THE "GOD MODULE" AND THE COMPLEXIFYING BRAIN

by Carol Rausch Albright

Abstract. Recent reports of the discovery of a "God module" in the human brain derive from the fact that epileptic seizures in the left temporal lobe are associated with ecstatic feelings sometimes described as an experience of the presence of God. The brain area involved has been described as either (a) the seat of an innate human faculty for experiencing the divine or (b) the seat of religious delusions.

In fact, religious experience is extremely various and involves many parts of the brain, including some that are prehuman in their evolutionary history and some that are characteristically human. In the continuing integration of such experiences, spiritual formation takes place. Thus the entire human brain might be described as a "God module."

Such a process is only possible because of the brain's complexity. The human brain is the most complex entity for its size that we know of. As used here, *complexity* is a specialized term denoting the presence of a web of interlinked and significant connections—the more intricate the web, the more complex the entity. Complex systems develop only in a milieu that provides both lawfulness and freedom, and they tend to be self-organizing, becoming more complex and more effective as a result of both inward and outward experience. The evidence suggests that both personal growth and spiritual growth are processes of complexification of character, and of the brain itself. This thesis is tested in light of the work of William James and James W. Fowler.

Keywords: brain; complexity; emergence; James W. Fowler; God module; William James; religious experience; spiritual formation; teleology; teleonomy.

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Saint Augustine once wrote, addressing God, "Thou has formed us for Thyself, and our hearts are restless till they find rest in Thee" (Augustine [c. 400] 1934, 1005).

To a postmodern ear, accustomed to scientific discourse, what might this mean? Surely our muscular pump of a heart does not fit into a divine resting place! It sounds just as odd to say that the gray matter inside our skull might include a special place for God.

But recently the popular press reported the "discovery" of just such a niche, and dubbed it "the God module." This supposed niche in fact was said to have a specific location, in the left temporal lobe, near the left ear. The press was drawing on the work of the eminent neuroscientist V. S. Ramachandran, especially as described in a book coauthored with science writer Sandra Blakeslee, *Phantoms in the Brain* (1998). Although these authors stop short of claiming that a "God module" has been identified, they do conclude that there are circuits in the human brain that are specifically involved in religious experience (1998, 188).

Ramachandran's work focused especially on manifestations of epilepsy originating in the left temporal lobe, where epileptic seizures tend to begin (Begley 2000, 51). Besides causing seizures, epilepsy can lead to unusual mental experiences, and many patients report

> deeply moving spiritual experiences including a feeling of divine presence and the sense that they are in direct communion with God. Everything around them is imbued with cosmic significance. They may say, "I finally understand what it's all about. This is the moment I've been waiting for all my life. Suddenly it all makes sense." Or, "Finally I have insight into the true nature of the cosmos." (Ramachandran and Blakeslee 1998, 179)

Not surprisingly, persons who have such spiritual experiences during seizures tend to become preoccupied—even obsessed—with God and religion during periods between seizures as well. The authors suggest that the seizure experience may establish and reinforce brain "tracks" dedicated to this kind of thinking. From such observations, some have drawn the inference that the left temporal lobe is either (a) the seat of a God-given human faculty for experiencing the divine or (b) the seat of religious delusions. Ramachandran is careful to note that patients may in fact be experiencing God—who can say?[1]

Although temporal-lobe epilepsy may be induced by trauma, it often has a genetic component (Berkovic, Howell, and Hopper 1994, 261). V. Elving Anderson's research group at the University of Minnesota is closing in on genes that predispose to epilepsy, including temporal lobe epilepsy (Anderson 2000). Is religious experience, then, attributable to a genetic defect? Or, as Ramachandran suggests (1998, 187), by removing a portion of the temporal lobe, could we perform a "Godectomy"?

Underlying the "God module" reports is the assumption that religious experience is basically unidimensional—mystical—rather than compris-

ing a rich menu of various kinds of experience. But in fact, religious experience does go far beyond the mystical states that Ramachandran and Blakeslee associate with the left temporal lobe. Certainly, mystical experience happens, and those who enter this dimension report that it is extremely meaningful (d'Aquili and Newberg 1999, 157).[1] But in addition, religious experience may include feelings of community associated with sharing in rituals—such feelings of attachment are centered in the limbic system, while ritual also involves some evolutionarily older parts of the brain. For persons of mathematical inclination, including Albert Einstein, an understanding of the subtle and pervasive mathematical order of the universe—perceived mainly by the left cerebral cortex—leads to a sense of awe and wonder. To Einstein, "The eternal mystery of the world is its comprehensibility" (Einstein [1934] 1954, 292). Those whose plans for the future involve apparent divine guidance are using their frontal lobes. Appreciation of music, usually centered in the right cerebral hemisphere, provokes religious experience for many people. In fact, it is difficult to identify any part of the human brain that is not involved in some form of religious expression.

Furthermore, neuroscientists know that the brain does not work as a collection of unrelated modules. Areas of the brain do specialize, but in the human brain these areas are intricately interlinked (Angier 2000). Nor can religious experience, spiritual development, or God be confined to a single sort of experience, or to a module of the brain. The quality of a brain and the quality of religious experience are both the product of their own complexity.

Complexification through Time

What is meant by *complexity?* Here the word is used in a special sense common to members of the Santa Fe Institute. This "think tank" in New Mexico is the epicenter of work in a somewhat controversial scientific movement. Key figures have included Nobel Prize-winning physicists Murray Gell-Mann and Philip Anderson, biologist Stuart Kauffman, artificial intelligence specialist John Holland, and Nobelist-economist Kenneth Arrow. Participants are attracted because they believe they have discerned, in their various disciplines, a process they call complexification.

Even in literature from Santa Fe, it is difficult to find a definition of *complexity* (cf. Kauffman 1995, Gell-Mann 1994, Waldrop 1992). For our purposes, let us use the term to denote the presence of a web of *interlinked* and *active* connections—the more intricate the web, the more complex the entity. *Complexification,* the increase of complexity over time, leads to *emergence*, the appearance of new phenomena based upon but different from their underlying parts. As a simple example of emergence, water is quite different from either hydrogen or oxygen.

It is certainly true that, in the history of the universe, simpler systems have persisted—bacteria still outnumber mammals—but more complex entities have entered the picture as well. Paul Davies has described the phenomenon as follows:

> The universe is undeniably complex, but its complexity is of an *organized* variety. Moreover, this organization was not built into the universe at its origin. It has emerged from primeval chaos in a sequence of self-organizing processes that have progressively enriched and complexified the evolving universe in a more or less unidirectional manner. (Davies 1994, 45, cited in Artigas 1999, 119)

What lies behind this "more or less unidirectional" progression? Most biologists say *teleonomy;* scientist/theologian Pierre Teilhard de Chardin and theologian Wolfhart Pannenberg are among those who point to *teleology.* Definitions of these two terms overlap. Biologist Ernst Mayr says:

> All teleonomic behavior is characterized by two components. It is guided by a "program" and it depends on the existence of some end point, goal, or terminus that is foreseen in the program that regulates the behavior. This end point might be a structure, a physiological function, the attainment of a new geographical position or a "consumatory". . . act in behavior. . . . It is in the nature of a teleonomic program that it does not induce a simple unfolding of some completely preformed Gestalt, but that it always controls a more or less complex processes which must allow for internal and external disturbances. (Mayr [1976] 1997, 390)

What is the origin of such a process? To Mayr, "each particular program is the result of natural selection, constantly adjusted by the selective value of the achieved end point" ([1976] 1997, 390).

Robert Wright describes teleological behavior as "persistence toward the hypothesized goal under varying conditions by processing information" (Wright 2000, 312). However, he qualifies the definition: "only if evolution was designed to move in a particular direction does that direction qualify as a telos" (p. 310). His conclusion: "It may indeed be that evolution is not teleological. But if that's the case, then evolution is the only thing I can think of that exhibits flexible directionality via information processing and *isn't* teleological" (p. 315).

Whether teleological or teleonomical in nature, complexification proceeds only under certain conditions. Complexification thrives on the cusp between order and disorder, predictability and contingency: optimally, some functions and interactions remain dependable, while others hinge on chance or decision. Complexification also requires a milieu whose elements are *interactive,* for complexification is a *process* (Kauffman 1995, 26). As new phenomena emerge, those that are effective are likely to persist, and in the process they develop further qualities which are emergent. (Thus they are sometimes known as *complex adaptive systems*.) This generalization applies to entities as simple as colonies of slime molds, which develop a simple division of labor for taking in nutrients and excreting waste; such colonies tend to do better than isolated slime mold plants. Near the other end of

the continuum, we observe that more complex economic systems tend to co-opt those that are less complex. Similarly, complexification takes place in neural nets—computer simulations of brain connectivity (see Holland 1998; Coveney and Highfield 1995).[2]

Complexification and the Brain

It is generally agreed that the human brain is the most complex entity for its size that we know of, anywhere in the universe. There are something like one hundred thousand million neurons in the brain—a number that rivals the number of stars in our galaxy. The number of connections among them is about one thousand million million, and the total length of this "wiring" is roughly one hundred thousand kilometers (Coveney and Highfield 1995, 283).[3] (This still does not make the brain the "crown of creation," for our universe has not yet run its course.)

Brains are not all alike; even in gross appearance, they are as different as faces are. Their "wiring" also varies from person to person. These arrangements are influenced by the genes, but they are also subject to the influence of internal and external experience. The first few years of life have a profound influence on the architecture of a person's brain. In the brains of infants and toddlers, a process called *programmed cell death* is highly active. The infant brain comes equipped with an overabundance of neurons. Those that are put to use will continue to live, but those that are not will self-destruct. Similarly, stimulation of neuronal circuits strengthens their connectivity. These are physical reasons why early childhood experience has a major effect on personality and intelligence.

However, we are not entirely captive to the consequences of our early years. The brain's interconnections remain *plastic*—physically responsive to experience—throughout life (Diamond 1988, 91–114), although the effect in adults is not so rapid and dramatic. In other words, as an experience activates brain networks, those networks will become more responsive to future demands of the same kind, and they also build up memories. Conversely, brain circuits that are seldom used become progressively less responsive, and less neuronal space is devoted to them. By these means, experience may have a lasting effect not only on the brain but also on behavior and personality.

Over the course of a lifetime, the brain may develop, or it may remain relatively static. Personalities may become "locked in" or increasingly complexified. In the latter case, for example, emotional impulses may become fine-tuned to empathic understanding; calculated plans may interact with religious insight. Integration of different mental operations implies increased brain connectivity, and in fact some research has indicated that this is exactly the case.[4] (For example, outstanding musicians seem to have unusually strong links between parts of the brain that control technique and those that experience emotion [Begley 2000, 52].)

Efforts and experiences may discourage or promote personal integration, and these may be inner or outer—that is, they may involve thoughts, decisions, and feelings and/or interactions with the environment (Damasio 1999, 23–24). Complexification of the brain/mind thus is not a mechanistic process that is completely beyond a person's control; on the contrary, thoughts, decisions, and responses may play a central role in the development of complexity of mind. For, according to Nobel laureate Roger Sperry (1992, 251), physicist George Ellis (2000), and others, the brain's activity is not only "bottom-up"—run by the "basic wiring"—but also "top-down"—guided by the more recently evolved parts of the brain, which express goals, values, and choices. Furthermore, top-down and bottom-up operations are highly interactive with one another.[4] And as we have already seen, the way a brain is used affects its proclivities.

Complexification and Spiritual Formation

I have suggested that complexification of the character may be intricately related to religious experience and spiritual development. To pursue this contention, let us recapitulate some observations of two scholars of religious experience, William James and James W. Fowler.

In *The Varieties of Religious Experience,* James's Gifford lectures published in 1902, we see an amazingly prescient approach to many of these same issues. James chooses to confine his purview to "personal" religion, as opposed to "institutional" religion of theology, liturgy, and governance. Even so, he finds in religion "not one essence but many characters" (James [1902] 1997, 39) comprising "the feelings, acts and experiences of individual men in their solitude, so far as they apprehend themselves to stand in relation to whatever they may consider the divine" (p. 42). He does not ignore the ugly faces of religion, including the "spirit of dogmatic dominion" (p. 269), closed-in theoretic systems, and fear or hatred of the new and alien. Nor does he fail to examine the similarity of mystical experience across cultural and religious boundaries. But his central focus, it seems to me, is upon religion as a centering and organizing system—the "habitual centre of . . . personal energy" (p. 165).

Like Mihaly Csikszentmihalyi in his book *Flow* written nine decades later (Csikszentmihalyi 1990), James sees the organization of consciousness as a source of human well-being and a state for which people strive. He says:

> The normal evolution of character chiefly consist[s] in the straightening out and unifying of the inner self. [Parts of the personality begin as] a comparative chaos within us—they must end by forming a stable system of functions in right subordination. Unhappiness is apt to characterize the period of order-making and struggle. ([1902] 1997, 146)

James acknowledges that

> [t]he process of remedying inner incompleteness and reducing inner discord is a general psychological process which may take place with any sort of mental material and need not necessarily assume the religious form. . . . [Inner unity and peace] may come gradually or . . . occur abruptly; . . . through altered feelings or through altered powers of action; . . . through new intellectual insights, or through experiences which we shall . . . have to designate as "mystical." However it comes, it brings a characteristic sort of relief; and never with such extreme relief as when it is cast into the religious mould . . . [bringing] a firmness, stability, and equilibrium succeeding a period of storm and stress and inconsistency. (pp. 149–50)

Thus, in James's view, increased personal organization and increased religious organization are often related.

James Fowler, in his classic *Stages of Faith* ([1981] 1995) and his more recent *Faithful Change* (1996), postulates six stages of spiritual development. The first two are characteristic of children. Many adults reach equilibrium at stage three or four, but some push on to stage five, and a few—very few—reach stage six, a rough equivalent of sainthood. The following summaries trace the path of Fowler's thinking.

> Stage 1, Intuitive-Projective faith, is the fantasy-filled, imitative phase in which the child can be powerfully and permanently influenced by examples, moods, actions, and stories of the visible faith of primally related adults. (Fowler [1981] 1995, 133)

> Stage 2, Mythic-Literal faith, is the stage in which the person begins to take on for him- or herself the stories, beliefs and observances that symbolize belonging to his or her community. Beliefs are appropriated with literal interpretations, as are moral rules and attitudes. ([1981] 1995, 149)

> Stage 3, Synthetic Conventional faith, reaffirms . . . reliance on external authority and . . . commitments to particular values and images. . . . Symbols and ritual representations expressive of [this] faith . . . are not separable from what they symbolize. . . . [These commitments] can exert a powerful ordering [effect]. ([1981] 1995, 162–63, 154)

> Stage 4. Individuative-Reflective faith brings a relocation of authority within the self. . . . [No] longer defined by the composite of one's roles or meanings to others, . . . [one] must begin to take seriously the burden of responsibility for his or her own commitments, lifestyle, beliefs and attitudes. The "mystification" of symbols . . . is broken open. ([1981] 1995, 179, 181–82)

> Stage 5. Conjunctive Faith [involves a] willingness to let reality speak its word, regardless of the impact of that word on the security or self-esteem of the knower. . . . [One] accepts as axiomatic that truth is more multidimensional and organically interdependent than most theories or accounts of truth can grasp, . . . [and so] reunites symbolic power with conceptual meanings. ([1981] 1995, 185–86, 197)

> Stage 6. Universalizing Faith, heedless of . . . threats to self, to primary groups, and to institutional arrangements of the present order, becomes a disciplined activist *incarnation* . . . of the imperatives of absolute love and justice. . . . Life is both loved and held to loosely. . . . [Although] greatness of commitment and vision often coexists with great blind spots and limitations, . . . trans-narcissistic love of

> human futurity accounts for . . . readiness to spend and be spent in making the Kingdom actual. ([1981] 1995, 201–2, 211)

Upon reflection, one may conclude that each of these stages of faith requires increased mental complexification. An increasing spectrum of thought and information is taken into account; control is assumed by the individual, who weighs various factors in shaping outcomes; links to others become more numerous, subtle, various, and responsible. Such functioning requires input from parts of the brain concerned with sensory input, logic, planning, judgment, and emotions. Structures necessarily complexify as well, *allowing the brain to process and integrate the information.* This is key. As both John Haught (2000, 76) and Robert Wright have recently observed, "though both energy and information are fundamental, information is in charge" (Wright 2000, 247).

Growth in understanding of "the way things really are," in breadth of vision, and in courage focuses one's powers toward an increasingly organized and transcendent vision of self-in-community and fosters dedication to its actualization. Thus, complexification of character—in the Santa Fe sense of the term *complexification*—may indeed be correlated with spiritual development. Paradoxically, a highly developed person may present an impression of simplicity. Fowler observes: "The rare persons who may be described by this stage have a special grace that makes them seem more lucid, more simple, and yet somehow more fully human than the rest of us" (Fowler [1981] 1995, 201). I submit that such simplicity is in fact an evidence of personal integration—James's "unifying of the inner self"—and not of an impoverished character.

Far from focusing solely on mystical contemplation and union with the infinite, such persons care passionately for the world and are connected with it by multiple links of love.[5] While they may, indeed, feel the closest connection with their Ground of Being (however they experience it), they also are deeply engaged in their particular work, with their particular colleagues, and with their efforts toward a larger vision of the future. They may indeed have significant blind spots, and may at times be seen as prickly characters. Yet, their overall unification of character provides exceptional energy and focus toward larger ends.[5] As exemplars of such persons, Albert Schweitzer and Mother Teresa come to mind.

While the brains of mystics have been studied (d'Aquili and Newberg 1999, 200), systematic imaging of the brains of "stage 6" personalities has apparently not been attempted. The intricacies of the brain's organization may in fact be too subtle for current imaging techniques to confirm or deny the proposal that neurological complexification may be linked with complex traits of character. But perhaps the heuristic presented here may prove fruitful for the study of spiritual development, of psychological growth, and of cognitive neuroscience as well.

NOTES

1. In their studies of mysticism, d'Aquili and Newberg also suggest that a mystical state that they call "absolute unitary being" (AUB) may indeed be an experience of the divine (1999, 201). Although d'Aquili and Newberg apparently see mysticism as the primordial religious experience and possibly an actual identity with the Deity, they also explore forms of religious experience associated with other "operators" within the brain (1999, 164–84).
2. This observation does not contradict the second law of thermodynamics, which predicts that in a *closed* system, all parts of that system will eventually relax into one temperature, with maximal entropy. Open systems—including all living things—"export" waste products to the larger environment, and so, as regards entropy, the "books" remain balanced (Kauffman 1995, 92).
3. For more detailed consideration of brain anatomy and function, see Bloom and Lazerson 1988; Ashbrook and Albright 1997; Albright in press.
4. In addition, the brain and the rest of the body are continually interactive. It is highly likely that this sort of interactive process lies behind the findings that hope and optimism and participation in support groups and religious groups are linked with length of life and even cancer survival.
5. From the point of view of inclusive fitness, this set of characteristics may provide a clue to the usefulness of such personal development: persons with such traits may lead constructively and effectively.

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