STORAGE OF NON-HERTZIAN FREQUENCY INFORMATION IN WATER

INTRODUCTION

Nineteen century scientists who first measured the physicochemical properties of water noted its peculiar nature (Dorsey, 1940). However, it wasn't until the 1930's, with the introduction of spectrographic techniques, that the anomalous properties of water began to be understood. In the 1950's the key role of hydrogen bonds between individual water molecules became clear (Pople, 1951). More recently, the development of sophisticated computing techniques has led to a quantum mechanical approach to studying the cooperative, long-range interactions between individual water molecules (DelGiudice, 1988).

These cooperative interactions have been used to explain the physicochemical properties of water which are unique amongst liquids and which are constantly changing (Franks,1972). Two of these anomalous properties form the bases for the hypothesis presented in this article: 1) each water molecule is capable of hydrogen bonding with four neighbor molecules thereby forming three dimensional (3D) structures and 2) water has a particular large heat capacity which allows it to store considerable quantities of thermal energy (Franks,1972). Infrared (IR) spectroscopy and Raman spectroscopy are two commonly used techniques to measure hydrogen bonding (Walrafen,1964 and Green,1986). Weakening the hydrogen bonds allows water molecules to cluster more closely resulting in a more structured 3D geometry. Water in the form of ice is tetrahedrally co-ordinated (with four neighbors) forming a regular hexagonal structure closely resembling diamond. Since water can form nine different types of structuring/clustering due to different types of hydrogen bonding, several models for the structure of liquid water have been proposed. The Flickering Cluster model suggests that for short periods of time there are localized regions which form the hexagonal structure of ice. The Vacant Lattice Point model describes water as an open crystalline hexagonal lattice. Water may also contain other stable configurations, notably pentahydrate and hexahydrate polymers (Franks,1972).

Structured water occurs naturally in biological systems surrounding biomolecules and at the surface of the cell membrane. Most of the water in biological systems is bulk water, where decreased hydrogen bonding between individual water dipoles results in a more random orientation (Fullerton,1986). A functional role for structured water is suggested by experiments where the hydrogen bonds are intentionally broken, causing a shift in the orientation or the "order parameter" of the biomolecules (eg. glycoproteins in the cell membrane) (Das,1985). Structured water in biological systems is characterized by altered electrical properties (eg. dielectric constant and conductivity) and is readily and reversibly converted to random bulk water (Ecanow,1976). Thus, structured water and bulk water are in equilibrium. Although the nature of the transition energy between these two forms is unknown, protons can travel between the two water phases via the hydrogen bonds.

In addition to having a large heat capacity for storing thermal energy, water can store other forms of energy in various internal modes after the energy has been absorbed by individual water molecules. Thermal energy is stored in vibrational and rotational modes, whereas ultraviolet energy is stored in excited electronic states. Vibrational modes and excited electronic states are most likely to be involved with storage of information, although such storage would require quasi-stable states.

The ability of water to form stable 3D structures and its ability to store energy may explain what is likely to be water's most unique property- it's memory. The addition of small solute molecules (additives) to water results in their hydration, ie. they become surrounded by water molecules. The ability of additives (like sugar and polyols) to structure water is dependent on the previous state of the water and the degree to which that state was structured (Trincher,1981). This hydration memory of water was more recently confirmed (Lareta-Garde,1988) by studying the ability of various additives to alter the enzyme kinetics for a solution of lysozyme. The authors discovered that the enzyme activity was not related to the chemical structure of the additives, but to the ability of the additives to structure water. Furthermore, the enzyme remembers the structuring of water even after extensive dilutions. These anomalous properties of water may explain the phenomenon of homeopathy, where water stores and remembers chemical information of a chemical it had been previously exposed to- even when the chemical is no longer present. Water appears to remember different chemical structures in that different chemicals cause different biological effects and different physicochemical properties (Brucato, 1966; Nelson; Young,1975).

1. Electromagnetic Field Effect on Water

The main hypothesis in this paper is that in addition to chemical memory, water can also remember and store frequency information. The ability of water to store frequency information associated with electromagnetic fields (EMF) appears to be another anomalous property. The theoretical work of DelGiudice (1988) which is based on the quantum coherent behavior of water molecules predicts that water structure should be sensitive to external EMF. Imprinting, potentizing or charging water in this way is well known in homeopathy where remedies have been prepared by exposing water to UV, visible light and X-rays. These remedies, charged with EMF of different frequencies, produce different biological effects. More recent research indicates that more traditional homeopathic remedies (ie. chemically based) can be enhanced when they are made with water which had been previously charged with frequency information. Nelson of Eclosion (Boulder, CO), for example, has shown that remedies made from water charged with a 10kHz spike wave (via direct electrode insertion) are more potent (Nelson). These findings suggest that water is capable of storing and remembering the specific frequency information imparted to it and that biological systems can "read" this information. More recent studies have also investigated the ability of water to store frequency information from EMF.

Smith of the University of Salford in England has demonstrated that electromagnetically sensitive individuals, known to respond to specific EMF frequencies, respond to the same frequencies when transferred to water. In these experiments a sealed vial is exposed to the EMF radiating from a solenoid coil for less than one minute. Magnetic fields of several mT are required to charge the water unless the water is simultaneously succussed in which case only nT field strengths are required (Smith,1989). Smith has further studies some of the properties of the frequency information stored in water (Smith, 1994):

1) The information can be further potentised by dilution and succussion akin to preparing a homeopathic remedy.

2) The information will propagate along a copper wire, even if the wire is wrapped around the outside of the glass container. In this way the frequency information can be transferred to a separate water

sample. The information can also be conducted by aluminum foil and will pass through a capacitor, a resistor and a p to n semiconductor. It will not propagate along solder (a tin and lead alloy) or plastic.

3) The propagating signal is not like electrical current since it is coherent. Propagation is independent of the frequency of the information and the propagating signal can be blocked by a DC magnetic field.

4) The information is evenly distributed throughout the entire water sample.

Patrovsky, a chekoslovakian researcher, observed water charged with specific frequencies, less than 500 Hz and in the GHz range, effects calcium carbonate solubility (important in de-scaling of industrial boilers) as well as producing characteristic changes in IR spectroscopy associated with structuring of water. Patrovsky further correlated physical/chemical changes in water with biological changes. Water charged with these specific frequencies, referred to as resonant water, had no effect of plant growth. Water charged with electrostatic fields, DC magnetic fields or ultrasound, on the other hand, had the opposite effects. This water, referred to as polarized water, stimulated plant growth and had no effect on calcium solubility or IR spectroscopy.

Other investigators have also studied the ability of DC magnetic fields to charge water. Reports from Eastern Europe and China describe the use of magnetically charged water. These include modulation of calcium carbonate solubility, dissolution of lime deposits, desalination of soil, accelerated plant growth and favorable effects in the treatment of kidney stones (Kronenberg, 1989 and Herzog, 1989). Some studies also report changes in the physicochemical properties of magnetically charged water (Klasen, 1968 and Minenko, 1969). These effects appear to be due to a general structuring of water without imparting specific frequency information.

2. Non-Classical EM Field Effects on Water

Although EMF can be used to charge/structure water, the effects are often difficult to reproduce and are relatively short-lived. In addition to the B (magnetic) and E (electric) field components of classical EMF, an A (potential) field also exists at right angles to B. (Olariu, 1985). In addition classical potentials based on Maxwell's equations, Bohm described a new quantum potential based on

Schrodinerg's equations. Quantum potentials were proposed to exist in an implicate (subtle) level enfolded within the explicate level of the classical EMF (Bohm, 1952). The quantum potential describes a quantum energy field which is more fundamental than the classic EMF, since the later can be mathematically derived from the quantum potential (Aharonov, 1959). Although the potentials were originally considered a mathematical theory applying to the subatomic domain, Aharonov and Bohm predicted that potentials, in the absence of E and B fields, could have real macroscopic effects (Aharonov, 1959). Such effects have been directly measured in terms of their ability to influence the wave function of an electron (Chambers, 1960).

These findings offered a scientific explanation for the earlier work of Tesla who measured a variety of anomalous EMF effects. Tesla believed he had discovered a new type of field which propagated without loss of energy. He used the term non-Hertzian to describe this energy since its properties were radically different from those of classical EMF described by Hertz and Maxwell. Other researchers have since verified his work and confirmed that non-Hertzian energy appears to be distinct from classic EMF (Bearden,1990). This research often utilizes specially designed self-canceling coils with toroidal, mobius and caduceus configurations. These coils, like the solenoid used in the Aharonov-Bohm effect, cancel classical EMFs and are believed to generate some form of non-Hertzian energy (King, 1990 and Taylor,1991).

Bohm has recently proposed the existence of an even more subtle energy level which underlies the quantum potential (Bohm,1990). Bohm refers to this fundamental energy level as the super-quantum potential. Unlike quantum potentials which reside in our ordinary 4-D space/time, it is believed that super-quantum fields are higher dimensional (Bohm,1990) or informational in nature. It is unknown whether self-canceling fields also generate this higher dimensional energy, although this conclusion is consistent with a previous proposal that they locally warp space/time (Bearden,1990 and King,1990). The term non-Hertzian will be used here to refer to potential, quantum and super-quantum fields.

The possibility that non-Hertzian fields might be used to transfer their frequency information to water has received some experimental evidence. Smith has recently extended his original research with EMF effects on water and has demonstrated that potential A fields are responsible for transferring frequency information to water (Smith,1994). Solenoid coils, which generate both A and B fields and

toroidal coils, which generate only A fields (B fields are contained inside) were used to charge water. Smith concluded that the A field charges the water, while the simultaneous use of succussion or a B field is required to "format" the water. A similar process occurs with computer disks which must be formatted before they can store information. Smith's results further demonstrate that DC magnetic fields may also be involved with charging of water, but that alternating E fields are not.

Several scientists worldwide have discovered technology for transferring non-Hertzian frequency information into water. Since the technologies have typically been sold to marketing companies, the scientific details are proprietary. It is therefore not clear whether they are generating the same or different forms of non-Hertzian energy. Rod water, tachyon water, Bio-Quest water, and Wekroma water products are a few examples which are available on the market. The Wekroma technology generates A fields, although they are described as K fields. Kropp, a swiss researcher, has concluded that K fields are more effective than EMF for charging water with specific frequencies (Wekroma, 1989). Water is charged with these technologies has been used in a variety of applications including agricultural, food reprocessing, industrial waste management and in the cosmetic industry.

Several of these products are also being used in the biomedical field, although due to FDA restrictions and lack of scientific research little information is available about their biological effects. Most evidence is based on anecdotal evidence from individuals who claim to experience alleviation of a variety of physical symptoms. It is not clear to what extend these experiences are above and beyond the placebo effect.

Smith has extensively studied the biological effects of water charged with specific frequencies using electromagnetically sensitive individuals known to respond to specific EMF frequencies. Some of these individuals show marked effects when they hold in their hands a sealed vial of water charged with specific frequency information. Certain frequencies trigger physical symptoms whereas others reduce symptoms triggered by external EMF (Smith,1994).

Eckl of the University of Salzburg in Austria has studied the effect of water charged with an application of the Wekroma system referred to as Energetic Resonance and Interference

Technology (ERIT). Energetic resonance refers to the hypothesis that cells only absorb frequency information missing or needed by the cells to function properly. Although the unpublished data is preliminary in nature, he has observed that the growth rate of rat liver cells grown in tissue culture can either be stimulated or inhibited depending on the frequencies used to charge the water.

Working in collaboration with Gagnon of Dynamic Engineering (Sacramento, CA), the author has conducted a series of biological experiments with water charged with non-Hertzian frequency information (Gagnon and Rein,1990). The water was charged with a modified caduceus coil consisting of two concentric and oppositely wound coils. The unique waveforms designed by Gagnon, referred to as Structured-Electromagnetic Quotient Stimuli (S-EMQS), consisted of a series of envelopes repeated at 5 microsecond intervals. Each envelope contained three to seven superimposed square waves varying in frequency from 2 kHz-6kHz. The charged water was then tested for its ability to effect DNA synthesis in cultured human lymphocytes. This in vitro assay is considered a standard method for assessing the activity of the immune system. The charged water caused a 61% stimulation of DNA synthesis whereas direct exposure of the cells to the coil produced a similar 87% stimulation (relative to untreated controls). The information pattern in the water could be restructured by subsequent exposure to a different non-Hertzian field. Thus, a second set of frequencies, which were designed to inhibit DNA synthesis, were superimposed onto the water which had been previously charged with frequencies know to stimulate DNA synthesis. This water caused a 58% inhibition of DNA synthesis, thereby canceling the original stimulatory information pattern stored in the water.

These results indicate that water can store/remember information associated with specific frequencies and that this information can be utilized for a variety of applications. Biological systems, for example, are capable of reading/decoding this information. Biological systems appear to respond equally to the frequency information whether it is delivered via a `'field`' in air or via water. The mechanisms involved in these processes are presently not understood.

3. Methods for Detecting Frequency Information Stored in Water

IR, Raman, UV and NMR spectroscopy have been used to measure the informational content of homeopathic remedies (Young,1975) or water charged with bioenergy from certain "gifted"

individuals (Dean,1983 and Schwartz,1990). In addition to traditional spectroscopy, special methods have been developed based on the principles of spectroscopy. Nelson, for example, measured specific absorption patterns when current was directly delivered to a petri dish containing a homeopathic remedy. Both the signal generator and the oscilloscope were directly connected to the petri dish (Nelson). This work has recently been confirmed by Kenyon in England (Kenyon,1993).

A few spectroscopic measurements have also been obtained from water charged with EM or non-Hertzian fields. Patrovsky measured characteristic changes in IR spectroscopy associated with structuring of water after charging water with ELF or MW frequencies. Smith used a low-noise, high-gain narrow-band amplifier to measure dielectric and capacitance changes in water charged with a 50kHz magnetic field (0.1mT) (Smith,1994). Working in collaboration with Kropp in Switzerland, Smith demonstrated that water charged with a toroid showed unusual absorption changes around 300nm using UV spectroscopy (Smith,94). Ohlenschiager of the University of Frankfurt developed a special resonance spectrophotometer which uses gold electrodes to detect an electromagnetic signal from water acoustically excited with a piezoelectric disc. Fourrier analysis of the resulting signal produced a unique spectrum between 6 and 8 kHz (Wekroma,1989).

Other miscellaneous methods have also been used to measure frequency information in water. Homeopathic remedies, for example, show changes in pH, surface tension, permitivity and dielectric strength (Brucato,1966) as well as conductance, magnetic inductance and capacitance (Kenyon,1993 and Nelson). Changes in some of these physical properties have also been observed in water charged with electromagnetic fields (Kronenberg, 1989). In addition, Jaberansari measured characteristic changes in X-ray crystallography of ice using water which was frozen in the presence of a 12mT DC magnetic field (Jaberansari,1989).

METHODOLOGY

EM fields and non-Hertzian fields were generated for these studies using tree different signal generators:

1. Standard computer: In these experiments square wave signals were generated by an IBM compatible computer using specially designed software . Standard square waves were generated

with a single repetition rate of 29kHz or by scanning all frequencies between 37Hz and 37kHz (one second per frequency). The latter will be referred to as the scan signal. A standard computer was also used to generate complex S-EMQS signals using a specially designed software program from Dynamic Engineering, Sacramento, CA. This signal consists of a series of envelopes, repeated every 5 μs and carried on a 60Hz sine wave. Each envelope contained seven superimposed square waves (2-6kHz). This is the same signal which was previously used to charge the water which was used to measure DNA synthesis (see Introduction).

2. GoodField One (Computer Continuum, Daly City, CA): This generator uses two tunable high frequency oscillators that mix together to create beat patterns which generate a wide spectrum of RF frequencies between 17 MHz and 300MHz.

3. REM Superpro (ELF International, St.Francisville, Il): This generator has two modes. In the continuous mode the device scans through three square waves (700-1400 Hz) generated by separate frequency controlled oscillators. In the pulsed mode, the signal was specially modified by a proprietary technique to electronically self-cancel. The coil design used with this generator is also proprietary but is not of a self-canceling configuration. Therefore, the continuous mode generates a conventional EMF, whereas the pulsed mode generates a non-Hertzian field.

The 9-12V signals from these generators were then broadcast through a variety of different coil configurations. The 29kHz signal and the scan signal generated by the computer were fed into a standard caduceus coil. The caduceus coil was wound in the standard cancellation mode (Smith,1964) using 5 layers of insulated 77 ga copper wire. The wires cross over (at a 22° angle) at five nodal points along the active axis corresponding to a length of 17.8 cm. Some of the physical properties and anomalous characteristics of this coil have been previously characterized (Rein, 1991). The resonance frequencies of the caduceus coil were numerous and were not harmonically related with values ranging from 59kHz to 40 MHz.

The 29kHz signal and the scan signal were put into another self-canceling coil configuration designed by Reiter of Computer Continuum (Daly City, CA). This is a flat two-sided spiral coil with two sources of current entering on either side of the coil at the center. The current spirals out clockwise on one side and spirals out counterclockwise on the other side. The resonant frequencies

of the spiral coil, which were measured only at 9MHz and 47MHz, are quite different from those of the caduceus coil. S-EMQS signals were delivered through a modified caduceus coil designed by Gagnon. The coil consists of two concentric anti-parallel coils in the same plane. The coil was wound with 24 ga wire to a final impedance of 8.2 ohms (Gagnon and Rein, 1990).

In testing the effects of conventional EMF, the 29kHz signal, the scan signal and the GoodField signal were used in conjunction with a flat spiral coil with current flowing clockwise on both sides. This coil was impedance matched to the self-canceling version of the coil.

These coils were used to charge water for 24-36 hours by placing water in a sealed glass container directly on top of or adjacent to the coils. Water which was taken from the same stock bottle was placed in an identical sealed glass container and was placed at least at least 50 feet from the sample being charged. These samples were used as a control in all experiments. Therein both samples were treated identically and exposed to the same environmental factors (eg. temperature, agitation or exposure to external EMF). Distilled water was used for most experiments since a preliminary study indicated similar results with ultra-pure deionized/distilled water. A constant ratio of water to air was maintained in all experiments. All exposures were done at room temperature in the absence of EM shielding.

A special procedure was developed to measure the information content of water treated with non-Hertzian frequency information. The hardware for these measurements was a double beam, micro computer controlled, temperature regulated Perkin-Elmer Lambda 9 Spectrophotometer. This research grade spectrophotometer is accurate from 185-3200nm. Most spectrophotometers are not sensitive in the near UV region below 200nm. The same cuvette was used for all samples and samples were maintained at 20° C for the duration of the run using a water-jacketed cuvette. One experiment was done using a Brucker IFS 6 Raman spectrophotometer with an FRA 106 Raman unit attachment. All Raman measurements were made by an experienced practitioner who wishes to remain anonymous.

RESULTS

1. Raman Spectroscopy

Water charged with non-Hertzian energy generated by the S-EMQS signal with the modified caduceus coil was analyzed by Raman spectroscopy. Overall, the spectra was similar to that of untreated control water, although an increase in the amplitude of a specific peak at 985 cm-1 was observed (Figure 1). The interpretation of this data is quite interesting because the observed non-Hertzian effect did not occur at 3400 cm-1 , the fundamental stretching frequency of the covalent (intramolecular) O--H bond or anywhere near the broad peak below 300 cm-1 which corresponds to the bending and stretching modes of the (intermolecular) hydrogen bond. Thus it appears that non-Hertzian energy produces an unusual change in the vibrational/ rotational modes of water and does not structure water by directly influencing the hydrogen bond.

2. UV Spectroscopy

In most of the experiments UV spectroscopy was used to measure the effects of non-Hertzian energy on water. In all the spectra presented below the wavelength of the absorbed light in nanometers (nm) (x axis) is plotted against the amount of light absorbed (arbitrary units on the y axis). For discussion purposes the UV spectra will be divided into three regions: 1) the peak at 186nm, 2) the near shoulder of that peak around 196nm and 3) the tail of that peak around 210nm. For comparison with the Raman spectra described above, UV spectroscopy was also used to analyze water charged with non-Hertzian energy generated by the S-EMQS signal with the modified caduceus coil. These results (Figure 2) indicate that water charged in this manner showed an increased absorption at 186nm as well as all frequencies up to 350nm where the absorption values gradually dropped to control values. Thus, charging water in this manner produces effects in all three regions of the spectra.

Identical experiments were conducted using a standard caduceus coil fed by the scan signal (37Hz to 37kHz). The scan signal was used to simulate the complex S-EMQS waveform, ie. the intention was to use as many harmonics as possible. The results in Figure 3 indicate a similar pattern as obtained with the S-EMQS signal through a modified caduceus coil in that all three regions of the spectra showed an increased absorption. However, the standard caduceus coil with the scan signal produced an additional shoulder peak at 196nm.

Since the complex S-EMQS and scan signals were so effective at changing the UV spectra, it was of interest to examine the effects of a single frequency. The simple 29kHz square wave pulse run through the standard caduceus coil produced a markedly different spectra. In this case absorption values at 286nm were less than in untreated control samples (see Figure 4). This inhibitory effect was seen throughout the spectra up to 300nm (data not shown). Therefore, the pattern was similar to that obtained with the modified caduceus coil (Figure 2), although exactly opposite in direction (ie. decreased absorption).

Decreased absorption values were also seen using a completely different signal generated from the REM Superpro. Water charged with the Superpro (Figure 5) in the continuous mode, which would generate a conventional EMF, produced a spectra which was similar to that obtained from water charged with the 29kHz signal (Figure 4). However, the water charged with the Superpro showed a decrease absorption only until 230nm. In the pulsed mode the Superpro produces a self-canceling electronic signal which generates a non-Hertzian field. This signal produced a markedly opposite effect than the continuous mode signal (both run through the same coil). Thus the non-Hertzian field produced a large increase in absorption at all three regions of the spectra. This pattern was similar to that obtained with the modified caduceus coil (Figure 2). The two signals generated from the Superpro were also measured using a version of Hodowanec's gravity wave detector (Hodowanec, 1989) modified by Jeff Byrd of ELF International. In the pulsed signal mode the device produced a deflection in detector, whereas the continuous signal did not. This finding supports the hypothesis that only the pulsed signal produces a non-Hertzian field.

Since these results clear indicated that non-Hertzian fields generated in several ways could alter the UV spectra of water, it was of interest to determine what effects a conventional EMF would produce. Similar results were obtained using the scan signal, the 29kHz signal and the wide band signal generated from the Goodfield. A typical spectra for water charged with the scan signal is shown in Figure 6 where a small increase in the absorption at 186nm can be seen although the remaining regions of the spectra were identical to control water. Thus EMF produce a small effect on the UV spectra of water and have a very different spectral pattern than observed with non-Hertzian energy.

To measure the reproducibility and experimental error associated with making repeat measurements on different samples, three control samples were measured. These samples, like all the treated

samples, were taken from the same stock bottle of distilled water and were measured sequentially over a 15 minute time frame. The results, which are presented in Figure 7, indicate the spectra from the three samples are superimposable.

DISCUSSION

Previous studies have shown that water structured with non-Hertzian energy causes biological effects similar to those observed when the biological systems are directly exposed to the non-Hertzian fields (Gagnon and Rein, 1990). Homeopathically charged water, which is also biologically active, shows characteristic spectroscopic changes associated with increased structuring (Brucato,1966, Kenyon,1993 and Young,1975). These findings suggest that frequency information, whether derived from a chemical or directly put into water, can be stored in water and subsequently "read" by biological systems. It was therefore of interest to determine whether water structured with non-Hertzian information also showed such structural alterations.

The results of this study clearly indicate that water charged with non-Hertzian energy shows altered physical properties. One of the non-Hertzian fields used in the present study, the S-EMQS signal in conjunction with the modified caduceus coil, was previously shown by the author to increase DNA synthesis in human lymphocytes (Gagnon and Rein, 1990). Taken together these studies indicate the existence of a third category of charged water according to Patrovsky's classification- water which is both biologically active and structurally altered. Homeopathic remedies also fall into this third category. Previous findings also indicated that different frequencies of non-Hertzian energy produce different biological effects (Gagnon and Rein, 1990). The present study clearly demonstrates that different frequencies of non-Hertzian energy produce different structural changes in water. Therefore, at least for the S-EMQS signal, a direct correlation can be made between structural changes in water and biological changes.

Raman spectroscopy measures structuring of water according to its vibrational and rotational modes as well as the interaction between these modes. Raman spectroscopy therefore gives more information than IR spectroscopy which only measures the vibrational modes of water. Raman spectroscopy has not been previously used to study water charged with non-Hertzian energy. The effects observed with water charged with non-Hertzian energy, at 985 cm-1 is in a region of the

spectra distinct from where changes have been observed with water charged with healing energy or from homeopathic succussion (Dean, 1983, Schwartz,1990 and Young,1975). Water charged with non-Hertzian energy did not show changes in these regions. These results suggest that non-Hertzian energy generated from a caduceus coil has different properties (at least in terms of its ability to change the structuring of water) than other forms of subtle energy. The portion of the spectra effected by non-Hertzian energy is known as the librational region and is due to restricted rotational motions arising from restraints placed on the individual water molecules due to hydrogen bonding. The librational part of the spectra for Raman spectroscopy is a broad region from 200-1100 cm-1 (Franks,1972). Although the non-Hertzian effect occurs within this region, it is still an anomaly since it produced a sharp peak at 985 cm-1.

UV spectroscopy has not been previously used to measure water charged with non-Hertzian energy/information. Unlike Infrared and Raman spectroscopy which measures the vibration/rotation modes of water molecules, UV spectroscopy measures electronic transitions at the atomic level. Externally applied UV light is absorbed by the water molecules and excites outer shell electrons to a higher orbital. It is the oxygen atom itself, rather than the hydrogen atom or the hydrogen bond, which is responsible for the absorption peak at 186nm. Therefore an increased absorption of this peak represents a facilitated movement of electrons to higher shells in the oxygen atom. The data presented here clearly indicate that non-Hertzian energy, depending on the frequency, can either increase or decrease the amplitude of the absorption peak at 186nm. Although the mechanism behind such changes is unknown, several explanations will be considered.

Non-Hertzian energy imparted into the water does not contain enough energy (several eV are required) to cause electrons to be excited, but apparently prior exposure of water to this form of subtle energy changes the susceptibility of the electrons to UV light from the spectrophotometer. In the case of the 29kHz signal through a standard caduceus coil the electrons were less easily excited (decreased absorption), whereas the scan signal through the same coil appears to have increased the susceptibility to UV (increased absorption).

Although non-Hertzian fields may not have enough energy to induce an electronic transition, they may contain enough information to change the qualitative nature of the transitions. It is well known that electron transitions are only allowed between certain energy states. For example, transitions are

not allowed if the spin quantum number of the electron is altered. Since A fields and perhaps non-Hertzian fields are known to alter the phase of electrons (Chamber, 1960), it is conceivable that they might also alter their spin. This would allow new types of electron transitions to occur and might explain the anomalous observation of forbidden transitions observed by other investigators (Franks, 1972).

Since 100 fold less energy is required to change the hydrogen bonding of water than to excite electrons, non-Hertzian fields might directly effect the hydrogen bonds. This would change the clustering between individual water molecules resulting in a change in the molecular orbitals which would manifest as a shift in the UV spectra.

It is interesting to note that unlike conventional EMF which produce a small but localized effect at 186nm, non-Hertzian fields also produce effects at the shoulder and the low frequency end of the tail. In fact different frequencies produce different effects in these regions of the spectra. Although individual atoms absorb UV at discrete frequencies, wide peaks are characteristic of molecules (especially when in solution) which contain so many closely spaced electronic transitions that the spectrophotometer can not resolve them. The fact that non-Hertzian energy/information affected such a wide portion of the spectra (from 186 to 350nm) suggests that it is affecting a large number of electron transitions. The effect is not, however, non-specific since different frequencies effected different regions of the spectra. For example, one of the frequencies in the scan signal produces a small peak at 196nm which was not present in any of the other signals. Therefore, it is possible that the information associated with different frequencies of non-Hertzian energy could differentially effect specific electronic transitions.

he wide peak in the UV spectra of water may also be due to the presence of two main absorbing components. Assuming the 186nm peak is due to oxygen, there are two distinct sources of oxygen in water; the oxygen comprising the water molecule itself and the oxygen absorbed from the air. Since these two oxygen atoms have a different chemical environment, they will absorb UV light at a slightly different wavelength (in nm). If the two corresponding absorption peaks are too close together, they can not be resolved by the spectrophotometer and they appear as one wide peak. To keep the relative amounts of these two sources constant, the same ratio of air to water was used in all experiments. The results indicate that non-Hertzian energy effects both types of oxygen atoms

similarly since the spectra obtained from charged water samples always runs parallel to control water spectra. However, the author has observed that other forms of subtle energy have differential effects on the two types of oxygen atoms since it has been observed that the spectra from charged and control water samples crossover.

Most of the theories which have been proposed to explain the anomalous ability of water to store information, whether chemical or frequency based, have focused on the ability of water to form 3D crystalline-like lattice structures. Nelson has extended this idea in proposing that alterations in the clath rate structure of water or the shape imparted into the liquid crystal structure of water is an important component to memory storage. He further proposes that the "quantic" state of the electron determines the ability of water to store higher dimensional energy (Nelson). This hypothesis is based on the very short life time (approximately 10-10 sec) for an individual hydrogen bond (Franks,1972). The rapid making and breaking of these bonds has therefore been considered a quantum/probabilistic event (Stanley,1981). The data reported here are consistent with the hypothesis that quantum events at the electron level are involved with the storage of non-Hertzian energy in water.

Quantum physics and quantum electrodynamics is also being used by DelGiudice to explain the memory of water. DelGiuidice's model of coherent domains in water offers a unique explanation for memory in water (DelGiudice,1988). The hypothesis predicts long-range coherent electromagnetic interactions between water molecules which are stable enough to engage electrostatic attractive forces. Therefore, coherent domains are set up which can exist permanently in the ground energy state. Although these localized coherent domains are separated by larger regions of incoherent bulk water, they can communicate using the Josephson effect.

Using quantum electrodynamics, DelGiudice further predicts that electric polarization waves can be generated in water as a result of small electrical disturbances. Electrical polarization is brought about when there is a spontaneous breakdown in rotational quantum symmetry (DelGiudice, 1986). A mathematical description of the electrical polarization reveals it is mediated by long range coherent electromagnetic fields which propagate via a self focusing mechanism reminiscent of a phenomenon called superradiance. Superradiance, which also requires breaking rotational symmetry, involves internal EM fields which are trapped within a physical region (DelGiudice, 1990).

In the case of coherent domains of water, EM fields reflect off internal surfaces which act as a natural cavity preventing the EM field from radiating outward. In other superradiant systems, the trapped EM field can nonetheless propagate in a specialized vacuum-like region where the symmetry is broken and the current vanishes to zero. In the case of water this specialized region refers to a space where no coherent interactions are occurring between water molecules.

This unusual propagation without energy loss has been described by Anderson, Higgs and Kibble and is referred to as non-Maxwellian, superconducting and self focusing. Although the exact nature of these long-range fields is unknown, DelGiudice concludes that 1) they are associated with quantum potentials, 2) their photons acquire a non-zero mass, 3) they propagate without loosing energy (first described by Tesla) and 4) they are associated with several anomalous phenomena.

According to DelGiudice, non-Maxwellian propagation may also associated with charging of water with EMF (DelGiudice, 1986 and 1988). Using quantum field theory, DelGiudice proposes that the energy of an external EM field is stored in the long range coherent interactions between water molecules in a frequency dependent manner. Thus coherence will only be established between components resonating at the same frequency. After being absorbed in this network, the emitted EMF would propagate in a non-Maxwellian manner. This hypothesis offers a novel explanation for the storage of information in water. It is proposed here that non-Hertzian energy may also be absorbed and stored in the coherent network. The added frequency information would result in a change in the structuring of the water. The frequency dependence of the effects observed in this study offer direct experimental evidence in support of DelGiudice's theory of non-Maxwellian propagation in water.

Smith has utilized some of DelGiudice's findings in his model for information storage in water (Smith, 1994). Smith proposes that if the coherent domains in water can communicate using the Josephson effect, then water should be sensitive to magnetic flux quanta. This would result in a change in the magnetic flux density which would generate an internal EMF. Smith proposes that such an EMF could maintain the magnetic flux. The time-invariance of this process indicates that all frequencies could be stored.

Previous results by the author using water sequentially charged with two sets of non-Hertzian frequencies producing opposite biological effects are informative when discussing mechanisms of information storage in water. The fact that the new information was the set which was more easily read by the biological system suggests that the original set of frequencies were either erased or were stored in a non-readable configuration. Gagnon draws an analogy to a computer by postulating that the original frequencies were put in a back file. The possibility that two sets of frequencies can be stored simultaneously in water is not surprising considering complex homeopathic remedies are in fact such a mixture of frequencies. It is not clear in the case of non-Hertzian energy whether multiply sources of information can be stored or for that matter whether the nature of the stored energy is similar to the chemical information stored in a homeopathic remedy.

Nonetheless, the results of the present study clearly indicate that non-Hertzian energy/information can alter the UV spectra of water in a frequency specific manner. These results, when taken in conjunction with previous experiments indicating that water charged in this manner produces biological effects, indicate that some form of frequency information is stored in the water. Although conventional EMF also alter the UV spectra of water, these results are quantitatively and qualitatively different from the results obtained with non-Hertzian energy. The results therefore support previous research indicating the existence of non-Hertzian energy with different properties than classical EMF. The results presented in this paper offer a new experimental approach to studying the anomalous memory of water.

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