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A Brief Introduction to Light and Sound

by Richard Daab

The study of "brainwaves" has played a vital role in the understanding of how the brain and mind function. Discovered in the 1920s by German researcher Hans Berger, these tiny electrical signals mirror the shifting patterns of mental activity. They are measured by attaching special sensors, called electrodes, to the scalp; these pick up brainwave activity which is then measured by an instrument called an electroencephalograph, or EEG. Brainwave activity tends to fall into four groups: beta, alpha, theta and delta. These categories are associated with the rapidity of oscillation (frequency) of brainwaves. As it turns out, certain patterns of brainwave activity are also associated with specific mental states.

Beta is associated with normal, waking consciousness; attention directed towards the external environment. You are most likely in the "beta state" as you read this. Beta waves oscillate between approximately 14 and 30 times per second (Hz).

Alpha is relaxed, not thinking about anything in particular, sometimes a pleasurable feeling of "floating". Often dominant in certain kinds of meditation, alpha waves have for the past twenty years been associated with calm, lucid mental states (the "alpha state"). They are also often detected during dream sleep. Alpha waves oscillate between 9 and 13 times per second.

Theta Found in states of deep relaxation, theta activity is also associated with bursts of creative insight, twilight ("sleep") learning and vivid mental imagery. It is also found in more advanced meditators. Theta waves oscillate between 4 and 8 times per second.

Delta This slowest of brainwave activity, is found during deep dreamless sleep and sometimes in very experienced meditators. They oscillate between 1 and 3 Hz.

Your brainwave activity is constantly shifting and changing during the day and night. Virtually every form of mental and physical activity will cause changes in this activity. Abrupt, unexpected noises or other events will quickly alter your brainwave patterns. Even watching TV can dramatically alter brainwave activity in an undirected manner.

Over the years many techniques have been developed to allow you to enter these states, particularly alpha and theta, at will. Most methods, such as meditation, require years of regular practice to master. Alpha wave biofeedback, quite popular in the 70s, re-quires the sometimes awkward placement of electrodes as well as considerable practice.

The Frequency-Following Effect

In the 1940s researcher Gray Walter discovered that brainwave activity tends to mirror flickering light, particularly in the alpha and theta frequencies. This effect has become known as the [frequency-following effect.} A familiar example is the tendency to slip into a relaxed or dream-like state while gazing into a fire-the flicker rate of which happens to average in the alpha/theta range!

More recently, sound has been shown to produce similar results, particularly pulsed sound and binaural beats. This last effect, binaural, results when one ear hears a pure tone of a slightly differing pitch than the other ear. The brain then actually synthesizes the difference between the two. The portions of the brain associated with hearing tend to fall into step with this pleasant, gently pulsing rhythm. The combination of pulsed light and binaural beat frequencies can be a particularly effective tool for relaxation and preparation for meditation. Pulsed sound in the form of musical rhythms has been entraining people for thousands of years.

Research conducted at the Monroe Institute and elsewhere suggests that both binaural beats and flickering light stimulation can synchronize the activity of the left and right hemispheres of your brain. It is thought that this synchronization can increase the flow of information between the two hemispheres, thereby accelerating learning and increasing creativity.

Altering your mood

Another benefit of light/sound technology lies in its ability to interrupt negative emotional response loops. Examples of such "loops" include moderate levels of anger, worry, sadness, irritability and depression. Let's say that you've had a tough day at the office. On your way home a driver cuts sharply in front of you without signalling, nearly causing an accident. You arrive at home with a "short fuse", growling at your children or spouse. You realize that you are experiencing an undesirable mental state, but don't know quite how to change it. All too often, the solution may be to have a few drinks or switch on the TV. A nap can be effective, but you don't want to take the time. What are the alternatives?

Before showing you how to reduce this sort of emotional response, let's examine what happens when an event has a negative emotional impact. When the event first occurs, you respond directly. So when your boss snarls at you, you respond internally, even if you cannot voice your response directly. The problem lies in what can happen next: you mentally "act out" the exchange a number of times, and respond emotionally to each of these imaginary events. This is what we call a negative emotional response loop, because you are repeating (looping) your emotional response in a series of make-believe events that can stretch out over hours or days. Often times you may not even be aware that this process is taking place. If your boss is a real jerk, then after a number of unpleasant encounters you may become upset just by being near him or her.

An awareness of your mental process is an important step in changing your emotional response. Another step is to interrupt the feedback loop. Sleep is an effective way to do this, which is why you often wake up feeling refreshed and renewed. Nobel Prize winner Sir Francis Crick hypothesizes that dreaming serves a

necessary function by clearing away the various loops and impressions of the day on a synaptic level.

A much faster technique is to run a session with a well manufactured AVE device. The trick is to run a session that is long enough to divert and refresh you, but not long enough to put you to sleep. Why is this effective? Because the pulsing light and sound saturates your senses and constantly directs and diverts your attention towards the rhythms and patterns of the experience. Try it! Chances are that after a few weeks of regular use, you will generally feel calmer and more centred.

For more information about audio visual entrainment and how you could benefit from a personally programmed AVE device, please contact Life Systems International.

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