CHAPTER 8

Enacting Environments: From Umwelts to Institutions

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1   INTRODUCTION

What we know is enabled and constrained by what we are. I know a very different world from that of a butterfly even though we both live in the "same" world. The butterfly perceives what is of value to it: what it can eat, the places it can land, and the dangers it must evade. And, almost all of these are different from the aspects of the world that show up to me as meaningful. While we share a world, in some sense our environments are different. These observations may seem trivial but in fact they can serve to unpack a sharp divergence in approaches to understanding perception and cognition in the philosophy of cognitive science. On the one hand, there is a dominant approach which takes perception to be the representation of an external world and cognition to be the manipulation of those representations. And, on the other, there are more recent embodied, embedded, enactive, and extended approaches in which perception and cognition are taken to be activities or processes which organisms enact in relation to the world. On this model an animal's body plays a non-trivial role in the

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activities of perceiving and cognising by relating it to aspects of the world that are relevant to it. Moreover, this activity of the body in relation to the world is the enactment of an environment for the animal, an environment that is different from one animal to the next, and which—as we will see— can scaffold us from simple responses to stimuli to cultural creations. The purpose of this chapter is to give a brief introduction to some of the key ways in which cognition is taken to be world-involving on this second approach, ways that I believe will resonate with non-western thought.

There is a natural fit between embodied, embedded, enactive, and extended ("4E") approaches to philosophy and cognitive science with some of the ways of thinking pervasive in some non-Western philosophical traditions. We can see that this is not a coincidence if we look at the intellectual backgrounds of and influences on some of the key researchers in 4E philosophy and cognitive science. For example, Varela, Thompson, and Rosch's book *The Embodied Mind* (Varela et al. 1991/2017), which introduced enactivism to the philosophy and cognitive science communities, is probably one of the most influential books to bring cognitive science into dialogue with Buddhist philosophy (in particular). Evan Thompson studied Asian Philosophy (including Chinese Philosophy) before training in Philosophy of Mind and Cognitive Science (and continues to work on Buddhism[1]). Francisco Varela was also influenced by Chinese Philosophy, which can be seen explicitly in his book *Ethical Know-How: Action, Wisdom, and Cognition* (Varela 1992/1999). It is therefore unsurprising that we see resonances between enactivism and Chinese Philosophy. In addition, much of the other work in 4E philosophy, even if it does not explicitly identify as enactivism, is inspired by or influenced by *The Embodied Mind* and/or Heideggerian ideas which themselves take inspiration from Classical Chinese and Japanese Philosophy.

Researchers in 4E philosophy of mind and cognitive science tend to understand cognitive and social phenomena as relational, dynamic processes and have a deep appreciation for the subtlety of complex systems. This results in explanations of perceptual and cognitive phenomena that breach the boundaries of skin and skull, explanations that are "extended".[2]

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[1] See, for example, Thompson (2014).

[2] Not all of the "Es" in 4E cognition are necessarily consistent with each other so it is not the case that "extended mind" proponents are necessarily enactivists or vice versa (for some discussions of this, see (Thompson and Stapleton 2009); (Ward and Stapleton 2012); (Ward et al. 2017). Nevertheless, the term "4E" or "4EA" (where "A" stands for "Affective") serves to capture a general category of approaches that take an attitude of openness to inves-

Increasingly, philosophers of mind and cognition are now returning to non-Western traditions to see examples-in-action of philosophising in which there is no default assumption of a strong subject-world divide or that the individual is separate from, and ontologically and ethically prior to, culture and society.[3] These are assumptions which pervade "Western" philosophy and against which researchers within the various embodied, embedded, extended, and enactive approaches have been reacting with their criticisms of orthodox analytic philosophy of mind and cognitive science. Part of this project (if we can generalise such a diverse collection of researchers as having a "project") is exactly to cash out how we might understand cognition if we do not start from these default Cartesian and individualist assumptions. In this chapter, I will introduce a collection of concepts and ideas that are routinely drawn upon by researchers in this tradition in their various attempts to do this. Approaching this task from a bottom-up perspective, I also try to show how these concepts that are drawn from sometimes very disparate lineages can coherently be seen to interconnect and build on each other. The result of this is a world view in which cognition is not an internal process of an individual who is seen as separate from the world that it lives in and acts on. Rather, it is the activity of an organism deeply embedded in relations with the physical, interpersonal, and cultural world. A world view that has strong resonances with the thinking underpinning much of Classical Chinese Philosophy.

2   Cognition as World-Involving Rather Than World-Representing

Traditional cognitive science and analytic philosophy of mind is "internalist" in the sense that it presumes that all of the important computational crunching that makes up cognition is taken to be going on inside the head. On this model, our butterfly perceives the world by representing the leaves, the nectar, and the bird in its tiny mind even if not "as" leaves/

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tigating the important roles that body, action, and world variously play in our perception and cognition. It is this broad sense that I am using the term "extended" to capture. This is consistent with the way it has come to be used in the cognitive sciences outwith the metaphysics of mind debates.

[3] For an example of the 4E approach being unpacked in respect to Confucian philosophy, see (Ott 2017). For examples of papers putting Japanese Philosophy into dialogue with themes and issues prevalent in 4E philosophy of mind and cognition, see (Krueger 2013, 2020) and (McKinney 2020).

nectar/bird but merely as rest/food/threat. If we attribute to the butterfly any cognitive capacity rather than mere stimulus–response mechanisms, then this cognitive capacity consists in computations over these representations along the lines of [threat+near=fly now] or [food+hunger=fly towards]. This approach might seem to be a simple and plausible mechanism for perception and cognition. And we can certainly build highly complex representational/computational models of many functions that are deemed "cognitive" as many successes in Artificial Intelligence research are testament to. However, it can be criticised for being biologically implausible, for failing to incorporate genuine value for the system, and for failing to enable flexible, adaptive behaviours in different contexts and environments. Moreover, on this approach there is a stark Cartesian mind/world divide that separates "the organism" that senses from "the world" in which it acts. Susan Hurley nicely described this view of how perception, action, and cognition are related as the "Classical Sandwich" model (Hurley 1998). On this "classical" view, cognition is separated from perception and action; perception feeds information to the organ of cognition, which then gives instructions for bodily acting. Acting of course will change the information available for perceiving, and so there is a feedback cycle but it is one in which this "feedback" is just the trigger for a new linear loop.

The classical sandwich model of perception, cognition, and action may seem like a common-sense view. However, even if one takes a cognitivist approach and assumes that cognition is the manipulation of internal representations, there is reason to doubt this model of perception[4]. Over the last forty years, there has been a lot of work in neuroscience and psychology that suggests that the perception, cognition, and action connections look less like a sandwich and more like a bowl of spaghetti. It is often not clear where one "function" (i.e. perception, cognition, or action) ends and another begins. Moreover, even if we separate out these functions and view them independently, we see that they feed back to each other not only at the end of each functional "act" but recurrently throughout these very acts themselves.[5]

In contrast to the cognitivist approaches, much of the work that falls under the banner of "extended" or "enactive" cognition takes perception

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[4] For summaries of some of this work, see especially (Clark 1997); (Noë 2004, 2010); (Stapleton 2013).

[5] See, for example, (Barrett and Bar 2009) for a clear model of this.

and cognition to be activities.[6] These approaches do not deny that the brain plays an important role in perceiving and cognising in many animals. However, they are "externalist" in that they argue that we are first and foremost embodied organisms embedded in an environment, and the result of this is that many of our perceptual and cognitive abilities are world-involving.[7] On this view, action and perception are connected fundamentally. Not in terms of perception-causing action and action-causing perception nor even in terms of action being required for perception to develop normally (though these observations may be true). Rather, action seems to be constitutive of perception; the very act of perceiving involves action. Examples of this range from the fact that even my perceiving when I stand very still involves my eyes making many microsaccades per second in order for me to be able to see, to the way that dogs (and us) catch balls not by magnificent feats of internal calculations involving representing trajectory and speed but instead by taking embodied short-cuts such as adjusting one's running speed towards the ball so that the ball looks like it is falling at a constant rate.[8] This approach to understanding the way that perception and action are fundamentally intertwined is usually labelled as an "enactive" account of perception (Varela et al. 1991/2017; Thompson 2007) or as "sensorimotor contingency theory" (O'Regan and Noë 2001). There are various claims that go along with these particular accounts some of which may be more or less palatable to philosophers of different temperaments. But, the basic insight outlined above, that action is part and parcel of perception, is now considered to be the orthodox understanding of how perception works and is taken for granted by researchers in both the philosophy of perception and the perception

[6] Research within these embodied, extended, and enactive approaches has flourished in recent years with the developments in philosophy matched by those in robotics, psychology, psychiatry, and cognitive science more generally. For some representative overviews, see (Clark 1997; 1999; 2008); (Di Paolo et al. 2017), (Gallagher 2005, 2017); (Pfeifer et al. 2007); (Thompson 2007); (Varga 2018).

[7] Externalism of course has rather different meanings in the various subdisciplines of philosophy. To avoid conflation with these other kinds of externalism (especially e.g., the "twin-earth" semantic externalism of Putnam and Burge), we can talk instead in terms of "extended cognition" in which the term "extended" is broadly construed to include, for example, enactive approaches rather than just referring to the particular line of research following from the publication of (Clark and Chalmers 1998) paper "The Extended Mind".

[8] See Chap. 1 of Andy Clark's *Being There* (Clark 1997) and Chap. 3 of Di Paolo, Buhrmann, and Barandiaran's *Sensorimotor Life* (Di Paolo, Buhrmann, and Barandiaran 2017) for accessible introductions to this kind of research.

sciences. Implicit in this account is that the way our body is shaped (and therefore the actions that are available to us) is going to enable and constrain what is available to be perceived.

3   COGNITION FROM THE BOTTOM-UP

One other difference in these two approaches is the starting point for their explanatory endeavour. The traditional cognitivist approach generally takes as its primary explanandum human-level (not butterfly-level!) cognition, and it attempts to explain perception and cognition from this vantage point. In this respect we might think of cognitivism as a "top-down" approach; it starts with human capacities (indeed often adult human capacities) and seeks to understand how they function in terms of simpler mechanisms which may or may not be present in non-human animals. Extended and enactive approaches, on the other hand, often start from the vantage point of simple creatures or (robotic) critters that are able to behave in ways relevantly similar to what we might consider as perceptual or "cognitive" without performing complex computations over representations. Rather than constructing internal models of the world, they consider the world to be—at least much of the time—"its own best model" (Brooks 1991). Extended and enactive approaches might thus be thought of as "bottom-up" approaches as the challenge for these researchers is to then explore how well these kind of perceptual and cognitive abilities "scale up" to human-level cognition: How much of human cognition can be explained without having to appeal to internal computations over representations?[9]

This bottom-up approach is most evident in the enactive paradigm instigated by Francisco Varela, Evan Thompson, and Eleanor Rosch which has subsequently been labelled "autopoietic enactivism"[10] to distinguish it

[9] This generalisation captures much of the work that goes under the banner of extended cognition broadly construed as well as enactivism. However, there is work in the extended cognition stream of research that is better characterised as top-down according to this categorisation—indeed, much of the work in respect to the extended-mind hypothesis is representationalist. Nevertheless, much of the research in the extended cognition paradigm that is more cognitive science oriented draws upon and relies upon this kind of bottom-up research, and this is in clear contrast to the classical cognitivist approach.

[10] For short, accessible introductions to enactivism see (Di Paolo and Thompson 2014) and (Thompson and Stapleton 2009). In depth presentations of the approach are available in (Thompson 2007) and (Di Paolo et al. 2017).

from more recent approaches which focus solely on perception ("senso-rimotor enactivism") and those whose primary motivation is to debunk representational models of mind ("radical enactivism").[11] Researchers within autopoietic enactivism (which I will just refer to as "enactivism" from now on) take inspiration from the self-organising and self-producing nature of individual cells and take the view that fundamental aspects of cognition can already be observed (at least in "proto" form) in this most minimal form of life. The most common example used is of a bacterium swimming in a sugar gradient. Although a bacterium is just a single cell and has no nervous system, it is able to sense the parts of the world that are of value for it and move towards them. What it is for something to have value for it is that it plays a role in the bacterium's self-generation processes. Sugar can be metabolised by the bacterium to help the system self-organise and generate the things it needs to keep itself alive in a world of precarity. The world is precarious—even for a bacterium—because bacteria do not typically live in a world in which there is a constant supply of nutrients. If it finds itself in a situation where there is not a sufficient sup-ply and it does nothing, then its organisation will disintegrate. It needs energy to generate the continuously dynamic processes that produce the parts of the cell that make up its boundary. Without a boundary it disinte-grates and is no longer an organism.

There are two key ways in which the example of the bacterium is used to help us understand the enactive approach to cognition. Firstly, it helps us to see that it is the organisation of the cell itself that makes it a living organism. This organisation generates the very processes that make it an organism distinct from the environment by creating its boundary (i.e. the cell membrane) which then enables this organisation to arise and con-tinue. This autopoietic (self-generating and self-producing) organisation distinguishes the cell from the surrounding milieu and allows it to con-tinue existing so long as it is in an environment which provides the right materials for it to metabolise. What is important here is the recursive *organisation* and not the particular implementation of that organisation. This means that it is not autopoiesis and the self-generation of a physical boundary that is the key insight. Rather, it is because this autopoietic organisation evident in the cell instantiates an autonomous system. And, being an adaptive autonomous system is a principal feature of systems that we deem cognitive (like ourselves). Thus, there is a continuity between

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[11] See (Ward et al. 2017) for an accessible introduction to the different enactive approaches.

even such simple organisms as bacteria and complex organisms like ourselves; that we all instantiate adaptive, autonomous organisation. This notion of autonomy (and its role in the deep continuity between mind and life) is introduced in Francisco Varela's monograph *Principles of Biological Autonomy* (Varela 1979) and further developed in Evan Thompson's landmark exploration of the continuity between life and mind, *Mind in Life* (Thompson 2007). It can be summarised as follows:

> An autonomous system is a system composed of processes that generate and sustain that system as a unity and thereby also define an environment for the system. […] Considered abstractly, for a system to be autonomous, its constituent processes must meet the following conditions: […They…]

> (1) recursively depend on each other for their generation and their realization as a network;
> (2) constitute the system as a unity in whatever domain they exist; and
> (3) determine a domain of possible interactions with the world.

> This definition captures what Varela (1979, 1999) meant when he proposed that the crucial property of an autonomous system is its operational closure. In an autonomous system, every constituent process is conditioned by some other process in the system; hence, if we analyse the enabling conditions for any constituent process of the system, we will always be led to other processes in the system. (Thompson and Stapleton 2009: 24.)

It is in the third condition presented above (that the processes "determine a domain of possible interactions with the world") that we see the second key way that the example of the bacterium is supposed to help us understand the enactive approach to cognition. It is through the system's own activity of generating and maintaining itself that it transforms the world into an environment for itself. In the case of the bacterium, it is the activity of generating and maintaining the metabolism of the cell that determines what things in the world are relevant to it. Sugar is needed by the cell to drive these metabolic processes, and so it has value for the cell in terms of being relevant to its continuing self-maintenance and production. Things that are poisonous to the cell because they will disrupt its metabolic processes in some way have dis-value for the cell, so they are also relevant to its continuing self-maintenance and production. Bacteria, like us, do not typically exist in a world in which all those things that have

value for it are provided, and all those that have dis-value for it are kept away. To survive, they must adapt by either making changes to their internal structure or making changes to the world by means of moving around in it to get to a place that better provides the things it needs. In this way, it is the structure of the autonomous system (here instantiated in the autopoietic organisation of a living bacterium) and the way that it adapts to changes that are relevant for the continuation of that system that determines what parts of the world will be interacted with, and therefore make up its environment. This activity of the system that relates it to parts of the world is referred to as sense-making. It is the system enacting a world of sense, that is, a world of relevance or value to itself.

The example of bacterial sense-making is an example of the extreme of the bottom-up approach to understanding cognition. Many people (even within the extended and enactive approaches) resist the idea that bacteria are cognitive, or even that what is described is "proto-cognitive". For the autopoietic enactivist, the example is important however, because (i) it demonstrates the enacting of a world as a result of an instantiation of an adaptively autonomous organisation at the level of the most basic form of life, and (ii) it brings to the fore the activities of the organism—even very simple organisms—in relation to its environment. These *sense-making* activities "transform the world into a place of salience, meaning, and value—into an environment (*Umwelt*) in the proper biological sense of the term." (Thompson and Stapleton 2009: 25)

Evan Thompson expresses these key points clearly in the introduction to the recent revised edition of *The Embodied Mind*.

what is meant by "body," for the enactive approach, is not the body as a functional system defined in terms of inputs and outputs—as it is for functionalist cognitive science—but rather the body as an adaptively autonomous and sense-making system. An adaptively autonomous system is one that generates and maintains itself through constant structural and functional change (like a living cell), and in so doing brings forth or enacts relevance. In being a self-individuating system, it is also a sense-making one, and in being a sense-making system, it is also a self-individuating one. Cognition and world are interdependently originated via the living body." (Varela et al. 2017; xxvi)

a cognitive being's world is not a pre-specified, external realm, represented internally by its brain, but is rather a relational domain enacted or brought

forth by that being in and through its mode of coupling with the environment." (*ibid.*, "Introduction", p. xxvii)

It is this relational domain that I am primarily concerned with in this chapter: the transformation of the world into an *Umwelt* in virtue of the coupling between a system and the world, a transformation that is enabled by the system's sensory and motor capacities. Enactivism places great weight on demonstrating how this activity of enacting a relational domain emerges from autonomous, adaptive organisation—an organisation that is instantiated in a physical system. It is thus a deeply embodied approach; the body is fundamental to cognition from the bottom-up. And this deep embodiment will shape all the processes and activities that the system can engage in, enabling some and constraining others.

Other approaches that come under the enactive and extended banners often share this commitment to embodiment and the enaction of a relational domain between an organism and its world even if they do not take inspiration from the notions of autonomy and adaptivity. For some, the paradigmatic example of the bacterium in a sugar gradient is just too bottom-up, and they struggle to see the commonalities between sense-making at this level and human cognition. The autopoietic enactivist is of course not committed to viewing the bacterium as *experiencing* the value that things in its environment have for it. Nor, to viewing the bacterium to be *purposefully* regulating its coupling with the environment, where "purposeful" is understood in the terms we normally use it—as implying some kind of reflection on a goal state and striving to achieve that goal state by behaving in a way in which one could have done otherwise.[12] Nevertheless, it is admittedly difficult to see how these aspects of human-level cognition can scale up from such a minimal form of sense-making and thus to use the bacterium example as more than an analogy. (Indeed, exploring ways in which this might be done is part of the enactivist project). In order therefore to not alienate those who do not find the autopoietic example and the sense-making of bacterium motivating—or who even might find it a hindrance to engaging with the enactive view—it is helpful for us to look to other examples of world-making which demonstrate the activity of enacting a world of value at a slightly higher level than the bacterial, examples of creatures that are not only multicellular but that have organs of

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[12] See (Weber and Varela 2002) for an extended discussion of the notion of teleology and its applicability to the enactive project.

perception and various means of moving around in the world. It is at this level that we start to see a consensus between different strands of the extended and enactive communities in their understanding of the relational domain that is enacted by organisms through their activity.

4   RELATIONAL WORLDS

Jakob von Uexküll's *Umwelt* theory has served as a unifying inspiration[13] for many of the proponents of the various approaches that come under the banner of extended, enactive, embodied, and embedded cognition ("4E" cognition). Von Uexküll's essay from 1934, "A Stroll Through the Worlds of Animals and Men: A Picture Book of Invisible Worlds," is a playful exploration of the perceptual worlds of different animals (Von Uexküll 1934/1992). Writing partly in a literary—almost poetic—style and sometimes in prose that reads more like a text-book in physiology, it is an incongruous but delightful piece of writing that has inspired generations of scientists and philosophers. The essay starts:

> This little monograph does not claim to point the way to a new science. Perhaps it should be called a stroll into unfamiliar worlds; worlds strange to us but known to other creatures, manifold and varied as the animals themselves. The best time to set out on such an adventure is on a sunny day. The place, a flower-strewn meadow, humming with insects, fluttering with butterflies. Here we may glimpse the worlds of the lowly dwellers of the meadow. To do so, we must first blow, in fancy, a soap bubble around each creature to represent its own world, filled with the perceptions which it alone knows. When we ourselves then step into one of these bubbles, the familiar meadow is transformed. Many of its colourful features disappear, others no longer belong together but appear in new relationships. A new world comes into being. Through the bubble we see the world of the burrowing worm, of the butterfly, or of the field mouse: the world as it appears to the animals themselves, not as it appears to us. This we may call the *phenomenal world* or the *self-world* of the animal. (*Ibid*: 319)

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[13] See,, for example Andy Clark's *Being There* (Clark 1997) and Tony Chemero's review (Chemero 1998), as well as (Thompson 2007). See also (Vörös 2017) for connections to Varela's thought and (Ziemke and Sharkey 2001) for applications to Artificial Intelligence and robotics.

The work is at the same time both self-consciously playful (the subtitle of the essay after all reads "A Picture Book of Invisible Worlds") and earnestly radical. Von Uexküll is explicitly reacting against what he calls the "mechanistic theorists". These are the theorists who look at animals as made up solely of tools to perceive and tools to act "connected by an integrating apparatus which, though still a mechanism, is yet fit to carry on the life functions" (*Ibid*: 320). The expression of this approach in the study of humans was captured by the behaviourism of the time. While that kind of behaviourism is unpopular nowadays, a close relative of these primitive mechanistic theories—functionalism—has become the default approach in the cognitive sciences. And, it seems to be not at all uncommon—and perhaps the norm—to think about simpler creatures and insects in these mechanistic terms, even if creatures judged as more intelligent (primates, corvids, etc.) are generally considered to be more than mere biological clockworks.

Von Uexküll rejects this mechanistic picture of creatures, arguing that there is more to organisms than their mechanical structure: "there is also the operator, who is built into their organs, as we are into our bodies" (p. 6). This is not a bid to seek out a homunculus or put a ghost in the machine. Rather, it is a prompt for us to see the subjectivity inherent in the very activity of perceiving and acting. And in this way, "[w]e thus unlock the gates that lead to other realms, for all that a subject perceives becomes his perceptual world and all that he does, his effector world. Perceptual and effector worlds together form a closed unit, the *Umwelt*" (*Ibid*).

Although *Umwelt* translates literally from German into English as "environment," we must be careful not to conflate the two terms. Von Uexküll uses "the environment" to refer to the world that the creature finds itself in, whereas its *Umwelt* is *its* world; the world that *it* senses and acts in from *its* perspective.[14] The *Umwelt* of a butterfly in my garden then is quite different to my *Umwelt*, despite our sharing an environment. To prompt an understanding in us of the radically different worlds of the animals in the environment, von Uexküll invites the reader to join him and "ramble through these worlds of wonder" (Von Uexküll 1934/1992:

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[14] Recently, there has been some work done to unpack the notion of *Umwelt*, how it relates to the concept of environment, and how these fit with affordance approaches. I am using these terms in the most general sense that they are presented in this work. The reader who is interested in more fine-grained distinctions and their implications is directed towards (Baggs and Chemero 2018, 2020) and (Feiten 2020).

320). The first of these worlds of wonder, and the one most often cited, probably because its world is so dramatically different to ours in virtue of its simplicity and security, is that of the tick.

The tick is an intriguing animal for understanding how other organisms experience the world because it seems to be sensitive to the world in only three ways: its skin is photosensitive, it has receptors for butyric acid which is released from the skin glands of mammals, and it can sense the warmth of a mammal's warm blood. Von Uexküll writes:

> From the egg there issues forth a small animal, not yet fully developed, for it lacks a pair of legs and sex organs. In this state it is already capable of attacking cold-blooded animals, such as lizards, whom it waylays as it sits on the tip of a blade of grass. After shedding its skin several times, it acquires the missing organs, mates, and starts its hunt for warm-blooded animals.

> After mating, the female climbs to the tip of a twig on some bush. There she clings at such a height that she can drop upon small mammals that may run under her, or be brushed off by larger animals.

> The eyeless tick is directed to this watchtower by a general photosensitivity of her skin. The approaching prey is revealed to the blind and deaf highway woman by her sense of smell. The odor of butyric acid, that emanates from the skin glands of all mammals, acts on the tick as a signal to leave her watchtower and hurl herself downwards. If, in so doing, she lands on something warm—a fine sense of temperature betrays this to her—she has reached her prey, the warm-blooded creature. It only remains for her to find a hairless spot. There she burrows deep into the skin of her prey, and slowly pumps herself full of warm blood. (*Ibid*: 321)

It is the fact that the tick has receptors for these aspects of the environment that allow her to respond to them, but it is likewise that the tick has these receptors that enable those aspects of the environment to be cues for her. Another way of phrasing this is that "[w]hat we are dealing with is not an exchange of forces between two objects, but the relations between a living subject and its object." (*Ibid*: 325). For von Uexküll, *Umwelten* then are unashamedly relational. The organism is related to its environment in virtue of the organism's perceptual and effector capacities. What this means is that what perception is, or rather what its perceptual world is made up out of, is the relation-in-action of the organism with those aspects of the environment which its particular sensory systems enable it to be in

contact with. This relationality of perception that we see by looking at creatures in terms of their *Umwelts* is important. It reveals first and foremost that an organism already finds itself in a meaningful world, a world that has value to it in terms of what it can sense and what it can do in it. The tick is not thrown into a world devoid of value which it has to somehow represent and make complex computations to find its way around in and survive. It does not have to select what may be useful to it from that which is not relevant to its survival. Rather, it is thrown into a world that already has meaning for it. It is born able to sense and respond to those things that will enable it to continue its existence. Outside the realm of stimuli which the tick has receptors for, it does not perceive. Perception for it is the relation between that part of the world that it is sensitive to and its bodily sensing of that.

Although this story of the tick's perceptual/effectual world might seem a far cry from the human case, von Uexküll absolutely wants us to acknowledge that it is not only animals but humans as well that have *Umwelten*, and indeed that individual humans have individual *Umwelten*.[15] Humans are of course sensitive to many more (and of course different) things than ticks are, and so our worlds are bigger than other animals. But they do not necessarily subsume these smaller worlds. We cannot, for example, just bracket off the parts of the world that the tick is not sensitive to and then experience the world as a tick would because we are not (typically) very sensitive to, for example, butyric acid. Nor do we have the particular effector organs that ticks do. But a key similarity between us and other animals concerns our particular bodies, how they are set up with sensory receptors and how effector organs determine the parts of the world that we will be sensitive to, and in what way we will be sensitive to them.

5   AFFORDANCES AND VALUES

Von Uexküll's stroll into the *Umwelt* of the tick illustrates the meaningfulness of the world for evolved organisms. All organisms have parts of the world they are sensitive to and in which they can act. The set of those parts of the world afford possibilities for action to the animal. We can see then

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[15] See (Von Uexküll 1934/1992: 339). Note however that there can be shared elements in each individual *Umwelt* so he does not necessarily relegate us to living in isolated solipsistic worlds—a conclusion that would certainly be at odds with embodied-extended-enactive approaches to the mind.

that parts of the world that afford a particular action to one animal may not be the same as those for another animal.[16] The presence of butyric acid does not afford anything to me even though it affords dropping (onto the mammal exuding it) for the tick. Similarly, although some parts of the world may afford possibilities for several types of organism, these affordances may be different in kind. A standard kitchen chair affords sitting on to me, walking under to my cat, landing on to a fly, and perhaps jumping onto for a child in the throes of playing "the floor is lava".

This concept of affordances comes from the psychologist J.J. Gibson in his landmark book *The Ecological Approach to Visual Perception* (Gibson 1979/2015). Like von Uexküll, Gibson was a scientist who was also strongly influenced by philosophy, in particular the radical empiricism of William James and the phenomenological approach of Merleau-Ponty, who himself of course was strongly influenced by Kant, Husserl, Heidegger, and Sartre.[17] And, like von Uexküll's concept of *Umwelts*, Gibson's concept of affordances has fed back in to philosophy, in particular having a great influence on extended and enactive approaches to perception and cognition. Gibson defined affordances as follows:

> The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. The verb to afford is found in the dictionary, but the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment. (Gibson 1979/2015: 119)

[16] Note however that Gibson resists identifying a niche with the phenomenal world of an animal because affordances are for him not merely subjective phenomena. And indeed, some of Von Uexküll's comments indicate that he holds a Kantian position whereby the real world beyond the phenomenal world cannot be known. However, the notion of *Umwelts* does not necessitate having this distinction between the phenomenal and objective world. We can read them in light of the idea of sense-making outlined earlier as both being subjective in terms of being enacted and thereby being a perspective, and at the same time being aspects of the world that can be shared—and thus in this sense are objective.

[17] A great resource for the connections between the psychologists and the phenomenologists of the late nineteenth and early twentieth century is (Käufer and Chemero 2015). An introduction to phenomenology aimed at cognitive science students.

While this part of the definition is often cited, it is worth seeing the rest of the paragraph in which it occurs to see how he emphasises the relational nature of affordances[18]:

> If a terrestrial surface is nearly horizontal (instead of slanted), nearly flat (instead of convex or concave), and sufficiently extended (relative to the size of the animal) and if its substance is rigid (relative to the weight of the animal), then the surface affords support. It is a surface of support, and we call it a substratum, ground, or floor. It is stand-on-able, permitting an upright posture for quadrupeds and bipeds. It is therefore walk-on-able and run-over-able. It is not sink-into-able like a surface of water or a swamp, that is, not for heavy terrestrial animals. Support for water bugs is different.

> Note that the four properties listed—horizontal, flat, extended, and rigid—would be physical properties of a surface if they were measured with the scales and standard units used in physics. As an affordance of support for a species of animal, however, they have to be measured relative to the animal. They are unique for that animal. They are not just abstract physical properties. They have unity relative to the posture and behavior of the animal being considered. So an affordance cannot be measured as we measure in physics. (Gibson 1979/2015: 119–120)

This talk of affordances being relative to the animal might make us worry that he is proposing a relativistic theory inasmuch as these properties are present only relative to a particular animal and are therefore subjective. This suspicion might be heightened by the explicit declaration that the theory of affordances "implies that the "values" and "meanings" of things in the environment can be directly perceived" (*Ibid*: 119). It is indeed the case that affordances that are perceived are relative to an animal but what this means is that "to perceive the world is to co-perceive oneself" (*Ibid*: 113). That is, that one perceives what one can do in-and-with the environment. We should not interpret the relationality of organism and world in the enacting of worlds or the perceiving of affordances as the construction of a subjective world in some idealist sense of the term. There are values and subjectivity, but these are not separate from the world; they are enacted in the relation between the animal and its environment. As Gibson puts it: "an affordance is neither an objective property nor a

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[18] For a deeper investigation into the relational nature of affordances, see (Chemero 2003, 2009).

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" (*Ibid*: 121).

Affordances and their values to the observer should be understood as "properties of things *taken with reference to an observer* but not properties of the observer" (*Ibid*: 129). So while they are relational, they are not relativistic. They are real things in a real world and can be shared by others. Nevertheless, they have the values and opportunities for action that they have for a particular animal at a particular time in virtue of the bodily capabilities and needs of that animal. An affordance is objective in that it *could be* perceived by another animal with appropriate bodily capabilities, but the affordances that are actually perceived by a particular animal at a particular time are those that are relevant to its needs (p. 130). We can see therefore that, in common with the enactivist concept of sense-making and von Uexküll's *Umwelts*, perception for Gibson is value-laden from the bottom-up:

> The perceiving of an affordance is not a process of perceiving a value-free physical object to which meaning is somehow added in a way that no one has been able to agree upon; it is a process of perceiving a value-rich ecological object. Any substance, any surface, any layout has some affordance for benefit or injury to someone. Physics may be value-free, but ecology is not. (*Ibid*: 131–132).

6   AFFORDANCES AND NICHES

Much of Gibson's exploration of the idea of affordances consists in showing how animals can perceive opportunities for behaviour in virtue of the way that light is structured differently when it is reflected off surfaces. This was a radical innovation in psychology as it provided a means to explain how animals can pick up visual information directly. This means that they can be understood as perceiving by directly responding to structural differences in their environment. For example, the light they can perceive from their physical point of view is structured in a particular way as a result of both the surfaces near them and their position in space relative to those surfaces. I perceive the chair in virtue of the way light rays are reflected off it. The angles of those rays will depend on where I am standing and how

tall I am. The outcome of this is that the "information" that is picked up is "out there" in the environment. There is thus no need to represent the chair "in my head" and compute what actions I can take upon it. Rather, the actions that I can take upon it are already specified in the light that I am perceiving and are different for me and for a toddler. I perceive the chair (in virtue of the angles of the light that it reflects) as sit-on-able, whereas the toddler—for whom the angles of the light merely specify placing things on at arm height—may perceive it as put-things-on-able.

There is a great deal of research in ecological psychology and the philosophy of cognitive science that debates how we should conceive of affordances, how we should understand direct perception, and the notion of information at play in Gibson.[19] For our purposes here, however, it will suffice to use the term "affordances" broadly as it often is in the extended and enactive literature. This broad sense captures both the gist of Gibsonian affordances and the enactive concept of sense-making. It is, for example, a key aspect that the way my body is shaped allows me to perceive something as having certain affordances. Something that is step-on-able to me is so because I have legs that are shaped in a particular way, can move at particular angles, and are a particular length/height. It is not perceived as step-on-able by a toddler or a snake. It should be clear that all of the key concepts discussed so far—sense-making, *Umwelts*, and affordances—are ways of investigating and cashing out the organism–environment system in terms of the relations between the organism and the environment. The key difference between the ecological psychology project and the enactive project that is relevant here is that ecological psychologists place greater weight on investigating the structures in the environment that the organism couples with, whereas enactivists emphasise the organismic processes that make this coupling possible (Stapleton 2016; Baggs and Chemero 2018, 2020). But as we have seen above, Gibson was also clearly concerned with what the organism brings to the affordance relation in respect to both physical capacities and the values that emerge.

Using the notion of affordances as broadly construed in this way then, we can take some liberties with it and connect it with von Uexküll's concept of *Umwelt*.[20] The key takeaways from both—as broadly

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[19] Some accessible introductions for philosophers to these issues are in (Chemero 2003, 2009); (Käufer and Chemero 2015); (McGann 2014); and (Baggs and Chemero 2018).

[20] Strictly speaking, von Uexküll's Umwelt theory and Gibsonian affordances may not be compatible. For example, von Uexküll meant his theory to be constructivist in the tradition

construed—are this: (1) what we perceive is dependent in important ways on what we can do, indeed on what we are doing; (2) our physical make up (both physiological and morphological) opens the space for what we can do and perceive; and (3) our worlds (read *Umwelts*) are made up of the possibilities for action (affordances) available to us and are therefore worlds of value. On this way of thinking, the world is not something that is perceived and then acted upon. Rather it is something that is attuned to and acted in accordance with.

We must distinguish between the affordances that we perceive at a particular time that have value for us based on our current needs, and the affordances that are available to be perceived by us if we had the need. This latter set of affordances are what Gibson refers to as a niche:

> Ecologists have the concept of a niche. A species of animal is said to utilize or occupy a certain niche in the environment. This is not quite the same as the habitat of the species; a niche refers more to how an animal lives than to where it lives. I suggest that a niche is a set of affordances.

> The natural environment offers many ways of life, and different animals have different ways of life. The niche implies a kind of animal, and the animal implies a kind of niche. Note the complementarity of the two. But note also that the environment as a whole with its unlimited possibilities existed prior to animals. (Gibson 1979/2015: 120)

Even though von Uexküll presents his *Umwelt* theory in terms of phenomenal worlds, it is really this idea of a niche implied by each animal in virtue of what the animal can perceive and do in the world that is evident.

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of Kant, whereas Gibson's approach was unambiguously realist. There has begun to be a stream of literature that concerns itself with setting out these differences (and the differences with each and the enactive paradigm) and considering whether the approaches can be coherently connected. See, for example, some of the contributions to the recent *Frontiers in Psychology* Research Topic on "Enaction and Ecological Psychology: Convergences and Complementarities" https://www.frontiersin.org/research-topics/10973/enaction-and-ecological-psychology-convergences-and-complementarities#overview, especially: (Corris 2020); (Feiten 2020); and (Crippen 2020), as well as (Baggs and Chemero 2018, 2020). For our purposes, these details don't matter. I am concerned with the way that the notions of *Umwelt* and affordances were being used in the extended and enactive literatures in order to engender a certain way of thinking about the mind and the world (that I consider all of the above authors to share) that is distinct from the way of thinking pervasive in the cognitivist paradigm.

An animal's phenomenal world is a time-slice of its engagement with an aspect of its niche. For the tick, of course, its *Umwelt* is so small that it may be identical with its niche. The tick's world is so utterly secure that it does not have competing affordances to deal with. And its niche is completely made up of biological imperatives; if it senses butyric acid, then it will drop onto the mammal exuding it, otherwise it will stay where it is. At the other end of the spectrum, we humans live in a world in which we are presented with a huge array of possibilities for action, some of which are biological imperatives, and some of which are possibilities in the more modal sense of the term. A chair, for example, affords sitting on but unless I have a specific neurological disorder that makes me compulsively respond to affordances,[21] I do not automatically sit on every chair I see. The parts of the world around me that afford action vary in soliciting my behaviour depending on my needs in the moment. When I am thirsty, a glass of water will solicit drinking, whereas when I am overwhelmed with disgust, it may not. For creatures like us however, affordances are not merely possibilities for action that respond to some immediate physiological imperative. How can we understand this from a bottom-up perspective?

One way to think about this is in terms of how organisms affect their niches. A tick does not make any changes to its niche which stays stable throughout its life cycle unless, for example, its carrying of something like Lyme disease were to result in its wiping out its food source. Other animals however enter into a coupling relationship with their worlds whereby—intentionally or not—they regulate that coupling. One oft-cited example is how beavers construct the environments in which they fit. By changing the landscape around them, they make that landscape more suited to their lives; the activity of their gnawing down trees and constructing dams changes the possibilities for action that are available to them. These changes also have an effect on the larger ecosystem in which they live, which then of course spirals back and changes the world in which they find themselves. Beavers literally construct their own niches. This phenomenon is not unique to beavers however, we can see similar behaviours in much simpler creatures such as ants and termites. In his landmark book on Extended Cognition *Being There*, Andy Clark gives a detailed example of how the tendency of some species of termite to roll mud balls and to deposit them near each other as a result of the chemical traces left on them results in their building of grand termite mounds (Clark 1997).

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[21] This neurological disorder is called "utilization behaviour". See (Lhermitte 1983).

This is an example of stigmergy: complex behaviour emerging from the self-organisation of organisms following simple cues that they lay down themselves.

The point is not that termites and beavers purposefully construct their own habitats. On the contrary, the interesting thing is that there does not need to be a purposeful construction. Niche construction is not niche building in the way that we build houses. It is the emergence of new affordance structures as a result of changes in the environment that the activity of the organism brings about. But as simple as this construction might be in that it does not require any particular intelligent planning to bring it about, it nevertheless opens up the world to the organism. It is no longer restricted to the biological imperatives of the *Umwelt* in which it was thrown into as a newborn. The construction of the niche expands this *Umwelt*. It is now an *Umwelt+*. The possibilities for action afforded to our termites (and thus their perceptual worlds at any particular time) have now increased as a result of the mound that has arisen around them in virtue of their own activity.

7   CONSTRUCTING INSTITUTIONAL WORLDS

Animals change their environments. The termites discussed in the previous section actively (even if unwittingly) construct a new environment for themselves through their activity. The new termite mound in which they live and interact makes available new and different affordances for the group. Humans excel at changing their environments, and thus changing what that environment affords them. We know that this can of course be done by intentionally making changes to the structures of the environment. And, if we take a top-down, cognitivist perspective we might think that this is the principal means by which we change our worlds and construct new physical and cognitive environments in which to live. Taking a bottom-up perspective, however, can give us a rather different view on this process. Andy Clark, for example, has argued that our human-level cultural successes are partly a result of something akin to the stigmergic algorithms that we see in evidence in the termite community:

> Stigmergy, recall, involves the use of external structures to control, prompt, and coordinate individual actions. Such external structures can themselves be acted upon and thus mold future behaviors in turn. In the case of termite nest building, the actions of individual termites were controlled by local nest

structure yet often involved modifications of that structure which in turn prompted further activity by the same or other individuals. Humans, even when immersed in the constraining environments of large social political or economical institutions, are, of course, not termites! Unlike the termite, we will not always perform an action simply because an external prompt seems to demand it. However, our collective successes (and sometimes our collective failures) may often be best understood by seeing the individual as choosing his or her responses only within the often powerful constraints imposed by the broader social and institutional contexts of action. And this, indeed, is just what we should expect once we recognize that the computational nature of individual cognition is not ideally suited to the negotiation of certain types of complex domains. In these cases, it would seem, we solve the problem (e.g. building a jumbo jet or running a country) only indirectly—by creating larger external structures, both physical and social, which can then prompt and coordinate a long sequence of individually tractable episodes of problem solving, preserving and transmitting partial solutions along the way. (Clark 1997: 186)

Clark refers to this tendency that humans have as "stigmergic self-modulation". Humans excel at creating self-stimulating loops in which they change the kinds of stimulation/affordances available to them.[22] This can happen either on an individual or a collective level. One of the most impressive examples of this at the individual level is that of the dolphin and tuna, who are able to manoeuvre quicker than they should be able to given the capacities of their bodies.[23] They seem to be able to do this by exploiting the dynamics available in the water. Where rocks form eddies or vortices in the water, they use these to then push off from, rather like a human swimmer using the side of a swimming pool to push off when doing lengths. But, and this is where the idea of self-stimulation comes in, they also seem to create eddies and vortices in the water themselves through their own movements and then use these—self-generated—environmental structures to push off from. They have generated a new set of possibilities for action through their own action.

In the human-realm we see this self-stimulating activity in what have been labelled "epistemic actions".[24] Epistemic actions differ from

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[22] See his book *Natural Born Cyborgs* (Clark 2003) for an extended exploration of this.

[23] (Triantafyllou and Triantafyllou 1995) cited in (Clark 1997). See especially (Clark 1997, ch. 11) for discussion of the tuna.

[24] (Kirsch & Maglio 1994) cited in (Clark 1997). See especially Chap. 3 for detailed discussion.

"pragmatic" actions which are actions taken to change a part of the world in order to achieve a physical goal. Simple tool use in animals is an example of pragmatic actions. The chimp licks the stick and pokes it in the termite mound to reach the termites so it can eat them. Or, a captive honey badger moves stones to the corner of a wall so that it can use them to climb up, over, and escape. Epistemic actions on the other hand don't have a physical goal but rather an epistemic goal. The idea is that by changing the world in certain ways we are able to then engage with it in ways that are simple and straightforward (much like the termite stigmergy) rather than having to represent the problem space internally and perform complex computations over these representations. In this way, an epistemic action is a world-involving loop that is a constituent part of an animals cognitive process. Kirsch and Maglio's key example of this is their study of how advanced players of the game Tetris physically rotate the zoids as they are descending. We might assume that mental rotation of the zoids to see where they would best fit in the line that needs completing would be quicker than physically manipulating the controller to change their orientation on the screen. However, it turns out that actually the physical rotation of the zoids enables the player to better determine where it would fit within the time frame. Another simple example of epistemic action concerns the use of Scrabble tiles.[25] An expert player typically will not simply place his set of tiles in the holder and then mentally run through the permutations of the letters to come up with the set of words that they can form. Rather, they move the tiles around in the holder, changing their positions and setting them up in such a way that it is easier for their brain to perform pattern completion on the letters and come up with words.

Andy Clark predominantly talks about these kinds of environmental manipulations as transforming problem spaces. But, it should be clear that—in line with Gibson—what these environmental manipulations do is change what the environment affords us. And in the case of epistemic actions, their very purpose is to realise different affordances that will allow us to further cognitively engage with (and therefore solve) a task. This continuity between the natural environment offering affordances, the man-modified environment offering affordances, and the cultural environment is already pressed by Gibson in his chapter on the "Theory of Affordances" (Gibson 1979/2015). The examples of epistemic action given above are those in which the agent has intentionally made changes

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[25] Also from Kirsch and cited in (Clark 1997).

to their environment in order to modify the problem space. However, this is not a necessary element of an epistemic action. We might happen upon the method of rotating zoids, or scrabble tiles, and habitually use it even if we do not realise that it is our doing this that makes the problem easier to solve (knowing only that it does allow it to be solved). Similarly, a small child might imitate an older player by moving their scrabble tiles around in their holder without knowing why they are doing it (in the way that a toddler imitates a parent by sitting with a newspaper on their lap "reading" it, before they can actually read). Nevertheless, these actions can still play the epistemic role of simplifying the problem space opening it up to interacting with in a more stigmergic-like fashion. Much of our culture is like this. We might habitually run the cold tap when pouring the boiling water from the pasta into the sink because those we have learned to cook from have always done this, without realising why this is done. Nevertheless, it is effective. Of course, an awareness of the role that these actions play in modifying our environment so as to reshape our problem space provides opportunities for us to construct new epistemic actions to accomplish these goals even more efficiently or to accomplish other goals. However, these new possibilities for epistemic action are not only not always constructed intentionally, they are also not necessarily transmitted intentionally. They can be inherited as part of the cultural background that sits unquestioned.

The examples of rotating zoids and rearranging scrabble tiles are also of course epistemic actions pitched at the individual level. But as I indicated above, these actions and their epistemic consequences do not necessarily die with the original actor. They can be culturally inherited, and in many cases can better be understood as a culturally constructed niche (see Sterelny 2010). Kim Sterelny has argued exactly this: that epistemic action is a form of niche construction and that this niche construction has cross-generational effects. His proposed model is of "environmentally-scaffolded cognition", which he distinguishes from Andy Clark's Extended Mind model (e.g. Clark and Chalmers 1998). Sterelny argues that "the most compelling and plausible cases for the extended mind hypothesis are limiting special cases of scaffolded minds" (Sterelny 2010: 463). Nevertheless, Sterelny's proposal fits coherently with many of the ideas proposed by Clark (1997) and which often appear under the banner of "Extended

Cognition".[26] The environment "scaffolds" cognition in the Vygotskian sense that it provides support for learning something that might not otherwise be able to be easily learned (or perhaps learned at all). A simple example of this is counting on our fingers or using an abacus to perform more complex calculations. In the case of counting on our fingers, this scaffolding is usually thrown away once counting has been mastered. But the abacus may not be; it may be retained to use as scaffolding in future cases, so the scaffolding is not merely for learning but also for doing. In this way, environmental scaffolding is a part and parcel of our cognitive activities. But the idea of scaffolding should not be reduced to mere tool-use. The idea is that we are embedded in layers upon layers of scaffolding, some of which we have inherited and some of which we create ourselves. Our cognitive activities are therefore at no time separable out from the scaffolding in which they are taking place. And, scaffolded in this way, much of our seemingly very complex behaviour is explainable in terms much akin to the kind of stigmergy encountered with our trusty termites.

One great example of this kind of distributed, scaffolded, cognitive system is the way that Elizabethan actors putting on performances of Shakespeare's plays were able to play a huge number of different roles at any one time, as well as constantly learning new roles (Tribble 2005).[27] The puzzle was not only how they managed to commit so many roles to memory (itself an enormous task) but how they managed to do so when they were not given full copies of the scripts. They were only given access to pared-down copies detailing their entrance cues and minimal plot maps. It would therefore seem unlikely that the internalisation of all of the scripts would have been the means by which they accomplished this task even if the actors had indeed had superior memory abilities. As John Sutton writes in respect to this proposal: "Roughly, the Globe's artifacts worked to get the actors to the right place at the right time for further local

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[26] We can distinguish here between debates about the "Extended Mind" thesis which concern the best way of metaphysically individuating cognitive states and discussions of "Extended Cognition" which concern the dynamic loops between brain, body, and world that constitute many of our cognitive activities. It is the latter that is consistent with Sterelny's approach.

[27] Cited and summarised in (Sutton 2010). See also (Sterelny 2010) for his discussion of this in respect to the extended mind thesis.

environmental alterations (such as a particular line or event on stage) to call forth spontaneously the required specific behavior"[28] (Sutton 2010: 203).

Although the behaviour that emerges—the performance and production of many, many plays—is highly complex and dynamic, and arguably a clear instance of higher-level cultural cognition, we nevertheless should see the connection here to the stigmergy discussed above. The structured environment carries much of the "information" so that the individual actors do not need to. The inherited performance "niche" affords certain possibilities for the actors and constrains others. As the interactional dynamics of their responding to cues unfolds, their very actions change the space of affordances available to them and their fellow actors, constantly constructing and co-creating their collective environment.

This line of reasoning has been pushed even further into the sociocultural realm by Gallagher and Crisafi who have argued that we can use the extended mind framework to understand how social institutions function. Their prime example is of the legal system which they refer to as a "mental institution" due to its cognitive nature. They write:

> The legal process is a cognitive one—it is cognition producing, insofar as it produces judgments—and cognition produced, in the sense that it is the product of many (and perhaps generations of) cognizers, although it is not reducible to simply the cognitive processes that occurred in their individual heads. The practice of law, which is highly cognitive (and communicative), is carried out via the cooperation of many people relying on external (and conventional) cognitive schemas and rules of evidence provided in part by the legal institution itself; it depends on a large and complex system, an institution, without which it could not happen. It is a cognitive practice that in principle could not happen just in the head; indeed, it extends cognition through environments that are large and various. (Gallagher and Crisafi 2009: 48)

We might think about the creation, maintenance, and use of these so-called mental institutions as collective epistemic actions that take place

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[28] Sutton here directs the reader to Andy Clark's discussion of Edwin Hutchins' "distributed cognition" model (Clark 1997, p. 76). "Distributed cognition" is a close relative of extended views but instead of making claims about the constitution or location of cognition, it is a perspective on cognition that sees cognition as emerging from distributed processes (see Hutchins 2014).

over generations. They are cultural niches, created and engaged with partly through stigmergy and partly through intentional construction. They provide a constrained set of possibilities for action for individuals, but the dynamics of this engagement that emerges constitutes highly complex cognition and behaviour.

We can think of this collective construction of the environments in which we and our descendants grow up within as an example of an *Umwelt+*. Unlike the case of the simple *Umwelt* of the tick, we are of course not born into this *Umwelt+* able to perceive and engage with all aspects of it. We have to learn about some of the affordances, both physical and epistemic. And in the process we lay down new stigmergic trails, create new possibilities for action and thought, new scaffolds to engage with. These scaffolds are ones that are set up (in virtue of their being inherited) to be relevant to our needs, and thereby have value for us. We use them to make sense of the world. It is a cycle of constructing an environment through acting in relation to those aspects of the world that are relevant to us and thereby laying down new scaffolds for ourselves and others. In this way, we can start to see how bottom-up approaches to perception and cognition may contain the seeds to understand how some very high-level complex cognition and behaviour can come about.

8   CONCLUSION

The purpose of this chapter has been to walk readers unfamiliar with the literature in extended and enactive cognitive science through a selection of the ways in which perception and cognition are seen to be world-involving on these approaches. It is my hope that even such a brief introduction to some of the various contents of the extended and enactive conceptual toolkit can generate in the reader an insight into a way of thinking that is shared by many of those who do research under the broad banner of "extended cognition" or who take inspiration from it. It is of course by no means the case that all those who identify as extended cognition researchers or enactive cognition researchers embrace all of the approaches I have outlined here. Nevertheless, the concepts of sense-making, *Umwelts*, affordances, cultural niches, epistemic actions, environmental scaffolding, and mental institutions/the socially extended mind are all ways of expressing the world-involvingness of cognition and emphasise different aspects of this world-involvingness. They should also serve to convey a sense of how, on this approach, perception, and cognition are taken to be

fundamentally relational phenomena, and ultimately how we as cognisers exist as—and in—a dynamic, relational web embedded within the natural and cultural worlds, actively constructing and shaping our environments through our activity. It is this sense that I believe will particularly resonate with those who are familiar with the kinds of non-Western philosophy enagaged with in this collection of essays. This brief exploration will thus perhaps provide a gateway for philosophers from a diverse set of backgrounds to enter into the worlds of extended and enactive cognitive science.

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