



## It's A Golden Age

Miracles happen, and emotional plasticity may be one of them.

A few years ago, I met with a warm, fatherly psychiatrist to explain the science and methods of EBT. During our conversation, there came a moment when words failed me. I suggested that he try one of the tools, and he demurred, so I volunteered to demonstrate the technique.

I had not been aware of how stressed I was at the time – that I feared that I would never get this method out and would go to my grave with the tools still inside me. However, in the warm womb of his comfy office, I launched into using a tool. I fired up anger that sported a few expletives, made a brief pass through sadness with tears sparkling in my eyes, next touched on fear, and then on guilt.

At that point, the bottom of my reptilian brain opened up. I had unlocked a previously unconscious, completely unreasonable expectation that had taken up residence in my brain. Perfect! Moments later, I had switched that expectation to a reasonable one of my choosing, and a burst of dopamine, oxytocin, and endorphins came over me. I was in joy!

All of this had taken less than four minutes.

He sat quietly. I had no idea what he would say.

Then he gazed straight into my eyes and said, “Nothing in my 40 years of psychiatry has prepared me to explain what I just observed.”

Through his eyes, my use of the tools must have seemed strange in two ways. One was that I could self-activate strong negative emotions and rapidly turn them into intense positive feelings. The other was that I had opened my unconscious mind, and transformed a circuit that harmed me into one that healed me. This is something that typically only occurs during an unexpected magical moment over which we have little control, such as a profound insight, a spiritual awakening, or an intimate sharing with a loved one.

Yet it had happened in his office, not by chance, but by choice. I had used such simple tools!

This was emotional plasticity in action. The science is new and the tools are solid, however, we have a lot to learn to realize its potential to help us lead happier, healthier lives. We need a golden age, a time of transformation in which we tap into our greatest resource, our individual power to take charge of our emotional brain, as well as update our healthcare system so that it honors our power, and becomes brain-based.

There has already been a golden age in healthcare. Perhaps we can learn from it . . .

### **The First Golden Age of Healthcare A Root Cause of Infectious Diseases: Bacteria**

Until about 1900, the leading cause of human death was infectious diseases. The first pandemic in recorded history was in 430 BC, which wiped out two-thirds of the population of Athens. Infectious diseases spread through broad swaths of the world, killing people in droves. Scourges such as syphilis, cholera, salmonella, influenza, typhus, measles, leprosy, and yellow fever exacted heavy tolls on human life.

## **The Problem: Bacteria**



Before 400 BC, our medical defenses were exorcism, magic, potions, enemas, and ointments. Then Hippocrates, the father of modern medicine, coined the Hippocratic Oath and established medicine as a profession. This paved the way for the systematic study of the clinical treatment of health problems.

As clinical medicine evolved, infectious diseases continued their reign of terror. It was not until 1646 AD that Athanasius Kircher, a German Jesuit priest who was caring for plague victims, examined their blood under a microscope. He noted the presence of "little worms," and concluded that the disease was caused by microorganisms or "germs." A competing theory of what was causing these diseases was posited by Lazzaro Spallanzani, an Italian Jesuit priest. He thought that the problem was the rotting of organic matter, which led to "bad air."

Finally, in 1860, amid much drama, the French Academy of Sciences offered 2,500 francs to the scientist who could end the debate between bad air and germ theories. This triggered a flurry of scientific activity until 1862, when Louis Pasteur, a French scientist, conducted a series of elegant experiments proving germ theory. Germ theory is still the basis for treating infectious diseases today.

## The Solution: Antibiotics



### Healthcare in Transition 100 Years Without a Root Cause to Treat

Identifying the root cause of infectious disease launched the golden age of bacteriology. Now there was a modifiable biologic cause of problems! Scientists could explore lock-in-key solutions, such as antibiotics and vaccines to kill “germs” so that many cases of infectious diseases could be resolved. Although far from perfect, this golden age radically reduced the loss of human life.

With infectious diseases being addressed, medicine faced new challenges. People began living longer, long enough to develop chronic conditions, such as asthma, diabetes, heart disease, cancer, obesity, arthritis, anxiety, and depression. These diverse conditions had no unifying modifiable, biologic root cause. Medical advances centered around diagnosing and treating problems, developing medications and procedures, and designing diagnostic and therapeutic devices. It was a highly productive time, however, the more progress that we made, the more we became aware that something might be missing. There were many important successes, but primarily we were managing diseases rather than curing them.

### The bubble finally bursts

By the late 1990s, American health and happiness were deteriorating. That downturn has continued. Presently, 45 percent of Americans have at least one chronic disease. Nearly 10 percent of the U.S. population has diabetes, and 35 percent of all adults have metabolic syndrome (a combination of obesity, high blood pressure, type 2 diabetes, and poor lipid profiles). Mental illness and substance abuse affect 20 percent of Americans, and deaths by suicide have increased by about 30 percent since 1999. Despite spending double what other wealthy countries pay per person on healthcare,

including the highest per-capita pharmaceutical expense in the world, the U.S. currently ranks last in life expectancy among the 12 wealthiest industrialized nations.

In 1987, the RAND Corporation, a non-profit think tank, reported on a novel study they conducted to evaluate healthcare in America. They discovered a great deal of both over-utilization of care and blind spots where needed care was not administered. This report launched a new movement to make healthcare evidence-based. In the 1990s, organizations including the American Medical Association began stepping up efforts to evaluate treatments, searching for new solutions, revisiting disregarded theories, and questioning accepted ones.

### **Freud was right: It's the emotional brain**

As part of this trend, scientists in the early 2000s used new research methods, molecular medicine, and brain imaging, and were able to validate Sigmund Freud's theory that emotional and behavioral problems are caused by errant pathways in the emotional brain. These pathways or "faulty memories" can be encoded by experiences during childhood and later in life during stress overload. Cognitive neuroscientists showed that the brain regards as solid truth these momentary experiences and encodes them into long-term memory. The brain holds onto these experiences in the form of neural circuits and reactivates them. When we catch ourselves repeatedly doing something completely illogical or feel triggered and experience overwhelming cravings, overreactions, or shutdowns, that's likely to be the result of these faulty memories.

Research methods that could validate Freud's theories were not available during his life. He turned his attention to developing psychoanalysis, with some techniques that were seen by his peers as capricious and impractical, fueling interest in a new, more practical approach: behaviorism.

### **Stopping short of treating the emotional root cause**

A movement away from peering into the unconscious mind and attempting to change it took off in the early 1900s. In 1913, John Watson conceived of behaviorism. The treatment used various conditioning techniques to change behavior, including recording actions, manipulating behavioral antecedents and consequences, and rewarding changes. The fatal flaw in this approach was defining the problem as a behavior, without treating the underlying factors that drive it.

In 1960, American psychiatrist Aaron Beck applied behavioral techniques to changing faulty thoughts, leading to the development of cognitive behavioral therapy (CBT), the most widely accepted and utilized mental health treatment today. However, CBT therapists and others became concerned that the method had lost both its physiologic roots and psychological sensibilities. In 2000, a new wave of behaviorism appeared. This was applying behavioral techniques to change one's approach by using openness, acceptance, and awareness. The most popular modality of contextual behavioral therapy is based on mindfulness, which was launched in the United States by the University of Massachusetts Medical School professor Jon Kabat-Zinn. Despite the appeal of the simplicity of changing behavior and thoughts, the results were not encouraging. Research showed that these methods did not produce lasting or generalized effects. This was also supported by a series of meta-analyses performed in the last decade. For example, a 2012 meta-analysis published in *Cognitive Therapy Research* gave tacit approval to cognitive behavioral

therapies but pointed out that supportive data were scarce. Most controlled clinical trials did not have an active control group and failed to follow participants after treatment ended, which are two essential criteria for evaluating effectiveness. However, the number of conditions being treated with these therapies rose at astonishing rates.

In 2006, German researcher Stefan Bornstein authored a whimsical article about the consequences of these approaches. He imagined what Freud might have said on the occasion of his 150th birthday, watching the financial collapse of our healthcare system due to “unprecedented and uncontrollable” rises in metabolic disease, cardiovascular disease, mental health problems, obesity, and other health problems. He argued that the enormous increase in the rates of these conditions was the logical consequence of the wholesale promotion of behavior change without addressing its emotional root cause.

In the 1980s, my own clinical research was based on CBT, and I wanted to improve my patients’ results. One day, I struck gold when I discovered an article on obese children and their families published in 1940 by Hilde Bruch, a psychiatrist at Baylor College of Medicine. Her research showed a pattern of missed emotional connection between parent and child, just what I had observed in our clinic. At that time, I was treating families in our earliest EBT intervention, the Shapedown Program. Adding a way for families to create emotional connection seemed like a logical next step, and so I constructed the “magic words” to share feelings and needs, which are the basis for one of the EBT tools today (the Feelings Tool). Soon after I started using this technique, to my astonishment, the mother of a 10-year-old girl with brown curly hair said to me, “What is going on? My daughter has stopped overeating, and instead, she wants to go outside and play!” I had no way to explain what this child had experienced, as the brain science that eventually would explain did not yet exist. I became convinced that we needed to address the emotional root cause of unwanted behavior and went on to expand these emotional tools to adults, not just for obesity, but for all stress-related problems.

### **Cognitive methods fail the stress test**

Researchers remained perplexed about why traditional methods were not causing turnarounds in health problems. A line of inquiry centered around the fact that their common therapeutic feature was reliance on neocortical (“top-down”) functioning. Research had already shown that the neocortex relinquishes control to the emotional brain in high stress, to defer to the fast processing of the emotional brain to favor the survival of the species.

For example, when threatened by a lion in hot pursuit, the brain does not use the slow processing of the neocortex. Also, the phenomenon through which retrieving memories is accomplished, “state-specific memory,” further undercuts the functioning of the thinking brain when we are stressed. Our ability to remember something is better when we are at the same level of stress as when it actually happened. Learn how to play chess when we’re relaxed and happy, and later, when we are stressed out, we won’t remember anything about how to play chess! As most top-down methods are learned in low-stress situations, they may not be accessible during high-stress times, right when they are most needed.

In 2013, Candace Raio, Elizabeth Phelps, and colleagues conducted an elegant study that investigated the effectiveness of cognitive techniques to deactivate Stress Circuits during high-stress and low-stress situations. The participants were healthy adults and the study was performed over a two-day period. On the first day of the study, healthy adults underwent fear conditioning, so that when they saw fear-inducing photos, they activated a physiologic stress response and negative emotions. Then participants learned how to shut off stress using cognitive methods. On the second day of the study, the participants were instructed to use the cognitive techniques they had learned the day before to reduce their stress. They were then either stressed (by submerging their hand in cold water), to activate the stress most of us experience in modern life, or not stressed (by immersing their arm in tepid water). Then they were shown the fear-inducing photos again, and emotional and physiologic measures of stress were taken afterward.

As hypothesized, the use of cognitive methods did not reduce stress when participants were under stress. In essence, the cognitive techniques failed the stress test. Also, as predicted, the cognitive methods were effective when the participants were not stressed. Both findings are interesting, because the effectiveness of these techniques during low-stress experiences gives us a false sense of security, making it even more difficult to determine “why” we keep repeating old patterns, which typically occurs during times of stress! According to the researchers, “The finding that cognitive stress reduction techniques are rendered ineffective when we are stressed has broad implications for the efficacy of cognitive regulation to change behavior in everyday life. Importantly, these results offer insight into why even among emotionally healthy people, cognitive strategies taught in the clinic may not generalize to the real world, where stress exposure is ubiquitous.”

### **We need some relief: A culture on meds**

With traditional methods not providing the results that we needed, it's no wonder that we turned to chemicals for support. But how well are they working? Some drugs have shown impressive results, such as medications for heart disease, erectile dysfunction, addictive drug overdose, and some types of cancer. However, for others, the mechanism for effectiveness is not known and the results are only marginally better than a placebo and often cause unwanted side effects.

The damage caused by inappropriate prescriptions is staggering. About 1.3 million people went to U.S. emergency rooms in 2014 due to adverse drug effects, and some 124,000 died from those episodes, based on data from the Centers for Disease Control and Prevention as well as the Food and Drug Administration. Opioid addiction currently affects 2.1 million people in the U.S., and an average of 115 Americans die each day from opioid-related overdoses. Perhaps the problem is not the medications, but how much we are forced to overuse them because we have not discovered a treatable root cause of our suffering.

### **The Second Golden Age of Healthcare A Root Cause of Chronic Diseases: Stress Circuits**

That treatable root cause of our suffering was stress. In the first decade of the new millennium, stress was the buzzword in medical circles. At conferences, people would say, “Well, the problem is stress . . .” and their voices would trail off, as what do you do about stress anyway? It's part of life.

However, the scientists who examine the causes of health problems had been discovering that stress was the root cause of a broad range of health issues. In fact, research conducted by Nobel Prize winner Elizabeth Blackburn and neuropsychologist Elissa Epel showed that psychological stress can shorten the protective ends of our genes and accelerate aging, an underlying cause of cancer, diabetes, and heart disease. This research made it plain that stress had wormed its way under our skin and into our bodies, and that it was killing us.

The science was clear: we needed to find a way to target and oust stress from our brain and body, much the way we would if it were a germ. However, we had no idea how to do that, until five discrete discoveries of the last 50 years coalesced into a novel approach to stress, one that is based on neuroplasticity.

### **Discovery #1: Allostasis – A new kind of stress**

The first discovery that made stress treatable was allostasis. In the mid-1960s, social activist and neuroscientist Peter Sterling was canvassing door-to-door in African American ghettos in Cleveland, Ohio, which were hotbeds of social disruption. Many people who answered their doors had drooping faces or relied on canes to ambulate, possibly due to strokes. In contrast, in more affluent neighborhoods nearby, Dr. Sterling saw no canes or drooping faces. He wondered if stress had become so toxic in these communities that it was causing these strokes.

Four years later, Dr. Sterling, now a young professor at the University of Pennsylvania, met another activist, Joseph Eyer. He was a biologist who was studying population data, just the information Dr. Sterling needed to begin to answer his question. Their collaborations began, and their data analysis confirmed the link between stroke, heart disease, and hypertension, and severe social disruption, including migration, industrialization, urbanization, segregation, unemployment, and divorce. Next, Sterling and Eyer tried to understand how psychosocial stress could impact health. At that time, the way the body was assumed to process stress was based on homeostasis. Physiologist Walter B. Cannon had coined the term in 1926, deriving it from the Greek words “homeo,” meaning same, and “stasis,” meaning stable. Homeostasis means “remaining stable by staying the same.” The defining feature of homeostasis is that it is a *negative feedback loop*, which means it self-corrects, it holds onto a drive to move whatever is out of balance back into balance. If our body temperature goes down too much, we automatically start shivering, an internal mechanism that warms us back up, returning us to a homeostatic state.

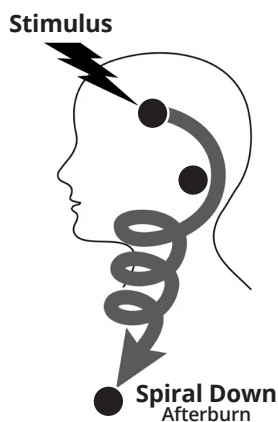
The people who were suffering from so much emotional turmoil and social disruption in Ohio must have been so stressed that their bodies could not stay within the gentle limits of homeostasis. The researchers theorized that sometimes the body maintains stability by pulling out all the stops and going to extremes with behavior or physiology. It goes into another gear that is outside of the homeostatic range. In 1988, Sterling and Eyer coined the term for this “pull out all the stops” gear as “allostasis.” It was derived from the Greek “allo,” which means “variable” so allostasis means “remaining stable by changing.”

Allostasis is reserved for the times when we are careening out of control, and our brain tries to do something to stabilize us – with behaviors, such as overeating, drinking too much, or bingeing on videos, or with extremes of physiology, such as high blood pressure, elevated dopamine, or high blood glucose. Although allostasis is effective in the short term, it causes wear and tear. It helps us adapt and establish new normal ranges, even if they are not good for us.

Allostasis was disruptive for scientists! Until the 1980s, it was thought that our homeostatic processes were not controlled by the central nervous system (the brain and spinal cord), but by the peripheral nervous system (all the other nerves). After all, we don't consciously modify our heart rate or keep tabs on our electrolytes! Sterling and Eyer suspected that the central nervous system must be far more engaged in our physiologic activities than we had thought.

To their astonishment, using fluorescence microscopy, the researchers found that the brain was connected to cells throughout the body. This was of great importance in two respects. First, the emotional brain, our unconscious mind, takes in our experiences, without our permission or awareness, including the stress overload of modern life. This is the ultimate invasion of our privacy! The external stress of the world flows into our brain and then right to the cells of our body. Second, based on their research and that of others, the body and brain are in two-way communication. Brain activations influence what happens on the periphery and activities on the periphery influence what happens in the brain. This is the basis for allostasis being a *positive feedback loop* that can careen out of control.

## The Problem: Stress Circuits

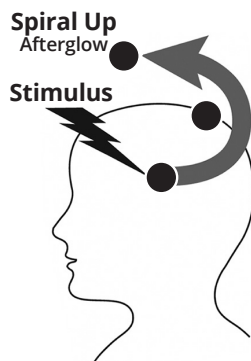


Scientific leaders of the time, including Bruce McEwen, Robert Sapolsky, and George Koob, embraced Sterling and Eyer's concept of allostasis, which led to more research. In 1993, Bruce McEwen coined the term "allostatic load" to describe the cumulative impact of repeated episodes of allostasis. High allostatic load lowers the brain's set point, and a set point in stress becomes the brain's habit. With the brain stuck in stress, health problems can become overwhelming, which is why reversing allostatic load and maintaining a high set point is becoming the goal of healthcare.



The discovery of allostasis was monumental. Had it been a germ, legions of scientists would have been eager to study it. However, there was no bacteria or other pathogens to kill. No medication, no vaccination, nor any procedure could provide a ready solution to the problem. What's more, the impact of this stress overload was all-encompassing, impacting every cell of the body! As a result, allostasis was largely ignored by clinical medicine for 30 years.

## The Solution: Joy Circuits



### Discovery #2: Neuroplasticity – The brain can change

The second discovery that made stress treatable was neuroplasticity, which was proposed in 1890 by William James, in the first textbook ever written on psychology. However, his idea, like those of the early investigators of infectious disease, was largely ignored. Then in 1949, neuroplasticity was propelled forward when Donald Hebb, a Canadian psychologist, proposed Hebbian theory, that changes in the brain are use-dependent, and neurons that fire simultaneously strengthen the synaptic connection between them. This is also called use-dependent plasticity. For example, if we need love and reach for a handful of cookies, the brain encodes that experience, creating a circuit that associates love and eating sweets. In the future, when the need for love arises, that wire can become activated and trigger a drive to overeat. Hebb's rule, "neurons that fire together, wire together," remains a core principle of neuroplasticity today, however, this breakthrough did not stimulate widespread interest. It was believed that the brains of adults were fixed, immutable, and no longer capable of changing. Neuroplasticity was thought to occur only in children.

Neuroscientist Michael Merzenich was not convinced. He had conducted research on adult monkeys in his post-doctoral studies at the University of Wisconsin-Madison that suggested their brains could change. In 1971, at UCSF, he reconnected with one of his postdoctoral associates, Jon Kaas, of Vanderbilt University, who was experimenting with owl monkeys. Much like Sterling and Eyer had brought about a breakthrough in physiology, Michael Merzenich and Jon Kaas were poised to do the same for neuroplasticity.

The study tested whether or not adult monkeys' brains changed with experience. They cut a nerve in one hand, leaving them with no feeling on the thumb side. If the brain were hardwired and not changed by experience, soon there would be a "black hole" in the brain where it used to receive

input via the severed thumb-to-brain nerve. When they examined the monkeys' brains several months later, there was no black hole. In fact, the brain area lit up with activity and had already found a new calling, processing the input from the pinky finger side. They showed use-dependent neuroplasticity in adult monkeys, and other scientists joined in, and by the end of the century, the plasticity of the adult human brain was widely accepted. Dr. Merzenich received numerous awards, including the world's top neuroscience award, the Kali Prize, for his achievements in neuroplasticity.

### **Discovery #3: Allostatic Circuits – Finally, a “germ” we can treat**

The third discovery that made stress treatable was allostatic circuits. We needed to find a way to shut off allostasis and activate homeostasis. Rewiring circuits was the logical strategy, as neural pathways control our responses in daily life. Research at the time focused on identifying specific errant neural wires as the nature of science is reductionistic. Scientists investigate the smallest aspects of a problem, with an eye to assembling a bigger picture over time. In the case of allostasis, that approach may have caused scientists to miss the forest for the trees.

In April 2007, Igor Mitrovic saw the forest. As a neuroscientist and physiologist, he taught physiology to all health science graduate students at UCSF and was passionate about EBT. His wife, a stress researcher with her own lab at UCSF, had given him a book on EBT in 2003, mentioning that another professor at UCSF had written it and that it might help with his anxiety. Soon we met, and Dr. Mitrovic began to guide the method in finding its conceptual neuroscience basis, eventually becoming the method's scientific director.

His breakthrough came during an EBT research meeting, when his face suddenly lit up, and he exclaimed, “EBT is rewiring the stress response!” Then he began marking up a nearby whiteboard, first drawing a simple symmetrical triangle, and calling it a homeostatic circuit. In a flash, he erased the image and drew a misshapen triangle, then several more on top of one another, clearly careening out of control. He called that an allostatic circuit. Those whiteboard drawings, for a physiologist, were the equivalent of the 1848 Eureka moment when gold was discovered at Sutter's Mill in California. If the EBT tools could rewire our stress response, which controls our physiology, then we could offer a new paradigm in healthcare.

Dr. Mitrovic had conceptualized the stress response, the primary controller of our physiology, as two opposing types of circuits. He recognized that instead of seeking to discover specific errant circuits causing particular unwanted responses, what mattered the most was training the brain to choose a homeostatic circuit rather than an allostatic circuit. What was most important was whether we spiraled up to a state of well-being, activating healing chemicals, or spiraled down into toxic stress, triggering harmful chemicals. His creativity, clarity, and decisiveness gave medical science of the 21st century its germ. Instead of treating the downstream effects of stress, we could directly treat stress itself: the allostatic circuit. Soon after that, Igor Mitrovic, Lynda Frassetto, Lindsey Fish, and I authored an article published in the journal *Hypothesis* entitled “Rewiring the Stress Response: A New Paradigm in Healthcare.”

Five years later, Joseph LeDoux authored a landmark paper, “Rethinking the Emotional Brain,” which documented a wealth of science about allostatic circuits. He proposed that the most extreme

allostatic wires, “survival circuits,” which evolved to defend life, through actions such as physical defense, the balance of fluids, and reproduction, were vulnerable to corruption through negative emotional plasticity. Other wires could be incorporated into this circuitry, based on Hebbian learning, if they were activated at the same time, locked into unconscious long-term memory systems, then retriggered without our awareness or permission. The implications of this were enormous! Imagine a “fight-or-flight” circuit and a “drinking wine” circuit coactivating to produce a fight-or-flight drive to drink too much. These corrupted wires that drive our responses to daily life are the engine behind being triggered, overreacting, and going to excess. They can encode seemingly unstoppable drives for extremes of emotions, behaviors, sensations, thoughts, or states, or whatever we happen to turn to when we are highly stressed. Thus, the brain can encode circuits that cause us to be addicted to nearly anything!

#### **Discovery #4: Switching Circuits - On-the-spot stress relief**

The fourth discovery that made stress treatable was a full set of powerful resiliency tools. We needed tools that could stand up to a fight-or-flight response and stare it down, or better yet, switch it off. Neuroplasticity is use-dependent, so rewiring stress overload and optimizing natural, sustainable well-being takes repeatedly switching off allostatic circuits and activating homeostatic wires in the throes of the stresses of our day. It’s not something that “can wait” until we have time to talk with a friend or go for a walk. We need on-the-spot stress relief to wire our brain for resilience.

This is easier than one might think, as evolutionary biology has given us a brain that rapidly alleviates stress by processing emotions. Our Stress Circuits give off steam in the form of negative emotions. By leaning into emotions and processing them effectively, we shut off Stress Circuits and activate Joy Circuits, changing the chemicals in every cell of our being. Emotions are not just psychological; they are our pathway to rapid and profound improvements in our biochemistry.

This concept that emotions were biologic, not just psychological, was initially forwarded in 1872 by Charles Darwin, who proposed that emotional expressions cross species and that facial expressions and body movements conformed to emotions. In the 1960s and 1970s, UCSF psychologist Paul Ekman built on Darwin’s theories, showing that human emotions identified by specific facial expressions were universal, the same in diverse Eastern and Western cultures, and even in a remote community in Papua New Guinea, which was separated from other cultures by steep mountains. However, it was in 2003, that Antonio Damasio, a neurologist, and professor at the University of Southern California, took the emotion-physiology link a step further. He proposed the Nesting Principle, that emotions were the product of an elegant, multi-leveled set of inputs from our most primitive immune responses, reflexes, and metabolic regulation, through pain and pleasure, as well as behaviors, all the way to drives and motivations. If emotions were the tip of our iceberg, and we could positively impact that tip, all below it, our entire physiology and experience of life, would follow along.

Developing a system for processing emotions was not an “aha” moment. Igor Mitrovic had prepared his entire life, including three decades of scientific training, to bring about the stroke of insight that all human circuits could be categorized as homeostatic or allostatic. For me, developing an emotional processing system that matched the brain’s ways was a step-by-step process over

the same period. The first tool was easy to develop, as it is the tool that enables us to bring to consciousness our feelings and needs, taming emotions while in homeostasis. The next two, one used at the tipping point between homeostasis and allostasis, and the other for our initial wandering into allostasis, came soon after that. In developing the second and third tools, we drew upon the work of psychologist John Gray, who pioneered strategies for guiding the flow of negative emotions into positive ones. This process was essential to effective emotional processing, as we had learned from catharsis therapy (wholesale expression of anger) that negative emotions can become stuck and extreme, causing still more stress and problems. With two tools that prevented negative emotions from becoming stuck and harmful, and instead caused them to flow into positive emotions, we could accomplish our goal of switching circuits in real time.

There was only one problem at this point, which was the world was changing. The shared stress load of modern life had increased, and even the healthiest and happiest people had Stress Circuits rattling around at the bottom of their brain. Technology made this more pronounced as processing emotions requires feeling them, and feeling them takes a few moments, during which time at least four texts might arrive! Artificial, addictive temptations were sprouting up everywhere, and their use corrupted our brain's reward center, so we needed to retrain it to enjoy natural pleasures.

This led to adding two more tools to the set in 2007, one for stress overload and another to promote high-intensity natural pleasure. The resultant EBT 5-Point System for Emotional and Behavioral Regulation mirrors both neurophysiology, drawing upon understandings of emotional processing in the brain, and attachment theory, modeling the tools on the resilience methods used by parents of securely attached children. The work of Allan Schore, a neuropsychologist at the University of California, Los Angeles, and Judy Zehr, Master EBT Trainer and attachment theory specialist, guided our way. The EBT 5-Point System was developed to achieve immediate switches from allostasis to homeostasis, but one additional discovery was needed to treat some of the more stubborn circuits that showed up in our brain due to random moments of stress overload: reconsolidation.

### **Discovery #5: Rewiring Stress Circuits – The gold standard of reconsolidation**

The fifth discovery that made stress treatable was reconsolidation, not just building a healthy circuit on top of faulty ones, as that is what has produced the Band-Aid approach to healthcare. Many methods can work through external support – counseling, medications, procedures. However, without addressing the root cause of the problem, treatment must be ongoing or, if not, often results in a vicious cycle of treatment and relapse.

### **The 3 Rules of Reconsolidation**

- Rule #1. A Spark – Unlock the old circuit with a moment of stress.
- Rule #2. Emotional Flow – Feel your feelings and encode a new circuit.
- Rule #3. Spiral Up – Lock in the new circuit with a surge of dopamine.

Given the absence of an underlying cause of chronic diseases to target and treat throughout the 20th century, we have become accustomed to treatments not curing problems. That could change, as physiologic stress is an underlying cause of most health problems and curtails the effectiveness of interventions. Psychologist Roy Baumeister and behavioral economist Kathleen Vohs wrote, “every personal and social problem affecting large numbers of modern citizens involves some kind of failure of self-regulation.” On a neural level, a failure of self-regulation is the encoding or activation of allostatic circuits. The only treatment for these circuits that has the potential to erase a wire for lasting results is reconsolidation.

The research of Elizabeth Phelps and colleagues in 2010 (see The Missing Link page 5) showed us more about how to accomplish reconsolidating a circuit. By briefly achieving the same level of stress in which the circuit was encoded, the synaptic connections between neurons unlock. By delivering a new experience to the unlocked circuit, the wire changes. Then, by sparking a dopamine surge with positive emotions, the new circuit can both erase the old wire and encode a new one. Although the hippocampus keeps the memory fragile for up to six hours, it then locks that new wire into long-term memory. Our personal storehouse of these new and improved wires that have erased others is our best defense against relapse, as well as the self-blame and discouragement that often follow. The Phelps research showed us that stress activation was the doorway to lasting change. However, if we wanted to rewire those circuits on our own, we needed to quickly ease stress enough to deliver a new message to the brain, then lock in that new circuit. In 2017, we developed the three rules of reconsolidation to make it easier for us to direct our own rewiring and to see if our “antibiotic” of neuroplasticity was beginning to kill the “germ” of a Stress Circuit.

The first of the three rules of reconsolidation is to use stress to unlock the synapses of the circuit. This rule is based on the Phelps study described above. The second rule is to follow that stress

<b>Method</b>	<b>Follows the 3 Rules of Reconsolidation?</b>
<b>EBT</b>	<b>yes</b>
<b>Psychotherapy</b>	<b>sometimes</b>
<b>Relationships</b>	<b>sometimes</b>
<b>Group Support</b>	<b>sometimes</b>
<b>Spiritual experiences</b>	<b>sometimes</b>
<b>CBT*</b>	<b>no</b>
<b>Mindfulness*</b>	<b>no</b>
<b>Exercise</b>	<b>no</b>
<b>Relaxation</b>	<b>no</b>
<b>Medications</b>	<b>no</b>

\*Does not stress-activate the circuit. Relies on cognitive processing for stress reduction, which has been shown to be ineffective. Raio, CM, et. al. (2013). Cognitive emotion regulation fails the stress test. *Proceedings of the National Academy of Sciences* 110:15139-44

activation with a flow of emotions, which rapidly reduces stress, so the prefrontal cortex stays online as we rewire. This is based on the research of Candace Raio, Elizabeth Phelps, and colleagues that is described above, which showed that cognitive processing when we are in stress fails to improve stress and negative emotions. The third rule of reconsolidation is to lock in the new synaptic connections with a dopamine surge, which is based on Michael Merzenich's research. He showed that by stimulating the reward system, the ensuing release of dopamine increases brain plasticity. Feeling that glow of reward after the rewiring experience is a sign that we have locked in the new learning.

By identifying the three rules of neuroplasticity, the rise in stress-related diseases makes more sense. All conditions are multifactorial, but traditional therapies may not have adequately addressed the root cause of what ails us. The table above lists the most common treatments for stress-related problems. Most were developed 50 or more years ago, long before the age of neuroplasticity. As we focus on updating our treatments, how will rewiring circuits fit in? Stress circuits impact our physiology, and to the extent that we rewire them, the role of EBT may become foundational. With lowered physiologic stress, other treatments could become more effective and relief from allostasis could boost well-being in all domains of life.

### **The emergence of a new golden age**

Neuroscience-based medicine is gaining ground – and it is all because of the important successes of the past. If germ theory had not made strides toward wiping out many infectious diseases, people would not have lived long enough to develop chronic diseases. If medical progress had not been so exceptional, we would have kept looking for a “silver bullet” medication. Yet with growing acceptance that the solution is not a pill, a cluster of discoveries have begun to offer a new paradigm in healthcare. The problem all along was stress, which we can now treat in a matter of fact way, as if it were a germ!

At the start of a golden age, once the modifiable root cause of a problem has been discovered, enthusiasm abounds. Scientists want to study it, clinicians want to explore using it, and people want to try it out. We may be seeing the beginnings of that enthusiasm now. Physicians are using “bedside EBT” in hospitals. Psychologists have asked about using EBT rewiring plans rather than diagnoses for emotional health issues. Expectant parents are using neuroplasticity to improve their own wiring so that they can pass along highly effective wires to their babies. Training to enhance mental sharpness has become mainstream, and couples are using brain-based techniques to reset their relationships. People are busting up their old addictive circuits and encoding new wires of optimal health and well-being.

Yet, just when neuroplasticity begins to sound concrete and practical to you, consider that there is another level to this story. The golden age of bacteriology saved us from infectious diseases, but this golden age is different, for the wires of stress are stored in the emotional brain, the center of connection and the seat of the soul. To transform those wires, we must connect to the deepest part of ourselves. In that state of connection, we automatically radiate our peace and joy to others. As we raise our own set point, and become healthier, we do our small but important part to raise the set point of the planet. That alone may be worthy of sparking the beginnings of a new golden age . . .