Bruce Lipton, PhD: The Jump From Cell Culture to Consciousness

Interview by Craig Gustafson

***Bruce H. Lipton, PhD**, cell biologist and lecturer, is an internationally recognized leader in bridging science and spirit. Bruce was on the faculty of the University of Wisconsin's School of Medicine and later performed groundbreaking stem cell research at Stanford Medical School. His pioneering research on cloned human stem cells presaged today's revolutionary new field of epigenetics. He is the bestselling author of* The Biology of Belief *and* The Honeymoon Effect*, and he is the coauthor, with Steve Bhaerman, of* Spontaneous Evolution. *Bruce received the prestigious Goi Peace Award (Japan) in honor of his scientific contribution to world harmony.*

***Integrative Medicine: A Clinician's Journal* (*IMCJ*):** Would you start by explaining how you got from culturing what you determined to be stem cells in a Petri dish to ruminating about belief and consciousness and evolution?

Dr Lipton: When I was doing my research on cloning stem cells, at the same time I was also teaching in medical school. Genetic determinism was, at the time, a prevailing belief—that genes are capable of turning themselves on and off and regulating not just our physical structure, but our emotions and our behaviors as well. Genes seem to be the controlling factor of all characteristics of our lives. We attributed to them, at that time, the character of self-actualization, meaning that genes can turn themselves on and off.

In summary, what I was actually teaching future doctors, which they would then relate to their patients, is that genes are controlling their lives. As far as we know, we did not pick the genes that we came with. If we do not like the characteristics we have, we cannot change the genes. That leaves us with an unfortunate conclusion: We are victims of our heredity. Meaning, if there is cancer running in your family, well, anticipate that their gene for cancer is going to affect you and you are going to have cancer or cardiovascular disease or diabetes or Alzheimer's or whatever those so-called hereditary issues are. So, we are powerless in controlling our biology, because the genes control it by turning on and off, and we have no control over them.

What would you do if you were powerless? The answer is: You have to find a rescuer. Therefore, you give up power over your life—because you believe you have no power—and hand it to someone who is recognized as a rescuer. A medical doctor, a pharmaceutical agency, or whatever it is, will take care of us. That is what we are teaching.

At the time I was teaching that, I was also doing work on cloning stem cells. *Stem cells* is just another term for *embryonic cell*. They are exactly the same. The difference is, I can call a *cell* an "embryonic cell" when you are an embryo. The moment you are born, you are no longer an embryo, so I cannot call it an *embryonic cell*. I change the name to *stem cell*. We want to equate the two. A stem cell is an embryonic cell in the body of a person who is born.

Why should I have these so-called embryonic cells in my body? We have to recognize that, on a daily basis, we lose hundreds of billions of cells from normal attrition: dying, old-age, damaged, or some problem with them. We have to replace them. How many days in a row can you stay healthy when you are losing hundreds of billions of cells every day? At some point, if you are not replacing those cells, you are in a lot of trouble. The fact is, our population of stem cells, embryonic cells, are there to replace any type of cell we lost, whether it is skin cells, bone cells, muscle cells, or brain cells. We can replace these cells, thank God; otherwise, there would be a problem.

My work was very simple. It was to identify a single stem cell and put it in a tissue culture dish by itself. The cells divide every 10 to 12 hours. I started with 1 cell, 10 hours later there were 2, and 10 hours later 4. Every 10 hours it was doubling: 4, 8, 16, 32, etc. After a week, I had about 50 000 in the Petri dish. The most important insight is that all 50 000 cells were derived from the same parent. By definition, I have 50 000 genetically identical cells in my culture dish.

I grow these cells in something called *culture medium*, which is the environment in which cells live. In other words, cells are like fish; they live in a fluid environment. So what is culture medium? It is the laboratory version of blood. If I take the cells out of the body, I want to put them in a very similar environment, so I create a synthetic version of blood for the culture dish. Because I am creating a synthetic version, I can change the composition in my medium.

Now, in the experiment that blew my mind, I created 3 slightly different versions of culture medium, by changing some of the constituents. I put these 3 different

environments in 3 different Petri dishes, but all the dishes had portions from the same culture of genetically identical cells in them. As a result, cells in environment A became muscle. In the second Petri dish with genetically identical cells to the first but in a slightly different environment, the cells became bone. Then in the third dish, again with genetically identical cells but a different environment, the cells became fat cells. Now you are left with a very profound question: What controls the fate of the cells?

You start with the first premise: All 3 groups of cells are genetically identical. I cannot say there were different genes in dish 1 and different genes in dish 2. That's not true; they are all genetically the same. The only difference was the composition, or the chemistry, of the culture medium—the environment in which the cells live. The conclusion was profoundly important. It is the environment that selects the genetic activity of the cell. This is profoundly different than the genes making the decisions as to what cells are going to be. So, this is a pretty interesting story about cells in a plastic dish, but what the heck does this have to do with me as a human? The jumpy part is that, when we look in a mirror and see ourselves as single individual entities, that is an illusion. It is a misperception. Because the truth is, a human body is actually a community of 50 trillion cells. When I say the word *Bruce* or you say the word *Craig*, that is a term that does not represent a single entity. It represents a single community of up to 50 trillion cells.

***IMCJ*:** … and several trillion microbes.

Dr Lipton: Yes, that is the newer version of the human as a super organism. Instead of just human cells, we cannot survive without our microbiome. That expands, as you just said, to trillions of additional cells that are not ours but our microbiome's cells. When you look at yourself as a single entity, that is the illusion. That truth, which is the jumpy part, is that we are skin-covered Petri dishes inside of which are 50 trillion-plus cells. Inside the body is the original culture medium called *blood*.

Here is the point: It doesn't make a difference to the fate of the cell if it is in a plastic dish or the skin-covered dish. Because the fate of the cell is controlled by the conditions of the environment. The blood composition is really the factor that controls the genetic response of the cell. So then, what controls the composition of the culture medium? The blood. So, the brain is the chemist.

That leads us then to the next and more important question: I know the brain is the chemist, but what chemistry should the brain put into the blood? The chemistry put into the blood by the brain is a direct complement to the picture we hold in our mind. In other words, the mind's image is translated by the brain into chemistry, which then goes to the body to create a physical complement to the image in the mind. In ancient terms, back from the days of the Buddha, 2500 years ago, "What we believe, we become." Basically, our perception changes the chemistry of our blood.

In my lectures, I simply give this story: If you are sitting there with your eyes closed and you open your eyes and see someone you love, your mind holds a picture of love. A picture of love in the mind is translated by the brain into very specific chemistry. In a state of love, the brain releases dopamine for pleasure into the blood. The brain releases oxytocin into the blood, which is a chemical that helps us bind to the source of love that we are experiencing. The experience of love also releases another chemical into the growth medium—into the blood—called *vasopressin*. It helps us become more attractive so that our partner sticks with us even more. Another very important factor released by our brain while perceiving love is growth hormone—which, by its name does exactly what it says: It influences our growth. That result is that the chemistry of the body's natural culture medium—blood—is adjusted by the perception of the mind.

The perception of love introduces such elements as dopamine, oxytocin, vasopressin, and growth hormone, all of which are chemicals that enhance the vitality and health of the 50 trillion cells in our skin-covered culture dish. In a state of love, the chemicals released in love result in health and harmony and a glowing body. People say, "Oh, look, you can see how in love they are. See how they glow." That is a chemical expression of the culture medium, affecting the vitality of the cells.

Then I say, "Wait. The same person could open their eyes and instead of seeing love, see something that scares them." In a state of fear, the brain does not release the chemicals associated with love. It releases chemicals associated with fear, which are stress hormones and inflammatory agents, changing the chemistry of the culture medium. Then, go back and recognize that the fate of the cell is directly dependent on the chemistry of the culture medium.

Now with stress hormones and inflammatory agents released in the blood, I change the genetics and behavior of the cells and start to express a protection posture, which is antagonistic to growth. In fact, it actually cancels growth. The protection chemicals in the blood allocate energy for fight or flight, getting ready to run from a perceived fear.

The genetics of the cell give us all kinds of potentials. The potentials expressed are related to the composition of the culture medium. The culture medium composition in a laboratory is synthesized by me—synthetic blood. In your natural skin-covered Petri dish, or body, the brain is the chemist and it translates your perception into chemistry that complements that perception. The result is that your biology becomes complementary to your mind and its perception, hence the nature of what is called the *placebo effect*.

In the placebo effect, a person is ill in some degree then is given an opportunity to take a very specific medicine. The physician says, "This is the latest, greatest drug to treat you. Look, it's colored purple, it's very good. Even the color is going to heal you." You believe,

"My God, I found a drug that is going to heal me." You take the drug, you get better. Later, you find out that the drug was just a sugar pill. What healed you? Well, obviously not the sugar pill. It was your perception and beliefs about the sugar pill that healed you. Almost everybody says they are familiar with that—how the mind can release chemistry in a belief that actually turns around and heals us.

What most people do not recognize is the consequence of a negative belief, in reference to the fact that a placebo is a consequence of a positive belief. A negative belief is equally powerful in shaping our biology and our genetics. It works in the opposite direction of a positive belief. A negative belief can result in any illness and even cause us to die. Just a belief. It can because that belief is translated in chemistry that will not support our vitality.

A negative belief relates to something called the *nocebo effect*. The nocebo effect is a consequence that can include any illness, disease, or death. That result is simple. The chemistry that determines our biology, genetics, behavior, and life characteristics is chemistry derived from the brain which, in turn, is derived from the brain interpreting an image in our mind. As we change our mind, we change our biology.

This is the foundation of something called *spontaneous remission*. Say a person is going to die of terminal cancer. All of a sudden, there is spontaneous remission. What does this spontaneous remission do? In every case, the remission is due to the fact that the patient had a profound change of belief, a change of mind in regard to the factors that affect their lives. A letting go of the stresses and of the mind issues that were creating a nocebo effect. Letting go of those stresses can actually cause cancer to undergo spontaneous remission. The power is not in the genetics; the power is in consciousness. Our consciousness is translated into biology via the chemistry of the natural culture medium called *blood*.

***IMCJ*:** How does that relate to your beliefs on the effects of environment on the evolution of genetics?

Dr Lipton: Let's pretend that the old belief of genetic determinism is valid. That would mean that the genes you are born with are going to control the characteristics of your life. Well, the problem is that the environment is ever-changing. There is no static environment. Why is that relevant? Well, if your genes are designed to keep you alive in environment A and then the environment changes to environment B, then those genes may not support your vitality at all. They may actually lead to your death. Therefore, then, your life is totally under the control of these mechanical devices, which are not connected to the environment.

That would be silly. Life would have died out a long time ago when upheavals in the environment occurred, like we are experiencing right now in regard to climate change. Why is this new insight important? Because the new insight says, "No, you are not controlled by your genetics. Your genes are controlled by your environment, and more specifically your perception of the environment." This allows dynamic control of your biology. If genes controlled your life, your fate would be determined regardless of what was happening in the environment: "These are your genes, this is your life. You have this cancer gene, you are going to get cancer and die." The fact is, there is no such thing as a cancer gene.

That is a belief that is self-sabotaging. If you believe you have a cancer gene and you believe that gene can turn on and give you cancer, then your belief is manifesting a chemistry that will create cancer because you are translating your perception into chemistry. A perception of cancer can cause cancer. Less than 10% of cancer has any hereditary linkage of all. The other 90% or more of cancer is a direct response to the environment and the perception of the individual in that environment. It basically says, "Genetic control is a limitation, because you can only express what your genes express."

The new science called *epigenetic control* sounds almost like the same thing. When I say *genetic control*, it translates as "controlled by genes." The new science is called *epigenetics*. It sounds similar, but it is profoundly different. *Epi* means "above," so when I say *epigenetic control*, I am literally saying, "control above the genes." This is the new biology. It reveals that the environment and our perception of the environment are what control our genetic activity.

This is profound. A revolution for the simple reason that the conventional belief, which most of the public is already programmed with, is genetic determinism. That makes us victims because, as I said, I cannot control the genes if the genes are controlling themselves. Therefore, my life is an expression of a pattern of genes unfolding and I am a victim of this pattern. Epigenetics changes the entire game, because it says that genetic expression is directly due to the environment and our perception of the environment.

We are capable of changing the environment we live in and we are capable of changing our perceptions. Therefore, we are not victims, but we are actually masters of our genetic activity. We have to recognize that the belief of being a victim is a perception. If that is what you believe, then you can be a victim because you are going to translate your perception into biology. This is why your work becomes important in this case, Craig, because knowledge is power. A lack of knowledge is by definition a lack of power.

A lack of knowledge about this new understanding of epigenetics is actually a disempowering experience for the individual on this planet. If you believe genes control your life, then you let go of the control and programs take over. If you understand epigenetics and you say, "Wait, I have the ability to change conditions environmentally or perceptually to enhance my life, rather than to fall victim to illness," that is self-empowerment. That is why the new knowledge is power inducing.

***IMCJ*:** As a person's belief system manifests in their chemistry, what are the factors that come together to constitute somebody's belief patterns?

Dr Lipton: The more fundamental statement is, I said, "The brain is the chemist." But the mind is the imagery that the brain is trying to complement with chemistry. The brain is perceiving the mind. Whatever the mind's image is, the brain is going to translate that image into chemistry.

Many of us, when we were young, played with something called *paint by numbers*. You get an image that is all carved up into little pieces with numbers inside each little fraction of this fractured image. The numbers refer to a paint color in the paint box. If you match the paint and fill in the spaces with the right numbered colors, then lo and behold, you create this beautiful picture. To simplify what life is all about, it is doing paint by numbers in reverse. The mind starts with a completed picture and the brain breaks down the picture into numbers. The numbers do not represent paint. They represent neurochemicals, hormones, growth factors, and regulatory agents. These secretions then go into the body and cause the body to become a physical complement to the image.

***IMCJ*:** So the brain, our chemist, is actually doing the mind's bidding?

Dr Lipton: That is where a problem arises. The term *mind* is actually a misinterpretation or a misperception. *The mind* suggests that there is a single mind. No. The fact is that what we refer to as the *mind* is actually two interdependent mechanisms working in harmony with each other. We refer to these two different pieces of the mind as one: the first being the conscious mind, and the other being the subconscious mind.

This is really important because the two minds learn in different ways, which is very critical. The two minds are interdependent. They work together, but they have different functions. The subconscious mind is the primal mind and constitutes about 90% of our brain. The subconscious mind is habitual. It has programs in it—habits. These habits play automatically without us thinking about them. It is subconscious, meaning that these behaviors would play without our conscious even being involved.

When you were an infant, you learned how to walk. It was a conscious process. Then it became a habit. Today, you don't have to think, "I'm going to walk from this side of the room to the other side of the room. Left leg first, okay, now move the right leg." All you have to do is have the intention to move to the program, then the subconscious mind will automatically do this without your conscious mind participating at all.

Many of the habits are derived from instincts built into the system. In other words, if you walk outside and it is cold out, the reception of the cold by the nervous system will adjust the biology to heat itself up and keep your temperature at 98 degrees by warming up the system. If you walk outside and it is warm out, the nervous system will pick up that information and it will adjust the body to cool itself down so it does not go above 98 degrees. Your body temperature is not under your conscious control; it is subconscious.

Those are instincts that built in. We also acquire habits. As I said, walking is a habit. We did not have that habit when we were born; we had to learn to how to walk. It is not just restricted to learning as a youth. For example, when you were old enough to get a driver's license, you had to learn how to drive. You had to practice. You create a habit by learning. Once you learn how to drive, you don't have to think about the details of driving.

Consider the first time you got into a car. Look how overwhelming it was for the conscious mind to deal with that. We have mirrors—rear-view mirrors, and mirrors on the door. We have this windscreen to check out what is going on in front of us. We have the dashboard with gauges and all kinds of things happening. We have the gas and brake pedals, and the clutch pedal if you have a manual transmission. When you learned how to drive, it was super complicated because so many details had to be considered.

Now you have been driving for a while, and guess what? When you get in the car, you do not have to think about any of those details. They are now automatic habits. I can get in a car, click the ignition key, start driving the car, and never once think about the details. Habit will manage the driving of the car for me. The subconscious mind is the habit mind. We learn habits through life experiences, as well as those that were programmed as instincts.

On the other hand, there is the conscious mind. The conscious mind is completely different in its function. It is a creative mind. It is the mind that expresses our wishes, our desires, our aspirations, and what we want from life.

If I say, "Hey Craig, tell me what you want from your life?" Whatever you offer is going to come from the conscious mind, because that is the creative wish. That is, something that you are looking forward to having. It does not exist, but you can visualize that it can occur. Consciousness is creative, and subconscious is habitual.

***IMCJ*:** How do the conscious and subconscious minds work together?

Dr Lipton: I could look at my life and I say, "I want my conscious mind to run my life; that would be really great. Behavior would be controlled by wishes, desires, and aspirations, and I should be able to manifest it." Well, here is the interesting conundrum: What happens when the conscious mind is engaged and not focusing on the world?

For example, Craig, what are you doing on Sunday at 2:00 PM? If you are going to answer that question, recognize that you have to take your conscious mind away from observing the world around you. It must go inside your head and look for the answer. Because the answer to

"What are you going to do in the future?" is locked in some calendar inside your head. When you are thinking, the conscious mind has to go inside to process the information. Wait, if you are driving your vehicle, your biology is using the conscious mind. Then I start thinking, "Then who is controlling the vehicle at that moment?"

In the moment that the conscious mind is engaged in thinking, all functions are taken over by the habits stored in the subconscious mind. By definition, *subconscious* means "below consciousness." That means I can continue walking down the street while my conscious mind is internally engaged in thought. As I am walking, I am not going to walk into a tree or fall off the curve because my subconscious mind functions as an autopilot.

I can either use my conscious mind to create my life, or if my conscious mind gets engaged in thinking or focusing on something, my life is taken over by the autopilot: the subconscious. On autopilot, the behavior that is going to be expressed comes from programs that were already downloaded into my mind. Here comes where the rubber hits the road on this. Before you create consciousness in your life, you have to have programs in your subconscious to give you a parallel story.

Consider that I go to the Apple Store and I am interested in buying a brand-new iPod. I am so excited; I got this new device. I get it out of the box and on the front of the iPod is something called the *touch screen*. This is where you have conscious control over the program. On the touch screen, I push *play*, and nothing happens.

Now I am really upset because I just spent all this money on a damned iPod and it does not work. There is this little 5-year-old kid standing next to me, looking up at me like I am an idiot. "Hey mister," he says, "you can't play any music until you download some music." I say, "Oh yeah, there is a hard drive in the iPod." You can put programs and music in the hard drive and then once you have these programs, you can use the touch screen to be creative with them.

The conscious mind is the touch screen. The conscious mind is creative. I can imagine things and I can do all these things, but the conscious mind cannot work if there is no program in the subconscious mind. This is why the first part of our lives, from the last trimester of pregnancy through the first 7 years of our lives, our brains are functioning at a lower vibration, as determined by electroencephalograph, or EEG. The brain predominantly operates in a vibration or frequency called *theta* for the first 7 years. Theta is a frequency lower than consciousness. Theta is actually a brain function associated with imagination.

Think about it. A kid under 7 years of age is riding a broom as a horse. In the mind of the child, that is not a broom anymore; that's an actual horse. The kid can visualize being on a physical horse, riding it around when it is only a broom. That is theta; that is imagination. If the mother says, "Give me the broom back," the child thinks, "I don't understand what you're talking about; this is a horse." That is the character of theta. Theta is also hypnosis.

The relevance is that consciousness as a brain function, expressed as *alpha* EEG activity, does not really kick in until about age 7. If you do not have any data in the hard drive, you have nothing to be conscious of. Your biology provides the first 7 years as a download period. When you get to age 7, your consciousness then can have access to these programs and create a life from them. Just like I cannot create music playlists on my iPod until I download some music, first.

The issue is that the fundamental programs in our subconscious mind did not come from our personal wishes, our desires, or our spiritual quest. The first programs that come into our minds go into the subconscious mind as downloads via hypnosis in the theta period. But where did those programs come from? Observing others. Observing our mothers, our fathers, our siblings, and our communities in the first 7 years is how we acquire the behaviors to become a member of the family and a member of community. These behaviors do not reflect our wishes and desires; they are just copied from other people.

Here is the problem: The subconscious programs do not necessarily reflect or support my own wishes or my desires for health, happiness, and love. These things may not be in those programs I downloaded from other people. Then you say, "Okay, I'm not going to default to those programs. I'm just going to operate my life with my conscious mind."

That is a wonderful intention. Scientific assessments reveal that the wishes, desires, and aspirations of our creative conscious minds only control cognitive behavior about 5% of the time. Subconscious programs are in control 95% of our lives. Why should that be? The answer goes back to, "Hey, Craig, what are you doing on Sunday?" That means your conscious, creative mind is now going inward looking for some answer in thought. At the same time, because it is going inward, it is not paying attention to what is going on to the outside. That is when the autopilot subconscious kicks in and controls our behavior.

Of the downloaded behaviors acquired before age 7, the vast majority—70% or more—are programs of limitation, disempowerment, and self-sabotage. These programs were acquired from other people, not from ourselves. Again, being subconscious, these programs are occurring without conscious recognition and awareness. Therefore, though we have the perception in our mind that we are controlling our lives with our wishes and desires, the truth is far from that. Since thought causes 95% of our cognitive behavior to be controlled by the subconscious—ie, *below* conscious—mind's "invisible" behaviors, we struggle to manifest our conscious mind's wishes and desires.

***IMCJ*:** How does this interplay affect genetics?

Dr Lipton: Becoming aware of the subconscious source of our behavior gives us an opportunity to change our lives by rewriting the programs of limitation or the things that interfere with us. If we change those programs, we are empowered; free to express the wishes and desires of the conscious mind. This is really what the whole new biology is all about. Take us away from, "You are a victim of life," to introducing the fact that we are the creators of our life. Our consciousness is the source of the great potential of creating heaven on Earth.

We must leave behind the notion of victim and recognize the new science of epigenetics—the science of *mind over genes*—in order for us to regain power and create the lives we would like.

***IMCJ*:** Is there a time when this happens naturally?

Dr Lipton: Yes. When we fall head over heels in love with somebody, a profound change occurs in our lives. Your life could suck all the way up to the day you meet person X. The next day is like, "Oh my God, I'm so in love!" It is heaven on Earth. Things become more beautiful and life is so much easier. You are healthier. You are happier. You are creating a world of joy and love, and that's called the *honeymoon*. When we fall in love, we stop focusing our conscious mind in thought and start keeping it present. It is called *being mindful*. Meaning, if you've been looking for this person your whole life, why would you redirect your mind to go interior into thought when what you have been looking for is right in front of your face?

Science has recognized that immediately after falling in love, we enter a period of mindfulness where we keep our conscious mind present. It means when you fall in love for the first time, you stop playing subconscious programs that have been controlling 95% of your life. You start running programs that are based on your conscious wishes and desires. All of a sudden, without the programs—without the subconscious programs—we begin to experience a heavenly life.

The programs eventually kick back in, because inevitably we start thinking again. Guess what? They sabotage the entire honeymoon experience, which ultimately disappears; then life returns to the way it was beforehand. The vast majority of those programs are disempowering and self-sabotaging. We are quite powerful if we can get out of the program.

This is where the future will take us: Knowledge that we are powerful is quite different than the program we receive that we are victims. We are moving into a new future where we start to recognize, "Oh my God, my mind is creating the problems."

Getting back to health, it comes down to a simple fact: Less than 1% of disease is associated with genetics. Over 90% of disease is a total reflection of environment and especially our programming: the disempowering, self-sabotaging behaviors that we acquired in the first 7 years. Since those disempowering programs are based on our environment and our perception, and since we can change the environment and our perception, we have the power to free ourselves from disease and to start living that happily-ever-after honeymoon of life experiences that we all believe that we can have. The way to do that is by eliminating the self-sabotaging subconscious programs acquired during the first 7 years of our lives.

***IMCJ*:** What have you observed on the cellular level that leads you believe that the cells demonstrate this awareness?

Dr Lipton: As I said, I grew cells in tissue culture dishes and used culture medium to approximate blood. In addition to nutrition and oxygen carried in the blood, the blood is also sending information: signals, hormones, growth factors, and neuroregulatory agents. Information is in the environment of the cell. This information, by interfacing with the cell membrane—which is the brain of the cell—then enables the cell to engage in behaviors that are elicited by this information. The cell becomes aware of the environment by reading the information in the culture medium, the natural culture medium called *blood*.

Signal transduction, a new science, reveals the pathways by which an environmental signal engages a biological behavior. The interface of the cell membrane reads the environment of the cell and, in response to the information, adjusts the behavior and genetics of the cell to survive in that environment. The awareness process becomes biological awareness of the interface of the cell membrane, which then translates the environmental information into biological behaviors—signal transduction.

Part of signal transduction is the new science we mentioned, epigenetics. Signal transduction is the whole process: Environmental signals controlling cell behavior and cell behavior include genetics. The environmental signal via signal transduction can go into the nucleus and selectively change the reading of our gene blueprints.

***IMCJ*:** That can elicit a differentiated response?

Dr Lipton: Absolutely. This is why a change in perception of an individual can change their biology, virtually immediately. How fast can you change genetics? There are studies that showed the genetic readout of some inflammatory genes in a group of people who then went through a meditation process. After 8 hours of meditation, the activity of the genes changed. How long did it take? Well, less than 8 hours.

You can change your genetic activity by how you change your response to the environment. The commonly held perception is that your genes are a blueprint of your life—this is totally false. The blueprint of your life is based on your perception, because your genes will change according to your perceptions via epigenetics. Rather than

putting emphasis on genes controlling life, the emphasis is fully turned around to recognize your perceptions, via signal transduction, are translated into biological behavior. These factors control not only your behavior but also control your genetic activity.

***IMCJ*:** You mentioned that you see the cell membrane as the brain of the cell. Doesn't that conflict with conventional wisdom at this point that the nucleus is the brain of the cell?

Dr Lipton: Well yes, because we have held that the genes are self-actualizing. Which means that if genes are capable of turning themselves on and off, like we thought, then that would make the nucleus of the cell the brain. Because that is where the genes are located—essentially, 98% of them. Since genes were then given the opportunity of self-actualization, then all the decisions are being made by the genes in the nucleus. Well, that turns out to be totally false. Genes are not self-actualizing. They do not make any decisions at all. The control of genes is not due to any inherent activity in the DNA itself. The change of genetic activity is due to the interaction of the cell with environmental signals.

When I put my cells in the tissue culture, the fate of the cells was not determined by the genes. They all had the same genes. The fate of the cell was determined by the information in the environment.

So, what is reading that information? The answer is, "Not the genes directly." It is the cell membrane through receptors picking up the signals and translating them into biology, which then sends signals into the nucleus, which then controls the genetic activity. This is the essence of what the new science *epigenetics* is all about. Genes do not make decisions, so then the question is this: "If they are not making decisions, where are our decisions being made?" That takes us back to the cell membrane, which is the first organelle to evolve in the evolution of cells.

If there was no membrane, of course, there is no cell. As the interface between what is outside the cell and inside the cell, the membrane reads both environments. In this position, the membrane reads the external environment and then adjusts the functions of the internal environment to keep the cell alive. The idea of genes controlling biology is totally false. I understood this in 1964 when I did my first enucleation experiments. If you remove the brain from any living organism, the necessary consequence is death. So, if the nucleus is the brain of the cell, then the process called *enucleation*, which is removing the nucleus using a micropipette, should lead to the death of the cell.

Guess what? You can enucleate a cell. The cell will survive for months without any genes in it. It is not just sitting there; it's doing every function it had before. It is moving around. It is ingesting food. It is breathing. It is defecating. It is communicating with other cells. All of this is happening without genes. Well then, obviously something must be coordinating the behavior of the cell and there are no genes in it. Where the heck is the control coming from? The answer is what led me to the cell membrane. The cell membrane is the interface of control. Genes are just responsive elements farther down the line.

The relevance is that the whole DNA story perpetrated and propagated by Watson and Crick as "DNA controls life and it's self-replicating, therefore it controls itself," led to something called a *central dogma*, which is a reflection of how information flows in biology's conventional thought. This convention stipulates that information flows from DNA to RNA to protein in a unidirectional manner; this flow of information led to the belief that genes control our lives. Unfortunately, Watson and Crick left some very important stuff out of that explanation. They left out the membrane proteins and the chromosomal proteins that control the DNA, called *regulatory proteins*. But even those proteins are controlled by environmental signals. It is not DNA to RNA to protein.

The new understanding is: environmental signals to regulatory protein to DNA to RNA and then to protein. Why is it relevant? DNA is not at the top of that information scheme; the environment is. Leaving out the chromosomal regulatory proteins, which are responsible for regulating DNA, we had a complete misperception on the nature and role of DNA in controlling our lives.