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Cognitive science was founded on the idea that intelligent human behaviour is caused by internal psychological processes that work in much the same way as a digital computer. Digital computers are physical devices that construct interpretable and combinable elements or symbols, and carry out operations on those elements, such as copying, combining, creating, erasing, storing, retrieving etc. Early cognitive scientists hypothesised that something similar takes place in us whenever we think and reason. Psychological processes like expert reasoning, language production and understanding and logical problem solving were explained in terms of the construction, storage, retrieval and manipulation of symbolic representations. Some cognitive scientists even made the strong claim that there was no other way our minds could work. No system could possess the type of psychology required for intelligent behaviour that didn’t also produce, store and manipulate symbolic representations. Newell and Simon (1976) captured the spirit of this strong claim succinctly with their physical symbol systems hypothesis according to which, digital computation is both necessary and sufficient for “general intelligent action” (p.87). Once we conceptualise cognition in this way, it makes eminent sense to study cognition by building and programming computers that can think. Suppose, as classical cognitive scientists thought, that all we are doing when we engage in the types of psychological processes that generate intelligent human behaviour is accessing stored symbolic representations, building new representations and carrying out rule-governed operations on these representations. Computers can build, store, retrieve, transform and manipulate representations. Hence they have all the necessary ingredients cognitive scientists took to be required for cognising in ways that lead to intelligent behaviour. Moreover, by building machines that
think and reason as we do, cognitive science could make intelligible how reason-respecting behaviour was in fact the outcome of perfectly mechanical processes. So it was that the project of engineering artificial intelligence was born.

The idea that minds are computational engines remains at the core of thinking in cognitive science today, but much has changed in recent years. John Haugeland (1985) labelled symbolic approaches to Artificial Intelligence of the kind just described “Good Old Fashioned AI” (GOFAI). The new fashion in AI circles, and in many other areas of cognitive science, is to emphasise real-time, dynamic couplings between brain, body and world, and the multiple ways in which cognisers exploit bodily and environmental structures to simplify or enhance the computational operations carried out by brains. GOFAI was premised on a thoroughly disembodied understanding of our psychology that entirely ignored the ways in which cognition takes place in organisms that are geared into cultural worlds. This view of cognition as taking place entirely inside of the heads of individuals that lack a history and a culture is undergoing gradual replacement by a view that takes brain, body and world to be equal partners in the production of cognitive behaviour.

Part of the impetus for this shift in thinking came from (what some thinkers considered to be) insuperable problems and failures that ultimately led the GOFAI research program to degenerate. Hubert Dreyfus has long argued that the reasons for the failure of the GOFAI research program can be accurately diagnosed using the writings of Martin Heidegger. Dreyfus looked in particular to Heidegger’s phenomenological description of being-in-the-world. Human beings always find themselves in familiar situations that matter to them in determinate ways, and that they know how to deal with in such a way as to meet their concerns. What we encounter in those situations are meaningful things we know how to put to work to meet our interests and needs. We know how to find our way about in the world not because we have knowledge of a vast body of facts and rules that tell us what to do in each of an open-ended number of different situations we might encounter. Throughout our lives we acquire practical skills and habits, and it is because of this know-how that situations show up as offering possibilities for action that are keyed into our interests. Computers, argues Dreyfus, have to be programmed to deal with real-world situations using rules and representations on the basis of which they must somehow reconstruct the meaning the world always already has for us. They have to first construct a model of a situation or context of activity, and then form a
plan of action based on a model of a situation and knowledge of a vast body of rules and facts. Dreyfus argued that no computer that works in this way is likely to be capable of flexible and adaptive responses to the open-ended variety of situations we deal with as humans. The computer must work out which of the many rules and facts it knows are of relevance to its current situation. This problem is multiplied once we build in the fact that the world is constantly changing in all sorts of unexpected ways. In order to deal with these changes the computer must know what to keep constant and what to change in its assessment of what is relevant and what is not. Perhaps the computer could be programmed with representations of lots of different contexts in which it will be required to act, and heuristics that tell it what to do in each of these contexts. However, it is hard to see how this is going to help, since the machine will still need to work out which of these rules and representations it is appropriate to bring to bear in its current situation. We get the same problem again but at a higher-level of rules and representations, and there is no reason to think that the regress should end here.

The problems I have just sketched have become known as the frame problem. Dreyfus’s Heideggerian diagnosis was to argue that the problem gets started because of an assumption at the heart of GOFAI that contextually appropriate action must be the outcome of internal representations that act as physical stand-ins for external situations and objects. This notion of internal representation is undoubtedly a core component in the GOFAI modeller’s explanatory toolbox. Dreyfus argued that it was highly unlikely that any satisfactory account of being-in-the-world would be forthcoming in representational terms. His reasons for scepticism are threefold.

First, he argues that the skills we bring to bear in our everyday dealings with the world, involve practical, not propositional knowledge. Representations have propositional content and underwrite a kind of propositional knowledge or knowledge that $p$. But there is no possibility of reducing practical knowledge to propositional knowledge. Hence, there is no possibility of accounting for practical knowledge in representational terms.

Second, drawing on Heidegger, Dreyfus points out that the world we deal with is first and foremost a world of equipment in which things are perceived in terms of the possibilities for action they offer. Heidegger tells us that each item of equipment occupies a place in a network of equipment, and it through its relationship with other items that make up the network that the entity has the meaning it does [Heidegger, (1962: 97)]. Equipmental entities are assigned roles within human
practices or patterns of activity, and it is against the backdrop of our practices that equipment shows up for us as significant. Computers for instance are used for writing introductions to books like this one, introductions form a part of academic anthologies, anthologies are used by readers for the sake of their research, an activity humans mostly undertake in the context of the academic world. I’ll call the networks that equipment form, involvement networks. A large part of our inhabiting a familiar world is our knowing how to find our way about these involvement networks. They delineate the contexts within which our everyday activities are situated. Can we take what we know when we know how to navigate an involvement network, and reconstruct this knowledge in terms of representations of determinate facts?

Dreyfus thinks that any such attempt will be doomed to failure since involvement networks have a holistic structure: what makes a thing the individual item of equipment it is, is its place within an involvement network. In spelling out the links between the elements of an involvement network, we will make reference to interrelated patterns of activity. It is going to be prohibitively difficult to account for these interconnections in our practices by appealing to representations of determinate facts. The difficulty here stems in part from the holistic nature of involvement networks. Representations of determinate facts will at best give you the elements of a network. We still face the difficult task of building up a picture of the whole from representations of the parts. Even supposing we can solve this problem, the system that we are programming with this knowledge will have to negotiate a computationally debilitating, large body of representations. The prospects of building a machine that can do this for each and every involvement network we know how to negotiate look decidedly bleak.

Third, Dreyfus argues that representations as employed in GOFAI models are context-independent structures. How can we account for the ability to act appropriately in specific contexts of activity in terms of context-independent representations? Recall the threatening regress we described above: in order to know which rules and facts are relevant to the situation the program is dealing with, the system must use more context-independent representations and rules, and it must know which of these is appropriate to the situation it is in. The regress arises according to Dreyfus because we are attempting to account for the significance we find in the world by, using context-independent elements. The GOFAI system is always starting from a position outside of the situations we ordinarily operate in. Thus, the system must work out what is relevant and what is not through a trawl of everything it
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knows. So long as a machine is operating outside the worldly situations with which we ordinarily deal, it is never going to succeed in modelling our skilful dealings with the world. The machine is always going to face the difficulty of having to reconstruct context-dependent significance using building blocks that are context-independent and without significance.

The ultimate source of the frame problem lies in a set of faulty metaphysical and epistemological assumptions the GOFAI modeller is implicitly operating with. The GOFAI modeller relies on a Cartesian understanding of the cognitive agent, according to which subjects and objects are radically different kinds of entities. Of course no one working in GOFAI would endorse Descartes’ dualism of the mind and body. However, we’ve just seen how the frame problem may have its source in an assumption that cognitive agents ordinarily operate outside of the everyday situations in which we spend most of our lives acting. The problem we then face is how to assign significance to just those internal context-independent representations that match the situation we find ourselves in at the time.

GOFAI modellers implicitly assume a subject–object dichotomy, even if a mind–body dichotomy is firmly eschewed. They assume that the “world” is the objective physical world about which the subject has beliefs. This world is “objective” in the sense that it is made up of substances, properties, relations and events whose way of being is “independent” of any subject of experience in that it could exist without any subjects existing. The individual cogniser, on the other hand, is assumed to be in pretty much the same epistemic predicament as the Cartesian subject. The Cartesian subject is immediately and directly acquainted with his own mind, and can arrive at knowledge of an objective reality only when the states that are internal to his mind match those in the external world. We’ve just seen how researchers in GOFAI assumed something similar was true of the individual cogniser. An individual cogniser has epistemic access to the world via internal representations that physically stand in for worldly states of affairs. He must work out what representations are relevant to his current behavioural context using representations of facts and rules that are context-independent. The cogniser is thus assumed to be located outside of situations of significance just as the Cartesian subject is located outside of the world he is attempting to know, and must struggle to gain epistemic access to this world via internal representations.

Heidegger was highly critical of philosophers in the Cartesian tradition for overlooking, covering-over, and generally obscuring from our
philosophical view, the way in which being-in-the-world is our mode of existence as human beings. We always find ourselves already situated in a meaningful world. The situations we encounter in this world are ones that always already matter to us in definite ways. These situations present us with possibilities for action, a subset of which stand out as relevant to our projects and interests because of the practices we have grown up with, and into which we have been enculturated. So long as we conceive of subject and object along Cartesian lines we will overlook the way in which our way of being as human beings is being-in-the-world. We will think of human beings as located outside of the world of physical objects struggling to gain epistemic access to this world. We will think of subject and object as radically different kinds of substances separated from one another by a metaphysical abyss.

We have seen then that GOFAI is based on Cartesian assumptions that lead directly to the frame problem. GOFAI and a Cartesian view of the mind share a common fate. If the frame problem was the downfall of GOFAI and the frame problem has its source in wrongheaded Cartesian ideas about our nature as cognitive agents, then the frame problem ought also to spell trouble for these Cartesian ideas. Moreover, Dreyfus has based his diagnosis of the frame problem substantially on Heidegger’s account of our existence as human beings. It might also be thought that the lessons from the failure of GOFAI also provide support for a Heideggerian understanding of human existence in terms of being-in-the-world.

However such an argument for a Heideggerian view of human existence is unlikely to succeed. It could equally well be argued that the frame problem isn’t quite the serious obstacle to the success of GOFAI that Dreyfus has made it out to be. The frame problem is the problem of how to assign relevance to context-independent representations without running into an infinite regress of higher and higher-levels of context-independent representations. Someone friendly to GOFAI might argue that there is no regress since there are self-standing high-level context-independent rules and representations that do not require further rules and representations to determine their application. Far from amounting to the downfall of GOFAI, it could be argued that the frame problem is just a temporary set back for a scientific project that remains in its infancy.

In order to make the argument stick that the frame problem properly sunk the good ship GOFAI once and for all, and thereby vindicated Heidegger over Descartes, it would have to be shown that there is a genuine alternative to GOFAI emerging in cognitive science today.
Moreover, it would have to be shown that this new paradigm wasn’t vulnerable to the frame problem because it was consistent with, and could make intelligible how our existence could have the character of being-in-the-world in a way that GOFAI conspicuously (and perhaps necessarily) fails to. I believe there is such an alternative paradigm that is already well established in cognitive science today. Following others, I will call this research programme 4EA cognitive science (an acronym for Embodied, Embedded, Extended, Enactive and Affective). Unlike its GOFAI predecessor, 4EA cognitive science doesn’t conceive of cognitive agents as being located outside of situations of significance, but recognises how we are of the world, always at home in it, affected by the possibilities for action it offers a subset of which matter to us. We will argue in the next section this makes for a cognitive science much better positioned for integration with a Heideggerian account of what it is to be human.

II. A Heideggerian cognitive science?

We’ve seen how, in his descriptions of our everyday existence as human beings, Heidegger highlights our skilled dealings with equipment as our basic way of acting. In going about our everyday business we are able to deal effortlessly and unreflectively with the situations we run into without having to explicitly plan or deliberate about our actions. Our expertise at navigating involvement networks makes it the case that situations show up for us as inviting specific responses. The world is not only a totality of facts, “a set of things that are” [Blattner: (2006: 42)], but is also a set of places we inhabit. The entities that coexist with us at these places are not simply “present-at-hand” but have as their mode of being “readiness-to-hand”: they present themselves to us as available to be put to use in the light of our concerns. Of course our dealings with equipment don’t always go smoothly, and frequently we will encounter one hitch or another that throws us of our stride. When we run into a problem our attention switches from its immersion and absorption in the activity we are performing to the equipment we are involved in using. The entity is still encountered as having a significance that derives from its place in an involvement network. To borrow a helpful example from Mike Wheeler, a clock that is running slow is still experienced as a timekeeper, albeit a faulty one, and in our use of it we simply make allowances for its slowness. This needn’t call for much if any thinking on our part but it does stand in the way of our using the clock transparently in order to keep track of time. When there is some
impediment to our smoothly dealing with entities that has to be over-
come if we are to accomplish our goals, Heidegger says the entity has the mode of being of the “unready-to-hand”.  

According to Heidegger’s phenomenological analysis of our everyday existence, we spend much of our lives dealing with entities that are encountered by us either in the mode of the ready-to-hand or the unready-to-hand. This is something that has been overlooked, or worse still covered over, by a philosophical tradition that has repeatedly assigned priority to disinterested knowledge, and overlooked the concern we have for the things that surround us and the situations we confront. Scientific theorising is the paradigm example of disinterested knowing. When we theorise about an entity we take it out of the practical setting in which it is ordinarily situated, and we reveal it as a fully-fledged object that is the bearer of determinate and quantifiable properties. In doing so we reveal ourselves as subjects that are set over against, as opposed to involved with, the objects we find around us. Heidegger calls the mode of being that entities have when they show up for as full-fledged objects with determinate properties “presence-at-hand”. The philosophical tradition has tended to take for granted this present-at-hand, subject–object understanding of human beings and the world we inhabit. As we have already highlighted, Heidegger views this assumption as fundamentally misleading, its adoption resulting in a distorted understanding of our own being and that of the entities we encounter in the world. The theoretical stance we take up in understanding entities in present-at-hand terms is just one of a spectrum of different modes of encounter with the world. At the other end of this spectrum lies smooth coping with equipment, and somewhere in between these two extremes lies a range of different cases in which we deal with entities that are revealed to us as unready-to-hand. Some of these cases will involve disturbances in which we are aware of an entity as bearing certain determinate properties, but this won’t always be the case. Any approach to cognitive science that purports to cohere with Heidegger’s thinking must avoid the error of the philosophical tradition in its prioritising of a present-at-hand understanding of ourselves and the world. It must be able to accommodate the spectrum of different modes of encounter with the world we have just sketched. This is a basic desideratum that any cognitive science deserving of the label Heideggerian must satisfy.  

One of the defining themes in the research that falls under the umbrella of 4EA cognitive science is the primacy assigned to online sensorimotor intelligence. We'll see shortly that there is some disagreement within
the 4EA community about how to think about sensorimotor intelligence. Putting these disagreements to one side for now, I believe that we can find in this empirical work on online intelligence, sub-personal analogs of the personal-level phenomena Heidegger describes in terms of our skilful dealings with the ready-to-hand and the unready-to-hand in practical problem solving. Where GOFAI went wrong was in modelling cognition entirely on our cognising in the mode of the present-at-hand, and either overlooking or downplaying our involvement with equipment in the mode of the ready-to-hand. We have already seen how any attempt to explain our relationship with the world in terms of representations of objects with determinate properties will fall foul of the frame problem. Might a cognitive science that privileges sensorimotor intelligence be well placed to avoid this pitfall? Moreover, might it provide us with solid scientific considerations for siding with Heidegger against Descartes?

Before I tackle both these question, I want to briefly sketch two very different ways in which sensorimotor intelligence is currently understood within the 4EA community. I will suggest that this disagreement points to two very different (perhaps even incompatible) trajectories 4EA cognitive science is currently following. Recall that the 4 “E’s” in 4EA stand for “embodied”, “embedded”, “extended” and “enactive”. The disagreement, we shall see, concerns the correct account of “embodiment” and “embeddedness”.

III. 4EA cognitive science: some internal disputes

Extended mind approaches to 4EA cognitive science view brains as control systems for our bodies, generating flexible, real-time adaptive responses to situations in ways that fit with our embodied concerns. Setting aside for the moment the different views of “embodiment” and “embeddedness” I’ll highlight shortly, cognition can be understood as embodied and embedded because of non-trivial causal spread. This is a phenomenon one finds when non-neural bodily factors and environmental elements are causally responsible for the adaptiveness or flexibility of some cognitive behaviour (Wheeler & Clark 1999; Wheeler 2005). What we find in such cases is that the causal factors responsible for bringing about the behaviour in question are distributed across brain, body and world with the non-neural bodily and environmental constituents making explanatorily non-negligible contributions. The contributions of the environmental and bodily elements is explanatorily non-negligible insofar as the adaptiveness and flexibility of the behaviour
partially derives from them, and the work that would otherwise have to be performed by neural elements has been offloaded onto body and world.

This much is consistent with what I’ll call a *merely embedded* view of cognition that conceives of cognitive processes as taking place entirely within the boundaries of the biological organism’s brain whilst nevertheless causally depending in surprising ways on the non-neural body and items located in the cogniser’s environment (Rupert 2009; Adams and Aizawa 2008). Proponents of this view resist what they take to be the more radical claim of proponents of the extended mind that cognitive processes can literally include, as proper parts, the non-neural body in its interaction with environmental structures. There are a number of different strategies that proponents of the extended mind have pursued in arguing against a merely embedded view of cognition. One strategy has been to exploit the so-called *parity principle*, which invites us give equal treatment to elements located inside and outside of the boundaries of the biological organism when assessing the cognitive status of those elements (Clark and Chalmers 1998; Wheeler 2010b). 14 We shouldn’t treat an element of a cognitive system differently, withholding the status of cognitive from this element, simply because it happens to be located outside the boundary of the organism’s brain. We should instead look at the causal work the element does in bringing about intelligent behaviour. If we found an element internal to the organism doing the same or similar causal work, and we treated this element as cognitive, we should have no hesitation in according the same treatment to elements located beyond the skin of the biological organism.

What distinguishes the views of the extended mind and embedded mind is a metaphysical thesis. Both accept the explanatory thesis of non-trivial causal spread according to which a cognitive process can causally depend in surprising ways on bodily and environmental factors. The metaphysical thesis rejected by proponents of an embedded theory says that these bodily (in the sense of extra-neural) and environmental factors can sometimes be among the component mechanisms that realise a cognitive process.

Let us briefly return to the explanatory thesis accepted by both embedded and extended mind theorists. Examples of non-trivial causal spread bifurcate into extreme and moderate cases. We find extreme cases when it is the extra-neural factors that are doing the heavy lifting in bringing about some cognitive behaviour, and the causal contribution from the neural is minimal. Cases of smooth coping with the ready-to-hand may well be underwritten by mechanisms that exhibit this kind
of extreme non-trivial causal spread. The explanation of how the agent smoothly copes will be in large part to do with how their bodily expertise is geared into the world, and their grasp of the actions a situation invites. The explanation of this competence is one that is likely to be best framed in terms of the dynamics of the agent’s coupling with its environment. It is a feature of this kind of dynamical explanation that the appeal to representational states is both unnecessary and inappropriate. It is inappropriate because the principal source of the structure of the behaviour is not the neural parts of the system. This is where we would expect to find representations causally responsible for bringing about the behaviour. The neural contribution is more like that of a conductor in an orchestra, ensuring the overall coordination of the elements that make up the system, subtly influencing the tempo and dynamics of the unfolding music. It is unnecessary to appeal to representations because as Chemero (2009: 77) has recently argued, before we can construct a representational explanation of these kinds of behaviours, we must first have a dynamical explanation. The dynamical explanation renders the representational explanation superfluous.

In moderate cases of non-trivial causal spread the neural components of a brain–body–world cognitive system may play more of a central role in generating adaptively rich and flexible behaviour. Given this causal role, it might be both appropriate and necessary to invoke representations in our explanations of the behaviour. However the representations in question won’t be the kinds of context-independent representations that we have earlier diagnosed as the source of the frame problem. Where we find cases of moderate non-trivial causal spread, the species of representation it is appropriate to invoke in our explanations will be action-oriented. Consider for instance research in situated robotics the aim of which is to build machines that can coordinate perception and action so to achieve simple goals in real world situations. Many of these robots exploit their own bodily morphology and sensorimotor interaction with the world to solve a problem. Categories can be learned, for instance, through interactions with the environment in which agents actively generate structured flows of sensory stimulation. This structure takes the form of correlations between different types of sensory information and sensory and motor behaviour that facilitates the discovery of categories. The representations these robots utilise don’t take the form of detailed internal models of the external environment, and nor do they generate actions based on detailed plans. Rather, the representations these robots make use of are a part of a process that exhibits non-trivial causal spread in which the robot’s control architecture exploits
the details of its own morphology in its interaction with the environment to solve a problem.

Action-oriented representations have their home in practical problem solving, in our negotiating situations in which we encounter entities that are unready-to-hand. Recall that entities show up for us as unready-to-hand when there is a breakdown in the practical activity we are engaged in. This may occur because the equipment we are using malfunctions, or we encounter some unexpected obstacle, or some item of equipment we require is missing. When this happens, equipment no longer functions transparently for us, thus preventing our attention from being fully absorbed by the task at hand. Instead our attention shifts to the equipment we are using, and what needs to be done to get our action back on track. Normally this is a question we can settle skilfully and effortlessly without giving the matter too much thought. Action-oriented representations are most likely a key part of the explanation of how we successfully negotiate these kinds of temporary setbacks in our skilful dealings with the world.\textsuperscript{16} They are types of representation marked out by the following three intertwined features.\textsuperscript{17} First they are action specific in that they are tailored to the job of producing the specific behaviour required rather than being action-neutral models of the world. Second, they are egocentric, encoding features of the environment in terms of agent-centred properties (e.g. position relative to the agent rather than position in objective space). Third, they are intrinsically context-dependent, such that context itself need not be represented. The computationally debilitating strategy of representing context is avoided through the embedding of the kind of representational structures characterised by our first two features within task-specific behaviour-generating mechanisms that feature non-trivial causal spread. To give the flavour of this idea, consider a mechanism that is designed to track a particular entity \textit{via} the specific sound which that entity makes. If the mechanism (a) is input-sensitive only to the sound in question, rather than to sounds in general; and (b) regularly senses its environment to guide its actions (what some have called “using the world as its own best model”, see Dreyfus 1992; Brooks 1991), then arguably it will have no need to build context-specifying representations in order to select the relevant sound from all the irrelevant ones or to maintain the relevance of its ongoing activity.

Some extended mind theorists have taken our cognitive behaviours to form a spectrum from non-representational online smooth coping at one extreme to offline reflective theorising at the other.\textsuperscript{18} In between these two extremes we find a class of cognitive behaviours that we have
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existence. The same is true of the situated robots mentioned above that can successfully couple seeing and doing to cope with real world situations. Nothing is at stake for these machines with regards to their existence. John Haugeland has made the point in a characteristically straightforward way: “The problem with artificial intelligence is that computers don’t give a damn” (Haugeland, 1979/1998: 47). Haugeland was of course discussing GOFAI systems but there is no reason to think that the situation is any different with regards to the situated robots of today. The simplest of living system will differ crucially from most of these robots in having a concern for their own existence. Hans Jonas (a thinker who has had a major influence on enactivism) describes well this concern that any living system will have for its own existence:

“The organism has to keep going, because to be going is its very existence – which is revocable – and, threatened with extinction, it is concerned in existing.” (Jonas, 2001: 126)

Any living creature has a precarious existence, and part of what it is for the creature to survive is for it to sustain its own identity and organisation across exchanges of matter and energy with its environment. The most basic concern a living system has is to maintain its own integrity or organisation, a goal it accomplishes through metabolism. In maintaining its organisation, the creature establishes a boundary between itself and the environment, thereby establishing a point of view or perspective on the world. Enactivists take living systems to have a kind of autonomy or capacity for self-determination in that they are systems that generate and sustain their own organisation by following laws or norms “set up by their own activity” (Di Paolo et al. 2011: 37). The environment is encountered from the organism’s point of view in terms of how it bears on the organism’s well being and the organism regulates its interactions with the environment accordingly. The environment is not a neutral milieu that impacts on the organism’s behaviour only by being internally represented. The organism doesn’t take in meaningless information from the world and transform this information into an internal representation, which then gets used downstream to plan actions. Rather the organism is always making sense of the environment in the light of its values and concerns, the most fundamental of which is, as we have seen, the generation and sustaining of its own identity. At the same time as the organism generates its own identity, it also specifies an environment to which it is related, and set of norms that relate to its ongoing existence.”
The problem the enactive theorist is raising for extended approaches is that there doesn’t seem to be anything in the idea of online sensorimotor intelligence as conceived by the extended mind theorist that can account for the concerned point of view that informs every encounter a living system has with its environment. The extended mind theorist gives us an account of online sensorimotor intelligence according to which body and world form a part of the functional organisation of a cognitive system that can skilfully cope with its environment. Enactivists, by contrast, understand embodiment in terms of the organisation of an autonomous system that generates and sustains its identity in the course of its interactions with the environment.

Thus we have two very different conceptions of the body and its contribution to cognition. Extended mind theories take the body to make a contribution to cognition in virtue of its causal role. An entity with very different causal properties to that of a biological living body could make the same contribution to cognition by playing the same causal role. This is one reason why it is possible to model online sensorimotor intelligence by building situated robots whose bodies have causal properties very different from those of the human body. Enactive theories deny that the contribution of the body to cognition can be captured in terms of a functional or causal role. Nothing can be a cognitive system unless it is also an autonomous system that is self-constituting and can adaptively regulate its sensorimotor interactions with the environment in the light of its concerns.

Of course enactive theorists can (and will) allow for the existence of genuinely autonomous robots. (Indeed Froese and Ziemke (2009) have argued that this is the direction artificial intelligence must pursue if it is to avoid the problems identified by Dreyfus and discussed above.) This might encourage a functionalist view of the body, since we might suppose now that what matters for a system’s autonomy is simply its functional organisation. So long as two systems exhibit the right functional organisation we might suppose this will suffice for them to both qualify as autonomous systems, and so as cognitive, at least given an enactive definition of cognition. Enactivists will object however that what makes a robot a cognitive system is not only to do with the functional organisation the robot instantiates. Any system that is autonomous will care about its own continued existence and will thereby inhabit a world in which entities are encountered as meaningful because of the ways in which they contribute positively or negatively to the system’s well being. It is this basic concern that takes on progressively more elaborated forms as the system and its world becomes increasingly complex,
which enactivists claim tells us something fundamental about what it is to be an embodied cognitive system. The worry they are raising for any functionalist understanding of embodiment is that the concern that animates an autonomous system’s every move in the world is not readily explained if we characterise the organisation of the system purely in functional terms. We don’t get an explanation of how living systems come to have a world, since this is something the enactivist ultimately cashes out in terms of this basic concern a living system has for its own continuation. This basic concern, and the more complex forms this concern takes as the organism’s world takes on increasingly complex forms, doesn’t seem to be explained by the causal organisation a system instantiates.

If extended mind theories have a problem accounting for the concern every living system has for its own existence, the problem would seem to be multiplied in the case of human beings. For the concern each human being has for their own existence is of course a good deal more complex than anything we find in the biological world more generally. So much so that Heidegger reserves the term “existence” for our way of being as human beings. In §9 of Being and Time, Heidegger identifies four traits that are characteristic of existence, but the key one for our current purposes is that human beings relate to their own being in such a way that “Being is that which is an issue for every such entity” (p.67). 25 We care about what we make of our own lives, where our lives are going and what we are becoming through our actions. It matters to each of us who we are, and this is a question we are constantly settling through the projects we pursue often in collaboration with others, always within networks defined by our socio-cultural practices. 26

Of course it might well be argued that this problem of scaling up to human-level concern is a problem not just for extended theories, but also for enactive theories. How does the complex form that concern takes in human beings relate to the more basic variety of concern that every living thing has for its own existence? Evan Thompson argues for a thesis of the deep continuity of life and mind, which might be thought to settle this question if it can be made to work. He explains the idea as follows: “life and mind share a set of basic organisational principles, and the organisational principles distinctive of mind are an enriched version of those fundamental to life” (Thompson 2007: 128). Drawing on Jonas, Thompson goes on to apply this idea to human experience arguing that “certain basic concepts needed to understand human experience turn out to be applicable to life itself” (op cit, p.129).
Could there however be a radical break between our way of being as human beings, and the being enjoyed by non-human animals as Heidegger famously thought? Might the capacity for self-interpretation that characterises our mode of existence as humans be somehow anticipated by or grounded in the concern an autonomous system has for its continued existence? These are difficult questions a Heideggerian cognitive science must grapple with, and this is not the place to attempt to settle them. My aim in this section has been the more modest one of pointing to significant ontological controversies about how exactly to understand the embodiment that remain up for grabs within 4EA cognitive science. Both ways of developing 4EA cognitive science cohere with Heideggerian phenomenology. The form that a Heideggerian cognitive science will take in the future may depend in part on how the science plays out, but it may also depend on resolving difficult philosophical questions about the relationship between our mode of being as Dasein and that of other non-human animals.

IV. The Dreyfus–Wheeler debate

We have seen in the previous section that there is significant discord within 4EA cognitive science. There is nonetheless broad agreement about why it is that humans don’t run into a frame problem in their everyday dealings with the world, and it is this question that must be settled if we are to secure an empirical argument for a Heideggerian philosophy over its Cartesian rival. We saw in §2 how the source of the frame problem lies in the assumption, implicit in GOFAI, that cognitive agents find themselves located outside of situations of significance. If this were our predicament, we would face the problem of having to deploy representations of brute facts to work out, from everything we knew, what facts were relevant to our current context of activity. All 4EA cognitive scientists are agreed however that this is not the predicament we find ourselves in: instead we always find ourselves involved with the world, and things we encounter in the world show up for as inviting actions that are appropriate to our projects, goals and interests. Admittedly, there is significant disagreement about what it is that explains this phenomenon, but there is at least widespread agreement about the phenomenon itself.

In what follows I will leave behind enactivism, and switch my attention back to a version of the extended mind that has been developed by Michael Wheeler. My reason for doing so is that his handling of the frame problem has served as the basis for a recent critical exchange with
Dreyfus (2007) about the form a Heideggerian cognitive science ought to take. An abridged version of Dreyfus’s chapter opens this collection, and his Heidegger-inspired critique of the extended mind also informs a number of contributions to this collection (see the essays by Rietveld and Ratcliffe and see Wheeler’s contribution for a response).

Wheeler (2008) appeals to what he dubs “situated special purpose adaptive couplings” as the mechanistic basis of our skilled coping behaviour. The mechanisms that generate this behaviour are “special purpose” in the sense that they are dedicated to accomplishing particular tasks in specific situations. This is to say that they normally perform their functions in particular contexts of activity, and involve the manipulation and exploitation of environmental structures. In his contribution to this collection, Wheeler explains how these special purpose mechanisms are the mechanistic basis of what Heidegger called “thrownness”. They explain how it is that we can find ourselves in a situation that is already meaningful to us in ways that preclude the need for us to figure what is relevant and then respond appropriately. We are as Wheeler puts it “thrown machines” (Wheeler, this volume, p.197). Intelligent responses reside in the dynamic coupling between agent and environment, with the environment nudging the agent along particular behavioural trajectories. The mechanisms that generate her action exploit the details of the contexts as a part of their normal functioning.

It is precisely this context sensitivity that is also exploited by action-oriented representations in breakdown situations when the agent finds herself dealing with entities that are showing up as unready-to-hand. When encountering a breakdown situation, some cognitive distance is introduced between the agent and the world, but still the agent finds herself firmly embedded in the situation in which she is acting. The action-oriented representations she deploys perform their function as part of a special-purpose adaptive coupling in which the agent’s brain and body are tightly coupled with environmental structures and it is through this tight coupling that a solution to a practical problem is found. The mechanisms that underpin her actions perform their respective functions in a context-sensitive manner, so there is no need for the agent to work out how to deal with context.\footnote{Dreyfus has argued that extended mind theories fail to escape a number of key Cartesian assumptions, and thus represent a regression to GOFAI. Insofar as GOFAI must fall foul of the frame problem, Dreyfus argues that extended mind theories will also succumb to this problem. He suggests that extended mind theories remain committed to the claim that our basic way of relating to the world is \textit{via} propositional attitudes.}
This is a charge he bases on Clark and Chalmers (1998) seminal discussion of belief, in which they argue that a state that plays the functional role characteristic of belief could be realised in machinery that crosses the boundary separating brain, body and world. In making this argument, Clark and Chalmers were engaging with the mainstream in analytic philosophy of mind that takes intentionality to be a property of propositional attitudes. Their objective was to show that if one understands intentionality as a property of propositional attitudes, it would be internalist prejudice to claim that a state doesn’t qualify as a propositional attitude simply because it is realised in machinery that crosses the boundary of the organism and its environment. One could endorse this argument without also agreeing with the mainstream view of intentional states as propositional attitudes. The extended mind theory can remain neutral on how intentionality is to be understood since it is an account of the vehicles of mental states, not of contents. That the extended mind is in no way committed to an understanding of intentionality in terms of propositional attitudes as is well demonstrated by Wheeler (2005), in which propositional attitudes receive little if any discussion. Instead, the discussion of what Wheeler calls “human agency” is almost entirely framed in terms of smooth coping and practical problem-solving.

Dreyfus does however raise a more serious worry about the extended mind, a worry that in different ways informs the essays by Ratcliffe and Rietveld. He argues that extended mind theories fail to adequately account for being-in-the-world. If correct this would be a serious failing in any approach to cognitive science purporting to be Heideggerian. “World” is here understood in a Heideggerian sense as the place in which human beings go about their everyday business, and not as a totality of things. The term “being-in-the-world” designates the defining feature of our existence that we are at home in the world, and we know how to find our way about in it. “Being-in” characterises the relation that humans stand in to the world, but the “in” is not to be understood in terms of “containment” – humans are not “in” the world in the sense that one entity is inside another when the second contains the first. Humans are “in the world” in the sense that our very identity (what Heidegger calls our “abilities-to-be”) as persons is bound up with what we do, with the practical activities in which we engage, and with the ways in which each of us is concerned with, and involved with the world. Dreyfus argues that our being-in-the-world informs all of our skilled dealings with entities, whether they show up for us as ready-to-hand, unready-to-hand or as present-at-hand. We’ve seen how Wheeler
proposes to account for our skilful dealings when we are smoothly coping, and when we are engaged in practical problem solving in terms of situated special purpose adaptive couplings. Dreyfus’s worry is that the explanation on offer takes for granted, and so fails to account for our being-in-the-world. Being-in-the-world is the precondition for any skilful coping and as such it cannot be explained just by explaining skilful coping.34

Dreyfus goes on to outline a dynamical model of being-in-the-world based on the neuroscientist Walter Freeman’s work on learning in rabbits. Freeman, in agreement with Heidegger, argues that the rabbit always find itself in an environment composed of significant things. The animal’s perceptual system is primed by past experience to seek out rewarding experiences and avoid situations previously experienced as dangerous. When the rabbit undergoes a rewarding experience the synaptic connections between neurons are reinforced so as to form what Freeman calls “cell assemblies”. Through this process of Hebbian learning, cell assemblies are formed that respond to specific stimuli of significance to the animal. Now suppose that the animal is hungry on some later occasion and encounters an enticing carrot. The cell assemblies that have been formed on the basis of the animal’s previously rewarding encounters with carrots will be reawakened, and the rabbit will respond accordingly, and most importantly in ways that are appropriate given its concerns at the time.

Freeman describes this reawakening of neural circuits in dynamical terms in terms of the animal’s brain entering an attractor state – a state towards which the system converges over time. Each class of learned stimuli is associated with an attractor landscape (a set of attractor states) with a number of adjoining basins of attraction. The brain’s movement into an attractor state corresponds with the animal’s readiness to act on an affordance in the environment. As the animal undergoes new experiences, the patterns of activity in its brain are constantly “dissolving, reforming and changing”,35 resulting in a transformation of the attractor landscape. The reconfigured attractor landscapes will result in different stimuli in the environment standing out as significant. In this way the animal can acquire an increasingly sensitive capacity to discriminate what is relevant from what is not given the animal’s current state of arousal.

Dreyfus’s picture of the underlying machinery of the mind is one in which, as the animal interacts with its environment, the brain shifts from one attractor state to the next in ways that correspond with the environment’s invitation to the animal to act.36 Normally, we won’t
encounter a problem of having to work out what from everything we know is relevant to the current context of activity we find ourselves in. Our past experience has sculpted the attractor landscapes instantiated by the brain–body–environment system so that the attractor states the system moves into at each moment correlate with aspects of the environment that matter to the animal. Rietveld (2008) has highlighted an important distinction between *affordances* – the possibilities for action an ecological niche offers to an animal with certain abilities – and *solicitations* – potential actions that have “affective allure” because of the way they are of significance to the organism and its projects. Dreyfus’ model describes what might be taking place in the brain–body–environment system that makes an animal sensitive not only to the environment’s affordances, but also to its solicitations, to the affordances that are of significance to the animal given its current needs.

Of course we don’t just know our way about in particular contexts of activity. We also have a sense of other potentially relevant situations that lie on the horizon. These other potentially relevant situations are disclosed to us in experience and can invite us to move out of one context of activity and into another. Dreyfus suggests that this shift between contexts of activity might be modelled in terms of the brain’s *metastability*, which is to say in terms of the transition from one attractor landscape to another. We have seen above how attractor landscapes are continuously dissolving and reforming in ways that reflect the animal’s ongoing experience. As the animal is summoned to shift out of one context of activity and into another by the environment, so the brain moves out of one landscape and into another with its own unique basins of attraction.

The above is a very rough sketch of how Dreyfus thinks cognitive science might explain being-in-the-world. The explanation he proposes of why we don’t run into a frame problem is non-representational because the explanation lies with being-in-the-world. It is being-in-the-world that explains why we always find ourselves in a situation and so don’t face the problem of having to work out how to make our action fit with the context in which we find ourselves. The sub-personal story we have seen Dreyfus proposing about the mechanisms that support being-in-the-world is dynamical and non-representational. The dynamics of the brain–body–environment system are set up in such a way that the animal is at any time sensitive to relevant affordances, to aspects of the animal’s situation that are of significance to the animal. The attractor states in the animal’s brain do not represent things in the world. Dreyfus tells us “the brain’s current state is the result of the sum
of the animal's past experiences...the brain state is directly coupled with (or in Gibson's terms resonates to) the affordances offered" (by the environment) (Dreyfus, this volume, p.85).

The dispute between Dreyfus and Wheeler comes to a head in their respective accounts of what Wheeler (2008: 340) has called the intra-context frame problem. It will be worthwhile rehearsing something of this disagreement since in different ways it forms the starting point for Rietveld and Ratcliffe's essays to follow. The *intra-context* frame problem is the problem an agent faces of working out what, from his body of knowledge, is relevant to a context of activity. It contrasts with the *inter-context* frame problem, the problem of bringing a body of knowledge to bear in moving between contexts of activity. The problem is to produce actions that are appropriate and flexibly adapted not just to the context one is currently operating in, but to a potentially open-ended number of different contexts. It is only if our actions can be made to fit with an open-ended and indeterminate number of different contexts of activity that an agent will be able to move smoothly from one context to the next, behaving in ways appropriate to each when the world changes or new information comes to light.

Wheeler agrees with Dreyfus that an agent’s ability to smoothly shift between contexts of activity may well be explained along dynamical lines in terms of transitions between attractor landscapes. He has argued in particular for the importance of neuromodulators whose rapid and transient spread through the brain may account for transition from one attractor landscape to another, and for how we can so effortlessly shift from one context of activity to the next. Wheeler disagrees, however, about whether the same story can also be said to apply to the *intra-context* frame problem. For he argues that in our dealings with the world in particular contexts of activity, these dealings are only very occasionally hitch-free. Hence our everyday dealings with the world rarely have the phenomenology characteristic of dealings with the ready-to-hand. More often, we find ourselves dealing with the unready-to-hand, solving practical problems using action-oriented representations that inform us of what to do to overcome a temporary problem we’ve run into.

If Wheeler is right, the solution to our two frame problems doesn't necessarily lie in non-representational being-in-the-world. The two frame problems require different solutions. The overall explanation of why we don't normally run into a frame problem when we are acting within a context lies with situated special purpose adaptive couplings. When we come up against a practical problem, we
deploy action-oriented representations informing us of what action the situation calls for. For Wheeler, then, the frame problem doesn’t necessarily have its source in representations as Dreyfus has argued, and the solution to the frame problem doesn’t necessarily require a non-representational explanation of our online skilful coping. On the contrary, action-oriented representations will often figure in the mechanisms that explain how we act effectively and appropriately in a particular context of activity. More generally, we can say that it is situated special purpose adaptive couplings (by virtue of their in-built context sensitivity) that account for how our responses can be delicately tuned into the situation in which we are acting.

Dreyfus has responded that action-oriented representations always presuppose our ground-floor being-in-the-world (this volume, §5 & 10). The explanation of the latter is, we have seen, dynamical and non-representational. What is doing the real explanatory work even in practical problem-solving must be the non-representational dynamics that governs agent–environment interaction. He argues that it is being-in-the-world that accounts for the dissolution of the frame problem, and being-in-the-world is a fundamental presupposition of any representational activity. Being-in-the-world has the status of a transcendental condition – it is the condition of the possibility of any understanding of being, of anything in the environment showing up as intelligible for Dasein. Given the transcendental status of being-in-the-world, it cannot be explained in terms of representations. Any representation of the world will have intentionality – it will be about the world, but being-in-the-world is what makes intentionality possible (Dreyfus, this volume, p.78).

Wheeler (2008) responds that while being-in-the-world is indeed a precondition for any kind of dealing with the world, it should not be thought of in abstraction from our dealings with the world. It is rather “exhibited in” our dealings with the ready-to-hand and in our practical problem solving. Expanding on this point, Wheeler and Cappuccio (2010) have argued that the relationship between background understanding (or being-in-the-world) and skilful coping should be understood as a background–foreground relation. In dealing with the world, whether on the basis of action-oriented representations or not, the agent is enacting certain possibilities for action that are in the foreground, but these are always situated within a background of other possibilities for action disclosed to us because of our being-in-the-world. Wheeler and Cappuccio argue that given the way in which being-in-the-world and skilful coping are interrelated and co-dependent, we cannot give
a sub-personal explanation of the one without at the very same time explaining the other. In particular, we shouldn’t think of being-in-the-world as requiring some additional mechanistic explanation over and above that which has been given in addressing the two frame problems.

V. The field of perception and action

In Chapter 2 of this collection, Erik Rietveld returns to this debate between Wheeler and Dreyfus and offers a sophisticated argument against Wheeler’s distinction between the intra-context and inter-context frame problem. He starts off by agreeing with Cappuccio and Wheeler that background understanding and the foreground understanding we manifest in skilful coping are interrelated and co-dependent. However his explanation of this co-dependence is developed in the context of a theory of affordances, whereby all perception and action take place within a field that has the foreground–background structure I have just described. The field is composed of affordances or action possibilities available to be detected by agents with the requisite abilities. However from this field of affordances, certain possibilities stand out as inviting or soliciting the agent to act. These inviting affordances stand out as figures in the perception–action field. The other possibilities that aren’t in this way alluring and inviting are nevertheless picked up as potential actions available to the agent, and form the background against which our ongoing action unfolds. When we switch from one context of activity to another this is because one of the possible actions, previously on the margins of our experience, has now become salient or relevant to us. We can think of this in terms of attention moving from one salient affordance to another, and with each shift in attention so also will there be a shift in how the situation invites us to act.

Being-in-the-world (although he doesn’t use this term, preferring instead to talk of “background understanding”) is characterised by Rietveld in terms of an agent’s readiness to respond to the affordances that make up the field of perception and action. As we move from one context of activity to another, Rietveld suggests that this can be understood in terms of a change in action readiness, in what we are motivated by the situation to do. Rietveld follows Nico Frijda, an influential psychologist of emotion, in understanding emotions in terms of action-readiness. Shifts in action readiness, he suggests, are due to fluctuations in affect. Different aspects of the environment attract us and our body prepares itself to act, while other aspects of the environment at
the same time repel us. As we move from one context of activity to another this is due to how the environment is affecting us, moving us to act in ways that are keyed into the situation and our emotional interests. Rietveld offers the helpful example of the cup of coffee and cookie handily situated within reach while he writes. As he types the keyboard is inviting particular responses because of the thoughts he is articulating, but he is at the same time ready to reach for the cookie. When he stops typing to take a bite from the cookie this is because his attention has been drawn to the cookie, and its alluring invitation to him to eat it.

Any action within a context always has to be understood as taking place against a background of other possible contexts of activity that we are ready to deal with. We have seen how Wheeler argues that the phenomenology of online sensorimotor intelligence forms a spectrum from rare cases in which we are smoothly dealing with the ready-to-hand to more common cases of practical problem solving. Sensitivity to what is relevant in a particular context of action is, Wheeler argues, delivered by mechanisms he has described in terms of situated special purpose adaptive couplings keyed into handling particular concrete situations. However Rietveld argues that on any given occasion we are not only sensitive to what is relevant in our current context of activity, but also to other potentially relevant situations that lie on the horizon. Sensitivity to what is relevant in a given situation is thus always embedded in a decidedly more complex form of sensitivity to other potentially relevant contexts of activity. Part of Rietveld’s worry is that situated special-purpose mechanisms are keyed into dealing with very specific situations, and are thus powerless to account for how we are simultaneously sensitive to other potentially relevant situations that lie on the horizon. Our sensitivity to what is relevant in a concrete context of activity is holistic in a way that cannot be captured by appeal to special-purpose mechanisms.

Rietveld agrees with Wheeler and Cappucio (2010) that skilful coping and being-in-the-world are mutually dependent. However he argues that Wheeler cannot satisfactorily account for this interdependence in terms of situated special purpose adaptive couplings. Thus Rietveld provides reasons for siding with Dreyfus in taking the non-representational, dynamical explanations to be ontologically basic. If he is right about the holistic nature of adequate responsiveness to what is relevant in the field of perception and action, this responsiveness is best modelled in terms of dynamics of the agent–environment interaction in the way we have seen Dreyfus describe. Special purpose adaptive
couplings won’t be up to the task of explaining skilful coping because they fail to capture the holistic character of our skills.\textsuperscript{43}

Wheeler’s chapter (see §§ 3&4) offers an explicit response to Dreyfus and Rietveld. Part of his strategy is to raise some hard questions about inter-context sensitivity to relevance. Inter-context sensitivity to relevance is sensitivity not only to what is relevant in the actual context in which one is acting but also to the open-ended number of other possibly relevant contexts of activity one could switch into. Dreyfus, Rietveld and Wheeler are all agreed that for this type of sensitivity to relevance, what might matter is the ability of the system to rapidly and fluently reconfigure both structurally and functionally the large networks of (neural, bodily and environmental) elements of which it is composed. They are further agreed that nonlinear dynamics may well hold the key to explaining this kind of fluid and rapid reconfiguration of cognitive machinery. In his recent work, however, Wheeler (2009, this volume) has been raising some critical questions about this purported explanation. Both Dreyfus and Rietveld appeal to ideas from Walter Freeman’s work on neurodynamics to frame their respective explanations. We’ve seen above how according to Freeman the brain’s response to some significant stimuli in the animal’s environment can be described in terms of attractor states and basins of attraction. Context-switching is the outcome of the collapse of one attractor landscape and the formation of a new landscape. Wheeler asks what the role of attention is in inter-context relevance sensitivity. Are shifting attractors the causal basis of shifts in attention required for context-switching or are they caused by attentional shifts? If the former, Dreyfus and Rietveld owe us an explanation of attentional shifts, and how they occur in a relevance sensitive way. If the latter, we are still owed some explanation of how these shifts in attractor landscapes happen in ways that are relevance-sensitive. Either way, it seems we have no explanation of inter-context relevance sensitivity. This problem threatens to generalise if we suppose, as Dreyfus and Rietveld both argue, that because of the holistic structure of the field of affordances inter-context and intra-context sensitivity to relevance are intertwined and inseparable. Wheeler suggests the correct response from Heideggerian cognitive science should be to deny that these capacities are inseparable, and to pursue a divide-and-conquer strategy. We treat intra-context sensitivity to relevance as the product of thrownness, which we explain in terms of special purpose adaptive couplings that may or may not involve a role for action-oriented representations.
So far we have been concerned with the issue of the shape a Heideggerian cognitive science ought to take. We have seen Dreyfus argue that the challenge facing any cognitive science is to account for background understanding, and that a dynamical cognitive science that eschews representations stands the best chance of success. Wheeler agrees that dynamics of brain, body and world interactions may have a central place in cognitive science, but he suggests that representations may also have a place as they figure in some types of situated special purpose adaptive coupling.

We will turn next to criticisms explored in the chapters by Ratcliffe, Rehberg, and Talero that there are in-principle limits to what a cognitive science can explain. According to this line of objection, Heidegger’s philosophy is, to put it mildly, in tension with the commitment to philosophical naturalism that has been implicit in our discussion thus far. This tension threatens to render incoherent my objective of casting cognitive science in Heideggerian terms.

VI. Heidegger’s anti-naturalism

Before we delve into the question of Heidegger’s anti-naturalism, we must first say something brief about how philosophical naturalism is to be understood. De Caro & Macarthur (2004) take naturalists to be committed to the following two theses: (1) the world contains only those entities recognised by science, and (2) philosophical inquiry is “continuous” with science. There are a number of different ways of understanding “continuity” in the second of these claims. On what is perhaps the strongest construal, what is being claimed is that one arrives at “genuine” knowledge only by following the empirical methods of the natural sciences. Philosophy, on this reading, has no autonomy whatsoever from science, and to the extent that it has any work of its own to do, it is in making general and abstract claims that have their basis in scientific findings.

This very strong reading of the continuity claim would seem to leave little room for phenomenology to make any contribution to the philosophy of mind. Phenomenology has its own methods, and there is much discussion among phenomenologists about the nature of these methods, whether they should be transcendental or hermeneutic, and to what extent a hermeneutic method is also transcendental (see Carman 2003, ch. 1 for some discussion). However these questions are resolved, all phenomenologists are agreed that the methods of phenomenology are radically different from the methods of the natural sciences. A
strong reading of continuity would imply that because of its distinctive methods, phenomenological philosophy has nothing to contribute to our knowledge and understanding of mind.

We will need a weaker understanding of “continuity” if the project of developing a Heideggerian cognitive science is to get off the ground. For such a project implies that a philosophical theory of mind must be informed both by Heidegger’s hermeneutic phenomenology and by cognitive science. Fortunately there is a weaker understanding of the continuity between philosophy and science available that doesn’t foreclose such a project from the outset.\(^4\) On this understanding, continuity between philosophy and science is to be understood in terms of the consistency of philosophical claims with those of the natural sciences (see Wheeler 2005, this volume). The naturalist, on this understanding, is not committed to any claim about the methods appropriate to philosophy, and so she need have no scruples about philosophical claims that have been arrived at on the basis of Heideggerian phenomenological interpretation. Nor is the naturalist committed to the possibility of giving a complete and exhaustive explanation of every phenomenon Heidegger describes in his philosophy, a point we will make much of below. The commitments of the philosophical naturalist are simply that when philosophy clashes with science, philosophy must give way (Wheeler, 2005: 5–6, see also Price 2004). If a philosopher posits the existence of an entity or process that finds no echo in our best scientific theories, the philosopher must concede that the entity or process in question doesn’t exist. Understood in this way “continuity” is just a logical consequence of the first of De Caro and Macarthur’s two naturalist theses that the world contains only those entities recognised by science. Wheeler has labelled a version of this thesis the “Muggle Constraint” since it commits the naturalistic philosopher to a world in which nothing magical exists.

Understood against the backdrop of what I will call “soft naturalism”, Heideggerian cognitive science is the project of making scientifically intelligible the descriptions of our existence as persons found in Heidegger’s hermeneutic phenomenology (Wheeler 2005, this volume). Hermeneutic phenomenology describes the situatedness of whole persons, while cognitive science offers descriptions of our existence framed at the sub-personal, or sub-agential level. The Muggle Constraint can be understood as the requirement that cognitive scientific explanation can identify mechanisms that make it intelligible how “unmysterious causal processes” make it the case that we exhibit the kind of situatedness Heidegger describes. A Heideggerian cognitive scientist
will accept the existence of a mutual, bidirectional constraint. Given a commitment to soft naturalism, which is implicit in the practice of cognitive science, any phenomenological description must cohere with our best explanations in cognitive science in the way we’ve just described. At the same time, there is a constraint that hermeneutic phenomenology imposes on cognitive science that its explanations fit with the interpretations of what it is to be human to be found in the writings of phenomenologists. A philosophical naturalist might balk at the latter constraint. Why should science be accountable to phenomenology, a naturalist is likely to wonder?

This important question requires a lengthy discussion, and some of what we will say below in responding to Heidegger’s alleged anti-naturalism may go some way towards addressing it. A brief answer can be found in Heidegger’s discussion of science in Being and Time (1962: 71–77), where Heidegger argues that science operates with what Ratcliffe calls “basic concepts” and Wheeler (2005) labels “constitutive assumptions”. These basic concepts and assumptions provide the scientist with a conceptual framework that informs the kinds of questions he asks about a domain of inquiry, the ways in which the science’s subject matter is conceptualised, the methods the scientist employs, etc. What hermeneutic phenomenology can do is provide “a productive logic” that “leaps ahead, as it were, into a particular region of being, discloses it for the first time in the constitution of its being, and, after thus arriving at the structures within it, makes these available to the positive sciences as transparent assignments for their inquiry” (Heidegger, 1962: 10).

We’ve seen something of this productive logic at work in our discussion of the ontological Cartesian assumptions of GOFAI above, and the Heideggerian ontological assumptions of 4EA cognitive science. There we have exposed the implicit assumptions at work in GOFAI about what it is to be a cogniser. In particular, we’ve seen how GOFAI assumed that cognisers relate to the world as subjects relate to objects. Cognisers are always located outside of contexts of activity and have to work out what from everything they know is relevant to the context in which they are acting before they can work out how to act. Crucially these are assumptions about what it is to be a human agent, assumptions that we can critique both from within cognitive science, but also crucially as hermeneutic phenomenologists. As hermeneutic phenomenologists, we can argue against this interpretation of what it is to be a human agent because of what it obscures from view – our way of being as human beings, or being-in-the-world.
What might Heidegger have made of our soft version of philosophical naturalism? There is absolutely no doubt that Heidegger was strongly opposed to *scientism* – the view that science will, in the fullness of time, provide us with a complete and exhaustive understanding of reality. Science operates with a present-at-hand understanding of what is real. It takes entities out of the everyday involvement wholes in which we normally deal with them, and provides us with theoretical framework from the standpoint of which entities have a new mode of intelligibility. Entities show up for the scientist as present-at-hand, as occurrent material things with causal properties that can be subsumed under laws of nature. We have seen above how any present-at-hand understanding of entities must presuppose being-in-the-world, or that in virtue of which we are at home in a world that is familiar to us. Heidegger sometimes describes this sense of belonging to the world as “worldliness”. In *Being and Time* he tells us: “Nature’ as the categorical aggregate of those structures of being which a definite being encountered within-the-world may possess, can never make worldliness intelligible” (Heidegger 1962: 93–94). In his lecture course *History of the Concept of Time* he tells us the reverse is the case: “nature can only be understood on the basis of worldliness” (Heidegger 1985: 199).

Ratcliffe (this volume) uses the example of space to drive this point home. “Physical space” – by which he means spatiality understood in present-at-hand terms, the space of physically extended objects represented using allocentric coordinates – is an abstraction from “existential” or “lived” spatiality. Existential spatiality is precisely not an objective, geometric spatiality. This is nicely brought out in Heidegger’s notion of “de-severance” [*Ent-fernung*], a term Heidegger uses to describe how the distance between us and familiar things is abolished even when the familiar entity is physically remote from us. “De-severing” he tells us “amounts to...making the remoteness of something disappear, bringing it close” (1962: 139). The closeness of what is intelligible to us cannot be captured using a present-at-hand understanding of spatiality. “Closeness” is rather a matter of our knowing our way about in a space made up of pragmatically determined regions, and functionally defined places. Think here of an office and the way in which computers, office desks and chairs, photocopiers, water dispensers etc. are all available to the office worker to put to use in his everyday office duties. A present-at-hand understanding of spatiality is an abstraction from an existential or lived spatiality, but it is an abstraction that at the same time is rooted in this lived or existential sense of space. The existential sense of space is an aspect of our being-in-the-world and we have seen how it
is by virtue of our being-in-the-world that entities can show up for us as significant.

Ratcliffe (this volume) doesn’t just take Heidegger to be opposed to scientism but also to naturalism. He makes a transcendent argument aimed at proving the impossibility of any complete understanding of our existence as human beings in present-at-hand terms. He takes this argument to impugn naturalism. Empirical science, Ratcliffe tells us, is concerned with the question of what kinds of things populate reality, but as such it presupposes an understanding of the distinction between being and not being, or an understanding of what it means to be. This understanding of being is however a defining characteristic of our existence as human beings (Heidegger, 1962: 32). There is therefore a fundamental, indeed defining, characteristic of our existence as human beings that is presupposed by science, and hence cannot be given an explanation in scientific terms.50

Ratcliffe locates the source of the problem for the naturalist in a discontinuity between our human mode of existence where this is characterised in terms of “worldliness” and that of non-human animals. Heidegger is well known for having argued that non-human animals have an environment, but they are “poor in world” (1995: 177). Ratcliffe argues that this impoverishment is not to be understood as a behavioural difference between humans and other animals, but is instead to be understood in terms of the kind of significance that entities can have for humans, but not for non-human animals. Dasein’s encounters with the world are founded upon what Heidegger calls the “care” structure. On the basis of our thrownness or situatedness in a world that is encountered as already mattering to us in determinate ways, we project ourselves towards particular concrete possibilities. Entities then show up for us as significant in determinate ways because of the possibilities we are pursuing. Thus Ratcliffe argues that our understanding of being is characterised by “an understanding of possibilities as possibilities”. To have an understanding of possibilities as possibilities is to encounter a world of significant possibilities, a world in which particular possibilities for action are marked out as meaningful. It is this form of understanding that he argues the explanations in cognitive science are constitutively incapable of grasping.

This is not the place to provide a full response to Ratcliffe’s important challenge to naturalism, but notice that the soft naturalism we’ve outlined above could perhaps concede a good deal of ground to Ratcliffe.51 We’ve argued that naturalism is committed to the consistency of any philosophical claim with the best science of the day. This
in no way implies scientism – the view that science can provide a complete and exhaustive description of what there is. It doesn’t imply what McDowell (1994) has described as a “bald naturalism” – the view that nature is exhausted by entities that enter into causal relations subsumable under laws of nature. On the contrary, it can allow for multiple modes of explanation, just so long as each of these explanations is consistent with what the best science of the day tells us. Nor is the soft form of naturalism we are recommending committed to any privileging of the epistemic practices of the natural sciences. It doesn’t say that science has any unique claim to accessing how things are, but can recognise that there are many ways in which being can be understood. The claims of science don’t have any special authority above and beyond what falls out of the Muggle Constraint.

Thus the philosophical naturalist need not be committed to the claim that a complete and exhaustive description of reality can be given in present-at-hand terms. Indeed a Heideggerian cognitive science might even make a contribution to explaining why such a description of reality probably cannot be given. We’ve seen above how all 4EA cognitive scientists agree that Dasein is always in the world, and never finds itself without world. Ratcliffe has argued that no present-at-hand understanding of Dasein can grasp what it means to be in the world; 4EA cognitive science would say this is indeed likely to be the case if we start from an understanding of human beings as existing without a world. However 4EA cognitive scientists will deny that a present-at-hand understanding of our existence as human beings must be an understanding of human beings as existing without a world. The 4EA cognitive scientist can happily agree that human beings have an existence characterised by worldliness; indeed this falls out of the explanations they provide of how our minds work. The soft naturalist only requires that whatever is involved in worldliness, this must be consistent with what we learn about human beings from cognitive science. We’ve seen above how this is a requirement that is indeed satisfied by 4EA cognitive science.

The theme of Heidegger’s anti-naturalism also takes centre stage in Rehberg’s essay, albeit in quite different terms. Rehberg begins by criticising Heideggerian cognitive science for its selective appropriation of Heidegger’s ideas. Our discussion above has drawn upon ideas found in Division 1 of Being and Time, but in doing so we’ve neglected the wider context in which these ideas are developed. Particularly serious is our neglect of the “preparatory” nature of the phenomenological descriptions Heidegger offers in Division 1. Heidegger takes pains to
tell us at regular intervals that the analysis he is giving of being-in-the-world in this part of the text is only a provisional interpretation of Dasein’s existence. The result of neglecting such themes as Dasein’s historicality from Division 2 is “a pared down, schematic version of Heidegger”, one that ignores core elements and larger issues at work in his thought. Consider for instance the critique of Cartesianism in Heidegger’s philosophy, something we’ve already made much of above. Rehberg focuses her discussion on Heidegger’s analysis of the concept of extension in Descartes. She demonstrates that a conception of space as extension leads to an understanding of beings as calculable and manipulable. Beings are understood as “available” for the “manipulating rationality of the... Cartesian subject” (Rehberg, ms, p.8). Thus in his analysis of Descartes, Heidegger isn’t just showing how a Cartesian understanding of space covers over a richer notion of world as we’ve suggested above. His analysis of Descartes is to be understood against the backdrop of a wider critique of instrumental, calculating rationality. Rehberg goes on to show how Heidegger’s critique also naturally extends to cognitive science, which she claims is likewise guilty of operating with essentially the same calculative and instrumentally rational mode of thinking. Heideggerian cognitive science is ultimately incoherent she argues because cognitive science is inescapably implicated in the very modes of thinking Heidegger was attempting to point beyond with his *Destruktion* of the history of ontology.

Let us briefly zoom in on this last point. Rehberg draws on a number of essays from the late 1930s in which Heidegger describes science as operating with a framework that produces beings as fixed 
\[\text{festgestellt}\] into objectness \[\text{Gegenständigkeit}\] and makes being as a whole stand forth into constant presence \[\text{Anwesenheit}\]. Beings are thereby made ready for “human use, manipulation and exploitation” (ms, p.18). Science continues to operate with a “mathematical projection of nature” as orderable and calculable, an understanding of being that we have seen above originates with Descartes. 53 Rehberg goes on to argue that any attempt on the part of cognitive science to make Dasein as being-in-the-world into a fixed object of study must be doomed to failure. We’ve already seen how she charges Heideggerian cognitive science of operating with a pared down version of Dasein as being-in-the-world. 54 Rehberg argues this is inevitable since Dasein cannot be reduced to the status of an object. Modern science is essentially rational and calculative, but Heidegger’s philosophy points to alternative modes of thinking that “hold-off” (Rehberg’s translation of \[\text{Verhaltenheit}\]) bringing being under one’s control, and that can instead recognise its irreducible
otherness. This recognition of the otherness of being is, Rehberg argues, something that is necessarily precluded so long as we persist in thinking scientifically. Thus the idea of a Heideggerian cognitive science is ultimately incoherent Rehberg argues. The path we chart in Heidegger's thought that leads us to an overcoming of metaphysics also takes us through scientific thinking to modes of thinking that disclose being in ways that are foreclosed by scientific modes of thinking.

Once again, this is not the place to attempt a full response to the deep questions Rehberg's careful and illuminating reading of Heidegger raises. I would however like to briefly question whether cognitive science really is necessarily embroiled in the kind of technological calculative thinking that Rehberg, following Heidegger, rightly takes issue with. I have painted a picture of cognitive science as being in a constructive dialog with Heideggerian phenomenology. Cognitive science as I understand it is partly constrained by hermeneutic phenomenology because the latter can uncover the understanding of being that is tacitly at work in the way that any scientific theory discloses reality. Rehberg takes “the scientific mode of knowing” to present itself as “decisive, definitive, authoritative”, the “measure” of “what is considered real” (p.19). One is reminded here of Wilfrid Sellars' characterisation of naturalism as the view that “science is the measure of all things, of what is that it is, and what is not that it is not” (1963: 173). However this view of ontological commitment is not logically implied once one accepts soft naturalism, which recognises a plurality of ways of understanding being, and doesn’t assign any special, privileged authority to scientific modes of thinking. We’ve seen how naturalists are committed to the thesis that the world contains only those entities recognised by science, but this is a thesis about entities, not about our understanding of those entities. Soft naturalism is in no way committed to the view that a scientific understanding of being has any claim to exclusive authority when it comes to understanding what there is. On the contrary, to the extent that soft naturalist accepts a constraint from phenomenology this is precisely because it recognises the potential of a science to operate with a partial understanding of being that often hides and obscures from view other equally valid ways of understanding of being.

Talero (this volume) argues that the phenomena of “expressive intersubjectivity” which she finds in Heidegger’s discussion of Dasein’s being-with [Mitsein] also points to the limits of scientific explanation. Heidegger argues that Dasein’s existence is essentially social. The wordliness, which we have seen is a defining characteristic of our existence as human beings, is Heidegger argues necessarily shared:
“By ‘others’ we do not mean everyone else but me – those over against whom the ‘I’ stands out. They are rather those from whom, for the most part, one does not distinguish oneself – those among whom one is too. This being-there-too with them does not have the ontological character of a being-occurrent-along-“with”-them...This “with” is something of the character of Dasein....By reason of this with-like being-in-the-world, the world is always the one that I share with others. The world of Dasein is a with-world. Being-in is being-with others.” (Heidegger 1962: 118)

Talero explains how inscribed into this relation with others is the potential for what she calls “discursive expressivity” the bringing forth (“co-enactment”) of a shared meaning in our interaction with others. The phenomena of discursive expressivity she wishes to point to might naturally be thought of in terms of communication insofar as it involves a sharing of meaning between two or more individuals. Crucially, however the type of communication Talero has in mind needn’t involve verbal communication. Indeed many of the examples Talero discusses such as gesture and joint attention, are examples of non-verbal forms of communication. Nevertheless, both gesture and joint attention are examples of communication insofar as what is accomplished in both cases is a sharing of meaning. Talero shows how for Heidegger the potential for communication is an aspect of projection or Being-ahead-of-itself, one of the three temporal ecstases that makes up the unifying structure of Dasein’s existence Heidegger labels “care”. Expressivity is therefore, as Talero rightly points out, at the very heart of Heidegger’s analysis of how the world is disclosed to Dasein as intelligible.

What is it about expressivity that Talero thinks must escape explanations in the terms of the cognitive sciences? She argues that expressive intersubjectivity has what she calls a transphenomenal dimension, by which she means “dimensions” of experience that contribute to the constitution of experience, but that are not themselves given as experiences. Whenever we are undergoing an experience there is always for instance the potential for the sharing of this experience with others through joint attention. This potential is, Talero suggests, an aspect of what Heidegger calls being-with [Mitsein]; it is a graphic illustration of how each individual is always in the world with others like itself. However the precise meaning of what is shared is not fixed and stable but is shifting always open to being re-inscribed in a new context. Talero offers a vivid example of this instability borrowed from Tomasello (1995): you are at a dinner party and you’ve just emptied your glass.
You try to attract the attention of your host by gently nudging your newly emptied glass in his direction, but you don’t want to over do it and appear rude and demanding. The interaction that unfolds invites a number of different interpretations because what one negotiates in sharing attention is a complex, interpersonal space. The meaning that gets generated through joint attention is, Talero argues, indeterminate because it always offers material for a “new and different ‘Gestalt’” just by being re-contextualised. This openness and indeterminacy is, Talero argues, a transphenomenal dimension of the lived experiences we share through joint attention. What makes it recalcitrant to empirical inquiry is that cognitive science can investigate only what it can operationalise, quantify and measure. Discursive expressivity doesn’t have a fixed and stable identity that admits of operationalisation, quantification and measurement. Cognitive science can investigate joint attention only by abstracting away from its epistemic openness that is a key aspect of the meaning that gets made through joint attention. Talero argues that the best any empirical investigation will be able to achieve is to account for phenomenal dimensions of lived experience. (Doubts about this possibility are a familiar landmark in the naturalist terrain (cf. the hard problem and the explanatory gap).) The transphenomenal dimensions of experience will necessarily elude empirical investigation because they lack a fixed identity of the kind that would be required for empirical investigation.

Notice however that once again a soft naturalist can concede to Talero the claim that joint attention (and indeed expressive intersubjectivity more generally) has transphenomenal dimensions. It is not committed to the possibility of providing a complete and exhaustive explanation of human existence, and so it needn’t claim that every aspect of lived experience can be identified with the sorts of entities and properties posited by our best explanations in cognitive science. The soft naturalist can concede that there are limits to what we can explain and understand on the basis of the concepts available to the cognitive scientist, and admit that there is a surplus of meaning to our everyday lived experience we miss so long as we are operating from within the conceptual framework of cognitive science.

We began this section by asking why cognitive science should be thought to be accountable to phenomenology. Why should a naturalistic philosophy of mind try to make room for insights from phenomenology? What Talero and the other anti-naturalist contributions to this collection highlight is that are limits to what we can learn from cognitive science about human existence. Phenomenology has a necessary
role to play in philosophy of mind since cognitive science, like all science is naïve about its presuppositions. Phenomenology can help to bring those presuppositions to light in a way that allows us to criticise a scientist’s working assumptions and establish their limits. We’ve been arguing that recognising the limits of science shouldn’t trouble a philosopher committed to a soft naturalism. Once we’ve conceded that science has limits, it stands to reason that there are transphenomenal dimensions to experience that lie at the limits of science that are hidden so long as we operate within science, but that can only be disclosed once we abandon scientific modes of thinking.

VIII. Post-Dreyfus Heideggerian cognitive science

It is a testimony to the importance of Hubert Dreyfus’ contribution that so much of our discussion in this introduction has taken the form of a dialog with his Heidegger-inspired critique of cognitive science. However a number of our contributors take up themes that are either absent or marginalised in Dreyfus’s writings, or receive treatments by Dreyfus that are, according to our contributors, distortions of Heidegger’s thinking. I take this development to be a sign that the seeds initially planted by Dreyfus have taken root and are now branching out to explore new territory either left unexplored in Dreyfus’s writing or closed off by his reading of Heidegger.

Jeff Malpas uses Heidegger’s early and late writings to mount an important challenge to Dreyfus based on his reading of Heidegger on spatiality. Dreyfus presents Heidegger as challenging a Cartesian understanding of space in terms of extended substances that fill space in the way water might fill a glass or clothes a wardrobe. Heidegger, he suggests, offers a different existential interpretation of being-in to that of spatial containment, which stresses our concernful involvement, and skilful dealings with the world. Malpas begins by arguing that this cannot be correct, since any skilful engagement with equipment presupposes “an extended dimensionality” (p.335), a space in which Dasein can connect with its surroundings. Dasein always finds itself in a space in which it can navigate, distinguish between, and connect regions as parts of a larger space. This space is public in that it is shared with other people, and the entities Dasein encounters are accessible not just by itself but by others as well. Hence, Dasein’s involvement with the world presupposes a space that is ‘objective’ (in the sense that it is a space filled with things), ‘subjective’ (in that it is understood through Dasein’s practical engagement with the ready-to-hand) and ‘intersubjective’ (in
that the ready-to-hand is accessible to others) (Malpas, this volume, ms, p.9). Malpas therefore argues that space and world are interdependent notions, they stand in an internal relation such that there is no making sense of space without also making sense of world and vice versa.\textsuperscript{56}

This of course has significant implications for reading Heidegger along the lines we have been suggesting above. There it is has been suggested that we understand being-in-the-world through our skilful dealings with the world, and our facility for finding our way about in the world. If Malpas is correct, our practical involvement with the world is not prior to any notion of spatiality. Rather it may well depend on a notion of spatiality left unanalysed, and that very likely imports the very notions of extension and containment we are purporting to replace in pointing to Dasein’s practical engagement with the world.

Malpas goes on to argue that any attempt at deriving spatiality from our practical involvement with the world will amount to a “subjectivisation” of space, a view that Heidegger took increasing care to distance himself from in his later writings.\textsuperscript{57} Creatures with different skills configure space in different ways, the possibilities for action that show up for them will differ in the light of these differences in skill. To the extent that they understand space differently, they can also be said to inhabit different spaces. However space, Malpas insists, is unitary in the sense that there cannot be multiple spaces; there is one space in which every location is connected to every other location ultimately because of connections to be found within unified agency.\textsuperscript{58} It is a shared space in the sense that it is accessible to all, irrespective of what they can do. Certainly space is only accessible subjectively, from a point of view occupied by a subject’s body. This does nothing to undermine the point that the space we configure is nevertheless an objective space, a single unitary space we inhabit with others.

Malpas drives home this objection to Dreyfus by drawing on Heidegger (1995), a series of lectures given in 1929 in which (among other things) Heidegger differentiates his view of worldhood from that of the biologist Jakob von Uexküll.\textsuperscript{59} Von Uexküll described how each species of animal inhabits its own distinctive niche or what he called an Umwelt (environment). The world appears differently to each species not only because each species has sense organs that are selectively responsive to different features, but also because objects show up as having different functional characters for creatures with different abilities. Heidegger argued in these lectures that humans have a world in a very different way from that of non-human animals. He tells us that human’s relation to the world is “world-forming”, a possibility that is not open to any
non-human species of animal. Malpas quotes Heidegger’s definition of “world-formation” as “the manifestness of being as such, of beings as beings”. Beings can be made manifest to us in this way (as beings) through language understood as logos, but crucially this assertion can uncover or make manifest being only because we are already open to the world as a whole. This openness to the world as a whole is what Heidegger calls “world formation”. Malpas goes on to trace a connection between spatiality and world-formation via the notion of “projection”. This was a concept that was already at work in *Being and Time*, but Malpas argues that in his later writings Heidegger stripped this concept of any connection with Dasein, characterising “projection” instead in terms of spatialisation. Hence Malpas traces a path through Heidegger’s thinking that shows how spatiality is a condition of the possibility of world-formation.

Malpas’s argument is clearly very complex, but his take-home point seems to be that to characterise spatiality in terms of Dasein’s practical involvements with the world is to miss the difference between the human world and the Umwelt of non-human animals. This difference as we have just seen is what Heidegger points to in his discussion of world-formation. Space and world are interdependent in ways that we might miss if we try to characterise space by reference to Dasein’s practical dealings with things. Such a characterisation of space would seem to apply equally well to the places where animals live. Yet animals are “poor in world” insofar as it is only for humans that beings manifest as beings, and spatiality, Malpas argues, is at the very heart of Heidegger’s story about how this is possible.

Not all of our contributors end up taking the side of Heidegger in the dialog with cognitive science. Jacobsen and Gallagher for example offer arguments that purport to show the inadequacy of Heidegger’s account of being-with based on developmental research concerned with social interaction and intersubjectivity. They begin by agreeing with Heidegger that to describe the relation between self and other in terms of social cognition is to misdescribe our everyday encounters with other people. We normally don’t find ourselves imprisoned within the confines of our own minds facing the problem of how to make sense of others. We always already find ourselves in a world that is shared with others, or as Heidegger puts it: “Being-in is Being-with Others” (Heidegger 1962: 155). Most of the time there is no need for us to have recourse to imaginative projection or to engage in theoretical reasoning about the hidden contents of other people’s minds because other people act in ways that are already make sense to us, and hence we can smoothly cope in our
dealing with them. Clearly possibilities for misunderstanding and miscommunication are constantly present on the horizon in our interactions with others, and this is part of what makes for the drama of everyday life. However, these are possibilities that exist only within the context of an existence that is social through and through, and that is characterised by a shared understanding of the world. Gallagher and Jacobsen therefore agree with Heidegger that any account of intersubjectivity that is framed solely in terms of social cognition will fail to do justice to our lived relation with others. For the most part other people don’t show up for us objects that behave in alien ways we must struggle to understand; others are with us in a familiar world we can effortlessly navigate.

Despite this agreement, Gallagher and Jacobsen argue that Heidegger’s account of being-with is woefully inadequate. This is an accusation that has often been levelled at Heidegger, but Gallagher and Jacobsen add to this critique empirical considerations from cognitive science. They begin by pointing to research on early development that suggests that from birth infants are perceptually attuned to what the other person intends and feels. The other’s intentions and feeling can be “directly” perceived in their gestures – in their expressive movements and instrumental actions.\(^60\) Our earliest relations to others are intersubjective in the sense that more or less from birth there is a mode of awareness that is \textit{shared} between self and other. As the infant grows, so this awareness becomes progressively elaborated. Around 9–14 months for instance, infants begin to acquire a capacity for sharing attention, and for gaining an understanding of the world through interaction with others.\(^61\) Gallagher and Jacobsen argue that Heidegger overlooks the intercorporeal connection that binds self and other together. Right from birth infants are attuned to the meanings that are enacted in their richly affective, face-to-face interactions with others. This dimension of intersubjectivity doesn’t get recognised in Heidegger’s analysis of Being-with. On the contrary, Gallagher and Jacobsen argue that it is obscured from view by the analysis that Heidegger provides, which they label somewhat severely, “philosophically autistic”.

The basis for this charge is in part that Heidegger neglects the affective component of our relation with others: he misses the way in which being-with is commonly also an ethically charged, feeling-with. Heidegger’s account of being-with is framed primarily at the level of the pragmatic contexts in which others are there with us too. Following Olafson (1987), Gallagher and Jacobsen argue that Heidegger even fails to make clear how there is intersubjective agreement about the ways in
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which the world is disclosed to Dasein. Olafson argues that Heidegger’s analysis of Dasein’s relation to the ready-to-hand is individualistic, and fails to do much more than stipulate that the intelligibility that entities have for each individual is shared with others. Gallagher and Jacobsen echo this complaint; they read Heidegger as arguing that others are encountered only through our encounters with the ready-to-hand, and argue this is to precisely get matters back to front. They argue, on the basis of findings from developmental psychology, that others are encountered first, and we learn about what we can do in the world only through our encounters with others.

Gallagher and Jacobsen recognise that Heidegger’s objective in his Dasein analytic was not to account for the ontogenesis of Dasein. Heidegger’s aim was phenomenological and hermeneutic, as we’ve seen above; he sought to uncover structures of our existence as human beings that have hitherto been hidden from view by metaphysical theories that neglect the ontological difference, the difference between being and beings. Gallagher and Jacobsen’s worry is that Heidegger’s phenomenological interpretation of being-with fails because it leads to a distorted ontology of intersubjectivity. There is of course an implicit assumption at work here that Gallagher has explored elsewhere that empirical findings in cognitive science can have implications for phenomenological ontology. Gallagher and Jacobsen are in effect providing us with a practical application of the mutual constraints methodology that was argued above to be a commitment of soft naturalism. They have shown how developmental psychology can constrain phenomenological interpretation, and can be deployed to bring to light phenomenological descriptions that have gone awry because of faulty ontological presuppositions.

Gallagher and Jacobsen close their chapter with a brief, but highly illuminating historical discussion of how a distorted interpretation of intersubjectivity was perpetuated by thinkers that followed Heidegger from Aron Gurwitsch via Samuel Todes through to Hubert Dreyfus today. What all of these thinkers have in common, it is argued, is a picture in which our relation to others is subordinate to our skilful dealings with the ready-to-hand. The view they find in all these thinkers is succinctly captured by them in the phrase: “Things first, people second”. For example, in discussing Dreyfus’s descriptions of a teacher dealing with a classroom, Gallagher and Jacobsen point out that Dreyfus never mentions the possibility that other people might summon us to act, and not just beings that are encountered as ready-to-hand. This is not simply a contingent failing, they argue, but is endemic to Dreyfus’s
treatment of expertise. We find in Dreyfus no discussion of the role of imitation or of communicative practice in the acquisition of skills. Yet Gallagher and Jacobsen suggest that it is precisely these capacities for imitative learning and communication that are crucial to explaining how we are able to solve the frame problem: we learn from others how to deal with the ready-to-hand.

However given the importance that Dreyfus places on what Rietveld (2008) has called situated normativity one might have doubts about the fairness of this charge. Dreyfus follows Heidegger in stressing that our dealings with the ready-to-hand always take place in normative contexts, or within involvement wholes into which Dasein is enculturated. The contexts in which we deal with the ready-to-hand are always shared because these contexts are defined by socio-cultural norms. We don’t encounter things for the most part (as Gallagher and Jacobsen clearly and concisely point out at the outset of their chapter); we encounter equipment that occupies a place within an involvement-whole. It may be true that Dreyfus (and Heidegger) offers no conception of others apart from through Dasein’s dealings with equipment. However, crucially in Dreyfus’s reading of Heidegger equipment has an intelligibility that ultimately derives from the social roles in terms of which Dasein makes sense of itself. These social roles all derive from socio-cultural practices – an example might be being a good teacher. Thus when equipment summons us to act it is always within a context whose intelligibility ultimately derives from social and cultural practices. It doesn’t seem right to describe this in terms of things first, people second because the things in question show up first and foremost in the light of what people do.

Perhaps Heidegger can still be charged with overlooking entirely primary intersubjectivity – the perceptual attunement to expressive behaviour that Gallagher and Jacobsen argue is present from birth. However, it remains an open question whether this necessarily leads to the distorted view of our intersubjective relation with others that Gallagher and Jacobsen attribute to Heidegger. For the latter charge rests on the claim that Heidegger puts our relation to others in a subordinate relation to our relation to things, a charge we have just seen there is reason to doubt.

Gallagher and Jacobsen describe the phenomenon of primary intersubjectivity in terms of “the opportunities for action and imitation, for interaction and expressive behaviour” the infant can perceive the other person’s body as affording (ms., p.5). One might naturally wonder then whether Heidegger’s neglect of primary intersubjectivity might derive
from his widely noted failure to enter into any discussion of the body in *Being and Time*. Heidegger writes that Dasein’s bodily nature “hides a whole problematic of its own” (1962: 143) that he will not take up in *Being and Time*. However, Malpas argues that despite his own declarations to the contrary Heidegger does in fact offer an analysis of the body in *Being and Time*. Malpas argues that the problematic of the body is bound up with the problematic of giving an account of spatiality appropriate to Dasein’s existence that doesn’t treat space as homogeneous extension. Malpas tells us that Heidegger regards “the issue of the body as already encompassed, inasmuch as it is relevant, by the treatment of spatiality, and so also by the account of temporality” (ms., p.4). Dasein’s embodiment flows from the character of its existence, being-in-the-world, and we noted above how the notions of “being-in” and “world” are through and through spatial notions. If Malpas is right, the neglect of primary intersubjectivity doesn’t so much flow from a wider neglect of the body. It might instead be due to a faulty phenomenological interpretation of embodiment on the part of Heidegger, but such a claim would require further argument. Malpas argues that questions about embodiment are always secondary to questions about spatiality and by extension being-in-the-world. With the help of Malpas’s reading of Heidegger we can see that what seems to really be at stake in Gallagher and Jacobsen’s chapter are questions about Heidegger’s analysis of being-in, and whether in the end this analysis might turn out to be too individualistic.

The theme of embodiment is also central in the last two chapters in our collection by De Preester and Schatzki respectively. De Preester takes up Heidegger’s discussion of existential spatiality in *Being and Time*, and shows how work on tool-use in cognitive neuroscience can clarify Heidegger’s concept of de-severance. The boundaries of the body are plastic, and seem to extend during tool use in such a way as to include the tool. A Victorian lady might feel so at one with her feathered hat that she feels like the outer limits of her body have expanded to include the feather. An expert skier might feel like his feet have extended to the very tips of his skis. These experiences of tool use are often described in terms of changes in the feeling of body ownership. De Preester suggests however that this description gets the phenomenology wrong. When we use a knife and fork for instance we don’t feel like these items of cutlery have been literally incorporated so as to become parts of our body, and nor do we feel like we have lost parts of our body when we place the knife and fork side by side once the meal has ended. De Preester suggests instead that we understand the phenomenology of tool use in terms of an “extension of bodily space”. She suggests that it is precisely
this notion of bodily space that we can use to clarify Heidegger’s discussion of de-severance.

We’ve seen above how Heidegger argues that being-in shouldn’t be understood as the presence of Dasein as a physical substance at a spatial location precisely quantifiable using a set of Cartesian coordinates. Dasein is “in” the world through its concerned dealings with things, and these things show up as “near to” or “far from” Dasein just to the extent that they are readily available to Dasein to be put to use in the pursuit of its projects. Heidegger’s defines de-severance, which he takes to be definitive of existential spatiality, as “making the farness vanish – that is making the remoteness of something disappear, bringing it close” (1962: 139). This phenomenon can be understood in terms of Dasein’s concerned involvement with the world.

De Preester gives the helpful example of the telephone: an intimate conversation with a friend can bring a physically remote friend close to you, through the intimacy of the conversation. The friend is physically removed, but because of your involvement in the conversation this distance can feel like it has vanished. The reverse can also be true: as you are involved in the conversation, the phone maybe physically close to your ear. Yet there is also a sense in which it is remote from you, just so long as it remains inconspicuous and unobtrusive. Your attention is not with the phone, but with the conversation, and when all is going well, the phone seems to almost entirely disappear from your field of awareness.

Let us return again to the phenomenology of tool use. The use of the tool modifies the agent’s sense of what he can do with his body: scissors for instance can expand the repertoire of behaviours available to an agent. This change in the agent’s sense of what he can do is, De Preester suggests, best understood as a change in existential spatiality. A rake can bring physically distant objects “near” to the agent in the sense that it can make them reachable. However De Preester suggests that “reachability” is not to be understood here simply in terms of physical proximity. It should also be thought of in terms of what sorts of projects the tool opens up to the agent. The tool doesn’t so much alter the agent’s sense of the boundaries of his body, and what is a part of his body and what is not. It rather transforms the agent’s being-in-the-world. De Preester tells us it would be a mistake to conceptualise this in terms of a representation of the body expanding to include the tool or in terms of a change in the sense of ownership because on both models we are dealing with a subject in relation to an object a tool. Whereas the lesson of Heidegger’s discussion of existential spatiality is precisely that
it is not correctly described in terms of a subject’s relation to an object. Rather, we’ve seen in our brief discussions of existential spatiality that it is most revealingly disclosed if we interpret this kind of spatiality in terms of Dasein’s concerned involvement with the world.

Schatzki presents Heidegger as subscribing to a version of what we’ve earlier called “enactivism” – the view that mind is not substance like in nature, but that “mind and action form a single realm” (ms., p.2). Schatzki attributes a version of this view to Heidegger that has far-reaching consequences for cognitive science, but also for philosophy of mind. Specifically, it calls for a reframing of the mind–body problem, which shouldn’t be thought of as the problem of how to find a place for minds conceived of as bearers of mental states, propositional attitudes, perceptions, feelings etc. in a world of physical substances. Our starting point in thinking about mind should instead be what Schatzki calls “human activity” – events of performing actions like cooking a meal or reading a book or writing a book introduction. We can then inquire about the place of human activities in a physical world that is causally closed. The physical world is causally closed in the sense that every event in the physical world has a physical cause that is sufficient to bring this event about. In other words “Anything that has a causal impact on the physical realm must itself be physical” (Papineau 2008: 54). The mind–body problem as understood by Schatzki’s Heideggerian enactivist asks in what sense human activities are a part of the physical world so conceived.

The answer that Schatzki finds in Heidegger is that human activities have a degree of autonomy from the physical world. Schatzki accepts that human activities are very likely causally underpinned by physical processes, and he allows that activities can bring about physical effects (ms, pp.7–8). However he argues that human activities cannot be completely subsumed within the causal nexus. This is not to deny that the physical world is causally closed; human activities are physically caused, but they are not mentalistically caused. Mental causation is typically understood in the philosophy of mind by invoking propositional attitudes such as beliefs, desires, intentions, and sometimes although infrequently, emotions that are appealed to in explaining a person’s reasons for acting, or in answering a question about why the person acted. The idea behind mental causation is that the person’s reasons for acting can also be the causes of their actions. Schatzki accepts that a person will normally have reasons for the actions she performs (more on how he thinks about these reasons in a moment), but he denies that reasons ever cause the actions a person performs. Schatzki argues for
this position based on Heidegger's analysis of the temporal structure of
activity.\footnote{65}

In chapter 5 of *Being and Time*, Heidegger shows how “care”, the
unitary structure of Dasein’s existence, has three temporal dimensions:
(1) thrownness, a “having-been-ness” [*Gewesenheit*]; (2) falling, a making-
present [*Gegenwärtigen*]; and (3) projection, a coming-towards [*Zukunft*].
Schatzki shows how these three dimensions of temporality combine to
make possible human activities. Thus every activity, as we’ve already seen,
is acting for the sake of a way of being of Dasein, a social role in terms of
which Dasein makes sense of its own activities. Schatzki argues that this
teleological dimension of activity – that every activity is for the sake of
some way of being of Dasein – corresponds with projection, or the future
directed dimension of care. Furthermore, all activities are motivated by
something in the world that matters to Dasein, and that summons Dasein
to act. Schatzki characterises this motivational component of activity in
terms of *thrownness*, and the way in which Dasein always finds itself in a
situation in which aspects of the field of perception and action stand out
as relevant, and as inviting action. The present dimension of care that
Heidegger characterises in terms of “falling” Schatzki identifies with the
agent’s “stretching out between that towards which she is coming and
that from which she is departing” (ms., p.14).

Schatzki argues that we find in the temporal structure of activity the
determinants of the actions an agent performs. These determinants
include the teleological dimension of the action – the way of being for
the sake of which the agent acts – and the motivational dimension – the
things in the world that always already matter in some definite way to
the agent and invite her to act. These determinants can be understood
as Aristotelian formal causes that “specify what it is that a person does”
(p.15). However they do not precede an activity in such a way that the
action an agent performs could be described as an effect that is materi-
ally caused by the agent’s goals and motivations. The temporal dimen-
sions of activity occur together simultaneously; past, present and future
are not successive moments of an activity, but occur in the activity “at a
single stroke” (p.12). Thrownness (which Schatzki characterises in terms
of “motivation”) doesn’t come before falling, and nor does projection
(which Schatzki describes in terms of “teleology”) come after. Given
this analysis of human activity, it doesn’t make sense to think of the
mentalistic determinants of human activities (teleology and motiva-
tion) as causing the actions that a person performs. The action doesn’t
succeed these determinants in the way that an effect succeeds a cause.

Schatzki expands on this point by arguing that human activity is
characterised by indeterminacy: nothing “prior to t₁ settles what a
person does at $t_1$” (p.29). What the person is going to do isn’t decided or determined until they act. Reasons don’t precede actions as the causes of the actions a person performs. Rather reason in the form of motivation and teleology are aspects of an activity that determine what a person does. What the person is going to do is not settled prior to the act they perform because which ways of being and which states of affairs motivate her to act isn’t something that is decided, but remains open until such a time as the person performs an action. Once again this is not to say that human activities are somehow located entirely outside of the physical world. Schatzki accepts that human activities are physically and causally underpinned. Rather it is to present human activity as an irruption within this causal order that introduces something novel and new, that can then contribute to the future causal trajectory of the physical world. Schatzki would seem to be committing Heidegger to the view that human activities are emergent properties of human agents in the following sense. While the physical and causal properties of human beings are nomologically necessary for the actions a person will perform, what the person will do at any given moment isn’t necessitated by her causal and physical properties.

Schatzki claims to find support for this Heideggerian view of human activity as indeterminate in recent experimental work on voluntary action in cognitive neuroscience and behavioural psychology. This work has been interpreted as establishing that the causes of voluntary action are for the most part, non-conscious neural processes. These neural processes prepare us for action quite some time before we are aware of any decision or intention to act. Benjamin Libet for instance has interpreted his experiments as showing that the brain unconsciously decides how we are going to act a few hundred milliseconds before the person is conscious of having reached a decision. More recently, Haynes and colleagues have shown that by combining fMRI and machine learning, they can predict simple choices like whether to respond left or right up to seven seconds before the person is conscious of having made a decision. The natural conclusion that has been drawn from this work is that conscious decision and intention plays no part in the etiology of action. Schatzki argues that these findings are just what his Heideggerian enactivism would predict: “only with commencement of the brain processes that lead to voluntary movement, does intention become determinate” (p.22). Thus he agrees with the sceptics about free will (the so-called “hard determinists”) that conscious intentions do not cause our actions. He doesn’t however draw the conclusion cognitive scientists often go on to draw that human agency and freedom are illusions. Instead he argues for the emergentist position that human
agency brings into being events that are genuinely novel with respect to the causal order. I read this as the claim that at the level of description of physical, causal processes we must think of the human agent as a swirl of dynamical, self-organising distributed processes. There is no central executive whose ends, purposes and motivations results in decisions and choices that precede and cause our actions. There is just a play of dynamical forces out of which human activity irrupts. The activity that unfolds is rationally intelligible because of its temporal structure – it is for the sake of some way of being that the activity moves towards, and it is motivated by entities encountered in a world that always already matters in some way to the human agent.

Schatzki ends his chapter by suggesting that this non-causal account of human activity he has outlined has important implications for explanation in social science, which accepts that human activity is informed by socio-cultural practices. Schatzki suggests, intriguingly, that explanations that appeal to practice, tradition, custom, hierarchy etc. are not causal explanations for precisely the reasons that have been just outlined. Human activity is indeterminate, and so these structures do not decide what humans will do in advance of their actions. Some proponents of the extended mind argue that the boundary between the cognitive and social sciences is breaking down because of the recognition of the multiple ways in which human cognition depends upon the collaboration of the biological with the technological scaffolding we construct around us. Sutton (2010) has for instance argued that the study of “extended cognitive physiologies” opens up cognitive science to history and culture. He has proposed “an historical cognitive science” that works in collaboration and close dialog with cognitive anthropology and cognitive archaeology. Schatzki’s suggestion that explanation in social science must, in the light of the temporal structure of human activity, take a non-causal shape would also seem to carry across to how we think about explanation in Sutton’s historical cognitive science. These explanations will turn out to be irreducibly teleological if they are to capture the temporal structure of human activity as it is analysed by Heidegger.

**Conclusion**

What does cognitive science stand to gain from an engagement with Heidegger’s philosophy? Why should anyone interested in Heidegger care about cognitive science? These are big questions that are at least partially addressed in the essays to follow. I’ll end by briefly summarising what I’ve said in response to these questions above. I’ve suggested
that cognitive science has followed an intellectual trajectory as a matter of its own internal dynamic that has naturally led them to basic concepts (or constitutive assumptions) that are fundamentally Heideggerian in character. Cognitive science started out by operating, at least implicitly, with philosophical assumptions that were fundamentally Cartesian in nature. Cartesian cognitive science however pretty soon found itself struggling with the problem of how to account for the relevance-sensitivity each of us brings to bear in producing fluent, flexible and adaptive behaviour that fits the situation we find ourselves in. It was in attempting to account for this capacity that cognitive science took a decidedly Heideggerian turn. In particular, cognitive scientists abandoned the assumption that cognitive agents are fundamentally deworlded and disembodied dealing with meaningless situations based on representations of brute facts. Cognitive scientists started instead to recognise the complex and entangled relationships embodied cognitive agents enter into with their environments, and the ways in which culture can transform and enhance cognition. Cognitive scientists increasingly recognised the importance of temporality and history – for example, the way in which past interactions with the environment imbued with affect can shape and sculpt the dynamics that govern the agent’s embodied interactions with the environment here and now. They came to think of cognitive agents as necessarily situated, dealing skilfully with contexts of activity that always already make sense and matter to the agent in determinate ways.

Thus, the answer to our first question is that cognitive scientists should care about Heidegger’s philosophy because Heidegger can help cognitive scientists to understand their intellectual history. His philosophy can bring to the foreground some hidden, and frequently problematic, philosophical assumptions that implicitly guide research in cognitive science and impede empirical progress. More positively, his philosophy can uncover alternative interpretations and ways of understanding what it is to be human that may point to the way out of scientific problems and dead ends. I’ve been arguing that cognitive scientists (quite independently of Heidegger, often on the basis of engineering and scientific considerations) have stumbled across ways of thinking about the mind that find an echo in Heidegger’s philosophy. Any cognitive scientist who is philosophically curious should therefore read Heidegger because he can help them to understand more deeply what they are, if I am right, very likely already thinking.

Why should philosophers interested in Heidegger care about cognitive science? In part because Heidegger provides resources for pointing to the limits of what we can learn about human beings from cognitive
science, as is argued by a number of our contributors (Rehberg, Ratcliffe and Talero). A Heideggerian cognitive science can however recognise that a science of Dasein cannot provide a complete and exhaustive account of Dasein (see the discussion of soft naturalism above, and Wheeler’s discussion of minimal naturalism in his essay). Heideggerian philosophers should therefore engage with cognitive science from a critical perspective, pointing out the limits of what we can understand about our existence as human beings from the perspective of cognitive science. More positively cognitive science can also make a contribution to hermeneutic phenomenology. This it can do by bringing to light errors informing Heidegger’s interpretation of some phenomena. Gallagher and Jacobsen, for instance, argue that the science of social cognition provides resources for challenging Heidegger’s interpretation of Mitsein. De Preester illustrates how cognitive science can help to disclose some phenomena Heidegger also reveals to us through phenomenological interpretation such as existential spatiality. Finally, if a Heidegger-inspired philosopher is at all impressed by the Muggle Constraint – the claim that we live in a world in which nothing magical happens – she’ll want to understand how there can be an intelligible interplay between science and Heideggerian philosophy of mind. It is precisely this type of dialog traversing the boundary separating the humanities and sciences that Heideggerian cognitive science encourages.

Heideggerian cognitive space opens up a space within in which very different styles of thinking can meet and mutually inform each other. We’ve already seen how some of the essays that follow take the paths out of this space to lead only to philosophical dead ends. I’m convinced, however, that a Heideggerian cognitive science is not only essential if cognitive science is to flourish, but is itself already a flourishing movement. This volume doesn’t just do the important work of raising critical questions about the limits of such an interdisciplinary adventure, but also points to a number of exciting new directions that will undoubtedly inform future research in this newly emerging field.

Notes

1. See for instance Jose Bermudez’s (2010) recently published textbook on cognitive science, which is organised around this idea.
2. Dreyfus has also drawn extensively on ideas from Merleau-Ponty and the later Wittgenstein in developing his critique of GOFAI, but for obvious reasons we will concentrate on the aspects of his critique that are Heideggerian in provenance in what follows.
3. For further discussion see Dennett (1984); Pylyshyn (1987); Shanahan (2009); Wheeler (2005: ch. 7; 2009).
4. For a fuller analysis, see Wheeler (2005, ch. 7; 2008).
5. I could spend quite some time explicating “objectivity” but this rough and ready characterisation should suffice for our purposes. For further discussion of the subject–object dichotomy and its influence on thinking in cognitive science see, Wheeler (2005: §2.2).
7. See Samuels (2010) for a recent careful attempt to make an argument along these lines from a roughly GOFAI perspective.
9. This is of course the argumentative strategy adopted by Wheeler in his (2005) to which much of my discussion in this chapter is indebted.
10. Strictly speaking the “embedded” view doesn’t really represent much of a departure from classical cognitive science. It is an alternative, conservative way of describing much of the empirical research appealed to by proponents of the extended and embodied mind. On the embedded view, the mind is still in the head but depends in surprising ways on body and world. It is thus more or less in keeping with traditional cognitivist approaches to cognition that appeal to rules and representations to explain cognition. The main difference is that it recognises a pervasive role for worldly and bodily scaffolding in supporting the kind of internal information processing constitutive of minds like ours. I’ll discuss the embedded view below. We shouldn’t assume from the 4EA label, any uniform and agreed consensus on the nature of mind. We’ll see below that there is a significant disagreement within the field over a number of philosophical issues. Clark (2008) describes a disagreement between the extended view of the mind he favours and some proponents of an “embodied” view of the mind (he targets in particular Shapiro (2006)). This debate is also the central premise behind Rowlands (2010). Wheeler (2010, forthcoming), Thompson & Stapleton (2009), Di Paolo (2009) discuss the potential conflict and disagreements between enactive and extended views of the mind. I’ll make some brief comments of my own concerning this debate in section 3 below.
11. I am drawing on Division 1 of Being and Time here, in particular sections 12–24. Also see Heidegger [(1982, §15) & 1985, §§19–24)]. It is of course a controversial strategy to concentrate on ideas from these sections and ignore the wider context in which they occur, since Heidegger’s phenomenological analyses of our existence are densely interweaved. Moreover the ideas that are in germination in these writings are a part of a larger corpus, and a much more ambitious philosophical project from which they cannot be isolated without doing them violence. Andrea Rehberg forcefully presses this objection in her contribution to this collection (see chapter 5); I will discuss her important criticisms in a little more detail below. Also see sections 1 and 2 of Wheeler’s chapter in this volume (chapter 6).
12. See Wheeler (2005, chapters 8–11; 2008; this volume), for extended arguments to this effect.
13. For further discussion see Froese & Ziemke (2009); Wheeler (2010; forthcoming); di Paolo (2009); Thompson & Stapleton (2009); and Kiverstein (forthcoming, 2012).
14. An alternative strategy favoured by second-wave extended mind theory is to argue that what distinguishes cases of extended cognition is the integration
or complementarity of internal and external components (see Sutton 2010; Menary 2007; Rowlands 1999). These theorists argue that integration of external resources and internal processing enables a kind of cognitive enhancement whereby coupling with external artefacts, and in particular with public language systems, enables cognitive capacities that the naked biological brain is incapable of supporting in isolation from a wider cultural context. Second wave defences of the extended mind still face the challenge of distinguishing the causal necessity of external scaffolding from a constitutive contribution to cognition, which in my view makes some appeal to parity considerations in defending the extended mind unavoidable.

15. For further discussion see, Pfeifer et al. 2008.
16. See Wheeler’s account of thrown machines in his essay for this volume for further defence of this claim.
17. For further discussion and examples see Wheeler (2005, §8.2–4 & 2009).
18. This is explicit in Wheeler (2005) and is implicit in some of John Sutton’s work on skills, see e.g. Sutton et al (2011). Andy Clark has also made comments that suggest a position along these lines to me in discussion. The claim that GOFAI correctly describes types of behaviour at the reflective, theoretical end of the spectrum of the cognitive behaviours is implicit in some of Wheeler’s writings but might well be resisted by other supporters of the extended mind.
20. I don’t mean to foist enactivism on Ratcliffe here, but in his essay he does articulate nicely a point that has also been made by enactive theorists like Di Paolo. Also see Gallagher (2008).
21. For more on the question of the role of representations in embodied cognition, see the exchange between Dreyfus and Wheeler in this volume. Also see Gallagher (2008) and Wheeler’s (2008b) reply.
22. “Dasein” (literally “there-being”) is a technical term Heidegger uses in Being and Time to name the mode of being that marks out human beings from other entities. Heidegger argues that human beings are distinguished from other beings in that we live with an understanding of being (what I’ve been describing above in terms of an openness to the world in virtue of which the things we encounter show up for as significant or meaningful, as having relevance for our projects). Heidegger uses this technical term in order to avoid metaphysical baggage that comes with terms like “person” and “subject” that encourage us to think of our mode of being in present-at-hand terms. Heidegger will argue that such a characterisation of being (not only our own mode of being, but that of beings more generally) tends to lead to a distorted ontology in which we think of all being in terms of the temporality of the present, and we are thereby led to overlook the “ecstatic” unity of past, present and future. Heidegger thinks he can uncover for us an alternative way of understanding our manner of being whereby our existence is essentially situated. We exist there among things in the sense that we always find ourselves in the midst of things making sense of them in a particular way. For some illuminating discussion of Heidegger’s Dasein terminology see Sheehan 2001, and Malpas 2008, §2.2.
23. Di Paolo (2005, 2009) has coined the term “adaptivity” to describe the feature of cognitive systems whereby conservation of identity through material
change is a basic internal norm or value that governs a living system’s interactions with the environment. Against the backdrop of this norm, all of an organism’s encounters with the world count as better or worse, good or bad for the organism. Di Paolo argues that adaptivity combined with a self-sustained precarious organisation is sufficient for cognition.

24. My thanks to Mike Wheeler for pressing me on this point.

25. Heidegger writes: “We are ourselves the entities to be analysed. The being of any such entity is in each case mine. These entities, in their being, comport themselves towards their being. As entities with such being, they are delivered over to their own being. Being is that which is an issue for every such entity”. (1962, 67) The four ontological traits he identifies as definitive of existence are:
1. Mineness – each Dasein has its own life to live.
2. Self-relatedness – Dasein is always taking up a relation to its own life in the living of it.
3. Self-questioning – Dasein is “delivered over to its being” in that the question of how to live is an inescapable one.
4. Self-concern – Dasein is constantly taking a stand on its own identity through the projects it pursues.

26. This is something we will have cause to return to later in our discussion of Ratcliffe’s contribution to this volume.

27. See Barbaras (2011) for an important discussion of this possibility in relation to Jonas.

28. Wheeler 2011 – JCS, 18 (5–6) 2011 offers a rich and important critique of enactive thinking about the life–mind continuity thesis which space precludes me from engaging with here. Towards the end of this chapter he offers his own functionalist and extended mind version of a continuity thesis, but he doesn’t engage head on with the existential question I’m posing here about how to account for the concern every living system has for its own existence. Wheeler (2005, §6.3) contains an interesting discussion of the status of non-human animals in Heidegger’s philosophy. He introduces the notion of a biological background to account for the type of understanding of being non-human animals might have in common with humans.

29. The enactive theorist has a different explanation for why it is we always find ourselves dealing with situations that are meaningful to us. We have seen how enactivists claim that cognitive systems are autonomous systems that produce and sustain their own identity and in doing so enact a domain of interactions. On this understanding of a cognitive system, it should be clear why the frame problem doesn’t arise. A cognitive system never encounters a world of meaningless facts; “it brings forth its own context of significance in the same movement that generates its precarious identity” (Froese & Ziemke 2009: 486).

30. See my earlier discussion of Clark and Chalmers’ parity principle.

31. Perhaps however the charge of a residual Cartesianism can be sustained on other grounds to those provided by Dreyfus. See the discussion above about the role of minimal action-oriented representations in accounting for online action, and the questioning of the distinction between online and offline cognition. For further discussion see the debate between Gallagher 2008 and Wheeler 2008b.
See Heidegger, 1962, §14 where Heidegger distinguishes between four meanings of world. The notion of world I’m employing here he refers to as “a pre-ontological existentiell signification” (p.93).

For further discussion of Heidegger’s notion of world see the essays by De Preester and Malpas in this collection.

Dreyfus switches between using the expression “being-in-the-world” and using his own concept of “background understanding”. I take these expressions to be co-extensive. In my later discussion of Dreyfus’ debate with Wheeler I will use the expression “background understanding” since this is the expression that is commonly employed in the debate. Wherever I employ this term it can equally well be translated as being-in-the-world.

Freeman (2000: 22) quoted by Dreyfus (this volume, p. XX).

Dreyfus also has a detailed story to tell about what happens in the brain as the animal acquires a skill. For some of the details, see the sections “The Perception–Action Loop” and “Optimal Grip” in Dreyfus’s chapter.

See Rietveld (2008, this volume). For further discussion of Rietveld’s use of this distinction see below.


Wheeler’s chapter for this volume takes up this common ground and describes a problem that this account of inter-context sensitivity to relevance faces. I will discuss this in a little more detail below.

So far this is just to repeat his distinction between affordances and solicitations introduced above. For some further discussion of this distinction see Dreyfus and Kelly (2007) and Rietveld (2008).

We have seen how Dreyfus suggests this sensitivity to other potentially relevant affordances can be modelled in terms of mutual influence between attractor landscapes that are interrelated in ways that reflect the animal’s learning history. Each attractor landscape is formed on the basis of the animal’s past experience. Past experience makes it the case the animal isn’t just sensitive to what is relevant in its current situation, but also to other familiar situations whose attraction and allure one is currently resisting.

I’ve only been able to scratch the surface of Rietveld’s rich contribution here. Rietveld also offers a detailed discussion of the pathology of utilisation behaviour in making his argument for the holistic character of skilful coping. Patients with utilisation behaviour (UB) respond to affordances in ways that are technically correct. Thus they cope very well with particular contexts of activity. They seem to have intact special-purpose adaptive couplings that ensure they are able to act appropriately within particular contexts of activity. However they will respond to affordances in an indiscriminate fashion quite independently of their concerns and interests. Rietveld argues that in normal subjects lateral and medial premotor systems interact in such a way as to ensure that patients responses to affordances are informed by their projects, and concerns. The medial premotor system is lesioned in UB patients which disinhibits the lateral premotor system. This has the consequence that patients end up responding to affordances regardless of their relevance to the patient’s concerns. Rietveld uses the example
of UB to illustrate what motor behaviour is like in individuals that can deal perfectly well with particular contexts of activity in ways that are more or less independent of inter-context sensitivity to relevance. Wheeler (this volume) disputes that UB patients exhibit even intra-context sensitivity to relevance. They may be able to behave in ways that are technically adequate but this isn’t sufficient. Wheeler suggests that part of their difficulties may lie in a lack of interaction between local contexts in which they can perform competently and the wider background. However this seems to amount to the concession that local and global sensitivity to relevance are intertwined in precisely the ways Dreyfus and Rietveld argue so that if you lack this global sensitivity you also lack local sensitivity.

44. For more on this question see the first two parts of Wheeler’s essay in this volume in which he outlines and defends a position he calls “minimal naturalism”. The version of naturalism I outline below is more or less identical with Wheeler’s minimal naturalism (this volume) but I understand the constraint that phenomenology places on cognitive science slightly differently. I’ll have a little more to say about this disagreement below.

45. Of course, this doesn’t mean we are home and dry yet since we’ve only been considering the question of whether Heideggerian cognitive science makes sense from the perspective of philosophical naturalism. We are yet to consider the arguments that can be made against such a project on the basis of Heidegger’s philosophy.

46. Wheeler (this volume) doesn’t use the language of mutual constraints I’m employing here, preferring instead to talk about there being an “intelligible interplay” between phenomenology (understood as in the business of providing constitutive explanations) and science. He uses some passages from Heidegger to illustrate what he means by this interplay where Heidegger seems to argue that phenomenology can make ontologically transparent and recapitulate what has already been “ontically discovered” in positive science (Heidegger 1927/1962: 76). This however suggests to me that the most phenomenology can contribute to a Heideggerian cognitive science is clarification of ontological assumptions already at play implicitly (already “ontically discovered”) in the science. I would argue that phenomenology can do more than this, answering questions that simply do not show up in the course of day to day scientific investigations. The sort of philosophical questions I have in mind are the questions that occupy us when we do what Heidegger called “fundamental ontology”, and we consider the question of the meaning of being. At least on one understanding of this philosophical project, Heidegger is engaged in a transcendental philosophical project in which he inquires after the conditions of the possibility of intelligibility or significance of the kind we find in our everyday lives. Cognitive science doesn’t answer this kind of question, and arguably it can’t answer this type of philosophical question. All scientific practices take place from within a framework in which things already make sense, and scientists don’t step outside of this framework to answer the “how-possible” question that I’ve suggested Heidegger is interested in. I depart from Wheeler then in arguing that phenomenology can contribute something in addition to making transparent an ontology implied in scientific theorising. It can also answer questions that are prior to any scientific investigation. The answers it provides to
these questions can then function as constraints on our subsequent scientific theorising.


48. For some discussion of existential spatiality in this volume, see the essays by de Preester and Malpas.

49. My thanks to Mike Wheeler for this example.

50. Ratcliffe runs a similar line of argument for Dasein’s sense of belonging to the world, or what we’ve earlier called “being-in-the-world”. He argues that being-in-the-world cannot be given an explanation in present-at-hand terms. It is “in the world” that we encounter entities as present-at-hand. Hence our being-in-the-world is presupposed in every encounter with the present-at-hand, and given its status as a transcendental presupposition it cannot be explained in present-at-hand terms.

51. For a fuller response, see Wheeler’s essay in this volume.

52. See the discussion in sections V and VI above of being-in-the-world.

53. Rouse (2005: 186–188) takes issue with this characterisation of the essence of science, offering a number of examples of modern scientific research in which “calculative precision” and “laboratory control” are not advanced but are sacrificed. Rouse argues that there is no sharp boundary separating science from other “practices that allow entities to show themselves intelligibly” (p.187).

54. Rehberg argues that because of the impoverished version of Dasein it operates with, Heideggerian cognitive science misses in particular Dasein’s ways of “being-in-language and being-in-history” (ms, p.22).

55. See Wheeler’s chapter in this volume for some further discussion.

56. Malpas frequently notes the Kantian heritage of this claim, the idea that there is an intimate connection between spatial thought and the capacity for representing an objective world. Subjectivity and objectivity are interdependent and “inextricably bound together” (Malpas, ms., p.10).

57. In *Being and Time* Heidegger treats spatiality as founded upon Dasein’s originary temporality. He shows in Division 1 how spatiality (or “being-in-“) is grounded in Dasein’s practical involvement with the world, and in Division 2 he shows how originary temporality is what unifies being-in-the-world as Dasein’s mode of existence. Malpas argues that from the middle of the 1930s a shift takes place in Heidegger’s thinking away from understanding spatiality in terms of Dasein’s existentiality and towards an understanding of world as the *place* in which things come to presence. Malpas argues that this turn towards place was a reaction against the “subjectivism” and “anthropologism” of *Being and Time*, both of which Malpas claims are connected to the prioritising of practice in Heidegger’s early writings.

58. Malpas is again drawing on Kant’s discussion of space here (he cites A25/B39 from the first *Critique*).

59. The lectures Malpas is discussing have been translated by William McNeill and Nicholas Walker and published as *The Fundamental Concepts of Metaphysics: World, Finitude, Solitude* (Heidegger (1995)).

60. The use of “direct” here is intended to denote that the understanding of the other isn’t achieved inferentially on the basis of simulation or theorising. Direct perception is being used here in a way that is related to its
usage in naïve realist theories of perception in that the perceptual experience is taken to be a relational property of the perceiver that holds when the perceiver stands in a particular type of relation to other people. However “directness” here isn’t so much to do with the metaphysics of perceptual states, but is rather concerned with the richness of the contents of those states. Perception is claimed to be “direct” in the sense that the contents of perception are sufficiently rich as to allow us to perceive the intentions and feelings expressed by the other without the need for recourse to theorising or simulation.

61. De Jaegher and Di Paolo (2007) have labelled this form of understanding participatory sense-making.

62. See e.g. Gallagher (2005) on pre-noetic structures.

63. Heidegger labels each social role in terms of which Dasein interprets its own existence, a “for-the-sake-of-which”. See his discussion of worldhood in chapter 3 of Being and Time.

64. See for instance Metzinger (2009: ch.3); de Vignemont (2007). De Vignemont (2011) has recently modified her view somewhat in distinguishing what she calls a “sense of ownership” from a “sense of embodiment”. She argues that tool use can alter our sense of embodiment by altering the spatial content of a body representation without altering our sense of ownership. Although her terminology is different, she is in agreement here with De Preester.

65. It is an interesting question to what extent Schatzki’s chapter is consistent with what we called soft naturalism above. There it was argued that phenomenological interpretations of human existence must cohere with scientific explanations, but there is no requirement that scientific explanation provide a complete and exhaustive explanation of human beings and their ways of being. Schatzki accepts that human activity is very likely causally underpinned by physical mechanisms, but this seems to amount to an acceptance of Wheeler’s Muggle Constraint. Doesn’t this commit Schatzki to the view that human activity is seamlessly integrated into the causal order of physical things, even though human activity is not mentalistically caused?

66. The idea of nomological necessity is commonly analysed using possible worlds. Let us suppose that there are two twins s1 and s2 existing in different worlds, w1 and w2 respectively. The idea of nomologically necessity is that it is impossible for there to be two worlds w1 and w2 where s1 at w1 at t1 is physically identical with s2 at w2 at t1, but s1 and s2 differ in their non-physical properties at t2.

67. This is not the place to consider whether this conclusion really is warranted but for some critical discussion see Dennett (2003); Mele (2009); and the essays in Baumeister et al. (2010). For a recent exposition of the challenge to commonsense belief in free will from cognitive science see, the introduction to Vierkant et al. forthcoming.

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