

An introductory exploration of Light and Color

Initially my exploration began with my interest of how color and sound may be combined in energy body healing work. As I researched color, I quickly realized that I first needed to better understand light, or radiant energy, in addition to our coursework in sonic energy, before contemplating the incorporation of color.

In basic high school physics, Energy is defined as a measure of the ability to do work. (I don't much like that definition but for the purposes of my exploration I accept it.) There are 2 main categories of energy, either kinetic or potential. Kinetic energy is determined by the movement of an object, while potential energy reflects the potential of an object to have (or to be in) motion. Energy can be further categorized by the forms it takes including Electrical, Mechanical, Thermal, Nuclear, Chemical, Electromagnetic (radiant or light), and Sonic.

In physical sciences, mechanical energy is the sum of potential energy and kinetic energy. In Chemistry, energy is the potential of a chemical substance to undergo a chemical reaction to transform into other substances. In biology, energy is an attribute of all biological systems from the biosphere to the smallest living organism. What is most provocative to me is that Energy can neither be created nor destroyed but only changed from one form to another. *I wonder, is this really true? While I am intrigued by the question the answer is beyond this paper.*

In the world around us, **Energy is transported** via 2 important ways, either via mechanical waves or electromagnetic waves. The basic definitions of wave forms are 1) disturbances in a particular physical medium or a field resulting in a vibration or oscillation (this is familiar); or 2) the **transmission of energy** from one point to another. Further, in our coursework we've been introduced to the basic properties of waves including amplitude, wavelength and frequency.

Mechanical Waves are caused by a disturbance or vibration in matter, whether solid, gas, liquid, or plasma. These waves move through a medium by causing the molecules to bump into each other *like falling dominoes* transferring energy from one to the next.

Electromagnetic Waves travel not only through air and solid materials, but also through the vacuum of space. They consist of 2 waves oscillating perpendicular to one another: One of the waves is an oscillating magnetic field; the other is an oscillating electric field. These fields transport the type of energy we call electromagnetic radiation, radiant energy (or light). Charged particles—such as electrons—create electromagnetic fields when they move. This vibration creates a **wave** which has both an electric and a magnetic component.

We classify and arrange electromagnetic waves according to their various wavelengths and frequencies. The resulting **electromagnetic spectrum** is the range of light rays. Of which, only light rays that fall between certain frequency and wavelength are visible to human eyes, the rest are not. What's more, all electromagnetic radiation, regardless of wavelength or frequency, travels at the speed of light. In theory nothing can travel faster than light: 186,282 miles per

second, in a vacuum. *The question if sound travels faster than light has been raised, but is beyond the scope of this paper.*

A vast range of electromagnetic waves are created when energy, light, is absorbed or emitted by electrons. At the microscopic level, an electron moves to a higher state of energy when it absorbs energy or drops to a lower state of energy when it emits energy. Depending upon the atom, different amounts of energy are required to move the electron up or down. This movement is referred to as Transition. The moving charge of the electron creates an oscillating magnetic field that creates an oscillating electric field perpendicular to it.

As I research more I come across photons, which is a topic found in some metaphysical books and such, but the meaning has been a little elusive to me, so I explore more to get a better understanding. What are photons?

The **Photon** is the smallest discrete amount or quantum of electromagnetic radiation. **It is the basic unit of light.** A photon quantum is a packet of energy that is absorbed or emitted by atoms and molecules. Not only is light made up of photons, but all electromagnetic energy – across the spectrum (i.e. microwaves, radio waves, X-rays, and etc.)--is made up of photons. What's really intriguing to me is that photons obey the laws of quantum mechanics, which means that their behavior has both wave-like and particle-like aspects. (Wave-particle duality: Einstein won a Nobel prize in physics for his work on this concept of duality.)

Now with my elementary understanding of Photons, I return to the Electromagnetic Spectrum. Radiation can be described in terms of a stream of [photons](#), each traveling in a wave-like pattern at the [speed of light](#). Each photon contains a certain amount of energy. The different types of radiation are defined by the amount of energy found in the photons (i.e., radio waves have photons with low energies, up to the most energetic of all, gamma rays).

And now I get to color, drum roll please....A **photon's** energy **determines** its **color**: the more energy, the shorter the wavelength (and higher the frequency), the 'bluer' the **color**. An electron can only absorb or emit energy that lets it change levels, so it can only interact with certain **colors** of light. An object appears to be colored because of the interaction of white light with the object. White light hits an object, the object absorbs only certain parts of the light (photons, energy), and the light emitted by the object—the color that remains—is the color that we detect.

Now with this elementary understanding of light and color, I can begin to contemplate how color is associated with musical notes. The use of color associated with the 7 main chakras holds a great deal more depth of meaning for me and when I get 'hits' of color when I meditate or do energy work, now I can relate it all to frequencies and wavelengths of photons. It's all just energy in different radiant forms.

Endnote

And what colors correspond to my first favorite song, Little April Shower, from my Bambi album? I would play this song over and over and over again on my little portable record player. Now I listen and hear some beautiful dimension, tones, and pitches. The percussion instruments at the beginning, triangle and oboe, and vocals C-G-C-G-C-G-A. All evoke nature and lightness for a little 5 year old. It's activating but soothing too.

Drip, drip, drop
Little April shower
Beating a tune
As you fall all around
Drip, drip, drop
Little April shower
What can compare
To your beautiful sound

Sources:

Theatlantic.com

Cosmosmagazine.com

Crash Course

Kahn Academy

NASA.com

Science.com

Space.com

Wikipedia