A TASTE OF COLOR THEORY – THE ART AND SCIENCE OF USING COLOR

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SELECT DEFINITIONS

Color Model – framework for how we see color in the visible spectrum and how we create color in art and technology. Most artists use the RYB model (for us left-brain thinkers, read the "Into the Weeds" handout.)

Hue – a color family from the main part of a color wheel, such as red, red-orange, orange, orange-yellow, yellow, etc.; a pure spectrum; dominant wavelength in the visible spectrum (objective quality)

Hue (different meaning when describing art pigments) - refers to a composite pigment made up of other pigments to use in lieu of a single pigment that may be poisonous (e.g., cadmiums), expensive (e.g., cerulean), or fugitive (e.g., aureolin). When using hues, be aware of the characteristics of their individual pigments.

Value – Lightness or darkness. Pigments have a value that cannot be made darker than when pure, except by adding a gray or black, or complement. Value can be lowered slightly by layering, but a pure red will usually go no lower than a 5 or a yellow no lower than an 8. Value study app: "Value Study: art reference" – use to study composition based on value.

Tint – a lighter value achieved by adding water (or white in other mediums)

Tone – a darker value achieved by adding gray, although a complement makes better shadows than grays in watercolor.

Shade - a darker value achieved by adding black.

Some value scales start at 1 for white and go to 10 for black. Others start at 0 for black and go to 10 for white. The latter makes more sense because white is all the visible colors. White should have a higher value. (Think <u>high</u>lights vs l<u>ow</u>lights in hair coloring.) A high value painting is called high key, and low value, low key.

Chroma –the brightness or intensity of a color; technically, the distance in intensity from a gray of the same value (https://munsell.com/about-munsell-color/how-color-notation-works/munsell-chroma/)

Color – Hue + Value (lightness) + Chroma (vibrance, saturation)

Luminosity – a perception of glow; created through choice of application (such as layering), use of contrast in value, and/or use of complements.

Temperature – perception of relative warmth or coolness of a color. What color is hottest? Are you sure? It's complicated….

Primary, Secondary, Tertiary, Analogous, Complementary, Split primary, Monochromatic, Color Wheel, Munson Wheel, Quiller Wheel, Balance, Harmony…. And the list goes on.

Pigment – organic or chemical substances that give paint its color by absorbing or reflecting light of different wavelengths. Pigments of the same organic or inorganic base may differ due to how it is processed through grinding, heating, sifting, etc, as well as the additives used.

Into the Weeds *or* Understanding color for the rest of us

Primary color – cannot be mixed from other colors Or can they….?

The RGB Color Model is based on visible light, often credited to Isaac Newton's prism experiments from 1666. The primary colors in light (RGB color model) – think of your TV screen – are:

Red, Green, Blue – these are the lights that three kinds of cones in human eyes best perceive.

Mixing light is an **additive** process. The secondary colors of light are:

Cyan (green + blue)
Magenta (blue + red)
Yellow (red + green)
White contains all light (red + green + blue).
Black is the absence of light. You don't see color in the dark!

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The RYB Color Model

The RYB model was created by artists in the 18th and 19th centuries. Their primary colors **in pigment (RYB model)** are:
Red, Yellow, and Blue

The RYB model less accurate than the newer CMY model (below). Why? Because mixing pigment is a **subtractive process** based on light.

The secondary colors in in the RYB model are:
Orange (yellow + red)
Violet (red + blue)
Green (yellow + blue)
How is that subtractive? Read on.

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The CMY Color Model

The CMY model is used in art and printing. It is technically more accurate than the RYB model because it shows that mixing colors is a subtractive process. This **modern color theory** was developed by physicist in the late 19th century. The CMY primary colors for pigment are:
Cyan, Magenta, and Yellow.
To get a secondary color, you subtract the other colors from white (all the colors) by blocking them. (Note that the primary colors of the CMY model are the secondary colors of light in the RGB model.)

We can create the secondary colors of the CMY model (also the primary colors of light in the RGB model) by "subtracting" these colors from white light

1. Red (white – (magenta + yellow)) – try it – you can mix red!
2. Green (white – (yellow + cyan))
3. Blue (white – (cyan + magenta))

Exercise 1: Choose any paint tube and try to find the characteristics of the paint – series, transparency, staining strength , lightfastness. Some are listed. Some are not.

The table below shows you where to find the information by manufacturer. Items in red are not provided on the paint tube for that brand. Be sure to read the notes on the next page.

Table 1. How to find information about your paint choice by manufacturer

Manufacturer	Name[1]	Pigment #(s)[2] (on tube)	Series[3]	Transparency / Opacity	Staining (won't lift easily)	Lightfast-ness or Perman-ence[4]	Binder (for most pigments); also add surfec-tants[5]	Granu-lation	To find info not on tube:
American Journey	Indanthrone Blue	PB60	Not listed	Not listed	Not listed	Not listed	Not listed	Not listed	No info found – do not rely on old Cheap Joe's info as pigments may have changed. Instead use pigment characteristics.
Daniel Smith	Indanthrone Blue	PB60	2	Transparent	Medium	1 - Excellent	Gum Arabic	No	https://danielsmith.com/daniel-smith-watercolor-pigment-characteristics-chart/
Holbein	Royal Blue	PB60	C	Transparent[6] ■	Non ○	Excellent ***	Gum arabic	Yes	https://holbeinartistmaterials.com/wp-content/uploads/2020/12/HWC.pdf
Mijello: Mission Gold	Indanthrone Blue	PB60	E	Semi-transparent ◢	Semi-staining	Excellent *****	Gum Arabic and Honey	No	https://artistpigments.org/brands/mijello-mission-gold-watercolor/chart
Royal Talens Rembrandt	Indanthrene Blue	PB60	2	Transparent ■	Staining ◆	Excellent *** (of 3)	Gum arabic	No	https://mediabank.royaltalens.com/royaltalens/file/96a0b1421fb38b18030aeb8bf12a4d77/5e456e38/documents/dir1/Rembrandt%20water%20colour%20ENG.pdf?_gl=1*1rkvpof*_gcl_au*OTY3MTE1NzAyLjE3NTc3OTQ0OTc.
Schminke Horadam	Dark Blue	PB60	2	Transparent	Semi-staining	Excellent ****	Gum Arabic	No	https://www.schmincke.de/en/service-contact/downloads - choose English as language and download Horadam charts
Sennellier	Blue Indanthrene	PB60	3	Transparent □	Not listed	Excellent *** (of 3)	Gum Arabic and Honey	No	https://www.sennelier-colors.com/article/photo/dossier494/ColorChart-ENG-WATERCOLOR.pdf
Winsor & Newton	Indanthrene Blue	PB60	3	Semi-transparent	Not listed	Excellent	Gum Arabic	No	https://www.winsornewton.com/collections/professional-watercolour/products/professional-watercolour-lemon-yellow-nickel-titanate?_gl=1*12gelgn*_up*MQ..*_gs*MQ..&gclid=Cj0KCQjwrJTGBhCbARIsANFBfguUchXG2sTIYKiy3drgHIUxPi6jpg8Cx3VJNh2yKVWh8rB7yzFLHAoaAo6fEALw_wcB&gbraid=0AAAAA_LFj02d0gGoSIKFHH_AISfdtEHBk

Chart Notes:

[1]Names are not standard across manufacturers. Note that all the blue examples in the chart use the same pigment but have different names. Also, colors across batches within the same manufacturer can vary. This is especially true for some of the earth colors. Always check your pigment numbers before you buy.

[2]Pigment numbers begin with P for Pigment then have a color abbreviation **PY** = Pigment Yellow; **PO** = Pigment Orange; **PR** = Pigment Red; **PV** = Pigment Violet; **PB** = Pigment Blue; **PG** = Pigment Green; **PBr** = Pigment Brown; **PBk** = Pigment Black; **PW** = Pigment White; **PM** = Pigment. Some paints, such as Daniel Smith *PrimaTek* paints will list the mineral content instead of a pigment #.

[3]A number or letter indicating relative price based on pigment cost. Lower numbers/letters are least expensive.

[4] Lightfastness (resistance to light) and Permanence (resistance to light AND chemical stability) indicated by *** or +++ symbols or sometimes by numbers. (More *'s or +'s are better. Usually go to 3. Low numbers are good in some charts.) Always aim for permanent, lightfast colors so that they do not change over time.

[5]Binders hold the pigment together. Surfactants improve flow and distribution of paint.

[6] The boxes and circles and diamonds and triangles have different codes that vary by brand. A clear box might mean transparent in one brand and opaque in another!

Note 1: Red type indicates information not on paint tube for this manufacturer.

A Taste of Color Theory – Exercise 2

Choose one yellow and one blue paint.

1. List the pigment characteristics of your choices from your tube information, if given:

Hue	Brand	Pigm.Name	Pigm. #	Transp.	Staining	Gran.	Temperature	Value
Yellow								
Blue								

Transparency vs Opacity (T, ST, SO, O); Staining vs Lifting (4= most staining)
Granulating (yes or no); Temperature (relative to its color family); Value – 10=white, 0=black

2. Paint a toothpaste-consistency square of yellow onto your paper. Note your color's temperature and its value at its most intense. Add a few drops of water, mix, and paint a square to the right of your first square. Add another few drops, mix, and paint. Repeat as often as you like. You have just created tints. You raised the value of the original color with each drop of water. Tints raise the value of a color. (In oil and acrylics, white makes tints.)
3. Repeat step 3 for your blue pigment.
4. Which of your squares is most luminous for each pigment? Why? Luminosity is a subjective perception, but we tend to find some watercolors most luminous with more water added than others. Note how many drops of water made yellow most luminous vs blue. Always experiment with different proportions of the colors you are mixing. (It is a common myth that light passes through transparent watercolor pigment and reflects back the white of the paper which makes a more luminous appearance. In fact, light either is absorbed by the pigment or reflected back from the pigment, never striking the paper and reflecting back through the pigment. To get in the weeds on this, see: https://www.handprint.com/HP/WCL/tech16.html)
5. Try mixing your two colors on the palette and paint a square. Now lay down the yellow then drop in the blue. Note the differences. Which do you prefer?
6. Make a tone by adding a gray to your green. No, don't do that! Find your green's complement and try adding that in. Note the beautiful tones (lower value) and how they might be used to make more realistic greens in nature. Try to find a single-pigment complement for best results. Some pigments and their complements will never get as dark as you'd like because they are both high key. In this case, a darker neutral is needed.