

**Biological Effects of Quantum Fields and Their Role in the Natural Healing Process**

**Glen Rein, Ph.D.**  
**Quantum Biology Research Lab**  
**Miller Place, N.Y. 11764**

**Abstract**

Physicists are well aware of the existence of energy fields which have properties which are not explained by the classical equations of Maxwell or Schrodinger. Experimental anomalies associated with “free energy” research may also involve non-classical energy fields, referred to here as quantum fields. Recent findings in biology indicate that certain biomolecules act as superconductors and biological systems in general exhibit non-local, global properties which are consistent with their ability to function at the quantum level. The possibilities that such anomalous behavior might be accounted for by the presence of endogenous quantum fields in biological systems has received little attention.

Experimental evidence is presented in this paper in support of this hypothesis. It has been previously proposed that quantum fields can be generated (in combination with potential fields) from self-canceling coils with unique winding geometries. These coils were used to demonstrate that quantum fields inhibit neurotransmitter uptake into nerve cells, stimulate the growth of human lymphocytes (white blood cells) and alter the absorption of UV light of water treated with quantum fields. In all cases, the quantum fields produced larger effects than classical electromagnetic force fields. This new experimental evidence is used as the basis for a model which introduces the concept of a bio-field composed of layers comprising force fields, potential fields and quantum fields embedded within one another. The model further proposes that healing information originates from a higher dimensional source and is transformed into biologically usable electromagnetic energy as it propagates through the layers of the bio-field.

It is well established in the Bioelectromagnetics community that weak (non-thermal and non-ionizing) electromagnetic (EM) fields produce a variety of biological effects at all levels of biological complexity, clinical, cellular and subcellular (eg. individual biomolecules). Relatively little attention, however, has been given to the role of endogenous (internal) EM fields or their role in the body's remarkable self-healing capabilities.

**The Global Bio-Energy Field**

The concept that these local EM fields might be part of (a subset of) a more fundamental, global bio-energy field inside the body has not been incorporated into mainstream bioelectromagnetic thinking. Nonetheless, this idea has become a basic tenet in the new emerging field of Energy Medicine where it is proposed that such endogenous fields regulate biochemical processes and that changes in the bio-energy field precede the physical/chemical changes which manifest as disease and that early diagnosis and treatment of disease can be achieved by normalizing an imbalanced bio-energy field.

The scientific rationale for the existence of a bio-energy field which functions more at the quantum level than the classical level (like EM fields) is supported by early experiments in the 1970's by Cope (1975) who obtained preliminary evidence that certain biomolecules behaved as superconductors. This pioneering research was followed up and confirmed by Frohlich, Popp and Smith in the 1980's who demonstrated that EM fields emanating from the body are coherent in nature. Smith further demonstrated that the EM fields in the body are quantized by demonstrating that biological systems are sensitive to a single magnetic flux quanta (DeGiudice, 1989). This finding is consistent with the superconductive properties of biomolecules and indicates biological systems are capable of functioning at the quantum level (in addition to the classical level which of course is the basis for most of biochemistry). As Smith points out (see article in this volume), since the body is a quantum system not only will it respond to potential fields, even in the absence of classical EM force fields, but the action of potential fields may occur through quantum fields. Potential fields are associated with magnetic *vector potentials* ( $\mathbf{A}$ ) and electrostatic *scalar potentials* ( $\varphi$ ). Since classical EM fields are derived from these potentials, they can be considered more fundamental. Quantum fields, on the other hand, are considered a new type of energy similar to Bohm's "subtle" information fields and those described in quantum field theory. Potential fields may be considered as a bridge between the "higher order" quantum fields and the more familiar classical EM fields.

## **The Quantum Energy Healing Model**

As a result of these recent scientific observations, a new model for Energy Medicine becomes apparent. The Quantum Energy Healing Model proposes that the bio-energy field is composed of a series of at least three different types of energy, classical EM force fields, potential fields and quantum fields. The Quantum Energy Healing Model also proposes that the relationship between these fields can be defined using Bohm's model (Bohm, 1980) of the implicate order which is embedded within the explicate order. In this case, classical EM fields exist at the level of the explicate order which has embedded within it the potential field, which in turn has embedded within it the quantum field. According to Bohm the implicate order is composed of a series of levels, each embedded within the next, where each level is increasingly more subtle and fundamental. If one adds to this model the concepts in quantum physics of hyperspace, then eventually a subtle level in the implicate order will be reached which is higher dimensional. The assumption is made in this article that quantum fields exist in this higher dimensional level. Quantum fields can thus be considered a scientific term for the more popular concept

of “subtle energy”. Even Einstein himself used the term subtle to refer to energy which could not yet be measured. It is proposed here that healing information originates at the most fundamental level in the implicate order, that of spirit, and cascades into the outer layers of increasing energy density eventually reaching the electromagnetic domain. Thus, quantum fields act as a bridge between the higher dimensional energies of spirit and classical EM field. EM fields then regulate the biochemical level as demonstrated by the Bioelectromagnetics community. Healing with energy therefore occurs by an infusion of energy from some external source which resonates with the level in the bio-field according to how “subtle” it is. Healing can also occur through internal sources of energy generated from the individual in a meditative state of consciousness.

### **Scientific Evidence for the Quantum Energy Healing Model**

Although potential fields are traditionally thought of as theoretical constructs to simplify their mathematics, as early as 1960 physicists demonstrated that potential fields, in the absence of classical EM fields, have physical effects at the subatomic level on electrons (by changing their phase) (Chambers, 1960). In the 1980's two patents appeared for the use of potential fields to transfer information (Gellinas, 1984; Wekroma, 1989) with some preliminary clinical effects used to support the patent claims. Then in the early 1990's Smith experimentally demonstrated that potential fields can produce macroscopic effects by imprinting water with coherent information (Smith, 1994). Water is, of course, an integral part of all biological systems. Shortly after later Ho, using the same methodology as Smith, demonstrated that potential fields can increase the abnormalities in Drosophila embryos (Ho, 1994). These findings are therefore the first pieces of experimental data supporting the Quantum Energy Healing Model.

Since biological systems function at the quantum level (DelGiudice et al 1989, Smith (this volume), Popp, 1979), they should contain endogenous quantum fields which will theoretically respond to potential fields. However, since potential fields will also influence endogenous EM fields in the body, it is not clear whether externally applied potential fields are necessarily acting through quantum fields in the body. The demonstration that biological systems also respond to external quantum fields would for the first time associate them directly with biochemical and physiological functions in the body, thereby demonstrating their role in the intrinsic self-healing mechanisms and adding support to the Quantum Energy Healing Model

The author's contribution to this field, beginning in 1987, was inspired by Tesla's research at the turn of the century, by Cope's research on biological superconductivity and by a relatively obscure body of research on "free energy". Non-traditional electrical engineers studying free energy had demonstrated an anomaly known as "over unity" where the total power emitted from an electrical system was greater than the input power. Other anomalies were also observed with respect to temperature, inertia, mass and gravity measurements (Aspden, 1991). Although there are numerous theories to explain these observations, the intriguing hypothesis has been proposed that the additional electrical energy comes from an influx of higher dimensional "zero-point" energy (ZPE) (King, 1990). Although ZPE is normally considered as a background universal EM field, present even in the absence of motion, its higher dimensional counterpart can be considered a quantum field.

Anecdotal reports suggested that plants grew better in laboratories where over unity devices were operating. The author became intrigued with the possibility that these devices could be used to generate quantum fields and measure their effects on biological systems. Many of the over unity devices have a particular electronic component in common - a coil wound in a special geometry which causes self-canceling of the EM field. These non-inductive self-canceling coils are distinctly different from the toroidal coil used by Smith and Ho which traps EM force fields inside and allows potential fields to radiate on the outside. Self-canceling coils are composed of two sets of windings where current flows in opposite directions thereby bucking and canceling the EM field. These coils have unusual windings, known as the *caduceus* winding (Smith, 1964) and the *mobius* winding (Seiki, 1990), which have been proposed to warp space/time and generate higher dimensional quantum fields (King, 1990; Reed, 1996; Seiki, 1990). These coils are reminiscent, but different than the more familiar *bifilar* winding which is also self-canceling. *Caduceus* coils do oppose the current flow by exactly 180 degrees and therefore do not entirely cancel the EM force fields or the potential fields. Nonetheless these three types of coils will generate force fields, potential fields and quantum fields in varying ratios.

The first application of self-canceling coils was accomplished by Tesla at the turn of the century. Tesla's magnifying transmitter used two spiral coils (yet another self canceling configuration) where oscillations were phased to create opposing magnetic fields (Sector, 1916). He demonstrated that such a coil could transmit energy over long distances without losses (Tesla, 1904). Biological experiments using Tesla's self canceling coil, if any, were not well documented. Tesla used the term non-Hertzian to describe the new energy field because it did not behave according to standard EM field theory described by Hertz and Maxwell. Today physicists use the term non-Maxwellian, non-Abelian and non-dispersive for similar reasons. Other terms used to describe this new energy include longitudinal waves (classical fields

are transverse), scalar waves (classical fields are vectors), standing waves (classical fields propagate), force-free fields (classical fields have force), time reversed waves (classical fields travel forward in time), solitary waves and tachyon energy. The term quantum field is used in this report to distinguish these fields from force fields and potential fields which are both electromagnetic in nature.

## Biological Experiments with Mobius Coils

A preliminary report appeared in 1979 which used a *mobius* coil to produce a change in the electrical conductivity of skin (Flannigan, 1979). Although the author was unaware of this obscure publication, it suggested that quantum fields in addition to potential fields may be biologically active thereby supporting the Quantum Energy Healing Model.

In the mid 1980's a commercial device (Teslar Shielding Device) became available which utilized a mobius coil. The device was based on a patent which used a *mobius* strip in a crystal oscillator circuit (Puharich, 1984). Anecdotal case reports from electromagnetic sensitive individuals wearing the shielding device suggested it might block adverse effects of power line EM fields. Morley used electrodiagnostic measurements (EAV) with these individuals and demonstrated the shielding device normalized their electrical meridian readings after exposure to powerlines. A more scientific approach was taken by Byrd who observed a decrease in overall amplitude and a shift toward lower frequencies in EEG recordings from individuals wearing the shielding device (Byrd, unpublished observation).

Despite these encouraging preliminary results, it is still possible that the observed effects were due at least in part to the belief system of the individuals. In order to eliminate placebo effects and to determine whether the quantum field generated from the shielding device might have direct effects at the cellular level, the author designed a series of in vitro experiments using nerve cells (Rein, 1988) and immune cells (Rein, 1989) grown in tissue culture.

In the nerve cell experiments, biological effects were determined using two types of shielding devices, with and without the *mobius* coil. In the absence of the coil, the control device generated a broad spectrum, low frequency electric field (with no quantum field). The experimental shielding device, containing the *mobius* coil, should generate a quantum field in the presence of the electric field. The electric field was measured using a specially designed electrometer and shown to contain a wide spectrum of low frequencies peaking around 260 Hz. The electric fields were identical in amplitude and frequency in the two devices.

The PC12 nerve cell line was chosen for these studies since the author had previously demonstrated normal neurotransmitter functional properties in these cells (Greene and Rein 1977) which could be modified in the presence of classical low frequency EM fields (Dixey and Rein, 1982; Rein, 1987). Neurotransmitter uptake (transport across the cell membrane) was reassessed, using the same standard biochemical protocol (using radiolabelled norepinephrine) following a thirty-minute exposure of the cells to the two shielding devices.

The results indicated that both the experimental and control shielding devices produced an inhibition of neurotransmitter uptake (Rein, 1988). These effects were similar to those previously obtained using an EM force field (Rein, 1987). However, the quantum field, in the presence of the electric field, produced a 19.5 % larger effect than the electric field by itself ( $p = 0.05$ ,  $n=6$ ). The additional effect can be attributed to the presence of the quantum fields since the electric field was the same in both devices. This is a very important conclusion if quantum fields are generally shown to be more biologically active than classical EM fields.

To determine whether quantum fields generated from a mobius coil might also influence other cell types, the experiments were repeated using human lymphocytes (critical white blood cells involved with cellular immunity) grown *in vitro*. Using standard biochemical techniques, a pooled preparation of T and B lymphocytes was isolated from the blood of healthy volunteers and grown in tissue culture for 2 days in the presence of radioactive thymidine (Rein, 1989). Thymidine incorporation into DNA is a quantitative measure of the amount of cell division. In the presence of the control shielding device (electric field alone), lymphocyte growth ( $90 \pm 31$  cpm/ $10^5$  cells) was stimulated by 34% relative to cells grown in the absence of any exogenous field. This effect is similar to that obtained from other studies using classical low frequency EM force fields (Conti, 1983). When grown in the presence of the experimental shielding device (quantum and electric fields), lymphocyte proliferation increased to  $159 \pm 53$  cpm/ $10^5$  cells. Thus, as in the previous experiments with nerve cells, the quantum field produced a 76% larger biological response ( $p = 0.01$ ,  $n=7$ ) than the electric field by itself.

## **Biological Experiments with a Caduceus Coil**

These initial studies were the first to demonstrate a direct biochemical effect of quantum fields at the cellular level and indicated that such effects can occur in the absence of placebo effects. It was of interest to determine whether a different type of quantum field, with different amounts of potential and EM force fields, would also effect lymphocytes. In the next series of experiments a specially designed

caduceus coil (from Dynamic Engineering, Sacramento, CA) was used which was driven by a complex square waveform generating a broad spectrum of frequencies peaking around 4 kHz.

Freshly isolated human lymphocytes received four 15 minute treatments during a 12 hour period and their growth rate determined as described above after an additional 12 hours. Control cells (no energy treatments) showed low growth rates (358 cpm/ $10^5$  cells) since no chemical growth factors (mitogens) were included. Cells treated with the caduceus coil showed a twenty-fold stimulation of cell growth ( $6880 \pm 183$  cpm/ $10^5$  cells) in the absence of chemical growth factors (Gagnon and Rein, 1990).

Conventional EM fields are also capable of stimulating lymphocyte growth, although the magnitude of this response is substantially less than twenty-fold, typically on the order of one-fold or less (Conti, 1983). It was therefore of interest to determine whether the large effect observed here was due to the quantum field or to the specific and complex set of frequencies used. Therefore, the exact waveform used above was also run through a conventional coil (impedance matched to the caduceus coil). This standard coil, which generates only classical EM fields, gave a 3.5-fold lower effect on lymphocyte proliferation. These results support the previous experiments with the mobius coil and indicate that quantum fields produce larger biological responses than classical EM fields.

Taken together the results clearly indicate that quantum fields have biological effects and offer strong support for the Quantum Energy Healing Model.

### **Water Experiments with a Bifilar Coil**

The caduceus and mobius coils used to generate quantum fields in the experiments described above will also generate potential fields and a small residual EM force field (due to incomplete cancellation). The simplest method to determine (and quantify) the ratio of the different types of fields is to use mathematical calculations. Such calculations are enormously simplified by using less complicated geometric windings than caduceus or mobius coils. Since the bifilar coil, with current flowing in opposite directions (see Figure 1), has a relatively simple geometry it was used in the next experiment designed to determine the relative roles of quantum, potential and force fields.

Smith (1994) has previously shown water is sensitive to potential fields and the author has shown that water treated with a variety of self canceling coils shows altered absorption of UV light (Rein 1992). We therefore decided to use water as the target for quantum fields generated from a bifilar coil. Calculations by Dr. Tiller of Stanford University indicated that the magnitude of the magnetic (**B**) field along the inner vertical axis of the coil was equal to  $33 \times 10^{-12}$  Tesla and the vector potential (**A**) field

along the same axis was equal to  $16 \times 10^{-14}$  Tesla/cm. Thus, this particular self canceling bifilar coil in addition to being highly successful in canceling EM force fields also canceled the (vector) potential field to negligible levels. Since we were also interested in comparing this bifilar coil with a standard EM solenoid coil, generated by using only one of the windings of the bifilar coil, the total power output of the two coils was adjusted until equal (ie. taking into account the different impedance of the two coils).

The effect of these two coils on the optical properties of water was measured using a standard diode array UV spectrophotometer. Samples were measured before and after a short 1.5 hr exposure to the two coils. Variations in baseline readings from sample to sample were minimized by using aliquots of one large vat of water and by calculating delta values between before and after paired measurements. A 43 kHz sine wave (106mV amplitude) through the bifilar coil produced approximately a 5% increase in UV absorption (at 224nm) for the treated water. In contrast the same 43 kHz sine wave (409mV amplitude) run through the solenoid coil produced no effect on UV absorption (less than 1%) of the treated water. The difference was highly significant at the  $p < 0.001$  level ( $n = 6$ ) (Rein, 1996).

The inability of the solenoid coil to produce a measurable effect is not surprising since its **B** field is substantially weaker than the threshold ( $7.6 \times 10^{-6}$  Tesla) determined by Smith that is required to imprint water (Smith, 1994). The vector potential (**A**) field in the solenoid coil is also not strong enough to produce a measurable effect and is substantially weaker than the required imprinting threshold ( $20 \times 10^{-12}$  Wb/m) determined by Smith (Smith, 1994). Comparison between the types of field generated by the solenoid and bifilar coils reveals a surprising result. Although the solenoid generates a **B** force field, a vector potential (**A**) field and a scalar potential ( $\varphi$ ) field, none of these fields are apparently capable of producing a measurable effect. The bifilar coil, however, does produce an effect despite the fact that its **B** and **A** fields are negligible. The question therefore arises whether the potential ( $\varphi$ ) field from the bifilar coil could produce the observed effect. The magnitude of the potential ( $\varphi$ ) field is proportional to the magnitude of the electric (**E**) field which is in turn directly related to the applied voltage. Thus the magnitude of the potential ( $\varphi$ ) field in the bifilar coil is four times less than that of the solenoid coil. The inability of the potential ( $\varphi$ ) field to account for the observed effect is also supported by Smith's finding that the **E** field (and therefore the potential  $\varphi$  field by implication) is not involved with imprinting water (Smith, 1994). If we assume that the properties of potential ( $\varphi$ ) field generated from the two coils is the same, it is unlikely to be responsible for the effect produced by the bifilar coil. Thus, we have a force-free, potential-free effect and need a new type of energy field, eg. a quantum field, to explain the results. Alternatively, the  $\varphi$  potential field generated by the bifilar coil has different properties from the classical  $\varphi$  potential generated from a solenoid. The results from this experiment support the hypothesis that



quantum fields exist and are distinct from potential fields and EM force fields. When taken taken in conjunction with the previous experiments with caduceus/mobius coils, the results also support the Quantum Energy Healing Model.

## **Discussion:**

The results from the bifilar coil indicate, for the first time, a macroscopic effect on water in the absence of EM force fields and potential fields. Modern physics may help explain this anomalous finding and support the hypothesis that quantum fields are distinct from potential and force fields. These theories postulate that under special conditions fields and potentials exist in a modified form with new properties compared to their typical behavior under classical conditions. Although physical effects of classical potentials have been measured (Chambers, 1960), they are not considered to be real since they are not gauge-invariant, ie they change when transformed (eg. to a new location in (or out of) 4D space/time). According to basic EM field theory potentials can only be real if they are gauge-invariant.

This contradiction in theory has inspired some physicists to modify Maxwell's equations. The new equations have solutions which generate new types of potentials with unique properties, eg. gauge-invariant potentials. Alternatively, when dealing with non-classical conditions, it is justifiable to use new mathematical expressions for redefining potentials. The non-Maxwellian equations which are thereby generated describe energy fields which have unique properties. A third approach has also been used, where classical potentials are decomposed into more fundamental components. Thus, like force fields can be decomposed into potentials, classical potentials can be further decomposed into "super-potentials". Super-potentials and their corresponding super-fields are often used in supersymmetry field theories and string theories. Super-potentials and super-fields have unusual global properties associated with negative energy states of subatomic particles.

Decomposition of potentials has also revealed another unusual type of energy field called the standing wave. Standing waves are of particular interest because they are experimentally generated by the same concept utilized in self-canceling coils. Thus, standing waves are generated when two EM force fields (of a special type referred to as circularly polarized) travel in opposite directions. Standing waves are an example of a non-Hertzian, quantum field since the orientation of their electric (**E**) and magnetic (**B**) vectors is unique. Classical EM fields have their **E** and **B** vectors a) oriented perpendicular (orthogonal) to each other and b) oscillating perpendicular (orthogonal) to the direction the field is propagating. Standing waves may have both of these properties altered. Some standing waves have

their **E** and **B** vectors parallel to each other, whereas others have their vectors oscillating in the same direction the field is propagating. The later type is referred to as a longitudinal wave. Longitudinal waves were first proposed by Tesla at the turn of the century to explain the anomalous behavior of the non-Hertzian energy fields he was working with. Yet another type of standing wave is classified as “force-free” (since their Lorentz force is zero). Force-free fields can be experimentally generated under special conditions where certain gases are put under pressure thereby generating plasmas. Plasmas are notorious for their anomalous behavior and have been well studied by contemporary physicists.

Other examples of non-classical conditions, which allow modification of classical potentials, are quite fascinating. The new conditions often involve the modification of space/time itself. One such modification of space/time is its extension from four dimensions to higher dimensions. Energy fields associated with higher dimensions also have unusual properties, eg. non-locality, super-luminol velocities and negative energy. These energy fields and their corresponding potentials have been characterized as complex meaning they have imaginary components as well as real components (Rauscher, 1968). It is interesting to note that Seiki also used these ideas in describing the imaginary components of the quantum fields generated from mobius coils (Seiki, 1990).

Imaginary particles are a mainstay of quantum physics according to Dirac, although the energy fields associated with such particles is not typically examined in mainstream quantum physics. Nonetheless, the concept of a quantum information field and a quantum potential has been introduced by Bohm (1975) in conjunction with Schrodinger's wave equation. Like non-Maxwellian fields, these quantum fields have unusual properties, eg. non-local action at a distance. Thus, it is clear that contemporary physicists have many elaborate theories, and some experimental data to support the hypothesis that quantum fields exist which are distinct from classical potential fields and force fields. It is now up to the biologists to study the role these fields play in the natural healing process.

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