ZYGON'S 1996 EXPEDITION INTO NEUROSCIENCE AND RELIGION

by Carol Rausch Albright

Abstract. Neuroscience is in a period of explosive growth. To address the implications of the new findings for religion and science, *Zygon* in 1996 published fifteen articles in this field. Although the authors' explorations of neuroscience and religion are various, three issues in particular are addressed repeatedly: (1) the nature of human identity, or hallmarks of humanness; (2) the nature and origin of religious consciousness; and (3) our means of discovering or constructing order and integration in the brain/mind, in the environment, and holistically. With these categories as templates, this article correlates the findings of the *Zygon* neuroscience contributors of 1996.

Keywords: brain; consciousness; ethics; fitness; human identity; language; meaning; mind; mysticism; Neanderthal; neuroscience; sentience; soul; symbol systems.

Because the brain seems the most human of organs, new understandings from the sciences of the brain affect fundamentally our views of who we are. These lead unavoidably to fresh explorations on the interface between scientific and religious understandings.

But the beckoning pathways are various. Neuroscience is no narrow discipline. It deals, for example, with neural development, anatomy, and degeneration at all ages from fetal life through old age. It analyzes electrical and chemical features of the operations of the nervous system. It explores the neurobiological substrates that support love and hate, vision and hearing, language and analytical thought, goal setting, and muscular coordination. It considers gender differences and mystical experience.

This volume of *Zygon* makes a major effort to explore implications of new understandings of the brain made possible by advances in imaging

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technology, cell biology, and related disciplines. The June, September, and December 1996 issues of this journal have presented fifteen articles in this field, including a profile of neurotheologian James B. Ashbrook. Some of these articles had their source in a conference, entitled "Knowledge Most Worth Having in the Decade of the Brain," presented in the summer of 1994 at Star Island, New Hampshire, by the Institute for Religion in an Age of Science (IRAS).

Our authors not only explore various aspects of brain research but also take different routes toward the interaction of neuroscience and religion. Some assume the reality of God; some examine religion as a natural phenomenon; and some edge gingerly to the interface.

But there are commonalities. Three issues in particular are addressed repeatedly: (1) what it means to be human: the nature of human identity, or hallmarks of humanness; (2) the nature and origin of religious consciousness; and (3) the means of discovering or constructing order and integration—in the brain/mind and "beyond." By examining the range of positions that our authors took, we can begin to limn the dimensions of the issues that must be addressed in any ongoing examination of the neurosciences from the perspectives of religion, theology, and values.

I. The Nature of Human Identity: Hallmarks of Humanness

A few years back, it seemed that physical anthropology had it all sewed up. You could tell a human by her foot. No other critter has a foot that allows miles of bipedal striding.

Brain research has reopened the inquiry on another front. What is it about the brains of humans that sets them apart from the brains of every other animal? Is there any particular neurological hallmark of humanness?

Our authors were surprisingly varied in their positions on this issue. In their examination of what it means to be human, they keyed on sentience or consciousness; courage in the face of existential despair; relationships and emotions; language and symbols; ethics and responsibility; the making of meaning; and soul. The categories were not, in most instances, mutually exclusive. Many authors examined more than one characteristic essential to humanness and showed how one quality supported, or necessitated, another.

Sentience and Consciousness. The question, Who is a person? has peculiar poignance for medical professionals dealing with research and treatment plans that utilize neural tissue taken from aborted fetuses. Does neural tissue represent the essence of a person and therefore of the fetus? By implanting fetal neural tissue in the brain of a person already born, do

we create a "monster"—two persons become one—or allow the fetus a second chance at life? In addressing such issues, medical ethicists Lois Nora and Mary Mahowald focus on sentience as one hallmark of humanness. A fetus becomes sentient—able to hear and to feel pain, for example—after about twenty weeks gestation. Or perhaps it should be defined as a person at about ten weeks' gestation, when it has "synapses allowing neuronal cross-talk between cortical tissues"—or after eight weeks, when "postmitotic stationary neurons begin to form at the cortical plate." Prior to these events, they suggest, a fetus may be defined as a human, but not a person (Nora and Mahowald 1996, 626).

Psychologist John Teske agrees that "ultimately our capacity for mental and spiritual life is built on the sentience we share with many other animals," adding that human mental life also requires "a limbic system that forms the substrate of our emotional life and the circuitry necessary to bring sensed elements together into integrated scenes"—that is, consciousness (Teske 1996, 216).

The nature of consciousness is at present a controverted issue in the neuroscience community. Psychiatrist Eugene d'Aquili and physician Andrew Newberg, among others, draw a distinction between subjective awareness and consciousness: "subjective awareness is consciousness without a clear reified Self, and consciousness is subjective awareness with a reified Self." This definition restricts consciousness to primates, and especially to human beings (d'Aquili and Newberg 1996, 238, 239). As Teske points out, "all states of awareness are *of* or *about* something," yet, d'Aquili and Newberg argue, the relation of subjective awareness to external material reality has been a puzzle at least since the Enlightenment (d'Aquili and Newberg 1996, 236, 237). Many scholars are suggesting that consciousness is actually a mental construct, not a single phenomenon within the mind. The construction of a self, and of a perceived world, is discussed at more length below.

Despair and Courage. Philosopher C. Don Keyes is not sure that we can construct a self in any philosophical sense—nor does he care. The issue for him is an existential crisis: humans are confronted with meaninglessness, a lack of apparent purpose in life, which, after all, ends in the absurdity of death. If it is true, as some brain scientists assert, that our precious personal identity rests on nothing more than neurons and neurotransmitters, meaninglessness becomes even heavier. In face of despair, Keyes counsels courage. True humanness is gained by accepting, then spiting, despair, and Keyes discusses some strategies for the struggle. Echoing Søren Kierkegaard, he explores the values of aesthetics and beauty, ethics, and religious ritual and belief in creating a life.

Relationships and Emotions. Philosopher Marya Schechtman sees

experiential and physical realities as acting together in the formation of a person. "There are very detailed observations about the ways in which fear, depression, or danger, e.g., affect specific parts of the brain," she observes. Thus, "biological accounts of the brain may turn out to require terms like *beliefs*, *desires*, and *feelings* as well as *neurons*, *synapses*, and *serotonin*" (Schechtman 1996, 613).

Theologian James Ashbrook and neuroscientist Paul MacLean, in particular, underscore relationships as essential to human identity. All young mammals require care from a nurturing parent figure; without it, they fail to thrive and may even die. If parent and young should become separated, they express their emotional pain through the characteristic "mammalian separation cry." Yet separations are inevitable. In humans, real or remembered pain of separation underlies intense motivations that continue throughout life, prompting us to search for our place in the world and in the universe. We search for connection—in human relationships and in spiritual life.

MacLean speculates on other consequences of our connectedness. He sees it as foundational to the evolution of language, and even of an ethical sense. He observes that female mammals generally display a sense of responsibility for their young. With the evolution of human beings "such a sense [may have] generalized psychologically to include others and become what we call 'conscience' " (MacLean 1996, 437).

Language and Symbols. Neurophysiologist Terrence Deacon examines the evolution of language to see if it provides a clue to an essential jumping-off point that demarcates humans from other animals. Language gives us a form of *symbolic representation* that goes far beyond simply giving names to things. Symbolic representation works by arranging symbols in relation to other symbols. The power is in the *pattern* of symbols, not simply in the words themselves. The ability to manipulate symbols made our brains much more powerful instruments than nonsymbolizing brains. The breakthrough into symbolizing made us smarter.

In addition, "the radical change in the mode of mental representation from iconic and indexical [as in other animals] to symbolic representation [as in humans] must inevitably constitute a change in the mode of consciousness (Deacon 1996, 637). . . . We are able to take another's perspective in this virtual world, and know something of the consequences of our actions on them. We experience a sort of empathy available to no other creature, a virtual empathy. . . . It is the basis for our most noble acts of self-sacrifice and caring, but it is also the basis for our most detestable and revulsive acts of terrifying and torturing. . . . This representational ability, with all its powers, was what was in the proverbial apple that got us kicked out of the garden in the first place! . . . [And it] all came into the world in the last 2

million years as a result of incremental changes in biology" (Deacon 1996, 637–38).

Ethics and Responsibility. As Deacon, neurophysiologist Rodney Holmes, and philosopher Norbert Samuelson all point out, it was knowledge of ethics that ended our idyl in the innocence of Eden. Ethics rests on at least two of the attributes of personhood already discussed: the ability to think conceptually and the need to live in relation to others. A brain capable of conceptual thought enables us to function *symbolically* and *contextually*. Without these abilities, there could be no conception of good and evil. Secondly, to think about ethics, one must think about the *individual in community*; ethics is about how to live so that both individual and community can thrive. For not only is communal life a key element in human survival in a Darwinian sense, but in a psychological sense we cannot become fully realized persons in isolation. As Samuelson notes, "a 'self' is something that you are or become in yourself, but a 'person' is something you can be only in relation to others" (Samuelson 1996, 708). Those who emphasize the ethical dimension of human identity recognize the paradox that we cannot be fully ourselves unless "the cry for the other" receives an answer (see Ashbrook 1994). To speak of the human brain in "splendid isolation" means no community, no ethics, and no real personhood.

A third requirement for ethical behavior is the ability to choose, which implies responsibility. Deacon maintains that we must "take responsibility and authorship for our own actions" because of our unique capacity for "symbolic reference [which enables us] to be at the same time above and within our own mental processes" (Deacon 1996, 638). To theologian Kenneth Vaux, accountability is a central feature of the human condition. "We are addressable, answerable, accountable—responsive and responsible beings" (Vaux 1996, 467).

Meaning-Making. Ethics rests on our ability for cognitive organization, which enables us to search for our place in the larger scheme of things. Ashbrook points to a psychodynamic reason why we search for meaning. As we leave early childhood, we reluctantly give up close, symbiotic connectedness with our caregiver. In its stead, we begin to search for our connectedness to the world in a larger sense—through our family and vocation, through the arts and creative endeavors, for example, but above all, through religion and spirituality. As Ashbrook put it, we become "makers of meaning" (Ashbrook 1996b, 419; Ashbrook and Albright, forthcoming).

Holmes takes a historical view of meaning-making, explaining that with the Neanderthals, some seventy thousand years ago, human neuroanatomy reached modern dimensions. He concurs with the views

that the first records of religious observances are found in the Neanderthals' apparent interpretation of death as a meaningful event—a religious view "correlated (and not merely coincidental) with the evolution of the neocortex" (Holmes 1996, 451).

Related to meaning-making is psychologist John Teske's concept of *spiritual integrity*—

> the unity and coherence of complex selves [which] seems to be achieved, not given. . . . [W]e may need to see spirituality, not as inborn, but as developed, attained, or even socially constructed. . . . Ultimately the meaning, purpose, and unity which can be the only solutions to the integrity problem may be obtained, not in the annihilation of the self, but in the identification of self with larger and larger units of which the individual nervous system is a part. . . . By the giving, or sacrificing, of self to what is beyond it we make our lives meaningful because that meaning *is* a function in a larger system. (Teske 1996, 228, 229, 230)

Soul. Beginning with Rollo May's assertion that an affinity exists between "the capacity for self-conscious affirmation of [our] own being" and the classical meaning of "soul," Ashbrook searches for a view of soul appropriate to a "new natural theology in a empirical mode" (Ashbrook 1996b, 413). In the abstract, he defines soul as the essential identity of each individual, but in the empirical mode, he seeks to understand how a soul comes to be constituted. He keys on the process by which we integrate our present experiences with our past, selecting some events to weave into our narrative of who we are, how we came to be the way we are, and how we are to live. This is our process of finding meaning in our lives. We thereby develop an integrating and adapting sense of the continuity of self and species. "Soul is that centering, whole-making activity of the brain-mind. Without soul we are not ourselves. . . . [M]eaning-making is the making of soul" (Ashbrook 1996b, 418).

II. The Nature and Origin of Religious Consciousness

Ashbrook's sense of soul points to a religious consciousness in humans. None of our writers denies that there is a human propensity to religiousness, and some discuss it at length. They vary, however, in their ideas about its basis. Some emphasize an origin of religious belief and practice that is external to humans; one might say that they see religion as originating "from above." Others base religiosity in natural phenomena; to them, the origin of religious phenomena is primarily "from below." A third group attempts to bridge these positions by describing religion as based in human perception but expressing basic truth.

RELIGIOUS CONSCIOUSNESS ORIGINATING "FROM ABOVE." The articles by Vaux and by d'Aquili and Newberg exemplify the view of

religion as originating "from above." Although these writers acknowledge that human participation is a necessary element of religious experience, they see the true origin of religious consciousness as being from sources outside the human.

Vaux sees transformation of character and human regeneration as real enough, but he does not think they are entirely the product of human effort. "Humans do not project deity and moral purpose on to the world; [but] soul embraces body as God enfolds world." Like Jonathan Edwards, Vaux sees religious experiences as "visitations of the Holy Spirit within human consciousness" (Vaux 1996, 466).

D'Aquili and Newberg combine traditional philosophical analysis with views that echo mystics of many traditions. Recapitulating various positions regarding the mind/body problem, they reject naive realism: "The world is inseparable from the subject, but from a subject which is nothing but a project of the world, and the subject is inseparable from the world, but from a world which the self itself projects." They acknowledge the everyday practicality of assuming that material reality exists, but they nevertheless conclude that "if one wishes to take a rigorous phenomenological approach, it is clearly impossible to get outside of subjective awareness to determine the existence of a corresponding alternate reality" (d'Aquili and Newberg 1996, 247, quoting Merleau-Ponty 1962, x-xi).

In an attempt to "get a handle on this knotty problem," d'Aquili and Newberg have investigated the experiences of mystics of various traditions. The primordial mystical experience, which they label the state of Absolute Unitary Being (AUB), is a mental state, "usually achieved through intense meditation, in which there is pure awareness with the perception of no discrete reality, the sense of no passage of time, the sense of no extension of space, and without the self-other dichotomy." It is neither subjective nor objective, but seems to be "anterior to either subject or object"—in other words, it may be *prior to* the phenomena that lead to the mind/body problem. "This ineffable state has tempted many mystics and some philosophers to speculate that the pure awareness experienced in AUB is not only nonlocal but also creative. . . . At this point, one can see the possibility of an externally creating God or ground of being beginning to emerge" (d'Aquili and Newberg 1996, 248–49). Farther than this they decline to go in this paper.

RELIGIOUS CONSCIOUSNESS ORIGINATING "FROM BELOW." Other writers suggest that religious phenomena may have a natural basis. Some point to the possibility that religion has enhanced—and may still promote—human fitness in an evolutionary world. Others explore the possibility that religion may be secondary to various human abilities—an epiphenomenon, if you will.

Religion as Functional. In purely naturalistic terms, some of our writers point out, religion may be an asset to humans. It may promote the interests of the species, of the individual, or of human communities. The choice of beneficiary depends primarily on how the evolutionary process is understood.

MacLean's discussion focuses on the role of the female in mammalian evolution, particularly in regard to certain qualities promoted by traditional religions: responsibility, empathy, altruism. He theorizes that these qualities evolved from the "maternal instinct to feed her young. . . . [W]ith the ascendancy to humanness, such a sense generalized psychologically to include others and became what we call 'conscience'" (MacLean 1996, 437). MacLean sees concern for others as essential to the survival and well-being of the human species. At the human level, these qualities are transmitted not only genetically but also in large degree culturally through the family and society.

Philosopher Marya Schechtman explores the mechanisms through which individual psyches become products of both genes and experience—for example, human nurturance, trauma, or the vagaries of brain chemistry. She proposes an "integrated psychobiological model of mental illness," in which, for example, "the immediate cause of . . . distress [may be] a biological problem involving serotonin levels, but . . . the cause of this biological problem may have been . . . psychological trauma" (Schechtman 1996, 607–8). A biologically vulnerable person may be more vulnerable to psychologically mediated neurological change. "On this view, psychological events can—and regularly do—impact and alter the functioning of the brain, and so a complete biology will need to include reference to thoughts, feelings, beliefs, and desires as well as the traditional elements of biological explanation" (Schechtman 1996, 612). This view does away with traditional substance dualism. "There is only one kind of substance—material substance—[but] the laws according to which [that substance acts] must contain both physiological and psychological terms" (Schechtman 1996, 613).

While Schechtman addresses the interaction of biology and culture on the level of individuals, Holmes unbundles this interaction on the immense time scale of human evolution. He believes that Neanderthal burial sites mark the first evidence of religious consciousness among hominids. Neanderthal was the first neuroanatomically modern hominid, having "virtually all of the brain that we enjoy, although it may have differed in some details" (Holmes 1996, 451). And, Holmes has concluded, it is "now clear that a Darwinian struggle for existence is insufficient as a driving force for the evolution of such a brain" (Holmes 1996, 450). "The modern hypothesis is that the mechanism is coevolution, where the evolution of the brain is driven by feedback of emerging

linguistic, historical, and religious functions" (Holmes 1996, 450).

Psychologist Robert Glassman points out that the theory of a partnership between biological and cultural evolution is related to Ralph Wendell Burhoe's novel use of the concept of *symbiosis*, which he extended to "refer to the intimate multifaceted relationship between the human genetic information system and the human cultural information system" (Glassman 1996, 193). Recalling Burhoe's assertion that "religion is the repository of cultural wisdom that most encourages mutual altruism among nonkin, long-term social survival, and human progress," Glassman suggests that secularists, for their own good, should "sometimes take religion on its own terms by suspending disbelief about God." For without a religion, the various phenomena of culture "do not have the necessary reach or strength to unify groups" (Glassman 1996, 194).

However, Glassman cautions, not just any religion can serve such a purpose. To succeed, a religion must draw upon, and amplify, a variety of human attributes. For example, the "collective memory" transmitted by culture helps to overcome the finitude of individual experience and mental capacity. Religions, in particular, pass along "well-winnowed traditions" regarding which courses of action tend to be beneficial for groups and for individuals. There is also a mismatch between the capacities of human *perception* and the requirement to adapt to rapid change in contemporary society. Religion may remediate this mismatch by operating on a time scale intermediate between the slow response time of genetic evolution and the mercurial vacillations of popular culture. As another example, humans are programmed by nature and culture to focus on *personality*. By personifying the great mythic themes, such as the creation stories in Genesis 1 and 2, religion may "help us better to appreciate their implicit ethical principles."

Finally, Glassman calls attention to the problem of *motivation*. By "absorbing sufficient passion to smooth over our individualistic striving," religion has the potential to "help turn our society into . . . more of a synergy," he suggests. Thus, the "material life-and-death form of evolution may be supplanted by a more informational kind in which new forms of organization are naturally selected primarily by means of continuing, friendly, self-sorting recombinations of human groups, accompanied by mutual teaching, new self-discoveries, and continuing development of culture." Such a development could "help to set and maintain appropriate spiritual/psychological conditions for long-term continuity of a good civilization" (Glassman 1996, 200).

Religion and Neurological Mechanisms. MacLean suggests that one substrate for religious experience may be the limbic system. This area of the brain, which humans basically share with other mammals, deals with self-preservation and procreation and, in its more recently evolved sectors,

with nurturance and emotional attachment. Its emotional signals seem to be a prime source of our motivation and valuing. Studies of limbic epilepsy—"electrical storms" in this sector of the brain—indicate that "strong feelings of conviction and belief that what is being experienced at the moment is of the utmost importance or is expressive of the absolute truth" are limbic in origin (MacLean 1996, 437). The reader may conclude that some aspects of religious commitment stem from the limbic system.

But even though religion may be powered by a faith commitment related to the limbic system, our religions are consciously apprehended as symbol systems, often expressed as narratives. Holmes maintains that human beings are connected less by genes reproducing themselves than by story (Holmes 1996, 442). Our stories include religious understandings, "the imaginative narratives by which humans bridge the gap to the divine." "We are a *Homo religiosus*," he concludes, "connected with each other by our narratives about what is ultimately significant" (Holmes 1996, 444).

Holmes adds that such spirituality is made possible not only by certain cortical structures but also by human speech and abstract thought and by a theoretic culture involving symbolic systems. Terrence Deacon analyzes the coevolution of these components. Language, he points out, is an evolutionary anomaly—a method of mental operation that simply is not found to a significant degree in any other species. For language involves far more than a simple correlation between a word and the object or concept to which the word refers. It depends on a complex scheme of symbolic reference. The power of words is not so much that they symbolize objects but that the symbols interact with one another in a complex hierarchical system. And the ability to think contextually makes us a different kind of animal (Deacon 1996, 663–64, passim).

> We are conscious of the possibility that there was a Big Bang which created the known universe, we are painfully conscious of our impending end of life, we are conscious of our confusion over the nature of the infinite, and most important, we are conscious of others who are conscious of us. . . .
>
> We . . . take responsibility and authorship for our own actions with the aid of symbolization. . . . We possess a form of agency which is unavailable to other species that is enabled by the representational distance that symbolization provides. (Deacon 1996, 637–38)

In other words, because of our evolved, unique mental ability to handle abstractions and symbol systems, we (1) consider our position within the cosmic scheme of things, (2) are aware that we can do good or evil to one another, and (3) have responsibility for our actions. Of these is the essence of religion.

BRIDGING THE GAP. Teske and Ashbrook, in particular, attempt to bridge the gap between the contrasting theories we have noted concerning the origins of religious consciousness. Teske explores the outer bounds of human spiritual experience as they are delineated by the mental equipment that we have to work with. This includes left brain narration, right brain contextualization, and subcortical valuing, including our "subcortically mediated emotional life and perhaps even our neuroimmunology" (Teske 1996, 227). Furthermore, he continues, "the self as a neurocognitively constituted unit may be incomplete without a place, a role, a position in some larger system of social relationships" (Teske 1996, 228). He asserts that spiritual activities require a neuropsychological endowment sufficient for mapping, modeling, or symbolically representing a world and a self within it (Teske 1996, 209). For "*human beings are spiritual beings to the extent that they can apprehend meanings and purposes extending beyond their individual lives*" (Teske 1996, 213, emphasis in original). Yet, hovering in the background of Teske's article is a sense of a "beyond" that is there to be addressed. "The final level of spirituality," he concludes, "involves participation in a transindividual world, transformation by it, and even sacrifice to it. . . . What is involved is a sacrifice of the boundaries that once defined self, not to lose oneself but to gain the world beyond" (p. 230).

Ashbrook sets out to make sense of both self and God:

> I assume a new natural theology in an empirical mode. It is "natural" because it takes cognitive processes (both cortical and subcortical)—or mind—as indicative of the nature of ultimately purposive reality, or God. . . . Instead of starting with a philosophical view of God as Being Itself, I turn to a neurophysiological understanding of brain as a metaphorical-analogical understanding of God as God. . . .
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> In pursuing my study of the brain, I have never sought to "prove the existence of God." Rather, I have tried to make God—the reality of God and how people perceive God—meaningful in human experience. (Ashbrook 1996b, 407–8).

At times, theologian Larry Greenfield points out,

> Ashbrook seems to propose that human brains themselves are the source of revelation, disclosing most fully what is human, natural, cultural, and divine. . . . That, I am persuaded, is a misreading of what he intends. [Rather,] concerned to overcome the distortions of divisions and dualisms, Ashbrook discerned that the multidimensional and multifunctional character of human brains actually provide connections with the traditional sources of revelation. (Greenfield 1996, 459)

Yet, in Greenfield's eyes,

> a scientifically based theology of the kind Ashbrook proposes may have to account for the human sense of being related to a dynamic reality that is at least in part outside the human sphere without either denying the legitimacy of that human sense or attributing will and purpose to that dynamic reality. (Greenfield 1996, 462)

III. How Do Our Brains Discover or Make Order? Putting It All Together

The ordering of self and world is an issue repeatedly addressed by the writers. Some focus on the integration of the self through the creation of order in the brain. Others are more concerned with how we discern—or construct—order in our environment, including both the material world and the ideas and concepts that make up a cultural milieu. Most ambitiously, some addressed issues of order on a holistic level that incorporates realities beyond brain and environment.

The authors do not agree about the method of ordering to employ. In general, they espoused either constructivism or critical realism of various sorts. Simply put, constructivists believe that we "create" an orderly world through our own mental activities; for them, order is not inherent in the world. Critical realists believe that our mental activities refer to something real beyond the mind, even though this reference is not a one-to-one correlation.

Order in the Brain. Although the conscious "I" would seem to be a straightforward concept intuitively understood by everyone, in fact, the nature of consciousness is a controverted issue. The consensus is that, one way or another, we "construct" an "I," basing it upon input from the various modules of the brain. For most of the writers, the sense of self depends as well upon our embeddedness within a physical and social world outside ourselves.

For d'Aquili and Newberg, for example, "certain brain structures must have evolved before a conscious Self could be constructed. The diverse elements of this mind/brain input are reified [and] [t]his reification of the perceived diverse functions of the mind/brain is the conscious self" (d'Aquili and Newberg 1996, 249).

MacLean would widen the net, noting that "a sense of personal identity depends upon an integration of information from internal and external sensory systems" (MacLean 1996, 436). In her proposal for integration of psychology and physiology in the formation of the self, Schechtman also draws upon both brain and experience. Teske would agree. While he sees mental states as "dynamic, emergent properties of brain states, [which] cannot exist apart from those brain states" (Teske 1996, 215), he notes that the mental state we call *consciousness* requires external input as well. He describes

> a subset of sentient creatures whose anticipation of pleasure and pain enables them flexibly to seek one and avoid the other. . . . The defining characteristic of conscious mental life is that it has "intentional" content, that is to say, that mental events refer to—are *about*—events or objects outside themselves. . . . It is this intentionality of our conscious mental life that allows us to have any comprehen-

sion of what is outside us, to direct ourselves beyond immediate experiences, and to entertain alternative courses of action. . . .

If we can represent the world, and act in it, we can also learn to include our own actions, and some gradually stabilized representation of ourselves, as another degree of interiorization. (Teske 1996, 216–17)

A stable "I," Teske continues, may also depend upon the valuational processes of the limbic system and the information stored in memory, which may reflect years of biographical development and social experience. However, he cautions, "these representations, including our beliefs about ourselves, may be extremely malleable. . . . We may recast ourselves far more frequently than our beliefs about our own continuity would lead us to think" (Teske 1996, 218, 220). He cites thinkers such as Daniel Dennett, who see the self as a sort of linguistic "fiction" generated by the brain to provide coherence only in retrospect (Teske 1996, 226).

Order beyond the Brain. Our structuring of the environment may rest on similarly shaky ground. "The neurosciences cannot stand alone as a source of 'making sense' of reality. Because the neurosciences explore and explain the connections with other dimensions of reality, they also have correlates with intellectual disciplines that attend to those other dimensions," notes Larry Greenfield (Greenfield 1996, 459). The "other dimensions" to which the *Zygon* writers most attend are the natural sciences—a bias perhaps to be expected among contributors to this journal.

The natural sciences, like religion, rest on faith. The scientific articles of faith include the assertion that the realities of the world can be detected by the human senses and their extensions (such as drift chambers and electron microscopes); that physical phenomena are subject to laws of causality, and repeatable; that the whole is comprehensible to human intellect. In the course of human history, not all of these assertions have been taken for granted.

If we do assume the validity of these assertions, we are pointing back to neuroscience. For in order to comprehend a lawful world, human intellect must have the ability to manipulate symbols. Assuming that we apprehend the physical world almost as well as, say, our dog, how is it that we have developed a complex host of algorithms to explain it, predict it, manipulate it, employ it? As Deacon points out, the unique human ability, not only to name objects and concepts, but also to manipulate these symbols sequentially, hierarchically, and holistically enables us to construct a unique knowledge of physical reality. This knowledge allows us to conduct our lives in a way different from that employed by any other species. But our understandings are continually subject to revision.

Global Order. Our ability to manipulate symbols and abstractions enables us not only to construct an understanding of the context in which we conduct our lives but also to consider the ultimate reality in which we are embedded. And as Holmes notes, from the ability to look for ultimates comes the drive to do so. Citing the "unseen order" described by William James in his 1901–1902 Gifford Lectures, Holmes concludes that this order is in fact *not* unseen; it is that order *created* by humans as they search for whatever it is that underlies all of human experience.

Global understandings are not always put together through algorithmic thinking. Keyes, for example, points to an existential mode of arriving at a meaningful existence. In the absurdity of death, in the sheer physicality of the brain, and in our pieced-together "I," he sees grounds for despair. The acts through which we negate negativity are what validate us. As we spite despair through our art, through religious symbolism, and through ethics, we create a self-in-the-world.

Glassman speculates on our place within a larger reality:

> It is conceivable that all the earth's diverse, seething, purposive systems, and quasi-purposive systems with living components, are gradually feeling their way—by natural selection—to a set of subtle linkages of a higher order that are in part outside of human intention. (Glassman 1996, 180)

He wonders whether religiously gifted individuals may indeed be able to perceive a "God gestalt" that most of us cannot identify:

> Secular intellectuals might grant the possibility of legitimacy to a God-object hypothesis, as the hypothesized coherence of pattern behind a large selection of life's experiences that are broadly distributed within our lives. . . . What I am *not* hypothesizing here is merely that theists are cultivating belief, based on the local faith sources of their parents and neighbors. And while the emotional components of religion are important, I am also not hypothesizing that theists are merely having an oceanic mystical experience. (That is too easy to cultivate by tricks of mental self-stimulation or to simulate with drugs.) My hypothesis is that the perceptive theist may actually be having a perceptual experience. . . .
>
> Good athletes . . . see where the ball or other object of play is going, and they dance with it successfully. Admittedly, it is a big leap of analogy from this to the hypothesis that a perceptive theist can in a similar sense perceive God; but we are constantly confronted with examples of people whose skills are wonderful at things the rest of us can only dream of doing. We secularists simply do not know whether there are theists who genuinely have such a form of expertise. Perhaps there are. (Glassman 1996, 171–72)

Teske may have glimpsed the "underlying pattern." He believes that

> ultimately, the meaning, purpose and unity which can be the only solutions to the integrity problem may be obtained, not in the annihilation of the self, but in the identification of self with larger and larger units of which the individual nervous system is a part. . . . Stepping beyond oneself is the only way self can have meaning: by giving oneself to something greater, by giving oneself back. (Teske 1996, 230)

Ashbrook is engaged in a parallel search in his "natural theology in an empirical mode." In his explorations of "soul," he seeks for the sum-total identity of the person—reason, perception, memory, emotion. And that whole human seeks for meaning in the whole world, and thus for a God. To Ashbrook, this search for God and meaning is grounded in early human experience, particularly the inevitable separation from a parent and substitution of other sources of connectedness. These form the basis of the human openness to God—but for Ashbrook, they do not limit God's nature to mere anthropomorphic projection. As Greenfield notes, Ashbrook's "making sense of making sense" opens the way for a new mode of theology that is "conceptually plausible, empirically identifiable, and experientially meaningful" (quoted from Ashbrook 1988, 129). Greenfield would wish for an account that could command our belief and worship: "when choice or intention or volition in meaning-making carries with it a parallel attribution to a declared reality that is not encompassed by the self"—that, to Greenfield, would be a defining move (Greenfield 1996, 461).

IV. Questions for the Future

We have delineated three areas of inquiry that *Zygon*'s authors have approached from various vantage points in our 1996 expedition into neuroscience. These scholars have addressed issues that beg answers—even partial and incomplete answers—and that seem central to the concerns of this journal and significant to the larger society. The answers, and even the issues, are subject to change, for it is in the nature of research to produce unexpected data and lead to unforeseen avenues of exploration—and this is doubly true in so highly active a discipline as neuroscience. With this caveat in mind, we underscore once again three areas of research on the neuroscience-religion interface that seem likely to attract continuing attention.

First, *how do the neurosciences shape our understanding of what it means to be human?* Competing assumptions about the human condition underlie many current discussions in both the public sector and academia. For example, to what degree is our humanity defined by our individuality, and to what degree does it depend on social interaction? How much to honor individualism and how much to promote the well-being of the larger community is a controverted issue in social, political, and economic analyses of our culture—in governmental policies, business practices, and civic participation, for example. Another recurring question about the nature of persons concerns intelligence. How do we understand cognitive ability and "emotional intelligence"? Do other kinds of intelligence exist? What roles do they play in human living? Can—and should—child-rearing and education promote various kinds

of intelligence? Can artificial intelligence (AI) simulate more than the cognitive features of human intelligence? AI also relates to the mind/body and mind/brain problems and related issues of dualism and materialism. These issues have concerned philosophy for centuries; brain science is making significant contributions to this discussion. Other examples could easily be cited.

Second, *what light do the neurosciences cast on the nature and origin of religious consciousness?* At present, many people perceive a forced choice: should they cast their lot with those who believe that religion comes "from above" *or* those who believe religion comes "from below"—from sources outside the human *or* from human needs and interests? Many thoughtful seekers see either option by itself as untrue to experience and conviction. Are there ways in which both sets of insights may be correct? If, as physicist Murray Gell-Mann recently remarked in a lecture on complexity, "religion is the DNA of culture," then useful answers to this question could provide a more integrated template for wholesome living than our society currently provides for many individuals who perceive its fragmentation.

Third, *is the order that the mind creates simply an intraneurological order, or does it correlate to reality beyond itself?* This debate is reflected in conflicts between constructivism and critical realism which play a lively role in problems of educational methodology, philosophy of science, psychotherapy, social analysis, and other avenues of inquiry. Thus, the debate over constructivism and critical realism in neuroscience and religion is part of a much larger set of issues pervading discourse in our society. As *Zygon*'s part in the debate is affected by other voices, its conclusions may influence them in turn.

Zygon will continue to monitor these and other developments. Its chosen role will remain theoretical: to develop basic understandings of the nature of humans and the world in light of both scientific and religious knowledge. Debates over applications of its insights—or of competing views—will seldom concern the journal directly. Its editors continue to believe, however, that from basic understandings there may develop an enormous variety of consequences.

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