

The Science Behind The Sounds: Brainwaves And States Of Mind

Disclaimer: Nothing in this information is intended to diagnose, treat, cure or prevent any medical condition of whatever nature, and shall not be construed to mean medical advice, implied or otherwise. Information is intended for educational edification and use only.

Brainwaves are minute electromagnetic wave forms produced by electrical activity of the brain cells. They can be measured with sensitive electronic equipment – the electroencephalogram, or EEG. The frequencies of these electrical waves are measured in cycles per second, or Hertz (Hz). Brainwaves change based on neural activity within the brain and are closely tied to changes in mind or consciousness.

Brainwaves fall into a number of general classes which have grown steadily over the decades as new research has revealed more types of brain activity. The original four classifications of brainwaves:

- Beta (13-35 Hz),
- Alpha (7-13 Hz),
- Theta (3.5-7 Hz) and
- Delta (0.5 – 3.5 Hz)

has been expanded over the years to now also include:

- Epsilon (frequencies below 0.5Hz...discovered in 1989 by Dr. Jeffrey Thompson),
- Gamma (around 40Hz),
- Hyper-Gamma (100 Hz),
- Lambda (200 Hz),
- MU (9-11 Hz special activity),
- Default Mode Network (DMN – 0.1-0.2 Hz),

And a number of “borderline” brain frequency states first proposed by Dr. Thompson in 1990. Some of these borderline states have since been independently confirmed. These are:

- Beta/Alpha (13 Hz),
- Alpha/Theta (7 Hz),
- Theta/Delta (3.5 Hz),
- Delta/Epsilon (0.5 Hz).

Each of these brainwave states is associated with specific states of mind, briefly as follows:

1. **Beta:** Ordinary waking consciousness, linear, logical thinking and single point focus on a task.
2. **Alpha:** When the mind moves from the external to the internal mental world; a more holographic function rather than a linear function of the mind.

3. **Theta:** Associated with dreaming sleep, daydreaming states, Imagination and all creative activity of the mind, the time at night when emotional issues are dealt with in dreaming sleep.
4. **Delta:** This wave form is associated with deep sleep stage and when awake associated with stillness in the mind.
5. **Epsilon:** associated with extraordinary experiences, moments of epiphany, personal realization, “psychic” experiences, “precognitive” moments and spiritual revelation. This is a “metaphysical” state. Epsilon activity is closely related in brainwave speed to the DMN frequencies discovered with fMRI studies of the brain.
6. **Gamma:** Along with Hyper-Gamma and Lambda brain activity, was discovered during open brain surgery with EEG electrodes attached directly to the brain. Gamma activity is associated with cognitive consciousness because it is the only brain frequency which disappears with general anesthesia. Its function is described as the “Binding” frequency, in which all the information from all five senses processed in various locations in the cortex are “bound” together through Gamma activity so all our experiences synchronize together and make sense. Our research, at the Center for Neuroacoustic Research, indicates a possible deficiency of Gamma activity associated with Autism Spectrum Disorder.
7. **Hyper-Gamma and Lambda:** Still under research. These extremely high frequencies seem to be associated with certain types of meditative states and extreme high mental states of activity.
8. **MU:** This type of activity shows a specific type of electrical wave form in the brain, the “Wicket” pattern and is associated with what is called “Mirror Neuron” activity. This is how the brain learns socialization skills by mirroring brain activity in synch with the body language and facial expressions and intonations of others around. This is the “Monkey See / Monkey Do” neural activity. Deficiencies of or missing MU activity have been shown to have a direct relationship to Autism Spectrum Disorder.
9. **DMN:** (Default Mode Network). Discovered recently via fMRI studies of brain activity, this is the cutting-edge of neuroscience in the 21st century. The discovery was of four brain regions, frontal, posterior and right/left temporal regions that are all very strongly synchronized together in a very slow brainwave rhythm of one pulse every 10-20 seconds. DMN activity is associated with many things and new things are being discovered every year. The frontal zone is associated with one’s sense of self on the inside. The posterior zone is linked to sense of self related to all on the outside. The right / left temporal zones are related to one’s sense of the present moment compared with memories of the past which have led to the present moment vs. anticipated movement into the future based on the time stream moving forward. Many specific diseases and disorders are now confirmed to be directly related to a de-synchronization of the Default Mode Network of these four zones: Autism, ADD/ADHD, Depression, PTSD, Alzheimer’s, Parkinson’s, Schizophrenia, Bipolar Disorder, etc.
10. **Alpha/Beta:** This borderline state has been shown to be associated with high IQ “prodigy” children and also linked to high levels of information processing in the brain...high states of learning ability.

The Science Of Sound On This CD Set:

The various methods of the scientific use of sound on these CD's is the result of 30+ years of development in a clinical setting with thousands of patient visits using sophisticated medical monitoring equipment to fine-tune the types of sound which work the best for different neurologically related conditions. The positive responses clinically over the years has helped us to refine our techniques and proved to us that we are on the right track.

We use a variety of different acoustic techniques on these CD's which we will describe in more detail later in this booklet: Brainwave Entrainment, Hemisphere Synchronization, Default Mode Network Synchronization, Primordial Sounds, Acoustic Pacing, Psychoacoustic 3-D Recording technologies.

Brainwave Entrainment and Binaural Beats

The brain tends to match its own wave pulses to those of exterior sound pulses in the environment, a phenomenon known as "Acoustic Brainwave Entrainment". The first article on this was published in Scientific American in 1973 by a researcher named Gerald Oster. Research has shown that various brainwave states can be induced through hearing sound pulses beating at brainwave speeds. For instance, it is possible to induce a Delta brainwave state by listening to a soundtrack with sound pulses beating at a delta brainwave speed. Using this scientific principle we have developed sophisticated new ways of inducing this principle in soundtracks of music to subtly cause this brainwave entrainment response. When one's brain senses these hidden pulses, the brainwaves will tend to match them, inducing an altered state of consciousness. These hidden pulses are created by aligning two separate frequencies in the right/left headphone speakers. These two separate frequencies are slightly out of tune with one another and it is this difference which causes the beats which drive the brainwaves in entrainment.

This audio program will only change your brainwaves when you are listening to it. Listening does, however, create a learned neurological response in the nervous system over time. The more you go to a highly desirable state of consciousness, the more your mind learns how to be in this state, the easier it is to find your way to it. It's like going to a Gym for your brain. The effects are accumulative over time. Eventually you may be able to find this state of mind easily without the audio program, which you may want to think of as high-tech "Training Wheels" for enhancing your brain function. Remember, this audio program is not creating any states in your brain; it is merely enhancing the capacity of your brain to expand the abilities it already has but may have difficulty contacting. Look upon it as "stacking the deck" in your favor, to dramatically increase your ability to enter these states of consciousness.

Hemisphere Synchronization

One of the discoveries of Gerald Oster outlined in his Scientific American article in 1973, aside from the phenomenon of brainwave entrainment with binaural beats, was the fact that when these binaural beats were listened to with headphones it caused the right/left hemispheres of the brain to synchronize their electrical activity across the bundles of nerve fibers that connect the two halves of the brain together. This “Hemisphere Synchronization” was a novel discovery in neuroscience – no one had ever been able to do this before and now it was being done with sound waves. Clinically, we were to discover that using this principle of Hemisphere Synchronization for neurological conditions in which the communication between the hemispheres was compromised has extremely positive results in patients with conditions like Autism, ADD/ADHD, Concussion, Stroke, PTSD, Dyslexia, Bipolar Disorder and a number of others. One of the features of Autism is a spectrum of various degrees of deficient or non-communication of the hemispheres of the brain. Binaural Beats through headphones facilitating hemisphere synchronization is precisely what the brain needs to re-route neural communication again through these pathways and wake them back up.

Phased Modulation Binaural Beats

This audio program uses a unique process for building sound frequency binaural beat pulses into musical soundtracks. We use a system developed in 1982 by Dr. Thompson that is different from all other binaural beat soundtracks you might see on the market today. All other systems use Gerald Oster’s method of two separate sine waves to generate the binaural beats. Sine waves are man-made electronic tones with no harmonics, great for doing research studies, but awful to listen to. So, those who use sine wave must cover them over with something nicer to listen to, in other words they must “tack” nature sounds or music on top the sine waves to make them easier to listen to. **Our Phased Modulation technique creates the binaural beats directly inside the harmonics of all the sounds you hear on the soundtrack without the use of sine waves to make the binaural beats.** This means that wherever your mind goes following the sounds you hear, everything you hear is a carrier wave for the phase modulated binaural beats. There is no “dead wood” in the recording. **The pulsed modulations, which cause the brainwave entrainment and the hemisphere synchronicity response, are an integral part of the harmonics and overtones of the music and other sounds of the soundtrack.**

Primordial Sounds

The nature sounds you hear are also processed in a unique way. Sounds of crickets, birds, dolphins, whales, water, rainfall and the ocean – recorded by Dr. Thompson at locations around the world – are changed electronically to make some of them unrecognizable to the conscious mind. Changing octaves, speeding and slowing sounds and passing them through complex filters ensure that they will be recognized only by the unconscious mind. Electronically altering these sounds can produce strong physical and psychological

responses of relaxation, safety, openness and relaxation and increase the brain's ability to experience the entrainment states more quickly and easily.

NASA Space Sounds

This audio program also uses “Beyond Earth” nature sounds not found anywhere else in the world. In 1989, representatives associated with NASA and JPL provided Dr. Thompson with sound recordings taken from the Voyager I & II spacecraft as they passed by the outer planets of our solar system – Jupiter, Saturn, Uranus and Neptune. Dr. Thompson has carried out extensive research of the therapeutic benefits of these sounds, charting their effect on the unconscious mind for deep relaxation, stress reduction and access to the deeper parts of the self. These represent a deeper level of “Primordial Sounds” and are unique to Dr. Thompson's field of study.

Psychoacoustic 3-D Recording Processes

The music and nature sounds in this audio program are especially powerful because of the extraordinary three-dimensional recording techniques used. Instead of recording with only two microphones, resulting in a simple stereo effect, Dr. Thompson records nature sounds using clinically developed 3-D microphones worn directly at the ear positions on the head. These recordings reproduce authentically the environment of the sound – the interaction of sound waves with both the ears and the rest of the human body. As you listen, the sounds move around, above, below and in some cases through your body.

Specially Designed “Non-Linear” Music

The music on this audio set is highly complex, multi-tracked compositions of many layers of sound. You will notice that there are many types of “musical environments” which the music moves through. Many of the techniques used in the orchestration of these soundtracks require new, creative, “outside the box” musical ideas to help enhance the subconscious open state required for the best entrainment response, the best relaxation response and the best hemisphere synchronization response. We call this music “Non-Linear” Music.

How To Use These Soundtracks

These soundtracks are a training program for the brain and nervous system, so they must be used as if going to a gym for the brain. This means regular use on a daily basis with headphones. Use the Delta CD at night to help get to sleep if this is a problem or an issue – No Headphones Are Necessary For Use to help Get To Sleep With This CD. Use the other CD's in the set with headphones in the following order each one used for one week before moving on to the next CD. At the end of this cycle of using all the CD's for one week each, repeat this process in an extended cycle for six months to one year.

About The Composer

Dr. Jeffrey Thompson began experimenting with sound pulse patterns and their effect on the brain in his holistic health center in Virginia in 1981. In 1988, he established the Center for Neuroacoustic Research in Encinitas, California. His clinical research with thousands of patients over the years has led to groundbreaking discoveries in how sound frequency patterns built into music musical tracks induce brainwave entrainment. Dr. Thompson has taught courses in Behavioral Psychoacoustic and Neuroacoustic Therapy, each accepted by the state of California for Ph.D. credits in clinical psychotherapy. His work is one of a handful of leading-edge techniques chosen for research at the University of Virginia Medical School, which was funded through an NIH grant as part of the Center for the Study of Complementary and Alternative Therapies (CSCAT). Fortune 500 companies, healthcare professionals, clinics, hospitals, meditation groups and individuals worldwide use Dr. Thompson's high-tech musical soundscapes for deep relaxation, healing, inner exploration and meditation.

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