Perception of Color

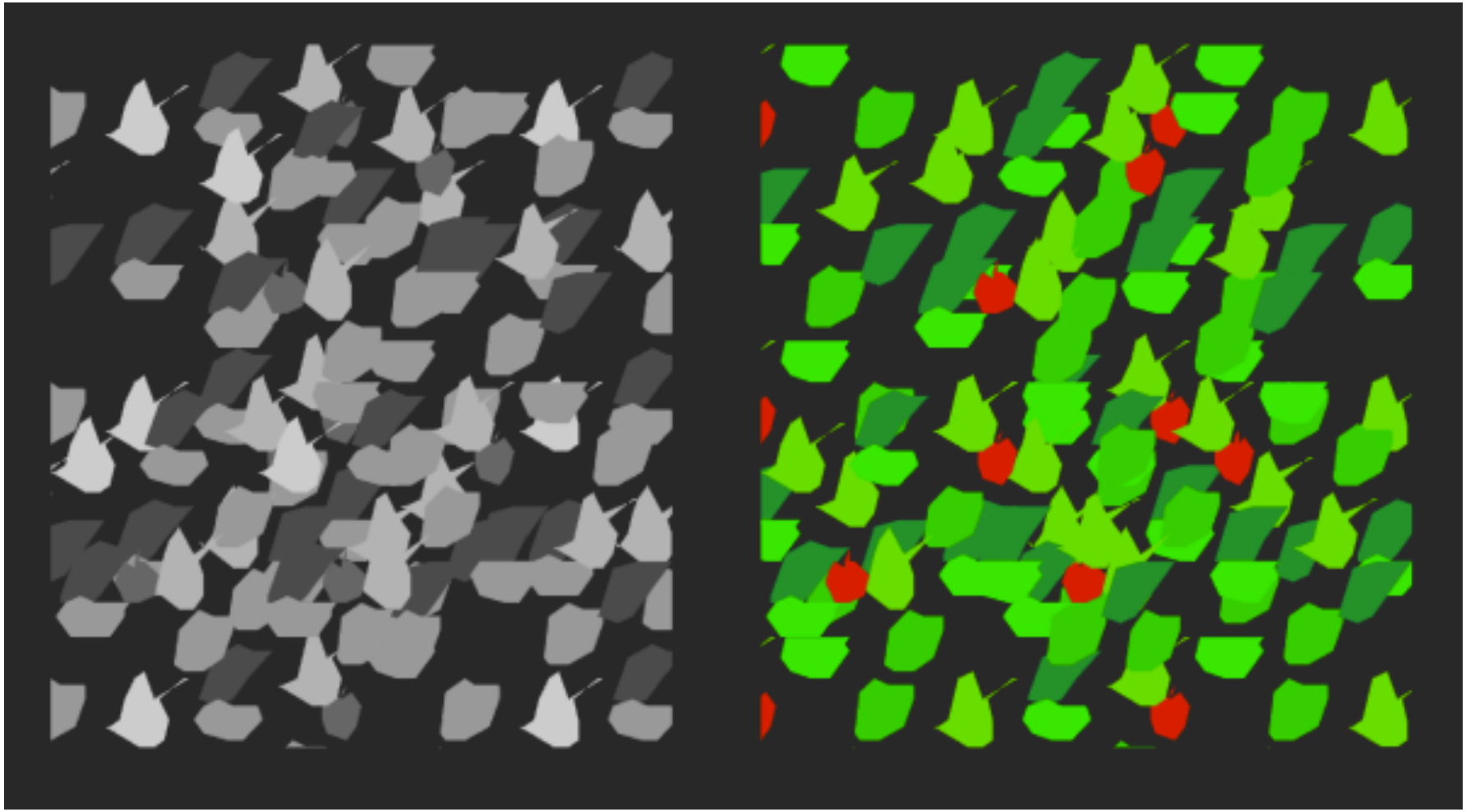


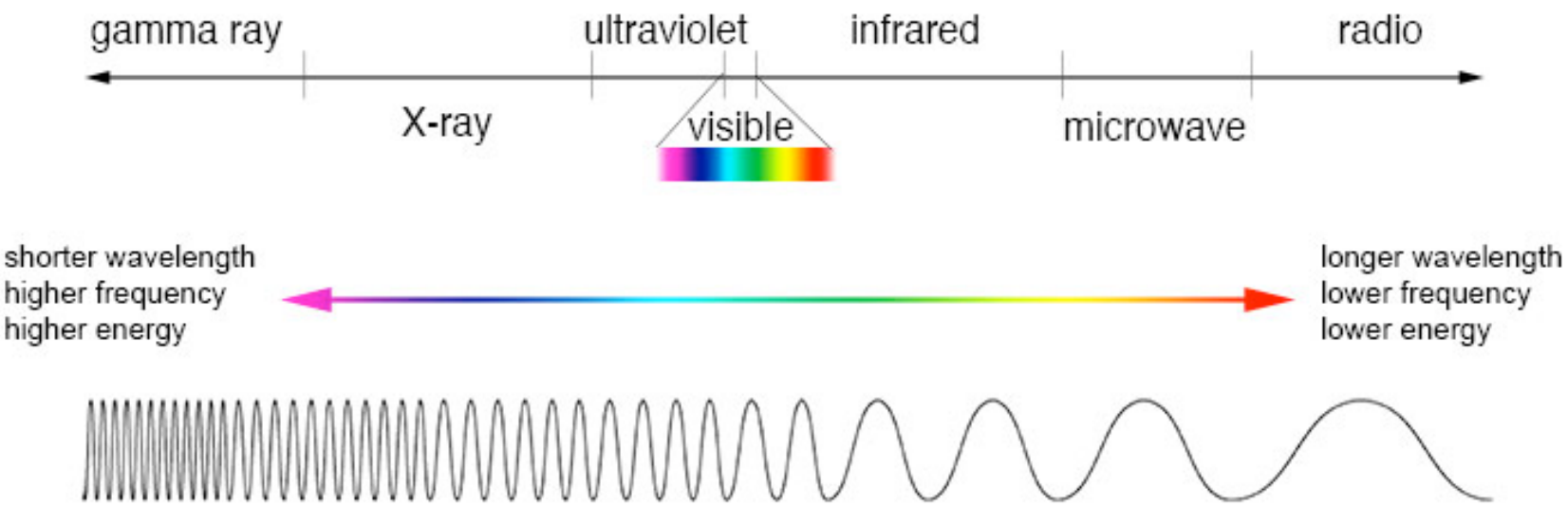
Image source: Ware, C. (2012). *Information visualization: perception for design*. Elsevier.

Uses of Color

- Label
- Measure
- Represent/imitate reality
- Enliven/decorate

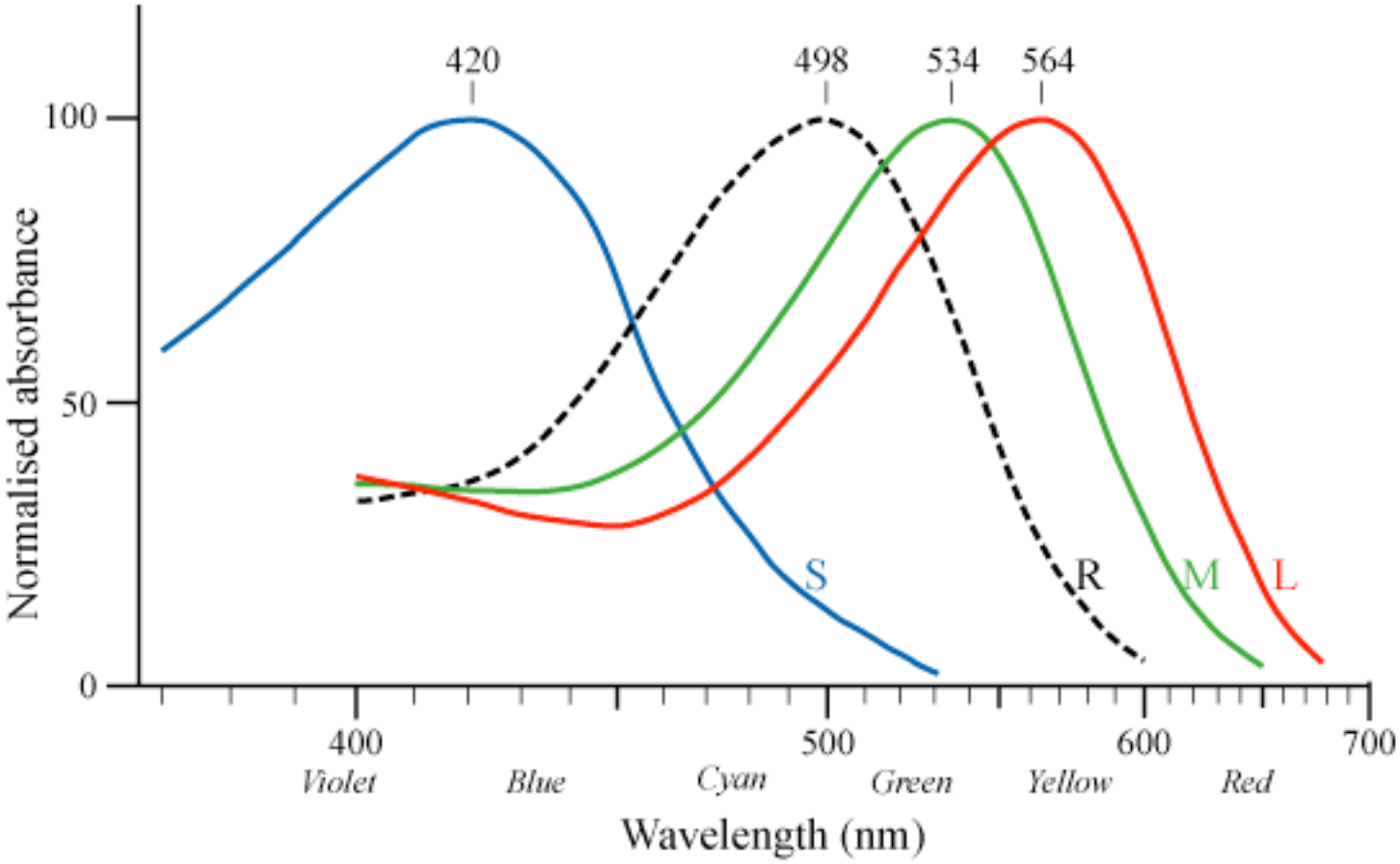
(Tufte, 1990)

Electromagnetic Spectrum



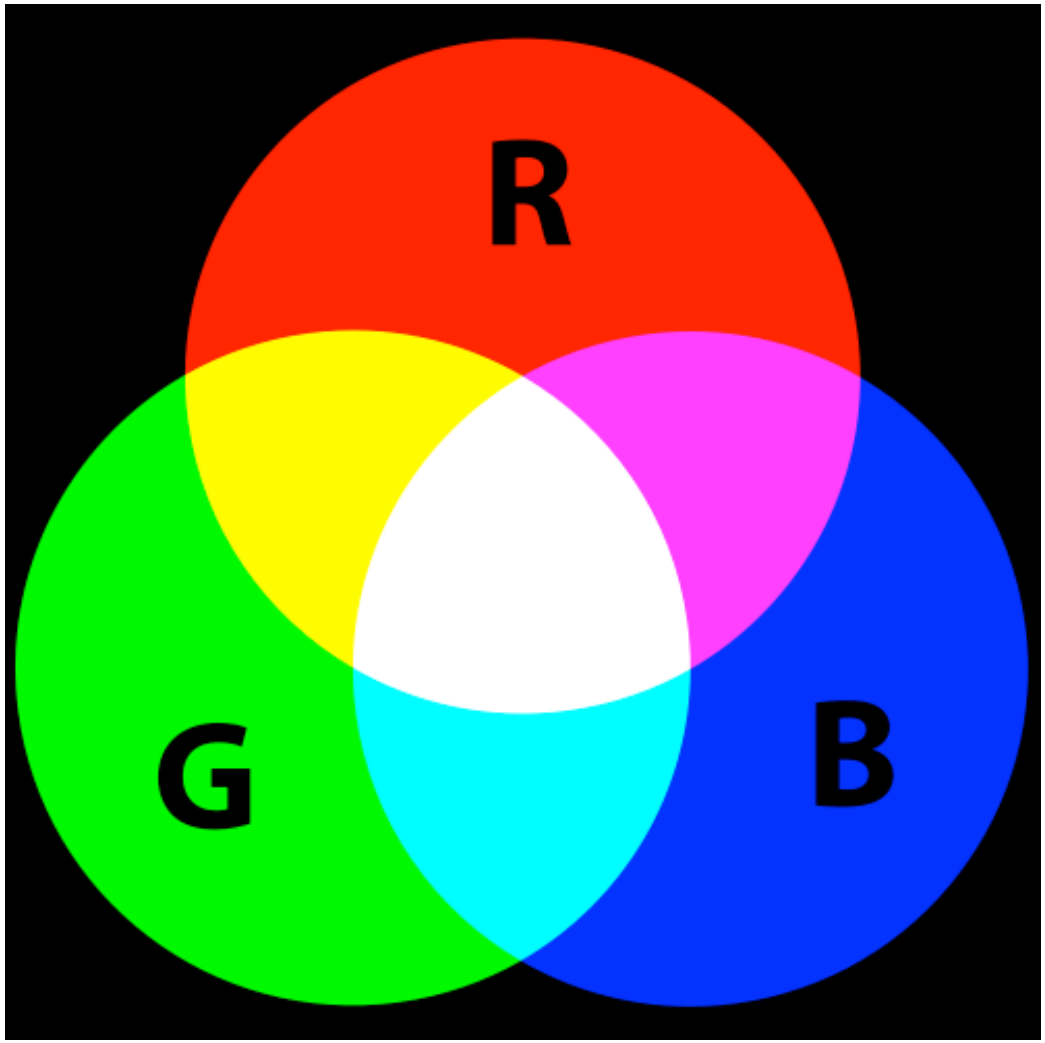
Source:
NASA

Rods and Cones



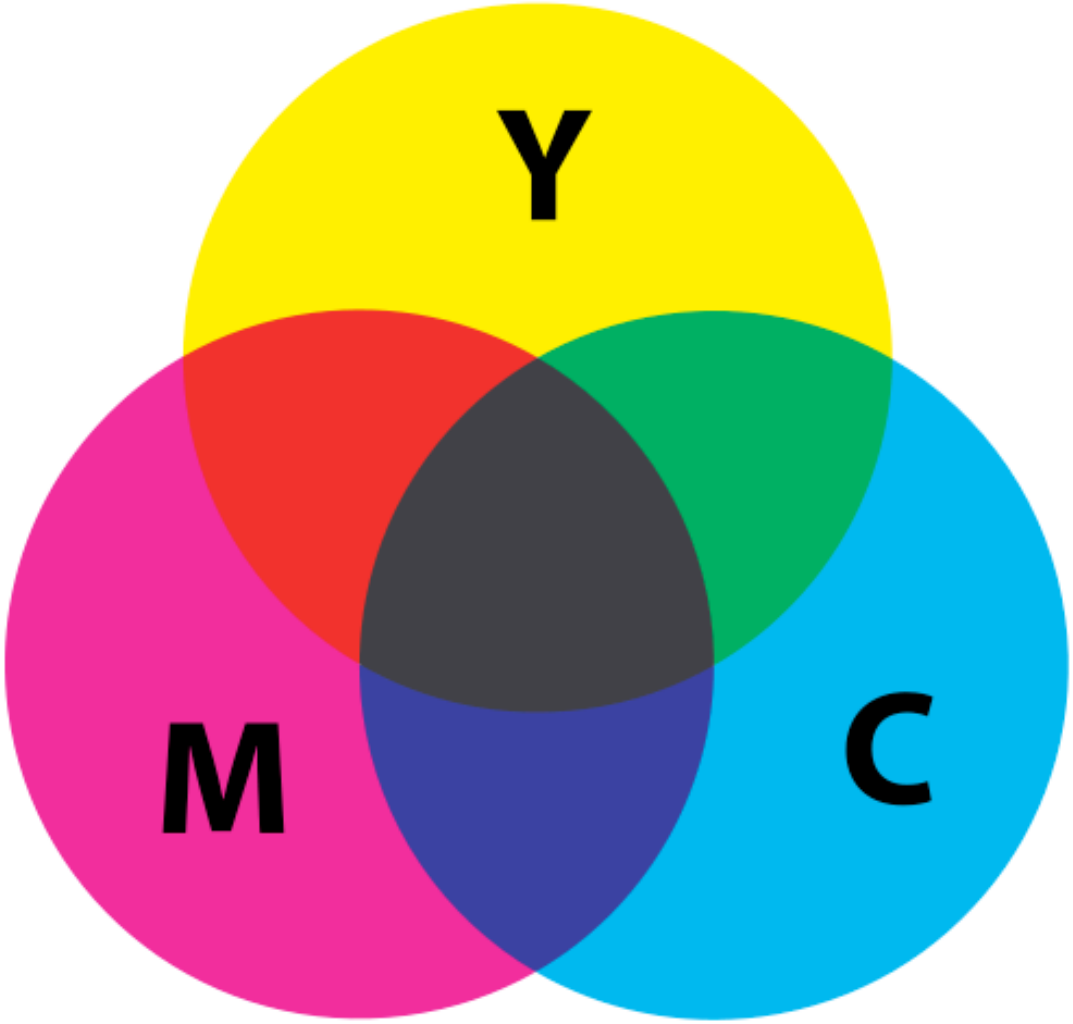
Source: Wikimedia Commons, after Bowmaker and Dartnall, 1980

Additive Color



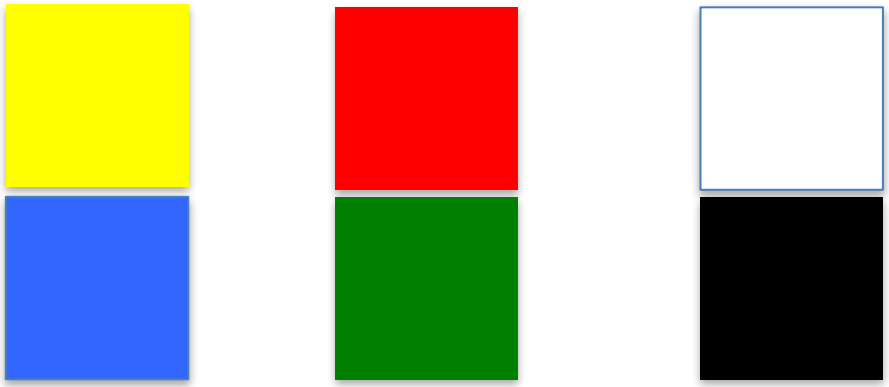
Source: Wikimedia Commons

Subtractive Color



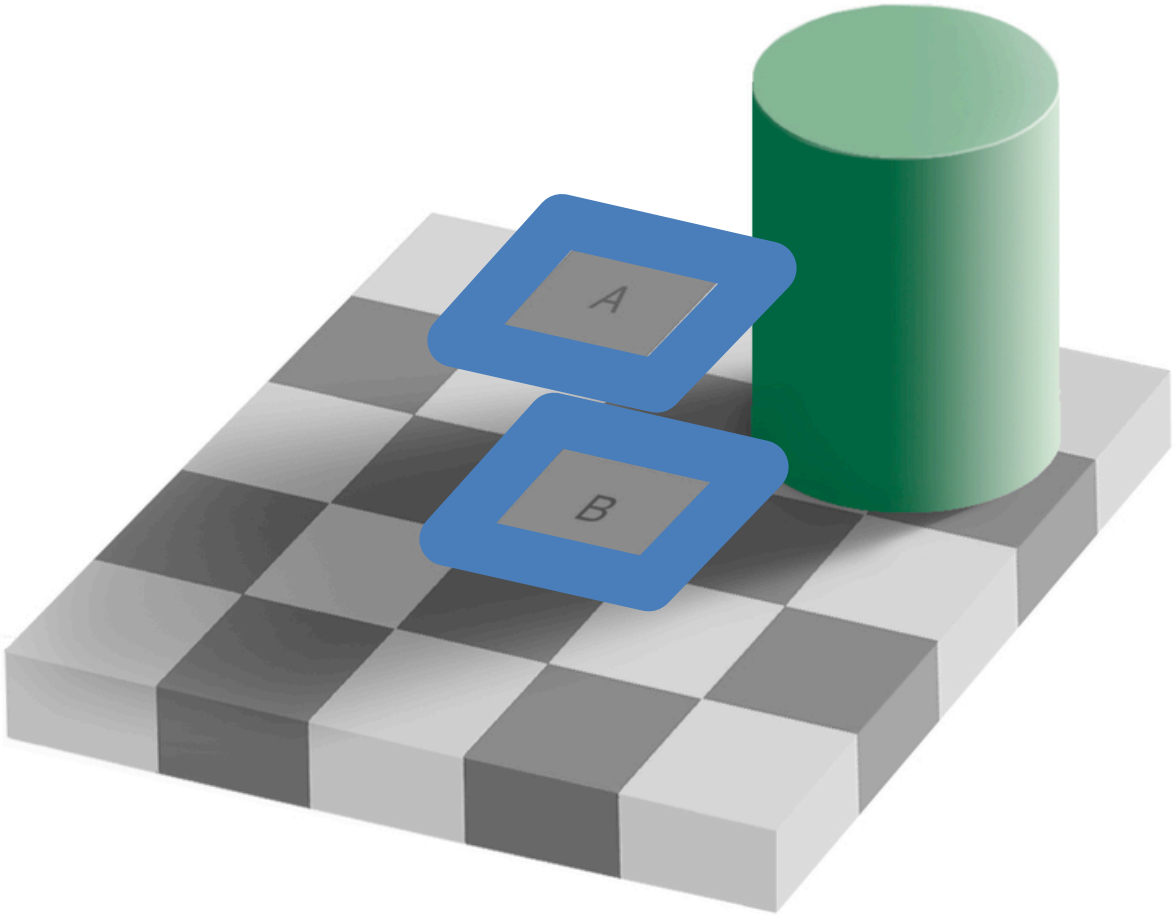
Source: Wikimedia Commons

Color Opponency



Color Opponency

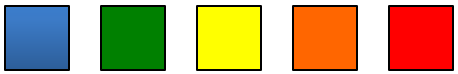
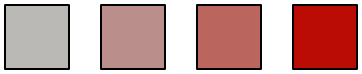
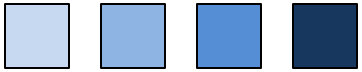
Color Constancy



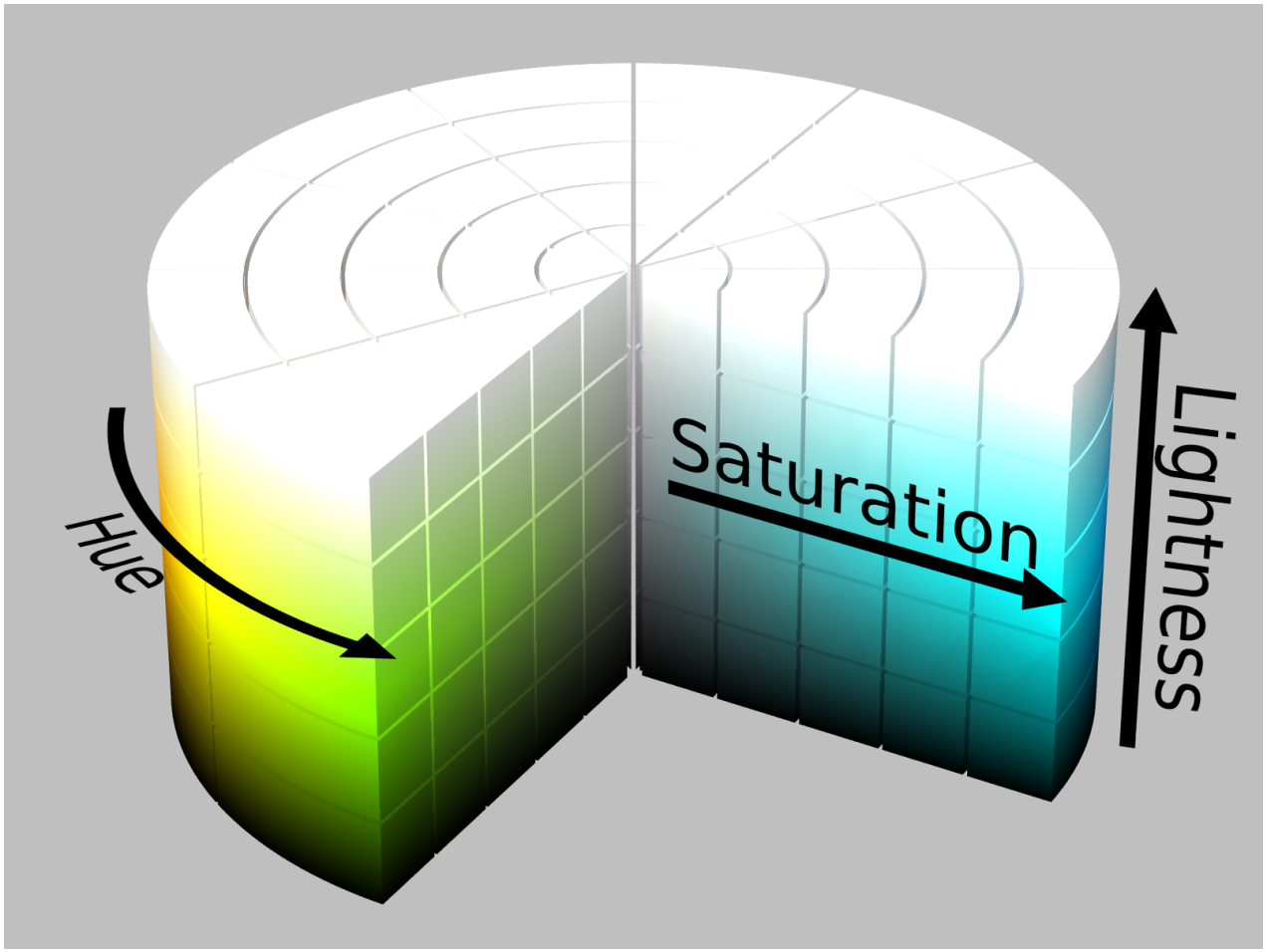
Source: Wikimedia Commons

Color Models

Terminology

- **Hue** 
  Dominant wavelength, named color
- **Saturation** 
  Intensity or purity of color
  Distance from gray/white/black
- **Lightness** 
  Light to dark

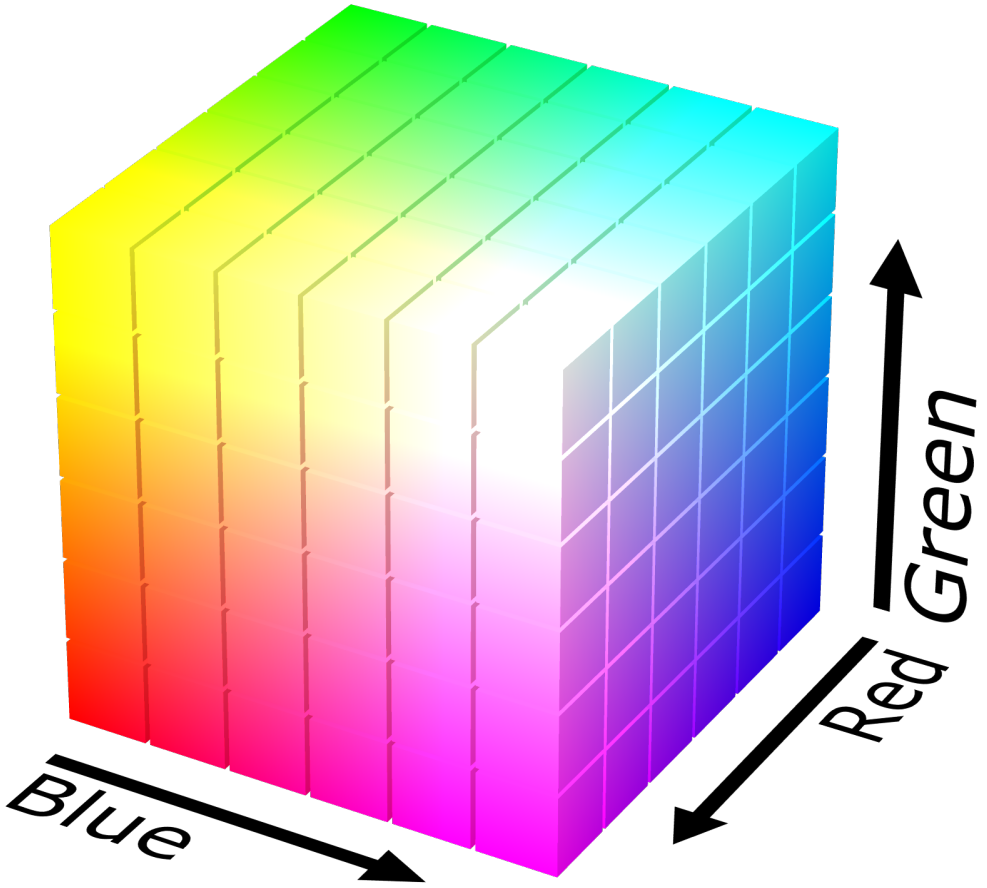
HSL Color Model



By SharkD, derivative work, CC BY-SA 3.0,
https://commons.wikimedia.org/w/index.php?curid=9801661

Color Wheel

RGB Color Model



By SharkD - Own work, GFDL, https://commons.wikimedia.org/w/index.php?curid=3375025

Other Models

Designed for perceptual uniformity

- HCL
- CIE Lab
- Munsel

Culture and Emotion

Color Harmony

- Difficult to study
- Conflicting results
- Confounding of preference and harmony

Individual Colors

Yellow < orange < purple < green < red < blue (Eysenck, 1941)

Color preference based on affective response to objects of that color. (Palmer & Schloss, 2010)

Pairing of colors to emotions is consistent.

Hue is not the main influence on emotion;

saturation is. (D'Andrade & Egan, 1974; Kieffer, 1974; Johnson, Johnson, & Baksh, 1986)

Emotional Responses

- Blue, green, white: peaceful, gentle, calming (beautiful, pleasant in some countries)
- Black, brown: sad, stale (formal, masculine in some countries)
- Gold, orange, yellow: no strong associations
- Purple: similar to brown for Asian countries
- Red: active, hot, vibrant, emotional, sharp (pleasant in PRC and Taiwan)

(Madden, Hewett, & Roth, 2000)

Berkeley SCHOOL OF INFORMATION