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Is Consciousness Embodied?

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1. Introduction

Consciousness is trendy. It seems that more pages are published on consciousness these days than on any other subject in the philosophy of mind. Embodiment and situated cognition are also trendy. They mark a significant departure from orthodox theories, and are thus appealing to radicals and renegades. It's hardly surprising, then, that consciousness, embodiment and situated cognition have coalesced (see, e.g., Cotterill, 1998; Hurley, 1998; Mandik, 1999; Noë, 2005; O'Regan & Noë, 2001; Thompson & Varela, 2001). Both topics are exciting, and being exciting is an additive property. An embodied/situated theory of consciousness is the philosophical equivalent of a blockbuster. But excitement is not always correlated with truth, and the embodied and situated approach to consciousness may be easier to sell than to prove.

In this chapter, I assess situated and embodied approaches to consciousness. This is neither an exculpation nor an execution, but an exploration. My verdict is tempered. The radicalism of embodied and embedded approaches has been taken too far, but people who are prepared to dismiss these approaches may be missing out on a catalogue of helpful resources. I don't think embodiment and situated cognition hold the basic key to explaining consciousness, but something in this ballpark may help us explain certain aspects of conscious experience. We should resist the most seductive theories, but pay close attention to more modest ones. In general, I think the great promise of embodied and situated cognition will emerge as the excitement dies down. As with connectionism, the value of these approaches is harder to see if we focus on how radical they are. Radicalism may be good for politics, but it's bad for science. In science, I promote middle of the road liberalism. After critically evaluating some radical theories, I will advance four moderate proposals that take embodiment seriously.

Before proceeding, it will be useful to offer some working definitions. The term "embodied" is most generically used to mean involving the body (compare discussion in Gallagher, 2005). To say that a mental capacity is embodied can mean one of two things. It can mean that the capacity depends on the possession and use of a body, not just a brain. I exclude the brain, because the brain is part of the body, and all materialists (and some dualists) believe that mental capacities involve the brain. Some embodiment theorists think other parts of the body are important as well. Other embodiment theorists don't go quite this far. Instead, they say that embodied mental capacities are ones that depend on *mental representations or processes* that relate to the body (see, e.g., Glenberg & Kaschak, 2003). Such representations and processes come in two forms: there are representations and processes that represent or respond to body, such as a perception of bodily movement, and there are representations and processes that affect the body, such as motor commands. We can call the first class "somatic" and the second class

“enactive.” On this use of the term “embodiment,” everyone agrees that, say, proprioceptive states of the central nervous system are embodied. The controversy concerns whether other forms of perception and cognition are embodied. For example, only an embodiment theorist would say that vision is embodied in any of the ways described here. To say that consciousness is embodied is that say that consciousness depends either on the existence of processes in the body outside the head or on somatic or enactive processes which may be inside the head.

Colloquially, the term “situated” means located somewhere. On this definition, all materialists and many dualists think that mental states and processes are situated. The thoughts you are currently having are in your brain and your brain is in a specific geographical location. We could locate your thoughts if we affixed a GPS device to your cranium. Defenders of situated cognition mean something stronger, of course. They mean that being located in a physical environment makes an essential contribution to our mental capacities. Consciousness is situated if being conscious in the way that we are depends on whether and where we are located. Someone who held this view might suppose that, if two people with the same internal state were in different environments,, their conscious experiences would be different. Defenders of situated cognition, like defenders of radical embodiment, would deny that a brain a vat would have consciousness states like our own; a brain in a vat has no body and does not interact with the environment in the way that we do.

I will now argue that many of the standard ways of defending these hypotheses about consciousness do not enjoy adequate support (see also Prinz, 2000b; 2006). After that, I will get more concessive. I think that certain aspects of consciousness may depend on systems involved in perceiving and controlling the body. The brand of embodiment I favor may not be as sexy as other varieties on the market, but I think the brand I favor may capture what is true and important about this trend in consciousness studies. I think defenders of more radical views have ultimately done a great service by drawing our attention the relationship between experience and action, and understanding that relationship will prove to be essential for an adequate theory of consciousness.

2. Situated Experience

People who advocate situated cognition tend to also advocate embodiment. This is not surprising. If you think that the environment makes an important contribution to mental capacities, then you might be disposed to accept the idea that the body makes a contribution. For one thing, the body can be regarded as part of the environment of the mind or brain—it’s just a very local part. And, for another thing, we need a body to explore the environment, and for fans of situated cognition, interactions between the environment and the body are often regarded as crucial for intelligent behavior. For example, catching a baseball involves moving one’s body in a way that keeps the ball in the center of the visual field. Nevertheless, it is useful to discuss situated cognition and embodiment separately, because the proposals that have been advanced with respect to consciousness are dissociable. It’s possible, for example, to think that consciousness is embodied in some sense without accepting strong versions of the hypothesis that consciousness is situated. In this section, I will focus on situated consciousness.

At the outset, it is important to distinguish three ways in which conscious experiences may be dependent on the external environment. One form of dependency is

semantic. Externalists about mental content argue that content does not supervene on what's in the head (e.g., Fodor, 1994; Wilson, 2004). Intentional content, in particular, depends on relationships between mind and world, where those relationships are usually understood as causal, teleological, or informational. Some people think that the character of conscious experiences depends on their intentional content; this is one version of the view known as representationalism (e.g., Dretske, 1995; Tye, 1995; Lycan, 1996). If you are a representationalist and an externalist, then you are committed to the view that conscious experience depends on the external environment. But this is not the kind of dependency that proponents of situated cognition are after. Externalists think that the relevant environment is the world that an agent resides in, or perhaps some merely possible world. Proponents of situated cognition think that the conscious states depend on the local environment currently surrounding and impinging upon the agent. This dependency usually isn't construed as semantic.

The second kind of dependency is causal. The experiences you are having might be causally dependent on the environment you are in. On one formulation, this hypothesis is uncontroversial. The environment can causally stimulate our sensory receptors and bring about experiences. Proponents of situated cognition defend a much more intimate link. First, they tend to suppose that conscious states are causally *coupled* with the environment (e.g., Thompson & Verela, 2001). Coupling is a term from dynamical systems theory. Roughly, two systems are causally coupled if the equations describing the dynamics of one include variables that quantify over states of the other, and conversely. Almost everyone agrees that mind and world are causally coupled. What proponents of situated consciousness add to this platitude is the claim that conscious experiences arise only when certain dynamical relations are instantiated; the dynamical processes are essential for consciousness. If one thinks that consciousness depends on the instantiation of certain dynamical systems, and those systems are coupled with the environment, then one might conclude that conscious experiences would not arise were it not for causal interactions with things in the environment.

Presented in this way, the situated view still locates consciousness in the head. The hypothesis is that consciousness depends on processes in the head that simply could arise in the way that they do if it were not for steady causal interactions with the world. An even more radical suggestion is that consciousness has a *constitutive* dependency on the environment. One might think that consciousness supervenes on features of the environment along with internal states. On this view, conscious states are realized by dynamical systems that extend beyond the skin. Thus, we have two situated consciousness hypotheses: causal and constitutive. Both of these hypotheses come in stronger and weaker versions. On the stronger version, we could not have conscious states at all were it not for being hooked up the environment in a particular way. On the weaker version, consciousness can arise without environmental hookups, but the character of conscious experience is different in such circumstances; environmental hookups affect the character of experience. As Block (2005) and Aizawa (this volume) point out, these views are sometimes conflated by defenders of situated consciousness.

I think we can reject the stronger versions of the situated approach outright. Conscious states arise when we are dreaming or hallucinating despite the fact that, under those cases, the contents do not reflect causal interactions with the external environment. Even more dramatically, people have rich conscious experiences when they are put in

sensory deprivation chambers, suspended in liquid with eyes ears, and chemical senses cut off (e.g., Feynman, 1997). People in sensory deprivation chambers report visual hallucinations, and there is no reason to suppose that the content of those hallucinations is dictated by the environment they are in.

What about the weaker suggestion that the character of conscious experiences is affected by the environment? I think the causal version is perfectly plausible. Everyone agrees that the environment can influence our experiences. It may turn out that the specific character of an experience depends on how internal states unfold dynamically over time, and such unfolding can be influenced by the environment. The casual situated hypothesis is really controversial only on stronger versions. Its controversial to say that we couldn't be conscious at all if we weren't hooked up to the environment in a specific way, but relatively uncontroversial to say that the character of the experiences we actually have results from how we are dynamically hooked up to the environment. I will leave this relatively uninteresting suggestion to one side. Much more contentious is the constitutive view. Proponents of situated consciousness like to suggest that, when we are not dreaming or hallucinating, our experiences are constituted by an interaction between internal states and the environment. (I use "constitution" broadly to cover relations of identity, realization, constituency, and so on.) Views of this kind have been defended by James (1904), Noë & Thompson among others. Noë (2005) says it is one way to cash out the idea of direct perception: perception is not mediated by an internal representation that stands between mind and world, but rather is constituted by a mind-world interaction.

It's difficult to defend a view like this. Given that consciousness can arise in situations that are indifferent to the external world (hallucination in a sensory deprivation chamber), we have reason to think that consciousness does not have environmental substrates on some occasions. Why, then, should we think the environment is *ever* a substrate of experience? On the face of it, hallucinations provide reason to reject situated consciousness. If veridical perceptions are just like hallucinations, and hallucinations are independent of the environment, then veridical perceptions are probably independent as well. But defenders of situated consciousness reject the first premise. They argue that hallucinations are not like veridical perceptions. I think that is a very hard nut to chew. Many hallucinations may be unlike real experiences in various affects, but given the fact that hallucinatory experiences (including dreams, mirages, phantom limbs, as well as psychotic experiences) are frequently mistaken for reality, it seems overwhelmingly likely that there can be hallucinations that are qualitatively indistinguishable from veridical perceptions.

Let me offer here what I consider to be the best argument for a situated view of consciousness. It is loosely inspired by suggestions made by Alva Noë (2005), and following Noë, I will focus on vision. The argument begins with a premise that is axiomatic for the situated cognition enthusiasts: the world is its own best model (Brooks, 1991). Proponents of situated cognition argue that, if we form internal representations of the world at all, they are sparsely detailed; we do not internally represent the external environment in all its rich splendor. There is no need to. If we need more information than we have currently encoded at any given moment, we can always consult the world. Our senses can sample the environment at any given moment. The environment is trivially a more accurate source of information about itself than any internal representations we happen to form, so we might as well save processing power and

represent as little of it as possible. This is what fans of situated cognition like to say, but, when it comes to conscious experience, a puzzle immediately arises. Conscious experiences *seem* to be richly detailed; the visual field, for example, seems to have shapes and colors in every corner. Some people think this is an illusion. Dennett (1969), for example, says it's an introspective trap caused by the fact that, whenever we try to examine a part of the visual field, we sample the corresponding part of the environment and retrieve the relevant details. But this explanation is slightly unsatisfying. When I am watching TV, I can, at any moment, flip the channels and see what's happening on every network, but I have no illusion that I am experiencing multiple channels at once. In response, defenders of the view that richness in an illusion might argue that saccades are faster than channel switching on a TV set, and the speed is what makes the image seem to rich. But I don't see why speed should make a difference here. If each visual instant were lacking in detail, then we should experience a flickering barrage of sparse images. A rapid sequence of sparse images should engender an experience of a unified image only if the brain integrates the successive snapshots into a single rich composite. If you still think the saccade story can explain why the visual field seems rich, then try to stare at the scene in front of you keeping your eyes fixed. Much of what you experience may be blurry (sharp focus is restricted to the fovea), but the visual field will still seem very rich. The richness of experience seems to reside in the present, not in any capacity I have to get more information a moment from now. That aspect of phenomenology needs to be explained. And here is where the situated cognition thesis arises. If conscious experience is not restricted to what's in my head, but includes the environment around me, then the richness of experience is not an illusion. Experience really is rich, even though internal representations are sparse. It is rich because experience is partially composed by the world, and the world is rich. The idea that the world is literally a component of conscious experience may sound bizarre, but it has been proposed as a serious possibility. Noë and Thompson (2004: 26) say, "[T]he substrates of consciousness — in particular of visual perceptual consciousness — seem to cut across the brain–body–world divisions."

The argument that I just sketched for the conclusion that consciousness is partially constituted by the world rests on two assumptions. It rests on the assumption that experiences are rich, and that internal representations are not. I will not take issue with the first assumption. Admittedly, experience seems sparse under certain circumstances. For example, if you try to count the serifs in this letter "P" you might briefly lose awareness of the surrounding letters (see the discussion of inattention blindness below). But experience is not always sparse. If you stare at this whole page rather than a single "P", it will look like a rich field of clustered letters. You probably won't be able to read those letters (they are not all in focus, and it's hard to read multiple letters simultaneously), but you will experience them, lined up in neat rows spanning across your visual field. Under such circumstances, it's difficult to deny that experience seems rich. I am not suggesting that the visual field seems uniformly *detailed*. When staring at a scene, many objects may be out of focus or unidentified, but we still seem to experience a field that is filled rather than sparse. That's what I mean when I say that experience seems rich.

If richness is hard to challenge, what about the second premise in the argument for situated consciousness? Should we accept the claim that the richness of experience is

not a consequence of rich internal representations? Alva Noë (2005) thinks that we must accept this claim. He thinks there is empirical evidence demonstrating that internal representations are not rich. In particular, he cites studies on change blindness. In these experiments, subjects are presented with two consecutive images that differ in some respect. For example, a pair of people in the first image might swap hats, a parrot might change color, a building might shrink in size, an aircraft engine might disappear, and so on. These large changes in the pictures often go unnoticed. Many subjects cannot see any difference between the two pictures. That suggests that they are not encoding every detail. Noë uses these findings to conclude that internal representations are sparse.

But Noë's conclusion does not hold up on scrutiny. Another hypothesis is that people encode pictures in very rich detail, but don't store all those details from moment to moment (Simons & Levin, 1997). On this interpretation, subjects form internal representations that change when the pictures are swapped, but they do not keep track of these changes: there can be changing representations without representations of the fact that a change has taken place. There is strong evidence suggesting that this interpretation of change blindness is right: people form rich representations and simply don't store all the details in memory long enough to make comparisons from moment to moment. Consider priming studies. Silverman and Mack (2001) have shown that information that people fail to notice during change blindness experiments can prime information processing. For example, if you show subjects an array of letters and then change some, they won't always notice that some have changed. But the letters from the initial array that went unnoticed must be internally represented, because when subjects are given a subsequent test in which they need to complete a picture of a letter that has been distorted, the letters that they were shown in the change blindness task influence their responses. In a more recent study, Mitroff et al. (2004) showed subjects consecutive pairs of images depicting an array of objects. Subjects were often unable to tell when one of the objects had changed, but when asked to confirm which objects they had seen on a subsequent probe, they were well above chance in recalling the objects whose disappearance had gone unnoticed. This suggests that those objects were internally represented. On the sparse representation interpretation of change blindness, unnoticed features are not internally represented. The Silverman and Mack study and the Mitroff et al. study contradict this hypothesis. Unnoticed features must be represented because they cause priming and they are available for cued recall. Noë himself acknowledges this, when he notes that people in change blindness experiments are above chance at cued recall for objects whose disappearance they failed to notice. But this concession undermines the argument for situated consciousness. That argument was premised on the idea that the apparent richness of experience can be explained only by the richness of the environment, because internal representations are not sparse in detail. The studies just reviewed refute this premise by establishing that internal representations are rich. If so, then one can explain the apparent richness of experience without making the radical claim that the external world is a substrate of experience.

Other arguments for the view that conscious experiences are constituted, in part, by the environment can surely be imagined, but I don't think any argument for that conclusion will be convincing. Such an argument would need to show that there can be aspects of phenomenal experience that are not explained by events in the head. In this spirit, proponents of situated consciousness argue that there are no neural correlates of

consciousness (Noë & Thompson, 2004). Without taking up this issue, let me just comment that the attempts to correlate consciousness experiences with brain states has been amazingly productive (Metzinger, 2000; Koch, 2004; Jack and Prinz, 2003). We can find brain states that encode the same information as conscious states, and occur at the same time. We find line detectors in visual areas active when we see illusory contours, and we find motion detectors active when we see illusory motion. Neuroscience is still a young field, but every phenomenal feature that we investigate seems to have a systematic correlate. Of course, we don't know why neural events give rise to phenomenal qualities ("the hard problem"), but that mystery will not be solved by assuming that consciousness supervenes on items in the environment. The bottom line is there is no serious reason at this time to suppose that the correlates of consciousness will include anything outside the head. Indeed, given how far we have come in neuroscience, it is hard to take that suggestion very seriously.

3. Radical Embodiment

When interpreted as a thesis about constitution, situated consciousness is a very radical hypothesis; it says that the environment is a component of our conscious experiences. To accept this is to give up a central plank of modern materialism—the supposition that consciousness supervenes on the brain. I have yet to encounter an argument that is nearly powerful enough to consider giving up the brain doctrine. The claim that consciousness is embodied is sometimes presented as a version of situated consciousness. Just as proponents of situated consciousness locate experience partially in the world, some proponents of embodied consciousness locate experience partially in the body (outside the brain). Some combine these views, suggesting that consciousness supervenes on interactions between body and world. The claim that consciousness extends into the body is only marginally more plausible than the claim that consciousness leaks out into the world. We have never found any cells outside the brain that are candidates as correlates for experience. Such cells would have to co-vary with conscious states in content and time course. Every component of the body that we can experience is represented in the brain, and when the corresponding brain areas are damaged experience is lost. Conversely, bodily experience can continue after the body is damaged, as in the case of phantom limb pain. There is, in short, little reason to think the correlates of experience extend beyond the cranium.

Fortunately, one can defend the view that consciousness is embodied without abandoning the assumption that consciousness resides in the brain. As we saw in the introduction, the term "embodiment" sometimes refers to views according to which mental capacities involve internal states and processes that control or respond to the body. Put loosely, on one use of the term, a mental capacity is embodied if it depends on bodily mental representations. (This characterization is loose, because some embodiment theorists reject the representational theory of mind. I address anti-representationalism elsewhere (Prinz & Barsalou, 2000).) If mental representations are located in the brain, then this approach to embodiment does not carry exorbitant metaphysical costs. It is less extravagant than the constitution version of the situated approach, and worth taking more seriously.

Embodied approaches are less metaphysically extravagant, but they are often radical in other respects. As Hurley (1998) puts it, she and other defenders of

embodiment want to dispose of “the Classical Sandwich” model of the mind, which dominates in contemporary philosophy and cognitive science. On the Classical Sandwich model, the mind divides neatly into input systems, which receive sensory information, cognitive systems, which engaging in thinking, and output systems, which execute motor actions. On this approach, thinking is a proprietary class of capacities nestled between input and output systems and largely independent of both. I am skeptical of the Classical Sandwich myself, because I believe that thinking incorporates representations used for perception and motor control (Prinz, 2002). But Hurley and others want to go even farther. They want to demolish the border between inputs and outputs. I believe that the senses and motor systems interact, but they are nevertheless distinct: they use different representational codes, follow different rules, can function independently, and often reside in different parts of the brain. Hurley, and some other radical embodiment theorists, believe either that there is no division between input and output systems (instead we have unified “sensorimotor systems”) or, to the extent that such a division exists, input systems causally depend on output systems to do any serious work. In other words, embodiment theorists like to defend either a constitution thesis or a strong causal thesis about perception and action: perceiving is either partially constituted by processes that are motoric in nature or causally depend on those processes for normal operation. I will not dwell on this distinction. Following O’Regan and Noë (2001), I will refer to all versions of this general approach as “the enactive view.”

The enactive view should be distinguished from less controversial hypotheses about the relationship between inputs and outputs. Everyone agrees that there can be causal interactions between two. For example, everyone agrees that when a person looks at a hammer, she might spontaneously generate a motor command consistent with grasping the hammer. In Gibson’s term, we can see what actions an object affords. But seeing affordances is understood, on orthodox views, as an associative process. Visual states bring motor responses to mind. Likewise, everyone agrees that motor states can have some impact on perception. To take a trivial example, shifting your eyes affects what you see. It’s even likely that a merely imagined shift of gaze can affect visual perception by shifting the focus of visual attention. Thus, motor representations can cause changes in visual representations. Defenders of the enactive view have something more radical in mind. They suppose that motor representations are (causally or constitutionally) essential to perceiving; we would be blind, in some sense, without them.

Applied to consciousness, the enactive view holds that the conscious experiences caused by sensory encounters with the world depend on motor responses. For example, visual experience may depend on motor representations that control eye position. Noë and O’Regan say that seeing involves a skillful engagement with the world. More specifically, they say that every thing that we can distinguish in perception affords different potential motor interactions, and that perceiving involves the registration of these “sensorimotor contingencies.” As I understand it, the idea is that we have various action dispositions associated with the stimuli that we encounter, and each of these dispositions, if carried out, would alter the sensory inputs; sensorimotor dispositions constitute implicit knowledge of how stimuli would change if we were to move in some way. When a stimulus impinges on our senses, those dispositions become available as operative possibilities for action, and, proponents of the enactive approach, believe that this is a precondition for normal perceptual consciousness. To see normally, for example,

we must know how a visible surface would change if we were to alter the position of our eyes or bodies. Noë and O'Regan are a little vague about whether we could see at all without picking up on sensorimotor contingencies, but they clearly think that ordinary experience, including the distinctive qualities of colors and the differences between the senses, requires motor dispositions. In his book, Noë (2005) is more explicit; he seems to suggest that we would literally be blind without having dispositional motoric responses to visual inputs. That is a fascinating hypothesis. I think it's false, but it certainly isn't obviously false.

To assess the enactive view, we need to get a bit more clear on what its defenders claim. I will distinguish three enactive hypotheses. All are compatible, but they are potentially dissociable, and they call on different evidence. The first enactive hypothesis is developmental. One might think that ordinary conscious perception cannot develop without the exercise of motor skills. The developmental hypothesis is compatible with the supposition that perceptual consciousness does not depend on motor responses later in life. In this respect, it is a more moderate hypothesis than the next two that I will consider. But should we think it's true?

The main item of evidence advanced in favor of the developmental enactive view is a study conducted in 1963 by Held and Hein (see Cotterill, 1998; Mandik, 1999; Noë, 2005). Held and Hein performed an experiment with two young kittens, reared in darkness. For three hours a day, the kittens were brought into an illuminated room and placed on either side of a harness, which allowed one kitten to walk around a room while the other hung suspended in a cradle. The second kitten was able to see the room as the other kitten roamed around, but it was not able to move on its own. After ten days in this apparatus, the kittens were freed and their vision was tested. Held and Hein found that vision in the active cat was normal, but vision in the passive cat was abnormal in three respects: it did not blink when objects loomed towards it, it had difficulty guiding its paws visually, and it did not avoid visual cliffs. They concluded that physical interaction with the world is necessary for development of vision. Applied to consciousness, one might be tempted to conclude that visual consciousness will not develop in the absence of physical interaction.

The Held and Hein result is fascinating, but it cannot be used to support a strong version of the hypothesis that consciousness depends developmentally on action. First, the passive cat was not blind. It was able to move about successfully using vision; it just suffered from very specific behavioral deficits. Second, these deficits are unsurprising. The cat failed to assign motoric significance to its visual episodes. It didn't understand that an object rapidly filling its visual field was looming towards it (perhaps the object just appeared to be growing); it had difficulty with visually coordinating its paws, because it didn't have experience calibrating kinesthetic feedback with visual feedback; and it did not avoid visual cliffs, because experience may be needed to learn that surfaces that look a certain way are farther away. But, for all that, the passive cat's visual experiences may have been just like the active cat's visual experiences; the difference was that the passive cat didn't assign the same action-related significance to those experiences. This is utterly unsurprising. Deprive a cat of action, and it will not learn what actions various visual experiences afford. Third, the passive cat attained normal visual abilities quickly after the experiment. Fourth, the experiment has not been replicated. Fifth, lessons from cats may not apply to us. Rivière and Lécuyer (2002)

recently studied visuospatial abilities in young children who suffer from congenital motor atrophy. These children had no experience moving around in the world but their visual abilities were the same as healthy children.

These points raise serious doubts about the developmental embodied consciousness hypothesis. I am aware of no good evidence for the thesis that moving around one's environment is necessary for the development of conscious perception, and there seems to be plenty of evidence against that hypothesis. Radical inferences from the Held and Hein cat studies should be put to rest.

Let me turn to a second radical enactive view. Some enactive theorists imply that there can be no conscious perceptual experiences in the absence of internal states that register sensorimotor contingencies—the motor responses that the perceptual states afford. This would be a stunning fact if true, but why should we believe it? Defenders of enactive consciousness are sometimes a bit unclear about what evidence is supposed to support this necessity claim, but let me consider one argument. Noë (2005) is impressed by results from the study of prism lenses that either invert or shift the visual field. When people wear these lenses, the sensorimotor contingencies that they have mastered no longer apply. Normally if an object appears in front of us when we stare straight ahead, we can grasp it by reaching straight forward. If we are wearing lenses that shift the visual field to the left, a forward reaching motion will miss the object. Over a period of time, people wearing the lenses adjust to the new contingencies, and they report being very disoriented when they first put the lenses on. Noë is struck by the reports of disorientation. As he describes it, people are temporarily blinded when they first wear the lenses. This is just what the enactive hypothesis under consideration would predict. When we realize that the expected contingencies are wrong, we need to dispense with them, and as we do so, perceptual experience should be dramatically affected or lost.

The trouble is that Noë's characterization of what happens when people wear inverting lenses is misleading. People do not experience blindness and, as long as they don't try to move, the visual world will remain unaffected (I get this from first hand reports by Fred Dretske, who has tried the lenses). Disorientation arises when people try to physically interact with the objects they see. It is very disorienting to reach for an object and miss! I am even willing to grant that inverting lenses can alter perceptual response. For example, I wouldn't be surprised if receptive fields in visual areas of the brain shift as one adapts to the lenses; we know that receptive fields change with shifts of attention (Moran & Desimone, 1985). But those changes do not support the enactive view. Everyone agrees that the senses interact, and that events in one sense can alter another. For example, ventriloquists can cause us to shift the location of speech sounds in auditory space by making us watch the lips move on a dummy. In the McGurk effect, the visual appearance of moving lips actually alters the sound that we hear, and the effect is instantaneous (McGurk & MacDonald, 1976). Likewise, we shouldn't be surprised if misalignments of vision and action cause changes in visual experience. Such causal effects fall far short of the hypothesis that motor responses are *necessary* for perceptual experience. By analogy, the fact that vision affects hearing does not entail that we cannot hear without seeing.

To establish that motor representations are necessary for conscious perceptual experience, it would be useful to show that damage to motor systems results in perceptual deficits. There is little evidence for this in the clinical literature. For example, patients

with amyotrophic lateral sclerosis (Lou Gehrig's disease) suffer from a degeneration of premotor neurons. This profoundly disrupts motor response, but it leaves perceptual consciousness intact (Kandell et al. 2000). Likewise, paralysis of the ocular muscles, which control eye movements, does not prevent people having conscious visual experience. For example, Land et al. (2002) describe an individual who has relatively normal vision despite the fact that she had life-long congenital oculofibrosis, which prevents her eyes from moving. People with paralyzed eyes often report double vision, because their eyes come out of alignment, but they can certainly see. This is the case even when the paralysis of the eyes results from the elimination of receptors in the nerves that control eye movement, as in myasthenia gravis (Cassell et al., 1998). In addition, people with damage to parietal cortex can suffer from disruptions in visually guided action, saccade control, and the allocation of attention to multiple objects, but they are not blind (Milner and Goodale, 1995). In sum, I am aware of no insult to any brain system involved in motor control that results in blindness.

To deal with the clinical findings, enactive theorists might argue that the relevant motor responses are located in the visual pathway and other sensory systems, not in areas traditionally associated with motor control. I hope it goes without saying that responses of this kind are *ad hoc*. Damage to visual pathway does not cause motor deficits, and there is no theory-independent reason to say that motor dispositions are encoded therein. If one retreats to dispositions and anachronistic definitions of the motor areas in the brain, there is a danger that the enactive view will become unfalsifiable. Enactive theorists should identify and test precise predictions of their theories. They should tell us which motor systems are involved in vision, and they should predict that insult to those systems would have serious repercussions for visual experience.

Enactive theorists should also provide evidence for the claim that motor systems are necessarily active when we have conscious visual experience. They often emphasize the importance of eye-movements for experience, but there is little evidence for the claim that visual perception depends on saccades. We perceive both during and between saccades, and when we keep our eyes fixed, we don't become blind. Defenders of the enactive view might respond by saying that, under these circumstances, motor responses are available dispositionally. Perhaps they're right, but this must be established empirically, and, it must also be established that if the dispositions were disrupted or eliminated, experience would change. Suppose you train yourself to saccade to the right when you see a certain shade of blue, and then, after firmly establishing that disposition, you re-train yourself to saccade to the left. Will the visual experience of that blue change after re-training? I doubt it. Is this a prediction of the theory? If not, why not?

Let me turn now to one final enactive hypothesis. Suppose the enactive theorists were to concede that motor responses are not *necessary* for perceptual consciousness. They might still argue that motor responses, when available, affect the character of perceptual experiences. Now, to avoid triviality, this hypothesis cannot just be a causal claim. As noted, everyone can agree that motor responses can causally affect perceptual responses. To advance a substantive proposal, enactive theorists might defend a version of the constitution thesis. They might claim that when motor responses are available, they are constituent parts of perceptual experiences. When we see something, on this proposal, the conscious visual experience is partially constituted by the fact that we are registering sensorimotor contingences. Put differently, the enactive theorists might say

that the phenomenal character of perceptual states is comprised in part by the motor consequences of those states.

This thesis is usually taken to have two implications. The first has to do with distinguishing phenomenal experiences within a single sense modality. Enactive theorists suggest that two different experiences within the same modality differ in virtue of being associated with different motor responses. For example, the experience of seeing a curved line and a straight line afford different kinds of grasping, and, more controversially, the experience of two colors affords different movement of the eyes and pupil aperture. Noë (2005) argues for the latter thesis by suggesting that color constancy—our capacity to recognize a color as the same under very different luminance conditions—might be achieved by keeping track of the ocular affordances that each hue has under multiple conditions.

The second implication of the enactive constitution view has to do with our capacity to distinguish different senses (Noë, 2005; Noë and Hurley, 2003). The proposal implies that vision and hearing, for example, are phenomenally different in virtue of differences in sensorimotor contingencies. The two senses can register the same feature of the environment, but, because they have different implications for action, they feel different. One item of evidence used to defend this claim comes from Bach-y-Rita's (1972) research on "prosthetic vision" (Noë, 2005; Mandik, 1999). Bach-y-Rita developed an apparatus that converts visual information (acquired from video cameras affixed to a pair of eyeglasses) into tactile information by pressing tiny pins configured in the same pattern as the visual signal into the torso or tongue. People who wear this apparatus come to report that the tactile inputs have visual significance. For example, they can use the tactile inputs to avoid looming objects, grasp, and navigate between obstacles. On the enactive interpretation, the tactile information has come to have the motor contingencies normally associated with vision, and that results in the tactile sensations actually feeling as if they were visual (see also Dennett, 1991). In this way, sight can be restored to the blind.

I am not persuaded by these lines of evidence for the enactive view. First consider the claim that we distinguish different qualities within a sense modality by distinguishing sensorimotor contingencies. That seems intuitively wrong. If you see a stick in the water, it looks curved, but if you know it's a stick, you know that you can grasp it the same way you would grasp a straight object. Sticks in the water and out of the water look different, but they afford the same actions. The color case is even less plausible for the enactive view than the shape case. Suppose you compare the experience of staring at two uniformly colored and uniformly bright fields, one red and the other blue. It's obvious that these look different, but unlikely that they afford different eye movements. Of course red and blue may afford different eye movements under other conditions, but that fact is irrelevant: the colors look different here and now. Conversely, imagine staring at a giant field of red first with your eyes to the left, and then to the right. Under these two conditions, the red looks the same, but the sensorimotor contingencies differ; in one case you are able to shift gaze back to the right, and in the other you are able to shift gaze back to the left. Differences in sensorimotor contingencies are neither necessary nor sufficient for differences in perceptual qualities.

The same conclusion follows for distinguishing between modalities. Enactive theorists would have us believe that people using the prosthetic vision device experience

visual qualities. That doesn't seem to be the case. Instead, they just learn to use tactile properties as a distance sense. Over time, they may stop focusing on the surface of their bodies and direct attention outward, but they are not having visual experiences. The blind don't suddenly see. Touch functions like vision in this case, but it doesn't feel like vision. By comparison, imagine feeling the surface of a street using a walking stick. Like Bach-y-Rita's device, this turns touch into a distance sense, but it does not result in a visual experience. Seeing a street and feeling it with a cane is phenomenally different. Indeed, there are many cases in day-to-day life where different senses afford the same behavioral responses. Compare hearing something to the left and seeing something on the left. Both cases afford head shifting and alternations in auditory and visual attention. When we see something on the left, we look and listen; and when we hear something on the left, we do the same. Despite these similarities in sensorimotor contingencies, the experience of seeing is qualitatively different from hearing. The enactive account of how we distinguish between the senses seems to be false. It's also unnecessary. There are plenty of differences in how our perceptual systems represent the world; they use different rules and representations. There is no need to appeal to motor processes to explain how we differentiate the senses.

4. Moderate Embodiment

I have been raising doubts about the enactive approach to conscious experience. Earlier, I also raised doubts about the situated approach. Those who have been tempted by these views tend to be radical. Some of them entertain the view that consciousness does not reside entirely inside the head. Some argue that conscious experience could not occur in the senses without the activation of motor representations. Some maintain that motor representations are constituent parts of our sensory experiences and an essential contributor to ordinary perceptual qualities, such as color experiences. These views are exciting, to be sure, but they do not enjoy much empirical support. We should resist gratuitous radicalism. But that does not mean we should reject embodied and situated approaches entirely. There may be aspects of conscious experience that will ultimately be explained by appeal to our nature as embodied and embedded agents. Some authors have been developing theories of perception that emphasize the influence of action systems without arguing for strong forms of dependency (e.g., Findley and Gilchrist, 2003; Matthen, 2005). I will not review this literature, but I will indicate four avenues for future exploration.

The first possibility that I want to consider is that embodiment contributes to self-consciousness (see Bermúdez et al., 1995; Roessler & Eilan, 2003; Jeannerod & Pacherie, 2004; Gallagher, 2005; Boyer et al., 2005). There is a notion of the self that is bodily in nature. On one use of first-person concepts, I am my body. If you kick my body you are kicking me. To have a conscious experience of the self includes awareness of the body. It includes awareness of actions, posture, and the internal patterns of bodily changes that we experience as emotions and moods. Arguably, a person lacking experience of a body would lack an important kind of self-consciousness. Such a person would experience the external world, but not a self. Of course, such a person could observe her own body through vision, but that would be like observing the body of another person: it would not be an experience of the body as a self. Such a person would experience the world from a specific vantage point, of course; the senses deliver information from a perspective. But

perspectival does not entail personal. By analogy, a movie camera captures the world from a point of view, but that does not imbue the camera's image with a self-like quality. Cameras provide a view from somewhere, not necessarily a view from someone. Without body experiences, perception and perceptual memories might feel like selfless sequences of film.

The second possibility builds on the first. If perception of the body constitutes a form of self-consciousness, then it is also plausible that experiences of the body contribute to the sense of ownership that inheres in ordinary perceptual experience. When I perceive the world, the perceptual experiences that I have seem to be mine. Experiences have a subject. One tempting explanation is that the experience of ownership comes from the fact that my experiences occur in my body and I can initiate and experience bodily responses to what I perceive. If an object looms towards me, I duck. Such sensorimotor contingencies may link perception of the external world to perceptions of the embodied self in a way that makes the embodied self feel like a subject of experience. The phenomenology of ownership may consist in my felt reactions to the world I perceive.

These two proposals leaves various issues unsettled. Can one have a conscious experience of oneself and of ownership without bodily experiences? Does the bodily component of self-consciousness involve both the experience of motor responses and the perception of bodily changes (motor and somatic components), or is just one of these components enough? These are questions for future research.

I want to move now to a third possible role for embodiment in conscious experience. Sense modalities are independent from each other; they process different information, have different phenomenal qualities, are vulnerable to selective deficits, and reside in different parts of the brain. Despite this profound division between the senses, conscious episodes seem unified. When I experience sight and sound simultaneously, it is not as if I had two separate streams of consciousness, like the two hemispheres in a split brain patient. Both sensory streams are part of a single coherent experience. What allows for such phenomenal unity?

One popular answer is that the modalities are bound together by some neural process; perhaps they fire at the same rate (e.g., Crick & Koch, 1990; Singer & Gray, 1995). The physiological evidence for neural synchrony theories of binding is not very strong (Reilly et al. 2003), but let's suppose that bound experiences do fire at the same rate. Would that explain the unity of experience? Decidedly not. After all, cells in your brain may fire at the same rate as cells in my brain, but there is no unified consciousness encompassing our two heads. Simultaneous firing is, at best, a computational marker that allows a system to integrate experiences in some other way (for other objections, see LaRock, forthcoming). Perhaps embodiment holds the key.

Here is a highly speculative proposal. Perhaps, I experience unity in my senses because they are all available to a common locus of agency. Perhaps unity consists in my capacity to act on information in each of my senses. Notice that the two streams of consciousness in a person with a split brain both contribute to control of the same body, but they are not available to a common locus of agency. The information processing resources that use inputs from the right hemisphere to select behavioral responses cannot avail themselves to inputs from the left hemisphere, and conversely. Thus, there is no transhemispheric unity in the split-brain patient. For the rest of us, inputs from both

hemispheres are unified, and that unity may derive from the fact that both hemispheres feed to the same action control centers. Unity across the senses may work in the same way. This is certainly an avenue worth exploring.

Let me turn now to a fourth and final avenue for future research. One of the most vexing questions in consciousness studies concerns the function of consciousness. What purpose does consciousness serve? I suspect that there is no special function of consciousness as such: an unconscious creature could do what we do. But there is undoubtedly a particular functional role played by the mental states that happen to be conscious in us. To identify that role, we can first determine which of our mental states are conscious and then see whether those states make any distinctive contribution to information processing. Towards this end, I will briefly sketch a theory of consciousness that I have defended more fully elsewhere (Prinz, 2000a; 2005; forthcoming).

The theory begins with a question about the locus of consciousness. Perceptual systems have many components and these are organized hierarchically. Marr (1982) presented a general theory of how these hierarchies are organized, which is still widely accepted today; Marr got details wrong, but he correctly distinguished three levels of perceptual processing. Low-level perception extracts the local features that impinge on the surfaces of our sensory receptors. Typically, these features are sampled piecemeal and not bound into unified spatiotemporal wholes. Low-level vision delivers a constellation of edges, and low-level audition gives us individual tones. At an intermediate level these parts are bound together into more coherent representations. Edges become shapes and tones become melodies or word-sounds. High-level perception produces categorical representation by extracting invariants from the intermediate level. An intermediate-level visual representation of a cow will present it from a particular vantage point: it will be a bound contour assembled from the edges detected at the low level. High-level visual representations extract away from vantage point, and produce a representation of the basic form of a cow that remains constant across a wide range of viewing positions. Marr calls this a structural description. In audition, categorical representation may abstract away from specific acoustic properties. For example, if two people say the word "cow" there will be differences in the sound captured at the intermediate level, but the high level may treat the two sounds as if they were alike. In 1987, Jackendoff took this theory of perception as a point of departure, and asked where in the hierarchy does consciousness arise? The obvious answer is that consciousness arises at the intermediate level. We see whole objects, not constellations of edges, and we see them from a particular point of view. We hear words and melodies, not isolated tones, and we hear their specific acoustic properties, rather than categorical invariants.

I think Jackendoff is right about where in information processing consciousness is located, but his theory of consciousness is incomplete in a crucial respect. Mere activation of an intermediate-level representation is not sufficient for consciousness. After all, we can perceive things subliminally. Consciousness requires something more. I think the missing ingredient is attention. When attention systems are damaged, as in cases of unilateral neglect, consciousness of the unattended regions is lost (Bisiach, 1992). This suggests that attention is necessary for consciousness. Cases of subliminal perception may be explained by supposing that subliminally stimuli are presented too quickly to become object of attention.

To directly test whether attention is necessary for consciousness, researchers give

subjects tasks that demand a lot of attention, and they see what effect this has on consciousness. For example, Mack and Rock (1998) asked subjects to determine which of the two lines comprising a crosshair was longer. This is difficult to do, and while subjects were intensely examining the crosshair, they briefly flashed a word, a face, or a geometrical shape. Many subjects failed to notice the flashed object. Attention prevented them from seeing. Most et al. (2005) have shown that subjects can fail to notice an object that slowly moves across the center of a computer screen if they are attending to movements of other object on the screen. This phenomenon is called “inattentional blindness.” It differs from change blindness because in cases of change blindness we probably do experience the stimuli presented to us in rich detail, we just fail to keep track of how those stimuli change from one moment to the next. In inattentional blindness, we don’t experience the unattended stimuli. Indeed, when attention is very narrowly focused, the visual field loses much of its richness, as if it contained only those objects that are currently being attended. Ordinary we are not engaged in tasks that require highly focused attention, so we allocate attention resources diffusely over the space in front of us, allow us to experience many things simultaneously. One can think of the visual field as a phenomenally varied landscape, with some things vividly present in consciousness, other things less vivid, and still others not consciously processed at all. This variation seems to be determined by the varied allocation of attention. These observations suggest that consciousness arises when, only when, and to the extent that we attend. Combined with Jackendoff’s hypothesis, we end up with what I call the AIR theory: conscious states are attended intermediate-level representations.

The AIR theory allows us to address the question of function. First, we can ask, what purpose do intermediate-level representations serve? Obviously, they allow us to derive high-level representations. Notice, however, that they serve this purpose even when they arise unconsciously. To understand what function *consciousness* serves, we need to ask why intermediate-level representations ever become targets of attention. This question can be addressed by reflecting on how attention works. Attention is essentially a tool for directing information access. When we attend, perceptual information gains access to working memory. The term working memory refers to systems that store information for a brief period of time. Working memory is not a passive storehouse, however. As the name implies, working memory works. It is where we make decisions (as opposed to responding automatically). So the question of what consciousness is for boils down to the question of why intermediate-level representations become available for decision-making. Why do the centers of decision have special need for representations that are viewpoint specific?

The natural answer to this question is that viewpoint-specific representations are extremely valuable for making decisions about action. Suppose you encounter a bear while hiking through the woods. You need to make a quick decision about what to do. To make that decision, it’s extremely important to know several facts: is the bear facing you or facing away? Is it close to you or in the distance? Is it staring at you or looking elsewhere? These questions can be answered by consulting visual information that is encoded at the intermediate level, but probably not encoded at the high-level, which abstracts away from such details of vantage point. The best explanation for why working memory gains access to intermediate-level representations is that those representations are privileged with respect to deciding how to act.

Low-level representations are too fragmented to be especially useful for decision-making; in responding to the bear, we have to see it as a coherent object, not as a disconnected group of edges. High-level representations can be useful for decision-making, but they facilitate decisions that are different in kind from the decisions that depend on the intermediate level. If you encounter a bear, it's important to know it's a bear; if it were a bush or a pony or your uncle Charlie, then there would be no need to flee. High-level representations are presumed to be the primary tools for making such categorical judgments. It's at the high-level, then, that we establish category-related goals. If you see a bear, your goal might be to get away from it some how. But that is an end, not a means. You can't decide how to achieve your goal without knowing how you are situated. If the bear is close by, looking at you, and approaching from the right, then you should flee to the left. If the bear is far off or facing another direction, then you should freeze. Viewpoint-specific information is needed to determine how your goal can best be realized: it's information that provides a means to the end. It is in that respect that the intermediate-level is tightly linked to action. If you have to decide what to do with your body, rather than just where you want to end up, then the intermediate level becomes crucial.

I will not develop this rough proposal here. I mention it to suggest that consciousness and action might be closely related after all. If I'm right, consciousness arises when decision centers gain access to the representations that are especially useful for deciding how to act. Consciousness may not require motor responses, but it works in the service of such responses. This is a moral victory for the enactive approach, even if many authors currently exploring the relationship between consciousness and action are hoping to identify a more intimate link. Those authors want action to be somehow constitutive of consciousness. I want to suggest that consciousness is a precondition for deciding how to act, and the representations that become conscious are ideally suited for this purpose. It is a central function of consciousness to provide action systems with the information needed to make real-time decisions.

5. Conclusions

Situated and embodied approaches have a tendency to drift towards excessive radicalism. Practitioners argue that orthodox conceptions of the mind will be completely undermined once we recognize a place for body and world in mental life. I think we should resist such extremes. In issuing that warning, the bulk of this discussion has been critical, but that was not my ultimate purpose. I think the situated and embodied approach has much to offer. Rather than focusing on debunking or defending radical claims, we should look for the ways in which an embodied orientation can lead to genuine insights about the nature of consciousness. I think this approach is leading to exciting and promising views which might have been neglected otherwise. Recent work on self consciousness has focused on awareness of the acting body, and work on the unity and function of consciousness may move in the same direction. If these forecasts are right, a complete theory of consciousness will be an embodied theory, in a moderate sense of the term. A complete theory will implicate systems that are involved in representing and controlling the body. The contributions of these systems are, I suspect, highly significant. They give us a sense of agency, ownership, and unity. These are pervasive aspects of conscious experience. Moreover, the mechanisms that give rise to consciousness may have evolved

in the service of action. If so, consciousness is not about sensing; we can do that without consciousness. Nor is consciousness about making life more pleasant or more miserable; these are just side effects. Rather consciousness is about acting—it emerges through processes that make the world available to those systems that allow us to select behavioral means to our ends. In resisting radical situated and embodied theories, we mustn't lose sight of this fundamental fact.

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