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Book review: Contemporary sensorimotor theory

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A book review on
Contemporary sensorimotor theory

by Bishop, J. M., and Martin, A. O. (eds). (2014). Switzerland: Springer International Publishing

Consciousness, with its irreducible subjective character, was almost exclusively a philosophical topic until relatively recently. Today, however, the problem of explaining the felt quality of experience has also become relevant to science and engineering, including robotics and AI: "What would we have to build into a robot so that it really felt the touch of a finger, the redness of red, or the hurt of a pain?" (O'Regan, 2014, p. 23). Yet a practical response still requires an adequate theory of consciousness, which brings us back to the hard problem: how can we account, from a scientific point of view, for the phenomenological character of experience? Over a decade ago, O'Regan and Noë (2001) proposed a new approach to these questions, the so-called sensorimotor approach to perceptual experience. How far has this approach come and what are its outstanding challenges? The volume *Contemporary Sensorimotor Theory*, edited by Bishop and Martin, takes stock of the current state of the field.

The book starts with Bishop and Martin (2014) presenting different facets of sensorimotor theory, highlighting, for example, that O'Regan (2011) and Noë (2004) ended up developing different ideas concerning the applicability of the theory to robots: a positive account appealing to higher-order cognitive capacities versus a skeptical stance citing the necessity of life for mind, respectively. Ambiguous labeling does not help the current situation. According to Hutto and Myin (2013), the sensorimotor approach of O'Regan and Noë (2001) is also "enactive," a label which Noë (2004) himself began to adopt, but from which Pascal and O'Regan (2008) distanced themselves. In fact, several overlapping approaches may be distinguished in addition to the classic sensorimotor approach, including sensorimotor enactivism (Varela et al., 1991; Noë, 2004), which turned into autopoietic enactivism (Thompson, 2005, 2007; Noë, 2009; Froese and Di Paolo, 2011), and which is distinguished from radical enactivism by Hutto and Myin (2013). The book's contributions range over all of them.

Noë did not contribute to this volume, but his absence is compensated by other submissions. Pepper (2014) points out some conceptual difficulties with Noë's theory of perception, which could be resolved with Merleau-Ponty's phenomenology of the body schema and sedimentation. Wadham (2014) claims that Noë's theory implies the invisibility of perspectival properties, which requires a revision of his theory of perspectival content.

O'Regan (2014) reports on his sensorimotor approach. He proposes that "experiencing a sensation involves being engaged in sensorimotor interaction" but that "being conscious of something [...] requires appeal to a form of 'higher-order' cognitive access" (p. 34). In contrast, Rainey (2014) argues that consciousness is non-conceptual while experience is conceptual, and that consciousness is, therefore, the enabling ground for the possibility of experience.

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Scarinzi (2014) points out difficulties faced by O'Regan's approach, characterized as "semi-enactive," that could be resolved by paying closer attention to the lived body, as done by autopoietic enactivism (Thompson, 2007). Paine (2014) also critically examines O'Regan's proposal, evaluating how Heideggerian phenomenology may help his ideas about robot consciousness to evade Dreyfus (2007) objections against AI. Paine also notes that O'Regan leaves out any role for emotion.

This concern is shared by Parthemore (2014), who proposes to extend sensorimotor theory by taking into account emotional affect and the somatosensory system, and to, thereby, turn it into a better theory of concepts. Other authors also propose extensions. Lyon (2014) explores the implications of extending sensorimotor theory beyond vision and touch, in particular to audition. Rucinska (2014) extends sensorimotor theory to explain basic forms of pretense. Cowley (2014) considers how language extends the sensorimotor domain.

There is also an unresolved tension about the role of informational content in the generation of perceptual consciousness in the book. Some authors explore the qualitative differences between types of sensations in terms of information processing (Gamez, 2014), while others advocate abandoning the appeal to informational content altogether (Loughlin, 2014). One problem with a non-representational approach is to explain the experience of imaginary things. Rucinska (2014) account of "seeing-as" may help in developing a solution.

To sum up, this volume invites us to refine our notions of consciousness and experience on the basis of the close relationship between action and perception. However, more work needs to be done to compare and contrast the distinct kinds of sensorimotor/enactive theories. In the context of AI and robotics, for example, we need to clearly distinguish between sensorimotor and autopoietic enactivism. The popularity of the sensorimotor approach is largely explained by its applicability to the design of AI and robotics (e.g., Hoffmann, 2014; Lyon, 2014), and by O'Regan's (2014) claim that it could lead to genuine examples of conscious machines. But this appeal is counterbalanced by a set of philosophical difficulties (Bishop and Martin, 2014), including a lack of clear definitions as to what it means to be an agent or to perform an action (Thompson, 2005).

Autopoietic enactivism, on the other hand, gives us a more solid conceptual foundation of subjectivity by drawing from biological embodiment and from the phenomenological tradition, but not without unfortunate implications for research in AI and robotics (Froese and Ziemke, 2009). Although dynamical systems models of cognition can help us to formally define different notions of sensorimotor contingency (Buhrmann et al., 2013), they are forced to abstract away the autopoietic foundations of agency. Of course, even on this view, research in robotics and the sensorimotor approach continue to form a productive relationship. Yet investigating the hard problem of perceptual experience requires working directly with the first-person perspective. In accordance with the contribution by Gibbs and Devlin (2014), we propose that we can keep the advantages of a synthetic methodology by shifting emphasis from autonomous robotics to human–computer interfaces (Froese et al., 2012). As Gillies and Kleinsmith (2014) propose, such an embodied and enactive approach to designing human–computer interfaces opens up new opportunities for exploring more intuitive interfaces that directly tap into our bodily capacities for perceptual consciousness.

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