

What's All This Furor About An Enchanted Loom?

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ABSTRACT

This article explores the growing interconnections between the Brain Sciences and the Social Sciences. It provides a brief historical summary of the development of brain science, reviews advances in what is currently known about the brain, and describes where the field stands today. Importantly for those interested in the Social Sciences, the article also discusses the potential impact of the brain sciences on work in the discipline, indicates why we should care about developments in the brain science field, and provides some practical tools that have come out of the research. The article concludes with a summary of what all the developments might mean for a Social Science practitioner.

Keywords: Brain science, Enchanted loom, Neuroscience, Social Science

INTRODUCTION

A Little Brain Science Context

Historically, the currently intense scientific interest in the brain has not always been the norm. The ancient Egyptians thought the brain was so insignificant that they removed and discarded it from the body prior to mummification of the dead. The famous Greek philosopher Aristotle believed that the heart was the most central organ in the body. He thought that the heart and not the brain was primarily responsible for sensation and movement. We now realize the brain operates electro-chemically and is one of the most intricate and complex systems known to exist.

Pioneering British neurophysiologist Sir Charles Sherrington imaginatively called the brain an "*enchanted loom*." His comparative metaphor combined the mysterious (enchanted) with the commercial (a weaver's loom). In the 1940s, when Sherrington first coined the phrase, relatively little was known about the three pounds of grey and white goo that constitute the human brain.

Just how complex is the brain?

In the past ten years we have learned just how really complicated the brain really is and how little we may know about its secrets. Examples are: the crinkled outer layer or cerebral cortex is composed of more than 86 billion neurons; each individual neuron is connected to up to 10,000 others; and the range of possible interconnections exceeds 100 trillion or more than the number of known stars in the universe. The brain is also a very costly organ to operate. Although the brain is typically about 2% of total body weight it consumes about 20% of the available energy. Additionally, the brain generates enough electrical power to illuminate a 20-watt light bulb and it continues to unconsciously control our essential bodily functions even while we sleep.

The convoluted cerebral cortex, if unfolded, is about the size of a table napkin and about as thick as a nickel. Following the pioneering work of American physician and National Institute of Mental Health researcher Paul MacLean in the 1970s, many prominent neuroscientists think that the brain has evolved over time in three stages. In the first stage of its development, the human brain is very similar to that of a reptile. The reptilian brain controls most of our basic life functions such as respiration, wake/sleep cycle, heartbeat, and level of consciousness.

The second stage brain resembles that of a simple mammal such as a mouse or a cat. At this level the brain is concerned with emotions, the fight, flight or freeze response, as well as many learning and memory functions. In its third or most advanced stage human brain structure is very close to that of our primate cousins the gorillas, orangutans, chimpanzees, and bonobos. This most recent evolutionary phase consists anatomically of four main lobes or sections. Collectively, these areas generate the essence of what it means to be human, including: language, creativity, sight, audition, music, cognition, and problem solving. In practice, the three stages or levels are highly interconnected and exist concurrently within the human brain.

Additionally, we have learned that the three-layered physical structure of the brain hasn't changed much in 10,000 years. We essentially have the same physical brain architecture as that of our earliest hominid ancestors. The brain appears to be evolutionarily geared to focus on individual survival in service of the continuation of our species through the passing on of genetic material.

Can the Brain Actually Repurpose Itself?

The brain seems to be oriented toward maximizing pleasure and minimizing pain and is exquisitely sensitive to threat. Much of its original organizational structure has been repurposed by evolution to meet the demands ever more complex and changing environments. For instance, many of the same brain circuits that register physical pain also react to social or emotional pain. The use of tools, language, and the development of artistic expression also appear to have significantly altered how our brain components are wired together. The brain's immense power seems to arise from its plasticity, massive interconnectivity, and ability to learn and adapt.

The development of electronic sensing devices has greatly altered how we can look at existing blood flow in the brain to see which areas of the brain are active for particular tasks and display it in colorful images. Sophisticated electroencephalographs or EEG can detect and display the brain's weak electrical signals from multiple brain regions simultaneously as they occur.

Thus, we are now able to noninvasively, in near real time, depict what is going on inside the brain as it does its work. And, what scientists are seeing has greatly advanced what we know about the way the brain functions including how it attempts to make decisions and solve problems.

Where does brain science stand today?

Currently many neuroscientists believe that we have learned more about the brain in the last fifteen years than in all previous history combined. Much of this knowledge has come from major institutional research initiatives such as the U.S. Library of Congress and National Institute of Health's co-sponsorship of the "The Decade of the Brain" during the 1990s. The

emphasis was continued with the White House's funding of the BRAIN or "Building Research Through Advancing Innovative Neurotechnologies" in 2013. Additionally, the European Union is presently investing about 1.9 Billion Euros for its ten year "Blue Brain" research project to replicate a mammalian brain within a computer.

One of the more important recent advances concerns dispelling the myth that neurons cannot regenerate themselves. Researchers have found that certain neurons in the hippocampus (an area closely associated with memory) as well as a set of neurons associated with the sense of smell can regenerate. Additionally, researchers have discovered the brain's default or idle mode. This is what the brain does when it is not in actively processing information [Levitin, 2014].

Also significant is the emergence of the multi-disciplinary field of psychoneuroimmunology. This integration of Psychology, Neurology and Immunology discipline recognizes that the mind, brain, and immune system are highly interwoven, influence each other, and consistently intercommunicate.

What's Been the Impact Thus Far?

The result of this explosion of new knowledge about the brain has resulted in a whole plethora of new sub-disciplines. These specialties include, among others: neurofinance, behavioral economics, neuromarketing, and neuroleadership. Neurofinance is concerned with studying the nature of the mental processes engaged in obtaining, processing, and utilizing information related to financial decision making. Behavioral economics focusses on the identification and consequences of decision choices on individuals and organizations particularly in relationship to allocation of resources. Neuromarketing studies the brain's responses to marketing stimuli. Neuroleadership applies the findings of relevant brain research to the field of leadership.

The Social Sciences appear to be at just the beginning of possible use of brain science concepts in its work. For, example the use of functional Magnetic Resonance Imaging (fMRI) has already shown promise within other disciplines. It has been employed to image what is going on in the brains of their practitioners when solving problems or engaging in creative work. Prominent neuroscientist Eric Kandel [2016] has written extensively about the idea of reductionism in the sciences. Additionally, an article by Zeki [2014] in the brain science journal *Neuron* suggests similar brain operations are involved in both the social and brain sciences.

Why Should You Care?

In a very practical sense, several potentially useful tools and ideas are coming out of all the brain science research interest. The notions of implicit and explicit biases in decision-making, frameworks for thinking, belief in destructive myths, and methods for coping with personal and organizational stress are all areas where further clarity might be of value in improving your ability to do your work. Here are five examples:

Biases. Research has currently identified about 150 known biases [Dimitriadis & Psychogios, 2021] They appear to occur most often when urgency is heightened, information is confusing, and the social environment suggests conformity. Additionally, biases appear to be related to the brain's determination of whether an individual is recognized as a member of our ingroup friends or assigned as a member of an outgroup foes. One suggested method for dealing with

biases is called PAUSE. This abbreviation stands for: *Pay* attention to what's happening; *Acknowledge* your judgments; *Understand* possible reactions; *Search* for the most productive way to deal with the situation; and, *Execute* your action plan:

Myths About the Brain. Cognitive neuroscientist Christian Jarrett [2015] has identified and dispelled 41 myths about the brain. These myths include ones that relate to: brain practices, myths that are enduring but wrong, the physical structure of the brain, technology and food, and brain order and illness. Perhaps those myths relating to perception and action might be most interesting to those working in the Social Sciences. These myths include: believing that the brain perceives the world as it is, that it receives information from five separate senses, and that the information it does receive is both accurate and stable.

Frameworks for Thinking. Nobel prize winner in Economics and Psychologist Daniel Kahneman has extensively studied how managers make decisions. Kahneman [2013] proposed the brain has two basic modes of decision-making he called System 1 and System 2. System 1. is fast, unconscious, automatic, and effortless. The brain typically tends to make decisions based on heuristics or short cuts. System 1 is estimated to comprise about 98% of our thinking. System 2 is slow, conscious and deliberate. It is also controlled, effortful, and rational.

Thinking Styles. Ned Herrmann [2015], the former head of management development at General Electric, developed a method to understand thinking based on physical brain structure. Founding his approach on research in brain anatomy and gestational development, Herrmann identified four basic ways in which people think. Each of the four styles is rooted in the physical and functional organization of the human brain. Although the approach is considered somewhat controversial, it has achieved wide acceptance among practitioners and organizations for its practical utility. The four styles include: analytical thinking, sequential thinking, interpersonal thinking, and imaginative thinking.

Analytical thinking tends to focus on facts. It is also rational, critical and quantitative. Sequential thinking emphasizes form. It is concerned with structure, organization, planning, safekeeping and detail. Interpersonal thinking relates to feelings. It is kinesthetic, spiritual, sensory and emotional in nature. Finally, the imaginative thinking style relates to the future. It is visual, holistic, innovative, and conceptual in nature. Herrmann conducted a study of a large sample of Chief Executive Officers and found they tended to be whole-brain or were likely to use all four quadrants of the model in conducting their work.

Stress Differences Between Men and Women. A study by the American Psychological Association [2012] addressed the issue of gender burn out. Findings suggest that men and women report very different reactions to stress. Women appear to be more likely to report physical symptoms and do a better job of connecting with others to alleviate their symptoms. The study lent some credence to the common assumption that under pressure men become either more aggressive or withdraw. That is, males revert to fight or flight reactions. Women, it appears, enhance relationships as they are more inclined to tend and befriend.

What does it all mean?

When you think about it, our brains are at the very core of who we are and what we do. Ongoing research and the related upsurge of information about brain processes and functions offer great

opportunities to advance the subfields associated with the social sciences and help to keep them relevant and current. Alternatively, the accelerated growth of knowledge about how the brain-mind works has yet another facet. It also brings with it a whole new constellation of questions about what it means to be human. Important concerns also include the vexing ethical issues to be resolved and the real possibilities for negative behavioral manipulation.

Looking ahead, brain science authors and practitioners Lanz and Brown [2020] offer a six-point description of the sustainable organization of the future based on neuroscience principles. The initial three elements include; understanding human energy, developing the organization's capacity to care, and an awareness of the importance of effective relationships. The final three comprise: construction of a working energy model of the organization, recognition that information is a valuable and perishable commodity, and that the role of managers is to create the primary conditions under which members brains can be productively engaged.

As the future unfolds it will be fascinating to see just how we individually and collectively respond to this new set of challenges. It seems very likely that both planned and unplanned encounters will continue to arise that mix brain science with the Social Sciences. Will we be up for it?

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