"MIND" AS HUMANIZING THE BRAIN: TOWARD A NEUROTHEOLOGY OF MEANING

by James B. Ashbrook

Abstract. The concept "mind" refers to the human and humanlike features of the brain. A historical review of thinking about the mind contextualizes humanity's search to understand itself by sketching biblical and philosophical perspectives from the Hebrew scriptures through the Greeks and Descartes to the German philosophers Goethe, Kant, and Hegel. These provide an enlarged context for an analytic approach to mind as focusing on the interface between physical signals and experiential symbolic expressions. Drawing on a holistic paradigm, several features are discernible: empathic rationality, imaginative intentionality, meaningful memory, and adaptability. These reflect the evolutionary development of uncommitted cortex that contributes to the brain's explosive capacity for order, complexity, and novelty. The basic issue continues, namely, how are the distributed modules of information-processing integrated into the meaning-making reality of human beings?

Keywords: brain; holistic paradigm; mind; neuroscience; philosophy; religion.

I suggest that the concept "mind" refers to the human and the humanlike features of the brain, whether in humans or in animals. The primary features (especially of human brains) are those of intentionality and subjective consciousness, reinforced by empathy, rationality, imagination, memory, and adaptability. In short, whenever the concept mind is used in relation to brain, it "humanizes" the meaning of brain; and whenever the concept brain is used in relation to mind, it "concretizes" the meaning of mind. "Mind," therefore, can serve as a bridge between religious/theological convictions and scientific/neuroscience investigations.

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As physicist Paul Davies puts it:

> Mind—i.e., conscious awareness of the world—is not a meaningless and incidental quirk of nature, but an absolutely fundamental facet of reality. . . . We human beings are built into the scheme of things in a very basic way.
>
> Our mental processes have evolved as they have precisely because they reflect something of the nature of the physical world we inhabit. (Davies 1992, 16, 24)

The humanizing brain potentially carries the most privileged information about the nature of reality to which we have access (cf. Guthrie 1993).

Wrestlers with the brain-mind puzzle have tended to locate themselves on separate ends of a single polarity. At one end, the brain is (nothing but) the mind, and at the other, the mind is (nothing but) the brain. The most rigid position is an absurd dualism that splits brain and mind a la René Descartes. People no longer can maintain those positions in light of new developments in understanding knowledge of reality. We have come to the era of interdisciplinary collaboration, multiple perspectives, postmodernism, and engagement in an open system of emergent possibilities.

As an increasingly typical observer put it: "Psychology needs to get back to the problems that initially inspired the discipline: the nature of consciousness, the nature of religious experience, the body-mind problem, basic issues in epistemology, in how we experience the world . . . we need to become more tolerant of crazy ideas and wiggly sorts of notions. We have to suppress the critical editorial function and sort of enlarge or reward or prop up the imaginative and playful faculty of people's mind. . . . Generally, we need to loosen up" (Hogen 1979, 5; see also Sperry 1977). This does not mean reckless speculation; rather, it means risking hunches and hypotheses, stating them as clearly and concisely as possible and laying them out for critical scrutiny and reflection.

To begin to comprehend these changes there is value in a quick review of how we have arrived at this new configuration of understanding, and then we examine implications of that configuration for understanding the meaning of mind.

Where We Have Come From in Thinking about Mind

I begin by contrasting the biblical perspectives and the philosophical perspectives. Part of the value of such a review is less for its historical significance and more for its contextualizing humanity's search to understand itself and its place in the universe. In saying this, I am making the assumption that the presence of humanity as a meaning-discerning/meaning-making piece of empirical data is crucial in understanding the cosmic/universal context in which we find ourselves. Without the human context, it is empty and void; with only the human context, it is limited and inhibiting. Together, the physical universal

and the human cosmos provide the alpha and the omega of meaningful reality.

THE BIBLICAL PERSPECTIVES. The word *mind* represents one of three Hebrew words: *nephesh* (soul), *ruach* (spirit), and *leb* (heart) (Dentan 1962). Mind as the seat of thinking and heart as the seat of feeling are at odds with each other. In Greek, *leb* becomes *kardia* as the seat of reason and will and is overwhelmingly common (used about 150 times) in the New Testament compared to *dianoia* (used 12 times) and *nous* (used 24 times). In classical Greek, *nous* meant intellect, reason, and mind in a more general sense, including feeling. *Dianoia* did not include feeling but did mean intention or purpose (Blackman 1951).

Mind is used as a translation of a number of Hebrew and Greek words. Despite various meanings, all include "the idea of the human capacity for rational thinking." The Hebraic mind did not divide the person into separate categories or faculties. "Feeling, thinking, planning, and willing were all conceived to be functions of the entire personality, so that the conception of 'the mind' as the special seat or organ of reflective thinking as distinguished, e. g., from the heart as the seat of the emotions would have been, for the Hebrews, almost unintelligible" (Dentan 1962).

Leb or *heart* in the Old Testament referred "to the inmost center of [a person's] entire personality, the hidden part of his [or her] being, in which take place all those activities—affective, volitional, and intellectual—which finally determine the direction of [one's] external acts" (Dentan 1962). "The idea of pure, disinterested thinking for its own sake is alien to the Hebrew mentality" (Dentan 1962).

For Paul, mind refers to "the thinking, reasoning, reflective, and purposing aspect of [humanity's] consciousness. It is a purely human element. . . . It is, therefore, *potentially* a designation for the higher nature as opposed to the *Flesh*, which is frequently a name for the lower nature." In 1 Cor. 2:16, "we have the mind of Christ" means "spirit." It is "the whole of the self conceived as the subject of its thinking, feeling, and judging, whereas *Body* is the same self regarded as the object of these activities." "Mind" can be taken as including "the whole [person] and can, in fact, often be taken as practically the equivalent of 'character' (Rom. 1:28; 11:34; 2 Tim. 3:8)" (Dentan 1962).

THE PHILOSOPHICAL PERSPECTIVES. The idea or concept of "mind" has a long and rich history (Hutchins 1952, 171–204; Gregory 1981).

The Hellenic-Greek Perspective. Bruno Snell (1953) attributed the discovery of the mind to the Greeks. While rationality emerged in Greece, that culture always struggled with irrationality (Dodds [1951]1973). During the Archaic Period (620–480 B.C.E.), people became conscious of a

quasi-independent self (Finney 1966). Julian Jaynes (1977) has argued that the origin of the self-conscious human being lay in the breakdown of the bicameral (two-chambered) mind during that period. Jaynes theorizes that, in very ancient times, right-brain responses to stress were experienced as voices—believed to be the voices of gods. But the voices—the "gods"—did not necessarily agree with one another; the disagreements forced people to make choices and, ultimately, to take responsibility for their choices. With that, the gods grew more distant, and dogma declined. Thus arose a sense of human self-consciousness and rationality.

Thinkers in the cradle of Western civilization came to regard the human mind as analogous to the cosmos, the universe of meaningfulness, ordered and controlled by Mind or God. The two were seen as microcosm and macrocosm. For the Greeks, especially, "there was no material world devoid of mind, and no mental world devoid of materiality; matter was simply that of which everything was made . . . and mind was simply the activity by which everything apprehended the final cause of its own changes" (Collingwood 1945, 111). In all its manifestations, Mind imposed "order first upon itself and then upon everything belonging to it, primarily its own body and secondarily that body's environment" (Collingwood 1945, 3).

The Cartesian Perspective. Modernity found its philosophical and scientific emergence in the thinking of René Descartes (1596–1650) (Descartes [1637] 1952). His celebrated "method of doubt" and his infamous misleading affirmation "I think, therefore I am" provided the background for a strictly mechanical model of reality based on mathematical principles. He hypothesized two radically different kinds of substance: a physical, extended substance (*res extensa*) and a thinking, unextended substance (*res cogitans*). While doubting all physical objects, including his body, he could not doubt himself as a thinking being.

His dualistic position has influenced subsequent theories of the mind. Few support a "substantive dualism" in which the mind as a nonphysical entity is separate from the body. Others, however, are attracted to a weaker version, technically called "attributed dualism." In this version, while the mind is not a separate entity, two distinct properties are ascribed to human beings: one psychological (including thoughts, feelings, volitions); the other physical (including electrical and chemical properties of the nervous system) (Gregory 1987, 189–90). "Attributive dualists maintain that even if all human activities must depend on some kind of physical substrate, there is nonetheless an important sense in which psychological descriptions of those activities cannot be reduced to mere physiological descriptions" (Gregory 1987, 190). The analogic metaphor of the computer, with the brain as hardware and the mind as software, applies to such a dualistic framing.

Modernity and Philosophical Perspectives. Walter Kaufmann, professor of philosophy at Princeton University, analyzed the eighteenth and nineteenth centuries of intellectual history in proposing an understanding of self-knowledge or rediscovering the mind, with specific attention to Goethe, Kant, and Hegel. He regarded Goethe as advancing the discovering of the mind, Kant as a disaster, and Hegel as a failure in trying to reconcile Goethe and Kant. Kaufmann's own position on mind is similar to the biblical perspective, namely, "'mind' . . . is an inclusive term for feeling and intelligence, reason and emotion, perception and will, thought and the unconscious" (Kaufmann 1980a, 4).

Kant's mistake, according to Kaufmann, was viewing science as "Newtonian science." This led to his insistence on "absolute certainty" in developing a philosophy of mind. In contrast, Goethe developed "a non-Newtonian science." He regarded this poetic approach as more fruitful though less absolute, more dynamic and developmental than set and stabilized (Kaufmann 1980a, 7–8, 29).

Kaufmann's basic critique of Kant and Hegel, which assumed a Newtonian scientific orientation, was that they linked their view of science with "rigorous deduction, necessity, certainty, and completeness" (Kaufmann 1980a, 204–11). In contrast, Goethe reflected a dynamic, living, inclusive view of life. For instance, consider his conviction: "Works of nature and art one does not get to know when they are finished; one must catch them in their genesis in order to comprehend them to some extent" (quoted in Kaufmann 1980a, 202).

In conclusion, Kaufmann recognized that despite the advances Goethe and Hegel made in the discovery of the mind, psychology had not yet emerged when they died in 1831 and 1832, respectively. He believed that from a philosophical perspective Nietzsche and Freud developed Goethe's legacy apart from Kant. However, in discovering the mind there is value in knowing that both Goethe and Hegel "were right when they insisted that what is of the mind must be caught in its genesis to be comprehended." Further, Hegel was "right" in juxtaposing Goethe and Kant in a dialectic of opposing views (Kaufmann 1980a, 268). Finally, however, we need to continue to

> learn from Goethe's insistence on the crucial importance of development and from his conception of science. Being a poet as well as a scientist, he knew that poetry and science are not totally different but creations of the same mind. *Those who would discover the mind cannot afford to ignore poetry and art.* (Kaufmann 1980a, 269, emphasis added)

A fuller understanding of mind leads from these three through Kierkegaard, Nietzsche, Freud, Jung, Adler, Heidegger, and Buber (Kaufmann 1980b; 1980c), among many (e. g., Langer 1967; 1972; 1982; Arendt [1971] 1977; 1978). What I have sketched presents the value of a

dynamic, contextual, and inclusive approach to understanding mind. A static, selective, and delimiting approach only distorts the reality of the humanizing brain.

Valuable as such an enlarged context of analytic understanding is, however, to those of us on the interface of science and religion, a single perspective is not enough, especially a philosophical one. We look to the neurosciences as well as to the human and social sciences for basic data with which to understand mind as the human and humanizing meaning of brain. Beginning with the emergence of the cognitive revolution (e. g., Gardner 1985), theorists have sought to combine philosophical ideas and behavioral data. Jordon M. Scher, for instance, illustrates that trend in his edited work on *Theories of the Mind* (1962), in which he examines "Mind as Brain," "Mind as Participation," and "Mind as Method."

I turn now to where the current interface between empirical physical signals and experiential symbolic expressions occur. Much of the material still is biased toward an empirical exclusivism (e. g., "Mind and Brain" 1992), but increasing sophistication in methodology is expanding the locus of attention.

What Is Emerging in Thinking about Mind

I turn from the philosophical to neuroscience as the crucial threshold in what is emerging in thinking about mind. This focuses explicitly on the brain and its functioning, especially in terms of cognitive neuroscience. The biochemical and behavioral intertwine as investigators operate on the assumption that "the mind is what the brain does." The task is to determine "how brain function gives rise to mental activity" (Kosslyn and Shin 1992, 146, quoted in Sarter, Berntson, and Cacioppo 1996, 13) and how mental activity manifests itself in brain function.

Let me state my position briefly: I regard mind as referring to intentional, representational, imaginative information processing (e. g., Springer and Deutsch [1981] 1989, 48). This includes specific focus on attention, perception, emotion, empathy, memory, anticipation, aspiration, and evaluation. Whether these processes are modular and separate or basically organized and centralized is open to exploration. The fact that they reflect a humanizing brain, however, is crucial.

NEUROSCIENCE PERSPECTIVES. Roger W. Sperry (1993) argued that the cognitive revolution "contradicts" behaviorism's rejection of consciousness in explaining brain function. "Subjective mental states [are] emergent interactive properties of brain activity . . . irreducible and indispensable for explaining conscious behavior . . . and get primacy in determining what a person is and does." This modified two-way model of causal determinism

emphasizes "downward holistic and subjective causation . . . replacing reductive physicalism as the basic explanatory paradigm of science."

These paradigm shifts "to mentalism and to wholism are interlinked, tied to, and dependent on the revised model for causal determination. Both [mentalism and wholism] depend on the causal reality of irreducible emergent phenomena that interact as wholes at their own macrolevel and in the process carry their embedded constituents along a space-time course determined by emergent interactions at the higher level. Subjective agency may thus be viewed as a special instance of downward control, a special case of emergent causality in the reciprocal up-down paradigm for causal control" (Sperry 1993, 882).

I suggest that we regard Sperry's "concept of the irreducible whole" as referring to the mind in its functioning in contrast to the brain and its activity.

Neuropsychologist Michael S. Gazzaniga, a former student and colleague of Sperry, has developed a view of brain-mind that assumes we are "a believing species" (1985, 201). He disagrees with Sperry, Jerre Levy, and Colwyn Trevarthen, among others, in dichotomizing verbal versus visual-spatial or analytic versus holistic processing. The brain system, he contends, lies "built in a modular way [that is, with many subsystems, yet also needs] a single interpreter to explain the various behaviors emitted over time by the modules, enabling a human to construct a unified theory of self" (Gazzaniga 1985, 195). The interpreter—the left hemisphere—manages the separate cognitive entities by virtue of multiple, parallel processing and by maintaining an explanatory vigilance (Gazzaniga 1985, 23, 70, 89–91).

IMAGING THE MIND. Imaging the mind intends "to represent psychical processes as quantitatively determinant states of specifiable material particles" ("Imaging the Mind" 1995). These noninvasive techniques allow public access to private events. No longer is analysis dependent upon introspective reports alone. Researchers now can correlate physiological signals with psychological significance and symbolic expressions (Cacioppo and Tassinary 1990; Sarter, Berntson, and Cacioppo 1996).

This correlation allows for a convergence of the "top-down" approach of intentional mental representation and the "bottom-up" approach of behavioral and biochemical neuroscience. It is becoming possible to observe what happens in the brain when we engage in such mental activity as speaking, imagining, or shifting our attention from a passive to an active interest in something (Posner and Raichle 1994). Both cognitive events and neural events can be manipulated in order to identify correlational and causal factors.

For instance, Steven R. Dager (1995) demonstrated that magnetic resonance spectroscopy (MRS) could identify changes in brain chemistry —that is, "a disproportionate increase in brain lactate concentration" —not only as a result of a specific physiologic abnormality in pain disorder but also in the emotional state of overwhelming anxiety or a sense of danger.

It is possible to observe brain structure by magnetic resonance imaging (MRI), chemistry by MRS, *and* function by functional MRI "without the use of ionizing radiation." High-speed imaging allows "a method by which alterations of regional cerebral blood flow and blood volume can be observed and measured," such flow being "tightly correlated with the degree of local activity of the brain . . . [and allowing] an estimation of regional activation." Such functional resonance scanning is providing evidence of increases and decreases at the beginning and end of various tasks such as "visual processing, repetitive movements, and word production, in appropriate regions of the brain" (Dager 1995).

Physiologic changes have been reported for reductions in healthy neurons in the temporal lobe of patients with schizophrenia; abnormalities of choline metabolism in the basal ganglia in patients with major depression and bipolar disorder; increased response to sensory stimulation in schizophrenic patients, including decreased frontal cortex activity during certain cognitive tasks; and regional activity in response to psychoactive drugs such as alcohol and cocaine.

Such enhanced technology allows researchers to address questions related to neurochemical and neurophysiologic changes and higher brain functions such as the production of properties of sensation, cognition, and emotion, all associated with what we refer to as "the mind." However, I sound a caveat in pursuit of brain localization of mental representations.

Life is always "more than" the sum of its parts. Parts always function in novel and surprising self-organizing ways (Kaufmann 1995). In pursuing technological refinements of cognitive processing we are to avoid what Alfred North Whitehead alluded to as "misplaced concretion." No part is capable of containing the whole. Such is the religious warning against idolatry and such is the implicit assumption of equating brain and mind.

In addition to technical and methodological complications about the psychological and phenomenological significance of physiological signals there are interpretive limitations. Accurate and precise functional localization is uncertain for several reasons. It may be widely distributed and/or diffusely organized. It may represent anatomical overlaps and even shared neuronal elements with neural structures that mediate different functions. It may engage in different functions

depending on input patterns associated with other cognitive conditions. Most of all, "some central circuits may have differential and overlapping functions depending on the pattern of activation" (Sarter, Berntson, and Cacioppo 1996, 16–17).

Neurosurgeon Wilder Penfield (1891–1976) asked the question: "Can the brain explain [the human being]? Can the brain achieve by neural action all that the mind accomplishes?" He answered that it could not (Penfield 1975, xxii, 5). The great British neurophysiologist Sir Charles S. Sherrington described the "functional instability" in results from stimulating the same cortical point in chimpanzees, gorillas, and orangutans. He also found variations from time to time in the same animal. Penfield spoke of the comfort Sherrington's findings gave him. If such variations were present among animals, then he could be less distressed with "the vagaries of response" that he found in the human cortex (Penfield and Rasmussen [1950]1957, 14).

Most recently, neuroscientist Antonio R. Damasio (1994) contends that in separating body and soul the Cartesian split of emotion and reason led to a breakdown in rationality itself. Further, he concludes, "it should be clear . . . that the secrets of the neural basis of mind cannot be discovered by unraveling all the mysteries of one single neuron, . . . or by unraveling all the intricate patterns of local activity in a typical neuron circuit" (p. 259). A purely physical-biological model of the human person—or mind, if you will—fails to deal with the complexity of human suffering. It equally fails to engage the creativity of human significance. "The truly embodied mind," he insists, "does not relinquish *its most refined levels of operation, those constituting its soul and spirit*." For here is the dignity, the complexity, the uniqueness, the "human scale" that is basic to our being the human beings that we are (Damasio 1994, 252, emphasis added). Our minds *cannot* operate as simple entities, but only as expressions of a complex whole.

MOSAIC OF MEANINGS OF MIND. Drawing upon the wholistic paradigm, I suggest that we may conceive of mind as a configuration of several features: empathy, imagination, intentionality, memory, and adaptability. I say a bit about each of these features and then propose that they reflect what Penfield (1975) refers to as "uncommitted cortex," the noninstinctual portion of the brain. In focusing on distinguishable features, however, I remind the reader that mind is not a thing, an entity. Rather, mind constitutes a dynamic, differentiating-integrating process of meaning-discernment and meaning-making.

Empathic Rationality. We live in a relational universe (Ashbrook 1989/1993). What we know of what matters depends upon our cooperative engagement with others (Trevarthen 1986/1993). This process of

knowing what is needed for survival and significance is focused in the paleomammalian brain, the emotional mind as neurophysiologist Paul D. MacLean refers to it (MacLean 1975/1993, 1990) and as neuroscientist Antonio R. Damasio demonstrates (1994).

The social matrix influences all that we know and do. Behavioral studies of animals, for instance, reveal "strong social influences on biological processes . . . [such as] sexual, parental, and communicative behaviors" (National Advisory Mental Health Council 1995, 485).

> For example, when female rats live together, their ovarian cycles become synchronized; [this is] something that happens in humans as well. . . . Studies of groups of baboons show that changes in the dominance hierarchy of their social group, such as the entrance or exit of a dominant male, affect the testosterone levels of the males who remain—lowering or raising them, respectively. . . . Studies of nonhuman animals also show that experiences of learned helplessness—that lead people to develop expectations and beliefs characteristic of depressed patients, actually reduce levels of the neurotransmitter norepinephrine, which is also reduced in depressed illness. *This kind of research makes it clear that people are not merely puppets pulled by the strings of biological processes; behavioral, mental, and social factors have powerful, reciprocal effects on biological function*. (National Advisory Mental Health Council 1995, 489, emphasis added)

Attributing intention/agency/goal to "others" (Brothers and Ring 1992) is a behavioral expression of that empathic property of mind. Specific brain regions—core cognitive operations—encode high-level, psychological representations of other individuals. "[P]rocessing of social information depends on intact limbic structures, notably, the amygdala and orbital frontal cortex, with which the amygdala is interconnected. . . . It thus appears that, in both humans and macaque monkeys [for instance], limbic lesions interrupt pathways that ordinarily produce automatic, correct responses to social stimuli" (Brothers and Ring 1992, 110). The subjects infer from the features of faces, hands, and voices the attitudes and propensities of the other. That is, what they infer goes "far beyond the information given. . . . This suggests that processing a face for identity can remain intact while processing it for psychological attributes fails" (Brothers and Ring 1992, 109).

In short, these representations of mind reflect cognitive processes constructed from sensory inputs such as faces and gestures. Together with this "recently evolved cognitive capacity for representing minds as independent loci of beliefs" there are the mind's "phylogenetic origins first in simple responses to affective displays and, more recently, in the assignment of social traits within a cooperative social order. . . . [Because of this] there should be a premium on the accurate assignment of qualities such as 'helpful,' 'generous,' 'selfish,' and 'untrustworthy' to other individuals" (Brothers and Ring 1992, 115, 116; Damasio 1994). We are

able to distinguish between "responses to incidental visual features and responses to higher level content" (Brothers and Ring 1992, 116).

Empathic attunement or the ability to discern what is intended in the activity of others and the logic of that activity is a basic building block of mind—its relational and rational structuring.

Imaginative Intentionality. I combine two additional features or properties of mind because it is almost impossible to separate them. I call this imaginative intentionality. Each attribute assumes the mammalian organism is an active organism, not a passive one. We are not blank tablets upon which the environment writes its script. Rather, we are co-authors, co-creators to use theologian Philip Hefner's designation, in crafting our destiny and that of the context in which we dwell (Hefner 1993).

This active, intentional, constructing aspect of *Homo sapiens* is succinctly summarized in "A Report of the National Advisory Mental Health Council" on what we have learned from basic behavioral science research:

> Learning is no longer viewed as the passive acquisition of stimulus-response associations but rather as the active generation of predictions and hypotheses concerning forthcoming events. Likewise, perception turns out to be more than the flow of stimulus information from peripheral receptors to the brain. Rather, it reflects a complex interaction between levels of processing in the brain and the rest of the body. Our understanding of how people think, reason, and make judgments and decisions now challenges the belief in human rationality that had prevailed for more than 2,000 years. We have an entirely new view of the nature of unconscious mental life and of the reciprocal relations between cognitive and emotional processes. ("A Report" 1995, 487)

The imaginative, constructive property finds expression in the ways we select and shape information. No one is of "one mind." At the very least we each are of "two minds" and probably, as researcher Marvin Minsky (1985) puts it, a "society" of mind. Considerable debate continues to surround the issue of "two minds" (Gazzaniga 1972; Hellige 1990; Davidson and Hugdahl 1995). Some argue for double and bimodal consciousness (e. g., Deikman 1971/1973; Sperry 1968). A few identify mind or consciousness with volitional activity generated from subcortical sources such as the upper brainstem (e. g., Penfield 1975). Still others regard mind as linked with language, which is operative in both integrated and double consciousness (e. g., Gazzaniga and LeDoux 1978; Pinker 1994).

Researchers Sally Springer and George Deutsch provide a balanced review of the evidence of the structure and functional asymmetry of bimodal consciousness. They identify inconsistent findings and warn against the temptation to speculate. While hemisphere differences can be

exaggerated, Springer and Deutsch ([1981] 1989, 340) "have become even more impressed with the reality of hemisphere differences and with their potential for helping us understand the brain mechanisms underlying higher mental functions."

Meaningful Memory. Another feature of mental representation is the development of a richness of cognitive processes that allow behavior based on accumulated and generalized and generalizable knowledge (Squire 1987). We know these processes as "memory," the sensible and meaningful derivation of data from experience and sophisticated generalization (Gregory 1987, 149). Mind includes more than "immediate experience and the awareness of the external world." It includes perceptual, cognitive, motor, and linguistic activities, the highest level of functional organization that generates the reality of immediate and ongoing experience (Jerison 1985, 6, 10).

Although behavioral scientist Harry J. Jerison is not without his critics on the evolution of encephalization as the criterion of intelligence, we can still consider his conclusions as basic:

> Behavioral capacities developed in adaptations correlated with encephalization are most likely to be related to sensory/perceptual and cognitive information processing, since that is the only kind of processing known to require very large amounts of neural tissue. The capacities are, therefore, likely to be related to the reality constructed by a species. The evolutionary perspective emphasizes the specificity of adaptations of species to their niches, and this specificity is consistent with the idea that different species create different realities, and, furthermore, that the different realities can be based on comparable grades of processing capacities. There should, therefore, be a variety of "intelligences" evident in the evolution of mind in animals. *The human mind may serve as the model for mind in other species.* (Jerison 1985, 28; emphasis added)

Memory is neither a single phenomenon nor a single process (Squire 1992). For our purposes, however, it involves incorporating highly organized, contextually relevant, and emotionally significant information into a sense of the continuity of reality (Winson [1985] 1986, 30–34, 201–2; Fox 1986). What is novel and uncertain gets our attention. With the amygdala serving the "gate-keeping function" of "selective attention" between our senses and our emotions (Mishkin and Appenzeller 1987, 10), we select information, sort it, filter it, and perhaps take it in, particularly if it is interesting and pleasurable or dangerous and painful. Then, the hippocampus computes that information into "an enduring and useful form" (Squire 1987, 194, see also Squire 1992; Fox 1986, 35–37; Maren and Baudry 1995).

We remember what matters to us, "some overall characteristic" of life circumstances (Neisser 1988, 365–66). These recollections give us our life themes, our sense of self, our sense of coherence and cohesion (Bar-

clay and DeCooke 1988, 91–92; Squire 1987, 223; Erikson 1968). Events that others may perceive as isolated make sense to us "only because [these events] fit into a broader framework of self-knowledge" (Barclay and DeCooke 1968, 120) or what I am referring to as mind.

Adaptability. Drawing on the work of Stanley Cobb, Penfield (1975, 20) identified a variety of cortical patterns: motor, auditory, somatic sensory, olfactory, visual, and uncommitted (fig. 1). His point was that the largest area not committed to sensory functions at birth is found in humans. The rat and ground shrew each have some uncommitted cortex, while that of the chimpanzee begins to approach the extensiveness of the uncommitted cortex of *Homo sapiens*.

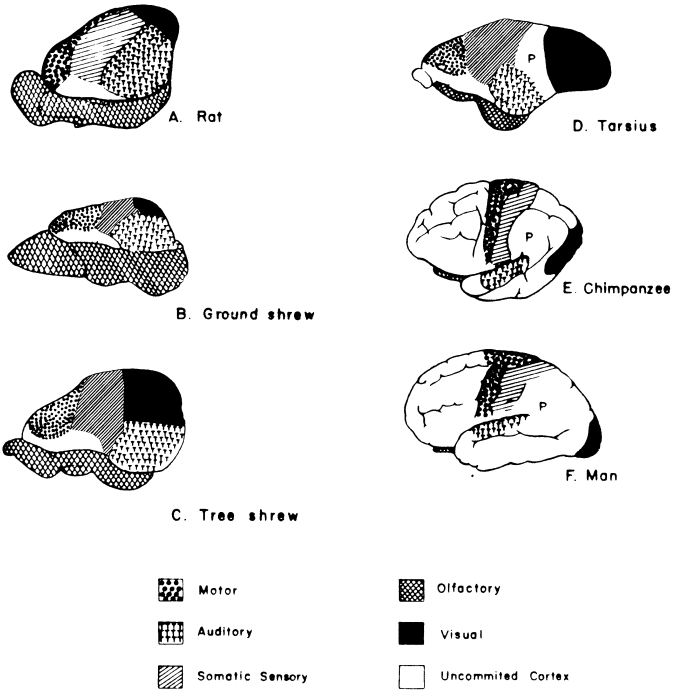

Fig.1. Uncommitted cortex.

Source: Reprinted, by permission, from Penfield 1975, 20.

Although there are no qualitative differences between our brains and brains of other animals, especially primates, "there are clear quantitative differences" (Kolb and Whishaw [1980] 1985, 88–91). The most dramatic difference is in the neocortex; in proportion to body size, it is 3.2

times greater than the volume that would be predicted for nonhuman primates and about three times greater than predicted for chimpanzees. This uncommitted neocortical area comes with the general increase in the association cortex. It is this cortex that makes for imaginative adaptability. It is the source for what cognitive philosopher Daniel C. Dennett calls our "explosive new capacity to look ahead" (Dennett 1995, 379). Because mind is "a construction of the brain," according to evolutionist Harry J. Jerison, the perceptual worlds of what matters for survival differs among different species (Jerison 1985, 2).

In combination, the association cortices and the frontal lobes make for maximum adaptability to the changing scene of environmental circumstances. We live in the context of universes of influence, a configuration of order, complexity, and novelty. Survival depends upon remembering, evaluating, anticipating, planning, sequencing, and selecting. These combine to make up what is commonly agreed on as the meaning of mind.

A NEUROTHEOLOGICAL PERSPECTIVE. I have argued for using the brain-mind as an analogic metaphor for understanding humanity and our place in this universe (Ashbrook 1984; 1989/1993; 1996). While we can distinguish between levels of organizational complexity and disciplines of discourse, *relating* these levels and disciplines is never the same as *reducing* to the simplest level or *enveloping* lower levels by the highest level. "Mind" allows us to relate levels as disparate as biochemical (e.g., Oakley 1985; Hobson 1994), cortical (e.g., Levin 1991; Gazzaniga 1992), cultural (e.g., Taylor 1979; Hampden-Turner [1981] 1982); and cosmic (e.g., Ashbrook 1984; Davies 1992).

"Just as the mind reveals the human meaning of the brain, so God discloses the religious meaning of the mind" (Ashbrook 1984, xviii). In the loose interface between sensory input and symbolic/cultural output we find clues to subjective consciousness. These clues allow us to move dialectically between the mystery of the human mind and the mystery of the universe in which we dwell (Taylor 1979). With this dialect we expand and deepen our knowledge of what matters to human life.

The phrases "brain-mind" and "working brain" suggest what mind can mean by identifying how the brain works. The terms refer to that reality that includes both the materiality of brain matter and the integrated meaningfulness of mind representation. They mark the interface between sensory input, personal experience, and symbolic construction. The empirical features of brain sharpen the imaginative reaches of mind, while the imaginative reaches of mind enrich the empirical features of brain.

The brain itself is a model of successive regularities. Taken alone it can be viewed as an entity, an autonomous center that coordinates and governs lower levels of neural and endocrine activity, in short, a closed sys-

tem. The mind, in contrast, is an image of emergent features. It cannot be understood by itself. Mind reflects an expanding universe of influences that affects its functioning and is affected by its character—in short, a dynamic system. Thus the brain can be viewed as both a whole and a part (Pribram 1979; Koestler 1967, ch. 12). In itself, the brain is an organized whole, complex yet integrated. We can analyze predictable regularities through its parts.

Mind, with its emergent features, on the other hand, cannot be predicted from lower levels of analyses. These are unpredictable in principle (Livingston 1978, 2). Between the predictable brain and the unpredictable mind lies the challenge of understanding mind as the human meaning of the brain. How that whole emerges from the parts defies explanation (Utall 1978, 694) even as it invites exploration.

Twenty years ago, neuroscientist Robert B. Livingston argued that scientists have been "too shy about making inferences" (Livingston 1978, 2). They prefer the security of the brain's regular features. In contrast, theologians have been quick to rationalize mystery by insisting on the mind's unpredictability. I opt for suggestive inferences from the brain's regularities to the mind's unpredictability to understand the nature of reality itself.

My neurotheological approach is analogical. Mind is the human significance of brain; at the same time, brain is the contextual significance of mind.

Michael Polanyi has argued against reducible levels of analysis. He contended that the mind, though rooted in the body, is free in its actions. Consequently, "body and mind are profoundly different singly, and not two aspects of the same thing." Inquiry, thus, presumes that "two faculties of the mind are at work jointly . . . the deliberately active powers of the imagination, and the other a spontaneous process of integration which we may call intuition" (Polanyi 1968). The materiality of brain gives more content to what mind can mean than theology ordinarily includes, though I remind readers of the inclusiveness of the Hebraic mosaic of meaningful referents. Without reducing mind to brain, the working brain anchors the meaning of mind in a more objectifiable context than mind alone. At the same time, without equating mind with universe/God, the functioning mind allows intimations of what matters most to our humanness as human beings.

As an analogy, mind as metaphor crosses the two disciplines of neuropsychology and theology/religion without assuming literal correspondence. Paul Ricoeur (1975) explored the hermeneutics of metaphor in the need to shift referents in describing reality. Metaphor requires the dual function of rhetoric/proof/persuasion and poetics/mimesis (representation of reality)/catharsis (purification) (Ricoeur 1975, 12–13). It is

"a semantic event that takes place at the point where several semantic fields intersect" (p. 98) in the instance of mind between the natural sciences and the human and social sciences.

Two transfers of context are made. The first is a "metaphysical transfer of the sensible to the non-sensible," and the second is a "metaphorical transfer of the literal to the figurative" (Ricoeur 1975, 281), in our instance, from the sensible brain to the figurative mind. There is a circularity of movement between "the abstractive phase" of conceptualizing of traits of brain in terms of mind and "the concretizing phase" of making referents of mind appear in terms of brain (Ricoeur 1975, 298).

Ricoeur concluded that "what is given to thought in this way by the 'tensional' truth of poetry is the primordial, most hidden dialectic—dialectic that reigns between the experience of belonging as a whole and the power of distanciation that opens up the space of speculative thought" (Ricoeur 1975, 313). Such a hermeneutic position finds support in the linguistic theory that language and thought are based on metaphorical, nonliteral, figurative, imaginative processing (Lakoff and Johnson 1980; Lakoff 1987; Johnson 1987; Gibbs 1994). While this experiential realism —the metaphorical nature of thought—is controversial, I find it persuasively convincing. This probablistic, nonpropositional view shifts our understanding of concepts and conceptual structures from similarity and the literalistic to organized theories and configurational constructions (Medin 1989). Mind is more than brain.

Conclusion

I have suggested that "mind" is more poetic and primordial than brain because of its extensive human-symbolic-cultural referents. Brain is more sensible and concrete than mind because of its more focused biochemical neuronal referents. Together, brain-mind provide(s) a neurotheological basis of meaning. As an analytic metaphor, the concept of the working brain or human mind holds together imaginative, intentional, emotional, rational, natural, aspirational, and empirical referents and values.

In exploring the history of explanation in psychology and physics, British psychologist and expert in visual processing Richard L. Gregory (1981) refers to this as "mind in science." For him it is a matter of grasping the relation of Matter and Mind. He believes that "Matter is ultimately mysterious." He goes on to suggest that Mind or consciousness and Matter are "ultimately mysterious because for neither can we point to anything more general—or anything in our technology—to provide analogies for Matter or Mind" (Gregory 1981, 480). He concludes, even as I conclude:

Perhaps I have been trying here to explain one mystery with another; for *meaning* is almost as mysterious as the Mind-brain relation and consciousness. But considering the mystery of the fundamental concepts of physics—matter, time, energy, gravity—together with the immense success of physics at explanation, perhaps this is typical of science! (1981, 480)

Granted that Mind is entirely based on physical brain function . . . it is still very far from clear that physical descriptions of brain structure and function will describe Mind. (1981, 566)

The basic question continues for neuroscientist and humanist/religionist alike: How are the distributed modules of information-processing integrated into the meaning-making reality of human beings?

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