Paper Title: Neuroscience, Consciousness, and the Soul
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Paper Abstract:
In a recent Templeton lecture, George Ellis stated that one of the most crucial issues confronting the Science and Religion community is the attempt by hard-line neuroscientists to reduce all human experience to the interaction of neurons and in so doing, eradicate such notions as free will, meaning, and most significantly, God.

This paper addresses this point of contention head on, providing a broad survey of recent neuroscientific findings, and exploring the implications of some of these findings for the way we think about the self, consciousness, and the spiritual dimension of life. With advances in neuroimaging, neurochemistry, and the study of brain damage, many scientists are increasingly confident that they will soon be able to demonstrate the biological basis of all human behavior and experience. Others argue that the higher dimensions of who we are will never be reducible to biological processes. How are we to navigate this increasingly complex terrain?

Synthesized from in-depth interviews with over twenty leaders in the fields of neuroscience and consciousness studies, this paper presents the latest theories on the relationship between consciousness and the brain from both materialist and nonmaterialist schools and poses some central—and as yet unanswered—questions about what makes us who we are.

The paper's key contribution to the dialogue between science and religion is its contextualization of the latest neuroscientific discoveries in the light of broader theological and epistemological questions. It challenges adherents to consider scientific-materialist as well as religious viewpoints and to suspend fixed conclusions, considering anew what the nature of consciousness might be in light of the findings of contemporary science.

The overarching questions guiding the research of this paper include: 1) How can we remain truly scientific in our exploration of the brain, mind, and consciousness, without falling into dogmatic materialism and minimizing or rejecting our human and spiritual experience? 2) How do we make sense of the miracle of human consciousness in light of recent advances in brain science? 3) How will religion need to change to accommodate the findings of brain science? 4) How will science need to change if it is unable to solve the problem of consciousness? 5) How will *we* need to change in light of what we discover?

Through conversations, scientific anecdotes, and consideration of key theories on consciousness and the brain, this paper asks, and at times also poses answers to additional questions including:

· Is the brain a "cognitive prosthesis for the soul," or the source of consciousness itself?

· How could physical processes in the brain give rise to subjective experience?

· What conclusions are we to draw from neuroscience's ability to map regions of the brain to different aspects of our personality?

· What does the study of localized brain damage imply about the veracity of our deep-seated notion that the self is a unified whole?

· How can we preserve our humanity and spirituality while staying true to the findings of the laboratory?

Biography:
Craig Hamilton is the managing editor of the award-winning magazine *What Is Enlightenment?* His feature articles have examined the landscape of an emerging evolutionary spirituality and have explored the work of some of the leading religious thinkers of our time. Hamilton is a founding member of Ken Wilber's Integral Institute, Integral Education colloquium, and a participant in the Synthesis Dialogues, a 35-person interdisciplinary think tank moderated by His Holiness the Dalai Lama. He has lectured widely on the themes explored in *What Is Enlightenment?* and recently moderated a panel discussion on the Future of Religion at the 2004 Parliament of the World's Religions in Barcelona.

Paper Text:

<u>Introduction: Across the great divide</u>

I don't know why, but I've always found it hard to take sides in the war between science and religion. It's as if I have two competing instincts—one from my rationalistic upbringing, the other from my spiritual seeking—that have never quite faced each other in the light of day. On one hand, like many postmoderns, I have an instinctive revulsion for religious dogma and an innate trust in reason, which makes me favor science's rationality and clear-headedness in any debate. But on the other hand, I often find myself compelled by an equally instinctive, and hopefully equally rational impulse to protect the sacred from the ever-advancing triumphalism of scientific materialism.

Admittedly, the further back I go, 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, 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. And 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 quickly start to fade.

Still, if the science and religion battle were to stop with the debate over biological evolution, I would of course in the end have to come down on the side of the 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, or even, for that matter, slowing down. In fact, in recent years, thanks to the ambitions of the thriving field of neuroscience, 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.

Employing powerful new methods for studying the intimate workings of the brain, a growing cadre of neuroscientific pioneers aspires to demonstrate once and for all that the mind, emotions, and even consciousness itself are entirely generated by the three pound lump of grey matter in our skulls. For a generation of researchers in this field, the prime directive has become proving 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 21st 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. 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.

In a recent *New York Times* editorial 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, 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." And 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. 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 one of our most basic convictions—the belief in an immaterial soul or (if we're Buddhists) 'mind essence' that transcends the physical body. And 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. As convinced as the neuroscientists are of their case, I can't help feeling there must be more to the picture.

And here, as they say, is the rub. Because, if I take a step back from my own convictions, there is something about this situation 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 how the elders of the Church felt when Galileo attempted to oust the Earth (and thus human beings) from the center of God's universe?

I would of course like to think that the current situation is different. That, in attempting to tread on the sacred ground of the human soul, science has finally flown a bit too close to the sun. But 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 in beginning to tap the mysteries of the brain, our sense of who we are would come out unscathed. We are indeed in a challenging predicament. And for all of my ambivalence on the science and religion debate, I have to admit that this one makes the others look easy—particularly for those of us with spiritual inclinations who also feel it is 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?

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, it was widely held that the mind, or soul, was located in the heart. 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.

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 it, it was picked up by early Roman physicians who broke the taboo against dissecting cadavers and discovered the nervous system branching out from the skull and spine. But although this view gradually took hold, and has remained dominant ever since, it was still being disputed as late as the 17th 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 than the model we subscribe to today. Whereas we now see a vast, complex electrochemical network of some 100 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 along the way. 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 a large iron rod straight into his left cheek, through his brain's frontal lobe, and out through the top of his head. But, to everyone's amazement, Gage 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 co-workers who had witnessed it. But although his basic cognitive functions remained unaltered, over time it became clear that something fundamental had changed about Gage. According to the physician who followed his case, where prior to the accident Gage had 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 are 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. And their stories are often as perplexing as they are revealing.

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. According to Ramachandran, the explanation for this peculiar delusion, known as Capgras syndrome, is 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.

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 we are a unified whole. What we find 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. Harm 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 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

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, intuitive. In a normal brain, these two hemispheres communicate with one another through a large band of nervous tissue known as the corpus callosum. 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?

In an attempt to control severe cases of epilepsy, in the 1960s, neurosurgeons began cutting the corpus callosum to prevent the seizures from spreading from one side of the brain to the other. In these "split-brain" patients, psychobiologist Roger Sperry soon recognized a rare opportunity to study the differences between the two hemispheres in a way never before possible. Over the decades that followed, he pioneered a series of studies that ultimately earned him a Nobel Prize.

One of the most commonly known facts about hemispheric specialization is that the right brain controls the left side of the body and 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.

Employing this method, Sperry and his colleagues had learned early on that the dominant left brain, with its ability to reason and use language, was 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, subjects 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 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 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 commonly 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. 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 he was even afraid to go to sleep for fear that his left hand would strangle him.

As extreme as it sounds that the two halves of a brain could each 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 they asked them about their 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 a splitting of the self is a challenging one with enormous implications for our understanding of the brain's role in creating consciousness and even individuality. It is no surprise therefore that it has remained a controversial finding, even among scientists. But for the man who won 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 in 1968. "That is, two separate spheres of consciousness."

This is your brain on drugs

In the neuroscience age, the relationship between brain chemistry and consciousness 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. 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."

Part of the widespread confidence behind this idea comes from observing cases where a sudden chemical imbalance can cause a severe psychological disturbance. But more of it has come from observations of the overwhelmingly positive transformations that attaining the right internal chemistry can bring. 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?

We all probably know Prozac as the first 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."

In his 1993 bestseller, *Listening to Prozac,* psychiatrist Peter 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 personality. One such case was a woman named Tess who, in addition to being relieved from her depression, almost immediately reported being simultaneously more at ease and more energetic, less subject to emotional disturbance, and even more extroverted, socially adept, and competent at her work. 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, who 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 account, 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?" It's a big question. And in light of the present inquiry, I would add another: 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 and horizontal lines, another that only sees curves, another for detecting motion, and another for seeing color. And 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?

But discovering the biological basis of speech and perception is 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.

The profound implications of these findings are not lost on the neuroscience community. Indeed, one of the more interesting new areas of discussion opening up is around what has become known as "neuroethics." According to psychologist Martha Farah, brain imaging in particular has opened 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 you're an illegal drug user, by showing you photos of drug paraphernalia and seeing whether your brain enters a "craving state." Meet the new war on drugs.

And then there is what Farah refers to as "brainotyping." 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? A neurotic? Persistent? Empathic? Even such core personality traits as these are now laid bare before the new neurointerrogation.

Ethical issues indeed.

But as Farah points out, the trickiest ethical concerns surrounding brain imaging will probably only arise as the public starts to grapple with what it is revealing about our own nature. "Neuroscience is showing that . . . character, consciousness, and a sense of spirituality are all physical functions of the brain. When you think of how much political controversy the theory of evolution engendered in this country, just remember that the existence of an immaterial soul is a far more widely held belief than the genesis myth."

Is God all in your head?

The assertion that spirituality is a "physical function of the brain" is an intriguing one. And among those who have dedicated themselves to exploring this idea, there is perhaps no one more qualified to speak on it than 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*, (co-written 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, and been inundated by speaking requests from churches and medical schools alike. All of which points to just how much public interest (or fear) there is around the possibility that even spirituality may have its roots in our cranium.

I spoke with Newberg during a visit to Philadelphia last winter. 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 subjects' brain before meditation, and 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: a group of eight American Buddhists doing a concentrative form of meditation and a group of three Franciscan nuns practicing contemplative prayer. And 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," he 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. But so far 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 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. And conversely, 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."

As Newberg went on to speak 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 which may account for his surprisingly non-materialistic 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 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 through the labyrinth out to the hospital lobby, I told Newberg more about the questions that had sparked my own recent inquiry into brain science. And to my surprise, he said he wasn't much bothered by the mind/body problem or 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. Where 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 a renewed confidence in the ability of our humanity to 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 in fact 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. 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 brain science in particular. 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.

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. 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 mass media coverage of the phenomenon, most of us are by now familiar with the basic outline. Upon being pronounced dead, the patient experiences themselves outside of the body witnessing the scene of the accident or operating room from above. From here they at some point 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 (and 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? But 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.

But 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. In one widely reported case, a post-operative 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 60 degrees F, stopped her heart and respiration, and drained all the blood from her body and brain. She was, by any reasonable definition, brain dead. Her EEG was a flatline and her brainstem showed no response to the "clickers" placed in her ears. 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 on documenting with increasing rigor those NDEs that could provide hard evidence that something more than the brain is at work. Initial results from several large, multi-hospital cardiac ward studies are highly supportive of the notion that various cognitive and perceptive capacities can exist in the absence of a functioning brain. And if future research is able to provide adequate empirical evidence, it will indeed raise some very big questions.

A Mind Field

If the mind is not contained in the brain, just where exactly is it? The traditional dualist answer, around since Descartes, 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 what is known in philosophy as the "mind/body problem" in the first place. 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? 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 explanatory 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 19th century. "From electromagnetic fields, to gravitational fields to quantum matter 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 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 then 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. "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 cell phone. 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." Approaching the mind/body problem in this way, Sheldrake feels, allows for an explanation of both the voluminous data that shows the dependence of consciousness on brain function as well as 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.

"If I switch on my TV set to PBS and if you measure different bits of the tuning set, you'll find certain bits are resonating at certain frequencies. And then 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."

The view from above

In their quest to counter the reductionist tendencies of materialism, frontier scientists like Sheldrake are not alone. Philosophers, theologians, cosmologists, and even mainstream cognitive scientists are 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 philosopher 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. 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 called "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 then 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.

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. But to say that consciousness can be reduced to the brain would be a category mistake. Emergence theory holds that interactions between lower-order phenomena can give birth to higher-order phenomena with properties which 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 advantage of this way of thinking is that while it does

not deny the biological roots of mind, it nonetheless acknowledges the validity of higher orders of human experience.

What the panpsychists and emergence theorists share is a conviction that reductionism'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 human being—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 remains 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 making the pilot fly 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 will or even might be overturned remains anybody's guess. 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 be 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, it would no doubt give the gods—and perhaps even Icarus—a good chuckle.

CONCLUSION: A Higher Order

As I sit writing these words, several of my 100 billion neurons are firing off messages to some of the 50,000 other neurons they're each connected with. A microscopic electrochemical fireworks display that makes Coney Island on the 4th 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 underway, 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.

And at the same time, 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 is itself perhaps life's greatest mystery. And if indeed it can be solved, 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 a complex picture, one can't help but feel compelled to reach for synthesis, whether it's the neurons or God that are doing the compelling.

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. But although we may not lose our humanity to neuroscience, 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 our brain. Based on the evidence, it doesn't seem likely at this point that it will quite be able to do that. But let's say it were able to show that *most* of our behavior and experience is rooted in the brain. What will that mean? Well, for starters, we'll 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 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 21st 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 20th century Russian mystic G.I. Gurdjieff's proclamation that "man is a machine," a central thrust of spiritual 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 the ages, 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 be inadvertently 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 religious experience or 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 reveals itself in mystical experiences—*that*, I would dare to speculate, is probably not going to be reducible to our synapses. Based on everything I've seen, I think that here the evidence seems to suggest that 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 a higher spiritual 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 pointed out, 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. But, 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. Because, as Newberg's research makes clear, there is little doubt that the brain is at least a big part of what is enabling us to perceive that higher order. Which 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 an order higher than itself, perceiving, even, that which many believe to be the very source and creative driver of the kosmos. 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 lives in 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.