

# Methodological Principles for Research in Neurotheology: Practical and Philosophical Implications

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## **Abstract**

“Neurotheology” has garnered substantial attention in the academic and lay communities in recent years. As would be expected, there have been many positive and negative responses to purported neurotheological studies. The attempt to integrate neuropsychology and theology has been extremely controversial and often dismissed as an attempt to integrate incommensurables. Thus, if neurotheology is to be considered a viable field going forward, it requires a set of clear principles that can be generally agreed upon and supported by both the theological or religious perspective and the scientific one as well. I have recently expanded upon these principles in the book entitled, *Principles of Neurotheology* (Newberg, 2010). The purpose of this paper is to discuss some of the principles which can be used as a foundation for future neurotheological discourse, particularly as it may pertain to the relationship between the brain and quantum mechanics. Rather than to specifically try to answer major theological or scientific questions, this paper intends to set forth a program of scholarship and a methodological basis for future inquiry thereby laying the groundwork for a new synthesis of scientific and theological dialogue. The first part will review some of the methodological principles of neurotheology, the second part will describe preliminary data that might be particularly relevant in terms of developing future neurotheological research, and the third part will consider some of the more speculative, philosophical, and theological implications of such work. In the end, neurotheology, a term sometimes fraught with potential problems, might nevertheless, be a highly useful and important voice in the greater study of religious and theological ideas and their intersection with science.

**Key Words:** neurotheology, research, philosophy

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## **Introduction**

“Neurotheology” has garnered substantial attention in the academic and lay communities in recent years. As would be expected, there have been many positive and

negative responses to purported neurotheological studies. The study of neurotheology may have found its origins in the line of research and scholarship that began in 1975 when Eugene d’Aquili and Charles Laughlin published “The Biopsychological Determinants of Religious Ritual Behavior” in *Zygon*. Their thesis was that all religious phenomenology arose from neuropsychology, but in a way much more complex than simple materialistic reductionism. The first ten years of this

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scholarly movement were very difficult indeed. The attempt to integrate neuropsychology and theology was extremely controversial in the mid 1970's and often dismissed as an attempt to integrate incommensurables. Among those scholars who became involved in the project of relating neuropsychology to religious phenomenology were, in addition to d'Aquili and Laughlin, John McManus, the Nobel laureate Roger Sperry, Colwyn Trevarthen, Solomon Katz, Victor Turner, and James Ashbrook. Indeed, Ashbrook was the first academic scholar to use the term "neurotheology" in an article he published in 1984, also in *Zygon*, entitled, "Neurotheology: The Working Brain and the Work of Theology." Ashbrook painted neurotheology with broad strokes in terms of the split-brain physiology being researched at that time. His was a vision begging to be realized rather than an accomplished fact. More recently, additional research has been incorporated into this field including the work of James Austin (1999), Mario Beauregard (2007), Alan Wallace (2006), Rhawn Joseph (2003), George Vaillant (2008), and Warren Brown, Nancey Murphy, and H. Newton Malony (1998), and each of these scholars have contributed in different ways with some providing empirical data and others providing the theoretical or theological foundation.

As someone who has been substantially involved with this topic, I have realized that if neurotheology is to be considered a viable field going forward, it requires a set of clear principles that can be generally agreed upon and supported by both the theological or religious perspective and the scientific one as well. I have expanded upon a full list of principles related to neurotheological scholarship in the book entitled, *Principles of Neurotheology* (Newberg, 2010). The purpose of this paper is to consider some of the principles most relevant to the relationship between the brain and quantum mechanics. It should be emphasized up front that this paper intends to set forth a program of scholarship and a methodological basis for future inquiry rather than to specifically try to answer major theological or scientific questions. However, the second part of this paper will present a preliminary study that might

actually help provide more specific direction for developing future studies that might actually begin to address theological questions. In the end, it is my hope that neurotheology, while a term that is fraught with potential problems, can nevertheless, be a highly useful and important voice in the greater study of religious and theological ideas and their intersection with science.

### **Defining Neurotheology**

Clearly, one of the initial problems with neurotheology as a field is the use of "neurotheology" as a term. Too often, the term "neurotheology" has been used inaccurately or inappropriately. Many times, it appears to refer to a study or idea that incorporates neither neuroscience nor theology. Strictly speaking, neurotheology refers to the field of scholarship linking the neurosciences and theology. Neuroscience would thus refer to the empirical study of the central nervous system or brain and theology would refer to the critical and rational analysis of a particular religious belief system, specifically one pertaining to God. Of course, both the terms "neuroscience" and "theology" have evolved over time. Neuroscience used to imply the study of nerve cells and their function without a clear regard for behavioral and cognitive correlates. Neuroscience today tends to reach over many different fields including cognitive neuroscience, neurology, psychiatry and psychology, and even social behavior. And as many of the papers in the journal, *NeuroQuantology*, would suggest, quantum mechanics may play a very prominent role in the future study of neuroscience and vice versa. The tools have also become much more advanced for exploring the translational relationship between the brain and various cognitive, emotional, and behavioral processes.

Theology has also changed over time. In a very strict sense, theology is the study of a *theos* or God. Thus, the word "theology" should be reserved for theistic religions only, and even more specifically, from those arising out of the Greco-Jewish tradition, i.e. Judaism, Christianity, and Islam. However, with the development of comparative theology in the early part of the last century, it became apparent that the non-personal

Eastern religions possessed many of the formal characteristics of the classic Western religions. It became academically fashionable to use the term “theology” for the formal study of any belief system centered on an Ultimate or Absolute, whether personal or non-personal, whether understood as God or as an ultimate state. It is now acceptable to speak of a theology of Buddhism, a theology of Hinduism, and even of a theology of Shamanism (Kidwell *et al.*, 2001; Makransky 2000).

I would argue that neurotheology should not be limited to only neuroscience and theology. In reconsidering the term “neurotheology” then, it seems appropriate to allow for expanded uses of the “neuro” component and the “theology” component. It would seem appropriate for neurotheology to refer to the totality of religion and religious experience as well as theology. This ability to consider, in a broad scope, all of the components of religion from a neuroscientific perspective would provide neurotheology with an abundant diversity of issues and topics that can ultimately be linked under one heading. As we shall see, the neurosciences also must be considered in a broad scope to include not only what goes on within the human brain, but within the human body as a whole. Furthermore, since mental processes are intimately linked to the brain, the “neuro” component of neurotheology should be considered to include psychiatry, psychology, endocrinology as well as other macro- and micro- perspectives of the neurosciences. One might even consider variations on the theme of neurotheology to include other hybrid terms such as “neurospirituality”, “psychotheology”, or “biotheology”. However, for better or for worse, we seem to be stuck with the word, “neurotheology” since it appears to be the term that has received the most use and acknowledgement in both the academic and popular domains.

### **The Principle of Interaction Between Neuroscience and Theology**

An important point, I would argue, regarding neurotheology as a field and term, is that neurotheology should be considered a “two-way street” with information flowing both from the neurosciences to the theological

perspective as well as from the theological perspective to the neurosciences. In other words, neurotheology should not be considered the “neuroscientific study of religious or theological concepts”, a procrustean trap that many scholars have fallen into. Theology and religion must also be able to freely inform us about neuroscience and how we interpret the human person from a psychological, social, and spiritual perspective. By enabling a free exchange of ideas, data, and information, neurotheology can achieve a very high level of sophistication. This last point should also be considered an important principle of neurotheology – *neuroscientific and theological perspectives must be considered to be comparable contributors to neurotheological investigations.*

By comparable, I mean that both perspectives should have similar, and reciprocal, emphasis in the overall dialogue between neuroscience and theology. However, it must also be clear that there are investigations and arguments that will sometimes be weighted more towards neuroscience and others that are weighted more towards theology. For example, an analysis of a sacred text such as the bible might lead to a primarily theological interpretation with minor assistance from the neuroscientific perspective. On the other hand, a study designed to explore the brain changes during a particular religious practice, such as the Rosary, will more likely require emphasis on neuroscientific methodology. Again, though, any interpretations from such investigations should strive to include both perspectives.

### **General Principles of Neurotheological Investigations**

Regarding neurotheological investigations, we might consider some principles that will arise more from the neuroscientific perspective while others will arise more from the theological one. However, they are all equally important in developing an appropriate neurotheological foundation. For example, a neuroscientific research study of the effects of prayer without clear knowledge about the type of prayer, the meaning and purpose of that prayer, and the

theological basis behind that prayer, will yield poor scientific data.

We will start with an important neuroscientific concept. This is that, “the brain is what processes all external and internal information into a coherent rendition of reality.” This applies to many different fields of study, but also equally applies to theology. Whether one is reading sacred texts, interpreting those texts, using rational and emotional processes to guide theological arguments, or trying to comprehend the meaning of religious ideologies and experiences, it is the brain that helps with processing all of this. This notion can be modified by the religious and theological perspective to lead directly to two crucial neurotheological principles:

***The brain has universal functions and thus all religious beliefs and all religious systems can be considered from a neurotheological perspective.***

This principle relates to what Dr. Eugene d’Aquili and myself (d’Aquili and Newberg, 1999) have previously referred to as a “metatheology”. A metatheology can be understood as the overall principles underlying any and all religions or ultimate belief systems and their theologies. A metatheology comprises both the general principles describing, and implicitly the rules for constructing, any concrete theological system. In and of itself, a metatheology is devoid of theological content, since it consists of rules and descriptions about how any and all specific theologies are structured. Furthermore, a metatheology must account for three things. First, it must describe how and why foundational, creation, and soteriological myths are formed. Second, it must describe how and why such myths are elaborated into complex logical systems which we call specific theologies. Third, it must describe how and why the basic myths and certain aspects of their theological elaborations are objectified in the motor behavior that we call ceremonial ritual.

Does neurotheology address these three constitutive demands? Neurotheology, via its consideration of the brain functions that enable human beings to consider and reflect upon religions’ foundational myths can provide information about the possible

origin and nature of these foundations. The analysis of the various cognitive functions may suggest the possibility of a complex approach to understanding many aspects of theological systems. Finally, the ability to describe changes in brain physiology, neurotransmitters, and the autonomic nervous system, during rituals and meditative practices, enables neurotheology to address issues pertaining to fundamental religious and spiritual experiences (including those that might be considered spontaneous). Thus, it seems reasonable to consider neurotheology as a possible metatheology. This is particularly the case since the universal functions of the human brain offer a window into understanding religious beliefs in all human beings and cultures. It should also be noted that such a perspective need not apply specifically to religious beliefs, but could be extrapolated to all types of belief systems including political, moral, cultural, or scientific.

The next two principles refer to more specific approaches that neurotheological study must take. In particular, it is important to keep these principles in mind when beginning a study utilizing both the neuroscientific and theological perspectives. These principles should ideally propel such research in a beneficial direction for both science and religion and also open up new avenues of thought.

***Neurotheology should strive to support both practical and esoteric goals of scholarship and research. Theology and neuroscience must allow for new methods, concepts, and conclusions to arise from neurotheology.***

The first principle refers to the importance of focusing neurotheology on both practical as well as theoretical problems. This principle also recognizes the interrelatedness of both types of problems. Thus, neurotheology research may gain as much from a study of religiosity and mental health as an analysis of the meaning of sacred texts in determining the nature of God. Each issue may require its own distinct paradigm in order to arrive at some conclusion, but the results may ultimately have implications for the other.



It is important to continue to advance the scientific evaluation of various aspects of religious experience and practice. Studies relating religiosity to health and well-being as well as neurological studies of specific types of religious phenomena help to provide a foundation of data from which neurotheology can address many different questions. An additional benefit is the ability for neurotheology research to advance scientific methodology in evaluating subjective experience and complex neurocognitive processes. This area of research also helps to advance our overall understanding of the human person and human health from both a biological as well as a spiritual perspective.

Esoteric goals of research may include both philosophical and theological analysis of various types of rational, emotional, and perceptual concepts in the theological arguments. These goals would help to address traditional theological issues relating to the nature of God, the interpretation of sacred texts, and the ability to relate such ideas to human life and behavior. In many circumstances, such an analysis may rely very little on actual neuroscientific data, but rather focus on theoretical aspects of the human psyche and mind. Esoteric goals may also relate to questions regarding the possible dual nature of the human body and the human spirit. Questions regarding the soul, consciousness, spirit, mind, and brain should all be accessible to the field of neurotheology. The esoteric goals of neurotheology may also relate to models of ethical behavior. Such a research program may ultimately lead towards concepts associated with neuroethics.

The second principle stresses the need to recognize the complexity of the field of neurotheology in the context of how this field should proceed from a methodological perspective. The implication here is that the questions involved in neurotheology are so multidisciplinary and complex that existing methods in both science and theology may ultimately be limited in their capabilities. This does not mean that the existing methods should be bypassed. Quite the contrary, existing methods should be the initial approach for neurotheology

scholarship. However, should various issues and problems arise that go beyond the ability of current methods, it is critical to be open to the possibility of developing new methods and new paradigms for understanding neuroscience and theology. As an example, it has been frequently discussed among scholars engaged in neurotheology research that the traditional randomized double-blind controlled trial associated with Western biomedical research may not be able to capture important issues related to the subjective experience of religious and spiritual phenomena as well as the inter-individual differences that might arise from such phenomena (Newberg and Lee, 2005). Similarly, theology often proceeds through a variety of rational arguments originating from a complex foundational myth often grounded in historical events. But now, theology may also have to find ways of incorporating information obtained through scientific methods. For neurotheology research to proceed in earnest, scholars should also be open to the possibility that a priori assumptions and a posteriori conclusions may not always hold up in a multidisciplinary dialogue. However, great care must be taken in drawing quick conclusions that might dismiss either theology or science before unequivocal results are obtained.

It should also be mentioned that a new approach that fully integrates theological and scientific perspectives might be necessary. Such an approach may represent a "contemplative science" in which scholars engage in both contemplative practices such as meditation and mysticism as well as empirical research found in the neurosciences. Several scholars have suggested this path may be necessary for a deeper understanding of human beings and the universe itself (Wallace, 2000; 2006). Recognizing that there may be inherent limitations in both science and religion, a combined approach, if performed carefully, may provide a methodology for bypassing such limitations.

### **A Practical Application of Neurotheology: The Blessing Study**

Let us consider how some of these basic principles can influence actual

neurotheological studies. We initiated a preliminary study on a practice that is referred to as the Deeksha or the “Oneness Blessing.” This practice arose in India and involves the intentional sending of this blessing from one individual to another. According to the practitioners, the Oneness Blessing is not derived from the energy of the person who is giving it. The Oneness Blessing givers are considered to be an instrument for divine grace. Grace come only from the divine and cannot be purposely conjured up or made up. Grace is real and can be felt by anyone anywhere open to receive it. We were able to bring into our laboratory several practitioners of the Oneness Blessing who claimed to be able to send this blessing to others without being in direct physical contact with the receiver. We utilized single photon emission computed tomography (SPECT) imaging to measure changes in cerebral blood flow in both the individuals giving the blessing (the “Givers”) and in individuals who were the focus of receiving the blessing (the “Receivers”). The primary goal was to determine the feasibility of even doing such a study. The secondary goal was to determine if there were changes in CBF in either the Giver or Receiver groups, or both.

To our knowledge, this was the first attempt at utilizing SPECT imaging to measure such a phenomena. Given the above described methodological issues, it is clear that this type of study would have a variety of potential issues with regard to design and analysis. Our initial hypothesis was that since the Givers were doing a type of practice that had certain similarities with other spiritual practices with the intent to send a spiritual blessing to others, we would see activation in areas previously associated with such practices. The structures that might be observed to change would include parts of the frontal lobe, limbic regions, parietal lobe, and thalamus. We might expect decreased activity in the frontal lobes in the Givers since their experience is not to increase their intention, but rather to become a “conduit” for the energy being given. In previous studies, we have found such an experience to be associated with decreased activity in the frontal lobes (Newberg, 2006). Since the practice is also regarded as intensely blissful, we might expect decreases in CBF in the

limbic regions and thalamus. Finally, since the Givers believe they are engaged in a deep spiritual interrelationship with the Receiver, that the parietal regions might be decreased. The parietal regions have been observed to decrease when people are engaged in practices that are associated with a blurring of the boundary between the self and the rest of the world. Since Givers perceive to blur the boundary between their self and the self of the Receiver, we might expect to observe decreased activity in the parietal regions.

### *Methods*

Four Givers and four Receivers were recruited. None of the subjects had any clinical evidence or history of medical, cognitive, or neuropsychological problems that would potentially alter cerebral blood flow. The Givers were 2 males and 2 females ranging from 30-60 years old with a mean age of 48 years while the Receivers were 1 male and 3 females ranging from 21-26 years old with a mean age of 23 years. The Givers were all trained and had been performing the oneness blessing for over a year. The Receivers were healthy individuals who were not familiar with the Oneness Blessing. On the day of the study, informed consent, approved by the human Institutional Review Board was obtained. Females of childbearing potential were administered a pregnancy test. Subjects were brought to a private room in the Nuclear Medicine department at which point an intravenous canula (IV) was placed in one arm with a long IV line in order to permit relatively free range of movement. The subjects reported minimal discomfort from the IV that resolved prior to initiating the remainder of the study.

The Givers and Receivers did not meet until the end of the entire study. Each Giver was paired to a Receiver and they were placed in separate rooms so that they could not possibly have any type of direct interaction. The Giver was provided information about the Receiver such as the name, age, and gender, a photograph, and their location. Each subject in each pair underwent two SPECT scans, one at rest and one during the administration of the Oneness Blessing. The Receivers were not told whether they would receive the Oneness Blessing during the first scan or the second

scan. However, the order was kept the same for all four subject pairs. The baseline condition was always first since the Givers expressed concern that if the Blessing was received, it might interfere with the baseline scan if this was obtained second. For the baseline condition, both the Giver and Receiver were asked to rest quietly in their respective rooms. The Receiver was instructed to rest quietly, but also to try to be aware of any perceptions, thoughts or feelings. They were given the same instructions during the second scan. After being at rest for approximately 10 minutes, both the Givers and Receivers were injected through the IV with approximately 7 mCi of <sup>99m</sup>Tc-ECD (Amersham International, Arlington Heights, IL, prepared as specified by the manufacturer). They remained in the resting state for another 10 minutes at which time they were brought separately into the scanner room.

All images were acquired on a Picker-Prism 3000XP (Picker Inc, Cleveland, OH) triple-headed rotating gamma camera using high resolution fan beam collimators. Projection images were obtained at three-degree angle intervals on a 128 x 128 matrix (pixel size 3.56 mm x 3.56 mm) over 360° by rotating each head 120°. These SPECT images were reconstructed in the transaxial, coronal, and sagittal planes using filtered backprojection, followed by a Weiner post filter and 1st order Chang attenuation correction. The reconstructed slice thickness was 4 mm with a spatial resolution of 8-10 mm. Thus, both the Givers and Receivers underwent a resting SPECT scan to obtain their baseline CBF.

Following this resting scan, the subjects returned to their respective rooms. For the second scan, the Givers were instructed to do their best to send the Oneness Blessing to the Receiver. The Receiver was instructed to rest quietly again and to be aware of any perceptions, thoughts or feelings. After 10 minutes of either Giving or Receiving the Oneness Blessing, both the Giver and Receiver were injected with 25 mCi of <sup>99m</sup>Tc-ECD through the IV without disturbing the subject. The Giver then continued to attempt to send the Oneness Blessing to the Receiver who continued to rest quietly. The subjects were then scanned

again using the same imaging parameters as for the initial resting scans. The second scan for both the Givers and the Receivers will be referred to as the Blessing scan.

#### *Image Analysis and Statistics*

The images of the resting and Blessing scans were reconstructed and resliced, using an oblique reformatting program, according to the anterior-posterior commissure line so that the final two sets were at comparable anatomical sites for the analysis. A previously validated template methodology consisting of regions of interest (ROI) corresponding to the major cortical and subcortical structures was placed over the singing scan (Resnick *et al.*, 1993). For the purposes of this study, we examined the rCBF as measured in only a selected number of ROIs which was hypothesis driven. The ROIs examined were the inferior frontal, superior frontal, dorsolateral prefrontal, orbitofrontal, dorsal medial cortex, inferior temporal, superior parietal, inferior parietal, occipital, and sensorimotor areas, as well as the caudate, thalami, midbrain, cerebellum, and cingulate gyrus. Each ROI (which are small and therefore represents a “punch biopsy” of any given area) had its placement adjusted manually in order to achieve the best fit according to the atlas. The ROIs were then copied directly onto the second scan. This was possible because the images were already resliced into the same planes as described above. The count values for the second (Blessing) scans were obtained by determining the number of counts in each ROI on the Blessing scan and subtracting the number of counts in the same ROI on the initial resting scan which were decay corrected to the midpoint of the two scans. Counts per pixel in each ROI were obtained for both the resting the Blessing scans and normalized to the whole brain activity. This provides a rCBF ratio for each ROI compared to the whole brain. A percentage change was calculated using the equation:

$$\%Change = \frac{(Blessing-Resting)}{\frac{1}{2} \times (Blessing-Resting)} \times 100$$

Regions were compared between the resting and Blessing scans using a paired t-test (Minitab).

## Results

The data revealed a substantial contrast between Givers and Receivers (Table 1). In spite of the small number of subjects in the study, the Givers, as a group, had 21 structures that were significantly different between the Blessing and the resting states.

**Table 1.** Changes in CBF in givers and receivers of the oneness blessing percentage change between baseline and blessing state in givers. SD: standard deviation, L: left, R: right.

Structure	% Change	SD	p-value
L Calcarine Cortex	-7.9	5.8	0.038
L Prefrontal Cortex	-6.8	4.0	0.021
L Dorsal Medial	-5.2	3.2	0.026
L Inferior Frontal	-6.1	4.0	0.031
L Inferior Temporal	-14.4	6.7	0.009
L Lateral Visual Cortex	-8.5	2.4	0.005
L Parietal	-7.4	2.3	0.003
L Precuneus	-12.7	8.8	0.033
L Superior Frontal	-10.2	6.0	0.019
L Supramarginal Gyrus	-13.1	5.9	0.011
L Temporal Pole	-10.9	4.7	0.008
Pons	11.1	4.8	0.013
R Calcarine Cortex	-7.6	3.4	0.012
R Caudate	-14.1	10.2	0.038
R Globus Pallidus	11.8	8.0	0.029
R Hippocampus	-14.4	6.2	0.009
R Inferior Temporal	-13.9	9.0	0.027
R Lat Visual Cortex	-9.4	6.0	0.025
R Medial Occipital	-6.3	4.4	0.035
R Precuneus	-15.0	6.8	0.008
R Temporal Pole	-9.0	2.9	0.004

Percentage change between baseline and blessing state in receivers.

Structure	% Change	SD	p-value
L Hippocampus	-4.0	1.4	0.006
L Thalamus	5.6	3.5	0.022
R Caudate	-12.1	2.7	0.002
R Hippocampus	-11.8	7.2	0.026
R Post Cingulate	5.6	2.2	0.007
R Temporal Pole	-3.5	1.9	0.017

All but the region of the pons had decreased CBF during the Blessing state. Structures in both the right and left hemispheres were decreased. The left frontal regions, left inferior temporal regions, and several subcortical structures had decreased CBF during the Blessing state of the Givers.

The Receivers had markedly fewer structures (only six) that were significantly different between the Blessing state and the

resting state. Four regions had decreased CBF while the left thalamus and the right posterior cingulate had increased CBF. It may also be interesting to note that the right hippocampus and right temporal pole were significantly decreased in both Givers and Receivers. However, when Receivers were asked to subjectively determine which session was the one in which the Oneness Blessing was given, two were correct and two were incorrect in their selection. Thus, any correlation between the structures involved is of uncertain relevance.

## Discussion

This preliminary study demonstrates some important points regarding neurotheological research. As with many early studies in a developing field, there are substantial limitations. Often the subject number is small usually due to funding limitations or access to specific populations. This makes any results, including the one's presented here, very difficult to know how to interpret. First, Type II errors are possible when there are negative results. But even with all of the significant findings reported here, the limited sample size would cast doubt on the findings since it is difficult to perform adequate statistics or account for multiple comparisons without adversely affecting all of the results. In our study, there were also differences between the age distribution of the two groups with the Givers being significantly older. However, this may be less relevant since the groups were not compared to each other, but rather between the baseline and the Blessing states. Ultimately, though, a larger study with more diverse subjects would be required to confirm these preliminary data and improve the overall ability to interpret any findings.

Early studies in neurotheology also suffer from methodological uncertainties simply because such phenomena have never been studied before. Whether the study design is adequate or correct for evaluating a particular religious or spiritual practice is inherently uncertain. In this case, the Oneness Blessing is a practice that can be performed in a directed manner so it is amenable to being studied in a laboratory setting. However, after our initial cohort, it became less clear whether the Givers should



have been placed in a separate room from the Receivers. As we learned, the Oneness Blessing is believed to be best performed in direct contact with the Receiver. This might invalidate the findings altogether. However, other Givers supported the possibility of the Blessing being given without any direct contact.

Another design issue is the order in which the different states were scanned. In this preliminary study, the resting was always performed first even though the Receivers were not informed of the order and were told that the Blessing might be given first or second. That the subjects were correct on half of the pairings implies that any strong experiential elements were not obtained. This also raises the question as to the ultimate cause of the CBF findings. Since the order was maintained for all pairings, it is possible that the Receivers merely had changes in CBF because they were more familiar with the study and more relaxed during the second scan. In test-retest studies using a similar imaging methodology, we typically have found few if any changes that were significant or greater than 6% different (Newberg et al., 2005). In fact, in the Receivers, only two structures actually had changes that were greater than 6% between the resting and Blessing states. A future study would most likely need to randomize the order. However, this might yield a different methodological problem, namely the concern that once the Oneness Blessing is given, it might interfere with the subsequent resting state. If this is the case, any ordering might be problematic. This is true of other types of studies pertaining to religious/spiritual practices such as meditation or prayer since it is not yet known what the "washout curve" looks like for their effects. If a baseline is performed too shortly after an intense meditation session, there may still be significant residual effects.

A similar argument could be made with regard to the Givers, that they had become more familiar with the study and hence had differences between the two scans. However, the changes in the Givers seemed much more extensive and robust to merely reflect familiarity with the study. Again, while randomizing the order in the future might be useful, it also might result in

affecting the resting scan if the Blessing is given first.

In spite of these limitations, this preliminary study also achieves what many other neurotheological studies have achieved. The results, if real, are quite fascinating with potentially ground breaking implications. On one hand, it is not too much a surprise that the Givers affected significant changes in CBF in their own brain during the Blessing state. As with other spiritual practices such as meditation and prayer, there appear to be a number of brain structures that become activated or deactivated depending on the nature of the practice (Newberg and Iversen, 2003). Since the Blessing state is one in which the Giver is actually not purposely giving the Blessing but acting as a conduit, it seems reasonable that there would be significant decreases in CBF. Nevertheless, it is interesting to observe how this particular practice has similarities and differences compared to other practices.

The finding with potentially far more interesting implications is that there were a few alterations in CBF in the Receivers. At this point, it certainly must be conceded that the findings may have nothing whatsoever to do with the Blessing itself and everything to do with the nature of the study design. However, if future studies bear out the changes associated with the Blessing being given with no direct contact between Giver and Receiver, then the findings could be startling. There are hundreds of studies which have reported significant findings associated with the effects of distant intentionality. The most famous of these are the effects of human consciousness on the function of random number generators (Radin, 1997). If the results of our preliminary study hold in larger trials, we *might* be observing evidence of a similar effect at the level of brain function. In other words, it might actually be the case that the brain is capable of affecting another person's brain at a distance. While this is purely speculative, it is part of what gives neurotheological research such appeal. There is a great deal of stimulation of ideas that arise from such studies.

## Reflections on Major Topics of Neuroscience

In this third part of the paper, we will consider more speculative ideas in terms of how neurotheology relates to major topics in neuroscience and theology. There are several major concepts associated with neuroscience that will be considered from the neurotheological perspective. These are issues that challenge neuroscience itself as well as the methodology used in order to acquire neuroscientific information. One of the major issues that neurotheology faces is the problem with the ability to determine the actual subjective state of the subject. This is also a more universal issue in the context of cognitive neuroscience. After all, one can never know precisely what a research subject is thinking at the moment of imaging. If you have a subject solving a mathematical task, one does not know if the person's mind wandered during the task. You might be able to determine if they did the task correctly or incorrectly, but that, in and of itself, cannot determine why they were right or wrong. The issue of the subjective state of the individual is particularly problematic in neurotheology. When considering spiritual states, the ability to measure such states empirically while not disturbing such states is almost impossible. Hence, it is important to ascertain as much as possible what the person thinks they are experiencing. Neurotheology research can help better refine subjective measurements. Spiritual and religious states are perhaps the best described of all states and thus, can be an important proving ground for advancing research in the measurement of subjective states.

The problem of consciousness and its ability to arise in the brain is of primary concern in the neurosciences. Consciousness of anything, and particularly self-reflexive consciousness in human beings, is something that has not been adequately elucidated on the basis of current empirical research (Zelazo *et al.*, 2007). Spiritual and religious states often involve altered states of consciousness. And in many circumstances, these states are purposefully manipulated. Those individuals who are most capable of altering their consciousness and enable that consciousness to affect other parts of their body, might be particularly useful in furthering our understanding of human

consciousness. It is akin to studying the brain of Mozart and Beethoven in order to understand how music is associated with brain function.

Another area in which neurotheology could provide important information is in understanding the link between spirituality and health. A growing number of studies have shown positive, and sometimes negative, effects on various components of mental and physical health (Koenig 1998; Koenig, McCullough, and Larson 2001). Such effects include an improvement in depression and anxiety, enhanced immune system, and reduced overall mortality associated with individuals who are more religious. On the other hand, research has also been showing that those individuals engaged in religious struggle or have a negative view of God/religion, can result in increased stress, anxiety, and health problems. Research into the brain's responses to positive and negative influences of religion might be of great value in furthering our understanding of the relationship between spirituality and health.

One of the most important goals of cognitive neuroscience is to better understand how human beings think about and interact with our environment. In particular, this relates to our perception and response to the external reality that the brain continuously presents to our consciousness. As we have described above, neurotheology is in the unique position to be able to explore epistemological questions that arise from neuroscience. Integrating religious and scientific perspectives might provide the foundation upon which scholars in a variety of disciplines can address some of the greatest questions human beings face.

## Reflections on Major Topics of Theology

In this section, several of the major concepts associated with theology will be briefly considered from the neurotheological perspective in order to provide examples of how neurotheology can be more specifically applied. The following questions, among many others, often are at the center of much theological inquiry:

1. Can the existence of God be proven or, is there a God?

2. What is the nature of God?
3. What is the nature of good and evil and how does this relate to sin and free will?
4. What is the nature of spiritual revelation?
5. What is the causal relationship between God and the universe?
6. Is God immanent in the universe?
7. What is the nature of God's relationship to human beings?
8. Is there a soul?
9. What is the process by which salvation can be attained?

Theology attempts to make logical arguments that address these and other issues related to God and God's relationship to the world (Migliore 2004). To some extent, proof of the existence of God is not completely necessary from a theological perspective since the foundational elements of religion, namely that there is a God, is taken on faith. A number of "arguments" have been offered throughout the history of theological development which include the Cosmological Argument -- that since the world exists and since the world cannot come from nowhere, there must be an original or first cause which is God; the Teleological Argument -- which suggests that there is a purpose and intelligent design in the universe which must arise from God; the Moral Argument which states that God is what must have provided human beings with their sense of morality; and the Ontological Argument -- which states that that "If [we] could conceive of a Perfect God who does not exist, then [we] could conceive of someone greater than God himself, which is impossible. Therefore God exists." What is interesting about each of these, and the many other arguments put forth to prove, or at least support, God's existence, is that they each depend on various functions of the human brain. If our brain did not perceive causality in the world, then we would not conceive of a cosmological argument. Thus, the sense or lack of sense that these arguments provide are highly dependent upon the brain functions that conceive of them.

Neurotheology may play a prominent role in the discussion regarding the existence of God. The reason for this is that if God can

be proven not to exist, then the only other alternative is that God is a manifestation of the human mind. If the human brain creates the concept of God and its elaboration through religion, then neurotheology could provide critical information as to how this might happen. A neurotheological perspective would also have to take into consideration the possibility of religion being a cultural construct as well as other factors such as philosophy, nationalism, racism, myth and ritual. However, neurotheology must also constantly remind scholars of the limitations imposed on human beings in discerning reality. For example, a brain scan that demonstrates changes in certain structures when a nun experiences being in God's presence could indicate that the brain changes created the experience or that the brain was responding to the actual experience. The scan itself should not be construed as proving the existence or non-existence of God in this context. Neurotheology should continue to encourage research of brain function during religious experience and seek to determine if a study design might be possible that could more specifically address the proof of God question. The methodological challenges of such a study are clearly very substantial, but it is important to stress the need for careful planning and interpretation of results.

If God does exist, then neurotheology continues to provide information about how human beings relate to God, but there is also the possibility that such studies might determine which ways of relating are "better" than others. This is a potentially dangerous proposition since the implication is that various religious groups could utilize such information to proselytize, criticize, oppress, or attack other groups. It would seem unlikely that any neurophysiological study could provide the kind of evidence that would support which beliefs are more accurate, but results from such studies might help individuals determine what works best for them. There is probably too much variability in normal human function to clearly differentiate the effectiveness and accuracy of certain beliefs or practices. Nonetheless, neurotheology has the potential to be thrust into the middle of many different kinds of conflicts and anyone seeking to be a scholar in this field should

maintain a very cautious position regarding results and interpretations of such studies.

Another interesting aspect of theological concepts is the determination of the attributes of God. God's attributes are sometimes divided into those that cannot be shared with human beings (incommunicable), and those that can be shared (communicable attributes). Here there is a clear distinction between what the human brain can and cannot perceive. Incommunicable attributes are those related to God being considered: omnipotent, eternal, infinite, omniscient, and omnipresent. Communicable attributes are related to those things that human beings can potentially perceive such as: mercy, justice, wrath, and love. God's immanence in the world may also be an appropriate question for neurotheology in the context of how God might be immanent within the human brain. After all, the ability of God to be immanent within the human brain would seem to be crucial for understanding the relationship between God and human beings.

Spiritual revelation in the context of neurotheology is akin to the ability of the human brain to receive God. The concept of Revelation thus raises the issue of how do human beings come to have any understanding that God exists and that God wants us to do certain things? Revelation is more religiously, rather than neurologically, oriented. However, there is much that can be considered from a neuropsychological perspective. For example, how are human beings limited in what can be revealed? If human beings can only have access to communicable aspects of God, then there are specific limitations that are placed on the ability to perceive and understand God.

Along similar lines, the ability of a human being to be saved is another important theological issue upon which neurotheology might provide an interesting perspective. One such perspective might be the following: Salvation should pertain to both the spiritual and material nature of who we are. It might be argued that salvation requires the brain, at least to some degree, in order to help the individual understand what salvation requires and what thoughts, beliefs, and behaviors are associated with

salvation. While salvation refers specifically to the soul, a neurotheological interpretation could be commensurate with psychiatry and neurology which continually seek out ways of improving mental life. However, a deeper understanding of the brain's ability to change and to seek religious and spiritual goals might provide highly useful in understanding the concept of salvation.

It should also be clearly stated that whatever limitations the human brain places on our ability to conceive or receive God, this has no impact on whatever is the true nature of reality. If the human brain could not perceive causality in the world, then God could not be understood as the first cause. The inability to understand God as the first cause has no bearing on whether or not God actually is the first cause. Furthermore, one has to be very careful interpreting neurotheology as being able to comment on whether or not God does exist and whether the brain creates God or God creates the brain. This is an extremely complex question that often is approached with substantial biases from both believers and non-believers. The perspective that is most appropriate from a neurotheological perspective is to carefully evaluate all ways of understanding God, including an absence of God, in order to best determine what the brain can know about reality.

However, the very notion that theology pertains more to the human understanding of God is commensurate with the goals of neurotheology. Neurotheology necessarily must explore how the brain can think, feel, and perceive the concept, (or the actual reality) of God. More specific theological analysis can be developed depending on the focus of a particular course. In this regard, a historical discussion of theology from the early Christian Church, to Augustine, to Aquinas, to the Reformation, can all be elaborated upon. What is important in terms of neurotheology is to observe how the various developments in theology pertain to human perceptions, feelings, cognitions, and behaviors. Any time the focus turns to one of these aspects of theology, a neuropsychological perspective can be added that deepens the understanding of these concepts.



## **The Uncertainty Principle of Neurotheology**

In returning to the principles of neurotheology, there are two additional principles that might be considered as part of an “uncertainty principle” of neurotheology (Newberg, 2010). Specifically this refers to the absolute limitations that any theological or neuroscientific evaluation faces when trying to understand the universe. These might be viewed somewhat analogously to the Heisenberg Uncertainty Principle but for slightly different reasons. The basic issue is that whenever we measure anything, we naturally affect that thing. On the macro level, these effects are negligible and thus practically unimportant. However, on the atomic level, these effects can be substantial. From the perspective of the brain, there are limitations, particularly with regard to conscious perceptions of the world that might limit our ability to say anything completely definitive about the nature of the universe. This limitation is critical for understanding neurotheology and its ability to evaluate theology and the subjective experiences that arise within the brain.

***Since the brain cannot readily escape its own functioning, there is a fundamental uncertainty in all beliefs about reality.***

***If the brain by itself cannot definitively determine truths about the world, then a combination of approaches is necessary to evaluate epistemological and ontological claims.***

These two principles reflect one of the most ancient problems of philosophy, religion and science which is: “How do we know that the external world corresponds completely, or at least partially, to our mental representation of it?” This neuroepistemological question is critical to theology since we must always ponder whether any conception of God represents a true reality or not. Certainly, the atheists would argue that any belief in God is misguided and does not represent what is actually in reality. For the religious individual in general, and theology in particular, the issue of God’s existence must be addressed even if it is taken as a priori. The question of what is “really real” has been considered, with various answers, since the

time of the presocratic Greek philosophers in the West. Preoccupation with this question is even older in Eastern religio-philosophical traditions. The three most common criteria given for judging what is real are (d’Aquili and Newberg, 1999):

1. The subjective vivid sense of reality.
2. Duration through time.
3. Agreement intersubjectively as to what is real.

From a neurotheological perspective, all three are associated with specific brain functions and thus, I would argue that all three of these criteria for determining what is real can be reduced to #1 above -- the vivid sense of reality. For example, the sense of duration through time depends on the structuring of time in baseline reality. It appears that the ability to have a sense of time, or more properly duration, is structured by the brain. Alteration of function of parts of the brain, for any reason, results in a significant distortion of the perception of time in a number of ways. Most dramatically, during mystical states, there is no sense of time or duration while the person is in that state. It becomes obvious that time and duration are not absolutes, and derive their perceived qualities from brain functions. Hence, it begs the question to derive the reality of baseline reality from one of the *qualia*, in this case time, which is itself perceived by the brain. This same critique applies to any appeal for the reality of objects which depend on characteristics of baseline reality the perception of which is known to be experienced by the brain. The third criterion for the reality of entities, i.e. intersubjective validation, again arises from begging the question. The “subjects” who agree or disagree about objects being real are themselves only images or representations within the sensori-cognitive field of the analyzing subject-theologian. Thus, it may be unfortunately true that any person analyzing his or her own experience must start out, at least, as a naive solipsist.

Neurotheological analysis suggests that the only way around this problem would be to somehow escape one’s own mind. In the usual state of reality, this is a fundamental problem. This throws all

beliefs into question and not just religious ones. Moral, political, social, health and all other beliefs that we rely on each day must have at their core a fundamental uncertainty. The need for a “leap of faith” is expressed often in religious texts. However, a neurotheological approach would argue for augmenting or integrating in some manner whatever religious or spiritual beliefs one has with a scientific perspective. It might be argued that science is limited in its knowledge of reality by its perpetual need for an observer who can never fully escape the world as represented in the brain. On the other hand, spiritual and mystical experiences sometimes are described as enabling the individual to escape the self, to get beyond the objective and subjective nature of reality, and to experience ultimate reality. Mystical experiences, near death experiences, and even some drug induced experiences can fall into this category. It is interesting to note that such experiences are also perceived to be “more real” than our everyday experience of baseline reality.

If we are forced to conclude that knowledge of reality is ultimately reducible to the vivid sense of reality, then what are we to make of such states that appear to the experiencing subject as more real than baseline reality, even when they are recalled from within baseline reality? If one takes baseline reality as the point of reference, it seems that there are some states the reality of which appears to be inferior to baseline reality and some states the reality of which appears to be superior to that of baseline reality when these states are recalled in baseline reality. And this is the crucial distinction since these are not experiences that appear real only while one is experiencing them, these are experiences perceived to be more real than baseline reality *when recalled from baseline reality*.

Neurotheology should take the stance that while we may not necessarily know whether mystical experiences truly take the individual to ultimate reality and enable them to experience it without objective and subjective states of the brain, such experiences must be carefully considered as a mechanism by which the most profound scientific and theological questions can be approached.

## Conclusions

The purpose of this paper was to consider the several principles of neurotheology and explore how these principles relate to neuroscience and theology. As an emerging field of study, neurotheology has the potential to offer a great deal to our understanding of the human mind, consciousness, scientific discovery, spiritual experience, and theological discourse. However, neurotheology must tread carefully upon these hallowed grounds, developing clear, yet novel methods of inquiry. The results of neurotheological scholarship must be viewed and interpreted cautiously. However, if neurotheology is ultimately successful in its goals and principles, it has the potential to revolutionize our understanding of the universe and our place within it.

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