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Embodied cognitive science: Gibbs in search of synthesis

Paweł Gładziejewski, Anna Karczmarczyk and Przemysław Nowakowski

Embodiment and Cognitive Science

RAYMOND W. GIBBS, Jr.

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Despite the fact that embodied approaches to cognitive science have been developed since the early 1990s (Varela, Thompson, & Rosch, 1991), no comprehensive compendium has so far been produced that would address exhaustively the role of the human body in cognition. While a considerable number of papers (e.g., Clark, 1998; Hanna & Thompson, 2003; Noë 2001; Thompson & Varela, 2001; Wilson, 2002) and books (Bermúdez, 2000; Clark, 1997; Gallagher, 2005; Johnson, 1987; Lakoff & Johnson, 1999; Noë, 2005; Port & van Gelder, 1995; Rowlands, 1999) have been published that present the specific questions from that area, the key ambitious tasks of (1) summarizing existing research and (2) formulating the results in terms of a unified and internally coherent conceptual frame, have not as yet been undertaken. Taking such a step is necessary but very difficult. Books such as Clark (1997), Gallagher (2005), Noë (2005), Thompson (2007), and many others present in detail both research and theoretical frameworks concerning such topics as body schema, the role of the living body in enculturation, consciousness, and the role of representations in action. Still, it remains unclear how the very notion of “embodiment” should be construed, and how it could be used to unify such theoretical considerations into a coherent branch of cognitive science.

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Raymond W. Gibbs, professor of psychology at the University of California, the author of books such as *The Poetics of Mind: Figurative Thought, Language, and Understanding* (1994) and *Intentions in the Experience of Meaning* (1999), aims at filling this gap with his latest work, *Embodiment and Cognitive Science* (2006). Although the original academic focus of the author was the theory of metaphor in cognitive linguistics, in the book discussed here the object of study has a much broader scope, including perception and action, reasoning and communication, and consciousness. Gibbs' main objective is to synthesize the results of research in embodied cognitive science to demonstrate "how people's subjective, felt experiences of their bodies in action provide part of the fundamental grounding for language and thought" (p. 9). In what follows, we will argue that while the tome provides quite a good review of the relevant empirical results (i.e., it fulfils the former of the two goals introduced above), it does not rise up to the challenge of theoretical adequacy (it fails to fulfill the latter goal). Let us now proceed to examining the author's main theses.

1. The Main Points of the Book

The title of the Gibbs' book suggests that readers can expect an empirically adequate and theoretically exhaustive conceptualization of the specific idea of *embodiment*. Let us begin with an explication of how Gibbs understands this notion, so fundamental for his considerations. This question could be approached on three levels: (1) the role that Gibbs assigns to the notion of "embodiment"; (2) the scope of explanatory validity conferred on this notion; and (3) the preferred theoretical outlooks that constitute the best way of implementing the "embodied" approach to research on cognition.

As to the first of these levels, Gibbs shies away from defining embodiment *per se*. Instead, the author proposes that an "embodied" approach to cognition is founded upon what he calls the "embodiment premise":

People's subjective, felt experiences of their bodies in action provide part of the fundamental grounding for language and thought. Cognition is what occurs when the body engages the physical, cultural world and must be studied in terms of the dynamical interactions between people and the environment. Human language and thought emerge from recurring patterns of embodied activity that constrain ongoing intelligent behavior. We must not assume cognition to be purely internal, symbolic, computational, and disembodied, but seek out the gross and detailed ways that language and thought are inextricably shaped by embodied action. (p. 9)

On the one hand, the embodiment premise contains the elements that recur in the loosely defined embodied approach to cognition: it asserts the importance of the consciousness of one's own body (i.e., the phenomenology of the body) and the interaction between the organism and its broadly understood environment; it acknowledges the connection between high-level cognitive processes and bodily action; and finally, it goes on to formulate a practical directive regarding the way of

doing research. Still, Gibbs does not name the necessary and sufficient conditions that must be fulfilled for a process to be classified as “embodied.” What is more, while Gibbs states that thought and language “emerge” from bodily activity, he never makes it explicit whether this relation should be read as purely genetic or constitutive, or whether the word “emerge” carries the technical meaning from dynamical systems theory.

Gibbs considers the problem of the explanatory role of embodiment within cognitive science with similar caution. Despite admitting the necessity of adopting the abovementioned approach to the sciences of the mind, towards the end of the book Gibbs writes: “nothing in what I have argued in this book necessarily indicates that the mind is completely, irreducibly embodied” (p. 276). This leaves open the central question of whether embodiment can aspire to the status of a new paradigm within cognitive science, or alternatively, it boils down to a much weaker claim that the body plays an important role in many of the subject’s cognitive processes. The modesty of Gibbs’ theses may be laudable but, on the other hand, his position remains hazy to a certain degree: is “embodied cognitive science” a new approach, clearly distinct from the former, “classical” one (the *revolutionary* interpretation), or is it merely a set of amendments to it (the *evolutionary* interpretation)?

Finally, at the third of the aforementioned levels, Gibbs articulates a certain bias towards two theoretical perspectives. The first of them is dynamical systems theory (as applied to cognitive science) and the second is the theory of metaphor, taken from cognitive linguistics. From the dynamical systems theory perspective, as Gibbs presents it, both the brain itself and the triad of body-brain-environment constitute complex, self-organizing systems and the ongoing interactions of their components emergently produce stable patterns of individual’s adaptive actions. According to Gibbs, an important aspect here is the fact that dynamical systems theory can provide explanations for the organism’s complex adaptive actions (as well as its interactions with its environment) without resort to the notion of internal representations of the world. However, the author plainly states this as a feature of the dynamical systems theory without explicitly indicating what exactly enables its explanations to succeed without mentioning the concept of representation. At the same time, as is acknowledged by Gibbs himself, this dynamic, nonrepresentational perspective is only occasionally assumed in the course of the book: it figures prominently only in the discussion of “emotional expression” and consciousness. Far more frequent are Gibbs’ references to research in the tradition of cognitive linguistics—more specifically, the theory of metaphor—which constitute the latter of the two preferred theoretical outlooks. According to the author, the essence of this view is that the experience of one’s own body and action make up the scaffolding which both enables the emergence of and provides the structure for high-level mental phenomena, such as language and concepts, including abstract concepts. Crediting the theory of metaphor—and cognitive linguistics in general—with such a fundamental role in the research on the embodied mind is a highly original element of Gibbs’ work, undoubtedly influenced by the author’s primary academic specialty.

2. Topics of Investigation

2.1. Persons and Bodies

In contemporary cognitive science, including its embodied current, the notions of “person” and “personhood” are almost totally neglected (for an exception, see Shoemaker, 1999). Gibbs, however, addresses this subject matter in his first chapter. Based upon a broad range of research from many disciplines—philosophy, anthropology, cognitive science, psychology, neuroscience, and linguistics—he scrutinizes the role the body plays in being a person. He distinguishes such aspects as:

- the ability to have a first-person perspective (p. 15)
- the dynamics of some important connected parts (p. 18)
- present-moment experience of one’s bodily existence (p. 19)
- the sense of agency (p. 22; see Marcel, 2003)
- acting and experiencing the consequences of one’s actions, including predicting the consequences of actions, termed by Gibbs “the prediction of action” (pp. 19, 23; see Blackemore, Frith, & Wolpert, 2001)
- multiplicity of both selves and bodies in the case of one individual (pp. 20–21)
- intermodal correlations (p. 19; see Botvinick & Cohen, 1998)
- cultural and physical affordances (we leave it an open question whether Gibson, referenced here by Gibbs, was similarly liberal in his construal of affordances)

Those are only the examples from the several initial pages of the book. On subsequent pages Gibbs presents further studies, discusses further cognitive processes and progresses to put forward hypotheses, supplying loosely connected details on the way. Nevertheless, the discussion fails to achieve the goal of describing the person within a unitary theoretical framework. Firstly, the necessary and sufficient conditions for being a person are not provided. Secondly, no explanation is provided as to why these particular processes or properties are crucial for being a person. Should the fact that researchers having so diverse backgrounds—Dennett, Damasio, Lakoff, and Johnson—all distinguish several kinds of the self be taken to indicate that each person is actually many persons, or rather, that each person has many selves and many bodies? Assuming we have distinguished several kinds of bodies, are all of them fundamental to being a person, or just some of them?

Gibbs stresses, too, the important role the sense of agency plays in being a person, declaring that “The sense of agency, as a causal basis for action, is perhaps the most convincing evidence for the ‘I’ we experience as a person” (p. 22). If the “sense of agency” is what constitutes the causal basis for action, then the distinction between the sense of agency and agency *per se* escapes us. When a person suffering from “Anarchic Hand Syndrome” (Della Sala & Marchetti, 2005) experiences the movements of one of their hands as alien (i.e., brought about by another person), the question arises whether the movements themselves are alien, i.e., whether they count as the movements of the body of this subject, or the movements of the body of another subject. Even on the next page, Gibbs discusses a study by Wegner and goes on to indicate—if not purposely—that the sense of agency, although present, follows

action rather than precedes it, which would make it causally void. Also, it is not clear how the sense of action could attest to our feeling of being a person. The sense of action may be key to the constitution of the experiential aspect of being a person, to the sense of being the agent of own movements, and may also be crucial to the perception of free will (we do not consider here the question of the existence of free will) and the experience of being a free person.

Gibbs then proceeds to present the case of Siamese twins, in which two persons share the common part of their conjoined bodies—an important phenomenon that is often neglected in the studies in this area. Still, despite the fascinating descriptions, no conclusion follows as to the possible consequences of this phenomenon for personhood.

The concept of body schema is without doubt of crucial importance for the research on body's role in cognition (Gallagher, 2005). As might then be expected, Gibbs focuses on and makes use of this concept in his book. He does it in the context of discussing the problem of personhood. What is the function of the body schema for the notion of a person according to Gibbs? How are we to integrate research like that of van der Bos and Jeannerod (2002)¹ into this frame? Gibbs treats such studies as research on the body schema which, as he declares, contributes to our “recognizing who we are as unique persons” (p. 31); still, even though the ability to recognize one's own body as “oneself” is a strong candidate for a property constitutive of personhood, the body schema, located entirely on the subpersonal level, can by no means serve as the source of personal uniqueness.²

IW, a sensory neuropathic patient (suffering from a selective damage to thick myelinated nerve fibers responsible for both proprioception and discriminative touch), has almost completely lost the sense of his own body. On Gibbs' account, what was impaired was his body schema rather than his body image (p. 34). This, however, conflicts with Gallagher's (2005) interpretation of IW's condition. According to Gallagher, the recovery of the ability to move his body was possible solely because of the preserved body schema and the replacement of proprioceptive-haptic layers of his body image with the layers related to visual information. Gallagher's account is supported by the studies of IW in which despite the lack of visual control, IW's movements preserved its morphokinetic properties (pp. 107–128); that is, despite the absence of visual feedback (visual body image), IW could move in an organized manner. What is more, when one considers the distinction into body image and body schema, it can be shown that even though the body image participates in action, it does so only in close cooperation with schematic processes (see Gallagher, 2005, pp. 17–64).

In the recapitulation of this chapter, Gibbs writes: “people's experiences of themselves as ‘persons’ are clearly intimately related to their ordinary bodily experiences” (p. 40). He goes on to state that “personhood is an emergent property of the interactions of the brain, body and world” (p. 41), and that “minds are related to whole persons” (p. 41). Such a conclusion of a chapter on the significance of the body for personhood leaves us with a number of questions. For example, should the fact that experiencing oneself as a person is closely connected to one's bodily

experiences be taken as a distinctive marker of the embodied approach in cognitive science? Are animals persons, too, considering that they cannot be denied body-brain-world interaction? Should the last quotation be read as claiming that mind is a purely personal level phenomenon and thus cannot be analyzed exclusively on the neuronal level; or maybe that there is no such process or property in a person that would not be related to the mind; or maybe that there can only be persons with minds, where the lack of a mind equals the lack of a person? All the above questions follow directly from the author's failure to provide an explicit definition of person, or to present an exhaustive conception of embodiment.

2.2. Reasoning, Language, Concepts: High-Level Cognitive Processes

The part of Gibbs' book dealing with high-level cognitive processes—that is, reasoning, and using language and concepts—is particularly noteworthy. Gibbs aims at showing the presence and crucial character of bodily experience for specifically human cognitive abilities by reference to metaphors in language. This, then, is the point of convergence of the past and present interests of the book's author, who—as already noted—is known for his work in cognitive linguistics.

Metaphors, in particular those that refer to sensory images, constitute an aspect of human thought that is supposed to reflect and testify to the inalienable role of the human body in cognition. The author's substantiation of such a point of view begins in an analysis of concepts. He criticizes the theory of concepts formulated within traditional philosophy and psychology: according to Gibbs, the currently received approach to concepts treats them as a type of mental representation that are stable (do not change) and represent properties of the objects by means of individual, amodal symbols, independent from language, context-free, and essentially “disembodied.”

Thus, the author proposes to focus on the construct known as *image schema*. Image schemas are mental structures that lie beneath our mental representations. More precisely, they can be defined as cognitive structures constituted on a basis of recurring sensorimotor patterns of our embodied experience. Image schemas have dynamic features, as they are related to different types of activity. They are regularities according to which we arrange our actions, acts of perceptions and concepts (Johnson, 1987). What is important, they not only organize our experience, but enable us to describe it. Image schemas are situated on a higher level of abstraction than detailed individual images, but still beneath propositional structures. They were discussed by Mark Johnson (1987), who showed that such structures constitute a basis for concrete and abstract concepts. That is why concepts are to be grounded in motor and perceptual activity, and possess nonpropositional content, so as to should counterpoise the traditional view on schemata in cognitive science, which are characterized as abstract, propositional and conceptual (at this point Gibbs quotes Rumelhart, 1980).

Image schemas are also proposed to provide the foundations for reasoning processes, which would contradict describing reasoning in terms of the application of

the rules of inference—a stance typical of contemporary philosophy, developed from rationalistic roots. According to Lakoff (1990), the majority of inferences are metaphorical reflections of certain spatial properties related to the structure of image schemas. Gibbs, quoting the works by Lakoff (1987) and Johnson (1987) identifies and describes about twenty distinct image schemas and their transformations that appear regularly in everyday thought such as, for example, the schemas of *balance*, *source-path-goal*, *link*, and others (p. 91).

According to the author, this constitutes the reason for which the problem of human reasoning, as has already been remarked, cannot be reduced to the subject's executing abstract mental strategies and algorithms, but has to be enriched with the aspect of bodily involvement. The latter is the case in, e.g., mental simulations (which incorporate imagined actions), manipulating one's own body to facilitate the performance of mental operations (e.g., recruiting gestures for expression), developing the so-called kinesthetic intelligence (reading the dynamic clues that depend according to the position in which we put our own body), or using the environmentally available tools. Behind deliberating upon higher-level cognitive processes, the author emphasizes his intention, which was to protest against their traditional view: as computational operations on symbolic data, strictly delimited to the inside of a human skull.

In formulating the above claims, however, Gibbs appears to present his theses as more revolutionary (relative to the present consensus in cognitive science) than they really are. This leads to some of Gibbs' critiques being unclear, as when he considers the nature of concepts, mental representations, and human reasoning. For instance, in trying to refute the computational model of human reasoning, Gibbs does not formulate any explicit definition of reasoning that he would accept as valid. The examples he provides of the role of the body in thought processes (listed above in the text) seem to be better understood as supplement of the more basic operations on mental representations. Possibly, the problem resides in an overly restrictive approach of the author to the notion of mental representations, which he takes to be necessarily amodal, fully independent of bodily experience, and reduced to the role of objects on which arbitrary, rule-governed operations can be performed. This, however, does not seem to be accurate in the context of present-day cognitive science. Gibbs' views may thus lack the clearly antagonistic status relative to those found in contemporary cognitive science.

Also, the analysis of the very notion of image schema appears to be unsatisfactory (the author focuses more on presenting the ideas of other researchers); for example, stating that image schemas are more abstract than common images is not convincing. Interestingly enough, the author employs here the notion of "abstractness," earlier considered to be incompatible with the embodied outlook on mental processes.

Another point of concern is the problem of metaphor, pivotal to the considerations presented above. Metaphors are supposed to express image schemas and show how they function in the formation of more complex schemas that participate in the processes of reasoning, with regard to for instance argumentation. This would give the latter processes a bodily-experiential grounding. However, in his

discussion of this topic, the author does not go beyond presenting a succession of metaphors, as he himself observes that as yet no experimental support for those speculations has been offered. This detracts from Gibbs' argument: despite his ambitions to expound the processes of reasoning, concept use and language use in a way that is novel, exhaustive, and in line with the spirit of embodiment with relation to other aspects of human cognitive functioning (such as perception), he fails to achieve this goal. Whether this should be blamed on the specific nature of the high-level cognitive processes, or on the insufficiency of the author's treatment of the subject, is an open question.

2.3. *Consciousness*

The final topic addressed by Gibbs is nothing other than cognitive science's Holy Grail: consciousness. However, the way in which the author discusses this problem area may appear equivocal and problematic. On the one hand, Gibbs accepts the existence of the hard problem of consciousness (Chalmers, 1996), as well as the explanatory gap between phenomenal experience and objectifying scientific description (Levine, 1983). On the other, inspired by Baars' (1997) theory of consciousness as global workspace, he considers consciousness in terms of its structural-functional properties, such as accessibility of conscious information to effectors and action schemas. Consequently, it is unclear whether Gibbs acknowledges the distinction between phenomenal consciousness and access consciousness or considers it to be merely a philosophical fiction. Likewise, it is unclear whether Gibbs accepts the nonreducibility of the first-person perspective (firmly established in neurophenomenology, a subdiscipline with very close ties to embodiment—see, e.g., Thompson & Varela, 2001), or if the conception of solving the mystery of consciousness he advocates, based on the theory of dynamic systems, should be counted as a reductionist explanation. On Gibbs' account, consciousness is an emergent property of the interaction between the brain, body, and world. Such a stance, while interesting and cognitively fruitful, still remains vulnerable to philosophical antireductionist arguments, such as the ones by Chalmers or Levine—defending against them successfully would require much more work, both conceptually and analytically, than Gibbs actually does in his book.

3. Conclusion

Embodiment and Cognitive Science offers an impressively broad, but at the same time somewhat superficial and cursory review of research in the embodiment tradition—at least research before 2006. Although Gibbs occasionally misinterprets or misrepresents studies outside the area of metaphor theory, his work strikes one as a generally sound and adequate—if a bit perfunctory—exposition of research that in one way or another connects to the idea of embodied cognition. Regrettably, the author does not attempt, except perhaps in a very hazy and imprecise way, to sketch out a unified, coherent and nontrivial theoretical background for this wealth of the

relevant data. This means that on the conceptual level, Gibbs' work is a disappointment. Many of the key notions are left undefined, and the occasional attempts at conceptualizing them explicitly (e.g., in the case of the embodiment premise described above) are much too cautious and general to be considered satisfying.

Interestingly, the publication of *Embodiment and Cognitive Science* coincided with an important debate in the electronic journal *PSYCHE* concerning Thomas Metzinger's (2003) *Being No One*. In reply to Shaun Gallagher's criticisms, Metzinger (2006) formulated a model of embodiment that distinguished three levels: (1) the level of passive interactions with the environment, where, e.g., morphology plays a vital role; (2) the level of action, where the systems relies on the internal model of itself in order to act efficiently; and (3) the level of the conscious experience of oneself as being an embodied "self." Each level refers to a different type of analysis, all of them being fundamentally important to research on embodied cognition. This way, Metzinger's proposal is to treat these levels as constituting a single, unified research field, thus enabling us to conceive embodied cognition as a structured whole.

One could try to extend Metzinger's rather schematic account a little. On the first level we distinguish the body's mechanical and morphological properties. These properties are of special interest to the research area known as morphological computation (Pfeifer, Iida, & Gómez, 2006). This way we can include the body's primitive, but at the same time crucially important (e.g., by making it possible to reduce the computational complexity of acting in the world³) aspects in our research on the role of the body in cognition. The second level proposed in Metzinger's account brings together all concepts connected theoretically with the notions of body schema and internal models—that is with motor control theory and the internal models of the body and environment that this theory postulates. On this level we conceptualize the subpersonal mechanisms that make coordinated action in the world possible. On the third level we finally refer to conscious experience of the body (including its' affective aspects) as well as the concept of the body as they are described on the personal level.

Does this kind of account solve all the conceptual problems with the idea of embodied cognition? Probably not. Yet still, it provides us with a single, coherent conceptual framework that encompasses the embodied cognitive science at different levels of analysis. Take Lakoff and Johnson's theory, for example. Although these authors formulate their ideas in a way that is orthogonal to Metzinger's account, their proposal could be conceived as describing the interactions between the second (bodily interactions with the world that ground the front-back, top-down, left-right relations) and third (the world of concepts we make use of as persons) of Metzinger's levels, where these levels are understood more broadly as representing cognitive subpersonal and personal dimension of embodiment, respectively.⁴

Metzinger's three-level account clearly implies the consequence that research which cannot be classified as relevant to one of the three levels cannot be classified as belonging to current embodied cognitive science. Such a conceptualization does not

exclude action, the brain-body-world interaction, or mental phenomena such as emotions and perception, but at the same time it allows us to distinguish the neuronal, functional, and experiential aspects of embodiment. Most importantly, however, it provides an opportunity to expound the role of the body in cognition, that is, present the essence of the idea of embodied cognition. Metzinger's approach thus demonstrates that it is indeed possible to articulate a satisfying theoretical outlook that would integrate the results of empirical research related to the idea of embodiment. Unfortunately, as we have been striving to show, this is a task at which Gibbs does not succeed with this book.

Notes

- [1] Known as "alien hand" research. This denomination, however, calls for more caution, since it refers both to the research paradigm on the sense of action established by Nielsen and to the disorder of the sense of ownership of the hand, related to the damage to the corpus callosum (see Sørensen, 2005).
- [2] In writing this, we are aware of the possible criticism that we are confounding the analysis of person with the *personal* level of analysis. However, we assume that considering person as beings individuated purely on the personal level of analysis is a simplification that can be accepted for the purposes of this review. Secondly, if we want to avoid a hypostasis of body schema and instead treat it as complex of unconscious sensorimotor processes (Head & Holmes, 1911), it can hardly be employed as an instrument for individuating persons.
- [3] Here, we employ a rather liberal concept of computation.
- [4] As for the first level of Metzinger's account, within this kind of broader interpretation it could be described as representing subpersonal, noncognitive, yet cognitively significant aspects of embodiment.

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