

A MIND OF ITS OWN

Resisting the tyranny of the brain

By Gary Greenberg

Discussed in this essay:

Best of the Brain from Scientific American: *Mind, Matter, and Tomorrow's Brain*, edited by Floyd E. Bloom. Dana Press. 270 pages. \$25.

The Self and Its Brain, by Karl R. Popper and John C. Eccles. Routledge. 616 pages. \$55.95.

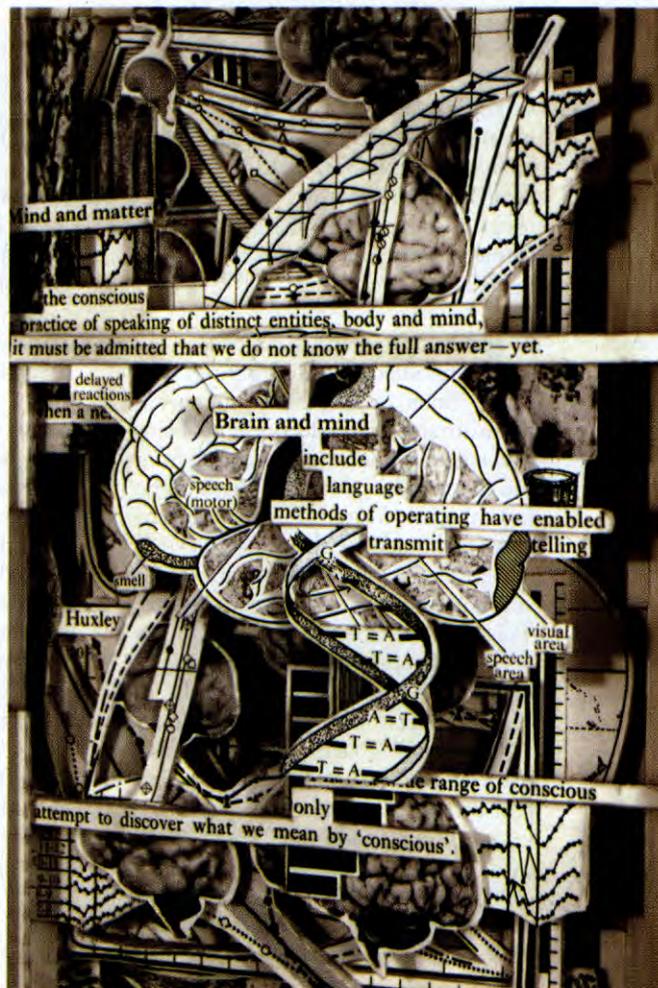
The Accidental Mind: How Brain Evolution Has Given Us Love, Memory, Dreams, and God, by David Linden. Belknap/Harvard University Press. 276 pages. \$25.95.

The Spiritual Brain: A Neuroscientist's Case for the Existence of the Soul, by Mario Beauregard and Denyse O'Leary. HarperOne. 368 pages. \$25.95.

Train Your Mind, Change Your Brain: How a New Science Reveals Our Extraordinary Potential to Transform Ourselves, by Sharon Begley. Foreword by the Dalai Lama. Ballantine. 283 pages. \$14.95 (paper).

The modern age of neuroscience may have begun in 1848, when a poorly loaded explosive charge sent a tamping iron through the skull of Phineas Gage, a Vermont railroad worker. Gage survived, but he was impulsive and irritable where he had once been steady and affable—a change that doctors eventually attributed to the damage done to his frontal lobes. We could also look for neuroscience's beginnings in the early 1860s, when pathologists used autopsies to pinpoint brain lesions associated with the inability to speak or to understand language. In any event, by 1874 enough evidence of the mind's material origins had been collected for the English biologist Thomas Huxley to conclude that consciousness in humans as well as animals “would appear to

Gary Greenberg's most recent article for Harper's Magazine, “Manufacturing Depression,” appeared in the May 2007 issue.



Altered book by Brian Dettmer, courtesy Packer Schopf Gallery, Chicago. Dettmer's work is currently on display at Kinz, Tillou + Feigen, New York City

be related to the mechanism of [the] body simply as a collateral product of its working, and to be completely without any power of modifying that working as the steam-whistle which accompanies the work of a locomotive engine is without influence upon its machinery.” Cartesian dualism may have prevailed among scientists long after Huxley's pronouncement, but events were already conspiring to turn the mind's doubt about its impressions into a creeping certitude that the mind didn't really exist.

The twentieth century did little to reverse this course. Even as Freud mapped the terrain of the psyche, doctors were discovering that many cases of insanity were caused by the syphilis spirochete, which took up residence in the brain and could be treated with a timely dose of penicillin. Psychosurgery and psychiatric drugs showed that changing the brain's

anatomy and biochemistry could radically alter consciousness, and advances in electron microscopy allowed scientists to see what it was the surgeons and pharmacologists were doing. Scanning devices—MRIs, CTs, PETs, SPECTs—were able to catch the brain at work as people dreamed, learned, remembered, and even watched pornography. The brain's supremacy was confirmed by presidential proclamation when George H.W. Bush declared the Nineties “The Decade of the Brain,” committing the government to increased funding of neuroscience and a campaign to “enhance public awareness” of the benefits afforded by studying the “3-pound mass of interwoven nerve cells that controls our activity.” As the twentieth century drew to an end, most neuroscientists were in agreement with Nobel Laureate Eric Kandel, who announces in his contribution to *Best of the Brain* that the “mind is a set of operations carried out by the

brain, much as walking is a set of operations carried out by the legs, except dramatically more complex.”

In a single month last fall, a casual consumer of media could glean that “the sleeping brain is actively working on the day’s streaming video of information”; that because of “a design flaw at the interface where the brain encounters a computer screen,” email “generally increases the likelihood of conflict and miscommunication”; that the impulse to dance to music arises because “the motor cortex and cerebellum—the parts of the brain responsible for initiating and coordinating movements—are active during music listening”; that if I drop the word *fuck* into an essay, I am “pinging your amygdala”; and, if you happened to be reading the Fitness Fools comic in *Jack and Jill* magazine, that your hypothalamus “tells you when to breathe.” This is all before you’ve heard from your pediatrician about the frontal-lobe deficits that have impaired your child’s “executive function,” or from your friend about the antidepressants that have cured her neurochemical imbalance, or from the book *Your Money and Your Brain* about how the “science of neuroeconomics can help make you rich.” Now that we’ve turned Huxley’s heresy into orthodoxy and discovered how the brain generates its steam, it seems we can whistle all the way to the bank.

And, as one enthusiastic neuroscientist, V. S. Ramachandran, has said, “If all this seems dehumanizing, you haven’t seen anything yet.” One hundred years after Freud invoked his strange language of *complex* and *cathexis* to tell us how our history makes us who we are, neuroscientists are delivering a different verdict in the language of *neuron* and *synapse*: what matters is not biography but biochemistry. Our brains are us.

But before we surrender to our brains, and to the doctors and the drug-company scientists who claim to understand and treat them, we should bear in mind something that Karl Popper said in 1977. In *The Self and Its Brain*, which he coauthored with pioneering neuroscientist John Eccles, Popper objected to what he called “promissory materialism”: the tendency of scientists to behave as if they have already demonstrated that the

mind is no more and no less than what the brain does, assuming that eventual proof is inevitable. This approach, he wrote, “offers us the promise of a better world, a world in which mental terms will have disappeared from our language, and in which materialism will be victorious.” Findings reported by neuroscientists can be read as further evidence for that world, of course, but, as Popper points out, they can also be read as a form of propaganda:

With the progress of brain research, the language of the physiologists is likely to penetrate more and more into ordinary language and to change our picture of the universe, including that of common sense. So we shall be talking less and less about experiences, perceptions, thoughts, beliefs, purposes and aims; and more and more about brain processes.... When this stage has been reached, mentalism will be stone dead, and the problem of mind and its relation to the body will have solved itself.

Thirty years later, neuroscientists have not yet put paid to the promissory note, though this doesn’t stop them from talking as if they had. And you should pay attention to what they are saying to you. Because if you are going to live, whether you like it or not, in thrall to your brain, then your future belongs in some way to the doctors who claim to be the only people qualified to explain you to yourself.

There are approximately one hundred billion neurons in your brain, about the same number as there are stars in the Milky Way. Neurons sprout tendrils that can reach from the very bottom of the brain stem to the frontal lobes, forming a pulsating tangle of fibers laden with amino-acid-rich juices that are in turn soaked up by other tendrils connected to other neurons. There are perhaps five hundred trillion of these synapses; the number of possible circuits among neurons is thus, as one scientist has put it, “hyper-astronomical”: in the neighborhood of ten followed by a million zeros. By comparison, the number of particles in the known universe add up to ten followed by a mere seventy-nine zeros.

Whether they believe, along with neurologist Mark George, that the brain “is fundamentally an electrical organ that transmits electrical signals from

one nerve cell to the next,” or prefer instead Kandel’s formulation—“a complex biological organ of great computational capability”—the prominent neuroscientists who contribute to *Best of the Brain* are sure that a full explication of its operations is just a supersized technical challenge that will soon be met. “By 2050,” Antonio Damasio promises in his chapter, “sufficient knowledge of biological phenomena will have wiped out the traditional dualistic separations of body/brain, body/mind and brain/mind.” What we will be left with is biology, with a little chemistry and physics thrown in for good measure.

Of course, the resulting explanation will be of vastly more significance than an account of, say, how our legs propel us forward. Having observed the brain at work, scientists will pronounce truths on that most elusive of subjects: human nature. They will tell us—with the certainty of science and without the messy complications of metaphysics or ideology—where we come from, how we emerge from the “mass of interwoven nerve cells,” what we can expect of ourselves, and what we should do when we don’t measure up. There may still be some doubters—“naysayers,” Damasio calls them, who insist that “the exhaustive compilation of all these data adds up to *correlates* of mental states but nothing resembling an *actual mental state*”—yet Kandel is confident that they are dualist dead-enders who will soon be swept aside by “a science that uses the power of molecular biology to examine the great remaining mysteries of life.”

These halcyon days have yet to arrive, but if you listen to the way the scientists are talking, you begin to suspect that the fix is in. According to our leading neuroscientists, the brain is a “creature of habit” with a “natural intentionality.” It “constructs our sensory experiences, regulates our thoughts and emotions, and controls our actions.” It “issue[s] fine corrections” and “form[s] a prediction,” “become[s] aware of... difference” and “create[s] memories,” “talk[s] to the reward pathway” and “bestow[s] moments of illumination.” Its “hardworking neurons” are “born cartographers.” Its left hemisphere “analyzes” and its right hemisphere “interprets,” one side keeping

the other “in check.” And the most important piece of all: “The frontal cortex is the substrate of our individuality... Not just our cognitive capacities but our character—our personhood, so to speak—resides in this.” The brain, it seems, has a mind of its own.

Who can blame these men for creating the brain in their own image? As a neuroscientist will no doubt someday discover, metaphor is something the brain does when complexity renders it incapable of thinking straight. One cannot really write about the source of human agency without indulging in the pathetic fallacy; what differentiates these writers from Cartesian dualists is the nature and location of the agent. “There is no separate spectator for the movie-in-the-brain,” writes Damasio, using his own metaphor for our sense that we are a narrative held together by an interior author. “No ghostly homunculus haunts the theater. Objective brain processes knit the subjectivity of the conscious mind out of the cloth of sensory mapping.” Behind the curtain is no little man but only the all-powerful brain, and selfhood is a bootstrap operation: of the brain but not in it. The brain lords over us, makes us out of neurochemicals and meat in the same way that we used to think God made us out of dust.

And if you still think God made us, there’s a neurochemical reason for that too. “Our brains have become particularly adapted to creating coherent, gap-free stories,” writes David Linden in *The Accidental Mind: How Brain Evolution Has Given Us Love, Memory, Dreams, and God*. “This propensity for narrative creation is part of what predisposes humans to religious thought,” and that propensity can be found in the left cortex. (We know this because people with surgically split brains—most of them epileptics whose seizures can be controlled only by severing the connections between the hemispheres—consistently use only their left cortices to construct narratives that explain their behavior in certain experiments.) The narrative drive is so powerful that it cannot be shut off, even during sleep—which is why, according to Linden, the fragmented and illogical is spun into story in our dreams. In dreaming, he argues, our

brains learn “to make the cognitive leaps that underlie nonnaturalistic thought.” Applying this lesson to the mysteries of existence, the left cortex comes up with religious explanation.

One wouldn’t want to take the fact that the brain is equipped for religion too far—to believe, for instance, that the brain is designed by an intelligence that wants to be recognized:

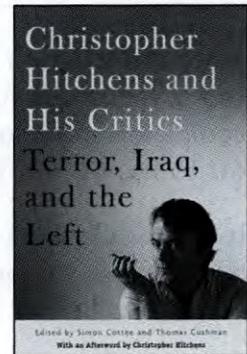
Nothing could be further from the truth. The brain is, to use one of my favorite words, a kludge (pronounced “klooj”), a design that is inefficient, inelegant, and unfathomable, but that nevertheless works. More evocatively, in the words of the military historian Jackson Granholm, a kludge is “an ill-assorted collection of poorly matching parts, forming a distressing whole.”

According to the *Oxford English Dictionary*, Granholm coined “kludge” as an ironic twist on *kluge*, German for “smart” or “clever,” but the hackers and geeks among whom the word is a popular term to describe a jerry-built computer system claim that it is related to a Scots word for “latrine.” Either way, Linden’s point is made: the magnificent brain and the mind that it fabricates are just more accidents of evolution, a series of modules of various capacities that developed for different reasons and then piled on top of one another like, as Linden puts it, so many scoops of ice cream melting together in messy, if often delightful, ways.

Invoking natural selection may reassure us that our destinies are dealt by a rational (if invisible) hand rather than by an irascible (and hidden) God, but these explanations of our complex behavior do beg an important question. When neuroscientists tell us where storytelling comes from, or why we can’t tickle ourselves (our cerebellum, stimulated when we move our own hands, cancels the tickle signal from the somatosensory cortex—something we know because scientists have tickled people in MRI machines), or how “mirror neurons”—brain cells that are activated both when we perform an action and when we witness someone else performing it—appear to account for empathy, it’s hard to understand what difference that explanation makes. What exactly do we know that we didn’t know before?

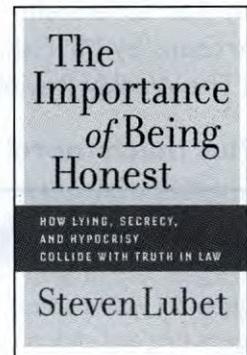
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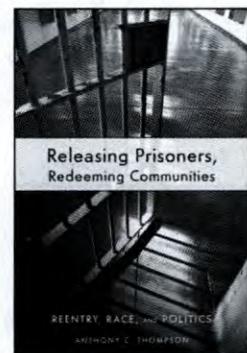
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Well, if you persist through such sentences as these from *The Accidental Mind*—

Neither glutamate binding alone nor depolarization of the membrane alone will open the NMDA-type receptor's ion channel. Background activity will produce the former but not the latter, but bursts of high-frequency spikes will produce both glutamate binding and depolarization and the ion channel will open.

—then you will get to know some brain chemistry, which can be gee-whiz fascinating. (I cannot fault Linden, who is an agreeable enough writer to spend an afternoon with, for these eye-glazing passages. This is brain science, and when you get down to specific cases, it's about the unexciting details of binding and receptors and depolarization.) I suppose it's nice to know that there is a reason you can't tickle yourself (although this explanation leaves you wondering why you can masturbate successfully; I'm sure some willing onanists will soon be climbing into the scanners so scientists can find out). And even the hardest-hearted skeptic, presented with the fact that empathy has a basis in biological processes, might have to acknowledge empathy's importance, so perhaps there is some social value to this research.

Nevertheless, this kind of knowledge—which, after all, merely reiterates the indisputable and unremarkable fact that our conscious life is totally dependent on having a functioning brain—often seems more a restatement than an explanation of the phenomenon. I say “fuck” and your amygdala pings; I say “fuck” and you snap to attention, take offense, maybe swear back or take a swing at me. Is this a phenomenon and an explanation? Or a phenomenon stated in two different languages? The fact that your amygdala is pinging may be of interest if you want to take drugs to stop your reaction to cursing. But it doesn't really tell me *why* you do those things, any more than a cell-by-cell account of how my nerves and muscles make my arm move when saluting the flag answers Wittgenstein's famous question about what is left over when I subtract the fact that my arm goes up from the fact that I raise my arm.

For all their fascination and revelation, these books may not do much more than tell us about our pipes and wires, about the infrastructure of personhood, about the necessary, but not the sufficient, conditions of being a self. Telling me about my high-frequency spikes and my ion channel doesn't explain why I have an experience of myself as the narrator of my life who feels love and loss, just as a careful analysis of pigment and texture and shape, or even of the physics and geometry of the human smile, doesn't tell me why the *Mona Lisa* moves me.

What this account does do is reiterate the belief that what matters is matter. No number of biochemical assays or brain scans can actually *prove* that brain states are mental states. To put it in terms Popper might have used, that claim is, at least for now, non-falsifiable. It is, in other words, a matter of faith, which means that the scientists who make it are not only dispassionate reporters of nature's facts but also apostles of materialism. Which is why Damasio refers to those who resist the new orthodoxy as “naysayers,” and why Linden urges his readers to “fire off an e-mail” the next time their “misguided congressman” opposes funding for neuroscience. It is also why it might not be such a good idea to ask a neuroscientist whether the mind is really nothing more than brain chemistry—for the same reason you wouldn't want to ask a barber whether you need a haircut.

Carl Woese, one of America's preeminent biologists, has distinguished between two kinds of reductionism—“empirical” and “fundamentalist”—in scientific inquiry:

Empirical reductionism is in essence methodological; it is simply a mode of analysis, the dissection of a biological entity or system into its constituent parts in order to better understand it. Empirical reductionism makes no assumptions about the fundamental nature ... of living things. Fundamentalist reductionism ... on the other hand, is in essence metaphysical. It is ipso facto a statement about the nature of the world: living systems (like all else) can be completely understood in terms of the properties of their constituent parts.

Fundamentalist reductionism hides its materialist metaphysics under the guise

of science, and at least according to Mario Beauregard, a faculty member of the University of Montreal and a self-described “nonmaterialist neuroscientist,” most of his colleagues are guilty of this bad faith. “Neuroscientists have not discovered that there is no you in you,” he writes in *The Spiritual Brain: A Neuroscientist’s Case for the Existence of the Soul*. “They start their work with that assumption. Anything they find is interpreted on the basis of that view.” And, worse, these materialist metaphysicians can count on the mass media to spread their gospel.

The culture of popular science is one of unidirectional skepticism. . . . It is skeptical of any idea that spirituality corresponds to something outside ourselves, but surprisingly gullible about any reductionist explanation for it.

His book is a broadside against that assumption and a plea for the return of some form of dualism.

Beauregard doesn’t stop at logical objections to materialist neuroscience. He cites some cases that contradict it, notably people who report mental experiences even when their brains are presumably not working: a woman who, her body cooled to sixty degrees for a surgical procedure, her EEG flat, gives an accurate, bird’s-eye-view description of her operation; a once-comatose heart-attack victim who, after his revival, “recalled” that a nurse put his dentures in a drawer while he was being given CPR; the blind people whose near-death experiences include vision. If mental life is only what the brain provides, Beauregard argues, then “cases like these should not only be very rare; they should be impossible.”

Beauregard reports on research into other brain-related weirdness: mystical experiences (which he says he has had), telepathy and telekinesis, phantom limbs and placebo effects (quoting approvingly from an article I wrote on the latter subject). But he also relates a finding from mainstream contemporary neuroscience, one that he takes as evidence for a brain-independent mind: brain plasticity. During the Decade of the Brain, the old neuroscientific certainty that the structure of the adult brain is more or less fixed—that accepting traumatic damage and age-related decay, the brain you develop in

your childhood (and presumably the self it knits) is the one you’re stuck with for the rest of your life—fell by the wayside. It turns out that we do grow new brain cells, wire together new neural networks, and make basic changes in the fundamental structures of the brain, and that we do so according to experience. If the brain is plastic, Beauregard reasons, there must be a you in you, shaping the brain to its needs. And if that is the case, then, as Sharon Begley puts it in her book’s title, you can “train your mind [to] change your brain.”

Begley, a senior editor at *Newsweek* and one of the few science journalists of whom Beauregard seems to approve, argues that everything the neuroscientists are telling us is true, with one important exception: the “causal arrow” is “two-way . . . with mind being both the expression and the cause of physical changes in the brain.” This is not, however, your grandfather’s ghost-in-the-machine Cartesianism but the updated version, dualism for the self-help society, in which “connections among neurons can be physically modified through mental training just as a biceps can be modified by physical training.” Having a mind is like walking, so there’s no reason one cannot learn how to run a mental marathon; what’s left over after I subtract the fact that my arm goes up from the fact that I raise my arm may well just be my personal trainer.

Or, in the cases Begley is most fond of, it may be the Dalai Lama, whose interest in neuroscience has led him to encourage his monks to strap on the EEG electrodes, to climb into the MRI, and to meditate for science. Which has resulted in the discovery that when monks meditate, their brains flex like Popeye’s forearms after a can of spinach. The areas of their brains linked to maternal love and empathy percolate with activity. Their gamma waves (brain waves that are a “signature of neuronal activity that knits together far-flung brain circuits—consciousness, in a sense. They appear when the brain brings together different sensory features . . . that lead the brain to its *aha!* moment”) go “off the charts,” an effect that persists at a lower level even when they aren’t meditating. This, says Begley, is “evidence of the effect of mental training not on an in-the-moment brain state but on an enduring



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brain trait." Hit the brain health club, she says, and you can do a lot better than not being depressed or obsessive-compulsive. "What we learn from [the Buddhist meditators] may provide the key to raising everyone—or at least everyone who chooses to engage in the necessary mental training"—to a "happiness baseline . . . that most mortals achieve only transiently."

Both Begley and Beauregard recognize that such forms of self-improvement have significant sociopolitical consequences. The one-way causal arrow of the materialist neuroscientists points to "neurogenetic determinism" and a blame-the-brain, no-you-in-you morality. "If will is an illusion, then what is the basis for personal responsibility?" Begley asks. None, Beauregard answers, and worse than that, he says, echoing the religious right's complaint about materialism's evisceration of our moral lives, "If the will is an illusion, the very idea of evil is evacuated. . . . What fills the vacuum? Desires and dislikes." But use your mind to modify its (temporary) home, guiding it with the appropriate teaching, and you have a way not only to reclaim ethics but to bring a muscular brain to bear on your dilemmas.

It isn't an accident that Begley and Beauregard use monks and nuns as exemplars (or that Beauregard's cowriter, Denyse O'Leary, describes herself on her "Post-Darwinist" blog as a "Roman Catholic Christian" and has written books like *By Design or by Chance? The Growing Controversy on the Origins of Life in the Universe*). Talk about dualism cannot go very far without running into religion. Indeed, the two may be inseparable, at least so long as our choices are spirit or matter, Descartes or Kandel. If there is a you in you, it must come from somewhere, and where else could that be but some transcendent realm? Of course, the neo-dualists are no more able to prove that mind exists than their materialist counterparts can prove the opposite,* and if their relative honesty about the fact that they possess a metaphysics is

* Beauregard told me that he doesn't think neuroscience can prove the existence of the soul. When I asked him about his book's subtitle, *A Neuroscientist's Case for the Existence of the Soul*, he responded that the publisher made it up.

refreshing, their moralizing is not. Such is life in a culture war. I watch the straw men shoot at the clay pigeons and I just don't know whom to root for.

Now, I don't know about you, but I am dead certain that the sun rises in the morning, moves across the sky, and then sets at night. Five hundred years after Copernicus swatted the earth out of the center of the cosmos, I still live in a Ptolemaic universe, at least when I'm just looking out my window. If I had to launch a mission to Mars or figure out the time of the next eclipse, I would, of course, become (or at least hire) a Copernican. Likewise, when my wife and I discovered that our son was dyslexic, we turned to neuroscience for understanding and help. Were I to suffer a brain injury, I would consult Damasio before the Dalai Lama.

But unless I miss my guess, you also believe that you are in there, behind the eyes that are reading these words. As illusions go, the *cogito* is a convincing one, and I cannot imagine even a thousand Kandel's at a thousand typewriters persuading me otherwise. If Popper was right, however, they wouldn't have to undertake such a project. He forecast not sudden dislocation, not the *aha!* moment when I realize that my brain made me, but the death of "mentalism" by a thousand cuts, and he worried about its impact not on the treatment of disease but on how we think of ourselves, on the way we conduct our lives.

By changing how we understand the heavens, Copernicus also revolutionized human understanding of the daily lives that take place beneath them. But just as intimations of our cosmic insignificance no longer necessarily bring Copernicus to mind, so, too, will people soon forget the twenty-first-century neuroscientists who invented the neurochemical self, with future generations living happily as neuroscience's invention. Your descendants will heed the neuroscience gospel and give obeisance to their brains, ply them with exercise and drugs and whatever else they demand, and think it was mighty strange that you thought of yourself as the agent of your own life, as a consciousness in a body, with no idea whether you were thus trapped or blessed or how you

ended up in there in the first place yet certain that there was a you in you.

Of course, I think my grandchildren, if I ever have them, will be missing out on something, but that's what it means to be a grandfather. And if I complain out loud to the whippersnappers, whose brains will no doubt have been trained and bettered and perhaps even perfected, the loss I will regret the most is the uncertainty, the not knowing how the mind emerges from the brain, and the teasing possibility that there is something else lurking among my molecules. I still believe that cultivating the "remaining mysteries" is as close as we can get to transcendence, and if they disappear under the light of scientific certainty, I will surely mourn them. Negative capability undoubtedly has its limits, but the certainties of carbon, hydrogen, oxygen, and nitrogen seem dispiriting in contrast with what has come before.

There is hardly any point in reiterating that scientists have yet to show that the brain is both the necessary and the sufficient cause of our minds, or that elucidating neural circuitry in all its glorious detail is not the same thing as explaining how that circuitry gives us the strange experience we call consciousness. Nor, for that matter, need we trouble ourselves about the fact that no one really knows where consciousness comes from or where it resides, that it may well inhabit a place where no one has thought to look and be of a composition that cannot yield to our instruments any more than feathers can make themselves apparent to a magnet. Because these objections do not matter: We are what we perceive ourselves to be. We have been thinking about who we are, revising that perception and reinventing ourselves, for a long time, and it is a credit to our species that we put in that time to do so. Given our apparent compulsion to try to figure ourselves out, it isn't surprising that ideas outlive their usefulness, that people get sick of the boundaries of themselves, that old selfhoods wither away and new ones arise to take their place. Nor is there much to be gained in lamenting this, at least not for too long. It is disconcerting, however, to live while it happens, to have your self pulled out from under you while you watch. ■