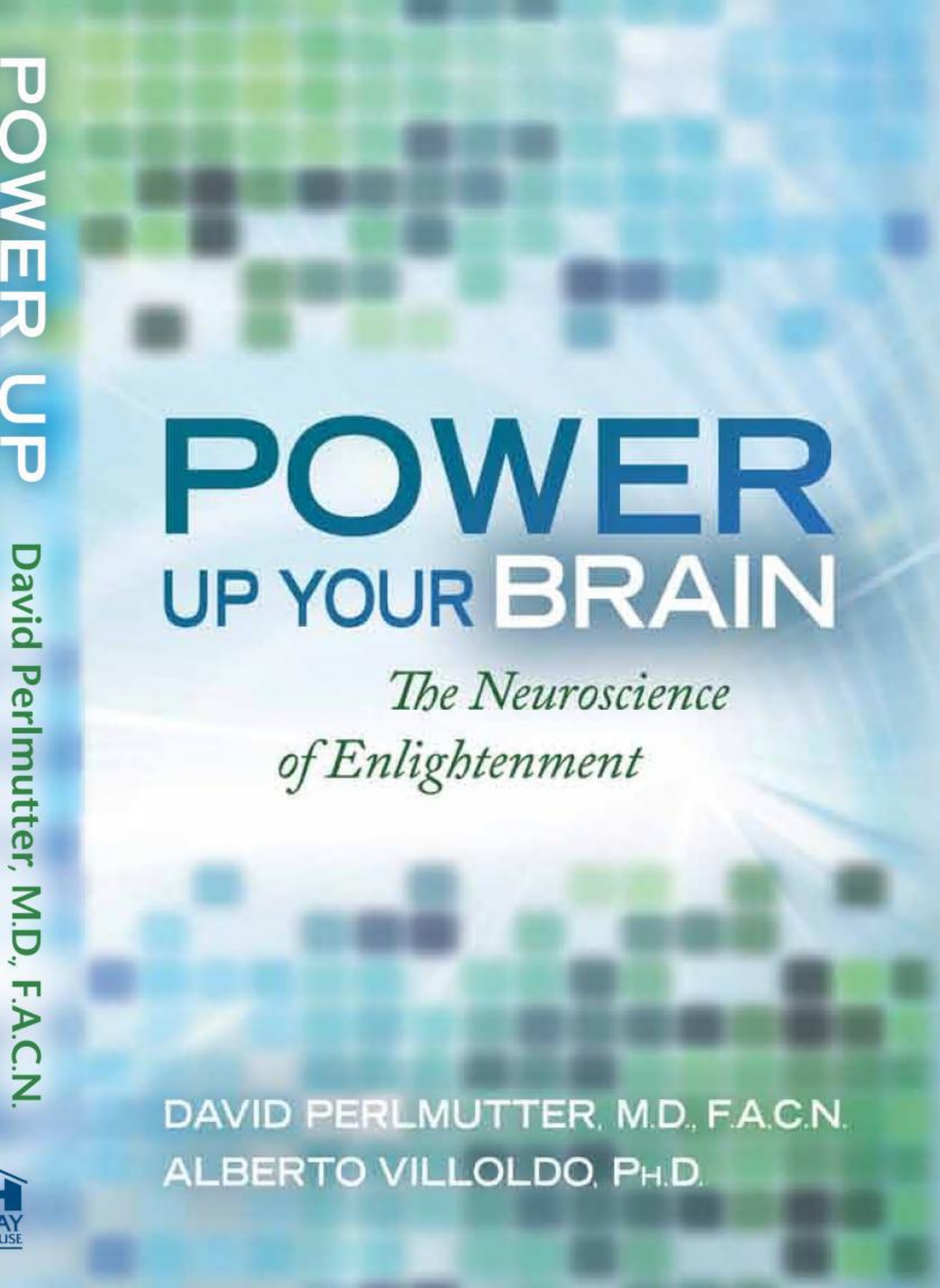
POWER UP

David Perlmutter, M.D., F.A.C.N.



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Prime Your Brain for Enlightenment

The quest for enlightenment has occupied mankind for millennia. And from the depictions we've seen—monks sitting on meditation cushions, nuns kneeling in prayer, shamans communing with the universe—it seems that this elusive state is reserved for a chosen few. But now, neuroscientist **David Perlmutter** and medical anthropologist and shaman **Alberto Villoldo** have come together to explore the commonalities between their specialties with the aim of making enlightenment possible for anyone.

Joining the long-separated worlds of science and spirit, Perlmutter explores the exciting phenomena of neurogenesis and mitochondrial health, while Villoldo brings his vast knowledge of shamanic and spiritual practices to the table. Drawing the most powerful tools from each discipline, Perlmutter and Villoldo guide you, step by step, through the groundbreaking, five-week Power Up Your Brain program, which helps you overcome toxic emotions and awaken the power of your higher brain.

The nutritional advice, dietary supplements, fasting, and physical exercise outlined in the plan will not only help repair parts of your brain that have been affected by stress but also create a fertile environment to grow new brain cells and turn on the genes responsible for longevity, improved immunity, and enhanced brain function. And the shamanic practices, meditation, and visualizations will help bring online brain regions that allow for peace, compassion, innovation, and joy to arise naturally.

Following the Power Up Your Brain program will help you clear your mind and heal from trauma; and open you up to experience the inner peace, vast insight, and extraordinary creativity that define the experience of enlightenment.

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POWER
UP YOUR BRAIN

The Neuroscience of Enlightenment

DAVID PERLMUTTER, M.D., F.A.C.N.

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PUBLISHER'S FOREWORD

Shamanism and neuroscience: what do they have in common? They are both keys to personal health and wellness, mental excellence, spiritual awareness, growth and prosperity, improved personal relationships, a higher quality of life, and a greater ability to perform and contribute to society—to name a few benefits.

Yet, seldom have we seen these words—*shamanism* and *neuroscience*—used in the same sentence. Why is that? Because we have been living in a time of reductionism during which the realm of spirit and the domain of science have been separated, split, divided, and divorced from one another.

This was not always so. For millennia, shamans were also astronomers, wizards were scientists, spiritual seekers were explorers, and researchers were risk takers. Their opinions were valued by emperors, chieftains, tsars, kings, and potentates. That is, until the time when established authorities—the popes and princes of the powerful status quo—labeled visionaries as heretics and decreed that religion and science should follow their disparate paths.

Fortunately, the relationship of spirit and matter, while subjugated to the background, was never totally erased from human consciousness. Scientists have always suspected that a connection, preserved in some basal paradigm, exists between the soul and the brain. And this thought began to reemerge a few decades ago, phrased as the mind-body-spirit connection.

And now two men, two seers—a shaman and a scientist—are combining their experiences and expertise to explore the totality that includes all of the spirit world and all of the scientific world—as One.

Power Up Your Brain: The Neuroscience of Enlightenment is a collaboration of Dr. David Perlmutter, a neuroscientist and practicing neurologist; and Dr. Alberto Villoldo, a medical anthropologist and shaman. Unlike the majority of scientists who have investigated meditation and the extraordinary feats of yogis, both of them are hands-on clinicians, helping countless patients heal their emotions, repair their brains, and enlighten their minds. Therefore, this book's message is a reunion of ethereal spirit and hard science. And its content is a spiritual blessing and a physical benefit to you—and to others with whom you share this story.

Why? Because *Power Up Your Brain* is blend of deep shamanic truths and profound scientific facts.

Do David Perlmutter and Alberto Villoldo dare to use the words *neuroscience* and *shamanism* in the same sentence? Yes! Resoundingly, yes. Because, in effect, neuroscience and shamanism are cut from the same cloth, threads in the same fabric of human history and human evolution.

PREFACE

David Perlmutter: Explorations, Then and Now

As we followed the shaman up the mountain along the ancient stone pathway crafted by the Inca some six centuries ago, the silence was broken only by the sound of his flute. Our destination was Ollantaytambo, near Machu Picchu, not only one of Peru's best-preserved archaeological sites but also a site of great spiritual significance.

My companions seemed to be energized by their spirited endeavor, yet I was more concerned with the pounding in my head. The shock to my body of traveling quickly, from sea level in Florida to almost 10,000 feet in the Andes, focused my attention on the inescapable fact that I was suffering from shortness of breath and blurred vision. Thankfully, my wife and two children seemed less affected.

One of the shamans traveling with us noticed my distress and offered me a handful of coca leaves to chew. I decided to try it instead of the acetazolamide I carried in my backpack in case of high-altitude sickness. Soon I felt numbness in my mouth and, very quickly, my symptoms disappeared!

How did this descendant of the Inca know that the leaves of the *Erythroxylum coca* plant could help with the symptoms of high-altitude sickness? The obvious answer is that it was the benefit of ancient wisdom, yet that only partially satisfied me. It seemed improbable that some hapless forebear had been chosen to chew his way through all the local plants to check their medicinal use. Meanwhile, my companion studied my countenance, much as I would observe my own patients. Meeting his gaze, I realized that his knowledge of the coca leaf did not come from lessons learned but was rooted in a profound knowledge of soul and spirit—not a concept that sat easily with my Western medical training, and yet I felt moved to accept it.

My journey to the Andes in the company of my family was inspired by my wife after she had read several books by Dr. Alberto Villoldo. We chose this expedition *because* Alberto was leading it, and it was not long after my healing encounter that I had a chance to speak with him. Our conversation flowed naturally, without elaborate introductions, and soon revolved around a discussion of the sustainability of cultures living seemingly off the grid. Later that same day, back at our hotel, I asked Alberto about the shaman's apparently unique ability to access complex information by means of intuition.

"That has been my mission for the past thirty years," Alberto replied, explaining that he had made it his life's work to discover how such unassuming individuals are able to amass such a vast compendium of information. "It is not knowledge that comes from others," he continued. "It comes from the source of all knowledge, which is the Great Spirit. The sages are able to tap into this wisdom, and to a certain extent we all have the potential to do this, not just indigenous peoples. After all, there have been individuals throughout the ages and in all cultures who were considered enlightened."

I returned to my medical practice serving patients with a variety of challenging brain disorders, my treatment plans always integrating lifestyle issues and nutritional interventions with standard pharmaceutical-based approaches. This less than traditional neurological methodology allowed me to gain a deep understanding

of health issues while retaining a mind-set that was open to new ideas. Nevertheless, I continued to be challenged by patients who suffered diseases that were well beyond the scope of neurology alone, including cancer, advanced arthritis, diabetes, and other equally challenging disorders.

I began to focus on the small but growing number of patients who were actually able to regain their health despite what could have been a diagnosis of incurable disease. What was it about these patients that turned things around? The answer was presented to me late one Friday afternoon during a consultation with a woman suffering from chronic progressive multiple sclerosis, a frequently fatal and crippling auto-immune brain disorder.

We had placed Beth on our standard array of nutritional supplements, specific essential fatty acids, and nutrient injections for the disorder several years before. Although her decline had slowed somewhat, she was forced to use a walker and even a wheelchair at times. That afternoon, however, my staff and I were astounded to see her walking down our hallway unassisted.

"We are putting you on our miracle list," I told her, referring to the growing number of our patients whose improvements could not be explained by medical science.

In the examining room, we explored what had changed in her life and to what she attributed her miraculous improvement.

"I have been studying shamanism for a few years," she replied, scrutinizing my face for any sign of familiarity with the term. "Basically, I've gained the ability to tap into what I call *healing energy*," Beth continued. "Not only am I doing so much better as far as my MS is concerned, but I also feel really peaceful and positive about my life. I've been practicing some meditation techniques for years," she explained, "but they never really clicked until about three months ago."

Over the coming months, I began to notice that we were putting more and more people on the miracle list. And it was becoming clear to me that, overwhelmingly, the patients who achieved the most profound recoveries were those engaged in some form of meditative or spiritual practice. Whether they repeated affirmations, meditated, or prayed in some fashion, virtually all of these

patients were somehow connecting with what the shaman had referred to as the Great Spirit.

There were several other characteristics in the lifestyles of our miracle-list patients that began to stand out in addition to their spiritual practices. Many of them had adopted the practice of fasting from time to time. Almost all of them engaged in some form of physical exercise. And an overwhelming number were taking some form of docosahexaenoic acid (DHA). The use of this omega-3 supplement was no doubt the result of my personal enthusiasm for it; indeed, I later discovered that it has a special attribute that was probably playing a much larger role in enhancing the efficacy of lifestyle changes in my patients than I had previously imagined.

Over the next three years, my encounters with Alberto evolved into a close friendship, and we realized that we should put our heads together and collaborate. For it had become clear to us that access to the Great Spirit or Divine Energy—that natural force which is called by so many names—is available to all. In a sense, we are all shamans, and the most advanced teachings in cellular biology are validating lifestyle activities that, for centuries, have been paving the way to enlightenment through meditative practices not just for the chosen few but for all who care to learn. Our collaboration explores the implications of this not only for individuals but for all of humanity.

■ ■ ■

Alberto Villoldo: Journey from the Brain Laboratory to Enlightenment

Over time, I grew accustomed to the stench of formaldehyde. Stinky five-gallon vats held all kinds of brains—sheep brains, cow brains, human brains—but it was the only laboratory space I was able to wrangle from the biology department at San Francisco State University. And so, under these conditions, surrounded by hundreds of brains, I conducted my research into how the mind

creates psychosomatic health or disease and how shamans are able to cure illness.

One day, two years into my research, I realized that I had been viewing the mind through the wrong lens. I had been trying to understand a spiritual tradition of indigenous America by looking at changes in brain and blood chemistry. The following week, I resigned my post at the university and shut down my lab. And before the month was over, I had purchased a one-way ticket to the Peruvian Amazon to study the shamans in their own environment. My best friend, a medical student, gave me a very large hunting knife as a gift, with a note that said, "You might need this in the Upper Amazon." Everyone I knew, including my own family, thought I was mad to throw away a promising career in academia to follow a harebrained dream of being an explorer and adventurer. I had my own doubts and reservations, but I shared them with no one. I was a city boy who had never set foot in the jungle. But I was sure of one thing: I would not find answers about the mind in a laboratory.

I spent the next quarter of a century traveling and studying with the most renowned sages of the Americas. During that time, I witnessed extraordinary cures—persons whom Western medicine would have long given up on returned to health through ways I could only ascribe to a miracle or spontaneous remission. Over time, I became an apprentice to the shamans and learned their healing practices and methodologies. Yet part of me always felt like an outsider. One old Indian I worked with for many years, a man who eventually became my mentor, explained to me: "That's because your God is a descending God. He comes down from the heavens on rare occasions to touch those of us here on the Earth; whereas our deity is an ascending divinity who rises from the Earth like the golden corn and resides among us. Our creative force is known as Pachamama, the Divine Mother."

The sages I studied with worked with the Divine Mother, an energy or intelligence they were capable of interacting with to heal their patients. They believed that we ourselves *are* this divine energy embodied in matter, much like ribbons of sunlight that wrap themselves around the trunks of trees and then release their

light when we place a log into the fire. They claimed they were able to *see* emanations of this energy around the body of a person in the form of a luminous matrix. Dark spots in the matrix indicate the presence of disease, they said, even if the illness had not yet manifested in the physical body.

After many years, I also learned to *sense* this luminous field and to comprehend the shamans' concept of all life being interconnected through strands of light. In the beginning, my scientific mind had to grasp this notion by explaining to myself that we eat animals that eat grasses that feed on sunlight. I reminded myself that chlorophyll turns light into carbohydrates, such as wheat and other grains, and that we turn carbohydrates back into light inside our cells for fuel through a process known as the Krebs Cycle. With time, my logical brain relaxed its vise-like grip on my awareness, and I was able to perceive more directly the luminous weave of all creation.

With time, I learned that trauma leaves an almost indelible signature that a healer can perceive in her clients' luminous field. Healers believe that this marks a person's experience of health or disease for their entire life, like a cross that each of us has to shoulder. A shaman can help people to lighten their load, perhaps even help them understand the lessons they needed to learn from the original trauma they experienced, but it is up to each person to choose whether they carry their cross lightly, discard it altogether, or become burdened and overwhelmed beneath the weight. According to the shamans, the way to clear these marks and shed this burden that defines our personality and our health is by healing our toxic emotions via energy medicine.

I learned the practice of energy medicine during my years with the shamans and now teach it to students in the United States and Europe. Our graduates learn to use timeless healing techniques to help friends, family members, and clients. As modern shamans, we also know that if a person wants to be healed of disease and be truly free and enlightened, then it is essential to strengthen the feminine life force within. This requires fasting, prayer, and meditation, combined with the use of healing herbs and plants.

During my years studying with the shamans, I learned about their belief in the Divine Mother, which we each have the potential to discover in nature. This was not the bearded old man whose image I had come to associate with "God." Rather, this was a force that infused all of creation, a sea of energy and consciousness that we all swim in and are part of. I came to understand that our Western notions of the divine are perhaps a masculine version of this life force that infuses every cell in our bodies, that animates all living beings, and that even fuels stars. The shamans helped me to develop an original and fulfilling relationship with the power of Pachamama.

In 2006, on one of my yearly expeditions to the Andes, I met David Perlmutter. He first caught my attention as we were hiking up the ancient Inca stone steps to reach the Temple of the Winds, near the village of Ollantaytambo. He was short of breath but was greatly helped by chewing the coca leaves that the local people consider medicinal. His pace and demeanor picked up, and later we struck up a comfortable and easy conversation, as if we had always known each other.

I had heard of David and his work over the years and was delighted to hear he was also interested in indigenous healing practices. As we talked on that first day of our encounter, I mentioned the shamans' notion of how important it is to restore the feminine life force, and his face immediately lit up. "Yes," he remarked, "it's the mitochondria."

On hearing this, I nearly fell off my chair. Here was the link between the ancient shamanic practices and modern neuroscience. I remembered that our mitochondria are inherited only from our mother's lineage. Here was the source, inside each cell of every living creature, of the feminine life force that sages speak about. I became very excited when he mentioned how these energy factories seemed to be breaking down under the continual barrage of stress in our fast-paced lives and from biochemical toxins, including mercury, pesticides, and water and air pollution. David hinted that the ancient shamanic practices, including prayer, fasting, and meditation as well as dietary supplementation with special herbs, help restore mitochondrial function.

The more we conversed, the more obvious it became to both of us that there are many elements of *ancient* healing and spiritual practices that can be described in *modern* neurological terms. The feminine life force of Pachamama could be found in our mitochondria; the marks of trauma in our Luminous Energy Field correspond to neural networks in the brain that produce toxic emotions and define our personality.

I was overjoyed. Here was the missing element that had eluded me in the Amazon but that had been all around me during my days at the laboratory, ensconced between shelves stacked with chemically preserved brains.

The fact is that, although I had succeeded in translating ancient shamanic healing methods into scientifically sound practices and my students at the Healing the Light Body School and patients reported extraordinary life transformations, some found it very difficult to break free from their destructive beliefs and emotions. It was also impractical for my students to do what I had done during 25 years in the Amazon and Andes; namely, to fast for many days in the wilderness while eating only special barks and berries.

David had knowledge of rich brain nutrients that could accomplish the same thing—perhaps even more finely and certainly more conveniently than the rigorous diets the shamans prescribed. He understood how to repair the mitochondria and restore the feminine life force. He knew how to prime the brain for enlightenment. I, meanwhile, had studied in depth the shamanic and yogic practices that would help to switch on the higher-order functions of our brain to help it heal from trauma and experience joy.

What if we could bring these methodologies together to help our students and patients heal their brain, restore their health, and experience freedom from destructive emotions like anger and fear?

INTRODUCTION

Enlightenment. This elusive state has been the focus of some of the greatest minds throughout history. Thousands of people have dedicated their lives to its pursuit. We see images of monks sitting peacefully on meditation cushions . . . nuns kneeling in prayer . . . shamans living in the wilds of the Amazon. And while these representations of enlightened individuals may be accurate, they also imply that this desired state is reserved for a privileged few.

We believe, however, that enlightenment is available to all those who are willing to dedicate the time and effort necessary to attain it. Finding this state does not require a lifestyle that is incompatible with surviving in the modern Western world. And the rewards of enlightenment are not limited to the attainment of spiritual knowledge enjoyed by the contemplative mystic. They can also be reaped in the discovery of DNA sequencing by the innovative scientist, the preparation of a mouth-watering meal by the inventive chef, or the creation of an inspiring masterpiece by the insightful artist. We believe that enlightenment promises everyone the possibility for innovation, extraordinary creativity, and inner peace.

We also believe that the search for enlightenment can be accelerated by following a practice focused on awakening the power of the higher brain. When our higher brain functions are engaged, we have the potential to change our lives both spiritually and biologically.

But to achieve this desired state of consciousness, we must not only master ancient enlightenment techniques but also restore the brain's health at the cellular level. These two goals are inextricably linked.

YOUR OPTIMAL BRAIN

Anger, fear, jealousy, greed, and worry, while commonplace, undermine our inner peace and sense of self-worth. But even on a weekend meditation retreat or during a walk in the quiet and stillness of the woods, the mind continues to chase thoughts, compose to-do lists, and fret about activities not yet completed and situations not yet resolved. Hard as we might try to sit quietly and empty our mind of thoughts, it continues to gravitate toward the unfinished business of our past.

Power Up Your Brain helps you understand why, instead of operating at its optimal level of functioning, your brain instead relies on the neural networks created by the prehistoric, survival-at-all-costs brain regions—the reptilian brain and the limbic brain. It also shows you how to overcome the toxic emotions of your old wiring, the conditioning based on negative experiences from the past. By healing that prehistoric brain, you engage newer, higher, more evolved brain structures—the neocortex and, specifically, the prefrontal cortex—which will help you eliminate fear, poverty mentality, and anger from your life. This is done through the creation of new neural networks in your brain.

Until quite recently, most brain researchers held that, even though the brain is malleable in the early years of a child's development, the window of opportunity for changing its wiring slams shut by around the age of seven years. While it is true that the brain of a fetus or a young child is like a dry sponge, with the

potential to soak up all the knowledge, beliefs, and behaviors it needs to survive in its new worldly environment, the premise that the brain can no longer be rewired past a certain early age has now been upended.

Leading-edge neuroscience research now confirms that we can grow new brain cells and change the actual networks in the brain. Once we provide our neurons with specific nutrients lacking in our everyday diet and embark on stimulating new activities, we can establish new neural networks that help transform limiting beliefs and behaviors and recapture long-lost feelings of joy, optimism, and tranquility.

To achieve these benefits, you must start by learning how the brain functions and how your mitochondria have become compromised.

A HEALTHY BODY

In the language of neuroscience, enlightenment is the condition of optimal mitochondrial and brain functioning that allows us to experience both well-being and inner peace *and* the urge to create and innovate. Mitochondria are the energy factories at work within your cells. They impact your moods, your vitality, your aging process, and even how you might die. They are also in charge of the elimination of old cells and replacement with new cells, a function that occurs automatically, without your conscious awareness.

The mitochondria are influenced by the foods you eat, the amount of calories you ingest, the extent to which you exercise your body, and the inclusion of specific nutrients.

Power Up Your Brain will give you access to keys encoded in your mitochondrial DNA that, until now, have been password-protected due to an inability to reverse the damage caused by free-radical damage to the brain. When you unlock this code, you break free of the illness-ridden journey that many Westerners suffer from cradle to grave. With your mitochondria restored, your cells will be able to express the genes that promote brain health

and physical longevity, and you won't have to continue perpetuating the ills and traumas of your family of origin.

THE POWER UP YOUR BRAIN PROGRAM

Blue Zones are regions on the planet where ten times more people reach the age of 100 compared with people in the United States. Dan Buettner, a *National Geographic* writer and researcher, wrote a book about this phenomenon and reported that these individuals have certain traits in common, including calorie reduction (they eat 25 percent less than what you would need to feel full), avoiding meat and processed foods, and living lives that have meaning and purpose.[1] Buettner cites a Danish scientific study of twins that indicates that genes dictate less than 25 percent of a person's health and longevity. The remaining 75 percent is determined by lifestyle factors: what you eat, how you love and are loved, how much you exercise, and how you discover meaning in your life.

Lifestyle factors actually modify our genetic expression by shutting off the genes that predispose us to malignancy and disease. Our mitochondria regulate the switching on or off of these genes. Therefore, to live long and live well, we need optimally functioning mitochondria.

At our facilities—the Center for Energy Medicine in Los Lobos, Chile, and the Perlmutter Health Center in Naples, Florida—we help our clients restore their mitochondria to repair their brains. Our protocols utilize intravenous glutathione and hyperbaric oxygen to optimize mitochondrial function as well as foods and supplements that help undo the damage done to the brain by years of stressful living. We find that mitochondria, the mind, and the brain respond extraordinarily quickly to these interventions. Then, through shamanic meditation practices, we can heal from toxic emotions and discover inner peace.

But you do not have to take part in one of our seven-day intensives to accomplish this. In *Power Up Your Brain,* we present a program to help you do the same things: heal your mitochondria

and rewire your brain for peace and joy instead of suffering. We combine two complementary strategies: brain-specific nutrients used in conjunction with fasting and enlightenment practices. The neuronutrients recommended by Dr. Perlmutter work to repair regions in your brain that have been affected by stress, psychological trauma, and degenerative brain disease to help grow new brain cells and turn on the genes responsible for longevity, improved immunity, and enhanced brain function. And the enlightenment practices pioneered by Alberto Villoldo, Ph.D., help awaken brain regions that allow peace, compassion, innovation, and joy to arise naturally. Together, they will enable you to establish new neural networks for joy and well-being.

Using this program, you can develop the gifts once ascribed only to a privileged few. And in the process, you'll have the chance to gain other health benefits, including a reduced risk of devastating brain diseases, cancer, heart disease, and Parkinson's; elimination of debilitating mood swings; the breaking of unhealthy emotional and behavior patterns; the overcoming of painful memories and past traumas; a powerful clarity of thought; and the potential for maximum human life span; all without the use of drugs.

When we repair our brains and heal our toxic emotions, we move toward a state of personal health and well-being. Then, we can bring forth the qualities attributed to enlightened beings: inner peace, wisdom, compassion, joy, creativity, and a new vision of the future.

CHAPTER 1

THE NEUROSCIENCE OF ENLIGHTENMENT

Can neuroscience deliver on the promises presented by religion: freedom from suffering, violence, scarcity, and disease? Can neuroscience deliver us into a life where health, peace, and abundance reign?

The pledges of the world's religions are so universal that it's likely the longing for joy, inner peace, and well-being are hardwired into the human brain and have become a social instinct as powerful as the drive to procreate. The Bible, the Koran, and Buddhist and Hindu scriptures all teach that we can be delivered into a paradisiacal state, whether after death, at the end of time, following many reincarnations, or as a result of personal effort and merit. This state of liberation is called grace or Heaven by Christian religions, Paradise by Muslims, while Eastern traditions refer to it as awakening or enlightenment, using various terms such as *samadhi*, *mukti*, *bodhi, satori,* and *nirvana*.

But what if grace, samadhi, and enlightenment are really based in biological science? What if they are states of higher order and complexity created by programmable circuits in the brain? What if these circuits could make it possible to attain lifelong joy, inner

peace, health, and well-being now, in this physical world, and not in some distant future or afterlife?

THE ENERGY MATRIX

In the 1930s, Dogon shamans of western Africa informed two French anthropologists of the existence of a companion sun to Sirius, the Dog Star. This celestial body could not be seen with the naked eye, and the shamans had no access to sophisticated telescopes. Yet they described it as extremely heavy, orbiting around Sirius in an elliptical pattern that required half a century for each complete cycle. Forty years later, astronomers with powerful telescopes identified the star and named it Sirius B.[1]

There are many more examples of the discovery of seemingly impossible knowledge. For example, Amazon sages claimed that, after fasting and praying during vision quests, they were taught by the plants themselves how to prepare curare, a neurotoxin employed for hunting and also used for modern anesthesia.

Curare contains deadly poisons from the bark of *Strychnos toxifera* and from moonseed flowers, in particular from *Chondrodendron tomentosum*. The most common method of preparation is to slowly cook the bark scrapings of *Strychnos* and moonseed for exactly 75 hours, after which the mixture becomes a dark, syrupy paste. During cooking, if its sweet-scented vapors were to be inhaled, the muscles involved in respiration would relax and cease to respond, resulting in instant death from asphyxiation. The men who prepare it watch it cook from a safe distance so as to avoid inhaling its fumes. A victim of curare poisoning is horribly aware of not breathing and lucidly witnesses the body going into convulsions while being unable to move or call for help. Amazingly, however, *after* curare is cooked, it can be safely touched and rolled into a paste that is harmless even if swallowed. But if curare comes into direct contact with the bloodstream, it is deadly—as when the poison is applied to arrow tips that pierce the skin of victims. How could the shamans have known about this effect? It is statistically impossible to discover the formula for curare through trial

and error, which underlines the shamans' claim that they accessed information from the natural world—from the biosphere itself—by tapping into the invisible wisdom of a field that permeates all of life. This web of life, which they refer to as the Divine Mother, is a living energy system that supports and informs all creatures. It is, in essence, a matrix of energy that connects all living entities. This concept is making its way back into the minds of the science community. Scientists are also beginning to reconsider the notion of space as one huge void. Instead, a growing number of physicists postulate that space is not empty but full of energy: cosmic radiation from the Big Bang, pulsating electromagnetic fields, and gravity. Could this energy be a vast storehouse of information as well?

THE FEMININE THROUGH HISTORY

Ancient peoples recognized and revered the power of the divine feminine in her many forms, such as the Divine Mother of the shamans. For millennia, before the advent of the alphabet, cultures around the world, from the Indus Valley to Central Europe, celebrated the Goddess. In India, Kali has long been worshipped as the Great Mother and the ultimate reality. In Greece, Hera represented a much older mother deity, perhaps related to the Sumerian goddess Inanna, while the goddess Demeter, revered in the Eleusinian Mysteries, was the Great Mother of planting and harvesting crops.

Throughout Central Europe, the earliest of representations of the Great Mother are stone and bone pieces collectively referred to as Venus figurines. The best known of these is the Venus of Willendorf, a symbol of fertility with large breasts and hips, named after the village in central Austria near which it was found. This statuette was carved close to 25,000 years ago from limestone and tinted with red ocher that is not native to the area, suggesting that it had perhaps been a treasured possession brought from elsewhere by a pilgrim. Similar figurines have been found throughout the area and in such great numbers that some anthropologists are

convinced they point to a time when the feminine form was the singular representation of the Divine.

Marija Gimbutas, an archeologist known for her research into the Neolithic cultures of Europe, offers compelling evidence that the European heartland was once invaded by Indo-European peoples from what is today the Ukraine and southern Russia. Being fierce warriors, these invaders rode newly domesticated horses and easily defeated the Goddess-worshipping Neolithic farmers. These invaders were known as members of the Battle Ax culture because they characteristically placed a stone battle ax, which by that time was useless as a weapon but held only symbolic value, in the graves of males.

When the Battle Ax people arrived in Europe around 3000 B.C.E., they replaced the mythologies of the Great Mother with those of a male deity, and the representation of the Divine became the phallus or the tree of life. The chief deity in the Indo-European pantheon is Dyeus, God of the Sky, who was addressed as Father Sky or Shining Father. The name Dyeus is the root of the Latin word for deity, *deus*. In Greece, Dyeus would become Zeus and, in Rome, Jupiter.

THE LOSS OF THE FEMININE

With the first Sumerian cuneiform tablets, Indus script, and Egyptian hieroglyphs around 3000–2500 B.C.E., at the start of the Bronze Age, scribes of that period began to record the stories of military leaders and the songs of poets. Accounts of historical events became regarded as undisputed fact and began to replace legends, which were a mixture of fact and myth conveyed from one generation to the next through a rich oral tradition. Male gods of the sky and heavens, such as Zeus, Yahweh, Thor, and Shiva, took dominance over goddess traditions and the earth goddesses.

People no longer saw nature as the manifestation of divinity but as a resource: forests were for building houses and ships, soil was to be tilled for crops, and animals were to be bred for food. A mechanistic view of nature began to prevail as alchemists gave

way to chemists and astrologers to astronomers. With the arrival of Newtonian physics in the late 1600s, any force that couldn't be explained by science was dismissed as superstition.

Western medicine was born of this worldview. Instead of relying on natural remedies to cure the ailments of the body, physicians turned to synthetic drugs and surgery. The scientific worldview replaced the mysterious world of the ancients. The invention of microscopes enabled scientists to investigate what were once deemed invisible "spirits" that cause disease and to catalogue them as microbes.

Later, investigators discovered the genetic code and began to entertain the notion that mortal humans could control health in the same way they controlled nature. Geneticists and chemists found ways to manipulate genes and conquer disease with prescription drugs.

These days, Western physicians seem overly focused on reflexively responding to physical problems that they believe underlie their patients' maladies. Whether the cause is a smoldering infectious agent or a chemical imbalance, all too often both physician and patient regard the prescription pad as the sole means to treat a disease, thus ignoring the more fundamental issue of patient uniqueness.

A RETURN TO THE FEMININE

And yet, the pendulum has begun to swing back to the belief in an interconnected universe and the importance of the divine feminine. Contemporary scientists, including the Noble Prize–winner Erwin Schrödinger, the neuroscientist Humberto Maturana, and the physicist Francisco Varela, have suggested the interrelatedness of all particles in the universe.

We can find evidence of this interconnectedness in physics in a property known as entanglement. Evidence indicates that when two particles are created together, such as through the radioactive decay of other particles, they remain linked together, or entangled, no matter how far apart they might be from each other.

Variables in the condition of each particle remain undetermined until they are observed and measured. For example, when one entangled particle has a positive charge, its mate will have a negative charge. Reversing the charge of one causes an instantaneous reversal in the other. This defies the laws of General Relativity because it would involve a signal traveling faster than the speed of light. Yet the concept of entanglement is consistent with the laws of quantum mechanics, which describe a universe in which distant interactions are not only permitted but commonplace. Quantum mechanics is thought to apply only to subatomic particles because quantum effects are not observable on a larger scale. But Stuart Hameroff, an anesthesiologist and professor at the University of Arizona, and Jack A. Tuszynski, a physicist at the University of Alberta, both suggest that quantum processing—on a level larger than subatomic—may actually be occurring inside the brain.[2]

A commonly accepted scientific model states that consciousness arises as the result of the computational power—the information processing capabilities—of the human brain. Hameroff is studying microtubules, which are structural components of the cell that transport nutrients from the cell body to the axon terminal. In Hameroff's research, he noted that anesthesia works through an effect on neural microtubules. The correlation between consciousness and computational power led Hameroff to reason that these microtubules could, in fact, act as information-processing modules, which would increase the current estimates of human computational capabilities more than a millionfold. And if this were the case, simple computing power could offer humans the mental "bandwidth" necessary to commune consciously with the biosphere—in essence tapping into the information of our interconnected universe. With research such as this, scientists are finding models to elucidate what shamans and seers have so elegantly and simply explained in the past as our ability to have an active dialogue with all of nature.

YOUR COMPUTATIONAL MIND

The number of neurons in the brain is 10 to the 11th power—that's a 1 followed by 11 zeroes, or 100 billion! With close to 10,000 synapses in every large neuron and with switch rates close to 1,000 times per second, this means that the number of operations the brain can process per second is 10 to the 18th power.[3] While this is an incredibly large number, it becomes minute if neuronal microtubules are involved as computational subunits. With more than 100 million microtubules in each neuron, the increased computational capability of the brain becomes staggeringly immense.

But whether the number of computations the human brain can perform is a 10 followed by 18 zeroes or a 10 followed by 27 zeroes is not as consequential as how well we are using the brain we have now. If we were to ask you to remember the song "Hey Jude" for a moment and then ask you to forget it, you, in common with most people, would have a hard time putting it out of your mind. Regardless of the possible number of computations our brain is capable of, the truth of the matter is that most people use most of their computational ability to dwell on everyday problems. This waste of a good brain leaves hardly any computational power for innovation, creative problem solving, and enlightenment.

If Hameroff is right about microtubules exhibiting quantum mechanical events inside your brain cells, then consider the possibilities and potentials that you are capable of, especially when you turn off thoughts of fear, sex, greed, or incessant worry. You could have the power to engage in nonlocal interactions, to access information from across the galaxy, and to draw upon the lessons from your past, your future, or even from the collective past and future of humanity—just as enlightened meditators and shamans do and have done. As the Dalai Lama states, "Those on a high level of spiritual experience have . . . developed meditative concentration to the point of becoming clairvoyant and generating miracles."[4]

THE BRAIN AND ENLIGHTENMENT

So with all this expanded brain power, what are we striving for? In the East, enlightenment has traditionally been associated with qualities such as generosity, compassion, peaceful acceptance, and an experience of oneness with all creation. In the fiercely individualistic West, our rather vague notion of enlightenment suggests an acceptance of the world as it is, or of discovering how we can change it for the better. Enlightenment for us also implies the common longing for novelty, exploration, and creativity, as personified by the explorers who venture into space.

If we take the Eastern qualities of enlightenment out of their religious context and place them in the realm of biological science, we find that they are attributes associated with the activation of the prefrontal cortex—the newest part of the human brain. On functional MRI scans, people who meditate regularly are shown to have developed brains that are *wired* differently than the brains of people who don't meditate. They are better able to remain calm and stress-free, live in peace, and practice compassion. Curiously, their prefrontal cortex is the most active region in their brain during the states they describe as samadhi, or enlightenment. His Holiness the Dalai Lama describes enlightenment as "a state of freedom not only from the counterproductive emotions that drive the process of cyclic existence, but also from the predispositions established in the mind by those afflictive emotions."[5] The Dalai Lama is suggesting that enlightenment is a state of freedom from destructive emotions and from the limiting beliefs and repetitive behaviors created by these emotions.

Generosity and compassion arise only when the prefrontal cortex is able to throttle back the more prehistoric regions of the brain. Yet, for the prefrontal cortex to create functional pathways for joy and peace, the entire body and brain need to be healthy, fed with the proper nutrients, and trained with an inner discipline. We must heal our bodies and minds to empower the prefrontal cortex—the new brain, which is biologically programmable for bliss, extraordinary longevity, peace, and regeneration. For too long, this brain region has been kept offline, silenced by the same

forces—scarcity, violence, and trauma—from which it promises to deliver us.

Once this new region in the brain is brought online, brain synergy is possible. Synergy means that the whole is greater than the sum of its parts. Engineers are familiar with how synergy operates. The tensile strength of stainless steel, for example, is nearly ten times greater than the tensile strength of iron, even though stainless steel is basically iron with a minute amount of carbon added to it. Both carbon and iron, by themselves, are brittle and flake easily. Yet, when combined, they make an extraordinarily strong material.

Brain synergy signifies a neurocomputer whose circuits are all turned on, tuned in, and operating collaboratively, each region attending to its functions—much as the heart attends to circulating blood while the lungs attend to respiration—creating a system that cannot be defined or even described by its component parts.

ATTAINING SYNERGY

People in the East say the path to brain synergy is through the practice of meditation. Shamans use the term *clear perception*. In yoga, it is called samadhi, the highest stage of meditation, oneness with the universe. Regardless of the term used to describe the process, the challenge is to *dis-identify with your limited sense of self that was created by destructive emotions*.

Think of a lake. When the waters of the lake are still, it reflects everything around it perfectly. You see pine trees on the other side or a rising moon as mirror images. But when even the slightest breeze crosses the lake, the surface reflects only itself. It, in effect, says, "Look at me." Similarly, when your mind is disrupted by uninvited thoughts or emotions or when it is distracted by television or a barrage of commercial advertising or social gossip or trivial banter, it removes itself from connection with the greater universe. It interrupts your deep, innate desire to perceive the grand mystery of creation—and be part of it. Shamans believe that, to interact with the vast information fields of the biosphere,

you must enter a state of clear perception. Your mind must be at peace in order to perceive the true nature of the world and not merely the reflection of your own below-the-surface drama created by your destructive emotions.

A teaching story from the North American Plains Indians tells of a young man who comes to his grandfather and says, "There are two wolves inside of me. One wants to kill and destroy, and the other one wants to make peace and bring beauty. Which one will win, Grandfather?" The old man answers, "Whichever one you feed."

Likewise, you have a choice: To feed the wolf of chaos and confusion, the wolf that devours your positive thinking, destroys your sense of self-worth, and consumes your entire being. Or to feed the wolf of inner peace that will enable your mind to become like the beautiful, reflective surface of a still lake and access the attributes and gifts of your higher brain.

Once you heal your emotional brain and create the state of brain synergy, the gifts of your prefrontal cortex will come online naturally. You will no longer need to pursue happiness through artificial means, because *happiness will arise from you* with ease. For the prefrontal cortex, happiness is not the result of good luck or happenstance. No, happiness is a treasure of clear perception that will be eternally yours.

CHAPTER 2

THE POWERFUL MIND

In our work—both as an anthropologist who dedicated many years to investigating the healing practices of Amazon and Andean sages, and as a neurologist who has spent decades treating individuals suffering from degenerative brain diseases—we have long been intrigued by the power of the mind in achieving unbelievable feats, both physical and mental. We've met and studied with sages who were able to achieve extraordinary brilliance, inner peace, and creativity. We've heard of Tibetan monks who are able to meditate overnight on an ice-covered mountain without freezing to death, dusting the snow from their naked shoulders as the sun rises.

The full power of the mind is still not completely understood, but we witness examples of it on a regular basis.

HEALTH AND THOUGHTS

Years ago, people saw support groups and stress management techniques as harmless adjuncts to the medical treatment of those with serious illnesses. Recently, however, research has shown that patients who use techniques such as mindful meditation not only are less stressed emotionally by their illness but also

experience better physical health. This research is, in fact, showing how thoughts, beliefs, and emotions influence the health of the body.

In the July 2009 issue of *Scientific American*, the neurologist Martin Portner describes the case of Gretchen, a participant in a 2005 study on the viability of a testosterone patch to treat hypoactive sexual desire disorder, a condition in which a person's libido is so diminished that he or she feels no sexual interest or attraction. Testosterone, a hormone produced by the testes in males and the ovaries in females, is associated with sexual arousal. Gretchen had felt no sexual desire ever since undergoing an operation that removed her ovaries.

After wearing the patch for 12 weeks, Gretchen felt the stirrings of desire again. "It can only be because of that patch," she reported. Shortly thereafter she was able to make love with her husband again and experience an orgasm for the first time in years. But the most amazing part of the story is that Gretchen, unbeknownst to her, was part of the study's control group and the patch given to her was a placebo with no testosterone in it whatsoever.

The return of Gretchen's sexual appetite was clearly related to a change in her neural wiring, some literal *change of mind* of which she was not even cognitively aware. Yet, it happened. And that change was felt throughout her body.

Most of us are more familiar with psychosomatic disease than with psychosomatic wellness. We know that we can worry ourselves sick, and we suspect that we can laugh ourselves to health. Even so, medicine gives little credence to the idea that psychosomatic health can be achieved. After all, we cannot knowingly administer a placebo to ourselves, in the same way that it is impossible to tickle yourself. Yet societies that rely on traditional healers—medicine men and women—have long understood the power of the mind to either heal or kill. At times, shamans resort to great pomp and ceremony to mobilize the mind's ability to heal the body. Their complex ceremonies activate the prefrontal cortex to create health.

Yet, in modern societies, we have largely declared these practices to be superstition or quackery; "placebo" is even a term of dismissal in everyday conversation. The irony is that our modern-day "ceremony" consists of giving the patient a sugar pill, a tablet that contains no pharmaceutical ingredients. Testing new medicines against a placebo is a common practice for determining the efficacy of all medications, which is, in effect, strong evidence that the mind alone does have the power to soothe inflammation, calm nerves, and influence organs and tissues of the body to return to a state of health.

Studies have shown, for example, that a sugar pill can be as effective as morphine in 56 percent of people.[1] Yet, even though the sugar pill is the most carefully studied "medication" by manufacturers and researchers of pharmaceutical medicine, it is the one least appreciated or recognized as a potential cure.

A friend of ours once suggested that if we wanted to get rich we should press chicken soup into pill form and sell it over the counter with the name "Placebo," as we could make legitimate scientific claims that it would be almost as effective as expensive medications in treating a host of complaints, ranging from headaches to erectile dysfunction.

The placebo effect and psychosomatic wellness are the result of tapping into the healing potential of the mind, which has been common practice in humankind for thousands of years. By dismissing the placebo effect, Western medicine has, in reality, failed to investigate how this phenomenon can give us a glimpse into the immense power of the prefrontal cortex.

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David: Cancer? What Cancer?

As a trained neurologist, I'm intrigued by how I am often accused of practicing "nontraditional" medicine because, in

addition to offering nutritional recommendations, our clinic's protocols also incorporate such modalities as affirmations and meditation. The paradox is that these practices, or similar ones, have been a part of health care for thousands of years, and are thus "traditional" by definition.

In late 2007, a patient with a very serious health issue came to see me. "Marvin" was a 74-year-old man who had just returned from a top cancer treatment facility, where he was told to "get your affairs in order" because he had been diagnosed with aggressive pancreatic cancer that had already spread to the adjacent lymph nodes. Chemotherapy was an option, but the success rate, especially at his age, was almost zero percent. Given what modern medicine has to offer someone in Marvin's condition, the cancer specialists had told him what they assessed to be the truth about his devastating illness: he had, at best, about six months to live.

Knowing how much of an impact beliefs have on physical health, I asked him if he truly believed that, and he replied, "Absolutely not!"—which was exactly the response I was hoping for.

Working with my team, we therefore designed a program of specific nutritional supplements to enhance his immune system. I also added a high-dosage DHA to augment the meditation practices and affirmations he was to begin. The focus of both of these techniques was simply the thought, "I am healthy."

Within one week, his previous sallow appearance had disappeared, and remarkably, within six weeks, his previously abnormal blood studies related to pancreatic and liver function had completely normalized. Three months later, he returned to the renowned hospital where he'd been diagnosed. His CAT scans revealed no evidence of cancer whatsoever.

"What did they say when they saw your results?" I asked him.

"Well," he replied, "they really didn't seem interested in learning what I was doing, but they did say that whatever it was, I should continue it."

Almost two years later, at the time of writing this book, Marvin remains cancer-free. Sure, it could be argued that this is simply a case of spontaneous remission, but that is exceedingly rare with this type of cancer, as any cancer specialist would confirm. I

submit that the key intervention was the relationship he cultivated with the Divine as a result of using the two-pronged approach of neuronutrients and shamanic meditative techniques that allowed him to access the healing energy that infuses all that exists.

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In contrast to the placebo, the nocebo is an insidious complement. A nocebo is an otherwise harmless substance or inert medication that can cause harmful effects due to the patient's negative expectations, beliefs, or psychological condition—regardless of the person's physical condition.

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Alberto: The Curse Is Real

The most dramatic example of the nocebo effect I ever witnessed occurred in the Peruvian Amazon when I met a perfectly healthy man who had been "cursed" by a local sorcerer. At the time, I was investigating the healing practices of shamans near the headwaters of the Marañón River. When the patient came in for a consultation, the healer informed the patient that his nausea and headaches were being caused by this curse, that there was nothing he could do to help him, and that he should prepare himself and his family for his passing. Within 24 hours the man was dead. When I asked the healer why he had not helped the man, he replied that the man had broken a village taboo but it was his own fear that had killed him. I immediately questioned him further, asking if the curse was all in the man's own mind, that the sorcery was not real. "Oh no," he emphasized. "The curse, the sorcery, is absolutely real."

What I learned in that corner of the Amazon was the same thing that advertising agencies on Madison Avenue have long understood: that the mind can be programmed to purchase vehicles that will make us feel like we are young again and dresses that

promise to make the hurt of depression go away. The mind can even be programmed to go against every instinctual survival function ingrained through millions of years of evolution. It is very difficult to override the body's immune system. Yet that man's belief had managed to kill him. The question that came to my mind that day was: What about the long list of disclaimers and possible side effects that come with every medication we buy? Could they be affecting our very suggestible minds in a noxious way? Rather than falling prey to nocebos—whether of the physical body or mind—how can we program ourselves for life, health, and joy?

I have since come to realize that physicians are hesitant to suggest a placebo or to recommend what were once called "soft therapies," such as counseling, relaxation techniques, or meditation, because they believe these methodologies constitute phony medicine. They worry about the implications of "tricking" the patient into healing the body, even though the success of many medically accepted therapies and surgical interventions currently performed by those same doctors may be, in large part, enhanced or facilitated by the placebo effect.

But above all, as I have come to understand the capabilities of our mind, I realize that you and I and everyone can use these faculties consciously to create psychosomatic health. In effect, we will be able to volitionally heal ourselves from physical and emotional disorders, without having to resort to trickery. To do this, we first have to understand how the brain works, and how trauma can injure the brain regions that allow us to tap into these abilities.

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THE TRIUNE BRAIN

In the mid-1950s, Paul D. MacLean, an American neuroscientist, proposed a model to help explain the evolution of the human brain. MacLean's model became known as the triune brain, and it describes how we have three evolutionarily distinct neurocomputers, each with its own intelligence, subjective feel of the world,

and sense of time and space. MacLean's model is too general to be of value to students of evolutionary anatomy, yet it is helpful to metaphorically understand how each of us reacts differently to situations, depending on the "brain" we are responding from. It explains how, when we smell the scent of wolf, one of us may sense danger while the other may detect opportunity.

The Old Brains

The first brain is the reptilian brain, or R-brain, which is anatomically very similar to the brain of modern-day reptiles. This brain region is completely instinctual and is primarily interested in survival. It regulates most autonomic functions, such as breathing, heart rate, and body temperature; and it is involved in the fight-or-flight response. There is nothing cuddly about a reptile, and this brain region, like a cold-blooded serpent, feels no emotions.

The second brain is the limbic system, which is made up primarily of the amygdala, the hypothalamus, and the hippocampus. MacLean described this as the brain of instinct and emotion. The limbic system is also known as the mammalian brain, or M-brain. As the name implies, this is the brain most dominant in mammals, which flourished about the same time that dinosaurs were staving off extinction. As such, it represents one more step in the ladder of evolutionary complexity.

In the limbic system, signals are decoded according to four fundamental programs, known as the Four F's—fear, feeding, fighting, and fornicating. The M-brain will interpret meeting a person for the first time as an individual to be wary of, a dinner date or a promising business partner, a potential adversary, or a possible mate. This brain also interprets color according to the cultural environment that programmed it: red, for example, means "danger, stop" in the United States, but it means "good fortune" to the people of China, and "best" or "beautiful" to Russians.

Anatomy of the Limbic Brain

To better understand how the limbic, or mammalian, brain functions, let's look at the structures within it that evolved to ensure our survival. The limbic brain contains the seahorse-shaped hippocampus and the almond-shaped amygdala. Both are involved in processing information from our environment via our emotions. If an enemy ambushes us, we become terrified and fight or flee. If a snake strikes out at us, we instinctively jump away.

The hippocampus is located in the deepest and most forward portion of each medial temporal lobe and extends into both hemispheres of the brain. The hippocampus received its name in the 16th century when Italian anatomist Julius Caesar Aranzi noted its uncanny resemblance to the seahorse and chose the name *hippocampus,* the Greek word for this creature.

Early researchers, attempting to ascribe particular functions to specific brain areas, believed the hippocampus was involved with olfaction, the perception of smell. No doubt this belief was strengthened by the location of the hippocampus near the olfactory system. Even though research later showed that olfaction was not a primary function of the hippocampus, investigators continue to explore the relationship between the memory of scents and hippocampal function. Notice how a familiar smell will remind you of your childhood, such as a whiff of sizzling bacon that evokes the breakfasts your mother used to make.

More refined research today, however, reveals that, rather than serving as a storage center for memories, the hippocampus acts more as a way station, acquiring information from the five senses and then parceling out the data for processing either by the amygdala, in the event of a perceived threat, or to the cerebral cortex for all other needs.

In effect, the hippocampus operates something like a digital camera that can process both still pictures and video. Facts, like photographs, are pieces of data that can generally be verbalized in simple terms. Recalling facts is termed declarative memory. Events, like video, are more complex and involve relationships that are both spatial as well as temporal. This mental activity is called episodic memory.

When the hippocampus begins to deteriorate, new experiences are less likely to be stored and memorialized, and this is a hallmark of Alzheimer's disease. Advanced imaging techniques like MRI and PET scans now clearly show that loss of physical tissue as well as loss of function in the hippocampus is an early indicator of this disease.

As you'll see later in *Power Up Your Brain*, the hippocampus begins to fail due to free radical and chemical damage caused by trauma and stress. Basically, once the hippocampus begins to fail, school is over and learning pretty much stops. Conventional wisdom believes that the ability to process information through higher brain centers is stunted, that our emotional repertoire is diminished, and that genuine feelings become inaccessible.

Our mission, however, is to challenge that paradigm and demonstrate to you that neurodegeneration is preventable and even reversible. Ring the bell. School is back in session.

The amygdala, from the Greek word for *almond,* governs our so-called fight-or-flight response, which is our automatic and instantaneous reaction to real or imagined threats. Basically, it's the fear center of the brain that allows us to respond to dangerous situations reflexively, unconsciously, and immediately.

The New Brain

The third brain identified by MacLean is the neocortex, which is well developed in all the higher mammals and is responsible for speech, writing, and higher-order thinking in humans. If we do not need to fear, fight, seduce, or dine with a person we encounter in any particular situation, the thalamus relays the sensory information, colored by the joys, excitements, worries, or concerns of the limbic brain, to the neocortex for reflection and appropriate behavior.

The neocortex processes signals in a holistic fashion, interpreting environmental sights and sounds into coherent messages. Through the neocortex, we recognize the value of all people and set aside any thoughts about how they could be useful to us or

what we might be able to get from them, either legally or illegally. The neocortex reminds us to call friends for no reason other than to say hello and wish them well and not only when we need to ask a favor.

It is in these higher cortical areas that selfless love, reasoning, and logic take place. This brain allows us to create new ideas and entertain notions such as democracy as well as to understand mathematics, write poetry, compose music and art, dream of freedom, and envision the future.

Our two older neurocomputers, the R-brain and the limbic system, think primarily in terms of distance to the kill, how far back to the village of origin, the friendly confines of the childhood home, and personal space. They recognize spatial boundaries associated with relationships, the blood family, clan territory, ethnic neighborhoods, and national borders. With these anchors firmly embedded in memory, the primordial brains can easily identify what is "my area" and what is "their land." These brains believe that good fences make good neighbors and perceive "those people over there" to be "others" and "not our kind." They associate people with places, which is helpful knowledge to ensure survival but limiting to the concept of a global community. Consider how easily you can forget someone's name but remember the face. That situation stems from your primitive brain's ability to draw upon memory and emotion in order to discern between "the bad guys on the other side of the tracks" and "the good guys who are like us."

In contrast, the neocortex, associated with the higher executive functions, is able to think in terms of time and not only of space. It can store food for the winter, plan an irrigation canal for the dry season, and anticipate where the herd might go for the spring. It will mark the turning of seasons and have an inclination for mathematics and music. This brain is able to plan and recognize future actions and consequences, to choose between good and bad, right and wrong, and to suppress socially incorrect behaviors and responses. The neocortex can restrain the Four F's of the limbic brain and is involved in meditative and transcendental experiences.

Perhaps it is the neocortex's ability to comprehend our limited time on earth that generates a fear of death and keeps many of us from exploring its potentials. The limbic brain understands that death happens in the same primal way that children know that kittens and grandparents die. But the limbic brain does not realize that death will happen to *us* and somehow imagines that we are immune from it. This, coupled with the fact that the developing brain is more prone to risk-taking behavior, is why some teenagers act as though the laws of gravity and centrifugal force do not apply to them as they speed with a carload of friends along a winding mountain road after drinking too much

If you have not awakened your neocortical gifts in your youth, they will tend to remain dormant until much later in life, only to awaken reluctantly. By the age of 40, most of us have grown to accept that we may not have a second chance at youth. Perhaps this is why, for instance, Orthodox rabbis traditionally warned against the study of mystical texts until age 40, when maturity was more likely to be accompanied by wisdom. Likewise, life insurance salespeople know it is nearly impossible to sell a policy to anyone who does not yet recognize that their time will run out and that every moment is precious; until that stage of practical enlightenment, which happens around age 40, these persons are convinced that death will not happen to them.

Advanced Neocortical Thinking

Synesthesia, which is the ability to blend senses, is one of the many faculties of the neocortex. Artists and musicians possess this quality, which enables them to see a V of flying geese at a distance, imagine the sound of their flapping wings, then set that aural and visual composition to music or canvas. Even in common language, we sometimes use synesthetic or cross-sensory descriptors to create juxtapositional idioms, such as a "bitter wind" or a "loud color."

Daniel Tammet, an English savant, is one person who expresses synesthetic capability literally to the nth degree. Tammet can, for example, recite the mathematical constant pi from memory to 22,514 decimal places and divide 97 by 13 with complete accuracy to over 100 decimal places. In his best-selling book

Born on a Blue Day: Inside the Extraordinary Mind of an Autistic Savant, Tammet describes how he thinks.

He says that when he performs a mathematical calculation, such as multiplying 37 to the power of 4, which he can do faster than you can press the numbers on a calculator, the answer comes to him in a rich, kaleidoscopic confluence of colors, textures, shapes, hues, and feelings.

Tammet was diagnosed as having high-functioning autism. He developed his extraordinary capabilities after a series of epileptic seizures during childhood that may have rewired his brain, allowing him to tap into a limited range—a deep but narrow slice—of his neocortical capabilities. Daniel's experience is not unlike that of sages in the high Andes who claim that extraordinary telepathic and clairvoyant skills appeared shortly after they were struck by lightning or after a strenuous vision quest of fasting and praying for numerous days.

Daniel Tammet's gifts are not limited to mathematics. He also has the ability to learn a new language within a short period of time. For a television special, he mastered the complex and difficult Icelandic language—which contains, for example, 12 words for each of the numbers one, two, three, and four, depending on the context, and a strict adherence to gender agreement between nouns and adjectives—in less than a week. This enabled him to conduct a live interview on Icelandic television in the native language, a task that he performed flawlessly.

Some investigators argue that such great gifts come at a great price; they say that nearly 50 percent of all savants are also autistic. This has led Wisconsin psychiatrist and investigator Darold Treffert to suggest that savant syndrome is caused by damage to the left brain hemisphere, particularly the frontal areas, which causes the right hemisphere to overcompensate.[2]

This is said by Dr. Treffert to be accompanied by a shift from high-level frontal lobe memory and processing to low-level procedural memory, which allows persons like Daniel Tammet to master numbers and languages with such ease.

CHAPTER 3

THE EVOLUTION OF THE BRAIN AND THE MIND

Thousands of years ago, our ancestors faced a neurological opportunity similar to the one we face today, an opportunity that facilitated an evolutionary leap forward. With the awakening of the neocortex, our forebears acquired a new brain structure that nature had wired for joy, creativity, and innovation.

To access that potential, our ancestors required specific nutrients to provide fuel to run their neurocomputer. Once they added brain-enriching foods to their diet, the faculties of certain individuals, the visionaries of their day, came online and began to create great works of art, devise written language, establish civilizations, and lay the foundations for our modern human experience.

During this time, ancestral shamans described Creation as a web of life in which we are all interconnected. This was a kind of Indra's Net, which the mythology of ancient India describes as a web with an infinite number of intersecting strands and a precious jewel at the intersection of every strand. Each of the infinite number of jewels reflects every other jewel perfectly. Within this

mythical net, all beings are interrelated, and all of our actions, no matter how slight, affect everyone else. Within this net, prophets converse with God and interpret His will, while mystics search for the elixir of immortality and alchemists attempt to transform lead into gold. These sages, mystics, and alchemists shared the same preoccupations as seers of today. They asked, as we do now: How can we live long and healthy lives, unaffected by debilitating illness and degenerative brain disease? How can we turn the dense *lead of human suffering* into the *gold of enlightened consciousness*?

In the scheme of history, the quest for metaphysical answers about the origin of life died when Charles Darwin published *The Origin of Species*. The popular understanding of the time was that life is a perennial struggle for survival, that humankind is governed by a harsh Law of the Jungle where only the fittest win.

But, fortunately, after centuries of scientists' dismissal and ignoring of the ancient teachings, people in all walks of life are once again asking the mystic's questions about the significance and potential of human consciousness. Could evolution have also been favoring the survival of the wisest?

WAYS OF FEAR, WAYS OF WISDOM

The history of human consciousness is marked by the battle between the older awareness, *the ways of fear*, and the newer awareness, *the ways of love*. When the newer awareness prevails, we discover a God of love and compassion, express religious freedom, and practice generosity. When the older awareness dominates, we tend to worship an angry god who scourges his enemies with plagues and who sends his chosen people on so-called holy wars to ensure his dominance. With the older brain, greed and intolerance prevail.

Lower awareness views everything, even nature's beauty and bounty, as a commodity, valued only as a means to generate profit. Water, one of the essential elements of life, is seen not as a home of aquatic organisms and a natural means of transportation but as a liquid to be bottled and sold. Air, another essential element, is

seen not as a vital substance indispensable for breath but as vacant space in which to emit industrial waste products. Soil is seen not as a necessity for growing food but as property to be owned, fenced, and contaminated with agricultural chemicals and industrial and domestic waste. Mountains are seen not for their majesty but as places to be stripped of minerals and ores. Forests are seen not as animal habitats and places for spiritual retreat but as potential planks and boards. Even space beyond the sky above is seen not just as an opportunity for galactic exploration but as a place to dump planetary trash and spy on our global neighbors.

Even human beings are viewed as a commodity when our thinking is fettered to the ways of fear. Children in developing nations, for example, are seen as labor pawns in sweatshops or, in developed countries, as future rank-and-file employees. Senior citizens, at least in Western societies, are not revered for their wisdom but warehoused in "old people's homes" until death finally gets them out of the way. People of ages in between, according to Darwinian protocol, are often trained in warfare or programmed to "get even," if not "get ahead," even at the expense of other fellow humans. But perhaps the worst dismissal of human value occurs in the spinmeister term "collateral damage," which would have us heartlessly gloss over the killing of innocent civilians who happen to be caught in a war zone.

And while the new, higher awareness offers us the ability to think on a sophisticated and grand scale—to see Earth from space and to comprehend that, as the health of the planet goes, so goes our own health and well-being—we find societies, whether developed or emerging, returning again and again to seemingly inevitable violence in order to resolve conflicts and impose values on others.

While arguments wage over global warming—whether it exists or not and, if so, who is to blame, and what is the cause and the cure—and whether or not the world is perched on the edge of ecological disaster, many individuals are beginning to realize that human society is also standing on the brink of an extraordinary leap in consciousness.

In the previous chapter, we carefully looked at the characteristics of the brain's first three evolutionary stages: that is, the reptilian or R-brain, the limbic system, and the neocortex. Now, to understand this extraordinary leap and to better manifest the opportunity at hand, we need to look more closely at the development of the fourth brain—the prefrontal cortex.

THE PREFRONTAL CORTEX: KEY TO ENLIGHTENMENT

In humans, the prefrontal cortex, located in the front of the brain, takes on critically important significance as our link to the future, our key to enlightenment, the answer to those ancient questions: How can we live long and healthy lives, unaffected by debilitating illness and degenerative brain disease? How can we turn the dense lead of human awareness into the gold of enlightened consciousness? How can we program the brain for life, health, and joy? *How will we evolve?*

The prefrontal cortex is associated with the loftier brain functions such as reasoning, inventing the alphabet and music, discovering science, and engaging in creative thinking. Many of the functions of the prefrontal cortex remain a mystery, but we know that it is associated with personal initiative and the ability to project future scenarios, and it is quite likely the place where our individuality and sense of self developed.

When our brain functions synergistically, our prefrontal cortex is fully awakened and we have the ability to develop the very highest form of intelligence and creativity *and* remain grounded and effective in the world. We understand who we are in relationship to our village and our history. Able to think originally, we recognize what holds us back from achieving a higher level of consciousness and what will help us to attain it. We recognize how we can survive *and* thrive.

Which Brain Are You Using?

Is your life a struggle for survival? Are you forever trying to make ends meet financially? Are you living hand to mouth? If so, then your reptilian brain is in the driver's seat of your cognitive apparatus.

Do you learn your lessons through difficult love relationships? Does your prince turn into a frog with a drinking problem after the honeymoon—just like your previous prince did? Are you always ending up with abusive bosses or business partners who never seem to appreciate your contributions? If so, then your emotional mammalian brain is predominantly in charge of your consciousness.

Does your intellect get in the way of your passion and joy? Are you forever analyzing things in your head? Do you fail to listen to your instinct and your intuition? Do you mistrust anything that is not proven scientifically? Are you disconnected from your feelings and insensitive to the feelings of others, even when you try not to be? If so, then you are strapped and bound to the fiendishly logical aspect of the neocortex.

Or are you flighty and ungrounded, with your head up in the clouds? Do you walk into a room and forget what you went there to do? Are you more conversant about quantum physics, the bloodline of Mary Magdalene, and international conspiracy theories than about your children's homework or what is happening in your neighborhood? If so, then your consciousness is probably in the grip of the prefrontal cortex.

If you are experiencing a predominance of any one of these brains, it is a sign that the parts of your brain are not acting in concert with each other, that those in the background at the moment are allowing another part to dominate and exhibit only its limited traits.

In actuality, to experience brain synergy, it's necessary to be aware of your financial situation and your relationships; it's good to think logically and to dream with whimsy; and it's vital to keep all of these mental activities in balance with each other.

AWAKENING THE NEW BRAIN

In the 17th century, James Ussher, Anglican Archbishop of Armagh and Primate of All Ireland, published a treatise that identified the date on which God created the world: the evening preceding Sunday, October 23, 4004 B.C.E. on the Julian calendar. Although his chronology was based on the patriarchal lineages described in Genesis and inaccurate from a scientific perspective,

the Archbishop was not totally wrong. Today, while we dismiss the good Archbishop's claim as a flight of religious fancy, he did approximate the date on which the gifts of the prefrontal cortex were becoming available for large sections of humanity at the dawn of civilization and the invention of writing

But this self-awareness didn't happen overnight; rather, it took countless generations for the prefrontal cortex to become functional enough to warrant a circuitry connection with the older parts of the brain. In fact, fossil evidence of the earliest changes in this part of the brain dates back 2.5 million years ago, during the Pliocene epoch, when an early hominid called *Australopithecus africanus* lived. The enlarged cranium of *A. africanus*—a member of the "Great Apes" family, which includes humans—was more like that of modern humans than his immediate predecessors.

This means that the artists of the Altamira cave and the hunters of the Pleistocene epoch who lived 20,000 years ago had the same brain structures we have today. Yet most members of the species lacked the nutritional support and mind-body disciplines that would allow them to experience artistic creativity and scientific discovery. This is why only a few isolated individuals awakened to the potential of the prefrontal cortex. Indeed, the gifted crafted their great works of art during secretive ceremonies deep inside caves.

With the end of the last Ice Age, around 10,000 years ago, when abundant and brain-rich food supplies became available, the prefrontal cortex began to stir. During the late Neolithic period, starting around 7,000 years ago, our ancestors initiated horticulture, which ended the need to follow and harvest food from a nomadic herd. They domesticated cattle and sowed grain crops and ground the grain into cereal. They developed a curiosity for science, exploration, and perhaps even love. And they conceived of transoceanic travel; for example, Micronesian navigators built sailing canoes in which they navigated the open ocean for hundreds of miles, using only the stars for reference and arriving at islands that were not visible from their point of departure. It was around this time in history that writing and city-states emerged in many geographically disconnected societies around the globe.

At that time, as civilization emerged in the Fertile Crescent in western Asia and the sprawling city of Mohenjo-Daro rose along the Sarasvati River in what is now Pakistan, the dietary staples of the political and religious leaders came from the Himalayan rivers and the Mediterranean Sea. These were fish and mollusks rich in docosahexaenoic acid (DHA), a brain food that has become increasingly scarce in the human diet of today. DHA provided the neuronutrient boost that brought the previously installed prefrontal cortex's software online. Is it not possible that the benefits of a DHA-rich diet explain why a great Master—Jesus of Nazareth—chose simple fishermen as candidates wise enough to be his apostles, his "fishers of men"

However, while the prefrontal software was already installed in all humans of the time, the masses, though capable of tapping into the wisdom of this brain, were still struggling between two mind-sets—the old and the new.

THE OLD MIND-SET VERSUS THE NEW MIND-SET

To truly understand the conflict inside the human mind, let's compare the power of the prefrontal cortex, or new, higher brain, with the prowess of the old brain. This comparison is akin to "the ways of fear and ways of wisdom" presented earlier in this chapter. However, there we explored fear and love from the *software* perspective, that is, emotions that come from our belief systems. Here we are examining fear and love from a *hardware* perspective, that is, the physical brain that processes those emotions.

The old brain perceives the world as a frightening place, filled with rivals competing for the same scarce resources. To this brain, what matters most is survival, and it is always ready to fight or to flee. Considering that the old brain developed in mammals at a time when large, stomping dinosaurs still roamed, it is no wonder that these survival mechanisms were firmly embedded in the core of those small, fuzzy creatures that we developed from.

The old brain in humans gave rise to the belief that the spirit world is populated with fierce gods who demand sacrifice

and that the physical world is prey to invisible forces that are to be appeased. In many mythologies, the earth was populated by titans, giants with extraordinary powers, who had to be defeated. The early Greeks, for example, identified 12 Titans who ruled the earth during the legendary Golden Age. In the King James Bible, God tells Moses of "a land of giants [who] dwelled therein in old time."[1] In Greek mythology, the Titans were a race of older gods whom the Olympians banished to the darkest depths of the underworld in the War of the Titans.

The old brain seeks magical and religious explanations for natural phenomena, be they the formation of mountain ranges or the course of rivers or the tempest of storms. Legends of the Inca tell of the four original beings who could move mountains and establish the course of rivers with their bare hands. Zeus, the king of the sky, wielded a thunderbolt that he periodically used to wreak havoc on the earth.

With such mythic precedent, the old brain righteously claims, "My god is stronger than your god," and believes that only those of "our faith" have been chosen for salvation, while everyone else is a pagan or a heathen destined for a hellish experience in the afterlife.

The new brain, however, understands that we do not have to live in a continuous state of threat. It knows that we are not struggling to survive in a hostile world haunted by death. It comprehends, rather, that we are all interconnected, that we can practice compassion by "turning the other cheek" and "loving our neighbors as we love ourselves," and that physical "death" is really an opportunity to return to a heavenly realm—a precept that lies at the core of the three Abrahamic religions, Judaism, Islam, and Christianity.

But even this mind-set is a matter of consciousness. At first, only those living in monastic communities and among religious orders attained this insight of the ways of wisdom. Meanwhile, the older mind-set in the majority of the populace continued to be tempted by the ways of fear. This mind-set continued to seek wealth and justify greed, while the newer, higher mind-set called out to the ways of love. These two, seemingly opposite callings

have plagued humanity for millennia—and continue to do so. The disparity will only be resolved when we can turn on the truly beneficial neural programs inherent in the prefrontal cortex.

It is clear that our reasoning abilities, rooted in the more evolved brain, are not enough to prevent our suffering or give us the opportunity to create a more habitable, peaceful, and sustainable world. Indeed, if reason had ever prevailed over passion, the story of humanity would not be written in blood.

At this point in history, our species is in need of the next great opportunity offered by our prefrontal cortex, which will allow us to entertain the ancient notion of a web of life in which all creatures, and even inanimate matter, are interconnected as part of a field of information and energy. To experience enlightenment and learn to interact with this cosmic web, we must begin by healing that part of our bodies that allows us to dream a new world into being: our prefrontal cortex.

CHAPTER 4

MITOCHONDRIA AND THE FEMININE LIFE FORCE

Intricately linked to the ability of the prefrontal cortex to come fully online are the mitochondria—the powerhouses of your cells and the feminine life force referred to by shamans. Mitochondria are the conductors of the genetic orchestra that regulate how every cell ages, divides, and dies. They wave the baton that helps dictate which genes are switched on and which are switched off in every one of our cells. And they provide the fuel for establishing new neural networks. And all of the mitochondrial DNA in your body is inherited solely from your mother's lineage. That means that the source of energy that sustains your life is derived exclusively from the women in your family tree—your matrilineage.

THE POWER SOURCE WITHIN YOUR CELLS

Mitochondria were first observed by the German pathologist Richard Altmann in 1890. Seen through a microscope, these small intracellular particles look like tiny, threadlike grains. Hence

the name mitochondria, derived from the Greek *mitos* meaning "thread," and *chondrin*, meaning "grain." It was not until 1949, however, that the role of mitochondria, as the producers of cellular energy, was fully explained by two biological chemistry researchers, Eugene Kennedy of the Harvard Medical School and Albert Lehninger, then of the University of Wisconsin–Madison.

Mitochondria use carbohydrates as fuel, which they convert into life-sustaining energy with the by-products of water and carbon dioxide. This process is called *oxidative metabolism*, so named because oxygen is consumed in the process, just as oxygen is consumed by fire (as demonstrated when we extinguish a flame by smothering it and depriving it of oxygen).

But, unlike in a fire, which releases energy in an uncontrolled reaction, the energy, or life force, produced by mitochondria is stored in a chemical "battery," a unique molecule called adenosine triphosphate (ATP). Energy-rich ATP can then be transported throughout the cell, releasing energy on demand in the presence of specific enzymes.[1]

In addition to the fuel they produce, mitochondria also create a by-product related to oxygen called reactive oxygen species (ROS), also known as free radicals.[2]

THE ROLE OF FREE RADICALS

These free radicals perform an important, positive function in human physiology. They play a pivotal part in regulating *apoptosis*, the process through which cells initiate self-destruction. Apoptosis happens when genetic switches that instruct a cell to die are turned on. While it may be puzzling to look upon cell death as a positive event, apoptosis is indeed a critical function that enables growth and healing of the greater organism.

Until quite recently, scientists pretty much subscribed to the paradigm that all cellular functions, including apoptosis, were directed by the cell nucleus. But, as Nick Lane notes in his compelling book, *Power, Sex, Suicide,* "there has been a change of emphasis that amounts to a revolution, overturning the nascent

paradigm. The paradigm was that the nucleus is the operations centre of the cell, and controls its fate. In many respects this is of course true, but in the case of apoptosis it is not. Remarkably, cells lacking a nucleus can still commit apoptosis. The radical discovery was that the mitochondria control the fate of the cell: they determine whether a cell shall live or die."[3] Mitochondria, then, must be looked upon as being so much more than simply organelles whose job involves turning fuel into energy. They wield the Sword of Damocles.

Hippocrates was the first to use the term *apoptosis*, which literally means "the falling of leaves from a tree." However, apoptosis didn't gain traction in the scientific community until the pathologist Alastair R. Currie published an important paper describing cellular self-destruction as a basic biological phenomenon.[4] Thereafter, researchers used *apoptosis* to describe the process through which the body intentionally eliminates cells in order to serve a larger purpose.

This process begins even while the fetus is in the womb. As an example, during embryonic development, human hands initially resemble the webbed appendages of a frog. But death of the cells in the webbed area transforms these extremities, allowing for definition of individual fingers and refinement of the entire hand.

Furthermore, after birth, apoptosis is the protocol that enables your body to continuously rid itself of as many as ten billion cells every day, making room for new, healthier cells. The outcasts include a multitude of cancer cells. Most of the time, when these pathogenic cells appear, mitochondria send a signal that tells them to die rather than replicate. This is a very important mitochondrial function because runaway cancer cells don't know they need to undergo apoptosis, and, without that message from the mitochondria, they would continue to reproduce, out of control, until they endanger the host—you.

THE PROBLEM WITH FREE RADICALS AND CELL DEATH

While cellular suicide, as described above, is generally positive, it becomes a negative situation when mitochondrial function becomes impaired and sends signals that tell normal cells to die. In fact, this is the fundamental flaw in the mitochondrial mechanism that leads to the destruction of brain cells in essentially every neurodegenerative condition, including Alzheimer's, multiple sclerosis, Parkinson's, and Lou Gehrig's disease, to name just a few. However, this brain cell apoptosis is not limited to just these diseases. The process occurs throughout your lifetime and is responsible for a general decline in brain function, even if not categorized as a disease per se.

And the catalysts—or culprits—are free radicals. Free radicals are chemicals that cause oxidative damage to tissues, essentially causing them to rust like a piece of iron left exposed to the weather. They can also damage proteins, fat, and even DNA. In fact, damage to your tissues by free radicals is thought to underlie the process of aging, a theory first described by Denham Harman, a biogerontologist who was then a research associate at the Donner Laboratory of Medical Physics at the University of California, Berkeley. His much-cited article, now considered to be a landmark work, appeared in 1956.[5]

Dr. Harman also stated that free radicals are "quenched" by antioxidants and thus laid the groundwork for an understanding of the positive effects of ingesting antioxidants, which we will learn more about later in the book.

MITOCHONDRIAL DNA

Mitochondria play a far more interesting role than simply being an energy factory and the source of ROS. Indeed, there are many characteristics of the mitochondria that serve to differentiate them from all the other structural parts of our cells. For instance, mitochondria possess their own DNA (referred to as mt-DNA),

which is distinctly separate from the far more familiar and more often studied DNA in the nucleus of the cell (known as n-DNA).

While the nucleus of the cell contains exactly two copies of its DNA, mitochondria may have anywhere from two to ten copies of DNA. Interestingly, the mt-DNA, unlike n-DNA, is arranged in a ring, a configuration much like that seen in bacteria. Furthermore, in addition to similarities in the shape of their DNA, mitochondria and bacteria both lack the protein surrounding their genetic code that helps protect it from free radical damage, while in contrast, nuclear DNA is invested with protective proteins called histones, which also serve to regulate its function.

These similarities led the biologist Lynn Margulis to propose an important new theory of the origin of mitochondria.[6] She posited that mitochondria evolved hundreds of millions of years ago from aerobic (oxygen-breathing) bacteria that gradually entered into an "endosymbiotic" relationship with anaerobic bacteria, which means they began to live inside the bodies of these other organisms. This symbiosis enabled the anaerobic organisms to survive in an oxygen-rich environment. Over time, the mitochondria assumed the primary function of energy production, intracellular signaling, apoptosis regulation, and perhaps communicating with the biosphere. Human mt-DNA contains only 37 genes, while n-DNA has thousands, and it is possible that, over time, n-DNA has been taking on more of the functions of mitochondria, allowing other organelles in the cell to specialize in such activities as protein building, waste elimination, and reproduction.

Eventually, one bacterium engulfed another. The result was that these formerly free organisms now reside within each of your cells. Because of their role in energy metabolism, we might expect larger numbers of mitochondria in the cells of tissues to be more metabolically active. And, indeed, individual cells of the brain, skeletal muscle, heart, kidney, and liver may contain thousands of mitochondria, comprising in some cells up to 40 percent of the cellular material. According to Professor Enzo Nisoli of the University of Milan, a human adult possesses more than ten million billion mitochondria, making up a full 10 percent of the total body weight.

So, while nuclear DNA's main function is to provide the information your cells need to manufacture the various proteins that control the metabolism, repair, and structural integrity of your physical being, it is mitochondrial DNA that directs the production and utilization of your *life energy.* It determines the fate of every cell, tissue, and organ in your body and the energetic fate of your being as a whole.

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David: An Energy Crisis

"Where would you like to begin?" I asked "Susan" as I settled into my chair in the examining room.

"Let me tell you. I have a whole list of problems," she began as her mother, who had accompanied her from their home state several hundred miles away, looked on.

"Perfect, because I am a 'whole-listic' doctor," I replied, hoping to lighten her mood.

Susan's problems began about four years earlier, when she had just turned 40. She described her life before becoming ill as active and full. She had actually been quite an accomplished athlete while at the same time working full-time and raising two young children with her husband.

Late in the summer she became suddenly quite ill with what she described as a "bad flu" that pretty much put her out of commission for the greater part of a week. The illness was accompanied by a fever that peaked out at 102 degrees. But it was unlike a normal flu, because after the fever and other symptoms like coughing and diarrhea had passed, she was still experiencing fatigue, even several weeks later.

"I couldn't take it anymore. I just couldn't function," she continued.

Meeting the expectations of her previous active life became insurmountable, so, after a month of waiting it out, she visited

her gynecologist, the only physician with whom she had a professional relationship. Blood tests indicated the need for a potent oral antibiotic, which she reluctantly but faithfully took. Two weeks later, Susan's health had not improved.

"Can you describe exactly how you were feeling at that point?" I asked.

She proceeded to list her various complaints, ranging from "brain fog" to fatigue. "I could sleep for ten hours and still wake up tired," she lamented. She went on to describe diffuse aching pain in her muscles and, to a lesser extent, pain in her joints as well.

As is so often the case, Susan began a journey, visiting doctor after doctor who prescribed an extensive battery of medical tests, all of which provided no helpful revelations. She was told on more than one occasion that she should consider seeing a psychiatrist because no explanation was evident in the various physical tests.

"All they did was give her antibiotics and steroids, over and over, and then tell her she was depressed," her mother informed me. The look of frustration on the mother's face rivaled that of her daughter.

About 18 months before I saw Susan, she had visited a doctor in a nearby state who specialized in Lyme disease. Through extensive blood studies, the specialist confirmed that, indeed, Susan was suffering from chronic Lyme disease and prescribed an aggressive antibiotic program that would help her regain her health.

"It was the first glimmer of hope for me," Susan recounted.

She was first placed on two powerful oral antibiotics that she took faithfully for the following six weeks. With no improvement in her condition, she was switched over to intravenous antibiotics after getting an access port installed in her chest to facilitate the administration. Antibiotics were infused intravenously through the port seven days a week for the following four months, but to no avail. Another few rounds of various oral antibiotics were tried, but nothing seemed to help.

By the time Susan came to our center in Naples, Florida, it was very clear that she had almost reached the end of her rope. The desperation in her voice was palpable. Her life was devastated. She was overwhelmed by fatigue, body aches, and a new

symptom that had started a year earlier, profound sensitivity to various chemicals. Just passing by a person wearing perfume or aftershave was enough to cause a debilitating headache and even more confusion.

At that point we reviewed the rest of her medical history; aside from a few minor ailments over the years, nothing stood out to provide any meaningful clue to what might be causing this severe condition. Nor did her family history provide any revelatory information. Indeed, her mother confirmed that before the onset of the initial illness, Susan was healthy and enjoying a wonderful relationship with her husband and children.

The standard physical examination added very little insight, with the exception that her blood pressure was a bit low. The neurological examination, which is a more in-depth assessment of various functions of the nervous system, also revealed no abnormalities. Then, as has been my practice for many years, I evaluated her pulse, not in the standard way of counting the beats and checking for a normal rhythm but rather from an Ayurvedic perspective.

Many years ago I was trained in Ayurveda, a system of traditional medicine that dates back to the ancient Vedic period in India. The word *Ayurveda* is derived from the Sanskrit *ayus*, meaning "life," and *veda*, meaning "science" or "knowledge." While I have never considered myself to be a true practitioner of Ayurvedic medicine, nonetheless the pulse diagnosis training has served my patients very well, often providing diagnostic clues when none was otherwise apparent.

And Susan's pulse did tell a story. The Ayurvedic pulse gives information about the three *doshas,* or energies—*vata, pitta,* and *kapha*—that correspond to the energies of wind or air, fire, and earth. The sense I got from Susan's pulse was like a cold wind blowing through a tree that had no leaves to capture and hold the energy. Basically, it felt as if she were "disconnected" from the energy forces blowing through and around her.

I left the examining room and began to review her previous medical reports and laboratory studies—and they were extensive. Interestingly, aside from a very mild anemia, her studies

showed nothing to explain her symptoms. Even the blood tests for Lyme disease, which had been repeated several times before, during, and toward the end of her antibiotic treatment, were all normal. Susan and her mother had brought MRI scans, which we reviewed together. Once again, everything looked fine.

When I returned to the examining room, I observed that Susan had displayed all of her numerous nutritional supplements on the examining table. Obviously, along her journey, she had visited a number of complementary medicine practitioners, and each had seemingly given their best advice in hopes of getting her back on her feet.

"Before we go through your supplements," I said, "let me share my thoughts."

I started by giving Susan and her mother an overview of the medical records, including telling them that the Lyme panels were normal, which clearly surprised both of them. I discussed the MRI scans as well as the reports given by the various other practitioners. I then sat back a bit and began to explain my ideas as to why she was so incapacitated.

"I do not have a name for your illness," I said, "but that doesn't mean I can't help you."

I told Susan that the issue ultimately compromising her health was centered on energy. I explained how mitochondria provide energy to the body, and that, for whatever reason, perhaps the initial severe viral infection, her mitochondria were just not fully functional.

"But," I continued, "there is another energy that we need to consider." I explained that energy surrounds every person, that to be alive is to interact with and share in the energy that exists throughout the universe. I carefully watched her face, knowing that this discussion could cause her, or her mother, to feel uncomfortable, but Susan nodded her head with understanding. The really good news was that her mom was also smiling in agreement.

We then went through her various nutritional supplements, and I selected several that would help improve mitochondrial function. I added several more to the regimen as well as coconut oil and DHA, an omega-3 oil. "We're going to get your mitochondria back on line," I explained.

I then went further into the idea of "tapping in" to the energy that surrounds all of us and demonstrated a brief meditation technique that I asked her to perform twice daily.

There wasn't any real need for extensive blood work, because what she had provided was more than comprehensive. But we did check one simple blood test, an evaluation of lipid peroxides that is available at most standard laboratories and provides an assessment of mitochondrial function. It took three weeks to get the results, but what they showed—a very abnormal condition—did confirm that we were on the right track.

After the initial evaluation, we began a series of injections to administer glutathione—a natural compound that enhances mitochondrial function as well as the process of detoxification—in conjunction with the oral supplements.

In addition, I ordered hyperbaric oxygen therapy, a treatment in which Susan sat in a clear acrylic chamber filled with oxygen under pressure. This is the same technology used to help underwater divers recover from decompression sickness caused by returning from pressurized depths to the surface too quickly.

Together, the nutritional supplements, glutathione, and hyperbaric oxygen created a comprehensive program to reestablish mitochondrial health and function in Susan's body. (We will describe each of these in detail later in the book.)

I checked on Susan and her progress during the week that she received her various treatments, then saw her in my office a week later. Even after just one week, Susan was transformed.

But the real evidence was not in how she looked but on her mother's face. I have learned over the years that a parent's concern for an ill child is the same whether the child is 5 or 50. Clearly, Susan's mother had finally seen some daylight at the end of what had been a long tunnel for both of them, and the tears she shed were tears of relief.

"We're going to add a couple more things to your program," I said, recommending some light daily exercises.

Susan eagerly agreed. "I can't believe I'm going to start exercising again," she said, beaming.

In addition to the meditation practice, we began to incorporate affirmations. Several times a day, Susan repeated phrases such as "I am well," and "I am part of all that is around me."

The other new aspect of her program was a day-long fast once every three weeks. Even though she looked puzzled when I first proposed this, I explained both the current science that validates the effects of fasting on mitochondrial function and the rich history of this practice in virtually every one of the world's religions.

Two weeks into the program, Susan was walking 45 minutes each day, was clear-minded enough to keep a journal of her thoughts and activities, and, remarkably, was no longer sensitive to chemicals.

She returned to her home and arranged to receive injections of glutathione three times a week, first at her doctor's office and subsequently with a visiting nurse. She continued the supplement program and fasted every three weeks, as we had discussed. Meditation and affirmations had become a regular part of her day, and she happily reported, "Even my husband is doing them."

We consulted by telephone three weeks after she left our clinic, and she reported that she was able to accompany her husband and two children on bicycle rides. She no longer experienced pain in her muscles, and the headaches and chemical sensitivities had disappeared. I recommended that she reduce the glutathione injections to once a week for the following month.

During our telephone follow-up one month later, Susan reported that all was well. She was continuing with all components of her program and had returned to part-time work. We stopped the intravenous glutathione at that point and made plans to speak several months later.

Our next contact, however, came sooner than that when our office received a Christmas card from Susan and her family that included a photograph of a now-healthy, young-looking woman with her husband and two children.

CHAPTER 5

NEURAL NETWORKS AND HABITS OF THE MIND

Neural networks are unique patterns created by millions of interconnected neurons. Individual neurons extend nerve fibers that reach out to other neurons like the branches on a tree. The links they create can direct traffic along many routes of an extraordinarily intricate web. The neural pathways can join to form networks through which particular patterns of thought, action, and reaction occur. In other words, the neural networks in your brain are made up of a team of nerve cells that have learned to fire together and have subsequently wired together to perform a specific, reproducible function. It is because of neural networks that you are able to accomplish such tasks as chewing gum, snapping your fingers, or recalling the lyrics to "Hey Jude."

CREATION OF YOUR BASIC NEURAL NETWORKS

For the sake of survival, a child needs to develop an instinctive sense for potentially threatening situations. This is why, early in

life, we develop aversions and fears in association with events and experiences that, rightly or wrongly, we perceive as dangerous. A great many of these aversions developed while we were still inside our mother's womb.

A flood of stress hormones crosses the placental barrier and informs the fetus of exactly the mood and feeling state that its mother is in. If the mother is happy, the fetus is joyous. If the mother feels safe and loved, this message is registered by the fetus, who also feels safe and loved. If the mother considers terminating the pregnancy, neural networks in the fetal brain are coded for fear as it may intuitively perceive that its life is in danger.

It is in this formative prenatal time that a large percentage of the neural pathways in our limbic brain develop, biasing the way we see and feel the world, and determining our personality. These biases are later reinforced by the codes of conduct and the emotional repertoire that we learned from our parents.

Until about age seven, the human brain is a fertile field, absorbing information, first from the mother's placenta, then from a host of external post-birth influences. Some of these, such as the mother's and father's loving touch and the sound of family laughter, enrich the infant's brain with positive experiences. Other experiences, including that initial inhalation of the first breath, infuse a sense of change, if not danger, in this world outside the mother's warm, watery womb.

During those early years of life, the child's brain is like a digital recorder set on constant record. Or, measured with an electroencephalogram (EEG), the brain-wave frequency of a child from birth to age two is in the delta range, which is also the frequency of the brain waves in a sleeping adult. The brain-wave frequency for a child from two to six is in the theta range, which is what an adult experiences in a state of imagination or reverie or while dreaming. Only into young adulthood does a child's brain become fully adult-functional, operating in the higher frequencies of the alpha or beta wave ranges. In other words, a child under seven years of age basically functions in a hypnotic trance or dream state, which allows that digital recorder in the brain to gather information—*and* form neural pathways—appropriate for the youngster's

environment without the filtering and interference of logic and reasoning from the neocortex.

Then, between the ages of 7 and 16, something quite the opposite happens. We take ourselves out of the record mode and start playing around with delete/erase mode instead. During the years of adolescence, our brains eliminate over 80 percent of the interconnections between neurons, in a process known as synaptic pruning.

Why? Because we have learned what's happening in the environment around us. We have a pretty good idea of whom to trust and whom not to trust, who provides food and hugs, and who inflicts pain and punishment. And so we no longer need to gather data from all possible sources, explore behavioral options, and seek alternative ways of experiencing the world.

Shortly after our late teens, we become bound by tradition, anchored by the way things have always been, and entrenched in the belief that everything will remain the same even as the world changes around us. Our worldview is set—not in stone, but in the neural networks of the brain. And while these neural networks communicate chemically and electrically, we experience them as emotions.

THE TYRANNY OF EMOTIONS

There are many schools of thought about emotions, and there is no universally accepted theory or taxonomy of the emotions. Some biologists speak about one set of emotions being instinctual and generated by the amygdala (which is involved in processing the memory of emotional reactions), and another kind as being generated by the prefrontal cortex, and being conscious, cognitive experiences. For the purposes of this book, we will employ these descriptions.

The *cognitive emotions* are conscious, original, and of the moment. It's natural for you to feel happy, angry, or sad at different times in your life, and often for no reason whatsoever. No amount of positive thinking will keep us from occasional

unpleasant feelings. Fortunately, these feelings do not last for long. Even though you can have feelings about someone for an entire lifetime, these cognitive emotions are not burdensome, nor do they take up any space in your awareness, and the very act of recollecting them offers you a brief and passing sensation. You might remember your beloved warmly, your childhood sweetheart lovingly, or the school bully fearfully. These emotions are reasoned and make sense with the situation to which they pertain.

Instinctual emotions are toxic. When you become upset during an argument and remain so long after the exchange is over, it's a sure sign that you're experiencing an instinctual emotion. When overcome with this kind of emotion, you walk around angry without knowing why; your spouse asks you why you were rude to the waiter, and you do not recall being rude; someone stops you to ask you a question, and you nearly bite off their head for no reason at all. When the higher brain functions try to intercede, they are instead hijacked, and you find yourself relentlessly attempting to convince yourself that you were right and the other person was wrong, even years after the event. This results in a refusal to forgive, so that with every recollection of the offending incident, your adrenaline pumps into your nervous system and your body relives the event over and over just as if it were happening again, and you debate how you would have responded differently. Only with difficulty—sometimes extreme difficulty—will your nervous system settle down.

Instinctual emotions are produced by ancient survival instincts—often coupled with smoldering memories of trauma—that are wired into our brain. Toxic emotions of fear, sorrow, envy, and anger, which are often passionate, sometimes violent, and always draining, are never experiences of the present moment only. In fact, we can think of them as eruptions caused by trauma that was imprinted into the very fabric of your being. These emotions dredge up stories from your childhood that are superimposed onto the current moment. They prevent you from experiencing authentic feelings, here in the now. Everyone you meet reminds you of someone you have known before, and every new situation seems like a déjà vu. In that way, instinctual emotions are like ancient viral programs that hijack the brain's mainframe