HUE, VALUE, SATURATION What is color?

In short, color is the visual byproduct of the spectrum of light as it is either transmitted through a transpar-

learn.

ent 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. For the physics behind color, see the **Primary Color Models page**. This will REALLY help you understand

how color works!

3. saturation (also called "chroma")

Color consists of three main integral parts:

1. hue

2. value

Let's start with "hue" Hue is more specifically described by the dominant wavelength and is the first item we refer to (i.e. "yellow")

readily experience when we look at color, or its purest form; it essentially refers to a color having full saturation, as follows:

ration is equivalent to a muddy dark grey, as 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.

when adding in the three components of a color. Hue is also a term which describes a dimension of color we

When discussing "pigment primaries" (CMY), no white, black, or gray is added when 100% pure. (Full desatu-

As is discussed on the "Elements: Value" page, 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.

Lastly, let's look at "saturation," or "chroma"

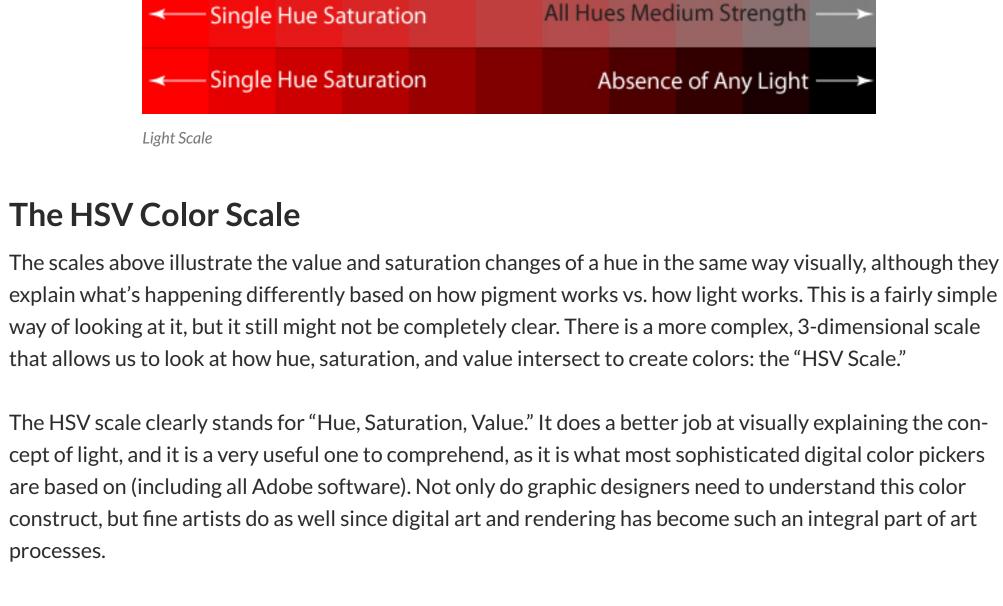
Saturation defines the brilliance and intensity of a color. When a pigment hue is "toned," both white and black (grey) are added to the color to reduce the color's saturation. In terms of the "additive" light color model, though, saturation works on a scale based on how much or how little other hues are represented in the color.

Next, let's look at the "value"

(NOTE: In the simple scale diagrams below, the first model indicates amount of black, white, or grey *pigment* added to the hue. The second model illustrates the same scale but explains the phenomenon based on light [spectral] properties.)

TINT = pure hue + white

TONE = pure hue + grey SHADE = pure hue + blackPigment Scale All Hues Full Strength -Single Hue Saturation



process light waves. So let's start with the light Additive model to see how it filters into the Subtractive model and to see how hues, values and saturation interact to produce unique colors.

All Color Starts With Light

The three primary hues in light are red, green, and blue. Thus, 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.

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

hues are mixed, as follows:

1. Blue + Red light -> Magenta

2. Red + Green light -> Yellow

3. Green + Blue light -> Cyan

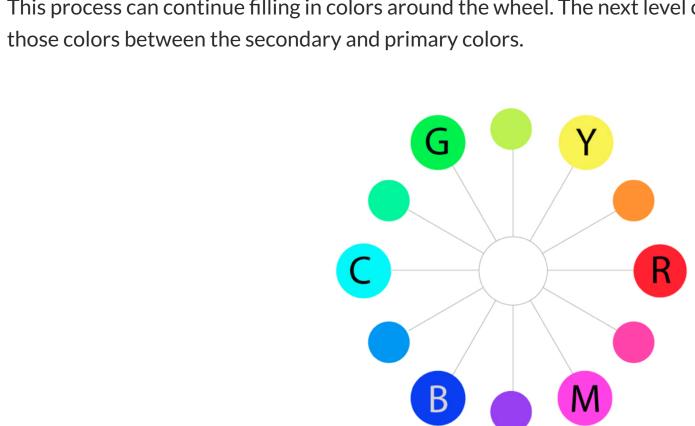
Overview of Hues

Saturation

Value

below:

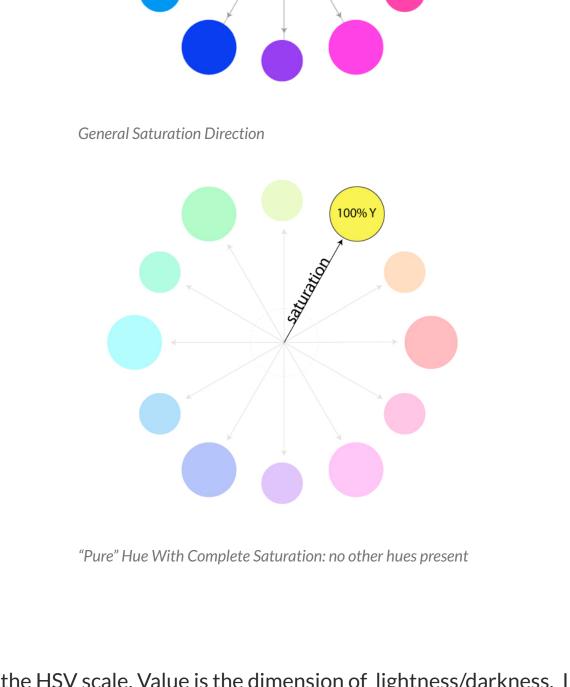
Mixing Adjacent Primaries = Secondary Hues Making Cyan, Magenta, and Yellow Although additive and subtractive color models are considered their own unique entities for screen vs. print purposes, the hues CMY do not exist in a vacuum. They are produced as secondary colors when RGB light



Desaturation: hue becomes less dominant, moves to circle's center Naturally, the opposite of the image above is to saturate color. The first example below describes the general direction color must move on the color circle to become more saturated (towards the outside). The second example depicts how a single color looks completely saturated, having no other hues present in the color.

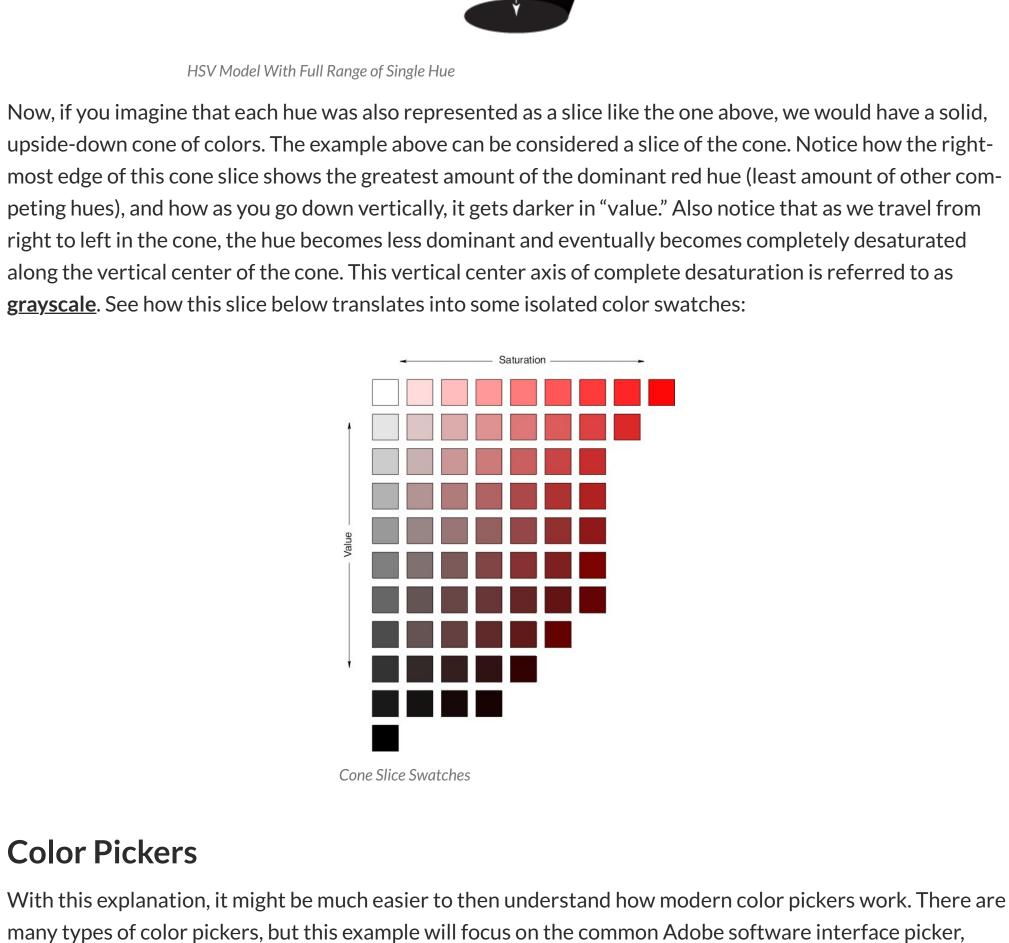
even% G even% B

desaturate



desaturation

saturation



continuing to use the red hue as the example below. By the way, relate the similarity of our cone-shaped red

In Figure-1 below, first notice the center vertical slider. This is where we select the hue. It is currently set to

the lowest selection and corresponds to the "H:O" radio button value on the right. The "H" indicates "Hue,"

and the zero value describes which numerical hue assignment we have selected. Below it, you will see that

slice above to the "Select Color" window below to better visualize how this works.

Only Web Colors Figure 1: RGB Color Mode - Pure Red Hue

Select Color:

Only Web Colors

Figure 2: RGB Color Mode - Pure Red Hue

Now, as a means of comparison, look at the next model. Do you see the difference?

Color Picker

ness, or value.

low and magenta.

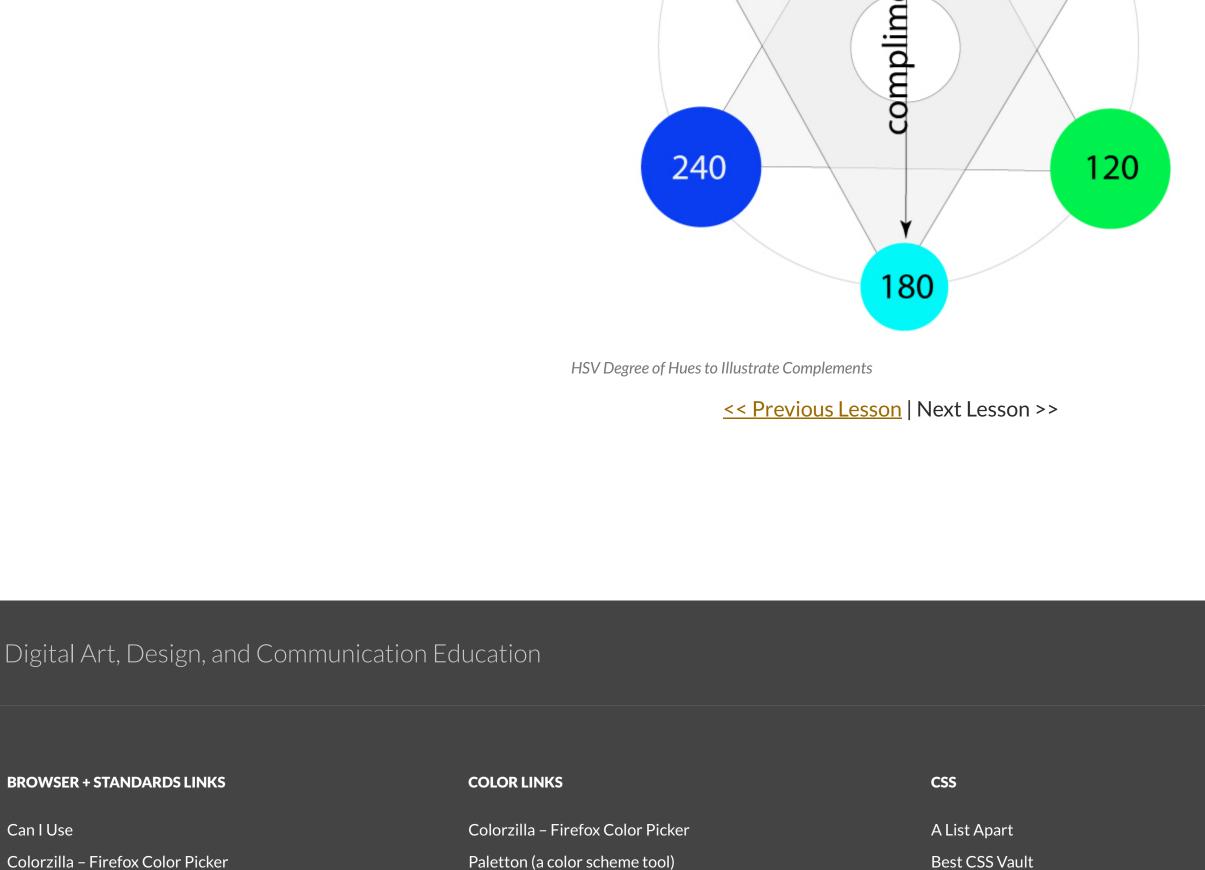
cause we are basing it on the HSV cone model as illustrated earlier, and the hues at the top of the upsidedown cone are in a full 360-degree circle. Thus, we have completed the circle by starting at the zero-level red and moving through the full visible spectrum to the same 360-level red. To get a more complete picture of how this works, lets look at the RGB equivalent of "cyan", which is directly across from it on the color wheel, and is thus red's complementary hue. Color Picker

In case you don't see the difference, it is in the Hue number setting and where the slider is located. This is es-

sentially the same hue as in the previous Figure-1, except that the setting has gone from 0 to 360. This is be-

300 60 compliments

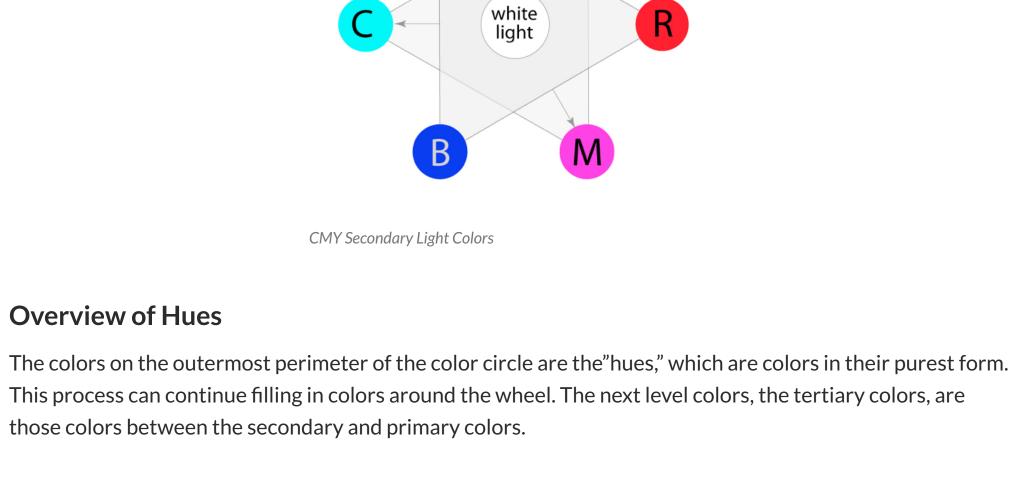
0/360



Hues

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.

white light



even% R

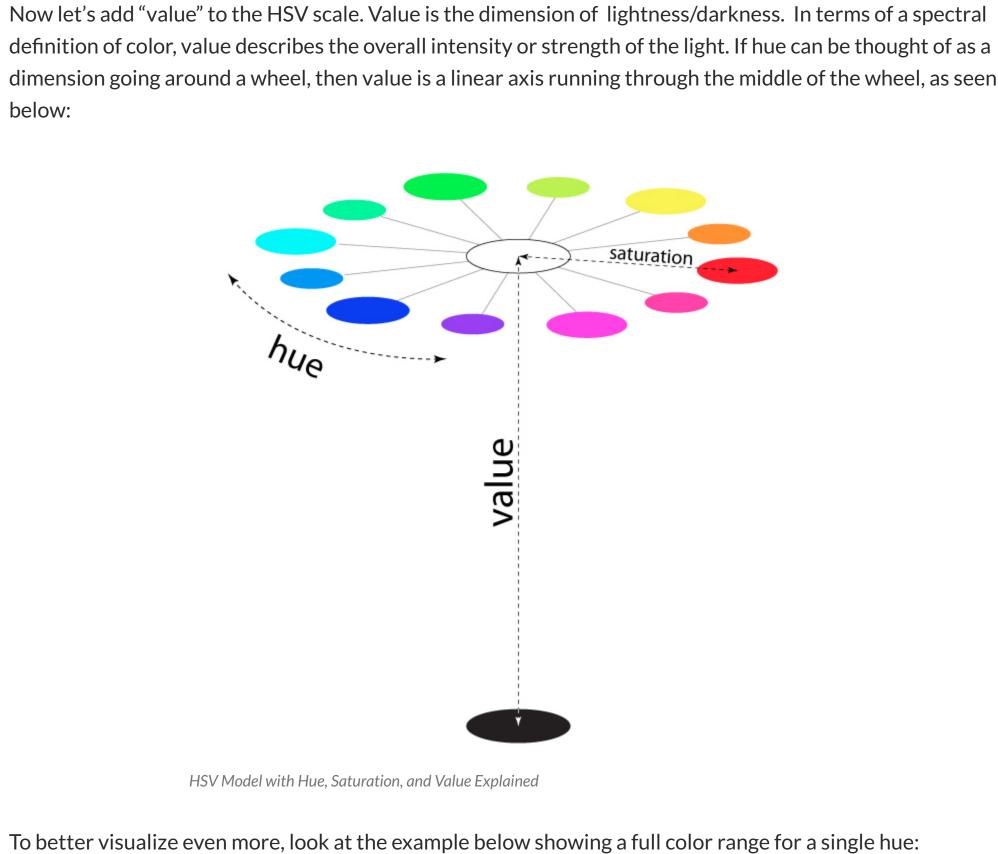
Saturation is also referred to as "intensity" and "chroma." It refers to the dominance of hue in the color. On

using to describe the color dominates less and less. When you reach the center of the wheel, no hue domi-

the outer edge of the hue wheel are the 'pure' hues. As you move into the center of the wheel, the hue we are

Primary, Secondary, and Tertiary Hues

nates. These colors directly on the central axis are considered **desaturated**.



"Red" is set to "255," or the fullest level of light represented on a computer (0 = lowest). Notice that Blue and Green are set to zero, indicating that Red is at its fullest level of saturation. Next, notice where the picker circle is in the "Select Color" window. It is located at the top-right, indicating where on the scale you want the saturation to fall. As we said, the sample is equivalent to the purest red hue with full saturation, and it corresponds to the outermost edge of the color wheel. The "S:100%" on the right describes the level of saturation in the color we have selected, and the "B:100%" corresponds to the bright-As a side note, notice that under the CMYK levels that Yellow and Magenta are basically equally represented at their fullest capacities. This supports how in the Subtractive Color Model, red is a secondary color of yel-Color Picker Select Color: ⚠ OK Cancel Color Swatches ⊙ H: ○ S: 100 100 %

255

0

) B: 0

FF0000

⚠

360

100

100

255

0

0

FF0000

G:

C: 0

M: 99

Y: 100

OK

Cancel

Color Swatches

%

C: 0

K: 0

99

100

K: 0

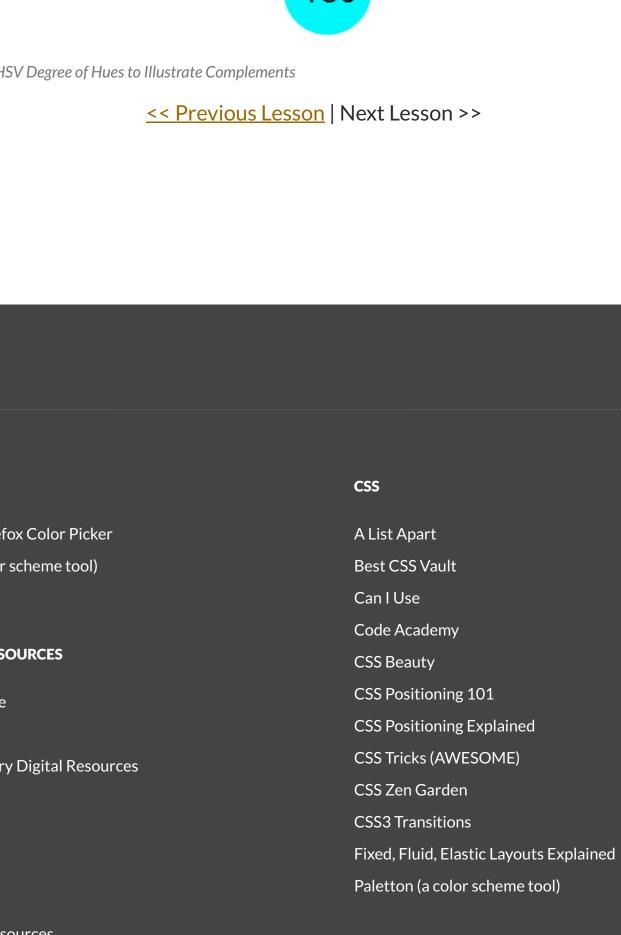
%

%

⊝ R:

⊕ **G**:

Select Color: OK Cancel Color Swatches • H: 180 100 100 C: 52 0 % M: 0 255 % 255 Y: 13 % K: 0 # 00FFFF % Only Web Colors Figure-3: RGB Models rendering of the secondary Cyan Notice that in Figure-3 that the hue setting is "180," or located at 180-degrees on the color circle, half of 360. This is what numerically indicates the cyan is red's complement. Also, you'll notice that it is the secondary RGB color produced by mixing equal parts Blue and Green, where Blue=255, and Green=255. As a quick reminder of the basic color wheel to help you visualize, here is how cyan relates to red:



Typetester – test font choices! **FREE VIDEO RESOURCES** Internet Archive NY Public Library Digital Resources

A List Apart Code Academy CSS Tricks (AWESOME) htmlentities reference list

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