

# Pathological and Normal Spiritual Experiences

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We aren't disappointed [with the results from our brain imaging study]. The finished scan images show unusual activity in a small lump of gray matter nestled in the top rear section of the brain. The proper name of this highly-specialized bundle of neurons is The Posterior Superior Parietal Lobe, but for the purposes of this book, Gene and I have dubbed it the Orientation Association Area, or OAA.[i]

The primary job of the OAA is to orient the individual in physical space--it keeps track of which end is up, helps us judge angles and distances, and allows us to negotiate safely the dangerous physical landscape around us.[ii] To perform this crucial function, it must first generate a clear, consistent cognition of the physical limits of the self. In simple terms, it must draw a sharp distinction between the individual and everything else; to sort out the you from the infinite not-you that makes up the rest of the universe.

So, not surprisingly, the baseline SPECT scans of Robert's brain [Robert, you will recall, was our meditator in Monday's Metanexus: Views 2001.12.10] that were taken before his meditation, while he was in a normal state of mind, show the Orientation Area to be a center of furious brain activity. This activity appears on the scans in vibrant bursts of brilliant reds and yellows.

The scans taken at the peak of Robert's meditative state, however, show the Orientation Area to be bathed in dark blotches of cool greens and blues--colors that indicate a sharp reduction in activity levels.

This finding intrigued us. We know that the Orientation Area never rests, so what could account for this unusual drop in activity levels in this small section of the brain?

As we pondered the question, a fascinating possibility emerged: What if the Orientation Area were working as hard as ever, but the incoming flow of sensory information had somehow been blocked?[iii] That would explain the drop in brain activity in the region. More compellingly, it would also mean that the OAA had been temporarily blinded, and deprived of the information it needed to do its job properly.

How can we study spiritual experiences from a scientific perspective? While these issues are touched upon in *Why God Won't Go Away*, I am elaborating on them here because of the complexity of developing such a field of study that remains true to both science and the spiritual. However, the research on brain function (particularly associated with spiritual experiences) described in *Why God Won't Go Away* and performed both in our lab and laboratories across the country provides a major step towards developing a coherent and comprehensive model of religious experience.

An examination of the current literature data bases suggests that there are sufficient reports concerning various neurophysiological and physiological aspects of spiritual phenomena to, at least, consider the plausibility of an experimental neuroscience of spiritual experience. Indeed, the literature contains a number of studies in several specific areas regarding the relationship of the central nervous system to spiritual phenomena.

Certain psychopathological disorders, such as mania and schizophrenia, tend to be associated with a high prevalence of intense spiritual phenomena (Saver & Rabin, 1997). Some of the reasons for the association of spiritual experiences with neuropsychiatric disorders involve what appear to be hallucinations, visions, voices, and often unusual thought processes that can be misidentified as pathological. On the other hand, there appears to be a clear distinction between spiritual pathology and non-pathological spiritual experience. Specifically, although many people with psychopathological disorders may experience spiritual phenomena, not all spiritual phenomena occur in a pathological state in a previously normal subject. There is abundant evidence in the charismatic traditions and biographical observations of spiritual individuals to rule out psychopathology as a sufficient explanation for all such experiences (Eliade, 1964; Mandell, 1980; Wright, 1989).

There are also a number of neuropathological disorders which are associated with altered senses of spirituality and unusual spiritual experience. For example, profound religious experiences including religious conversion are often associated with temporal lobe epilepsy (Bear, 1979; Bear & Fedio, 1977; Saver & Rabin, 1997). However, other investigators have suggested that there is no correlation between temporal lobe epilepsy and unusual religious experiences (Tucker, Novelly, & Walker, 1987). Therefore, not all subjects with temporal lobe epilepsy have spiritual experiences, and certainly not all spiritual experiences are related to epileptic activity in the temporal lobe. Subjects suffering from head trauma, other types of brain damage, or dementia may also have alterations in their usual set of spiritual experiences. Specifically, as cognitive and emotional functions decline, there may be concomitant changes in spiritual experience. Thus, the neuroscientific study of spiritual experience must, in part, involve further distinguishing between spiritual experiences that occur in individuals without neuropsychiatric disorders and spiritual experiences associated with pathology.

There also needs to be a clear distinction made between "normal" and "pathological" spiritual experiences. In order to do this, one of the first obstacles that must be overcome is the lack of clearly defined interventions which maintain enough constancy to be scientifically investigated in normal individuals. Neuroscience may itself help to distinguish spiritual experiences that are "normal" from those that are "pathological" as well as the association of these experiences with neuro- and psychopathology.

Another rich source of spiritual phenomena is the pharmacological activation of profound spiritual experiences by a number of drugs, including LSD-like indoles and substituted amphetamines (Mandell, 1980; Wright, 1989). Indeed, some drugs are so adept at reproducibly inducing spiritual experiences that they have provided a foundation for some indigenous religious rituals, for example, peyote use by some Native-American groups. However, not all subjects will attain spiritual experiences with a given drug. Cultural, personal, and

pharmacokinetic and dynamic actions on neurophysiology interact with neuronal actions of such agents. Nevertheless, the fact that substances that are known to alter specific neurochemical pathways can produce spiritual experiences suggests that certain neurophysiologic states can subserve some types of spiritual experiences (Mandell, 1980; Wright, 1989).

Another source of literature for developing a neuroscience of spiritual experience are experiments that have measured various physiological responses to spiritual interventions such as intense meditation. For example, subjects who perform meditation have been found to have lowered blood pressure, decreased respiratory and heart rates, and changes in galvanic skin responses (Corby, Roth, Zarcone, & Kopell, 1978; Kesterson, 1989; Jevning, Wallace, & Beidebach, 1992; Sudsuang, Chentanez, & Veluvan, 1991). However, it is difficult to determine a consistent set of physiological changes related to "spiritual interventions" since the literature considers a wide variety of interventions that may result in different physiological responses. Nevertheless, there is little doubt that physiological changes do occur during spiritual interventions such as meditation. Indeed, the central nervous system is capable of altering body physiology through various hormones, neurotransmitters, and autonomic activity, and there is a strong literature to support the notion that any intervention that affects the central nervous system may ultimately affect body physiology. The same should be true of spiritual interventions which involve consistent changes in brain activity. Therefore, interventions such as meditation should be capable of altering body physiology via changes in brain activity. Studies of spiritual interventions should thus be limited to those experiences that can be regularly and reproducibly initiated under circumstances that allow for neurophysiologic and physiologic measurement.

Of particular interest are the studies directly showing neurophysiological changes during spiritual interventions such as meditation or prayer. For example, electroencephalographic, or EEG, studies of subjects undergoing meditation have suggested alterations in brain wave frequency and amplitude (Hirai, 1974; Schacter, 1977). These same studies have shown that depending on the depth and type of the meditation, different, but consistent, changes in EEG recordings are obtained. Furthermore, functional brain imaging studies such as ours and others have shown changes in cerebral blood flow and metabolism during meditation.

Based on the above review of the existing literature, a number of neuroscientific paradigms appear to be able to contribute to the initial scientific operationalization of spiritual experience. These paradigms include:

- 1) the neuropsychology of spiritual interventions;
- 2) altering spiritual interventions with various pharmacological agents;
- 3) drug-induced spiritual experiences; and
- 4) neuropathologic and psychopathologic associated spiritual experiences.

The first paradigm involves an experimental spiritual intervention such as prayer or meditation with concomitant measures of a psychological- and spiritual- dependent evaluation. This will help to define and delineate the nature of the spiritual intervention itself. These psychological and spiritual measures can then be compared to simultaneously derived neurobiological parameters, such as electroencephalographic activity, cerebral blood flow,

cerebral metabolism, and neurotransmitter activity. Such measures can be performed with state of the art imaging techniques. Body physiological scalar parameters such as blood pressure, body temperature, heart rate, and galvanic skin responses can also be measured. Other body physiological parameters such as biofluid and immunological assessments, hormonal concentrations, and autonomic activity must eventually be included to complete a thorough analysis of the effects of spiritual interventions. Additional research is necessary in order to refine the measurement techniques and to better compare spiritual and physiological measures.

The second existing paradigm that might be employed to investigate spiritual experience from a neuroscientific approach uses pharmacological agents in an attempt to alter spiritual interventions. Thus, using this paradigm, a previously measured spiritual intervention will be compared to the same intervention with the addition of some pharmacological agent. For example, studies might attempt to show the effects of an opiate antagonist on the strength of the subjective experience of meditation or prayer. Preliminary studies of this type have shown no effect on EEG patterns during meditation when subjects were given either an opiate or benzodiazepine antagonist (Sim & Tsoi, 1992). However, it is clear that more extensive studies measuring a number of neurophysiological parameters are required. Other agonists and antagonists may be utilized to determine their ability to augment or diminish spiritual experiences.

A third paradigm that can be employed utilizes those people whose use of hallucinogenic agents has resulted in spiritual experiences. Since it has long been observed that drugs such as opiates, LSD, and stimulants can sometimes induce spiritual experiences, careful studies of the types and characteristics of drug-induced spiritual experiences, perhaps utilizing modern imaging techniques, may help elucidate which neurobiological mechanisms are involved in more "naturally derived" spiritual experiences. Comparing this paradigm to naturally occurring spiritual phenomena may allow for a better distinction of pathologic and non-pathologic spiritual experiences as well as help to gain entry into the complex functioning of the mind. Furthermore, by carefully delineating the effects of these agents, associations can begin to be made between various neurotransmitter systems affected by these agents and the associated experiences. Such an analysis can provide information regarding spiritual experiences on the level of the neurotransmitter systems, in addition to the brain structures involved. Another related approach that might also be useful would be to study the effects of drug withdrawal on spiritual experience. However, there are no reports in the literature of such findings.

A fourth paradigm would utilize patients with various known neuropathologic and psychopathologic conditions. Neurological conditions including seizure disorders, particularly of temporal lobe origin, brain tumors, and stroke, have been associated with spiritual experiences and/or alterations in religious beliefs. For example, temporal lobe epilepsy has been associated with hyperreligiosity and religious conversions. Psychiatric disorders such as schizophrenia and mania have been associated with spiritual experiences and religious conversions. Delineating the type of pathology and the location of that pathology will aid in determining the neurobiological substrate of spiritual experience. Thus, neuropsychiatric disorders can be an effective tool for the neuroscience of spiritual experience.

Research on pathological conditions has classically been used to elucidate the normal

functions of biological systems. Pathological spiritual experiences in psychiatric and neurological disorders may be central to the identification of largely nascent neurobiological systems that subserve "normal" spiritual experience. This presents a crucial counterdistinction to the historic psychiatric implication that spiritual experience is an expression of psycho- or neuro- pathology. This provides a framework in which normal spiritual experiences can occur in pathological and normal conditions and pathologic spiritual episodes might occur in individuals with or without psychopathological disorders. A parallel construct of equal importance is to counter the scientific tendency to equate mechanisms and data with the phenomenon, for example, "spiritual experience is nothing but activation of specific neuronal pathways". Therefore, care must be taken to avoid the referring to spiritual experience only in pathological terms or associated with pathological conditions as well as not reducing spiritual experiences only to neurophysiological mechanisms.

The information described above is partially summarized from a consensus conference of research scientists from across the country that was sponsored by the National Institute of Healthcare Research several years ago. This approach to studying religious and spiritual experience is a crucial factor in the development of the emerging field of neurotheology. Neurotheology refers to the field of study that combines neurophysiology and neuropsychology, with religious experience and theology. We will consider neurotheology in more detail in the next and last installment, but suffice it to state here that empirical research is very necessary for exploring the link between mental processes and religious experience. However, its role in the epistemological questions considered in the prior installment still remains to be completely determined.

#### Notes

- i. We should note here that many of the terms utilized throughout this book are not specifically scientific, but rather are designed to make the complex workings of the brain easier to understand. However, we will try to indicate what the scientific terms are as a reference for those interested.
- ii. Throughout this book, we will also refer to various functions of different parts of the brain. While it is possible to localize function to a reasonable degree, it is important to realize that the brain needs to work as a functional unit with each part needing the other parts to work normally.
- iii. This type of blocking of input has been shown to occur in both normal and pathological states. Blocking of input can also occur to a variety of brain structures via various inhibitory influences throughout the brain. We will consider this in more detail later.

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