

Qi and Bioelectromagnetic Energy

By Randall L. Waechter

A Minor Area Paper
Submitted to the Faculty of Graduate Studies
In partial fulfillment of
The Doctorate of Philosophy Degree
York University

Draft June 2002

QI AND BIOELECTROMAGNETIC ENERGY

QI ENERGY

The Chinese concept of Qi Energy is not easily translated into western thought or language. It has been defined as ‘vital energy’, ‘air, breath or steam energy’, ‘life force’, and ‘living essence’. Qi is all of these and none of them. “It is that which differentiates life from death, inanimate from animate. To live is to have Qi in every part of your body. To die is to be a body without Qi. For health to be maintained, there must be a balance of Qi, neither too much nor too little” (Eisenberg, 1995, p.43). Most people are not aware of Qi energy, either within them or in the external environment, since it is considered the most fundamental element, it operates at the root of our experience (Fenton, 1996). People are also unaware of the existence of Qi because the energy is so perfectly balanced, likened to an isometric exercise where two equal forces opposing each other give the impression of nothing happening (Thurnell-Read, 1995).

According to the experience of those who can feel and ‘manipulate’ Qi energy for healing or other purposes, “Qi can be best explained as a type of energy very much like electricity, which flows through the human or animal body” (Yang, 1998, p. 9). When this circulation of electricity-like energy becomes blocked or unbalanced, the individual or animal will become ill and if the flow is not restored, will die (Thurnell-Read, 1995; Yang, 1998). One of the roles Qi plays in the human body involves the communication and the provision of information to cells and between cells, beyond the information supplied through the nerves and the hormonal system (Thurnell-Read, 1995).

Qi ‘flows’ through the body via channels or meridians that connect all parts of the body. These meridians have been outlined, described, and manipulated by Chinese health practitioners for thousands of years (Gao, 1997), and are not identical to nerve routes or any other anatomical

structures known to Western medicine (Eisenberg, 1995). These meridians contain “gates” or points along their paths where the manipulation of Qi flow within the meridian is especially effective. By manipulating these gates or points, one can control the flow of Qi energy along the meridian by opening a blocked meridian, blocking the flow of Qi, or introducing external Qi into the body. These points, referred to as acupuncture or pressure points, are used by acupuncturists who attempt to balance Qi flow in the body by inserting tiny needles into the meridians, enhancing Qi flow. These same points are also used by Shiatsu specialists, akin to massage therapists in the West, to manipulate Qi energy flow in certain meridians by moving and manipulating the deep tissues and muscles surrounding the meridians. The masters of Shiatsu, it is said, “do not merely sense and redirect the flow of Qi; they transmit it from their own bodies into their patient’s body by way of the appropriate meridian” (Eisenberg, 1995, p. 112). It is important to note that these same acupuncture, or pressure points, can be used to disrupt Qi energy flow along a meridian and cause harm to the body. As a result, traditionally, martial artists attacked these pressure points to defeat their opponents.

As a result of these acupuncture meridians, there is no part of the body that does not contain Qi energy. A Blockage or disruption in any of these meridians results in the improper flow of Qi Energy throughout the body, and stagnation of Qi. If balance is not attained, then the normal physiological functioning of the body becomes impaired, allowing ever-present illness and disease (in the form of pathogens) to take hold over the weakened body (Gao, 1997). The Chinese believe that the proper Qi flow, and thus, balance, is maintained by eating appropriately, exercising daily, getting the appropriate amount of rest, and minimizing stress via meditation and other mind-control techniques (Eisenberg, 1995). The notion that health and vitality depends on

behaviour and thought is key to Chinese philosophy and medicine, a philosophy that has developed over a period of 3,000 years.

The theory of Qi energy dates back to the period of the warring states in Chinese history. It is written about quite extensively in *The Yellow Emperor's Classic of Internal Medicine*. This document was written between 2700 and 2600 BC by numerous ancient physicians, and is still required reading for doctors of traditional Chinese medicine. It is believed that Chinese Taoists originally described Qi energy and how to manipulate and control it, but Indian Buddhists influenced later Qi energy theories (Eisenberg, 1995). As a result of this past, the principle of Qi and Qi manipulation is intimately linked with Chinese history, medicine, and culture. All of China's famous philosophers and scholars, including Confucius, Lao Ze, and Mencius, were students of Qi theory (Eisenberg, 1995). Not long after the theoretical basis of Qi energy was established and disseminated, Scholars began to investigate the manipulation and control of Qi energy. This investigation lead to Qi exercises.

To maintain vitality and a healthy Qi balance within their bodies, millions of Chinese, and now, people all over the world, take part in daily exercises that are designed to enhance the flow of Qi through the meridians of the body. These exercises have been developed over thousands of years, as people slowly observed that Qi circulation affected their health. As a result of this observation, they attempted to improve this circulation by developing forms or exercises such as Tai Chi, Tai Ji Quan, and Qi Gong (Yang, 1998). These exercises are the basis for all martial arts, including Kung Fu, or Wu Shu, Jujitsu, Tai Kwan Do, and Karate. Qi Gong, to focus on one example, “means the ‘manipulation of vital energy’, and the term refers to an ancient practice, crucial to the development of Chinese medicine” (Eisenberg, 1995, p.48). “The word Gong means work in Chinese, and Qi is the energy which circulates within the body, so Qi

Gong means the cultivation of the body's energy to increase and control its circulation" (Yang, 1998, p. 1). The practice of Qi Gong is designed to develop one's ability to manipulate Qi energy within one's body through breathing exercises, physical training, and meditation. It is this last part, meditation, that is the hardest to master and the key to manipulating the flow of Qi. Qi Gong masters claim to have absolute control over their Qi energy, directing it within their bodies (internal Qi Gong) and extending it beyond the physical boundaries of their bodies (external Qi Gong) at will. In 1979 the Shanghai Institute of Traditional Chinese Medicine started conducting scientific investigations of Qi energy and Qi Gong. Among the results of these experiments involving the external manipulation of Qi energy involved the following:

The Qi Gong master stood in front of an oscilloscope in a research laboratory.

On command, the Qi Gong master huffed and puffed. He tensed his muscles to get his Qi flowing, directed it down his right arm, and then supposedly shot this Qi out his fingers. The oscilloscope registered little beeps of energy each time the Qi Gong master fired away. The research laboratory had also taken pictures of what it said was Qi tracking down the extremities of Qi Gong masters, along with the precise course of acupuncture meridians. The implications were that Qi existed as a physical force and that it could be emitted at will by Qi Gong masters (Eisenberg, 1995, p. 50).

Is this report of supposedly sound scientific research true? Does Qi, the principle of vital energy at the core of Chinese medical theory and practice, have a physical reality that Western science will ultimately recognize? (Eisenberg, 1995). Acupuncture anesthesia was once declared impossible by Western science and after that as nothing more than a placebo effect, but recent research has provided objective evidence suggesting that the analgesic effects of acupuncture are

real. These effects are now thought to be moderated by the release of endorphins and enkaphalins, powerful analgesic neurotransmitters, in the brain (Fenton, 1996). Could the future hold some reasonable scientific explanation for Qi energy, despite the fact that external Qi Gong plays havoc with Western biophysical laws?

For traditional Chinese medicine and philosophy, Qi is a physical reality. However, from a Western scientific point of view, the existence of Qi is an unproven, unclassified form of energy (Eisenberg, 1995 p.47). Despite this widely held belief, Yang (1998) suggests that “although there is no precise Western definition of Qi, it is often referred to as bioelectricity. In fact...Qi is actually the bioelectricity circulating in all things” (p. 9). In support of Yang’s (1998) view, the purpose of this paper is to suggest that Qi energy does have a basis in Western scientific theory. It is hypothesized that the Chinese concept of Qi energy is comparable, and in fact, identical, to a very well known and widely accepted concept of Western physics: Electromagnetic energy. More specifically, the electromagnetic energy emanating from human beings and all animals, which is often referred to as bioelectromagnetic (BioEM) energy. To support this hypothesis, both Qi and Electromagnetic Energy must be described and compared.

THE ELECTROMAGNETIC SPECTRUM

With innovation and new technologies come new ways of perceiving and measuring the physical world. This ability to measure and observe the physical world opens new avenues for research. In the past, any theory or concept that could not be physically measured or experienced was generally ignored by scientists in North America and other Western nations. These immeasurable concepts were impossible to collect physical data on and thus, were considered ethereal. To this day, any topic or concept that cannot be objectively measured or experienced is considered unsuitable for scientific examination, and remains the topic of philosophy and religion. This is not to say that such ethereal forces and concepts do not exist, only that they are considered to be beyond the strict vigor of scientific inquiry.

In recent decades, the advent of more sophisticated technology has made the once immeasurable, measurable, and once ethereal topics open to scientific scrutiny. As these technologies continue to develop, a new realm of phenomena that was once left to the study of theologians and philosophers is being examined via the scientific method. Nowhere is this more relevant than the study of the electromagnetic spectrum.

The electromagnetic spectrum is based on the Western scientific concepts of electricity and magnetism. Both electricity and magnetism are concepts or languages, developed by physicists in an effort to explain the world in which we live. In order to understand the electromagnetic spectrum, it is necessary to have a basic comprehension of both electricity and magnetism.

According to Western physics and chemistry, atoms are the fundamental building blocks of the universe. Atoms, and hence, all matter, are composed of three fundamental particles: Electrons, protons, and neutrons. According to the Rutherford model of the atom, the proton,

which is positively charged and the neutron, which has no charge, together form the center of the atom. The electron, which has a negative charge, orbits the centrally located proton and neutron. The difference between the positive, negative, and neutral charges of these particles is the basis for electricity. Countless studies have indicated that it is the difference in charge between these particles that holds atoms together, forming molecules, and ultimately, all matter. As such, the electrical charge between these particles is the basis for all life, and all matter, in the universe (Whitten, Davis, and Peck, 1996).

While protons and neutrons are relatively stable at the centre of an atom, and can break away from the center of that atom, or nucleus, only through nuclear reaction or decay, the electrons orbiting the nucleus are not as stable. They can move from orbit to orbit (quantum leaps) as the result of inputting electromagnetic radiation (quantum leap outward) or the expulsion of electromagnetic radiation from the atom (quantum leap inward). Electrons can also move from atom to atom in a molecule, and two atoms can even share a single electron, which bonds the atoms together, forming a molecule. This movement of electrons is referred to as electric current. An electrical current can occur in any material that has empty positions for an electron around the nucleus of an atom and / or a lattice-like, or repetitive atomic structure, such as occurs in alloys, metals, crystals, and water. Although the nature and movement of electrons has been described in detail here, the movement of any charged particle such as the movement of a calcium ion across the membrane of a nerve cell is considered an electrical current.

Electricity and magnetism are intimately linked. All electric currents generate magnetic fields, the rate of current flow through the electrical coil determining the strength of the field. (Washnis & Hricak, 1993). This phenomenon is known as the Hall Effect, and is an accepted physical law describing the relationship between electricity and magnetism. The Hall Effect

states that a magnetic field oriented in a certain way to the flow of an electric current will divert the flow of charged particles to create a flow that is perpendicular to the original current. This effect works better for semi conducting currents, which have fewer particles and are more mobile, than conducting currents. Alternatively, it is a basic law in physics that when an electric current flows through a conductor, a magnetic field is produced around the wire, the strength of which is related to the amount of current flow (Oschman, 2000; Washnis and Hricak, 1993). It is also important to note that the magnetic field produced by the flow of current through a conductor, whether physical or biological, is infinite. The field, much like circles of sound waves that get bigger and bigger as they move through space, become weaker as they travel, but theoretically never end. For instance, Dr. Harold Saxton Burr has measured what he calls 'L-fields', or the 'fields of life', with electrodes placed a short distance from the skin (Burr, 1972). All electrical currents then, including those arising from living organisms, are accompanied by magnetic fields that extend and interact throughout space, but what exactly is a magnetic field?

“Magnetism can be defined simply as the alignment of dipoles in a ferrous or other material so that the molecules face in a uniform direction, the more molecules aligned, the greater the magnetic intensity” (Washnis & Hricak, 1993, p.8). The molecular theory behind magnetism revolves around the conception that molecules are tiny magnets that are mis-aligned in non-magnetized material, which means similar poles do not point in the same direction. The north (negative) pole neutralizes the south (positive) pole and vice-versa. The process of magnetization changes the existing positions to align the poles properly, north with north and south with south (Thurnell-Read, 1995). The strength of the magnet is determined by the percentage of the molecules in the object that are properly aligned. At the molecular level, magnetism and electricity are related in that both physical concepts are based on the existence of

negatively (e.g. electron) and positively (e.g. proton) charged subatomic particles. Negatively charged particles attract positively charged particles. Why? No one knows. Ultimately, “we still do not know exactly what electricity and magnetism really are” (Oschman, 2000, p.28).

However, countless experiments and observations over thousands of years have consistently indicated that this is the ‘natural order’ or ‘natural law’ by which charged particles behave.

Despite our limited knowledge, this natural law is the basis of the universe in which we exist.

Visible light is the most familiar form of electromagnetic energy, because we, and all other animals, have evolved a bodily mechanism for detecting it: Eyes. Visible light is thought to radiate through the environment, and thus, is referred to as radiant energy. However, visible light is just one small slice of the total electromagnetic spectrum, which also includes radio, infrared, ultraviolet, gamma, x-ray, and radio waves. All types of electromagnetic radiation, or radiant energy, including these, can be described in the terminology of waves. To help characterize any wave, one can specify its wavelength, or its frequency. Wavelength is the distance between any two adjacent identical points of a wave, such as two crests. Frequency refers to the number of wave crests passing a given point per unit of time, and usually expressed in cycles per second. One cycle per second is also called one hertz (Hz.) after Heinrich Hertz, who in 1887, discovered electromagnetic radiation outside the visible range and measured its speed and wavelength.

Electromagnetic radiation is a form of energy that consists of electric and magnetic fields that vary repetitively. In addition to wavelengths of visible light, sunlight also contains shorter wavelength (e.g. ultraviolet) radiation as well as longer wavelength (e.g. infrared) radiation.

Neither of these can be detected by the human eye, but both may be detected and recorded photographically or by detectors designed for that purpose. Many other familiar kinds of radiation are simply electromagnetic radiation of longer or shorter wavelengths. Although

electromagnetism is commonly described in terms of wave behaviour, it is also possible to discuss electromagnetism in terms of particles, called photons. According to research conducted by Max Planck in 1900, each photon of electromagnetic radiation (e.g. visible light) has a particular amount, or quantum, of energy. Furthermore, the amount of energy possessed by a photon depends on the frequency of the electromagnetic wave. Thus, the energy of an electromagnetic wave is directly proportional to its frequency.

ELECTROMAGNETISM AND LIVING ORGANISMS

Every living organism on this planet is born, lives, and dies in a sea of electromagnetic radiation. All life has evolved in an environment consisting of electromagnetic energy. As a result, the interactions that take place between all living organisms and electromagnetic energy are both crucial to life and extremely complex. To deny interactions between electromagnetic fields and living things “would be to deny the fundamental reaction upon which every living thing on the planet depends, namely, the absorption of sunlight by green plants” (Oschman, 2000, p. 32).

Electrobiology is the formal study of the electrical properties, and thus, corresponding magnetic properties of living systems. Traditionally, the study of energy fields in the physical environment and living organisms has been a bitter controversy for biologists and other scientists. The controversy has revolved around the basis of any possible interaction between living things and energy fields, and namely, electromagnetic radiation. Was there an interaction? What was the nature of such an interaction? As the nature of light and the electromagnetic spectrum became measurable and comprehensible in the early 1900's, it was assumed that electromagnetic radiation influenced living organisms only at higher frequencies, above the range of visible light via the ionization, or heating of tissues.

Around the turn of the 20th century, a Dutch physician discovered that the electrical fields of the heart could be routinely measured with a very sensitive galvanometer (Einthoven, 1906). Based on the connection between electricity and magnetism, scientists hypothesized that the electrical currents produced by the heart would also produce heart magnetism (Oschman, 2000). In 1963, Baule and McFee (1963) used a pair of two million-turn coils on the chest to pick up the magnetic activity produced by the heart. This was a major breakthrough concerning the

relationship between living organisms and physical electromagnetic fields. The electrical activity that takes place in the human body produces magnetic fields, similar to the electrical activity that occurs in the physical environment. One of the philosophical debates that resulted from this discovery concerns “the boundary between the organism and the environment. In the past, we could define an individual as that which lies within the skin; but it is a fact of physics that energy fields are unbounded” (Oschman, 2000, p.29). The magnetic field produced by the heart, and all other organs and tissues in the body, extend indefinitely into space and interact with the electromagnetic fields produced in the environment and by other human beings and animals – sometimes at considerable distances, (e.g. 15 feet from the body). In actuality, there is no point at which these fields end, they simply become weaker and weaker until they vanish in the sea of electromagnetic fields that exist in the environment.

By the late 1960’s the magnetic fields emitted by the heart were measured on numerous occasions in numerous labs. By the early 1970’s, researchers were starting to record the magnetic fields arising from other organs in the body as a result of the electrical activity of these organs (Oschman, 2000). For example, Cohen (1972) was able to measure the magnetic fields produced by electrical activities of the brain for the first time with the aid of a superconducting quantum interference device (SQUID). This research was based on previous work by Hans Berger (1929) in which small electrical fields were recorded from the brain by attaching small electrodes to the head. This standard diagnostic tool, called an electroencephalogram (EEG) is based on the same technology as the electrocardiogram (ECG). Today, the magnetoencephalogram (MEG) is generally considered a more accurate method of measuring brain activity than the EEG, mostly because magnetic fields pass through the brain, cerebrospinal fluid, and skull undistorted, as opposed to electrical signals.

Despite the theoretical and applicable advances that have taken place in biology, physics, health care, and other life sciences as a result of research into the electrical and magnetic fields produced by living organisms, many questions remain. Most academics now agree that electrical and magnetic fields arise from the everyday functioning of the human body. In this regard, the laws that govern the physical interaction of objects in the environment also govern the interaction of the human body with the environment. Despite this acceptance, the majority of academics remain skeptical to the idea that the electrical and magnetic fields produced by the tissues and organs of the human body might have an important biological function. Instead, these fields are generally regarded as by-products of the normal physiological functioning of the tissues and organs of the body (Oschman, 2000). This view seems simplistic and does not account for the fact that certain parts of the human brain are influenced by electromagnetic fields. If these brain structures are influenced by electromagnetic fields in the environment, why would they not also be influenced by the electromagnetic fields produced by the tissues and organs within the individual's own body? As will be discussed, "biological fields are not just by-products of physiological processes, they are part of the mechanism by which the body communicates with itself" (Oschman, 2000, p. 15).

Thus, we have taken one more step to understanding the complex interaction between what were once invisible forces. Technological advances over the past several decades have made it possible to measure these subtle yet important electromagnetic energy fields within and around the human body (Oschman, 2000). Numerous research studies have been conducted in recent years examining the implications, source, and explanation of these fields. Through this research, scientists have developed reasonable, measurable, and logical connections between Bioelectromagnetic (BioEM) fields and accepted scientific laws and theories. These connections

indicate a significant revolution within biology, physics, medicine and other scientific fields.

BioEM energy was considered non-existent by researchers within these fields and the scientific community as a whole only a few decades ago (Oschman, 2000).

Studies are now explaining the biophysical mechanisms that enable human beings, including therapists, health practitioners, and martial artists, to sense and manipulate the BioEM energy fields produced by their bodies, and the implications of this manipulation (Beck, 1986; Oschman, 1993; Oschman, 2000; Russek & Schwartz, 1996). These studies are beginning to indicate that any interaction between a human being and other people, animals, chemicals and physical objects involves the interaction of energy fields in one form or another, just as the interaction of all inanimate objects involves the interaction of different wavelengths within the electromagnetic spectrum. These interactions make the study of energetics a rich, multidisciplinary topic (Becker, 1990; Beisteiner, Erdler, & Teichmeister, 1997; Brewitt, 1996; Brewitt, 1999; Cuzick, 1998; Marino, Ilev, & Schwalke, 1994; Miller, 1995; Payne, 1990; Quinn, 1992). The study of BioEM energy can teach us about the mechanisms of the smallest components of the human body as well as the properties that arise from the complex interaction between these parts. This interaction refers to the "property of wholeness, the integration that enables the parts to work together as a successful unit" (Oschman, 2000, p. 2). The concept of wholeness or oneness has been generally disregarded in Western medicine and scientific inquiry, but is an integral component of Eastern medicine, philosophy and scientific thought. In the East, the oneness that is crucial to the process of life is referred to as Qi energy.

THE QI ENERGY AND BIOELECTROMAGNETIC CONNECTION: AN OVERVIEW

In some form, the Chinese have known about the BioEM fields emitted by the human body for thousands of years. As a result of this observation, the Chinese system of medicine has evolved around the concept of wholeness – the interaction of the various complex components found in the human body. This evolution in medical practice has partially resulted from the Chinese system of scientific inquiry, which is phenomenological and circular, as opposed to the western focus of a priori cause-and-effect relations (Dillman & Thomas, 1992). To the Chinese, it was more important to know that by manipulating certain areas of the body in certain ways via herbs, acupuncture or shiatsu, the health practitioner would obtain certain results in the form of healing and a reduction of disease symptoms. To these health practitioners, the molecular cause or mechanism of these results was less important than the actual reduction of symptoms. This methodology allowed Chinese scientists and health professionals to accept, understand, and utilize the BioEM fields produced by the human body to heal and promote health long before fully understanding the molecular and physical mechanisms underlying these fields.

Comprehending Eastern medical practices also requires an understanding of the traditional Chinese philosophy of nomenclature. As stated, the Chinese were more concerned with the result of a manipulation than accurately describing how this result occurred. As such, the labeling of ideas and influences, which in Western tradition is based upon the mechanism behind such influences, is more of an exercise in common language and labeling in the East (Dillman & Thomas, 1992). In the West, we refer to the energy emitted by human beings as electromagnetic, biomagnetic, or bioelectromagnetic fields. All of these titles are based on the names already given to the laws and theories of the scientific processes thought to be the basis of these fields. These theories include the belief that chemical processes in biological organisms

involve charged potentials and thus, the flow of electric current. This electric current then produces corresponding magnetic fields inside and around the human body. Many years before the concepts of electricity and electromagnetism were described and well known the Chinese required a common term to describe the fields or 'energy' which they believed flowed through living organisms. The common term eventually adopted throughout the East to describe these energy fields was Qi. This term is not designed to describe the way in which these energy fields are produced or emitted, nor was it chosen to accomplish this task.

One of the objectives of this paper is to argue that what has become measurable and relatively widely studied in Western science over the past several decades, namely, bioelectromagnetic energy, is what Chinese medical practitioners and healers have referred to as Qi energy for thousands of years. The mechanism, effects, and basis of Qi and BioEM fields are one in the same. As a result of the distinction between Western and Eastern cultures and their traditionally different approaches to scientific inquiry, scientists and health practitioners in both of these countries are studying the same phenomenon under different titles. The time has come to consider the Chinese concept of Qi energy and the implications of energy flow in the language of BioEM fields.

In general, Eastern health practitioners, Qi Gong masters, and martial artists are much more familiar with the influence and nature of Qi energy fields than Western scientific concepts. Once a positive link has been made between Qi and BioEM fields, health practitioners, researchers, and martial artists in the East and the West can study the effects of Qi energy manipulation with the aid of Western scientific theory and research methodologies. But before this acceptance can occur, Western researchers, health practitioners, and the general public must be convinced that Qi energy and the stringently researched concept of BioEM energy fields are

the same phenomenon. The scientific evidence for the existence of BioEM fields is comprehensive, extremely convincing, and growing daily. This paper will present the evidence and attempt to link the concepts of Qi and electromagnetic energy by elucidating the numerous similarities between these two phenomena.

In this way, the primary goal of this research paper is to explain the Chinese concept of Qi energy in western scientific terms by examining in more detail the similarities between Qi and BioEM energy. The result will ultimately be the translation of Qi energy and the details of its existence as documented for thousands of years by the Chinese in a language that is more familiar to those of Western cultures.

QI ENERGY AND BIOELECTROMAGNETISM: THE EVIDENCE

The Life Factor: Qi Energy and the Electromagnetic Spectrum as a Blueprint

The human body is composed of Qi energy. According to traditional Chinese medicine, Qi is life, and the absence of Qi is death. To be truly alive and maximally healthy is to have Qi in every part of the body, and flowing through and beyond the body: “To die is to be a body without Qi. For health to be maintained, there must be a balance of Qi, neither too much nor too little” (Eisenberg, 1995, p. 43). Simply stated, human beings cannot be alive without Qi energy. From the instant of conception until we take our last breath, Qi flows through our bodies.

The Chinese believe that there are three sources of Qi energy (Eisenberg, 1995). The first of these is Nutritional Qi, which is obtained from the foods we eat and the liquids we drink. This Qi is constantly replenished and is greatly influenced by the quality and quantity of the foods we consume. A variety of foods should be consumed, with a focus on vegetables. Eating too many high fat foods at the expense of other foods causes an imbalance in nutritional Qi, and consequent illness.

The second source whereby we ‘absorb’ Qi energy is through the air, and is called Air Qi (Yang, 1998). This Qi is also constantly replaced during every breath. Air Qi is also the easiest source of Qi energy to manipulate, through meditation, martial arts, and other exercises. Traditional Chinese healers, Qi Gong masters, and certain martial artists are thought to perform spectacular feats of healing or harming by manipulating this source of Qi energy. This practice takes years of development and training, and often involves the achievement of a meditative state in which the practitioner is able to control and externally project Qi energy from the body.

The final source of Qi energy is called Original Qi. This is that portion of Qi energy that is inherent to you, and was transmitted to you at conception from your parents. It cannot be

replenished, and it is thought to slowly diminish in intensity over the course of our lives (Eisenberg, 1995). In a sense this form of Qi energy is not absorbed from the immediate environment like Nutritional or Air Qi, and as such, is not as easily manipulated as these first two. However, Original Qi is the basic pattern of your being, and as such, is critical to life (Gao, 1997). Upon death, this form of Qi energy, like Nutritional and Air Qi, ceases to flow through the body.

In 1972 Harold Saxton Burr, an anatomist at the Yale School of medicine, proposed that human beings, and in fact, all forms of life, are ordered and controlled by electromagnetic fields, which he had measured and mapped with precision (Burr, 1972). These fields of life, or L-fields as Burr called them:

Are invisible and intangible, and it is hard to visualize them, but a crude analogy may help to show what the fields of life...do and why they are so important: Most people who have taken high school science will remember that if iron filings are scattered on a card held over a magnet they will arrange themselves in the pattern of the 'lines of force' of the magnet's field. And if the filings are thrown away and fresh ones scattered on the card, the new filings will assume the same pattern as the old. Something like this – though infinitely more complicated –happens in the human body (Burr, 1972, p. 4).

Burr (1972) and later authors, including Oschman (2000) go on to explain that the human body is constantly regenerating itself. Most tissues in the body are replaced at varying intervals throughout our lives. For example, it is thought that the bones are completely replaced every seven years, and the skin every year. Western science has done an excellent job of explaining the biological and most importantly, cellular mechanisms that are responsible for this regeneration,

but how the human body maintains its original form through all of these processes remains a mystery. Burr (1972) believed that the electromagnetic fields produced by the electrical activity of the body provide the blueprint or 'mould' which defines the shape of the material that makes up the body. As the body's mould, the fields instruct any new material that is introduced into the body as part of its normal regenerative functions where to go. The electromagnetic field is responsible for determining the position and movement of all charged particles: "When we meet a friend we have not seen for six months there is not one molecule in his face which was there when we last saw him, but thanks to his controlling L-field, the new molecules have fallen into the old, familiar pattern, and we can recognize him" (Burr, 1972, p. 5).

In short, Burr believed that the electromagnetic fields produced by the body, what he called electrodynamic fields, are the basic blueprints for all living things, and that the fields can be used to diagnose mental and physical conditions. These electromagnetic fields first appear following conception, when they are lost in the noise of the biomagnetic fields arising from the mother's body. It is thought that the biomagnetic fields emanating from the mother's body act as a blueprint, directing the migration and differentiation of cells in the fetus, until it has developed to the point where it can begin to generate its own biomagnetic fields. Burr (1972) and later, Oschman (2000) have suggested that the biomagnetic fields produced by the mother's body are the mechanism by which the great mystery of embryology may be solved. Namely, how does a single cell divide and develop into a human being? Genetics may explain the division and differentiation of cells, but what about formation of the fetus? How does each cell know where it must go in order to form a recognizable human being? Burr (1972) and Oschman (2000) believe that local fields of differing polarity and wavelength in the womb during the many stages of fetal development in essence tell different types of cells where to migrate. Similarly, practitioners of

traditional Chinese medicine believe that Original Qi, which is integral to the development of human beings, is obtained from one's parents.

External Qi Energy Fields and the Electromagnetic Environment

Nei Shi Gongfu, or the Chinese method of studying health and illness from an internal perspective, developed from observations of the correspondence between changes in nature and the way people felt. Nature here refers to periodic cycles, such as the time of day, season, air pressure, wind direction, precipitation, storms, and humidity as well as geographical features such as lakes, mountains, and oceans (Yang, 1998). These observations lead to the conclusion that Qi energy is an integral part of the world around us, and can be projected externally from the human body. Recently, many scientists in the west have gone from a conviction that "there is no such thing as energy fields in and around the human body to an absolute certainty that they exist" (Oschman, 1998; p. 27). Using sensitive magnetometers, scientists have measured the magnetic signature produced by the human heart from a distance of up to 15 feet in front of the body, resulting in a blurry distinction between an organism and its environment.

The Chinese also believe that an individual 'obtains' Qi energy from the environment, through the air one breathes (Air Qi), and the food one eats (Nutritional Qi). This 'absorption' of Qi energy can be enhanced during relaxation and meditation exercises, and is manipulated and utilized by health practitioners who use Qi energy to heal, as well as some martial artists, who use Qi energy to harm (Yang, 1998). It is also recognized that the absorption of Qi occurs more readily in certain geographical locations such as mountainous terrain, and near large bodies of water, as well as during the day, especially during clear sunny days, as opposed to night time.

How do these observations of Qi absorption relate to what we know about electromagnetic energy both in the environment and within the human body?

Every square inch of the earth is influenced by a natural magnetic field called the geomagnetic field that arises from the motion of the molten iron core of the earth. It is the geomagnetic field that causes the compass needle to point towards the North Pole.

However, if you look carefully at a compass needle with a microscope, you will see that the needle is rarely still – it dances back and forth in a variety of rhythms. Some of these rhythms are diurnal (24 hour), some are much slower, and others are quite fast (in the ELF range). The last are called geomagnetic micropulsations. They are caused by a unique geophysical mechanism known as the Schumann resonance (Oschman, 2000, p. 97).

The Schumann resonance is a widely cited phenomenon (Becker, 1995; Burr, 1972; Thurnell-Read, 1995; Washnis & Hricak, 1993) and was first described by W. O. Schumann (1952), a German atmospheric physicist. He hypothesized that the space between the earth and the ionosphere acts as a resonant cavity. What resonates within this cavity? Lightning. Every second of every day, somewhere around the earth, there are roughly 200 lightning bolts streaking through the sky, releasing massive charges of electricity into the atmosphere. The energy released by these lightning strikes vibrates or resonates within the earth-ionosphere cavity in the extremely low frequency (ELF) range (Oschman, 2000). Balser and Wagner (1960) and Galejs (1972) have confirmed Schumann's theory by measuring the electromagnetic waves as they reflect from the ionosphere down to the surface of the earth, back to the ionosphere etc., in the same way that certain radio waves skip back and forth, travelling great distances around the earth.

Balser and Wagner (1960) and Galejs (1972) determined that the average frequency of the Schumann resonance is about 7-10 Hz, but the range is 1-40 Hz, which results from the movement of the ionosphere. The Schumann resonance occurs more often during the day and in fair weather than at night and during inclement weather, and is also influenced by extraterrestrial activity such as solar flares and sun spot activity, when the resonance ceases altogether (Oschman, 2000; Washnis & Hricak, 1993). How are human beings influenced by the Schumann resonance?

The Schumann resonance, being an electromagnetic field, passes through physical objects and propagates throughout every location on the earth. The average frequency of the Schumann resonance (7-10 Hz) corresponds to the average frequency of brain waves in humans (Oschman, 2000), a correlation that seems to have evolutionary and physiological significance (Becker, 1990; Dierenfeld, 1983). The significance of this correlation is that the activity of the human brain is influenced by the Schumann resonance through a mechanism known as entrainment.

The functioning of the brain, heart, and other organs in the human body are intimately linked with electromagnetic oscillations in the extremely low frequency (ELF) range of 1-50 Hz. Becker (1990) has conducted extensive research indicating that the electromagnetic waves produced by the brain regulate the overall operation of the nervous system, and especially the state of consciousness, through the mechanism of entrainment. This term is used in physics to describe a situation in which two rhythms that oscillate in very similar patterns become coupled together, so that ultimately both oscillate at the same rhythm (Oschman, 2000). “Technically, entrainment means the ‘mutual phase-locking of two (or more) oscillators’ (Oschman, 2000, p. 96). The question

remains as to what part of the human brain is predisposed to entrain with the Schumann resonance.

As measured by an electroencephalogram, brainwaves are not constant in frequency, but vary over time. The waves vary in frequency depending on the activity level of the individual. Delta waves, in the range of .3 to 4 Hz. appear during sleep, theta waves (4 to 7 Hz.) appear during emotional stress, and stages of sleep. Alpha waves (8 to 14 Hz.) are associated with a normal and alert state of mind, and finally, beta waves (14 to 50 Hz.) are associated with intense activity of the nervous system. One of the anatomical structures that controls the rhythm of brain waves is a nucleus, or part of the thalamus known as the thalamic rhythm generator (Andersen & Andersson, 1968). Another structure in the brain that is important for controlling the sleep / wake cycle, and thus consciousness, is the suprachiasmatic nucleus (SCN), which is located in the hypothalamus (Kalat, 2001).

The thalamus and the hypothalamus are closely connected, and it is thought that these two brain structures control daily rhythms by working in tandem. It is also important to note that the different stages of brain wave activity are associated with differing levels of consciousness. It has long been known that a structure in the brain called the pineal gland is involved in the rhythms of consciousness via the secretion of a hormone called melatonin, which causes sleep in humans (Kalat, 2001). Not only does the SCN of the hypothalamus influence the pineal gland by timing the release of melatonin, but the pineal also sends information back to the SCN to reset the biological clock (Kalat, 2001). The Pineal gland also contains minute copulates of a magnetically sensitive alloy called magnetite. Washnis and Hricak (1993) believe that the magnetite in

the pineal gland is sensitive to the electromagnetic fields produced by the earth, and sends signals to the hypothalamus concerning the sleep / wake cycle (and thus, consciousness) based on fluctuations of the magnetic field. Evolutionarily speaking, similar organs originated very early in bacteria, insects, fish, amphibians, and mammals, allowing living creatures to sense the earth's magnetic field and derive information from it (Washnis & Hricak, 1993).

In this way human beings, as well as other animals, can sense if only at a subconscious level, and make use of electromagnetic fields in the environment. These fields, the most important of which is the Schumann resonance, seem to play an important role in the diurnal sleep / wake cycle or cycle of consciousness that governs our day. Individuals who have a disturbance in the functioning of their pineal gland, thereby disturbing their ability to sense and relay information regarding electromagnetic fields, experience great difficulty falling asleep, as well as other health problems associated with a disturbed diurnal cycle (Haimov & Levie, 1996). This demonstrates the importance of being able to detect and make use of information gleaned from the electromagnetic fields in our environment.

The comparison between the Schumann resonance and Qi energy is straightforward. The Chinese believe that we take in Qi energy from our environment, much as the pineal gland senses electromagnetic fields around the body. It is also stated that Qi energy is absorbed 'from the air one breathes', which also restores Qi within the body. According to established theories in chemistry, oxygen is one of the strongest of the paramagnetic gases, making it magnetically susceptible to resonating with the earth's magnetic field (Washnis & Hricak, 1993). As we breathe this magnetized oxygen in, it

also resonates with the cells in our body, thereby ‘resetting’ the natural biomagnetic fields of the body with the earth’s magnetic field and the Schumann resonance. In this way, “(Electro) Magnetism (Qi energy) is a force all around us and within us” (Washnis & Hricak, 1993, p. 42). The Chinese also believe that the absorption of Qi energy is more efficient during the day, and in fair, sunny weather. In relation, research has indicated that the Schumann resonance occurs more often during the day and in fair weather than at night and during inclement weather (Oschman, 2000, Washnis & Hricak, 1993). Lastly, traditional Chinese beliefs indicate that it is easier to absorb Qi energy when one is surrounded or near certain geographical formations such as mountains and large bodies of water. The electromagnetic correlate to this observation is associated with resonance, in that electromagnetic energy interacts with or resonates with granite and other types of rock found in mountains as well as with large bodies of water (Washnis & Hricak, 1993). Both of these geographic landmarks are composed of tightly bound molecules that form a lattice-like structure. Electromagnetic waves are more likely to propagate through lattice-like material as opposed to more porous or loosely structured materials. As such, it is easier for the pineal gland and the brain to sense electromagnetic fields (Qi energy) when one is near these geographical landmarks.

Absorption of Qi Energy and Entraining Brainwaves with the Schumann Resonance

As discussed in the previous section, traditional Chinese philosophy states that there are three sources of Qi energy: Original Qi, Nutritional Qi, and Air Qi. While original Qi is with us from the moment of conception, Nutritional Qi is absorbed by the foods we eat, and Air Qi is

absorbed from the environment every minute of every day, with every breath one takes. The absorption of Qi from the environment, essentially being 'in tune' with the environment and allowing this external energy to permeate one's body, is essential to health and well-being (Gao, 1997; Yang, 1998). The Chinese also believe that the absorption of external Qi is variable, occurring more efficiently during the day than at night, especially early morning, when most individuals practice Qi Gong exercises. The absorption of external Qi is enhanced through a variety of methods, including Qi Gong exercises, breathing, and relaxation. The common denominator between all of these methods is meditation, which can be considered an altered state of consciousness, similar to being hypnotized. It is well documented that a hypnotized person can do things that are far beyond what is possible when in a 'normal' state of consciousness (Yang, 1998). Likewise, the Chinese believe that it is possible to enhance and gain control over the absorption of external Qi energy when in a meditative, or altered, state of consciousness. This is a belief that will be examined in more detail in the next section. For now, a Western scientific explanation of the passive absorption of external Qi, or electromagnetic energy, is proposed.

The Schumann Resonance is a small part of the electromagnetic spectrum that resonates between the earth and the ionosphere, pulsing, on average, at 7-10 Hz. This frequency is similar to one of the four frequencies, or stages of electromagnetic activity recorded in the brain. For instance, electromagnetic fields in the range of 4-7 Hz emanate from the brain during the theta stage, which occurs during certain stages of sleep and altered consciousness. Fields in the range of 8-14 Hz can be detected from the brain during the alpha stage, which is associated with a normal and alert state of mind (Oschman, 2000). These are only two stages of brainwave activity, the other two being the delta (.3-4 Hz.) and beta (14-50) wave stages. Together, these four stages of brainwave activity are intimately linked with stages of consciousness in human

beings, from delta, to theta, than alpha, and finally, beta. Delta waves are associated with deep sleep and relative unconsciousness, and at the other extreme, beta waves are correlated with intense mental activity (Kalat, 2001). The range of resonate activity of the brain, through all of these stages, is about 1-50 Hz., with relatively little activity seen above 45 Hz. (Oschman, 2000). As such, it can be argued that the bioelectromagnetic activity seen in the human brain resonates within a range that closely corresponds to the range of electromagnetic pulsations of the Schumann Resonance, at 1-40 Hz.

At an anatomical level, It has also been argued that the pineal gland plays a crucial role in the daily sleep / wake cycle and other medial stages of consciousness (Kalat, 2001). The pineal gland is also thought to contain tiny traces of magnetite, which is a magnetically sensitive substance that reacts with electromagnetic fields (Washnis & Hricak, 1993). The connections of the pineal gland with other structures in the brain are complex, but are known to involve two-way communication with both the thalamus and hypothalamus. These are two very important structures for relaying information to the neocortex, where “higher” cognitive functions, such as the directing of attention and problem solving are thought to occur. As such, higher cognitive functioning is dependent on level of consciousness, and level of consciousness is a fluctuating phenomenon.

It is well known that every organism on Earth has daily rhythms of consciousness, more commonly known as the wake / sleep cycle. The human body spontaneously generates its own rhythm of wakefulness and sleep, which is referred to as the circadian rhythm (Kalat, 2001). Despite this endogenous circadian rhythm, research indicates that external forces act to reset the biological clock, setting it to a 24-hour rhythm. These external forces include light, strenuous exercise (Eastman, Hoese, Youngstedt, & Liu, 1995), noises, meals, and the temperature of the

environment (Refinetti, 2000). Oschman (2000) also believes that the Schumann Resonance, the pulses of which occur more often during the day than at night, also act to reset the biological clock. Is it possible that the Schumann Resonance is the most important external variable for resetting the endogenous rhythm of consciousness in humans? The proposed mechanism by which the Schumann Resonance influences the cycle of consciousness is described below.

Brain waves are not constant in frequency, but vary from moment to moment. The brain's pacemaker determines the frequency of the brain waves at any given time, which is anatomically located in the thalamus (Andersen & Andersson, 1968). As a result of physiological constraints with the movement of calcium ions across the membrane of a neuron, these pace-making thalamocortical neurons experience a 'silent phase' every 1.5 to 28 seconds. During these thalamocortical silent phases, which can last from 5 to 25 seconds, the brainwaves are said to be in a 'free run' period, and are susceptible to entrainment with outside fields. It is during these free run periods that the Schumann Resonance entrains with the brainwaves. It is also possible that the magnetite in the pineal gland, as a result of the intricate connections with the thalamus, also becomes susceptible to entrainment during these free run periods. With the coming of night, the ionosphere moves higher, and the frequency of the Schumann Resonance falls to the low range of the spectrum (1 to 7 Hz.) These frequencies entrain through the pineal gland and overall brainwave activity during the free run period, resetting brainwave activity to between 1 and 7 Hz, which corresponds to the delta and theta stages of brainwave activity. These stages are associated with light and deep sleep and other stages of altered consciousness in humans. In this way, human behaviour is influenced by electromagnetic fields in the environment.

The Western scientific theories which describe the resetting of the biological rhythm, the differing brainwave frequencies associated with levels of consciousness, and the entrainment of

brainwaves with external electromagnetic fields are directly comparable to the Chinese belief that human beings absorb Qi energy from the environment. But what about the belief that through exercises, such as Qi Gong, and meditation, one can enhance the ability to absorb Qi energy from the environment and direct it throughout the body, which is known as internal Qi? Is there a corresponding scientific theory to account for this? The question as to whether human beings can effect one another by tapping in and projecting bioelectromagnetic fields within these resonances, in relation to Qi Gong masters who tap in to and ‘project’ external Qi, is discussed below.

The Absorption and Projection of External Qi and Electromagnetic Energy at Will

Qi Gong masters have the ability not only to absorb Qi from the environment, which is a passive process that occurs in every living thing, but also to manipulate Qi energy at will. This manipulation involves the projection of Qi energy beyond the boundaries of their bodies, which is known as external Qi. The Chinese believe that external Qi is merely the extension of one’s internal Qi. This projection of external Qi can influence other living things as well as inanimate objects (Eisenberg, 1995). For instance, Eisenberg (1995) discusses a case in which he witnessed a Qi Gong master project Qi energy from his hands, causing a fluorescent light bulb to glow. He also discusses scientific studies carried out in China in which infrared radiation (which is a small aspect of the complete electromagnetic spectrum) was measured as it was projected from various portions of the bodies of Qi Gong practitioners, including the palms of the hands (Eisenberg, 1995).

This extraordinary ability to project external Qi takes years of practice and training, and first requires the mastery of manipulating Qi energy internally. This is accomplished through a series of Qi exercises consisting of specific physical movements resembling those of Tai Ji Quan, relaxation and meditation, as well as meticulous attention to abdominal breathing (Fenton, 1996). All of these exercises are designed to alter one's state of consciousness, creating a 'doorway' in which the conscious mind can access bodily functions that are normally controlled unconsciously by the autonomic nervous system. To the Chinese, these exercises are designed to give one control over the movement and projection of Qi energy. The most important aspect of these exercises is to learn that everything is controlled by the mind, at some level of consciousness (Yang, 1998). To the Chinese, these meditative exercises are a form of self-hypnosis that can lead to an enhanced ability to manipulate Qi energy, both internally and externally. "In Qi Gong training the mind controls the flow of Qi, just as it controls other bodily functions...in Qi Gong training, concentration is the key to success. By concentrating attention on the abdomen and doing certain exercises, Qi is generated and circulated throughout the body. The amount of Qi that can be generated is determined largely by the level of concentration" (Yang, 1998, p. 11).

Meditation, hypnosis, and other relaxation exercises alter one's level of consciousness as indicated by changes in brainwave activity. As one enters a meditative state, the frequency of the brainwaves drops from the beta (14 to 50 Hz.) range to the alpha (8 to 14 Hz.) and theta (4 to 7 Hz.) range (Oschman, 2000). As such, the interaction between mind and body that is enhanced through relaxation and meditative exercises is crucial to the conscious manipulation of internal and external Qi energy. External Qi can then be projected to other people, either to heal or harm.

The increasingly growing cases of the projection of external Qi by Qi Gong masters continues to play havoc with Western biophysical laws (Eisenberg, 1995). Is there a Western scientific explanation involving bioelectromagnetic energy that can account for the external manipulation of Qi energy? First of all, the distinction between internal Qi and external Qi is not as clear cut as one might think. The fact remains that electromagnetic fields readily permeate solid objects. As such, any biomagnetic field that arises within the body as a result of the electrical activities of life processes extends beyond the physical boundaries of the body into the surrounding space (Oschman, 2000). Theoretically, these fields extend infinitely into space, becoming weaker as they move further from their source, and ultimately being drowned out in the background noise of other electromagnetic fields.

There is also growing physiological evidence to indicate that the electromagnetic fields emanating from the body as a result of these bodily life processes can be consciously manipulated and projected from certain body parts of trained individuals. More specifically, these fields can be detected emanating from the hands of many Qi Gong, Reiki, Martial Arts, and Shiatsu or Massage practitioners. This phenomenon will be explored further in the next sections: Qi energy projection for healing and for hurting.

1. Qi Energy Projection for Healing

According to traditional Chinese medicine, illness, disease or a malfunctioning of normal body rhythms, such as the sleep / wake cycle results from a an obstruction in Qi flow, an imbalance in Yin and Yang Qi energy, or a lack of Qi in the body (Gao, 1997). Chinese healers first attempt to diagnose an individual's Qi energy problem, and then rectify the problem through the administration of herbs, Shiatsu or Massage Therapy, Acupuncture, or direct influx of Qi

energy. To resolve an obstruction in Qi flow, the appropriate meridian is 'opened' either with the use of acupuncture needles or direct manipulation of the tissues surrounding the blockage via Shiatsu or direct Qi energy introduction. To resolve an imbalance in Yin and Yang Qi energy, certain herbs are ingested to restore the balance, or one type of Qi energy, either Yin or Yang, is directly introduced into the body. To resolve a lack of Qi, the patient is encouraged to eat appropriate foods and practice certain energy-enhancing exercises. However, when someone is lacking Qi energy or cannot generate enough Qi by themselves to overcome a serious disease, one of the functions of a Qi Gong healer is to turn on the internal 'Qi switch' in another person, allowing the start of treatment (Fenton, 1996).

A Qi Gong healer treats low Qi levels in a patient by taking Qi energy in from the environment at will and projecting this Qi into the patient – without touching them: “Masters of shiatsu massage do not merely sense and redirect the flow of Qi, they transmit it from their own bodies into their patient’s body by way of the appropriate meridian” (Eisenberg, 1995, p. 112). The patient’s body, which may not be able to absorb Qi energy from the environment as a result of the illness, takes this Qi in and a balance is restored within his body. Once this balance is restored, the body functions more efficiently, and can heal itself. Only Qi Gong healers can perform such feats because they have learned to ‘tap into’ and absorb Qi energy from the environment. As such, they have the ability to quickly restore the Qi that they are projecting from their own bodies into the body of their patient. In effect, the Qi Gong healer acts as an ‘antenna’ between external Qi energy and the patient’s body. The Qi Gong healer absorbs this Qi energy from the environment through breathing exercises, relaxation, and meditation, and through visualization techniques, projects this energy to his patient. In this way, it is believed that through meditation, it is possible to manipulate and control Qi energy as one sees fit. This is

exemplified by the Chinese traditional medical belief concerning the power of the mind to influence the physical state of the body (Eisenberg, 1995).

From a Western scientific standpoint, the concept of emitting some sort of 'vital energy' from one's own body into the body of an ill patient to effect a treatment seems ludicrous. This is clearly the material of science fiction. However, history has repeatedly demonstrated that science fiction often becomes science fact. Accepted physical and biological laws and theories can now explain how such phenomenon can occur, and ever evolving electronic measuring devices can now detect certain forms of energy emanating from the hands of these practitioners (Oschman, 2000). This energy is electromagnetic in origin.

It is possible to control one's state of consciousness by meditating and going into a self-induced 'trance'. Many of the individuals who accomplish this feat have been classified as highly hypnotizable. During this trance, the frequency of brainwave activity drops from the alpha stage (average of about 10 Hz.), which is associated with a normal and alert state of mind to the theta stage (average of about 6-7 Hz.), which is associated with altered or reduced consciousness and various stages of sleep. This stage is associated with the average frequency of the Schumann resonance, as described in the section on the absorption of Qi energy and the entrainment of brainwaves with the Schumann Resonance. It is during this altered meditative state of consciousness that the brainwave pacemaker, which is located in the thalamus, effectively enters into a 'free-run' period in which the brainwaves are susceptible to entrainment by the Schumann resonance and other external electromagnetic fields through the magnetically sensitive magnetite found in the pineal gland. The brainwaves are then propagated through the acupuncture meridians and the circulatory system of the body, which is an excellent conductor of electromagnetic energy as a result of the salinity of the blood (Oschman, 2000). These

electromagnetic waves then project from the hands of the Qi Gong healer, and into the body of the patient, where the bioelectromagnetic fields are resonating at the incorrect frequencies, resulting in illness and improper bodily functioning (Washnis & Hricak, 1993). These projected fields scan or sweep through the frequencies medical researchers are finding useful for ‘jump-starting’ injury repair in a variety of tissues (Seto, Kusaka, Nakazato, 1992). Oschman (2000) provides an excellent summary of this entire process:

Taken together, the research (conducted in the West) points to a remarkable model that may explain the unusual emissions of Qi or ‘healing energy’ and other phenomenon observed in a wide variety of energy therapies. What these practices have in common seems to be periodic entrainments of brainwaves and whole-body biomagnetic emissions with the Schumann resonances in the earth’s atmosphere...if these speculations are correct, the next question is what function coherent biomagnetic emissions would serve in healing. The healing power of projected fields may arise from their ability to entrain similar coherent rhythms in the tissues of a client. Perhaps such entrainment enhances the evolutionarily ancient communication and regulatory systems involved in wound healing and defense (Oschman, 2000, p. 109).

2. Qi Energy Projection for Hurting

In the last section, the traditional Chinese medical process of treating the ill via the projection of Qi energy from a Qi Gong healer to a patient was explained in terms of electromagnetic fields and Western scientific theory. But what about the stories of Martial Artists

who supposedly possess the ability to inflict incredible harm on their opponents by emitting 'harmful' Qi into their bodies?

Although the martial arts have been studied by the Chinese for more than four thousand years, it was only about 2000 years ago that the application of Qi energy techniques started being applied to the martial arts in conjunction with the advancement of Qi energy theories and techniques for medicine (Yang, 1998). As a result of the development of the martial arts in conjunction with Chinese traditional medicine, the theory and application of Qi energy to the martial arts is almost identical with Qi energy theories in traditional Chinese medicine, as have been described in previous sections.

When Qi energy exercises were introduced at the Shaolin temple in approximately 500 AD for the improvement of overall health, it was only natural that the monks would apply these techniques to the martial arts (Eisenberg, 1995). Once it became known that a balanced, unimpeded flow of Qi was necessary for life and well-being, the next step of martial Qi training was to find ways to affect an enemy's Qi flow (Yang, 1998). The monks found that they could direct Qi to different parts of their bodies to protect themselves from blows as well as transmitting Qi into their opponent's bodies to inflict more damage. This was often accomplished by directly striking certain pressure points along the meridians of the opponent's body. By striking pressure points, which are gates or spots in which energy can be transmitted into a meridian, the flow of Qi energy along the meridian could be blocked or disrupted, resulting in illness or disruption of the body's normal functioning.

Some martial artists who practice their art, as well as Qi energy exercises for many years may obtain the ability, like Shiatsu and Qi Gong healers, to move or emit energy outside of their bodies. Using pressure points in the same manner as Qi Gong healers, they can put Qi energy

into a person's body or take it out without touching, or very lightly touching, their opponent (Yang, 1998). More recently, studies investigating the harmful effects of Qi energy projected from a human practitioner to other living organisms have been conducted in China. In 1981 Dr Fong Li-da conducted an experiment and published an article in which a Qi Gong master capable of emitting external Qi was instructed to use his Qi to either kill or promote the growth of bacteria. He handled three tubes with equal numbers of the bacteria *E. coli.*, the first of which he just held for one minute and then put down, the second of which he projected 'lethal Qi' onto for one minute, and the third of which he projected 'health-promoting Qi' onto for one minute. More than forty repetitions of this experiment unequivocally demonstrated that a 'health-promoting' dose of external Qi resulted in a seven to ten-fold increase in the number of *E. coli.*, while a 'lethal dose' of Qi resulted in a lowering of the number of *E. coli.* Bacteria by one half or more (Li-da, 1983). Other documented cases have shown that the projection of external 'harmful' Qi by martial artists and other practitioners can result in unconsciousness and other health problems among their opponents. Is there a Western scientific explanation for such phenomenon?

The physical mechanism behind this external projection of harmful Qi energy is similar to that described in the previous section, which discusses the projection of Qi energy for the purposes of healing. During a confrontation a well-trained martial artist enters a meditative-like trance or state similar to the meditative state taken Qi Gong masters during their healing sessions. Miyamoto Musashi, a samurai who lived in Japan during the late 1500's and early 1600's, refers to this state of mind in 'The Book of Five Rings'. His teachings are considered required reading for the serious martial artist, and his wisdom springs from successfully defeating more than 60 other samurai before his 30 birthday. Musashi writes that during battle one must "keep your mind on the center and do not waver. Calm your mind, and do not cease the

firmness for even a second” (Musashi, 1624). Through this meditative state of mind and relaxed physical state, the martial artist is able to entrain his brainwaves with the Schumann resonance of the earth’s atmosphere. The slower brainwaves associated with this meditative state of mind would then propagate throughout his body via the circulatory and acupuncture meridian channels, which will be discussed in the next section. These electromagnetic signals would then project from the hands of the martial artist as he attacked his opponent, entraining with this opponent’s own biomagnetic signals through space. The ultimate result would be the unconsciousness of his opponent through one of two mechanisms. The first would be as the result of a disruption in the flow of Qi through his opponent’s meridians, a common effect of such disruption being illness and an altered state of consciousness. The second mechanism would be the entraining of the opponent’s brainwaves with the 1 to 4 Hz. signal being projected from the martial artist, which is related to the delta stage of activity. This stage is associated with deep sleep in normal people and certain brain disorders (Oschman, 2000).

Qi Energy Meridians and the Circuitry of the Body

In traditional Chinese medicine, acupuncture and acupressure both involve the accurate manipulation of specific points on the body via the insertion of fine needles or hand massaging, developed over a period of at least 5,000 years. Acupuncture points are located in specified patterns on the human body, the location of which have been defined via trial and error experimentation over thousands of years (Gao, 1997). Through careful observation, it was realized that certain acupuncture points are connected to each other by pathways or channels that came to be described as meridians. Acupuncture and acupressure manipulation effects a treatment for certain illnesses by stimulating certain acupuncture points in an effort to enhance

circulation through the meridians and promote the function of the internal organs and the limbs which the meridians run through (Gao, 1997). Needling acupuncture points can lead to a feeling of electric shock along the path that the meridian travels, which is called 'obtaining the Qi'. Theoretically, needle insertion influences the flow of Qi, Blood, and nourishing fluids, which results in these altered sensations (Eisenberg, 1995). As such acupuncture points are grouped along meridians in such a way that pressing points on a meridian effects the flow of Qi energy along the entire channel.

Qi energy flows along the meridians in specific directions to every nook and cranny of the body. The meridians travel along the extremities and outer surface of the body and then travel deep into the body and are associated with the internal Zang-Fu (solid and hollow) organs of the body. There are twelve primary Qi meridians that run bilaterally over the surface of the body, as well as two extra meridians that run up the front of the body (Conception meridian) and the back (Governor meridian). Each of these twelve bilateral meridians is named according to its association with internal organs: lung, large intestine, stomach, spleen, heart, small intestine, bladder, kidney, pericardium, (associated with the heart) triple burner (associated with heart), gallbladder, and liver. Illness and disease can be diagnosed by the outward signs that indicate a malfunctioning in one of these organs. In turn, the malfunctioning of the organ is the result of disturbed (blocked, imbalanced, or deficient) Qi energy flow along the meridian associated with that organ. Acupuncture and acupressure stimulates the meridian with either a needle or hand massage, which compensates for the disturbed Qi energy flow along the meridian, thereby restoring healthy function to the organ in question.

These pressure point meridians were investigated and described long before Chinese doctors had a detailed understanding of human anatomy and physiology. While modern

anatomical charts indicate that the acupuncture meridians correlate with the nervous system and circulatory system of the body, this correlation is not perfect, and there are many instances where acupuncture or pressure points do not correspond to any nerves or blood vessels in the body. This suggests that these meridians are a separate phenomenon. A Western scientific explanation for these Qi energy meridians may be found in the realm of bioelectromagnetic energy. It appears that acupuncture meridians, as described and utilized in traditional Chinese medicine, are electromagnetic in nature and so are vulnerable to disturbance by other electromagnetic energies (Thurnell-Read, 1995).

We have seen that the daily activities that occur in the body produce electrical currents, which, as a result of the physical phenomenon called the Hall Effect, necessarily results in the production of magnetic fields within and beyond the boundaries of the body. What has not been discussed is the location or flow of these bioelectrical charges and how this flow is influenced by disease and illness. There are, indeed, energetic circuits in the living organism, in which electromagnetic information passes through on its way to every corner of the body (Oschman, 2000). The flow of this energy is influenced by subtle energies in the environment, and disorders of the tissues in the body influence the flow of these charges in consistent ways, as described by traditional Chinese medicine (Oschman, 2000).

An important distinction that must first be made is between electrical conduction and electronic conduction. Electrical conduction occurs in neurons throughout the body via the movement of ions and other relatively large, charged particles. The more subtle electronic conduction, as occurs in electronic devices in your home via the movement of electrons through *solid state* materials such as semi-conductors, also takes place in the body (Oschman, 2000).

Recent research in the field of biochemistry has indicated that the living cell is not actually a 'bag filled with fluid', but is packed with microfilaments, microtubules, and trabeculae, collectively called the cytoskeleton. As a result, there is little room left for solution (Ling, 1992). Recent research has also indicated that this cellular cytoskeleton is connected, across the cell surface, with the extracellular matrix that connects all cells of the body together as well as the cell nucleus: "Conceptually, these discoveries are profoundly important. The boundaries between the cell environment, the cell interior, and the genetic material are not as sharp or impermeable as we once thought...(when you touch) the skin – you contact a continuous interconnected webwork that extends throughout the body...(an) interconnected system that has been called *the living matrix*" (Oschman, 2000, p. 47). This directly relates to the traditional Chinese belief that one's thoughts, through the activity of the mind, can influence the physical state of the body and, through meditation, allow one to manipulate and project Qi energy at will.

It also appears that the cytoskeleton and extracellular components that link together to form the living matrix are also crystalline in structure, as crystalline arrangements in living organisms are the rule as opposed to the exception (Oschman, 2000). More importantly, the physical properties of crystals are such that bending or placing pressure on them produces an electrical current – called the piezoelectric effect, and crystals readily absorb and resonate with electromagnetic energy. It is through the living matrix that specific electromagnetic fields associated with the intention (or thoughts) of the Qi therapist or martial artist are transmitted from one individual to another, ultimately influencing the electromagnetic fields within the body of the recipient. The crystalline structure of the living matrix also resonates with the

electromagnetic field of the earth and the Schumann resonance, which is one more way in which the human body absorbs Qi (electromagnetic) energy from the environment.

In sum, it appears that the living matrix is a high-speed communication network that links all tissues and parts of the body with every other part, resulting in an elegant and very efficient way of sending information throughout the body. Becker (1985, 1990, 1991) describes the connective tissue that surrounds all neurons in the body, called the perineurium, as the second part of a 'dual nervous system' in the body – the classic nerve network widely studied in the West as well as the evolutionarily ancient perineural system, which operates on a direct current (DC) system. Oscillations of the direct current in the perineural system are called brainwaves, and one of the jobs of this system is to control the level of consciousness via connections with the pineal gland and the thalamus, as described in previous sections (Becker, 1985, 1990, 1991). The perineural system, like the pineal gland, is sensitive to magnetic fields.

As it turns out, “the best introduction to the electronic circuitry of the human body is to be found in the study of acupuncture” (Oschman, 2000, p. 57). The acupuncture meridians are actually low resistance pathways for the flow of electromagnetic information through the living matrix (Morton & Dlouhy, 1989). These electromagnetic signals, like the Chinese concept of Qi energy, then enter each and every organ, tissue, and cell of the body through the intracellular matrix between cells and cytoskeleton within cells. “The meridians are simply the main channels or transmission lines (for electromagnetic signals) in the continuous molecular fabric of the body” (Oschman, 2000, p. 70). Some of these channels pass closer to certain organs within the body, ultimately relaying the strongest part of any signal travelling along that meridian to the corresponding organ. In this way, the Chinese are able to influence the health of specific organs by manipulating the flow of Qi (bioelectromagnetic) energy along specific meridians.

Becker (1985, 1990, 1991) believes that acupuncture points and meridians are input channels for a system that regulates tissue repair. As a result, the correct functioning of the Qi energy meridians is of vital importance to an individual's health (Thurnell-Read, 1995). A blockage in any of these channels will slow down or block the flow of Qi energy through the body (Yang, 1998). To prevent blockages in the Qi energy meridians, daily isometric exercises, such as Tai Chi Chuan, Qi Gong, or any of a variety of Martial Arts are practiced to tone and build the muscles of the body. Over time, these practitioners gain a natural tightness to their bodies, which opens the meridians and enhances the flow of Qi, much like traffic that moves more freely over a straight highway versus one with curves (Fenton, 1996). From a Western standpoint, such conditioning of body tightens the living matrix and enhances the crystalline nature of the extracellular integrins, resulting in the more efficient resonance of the matrix with internal and external electromagnetic fields. The result is the more efficient transmission of signals through the meridians that are crucial to the optimum functioning of the organism. In this way the enhanced Qi flow through the meridians promotes optimum general health and well being as every part of the body efficiently communicates with all the other parts, and the organism functions as a seamless whole.

Qi Energy for General and Preventative Health and the Electromagnetic Connection

The Chinese have known since the birth of Chinese medicine during the reign of the Yellow Emperor, Huang Di (2697-2597 B.C.) that encouraging the flow of what they called Qi energy through the body could stimulate healing of broken bones and soft tissue damage, help to cure disease, prolong life and prevent illness (Yang, 1998). In traditional Chinese medicine, it is a well-established principle that the flow of blood in the body is influenced by the flow Qi.

Therefore, enhancing the flow of Qi attracts and guides the blood, which strengthens the entire body (Fenton, 1996). The enhancement of Qi flow is facilitated by Qi practitioners or healers who use various message and touching techniques to introduce Qi energy from their own bodies to their patient's bodies in an effort to enhance their patient's Qi flow.

Today in North America, medical research is demonstrating that medical devices that produce pulsing electromagnetic fields of particular frequencies can stimulate the healing of a variety of tissues. These oscillating magnetic fields are being researched at various medical centers for the treatment of bone, nerve, skin, capillary and ligament damage (Oschman, 2000). Research being conducted in the West is also demonstrating the importance of the 'messages' that BioEM fields send throughout the body to overall health and damage repair. BioEM fields are thought to jumpstart the immune system into repairing damaged tissue, including bone, nerves, and skin (Oschman, 2000). The propagation of BioEM fields throughout the body via highly conductive pathways can be compared the concept of Qi energy flow through acupuncture meridians, which the Chinese believe is crucial to maintaining health and injury repair.

Lastly, the Chinese have long believed that anyone can enhance Qi flow and thus, their health and longevity, through exercises and martial techniques, meditation, relaxation and mental discipline. Through years of practice and discipline Qigong health practitioners can absorb Qi energy (entrain brainwaves) from the environment (the Schumann resonance) and transmit this Qi energy into the bodies of their patients. Research conducted in the past several decades has consistently demonstrated that most individuals are capable of controlling what are considered to be non-conscious bodily functions such as heart rhythm through biofeedback, and that this control is enhanced through repetition and training. Furthermore, BioEM fields arise from the electrical activity taking place in the nerves, muscles, and other tissues in the body. By focusing

on specific thoughts during meditation or contracting certain muscle groups, it is possible to control the electric, and thus, biomagnetic fields produced by and projected from certain areas of the body such as the hands.

It has been said that “there is only one health, but diseases are many. Likewise, there appears to be one fundamental force that heals, although the myriad schools of medicine all have their favourite way of cajoling it into action” (Becker, 1985, p. 25). It now appears that the fundamental force, like the many ways that exist to cajole it into action, has many labels. The Chinese refer to this force as Qi energy. In his discussions, Becker referred to electromagnetic energy as the fundamental force. By ‘cajoling into action’, Becker believed that many of the cures offered in the West for a myriad of diseases ultimately influence the bioelectromagnetic fields of the human body, either to effect the cure or as a consequence of it. Similarly, according to traditional Chinese medicine, an examination of Qi flow and Qi energy patterns in the human body allows for the diagnosis of illness and as a measuring stick of health. A variety of interventions from acupuncture to shiatsu to the administration of herbs are then used to treat the illness. Once a balance of Qi energy has been restored, the individual is given a clean bill of health.

Similarly in the West, patients first visit their doctor or health practitioner to complain of a symptom. It is at this point that the differences between traditional Eastern medicine and Western medicine emerge. The physician in the West does not examine Qi balance or energy flow in his patient, which would be equivalent to measuring the bioelectromagnetic fields within and surrounding his or her body, but rather treats the patient’s symptoms directly. This treatment may take the form of prescribing a medication, removing or physically altering tissue in the form

of surgery, or offering psychological counseling. Ultimately, all of these treatments influence the bioelectromagnetic fields of the patient.

For instance, the biochemical theory underlying the effectiveness of pharmacological agents is that of billiard ball interactions. This theory states that all biological regulations in the body occur when structurally matching molecules exchange energy and information by billiard-ball type direct impacts. When a pharmacological agent is introduced in the body to treat an ailment, the molecules diffuse, wiggle, and bump about randomly until they chance to approach a receptor site and the 'key' fits into the 'lock', resulting in a biochemical reaction. An alternate theory that accounts for this biochemical reaction is that of energetics. According to this theory, communication occurs between signal and receptor molecules that are not touching (Benveniste, 1998). This communication occurs via the electromagnetic signals that are inherent to each molecule. In essence, when two biological molecules are compatible, their reaction will occur via co-resonance, as the electromagnetic signals given off by each molecule interact like a radio transmitter and receiver (Oschman, 2000). In this way, the molecules of a pharmacological agent alter the bioelectromagnetic field of a certain diseased tissue in the body by co-resonating with the target tissues, thereby altering the overall electromagnetic field of the tissue (Oschman, 2000). As such, it is theorized that prescription drugs, like traditional Chinese herbs, affect a cure by altering the bioelectromagnetic fields, or Qi energy flow, of the body. Becker (1985, 1990) maintains that all forms of medical intervention, either in the East or the West, ultimately influence the energy fields within and around the body, whether one calls these fields Qi or bioelectromagnetic energy.

SUMMARY: QI ENERGY AND BIOELECTROMAGNETISM - ONE IN THE SAME?

Although its exact origins are shrouded in mystery and the veil of time, it is generally accepted that the concept upon which traditional Chinese medicine is based, that is, the existence of Qi energy, is more than 4,000 years old. Until relatively recently, the strict empirical methods of Western scientific thought dismissed the concept of Qi as an integral energetic component of living organisms as, at best, immeasurable and unobservable, and at worst, a phenomenon that exists only in the mind. Despite this, the theory of Qi energy has persisted for more than four millennia, and is manipulated by acupuncturists, shiatsu therapists, herbal doctors, Qi Gong masters, and martial artists every day with predictable and observable, albeit subjective, results. Over the past several decades, more Western scientists as well as the general populace have taken an interest in traditional Chinese medicine and necessarily, the concept of Qi energy. This interest has been partially motivated by worldwide technological advancement that is allowing scientists to study Qi energy under the scrutiny of observable, yet objective methods.

The results of these objective studies, in conjunction with other studies in the fields of biology, biochemistry, physiology, psychology, and physics, are suggesting that many of the claims made by traditional Chinese medical doctors concerning the manipulation of Qi energy for purposes of healing do in fact have a basis in Western scientific theory. It seems that the Chinese concept of Qi energy is directly comparable to a concept that is very familiar to scientists in the West: Electromagnetic energy. This paper has compared a number of aspects of Qi energy to what is known about the electromagnetic fields produced by living organisms, which have been called bioelectromagnetic fields. The mechanisms behind the flow and nature of Qi energy have also been described in Western physical terms and what is known, through numerous scientific experiments, about electromagnetic fields.

For instance, the Chinese belief that the 'Original Qi' obtained from our parents at conception and our mother in the womb has been compared to Burr's (1972) concept of 'Life Fields'. These Life Fields, Burr claims, are electromagnetic signatures found in the womb which control the development of the fetus into a functional human being and coordinate the cells and tissues of our body throughout our lifetimes. In this way, Life Fields are the electromagnetic 'blueprints' by which living things are organized (Burr, 1972).

The belief that Qi energy is absorbed from the environment and used to enhance the strength and functioning of the human body was compared to the electromagnetic spectrum produced by the earth. More specifically, the Schumann resonance, which is an electromagnetic field that travels through the atmosphere and the ionosphere was discussed. The implications of the fact that the Schumann frequency resonates at an average frequency in relation to the biomagnetic waves produced by the brain, was discussed. The mechanism by which the body 'absorbs' the Schumann resonance, entrainment, was discussed and compared to the theories of Qi energy absorption.

The ability of Qi Gong masters and other individuals to absorb Qi energy from the environment and project this Qi externally towards others for purposes of healing or harming was also examined. Western scientific explanations involving the alteration of consciousness and the conduction of electromagnetic energy from the brain through the bodies of practitioners was discussed. This conduction takes place through an evolutionarily ancient perineural conduction system, which has been referred to as the living matrix. This system is crucial to the passing of information through the body, and the scientifically verifiable pathways these message travel across were compared to the acupuncture meridian system described by traditional Chinese medicine as being crucial to the healthy functioning of the body. Lastly, the importance of the

efficient flow of Qi energy through the meridians of the body and the electromagnetic correlates to this principle were discussed.

Through these comparisons and correlations, it is hoped that the reader now appreciates the rich heritage and usefulness of the Chinese concept of Qi energy. The hypothesis set forth in this paper is that Qi energy and the Western scientific concept of electromagnetic, and more specifically, bioelectromagnetic energy is the same phenomenon. The countless similarities between these two phenomena suggest that at some level, these two concepts are, at the very least, intimately related. Scientists, health practitioners, martial artists, and the general populace of the West have been reluctant to accept traditional Chinese medical theory. The cornerstone of this theory is the belief that Qi energy flows in and around us and is a crucial component of all living things. Perhaps these individuals would be more comfortable discussing 'bioelectromagnetic' energy as opposed to 'Qi' energy. Ultimately, the label one gives this phenomenon is irrelevant, but first, one must be convinced that Qi energy is nothing more than electromagnetic energy. The purpose of this paper was to provide evidence for this theory. At the very least, it is hoped that the reader will be intrigued by the concept of Qi energy, and perhaps now have a framework, from a Western scientific paradigm, with which to understand this fascinating phenomenon.

REFERENCES

- Andersen, P. & Andersson, S. A. (1968). *Physiological basis of the alpha rhythm*. New York, NY: Appleton-Century Crofts.
- Balsler, M. & Wagner, C. A. (1960). Observation of earth: Ionosphere cavity resonances. *Nature*, *188*, 4751.
- Baule, G. M. & McFee, R. (1963). Detection of the magnetic field of the heart. *American Heart Journal*, *66*, 95-96.
- Beck, R. (1986). Mood modification with ELF magnetic fields: A preliminary exploration. *Archaeus*, *4*, 48.
- Becker, R. O., Seldon, G. (1985). *The Body Electric: Electromagnetism and the Foundation of Life*. New York, NY: William Morrow and Company, Inc.
- Becker, R. O. (1990). *Cross Currents: The Perils of Electropollution, the Promise of Electromedicine*. Los Angeles, CA: Jeremy P. Tarcher.
- Becker, R. O. (1990). The machine brain and properties of the mind. *Subtle Energies*, *113*, 79-97.
- Becker, R. O. (1991). Evidence for a primitive DC electrical analog system controlling brain function. *Subtle Energies*, *2* (1), 71-88.
- Beisteiner, R., Erdler, M., & Teichmeister, C. (1997). Magnetoencephalography may help to improve functional MRI brain mapping. *European Journal of Neuroscience*, *9*, (5), 1072-1077.
- Benveniste, J. (1998). From 'water memory effects' to 'digital biology' on the world wide web at <http://www.digibio.com>
- Berger, H. (1929). Uber das elektrenkephalogramm des menschen. *Archiv fur Psychiatria*, *87*, 527-570.
- Brewitt, B. (1996). Quantitative Analysis of electrical skin conductance in diagnosis: Historical and current views of bioelectric medicine. *Journal of Naturopathic Medicine*, *6*, (1), 66-75.
- Brewitt, B. (1999). Electromagnetic Medicine and HIV/AIDS treatment: clinical data and hypothesis for mechanism of action. In: Standfish, L. J., Calabrese, C., & Galatino, M. L. (Eds.). *AIDS and Alternative Medicine: The Current State of the Science*. New York, NY: Harcourt Brace.

- Burr, H. S. (1972). *The Fields of Life: Our Links with the Universe*. New York, NY: Ballantine Books.
- Cohen, D. (1972). Magnetoencephalography: Detection of the brain's electrical activity with a superconducting magnetometer. *Science*, *175*, 664-666.
- Cuzick, J. (1998). Continuation of the international breast cancer intervention study (IBIS). *European Journal of Cancer*, *34*, (11), 1647-1648.
- Dillman, G. A. & Thomas, C. (1992). *Kyusho Jitsu: The Dillman Method of Pressure Point Fighting*. Reading, PA: George Dillman Karate International.
- Direnfeld, L. K. (1983). The genesis of the EEG and its relation to electromagnetic radiation. *Journal of Bioelectricity*, *2*, 111-121.
- Eastman, C. I., Hoese, E. K., Youngstedt, S. D., & Liu, L. (1995). Phase shifting human circadian rhythms with exercise during the night shift. *Physiology & Behavior*, *58*, 1287-1291.
- Einthoven, W. (1906). Le telecardiogramme. *Archives Internationales de Physiologie*, *4*, 132-164.
- Eisenberg, D. (1995). *Encounters with Qi: Exploring Chinese Medicine*. New York, NY: Norton & Company.
- Fenton, P. (1996). *Shaolin Nei Jin Qi Gong: Ancient Healing in the Modern World*. York Beach, MA: Samuel Weiser, Inc.
- Galejs, J. (1972). *Terrestrial propagation of long electromagnetic waves*. Oxford, England: Pergamon Press.
- Gao, D. *Chinese Medicine*. New York, NY: Thunder's Mouth Press.
- Haimov, I. & Lavie, P. (1996). Melatonin – A soporific hormone. *Current Directions in Psychological Science*, *5*, 106-111.
- Kalat, J. W. (2001). *Biological Psychology*, 7th ed. Belmont, CA: Wadsworth / Thomas Learning.
- Li-da, F. (1983). The effects of external Qi on bacterial growth patterns. *China Qi Gong Magazine*, *1*, 36.
- Ling, G. N. (1992). *A Revolution in the Physiology of the Living Cell*. Malabar, FL: Krieger Publishing Company.

- Marino, A. A., Ilev, I. G., & Schwalke, M. A. (1994). Association between cell membrane potential and breast cancer. *Tumor Biology*, *15*, 82-89.
- Miller, J. (1995). Going unconscious. In: Silvers, R. B. (Ed.). *Hidden Histories of Science*, pp.1-35. London, UK: Granta Books
- Morton, M. A. & Dlouhy, C. (1989). *Energy Fields in Medicine*. Kalamazoo, MI: John E. Fetzer Foundation.
- Musashi, M. (1624). *The Book of Five Rings*. New York, NY: Bantam Books.
- Oschman, J. L. (1993). Biophysical basis for acupuncture. The Proceedings of the First Symposium of the Society for Acupuncture Research. Rockville, MD: 23-24 January.
- Oschman, J. L. (2000). *Energy Medicine: The Scientific Basis*. New York, NY: Churchill Livingstone.
- Payne, B. (1990). *The Body Magnetic*. Santa Cruz, CA: Privately published.
- Quinn, J. F. (1992). The senior's therapeutic touch education program. *Holistic Nurse Practitioner*, *7*, 32-37.
- Refinetti, R. (2000). *Circadian Physiology*. Boca Raton, FL: CRC Press.
- Russek, L. G. & Schwartz, G. E. (1996). Energy cardiology: A dynamical energy systems approach for integrating conventional and alternative medicine. *Advances: The Journal of Mind-Body Health*, *12*, (4), 4-24.
- Schumann, W. O. (1952). On the characteristic oscillations of a conducting sphere which is surrounded by an air layer and an ionospheric shell. *Zeitschrift fur Naturforschung 7a*: 149-154.
- Seto, A., Kusaka, C., & Nakazato, S. (1992). Detection of extraordinary large biomagnetic field strength from human hand. *Acupuncture and Electro-Therapeutics Research International Journal*, *17*, 75-94.
- Thurnell-Read, J. (1995). *Geopathic Stress: How earth Energies Affect Our Lives*. Rockport, MA: Element.
- Washnis, G. J. & Hricak, R. Z. (1993). *Discovery of Magnetic Health*. Rockville, MD: Nova Publishing Company
- Whitten, K. W., Davis, R. E., & Peck, M. L. (1996). *General Chemistry*, 5th Ed. New York, NY: Saunders College Publishing.

Yang, J. M. (1998). Qigong for health and martial arts: Exercises and meditation. Boston, MA:
YMAA Publication Center