

THE HUMAN BRAIN AND HUMAN DESTINY: A PATTERN FOR OLD BRAIN EMPATHY WITH THE EMERGENCE OF MIND

by *James B. Ashbrook*

Abstract. The human brain combines empathy and imagination via the old brain which sets our destiny in the evolutionary scheme of things. This new understanding of cognition is an emergent phenomenon—basically an expressive ordering of reality as part of “a single natural system.” The holographic and subsymbolic paradigms suggest that we live in a contextual universe, one which we create and yet one in which we are required to adapt. The inadequacy of the new brain—especially the left hemisphere’s rational view of destiny—is replaced by a view of a new relatedness in reality in which human destiny comes from and depends upon the mutual interchange between the new brain (cultural knowledge) and the old brain (genetic wisdom) for the survival of what is significant to the whole systemic context in which we live.

Keywords: brain-mind; cognition; culture; destiny; emergent evolution; genetic wisdom.

People tend to separate destiny from origin, omega from alpha. It is as though who we were (genetically and historically) bears little relationship to where we are going and who we will be when we get there. Destiny takes on the sole meaning of future development unhindered by continuity with nature or adaptation in the present.

Such a narrow, tunnel view of human destiny is comparable to the reverence given to our ideas of the new brain—the neocortex. This evolutionary development has been taken as our crowning glory, that which separates us from all other mammals and the rest of creation.

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[*Zygon*, vol. 24, no. 3 (September 1989).]

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That separation allows us to transcend the complexities of the human brain when the definition of being—life's fullness—resides primarily in the new brain, more particularly the left hemisphere, thus distancing us from the whole created order. This view of destiny cuts us off from the physical universe which gives us life.

I call this view the "new brain" illusion, more particularly the illusion of the left hemisphere. The illusion is dispelled in recognizing that the rationality of the left half of the new brain is an outmoded and distorted understanding of the human mind. The new brain is an extension and elaboration of the old brain—the reptilian and mammalian brains which set our place in the evolutionary scheme of the universe.

An understanding of human destiny requires that we reject the new brain-left hemisphere superiority and rediscover old brain-new brain—or full mind—interdependence. A multidimensional approach to human destiny takes into account the complexities of the human brain—its biological roots *and* its cognitive reaches. While not reduced to the brain, our destiny involves—yes, and requires—the whole brain. In light of this new understanding of the whole brain, we ask the question of what might be the relationship between our brain and our destiny? How does the way the brain is shed light on what humanity is about?

A superficial view of what is happening in the brain sciences could be characterized as a move downward from psyche as mind to soma as body, from mind to brain, from spirit to matter. The dramatic attention to the chemical make-up of the brain as "the hardware of consciousness" (Hooper & Teresi [1986] 1987) supports that impression. In efforts to cope with various forms of mental dysfunction, scientists have turned increasingly to psychopharmacological processes (Snyder 1974). For instance, chemical imbalance contributes to severe depression and so is treated medically. Instead of exploring how a person feels or thinks, effort is directed to the brain's biochemistry. Quite simply, the focus marks a shift from "oppressive beliefs" and "troubled minds" to "broken brains" (Andreassen 1985). Genetic, biochemical, and neurological factors contribute to disturbed behavior (Tanguay 1985).

A closer look, however, reveals a more complex picture. Biological intervention alone is not enough. We need think only of the disillusionment surrounding the deinstitutionalization of mentally ill people by putting them back into the community. Families, support networks, societal conditions, interpretive frames of meaning affect our lives as much as chemistry. These enhance or restrict what is done medically.

A multidimensional approach to human life and human destiny thereby takes into account the complexities of body-mind interaction.

Those interactions include biological brains, cultural beliefs, social conditions, interpersonal patterns, and individual minds. The idea that the mind is not separate from the body is bringing about changes in the way we understand ourselves. The revised view understands that the mind is very much part of the old brain even as the old brain is very much part of the mind.

THE CHANGE IN HOW WE VIEW OURSELVES

In efforts to understand how cultural values and beliefs are mapped onto the brain, part of psychology has been moving upward from soma as physical to psyche as cognitive. Traditional distinctions such as mind-body or matter-spirit no longer fit the empirical data. Researcher Howard Gardner interprets this phenomenon as the cognitive revolution. For him and others, it has become "the mind's new science" (Gardner 1985).

Until the last two decades we have been limited in understanding the connection between soma and psyche, human nature and human destiny. Now we are on the threshold of a reconstruing, catching up with what the poetic and religious traditions have always known. We are neither our own origin nor our own destiny. In the imagery of the writer of *The Revelation of John*, the Lord God is both our alpha, our beginning, and our omega, our fulfillment (Rev. 1:8; 21:6; 22:13).

In reflecting on his experience of himself, Augustine voiced the dilemma of our trying to understand our destiny in terms of consciousness: "I do not myself grasp all that I am. Thus the mind is too narrow to contain itself. But where can that part be which it does not contain?" (Augustine 1955, Bk. X, viii, 210).

The cognitive revolution is returning "mind" to an embodied place in our understanding of ourselves and how we function. Popular books are heralding the unity of body and mind (see Benson 1984; Borysenko 1987). No longer can we view ourselves—nor even other mammals—as passive objects, mechanical organisms, to be manipulated chemically with no attention to the experiential reality which is expressed in and through the physical. We are discovering the crucial role the limbic system plays in that unity. There is a bodily base in all that we feel, imagine, and about which we reason (Rossi 1986; see also Johnson 1987), including our sense of destiny.

The cognitive revolution regarding the mind gives "human" meaning to its biological origin, integrating nature and nurture, instinct and experience. As brain, the concept of mind gives "human" meaning to the evolutionary matrix out of which both itself and culture have emerged. Similarly, as brain, the concept of mind gives "human" meaning to the universe in which it finds itself. The human brain

literally embodies the “human” meaning of divine purpose. Let me explain.

The brain constructs a reasonable view of reality by imaging or representing in a mental schema how things go together. To have a brain and to give a reasonable explanation of the world are one and the same. To have a brain is to be a co-creator of what matters most in human life. There is no way the mind cannot *not* interpret what it observes and imagines (Gazzaniga 1988).

Except in conditions which suspend or negate its natural functioning, the brain does not work by itself. We are part of, and we shape, universes of influence—social, cultural, cosmic. In truth, we live in a contextual universe, a universe of meaning which we create as much as a universe of meaning which we find.

Cognitive psychologist Ulrich Neisser describes that relationship between cognition and reality with a cleverly concise statement: “No choice is ever free of the information on which it is based. Nevertheless, that information is selected by the chooser. . . . On the other hand, no choice is ever determined by the environment directly. Still, that environment supplies the information the chooser will use” (Neisser 1976, 182). In other words, in relation to the environment mind must be understood as semi-autonomous.

Mind is “semi” (autonomous) in the sense that the neocortex—the new brain of the two hemispheres—is always processing information both from the old cortex and from what it observes in the environment. Therefore mind is not creating something out of nothing. Cognition manifests a perceptual *realism* (Lakoff 1987).

Mind is (semi) “autonomous” in that its associations, connections, gestalts precede and go beyond sensory input. It selects and combines input in novel ways. The cerebral cortex transforms the regularities of the old reptilian and the mammalian brains into emergent mental representations. The results are what the triune brain of three minds (MacLean 1970) takes to be real and right, or true. Cognition reveals an experiential *construction* (Lakoff 1987).

These cognitive creations express our emotional convictions of the way the world is put together. The reptilian and mammalian brains do not displace the new brain nor does the new brain displace the older brains. In effect, the concept of mind expresses the human meaning of the physical brain (Ashbrook 1984).

THE EMERGENT MIND AS THE EXPRESSIVE BRAIN

By understanding the older and newer brains as one mind we can approach the cognitive dimension of life as an emergent phenomenon

of a basically expressive ordering. Mind comes out of nature and does not function apart from nature. Mind shapes the physical world even as the physical world shapes mind. Mind creates our destiny even as our destiny comes in and through our mind.

The cognitive—or mental, to use the more conventional word—bridges what we take to be physical and what we regard as human. Matter and meaning are both aspects of biochemical activity. Molecular biology and brain studies point to “the inseparability or oneness of the reality designated by the two domains called ‘life’ and ‘matter’ and the two domains called ‘mind’ and ‘matter’” (Burhoe 1981, 126). Their features and reaches are shaped by the fields of influence—contexts—in which they are located and with which they interact. The brain, as human matter, both reflects the historical reality of the world and shapes that reality on the basis of its own input, including its reptilian and mammalian input. We integrate our cultural contexts and our genetic inheritances into the living realities which we are (Trevathan 1986).

At the loose interface between physical data and vivid personal experience—that nonphysical yet imaginable space which Gordon Rattray Taylor (1979) defines as mind—we find clues to the human meaning of being in a physical universe (Sperry 1982). Those clues consist of “such fancy trimmings as a sense of identity, a sense of humour or a sense of deity” (Taylor 1979, 17-19). These trimmings reflect core features of our brain: our identity as persons; our capacity for perspective through humor; and the nature of the contextual universe in which we locate ourselves or what in religious language we call God. We are part of “a single natural system” (Burhoe 1981, 82, 74-75), an “emergent interactionism” or “mentalist monism” as Roger Sperry (1982) puts it.

Unexpectedly, the cognitive revolution is contributing to the pivotal notion of mind (Gardner 1985). Instead of referring to mind *per se*, the mind’s new science focuses on the centrality of mental representations. We conceive an objective world by uniting three elements into one mental representation: what our senses tell us; the truth or weight of our perceptions tested or checked out against what we remember through use of memory; and an integrating synthesis by means of morality—or sense of order or rightness—in our universe (Johnson 1987; Lakoff 1987). A set of constructs—variously labeled schemas, images, rules, frames, transformations, and other mental structures and operations—is being used to explain cognitive phenomena. These phenomena range from what we see, to understanding stories, to what I call “belief” which is the configuration of assumptions we make about the really real, in short, about our human destiny.

I view this breakthrough in making sense of human life as a wider view of cognition than the older dualistic view of mind as separate from body. This more natural cognition can incorporate physical explanations at the level of the neuronal brain, socio-psychological explanations at the level of the socio-cultural mind (Gardner 1985, 383; TenHouten 1985), and spiritual explanations at the level of the soul (Ashbrook 1989).

Left-brain cognition follows the rules of formal logic. Its information comes from what it observes. It uses language in a way which creates a second-order vocabulary. That is, its vocabulary is less about actual events and objects and more about whether statements are consistent or inconsistent (Gardner 1985, 385). We make sense of life—and create consistency—through the way we interpret life. It is the left brain's analytic processing that makes reality appear objectively stable—and this whether it is or not—conforming it to immediate perceived needs or desires, allowing no place for argument or disagreement, thus making our worldview potentially misleading. When isolated from input from the rest of the brain, the left hemisphere taken by itself is simply the limited mind of myopic rationality. It takes what it thinks—and says—as the last word about reality.

In contrast, right-brain cognition works according to a situational logic. Its information arises from an imaginative construction of patterns or wholes. These mosaics of what is meaningful come about as a result of processing which can be described as simultaneous. Though it never works completely independently of left brain input, especially in the frontal area, the right brain functions in a way that falls “into patterns with huge numbers of interconnections and a minimum of formal symbolic processing” (DeAngelis 1987; Rumelhart et al [1986] 1987; see Pribram 1986).

The ability of the right hemisphere seems to be based on “the *pars-pro-toto* principle, that is, the immediate recognition of a totality on the basis of one essential detail” (Watzlawick 1978, 69-73). Everything is there—all at once, by a leap of imagination. We see *archetypes*, according to neurophysiologist Paul D. MacLean, partial representations which we take for the whole (Hopper and Teresi [1986] 1987, 47).

Pars-pro-toto is a way of seeing things obliquely—not looking at an object or event straight on or with a direct, studied look but rather from a glancing, off-centered view. This may be similar to “seeing through a glass darkly” (1 Cor. 13:12). And it may be exactly the way that part of the brain has to operate later on in order to make symbolic connections possible through images which are seen, though they are not seen in an objective or physical sense.

THE HOLOGRAPHIC PARADIGM

Research scientists such as Karl Pribram identify this phenomenon of the oblique imaging of the whole as the *holographic paradigm* (Wilber 1985; Pribram 1985, Pribram 1986, 514). We do not “see” objects directly, rather we “construct” objects as when we listen to music from two stereo speakers so balanced that the sound seems to come from a point midway between them (Wilder 1985, 9).

Holography is a form of optical storage in which each individual section (part) of a photographic plate contains the image of the whole picture in condensed form. If you take a holographic picture of a person, for instance, and cut a section out of the person’s head, and then enlarge that section to the original size of the picture, you do not get a big head but rather the whole person (Wilber 1985, 2).

Belief patterns, I suggest, are basically holographic. When theologians talk about unity-in-diversity, therefore, they are saying that the whole is in the part; and when they speak of diversity-in-unity, they are indicating that the part contains the whole. Any and every part of the hologram reconstructs the whole image.

From research and reflection on the precise mathematical holographic transformations of waves of information (which are distributed over the entire photographic film) into whole images, Pribram speculates about the classic dichotomy between the physical and the mental (Pribram 1986; 1985). On the basis of the holographic paradigm he rejects the mentalist who gives the primary weight of evidence to experience and phenomenology as well as the materialist who gives the primary weight of evidence to “the contents of the experience” and the physical. For him, “structure” constitutes both mind and brain in that each proceeds in a different direction in conceptualizing and realizing systems of information (Pribram 1986, 512).

The brain, according to Pribram, does not organize input gained from the physical world (through the senses) and from this construct “mental properties.” Instead—and this is the astonishing speculation—“Mental properties are the pervasive organizing principles of the universe, which includes the brain” (Pribram 1985, 29-30).

From this perspective, the brain-mind reflects the basic structure of the universe. It is *the relationships* which exist among the many observations that are cognitive and thereby mental phenomena. This leads Pribram to suggest that “perhaps the very fundamental properties of the universe are therefore mental and not material” (Pribram 1985, 29). Order itself constitutes the really real and not the components which make up order. In theological language this has been called “Logos,” the “Word.”

The question then becomes whether mind and cognition are “emergents or expressions of some basic ordering principle” (Pribram 1985, 33-34). If mind is “emergent” from nature, then mind evolves from brain and brain evolves from matter and matter means the separate and many particles of dust. If mind is an “expression” of nature, then mind reveals a basic undivided, whole universe of imaged relationships. Then the separate “entities” which we observe in ordinary time and space are images which we “read out” from each part which has access to the whole even as the whole is present in each part.

A photographic lens focuses, objectifies, and sharpens boundaries between the parts of any scene. It functions in a left brain step-by-step manner. In contrast, holographic operations are distributed, implicit, unbounded, and holistic. These operate in a right brain all-at-once process which draws directly upon the subsymbolic, parallel, distributed activity of the limbic system. Our senses “make sense” of reality “by tuning in (and out) selective portions of this [holographic] domain” (Pribram 1986, 517-18).

Thus, the brain is an analyser and transformer of energy and relationships. Reality consists of the imaged configurations of energy systems rather than raw objective stimuli. Only the ordinary world of experience is made up of physical matter. Real reality is “neither material nor mental, but neutral . . . [an] informational structure” which organizes energy (Pribram 1986, 512).

As Howard Gardner characterizes this wider form of cognition, we do not approach the “more complex and belief-tainted processes such as classification of ontological domains or judgments concerning rival courses of action . . . in a manner that can be characterized as logical or rational or that entail step-by-step symbolic processing” (Gardner 1985, 385). What we believe to be true, what we take to be right, what we decide is the best way to proceed in a specific situation all require a patterning of reality which involves something other than a logical progression. Instead, we use biases, images, hunches, vague patterns—yes, and beliefs as well. Our destiny arises from our imaging and imagining, and our imagining is, finally, confirmed by optimal evolutionary adaptation.

For me, faith is the experiential anchoring of what matters most in life. It appears in the old brain, below the conscious level of the two hemispheres. That bodily sense of reality then gets voiced in terms of what we believe.

As the Letter to the Hebrews puts it, “faith is the assurance of things hoped for, the conviction of things not seen” (Heb. 11:1 RSV). “Assurance” and “conviction” about what matters are right brain responses to limbic activity in the service of survival of the self and continuity of the

species. Belief thereby is a transformation of biological experience into conceptual explanation. Beliefs are left brain explanations of visceral experience. They give conceptual focus to our sense of destiny. They derive from limbic environmental empathy and direct us back to that context.

The formal categories of the left brain tend to take on permanence. It is as though these categories of “what’s there”—objects, experiences, and events, or even ourselves, the world, and God—actually exist as objective “entities” so that when we think about them our mind is “mirroring” the “entity” in the external world. But in viewing our categories as existing independent of ourselves we fail to take account of the fact that these perceptions are always “messy, intuitive, [and] subject to subjective representations” (Gardner 1985, 380, 386).

These intuitive representations reflect right brain and limbic decision-making as to what is perceived to be there and whether that is desirable or undesirable, to be approached or avoided, to be sought or fought. Here in the messiness of life we find the issue of our destiny. That issue includes “the role of the surrounding context, the affective aspects of experience, and the effects of cultural and historical factors” on how we act (Gardner 1985, 387). Everything we think or feel occurs in a context of meaning. We construct that meaning based on bodily experience and the imaginative use of reason (Johnson 1987; Lakoff 1987). And as Thomas Aquinas expressed the belief, God as our source is always our good (Burrell 1973, 169-70).

THE SUBSYMBOLIC PARADIGM

Some scientists are now calling this whole brain process the *subsymbolic paradigm*. That means “the most powerful level of description of cognitive systems is hypothesized to be lower than the level that is naturally described by symbol manipulation” (Rumelhart et al. [1986] 1987, 1: 195), or what we ordinarily think of as language. For all the power of the symbolic-sequential capability of our left hemisphere (what we ordinarily know as the rational mind), it is the subsymbolic activity of our total cortex—primal, emotional, and rational—which accounts more adequately for what we know and how we know it. The left brain, whose “mental processes can be modeled as programs running on a digital computer” (Palmer 1987), simply does not function without the subsymbolic activity of the rest of the brain, whose mental processes may be best modeled as “the flux of global patterns of activation over the entire network” (Palmer 1987), nor does the rest of the brain function without the symbolic activity of the left and right hemispheres of the new brain.

In other words, the left brain, with its vigilance and explanations, approaches reality in terms of a symbolic paradigm. The symbolic paradigm is restricted to the new brain and more especially to its rational mind, though it is important to remember that it is the relational mind of the right brain which creates the whole symbolic paradigm. I suggest that this process of abstracting realistic features from immediately perceived experience contributes to the dualistic distinction between an objective physical world and a subjective phenomenal realm.

In contrast to such a dualistic view, brain research is directing us toward an approach to reality more in terms of a subsymbolic paradigm. The approach gives greater weight to natural processes in meaning-making, what are technically known as category construction and definitional classification (Lakoff 1987; Johnson 1987). The questions of classification are these: What features constitute "an object?" and How is that object distinguished from all other objects?

Only by studying how alike things are can we arrive at their differences or see those differences when they do exist. Concepts of perfection, adaptation, and invention can occur as a result of this perception of likeness. The perception might lead to an idea of beauty, of joy and order which transcends our presence and opens the mind and soul to a holy place or idea of God. For we always come back at this point to a realization that the order was there before we were and we ourselves did not make it. With Aquinas we can say that God is the name by which we identify "the origin and the goal of this inbuilt orientation" (Burrell 1979, 31) of order: we are "directed to God as to an end that surpasses the grasp of [our] reason. . . . But the end must first be known by [us] who are to direct [our] thoughts and actions to the end" (Aquinas 1945, 1:6) of perfected ordering.

These natural processes operate at every level of brain organization, and by so doing they are identified as massively parallel and widely distributed in both what is represented and how it is controlled. They combine memory and novel associations of memories. This mind-ful brain makes us different from the machine-like (rational) left hemisphere and the mammalian-like (emotionally motivated) right hemisphere. We construct a world—the realism of the symbolic paradigm—in terms of our subsymbolic experience. Our destiny includes and requires biological-genetic activity.

No matter how sophisticated we make machines, we are still better at "perceiving objects in natural scenes" than any machine. We are quicker at noting relationships. We more easily understand commands and retrieve "contextually appropriate information from memory" (Rumelhart et al. [1986] 1987, 1:3). We make plans and carry them out more effectively than even the most sophisticated computer.

In essence, we are “smarter than today’s computers.” The reason lies in the fact that our brain is better suited to deal with tasks which require “the simultaneous consideration of many pieces of information or constraints,” since every constraint may be vague, ambiguous, and inadequately specified. Furthermore, “most everyday situations cannot be rigidly assigned to just a single” frame of reference or schemata of meaning (Rumelhart et al. [1986] 1987, 1:9). This kind of common-sense complexity requires a grasp of the context in which we act, and it is precisely the context which is of our own making. Further, the context we make reflects our destiny as we imagine it to be.

In relation to animals, we are better at sequential symbolic processing. Traditionally we have called this “rationality” our capacity to imagine, to think, to plan, to implement, to evaluate in conscious ways. The capacity points to the higher-ordering processing in which we engage—the macrostructures of meaning. There is no way our cultural heritage, with its technology and its artistry, can be explained simply on the basis of genetics alone (Burhoe 1981; 1987). Unlike other animals we can pass on to future generations accumulated information about the past. That is why so much of our experience consists of what we learn instead of what is instinctual. We have more cortex uncommitted to motor or sensory function at birth than any other mammal (Penfield 1975, 20).

According to the mythical interpretations of our origin in the Book of Genesis, we are breathing dust (Gen. 2:7). We embody all that is and is to be, created, as the phrase has it, “in the image and likeness” of that Reality which is and will be what it will be (Gen. 1:27; Exod. 3:14). Undoubtedly, this capacity to order “Order”—to have dominion over everything (Gen. 1:28b) by “naming” it (Gen. 2:19-20) and thereby objectifying it—reflects the higher-order processing of the neocortex, a recognition of the larger contextual universe in which the human brain exists.

In effect, every logical piece of information is embedded in a distributed, parallel, simultaneous, contextual network of meaning. I take this subsymbolic, microstructure of meaning to refer to the neuronal activity of the brain. What gains our attention because it is new, different, and/or disturbing is seen, then grasped, as it resembles what we have seen before. We catalogue objects according to their apparent similarity in terms of how they appear, the associations we make about them, and the feelings we identify with them in memory.

Parallel to that microstructure of meaning in the older brain, I regard that activity of meaning-making as inevitably part of the symbolic macrostructures of meaning in the new brain. These conscious processes are the “observed regularities” in our world (Rumelhart et al. [1986] 1987, 2:548). In their most global form these observed

regularities are belief patterns—what might be viewed as the imaged realities of holography and our projection of our perceived destiny. I suggest that these belief patterns are a result of our observed order of things in our universe—the overwhelming sense we sometimes arrive at that all our knowledge, all our being only leads back to this order which if we find, we find ourselves a part of it—and we often call that part of ourselves that reaches it our connection with God. It becomes our purpose and our existence defined.

Even though language is our most regularized structure of meaning, language is turning out to be metaphorical, not objective (Lakoff and Johnson 1980; Gerhart and Russell 1984). Concepts define everyday realities by structuring what we perceive, how we get around, and how we relate to each other. This is the order that the likeness of things established. But concepts arise out of metaphors, which means that concepts reflect our experience more than a mirrored reality of absolute truth. “*The essence of metaphor is understanding and experiencing one kind of thing in terms of another*” (Lakoff and Johnson 1980, 5; italics in original). Only a subsymbolic, parallel, distributed process can generate these kinds of unpredictable associations.

Differences of opinion, for example, can be viewed as “a dance,” though they usually are conceived as “an argument”—and arguments are structured as “war.” We need only think of phrases we use in describing much of our conversation with each other: “Your claims are *indefensible*.” “He *attacked* every weak point in my argument.” “His criticisms were right *on target*.” “He *shot down* all of my arguments” (Lakoff and Johnson 1980, 4; emphasis in original).

The metaphorical basis of how we think and talk makes language an imaginative creation based on visceral experience and visual perception. Words are not permanent, substantial, independent entities. Symbolic regularities exist in our conscious mind more than in the distributed processes of dynamic interaction. Words and ideas are finite, subjective, abstract configurations of reasonable sensibilities. We develop a coherent system of metaphors which we then use as the basis of the abstract concept.

Figurative and denotative language patterns—the poetic and the mechanical, the religious and the scientific, the metaphorical and the analogical, respectively—are not fundamentally different types of meaning arising from fundamentally different processes in the brain. Instead, I submit that what is suggestive and what is exact, what is psyche and what is soma, what is purposeful and what is physical, what is mind and what is brain are “coarse categories describing the nature of the meanings synthesized” by *parallel distributed processing networks* (Rumelhart et al. [1986] 1987, 2:550). Instead of local representations of the symbolic process being primary in cognition, a distributed

dynamic network with feedback loops is more basic. When the mind is working optimally it is constructing phenomena across time and space. There are no hard and fast boundaries. As a folk saying puts it: we lose ourselves in thought. This is how and why the cognitive revolution is carrying us into a wider realm of mental representation than Enlightenment Reason suspected to exist.

THE INADEQUACY OF THE INTERPRETIVE LEFT HEMISPHERE

From the 1500s on, the Western world has been dominated by the scientific revolution and its counterpart in the intellectual tradition which found coherence between science and the humanities (Bronowski and Mazlish 1960). Enlightenment Reason combined the lawfulness of mathematical certainty and the objectivity of empirical observation with the logic of formal rationality (Barbour 1966). In very specific ways we are the inheritors of the dualism of René Descartes (1596-1650) and the mechanism of Isaac Newton (1642-1727).

Ironically, Descartes' method of seeing the universe as a mathematical and logical structure came specifically from a mystical experience he had during the night of November 10, 1619, at the age of 23 (Bronowski and Mazlish 1960, 216-29). By doubting everything, he forged the empirical method of observation and the logical method of formal reasoning. In this way he arrived at a view of the universe which was "both realistic and orderly" (Bronowski and Mazlish 1960, 229). Because he distrusted the imagination, he drew a sharp cleavage between the inward experience of mind and the outward examination of matter. Even so, he remained a devout Catholic all his life and treasured the memory of his dream discovery.

In a similarly ironic way, Newton's method of combining mathematics and experimentation came neither from observation nor deduction alone. Rather, his discovery of the law of gravity and his metaphor that nature is a law-abiding machine required "creative imagination" and his belief in God (Barbour 1966, 34-55). He, and the other English scientists of the second half of the seventeenth century, directed their investigations "to the glory of God and the benefit of the human race" (Barbour 1966, 37). Whether God was the Divine Clockmaker who wound up the world like a clock, the Cosmic Plumber who mended leaks in the system, the Ultimate Conservative who maintained the status quo, or the Cosmic Architect who built the universe, religion was more a matter of "intellectual demonstration" than of "living experience" (Barbour 1966, 40).

That rational, objective certainty—what I identify as the symbolic paradigm of the interpretive left hemisphere—sprang from and depended upon relational patterned imagination: what I identify with

the subsymbolic paradigm of parallel distributed processing and the holographic paradigm. To the early modernists science was “a religious task,” and so it can be today. Without using explicit “religious” language, we can say that *human destiny requires integrating nonconscious subsymbolic experience and conscious symbolic realism, genetic givens and cultural inheritance.*

Cautious scientists insist we are “a long way from connecting our more abstract networks with particular brain structures” (Rumelhart et al. [1986] 1987, 2:552). Even so, it is evident that our left brain’s reasoning capacity is an interpretation of our right brain’s meaning-making sensibility. Despite the vigilance of the left hemisphere, our right brain’s responsiveness to the felt-meaning of the environment continues to be primary. Whole brain processing is more fundamental—and a lot more—than half brain activity (Levy 1985).

Ordinary consciousness carries on with all the exact representationalism which assumes that the maps we make in our heads correspond to the territory we actually are and the territory in which we find ourselves. But maps are never the territory (Korzybski 1933; Hooper and Teresi [1986] 1987, 103-4). Increasingly, we are recognizing that no amount of human mastery can dispel the cosmic mystery which we incarnate. Our three-pound universe reveals an integrated and integrating reality, a higher-order processing of lower-level randomness (see Gen. 1-3).

In light of the mystery of our three-pound universe one might ask: If following the nature we are made in, namely the image of God, and if God is the order and ordering logic of the universe, and if such an order and ordering reflects stringent, analytical processing, then why should not humanity, as made in God’s image, duplicate such an order and ordering analytical process?

So I suggest in understanding mind that we move from the cognitive focus on mental representation to understanding mind as a way to summarize all that includes the human meaning of the brain: bodily perception, imagination, culture, values, beliefs, destiny. What we learn about cognition, based on what the brain knows and how that is represented mentally, leads us to what matters ultimately; namely, what we take God to be, the alpha and omega of our destiny. Here we deal with the survival of what is significant and the significance of what survives (Burhoe 1981, 158).

WHOLE MIND AND NEW DESTINY

The concept of mind, expressing as it does the human destiny of the human brain, directs our attention downward into the organized regularities of the reptilian-mammalian levels and equally encourages us to

turn outward toward the emergent aspects of human purposes (Ashbrook 1986). The royal road toward understanding how culture is mapped onto brains, as Gardner puts it, is the representational level (Gardner 1985, 390-91). The whole mind makes belief more credible and destiny more immediate.

To speak of "the whole mind" is to refer to the "whole" brain—old cortex and new cortex together, inseparable, interdependent. Consciousness consists of both the pattern-making construction of the right hemisphere and the observing-objectifying activity of the left hemisphere. Yet consciousness derives from the environmentally empathic, adaptational activity of the nonconscious, subsymbolic older brains. Consequently, the concept *mind* includes both nonconscious information as well as conscious representation.

The roots of the mythic Tree of Life (Gen. 2:9a) go down into the genes—our reptilian and mammalian heritage—and its branches—the neocortex or the mythic Tree of Knowledge (Gen. 2:9b)—stretch out into the ecosystems in which we participate. Through all of this processing God works, providing us with our purposes, our values, our convictions, our commitments. Just as mind discloses the human significance of brain, so mind points to what I understand to be the intentionality of God.

The prophet Jeremiah expressed this inner link between God's purposes and humanity's understanding when he had Yahweh God say: "Deep within I will plant my Law, writing it on the heart" (Jer. 31:33 JB). In biblical psychology, the heart is the unifying and central focus and equivalent of the personality, the seat of our psychic life including emotion, intellect, volition, the moral life, and the point of contact with God (Sellers 1962). In technical terms, theology and ontology are dependent upon epistemology, and epistemology depends upon the functioning of the brain (Ashbrook 1989). The nature of God, the nature of human nature, the nature of the universe, the nature of human destiny are matters which depend upon how we know and how we process what we know.

I believe the distinction between disclosed and discovered truth, or between revelation and reason, is misleading. Such dichotomies reflect the Cartesian split between mind and body and the earlier Hellenic duality of body and soul. It is precisely such splits that the newer brain sciences and this newer form of theology are overcoming. The revised view of cognition makes sense; the old view of cognition does not.

A RENEWED RELATEDNESS IN REALITY

In relation to the larger scheme of things we wonder: How can we be who we are in the midst of the mystery that is ourselves? In relation to

more immediate situations we ask: How can we survive and find satisfaction in an environment which is both threatening and inviting?

For me, these issues of our nature and destiny are linked inseparably with the data of evolutionary development, brain-mind activity, cross-cultural comparisons, and religious expressions, most particularly biblical and theological images, events, and interpretations. Despite the supposed conflict between the selfish genes of our biological nature and the pro-social motivation of our human capacity for symbolization, evidence points increasingly toward our destiny as one in which we are to be "in harmony with the universe" (d'Aquili 1983, 266-67).

In truth, I question whether we are citizens of two worlds—a world of biology and a world of culture (Theissen [1984] 1985, 145), because I believe it is more accurate to say that we as organisms are expressions of—participants in and citizens of—one reality, a reality in which we must "choose" to be at home and for which we are responsible. Our brain—the whole mind—reveals "parallel but interrelated processes, one biological and the other cultural . . . [with] separate mechanisms for the production," selection, and transmission of variations over time (Csikszentmihalyi 1987). As theologian Philip Hefner characterizes the issue of genes and culture, humanity "is always struggling to integrate its biological equipment into the cultural configuration which the human has become" (Hefner 1986, 3).

Take the everyday experience of sweating as an illustration of the struggle to integrate genetic input and cultural context. We sweat differently in different situations. The profuse sweating which accompanies strenuous exercise has a beneficial effect on the body and the mind (Achterberg 1985, 139), reducing the stress of the sympathetic nervous system and activating the relaxation of the parasympathetic system as blood flow to the skin is increased (Achterberg 1985, 33-35). Yet the profuse sweating which comes in situations of extreme anxiety, focused fear, and even mild threat activates the survival reactions of the limbic system. The resulting tension sets off an alarm which puts the system on alert, aroused, vigilant, running full speed (Selye 1976).

The point is straight forward: we change to fit into what we experience to be happening in our world. And those changes result from the activation of the old brain and the imagination of the new brain; genes and culture, subsymbolic and symbolic processing. Our destiny comes from the whole mind, cortical and subcortical, new brain emergence and old brain empathy.

Consider, as an example, the very real changes women are going through in being both mother and a person with a "career." This is not a new situation for women because such has been the experience of many women in the past. Rather, the problem is more general now. We

do not talk about “work” which women did in the past when they “worked” outside the home. Instead we refer to that pattern as “career,” especially for those with education. To be paid for doing something carries the message for a woman and others that she is “worth” something. She is “doing something” significant.

These new cultural expectations and demands radiate all kinds of effects: family structure, redefining of “traditional” male and female roles in the social, economic, and political sectors. In the process we as a society are undergoing new and different ideas of nurturing and caring for our young. Beyond these changes we can think of the more fundamental changes in family structure that are coming about because women in greater numbers are single heads of generally very poor families. The pattern is being called “the feminization of poverty.”

Parallel but interrelated processes—biological and cultural—are everywhere evident. Consider the social pattern of the single-parent woman. How might her “mind” gather her life together if she is on welfare and supporting one, two, three, or more children? Vigilance is likely to be more in the service of the children—the continuity of the species—than in the survival of the self, a limbic activity with the arousal of the amygdala utilized by the septum for protection and nurturing. In less adaptive circumstances vigilance serves to maintain a woman’s own survival, with the needs of her children quite secondary; a limbic activity with septal activation subsumed by the sympathetic arousal of the amygdala. At the most adaptive level, care of her children requires care for herself as well—a level of moral development in which a balance of care and rights, intimacy and identity, interdependence and integrity constitute maturity (Gilligan [1982] 1983, 151-74); an integration of all limbic activity for optimal environmental adaptation.

Contemporary experiences of patriarchal oppression and ecological precariousness suggest a reversal of the concern for genetic-cultural integration. Perhaps the issue is less one of integrating our “biological equipment into the cultural configuration,” as Hefner (1986) and others have stressed, and more one of integrating our cultural patterns into our biological and ecological universe. When viewed this way, transcendence of the human situation requires that we move from the new brain’s prominence and domination back into the old brain’s primacy and purpose, namely, the best evolutionary adaptation under the circumstance. Our destiny lies in the recovery to our relatedness to the whole of creation, not in our getting beyond that origin. Only as the symbolic paradigm arises from *and returns to* the subsymbolic parallel distributed paradigm of what is going on in our contextual universe, only thus do we become the human creatures that we are.

The various data bases of brain and belief, of the physical and the human, of matter and spirit, are intelligible by virtue of both the empirical and the experiential approaches to what is true in human experience. These bases are not reducible to each other, yet they are related. They are not the same, yet they are interdependent. They are not autonomous, yet they are distinguishable. Whether they are emergent or expressive (see Pribram 1985) is not easily determined.

Paul D. MacLean speculates about our place in the cosmos: "Human beings . . . are the only creatures known to shed tears with crying. Is it possible that the misting of the eyes so commonly experienced upon observing an altruistic act is in any way owing to a reciprocal innervation of mechanisms for parental rescue and for crying represented in the cingulate gyrus [of the limbic system]?" He goes on to point out that "human beings and their antecedents are the only creatures known to have used fire." Then MacLean advances his own conviction about human destiny in the form of a question: "In the course of millions of years did there arise some connection between smoke and tears and activities surrounding fire, including ceremonies involved in disposing of departed loved ones?" (MacLean 1985b). Tears and transcendence link us to an evolutionary adaptation which reveals both our origin and our destiny. We are not simply here, like the alligators or the fruit flies. Rather, we are here on earth, in this universe, in a way that calls forth our caring for one another—in death as well as in life.

This empathic caring marks the most striking change in evolutionary adaptation. Brain and family evolved together (MacLean 1982). Empathic caring came with the long period of dependency necessary for children to get them to functioning "adulthood." With these demands unceasing and the rewards often unseen, early huminoids must have gone through radical old brain-new brain transformation to insure survival of the species along with differentiation of the self. Parent-offspring smiles and soothing sounds reinforced attachment behavior necessary for physical survival and emotional security on the one hand and activated exploratory activity in response to novelty on the other (Paterson and Moran 1988). The consequence was seeing the child as part of oneself within the family, and with the appearance of religion (Burhoe 1981) seeing the other—nonkin stranger and enemy alike—as neighbor to be loved as one loves oneself (Lev. 19:18; Matt. 5:43; 19:19; 22:39; Mark 12:31; Luke 10:27; Rom. 13:9; Gal. 5:14; James 2:8). Process thought points to this caring when it claims that "sympathy, 'feeling of feeling,' is an ultimate principle, applicable to deity and every other singular activity" (Hartshorne 1975, 92).

Research psychologist George Wolf picked up that emphasis upon altruistic empathy in an article on "The Place of the Brain in an Ocean

of Feelings" (Wolf 1984). He described visiting a laboratory "in which the activities of individual neurons were being monitored by transducing [transforming and translating] the neural impulses to pulses of sound." In the midst of the "popping" sounds of the neural impulses, he heard what he described as "a soft moan." The researcher told him that "it was the sound of a dying cell—a high frequency discharge as the cell's life ebbed away." Wolf claimed that his "empathic interpretation" of that event could be taken as "an empirical-hypothesis," yet he himself believed that "the moan was an expression of a feeling that all sentient creatures share—it was a feeling of perishing" (Wolf 1984, 119).

Perhaps in the end we represent moral order in the mind because when observed over time we see nothing but order in nature: parts relating to other parts, each to another to make a whole. This idea of order is so stupendous we develop symbols to describe it, symbols which continue for us—as it must have for our ancestors in the furthest reaches of time when they first formed words—to express and articulate the inexplicable.

A cell's soft moan as its life ebbs away, a mammal's cry in recognition of separation from nurturing care, human tears in the presence of death, religious testimony to a gracious God, theological expressions of transcendent purposes, values, and beliefs—each of these bridges the simply physical and the surely spiritual. In the language of evolutionary psychiatry, MacLean says what I am groping to say in the language of theology: "Perhaps we can trace to this situation [of the separation call] the evolutionary roots of unity of the family, unity of the clan, unity of the larger societies, as well as the human philosophic yearning for an abstract kind of unity" (MacLean 1985a, 415).

But that abstract unity is turning out to be a concrete unity—a oneness with the whole created order through every level of organization, from dust to breath to belief to dust—brain is being and being is brain. Or in the poetic words of Emily Dickinson: "The brain is just the weight of God" (in MacLean 1988). It bears the glory of divine destiny. As we understand ourselves and our place in our world, we are understanding the relatedness of everything that is. The thrust of the ecology movement represents but another change in a world which is changing our understanding of who we are in the universe in which we find ourselves.

In our penultimate knowing, we see through the obscuring lens of our perceptual-cognitive biases, the cognitive maps or mental representations of culture, if you will. In the imagery of the apostle Paul, we see through a glass darkly (1 Cor. 13:12). Even so, we are discovering that matter and meaning, the physical and the psychic, the sensory and

the spiritual are more alike than different. Whatever the mutative selectivity that has combined dust and breath, we cherish it. We are object-seeking creatures and meaning-making animals.

The old brain (with its genetic knowledge) and the new brain (with its cultural knowledge) make meaning-making understandable in new ways. Even as symbolic meaning is demystified, we are coming to a deep sense of mystery in the materiality of the human brain and the mentality of the physical universe—our destiny as human beings. We live in a universe in which variety is constantly being created and the world is ever renewed (Ps. 104). New things are always being disclosed, created out of the hidden unformedness in which we dwell (Is. 48). The hidden wisdom which permeates our universe (the older cortex) is being revealed through the image and likeness of the creative Spirit in us (the whole cortex). And that Spirit explores everything, even the depths of our own creative imaginative Spirit (1 Cor. 2:10).

REFERENCES

- Achterberg, Jeanne. 1985. *Imagery in Healing: Shamanism and Modern Medicine*. Boston: New Science Library/Shambhala.
- Andreasen, Roberta. 1985. *The Broken Brain: The Biological Revolution in Psychiatry*. New York: Basic Books.
- Aquinas, Thomas. 1945. *Basic Writings of Saint Thomas Aquinas* vols. 1 and 2, edited and annotated, with an Introduction by Anton C. Pegis. New York: Random House.
- Ashbrook, James B. 1984. "Neurotheology: The Working Brain and the Work of Theology." *Zygon: Journal of Religion and Science* 19 (September):331-50.
- . 1986. "Brain, Mind and God." *The Christian Century* (March 19):295-98.
- . 1989. "The Whole Brain as the Basis for the Analogical Expression of God." *Zygon: Journal of Religion and Science* 24 (March):65-81.
- Augustine. 1955. *Confessions and Enchiridion*, ed. and trans. Albert C. Outler. Philadelphia: Westminster.
- Barbour, Ian G. 1966. *Issues in Science and Religion*. Englewood Cliffs, N.J.: Prentice-Hall.
- Benson, Herbert. 1984. *Beyond the Relaxation Response: How to Harness the Healing Power of your Personal Beliefs*. With William Proctor. New York: Times Books.
- Borysenko, Joan. 1987. *Minding the Body, Mending the Mind*. With Larry Rothstein. Foreword by Herbert Benson. Reading, Mass.: Addison-Wesley.
- Bronowski, Jacob and Bruce Mazlish. 1960. *The Western Intellectual Tradition: From Leonardo to Hegel*. New York: Harper & Brothers.
- Burhoe, Ralph Wendell. 1981. *Toward A Scientific Theology*. Belfast: Christian Journals Limited.
- . 1987. Personal conversation and notes critiquing James B. Ashbrook's "From Being to Brain: Natural Theology in an Empirical Mode." Paper presented to the Science and Theology Section of the American Academy of Religion, Boston.
- Burrell, David. 1973. *Analogy and Philosophical Language*. New Haven: Yale Univ. Press.
- . 1979. *Aquinas: God & Action*. London: Routledge & Kegan Paul.
- Csikszentmihalyi, Mihaly. 1987. "On the Relationship Between Cultural Evolution and Human Welfare." Paper for the American Academy of Science meeting, Chicago.
- d'Aquili, Eugene. 1983. "The Myth-Ritual Complex: A Biogenetic Structural Analysis." *Zygon: Journal of Religion and Science* 18 (September):247-69.

- DeAngelis, Tori. 1987. "Computer Theorist (David Rumelhart) Nabs MacArthur Prize." *APA Monitor* August 28:28.
- Gardner, Howard. 1985. *The Mind's New Science: A History of the Cognitive Revolution*. New York: Basic Books.
- Gazzaniga, Michael. 1988. *Mind Matters: How the Mind and Brain Interact to Create our Conscious Lives*. Foreword by Robert Bazell. Boston: Houghton Mifflin Bradford Books.
- Gerhart, Mary and Allan Russell. 1984. *Metaphorical Process: The Creation of Scientific and Religious Understanding*. Foreword by Paul Ricoeur. Fort Worth: Texas Christian Univ. Press.
- Gilligan, Carol. [1982] 1983. *In a Different Voice: Psychological Theory and Women's Development*. Cambridge, Mass.: Harvard Univ. Press.
- Hartshorne, Charles. 1975. "Physics and Psychics: The Place of Mind in Nature." In *Mind in Nature*, ed. John B. Cobb, Jr. and David Ray Griffin, 89-97. Washington, D.C.: University Press of America.
- Hefner, Philip. 1986. "Evolutionary Interpretation of the Christian Faith." Mimeographed paper for the Seminar on Science and Religion. Chicago: Lutheran School of Theology.
- Hooper, Judith and Dick Teresi. [1986] 1987. *The 3-Pound Universe: The Brain*. Foreword by Isaac Asimov. New York: Laurel, Dell.
- Johnson, Mark. 1987. *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*. Chicago: Univ. of Chicago Press.
- Korzybski, A. 1933. *Science and Sanity*. 4th ed. Lakeville, Ct.: The International Non-Aristotelian Library.
- Lakoff, George. 1987. *Women, Fire and Dangerous Things: What Categories Reveal about the Mind*. Chicago: Univ of Chicago Press.
- _____ and Mark Johnson. 1980. *Metaphors We Live By*. Chicago: Univ. of Chicago Press.
- Levy, Jerre. 1985. "Interhemispheric Collaboration: Single Mindedness in the Asymmetrical Brain." In *Hemisphere Function and Collaboration in the Child*, ed. Catherine T. Best, 11-29. Orlando, Fl.: Academic Press.
- MacLean, Paul D. 1970. "The Triune Brain, Emotion, and Scientific Bias." In *The Neurosciences: Second Study Program*, editor-in-chief F. O. Schmitt, 336-49. New York: The Rockefeller Univ. Press.
- _____. 1982. "The Co-Evolution of the Brain and Family." In *Anthroquest: The L. S. B. Leakey Foundation News* 24 (1):14-15.
- _____. 1985a. "Brain Evolution Relating to Family, Play and the Separation Call." *Archives of General Psychiatry* 42 (April):405-17.
- _____. 1985b. "Evolutionary Psychiatry and the Triune Brain." *Psychological Medicine* 15:219-21.
- _____. 1988. Emily Dickinson poem quoted in personal correspondence, December 20.
- Neisser, Ulrich. 1976. *Cognition and Reality*. San Francisco: W. H. Freeman.
- Palmer, Stephen E. 1987. "PDP: A New Paradigm for Cognitive Theory." Review of David Rumelhart et al. *Contemporary Psychology* 32 (11):925-28.
- Paterson, Randolph J. and Greg Moran. 1988. "Attachment Theory, Personality Development, and Psychotherapy." *Clinical Psychology Review* 8:611-36.
- Penfield, Wilder. 1975. *The Mystery of the Mind: A Critical Study of Consciousness and the Human Brain*. Princeton, N.J.: Princeton Univ. Press.
- Pribram, Karl. 1985. "What the Fuss is all About." In *The Holographic Paradigm*, ed. Ken Wilber, 27-34. Boston: New Science Library/Shambhala.
- _____. 1986. "The Cognitive Revolution and Mind/Brain Issues." *American Psychologist* 41 (May):507-20.
- Rossi, Ernest Lawrence. 1986. *The Psychobiology of Mind-Body Healing: New Concepts of Therapeutic Hypnosis*. New York: W. W. Norton.
- Rumelhart, David E., James L. McClelland, and the PDP Research Group. [1986] 1987. *Explorations in the Microstructure of Cognition: Computational Models of Cogni-*

- tion and Perception*. Vol. 1: *Foundations*; vol. 2: *Psychological and Biological Models*. Cambridge: MIT Press.
- Sellers, O. R. 1962. "Heart." In *The Interpreter's Dictionary of the Bible: E-J*, ed. George A. Buttrick, 549-50. New York: Abingdon Press.
- Selye, H. 1976. *The Stress of Life*. New York: McGraw-Hill.
- Snyder, Solomon H. 1974. *Madness and the Brain*. New York: McGraw-Hill.
- Sperry, Roger. 1982. *Science and Moral Priority: Merging Mind, Brain, and Human Values*. New York: Columbia Univ. Press.
- Tanguay, Peter E. 1985. "Implications of Hemispheric Specialization for Psychiatry." In *The Dual Brain: Hemispheric Specialization in Humans*, ed. D. Frank Benson and Eran Zaidel, 375-84. New York: The Guilford Press.
- Taylor, Gordon Rattray. 1979. *The Natural History of the Mind*. New York: E. P. Dutton.
- TenHouten, Warren D. 1985. "Cerebral-Lateralization Theory and the Sociology of Knowledge." In *The Dual Brain: Hemispheric Specialization in Humans*, 341-58. See Tanguay 1985.
- Theissen, Gerd. [1984] 1985. *Biblical Faith: An Evolutionary Approach*. Philadelphia: Fortress Press.
- Trevarthen, Colwyn. 1986. "Brain Sciences and the Human Spirit." *Zygon: Journal of Religion and Science* 21 (June):161-200.
- Watzlawick, Paul. 1978. *The Language of Change: Elements of Therapeutic Communication*. New York: Basic Books.
- Wilber, Ken, ed. 1985. *The Holographic Paradigm and Other Paradoxes: Exploring the Leading Edges of Science*. Boston: New Science Library/Shambhala.
- Wolf, George. 1984. "The Place of the Brain in an Ocean of Feelings." In *Existence and Actuality: Conversations with Charles Hartshorne*, ed. John B. Cobb, Jr. and Franklin I. Gamwell, 167-84. Chicago: The Univ. of Chicago Press.

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