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Introduction: How Can Neuroscience Help Us Understand the Past?

Neurohistory is a nascent field that synthesizes the insights of neuroscience with those of history to deepen our understanding of the past. Daniel Smail coined the term “neurohistory” in his 2008 book *Deep History and the Brain*. History, he argues, inevitably has a psychological component and thus involves assumptions about how the brain works. Nor is culture independent of 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” (Smail 2008, 154). Neurohistory thus complements environmental history in that it emphasizes the reciprocal character of our relationship with nature. Not only do we alter the environment, our physical surroundings can also affect our behavior.

Neurohistory is so young that it is impossible to predict its future with any confidence, but a workshop hosted by the Rachel Carson Center on 6–7 June 2011 offered a starting point for creating a community of scholars who are interested in thinking seriously about its potential. This issue of *RCC Perspectives* is intended to take the discussion to a wider audience and catalyze broad consideration of the promises and pitfalls of this new approach. It publishes revised versions of most of the papers from the workshop. They range from theoretical considerations of the relationship between the neurosciences and history to concrete applications of neuroscience to specific historical topics. The authors come from a wide variety of backgrounds, including history, philosophy, literature, medicine, and psychology.

The texts in the volume range from broad theoretical considerations of the possibilities of neurohistory to investigations of specific historical, cultural, and biological phenomena. Several authors reflect upon wide-reaching philosophical ideas such as our understanding of learning processes and consumption (Kirsten Brukamp) and the pathology of historic individuals and crowd behavior (C. U. M. Smith). Alejandro Gomez considers neurohistory in the context of the history of representations. Peter Becker, on the other hand, takes a critical view of the evolutionary narrative suggested by neurohistory.

More concrete applications include questions of whether our perception of time and causality are the result of the way our brains are wired (Benedikt Berninger), how the physiological basis for emotions such as shame and pleasure interacts with the development of culture and society (Jörg Wettlaufer and David Matuskey), and whether the placebo effect can be used to explain historical decision-making processes (Karin Meisner and Carlos Collado Seidel). Daniel Lord Smail's contribution integrates a number of these themes, looking at cultural practices which exploit psychotropic mechanisms to gain power. Finally, Frank Zelko suggests that patterns of holistic or religious and rationalistic thought may have parallels in the two hemispheres of the brain.

This issue also includes two texts which look ahead and offer sketches for future research in the classroom and the laboratory. Steve Fuller considers the possibilities of the brain as an organizing idea for education in the twenty-first century and presents a course syllabus outlining such a course of study. The other text is an abstract describing an experiment conducted in conjunction with the workshop by Evgeny Gutyrchik and his collaborators. Workshop participants had the opportunity to watch researchers scan the brains of subjects as they imagined healing and non-healing environments. The experiment focused on contemporary environments, which are the products of human and natural history.

The essays collected here represent only a small selection of the possibilities offered by neurohistory as a field. Yet it is possible to identify several overall questions which inform the discussion. The rest of this introduction will therefore be dedicated to a consideration of the diverse opportunities and pitfalls that neurohistory may face in the future. It will conclude with some thoughts on the relevance of neurohistory for environmental studies in particular.

What ideas and methods have neuroscientists developed that historians can use to shed a new light on the past (and vice versa)?

Neuroscience offers a way of thinking about human beings and a set of experimental methods potentially useful to historians.

Neuroscientists are keenly interested in the physiology of brains, as well as in links between brains and behavior. They recognize that human inheritance occurs through

genetic and epigenetic (non-DNA) mechanisms. Culture is one form of epigenetic inheritance. *This perspective does not mean that evolution determines human history.* On the contrary, neuroscientists recognize that human inheritance has made an astonishing array of behaviors possible, and they are curious about the mechanisms that make such variation possible. The main contribution of neuroscience is not to undermine the importance of culture in human history, but rather to open the black box of the brain to better understand how ideas develop, are processed, and affect behavior.

Neuroscience offers one avenue through which history could become an experimental discipline. The people and brains of today can serve as models for those of the past. Neuroscientific methods available to historians include both physiological and behavioral techniques. One of the most popular methods today is functional magnetic resonance imaging (fMRI), which the experiment conducted with the workshop used.

One of the important discoveries of neuroscience is that human brains are plastic throughout one's lifetime. Patterns of behavior, which derive from culture, can create measurable differences in the volume of brain regions within the space of just a few weeks. This is important because it contradicts the idea that biologists believe in some sort of genetic determinism of human behavior.

What new research questions can neuroscience suggest for historians (and vice versa)?

The neuroscientific focus on links between physiology and behavior can prompt new questions for historians, such as why certain individuals have emerged as leaders, how leaders have capitalized on the physiology of brains to promote obedience (e.g., through the placebo effect or by elevating levels of stress hormones), how cognition (emotion and reason) shapes decisions and social patterns, the extent to which human beings share universal traits, the extent to which they vary, the links between brains and health, the contribution of brain structures and neurotransmitters to behaviors, and the role of sleep in history.

The neuroscientific study of religion offers an example of the kind of findings that historians might find useful and provocative. Historians studying religion have often focused on theology, which tends to guide attention to philosophical differences among

organized relations. Neuroscientific research has shown that meditation and prayer have similar effects on brains, suggesting that religious practices might bring similar physiological benefits to practitioners despite differences in dogma. This perspective could encourage historians to locate the appeal of religion not just in its cultural or social context, but also in its physical context.

What are the biggest challenges in developing neurohistory as a field, and how can they be overcome?

One of the biggest questions facing neurohistorians is how to understand scientific research. Mastering neuroscience is challenging enough for experts, so historians interested in the field need to be willing to invest significant time in understanding the science well enough to use it wisely. Neuroscientists disagree on the extent to which one can generalize from a particular data set and on how to interpret specific results (e.g., activation patterns in brains recorded through scanning technology). It is easy to overreach, and the popular media carry stories about neuroscientific findings that some neuroscientists consider exaggerated or too preliminary to be reliable.

Neuroscience is changing rapidly, so ideas current today will probably become obsolete in a few years. Historians need to feel comfortable with the provisional nature of scientific knowledge, rather than looking to science for eternal truths.

One of the best ways to overcome these challenges is for historians to collaborate with neuroscientists. A team approach enables scholars to complement strengths. Some historians might want to join laboratories and learn about neuroscience firsthand. Others will be more interested in discussing science without practicing its methods. The field will probably be best served by a variety of approaches.

Researchers in any area need to be aware of the ethical implications of their work. Biology and history alike have been mustered in the past on behalf of discriminatory beliefs and malign social policies. Both have been used to argue that certain groups of humans are so fundamentally different than others that they deserve different treatment, a position that all humane scholars must reject.

How might neurohistory shed light on the interaction between people and their environments, in both the past and the present?

A starting point for neuro-environmental history is environmental psychology, which has tried to understand how and why human beings react to specific types of environments. Typically, this field has relied on behavioral studies, rather than specifically neural measurements, but the findings suggest that human beings from a variety of backgrounds favor savannah-like landscapes over forests or built environments lacking plants or non-human animals. A common hypothesis holds that people developed this preference while evolving in the African savannah. Some researchers believe this preference is hardwired in people (more studies are needed to draw a firm conclusion). Environment appears to have a concrete impact on health in ways unsuspected by some medical practitioners. A classic study found that hospital patients recovered from surgery faster, with fewer complications and less need for medication, if their hospital window looked onto trees than if it looked onto a brick wall. It may be that environments that historians have considered to be primarily cultural products, such as English garden parks, reflect something with a stronger biological basis than previously assumed. Neuroscientists are trying to understand the neural bases for environmental preferences. Brain scans have shown differences in activation patterns when subjects viewed urban versus rural scenes, for example.

The impact of environmental modification on brains offers another fruitful avenue of research. Most historians know that lead causes brain damage, but recent research has identified other elements and compounds that are neurotoxins. New research suggests that air pollution and psychological stress also can have a deleterious impact on the brain.

In conclusion, neuroscience offers historians ideas, methods, and questions that might help us understand the past in new and deeper ways than the traditional methods of history alone provide. Environmental historians in particular might find it attractive to help understand broad patterns of history, including how and why people have modified environments in certain ways, and how such modifications have shaped human experience.