Christians in Science Summer 2011 Essay Competition

Second Place Essay

The Neurological Basis For Belief

Esther Ng, August 2011

For many centuries, philosophers and scientists have deliberated, debated and disputed over the interaction between faith and the brain. However, it is only in the last 2 decades that imaging techniques such as magnetic resonance (MRI) and positron emission tomography have advanced to the point that the functioning brain can now be studied with a resolution equivalent to post-mortem examination. Coupled with improvements in electrophysiology, these tools provide us with means to probe for answers to previously intractable neurological questions. This essay explores recent developments in our understanding of neuroscience within the context of religion and discuss how these findings influence our beliefs.

One approach for investigating the neurological basis for religion is to study those on the extremes of the spectrum. Several neurological and psychiatric diseases are associated with hyperreligiosity as well as unusual religious activity. Temporal lobe epilepsy is associated with increased religious experiences in the ictal, postictal and interictal periods, as well as religious auras in the preictal period (Devinsky and Lai, 2008). Schizophrenia and obsessive compulsive disorders are also associated with religious experiences and increased religious practices (Mohr et al, 2010; Yorulmaz et al, 2009). Structural as well as biochemical evidence from these patients suggest that the network controlling religious activity in the brain is extremely extensive. Many different anatomical locations are implicated, including the prefrontal, temporal and parietal cortices, as well as the hippocampus, thalamus and brainstem (Raine and Yang, 2006; Damasio, 1999; Markowitsch et al, 2003). Furthermore, all neurotransmitter systems except the noradrenergic system have been implicated. This includes the dopaminergic, serotonergic, glutaminergic as well as cholinergic systems. (Cohen and Carlezon, 2007; Previc, 2006; Danbolt, 2001)

The ability of our brains to synchronise these disparate mechanisms in coordinating faith-based activities points towards our innate tendency towards religious belief. However, is religion in healthy individuals on the same continuum as psychopathological religion, or is it a different entity? Psychotropic drugs such as phencyclidine, ketamine and amphetamines, which interfere with neurotransmitter systems implicated in these disorders, can also trigger religious experiences in healthy individuals (Nencini and Grant, 2010), suggesting underlying qualitative similarities between religion in between healthy and so-called mentally ill individuals. Furthermore, delusions with religious themes are more common in societies which have a heavy emphasis on the supernatural, suggesting that that they are an outlier manifestation of spirituality rather than a separate phenomenon.

Even within healthy individuals, religiosity exists on a continuum. Twin and adoption studies suggest that the effects of genetics and heritability on religiosity ranges from 27% to 62%, depending on age and gender (Koenig et al, 2008; Eaves et al, 1999). While no specific religiosity gene has been identified so far, inter-individual differences in brain structure have been linked to religious variability. Kapogiannis et al (2009) carried out an MRI study on 40 healthy adults, demonstrated that those who reported experiencing an intimate relationship with God and engaging in religious behaviour had increased volume of the right middle temporal cortex. Experiencing fear of God was associated with decreased volume of the left precuneus and left orbitofrontal cortex and doubting God's existence was associated with increased volume of the right precuneus. Naturally, this raises a causality question – could these MRI differences be the result of environmental factors such as upbringing? In this study, the authors found no correlation between religiosity of upbringing and anatomical features. While this does not entirely exclude environmental influences, it certainly shows that inborn biological differences have considerable significance in shaping our beliefs.

In the Christian context, this calls into question the perennial conundrum of pre-destiny. If one is genetically predisposed to be doubtful (possibly due to an increased size of right precueus), is it fair to hold the person accountable for refusing to believe

in God? If genetics and brain structure play such important roles in religious variation, how much of our religious choice is actually free will? For that matter, does free will actually exist in the realm of molecular neuroscience?

All thoughts are mediated by electrical impulses that travel within a neuron then to the next neuron through the release of neurotransmitters molecules at the membrane synapse (gap between the 2 neurons). These electrical impulses are governed by the physical principles that permeate the rest of the world. This presents a philosophical dilemma. Classical physics, such as that which controls speed and acceleration of vehicles, is deterministic in nature, and does not make any room for free will. It states that humans are automatons who act entirely according to the electrical impulses generated in their brains, which begs the question – who generates the impulses?

Quantum physics is a paradigm shift that attempts to answer this. According to quantum theory, the state of the brain has a part in which the neurotransmitter is released and a part in which the neurotransmitter is not released. This quantum splitting occurs at every one of the trillions of nerve terminals. Hence the quantum state of the brain splits into a vast host of classically conceived possibilities, one for each possible combination of the release or no release options. The result of these physical processes is not a single discrete set of non-overlapping physical possibilities but rather a smear of classically conceived possibilities (Schwartz et al, 2005). An agent is needed to select between these possibilities, which allows for the input of free-will. In that case, how can we differentiate between God speaking to us (and generating the electrical impulses) and us generating these impulses ourselves through our own thoughts?

While the study of neuroscience in religion seems to raise more questions than it answers, will it ever prove or disprove the existence of God? I doubt it. Despite the development of advanced brain imaging techniques and state-of-the art-particle colliders, much of neuroscience and quantum physics is still dependent on believing in certain theories for which we are still searching for empirical proof. This, in fact, is

the essence of faith. Examining how our brain experiences faith is a worthwhile endeavour, but would not help to support the existence of God. For that, a personal relationship is essential, but for some people, myself included, contemplating the neurological basis for this relationship helps to enhance it. For such people, the neurology of theology is certainly worth further exploration.

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