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COLOR AND VISION

Energy radiates out from the sun in waves. These radiant energy waves are of varying frequencies, or lengths. Short wavelengths can be smaller than a billionth of a meter. Very long waves, like radio waves, can be as long as a kilometer. The range of these waves is called the electromagnetic energy spectrum. The human eye can only detect a very small portion of these wavelengths, called the visible spectrum, ranging from 380nm to 760nm.

Gamma	xray	ultraviolet	visible	infrared	microwaves	radio & television waves

The lining of the human eye, the retina, is considered to be part of the brain. It is a complex nerve structure containing photoreceptors that are light-sensitive, and are responsible for translating incoming light into electrochemical nerve impulses. Because of how they are shaped, these receptors are known as rods and cones.

Rods function in low light and are responsible for night or low light vision. The rods in the retina are sensitive to a broad range of light intensities but don't distinguish color.

Cones contain photo pigments, which are light-sensitive chemicals. These photo pigments contribute to the sensation of color. The cones are sensitive to different wavelengths, which the brain interprets as color. These wavelengths, in their pure form, represent the colors red, green, and blue. Varying combinations and intensities of these wavelengths are interpreted as secondary colors by the brain, allowing extremely subtle color distinction.

The information from the rods and cones travels from the retina along the optic nerve to the brain. If some of the rods and cones are defective, the viewer's interpretation of some colors will be affected, and color blindness may result. Some individuals are born with these color vision abnormalities.

Artificial light sources are compared to sunlight with what is called the Color Rendering Index (CRI), a metric indicating the percentage of the visible spectrum delivered by the source. For example, daylight is 100CRI (that is, it contains all the visible spectrum). Incandescent light is also 100CRI. Older warm-white & cool-white fluorescent sources are rated 62CRI, a poor color rendering choice as it only contains 62% of the visible spectrum. Standard metal halide is about 65CRI (not much better), and high pressure sodium is 22CRI – a very limited portion of the spectrum (mostly yellows).

T5 comes standard in 85CRI, which is extremely representative of daylight CRI.