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## Vision: Color Theories

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Every object seems to bear one or more colors, making our world look brightly colored. Blue waters, green grass, and colourful clothes – these do not have color at all.

Psychologists say that color is an experience of the mind. All objects only reflect or produce light in different intensities, amplitudes and wavelengths. The process by which light information is processed through the sensory organs and the brain can be explained by two theories – the Trichromatic Theory and the Opponent Process Theory.

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## Trichromatic Theory

The process of color vision starts in the retina according to the Trichromatic Theory. This theory was developed by Thomas Young and Herman von Helmholtz, and thus it is also called the Young-Helmholtz theory. In the trichromatic theory, they proposed that the retina is comprised of three distinct types of cones or color-sensitive photoreceptors. Each of these types react to light that has three discrete wavelengths – blue, red, or green. When the activation of these cones occurs, may they be stand-alone or in combination and in different intensities, causes us to perceive that color/s of the object.

A process called additive color mixing occurs when different colors are mixed, producing addition of wavelengths and thus, more light. The opposite of this is subtractive color mixing, in which the wavelengths are diminished causing lesser light. White light results from the

mixing of the colors of red, orange, yellow, green, blue, indigo, and violet light. However, the paint forms of these colors result to muddy brown when mixed.

The Trichromatic theory <sup>[1]</sup> is useful in diagnosis of color blindness, a medical condition that leaves a person unable to determine between two or more colors. Most people afflicted with this hereditary disorder are dichromatic people. This means that they are only able to sense two out of three wavelengths of light, with red or green as the most common wavelength that they could not sense.

## Opponent Process Theory

This color theory was proposed by Ewald Hering. The Opponent Process Theory states that there are color receptors present in the visual system that respond to the three pairs of colors in an opposite manner, thus the name of the theory. These 3 color pairs include black-white, blue-yellow, and red-green. The theory suggests that a blue light's wavelengths activate color receptors corresponding to "blue". However, these color receptors corresponding to blue light are turned off by yellow light's wavelengths. This concept also applies vice versa, as well as in other color pairs.

The Opponent Process Theory is useful in explaining why people also perceive yellow as a primary color rather than a combination of colors, along with the primary colors red, blue or green as explained by the Trichromatic theory.

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### Links

[1] <http://www.sparknotes.com/psychology/psych101/sensation/section2.rhtml>