Theoretical

THE SPECIAL RELATIONSHIP BETWEEN SOUND AND LIGHT, WITH IMPLICATIONS FOR SOUND AND LIGHT THERAPY

John Stuart Reid

ABSTRACT

In this paper we explore the nature of sound and light and the special relationship that exists between these two seemingly unrelated forms of energy.

The terms 'sound waves' and 'electromagnetic waves' are examined. These commonly used expressions, it is held, misrepresent science and may have delayed new discoveries.

A hypothetical model is proposed for the mechanism that creates electromagnetism, named "Sonic Propagation of Electromagnetic Energy Components" (SPEEC). The SPEEC hypothesis states that all sounds have an electromagnetic component and that all electromagnetism is created as a consequence of sound. SPEEC also predicts that the electromagnetism created by sound propagation through air will be modulated by the same sound periodicities that created the electromagnetism.

The implications for SPEEC are discussed within the context of therapeutic sound and light.

KEYWORDS: Sound, Light, SPEEC, Sound and Light Therapy

THE NATURE OF SOUND

Sound traveling through air may be defined as the transfer of periodic vibrations between colliding atoms or molecules. This energetic phenomenon typically expands away from the epicenter of the sound event as a bubble-shaped emanation. As the sound bubble rapidly increases in diameter its surface is in a state of radial oscillation. These periodic movements follow the same expansions and contractions as the air bubble surrounding the initiating sound event.

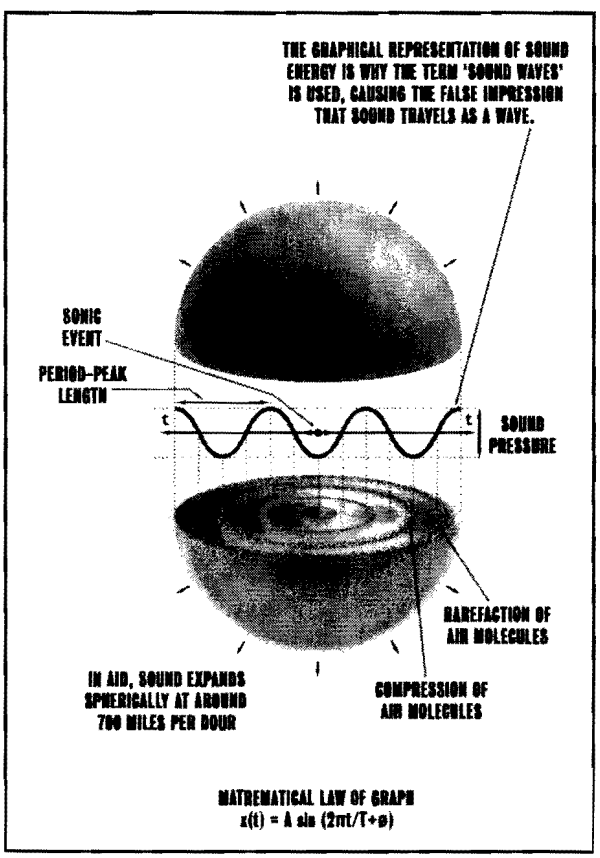

Figure 1. *Sound is an expanding bubble containing radial oscillations of molecules. The initiating sound event is illustrated at the center of the bubble.*

The out-dated, yet widely accepted model of sound depicted as a "wave" is incomplete because it proliferates the idea that sound's motion through a given medium is wave-like. This wave model is a purely graphical representation, typically shown as sound pressure level in the vertical axis versus time in the horizontal axis. The graph in figure 2 represents the periodic law of sound energy, expressed by the equation:

$$x(t) = A \sin (2 \pi t / T + \phi)$$

The units of x, are typically sound pressure in units of the decibel (dB). The 'wave' starts at t = 0 and then increases by T, the period in seconds. The phase ø, expressed in radians, is the value when t = 0. The units of A, the amplitude, are the same as that for x.

While this sinusoidal representation of a pure sound tone is correct in the mathematical and graphical sense, it does not accurately depict how sound actually moves through gases, fluids or solids.

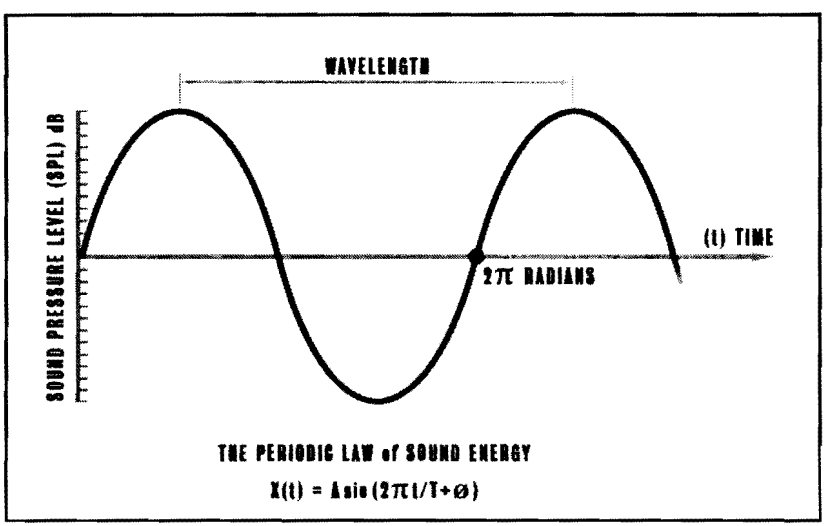

Figure 2. *Classical depiction of a "sound wave"*

THE "WAVE" VERSUS "SPHERICAL" MODELS OF PROPAGATION IN SOUND -AND ELECTROMAGNETISM

The concept of spherical propagation in both sound and electromagnetism is well known in the fields of acoustic physics and electromagnetics respectively. [1,2] The spherical concept of energy was also well known to the ancient Sanskrit philosophers. [3] Yet the terms "sound waves" and "electromagnetic waves" persist in all forms of media to describe these phenomena. Furthermore, the concept of wave propagation continues to be taught in our educational institutions and is perpetuated as a convention in almost every modern text on physics. In such publications wave diagrams abound to illustrate these movements of energy as sound "waves" and electromagnetic "waves."

A second example of the classical depiction of wave energy is provided in Figure 3. Here, the electric and magnetic field components of electromagnetism are drawn as in-phase waves representing the orthogonal relationship between these two inter-related forms of energy. This standard depiction was conceived by the great Scottish scientist, James Clerk Maxwell in the 1850's and 1860's. Over a century and a half later, his wave equations and diagrams remain as the foundation of our modern electromagnetic theory. [4]

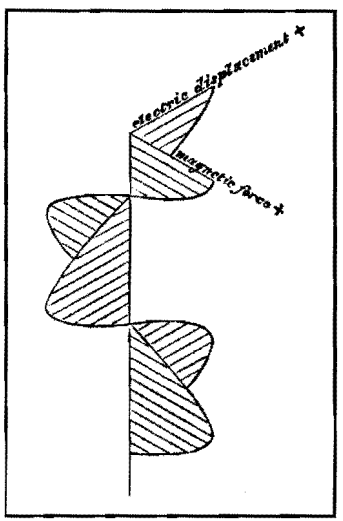

Figure 3. *James Clerk Maxwell's depiction of an electromagnetic "wave" with electric and magnetic components drawn orthogonally.*

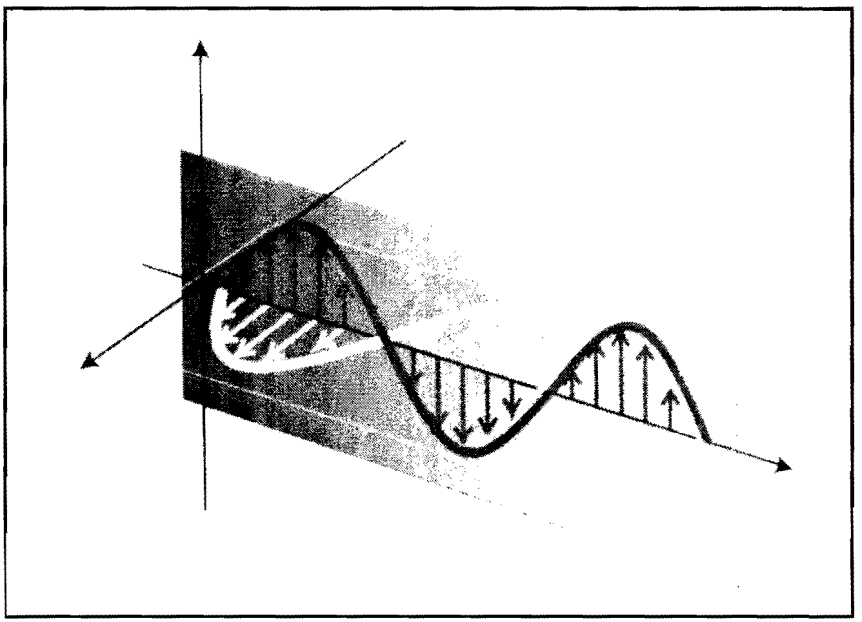

Figure 4. *A modern version of Maxwell's depiction of an electromagnetic "wave."* Drawing reproduced from: 'Contemporary College Physics.' Edwin R. Jones and Richard L. Childers. With kind permission of Addison-Wesley Publishing Company.

In actuality, the space-form of the two components of electromagnetism would not manifest as waves but as nested spheroids expanding in oscillating union through space. The respective planes of the two spherical fields always oscillate orthogonally. Both oscillating spherical fields reach their peaks of excursion at the same time, and therefore are 'in phase' with each other. While the periods of oscillation of the two fields follow a sinusoidal law it is not accurate to describe the energy as a wave since the actual space-form of the energy is spherical.

Since electromagnetic energy and sound energy are not wave-like in physicality, it is possible that the results of some experiments in physics may have been misinterpreted. Even the classical "double slit experiment" may need to be re-examined in the light of this more complete model of electromagnetism. When the energy reaching the slits is regarded as nested oscillating spheroids, the resulting interference patterns may be interpreted differently.

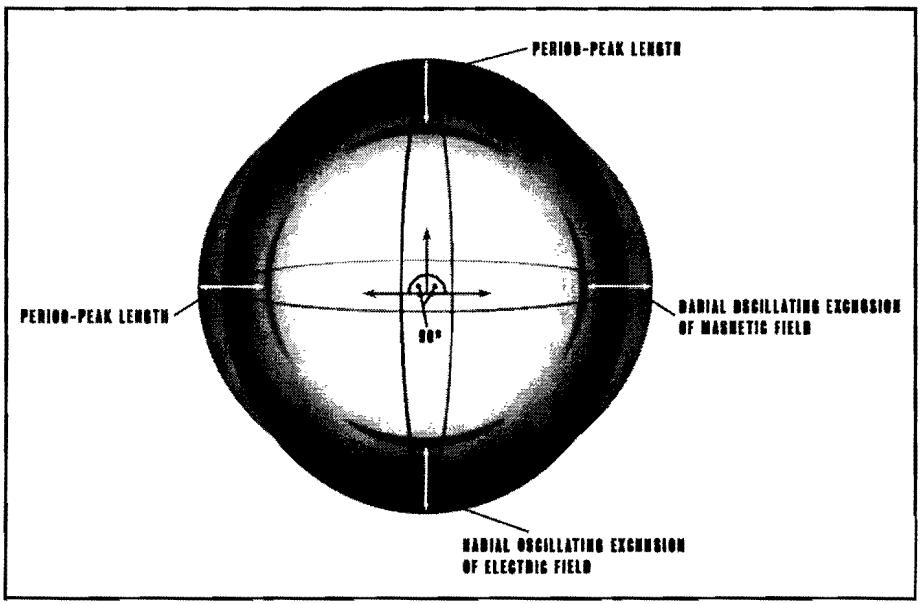

Figure 5. *Electric and magnetic field components of an electromagnetic bubble. (Components are frozen to permit study.) Note that the oscillating excursions of two spheroid fields have been exaggerated to show their phase relationship.*

SPHERICAL SOUND PROPAGATION

When sound propagates through air the sound bubble will be almost perfectly spherical for frequencies up to approximately 500 Hz. As the frequency increases the general spheroidal form remains but there is more radial vibration (greater sound pressure) in the direction of propagation. This effect occurs due to the diffractive effects of air. As the frequency increases, diffraction increasingly acts to reduce the radial oscillation of the bubble in every direction except that of propagation.

The reactive components of atomic collisions in air cause sound energy to move away in all directions almost simultaneously. However, in absolute terms the reactions take a finite amount of time to occur, thus causing the resulting sound bubble to be minutely ovoid. Diffraction becomes progressively less pronounced at frequencies above 500 Hz, due to the increasingly limited range of motion

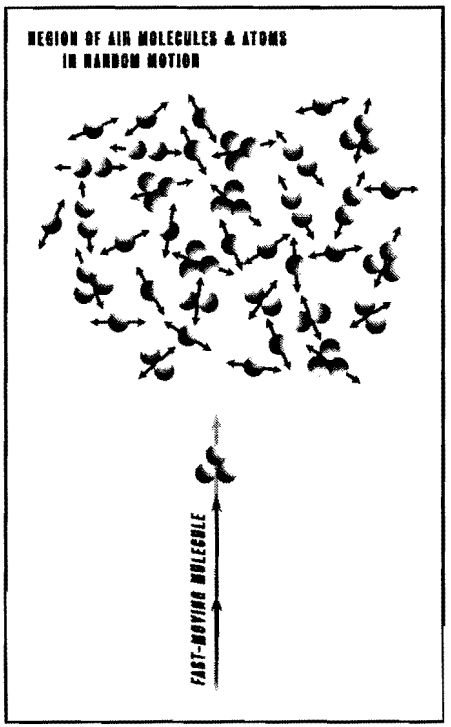

Figure 6. *The higher voice frequencies are designated by the darker areas, thus illustrating greater radial vibration/sound pressure in the direction of propagation.*

of the atoms and molecules. This reduction of motion results in fewer reactive collisions due to the distance between air components and, hence, more and more sound energy leaves the epicenter on axis with the direction of propagation as the frequency increases.

THE HOLOGRAPHIC NATURE OF SOUND

Sound can be said to be holographic since every atomic particle contained within a sound bubble, whether from a person's voice or any other source, shares all of the data that describes the sound.

To further explain this principle, air, the combination of gases we breathe, consists of individual atoms such as oxygen and nitrogen in addition to molecules of carbon dioxide. Other gases are present but in minor concentrations.

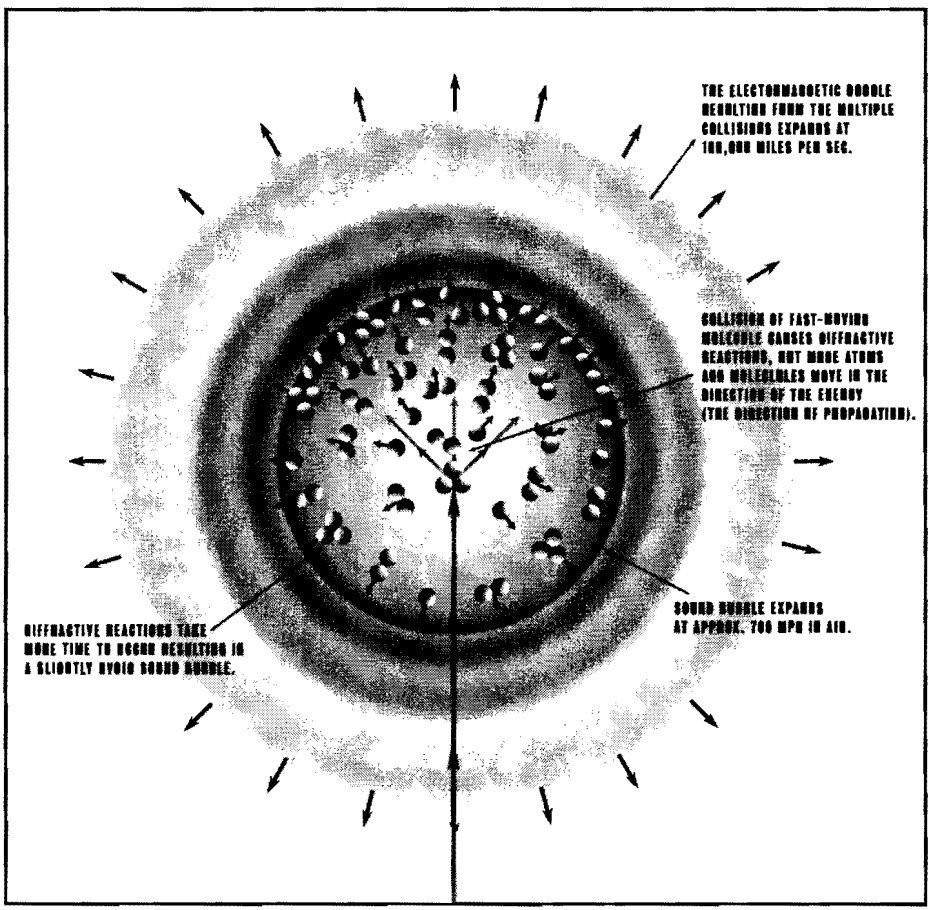

Figure 7. *Sound diffraction is caused by the reactive scattering of molecules as they ricochet off of each other, rather like the game of pool. However, most energy is transmitted in the direction of propagation.*

When audible sound propagates in air, every atom or molecule lying in the path of propagation is involved in the process of passing on the "data" of the sound source.

Every atom and molecule within a pure tone sound bubble carries only one sinusoidal periodicity. When the sound is complex, such as that of the human voice, every atom and molecule carries all of the periodicities.

Using the example of the human voice, every atom and molecule of air that comes in contact with the vocal folds transmits all its vibrations to neighboring atoms and molecules, creating a small pearl-like orb of sound around the vocal folds. This pearl of sound rapidly expands, leaving the person's nose and mouth a millisecond or so later. The sounds that began at the vocal folds are modified in tonality by the oral and sinus cavities. The combined vibrations of the oral and nasal sound emissions describe the uniqueness of a particular voice. When considering the number of air components necessary to contain the uniqueness of that voice, we realize that all the periodic motions of the original sound, together with its tonal modifications, are contained within a single atom or molecule.

The holographic aspect of sound has implications for many fields of science. We will return to sound holography in the section covering therapeutic applications for sound-light interactions.

ULTRASOUND PROPAGATION

Frequencies immediately above the range of human hearing, those above 20 KHz, are sometimes referred to as low frequency ultrasound and provide an atypical case of sound propagation. As frequencies rise above 20KHz, the effects of diffraction diminish rapidly. The shape of sound transforms from a spherical emanation to that of a pencil-like beam. As with high frequency audible sound this tendency occurs as a result of the smaller periodic range of motion within each atom or molecule, resulting in insufficient energy to cause diffraction. However, sphericity in low frequency ultrasound begins to return at very high sound pressure levels, for example at 130 dB and higher, since sufficient energy is then present to cause a gradual return to multiple atomic and molecular collisions.

THE NATURE OF ELECTROMAGNETISM

Visible light is comprised of a particular narrow band of frequencies in the electromagnetic spectrum. However, invisible "light" covers a far broader array of frequencies. Although the precise nature of electro

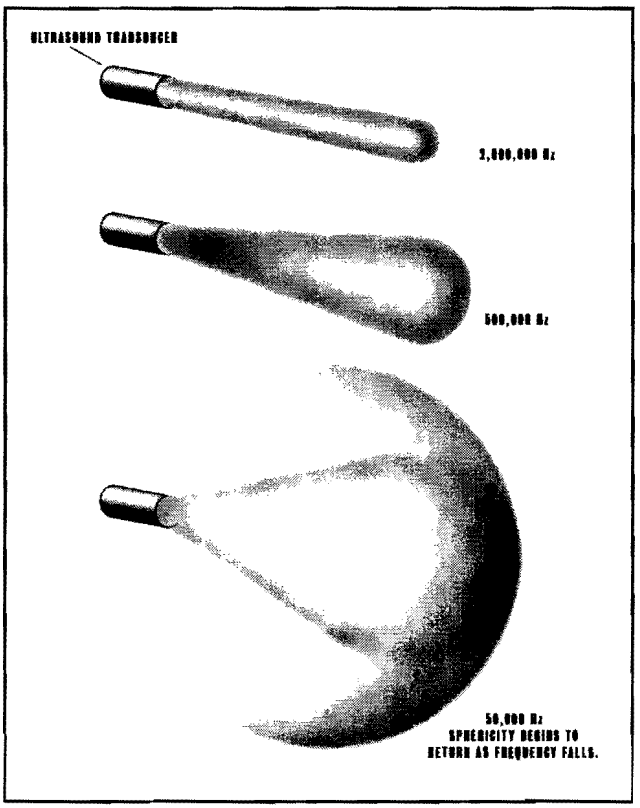

Figure 8. *The spherical nature of audible sound becomes increasingly pencil shaped as the frequency increases from low frequency ultrasound to higher frequencies.*

magnetism is not known, it is postulated here that it is the result of the interaction of the static magnetism that surrounds the outer shell of a given atom or molecule with that of the magnetic shell surrounding a second atom or molecule. When the magnetic shells of the two atoms or molecules collide (the definition of sound) there are two primary results: First, there is a transfer of the periodicities between the two atoms or molecules. The second result, it is postulated, is the creation of electromagnetism. It is proposed that all electromagnetism in the Cosmos is a consequence of sound. Put differently, electromagnetism would not exist without sound.

It is further proposed that the orthogonal phase relationship between the electric and magnetic components of electromagnetism is determined at the moment of collision between any two adjacent atoms or between a particle colliding with an atom.

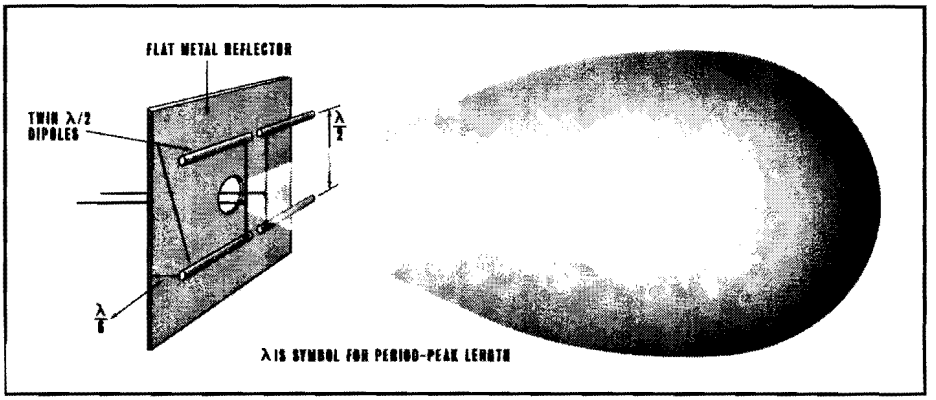

Figure 9a. *A dipole antenna in which the reflector causes electromagnetism to radiate as an airship-shaped emanation.*

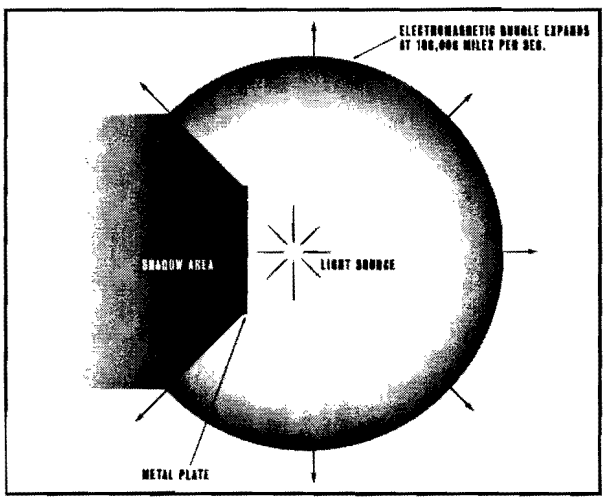

Figure 9b. *A light source in which the spherical nature of the electromagnetic bubble has been modified by a metal screen.*

The frequency of electromagnetism resulting from colliding magnetic shells is proposed to be a function of the intrinsic energy states of the atoms or molecules (dictated by the local temperature) and the velocity of the collisions.

The amplitude of electromagnetism resulting from colliding magnetic shells is proposed to be a function of the number of collisions (in part determined by the the density of the atoms or molecules) and the sound pressure level.

Multiple collisions between atoms or molecules in sufficiently energized systems generate diffractive reactions with neighboring atoms or molecules. In common with spherical sound propagation the resulting electromagnetism will propagate in all directions simultaneously, that is, spherically.

There are exceptions to the general principle of electromagnetic sphericity. When, for example, a metal shield is placed near the source of electromagnetism a shadow results, preventing a full sphere from emerging. This is exactly the result we would expect if we placed a metal shield near a light source. Electromagnetic energy radiating from a dipole antenna is also often shaped oddly due to the reflection of the electric field from the antenna's reflector plate.

Hypothetically, when electromagnetism is created by atomic collisions in which the energy states are too low to create visible light, infrared electromagnetism will result. At even lower energy states the hypothesis predicts that collisions will create radio frequency electromagnetism.[5] Electromagnetism created by atomic collisions in which the energy states of the atomic particles are very high is known to create X-rays and gamma rays.

THE SINUSOIDAL LAW OF ELECTROMAGNETISM

As mentioned earlier, it is postulated that the process by which electromagnetism is created is the result of atomic collisions. A simple verification of this proposition is the act of vigorously rubbing one's hands together. Heat (infrared electromagnetism) is generated as the molecules of skin in one hand slip past those in the other hand.

Let us examine the case of two adjacent atoms that are close enough in proximity to collide. It is proposed that the electromagnetism created will be a function of the periodic motion of the two colliding atoms. The atoms will have the same period of motion since they occupy a small area of space. (In small areas of space the energy states of the atoms are generally uniform since they have been exposed to the same external forces and fields.) It follows that at the moment of collision the static magnetic shells that surround each atom will influence each other by virtue of their respective oscillations. As the static

magnetic shells interact, the electromagnetism that is created follows a sinusoidal law since each atom vibrates between two extremes of movement with a sinusoidal period of motion.

In order for electromagnetism to be created there must be a zone of influence in which the static magnetic shells of the atoms are able to interact. The zone of influence in which the two atoms reside must be comprised of sufficiently dense matter, such as a solid or a dense gas like air.

SONIC PROPAGATION OF ELECTROMAGNETIC ENERGY COMPONENTS (SPEEC)

A sound bubble propagating in air expands at the rate of approximately 700 miles per hour, depending on air pressure and temperature. This process involves countless collisions between the atoms and molecules that form the atmosphere. Each collision creates friction between the air components, resulting in heat, more accurately described as electromagnetism. The amplitude of the electromagnetism is a function of the sound pressure level, the local temperature and the local air pressure, the latter quantity dictating the number of collisions that occur.

Hypothetically, there are two component frequencies of oscillation in the sound-generated electromagnetic sphere. The first is the frequency of the electromagnetism, determined by the energy in the collisions. The second component is the modulation of the electromagnetism by the inherent sound periodicities of the colliding atoms or molecules. The effect is predicted to be similar to amplitude-modulated radio transmissions, although with Sonic Propagation of Electromagnetic Energy Components (SPEEC) the "carrier wave" frequency is far higher. Put simply, the electromagnetism created by sound propagation through air will be modulated by the same sound periodicities that created the electromagnetism.

The modulated electromagnetism, so created, will typically be in the infrared spectrum, although very low intensity sounds may possibly result in creation of modulated microwave or short wave radio frequency energy. These predicted results await experimental confirmation.

It is expected that high intensity sounds will generate infrared energy. Low intensity sounds are expected to generate low-level microwave or short wave radiation.

The sound of a person shouting outdoors typically expands to a sphere of about one mile in diameter before becoming too weak to be detected by human hearing. The electromagnetic sphere created by a human shout, on the other hand, would not be significantly attenuated by clear air.

The modulated infrared electromagnetic sphere will travel relatively unimpeded through cloudless skies and even beyond the earth's atmosphere into space, where it will travel forever unless it meets dense matter. Thus, if the SPEEC hypothesis is proven valid by experimentation, it would imply that all the data contained within outdoor sounds has been rushing through the Cosmos at the speed of light since the earth took form.

THERAPEUTIC APPLICATIONS FOR THE SPECIAL RELATIONSHIP BETWEEN SOUND AND LIGHT

It is now widely accepted that electromagnetic interactions are fundamental to the functioning of biological tissues. The drawing below shows this effect diagrammatically. Even though the two protein molecules are not in direct contact, the electromagnetic field of the protein on the left brings about complimentary motions in the protein on the right.[6]

The work of Herbert Frohlich predicted that crystalline molecular arrays within the structures of the human body would be extremely sensitive to electromagnetic energy fields in the environment.[6] His prediction was confirmed by a number of laboratories.[6] His later work showed that cells share data via electromagnetic transmissions, an effect Frolich termed "coherence." It is generally believed that biological coherence is the means by which the body integrates processes such as growth, tissue repair and defense.
Other related research involves the cellular emission of light, referred to as "biophotons." [7] Intrinsic random noise, created by the activity of membrane ion channels, may be entrained by incoming weak electromagnetic fields to

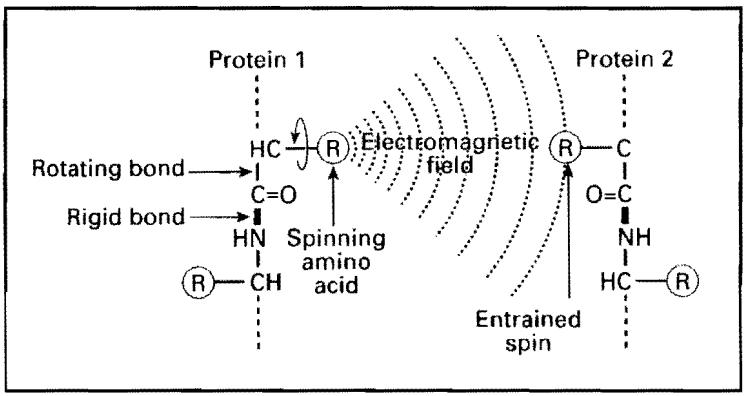

Figure 10. *Entrainment between two protein molecules.*
Allen & Cross 1963, Sauer 1995.

create cell signals that harmonize with the incoming frequency. This effect is known as "stochastic resonance" and is thought to have positive effects on cell function.

One way to trigger cell division is to apply external electromagnetism to the affected body part. There are many such modalities currently in use, including shortwave diathermy, microwave diathermy and infrared therapy. [8]

Another technique that encourages cell division is the application of sound energy. There are a number of therapeutic sound modalities in current use that utilize either ultrasound, audible sound or infra sound. Therapeutic ultrasound is already a mainstream modality for the support of soft tissue injury and certain types of bone fracture. Audible sound therapies are under development by a number of manufacturers and the first commercial units are beginning to prove their efficacy in support of a large range of ailments. [9]

However, in common with therapeutic ultrasound, the underlying cellular mechanisms triggered by audible sound therapies are not fully understood. Since there is voluminous evidence showing the efficacy of various electromagnetic modalities, it seems possible that it is the electromagnetic component of acoustic modalities that is responsible for triggering the healing response in cells, rather than the sound itself.

The field of signal transduction may confirm that the electromagnetic component is the prime mover in the healing response. It has been shown that cells receive and transmit signals by means of "integral membrane proteins." These proteins extend beyond the cell membrane, acting as receptor antennas, and some are able to 'read' electromagnetic signals. [10] Thus it seems reasonable to propose that the infrared electromagnetism component of the sounds emitting from the therapeutic acoustic modality are transmitted into the body and are received by the antennae of the integral membrane proteins of cells.

Precisely how cells process sound-modulated infrared electromagnetism is not known. Cells may demodulate (retrieve the imbedded acoustic data) in the infrared electromagnetism by some mechanism as yet unknown. However, as explained in the section on the holographic nature of sound, every molecule within a sound field contains all of the data. Therefore, when sound penetrates tissues, every molecule within the region of the body being treated shares in all the sound data. The integral membrane proteins and even the DNA within the cells receive all the data.

Another aspect of the holographic nature of sound relates to the ability of a cell or its components to resonate with audible frequencies. Let us use an example of a sound of 100 Hz. Its "period-peak length" is approximately 11.3 feet. [11] Comparing this with a blood cell, which has a width of approximately 2.5 thousandths inch, it is obvious that there is a huge disparity. Thus, there has been a question surrounding the ability of cellular matter to efficiently absorb audible sound energy. Even so, acoustic resonance principles do apply perfectly to the cells of humans and animals due to the fact that every molecule within the fluid surrounding cells carries all the sound data from the therapeutic modality. The number of molecules bearing sonic data that act upon a given cell or cell component will, therefore, always match perfectly the dimensions of the cell or cell component.

CONCLUSIONS

It is important to change the current model of sound "wave" and electromagnetic "wave" propagation to spherical propagation models in order to better understand the nature of these two interrelated phenomena. Since sound and electromagnetic energy do not propagate as waves, there is the risk that physics

experiments may be misinterpreted. A new term to describe "wave length" is necessary if we are to change the old, incomplete models of sound and electromagnetism. The term, "period-peak length" may suffice, although a better term may evolve.

The nature of electromagnetism, in particular, is a difficult area to probe. Albert Einstein believed that it was necessary to have a clear and simple model in order to understand physical phenomena. It is hoped that the simple illustrations and explanations offered in this paper will help to provide fresh inspiration for others working in this field. Experimental research is needed to prove the SPEEC hypothesis and to provide the basis for an investigation into the effects of modulated low-level infrared electromagnetism on biological systems.

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5. Very gentle stroking of the skin may generate microwave or short wave radio frequencies, albiet of very low amplitude. It may be possible to detect this effect in a Faraday cage with suitably sensitive electromagnetic instrumentation. If this effect is proven by experiment it is not improbable that human cells are sufficiently sensitive to react to such fields.
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11. The term "period-peak length' is suggested as a replacement for the historical 'wave length' meaing the distance between peaks of energy in the space-form of a give sound or electromagnetic emission. Continuance of the term 'wave length,' it is held, could delay new discoveries.

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Report

THE EFFECT OF VOCALIZED SOUND ON CONSCIOUSNESS AND ENERGY

by Puran Bair, with Susanna Bair

ABSTRACT

Every sound is a word, the meaning of which is derived from the physical effect of making or receiving the sound. This is onomatopoeia, a feature of every language and a useful tool in exploring the mind-body connection. In particular, onomatopoeia is an essential aspect of mantra: vocalized sound used to develop consciousness and internal energy. This paper explores the effect on the energy centers, called chakras, of some of the qualities of vocalized sound: the frequency of the sound, the pattern of harmonics, the time of attack and decay, and the timing of repetition.

KEYWORDS: sound, chakra, consciousness, heartbeat, onomatopoeia

In the Bible it is written that first was the word, and from the word all things came. But before the word was the breath which made the word. We see that a word can make us happy, and a word can make us sorry. It is told that once a mystic was healing a child. He repeated a few words and then gave the child to the parents saying, "Now he will be well." Someone who was antagonistic said to him, "How can it be possible that by a few spoken words anyone can be healed?" From a mild sage an angry answer is never expected, but this time the mystic turned to the man and said, "You understand nothing about it, you are a fool!" The man was very much offended; his face was red; he was hot. The mystic said, "When a word has the power to make you hot and angry, why should a word not have the power to heal?"

THEORY OF VIBRATION

The mystic's realm is that of consciousness and energy, both of which are necessary for creation or transformation. Consciousness and energy meet in vibration, and vibration that interacts with the physical world is called "sound" by the mystics, whether it is audible or not. In speaking, a meaning (consciousness) is combined with breath (energy) to produce a sound. Every sound is also a word, and every word is also a name. The effect of a sound is to invoke the named being (consciousness) and create stimulation (energy) in the listener that this being may be experienced.

"White noise," composed of vibrations of an equal amplitude across the spectrum of sound frequencies, can be compared to "white light," which is composed of vibrations of an equal amplitude across the spectrum of light frequencies. These are analogs of the background consciousness and omnipresent field of subtle energy. Out of this background, individuality arises as a signature vibration that emphasizes some frequencies and diminishes others. Colors appear when one frequency of light is more intense than another, like notes of sound. Stars can be identified by a spectral analysis of their light, as every star has a unique vibration. People can also be distinguished by their unique combination of frequencies.

Stars, people and all matter can be observed emitting vibrations at certain frequencies, but the mystic sees the physical world from the other side -- matter

is being continually formed out of the sea of vibration and exists in what appears to be a static state in the same way that a wave interference pattern creates stable images. In this view, all of reality is dynamic, becoming what it is meant to be by a combination of intention (consciousness) and breath (energy). This intention arises in the mind of the universe from a desire to explore its own potentials. By "breath" is meant that life stream that activates intention and causes a rising and falling wave of circulation within and between each living being.

That complex vibration spanning many frequencies that constitutes an individual person can be readily affected by vibrations from without which resonate within. (The mystic sees all of life as a system of reflection, a "palace of mirrors" in the realm of light, or a system of resonance in the realm of sound.) Realizing this, the master deliberately participates in his or her dynamic creation by self-generating sound vibrations that will interact with his or her signature vibration to promote aspects of the self that are needed to accomplish his or her purpose. The aspects of vocalized sound that can be controlled and utilized for this purpose are the pitch, or frequency, the harmonic content, the speed of attack and decay, and the rhythm of repetition.

OBJECTIVES

This paper will explore the following questions:

- What sounds intensify and release energy in the body's energy centers called "chakras"?
- Is a continuous tone or a pulsating tone more effective?
- What characteristic of sound causes an expansion or concentration of consciousness?
- What sound represents a tuning of consciousness to the soul, versus the heart?
- What rhythm is most effective for stimulating the heart?

EQUIPMENT

An audio spectrum analyzer is an instrument that visually represents the intensity of each separate frequency within the audible range that it's monitoring. Attached to a microphone, it can show the frequencies in one's voice. The instrument used in this paper is a computer program that performs an FFT calculation in 2.7 Hz steps, making 4096 steps in the range from 0 Hz to 11025 Hz.

OBSERVATIONS OF VOCAL SOUNDS

The human voice produces a fundamental frequency and a series of overtones that give the note a distinguishing richness. A sine wave is a fundamental frequency without overtones; it is a pure sound that is not colored by the instrument that produces it. Any two instruments that produce a sine wave of the same frequency are indistinguishable by their sound. A sine wave is hard to create vocally; here is the spectrum analysis of an open "E" vowel at approximately 220 Hz. It shows one very strong frequency, shown by the tall vertical line, and very slight harmonics above that. (The frequencies below—shown to the left of the note are mostly background noise.)

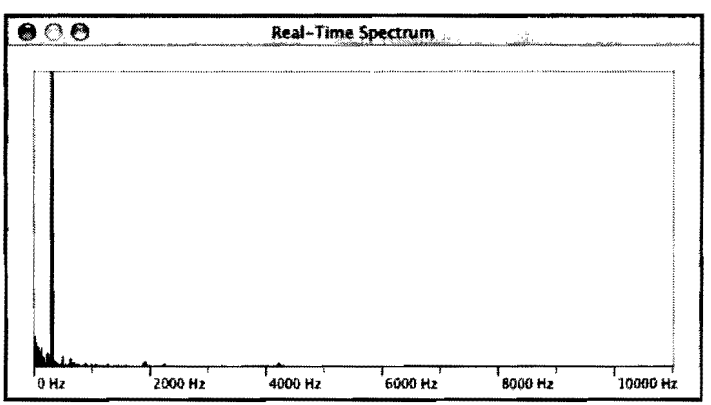

Figure 1A. *A simple E vowel.*

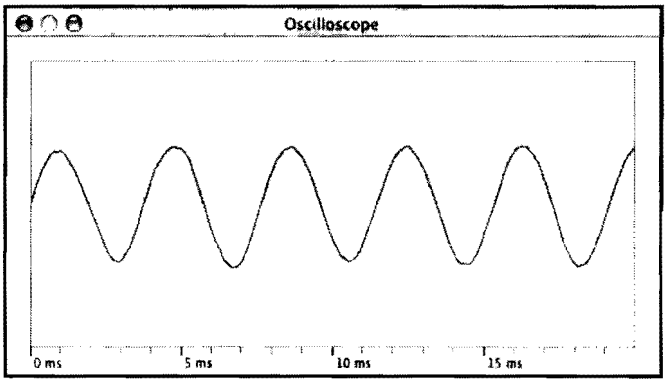

Figure 1B. *The same E vowel on an oscilloscope showing a pure sine wave.*

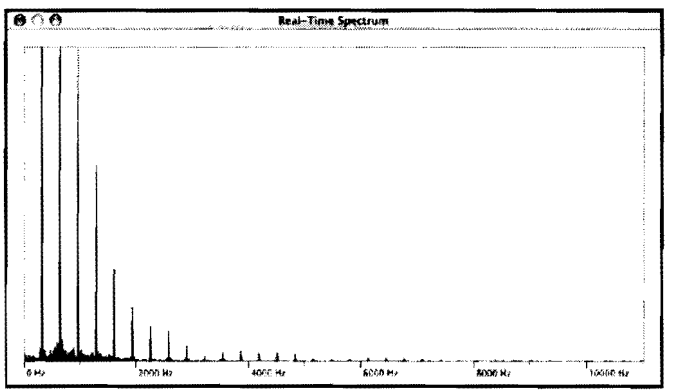

Figure 2A. *Vowl O with harmonics.*

A more typical vowel sound includes a series of harmonics, which appear as vertical lines, generally of descending height, equally spaced as multiples of the fundamental frequency, as in this "O" vowel:

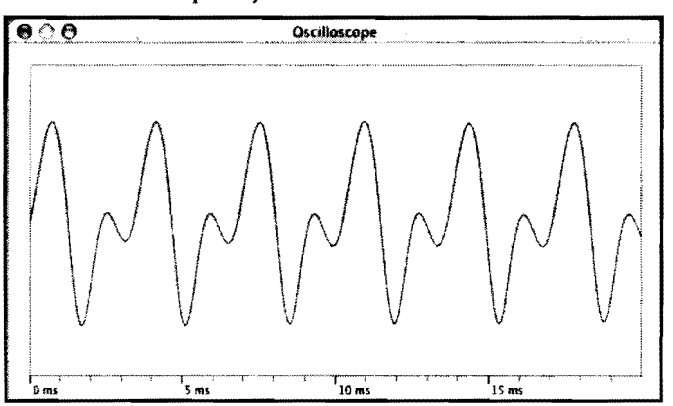

Figure 2B. *The same O on an oscilloscope, showing a complex sine wave.*

Human voices are roughly in the range of 80 Hz to 1100 Hz, for the fundamental frequency. The harmonics of the fundamental can extend far above the range of the voice, and even beyond the range of hearing. Here is a more "rich" "E" vowel that shows harmonics stretching to the end of the 11025 Hz range of the spectrum analyzer.

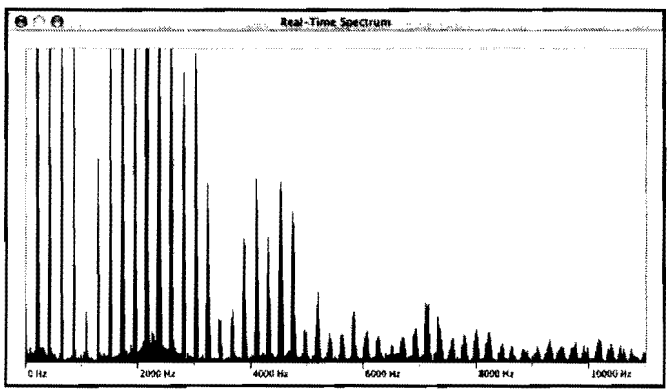

Figure 3. *A vocal rich vowel E with many harmonics.*

This note still sounds like a 220 Hz note, or the A one octave below middle A on the western musical scale. However, this sound would be easily distinguished as my own even among a choir because of the number and intensity of the particular harmonics of my voice.

Whistling range is about 500 Hz to 2500 Hz. Harmonics can be sustained above 20,000 Hz, either by voice or whistle. Here is a whistled note at about 2200 Hz. Note that a whistle is a very pure sound with no harmonics.

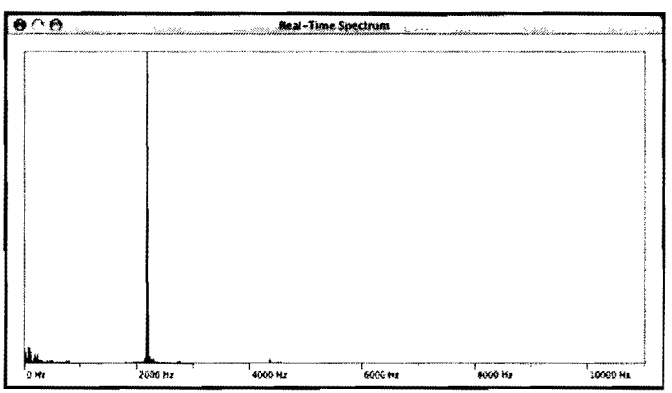

Figure 4. *The pure single frequency produced by whistling.*

USE OF VOCALIZED SOUND TO STIMULATE ENERGY

Different parts of the human body resonate at different frequencies, and each part of the body is associated with a human quality. For example, the middle of the brain can be stimulated by sound to promote an exceptional clarity of insight, the center of the chest to promote courage and the solar plexus to promote compassion. The mapping of five energy centers along the spine and two in the head, and corresponding glands, to certain human qualities, began with the ancient Hindu system of chakras, and has been updated most recently by the Sufis. Further updates will follow new instrumentation and research. The frequency of each energy center is not a fixed frequency; it depends on such things as bone density and muscle tension, so each meditator must experiment within a frequency range. The higher frequencies resonate mainly in the head; the lower frequencies in the torso, but a low-frequency "OM," for example, can be made to resonate in the head because the harmonics of the sound can reach into the high frequencies.

The following sound is designed to stimulate the third-eye energy center, and I have tuned it to maximize the intensity in the center of my head. I increased the fundamental frequency to 537 Hz as I tuned the sound to be most effective at one task—vibrating the center of my head to provoke a burst of insight. Comparing this spectrum analysis with the "E" sound in Figure 3, one very intense second harmonic, at about 2150 Hz is retained while other harmonics were dropped.

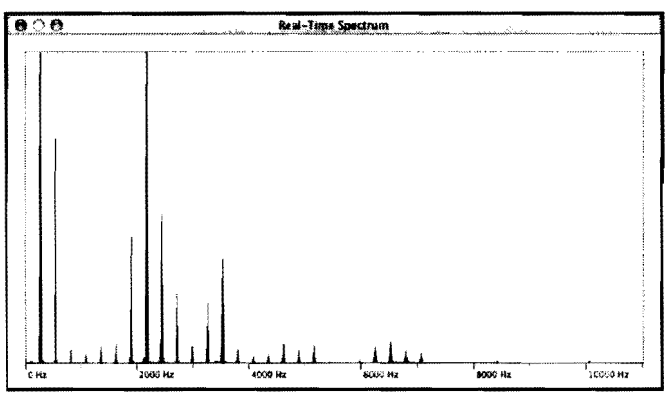

Figure 5A. *The frequency spectrum of a vowel E tuned to the third eye.*

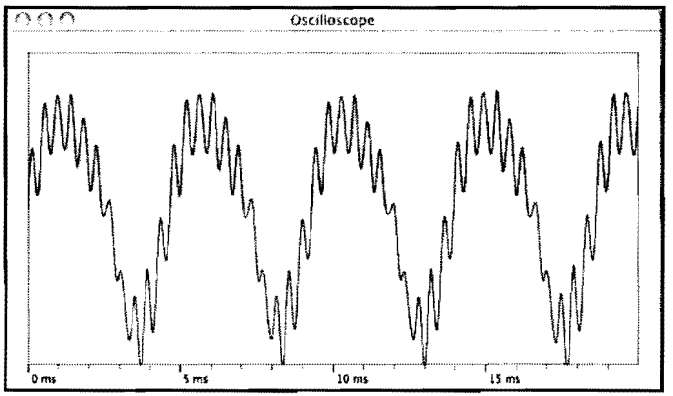

Figure 5B. *The same third-eye sound on an oscilloscope.*

To stimulate the "third-eye" energy center, the sound needs to reach the 2 kHz range. At that frequency, it feels to me that the pineal gland in the center of my head is being stimulated. The sensation is quite extraordinary. To create a very strong harmonic in this range, as shown in Figure 5A, the "E" vowel is necessary. The highest strong harmonic I can make with the "O" vowel is the first harmonic, at about 1300 Hz. With an "A" vowel, I can do no better. Only the "E" vowel can produce powerful, sustained harmonics above 2000 Hz. For this reason, the "E" sound has been associated with the third-eye for thousands of years.

To stimulate the heart center, a lower sound is needed, corresponding to the resonant frequency of the heart organ in the chest cavity. The heart hangs suspended in fascia, which is connected to the ribs and spine and to the shoulders. The resonant frequency of the heart is affected then by the placement of the shoulders and the curvature of the back. With the shoulders back and the spine straight, I find the resonant frequency of my heart to be about 61 Hz, as shown in Fig 6A with the leftmost line on the spectrum analyzer indicating the fundamental frequency of my voice as I vocalized the sound that vibrated my heart.

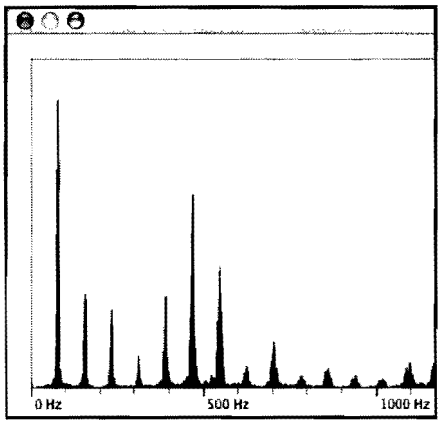

Figure 6A. *Spectrum of an A vowel, with heart resonance.*

This note is extremely pleasing to make. It causes physical vibration in my chest that I can feel with my hand placed over the center of my chest, indicating that my ribs and sternum are also vibrating. Experimenting, I found another extremely pleasing note and when I recorded it, I found it was exactly the first harmonic of the first note. Fig. 6B is the spectrum analyzer showing a fundamental frequency of 102 Hz. This note also produces resonance in my chest, but not as intensely as the lower note.

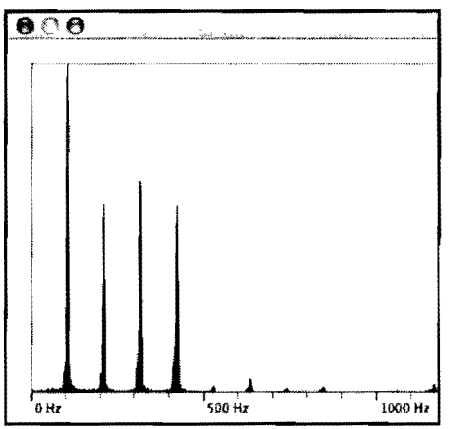

Figure 6B. *Spectrum of an A vowel, also with heart resonance, one octave higher.*

The "A" vowel has been associated with the heart throughout history. It's the easiest sound to make—it requires no lip positioning, just an open mouth—and is the vowel often used by children in their word for "mama" or "papa." Any other vowel one would make restricts the lowest frequencies somewhat.

Despite the efficiency of "E" for the "third-eye" energy center and "A" for the heart, any vowel can activate any center, provided that the note is tuned to the resonant frequency of the organ associated with the chakra and "placed" at that physical point. A sound can be placed anywhere in the body by visualizing a target point and adjusting the sound until a tingling is felt there. Using physical sensation as feed-back, one can increase the stimulation at the desired location. This is done with the energy centers to intensify the particular kind of energy that center holds, and to apply the energy by directing it along a path within the body or out into the environment. For example, the heart energy can be directed upward into the head, to creatively inspire one's mind, or forward into the world to project love and peace into a situation.

USE OF PULSATING OR CONSTANT SOUND

To make a sudden burst of sound requires a forceful breath to deliver the power to ramp up amplitude from nothing to full force in a few milliseconds, and this sound delivers tremendous power, like a punch, to its target. For the same reason that AC electric current is used in power lines instead of DC, a wave of pulsating amplitude can push through resistance and carry farther than a current of constant amplitude. Like a wave in the ocean, a rapidly changing volume of sound has a velocity, not just a level. The effect of the sound on an energy center is many times greater than the effect of a continuous sound.

A pulsating sound can be very effective when dealing with the heart or solar plexus energy centers, which can absorb an energy burst to advantage. It is not recommended when targeting the throat, third-eye or crown energy centers, as they are too delicate; they could be damaged by the force of a pulsating sound. With the higher centers we use a continuous sound.

Figure 7 shows the sound envelope of a sound with a rapid "attack," or build-up of sound volume. This graph is similar to the oscilloscope graphs used in other figures in that it shows intensity against time. Each vertical line is one cycle, from its highest point to its lowest point. The time marks on the X axis are one second apart. The time from silence to the loudest point in the sound is only 15 ms. This particular sound is used to convey a "blessing,"

and anyone who has received this sound, made by themselves or others, would certainly say that the sensation of it in their chest, and the glowing feeling in the heart it produces, are what is meant by "blessing."

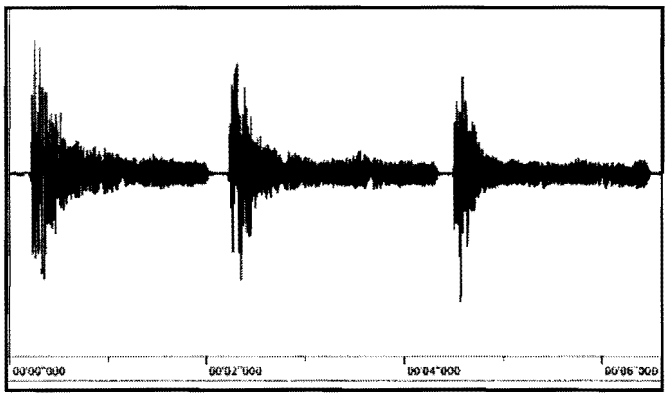

Figure 7. *Oscilloscope of a vocalized, pulsating sound targeting the heart.*

USE OF VOCALIZED SOUND TO EXPAND OR CONCENTRATE CONSCIOUSNESS

Consciousness is not the same as awareness; consciousness is the perception of the self, whereas awareness is the perception of sensation. However, consciousness can be influenced by awareness, and sound can be used to expand or narrow awareness of audio sensation.

The effect of listening to the pure note of a whistle, as in Fig. 4, is of focusing attention very intensely. Within the one note, attention reveals, is a symphony of sound. This is the mystical experience of "Infinity in the finite, eternity in the moment," sometimes induced by staring at a spot on the wall. One brings the enormous power of attention to rest on a single sensation, and that sensation then opens up to become incredibly rich. When that attention is then applied to the self, one experiences an essential core that is at once both very pure and simple, like the whistle, and also more complex in potential than one could imagine. This is called the experience of the soul.

The opposite extreme to the whistle is called the "Sound of the Universe," or the "Music of the Spheres." Sometimes in the still of the night one can "hear" a sound that resembles the hiss of an FM tuner between stations, or the ringing in the ears of tinnitus. It is not an external sound; it's the "white noise" of the auditory sensory system. Mystics have been fascinated with this inner sound and have classified ten different kinds of sounds within it: buzzing of bees, bells ringing, whistles blowing, fluttering of leaves, running water, the sound of a Vina, cooing of wind, crashing of thunder, melodies, and high-pitched singing. Regarding the melodies within the Music of the Spheres, Johann S. Bach said he "heard" his compositions in the inner sound and simply wrote them down.

The Music of the Spheres can be approximated by a vocalized sound that spans a very wide range of frequencies, at nearly equal amplitudes. This is the definition of white noise, and it's amazing that the human voice can produce anything remotely like it. Fig. 8 shows such a sound. It is made by humming, then continuing with a high-pressure blowing through lips almost closed. The result has no fundamental frequency, but an almost even distribution of sound intensity across the audible spectrum, and probably beyond. The operating range of the microphone is exceeded.

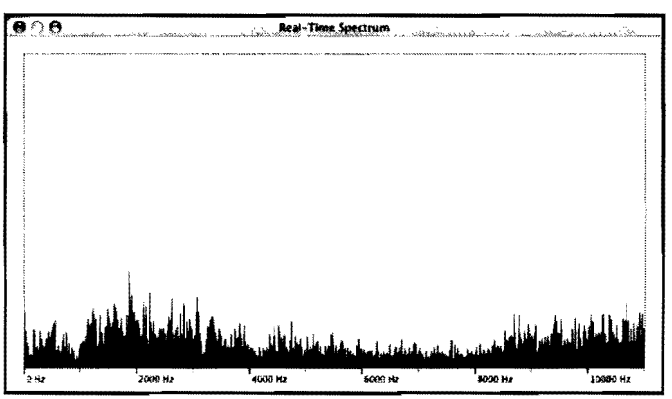

Figure 8. *A vocalized Music of the Spheres, showing distribution of frequencies.*

On hearing this sound, or even better, making it, one's sensory awareness is stretched to the limit of the audible range. The effect is such an expansion of consciousness that one almost loses one's sense of individuality all together. This is not the experience of the soul; it is the mystical experience of "Becoming a part of all things," and the sound of all frequencies is its perfect analog.

USE OF RHYTHMIC VOCALIZED SOUND TO STIMULATE THE HEART

The heartbeat is the most natural of all rhythmic sounds. The sound envelope of a human heartbeat is shown in Figure 9. This shows 60 heartbeats per minute. The attack, or time required from silence to the peak sound, is 30 to 45 ms.

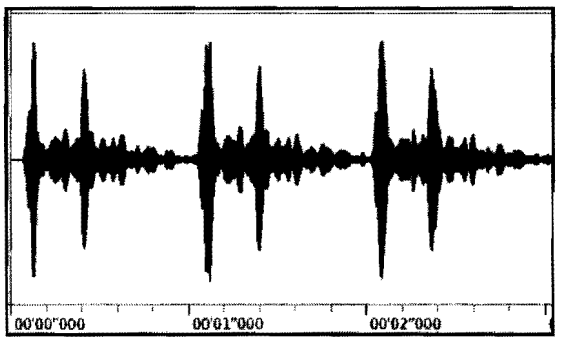

Figure 9. *Oscilloscope of a Human heartbeat.*

Notice that the first beat ("LUB") is slightly louder than the second ("dub"). According to Dr. John Diamond, rock music that has a lub-DUB rhythm, where the second beat is louder, has a weakening effect on the physical heart. In order to strengthen the heart energy center, we vocalize a pulsating sound that mimics the sound of the heartbeat. Such a sound is shown in Figure 10. The rhythm of this sound is paced to match one's own heartbeat.

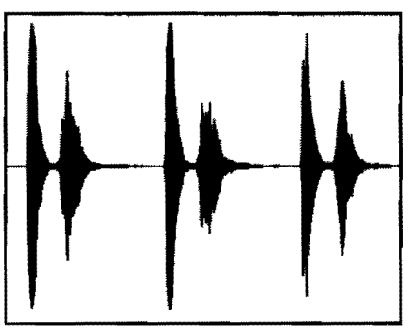

Figure 10. *Oscilloscope of a vocalized heartbeat simulation.*

The effect of this sound on a person is to bring the heart center energy strongly forward, giving an experience of tremendous courage with deep compassion, the natural experience of a person with a "big heart."

Another heart sound we frequently use is described as the sound of a stream, consisting of two parts: the sound of the water rumbling over the rocks, heard best with one's ear to the ground, and the sound of the water interacting with the air. The objective is to make both sounds simultaneously, which is something like humming and whistling at the same time. Among all the sounds we use to stimulate energy and consciousness, this sound is the hardest one to make. The spectrum analysis of this sound is shown in Figure 11.

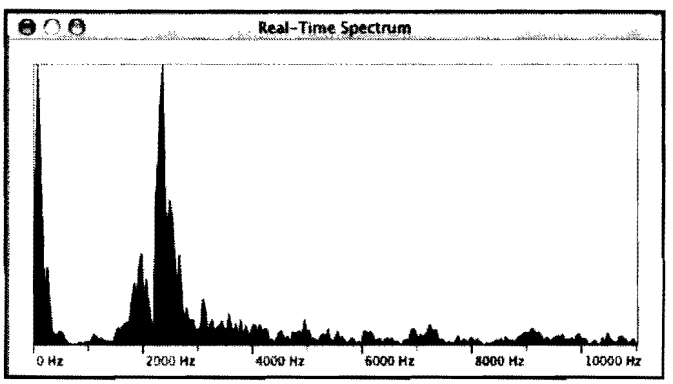

Figure 11. *A vocalized sound of a stream.*

There are two prominent frequencies, the first very low, and the second above 2000 Hz. Overall, it sounds "fuzzy," instead of clear like Fig. 5A. The body, receiving these vibrations, integrates them together. The result is an experience of a dynamic flow of energy downward, into and through the heart. We imagine this energy stream to spill out forward from the chest in the form of creativity and generosity, and such behaviors follow from this practice naturally.

CONCLUSIONS

We have found the following:

- The frequency of the sound will affect the quality of energy.
- The harmonic content of the sound will affect the quality of consciousness.
- A sound with a fast attack will have a greater impact than a continuous sound, but can only be used on the lower energy centers.
- The sound envelope should match that of the heartbeat for maximum effect on the heart.

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