BOOKS: NEUROSCIENCE

Synaptic Substrates of the Implicit and Explicit Self

Richard J. Davidson

In his opening chapter titled "The Big One," neuroscientist LeDoux defends his choice of the self and personality, rather than the now more fashionable problem of consciousness, as the outstanding issue in neuroscience. Consciousness, he explains, is overrated. So much of our behavior emerges from processes to which we have little conscious access. Who we are, LeDoux argues, is not synonymous with who we consciously believe ourselves to be. And the former is the much more fundamental because it often allows for a better prediction of behavior than the latter.

Synaptic Self
How Our Brains Become Who We Are
by Joseph LeDoux
Viking, New York, 2002. 416 pp. $29.95, C$43.99. ISBN 0-670-03028-7.

This is a book with a very broad reach. It will be important in helping to dispel three popular myths about brain and behavior, the notions that (i) biological differences among individuals imply that those differences are heritable, (ii) complex psychological functions are localized in discrete places in the brain, and (iii) particular forms of psychopathology are caused by abnormalities in specific chemical systems of the brain (i.e., the one molecule, one disorder idea). LeDoux helps us to appreciate the exquisite complexity of the brain so that we don't fall prey to these common fallacies, but he does so by rendering the complexity in a comprehensible and highly readable form.

The book's central message is that the self is the product of patterns of interconnectivity among neurons in the brain. Who we are is in large part learned through experience and much of this information is stored implicitly, in ways that affect our behavior but are not fully accessible consciously. This message is an important one because much of the contemporary psychology of personality and psychopathology is based on measures of what people consciously know about themselves as gathered from questionnaires and interviews. LeDoux challenges this approach by noting that "the self consists of more than what self-aware organisms are consciously aware of." By this logic, all animals have selves. For most animals, however, the self is implicit; only for those animals that have a capacity for conscious self-awareness can the self be explicit.

Given that it is life's experiences that largely contribute to the construction of the self, it is then the mechanisms of implicit and explicit learning and memory that constitute the key substrates through which the self is instantiated. LeDoux uses this principle as the critical segue into territory with which he is much more familiar and to which he has made seminal contributions, namely the molecular neurobiology of emotional learning and memory.

The vast bulk of this book is a detailed but very accessible journey into the world of circuits and synapses, how they are formed, and the mechanisms by which they are shaped through experience. LeDoux takes on the age-old topic of nature versus nurture but handles it in a sophisticated and informed way that does justice to the complexity of the arguments. He avoids taking an extreme stand on the issues but he does make it clear that, though there are some innate constraints to which we must be sensitive, experience is a powerful force in shaping the synaptic organization of the brain. He also addresses a number of topics where neuroscience and public policy intersect. For example, the idea of sensitive periods in development and its implications for education are considered. LeDoux makes clear that even though sensitive periods have been established in animals for specific types of learning, the casual application of this notion to human development is fraught with risk.

Image not available for online use.

The major building blocks of the self are the mental trinity of thinking, emotion, and motivation. LeDoux devotes separate chapters to each of these components and, in doing so, underscores his view that the mind is much more than a thinking device, as some cognitive scientists would have us believe. Rather, it is an integrated system that depends on interactions among the arms of the mental trinity. Throughout this discussion, LeDoux highlights the complementary roles played by explicit and implicit neuronal systems thus adding more substance to his argument on the importance of nonconscious processes.

Toward the end of the book, LeDoux applies information gleaned from basic research to the problem of "synaptic sickness," the placeholder used for the neural substrates of psychopathology. He considers psychiatric disorders including schizophrenia, depression, and anxiety disorders and provides a succinct summary of some modern neuroscience approaches to these afflictions. This review is necessarily quite selective and emphasizes those parts of the story that fit best within the overall scheme and will provide a very useful introduction for those seeking a rigorous overview of biological perspectives in psychiatric illness.

In closing, LeDoux articulates seven principles that summarize and synthesize the crux of the book. Though his principles may seem obvious to a scientific audience, reducing the book to these noteworthy points will help the reader to appreciate the importance of circuits and synapses in the construction of the self. The final principle—"Implicit and explicit aspects of the self overlap, but not completely"—is difficult to overemphasize. LeDoux concludes by noting, "Our brain has not evolved to the point where the new systems that make complex thinking possible can easily control the old systems that give rise to our base needs and motives, and emotional reactions...*Doing* the right thing doesn't always flow naturally from *knowing* what the right thing to do is." A major challenge for biobehavioral science is to discover more effective methods of top-down control—using the neuronal circuitry that instantiates explicit self-systems to influence and modulate the activity of the circuits that control the implicit self—that facilitate "doing the right thing." But, before such methods can be developed, we need to better understand the mechanisms by which these systems interact.

The body of theory and research surveyed by LeDoux should be mandatory reading for anyone wishing to develop a comprehensive understanding of personality and the self, for any scholar in neuroscience with interests in the "big questions," and for all students of social and personality psychology and psychopathology. LeDoux presents a vision for a truly unified psychology that will eventually enable topics that are now relegated primarily to the social sciences to become fully integrated into a mature life science.

The author is at the Laboratory for Affective Neuroscience and W. M. Keck Laboratory for Functional Brain Imaging and Behavior, University of Wisconsin-Madison, 1202 West Johnson Street, Madison, WI 53706, USA. E-mail: rjdavids@facstaff.wisc.edu

CREDIT: HYBRID MEDICAL ANIMATION