# What Do Brains Have to Do With It?

## How Neuroscience Can Contribute to Understanding the Role of Religion in Society

By

Margaret M. Polski, Ph.D.
Center for the Study of Neuroeconomics, George Mason University
Email: mpolski@gmu.edu
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**Abstract**

In *Wired for Survival: Rational (And Irrational) Choices from the Gas Pump to Terrorism* (September, 2008) I argue that our primary social values and institutions are codified not in contracts, law, government, culture, religion or other governance systems, but in the neural networks embedded in our bodies and our brains. For centuries we have debated whether a better society depends upon better people or better belief systems, institutions, and organizations. This debate fueled the work of the 18th century Anglo-Scots moralists, whose work has influenced over 200 years of political and economic thought and policy-making. Yet today when social scientists think about moral choice and social regulation, we typically focus on discovering arrangements that are associated with ideal outcomes without considering the real capacities of the people who are the object of our interest. North (2005) argues that for societies to evolve, the minds of those in the society must evolve. But the scientific evidence suggests that we can't change our minds or our societies without changing our brains: Social change requires remapping our individual selves, the way that we interact with others, and consequently, the way that we think and make choices. This essay summarizes what we know about the biological basis of human nature and develops implications for analyzing the role of religion in society.

Perhaps it is my Catholic upbringing but as I am writing this paper for an association of people who are interested in the role of religion in society, I feel as though I must begin with a confession. I am a political economist by training: My research interests are growth and change and my methods are strongly situated in new institutional economics. While I have gotten used to writing about brains and the relevance of neuroscience in my own research area, I don't usually write about religion or the role of religion in society and so in writing this paper the first thing I have had to do is think about what is meant by "religion" and put it in a familiar context.

The online version of Webster's Dictionary surmises that the origin of the word "religion" may be traced to the Latin word *religare*, which means to restrain or tie-back. So to the extent that we practice a religion or think about the role of religion in society, one interpretation of the term is that it has something to do with the way we restrain or govern our selves. But another sense of the term has to do with constraint or sanction in which a "God" or some other supernatural force governs us as individuals, our societies, and the events we experience. Finally there is the sense in which religion refers to moral choice or a system of values, beliefs, attitudes, or practices that reconciles self-interest (private interest) with concern for others (public interest or the "social welfare" of society as a whole).

In each of Webster's definitions of religion, governance and the "rules of the game" are relevant. So in this paper when I refer to religion I mean a set of rules including norms and practices, about social awareness and behavior in which 1) individuals consider the impact of their behavior on others; 2) individuals experience reward or punishment based

on the extent to which they reconcile private and public interest; 3) rewards and punishments may occur in the naturally occurring world or in a supernatural world that transcends time and space, and they may be meted out by natural or supernatural beings. In short, the role of religion in society is to create or reinforce individual social "conscience" or cognition, and to encourage self-governed, socially cognizant behavior.

**Socially Cognizant Behavior**

Many of us who have been educated in liberal political economies – particularly those of us who work on economic issues – have been trained to believe that it is easy and natural for us to make formally rational choices and to interact with each other on a socially cognizant basis. We assume that with the right education and training we are equally capable of self-restraint, reflection, and dispassionately reasoned social optimization: Anti-social behavior, which we often characterize as "irrational," "crazy," "dumb" or "evil," can be ameliorated by education, training, rulemaking, cultural or organizational change, adjusting incentives to reward desirable behavior and punish undesirable behavior, or religious practice.

However, our standard assumptions about how we think, choose, and behave rest on rather thin empirical foundations: Since the mid-twentieth century, psychologists, psychiatrists, experimental economists, and cognitive neuroscientists have been using an increasingly sophisticated set of tools to test the predictions of standard models of social behavior. Thus far this research demonstrates considerable

variability in socially cognizant behavior across individuals and groups even when controlling for social, cultural, and institutional differences.[1]

Consider for example the behavioral evidence that has emerged from field and laboratory studies of people who are solving problems that involve reconciling self-interest with the common or public interest, e.g. in managing common pool resources like fisheries, forests, grazing lands, or water resources, or making voluntary contributions from private resources that improve social welfare.[2] The cumulative research reveals that some individuals and some groups are "naturally" better at achieving social returns than others and identifies some of the problems that high performing groups solve in achieving these returns. However, research has yet to explain why these differences exist or why they persist over very long periods of human history.

Human variability under similar constraints – religious or otherwise – suggests that our models of behavior systematically miss-specify human capacities and we ought to reconsider our assumptions about human cognition and behavior. If religion facilitates self-governance and empirically we observe people who are more and less successful in this endeavor with and without the benefit of religious practice, one might wonder about the human capacity for religious behavior: Is the capacity for social

[1] Hauser (2007) argues that there is a universal set of moral "instincts" that transcends social, cultural, and religious differences however the evidence for this thesis has yet to be convincingly assembled. For a more detailed analysis of the biological evidence as it relates to human thinking and choice, see Polski (2008).

[2] For overviews of field evidence on common pool resource (CPR) management, see Ostrom and Nagendra (2006), Dietz, et al. (2003) and Ostrom (1990). For experimental evidence on CPR behavior, see Ostrom, Gardner, and Walker (1994). For overviews of the experimental literature on voluntary contributions, see Kagel and Roth (1995), Davis and Holt (1993), and Smith (1991).

awareness, self-governance, and religious practice in our nature? If so, what are the biological mechanisms that make this possible and what does this suggest about the role that religion can play in developing and sustaining socially moral order?

**The Biology of Behavior**

Our ability to think, chose, and act requires coordinated action among chatty bundles of neurons or "nerve" cells. We know from studies of injuries that our central nervous system plays a key role in producing and sustaining both voluntary and involuntary human activity.[3] Rather than being dispassionate optimization machines, the evidence suggests that we are complex, highly advanced sensors that adapt intuitively to particular physical and social contexts.

From a biological perspective, human activity arises from interaction among neurons in the brain (assisted by molecules acting as neurotransmitters), which receive incoming signals from other neurons located throughout the nervous system and respond by sending out a stream of their own signals. The signals that neurons send are generally related to their perception of signals in other parts of the nervous system. In other words, our perception of what is going on in our bodies and the world around us is not just in our heads but arises from neural chatter throughout the nervous system in response to cues in our physical and social world. As Francis Crick (1994) put it, we are a "pack of interacting nerve cells and their associated molecules," and who we are, what

[3] Consider for example, the loss of functionality or personality changes associated with stroke and "brain death," the ability of the brain to control advanced prosthetic devices, or our capacity to reassess our prior experiences and change our beliefs and experience such that we behave differently than we would have without reassessment.

we perceive, think, and do emerges from these largely involuntary and transitory neural interactions that occur in response to our experience in our environment.

Marcus Raicle argues that to understand the biological basis of mental life we need to understand and differentiate between task-related activity and "spontaneous intrinsic functional activity."[4] Estimating that task-related neural activity accounts for less than 10% of functional brain activity whereas spontaneous, intrinsic activity consumes more than 50% of the brain's energy budget, Raicle (2006) and Raicle, Macleod, Snyder, Powers, Gasnard, and Shulman (2001) view the brain not as a system simply responding to changing circumstances but as one operating on its own with sensory information modulating the operation of the mind-body system.

The implications of Raicle's research are subtle but profound. Brain activity is continuous and energy-intensive, consuming over 20% of total body energy. The energy intensive spontaneous intrinsic activity in the brain that is the subject of Raicle's research is associated with cycling glutamate. Glutamate sustains the metabolic processes that keep us alive and well. It also functions as a neurotransmitter in the brain, which enables neural signaling. If maintaining system balance expends the greater part of the brain's total available energy, than either our brains primarily operate on the neurobiological equivalent of auto-pilot, or some as yet undiscovered mechanism exists that allows us to reallocate brain energy from spontaneous functions to directed functions. In the former case, our environment and our internal sensory systems

[4] Presentation, Decade of the Mind conference at George Mason University, May 2007.

potentially play a greater role in thinking and choice that we typically imagine and in the later case the brain retains its super power status.

The current evidence suggests that our brain may be necessary for thinking and governing behavior but it is probably not sufficient. Our "mind" is a brain and a body state that represents a specific physical and social state, which is fleeting but recordable. It emerges from neurobiological signaling that ultimately synchronizes around a common estimate of excitation or inhibition that the brain recognizes as a focal point. We can call this focal point, which is a biological composite of our current and past experience in the world, a "state of mind."[5] In other words, it may take a whole body – including the brain – as well as cues in our environment to engage in moral cognition and behavior. Gerald Edelman (2006) puts it succinctly: "Our brains are embodied and our bodies are embedded (in a physical and social environment)," which means that thinking and choice occurs in a homeodynamic mind-body-environment context.[6]

***The Homeodynamics of Cognition***

While there is still much to be learned about our reasoning and choice processes there are several propositions for which there is considerable consensus. First, our primary mode of reasoning is pattern recognition, which gives us substantial latitude to imagine, create and to adapt to novel situations. While we do not operate according to formal rules of logic or externally imposed codes, some of us are capable of learning and employing logical systems and creating and conforming to beliefs, rules, and practices.

[5] For a more detailed discussion of theories and evidence, see Polski (2008), Chapters Four-Six.
[6] For a recent overview of theories of "grounded cognition," see Barsalou (2008).

Second, our thoughts and choices emerge from intuitive and dynamic interactions among brain, body, and environmental cues. Our memories are artful reconstructions more a kin to inventions than archival records. We reason based on the gist of things, which makes it difficult for us to work with detailed information. As a consequence, human reasoning trades off precision for rapid, associative power, which means that it is error-prone and subject to bias.

Third, our biases are innate, pervasive, and automatic. Heredity, experience, training, sensations, emotions, anatomy, physical circumstances, and the presence of others affect thinking and behavior in ways that are not predicted by standard theories. Our past and our biases are sources of friction that tend to lock us into status quo routines and moral mindsets. While we can reassess our past experience, acquire new experience, and reform our cognitive maps, these changes are not easily achieved and require concerted effort.

In short, thinking and choice is homeodynamic: It emerges from interactions among activities in an external state (our physical and social surroundings); an internal state, which emerges from the sensory activities involved in perceiving and coping with our environment (including maintaining homeostasis); and a brain state, which is represented by the mental maps that emerge from neurobiological signaling triggered by cues in our environment and our body (Figure 1).

*External states*

Contrary to folk theory, intuitive thinking and choice is fact-based, data driven, and logical although not perfectly so: As Vernon Smith argues based on his research on

economic behavior, human choice is “ecologically rational” (Smith, 2003). Our intuition is informed and structured by a combination of past experience and immediate experience. Cues in our physical environment inform our bodies and brains of tangible opportunities and threats, and that they need to make adjustments to maintain homeostasis. Similarly, our social environment provides cues about intangible opportunities and threats that potentially interact with tangible cues.

*Internal states*

While our physical and social environment provides cues that help us get a feel for things, we need our bodies to sense and process these cues. We have a very sophisticated and largely automated internal sensory system that works in tandem with our brains and our other perceptual systems to literally and figuratively get a feel for a place, things, people, and situations, and to adjust to changes in our environment.

Internal sensory signaling creates neurobiological maps that provide directions for those members of the nervous system – including the brain – that are involved in serving the chemical cocktails associated with sustaining proper body temperature, blood oxygen concentration, and PH levels, all of which help us regulate ourselves and our choices.

Standard approaches to decision-making assume that we all have the same body-sensing experiences, that internal states do not differ among individuals or in different environments, and that sensory experience does not influence thinking or choice. Yet internal dynamics are a critical component of thinking and choice, and like so many other human attributes, there is considerable variation among individuals.

*Brain states*

The brain is a necessary partner in cognition: when it is damaged, thinking, choice, and behavior are often impaired. When it is severely damaged, life itself is compromised. As Damasio (1999) observes, our brains both preserve and expand our ability to sense internal and external states and to adapt to changes in these states. How our brains do this – both consciously and unconsciously – is one of the most challenging research enterprises in neuroscience.

In addition to understanding "unconscious" or spontaneous thinking and choice another challenge is to understand activity in the brain when we are consciously and deliberately engaged. The goal of this research is to be able to identify which neural networks are involved in particular actions and experiences and describe the signaling pathways that link these networks. This line of research is important because it can help us understand the components of our decision making processes and their sensitivity to different stimuli, which in turn may tell us something important about the nature of behavior.

***The Social Dynamics of Cognition***

It is cliché but nonetheless true that we are inescapably social creatures: The boundaries between our unique selves and those with whom we are interacting are tenuous and easily pierced. "Them" is often us: Thinking, choice, and action are influenced by the actual, imagined, or implied presence of others. In social interaction, our minds are viral, and they are contagious.

The ability to understand social signals, represent the experience of others in our own minds, and to perceive and transmit mental desires and beliefs is a quiet cornerstone of our intelligence and functionality. An important aspect of our sensitivity to social cues is that we have the ability to read each other's minds: That is, we have neurobiological mechanisms that allow us to quickly and fairly accurately intuit the motivations, feelings, beliefs, and intentions of others. But how might we do this?

Lawrence Barsalou (2008) argues that cognition is "grounded:" That is, cognition emerges from multiple neurobiological experiences including simulations, action situated in a particular environment, and body states. Our ability to mentally imagine or simulate perceptual, motor, and introspective states suggests that during experience, we have ways to capture neurobiological signaling patterns and story them in memory. One line of research focuses on a system of "mirror neurons" that allows us to simulate and mimic the states of others -- to "get inside their head" -- and thereby estimate their intentions and respond accordingly. When we simulate the actions or feelings of others, it triggers the same neurobiological activity that we would experience if we were engaged in the identical action or emotional state.

There is also considerable evidence that body states can trigger cognitive states and be effects of them (Barsalou et al. 2003): A good deal of what we learn and experience becomes embodied in facial expressions, postures, gestures, and so on. These body states then become associated with specific states of mind, which include sensations, emotions, memory, and thoughts. Social interaction can trigger body states,

and body states can affect how we feel and what we think, which in turn, affects motivation and performance.

All other things being equal, a person with extensive, wide-ranging experience and broadly developed skills is better prepared to accurately understand others' intentions than someone with less experience or skill: The larger our repertoire of mental models, the more accurately we can understand others and predict their intentions. Conversely, in those situations when we observe others looking on helplessly or exhibiting "cluelessness," assuming it does not reflect disease or disorder, it likely reflects a dearth of similar training, experience, or perhaps capacity, rather than a motivational deficit or a failure of will.

Social change is a similar mind-body-environment challenge. Change would be a relatively simple exercise in individual choice except for the fact that we live in social groups in particular environments that may or may not be conducive to the changes we wish to or ought to make. Although changing ourselves when we want to change is difficult in the best circumstances, changing an entire social order when not everyone wishes to do so is an even greater challenge. Well-intended, large-scale social change efforts, such as moral or religious “crusades” fail more often than they succeed because to change outcomes, one must change patterns of behavior. To change patterns of behavior, one must change many minds and bodies, which are embedded in contexts that include the physical conditions or state of nature in which they live, their everyday rules of the game, and the relationships and networks that make up their social world.

To sum up, the evidence suggests that we are complex, highly advanced, but biased sensory systems that adapt intuitively to a physical and social context that is partly real and partly imagined. Many of our thoughts and choices are automatic rather than the product of calculation: "Thinking" occurs after a choice has been made. However, many of us (but not all) have the capacity to develop and use logic tools, religion, and other forms of social order to shape and regulate thinking and behavior so let's take a deeper dive into the cognitive neuroscience of our capacity for socially cognizant self-governing behavior.

**Social Cognition and Self-Governance**

We know from experience and experimental studies that there is considerable variability in what Adam Smith referred to as "moral sentiment" or what I will call "social cognition" that cannot be explained by cultural differences. Some of us are more socially aware than others. And some, whether or not we have a strong capacity for social awareness, are more and less able to regulate our selves in social settings.

Consider for example the phenomenon of antisocial personality disorders such as sociopathy and psychopathy, or those that arise from traumatic experience, brain injuries, strokes, or dementias. The behaviors associated with these disorders may include actions that suggest little or no genuine concern for others, distorted thinking, poor impulse control, unwarranted aggression, and in extreme cases, intentionally harming others. These patterns of behavior are stable and recognizable across social groups and cannot be reduced to differences in social norms or culture.

Neurobiological evidence from lesion and imaging studies suggests that the brains of people with antisocial personality disorders significantly differ from those of socially adjusted people. By studying the brains of people with patterns of behavior that show social impairment as well as people with patterns of behavior who do not show impairment, we can develop a better understanding of the human capacity for social cognition and self-governance.

An emerging field of cognitive neuroscience research strives to understand the neural basis for social cognition and behavior. In a review of the research in this area, Moll, Zahn, Oliveira-Souza, Krueger, and Grafman (2005) argue that the neural mechanisms for socially cognizant or "moral" emotions, values, and behavior are not restricted to any specific brain region. Rather, they emerge from the neurobiological integration of cultural and context-specific knowledge, semantic and social knowledge, and basic emotional and motivational states.[7] An important implication of this view is that "rational" or logic-based cognitive mechanisms co-exist with social and emotional mechanisms and do not control or dominate them.

It seems to me that the biological perspective on the nature of cognition and rationality is really quite consistent with the tenets of classic liberal political economy. Adam Smith argued that rational choice is socially astute and requires the ability to

[7] The brain regions associated with moral cognition and behavior in imagining and clinical studies include cortical regions (anterior prefrontal cortex, medial and lateral orbitofrontal cortex, dorsolateral prefrontal cortex, ventromedial sectors of the prefrontal cortex, anterior temporal lobes, and the superior temporal sulcus) and subcortical structures (amygdala, ventromedial hypothalamus, septal area and nuclei, basal forebrain, the walls of the ghird ventricle, and rostral brainstem tegmentum. (Moll et al. 2005.)

experience and reconcile both dispassionate logic and deeply felt emotion.[8] Similarly, Hayek argued that socially rational choice emerges from spontaneous order for the reason that it is grounded in a particular context that contains the local time and place knowledge needed to effectively reconcile private and public interests.[9]

Now that we have some sense of the biological nature of our capacity for social cognition and self-governance, let's turn to our capacity to think about God and formulate religious beliefs. Is there a biological basis for religion?

**Cognition and Religion**

Religious belief and practice is a ubiquitous and (as far as we know) unique aspect of human life that is found in all cultures. Many contemporary theories associate religious belief and behavior with the development of higher-level cognitive functioning in the human species. Joseph Bulbulia (2004) argues that most evidence of religious behavior dates back only about 10,000 years, which leads him to surmise that religious belief probably facilitated human evolution.[10]

In a study that is forthcoming in the Proceedings of the National Academy of Sciences, Kapogiannis, Barbey, Su, Zamboni, Krueger, and Grafman define the psychological structure of religious beliefs in terms of underlying cognitive processes and investigate the associated pattern of brain activity using functional magnetic braining imaging (fMRI). In their study of 40 people (some religious and some not religious) the

[8] See Smith (1759), which precedes and is widely interpreted as the foundation for his later, more widely cited work, *The Wealth of Nations.*

[9] While Hayek's (1960) work on spontaneous economic order is well known to social scientists, less well known are his theories about biological order. See Hayek (1952).

[10] For a comprehensive overview of contemporary research on the evolution of religion, see Bulbulia, et al. Eds. (2008).

authors found that when subjects considered statements about God's level of involvement in their lives, God's level of emotion, and religious knowledge, the same areas of the brain that are used to interpret the emotions and intentions of other people are active.[11] As National Public Radio reporter Jon Hamilton (2009) puts it, "To the brain, God is just another guy."

Specifically, Kapogiannis et al. demonstrate that religious belief is integrated in cognitive processes and engages well-known brain networks that are used in social (moral) cognition. In other words, religious cognition is a social activity that involves representing an awareness of others, emotional processing, language, and logical reasoning. Measureable differences in these core cognitive processes appear to predict specific patterns of response to religious stimuli. Consistent with Bulbulia's conjecture, their findings lead the authors to hypothesize that religious cognition co-emerged in the human species with the development of social cognition, language, and logical reasoning.

Another important implication of this study that is particularly relevant for this essay is that religious beliefs appear to have a biological expression, can be experimentally studied, and can be compared to other beliefs such as those employed in the fields of economics and culture. For example, the data suggest that one way of thinking about the role of religion in society is as a means to instill an internal representation of restraining authority that facilitates self-regulation and self-governance at individual and group levels.

[11] The study involved two experiments with subjects drawn from a modern Western society: 1) A multidimensional scaling (MDS) study to determine the psychological components underlying religious belief, and 2) an evaluation of the neural foundations of religious belief using event-related fMRI to reveal brain activity. Neuronal activations were found in areas of the brain associated with understanding agents' actions and intentions, emotional processes and higher order emotional regulation, and abstract semantic processing.

Building on the Kapogiannis, et al. study, one might experimentally test the relative performance of different types of beliefs in achieving self-restraint and self-governance in addressing a range of social dilemmas.

**Implications For Understanding the Role of Religion in Society**

I began this essay with the conjecture that the role of religion in society has something to do with stimulating social awareness, facilitating self-restraint, and thereby maintaining an orderly society.

Referring to the book upon which this essay is based, I have argued that our most fundamental motivations and capacity for action arise from neurobiological signaling, which occurs as we engage in our environments. This would imply that religion has a very limited role in society. However, while our first order "rules of the game" arise endogenously, they can incorporate exogenous social experience (including religious experience) through a system of processes generally described as social or moral cognition, which implies that religion may have a strong role in structuring and sustaining social order.

Yet the data show that there is considerable variability across individuals in the extent to which we are capable of social or moral cognizance: Some individuals are born without this capacity, and some lose this capacity as a function of experience, illness, injury, or disease. These data imply that some individuals may be impervious to religious experience or only very weakly influenced, which again implies a more limited role for religion in society, particularly with respect to influencing those who may have the greatest need for the moderating influences of religious practice.

And so in the time-honored tradition of the three-handed (political) economist, I am left to argue that even with the benefit of investigations in the neurosciences the role of religion in society cannot be determined with certainty but depends upon: 1) Individual capacities for social influence; 2) The nature of social influence including religious influence; 3) Competing "ecological" influences that are contextually specific. However, I do hope that I have stimulated some modest interest in finding ways to combine standard tools in the social sciences with those in neuroscience to extend our knowledge of human behavior.

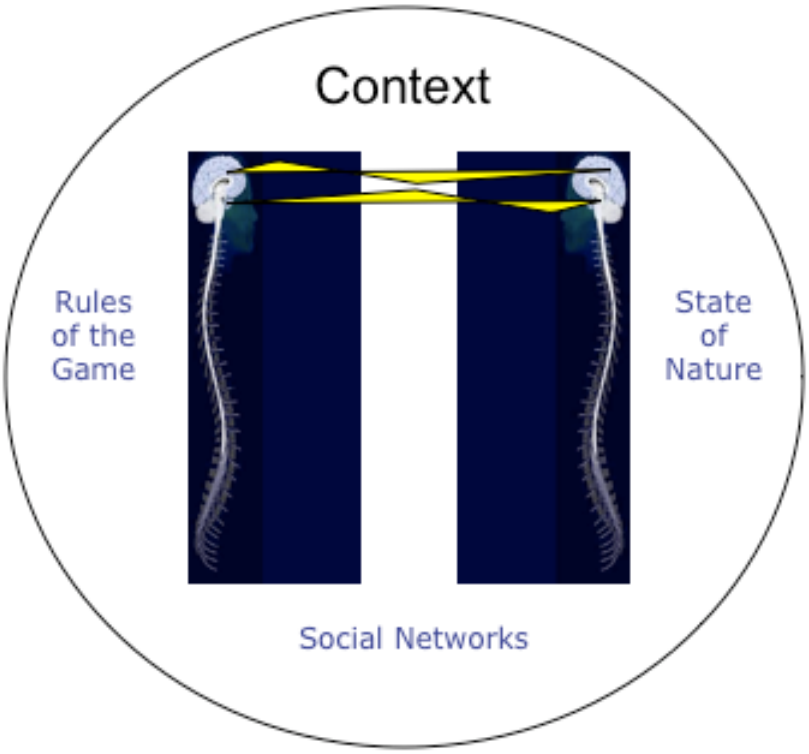


**Figure 1: The brain is embodied and the body is embedded in a physical and social context**
Source: Polski (2008)

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