

Neurotheology: Confirming the Existence of a Naturally Mystical Mind

FLORENTINE RUTAGANIRA



***WRITER'S COMMENT:** In Dr. Evan Fletcher's course IST&A: The Study of Consciousness, I was confronted with an interesting term paper topic: Neurotheology. In an era of numerous scientific advancements, many people believe that the truth behind religion will finally come out. One of the proposed methods is neurotheology, which attempts to explain recent connections between neurophysiology and spirituality. Although I am very interested in science, I am also a devout Christian. This term paper topic put my faith to the test. While writing this paper, I was confronted with many interesting approaches to confirming the notion of a human mind. Although some were ingenious, others were downright ridiculous. In the end, I concluded that it is possible for science and religion to coexist. Neurotheology may be able to prove that the human mind is naturally mystical. However, science cannot prove or disprove the existence of God.*



—Florentine Rutaganira

Instructor's Comment: In some ways, neuroscience and religion mix like oil and water. The traditional dualistic notion that we possess a soul and a body has largely been rejected by neuroscientists, who seek an explanation of consciousness as arising from the brain. Nonetheless, there has been recent research into the relationship between brain processes and religious or mystical experiences, and as Flora says in her introduction, this has become an active subfield of neuroscience. Neuroscientists Newberg and D'Aquili investigated the changing blood flow patterns in the brains of meditators, and found that feelings of transcendence and unity with the world seem to be associated with decreased flow to a specific area of the brain. They further made the bold—and controversial—hypothesis that this brain change does not necessarily mean the mystical experience is “all in the brain”: perhaps it

actually enables us to apprehend an alternate reality. Other researchers have noted that epileptic attacks seem to induce religious experiences and have even sought to artificially induce these experiences by applying fluctuating magnetic fields to localized brain areas. Such research has been interpreted to mean that these religious episodes really are just brain episodes—taking the opposite interpretation from Newberg and D’Aquili. Flora does a nice job of balancing these points of view. She concludes by saying that religious experience is built into our brain wiring. But the question of God remains a matter of faith.

—Evan Fletcher, *Integrated Studies*



ALTHOUGH VERY CONTROVERSIAL IN NATURE, neuroscience and the study of consciousness has become a hot topic. Specifically, neuroscience has recently attempted to answer David Chalmers’s so-called “hard problem”: how do physical processes in the brain give rise to subjective experience?¹ Although many neuroscientists have attempted to solve this problem, their efforts have been futile; only variations of the “hard problem” have resulted. The current driving force of neuroscience is the Neural Correlates of Consciousness (NCC) approach,² which sidesteps the hard problem by looking for brain structures that are reliably associated with consciousness, recognizing that it is still difficult to explain how the structures may be causal to conscious experience. However, endeavors in this area have not been able to completely solve the problem. It may be necessary for neuroscience to look at another phenomenon in order to solve the question of consciousness: the perseverance of spirituality in the midst of a scientific era.

In an age of continuous scientific advancements, one would expect to observe a decrease in interest of spirituality. Surprisingly, spirituality remains common in contemporary life. Ninety-five percent of Americans believe in God, ninety percent pray or meditate, eighty-two percent believe that God performs miracles, and seventy percent believe in life

¹Susan Blackmore, *Consciousness: An Introduction*, (New York: Oxford UP, 2004) 21.

²Neural correlates of consciousness (NCC) is an approach that Francis Crick and Christof Koch have used as a framework to eventually explain consciousness. NCC is defined as the minimal set of mechanisms jointly sufficient for a conscious percept.

after death.³ Consequently, many have come to believe that the human mind is naturally mystical, and religion provides a way to explain mystical experiences. In an effort to explain the relatively recent connections of neurophysiology and spirituality, neurotheology was born. Today, neurotheology is emerging as one of the dominant fields in neuroscience. As in the study of NCCs, which connect brain regions with states of consciousness, neurotheologians have attempted to associate brain regions with spiritual awareness. Although confirming the existence of God may be beyond reach, through research in areas such as imaging scans, seizures, psychedelic drugs, and twin studies, neurotheologians will discover the molecular alterations in the brain that underlie spiritual experiences, and in effect, confirm the notion of a mystical mind intrinsic to every human being.

One approach of neurotheology observes patterns in the brain that occur during peaks of spiritual awareness. Two pioneers in this method are Andrew Newberg and Eugene D'Aquilli. In *Why God Won't Go Away*, they analyze their findings with SPECT scans of the brain in heightened states of spiritual awareness. SPECT scans enable Newberg and D'Aquilli to create a more relaxing experience for the subject. As opposed to lying on a table and being inserted into an MRI scanner, the subject is able to relax in an examination room. At the peak moment of his spiritual experience, the subject pulls on a kite string, which notifies Newberg and D'Aquilli in an adjacent room to inject radioactive material into a long intravenous line that runs into the subject's left arm. After the subject finishes his spiritual experience, he is placed on a metal table where a SPECT camera scans the inside of his head by detecting the radioactive fluid, and creates an accurate freeze frame of blood flow patterns just moments after injection—at the peak of spiritual awareness. Increased blood flow to a specific part of the brain correlates with heightened activity in that particular area. Throughout the years, Newberg and D'Aquilli have compiled numerous SPECT scans of advanced spiritual people such as Franciscan nuns and Tibetan monks. In virtually every case, the SPECT scans show a sharp reduction of activity in the orientation association area, or OAA⁴, located in the posterior superior parietal lobe.. Through lesion studies, neuroscientists have been able to

³Dean Hamer, *The God Gene: How Faith is Hardwired into Our Genes*, (New York: Doubleday, 2004) 4.

⁴Newberg et al. 3–7.

determine the function of the OAA: by using the senses, it draws a sharp distinction between the individual and the rest of the universe.⁵ When blood flow is diminished to the OAA, the individual loses the distinction between the world and himself, and perceives that he is one with the world, an experience commonly felt by the spiritually advanced.⁶ Although their experiment appears to explain the connection of the OAA with spirituality, Newberg and D’Aquilli’s approach has many critics. In *Rational Mysticism*, John Horgan criticizes their experimental setting. Some subjects find the intravenous needles uncomfortable, and they have to remain self-conscious enough to remember to pull the sting when they reach what is supposed to be their deepest state of awareness. In addition, a SPECT scan only provides a single snapshot of the brain; it cannot reveal all the complex changes that take place during a session of meditation or prayer.⁷ Although John Horgan and others discredit Newberg and D’Aquilli’s approach to connecting spirituality and consciousness, numerous SPECT tests have shown consistent patterns of decreased blood flow to the OAA. It appears that the OAA is relevant to brain patterns that occur during peaks of spiritual awareness.

Through studies of epileptic seizures, neuroscientists have also credited the temporal lobe, particularly the left temporal lobe, with the neural connection to spirituality. Specifically, when the brain is disrupted by a head injury, epileptic seizure, stroke, drugs, psychological trauma or external electromagnetic pulses, our left brain self may detect activity in the right hemisphere as another self or a “sensed presence.” In addition, the left temporal lobe is also important for speech recognition. Common to many spiritual states is the misattribution of one’s inner speech to something outside oneself. During this experience, the brain’s Broca’s area switches on. Due to the lack of sensory information during spiritual practices such as meditation, one perceives the voice as coming from an external source.⁸ Our circumstances and religious backgrounds shape this

⁵Susan Begley, *Religion and the Brain*, May 2001, 1 December 2006, <https://geckomail.ucdavis.edu/read.php?read=5&attachment_num=2&attachment_action=2>.

⁶Andrew Newberg et al., *Why God Won’t Go Away: Brain Science and the Biology of Belief*, (New York: Ballantine Books, 2001) 3–7, 28.

⁷John Horgan, *Rational Mysticism*, (New York: Houghton Mifflin Company, 2003) 80.

⁸Sharon Begley, *Religion and the Brain*.

external source as coming from extraterrestrials, ghosts, angels, fairies, muses, demons or God Almighty.⁹ Some types of temporal lobe epilepsy can trigger spontaneous, hallucinatory events that strongly resemble the experiences described by mystics. Many neuroscientists have gone so far as to diagnose history's greatest mystics as victims of epileptic seizures: Mohammed, St. Paul, Joan of Arc, Saint Theresa of Avila, Joseph Smith, Emanuel Swedenborg, Vincent Van Gogh.¹⁰ V.S. Ramachandran, a neuroscientist at the University of California, San Diego, stands firmly in this camp. One of his patients, Paul, is a "text book case" of temporal-lobe syndrome. Paul was a 32-year-old epileptic who obsessively talked and wrote about religious subjects. During his seizure he described feelings of "oneness with the creator" that carried over into the rest of his life.¹¹ Although it is drastic to state that all spiritual persons have temporal lobe epilepsy, the temporal lobe may play an important role in generating spiritual states.

In an effort to experimentally confirm the connections of the temporal lobe with spirituality, Michael Persinger, a psychologist at Laurentian University in Sudbury, Canada, proposed a machine for inducing spirituality called the "God Machine." He presumes that anomalous electromagnetic fluctuations can trigger disturbances resembling epileptic seizures. These "micro seizures" can generate a wide range of altered states, including religious and mystical visions, out of body experiences, and even alien-abduction episodes. The latest version of the God machine is the Octopus. It consists of a Velcro headband with 8 electrified magnets or solenoids that encircle the head and deliver computer-controlled electromagnetic pulses to specific regions of the brain.¹² Forty percent of Persinger's subjects "sense a presence" while they are being stimulated compared to 15 percent of a control group. However, Persinger's work merits much skepticism. Media coverage has implied much more dramatic results than Persinger's papers support.¹³ Consequently, his experiment does not provide much evidence for the theory that temporal lobe excitation can cause mystical visions in healthy subjects. Nevertheless, Persinger remains confident in his study; he credits the Octopus as the

⁹Horgan 92–2.

¹⁰Newberg et al. 111.

¹¹Horgan 89–90.

¹¹Horgan 92, 97.

¹³Horgan 98–9.

prototype of a God machine that will be able to evoke spirituality in non-spiritual subjects.¹⁴ However, creating a God machine that can produce the large-scale disturbances that occur during epileptic seizures may not be possible, due to ethical and moral issues surrounding the topic.

In recent years, psychedelic drugs and their effects on the brain have enabled neuroscience to observe different states of mental awareness, which some equate with spirituality. Many studies, such as the Good Friday experiment, have analyzed drugs' effects on the brain. In one study, 36 volunteers were given either psilocybin or a comparable drug, methylphenidate hydrochloride, a drug most commonly known as Ritalin. In a questionnaire following the session, more than 22 subjects described the effects of psilocybin in ways that met criteria for a full mystical experience according to established psychological scales. However, when the subjects took methylphenidate hydroxide, only 4 of the 36 reported satisfactory results. In a two-month follow up, two-thirds of the individuals rated the experience with psilocybin as either the singly most spiritually significant in their lives, or among their top five. The positive results of the study prompted Professor David Nichols of the Purdue University School of pharmacy to say that it is likely that psilocybin triggers the same neurological process that produces spiritual experiences during fasting, meditation, sleep deprivation or near-death experiences.¹⁵ Drugs such as LSD and psilocybin have been credited with the ability to induce spiritual states in non-spiritual persons. The dramatic effects of drugs on the brain have prompted some neuroscientists such as Albert Hofmann to radically conclude that our deepest spiritual convictions may be nothing more than fluctuations in brain chemistry.¹⁶

Due to the widespread nature of spiritual practice, neurotheologians theorize that spirituality is a product of evolution, and is therefore passed through generations genetically. Since spirituality, as a first person subjective experience, can only be described through observed behavior, behavior genetics is the proper method to use when determining whether spirituality is a genetic trait. Robert Cloninger, a physician-scientist at Washington University School of Medicine in St. Louis, developed a self-

¹⁴Horgan 91.

¹⁵Judy Skatsooon, *Health & Medical News – Magic Mushrooms Hit the God Spot*, 12 July 2006, 8 December 2006, <http://www.abc.net.au/science/news/health/HealthRepublish_1682610.htm>

¹⁶Horgan 156.

transcendence scale which grew out of a system of personality classification called the biosocial model. The self-transcendence scale attempts to separate one's spirituality from one's religious beliefs by avoiding questions about beliefs in a particular God.¹⁷ Many studies of behavior genetics have relied on Cloninger's self-transcendence scale in compiling data.

Today, twin studies dominate research in behavior genetics. Heritability is defined as the percent variation in a behavior due to genetic differences. Heritability can be most directly approximated by comparing identical twins separated at birth and raised apart. Therefore, one can determine whether the environment has an effect on observed behavior.¹⁸ In behavior genetics, the environment is defined as anything and everything that is not inherited as DNA.¹⁹ Unfortunately, due to the scarcity of identical twins separated at birth, it is hard to compile an adequate amount of data. Consequently, behavior genetics also uses data from fraternal twins and siblings separated at birth. Due to differences in genetic makeup, similarity in identical twins would be twice as great as fraternal twins. The Australian National Health and Medical Research Council Twin Registry mailed a health and lifestyle questionnaire focusing on twins over 50 years of age. Self-transcendence was assessed using fifteen questions from Cloninger's TCI inventory. They found that genes played an important role in self-transcendence. For males, the self-transcendence scores were similar for 40% in identical twins and 18% for fraternal twins. For females, scores were similar for 49% of identical twins and 26% of fraternal twins.²⁰ This is consistent with the genetic makeup of identical twins being twice that of fraternal twins. One would expect that self-transcendent scores for siblings would be much less than those for twins. However, in Dean Hamer's study of siblings, self-transcendent scores for a group of 447 pairs of siblings was 37%, regardless of age, sex, or race.²¹ These results were much higher than expected from the heritability calculated from the Australian study. Through results from twin studies and sibling studies, there appears to be a property of spirituality that is heritable.

¹⁷Hamer 10.

¹⁸Hamer 40.

¹⁹Hamer 47.

²⁰Hamer 45, 47.

²¹Hamer 53.

In addition to heritability, studies have also investigated the importance of shared environment versus unique environment. Shared environment consists of everything that both twins experienced by growing up in the same household, such as general parenting style, income level, social class, schooling, and religious upbringing.²² The twin data on self-transcendence establishes the importance of unique environment. In the univariate statistical model, the unique environment accounts for 48 to 52 percent of variance in men and women respectively and the shared environment accounts for zero. In the multivariate model, unique environment accounts for 42 to 50 percent variance in men and women, and shared environment remains insignificant.²³ These data imply that spirituality, measured in terms of self-transcendence, does not result from outside influences. All of these influences are present in the twins' shared environment, but the twins have different self-transcendence scores. The irrelevance of shared environment to spirituality is quite contrary to popular thought which claims that children learn to be spiritual from outside influences such as their parents, teachers, religious teachers, culture or society.

Spirituality may have arisen from the mind as a tool for survival. Religious beliefs and practices have been said to improve mental and emotional health. Rates of drug abuse, alcoholism, divorce, and suicide are much lower among religious individuals. In addition, spiritual practices such as meditation, prayer or participation in devotional services have been shown to reduce feelings of anxiety and depression significantly, boost self-esteem, improve the quality of interpersonal relationships and generate a more positive outlook on life.²⁴ A canvass of 21,000 Americans found that those who never went to church had a 50 percent increased rate of mortality compared to those who attended frequently. In another large survey, which followed 5,286 Californians for 28 years, regular church service attendees had lower death rates. One can say that these results are tainted. Religious organizations tend to attract people who already have good health habits. However, in a 28-year study of nearly 7,000 participants who were surveyed about all types of behav-

²²Hamer 48.

²³Hamer 49.

²⁴John David Ebert, *Twilight of the Clockwork God: Conversations on Science & Spirituality at the End of an Age*, (Tulsa, Oklahoma: Council Oak Books, 1999) 130.

iors showed that the religious subjects continued to improve over the three decades.²⁵ Consequently, it seems that religious involvement actually promotes good behavior. The effect of religious practice can also be explained through changes in brain activations. EEG measurements of meditators show a shift in activity from right to left in the frontal cortices of the brain. That pattern is associated with positive feeling such as joy, happiness and low levels of anxiety.²⁶ Due to its ability to improve mental and emotional health, an evolutionary theory for the perseverance of spirituality is plausible.

Although it is a relatively new science, neurotheology has already come very far. Research with imaging scans, epileptics, and drugs has given much insight into how spirituality arises in the brain. The OAA and the temporal lobe may be responsible for the molecular changes in the brain that evoke spiritual experiences. In addition, the emotional benefits of spirituality may account for the need of an intrinsically mystical mind. Neurotheology is well on its way to discovering the molecular alterations in the brain that underlie spiritual experiences.

As expected, neurotheology has many critics. Philosophers believe that science and spirituality are irreconcilable, and many scientists have a problem with studying an experience as subjective as spirituality.²⁷ In addition, neurotheology has many similarities to neuroscience and the NCC approach in attempting to describe spirituality as a set of biological processes. Some believe that this discredits the notion of a God.

However, tracing spiritual experience to neurobiological behavior does not disprove its authenticity. If God does exist, there is no other way for Him to get into our minds except through the brain's neural pathways.²⁸ Experiments in neurotheology suggest that a mystical mind is intrinsic to every human being. Whether or not one believes God created our brain wiring or vice versa depends on one's faith.



²⁵Hamer 146–7.

²⁶Susan Begley, *Try Whipping Your Brain Into Shape This Year*, 10 January 2003, 1 December 2006, <http://www.tibet.ca/en/wtnarchive/2003/1/10_7.html>.

²⁷*Neurotheology*, 7 December 2006, 8 December 2006, <<http://en.wikipedia.org/wiki/Neurotheology>>.

²⁸Andrew Newberg et al. 37.

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