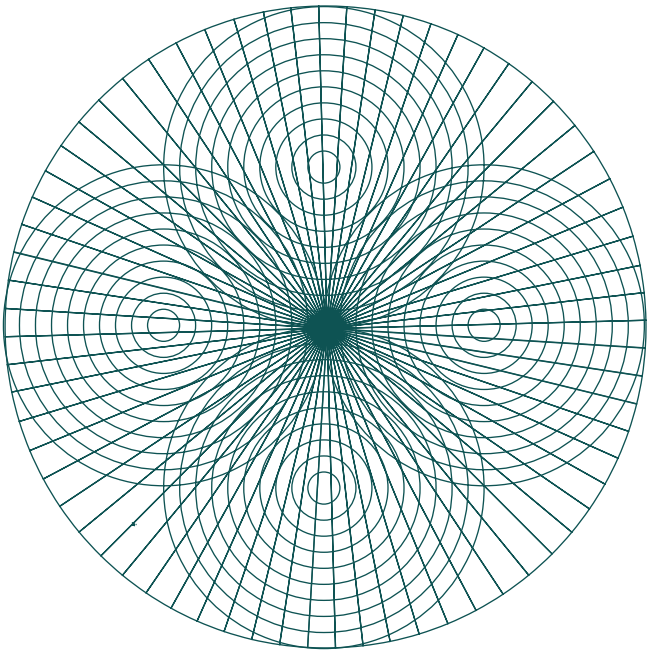
EYES, EARS & BRAIN

by Buddy Hanson



Throughout our lives, the optical nerves guide us through an elaborate symphony of light, color, shape, pattern and texture. The eyes are biological cameras, absorbing light and capturing spectacular visual detail. The ears are sensitive microphones which also capture energy but of a different type. Then we have the brain, a highly sophisticated chemical computer, working perpetually to process energy that is collected by our senses. Thoughts, memories, dreams, movement and emotions are all processes of the brain, like an array of sophisticated software applications. Each brain operation is a program which serves a unique purpose and builds a different part of our daily experience. Together, the eyes, ears and brain are a powerful synergistic system. Working as a team, they help us derive meaning from a complex network of sensory input and audio/visual information. Ultimately these organs form our bridge between internal and external experience.

As a designer, my role is to identify and explore subject matter which stimulates new bridges of experience, connection and meaning. Combining audio with visual, I develop projects which follow a discipline similar to the scientific method, with roots in observation and research. I am far from a real scientist. However I have found that the scientific methods of research, observation and intellect are useful (and fun) when directed towards creative applications, such as: art, design and research.

In my work, instruments and images (ears and eyes, sound and light) are parallel interests. Over the years, I've studied bits and pieces of both subjects. I once interviewed a optician in London to learn more about the anatomy of my own eyes. Apparently, human eyes contain tiny photoreceptors, called rods and cones, which carry visual information to the brain. For example, rods are sensitive to low energy but do not detect color. Cones are sensitive to high energy and detect color. In college, I wrote a research paper on the history and origin of royal purple pigment, which was originally extracted from the inner lining of a shell fish called a purpura (now extinct). The brilliant purple pigment was dried and pulverized into a fine powder or pigment and used for vibrant fabric dyes and inks. Royal purple gets it's name from the precious

quality of the pigment, which was rare and expensive. Only people of nobility and wealth could afford royal purple items, hence the name "royal" purple. Also in college, I explored ultra-violet light fixtures in a lighting design course offered through the interior architecture program. Ultra-violet light has always fascinated me and it turns out that tonic water and anti-freeze glow brilliantly under a black light. Another fun fact, finger print dust (the kind used in criminal investigations) is actually industrial strength fluorescent pigment. It is also ultra-violet active and glows brilliantly under a black light. These tid-bits are interesting and entertaining. However the really interesting audio/visual science is the relationship between the physics of light and sound energy itself.

Images and sounds consist of two specific bands of wave form energy, which are are a small part of a much larger energy field. This larger energy field is known in scientific terms as the electromagnetic spectrum. The visible spectrum contains all of the usual, primary and secondary colors: red, blue, yellow/green, orange and violet. Just outside of the visible light/color spectrum there is infrared and ultraviolet light (my favorite); then microwaves and x-rays; and a little further there is radio and gamma. By scientific definition, light is electromagnetic radiation, which is visible energy. On the other hand, sound is by definition resonant vibration, which is invisible energy. Note that both contain energy but each is of a different character.

Light and sound are measured according to the number of vibrations (oscillations) per second and this vibration is interpreted geometrically as a wave form (or Hertz). Hertz is a unit of measurement to explain the character of each wave form. The difference between them is significant because the vibrations per second is dramatically different. The following list explains the different levels of measurement:

HERTZ	=	Hundreds	of vibrations/oscillations per second
KILOHERTZ	=	Thousands	of vibrations/oscillations per second
MEGAHERTZ	=	Millions	of vibrations/oscillations per second
GIGAHERTZ	=	Billions	of vibrations/oscillations per second
TERAHERTZ	=	Trillions	of vibrations/oscillations per second

Our optical nerve is sensitive to light waves in the range of 450 - 750 THz (terahertz), which amounts to trillions of vibrations per second. On the other hand, we are sensitive to sound in the range of 20 - 20,000 Hz (hertz), which is thousands of vibrations per second. In sound, low frequencies (bass range) have a small number of cycles per second. High frequencies (treble range)

have a large number of cycles per second. To draw a comparison between a light wave and a sound wave, consider that 1 terahertz equals 10 to a power of 12 (1 with 12 zeros behind it). On the other hand, we detect sound waves at a minimum range of 20 vibrations per second. In other words, there is a significant difference between light energy and sound energy. Light energy consists of very high levels of vibration. Sound energy contains a significantly lower level of vibration. The gap between the two, light & sound, is enormous. Yet, somehow, regardless of the differences in sensitivity to vibration, our eyes and ears are sympathetic to one another and the brain combines both forms of light and sound energy into a single simultaneous experience. Our brain is basically a calculating sponge, soaking up light and sound energy, decoding it and feeding it to the other functional areas of our experience. It's worth noting that our eyes and ears are calibrated to tune into specific areas of the energy spectrum and ignore other areas of energy. The question of why we perceive one form of energy and not another is a mystery.

Casting differences aside, our eyes and ears are both sensitive to the electromagnetic spectrum. The relationship is synergistic and unique. Both organs, eyes and ears, rely on the brain for processing power to build our experiences. The synergy between these three parts of our nervous system is sophisticated and profound. Overall, we carry a powerful sensory experience system, which is capable of detecting two very different - low and high - bands of energy within a much larger energy field. Perhaps this explains why television and movies (a blend of light & sound) are so mesmerizing. One second of television transmits a lot of energy into a single moment of eye, ear and brain experience.

As a designer, I consider audio/visual science as biologically significant and artistically very compelling. The eyes, ears and brain are the tools that provide us with our actual image of reality, which we perceive through a tightly woven fabric of light and sound waves. In my view, sound and light are essentially parts of the same whole. Both types of energy are levels of vibration. Light carries high energy; sound carries low energy; and brain crunches the numbers - three parts of one synergistic symphony of light and sound. My work aims to build bridges within this complex synergistic system, in an effort to discover meaningful relationships between light and sound.