

Buddhism and Modern Science

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Summary

Use of modern scientific knowledge to understand what happened during meditation, *Pancha Abhinna*s and some of the concepts described in Buddhism gave an tremendous impact to the acceptance of Buddhism as a world religion having practical applicability than any other religion. Development of several scientific methods and instruments such as computer generated methods on testing esp ability of individual persons, electroencephalographs (EEG) to record brain wave patterns, artificial stimuli given to certain sections of the brain that will regenerate some of above conditions and the Frequency Following Response (FFR) technique developed after studying the brain wave patterns under meditation to regenerate similar state of trance had lead to study the Buddhist meditation techniques and concepts like *Pancha Abhinna* by the scientists giving much recognition to the Buddhism and its application in daily life.

This paper describes the application of scientific methodology in spiritual development, development of scientific background on brainwaves and meditation, latest research findings on advantages of practicing meditation, a scientific explanation on how the telepathy-remote viewing and remote influencing work, a Buddhist approach to psychotherapy, scientific aspects of Buddhist pirith chants and a description on an attempt made using theoretical physics to understand the relationship between mind and matter.

Recent research in medicine, in experimental psychology and what is still called parapsychology has thrown some light on the nature of mind and its position in the world. During the last forty years the conviction has steadily grown among medical men that very many causes of diseases organic as well as functional, are directly caused by mental states and that meditation, on the contrary, would act as a supportive to cure. According to latest research on Neuroplasticity, one of the hottest topics in brain science, which refers to the brain's recently discovered ability to change its structure and function, Buddhist meditation not only produce a calming effect on mind and increase the body's immune system, it also produces lasting changes in the brain leading to increase the IQ level, learning abilities and problem solving capabilities, sustained positive emotions, gives relief for insomnia, reshapes and expands the mind to foster happiness and cultivate compassion, thicken the brain tissues, increase attention and sensory processing, and increased oxytocin peptide will increase the well-being and sense of trust in social situations. Hours of daily meditation practice is more significant than the age of a person on achieving those benefits of meditation. At least 40 minutes session of daily meditation is revealed to provide the above beneficial effects.

Mind not only makes a person sick, it also cures. The recorded instances of faith healing includes cases in which even organic diseases were cured almost instantaneously. The second part of this paper describes some research been conducted to understand the benefits of listening to Buddhist Paritta (Pirit) chants. In this connection it is interesting to observe the prevalence, in Buddhist lands, of listening to the recital of the *dhmma* or the doctrine of the Buddha in order to avert illness or danger, to ward off the influence of malignant beings, and to promote health, prosperity, welfare, and well-being. The selected discourses for recital are known as "*paritta suttas*," (**discourses for protection**).

In order to investigate the effect of pirit sound on human beings, an experiment was conducted by Ven Madawala Upali and the author in 2002 at the Kanduboda International Meditation Centre in Sri Lanka. The *Cool Edit* and *Band-in-a-Box* computer software packages and a stethoscope fitted with high band width microphone fitted to a computer was used to analyse the pirit sound and heart beat of subjects listening to pirit, simultaneously. The study revealed that Buddhist chanting of pirit gives best results when it is chanted at medium speed. The Pirit sound gives only four notes contrary to the conventional music having 7 notes and therefore would induce no *raga* thoughts in once mind producing better results by pirit than those of special musics used in music therapy. When subjects are allowed to listen to pirit chants, it is found that within 10 minutes of the commencement of the pirit, their heart beat reduces and the heart pulse amplitude halved and they come to an alpha state similar to what you get under a meditative trance. Therefore, listening to pirit is good for your heart and also gets the similar benefits that one get under trance condition in meditation such as increasing the body's immune system, producing lasting changes in the brain leading to sustained positive emotions.

Moreover, a recent Japanese study conducted by Masaru Emoto shows that water when exposed to pirit sound for several hours and then freezed produced hexagonal shape ice crystals. Since our body is consisting of about 70% of water, when listen to the pirit, many water molecules in our body become hexagonal aggregates (other wise pentagonal or some other shape). It has been found that such hexagonal water made our body and its cells healthy and disease free and even can stop further development of cancers in cancer patients.

In conclusion, above findings shows that the confluence of scientific knowledge and Buddhism will lead to the complete development of mankind.

1. Application of Scientific Methodology in Spiritual Development

Science is an understanding of matter, whereas spiritualism is related to the consciousness of the soul. Usually we analyze them as separate entities, whereas in reality, they are indeed inter-dependent and inalienable parts of each other. Though most of the religions lead to the spiritual development it was Buddha some 2500 years ago clearly indicated the 'Mind-and-Body' (*Nama_Rupa*) mentality and corporeality conditioned by sixfold sense-based Consciousness. In science, originated in the west, the concept on existence of Mind as a separate entity different from the Body was first put forwarded by French philosopher and a physician R. Descartes (1556-1650). In 1860 Gustave Feschner published '*Elements of Psychophysics*' in which he outlined his experimental method of measuring the relationship between the physical stimulus and the sensory experience. This was one major milestone that led to what is now known as field of Psychology.

In the west, **spiritualism** is defined as a philosophical doctrine that perceive all reality as spiritual, not material. Whereas **science** is knowledge gained by the study of the physical world. The so-called scientific method that we use today in modern science is based on building up a hypothesis using data obtained through observations and come to a conclusion through experiments. Since is based on observable, material world experiments, up to about 1960s the supernormal, non-materialistic knowledge flourish with one's spiritual development described in Buddhism as *Pancha Abhinna* received more or less no scientific acceptance. However, with the Development of **Metaphysics** and **Parapsychology** those *Abhinnas* are now being accepted as it is under the same classification given in Buddhism, but with new names given viz. 1) Magical powers (*iddhi-vidha nana*) – renamed as Psychokinesis or PK, 2) Devine ear (*dibba-sota nana*)- renamed as clairaudience, 3) Penetration of the mind of others (*ceto-pariyaya-nana*) –renamed as telepathy, 4) Divine eye (*dibba-cakkhu-nana*)-renamed as clairvoyance, 5) Remembrance of former existences (*pubbe-nivasanussati nana*) – as renamed post cognition. The only difference between Buddhist classification and the modern Parapsychology is that in parapsychology if you perceive some knowledge beyond your five senses, by yourself or even through the help of a spirit, it is called extra sensory perception (esp) and goes under any of the above last four categories; whereas in Buddhism above *nana*'s are developed by yourself and any information obtained through spirits are not taken as *abhinna*. The first *nana* goes from you to the world outside (also now known as *remote influencing*) and the last four you perceive the knowledge from world out side (now known as *remote viewing* or *esp*) through extra sensory perception. In today's world, spiritualism has become a way of life like food and drink, exercise, and is a path taken by millions worldwide.

So much so that these fields are now recognized with opening up of departments with professors and doctoral students in universities like Edinburgh in UK. These research are more focused on the areas of mechanisms of psi, electromagnetic sensitivity and psi, observer's impact on an event, psychokinesis research, direct mental interactions with living systems (DMILS), precognition and intervention, the nature of operation of volition, psychological correlates of ESP, altered status of consciousness, the phenomenology of psychology of the OBE(Out-of-Body-Experience). It is well-known that technologically advanced nations are now having separate military units established on Remote Vision, Remote Influence – as a latest technique of spying. Like many other branches of the science (e.g atomic energy) with the introduction of Extra Sensory Perception in to military applications the field of spiritualism today has began to grow fast scientifically. The recent discovery(during the Iraq war) of how telepathy work to exchange global information between human minds through Schuman Resonance described in electromagnetic theory (7.52 Hz frequency of a em

wave traveling round the world) and alpha level of mind reached under meditation (frequency 7-14 Hz) is one such example.

2. Development of Scientific Background on Brainwaves and Meditation

2.1 Discovery of EEG (Electroencephalogram)

Although scientists knew flickering light and audio beats affected our frame of mind, they were unable to prove how that interaction existed. Then in 1924, Hans Burger, a German psychiatrist, published pictures depicting electrical activity of the human brain. From the discovery of these "wavy" lines emerged a new scientific field called "electroencephalography". Brain cells communicate by producing tiny electrical impulses. During EEG studies, researchers place several electrodes on a subject's scalp to detect and record patterns of electrical activity in the brain.

During the 1940's several researchers, including W. Gray Walter, utilized powerful electronic strobes with new versions of EEG instrumentation to alter brainwave activity, producing states of profound relaxation and imagery. In 1949, brainwave signals were brought to the screen with the invention of the Tuposcope. This breakthrough allowed the tracking of brainwave patterns (*Beta, Alpha, Theta and Delta*). Within five years, hundreds of hospitals were equipped with EEG's.

In the 1950's and 1960's, research on Zen and Yoga meditators showed a predominance of alpha and theta waves during meditation. These findings were made through the data collected by researchers including M.A. Wanger of the University of California at Los Angeles; B.K. Bagchi of the University of Michigan School of Medicine; and B.K. Anand of the All India Institute of Medical Sciences in New Delhi (Ditson-Sommer, 1995).

During the late 1960's and into the 1970's interest in producing altered states without chemicals increased. Alpha EEG feedback by Dr. Joe Kamiya at Langley-Porter Neuropsychiatry Institute in San Francisco aided in initiating the age of *biofeedback*. Others, including Jack Schwarz and Richard Townsend, continued their investigations of rhythmic light and sound combinations, with emphasis on hemispheric brain synchronization and *EEG entrainment* (Budzynski, 1991).

2.2 How Are Frequencies Associated With Brainwaves?

Brainwaves are the electrical wave patterns generated in every person's brain. These waves vary according to level of consciousness, subconsciousness and unconsciousness and are characterized by four distinct types of brainwaves. Each of these electrical wave patterns have distinctly different ways of perceiving, processing, learning and knowing information (Hoiberg, 1989). All of these brain waves are produced at all times. However, a predominance of a specific desired brainwave state can be created at will, which allows a person to potentialize his or her capabilities towards achieving human excellence.

Brainwave frequencies are described in terms of hertz (Hz), or cycles per second, which are measured by the electroencephalogram (EEG) described above. Gamma brainwave frequencies are a high frequency pattern beginning at thirty-five hertz. There has been some evidence that gamma frequencies are associated with states of peak performance. Most light and sound instruments have the capability to generate gamma frequencies. While in this brainwave state, sensations are centered on

being mentally, emotionally and physically "charged" or extremely energized. These frequencies are the highest known brainwave patterns, but are considered to be part of the beta frequency category.

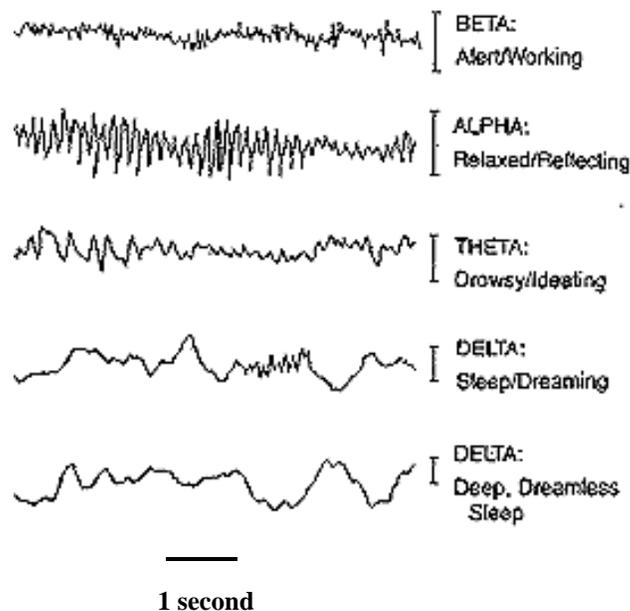


Figure 1. Sketch of beta, alpha, theta and delta brain wave patterns recorded on a chart recorder. (Extracted from *Jaggi, 1984*)

The four general categories of brainwave frequencies and their main characteristics

a. Beta (β) brainwaves: 14 -34 hertz

- beta brainwaves are characterized by logical, analytical and intellectual thinking, verbal communication and awareness of surroundings.

b. Alpha (α) brainwaves : 7 -14 hertz.

- they most commonly occur when we are calm and relaxed, yet mentally alert
- they also present at the lower or middle level of trance in meditation.
- these brainwaves are also present during daydreaming.

c. Theta (θ) brainwaves: 4 – 7 hertz

- characterized by being deeply relaxed and inwardly focused.
- they also present at the very deep level of trance in meditation.
- this state is also associated with rapid learning and the assimilation of new information with high retention, heightened motivation to activate goals, bursts of creativity, insight and new behavior patterns.

d. Delta (δ) brainwaves : 0.5 – 4 Hz

- being extremely relaxed, characterized by sleep.

2.3 Brain wave patterns during meditation

Left part (left hemisphere) of our brain controls the right side of the body and it also responsible for our logical thinking, interest in mathematics etc. The right hemisphere of our body controls the left side of our body and is responsible for our artistic abilities, music etc. When we are fully awakened more beta waves are emitted from both the left and right parts of the brain, but there is a grate disparity between the left and the right activity (see Figure 2 b). During sleep, neurons fire with more synchrony than during wakefulness. In the deepest stage of non-REM sleep, the dominate brain wave is called a delta wave. Under meditative trance, the neuron firing rates in the brain are such that both the parts are generating more alpha waves compared to the other waves and moreover both the left and the right brain hemispheric activities become well balanced (Figure 2c).

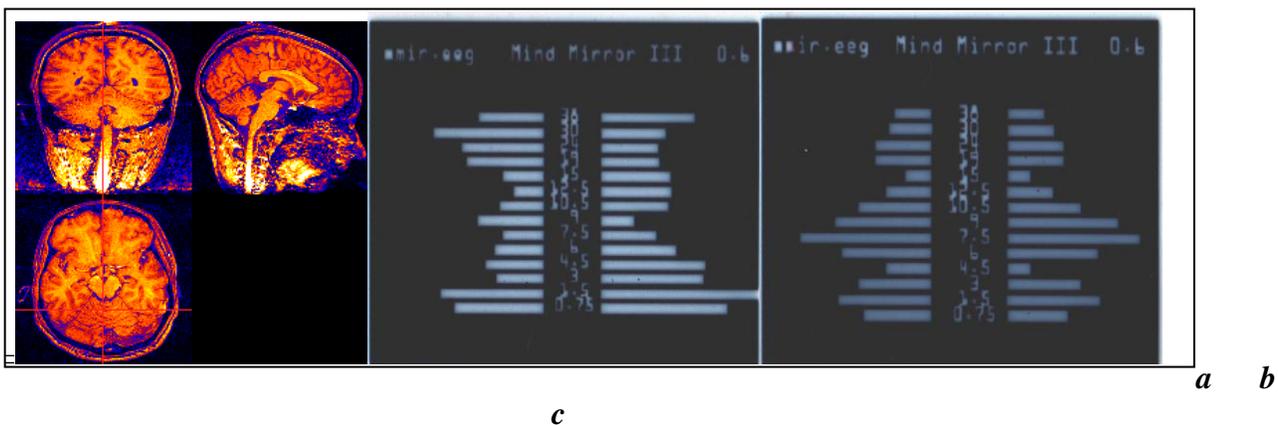


Figure 2. *a.* The human brain-three views, *b.* brain wave histogram for a non meditator and *c.* brain wave histogram of a meditator in trance with highest activity at alpha level in 7.5 Hz (Histograms are from 0.75 Hz to 38 Hz.).

3. Frequency Following Response (FFR)

If the brain generate say 7.5 Hz at meditation (trance state) if we can feed the same frequency from outside either as sound or vibrating light, one should go into a trance. This is the theory behind Frequency Following Response (FFR) technique. This technique was developed by Bob Monroe in 1975 where through the use of audio (headphones) and visual (eye frames with LEDs) stimulation, listeners are gently guided into specific states of mind. Brainwaves change frequencies based on neural activity within the brain, be it by hearing, touch, smell, vision and/or taste. These senses respond to activity from the environment and transmits that information to the brain via electrical signals. Hearing and vision are considered favorable senses for affecting brainwaves safely. By presenting these beats and pulses to the brain, within a few minutes, the brain begins to mimic or follow the same frequencies as the stimuli (the beats and pulses). This process is referred to as entrainment. In essence, these *light and sound* instruments speak to the mind in it's own language- the language of frequency. Since the human ear does not here frequencies less than 20 Hz, he used a headphone with one ear providing a sound having a frequency of 151 Hz and the other a manually variable frequency of 140-147 Hz so that the subtraction of the two frequencies will give a desired frequency of alpha, theta or delta. In order to reconcile these two signals, a part of the brain called the olivary nucleus creates a composite signal within the brain (often called a "binaural beat"). To accomplish this, the left and right sides of

the brain must communicate in a new way, and to facilitate this communication, new neural pathways are created linking the two sides of the brain.

3.1 Instruments to simulate meditation ?

The Frequency Following Response (FFR) that the mind experiences through light and sound stimulation provides a focus for the brain. This focus safely quells any internal dialogue or "brain chatter", and enables the listener to reach more quickly and effectively the optimum state of mind targeted for the task at hand (i.e. energizing, learning, relaxing, etc.). However, one should not get into unnecessary fears like whether an instrument could replace the meditation. This is a by product of meditation and actually gave concrete evidence, as believed by the west since a instrument is involved, that meditation is not gimmick, but a powerful tool. Of course the machine cannot take you to the Nirvana, as vidarsana(insight) meditation is a completely different process. This will only bring one to a deep trance, but no sooner than a daily meditation parishioner can do.

4. Meditation and Neuroscience

Use of neuroscience techniques to understand meditation's effect on the brain led scientists to discover new things about human biology. People have studied the connections between meditation and brain physiology for years. Only recently has research been rigorously performed, fueled by two developments (Lieberman, 2006).

i) One is Gage's 1998 discovery and subsequent studies that new cells can in fact grow in the adult hippocampus, an area of the brain associated with learning, memory and emotion. It had long been thought that cellular growth stopped in the adult brain.

ii) The other is the continual refinement of technology used to image and measure changes in the brain.

5. Scientific Findings on How Buddhist Meditation Will Improve the Quality of Life

Though the ultimate aim of a Buddhist is to attain Nirvana (*Nibbana*), and use meditation as a tool to achieve that goal, the effect of meditation is also available for the betterment of life here and now in the present life. The Buddhist way is not some thing, as mistakenly believed by many, limited to life after the death, but for the enhancement of the quality of life of its practitioner here and now. The following sections would give a brief introduction to the recent findings of the advantages of doing meditation.

5.1 Meditation reshapes and expands the mind to foster happiness and cultivate compassion

In the early 1990s, American scientist Richard Davidson travelled to India at the request of the Dalai Lama to meet with Buddhist monks who devote their lives to meditation. A Harvard-educated researcher at the University of Wisconsin, Davidson has since brought Buddhist monks to his lab. There he connected them up to an electroencephalogram, or EEG, to measure changes in the electrical activity of the brain (Lieberman,2006).

In his studies of monks, Davidson found that **electrical activity was heightened during meditation in an area of the brain called the left prefrontal cortex, just behind the forehead. Scientists have**

associated activity in this region with positive emotions, as opposed to the right prefrontal cortex, where increases are associated with negative feelings.

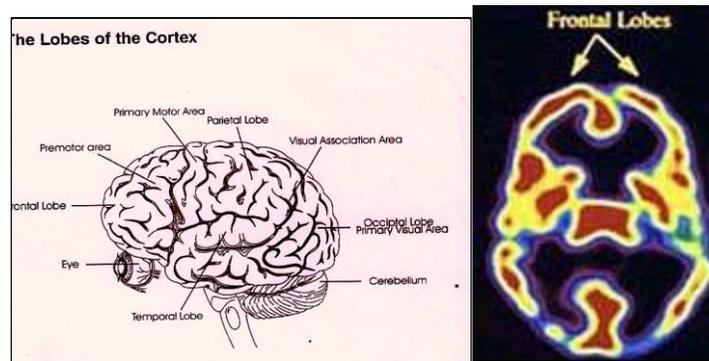


Figure 3. Lobes of the cortex (Left) and an MRI indicating frontal lobe activity(Right) (extracted from Kimble et.al., 1985)

More recently, Davidson has found that long time Buddhist practitioners of meditation can induce a heightened pattern of electrical signals called gamma-band oscillations – which are associated with concentration and **emotional control** – not seen in control groups. **These changes are sustained even after meditating** (Davidson, 2004).

These findings indicate that a person practicing meditation daily at least about 40 minutes will have a brain growth in the front left part responsible for positive emotions. In other words he will see the world in a positive way, positive aspects of situations that he encountered in daily life. **The most important thing is that even after meditation this positive attitude condition retains compared to non-mediators** who may collapse when a problem comes due to negative attitude, or get depressed.

5.2 Meditation will thicken the brain tissues, increase attention and sensory processing

At Harvard, Lazar has found that people who meditate daily (an average of once a day for 40 minutes) have thicker brain tissue in regions associated with attention and sensory processing. Her results, published in November in *NeuroReport*, showed that those regions were 20 percent larger than in control groups. **Practicing meditation regularly may slow age-related thinning of the frontal cortex, her study suggests. This was the first time we were able to show something really concrete, a measure of something that changes permanently** (Lieberman, 2006).

5.3 Increased oxytocin peptide will increase the well-being and sense of trust in social situations.

There are still many questions about what exactly is changing in the brain and what is behind the changes. UCSD's Patricia Churchland said meditation may alter production of peptides. More than 100 of the small-chain molecules populate the brain, mixed among the brain's billions of neurons, glial and oligodendrocyte support cells and blood vessels. One of these peptides, called oxytocin, has been associated with a general feeling of well-being, even a sense of trust in social situations. This is an area still under research condition. On psychological tests, **meditated subjects scored as being psychologically healthier, had more social poise, were less rigid and conforming, and were more**

self-accepting and creative. Another remarkable effect was that these subjects became very healthy. Emotionally, these people had improved relationships with other people as well as greater tolerance, understanding, and love of oneself and of one's world.

5.4 Meditation for better health

There are hundreds of research papers published throughout the world indicating health benefits of meditation. Research indicate that more than 20 weeks of meditation (one hour per day on the average) would reduce the blood pressure, anxiety and even depression (though meditation is not given for depressive people thinking that they will be further depressed). Results show that the plasma cortisol content in the body is less among regular meditators. Less cortisol means better functioning of the body's immune system. In other words **regular meditators will be much healthier than the non meditators and they are less prone to infectious diseases.** Meanwhile findings of Prof. Ian Stevenson (1990,1992) that thoughts can influence the skin lead to the development of another application of meditation - the beauty care. Instead of applying various types of creams on the skin to get a clear skin colour, **some beauty culturists now use meditation as the newest type of skin care** – an aspect described under the benefits of Metta Meditation in Buddhism. (Graphical representation of these results are omitted here to avoid the text elongation, but will be shown at the presentation).

5.5 Buddhist meditation produce lasting structural changes in the brain

Of all the concepts in modern neuroscience, it is neuroplasticity that has the greatest potential for interaction with Buddhism. Neuroplasticity, one of the hottest topics in brain science, refers to the brain's recently discovered ability to change its structure and function.

In an article in Medical News, (Nazario, Brunilda, 2004) it is reported that meditation may not only produce a calming effect, but according to the new research, **practice of Buddhist meditation may produce lasting changes in the brain.**

Researchers found that monks who spent many years in Buddhist meditation training show significantly greater brain activity in areas associated with learning and happiness than those who have never practiced meditation. The results suggest that long-term mental training, such as Buddhist meditation, may prompt both short and long-term changes in brain activity and function.

In the study, researchers compared the brain activity of eight long-time Buddhist monks and 10 healthy students. The average age of the monks was 49, and each had undergone mental training in meditation for 10,000 to 50,000 hours over the course of 15 to 40 years. The students' average age was 21. They had no prior experience in meditation and received one week of meditative training before the start of the study. Both groups were asked to practice **compassionate meditation**, which does not require concentration on specific things. Instead, the participants are instructed to generate a feeling of love and compassion without drawing attention to a particular object. Researchers measured brain activity before, during, and after meditation using electroencephalograms.

- They found striking differences between the two groups in a type of brain activity called gamma wave activity, which is involved in mental processes including attention, working memory, learning, and conscious perception.

- **The Buddhist monks had a higher level of this sort of gamma wave activity before they began meditation, and this difference increased dramatically during meditation.** In fact, researchers say the extremely high levels of gamma wave activity are the highest ever reported.
- **The monks also had more activity in areas associated with positive emotions, such as happiness.**

Therefore the brain, like the rest of the body, can be altered intentionally by strengthening circuits used regularly and weakening those engaged rarely.

After studying the brain projections of hundreds of Tibetan monks, the researchers concluded that just as aerobics sculpt the muscles, mental training sculpts the gray matter. The neuroscientists, in their experiment, compared brain activity in volunteers who were novice mediators to those of Buddhist monks at the Dalai Lama's residence in Dharamsala, who had spent more than ten thousand hours in meditation.

The novice mediators showed a slight increase in high-frequency brain activity or gamma waves, but **most monks showed extremely large increases of a sort that has never been reported before in the neuroscience literature**, said Richard Davidson of the University of Wisconsin, Madison, who led the research. **The study suggests that mental training can bring the brain to a greater level of consciousness.**

Although age differences may also account for some of the differences found by this study, researchers say that the hours of meditation practice, rather than age, significantly predicted gamma wave activity.

5.6 Two hours of meditation equals one hour of sleep ?

Bruce O'Hara, from the University of Kentucky, has been interested in claims by Buddhist monks that dedicated meditation can reduce the need for sleep. If true, meditation might be of value to people with sleep disorders or those whose jobs leave them sleep-deprived.

O'Hara first put subjects to a psychomotor vigilance test, which is a simple measure of reaction time. During the test, subjects press a button as soon as they see an LED clock display begin to tick. Most alert people push the button after about 200 milliseconds. The test randomly repeats over 10 minutes, and a subject's results are closely correlated with how sleepy they are, going into the test. Each subject, none of whom was an experienced meditator, took the test after spending 40 minutes in casual conversation, reading, sleeping or meditating. Only when the subjects meditated prior to the test did their scores improve. It is reported that twelve out of 12 of their first subjects all improved (on the test) following meditation.

O'Hara also tested subjects who deprived themselves of sleep the night before. Those who meditated right before the test performed better than those who did not. O'Hara next examined sleep-deprived subjects who took a nap right before the test. They actually did worse because it takes time to fully recover alertness after a nap. The biggest boost in performance was found to be short-lived. Meditating subjects, whether alert or sleep-deprived, still performed better on the test an hour after meditating, but their performance did decline. As for the question of whether meditation can replace sleep among practiced meditators, O'Hara says "it looks like there is a payback, but at best it's that two hours of meditation equals one hour of sleep." (Lieberman, 2006).

5.7 Relief for Insomnia –the sleeplessness

Most of the benefits described in Metta meditation as described in Mettnisamsa Sutta are being verified by modern science. He who does meditation sleeps well. Research indicates that those who rumble in the bed without sleep for 70-80 minutes could sleep within 10 minutes if practice meditation regularly (Graphical representation of these results are omitted here to avoid the text elongation, but will be shown at the presentation).

5.8 Meditation is good for students as it increases the IQ level, learning abilities and problem solving capabilities

Alpha level at meditation leads to what scientists call "whole brain thinking" or "whole brain functioning" where the two sides of the brain are working together in a synchronized manner, rather than in a manner where one hemisphere at a time is dominant. What is now known as "super-learning" began in the late 1960s and early 1970s with the work of Bulgarian psychiatrist Georgi Lozanov. Lozanov used deep relaxation combined with synchronized rhythms in the brain to cause students to produce alpha waves. In this state, he found that **students learned over five times as much information in less time per day, with greater retention. In some cases, as much as thirty times as much was learned.** One researcher, speech-language pathologist Suzanne Evans Morris, Ph.D., extensively describes the relationship between different brain wave patterns and learning, as well as other related states such as concentration, problem solving, receptivity, and creativity: "Receptivity for learning is related to specific states of consciousness. Predominant brain wave patterns are associated with different states of consciousness or awareness. For example, beta frequencies ranging from 14-26 Hz are associated with concentration, and alert problem solving; alpha frequencies (7-14 Hz) occur when the eyes are closed and a state of alert relaxation is present; theta (4-7 Hz) is associated with deep relaxation with a high receptivity for new experiences and learning. Results of an experiment conducted using students indicate that the **accuracy of solving mathematical problems, speed of solving mathematical problems and the IQ level of students subjected to regular meditation sessions increased compared to the non-meditating control group.** (Histograms of these results are omitted here to avoid the elongation of the text, but will be shown at the presentation).

The linear, sequential style of problem solving preferred by the left hemisphere is brought into balance with the global, intuitive style of the right hemisphere and limbic system (subcortex). This allows the learner to have greater access to internal and external knowledge and provides a milieu for expanding intuition in problem solving. **One of the by-products of hemispheric synchronization appears to be a highly focused state of attention. It also provides a greater openness and enthusiasm for learning. It also provide the ability to reduce 'mind chatter' and focus the attention which is critical for efficient learning.** Meditation or FFR techniques brings brain to its alpha level creating an internal physiological environment for learning which involves the whole brain.

6. Schuman Resonance – A Scientific Explanation to the Telepathy and Remote Viewing

The Schuman resonances are standing extremely low frequency (ELF) electromagnetic waves. Their frequencies are in the same range as brain waves. They vary in intensity locally and temporally, depending on the distance between the surface or the earth and the ionosphere, which form two conducting layers separated by an insulating layer. Schuman resonances are best measured by the horizontal component of the atmospheric magnetic field. They have been measured all over the

earth. The maximum intensity of first Schuman resonance mode of natural emissions occurs between 7-9 Hz with peak around 7.52 Hz (Bliokh, 1977). These waves travel around the earth in a fraction of a second.

These ELF waves seem to amplify brain waves, and through the quantum Zeeman-Stark Effect cause other changes. They also drive brain waves of the same frequency and of harmonic frequencies (Belyarev, 2003). When a person is doing meditation his brain will reach the alpha level described above and brain cells firing activity is at 7-14 Hz frequency range. So, external ELF waves may actually "scramble" the conscious process. In other words mind will tune to the information superhighway - the electromagnetic resonance at first Shuman resonance mode. This means that a person under meditative trance can obtain information from the outside world and moreover, he could send the information on what he wanted or what he plans to do to the world outside. In other word, hitherto unexplainable processes like how the remote viewing and remote influencing work can be explained using this model. It is said that when some priests in Himalayas had a wish to receive some thing in the morning, it will be offered by some laymen from the village at noon. This is remote influencing (RI). There may be hitherto undiscovered other explanations, but at least we have some scientific explanation to describe the concept of Telepathy now. In the USA there are academies opened on Remote viewing and remote influencing to teach these techniques.

Applications-i : Remote Viewing (RV) has become a technique used by many spy agencies throughout the world. It has been found to be highly valuable in collecting data by specially trained agents using mind power alone. Teams of remote viewers have been successfully operating throughout the world in many sensitive intelligence collection assignments. The US intelligence community declassified some of its methods in 1995 and many schools have sprung up world-wide that teach RV methodologies. For example the Academy of Remote Viewing is one of the such oldest (1997) RV teaching institutes in the USA.

Applications-ii : The author has recently conducted a research using 120 students in the advance level and university undergraduate level (17-23 age group) to apply this RV and RI technique in to their examinations. After a meditation session of one hour they were asked to use the last minute before they come out from the trance to visualize in vivid pictures how they study happily, how they confidently answer the question paper at the examination hall and finally how they express their happiness when they received the desired result. More than 80% of the students said that when they got the question paper at the examination, they felt familiarity with it as if they have seen it before. Many have received the desired result too like three A grades. Actually they have not seen the question paper or dreamt it before hand, but had studied mainly the sections that are appeared in the question paper. This phenomenon was not reported by the control group with no visualization done at alpha level.

7. A Buddhist Approach to Psychotherapy

Incorporating Buddhist ideas and philosophy into psychotherapy is not new - meditation has been used for some time as a form of relaxation and a way of helping an individual understand the workings of the mind.

However, according to Dr Belinda Siew Khong Khong of Department of Psychology Macquarie University, Australia, meditation can be used for personal growth beyond therapy if it is understood against the backdrop of the Buddha's teachings and integrated holistically with psychotherapy. She is

not a Buddhist, but aware about the Buddha's teachings. She conducts workshops on the integration of Buddhist psychology and philosophy in psychotherapy based on the principle that the Buddha teaches an attitude rather than an affiliation. Her main focus has been on the use of meditation and mindfulness as an adjunct to therapy.

Khong (2004) explains that in this teaching, the Buddha is describing a set of practices rather than a set of beliefs that the individual can use to overcome his or her own emotional suffering. Two types of meditation are commonly being used. The first type, known as concentration or tranquility meditation, encourages the individual to let go of negative thoughts that impinge by concentrating on one neutral object to the exclusion of all others. This is a popular tool used in psychotherapy to help the individual to quieten down the mind and to relax. The second type, known as insight meditation or mindfulness practice, is unique to Buddhism and is often used to complement concentration meditation.

Khong (2004) explains that once you calm down the mind you still need to deal with the feelings and emotions that come up. Mindfulness practice encourages the person to be mindful of whatever enters the mind. Mindfulness helps us to look at all the feelings and emotions as they arise, to name them, to see anger as anger and sadness as sadness without judging them or repressing them or carrying on an internal dialogue ("Why do I feel like this", or "I shouldn't feel so angry"). The practice of mindfulness teaches the art of acceptance and letting go, the key elements in the attitude that the Buddha encourages. According to Khong, through mindfulness you can see what is really triggering off your own feelings and emotions without allowing them to spiral. When you are not mindful you react. When you are mindful, you respond. This kind of attitude is the most powerful tool my clients take away from counselling because it gives them choice when they want to be angry or depressed because it gives you the emotional distance from the problem before you become reactive. When mindfulness is practiced alongside other complementary therapeutic approaches, the result is an incisive and powerful tool for empowering clients to understand and deal with their problems with less reliance on the therapist.

Sri Lankan experience - Dr. D V J Harischandra a Senior Lecturer in Psychiatry at the Department of Psychiatry, Faculty of Medicine, University of Ruhuna, Sri Lanka has written a book on "Psychiatric Aspects of Jathaka Stories" in 1998 incorporating his age old experiences on how he used Buddhist Jathaka stories to treat psychotic patients. "Jathaka" means births. In Buddhist scriptures this term refers specifically to the Buddha's previous births or existences. Dr. Harishandra has extensively used the role play technique to treat his patients mainly under group therapy. There are close to 550 Jathaka stories and with or without any psychotic problem if one even could read those stories he will have a great mental relief. There is a story related to any sort of problem that we encounter in our day-to-day life and the story will tell you how to face the situation.

8. Scientific Aspects of Buddhist Paritta Chants

'Mind not only makes a person sick, it also cures. An optimistic patient has more chance of getting well than a patient who is worried and unhappy. The recorded instances of faith healing includes cases in which even organic diseases were cured almost instantaneously.

In this connection it is interesting to observe the prevalence, in Buddhist lands, of listening to the recital of the *dhamma* or the doctrine of the Buddha in order to avert illness or danger, to ward off the influence of malignant beings, to obtain protection and deliverance from evil, and to promote health, prosperity, welfare, and well-being. The selected discourses for recital are known as "*paritta suttas*," (discourses for protection) .

From among the 24 partitas described in the Book of Protection (*Pirith Potha in Sinhala*), five parittas viz. 1) Factors of Enlightenment (Maha Kassapa Thera Bhojjhanga), 2) Factors of Enlightenment (Maha Moggallana Thera Bhojjhanga), 3) Factors of Enlightenment (Maha Cunda Thera Bhojjhanga), 4) Discourse to Girimananda Thera (Girimananda Sutta), 5) Discourse at Isigili (Isigili Sutta) by Buddha is said to be specifically discoursed to cure illnesses.

Originally, in India, those who listened to paritta sayings of the Buddha understood what was recited and the effect on them was correspondingly great. The Buddha himself had paritta recited to him, and he also requested others to recite paritta for his own disciples when they were ill. **This practice of reciting paritta is still in vogue in Buddhist lands. The habit of listening to the recital of paritta suttas among the Westerners too is growing slowly but steadily.**

Several factors is said to be combine to contribute towards the efficacy of paritta recitals.

(i). The Power of Truth

Paritta recital is a form of saccakiriya, i.e., an asseveration of truth. Protection results by the power of such asseveration. At the end of the recital of each sutta, the reciters bless the listeners with the words, etena sacca vajjena sotti te hotu sabbada which means "by the power of the truth of these words may you ever be well."

(ii). The Power of Virtue

Several discourses of the Book of Protection describe the virtuous life. The starting point in Buddhism is sila (virtue). Standing on the firm ground of sila one should endeavor to achieve a collected mind. If it is true that virtue protects the virtuous, then a person who listens to the recital of paritta suttas intelligently, in a reflective mood, with complete confidence in the Buddha's words, will acquire so virtuous a state of mind as would enable him to dominate any evil influence, and to be protected from all harm.

(iii). The Power of Love

The reciters of the paritta are expected to do so with a heart of love and compassion wishing the listeners and others weal and happiness and protection from all harm.

(iv). The Power of Sound

It is believed that the vibratory sounds produced by the sonorous and mellifluous recital of the paritta suttas in their Pali verses are soothing to the nerves and induce peace and calm of mind; they also bring about harmony to the physical system.

This section describes the results of some scientific experiments conducted in Sri Lanka by the author and a few other scientists in other countries to understand this fourth cause-the power of sound in pirith.

8.1 Science Behind Buddhist Paritta Chants

A research study conducted by Ven Madawala Upali Tero and the author in 2002 at the Kanduboda International Meditation Centre in Sri Lanka using the *Cool Edit* and *Band-in-a-Box* comp As such, seven notes would induce *raga* thoughts in your mind but not so with pirith and it will calm you down. It was also found that the reitiation of pirith gives best results when it is chanted at medium speed When the recitations are done in a hurry or very slowly by dragging the words and sentences like a song, the computer indicated more than 4 notes producing no soothing effect.

uter software packages and a computer connected microphone fitted to a stethoscope end revealed that Pirith sound gives only four notes contrary to the conventional music having 7 notes.

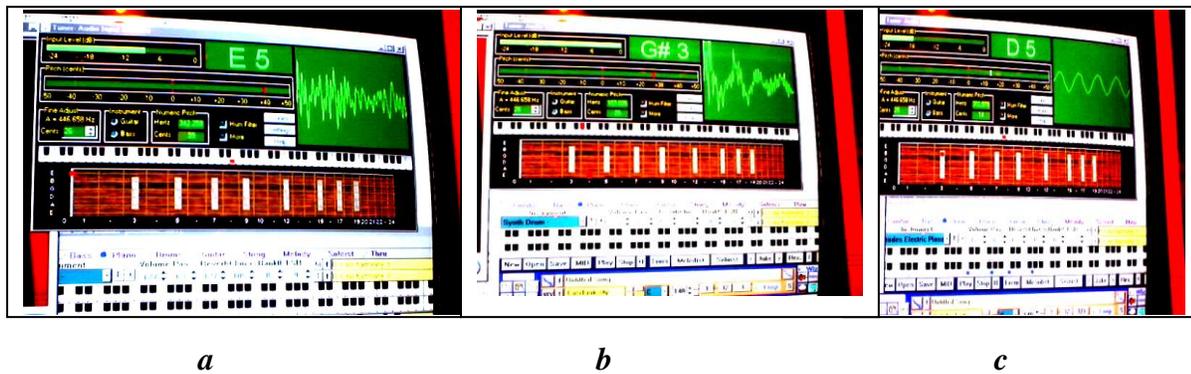


Figure 4. Computer analysis of music and paritta chants using the Cool Edit Programme. *a)* wave patterns of normal classical music-*disorganised rough waveforms*, *b)* and *c)* wave patterns of paritta chants –*smooth waveforms*.

When subjects are allowed to listen to pirith chants, it was found that within 10 minutes of the commencement of the pirith their heart beat reduces and the heart pulse amplitude halved and they come to an alpha state similar to what you get under a meditative trance.



Figure 5. Computer sound analysis chart indicating the reduction of heart beat and pulse amplitude of a person within 10 minutes after the commencement of listening to pirith chants.

This implies that listening to pirith is good for your heart and also gets the similar benefits that one get under trance condition in meditation Prolonged listening to a pirith chant done throughout a whole night could thus produce higher benefits similar those of meditation (benefits received at alpha level). Here we limited our research only to study the effect of sound. It was also found that live pirith chants made by priests or laymen produce better results than those of playing back the same pirith chant recorded in some form. Here the sound quality of the speakers affects very much.

8.2 Effect of paritta sound on water molecules in the body to cure diseases

A recent Japanese study conducted by Masaru Emoto shows that water when exposed to pirith sound for several hours and then frozen produced hexagonal shape ice crystals. Since our body is consisting of about 70% of water, when listen to the pirith, many water molecules in our body become hexagonal

aggregates (other wise pentagonal or some other shape). It has been found that such hexagonal water made our body and its cells healthy and disease free.

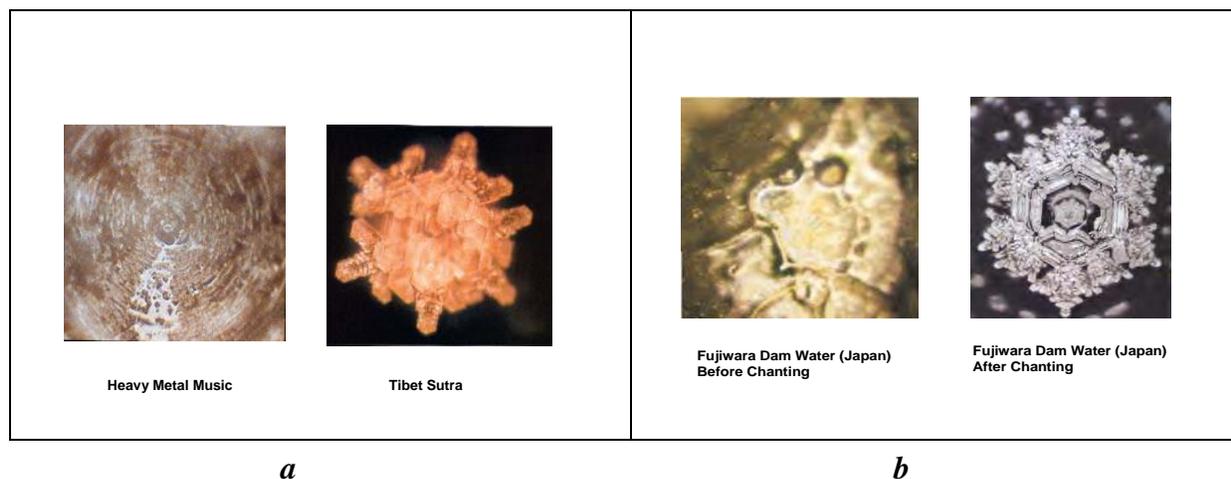


Figure 6. Water exposed to several hours of paritta chants and freezed shows clear hexagonal shape ice crystals (a) Same water sample - heavy metal produce no clear shape, but the Tibet Buddhist Sutta, (b) Fujiwara Dam Water (Japan) – before and after chanting paritta.

9. A Scientific Approach to Understand the Relationship Between Mind and Matter

David Bohm, a theoretical physicist attached to the Department of Theoretical Physics, Birkbeck College, University of London in United Kingdom has presented a new theory of the relationship of mind and matter (Bohm, 1990). His approach is based on the **causal interpretation of the quantum theory, in which an electron, for example, is regarded as an inseparable union of a particle and a field.** This field has, however, some new properties that can be seen to be the main sources of the differences between the quantum theory and the classical (Newtonian) theory. These new properties suggest that the field may be regarded as containing objective and active information, and that the activity of this information is similar in certain key ways to the activity of information in our ordinary subjective experience. The analogy between mind and matter is thus fairly close. This analogy leads to the proposal of the general outlines of a new theory of mind, matter, and their relationship, in which the basic notion is participation rather than interaction. Although the theory, can be developed mathematically in more detail the main emphasis here is to show qualitatively how it provides a way of thinking that does not divide mind from matter, and thus leads to a more coherent understanding of such questions than is possible in the common dualistic and reductionistic approaches (Bohm, 1990). These ideas may be relevant to connectionist theories and might perhaps suggest new directions for their development.

These new trends indicate that ultimately, as Dr. Pranav Pandya of India said, the confluence of scientific knowledge and spiritualism will lead to the complete development of mankind.

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