

The Mind and the Brain: Neuroplasticity and the Power of Mental Force - Jeffrey M. Schwartz, Sharon Begley (2003)

EPILOGUE

It is telling that the Decade of the Brain, as (the first) President Bush designated the 1990s, had that name rather than the Decade of the Mind. For it was in the brain rather than the mind that scientists and laypeople alike sought answers, probing the folds and crevasses of our gray matter for the roots of personality and temperament, mental illness and mood, sexual identity and even a predilection for fine food. In my own profession of neuropsychiatry, this attitude is encapsulated in the maxim "For every twisted thought, a twisted molecule." Any mood, preference, or behavior once ascribed to the way we were raised, or even to freely willed volition, instead came to be viewed as the child of our genes and our neurotransmitters, over which we had little, if any, control.

The brain, to be sure, is indeed the physical embodiment of the mind, the organ through which the mind finds expression and through which it acts in the world. Within the brain, ensembles of neurons represent the world beyond, recording both the perceptions of our five senses and the world of mind alone: internally generated imagery produces no less real and measurable a neuronal activation than images of the outside world. But the brain is more than a reflection of our genes. As we saw in Chapter 3, the paltry 35,000 or so genes in the human genome fall woefully short of the task of prescribing the wiring of our 100-trillion-synapse brain. The brain is therefore shaped by and etched with the traces of our experiences—the barrage of sensory stimulation that our peripheral nerves pass along to our brain, the skills we acquire, the knowledge we store, the patterns our thoughts and attention make. All these, and much more, leave their mark.

A mere twenty years ago neuroscientists thought that the brain was structurally immutable by early childhood, and that its functions and abilities were programmed by genes. We now know that that is not so. To the contrary: the brain's ensembles of neurons change over time, forming new connections that become stronger with use, and letting unused synapses weaken until they are able to carry signals no better than a frayed string between two tin cans in the old game of telephone. The neurons that pack our brain at the moment of birth continue to weave themselves into circuits throughout our lives. The real estate that the brain devotes to this activity rather than that one, to this part of the body rather than that one, even to this mental habit rather than that one, is as mutable as a map of congressional districts in the hands of gerrymanderers. The life we lead, in other words, leaves its mark in the form of enduring changes in the complex circuitry of the brain—footprints of the experiences we have had, the actions we have taken. This is neuroplasticity. As Mike Merzenich asserted, the mechanisms of neuroplasticity "account for cortical contributions to our idiosyncratic behavioral abilities and, in extension, for the geniuses, the fools, and the idiot savants among us."

Yet even this perspective assumes a brain more passive than we now understand it to be. It reflects an outdated, classical-physics view of the relationship between mind and matter. For above and beyond the “cortical contributions” to our uniqueness are the choices, decisions, and active will that both propel our actions and, through directed mental force, shape our very brain circuitry.

In the decade since Merzenich’s insight, our appreciation of the power of neuroplasticity to reshape the brain has only deepened. We now know that the circuits of our minds change when our fingers fly over the strings of a violin; they change when we suffer an amputation, or a stroke; they change when our ears become tuned to the sounds of our native language and deaf to the phonemes of a foreign one. They change, in short, when the flow of inputs from our senses changes. This much, the Silver Spring monkeys showed us. But the brain—true to its role as the place where Descartes’s two realms, the material and the mental, meet and find expression—reflects more than the changing inputs from the body. Neuronal circuits also change when something as gossamer as our thoughts changes, when something as inchoate as mental effort becomes engaged—when, in short, we choose to attend with mindfulness. The power of attention not only allows us to choose what mental direction we will take. It also allows us, by actively focusing attention on one rivulet in the stream of consciousness, to change—in scientifically demonstrable ways—the systematic functioning of our own neural circuitry.

The passive side of mental life, which is generated solely and completely by brain mechanisms, dominates the tone and tenor of our day-to-day, even our second-to-second, experience. During the quotidian business of daily life, the brain does indeed operate very much as a machine does. The brain registers sensory information, processes it, connects it with previously stored sensory experience, and generates an output. It is only a slight exaggeration to say that this much of life is nothing but the brain’s going its merry way, running on default awareness. The kind of attention-driven neuroplasticity that Merzenich and his team documented occurs during a mere fraction of our normal experience (more, perhaps, if we are young, and spend many of our waking hours in formal and informal learning); the kind of focused effort that Taub’s stroke patients exert is the exception rather than the rule. In general, even the rigorous practice of mindfulness takes up but a few hours in the day of all but the most dedicated practitioners. And even in these cases, when attention is brought to bear, the content of our conscious experience remains largely determined by the inner workings of the brain.

But the content of our character does not, for the amount and quality of attention we focus on this or that aspect of our passive experience as it arises are determined by an active process—one for which brain mechanisms alone provide insufficient explanation. In treating OCD, the capacity to distinguish between passive and active mental processes has turned out to be clinically crucial. When an obsessive thought or compulsive urge enters a patient’s mind, the feelings of fear

and anxiety it generates are biologically determined. But, as clinical data and PET scans show, patients can willfully change the amount and quality of attention that they focus on those cerebrally generated feelings of anxiety and stress, changing in turn the way the brain works.

The willful focusing of attention is not only a psychological intervention. It is also a biological one. Through changes in the way we focus attention, we have the capacity to make choices about what mental direction we will take; more than that, we also change, in scientifically demonstrable ways, the systematic functioning of neural circuitry. Nowhere is this more clear than among patients with OCD who practice the mindfulness-based Four Step therapy. By Refocusing attention in a mindful fashion, patients change their neurochemistry.

How? By volitional effort, which is effort of attention. Though OCD symptoms may be generated, passively, by the brain, the choice of whether to view those symptoms as “me” or “OCD,” whether to become ensnared by them or to focus on a nonpathological behavior, is active. That choice is generated by a patient’s mind, and it changes his brain. Mindfulness, as applied in the Four Steps, alters how the connections between the orbital frontal cortex and the caudate nucleus function. The power of attention, and thus the power of mind, reshapes neural circuitry and cortical maps—and does so by means of what I call Directed Mental Force. We now have a scientific basis for asserting that the exercise of the will, the effort of attention, can systematically change the way the brain works. The act of focusing attention has both clinical efficacy (in the treatment of patients besieged by troubling neuropsychiatric symptoms) and biological efficacy (in its power to change the underlying chemistry of the brain). Mind, we now see, has the power to alter biological matter significantly; that three-pound lump of gelatinous ooze within our skulls is truly the mind’s brain.

Our will, our volition, our karma, constitutes the essential core of the active part of mental experience. It is the most important, if not the only important, active part of consciousness. We generally think of will as being expressed in the behaviors we exhibit: whether we choose this path or that one, whether we make this decision or that. Even when will is viewed introspectively, we often conceptualize it in terms of an externally pursued goal. But I think the truly important manifestation of will, the one from which our decisions and behaviors flow, is the choice we make about the quality and direction of attentional focus. Mindful or unmindful, wise or unwise—no choice we make is more basic, or important, than this one.

At the end of the nineteenth century, William James recognized that the array of things we can attend to is determined passively by neural conditions—but the amount of attention an aspect of consciousness receives after it has caught our mental eye is determined by active mental processes, by what he called “spiritual force.” One’s choice of what aspect of experience to focus on is an expression of the active part of mental life. “This strain of attention is the fundamental act of will,” James observed in *Psychology: A Briefer Course*. This active component can

contribute as much as, and even more than, cerebral conditions in determining where and how attention is directed, and certainly what kind of attention—mindful or unmindful, wise or unwise, diligent or default—is engaged. The feeling that we can make more or less mental effort, as we choose, is not an illusion. Nor is the sense that we have the power to decide, from one moment to another, which aspect of consciousness to attend to. In this critical respect, Jamesian psychology, Buddhist philosophy, and contemporary physics are in total accord. Whereas the contents of consciousness are largely determined by passive processes, the amount and type of attention we pay to those contents are subject to active input via willful mental effort. Cerebral conditions may determine the nature of what's thrown into our minds, but we have the power to choose which aspects of that experience to focus on. The brain may determine the content of our experience, but mind chooses which aspect of that experience receives attention. To repeat: "Volitional effort is effort of attention," James said. And attention—holding before the mind that which, if left to itself, would slip out of consciousness—is the essential achievement of will. This is why effort of attention is, it seems to me, the essential core of any moral act.

What does mind choose to attend to? Buddhist philosophy offers one avenue to understanding this. The traditional practice of Buddhist meditation is based on two broad categories of mental activity: *samatha*, translated as "calmness," "tranquillity," or "quiescence" and *vipassana*, or "insight." In the beginning stages of training in samatha, attention plays a crucial role by focusing on a single tranquil object, such as the surface of a calm lake or the sensation of breath passing through the nose. The goal is to develop the level of concentration required for attaining a quality of Bare Attention that is steady, powerful, and intense enough to achieve vipassana. Buddhist philosophy teaches that the power of habit can greatly increase the functional effects of the power of karma (which in Buddhist philosophy always means volitional action). Thus the great monk-scholar Ledi Sayadaw (1846–1923) states that "habituating by constant repetition" causes the effects of the subsequent karma to "gain greater and greater proficiency, energy and force—just as one who reads a lesson many times becomes more proficient with each new reading." The will has powers that, at least in the West, have been radically underestimated in an ever more technological and materialist culture. The Law of Karma holds that actions have consequences, and its stress on the vital importance of the state of the will can serve as a counterweight to the materialist bent of Western society, one that has become too credulous about the causal power of material conditions over the human mind. We have been blinded to the power of will to direct attention in ways that can alter the brain. Perhaps, as the discoveries about the power of directed mental effort systematically to alter brain structure and function attract public awareness, we will give greater weight, instead, to the role of volition.

The discovery that the mind can change the brain, momentous as it is both for our image of ourselves and for such practical matters as helping stroke patients, is only

the beginning. Finally, after a generation or more in which biological materialism has had neuroscience—indeed, all the life sciences—in a chokehold, we may at last be breaking free. It is said that philosophy is an esoteric, ivory-tower pursuit with no relevance to the world we live in or the way we live. Would that that had been so for the prejudice in favor of biological materialism and its central image, Man the Machine. But biological materialism did, and does, have real-world consequences. We feel its reach every time a pharmaceutical company tells us that, to cure shyness (or “social phobia”), we need only reach for a little pill; every time we fall prey to depression, or anxiety, or inability to sustain attention, and are soothed with the advice that we merely have to get our neurochemicals back into balance to enjoy full mental health. Biological materialism is nothing if not appealing. We need not address the emotional or spiritual causes of our sadness to have the cloud of depression lift; we need not question the way we teach our children before we can rid them of attention deficit disorder. I do not disparage the astounding advances in our understanding of the biochemical and even genetic roots of behavior and illness. Some of those discoveries have been made by my closest friends. But those findings are not the whole story.

Though a substantial majority of the scientists who have done the work leading to those findings agree that there is significantly more to the story than just biology, there has been, up to now, a morbid silence surrounding the moral vacuum created by a worldview dominated by materialist preconceptions. I vividly recall a conversation in which one close and prominent colleague of mine was bemoaning the fact that, according to the dominant materialist view of science, his love for his wife could be explained “solely in terms of the biochemistry of my brain and my viscera.” But, because he is a true gentleman who shuns controversy, nothing he does or says in his professional life would give any hint of this demurral. It is my sincere hope that an evolving neurobiology of Directed Mental Force will help rectify this situation.

Human beings are only partially understandable when viewed as the product of material processes. Human beings think, make judgments, and exert effort on the basis of those judgments and in so doing change the material aspects of both their inner and outer worlds in ways that defy the narrow categories of materialist modes of analysis. Understanding our capacity to systematically alter our own neurobiology requires welcoming such concepts as choice and effort into the vocabulary of science. In this new century, questions about the mind-brain interface will become increasingly important as we try to understand how humans function in fields ranging from medicine to economics and political science. Knowing that the mind can, through knowledge and effort, reshape neurobiological processes must powerfully inform that effort.

It is the perspective of what we might call biological humanism, not biological materialism, that fits with the findings of neuroplasticity. It’s a mental striving, not a deterministic physical process, that best describes the clinical data on directed neuroplasticity. This may seem to be wishful, even reckless, thinking; after all, to

pronounce oneself a skeptic on the subject of biological determinism is to court ridicule, to risk being tarred with the brush of “nonscientific thinking” or even “New Age nonsense.” But it seems to me that what we have learned about neuroplasticity and, especially, self-directed neuroplasticity—even this early in our understanding—is that our physical brain alone does not shape our destiny. How can it, when the experiences we undergo, the choices we make, and the acts we undertake inscribe a diary on the living matter of our cortex? The brain continually refines its processing capacities to meet the challenges we present it, increasing the communicative power of neurons and circuits that respond to oft-received inputs or that are tapped for habitual outputs. It is the brain’s astonishing power to learn and unlearn, to adapt and change, to carry with it the inscriptions of our experiences, that allows us to throw off the shackles of biological materialism, for it is the life we lead that creates the brain we have. Our new understanding of the power of mind to shape brain can advance not only our knowledge, but also our wisdom. Radical attempts to view the world as a merely material domain, devoid of mind as an active force, neglect the very powers that define humankind. The reality of the mind-shaped brain encourages a cultural climate in which scientific research not only yields advancements in our knowledge, but also adds to our wisdom as an evolving species. By harnessing the power of Directed Mental Force we may yet live up to our taxonomic designation and truly become deserving of the name *Homo sapiens*.

I began, in Chapter 1, with an exploration of the dilemma posed by the notion of a mind’s arising from matter, and with Descartes’s separation of nature into the material and the mental. Cartesian dualism served science well, at first: by ceding matters of the spirit to men of the cloth, it got the Church off the back of science, which for centuries afterward was perceived as less of a threat to religion’s domain than it would otherwise have been (*pace*, Galileo). But Cartesian dualism was a disaster for moral philosophy, setting in motion a process that ultimately reduced human beings to automatons. If all our actions, past and present, can be completely understood as the passive results of machinelike physical mechanisms, without acknowledgment of the existence of consciousness, much less will, then moral responsibility becomes meaningless. If our conscious thoughts matter nothing to the choices we make, and the behavior we engage in, then it is difficult to see how we are any more responsible for our actions than a robot is. That’s why the question of whether the mind is capable of real activity (and thus capable of generating a physically effective mental force) is, at its core, an ethical one. “I cannot understand the willingness to act, no matter how we feel, without the belief that acts are really good and bad,” James wrote in *The Dilemma of Determinism*. The notion that the mind and the attention it focuses are merely passive effects of material causes, he wrote, “violates my sense of moral reality through and through.”

But this conflict between science and moral philosophy vanishes like fog in the light of dawn if, instead of continuing to apply to minds and brains a theory of matter

and reality that has been superseded—that is, classical physics—we adopt the most accurate theory of the world advanced so far: quantum theory. In quantum theory, matter and consciousness do not stare at each other across an unbridgeable divide. Rather, they are connected by well-defined and exhaustively tested mathematical rules. “Quantum theory,” says Henry Stapp, “rehabilitates the basic premise of moral philosophy. It entails that certain actions that a person can take are influenced by his stream of consciousness, which is not strictly controlled by any known law of nature.” A quantum theory of mind, incorporating the discoveries of nonlocality and the Quantum Zeno Effect, offers the hope of mending the breach between science and moral philosophy. It states definitively that real, active, causally efficacious mind operates in the material world.

The shift in understanding inspired by neuroplasticity and the power of mind to shape brain undermines the claim of materialist determinism that humans are essentially nothing more than fleshy computers spitting out the behavioral results of some inescapable neurogenetic program. “The brain is going to do what the brain was always going to do,” say the materialists. Both modern physics and contemporary neuroscience reply that they are wrong. The teachings of faith have long railed against the perils of the materialist mind-set. Now neuroscience and physics have joined them at the barricades. The science emerging with the new century tells us that we are not the children of matter alone, nor its slaves. As we establish ourselves in the third millennium, the Law of Karma elaborated so eloquently by Gotama five hundred years before the first millennium still resonates: “All Beings are owners of their Karma. Whatever volitional actions they do, good or evil, of those they shall become the heir.”