Secrets *of* Your CELLS

Discovering Your Body's Inner Intelligence

Sondra Barrett, PhD

SOUNDS TRUE
Boulder, Colorado

The best way I have to honor God
is to understand the secrets of Nature.

—DR. MICHIO KAKU theoretical physicist

Contents

Chapter 4

The Fabric of Life—Choose

Each cell can take in information about its circumstances and respond to it purposefully.

—BOYCE RENSBERGER *Life Itself*

What is it that tugs on the edges of our cells and consciousness and urges change? What convinces the cell to choose one focus of attention over another?

Cell biologists have long believed that a cell behaves the way it does because of genes, proteins, and signaling molecules. Yet pioneering scientists now show that by physically twisting, bending, and pushing the cells, *mechanical forces* help control which action a cell performs.[1]

Embedded in the design of our cells is a translucent, dynamic webbing that decides the cell's direction. While the external receptors we have learned about in preceding chapters *listen* to our molecules, the fabric or "strings" of our cells *manifest action.*

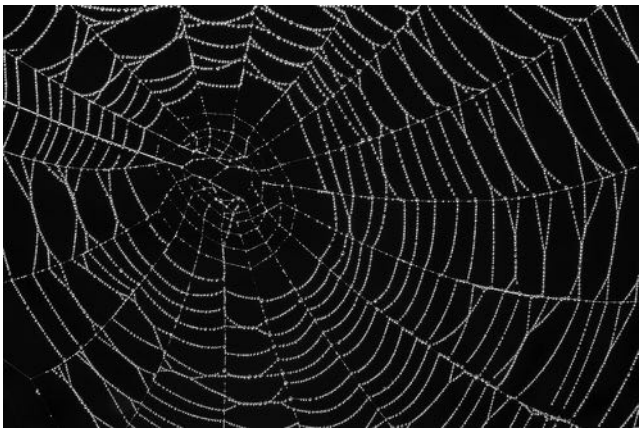

Figure 4.1 Spiderweb illustrating a similar design as the cellular cytoskeleton

Connecting inside with outside, the strings vibrate, push, and pull, guiding the cell into delivering what it's supposed to. A new fluttering on its strings plays a new tune of activities. This is the way into the secrets of our cells.

The degree of tension on the matrix of the cell regulates the cell's expression and destiny.[2] Stretching taut triggers one genetic message and outcome; letting go of some tension initiates another message and outcome. Same genes, same internal intelligence—different future. This process of balancing forces and tension is a universal law of design called *tensegrity.*[3] Tensegrity guides the pattern of human-made structures, cells, and even complex tissues. We find it in buildings and atoms, spiderwebs, stars, and molecules (see figures 4.1–4.3).

Definition

Tensegrity: Refers to any physical structure that stabilizes and supports itself by balancing opposing forces of tension and contraction. Structures are stabilized mechanically by balancing internal and external forces.

Figure 4.2 Buckminster Fuller's geodesic dome, Toronto, Canada

The term was constructed from "tensional integrity" by architect-futurist Buckminster Fuller to describe situations in which push and pull have a win-win relationship.[4] Bucky used it to build his famous geodesic domes, the most stable of human-built structures (see figure 4.2).

Donald Ingber, when taking a design class as an undergraduate biology student in the 1970s, learned about sculptures that relied on tension to hold long tubes together and create stable forms. As he contemplated this, he had an intuition that cells, too, must be tensegrity structures. Now a Harvard professor, Dr. Ingber has put tensegrity on the map of cellular design, regulation, and intelligence. At a biological level, tensegrity allows us to comprehend how changes in shape and mechanical strain influence cellular choices and actions.

Had I not experienced a moment of synchronicity, I might have overlooked this important aspect of the cell altogether. It was 1998, decades after I had studied biology, when I was in a bookstore perusing popular magazines. Two articles at opposite ends of the shelf attracted

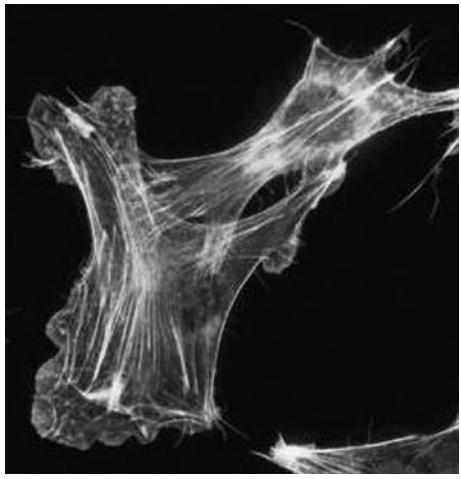

Figure 4.3 Tensegrity (cytoskeleton) in actual cell – (mouse embryonic fibroblast line) represented by the long thread-like structures; the dark round in the upper right is the nucleus; image by Feldman, M. E., et al.

my attention: one in the *Yoga Journal* and the other in *Scientific American.* Both used the Fuller-coined term *tensegrity,* which I had never heard before. One of the articles, written by Carlos Castaneda, concerned ancient practices he referred to as *tensegrity movements,* which were said to alter human consciousness.[5] The other, by Dr. Ingber, delved into the very architecture of life. He described the cell as having a tensegrity structure that guides its decision-making abilities. The notion that this architectural principle could be at work in both the microscopic stuff of which our bodies are made and in our consciousness came as a revelation.

The Architecture of Life—Cellular Mastermind

This remarkable architectural design as it manifests in living cells is the *cytoskeleton.* Likened to the cell's muscle and bones, the cytoskeleton is the scaffolding that connects all parts of the cell. It also prevents the cell from collapsing on itself. This cytoskelton matrix transports

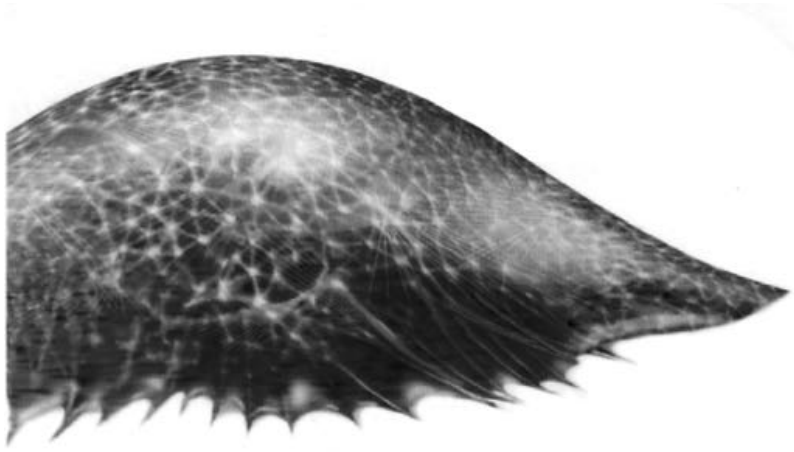

Figure 4.4 A drawing of the cytoskeleton fabric; image by Slim Films

molecules, coordinates information, and regulates genetic expression. With the ability to balance the push-pull of the cell, it is the newest biological candidate for the seat of cellular intelligence as well as the seat of consciousness.[6]

Many scientists still contend that the cell's intelligence is housed in its genes. Yet genetic intelligence is simply a vast text of chemical codes constructed from long, spiraling molecules of DNA. The text provides recipes for making the necessary protein ingredients for life—yet who, and where, is the "cook"? Some critical thinkers maintain that we could get closer to the cook—and our dynamic cellular intelligence—if we investigated how our cells are built instead of deciphering their genes. Put another way, in cellular communities, our genes are the plans; the cytoskeleton is the mastermind.

Noted scientist Dr. Bruce Lipton took cellular intelligence to the next level—beyond our genes to the receptors on the cell "mem-brain." Here we discover that cellular intelligence is carried in the interplay between receptors and the cytoskeleton.

Let's imagine shrinking ourselves until we are tinier than the cell itself so we can examine this fabric and inner scaffolding; Nobel Prize winner Christian de Duve would call us cytonauts—sailors inside the cell. To enter the sanctuary of the cell, we must first sail past the quivering receptors on the outside surface. Once inside, the sound of thousands of miniscule maneuverings attracts our attention. As we pause to listen, we observe the large "heart," or nucleus, at the cell's center. We may even hear the humming of hardworking energy generators, the mitochondria. Experimenting with the surface beneath our feet, we begin to gently bounce as if on a trampoline. Below us we see nothing but the translucent, gelatin-like cytoplasm. Looking closer, we notice tiny shimmering strings and tubes throughout this "Jell-O" holding us up and reaching throughout the cell. When we move, the strings respond. If we bounce or step lightly on one part of the cell, the rest of the cell adjusts to the change in tension. This dynamic, vibrating matrix is the true mastermind of cell intelligence.

The cytoskeletal fabric is composed of three different kinds of organized proteins: fat tubes (microtubules); skinny microfilaments; and long, willowy intermediate filaments. Acting as struts and pulleys, these vibrating filaments, tubes, and strings permeate the cell like a web. Each exerts the power to direct, manage, and coordinate cellular behavior.

Scientists have known for decades that microtubules help cells move, change shape, and divide, but only recently have we learned that they are also partners in managing cellular tension. And *a change in tension affects genetic expression* and, hence, cell abilities. Simply said, *alterations in the cell's physical state can alter its genes.* A cell that is stretched out, for example, has a different fate from one that is balled up—even though they contain the same genetic information. When pulled, pushed, plucked, or released, cellular scaffolding manifests different abilities and genetic programs. This dynamic interplay of forces keeps the cell "listening" to "choose" what to do next.

Signals felt like a pebble dropping on the surface of a pond, waves send responses inside the cell, so that the message can be heard.

Then silence, waiting for action or further listening.

—CHRISTOPHER VAUGHAN *How Life Begins*

Shifting Attention

Let's consider this further. Cells change shape and tension. They may stiffen or relax, and each physical state affects what the cell can do. For example, when an immune scavenger cell receives a tug—let's say, a message of bacterial invasion—it responds instantly. Elongating its usual spherical shape, it moves deliberately toward its prey. Upon meeting the invader, the cell attaches to it with sticky proteins, changing shape again to wrap around the intruder to eliminate it. This response requires the membrane receptors to recognize danger (that is, "not self") and attach, while the fabric inside the cell responds and coordinates the cell's activities.

Another shape changer, the microtubules, continually dismantle and rebuild about every ten minutes so that our cells are in a constant state of change and readiness, rebuilding to respond.[7] This also shows how flexible we and our cells are in allowing change. (See plate 1 in the color insert for a cell photograph of a human white blood cell (phagocytic neutrophil) recognizing and going after red blood cell from another species.)

Cellular Decision Making: Life and Death

Cell tension and shape orchestrate life and death.

Living cells do "either/or": they *either* reproduce *or* they mature; they make copies of themselves or "grow up." A reproducing cell exercises genetic intelligence only to make another cell—it doesn't produce the resources a mature cell needs. The mature cell engages a different set of genes to provide for its livelihood, and it does not reproduce (see table 4.1). The hidden strings and fabric of the cytoskeleton regulate all of this.

When we look at how cells establish growth in petri dishes, we see them anchor firmly onto the surface and then spread out on their new plastic home. Cells attach, stretch, and spread out, signaling the genes to begin dividing. New cells are made until the entire surface is covered: just as skin cells cover a gash to heal the wound, cells stretch to make more cells.

If the plastic home gets too crowded, some of the stretched cells let go of the dish and begin to assume more rounded forms. If too many cells are competing for the same space and resources, genes that trigger duplication are turned off. Cells may even turn on self-destruct genes. Consider that cells "choose" to sacrifice themselves for the benefit of the community, to make more room and food available for the rest. Is this a sign of cellular altruism?

Between the extremes of being stretched out with maximum tension (signaling growth genes) or balled up with little tension (signaling death genes), there are cells whose tension is "just right." In this in-between physical state, genetic programs instruct cells to manufacture the special "goodies" of fully developed, mature cells. Mature genetic responses maintain what's needed for their—and our—lives. Cells reproduce, mature, or die, one state at a time.

Table 4.1 Examples of Reproducing and Maturing Cells

Reproductive Phase: Make More Cells	Maturity: Functions and Products
A liver cell divides, making more liver cells	Detoxifies drugs and poisons with newly made proteins
An adrenal cell makes copies of itself	Manufactures adrenaline and releases it into the blood
An immune cell produces more lymphocytes	Produces antibodies, interferon, and protective potions

All cells in the body carry the same genes. (The exception is mature human red blood cells, which have no genes.) One gene program is launched by a tug or pull on the cell, while another is launched when tension is released. The genetic instructions carried out are influenced by cellular tension, location, and the body's chemical cocktails. The cytoskeleton is behind all of this cellular decision making.

Cells attached and stretched to their limits make copies of themselves. Over and over again, they repeat the same pattern. Cells that let go of their sticky attachments yet still retain flexibility and strength exert their maturation powers. Cells that do neither, completely let go—release—round in on themselves, and die a gentle death.

Cellular Buddhism?

Learn to let go and allow the changing mystery of life to move through us without fearing it, without holding or grasping. . . . Letting go and moving through life from one change to another brings the maturing of our spiritual being. In the end we discover that to love and to let go can be the same thing. . . . Both allow us to touch each moment of this changing life and allow us to be there fully for what arises next.

—JACK KORNFIELD *A Path with Heart*

According to a Buddhist concept, when we learn to let go of attachments, we mature on our spiritual journey. So it is with our cells. When they let go some—but not too much—they evolve into more mature citizens. They are farther along in their life's journey.

Could the idea of letting go of attachments to achieve spiritual maturity and enlightenment have arisen only from philosophical and psychological tenets? Or did clues for this idea originate with an observation or vision of the internal microscopic universe? What influenced the spiritual concept of maturity following a letting-go process?

Reflection

Attachments and Letting Go

A seed of the mighty oak tree nestles in the womb of Mother Earth.

Sending down shoots and roots, it attaches to the Earth Mother.

Only when it's connected and attached can it grow upward toward the light.

A single, tiny fertilized egg, anchoring into the mother's womb, attaches and proliferates into a trillion-celled baby. Letting go of the womb into the bright light of the world, the baby matures.

Throughout life we go through patterns of repeating ourselves, growing and maturing until our very last breath, when we fully let go.

Exploration

The Three States

In teaching, I have discovered that when we embody cell behavior, we learn concepts physically through our bodies that may be difficult to grasp with our minds. The following exploration of cellular states helps engage your cellular wisdom. Give yourself at least fifteen minutes for this exercise. Have ready a pad of paper and a special pen or a set of colored pencils, or anything else you might want to use to write about your experience afterward. If you are in a group, one person can be a timekeeper, calling out when to change states at about five-minute intervals or longer. If you are doing this by yourself, you can sense when it's time for you to change or set a timer.

Sit comfortably on the floor and let your mind and space be free of any distractions. Imagine yourself to be a cell that has choices to make. Do you want to be one that is attached, stretched out as far as you can reach and clinging to the floor, making more cells, repeating yourself? Next you might choose to experience being all balled up, surrendering to a gentle dying process. Or you could become a maturing cell, no longer tightly attached to the floor and now gaining in maturity; you can do this acting as any kind of

fully developed cell, such as one of the immune cells, a dancing neuron, or a beating heart cell. Use your imagination and pay attention to which state you want to enact first. Be with it for at least five minutes. Then shift to another state, feeling and sensing what that's like. Finally, choose the third state. You can do this in any order. When you feel the exercise is complete, write down what you experienced. What did you become aware of and what did you learn?

This is always a fascinating exploration during which people learn a great deal about themselves—it may be even more important than a better understanding of biology. Consider these states as metaphors for your own behavior. What were you drawn to first? Do you need to be making more of yourself, repeating some behaviors? Are you stuck in the same repetitive patterns, holding on too tight and not able to let go? Is there something you must fully let go of? Are you in a maturing phase of your life?

One of my students said that before doing this exercise she did not want to experience the death phase. So she put it off until almost the last minute. When she finally allowed herself to experience fully letting go, she felt great relief. It wasn't scary at all.

Letting Go—What If . . .

Until the summer of 2010, I saw the letting go process mainly in cellular, psychological, and metaphorical terms. Then I met someone who led support groups for people with cancer. In our discussions about cells and healing, a new possibility in letting go arose.[8]

He told me about people he's worked with whose cancer healed or went into remission when it "shouldn't have." The common factor he observed was that they'd let go of something *big*. Maybe it was their fear of dying, perhaps a detrimental relationship: a *big* letting go. He included himself in that group, now six years in remission after a deadly diagnosis of advanced stage IV lymphoma.

I reflected with him on the cell's letting-go process, and we both made huge discoveries and insights. Let's revisit that conversation now.

Cells attached with extreme tension keep making the same cells. The more attached and tense we are about something, the more we make the same thing: the same mistakes, the same program, body, mind, and cell. Unable to get free, we are forced to repeat the same old stuff.

My extreme mental tension about *not*—not having enough, not being good enough, the whole knot of "nots"—may hold me attached to that position. What if I finally let go of "not enough"? Will my body and mind allow me to receive a different message? Would moving my body through the different cellular states help me release this old pattern?

When we fully let go of attachment, of our "stuck-ness," perhaps we enable our cells to let go of a program they no longer need to carry out. If we fully let go, is it just possible that the cells we no longer need, like cancer cells, can now program themselves for death? Is it possible that people with cancer who let go *big* give their cancer cells permission to let go, effectively initiating the cells' own death?

What if a more intimate understanding of our cells gives us a deeper understanding of ourselves? What if letting go of a fear or a relationship or a destructive situation is not simply about emotional changes but exists concurrently on a cellular level? Just what if . . .

The questions we pursued in this conversation, which I have reflected on ever since, do not lead to the conclusion that a person's cancer remains because he or she doesn't/won't/can't let go: cancer is far more complex than that. These questions simply—or not so simply—offer a compelling idea about healing.

Doorways to the Unknown: About Cancer

Is it possible to change cancer cells by changing their tension, or their environment? Scientists in the lab are beginning to discover that some cancer cells are more rigid than normal, healthy cells, and that rigidity or stiffening triggers disorganization away from normal

cell growth.[9] When I first read that mammary tumor cells were stiffer than normal breast cells, I was not surprised, since many cancer cells are less mature and thus less flexible than normal cells. In general, normal immature cells are more rigid than mature cells. University of Pennsylvania scientist Dr. Valerie Weaver, examining cells grown in tissue culture, discovered rigidity in cancerous mammary tissue relative to healthy tissue. Not only that, she demonstrated that healthy cells that were grown on stiff materials showed abnormal tissue organization. Why? Because their cell "strings" were being pulled, increasing the mechanical tension.[10]

By contrast, chemicals that prevented pulling, attaching, and tensing permitted cells to grow into more normal-looking mammary tissue. Weaver hypothesized that mutant genes could activate biochemical pathways that increased cell tension, an early event leading to cancer. Furthermore, she suggested that by interfering with the mechanics of a cancer cell, we may be able to override aberrations in its genes. Researcher Donald Ingber is also studying whether changing the physical environment of a tumor can reverse the cancer process; he's attempting to manipulate a tumor's microenvironment by implanting artificial materials that mimic a healthy matrix. Will giving cells a softer "mattress" upon which to grow provide an environment in which cancer cells can change their genes?

We are always trying to solve the riddle of miraculous healings. Could one explanation be that when people soften their attitudes and tissues in some way, this triggers the cells to move toward normalcy? If I hadn't spent years in the lab showing that leukemic white blood cells could be pushed toward becoming more normal, it might not occur to me to ask this question: *can* cancer cells become normal? We accomplished that change in the lab using benign chemicals, though we didn't test whether those molecules worked by changing the tension of the cells or the genes. However, we did learn that their membranes became more fluid as they picked up more mature abilities in the process. But outside the lab, the question remains.

And it is followed by other questions that widen the scope of our discussion: If rigid environments can contribute to the disorganization of normal cells, what about rigidity when it comes to individual people or whole societies? How does inflexibility influence our development? What might we each be able to do to create a softer, gentler environment?

Ever wonder why someone doesn't try softer?

—Lily Tomlin

Looking back into the microscope, we find scientists discovering that if embryonic stem cells are grown *in vitro* on a stiff structure, they will be more likely to become muscle cells; when grown on a soft, rubbery structure, they will become neurons.[11] In other words, the mechanics of the environment influences the tension in the cell and its genetic expression, telling the stem cell what it is to become and which genes to use.

Changing Cancer

My passion about cancer prevention and treatment came from spending a great deal of time with children threatened by the disease. I saw the hopeful yet devastating effects of chemotherapy and radiation and questioned whether there could be something else, some other less-toxic strategy, to reverse the disease. My explorations ultimately brought me to learn more about our cells and the role of tensegrity in physically altering a cell's outcome. It also brought me to ever-deepening shamanic and inner practices for healing.

Crossing Over

In the preface I related my experience as the "balloon lady" on the pediatric floor of the hospital and of my great friendship with little Alvaro. When his leukemia returned after a year of remission, I was

overwhelmed—his death seemed inevitable, and I didn't know what to do. I called on the support of Dr. Tomas Pinkson, a psychologist who was clinical director for the Center for Attitudinal Healing at the time. Tom had also started one of the first hospices in the United States, so I knew he dealt with the end of life every day. When I called to ask him how to deal with Alvaro's impending death, he told me, "You don't deal, you feel." Of course, I didn't *want* to feel—that's why I was calling him. I was sure I'd be overcome with grief.

I met Tom in his office. Expecting a typical pristine professional space, I was surprised when he led me into what seemed to be an indigenous healer's space: it was entirely another world. On the floor were a Navajo rug and drums, on the walls were drawings and Huichol art. Tom invited me to sit on the floor across from him. Once I was settled, he lit what looked like a small bundle of twigs, blowing on them to raise smoke. Then he waved the smoke all around me. I would later learn that burning sage ("smudging," as it is called) is a Native American practice for cleansing and focusing energy.

From that moment, Tom's nonintellectual, nonlinear "shamanic" approach to inner wisdom intrigued me, and he became my lifelong teacher of healing—heart, mind, and soul. From him I learned a bit about letting go of my questioning mind and reaching into my knowing heart.

Changing Consciousness

My first experience of shamanic consciousness takes place at a drumming circle on the "left coast" of California, a place geographically, psychologically, and spiritually on the leading edge of human development. The year is 1985, and the place is a funky community center. I have traveled narrow, winding country roads to arrive here at Tomas's invitation.

Flickering candlelight brightens the darkened room. People are sitting on the floor in a circle. Some are drumming, shaking rattles, and chanting, and some are still: it is a strange scene to my scientist's eyes. I

wonder why in the world I agreed to come here. I sit down in the open space nearest the door—in case a quick getaway is called for. My mind chatters endlessly: *Get me out of here* now. *You're crazy to be doing this, and so are all the people sitting in this circle!*

I close my eyes, believing this will help me endure what I think will be a huge and awkward waste of time. But then the sound and vibration of rhythmic drumming and rattling begin to nudge me to a quiet place inside. Despite my mental struggle and the physical squirming that accompanies it, something else takes me over. The chatter stops. Images begin to fill my mindscape. And then the reason I am here becomes clear: I am to connect with a deeper kind of wisdom than I have experienced before, to seek a knowing beyond my intellect. Soon I am being held in this sacred space, and a sense of calm envelops me. I feel connected to myself, to the other people in the room, and to the divine holiness of the moment. Moments of inner peace, tranquility, and—who knows?—maybe even enlightenment penetrate my being.

Afterward, I couldn't deny my surprising and almost reluctant experience of the sacred. But my chattering mind resumed its monologue—how to make sense of this? I needed a physical explanation of how changes in consciousness and emotions occur before I could truly trust what had happened as genuine. I couldn't grasp how that internal "shamanic" shift to peace and wisdom had happened to me or to any of the others in the room whose state of consciousness had been altered. The answer was a long time in coming; it wasn't until I learned about the most elusive cytoskeleton decades later that I began to understand.

The Real Deal—Science Meets Spiritual Practice

When we drum, laugh, move our bodies, make love, or experience any other form of pleasure, our bodies surge with chemicals called endorphins.[12] Molecules ebb and flow, brain waves change, cell tensions ease,

and we re-create our emotional condition from the inside out. Our cells have the ability to use physical rhythm and the vibrating energy of our senses to create these pleasurable states. Energy shifts. Our muscles soften. We may even reach another level of being or knowing. Within our cellular scaffolding is where humming, drumming, light, movement, "vibes," and thoughts shift mind, body, and spirit.

Shape-Shifting

The underlying matrix of the cytoskeleton has roles beyond gene regulation. It is the "shape changer" and energy transformer; some say it's the seat of consciousness.

Shape change transmits information.

Shape-shift is an unusual word typically assigned to the shaman, magician, or mystic.[13] You may have read tales of Carlos Castaneda's Don Juan shape-shifting into a coyote or Harry Potter's godfather, Sirius, turning into a big black dog whenever the spirit moved him. While the idea is convenient in storytelling and myth, for our purposes *shape-shifting* means shifting our point of view and our emotional, mental, physical, and spiritual energy. According to many sacred teachings, when we change our body we shift our consciousness (and the reverse is also true). Our potential changes. Here science supports an ancient claim: if we move our bodies in certain prescribed ways, we can alter how we feel and what we are able to do. Our cellular kingdom changes. *It shape-shifts us.*

Ancient mystics and shamans discovered that certain tension-changing body postures improved overall well-being by uniting mind, body, and universal energies. To shift the mind and soul for this purpose, many traditions use complicated patterns of movement: among them shamanic dance, tai chi, yoga, and the ancient ritual postures explored by anthropologist Felicitas Goodman.

Carlos Castaneda, who purportedly spent years in Mexico studying sorcery and magic with Yaqui shaman Don Juan Matus, claimed that ancient physical practices can enable us to sense energy flows and

shape-shift our bodies. By doing what he called *magical passes,* we can tune in to both inner and outer energies and effect a change of consciousness. Though he never talked about the *cellular* tensegrity we have discussed here, he nevertheless codified these techniques as tensegrity movements—this was the subject of the *Yoga Journal* article I discovered in the bookstore that momentous day. The term is appropriate for magical passes and the other body practices previously mentioned, all of which emphasize tensing, stretching, and relaxing muscles and organs—similar to the very movements our microscopic cells naturally undergo.

An obvious question arises: if we engage in magical passes, qigong, or dance, do we change our cells' tension, memory patterns, or genes? Do we alter their intelligence or their future? By moving our bodies, can we adjust our state of mind, energy field, or consciousness? Consider that the property of tensegrity within our cells may provide a new explanation for why staying physically active prolongs life; it alters our mood and energy. It expands our potential for pleasure, well-being, and peace. Movement can change our lives; Sri Aurobindo would call this "yoga for our cells."

Our cells change shape, move, grow, and "choose" what to do with the help of tensegrity. They manage us through tensing and releasing tension. Our bodies need to stretch and move to keep our tissues healthy and flexible. Yoga and other forms of movement as well as massage and chiropractic may be viewed as therapeutic interventions based on this principle. They bring us into our bodies, help us sort out thoughts, enhance energy, and encourage letting go of patterns that no longer serve us by tapping into what I call our *cellular shaman.* When we pay attention to the matrix of forces occurring inside and outside of us, we can change our lives. Here is where science and sacred wisdom meet.

Consider that one stiff muscle can change the structure of the whole. If you have ever pulled a calf muscle or stood up from a session at your desk with a pain in your neck, you know this is the case. Tense structures share a critical factor: their tension is continuously transmitted

across all structures. The whole body reacts to a pain or pulled muscle. Muscles—which are bundles of cells—are able to shorten, lengthen, or freeze in place. A muscle held taut in one position reduces circulation of blood, breath, and information elsewhere in the body and can cause chronic pain. Rigid lung cells can hinder breathing.

> *These linings, wrappings, cables, and moorings are a continuous substance. Every single part of the body is connected to every other part by virtue of this network; every part of us is in its embrace.*
>
> —DEANE JUHAN *Job's Body*

Reflection

By understanding the mysteries within our cellular matrix, we uncover a teaching message from our cells: stretch and move for renewal and change. How have you stretched yourself today?

Tuning Our Strings

Our cells possess "tone" just as muscles do. To use an analogy, a stretched violin string produces different sounds when pressure is applied at different points along the string. In a similar fashion, a cell processes chemical signals differently depending on how much and where its cell strings are distorted or pressed.

Recalling the physical nature of our cellular matrix, we recognize that we are made of strings. Our cellular fabric shape-shifts us when we engage in physical, energetic, or shamanic transformative practices. *The strings of the universe can now include the strings of our cells.*

Only with personal experience can you find out if this is true.

Strings vibrate. Pluck a guitar string, and the adjacent strings will vibrate; the strings resonate with one another. The same is true of drums—strike one, and another close to it will vibrate in response. Consider that our cellular strings respond to movement, sound,

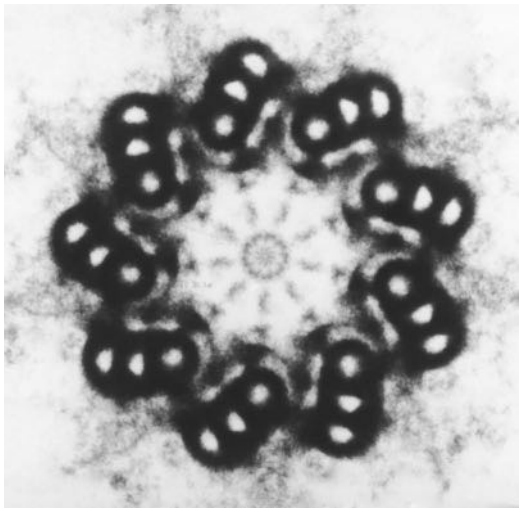

Figure 4.5 Two centrioles; notice the regular structure of nine sets of three microtubules; image by Don W. Fawcett/Photo Researchers, Inc.

humming, music, and chanting. Coming into harmony with our cells takes on a whole new meaning when you remember the resonating intelligence inside. Perhaps the scaffolding of our cells is the location where energy, movement, and vibrational healing take place.

Exploration

Strut Your Stuff

Hum, move, dance, get a massage. Discover what moves you to let go.

"Seeing" Energy

According to noted Northwestern University scientist Guenter Albrecht-Buehler, cellular movement is part of the cell's intelligence.[14] Cells seem to move intentionally toward each other: through a microscope you can see them touch and then slither away. To guide their

movements, cells see and "read" each other's energy with bizarre "eyes," strange constructions of microtubules called centrioles (each cell has two). The centrioles were once believed to only guide cell division, but now it is thought that the centriole may also be the director of all cell movement. A unique mathematical construction, each centriole is built in series of threes (3^3)—twenty-seven tubes (nine triplets) arranged to form a hollow channel in the center (see figure 4.5).

Resembling twisted pipes, the centrioles' construction is certainly unusual; their function is even more so. It is said that our centrioles can detect infrared energy generated from neighboring cells, and this is what enables them to "see" each other energetically.[15] Through their centrioles' eyes, cells pick up heat and each other.

Bending Consciousness

Energy-sensing centriole pipes cross and twist, bend and flex. Cells nearby respond and do the same. Nobel Prize–winner Francis Crick and world-renowned physicist Sir Roger Penrose join Albrecht-Buehler in proposing that the centrioles transmit information by changing their shape as a result of electrons flowing from one end of the centriole tube to the other.[16] According to these scientists, the electron flow down our cell tubes is "consciousness."

Consciousness? What is it? Where is it? One idea about which there is basic agreement is that when we are awake and conscious, we have a consciousness. Following from this, Penrose and anesthesiologist Stuart Hameroff explored the theory that microtubules are engaged in human consciousness.[17] Hameroff provided cellular evidence by exploring the effects of anesthesia—ether and halothane—which freezes the microtubules in brain cells and induces sleep. The conscious aware state halts while survival-based brain functions remain active. So when microtubules in the brain are "frozen" by anesthetics, human alert consciousness disappears. The exciting role of microtubules and cellular fabric in consciousness is certainly a fertile area for research.

Clearing Our Pipes: The Shamanic Roto-Rooter

During my now many years of training as a "wannabe shaman," and even before I started down that path, depression has been my periodic companion, visiting at times when I wanted to change but couldn't—when I was stuck. Whenever I was rooted in the quagmire of old, unproductive habits and behaviors, my shaman-teacher Tomas would tell me, "Clear your pipes! Spirit can't move through you to initiate change until you clear your pipes."

I had no idea what pipes he was talking about or where they were, and I never asked. The truth was, I was embarrassed that I didn't know. Were the pipes my arteries and veins, my windpipe, my energy channels? I didn't think much about these enigmatic pipes; I wrote them off as yet another expression the shaman used that I didn't understand.

Regardless, over the years I learned fairly dependable strategies for "unsticking" my mind or mood in the darkest of times, *if* I employed them frequently enough. Chanting and shamanic dance have been pretty consistent change makers, continuing into the present. On a recent morning spent working on this manuscript, for example, I felt the old "stuck-ness" return. My ideas felt old, my body and mind stagnant. I took a break, lit a candle, burned some sage, and closed my eyes. I began to chant, feeling my chest, ribcage, and heart vibrate and hum. At the same moment, a thought percolated to the surface: my cells had to be vibrating too! The invisible, flexing, fiber-optic tubes and webbing within my cell sanctuaries must be bouncing away, smoothing out the kinks, flexing, their electrons streaming.

An "aha!" moment—the light goes on. These centrioles could be the pipes in the shaman's directive—clear your pipes! Chanting and humming activate your cellular shaman.

Calling Your Cellular Shaman

> *A cellular shaman pulls on the strings of the invisible,*
> *and when those luminous filament are pulled*
> *or pushed, everything changes.*

A cellular shaman moves through, as archeologist, digging out old patterns and examining the remains—

To learn from, enjoy, prevent, ride through, or avoid altogether

Help your shaman choose.

Consider this: You have a particular pattern of behavior, such as reacting angrily to your partner or one of your parents, eating when you get tense, or chewing your fingernails while waiting in traffic. It's as if you have an attachment point that keeps bringing you back to the same old place again and again, all best intentions aside. Repetitive behaviors like these imprint on your body's cells.

Suppose you could cut loose from the broken record and create a new pattern to change your feelings, actions, and habitual responses. Psychotherapy can help—and so can engaging the cellular shaman.

Exploration

Drum a New Rhythm

Listen to a shamanic drumming tape, join a circle, and discover something new.

Body Prayer

Giving Thanks

Flex your wrists. Bend them back and forth.

Reach up toward the heavens; flex your wrists again. Give thanks.

Reach down to the earth, touching her, giving thanks.

Repeat this three times.

Each time, you can offer a different prayer of thanks or of intent: to feel grateful, to free yourself from pain, to take on a new discipline, to forgive. You'll know which prayer by listening to your shamanic wisdom.

Exploration

A Visualization Journey

To prepare for this journey, take some time to find a good place to sit or walk for a while. If you're walking, listen to where your feet want to guide you. Make yourself comfortable. Look around. Listen to the breeze. Feel the air or the sun on your skin. Take in the smells around you. Breathe in and out, letting the streams of air float easily together. Breathing in the universe unites us to our heritage, our home.

You can record the following instructions or simply recall them. Enjoy the journey and free your imagination.

Picture yourself entering a perfectly round structure, hide-covered and warm. There is a fire in the center, drums are softly beating, and the smell of piñon fills the air. You are home. You and your cells are peacefully at rest. As your eyes become accustomed to the dark, look around—people sit in a circle, drumming and chanting. Take a seat in the circle and notice who is in it with you. Drums beat the rhythm of your heart, and you breathe into your heart; it is resonating with the drumbeat.

Your heart cells beat in rhythm with the drum. Cells strum their tune throughout your entire body. You are breathing, moving, dancing, humming, and drumming your cells into a shared rhythm. Your mind is at peace in this cellular dance. You expand, connecting to a greater energy. Touch your own divinity and experience your own cellular shaman at play.

Enjoy this softened space and ask your cells, your shaman, and the people in the circle with you: "Is there anything I need to know or do to help expand my life?" Relax and listen. Receive whatever comes to you. Those sitting in the circle with you may have messages to guide your journey. Take in the peace and thank your cells for all they do. Thank the wisdom guides in your circle. When you are ready, shake out your hands and feet and come back to being aware and alive in the present moment. Then put what you learned into physical action to anchor it.

Reflection

When we move our bodies we begin creating new patterns; our cellular threads and neuromuscular wiring weave and anchor a new experience. We break the strands that hold us to old habits. Next time you find yourself reacting in the same old unwanted way, break the attachment to that behavior through sound or movement. The key is to begin!

What do I need to let go of?

Where is there too much tension in my life?

Am I attached to ideas, people, or habits that hinder my maturation?

What will expand me?

What contracts me?

Where am I being too repetitive?

Into the fabric of our cells our experiences are woven and rewoven.

We change the weave and pattern depending on what attracts and holds our attention and intention.

We are always in a state of creation.

What do you choose?

Untie the knots!

Break old strings and attachment points!

Weave new patterns!

Stretching Our Limits

I am visiting a friend in Santa Fe who suggests we go to an ancient sacred ritual site where she has done many ceremonies. What a wonderful idea! The day is cold yet sunny, the sky bright with blue winter light.

We arrive at one of the rare unguarded gates to Bandelier National Monument. Only a few cars are parked there, and we soon realize why; all the national parks and monuments are closed. The federal government has run out of money and shut them down to save a few dollars.

It's closed? How can this be? We have traveled all this way and want to pray there. I especially want to take photographs. I have snapped pictures of petroglyphs and pictographs in California and Arizona, and now is my chance to see what might await me at a sacred site in New Mexico. I have come to love investigating and documenting what our ancestors have left behind for us to learn from. In fact, I have been attempting to uncover a hidden language common to all cultures, human and otherwise.

My friend and I look at each other, then at the fence keeping us from our mission. The choice is obvious: climb over it! The people who belong to the few cars we see must have already done so.

We stroll up the entry path and begin a gentle climb upward. Then, after scampering over huge granite boulders, we come to a fork in the road—and a choice. Go up a ladder that has come into view, or head straight on the path and come down the ladder on our return. My fear of heights decides for me; if I go down it, I'll have to *look* down. The very thought petrifies me.

Up we climb. When we get to the top and I feel the solid mesa beneath my feet, we hear a voice. "Come back! The park is closed! Bandelier is closed!"

It's the park ranger, demanding that we leave the monument—*now!*

I argue with him for a few minutes, putting off the inevitable, dreaded trip down the ladder. "We pay taxes," I tell him. "This is our park, and we can visit it anytime. And we're not doing any harm."

"The park is closed! Come down now!"

Suddenly, for a moment, I step outside my fear and am swept with a feeling of tremendous loss. I feel the human pang of grief that comes from being exiled from sacred land. When I touch the earth at sacred sites I can sometimes sense the centuries-old spirit of life there, echoes from all the years of living, breeding, praying, playing, holding hands,

loving. When I stand on sacred ground, I can remember. To be separated from it breaks my heart.

My arguments have not worked, though, and we must descend. Terrified, I begin to follow my friend down the ladder. I feel like I'm undertaking a sacred journey, a quest—and in fact, I am. Halfway down the ladder, I reach into my backpack with trembling hands, pull out my camera, and document my journey.

Most importantly, though, and the reason I mention it in this chapter, is that the moment reminds me we have the power to *stretch. We all do.* Fear does not have to paralyze me; my cells and I can choose to *move.* This power is within you and your cells too.

We can all make the choice to recall what we already know deep in our souls: we have come here to do it right, to ignite the heart of what is sacred and divine in each of us. Barriers of mind, culture, dogma, or even karma may prevent us from remembering, but the push-pull of our cells, the intelligence that dwells there, does not forget.

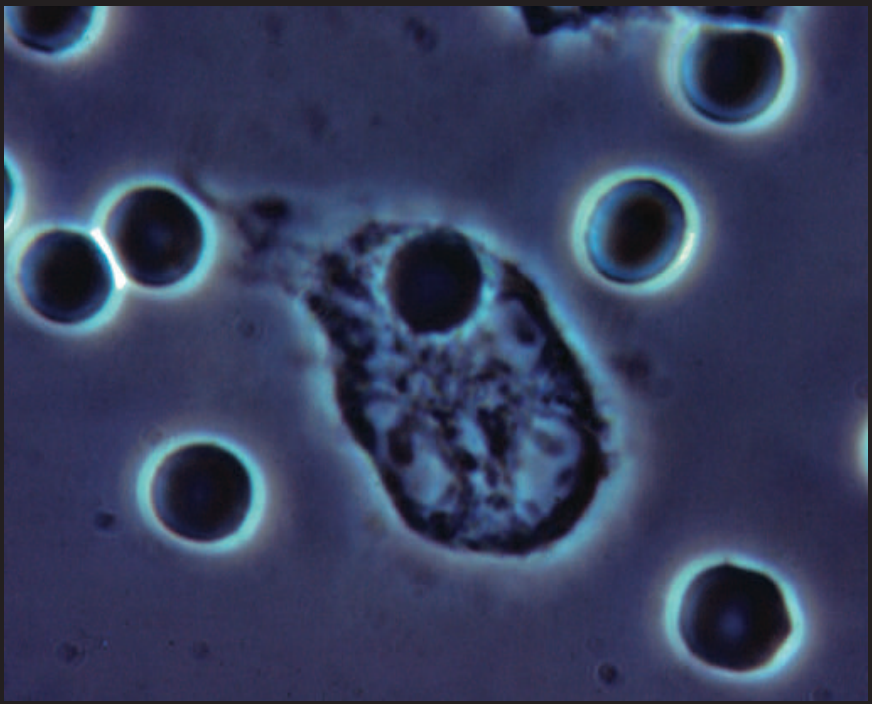

Plate 1 First cell photograph: Human white blood cell recognizing and discovering smaller cells from another species

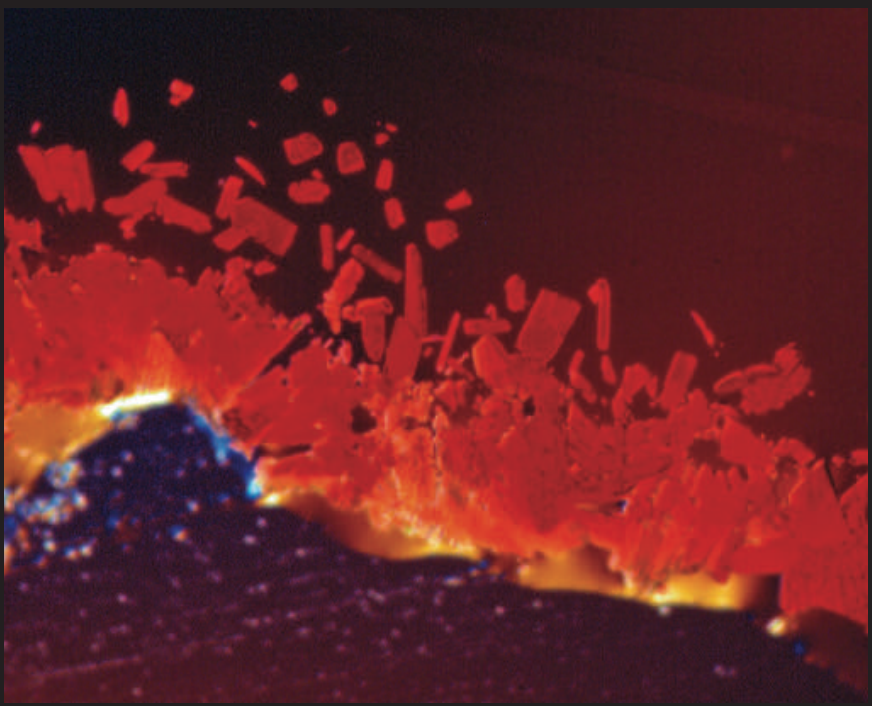

Plate 2 Vitamin B12

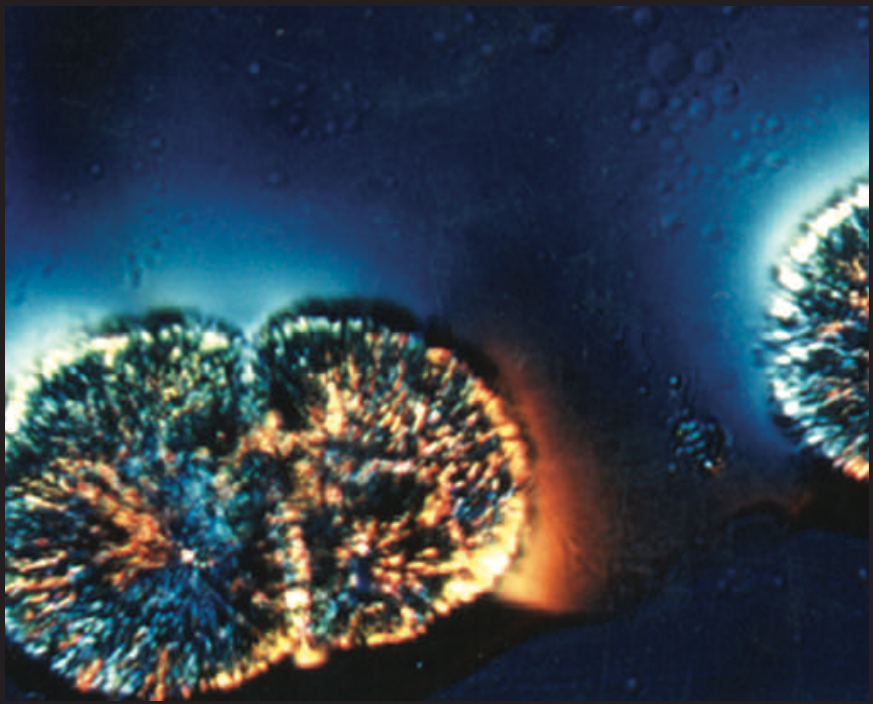

Plate 3a Earth, round, feminine—calcium phosphate associated with Capricorn

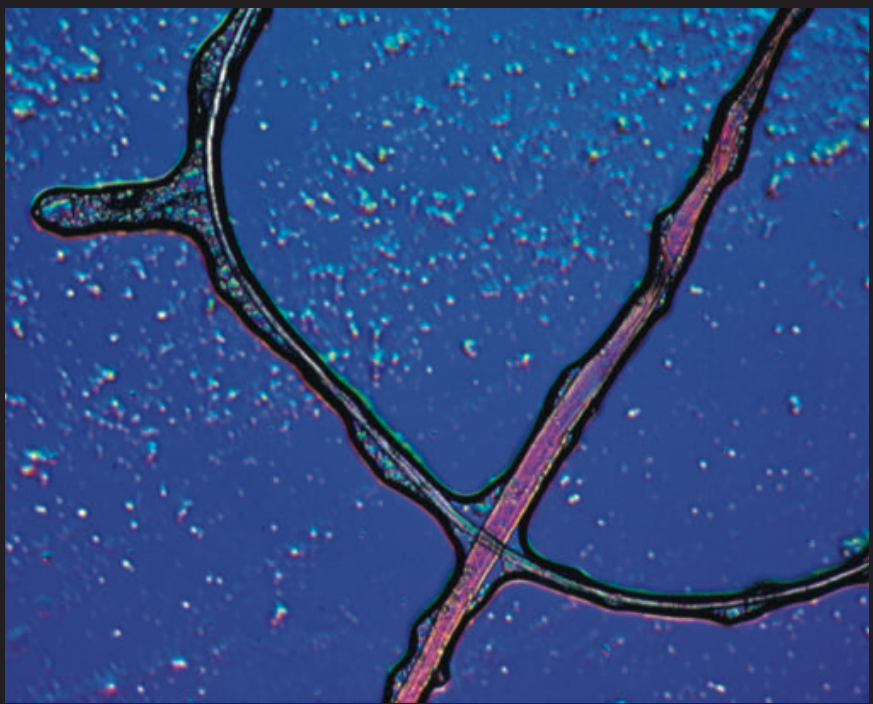

Plate 3b Water, fluid, feminine—calcium fluoride associated with Cancer

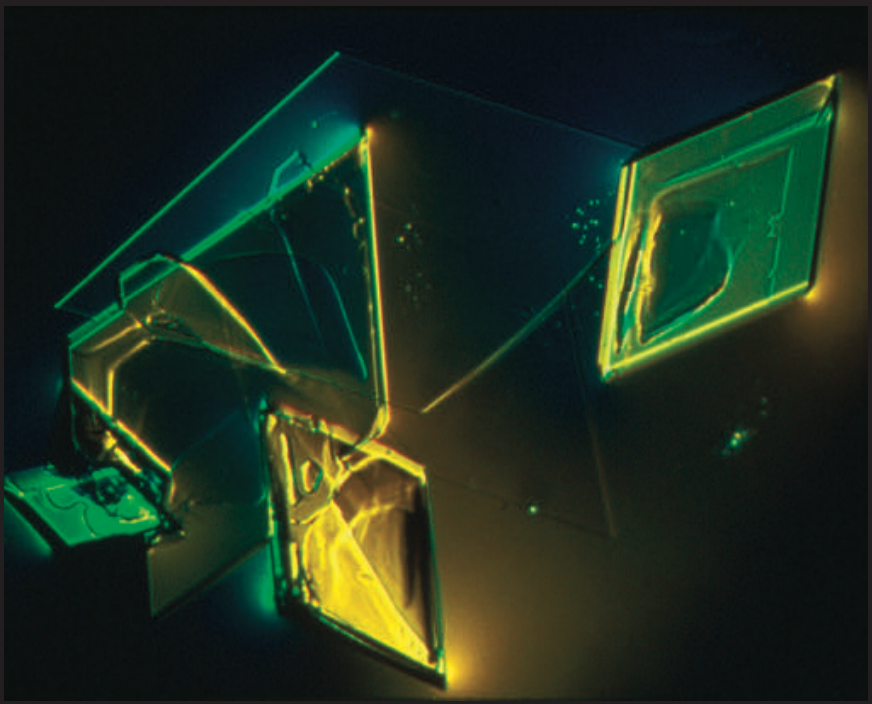

Plate 3c Air, linear, masculine—sodium phosphate associated with Libra

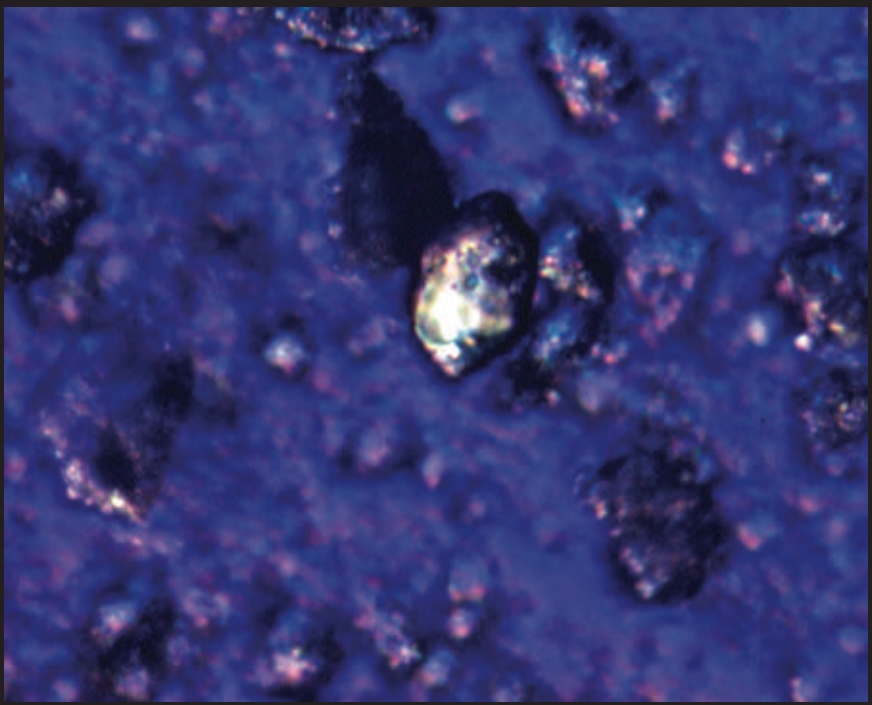

Plate 3d Fire, illumination, spirit, masculine—silica associated with Sagittarius

Plate 4 Medicine wheel pictograph

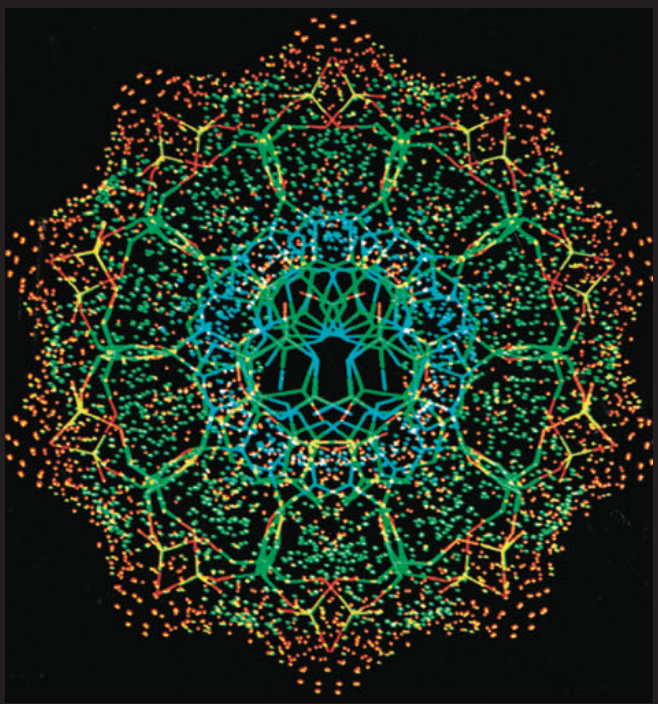

Plate 5 Computer graphic of DNA; image by Robert Langridge

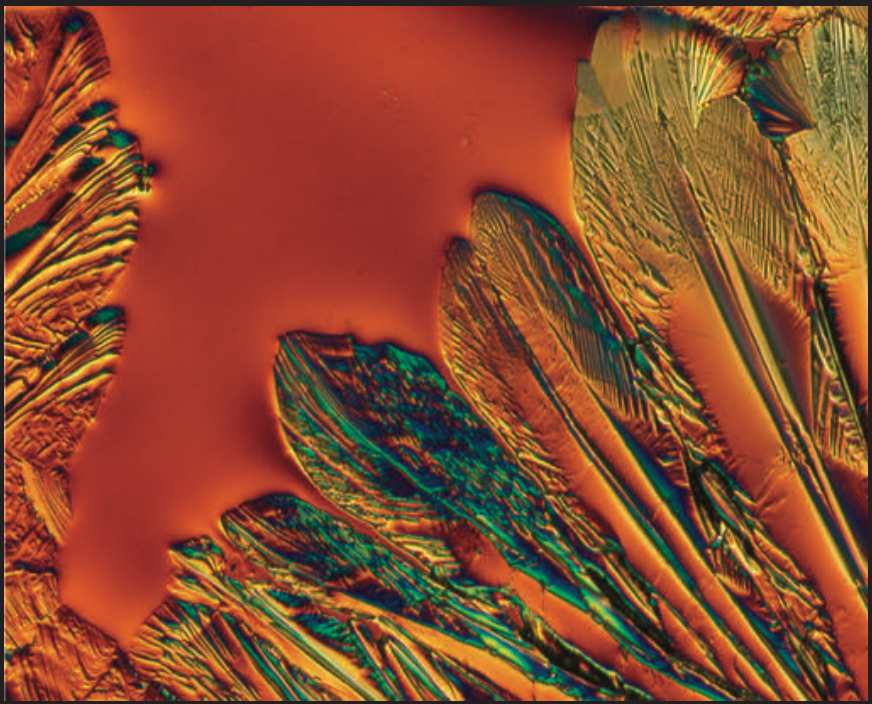

Plate 6 Sucrose, sweet taste

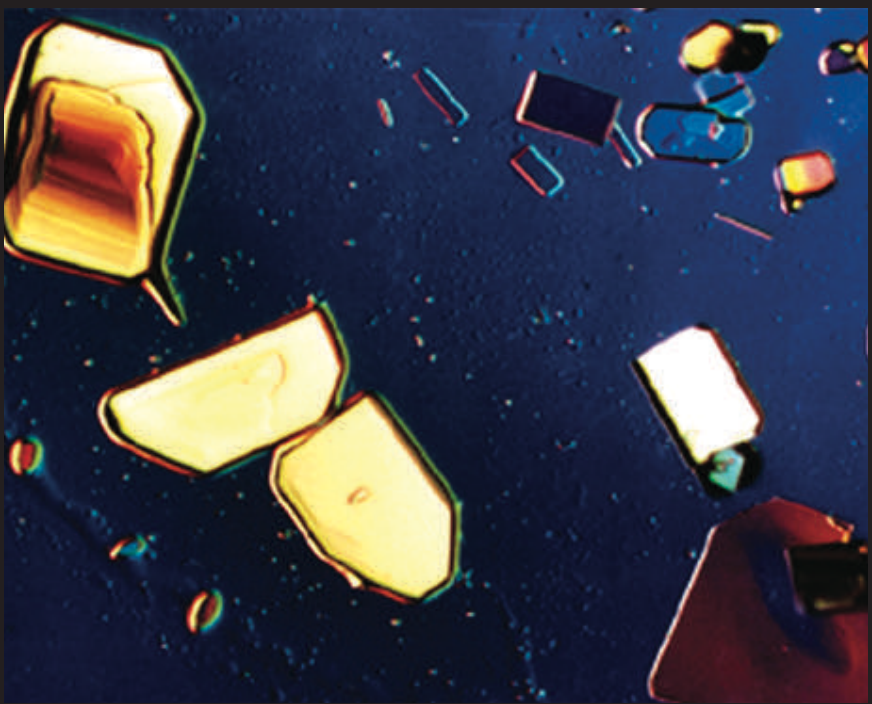

Plate 7 Malic acid, sour taste

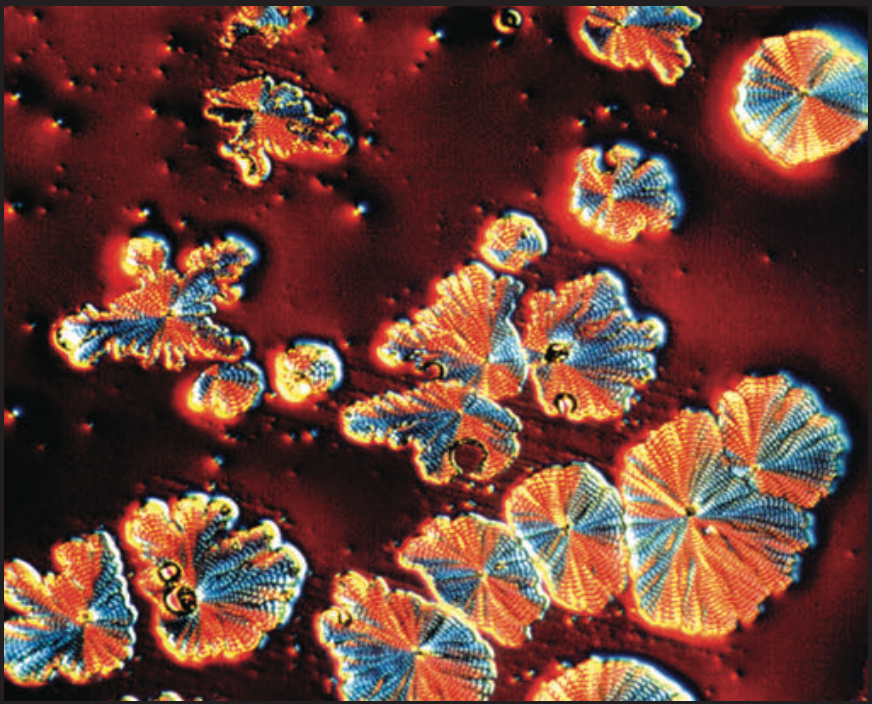

Plate 8 Adrenaline

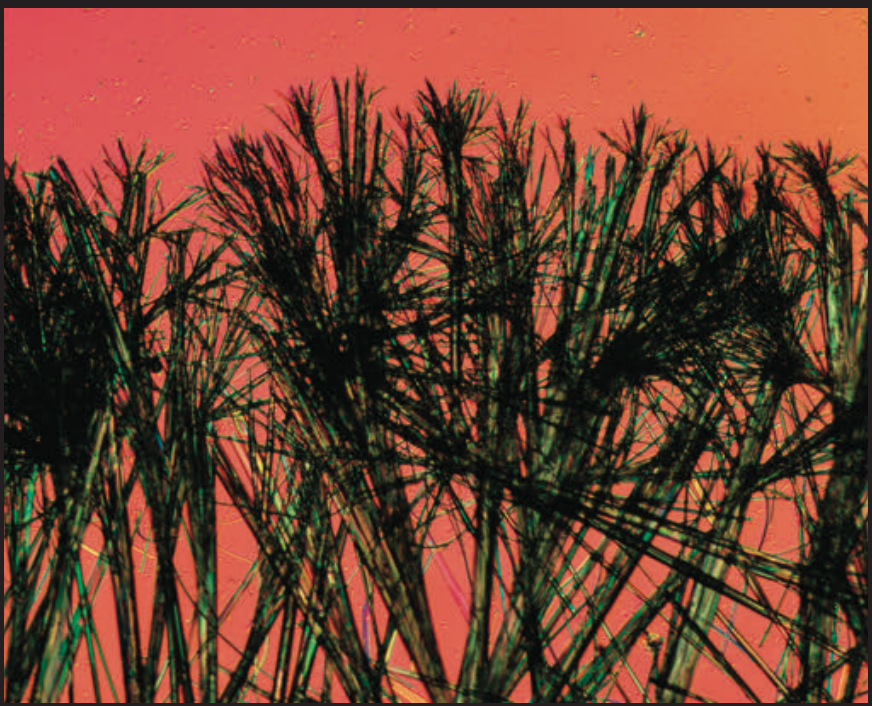

Plate 9 Caffeine, bitter taste

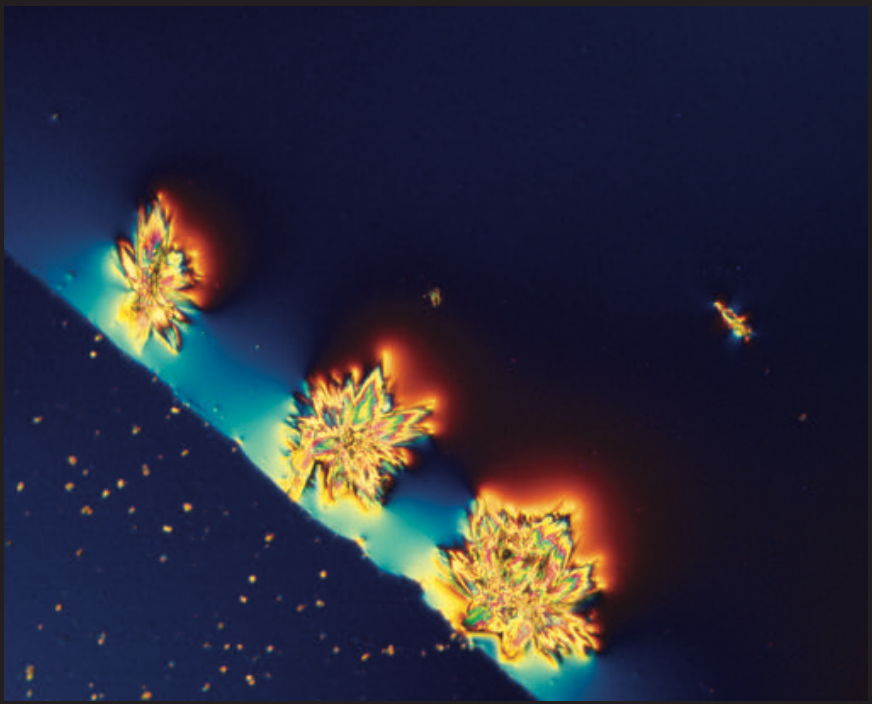

Plate 10 The molecule ATP—adenosine triphosphate

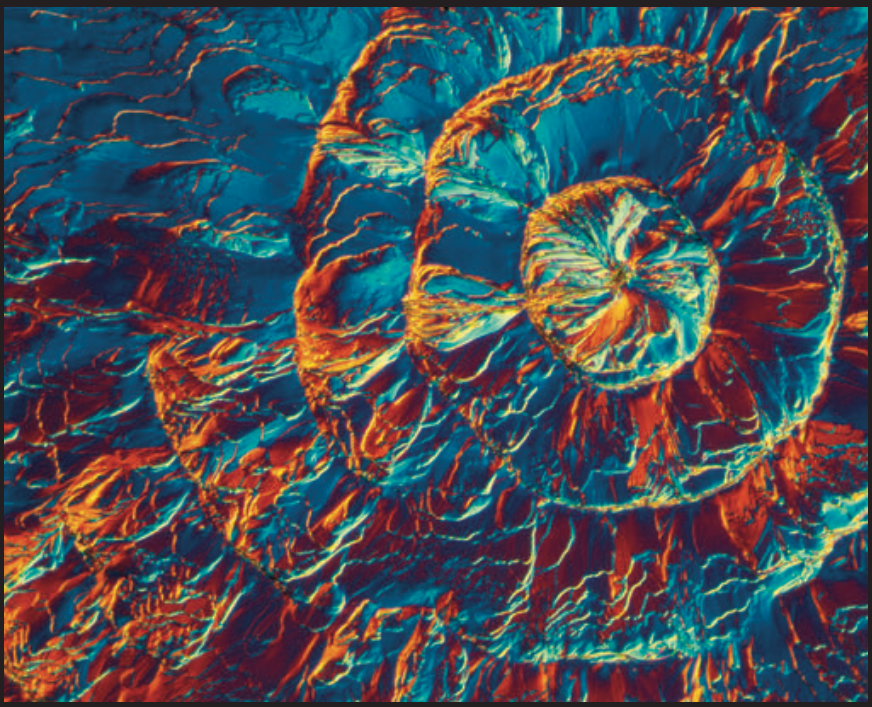

Plate 11 Creatine Phosphate—stores energy in our cells