

## SCHUMANN RESONANCE AND HUMAN PSYCHOBIOLOGY

Schumann's Resonances and Human Psychobiology

(extended version)

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### MAIN ARTICLE

Appendix 1: The Effect of Geophysical Phenomena on Human Health

Appendix 2: Electrical Technology and Human Evolution

**SIDEBAR:** Lewis B. Hainsworth of Western Australia first recognized the relationship of brain wave frequencies to naturally circulating rhythmic signals, known as Schumann's Resonances (SR), in the space between the surface of the earth and the ionosphere. Hainsworth imparted this awareness to Dr. Robert O. Becker, noted electromagnetics pollution expert, and to Harvard neurologists as early as 1975. In 1977, the relationship between brain-wave rhythms and natural earth ELF signals became the basis for Itzhak Bentov's *Stalking the Wild Pendulum* (Dutton, 1977). Later research confirmed a relationship to health, well-being, and even ESP or psi phenomena.

Hainsworth sent up a clarion cry against hazardous EM pollution. Dangers pale compared to the global threat of technologies such as HAARP, which send violent pulsations into the earth's ionosphere, potentially disrupting the entire electromagnetic shield of the earth. Some suggest that the frequency of the basic SR is changing in value, possibly threatening the whole biosphere, human welfare, and our evolutionary future. All biological processes are a function of electromagnetic field interactions, which are the connecting link between the world of form and resonant patterns. EM fields store gestalts or patterns of information. The bridge connecting solar system resonances and brain frequencies resides in our human DNA helix, which evolved in this environment.

### INTRODUCTION

The rhythm of life has evolved at an even tempo for epochs. We live in a matrix of oscillating fields; the tiniest fluctuations in one interlocked field carry over perturbation into others. Many times per second, pulses travel completely around the world between our planet's surface and the ionosphere sending coordinating signals to all organisms. These signals couple us to the global electrostatic field. Named for their discoverer, these Schumann Resonances (SR) provide the orchestrating pulse for life on our planet.

We all march to the cadence of this cosmic drummer -- our planetary heartbeat, which sets the tempo for health and well-being. Damaging this planetary pacemaker could spell doom for life as we know it. In the name of progress and defense, this pacemaker is now threatened, while vast amounts of public money are spent on this exploitation. Even more tax funds are allocated to implement the ill-conceived "Star Wars" missile defense, and the energy beam Project HAARP.

“What is clear is that part of the money voted to Bush’s Star Wars plan will be used for research into space-based lasers,” the Independent reported. “These, we are told, will be used to shoot down the missiles fired in anger by ‘rogue states.’ But they will, inevitably, evolve into weapons aimed at America’s enemies from space. U.S. Space Command doesn’t even bother to hide this fact. The most chilling illustration in Vision 2020 is of such a space-based laser firing a beam of energy at the earth.”

"What the Russians are worried about (as they’re trying to explain in badly translated prose from Moscow’s Interfax News Agency) are U.S. plans to begin large-scale scientific experiments using the Alaska-based HAARP in 2003. Ninety Russian deputies signed the appeal against the HAARP program, charging that the experiments “would create weapons capable of breaking radio communication lines and equipment installed on spaceships and rockets, provoke serious accidents in electricity networks and in oil and gas pipelines and have a negative impact on the mental health of people populating entire regions.” (Fittrakis, 2002)

The ionosphere shields us from deadly radiation from the sun and deep space. Holes are now being routinely punched in this insulating blanket by high-frequency radio waves, and may accidentally tear open the fragile cocoon of human and planetary evolution. Dire consequences could be as devastating as the failure of an individual's pacemaker. First, we will give an overview, then define and describe some terms used here in greater detail deeper in the article.

This environmental rhythm -- the fundamental driving system for all life on our small blue planet -- is jeopardized by human manipulations of the ionosphere, such as project HAARP. It is dangerous to fool with Mother Nature as the results of ozone depletion and other ecological calamities have shown. It might be easy to see that such survival risks don't balance alleged benefits, but targeted research on potential problem areas has been virtually non-existent.

Lewis B. Hainsworth was among the first to suggest that human health is linked with geophysical parameters by way of the naturally occurring Schumann ELF (extremely low frequencies). His hypothesis identified naturally occurring features which determine the frequency spectrum of human brain-wave rhythms. He concluded that the frequencies of human brain-waves evolved in response to these signals. If the hypothesis is correct, conditions for evolutionary changes in human brainwave patterns have now been established.

Hypothesis: "The frequencies of naturally occurring electro-magnetic signals, circulating in the electrically resonant cavity bounded by the earth and the ionosphere, have governed or determined the 'evolution' or development of the frequencies of operation of the principal human brain-wave signals: In particular, the alpha-rhythm is so placed that it can in no circumstances suffer an extensive interference from naturally occurring signals."

Further, variations in them can produce mild to disastrous health and behavioral changes. These waves probably help regulate our bodies' internal clock, affect sleep patterns (REM), and hormonal secretion. The nature of the applied stimulus makes it difficult to identify the responses directly, as they are most likely to occur in the form of stress-related conditions. They will therefore, show up as drastic increases in mental disturbance, anti-social behavior, psycho-somatic conditions, and neurological disturbances. Some electrical field phenomena have already been linked with abnormal cell growth and a decrease in immuno-competency.

All these factors could be expected to lead to the appearance of 'new' diseases, probably accompanied by a decline in resistance to many minor infections: an increase in conditions related to abnormal cell development, including cancer, birth defects, and infertility and an increase in psychological disturbance problems, e.g. drug addiction, and suicides. These existing psychobiological problems will increase in scale, but could be studied for deviations from 'normal' alpha cycles of 10.4 Hz with detectable changes in psychological characteristics and mental abilities.

Hainsworth therefore strongly urged that research be carried out by widespread measurements of the natural SR signals' frequency variations and field-strengths comparing them with resulting figures for the incidence of heart attacks, suicide attempts, road accidents, social violence, domestic accidents, crime, etc. Studies are often conducted in this inferential way, such as those by Krippner and Persinger (1989), searching correlations between the phenomenon of earth lights and tectonic strain with reports of UFO sightings, abduction reports and other anomalous psychophysical experiences, for an electromagnetic correlation to temporal lobe seizures.

The authors also strongly suggest that correlations of broad changes in the modulations of Schumann's Resonance be studied in relationship to microwave radiation, ELF signals, and HAARP, for both immediate and long-term consequences. We have discussed the obvious ramifications of such EM pollution and 10 - 50 Hz modulations on the human system elsewhere ("Synthetic Telepathy," 2001).

We (Miller & Miller) have discussed the benefits for human well being and relaxation to entraining with these natural rhythms in *The Diamond Body* (1981). When a person is deeply relaxed, slow rhythmic sine wave patterns can be detected in both the EEG and the heart-aorta resonating oscillator in the 6-8 Hz range. Resonance occurs when the natural vibration frequency of a body is greatly amplified by vibrations at the same frequency from another body.

Oscillators alter the environment in a periodic manner. Thus, standing waves in the body, during meditation/relaxation or not, can be driven by a larger signal. Progressively amplified wave forms, created by resonance, result in large oscillations entraining other circuits in the body tuned to those frequencies. A hierarchy of frequencies thus couples our psychophysical selves to the harmonic frequency of the electrical charge of the Earth, which naturally pulses at the same frequencies. This is hardly a coincidence as we are adaptive products of our environment.

Our planet is surrounded by a layer of electrically charged particles called the ionosphere. The lower layer of the ionosphere is roughly 80 km from the crust; this charged layer is known to reflect radio waves. Bombardment by HAARP signals "pushes" out this boundary layer, thus altering the natural pulsating rhythm. Natural fluctuations in frequency occur daily, by the lunar month, and in response to solar flares.

Since this is a highly charged layer, the ionosphere forms a so-called capacitor with the Earth. This means that there is a difference in electrical potential between the two, the Earth being negatively charged and the ionosphere being positively charged. This potential varies somewhat but is around 200 volts/m. This is a fundamental type of electrical generator. The solar winds, interacting with the upper atmosphere rotation, act as a collector and brushes of a generator. The lower atmosphere can be seen as a storage battery for this gradient potential.

This electromagnetic field around the earth can be viewed as a stiff jelly. When our bodies move and vibrate, these movements are transmitted to the environment, and vice versa. These fields not only impinge on our bodies, they also affect the charges inside our bodies. When we are standing on the ground, under normal conditions, we are grounded. Our body then acts as a sink for the electrostatic field and actually distorts the force lines somewhat. Our body also has its own electrostatic field about itself. These field lines are the result of the various biochemical reactions in the body. This resultant bio-field couples us to the isoelectric field of the planet (Miller & Miller, 1981).

In 1957, W. O. Schumann calculated the Earth-ionosphere cavity resonance frequencies, which were then named for him. He fixed the most predominant standing wave around 7.5 Hz. A "tuned system" consists of at least two oscillators of identical resonance frequencies. If one oscillator starts emitting, the other will be activated by the signal very shortly, in the process of resonance, entrainment, or kindling.

Kindling is a term applied, in particular, to the entrainment of neurons in the brain. They are ignited in coherent global patterns producing larger waves across a greater surface of the brain. It becomes obvious that in deep meditation, when waves of alpha and theta rhythms cascade across the entire brain, it is possible for the human being and the planet to come into resonance. There is a transfer of energy and information, which is embedded in a field rather than being a field. Perhaps the planet communicates with us in this primal language of frequencies.

Ample anthropological evidence shows that humans have intuitively synchronized with the planetary resonance throughout human history and back into the mists of time. There is cross-cultural evidence demonstrating a variety of ritualistic practices which enhance this harmonization with the planetary field. Perhaps the most obvious "drivers" of these trance states are shamanic drumming and trance dance, arguably employed for over 50,000 years. Pulsing light is another driver. A further example comes from the use in both the Jewish and Muslim faiths of bobbing and swaying while praying or reading holy books.

This trancing phenomenon can be presumed to ingrain texts at a deeper level and to create "experiences" to go along with conceptual indoctrination. It may also be linked in some manner to hypnotic gesturing (mudras) and speech, and therefore to charisma or so-called "mana" personalities. Mead and Bateson reported a technique transmitted to Balinese children which this culture intuitively employed to harmonize their communities. They discovered that the parents encouraged their children to vibrate parts of their body, harmonizing to the SR cycle. And you can do the same thing; you may already do it unconsciously.

If you sit in a chair and move your foot so that it's resting on the ball of the foot, and you get it at the right angle, your whole leg will start to vibrate. It goes into an oscillation. That oscillation is so close to the SR cycle as to be virtually the same. And that's what Balinese parents encouraged their children to do. It helps them go into trance.

If one looks into a classroom of children, one will notice that the children are never sitting still. Teachers and parents become annoyed, constantly telling them to "Sit still!" They are constantly bouncing their legs; and moving their arms. This may be a natural way in which our body energizes itself. And this may even be the heart and soul of most ceremonial experiences. The body will begin to move, and hands begin to flutter. When one look at the hands of a healer, they are typically fluttering. And if one looks at the older ceremonial practices, where there is less constraint on what they should or should not do, the whole body is usually shaking, fluttering, or in constant motion.

And you'll see this in the Kalahari Bushmen healing dance, where someone is filled with life energy. Every part of their body becomes aroused, hot, and begins shaking. If they grab another person and hug them, that person also begins shaking and may turn and grab someone else. One by one, everyone begins literally vibrate with this pulsing energy. However, by the time it gets to our culture or other contemporary cultures (like Chinese medicine), this phenomena becomes very constrained and expresses through more subtle practice, such as "therapeutic entrainment."

Can anybody intentionally induce this healing/energizing frequency? Yes, certainly. There are all the kinds of little tricks and techniques -- because there is not just one right way. It is a very natural capacity our bodies are intuitively capable of effecting, vibrating with the pulse of life itself. The purpose of this movement is to get outside the limitations and constraints of isolated individual mind and connect with something greater. It has any number of names but this "greater Mind" links us to one another and to nature as a whole. (Keeney, 1997)

C.M. Anderson, M.D. (1998) of Harvard describes a commonly experienced yet little-understood phenomenon he calls the Persistent Oscillatory Sound. Many people notice this internally-generated 'sound,' particularly when ill or dehydrated, as it seems to become "louder." It sounds like an insect hum. Anderson links it, as well as the REM or dream state and Post-traumatic stress syndrome (PTSD) to the normal alpha 10Hz rhythmicity, as cited by I. Miller (2001):

"Anderson speaks of the disturbing effect of lights and sounds, which might result from loss of normal global habituation due to RF destabilization, resulting in fear and/or rage. Again, trauma and drug abuse history is strongly associated with asymmetric hemispheric function. Temporal lobe structures such as the hippocampus and amygdala are particularly sensitive to the effects of child abuse and trauma.

"Anderson conjectures the oscillatory sound could indicate rapid shifting or cycling of attentional resources between the left and right hemispheres, downshifting the normally constant 10 Hz rhythmicity of the olivocerebellar system. This oscillatory auditory effect may function as an auditory driver. The downshift effect may indicate possible flooding of the left hemisphere by material from the uninhibited right which takes over primary conscious focus. This sets the stage, along with phasic fluctuations of the S-Net and uninhibited PGO, for the sudden onset of the SOC state and the waking dream period.

"Anderson alludes to "waking dreams as a healing journey through the fractal hyperspace of emotionally indexed childhood memories." He asserts that "the basolateral amygdala (BLA) is a critical neural substrate of the waking dream stage as fractal neural bursting in this subcortical cortex-like structure may represent access points in a fractal hyperspace of emotionally indexed memories."

"The effects of early trauma on the development of the amygdala and other temporal lobe structures may interfere with its normal bilateral function during REM-sleep mediated consolidation of emotionally significant events. The recall of traumatic childhood experiences in adults, due to the immaturity of limbic structures at the time of trauma, may require electrical stimulation or intensive PGO-like activity present during the oneiric state. Habitual disruption of normal sleep processes by stress associated with combat, bereavement, divorce, child abuse, neglect or chronic drug abuse interferes with the natural restorative function of phasic REM processes."

According to electrical engineer Hainsworth, the influence of naturally occurring SR signals on brain-wave pattern evolution is formally stated to show that low-power electrical fields could produce evolutionary change. The electrical fields produced by modern electro-technology are then possible sources of evolutionary change. The characteristics of some forms which might result should be considered. Some fields might inhibit survival of existing forms. Because of lack of available data, precise measurements are lacking and must therefore be quantitatively valueless. Technology not only will, but IS changing human evolution. Only extensive investigation of the naturally occurring signals will give any lead to show what results might occur.

The possibility exists that human health is linked with geophysical parameters by way of the naturally occurring Schumann Resonances. A number of attempts have been made to discover the correlation through geo-magnetic and ionospheric storms. The correlation comes through the biological fact that the human system is apparently sensitive to such low-power ELF signals. We don't know what the range of such a correlation might be.

The frequency values of the SR signals are determined by the effective dimensions of the cavity between the earth and ionosphere. Thus any events which change these dimensions will change the resonant frequencies. And as Hainsworth warned, "such events could be ionospheric storms, and could even result from a MAN-MADE IONOSPHERIC DISTURBANCE," [emphasis added]. In field theory, any disturbance that drives fields from their harmonious rhythm, spreads out to disturb neighboring fields. Harmonizing rhythms usually return to orderly pulsations once the source of disturbance is removed. A strong harmonizing rhythm will drive and entrain the matrix of interlocking fields, creating more orderliness.

Geomagnetic storms are the magnetic changes produced by ionospheric storms, and are thus associated with conditions capable of changing the Schumann signals. However, although such storms can produce these changes, measurement of these parameters can not give any indication of whether the resonant signals have changed to a value outside their normal range or not. Since the undisturbed state of the ionosphere corresponds to the normal Schumann resonance patterns, then ionospheric disturbances are likely to produce abnormal patterns, but will not necessarily do so in all cases. If biological response is linked to the Schumann signals, this will reduce any apparent link with geomagnetic or ionospheric data.

Trying to determine relations between geophysical and biological conditions can become extremely complex. The frequencies of the Schumann signals change with ionospheric conditions. These conditions change diurnally, seasonally, and with variations in solar activity. That, in its own turn, varies both with the eleven-year sunspot cycle, and also with a twenty-seven to twenty-nine day cycle, mainly during sunspot minimum periods. Lunar tidal changes in the height and thickness of the layers could also sometimes affect the cavity dimensions and hence the Schumann frequencies. So can powerful ELF signals from HAARP.

It should be born in mind that if some signal conditions are harmful, then other conditions might be beneficial. This mean that if, for example, season and tidal conditions have resulted in the signals being in a biologically disturbing state then the advent of a solar flare could result in changes in the signals bringing them into a biologically beneficial state. The converse could also occur. If we are sensitive to ELF signals, then when these factors are considered we would expect to get confusion if we try to link any effect with geophysical changes. For instance we could get incidence of classic states of "lunacy" some years if damaging signals coincided with full moons, then other year's observation and analyses would show that the effects were not lunar.

An analysis of the correlation between the incidence of ionospheric disturbances and rates of admission to Heathcote Hospital (Western Australia) for about a three year total indicated that when a disturbance occurred then the admission rate changed. The probability of the association being random was of the order of 2000:1 against. However, the fact that sometimes the rates went up and sometimes down, showed that ionospheric storms changed the rate of incidence of mental disturbance in a way that is consistent with that change being dependent on the actual causes being linked to variations in the

Schumann resonant signals. At that point, Hainsworth decided to concentrate on trying to get some observational work going on measuring the Schumann signals.

Hainsworth's set up used a 2000-turn 1 metre square antenna, and another of 1/3 metre square, plus amplifiers to handle signals from the 0-30 Hz. His amplified Schumann signals were analyzed in a laboratory. On one occasion the signal dropped to zero amplitude when a solar flare occurred, and did not start recovering for about an hour and a half. It was originally just under 7 Hz and came back at only just over 6 Hz. His next step would have been to develop a wave analyzer to try to pick out individual signals. But the failing health of both himself and his wife prevented this.

The value of proceeding with his seminal work has now increased many-fold by the threat to his homeland Western Australia by the proposed Missile Shield. This is the offspring of the United States' HAARP program in Alaska, whose *raison d'etre* or mission statement is vague to purposefully misleading, allegedly dealing with national security.

## EM FREQUENCIES AND BRAINWAVE RESPONSES

Hainsworth posed a series of questions, all of which are answered with a resounding 'yes.' This should lead us in the direction of extreme caution toward introducing new EM or ELF sources and ionospheric changes in our environment. He presented his data in the two appended papers.

1. Does the human biological system contain, use, or generate, any forms of electrical signal?
2. Does it respond to any of these signals?
3. Does it respond to audible signals at these frequencies?
4. Does it respond to optical signals at these frequencies?
5. Do human signals change with psychological or mental states, such as stress or problem solving?
6. Does the human system respond to any very, very low power electromagnetic signals?

Brain-waves have only been studied since about the mid-1920s, and the signal form that is apparently most widely known, and identified is the alpha-rhythm. The frequency of this signal varies from individual to individual, but it lies between about 8Hz and 12Hz, with an average value of 10.5Hz. Theta- and Beta- rhythm signals also occur, and are identifiable by EEG, below the 8Hz, and above the 12Hz frequencies.

Since the discovery and measurement of these signals a great deal of effort has been devoted to trying to work out how they originated in the first place, and what determines their frequencies of operation. In the early-to-mid 1950s a geo-physicist (almost certainly uninterested in neurology) suggested that electromagnetic signals might circulate at extremely low frequencies in the electrically resonant cavity between the earth and the ionosphere. He was right. The signal came to be called Schumann resonance. One major component was originally predicated at a frequency of about 10Hz. In 1959 it was

measured to be slightly different. Meanwhile the military co-opted the discovery for using ELF signals for submarine communications.

In fact, the first mode of these circulating signals has an average value of 7.8Hz with a typical diurnal range of from 7.2 to 8.8 Hz, and the second mode has an average value of 14.1Hz and a range of from 13.2 to 15.8Hz. These match the brain-wave Theta-rhythm and Beta-rhythm nicely. The blank range between the two modes is a very reasonable match with the normal frequency range of the human alpha-rhythm, between 8 - 12Hz or cycles.

Additionally, it was found that there is minimum (zero) power circulating in the earth/ionosphere cavity at 10.4Hz - which is virtually an exact match for the average value of the Alpha-rhythm. Hainsworth points out that the existence of these natural signals and the close relationship of their frequencies of oscillation was unknown to senior neurologists and mental health specialists as late as 1975.

Hainsworth argues that up to the end of 1979 no long-term systematic measurements of any great value of the Schumann resonance signals were being made. Measurements were being made intermittently for the purpose of obtaining research data for use by post-graduate geophysicists in constructing esoteric mathematical models of the ionosphere.

It follows from this that, until long after the end of 1979, no figures on these signals were available. Consequently no "expert" can produce numerical evidence to support an objection to Hainsworth's original hypothesis, since the only numerical values available are those favoring it. He left us with some open-ended questions:

7. Has any evidence ever been obtained to indicate that the human system is totally unaffected by externally applied electromagnetic fields?
8. Have any measurement programs ever been attempted to show whether the human system is either (a) totally unaffected, (b) always affected, or (c) sometimes affected by naturally [or artificially] occurring electromagnetic signals?
9. Have the existence of such signals, having a close relationship with human biological signal frequencies been known for many years?
10. Have those relationships been studied with adequate protocols in any detail?

Summary: Planet Earth has a natural frequency for electromagnetic radiation called the Schumann resonances. The human brain also has resonant natural frequencies for EM radiation "in tune" with the planetary cycles. Schumann Resonances are actually observed by experiment occurring at several harmonic frequencies between 6 and 50 cycles per second. A cycle equals a Hz. Specifically they are found at 7.8, 14, 20, 26, 33, 39, and 45 Hertz, allowing a daily variation of around +/- 0.5Hz.

Only as long as the properties of Earth's electromagnetic cavity remain about the same, do these frequencies remain the same. Cycles may vary somewhat due to ionospheric response to the cycle of solar activity, properties of the atmosphere and magnetosphere. Projects, such as HAARP, which heat up or blast out the ionosphere pose a potential threat to this interactive system of catastrophic proportions.

## MEASURING BRAINWAVES: EEG RESEARCH

The resonant cavity formed between the ionosphere and the earth produces rhythmic waves capable of entraining and phase locking with brainwaves. Even at the turn of this millennium, engineer Hainsworth (now deceased) seems to have been unfamiliar with extensive work in brainwave research in neurology, hypnotherapy and bio- and neuralfeedback. This research includes extensive experiments in frequency-following response (ffr) and relating brainwaves, brainwave deficiencies and irregularities to psychobiological states.

The brain is a massive source of ELF signals that get transmitted throughout the body through the nervous system, which is sensitive to magnetic fields. Brainwaves and natural biorhythms can be entrained by strong external ELF signals, such as stationary waves at Schumann resonance. Entrainment, synchronization, and amplification leads toward coherent large-scale activity, rather than typical flurries of transient brainwaves. Thus, resonant standing waves emerge from the brain, which under the right conditions facilitates internal and external bioinformation transfer, via ELF electromagnetic waves. These SR waves, exhibit non-local character and nearly-instant communication.

The EEG (electroencephalograph) measures brainwaves of different frequencies within the brain. Rhythmicity in the EEG is a key variable in the coordination of cortical activity. Electrodes are placed on specific sites on the scalp to detect and record the electrical impulses within the brain. Frequency is the number of times a wave repeats itself within a second. It can be compared to the frequencies on a radio. Amplitude represents the power of electrical impulses generated by the brain. Volume or intensity of brain wave activity is measured in microvolts.

Raw EEG frequency bands include Gamma (higher than 30Hz); Beta (14-30Hz); Alpha (7.5-13Hz); Theta (3.5-7.5Hz); and Delta (less than 4Hz). Their ranges overlap one another along the frequency spectrum by 0.5Hz or more. These frequencies are linked to behaviors, subjective feeling states, physiological correlates, etc. Clinical improvement with EEG biofeedback is traceable to improved neuroregulation in the basic functions by appeal to their underlying rhythmic mechanisms.

Schumann's resonance forms a natural feedback loop with the human mind/body. Our brains and bodies developed in the biosphere, the EM environment conditioned by this cyclic pulse. Conversely, this pulse acts as a "driver" of our brains, and can also potentially carry information as well. Functional processes may be altered and new patterns of behavior facilitated through the brain's web of inhibitory and excitatory feedback networks.

Like sound waves, the brain has its own set of vibrations it uses to communicate with itself and the rest of the body; EEG equipment distinguishes these waves by measuring the speed with which neurons fire in cycles per second. At their boundaries these waves can overlap somewhat, merging seamlessly into one another, so different researchers may give slightly different readings for the range of cycles per second. Rate of cycling determines the type of activity, kindling wave after wave over the whole surface of the brain, by igniting more neurons.

BETA waves (14 cycles per second and above) dominate our normal waking state of consciousness when attention is directed towards cognitive tasks and the outside world. Beta waves range between 13-40 Hz. Gamma (above 30 Hz) represents hyperarousal. The Beta wave is associated with peak concentration, heightened alertness and visual acuity. Nobel Prize winner, Sir Francis Crick and other scientists believe that the 40Hz beta frequency may be key to the act of cognition.

ALPHA waves (7-13 cycles per second) are present during dreaming and light meditation when the eyes are closed. As more and more neurons are required to this frequency, alpha waves cycle globally across the whole cortex. This induces a deep relaxation, but not quite meditation. In Alpha, we begin to access the wealth of creativity that lies just below our conscious awareness. It is the gateway, the entry point that leads into deeper states of consciousness. Alpha is also the home of the window frequency known as the Schumann Resonance, which is the resonant frequency of the earth's electromagnetic field. SR waves propagate with little attenuation around the planet. When we intentionally generate alpha waves and go into resonance with that earthy frequency, we naturally feel better, refreshed, in tune, in synch. It is, in fact, environmental synchronization.

THETA waves (4-7 cycles per second) occur most often in sleep but are also dominant in the deepest state of mediation (body asleep/mind awake). The optimum level for deep thought is this realm of Theta. In Theta, our senses are withdrawn from the external world and focused on the mindscape, internally originating signals. Theta waves are associated with mystery, an elusive and extraordinary realm we can explore. It is that twilight state which we normally only experience fleetingly as we rise from the depths of delta upon waking, or drifting off to sleep. In theta we are in a waking dream, vivid imagery flashes before the mind's eye and we are receptive to information beyond our normal conscious awareness. Theta has also been identified as the gateway to learning and memory. Theta meditation increases creativity, enhances learning, reduces stress and awakens intuition and other extrasensory perception skills.

DELTA waves range between 0-4 Hz. Delta is associated with deep sleep. In deepest meditation and dreamless sleep, Delta waves are generated. Each of these brainwave frequencies serves an important function. DELTA waves confer a suspension of external existence and provide the most profound feelings of peace. In addition, certain frequencies in the delta range trigger the release of growth hormone beneficial for healing and regeneration. This is why sleep, deep restorative sleep is so essential to the healing process.

## WE'VE GOT RHYTHM: HUMAN PSYCHOPHYSIOLOGY

There is a harmonic relationship between the earth and our mind/bodies. Earth's low frequency isoelectric field, the magnetic field of the earth, and the electrostatic field which emerges from our bodies are closely interwoven. Our internal rhythms interact with external rhythms, affecting our balance, REM patterns, health, and mental focus. SR waves probably help regulate our bodies' internal clocks, affecting sleep/dream patterns, arousal patterns, and hormonal secretion.

The rhythms and pulsations of the human brain mirror those of the resonant properties of the terrestrial cavity, which functions as a waveguide. This natural frequency pulsation is not a fixed number, but an average of global readings, much like EEG is an average of brainwave readings. SR actually fluctuates, like brainwaves, due to geographical location, lightning, solar flares, atmospheric ionization and daily cycles.

The most important slow rhythm is the daily rhythm sensed directly as change of light. Rhythms connected with the daily rhythm are called circadian (an example is pineal gland melatonin secretion). Some experiments in the absence of natural light have shown that the basic human "clock" is actually slightly longer than one day, and closer to one lunar day (24h 50min). The lunar day has a similar period (24h 50min).

On a slower scale, a strong influence on the Earth is its geomagnetic field, which is influenced by the following periods: the Moon's rotation (29.5 days); the Earth's rotation (365.25 days); Sun spots (11 and 22 years); the nutation cycle (18.6 years); the rotation of the planets (88 days to 247.7 years); and all the way out to the galaxy's rotation cycle (250 million years).

Very important rhythms are in the order of 1-2 hours, like hormone secretion, and dominant nostril exchange. In the range of human EEG, we have the Sun's electromagnetic oscillation of 10Hz, while the Earth-ionosphere SR system is resonant at frequencies in the theta, alpha, beta1 and beta2 bands.

Different species often have internal generators of environmental rhythms, which can be extremely precise, up to  $10^{-4}$ . The frequency of these oscillators is then phase locked loop (PLL) synchronized with the natural rhythms. Environmental synchronization sources are often called "zeitgebers." The mechanism of optical synchronization can be shown. The presented rhythms should inspire a better understanding of the interaction of internal and external rhythms during specific states of consciousness.

This bioelectrical domain is geared to thalamocortical generation of rhythmic activity. In neurofeedback, what is being trained is the degree of rhythmicity of the thalamocortical regulatory circuitry. Rhythmicity manages the entire range of activation and arousal in the bio-electrical domain. One role advocated for rhythmic activity is that of time binding, the need for harnessing brain electrical activity which is spatially distributed while maintaining it as a single entity. Brainwaves indicate the arousal dimension, and

arousal mediates a number of conditions. Changes in sympathetic and parasympathetic arousal "tunes" the nervous system.

Underarousal leads toward Unipolar or Reactive Depression, Attention Deficit Disorder, chronic pain and insomnia. Overarousal is linked with anxiety disorders, sleep onset problems, nightmares, hypervigilance, impulsive behavior, anger/aggression, agitated depression, chronic nerve pain and spasticity. A combination of under- and overarousal causes anxiety and depression, as well as ADHD. Instabilities in certain rhythms can be correlated with tics, obsessive-compulsive disorder, aggressive behavior, rage, bruxism, panic attacks, bipolar disorder, migraines, narcolepsy, epilepsy, sleep apnea, vertigo, tinnitus, anorexia/bulimia, suicidal ideation and behavior, PMS, multiple chemical sensitivities, diabetes, hypoglycemia, and explosive behavior.

Delta waves are the slowest but highest in amplitude. They are abundant in deep, dreamless sleep, non-REM sleep, trance, and unconsciousness. Theta waves mean 'slow' activity connected often with creativity, intuition, daydreaming or recalling emotions and sensations. Focus is internal in this state between waking and sleep. Under stress it may manifest as distraction, lack of focus. Alpha waves aid relaxation and overall mental coordination, calmness, alertness, inner awareness, mind/body integration and learning.

Beta is a 'fast' activity, present when we are alert or even anxious; problem-solving, judgment, decision making, processing information, mental activity, focus. Gamma appears to relate to simultaneously processing information from different brain areas: memory, learning abilities, integrated thoughts, information-rich task processing. Gamma rhythms modulate perception and consciousness, which disappears with anesthesia. Synchronous activity at about 40Hz appears involved in binding sensory inputs into the single, unitary objects we perceive.

The brain responds to inputs at a certain frequency or frequencies. The computer can create wave form patterns or certain frequencies that compare with the mind's neural signals in terms of mind patterns. If people can control their mind patterns, they can enter different states of being (mental relaxation, study, etc.). What happens when the mind is entrained with a sound or vibration that reflects the thought patterns? When the mind responds to certain frequencies and behaves as a resonator, is there a harmonic frequency that the mind vibrates to or can attune to? What does the study of harmonic resonance - sound or vibration have to do with the brain's frequency waves?

Soundwaves are examples of periodicity, of rhythm. Sound is measured in cycles per second (Hertz or Hz). Each cycle of a wave is in reality a single pulse of sound. The average range of hearing for the human ear is somewhere between 16 hz. and 20,000 Hz. We can not hear extremely low frequencies (ELFs), but we can perceive them as rhythmic.

Entrainment is the process of synchronization, where vibrations of one object will cause the vibrations of another object to oscillate at the same rate. External rhythms can have a direct effect on the psychology and physiology of the listener. Slower tempos from 48-70

BPMS have been proven to decrease heart and respiratory rates, thereby altering the predominate brainwave patterns.

Binaural beats are continuous tones of subtly different frequencies, which are delivered to each ear independently in stereo via headphones. If the left channel's pitch is 100 cycles per second and the right channel's pitch is 108 cycles per second, the difference between the two equals 8 cycles per second. When these sounds are combined they produce a pulsing tone that waxes and wanes in a "wah-wah" rhythm.

Binaural beats are not an external sound; rather they are subsonic frequencies heard within the brain itself. These frequencies are created as both hemispheres work simultaneously to hear sounds that are pitched differed by key mathematical intervals (window frequencies). The brainwaves respond to these oscillating tones by following them (entrainment) and both hemispheres begin to work together. Communication between the two sides of the brain is associated with flashes of creativity, insight and wisdom.

Alpha-wave biofeedback is considered a consciousness self-regulation technique, while alpha-frequency binaural-beat stimulation (frequency-following response) is a passive management technique where cortical potentials entrain to or resonate at the frequency of an external stimulus. Through the self-regulation of specific cortical rhythms, we begin to control those aspects of consciousness associated with that rhythm. When the goal is alpha, either in meditation or biofeedback, it means entraining with the primary Schumann resonance.

## MEASURING CHANGES IN THE SCHUMANN'S RESONANCES

Earth's background base frequency, or "heartbeat," (SR) fluctuates and may be rising dramatically. Though it varies among geographical regions, for decades the overall measurement was 7.8 cycles per second. This was once thought to be a constant and so global military communications were developed using this frequency. Recent reports set the rate at over 11 cycles, and climbing. Science doesn't know why, what to make of it, or even if these reports are credible.

Gregg Braden claims to have found data collected by Norwegian and Russian researchers, saying it's not widely reported in the U.S. These authors have been unable to substantiate this. He suggests the only reference to SR to be found in the Seattle Library reference section is tied to the weather. Science acknowledges SR as a sensitive indicator of temperature variations and worldwide weather conditions. Braden believes the fluctuating SR may be a factor in the severe storms, floods, and weather of recent years.

As previously stated, the Earth behaves like an enormous electric circuit. The atmosphere is actually a weak conductor and if there were no sources of charge, its existing electric charge would diffuse away in about 10 minutes. There is a 'cavity' defined by the surface

of the Earth and the inner edge of the ionosphere, whose height also fluctuates somewhat. At any moment, the total charge residing in this cavity is reported at 500,000 Coulombs.

There is a vertical current flow between the ground and the ionosphere described in the literature at  $1 - 3 \times 10^{-12}$  Amperes per square meter. The resistance of the atmosphere is 200 Ohms. The voltage potential is 200,000 Volts. There are about 1000 lightning storms at any given moment worldwide. Each produces 0.5 to 1 Ampere and these collectively account for the measured current flow in the Earth's 'electromagnetic' cavity.

The Schumann Resonances are quasi standing wave electromagnetic waves that exist in this cavity. Like waves on a string, they must be potentiated or excited in order to be observed. They are not caused by internal terrestrial factors, or Earth's crustal movements, or its core which does produce magnetic fields. SR is generated around electrical activity in the atmosphere, particularly emerging from intense lightning activity. While the properties of Earth's electromagnetic cavity remains about the same, these frequencies remain the same. Presumably there is some change due to the solar sunspot cycle as the Earth's ionosphere changes in response to flares and mass ejections during the 11-year cycle of solar activity. High energy charges coming off the sun brush across the upper atmosphere, ionizing gases in the upper atmosphere.

Since the earth's atmosphere carries a charge, a current and a voltage, it is not surprising to find such electromagnetic waves. The resonant properties of this terrestrial cavity were first mathematically predicted by German physicist W. O. Schumann between 1952 and 1957, and subsequently detected by him with König in 1954. Much of the research in recent decades has been conducted by the Department of the Navy who use Extremely Low Frequency (ELF) signals for communication with submarines. Of course, little attention is given by defense contractors to issues of psychobiological health and well being.

Between the almost perfectly conducting terrestrial surface and ionosphere, a resonating cavity is formed. Broadband electromagnetic impulses, like those from lightning flashes, fill this cavity, and create globally enveloping Schumann resonances ranging from frequencies 5 - 50 Hz (Schumann, 1952; Bliokh et al., 1980; Sentman, 1987). The nominal average frequencies observed are 7.8, 14, 20, 26, 33, 39, and 45 Hz with slight diurnal variation (Sentman and Fraser, 1991).

Standard magnetometers are not able to measure the Schumann resonances. Even the search coil (i.e., pulsation) magnetometers, most often sampled at about 0.1 Hz, do not allow such studies. Special equipment is thus needed (see, e.g., Sentman and Fraser, 1991). Current findings suggest,

- 1). The Schumann Resonances are actually observed by experiment to emerge at several frequencies related to brainwaves. They range between 6 and 50 cycles per second, specifically 7.8 (alpha), 14 (low beta), 20 (mid beta), 26 (high beta), 33 (high beta), 39 (gamma) and 45Hz (gamma), with a daily variation of about +/- 0.5 Hertz.

2). 7.83 is the strongest of the seven resonances, in the alpha brainwave range. If the rise in resonance continues, this primary resonance, the earth pulse, changes from sub band low alpha (7-10Hz) to sub band high alpha (10-12Hz), perhaps influencing our ability to deeply relax, balance and integrate our mind/body connection. It could influence REM sleep and dreaming. If it continues to rise, it will breach the threshold into 'fast' beta activity. Low beta (12-15Hz) is associated with lack of focused attention, and low beta can even reflect Attention Deficit Disorder.

3). The amplitude (i.e. intensity) of the Schumann resonance is not constant, and appears to be extremely dependent upon tropical (and hence global) temperature. Indeed preliminary results seem to indicate that a mere one degree increase in temperature seems to be correlated with a doubling of the SR. This could not be more significant, as it is unknown what psychobiological effect these fluctuations could have on humans.

One of the most crucial questions in science today centers on whether or not the planetary temperature is rising, falling, or remaining unchanged. Recently global warming has been acknowledged by most in the field, and technology is implicated. On one hand, analyses of thermometer measurements of near-surface global (land and sea) air temperatures suggest the planet has been warming in recent decades. But satellite measurements of the planet's lower atmospheric temperature show little perceptible warming from 1979 to 1998.

Temperature data from weather balloons launched throughout the world reveal variations and trends in global temperatures that correspond to those found in the satellite based measurements. Analysis of pressure thickness measurements from these same balloons also shows no warming in recent decades. It's no wonder we have such an ongoing "heated debate" about the recent temperature history of the earth! Most lay people know and recognize their local weather is markedly different than past decades.

Scientists have suggested lately that another method may exist to accurately monitor planetary temperature. The idea is simple, though the underlying physics of the processes are complex. The method is based on the well known fact that thunderstorms and lightning strokes in many parts of the world are directly related to lower-atmospheric air temperatures. Higher temperatures produce more lightning strokes, while lower temperatures tend to depress lightning activity.

Lightning discharges occurring anywhere in the world produce electromagnetic pulses that spread away from the source. Much of the energy is quickly degraded, but some of the energy the lightning produces falls in the extremely low-frequency, long-wavelength domain of the electromagnetic spectrum. At these long wavelengths, the energy from a lightning stroke is able to circumnavigate the earth without serious degradation. This low-frequency/long-wavelength energy creates SR signals which can be detected throughout the world.

Understanding SR waves requires a basic appreciation of the vertical structure of the atmosphere. In that upper reaches of the ionosphere, incoming ultraviolet radiation and

soft X-rays affect atoms or bonded groups of atoms, causing gains or losses of negatively charged electrons. This interaction creates an environment of positively and negatively charged particles of the high atmosphere that, among other interesting qualities, can readily conduct electricity.

The bulk of our insulating atmosphere lies between two conducting layers of earth's surface and the lower boundary of the ionosphere. This spherically concentric cavity, called the earth-ionosphere cavity, is bounded by those electrically conducting walls. Again, lightning discharges within the cavity produce electromagnetic pulses that spread away from the source in the extremely low-frequency domain, and the conductive walls of the cavity produce some interesting effects for the low-frequency energy.

For example, energy with a frequency near 7.5 Hz (7.5 cycles per second) would have a wavelength of about 40,000 km (recall that wavelength = speed of light / frequency). Because this wavelength equals the circumference of the earth, the energy is able to circumnavigate the earth's ionospheric cavity without serious degradation. The 100 or so lightning bolts occurring each second in the 2,000 concurrent thunderstorms around the world contribute to the energy in the 7.5 Hz portion of the spectrum, which can be measured anywhere on the planet. It is these resonance properties of the global spherical capacitor or resonator that Schumann first predicted over 40 years ago.

In an article published in *Science*, M.I.T. scientist Earle Williams (1992) constructed a powerful argument that links Schumann resonances to convection and ultimately to widespread tropical and/or global temperature. Williams concluded that a warming in the tropics should result in a fourfold increase in lightning activity, and he presented empirical data from several locations to support his conclusion. He noted that any measurable parameter nonlinearly related to temperature could be extremely useful in assessing the most subtle changes in global temperature. Others have presented different sensitivities: Price (1993) concluded warming would increase global lightning activity by 7 percent; Price and Rind (1994) found a 5 percent to 6 percent increase per degree C sensitivity; while Reeve and Toumi (1998) found the sensitivity to be near 40 percent per 1°C.

Regardless of the exact sensitivity, all scientists conclude that lightning increases for even moderate amounts of warming worldwide. More lightning generates a stronger SR, which may be useful in monitoring planetary temperature. The link between SR and the number of lightning strokes is supported by a mean day to night temperature fluctuation pattern. A diurnal pattern of worldwide lightning exists with three maxima recorded regularly due to the large number of mid- to late-afternoon thunderstorms in land areas of Africa, South America, and Southeast Asia and Australia. Storms typically are first generated in Asia, later they form in Africa, and later each day they congeal in South America.

Global warming has been linked to suspected rise in SR, and is a threat to its synchronization with our brainwaves. Small changes in temperature pump up into large signals in ELF resonances. Long-term monitoring and study of global climate changes

via measurements of extremely low frequency (ELF) electromagnetic waves needs to be studied more closely. Monitoring the intensity and frequencies of the lightning-induced ELF SR could help monitor changes in the Earth's climate over time.

One program proposed to set up two or three widely separated ELF field sites. One suggested site was a permanent SR monitoring station in the Negev desert, Israel. Members of this proposal want to develop, test, and install the appropriate software for automatic electromagnetic monitoring and preliminary processing of the incoming data. They suggested simultaneous measurements could be made in Russia and Sweden to test the global nature of the ELF signals measured in Israel.

Continuous ELF data measured in Israel could be compared with other ELF data sets from other locations around the world such as Hungary, USA, or Japan. Furthermore, the relevant global climate data sets, such as surface temperature, satellite observations of the global distribution of deep convection, and global atmospheric water vapor measurements can be used for comparisons with SR data to check the reliability of the "global thermometer" hypothesis.

A systematic study of SR parameters during high-energy particle precipitation events has also been presented. Protons and electrons with energies above 1 MeV ionize the upper boundary of the Earth-ionosphere cavity, leading to an increase of the resonance frequency and a decrease of the damping of the first Schumann resonance, as derived from measurements at Arrival Heights, Antarctica.

The study used the nine strongest solar proton events of the past Solar Cycle 22 and high-energy electrons emitted periodically from co-rotating interaction regions in the solar wind during 1994-1995. The variation of the SR parameters is in qualitative agreement with current theories of Schumann resonances. The study also shows that high-energy particle precipitation -- solar ejecta -- is not the only relevant source affecting SR parameters. The reported findings constitute a so far little-explored aspect of solar-terrestrial interaction.

## TAMPERING WITH THE IONOSPHERE

Clearly, the dangers from conventional EM pollution sources and solar system dynamics are substantial on their own. But the potentials from so-called "ionospheric heaters" are truly frightening, for we have no idea what possibilities can emerge from long-term meddling with the delicate balance of the ionosphere and global temperature, which is also linked to a world-wide oceanic pumping system whose source lies off Greenland.

Tesla technology has been applied in a variety of ways, through the HAARP Project, (High Frequency Active Auroral Research Program), which might have cavalierly been called, "How to Exploit the Ionosphere for Fun and Profit." Yet this is No Joke! There are smaller systems at Arecibo, Puerto Rico; Fairbanks Alaska; Tromso, Norway, Moscow, Nizhny Novgorod and Apatity, Russia; Kharkov, Ukraine and Dushanbe, Tadjikistan.

HAARP is the largest of the so-called 'ionospheric heaters'. The ionosphere begins approximately 35 miles above the surface and extends out beyond 500 miles. It contains both positively and negatively charged particles known as ions and electrons naturally created as a result of the action of the sun's radiation (solar winds). The ionosphere is capable of strong interaction with radio waves -- distorting them, totally reflecting or absorbing them. Downward propagating waves can couple into the Earth-ionospheric wave guide.

H. L. Roland, expert in beam and plasma physics at the Naval Research Laboratory in Washington D.C. says it is possible to modulate the ambient current flowing in the ionosphere. The auroral electrojet can be manipulated to generate extremely low frequency (ELF) and very low frequency (VLF) radiation. This ionospheric modification technique can provide such waves for probing both the Earth and the ionosphere-magnetosphere. The modification occurs in the lower D-region and can provide information about the ambient conditions in one of the least diagnosed regions of the ionosphere.

HAARP's massive antenna-array (360 72 foot tall antennas, over a thirty-three acre field, acting as one giant array) is managed by the US Air Force and US Navy in Gakona, Alaska (200 miles east of Anchorage). It heats the upper atmosphere with a focused and steerable electromagnetic beam designed to simulate and control ionospheric process. Gigawatts of effective radiated power of high frequency radio energy are pumped into the ionosphere. The transmitter (a particle injection device) can produce a beam anywhere from several miles to several tens of miles in radius, using the 2.5-10 megahertz frequency range, at more than 3 gigawatts of power (3 billion watts) creating plumes of charged particles.

In 1998 input power was raised to 10 gigawatts, transmittable in the the north-south or east-west direction. Reports say in each transmission cycle, HAARP switches from the east-west to the north-south beams and back again, producing a spiraling or "cork-screwing" upward at 0.9Hz.. This is called "circular polarization" of the radio signal. It makes ions in the upper atmosphere move in big circles with a one second lap time.

Optimum lap time is dictated by the plasma density related to the temperature, number of ions and neutral atoms in the ionosphere. This makes the ions, both electrons and protons, into little electromagnets. HAARP also can function as a particle gun. The particles shoot off into space, still spiraling and magnetic, following the earth's magnetic field lines, completing a circuit from pole to pole in one second.

A number of public reasons for this project are given, including ELF communications for submarines, but another host of surveillance and covert military applications are suspected, based on Tesla's original descriptions of the powers of such a massive pulse technology, including mind-control experiments. Detractors have called HAARP a "skybuster" since it effectively slices through the ionosphere like a microwave knife, producing a long tear or incision.

Physicist Daniel Winter, Ph.D. says HAARP high-frequency emissions can couple with longwave (low-frequency, or ELF) pulses the Earth grid uses to distribute information as vibrations to synchronize the dance of life in the biosphere. He terms this geomagnetic action 'Earth's information bloodstream', and claims it is probable that coupling HAARP HF (high-frequency) with natural ELF (extremely low frequency) can cause unplanned, unsuspected side effects.

As the Earth rotates, HAARP slices across geomagnetic flux (a donut-shaped spool of magnetic strings like longitude meridians on maps). HAARP may not 'cut' these strings in the magnetic mantle, but does pulse each thread with harsh, disharmonious high frequencies, whose noisy impulses vibrate geomagnetic flux lines, sensing shuddering vibrations throughout the geomagnetic web. We can only conjecture at this point about its effects on the foundations of human electromagnetic function.

Paul Schaefer, electrical engineer, alleges that radiation excites large numbers of tiny unstable particles, high-velocity particles in the atmosphere and Van Allen Belts and can be the villain in weather disruption as Earth discharges the buildup of heat, relieving stress and tectonic strain through earthquakes and volcanic action.

Ionospheric heaters deliberately create instabilities in the plasma layer of the ionosphere to rev up the the energy level of charged particles. This results also in electronic rain from the sky -- electron precipitation from the magnetosphere. It is caused by man-made very low frequency EM waves. The precipitated particles can produce secondary ionization, emit X-rays, and cause significant perturbation in the lower atmosphere, potentially affecting human brainwaves, and even our evolution, if Hainsworth is correct.

Thus, we see that HAARP can be employed for nefarious weather modification, which can also damage the ozone layer and cause earthquakes. An electronic beam can ionize or de-ionize the atmosphere over a given area, including military targets. Thus, the key to geophysical warfare is the identification of environmental instabilities where adding a small amount of energy can release vastly greater amounts of energy. Hopefully, this system won't soon be tested in any possible confrontation in the Middle East.

Frighteningly, mankind can now tamper with weather manipulation, climate modification, polar ice cap melting or destabilization, ozone depletion techniques, earthquake engineering, ocean wave control and brain wave manipulations using the planet's energy fields, according to geophysics and planetary physics expert Professor Gordon J. F. MacDonald. We must become more aware, as are scientists that global weather is a complex system, including air pressure and thermal systems, but also an electrical system. Because of the so-called 'butterfly effect' described in chaos theory, input of small charges get pumped up into big effects, since HAARP pulses the ionosphere where it is relatively unstable, creating greater turbulence. Complex systems, can suddenly collapse in catastrophic events. Cascades of effects could destroy the biosphere.

It is important to remember that the ionosphere is an active electrical UV shield which protects the biosphere from the constant bombardment of high-energy radiation and particles from space. This conducting plasma, along with the Earth's magnetic field, traps the electrical plasma of space and holds it back from going directly to the earth's surface, says Charles Yost of Dynamic Systems, Leicester, North Carolina. Power line harmonic resonance causes fallout of charged particles from the Van Allen (radiation) belts, and the falling ions cause ice crystals which precipitate rain clouds. HAARP can release a thousandfold-greater amount of energy than the power injected into the ionosphere.

Non-linear effects mean small input with multi-gigawatt pulsing leads to exponentially larger output. A "non-linear reaction" results from a small input of energy entering an environmental instability and producing a vastly increased energy output. Early ionospheric heaters began as ground-based antennae that would focus a cone-shaped beam of energy over a relatively large portion of the ionosphere, to heat it sufficient to get the desired energy gain. When physicist Eastlund reversed the cone of the radio beam, a much smaller spot on the ionosphere was pulsed with radio waves to superheat it. The array of antennae on the ground were all focused on a very specific point. When antennas fire in sequence, they produce a pulsed beam, up to 1,000-fold increase.

Therefore, human activities could cause a significant change in the planet's electrical circuit or electrical field through man-made ionization from radioactive material or HAARP-type skybusters. Solar flares modulate conductivity in the earth's electric field but may be barely detectable meteorologically. Still, their effects on mass communication and electrical grids is known to all. Man-made ionization pumps a much higher level of power to zap atoms and knock electrons off the atoms resulting in charged particles, and could potentially destabilize or 'short-circuit' the Earth, potentially exposing the entire biosphere to hard-core ultraviolet radiation.

We don't know the long-term outcome of Beat Wave Excitation. Ryutov, Cowley (UCLA) and Valeo (Princeton) say, "The simultaneous use of HIPAS and HAARP to heat the same patch of the ionosphere open up a new phenomena for study. Experiments to study this interaction are underway. One way to obtain very large beat wave amplitudes is to trap the beat waves as an eigenmode. We found weakly damped upper hybrid eigenmodes in our initial calculations. We plan to study various low group velocity modes. We have developed a raytracing code to follow both pump and beat waves. We use a numerical algorithm to determine the three wave matching point and use analytic formula to launch pump waves at this point." Are they actually saying that it's nice to fool with mother nature?

The HAARP pulse has two primary components. The pre-heat megawatt pulse is aimed straight upwards from the HAARP facility at the ionosphere, where it interacts with electrons, protons or ionized parts of atoms like oxygen, ozone, or nitrogen. Normally randomly moving particles in the near-vacuum of space become part of the atmosphere. When the pulse hits they become super-excited to 300,000 kilometers per second. Striking the atmosphere, they are ionized. Ions suddenly increase, and hit other atoms

creating the "ionospheric heating." In portion A of the pulse, identifier tones are sent at frequencies of 360, 1000, 1700 Hz, In Part B the tones are 650 Hz with harmonics at 1300 Hz. In Part C there is continuous tone signal at 2100 Hz remaining throughout the whole pulse, with a weaker tone around 2500Hz.

International concerns over HAARP and sister projects deploying similar energy beams have continued unabated for over a decade. The most recent developments and proposals are not encouraging:

"The U.S. military's Joint Vision 2020 report shamelessly documents its desire to establish "full spectrum dominance" over the Earth. "U.S. Space Command confirmed that Vision 2020 was its current policy, but a spokesman said it was in the process of being updated," Britain's Independent newspaper reported a year ago. The Independent article's thesis was obvious the United States is becoming a "rogue" state isolated from its Western European allies.

"What is clear is that part of the money voted to Bush's Star Wars plan will be used for research into space-based lasers," the Independent reported. "These, we are told, will be used to shoot down the missiles fired in anger by 'rogue states.' But they will, inevitably, evolve into weapons aimed at America's enemies from space. U.S. Space Command doesn't even bother to hide this fact. The most chilling illustration in Vision 2020 is of such a space-based laser firing a beam of energy at the earth."

"Earlier this year, U.S. Representative Dennis Kucinich told Alive that Vision 2020 is already an ongoing military program to experiment with directed energy. On November 9 last year, Carol R. Schuster, director for defense capabilities and management of the General Accounting Office (GAO), briefed the Democratic minority members of the House Armed Services Committee on Joint Vision 2020. Schuster explained, "Joint Vision 2020 also emphasizes the importance of experimentation to identify innovations in warfighting.

"Designated as DOD's [Department of Defense's] executive agent for joint warfighting experimentation in 1998, the U.S. Joint Forces Command conducts experiments on new warfighting concepts and operations." Schuster pointed out, "The Chairman of the Joint Chiefs of Staff recognizes that a joint force is key to operational success and envisions an interoperable joint force with technologically advanced warfighting capabilities able to dominate any adversary by 2020."

"Schuster confirmed Kucinich's comments in a report detailing that "the Joint Requirements Oversight Council plays a key role" in advancing Vision 2020, and that "U.S. Joint Forces Command conducts experiments on new warfighting concepts and operations." "In 1998, the U.S. Joint Forces Command began to implement a joint experimentation program to test new warfighting concepts that now support Joint Vision 2020," Schuster reported.

"The HAARP program is jointly administered by the U.S. Navy and Air Force and is a central part of the Vision 2020 strategy. A February 1990 HAARP Joint Service program plan drafted by the Air Force's Geophysical Laboratory and the Navy's Office of Naval Research documents the plan's military applications: The document indicates that HAARP will be used, among other things, for generating extremely low-frequency waves for submerged submarine communication and possible weather warfare applications, and for attempts to take advantage of natural ionospheric processes by directing energy through the ionosphere and back to Earth. The Russians and some European allies are worried that the U.S. military's experiments focusing large amounts of high-frequency energy for military purposes could theoretically trigger earthquakes. In April 1992, Defense News reported that the U.S. deployed an electromagnetic pulse weapon during Operation Desert Storm." (Fittrakis, 2002)

#### COLLATING THE GEOPHYSICAL AND PSYCHOBIOLOGICAL DATA

Great care needs to be taken collating geophysical and psychobiological data, because it is difficult to attribute specific agents to changes in human health and behavior since we all live in a webwork of tremendous complexity. Liasons need to be made with various sources monitoring the important dimensions for whatever reasons, and the data applied to this research direction.

Hainsworth strongly urged that research be carried out of widespread measurements of the natural SR signals' frequency variations and field-strengths comparing them with resulting figures for the incidence of heart attacks, suicide attempts, road accidents, social violence, domestic accidents, crime, etc. Studies are often conducted in this inferential and statistical way, such as those by Stanley Krippner and Michael Persinger, searching correlations between the phenomena of earth lights and tectonic strain with reports of UFO sightings, abduction reports and other anomalous psychophysical experiences, for an electromagnetic correlation to transient temporal lobe seizures (TLTs).

The authors also strongly suggest that correlations of broad changes in the modulations of Schumann's Resonance be studied in relationship to microwave radiation, ELF signals, and HAARP activity, for both immediate and long-term consequences. We have discussed the obvious ramifications of such EM pollution and 10 - 50 Hz modulations on the human system elsewhere ("Synthetic Telepathy," 2001). Specific HAARP transmissions could certainly have a negative emotional/psychological impact on people and an especially negative impact on already "unstable" individuals.

Other factors which must be considered include Solar Terrestrial Activity Reports, changes in the geomagnetic field, sunspot activity and coronal holes, solar flux, coronal mass ejections (CMEs) and flares (<http://www.dxl.com/solar/>). Some of this material has been collated at the 'Earth Monitor Website' by Michael Mandeville (<http://www.michaelmandeville.com/earthmonitor/>), a founding member of O.A.K. (Organization for the Advancement of Knowledge), with one of the authors, Richard Alan Miller. Mandeville's "Oak Tree Memorandum" described effects of sunspot activity throughout 2002-2003. Parameters of influence include human aggression, violence, and wars over the past couple of hundred years, stock market and food production, etc. as

well as the weather patterns of the past several years. Sunspot and ejecta activity for this 23rd solar cycle is expected to abate, as of April-May, 2003.

The HAARP Project (<http://www.haarp.alaska.edu>), itself, provides public records from its fluxgate magnetometer (<http://137.229.36/cgi-bin/magnetometer/gak-mag.cgi>). Geomagnetic storminess is usually indicated in oscillatory variations in the earth's magnetic field. Additional data concerning the nature and severity of the ionospheric disturbance can be found through analysis of the three components of the field. Data from a chain of magnetometers is also available on a regular basis.

Magnetic models of the annual magnetic means of global magnetic field changes (field strength, direction, vector-magnetic-field components) are also available (<http://geomag.usgs.gov/models.html>); regional and world models are available. The seven magnetic components include declination, inclination, horizontal intensity, vertical intensity, north-south intensity, east-west intensity and total intensity. John M. Quinn runs this program for the National Geomagnetic Information Center, U.S. Geological Survey in Denver, Colorado (1-303-273-8475).

## IMPLICATIONS AND DIRECTIONS

Further research on these electromagnetic relationships is essential, perhaps even to our psychophysical survival as a species. They affect our minds, the cellular and genetic structure of our bodies, our sleep and dream cycles, our emotions, perhaps even our spirit. Monitoring and collating these effects of atmospheric tampering and their potential influence on the ionosphere and SR, therefore human brainwaves and health, should be continued. We are approaching the end of the current sunspot cycle, and should use an entire 11 year cycle to acquire accurate data results, as Hainsworth suggested.

A team of researchers and physicists, including these authors, is pulling together some relevant data under the auspices of the Journal of Non-Local and Remote Mental Interactions (JNL RMI) at <http://www.emergentmind.com> edited by physicist Lian Sidorov. A major hypothesis of this group is that em fields outside of the body are crucial for our consciousness. Finnish physicist Matti Pitkanen has developed a model of physics, called Topological Geometro dynamics (TGD), highlighting the close relationship of human physiology with SR and other ELF and electromagnetic patterns.

Pitkanen believes that not only global, but interplanetary and interstellar magnetic fields are of great importance for conscious life. His explanations involve magnetic flux tubes, a dipole-like part of a field. A wide range of em waves, in particular microwaves and radiowaves are likely key elements in homeostasis, remote mental interactions between cells and other structures, and sensory representation, as well as in remote mental interactions both within and outside of the body. He explains that the noise level of Earth's magnetic field must be low for anomalous cognition (also called psi or ESP) to occur. Alan Frey suggested similar field notions decades ago, speaking specifically of microwave range inputs.

These em fields are only correlates of consciousness. Still, TGD allows the possibility of assigning someone's field body a topological field quanta identity. Pitkanin also suggests these fields and waves are influential when biological systems perform quantum computation-like processes. His biophysics suggests that neural circuits and molecules are bound by lock and key mechanisms through this process of magnetic circulation (topologically quantized dipolar magnetic fields).

Pitkanen even sees Earth's magnetic field as a quantized dipolar magnetic field interaction of knotting, linking, and complex twisting. TGD views the brain and nervous system as a sensory organ for our extended, electromagnetic selves, which have a length scale at least the size of the Earth's diameter. He suggests further that psi phenomena and distant healing may involve transfer of specific electromagnetic frequencies through Planck-length wormholes and join-along boundaries postulated by TGD, which would allow for the near-instant transfer of information.

[T]he magnetic sensory canvas hypothesis provides a mechanism for "sharing qualia" associated with distant points on the geomagnetic sphere - essentially a form of cognitive entanglement between operator and target. One clear advantage of TGD over other models of subtle energy transmission is that the EM fields are not directly carried from sender to target, but are simultaneously generated at the two locations by a vacuum (geometrical) current: hence they remain coherent while bypassing the paradox of non-attenuation with distance. . .the illusion of our locality is perpetuated by the data fed to us by our senses - that is, those perceptions we are habituated to pay attention to. (Sidorov, JNLRMI)

Other research suggests the fundamental interaction of internal and external fields is the right track. Joseph Jacobson (2002) at MIT, found a way to switch cells off and on with radio waves. His team also "unzipped" and manipulated DNA with a radio-frequency pulse. The same approach worked on proteins as well, and proteins orchestrate nearly all cellular chemical processes. Further, physicist Peter Gariaev has proposed a wave-based genome, whose main information channel is the same for both biophotons and radio waves (see [www.emergentmind.org](http://www.emergentmind.org)).

In 1973, Miller, Webb and Dickson described DNA as a holographic projector (see "Embryonic Holography"). In other words, genes encode and express themselves via light and radio waves, or acoustical holography (see "Quantum Bioholography", Miller, Miller and Webb, JNLRMI, 2002). Delocalized interference patterns create calibration fields (blueprints) for our bodies' space-time organization. The system works as a biocomputer -- a wave biocomputer. DNA can also function as a gel-like liquid crystal, emitting a weak laser-like light that can be converted into an electro-acoustic signal.

In conclusion, Miller and Miller postulate, along with others that,

1. The organization of all biological systems is established by complex electrodynamic fields. We are fundamentally electromagnetic, rather than chemical beings. Wave interaction is a key determinant of biological structure and optimal functioning.

Biosystems are sensitive to natural and artificial electromagnetic fields. Perturbations in environmental fields can induce changes in organisms informed by those fields. Field frequencies and amplitudes affect our biodynamic state.

2. ELF frequencies of Schumann's Resonance are intimately linked with those of human brainwaves. Natural or artificially induced changes in SR could affect subtle and perhaps gross brainwave generation. In particular, it could lead to changes in patterns and frequencies of resonance and resulting phenomena such as homeostasis, REM, psi, and healing.

For a decade, Robert Beck researched the brain wave activity of healers from all cultures and religious backgrounds (he enumerates psychics, shamans, dowers, Christian healers, seers, ESP readers, kahuna, Santeria, wicca practitioners and others). Independent of their belief systems, each exhibited "nearly identical EEG signatures" during their "healing" moments: a 7.8-8Hz brainwave activity, which lasted from one to several seconds and which was "phase and frequency-synchronized with the earth's geoelectric micropulsations - the Schumann resonance". (Sidorov, JNLRMI)

3. Liquid crystals (DNA, brain ventricles, and cellular structures) in the human body may operate as antennae for detecting and decoding such global and local ELF signals. Beal (1996) proposes that liquid crystals (which are an intrinsic part of cell membranes) act as a detector/amplifier/memory storage device for ELF EM patterns in the environment. Proteins, tend to orient themselves in the 10-Hz resonant EMF, so would be extremely sensitive to ELF changes in the 10Hz region. A coherent wave-field may emerge from the body's own liquid crystal (LC) matrix.

The very structure and organization of living tissues is, however, itself regulated by that master molecule, the DNA. The genetic system (consisting, to be more accurate, of an equidirectional translation function which may start equally well with DNA, RNA or protein) reveals itself as a complex, multidimensional code with both local (codon) and global (context), material (nucleotide) and field-like (EM hologram) parameters, all of which are mutually interdependent and at the same time subject to external, environmental influences. (Sidorov, JNLRMI)

4. There is a strong correlation between behavioral disturbances in humans and periods of solar and geomagnetic field turbulence. Conversely, studies show that subjects living in isolation from geomagnetic rhythms over long periods of time developed increasing irregularities and chaotic physiological rhythms - which were dramatically restored after the introduction of a very weak 10Hz electrical field. Early astronauts suffered until SR generators were installed in their spacecrafts.

Geomagnetic anomalies (tectonic strain, earthlights, geomagnetic field perturbations) can induce some forms of anomalous cognition - such as auditory and visual hallucinations, and TLTs (temporal lobe transients or small seizures). Also, one of the effects of meditation is to "quiet the mind" as a method of allowing the "free-run" (or silent thalamic periods) to become entrained by natural geophysical rhythms. This form of

tuning or "magnetoreception" is mediated by the pineal gland (30% of its cells are magnetically sensitive) and organic magnetite-containing tissues.

Persinger (1989) points out that deep temporal lobe activity exists in equilibrium with the global geomagnetic condition. When there is a sudden decrease in geomagnetic activity, there appears to be an enhancement of processes that facilitate psi reception, especially telepathy and clairvoyance. Increases in geomagnetic activity may suppress pineal melatonin levels and contribute to reductions of cortical seizure thresholds. Indeed, melatonin is correlated with temporal lobe-related disorders such as depression and seizures. (Krippner)

5. Optimal global ELF (calm night; low sunspot activity; low em pollution) conditions can facilitate anomalous cognitions, including psi such as ESP, remote viewing, and remote healing.

[P]si is always present in space and time, waiting to be accessed by crisis, emotion, or by optimal laboratory stimulus parameters. Geomagnetic activity may affect the detection capacity of the brain for this information, especially the neural pathways that facilitate the consolidation and conscious access to this information. Without this geomagnetic activity, awareness of the psi stimulus might not be as likely and the brain's "latent reserve capacities" would not be utilized. (Krippner)

6. Sidorov (2001) and others have suggested that human intent functions as a variable window of transmission/reception in the exchange of extrasensory information, possibly within the range of ELF electromagnetic frequencies. Brain synchronization with Schumann's Resonance of both sender and receiver facilitates psi, or "therapeutic entrainment," amplifying, re-radiating coherent waveforms derived from the environment, simulating the wave pattern of the environment. Sidorov further hypothesizes,

[B]rainwaves (particularly in the alpha range) can be transmitted along the perineural system (or via Frohlich excitation) to any distal parts of the body, and even to adjacent organisms, via ELF EM waves. These frequencies can be amplified by closely-related Schumann resonance waves, or by feedback mechanisms typical of the body's physiological pathways (akin to immunologic and neuroendocrinologic cascades). In turn, these basic frequencies can re-activate stalled healing processes, enhance growth, accelerate immune responses, and generally "jump-start" functions inherent to the body's tissues, by "rebalancing its energies" (according to Oriental medicine) or (in Beal's terminology) by re-configuring the liquid crystal orientation of cell membrane components and thus triggering specific intracellular responses.

In light of all of the above observations, we are proposing that the Schumann resonance may be the substrate for a radar-type extrasensory perception mechanism common to all living beings: like water bouncing off of rocks and other submerged objects, this non-specific frequency is absorbed and re-radiated in unique interference patterns by all objects it encounters; this interference pattern is a composite of external and internal

properties, as the constituent atoms, molecules and their global assembly all re-transmit this energy according to their specific configurations (see Beal on biopolymers). Not only that, but the "sounding" wave can be frequency and pattern (Wallaczek) - modulated by conscious intent in order to yield specific information (interference patterns), which are then decoded by the brain as they return almost instantly on the "back" of the Schumann resonance. Once recaptured, the patterns are then decoded by the brain in a Fourier-type transformation and the information translated into conscious data, much like other sensory processing. Conversely, specific effects may be imprinted as bioinformation and made to exercise a "mysterious action at a distance", once the signal wave reaches the target. That pattern, in turn, may, under the right ("pre-requisite") global conditions, avoid routine dissipation and become instead coupled to the dominating ("state-of-consciousness") standing wave that is picked up and carried by the Schumann resonance.

In a prior, "first-thoughts" essay discussing the presence of Schumann frequencies in the EEG during various healing practices we had proposed that mental intent might function as a variable window of transmission/ reception in the exchange of extrasensory information, which tuned into the Schumann resonance to carry such bio-regulating information to distant targets and acted as a primitive, radar-type sensory interface (Sidorov 2001). However, pursuing this line of thought soon led to the landmark experiments of Robert Becker - who, it became evident, had not only reached somewhat similar conclusions based on his own body of evidence, but had gone beyond them to suggest that such subtle currents could reach far deeper into our genetic and consciousness control mechanisms.

After nearly eight decades of EEG and other brain imaging studies, it is sobering to realize that we still can't tell with certainty where EEG voltages come from (Becker 1985, pp 88). It is conceivable that Becker's perineural system and/or the LC - liquid crystal matrix of the organism (including, but not limited to, connective tissues, cell membranes and DNA) might act as a full-body array of sensory receptors for Pitkanen's magnetic sensory canvas signals, with specific excitations patterns coding for different types of information.

[T]he body's ubiquitous liquid crystal arrays and their almost infinite configuration possibilities make them a top candidate for the primary sensory receptors parapsychology has been looking for. It is even conceivable that DNA phase-conjugation properties (see Popp and Chang 1998) allow it to function as a multi-mode antenna, altering its function according to surrounding signal fields and possibly acting not just as a regulatory program, but also an element of "extrasensory" perception.

As human beings we have extraordinary potentials we have hardly begun to study much less understand. Creative gifts, intuitions, and talents that are unpredictable or emergent may become stabilized in generations to come. Hopefully, we can learn to understand both our emergence from an essentially electromagnetic environment and facilitate our potential for healing, growth and non-local communication.

A tremendous amount of money has been spent on HAARP and its allied projects (such as the proposed Star Wars missile defense program) without a complementary sum going toward research about potential hazards. The costs in both dollars and ruined lives could be staggering compared to any potential benefits derived from such programs. For epochs, Schumann Resonances have provided the orchestrating pulse for life on the planet -- our planetary heartbeat, which sets the tempo for health and well-being.

Hopefully we will come to appreciate this fully before our technology drives the planet so far from the norm that the trajectory of human evolution is altered forever. Thus, the study of the relationship of our bodies, the electromagnetic environment and interaction with potentially planet-altering technology is more important than ever to understand on the subtlest levels.

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