Presidential Address

THE MUSIC OF THE HEART: A PERSONAL JOURNEY

by James L. Oschman, Ph.D.

ABSTRACT

This is a story of a personal journey and the blessings and miracles that took place along the way. Look back over your own life and recall those often-forgotten events and heartful gifts that have lead you to become who you are. The story is also about our limits as human beings: the limits to awareness, and the limits to what we can accomplish. What has emerged is a scientific basis for expanding our concepts of what we can know and what we can accomplish. One fascinating concept is that the living matrix, the fabric of our bodies, is composed of a material that enables us to sense and analyze and respond to the world around us in extraordinary ways. An idea emerged that seemed so extraordinary at first that there was little hope that it could be validated. But Albert Einstein supported the idea of looking at ridiculous ideas because of his repeated experience that concepts that do not at first seem absurd do not really stand a chance. Patience acquired from a loving father sustained an interest in the remarkable concept that our sensory receptors actually split incoming information into two pathways. One is the well-known neurological system. The other is the "integrated microcircuit" composed of the semiconductor molecules forming the fabric of the body, the living matrix. Studies of a phenomenon known as blindsight seem to confirm that we are capable of taking in information and processing it even when the neurological pathways are not operating. It is suggested that we consider the living matrix system as the physical seat of the unconscious, and the source of intuition and insight.

KEYWORDS: sensation, perception, inflammation, grounding, gravity, Rolfing, Structural Integration, neurology, living matrix, subconscious, intuition, insight, blindsight, semiconduction, syntropy, verticality, spin, quantum physics, scalar waves

INTRODUCTION

This presidential address is about a personal journey. It is about miracles and blessings. There is nothing special about the wonderful blessings that have come my way. Instead, my goal is to suggest that you to think of your own blessings – to look back over your life and think of the wonderful things that have happened that have brought you to where you are now.

When I give workshops on energy medicine, I make the outrageous statements that you know everything and that you can do anything. By the time I'm finished today, I hope you'll have an idea of why I feel I can make such radical statements.

If someone asks you if there is a scientific basis for subtle energies and energy medicine, the answer is "Yes." If someone asks you if there is a scientific basis for prayer and distant healing, the answer is "Yes." Of course there is a lot of skepticism: "It's all mental suggestion, the placebo effect. It's flakey, Twilight Zone, new age, airy fairy gobbledygook, mumbo jumbo. You probably also believe in UFO's! There is no evidence."

I view skepticism as a natural process and an interesting and sometimes helpful phenomenon. Here is what a skeptic (Hall 2005) said about my book on energy medicine: this book "implies a vitalistic philosophy: something immaterial produces life and health in a material body." I don't have a problem with that. "Oschman does not tell us what he does not believe." Actually, I think that people usually do not write books about what they don't believe. And another critique: "There are seemingly no limits to the claims of energy medicine." I like this point, because we really do not know what the limits are. Are there any limits? I don't know. So thank you, skeptics.

Of course this made me think if there are any inherent limits to what can be accomplished with energy medicine, the next logical question is, "What are our limits as human beings?" This organization, ISSSEEM, has a long history of pushing beyond what many agree are the limits in the world of subtle energies and energy medicine. In his book, *The Center of the Cyclone,* John Lilly reached an interesting conclusion about what our limits really are: "What we believe to be true is true within certain limits that are themselves beliefs. In the province of the mind there are no real limits." He referred to this as a "meta belief," a belief about belief systems. If he is correct, there may actually be no limits to what we can accomplish. So this is why I wonder if we can know everything and do anything. Knowing everything involves sensation and perception of the entire world around us. I'll say more about that later.

THANKS FOR THOSE WHO WENT BEFORE

This is a story of many blessings. I begin with my ancestors: my great-great-great-great-great grandfather, James Logan, lived in Dublin, Ireland. We don't know much

about him. My grandparents were Preston Breckenridge Logan, who was a United Presbyterian minister, and his wife, Jane McFall Logan, a very sweet woman who knew all the Christian hymns and played them on the piano during church services. She loved me dearly and took great care of me during World War II when my father was in the Navy in the Pacific. My paternal grandmother was Bessie Thresher Oschman. I remember her making amazing apple pies and I remember that she had an icebox in her apartment. A man came every few days and placed a fresh block of ice in the bottom – it was a real icebox. I never knew my grandfather. He died tragically and heroically in an accident. A steam pipe burst and he died while saving the lives of some of his employees.

My parents were Edward Logan Oschman and Anne Logan Oschman. I asked my father a million questions about the world and how it works. Whenever I asked a question he would immediately stop whatever he was doing and give me an answer. I remember specifically asking him about the moon. He used a plate and a salt shaker to explain to me how the moon orbits around the earth. He had great love for me and gave me the gift of infinite patience. This has been invaluable to me as a scientist because it has enabled me to ask very difficult questions and simply wait for the answers to come.

My mother also gave me a great gift. During the Great Depression (starting with the stock market crash of October 29, 1929), when some 25 million Americans were out of work, she got a job. That gave her a great sense of security – a belief that she would always be able to struggle through, no matter what. Many times she said to me, "Jim, people will tell you to get a secure and comfortable job. *Don't listen to them.* Security is not a secure job. Security is within you." And I've carried that with me as a belief and as a reality.

We do not always agree with our parents, but we must certainly be thankful for the lives they have given us. It is rather mind-boggling to think of the lives of those who went before us, all of the unknown things they did, their loves and hard times, and their survival so that we can be here now.

My first wife, Betty Jean Wall, is a blessing in my life. She lives in Boulder, Colorado and in Woods Hole, Massachusetts. She's a Rolfer and a Jin Shin Jitsu practitioner. I am thankful that she came to our meeting. Among many other blessings, she showed me how to cook Cantonese food.

One of Betty's thesis advisors, when she was getting her Ph.D. at the University of Pittsburgh, was a very distinguished and somewhat formidable endocrinologist, Ernst Knobil (1926-2000). I was scared of this guy. He looked like he could ask the devastating question that would make you have to start your thesis all over again. He didn't do that. In fact, he gave Betty a great piece of advice. He said, "For your post-doctoral research, go and work with the best scientist in your field. Don't be shy about it. Write to them. Tell them you want to work with them. They will respond and

they will invite you to come." And that's exactly what happened. And that led us, Betty and me, on an incredible journey to Cleveland, Ohio, where we worked in one of the best labs in the world, studying kidney physiology, and where we did some amazing research and met some remarkable scientists in the process. That was a great piece of advice from Ernst Knobil. Try it yourself. While it may surprise you, whatever you are doing, the people who are acknowledged as the best in your field will be happy to know of your interest in what they are doing.

Another blessing is my second wife (for some twenty-five years): Nora. Nora is a naturalist, among many other things. She takes very good care of me and makes it possible for me to be who I am. Nora's attitude is nicely summarized by a large sign in the library at the Marine Biological Laboratory in Woods Hole, Massachusetts. It was written in big letters by a famous Swiss naturalist, Louis Agassiz (1807-1873). The sign says, "Study nature, not books." He also said, "The book of nature is always open." That is a good description of Nora. She studies nature. She senses nature. She experiences nature. I live with lots of books, and Nora thinks they don't smell nearly as good as the outdoors. She would rather be outside studying nature than inside looking at dusty books. So we have a great balance. Nora sees and tells me about the wonderful things in nature that I will never find in books.

ROLFING, ENERGETICS, HAROLD SAXTON BURR

Rolfing (Structural Integration) has been another blessing in my life. Peter Melchior was a wonderful therapist, teacher and friend who lived in Lyons, Colorado. He introduced me to energy medicine while he was giving me Rolfing sessions, helping me find a way out of my sore back, probably from years of sitting hunched over the screen of an electron microscope. Peter was a beloved teacher of Rolfing; he was one of the first teachers of the method. Peter liked having a scientist as a client, and he introduced me to his teacher, Ida P. Rolf, Ph.D., and she, too, changed my life.

During the Rolfing sessions, Peter taught me a lot about energy medicine and specifically about the fascinating research of Harold Saxton Burr (Figure 1). I had never heard of Harold Saxton Burr – in spite of attending universities and being over-educated for more than twenty years. I wondered why his important discoveries were never part of my education as a biologist. Burr was a professor of anatomy at Yale University School of Medicine. He had done what a number of scientists do when they want to study something that is "politically incorrect." He did very conservative research, in his case on the development of the nervous system, became a full professor, obtained academic tenure so he could not be fired from his position, and then studied the subject he was passionate about: the biology of energy fields.

This was a time when medicine was becoming totally enamored with drugs, and there was virtually no interest in using energies such as light and electricity and magnetism for healing. Indeed, energy

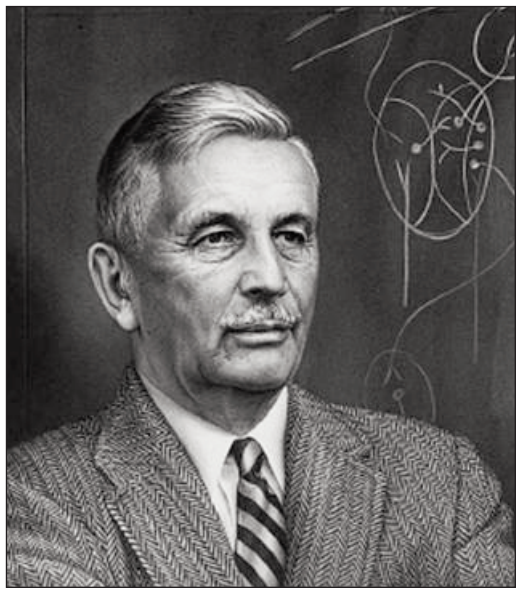

Figure 1. Harold Saxton Burr (1889-1973), Professor of Anatomy, Yale University School of Medicine. Between 1932 and 1956, Burr was responsible for hundreds of publications on the relationships between electricity and life.

therapies had been declared "scientifically unsupportable" and illegal after the Pure Food and Drug Act of 1906 and the Flexner report of 1910. What was meant by "scientifically unsupportable" was simply the fact that virtually no research had been done to determine whether these methods were effective. A century of science has changed all of that, and we now have a great deal of evidence supporting the usefulness of energy therapies.

Burr studied the relationships between electrical fields and life during a period when the medical establishment frowned upon such investigations. He and his colleagues published hundreds of papers on the relationships between electricity and life. They are brilliant papers. Read them. They will enlighten you. They are very well done; Burr was a very articulate person and his collaborators were some of the top scientists and thinkers in the country. You can see a complete list of these articles in the Yale Journal of Biology and Medicine (Burr 1957).

Burr was convinced that the early beginnings of disease can be detected in the energy field long before the development of symptoms of pathology, such as tumors. He theorized that if the disturbed energy field could be detected early, and restored to normal, the pathological changes would be stopped. For example, he developed a method for detecting the early stages of cervical cancer. He would have women touch electrodes with the index fingers of each hand. The electrodes were connected to a device that filtered out all but the unhealthy signals. A detectable electrical imbalance between the two fingers could indicate the beginnings of cancer. His research demonstrated that correction of the energetic imbalance stopped the disease process. This conclusion is virtually identical to the ancient teachings of east Asian medicine, with its long tradition of detecting and correcting energetic imbalances rather than treating pathologies.

Disease or energetic imbalance or inflammation

The implication of Burr's work, and of east Asian medicine in general, is that there really aren't any diseases – there are only energetic imbalances that can be detected

and corrected to prevent health problems and restore optimal functioning. That's a brief summary of ancient tradition and Burr's confirmation by modern measurement techniques. His work was possible because of the invention of the vacuum-tube voltmeter, a device with very high electrical impedance that can measure physiological voltages while introducing very little change to the system being measured.

All of this brings us to the most active area of investigation in biomedicine today: the study of inflammation. If you look up inflammation on PubMed, the database of the National Library of Medicine, you will find hundreds of thousands of recent papers, many of which have to do with cancer. An old article on this subject that is now being widely cited (Dvorak 1986), is entitled: "Tumors: wounds that do not heal." Modern biomedical research worldwide is focusing on persistent chronic inflammation as the cause of virtually all of the chronic diseases. Of course, inflammation is an energetic imbalance created by the focal accumulation of positively charged free radicals. In other words, modern research is confirming both the ancient concepts from acupuncture and Harold Saxton Burr's more modern research: bring energetic balance and harmony to the body, and disease will not manifest.

GRAVITY, VERTICALITY, SYNTROPY

Many noticed that the Rolfing process, which aims to balance the body in the gravitational field, seems to have a number of life-changing benefits. Dr. Rolf reported that any injury, whether physical or emotional, alters the body's relationship with the gravity field. Restoration of vertical balance can resolve the physical and emotional effects of old trauma, freeing the individual to live more in the present instead of under the "weight" of old injuries (Rolf 1977).

For a long time I wondered if there is a scientific explanation for these observations. For example, I have wondered about the collagen molecule, which is the basic building block of the human body (Figure 2). Collagen is a triple helix, and each helical protein is surrounded with a layer of water, also shown in Figure 2. When I'm standing vertically, most of my collagen molecules are oriented vertically. *Why* did evolution select the triple helix as the fundamental building block of our connective tissues and of our bodies?

Our verticality is a metaphor for who we are, what we're capable of, what we aspire to. Nobel Laureate Albert Szent-Györgyi wrote a fascinating article about syntropy (Szent-Györgyi, 1977). Syntropy is the opposite of entropy. Entropy is a consequence of the second law of thermodynamics – the tendency of structures to lose energy and order and essentially fall apart over time. Szent-Györgyi referred to syntropy as the drive in nature to perfect itself. When this concept is applied to evolution, it gives rise to the idea that evolutionary processes may be drawn toward a future goal, such as the change from walking on four legs to the upright stance. Of course, many scientists and

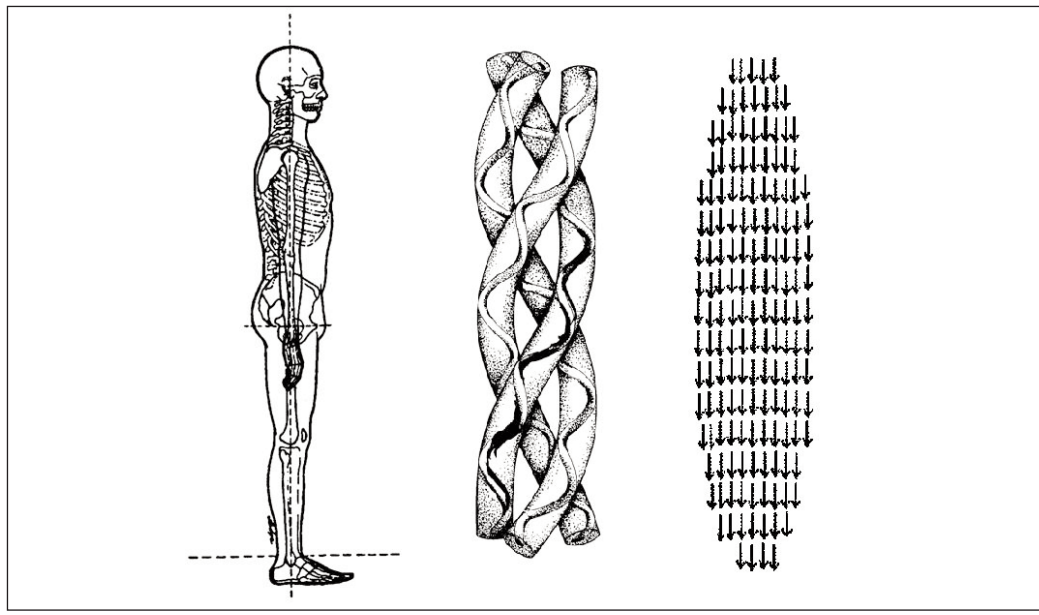

Figure 2. The vertical human form; the triple helix collagen oriented vertically in our bodies; and the water molecules in our bodies, aligned in a liquid crystal continuum, spinning coherently and aligned vertically, with the gravity field.

philosophers view ideas like this as "teleological thinking" or "vitalism," both of which are regarded by some to be entirely unscientific perspectives. Szent-Györgyi amusingly pointed out that in the scientific world a vitalist is viewed as something worse than a communist! I now see how putting such labels on a concept can block the exploration of ideas that could actually be very productive.

Here at our 2009 ISSSEEM conference, Puran Bair suggested that verticality in humans enables our heart fields to go out in a horizontal plane, enhancing our ability to make heartful connections with other people. In contrast, the heart fields of four-legged animals project downward toward the earth. Perhaps verticality does have a purpose; perhaps verticality is an evolutionary goal, a more heartfelt connection with our fellow beings. Perhaps this horizontal heart connection is complemented with a vertical connection, through our feet, to the earth. In fact, I have published a number of articles on the significance of barefoot contact with the earth, a subject I will go into in more detail later.

VERTICALITY, WATER, SPIN

Another aspect of verticality emerges from Mae-Wan Ho's work. Yesterday she showed a diagram of water molecules in the body, and she said, "All the molecules in the body, including water, are aligned in a liquid crystalline continuum and are moving coherently." These coherent motions include coherent spins, a subject that has been discussed in great detail by Stephen Strogatz in *Nonlinear Dynamics and Chaos*

(Strogatz 2001) and in his lucid and award-winning book, *Sync* (Strogatz 2004):

- Synchronization (sync) pervades nature at every scale from the atomic nucleus to the cosmos.
- Our bodies are symphonies of molecular rhythms.
- Nature uses every available channel to allow its oscillators to talk to one another.

Mae-Wan's drawing showed these molecules aligned in a horizontal plane. Here I have rotated her fascinating drawing 90 degrees, to the vertical, showing the possibility that all these water molecules that are spinning coherently in the vertical body will also be aligned with the gravity field (Figure 2). This effect could be part of the consequence of this syntropic goal in nature. Maybe this is one of the "reasons" we are vertical. Maybe there's something special here that relates spinning water molecules to consciousness. Mae-Wan has already discussed this interesting idea in her article with David P. Knight (Ho and Knight, 1998).

Related to the question of the helical nature of proteins are questions about spirals and spin (this topic was also discussed by Claude Swanson at our conference). Spirals are everywhere in nature, from galaxies to hurricanes to human structure and movement to subatomic particles. Electrons are spinning. Protons are spinning. Magnetic fields are vortices. Light travels in a spiral (this is sometimes referred to as the "cosmic corkscrew"). The light that comes from a distant star does not come to your eye in a straight line – it spirals through space, which itself has a spiral grain or fabric (Ginzburg 1996, 2002). Light spirals into the eye through the cornea. The plywood structure of the cornea, with each layer offset from the one above, makes it very strong structurally, but the arrangement may also be crucial for the transparency of the cornea by allowing light to spiral through it.

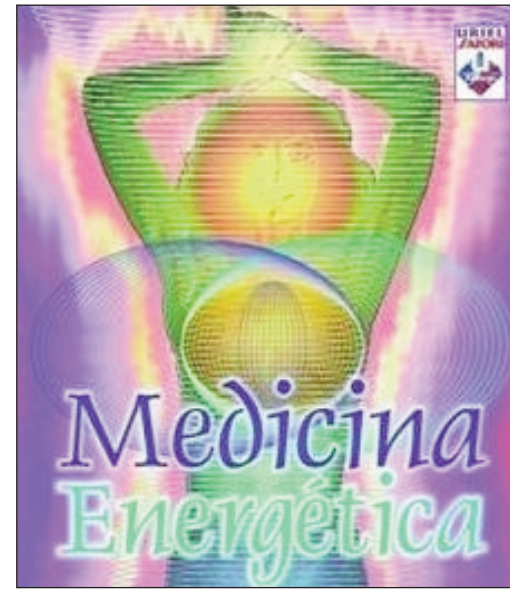

Figure 3. The Spanish edition of Energy Medicine, illustrating a vertical energy vortex in the human body and the torriodal field produced by the heart.

Many of the molecules in the body are helices: DNA, collagen, keratin, and so on. Energy spirals through the body. The heart's field is a vortex. This is illustrated on the cover of the Spanish edition of my book (Figure 3). The artist who made this cover illustration, Daniel Forte, showed us

something profound. He illustrated an energy vortex coming vertically down through the body, and the torroidal field produced by the heart. The energy coming from the hands of healers is vortical as well.

Here is a quote from Dr. Deepak Chopra, from the forward he wrote for a wonderful new book by Duane Elgin (2009) entitled *The Living Universe:*

> *The more we are in touch with the universe we come from, the more we will be able to heal ourselves and at the same time heal our planet. We are an integral part of a living and intelligent universe.*

Perhaps the practice of alternative and complementary therapies helps us get in touch with the universe we are a part of. Perhaps this is the experience of profound energetic connection that happens from time to time during therapeutic work.

Here's a quote from Yasuhiko Genku Kimura that relates to this topic:

> *You are the world. As you are woven into the fabric of the world, so is the world woven into the fabric of your being – as if holographically. You are humanity. As you are a part of humanity, humanity is a part of you. To know that you are the world, that you are humanity, is to have true compassion, and to act from this knowledge is to be moral in the deepest sense of the word.*
>
> –Yasuhiko Kimura

A key question in energy medicine concerns what happens when you bring your hand near somebody's body without touching them, as happens during Reiki or Healing Touch or Therapeutic Touch or Polarity Therapy or other techniques. What is the nature of the relationship that is created through the energy field? Does this relationship involve our connections with the universe we come from? These are issues I have thought about for a long time.

Reiki is now being offered in hospitals all over New England and in major medical centers around the country. This is a revolution that took place very quickly, and is spearheading the movement of alternative medicine into hospitals. Another blessing I'll mention is Melinda Connor. We can ask the question: Has anyone ever actually measured biomagnetic fields coming from Reiki practitioners or other energy therapists? Melinda did that (Connor and Schwartz 2006). Thank you, Melinda and Gary, for your cutting-edge work. They measured the biofield with a very simple magnetometer. This has opened up the opportunity for all of us to study our own energy fields.

Puran and Susanna Bair are also blessings for all of us. When I was asked who should be on our committee to organize this conference, I asked for them, and they kindly agreed. They have delivered their blessings to you, and I'm so grateful for that. Puran's book (Bair 1998) will change your life. It is entitled *Living from the Heart, Heart Rhythm Meditation.* I love this book. I tell everybody to get it, read it, and do the practice of heart rhythm meditation.

And the Bairs now have another beautiful book: *Energize Your Heart* (2007).

Woods Hole, Albert Szent-Györgyi, electronic biology

Woods Hole is a transcendent place for a biologist. I have worked there for a number of years, first with Betty and later with Nora. The first time, our lab was across the hall from the Institute for Muscle Research that Albert Szent-Györgyi set up a few years after winning the Nobel Prize in 1937 for the synthesis of Vitamin C. (Figure 4.) He discovered actomyacin, which led to a prestigious Lasker Award in 1954. That discovery laid the foundation for all of modern muscle biochemistry. And then he went on to create a new field of electronic biology or solid-state biochemistry. *Very few scientists followed him.* The scientific community thought he was crazy or senile, or maybe both. And this probably was his most important work. But nobody paid attention. I asked many people in the scientific community, "Do you know about Dr. Szent-Györgyi's work on electronic biology?" "Yes." "What do you think of it?" "Oh, well, it's just not very important." I thought, *what?* "Well, what's the problem with it?" A common response: "I don't really know enough about it to give a good answer."

I discovered that scientists can be lazy-minded. If some new information comes along, many would prefer to ignore it, because it makes their life easier. In the case of Szent-Györgyi's work, they would have to learn some quantum physics to understand what electronic biology is all about. In those days, few biologists were interested in quantum physics. Fortunately this is changing, and Dr. Szent-Györgyi's seminal work in molecular electronics and semiconduction in collagen is finally being recognized (e.g. Hush 2006).

Figure 4. Nobel Laureate Albert Szent-Györgyi (1893-1986), M.D., Budapest; Ph.D., Cambridge; pioneering muscle biochemist, and creator of the field of electronic biology.

Szent-Györgyi reached some interesting conclusions. He said, "Life is too rapid and subtle to be explained by slow moving chemical reactions and nerve impulses." There's something else going on. He got this idea from watching his cat. He went on a camping trip in England with his cat. One morning, the cat walked out of the tent and saw a snake in the grass, and the cat went BOING, straight up in the air. And he thought about that.

A well-known quote from him is, "Discovery consists in seeing what everyone else has seen and thinking what no one else has thought." So he thought about the cat for a long time. And he thought: cat sees snake in the grass, image falls on retina, image gets converted into nerve impulses that go through optic nerve to brain, brain recognizes snake as dangerous, signals are sent down through motor nerves to muscles in legs, muscles contract, and BOING – cat goes up off the ground. No! It was too fast for that sequence of events. Something else must be going on.

This is from an interview with Ron Pethig (2004), one of his colleagues:

> *The cat just suddenly shot up in the air because it had seen a snake, and he (Szent-Györgyi) said there was no way that the whole reaction, that cat, everything in that cat, would turn on all at once. There was no way that that could be related to anything mechanical. It had to be sub-molecular.*

In other words, the reaction was far too fast to be explained by neural impulses traveling at meters per second in the neuromatrix, and biochemical processes that are rate-limited by random diffusion. He was forced to look at this from the perspective of quantum physics.

It turns out there's just not enough time in *many* of the things we do for our nervous systems to handle them. This shows up often in athletic and artistic performances. For example, it's impossible to hit a baseball. Scientists who have looked at baseball have reported that there is just not enough time between the instant the pitcher releases the ball and the moment it crosses the plate for a hitter to spot it, react to it and move the bat across the plate to meet it (Slater-Hammel and Stumpner 1950). It can't be done.

Ted Williams, who was the greatest hitter of all time, the only hitter to end up with a 400 average at the end of his career, wrote a book called *The Science of Hitting* (Williams 1986). In his book, he said that the way to hit a baseball is to watch the pitchers intently. Study everything the pitcher does. And then when you get up to bat, you guess. *You guess.* That's how you hit a baseball!

Another example is provided by the cheetah running at 70 miles an hour. When the cheetah's foot hits the ground, she senses the surface and uses that sensory input to adjust her musculo-skeletal system for the next stride. A simple calculation shows that if that process is accomplished by nerve impulses going from the bottoms of her feet up to her brain and then other nerve impulses going back down to adjust the tensions in her musculo-skeletal system, she would go seven steps before the adjustment could be made. It's impossible. There has to be something else that is much faster.

This is about another side of us. We know about our neural side – I'm glad I have a nervous system, and I want to keep it as long as I can. But there's another system that's much faster.

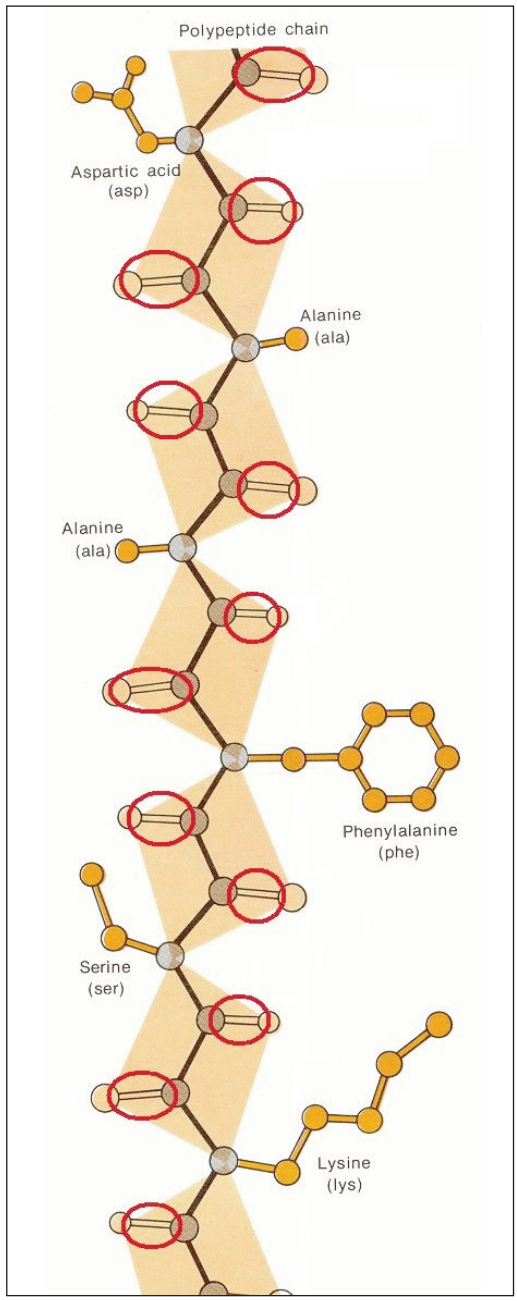

Figure 5. Polypeptide chain. Double bonds in the protein backbone provide free, mobile or delocalized electrons.

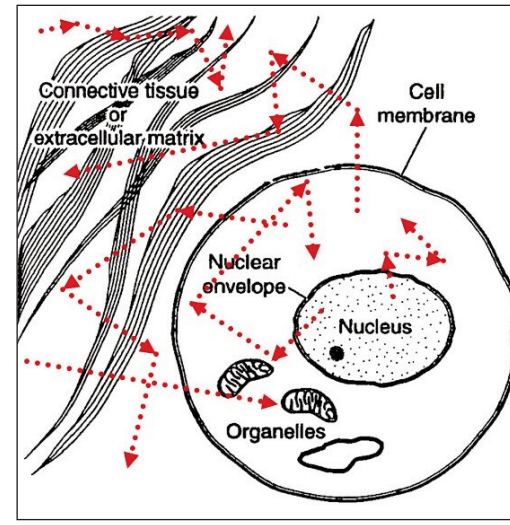

Figure 6. Bag of Solution Model: teaches that regulations are rate-limited by random diffusion of signal molecules.

We called Dr. Szent-Györgyi "Prof." Here's what Prof said:

> *The proteins are the stage upon which the drama of life unfolds. The actors can be none other than small and highly mobile units such as electrons and protons.*

He suggested that each of the double bonds in the protein backbone has a pair of electrons (Figure 5). One electron has to stay in place to provide structural stability, while the other electron is free to move. These are referred to as free, mobile or delocalized electrons.

THE LIVING MATRIX

We are taught that the cell is a bag containing a solution (Figure 6). The signals that regulate our biology are molecules that move through tissues and within cells by random diffusion. Diffusion

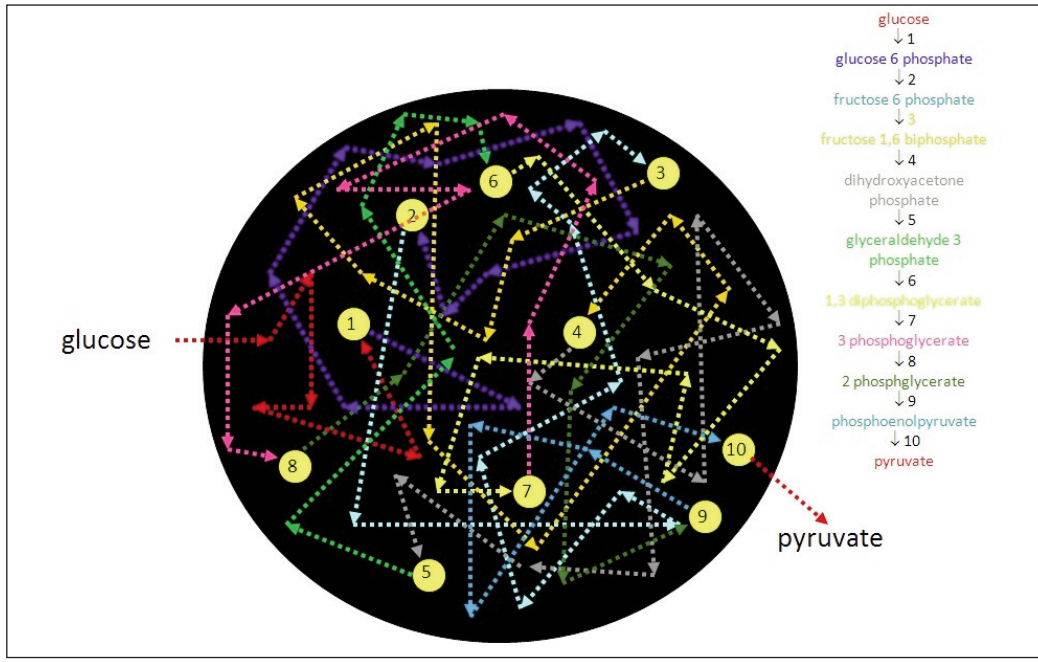

Figure 7. The drunken-sailor model of metabolism – an impossible mechanism.

is a very slow process. Life is too fast for this.

Likewise, we're taught that biochemical reactions involve molecules randomly staggering around inside the cell until they chance to collide with enzymes and substrates. I call this the drunken-sailor model of metabolism. This is just too slow.

As an example, glycolysis, the breakdown of sugars, is a ten-step process involving ten different enzymes. In the cell soup model we are usually taught, these enzymes are moving targets floating around inside the cell (Figure 7). We are taught that glucose comes into the cell and staggers around until it chances to meet the first enzyme, which attaches a phosphate molecule to create glucose 6 phosphate. The glucose 6 phosphate then staggers around looking for the second enzyme in the sequence, and so on, through ten stages, leading to the production of pyruvate. This staggering around process is supposed to explain how sugar is metabolized. This mechanism is obviously impossible. If this were the way sugar is metabolized, it would take you ten thousand years to digest your breakfast. It can't be like this.

A much more realistic view of cell structure and metabolism is this: the enzymes are organized on the matrix, on the fabric of the cell. The enzymes for glucose metabolism are aligned in sequence on the matrix. It is like the assembly line in an automobile factory: glucose hits the first enzyme, is

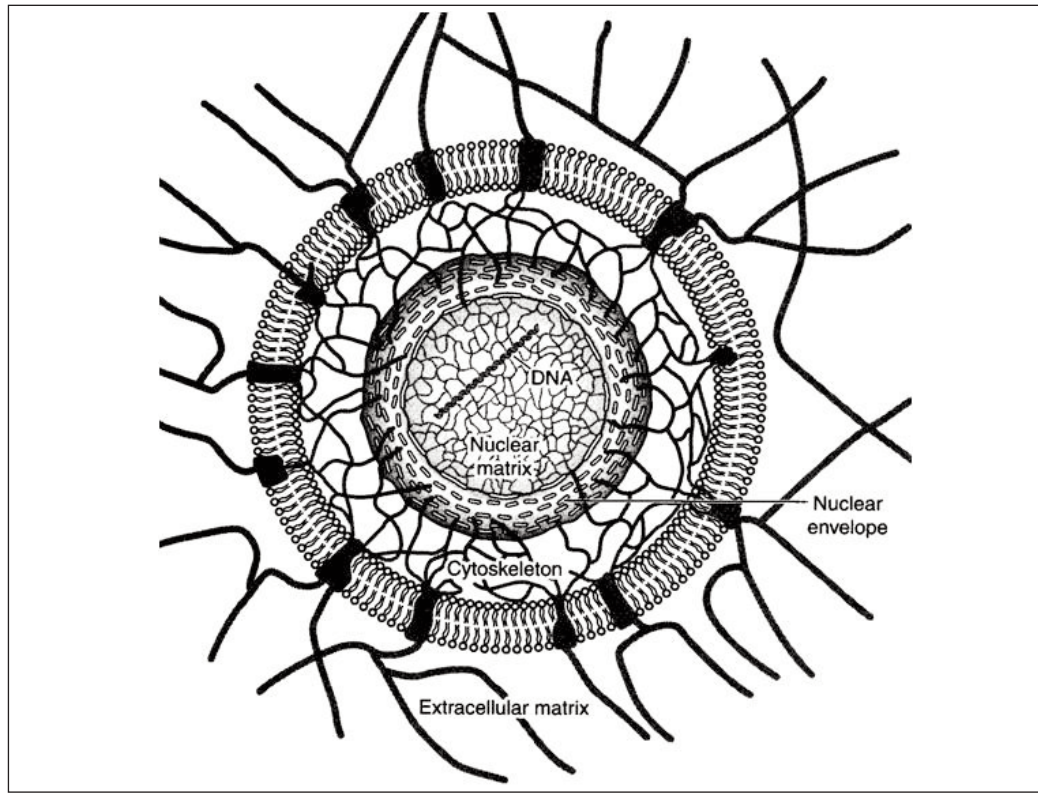

Figure 8. The Living Matrix. The extra-cellular matrix is hard-wired to the cytoskeleton nuclear matrix. The links are both mechanical and energetic.

passed to the next enzyme, and so on, until pyruvate pops off the other end of the chain. Biochemists have known about these enzymatic assembly lines for a long time. They are called the metabolons (Srere 1985). The velocity of molecular motions has actually been measured, using a technique called femtosecond spectroscopy, for which the Egyptian chemist Ahmed Zewail received the Nobel Prize (Zewail 1999). Using a clever system involving pulses of laser light, Zewail was able to estimate the velocity of molecular motions during chemical reactions. Remarkably, they occur at the speed of a rifle bullet, about 1000 meters per second.

The cell is really not a bag – it is better described with reference to the whole system, connective tissues, membrane proteins, and the structural fabric of the cell and nucleus. In a paper presented in January of 1993 I referred to this whole system as "the connective tissue/ cytoskeleton matrix." Later in the same year, Nora and I began using the term *living matrix* (Oschman and Oschman 1993) (Figure 8). The specific sentence in that paper was, "Therefore while we are discussing the cell membrane we keep in mind that we are dealing with a component of a vibratory living matrix, a component

that is connected with elements of the cytoskeleton, nuclear matrix, connective tissue, and fascia." *The living matrix* concept has been widely accepted in the alternative medicine community, as evidenced by more than a thousand references to it on the World Wide Web.

Cell surface molecules called integrins actually integrate what is going on inside of the cell with what is going on outside of the cell. They connect the cytoskeleton to the outside world, and vice versa. The cytoskeleton also interacts with the nuclear envelope and the nuclear fabric, and DNA within the nucleus. The extra-cellular matrix is hard-wired to the cytoskeleton nuclear matrix. The links are both mechanical and energetic. So this is the basic design of the body. The cell has a nucleus, which is a matrix, which is inside of a larger matrix – the cytoskeleton – which is inside of a larger matrix, which we call the connective tissue.

Maurie Pressman always gently reminds me that there's another matrix outside of the body: the bio-field and the other energetic emanations of the body. So we're really talking about a matrix inside of a matrix inside of a matrix inside of a matrix.

The integrins link the cellular matrix with the extra-cellular matrix, and the various connective tissues: tendons, ligaments, myofascia, cartilage, bone, and superficial fascia. This is a continuous system; we use words to describe its different parts, such as fascia, tendon, ligament, cartilage, and so on, but it's really a single continuous system. When you interrogate the matrix, you can interrogate the whole organism, including all of the tissues and cells and the genetic material. When you energize the matrix, you can influence the entire organism, including all cells, tissues and the genetic material. The living matrix influences every physiological process in the body. It is a material and energetic substrate for communications that integrate and coordinate all actions, including the healing of injuries and diseases.

This model helps us understand epigenetics, which teaches that every thought we have, every word we say, every word that is said to us, every event in our lives affects our genetic transcription. For example, see Bruce Lipton's classic *The Biology of Belief,* and the award-winning book *The Genie in Your Genes* by Dawson Church (2009). I believe the matrix is the system that connects our thoughts, our words, and the events around us, right down to the nucleus and the genetic material. It is an informational system that goes everywhere in the body. The model has been very valuable to alternative therapists because it helps them understand their experiences of touching the body in one place and affecting processes at a distance, or even affecting the body as a whole. Likewise, many therapists find that they can "tune in" to the whole system when they touch one place on the body, and may wonder how this works. This has to be a classic example of a system we are talking about when we use the term "holistic." It makes whole-systems thinking politically acceptable, because we know a great deal from modern biomedical research

about all of the thousands of components in this system. It is a concept that has been built up from reductionist research done over a very long period of time.

Another blessing: Roger Taylor. I met him here at this conference. I'm so grateful that he came to be with us. He said some very interesting things. He raised the fundamental question (mainly quoting from Mae-Wan Ho, 1994): "How do we account for the unitary nature of a living organism: the way it responds as a whole to any stimulus – as if every part of it knew what every other part is doing?" As I mentioned above, Dr. Szent-Györgyi asked the same question in a slightly different way. Mae-Wan went on to say, "Life has this holistic property at any scale, from an amoeba to an elephant, and whether or not it has a nervous system." This is some of the poetry of modern science!

Biologist Andrew Packard posed the question in a slightly different way: "How is it that an organism behaves as a whole, and not just a collection of parts?" And Mae-Wan provided an answer:

> *Quantum physics provides us with an exact science for which such a holistic view is only natural. It lets us understand how the wavefunctions of protons and electrons which make up an atom or molecule sink their individuality into a common wavefunction: an irreducible holistic property. I want to persuade you that a living organism is a quantum being, with a unified wavefunction, in the same way that an atom is.*

Well, that's something to think about.

Here's another example of this unified wavefunction. In Oslo I met a physician who is a classical homeopath. She gives people their constitutional remedy, a substance that emits a specific frequency that resonates with the particular individual, their core wave function. She has done this for so long that she can look at a person and tell what their constitutional remedy is. Of course, we emit many frequencies, but there is a fundamental frequency that is highly individualized. She told me what she thought my constitutional remedy is. What convinced her that she had the right remedy was when I was going through my bag and my copy of *Mama Mia* fell out. And she said, "Oh, that's it. You're an artist. That's the last piece I need to confirm your remedy."

LIGHT THERAPIES AND SENSATION

In my travels I meet many different kinds of therapists. One little-known remarkable therapy is called Syntonic Optometry. These are optometrists who also practice a healing technique that involves putting particular colors of light into a patient's eyes. I was very impressed with the therapeutic effectiveness of this method. Of course, I wanted to know how it works. How does a light in the eyes affect a disorder in the abdomen, for example?

I thought about that for a while, and I remembered something from histology from a century ago. (Figure 9). Histologists studying the retina noticed a structure they referred to as "the outer limiting

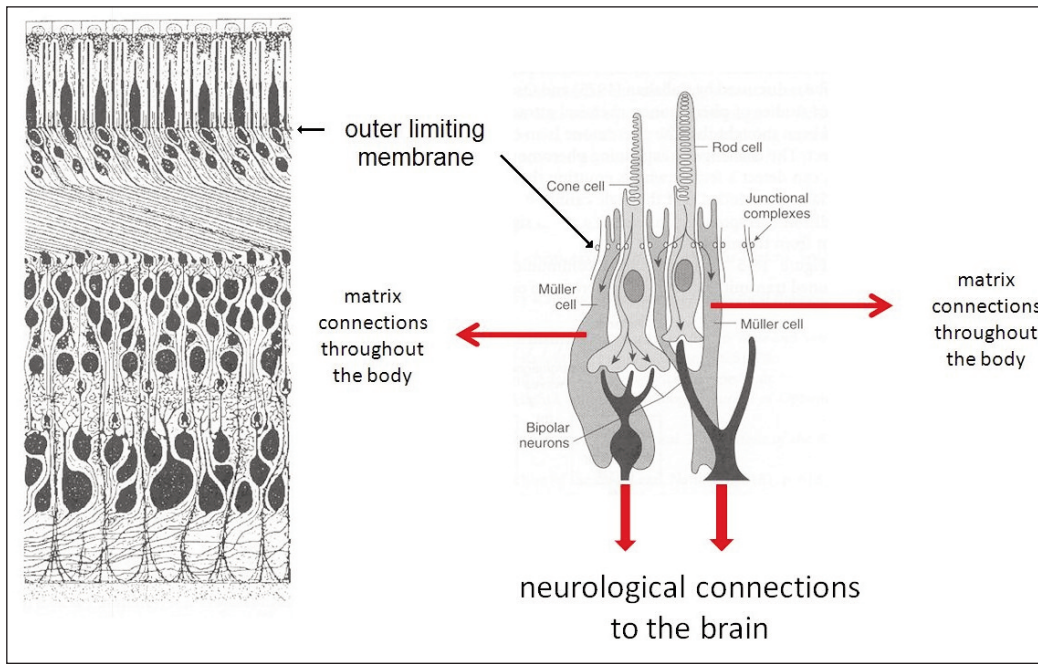

Figure 9. Retinal pathways. Perhaps the signal produced when light hits the retina splits into two pathways: to the visual cortex, and to Muller cells, which are neuroglial connective cells – part of the living matrix.

membrane." But the electron microscope has revealed that it is not really a membrane. It is a row of gap junctions – and gap junctions conduct electricity from cell to cell. On the basis of this I developed a totally bizarre hypothesis: perhaps the signal produced when light hits the retina splits into two pathways (Oschman 2001). It is well established that the signal is conducted along the surface membranes of the rod and cone cells and eventually depolarizes the nerves that go to the visual cortex, where the visual image forms (summarized by Stryer 1985). But perhaps the signal also jumps across the gap junctions to neighboring cells, called Muller cells, which are neuroglial connective cells. The Muller cells are therefore part of the body-wide connective tissue system. So this gave me the idea that maybe there's more to seeing than we usually think there is. Maybe our living matrix tunes in to the world we see before we form the visual image. Of course, at first this seemed to be a completely absurd idea.

But then I came across *Blindsight,* by Lawrence Weiskrantz (1986), a scientist from Oxford University in England. Blindsight is a phenomenon that was described in the First World War. A soldier might have his visual cortex destroyed in battle and he would keep on going – helping his comrades, avoiding obstacles, dodging bullets and so on. He acted like he could see, but he couldn't possibly see.

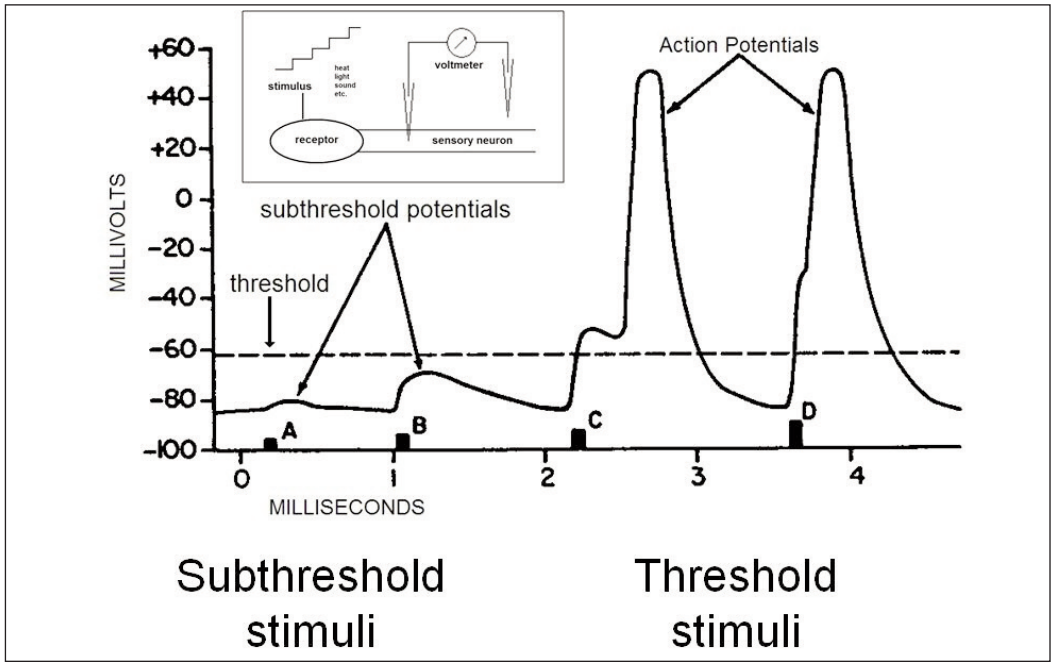

Figure 10. Studies of sensation record sub-threshold stimuli, which may be information used by the living matrix. Perhaps in the living matrix, the subconscious stores, processes and integrates vast amounts of energetic information.

Weiskrantz found a patient who had no visual cortex on the right side of his brain; it was gone. He couldn't see out of his left eye. So they created an experiment with a computer screen that he could look at with his left eye, and a barricade so that he couldn't cheat and look around with his good eye. They put up images on the computer screen, and out of a hundred images, he told them what was on the screen with 100% correct answers, even though he couldn't see it. They asked him, "How do you do that?" He said, "I guess." But he guessed right all the time. So there's something going on here. My hypothesis is that blindsight, and the effects of light on the eyes, might involve light energy coming into the eyes and going to the visual cortex, of course, and also through the whole living matrix system. Maybe you see with your whole body, including with your feet, before you see with your eyes.

Could this hypothesis apply to all the other sensory systems? The energies that we sense in our environment – heat, light, sound, smell, taste, gravity, touch – affect receptors. Perhaps the receptor is a filter that allows neurological perception to be manageable by splitting the information into two pathways – the living matrix pathway, and the neurological pathway.

Take a close look at how we study sensation. Neuroscientists, especially psychophysiologists, study sensation by applying stimuli to a receptor and recording from microelectrodes inserted into the sensory neuron (Figure 10).

They gradually increase the intensity of the stimulus, whatever it is – heat, light, sound or whatever – until the sensory nerve fires, and they record a spike traveling along the neuron. Some signals are below threshold. They are not strong enough to generate a neural impulse. They are referred to as sub-threshold or subliminal stimuli. If they are strong enough, receptor membrane potential reaches threshold and you can record an action potential that travels to the brain.

As a biologist, I view these sub-threshold events as information, even though they never get conveyed to the brain. The obvious biological question is, are the sub-threshold signals thrown away; does the organism discard them? Living systems are characterized by their great efficiency – they are not wasteful. Perhaps the sub-liminal or sub-threshold information is important. Perhaps under some conditions that information could save your life.

I suggested that this sub-threshold information goes into the matrix. Our senses split sensory information into two pathways, the living matrix and the neuromatrix (see Figure 11 and Oschman 2003). And I further suggest that receptors are the places where analog signals are converted to digital signals. Any neuroscientist will agree with this: receptors digitize signals. If it's strong enough, a nerve impulse is generated. If it's not strong enough, no impulse is produced. This is referred to as "All or none," or digital signaling.

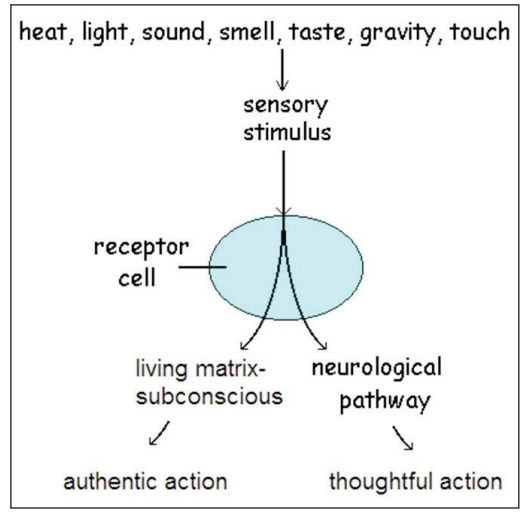

Figure 11. Receptor cells, which perhaps split sensory information into two pathways, giving rise to two kinds of consciousness and two kinds of action.

THE SUBCONSCIOUS

Adding another hypothesis, I proposed that the sub-threshold input into the matrix gives rise to what has traditionally been called the subconscious. To me, this is one of the most profound speculative ideas to come from the living matrix concept. The subconscious has been a kind of nebulous term. Not even psychologists agree that there even is such a thing. There's a lot of debate about it. Maybe the living matrix is where the subconscious lives. Maybe this is where memories are stored, processed, and integrated. Here's the reason for my excitement about this: I believe we will soon have sensing technologies that will enable us to "tune in" to the electronic operations taking place within the living matrix, and thereby study the subconscious with even greater precision than the various methods that are used for studying the functioning of the nervous system.

To build on this hypothesis: The sensory inputs to the subconscious may operate right down to zero intensity, to the quantum level. For example, the retina can respond to a single photon, and quantum physics tells us that there is no smaller amount of light. It has been suggested that all of the sensory systems may be able to detect a single quantum of energy (Bialek 1987).

What emerges from all of this is that the person in front of you, whether it's your friend or a patient or someone you've never met before, is broadcasting a vast amount of information to you in the form of various kinds of energy: heat, light, sound, biomagnetism, and so on. Most of this information is sub-threshold; it does not get into your neurology – if you sensed all of it with your nervous system you would be overwhelmed. So most of the information goes into the matrix and becomes part of your subconscious.

This is what I mean when I say that you know everything. We do not know the limits of sensory awareness. Certainly you "know" a lot more than you think you know. We would like to be able to tap in to the vast store of information available in our "big brain." There are many therapists who are very good at this, and are curious about how it works. This is the beginning of an explanation of how it works.

The hypothesis is that the receptor is a filter that allows neurological perception to be manageable. Two concepts emerge from this scheme. There is what the psychologists refer to as declarative or neural knowledge, when your *conscious mind* knows something, and knows how to do something. And then there is proceduralized or matrix knowledge, when your *body* knows how to do something (Allard and Smith 1991). There are two kinds of consciousness, two kinds of time, and two kinds of action. (Figure 11). Neurological consciousness, neurological time, and matrix consciousness, matrix time.

Neurological consciousness gives rise to thoughtful action (Dr. Chopra also talked about this). We think about what we want to do and we do it. Matrix consciousness gives rise to authentic action, which is not derived from thought. It is derived from some other source and leads to a different type of action. For example, consider the "inner knowing" that was acquired by Ted Williams from intently watching pitchers, and put into authentic action by guessing how to swing the bat.

Ordinary consciousness is the tip of the iceberg. Carl Jung said that psyche is not in the head or the brain. Specifically, Jung said, "The psyche is not in the head, not only because it involves more than thinking, but because thinking is not necessarily done with the head either" (cited by Brooke 1990). How did we come to believe that thought is in the head? "If the psyche is imagined as being in the head, this reflects only the curious course of western history in which one's existential centre has come to be felt there." (Romanyshyn 1984)

Dr. Chopra referenced the work of Candace Pert. She published an audio CD about these ideas, with the title: *Your Body is Your Subconscious Mind* (Pert 2004).

There is an interesting book called *Blink, the Power of Thinking Without Thinking,* by Malcolm Gladwell (2005). *Blink* is about people who solve very complex problems that are difficult to even think about. If you ask them, "How did you figure that out?" they say, "I don't know." *They don't know.* This is about spontaneous insight.

"The intuitive mind," Einstein said, "is a sacred gift and the rational mind is a faithful servant. We have created a society that honors the servant and has forgotten the gift." So I teach therapists to pay attention to their intuition, because it's the best source of information since it's based on a lot more information than neurology. Many therapists successfully rely on their intuition to solve mysteries about their patient's problems.

Here's a wonderful statement from the chiropractic world that goes way beyond the standard model of subluxation where the vertebrae are pressing on the nerves; it acknowledges that there is a very fast communication system which is in the fibrous systems, the connective tissues, the living matrix system. It's from *The Art of Chiropractic,* by R.W. Stephenson (Stephenson, 1927):

> *Subluxations interfere not only with nerve conduction but more importantly with the mental impulse. The mental impulse is unconscious, faster than nerve impulse, connecting our bodies with innate intelligence which is connected to the universal intelligence.*

Recall that Dr. Szent-Györgyi also referred to something that was faster than nerve impulses. I like this convergence of ideas.

Prayer and distant healing

Next I will say a little bit about prayer and distant healing. If you want to find out about the science behind prayer and distant healing, look at Milo Wolff's website. It is one of the most widely viewed websites in the worlds of science and philosophy. It is about quantum phenomena. In one of his web articles, Milo discusses the "Origin of the Mysterious Instantaneous Transmission of Events in Science." Examples of these events are the gravitational force, magnetic force, inertial force, the Einstein-Podolsky-Rosen effect, and prayer and distant healing. His website (www.QuantumMatter.com) is a rich source of information.

Milo Wolff says that a particle exists because of quantum waves that interact – the out-waves and the in-waves (Figure 12). "For its existence, the particle depends on the interaction between its own *out* waves and the waves coming *in* from all of the other particles in the universe." The electron is a standing wave. On his website you can see the wonderful animated graphics Dr. Wolff and his colleagues have made to show the out-waves leaving an electron and their interaction with the in-waves coming in from

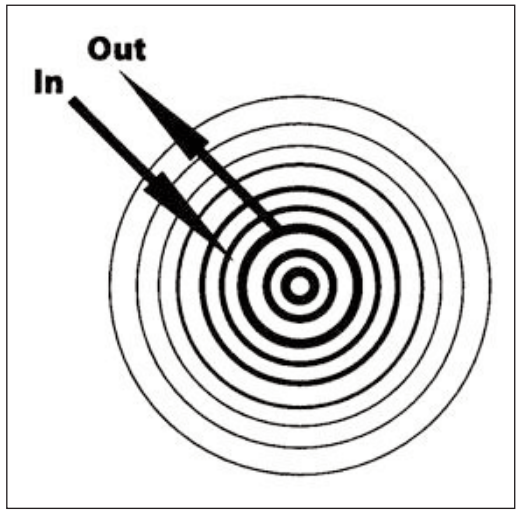

Figure 12. Particles exist because of the interaction of quantum waves: its own out-waves and the waves coming in from all the other particles in the universe. See animated graphics showing standing waves at www.QuantumMatter.com

every other electron in the universe. Spherical standing waves result from the interaction of the in-waves and the out-waves.

The electromagnetic field produced by your first heartbeat, when you were a developing embryo, is still traveling through space at the speed of light. The strength of this signal obviously diminishes rapidly with distance, but physics tells us that there is no actual place where the signal ends. It simply gets more and more difficult to detect because it is immersed in the ambient noise. Where is the edge of your body? Where do you end and where does the rest of the universe begin? Wolff's interpretation is that the in-waves come into you from every other object in the universe, and out-waves from you reach every other object in the universe.

Look at the graphics of the spherical standing waves on Milo Wolff's website, and you will notice that the electron blinks in and out of existence. The whole universe blinks on and off, as Dr. Chopra mentioned in his talk. If you want to know about this, read Duane Elgin's work: "A giant wave of manifestation spreads across the universe at the speed of light. The giant wave of manifestation continuously creates and recreates all objects including our bodies." (Elgin, 2004)

Every object in the universe, including us, disappears and reappears, and is re-manifested again and again. And if you can interact during that that in-between zone, very interesting things happen, as Duane Elgin said. We're constantly being recreated.

What are these waves? One person who has written eloquently about them is Konstantin Meyl (2003). These are probably scalar waves, and Konstantin has written a book about them that you can read either in German or in English.

Lynne McTaggart has discussed this idea – that every part of the universe is in touch with every other part, instantaneously, in her very readable book, *The Field.* If you want more technical details, see Bohm and Hiley (1995): *The Undivided Universe.*

THE PHYSIOLOGY OF BAREFOOT

Another blessing is a wonderful research project concerning what happens when you take your shoes and socks off and walk barefoot on the earth. The findings are

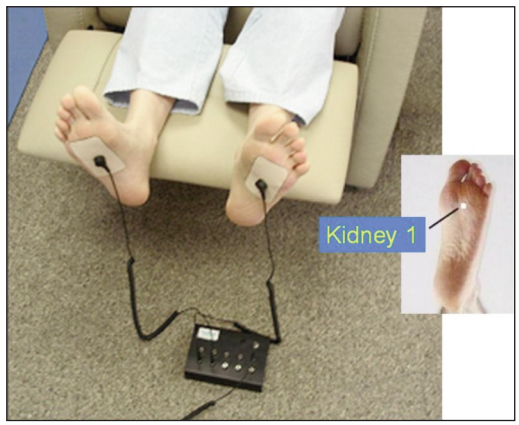

Figure 13. An experimental set-up used to study the effects of electrical contact with the earth's antioxidant electrons through the Kidney 1 points on the soles of the feet.

incredible. People know they feel better when they go barefoot. Why? Well, we are finding out. During the last century humans have disconnected from the earth by wearing shoes with rubber or plastic soles – insulating materials. From the research, it now appears that insulating ourselves from electrical connection with the earth's surface has had a dramatic effect on our physiology and our health. Specifically, the earth is a source of antioxidant electrons. We have been in barefoot contact with the earth for most of our evolutionary history. Our ancestors either went barefoot or wore leather on their feet, and leather is electrically conductive. We now see that our immune system evolved its elaborate defense mechanisms in an environment that contained abundant mobile electrons that entered our bodies from the earth through our bare feet.

Figure 13 shows an experimental set-up being used to study the effects of electrical contact with the earth (Chevalier and Mori 2009). Conductive patches are placed on the soles of the foot at a point known to acupuncturists as Kidney 1 – the beginning point of the kidney meridian, an electronically conductive system that connects to the other meridians that extend into every part of the body. When you walk barefoot on the ground, your whole meridian system becomes electrically connected to the earth through Kidney 1.

The subjects in these studies are connected to equipment that monitors a wide range of physiological processes. After a period of recording their physiological baseline, the conductive patch is connected to a wire that goes to a rod in the ground. In essence, barefoot contact with the earth is established in a precisely controlled manner. All of the physiological systems are affected, and we are sorting out the details.

The meridian system includes the living matrix, which is made up of the principal protein in the body, collagen – which is a hydrated semiconductor (refer back to Figure 2). The electrons move through the helical protein. The protons migrate through the hydration shell that surrounds the protein fibers. Charge transfer is vital to life, and this charge transfer can neutralize free radicals (Oschman 2009). New research is revealing how the living matrix functions as an antioxidant defense system.

In an animated diagram of the living matrix on my website (www.energyresearch.us), I

have little red dots representing electrons. Of course, electrons aren't little red dots; nobody has ever seen an electron. The diagram is meant to give you an idea of the dynamic motions of electrons through the living matrix. They are mobile, excited or delocalized electrons (refer back to Figure 5).

Another important concept arising from the study of barefoot connection to the earth and the study of the living matrix has to do with aging. Here is a quote from the preface of a recent summary by Miwa, Beckman and Muller (2008), *Oxidative Stress in Aging:* "Aging remains one of the biggest unsolved problems in biology. More than 50 years ago, Denham Harman proposed the free radical theory of aging, arguing that cumulative damage from oxygen free radicals was causal to the process of aging. A recent explosion of investigative interest and endeavors has made the free radical theory the most extensively tested of all aging theories."

The dominant theory of aging is the free radical theory. The idea is that aging is the result of cumulative damage to mitochondria, DNA and proteins caused by free radicals. You can avoid getting free radicals in your tissues by stopping eating, stopping breathing, and stopping bumping into things. In other words, the formation of free radicals in your body is unavoidable.

Here is the new perspective on aging. The living matrix is an antioxidant defense system that extends throughout the body. Longevity requires an intact matrix, and an input of electrons. This can best be accomplished through barefoot contact with the earth. Here at the conference this year we have had some exhibits of barefoot technologies that enable you to connect to the earth's subtle electrical field while you sleep and while you are sitting at your computer. A book on this subject is being published by Ober, Sinatra and Zucker (2010).

The significance of grounding to aging can be explained very simply. Anywhere a free radical forms in the body, whether in the extracellular matrix, the cytoplasm or the nucleus of a cell, electrons from the matrix will quickly neutralize it. The requirements for the optimum functioning of the matrix system is that it be intact, and that it have adequate electrons to neutralize free radicals as they form. Your matrix becomes saturated with electrons when you are connected to the earth. This is a new theory of aging and how various bodywork, energetic and movement therapies support the matrix functions that are vital for longevity.

Conclusions

I now see the living matrix as the ultimate transducer between our thoughts and our experiences. This quote from Dan Millman is relevant: "Energy follows thought. We move toward but not beyond what we can imagine. What we assume, expect or believe creates and colors our experience. By expanding our deepest beliefs about what is possible, we can change our experiences of life." We can do that.

The living matrix is a concept that enables us to link many ideas. As Theodore Zeldin

said, "All invention and progress comes from finding links between ideas that have never met."

Yasuhiko Genku Kimura writes about what he calls the third enlightenment, which builds on the spiritual enlightenment of the ancient masters and the scientific enlightenment of the industrial revolution. I believe the third enlightenment, as he describes it, is happening now: the convergence of the spiritual *and* scientific enlightenments.

I appreciate this wisdom from the I Ching that surely applies to our times:

The Turning Point:

> After a time of decay comes
> the turning point.
> The powerful light that has
> been banished returns.
> There is movement, but it is
> not brought on by force.
> The movement is natural,
> arising spontaneously.
> For this reason the transformation
> of the old becomes easy.
> The old is discarded and the
> new is introduced.
> Both measures accord with the time;
> therefore no harm results.
>
> (Cited from Fritjof Chopra 1984)

I'm happy to have had this time with you, and I want you to know what a blessing it has been to be a part of this conference. What a blessing that you all came. What a blessing that Oliver and his colleagues on the program committee put together such a fine gathering of speakers. And all of you are a blessing to me: getting to know you, getting to see you. This organization is a blessing on our planet.

• • •

This paper is based on James Oschman's Presidential address, presented at the Nineteenth Annual ISSSEEM Conference, Sacred Synthesis: Science with Heart (June 26 – July 3, 2009). His address immediately followed a talk by Deepak Chopra.

After a successful career as an academic scientist, specializing in cell biology and biophysics, Jim Oschman began to research complementary medicine. He has published about 30 research papers in some of the world's leading scientific journals, and about an equal number in journals related to complementary medicine. He has also written two books on energy medicine, and lectures internationally on this subject. He has presented workshops for virtually every therapeutic school and has also lectured at a variety of medical schools and hospitals around the world. Jim's investigations of the energetics of the living connective tissue matrix are the evidence base for integrating a wide range of therapeutic approaches that are part of the new medicine that is emerging worldwide.

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