Introduction: The Human Energy System and Energy Medicine

On the basis of what is known about the roles of the electrical, gravitational and photonic energies in living systems, it appears that there are many energetic systems in the living body and many ways of influencing them. What we refer to as the "living state" and as "health" are all of these systems, both known and unknown, functioning collectively, cooperatively and synergistically. The debate about whether there is such a thing as "Healing Energy" or life force is being replaced with the study of the interactions between the biological energy fields, structures and functions. JAMES L. OSCHMAN, Ph.D. (scientific researcher in energy medicine & leading author in the field)

The living organism is extraordinarily coherent: all its parts are multidimensionally, dynamically, and almost instantly correlated with all other parts. What happens to one cell or organ also happens in some way to all other cells and organs. . . . The organism is also coherent with the world around it: what happens in the external milieu of the organism is reflected in some ways in its internal milieu. ERVIN LASZLO (Philosopher of Science & Systems Theorist)

What is the human body? Is it a machine assembled of organ systems and tissues by a mysterious mechanic that we call life, requiring an outside hand to fix its broken parts? Or is it a complex, interconnected and self-correcting living system guided by a life force or an energy field or fields? Is it a sack of cells and chemicals held together with a neutral glue of connective tissue that plays no important role in health and disease? Or it is a living song of energy that guides and arranges cells with nearly instantaneous electronic communication between seemingly disparate parts through the medium of a living matrix of connective tissue?

"Energy medicine" is a broad term that refers to a variety of healing modalities and techniques that all share one thing in common: they use treatments that address human beings as energy systems, with material aspects organized by and within a field of energy and information, rather than as a machine or as a closed biochemical system. Treating humans as an energy system generates a profoundly different understanding of health and disease, wellness, and life itself.

Viewing humans as energy systems that operate within biomagnetic energy fields that shape biochemistry and physiology (rather than seeing all electrical and electronic phenomena in the body as the result of biochemical interactions and biomagnetic fields merely as epiphenomena of biochemical activity) also brings back into focus a plethora of medical and scientific findings from the 19th and early 20th centuries that fell into obscurity and neglect or were even rejected after the discovery of antibiotics in the 1930s shifted the focus of medical attention to curing disease with pharmaceuticals.

All three of the modalities that Somadome uses to create its unique relaxing and restorative environment – binaural beat meditations; color and light therapy; and the Biosyntonie tiles – can be understood as forms of energy medicine. The binaural beat meditations use a specific type of auditory stimulation to help the conscious mind relax and trigger brain wave energy states different from our everyday, waking beta state.[1] Color and light treatment appears to work by using specific colors in the visible spectrum to trigger vital cellular activity that supports healthy functioning.[2] The Biosyntonie tiles are designed to transform electromagnetic frequencies (EMFs) that are not natural to the human body (such as from wifi routers, cell phones and microwaves) into wave forms and frequencies that better match the frequency, intensity and shape of wave forms native to our bodies and to life on earth generally.

This White Paper offers an overview of what we know about the human body as an energy system and of energy medicine modalities currently in use today. It also suggests what

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[1] It is not clear what causes or generates the brain waves (EMFs) measured by EEGs, but it is clear that changes in a person's brain waves correlate to changes in that person's subjective experience.

[2] Jacob Liberman, O.D., Ph.D. *Light: Medicine of the Future*. Bear & Company: Rochester, VT. 1991.

scientific research has to say about how and why the Somadome might work to support healing, health and wellness it its users. As we have separate white papers on binaural beat meditations and color and light therapies, this paper focuses particularly on discussing the role that the Biosyntonie tiles might play in creating the Somadome's unique environment.

We want to state clearly that energy medicine is an emerging field and a controversial topic in medicine and science today. There is currently no coherent contemporary scientific theory of the human body as an energy system accepted by mainstream science and medicine. (Traditional Chinese Medicine and other traditional medical systems offer coherent theories of the body as an energy system, but these systems are based on empirical and clinical observation and evidence, not on scientific theories backed with experimental evidence.) However, there are many mainstream scientists and doctors past and present who have made findings that support this view of the body as an energy system (some of them cited here), and there are many mainstream physicians today using electrical, biomagnetic and electronic treatments to treat disease and dysfunction, even in the absence of a generally accepted mainstream scientific theory and mapping of the human body as an energy system.

There are those who would dismiss energy medicine as pseudo-medicine and pseudo-science. We do not agree. We believe that there is currently sufficient evidence to prove that human beings are governed by electromagnetic fields and function as energy systems, and that health can be supported and disease cured by manipulating or working with the human energy system. We offer our perspective here. We also believe that there is much more to learn and understand and we are committed to having Somadome be a part of that journey.

Life and the Vital Force

Traditional medical systems around the world, including Traditional Chinese Medicine (TCM), Ayurvedic medicine, Incan medicine, various shamanic traditions and ancient Egyptian and Greek medical systems all have identified a vital "life force" as central to human health and disease for thousands of years. These systems focus on working with energy to create health and vitality and to heal illness.[3] Acupuncture is probably currently the best known and most widely used of these traditionally-based healing systems in the United States.

Modern western medicine is notable for its explicit *rejection* of the idea of a vital force. Scientists and physicians tried but could not measure or locate the source of this supposed vital force, and debates about vitalism animated western science up until the 1930s, when vitalism was considered dead and dismissed as pseudoscience. Scientists did recognize that muscles twitched and acted through the stimulation of electrical impulses, as discovered by Galvini in 1780, and that our nervous system operated through electrical impulses being sent along nerve pathways, as shown by a number of researchers in the 19th century.[4] In the 19th century, as we began to understand more about electricity and how to control it, there was an explosion of interest in both electricity in the human body and using electricity, light and color to treat disease. There was some discussion of whether "vital force" was the same thing as electricity, but

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[3] It is really more accurate to describe them as theories of life than just medical systems, as all of these traditional systems offer explanations for what creates health, what creates strength and force in human action, and what leads to enlightenment or spiritual maturity and successful life. All of these systems therefore have branches that deal with martial arts and physical well-being and strength; medicine and healing of disease; and spiritual development. All three of these facets rely on understanding and manipulating energy flows in the body.

[4] It is worth noting that Galvini's experiments took place on dead frogs; this meant he had no opportunity to discover energy fields that might affect the operation of muscles or the body; he was able to study only local, mechanical phenomena.

the conclusion was that they were not, partly because there was no evidence of a cause or source of electrical impulses in the body apart from biochemical reactions. During the long course of this debate about vitalism, it was not understood yet that wherever electricity was generated, including in living tissue, a magnetic field also was generated.

By the time that James Clerk Maxwell proposed his theory of electromagnetic fields in the1860s, the concept of a vital force was already on the way out, supplanted by biochemical understandings of life (although it continued to live on among herbalists and homeopaths – part of the reason both groups of practitioners were ridiculed and increasingly marginalized in the early 20th century).[5]

The late 19th century also saw a huge explosion of interest in using electromagnetic devices in healing – and exploiting the commercial potential of the public's interest in electricity. While science had discovered ways to control electricity and offered new understandings of electromagnetic forces in nature, letting the genie out of the bottle, medicine and biology did not yet have ways to incorporate understanding of these forces into their fields or evaluate the medical claims made by manufacturers and users of these devices. The result in the U.S. was political concern about quackery and unsubstantiated medical claims that contributed to the passage, in 1906, of the Pure Food and Drug Act (which established the FDA). This Act declared

[5] Notably, although Western science rejected any idea of a vital force, our biology has failed miserably at pinpointing what makes something alive and how life could originate from a soup of inorganic chemicals. Life is typically defined self-referentially as that which distinguishes living things from inorganic matter, such as the capacity for growth, reproduction, functional activity and continual change until death. The dividing line between organic and inorganic is not as simple to make in practice as such definitions suggest, however, as evidenced by the long debate about whether or not viruses qualify as living organisms.

electrotherapy scientifically unsupportable and said that it should be legally excluded from clinical practice.

This shift away from electromagnetic treatments was cemented by the Flexner Report of 1910, the report that evaluated the regime of medical training and practice extant in the U.S. and proposed a national system of standards for medical training and practice. The Flexner Report supported the use of drugs and surgery in medical treatment over electrotherapy, homeopathy[6], and herbalism and set in motion the creation of today's mainstream medical system.

Today, as the quote from James Oschman at the beginning of this paper demonstrates, many clinicians and researchers are of a different mind We are at an exciting time of synthesis in medical science, electrical engineering and biophysics, where modern science, engineering and medicine are coming together with traditional medical systems, going beyond vague ideas of a "life force" to a deeper understanding of the way in which the human body functions as an energy system, connected to the larger energy systems of the earth and the cosmos. This emerging synthesis is leading to new understanding of old medical systems and to new, cutting edge treatments within western clinics that make use of this new paradigm of "energy medicine."

What Is Energy?

The most common definition of energy in physics is that it is the ability of a system to perform work. Energy also has another important quality, one that came into view only with modern, post-Newtonian physics: it carries information, which is why our TVs, radios and cell phones all work. In order to carry information successfully, energy has to be coherent, and that

[6] The most popular form of medicine in 19th c. America.

fact is relevant to understanding why exposure to certain kinds of energy may be disruptive to human health.

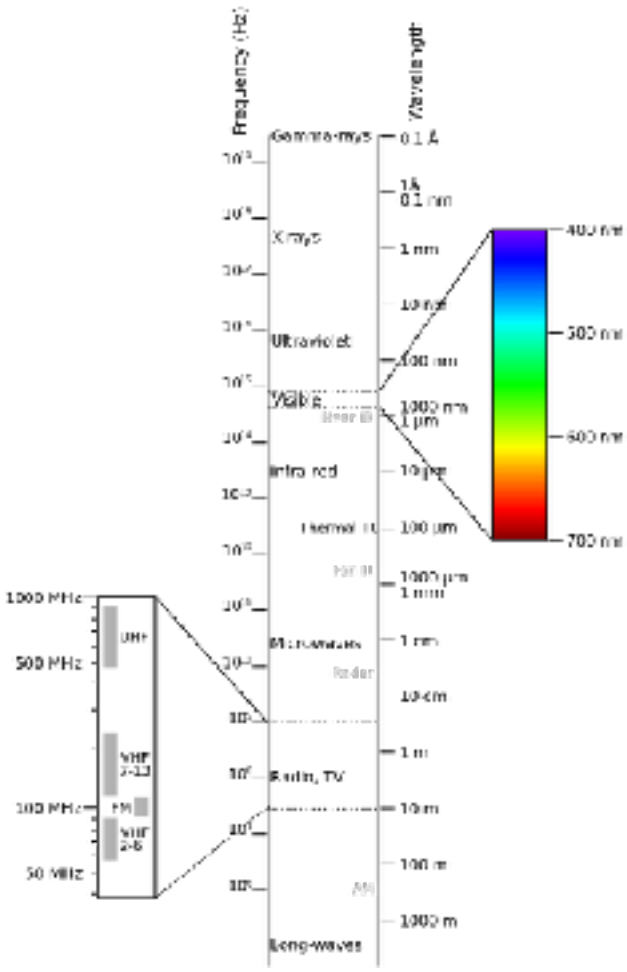
In this paper, we focus on electromagnetic energy that comes from the sun and the cosmos and is generated by the earth, as all other types of energy ultimately derive from these energies. Human tissues and organs both generate and respond to electromagnetic energy.

Physicists have demonstrated that there is a range of electromagnetic energies or frequencies in the universe. The spectrum of electromagnetic frequencies (EMFs) includes:

- the extremely low frequency energies of the human body and other life forms, which generally broadcast in the 0 – 30 Hz range and are often referred to as *extremely low frequency,* or ELF, radiation;
- extremely low electrical and magnetic frequencies generated by electrical transmission lines, power cables, electric motors, household appliances and transformers, typically in the 50 – 60 Hz range;
- micro waves and radio waves, in the 10Mhz – 300 GHz range; ultra-red radiation, which is lower in frequency than the red visible to human sight but higher than the ultra-low frequencies used for communication by human cells and tissue;
- the visible light frequency;
- ultra violet radiation, which is just above the highest frequency of light visible to the human eye;
- x-rays;
- gamma rays.[7]

The illustration below shows the electromagnetic spectrum as currently understood.

[7] The image is "Electromagnetic-Spectrum" by Victor Blacus - SVG version of File:Electromagnetic-Spectrum.png. Licensed under CC BY-SA 3.0 via Wikimedia Commons.



Until very recently, humans have been exposed in large quantities primarily to the low end of the spectrum, in the 0 – 30 Hz range of EMFs emitted by the earth; and to the infrared, visible light and UV spectrums that make up the majority of the solar energy that reaches earth. It is only with modern discoveries in physics and the development of electrical and electronic devices in the 19th century that humans have begun to be regularly exposed first to large doses of radio waves and microwaves and ELFs in the 50 – 60 Hz range (generated by electrical devices and transmission lines) and more recently to large doses of EMFs in what are called the "intermediate frequency" ranges (often abbreviated to "IF") between 300 Hz to 10 Mhz (the frequencies used by modern electronic devices such as WiFi, cell phones and computers).

The Body as an Energy System

As noted earlier, the concept of energy fields was introduced in the 1860s by James Clerk Maxwell, who proposed that light, electricity and magnetism were all aspects of the same force and that the magnetic lines of force that Michael Faraday had identified circulating around magnets were better understood as electromagnetic fields.[8] The fact that not just magnets but also the human body generate an energy field has been known since the early 20th century, when Kirilian photography captured this field visually.

Around the same time that Kirilian photography was being pioneered in Russia, other scientists were demonstrating that activities of cells and tissues generate electrical fields that can be detected on the skin surface. The scientist who first discovered and measured the electrical signals generated by the heart in the first EKGs, Willem Einthoven was awarded the Nobel Prize in 1924 for his discovery[9] – the same year that psychologist Hans Berger first successfully measured human brain waves with electrodes on the scalp, creating what he called electroencephalograms (EEGs)[10]. Subsequent research has shown that our brains' electromagnetic waves do not only signal brain activity but coordinate and activate specific activities in the brain and body, which explains in part why practices like meditation,

[8] en.wikipedia.org/wiki/James_Clerk_Maxwell, accessed 9/25/2015.

[9] http://www.nobelprize.org/nobel_prizes/medicine/laureates/1924/einthoven-bio.html, accessed 9/25/2015.

[10] Hans Berger. Über das Elektrenkephalogramm des Menschen. Archiv für Psychiatrie und Nervenkrankheiten, 1929, 87: 527-570.

mindfulness and biofeedback work to effectuate change at the physical level as well as at the level of consciousness.[11]

In 1936, Harold Saxton Burr and his colleagues C. T. Lane and L.F. Nims of Yale Medical School reported on their research using the voltmeter to measure electromagnetic potentials in the human body.[12] Burr spent his career studying electromagnetic fields in humans and other living creatures and concluded that every living thing has an electromagnetic field that he called the "L field" that serves as a matrix or blueprint for directing its growth, development and regeneration.[13] He also demonstrated that illness – in this case, cancer in laboratory mice – was preceded by measurable changes in voltage in cells.[14] His findings were marginalized partly because his research led him to reject materialist philosophies of science and declare his belief that humans have a soul, and that there is unity and order to life. In addition, once DNA was discovered, biologists shifted focus to DNA as the "blueprint" for life and genetic determinism became the order of the day. However, his findings about the EMFs of living beings has never been refuted and in fact has been validated by a number of scientists building on his work. Today, it has become clear that the functioning and expression of DNA is not mechanistic in the ways that classical genetics proposed, and the science of epigenetics has shifted focus to

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[11] Gary E. Schwartz. Biofeedback, Self-Regulation, and the Patterning of Physiological Processes. American Scientist, Vol. 63, No. 3 (May-June 1975), pp. 314-324. Published by: Sigma Xi, The Scientific Research Society Stable URL: http://www.jstor.org/stable/27845467

[12] "A Vacuum Tube Micro-voltmeter for the Measurement of Bio-electric Phenomena" Yale Journal of Biology and Medicine 10: 65-76.

[13] See particularly H.S. Burr and F.S.C. Northrop, "Evidence for the Existence of an Electro-Dynamic Field in Living Organisms," Proc Natl Acad Sci U S A. 1939 Jun; 25(6): 284–288.

[14] Ronald E. Matthews, M.S. "Harold Burr's Biofields: Measuring the Electromagnetics of Life." Subtle Energies & Energy Medicine • Volume 18 • Number 2 • Pp 55-61.

understanding how environment affects the expression of DNA. It may be that electrical, electronic and photonic communication are part of the answer.

One of those who followed on and validated Burr's observations was Robert O. Becker, an orthopedic surgeon, who studied regeneration of limbs in salamanders to better understand human bone growth and healing. Becker found that right after an injury, the tissue around the site of the injury generated a low level electrical field that was critical to regeneration. If he disrupted the field, the limb would either not regenerate properly or not grow back at all. The low level electrical field appeared to be an energetic blueprint for the missing limb that directed the cells in the existing tissue to replicate and migrate to the correct locations – validating Dr. Burr's findings.[15]

Becker applied his findings to humans and found that bones would heal better if a low level DC current were run through them. His work led to pioneering treatments for bone healing and pain management that are still in use by orthopedists today.

The laws of physics demand that any electrical current generates a corresponding magnetic field in the surrounding space. However, until the 1960s, science did not have instruments sensitive enough to measure the low level electromagnetic fields generated by the human body. Burr and Becker and those working in this area therefore could not measure magnetic fields generated by the electrical fields they were studying, and most other researchers assumed that human electrical fields could have no system-wide physiological significance because electrical currents have limited ability to penetrate tissue (whereas magnetic fields can

[15] Robert O. Becker, MD and Gary Selden. *The Body Electric: Electromagnetism and the Foundation of Life*. Harper, 1985: pp. 40ff.

penetrate the body without noticeable decrease in strength – which is why MRIs work to create detailed pictures of the human body).[16]

In 1963, Gerhard Baule and Richard McFee of the Department of Electrical Engineering, Syracuse University, Syracuse, NY, conducted experiments to see if they could measure electromagnetic currents generated by the body. They used two coils connected to a sensitive amplifier and were able to detect the biomagnetic field projected from the human heart – a literal heart energy. In 1970, David Cohen of MIT, using a SQUID magnetometer, confirmed the heart measurements. By 1972, Cohen had improved the sensitivity of his instrument, enabling him to measure magnetic fields around the head produced by brain activities.

The development of these tools for measurement stimulated medical and biological researchers to new explorations of electricity and the human body. Subsequently, it has been

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[16] This is not unusual in the history of science and medicine – that what we understand is limited by the tools we have for measuring and seeing the world. Our conscious minds and sensory equipment have inherent limits; we expand our understanding partly by expanding the tools that we have to make visible to us, in our narrow spectrum of human sensory perception, things that previously were invisible. Part of the story of energy medicine is that mainstream science and medicine have neglected the most sensitive instrument we have for understanding and interacting with the world – our human mind and body – in lieu of focusing on creating machines that create standardized measures that can be validated and easily shared. Adepts like qi gong masters, reiki masters and yoga masters have demonstrated that they have both perception and control of energetic forces that are beyond the ability of current machinery to measure. Great scientists do not make the mistake of concluding that our inability to measure these forces means that they do not exist. As anthropologist and natural historian Gregory Bateson reminded us, we should not confuse the map with the territory. Scientist Temple Grandin believes that humans retain extraordinary sensing abilities comparable to other animals but that our neocortex and human habits of thinking in schemas rather than attending to details cuts us off from these abilities. She suggests that autistic people like herself, whose neocortical processing does not work as well and who tend to be highly detail oriented and hypersensitive to visual and auditory cues, function more like animals (Temple Grandin and Catherine Johnson. *Animals in Translation Using the Mysteries of Autism to Decode Animal Behavior,* pp 63ff. Scribner 2005, Kindle Edition.). Her observations logically lead to the hypothesis that people who are best able to quiet their neocortex – the source of our conscious mind and internal chatter that Buddhists call "monkey mind" – will be best able to access these sensory powers. This may explain many of the siddhis –supernormal perceptual states – that masters in meditation and energy medicine can manifest. It also might explain many of the seemingly more ordinary benefits of meditation and mindfulness practice, such as having greater awareness of others' emotional states and being more sensitive to the world around you.

discovered that all tissues and organs produce specific magnetic pulsations, which have come to be known as biomagnetic fields. The traditional electrical recordings, such as the electrocardiogram and electroencephalogram, are now being complemented by biomagnetic recordings, called magnetocardiograms and magnetoencephalograms. For various reasons, mapping the magnetic fields in the space around the body often provides a more accurate indication of physiology and pathology than traditional electrical measurements.[17]

SQUID magnetometers have also been used to measure the human energy field, and those measurements confirm what Kirilian photography shows, that the average human energy field projects about 15 feet in space around the body.[18]

The fact that reading these fields with machines like these can help diagnose illness raises the question if purported medical intuitives like Carolyn Myss, who suggest they are able to read illness from the "energy body" of a person even before disease manifests on a biochemical level, are actually able to detect low-level EMF fields generated by human tissue.[19] Given the obvious importance of extremely low frequency (ELF) electromagnetic fields in human life and health, it certainly makes evolutionary sense that some people would have evolved abilities to directly perceive them.

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[17] Some materials adapted from Reiki News Website, the International Center for Reiki Training, "Science Measures the Human Energy Field," http://www.reiki.org/reikinews/sciencemeasures.htm

[18] James L. Oschman, Ph.D., *Energy Medicine: The Scientific Basis.* Churchhill Livingston Publishers. May 29, 2000 (1st Edition). Note that a 2nd edition has just been published. This is currently the best available book offering an overview of the scientific basis of energy medicine.

[19] C. Norman Shealy, M.D., Ph.D. *Energy Medicine: Practical Applications and Scientific Proof.* 4th Dimension Press: Virginia Beach, VA. 2011. Kindle Edition.

Siskin and Walker, following on the research of Baule, McFee and others, demonstrated that human cells and tissues resonate to specific electrical frequencies in the 0 – 30 Hz range – the same frequencies that the earth emits through geomagnetic forces and the Schumann resonance in our ionosphere – and discovered specific frequencies that aid healing of human tissues. Just as there are specific chemical "lock and key" systems that control cell membrane permeability, there are specific energetic frequencies that stimulate cells and tissues to perform their functions. [20] Subsequent research has also shown that the release of specific hormones can be triggered by specific EMFs[21]. Hormones are considered in conventional western medicine to be the primary regulators of bodily processes, so the fact that exposure to specific EMFs from external sources can trigger hormone release is medically highly significant.

We don't just generate these frequencies – we also absorb them from the sun, earth and sky through our eyes, skin and feet.[22] Just like us, our planet has an electromagnetic energy field with which we are in continual dynamic interaction. Without regular exposure to these electromagnetic frequencies in the 0 – 30 Hz range, people lose muscle and bone mass, lose energy, develop insomnia and can develop a range of other ailments and problems – something

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[20] B.F. Sisken & J. Walker, Therapeutic aspects of electromagnetic fields for soft-tissue healing (Advances in Chemistry Series 250. American Chemical Society, Washington DC, pp 277-285: 1995). Sisken and Walker found that 2Hz stimulated nerve regeneration; 7 Hz stimulates bone growth; 10 Hz stimulates ligament healing; and 15 and 20 Hz stimulate capillary formation.

[21] James D. Oschman, Ph.D. *Energy Medicine: The Scientific Basis.* Churchhill Livingston Publishers. May 29, 2000 (1st Edition).

[22] Clinton Ober's studies led him to conclude that walking barefoot or in electrical connection to the earth is an important way that our bodies absorb free electrons that help eliminate free radicals in our body. His findings suggest that using the Somadome without one's shoes on may improve the user's results. See Clinton Ober, Stephen J. Sinatra, MD, and Martin Zucker. *Earthing: the most important health discovery yet!* Basic Health Publications, 2014 (2nd edition).

that NASA found after sending the first astronauts into space.[23] Space suits and ships are now equipped with magnetic field or Schumann resonance generators to replicate the electromagnetic energies on which our bodies rely on earth so that astronauts maintain their health and vitality, and private companies sell pulsating electromagnetic field (PEMF) generator systems that individuals and doctors use to treat pain, inflammation, insomnia and other disorders.

In addition, the ligand ("lock and key") system turns out to work not just through mechanical chemical interactions of molecules bumping into each other in solution, but through energetic connection – through resonance, that is to say, vibrating on the same frequency. Another way of putting it is that chemicals in our body dance to specific energetic "music" as a way of communicating and connecting with each other.[24] Creating resonance and entrainment of our body's own natural electromagnetic waves and thereby of cellular and organ functions appears to be one key to creating health and optimal human functioning.

There is a great deal more that could be said about what science has discovered about the human energy system, but for our purposes, the most important facts are that our cells both generate and respond to signals in the 0 – 30 Hz range, which match the range of signals naturally generated by the earth; that our bodies require regular recharging with these natural energies to maintain health; and that resonance and entrainment among our body's constituents– being 'in sync" – appears to be a vital component in healthy functioning. All three of

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[23] T. Goodwin. Physiologic and molecular genetic effects of time-varying electromagnetic fields on human neuronal cells. Lyndon B Johnson Space Center, Sept. 2003. Also see Kyoichi Nakagawa, M.D. Magnetic Field Deficiency Syndrome and Magnetic Treatment. Japan Medical Journal (No. 2745), December 4, 1976.

[24] Candace B. Pert, Ph.D. *Molecules of Emotion: The Science Behind Mind-Body Medicine*. Touchstone Books, 1999 (first copyrighted 1997). Also Candace B. Pert, Ph.D., *Your Body Is the Subconscious Mind,* audiobook, Audible Audio Editions, November 2, 2005.

Somadome's modalities are designed to create resonance, entrainment and the free flow of energy in its users.

Energy Medicine in the Mainstream

The accretion of findings about the critical role the human energy system plays in human health in combination with the growing realization that pharmaceutical approaches to curing disease have significant limitations has spurred renewed interest in using magnetic and electrical methods to treat disease. There are two new energy medicine treatments being used by western medical doctors that we think are worthy of mention as examples of the increasing acceptance of energy medicine in the mainstream.

The first is the use of transcranial direct-current stimulation to improve learning and memory, relieve chronic pain, and treat chronic disorders, including fibromyalgia and Parkinson's. The treatment does not yet have FDA approval but is already in regular use at New York's Beth Israel hospital[25] and a few other hospitals around the country and is being used in research at about 30 clinics and hospital around the country.[26]

The other is the use of Magnetic Resonance Therapy (MRT) to treat a number of disorders including autism, PTSD, chronic anxiety, schizophrenia and depression. MRT is FDA-approved to treat depression and mainstream hospitals like Johns Hopkins offer it. Physician and electrical engineer Yi Jin is using it off-label, based on his research showing that when multiple

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[25] Beth Israel Web Site at http://www.bidmc.org/CentersandDepartments/Departments/Neurology/NoninvasiveBrainStimulation/OLDTMS/TranscranialDirectCurrentStimulation.aspx; and http://www.bidmc.org/Centers-and-Departments/Departments/Neurology/Noninvasive-Brain-Stimulation/Patient-Care/What-is-tDCS.aspx, accessed 9/29/2015.

[26] "Jump Starter Kits for the Mind," Kate Murphy, NY Times, October 28, 2013. Accessed online.

irregular frequencies interrupt the normal sinusoidal oscillations of the brain at 10Hz (or about 10 cycles per second), normal brain function is disrupted and disease results. He postulates that all of these mental disorders share an underlying trait of an excessively high brain metabolism, causing excessive levels of energy in the brain that are disrupting the synchrony of the brain's signals. Dr. Jin is currently working with the University of San Diego on two clinical trials, one testing MRT on autism patients and one testing it on vets with PTSD.[27]

Dr. Jin's hypothesis and clinical findings are in line with Siskin and Walker's findings that the body is quite precise in its tuning and that our organs, tissues and cells respond positively to stimulation only within specific ranges. He does not offer any ideas about what might cause these conditions, but one possibility is that interference with our body's natural electromagnetic system from "unnatural" EMFs in higher frequencies, such as the frequencies used by today's modern electrical and electronic devices, could have the impact of "scrambling" and confusing our body's electrical communication system, much as an unshielded and ungrounded television cable conveys static and a confused signal because of interference from signals of different frequencies that disrupt its message.[28] This leads into our next topic, relevant to Somadome's use

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[27] There are a variety of media stories about Dr. Jin's work. Details of his work are taken from the GEN online journal article, "Tackling Mental Illness with a Novel Approach," June 2015 (Vol. 35 No. 11), http://www.genengnews.com/gen%ADarticles/tackling%ADmental%ADillnesses%ADwith%ADa%ADnovel%ADapproach/5517, accessed 7/4/2015, and https://www.washingtonpost.com/lifestyle/style/brain-zapping-veterans-say-experimental-ptsd-treatment-has-changed-their-lives/2015/01/12/2fc8b3ca-58aa-11e4-8264-deed989ae9a2_story.html

[28] The apparent growth in the rise of autism, which appears to be a product of disordered neuronal growth and a failure of neuronal pruning during development, during the same historical period when humans are being exposed to large levels of human-made EMFs, seems to be a connection worth exploring, given Harold Saxton Burr and Robert O. Becker's findings that embryonic growth in mammals appears to be guided by an electromagnetic field that serves as a blueprint for cell division and placement.

of the Biosyntonie tiles – electrosmog and the impacts of human-made electronic devices and signals on human health.

Electrosmog and the Impacts of EMFs Outside of the Human Range

Having established that our bodies naturally operate in the 0 – 30 Hz EMF range, the question now arises: What is the impact of our regular exposure to EMFs that are *outside* of this range through exposure to personal electromagnetic equipment like cell phones, radios, computers, refrigerators, microwaves, fluorescent lights, and wireless telephones; and large-scale electromagnetic equipment like cell phone towers, high intensity power lines, satellite dishes and microwave towers? Author Bryant Meyers calls these EMFs (which are all in the IF range between the low frequency 0 – 30 Hz range and the visible light spectrum) "electrosmog," and we adopt his usage here.[29]

It is well established and uncontroversial that exposure to ionizing frequencies – the frequencies on the highest part of the spectrum, including x-rays, gamma rays and energy put off by radioactive decay – causes serious human health problems. It is a controversial and undecided question if regular exposure to ELF electrical fields, IFs or radio waves also causes human health problems. We present a selection of evidence here that exposure to these human-made ELFs is at minimum a reason for concern.

One of the first scientific and medical voices in the U.S. to raise concern about exposure to EMFs was Dr. Robert O. Becker, the orthopedic surgeon mentioned earlier. Based on his long

[29] Bryant A. Meyers. *PEMF - The Fifth Element of Health: Learn Why Pulsed Electromagnetic Field (PEMF) Therapy Supercharges Your Health Like Nothing Else!* Balboa Press, August 9, 2013. Kindle Edition. See particularly Chapter 7: The 2-Fold Problem: Magnetic Field Deficiency and Electro-Smog.

career of research exploring the impacts of electrical and magnetic fields on people and other living creatures, Dr. Becker became concerned the 1960s with the possible impact of high energy electrical transmission lines on human health. He and his colleagues began investigating the effects of low level EMFs in the 50 – 60 Hz range on human beings and other mammals as well as exploring the available scientific literature on the impacts of human-made ELFs in other countries. They found that exposure to these EMFs cause biological stress that resulted in a variety of health problems, often triggering them at levels below the animal's conscious awareness. They also became aware of the large body of research conducted in Russia on EMF biological effects, research that confirmed their concerns. These effects included:

- Stunted growth rates in lab rats
- Bone tumor growth in rates
- Slowed heartbeat in fish
- Various chemical changes in the brain, blood and liver of rates
- Bees exposed to a strong ELF field for a few days began to sting each other to death or leave the areas; some sealed off their hives and asphyxiated themselves.[30]

Dr. Becker was hardly a scientific outsider – he was an acknowledged expert on biomagnetism and human health, such that the U.S. Navy asked him to be one of the seven members of a committee established in 1973 to evaluate the potential health hazards of a Navy plan to build a giant antennae in Wisconsin. The Navy was not pleased when the committee decided that the risks were too great to proceed and that more information was needed to determine if the EMFs generated would be safe.

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[30] Robert O. Becker, MD and Gary Selden *The Body Electric: Electromagnetism and the Foundation of Life.* Harper, 1980: p. 280.

Becker writes that he believes he and his colleagues' public testimony in 1975 at the New York State Public Service Commission opposing the placement of nuclear power transmission lines close to human habitations was the first public scientific testimony in the U.S. stating that electromagnetic energy had negative health effects in doses below those needed to heat human tissue or have ionizing effects.[31] He suggests that ELFs like those generated by electrical transmission lines may actually be worse for humans than EMFs in higher frequencies because they are so close to the frequencies to which human tissues naturally respond. He points to evidence that suggest they disrupt biorhythms, trigger the adrenal glands and stress responses, induce depression and cause a higher incidence of suicide in those exposed, and have other systemic biological effects.[32]

A landmark 1996 EPA study that was released only after EPA staffers leaked it to the media also found a link between exposure to electrical power transmission lines and cancer. The report concluded,

> Studies showing leukemia, lymphoma and cancer of the nervous system in children exposed to magnetic fields from residential 60 Hz electrical power distribution systems, supported by similar findings in adults in several occupational studies also involving electrical power frequency exposures, show a consistent pattern of response that suggests, but does not prove a causal link.[33]

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[31] Robert O. Becker, MD and Gary Selden *The Body Electric: Electromagnetism and the Foundation of Life.* Harper, 1980: p. 281.

[32] Robert O. Becker, MD and Gary Selden *The Body Electric: Electromagnetism and the Foundation of Life.* Harper, 1980: pp. 287ff.

[33] Bryant A. Meyers. *PEMF - The Fifth Element of Health: Learn Why Pulsed Electromagnetic Field (PEMF) Therapy Supercharges Your Health Like Nothing Else!* Balboa Press, August 9, 2013. Kindle Edition, p. 139.

In 2011, the World Health Organization placed electro-hypersensitivity on its list of International Classification of Diseases registry, officially recognizing it as a disease. [34] It is not yet officially recognized in the US or Canada, although some health care providers are diagnosing and treating this condition.[35] Logically, that electrosensitivity could become a health problem makes sense because our bodies depend on the capacity to recognize and respond to electromagnetic fields.

Thirty scientists who met under the auspices of the International Agency for Research on Cancer in May, 2011 reviewed a number of studies on the relationship between glioma, a rare type of brain tumor, and cell phone exposure. They concluded that long-term exposure to RF-EMFs is "possibly carcinogenic" to humans[36]; their conclusions were not more definitive because many of the studies relied self-reports of cell phone use, a necessity since long-term laboratory experiments testing cell phone use are not practicable.

Scientists speculate that when using cell phones close to the head, our head and brain serve as an antenna, flooding the brain with the cell phone frequencies – something that makes sense given that our pituitary gland is full of magnetite, a metallic substance that also can be found in small quantities in our cell membranes. The presence of magnetite throughout our body suggests that we are designed to pick up and transmit naturally occurring EMFs – and that the

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[34] Electromagnetic fields & public health: Intermediate Frequencies (IF). Information sheet February 2005. World Health Organization. Retrieved Sept. 2015.

[35] Bryant A. Meyers. (2013-08-19). *PEMF - The Fifth Element of Health: Learn Why Pulsed Electromagnetic Field (PEMF) Therapy Supercharges Your Health Like Nothing Else!* (p. 138). Balboa Press. Kindle Edition.

[36] Carcinogenicity of radiofrequency electromagnetic fields, published online, www.TheLancet.com June 22, 2011. DOI:10.1016/S1470-2045(11)70147-4

human-made EMFs we surround ourselves with may be hijacking this electronic transport system.

The lack of mainstream acceptance that there is a human ELF energy system that predicts and impacts human health; a lack of tools to measure low level frequencies easily under ordinary clinical conditions; and a lack of a coherent theory of how the human energy system or systems might work all inhibit studies of the possible harmful effects of these EMFs. The work of people like Becker has been dismissed, not because their work has been shown to be incorrect or flawed, but because it does not fit into contemporary theories and understandings of how life and the human body work. It must also be acknowledged that there are significant institutional and economic players with strong interests in challenging scientific findings that human-made EMFs are likely hazardous to human health, including the US military.

Energy Medicine Modalities

There are generally five types of energy medicine modalities in use today.[37]

1. Modalities that use biofeedback, meditation and mindfulness techniques to teach individuals to change their brain waves or brain states and thereby change their physical, mental and emotional condition. These include:
    - Hypnotherapy
    - Biofeedback
    - Mindfulness training

These modalities work by harnessing our bodies' own internal energies. In our review of relevant literatures and personal experience, these modalities are most effective with people

[37] Two other therapies that are often included under the energy medicine umbrella, aromatherapy and homeopathy, are outside of the scope of this paper.

whose illness or imbalance is mild to moderate. People with more extreme energetic imbalances and more serious illnesses typically require additional treatments that put new energy into the system, manipulate the body's energy system from the outside or use surgery and conventional medicine together with holistic treatments.

2. Modalities that use light and color (which are, of course, just specific frequencies of electromagnetic energy) to heal. These include:
    - UV light therapy for psoriasis and eczema
    - Blue light therapy for infants born with excess bilirubin
    - Use of specific colors to create calming environments
    - Use of colored lenses to treat learning disabilities, emotional disorders, vision disorders and other diseases and ailments, as pioneered by Dr. Harry Ritler in a practice he called Syntonics.

These modalities make use of the visible spectrum of light, which is a narrow band of EMFs present on earth. They are a unique band of EMFs because we have evolved to see and respond to this range of EMFs (and they are the range of EMFs produced in greatest quantity by our sun). There is a large body of evidence that we respond both to full spectrum light and to specific colors in ways that trigger essential physiological processes, including cell mitosis, production of Vitamin D, and digestion and assimilation of food. It is proposed by those who have made careers of studying light that many of our modern illnesses are caused or made worse by living in what John Ott called "mal-illumination." The application of light and color therapy, in this model, is a restoring of balance to the body by appropriate inputs of energy from the sun or sources that mimic sunlight in the amounts that our bodies have evolved to expect and require to thrive.

3. Modalities that apply low-level electrical fields to the body through the hands or machines. These include:
    - Reiki
    - Hands-on Qi Gong healing
    - Healing Touch therapy
    - TENS therapy for pain
    - Electroshock therapy for depression
    - Low level electrical stimulation and biomagnetic field stimulation to aid in healing wounds and bone fractures.
    - Pulsating electro-magnetic field therapy (PEMF) for pain relief, improved circulation and overall health and energy
    - Transcranial stimulation with direct current
    - Magnetic Resonance Therapy (MRT)
4. Modalities that manipulate the body or body parts in ways that restore the free flow of the body's natural energies, thereby restoring health and balance to the body's functioning. These include:
    - Acupressure
    - Acupuncture
    - Chiropractic
    - Many kinds of traditional massage
    - Reiki
    - Tapping and EFT (Emotional Freedom Technique)
    - Myofascial release and trigger point therapy
    - Feldenkrais

- Alexander technique
- EMDR treatment for PTSD

5. Sound healing, which uses specific frequencies of sound to restore the free flow of the body's natural energies, thereby restoring health and balance to the body's functioning

There are also exercise practices such as yoga, qi gong, tai chi, Breema, and Feldenkrais that people who are not masters or experts can practice directly, learning how to connect with, stimulate and regulate their body's own energy. These might be thought of as energy development practices. Traditional energy development practices like yoga and qi gong have a spiritual component because there is an inherent connection between learning to become conscious of one's body, in all its manifestations; learning to quiet the mind; and becoming more conscious of what supports life and health versus what opposes it. The goal of such practices, in essence, is to become a coherent human being with a clean, healthy and strong energy field so that one is able to receive fully the coherent energy of nature and all the wisdom it carries.

Some of these treatments have roots in traditional medical systems that date back thousands of years; some are therapies developed more recently. All, even those available in mainstream medical settings, remain outside of our conventional frameworks for explaining health and disease.

As currently understood by most scientists and health care researchers today, the list above may seem like an unrelated potpourri of treatment modalities, some of which are scientifically well-validated and established while others are fringe treatments without a clear

scientific basis. However, all are designed to interact and change human energy fields that impact health and well-being. All are also used or prescribed in mainstream hospitals and clinics today.

Biosyotonie® Tiles: what do they do?

The Somadome incorporates Biosyntonie® ceramic tiles into the design. The tiles are made by French electronics engineer and biophysicist Pierre Nicolas, who sells them through his company, Terre de Lys. The technology is proprietary, so the design, materials and manufacturing process of the tiles is a trade secret to which Somadome is not privy. Nicolas created his first tiles in 1990. The tiles have been in production since 1999 and are sold around the world to individuals seeking to protect themselves from harmful EMFs and to healers, who use Biosyntonie products both to shield their spaces from harmful EMFS and to treat patients. Many acupuncturists around the world use Biosyntonie tiles in lieu of acupuncture needles, reporting superior results than from using needles.[38] Dr. Norman Suhu of the Somadome Research Advisory Board has used the tiles in his New York naturopathic practice for many years and teaches workshops to healers around the country in their use.

The tiles are unique in the world of energy medicine products. Most products are designed to either generate beneficial EMFs in the human frequency range of 0 – 30 Hz (such as pulsating EMF products) or to supply specific, targeted electrical impulses to areas of the body for treatment (such as TENS pain relief devices or TCM treatment of brain disorders). The Biosyntonie tiles are instead designed to be filters and transformers of the harmful EMFs we are now bathed in, into frequencies and wave forms that better match the natural frequencies and

[38] Personal communication, Dr. Norman Suhu and Jack Chang, members of the Somadome Research Advisory Board.

wave forms of the human body. The tiles do not just "step down" the frequencies of the EMFs, but also change the unnatural human-made wave forms into forms that more closely resemble the vortex wave forms that Dr. Nicolas says are found in nature. They make these energies more coherent to the human body.

Trace metals and minerals elements are found throughout the human body. The specific types and concentrations of these metals and minerals varies depending on the type of body tissue. Jack Chang of our RAB, an acupuncturist with training in electrical engineering, hypothesizes that the qi of Chinese medicine is related to these trace metals and minerals suspended in our body fluids, which create inductance fields and thereby energy flow throughout the tissues.[39]

Chang believes that electrosmog disrupts the flow of the trace metals and minerals in the body (and thereby the flow of qi or health life energy) to the point of causing physiological stress and disease conditions. Biosyntonie tiles restore the flow of qi to optimal level. That creates an environment in the Somadome in which the whole body is shielded for a certain period of time to allow the body to synchronize with its own natural waveforms. This causes the body to switch from producing stress hormones – which the body produces as a result of the scrambled EMF signals it is receiving on a regular basis, a contention validated by the research of Robert O. Becker among others – to biochemicals and hormones that repair damage to cells, tissues and organs. Another way of putting this is that the Biosyontonie tiles help create an environment in

[39] He also notes that different tissues and organs also have differing structures to their magnetic fields. This causes different vibratory frequencies in each of the different organs, which we see the Taoists utilize in their "6 Healing Sounds" qi gong methodology. By vibrating the body in that frequency, the organ is thus stimulated to the optimal frequency in which it can function properly.

which the sympathetic nervous system is turned off and the parasympathetic nervous system is turned on. We believe that is the major benefit provided by the Biosyntonie tiles.

How do we know the tiles work?

Right now, the only proof that the tiles work is anecdotal and clinical. Many of the Somadome RAB members have personally experienced use of the tiles and Dr. Suhu and Jack Change use the tiles in their practices and teach others the theory behind their use and how to use them clinically. We do not currently have controlled laboratory or clinical test results on the efficacy of the tiles.

Where do we go from here?

That we do not yet have definitive proof that the tiles work as described by Dr. Nicolas does not make using them unscientific. The place where science lives and is most vital is at the cutting edge of what works and do not yet understand. We have both personal and user experiences with the tiles that suggest they have a significantly beneficial effect on users of the Somadome and that is why they are in the Somadome. At the same time, we human beings are subject to seeing patterns where none exist and creating spurious causal relationships. The fact that we believe the Biosyntonie tiles work does not therefore mean that they do. History is replete with examples of human self-delusion. Modesty in claims and humility in our knowledge are therefore good habits to adopt. At Somadome, we are empiricists who are focused on what works – not on belief systems, whether religious or scientific. We believe that medicine and biology are approaching a paradigm shift with regard to understanding the human body as an energy system. We are committed to engaging in scientific research to test the healing efficacy of

Somadome, including the efficacy of the tiles, and to be a part of this emerging new paradigm of energy medicine.

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In addition to the footnoted sources, we have relied upon the sources below in preparing this paper. For those interested in delving more deeply into energy medicine, we particularly recommend reading the works of James Oschman; Robert O. Becker and Cyndi Dale's book, *The Subtle Body*, which provides a comprehensive and readable overview of both traditional and contemporary scientific systems of understanding energy and the human body.

V. Di Stefano. *Holism and Complementary Medicine: Origins and Principle*s. Crows Nest, NSW, Allen & Unwin; 2006.

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Finley Eversole, Ph.D. *Energy Medicine Technologies: Ozone Healing, Microcrystals, Frequency Therapy, and the Future of Health.* Inner Traditions/Bear & Company. Kindle Edition May 20, 2013.

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Robert O. Becker, MD and Gary Selden. *The Body Electric: Electromagnetism And The Foundation Of Life*. William Morrow: 1995.

Robert O. Becker, MD and Andrew A. Marino, PhD, JD. *Electromagnetism and Life.* Apr 6, 2010. Cassandra Publishing (Belcher, LA).

Cyndi Dale. *The Subtle Body: An Encyclopedia of Your Energetic Anatomy.* Sounds True publishing. February 2009.

Nobel Prizes in Medicine awarded in connection with diagnostic and clinical applications of energy or understanding the role of energy in producing disease

The Nobel Prize in Physiology or Medicine 1903

Niels Ryberg Finsen

"in recognition of his contribution to the treatment of diseases, especially lupus vulgaris, with concentrated light radiation, whereby he has opened a new avenue for medical science"

The Nobel Prize in Physiology or Medicine 1924

Willem Einthoven

"for his discovery of the mechanism of the electrocardiogram"

The Nobel Prize in Physiology or Medicine 1946

Hermann Joseph Muller

"for the discovery of the production of mutations by means of X-ray irradiation"

The Nobel Prize in Physiology or Medicine 1967

Ragnar Granit, Haldan Keffer Hartline and George Wald

"for their discoveries concerning the primary physiological and chemical visual processes in the eye"

The Nobel Prize in Physiology or Medicine 1979

Allan M. Cormack and Godfrey N. Hounsfield

"for the development of computer assisted tomography"

The Nobel Prize in Physiology or Medicine 2003

Paul C. Lauterbur and Sir Peter Mansfield

"for their discoveries concerning magnetic resonance imaging"