THE SPIRITUAL LIMITS OF
NEUROPSYCHOLOGICAL LIFE

by John A. Teske

Abstract. How neuropsychology is necessary but insufficient for understanding spirituality is explored. Multileveled spiritual requisites are systematically examined in terms of their neuropsychological constituents and limitations. The central "problem of integrity" is articulated via the "modularity" of our neuropsychology, and evidence is presented for disunities of self and consciousness. It is argued that the integrity of self or spirit is a contingent achievement rather than a necessary given. Integrating possibilities include belief, emotion, and relationships. Understanding integrity, and the transformations of self-surrender and sacrifice, may require explicitly stepping beyond neuropsychology and including the self in a larger system.

Keywords: levels of analysis; mind-brain relationship; neuropsychology; self; social cognition; spirituality.

The topic of spirituality is of enduring interest to religion and to the dialogue between science and religion. The central thesis of the present paper is that the very aspects of neuropsychological function that make spiritual life *possible* are what give us our spiritual *limits*, limits that *individuals* cannot transcend. If we are to arrive at a theological system that is coherent with science, we need to see how our neuropsychology is *necessary* for our spirituality. Nevertheless, to better see why theology is *not* reducible to science, we also need to map out the ways in which cognitive and neurosciences are insufficient for understanding human spirituality.

Human spirituality requires capacities, however limited, for reflection, for self-knowledge, and for self-transcendence. These capacities require a

John A. Teske is Associate Professor of Psychology, Elizabethtown College, Elizabethtown, PA 17022. Portions of this paper were presented in a Psychology and Religion Symposium, Holy Spirit Hospital, Camp Hill, Pennsylvania, in March 1985; a Monday at Ten lecture at Elizabethtown College in November 1988; and a workshop paper presented at the Fifth European Conference on Science and Theology in Freising, Germany, in March 1994.

neuropsychological endowment sufficient for mapping, modeling, or symbolically representing a world and a self within it. Such capacities entail limits that, as spiritual beings, we need to acknowledge. (1) *Selection entails limitation.* Knowing about the world, being able to represent the world in useful ways, always involves a process of selection, of sampling the world to the organism's advantage. The result is that our representations will be incomplete, limited, or even distorted in the direction of these values. (2) *Abstraction entails separation.* Knowing about the world involves a process of abstraction across objects or events, which enables us to escape from the particulars of our immediate circumstances, generalize, and respond to new situations. The result is that our relationship to the world is always mediated through abstractions and will be separated from it, losing the uniqueness of concrete relationship. (3) *Construction entails fabrication.* Knowing about the world involves building representations, and there are always multiple ways to do so. The result is that our knowledge of the world is always perspectival and is likely to be egocentric, fabricated, and self-deceptive. (4) *Specialization entails partition.* Knowing about and functioning within a complex world requires specialized parts and specialized representations. In a limited-capacity system, this results in some degree of partition, of modularization, which always runs the risk of fragmentation as the system differentiates and communication between elements decays. Like knowledge of the world in general, knowledge of oneself is selective, abstract, constructed, and specialized. But even fragile self-knowledge can point to the limitations and finitude we hope to transcend.

Our spiritual life is made possible, and given its challenges, by the appropriation of symbolic meanings that constitute conscious mental life. The central challenge is to construct, to represent, to symbolize the self, our only bastion of personal wholeness. This pursuit of integrity, as much a spiritual as a psychological pursuit, is dependent upon our neuropsychology but not required by it. Indeed, the modularity that may be necessary for the relative stability of a complex neuropsychological system itself entails deep risks: integrity may fail, the self may fragment, and spiritual life may become meaningless.

We will illustrate here how any unity must be an *achievement* rather than a given. We will suggest that spiritual integrity is *in fact* achieved by human beings, but not merely through the spinning out of neuropsychological function. Our spirituality resides, not in the finitude of our individual biology, but in a historically and culturally emergent symbolic world that precedes, canalizes and sculpts, and then passes well beyond us.

DEFINING HUMAN SPIRIT

One of the notorious difficulties in understanding relationships between mind and spirit is to differentiate contemporary meanings of

these terms from millennia of overlapping usages. Nevertheless, we must avoid the presumption that the languages of spirituality and those of mental life are incommensurable and that our spiritual and mental lives can only coexist splintered into separate conceptual domains. This presumption condemns spiritual concerns, at best, to well-defended conceptual enclaves or, at worst, to intellectual irrelevancy.

What makes conventional religious understandings of spirituality so incredible to those with a scientific and technological worldview is, as Ralph Burhoe put it, "not that what religion seeks to symbolize is essentially untrue, but that our religious culture has failed to translate from ancient conceptual schemes that used to be the grounds for terms such as 'soul,' 'breath,' 'spirit,' 'reincarnation,' 'resurrection,' or 'immortality' into the conceptual schemes of contemporary science" (1981, 139). Any religion must operate in the world in which people live; the contemporary world at the end of the second millennium just *is* a scientific and technological world.

Definition. Richard Swinburne (1987), like the mass of our contemporaries, defines the spirit or soul as both (1) consisting of our mental constitution, the intellectual endowments of the mind, and our moral feeling and (2) being capable of continuing beyond the death of the body. Dictionaries also capture this common usage, defining spirit both as being constituted by our mental and moral lives and as being *opposed to* or *other than* our material or carnal lives.

Unfortunately, these views continue to be widely held at a time when the cognitive sciences and neurosciences are making vast contributions to an understanding of our mental lives as dependent on complex neurobiological functioning, none of which survives our biological deaths. We understand that when someone dies, their life functions—their breath, their heartbeat, their brain functions—just stop; they don't leave and go elsewhere. This conception is very different from the ancient understanding that the breath of life (*ruakh*) is capable of existence independent of the body. We understand that when a person "loses his mind," it doesn't go somewhere else. Our individual spirits do not exist apart from the rest of us either; neurocognitive function is necessary for individual spiritual life. This view is consistent with biblical scholarship, (e.g., de Silva 1979), and it frees us, with Burhoe (1981), to understand the soul as whatever it is about us that is of long-range importance and that transcends the death of our bodies as individual, sapient centers of self-awareness.

History. Conventional dualist notions of the soul appear to be inconsistent with a number of theological views. In these views, the individual human soul (the Hebrew *nefesh* or the Aristotelian *psyche*) is

not easily distinguished from the mind, nor is it seen as separable from its embodiment. Biblically, there is no dichotomy in our nature, as there is in Platonic or Hindu thought (Barbour 1990). "The notion of the soul as an immortal entity which enters the body at birth and leaves it at death is quite foreign to the biblical view of man" [sic] (de Silva 1979, 75). As Adrian Thatcher (1987) has indicated, there is no theological reason for favoring dualism in a religious system in which creation, incarnation, resurrection, and ascension are central components. Pannenberg's (1982) survey reinforces this view and suggests that not only are the human spirit and the mind (*nous*) seen to be dependent and mortal, but they are equated, even by Augustine and Aquinas. While post-Hegelian philosophy may have reduced spirituality to the mind, Pannenberg argues that connotations of *nefesh*, as including both the self-transcendence and the indigence of living beings, are lost in conventional uses of *soul*.

Ian Barbour (1990) provides a biblical view of human nature that is consistent with contemporary sciences of the mind. According to this view, we are unitary persons with physical, mental, and spiritual *aspects*. Our *selves* are not separate entities, but one level in a hierarchy of systemic functioning, which includes responsible agency. Barbour also argues that the biblical view of human nature is fundamentally not an individualistic one. Our selves are constituted by our relationships, including our membership in a people capable of being bound in covenant. If Barbour is correct, then conventional dualism alienates us, not only from our natural, embodied, mortal existence, but from the social and communal world that constitutes the meaning of our individual lives, even as they pass away.

Multileveled Spirit.   Human spirituality is taken to reflect the hierarchy of biological functions out of which personhood is constructed. Dependent upon animal sentience, conscious mental life, and a capacity for reflective self-awareness, our spirituality consists in our efforts toward individual integrity, responsible agency, and ultimately self-sacrifice. Our spirituality is constituted by participation in a communal world within which our lives may have meanings beyond our individual mortality.

Any attempt to yoke religion and science cannot define the terms of one in ways incommensurate with the other. A relational and multileveled view is an alternative, not only to dualism, but to the reductive materialism that historically was invoked to replace it (Barbour 1990). The traditional difficulty of ascribing mental predicates to material objects (Wiggins 1987) may be like the difficulty of ascribing life to a rock. Life is not a separate nonmaterial entity but a type of organized activity, of matter in motion. So too is mentality an emergent form of

activity, of a particular type found only at higher levels of organic complexity. We can also view spirituality as a particular form of mental life. Predicating life upon a particular *form* of matter, mentality upon life, or spirituality upon mental life requires no evocation of a nonmaterial world. It requires only a material world with a particular organizational history.

Within a hierarchy of natural events, we can, with Pannenberg, "distinguish degrees of interiorization of spiritual dynamics" (1982, 155), from a stream and its currents to the vegetative and sensitive life of plants and animals, to intellectual life, and to human spirituality. Spiritual dynamics are not the dynamics *of* anything but matter, at varying levels of organization. The door is opened to view the "spirituality" of these dynamics just *as* their interiorization, interiorization that reaches its apogee to date in human mental life. The task that remains is to explicate the degrees of interiorization that constitute human spirituality.

REQUISITES OF SPIRITUALITY

What constitute the minima for a spiritually meaningful life is not a scientific decision. Nevertheless, the appreciation of nature's harmonies (or violent disharmonies), the awareness of some deeper connection with (or alienation from) God and the universe, and the experience of unity and integrity of self and spirit (or their dissolution) are likely to depend on rather sophisticated neurocognitive functioning. We will assume here that *human beings are spiritual beings to the extent that they can apprehend meanings and purposes extending beyond their individual lives*. Organisms without reflective apprehension of their condition, however centered and at peace they may appear to an observer, are beyond our purview here.

The basic thesis is that human spirituality is not separated from or opposed to biological and neurocognitive functions but generated by them. Just as the biological machinery of our brains is necessary for a mental life, so the symbolic language of our minds is necessary for spirituality. Brains are necessary constituents of both mind and spirit precisely because they enable us to generate symbolic realities not restricted to or instantiated entirely within the individual nervous system. Unity of self and integrity of spirit are not bestowed upon us *ab originam* but are end points that can be attained only within more systemic wholes of which our brains are parts.

LEVELS OF ANALYSIS.   A levels-of-analysis argument can articulate a brain/mind/spirit relationship that reduces the confusion between causal, functional, and compositional relationships. There is some consensus among neuroscientists and philosophers that one can retain a

thoroughgoing materialism without reductionism (Dennett 1991; Fodor and Pylyshyn 1988; Gardner 1985). If we can describe a fully material world at a number of different functional levels, then cognition and other higher-order events, while requiring description at a relatively high level of abstraction, are no less material for it (Churchland 1988). Similarly, spiritual experiences might be construed, not as *other* than material events, but as involving different levels of analysis, just as mental events are "tokened" in terms of physical substrates, including nervous systems. The relationship between events at different levels is not causal but compositional. Events at one level relate to those of another as parts to wholes. Brains are necessary for mind, and mind for spirit, as necessary parts nested within higher-order wholes.

There is a sense in which higher levels have "emergent" properties, but there is nothing magical or mystical about this (Simon 1962; Sperry 1988). Emergent properties are due to an organization of parts and not attributable to the individual parts themselves; nevertheless, such properties can be understood in terms of the properties of the components and the lawful characteristics of their interaction. The classic example is that of the fluid properties of water (H_2O); these are "emergent" properties but certainly depend heavily on properties of hydrogen and oxygen atoms and how they combine and interact under certain conditions of temperature and pressure. Similarly "making love" is emergent from two human beings interacting in certain ways under certain conditions and has properties that neither individual exhibits alone. The event is produced by them and understandable in terms of the interactions between subsystems locatable across the pair as well as within each individual.

One frequent source of misunderstanding (and, I suspect, a strong part of the objection to materialism more generally) is the belief that events at a "lower" level *cause* events at a "higher" level. In fact, the relationship between events at one level and events at another is not causal but *compositional*. Events at one level relate to those of another as parts to wholes. A bat striking a ball with the appropriate force and at the appropriate angle may *cause* the ball to fly out of the park over the center-field bleachers and *legitimates* the hitter running the bases. The whole set of events *constitutes* a home run. Causal analysis is still a valuable method of understanding an event in terms of nomologically law-governed interactions between the components of that event. But we also can understand an event in terms of its role or function in some higher-order structure of which it is a part. Any attempt to provide a complete account of human behavior or experience *must* provide synthetic as well as analytic understanding. "Is in love" or "believes in God" can be described in many ways—as patterns of existential values,

sociological categories, social interaction patterns, states of mind, combinations of hormonal levels and sensory input changes, or altered hypothalamic firing patterns and electrical instabilities in the temporal lobes. Each level of analysis may have some degree of validity, but none of them is really exhaustive.

The opposite kind of misunderstanding, and perhaps a more subtle and difficult one, is the misapprehension of causal language in discussions of "top-down causality." Such uses of higher levels to understand relationships at lower ones are healthy. Moreover, the attempt to reappropriate a richer, Aristotelian use of *causality* is to be applauded. However, since the conventional scientific use of *causality* is that of mechanical or efficient cause, its use to describe relationships between higher and lower levels of organization mystifies more than it clarifies. It is important to clarify what "top-down causality" is and what it is not.

Mental states, as dynamic, emergent properties of brain states, cannot exist apart from those brain states, any more than life can exist apart from cell structure or ice apart from water molecules. Such mental states have real effects, understandable in terms of efficient causality, on other events at their own macrolevel. But such proponents of top-down causality as Donald Campbell and Roger Sperry have wanted to argue further that "lower level laws become supervened by higher level controls of the subjective conscious self in which they are embedded" (Sperry 1993, 879). As much as we may frequently need a specification of higher-level events to understand the functional constraints on lower-level ones, we must not become mystical about "top-down causation." Sperry himself is clear that he is not introducing any supernatural power, that we live in an orderly universe, and that the "supervenience" of mental activity does not violate physiological operations but embeds them intact in a higher-level cognitive system.

Let us be clear that the causation in top-down causation is *not* efficient or mechanical, like the causal links between different events at the same level of organization. Top-down effects do not violate other causal influences and in fact are not the same as efficient causal forces, which frequently compete with and override each other. Top-down determinations of form do *not* operate via a transmission of energy, but via a flow of *information*. Actual efficient causal control, though its *form* be due to the higher-level event of which it is a part (by which it is *informed*), still operates via causal mechanisms at the same level. Higher-order influences may therefore be better thought of as formal or functional ones, rather than efficient or natural.

Top-down influences may in fact operate through a process of selection. Edelman's (1992) theory of neural group selection suggests that

consciousness is shaped as neural groups are selected and carved into increasingly complex mappings. Some neural processes are selected over others by the wider context of biological and social life in which they reside. If Edelman is correct, the relationship of higher to lower levels of organization might be better understood, not by understanding the relationship as "causality," or even as some sort of informational "instruction," but as the influence of the whole on the process of *selection*.

SENTIENCE.   Mental life is likely to be characteristic of a subset of living, sentient organisms. The evolutionary capacities which make neurocognitive life possible, viz., the development of a nervous system complex enough to provide unified sentience of the environment, also provide a first layer of constraints on our spirituality: our ability to experience pleasure and pain, and our ultimate obeisance to both natural selection and the law of effect.

Sentience represents a specialization within animate life and a first requisite to human spirituality. The logic of evolutionary change, of variation and selection, is interiorized, in sentience, from the life of the species, where change is produced through reproductive viability, to the life of the organism. Creatures capable of experiencing pleasure and pain and modifying relevant behavior accordingly (the law of effect), will be more likely to survive and reproduce across ecologies that change within the lifetime of an organism. However, there is vulnerability in a less automatic and therefore slower subset of behavior, and in the capacity for pain made possible by a central nervous system.

Ultimately our capacity for mental and spiritual life is built on the sentience we share with many other animals, along with a limbic system that forms the substrate of our emotional life and the circuitry necessary to bring sensed elements together into integrated scenes. Sensation is linked with movement in the kind of reflex and conditionable patterns we associate with simple forms of learning. But when combined with emotion and with more complex forms of planned action, the links between sensation and movement themselves become objects of higher-order mappings, reintegrated to form symbolic categories.

CONSCIOUS MENTAL LIFE.   Cognition and conscious mental life, which have a greater degree of interiorization than sentience, are produced in a subset of sentient creatures whose anticipation of pleasure and pain enables them flexibly to seek one and avoid the other. A consistency of purpose in the face of changing contingencies, a capacity to anticipate pleasure and avoid pain, and an emerging power to simulate potential courses of action and to re-present chains of previous actions and their consequences confer sentient and reproductive advantage.

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 (Dennett 1978; Edelman 1992; Flanagan 1984). Conscious mental life is *constituted* by this representational content as whole from parts rather than as effect from causes. Therefore, to the extent that mental life is conscious, and perhaps even to some extent when it is not, it functions to *represent* past, present, and future situations, enabling us to remember previous events, to plan, to map out means and pursue them to ends, to consider alternatives and to choose among them. To *also* function via such representations provides an adaptational advantage over those for whom the law of effect operates more directly. We do not need to experience physical pleasure or pain directly in order to modify our behavior. Instead, we can anticipate consequences, sometimes at great temporal distances, and direct our behavior accordingly (Dennett 1978). Representational categorizing and recategorizing also make it possible to abstract knowledge from multiple events and generalize to new situations. It is this *intentionality* of our conscious mental life that allows us to have any comprehension of what is *outside* us, to direct ourselves beyond immediate experiences, and to entertain alternative courses of action.

Any kind of spirituality, and finally integrity and wisdom, are likely to require some understanding of *noninstrumental ends* (cf. Browning 1973, 1987). As with any kind of progressive or developmental change (Kaplan 1967), so with spirituality: it needs some kind of telos, even one as common as companionship, friendship, or beauty. Such ends are always *beyond* the self. Our ideals both separate us from ourselves and direct us beyond ourselves; they frequently require us to treat the impossible as if it were possible, but they are all that we can ever have with which to transcend ourselves. Being spiritual seems to require us to *address* that which is beyond us—to manifest that urge to self-transcendence that is the core of faith for Paul Tillich (1957), and others like him. As Karl Rahner (1978) argued, the mind's desire to know drives us beyond every limited object toward the absolute.

We have seen that consciousness, or cognition, represents another requisite for human spirituality, another level in the hierarchy of unified organic function that makes human spirituality possible. To recognize such interiorized dynamics, however complex in their manifestation or time-delayed in their effects, does not require us to understand agency in noncausal terms but only to recognize the internal processes that play a role in more complex causal sequences. Since intentional, representational abilities are contingent upon having a relatively intact brain with a certain complexity of functional architecture,

spirituality is also *enabled* by the biology of a system capable of con-
scious mental life. But the neuropsychological advantages which make
human spirituality possible also limit it. Representations select and
highlight, sample and abbreviate the world of sentient experience. They
invariably include biases and distortions in the interest of the organism.
They inevitably risk alienation from the particulars of our own lives,
from a community of other people, and from any larger purposes.
Finally, representations are always constructions, necessarily going be-
yond the information given and always running the risk of fabrication
and deception.

SELF-KNOWLEDGE.   If human spirituality requires a capacity to
address that which is beyond us, then not only must we be symbolizing,
conscious beings, but we must exhibit self-awareness with enough fre-
quency to worry about our limits, and our place in the universe. Any
system with the capacity to represent may represent itself. Indeed, how-
ever limited the self-knowledge required for self-modification or self-
transformation may be, any possibility of self-transcendence rests on
this. The capacity to represent ourselves is necessarily limited by our
egocentric needs, the recognition of which may be important to our
spiritual lives. Our goals and ideals are continually recast as we learn
and develop, and so they recede from us infinitely, the dimensions of
our failures becoming more apparent as we step through each barrier to
self-knowledge. Since the very nature of representing involves selecting,
transforming, augmenting, and distorting, self-knowledge is inevitably
incomplete. It will involve the multiplicity of mappings required for
constructing representations, and risk active self-deception over and
above mere self-bias. But self-criticism, self-acceptance, and self-transcen-
dence also become possible. Finally, since representation partitions and
discriminates, it makes fragmentation and dissolution possible. Never-
theless, self-knowledge provides a possibility for unification through the
reflective construction and symbolization of our own integrity—an in-
tegrity not original to us but an end toward which we strive.

If we can represent the world, and act in it, we also can learn to
include our own actions, and some gradually stabilized representation
of ourselves, as another degree of interiorization. Our symbolization of
ourselves rests upon our *awareness* of our agency and its place in the
world. On the level of this second-order consciousness, this awareness of
self, we can become moral and responsible beings, socialized by culture,
internalizing our social interdependence. As Harre (1987) and Gillett
(1994) indicate, the self is not an interior entity but an intersubjective
mode of being, a product of learning to speak and think of self in ways
emerging from our encounters with other living, thinking beings. Self-

consciousness is therefore a product of our biology, of our mentality, and of our capacity to take the mentalities of other beings into account as objects of reciprocity (Wiggins 1987). It may be on the level of our agency that we can entertain alternative courses of action, but we require a second-order understanding of the role of that agency in a world of other agents to entertain moral arguments.

Our self-consciousness, and the self-knowledge it makes possible, grant us powers beyond the merely cognitive. They also make possible the awareness of our most tragic limitations. According to Don Browning (1987), even for Augustine, the image of God in man is not rationality but the capacity for self-knowledge and introspection, the capacity for self-transcendence. The self-transcendence is rooted, grounded, conditional, and contingent, limited by the rhythms and patterns of nature. The very symbolic powers that constitute self-consciousness make possible the existence of needs beyond food, rest, shelter, and sex, and make us "capable of happinesses and miseries quite unknown to other creatures, thereby evidencing a dis-ease with our evolved state, a lack of fit which calls for explanation and, if possible, cure" (Peacocke 1990, 76). Not only is self-consciousness the stage for human dramas of pain and suffering—reminders of our bondage to nature—but it increasingly is colored by awareness of our finitude: the inevitable mortal demise of our individual intents, the continuities of our memory, and possibilities for self-shaping. Among the distortions inevitable to any representations will be a self-deception motivated by our desire to avoid the painful realities of our mortal dependency on nature.

Limits to self-knowledge may be the rule rather than the exception. Our underprivileged access to the wellsprings of our own motivation is a major theme of an introspective tradition traceable from Augustine's *Confessions* through Schopenhauer and Nietzsche to Freudian psychology. As a number of contemporary cognitive researchers have suggested (cf. Dennett 1978; Erdelyi 1985; Kihlstrom 1987; Lewicki 1986; Marcel 1983; Nisbett and Wilson 1977; Uleman and Bargh 1989), the unconscious may be less a seething cauldron of repressed impulses than a requirement of a *limited capacity system* (cf. Simon 1947). In such systems, that which becomes conscious is restricted to avoid overloading the system with irrelevant information, including and in particular aspects of the system itself.

To borrow a metaphor from Daniel Dennett (Miller 1983), the conscious self is more like the public relations office than the boss. Information only gets passed on a "need to know" basis (or even, and with even greater risks of self-deception, on a "want to know" basis), invariably summarized, modified, or even distorted to meet purposes other than merely communicative. Psychologists repeatedly uncover similar

egocentric biases: better memory for self-relevant information, taking responsibility for success and externalizing blame for failure, thinking that others are more like us than they are, biasing our judgments in favor of our beliefs, and believing we have more control than we do (Greenwald 1980; Taylor and Brown 1988). Moreover, despite their obvious role in the generation of pathology and social conflict, such self-biases may be an important component of psychological health, self-confidence, and persistence in the face of adversity (Dweck and Leggett 1988; Taylor and Brown 1988). Finally, despite the risks of "mindlessness" (cf. Langer 1978, 1989), much of our neurocognitive functioning must become automatic, even if not initially so, to free our ponderous consciousness for creativity, exploration, and mastering the new tasks that are inevitable in a changing environment. One can play with symbols while driving to work only if the driving itself requires little conscious monitoring.

What we then say about ourselves, in the construction of a public persona or in the formation of our private beliefs, can be a product of only a limited portion of our working minds. Our beliefs about the unity of conscious life, about our coherence and stability across time and place, also may be due to limited and egocentrically biased representations. A generation of research in social psychology suggests that these representations, including our beliefs about ourselves, may be extremely malleable (Greenwald 1980; Markus and Wurf 1987; Taylor 1989; Taylor and Brown 1988). Moreover, the greatest biases seem to be in the direction of consistency, whether understood in terms of cognitive dissonance, self-perception (Bem 1967; Fazio et al. 1977), or a more global self-affirmation process (Steele 1988). Personhood itself may be constituted by cultural rules for the attribution of reason, intent, and autonomy (Shotter 1984, 1985, 1989), and we may recast ourselves far more frequently than our beliefs about our own continuity would lead us to think (Shotter and Gergen 1989). Whatever dimensions ultimately constitute our sense of integrity, they are likely to be constrained by a property of our neurocognitive individuation called *modularity*.

THE INTEGRITY PROBLEM.   The integrity problem provides the centerpiece of the argument that the very neuropsychology that makes spiritual life possible provides the limits which we as individuals cannot transcend. The pursuit of integrity is both important to psychological health and required for the higher manifestations of spirituality. Nevertheless, although this pursuit is supported by and dependent on an intact neuropsychology complex enough for conscious mental life and a modicum of self-knowledge, it is not entailed by it. We will argue that the modularity of mind, while making possible the complexity requisite

for specialization and differentiation of neurocognitive function, and being necessary for its stability, also makes likely a set of risks and biases over and above the self-knowledge limitations discussed above. Indeed, such risks include fragmentation, disunity, incoherence, and self-delusion to the point of severe failures of integrity or, in the extreme, dissolution of meaningful living. We will show that a number of characteristics of neurocognitive life are traceable to modular structure and, drawing on evidence from hemispheric specialization, brain dysfunction, and even ordinary memory, will show that unity and integrity of self or mind are achieved, not given. In a final, more speculative section, we will explore some of the possible routes to integrity and will suggest that the integrity of self and therefore of spirit are constituted by larger systems of which individual selves and spirits are parts.

The problem of psychological and spiritual integrity can be articulated in terms of the "modularity" currently believed to be a central neuropsychological property (Fodor 1983; Gardner 1983; Gazzaniga 1985). The basic point is that the unity of mind has been overstated: our neurocognitive system operates more like a system of separate committees whose workings are domain specific and largely nontransferable. The maintenance of any complex architecture may require separate, autonomous, encapsulated subsystems, which can be selectively damaged (Simon 1962). For example, there is neurological and behavioral evidence that there is a module whose only function is the acquisition and processing of linguistic structure; it learns quickly and reaches a steady state with little relationship to other skills or intelligence (Fodor 1983).

There has been some controversy about the precise candidates for modularity, about their physical localization, and about their level of abstraction (Marshall 1984). Given evidence from cross-modal memory (Meltzoff and Borton 1979) and from selective damage (Gardner 1983; Martindale 1981), it appears that modularity is not limited to sensory systems but must include, at minimum, input systems at the level of linguistic structure (Fodor 1983). Other clear candidates for modularity include the perception of color, shape, and three-dimensional space; visual guidance; the recognition of faces; the perception of facial expression; the reading of printed words; the manipulation of numbers; handwriting; the perception of limb positions, melodies, large manipulable objects, and small manipulable objects (Kolb and Whishaw 1990; Fodor 1983; Martindale 1981). Gardner's theory of multiple intelligences (1983) suggests that there may be modularity at an even higher level of broad symbolic domains, including spatial and logico-mathematical skills as well as linguistic ability. Even presuming the "centrality" of systems involved in remembering, there is a wide range of evidence for some level of dissociation, even without pathology.

Our experiences of consciousness similarly do not appear to have any *necessary* unity, particularly given their dependence on memory (cf. Edelman 1989, 1992), and may involve disunity even in principle. The late Norman Geschwind (Miller 1983) argued that the normal *nonunity* may be what produces the very character of human reflective consciousness. We all seem to be *most* conscious when we feel tendencies pulling in different directions, when we are making complicated decisions. While our control of conflicting tendencies may be reasonably good under normal circumstances, it is never perfect and can break down under stresses far less severe than brain damage. Indeed, Geschwind suggested that learning such control is what *socialization* is all about; its level of success varies widely, along with the looseness of the resulting federation of brain functions. Consciousness itself may actually depend on multiple mechanisms performing a variety of self-monitoring tasks, some of which may depend on acquired skills as much as on neural architecture (Churchland 1988).

It is clear that some semblance of human living can be maintained even under severe damage to the biological integrity of higher neurocognitive functioning (cf. Sacks 1985). What is less clear is the degree to which a fairly high level of dissociation between modules, intelligences, or even conscious subselves might be "good enough" for the higher neurocognitive functioning we normatively associate with the mental and spiritual lives of human beings in this era. We must exhibit some caution here. That the mind can be understood in terms of modules that normally (and evolutionarily) work together may imply nothing about consciousness and the integrity of self, only that modularity would also *permit* degress of dissociation. Indeed, under normal circumstances, modular specialization does not mean independence of function, but the opposite: integration of functions is what makes specialization possible. But *dissociations of awareness* (of memory, of internal access of each part to the other) *do* have implications for consciousness and the integrity of self, particularly since there is likely to be some level of dissociation even in the least pathological of undamaged brains. Evidence for dissociative phenomena, actual and potential, can be found in three areas: research on hemispheric specialization, clinical data on brain dysfunction, and research on normal memory.

Hemispheric Specialization. The classic research on hemispheric specialization in "split-brain" patients was carried out by the late Roger Sperry and his associates over the last twenty-five to thirty years (Gazzaniga 1985). These patients had the tissues connecting the hemispheres cut to control epilepsy. Although they behaved relatively normally, they were found to have some interesting difficulties when input was restricted to one hemisphere or the other. One of the most compelling

findings was the localization of linguistic specializations in the left hemisphere. For example, if one presented a small object to the left hemisphere (by rapid presentation to the right visual field), the patient could easily name it and pick it up with the hand controlled by that hemisphere (the right hand). However, if a similar object was presented to the right hemisphere, the patient could pick it up with the left hand but would be unable to name it. Left-brain areas responsible for linguistic response were not getting the information. Although patients showed signs of unease with continued testing, they did not appear *conscious* of information unavailable to the left hemisphere.

The research on hemispheric specialization has been extended beyond the split-brain patients by the sophisticated use of differential reaction-time measures, complex stimuli, and competing-response tasks, administered both to cortically intact and to brain-damaged individuals (Geschwind and Galaburda 1987; Springer and Deutsch 1985). As research documented specializations in each hemisphere (Allen 1983; Hellige 1990), global dichotomies like sequential versus simultaneous, logical versus intuitive, or analytic versus synthetic were used to summarize them (Martindale 1981). Although the excesses of popular mythology have been successfully debunked (Bradshaw and Nettleton 1981; Levy 1985), speculative extensions of this literature have appeared in a number of fields, including the theological work of James Ashbrook (1984, 1989).

While we may be able to understand the brain as a set of relatively modularized, functional subsystems, it is clear that we do not yet understand its overall organization. Indeed, it is unlikely to map neatly, if at all, onto global dimensions of conscious experience, like "language." Left-hemisphere mechanisms may understand syntax, translate print to the inner ear, and derive complex relations from linguistic representations, but the right hemisphere can recognize words and match rhymes and is needed for processing visual references and for comprehending metaphor, emotional content, meaningful past associations, and even overall narrative structure (Gardner et al. 1983). Most other global functions are equivalently decomposable into distributed networks (Blakemore and Greenfield 1987; LeDoux and Hirst 1986; Van Lacker 1991).

Findings of localization of function invariably raise the question of control. As in other systems, such as well-functioning basketball teams, there need not be a central control; the player with the best outside corner shot tends, by the coordinated actions of individual team members (that player included), to end up taking more of the outside corner shots (cf. Geschwind and Galaburda 1987). Similarly, left-hemisphere word recognition functions tend to inhibit those on the right

(Gazzaniga 1977; Kimura 1973). If you simultaneously display "TAR" to the right hemisphere and "GET" to the left, subjects point to "GET" with either hand. It appears that left-hemisphere modules dominate in this kind of conflict about language. For the recognition of nonlinguistic material, the right hemisphere contains the dominant modules (Levy and Trevarthen 1976; Levy, Trevarthen, and Sperry 1972). If you show a composite slide such that a woman with sunglasses is presented to the right hemisphere and a child to the left, subjects will subsequently *point* to a picture of the woman with sunglasses *with either hand,* although they will *say* they saw a child. Reaction time research reports similar variations in dominance for normal subjects (Hellige 1990). Given task-dependent shifts between modules "in charge," it appears that our brains neither produce our behavior nor shape our experience in anything like a unitary way (Allen 1983; Hellige 1990; Kolb and Whishaw 1990; Springer and Deutsch 1985).

Brain Dysfunction.   Our folk psychology includes assumptions about the seamless unity of many events, experiential, mental, and behavioral, that are neurocognitively decomposable in ways that defy common sense. Anterograde amnesiacs, with hippocampal damage, can learn a new skill but face its components each day anew, unknowingly (Cohen and Corkin 1981; Sacks 1985). While there is some controversy about the "fractionation" of memory systems in neuropsychological research (Sallice 1979), it appears the philosophical distinction between "knowing how" and "knowing that" may have neuropsychological basis (Cohen 1984; Cohen and Squire 1980; Squire 1982) in the distinction between "declarative" and "procedural" memory (Tulving 1985).

Other examples of the slippage between neurocognitive and experiential categories abound. Patients suffering hemineglect ignore and even deny ownership of one side of their bodies (Luria 1972). Alexic agnostics can write lucid prose but not read it (Alajouanine, Chermitte, and Ribacourt-Ducarne 1960; Geschwind 1965; Goodglass and Kaplan 1972). Facial agnosics cannot identify familiar faces but can read the faces' emotions (Cole and Perez-Cruet 1964; Damasio 1989). Alexithymics have the opposite problem (Kolb and Taylor 1988; Nemiah and Sifneos 1970). "Blindsighted" patients deny visual experience but can make visual discriminations (Weiskrantz 1986), and patients who actually are blind may provide other excuses for their visual errors (Kinsbourne 1980).

There also appear to be neurocognitive connections between certain sets of events viewed as incommensurate within our particular ethnopsychology. Tourette's syndrome is probably the classic example (Kolb and Whishaw 1990). My favorite example, related to temporal lobe epilepsy, has been called Geschwind's syndrome, though it might as easily be

called Saint Paul's. It can include a deepening of religious conviction, hypergraphia, altered sexual interest, hypermoralism, and ascription of divine guidance (Bear and Fedio 1977; Geschwind 1977).

Normal Memory.   One does not need to turn to the literature on the brain damaged to find more common, everyday varieties of dissociation. These include false feeling of recognition like déjà vu (Alcock 1981) and other varieties of reconstruction in memory (Loftus 1979; Neisser 1981). They also include a wide range of "encoding specificity" effects (Tulving and Thompson 1973) including context-dependent and state-dependent memory (Bower 1981; Godden and Baddeley 1975), best illustrated by intoxication-related memories difficult to retrieve during sobriety. What we can remember at one time and in one set of circumstances, including what we remember about ourselves, may differ both in kind and degree from what we remember at another time and in another set of circumstances. Moreover, these relatively minor dissociations may fall on a continuum with more serious varieties, like multiple personality disorder; neither variety seems to entail specific neurocognitive dysfunction (Putnam 1989).

RECAPITULATION.   The upshot of work in the cognitive and neurosciences over the last generation is that the neurocognitive system is not a unified, all-purpose intelligence but a modular one. There is little true *introspective* access to much of this functioning, nor would we really want there to be (Dennett 1978; Nisbett and Wilson 1977; Teske and Pea 1981). Consciousness itself, particularly self-consciousness, might then best be construed as a kind of endpoint: it has a limited causal role, and its power to unify our functioning is likely to be indirect. Finally, our neurocognitive system is rife with disconnections, actual as well as potential, of which our awareness is limited.

The level of spirituality beyond mere self-consciousness, with all its risks of fragmentation, dissociation, and self-deception, is that lifelong struggle for integrity so well articulated in the work of Erik Erikson (Browning 1987). Ware (1987) suggests that this drawing of different levels to unity is a central human vocation, thematic in Hasidic Jewish writers as well as the Greek patriarchs. It is what Eliade describes as the universal urge to find a sacred center, an origin, a destiny. The absence of a unity of meaning leaves us "living on scraps" (Browning 1987). If we fail to own a core psychological centeredness, our souls seem lost (Burhoe 1981).

DIRECTIONS.   From whence then comes our sense of unity, of integrity; how is it all fit together and comprehended? Three initial directions, neither mutually exclusive nor exhaustive, can be sketched.

The first is the *integrity of belief,* the assertion that our sense of unity and integrity is due to neurocognitive capacities for the generation of beliefs, narratives, or other symbolic accounts. The second is the *integrity of emotion,* the suggestion that our sense of unity and integrity is prior to and deeper than our cognitive capacities, and might be due to some functions below the level of conscious belief or intentionality. The third is the *integrity of relation,* which has to do with the possibility that the self as a neurocognitively and neuroemotionally constituted unit may be incomplete, insufficient for integrating our splintered and fragmented functioning, without a place, a role, a position (cf. Davies and Harre 1990) in some larger system or community.

Integrity of Belief.   Gazzaniga (1985) proposes that *belief*—that there is a God, that the ACLU does good work, and so forth—produces our sense of unified agency. He argues that the center of our self-conscious lives is "the interpreter"—a left-hemisphere, language-related capacity, that generates beliefs to account for behavior produced independently by other modules. An example is that split-brain patients' left-hemisphere language modules generate reasonable but incorrect hypotheses to explain behavior produced by the "nonlinguistic" hemisphere. A snow scene is presented to the right hemisphere, a chicken claw to the left. The subsequent selection of a snow shovel by the left hand and a chicken by the right is explained by the need for a shovel to clean up after a chicken (Gazzaniga 1984; Gazzaniga and LeDoux 1978). Thus, anxiety produced by continued inconsistencies results in new interpretations as this rationalizing ego, this embattled conscious "self," perseveres in the maintenance of security. Gazzaniga's proposal is consistent both with the automaticity and intrusiveness of linguistic functions (cf. Glass and Holyoak 1986; Neisser 1976) and the ease with which our beliefs are revised and reconstructed.

The possibility that integrity is constructed from belief has led thinkers like Daniel Dennett (1991) to a view that the ego-self is a sort of linguistic "fiction" generated by the brain to provide coherence only in retrospect. If the self is, indeed, a kind of fiction, then it makes sense to suggest, as have Francisco Varela, Evan Thompson, and Eleanor Rosch (1991), and Brian Lancaster (1993), that pursuit of a Buddhist *annata,* the annihilation of the illusion of self, is the spiritual avenue most convergent with neuropsychology. Nevertheless, unless one argues that all symbolic constructions are illusory, it is also reasonable to suggest (although I will not develop this argument in detail here) that the self, while constituted by language (and therefore in some sense "invented"), is not less real for so being.

However, a generation-interpretation account of integrity leaves us with the "problem of confabulation." We all can and do confabulate

stories about our lives and, maybe too frequently, believe them, shifting fluently but unaware among different interpretations. This operation is overseen by the left-hemisphere interpreter. Its work, however, is not the whole story. There is evidence that structures in the *right* hemisphere enable us to make judgments about the coherence, verisimilitude, and plausibility of our narratives (Gardner et al. 1983). Patients with right-hemisphere damage and no obvious linguistic difficulty show deeper failures of comprehension: failures to understand context, presupposition, tone, and point; impaired memory for events and their sequencing; impaired understanding of connotations or figures of speech; inability to paraphrase or draw morals; inability to detect bizarre or inconsistent story elements; and failure to make appropriate emotional attributions. Without such judgments, our intellectualization runs rampant, insufficiently connected to our deeper emotional lives, and our "interpreter" may dissolve into incoherence. While the right hemisphere mediates such judgments, and the coherence they enable, the framework it builds is likely to depend heavily on the cultural environment in which the developing neurocognitive system is embedded.

Integrity of Emotion. Whether integrity is defined in terms of ego boundaries or in terms of socially defined roles and responsibilities, any answer to the question of integrity must inevitably address issues of value. Many of the mechanisms responsible for behavior, including valuational processes, may be subdoxastic (below the level of conscious belief or intentionality) (Lewicki 1986; Stich 1978). For example, the role of the limbic system in providing emotional loading to cognitive categories has been the focus of much contemporary research (e.g., Armstrong 1991; Fox 1986). The importance of the hippocampus to memory is well established (Edelman 1992; Gazzaniga 1984; Kolb and Whishaw 1990). Moreover, it is likely that such subcortical structures as the limbic system are of necessity involved in the evolution of cognition per se (Benzon and Hays 1990).

Thus we see that subcortical functions are necessary, and perhaps even foundational, to human integrity. While they are likely to be constrained by evolutionary biology, they also are heavily canalized by social experience. Early social embedding is a sine qua non of the development of higher functions such as language and meaning (Pinker 1994; Vygotsky 1978; Wertsch 1979); it also shapes our subdoxastic, subcortically mediated emotional life and perhaps even our neuroimmunology. Basic human attachments form the foundation of our emotional lives, and affect complexes are probably constructed over decades of biographical development (Tomkins 1979). To the extent that this emotional substrate is fundamental to a spiritual "cry for the other" (Ashbrook 1994), it may be a product of deeply rooted social interdependency.

Integrity of Relation.   It is possible that integrity will be better understood by defining it in terms of appropriate relationships between self and community rather than in terms of either neuropsychological interiors or emotional boundaries between self and other. The neuropsychological system is tuned for social intercourse, genetically predisposed to a lengthy socialization, and continuously dependent on its embedding within a larger social system. We must also acknowledge forces outside the individual nervous system that shape it, bind it, and give it definition.

The symbols, linguistic and otherwise, that we use for making sense out of the world, for segmenting it, addressing it, objectifying it, and operating on it, are fundamentally social (Mead 1934; Wittgenstein 1953). Our very selves, our reflexive awareness, and our integrity are not self-contained but constituted by a symbolic and communal world. Our spirituality and our efforts toward individual integrity, responsible agency, and even self-sacrifice are constituted by and enable participation in a transindividual world in which the meaning of each life may extend beyond its biological demise. Language also enables us to step away from egocentricity and transcend ourselves in our constructive relations with others. Through the recognition of each other's failures of integrity, deceptions of self, and disunities of mind, we find an integrity that, like falling in love, cannot exist within persons but becomes possible only between them.

A relational answer to the question of integrity clarifies the insufficiency of neuropsychology. The self as a neurocognitively constituted unit may be incomplete without a place, a role, a position in some larger system of social relationships. Since Freud, we have understood that rationality is a tenuous achievement. The unity and coherence of complex selves also seems to be *achieved*, not given. So too, we may need to see spirituality, not as inborn, but as developed, attained, or even socially constructed. There need be no neurocognitive "central control." The control of this process is likely to be distributed beyond the neuropsychology of the individual, as systems theory might argue, and depend on attunement to the communal life in which we are embedded from conception. Whereas individual ego-consciousness may be defined by its boundedness from others, a broader, fuller, more whole self may not be so bounded. Indeed, the spiritual lives of individuals may require the repair of our social covenant (cf. Barbour 1990). The healing of our individual separation, fragmentation, and destruction is incomplete and bound for failure without attention to the separation, fragmentation, and destruction of our communities, not only because the latter influence the former, but because in many ways our communities constitute our selves. Our wholeness and spiritual integrity need, not only the

recognition of individual limits and dysfunctions, but the healing power of communion with others.

NEUROCOGNITIVE LIMITS AND THE COMMUNITY OF SPIRIT. At this level of spirituality, that of integrity, we begin to step beyond the boundaries of cognition and neuroscience, perhaps beyond psychology entirely. It is true that a certain amount of self-affirmation is required for the cohesion necessary for initiative and decision making (Browning 1987; Taylor 1989). The self also must exercise an active, narrative role, reflecting upon experience as less personal and more universal (Laughlin, McManus, and d'Aquili 1990). Nevertheless, the unity imposed by subjects in their conscious living is, as the Jungian Anthony Storr puts it (1987), part of a process of individuation. In its denial of the claims of the ego and its acknowledgment of guiding and integrating factors not of its making, this process is ultimately religious. The spiritual limits of neurocognitive life are nowhere more apparent than at the boundaries of self, when we see that the very integrity of self is dependent upon a community of selves in which it resides.

The intelligent self can deliberate, choose its beliefs, and defend its conduct with reasons. It has gained much autonomy over causal stimuli, although it continues creatively to respond to opportunities and threats presented in the environment. When, in addition to defending self, this response respects integrities outside itself, we become moral and loving. Mature persons are not only well-integrated in their self defense, but are well-integrated into the community in which they live. (Rolston 1987, 188)

For Pannenberg (1982) as well, human community provides the most obvious examples of processes of spiritual interpretation which transcend the life of the individual. For Pannenberg, as for Browning (1987), the evil we fight is the inordinate self-concern that, fueled by existential anxiety, prevents self-transcendence. For Burhoe, our souls are lost in our failure to integrate private and social purpose, and he provides a pragmatic grounding for mythic and religious constructions: "Societies will not function without a culture that informs and motivates its members to purposes extending beyond the interests and lifetime of its individuals" (1981, 118). Spiritual integrity is produced by the interiorization of such purposes and makes it possible to live life beyond oneself and to participate in a world of meaning that transcends individual mortality.

SPIRITUALITY AND SACRIFICE. 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, until this part needs to be expended for the benefit of the larger whole. This is not a vitiation of the self but its transformation, its *kenosis*. This brings us to the last requirement of spirituality, the surrender of self to broader communities. Finally the only existential answer to the problem of our individual finitude and death is in our generative contributions, and our sacrifices, to realities that live beyond us. The final level of spirituality involves participation in a transindividual world, transformation by it, and even sacrifice to it. This is the deepest degree of interiorization, the interiorization of what is *not* just the limited self of our mortal organism, but of identifying with something other than self and becoming it.

Many religions include ideas of self-denial, of self-sacrifice, or of the self as an illusion to be transcended. We need not value the obliteration or destruction of individual selves but only understand their value to be greatest in terms of larger social wholes. Macquarrie (1987) argues that it is a distortion of the biblical perspective to focus on individual beings rather than social beings; and Barbour (1990) would have us replace Neoplatonic dualisms with a biblical vision of the whole person in community. Rolston argues that all religions place the self in a larger environment, see the self as but a wave in a sea of forces transcending individuality. "[Humans] bear the divine likeness ultimately in self-sacrifice, in dying to self and rising to newness of life in God, in self-transcendent agape love. . . . Self-denial, not self-actualizing, propels us toward self-transcendence, toward God" (Rolston 1987, 194). But doesn't even self-denial involve too great a concern with self? It is not vitiation of the self but *kenosis* which is the goal: to empty the self into a larger vessel, to surrender the very sacredness of self that is maintained by fantasies of individual immortality. What is involved is a sacrifice of the boundaries that once defined self, not to lose oneself but to gain the world beyond.

As we begin to better understand our spirituality, and the universe as a whole, as a complex, hierarchically ordered system, we can better understand that the meaning and purpose of any entity or event can always be better understood by considering its function in a larger system. For finite beings, bounded in space and time, the realization of that meaning, the accomplishment of that purpose, will entail various forms of sacrifice: material, biological, evolutionary, cultural, and social. When we understand human life in terms of units beyond but inclusive of the individual, we understand life's purpose better. 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. Stepping beyond oneself is the only way self can have meaning: by giving oneself to something greater, by giving oneself back.

NOTE

REFERENCES

Allen, Max. 1983. "Models of Hemispheric Specialization." *Psychological Bulletin* 93 : 73–104.
Armstrong, Este. 1991. "The Limbic System and Culture." *Human Nature* 2(2) : 117–36.
Ashbrook, James B. 1984. "Neurotheology: The Working Brain and the Work of Theology." *Zygon: Journal of Religion and Science* 19 (September): 331–50.
_____. 1989. "The Whole Brain as the Basis for the Analogical Expression of God." *Zygon: Journal of Religion and Science* 24 (March): 65–81.
_____. 1994. "The Cry for the Other: The Biocultural Womb of Human Development." *Zygon: Journal of Religion and Science* 29 (September): 297–314.
Alajouanine, T., F. Chermitte, and B. de Ribaucourt-Ducarne. 1960. "Les alexies agnosiques et aphasiques." In *Les grands activités du lobe occipital* by T. Alajouanine. Paris: Massons.
Alcock, J.E. 1981. *Parapsychology: Science of Magic ?* Oxford: Pergamon.
Barbour, Ian. 1990. *Religion in an Age of Science: The Gifford Lectures 1989-1991, Vol. One.* San Francisco: Harper and Row.
Bear, D. M., and P. Fedio. 1977. "Quantitative Analysis of Interictal Behavior in Temporal Lobe Epilepsy." *Archives of Neurology* 34 : 454–67.
Bem, Darryl J. 1967. "Self-Perception: An Alternative Interpretation of Cognitive Dissonance Phenomena." *Psychological Review* 74 : 183–200.
Benzon, William L., and David G. Hays. 1990. "The Evolution of Cognition." *Journal of Social and Biological Structures* 13, no. 4:297-320.
Blakemore, Colin, and Susan Greenfield, eds. 1987. *Mindwaves: Thoughts on Intelligence, Identity and Consciousness.* New York: Basil Blackwell.
Bower, Gordon H. 1981. "Mood and Memory." *American Psychologist* 36 : 129–48.
Bradshaw, J. L., and N. C. Nettleton. 1981. "The Nature of Hemispheric Specialization in Man." *The Behavioral and Brain Sciences.* 4 : 51–91.
Browning, Don S. 1973. *Generative Man.* Philadelphia: Westminster Press.
_____. 1987. *Religious Thought and the Modern Psychologies.* Philadelphia: Fortress Press.
Burhoe, Ralph W. 1981. *Toward a Scientific Theology.* Belfast: Christian Journals Ltd.
Churchland, Paul M. 1988. *Matter and Consciousness.* Rev. ed. Cambridge: MIT Press.
Cohen, Neal J. 1984. "Preserved Learning Capacity in Amnesia: Evidence for Multiple Memory Systems." In *Neuropsychology of Memory,* ed. Larry Squire and Nelson Butters, 83–103. New York: Guilford Press.
Cohen, Neal J., and S. Corkin. 1981. "The Amnesiac Patient H. M.: Learning and Retention of a Cognitive Skill." *Neuroscience Abstracts* 7 : 517–18.
Cohen, Neal J., and Larry R. Squire. 1980. "Preserved Learning and Retention of Pattern Analyzing Skill in Amnesia: Dissociation of Knowing How and Knowing That." *Science* 210 : 207–10.
Cole, M., and J. Perez-Cruet. 1964. "Prosopagnosia." *Neuropsychologia* 2 : 237–46.
Damasio, A. R. 1989. "Mechanisms of Face Recognition." In *Handbook of Research on Face Processing,* ed. A. W. Young and H. D. Ellis. New York: Elsevier.
Davies, Bronwyn, and Rom Harre. 1990. "Positioning: The Discursive Production of Selves." *Journal for the Theory of Social Behavior* 20 : 43–63.
Dennett, Daniel C. 1978. *Brainstorms: Philosophical Essays on Mind and Psychology.* Montgomery, Vt.: Bradford Books.
_____. 1991. *Consciousness Explained.* Boston: Little, Brown.
De Silva, Lynn. 1979. *The Problem of Self in Buddhism and Christianity.* London: Macmillan.
Dweck, Carol S., and Ellen Leggett. 1988. "A Social-Cognitive Approach to Motivation and Personality." *Psychological Review* 95 : 256–73.
Edelman, Gerald M. 1989. *The Remembered Present: A Biological Theory of Consciousness.* New York: Basic Books.
_____. 1992. *Bright Air, Brilliant Fire: On the Matter of Mind.* New York: Basic Books.

Edelman, Gerald M., and V. B. Mountcastle. 1978.   *The Mindful Brain*. Cambridge: MIT Press.
Erdelyi, Matthew H. 1985.   *Psychoanalysis: Freud's Cognitive Psychology*. New York: W. H. Freeman.
Fazio, Russell H., Mark P. Zanna, and Joel Cooper. 1977.   "Dissonance and Self-Perception: An Integrative View of Each Theory's Proper Domain of Application." *Journal of Experimental Social Psychology* 13 : 464-79.
Flanagan, Owen J., Jr. 1984.   *The Science of the Mind*. Cambridge: MIT Press.
Fodor, Jerry A. 1983.   *The Modularity of Mind*. Cambridge: MIT Press.
Fodor, Jerry A., and Zenon Pylyshyn. 1988.   "Connectionism and Cognitive Architecture: A Critical Analysis." *Cognition* 28 : 3-71.
Fox, Robin. 1986.   "The Passionate Mind: Brain, Dreams, Memory and Social Categories." *Zygon: Journal of Religion and Science* 21 (March): 31-47.
Gardner, Howard. 1983.   *Frames of Mind*. New York: Basic Books.
———. 1985.   *The Mind's New Science: A History of the Cognitive Revolution*. New York: Basic Books.
Gardner, Howard; H. H. Brownell; W. Wapner; and D. Michelow. 1983.   "Missing the Point: The Role of the Right Hemisphere in the Processing of Complex Linguistic Materials." In *Cognitive Processing in the Right Hemisphere*, ed. Ellen Perecman, 169-92. New York: Academic Press.
Gazzaniga, Michael S. 1977.   "Consistency and Diversity in Brain Organization." *Annals of the New York Academy of Science* 299 : 415-23.
———, ed. 1984.   *Handbook of Cognitive Neuroscience*. New York: Plenum.
———. 1985.   *The Social Brain: Discovering the Networks of the Mind*. New York: Basic Books.
Gazzaniga, Michael S., and Joseph LeDoux. 1978.   *The Integrated Mind*. New York: Plenum.
Geschwind, Norman. 1965.   "Disconnexion Syndrome in Animals and Men." *Brain* 88 : 237-94.
———. 1977.   "Behavioral Change in Temporal Lobe Epilepsy." *Archives of Neurology* 34: 453.
Geschwind, Norman, and Albert M. Galaburda. 1987.   *Cerebral Lateralization*. Cambridge: MIT Press.
Glass, Arnold, and Keith J. Holyoak. 1986.   *Cognition*. 2d ed. New York: Rand.
Godden, Duncan R., and Alan D. Baddeley. 1975.   "Context-Dependent Memory in Two Natural Environments: On Land and Underwater." *British Journal of Psychology* 66 : 325-32.
Goodglass, Harold, and Edith Kaplan. 1972.   *The Assessment of Aphasia and Related Disorders*. Philadelphia: Lea and Tebiger.
Greenwald, Anthony G. 1980.   "The Totalitarian Ego: Fabrication and Revision of Personal History." *American Psychologist* 35 : 603-18.
Harre, Rom. 1987.   "Persons and Selves." In *Persons and Personality*, ed. A. Peacocke and G. Gillett, 99-115. Oxford: Basil Blackwell.
Harre, Rom, and Grant Gillett. 1994.   *The Discursive Mind*. Thousand Oaks, Calif.: Sage.
Hellige, Joseph B. 1990.   "Hemispheric Asymmetry." *Annual Review of Psychology* 41 : 55-80.
Kaplan, Bernard. 1967.   "Meditations on Genesis." *Human Development* 10 : 65-87.
Kihlstrom, John F. 1987.   "The Cognitive Unconscious." *Science* 237 : 14451-52.
Kimura, Dorothy. 1973.   "The Asymmetry of the Human Brain." *Scientific American* 228 : 70-78.
Kinsbourne, Marcel. 1980.   "Brain-Based Limitations on the Mind." In *Body and Mind: Past, Present, and Future*, ed. R. Rieber, 155-75. New York: Academic Press.
Kolb, Bryan, and L. Taylor. 1988.   "Facial Expression and the Neocortex." *Society for Neuroscience Abstracts* 14 : 219.
Kolb, Bryan, and Ian Q. Whishaw. 1990.   *Fundamentals of Human Neuropsychology*. 3d ed. New York: W. H. Freeman.
Lancaster, Brian. 1993.   "Self or No-Self: Converging Perspectives from Neuropsychology and Mysticism. *Zygon: Journal of Religion and Science* 28 (September): 507-26.
Langer, Ellen J. 1978.   "Rethinking the Role of Thought in Social Interaction." In *New Directions in Attribution Research*, ed. John H. Harvey, William Ickes, and Robert F. Kidd, 35-58. Reading, Mass.: Addison-Wesley.
———. 1989.   *Mindfulness*. Reading, Mass.: Addison-Wesley.

Laughlin, Charles D., Jr., John McManus, and Eugene G. d'Aquili. 1990. *Brain, Symbol, and Experience: Toward a Neurophenomenology of Human Consciousness.* Boston: New Science Library.

LeDoux, Joseph E., and William Hirst, eds. 1986. *Mind and Brain: Dialogues in Cognitive Neuroscience.* New York: Cambridge Univ. Press.

Levy, Jerre. 1985. "Right Brain, Left Brain: Fact and Fiction." *Psychology Today* (May): 38–44.

Levy, Jerre, and Colwyn Trevarthen. 1976. "Metacontrol of Hemispheric Function in Human Split-Brain Patients." *Journal of Experimental Psychology: Human Perception and Performance* 2 : 299-312.

Levy, Jerre, Colwyn Trevarthen, and Roger W. Sperry. 1972. "Perception of Bilateral Chimeric Figures Following Hemispheric Deconnection." *Brain* 95 : 61-78.

Lewicki, P. 1986. *Nonconscious Information Processing.* New York: Academic Press.

Loftus, Elizabeth F. 1979. *Eyewitness Testimony.* Cambridge: Harvard Univ. Press.

Luria, Alexander R. 1972. *The Man with a Shattered World.* Trans. L. Soltaroff. New York: Basic Books

Macquarrie, John. 1987. "A Theology of Personal Being." In *Persons and Personality,* ed. A. Peacocke and G. Gillett, 171-9. Oxford: Basil Blackwell.

Marcel, Adam. 1983. "Conscious and Unconscious Perception." *Cognitive Psychology* 15 : 238-300.

Markus, Hazel, and Elissa Wurf. 1987. "The Dynamic Self-Concept: A Social Psychological Perspective." *Annual Review of Psychology* 38 : 299-337.

Marshall, John C. 1984. "Multiple Perspectives on Modularity." *Cognition* 17 : 209-42.

Martindale, Colin. 1981. *Cognition and Consciousness.* Homewood, Ill.: Dorsey Press.

Mead, George Herbert. 1934. *Mind, Self and Society.* Chicago: Univ. of Chicago Press.

Meltzoff, Andrew, and R. Borton. 1979. "Intermodal Matching." *Nature* 282 : 403-4.

Miller, Jonathan. 1983. *States of Mind.* New York: Pantheon.

Neisser, Ulrich. 1976. *Cognition and Reality.* San Francisco: W. H. Freeman.

———. 1981. "John Dean's Memory: A Case Study." *Cognition* 9 : 1-22.

Nemiah, J., and P. Sifneos. 1970. "Affect and Fantasy in Patients with Psychosomatic Disorders." In *Modern Trends in Psychosomatic Medicine,* ed. D. W. Hill. New York: Appleton-Century-Crofts.

Nisbett, Richard E., and Timothy D. Wilson. 1977. "Telling More Than We Can Know: Verbal Reports on Mental Processes." *Psychological Review* 84 : 231-59.

Pannenberg, Wolfhart. 1982. "Spirit and Mind." In *Mind and Nature: Gustavus Adolphus College Nobel Conference XVII,* 134-57. San Francisco: Harper and Row. Reprinted in *Toward a Theology of Nature: Essays on Science and Faith,* ed. Ted Peters. Louisville, Ky.: Westminster/ John Knox Press, 1993.

Peacocke, Arthur. 1990. *Theology for a Scientific Age.* Oxford: Basil Blackwell.

Pinker, Steven. 1994. *The Language Instinct: How the Mind Creates Language.* New York: William Morrow.

Putnam, Frank W. 1989. *Diagnosis and Treatment of Multiple Personality Disorders.* New York: Guilford.

Rahner, Karl. 1978. *Foundations of Christian Faith.* New York: Seabury.

Rolston, Holmes, III. 1987. *Science and Religion: A Critical Survey.* Philadelphia: Temple Univ. Press.

Sacks, Oliver. 1985. *The Man Who Mistook His Wife for a Hat.* New York: Summit Books.

Shallice, Timothy. 1979. "Neuropsychological Research and the Fractionation of Memory Systems." In *Perspectives on Memory Research,* ed. L. G. Nilsson, 257-77. Hilldale, N.J.: Lawrence Earlbaum Associates.

Shotter, John. 1984. *Social Accountability and Selfhood.* Oxford: Basil Blackwell.

———. 1985. "Social Accountability and Self-Specification." In *The Social Construction of the Person,* ed. Kenneth J. Gergen and Keith E. Davis, 167-89. New York: Springer-Verlag.

———. 1989. "Social Accountability and the Social Construction of 'You.'" In *Texts of Identity,* ed. John Shotter and Kenneth J. Gergen. London: Sage.

Shotter, John, and Kenneth J. Gergen, eds. 1989. *Texts of Identity.* London: Sage.

Silva, Lynn de. 1979. *The Problems of Self in Buddhism and Christianity.* London: Macmillan.

Simon, Herbert A. 1947. *Administrative Behavior.* New York: Macmillan.

_____. 1962.   "The Architecture of Complexity." *Proceedings of the American Philosophical Society* 106 : 467-82. Reprinted in *The Sciences of the Artificial* by Herbert Simon, 2d ed. 192-29. Cambridge: MIT Press, 1981.

Sperry, Roger. 1988.   "Psychology's Mentalist Paradigm and the Religion/Science Tension." *American Psychologist* 43 : 607-13.

_____. 1993.   "The Impact and Promise of the Cognitive Revolution." *American Psychologist*, 48 : 878-85.

Springer, Sally P., and Georg Deutsch, eds. 1985.   *Left Brain, Right Brain.* 2d ed. New York: W. H. Freeman.

Squire, Larry. 1982.   "The Neuropsychology of Memory." *Annual Review of the Neurosciences* 5 : 241-73.

Steele, Claude M. 1988.   "The Psychology of Self-Affirmation: Sustaining the Integrity of Self." In *Advances in Experimental Social Psychology*, ed. Leonard Berkowitz, 361-402. New York: Academic Press.

Stich, Steven. 1978.   *From Folk Psychology to Cognitive Science.* Cambridge: MIT Press.

Storr, Anthony. 1987.   "Jung's Concept of Personality." In *Persons and Personality*, ed. A. Peacocke and G. Gillett, 150-63. Oxford: Basil Blackwell.

Swinburne, Richard. 1987.   "The Structure of the Soul." In *Persons and Personality*, ed. A. Peacocke and G. Gillett, 23-55. Oxford: Basil Blackwell.

Taylor, Shelley E. 1989.   *Positive Illusions: Creative Self-Deception and the Healthy Mind.* New York: Basic Books.

Taylor, Shelley E., and Jonathan D. Brown. 1988.   "Illusion and Well-Being: A Social Psychological Perspective on Mental Health." *Psychological Review* 103 : 193-210.

Teske, John A., and Roy D. Pea. 1981.   "Metatheoretical Issues in Cognitive Science." *Journal of Mind and Behavior* 3 : 123-78.

Thatcher, Adrian. 1987.   "Christian Theism and the Concept of a Person." In *Persons and Personality*, ed. A. Peacocke and G. Gillett, 180-96. Oxford: Basil Blackwell.

Tillich, Paul. 1957.   *Dynamics of Faith.* New York: Harper and Row.

Tomkins, Silvan S. 1979.   "Script Theory: Differential Magnification of Affects." In *Nebraska Symposium on Motivation 1978*, vol. 26, ed. Herbert E. Howe, Jr., and Richard A. Dienstbier, 201-36. Lincoln: Univ. of Nebraska Press.

Tulving, Endel. 1985.   "How Many Memory Systems Are There?" *American Psychologist* 40 : 385-98.

Tulving, Endel, and Donald M. Thomson. 1973.   "Encoding Specificity and Retrieval Processes in Episodic Memory." *Psychological Review* 80 : 352-73.

Uleman, James S., and James A. Bargh, eds. 1989.   *Unintended Thought.* New York: Guilford.

Van Lacker, Diana. 1991.   "Personal Relevance and the Human Right Hemisphere." *Brain and Cognition* 17 : 64-92.

Varela, Francisco, Evan Thompson, and Eleanor Rosch. 1991.   *The Embodied Mind: Cognitive Science and Human Experience.* Cambridge: MIT Press.

Vygotsky, Lev S. 1978.   *Mind in Society.* Cambridge: Harvard Univ. Press.

Ware, Kallistos. 1987.   "The Unity of the Human Person According to the Greek Fathers." In *Persons and Personality*, ed. A. Peacocke and G. Gillett, 197-206. Oxford: Basil Blackwell.

Weiskrantz, L. 1986.   *Blindsight: A Case Study and Implications.* Oxford: Clarendon.

Wertsch, James V. 1979.   "From Social Interaction to Higher Psychological Processes." *Human Development* 22 : 1-22.

Wiggins, David. 1987.   "Person as Object of Science, as Subject of Experience, and as Locus of Value." In *Persons and Personality*, ed. A. Peacocke and G. Gillett, 56-74. Oxford: Basil Blackwell.

Wittgenstein, Ludwig. 1953.   *Philosophical Investigations*, trans. G. E. M. Anscombe. New York: Macmillan.