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Authors

Hasselmann, Fred

Dale, Rick

Holden, John

et al.

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What Should we Be Realist about in Cognitive Science?

Fred Hasselman (f.hasselmann@psych.ru.nl)

Symposium organizer (with M.P. Seevinck & R.F.A Cox)
Behavioural Science Institute, Learning and Plasticity Program,
School of Psychology and Artificial Intelligence, Radboud University Nijmegen,
PO Box 9104 6500 HE Nijmegen, the Netherlands

Rick Dale (radale@memphis.edu)

Cognition and Integrated Action Lab,
Department of Psychology and Institute for Intelligent Systems
The University of Memphis, 202 Psychology Building
Memphis, TN, USA, 38152

John Holden (holdenj@ucmail.uc.edu)

CAP Center for Cognition, Action, and Perception
Department of Psychology, University of Cincinnati
PO Box 210376, Cincinnati, OH 45221-0376

Tony Chemero (tony.chemero@fandm.edu)

Scientific and Philosophical Studies of Mind Program,
Psychology Department, Franklin and Marshall College
Lancaster, PA 17794-3003

Abstract

The fundamental question that is the title of this symposium elicits answers that are not just philosophical in nature, directly pertain to measurement, interpretation of empirical results, modeling, as well as the daily practice and general philosophy of the science that studies cognitive phenomena. Four different perspectives on the realist question will be provided by the speakers in this symposium: *Ecological Realism*, *Measurement Contextuality*, *Explanatory Pluralism* and *Structural Realism*. The participants address differences and similarities between these perspectives and examine whether unification or consensus perspectives can be achieved.

Keywords: ontology; epistemology; scientific realism; complexity science; measurement contextuality; holism

Constituents of Mental Reality

Age-old philosophical questions continue to be posed in cognitive science and usually come in the form of what it is that makes up mental reality: What are the constructs of our various theories that we can say are *real*. While some may argue that visualization of brain activity while performing cognitive tasks has provided a new window into identifying such cognitive ontologies (e.g. Albright, Jessell, Kandel, & Posner, 2000), others may argue that the same puzzling questions of cognitive reality still remain (e.g. Van Orden, Pennington, & Stone, 2001). The prospect of a resolution appears to be remote and that is perhaps the best justification to re-examine the philosophical foundations that guide and focus empirical inquiries in the cognitive and behavioral sciences.

The speakers in this symposium will critically examine

these foundations. Though some share a theoretical background, the result is anything but a tidy accounting of cognitive ontology: Four very different answers to the realist question will be explored.

Structural realism

The realist commitment in Structural Realism (SR; Worrall, 1989) is towards uncovering the unobservable structure of the world by means of ontology that is considered dispensable: A temporary vehicle we need to make sense of the world. The idea is that we should believe what scientific theories tell us about this structure (that is retained across theory change), but not what they tell us about the proposed constituents of reality.

Fred Hasselman (with Michael Seevinck and Ralf Cox) will propose to adopt an SR approach to the study cognitive phenomena observed in cognitive systems (cf. Hasselman, Seevinck & Cox, submitted). A program of rigorous commitment to ontology is endorsed, but only with the realization that this is a temporary tunnel vision. Ontology should be crash-tested with reality in order to find out where and when it breaks down, which parts may be recycled, or whether a new design is needed. Hasselman et al. suggest cognitive science can benefit from setting the expiration date of its ontology to “as soon as possible”, rather than “not in my lifetime”

Being realist about what our best scientific theories propose as the furniture of the world, may lead to adoption of theoretical constructs by analogy. The danger in doing so without examining whether there is a shared structure between the phenomena in question will be discussed. As an

example, it will be argued that the current mathematical structure used to describe classical dynamical systems, cannot serve as the arena for constructs like holism (cf. Seevinck, 2004) and strong emergence, adopted by the complexity science approach to study cognitive phenomena.

Explanatory pluralism

Rick Dale (with Eric Dietrich) will argue for explanatory pluralism (see Dale, 2008 for a review), in which different emergent ontologies are posited to exist as a consequence of assuming the animal-environment system to be a complex dynamical system. From Marr's well-known levels, and before (e.g., Simon, 1962), cognitive scientists have often recognized the importance of identifying levels of analysis (in goals, and across scales of space and time) to understand the operation and ontological status of various theoretical constructs.

Dale and Dietrich will argue that this issue of levels puts cognitive science on the horns of an ontological dilemma. The dilemma can be phrased as two simple answers to the question that entitles this symposium. Given a (limited) set of theories being used to explain phenomena in cognitive science's many (partially overlapping) domains of inquiry -- what is real? Lots of it, or none of it. They will argue for the former answer, and advocate for integrating the various ontologies of cognitive theory, and briefly review research programs already carrying this out.

Measurement contextuality

Jay Holden will talk about the place of measurement in theories of situated behavior: What is the ontological status of measurement outcomes in cognitive science?

Historically, cognitive science relied on a largely mechanistic, materialist and rationalist ontology. An alternative ontology will be presented that is rooted in lessons learned from the physics of self-organization and quantum observations. While within reach, this alternative ontology has implications for the nature of knowledge and explanation for cognitive science.

The resolution of measurement problems inspired by quantum phenomena such as entanglement and complementarity will be discussed (cf. Holden, Choi, Amazeen, & Van Orden, 2010). Implications relating to modeling cognitive phenomena will be also be discussed.

Ecological Situated realism

Tony Chemero will describe a *Radical Embodied Cognitive Science* (cf. Chemero, 2009), in which behavior is explained in terms of animal-environment dynamics without invoking the concepts of computation and representation.

This implies an ecological realism, which is above all a kind of realism about meaning or significance. Meaning, on this view, is not a projection of information stored in memory onto stimuli in the brain; instead, animals discover meaning in the world. Methodological and philosophical consequences of ecological realism will be discussed.

Discussion

Several presented perspectives share a concern about falling prey to ontological fundamentalism by adopting any kind of realism. Solutions presented to deal with such fears will be discussed and compared. Also, speakers have different opinions towards adopting concepts from physical theories by analogy to describe cognitive phenomena or measurement outcomes. Cautions, warnings and successes will be debated. Finally, the symposium participants will evaluate to what extent they share the position that the dominant information processing ontology of computation and representation in cognitive science is inappropriate to adequately describe the behavior of agent-environment systems.

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