice Cimatti, "From ontology to ethology: Uexküll and Deleuze and Guattari" in *Jakob von Uexküll and Philosophy: Life, Environments, Anthropology*, eds. Francesca Michelini & Kristian Köchy (New York: Routledge, 2019), 184.
- ⁷⁰ Deleuze, *Spinoza*, 125.
- ⁷¹ Deleuze, *Spinoza*, 125.
- ⁷² Deleuze, *Spinoza*, 125.
- ⁷³ Deleuze, *Spinoza*, 126.
- ⁷⁴ Deleuze, *Spinoza*, 126.
- ⁷⁵ Jakob von Uexküll, *Staatsbiologie* (Hamburg: Hanseatische Verlagsanstalt, 1933).
- ⁷⁶ Deleuze, *Spinoza*, 125.
- ⁷⁷ Deleuze, *Spinoza*, 125.
- ⁷⁸ Maurice Merleau-Ponty, *Phenomenology of Perception* (New York: Routledge, 2002), 499-500.
- ⁷⁹ Deleuze, *Spinoza*, 122.

- ⁸⁰ Deleuze, *Spinoza*, 128.
- ⁸¹ Deleuze, *Spinoza*, 128.
- ⁸² Deleuze, *Spinoza*, 127.
- ⁸³ Deleuze, *Spinoza*, 127.
- ⁸⁴ Cimatti, "From ontology to ethology," 181.
- ⁸⁵ Deleuze, *Spinoza*, 129-130.
- ⁸⁶ Cimatti, "From ontology to ethology," 177.
- ⁸⁷ Varela and Maturana, *Autopoiesis and Cognition*.
- ⁸⁸ Pearson, *Germinal Life*.
- ⁸⁹ John Protevi, "Larval Subjects, Autonomous Systems and E. Coli Chemotaxis" in *Deleuze and the Body*, eds. Laura Guillaume and Joe Hughes (Edinburgh: Edinburgh University Press: 2011), 41.
- ⁹⁰ Eric Alliez quoted in Pearson, *Germinal Life*, 70.
- ⁹¹ Cimatti, "From ontology to ethology," 179.
- ⁹² Pearson, *Germinal Life*, 70.
- ⁹³ Pearson, *Germinal Life*, 71.
- ⁹⁴ Cimatti, "From ontology to ethology," 182.
- ⁹⁵ Cimatti, "From ontology to ethology," 178.
- ⁹⁶ Cimatti, "From ontology to ethology," 182.
- ⁹⁷ Foucault, "Introduction," 8.
- ⁹⁸ Tracie Matysik, "Writing the history of Spinozism," *History and Theory*, 55(3) (2016): 401-417.
- ⁹⁹ Timothy Lenoir, *The Strategy of Life: Teleology and Mechanics in Nineteenth-Century German Biology* (University of Chicago Press: 1982); John H. Zammito, *The Gestation of German Biology: Philosophy and Physiology from Stahl to Schelling* (University of Chicago Press: 2018).
- ¹⁰⁰ Ruth G. Millikan, *Language, thought, and other biological categories: New foundations for realism* (Cambridge, MA: The MIT Press, 1984).
- ¹⁰¹ Andreas Weber & Francisco J. Varela, "Life after Kant: Natural purposes and the autopoietic foundations of biological individuality," *Phenomenology and the Cognitive Sciences*, 1 (2002): 97-125. Di Paolo, De Jaegher, and Cuffari, *Linguistic Bodies*, 32-35.
- ¹⁰² Fultot and Turvey, "Von Uexküll's Theory of Meaning and Gibson's Organism-Environment Reciprocity."
- ¹⁰³ Ezequiel A. Di Paolo, "Afterword: A future for Jakob von Uexküll," in *Jakob von Uexküll and Philosophy: Life, Environments, Anthropology*, eds. Francesca Micheline & Kristian Köchy (New York: Routledge, 2019), 252-256.

¹⁰⁴ Feiten, “Mind after Uexküll.”

¹⁰⁵ Di Paolo, “Afterword,” 254.

¹⁰⁶ von Uexküll, *A Foray*, 63.

¹⁰⁷ von Uexküll, *A Foray*, 69.

¹⁰⁸ Merleau-Ponty, *The Visible and the Invisible*, 251.

¹⁰⁹ Di Paolo, De Jaegher, and Cuffari, *Linguistic Bodies*, 99.

¹¹⁰ Feiten, “Mind after Uexküll.”

¹¹¹ Buchanan, *Onto-Ethologies*, 132.

¹¹² Buchanan, *Onto-Ethologies*, 137.

¹¹³ Shaun Gallagher, *Enactivist Interventions: Rethinking the Mind* (Oxford: Oxford University Press, 2017), 126.

¹¹⁴ Gallagher, *Enactivist Interventions*, 23.

¹¹⁵ Spyridon A. Koutroufinis, *Organismus als Prozess: Begründung einer neuen Biophilosophie* (Freiburg, Karl Alber: 2019).