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1

10 Percent Misconception, 90 Percent Misdirection: The Brain at Work

Often it is said that we use only 10 percent of our brain. Is the brain really a vast, untapped resource of incomprehensible powers? Absolutely. I've heard countless vapid cell-phone conversations on street corners that attest to this. I remember one young lady giddy over a "brown baby pigeon" that was hopping about her feet while she was talking to her friend. The bird was a sparrow.

Remarkably, she was using nearly 100 percent of her brain in describing the "baby pigeon." Optic nerves were relaying the image of a tiny brown bird to the visual cortex way in the back of her brain via the thalamus, sort of the brain's relay station. Cochlear nerves in her ears were transmitting the electrical impulses of the sound of her friend's inane chatter through the brain stem and thalamus to the auditory cortex, where it was ultimately interpreted as language in her brain's Wernicke's area. Memory is spread widely through the brain, from the hippocampus and amygdala to the cerebral cortex, so it is not clear where the young lady was accessing the incorrect information that small brown birds in the city are baby pigeons and not sparrows. Most certainly, though, her brain stem was relaying motor function from her cerebellum and cerebral cortex to the muscles, enabling her to hold the cell

phone, turn her head, unconsciously check out a cute guy, and more or less to stand and breathe. Her brain's hypothalamus was regulating her body temperature. All and all, it was a busy time for her brain.

Our budding ornithologist might not have been using a full 100 percent of her brain on the cell phone all at once. After all, no one exercise utilizes 100 percent of one's muscle system. But she was using far more than 10 percent. More importantly, by the time she woke up in the morning after dreams of baby pigeons and cute guys, she would have used all of her brain. All of the brain's regions and many of its neurons would have gotten a workout.

Now, how you use your brain is your own business. You can read *War and Peace* or you can watch dating shows on television. While many argue that the latter is a waste of the brain's potential, no one can justifiably say that 90 percent of the brain lies dormant, like some untapped oil well, waiting to gush forth with unrealized brilliance.

The "10 percent" brain myth goes back at least a hundred years, perhaps more if one considers the teachings of transcendental meditation and the concept of maximizing the mind's power. Albert Einstein, whom no one accused of having a lazy brain, may have helped keep the myth alive when he told a reporter, wryly and perhaps sarcastically, that his brilliance came from using more than 10 percent of his brain. But this tale cannot be confirmed. Barry Beyerstein, a neurologist at Simon Fraser University in British Columbia, tried to isolate the origin of this myth in "Whence Cometh the Myth that We Only Use Ten Percent of Our Brain?," a chapter in the book *Mind Myths: Exploring Popular Assumptions About the Mind and Brain*. Beyerstein finds reference to a "silent cortex" in brain studies from the 1930s, as well as seeds of misconception from the 1800s.

The nineteenth century was a time of remarkable advancements in our understanding of the physical and biological world. The French physiologist Pierre Flourens's groundbreaking work on the brains of rabbits and pigeons in the 1820s and 1830s mapped out regions in the brain responsible for basic movements, memory, and mood. Basically, he removed parts of their brains and took

notes on what the animals could no longer do. A few decades later, Pierre Paul Broca, a French physician, isolated the region in the human brain responsible for controlling speech. He performed autopsies on stroke victims who had lost the ability to form words (but could still comprehend language). In the 1870s, Gustav Fritsch and Eduard Hitzig, two German physiologists, improved upon Flourens's work by zapping certain regions in a dog's brain with electricity and seeing which muscles moved.

The electrical zapping continued with greater precision in the 1930s. Researchers found that in all their brain volunteers, from animals to humans, there were certain regions in the brain that did not respond to stimuli. These regions were labeled the "silent cortex," and humans had a lot of them. The name was not meant to imply that the regions were inactive; merely, the electrical stimuli didn't provoke anything obvious, such as twitching. Further research has shown that the "silent cortex" is responsible for the very traits that make us human: language and abstract thought.

How can we be certain that we don't use only 10 percent of the brain? As Beyerstein succinctly says, "The armamentarium of modern neuroscience decisively repudiates this notion." CAT, PET and MRI scans, along with a battery of other tests, show that there are no inactive regions of the brain, even during sleep. Neuroscientists regularly hook up patients to these devices and ask them to do math problems, listen to music, paint, or do whatever they please. Certain regions of the brain fire up with activity depending on what task is performed. The scans catch all this activity; the entire brain has been mapped in this way.

Further debunking the myth is the fact that the brain, like any other body part, must be used to remain healthy. If your leg remains in a cast for a month, it wilts. A 90-percent brain inactivity rate would result in 90 percent of the brain rapidly deteriorating. Unused neurons (brain cells) would shrivel and die. Clearly, this doesn't happen in healthy individuals. In Alzheimer's disease, there is a diffuse 10 percent to 20 percent loss of neurons. This has a devastating effect on memory and consciousness. A person would be comatose if 90 percent of the brain—any 90 percent—were inactive.

The "10 percent" brain myth is silly even from an evolutionary standpoint. The brain is a hungry organ, requiring energy (in the form of oxygen and glucose) all day and all night. This organ, comprising only 5 percent of the body's total weight, consumes 20 percent of the oxygen and glucose. Evolution would have never favored a big, useless "high-maintenance" brain if only 10 percent of it were vital for survival. Darwin aside, just use common sense. Never do we hear a doctor say, "Fortunately the bullet wound destroyed the 90 percent of the brain he doesn't use. He's good to go; call me in the morning."

True, there are bizarre brain stories: people impaled by lead pipes and, still functioning, suddenly taking up an interest in yodeling; or people who have up to half their brain removed to control seizures. The brain never truly recovers its full capacity in these situations, but it can learn to adapt—particularly if the patient is young. The brain can reroute its wiring, or neural pathways, to maintain most of its function. Children whose parts of their brain have been damaged or removed can grow up, if treated, to lead productive and seemingly normal lives. Adults with brain damage have far greater difficulty attaining full function. This is because their streets have already been paved, unlike a child who is growing and learning. It is easier to pave a new street around a damaged area than it is to rip up an old street and start anew.

Yoga masters—and often those who are paralyzed from the neck down—learn how to better control their autonomic nervous system, that part of the nervous system responsible for things we do automatically without "thinking," such as breathing and regulating blood flow. For example, you are walking down a dark street and suddenly a mugger jumps in front of you with a knife. Your heart starts pounding. The rise in heart rate is a result of the sympathetic autonomic nervous system, the fight-or-flight response. Conversely, the parasympathetic autonomic nervous system will lower your heart rate and metabolism rate, allowing your body to conserve energy during times of rest. When you control your autonomic nervous system with your brain, you are not using any new brain parts. You are simply more conscious about using sections of the brain you have used all your life. Yoga masters have been known to lower their pulse rate well into the 30s, compared to a

resting pulse rate of 70 or so for most other people. Paralyzed individuals can learn how to regulate their bowels, and, in the case of men, even achieve penile erection by controlling autonomic nerves with their brain. But none of this is the unused 90 percent that psychics and other frauds talk about.

The "10 percent" figure popped up somewhere in the twentieth century. At first, the language was nonspecific, with lines such as "Scientists say we don't use most of our brain's power." In 1944 an ad for the Pelman Institute, which offered self-improvement courses, appearing on the inside front cover of a wartime Penguin edition of Stella Gibbons's novel *Cold Comfort Farm*, was perhaps one of the first to nail down a number:

> What's holding you back? Just one fact—one scientific fact. That is all. Because, as Science says, you are using only one-tenth of your real brain-power!

This is where the psychics and believers in extrasensory perception (ESP) pick up the ball. The mantra of those people who harness the Force as adeptly as Luke Skywalker is that your "other 90 percent" of the brain has the power to sense and move what the mundane 10 percent cannot. Uri "Sorry, I can't bend this spoon in a controlled laboratory setting" Geller is a magician who claims to use his brain to move objects without touching them and to read other people's minds. He's quite successful. With his clever brain, Geller mysteriously convinces fools to reach into their wallets and fork over big bucks to buy his books and to watch him perform. He's a consummate mind reader, knowing what his audience will fall for. In the introduction to his 1996 book, *Mind Power*, he writes:

> [M]ost of us only use about 10 per cent of our brains, if that. . . . I believe that we once had full power over our minds. We had to, in order to survive, but as our world has become more sophisticated and complex we have forgotten many of the abilities we once had.

Makes sense to me: the proliferation of books, quantum mechanics, superconductivity, semiconductors, laser surgery, X-ray telescopes that can probe black-hole event horizons . . . all these

things are making us stupid! Me hunt, me eat. That's the kind of stimuli we need. I will build shelter and a fire with my ability to mind-bend this spoon. Why is it that Geller can use his mind power to bend a spoon and not a lever in a Coke machine to get a free drink? Beats me. I must be part of the 10-percent-and-under crowd.

One cannot even speak of 10 percent in a diffuse sense, that our brains are only 10 percent full of knowledge. There's no limit to the mind's ability to store knowledge. This would be like saying we use only 10 percent of our ears because we never listen to 90 percent of the world languages, or 10 percent of our taste buds because we never eat 90 percent of the foods that others eat.

Metaphorically, this great brain tithing is a reflection of our deep-seated human inferiority complex: ancient civilizations could not have accomplished what they did on their own, we say; there must have been aliens guiding them or they must have moved massive stones with their minds. If Einstein could determine that mass distorts space in such a way to produce gravity, we say, he must have had access to a different part of the brain than I do. However, we cannot ignore the core message of the Uri Gellers and the fraudulent psychics—that humans often fail to attain their fullest potential. We can, as a species, rise above the ignorance of bigotry or fraud or malice, not by tapping into unused mystic portions of our brains but by reveling in the pursuit of knowledge.

Well, maybe tomorrow. There's a rerun of *Married with Children* on the tube.

2

Big Brain, Little Smarts: Brain Size and Intelligence

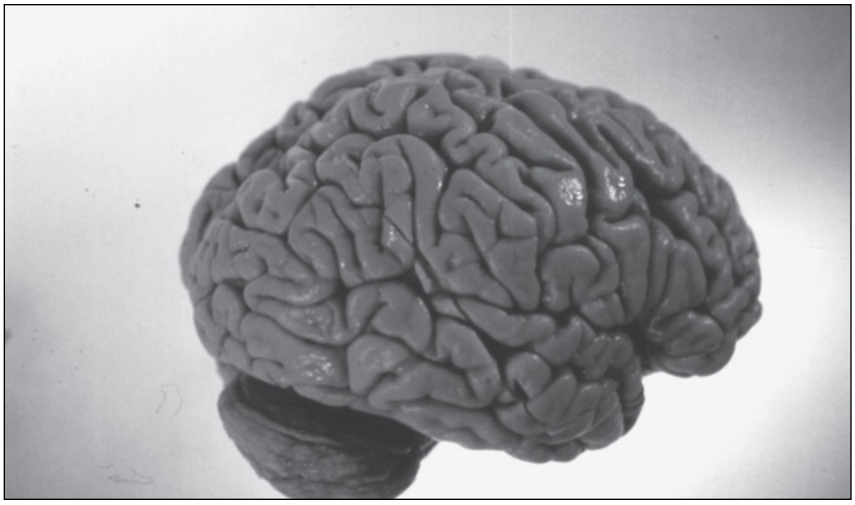
In Kurt Vonnegut's novel *Galapagos,* big-brained humans blow up the world with nuclear weapons. The only survivors are cruise-ship passengers shipwrecked on one of the Galápagos Islands of Darwin fame. Survival of the fittest plays out on the island, with those able to catch fish better suited to eat, live, mate, and pass on their genetic information. Smart people—the kind who can build weapons that destroy the world—are at a disadvantage on the island because all they know how to do is argue. They soon die. The dumb people, over the course of millions of years, evolve into dumber, penguinlike creatures skilled at catching fish. Vonnegut clearly doesn't have much respect for those with big brains. By "big brain," of course, he means the so-called smart person—creative liberty from a great author who knows deep down that human brain size has nothing to do with intelligence.

Assuming you could measure smartness (which we can't), and assuming you could measure brain size by measuring the outside of the head (which we can't), you'd still be wrong to assume that people with bigger heads are smarter. There have been geniuses with tiny brains and idiots with huge ones. Women have smaller brains than men, on average. Smaller people, particularly midgets, often have smaller brains. Unless you are prepared to defend the stance that women and short people are dumber, you'd be wise to drop the "big brain = big smarts" argument.

If the brain were a muscle, you'd be right in assuming that a bigger brain means more mental strength. Yet the brain is far more complicated than a muscle. The brain is a fluid-rich, spongelike tissue containing ten billion nerve endings controlling every thought and movement we undertake. The notion that a big brain equals big intelligence goes back several hundred years, yet it was in ancient times that humans first began to identify the brain as the organ that controls thought. The concept wasn't so straightforward. Imagine yourself with no medical instruments. How can you tell that the brain—which you see when you slaughter an animal—is responsible for thought in humans? Aristotle, a noted smart guy, thought the brain was a radiator that cooled the blood. The center of thought was the heart, according to Aristotle. This was around 350 b.c.e. Around 150 c.e., Galen, famed doctor to the Roman gladiators, began to noticed that violent head injuries from ridiculously gory gladiator games led to neurological disorders. He suggested that the brain might harbor thought, a concept met with giggles.

Barbarians of all brain sizes sacked Rome late in the fifth century, and serious thought went underground for a while. The philosopher René Descartes revisited the brain in the seventeenth century. Descartes, of "I think, therefore I am" fame, suggested that mental activity took place in the soul and transmitted itself to the brain, which served as a transceiver of thought. He was quite adamant that the brain was just a relayer and not the location of mental activity. A few hundred years later, phrenology suddenly became the rage. Phrenology is the study of head shapes to determine intelligence and personality. Phrenologists from Europe were the first group to subscribe to the idea that smart people have big brains and that other races were dumber because of their supposedly smaller heads.

Mind you, no group of people have smaller heads than others. In his book *The Mismeasures of Man*, the Harvard geologist and noted evolutionist Stephen Jay Gould reviewed data from centuries past to show that head measurements across races are more or less the same. Often, inaccuracies in measurements were a result of either foolishness or fraud, two fixtures of bad medicine that are



Size doesn't matter; it's how you use it that counts. *Courtesy of the National Institute of Neurological Disorders and Stroke*

difficult to discriminate. In one experiment from the nineteenth century, two skulls—one from an Englishman and the other from an African—were filled with gravel. The Victorian scientists packed gravel into the English skull and loosely filled the African skull, apparently demonstrating that English skulls hold more gravel and, therefore, larger brains. At any rate, the experiment said a thing or two about who had rocks in their heads.

Today, white supremacist groups and eugenicists—those who seek selective mating to produce superior offspring—use poor Gould's chart of brain sizes to show that they really do vary by race. (And again, even if they did—which they don't—this has nothing to do with intelligence.) The charts in Gould's book show that northern Asians have the largest brains, followed closely by Europeans. Native Americans and southern Asians have smaller brains. Ancient Europeans had even smaller brains, and modern Africans have the smallest. The problem here is the sampling. The size differences are small: 87 cubic inches for modern Europeans versus 83 cubic inches for modern Africans—although eugenicists argue this is the difference of millions of precious brain neurons. That may be true, but other samples of brain sizes show Africans

having larger brains than Europeans. It all depends on your sample population, and early headhunters collected the heads that best supported their arguments of Caucasian superiority. Phrenology was in full swing. Americans and Europeans alike used this pseudoscience as justification for the slave trade and the killing of native peoples in the Americas and Australia.

But what of big brains? Women have smaller brains compared to men. Are they dumber? Easy now. The average brain size is about 3 pounds or 1,400 grams. The brain of the French writer Anatole France was only 2.24 pounds, well below average. Lord Byron's brain was nearly twice this amount, over four pounds. These two geniuses with vastly different brain sizes lived roughly in the same era. Albert Einstein had an average-sized brain, most likely the same size as yours and mine. You can't even compare humans to other animals. Dolphins have about the same size brain as humans. Elephants' brains are five times bigger. Whale brains are bigger yet. If you compare the ratio of brain mass to body mass, the rat is the winner. Maybe rats *are* smarter. You try navigating the New York subway in the dark.

This all comes down to what is unique about the human brain. Whales and elephants need huge brains not to think but to move. Most of the whale's enormous brain, up to ten times bigger than a human brain, is devoted to moving its massive fins and sensing feeling along its massive body.

The human brain is unique in that it has a highly developed section called the cerebral cortex, which is located in the frontal lobe of the brain. The cerebral cortex is essential for processing thought and language. Early humanoids had a less developed cerebral cortex and therefore could not attain what we commonly call conscious experience. The same can be said for modern apes and dolphins. An ape's brain could get bigger, but unless the cerebral cortex develops in a certain way, the ape will never achieve "thought." The cerebral cortex is merely one section of the brain. A dog's brain has a larger section devoted to smell, and therefore dogs can detect and remember smells better than humans, regardless of brain size. Dogs went one way, humans went another.

Scientists are far from understanding what constitutes the "mind"—that combination of skills responsible for decision making,

emotion, perception, imagination, and self-awareness. Conscious experience does not arise from one neuron, nor is it confined to the cerebral cortex. The "mind" seems to be a neural network, a hardwiring of brain nerve cells with each cell connected to fifty thousand of its neighbors. Smarter people—creative, scientific, or physically skilled—make better use of the human brain through networking. Size doesn't matter, but how one relays nerve impulses around the brain does. Drug addicts and alcoholics hinder their ability to think by damaging neural networks. A connection is broken, and a skill or memory is lost. Likewise, neurological disorders such as Alzheimer's disease involve broken networks.

The brain of a child is primed for hardwiring, yet humans can generate neural connections throughout life. Taxi drivers in London, for example, develop over the course of many years a larger hippocampus, the section of the brain responsible for navigating and remembering directions. This well-circulated finding, conducted on about two dozen taxi drivers, sure gave cabbies a big head. The study confirmed the theory that certain types of thought lead to greater development of a particular part of the brain. With this development come more neurons, more capillaries, more blood, and, yes, more mass—in the case of the taxi drivers, a good milligram or two in a 1,400-gram (1,400,000 mg) brain. Inactivity in other parts of the brain leads to shrinkage. Overall, though, the brain doesn't gain much mass by "thinking hard."

Some of us are born with a brain better designed for certain types of thought. The brain is like farmland. True geniuses—which are few and far between—are often those people with one section of the brain that is more fertile than others. Einstein, for example, had a larger inferior parietal region, the part of the brain responsible for mathematical thought and the ability to visualize movement in space. This section was 15 percent wider, perhaps at the cost of making another section smaller (possibly the hair-combing section). Also, Einstein's brain lacked a groove called the sulcus that normally runs through this part of this brain. This absence may have allowed the neurons on either side to communicate more easily.

The bottom line is that Einstein's brain was just different, not larger. If eugenicists had their way, they would not "breed" other Einsteins, because Einstein had an average-sized brain. By

selectively choosing big brains and big brains only, you would miss the brain of an Einstein, of an Anatole France, and of the countless great artists, musicians, thinkers, comedians, and hard-working ordinary folks with average-sized brains or smaller.

Evolutionists have no problem accepting the fact that brain size doesn't matter. We say that humans became humans as their brains got bigger, but this is only partially true. Yes, early humanoids had smaller brains. As the prehuman developed, it grew larger but, more importantly, progressed in such a way that allowed for thought—separating humans from every other animal. Whale brains got bigger and bigger, too, as whales got bigger. Whales didn't necessarily become smarter because of it.

The human brain, by the way, isn't getting any bigger, nor are humans getting innately smarter. We are no smarter than the cavemen, those clever souls who domesticated fire and figured out that grain makes bread. Admit it. It took ingenuity to melt certain rocks into copper, bronze, and iron. A caveman alive today, socialized as a modern human, would be just as smart or dumb as the rest of us, depending on your perspective.

Humans will get smarter in terms of learning new things, despite the potential for permanent stupidity from watching television. Humans will build upon the knowledge of preceding generations. We will understand new physics and create technologies beyond our comprehension today. We may very well master deep-space travel and discover new dimensions and forces in the universe. Our brains will stay the same size, though. The notion of a future human with an enormous head to house an enormous brain is pure fantasy. Evolution simply doesn't favor larger heads over small heads. Evolution doesn't even favor smart people over dumb people. Dumb people mate with stellar success. For humans to develop bigger heads, we would have to kill off people with small heads and only mate with large-headed people. Of the offspring, only the largest of the large heads could mate. Then, over tens of thousands of years, assuming this ridiculous practice of big-head mating continued, humans would have larger heads. What we would gain is uncertain. Baseball caps would need to stretch; this much is sure.