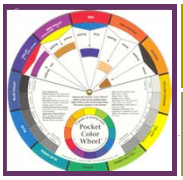


Color Theory

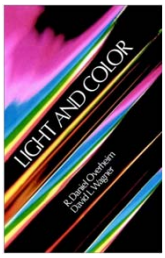
Color

- Color plays a vitally important role in the world in which we live.
- Color can sway thinking, change actions, and cause reactions.
- It can irritate or soothe your eyes, raise your blood pressure or suppress your appetite

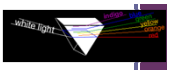
Color SCIENCE

Without light,
there is no color.

- You must understand the principles of light to understand color science.



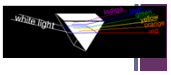
Where did color come from?



- Issac Newton first passed a beam of white light through a prism and saw it divide into colors, creating a spectrum of colors

see website
http://webexhibits.org/colorart/bh.html

What Color Is

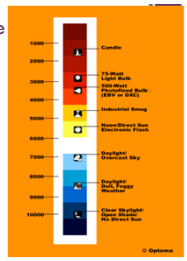


- The colors of the light wave spectrum are RED, ORANGE, YELLOW, GREEN, BLUE, VIOLET
- In physics, mixing the colors of the light wave together produces pure white light.

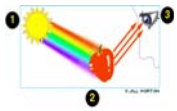
Color Temperature

- Light has a temperature.
- Temp is measured in KELVIN (K)
- In LIGHT, reds & yellows are cooler, blues and violets are hotter

(Think of a campfire)



How the Eye Sees Color



see
http://www.colormatters.com/seecolor.html

1. All the" invisible" colors of sunlight shine on the apple.

2. The surface of a red apple absorbs all the colored light rays, except for those corresponding to red, and reflects this color to the human eye.

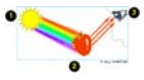
3. The eye receives the reflected red light and sends a message to the brain

How the Eye Sees Color

•Color originates in light.

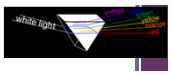
•Sunlight, as we perceive it, is colorless.

•In reality, a rainbow will show you that all the colors of the spectrum are present in white light.

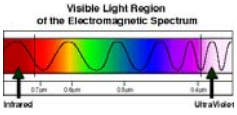


•Light goes from the source (the sun) to the object (the apple), and finally to the detector (the eye and brain).

What Color Is



- It is these light waves, bouncing off or being absorbed by objects around us, that give them color. Hence the theory, color is a property of light.



Color SYSTEMS

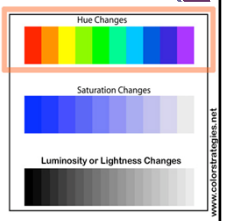
Ways people measure & name color

The Color Wheel

- A color circle, based on red, yellow and blue, is traditional in the field of art and is a way of arranging colors to show a variety of relationships between colors
- Sir Isaac Newton developed the first circular diagram of colors in 1666
- Since then scientists and artists have studied and designed numerous variations of this concept

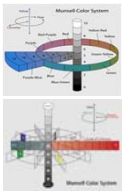
Hue, Saturation & Brightness (HSB)

- **Hue** is pure form of color – there are six basic hues: red, yellow, blue, green, orange, and violet
- **Saturation** is the brightness the color – From solid hue to white
- **Brightness** is the lightness or luminosity of a hue – a value of how light or dark a color is. (adding black)



Munsell color system (HVC)

see website
http://en.wikipedia.org/wiki/Munsell_color_system



- HVC is very commonly used. It separates brightness (Munsell's VALUE) from Hue and Saturation (Munsell's CHROMA)
- Hue- letter H, followed by a fraction. Top is VALUE, BOTTOM is CHROMA
- Value – light or dark, measured from 1-10. Black is 0, white is 10.
- Chroma – numbers vary according to saturation strength.

Pantone system – spot color

- Pantone System colors are based on ink colors common to the print industry.
- Swatchbooks can show ink mixing formulas and are simulated on Adobe Illustrator.
- Spot color means colors that are not mixed using CMYK.

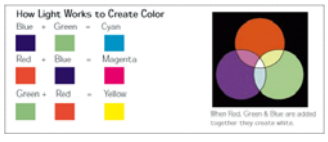
(like a bucket of paint)

Additive & Subtractive Color

see website
http://www.public.iastate.edu/~design/ART/ARTVS208/colorwheel.swf

Additive Color Theory

- **Additive Color Theory** states that in the natural world white light is made up of three basic components: red, green, and blue light
- In theory adding these three primary colors of light, red, green, and blue, together achieve white
- This is where we get *RGB* which is used by computer monitors

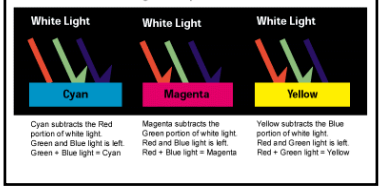


Subtractive Color Theory

- **Subtractive Color Theory** explains how **cyan**, **magenta**, and **yellow** pigments or inks on paper subtracts white light components
- Since white light is made up of red, green and blue light, the inks subtract out that color of light
- Whatever light that is left is recognized by the eye as a certain color
- This is where we get CMYK which is used in the printing process

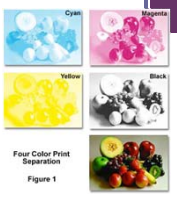
Subtractive Color Theory

Inks Subtract White Light Components



Color Separation

- Dividing the colors of a multicolored document in to the SUBTRACTIVE ink colors. (CMYK)
- Color Separation is done through the print menu.
- Uses for color separation – film for screenprinting, plates for printing press.



Primary Colors

- **Red, yellow, and blue**
- In traditional color theory, these are the three pigment colors that can not be mixed or formed by any combination of other colors
- All other colors are derived from these three hues

Secondary Colors

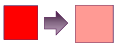
- These are the three colors formed by mixing two primary colors together - **green**, **orange**, **and violet**
- Blue + yellow = green
- Red + yellow = orange
- Red + blue = violet

Tertiary Colors

- These are the six colors formed by mixing a primary color with a secondary color - **yellow-orange**, **red-orange**, **red-violet**, **blue-violet**, **blue-green**, **and yellow-green**

Where do all the other colors come from?

- By adding white, black or gray, or another color.
- TINT – Color with WHITE added



- SHADE – Color with BLACK added

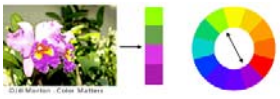
- TONE – Color with GRAY or a complimentary color added.

Basic Color Schemes

- Color schemes are ways to use groups of colors together so a desired affect is achieved by an artist

Complementary Colors

- Two colors OPPOSITE each other on the color wheel
  - red and green, blue & orange, violet & yellow
- Complimentary Colors create maximum contrast and accent one another perfectly
- **Pros: Extremely eye-catching and vibrant**
- Cons: The limited number of colors
  - Sometimes not paid attention to by viewers (too common)

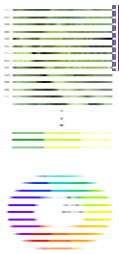


Monochromatic Scheme

- This uses a single pure hue with a number of tints and shades to give variety
- Pros: HARMONY
  - Establishes overall mood
- Cons:
  - Can be dull
  - lack of variation
  - can lose the interest of the viewer

Analogous Colors

- Analogous colors - three colors side by side on the color wheel. (yellow-green, yellow, and yellow-orange)
- Usually one of the three colors is most dominant
- Pros
  - Lots of possible combinations scheme
  - Versatile
  - great results - used in nature and is usually soothing and restful
- Cons: Can sometimes take away from theme of artwork



Triadic Color Scheme

- Draw a triangle on the color wheel and use those colors
- Primary colors gives the most IMPACT.
- Pros:
  - color perfectly balances with the other
  - bold and vibrant color scheme
  - useful for presenting information in bold decisive patterns
- Cons:
  - The vibrancy may be too strong and detract from the message

Split Complementary

- Pick a color, then look across color wheel – pick color on either side of that! (Red, blue-green & yellow-green)
- Pros: This scheme has more variety than a simple complementary color scheme
- Cons: It is less vibrant and eye-catching - it is difficult to harmonize the colors

SPLIT COMPLEMENTARY COLORS

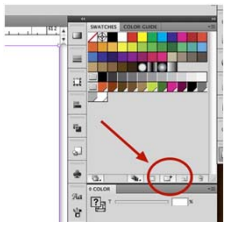
Warm Colors

- Yellow to red-violet on the color wheel
  - Advance to front of page
  - Excitement, passion, liveliness
  - Caution
  - Heat
  - Anger

Cool colors

- Violet to yellow-green on the color wheel
  - Cool colors recede to back of page
  - Serenity, calmness
  - Sometimes cold
  - Winter

Color Viewing Variables



Color – is a form of COMMUNICATION

- Red means "stop" and green means "go."
- Traffic lights send this universal message.
- Colors used for a product, web site, business card, or logo can cause powerful reactions.
- WHAT EXAMPLES CAN YOU THINK OF??

Color Viewing Variables

- **Color Blindness -** Inability to tell colors apart.
- Many color blind people confuse red and green, or green and yellow.

In the chart on the right, if you see a "5", you are not color blind. If you see a "2", you are:

RED-GREEN COLOR BLIND

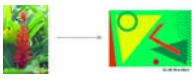
Color Viewing Variables

- **Vision Fatique – Viewing full color saturation for a long time can make the eyes tired. This will make any other color you look at appear different.**
- CHECK OUT:

- http://www.colormatters.com/optics.html

Nature

- Nature can help us choose color schemes
- red yellow and green create a harmony in nature, and in design



Color Context

- Color Context is how colors behave next to each other
- Compare the contrast effects of different color backgrounds for the same red square

- Red appears brighter against black background, duller against the white background
- Red against orange – dull. Red against blue-green – too bright
- Notice that the red square appears larger on black than on other background colors

Color Context

- The same color can look totally different with a different background

- Which side has the lighter violet inner rectangle??
- This can make THREE colors appear to be FOUR COLORS!

ITTEN's CONTRASTS

Johannes Itten created the SEVEN COLOR CONTRASTS:

Contrast of HUE
Contrast of Light and Dark
Contrast of WARM and COOL
Contrast of COMPLIMENTS
SIMULTANEOUS CONTRAST
Contrast of SATURATION
Contrast of PROPORTION

go to
http://www.worqx.com/color/palette.htmhttp://www.worqx.com/color/palette.htm

to practice color contrasts

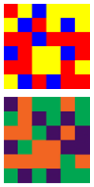
ITTEN's CONTRASTS

Contrast of HUE:

Putting 100% pure hues next to each other can create contrast.

The greater the distance between hues on the color wheel, the greater the contrast.

Hues must be the same percent. If you use 50% red, you must use 50% blue, etc.



ITTEN's CONTRASTS

Contrast of Light and Dark

.Dark colors come forward, light colors recede, or vice versa.

.Works with both black and white and color.

.Most dramatic of all contrasts.

ITTEN's CONTRASTS

Contrast of Warm and Cool

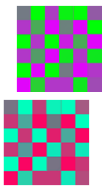
Contrasting Warm colors with Cool Colors

ITTEN's CONTRASTS

Contrast of COMPLIMENTS

•Contrasting colors that are opposite on the color wheel.

•Once again, 100% hues contrast more than less percentage of hues,



ITTEN's CONTRASTS

Simultaneous Contrast

•The simultaneous contrast is formed when the boundaries between colors perceptually vibrate. Some interesting illusions are accomplished with this contrast.
•Using 100% of complimentary colors with gray will make this happen.

ITTEN's CONTRASTS

Contrast of Saturation

•Contrast between colors that have more or less gray mixed with them.

ITTEN's CONTRASTS

Contrast of PROPORTION or EXTENSION

•Different amounts of one color than another.

•Example – a large area of light blue would contrast with a small area of bright red.

•Visual Weight of a color contributes to Contrast of Proportion.

These are all equally distributed contrasts.

Color Theory - Review

- Color Plays an important roll in our design world
- Light waves bouncing off or being absorbed by objects give them color
- Traditional color wheel created by Isaac Newton, RED, YELLOW, BLUE
- HSB – way of measuring colors
- Temperature of light is measured in KELVIN (K)
- Munsell's – HVC – measures color using fractions.
- HUE – 100% of a color.
- Primary Colors are RED, YELLOW & BLUE -you can't mix anything to make them.
- Secondary Colors are GREEN, ORANGE & VIOLET. -mix primaries to make them
- Tertiary Colors are made by mixing a primary with a secondary color

Color Theory - Review

- Tint – Hue mixed with White
- Shade – Hue mixed with Black
- Tone – Hue mixed with Gray or a complimentary color
- Additive Color – Red, Green, Blue mixed together makes white
- Subtractive Color – Cyan, Magenta & Yellow subtract white light.
- Pantone System – Color swatches for ink that are not mixed – think paint
- Color Separations – printing CMYK of a design so you can see the separate artwork.
- Monochromatic – Any combination of tints, shades and tones of the same color
- Analogous – three colors side by side on the color wheel
- Complimentary – Colors opposite each other on the color wheel

Color Theory - Review

- Triadic – colors in triangle of each other on color wheel – Red, Yellow, Blue
- Split Complimentary – one across color wheel, and 2 next to each other on the other side
- Color Blindness – inability to see certain colors
- Vision Fatigue – viewing too bright of colors for too long causes other colors to look bad
- Nature – look to nature for color harmony
- warm colors – yellow to red-violet on color wheel
- Cool colors – violet to yellow green on color wheel

Color Theory - Review

- Itten's Color contrasts:
  - Contrast of HUE
  - Contrast of Light and Dark
  - Contrast of Warm and Cool
  - Contrast of Compliments
  - Simultaneous Contrast
  - Contrast of Saturation
  - Contrast of Proportion
- see http://poynterextra.org/cp/colorproject/color.html

Color Meanings Video

- Watch this clever video about color, then go to the website to have some fun with colors!'
- http://www.mariaclaudiacortes.com/colors/Colors.html