Soul, Psyche, Brain

New Directions in the Study of Religion and Brain-Mind Science

edited by

Kelly Bulkeley
Soul, Psyche, Brain: New Directions in the Study of Religion and Brain–Mind Science

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Kelly Bulkeley
For Those Who Build Bridges
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ACKNOWLEDGMENTS

An edited book is, by definition, a collaborative project. My goal in *Soul, Psyche, Brain* has been to create a platform for the outstanding group of scholars whose works you will read in the coming pages. My thanks, then, go first of all to the friends and colleagues who have contributed chapters to this book. Each of them has crystallized a career’s worth of thought, research, and reflection into their chapters, and to these wonderful people—Holmes Rolston III, James W. Jones, Stanley Krippner, Robert Emmons, Tracey Kahan, Patricia Simone, David Kahn, Patricia Davis, Lewis Rambo, Charlene Burns, Richard Payne, Jeremy Carrette, and Walter Freeman—I express my deepest gratitude for their wisdom, intellectual passion, and critical acuity. No less crucial to the process of creating this book, the editorial staff of Palgrave Macmillan also deserves my abundant praise and thanks. Amanda Johnson, Matthew Ashford, Eva Talmadge, Yasmin Mathew, and Maran Elancheran have been steady, reliable companions in bringing *SPB* to fruition. Several schools, institutions, and audiences have provided venues for valuable conversations about religion and brain–mind science, and for that I thank the following: The International Association for the Study of Dreams, the Person, Culture, and Religion Group and the Religion and the Social Sciences Section of the American Academy of Religion, the Center for Theology and the Natural Sciences, the Graduate Theological Union, John F. Kennedy University, Santa Clara University, Harvard Divinity School, and St. Lawrence University. I am especially grateful to the many individuals who have generously shared their insights on the topics covered in *SPB*, including Nina Azari, Nancy Grace, Carol Rausch Albright, Don Browning, Bill Domhoff, Allan Hobson, Ed Pace–Schott, Roger Lohmann, Steven Bauman, and Ryan Hurd. Finally, over the past year I have been meeting regularly with three fellow alumnae from the University of Chicago Divinity School—Diane Jonte–Pace, Ann Taves, and Catherine Bell—to discuss the impact of recent developments in brain–mind science on the study of religion. Though we approach this subject from different directions, we agree that something very significant is happening here, and Diane, Ann, and Catherine have helped open my eyes to the exciting potentials, and formidable challenges, in this new era of religion–science dialogue.
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Do prayer and meditation really “work” in changing the way the mind functions?  
Is there a “God spot” in the brain, where religious experience originates?  
Are humans genetically hardwired to be aggressively violent, or morally altruistic, or both?  
Is philosophical dualism dead and monism triumphant? Can all religious and psychological experiences be explained in terms of chemical and electrical activities in the brain? Is the soul, finally, a scientifically outmoded concept?  

Yes, no, both, and no, no, no.  

Now that we have these simple-minded questions out of the way, we can get on with the task of exploring the new frontiers of religion and brain–mind science. There has been enough research in both religious studies and cognitive neuroscience to make this much clear: prayer and meditation do change the way the mind functions. There is no one specific neural region that triggers all religious experience. Humans are genetically predisposed toward both aggression and altruism. Philosophical monism is, at present, incapable of reducing all religious and psychological experiences to material brain functioning, and the soul remains a viable concept for understanding the fullness of what it means to be human.

I am not saying that people no longer argue about these questions. They do, and will continue to do so for many years to come. What I am saying (along with all the other contributors to this book) is that the time has arrived for us to move beyond these rudimentary questions and investigate the more complex and more interesting issues that have emerged in the dialogue between religion and brain–mind science. In just the past few years, cognitive neuroscientists have made several remarkable discoveries about the development and functioning of the brain–mind system. These findings raise fascinating questions about theological and philosophical conceptions of human nature. At the same time, recent investigations in religious studies
(in coordination with anthropology, history, and critical theory) have disclosed new ways of understanding the complex, multidimensional qualities of human religiosity. This work has tremendous significance for cognitive neuroscience theories about selfhood, agency, and consciousness. *Soul, Psyche, Brain* brings together these two realms of research, offering a new introduction to a dynamic and growing area of study.

It should be emphasized at the outset that this collection of essays is part of a long tradition of Western scholarship investigating the psychophysiological aspects of religious experience. David Wulff’s *Psychology of Religion: Classic and Contemporary* (1997) documents the efforts made throughout the twentieth century to analyze religion in scientific terms and explain it in relation to natural biological processes. All four of the major pioneers Wulff identifies in the field of psychology of religion—William James, Sigmund Freud, C.G. Jung, and G. Stanley Hall—were dedicated to the goal of discovering the deepest possible correlations between religious experience and brain–mind functioning. Psychology of religion researchers have scientifically examined the effects of particular behaviors long associated with religion, including fasting, sleep deprivation, sensory withdrawal, breath control, dancing, meditation, prayer, and the ingestion of various psychoactive substances. Researchers have also investigated certain brain phenomena (endorphin release, temporal lobe epilepsy, hemispheric specialization) in connection with subjective reports of spiritual experience. The results of these studies have been impressive insofar as they show that (1) religious experience is indeed rooted in the body, specifically in the psychophysiology of the brain–mind system, and (2) that humans have devised a wide variety of highly effective practices for altering that system in religiously significant ways. However, Wulff points out that something important is still missing in this research: “At issue is not whether neurophysiology plays a role in religious experiences—for presumably all experience is represented somewhere in the brain—but whether referral to brain and other bodily processes is *the most appropriate way* by which to comprehend them” (1997, p. 112, italics added).

This is precisely what every chapter in this book seeks—a more appropriate way of comprehending religion and spirituality in connection with the biological nature of our species. Each of the contributors is convinced, as am I, that religion and science can learn much from each other by combining their resources to explore the religiously activated brain. Every chapter offers a creative means of overcoming the conflict between absolutist positions at both extremes—the pro-religion advocates who reject evolutionary science and the pro-science advocates who reject all forms of religiosity. Although the contributors use quite different approaches (more on the details of their chapters in a moment), they all agree that the present moment offers a particularly auspicious time for developing new integrations of religious studies and psychological science. Wulff seems to have seen this coming, as he makes the following prediction in the 1997 edition of his book: “No other approach in the psychology of religion promises as revolutionary...
a future as the biological one” (p. 112). As you will see in the following chapters, that future is well nigh upon us.

In addition to its psychology of religion context, this book should also be seen as the continuation of a longer history of Western reflection on the evolutionary basis of religion. Charles Darwin himself was the first to speculate on this subject, beginning in the mid-1800s. From the start of his career, Darwin recognized the significance of evolution for everything having to do with human mental life. “The mind is function of body” he wrote in an early notebook, and foresaw, with a mix of gentlemanly trepidation and revolutionary excitement, that such a radical idea, if proven, would force a violent overthrow of many theological and metaphysical beliefs long cherished by the British upper class.

It is worth dwelling for a moment on Darwin’s experiences with religion. He was born in 1839 and raised in a well-to-do English family with a tendency toward freethinking atheism (something rather unusual for members of their elevated social class). Having failed at medical school, Darwin made a half-hearted attempt at becoming a minister with the Church of England. He was saved from that fate by the glorious voyage of the H.M.S. Beagle, on which he served as the ship’s official naturalist and upper-class companion for the captain. During his five-year circumambulation of the globe, Darwin came face to face with the mysterium tremendum of Nature. His eyes were opened to the incredibly diverse and interconnected phenomena of the natural world, and he experienced what were perhaps the most authentically spiritual sentiments of his life. The wild, verdant rain forests of South America inspired the twenty-seven-year-old Darwin to exclaim, “No one can stand unmoved in these solitudes, without feeling that there is more in man than the mere breath of his body.” Elsewhere, he spoke of the jungles as “temples filled with the varied productions of the God of Nature” (Desmond and Moore 1991, p. 191).

Alas, this transcendent experience did not have a lasting spiritual impact. The trajectory of Darwin’s intellectual development was decidedly away from religion in any form whatsoever. His experiences aboard the Beagle had shown him how puny humans are in the grand scheme of Nature, and he rejected Christian teachings about the special supremacy of humans in the created world. He felt that all the waste and violence in the world made a mockery of belief in a benevolent God, especially so after the deaths of his father and his beloved daughter Emma. These agonizing losses prompted Darwin to give up any pretense of Christian faith. He did not, however, join with those of his scientific comrades who were using evolutionary theory as a rhetorical weapon against organized religion. Darwin ended his days as a private but resolute agnostic, with no personal belief in God or an afterlife and yet no desire to force other people to believe as he did.

Still, Darwin continued thinking about religion and evolution, and two of his speculations are direct precursors to the major topics of this book. One is his idea that religious faith is not necessary for moral development or psychological maturity, because evolution has endowed humans with
social instincts that naturally incline us to form and maintain bonds of friendship with other people. The Golden Rule, in Darwin’s view, is a product not of divine decree but of evolved instinct. Second is the admittedly heretical idea that perhaps the experience of God can be explained as nothing more than the effect of a particular state of brain organization. Darwin saw quite clearly how materialist implications could be derived from evolutionary theory, implications that would be deeply disturbing to religious believers and would undermine the legitimacy (and political power) of church teachings.

Darwin’s influence on current brain–mind research cannot be overestimated. The evolutionary processes he identified remain the primary framework used by cognitive neuroscientists to explain their findings. Specifically, Darwin’s views on religion and other aspects of human psychology have spawned a growing literature in the evolutionary analysis of religious beliefs, rituals, and experiences. Particularly noteworthy in this regard are Pascal Boyer’s *Religion Explained* (2001), Ilkka Pyysiäinen’s *How Religion Works* (2001), and Thomas Lawson and Robert McCauley’s *Rethinking Religion* (2002). These works carry out an essentially Darwinian project of reducing religious phenomena to their material basis in the biology of human evolution. By contrast, the chapters in *Soul, Psyche, Brain*, though deeply informed by Darwin’s thought, do not stop with the materialist level of explanation. They take the materialist findings of brain–mind science and use them as a platform to ask *new* questions—about the future potential of our still evolving nature, about our capacity for creative imagination and spiritual growth, and about our understanding of what it means to lead a good, fulfilling, fully realized human life. If anything, this book is a call to return to Darwin’s rapturous experiences in the Brazilian rain forests. His own theory makes no place for such experiences of “unchurched spirituality,” but the contributors to this book show that the fullest extension of Darwin’s evolutionary thought must include an openness to these religiously charged dimensions of human existence.

A third context for this book is the one that reveals its greatest limitations. The title *Soul, Psyche, Brain* is intended to highlight the multiplicity of terms and concepts used in human efforts to know ourselves. *Soul* is the term favored by many religious believers, *psyche* is the defining concept of the discipline of psychology, and *brain* is the central focus of cognitive neuroscience. There are obviously great differences among these terms, and much of this book is devoted to exploring their various meanings. However, it should be just as obvious that all three terms share a common cultural foundation in Western civilization. To the extent that almost all the chapters of this book work within the conceptual universe defined by the trio of terms soul, psyche, and brain, the result is that many *other* ways of thinking about these issues will be neglected. The only exceptions are the essays by Kahan and Simone (chapter 5) and Payne (chapter 9), both of which discuss Western psychology in connection with Buddhist points of view. This is actually a fair reflection of the current dialogue between religion and
brain–mind science, at least in the United States. Most of the discussion involves Christian theology in connection with Western psychology and neuroscience, with a small but growing interest in Buddhism. How does this Western discussion relate to the rich traditions of self-knowledge in Islam, Hinduism, and the indigenous cultures of Africa, Australia, and the Americas? Unfortunately, you won’t get much of an answer to that question in the present book. But at least you won’t get a wrong answer, which is what happens too often when researchers use brain–mind science as an exhaustive (and dismissive) explanation for all of the world’s religious and spiritual traditions. If nothing else, the contributors to *Soul, Psyche, Brain* agree that future progress in this field depends on greater humility, open-mindedness, and willingness to learn from others.

Let me say a few words about each of the chapters and their authors. The first is “Genes, Brains, Minds: The Human Complex,” by Holmes Rolston III, a venerable professor of philosophy at Colorado State University and for many years a leading voice in the study of religion and science. Rolston begins with a wide-angle consideration of how our brains are shaped by the genetic inheritance of the human species. He shows how the emergence of culture allowed for tremendous advances in human psychological development, to the point where we now have a capacity for spiritual experience and self-transcendence. Just as he argued in his 1997 Gifford Lectures (later published as *Genes, Genesis, and God*), Rolston says the amazing new discoveries of evolutionary biology do not disprove religion in any simplistic way, but rather enrich our understanding of moral goodness, creative genius, and existential self-awareness.

James Jones of Rutgers University brings his experience as both a clinical psychologist and a religious studies scholar (along with training in the philosophy of science) to bear on the subject of his chapter, “Brain, Mind, and Spirit—A Clinician’s Perspective, or Why I Am Not Afraid of Dualism.” As already mentioned, the mainstream consensus among neuroscientists is that consciousness is a by-product of physical activities in the brain. There is no disembodied soul or purely rational mind—everything we feel, think, and experience can be explained in terms of brain neurophysiology. Many theologians and religious studies scholars have already challenged this materialist approach, though, as Jones shows in his careful analysis of Nancey Murphy’s recent work, these religious responses are themselves inadequate in helping us understand the complex realities of human consciousness and spiritual experience. Jones pushes back hard against the neuroscientific claim that the mind–body problem has been solved in favor of monism over dualism, and argues that a brain-centered approach cannot account for the counter-monistic findings of research in behavioral medicine, meditation, hypnosis, and other fields of psychophysiology.

Stanley Krippner’s long career as a globe-trotting, anthropologically informed psychologist is the foundation for the third chapter, “Psychoneurological Dimensions of Anomalous Experience in Relation to Religious Belief and Spiritual Practice.” The psychology of religion has always taken an interest
in unusual modes of awareness, knowledge, and power. Both Freud and Jung studied the precognitive dimensions of dreaming, whereas James examined people who claimed to be mediums. Recent findings in the neurosciences are adding new pieces of information to our understanding of such extraordinary psychological phenomena, and Krippner (of the Saybrook Institute) provides a concise survey of what is currently known about rare but emotionally and physiologically charged occurrences such as telepathy, mysticism, meditation, intensified dreaming, and near-death experience. He emphasizes that anomalous experiences such as these are not innately pathological or disordered; rather, they reflect the unusual activation of brain–mind processes, which are, in their ordinary condition, increasingly well understood by modern psychology.

Chapter 4, “Sacred Emotions” by Robert Emmons, considers the implications of perhaps the biggest change produced by cognitive neuroscience in our understanding of human nature—the discovery that reason cannot function without emotion. The psychological ideal of a purely rational mind, which goes back to Enlightenment philosophers like Descartes and Kant, has been exploded by neuroscientific research showing that human reasoning abilities suffer terribly if we lose our capacity for emotional experience. *We cannot be healthy and whole without emotions.* Emmons, a psychologist of religion at the University of California, Davis, argues that in light of these findings, we should reconsider the role of emotions in religion, particularly the way religions provide a context and direction for emotional experience and expression. He points to the considerable number of studies on “positive” emotions such as gratitude, awe, reverence, wonder, hope, forgiveness, and joy, all of which are regularly associated with a spiritual orientation toward life. For Emmons, the recent findings of psychological science are vitally important because they refute a simplistic, unidirectional brain→mind view of causality, and reveal instead a complex and dynamic interplay among the body, the mind, culture, and religion.

The practice of Zen Buddhist meditation is the subject of chapter 5, “Where Neurocognition Meets the Master: Attention and Metacognition in Zen.” Tracey Kahan and Patricia Simone, a psychologist and a neuroscientist, respectively, at Santa Clara University, bring together a wealth of new evidence demonstrating the extraordinary qualities of brain–mind functioning during Zen meditation. Many psychological studies have shown that the human capacity for “metacognition,” that is, thinking about thinking, is basic to our self-awareness, emotional regulation, and long-term planning. Of special interest to Kahan and Simone is the capacity for selective attention, involving the metacognitive process of deciding which perceptions, feelings, and ideas to attend to and which to ignore. What Zen meditation is able to do, according to Kahan and Simone, is discipline people’s attention and sharpen their metacognitive focus so they can achieve and then sustain a present-centered awareness. Carrying on James Austin’s project in *Zen and the Brain* (1998), Kahan and Simone further enrich our
understanding of the way certain spiritual practices can dramatically transform brain–mind functioning.

David Kahn’s “From Chaos to Self-Organization: The Brain, Dreaming, and Religious Experience,” offers a state-of-the-art report on the neuroscience of brain development. Kahn’s work at Harvard Medical School’s Department of Psychiatry has focused on the neural and psychological dimensions of dream experience, and in this chapter he uses dreaming as an illustration of a crucial insight about the way the brain functions. The brain, he argues, is a self-organizing system whose healthy and creative development depends on a constant, lively tension between structure and chaos. Kahn’s argument may be disconcerting for religious believers insofar as he claims no special creator is necessary to account for the emergence of human intelligence. But scientific materialists may be equally disturbed by Kahn’s evidence showing the inherently free, unpredictable, open-ended nature of human consciousness.

Kahn’s interest in the neuroscience of self-organization is, despite its very different academic perspective, quite similar to the main topic discussed by psychology of religion scholars Patricia Davis and Lewis Rambo (of the Graduate Theological Union) in their chapter, “Converting: Toward a Cognitive Theory of Religious Change.” The religious phenomenon of conversion, which Rambo has studied extensively, involves varying degrees of individual choice, along with multiple influences at the sociological, cultural, and psychological levels. By using the metaphor theory of cognitive linguist George Lakoff to analyze the language used by Christian converts as they describe their experiences, Davis and Rambo develop a new way of understanding the complex interplay of religious meanings, psychological functioning, and individual choice in experiences of conversion. What comes of Davis and Rambo’s analysis is the recognition that, at least in the case of Christian conversion, the process of religious change is characterized by unpredictable bursts of growth in cognitive complexity and self-awareness.

As illustrated by the Davis and Rambo chapter, much work has been done in exploring the connection between specifically Christian religious traditions and brain–mind science. Charlene Burns’ chapter “Cognitive Science and Christian Theology” gives a masterful overview of this particular area of religion–science dialogue. Burns, who teaches philosophy and religion at the University of Wisconsin, Eau Claire, gives special attention to the implications of brain–mind science for Christian theological claims about the soul. She critically reviews the ideas of the major researchers who have tried over the past several decades to correlate Christian belief with cognitive science, and, much like James Jones in chapter 2, rejects the “nonreductive physicalism” proposed by some contemporary theologians, even though that theory does mark an advance over the materialist reductionism of scientists who believe consciousness is a mere epiphenomenon of brain functioning. As an alternative to these unsuccessful theories, Burns points to resources in the Christian tradition that conceive of the human soul as a psychosomatic unity emerging in relation to a broader cultural community.
One does not have to be a Christian to appreciate the contemporary significance of these historical teachings about the embodied soul.

All of these issues look different when considered from the perspective of a religion other than Christianity. Richard Payne, dean of the Institute of Buddhist Studies at the Graduate Theological Union, explores in chapter 9 the connection between Western psychology and Buddhist teachings on the nature (and nonexistence) of the self. “Overcoming an Impoverished Ontology: Candrakirti and the Mind–Brain Problem” is devoted to the work of medieval Indian philosopher Candrakirti, who provides an especially lucid expression of Buddhist approaches to psychological self-awareness. In addition to providing a detailed portrait of Candrakirti’s prescient ideas, Payne’s chapter describes the long Buddhist history of careful philosophical analysis of the mind–brain question. He compares these teachings to recent Western psychological and anthropological work on the constructive nature of human perception, cognition, and selfhood. A new Western appreciation for the self as a social construct, combined with the ancient Buddhist spiritual quest for release from the illusion of the self—this is the possibility Payne wants us to consider. His chapter, along with chapter 5 by Kahan and Simone, points to an important (and non–Christian) direction for future investigation.

Chapter 10 presents my work on religious and psychological approaches to dreaming. “Religion and Brain–Mind Science: Dreaming the Future” brings together the leading findings about dreams and dreaming from both sides of the dialogue—historical and anthropological studies on the one hand, psychological and neuroscientific research on the other. We have learned a great deal in recent years about the many roles dreams have played in religious beliefs, practices, and experiences from cultures all around the world. We have also learned much about the basic neurocognitive processes that are and are not activated during REM dreaming. The best and most fruitful way of integrating these two areas of research (so I argue) is to study the phenomenology of what C.G. Jung called “big dreams,” that is, dreams that are extraordinarily intense and vivid, with striking images, physiological carry-over effects, and a high degree of memorability. The cross-cultural occurrence of big dreams, combined with their rootedness in the brain, strongly suggest the possibility that such dreams serve powerful adaptive functions, which can be explained and understood in evolutionary terms, the *sine qua non* of Western psychological science.

The penultimate chapter, “Religion Out of Mind: The Ideology of Cognitive Science and Religion,” is by Jeremy Carrette, a psychologist of religion at the University of Kent, whose work centers on a critical reappraisal of the social, economic, and political factors that have shaped, and continue to shape, the psychological study of religion. Carrette examines the recent work of evolutionary psychologists and cognitive scientists (particularly that of Lawson and McCauley) who claim to have identified the fundamental and universal mental processes that give rise to religion. He forcefully challenges the unspoken assumptions and biases that pervade
Lawson and McCauley’s assertions. Without dismissing scientific research in its entirety, Carrette calls into question the automatic authority that cognitive scientists are granted in Western society, and makes us more aware of the subtle but powerful ideological influences shaping everyone’s work in this field of study, including our own.

Walter Freeman, a neuroscientist at the University of California, Berkeley, reflects on the broader social implications of brain–mind research in the last chapter, “Brain Science on Ethics: The Neurobiology of Making Choices.” Originally presented as an invited address at a high-school graduation in Italy, Freeman’s brief chapter will hopefully encourage readers to think carefully about what moral, political, and spiritual lessons they draw from the latest findings of brain–mind research. Like David Kahn, Freeman appeals to research on chaos, complexity, and nonlinear systems in arguing that the human mind is fundamentally free and has the capacity to create its own future. If we accept Freeman’s claim that the scientific materialists are wrong about psychological determinism, and if humans are indeed blessed with the capacity for free moral choice, then the ethical and spiritual teachings of the world’s religious traditions become valuable resources in the future scientific study of the brain–mind system.

It will, I hope, come as no surprise that the book ends without a formal conclusion. There is no need to impose an artificial sense of closure on these issues—the future of religion and brain–mind science is truly wide open. We are living at a time when our sources of information about both religion and brain–mind science have far outstripped our theoretical understanding of how the two areas relate to one another. This gap is likely to widen in coming years, as religious studies scholars continue to analyze and evaluate religion’s increasingly significant role in global life and conflict, while cognitive neuroscientists discover ever more detailed features of brain–mind functioning. The only thing we know right now is that the traditional frameworks used by both religion and science are, by themselves, inadequate to the task of making sense of this surging cascade of new information.

References

Earth is the planet where the most complex creativity of which we are aware has taken place; and on this Earth, the most complex creative thing known to us is the human mind. John Maynard Smith and Eörs Szathmáry analyze “the major transitions in evolution” with the resulting complexity, asking, “how and why this complexity has increased in the course of evolution.” “Our thesis is that the increase has depended on a small number of major transitions in the way in which genetic information is transmitted between generations.” Critical innovations have included “the origin of the genetic code itself,” “the origin of eukaryotes from prokaryotes,” “meiotic sex,” “multicellular life,” “animal societies,” and especially “the emergence of human language with a universal grammar and unlimited semantic representation,” this last innovation making possible human culture (1995, pp. 3, 14).

Maynard Smith, the dean of theoretical biologists, finds that each of these innovative levels is surprising, not scientifically predictable on the basis of the biological precedents. He and his colleague are deeply impressed with the cybernetic and, eventually, cognitive character of what has taken place in natural history, expressed so strikingly in the human mind. What makes the critical difference in evolutionary history is increase in the information possibility space, which is not something inherent in the precursor materials, nor in the evolutionary system, nor something for which biology has an evident explanation, although all these events, when they happen, are retrospectively interpretable in biological categories—at least all except perhaps culture are. The biological explanation is modestly incomplete, recognizing the importance of the genesis of new information channels.

Since we humans find ourselves at the apex of these complex events, it becomes us, as far as we can, to figure out what to make of ourselves, both who we are and where we are. We proceed with an analysis of nature and culture, adapted versus adaptable minds, genes making human brains, human minds making brains, and the spirited human self and our self-transcendence.
At such levels of complexity, we will often be in “over our heads”; but one conclusion is inescapable: what is in our heads is as startling as anything else yet known in the universe. We will be left wondering how far what is going on in our heads is a key, at cosmological and metaphysical levels, to what is going on over our heads.

Nature and Culture

Both “nature” and “culture” have multiple layers of meaning. If one is a metaphysical naturalist, nature is all that there is, and so all things in culture—computers, artificial limbs, or presidential elections—are natural. Nature has no contrast class. At another level, however, culture contrasts with nature; and we need to be adequately discriminating about the real differences between them. Animals, much less plants, do not form cumulative transmissible cultures. Information in wild nature travels intergenerationally largely on genes; information in human culture travels neurally as persons are educated into transmissible cultures.

The determinants of animal and plant behavior are never anthropological, political, economic, technological, scientific, philosophical, ethical, or religious. The intellectual and social heritage of past generations, lived out in the present, re-formed and transmitted to the next generation, is regularly decisive in culture. Culture, by Margaret Mead’s account, is “the systematic body of learned behavior which is transmitted from parents to children” (1989, p. xi). Culture, according to Edward B. Taylor’s classic definition, is “that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society” (1903, p. 1).

Animal ethologists have complained that such accounts of culture are too anthropocentric (indeed chauvinistic!) and need to be more inclusive of animals (de Waal, 1999). Partly because of new animal behaviors observed, but mostly by enlarging (or, if you like, shrinking) the definition, it has become fashionable to claim that animals have culture. Robert Boyd and Peter J. Richerson revise the definition: “Culture is information capable of affecting individuals’ phenotypes which they acquire from other conspecifics by teaching or imitation” (1985, p. 33). The addition of “imitation” greatly expands and simultaneously dilutes what counts as culture. By this account, there is culture when apes “ape” each other, but also culture in horses and dogs, beavers, rats—wherever animals imitate the behaviors of parents and conspecifics. Geese, with a genetic tendency to migrate, learn the route by following others; warblers, with a tendency to sing, learn to sing better when they hear others. Whales and dolphins communicate by copying the noises they hear from others; this vocal imitation constitutes culture at sea (Rendell and Whitehead 2001).

But with culture extending from people to warblers, it has become a nondiscriminating category for the concerns we wish to analyze here.
One finds widespread animal cultures by lowering the standards of evidence. Critical to a more discriminating analysis is the difference between mind–mind interactions, sharing ideas, pervasive in human cultures, and not mere behavioral imitation, copying what another does, which is widespread among animals, that can acquire information. If we are going to call what warblers and geese do culture, then we will need to invent another word “super-culture”—to describe what humans do, which is indeed “super” to these animal capacities.

Opening an anthology on *Chimpanzee Cultures*, Wrangham et al. doubt, interestingly, whether there is much of such a thing: “Cultural transmission among chimpanzees is, at best, inefficient, and possibly absent” (1994, p. 2). There is scant and in some cases negative evidence for active imitation or teaching of the likeliest features to be transmitted, such as tool-using techniques. Chimpanzees clearly influence each other’s behavior, and seem to intend to do that; they copy the behavior of others. Chimps do seem to know when another chimp has seen something (e.g., where food is). But they do not differentiate between those who know and those who do not when they communicate with other chimps. The chimp world is local. In terms of acquired information, if a chimp doesn’t see it (or hear, taste, smell it), he doesn’t know it. If a brother chimp departs and disperses to another troop for a year and then returns, he does not remember and recognize (re-cognize) his brother; they take their family and troop cues from whoever is nearby and do not have the concept of “brother.”

There is no clear evidence that chimps attribute mental states to others. They seem, conclude these authors, “restricted to private conceptual worlds.” In the technical vocabulary, the chimps have little or no “theory of mind”; they do not know of other minds’ being there with whom they might communicate to learn what they know. Without some concept of teaching, of ideas’ moving from mind to mind, from parent to child, from teacher to pupil, a cumulative transmissible culture is impossible. Humans learn what they realize others know; they employ these ideas and resulting behaviors; they test and modify them, and, in turn, teach others what they know, including the next generation. So human cultures cumulate, but with animals there is no such cultural “ratchet” effect.

In a lead article in *Behavioral and Brain Sciences*, Michael Tomasello, Ann Cale Kruger, and Hiliary Horn Ratner pinpoint this difference:

Simply put, human beings learn from one another in ways that nonhuman animals do not . . . . Human beings are able to learn from one another in this way because they have very powerful, perhaps uniquely powerful forms of social cognition. Human beings understand and take the perspective of others in a manner and to a degree that allows them to participate more intimately than nonhuman animals in the knowledge and skills of conspecifics.” (1993, p. 495)

Bennett G. Galef, Jr. concludes: “As far as is known, no nonhuman animal teaches” (1992, p. 161).
We can better dissect nature, culture, and cumulative transmissible cultures with degrees of intentionality (Dennett 1987). Animals are variously socialized, and become what they become due to interactions with their surroundings, which include the groups in which they live. But there is little or no evidence of any higher-order intentionality, even among primates that are highly social. Organisms with zero-order intentionality have no beliefs or desires at all. Animals, such as vervet monkeys, intend to change the behavior of other animals—this represents first-order intentionality. Second-order intentionality would involve intent to change the mind, as distinguished from the behavior (though perhaps the behavior as well), of another animal, that is, to teach by passing ideas from mind to mind. Third-order intentionality involves knowledge that another, a teacher, intends to change one’s mind. Human language is in this sense recursive; animal communication is not. Primates do not seem to realize that there are minds in others to teach, although they often imitate each other’s behavior, as when adults are imitated by their offspring.

In this higher-order sense of communication, conclude Dorothy L. Cheney and Robert M. Seyfarth, “signaler and recipient take into account each others’ states of mind. By this criterion, it is highly doubtful that any animal signals could ever be described as truly communicative” (1990, pp. 142–143). They continue:

It is far from clear whether any nonhuman primates ever communicate with the intent to inform in the sense that they recognize that they have information that others do not possess . . . There is as yet little evidence of any higher-order intentionality among nonhuman species . . . Teaching would seem to demand some ability to attribute states of mind to others . . . Even in the most well documented cases, however, active instruction by adults seem to be absent . . . The social environment in most primate species is probably too simple to require higher-order intentionality. (pp. 209, 223, 252)

David Premack finds that humans are quite unique in their capacity to teach: “Teaching, which is strictly human, reverses the flow of information found in imitation. Unlike imitation, in which the novice observes the expert, the teacher observes the novice—and not only observes, but also judges and modifies” (2004, p. 318). In due course, in human societies, the pupil likewise judges and modifies what the teacher teaches. In such recursive loops, cumulative transmissible cultures can be endlessly generated and regenerated.

Cumulative transmissible cultures are made possible by the distinctive human capacities for language. Language “comes naturally” to us, in the sense that humans everywhere have it. The child picks up speech during normal development with marvelous rapidity; language acquisition is only more or less intentional. The mind of a child is innately prepared for such learning (Chomsky 1986). Human language, when it comes, is elevated
remarkably above anything known in nonhuman nature. The capacities for symbolization, abstraction, vocabulary development, teaching, literary expression, argument are quite advanced; they do not come naturally as an inheritance from other primates, whatever may otherwise be our genetic similarity with them. Though language comes naturally to humans, what is learned has been culturally transmitted; the specific language and content of childhood education is that of an acquired, nongenetic culture. The development, transmission, and criticism of culture depends on this capacity for language.

In a major recent study to determine whether animals have language, the authors Hauser et al. conclude: “It seems relatively clear, after nearly a century of intensive research on animal communication, that no species other than humans has a comparable capacity to recombine meaningful units into an unlimited variety of larger structures, each differing systematically in meaning” (2002, p. 1576). The primate communication “system apparently never takes on the open-ended generative properties of human language” (p. 1577).

After 30 years of study of communication in mountain gorillas, the researchers Harcourt and Stewart conclude:

Gorilla close-calls [those made within the group] are very far from being language-like, they seem to be of the order of complexity of threat displays, as indeed do chimpanzee calls. That simplicity raises the question of why apes, popularly considered more intelligent than monkeys, have apparently a simpler mode of communication, in the sense that they apparently do not label the environment by association of specific calls with specific contexts . . . We have no answer for the contrast. (2001, pp. 257–258)

Cheney and Seyfarth (1990) found that vervet monkeys give different alarm signals for snakes, leopards, and eagles; other monkeys hear these alarms and take cover appropriately to differing predators. Hence, it seemed that the calling monkey intended to refer and communicate its knowledge to others. But the most recent evidence raises doubt about whether the seeming “callers” intend to inform. Rather, these differing noises appear to be spontaneous response grunts in alarm, although other monkeys can learn from such grunts and respond appropriately to the predator that is present. Such signals cannot “be considered as precursors for, or homologs of, human words.” “There is no evidence that calling is intentional in the sense of taking into account what other individuals believe or want” (Hauser et al. 2002, p. 1576).

What is missing in the primates is precisely what makes a human cumulative transmissible culture possible. The central idea is that acquired knowledge and behavior is learned and transmitted from person to person, by one generation teaching another and ideas passing from mind to mind, in large part through the medium of language, with such knowledge and
behavior resulting in a greatly rebuilt, or cultured, environment. Humans have genes, of course; but humans live under what Boyd and Richerson call “a dual inheritance system” (1985; Durham 1991). They live both in nature and in culture. Discovery of the nature and origins of human language, making possible this emergence of culture, is quite possibly “the hardest problem in science” (Christiansen and Kirby 2003, p. 1).

**Adapted versus Adaptable Minds**

In nature, in the lives of animals, the microscopic determinants are coded in the genes, but the macroscopic determinants are found in the ecological niches these animals inhabit, in their need to cope, to survive, as this has been honed by natural selection. We next need to place the mind, which makes culture possible, in an evolutionary context. Mind is at once a survival tool in both nature and in culture. But this evolutionary past, while necessary for explaining our mental powers, may not be sufficient for a complete explanation.

Biologists distinguish between proximate and ultimate explanations (Mayr 1988, p. 28). Why does a plant turn toward light? Cells on the darker side of a stem elongate faster than cells on the brighter side because of an asymmetric distribution of auxin moving down from the shoot tip. But the ultimate explanation is that, over evolutionary time, in the competition for sunlight, there were suitable mutations, and such phototropism increases photosynthesis. Analogously, in the developing infant, genes produce a brain, which sponsors a mind. But the developing infant also inherits a long evolutionary past. The results of this ancient history are delivered biologically at birth to (all normal) members of *Homo sapiens*. These past evolutionary events (phylogeny) are recapitulated (more or less) and generate a contemporary brain (ontogeny), sponsoring a mind. What was achieved in millions of years (even billions if one includes all the biochemistries) is, via DNA suitably emplaced in a zygote in the womb, coded and copied, reenacted in the few natal/childhood months and years.

Therefore, whatever the proximate explanations about how an infant develops a brain and a mind, a more comprehensive explanatory framework is the evolutionary success; brains must have been good for something. Fish have fins, birds have wings, humans have brains—all for adaptive success. Fish must swim, birds must fly, and humans must be cultured. That seems obviously what the distinctive human brain is for. The infant, coming of age, needs to inherit a long cultural past. But there is a vital disanalogy. The information fish need to swim is in their genes, inborn and with some cutting and splicing of this information in the developing embryo; likewise with the birds who fly. The cultural information the infant needs, however, is not in his or her genes. It must be acquired by cultural learning. The previously solitary mind is able to import the acquired knowledge of others and to export its own acquired knowledge. So minds become
ideationally webworked where previously only bodies were genetically and ecosystemically webworked.

One might first think that genes and culture coevolve, and on some scales that can seem reasonable. Humans have lived in cultures for perhaps a million years, during which time they have reproduced across thousands of generations. There is every reason to expect that over these millennia, those humans who do best culturally will do best reproductively also, and vice versa that a genotype will be selected to produce a culturally congenial phenotype.

As cultures become more fluid and complex, however, any tight co-evolutionary connections become problematic. The genes need to produce a keen, critical, open mind, which can evaluate cultural options for their functional usefulness and for their contribution to a meaningful life. The direction of selection in humans, as evidenced by their enormous potential for diverse cultures, would then select for an unspecialized intellect with open educable capacity—from those of the Neanderthals to our high-tech computer age—all of which require intelligence in various roles.

When we try to map the evolution of the brain onto the mind’s acquisition of cultures, we immediately confront a time-joint problem. Evolution proceeds slowly over geologic timescapes; cultural changes can be quite rapid, especially in these modern times. The result is something like linking a horse and buggy with a jet plane. Information transfer in culture can be several orders of magnitude faster and overleap genetic lines. There is a radically accelerated transmission speed. Evolving genes shift in ecosystemic webs and this takes centuries and millennia. Passing ideas around takes minutes, hours, days, though these ideas do accumulate over millennia. The shift is something like that from snail mail delivered on horseback to e-mail on the Internet. The best strategy for slow-paced genes that need to succeed in fast-paced culture is not to build a relatively inflexible mind whose pace and preferences are genetically biased toward one culture or another, since these biases could misdirect persons in the rapidly shifting vicissitudes of culture. Rather, the genes will need to build a flexible mind, which can make preferences independently of any genetic/cultural biases.

When there emerges a later-evolved method of communication at the neural past the genetic level, the genes will subsequently need to develop so as to favor teachability above all. What will get selected is not so much specific gene traits coevolving lockstep with matching cultural behaviors as open teachability, which is to say that the genes will have to abandon tight control of behavior and cast their luck with launching a human organism whose behavior results from an education beyond their control. As more and more knowledge is loaded into the tradition (fire-building, agriculture, writing, weaponry, industrial processes, ethical codes, electronic technology, legal history), the genome selected will be the set that is maximally instructible by the increasingly knowledgeable tradition. This will require that the genes produce a flexible and open intellect, which is generalized and unspecialized, able to accommodate lots of learning and to do so
speedily, able to adopt behaviors that are functional in, or conform to, whatever cultures they find themselves in. Perhaps the owners of these genes may choose another culture and migrate there. Perhaps soldiers or traders from a variant culture will invade their territory and force their culture upon them.

Theodosius Dobzhansky, a principal founder of modern genetics, reached this conclusion: “A genetically fixed capacity to acquire only a certain culture, or only a certain role within a culture, would however be perilous; cultures and roles change too rapidly . . . Human genes insure that a culture can be acquired, they do not ordain which particular culture this will be” (1963, p. 146). Boyd and Richerson, wondering whether genetics might bias our cultural dispositions in our dual inheritance system, conclude: “Genetic differentiation between human populations for determinants of biases is unlikely” (1985, pp. 284–285). It is better to be able to learn any of the myriad human languages than to be genetically dispositions to learn French, better to eat a cosmopolitan fare than to like only Italian food, better to be able to use any of the various cultural ideas than to be genetically inclined to use only Polynesian-originated ones.

Intelligence, based on neurology, allows an organism to make an appropriate, rapid response to an environmental opportunity or threat, protecting it against the necessity of making slower, less reversible responses at the genetic level. If the genes supply intelligence in sufficient amounts, they need not themselves be closely tuned to directing behavior that can track environmental changes; they turn this over to the general intelligence they have created.

But, reply the evolutionary psychologists, this idea of a “global learning capacity” can be exaggerated. The genes do not build a tabula rasa mind; humans do need behavioral dispositions of some kinds, such as to fear snakes or spiders, to seek mates, to avoid incest, to protect their children, to reciprocate for mutual benefits, to obey parents, or follow leaders. Every earthbound culture must provide for persons to be washed, sheltered, go to the toilet, mate, and so on. Every culture must express and control the human emotions—love, fear, joy, grief, guilt, anxiety—and allow artistic, musical, religious expression, protect property and privacy, and provide for various activities to which they are “by nature” inclined. Perhaps humans could be genetically disposed toward religious beliefs or ethical practices, because of cultural group selection; those in such cultures prosper (Wilson 1978). So a genetic bias toward ideas useful in various cultures can be expected, and welcomed.

This account of evolutionary psychology can become too restrictive, however, with the claim that humans have more of an evolutionary adapted mind than a culturally adaptable one. John Tooby and Leda Cosmides, denying any all-purpose mind, claim that humans have what they call an “adapted mind.” The mind is made up of “a complex pluralism of mechanisms,” “a bag of tricks,” a set of “complex adaptations” that, over our evolutionary history, have promoted survival. “What is special about the human mind is
not that it gave up ‘instinct’ in order to become flexible, but that it proliferated ‘instincts’—that is, content-specific problem-solving specializations” (1992, pp. 61, 69, 113). “These evolved psychological mechanisms are adaptations, constructed by natural selection over evolutionary time” (Cosmides et al. 1992, p. 5). These form a set of behavioral subroutines, selected for coping in culture, by which humans maximize their offspring. The human mind is “an integrated bundle of complex mechanisms (adaptations)” (Symons 1992, p. 138). The mind is, says Cosmides, more like a Swiss army knife, tools for this and that, rather than a general purpose learning device.2

Humans have needed teachability; but they have also needed channeled reaction patterns. The adapted mind evolved a complex of behavior–disposition “modules,” “Darwinian algorithms,” each dedicated to task-specific functions in one or the other dimension of life, such as picking mates, or helping family, or obeying parents, or being suspicious of strangers, or dealing with noncooperators by ostracizing them, or preferring savannah-type landscapes. In picking mates, for example, men are disposed to select younger women, likely to be fertile. Women are disposed to select men of social status, likely to be good providers (Buss 1989; Buss et al. 1990; Symons 1992). Further, these dispositions to behavior, still present in any contemporary culture, are those that meant survival in a Pleistocene environment (such as fear of strangers, or desiring many children); and this may mean that they are neither optimal nor altogether desirable dispositions in a modern environment (where people may need to cooperate with strangers, have fewer children, and live in cities) (Cosmides et al. 1992, p. 5).

The human mind is indeed complex, and various subroutines to which we are genetically programmed (e.g., caring for children, obeying parents, and even ostracizing noncooperators or being suspicious of strangers) may indeed be convenient shortcuts to survival—reliable modes of operating whether or not we have reflected rationally over these behaviors. It seems plausible that humans are disposed to see colors in certain ways, or to like sweets and fats, or use nouns and verbs in our languages. Some more or less “automatic” behavior is desirable. It is hardly surprising that males look for females likely to be good mothers (able to bear children and care for them) and females look for males likely to be good fathers (able and likely to provide resources and care about the family). It would be surprising if evolution had selected any other dispositions.

It is also possible that selective forces in earlier cultures (for men with strength enough to hunt or plow) differ from those of later cultures (for persons who can read, write, and do arithmetic). We should probably not assume, however, that there was some one kind of Pleistocene environment, either in the various kinds of landscapes on which humans lived or in the various cultures that they developed. The Pleistocene environment too demanded multiple skills, and an adaptable mind that could integrate them well. Many of the successful behaviors (recognizing faces, planning for tomorrow, being resolute in difficult times, cooperating with others, learning from mistakes, using appropriate caution, controlling jealousy, or lust, or...
forgiving others) were just as relevant then as they are now. There is much
evidence, for example, that humans now taken as infants out of aboriginal
cultures can do quite well when educated into a modern European culture.

The mind is not overly compartmentalized, because behaviors interconnect.
Behavioral and genetic psychologists are fond of speaking of mental “mech-
anisms,” and any machine-like function, working instinctively, diminishes
the cognitive reflection required. But if women are prone to choose men of
status, that requires considerable capacity to make judgments about what
counts as status—economically, politically, religiously. They will have to
to judge which one from among their suitors, often still relatively young, is
most likely to attain it in the decades of their child rearing. If men are to be
good providers, that requires judgments about cooperation, and if one is
operating in a barter or market culture, judgments will be needed about
trading with strangers, or ostracizing merchants who renege on their prom-
ises. Men need to judge potential mates not just on their likely fertility, but
also on whether they too are likely to be good providers, able and willing
to care for offspring, and to educate them successfully into their culture,
until these offspring reach childbearing age.

Any such articulated behavioral mode needs to be figured back into a
more generalized intelligence (Sterelny 1995). Genetically programmed
algorithms seem unlikely for the detail of such decisions under changing
cultural conditions. Such decisions are difficult even for well-educated per-
sons; they may require insight into character and evaluation based on intu-
iton, additionally to conscious, explicit calculations; decisions at this level
take considerable capacity for judgment, not simply mental mechanisms.
The strongest finding by far in the cross-cultural study of mate preference is
that both sexes from cultures around the globe consistently agree on the
most promising characteristics they look for in a mate: kindness, under-
standing, and intelligence (Buss 1989, p. 13; Buss et al. 1990, pp. 18–20).
Capacities to select such a mate are perhaps somewhat “instinctive,” but they
are unlikely to be an adaptive mechanism isolated from general intelligence
and moral sensitivity.

Apparently, the mind is not so compartmentalized that humans—modern
ones who read this literature at least—cannot make a critical appraisal of
what behavioral subroutines they do inherit by genetic disposition, and
choose, if they wish, to offset these “Stone Age” dispositions in their evolu-
tionary psychology. Cosmides and Tooby are doing just that—if we may be
permitted an ad hominem argument. They themselves illustrate that the human
mind is more than a patchwork of naturally selected response routines when
they call for “conceptual integration” of the diverse academic disciplines
studying humans, their behavior, and their minds. These include “evolu-
tionary biology, cognitive science, behavioral ecology, psychology, hunter–
gatherer studies, social anthropology, biological anthropology, primatology,
and neurobiology,” among others (Cosmides et al. 1992, pp. 4, 23–24).

These are not disciplines in which one becomes an expert by behavioral
mechanisms in a Swiss-army-knife mind adapted for Pleistocene environment.