## HUE, VALUE, SATURATION

What is color?

Color is the visual byproduct of the spectrum of light as it is either transmitted through a transparent medium, or as it is absorbed and reflected off a surface. Color is the light wavelengths that the human eye receives and processes from a reflected source.

Color consists of three main integral parts:

- hue
- value
- saturation (also called “chroma”)

**HUE** - - - more specifically described by the dominant wavelength and is the first item we refer to (i.e. “yellow”) when adding in the three components of a color. Hue is also a term which describes a dimension of color we readily experience when we look at color, or its purest form; it essentially refers to a color having full saturation, as follows:

When discussing “pigment primaries” (CMY), no white, black, or gray is added when 100% pure. (Full desaturation is equivalent to a muddy dark grey. True black is not usually possible in the CMY combination.)

When discussing spectral “light primaries” (RGB), a pure hue equivalent to full saturation is determined by the ratio of the dominant wavelength to other wavelengths in the color.

**VALUE** - - - refers to the lightness or darkness of a color. It indicates the quantity of light reflected. When referring to pigments, dark values with black added are called “shades” of the given hue name. Light values with white pigment added are called “tints” of the hue name.

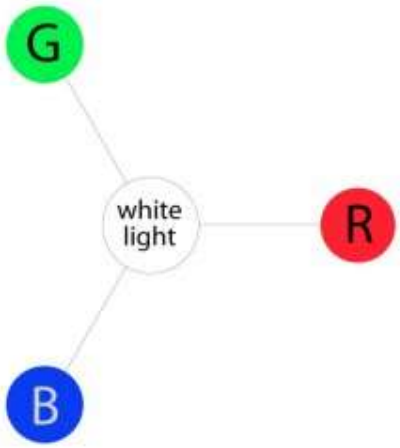
**SATURATION** - - - (INTENSITY OR CHROMA) defines the brilliance and intensity of a color. When a pigment hue is “toned,” both white and black (grey) are added to the color to reduce the color’s saturation. In terms of the “additive” light color model, though, saturation works on a scale based on how much or how little other hues are represented in the color.

## All Color Starts With Light

Regardless of the two Additive and Subtractive color models, all color is a result of how our eyes physically process light waves.

**Hues**

The three primary hues in light are red, green, and blue. That is why televisions, computer monitors, and other full-range, electronic color visual displays use a triad of red, green, and blue phosphors to produce all electronically communicated color.




**RGB Primary Color Triad**

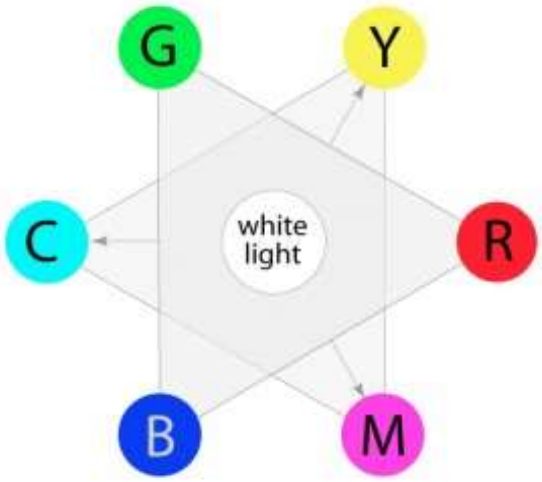
As we mentioned before, in light, all three of these wavelengths added together at full strength produces pure white light. The absence of all three of these colors produces complete darkness, or black.

## Mixing Adjacent Primaries = Secondary Hues

**Making Cyan, Magenta, and Yellow**

Additive and subtractive color models are considered their own unique entities for on-screen vs. print purposes. The hues CMY are produced as secondary colors when RGB light hues are mixed:

1. Blue + Red light –> Magenta
2. Red + Green light –> Yellow
3. Green + Blue light –> Cyan




**CMY Secondary Light Colors**

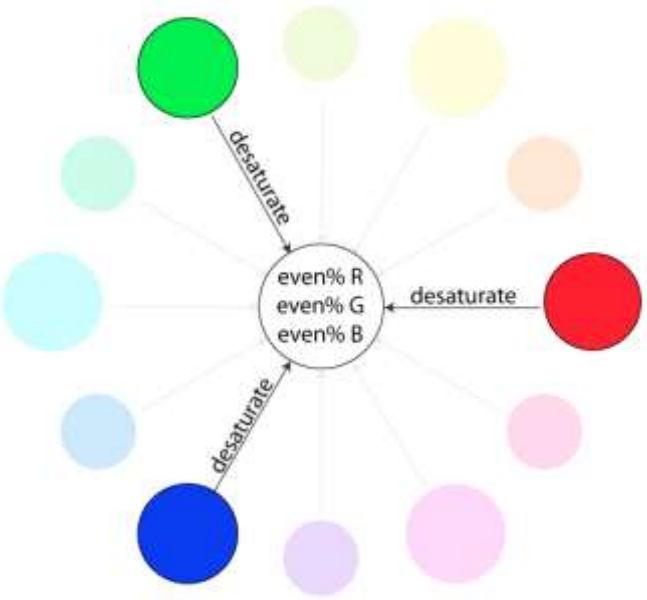
**Overview of Hues**

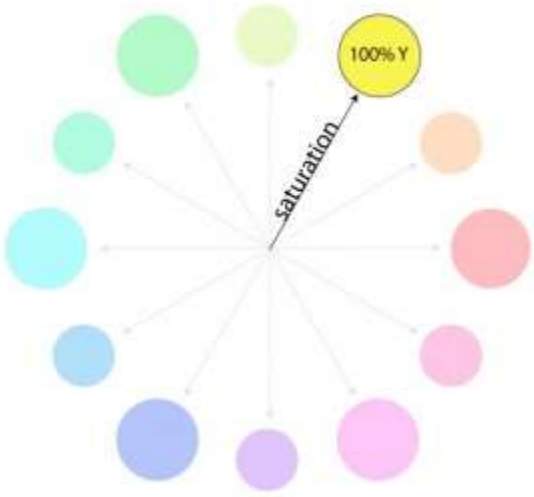
The colors on the outermost perimeter of the color circle are the ”hues,” which are colors in their purest form. This process can continue filling in colors around the wheel. The next level colors, the tertiary colors, are those colors between the secondary and primary colors.

**Saturation**

Saturation is also referred to as “intensity” and “chroma.” It refers to the dominance of hue in the color. On the outer edge of the hue wheel are the ‘pure’ hues. As you move into the center of the wheel, the hue we are using to describe the color dominates less and less. When you reach the center of the wheel, no hue dominates. These colors directly on the central axis are considered desaturated.

(desaturation: hue becomes less dominant, moves to circle's center)



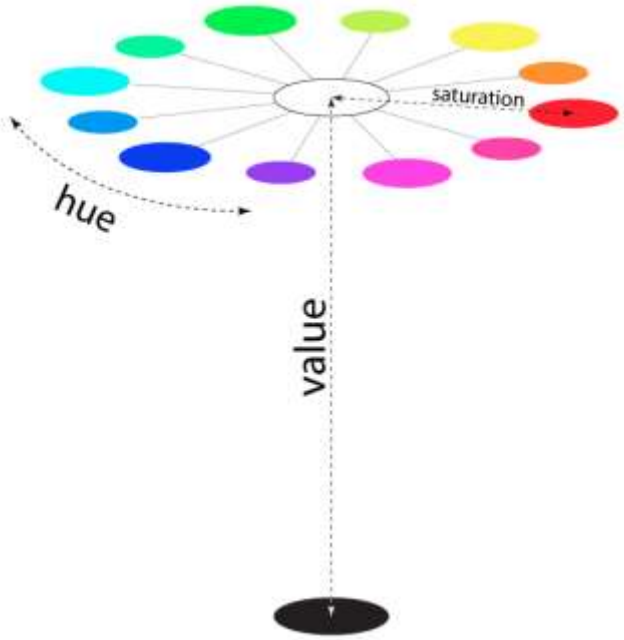




Naturally, the opposite of the image above is to saturate color.

(general saturation direction -- "pure" hue with complete saturation: no other hues present)

**Value**

Value is the dimension of lightness/darkness. In terms of a spectral definition of color, value describes the overall intensity or strength of the light. If hue can be thought of as a dimension going around a wheel, then value is a linear axis running through the middle of the wheel, as seen below:




To better visualize even more, look at the example below showing a full color range for a single hue:

Now, if you imagine that each hue was also represented as a slice like the one above, we would have a solid, upside-down cone of colors. The example can be considered a slice of the cone. Notice how the right-most edge of this cone slice shows the greatest amount of the dominant red hue (least amount of other competing hues), and how as you go down vertically, it gets darker in "value." Also notice that as we travel from right to left in the cone, the hue becomes less dominant and eventually becomes completely desaturated along the vertical center of the cone. This vertical center axis of complete desaturation is referred to as grayscale.