We are in a school for gods, where—in slow motion—we learn the consequences of thought.

—Brugh Joy, MD

Josephine Tesauro never thought she would live so long. At 92, she is straight backed, firm jawed, and vibrantly healthy, living alone in an immaculate brick ranch house high on a hill near McKeesport, a Pittsburgh suburb. She works part time in a hospital gift shop and drives her 1995 white Oldsmobile Cutlass Ciera to meetings of her four bridge groups, to church, and to the grocery store. She has outlived her husband, who died nine years ago, when he was eighty-four. She has outlived her friends, and she has outlived three of her six brothers.

“Mrs. Tesauro does, however, have a living sister, an identical twin. But she and her twin are not so identical anymore. Her sister is incontinent, she has had a hip replacement, and she has a degenerative
disorder that destroyed most of her vision. She also has dementia. ‘She just does not comprehend,’ Mrs. Tesauro says.

“Even researchers who study aging are fascinated by such stories. How could it be that two people with the same genes, growing up in the same family, living all their lives in the same place, could age so differently?

“The scientific view of what determines a life span or how a person ages has swung back and forth. First, a couple of decades ago, the emphasis was on environment, eating right, exercising, getting good medical care. Then the view switched to genes, the idea that you either inherit the right combination of genes that will let you eat fatty steaks and smoke cigars and live to be one hundred or you do not. And the notion has stuck, so that these days, many people point to an ancestor or two who lived a long life and assume they have a genetic gift for longevity.

Josephine Tesauro and her sister

“But recent studies find that genes may not be so important in determining how long someone will live and whether a person will get some diseases—except, perhaps, in some exceptionally long-lived families. That means it is generally impossible to predict how long a person will live based on how long the person’s relatives lived.

“Life spans, says James W. Vaupel, who directs the Laboratory of Survival and Longevity at the Max Planck Institute for Demographic
Research in Rostock, Germany, are nothing like a trait like height, which is strongly inherited...‘That’s what the evidence shows. Even twins, identical twins, die at different times.’ On average, he said, more than ten years apart.”

This report and photos, drawn from the New York Times in late 2006, illustrates the dramatic difference that epigenetic factors make in health and aging. Dr. Michael Rabinoff, a psychiatrist at Kaiser Permanente hospital, says, “It is known that identical twins, despite sharing the same genes, may not manifest the same psychiatric or other illness in the same way or not at all, despite the condition being thought to be highly genetic.” Same genes, different outcomes. Gary Marcus, PhD, professor of psychology at New York University, says it’s more accurate to think of genes as “providers of opportunity” or “sources of options” than as “purveyors of commands.”

Think about your own life. What makes the difference between you living like Josephine Tesauro—or like her sister? Clearly, the big health differences between them can’t be the result of genes, because they both started life with the same genes. Yet the intervening years have produced very different results in old age. The epigenetic signals that make one person vibrant and the other decrepit come from outside the gene, outside the cell, and sometimes outside the body.

Cataloging the entire list of genes in the human genome is an impressive accomplishment. It’s like piecing together a jigsaw puzzle of a photograph of all the members of a giant orchestra, sitting on stage, holding their instruments, ready to play. It’s a static diagram of where everyone sits and what instrument they’re clutching. But it tells you nothing about the choices the conductor makes for the program, about the rhythm or tone of the music, about the experience of sitting in the concert hall while a piece is being played. It tells you nothing about the swirling maelstrom of notes, what they each sound like, and how they mingle to form music. It tells you nothing about their effect on the audience. In the words of the late physicist Richard Carlson, “all the genome provides is the parts list. ...How things interact is what’s more important in biology than just
the things that are there. The genome tells us very little, if anything at all, about how things interact.” For biologists, understanding the mechanics of enormously complex self-organizing systems like the human body is a challenge of much greater magnitude than mapping the genome itself. And tracing the epigenetic influences that govern the music of the body’s function is a challenge of even greater magnitude, though we see evidence of such epigenetic control every day.

To get the right answer, you have to ask the right question. Only since the concept of epigenetic control has emerged in the last decade have scientists begun to design experiments that ask these questions. As they are published, they are starting to illuminate the precise pathways by which our body takes a signal from the external environment and turns it into a set of chemical or electromagnetic instructions for our genes. One such study has gained wide attention, because it shows some of the steps required for one such interaction.

**DNA Is Not Destiny**

One of the first animal studies that demonstrated that an epigenetic signal can affect gene expression was done with mice. While mice and humans are very different in size, they are very similar genetically, so mice are often used as subjects in laboratory experiments. In the early 1990s, researchers discovered that a gene that had long been known to affect the fur color of mice, called the agouti gene, was related to a human gene that is expressed in cases of obesity and Type II diabetes. As well as having yellow coats, agouti mice eat ravenously, have an increased incidence of cancer and diabetes, and tend to die early. When they produce offspring, the baby mice are just as prone to these conditions as their progenitors.

Randy Jirtle, PhD, a professor of radiation oncology at Duke University and winner of the inaugural Epigenetic Medicine award from the National Institute for Integrative Healthcare, discovered that he could make agouti mice produce normal, slender, healthy young. He also discovered that he could accomplish this by changing the expression of their genes—but *without making any changes to*
The mouse’s DNA. This neat trick was accomplished, just before conception, by feeding agouti mothers a diet rich in a chemical known as “methyl groups.” These molecule clusters are able to inhibit the expression of genes, and sure enough, the methyl groups eventually worked their way through the mothers’ metabolisms to attach to the agouti genes of the developing embryos.

In an interview with Discover magazine, Jirtle said, “It was a little eerie and a little scary to see how something as subtle as a nutritional change in the pregnant mother rat could have such a dramatic impact on the gene expression of the baby. The results showed how important epigenetic changes could be.” The article was entitled “DNA Is Not Destiny: The new science of epigenetics rewrites the rules of disease, heredity, and identity.” Such reports are starting to crop up in news reports with increasing frequency, as the importance of epigenetic influences becomes clearer. “The tip of the iceberg is genomics... The bottom of the iceberg is epigenetics,” says Jirtle—and the larger scientific community is beginning to agree with him. In fact, in 2003, a Human Epigenome project was launched by a group of European scientists, and a U.S. project has now begun.
Nurturing Epigenetic Change

The pathway by which epigenetic signals affect the expression of genes has many steps. Diet is the one demonstrated by the Jirtle study. A second clue comes from a series of experiments that show that being nurtured generates chemical changes in the brain that trigger certain genes. Dr. Moshe Szyf is a researcher at McGill University in Montreal, Canada, who studies the interactions between mother rats and their offspring. Members of his research team noticed that some rat mothers spent a lot of time licking and grooming their pups, while other mothers did not. The pups that had been groomed as infants showed marked behavioral changes as adults. They were “less fearful and better adjusted than the offspring of neglectful mothers.” They then acted in similar nurturing ways toward their own offspring, producing the same epigenetic behavioral results in the next generation. This by itself is an important finding (confirmed by many other experiments) because it shows that epigenetic changes, once started in one generation, can be passed to the following generations without changes in the genes themselves.

When researchers examined the brains of these rats, they found differences, especially in a region of the brain called the hippocampus, which is involved in our response to stress. A gene that dampens our response to stress had a greater degree of expression in the well-adjusted rats.

The brains of these rats also showed higher levels of a chemical (acetyl groups) that facilitates gene expression by binding to the protein sheath around the gene, making it easier for the gene to express. Additionally, they had higher levels of an enzyme that adds acetyl groups to the protein sheath.

The anxious, fearful rats had different brain chemistry. The same gene-suppressing substance as in the Jirtle mouse study (methyl groups) was more prevalent in their hippocampi. It bonded to the DNA and inhibited the expression of the gene involved in dampening stress.
DNA strand with and without methyl group (in box) attached

To test their hypothesis that these two substances were causing epigenetic behavioral changes in the rats, Dr. Szyf and his team injected the brain cavities of fearful rats with a substance that raised the number of acetyl groups in the hippocampus. Sure enough, the behavior of the rats changed, and they became less fearful and better adjusted. The researchers also took the offspring of loving mothers and injected their brains with methyl groups. This produced the opposite effect; these rats became more fearful and anxious, with a heightened response to stress.

An article in *Scientific American Mind* notes depressed and antisocial behavior in mice, accompanied by methyl groups sticking to genes. It also extends this research to human beings; the brains of schizophrenic patients also show changes in methylation of genes, or acetylation of their protein sheaths.⁸

Mapping the protein pathways by which behaviors such as nurturing facilitate or suppress gene expression helps us understand the implications of our behavior and beliefs, and their role in our health and longevity. The poet William Butler Yeats said, “We taste and feel and see the truth. We do not reason ourselves into it.” We intuitively feel
how important childhood nurturing is. But the huge extent to which it affects adult health might come as a shocking surprise to you.

**Childhood Stress Results in Adult Disease**

Experiments have shown a striking link between childhood stress and later disease. One large-scale, authoritative research project known as ACE, or Adverse Childhood Experiences, was done by the Kaiser Permanente Hospital in San Diego, California, in collaboration with the U.S. Centers for Disease Control and Prevention (CDC). The researchers conducted detailed social, psychological, and medical examinations of 17,421 people enrolled in Kaiser’s health plans over a five-year period. The study showed a strong inverse link between emotional well-being, health, and longevity on the one hand, and early life stress on the other. It emphasizes that there are some negative experiences that we don’t just “get over,” and that *time does not heal.*

The physicians at Kaiser scored patients on various measures of family functionality. Stressors included an alcoholic parent, divorced or separated parents, a parent who was depressed or who had a mental illness, and domestic violence. Over half the participants had experienced one or more of the defining childhood stressors, and where one stressor was present, there was an 80% chance that others were too, leading to a web of family dysfunctionality. A low score meant few stressors; a high score indicated several. The average age of study participants was fifty-seven, so in most cases it had been fifty years since the events occurred.

The study found that a person raised in such a family had *five times* the chance of being depressed than one raised in a functional family. Such a person was *three times* as likely to smoke. Participants who scored high on the family dysfunctionality scale were at least *thirty times more likely to attempt suicide* than those who scored low. A man with a high score was 4,600% more likely to use illegal intravenous drugs. Ailments more common in those who grew up in dysfunctional families included obesity, heart disease, lung disease, diabetes, bone fractures, hypertension, and hepatitis. The genetic links between
nurturing and gene expression in children have been traced in other studies. One found that children with a gene producing an enzyme that metabolizes neurotransmitters such as serotonin and dopamine were much more likely to become violent in their teens, “but only if they were mistreated as children.”)

Loving parenting is epigenetic therapy. Now that we understand this, our society should be pouring every possible resource into supporting parents and nurturing children, instead of ignoring abuse till the horrible results appear in later years.

The ACE study’s authors compared our society’s current medical orientation to a fire crew working diligently to disperse the smoke over a burning building, while ignoring the fire below. A study of rat pups might seem like an ivory tower exercise in epigenetics. It’s not: The quality of childhood nurturing is creating health or disease in the real world every day.

It’s the Gene Show, and You’re the Director

There are certainly lifestyle factors that make a big difference in our health and longevity. Having a Body Mass Index of twenty-five or less, eating a diet rich in fruits and vegetables, daily aerobic exercise, avoiding smoking and excess alcohol—all these contribute to living to a ripe old age. These are physical behaviors we can see. Yet metaphysical things we can’t see, like consciousness and intention—expressed in our beliefs, feelings, prayers, and attitudes—also play an important role in the epigenetic control of genes, by improving our emotional state and reducing our stress. The old view that our genes contain indelible instructions governing the functioning of our bodies is, in the scornful words of my teenage offspring, “So twentieth century.”

It’s taken hard science a long time to figure out that something as softly immaterial as a belief can take on a physical existence as positive or negative changes in our cells. But it turns out that these factors can affect health and longevity dramatically. Josephine Tesauro and her sister were born with an identical collection of instruments in their genes. The music they played in their first years may have
been indistinguishable, but the finale of each of their life concerts is quite different.

As we hold the scale of health in our hands, with good health on one side and decrepitude on the other, we can tilt the outcome. If we can add a brick to the side of good health, we can tilt it in our favor. Let’s take a look at some of the bricks we can drop on our scale. Each of these is based on sound scientific research and holds lessons we can apply from this day forward.

Beliefs and Biochemistry

A landmark study linking belief to health was reported recently by Gail Ironson, MD, PhD, a leading mind-body medicine researcher, and professor of psychology and psychiatry at the University of Miami. Dr. Ironson runs the Positive Survivors Research Center at the university, and has been awarded several grants from the National Institutes of Health. It is one of the first studies to link particular beliefs with specific changes in the immune system.¹

Dr. Ironson measured several indicators of health in HIV patients over a four-year period. One measure was their viral load—the quantity of the HIV virus in a sample of blood. She also counted the concentration of a type of white blood cell responsible for killing invading organisms. The concentration of these “helper T cells” (also known as CD4 cells) in the blood is one measure of the progression of AIDS. If the concentration of helper T cells drops, our bodies are less able to fend off other diseases like pneumonia. That’s why the 踅 and 逅 in AIDS stand for Immune Deficiency; as AIDS patients lose their T cells and their immunity to disease drops, they are more susceptible to the kinds of invading organisms—opportunistic infections—that healthy immune systems easily fend off.

Studies like those conducted by Dr. Ironson are especially meaningful to physicians and biologists because they identify key biological markers of illness, as opposed to subjective measures such as the patient’s level of depression, the number of doctor visits, and the dosage of medication required.
In her studies, Dr. Ironson found that there were two particularly interesting predictors of how fast HIV progressed in the bodies of her research participants. The first was their view of the nature of God. Some believed in a punishing God, while others believed in a benevolent God. She observes that, “People who view God as a judgmental God have a CD4 (helper T) cell decline more than twice the rate of those who don’t see God as judgmental, and their viral load increases more than three times faster. For example, a precise statement affirmed by these patients is ‘God will judge me harshly one day.’ This one item is related to an increased likelihood that the patient will develop an opportunistic infection or die. These beliefs predict disease progression even more strongly than depression.”

Dr. Ironson was surprised to find that many people reported a spiritual transformation subsequent to their diagnosis. This transformation was characterized by a sense of self that was profoundly changed, and resulted in different behaviors. Many kicked their habits of street drugs like cocaine and heroin, or legal ones like alcohol. Some went through such a transformation only after hitting rock bottom. Carlos, one of them, describes his experience of getting to the end of his rope:

I was planning to finish my BA, moving to New York. I found out that my ex partner had been doing drugs and cheating with other relationships. I was very scared, and I didn’t deal with it. For six months I didn’t get tested. When I did find out, I had no friends in New York so I had to deal with it on my own. I turned to cocaine, my life changed dramatically; I was sort of spiraling downhill, near the lowest point in my life. It changed everything, it changed my behavior, it changed my ambition, I didn’t have the same drive that I had going in after school to pursue my career. Things were so bad that any belief that I had in a higher being or in a spiritual presence was completely extinguished. I was on a course downhill. I just didn’t care.

After being diagnosed as HIV positive, Carlos’s infection progressed rapidly into full-blown AIDS. He suffered from serious
opportunistic infections, and had very low levels of T cells and high levels of viral load, despite taking HIV medication.

A common gateway to spiritual transformation was having a spiritual experience. After helping a drunk white man in distress, John, a gay African-American man with a college education, described the following experience:

I felt like I was floating over my body, and I’ll never forget this, as I was floating over my body, I looked down, it was like this shriveled up prune, nothing but a prune, like an old dried skin. And my soul, my spirit was over my body. Everything was so separated. I was just feeling like I was in different dimensions, I felt it in my body like a gush of wind blows. I remember saying to god, “God! I can’t die now, because I haven’t fulfilled my purpose,” and, just as I said that, the spirit and the body, became one, it all collided, and I could feel this gush of wind and I was a whole person again.

That was really a groundbreaking experience. Before becoming HIV-positive my faith was so fear based. I always wanted to feel I belonged somewhere, that I fit in, or that I was loved. What helped me to overcome the fear of God and the fear of change was that I realized that no one had a monopoly on God. I was able to begin to replace a lot of destructive behavior with a sort of spiritual desire. I think also what changed, my desire to get close to God, to love myself, and to really embrace unconditional love.\(^3\)

John’s story points to the second major factor Dr. Ironson noted: A participant’s personal relationship with God. Her study found that patients who did not believe that God loved them lost helper T cells “three times faster than those who believed God did love them.”\(^4\) Another correlation she found was that those who felt a sense of peace also had lower levels of the body-damaging stress hormone cortisol.\(^5\)
Dr. Ironson, in an article published in the *Journal of General Internal Medicine*, showed a fairly high number of people increase their spirituality in the year after they are first diagnosed with HIV/AIDS; 45% showed an increase in spirituality, 42% stayed the same, and 13% had a decrease in spirituality. The study showed an enormously strong association between spirituality and the progression of HIV.\textsuperscript{16}

“I was surprised that so many people had an increase in spirituality, because being diagnosed with HIV/AIDS can be a devastating event. I could hardly believe the figures, until I saw that another article in the same issue of the journal found an increase in spirituality of 41% of newly diagnosed patients. Perhaps a life-threatening illness, not just HIV, but cancer or a heart attack, can stimulate a person to reexamine their connection to the sacred.”

Dr. Ironson summarizes by saying, “If you believe God loves you, it’s an enormously protective factor, even more protective than scoring low for depression, or high for optimism. A view of a benevolent God is protective, but scoring high on the personalized statement ‘God loves me’ is even stronger.”\textsuperscript{17}

This echoes another study that found that, “Patients who believed that God was punishing them, didn’t love them, didn’t have the power to help, or felt their church had deserted them, experience 19% to 28% greater mortality during the two-year period following hospital discharge.”\textsuperscript{18}

Unfortunately, many more Americans believe in the God of thunderbolts and retribution than believe in a benevolent God. In a study done by Baylor University’s Institute for Studies in Religion, researchers found that 31% of Americans see God that way. The number of people believing in an authoritarian God goes as high as 44% of the population in the country’s southern states.

Just 23% of the population believes in a Benevolent God, according to the study, while the rest fall in the middle. They believe in a Critical God (16%), Distant God (24%), or are atheists (5%).”\textsuperscript{19}
Since our view of God can have such huge effects on our health, it’s worth examining our beliefs, and if our religion or spiritual orientation permits such recalibration, adjusting them to fit the most loving vision of God of which we are capable. Carlos, the young man who hit bottom in Ironson’s HIV/Spirituality study, says,

You don’t have to believe in any God that doesn’t love you or any God that isn’t here to help you. Because I had a Catholic background, during my addiction I felt like I was being judged, that I was being punished. I thought I was going to die for my sins. So when I went to this service and I heard [the minister talk about choosing a loving God, it] changed my God to one that was loving and helpful. It was revolutionary.

Shortly thereafter, Carlos went to Alcoholics Anonymous and became sober. Though you may not be in the same dire straits as Carlos was, your body will be deeply grateful if you adjust your religious faith in the direction of a loving God.

Psychology Becomes Physiology

What we believe about ourselves alters the facts. A 2007 Harvard study examined the difference between physical exertion and physical exertion plus belief. The researchers recruited eighty-four maids who cleaned rooms in hotels. The sample was divided into two groups. One group heard a brief presentation explaining that their work qualifies as good exercise. The other group did not.

Over the next thirty days, the changes in the bodies of the women who had heard the presentation were significant: “The exercise-informed women perceived themselves to be getting markedly more exercise than they had indicated before the presentation. Members of that group lost an average of two pounds, lowered their blood pressure by almost 10%, and displayed drops in body-fat percentage, body mass index, and waist-to-hip ratio.”

This marked physiological change occurred in just thirty days, and followed one brief session in which the researchers exposed the
women to new beliefs about their level of physical activity. Imagine the effect of the background music of our own self-talk, running in a continuous loop in our heads for many hours a day, as we perform our daily routines. Making even small changes in the program can lead to significant changes in our health.

The cholera pathogen was discovered by Robert Koch in 1884 after several pandemics had raged through Asia and Europe. One of Koch’s colleagues, Max von Pettendorfer, challenged his theory that the bacterium caused the disease by publicly drinking an entire vial of cholera. So strong was Pettendorfer’s belief system that he did not contract the disease—though when his student Emmerich tried a similar stunt, he suffered forty-eight hours of severe diarrhea.

Prayer

Prayer is one of the most powerful forms in which intention is packaged. Prayer has been the subject of hundreds of studies, most of which showed that patients who are prayed for get better faster.

One such study was done by Thomas Oxman and his colleagues at the University of Texas Medical School. It examined the effects of social support and spiritual practice on patients undergoing heart surgery. It found that those with large amounts of both factors exhibited a mortality rate one-seventh of those who did not. Another was done at St. Luke’s Medical Center in Chicago. It examined links between church attendance and physical health. The researchers found that patients who attended church regularly and had a strong faith practice were less likely to die and had stronger overall health.

These are not isolated examples. Larry Dossey, in *Prayer Is Good Medicine*, says that there are over 1,200 scientific studies demonstrating the link between prayer and intention, and health and longevity. Meta-analyses in the *Annals of Internal Medicine* and the *Journal of Alternative and Complementary Medicine* have compiled the results of many studies and found that prayer, distant healing, and intentionality have significant effects on healing.
Even a recent confounding study published in the *American Heart Journal* tells us more about the limits of scientists’ understanding of prayer than it tells us about prayer itself. Under headlines like “Strangers’ prayers didn’t help heart patients heal” (*Washington Post*, March 31, 2006), stories about this large-scale study of 1,800 patients undergoing heart surgery reported that those who were prayed for had as many complications as those who did not.

A variety of explanations were advanced for why prayer had appeared to fail in this study, and some scientists opposed to prayer studies argued that it was so conclusive that further money should not be put into a consciousness-based intervention that had been so thoroughly debunked.

I was most surprised at the study’s results, until I read the fine print. It turned out that, in order to “standardize” what was meant by prayer, the researchers had designed the study so that patients were prayed for only starting the day of surgery (or the evening before), and continuing for fourteen days afterward. In addition, a standard eleven-word prayer was used for every patient: “For successful surgery with a quick healthy recovery and no complications.”

Such sterilized prayer cannot be as successful as heartfelt, spontaneous prayer. Other studies have shown that the skill and fervor of the person praying has a marked effect on the subject of prayer. One controlled, randomized, double-blind study reported in Dossey’s *Prayer Is Good Medicine* measured the ability of people to increase the growth of yeast in test tubes. Three of the people were healers (one an MD who practiced spiritual healing) and the other four were student assistants. The results showed that mental concentration and intention definitely affected the growth of the yeast. “Analysis revealed that there were fewer than two chances in a hundred that the positive results could be obtained by chance. The bulk of the positive scores was credited to the three healers. When their scores were analyzed separately, there were fewer than four chances in ten thousand that the results could be due to chance...”
In a successful study of distant healing prayer by Elizabeth Targ, MD, PhD, healers used their own unique methods. These ranged from propping the patient’s photo against a statue of the Virgin Mary to Sioux peace pipe ceremonies to the “projection of qi.” Healers repeated their intentions for ten weeks, for at least an hour a day. In tests measuring the germination rate of prayed-for seedlings, “the more experienced practitioners produced the more powerful outcomes. These studies indicate that practice, interest, and experience make a difference in spiritual healing, which for most healers is based in prayer.”

The failure of the cardiac prayer study to show an improvement was due, I believe, to the scripted and structured nature of the “prayer” designed so carefully by the researchers, but which squeezed out any fervor, passionate intent, or personalization by the person doing the praying. To be powerful, intent must be deeply, personally, and sincerely engaged. The researchers in the cardiac study were not studying the effects of prayer at all; they were studying the effects of their own beliefs about what constitutes prayer.

**Doing Good Does You Good**

Besides helping the person prayed for, it is likely that prayer benefits the person doing the praying. Studies show that regular acts of altruism prolong our lives and improve our own happiness. Prayer is good medicine for the person doing the praying as well as the receiver.

In her book *The Energy Prescription*, pharmacist Constance Grauds, RPh, describes one such study done in Michigan. It included a large sample, 2,700 men, and it studied them over a long period—ten years. It found that the men who engaged in regular volunteer activities had death rates half of those who did not. She says that, “altruistic side effects include reduced stress; improved immune system functioning; a sense of joy, peace, and well-being; and even relief from physical and emotional pain. These effects tend to last long after the helping encounter, and...increase with the frequency of altruistic
Another study had participants watch a movie of Mother Teresa. As they witnessed her ministering to the poor in the streets of Calcutta, India, they got more in touch with their own compassion. Their immune markers increased, even though, rather than performing an altruistic act, they were merely witnessing one. Similarly, a study by the HeartMath Institute found that feelings of care and compassion increase the production of immune factors. With better immune responses, those who perform altruistic acts live longer too, reducing their odds of an early death by nearly 60%.

The bottom line of these and other studies is that doing good is not just morally satisfying, it also improves your overall health, affecting the production of hormones that are markers for the production of hundreds of beneficial proteins in your cells. Cultivating an attitude of compassion, and acting according to the Golden Rule, is an act of service to your own body. Jesus’s words “Blessed are the merciful, for they shall obtain mercy” are literally and physically true.

Seven Minutes of Spirituality

A study that demonstrates the effect of spiritual nurturing was performed by Jean Kristeller, PhD, a psychologist at Indiana State University. She reported that when doctors spent time talking with critically ill cancer patients about their spiritual concerns, follow-up revealed that after three weeks, the patients reported a better quality of life and less incidence of depression. Patients who had been talked to also felt that “their physicians cared more about their health, which was in contrast to those patients in the study whose physicians did not discuss spiritual matters with them.”

And the length of time of the discussion that so affected patients’ lives for weeks afterward? A mere five to seven minutes!

Meditation

The benefits of meditation are so numerous, and the subject of so many studies, that it’s hard to know where to start. Dr. Robert Dozor, cofounder of the Integrative Health Clinic of Santa Rosa,
California, says, “Meditation—all by itself—may offer more to the health of a modern American than all the pharmaceutical remedies put together.”

Recently, neuroscientist Richard Davidson, PhD, of the University of Madison at Wisconsin, has published a series of experiments using PET scans and EEG recordings to study the areas of the brain that are active during meditation.

When comparing the results obtained by novice meditators against those of experienced meditators such as Tibetan Buddhist monks, it was found that the monks, “showed greater increases in gamma waves, the type involved in attention, memory, and learning, and they had more brain activity in areas linked to positive emotions like happiness. Monks who had spent the most years meditating had the greatest brain changes.”

This means that when we meditate, we are bulking up the portions of our brains that produce happiness. Another report noted that, “In a pilot study at the University of California at San Francisco, researchers found that schoolteachers briefly trained in Buddhist techniques and who meditated less than thirty minutes a day improved their moods as much as if they had taken antidepressants.”

Love and compassion are health skills in which we can train ourselves, and they have no negative side effects.

**Epigenetic Visualizations**

The use of visualizations to help patients cope with cancer was pioneered by Carl Simonton and others in the 1970s. I vividly remember an interview I did with a woman in 1989. She impressed me as someone with great strength of will and courage.

Nancy had been diagnosed with metastasized Stage IV uterine cancer in 1972. Though her condition was terminal, she had rejected conventional medical therapy entirely, reasoning, “My body created this condition, so has the power to uncreate it too!” She quit work, exercised as much as her physical energy allowed, and spent hours lying in the bath. She came up with a visualization that tiny stars were coursing through her body. Whenever the sharp edge of a star touched a cancer cell, she imagined it puncturing the cancer cell,
and the cancer cell deflating like a balloon. She imagined the water washing away the remains of the dying cancer cells. She focused on what she ate, how far she could walk, her baths, and the stars.

Nancy began to feel stronger, and her walks became longer. She began to visualize what her future might look like many years from that time. She went back to see her doctor three months after the diagnosis. She did not make the appointment until she had a firm inner conviction that the cancer was completely gone. To the astonishment of her physicians, tests revealed her to be cancer-free. Curiously, many patients who use similar techniques report an inner knowing that the disease is gone, long before it is confirmed by medical tests. They also use highly individualized images that work for their particular psyche.

Many years later, Nancy was still in excellent health, and she would occasionally still visualize the stars rushing through her body, carrying away whatever traces of cancer might still remain.

It’s that last detail that points to the preventive possibilities in epigenetic medicine. Meta-analysis of large bodies of research indicates that many genes express differently in cancer patients than they do in people without cancer.

It’s possible that Nancy’s ongoing “star-cleaning” visualizations, long after she was diagnosed as cancer-free, helped keep her genetic profile favorable to cancer remission. Such visualizations are also free, safe, and noninvasive. Their ongoing effectiveness could be verified with DNA screening, biomarkers, and other nonintrusive tests.

The possibilities of visualization for epigenetic healing are indicated by a recent study that examined how the expectations of seventh grade students affected their math scores. Stanford University research psychologist Carol Dweck, PhD, noticed that students had beliefs about the nature of intelligence, and it had an effect on their performance. Some students believed that intelligence is a fixed quantum, like the number of inches in your height or the number of teeth in your mouth. Others believed that intelligence can grow and
develop, like a plant. She then compared the math scores of the two groups over the following two years.

She found that students who believed that intelligence can grow had increasing math scores. The math scores of those who believed that intelligence is fixed decreased.

Dweck then wondered, “If we gave students a growth mindset, if we taught them how to think about their intelligence, would that benefit their grades?” She took a group of one hundred seventh-graders who were all performing badly in math and divided them, at random, into two groups. The first group received instruction in good study skills. The second group was told our brains grow and form new neural connections when confronted with novelty and challenge. At the end of the semester, those students who had received the mini-course in neuroscience had significantly better math grades than the other group. Dweck says, “When they worked hard in school, they actually visualized how their brain was growing.” This visualization had concrete effects on their academic performance. Visualization can affect our health, too. What we imagine, we can create. Filling our minds with positive images of well-being can produce an epigenetic environment that reinforces the healing process.

**Attitude Is Everything**

“Attitude is everything with aging,” says Dr. Andrew Weil, author of *Spontaneous Remission* and other books. He cites studies that show that negative perceptions about aging can shorten our lives, whereas positive beliefs prolong them: Older people with positive attitudes about aging were found to live seven and a half years longer than those with negative attitudes. He also reminds us that optimism heals: “A study of nearly one thousand older adults followed for nine years concluded that people with high levels of optimism had a 23% lower risk of death from cardiovascular disease and a 55% lower risk of death from all causes compared to their more pessimistic peers.” Positive older people also have better memories and stay healthier.
Overall physical fitness is reflected in walking speed; positive elders were found to walk 9% faster than negative ones.\textsuperscript{42}

Neurosurgeon Norman Shealy, MD, PhD, in his book \textit{Life Beyond 100}, summarizes four personality types and links them to longevity. The first type has a lifelong pattern of hopelessness. The second group has a lifelong pattern of blame or anger. The third group bounces between hopelessness and anger. And the fourth group is self-actualized. They believe that “happiness is an inside job.” Shealy bases his analysis on the work of Dr. Hans Jurgen Eysenck, who conducted a more than twenty year study of over 13,000 European subjects.

Eysenck reported that people in the fourth category tend to die of old age, and that less than 1% of people in this category die of cancer or heart disease. About 9% of people in the third group die of one of those two conditions.

In contrast, he found that 75% of people who die of heart disease, and 15% of those who die of cancer are members of the Lifelong Anger Club, group two. And group one, those with lifelong patterns of hopelessness, tend to die thirty-five years younger than those in group four; 75% of them die of cancer, and 15% of heart disease.\textsuperscript{43} Studies of specific diseases reinforce the findings of Drs. Eysenck and Shealy. Breast cancer survivors have much shorter survival times if they have a hopeless or helpless attitude.\textsuperscript{44,45}

While attitudes such as optimism and positivity were once regarded as accidents, research like that of Richard Davidson is demonstrating that they are also learned skills. They can be cultivated. Knowing that we are having powerful genetic effects on the production of healing proteins in our bodies provides a strong incentive to learn techniques for improving our attitudes, a therapeutic tool that can exceed the promise of most conventional therapies. As you contemplate the fork in the road between positive and negative attitudes, imagine yourself splitting into two genetically identical individuals. Both are you at the present moment. Then fast-forward twenty years. Imagine that one of the twins has taken conscious control of attitude, and the other has not. Which one would you rather be?
Why Stress Hurts

What you are thinking, feeling, and believing is changing the genetic expression and chemical composition of your body on a moment-by-moment basis. The stress hormone cortisol has the same chemical precursors as DHEA, which is associated with many health-promoting functions, as well as longevity. DHEA is the most common hormone in your body and is associated with cell repair.

Both hormones are manufactured by the adrenal glands. When the adrenals use those precursors to make cortisol, production shifts away from making DHEA. When our cortisol levels are low, the raw materials from which our bodies manufacture life-giving DHEA are freed up and production of DHEA increases. But high stress levels suck biochemical resources away from cell repair and kill brain cells. Cortisol has been shown to reduce muscle mass, increase bone loss and osteoporosis, interfere with the generation of new skin cells, increase fat accumulation around the waist and hips, and reduce memory and learning abilities.

DHEA (left) and cortisol (right) are both manufactured by the adrenal gland using the same precursors

Engineering Your Cells Consciously

The body’s stress response encompasses far more than shunting production away from DHEA to produce cortisol. Over 1,400 chemical reactions and over thirty hormones and neurotransmitters shift in response to stressful stimuli. So by de-stressing ourselves using
attitude, belief, nurturing, self-talk, and spirituality, we are taking a role in determining which instruments in our genetic symphony predominate. This knowledge opens up a panorama for self-healing as vast as the number of moments left in your life. When you understand that *with every feeling and thought, in every instant, you are performing epigenetic engineering on your own cells*, you suddenly have a degree of leverage over your health and happiness that can make a critical difference. How you use that knowledge can determine whether your unique symphony comes to an early and discordant end, or whether you play beautiful music to a long finale.
When you choose beliefs, feelings, and other epigenetic influences that benefit your health, you can create a virtuous cycle of epigenetic health. In an epigenetic health cycle, you intervene consciously with positive emotions, thoughts, and prayers. Besides making you feel good psychologically, these benefit your body, modulating your gene expression toward peak health.

This peak of health differs from person to person, and there is little value in looking at your personal peak and comparing it to that of someone else, even an identical twin. For there are external influences that are beyond your control, and they can have profound epigenetic impact. Consider, for instance, two identical twins, one of which receives more nurturing than the other. Or think about twins living in different towns, one of which has severe environmental pollution while the other does not. Like the car that rams into you from behind on the freeway, there are random life situations that are beyond your control. It’s not worth worrying about these.

Yet no matter how well or sick we may currently be, we still have the ability to choose our thoughts and feelings, and select those that support peak vitality. I call this the epigenetic health cycle.

In an epigenetic health cycle, we select positive beliefs, prayers, and visualizations that support peak health. We avoid those that do not. In this way, we consciously intervene to send epigenetic signals to our cells. These signals can reduce stress and promote the synthesis of life-enhancing hormones like DHEA, as well as thousands of other beneficial substances.

We’ve seen how powerful each of these little bricks can be in tipping the scale of our health. Positive self-talk, nurturing beliefs, altruism, attitude, meditation, and prayer can add brick after brick to the scale. But what if we had at our disposal a truckload of bricks to dump on the side of good health? Some of the emerging new therapies promise just this kind of decisive intervention, as we will see in the coming pages.