INVASION OF THE BODY SNATCHERS:  
HOW EMBODIED COGNITION IS BEING DISEMBODIED

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Embodied cognition has been reframing our understanding of mind, brain, perception, action, and cognition more generally, since at least the 1990s, following the publication of *The Embodied Mind* by Varela, Thompson and Rosch. That landmark publication did not appear out of nowhere. It was building on the ongoing work in phenomenological philosophy from the time of Merleau-Ponty. With *The Embodied Mind*, and a growing number of publications since, the resources found in phenomenology, as well as pragmatism (especially the work of Peirce and Dewey) have now gained a foothold in the cognitive sciences and have been turning some things around in philosophy of mind.

This does not mean that there is a unified theory of embodied cognition. As in any philosophically informed approach there are healthy debates. In this case there are more moderate camps and more radical camps, and depending on the position of your own campsite a moderate view may look more conservative, and a radical view may look more moderate than your own. Most recent debates have been focused on ecological, enactive and extended conceptions of cognition – all
of them champions of embodied, pragmatic or action-oriented perspectives, one more or less radically embodied than the other. It may be too early in the game for there to be anything like a unified theory or even a unified definition of what counts as embodied cognition. We’re still learning about that, and empirical science tells us more about it all the time.

I don’t share Lawrence Shapiro’s worry that, like chemists and biologists, researchers in the area of embodied cognition should be able to reach consensus about what their scientific domain of investigation is, what the central concepts in that domain are, and why what they are doing is an improvement over older paradigms. First, because I don’t think embodied cognition is a science like chemistry or biology, or even like cognitive science, which is Shapiro’s third example. I would rather classify it as a research program within cognitive science. Indeed, as such, I think it is causing trouble for cognitive science and making it a bit more difficult for cognitive scientists to answer the questions that Shapiro poses. Second, because it is part of cognitive science, it is interdisciplinary in a way that chemistry or biology (as Shapiro conceives them) isn’t. It’s not clear to me that if you ask Shapiro’s questions of someone working on cognition in AI, you will get the same answer as when you ask a cognitive neuroscientist, or a cognitive anthropologist, or a philosopher of mind. Indeed, cognitive science and the field of embodied cognition include a bit of chemistry (if hormones and neurotransmitters have some effect on cognition) and more than a bit of (neuro-) biology. And since they also include a bit of philosophy, you should expect that there will be ongoing debates in every corner.

In most of the embodied (ecological, enactive, extended, etc.) approaches the body plays a real role in shaping cognition. There are different ways of thinking about this. The idea that the body, and not just the brain, processes information both prior to and subsequent to central manipulations; the idea that representations can be action-oriented; the idea that the body itself plays a representational role; or the idea that sensory–motor contingencies, bodily affects, posture and movement enter into cognition in a non-representational way; the idea that the body is dynamically coupled to the environment; the idea that action affordances are body- and skill-relative, and so on, are all ways of shifting the ground away from orthodox cognitive science. Disagreements about the nature and role of representation and functionalism, the precise nature of body-environment coupling, and the role of the brain, the nature of affordances, and so on, may define important differences among embodied cognition theorists, but that the body as such is an important factor in cognition is not as controversial. That seemed a safe statement up until the past few years and the advent of what I’ll call “body snatching”.

Under this title I want to focus on what I take to be a more reactionary move by some theorists, who I’ll call the body snatchers because in some real sense they devise a version of embodied cognition that leaves the body out of it. They still retain the term “embodied”, but in fact, for them, the body, per se, is not necessarily involved in the real action of cognition. Rather, the real action, all the essential action, occurs in the brain. Indeed, the body, in this
version of embodied cognition, is the “body in the brain”. In effect, body snatchers have invaded theories of embodied cognition and have replaced bodies with “sanitised” body-formatted (or B-formatted) representations in the brain. We find versions of this in psychology, neuroscience, linguistics, and philosophy. I’ll take my bearings from philosophy, with some brief excursions into neuroscience, psychology and linguistics.

The most recent, and perhaps clearest representative of body snatching can be found in the work of Alvin Goldman. Taking his cue from his own simulation theory of social cognition, Goldman considers the most general claims of embodied cognition concerning the role of the body itself in social cognition to be trivial at best. Rather than think that anything like anatomy, or sensory-motor contingencies, or environmental couplings should be relevant to cognition, he makes it clear that all important aspects of cognition can be found in the brain. Indeed, he simply assumes that “the brain is the seat of most, if not all, mental events”. Shapiro points out that the brain Goldman has in mind can just as well be thought to occupy a well-equipped vat since what makes the engine of cognition run are purely internal B- (or otherwise) formatted neural representations. Goldman, however, sees the need to qualify this claim due to a worry about the contents of such representations. Since it’s “possible (indeed, likely)” that the contents will depend on what the representations “causally interact with…. [E]nvatted brain states would not have the same contents as brain states of ordinary embodied brains”. This is as close as he gets to allowing the body itself to have some (unsanitised, contingently causal, but apparently not necessary) role to play in cognition. The body is a better-designed container that delivers information to the brain in its own peculiar way.

In his 2009 paper with Frederique de Vignemont, Goldman rules out any role for the body or the environment, and makes B-formatted representations the driving vehicles of at least some cognition. There, the primary example of B-formatted representations were mirror neurons, and the claim was that B-formatted representations likely had limited application, primarily in the realm of social cognition. Goldman expands their role in subsequent papers.

Here’s the central idea. B-formatted representations may originally have an interoceptive or motor task such that the content of the representation in some way references the body. Goldman adopts Michael Anderson’s “massive redeployment hypothesis,” i.e., the idea that neural circuits originally established for one use can be reused or redeployed for other purposes while still maintaining their original function. So, for example, mirror neurons start out as motor neurons involved in motor control; but they get exapted for purposes of social cognition and now are also activated when one agent sees another agent act. Any cognitive task that employs a B-formatted representation, in either its original function or its exapted function is, on this definition, a form of embodied cognition.

Another good example of this is to be found in linguistics. The language-grounding hypothesis proposed by Friedemann Pulvermüller shows that language comprehension involves the activation of action-related cortical
areas. For example, when a subject hears the word *lick*, one finds activation in a sensorimotor area that involves the tongue; action words like *pick* and *kick* activate cortical areas that involve hand and foot, respectively. Language comprehension thus reflects a reuse of interoceptive, B-formatted representations, and by implication this suggests that, as Goldman puts it, “higher-order thought is grounded in low-level representations of motor action.” From here it is a short run to the type of work done by Glenberg, Lawrence Barsalou or by George Lakoff and Mark Johnson, showing how, by simulation or metaphor, respectively, one can explain the embodied roots of abstract thought. Critics of this “embodied cognition hypothesis” think that it departs too radically from classic cognitivism, but Goldman is more on target when he contends that this version of embodied cognition is quite consistent with the internalist and representationalist tendencies of classic cognitivism. I note that Lakoff and Johnson are a bit less classical to the extent that they would maintain that human thought is constrained by morphological features of the human body. Such a constraint, however, is dismissed as trivial by Goldman and Vignemont.

There are behavioural studies and good neuroscience to back up Goldman’s version of embodied cognition. Besides the research already mentioned, the work on mirror neurons and canonical neurons is such a good fit that Vittorio Gallese has now defined his notion of “embodied simulation” in terms of B-formatted representations and the reuse hypothesis.

It’s clear that the body of this version of embodied cognition is entirely *in the head*; it’s the “body in the brain”. In this respect it is a “minimal” or “weak” form of embodied cognition, at best. A form of embodied cognition without the body as such; the latter replaced by B-formatted representations.

The very same behavioral and neuroscientific studies that support Goldman’s notion of embodied cognition also support the more radical notions of embodied cognition that suggest that the body itself (and not just B-formatted representations), or more precisely, the body as it is coupled to the environment, plays a constitutive role in cognition. To be clear, it’s the very same scientific data that is appealed to in all cases; the debate is about the interpretation of the data. Scientists rightly want to see the data, and one doesn’t get far without data; but the real theoretical action is in the interpretation. Are mirror and canonical neurons simulations that replicate a model of the world in the brain? Or are they part of an enactive and dynamical system that includes brain, body, and environment? If the latter, then we need to rethink what cognition is, what the mind is, and how the brain actually works. I think these are the real challenges posed by embodied cognition, and they seem to be missing in Goldman’s version.

Let’s consider evolution and the reuse hypothesis. First, let’s note that the brain is the way it is, and operates the way it operates, because it evolved along with the body. The brain is part of the body, and has always been part of the body; it’s regulated by the body and cannot function outside of the body. If our body were different – if humans had not attained the upright posture, for example, or did not evolve with hands, the human brain would likely be much smaller, our sensory and motor systems would be different (more attuned to the olfactory than to vision), and none of it
would function in the specific way it functions now. Indeed, we would likely have to redefine what we mean by rationality. This is not to deny the reuse hypothesis, but it suggests that the body itself places important constraints on how reuse works. Indeed, I think there is a good clue about cognition in the reuse hypothesis. Specifically, the idea that we reuse certain neural resources indicates that the original use may still govern the possibility of the reuse, and how it functions in any particular case. For example, the reuse hypothesis suggests that our perceptual-motor systems were originally and primarily designed for action, and specifically, only the kind of actions that our bodily details made possible – locomotion on two feet; reaching to grab near objects of certain sizes, etc. This primacy of action, and the specific characteristics of human action delimited by a human body arguably carry through to the reuse of our motor systems in contexts of cognition. Thus, for example, MN activation differentiates between actions performed by others who are nearby – within reachable, peripersonal space – and actions performed by others who are not nearby. If we were in differently arranged environments, or if our arms were longer than they are, or if we lost our arms to amputation (with resulting plastic changes in the brain), or if we grabbed a stick or tool, our brain would adjust. The brain attunes itself to what the body and what the environment affords. To discount the actual physical body and its various properties and capabilities, or the physical and social environment (which is, at the same time, to discount evolution, development, brain plasticity, and the very real constraints of physical existence), is to offer an oversimplified, sanitised cartoon of cognition.

On Goldman’s B-formatted hypothesis, vision and audition, the “outer” senses (he doesn’t mention touch), are not embodied. The idea that vision is the way it is because our eyes are positioned to deliver binocular perspective; the idea that the bodily position of our ears are such that we are able to tell which direction a sound comes from – these are considered trivial facts, together, apparently, with facts about the dorsal visual pathway to the motor system, not to mention enactive sensory-motor contingencies or the role of affect in vision and audition. In contrast to this view, for example, studies show that early visual processing in the visual cortex V1 area is already attuned to reward. Unless one thinks of reward as in some way disembodied, this suggests that, due to associated learning and plasticity effects, bodily affect is already implicit in vision.

Indeed, embodiment as it relates to cognition is not just about anatomical structure, body parts, sensory-motor contingencies, and action capabilities. The body’s affective life regulates brain function via hormonal and neurotransmitter levels. Together with peripheral and autonomic systems (including heart function and respiration), affect shapes cognitive function. There are numerous relevant examples in the literature. Consider the 2011 study by Danziger et al. providing evidence that hunger can distort higher-order cognitive processes. The study shows that whether a judge is hungry or satiated may play a significant role in judicial decisions. Favorable rulings drop from ≈65% to near zero from early morning to just before lunch; and rise again to ≈65% just after lunch. It’s difficult to fit this kind
of fact into a B-formatted representation. Perner and Ogden suggest that hunger is a “non-representational internal state” – not at all what Clark would call a representation-hungry state. But even if there were some kind of neural representation of hunger (in the orbital frontal cortex, or hypothalamus, for example), it’s not clear how a B-representation of hunger would somehow get reused as a B-representation of harsher legal sentences. Moreover, to fully understand the cognitive event that constitutes the judge’s legal ruling, one has to consider not only non- (or unruly-) representational processes complicated by autonomic and endocrine responses, but also social and institutional environments. A similar example involves changes in the perception of sexual attractiveness due to testosterone depletion (hypogonadism) or across menstrual phase. Affective phenomena such as these, related in part to body chemistry, and in part to environmental conditions, are good examples of how cognition can be the result of complex brain-body-environment couplings that simply can’t be captured by the concept of B-formatted representations.

This is not to deny that one might interpret linguistic comprehension not only in terms of motoric and somatotopic activations, as in Pulvermüller’s work, but also with reference to such affective phenomena as pain, or with reference to the “interoceptive cortex,” as Goldman does. Likewise, it’s possible that when I see someone express an emotion or sensation (e.g., joy or pain) my own viscero-motor and sensori-motor brain areas are activated. It’s not clear, however, that this kind of B-formatted representational account can explain how hunger, fatigue, pain, hormonal changes, etc. (and I would add ecological-environmental conditions) can affect the type of modulations of perception and judgment mentioned in the examples above. If, for example, I am living through my own pain, my experience of the world is modulated, and my judgments may be contorted in some way by that pain.

Perhaps what we need, to resist this invasion of body snatchers, i.e., the contentious appropriation of the term ‘embodied cognition’ by theories that discount or eliminate the role of the body or organism-environment per se in cognition, is a consensus on terminology – one that reflects substantive differences in theoretical approaches. Barsalou, for example, suggests the term “grounded cognition” to refer to the idea that cognition operates on reactivation of motor areas but “can indeed proceed independently of the specific body that encoded the sensorimotor experience.” This would certainly capture Goldman’s B-formatted conception of the body in the brain, and it would distinguish such theories from theories that specify both neural and extra-neural roles for motor, peripheral, autonomic, and ecological aspects of embodiment. It may be too late to reach terminological consensus, however. The invasion has already begun.

At the end of the film, Invasion of the Body Snatchers (the 1978 version with Donald Sutherland), the invading body snatchers win. The original human bodies, including the main characters, turn to dust, and only the sanitised and affect-less (somewhat mechanised) replacements are left. The aliens attempt to explain that everything is really still the same (sans human and affective aspects) after this massive redeployment. This idea, of course, strikes the viewer as unconvincing. In contrast, in the
original 1955 novel, *Body Snatchers*, written by Jack Finney, used (and reused) as the basis for more than one film version, the aliens decide to leave in the face of the resistance encountered in the main characters. Perhaps they start to see something in those characters that is convincing and that cannot be reduced to stand-ins for the real thing.

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