

Neurotheology-Matters of the Mind or Matters that Mind?

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ABSTRACT

Understanding the true nature of an individual, be it a child or an adult, a male or a female, is almost an impossible task. The vast abyss like behaviour of a human mind is virtually unfathomable. Yet, with the advent of neurosciences, it can be said that we, as the medical fraternity, have been in a position to decipher a considerable part of the human mind. This review accepts the fact that religion and theology have extreme reverence and respect. Yet, when it comes to extraordinary beliefs, phenomena, unimaginable feats and emotional deviations of the human mind, especially those which involve deep faiths and beliefs, comprehensive neuroscientific

explanations from the emerging data, with the aid of elaborate neuroimaging, have proved to be extremely rational and logical.

This review did make an attempt to untangle some facets of spirituality and to make rational explanations of the same. It was an attempt to understand the function of the mind (as an abstract) and the brain, on the spiritual experiences and sudden enlightenments, the experience of togetherness with the universe, and to understand the phenomena of trance and an altered state of consciousness, which is better referred as the emerging science of neurotheology.

Key words: Neurotheology, Neuroimaging, Neuroscientific

INTRODUCTION

The Science of Theology

Going by the stand which is taken by theologians, science cannot explain religion on the basis of experiments and research. Intellectually, the theologian, Haught has argued that “neuroscientists have isolated one small aspect of the religious experience and that they are identifying that with the whole of religion”. Religion is something which exists in all the nations on the earth and among the people of all walks of life. It binds people together with common values and beliefs. The believers state that science may be able to decipher the reactions of the human mind to certain phenomena, but that it definitely cannot explain God himself.

The rationality of the human mind and the behavioural attitude towards religion and spirituality have been spelt out by its practitioners, most famously by Francis Crick, whose “astonishing hypothesis” has been framed explicitly as a direct challenge to the legitimacy of the non-neuroscientific accounts of the human person: “The Astonishing Hypothesis is that ‘you’ – your joys and your sorrows, your memories and ambitions, your sense of personal identity and free will – are in fact no more than the behaviour of a vast assembly of nerve cells and their associated molecules” [1].

The Emergence of Spiritual Neuroscience

The science of neurotheology, or what is better known as spiritual neuroscience, is a recent entrant to the specialty of neurology [2]. The sub disciplines of neuroscience, i.e neuropsychology, neurophysiology and neurophilosophy have now come into the forefront. To this list, another very significant yet debated facet is being added, which is better known as “neurotheology”. These

four elements form the corner stones of neuroscience and they are in vogue as the basic instruments, to dissect, decipher and to deliberate on the basic human psyche and behavioural attitudes. The entire concept of neurotheology is to bridge the phenomenon of spirituality and the emanating subjective experiences, thereof, with plausible scientific explanations of the same. The promoters or experts in the field of neurotheology reiterate the fact that there is a neurological and an evolutionary basis for all the subjective experiences, which emanates from spiritual and religious practices [2].

Neuroscience has been always misused as a term, especially when religion and theology lock horns. This particular ambiguous status of neuroscience, more specifically, neurotheology, was made popular by James Ashbrook. He was a theologian who had turned into a neuroscience student, who made history by introducing neurotheology as a terminology. Though till date, there is no definition for the same, however, neurotheology does make an attempt to rationalize the phenomenon of religious experiences through scientific explanations [3]. The aim of neurotheology is to question and “explore theology from a neurological perspective, thus helping us to understand the human urge for religion and religious myths” [4].

The Anatomy of the God Spot

The central nervous system is the most elaborate and the highly evolved structure of the human body. Every brain is a complex intertwined network of neurons. Every individual is unique. The origin of the individuality of every human being lies in the neurochemical and the hormonal interactions between each part of the central nervous system. The brain interacts within itself between the cortex, hypothalamus, hippocampus, amygdala and the limbic system.

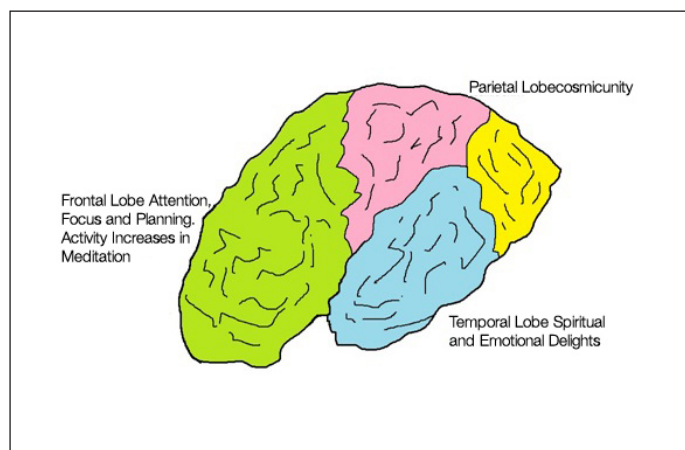
Every individual's uniqueness, and personality is determined by

the interactions amongst these areas. Certain basic functions are characteristic to that particular sector or part of the brain, which are especially in tune with neurotheology; just as the thought process is regulated by the prefrontal cortex, in tandem with the temporal lobes, the hypothalamus orchestrates the hormonal regulation. Certain aspects of the human mind, which have been further deciphered, include the hippocampus which connects the self of a human being with the external world, the amygdala which regulates the human response to motivation, affection and meaning and most remarkably, the limbic system which fills in the emotional quotient to the entire scenario.

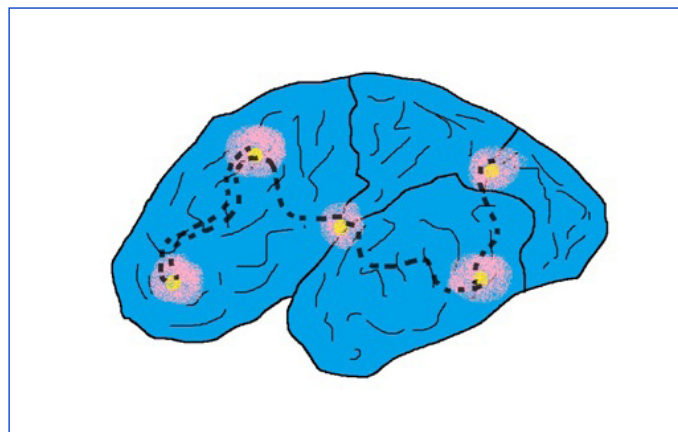
Certain studies have recently suggested specific mechanisms, whereby the evolutionary alterations in the structure of the brain may account for the development of religion as well as love, memory, and dreams. As the brain evolved, he explains, the overgrown cerebral cortex came to overlie the more primitive, emotion –regulating limbic structures, which in turn, surmounted the most primitive brain-stem structures and the associated hypothalamus. Linden argues that the accidental linking of these portions of the brain accounts for many of the tribulations of humankind –anxiety and other emotional disturbances arise in the substantial part from the ongoing war between the “rational” higher centres and the emotion-laden limbic system.

Various studies have been carried out to evaluate and analyze the human beliefs, responses, thoughts, and inhibitions which are linked to God and religion. The sense of a union with God or sometimes even greater experiences which are linked to enlightenment, emotions and consciousness of the body and mind are linked to the entire brain as a whole.

What we found to be common in a majority of the studies was that “no single God spot exists”. The brain is a hard wired centre of neurons in the seas of the gray and white matter, with the primitive brain stem being connected to the emotive centre, the limbic system, which is further governed by the higher intellectual centres of the brain i.e. the cortex as a whole, with all its lobes [Table/Fig-1]. There is no single anatomic site which can be dubbed as overtly religious or spiritualistic than the other. They all work in unison and each one is special in its property. These centres tend to contribute in their own unique way, for the propagation of spiritualistic feelings, thoughts, abstracts, visions, etc. It is all these centres and parts in a coordinated and sequential manner, that shows activation when they are recruited for such desired functions on religion and God.



[Table/Fig-1]: Basic theological orientation of lobes



[Table/Fig-2]: Kindling Phenomenon, where in the temporal lobe as well as the frontal cortex kinds into the other parts of the brain, kick starting a kind of an “electric mini storm”

Physiology of Religion

Our brain is a centre of excellence; it is a temple in itself for the realisation of the existence of God as well as to preach and to follow the moralities and prohibitions in the form of the practice which is called religion. However, it is the out of body experiences, transporting oneself to heaven and other neverlands, as well as the oneness with the universe, exaggerations on the flashy starry lights, visions and inner voices (the announcements from heaven), and other virtual episodic events, which are being interpreted and preached as reality and miracles, which form the extreme marker points of debates.

The biological continuum of the behavioural psyche seems to have no borders and after much pondering on the same, no well defined boundaries have been categorised to differentiate the right from the wrong, or to state where the normal mindset ends and to where an abnormal mindset begins. It can be rightly said that we are normal human beings as far as our personality and behavioural attributes are concerned and yet, some amount of madness is present in all of us. This particular shady zone of behaviour probably helps us to define something which is better known as malfunctioning temporal lobes in the form of transients, rather than full blown epilepsy. Norman Geschwind worked on the neurophysiological aspect of the temporal lobe. He noted that with temporal lobe seizures, the subjects tend to experience hypergraphia, hyperreligiosity, reduced sexual interests, fainting spells and pedantism, which are collectively termed as the Geschwind syndrome [5].

Among the most electrically unstable portions of the brain, the temporal lobes are quite sensitive to extremely low magnetic frequencies. There is a continuum of temporal lobe liability or sensitivity, and even normal individuals have sub-clinical microseizures frequently, particularly during REMs or dreams. The full-blown effects of such electrical storms are seen in the petit mal and the grand mal seizures of epilepsy. The seizures in epilepsy propagate in the brain sectors through a process which is known as kindling. The nerve signals are amplified in an excessive manner, resulting in a chaotic electrical storm that tends ultimately to stimulate multiple areas of the brain [6]. For example, in case of the temporal lobe scenarios, the spread of the ectopic electrical activity waves to the underlying limbic system and the hippocampus is frequently noticed. Unless the ectopic electrical impulses do not propagate the underlying motor system, there will be no physical seizures in such case.

The temporal lobe is a crucial site which houses multiple structures and it is responsible for multiple physiological functions which

include the language, interpretations of the visual and audio stimuli, memory, the interpretations of the emotions and meaning and the orientation of the self related to time and space. Multiple functions are regulated through the temporal lobes, and any sort of electrical overstimulation to the ectopic, results in the kindling of varied multiple sites of the temporal lobe [Table/Fig-2]. Most importantly Temporal lobe epilepsy (TLE), and temporal lobe ectopics (in normal individuals) are dubbed as temporal lobe transients. Such temporal lobe malfunctions which are caused by an exaggerated stimulation can result in classic personality changes. The most common temporal attributes which are affected, include mood swings from highs (like a feeling of elation or well being) to lows (as in depression and aggression), an anxious attitude, hypergraphia, neophobia, a very active dream process, an intense feeling of religious as well as spiritualistic and philosophical experiences and reports of psi experiences.

The amygdala is a very significant part of the limbic system. It can be dubbed as the 'emotional sentinel'. It is possibly, the first part of the brain to react to positive as well as negative environments around the brain. The amygdala is calibrated as early as during the foetal life in the womb, through the basic subjective perception by the foetus, whether the world around it is safe, comfortable and welcoming or whether the surrounding environment is unfriendly, difficult and toxic or even threatening. And in any case, the negative or positive perceptions of the amygdala, along with the entire limbic system, tends to perceive these emotive issues and makes necessary adjustments in the ultimate psyche and personality of an individual.

As far as the spiritual and religious personifications are concerned, the temporal lobe electrical ectopics result in supreme faith and hardcore rigid beliefs. The spiritual phenomenon results in a recurrent depersonification, time distortion, frequent anxious attacks or panic, a sensation of altered space and time, flying or floating sensations, a feeling of free falls, the presence of sacred or malefic ghosts or apparitions, confabulations or fantasies being expressed, voices and visual experiences of heavenly as well as hellish kinds and a whole more plethora of electrified episodic personality fluctuations. But these events are at times, disagreed and debated on as far as their origins are concerned and they are disagreed with as pathognomic of temporal events. With the TLE, in an individual, his or her episodic attacks are interpreted very differently, more spiritualistically and with a haullistic reasoning and ultimately, the individual ends up defining oneself as a unique persona with a special meaning for self.

It seems to be the limbic system that governs our responses to these outworldly matters and events and the related individuals. It is this system which decides our response and our detachments and our attached attitude towards life and death.

Neuroscience Misconstrued

The world has always put forth an aspiring theory with two views, in case of neurotheology. The case lies in the hands of theologians and scientists. The neuroscientific community has a reductionist approach towards religion. It tends to disapprove the religious basis of human extraordinary experiences, and phenomena, by furnishing a rather neuroscientific basis. Attempts to solve the mysteries and to unravel the truth behind various miracles and extraordinary phenomena, have been made in the past, which have culminated in many a speculation and animal experiments,

only to remain inconclusive in both ways –spiritually as well as scientifically. Extensive advanced imaging techniques have helped the neurologists in mapping the entire brain with its functional capacities and in analyzing the exaggerate at times erratic responses of these gray and white matter regions.

Michael Persinger has described his work on the reductionist school of thought. Persinger has explained that "God" was a terminology which was used to describe all that was felt by an individual in terms of his/her sensitivity and emotional liability due to external interactions, when in actuality, it was nothing but a neurological accident, be it seizures or ectopic impulses in the brain.

Persinger explained that any sensation, either of a positive nature (peacefulness or serenity) or a negative nature (fear and anxiety) emanate from neurochemical epicentric triggers like hypoglycaemia, hypoxia, stress, etc. Religion has nothing to do with these experiences. A person who experiences such negative or positive feelings tends to self believe and create God around him/her due to an internal phobia of extinction or imminent danger [7].

In stark contrast to the view of Persinger, the religionist school of thought has given due regards to the fact that all neural occurrences are an aftermath of genuine religious phenomena. This school emphasises that religion is the epicentre which triggers neurological activities which lead to spirituality, meditation, transdental phenomena and enlightenment. Eugene d'Aquili and Andrew Newberg, in their experiments which were done on mediating Buddhists monks and Franciscan nuns, demonstrated an increased cerebral blood flow in these individuals by Spectral Single photon emission computed tomography (SPECT) Scan. They concluded that all the religious or mystical phenomena which emanate from meditation or God-like experiences are not due to malfunctional, dysfunctional or distraught minds and that they should not be based on explanations like epileptic attacks, seizures, ectopics or a psychotic hallucinating behaviour, as has been emphasised by the reductionist school of thought. Most of these experiences occur when the hippocampus blocks the neural flow in the pariental lobe, which results in a loss of differentiation between self and non-self.

However, at the end, both the reductionist and the religionist have narrowed down to one thing for certain, that God and religion are not all about theology and that there are definitive neuroscientific evidences for a better understanding of religion. Theology seems to be unscientific and therefore, it should be replaced by neurotheology [8]. The science of neurology and the depth of religious spiritual phenomena are too complex to be easily unfolded, decoded, interpreted and preached to the medical and the theophilosophical worlds.

The Temporal Lobe Transients – Visual Delights !!!

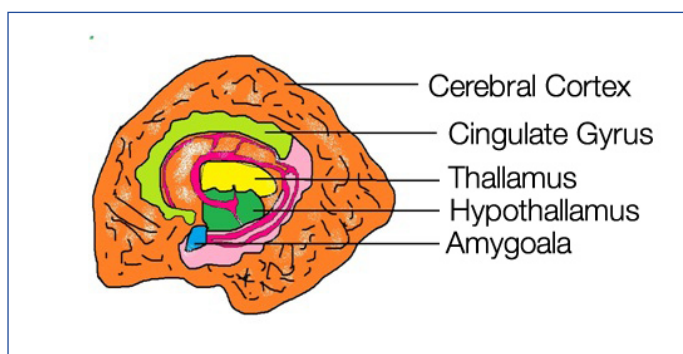
Visions have always been at the forefront of saintly and Godly experiences. Human beings, many a times, come across strong sentimental experiences which trigger their visual responses in the form of seeing or hallucinating a revered object or figure. The brain's visual area has a two way connection and it not only interprets the images which it sees but it also sends electrical impulses to the temporal areas. The temporal lobes which are housed on both sides of the head have circuits which are responsible for language, a conceptual thinking and associations. The temporal lobes are prone to the ectopics – which is better known as temporal lobe epilepsy. These temporal lobe aberrant electrical impulses

are the basic aetiology which causes such an overt outburst of visual stimulations, appearances of heavenly nature in the form of bright lights and figures which are revered in the psyche. During Persinger's experiment, the subject's sensory input eyes and ears were blocked, for detracting the influence from the surroundings. When the helmet is placed and mini electrodes are attached to it, it sends a kind of a electrical stimulation to the hemispheres of the brain, resulting in the development of a magnetic field pattern in the right hemisphere. The candidates (volunteers) tend to experience a sense of loss of time or say, timelessness and paranormal visions and some even come face to face with spiritual Godly entities. This can result in the development and the formation of micro-seizures. Such a kind of stimulation at the level of the limbic system can result in the reported feelings of a 'forced motion', a physical distortion and hyper emotionality.

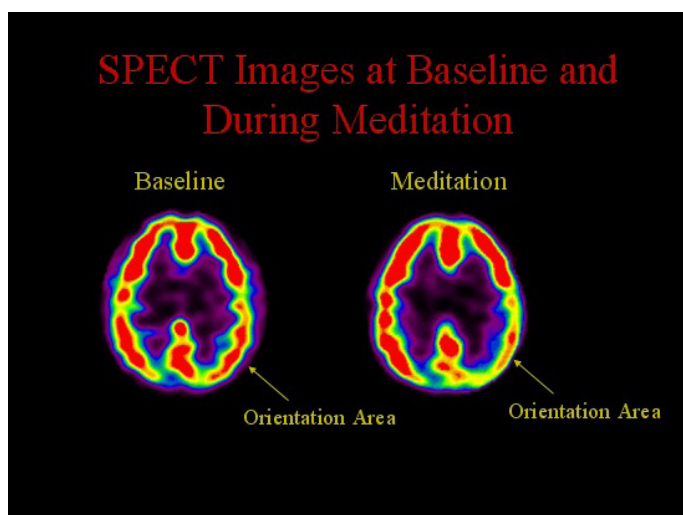
The entire limbic system, along with hippocampus and the amygdala, has a major role to offer. These are the seats of a higher emotion (amygdala), memory and experience (hippocampus) [Table/Fig-3]. In context to the stimulation of the temporal lobe cortex, this closely inter twined network of neurons in the limbic system also becomes hyper stimulated. This ultimately generates the feelings of hallucinations and visions. Neurochemically, there is the presence of large quantities of enkephalin and there is an increased expression of the opiate receptors in the amygdala as well. Such stimulatory effects from the temporal lobe to the limbic system ultimately result in the feelings of euphoria and rapture.

Pariental and Temporal – The Rhythm Divine !!

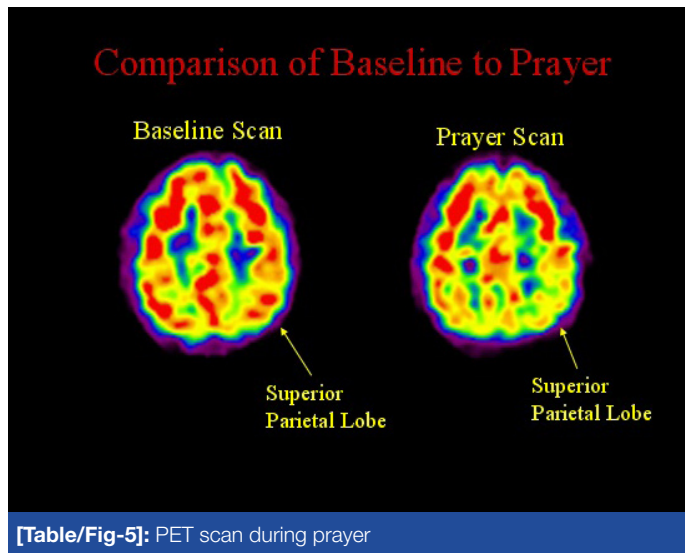
The temporal lobes actually play a major role in the whole scenario.



[Table/Fig-3]: Amygdala "the emotional sentinel" sensitized in the womb itself, along with limbic system seat of spiritual experiences, hallucinations, apparitions



[Table/Fig-4]: PET scan during meditation



[Table/Fig-5]: PET scan during prayer

These phenomena are caused by a simple misattribution of the 'inner voice', during periods of sensory isolation. In understanding the basic physiology, we have to get to know the broca's area, which is responsible for speech and language. This area remains active in its functioning, even during meditations and seizures as well. What actually happens during seizures and meditations, is that there is a kind of restriction of the sensory information which is imparted on to the broca's area, which is misconstrued and misjudged as the voice within or as the voice from an external entity, which is mostly of a supernatural nature.

Spiritual Enlightenment ! – Lobe Switch on off Mechanism

The experiments and the research of Newberg further explains the state of "hyperquiescene", wherein intense practice and deep meditation leads the candidate into entering a complete state of tranquility and a serene mind. This state of total tranquility is where personal thoughts and feelings, along with physical feelings and sensations, are absolutely restricted from invading the consciousness, a kind of a lobe switch off. Another important finding included the following: at times, an extensive sensory stimulation in the form of dancing and chanting hymns or prayers results in an excessive stimulation of the limbic system. The excessive arousal of the limbic system results in a heightened religious experience. Imaging researches which were carried out on people who experienced hallucinations, made us understand, that during hallucinations, there is a definitive deactivation of some neuronal activity from reaching other areas of the brain, which is mainly caused by the hippocampus, and at the same time, there is extensive stimulation of the limbic system. This switching off of a higher centre imaging and letting the limbic system manage the solely, result in an intense emotional condition of the human mind. This finally, prompts religiously significant phenomena of the sensory kind. The prefrontal cortex area depicted a dramatic increase in its neuronal activity (enhanced red areas) as compared to that in the baseline brain, a kind of an electric storm in that area. This activity in the frontal lobes is usually associated with a meditative state which is common in both monks (who usually practise meditation) and nuns (who practise prayer recitals) [Table/Fig-4]. They also showed similarity in the orientation area (the superior parietal lobe), which showed a dramatic decrease in its neuronal activity (enhanced yellow areas and reduced red areas) [9] [Table/Fig-5].

The prefrontal cortex is associated with attention and concentration.

In contrast, the parietal lobe which has its functions associated with the time concept and spatial activity, is rather quiescent. This limited neuronal activity of the parietal lobe makes it lose its ability in differentiating between the inner self and the outer world. Mediators and spiritualistic individuals report about a sense of unity with the universe, a “feeling of oneness” and becoming one with the supreme force, especially during intense trance.

Spirits (Drugs) and Spirituality

The phenomenon of neurotheology is just not limited to the epileptics or to normal individuals with transients. It is a concept of feelings or sights in the form of hallucinations, which can be entitled to any individual who is on narcotics. What actually rules the arena, are the neurotransmitters which excite the limbic system as a whole, the ‘emotional sentinel’ amygdala and even the hippocampus, resulting in, what can be termed as, the brain succumbing to the actions of neurochemicals. A high sense of euphoria which pertains to religiosity, comes into play with dopamine and at the same time, with a kind of a block on the action of the serotonin receptors. These kinds of neurotransmitter imbalances create similar feelings which are pretty much recited or told by individuals with temporal lobe epilepsy. The scientists in the pharmacological field came across a set of certain neurotransmitters like N-dimethyltryptamine, the increased levels of which in the pineal glands, tended to spark off or trigger hyper religious phenomena [10].

Hypothetical Commandments

To summate the whole concept of the neurotheology phenomenon, Ramachandran, the famous cognitive neuroscientist, stated the following four basic hypothesis [11]:

First – God actually visits the patients of temporal lobe epilepsy, out of sympathy or what ever and this cannot be disapproved by science in anyway. So, maybe these people are correct after all.

Second – This is an outright scientific viewpoint. These people who suffer from temporal epilepsy are nothing but mentally deranged people. Obviously, their temporal lobes are not functioning well as and so they are behaving irrelevantly.

Third – This hypothesis states that the right half of the brain is not working and so the left half takes over and starts to spin a yarn. It then starts confabulating in order to pacify the affected right half, resulting in strong faiths, beliefs and story making. This is possible through a cascade of neurological stimuli to the visionary centres which are helped out by the amygdala.

Fourth – This hypothesis has to do with the gateway to emotions, that is the limbic system, specifically the amygdala. Here, the phenomenon of kindling takes place, where the hyper excited temporal lobes kick start the limbic system emotions. The

candidate sees meaning and arousal in anything abstract or in nonliving objects and even in nonentities and he/she links it with overwhelming religious experiences.

CONCLUSION

As an author who is on a candid side, religion cannot be judged by some scientific researches and experiments. A religion has a past with an ethos and eons of years behind it. History states about miracles, which are being attempted to be explained by researchers. A religion means belief, faith, compassion, empathy, truth, culture, ethos, values, tradition, love and much more. Neurotheology falls short in explaining any of these facets. Explaining and deciphering some individuals’ experiences of re-awakening and re-kindling of the mind is not uncoding of a religion. Neurotheology cannot declare that Godly figures in their entirety are epileptics and get away. Till followers are there, religion will be there and so will metaphysical and mystical phenomena. God created humans and he made humans intellectually superior amongst the entire fauna and flora which are found on earth, to follow an institution called religion. However, the humans with an ever increasing intellectual capacity, ironically started deciphering the same mind which was created by God himself.

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Financial or Other Competing Interests: None

Date of Submission: **4 Dec, 2012**
Date of Peer Review: **25 Feb, 2013**
Date of Acceptance: **27 Mar, 2013**
Date of Online Ahead of Print: **08 May, 2013**
Date of Publishing: **01 Jul, 2013**