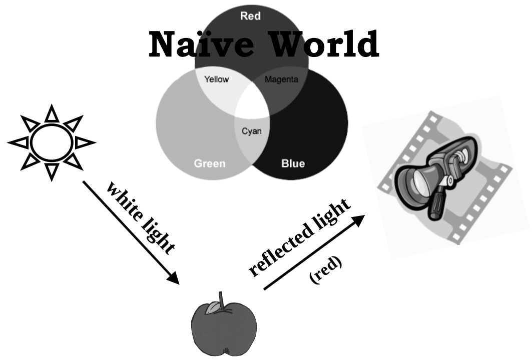
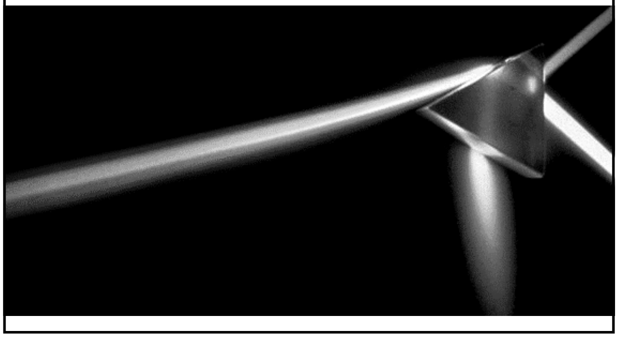
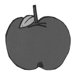
Naive World

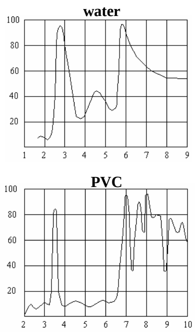


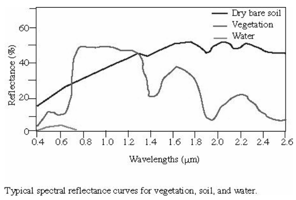
Color



Real World

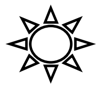


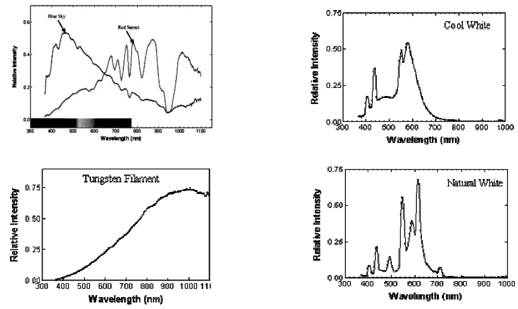




Typical spectral reflectance curves for vegetation, soil, and water.

Real World



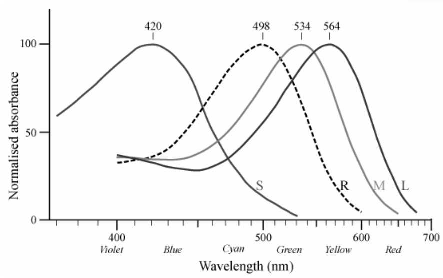


Natural Color Representation

- All we need to do for creating a "perfect" image of a complex scene, is creating a stimulus that will look identical

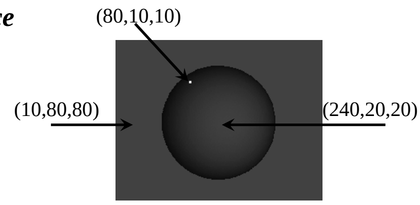
➲ The ***RGB*** color space is highly suitable for image capturing and image representation

Real World



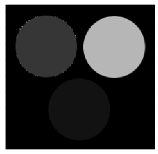
RGB drawbacks

- High correlation between the three channels (we store/transfer redundant information)
- Couples the notion of ***hue*** with that of ***luminance***



(also worth mentioning)

additive color model



monitor

RGB

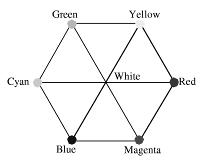
subtractive color model

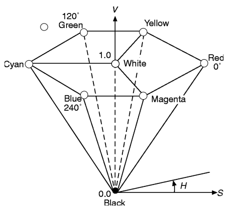
printer

CMYK

The HSV Color Model

- Hue, saturation, value (brightness)
- Hexcone subset of cylindrical (polar) coordinate system





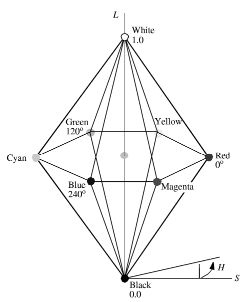
The YIQ & YUV Color Models

- Recoded RGB for transmission efficiency, compatibility with B/W broadcast TV
- Y = CIE's Y (luminance); I, Q encode chromaticity

$$\begin{bmatrix} Y \\ I \\ Q \end{bmatrix} = \begin{bmatrix} 0.30 & 0.59 & 0.11 \\ 0.60 & -0.28 & -0.32 \\ 0.21 & -0.52 & 0.31 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

The HLS color Model

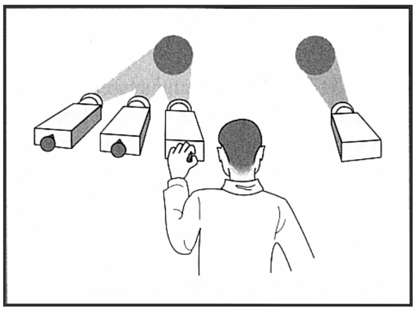
- Hue, lightness, saturation
- Double-hexcone subset



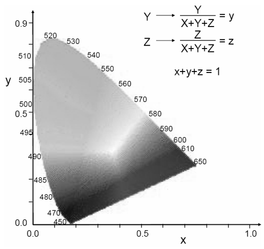
The HSV Color Model

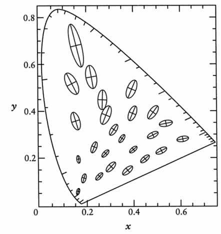
- Colors on V = 1 plane are not equally bright
- Complementary colors 180° opposite
- Saturation measured relative to color gamut represented by model which is subset of chromaticity diagram:
  - → therefore, 100% S ≠ 100% excitation purity

Color Matching



"perceptually uniform" color space





L*a*b* Space

- Non-linear model.
- More perceptually uniform then CIE-XYZ : ellipses are much closer to circles. As a result, Euclidean distance is useful.
  - **L* - Lightness.**
  - **a* - Red-green content.**
  - **b* - yellow-blue content.**

Color Matching

- Fit curves to three functions that describe the matching– f(r), f(g), and f(b)