

# *Engaging d'Aquili and Newberg's* The Mystical Mind

UNDERSTANDING BIOLOGY IN RELIGIOUS EXPERIENCE:  
THE BIOGENETIC STRUCTURALIST APPROACH OF  
EUGENE D'AQUILI AND ANDREW NEWBERG

by Michael L. Spezio

*Abstract.* What are the biological bases of religious experience? Are there biological constraints upon or determinants of religious narratives and practices? How does understanding the biology of religious experience inform the ongoing reconstruction of religious rituals and myths? In *The Mystical Mind*, Eugene d'Aquili and Andrew Newberg address these central questions and others from a distinct perspective called *biogenetic structuralism*. They propose a model of how brain activity gives rise to mystical experiential states, examine how neurobiological responses to rhythmic behavior form religious ritual, and point toward the development of a *megatheology*, or a theological system appealing to the widest scope of religious worldviews. This paper is a critical review of d'Aquili and Newberg's exciting work.

*Keywords:* biogenetic structuralism; brain imaging; mysticism; neuroscience; SPECT.

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With the publication of *The Mystical Mind* (1999), Eugene G. d'Aquili and Andrew B. Newberg offer a provocative view of how biology shapes and may even determine the varieties of religious experience. In "religious experience" the authors include mystical experience, states of spiritual ecstasy, and instances when a person "loses all awareness of discrete limited

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[*Zygon*, vol. 36, no. 3 (September 2001).]

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being and of the passage of time, and even experiences an obliteration of the self-other dichotomy” (d’Aquili and Newberg 1999, 110). But d’Aquili and Newberg also use “religious experience” to mean the cultural experience of religion in a number of domains, such as myth, ritual, belief, and theology. Thus, despite its interesting subtitle, *The Mystical Mind* is not primarily about the biology of mystical states. Rather, its aim is to develop a comprehensive, physicalist explanation for religion as a cultural system, one that is broad enough to include most religions.

Both authors are known for their expertise in neuropsychology and neurophysiology, and both have published numerous articles in peer-reviewed scientific journals. D’Aquili was, until his recent death, clinical associate professor of psychiatry at the University of Pennsylvania Medical School. He was the author of a number of books developing a biologically based theory of culture (d’Aquili 1972; d’Aquili and Laughlin 1974; d’Aquili, Laughlin, and McManus 1992). Newberg is clinical assistant professor in the Department of Radiology and instructor in the Department of Psychiatry, University of Pennsylvania Medical School.

Although the authors have a clear interest in and insight into the biology of mind, the language, methods, and theories of neurobiology and neurophysiology—as found in academic centers and in leading journals of the field—are not the focus of this work. This is exemplified by the absence of pictures of what brains do while people meditate or otherwise experience mystical states. Of the five figures in the book, three deal simply with the anatomy of the human brain (pp. 29–30) and two schematize the authors’ neurophysiological theories of experience brought on by meditation (pp. 111, 115). It would have been extremely helpful had the authors reproduced figures of their results of brain imaging experiments involving meditating subjects. The book also lacks a description of the authors’ results that would allow the reader to easily evaluate the scientific evidence for their model of mystical experience. This omission is rather striking given the authors’ claim that the “results of our preliminary studies, in addition to the results of related studies . . . clearly support our model” (p. 119). The section of the book entitled “Proof of This Model” (pp. 118–19) is less than two pages long, and readers are left on their own to investigate and interpret the research cited therein.

But these observations do not detract from the real purpose of the book, which is to provide a clear and convincing statement of how biogenetic structuralism explains many aspects of religious experience. Thus, *The Mystical Mind* is the fruit of a research program pursued by d’Aquili and his coworkers since at least the early 1970s. This line of research into the role of biogenetic elements in religious experience is rooted in an approach d’Aquili took early on in considering human culture as a whole (d’Aquili 1972). Indeed, *The Mystical Mind* is at once an argument from and for biogenetic structuralism, a theory that assumes “that *there exists no reality intervening between the central nervous system and the environment*” (d’Aquili

and Laughlin 1974, 11). Or, as d'Aquili and Newberg state in *The Mystical Mind*, "There is no manner in which we can come to experience or know reality other than through the functioning of the brain" (1999, 16). Influenced in language and style by the structuralist anthropology of Claude Lévi-Strauss and in content by a strongly neo-Darwinian approach to everything from cortex to culture, the theory attempts to identify neurophysiological "structures" that explain all aspects of human life and experience. The authors clearly state that their goal is to present a theory such that "this entire spectrum of human experience, from a very reductionistic to a very holistic perspective, will be understood as resulting from the human brain and the human mind" (1999, 97).

D'Aquili and Newberg begin to develop this model after an introductory chapter and a chapter on "The Brain and Central Nervous System." In the latter, the authors present an overview of the neuroscience relevant to understanding their neurophysiological model of mystical states. They assert that evidence from neuroimaging studies and from studies of patients with brain lesions leads to the conclusion that the brain "is eminently responsible for everything that we do or experience" (p. 45). Lay readers will find the jargon-laden text in this chapter to be a challenge, with little in the way of interesting examples illustrating key points. Figures depicting and explaining the various neuroimaging techniques would be welcome and would make some of the technically difficult sections of the text more transparent.

Neuroscientists, on the other hand, will be surprised that most of the scientific sources used in this chapter date from before 1985, when neuroimaging techniques like functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) had not yet been widely applied in cognitive neuroscience. This is particularly noticeable in the authors' treatment of emotion, where there is no reference to the research of Antonio Damasio and his colleagues. The authors' treatment of attention likewise makes no mention of the central work of Michael Posner and his coworkers. Fortunately, these omissions do not raise significant issues for the authors' model of the brain's role in mystical experience or for their theory of biogenetic structuralism.

Another surprising aspect of Chapter 2 especially is the absence of any discussion of V. S. Ramachandran's work with temporal lobe epileptics responding to religious terms and symbols. In 1997, this work created a stir in the media about a possible "God module" in the brain. Ramachandran addressed the work and its interpretation in his own recent book (Ramachandran and Blakeslee 1998). An interpretation by d'Aquili and Newberg of Ramachandran's work in light of their own theory would have added significantly to their book.

Following this brief introduction, the authors begin unpacking their term *mystical mind* in "The Basis for the Mystical Mind." They develop their model in subsequent chapters on "Why the Mind Creates Myth,"

“Ritual, Liturgy and the Mind,” “The Mind, Meditation and Mysticism” (their most neurophysiologically intent chapter, including the two pages of “proof” mentioned above), and “The Near-Death Experience as a Mystical Phenomenon.” The last part of the book applies their model to explain “The Origin of Religion” and to develop a “Neurotheology” that they combine with an understanding of “Consciousness and Reality” to envision a “Metatheology and Megatheology.” By *metatheology* the authors mean “overall principles underlying any and all religions or ultimate belief systems and their theologies” (p. 195). Such a metasystem is necessarily lacking in theological content. Megatheology, on the other hand, “should contain content of such a universal nature that it could be adopted by most, if not all, of the world’s great religions as a basic element without any serious violation of their essential doctrines” (p. 198). From the brief overview here it should be clear that what d’Aquili and Newberg have in mind is not a discussion of the neurophysiological correlates of religious experience or primarily a biological theory of how such experiences are mediated by the brain. Instead they are arguing a theory that grounds religion—mystical experience, myth, theology, ritual—in “inherently stable relationships within the mind/brain’s structure” (p. 83).

Yet d’Aquili and Newberg do present a neurophysiological model of how the brain produces mystical experiences in their chapter “The Mind, Meditation and Mysticism.” The model proposes that mystical experiences happen when some brain areas become activated (i.e., the neurons there generate increased numbers of electrical discharges) while other brain areas become deafferented (i.e., cut off from their normal sources of neural input) at the same time as brain areas associated with emotion undergo various patterns of activity. The authors claim that their model can apply to “most, if not all, religious experiences, whether generated by ritual, by meditation, or spontaneously” (p. 103), but they focus on the state of “absolute unitary being” (AUB) attained through meditation in order to simplify description of the model. AUB is “a state in which the subject loses all awareness of discrete limited being and of the passage of time, and even experiences an obliteration of the self-other dichotomy” (pp. 109–10). AUB may be “accompanied by blissful positive affect” and is “usually interpreted as the *unio mystica* or the experience of God” or of “the void or Nirvana of Buddhism” (p. 110).

A key aspect of d’Aquili and Newberg’s model is that AUB is caused in large part by cutting off the “orientation association area” from its normal neural input. The authors locate the orientation association area “in the posterior superior parietal lobule” of the brain (PSPL) and define its role as using visual and auditory input to “create a three-dimensional image of the body in space” and as helping “determine our position in space” (p. 33). They link this area to “the ‘self-other’ or the ‘self-world’ distinction that philosophers and theologians have discussed throughout the ages” (p. 34). The authors suggest that, when the right hemisphere’s orientation associa-

tion area gets completely cut off from its normal neural input, an experience of “pure space” ensues, which is labeled “absolute unity or wholeness” (p. 112). When the left orientation association area is cut off, this “results in the obliteration of the self-other dichotomy” (p. 112). This, when combined with the effects from the right area and with events occurring in the hippocampus, hypothalamus, and amygdala (areas associated with emotion), “results in the subject’s attainment of a state of rapturous transcendence and absolute wholeness that conveys such overwhelming power and strength that the subject has the sense of experiencing absolute reality” (p. 113).

To test their model, d’Aquili and Newberg performed experiments with “practitioners of Tibetan Buddhism who have meditated [an] average of one to three hours per day for the past fifteen years” (p. 183). Their experimental method is known as single positron emission computed tomography (SPECT). This method measures blood flow changes in the brain and is thus a way to assess changes occurring on a large spatial scale (i.e., 0.5–1 cm) in the brain of a person doing some prescribed activity. The authors found increased blood flow in the prefrontal cortex (PFC) and decreased blood flow in the posterior superior parietal lobe (PSPL, or the orientation association area) during meditation. They saw the decrease in PSPL on both sides of the brain, but it was more pronounced in the left hemisphere. They also found that the blood flow changes in PFC and PSPL were inversely correlated with each other. Finally, d’Aquili and Newberg also saw increased blood flow to the thalamic areas on both sides of the brain (p. 119; see also d’Aquili and Newberg 1998).

The authors interpret their results as indicating that the PFC plays a role in increasing a person’s concentration level while the person is meditating and that the decreasing activity in the PSPL, “near the orientation association area,” “would seem to reflect deafferentation [sic] of these areas” (p. 119). They believe that cutting off the PSPL from its normal input (i.e., deafferentation) “causes a breakdown of the self-other dichotomy and results in a sense of wholeness and unity” (p. 119). Interestingly, however, their subjects did not report achieving the AUB state at any time during meditation. Their interpretation relies on associating a decrease in *blood flow* in the PSPL with a decrease in *normal neural input* to this area. Two considerations suggest caution in following this interpretation. First, the authors do not explicitly consider the spatial limitations of SPECT in interpreting their data. These limitations make it difficult to infer a decrease in all neural input to or neural activity in an area from only a decrease in blood flow in that area observed with SPECT. Neurons are small (about .001 to .005 cm) in comparison to the 0.5–1 cm spatial limitations of SPECT. Work in monkeys and humans comparing measurements from single neurons with measurements from blood flow demonstrates that blood flow measures may miss important areas of neural activity or inactivity associated with particular sensory input. Thus, the blood flow decrease the authors see in the PSPL area does not necessarily imply that it is being

completely cut off from its normal input. A second consideration needing attention is the question of whether the observed decrease in blood flow in the PSPL implies a *shutting down* or a *cutting off* of the area. For, even if the decrease in blood flow accurately reflects an overall decrease in neural activity in PSPL, there is still the possibility that this decrease in activity is due to shutting down, and not cutting off, the area. Shutting down neural activity is known as *inhibition*, and inhibition of a brain area may result in decreased blood flow to that area. But the authors' model appears to require that the orientation association area remain active while it is cut off from its normal neural input, and their model would need to change significantly if the PSPL were actually shut down during mystical experience. It would have been helpful if the authors had addressed this possibility in discussing the evidence for their model of mystical experience.

Nevertheless, readers should note that these considerations do not significantly impact the authors' theory of biogenetic structuralism. One question that will arise for many readers, though, is whether the theory put forth by d'Aquili and Newberg is ultimately reductionistic. Indeed, assessing this is not as straightforward as it might first appear. The obvious place to look at the authors' stance on this is in their treatment of the relationships between science and religion and between the mind and brain. The authors deny any attempt at reducing religion to science while stating a view that regards science and religion as essentially the same:

Thus, science and religion will be explored in a complementary manner in order to develop a coherent analysis of the world. But, as we will see, our model goes one step further in that science and religion are not only brought together but are essentially considered to be one and the same thing without either being reduced to the other. . . . Thus, we would suggest that one cannot understand religion without understanding the mind and brain and that one cannot understand the mind and brain without understanding religion. (p. 10)

Such a unifying theme is also apparent in the authors' view of how the brain and the mind are related:

The mind represents the more intangible functional aspects of the brain. The brain simply refers to the more structural, physiological and "objective" aspects of neural activity. Thus, one might argue that there can be no brain without mind and no mind without brain. They are merely two different ways of looking at the same thing. To reject one and not the other is simply not possible. In fact, it might be more accurate to speak of a *mind/brain* rather than of a separated mind and brain. . . . Thus . . . the terms *mystical mind* and *mystical brain* will be essentially equivalent to the *mind/brain*. (p. 50)

Yet they allow that it is possible in theory if not in practice to separate mind from brain:

If one wished to take a dualistic approach, one could state that it is theoretically possible to determine the precise neural activity that creates a thought, such activity being seen as distinct from the thought it generates. Thus, if we had a sensitive enough machine, we could detect the neural events that work to yield an

epiphenomenal reality, that is, a particular thought. This is a bit disconcerting and certainly not holistic. While there might be some theoretical validity to such a notion, thoughts and feelings are so complex that they can only be generated by the highly complex and integrated working of hundreds of thousands of neurons. Thus, regardless of whether it is theoretically possible to ascertain the specific neuronal activity involved in a given thought or behavior, it is practically impossible both now and in the foreseeable future. (p. 48)

Nonetheless, the title of their book, *The Mystical Mind*, comes as much from the mystical quality of the relationship between the mind and brain, in which “dualities are broken down and the opposites are unified in a single nature” (p. 50), as from the mind/brain’s “ability to generate or experience mystical phenomena” (p. 49). The authors’ viewpoint thus appears to be an ontological monism, whereas their theory of religious experience and culture depends on a monism that privileges (at least causally) external, physical reality, including the brain, its underlying genetic structure, and—in the view of biogenetic structuralism—the environment the brain encounters.

Interestingly, however, d’Aquili and Newberg confess that such a view is an “act of faith” that is required on the part of any scientific approach—including theirs:

By now it should be obvious that for the individual subject seriously contemplating his or her “knowing,” there is no absolute priority either for external reality or for the subject’s own subjective awareness. . . . The cultures of the West tend to ascribe priority to external reality. But, in principle, there is no way to choose except by cultural prejudice or personal aesthetics. As scientists, we have chosen to place our “act of faith” consciously and explicitly in the priority of external reality. We feel that this allows for better science, although it may not be best in other aspects of life. Nevertheless, we are never unaware that it is, and must necessarily be, an act of faith. We would maintain that it is an act of faith for all scientists, at least implicit in their doing science. . . . We maintain that faith in the priority of external reality, at least unconsciously and implicitly, underlies the performing of science. Thus our entire approach has been “scientific” if only because of our insistence of [sic] working within the Western tradition of prioritizing external reality over consciousness. (p. 190)

The authors make an important move here. They could have simply advocated for a *methodological* physicalism; that is, they could have argued that physicalism is a good *method* to address publicly verifiable phenomenal regularities. They do not do this. Rather, the authors advocate a faith in physicalism that they argue is necessary for doing science. This may be because the authors hold that “neuropsychology, and indeed most biology, is based on direct observation with very few inferential leaps” (p. 124), a position that is in some tension with the philosophy of science of the last fifty years. Whatever the reason, it remains unclear whether they really mean that their act of faith is just “cultural prejudice” or is actually justified because it “allows for better science.” Methodological physicalism presumably also allows for good science, and does not demand the act of faith the authors ask of their readers. Moreover, it is difficult to see how this act



of faith would be incorporated into a megatheology whose content would be accepted by most of the world's major religions.

Another aspect of the theory that will create problems for a number of religious traditions is the authors' move from ontological physicalism to reductionism. Their theory requires a human mind that is highly genetically preconditioned, if not predetermined. This is evident in their proposed structuralist solution to the knotty problem of how cultures are transformed. They reject poststructuralist responses to this question (e.g., Foucault 1977) in favor of an evolutionary answer in terms of natural selection. Changes in cultural myths, for example, are the result of "various [mythic] configurations' being evolutionarily adaptive and thus conducive to survival" (p. 83). The authors also maintain that the relational structure between key aspects of a myth "is present and stable simply because it is adaptive psychophysiologically for an individual or social group" (p. 84). Changes in the external, physical environment "define exactly which surface manifestation of a deep structure will survive, either cognitively or socially, at any given time" (p. 84). This is an extreme adaptationism that is combined with a view of "the brain as a machine that operates upon whatever it is that fundamental reality may be" (p. 202). A deeply held determinism thus informs the authors' theory of biogenetic structuralism, and they do not clearly address how this impacts beliefs about human freedom in several religious traditions.

Biogenetic structuralism, as presented in *The Mystical Mind*, is a comprehensive and intriguing theory of the biological bases of religious experience. It may not lead to the kind of meta- and megatheology that the authors envision, but it is extremely helpful in framing exactly the kind of questions that are crucial to understanding the role of biology in religious experience, it is a creative response to those questions, and it is good at suggesting empirical approaches toward answering them. Eugene d'Aquili's personal advocacy of this powerful view will be missed, but his legacy and the vision he shared with Andrew Newberg will surely continue.

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