

Book Review

Exploring Our Past, Present, and Future through the Neurosciences

A review of Daniel Lord Smail, *On Deep History and the Brain*. University of California Press, Berkeley, 2008, 271 pp., US\$40.00, ISBN 978-0-520-25289-9 (hardcover).

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In an effort to explain what drives human behavior, scholars have generated a range of theoretical perspectives reflecting their ingenuity and endless curiosity in perhaps the greatest scientific quest of all. Despite the volumes of work and diligence of many researchers, a scientific understanding of why we behave as we do remains elusive. Polemics abound and speculation frequently reigns triumphant in the popularity contest of alternative views. Fortunately, an interest in both the neurosciences and evolutionary theory is beginning to push a slow but certain change in the way many scholars think about our past, present, and future.

Daniel Lord Smail's new book *On Deep History and the Brain* is an extraordinary scholarly accomplishment that may mark a paradigm shift in the study of history. Simply put, it is a foundation book for 21st century scholarship in history, a theoretical achievement of structural elegance written with clarity and logic. Professor Smail, a historian, demonstrates an exceptional grasp of key conceptual issues in the natural and social sciences, including biological theory, neurosciences, cognitive research, economics, anthropology, prehistory, psychology and the philosophy of science. Importantly, this work may serve as a catalyst for a more inclusive and integrative science of human behavior, grounded in the principles of evolutionary theory and interdisciplinary collaboration.

The challenges associated with the pursuit of renaissance-type knowledge in today's academic environment is achieved by few and seldom articulated with such mastery of detail, interpretation and synthesis. Like all great books, *On Deep History and the Brain* forces the reader to ask innovative questions derived from an alternative conceptual framework. Indeed, it is a "must read" for those interested in evolution and the causal factors behind human behavior as well as the relevance of such knowledge to contemporary, challenging social and technological problems. Contextually, this is a timely and provocative book, appropriate for this year's celebration of Darwin's birthday and the publication of *The Origin of Species*.

My review cannot do justice to the enthusiasm and detail that the author generates with his ideas and insights, but I shall try to document the salient components of his perspective that I believe are most pertinent. In addition, I shall briefly discuss empirical research in the

neurosciences and psychology that supports Smail's treatise. This book will not only enlighten the reader but will cause one to think seriously about deep history and the evolution of neurological propensities in the human lineage.

Content and Structure

The book begins with an examination and critique of contemporary academic history and its conceptual framework and methods. Smail suggests that historians are restricted intellectually by the outdated thought that history begins with written accounts. He makes concise arguments for what he terms *deep history*, which includes both our biological and cultural evolution. He argues that conventional perspectives arbitrarily separated human biological and cultural evolution at the expense of scientific understanding. Smail provides an informative narrative of why this is so by taking into account the predilections of historians based on their training, and then argues that an understanding of history must begin at the beginning: more than 200,000 years ago with a focus that "centers on biology, brain, and behavior" (p. 3). He poetically writes, "The cone of available evidence, like the flower of a trumpet vine, flares out after the invention of writing. But the history itself, from the long, narrow tube to the flaring bell, is seamless. This is the logic that makes the deep past legible" (p.6). Smail supports his advocacy with evidence generated by research on ancient DNA, recent archaeological discovery and, most importantly, on the human brain, a unique organ that is a by-product of dual-inheritance processes — the interplay of culture and genes. Here he discusses the value of uniting scholars in history, anthropology, archaeology, molecular biology, and neuroscience; the sections that follow elaborate this position.

The second section presents a well articulated account of how and why historians rationalize their focus on written history. It is a thorough review of history as a discipline, in which he attributes the self-imposed chronological restrictions to philosophical tenets that were originally developed to avoid conflict with religious dogma. Smail goes on to elucidate the empirical evidence generated by biologists, geologists, archaeologists, and anthropologists that revealed that the "grip of sacred history" (p.9) was intellectually and scientifically flawed beyond recourse. His discussion of figures such as Charles Lyell, Charles Darwin, Lewis Henry Morgan, Lord Kelvin and James Bryce is very informative. Smail argues that the resistance to an inclusive diachronic and global history has to this day maintained an intellectual stranglehold on historians. He also provides evidence of their inability to go beyond early 20th century convention by reference to several modern Western Civics textbooks.

Smail's is a compelling voice for change and commitment to intellectual growth and the pursuit of full knowledge and context of human history. This discussion also includes an impressive criticism of human intentionality as a driving force of cultural evolution while debunking Great Men arguments. Citing E. H. Carr, the author notes that, "It is the unintended outcomes that have great force in history" (p. 71) which gives the historian and others interested in prehistory and history such profound challenges in the pursuit of scientific evidence. He takes

the position that accurate multidisciplinary representations of the past will succeed when historians “become more scientifically literate, and biologists and physiologists... learn to think again with history” (p.73).

In the third section, Smail examines, in depth, the disputes between Darwinian and Lamarckian theory and provides an outstanding history of intellectual discussion that has framed the “nature versus nurture” debate. This is particularly interesting since the conflict has been so contentious at Smail’s home institution, Harvard University. Here the intellectual challenges between E.O. Wilson, and two of his most prominent critics, Stephen J. Gould and Richard C. Lewontin, generated some of the scholarly context for the development of evolutionary psychology, gene-culture coevolutionary theory, niche construction theory, memetics, and human behavioral ecology. Smail acknowledges the exceptional roles that anthropologists like Geertz, Cavalli-Sforza, Feldman, Durham and especially Boyd and Richerson have played in influencing his perspective on establishing deep history as the foundation upon which historians can rely for scientific explanation and interpretation. Smail fortifies his position by reference to works in philosophy and biology, noting the insights of Dawkins, Sober, David S. Wilson, and Dennett among others.

In the fourth section, Smail makes his case for a “New Neurohistory,” a conceptual framework that, if accepted, will cause a paradigm shift in the study of history. He argues that “the existence of brain structures and body chemical means that predisposition and behavioral patterns have a universal biological substrate that simply cannot be ignored,” (p. 114) although he is careful to caution the reader that his view should not to be confused with crude and simpleminded genetic determinism, going to great lengths to explain that human phenotypic plasticity is central to his position and that culture is undeniably of utmost importance. He astutely reviews recent advances in evolutionary theory, genetics, neurosciences, neurobiology, and human physiology, rightfully concluding that humans “are built by the intersection of genes, environment, and random developmental noise, to the point where there can be no nature without nurture and vice versa ...” (pp. 118-119).

Following the structure of his previous chapters, Smail builds his argument with well documented references to multidisciplinary research that is theoretical as well as empirical. Along the way he is critical of what he refers to as “pop sociobiology,” implying that evolutionary psychology is fundamentally flawed because of reductionism and logical inconsistencies; an issue that I address below. Bottom line: Smail presents a compelling argument “that there is not much culture without biology. Culture is made possible by the plasticity of human neurophysiology. With this insight, we can finally dispense with the idea, once favored by historians, that biology gave way to culture with the advent of civilization. This has it all backwards” (p. 154). According to the author, the brain is prewired for empathy, prosocial behavior, inferiority, dominance, superiority, etc., but our culture determines how we express these propensities. He argues strongly that “neurohistory is deep cultural history, offering a way out of the increasingly sterile presentism that constrains the historic imagination and contributes to the growing marginalization of early history in the curriculum” (p. 156). How

this perspective can become operationalized in historical research is the next topic.

His last chapter, *Civilization and Psychotropy*, is Smail's attempt to connect culture and biology via human physiology. Basically, he examines how neurobiology and biochemistry alter moods and emotions through release of epinephrine, norepinephrine, corticotrophin-releasing hormone and other neurochemicals. He uses examples of different emotional and biochemical reactions to social exchange, including the well known case of how Southern men respond differently, compared to Northern men, when their honor and ferocity are challenged. He concludes that human physiology is anatomically and culturally encoded. Smail contends that a combination of culture and neurochemical rewards cause particular kinds of behavior in humans. He posits that, through time, humanity has increased its consumption and provisioning methods of mood-alternating substances that are delivered by ingestion, through the visual cortex, or by our auditory system. Examples of what he calls *psychotropic mechanisms* include gossipy TV shows, novels, music, shopping, sports, coffee, alcohol, drugs, sex and pornography, among others. These mechanisms all affect our neurotransmitters, including cerebral and chemical processes that were part of our deep history and gene-culture coevolution. He argues that our "susceptibility to psychotropic mechanisms ultimately lies in the fact that we are social creatures" (p. 163) driven by psychological feeling associated with status, social position, a sense of self-esteem, and group membership.

Smail expands his argument by offering inferences about the evolution of political structure from our egalitarian hunters and gatherers roots to non-egalitarian hierarchies ruled by elites who manipulate *teletropic mechanisms* that generated a sense of fear, stress, and related biochemical changes in subordinates. *Autotropic mechanisms* differ in that items such as alcohol, tobacco, and coffee are ingested — resulting in changed body chemistry, which alters our mental states. Clearly these are two major factors that greatly influence the development of economic and political systems throughout world prehistory and history. Smail concludes that historians must take *psychotropic mechanisms* into account if they are to explain history and human behavior rather than simply describing events from documents.

The author concludes that the neurosciences and psychology are integral to the social sciences and that *neurohistory* is a grand explanatory paradigm that, if understood correctly, may provide humanity greater control of its future; I am skeptical but one can only hope. According to Smail "the deep past is also our present and our future" (p. 202) and thus his perspective will likely be pertinent to all social sciences. I suggest that Terrence Deacon's book, *The Symbolic Species* (1997) and Richerson and Boyd's *Not by Genes Alone* (2005) would be relevant companion volumes for upper division and graduate classes in history and anthropology. Finally, the general public, many of whom have been exposed only to traditionalists' views of history, will find this book fascinating and engaging.

Although Smail's book has a specific framework, I believe that its intellectual contribution would have been enhanced by more in-depth review and integration of principles from social learning and cultural transmission theory as explicated by Boyd, Richerson, Henrich, and colleagues. In my opinion, this expanded conceptual perspective coupled with recent

research related to neurochemical and cognitive propensities (see below) for copying, mimicry and other replicative behaviors are critical to explaining the historical spread of social ideas and material culture. Attention to epigenetic processes and to insights from EvoDevo might also have been appropriate. Alas, the author's quandary: a book cannot cover all relevant issues. Fortunately, however, scholarship is a community effort and I expect that such connections will be explored in the future by like-minded historians and anthropologists.

On the eve of Darwin's 150th birthday, we have only just begun to probe questions of our biological and cultural evolution. Smail's contribution is truly impressive, and should be read not only by historians but by all scholars and students interested in our inseparable biological and cultural evolution.

Neuroscientific Support for Deep History and the Brain

Traditionally, a book review does not include supporting context; however, I am compelled to include the following, because Smail's narrative argument is greatly enhanced when we consider recent contributions from genetics, neurosciences, cognitive research, evolutionary and developmental biology. In fact, there is significant empirical evidence for an emphasis on deep history, making it clear that evolutionary events are mapped in our DNA, in the human brain, in our biological chemistry and behavioral characteristics. The most salient research deals with the evolution of prosocial behavior. Hauert and colleagues (2007) as well as Boyd and Richerson (1985, 2005) have developed elegant mathematical models of how such behavior would become fixed in the human evolutionary trajectory. As they and others (Henrich et al., 2004, 2006) have shown, the theory and mathematical modeling of conformist behaviors have a strong empirical and ethnographic referent. Indeed, combining neurosciences with well-designed psychological experiments has generated extraordinary results relevant to the universality of deep history and tendencies for prosocial behavior.

Scientists have detected several neuroanatomical, neurobiological, and behavioral mechanisms that drive attitudes and behavioral tendencies. For example, Fehr and his colleagues (Fehr, Fischbacher, and Kosfeld, 2005; Kosfeld, Heinrichs, Zak, Fischbacher, and Fehr, 2005) demonstrated that neurological structures, biological chemistry, economic decision-making, and human behavior are strongly associated (also see Cacioppo, Visser, and Pickett, 2006; Gigerenzer and Selten, 2002; Harmon-Jones and Winkielman, 2007; Pfaff, 2007; and Platek, Keenan, and Shackelford, 2007). Especially interesting is the evidence of a relationship between the neuropeptide oxytocin and human trusting and trustworthy behavior (Kosfeld et al., 2005).

Confirmation is also reflected by high-resolution imaging studies, showing patterned activities in the frontal lobe under controlled experimental conditions involving laboratory games of political and economic decision-making, prosocial activities and cheaters who violate rules and norms (de Quervain and Papassotiropoulos, 2006; Delgado, Locke, Stenger, and Fiez, 2003; Kosfeld et al., 2005; Singer et al., 2006). Rules for "fair play," or norms, include expectations that each player will reciprocate behaviors of other fair players. Thus, there is strong

neurological and biochemical evidence that what Smail calls *psychotropic mechanisms* do indeed drive human behavior. Natural selection must have favored both cultural and neurobiological mechanisms, which reinforced reciprocators. This position has been a cornerstone in arguments advanced by advocates of evolutionary psychology. Recently, John Tooby, Leda Cosmides and colleagues (Ermer, Guerin, Cosmides, Tooby, and Miller, 2006) have generated exciting research involving neurochemistry, brain patterns, imaging, and behavioral experiments that I believe will temper criticisms by Smail and others of their school. In my opinion, evolutionary psychology is more than mere “pop sociobiology,” but like *deep history*, its ultimate relevance will be judged by the processes of scientific selection so well explicated by David L. Hull (2001).

Regardless of one’s position concerning evolution, there is little disagreement that empirical evidence is the high universal standard, which we all strive to obtain (Heyes and Huber, 2000; Lloyd, 1994; Popper, 1972. In this regard, recent research by Lin and colleagues (2006, 2007) is exceptional. In brief, they demonstrate that (1) the argument that the mammalian brain forms neural networks or modules has empirical support; (2) information “is coded in a manner similar to the way that the four letters or nucleotides that make up DNA molecules can be combined in a virtually unlimited number of patterns to produce the seemingly infinite variety of organisms on earth” (Tsien, 2007, p. 58); (3) these structures provide the source for knowledge, perception, and subsequent behavior; (4) high-resolution laboratory instrumentation provide reliable measurements, generate mathematically described neurological data, and allow directly visualized neurological and neurochemical processes under changing conditions; and (5) most important, brain codes, or neural cliques, are not inheritable but are generated only through experiences, unlike genetically inherited codes for heartbeat, breathing, and other reflexes. I am certain that their findings will have profound implications for self-organization theory, cognitive evolutionary science, deep history, and the nurture versus nature debate.

Looking forward, the promise of DNA studies of Neanderthals, early *Homo sapiens*, and of modern humans as well as our primate relatives will no doubt generate unanticipated insights into our evolution, neurological development and behavioral propensities. Although neuroscience is a relatively new field, its potential to contribute to our understanding of evolution and human behavior is great. It is an investigative framework that is interdisciplinary and is grounded in empirical data using advanced technologies (Kandel and Squire, 2000). The theoretical perspective, mathematical modeling, and neurological research discussed here reinforce Nowak’s assertion that numbers and psychological experiments can produce clarity and splendor in scientific reasoning (Nowak, 2006). Neurological and biochemical evidence for “hard wired” propensities is, in my view, indisputable, although an individual’s expressed behavior is doubtless mediated by both epigenetic (Gilbert and Epel, 2009; Kirschner and Gerhart, 2005; Muller and Newman, 2003) and cultural factors that are historical (life experiences and culture histories) and individualistic (Larson, in press).

Albert Einstein and Leopold Infeld wrote that “a courageous scientific imagination was needed to realize fully that not the behavior of bodies, but behavior of something between them, that is, the field, may be essential for ordering and understanding events” (1938, p. 295). Similar

to Einstein's and Infeld's ability to envision behavior between bodies, we can imagine multilevel properties and processes that govern the potential range of human behaviors. That is, rather than imagining atoms and neutrons or other physical phenomena such as strings and quarks, scientists interested in human behavior might imagine the properties of genes that transmit information to build the organism, which then become properties in the brains of humans (neuron modules or systems), and which then affect the biological chemistry of the organism, which in turn stimulate active behaviors that are reinforced or rejected by the organism's history of interactions with other organisms and/or the natural environment. An observed behavior expressed by a person is thus the last event in a long chain of biological and cultural interactions. So, it is the process and properties of these interrelated and interactive effects that we should strive to understand if we are to develop a scientific explanation of ultimate as well as proximate causation when it comes to human behavior. I can think of no better basis on which human relationships, governmental policy, and the future of humanity can be planned. By adopting this perspective, society would allow science rather than supernatural belief systems to play the paramount role in our collective affairs.

Conclusions

Professor Smail's laudable efforts to bring history into modern scientific reasoning are relevant to both scholarly research and to our pedagogical goal of training students to evaluate research critically and to reject narrow-minded polemics. *Deep History and the Brain* places the study of history among the many disciplines that now employ the power of evolutionary theory. However, much work needs to be done. Our challenge is to operationalize Smail's conceptual framework so as to allow us to test its principles using data generated by the most advanced methods in genetics, epigenetics, proteomics, molecular biology, neurobiology, neurochemistry, biophysiology, cognitive science, and cross-cultural experimental psychology coupled with brain scan multiset imaging studies. Optimistically, I believe insights from evolutionary theory, including Smail's perspective on neurohistory and the incontrovertible evidence for the importance of both nurture and nature, will soon represent "checkmate" in the intellectual popularity contests that now pervade history and the other social sciences. The work of David Lord Smail and those cited above signals a giant leap in scientific thought, but the question remains: when will the majority of social scientists catch up?

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