From Brain Imaging Religious Experience
to Explaining Religion: A Critique

Nina P. Azari, Ph.D. and Marc Slors, Ph.D.

Department of Psychology, University of Hawaii, Hilo, HI, USA
Department of Philosophy, University of Nijmegen, The Netherlands

Abstract
Recent functional neuroimaging data, acquired in studies of religious experience, have been used to explain and justify religion and its origins. In this paper, we critique the move from describing brain activity associated with self-reported religious states, to explaining why there is religion at all. Toward that end, first we review recent neuroimaging findings on religious experience, and show how those results do not necessarily support a popular notion that religion has a primitive evolutionary origin. Importantly, we call into question an assumption—key to that account of religion—concerning a conceptual relation between ‘religion’ and ‘religious experience’. Then, we examine the conditions that must be met in order to explain religion on the basis of brain imaging findings. Moreover, we list principled reasons to be sceptical of explanations of religion in terms of the neural underpinnings of experiences. We conclude that the data from neuroimaging studies are not suited for an explanation of religion.

Keywords
Brain, Religion, Religious Experience, Neuroimaging, Explanation

I. Introduction
Recent developments in human brain functional imaging technologies—such as positron emission tomography (PET), functional magnetic resonance imaging (fMRI), and single photon emission tomography (SPECT)—afford the possibility of examining brain activity associated with a wide variety of mental phenomena (Raichle, 1998). Now there are functional neuroimaging reports on religious experience (Azari et al., 2001b; Newberg et al., 2001). Such studies have attracted popular attention, refuelling perceived controversy between science and religion (Begely, 2001a, 2001b; Woodward, 2001). Indeed, findings from recent brain imaging studies of religious experience have been used to draw broad conclusions about religion as such, in particular, to explain why there is
religion at all (Newberg & d’Aquili, 2001). Here we ask, how tenable are those conclusions? Specifically, the aim of this paper is to critically examine the extent to which functional brain imaging data of religious experience can be used to explain religion.

II. Brain and Religious Experience

Early and influential studies
Inquiry into the physiological processes associated with religious phenomena is not new. Indeed, there has been an ongoing debate for more than thirty years about whether or not, in-between seizures (i.e., the inter-ictal period), patients with temporal lobe epilepsy (TLE) (i.e., seizure foci in the temporal lobes) show a distinctive personality disorder (Dewhurst & Beard, 1970; Ramachandran & Blakeslee, 1998; Tucker et al., 1987), commonly referred to as deepened or hyper ‘religiosity’ (Bear, 1979; Bear & Fedio, 1977). The temporal lobes are part of the limbic system, which plays an important role in emotional processes, in particular, emotional arousal. Correspondingly, those who have argued for a distinctive TLE hyper-religious personality, hypothesize that hyper-religiosity is rooted in limbic over-excitation, expressed as a generalized hyper-emotionality to otherwise neutral events (Bear et al., 1982).

There is also a body of literature, according to which mystical and religious experiences are a specific symptom of Schizophrenia (for a review see especially Austin, 1998), and/or occur more frequently in persons who suffer from psychotic delusions and hallucinations than in normal, healthy individuals (Stifler et al., 1993). A recent study, using human brain functional imaging technology, reported an association between hyper-activation of the left temporal lobe with occurrence of religious delusions in a single case study of Schizophrenia (Puri et al., 2001).

A Popular Hypothesis
The findings of studies using particular patient populations (i.e., TLE, Schizophrenia), as well as those using healthy volunteers (Persinger, 1983, 1984), have led to the notion that the neurophysiological basis of religious phenomena is fundamentally a matter of an abnormal brain state, localized to the limbic system (Persinger, 1983, 1987). More broadly, this view hypothesizes that limbic activity is necessary for (any and all) religious experience (cf. Newberg & d’Aquili, ...
Indeed, some have suggested that direct stimulation (electrically or magnetically) of the limbic system will artificially generate a religious experience, even in a person who claims to be non-religious (e.g., an atheist) (Persinger, 1983). Conversely, others have speculated that removing limbic structures will render someone incapable of having religious experience (Ramachandran & Blakeslee, 1998).

The idea that religious experience is ‘marked’ by (dysfunctional) brain activity involving limbic structures has come to be known as the ‘limbic marker hypothesis’ of religious experience (Joseph, 2001). According to this hypothesis, only if the limbic system is active during a reported experience, can one conclude that religious experience has occurred. The absence of limbic activity would mean that religious experience was not present. In sum, the ‘limbic marker hypothesis’ forwards a conceptualisation of religious experience as rooted in a primitive brain-reflex response, for which thoughts and beliefs of the experiencer are of little (if any) importance.

There has been considerable evidence cited against the TLE-religiosity hypothesis (Tucker, 1987). In addition, most serious scholars of religion do not endorse this view of religious experience (Austin, 1998; Glassman, 2002; Hood et al., 1996; McNamara, 2002; Peterson, 2001, 2002; Teske, 2001). However, the ‘limbic marker’ hypothesis of religious experience persists, and, in fact has only become all the more popular as new neuroscientific techniques to study the live human brain have emerged (e.g., Alper, 2001).

From religious experience to religion: An assumption

The ‘limbic marker hypothesis’ has encouraged efforts to explain the natural origin of religion on the basis of brain activity data acquired in studies of religious experience. The general idea has been that, if one can make the case that religious experience is rooted in evolutionarily ‘primitive’ neural circuitry (i.e., involving ‘lower-order’ brain systems that humans share with less-evolved species), then one can argue that religion also has primitive evolutionary roots, that religion emerged as part of the natural order. On this basis, then, one could conclude that there is a scientifically justified naturalistic explanation for religion, and particularly why there is religion at all.1

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Key to this line of argument is an assumption concerning a conceptual relation between 'religious experience' and 'religion'. That is, religious experience is conceptualized as the essence of religion. On this approach, in order to explain (the naturalistic roots of) religion, all one needs to do is to explain (the naturalistic roots of) religious experience. Of course, this agenda additionally turns on there being a primitive (physiological) basis for religious experience in the first place. Cognitive neuroscience—in particular, human brain functional imaging—is the singular domain of science, which is expected to deliver best on this challenge.

Functional neuroimaging findings on religious experience

Recent developments in human brain functional imaging technologies—such as PET, fMRI, and SPECT—afford the study of the brain function in normal healthy individuals (Raichle, 1998). Predictably, there is a rapidly growing literature on the neurophysiological processes associated with a wide variety of normal human mental phenomena, such as imagery, arithmetic, abstract problem solving, and memory recall (Binkofski et al., 2000; Cabeza et al., 1997; Dehaene et al., 1999; Duncan et al., 2000; Kosslyn et al., 1993). Now there are two recent neuroimaging reports on religious experience (Azari et al., 2001a,b; Newberg et al., 2001).³

Azari et al. (2001b) used PET-CBF to study a group of self-identified 'religious' subjects, who were Protestant Christians, and a group of control subjects who were self-identified as 'non-religious'. Specifically, the subjects in that study were 12 normal, healthy adults aged 28+/– 5 years (mean +/– standard deviation). All were right-handed, native German speakers. Six subjects (2 women, 4 men) were self-identified as religious, and were members of a Christian 'Free Evangelical Fundamentalist Community'. They were teachers at a private Christian secondary school, and had been selected for their teaching posts on the basis of rigorous faith-based criteria. Each of them reported having had a documented conversion experience, and interpreted biblical text literally as the word of God. According to those religious subjects, the first verse of Psalm 23 (i.e., 'The Lord is my shepherd...') was essential for each to get into and sustain a religious state.


³ Three earlier studies were designed to examine cerebral blood flow changes during meditative relaxation, conceptualized in a broader sense than in terms of religious experience (Herzog et al. 1990; Lazar et al. 2000; Lou et al. 1999).
defined as ‘being in a personal relationship with God as Jesus Christ’. Six subjects (2 women, 4 men) were self-identified as non-religious, and were students at the University of Düsseldorf, Germany, studying various subjects in the natural sciences. For those subjects, religion did not play any significant role in their daily life, and, in fact, they reported feeling somewhat indifferent to religious matters (i.e., none was a committed atheist, but also none felt strongly about any particular set of religious beliefs or practices). The two groups were matched on age, gender, and level of education.

Azari et al. employed a self-induction functional neuroimaging paradigm, which involved asking the subjects to induce in themselves a religious state (as they understood that to mean) with the help of biblical text that the religious subjects themselves suggested would be most effective, namely, Psalm 23. Subjects were PET-scanned in six conditions (occurring in a different order for each subject). For each scan, the subjects were asked to induce in themselves the requisite target state, with the help of particular textual material (i.e., ‘cues’). Directly before and after each scan, the felt-quality of each target state was assessed objectively, using a standardized questionnaire (called the Positive Affect Negative Affect Scale, or PANAS; Watson et al., 1988). In addition, after each PET scanning session, the subjects were asked to assess the extent to which each felt he/she had attained the requisite target state (i.e., religious, happy, neutral; these self-assessment ratings ranged on a scale of 0-10). The scanning conditions were as follows: (1) religious-read, (2) religious-recite, (3) happy-read, (4) happy-recite, (5) neutral-read, (6) rest. The textual cues used for the different task conditions were: religious—the first verse of biblical Psalm 23; happy—a well-known German children’s nursery rhyme; and neutral—instructions on using a phone card, taken from the Düsseldorf telephone book. Texts were matched on length, and the rhyme was not associated with music. All subjects were able to recite from memory both the religious and happy texts at the time of the PET scanning. In the read conditions, the texts were presented on a screen that was visible to the subjects as they lay on the scanner bed. In the recite conditions, the subjects had their eyes covered, and recited the textual material silently to themselves. In the rest condition, they lay quietly with their eyes covered.

According to their self-assessment ratings, only the religious subjects achieved the religious state (while reciting the religious text). The functional brain imaging results during their religious state showed a brain activation pattern that corresponded to their individual self-perspectives. Specifically, PET images acquired in the religious subjects in the religious state showed peak blood flow activation in the right dorsolateral prefrontal cortex as compared to the non-religious subjects. This activation pattern was observed also in contrast to the happy state and
the neutral read condition. Other activations in the religious state were the dor-
somedial frontal cortex (or, pre-SMA) and a posterior parietal area identified as
the right precuneus. A more recent network analysis of the PET data further
distinguished the non-religious happy emotion state from the religious state,
again highlighting the particular importance of the prefrontal cortex in the lat-
ter (Azari et al., 2005).

The prefrontal cortex—a structure whose connectivity patterns were associ-
ated with the religious experience—is most recently understood to play an espe-
cially important role in particular kinds of social-relational cognitive processes
(e.g., ‘mentalising’ or ‘theory of mind’) (Adolphs, 2003a,b). Specifically, findings
from recent functional imaging studies suggest that widespread connections
involving especially the prefrontal and medial frontal cortex are critical for rea-
soning processes that are necessary for social interactions, namely, those that
involve ‘mentalising’—i.e., attributing independent mental states to oneself and
others; reflecting on one’s own inner states and reading another’s mind (Calarge
et al., 2003; Fletcher et al., 1995; Goel et al., 1995; Happe 2003; Kampe et al.,
2003; Siegal & Varley, 2002; Vogeley et al., 2001); agency detection (Blakemore
et al., 2003); intentional (vs. incidental) self-processing (Kirchner et al. 2002);
decision-making in social context (Sanfey et al., 2003), and complex emotions
such as empathy and sympathy (Decety & Chaminade 2003; Wicker et al.,
2003).

Importantly, the PET data indicated increased blood flow in the left amygdala
(i.e., a limbic structure) only for the happy emotion; no significant changes in
blood flow involving limbic structures were evident for the religious experience.
This particular finding not only challenges the ‘limbic marker hypothesis’ of reli-
gious experience, but, as well, supports the conviction that religious experience
and emotion, while related, are not exactly the same thing (Azari & Birnbacher,
2004).

In sum, these recent PET findings are consistent with the idea that complex
cognition—belief-thought, subjective awareness, learning, memory—are central
to (at least one kind of) religious experience, and, that limbic activity may not be
necessary for (all kinds of) religious experience.

In another recent neuroimaging investigation, Newberg et al. (2001) used
SPECT to study Buddhist meditation. They, like Azari et al., employed a self-
induction neuroimaging paradigm, in which they asked their subjects—four
men and four women, self-described as experienced, practicing Tibetan Bud-
dhist meditators—to meditate while their brains were being scanned. The par-
ticipants were allowed to use incense during the scanning sessions (i.e., ‘cues’).
Brain scan data were collected when the subject indicated that he/she was in the
most intense part of the meditation. Newberg et al. reported that changed blood flow in brain areas involved in cognitive processes (i.e. complex visual perception, attention, orientation, and verbal conceptualisation) correlated with the Buddhist meditation experience (e.g. areas such as the prefrontal cortex and the posterior parietal lobe, thought to be involved in creating mental representations of the self and orientation in space). These investigators also did not observe changes in brain activity in limbic structures during the religious experience of their Buddhist subjects.

Taken together, the neuroimaging results suggest that complex cognitive processes are central to at least some kinds of religious experience, and thus support a picture of religious experience as cognitive (Dupre, 1998; Gelphi, 1994; Henry, 1991; McIntosh, 1995; Proudfoot, 1985; Schlitt, 2001; Spilka & McIntosh, 1995; Spilka et al., 1985, 1992, 1996). On this understanding, religious experience is itself structured in terms of past and present beliefs, perceived meaning, and interpretation of the given experiential context. In this way, recent human brain imaging findings challenge the alternative, popular view that religious experience—and religion—is a matter of a pre-cognitive, brain reflex-response localized to the limbic system—i.e., the 'limbic marker hypothesis'. Indeed, brain activity in limbic structures—which is central to a conceptualisation of the biological roots of religious experience (and religion)—simply was not observed in the neuroimaging results.

Despite this fact, the functional imaging data on religious experience have been used to argue for the naturalistic basis, and, in fact, evolutionary necessity of religion. That is, it has been argued that brain imaging data of reported religious experience show that the human brain is hardwired for religious experience, as it is for religion (Alper, 2001; Newberg & d’Aquili, 2001). Religion serves an evolutionary function (has a naturalistic basis), and recent brain imaging data can directly demonstrate this. How tenable is such a conclusion?

III. Conditions for Explaining Religion using Functional Imaging Data

Emphasising the evolutionary necessity of religion is, of course, not merely an attempt at explaining why God, or rather belief in God, won’t go away. It is at least also a way of explaining why belief in God is there in the first place. It would be odd indeed to explain the sustenance of religion in naturalistic, evolutionary terms, but not its emergence. If we’re looking for a naturalistic explanation of religion, it is not enough to explain its sustenance and leave its emergence a mystery. So, like the 'limbic marker hypothesis', cognitivist attempts at explaining
religion in neuroscientific terms must involve attempts to explain the emergence of religion.

In this section we shall concentrate merely on the question of emergence as regards neuroscientific explanations of religion. First we determine two conditions, which have to be met by neuroscientific data in order to be suitable for explaining religion. Next we argue that the limbic marker hypothesis can meet only one of these demands. Hence it cannot explain the emergence of religion. After that, the cognitivist alternatives of the hypothesis are put to the test. Although it may seem at first that at least one of these alternatives, the view of Newberg and d’Aquili, can avoid the problems with the limbic marker hypothesis and meet both conditions, we shall argue that this can only be the case on a much too narrow, and in fact incorrect, understanding of the myths sustaining religion.

What does it take to explain the emergence of religion primarily on the basis of brain data? Two constraints

If the emergence of religion is to be explained primarily in terms of neuroscientific data, then these data must meet at least two constraints. First of all the existence of these data as well as our characterization of them must be independent of an existing religious tradition. If we have to invoke a religious tradition in order to claim the existence of these data, or in order to describe or characterize their peculiarities relevant to the explanation of religion, then obviously these data cannot be used to explain the emergence of that very religious traditions, on pain of vicious circularity. Let us call the required independence of the neuroscientific data from the religious tradition, whose emergence are alleged to explain the noncircularity constraint.

Apart from the noncircularity constraint there is another (equally obvious) constraint on neuroscientific data that purport to explain the emergence of a religious tradition. These data must—ceteris paribus—indicate sufficient conditions for the emergence of such a tradition. Of course the ceteris paribus clause is important here. Brain properties alone may well be strictly insufficient for the emergence of religion, since all kinds of further conditions may have to be met too in order for religion to emerge as a consequence of these properties. Think, for example, of the existence of a language or of the availability of conditions for physical survival. As long as these extra conditions can trivially or unproblematically be assumed to be obtained, they can be considered background conditions for a neuroscientific explanation of the emergence of religion. Thus the neuroscientific data can be considered ceteris paribus sufficient for the emergence of religion. We may call this the sufficiency constraint.
The Limbic marker hypothesis

The ‘limbic marker hypothesis’ and associated theories are about neuroscientific evidence that appears to meet the noncircularity constraint. The experiences for which these theories cite neuroscientific evidence are entirely non-cognitive and can hence be characterized in complete abstraction from any religious tradition. Moreover, there is no problem whatsoever in imagining these experiences occurring prior to the emergence of institutionalized religion. Add the overly plausible claim that our current brains are relevantly similar to those of people living before institutionalized religion emerged, and it is clear that the ‘limbic marker hypothesis’ can claim to pass our first test. Unfortunately, though, the limbic marker hypothesis is not confirmed by the neuroimaging studies mentioned, which does at least diminish its credibility.

However, the real problem with the limbic marker hypothesis, interpreted as an attempt at explaining the emergence of religion, is that it cannot meet the sufficiency constraint. The very reason why it can meet the noncircularity constraint rather easily—the non-cognitive character of the claimed neural/mental precondition for the emergence of religion—is just the problem here. For non-cognitive states to give rise to a religion of sorts, they have to be interpreted as being experiences of some supernatural reality. Now of course this would be easy in the presence of a (dominant) religious tradition. Given a certain religious tradition, it is no mystery why and how certain non-cognitive emotional states can be interpreted as being experiences of some supernatural reality described in that tradition. But of course this route would lead to immediate circularity: the religious tradition would be a precondition for the explanation of its own emergence.

So, the question is how these non-cognitive states can be interpreted as giving rise to beliefs about some religious reality in the absence of a pre-existing religious tradition. This is not a rhetorical question; it is possible to interpret non-cognitive (emotional) states as experiences of something or other. It is certainly

4 For the sake of brevity, we shall ignore an extra problem that arises as a result of the fact that various forms of ‘mental externalism’ are by now the orthodoxy in the philosophy of mind and the philosophy of the cognitive sciences. Originally, externalism was the thesis that the contents of mental states can be individuated only by referring also to the world outside of the mind (Putnam 1975), or to the language community in which a thinker is brought up (Burge 1979). Recently, more radical forms of externalism have been developed, such as Clark and Chalmers’ ‘extended mind’ (Clark and Chalmers 1998), according to which the mind itself is coconstituted by items outside of the head. On the Burge-form of externalism, it is impossible altogether to assign content to an experience without drawing on a pre-existing language community. If radical externalism is true, information about the neural basis of an experience may well be insufficient to determine content altogether. We shall ignore the issue of externalism here, because all forms of externalism
imaginable, for instance, that specific emotional states are interpreted as experiences of some sentient being. The point, however, is that this is not enough to view such non-cognitive states or emotional experiences as the sources for the emergence of some religious tradition. For such a tradition is founded on beliefs. And though interpreting a non-cognitive state as experience of X is an important step towards the formation of a belief concerning the existence of X, it is not sufficient for the formation of such a belief in general and certainly not for the kind of belief relevant to the present context: a publicly shared belief.

Experiences of X do not spontaneously give rise to beliefs that X is the case. My experience of the book in front of me does not spontaneously lead to a full-blown belief that there is indeed a book in front of me. It may lead to my assuming there to be a book in front of me, but I only really believe that when, for example, I reach for it and indeed feel a book-shaped object to be there. In such a case my visual experience is corroborated by an experience of the same object in a different sense-modality. Or it may lead to a full-blown belief, because someone else that I observe looking at the same book, reports seeing the same book from a different angle; i.e. because I can—in the words of Donald Davidson—triangulate my experience with someone else’s experience of the same object. Corroboration and triangulation may perhaps not be necessary for the formation of subjective beliefs. But when it comes to beliefs that are publicly shared in the way that religious beliefs are shared—shaping the identities and lives of millions as well as shaping society to a significant degree—we move past the realm of subjective idiosyncrasies. Some extra epistemic (or quasi-epistemic) warrant is required.

Now the question is whether these extra epistemic procedures are available options in the case of religious experiences of the kind the ‘limbic marker hypothesis’ claims are responsible for the emergence of religion. It does not require a lot of argument to claim that neither of the procedures mentioned are available options. There is no other sense-modality by means of which we can experience the same religious reality (and the ‘limbic marker hypothesis’ does not claim there is). As for triangulation, this is not possible either. Triangulation requires us to be able to observe another subject observe or experience the numerically same reality that we are observing or experiencing. And that is clearly impossible as well.

are still contested, and the debate over the viability of externalism is far from over. We would like to stress, though, that from the viewpoint of the philosophy of mind and the philosophy of the cognitive sciences, explanations of religion based on neuro-scientific evidence presuppose a theory about the content of mental states—internalism, the negation of externalism—that is by now very much a minority position.
Here it can be claimed that corroboration and triangulation are indeed required for obtaining reliable beliefs only. They are logical demands. But here we are talking about psychological reality, and more often than not people are somewhat irrational. Could’t religious beliefs be the result of a rationally indefensible epistemic procedure, to which people are nevertheless prone given their psychological make-up?

Maybe. However, what is of interest for the alleged neuroscientific explanation of religion is whether or not this specific irrationality can be given a purely neuroscientific explanation. It seems to us that this cannot be the case. The reason for this is that there are many experiences that are epistemologically on a par with religious experiences and for which we can find neurological sufficient conditions that nevertheless do not give rise to beliefs of the kind involved in religion. For instance, hallucinations, dreams and experiences of voices heard by psychotics do not usually give rise to beliefs and practices similar to religion. And then there are experiences that are epistemologically similar to religious experiences and that do give rise to beliefs, but of a slightly different kind than religious ones. Experiences of ghosts may be cases in point. These did give rise to beliefs and belief-systems we know from spiritualism. But spiritualism is a belief-system that is subtly but significantly different from institutionalized religion. Things like creation myths, notions of salvation, and purely symbolic (i.e. non-manipulative) rituals, are sometimes present in spiritualist belief-systems. If so, however, they derive from religion which is very often mixed with spiritualist beliefs. Spiritualism itself does not give us these notions, which can be seen by considering the fact that there are secular versions of spiritualism that do not contain them.

So, our point is this: experiences that resemble religious experiences in that the neural substrates are (ideally) known and in their epistemological status, are nevertheless different from religious experiences in that they do not lead to systems of belief and practice that resemble religion. Our point is not that this implies that it is impossible to explain how specific experiences that are allegedly hardwired in our brains can give rise to religion. Our point is that though these hard-wired experiences may or may not be necessary for the explanation of religion, they can never be sufficient. For such an explanation, neuroscientific data presumably need to be supplemented with various sociological, psychological and epistemological considerations that are obviously much too substantial to count as mere background conditions.

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5 This is why e.g. Nick Zangwill’s rational critique of the possibility of religious experience is largely irrelevant for the present discussion. See Zangwill (2004).
The upshot of this is that there cannot be a naturalistic explanation of religion primarily in terms of neuroscientific data. Hence the sufficiency condition is violated.

The Cognitivist Alternatives

So the limbic marker hypothesis does well with regard to the noncircularity constraint but fails at the sufficiency constraint. Things appear to be significantly different with the more cognitivist alternatives for the hypothesis that are supported by the findings of the neuroimaging studies discussed above. Prima facie, these alternatives appear to have no problems with the sufficiency constraint and serious problems with the noncircularity constraint. But we shall argue that things are exactly the other way round.

What Newberg et al. and Azari et al. found was that among the areas of the brain involved in the religious experiences they studied are those regularly associated with cognitive tasks. In other words, these religious experiences are found to have a cognitive component; roughly: they involve beliefs and concepts. Hence, these cognitivist studies of religious experiences do much better with respect to the sufficiency constraint than the limbic marker hypothesis. For this time there are no particular problems with interpreting a nonconceptual experience in terms such that the experience gives rise to beliefs; the beliefs are already part of the experience. So let us put the sufficiency constraint to one side for a moment.

As soon as we ask where these beliefs come from, we can see that there are serious prima facie difficulties with the noncircularity constraint. It is more than likely that these concepts and beliefs reflect the religious traditions in which the subjects were involved. Not only do the descriptions the subjects give of their own religious experiences betray the traditions in which they stand, but the ways in which the experiences in these studies are induced also involve clear reference to pre-existing religious traditions. In the studies by Azari et al., religious experiences are induced through recitation of Psalm 23. In Newberg et al., the subjects used the meditation methods of Tibetan Buddhism, e.g. using incense that is associated with religion or religious experiences through tradition. The religious experiences studied by the experiments by Newberg and Azari, then, clearly presuppose a pre-existing religious tradition. Therefore, these experiences cannot be used to explain the emergence of religious traditions on pain of vicious circularity.

But here’s the catch: neither Azari nor Newberg claim that religious experiences alone can explain religion. Newberg, together with d’Aquili (and unlike
Azari), does claim that religion can be given a primarily neuroscientific explanation, but this explanation is not based purely on experiences. In fact, in the fourth chapter of their book, Newberg and d’Aquili claim to give a neuroscientific explanation for the emergence of myths, which they plausibly regard as the foundations of religion and religious traditions. For the sake of the argument we may presume that such an explanation of myth, if cogent, is sufficient to account—in neuroscientific terms—for exactly that what is presupposed by the religious experiences in the studies by Newberg et al and Azari et al. These experiences may serve to explain the sustenance of religion while their underlying myths may serve to explain the emergence of religion. Thus, the noncircularity constraint is not violated.

The sufficiency constraint is not violated, however, if and only if the neuroscientific explanation of myth offered by Newberg and d’Aquili is cogent. Our point is that it isn’t.

According to Newberg and d’Aquili, the emergence of myths can be explained in terms of (i) what they term the ‘cognitive imperative’, the irresistible, biology-driven need to comprehend things by means of a cognitive analysis of reality, (ii) the ability to anticipate and to fear what is anticipated (most importantly one’s own death), (iii) what they call ‘the causal operator’, i.e. the tendency to postulate causes for unexplained phenomena, and (iv) what they term ‘the binary operator’, i.e. the tendency to understand the reality in which we live in terms of opposing concepts such as ‘light’ and ‘darkness’, ‘heaven’ and ‘hell’, etc. All four elements, we may assume, have neuroscientific explanations. Elements (i) and (ii) explain the fact that we humans tend to be concerned with crucial questions about life and the human condition (e.g. what happens when we die?). Element (iv) explains the fact that we tend to frame those questions in terms of binary oppositions (e.g. life and death). And finally, (iii) explains how we find answers in terms of some ‘hidden’ part of reality—an afterlife, a spiritual world—that accounts for the manifest features of reality that cause fear and/or anxiety. The main purpose of these myths, then, according to Newberg and d’Aquili, is to take away this fear or anxiety.

One problem with this explanation is that many crucially important features of myths are not accounted for. Most or all religious myths, for instance, contain stories about the creation of the universe that are such that the structure of the tribe or society in which the myth functions is justified. A river, for instance, can be identified with, say, a mythical snake while the various sections of the river represent the various clans in the tribe who holds the myth and their interrelations. Another example: peoples are depicted as ‘the chosen’, and are attributed rights and duties accordingly. Yet another: Chiefs of tribes are sometimes
identified with celestial constellations, which invokes the need to devise cyclical conceptions of time and rituals in which the chief ‘becomes’ his forefather. Etc. etc. This sociological aspect of myth—the import of which cannot be underestimated—is simply ignored by Newberg and d’Aquili.

Another problem is the usually non-logical character of myth. If the main purpose of myth is to take away fear and anxiety by means of stories portraying a hidden reality that ‘causes’ manifest reality, why not stick to simpler and more logical stories (in fact the fictional examples Newberg and d’Aquili give are fairly logical, but in that respect they do not resemble actual myths).

But the main problem is this: despite the fact that all elements of the explanation for the emergence of myths apply to all normally functioning people, we must conclude that not all people develop myths or live by already developed myths. Despite the fact that (i)-(iv) apply to all normally functioning people, we cannot but observe that for a significant part of the western European and American population at least, God has gone away. There are simply too many atheists and agnostics at present to consider them not normally functioning. And since (i)-(iv) will apply to them as well, we must conclude that (i)-(iv) are not sufficient to explain the emergence of real myths and consequently religion.

So, even if we grant the claim that (i)-(iv) can be given purely neuroscientific explanations, this is not sufficient to claim that myths can be given a purely neuroscientific explanation. Hence, even if we grant that the step from myth to religion is small enough to ignore, religious experiences of the kind involved in the studies by Newberg et al. and Azari et al. are not explained in purely neuroscientific terms since they presuppose myths and traditions that are not themselves explained in purely neuroscientific terms.

In other words, the sufficiency constraint is not met. This result is a consequence of the way in which violating the noncircularity constraint was avoided (by invoking the idea of a neuroscientific explanation of myth). So, the cognitivist alternatives for the limbic marker hypothesis fail in a similar way to explain religion in primarily neuroscientific terms: by avoiding the noncircularity constraint, the sufficiency constraint must be violated.

III. Summary and Conclusion

In this paper, we started with a discussion of explanations of religion on the basis of abnormal brain states, localized to the limbic system—the limbic marker hypothesis. Next we discussed neuroimaging studies on religious experiences and concluded that they did not corroborate the limbic marker hypothesis and
concurring explanations of religion. What these studies suggest is that religious experiences have a strong cognitive component, something that does not fit with the hypothesis. But we concluded that at least some of the neuroimaging researchers still claim that religion can be explained in terms of the neuroscientific study of religious experience (i.e., functional brain imaging data).

To investigate the viability of that claim, we next articulated the conditions to be met by such an explanation: (1) the noncircularity constraint and (2) the sufficiency constraint. We argued that neither the limbic marker hypothesis nor its cognitivist alternatives can meet the sufficiency constraint due to the different ways in which they manage to avoid the noncircularity constraint. We conclude, therefore, the data from functional neuroimaging studies of religious experience are not suited for an explanation of religion.

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