

Explanatory Pluralism in Cognitive Science

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Abstract

This brief commentary has three goals. The first is to argue that “framework debate” in cognitive science is unresolvable. The idea that one theory or framework can singly account for the vast complexity and variety of cognitive processes seems unlikely if not impossible. The second goal is a consequence of this: We should consider how the various theories on offer work together in diverse contexts of investigation. A final goal is to supply a brief review for readers who are compelled by these points to explore existing literature on the topic. Despite this literature, pluralism has garnered very little attention from broader cognitive science. We end by briefly considering what it might mean for theoretical cognitive science.

Keywords: Theory; Pluralism; Emergence

We use many theories to understand the universe. This basic idea, often called explanatory pluralism, derives from the diverse levels of organization in the universe, and the equally diverse explanatory goals of human beings—concluding that many and multifarious theories are needed. We are writing to encourage cognitive scientists to consider this plural perspective for understanding the human mind. The mind, as somehow constituted by brain–body–environment interaction, is extraordinarily complex. In addition, we have many and assorted interests in that interaction. A mere glance at the proceedings of the society’s annual conference reveals this. Ever since the era of the “cognitive revolution,” many accounts of our short history portray new theories as subjugating or supplanting those that came before (Leahey, 2001). However, it is possible that the brain–body–environment system is sufficiently rich to admit of levels and goals of analysis that require pluralism to tackle them all.

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A big hang-up many have with plurality is its apparent flouting of ontology. One does not wish to accept the “reality” of some competing theory, because its constructs are somehow an “approximation” or “idealization” of purer, lower-level accounts. But reductionist ontology is not the only goal found across the sciences (Laughlin, 2005). If it were, then virtually every single concept from cognitive science can be cast aside as an idealization, including that fundamental fiction of “neuron” (which, in a reductionist’s ontology, would actually be “merely emergent” from even lower-level physical descriptions). If reductionist ontology were so central, then we would all agree with Horgan (1996) that cognitive science is just another cataloguing endeavor of the life sciences.

There are preexisting frameworks that encourage embracing theoretical diversity. Emergentism is one such framework, already well-rooted in the physical sciences (but still under development conceptually, Halley & Winkler, 2008). In very complex interactive systems, measurable properties of crucial epistemological value can be identified at a higher level of abstraction than the system’s substrate (Anderson, 1972). Some have recently used the phrase “emergent property” in a near-pejorative sense, calling out some constructs or others as “mere” emergent phenomena. There is a difference between convenient fictions and emergent phenomena. The former are inherently false in some vitiating way, while the latter are central to scientific understanding of a system. Genuine emergent phenomena are not mere, but reflective of how a system self-organizes into some function or operation or other. Whether this induces a “promiscuous plural ontology” (Dupré, 1993), or a more agnostic epistemological metatheory, the higher-level patterns and principles are needed in either case.

Yet our talk of low- and high-level phenomena simplifies much. Impressive research programs are in place for bridging these measurement scales as a rule, such as social cognitive neuroscience (Gilbert, 2002). Therefore, though they may be exemplary in their efforts to organize our understanding, schematic portrayals of the scientific agenda, such as Marr’s levels or more recent approaches (Sun, Coward, & Zenzen, 2005), cannot fully capture the heterogeneity of empirical and theoretical work. No normative schematic for the sciences has gained consensus in the philosophy of science, and we doubt any such schematic would win over all cognitive scientists either (Chemero, 2009; Chemero & Silberstein, 2008; Dietrich, 2008). However, intertheoretic relations can be drawn on a case-by-case basis (McCauley & Bechtel, 2001). For example, symbolic and connectionist/dynamic approaches may find synthesis in symbolic dynamics and other frameworks (Atmanspacher & beim Graben, 2007; Dale & Spivey, 2005; Smolensky & Legendre, 2005). This is not to say that there cannot be genuine competition between different theories in similar levels or situations. It does suggest the possibility of theoretical integration that cuts across contexts, rather than an endless wrestling match. Theoretical assumptions and “commitments” thus need not function as fundamental pillars to be upheld inviolately, but rather serve to define explanatory boundary conditions.

These reflections are not novel. For example, Bechtel and colleagues have for some time recommended developing a richer account of interfield and intertheoretic relations in cognitive science (Abrahamsen & Bechtel, 2006; Bechtel, 1990; Bechtel & Richardson, 1993; McCauley & Bechtel, 2001). Some work recently about processing and representation has

offered grounds on which cognitive pluralism can be embraced in an integrative manner (e.g., Dietrich & Markman, 2003; Looren de Jong, 2002; Markman, 1999; Smolensky & Legendre, 2005; D. Weiskopf, (in press); for a review, see Dale, 2008). In the broader philosophy of science, numerous scholars have argued that the universe and our understanding of it are based in epistemological heterogeneity, rather than theoretical homogeneity (Cartwright, 1999; Dupré, 1993; Giere, 2006; Kellert, Longino, & Waters, 2006; Mitchell, 2003). Some physicists have agreed (e.g., Anderson, 1972; Laughlin, 2005).

Despite this groundswell of discussion favoring plurality, it has not won much currency in broader theoretical debate in cognitive science. We hope this brief letter encourages readers to consider the plural option. At present this option has deep metatheoretical implications. One may be to give up on applying, implicitly or otherwise, Thomas Kuhn's observations about science. Human beings, and in general the behavior and structure of complex biological entities, may not admit of one single theoretical paradigm for explanation. Kuhn's ideas were historical generalizations, not prescriptions, and they seem to hold well in periods of early scientific development. However, we now know well that the world is complexly layered at numerous measurement scales, admitting of diverse patterns and principles that may look very different across these scales. Therefore, rather than assuming comprehensiveness of our theoretical frameworks, and continuing to envision the unfolding of some Kuhnian revolution, we can figure out how and why certain frameworks work when and where.

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