YOU HAVE A BRAIN

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CHAPTER 1

The Amazing Brain

When you saw the title of this book, *You Have a Brain*, you probably thought: *Well*, *duh*, *of course*, *everybody has one!*

Most people haven't given their brains much thought. I have. In more than thirty years as a brain surgeon, I have performed in the neighborhood of 15,000 surgical operations. Counting the scans I've studied, I've examined more than that. I had to know a great deal about the brain before I began my career as a neurosurgeon and I've learned much more since. My patients have been a most significant part of my education on the brain.

Christina was the oldest hemispherectomy patient I ever operated on. We'd had excellent results for years with young children, but I'd never considered the operation—the removal of half a brain—for a twenty-one-year-old. The younger the child, the more elastic and adaptable their brain and the easier it is for the remaining hemisphere to assume the responsibilities of the one that's been removed.

No one was sure how a twenty-one-year-old brain would respond.

But Christina had more than fifty violent seizures a day centered in one side of her brain—and that was under anti-seizure medication. Without the medication, she experienced even more seizures that wreaked havoc on her physically, mentally, and emotionally.

Her quality of life was poor, and the damage caused by the seizures was slowly, but surely, killing her.

So I told her and her family we'd give it a try. She did so well that within just a few months she went back to college. Where

she'd struggled to do C- and D-quality work before, after the hemispherectomy, she made As and Bs. Her academic achievement had improved significantly. She finished college, became independent, and started working and making a living. Last I heard, she'd gotten married.

One of the joys of my life right now as I travel around the country is that so many of my former patients seek me out. Most of them are long past childhood now, in their twenties or even their thirties. "I have a family now," they say to me. "This is my wife; here is my son. I wanted them to meet you, and I want to say thank you."

Some of these encounters make me feel old, but aside from that I feel grateful that I get to see some of the fruits of my labor. To be reminded again and again of the brain's resiliency and the amazing potential in even once-damaged and diseased brains. A gift so remarkable, you can have a normal life with only half of one.

Just how amazing and remarkable is this human brain you have?

- Inside each human brain are approximately 86 billion neurons interconnected by more than 100 trillion synapses (estimated since no one has counted them all yet), which science has only barely begun to understand.
- Your brain started developing almost immediately after conception. During the first months of your mother's pregnancy, your body was creating neurons at the rate of about 400 million per day.
- Your brain generates electricity constantly, enough every waking minute to keep a low-wattage light bulb fully lit. So

when you say, "That's a bright idea," your statement could be literally as well as figuratively true.

- Sensory signals move along an alpha motor neuron in your spinal cord at 268 miles per hour (mph). This is the fastest transmission of this type in the body. Skin sensory receptors, which travel at about 1 mph, are among the slowest in the body because they do not have a myelin sheath, which would insulate them and boost their speed.
- The brain of a normal twenty-year-old human possesses 100,000 miles of myelin-covered nerve fibers.
- Your brain can feel no pain because it has no pain receptors. The organ that controls the whole nervous system, and it can't feel pain! This is why we can operate on the brain without worrying about the pain level of the patient. It's also the reason we can perform surgery on people who are awake, as they feel absolutely nothing.
- Harvard University neuroscientist Jeff Lichtman, who is attempting to map the brain, has calculated that several million petabytes of data storage would be needed to index the entire human brain.[1]

When scientists try to quantify the capacity of the human brain, the numbers get so high that we can't get our minds around them. The potential of your mind is literally mindboggling.

My respect for the human brain has deepened over the years to an attitude I can only describe as awe. Every time I've opened a child's head and seen a brain, I marvel at the mystery. *This is what makes every one of us who we are. This is what holds*

1. David Russell Schilling. "Knowledge Doubling Every 12 Months, Soon to Be Every 12 Hours." Industry Tap. Apr. 13, 2013. http://www.industrytap.com/knowledge-doubling-every-12-months-soon-to-be-every-12-hours/3950.

all our memories, *all our thoughts*, *and all our dreams. This is what makes us different from each other in millions of ways.*

Do you realize that no super computer on earth can come close to the capacity of the average human brain? The most complex organ system in the entire universe is a tremendous gift from God. There are hundreds more neural connections in our brains than there are stars in the Milky Way galaxy.

I tell audiences of several thousand people that if I could bring one person up on stage, have her look out at the crowd for one second, then lead her away, then fifty years later I could perform an operation to take off the cranial bone and put in some depth electrodes, stimulate the appropriate area of her brain, and she could not only remember where everyone was sitting but also what they were wearing.

The brain sorts, organizes, and warehouses that deluge of sensory data flooding in at millions of bytes per second. It's the control and command center for all of our senses, all our other organs, our body temperature, and the operation of every system in the human body—respiratory, circulatory, and more. Much more. Most of this work the brain does automatically without a thought (literally) from us.

On top of all that, the brain enables us to imagine, to create, and to solve problems. A human brain comes programmed with the ability to extract information from the past, gather information from the present, integrate that data, and project it into the future—which means we're the only creatures on earth with the capacity to analyze, strategize, and prioritize so we can alter or improve the world around us. This is unlike other animals who only react to what's going on around them.

Yet, when I was a child, I did not think that my brain was capable of doing much of anything. My classmates considered me the class dummy, and I saw no reason to debate their conclusion.

My mother, however, always believed in me. She knew I had a brain, and she was convinced that brain could be my ticket to a bigger, better world beyond our tiny home and life on the big city streets of Detroit.

And she was right.