Fundamental of Digital Media Design

Chapter 4
Color Theory

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Chapter Description

- Aims
  - To understand the concept of color and color wheel.
  - To study the various types of color schemes.
  - To know about the meaning of colors.

- Expected Outcomes
  - Understand the basic concept of color theory.
  - Able to applied the color theory in graphic design.

- References

  - Cameron Chapman, Color Theory for Designers, Part 1: The Meaning of Color
    https://www.smashingmagazine.com/2010/01/color-theory-for-designers-part-1-the-meaning-of-color/
  - Norman Koren, Making fine prints in your digital darkroom. Light and color: an introduction
    http://www.normankoren.com/light_color.html
  - Basic Color Theory
    https://www.colormatters.com/color-and-design/basic-color-theory
  - Jade V. Villareal, Lecture Slide: Colors
    https://www.slideshare.net/jhong2x/lecture-1-colors

Topics

- What is Color?
- How are light and color related?
- The Color Wheel
- Color Schemes
- The Meaning of Color

What is Color?

To understand COLOR

we first need to understand

LIGHT

What is Color?

- Light is everywhere in our world. We need it to see: **it carries information from the world to our eyes and brains.**
- **Lightwave**

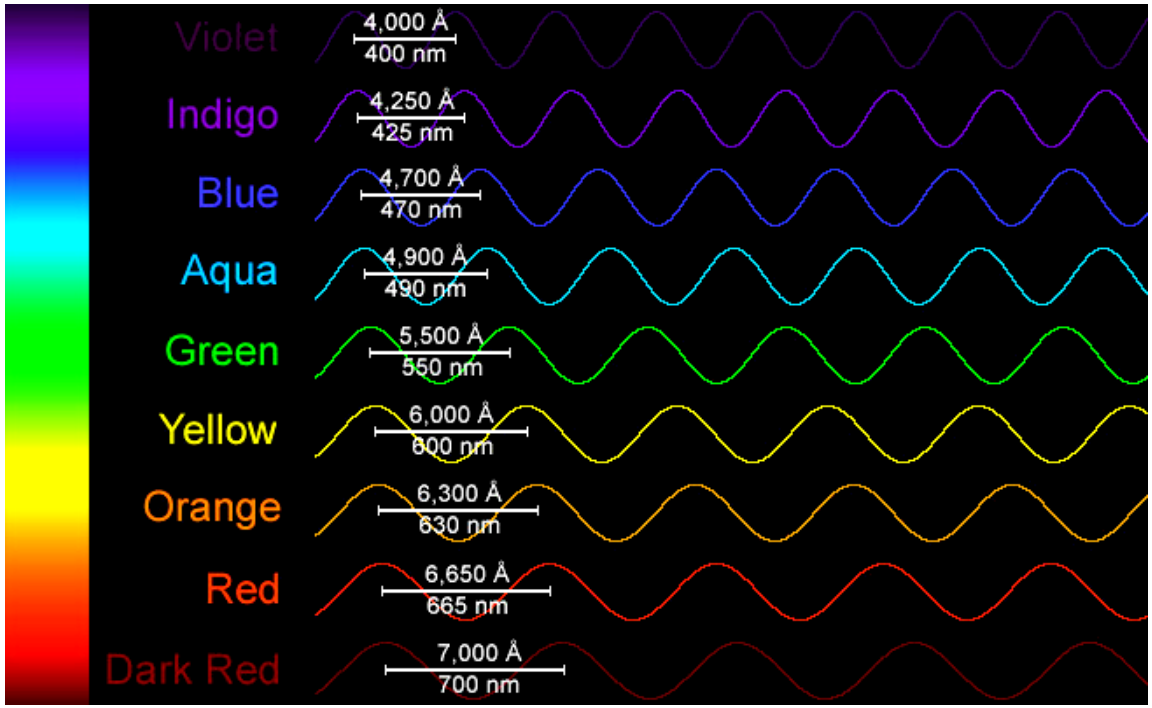


Image source: https://www.wwu.edu/skywise/img/light_spectrum.bmp

How are light and color related?

- Light travels in the form of waves
- **White Light** or the light from the sun, is made of colors and colors are different types of light recognized by their own wavelengths

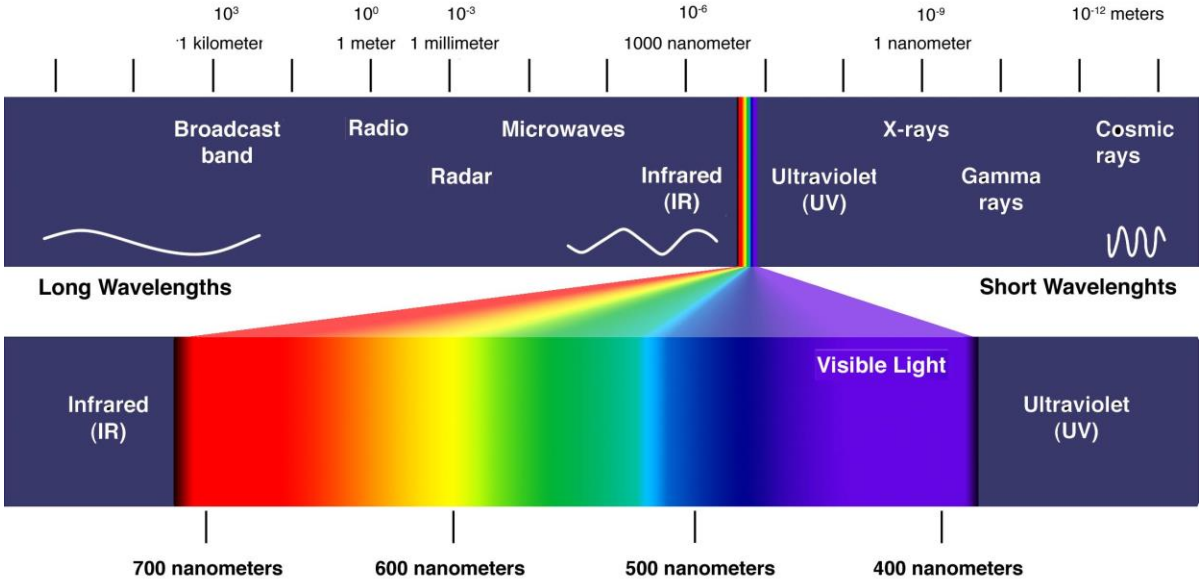


Image source: http://www.astronomersgroup.org/images/EMspectrum.jpg

When light travels, what can happen?

- It can be **reflected, absorbed, or transmitted.**
- **Black object > light hitting that object are absorbed & no light is reflected.**
- **Solid objects > will reflect light.**
- **Transparent objects > will transmit light through them.**

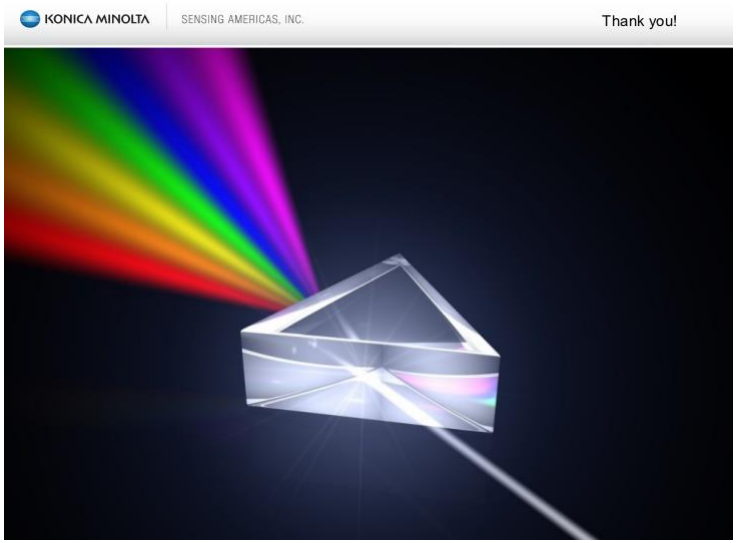
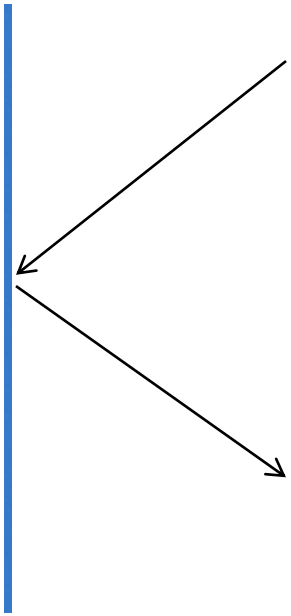
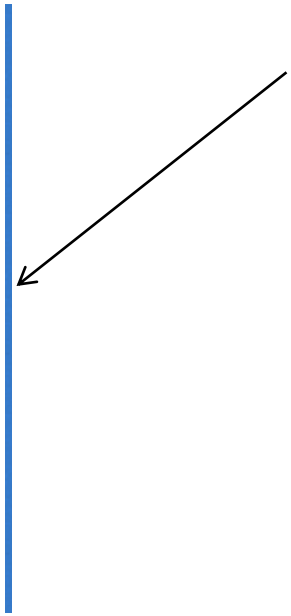


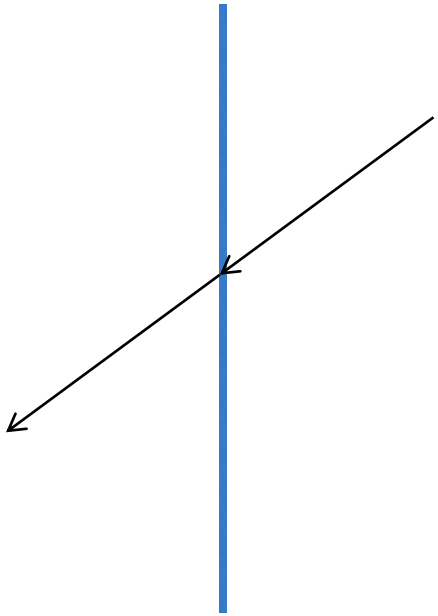
Image source: https://image.slidesharecdn.com/colorseminar-120828131216-phpapp01/95/color-seminar-6-728.jpg?cb=1346160136

Light Transfer

- Reflect
- Absorb
- Transmit







Do objects “have” color?

Picture source:
https://upload.wikimedia.org/wikipedia/commons/a/a8/Apple_and_Orange_-_they_do_not_compare.jpg
https://pixabay.com/p-723378/?no_redirect
http://www.mercadonacional.pt/image/cache/data/Frutas%20/Ma%C3%A7a/Ma%C3%A7%C3%A3%20Royal%20Gala-500x500.jpg

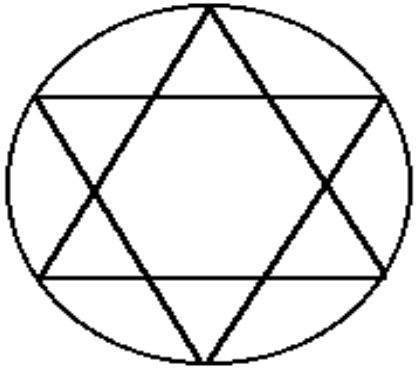
Do objects “have” color?

- The color of anything depends on the type of light sent to our eyes; light is necessary if we are to have any perception of color at all.
- An object is "colored," because of the light it reflects - all other colors are absorbed into that specific object.
- So then, an apple appears red because it reflects red light.

Do objects “have” color?

- Human eye can only respond to certain colors and wavelengths, and not everyone sees the same colors or exact same shades of a color.
- We are capable of seeing color because our eyes have light and color-sensitive receptors.
- These receptors are called **rods (receptive to amounts of light) and cones (sensitive to colors).**

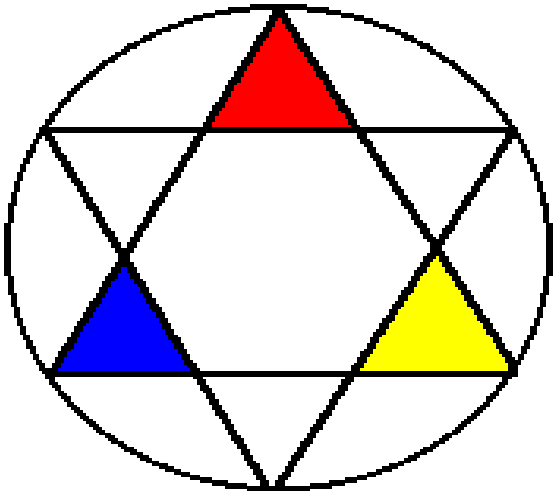
The Color Wheel



- The color wheel fits together like a puzzle - each color in a specific place. Being familiar with the
- Color wheel not only helps you mix colors when painting, but in adding color to all your art creations.

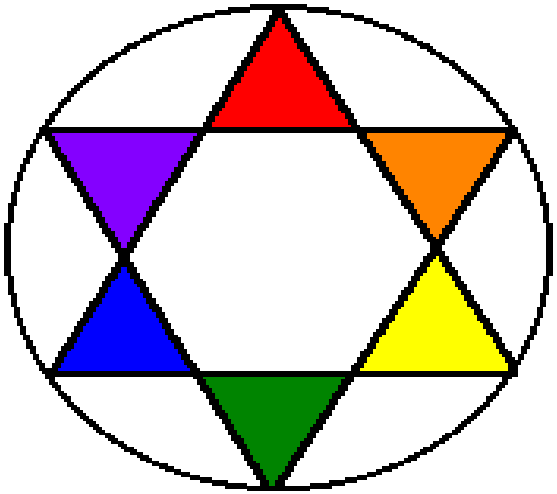
Primary Color

- Primary colors are not mixed from other elements and they generate all other colors.
  - Red
  - Yellow
  - Blue



Secondary Color

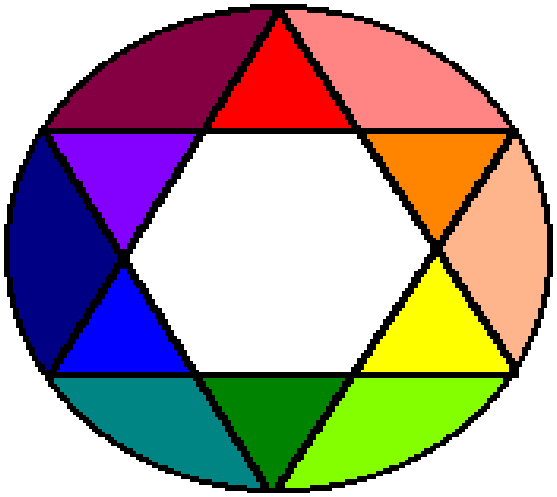
- By mixing two primary colors, a secondary color is created.
  - Red + Yellow = Orange
  - Yellow + Blue = Green
  - Blue + Red = Purple



Tertiary Color

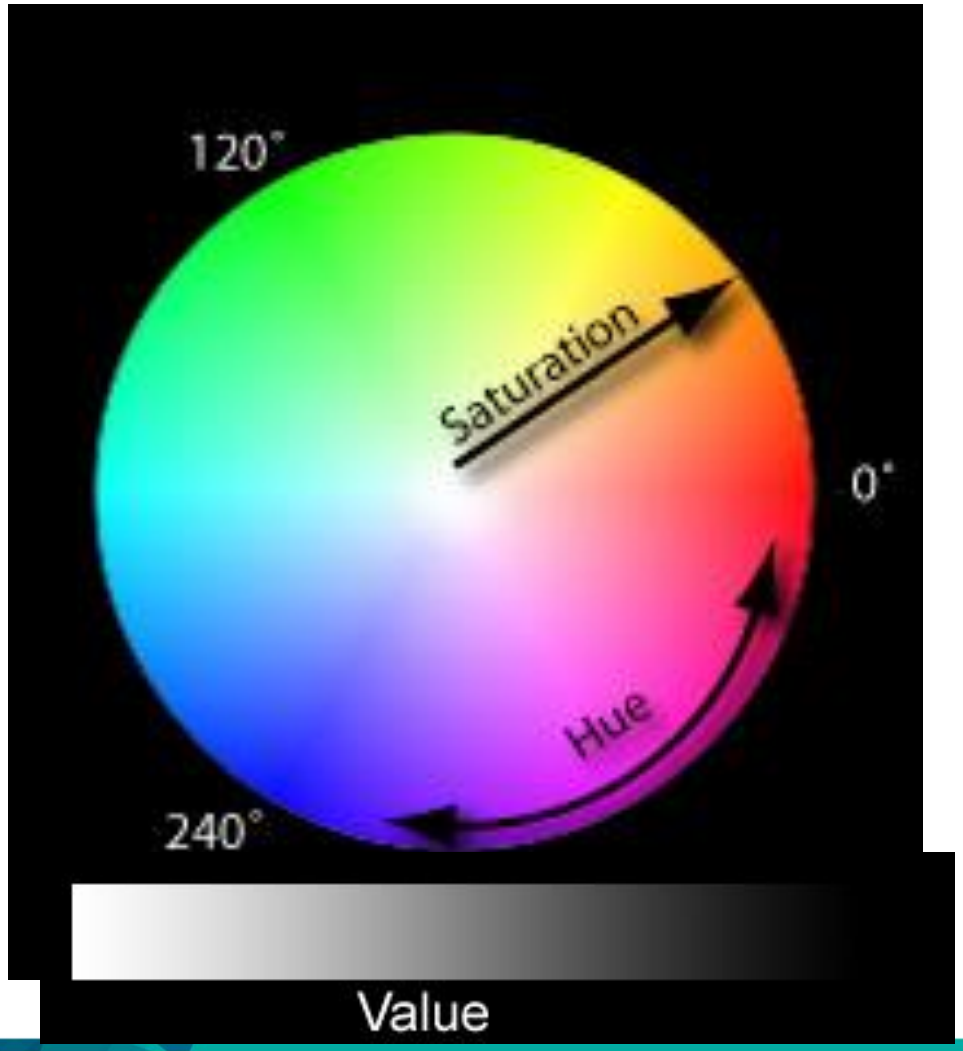
- Intermediate, or Tertiary, colors are created by mixing a primary and a secondary.

•red-orange
•yellow-orange
•yellow-green



•blue-green
•blue-purple
•red-purple

The Color Wheel

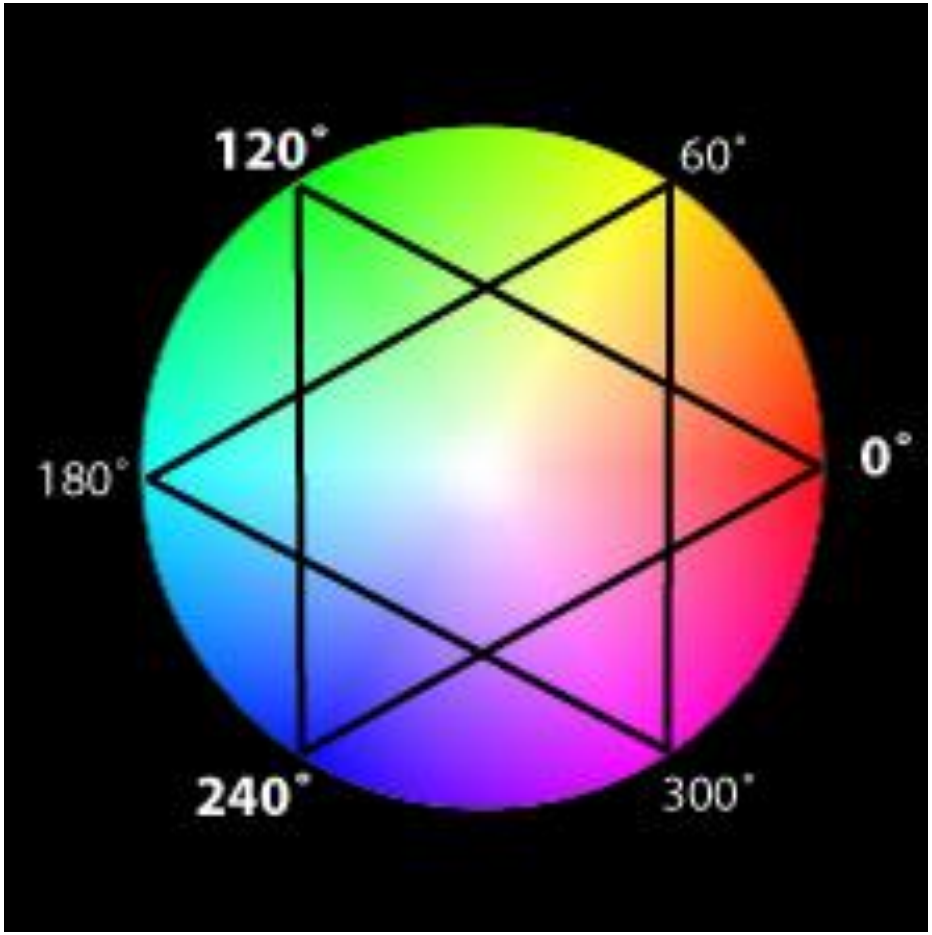


- **Colors on the wheel can be described using three parameters:**

1. **Hue**: degrees from 0˚ to 360˚
2. **Saturation**: brightness or dullness
3. **Value**: lightness or darkness

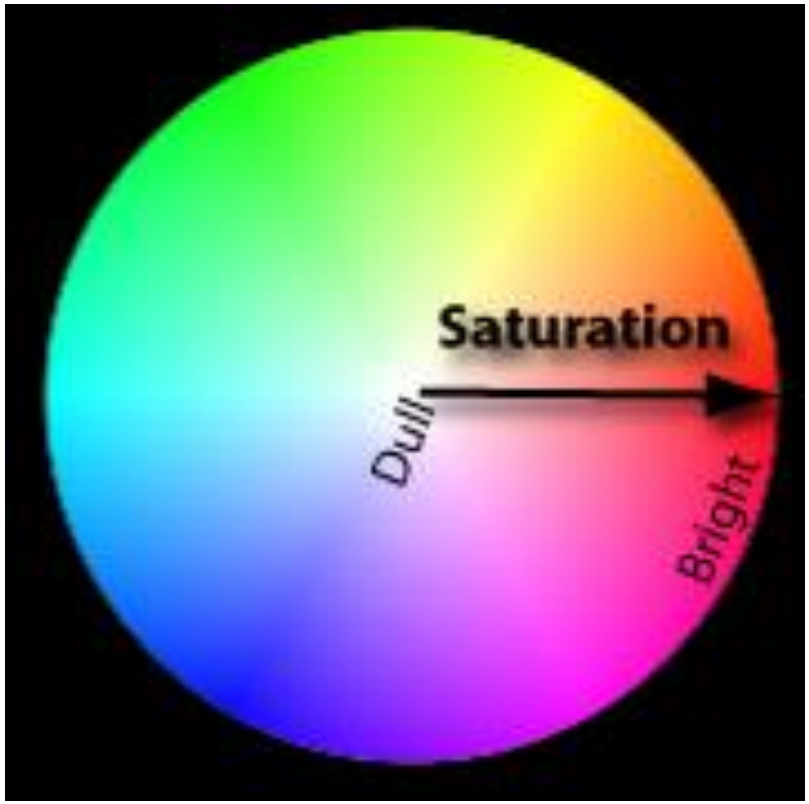
(As suggested by Henry Albert Munsell in *A Colour Notation*, 1905)

The Color Wheel: Hue



- Hue or Spectral Color is represented as an angle.
- **Primary Colors:**
  - 0˚ = Red
  - 120˚ = Green
  - 240˚ = Blue
- **Secondary Colors:**
  - 60˚ = Yellow
  - 180˚ = Cyan
  - 300˚ = Magenta

The Color Wheel: Saturation



- Saturation or Chroma is the intensity of a color.
- A highly saturated color is bright and appears closer to the edge of the wheel.
- A more unsaturated color is dull.
- A color with no saturation is achromatic or in the grey scale.

The Color Wheel: Value

Image source: https://brianneher.com/wp-content/uploads/2014/02/Value-of-Color.jpg

"the quality by which we distinguish a light colour from a dark one."

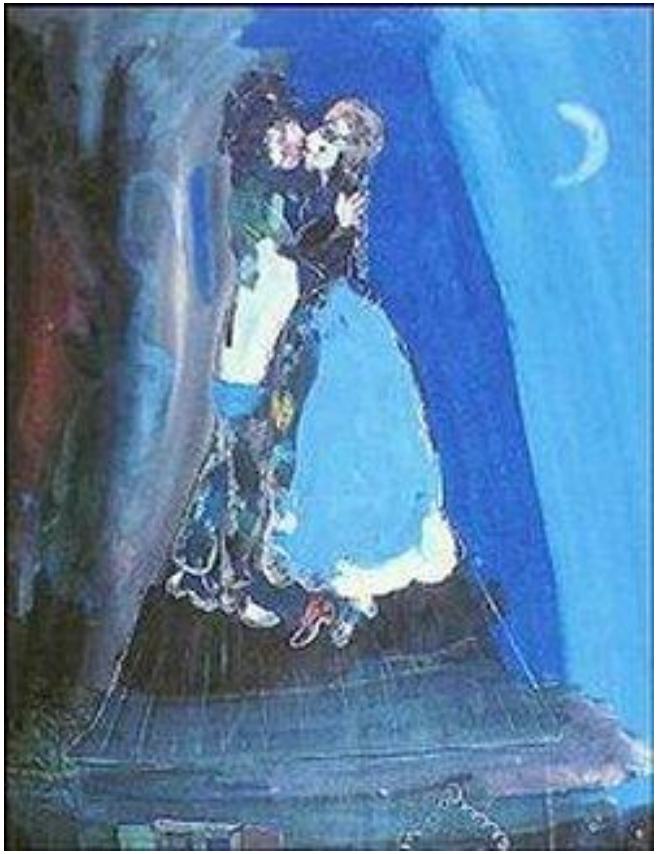
- Albert Henry Munsell
  A Colour Notation 1905

Value represents the luminescent contrast value between black and white

Color Schemes

- Systematic ways of selecting colors
  - Monochromatic
  - Complimentary
  - Analogous
  - Warm
  - Cool
  - Achromatic
  - Chromatic Grays

Color Schemes: Monochromatic



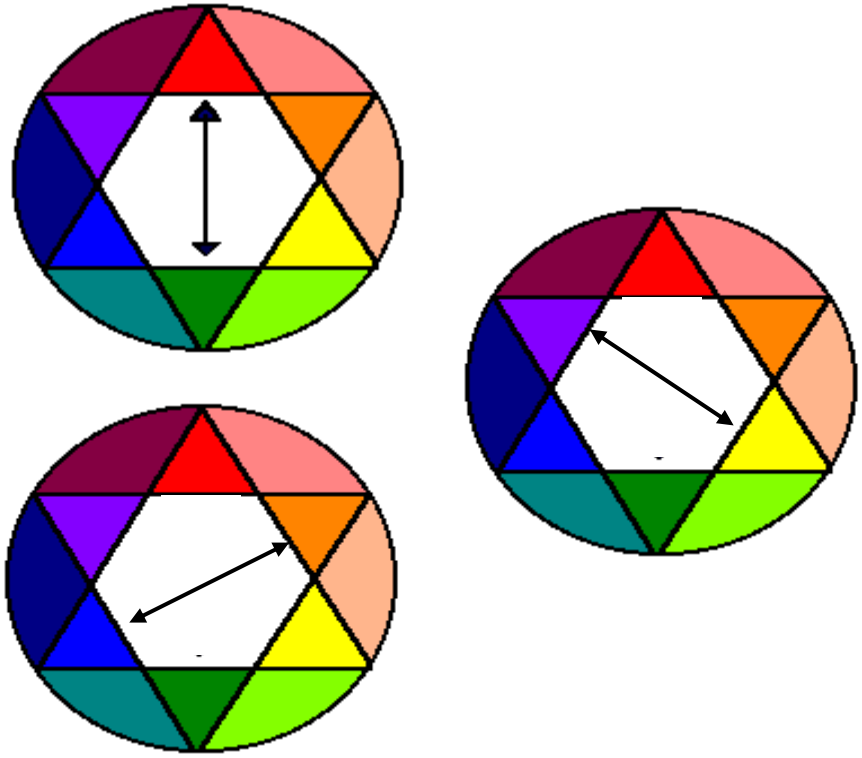
Artist: Marc Chagall
Title: Les Amants Sur Le Toit

- **Monochromatic:**

  One Hue many values of Tint and Shade

Color Schemes: Complementary

Artist: Paul Cezanne
Title: La Montage Saint Victoire
Year: 1886-88



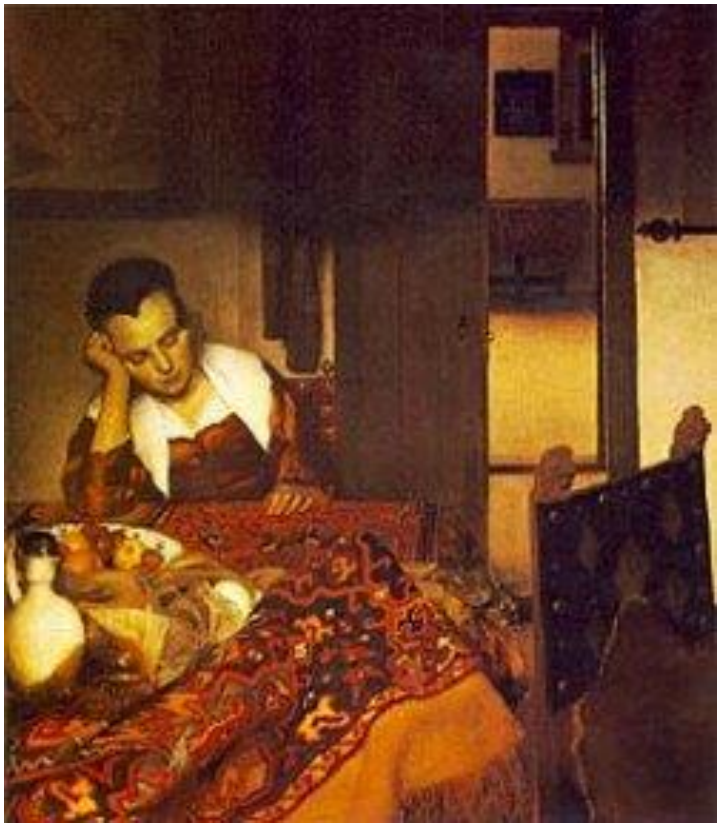
- **Complimentary:** Colors that are opposite on the wheel. High Contrast

Color Schemes: Analogous

Artist: Vincent van Gogh
Title: The Iris
Year: 1889

- **Analogous**: A selection of colours that are adjacent. Minimal contrast

Color Schemes: Warm



Artist: Jan Vermeer
Title: *Girl Asleep at a Table*
Year: 1657

Warm: First half of the wheel give warmer colours. The colours of fire.

Color Schemes: Cool

Artist: Pablo Picasso
Title: Femme Allongée Lisant
Year: 1939

Cool: Second half of the wheel gives cooler colors

Color Schemes: Achromatic

- Designating color perceived to have zero saturation and therefore no hue, such as **neutral grays**, **white**, or black

Image source:
http://www.directdigitalimaging.com/media/drew_garner_zebra_2009.jpg
https://c1.staticflickr.com/9/8134/8707738395_25fa570bc3_b.jpg

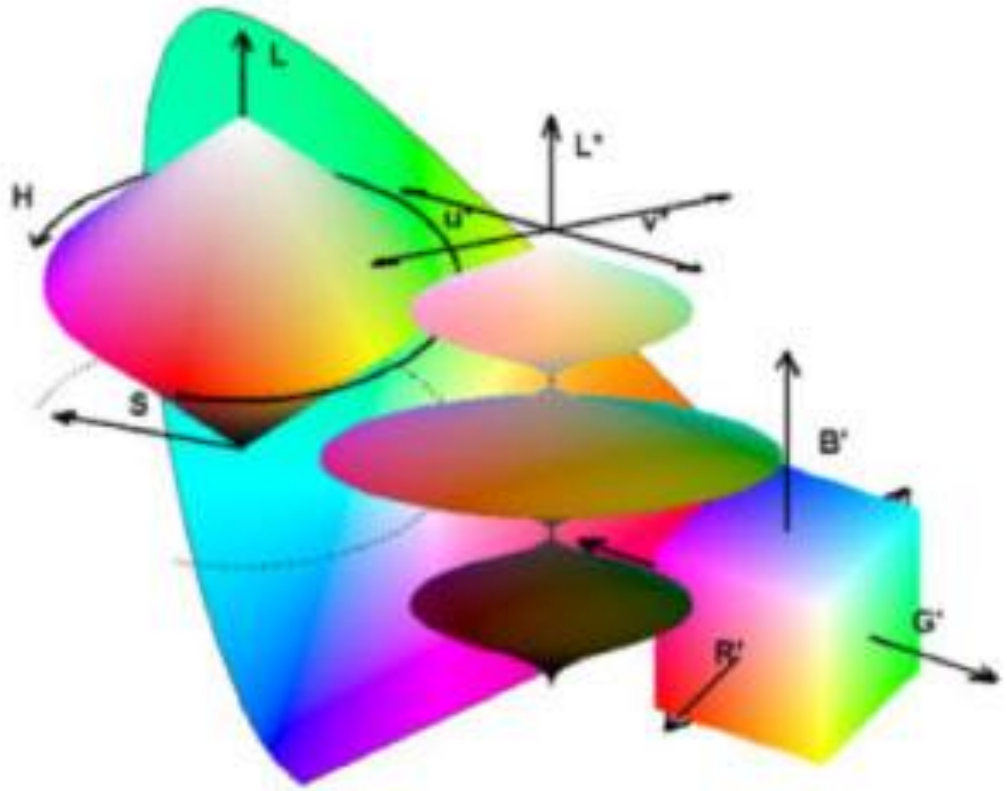
Color Schemes: Chromatic Grays

- **Chromatic Grays:** Also called neutral relief. Dull colors, low contrast.

Image source:
http://img02.deviantart.net/aa7a/i/2013/061/3/4/chromatic_grays_by_inkstoryrebel-d5wrg2f.jpg

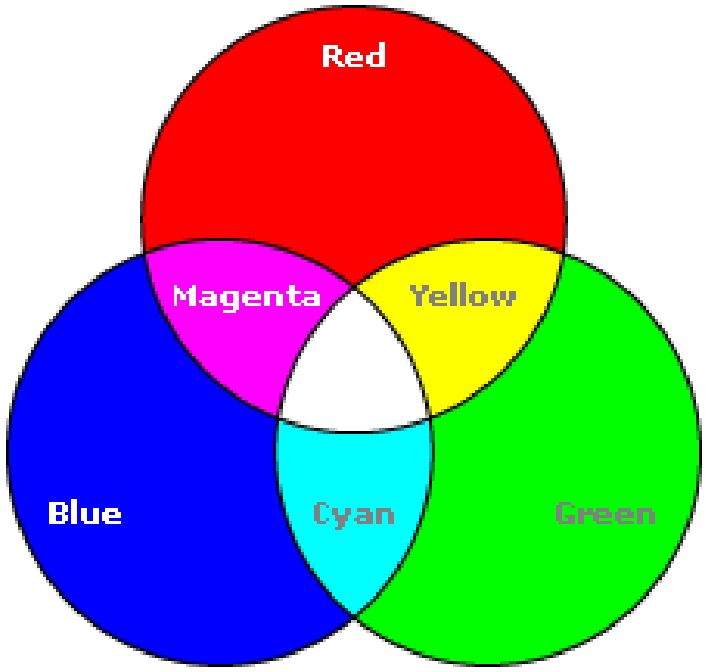
Color Models

- RGB
- CMY (K)
- HSV
- HSL



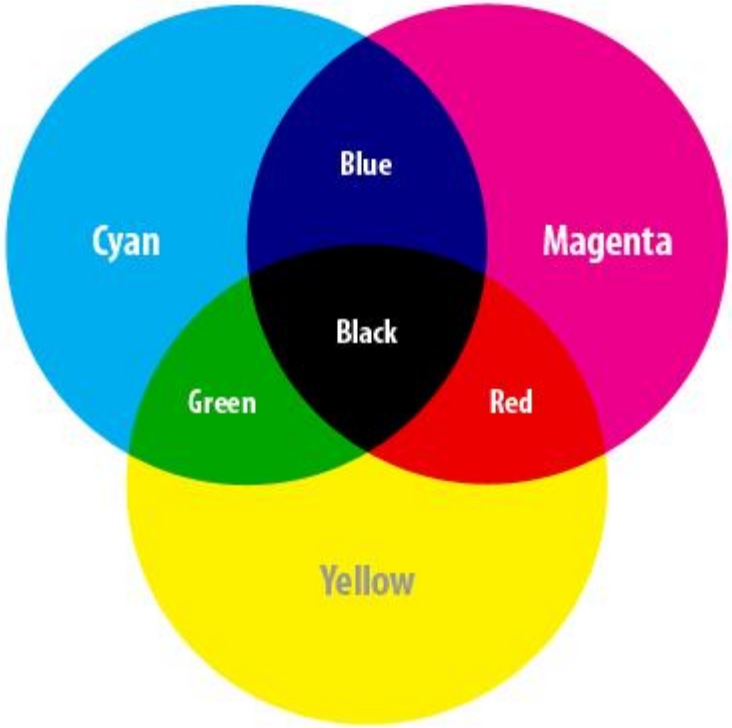
RGB

- Red, Green, Blue
  - Additive primary colors
  - Used for monitor screens and most image file formats



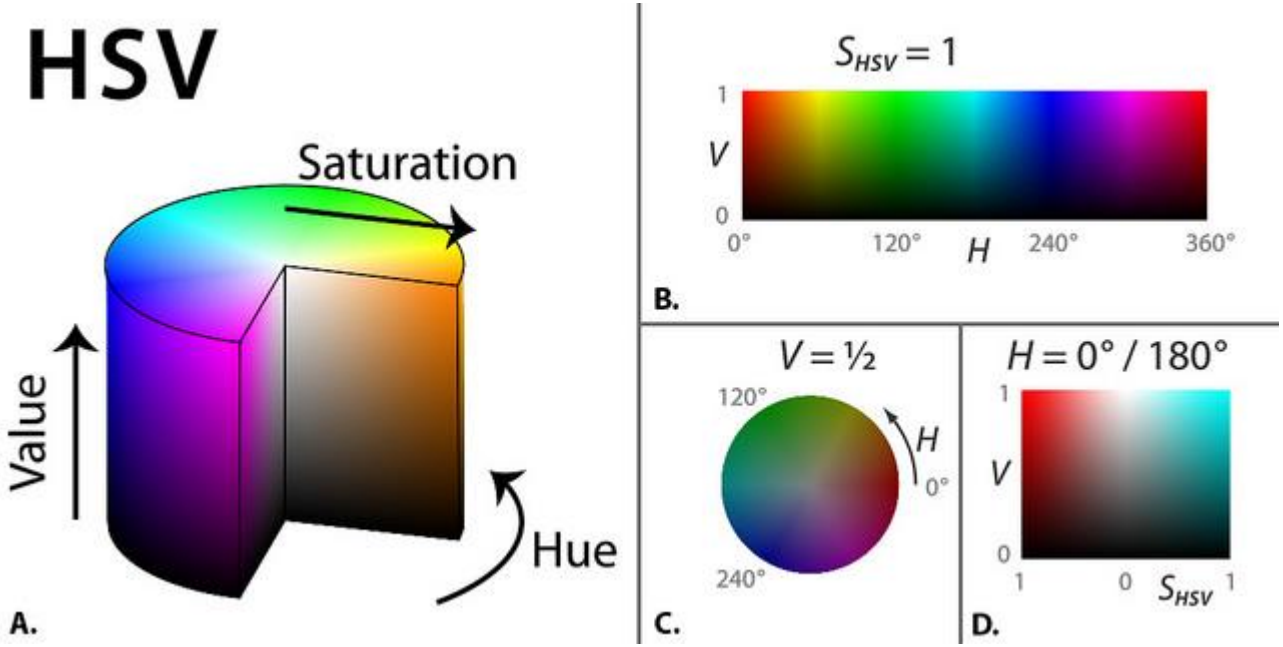
CMY(K)

- Cyan, Magenta, Yellow
  - Subtractive primary colors
  - Used in inks for printing with black (K) added because CYM pigments and inks rarely give deep, rich black tones by themselves (they tend to make a muddy brown).
  - Important to the prepress (printing) industry



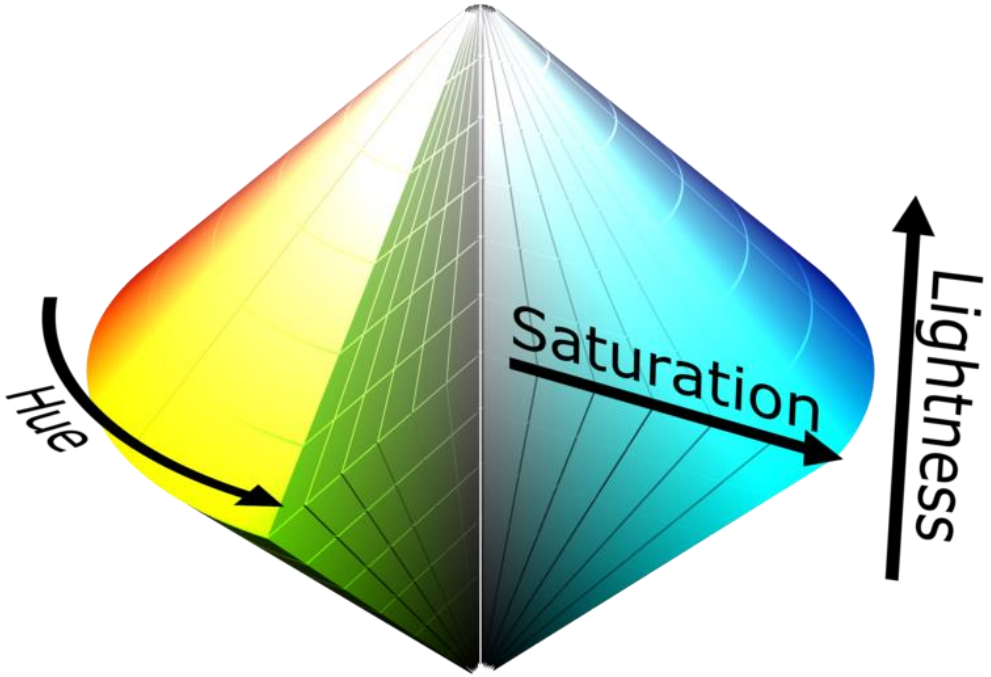
HSV

- Hue, saturation, value
  - Hue—perceived as color
  - Saturation—100% is a pure color, 0% is a shade of gray
  - Value—related to brightness

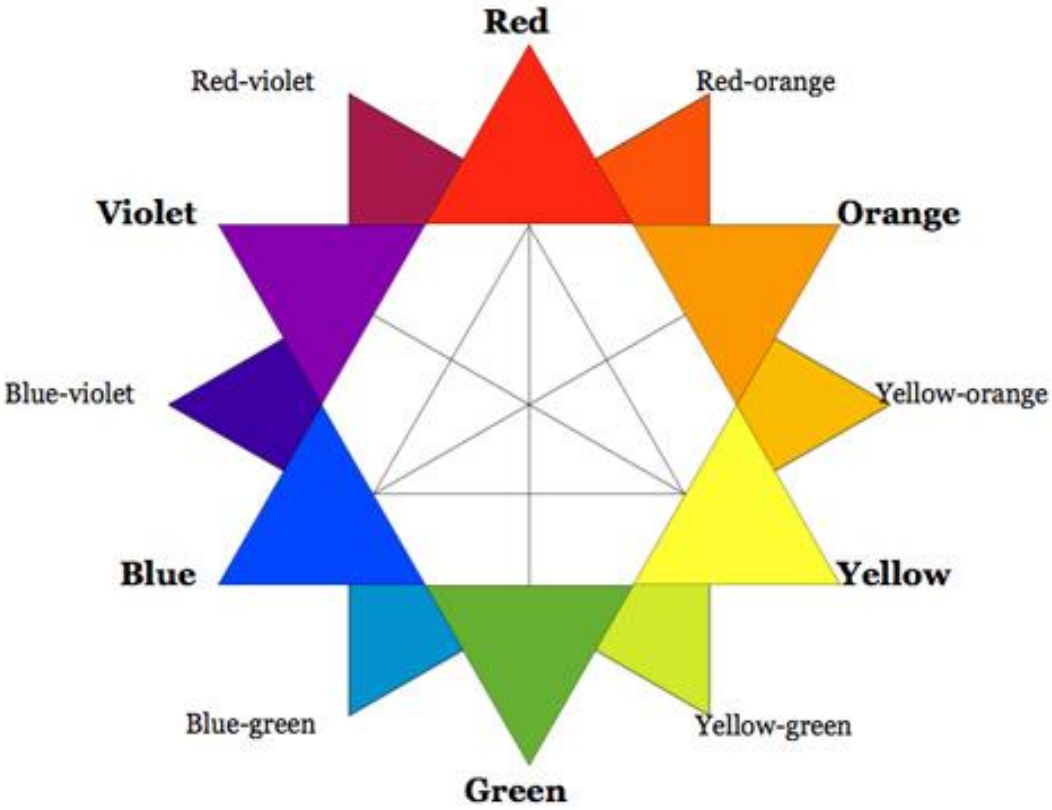


HSL

- Hue, Saturation, Lightness
  - Saturation is similar for dark colors but quite different for light colors.



The Meaning of Color



Red (Primary Color)

- A very hot color
- Associated with fire, violence, warfare
- love and passion
- Anger but also with importance (red carpet)
- Danger (stop light, warning labels)

Image source:
http://freevectorlogo.net/wp-content/uploads/2013/01/coca-cola-enjoy-.eps-logo-vector-400x400.png
http://1.bp.blogspot.com/-E4ql3-1up3I/ThlXoUhx_EI/AAAAAAAAAQg/GK3W6f0865Y/s1600/red-bull-logo.png

Orange (Secondary Color)

- Very vibrant and energetic color
- Associated with the earth and autumn
- Represents change and movement
- Health and vitality
- In designs, orange commands attention without being as overpowering as red
- More friendly, inviting and less in-your-face

Image source:
http://d1qhuz9ahqnrhh.cloudfront.net/wp-content/uploads/2012/03/orange-logos.jpg

Yellow (Primary Color)

- Brightest and most energizing among the warm colors
- Happiness, sunshine
- Also associated with deceit, cowardice
- Hope but also with danger

Image source:
https://www.famouslogos.us/images/nikon-logo.jpg
http://d1qhuz9ahqnrhh.cloudfront.net/wp-content/uploads/2012/03/yellow-logos.jpg
http://skyje.com/wp-content/uploads/2010/08/McDonald.png

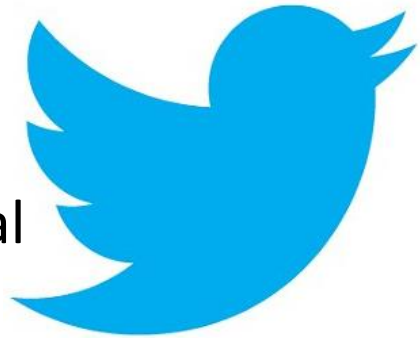
Green (Secondary Color)

- Very down-to-earth color
- Represents new beginning and growth
- Also envy or jealousy and a lack of experience
- In design, it can have a balancing and harmonizing effect, and is very stable
- Appropriate for designs related to wealth, stability, renewal, and nature

Image source:
https://images-na.ssl-images-amazon.com/images/I/51Q1i%2B0dJlL._SY300_.jpg
http://www.grand-arcade.co.uk/wp-content/uploads/2016/04/the-body-shop.png

Blue (Primary Color)

- Associated with sadness, calmness and responsibility
- Light blues are refreshing and friendly
- Dark blues are strong and reliable
- Also associated with peace and has some spiritual connotations in some cultures



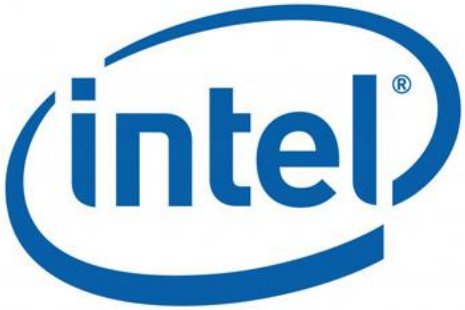


Image source:
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https://cfl.dropboxstatic.com/static/images/brand/logotype-vflHjIsop.svg
http://i.dailymail.co.uk/i/pix/2012/06/07/article-0-137BE603000005DC-613_468x312.jpg

Purple (Secondary Color)

- Associated with royalty, creativity and imagination
- In Thailand, purple is the color for mourning of widows
- In design, dark purples give a sense of wealth and luxury
- Light purples are associated with spring and romance

Image source:
http://studiorokit.com/wp-content/uploads/2013/09/current-cadbury-logo.jpg
http://www.logocritiques.com/images/uploads/resource_images/in_article/purple-hallmark.gif
http://logodatabases.com/wp-content/uploads/2012/01/yahoo-logo-purple.jpg

Black

- Strongest of the neutral colors
- Associated with power, elegance and formality
- Also, with evil, death and mystery
- In design, black is commonly used for typography and other functional parts, because of it's neutrality.

Image source: http://www.family-rewards-shop.com/Adidas/Adidas%20Logo.png
http://4.bp.blogspot.com/-2_gQ6qxXFt0/ThiuzuS8ZUI/AAAAAAAAALI/Jm22tGeGhII/s1600/all+black+logo.jpg
http://logodatabases.com/wp-content/uploads/2012/03/canon-logo-black.jpg

Gray

- Is at the cool end of the color spectrum
- Considered moody and depressing
- conservative and formal but also modern
- A color of mourning
- A sophisticated color, used in corporate designs

Image source:
https://www.media.volvocars.com/image/low/151336/2_2/1?i=1
https://thesashcompany.com/images/partners/internationalms/International-Ms-Logo-Grey.png
http://img.extremepc.fr/2009/logiciel/apple-logo-grey.jpg
http://freevectorlogo.net/wp-content/uploads/2013/06/volkswagen-grey-vector-logo-400x400.png

Conclusion of The Chapter

- Color is property possessed by an object caused by differing qualities of light being reflected or emitted. Color can be seen when there is a light.
- Color wheel shows the primary, secondary & tertiary colors.
- Colors scheme: Monochromatic, Complimentary, Analogous, Warm, Cool, Achromatic, Chromatic and Grays.
- There are 4 color models, RGB, CMYK, HSV & HSL.
- Each colors has different meaning.