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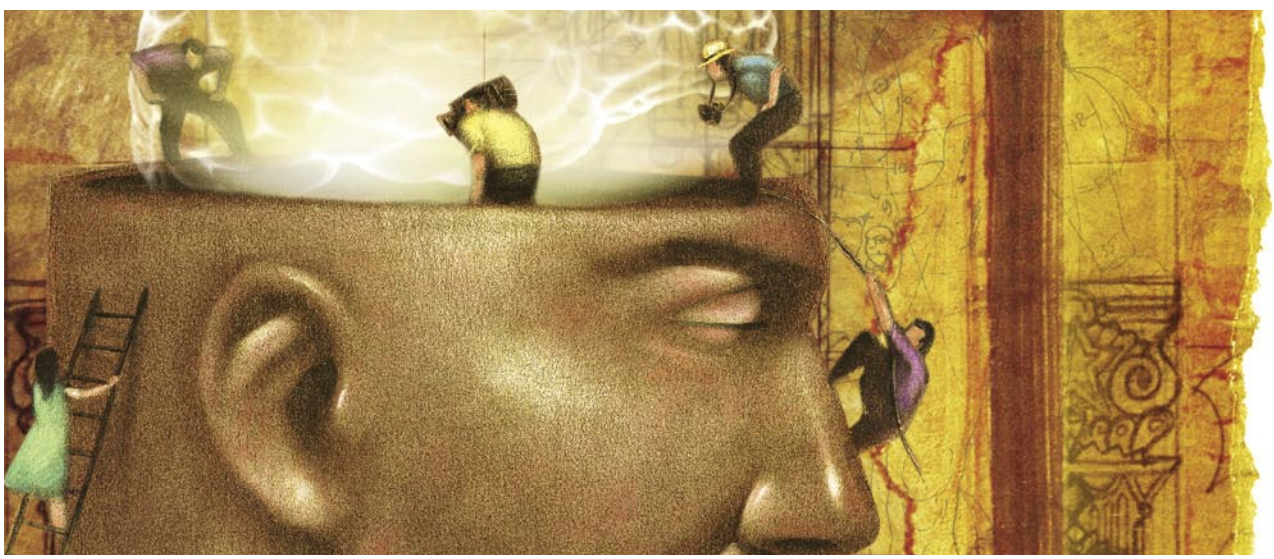
Is God All in Your Head?

Inside science's quest to solve the mystery of consciousness

by Craig Hamilton



Issue 29
June-August 2005

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PO Box 2360, Lenox, MA 01240 USA
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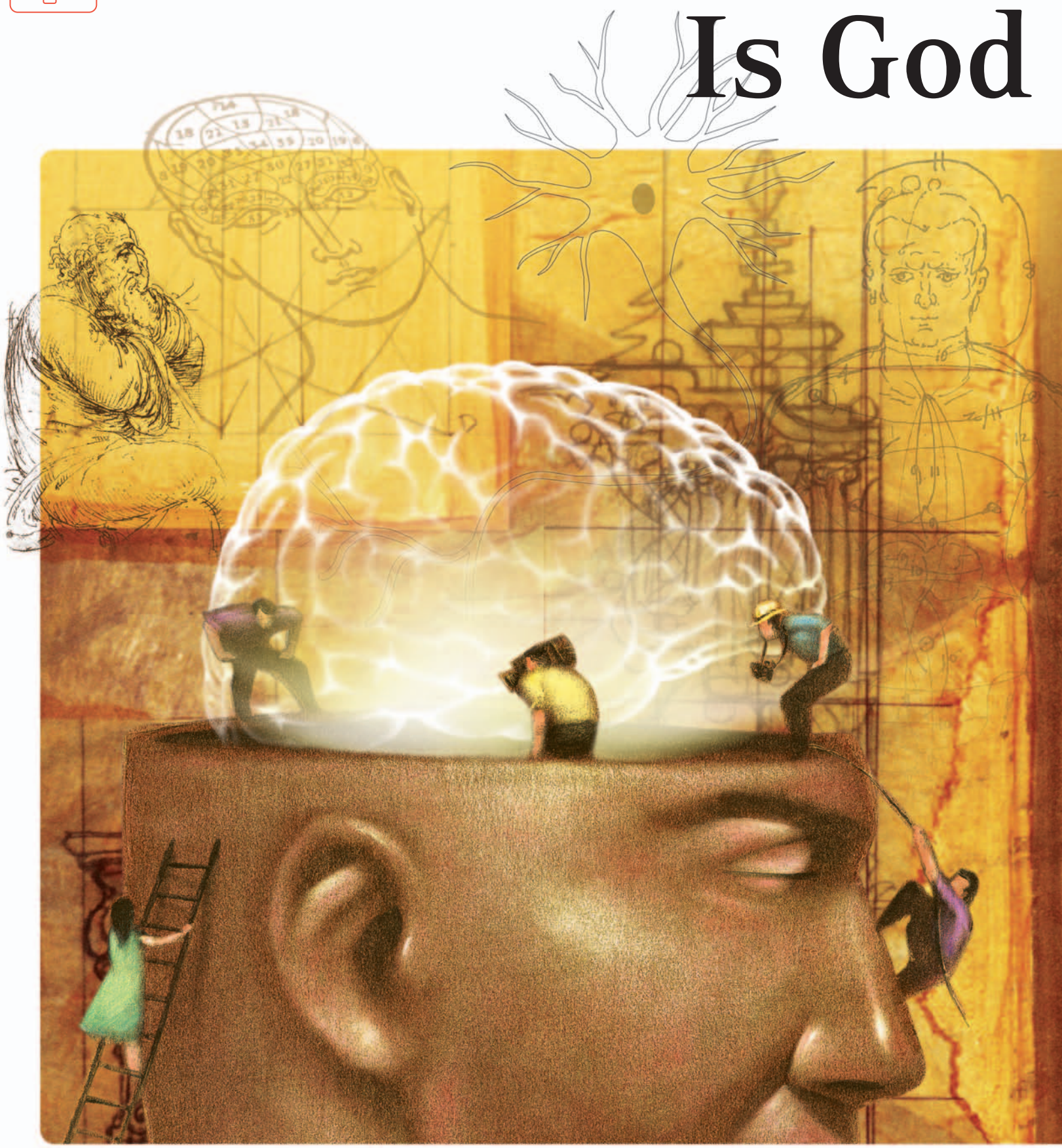
feature

Is God



All in Your Head?

Inside science's quest to solve the mystery of consciousness

by Craig Hamilton

LIKE A LOT OF PEOPLE INTERESTED IN MATTERS of the spirit, I've always had a somewhat conflicted relationship to science. On the one hand, for anyone interested in humanity's further evolution, it's hard not to be excited by the latest findings of a discipline that, in a single century, has managed to cure polio, crack the genetic code, send a probe to Saturn's largest moon, and invent the internet. But on the other, there is something about science's tendency to reduce even life's greatest mysteries to the movements of matter alone that has always left me a little chilled.

It probably goes back to my childhood. Raised by theologically ambivalent parents who were as committed to their agnosticism as many are to their faith, I was taught early on that science, reason, and rationality are a far better guide to truth than inspiration, doctrine, or dogma. But as years passed, and my inbred agnosticism gradually gave way to a committed spiritual quest, I soon began to have experiences of a deeper reality, far beyond anything described in my science textbooks. In the face of this unfolding world of meaning, purpose, and mystery, the notion that science held the keys to ultimate truth began to seem increasingly hard to accept.

I think the tension between these two sides of myself hit its peak during my senior year in college. Having majored in psychology because I thought it would help me understand human nature, I'd spent my first three years judiciously avoiding the "harder" scientific side of the field, focusing instead on the "softer," therapeutic, social, and humanistic dimensions. So when I finally signed up for the dreaded, mandatory "Statistical and Experimental Methods" course,

the last thing I expected was to be interested. But as we sank our teeth into data analysis and experimental design, once-foreign concepts like "statistical significance" and "double-blind control" began to take on an aura of magic for me. Even in our mock experiments, the fact that I could scientifically, experimentally, *statistically prove* that one hypothesis was right and another wrong acted on my nervous system almost like a drug. By the end of the term, to the disbelief of my friends, I was even considering applying to graduate school in experimental psychology. But as I began to look a bit more closely at what would be involved, I soon came face to face with an almost dogmatic materialism that seemed to grip the entire field. In the end, my interest in higher matters got the better of me, and it was my minor in religious studies and my growing passion for the spiritual quest that ultimately set the course for my life and career.

Although the call of the spirit saved me from a life in the laboratory, however, my sympathies for science haven't gone away. One result of this split personality is that whenever I'm confronted with the battle between science and religion, I always find it hard to take sides and end up in a sort of internal battle of my own. Whether it's the ethical debate surrounding biotechnology or the argument over the anthropic principle* in cosmology, it's as if I have a red-horned skeptic on one shoulder and a white-winged believer on the other, and it's hard to know who to listen to.

Admittedly, the further I look back in history, the less ambiguous it gets. When I think of Giordano Bruno having an iron rod driven through his tongue and being burned at the stake for proclaiming that the universe is populated with other suns just like ours, I don't have much difficulty condemning the Church's narrow-mindedness, to say nothing of its tactics. And there is certainly no doubt in my mind over what the outcome of Galileo's trial should have been. But follow the timeline a little closer to the present, and, for me at least, the picture quickly starts to muddy. Take the evolution vs. creation debate. There are few public expressions of ignorance more annoying than the insistence by fundamentalist Christians that biblical creationism be taught as an "alternative theory of origin" in our public schools. Yet when I see evolutionary biologists using the unproven dogmas of neo-Darwinian theory to convince our kids that they live in a purposeless universe, my sympathies toward science start to fade once again.

Of course, if the science and religion battle were to stop with the debate over biological evolution, I would, in the end, have to come down on the side of science, even if I were to quibble over the interpretation of some of the data. But if current trends are any indication, the battle is not stopping there. Nor does it seem to be calming down. In fact, in recent years, thanks to the ambitions of two influential new scientific disciplines, the attack from the science side seems to have taken a somewhat more insistent turn. And this time, the target is nothing less than our humanity itself.

The first of these emerging disciplines is evolutionary psychology. Originally dubbed "sociobiology" by biologist Edward O. Wilson, this relatively new field of study is responsible for the frequent headlines in Sunday science sections announcing the evolutionary origins of such complex human tendencies as monogamy, moral outrage, and our love of golf. Think Darwin as humanity's psychoanalyst, tracing the psychological quirks of the species to the adaptive challenges we faced in our childhood on the ancient savannah. Armed with this powerful new explanatory tool, a growing throng of theorists are racing to force every aspect of higher human behavior—from altruism to spiritual seeking—through the mechanistic grid of natural selection. As a result, many dimensions of human experience that were once considered to be beyond science's explanatory reach are now coming under the scrutiny of the microscope.

A growing throng of theorists are racing to force every aspect of higher human behavior—from altruism to spiritual seeking—through the mechanistic grid of natural selection.

But as effective as evolutionary psychology has been at stretching Darwin's dangerous idea to its logical limit, it is still largely a theoretical discipline, deriving its strength more from the explanatory power of its model than from the testability of its hypotheses. As such, it is, at best, still a moderate weapon in the arsenal of those who aim to scientifically explain the causes of human behavior and experience. For the heavy artillery, however, they need not look far. The thriving field of neuroscience promises to fill that void and then some. Employing powerful

*The observation that the physical constants of the universe seem to be finely tuned to allow the existence of life. Were the strong nuclear force only slightly different in strength, for instance, the stars could not shine and life as we know it would not exist. Some cosmologists have argued that this "fine-tuning" is evidence that the unfolding of cosmic evolution may be an expression of some kind of higher or even divine intelligence.

new methods for studying the intimate workings of the brain, the pioneers of this increasingly self-assured discipline aspire to demonstrate once and for all that the mind, emotions, and even consciousness itself are entirely generated by the three-pound lump of gray matter in our skulls. For a generation of researchers in this field, the prime directive is to prove what Nobel laureate Francis Crick, who turned to neuroscience after co-discovering the DNA helix, called "the astonishing hypothesis": That "you, your joys and sorrows, your memories and your ambitions, your sense of personal identity and free will are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules. . . . You are nothing but a pack of neurons."

Now at the dawn of the twenty-first century, the notion that the brain is *somehow* involved in mental life and consciousness is one that even the most devout among us would be hard-pressed to question. As consciousness researcher Marilyn Schlitz put it on the PBS program *Closer to Truth*, "All we have to do is take a sledgehammer and bang somebody over the head to see a reduction in consciousness." But the question of just *what* role the brain plays in mental and emotional life is another matter. And it is here that we enter the thorny territory.

Many dimensions of human experience that were once considered beyond science's explanatory reach are now coming under the scrutiny of the microscope.

In a recent *New York Times* column entitled "The Duel Between Body and Soul," developmental psychologist Paul Bloom describes a conversation he had with his six-year-old son, Max, in which he asked him about the function of the brain: "[Max] said that it is very important and involved in a lot of thinking—but it is not the source of dreaming or feeling sad or loving his brother. Max said that's what *he* does, though he admitted that his brain might help him out." Bloom, who clearly aligns himself with the neuroscientific perspective, goes on to explain that "studies from developmental psychology suggest that young children do not see their brain as the source of conscious experience and will. They see it instead as a tool we use for certain mental operations. It is a cognitive prosthesis, added to the soul to increase its computing power." And, Bloom laments, "This understanding might not be so different from that of many adults."

In my own case at least, Bloom has, I think, hit the nail on the head. For all of my studies in psychology, I must confess that my own idea about the relationship between the mind and the brain has remained something like that portrayed by the scarecrow in the *Wizard of Oz*. Despite his melancholy mantra, "If I only had a brain," the straw-stuffed overalls still had plenty of personality and emotion and at least enough cognitive capacity to get through the day. Although you probably wouldn't ask him to sort out the dinner bill, there was clearly somebody home. Indeed, when I was cast in the role in an eighth-grade school play, I knew what I had to do. Just act a bit dopey and absent-minded. Probably to the play's benefit, I didn't consult with any neuroscientists about what it might actually be like to not have a brain. And while my ideas have no doubt matured somewhat over the years, if you were to ask me to describe my current thinking on this issue, I don't think I could do better than Bloom's description of the brain as a "cognitive prosthesis" for the soul.

In light of Bloom's analysis, it seems likely that I'm not alone. Which means we have a bit of a problem on our hands. Because, although in the case of children this belief could be attributable to a lack of learning, where adults are concerned, the issue seems to cut deeper. A lot deeper. Despite the insistence of neuroscientists that our brains are the sole source of our experience and behavior, there are very strong reasons why most of us don't want to believe that this is the case. For starters, for most of us with religious or spiritual inclinations, accepting such a premise would eradicate, in one fell swoop, one of our most basic convictions—the belief in an immaterial soul or (if we're Buddhists) "mind essence" that transcends the physical body. Even for those who do not count themselves among the faithful, the notion that we are entirely reducible to brain stuff still seems to take away something essential—our humanity, our dignity, our sense of meaning. In my own case, no matter how hard I try, I find it exceedingly hard to accept that I am just my brain. And it's not just because I've had mystical experiences that point to the existence of something beyond the material. There is something about the experience of consciousness itself, some kind of mystery inherent in the fact that we are conscious at all, that seems irreducible to the mere firing of our neurons. As convinced as the neuroscientists are of their case, I can't help feeling there must be more to the story.

And here, as they say, is the rub. Because if I take a step back from my own convictions, there is something about this picture that starts to look suspiciously familiar. After all, isn't this how religious people always feel when their ideas are being challenged by science? Is there any difference between what

I'm experiencing and what the elders of the Church felt when Galileo attempted to oust the Earth (and thus human beings) from the center of God's universe? Could it be that far removed from how some Southern Baptists feel when the science teachers try to convince their children that God didn't create the world in six days? In all of my postmodern sophistication, those stories sound to me like an adolescent unwillingness to grow up. But can I be sure that I'm not guilty of the same thing?

I would, of course, like to think that the current situation is different—that, in attempting to penetrate the mysteries of the human soul, science has finally flown a bit too close to the sun. But given the trajectory of the science and religion debate over the past few hundred years, it would be hubris at this point not to take the claims of neuroscience seriously. As atheist apologist Keith Augustine put it in a recent essay on infidels.org:

> *Historically in the "war between science and religion" the "reconciliation" has always fallen on the side of science with theologians scrambling to redefine their faith in order to make it compatible with new scientific evidence. . . . That we never see the reverse—scientists scrambling over the latest theological speculation—illustrates the authoritative dominance of science over religious belief in the modern world. Scientific explanations of phenomena have been so successful that today believers are trying to develop scientifically informed theologies.*

Indeed, given the legacy of abandoned dogmas that the encounter with science has left in religion's wake, it would be more than a little naïve for us to think that as scientists begin to probe the mysteries of the brain, our sense of who we are would come out unscathed. We are clearly in a challenging predicament. And for all of my ambivalence on the science and religion debate, I have to admit that this round makes the others look easy—particularly for those of us with spiritual inclinations who also feel compelled, as a matter of integrity, to follow the truth wherever it leads. Are we willing to question our spiritual convictions deeply enough to grapple with what neuroscience has to say about the matter?

> **"You, your joys and sorrows, your memories and your ambitions, your sense of personal identity and free will are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules."**
>
> *Francis Crick*

It was my own recognition of this predicament last spring that convinced me that if I was to avoid ending up on the side of ignorance, I would have to dive into the unknown waters of brain science and find out for myself what the fuss is all about. What does it actually mean to say that our brains are the sole source of our experience? What evidence is there to prove it? And assuming it was true, would that mean that all of our spirituality is a ruse? Could the brain in fact be the soul? Over the past year, my journey into this mind-bending world has taken me from the cutting-edge conference on "consciousness studies" to the offices of some of the leading thinkers in the field to the laboratories of a few pioneering scientists who, far from the mainstream, are working to usher in a new, more holistic paradigm that is as true to the spirit as it is to the data. In the course of this adventure, I have moved in and out of confusion more times than I care to count. And though I can't say that as of this writing I have entirely found my way to the other side, what I can say is that I have learned a lot about the miraculous and as-yet mysterious workings of a part of myself I had honestly never given much thought—my own brain.

THE 10% MYTH

Everybody knows we only use ten percent of our brain, right? Not according to neuroscience. This modern myth, made popular by the self-help movement, is in fact not grounded in science at all. Through brain imaging techniques, scientists have learned that, although no single activity employs the entire brain, in the course of a day, we use it all.

"The hard problem is the question of how physical processes in the brain give rise to subjective experience."

David Chalmers

PART ONE: toward a science of consciousness

NEURAL CORRELATES OF CONSCIOUSNESS?

"Consciousness: that annoying time between naps," read the bumper sticker on a dusty SUV with California plates. It was barely nine AM, and the Arizona sun was already scorching as I made my way across the sprawling parking lots surrounding the Tucson Conference Center. On the heels of an unusually cold New England winter, I had come to the desert prepared for a reprieve, but in my long sleeves, I was still overdressed. A nondescript southwestern city, Tucson seemed an unlikely place for *the* cutting-edge conference on consciousness studies. But for those in the know, it is here that every other year for the past decade the brightest minds in mind science have gathered in pursuit of "a science of consciousness."

If ten years sounds like a short record for the defining conference in a major scientific field, it only owes to the fact that the notion that something as ineffable as consciousness can be scientifically studied is itself a relatively new idea. Having built its empire on the pursuit of the third-person "objective" perspective, science in general has long considered consciousness or subjective experience to be, at best, beyond the scope of its inquiry, and, at worst, irrelevant. There was a period in the early days of psychology, when William James and other introspectionists made a foray into the subjective domain by beginning to observe and chronicle the workings of their own minds. But this was quickly expelled from the discipline by James B. Watson's introduction of behaviorism in the early 1900s, which promised to make psychology a respectable science by limiting it

to the study of observable behavior. With the birth of cognitive psychology in the 1960s, and the subsequent decline of behaviorism, gradually the word "consciousness" began to trickle back into play. It wasn't until the early 1990s, however, that it would emerge as a serious area of study in its own right, due in large part to the increasing boldness of neuroscientists like Francis Crick. In an influential 1990 paper cowritten with his research partner Christof Koch, Crick, who had been determined from an early age to disprove the existence of God and the soul, made a passionate call for neuroscience to begin employing its growing scientific arsenal to demonstrate the material basis of consciousness. The paper was apparently a mark of the times, as, over the next few years, the field of consciousness studies surged into being, culminating in the inauguration of the first Tucson conference in 1994.

If the scene surrounding the opening plenary at the 2004 conference was any indication, in the ten years since, consciousness has become a hot topic. As I made my way into the conference center's largest ballroom, some eight hundred chairs faced a large video screen and stage, and cameramen jockeyed for position. Though the main section was already filled by the time I arrived, I managed to find a lone seat up front just as the conference organizer, MC, and resident bad-boy David Chalmers took the stage. Sporting faded jeans, a half-tucked-in T-shirt, black leather jacket, and scraggly long hair, the 39-year-old Australian would have been more convincing as a heavy metal singer than as one of the world's most respected philosophers of mind. But ever since the 1994 conference, when he famously challenged the audience to face up to the "hard problem" of consciousness, it's been difficult to read anything on the relationship between mind and brain without encountering Chalmers' name.

The "hard problem," as Chalmers defines it, "is the question of how physical processes in the brain give rise to subjective experience." This is as distinguished from the "easy problems" of consciousness, which involve understanding such things as the neural mechanisms behind perception, how we pay attention, and the differences between waking and sleep. The essence of Chalmers' challenge, which has seemingly been taken seriously by nearly everyone in the field, is that making progress on the "easy problems," as worthy an endeavor as that might be, does not necessarily bring us any closer to solving the hard problem. And where a scientific understanding of consciousness is concerned, the hard problem is *the* problem.

Those who studied a bit of philosophy in college may recognize in Chalmers' hard problem a restatement of the classic "mind/body problem"—what Schopenhauer called "the world knot"—that philosophers have been arguing about over the past few centuries. Ever since René Descartes gave birth to dualism by asserting the separation of mind and body, the big issue in the philosophy of mind has been figuring out how these two different substances—the mental and the physical—could interact with one another. On one hand, how could an objective, physical brain give rise to subjective, mental events? And on the other, how could those subjective, mental events—presumably not governed by physical laws—impact the objective, physical world?

The title of the opening session, and the theme for the conference as a whole, was "Neural Correlates of Consciousness," or NCCs, as they would come to be called. After a few welcoming words from Chalmers, we moved straight to our panel of three speakers, who would address what many consider to be the leading edge of the neurobiological approach to consciousness. The first speaker was, fittingly, Christof Koch, whose work with Francis Crick on vision and consciousness has made him one of the stars of the neuroscience world. With a delivery style that seemed to suggest he'd failed to heed the warnings about mixing high doses of caffeine with amphetamines, Koch proceeded to cram what seemed to be an entire semester of lecture notes into a thirty-minute session. I must confess to not having understood a word of it, but after concentrating as hard as I could on the next two panelists and listening to the often contentious debate that followed, I was able to piece together the rough outlines of the theory.

What Koch and other neurobiologists on the trail of NCCs are attempting to uncover is just how the brain behaves differently on the neuronal level when we are consciously perceiving something as opposed to when we are perceiving that same object unconsciously. Now, for most of us, the notion that we even could perceive something unconsciously probably sounds like an oxymoron. To illustrate, Koch refers to a curious and rather counterintuitive phenomenon known as "binocular rivalry."

A simple explanation would go something like this: Although most of us tend to think of ourselves as somehow looking out at the world through our eyes, the nature of vision is not at all as we experience it. What is actually happening is that two different inverted two-dimensional images are falling on the back of your two retinas and being sent to some thirty different visual centers in your brain for processing, the result of which, mysteriously, is the unified three-dimensional picture of the world you see. How that happens is an example of what is known as "the binding problem" and is itself a mystery that no one has yet solved convincingly. For the moment, though,

what's important to understand is that each of your eyes is seeing a different part of the picture, and your brain is piecing it together into a unified whole.

Now what happens if we isolate your eyes from one another and literally show each of them an entirely different picture? Will you see two things at once? No. This is where binocular rivalry comes in. As it turns out, your brain can only consciously represent one complete picture at a time, so when it is given two competing visual stimuli, it has to somehow choose which one to represent. At times it fixes on one image and ignores the other. Or, with the right sequence of images, it can be made to flip back and forth between the two. The key here in terms of consciousness is that regardless of which image is in consciousness at any given moment, the input into the visual centers in the brain is identical. The reason this is so exciting for Koch and his comrades is that, through the use of brain imaging techniques, it allows them to compare snapshots of the brain when a given perception is conscious and when it is not conscious. This, they hope, will ultimately give them some clues to understanding how neuronal activity correlates with consciousness.

If consciousness is, in fact, created by the brain, very little of our common-sense picture of reality is true.

If this description leaves you wondering how this kind of research is really going to help us understand consciousness, it may well be that you already have an intuitive feel for what David Chalmers was referring to when he distinguished between the "hard problem" and the "easy problems" of consciousness. By Chalmers' definition, Koch's work, and that of the other panelists, is entirely concerned with one of the easy problems. No matter how clear a snapshot we can get of what type of neuronal activity correlates with which sorts of conscious perceptions, we will still be no closer to understanding how the brain could possibly *produce* something like conscious experience itself. As philosopher John Searle wrote in a recent review of Koch's latest book, *The Quest for Consciousness,* "The subjects on whom these experiments are performed are already conscious. . . . So the most we can reasonably expect from this research is an explanation of how, within a brain that is already conscious, we can cause this or that perceptual experience. . . . In my view we will not understand consciousness until we understand how the brain creates the conscious field to begin with."

During the question-and-answer session following Koch & co.'s presentation, the questions ranged from experimental technicalities to quantum physics to the paranormal. One woman asked Koch how his "neurobiological framework for consciousness" would account for near-death experiences in which patients are able to report on events that happened while their brains were not functioning. Koch's curt reply was, "If they're having an experience, there must be neural correlates. I'd need to see a double-blind study." As I was pondering just how one would go about recruiting volunteers for such a study, I made my way to the stage to introduce myself to Chalmers. Engrossed in the business of conference organizing, he paused for a brief chat—until he connected my name to the magazine I'd sent him before the conference. Obviously pegging me for someone on the "fringier" end of the spectrum, he asked: "How would you feel about moderating the panel on Nonlocal and Paranormal Effects? The person we had scheduled didn't show up."

Always up for a little stage time, I smiled. "Sure, when is it?"

"It starts in ten minutes."

"Do I need to know anything? I'm not really an expert in the paranormal."

"No, you'll be fine. Just get there in time to talk with the panelists beforehand."

LET A THOUSAND FLOWERS BLOOM

Compared to the auditorium-sized plenary session; the breakout room with seats for about a hundred and fifty felt almost cozy. By the time I had found my way through the maze of hallways, all of the panelists had arrived, as well as most of the audience. Catching my breath, I did the fastest four interviews of my life, thought up a few jokes about materialism for my opening comments, and proceeded to try to lay out some context for the session.

The first panelist was prominent paranormal, or psi, researcher, Gary Schwartz, whose book *The Afterlife Experiments* reports on a series of experiments done with spirit mediums that suggest strongly that whatever consciousness is, it seems to be able to survive physical death. Schwartz, who runs the Human Energy Systems Lab at the University of Arizona, delivered a robust talk in which he summarized this impressive body of research, and expressed his frustration with the mainstream scientific community's unwillingness to even consider what it might mean for our understanding of consciousness. He was followed by Katherine Creath, another researcher

from the UA psi lab, who presented evidence for intentional remote energy healing—of plants. Using biophoton imaging technology, Creath found that "energy healers" from three different disciplines were able to significantly increase biophoton emissions (a sign of health) in injured plants, simply by "treating" them with the intention to heal. After my joke about never eating salad again failed to rouse the expected laughs, we moved quickly on to a talk on remote viewing by a young student from Florida and a presentation of research by a German scientist showing that we can consciously "will" the nervous systems of others into a calm state, even at considerable distance.

Following the materialism of the opening panel, I found it something of a respite to spend a bit of time contemplating the mysteries of consciousness beyond the brain. Given the conference's clearly neuroscientific bent, I was surprised to find a session so far outside the scientific mainstream. Indeed, over the days that followed, I was intrigued to discover that, in addition to a plethora of sessions devoted to discussing the intricacies of the brain, there was also a wide range of presentations on topics that would generally be considered fringe. One well-attended session explored the current state of research on "meditation and consciousness." Another, entitled "Art and Consciousness," included a talk on the relationship between altered states of consciousness and "visionary art." Stanford's Stephen LaBerge gave a workshop on lucid dreaming. And one of the plenary sessions was even devoted to research on the effects of psychedelic drugs.

Perhaps not quite as fringe, but no less far out, were several presentations from the artificial intelligence crowd on the possibility of building conscious robots, and a surprising number of panels and papers on models employing quantum physics to explain the relationship between consciousness and the brain. Over lunch one afternoon at a nearby Mexican restaurant, I asked Chalmers how a serious academic conference had remained open to such a wide range of approaches. Pausing momentarily from his chicken burrito, he replied, "There is so much that we don't understand about this that it's always been our approach to 'let a thousand flowers bloom.' There's room here for everybody, precisely because we don't know where the answers are going to come from."

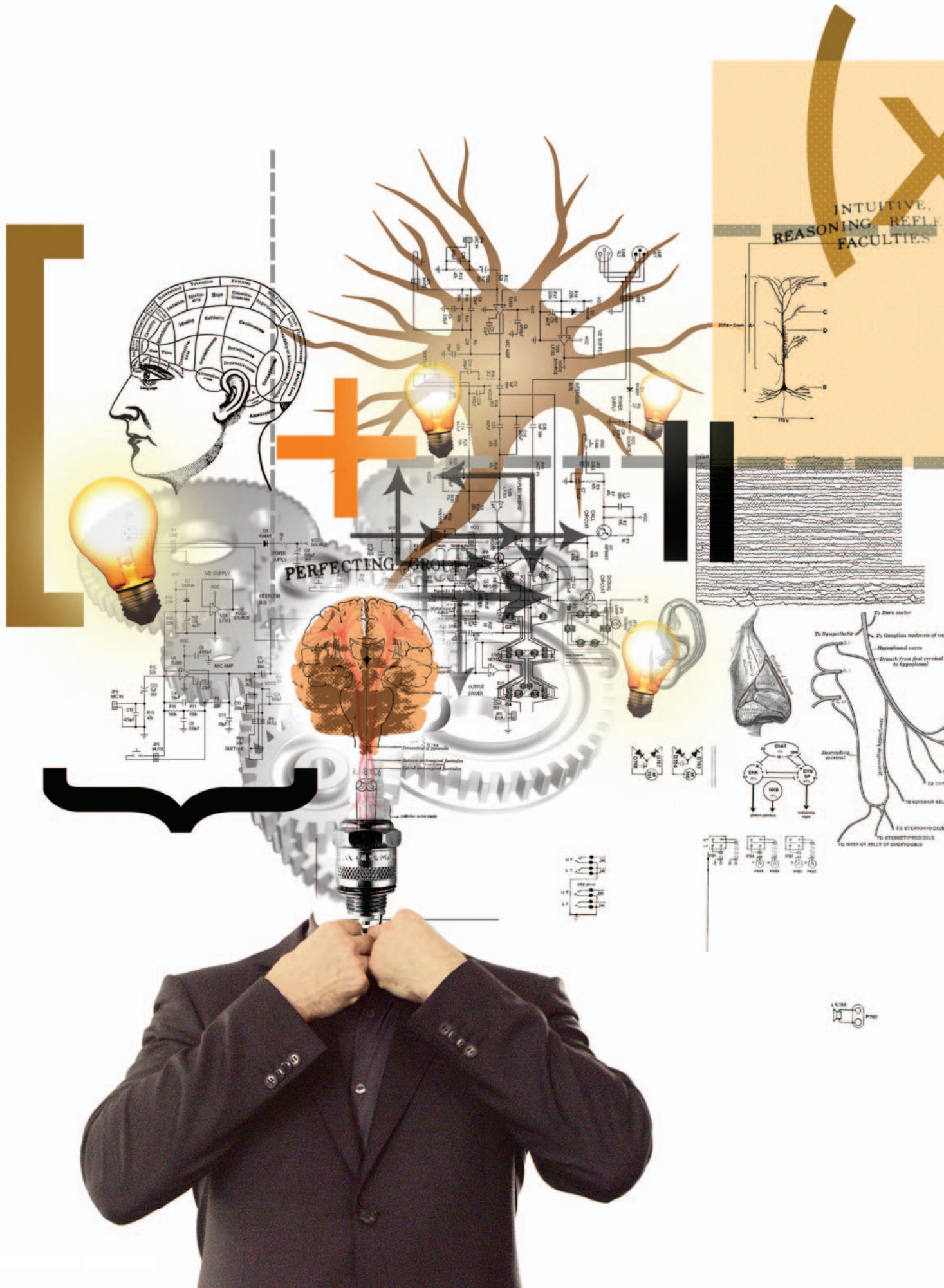
But despite the conference organizing committee's open-mindedness in embracing alternative thinking, it was nonetheless clear which camp is gaining the most ground. For although a thousand flowers may have been blooming in Tucson that spring, there was little doubt where the vast majority of them were rooted: in materialism and its fervent aspiration to reduce all human experience to the workings of the brain.

Indeed, though I had come to Tucson in full awareness of the conference's materialistic focus, as the week wore on, the larger implications of what it would actually mean to demonstrate the neurobiological basis of consciousness began to set in. And it is a disconcerting picture, to say the least. If consciousness is, in fact, created by the brain, it turns out, very little of our commonsense picture of reality is true. Over the course of the week, I learned several important things:

1) free will is an illusion
2) so is the self
3) consciousness sort of is, too, or at least, it doesn't do anything
4) even if we were to discover that we are living in the "Matrix," we should act as if it's real, and not worry about it. In other words, Neo took the wrong pill.

Having jumped in at the deep end, by the end of the conference, I was more or less thoroughly confused. In part, my confusion was conceptual. As a layperson, trying to listen in as professionals debate the finer points of brain science, AI, and philosophy of mind is not exactly an easy entry into the territory. I often found myself asking whoever was sitting next to me to translate what had just been said into "English." But I think the deeper source of my confusion was on a human level. Having someone look you in the eye and calmly tell you that they are "nothing but a complex of algorithms"—or worse, that they "have no conscious control over their actions"—is the kind of thing that makes you start scanning the room for a security guard. Over and over as the week wore on, I found myself wondering how it was that so many people could become so convinced of ideas that run so counter to our most basic experience of being alive. Given all the talk about artificial intelligence, I secretly began to suspect that, in fact, the speakers were all sophisticated robots programmed to try to convince us that we were too. I left the conference even more determined to understand the roots of this strange predicament, but I knew that before I could, I would have to figure out why it was that scientists are so sure that we are nothing but our brains.

I secretly began to suspect that in fact the speakers were all sophisticated robots programmed to try to convince us that we were too.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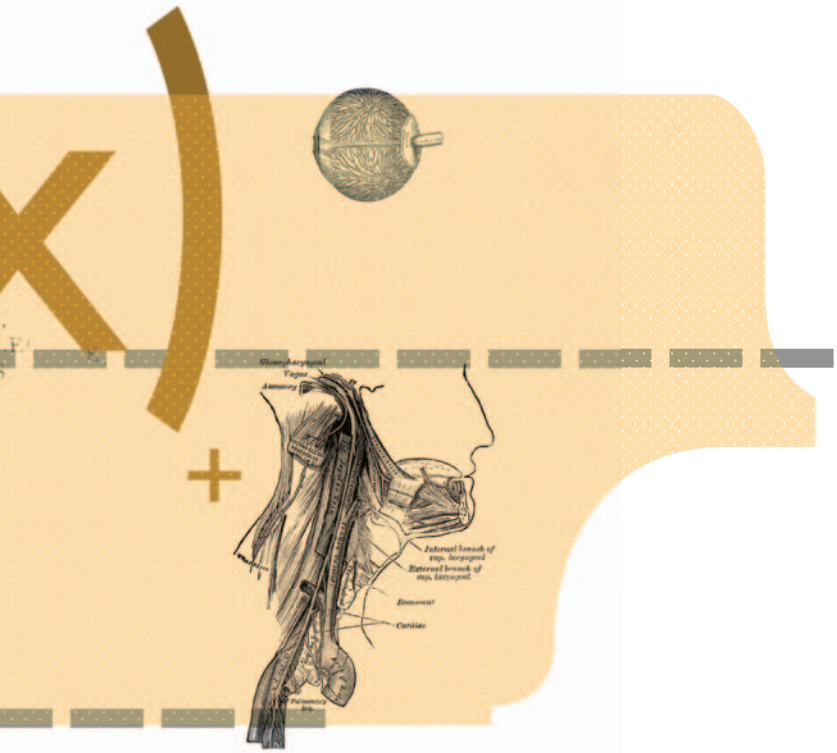
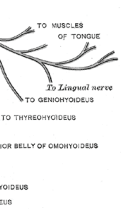




What if you could take a regular pill that would radically transform your personality, and even your sense of self, for the better?

PART TWO: steps to a biology of mind

A BRIEF HISTORY OF MIND

Fifteen years after President Bush senior inaugurated "The Decade of the Brain," it is hard to believe that until fairly recently in human history, the idea that the brain is even involved in mental life was a matter of considerable dispute. Indeed, the first thinker on record to suggest a link between mind and brain was the Pythagorean Alcmaeon of Croton, writing in the fifth century BCE. Prior to that, across cultures, it was widely held that the mind, or soul, was located in the heart. The priests of ancient Egypt, for example, when preparing the body of the deceased for the afterlife, would pull out the brain, piece by piece through the nose, but would leave the heart intact, believing it to be the center of a person's being and intelligence. In most ancient cultures, the idea of dissecting a cadaver was taboo, so with no knowledge of the nervous system, it was only natural to conclude that the accelerated heartbeat that accompanied an excited mind was a clear indication of the bodily location of mental life. Even such great thinkers as Aristotle subscribed to this view. But, rigorous biologist that he was, Greece's greatest polymath was certain that the brain must serve some function. Noticing that it was cool to the touch, he concluded that it refrigerated the blood—a conclusion that also allowed him to account for the inordinately large brains of humans. Because of our unusual intelligence, he argued, our hearts produced more heat and, thus, required a larger cooling system.

Alcmaeon's brain-centered theory, however, did manage to persuade the likes of Hippocrates and Plato to abandon the prevailing "cardiovascular theory," and despite Aristotle's resistance to the idea, it was picked up by physicians during the early Roman period who broke the taboo against dissecting cadavers and discovered the nervous system branching out from the skull and spine. Although this view gradually took hold, and has remained dominant ever since, it was still being disputed as late as the seventeenth century, when philosopher Henry More wrote, "This lax pith or marrow in man's head shows no more capacity for thought than a cake of suet or a bowl of curds." It is also worth noting that the model of the brain that prevailed through most of the second millennium was very different from the model we subscribe to today. Whereas we now see a vast, complex electrochemical network of some hundred billion neurons, these early anatomists were convinced that the mind, or soul, was a kind of etheric presence that lived in large "ventricles" or chambers in the brain, communicating its commands to the rest of the body through "vital spirits" that flowed through the nervous system's minute pathways.

Indeed, it has been this move away from a spirit-based view of the brain's workings toward a purely biological one that has led to the idea, so unpopular with the religiously inclined, that the mind, or soul, is ultimately reducible to brain activity.

LIKE A HOLE IN THE HEAD

The road to this now widely shared conviction has, like any scientific development, been marked by several major turning points. But few have struck the field with as much force as the story of a Vermont railroad worker named Phineas Gage. The year was 1848, and Gage was out supervising the construction of a section of track when an accidental explosion shot an iron rod more than three feet long and one and a quarter inches in diameter straight into his left cheek, through his frontal lobe and out through the top of his head, taking no small measure of brain with it. To everyone's amazement, Gage was back on his feet in a matter of minutes and appeared unfazed by the incident. In fact, according to the doctor who treated him an hour later, he was able to speak more lucidly about it than his shaken coworkers who had witnessed it. Although his basic cognitive functions remained unaltered, however, over time it became clear that something fundamental had changed. According to John Harlow, the physician who followed his case, where Gage had once been efficient, capable, and thoughtful, after the accident he became "fitful, irreverent, indulging at times in the grossest profanity, . . . manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires." So radical was the shift in personality that, "his friends and acquaintances said he was 'no longer Gage.'"

At the time of the Gage incident, there was already considerable speculation that specific regions of the brain were responsible for specific aspects of perception, cognition, and behavior—particularly among the "phrenologists," who attempted to "map" the regions of the brain according to the lumps on the skull. But the reason Gage's case caused such a stir was that it seemed to suggest that there were even systems in the brain responsible for the creation of our personalities, our unique selves. In the century and a half since, studies of brain-damaged patients by clinical neurologists have revealed much about the relationship between the functioning of the brain and the way we experience and respond to the world. Their stories are often as perplexing as they are revealing.

Until fairly recently in human history, the idea that the brain is even involved in mental life was a matter of considerable dispute.

In his book *Phantoms in the Brain,* neurologist V.S. Ramachandran tells the story of a young patient named Arthur who, after suffering a severe head injury in a car accident, began to insist that his parents were impostors. No matter how hard they tried to convince him otherwise, whenever he would see them, he would say, "You may look like my real parents, but I know you're not my real parents." When they would call him on the phone, however, he immediately recognized them. This peculiar delusion, known as Capgras' syndrome, has been chronicled a number of times in psychiatric literature and has generally been given Freudian interpretations relating it to the notorious Oedipus complex. But Ramachandran had a different idea. His explanation was that a connection had been severed between one of the visual centers of the brain and one of the emotional centers. So despite the fact that Arthur could recognize his parents' faces, he didn't *feel* anything when he saw them. Though Arthur's father did manage to temporarily convince him of his authenticity (by apologizing for hiring the impostor parents), Arthur soon returned to his original delusion.

It is hard for most of us to imagine what it would be like to have one of our most taken-for-granted faculties suddenly no longer available to us, like the ability to respond emotionally to

our visual experience. Indeed, what is most intriguing about these stories is the way in which they challenge one of our most fundamental intuitions—our sense that the self is a single, unified whole. Repeated throughout the neurology literature are cases in which damage to a specific part of the brain leads to the loss of some specific aspect of our ability to perceive and respond to the world. Damage one part of my brain and I'll lose the ability to learn any new facts. Damage another part and I'll be unable to recognize faces. Damage another area and my experience of the world will remain intact, but I'll be unable to find the words I need to speak clearly about it. Damage still another part and I'll lose the ability to pay attention to half of my visual field, but I will be convinced that the half I'm seeing is the whole picture. As a result, in the morning, I'll only shave half of my face. Taken together, the data from neurology suggest that despite our brain's ability to organize our experience of ourselves and the world into a seamless unity, we are, in fact, made up of many parts, the loss of any of which can have dramatic effects on the whole.

BEING OF TWO MINDS

When we think of brain damage, we generally think of damage caused by accident or disease. But there is also the kind of damage intentionally inflicted by surgeons in order to help resolve a brain disorder. Given our increased understanding of the delicate interrelatedness of the entire brain, such procedures are rarely done these days, owing in some part to the often disastrous results of the 45,000 frontal lobotomies performed in the U.S. in the 1940s and '50s. But another procedure, performed in the 1960s as a means to eliminate epileptic seizures, yielded some surprising findings for our understanding of the brain's relationship to the self.

Stories from neurology challenge one of our most fundamental intuitions—our sense that we are a unified whole.

However ignorant we may be of brain science, most of us are familiar by now with the idea that our brain has two hemispheres, a left one and a right one, each responsible for very different aspects of our behavior. Our dominant left brain, we are told, is more analytical; our right brain more emotional, creative, and intuitive. Although much of the popular psychology literature on the right brain–left brain distinction has been, in the eyes of neuroscience, exceedingly simplistic and inaccurate, the basic fact—known in the field as "hemispheric specialization"—is well established. In a normal brain, these two hemispheres communicate with one another through a large band of nervous tissue known as the corpus callosum (larger in women than in men, incidentally, accounting for their superior ability to multitask, among other things). But what would happen if the connection between these two halves of the brain were severed, leaving us, in effect, with two brains in our head? Would we end up with two different selves? Over the past few decades, a group of neuroscientists have had the chance to find out.

Epilepsy comes in many forms, some mild and some severe. In its worst manifestations, it brings with it nearly constant seizures that make life almost impossible for the patient. In an attempt to control these severe cases, in the 1960s neurosurgeons began cutting the corpus callosum to prevent the seizures from spreading from one side of the brain to the other. The procedure was remarkably successful, and to the relief of the doctors who pioneered the treatment, patients generally recovered well and were able to live relatively normal lives. But in these "split-brain" patients, psychobiologist Roger Sperry soon recognized a rare opportunity to study the differences between the two hemispheres in a way that had never been possible before. Over the decades that followed, he pioneered a series of studies that ultimately earned him a Nobel Prize. Most of these split-brain studies focused on illuminating the functional differences between the two hemispheres, but along the way, Sperry and his colleagues began to realize that there were implications to what they were seeing that went far beyond the scope of their initial questions.

One of the most commonly known facts about hemispheric specialization is that the right brain controls the left side of the body and the left brain controls the right side. Where visual input is concerned, the same rule applies. The left half of the visual field (of each eye) is routed to the right brain and vice versa. Knowing this, researchers realized that by presenting information quickly to only one side of the subject's visual field, they could ensure that the information only reached one side of the subject's brain. This technique provided the cornerstone of their research.

Employing this method, researchers had learned early on that the dominant left brain, with its ability to reason and use language, is the home of what we usually think of as the conscious mind. For instance, when asked to report on information that had been presented to their left brain alone, sub-

jects could speak about it quite normally. When information had been presented only to the right brain, by contrast, subjects seemed unaware of it. As the research progressed, however, the picture grew more complex. For instance, when the right brain was shown an image of a spoon, the subject's left hand (which is controlled by the right brain) could successfully identify an actual spoon from among an assortment of objects, even though the subject claimed to have no conscious knowledge of having seen it. Despite its inability to express itself, the right brain nonetheless seemed to have a will and mind of its own. Eager to test this, Scottish neuroscientist Donald MacKay devised a twenty-questions-type guessing game and successfully taught each of the two halves of a patient's brain to play it—first against him and then against the other half. But this image of the two halves of one brain competing with one another soon moved from the experimental to the macabre, as split-brain patients began to develop the bizarre malady known as "alien-hand syndrome."

Imagine just having zipped up your trousers with your dominant right hand only to find your left hand unzipping them and taking them off.

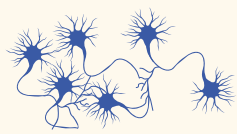
Imagine just having zipped up your trousers with your dominant right hand only to find your left hand unzipping them and taking them off. Or reaching to embrace a lover only to find your left hand punching her in the face. Or attempting to shop at the supermarket as your left hand grabs unwanted items from the shelves and shoves them in your pocket. If this sounds like a story straight out of *The Twilight Zone,* it is nonetheless exactly what a number of split-brain patients began to report. One patient said it regularly took her half a day to pack for a trip because each time she put an item in her suitcase with her right hand, her left hand would remove it. Another said that he was even afraid to go to sleep for fear that his left hand would strangle him.

As extreme as it sounds that each half of a brain could have its own agenda, this fact was eventually demonstrated experimentally by neuroscientists Michael Gazzaniga and Joseph LeDoux. Although in most of us, the dominant left brain houses all of our language capacity, in a small percentage of the population, the right brain also develops some linguistic functions. Using a rare case of a young split-brain patient whose right brain had developed a slight capacity for printed language, the researchers asked both halves of the brain a series of questions, and found that, particularly where preferences and opinions were concerned, there was often disagreement. What was most revealing, though, was when the patient was asked about his ambitions. In response to the question: "What do you want to do when you graduate?" his dominant left hemisphere answered, vocally, "I want to be a draftsman. I'm already training for it." His right hemisphere, which could only respond by using Scrabble letters to spell out its answer, responded "A-U-T-O-M-O-B-I-L-E R-A-C-E-[R]."

The idea that splitting the brain amounts to nothing less than splitting the self is a challenging one with enormous implications for our understanding of the brain's role in creating consciousness and even individuality. Therefore, it is no surprise that it has remained a controversial finding, even among scientists. But for the man who was awarded the Nobel Prize for his pioneering work in this area, the experience of working with split-brain patients for many years all pointed in one direction. "Everything we have seen indicates that the surgery has left these people with two separate minds," Sperry wrote. "That is, two separate spheres of consciousness."

THIS IS YOUR BRAIN ON DRUGS

One morning last summer, in the midst of my research, a longtime colleague and friend showed up at my office door looking a bit out of sorts.



THE INNERNET?

What is the most complex network yet developed? If you guessed the world wide web, guess again. The human brain, with its electrochemical matrix of over one hundred billion neurons, makes the internet look like a fancy spider's web. With each neuron linked to about 50,000 other neurons, that makes for a total of one hundred trillion connections.

"Something's really wrong with my dad," he said. "He's not himself."

Having spent time with my friend's father over the years, I was well aware of the twenty-year battle with Parkinson's disease that had slowly eroded the dexterity and agility of this successful trial lawyer and former athlete. And I had more than once seen the look, somewhere between pain and confusion, that engulfed my friend's face when the disease suddenly took a turn for the worse. But today there was something different.

"What do you mean?" I asked. "Is it the Parkinson's?"

"Sort of," he replied. "Somehow his medication has gotten out of whack. He's doing the most bizarre things. Late last night, my brother found him standing in the front yard with a water pistol in his hand. He was convinced that he was protecting the house from a gang of marauders."

"In Omaha?"

A smile momentarily broke his sobriety. "Yes. And when my brother found him, all he said was, 'It's about time you got here. I need some backup.'"

"How is he now?" I asked.

"They've got him in the hospital, and they're monitoring his medication, trying to figure out what went wrong. They have to keep him under constant supervision because whenever the nurse leaves the room, he tries to make a break for it." He paused for a moment. "It just seems so delicate. What does it mean that the person you thought you knew can change so dramatically simply because their brain chemistry changes? What does that say about who we are?"

The relationship between brain chemistry and consciousness is one that, in the neuroscience age, is hard to get away from. As neurobiologists have deepened our understanding of the powerful neurochemicals that underlie our moods and motivations, words like adrenaline, endorphins, dopamine, and serotonin have become part of our vernacular. And for those who have spent any time studying the field, it has become increasingly difficult not to think of human behavior in chemical terms. In his 2004 book *Mind Wide Open: Your Brain and the Neuroscience of Everyday Life,* journalist Steven Johnson sums up the prevailing view: "Our personalities—the entities that make us both unique and predictable as individuals—emerge out of these patterns of chemical release." Although part of the widespread confidence behind this view comes from observing cases like my friend's father, where a sudden chemical imbalance can cause a severe psychological disturbance, more of it has come from observations of the overwhelmingly positive transformations that attaining the right internal chemistry can bring about. Ever since the psychopharmacology revolution of the 1950s, when psychiatrists discovered the power of Thorazine to reduce even the worst symptoms of psychosis, the quest to chemically engineer mental health and well-being has been in full swing. Of course, most of us need look no further than our last trip to Starbucks or the local pub to see our own conviction in the benefits of chemically altered consciousness. But what if our power to chemically transform our experience went beyond a temporary release of inhibition or elevation of awareness? What if you could take a regular pill that would radically transform your personality, and even your sense of self, for the better? In the brave new world of psychopharmacology, even this bizarre possibility has become a reality.

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We all probably know Prozac as the first and still most popular of the new genre of antidepressant medications to have swept the civilized world over the past two decades. By inhibiting the cellular reuptake of serotonin, this magic pill has proven overwhelmingly successful in lifting the spirits not only of the clinically depressed but of anyone simply wishing to feel a bit "better than well." While this latter use, dubbed "cosmetic psychopharmacology" by psychiatrist Peter Kramer, raises many ethical issues and has been the subject of much heated debate, it is the results from Prozac's original clinical application that are of greatest interest here.

In his 1993 bestseller, *Listening to Prozac,* Kramer documents the cases of several patients who, after being prescribed the medication, experienced not only the expected elevation in mood but a wholesale transformation of their personalities. One such case was a woman named Tess who, in addition to being relieved from her depression, reported being simultaneously more at ease and more driven, less subject to emotional disturbance, and more extroverted, socially adept, and competent at her work. Two weeks after starting the medication, Kramer writes:

> *She looked different, at once more relaxed and energetic—more available—than I had seen her, as if the person hinted at*

in her eyes had taken over. She laughed more frequently, and the quality of her laughter was different, no longer measured but lively, even teasing.

With this new demeanor came a new social life, one that did not unfold slowly, as a result of a struggle to integrate disparate parts of the self, but seemed, rather, to appear instantly and full-blown.

"Three dates a weekend," Tess told me. "I must be wearing a sign on my forehead!"

This new personality remained consistent for nine months—until Kramer took her off the medication. Although Tess did initially manage to hold on to some of her newfound confidence, she gradually began falling back into the personality traits that had characterized her life before Prozac. "I'm not myself," she told Kramer after several months, at which point he promptly put her back on the medication.

Another patient, Julia, had experienced a similar transformation, following a stunning reversal of the obsessive-compulsive behavior that had been ravaging her family and work life. But when Kramer tried to lower the dose:

Two weeks later Julia called to say the bottom had fallen out: "I'm a witch again." She felt lousy—pessimistic, angry, demanding. She was up half the night cleaning. . . . "It's not just my imagination," she insisted, and then she used the very words Tess had used: "I don't feel myself."

In reflecting on Kramer's accounts, Walter Truett Anderson writes in *The Future of the Self,* "What is particularly fascinating here is that in both cases, the women believed their 'real selves' to be what they had experienced during the short period of treatment and not the way they had been for the rest of their lives. Which, then, is the real self? And who decides?" Kramer himself, perhaps the single greatest advocate of cosmetic psychopharmacology, also found it hard to come to terms with this particular outcome of the treatment. "How were we to reconcile what Prozac did for Tess with our notion of the continuous, autobiographical human self?" These are big questions. And in light of the present inquiry, I would add one more: If a simple shift in brain chemistry can bring about such a dramatic transformation of the self, what aspects of our selves, or souls, do we imagine are outside the control of the brain? Like the study of brain damage, psychopharmacology also seems to suggest that we are more a product of our brains than most of us would like to think.

NEUROETHICS

If the study of brain damage and neurochemistry provides the beginnings of an outline of the profound link between brain and mind, powerful new brain scanning techniques promise to fill out the details in living color. By providing a picture of the brain's blood-flow patterns when engaged in particular activities, PET, SPECT, and fMRI scans are enabling researchers to map the regions of the brain like cartographers once charted the contours of the globe.

Through extensive imaging studies, neuroscientists have been able to identify nearly a dozen areas involved in different aspects of speech alone. And that pales in comparison to the thirty-plus different areas involved in specific aspects of vision. There is one area that recognizes vertical lines, another for horizontal lines, another for detecting motion, and another for the color blue. When it comes to face recognition, the picture gets even more complex. Would you believe that there are specific clusters of neurons that light up when presented with specific faces at specific angles—that, for instance, there is one tiny part of your brain dedicated specifically to your grandmother's profile, and another reserved for the ubiquitous mug of George Bush?

Discovering the biological basis of speech and perception is, however, just the beginning. With experimental methodologies improving by the month, even the more complex aspects of our experience, such as emotion, reason, motivation, and will, are beginning to give up their secrets. In *Mapping the Mind,* science journalist Rita Carter writes: "It is now possible to locate and observe the mechanics of rage, violence, and misperception, and even to detect the physical signs of complex qualities of mind like kindness, humour, heartlessness, gregariousness, altruism, mother-love, and self-awareness."

There is one tiny part of your brain dedicated specifically to your grandmother's profile, and another reserved for the ubiquitous mug of George Bush.

The profound implications of these findings are not lost on the neuroscience community. Indeed, one of the more interesting new areas of discussion is what has become known as neuroethics. According to psychologist Martha Farah, brain imaging in particular has opened up an ethical can of worms with its unprecedented ability to peer into the previously private

reaches of the individual mind. For instance, with neuroimaging, it has now become possible to tell when someone is being deceitful, or even when they are deceiving themselves. Enter lie-detection 3.0. Scientists can also discern whether someone was involved in a crime by showing them objects from the crime scene and seeing how their brain responds. Welcome to the new forensics, as marketed by Brain Fingerprinting Laboratories, Inc. It's even possible to tell whether someone is an illegal drug user by showing them photos of drug paraphernalia and seeing whether the brain enters a "craving state." Meet the new war on drugs.

Then there is what Farah refers to as "brainotyping." Using these same methodologies, neuroscientists can now look behind the scenes of your persona and find out what sort of human being you really are. Do you secretly harbor racial prejudices? By watching your brain while you look at pictures of racially diverse faces, brain scanners can provide an answer. How about sexual preferences? By showing you a variety of erotic imagery, we can see who or what turns you (or your brain) on. (And don't bother trying to suppress your response. Your brain looks different when you do that too.) Are you a risk-taker? A pessimist? An introvert? Neurotic? Persistent? Empathic? Even such core personality traits as these are now laid bare before the new neurointerrogation.

Ethical issues indeed.

Within the discussion around neuroethics, however, there is a larger issue coming to the fore that some feel may rattle the very foundations of the way we think about ethics itself. In civilized culture, our ethical norms and even our legal system are built on the notion of individual responsibility. When judging the actions of another, we hold him or her accountable for having freely chosen those actions for good or ill. But if we look at the picture of the human being emerging from neuroscience, many feel that there is little in it to support the idea that we freely choose our actions. If our actions are entirely caused by the brain, and the brain is in turn shaped entirely by the interaction between genes and environment, where does free will enter the equation? This

Neuroscientists can now discern whether someone was involved in a crime by showing them objects from the crime scene and seeing how their brain responds.

may seem like philosophical nonsense, given that one of our most basic human intuitions is our sense of our own freedom to choose. But prominent neuroscientists claim that this deterministic picture of human behavior has, in fact, been reinforced by a number of experiments that seem to show that our brain makes choices before we are conscious of having made them, that in fact, conscious will is an illusion.

This bizarre notion, which is widely held within the neuroscience community, is clearly not one that will go over easily with the public at large. In fact, on the controversy scale, it may run a close second to what is no doubt going to be the most hotly disputed neuroscience claim of all—the notion that, as Farah puts it, even our "sense of spirituality" is itself a "physical function of the brain."

TODDLER RECALL

Childhood memories may last a lifetime, but try remembering something that happened before the age of three and you'll either draw a blank or be drawing on your imagination. What's the source of this memory barrier? Could it be repression, our ego's attempt to shield us from the trauma of the terrible twos? Not likely. As it turns out, the hippocampus, the part of the brain responsible for long-term memory, doesn't mature until around the age of four.


足陽明胃經之圖

"Our inability to account for consciousness is the trigger that will, in time, push Western science into what the American philosopher Thomas Kuhn called a "paradigm shift."

Peter Russell

PART THREE: the quest for a new paradigm

IS GOD ALL IN YOUR HEAD?

As my train surfaced just west of Penn Station, the light snow that had been with me since I left Massachusetts early that morning seemed to have picked up the pace. Settling in for the last two hours of my journey to Philadelphia, I pulled out the new issue of *Time* I had picked up at the newsstand. It was a "special Mind and Body issue" on "The Science of Happiness," and as I started flipping through it, I almost immediately landed on a two-page spread featuring a large color photo of a meditating Buddhist monk with electrodes attached to his head. Fixing the electrodes to his shaven scalp was psychiatrist Richard Davidson, the "king of happiness research," who observes the brain activity of meditators in an effort to understand the connection between meditative bliss and our prefrontal lobes. The article, entitled "The Biology of Joy," was only the latest in a series of reports that have hit the popular press in recent years documenting the efforts of neuroscientists to understand the relationship between spiritual experience and the brain. The first, and certainly most memorable, was a *Newsweek* cover story in May of 2001: "God and the Brain: How We're Wired for Spirituality." It was in that article that I first learned about the work of the man I was now on my way to Philadelphia to meet, the renowned meditation researcher Andrew Newberg.

A radiologist at the University of Pennsylvania Medical Center, Newberg earned his fame by conducting brain imaging studies on meditators in the late nineties. His findings, published in two books, *The Mystical Mind* and *Why God Won't Go Away* (cowritten with his research partner, the late Eugene D'Aquili), were some of the first to capture on film the distinct changes that occur in the brain during spiritual experience. Since that time, he has made the rounds of the progressive talk show circuit, been featured in nearly every relevant magazine, been inundated with speaking requests from churches and medical schools alike, and appeared in the recent science-meets-spirit cult film *What the Bleep Do We Know!?*—all of which points to just how much public interest (or

fear) there is regarding the possibility that even spirituality may have its roots in our cranium.

After meeting me in the hospital lobby and escorting me through a labyrinth of hallways to a small windowless office in the radiology department, Newberg turned his computer monitor toward me and said, "This is what I wanted to show you." On the screen were two colorful images of what I assumed was a human brain. "The picture on the left," he explained, "is the image of the subject's brain before meditation. On the right is what it looks like during meditation. In this case, the meditator was a Tibetan Buddhist, or, rather, an American Buddhist practicing a Tibetan form of meditation."

In their initial studies, Newberg and D'Aquili worked with two main groups, one comprising eight American Buddhists doing a concentrative form of meditation and another made up of three Franciscan nuns practicing contemplative prayer. Although the results of their studies varied somewhat between the two groups, the overall picture was remarkably consistent. Not surprisingly, Newberg and D'Aquili found that during meditation or prayer, there was an increase in activity in the prefrontal lobes, a region responsible for such higher faculties as intention, will, and the ability to focus our attention. But it was another one of their findings, in particular, that seemed to create all the stir.

"If you look here at this area at the back of the brain," Newberg said, pointing with his pen to a bright yellow blob of color, "you can see that it is much less pronounced during the meditation session than before. This is the posterior parietal lobe, what I call the orientation-association area. It's the part of the brain that allows us to orient ourselves in space, that gives us a sense of boundary between ourselves and the rest of the world. What we hypothesized was that the sense of unity, or oneness, that people experience during meditative practice would be correlated with a reduction of activity in this area. And this is exactly what the neuroimaging shows."

Hearing that the exalted mystical experience of oneness (what Newberg calls "absolute unitary being") comes about through the reduction of activity in a specific part of the brain is the sort of thing that could, as they say, take all the fun out of it, and fast. So far, though, Newberg seemed too good-hearted to be angling for the ultimate reductionist coup. To make sure, I hit him with my big question straight up: "Do you think your research shows that religious experience is completely reducible to brain activity? Is God all in my head?"

By his expression, I could tell he was ready for this one. "It might seem that way," he began, "but I don't think the research necessarily points to that conclusion. This may be a simplistic way of looking at it, but if I were to take a brain scan of somebody who is looking at a piece of apple pie, I can tell you what their brain is doing when they have the experience of seeing that apple pie. But I can't tell you whether or not that piece of apple pie exists in reality based on the scan. Likewise, if I take a brain scan of a Franciscan nun who has the experience of being in the presence of God, I can tell you what her brain is doing during the experience but I can't tell you whether or not God was really there, whether the experience represented a true reality. Neuroscience can't answer that epistemological question."

"When people have mystical experiences, they universally report that they have experienced something that is *more real* than our everyday material reality."

Andrew Newberg

As Newberg spoke further about epistemology—the study of how we know what we know—it became clear that for him, coming to grips with the philosophical and spiritual implications of his findings is at least as important as the findings themselves. "Let's say we were to take the materialist position that the only way we experience anything is through the brain. This means that the only way we can tell whether something is real is through our brain. The brain is the organ that discerns what is real. Okay, now this presents a slight problem for the materialist position because when people have mystical experiences, they universally report that they have experienced something that is *more real* than our everyday material reality. Which means that the brain perceives God, or pure consciousness, to be more real than anything else. So if the brain is what determines what is real and what isn't, and this is a universal experience of human brains across cultures, where does that leave us?"

In the course of our conversation, Newberg went to great lengths to make it clear that he is, in many ways, still agnostic on the big questions. But he also didn't hide the fact that the work he is doing is only the latest incarnation of a spiritual search that began in his youth—a fact that may account for his surprisingly nonmaterialistic interpretation of his own research. Although he acknowledged that his findings could easily be used to support a reductionist position, he feels that by experimentally demonstrating the reality of mystical experience, he is actually doing spirituality a service, perhaps even forcing science to take mysticism seriously for the first time. Indeed, what probably intrigued

me most about Newberg was his conviction that mystical experience itself may have something to offer science that it desperately needs—the possibility of breaking the bounds of subjectivity and opening the door to a truly objective perspective.

"One of the limitations of science is the problem of subjective awareness," he said at one point while giving me a tour of the scanning equipment used to conduct the research on the meditators. "Even with regard to our scientific studies and scientific measurements, science still has the problem of never really being able to get outside of our brain to *truly* know what is out there in reality. One of the reasons I've been so intrigued with spiritual experience is that it's the only state where one at least hears a description where a person claims to have broken the bounds of their own human self-consciousness and gotten into intimate contact with ultimate reality. And I think if that's the case, then as scientists, we have to look at that experience very, very carefully because that may be the only way of solving the problem of getting outside of the subjective mind."

As he escorted me back out to the hospital lobby, I told Newberg more about the questions that had sparked my own recent inquiry into brain science. To my surprise, he said he wasn't particularly troubled by the mind/body problem or by the mounting neuroscientific evidence for materialism. "The belief that matter is primary provides a good basis for explaining the material world," he said, "but it can give no clear answer as to where consciousness comes from. On the other hand, if we take a religious perspective and say that consciousness is primary, it's not so easy to explain the existence of matter. My own feeling is that perhaps consciousness and matter are two ways of looking at the same thing. But I think the bottom line is that we really don't know yet."

My encounter with Newberg opened my mind in ways I hadn't expected. Whereas I had gone to him bracing myself for yet another piece of seemingly irrefutable evidence for the brain as the sole source of experience, I left with some new perspectives on the terrain and with a renewed confidence that our humanity can withstand the challenges of brain science. As a

reputable neuroscientist, clearly Newberg was familiar with all the data I had come across, and no doubt a lot more. The fact that his own spiritual convictions hadn't been fazed and had even been bolstered by his studies of the brain seemed to suggest that there must be more to the story than the neuroscientific mainstream would have us believe.

As he reminded me, for all the evidence neuroscience seems to present for the case that the brain creates the mind, the reality is that nobody has yet been able to explain, let alone demonstrate, how it could actually do such a thing. The mind/body problem is as enigmatic as ever. And although this doesn't seem to be persuading the neuroscientific community at large to question its materialistic assumptions, as I would learn over the months that followed, there are a number of scientists on whom the implications of this fact have not been lost.

Emerging from the frontiers of a variety of scientific fields, there is a growing movement of pioneers who are seeking to counter the reductionist tendency in biology in general, and in brain science in particular. Convinced that the real problem of consciousness lies in the very way it is being approached, these new thinkers aim to root out the materialistic assumptions that are guiding the bulk of neuroscientific inquiry and replace them with a larger, more holistic paradigm capable of embracing the full complexity of human experience. Some are doing so by weaving elaborate alternative theories to account for the same data. Others are pushing the scientific edge with their own experiments attempting to demonstrate the existence of phenomena that cannot be accounted for by materialism. What they all have in common is a passion for preserving our humanity in the face of the mechanistic worldview, and a willingness to fiercely critique the dogmatic tendencies of scientific orthodoxy.

For all the evidence neuroscience seems to present for the case that the brain creates the mind, nobody has yet been able to explain how it could actually do such a thing.

INTO THE LIGHT

Perhaps the most intriguing challenge to the neuroscientific mainstream is emerging from the growing body of research into what physician Raymond Moody dubbed "near-death experiences," or NDEs. Throughout the ages and across cultures, people have reported a variety of mystical phenomena surrounding the dying process. But with the technological explosion of the twentieth century, one medical advance in particular has opened a significant window into the phenomenology of dying—namely, our ability to resuscitate people, to bring them back from the dead. Beginning with Moody's work in the early seventies, over the past several decades, a number of researchers have been exploring this terrain, yielding a remarkably consistent picture of what happens when people make a temporary sojourn through death's door.

Thanks to Oprah and other mass media coverage of the phenomenon, most of us are by now familiar with the basic outline. Upon being pronounced dead, these patients experience themselves outside of the body witnessing the scene of the accident or operating room from above. From there, at some point they begin moving into darkness, or sometimes a dark tunnel, at the other end of which they are met by deceased relatives and perhaps a "being of light" who then prompts them to undertake a review of their life. In most cases, there is an encounter with "the light," which is usually accompanied by feelings of overwhelming joy, love, and peace, after which they either discover or decide that it is not their time to die and are returned to their body. Although not all NDEs contain all of the above elements (in fact, some patients even report harrowing encounters with hellish realms, quite the opposite of the more common positive NDE), for most who have the experience, it is a life-transforming event, leading to a radical change in values and a loss of the fear of death.

It's easy to understand why these experiences would have such a profound psychological and spiritual impact. After an episode like that, who could doubt the existence of consciousness beyond the body and the reality of life after death? Indeed, given the widespread media attention these accounts have received, it may well be that NDEs are as responsible as televangelism for the continued widespread belief in the afterlife in contemporary America. And if we take them seriously, they certainly seem like good reason to question the notion that consciousness resides entirely in the brain. However, as neuropsychiatrist and renowned near-death researcher Peter Fenwick points out, "The simple fact that people have these experiences does not in itself prove anything one way or the other regarding the existence of consciousness outside the brain." Simply put, how do we know the NDE is not just a brain-generated illusion? According to the "dying brain hypothesis" as put forward by psychologist Susan Blackmore, all of the specific phenomena associated with the classic NDE can be accounted for by established brain responses to the "severe stress, extreme fear, and cerebral anoxia" that would naturally accompany a brush with death.

Yet riddled throughout the NDE literature are accounts that seem to suggest that there is more going on in these experiences than can as yet fit into the materialist picture. For instance, several physicians and nurses have reported patients being able to describe in detail events that happened when they were clearly unconscious, comatose, or even clinically brain dead. In one widely reported case, a postoperative patient correctly identified the nurse who had removed his dentures and the drawer she had placed them in—while he was in a coma. In another, an unconscious patient had an out-of-body experience after which she accurately described a tennis shoe she had seen on the outside ledge of a third-floor hospital window. But the most dramatic case to date is probably the now-famous story of an Arizona woman named Pam Reynolds. In a last-ditch attempt to save Reynolds from a brain aneurysm that threatened her life, doctors performed a rare and dangerous "standstill" operation in which they lowered her body temperature to below sixty degrees Fahrenheit, stopped her heart and respiration, and drained all the blood from her body and brain. Her EEG was a flat line, and her brain stem showed no response to the "clickers" placed in her ears. She was, by any reasonable definition, dead. Yet following her recovery from the operation, doctors learned that not only had she undergone a classic NDE, but she was also able to recount with astonishing accuracy many of the details of the operation, from the surgical instruments used to the conversation between the surgeons and nurses.

So far, the research into NDEs has been largely anecdotal, and as yet, no one has provided the kind of independent verification of data that would stand as scientific proof. But it is anecdotal cases like these that have inspired researchers to focus their inquiry on documenting with increasing rigor those NDEs that could provide hard evidence that something more than the brain is at work. In the cardiac ward, where death regularly comes and goes, they have found their laboratory. As Peter Fenwick puts it,

For most who have the near-death experience, it is a life-transforming event, leading to a radical change in values, and a loss of the fear of death.

> *For the scientific researcher, the interesting question is this: When does the NDE occur? . . . If it could be shown scientifically that the near-death experience occurs during unconsciousness, as suggested by those who have survived a cardiac arrest, when all brain function has ceased and there is apparently no mechanism to mediate it, this would be highly significant, because it would suggest that consciousness can indeed exist independently of a functioning brain.*

Fenwick and other NDE researchers agree that further research is required before the case can be closed with any certainty. But initial results from several large, multihospital cardiac ward studies are highly supportive of the notion of a nonmaterial mind. If future studies are able to provide adequate empirical evidence, it will indeed raise some very big questions about consciousness and the brain.

A MIND FIELD

If the mind is not contained in the brain, then just where exactly is it? The traditional dualist answer, around since Descartes' time, is that it is a separate immaterial substance that interacts with the brain and body in some mysterious way. Trying to figure out how this interaction occurs is what launched the debate over the mind/body problem in the first place. But today, thanks to advances in scientific theory over the past century and a half, some new ways of thinking about the matter are starting to emerge.

For renegade biologists like Rupert Sheldrake, one of the most powerful tools for understanding the workings of life and mind is the physical notion of the "field," first introduced to science by Michael Faraday in the nineteenth century. "From electromagnetic fields to gravitational fields to quantum matter

YOUR BRAIN ON BUDDHISM

Most neuroscientists are convinced that the brain creates the mind, but according to neuropsychiatrist Jeffrey Schwartz, there is increasing evidence to suggest that the mind also helps create the brain. Using basic Buddhist mindfulness techniques to effortfully focus their attention, obsessive-compulsive patients have been able to literally rewire their brain circuits to support new, healthy responses to once-troublesome stimuli.

fields, these field theories have taken over physics in such a way that everything is now seen as energy within fields," Sheldrake told me one afternoon at his home in north London. "As the philosopher of science Sir Karl Popper put it, 'Through modern physics, materialism has transcended itself, because matter is no longer the fundamental explanatory principle. Fields and energy are.' So what I'm asking is, When we come to the mind and the brain, what if the brain is a system that's organized by fields as well?"

According to Sheldrake, consciousness, or mind, is best understood as an information field that is anchored in the brain but extends far beyond it, that in fact, extends wherever our attention goes. "The field of a magnet isn't confined to the inside of a magnet. It stretches out beyond its surface. The field of a cell phone stretches out beyond the surface of the handset. So my point is that the fields on which mental activity depend interact with the brain and are rooted in the brain, but they're not confined to the brain any more than any of these other fields are confined to the material object they're associated with."

Approaching the mind/body problem in this way, Sheldrake feels, allows for an explanation of both the voluminous body of data that shows the dependence of consciousness on brain function and the mysterious evidence from his own studies of telepathy and other psi phenomena that seem to point to the ability of consciousness to reach beyond the parameters of the skull. "So, just as the field around the cell phone will be changed if you oblate a component or cut a wire in the handset, so the fields around the brain and the fields within the brain would be affected by changes in or damage to the physical components. But that doesn't prove that those fields are entirely limited to what's happening inside the brain."

According to Sheldrake, consciousness or mind is best understood as an information field that is anchored in the brain but extends far beyond it.

Indeed, in the course of my research, the most common metaphor I encountered among those seeking to counter materialism's robust claims was a notion first put forward by William James: the analogy of the brain as a kind of receiver/transmitter for consciousness. In Sheldrake's words:

> *If I switch on my TV set to PBS and if you measure different bits of the tuning set, you'll find that certain bits are resonating at certain frequencies. If I switch it to another channel, like Fox News, there will be measurable frequency changes in the various bits of the TV. But that doesn't prove that all the content of PBS programs and Fox News is generated inside that bit of the TV set. I think that the thinking behind a lot of neuroscience claims is as naïve as that, because it's based on the assumption that it's all inside the brain. Therefore the next question is: Which bits of the brain explain it? But if the brain is not like that, if the brain is more like a tuning system and a center for coordinating our actions and our sensations, then there's no reason to assume that all our mental activity is confined to the inside of the head.*

How exactly would such a receiver/transmitter model work in the case of the NDE, when the patient shows no brain activity at all? One idea, expressed by Dutch cardiac surgeon and NDE researcher Pim van Lommel is that "the informational fields of consciousness and memory are present around us as electrical and/or magnetic fields, but these fields only become available to our waking consciousness through our functioning brain and other cells of our body." According to van Lommel, when brain function is lost, these information fields continue to exist. Hence, brain-dead patients can still experience identity, attention, cognition, memory, and emotion. But these experiences will be brought into our waking consciousness only when brain function is restored.

Admittedly, such ideas, like those of other researchers on the frontiers of science, are far from being accepted by the academic mainstream. In fact, in speaking with Sheldrake, it became clear that he gave up trying to directly convince the scientific orthodoxy of his ideas a long time ago and is instead focusing his efforts on igniting a sort of parapsychology revolution among the masses. Through his recent popular books *The Sense of Being Stared At* and *Dogs That Know When Their Owners Are Coming Home* and his new participate-at-home email telepathy experiments, he is trying to awaken in the public an interest in exploring the mysteries of consciousness that surround them every day. His hope is that with enough popular support for the idea of psychic phenomena, the scientific establishment will have to start to take seriously the powerful evidence that he claims has been accumulating in parapsychology labs for decades.

THE UNIVERSE INSIDE YOUR HEAD

"Evidence is not the issue," the voice on the other end of the line said calmly. "We have plenty of evidence. But evidence alone is not enough. What we need now is a theory." I was speaking with

Dean Radin, senior scientist at the Institute of Noetic Sciences (IONS) and one of the leading voices in parapsychology, or "psi research," today. Having begun his parapsychology career in the mid-eighties doing government-classified research at SRI International (formerly part of Stanford University), Radin has worked in psi labs at a number of universities and spent several years as president of the Parapsychological Association. He is perhaps best known for his 1997 book *The Conscious Universe: The Scientific Truth of Psychic Phenomena*. In it, he presents an accessible and comprehensive overview of all psi research to date, including several meta-analyses of data from multiple studies that, taken together, make a persuasive case for the reality of such effects as psychokinesis, remote viewing, clairvoyance, telepathy, and distant healing—all of which seem to lend some support to the idea that the mind cannot be entirely contained within the brain.

In studies of psychokinesis, or "mind-matter interaction," for instance, researchers have found over thousands of trials that subjects can influence the output of electronic random-number generators to a statistically significant degree simply through the power of intention. "Remote viewing" research, much of it funded by federal agencies including the CIA, has shown that skilled psychics can accurately describe remote locations in controlled tests with odds against chance of over a billion to one. And despite recent controversies that have erupted around the field of "distant healing," studies suggest that "intercessory prayer" on behalf of others who don't know they're being prayed for can reduce secondary infection rates and hospital stays among AIDS patients, reduce the risk of complications during heart surgery, and even improve pregnancy rates for in vitro fertilization (results no doubt responsible for the 2.3 million dollars spent by the U.S. government on prayer research in recent years).

Psi research, like most frontier or "fringe" sciences, has been fiercely attacked by skeptics claiming research design flaws, inadequate samples, and experimenter bias. So I was curious to ask Radin what body of research he felt made the most irrefutable case for the existence of psi. While he was

quick to point out that "nothing in science is irrefutable," for the most convincing single body of data, he soon landed on the phenomenon of telepathy. Most of us have at some point been surprised to find ourselves seemingly picking up on another's thoughts, or knowing who was calling before we picked up the phone, or in this internet age, preparing to send someone a question via email only to receive their response before we sent it. While skeptics readily reduce all such phenomena to chance, a substantial body of research has been accumulating that aims to show just how far beyond chance they actually are.

The most potent evidence to date, according to Radin, surrounds what are known as "the ganzfeld experiments." Hypothesizing that reduced sensory input would place subjects in a more receptive state, in the 1970s researchers developed a basic, easily replicable experiment in which one subject, a "sender," views a single image for a period of time and attempts to send it telepathically to another subject, a "receiver," who has been "prepared" by spending ten to twenty minutes in a state of sensory deprivation. After this, the receiver is then shown a series of four images and attempts to identify the sent image from among them. If chance were the only factor involved, this would predictably lead, upon multiple trials, to a twenty-five percent success rate. But in the thirty years since its inception, this experiment has been replicated in over thirty-one hundred sessions across dozens of laboratories, producing an average success rate of thirty-two percent. For those not familiar with statistics, that might sound only mildly interesting. By the standards of science, however, it is nothing short of astonishing, showing odds against chance of over a trillion to one. "The magnitude of the effect is small, but it's stronger than the experiments that convinced the medical establishment that aspirin reduces the risk of heart attacks," Radin explained. "And telepathy is only one of many areas of successful psi research. This is why I'm saying that no amount of evidence alone is going to be enough. The implications for the current scientific paradigm are just too great."

For Radin, who has been battling skeptics for over twenty years, the accumulation of more data has, at this point, become a side issue. "This evidence, evaluated by the same standards as used in the behavioral, social, and medical sciences, establishes that psi effects are real," he explained. "The only reason that it's not accepted by the mainstream is that there is no clear, theoretical reason to accept it. It's not accepted because people don't know how to explain it."

> **"The only reason psi is not accepted by the mainstream is that people don't know how to explain it."**
>
> *Dean Radin*

When I spoke with Radin last winter, he was hard at work on his next book, *Entangled Minds,* in which, in addition to updating the results of psi research over the past seven years, he plans to present a new theory that he hopes will open the door for the scientific establishment to begin to take psi seriously. Like many theorists attempting to explain the unexplainable, he is looking to the mysterious world of quantum physics for answers. "Ultimately the mystery in psi is a mystery about physics," Radin told me. "The mystery is that something somehow got inside your head that didn't come through the ordinary senses, and that transcends time and space in some strange way. That mystery is about physics. It's not about biology, and it's not about psychology or neuroscience."

Drawing on the well-established idea of "quantum entanglement," Radin is proposing the existence of what he calls "bioentanglement." In a nutshell, quantum entanglement is the notion that seemingly separate subatomic particles, once they've been in contact with one another, will, in fact, remain connected even across space and time. This connectedness, or "nonlocality," was first demonstrated experimentally in 1972, and in the three decades since, Radin explains, physicists have been learning more and more about how widespread the phenomenon is. "It is far more pervasive and robust than anyone had imagined even a few years ago. And for me, the question is: What does that mean about the fabric of the world that we live in? What I think it means is that if in fact things are entangled, and if all that is required for two things to become entangled is some contact at some point in their history, then everything in our universe ought to be entangled, because cosmologists tell us that it all came from one source, the big bang."

Extending this idea of quantum entanglement out of the subatomic and into the "macro" realm is a controversial move, and one that, so far, most mainstream physicists are not yet ready to make. But for Radin, the notion of bioentanglement may provide a way of understanding phenomena that seem impossible to explain within a classical materialist worldview:

> *If brains behave as quantum objects, then it opens the possibility that our brains are connected, or entangled, with everything. In which case we can think of psychic phenomena not as a mysterious process of information being sent*

from one place to another and somehow getting into your head, but more as a change of attention within the brain. If the whole universe is already inside your head because you're bioentangled with it, then if you wish to see what is in somebody else's head or what's in a hidden envelope somewhere else, or what's on the other side of the world right now or last year, you simply need to attend to the portion of your brain that is entangled with that state.

THE VIEW FROM ABOVE

In their quest to counter the reductionist tendencies of materialism, frontier scientists like Radin and Sheldrake are by no means fighting a solitary battle. In recent years, philosophers, theologians, cosmologists, and even mainstream cognitive scientists have joined the fray, developing powerful critiques and alternative theories that attempt to expand the frame of our thinking about the mind and brain.

Philosophically speaking, one of the more intriguing ways around materialism—and indeed around the mind/body problem itself—is the increasingly popular, albeit ancient, theory of panpsychism. Advocated by a diverse range of thinkers from David Chalmers to theologian David Ray Griffin, this idea, and its close bedfellow panexperientialism, navigates the mind/body conundrum by asserting that consciousness, or experience, is a fundamental property of the universe that can in some form be found everywhere—all the way down to the most elementary particles. According to panpsychism, there is no need to try to figure out how consciousness arises from the complex human brain, because consciousness has been interwoven with matter from the beginning. But before you start imagining rocks having late night talks, note that the idea is not that pebbles and molecules and quarks are conscious in the way that we are, but that they would have some form of what Chalmers would call "protoconsciousness" or what Jesuit priest and paleontologist Pierre Teilhard de Chardin referred to as "interiority."

One advantage of this way of thinking is that it allows for the notion that consciousness is something that develops along a continuum of increasing depth and complexity. Instead of seeking for that magical circuit in the animal or human brain that suddenly gave birth to consciousness, panpsychists argue that consciousness has been developing steadily as an inherent part of the process of evolution. The more complex the organization of matter has become, the more complex the level of consciousness it has been able to sustain. Since the human nervous system is the most complex piece of hardware on the planet, it's no surprise that it is accompanied by the most complex form of consciousness. Though still eschewed by most mainstream philosophers and scientists, this view is gaining ground, particularly among the alternative intelligentsia, in large part because it provides a potentially nonreductionistic framework for understanding the relationship between the mind and the brain (even if some of its proponents, like Chalmers, use it as an argument for the possibility of conscious machines—if all matter is conscious, after all, why couldn't a supercomplex computer be as conscious as you or me?).

But probably the weightiest attempt to counter reductionism—and the one closest to the mainstream—comes from a broad category of theorists who look to the relatively new science of complexity, or emergence, to explain the brain's relation to the mind. For these scientists and philosophers, the notion that consciousness emerges from the activities of the brain is not in question. To say that consciousness can be reduced to the brain, however, is another matter. As Rita Carter describes it, emergence, simply put is "the idea that a complex system can produce something that is more than the sum of its parts." How exactly that happens is, well, complex. The basic idea is that interactions between lower-order phenomena can give birth to higher-order phenomena with properties that cannot themselves be reduced to the lower-order interactions. Just as the wetness of water cannot be found in the hydrogen and oxygen molecules that make it up, so the complex qualities of mind, like reason, decision making, reflection, and emotion, cannot be found in the behavior of our neurons. The appeal of this approach is that while it does not deny the biological roots of mind, it nonetheless acknowledges the validity of higher orders of human experience as having a reality of their own.

If all matter is conscious, why couldn't a supercomplex computer be as conscious as you or me?

Among proponents of emergence theory are many religious thinkers seeking a philosophically and scientifically respectable way to preserve the sanctity of our higher human faculties. But it has also found adherents among materially inclined philosophers and scientists who are not satisfied with reductionist explanations. As philosopher John Searle writes: "Consciousness is irreducible not because it is ineffable or mysterious, but because it has an essentially subjective first-person mode of existence and

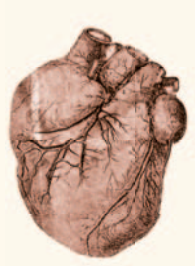
therefore cannot be reduced to third-person phenomena. The traditional mistake that people have made in both science and philosophy has been to suppose that if we reject dualism . . . then we have to embrace materialism. But . . . materialism is just as confused as dualism because it denies the existence of subjective consciousness as a thing in its own right."

What the panpsychists and emergence theorists share is a conviction that materialism's failure to adequately account for the actual complexities of human experience is itself reason to leave it behind. In this sense, they can be seen as part of a larger movement of holistic thinkers for whom partial, compartmentalized explanations of the phenomena of life and consciousness are no longer satisfying. Insisting that the only satisfactory theory will be one that addresses the multiple levels and dimensions of our humanity—from neuronal firing to cosmic consciousness—these new, more integral theorists are attempting to forge a science that while remaining true to the results from the laboratory is equally true to the realities of our lived experience. As Templeton prize–winning cosmologist George Ellis told me:

> *The standard mistake that fundamentalists make is to posit a partial cause as the whole cause. Yes, the neurons are there. That's a partial cause of what's going on. What these neuroscientists are missing, though, is the top-down action in the brain, which is the part that gives life its actual meaning. And if you only choose to look from the bottom up, you'll never see that meaning. Think of a jumbo jet flying. The bottom-up view of why it flies is because the particles are impacting the wing from below and moving a bit slower than the particles above. The top-down version of why the plane is flying is because someone employed a lot of draftsmen using computer-aided design tools to design the plane to fly. The same-level view of why the plane is flying is because the pilot is sitting at the controls and making it fly. Now, the physicists tend to miss both the same-level view and the top-down view. And it's the same with these neuroscientists. To return to our flight analogy, they would say that all that's enabling the pilot to fly the plane is the firing of some neurons in his brain. But then they would be missing the fact that actually he had decided to be a pilot when he was a boy. He got enthusiastic about it, he raised the money for his training, and all the rest of it. They just mess all of that up. They are unable to see those higher levels because they're focused on the lower levels.*

Taken together, these alternative theories seem to present a formidable case for the scientific establishment to reckon with. But the materialistic bias in Western science runs deep. And just how exactly it might be overturned remains anybody's guess. With approaches ranging from Radin's theory-making to Fenwick's search for more evidence to Sheldrake's parapsychology-for-the-masses, there is certainly no shortage of good ideas. Yet some feel that one of the more intriguing candidates for the proverbial back-breaking straw lies in the nature of the mind/body problem itself. As futurist and popular science author Peter Russell suggests in *From Science to God*, "I now believe this is not so much a hard problem as an impossible problem—impossible, that is, within the current scientific worldview. Our inability to account for consciousness is the trigger that will, in time, push Western science into what the American philosopher Thomas Kuhn called a 'paradigm shift.'"

Is it possible that it will be science's failure to solve the mind/body problem that will ultimately lead to materialism's undoing? Could neuroscience's bold attempt to penetrate the mysteries of the human psyche be that one step too far that brings the entire edifice crashing to the ground? It is of course far too early to say, but if such an eventuality were to unfold, given the mythic implications, it would no doubt give the gods—and perhaps even Icarus—a good chuckle.



HEART SMART?

The cranium may be home to the smartest organ in town, but when it comes to sheer magnetism, the gray matter in your head may have a little competition on its hands. According to the new science of neurocardiology, we have a second brain, in the form of a dense cluster of neurons, in the heart, and its electromagnetic field is five thousand times stronger than the brain upstairs. So, don't be surprised if the next person telling you to "follow your heart" is your doctor.

Which would really be more earth-shattering—to find out that the brain doesn't create the mind, or to find out that it does?

CONCLUSION: a higher order

As I sit writing these words, several of my hundred billion neurons are firing off messages to some of the fifty thousand other neurons they're each connected with—a microscopic electrochemical fireworks display that makes Coney Island on the Fourth of July look like a candelabra. With the recognition that the end of my project is in sight, a cascade of noradrenaline molecules dripping across the synaptic gaps between axons and dendrites quickens my pulse, bringing a renewed alertness and excitement. There is delight, too, which suggests that a serotonin squall is probably under way, with perhaps a dopamine shower for good measure. To keep up with the demands of the task, my frontal lobes are working overtime, drawing support as needed from the language areas in the temporal lobes and the memory networks wired throughout the cortex. My right hemisphere is appreciating the sense of the whole picture coming together. My left is grinding away to make sure the logic actually does hold together.

At the same time, on another level, *I* am thinking about what to say next. I'm reflecting on the points I've made, the examples I've used, the larger context I've set for the article, and what I ultimately want to communicate in its final few pages. I'm also thinking about who might end up reading it, and wondering what questions you might have at this point that I could still try to answer.

On still another level, I feel myself to be participating in a larger creative process that seems to have its own trajectory—one that was born when life first began to reflect on its own nature, or perhaps even long before, and that seems intent on continuing as long as there are conscious entities willing to partake in its unfolding.

How all of these levels fit together may be life's greatest mystery. And if indeed it can be solved at all, at our current rate of progress it doesn't seem likely that it will be giving up its secrets any time soon. Still, in the face of such multilayered complexity, one can't help but feel compelled to reach for synthesis, whether it's God or the neurons that are doing the compelling.

As I struggle to come to terms with my yearlong journey into the world of neuroscience and beyond, it's as if I'm staring down a hallway lined on both sides with images. On the left wall, I see Phineas Gage, his personality forever shattered by a loss of frontal lobe tissue. On the right, Pam Reynolds, returning from the other side of brain death with memories of the operation intact. On the left, I see my friend's father, Tess, and Julia, all swaying with the changing chemistry of their brains. On the right, Radin's and Sheldrake's psi research, pointing to the mystery of consciousness beyond the cranium. On the left, there are Roger Sperry's split-brain patients, trapped in a perpetual struggle between the two "centers of consciousness" sharing their skull. On the right, field theory, panpsychism, holism, and emergence theory, all insisting that it's time to leave an unworkable materialism behind.

By any stretch, it's a challenging picture to make sense of. And if I spend long enough on either side of the hallway, I find it all too easy to forget about the story on the other wall. Finding a worldview big enough to include it all does seem to be the elusive quarry of this quest—for the field as a whole, and for any individual who wants to come to grips with it.

For my own part, the easiest theories to rule out are those on either extreme. I find the materialist notion that the mind is an irrelevant byproduct of brain function about as plausible as the dualistic idea that consciousness is some ghostly ethereal substance that exists entirely independent of the brain. The truth, it seems, must lie somewhere in between. But where exactly?

Panpsychism holds a certain allure, not only because it does

away with the mind/body problem, but because it seems to validate a basic intuition—that whatever consciousness is, it must have been around since the beginning. But what exactly it would mean for a salt crystal to have "interiority" is still a bit beyond my ken.

Sheldrake's idea that the mind lives in mental fields extending out from my head also seems intriguing, in this case because it seems to provide some explanation for those mysterious spontaneous experiences of telepathy and for the powerful experience of collective consciousness that seems to arise when people gather in groups. Just how the brain's neural network could function as a "tuning system" for consciousness, however, is still something I'm struggling to visualize.

I'm also tempted to go with some version of the emergence idea, as it seems the closest to hard science to say that consciousness in some way comes out of the brain. But as one philosopher pointed out to me, "Until someone explains *how* emergence occurs, we might just as well say God did it."

And speaking of God, there is, of course, still the possibility, asserted throughout the mystical traditions, that consciousness came first and once *it* reached a certain level of complexity, matter emerged. As tantalizing as I find these sorts of explanations, though, they ultimately just replace one hard problem with another: How could something as ephemeral as consciousness give rise to something as concrete as a physical brain? And why did it need to?

Perhaps the most promising and ultimately satisfying theories are the integral ones that acknowledge the essential reality of different levels and dimensions of existence, allowing interiors and exteriors, consciousness and matter, to be seen as different sides of the same event, neither reducible to the other. Where mind and brain are concerned, however, even the most integral theories have thus far been unable to explain *how* the two interconnect, leaving the mind/body problem a mystery for another day.

In the course of my research, one thought experiment I've grown quite fond of is imagining that my consciousness really is being generated by my brain. Think about it—this whole three-dimensional experience of sound, color, thought, feeling, and movement all somehow arising out of the organic functions of this wrinkled slab of tofu-like substance in your head. It seems hard to imagine, but if it were true, what would that say about the nature of matter itself? In fact, if I think about it in this way long enough, I start to wonder which would really be more earth-shattering—to find out that the brain doesn't create the mind, or to find out that it does.

What does seem clear to me at this point is that no matter how much we learn about how the brain shapes our experience, we probably don't have to worry about losing our humanity in the process. As George Ellis and others have elucidated, there are levels of who we are that simply cannot be understood by looking at our neurons alone. Although we may not lose our humanity to neuroscience, however, it does seem likely that as research progresses, we will have to let go of a few ideas—possibly even some big ones—about what our humanity is made of. The great specter of brain science is that it will demonstrate that we are merely conscious organic machines, that all of our experience and behavior originates in the brain. Based on the evidence from frontier science alone, it doesn't seem likely at this point that it will quite be able to do that. But let's say that it were able to show that *most* of our behavior and experience is rooted in the brain. What would that mean? Well, for starters, we'd have to come to terms with the fact that we're a lot more organic machine than we'd like to think—that, as much as we savor the nuances of our personal wishes, aspirations, and personalities, most of our responses

BIRD BRAIN

Birds have long been believed to be at the lower end of the intelligence scale because their brains lack the complex structures that give higher mammals their cognitive capacities. But recent research has overturned this misconception, showing that some of our feathered friends are in fact as intelligent as higher hominids. Birds have been shown to have a sense of humor, be efficient in tool design, and some, like the African gray parrot, can even construct meaningful sentences using human language.

In an ironic turn of events, brain science just might end up supporting humanity's spiritual aspirations in a way no one expected.

are driven by genetic and social conditioning wired into our brains on a level we cannot see.

Now, if you look at that statement carefully, you might notice that it starts to look a lot like a sort of twenty-first-century version of how spiritual luminaries have been describing the human predicament for the last two or three millennia. From the Buddha's elaborate teachings on the conditioned nature of mind to twentieth-century Russian mystic G.I. Gurdjieff's proclamation that "man is a machine," a central thrust of mystical teachings throughout the ages has been a call to transcend our conditioned, mechanistic existence and discover a freedom that lies beyond all conditioning. And according to sages across traditions, the first step to doing so has always been facing just how deeply conditioned and machine-like we are. So, in an ironic turn of events, brain science just might end up supporting humanity's spiritual aspirations in a way no one expected. By exposing the impersonal mechanisms behind our cherished personalities, it may inadvertently be helping to clear the way for the discovery of that which the great masters have always said lies beyond them.

And what about "that which lies beyond"? What about the great mysteries of consciousness—of paranormal phenomena and mysticism? Will brain science have anything to teach us about those? In this case, the weight of the evidence would seem to suggest that the answer is probably "no." Whatever it is that is still paying attention when the brain is flatlined during NDEs, whatever it is that allows us to perceive at a distance in telepathy and other psi experiences, and more importantly, whatever it is that reveals itself in mystical experiences—*that,* I would dare to speculate, is probably not going to be reducible to our synapses.

In the case of our mysterious capacities to sense, know, and feel beyond the limits of our skulls, as Radin pointed out, these are ultimately questions of physics rather than of biology or neuroscience. The operative question, in this case, is: How is information being transferred through space and time in a way that bypasses the ordinary senses? Whether we explain that with Sheldrake's notion of mental fields or with Radin's "bioentanglement," in either case, we are well outside the realm of the neuron.

Where mysticism and spirituality are concerned, however, I think the issue is somewhat different. For although there are certainly a number of New Age physicists who would argue that mysticism, too, is a matter of physics, based on everything I've seen, I think that here we are dealing with something of a higher order—an order that by its very nature cannot be reduced to the levels below it. This is the testimony of mystics across the ages, and there is nothing in neuroscience as of yet that seems equipped to refute it.

Now, the fact that neuroscience alone cannot refute the existence of that higher order does not in itself make it any easier to prove that such an order exists. There are certainly many who would argue vehemently that we have no scientific reason to believe in the claims of religion and mysticism, however forceful or enduring they might be. Pointing to research like that of Andrew Newberg, they would assert that biology is perfectly sufficient to explain the experience of spirituality. But, as Newberg himself made clear, what they would be missing is the fact that those who have had even a taste of mystical experience universally report that experience to be "more real" than anything else they've experienced. Materialists could, of course, counter that such subjective perceptions have no place in the quest for objective knowledge. However, even if we take the materialist position that the brain is the sole mediator of experience and the final arbiter of truth, we are left with the fact that human brains across the ages have universally concluded that the spiritual reality glimpsed in mystical experience is in fact of a higher order than the ordinary reality we experience every day.

And this leads us to what may be the most interesting point of all. For as Newberg's research demonstrates, there is little doubt that the brain is at least a big part of what is enabling us to perceive that higher order. This means that, in what may be the greatest miracle we know, life somehow managed to evolve an organ capable not only of reflecting on itself but of perceiving something higher than itself—perceiving, even, that which many believe to be the very source and creative driver of the cosmos. Looked at in this way, the brain suddenly starts to seem a lot less like some frightening organic computer that we'd do well to distance ourselves from and a lot more like a rather mysterious and even spiritual event in its own right. After all, if it can do all that, who knows what kind of genius and untapped potential live within its folds? Given that human evolution is still in its early days, it in fact seems likely that the awesome powers of the human brain have only begun to reveal themselves. If we can use our gray matter to avoid destroying ourselves, we may find that the story of humanity's higher potentials is just getting started. ■

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