



REVIEW: Carl F. Craver, *Explaining the Brain: Mechanisms and the Mosaic Unity of Neuroscience*

**Author(s):** Kevin Morris

**Source:** *Spontaneous Generations: A Journal for the History and Philosophy of Science*, Vol. 3, No. 1 (2009) 239-242.

**Published by:** The University of Toronto

**DOI:** [10.4245/sponge.v3i1.6126](https://doi.org/10.4245/sponge.v3i1.6126)

#### EDITORIAL OFFICES

Institute for the History and Philosophy of Science and Technology  
Room 316 Victoria College, 91 Charles Street West  
Toronto, Ontario, Canada M5S 1K7  
[hapsat.society@utoronto.ca](mailto:hapsat.society@utoronto.ca)

Published online at [jps.library.utoronto.ca/index.php/SpontaneousGenerations](https://jps.library.utoronto.ca/index.php/SpontaneousGenerations)  
ISSN 1913 0465

Founded in 2006, *Spontaneous Generations* is an online academic journal published by graduate students at the Institute for the History and Philosophy of Science and Technology, University of Toronto. There is no subscription or membership fee. *Spontaneous Generations* provides immediate open access to its content on the principle that making research freely available to the public supports a greater global exchange of knowledge.

## BOOK REVIEWS

Carl F. Craver. *Explaining the Brain: Mechanisms and the Mosaic Unity of Neuroscience*. xx + 272 pp. Oxford: Oxford University Press, 2007.\*

Kevin Morris<sup>†</sup>

Human beings enjoy a wide range of mental capacities: we learn, remember, and think. And we have these capacities largely in virtue of the brain. But how does the brain work? Carl Craver's *Explaining the Brain* provides a careful, detailed examination of the explanatory framework employed in contemporary neuroscience and how this framework revolves around the notion of a mechanism. Moreover, he argues that an adequate appreciation of this framework requires reconsidering a number of issues in the philosophy of science.

*Explaining the Brain* can be understood in terms of the intersection of two recent trends in the philosophy of science. The first is methodological: the central task for the philosopher of science is descriptive, not prescriptive. Thus Craver writes that a philosophical account of explanation in neuroscience "should deal correct verdicts on...clear and uncontroversial examples unless there is a compelling reason to suspect that the judgments of science are wrong," which allows him to dispense with several well-known accounts of explanation (p. ix). For instance, Craver argues that the deductive-nomological (D-N) model of explanation under which explanation involves the subsumption of the explanandum event under a law of nature is inappropriate for neuroscience, essentially because neuroscientific explanations often involve an explanandum (for instance, the release of neurotransmitters) that doesn't typically follow the kind of events cited in the explanatory premises (for instance, action potentials). Thus he concludes that since "in neuroscience improbable things happen, and when they do, mechanisms can explain them," such explanation cannot be captured by the D-N Model (p. 40).

The second trend is the emphasis on the notion of a mechanism, particularly in the philosophy of biology and the philosophy of

\*Received June 2009. Accepted August 2009.

<sup>†</sup>Kevin Morris is currently a Ph.D student in the philosophy department at Brown University. He works primarily in metaphysics and philosophy of mind, but is also interested in philosophy of science, epistemology, and topics in the history of philosophy.

psychophysical sciences. Craver characterizes a mechanism as a “set of entities and activities organized such that they exhibit the phenomenon to be explained” (p. 5). His central claim is that neuroscience is in the business of discovering mechanisms—discovering how brain functions result from the components of the brain—and that neuroscientific explanations are thus mechanistic explanations, explanations that describe mechanisms. *Explaining the Brain* provides the most substantive and rigorously worked-out account of the mechanistic approach to date: Craver utilizes a “manipulationist” account of causation to spell out the sense in which mechanisms are constituted by entities and activities that exhibit, or produce, the phenomenon targeted for explanation (Chapter 3) and provides a detailed analysis of the relationship between the mechanistic approach and reductionism (Chapter 4), the conception of reality as consisting of different “levels” (Chapter 5), the possibility of non-fundamental explanation (Chapter 6), and the unity of science (Chapter 7).

Despite the many virtues of *Explaining the Brain*, Craver’s assessment of the status of the mechanistic outlook vis-à-vis reductionism is somewhat unsatisfying. Here he argues that despite its reductionist associations, the mechanistic approach in fact possesses a number of nonreductive credentials. But, first, there is an important tension between Craver’s methodological outlook and an adequately formulated reductionist position; second, Craver often seems to equate reduction with intertheoretical “bridge law” reduction, which is problematic if alternative conceptions of reduction and reductionism are available. I’ll consider these worries in turn.

Concerning the first worry, Craver argues that mechanistic explanations in neuroscience are often “multi-level” in the sense that they may “refer to the behavior of organisms, the processing functions of brain systems, the representational and computational properties of brain regions, the electrophysiological properties of nerve cells, and the structures and conformation changes of molecules” (p. 9). Craver takes this to imply the failure of “radical fundamentalism”—“the claim that the only real explanations are to be found at some fundamental level” (p. 12). More generally, an explanation that is “multi-level” is “nonreductive” in the sense that it doesn’t appeal exclusively to a privileged “lowest” or “most fundamental” level.

This shows that there is a sense in which explanations in neuroscience are not always “reductive,” and thus that there is a sense in which neuroscience is not reductive. But what follows from this? After all, when it comes to explanation, it is plausible that a reductionist should only insist on the in-principle explainability of the target phenomenon in lower-level

terms. And so if we have reason to believe that such an explanation is possible, we can maintain that the phenomenon is reductively explainable. It is compatible with some phenomenon being reductively explainable in this sense that extant explanations of that phenomenon may not qualify as strictly reductive and that working scientists may often not be interested in advancing reductive explanations. What Craver additionally needs to provide, then, is a reason for thinking that the “multi-level” explanations in neuroscience are the best that we could in principle advance with respect to the relevant phenomena.

Similarly, Craver often emphasizes that insofar as mechanistic explanation involves explaining some behavior or capacity of a macrosystem, the initial task is to adequately characterize the behavior or capacity that needs to be explained, which often requires considerable higher-level research (pp. 125-127). This gets us a nonreductive picture if we think that a reductionist is committed to the irrelevance of research into macrosystems independently of their micro-constituents.

But it is far from clear that a reductionist—say, someone committed to the in-principle explainability of macro-phenomena in micro-terms—must deny the importance of higher-level research, particularly given the epistemic limitations and often pragmatic motivations of human researchers. And while a mechanistic explanation will include the behavior of the macrosystem targeted for explanation, it is crucial to note that its role in the explanation is to serve as the *explanandum*: in a mechanistic explanation, we aim to explain the behavior of the system.

Concerning the second worry, Craver contrasts the mechanistic approach to “constitutive” explanation, explanation of the behavior of a system in terms of the parts of the system, with what he calls the “reductive approach.” On the latter account, constitutive explanation is a form of D-N explanation: the behavior of a macrosystem is explained by positing “bridge laws” between the theory utilized to characterize the system and the theory utilized to characterize the components of the system, which allows us to derive the laws that characterize the macrosystem from those that characterize the components. In contrast, the mechanistic approach “construes [constitutive] explanation as a matter of decomposing systems in their parts and showing how those parts are organized together in such a way as to exhibit the explanandum phenomenon” (p. 109).

If “reductive explanation” is the deduction of one theory from another via “bridge laws” and mechanistic explanation doesn’t work this way, then there is a sense in which mechanistic explanations aren’t “reductive.” But, for instance, we might just think of reductive explanation as the explanation of some phenomenon in more basic or lower-level terms; so, for instance, an explanation of some mental phenomenon is reductive

so long as it doesn't appeal to any distinctively mental properties in the explanatory premises. More generally, the worry is that many philosophers of a more reductionist temperament (for instance, Jaegwon Kim, David Lewis, and Andrew Melnyk) have discarded the bridge law model and provided alternative formulations of reductionist theses concerning both ontological and explanatory issues.

While the considerations advanced in *Explaining the Brain* thus don't seem to get us a substantive nonreductive understanding of the mechanistic approach, this doesn't impugn Craver's many careful discussions of explanation and theorizing in neuroscience. Moreover, Craver provides a number of insightful discussions of key issues and concepts in the philosophy of science, including the notion of a "level" and the unity of science. *Explaining the Brain* succeeds in advancing our understanding of the mechanistic outlook, both in neuroscience and more generally, and is recommended to anyone interested in these issues.

KEVIN MORRIS  
Box 1918  
Department of Philosophy  
Brown University  
Providence, Rhode Island  
02912  
kevin\_morris@brown.edu