

# Neurotheology: Avoiding a Reinvented Phrenology

Wayne D. Norman and Malcolm A. Jeeves

*Over the past several decades, a number of proposals have been advanced to explain the relationship between human brain functioning and religious experiences and behaviors. In the nineteenth century, phrenologists were also interested in these relationships. A wide variety of positions existed amongst deist and Christian phrenologists and continues in neurotheological writings today. More importantly, some of the conceptual and methodological issues that plagued phrenology may function as a cautionary tale for neurotheological endeavors today, including investigations that are empirical but not scientific, issues related to the relationship between brain and spiritual activities, and the relationship between natural law and spiritual activity.*

Neurotheology is the latest in a long history of attempts to link bodily processes and spirituality. Widespread current interest in the topic may be largely attributable to its almost daily media coverage with dramatic color pictures using the latest brain-imaging techniques. Interpretations vary widely. For some, it shows that researchers have now found “where God lives in the brain.” For others, it confirms that spirituality and claims to be in touch with a transcendent God are “nothing but” the chattering of millions of brain cells. What is frequently not realized is that attempts to localize specific spiritual activities to particular brain regions is not new. As in some other episodes at the science and faith interface, there may be important lessons to be learned from how these issues were handled in the past.

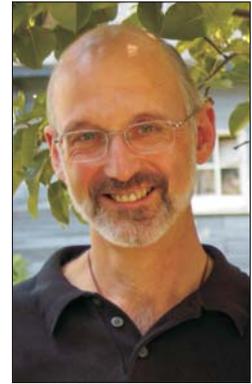
Almost two centuries ago, when phrenology was as popular as neurotheology is today, thoughtful scholars tried to answer questions about how most constructively to relate knowledge about localization of function in the brain with current Christian beliefs. We believe there are important lessons to be learned from a study of nineteenth-century phrenology.

Accordingly, we begin by describing phrenology in its heyday and ask how its relationships with religion were viewed then by different Christian positions. From this review, we seek to identify pointers that may help today in formulating constructive evaluations of neurotheology.

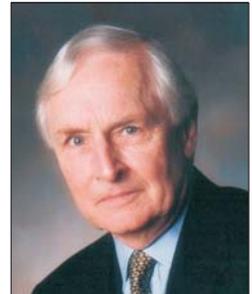
## Nineteenth-Century Phrenology

### *What Was Phrenology?*

A central doctrine of nineteenth-century phrenology was that mental functioning is the result of a discrete number of faculties, each of which corresponds to



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# Article

## *Neurotheology: Avoiding a Reinvented Phrenology*

a separate cerebral organ on the surface of the brain. In the earliest attempts at localizing mental life in the brain, the goal had been to find a single “cerebral organ” for all the mental processes. Soon, however, psychology was freed from the earlier dominant view that consciousness must be an indivisible whole. A new, so-called, “faculty” psychology developed. According to this view, there were specialized mental faculties, and it became proper to search for a material substrate for each of them. The brain became regarded as an aggregate of many organs, each of which embodied one particular faculty.

The task was to relate the contemporary picture of a “psychology of faculties” with current knowledge of the structure of the brain. In this endeavor, it was the leading anatomists of the time who gave the impetus to research.<sup>1</sup> In his 1835 treatise on the functions of the brain, Franz Gall took as one of his starting points, the contemporary “psychology of faculties.” He argued that the whole cerebral cortex is an aggregate of individual organs, each of which is the substrate of a particular mental faculty.<sup>2</sup> It was left to the German physician Johann Spurzheim, a collaborator with Gall in his neuroanatomical research, to popularize the term phrenology. As early as 1805, Gall had been content to refer simply to craniology or organology.<sup>3</sup> It was after Spurzheim left Gall and departed for Britain that the former popularized the term phrenology.<sup>4</sup>

### *Basic Varieties of Nineteenth-Century Phrenology*

When one surveys the writings of phrenologists, one sees a wide variety of systems, motivations, and emphases. Some, like Gall, focused on establishing phrenology’s empirical basis.<sup>5</sup> Spurzheim wrote about the philosophical and moral implications of phrenology.<sup>6</sup> George Combe believed phrenology was important in understanding the laws governing individual and social behavior.<sup>7</sup> And for Orson Fowler, phrenology had practical lessons to teach about every aspect of one’s life, from career decisions to child-rearing to marriage.<sup>8</sup> Of course, there were those who used phrenology for political reform, as justification for theological claims, and for pecuniary gain.<sup>9</sup>

Recently John van Wyhe has argued that “phrenology was used as an alternative or supplementary foundation for intellectual and epistemological authority.”<sup>10</sup> Van Wyhe’s point is that it was the

“certain knowledge” which phrenology supposedly provided that formed the foundation for its various claims and aspirations. This is important. Because phrenology was seen as based on scientific “facts,” advocates used this authority to make claims about issues far removed from phrenology’s core claims. A similar accusation might be made when examining some of the claims of neurotheology.

### *Aims of Phrenology*

Although the Enlightenment eludes any precise definition, it has been said that one defining characteristic of the movement was “an emphasis upon the ability of human reason to penetrate the mysteries of the world.”<sup>11</sup> These mysteries included the physical world of planetary motion and electricity and the mental world of human perception and the workings of the mind itself. More-ancient mysteries, those of religious belief, also came under the scrutiny of human reason. This led to explanations of belief and attitudes toward institutionalized religion that varied from skepticism to hostility.<sup>12</sup> Interactions between revealed and natural religion ranged from warfare to reconciliation to harmonization.<sup>13</sup> While the Enlightenment is often situated in the eighteenth century, modified forms of Enlightenment thinking seeped into nineteenth-century thought. One such outlet was the field of phrenology.<sup>14</sup>

### *The Impact of Phrenology on Religion and Religious Thinking*

For the purposes of this article, we make a distinction between two groups of phrenologists, recognizing that the line between them is sometimes easier to draw than to defend. The first group comprises deists, and includes Gall, Spurzheim, and Combe. Although similar to theists in believing in the existence of God, deists generally hold that God has created the cosmos but does not subsequently directly intervene in it by miracles, prophecy, or divine revelation. Accordingly, religious beliefs should be founded on human reason and what is observed in the natural order.

The second group comprises Christian phrenologists. Although their theological positions varied widely, they all subscribed to the basic tenets of Christianity. It is important to note that they did not reject science or, indeed, a naturalistic approach to understanding the world, including the human mind. The nineteenth century was a time that saw a dramatic increase in the acceptance of a naturalistic

methodology for studying all of nature. This acceptance occurred among Christians as well as theists, deists, and nonbelievers.<sup>15</sup>

### Deist Phrenologists

One of Franz Gall's (1758–1828) favorite mottos was "God and the Brain: Nothing but God and the Brain." It may be possible to glean what Gall meant by this from some of his writings. For example, in *On Innate Dispositions*, he says,

If we can demonstrate that a relationship exists between the exercise of the soul properties and the origination of their existence in the brain it would no longer be possible to doubt that it is possible to establish a doctrine which will enable us to know the noblest part of the organism.<sup>16</sup>

Gall's anatomical work led him to conclude that there was no single location of the soul since the fibers of the brain did not converge in one spot. He noted instead that the convolutions of the cerebral cortex are the peripheral expansions of those fibers.<sup>17</sup> In other words, the functions of the soul are mapped across the entire cortex.<sup>18</sup>

Gall did not deny the existence of the soul; on the contrary, his position advocated the organs of the cortex as the instruments through which the soul acts. He was, therefore, not an eliminative materialist. His research certainly advocated methodological naturalism, but as Patrick McDonald has pointed out with reference to mid-nineteenth century research,

... the move toward more naturalistic methods was not primarily motivated by a prior commitment to any particular worldview, whether theistic, naturalistic, pantheistic, or other.<sup>19</sup>

If this assessment is correct, then we can see Gall's position foreshadowing current debates about the impact of neurotheology on some widely held traditional religious views of human nature.<sup>20</sup>

Johann Spurzheim (1776–1832) sought to defend himself against charges of materialism and fatalism when he wrote *A View of the Philosophical Principles of Phrenology*.<sup>21</sup> In his work, *Phrenology, or the Doctrine of the Mental Phenomena*, he gives his phrenological explanation for religion.

In my opinion the religious phenomena are the result of several faculties. Causality searches for a cause for every thing and of every event.

Individuality personifies the Supreme cause it arrives at; another faculty inspires admiration and wonder, and believes in some relationship between God and man; a third feeling inspires respect and reverence, and religion exists. It is strengthened by the feelings of hope, conscientiousness and cautiousness.<sup>22</sup>

The purpose of religion, as regulated by the phrenological organs, was to improve morality. "All religious regulations, therefore, ought to be only auxiliary means of rendering mankind morally good."<sup>23</sup> Religious behavior and experiences could, for Spurzheim, be understood completely as the result of brain activity.

In writing about historical psychological texts, Thomas Dixon identifies three categories: theological, antitheological, and atheological. Theological texts privilege God-talk and antitheological texts explicitly reject God-talk. The third category is the more interesting one. Dixon suggests that atheological texts make no crucial reference to God. While God language may populate the text,

it is a secular and often "scientific" psychology that seems simply to neglect or ignore the language and concerns of the religious traditions and to adopt instead an epistemology and ontology proper to certain scientific enterprises.<sup>24</sup>

Spurzheim's writing seems to be a variant form of atheological texts. God-talk is used but does not appear to be crucial, or even important, to many arguments being made.

George Combe (1788–1858) became a convert to phrenology after attending lectures by Spurzheim in Edinburgh around 1817, and he began publishing articles on the topic shortly thereafter.<sup>25</sup> He believed that religion was good if religious emotions were guided by an enlightened intellect. In such cases, individuals would care less for the "formulas" of religion, would be more tolerant of members of other faiths, and would be more progressive in their opinions. On the other hand, he had harsh words for organized religions, viewing them as "the instrument of priests and sovereigns to maintain themselves in authority, and to repress the moral and intellectual life of nations."<sup>26</sup>

Combe focused on one central question, "How does God govern the world?" and it was the moral world which most concerned Combe. Since it was

# Article

## *Neurotheology: Avoiding a Reinvented Phrenology*

obvious to him that God governed the *material* world through natural laws, Combe reasoned the same must hold for the *moral* world. He used the principles of phrenology to explicate, through study and reason, how the constitution of the brain gave rise to natural religion and morality. His writings on the relationship between phrenology and religion focused primarily on defining the effects of the moral and intellectual phrenological organs on religious life.

Throughout his writings, Combe argued that we do not possess any faculty which would allow us to know the essence of a thing, nor would such knowledge be of any practical importance.<sup>27</sup> However, even though we cannot know with certainty the essence of matter, Combe makes his position clear. The “spiritual hypothesis,” namely an understanding of human nature based on our possession of an immaterial soul or spirit, blinds us to a true understanding of our constitution. For Combe, “The world is material, man’s nature is material, and the whole relation between them depend on material conditions.”<sup>28</sup>

Combe questioned the veracity of Christianity even before his involvement with phrenology. Judging from autobiographical statements and the main thesis of his major work, *The Constitution of Man*, his primary interest in phrenology was to show that it provided for law-like regularities in our moral nature, something he concluded was lacking in most forms of Christianity. Our phrenological make-up, as determined by the Creator, specifies how we should conduct ourselves and on what basis rewards and punishments will occur. He came to phrenology as a deist and argued for deism from phrenological principles. Thus, Combe’s critique of Christianity can be seen as an argument for the replacement of orthodox Christian doctrine with deistic principles. The hypothesis that God actively intervenes in the world had been pushed out of explanations in physics, meteorology, geology, and aspects of biology. Combe sought to extend that line of thinking to human actions, including moral behavior.

### Christian Phrenologists

The second group we examine might be labeled Christian phrenologists. In various ways, advocates of this position claimed that Christianity and phrenology were not, and in fact, could not be opposed because they dealt with two separate spheres of life,

the scientific and the spiritual. For many, phrenology did, however, harmonize with the moral doctrines that flowed from “natural religion.”<sup>29</sup> Some put Christianity in the upper story; others gave precedence to the science of phrenology. It is instructive to examine five such phrenologists (Henry Clarke, Charles Cowan, W. Easton, William Scott, and Orson Fowler) and their strategies for relating phrenology and Christianity.

In 1835, Henry Clarke, a minister in Dundee, Scotland, published *Christian Phrenology; or the Teachings of the New Testament Respecting the Animal, Moral, and Intellectual Nature of Man*.<sup>30</sup> While his writing shows a strong emphasis on Scripture, Bible selections are limited to those which speak to human beings’ moral nature. Phrenology (in the upper story) was seen as a friend and helpmate to (lower level) Christianity. Sanctification and redemption are not supernatural phenomena but follow from complete self-government as provided by phrenology. Human nature is threefold: animal, moral, and intellectual, with the “inward man” (or law of mind) made up of the moral sentiments.

Charles Cowan, a British MD, published *Phrenology Consistent with Science and Revelation* in 1841, advocating harmony between scriptural Christianity (which he believed to be of Divine origin) and the science of phrenology.<sup>31</sup> Since God is the God of both nature and revelation, such harmony must exist. Any evidence we have of a future life, the immortality of the soul, or free agency, comes from direct revelation. Science, including phrenology, cannot interfere with revealed truths. All matter, including the brain, is an instrument of the Creator’s will. Cowan disagreed with those of a more materialistic bent who proposed that the brain secreted thought.

Somewhat later another Scot, W. Easton, wrote *The Harmony of Phrenology and Scripture on the Doctrine of the Soul*. Easton’s view is more sympathetic to a materialistic reading. “The truths of Nature discovered by science must be respected, and Scripture must accommodate itself to these truths.”<sup>32</sup> The soul is not immortal nor is it an “invisible, immaterial second self.” It exists and is manifested through the harmonious organization of the phrenological faculties.

Theologically the most conservative of the Christian phrenologists, William Scott held a high view of revelation yet wanted to vindicate phrenology.

In his book, *The Harmony of Phrenology with Scripture*, Scott stated that our phrenological faculties “require the aid of revelation and of spiritual influences to lead us to the ultimate ends of our being ...”<sup>33</sup> The speculations of philosophy (including the science of phrenology) are subordinate to enlightened religious faith. The soul (or self) is a “simple and indivisible being of which the brain is the organ during life,”<sup>34</sup> and the phrenological faculties “are merely different states of this simple being; that the separate organs of the brain afford the means by which these states of mind are induced and manifested.”<sup>35</sup>

Probably the most interesting of the Christian phrenologists, and certainly the most prolific and popular American phrenologist, was Orson Fowler (1809–1887).<sup>36</sup> Fowler promoted a phrenology that sounded more like a new religion than a science. Fowler’s writings are liberally sprinkled with biblical references and phraseology. His is not the carefully thought-out argumentation of Combe, the lawyer, but reads more like revivalist preaching. His religious writings focused on more practical matters such as prayer, conversion, and the Sabbath. Most importantly, they contain a strong antisectarian element. Combe’s deism certainly led him to speak out against sectarianism. In Fowler’s case, however, the arguments take on a religious zeal. Sectarianism, but not Christianity, must be eliminated, and phrenology will accomplish it.

For Fowler, “Man has a soul—a spiritual essence—which sees without eyes, hears without ears, operates disembodied, and connects him with heaven, and with God.”<sup>37</sup> Such talk is, however, misleading, for one’s spiritual essence is due to the fact that one has an organ of spirituality. We have spirituality in the same sense in which we have color vision, because the brain is organized to make it possible. Fowler, like Combe, sought a scientific basis for religion. Being less theoretically oriented and operating in a climate that endorsed individual interpretation, he was deeply concerned with countering sectarianism. He can hardly be called a materialist of the eliminativist variety. But he appears to have been committed to a form of methodological naturalism and perhaps even methodological materialism. Fowler’s critique of Christianity, while questioning a number of orthodox doctrines by elevating reason over revelation, is in many ways a call for a purifying of Christianity.<sup>38</sup>

Note that by considering the views of this small sample of nineteenth-century Christians and deists seeking to relate the nineteenth-century “brain science” of phrenology with their religious beliefs, we find a wide variety of proffered solutions. Some wanted to *replace* religion with science (Combe), some to *purify* religion (Fowler), some to find in science *a friend and helpmate* (Clarke), some to *harmonize* science and faith (Cowan and Scott). The soul might use the brain or be a manifestation of its workings; revelation might be superior or inferior to the truths of science. However, those claiming to be Christian phrenologists found various ways to accommodate some degree of materialism and fatalism in terms of phrenological faculties while still maintaining a position within the Christian faith. In neurotheology, we will find a similar variety of viewpoints.

## Neurotheology

At the 1997 annual conference of the Society for Neuroscience, V. S. Ramachandran presented findings from a study with epileptic patients. In that paper, Ramachandran referred to the “God module,” a portion of the temporal lobes involved with religious experiences.<sup>39</sup> Upon learning of the research findings on this topic, a spokesman for Richard Harries, the Bishop of Oxford, said, “It would not be surprising if God had created us with a physical facility for belief.”<sup>40</sup> Neurotheology is the general term used to describe the relationships between human brain functioning and religious or spiritual experiences and behavior. It is an unfortunate term in many ways, not least of which is that many so-called neurotheological investigations contain questionable neurology and/or theology.<sup>41</sup> Matthew Ratcliffe and Warren Brown have discussed some of the conceptual, methodological, and philosophical difficulties facing neurotheological investigations.<sup>42</sup>

While an exhaustive survey of neurotheology is beyond the scope of this article, we briefly examine some of the major research programs on the topic. In addition, we describe several studies related to the overall intent of neurotheology. After giving a general overview, our discussion is then limited to a sample of neuroscientists who have actually conducted research on or related to the topic. Finally, we examine several issues and problems common to both phrenology and neurotheology.

# Article

## *Neurotheology: Avoiding a Reinvented Phrenology*

There is no single definition of neurotheology that will suffice for all current work being done. However, one starting place might be the response given by philosopher Matthew Alper to the interview question, "What do you mean exactly by a 'God' part of the brain?"

What I mean by this is that the human species possesses a mechanism, an evolutionary adaptation in our brain—a religious/spiritual function—which compels us to perceive and believe that there exists a transcendental/supernatural quality in the universe. But differences of opinion exist as to whether the neural basis of religious experience involves a relatively localized region or a network of interconnected areas.<sup>43</sup>

Using the latest brain imaging techniques, researchers have claimed to identify the part or parts of our brains most active when we are meditating, praying, or seeking to be in touch with the Transcendent. The multicolored pictures from such brain scans make eye-catching media material and some dramatic results have been published and gained wide media exposure. Such findings echo the phrenologists' maps of the "spiritual bumps."<sup>44</sup> We begin with a sketch of various neurotheological questions and cautions.

In early attempts to localize where in the brain we make contact with the Transcendent, interest focused on what appeared to be an above-average reporting of visions in those suffering from some forms of epilepsy. This led to the idea that it was in the temporal lobes that the capacity for being in touch (or believing that one was in touch) with the Transcendent is localized.

One of the earliest volumes on this topic had the provocative title *Where God Lives in the Human Brain*. The authors, Carol Albright and James Ashbrook, believed they had begun to identify the elusive "God spot," and suggested that it is possible that we are indeed hardwired to seek God. For example, they wrote, "All that may be new here is an analysis that finds in the human brain a mirror of these *imagines Dei* and thus may suggest further ways of comprehending them."<sup>45</sup> Clarke would have approved of this statement.

A more recent advocate of the temporal lobe as the elusive "God spot" is writer and researcher Willoughby Britton. Reporting on Britton's work, Julia Keller wrote, "The temporal lobe, Britton said, is considered 'the God module,' the part of the brain

that connects with the transcendent."<sup>46</sup> Others look elsewhere in the brain. Osamu Muramoto, a research neurologist, describes his interest in what might lead one to become hyper-religious. He writes,

Hyper-religiosity may stem from increased activity in the medial prefrontal cortex of the brain ... my theory is that the medial prefrontal cortex plays the role of the conductor of an orchestra in religiosity.<sup>47</sup>

Still others are more cautious in their interpretations. For example, Mario Beauregard who works in the Departments of Radiology and Psychology at the Université de Montréal is reported by Christopher Stawski as saying,

Obviously, the external reality of God can neither be confirmed nor disconfirmed by delineating neural correlates of religious/spiritual/mystical experiences. In other words, the neuroscientific study of what happens to the brain during these experiences does not tell us anything new about God.<sup>48</sup>

Scott would have applauded this sentiment.

The distinguished Jewish physician Jerome Groopman expressed his concerns about some of the motivations for neurotheology when he wrote, "Why do we have this strange attempt, clothed in the rubric 'neurotheology,' to objectify faith with the bells and whistles of technology?"<sup>49</sup> He went on, "Man is a proper subject for study in the world of science. God is not."<sup>50</sup> While acknowledging that the possibility that we are intrinsically wired for spirituality cannot be dismissed, Groopman wisely notes that "as has been the case with all attempts to 'prove' the presence or intent of God, SPECT (brain) scans and cerebral anatomy fall far short of doing so."<sup>51</sup> He concludes,

Indeed to believe that science is a way to decipher the divine, that technology can capture God's photograph, is to deify man's handiwork.

And that, both religious mystics and scholars agree, is the essence of idolatry.<sup>52</sup>

What have we learned from the phrenologists that may be of help as we begin to review different contemporary approaches to brain research? Everyone, including scientists, comes to their work with presuppositions, sometimes whole systems of presuppositions that we call worldviews. It is even the case, at times, that the authority-carrying names of the past, the great writers, are replaced by some of today's

leading philosophers. But they, too, have presuppositions, and these should be examined when they have things to say about the implications of contemporary brain research.

Combe sought to use phrenology to attack traditional religious understandings of society and morals, and Fowler attempted to find a scientific basis for religion from phrenology. Both men believed their critiques were validated by the scientific facts of phrenology. Given that the principles of phrenology turned out to be based on bad science, what happened to their critiques? Phrenology seemed to provide scientific evidence for “spiritual bumps” on the brain’s surface and an explanation of religious behavior and experience. Today, neurotheology has followed a similar process. Where will current explanations of religion stand when the neuroscience in neurotheology has moved on?

In the past, the leading figures such as Gall and Spurzheim looked over their shoulders at the powerful ecclesiastical and secular authorities of the day. It is not likely that today many scientists will be overly concerned about the views of ecclesiastical authorities. But there is an equal temptation to share and be influenced by widespread culturally determined views of human nature. One such set of views, shared by religious and nonreligious people, is an enduring package view of the human being as an immaterial something, whether of mind or soul, linked to a material base, the brain or body. There remains a lively debate among the well-informed about what contemporary neuroscience research on mind and brain relations means for our understanding of human nature, a debate which is sure to affect pronouncements on religion.

Another currently held view among many scientists is that of scientific naturalism. As Ronald Numbers points out, during the latter part of the nineteenth century, a widely accepted naturalism became more strident at the hands of scientists and philosophers such as Thomas H. Huxley and John Tyndall. The emerging scientific naturalism claimed to provide the “only reliable knowledge of nature, humans, and society.”<sup>53</sup> Yet prior to Huxley and Tyndall, many scientists, those religiously inclined and those not, held to some form of methodological naturalism. Today, with the distinction between methodological and scientific naturalism blurred, many believe that to hold a religious position,

especially one involving transcendence, entails a rejection of science. Within the context of those holding religious beliefs, and more specifically, some form of Christian belief, we saw that phrenology evoked a spectrum of different reactions. If we do not see the same variety of views today among neurotheologians, we should ask why that is the case.

With all that in mind, we now examine the major outlines of four models of neurotheology. The intent is not to critique these models but to present them as exemplars of current neuroscientific thinking on religious belief.

### *Michael Persinger*

In 1987, Michael Persinger published *Neuropsychological Bases of God Beliefs* in which he argued that god beliefs are composed of two components: the god experience and the god concept.<sup>54</sup> According to Persinger, everyone experiences aberrant, but transient, electrical activity, especially in the right temporal lobe. However, the frequency of such activity is distributed in the population such that some individuals experience more of these temporal lobe transients (TLTs). This occurs because temporal lobe structures such as the amygdala and hippocampus are susceptible to electrical instability. TLTs are similar to micro-seizures but lack, for the most part, any motor component. Persinger targets the temporal lobe for several reasons. First, he relies on the work of others<sup>55</sup> to link temporal lobe epilepsy to temporal lobe personality, a condition supposedly characterized by hyper-religiosity, among other traits.<sup>56</sup> Persinger also argues that since the amygdala and hippocampus are structures associated with processing a sense of self and meaningfulness, those would be likely structures to give rise to what we term “religiosity.”

Persinger’s theory of the relationship between brain functioning and religious behavior and experience has two major features. It is reductionistic in that religious behavior and experience can be fully explained on the basis of temporal lobe functioning and verbal conditioning. It is also a theory that categorizes religiosity as resulting from abnormal brain functioning. While all individuals experience TLTs, religious individuals do so in a pathological manner.<sup>57</sup>

According to Persinger, our sense of self is maintained by structures in the left hemisphere. Activity

# Article

## *Neurotheology: Avoiding a Reinvented Phrenology*

between the left and right hemispheres is usually matched. If activity becomes mismatched, as he proposes happens during TLT events, then the left hemisphere interprets right hemisphere activity as another self or “sensed presence.” In addition, activation of amygdalar and hippocampal areas results in attributing intense personal meaning to experiences. Precipitating factors for TLT events include natural events, such as loss of blood sugar or increased right temporal lobe lability, and stressful situations, such as fasting, prolonged anxiety, and near-death events.<sup>58</sup>

### *Andrew Newberg*

In *The Mystical Mind*, Eugene d’Aquili and Andrew Newberg aim to show that religious experience and, in particular, mystical experiences, can be understood as the outcome of the integrated functioning of specific processing units in the brain.<sup>59</sup> The generation of such experiences is neither the result of malfunctioning in these systems nor is it an epiphenomena of brain functioning. Rather, it is a primary function of these systems, working together, to generate religious experiences.<sup>60</sup>

In certain respects, d’Aquili and Newberg’s model is an updated and more detailed version of one put forward by Michael Gazzaniga in his 1985 book, *The Social Brain*.<sup>61</sup> D’Aquili and Newberg propose an explanation of mystical experiences with a model based on the two divisions of the autonomic nervous system (one, ergotropic or arousing; the other, quiescent), portions of the limbic system (namely, the hippocampus and amygdala), and tertiary association areas of the neocortex which function as primary cognitive operators (holistic, reductionist, causal, abstractive, binary, quantitative, and emotional value operators). In addition to these components is added the process of deafferentation whereby incoming information to one component of the system is inhibited. When this happens that portion of the system functions on its own according to its own internal logic.<sup>62</sup>

### *Peter Brugger*

While some researchers have investigated neurotheology on a grand scale, others have examined more limited topics. Peter Brugger’s work falls into the latter category. Brugger has looked at the relationships between belief and various neuropsychological functions. For example, in a 2001 study, Brugger and associates contended that believers in

the paranormal are more likely to form original associations presumably because believers adopt a looser response criterion when confronted with semantic noise.<sup>63</sup> Earlier work had shown that on a lateralized tachistoscopic lexical-decision task believers in ESP failed to display task-related hemispheric asymmetry. Nonbelievers displayed the expected right-visual field/left hemisphere dominance.<sup>64</sup> Brugger interpreted the results (enhanced left-visual field/right hemisphere performance) as indicative of right hemisphere processing bias among believers.

In another study, he showed that ESP believers perceived more meaningful patterns in visual noise, again indicating possible right hemisphere involvement.<sup>65</sup> This interpretation has been supported with electrophysiological evidence.<sup>66</sup> Those classified as strong believers in the paranormal differed from nonbelievers in terms of active, cerebral neural populations during resting state, and they showed relatively higher right hemispheric activation and reduced hemispheric asymmetry.<sup>67</sup>

It should be noted that Brugger has never portrayed his work as neurotheological. He sees his findings as relevant to an understanding of belief systems of schizophrenics and schizotypes. However, recently he stated, “The aptitude for drawing meaning from seeming abstraction must also inform psychic believers’ worldview, which is so often colored by magical thinking and heightened spirituality.”<sup>68</sup> Brugger may not draw the connection, but others have, between religious belief, schizotypal traits, and psychopathology.<sup>69</sup>

### *Mario Beauregard*

In their book *The Spiritual Brain: A Neuroscientist’s Case for the Existence of the Soul*, Mario Beauregard and Denyse O’Leary argue for three key ideas.

The nonmaterialist approach to the human mind is a rich and vital tradition that accounts for the evidence much better than the currently stalled materialist one. Second, nonmaterialist approaches to the mind result in practical benefits and treatments, as well as promising approaches to phenomena that materialist accounts cannot even address. Lastly ... our book shows that when spiritual experiences transform lives, the most reasonable explanation and the one that best accounts for all the evidence, is that people who have such experiences have actually contacted a reality outside themselves,

a reality that has brought them closer to the real nature of the universe.<sup>70</sup>

For Beauregard, religious, spiritual, and/or mystical experiences (RSMs) are neither a direct proof of the existence of God or the spiritual world, nor are they “nothing but” their associated brain states. RSMs are, instead, a fundamental aspect of human nature.

What evidence does Beauregard present in favor of this nonmaterialist view? One key study included functional magnetic resonance imaging (fMRI) and quantitative electroencephalography (QEEG) of the mystical experiences of Carmelite nuns.<sup>71</sup> Beauregard and his colleagues concluded that mystical experiences are mediated by many brain regions and systems.<sup>72</sup> There is, in other words, no “God spot.”<sup>73</sup> RSMs, they conclude, are mediated by brain regions that subserve perception, cognition, emotion, body representation, and self-consciousness.<sup>74</sup>

Beauregard also draws on studies that indicate individuals are able to intentionally modify patterns of brain activity.<sup>75</sup> To explain why mental phenomena appear to alter brain activity, Beauregard proposes the psychoneural translation hypothesis in which the mind and brain “represent two epistemologically different domains that can interact because they are complementary aspects of the same transcendental reality.”<sup>76</sup>

Where then does this leave us? Investigations of the relationship between brain functioning and religious and spiritual experiences and behavior emphasize neural systems and networks rather than centers, as did phrenology. Those networks are more circumscribed for some investigators than for others. Some take a materialist position, some a nonmaterialist one, and others are noncommittal. We found the same diversity of opinions in phrenology. In the last section, we turn to several issues and problems at the time of phrenology and ask what bearing they might have for neurotheology.

## Issues and Problems

### *Empirical but Not Scientific*

Franz Gall certainly believed that he was engaged in empirical, scientific work when he first laid out the principles of his “organology.” Gall’s position as an antivivisectionist led him to adopt noninvasive methods for investigating brain-behavior relationships. There is no question that Gall employed

empirical techniques. He worked at a time before sophisticated statistical analyses had been developed, and yet he was attempting to correlate many measurements of the cranium with behavioral dispositions such as murder or aggression. This he attempted by measuring the heads of the living and the skulls of deceased individuals.

Stuart Zola-Morgan draws a distinction between Gall’s descriptive anatomical research (for which he was and continues to be highly regarded) and his functional anatomical research, on which he based his organology. Even in this more speculative, functional anatomy, Gall attempted to proceed by empirical means. His collaborator, Spurzheim, however, did not share his scientific caution. As Zola-Morgan points out, Spurzheim “leaned more toward speculation and introspection.”<sup>77</sup> This, plus Spurzheim’s desire to popularize the findings of organology, contributed to his split with Gall. And once the process of popularization of phrenology was begun, the discipline continued in this speculative manner. Phrenologists were happy to point out Gall’s “scientific basis” for phrenology; but no one was prepared to explore the discipline in a scientific manner. Very few were even prepared to carry out empirical observations, being content to use, as had Spurzheim, speculation and introspection.

There were no systematic attempts to formulate hypotheses about the location or functioning of phrenological organs and then rigorously test those hypotheses, particularly by trying to disprove them. It is not the case that phrenology was not scientific because it was not experimental. That misses the point. On the one hand, not all experiments are scientific and on the other hand, some descriptive investigations can follow the scientific method. Phrenology’s descriptive statements, after Gall, were not based on rigorous and systematic observations. There was no good rationale for situating particular organs in particular spots. And disconfirming evidence was quickly and easily explained away.

Modern-day neurotheology runs the risk of following in phrenology’s footsteps. No one doubts the mass of empirical data that has been collected relating brain activity and various measures of religiosity. The question is whether investigations of the *relationship* between brain activity and religious/spiritual activity have been scientific. While many neurotheological investigations would only claim

# Article

## *Neurotheology: Avoiding a Reinvented Phrenology*

to be exploratory, some purport to be experimental in nature. But are these empirical data collected in support of hypotheses? One must ask whether the investigations are conducted in a manner that could, in principle, disprove the hypotheses. As was true for phrenology, there is a problem if investigations are designed only to collect confirming evidence or if results are explained in a *post hoc* manner.

Orson Fowler lacked convincing neurophysiological evidence for his phrenological claims about religious experience. By 1985, Michael Gazzaniga could cite numerous research findings in explaining how the brain processes information. His application of that knowledge to an understanding of religious belief was, however, highly speculative. From 1985 to 1999, the corpus of neurophysiological and neuropsychological knowledge had probably doubled or tripled. Nevertheless, neurotheological models, like the one proposed by d'Aquili and Newberg in *The Mystical Mind*, are disappointing on several counts. First, and foremost, while these models yield interesting hypotheses regarding some religious/spiritual experiences, their extension to more-garden-variety religious experiences, the ones experienced by the average "believer," is strained. Not only is the evidence for applying the models to such experiences lacking, but it is also unclear how these models would test hypotheses related to such phenomena.

Michael Persinger's temporal lobe model does not fare much better. He asserts that temporal lobe transients are a key element in explaining religious experiences. The purported microseizures are, however, sometimes too weak to detect. Perhaps technological advances will allow for measurement of these transients. However, until that happens, they appear to be a convenient fiction that fills in gaps in the theory. Persinger proposed "temporal lobe sensitivity" as a measure of one's susceptibility to these transients.<sup>78</sup> Unfortunately, the methodology used to measure temporal lobe sensitivity appears to have been flawed.<sup>79</sup> In addition, research linking temporal lobe epilepsy and religiosity has produced inconsistent and controversial results.<sup>80</sup>

### *The Relationship between Brain and Spiritual Activities*

It is hard to imagine someone taking the position that religiosity, be it affective, perceptual, or behavioral, could occur without some accompanying brain activity. The position of a dualism between mind/

soul and body might argue that activity could occur in the mind or soul without accompanying brain activity. But for that soul activity to find expression in the affective, perceptual, or behavioral life of the individual, areas of the brain would need to be involved.

What kinds of possible relationships might exist between brain and spiritual activities? The answer would appear to depend on how we define and then operationalize our terms. Defining what we mean by brain activity may not be a problem. Once we decide on the level we wish to examine (e.g., neurochemical, single-cell recording, patterns of blood flow), we would then choose an established procedure for making measurements. Of course, there is always the possibility that nonstandard or less commonly used procedures could be used (e.g., Persinger's transcranial stimulation procedure). This might raise questions about just what is being measured or manipulated.

Most would agree that spiritual activity is the more difficult part of the relationship to define and measure. Many neurotheological investigations have examined "extra-ordinary" aspects of spiritual activity such as visions, trances, and ecstasies.<sup>81</sup> More mundane aspects, such as reading and thinking about Holy Scriptures or participating in a worship service, have received less attention, although Brugger's work is a move in this direction. Perhaps there is an assumption that the mundane activities are subserved by the same brain systems that would be active when we read or think about nonholy writings or participate in nonreligious social activities. The "extra-ordinary" activities, on the other hand, might be supposed to involve unique brain circuits or at least some unique combination of circuits. Such a distinction would need to be justified, and to date no justification has been put forth. And then there are activities that might not even be considered by some as spiritual activities: feeding the poor, caring for the sick, visiting the prisoners.

These distinctions have led to debates about whether spiritual activity should be regarded as a way of perceiving, a way of experiencing, or a way of behaving. Studies such as the one by Azari and her colleagues argue that religious experience (at least the recitation of religious texts), rather than being an immediate affective event, is a cognitive event involving the reflexive evaluation of thought.<sup>82</sup>

Most researchers, however, seem to define spirituality or religiosity in terms of how we interpret the world or in affective terms.

It is usually assumed that phrenology explained human activity by emphasizing the size of a given phrenological organ. If someone had a large organ of veneration, that individual would be more prone to display behaviors and attitudes of devotion and respect. What is less well known is that phrenology also crafted explanations in terms of “networks” of brain areas. Taking veneration as an example, most phrenological charts show that organ in close proximity to the organs of spirituality, benevolence, hope, and firmness. Recall how Spurzheim proposed the interaction of numerous brain organs in producing religious behavior. When confronted with what looked to be disconfirming evidence (e.g., a devout individual who nonetheless appeared to have a very small organ of veneration), it was standard practice for phrenologists to point out the relative strengths and weaknesses of surrounding organs.

Many phrenologists resorted to such explanations in order to fudge their assessments of an individual’s character. An analysis based on the relative size of individual organs was easier to comprehend and explain to others. Interpretations based on combinations of interacting organs was complicated, and although they might be invoked, they were seldom explicated. A similar path has occurred in neurotheology. Explanations of religious/spiritual behavior based simply on “temporal lobe activity” are no longer acceptable. Later models, like that of d’Aquili and Newberg, recognized the need to expand the number of brain areas involved. And Beauregard reported significant activity in many areas of the brains of the Carmelite nuns in his study. It would be neat and simple if there was a single “God spot” in the brain or perhaps abnormal activity in the temporal lobes and underlying limbic structures. However, it appears religious/spiritual behavior must be understood in terms of emotion, perception, self-consciousness, memory, and many other functions. The relationship between brain activity and religious/spiritual behavior may be diffuse and context-dependent; too much so, in fact, to build a neurotheology.

#### *The Relationship between Natural Law and Spiritual Activity*

In a brief *Newsweek* article, Kenneth Woodward commented that “... religion comprehends a whole range

of acts and insights that acknowledge a transcendent order without requiring a transcendent experience.”<sup>83</sup> While Woodward intended the article to address the distinction between religious feelings and a more full-orbed faith that expresses itself on a variety of levels, there is an assumption in his argument about the reality of a transcendent order.<sup>84</sup>

It can be argued that scientific investigations conducted in the context of neurotheology will, by definition, deal with the natural order of things. The question is, to what extent can a naturalistic understanding further our understanding of spiritual activity that is conceived as transcendent? Of course, one need not presume transcendence to be the correct position. There are a number of scholars today who argue instead for some version of a naturalistic understanding of religion. This is evident in a recent series of responses to Loyal Rue’s book, *Religion Is Not About God*.<sup>85</sup> The variety of positions on this issue can be seen among phrenologists, some of whom argued for religion to be viewed as part of our natural make-up while others argued for religion as something revealed by God. Some believed that the science of phrenology informed our understanding of religion. Others held that revelation informed phrenological understanding. And of course, some believed that phrenology provided a complete explanation of religion. We should expect to see the same range of positions among those engaged in neurotheological investigation and debate.<sup>86</sup> And, of course, those holding differing theological stances will be more comfortable with some, but not other, neurotheological positions.

## The Way Ahead

How might this review of phrenology help neurotheology avoid the kinds of errors that eventually brought phrenology into disrespect? This is important to consider while we keep an open mind about potential new insights regarding how our spirituality is both embodied in our physical make-up and, at the same time, embedded in a context of shared beliefs about the Transcendent. We suggest two main areas where caution is needed: careful attention to conceptualizing and operationalizing terms, and rigorous hypothesis testing.

Most investigators recognize the inherent difficulty in conceptualizing the theology portion of neurotheology. It will not do to simply refer to religious behavior or spirituality. At the same time,

# Article

## Neurotheology: Avoiding a Reinvented Phrenology

the results of investigations of mystical experience or artificially induced “spiritual experiences” may not tell us much about the day-to-day religious behavior and experiences of most people. We also need to recognize the conceptual difficulties on the “neuro” side of the relationship. Brain-imaging techniques have provided tremendous insights into brain functioning, but there are questions about what such techniques can tell us about cognitive functioning, especially complex functions.<sup>87</sup> For neurotheology to advance, it will have to be engaged in a careful, critical discussion about what its underlying methodologies and technologies can tell us.

The second area of concern is related to the first. Phrenology quickly became divorced from any serious attempts to ground its findings in rigorous hypothesis testing. New adherents to the discipline tacked their own observations onto previous systems with little or no regard for empirical verification. While current neurotheological investigations are based on empirical research, most currently have an observational and descriptive tone. Advances will accrue when carefully crafted hypotheses, capable of being disconfirmed, are put to the test.

There may be too much concern about whether empirical neuroscientific research on religious and spiritual activities will support either a transcendental theological, or an antitheological position. As shown by several investigators,<sup>88</sup> theoretical and even worldview assumptions are sometimes underdetermined by their empirical research base. To those concerned that neuroscientific research will undermine their faith position, we encourage them to explore the conceptual linkages between the empirical base and possible worldview positions. On the flip side, we caution those committed to an antitheological (and especially an antitranscendental) worldview that theirs may not be the only position which can be legitimately derived from the empirical record. Phrenology was adopted by Christians, deists, agnostics, and atheists. A variety of neurotheological positions may likewise result from the same empirical base. ★

### Notes

<sup>1</sup>For example, in 1664 the English anatomist Thomas Willis proposed that imagination was located in the corpus callosum while sensation and movement were situated in the corpus striatum (Thomas Willis, “*Cerebri anatome: cuius accessit nervorum descriptio et usus*,” in *Thomas Willis: The*

*Anatomy of the Brain and Nerves*, ed. J. Martyn and J. Allestry, Tercentenary ed., 1664–1964 [Montreal: McGill University Press, 1965]). A historical survey of brain anatomy and function can be found in Stanley Finger, *Origins of Neuroscience: A History of Explorations into Brain Function* (Oxford: Oxford University Press, 1994), 18–31.

<sup>2</sup>Gall accepted the labeling of the faculties from contemporary psychological teachings. Thus, relatively simple functions (as they then thought) such as vision, auditory memory, or orientation in space, were assigned to separate areas of the cortex. In addition, he localized such traits as “an instinct for the continuation of the race,” a “love of parents,” “sociability,” “courage,” “ambition,” etc. There was immediate opposition to some of Gall’s ideas of localization of function. The view that the brain is an aggregate of separate organs was rejected by some physiologists who supported an alternative localization theory. Previous to Gall, Albrecht von Haller (1708–1777), for example, while accepting that the brain is a single organ, had argued that it is composed of parts of equal importance. Half a century later, Pierre Flourens, in 1824 (Marie Jean Pierre Flourens, *Recherches expérimentales sur les propriétés et les fonctions du système nerveux, dans les animaux vertébrés*, 1st ed. [Paris: J. B. Ballière, 1824]. See also Marie Jean Pierre Flourens, *Recherches expérimentales sur les propriétés et les fonctions du système nerveux, dans les animaux vertébrés*, 2d ed. [Paris: J. B. Ballière, 1842]) based his alternative views on the results of his physiological experiments on animals. He noted that when isolated areas of the cerebral hemispheres of birds were destroyed, the behavior of the birds was nevertheless largely preserved and that there was approximately the same degree of recovery, whichever part of the cerebral hemispheres was destroyed.

<sup>3</sup>Owsei Temkin, “Gall and the Phrenological Movement,” *Bulletin of the History of Medicine* 21, no. 3 (1947): 275–321.

<sup>4</sup>Arguments for and against structural differentiation in the cerebral cortex were to continue over the following centuries and are still alive and well today. However, the localizationist views were to progress and prevail. When Flourens was publishing his antilocalization observations, Bouillaud, soon to become head of the Paris Medical School, argued from his observations on patients, that the principle of localization extended to more complex processes such as speech (J. Bouillaud, “Recherches cliniques propres à démontrer que la perte de la parole correspond à la lésion des lobules antérieurs du cerveau et à confirmer l’opinion de M. Gall, sur le siège de l’organe du langage articulé,” *Archives générales de médecine* VIII [1825]: 24–45; and J. Bouillaud, *Essai sur la philosophie médicale et sur les généralités de la clinique médicale* [Paris, 1836]). From then onwards, further reports, notably by Dax in 1836 (see H. W. Buckingham, “The Marc Dax (1770–1837)/Paul Broca (1824–1880) Controversy over Priority in Science: Left Hemisphere Specificity for Seat of Articulate Language and for Lesions That Cause Aphemia,” *Clinical Linguistics and Phonetics* 20, no. 7–8 [2006]: 613–9); and Broca in 1861 (see Paul Broca, “Remarques sur le siège de la faculté du langage articulé; suivies d’une observation d’aphémie (perte de la parole)” (Remarks on the seat of the faculty of articulate language, followed by an observation of aphemia) in G. von Bonin, trans., *Some Papers on the Cerebral Cortex* [Springfield, IL:

Charles C. Thomas, 1960], 49–72) followed by those of Wernicke in 1874 (see Carl Wernicke, “Der aphasische Symptomenkomplex: eine psychologische Studie auf anatomischer Basis,” in G. H. Eggert, trans., *Wernicke’s Works on Aphasia: A Sourcebook and Review* [The Hague: Mouton, 1977]), accumulated many more findings and observations to support the localizationist views. The results of these three workers were focused on the localization of speech and language mechanisms in the left hemisphere of the brain.

- <sup>5</sup>Franz J. Gall, *On the Functions of the Brain and of Each of Its Parts: With Observations on the Possibility of Determining the Instincts, Propensities, and Talents, or the Moral and Intellectual Dispositions of Men and Animals, by the Configuration of the Brain and Head* (Boston, MA: Capen and Lyon, 1835).
- <sup>6</sup>J. G. Spurzheim, *A View of the Philosophical Principles of Phrenology* (London, 1825, 1826, 1840).
- <sup>7</sup>George Combe, *The Constitution of Man Considered in Relation to External Objects* (London: Simpkin and Marshall, 1828).
- <sup>8</sup>Orson Fowler, *The Practical Phrenologist, and Recorder and Delineator of the Character and Talents ...: A Compendium of Phreno-Organic Science* (Boston, MA: 1869).
- <sup>9</sup>See John D. Davies, *Phrenology: Fad and Science – A 19th-Century American Crusade* (1955; Reprint, New Haven: Yale University Press, 1971).
- <sup>10</sup>J. van Wyhe, “Was Phrenology a Reform Science? Towards a New Generalization for Phrenology,” *History of Science* 42 (2004): 326. See also J. van Wyhe, “The Authority of Human Nature: The *Schädellehre* of Franz Joseph Gall,” *British Journal for the History of Science* 35, no. 124 (2002): 17–42.
- <sup>11</sup>Alister E. McGrath, “Enlightenment,” in *The Blackwell Encyclopedia of Modern Christian Thought*, ed. Alister E. McGrath (Oxford: Blackwell Publishing, 1993), 150.
- <sup>12</sup>John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (New York: Cambridge University Press, 1991).
- <sup>13</sup>Craig James Hazen, *The Village Enlightenment in America: Popular Religion and Science in the Nineteenth Century* (Chicago, IL: University of Illinois Press, 2000).
- <sup>14</sup>McGrath (“Enlightenment,” 150–6) has pointed out that the Enlightenment critique of Christianity had both general and specific aspects. At the general level, “an attitude of respect for the sciences, but condescension toward orthodox religion, was usually sustained by extolling the power of human reason” (Brooke, *Science and Religion*, 153). McGrath refers to this as the principle of the omniscience of human reason, arguing that it developed over several stages. Religious beliefs, being rational, could be critically examined and, in fact, could even be derived from reason itself, thus negating the need for divine revelation. Having thus attained this status, reason could judge religious beliefs and practices, eliminating irrational and superstitious elements. As we will see, one might argue that in neurotheology, the purported scientific “facts” related to neural functioning serve in the place of reason. “The concept of natural law provided another channel through which the achievements of science could be favorably compared with the effects of religious complacency” (McGrath, “Enlightenment,” 154.). As Brooke explains, the physical sciences provided the model for the development of law-like explanations in the study of social structures and human nature. The proposed dichotomy between scientific reason and religious superstition “was often expressed through the complaint that institutionalized Christianity was a perversion of *natural* religion—a rational religion that would have been common to all humanity had it not been for the interference of priests” (Brooke, *Science and Religion*, 163). Together these assumptions promoted negative and sometimes hostile critiques of institutionalized religion, religion that was viewed as irrational and bigoted.
- <sup>15</sup>Thomas Dixon, “Theology, Anti-Theology and Atheology: From Christian Passions to Secular Emotions,” *Modern Theology* 15, no. 3 (1991): 297–330; Gary Hatfield, “Psychology, Philosophy, and Cognitive Science: Reflections on the History and Philosophy of Experimental Psychology,” *Mind and Language* 17, no. 3 (2002): 207–32; Patrick McDonald, “Naturalistic Methodology in an Emerging Scientific Psychology: Lotze and Fechner in the Balance,” *Zygon* 43, no. 3 (2003): 605–25; Ronald L. Numbers, “Science without God: Natural Laws and Christian Beliefs,” in *When Science and Christianity Meet*, ed. David C. Lindberg and Ronald L. Numbers (Chicago, IL: The University of Chicago Press, 2003), 265–85.
- <sup>16</sup>Franz J. Gall, *On Innate Dispositions* (Paris: Schoell, 1811), 292. See also Robert W. Rieber, “The Multiplicity of the Brain, the Unity of the Soul and the Duality of the Mind: Can You Have It All the Way?” (paper presented at the International Society for the History of the Neurosciences, Providence, RI, June 2003), note 3.
- <sup>17</sup>Temkin, “Gall and the Phrenological Movement,” 279.
- <sup>18</sup>Robert Rieber has argued that Gall’s statement about God and the brain is an example of the neopanthestic worldview held by Gall. It is these views which clashed with those of the Catholic Church in Austria. The church primarily embraced a Thomistic theory of causation diametrically opposed to any kind of pantheistic theory of causation. The place of potential conflict between true dogma and Gall’s views is seen by Rieber as Gall’s assumption that “living bodies are the result of the union of the body and soul” (Gall, *On Innate Dispositions*, 47). This position, Rieber says, was in direct opposition to the church’s long-held dogma that placed the soul above any material object. This was important because of its pragmatic consequences, namely, pertaining to the notion of free will. Thus, the leaders of the church in Vienna saw Gall’s unified theory of mind-body as a threat to the notion of free will, especially as related to their responsibility to guide all Catholics toward a proper form of moral conduct. All of this leads Rieber to conclude, “. . . it is my opinion that Gall was struggling, either consciously or unconsciously, with how to reconcile a holistic, monistic, theoretical concept of the organism, with an elementalistic brain-mind faculty type of psychology” (Rieber, “The Multiplicity of the Brain, the Unity of the Soul and the Duality of the Mind,” 18). This struggle continues today in discussions of the nature of the soul. See, for example, Malcolm A. Jeeves, ed., *From Cells to Souls and Beyond: Changing Portraits of Human Nature* (Grand Rapids, IL: Wm. B. Eerdmans Publishing, 2004).
- <sup>19</sup>McDonald, “Naturalistic Methodology in an Emerging Scientific Psychology,” 605–25. For an argument advocating methodological naturalism for all scientists, regardless of religious commitments, see Patrick McDonald and Nivaldo

# Article

## Neurotheology: Avoiding a Reinvented Phrenology

J. Tro, "In Defense of Methodological Naturalism," *Christian Scholar's Review* 38, no. 2 (2009): 201–29.

<sup>20</sup>See Dixon, "Theology, Anti-Theology and Atheology," 297–330; and Numbers, "Science without God," 265–85 for a similar argument.

<sup>21</sup>Spurzheim, *A View of the Philosophical Principles of Phrenology*, 100–8.

<sup>22</sup>J. G. Spurzheim, *Phrenology, or the Doctrine of the Mental Phenomena* (Philadelphia, PA: 1838), 94.

<sup>23</sup>*Ibid.*, 97.

<sup>24</sup>Dixon, "Theology, Anti-Theology and Atheology," 299.

<sup>25</sup>George Combe's first phrenology book, *Essays on Phrenology, or an Inquiry into the Principles and Utility of the System of Drs Gall and Spurzheim, and into the Objections Made against It* (Edinburgh: Bell and Bradfute) appeared in 1819, with *Elements of Phrenology* (London: Simpkin and Marshall) published in 1824. Along with his brother Andrew and others, he established the Edinburgh Phrenological Society in 1820. Around 1826, Combe began presenting his views to the Society, and in 1828, he published his most famous work, *The Constitution of Man Considered in Relation to External Objects*. A heated controversy arose from those discussions that led to a split in the Society between the evangelical Christians in the group and those taking Combe's more deistic view. In 1847, Combe produced a pamphlet titled, "The Relation between Religion and Science." Years later, Combe revised and expanded this work to a full-length book which he published with the slight title change, *On the Relation between Science and Religion* (Edinburgh: Maclachlan and Stewart, 1857). Combe's other work dealing with science and religion, *An Inquiry into Natural Religion: Its Foundation, Nature, and Applications*, appeared in 1853 [not published, but confidentially communicated by the author].

<sup>26</sup>Combe, *On the Relation between Science and Religion*, 216–7.

<sup>27</sup>Combe, *An Inquiry into Natural Religion: Its Foundation, Nature, and Applications*, 173.

<sup>28</sup>*Ibid.*, 175.

<sup>29</sup>Charles Caldwell, *Thoughts on the True Connexion of Phrenology and Religion, in a Letter to the Editor of the American Phrenological Journal and Miscellany, in Philadelphia* (Louisville, KY: J. Maxwell Jr., 1839).

<sup>30</sup>Henry Clarke, *Christian Phrenology; or the Teachings of the New Testament Respecting the Animal, Moral, and Intellectual Nature of Man* (Dundee: Advertiser Office, 1835).

<sup>31</sup>Charles Cowan, *Phrenology Consistent with Science and Revelation* (London: Sherwood and Co., 1841).

<sup>32</sup>W. Easton, *The Harmony of Phrenology and Scripture on the Doctrine of the Soul* (Edinburgh: Printed for the Author by Dr. R. Collie and Son, 1867), 33.

<sup>33</sup>William Scott, *The Harmony of Phrenology with Scripture: Shewn in a Refutation of the Philosophical Errors Contained in Mr Combe's "Constitution of Man"* (Edinburgh: Fraser and Co., 1837), 6.

<sup>34</sup>*Ibid.*, 178.

<sup>35</sup>*Ibid.*

<sup>36</sup>Fowler was waiting to enter Lane Theological Seminary in the fall of 1833 in preparation for the ministry. That summer, however, he and classmate Henry Ward Beecher began lecturing on phrenology. The enterprising Orson gave character readings of his classmates' heads at two cents each. At the end of the summer and with forty dollars in his

pocket, Fowler abandoned the ministry of the church for the ministry of phrenology (Davies, *Phrenology: Fad and Science – A 19th-Century American Crusade*, 31–2). Nathan Hatch has pointed out that deep and powerful undercurrents of democratic Christianity distinguish the United States from other modern industrial democracies. These currents insured that churches did not withhold faith from the rank and file. Instead, religious leaders challenged them to think, to interpret Scripture, and to organize the church for themselves. Religious populism, reflecting the passions of ordinary people and the charisma of democratic movement-builders, remains among the oldest and deepest impulses in American life (Nathan O. Hatch, *The Democratization of American Christianity* (New Haven, CT: Yale University Press, 1989), 5. See also Christopher G. White, "Minds Intensely Unsettled: Phrenology, Experience, and the American Pursuit of Spiritual Assurance, 1830–1880," *Religion and American Culture: A Journal of Interpretation* 16, no. 2 (2006): 227–61.

<sup>37</sup>Orson Fowler, *Religion; Natural and Revealed: or, the Natural Theology and Moral Bearings of Phrenology and Physiology, etc.* (New York: Fowler and Wells, 1844), 95.

<sup>38</sup>In 1843 he published *The Christian Phrenologist* with the alternative title *The Natural Theology and Moral Bearings of Phrenology; Its Aspect on, and Harmony with Revelation. Religion; Natural and Revealed*, published by Fowler in 1844, was written in a flowery evangelical style. And while he argues that phrenology provides the strongest arguments in favor of an immaterial soul, this spiritual aspect of human nature is to be understood in the same sense as having "a friendly nature, or an observing nature, or a moving nature" (p. 117). The mind, for Fowler, is known only as it manifests itself and acts by means of the phrenological organs. Natural religion (as discovered by the science of phrenology) uncovers our moral nature. Revealed religion (as discerned from Scripture) builds on this foundation "a system of doctrines and conditions of salvation" (p. 21).

<sup>39</sup>V. Ramachandran, W. Hirstein, K. Narmel, E. Tecoma, and V. Iragui, "The Neural Basis of Religious Experience" (paper presented at the annual conference of The Society for Neuroscience, New Orleans, LA, October 25–30, 1997): 23.

<sup>40</sup>Steve Connor, "'God Spot' Is Found in Brain," *LA Times*, October 29, 1997, [http://cas.bellarmine.edu/tietjen/images/new\\_page\\_2.htm](http://cas.bellarmine.edu/tietjen/images/new_page_2.htm) (last accessed September 2, 2010).

<sup>41</sup>Some recent, more narrowly focused work provides welcome exceptions. For example, see Andrea Hollingsworth, "Implications of Interpersonal Neurobiology for a Spirituality of Compassion," *Zygon* 43, no. 4 (2008): 837–60; Brick Johnstone and Bret A. Glass, "Support for a Neuropsychological Model of Spirituality in Persons with Traumatic Brain Injury," *Zygon* 43, no. 4 (2008): 861–74; and the discussion below of Peter Brugger's work.

<sup>42</sup>Matthew Ratcliffe, "Neurotheology: A Science of What?" in *Where God and Science Meet: How Brain and Evolutionary Studies Alter Our Understanding of Religion*, ed. Patrick McNamara (Westport, CT: Praeger, 2006), 81–104; Warren S. Brown, "The Brain, Religion, and Baseball: Comments on the Potential for a Neurology of Religion and Religious Experience," in *Where God and Science Meet*, ed. McNamara, 229–244.

- <sup>43</sup>F. Tremblay, an interview with Matthew Alper, posted July 1, 2003, [www.suite101.com/article.cfm/rational\\_spirituality/101114/1](http://www.suite101.com/article.cfm/rational_spirituality/101114/1) (last accessed September 2, 2010).
- <sup>44</sup>There is a danger, however, in assuming that these brain images provide the same type of evidential devices as normal photographs. As Roskies states, "We do not 'see through' the visual properties of neuroimages to the visual properties of their subjects; we do not understand the causal and counterfactual relationships between the images and the data they represent to the same extent that we understand them with photography." Adina L. Roskies, "Are Neuroimages like Photographs of the Brain?" *Philosophy of Science* 74 (2007): 871.
- <sup>45</sup>Carol R. Albright and James B. Ashbrook, *Where God Lives in the Human Brain* (Naperville, IL: Sourcebooks, 2001), 164.
- <sup>46</sup>Julia Keller, "Brushes with Death Transform Life and the Brain," *Science and Theology Research News* (June 2004): 8.
- <sup>47</sup>Muramoto Osamu, an interview on "Cortex Keeps Time in the Brain's Religious Orchestra," *Science and Theology Research News* (June 2004): 9.
- <sup>48</sup>C. Stawski and M. Beauregard, "Spiritual Transformation Q&A: Mario Beauregard," *The Global Spiral* (March 1, 2004): [www.metanexus.net/Magazine/ArticleDetail/tabid/68/id/10321/Default.aspx](http://www.metanexus.net/Magazine/ArticleDetail/tabid/68/id/10321/Default.aspx) (last accessed September 2, 2010)
- <sup>49</sup>Jerome Groopman, "God on the Brain," *The New Yorker* (September 17, 2001): 168.
- <sup>50</sup>Ibid.
- <sup>51</sup>Ibid.
- <sup>52</sup>Ibid.
- <sup>53</sup>Numbers, "Science without God: Natural Laws and Christian Beliefs," 281.
- <sup>54</sup>"God Experiences are transient phenomena that are loaded with emotional references. The nature of the experiences is influenced by the specific portion of the brain from which they originate. God Concepts are determined by verbal conditioning" (Michael A. Persinger, *Neuropsychological Bases of God Beliefs* [New York: Greenwood Press, 1987], 1).
- <sup>55</sup>D. M. Bear and P. Fedio, "Quantitative Analysis of Interictal Behavior in Temporal Lobe Epilepsy," *Archives of Neurology* 34 (1977): 454-67.
- <sup>56</sup>However, see D. M. Tucker, R. A. Novelly and P. J. Walker, "Hyperreligiosity in Temporal Lobe Epilepsy: Redefining the Relationship," *Journal of Nervous and Mental Disease* 175, no. 3 (1987): 181-4.
- <sup>57</sup>There is, however, some ambiguity on this point since Persinger also asserts that TLTs can arise in normally healthy individuals.
- <sup>58</sup>Michael A. Persinger, "Religious and Mystical Experiences as Artifacts of Temporal Lobe Function: A General Hypothesis," *Perceptual and Motor Skills* 57 (1983): 1255-62; Michael A. Persinger, "The Sensed Presence within Experimental Settings: Implications for the Male and Female Concept of Self," *The Journal of Psychology* 137, no. 1 (2003): 5-16; L. S. St.-Pierre and M. A. Persinger, "Experimental Facilitation of the Sensed Presence Is Predicted by the Specific Patterns of the Applied Magnetic Fields, Not by Suggestibility: Re-analyses of 19 Experiments," *International Journal of Neuroscience* 116 (2006): 1079-96.
- <sup>59</sup>Eugene G. d'Aquili and Andrew B. Newberg, *The Mystical Mind: Probing the Biology of Religious Experience* (Minneapolis, MN: Fortress Press, 1999).
- <sup>60</sup>Based on their model, which was originally developed to explain mystical experiences in general, they propose expanding their neurotheology into a metatheology. While devoid of specific theological content, this metatheology provides the rules by which any given theology can be generated. And finally, they use their neurotheology to construct the outlines for a megatheology which would contain most of the key elements of the world's major religions. From the functioning of the fight-or-flight response of the autonomic nervous system and association areas of the neocortex to a theology of theologies, this is the scope of *The Mystical Mind*.
- <sup>61</sup>Michael Gazzaniga, *The Social Brain: Discovering the Networks of the Mind* (New York: Basic Books, 1985). Writing about the "inevitability of religious beliefs," Gazzaniga proposed systems of the brain that are built to interpret events around us, and systems that provide the capacity for magical thinking. In some not-so-obvious manner, unexplained happenings are processed through these systems and the result is religious belief.
- <sup>62</sup>For additional comments on neurotheology by d'Aquili and Newberg, see "The Neuropsychological Basis of Religions, or Why God Won't Go Away," *Zygon* 33, no. 2 (1998): 187-201; "The Neuropsychology of Aesthetic, Spiritual, and Mystical States," *Zygon* 35, no. 1 (2000): 39-51; "The Creative Brain/the Creative Mind," *Zygon* 35, no. 1 (2000): 53-68; Newberg, "Putting the Mystical Mind Together," *Zygon* 36, no. 3 (2001): 501-7; Newberg and Bruce Y. Lee, "The Neuroscientific Study of Religious and Spiritual Phenomena: or Why God Doesn't Use Biostatistics," *Zygon* 40, no. 2 (2005): 469-89; Newberg, "Religious and Spiritual Practices: A Neurochemical Perspective," in *Where God and Science Meet*, ed. McNamara, 15-31.
- <sup>63</sup>L. R. R. Gianotti et al., "Associative Processing and Paranormal Belief," *Psychiatry and Clinical Neurosciences* 55 (2001): 595-603.
- <sup>64</sup>P. Brugger et al., "Functional Hemispheric Asymmetry and Belief in ESP: Towards a Neuropsychology of Belief," *Perceptual and Motor Skills* 77 (1993): 1299-308.
- <sup>65</sup>P. Brugger et al., "Meaningful Patterns in Visual Noise: Effects of Lateral Stimulation and the Observer's Belief in ESP," *Psychopathology* 26 (1993): 261-5.
- <sup>66</sup>D. Pizzagalli et al., "Brain Electric Correlates of Strong Belief in Paranormal Phenomena: Intracerebral EEG Source and Regional Omega Complexity Analyses," *Psychiatry Research: Neuroimaging Section* 100 (2000): 139-54.
- <sup>67</sup>Recently, Brugger has summarized much of his research on this topic in his article, "Tracking a Finer Madness," *Scientific American Mind* 18, no. 5 (2007): 76-9.
- <sup>68</sup>Ibid., 76.
- <sup>69</sup>J. Maltby et al., "Religious Orientation and Schizotypal Traits," *Personality and Individual Differences* 28 (2000): 143-51; E. Peters, "Are Delusions on a Continuum? The Case of Religious and Delusional Beliefs," in *Psychosis and Spiritual-ity: Exploring the New Frontier*, ed. I. Clarke (London: Whurr Publishers, 2001), 191-207; M. Jackson and K. W. M. Fulford, "Spiritual Experiences and Psychopathology," *Philosophy, Psychiatry, and Psychology* 4, no. 1 (1997): 41-65.
- <sup>70</sup>M. Beauregard and D. O'Leary, *The Spiritual Brain: A Neuroscientist's Case for the Existence of the Soul* (New York: HarperOne, 2007), xvi.

# Article

## Neurotheology: Avoiding a Reinvented Phrenology

- <sup>71</sup>The nuns were not actually engaged in a mystical experience but were instructed to remember and re-live a mystical experience.
- <sup>72</sup>To be sure they found, as have others, significant activity in the temporal lobe. But they also report significant activity in the inferior parietal lobule, caudate nucleus, left brain stem, visual cortex, left anterior cingulate cortex, right medial prefrontal cortex, left insula, right superior parietal lobule, right medial orbitofrontal cortex, and right middle temporal cortex.
- <sup>73</sup>M. Beauregard and V. Paquette, "Neural Correlates of a Mystical Experience in Carmelite Nuns," *Neuroscience Letters* 405 (2006): 186–90; M. Beauregard et al., "The Neurobiology of the Mystical Experience: A Quantitative EEG Study" (paper presented at the annual conference of the Society for Neuroscience, San Diego, CA, October 23–27, 2004).
- <sup>74</sup>Beauregard and O'Leary, *The Spiritual Brain*, 272.
- <sup>75</sup>Research has been conducted with patients with obsessive-compulsive disorder: J. M. Schwartz et al., "Systematic Changes in Cerebral Glucose Metabolic Rate after Successful Behavior Modification Treatment of Obsessive-Compulsive Disorder," *Archives of General Psychiatry* 53 (1996): 109–13; healthy young men suppressing sexual arousal: M. Beauregard, J. Lévesque and P. Bourgouin, "Neural Correlates of Conscious Self-Regulation of Emotion," *Journal of Neuroscience* 21, RC165 (2001): 1–6 and M. Beauregard, J. Lévesque and V. Paquette, "Neural Basis of Conscious and Voluntary Self-Regulation of Emotion," in *Consciousness, Emotional Self-Regulation and the Brain*, ed. M. Beauregard (Amsterdam: John Benjamins, 2004), 163–94; healthy adult women experiencing sadness: J. Lévesque et al., "Neural Circuitry Underlying Voluntary Suppression of Sadness," *Biological Psychiatry* 53 (2003): 502–10; children experiencing sadness: J. Lévesque et al., "Neural Basis of Emotional Self-Regulation in Childhood," *Neuroscience* 129 (2004): 361–9; spider phobia sufferers: V. Paquette et al., "Change the Mind and You Change the Brain: Effects of Cognitive-Behavioral Therapy on the Neural Correlates of Spider Phobia," *Neuroimage* 18, no. 2 (2003): 401–9; Parkinson's patients given placebo treatment for tremor relief: R. de la Fuente-Fernández et al., "Expectant and Dopamine Release: Mechanism of the Placebo Effect in Parkinson's Disease," *Science* 293 (August 10, 2001): 1164–6; and healthy adult men given placebo treatment for experimentally induced pain: T. D. Wager et al., "Placebo-Induced Changes in fMRI in the Anticipation and Experience of Pain," *Science* 303, no. 5661 (2004): 1162–7.
- <sup>76</sup>Beauregard and O'Leary, *The Spiritual Brain*, 150.
- <sup>77</sup>S. Zola-Morgan, "Localization of Brain Function: The Legacy of Franz Joseph Gall (1758–1828)," *Annual Review of Neuroscience* 18 (1995): 371.
- <sup>78</sup>K. Makarec and M. A. Persinger, "Temporal Lobe Signs: Electroencephalographic Validity and Enhanced Scores in Special Populations," *Perceptual and Motor Skills* 60 (1985): 831–42; K. Makarec and M. A. Persinger, "Electroencephalographic Validation of a Temporal Lobe Signs Inventory in a Normal Population," *Journal of Research in Personality* 24 (1990): 323–37; M. A. Persinger and L. Makarec, "Complex Partial Epileptic-Like Signs as a Continuum from Normals to Epileptics: Normative Data and Clinical Populations," *Journal of Clinical Psychology* 49 (1993): 33–45.
- <sup>79</sup>W. S. Brown and C. Caetano, "Conversion, Cognition and Neuropsychology," in *Handbook of Conversion*, ed. H. N. Malony and S. Southard (Birmingham, AL: Religious Education Press, 1992), 147–58.
- <sup>80</sup>Steven C. Schachter, "Religion and the Brain: Evidence from Temporal Lobe Epilepsy," in *Where God and Science Meet*, ed. McNamara, 171–88.
- <sup>81</sup>See J. L. Saver and J. Rabin, "The Neural Substrates of Religious Experience," *The Journal of Neuropsychiatry and Clinical Neurosciences* 9 (1997): 498–510.
- <sup>82</sup>N. P. Azari et al., "Neural Correlates of Religious Experience," *European Journal of Neuroscience* 13 (2001): 1649–52. See also N. P. Azari, "Neuroimaging Studies of Religious Experience: A Critical Review," in *Where God and Science Meet*, ed. McNamara, 33–54.
- <sup>83</sup>K. Woodward, "Faith Is More than a Feeling: The Problem with Neurotheology Is That It Confuses Spiritual Experiences—Which Few Believers Actually Have—with Religion," *Newsweek* (May 7, 2001): 58.
- <sup>84</sup>Transcendence, in religion, refers to that which is beyond physical existence. God may be said to be transcendent in the sense that God is independent of and beyond the physical reality in which we live. Two other theological positions have also been proposed: immanentism, in which the divine exists within the physical or natural order, and pantheism, where the divine is indistinguishable from the natural order. It should be clear that the position one holds will greatly influence how one conceptualizes the relationship between natural law and spiritual activity.
- <sup>85</sup>Loyal Rue, *Religion Is Not About God: How Spiritual Traditions Nurture Our Biological Nature and What to Expect When They Fail* (New Brunswick, NJ: Rutgers University Press, 2005). For responses to Rue's thesis, see Donald M. Braxton, "Religion is Not About God—Responding to Loyal Rue," *Zygon* 42, no. 2 (2007): 317–41; David E. Klemm, "Religious Naturalism or Theological Humanism?" *Zygon* 42, no. 2 (2007): 357–67; Leslie Marsh, "Taking the Super out of the Supernatural," *Zygon* 42, no. 2 (2007): 343–56; and William A. Rottschaefer, "Mythic Religious Naturalism," *Zygon* 42, no. 2 (2007): 369–408.
- <sup>86</sup>These distinctions have led to debates about whether spiritual activity should be regarded as a way of perceiving, a way of experiencing, or a way of behaving. In so far as "spirituality" is a fundamental aspect of religion, these distinctions bring to mind Bartlett's Riddell Memorial lectures entitled "Religion as Experience, Action and Belief" in which he argues that there is evidence that religion in all its variety and richness at times includes all of these. Studies such as the one by Azari (see note 82) argue that religious experience (at least the recitation of religious texts), rather than being an immediate affective event, is a cognitive event involving the reflexive evaluation of thought. Most researchers seem to define spirituality or religiosity either in affective terms or in terms of how we interpret the world.
- <sup>87</sup>For differing views on the ability of brain imaging techniques to elucidate cognitive functioning, see M. Brett, I. S. Johnsrude and A. M. Owen, "The Problem of Functional Localization in the Human Brain," *Nature Reviews: Neuro-*

science 3 (2002): 243–9; David Dobbs, “Fact or Phrenology?” *Scientific American Mind* 16, no. 1 (2005): 24–31; David I. Donaldson, “Parsing Brain Activity with fMRI and Mixed Designs: What Kind of State Is Neuroimaging In?” *Trends in Neuroscience* 27, no. 8 (2004): 442–4; Karl Friston, “Beyond Phrenology: What Can Neuroimaging Tell Us about Distributed Circuitry?” *Annual Review of Neuroscience* 25 (2002): 221–50; John-Dylan Haynes and Geraint Rees, “Decoding Mental States from Brain Activity in Humans,” *Nature Reviews: Neuroscience* 7 (2006): 523–34; D. J. Heeger and D. Ress, “What Does fMRI Tell Us about Neuronal Activity?” *Nature Reviews: Neuroscience* 3 (2002): 142–51; S. M. Kosslyn, “If Neuroimaging Is the Answer, What Is the Question?” *Philosophical Transactions of the Royal Society of London B* 354 (1999): 1283–94; N. K. Logothetis and B. A. Wandell, “Interpreting the BOLD Signal,” *Annual Review of Physiology*

66 (2004): 753–69; C. B. Nemeroff, C. D. Kilts, and G. S. Burns, “Functional Brain Imaging: Twenty-First Century Phrenology or Psychobiological Advance for the Millennium?” *American Journal of Psychiatry* 156, no. 5 (1999): 671–3; R. A. Poldrack and A. D. Wagner, “What Can Neuroimaging Tell Us about the Mind? Insights from the Prefrontal Cortex,” *Current Directions in Psychological Science* 13, no. 5 (2004): 177–81; and William R. Uttal, *The New Phrenology: The Limits of Localizing Cognitive Processes in the Brain* (Cambridge, MA: MIT Press, 2001).

<sup>88</sup>For early emotion research, see Dixon, “Theology, Anti-Theology and Atheology: From Christian Passions to Secular Emotions,” 297–330; and for early psychophysics research, see McDonald, “Naturalistic Methodology in an Emerging Scientific Psychology,” 605–25.

## Note from the Editor

I am pleased to present a tabular breakdown of the articles submitted to *PSCF* during the period from August 1, 2009 through July 31, 2010.

### Statistics: August 1, 2009–July 31, 2010

Articles and Communications	Total Submitted	Accepted	Pending	Rejected	Submitted by ASA/CSCA	Accepted from ASA/CSCA
Apologetics	1	0	0	1	0	0
Biology	2	1	0	1	2	1
Computers/AI	1	0	0	1	0	0
Cosmology	1	0	0	1	0	0
Design/ID	5	2	1	2	3	2
Environment	5	0	0	5	1	0
Evolution	6	0	1	5	4	0
Mathematics	2	0	0	2	0	0
Medicine	3	0	0	3	1	0
Philosophy	2	0	0	2	2	0
Physical Science	7	1	2	4	3	1
Sci/Rel/HOS	7	3	0	4	4	2
Social Sciences	12	6	0	6	5	4
Theology	16	4	1	11	6	1
Scripture/Science	3	0	0	3	2	0
YEC/Flood	1	1	0	0	1	1
Essay Review	2	2	0	0	2	2
<b>Totals</b>	<b>76</b>	<b>20 (26.3%)</b>	<b>5 (6.6%)</b>	<b>51 (67.1%)</b>	<b>36 (47.4%)</b>	<b>14 (18.4%)</b>

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