Welcome

ML Campbell Level Two
Color Development Specialist

Length:	4 Days
Pre-requisite:	Level I or Level I OLT
Instructor:	Darrel Young (darrel.s.young@mlcampbell.com)

Introduction

Agenda

Class Overview

- Color Vocabulary
- Color Matching Variables
- MLC Color Matching Tools
- Tint Load Review
- The Datacolor System
- Datacolor ColorReader Pro
- Process of Matching Solid Color
- Process of Matching a Stain
- Record Keeping
- Color Matching Games

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WOOD FINISHING SYSTEMS

Color Vocabulary

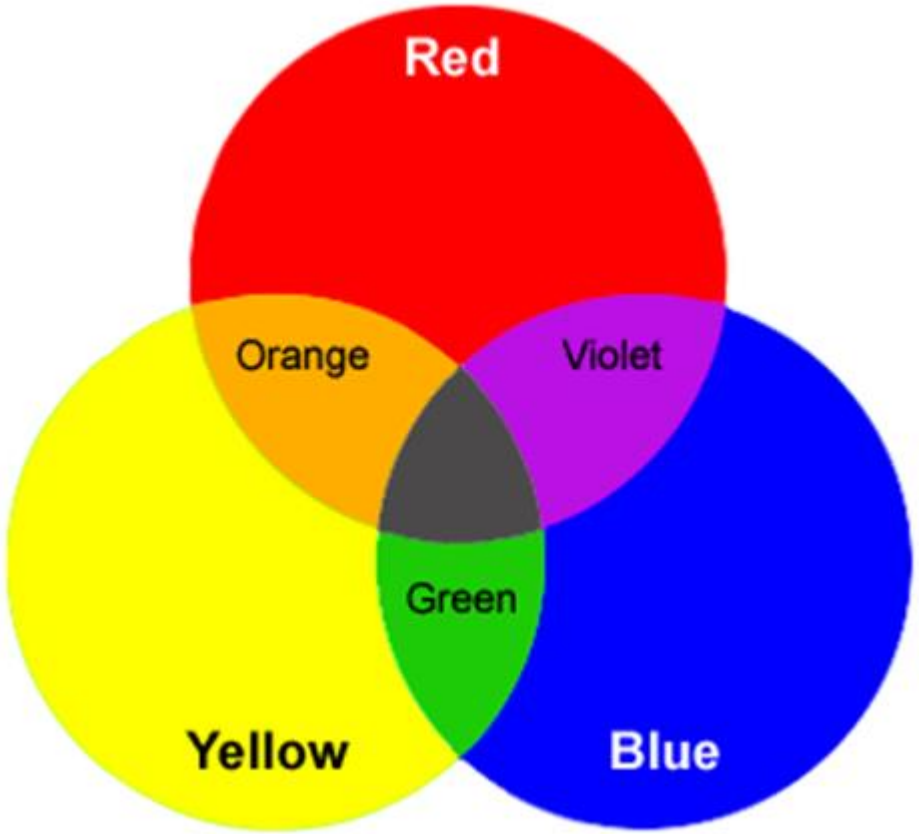
Color Vocabulary

Three Primary Colors

- Red
- Yellow
- Blue

Color Vocabulary

- A color is made by using any combination of the 3 primary colors.
- 1:1 mixing of the primary colors creates secondary colors.
- Hue – the dominant color family



Color Vocabulary

The Color Wheel

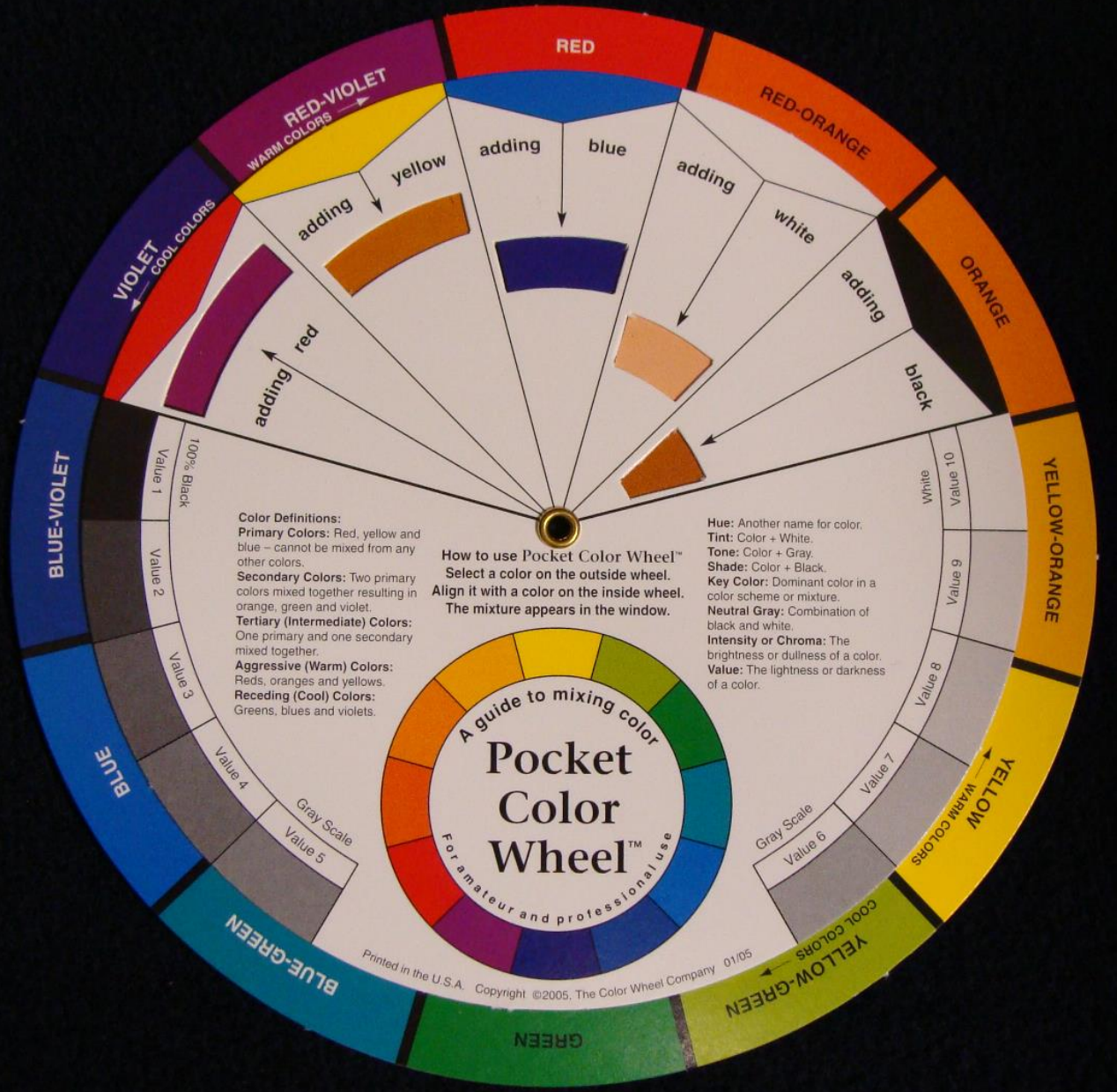

RED
RED-ORANGE
ORANGE
YELLOW-ORANGE
YELLOW
WARM COLORS
YELLOW-GREEN
COOL COLORS
GREEN
BLUE-GREEN
BLUE
BLUE-VIOLET
VIOLET
COOL COLORS
RED-VIOLET
WARM COLORS
adding
red
adding
yellow
adding
blue
adding
white
adding
black
100% Black
Value 1
Value 2
Value 3
Value 4
Gray Scale
Value 5
Gray Scale
Value 6
Value 7
Value 8
Value 9
White
Value 10
Color Definitions:
Primary Colors: Red, yellow and blue – cannot be mixed from any other colors.
Secondary Colors: Two primary colors mixed together resulting in orange, green and violet.
Tertiary (Intermediate) Colors: One primary and one secondary mixed together.
Aggressive (Warm) Colors: Reds, oranges and yellows.
Receding (Cool) Colors: Greens, blues and violets.
How to use Pocket Color Wheel™
Select a color on the outside wheel.
Align it with a color on the inside wheel.
The mixture appears in the window.
Hue: Another name for color.
Tint: Color + White.
Tone: Color + Gray.
Shade: Color + Black.
Key Color: Dominant color in a color scheme or mixture.
Neutral Gray: Combination of black and white.
Intensity or Chroma: The brightness or dullness of a color.
Value: The lightness or darkness of a color.
A guide to mixing color
Pocket Color Wheel™
For amateur and professional use
Printed in the U.S.A. Copyright ©2005, The Color Wheel Company 01/05


ILLUSTRATION OF COLOR RELATIONSHIPS
YELLOW-ORANGE
PURE COLOR
TINT
TONE
SHADE
ORANGE
YELLOW
RED-ORANGE
YELLOW-GREEN
How to use the Color Relationship Wheel:
Turn the dial so the arrow points to a Pure Color in the outer row. Color Relationships are shown using the diagram in the center.
01/05
THE COLOR WHEEL COMPANY
Philomath, Oregon
Phone: (541) 929-7326
www.colorwheel.com
0 89107 23501 0
TETRAD
TETRAD
TRIAD
SPLIT COMPLEMENTARY
COMPLEMENTARY
Mono-chromatic: Using any shade, tint, or tone of one color.
Analogous: Using any shades, tints, or tones of colors that lie adjacent to each other on the wheel.
Achromatic: A colorless scheme using blacks, whites and grays.
Color and Light: Subdued evening and candlelight create a distortion of color. Under these circumstances light colors need more intensity and dark colors less.
Color and Distance: Distance causes receding (cool) colors to "black out". Consequently lighter values of color should be employed for greater emphasis.
Complementary Colors: Combining a shade, tint or tone of one color and the color opposite on the wheel. Example blue and orange.
Split Complements: Choosing one color and using the color on each side of its complement on the color wheel.
Triad: Color scheme in which three colors equally spaced from each other. Example: the three primary colors – red, blue and yellow.
Tetrad: A contrast of four or more colors on the wheel.
PURE COLOR
RED-VIOLET
TRIADIC
VIOLET
SPLIT-COMPLEMENTARY
BLUE-VIOLET
COMPLEMENTARY
BLUE
SPLIT-COMPLEMENTARY
BLUE-GREEN
TRIADIC
PURE COLOR

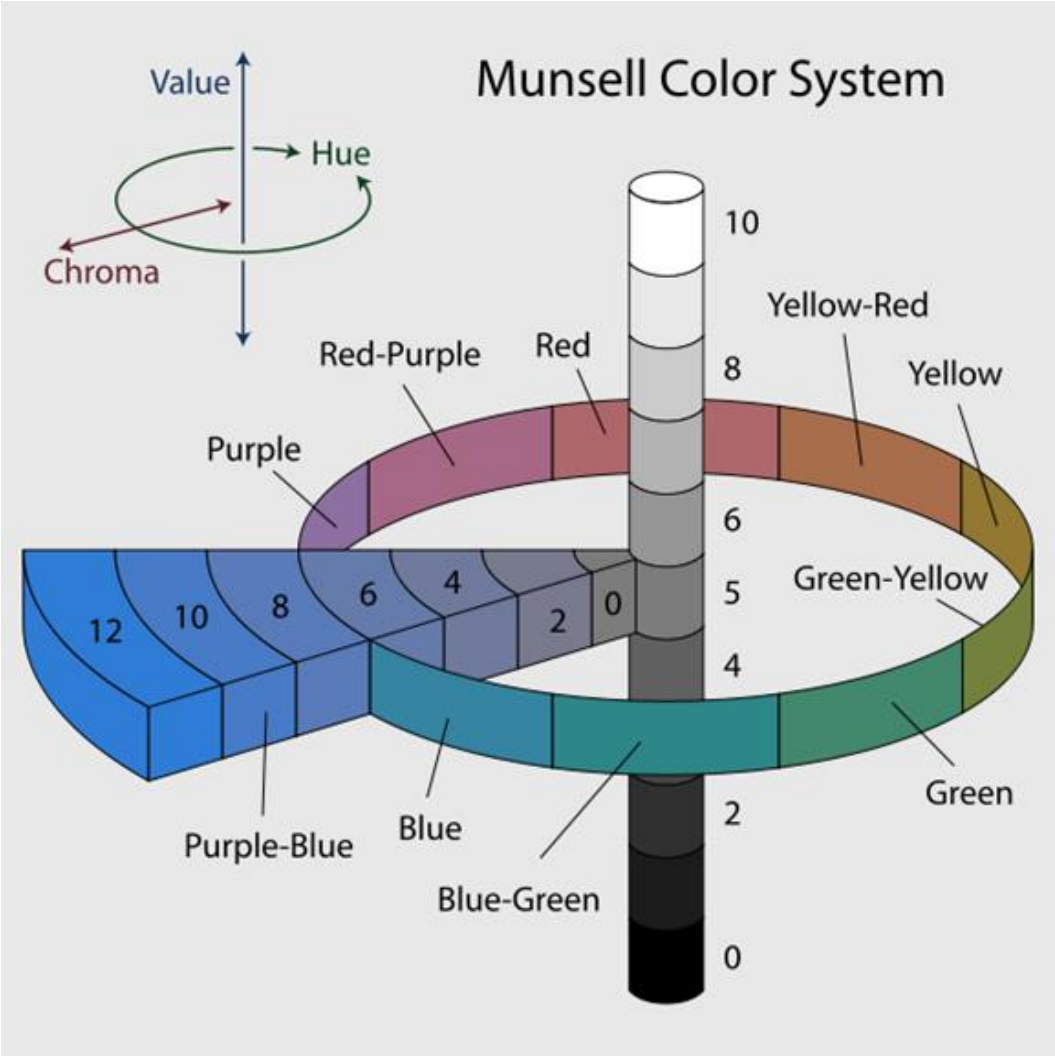
Color Vocabulary

Tint, Shade, and Tone

- **Tint** – the addition of white to a hue creates a lighter color and also a higher value (adding white to red creates pink)
- **Shade** – the addition of black to a hue creates a darker color (a lower chroma) and a lower value
- **Tone** – the addition of black and white (grey) to a hue results in a “greying” of a color (lower chroma) and a lower value

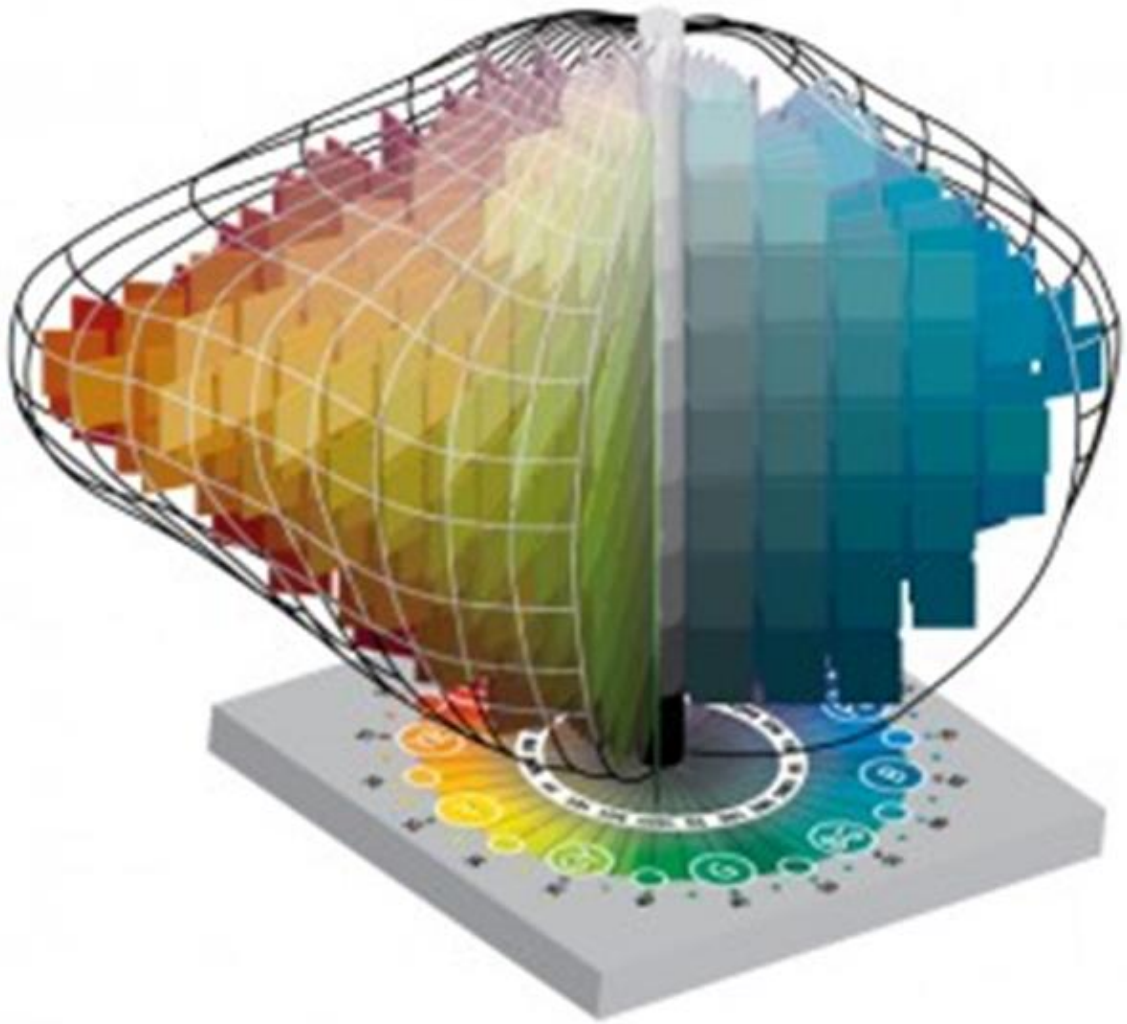
Color Vocabulary

- **Chroma** – intensity, depth, saturation, richness, purity, mass tone - difference from gray at a given hue and lightness
- **Value** – lightness or darkness - amount of reflected light



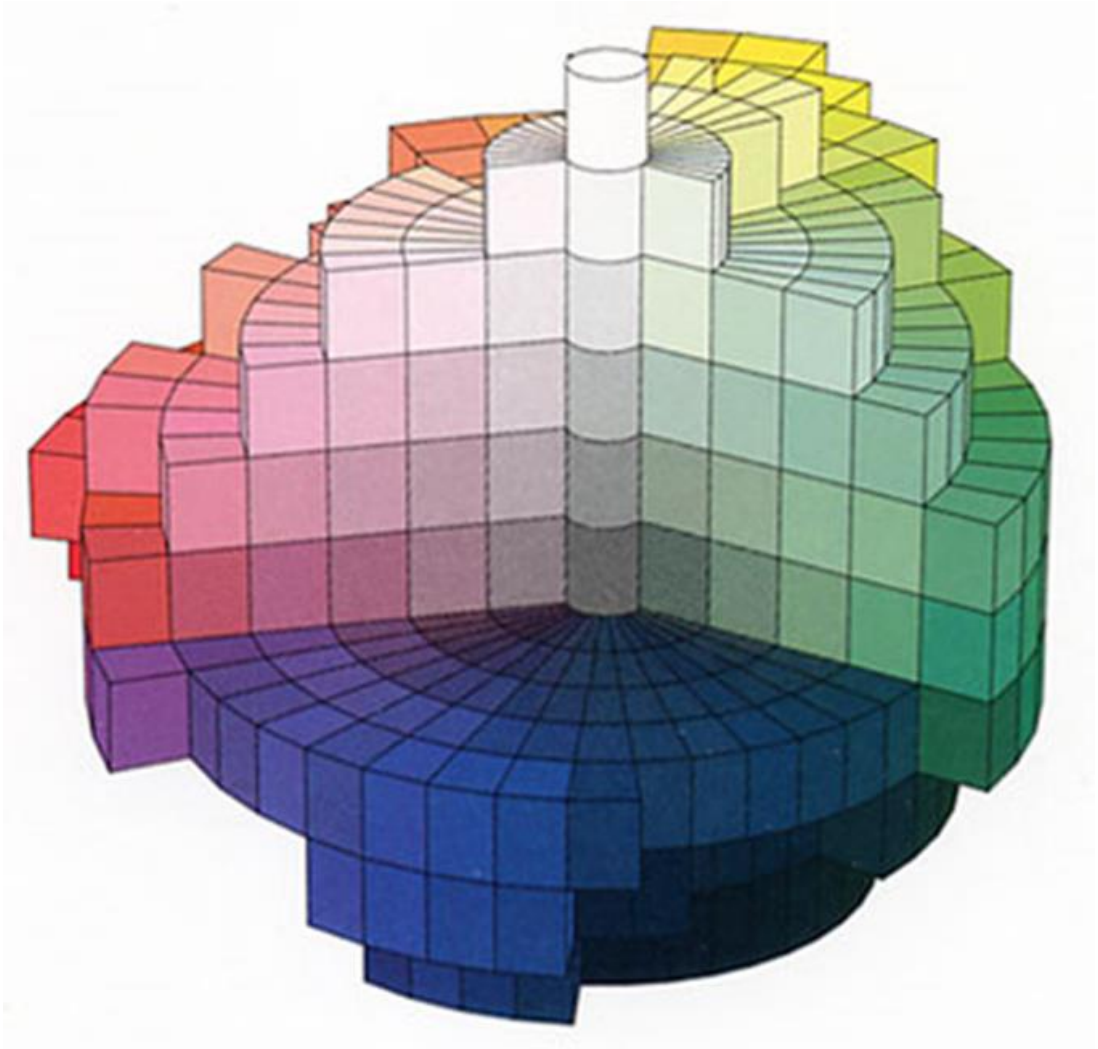
Color Vocabulary

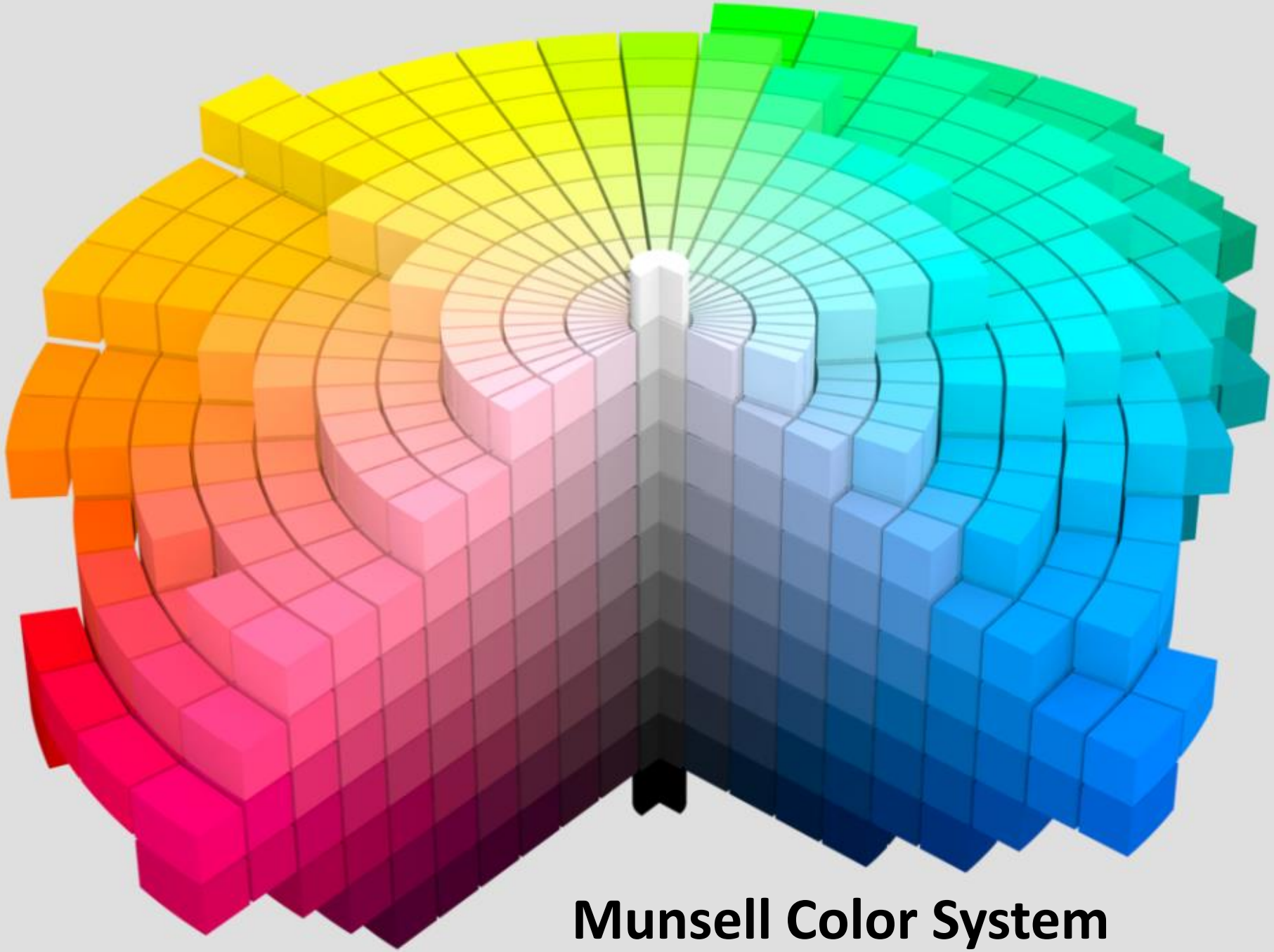
Munsell Color System



Color Vocabulary

Munsell Color System

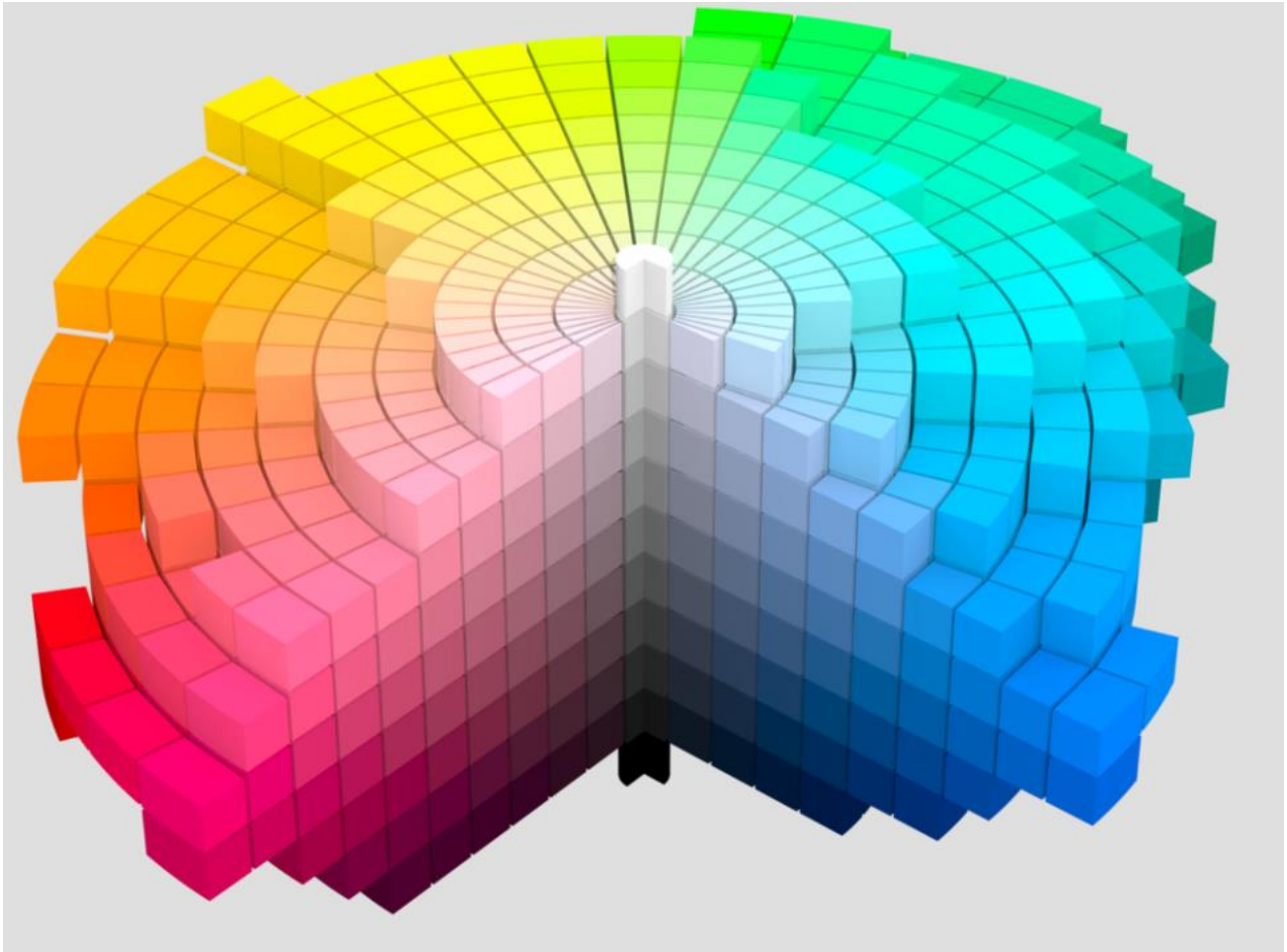




Munsell Color System

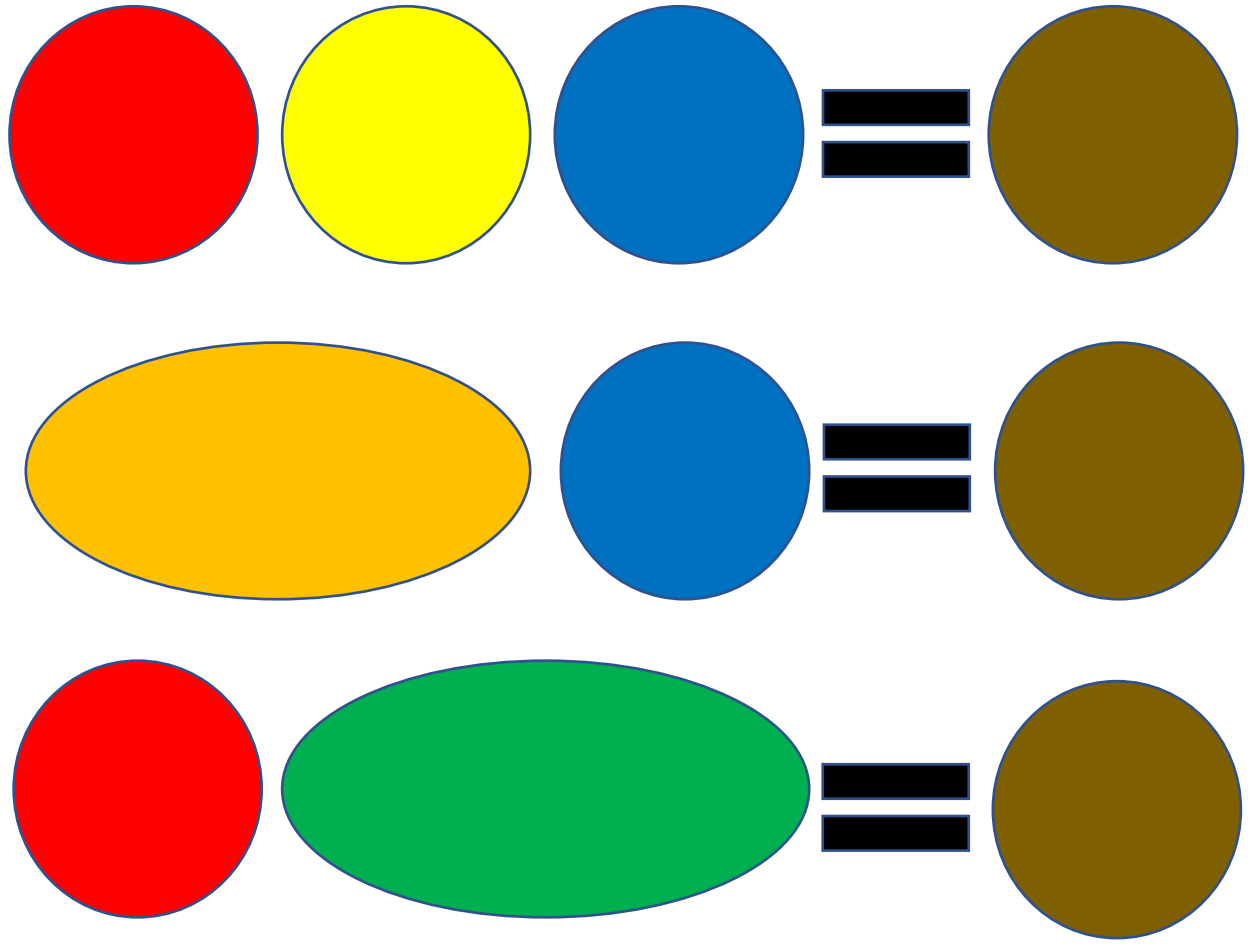
Color Vocabulary

Where's the Brown



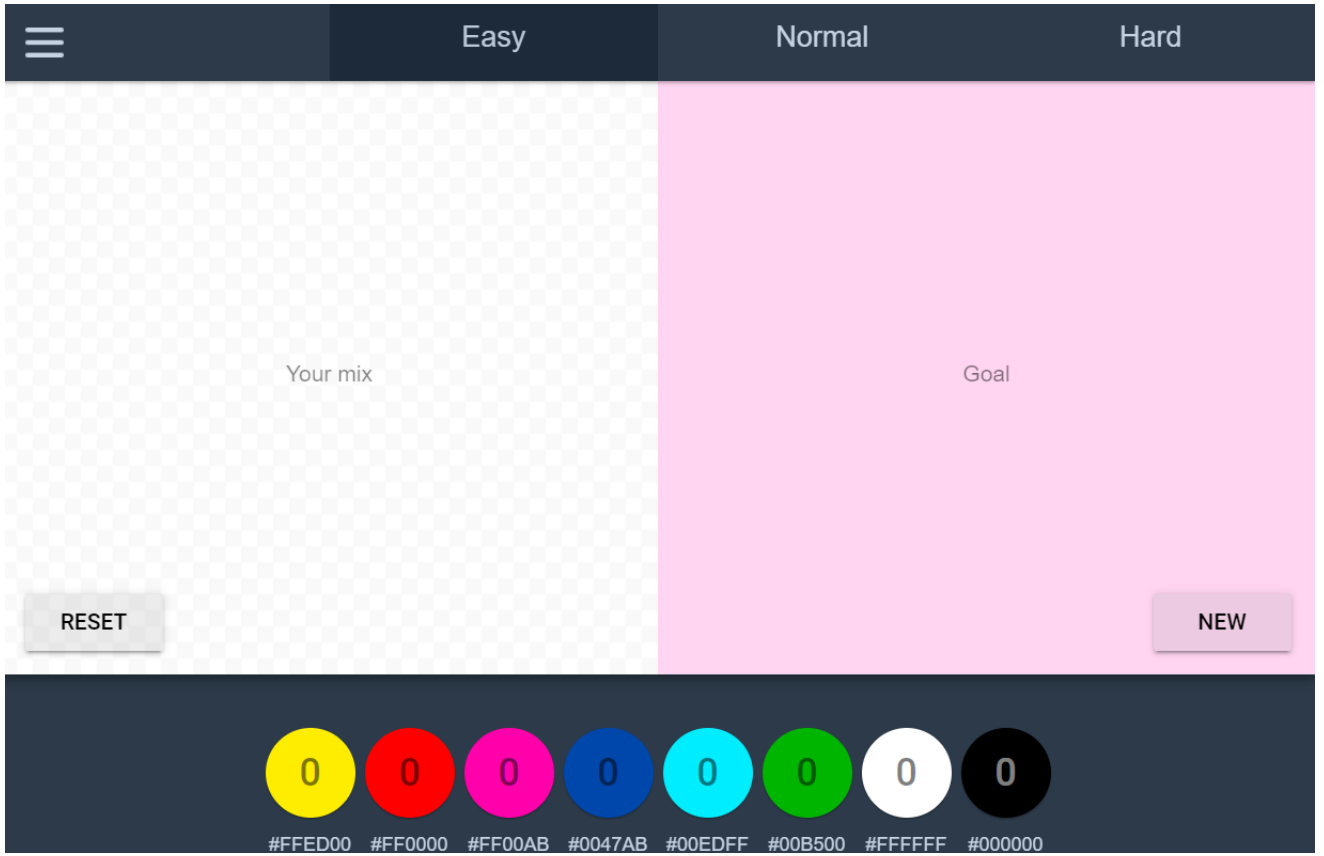
Color Vocabulary

Where's the Brown?



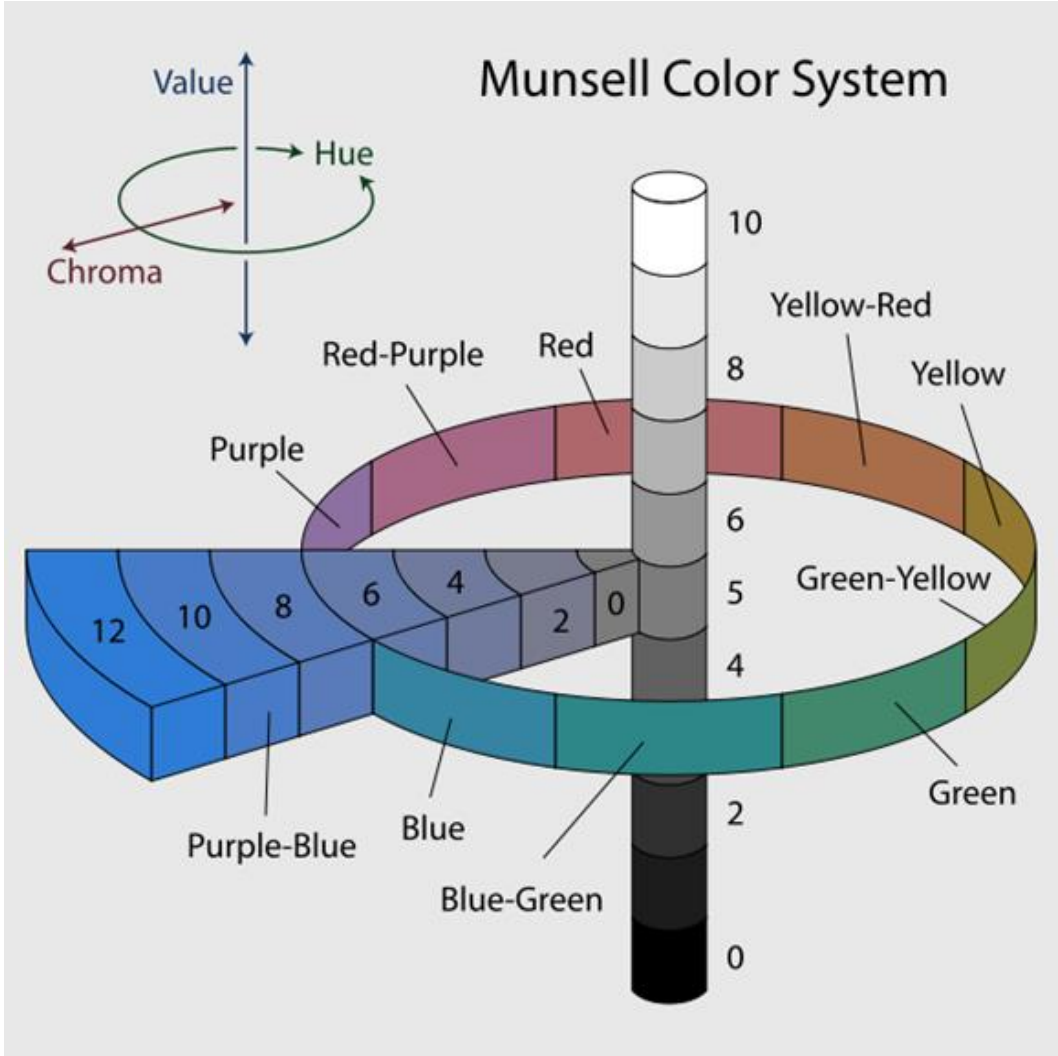
Color Matching Game

https://trycolors.com/game/



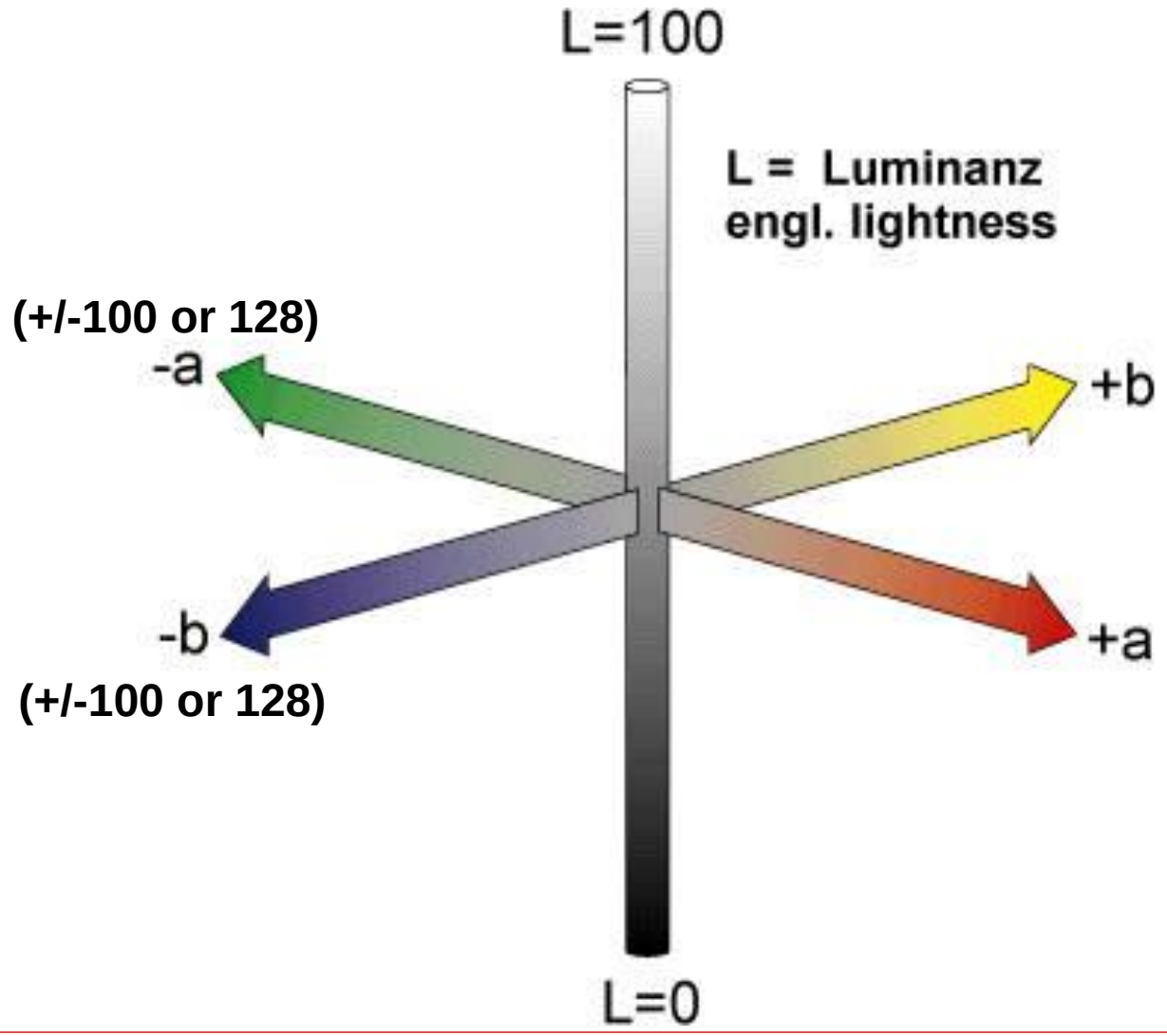
Color Vocabulary

Munsell Color System



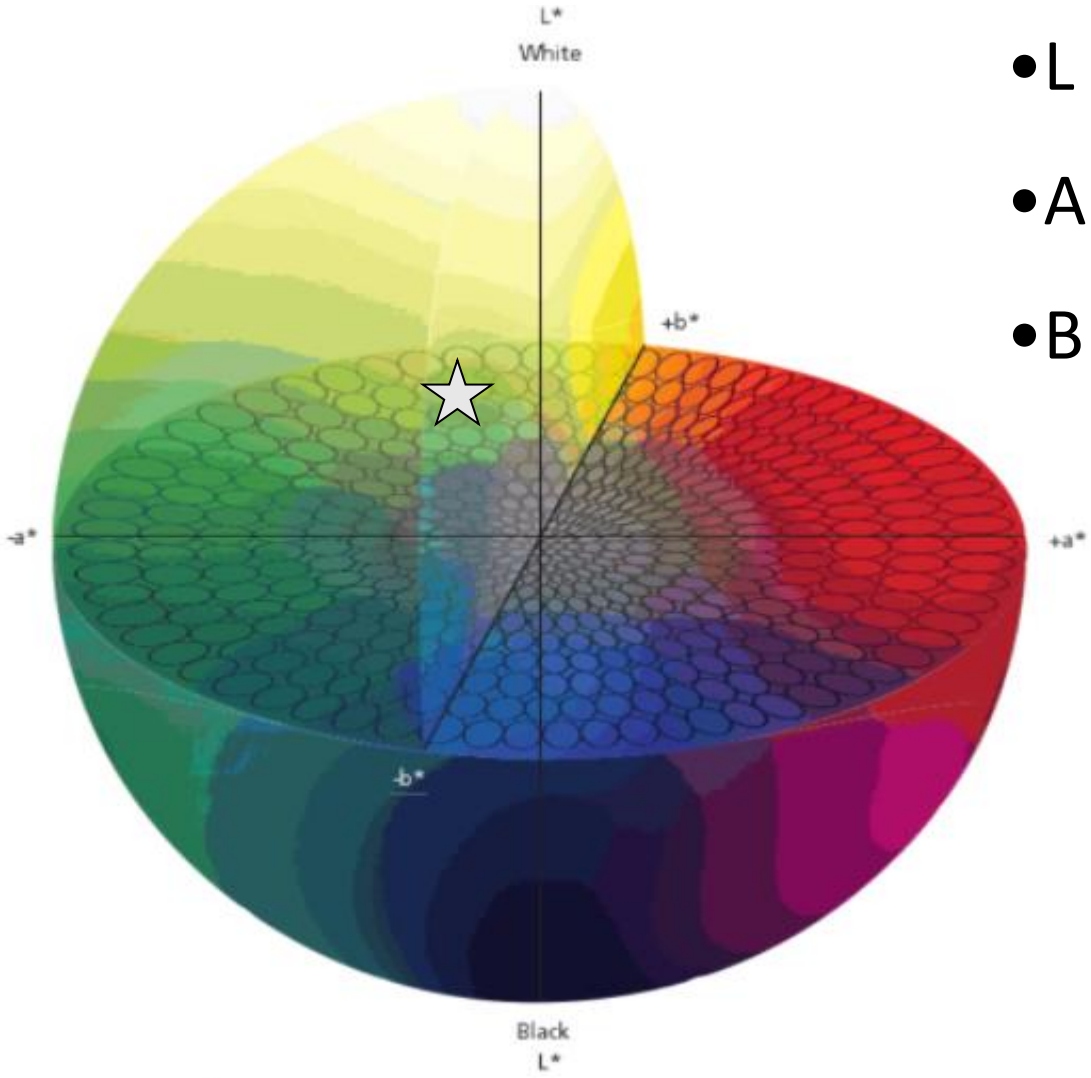
Color Vocabulary

CIELAB Color Space



Color Vocabulary

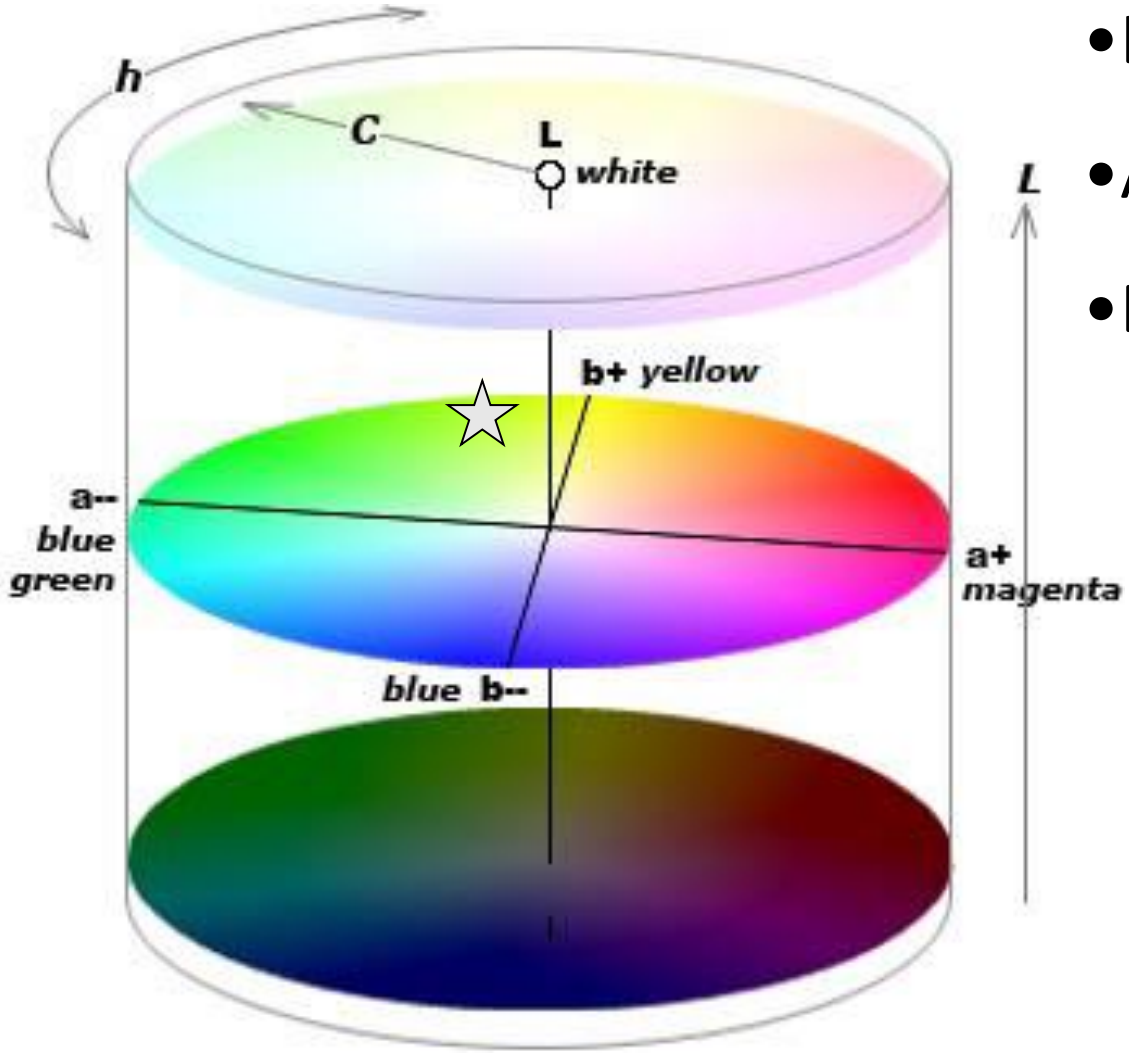
CIELAB Color Space



- L = 74
- A = - 21
- B = + 10

Color Vocabulary

CIELAB Color Space



- L = 74
- A = - 21
- B = + 10

Color Vocabulary

Why Do I Care?

Datacolor PAINT 2.8

Home | Auto-Formulate

datacolor PAINT

Color selection

Color cards | Measure | L*a*b*

Reference Color
Enter L*a*b* values

L*a*b* matches will only be performed using the illuminant D65/10°

L*	a*	b*
90	25	-25
0:100	-128:128	-128:128

Select color

Color selected

Color Geometry N/a

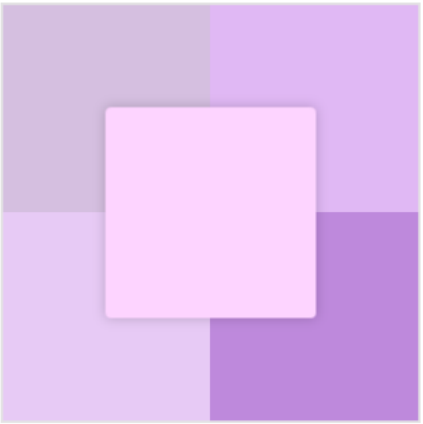
Color Name

Color Number

You have selected an L*a*b* color
Custom matching will not be available

Color coordination

Coordinated colors are calculated by the system based on selected color and color scheme



Color schema

Monochromatic

Next

Datacolor PAINT 2.8

Home | Correction

datacolor PAINT

COLORANTS	Original	Correct (Add)		Reformulated
Y48-96	Total	Addition	Total	Total
BU	0Y 29 0	0Y 0 0	0Y 29 0	0Y 28 0
LB	0Y 2 0	0Y 0 1	0Y 2 1	0Y 2 1
PG	0Y 7 0	0Y 1 1	0Y 8 1	0Y 8 1
TW	0Y 0 0	0Y 16 0	0Y 16 0	0Y 0 0
Total Restore	0Y 38 0	0Y 18 0	1Y 8 0	0Y 39 0
Delta E	1.88	1.21		1.17
Metamerism	0.45	0.30		0.30
Delta L	1.58	-1.19		-1.15
Delta a	0.83	-0.12		-0.12
Delta b	0.57	0.19		0.20
Contrast ratio		100.00		100.00
LRV		50.3		50.3

Show advanced values

View Correction | View Reformulation

Manufacturer
ML CAMPBELL

Color
Contented

SW 6191
Sherwin Williams ColorSNAP

Product
ALL SOLVENT BORNE TINT...

Paint Type
ML CAMPBELL SOLVENT BORNE

Base
WHITE/OPAQUE

Format
128.00 fl.oz.

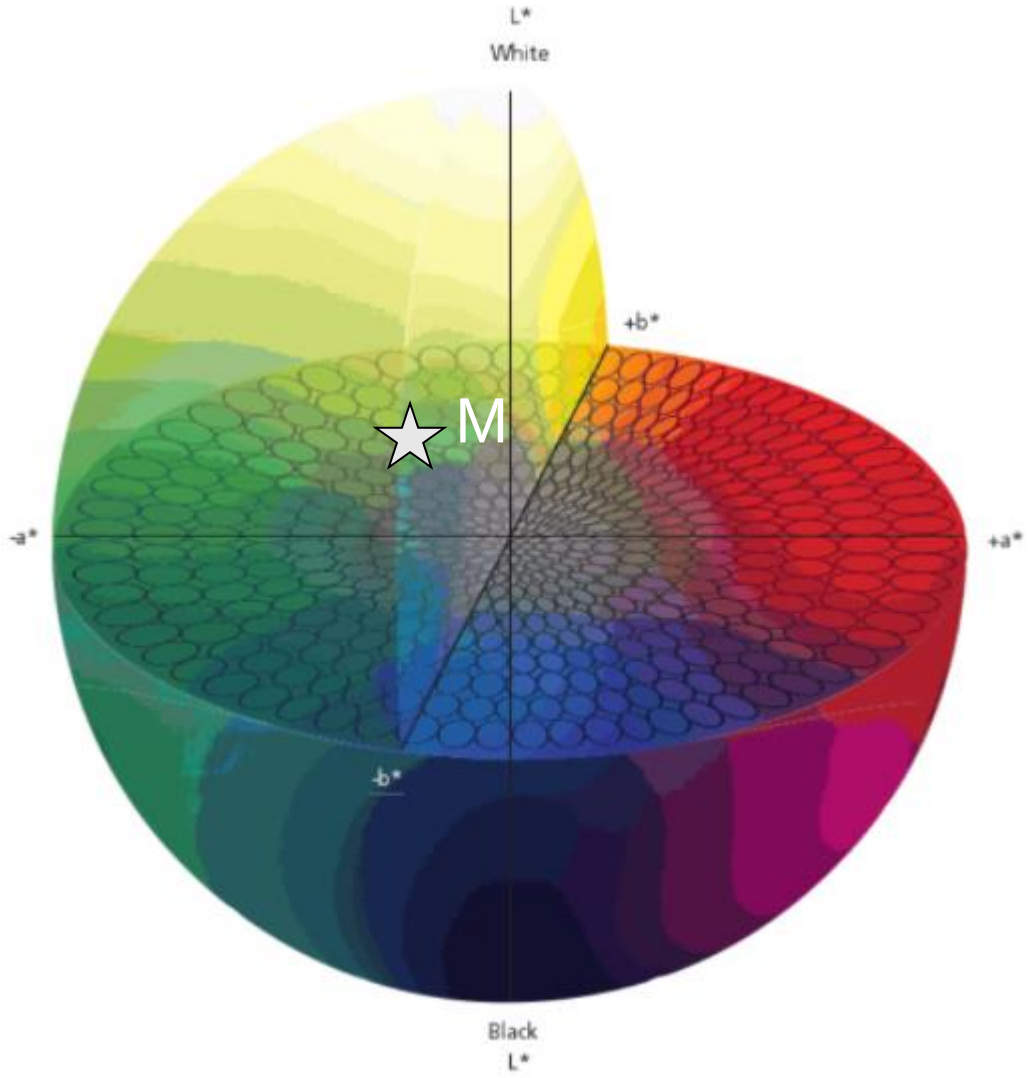
Tinting System
IC800

< Back

Color Vocabulary

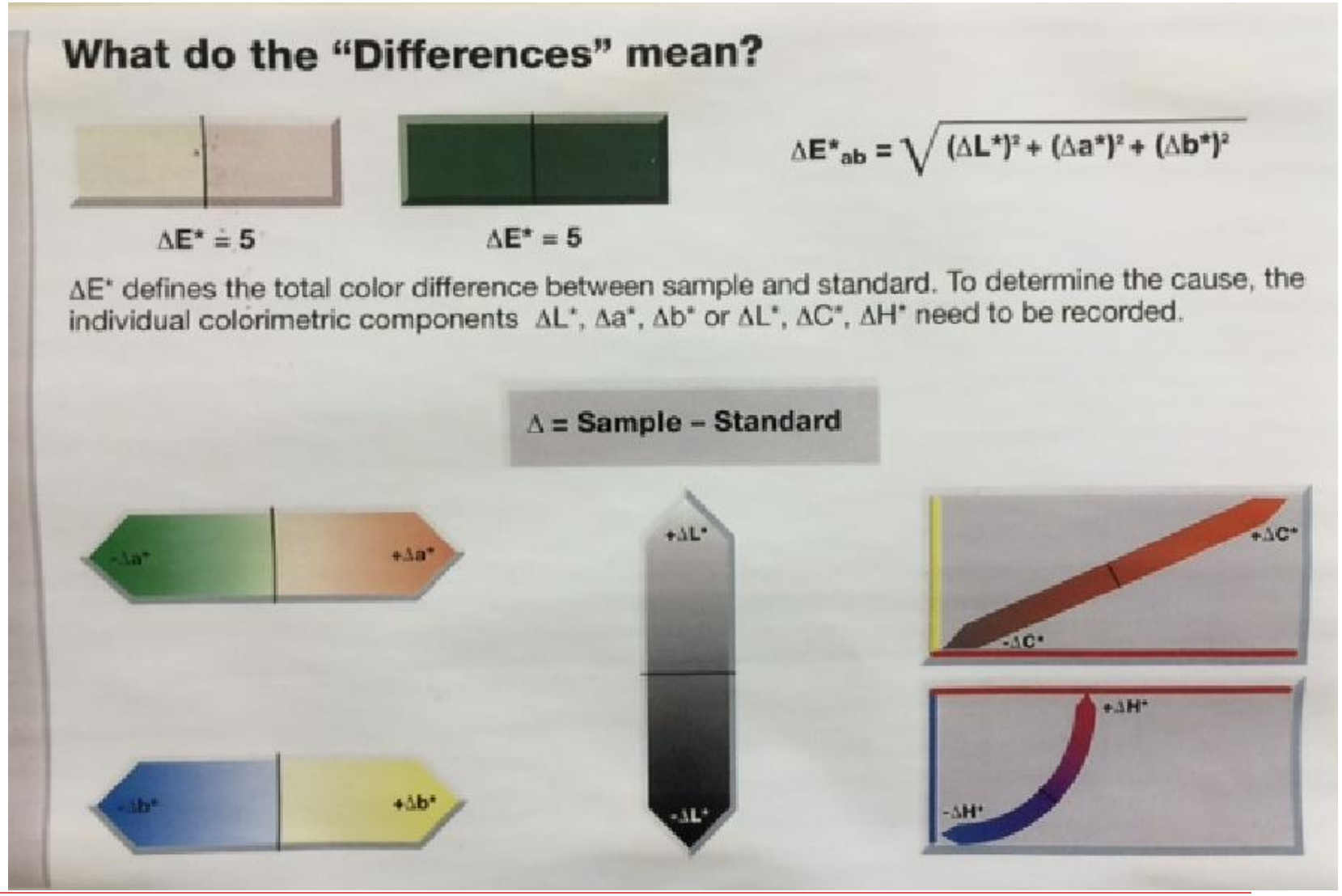
What is Delta E?

- ΔE = 1.88
- ΔL = 1.58
- ΔA = 0.83
- ΔB = 0.57



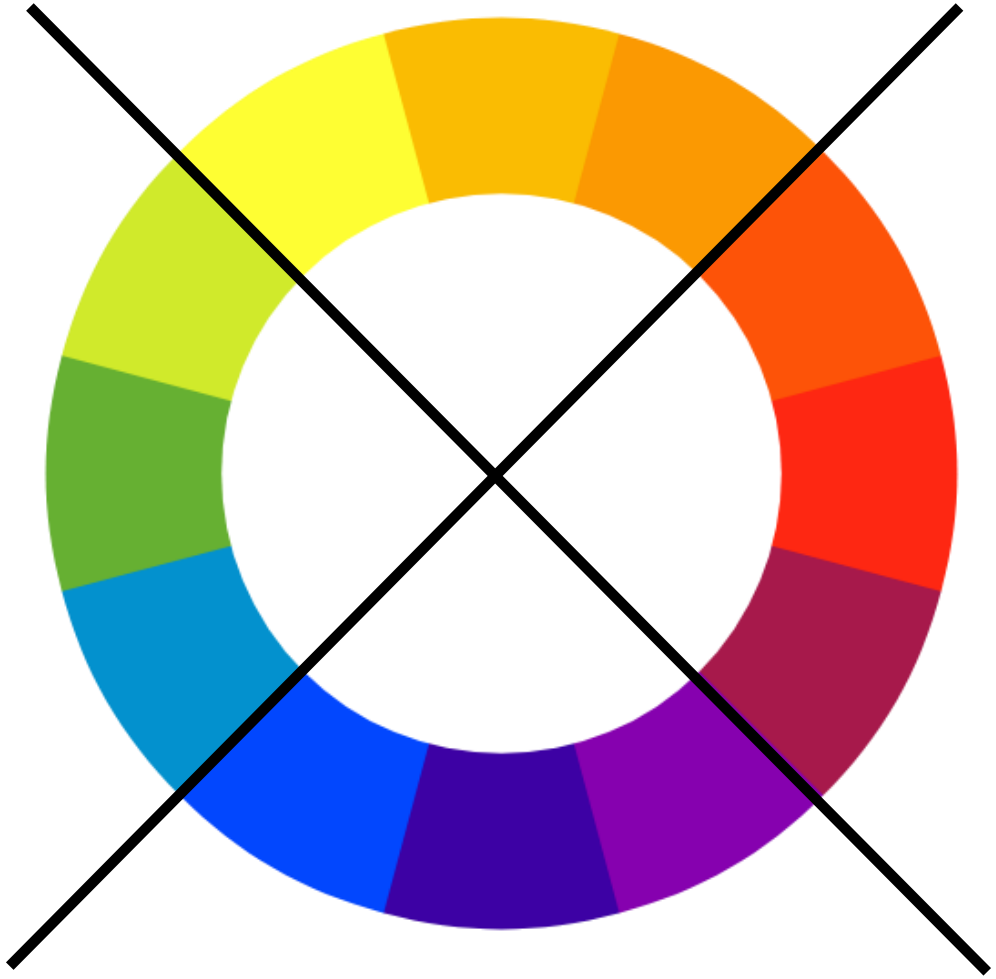
Color Vocabulary

What is Delta E?



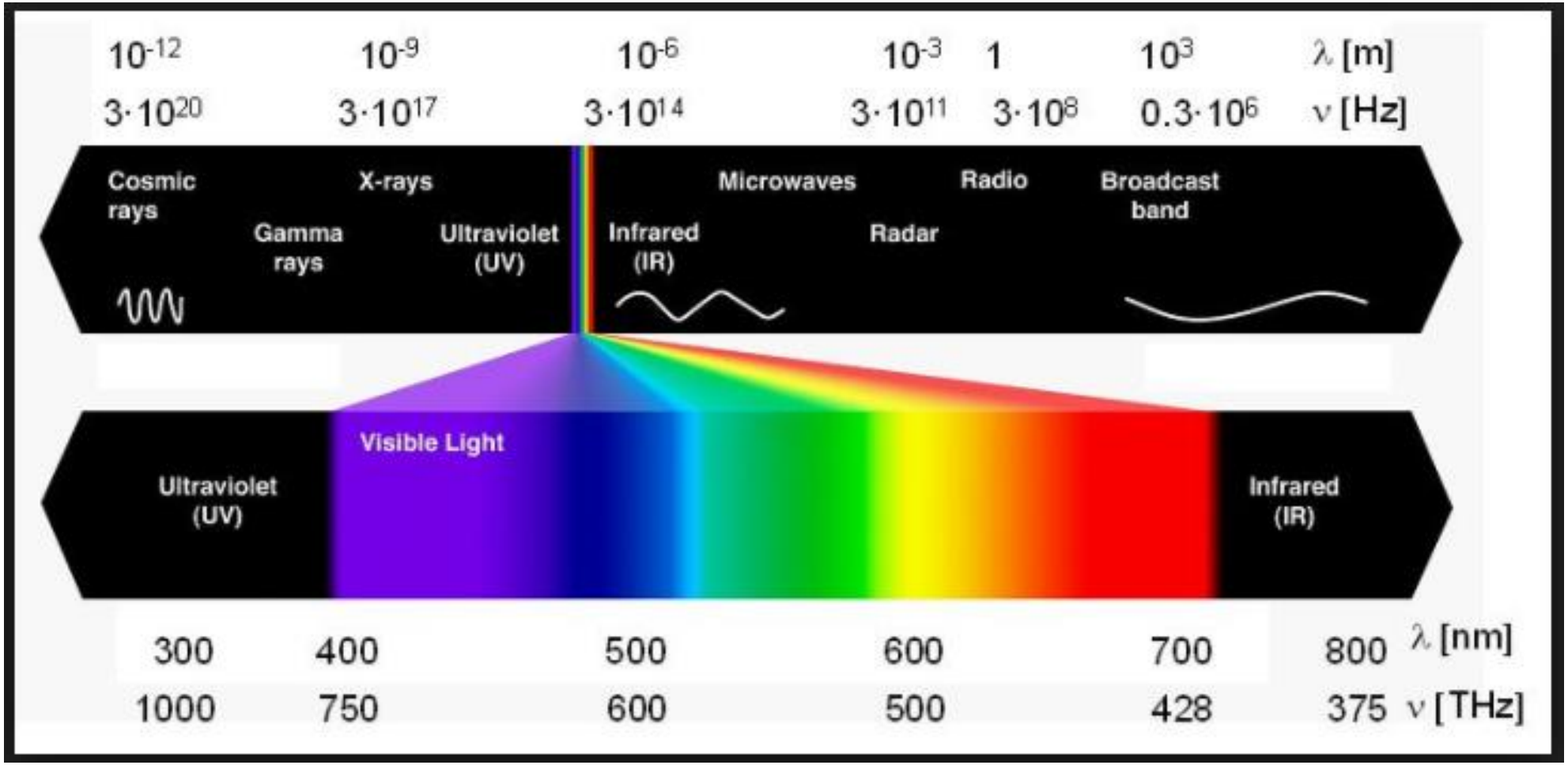
Color Vocabulary

What Kills What?



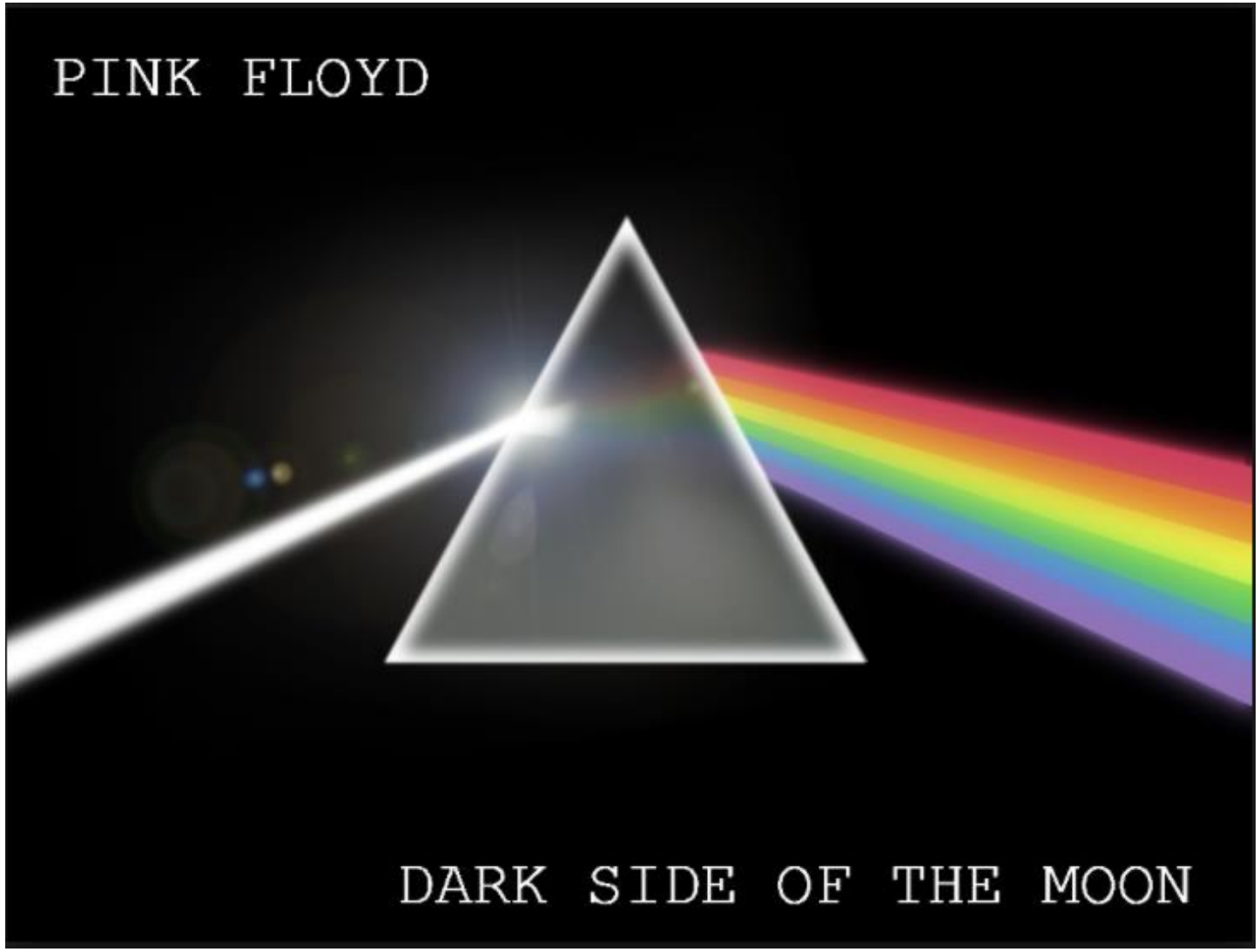
Color Vocabulary

Spectral Curve



Color Vocabulary

Visible Light Spectrum



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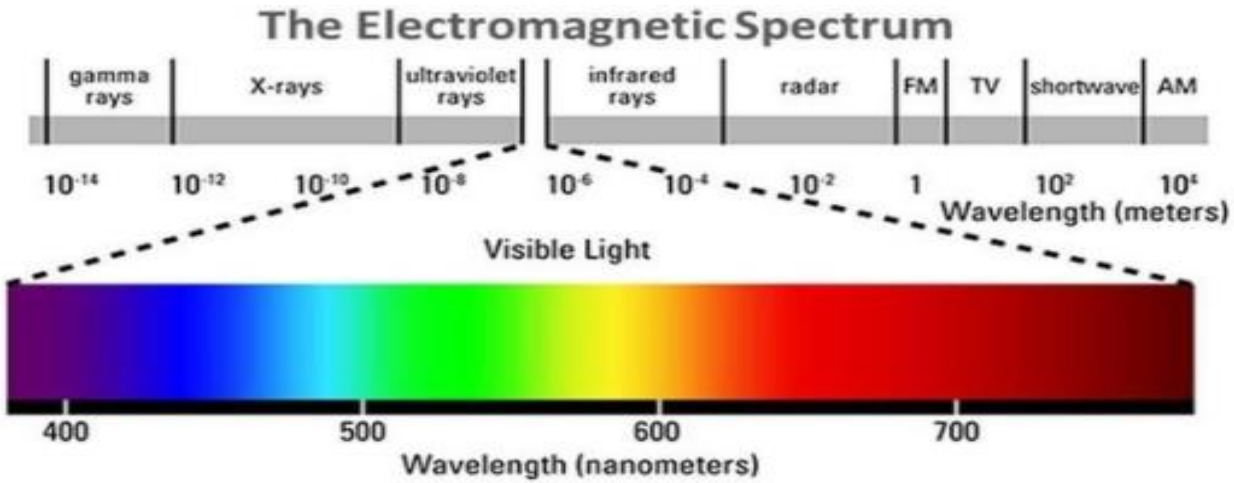
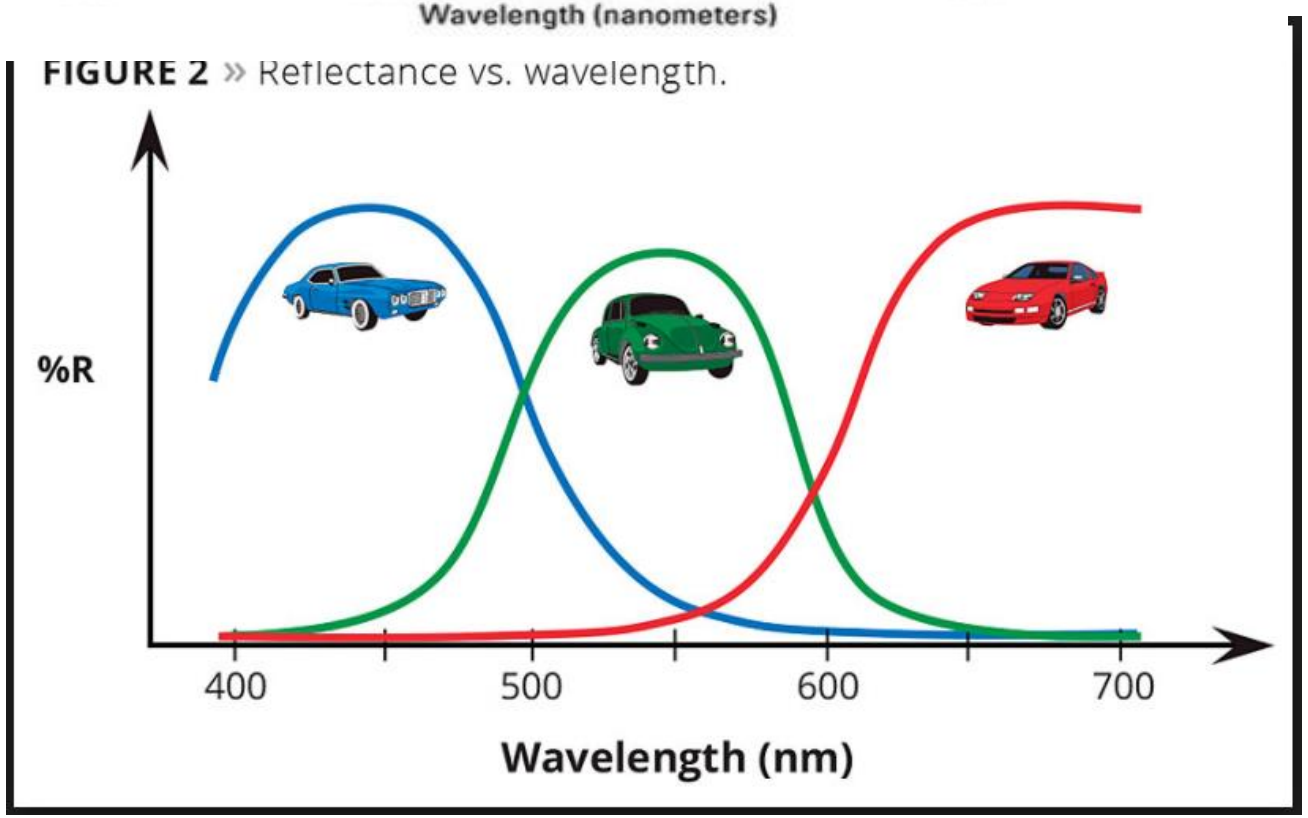
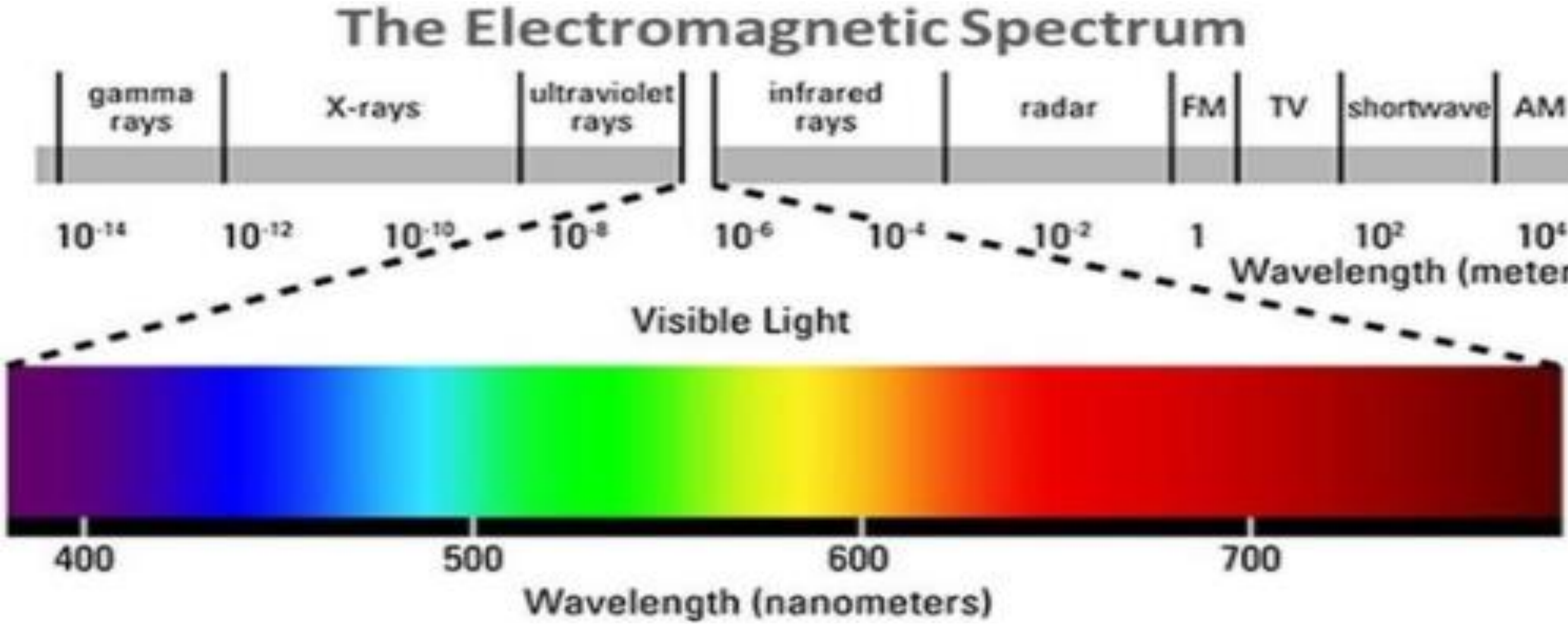
Spectral Curve



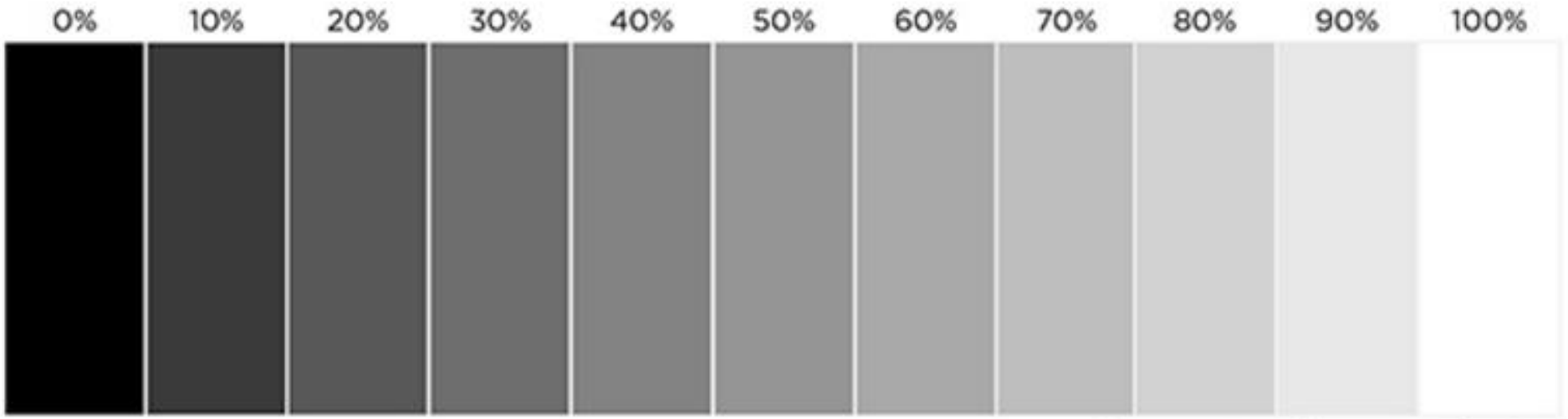




Name	Date	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700
FSW9551	26-Nov-19	37.896	52.467	57.338	58.893	60.238	61.162	61.335	61.411	61.279	61.552	62.052	62.686	63.363	63.925	64.494	64.777	64.93	65.085	65.185	65.117	64.88	64.522	64.249	63.985	63.764	63.598	63.422	63.123	62.908	62.607	62.257

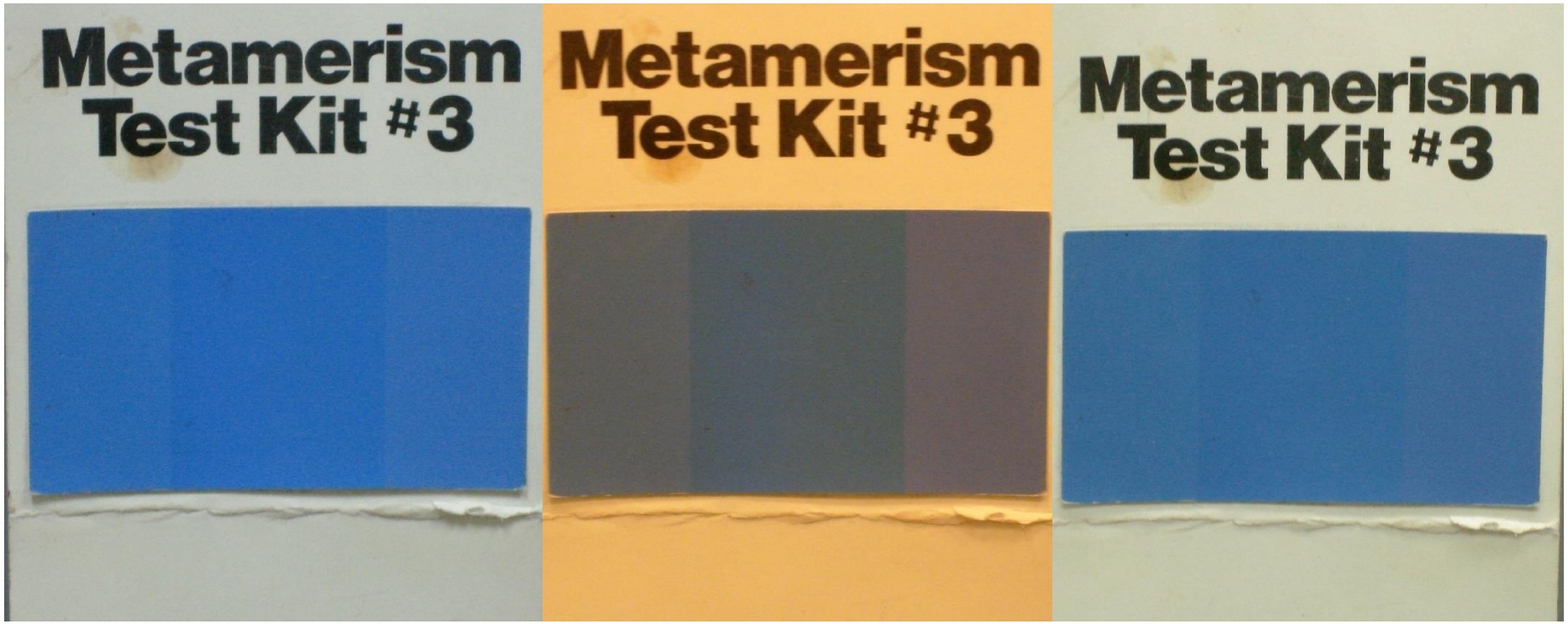
Color Vocabulary

LRV



Color Vocabulary

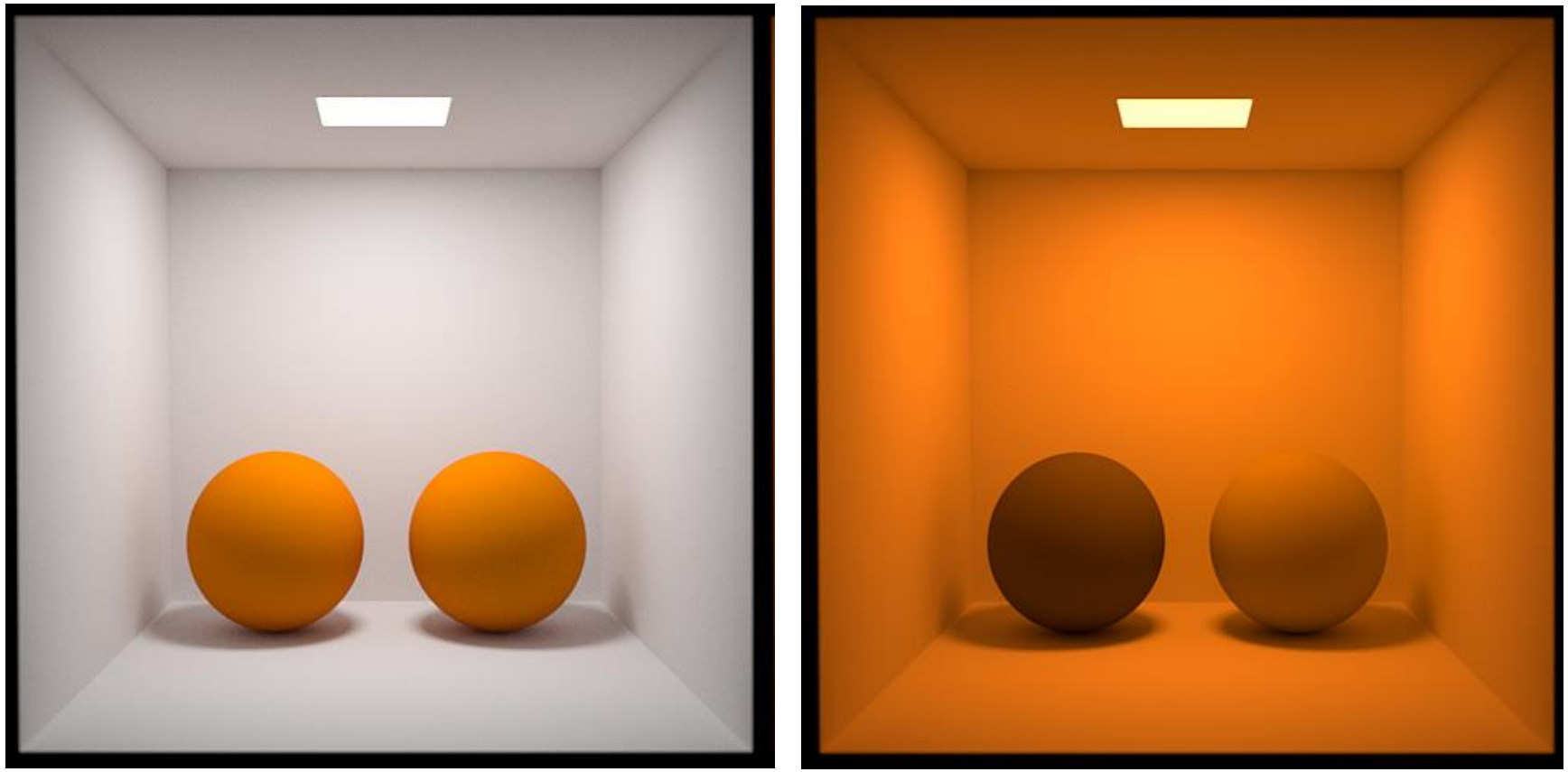
Metamerism



Daylight Horizon CWF

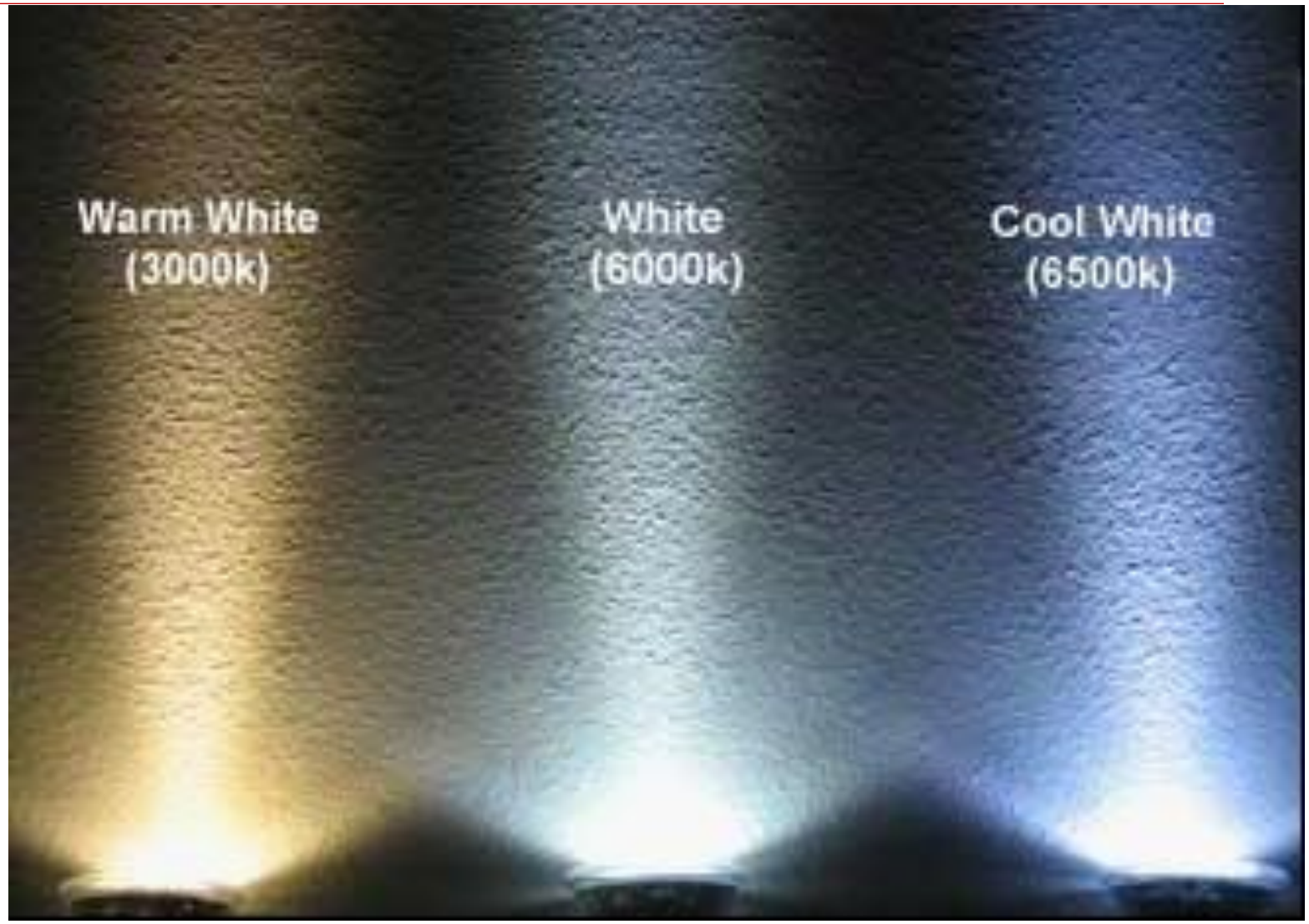
Color Vocabulary

Metamerism



Color Vocabulary

Color Temperature



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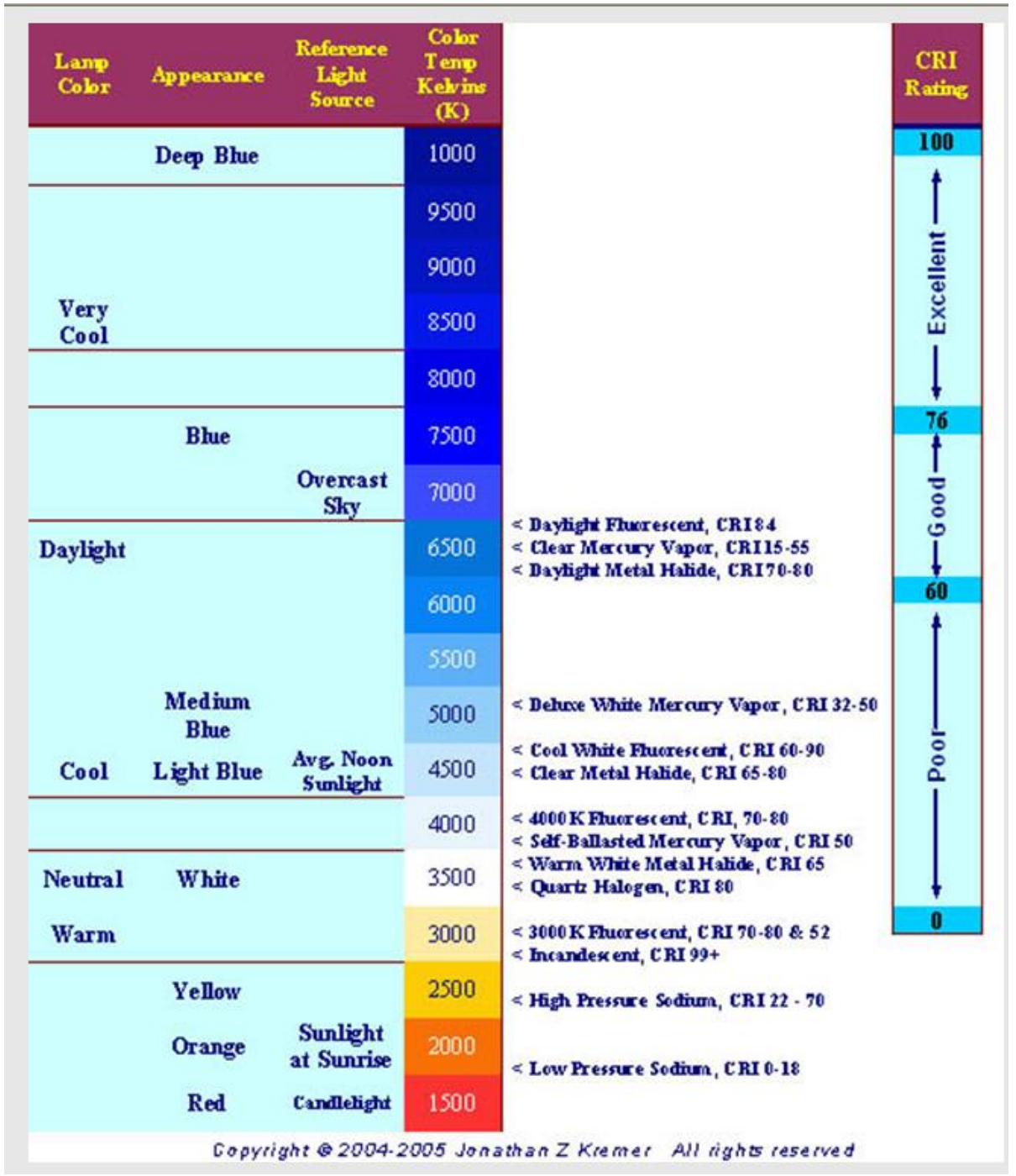
Color Temperature & CRI



Color Vocabulary

Units of Measurement

Color Vocabulary

Units of Measurement

Color Vocabulary

Units of Measurement

- 1 Ounce
  = 48/48th
  = 96/96th
  = 192/192nd
  = 384/384th
- 0.5 Ounce
  = 24/48th
  = 48/96th
  = 96/192nd
  = 192/384th

Color Vocabulary

Units of Measurement

- 1Y = 1 Yank = 1 Ounce = 29.5735 ml
- Typical Formula Measurement
- 3Y 13/48 1/96

=3Y 27/96

=3Y 54/192

=3Y 108/384

=3 Ounces + 28.1%/Ounce

Color Vocabulary

How Accurate Am I?

Color Vocabulary

Calibrating a Dispenser

Increment	Unit	Target	Actual 1	Actual 2	Average	% Dev
2	Ounces	86.975	86.97	86.98		
1	Ounces	43.488	43.48	43.5	43.49	0.01%
24/48	Ounce	21.744	21.79	21.78	21.785	0.19%
12/48	Ounce	10.872	10.9	10.92	10.91	0.35%
6/48	Ounce	5.436	5.5	5.49	5.495	1.09%
3/48	Ounce	2.718	2.81	2.8	2.805	3.20%
1/48	Ounce	0.906	1.03	1.02	1.025	13.14%
1/96	Ounce	0.453	0.55	0.54	0.545	20.31%
1/192	Ounce	0.226	0.31	0.31	0.31	36.87%

Color Vocabulary

Corob D600 Dispenser

Color Vocabulary

Manual vs. Auto Tinter

Color Vocabulary

Spectrophotometer

Color Vocabulary

Two Stage Match Program

- Good Commercial Match $
- Premium Custom Match $$$

Color Vocabulary

Shaking Colorants & Air Entrapment

To Minimize Air Entrapment:

- WB Colorants – 30 sec to 1 minute Max
- Solvent Colorants – 3 minutes is good
- Filling half-filled canister – use now
- Filling empty canister – rest and agitate over night
- Rotate Stock – 1st in = 1st Out

***Store Containers Upside Down

Controlling the Variables

ML Campbell Level Two
Color Development Specialist

Length:	4 Days
Pre-requisite:	Level I or Level I OLT
Instructor:	Darrel Young (darrel.s.young@mlcampbell.com)

Introduction

Agenda

Overview

- Color Perception
- Metamerism
- Colorant Spec Range
- Tint machine accuracy
- Tint formula accuracy
- Color Card Accuracy
- Base consistency
- Base color acceptance
- Fill Level
- Mixing
- Application method
- Film thickness
- Method of Drying
- Sheen Variation

Base Color Consistency

- Why do we see color variation when the same colorants are mixed into different product series MLC opaque bases? (i.e. Resistant and Magnamax)
- Why do we see color variation when the same colorants are mixed into different batches of the same MLC opaque base?
- Why do we see color variation when the same colorants are mixed into separate containers of the same batch of MLC opaque base?

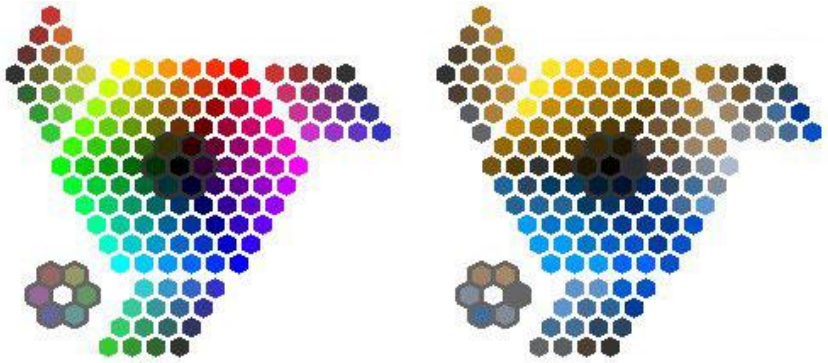
Base Color Consistency

- Many factors can affect the actual realized color of a tinted base.
- Each of the previously described scenario's is the result of one, or more of these factors.

Color Perception

colors as seen with normal vision

same colors as seen with red-green color deficiency



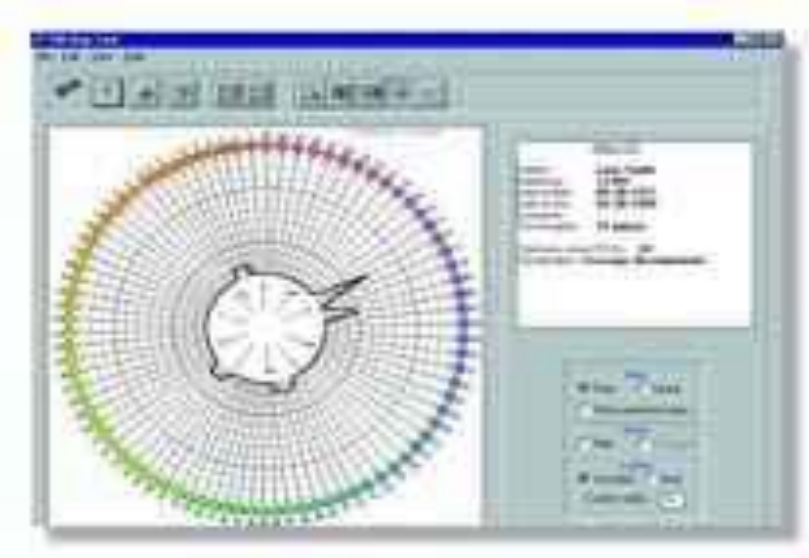
Standard Colors

Colorblind Version

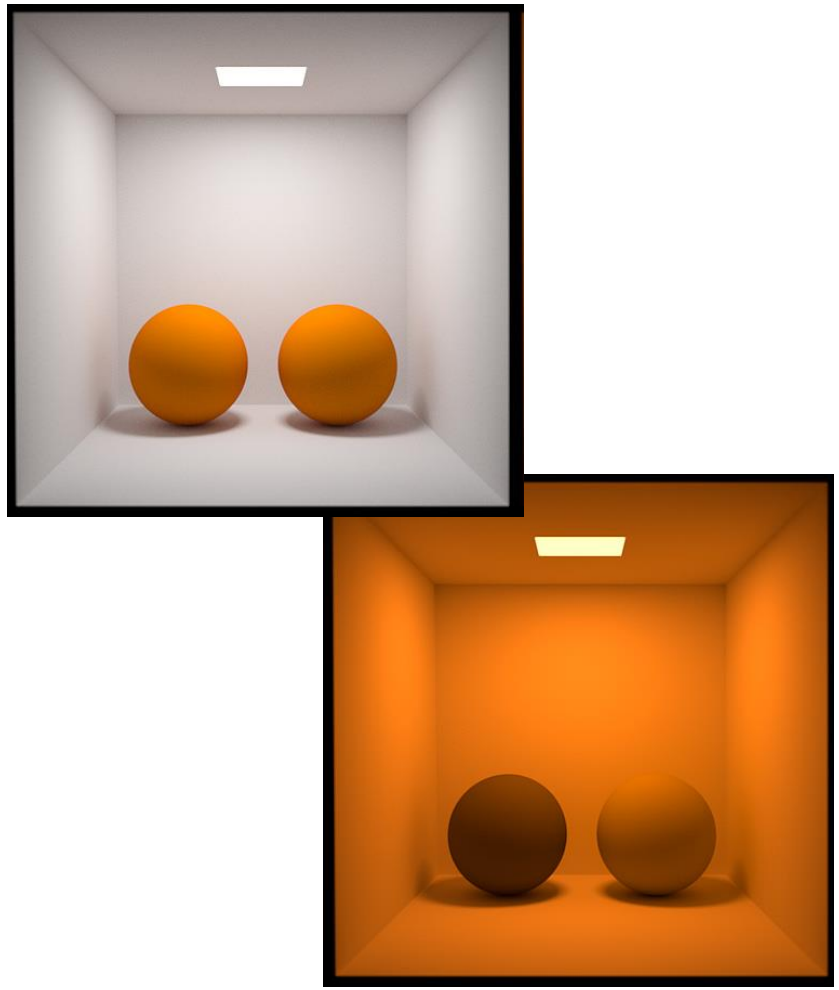
- Different people perceive color in different ways
- Limited or complete color blindness
- Most problematic when two different people view two different formulas that were used to arrive at the same color

Color Perception

- Farnsworth Munsell 100 Hue Color Test evaluates color perception



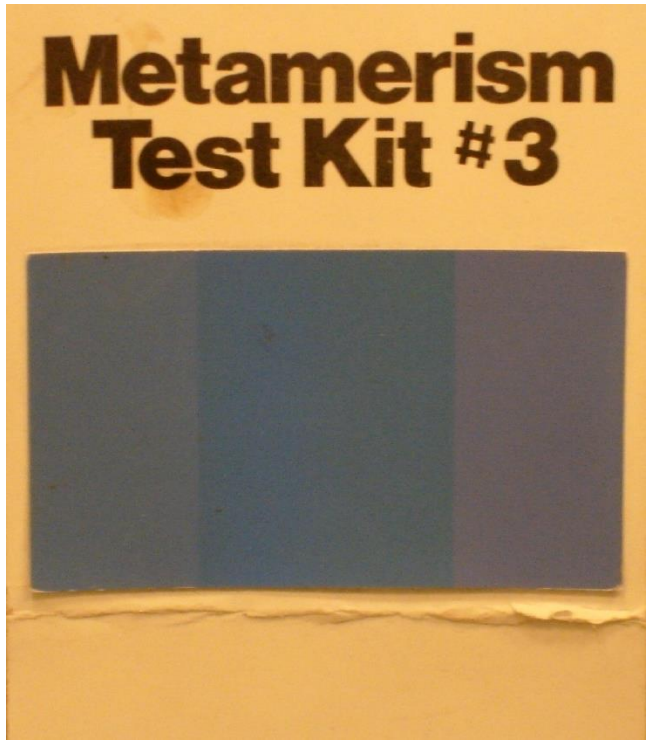
Metamerism



- Different sources of light highlight different aspects of the same colorant
- Most problematic when different formulas are used to arrive at the same color

Metamerism

Daylight

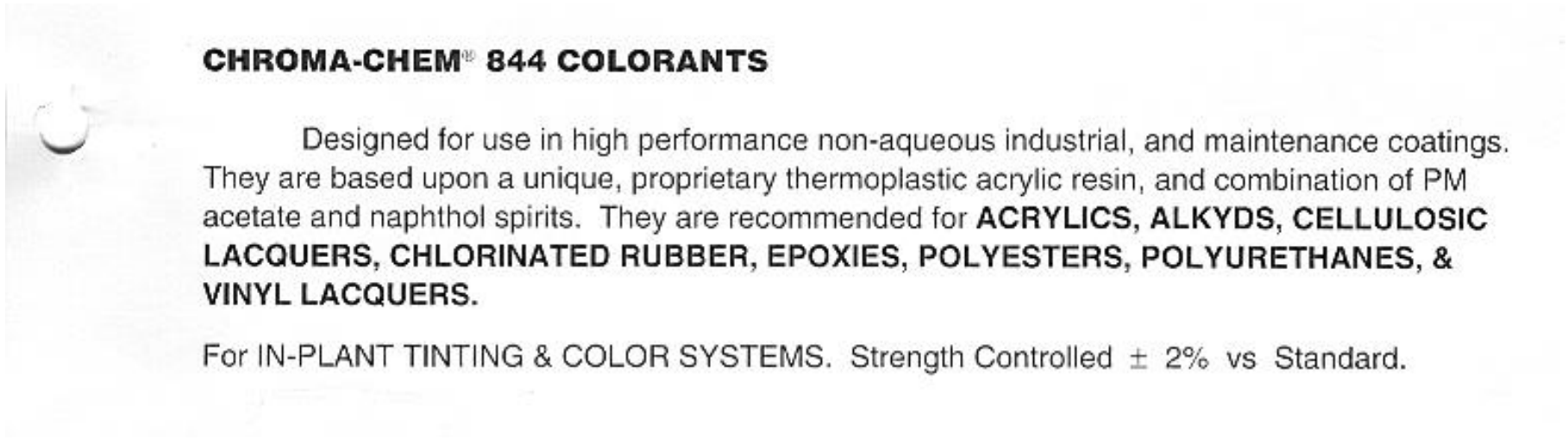


Horizon

CWF

Colorant Specification Range

- All colorants have a range of color strength acceptability.
- IC800 range is +/- 2% of standard (wt and volume)



CHROMA-CHEM® 844 COLORANTS

Designed for use in high performance non-aqueous industrial, and maintenance coatings. They are based upon a unique, proprietary thermoplastic acrylic resin, and combination of PM acetate and naphthol spirits. They are recommended for **ACRYLICS, ALKYDS, CELLULOSIC LACQUERS, CHLORINATED RUBBER, EPOXIES, POLYESTERS, POLYURETHANES, & VINYL LACQUERS.**

For IN-PLANT TINTING & COLOR SYSTEMS. Strength Controlled ± 2% vs Standard.

Tint Machine Accuracy

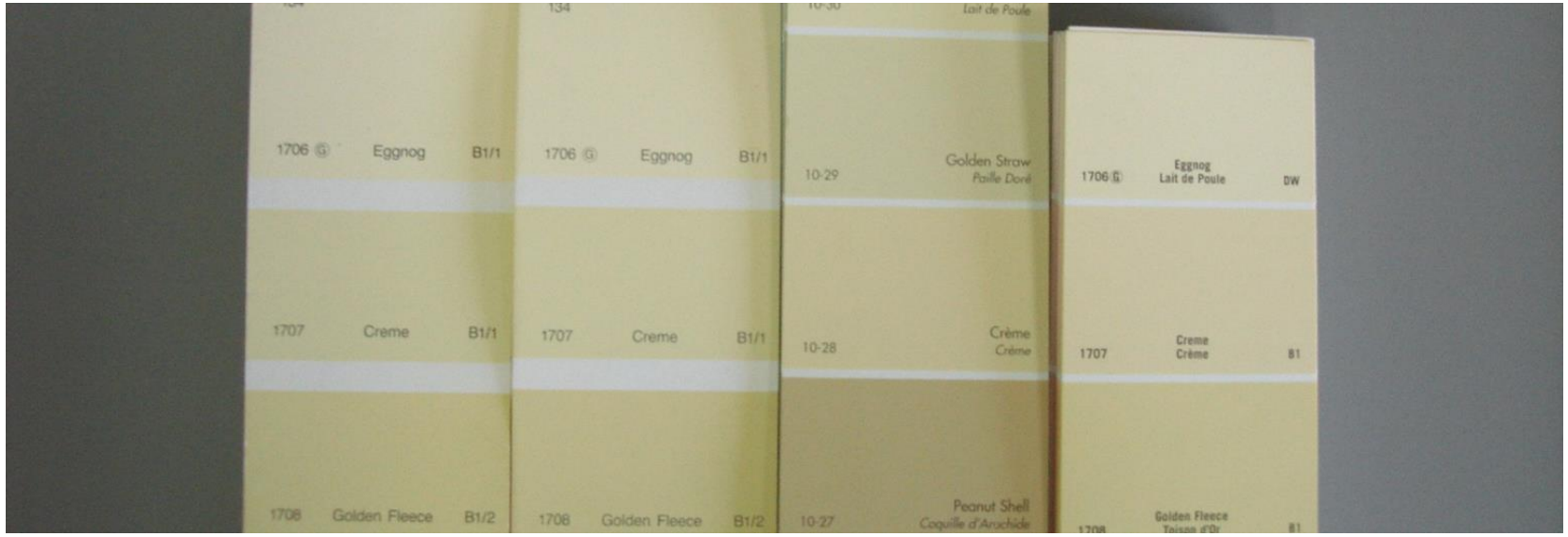
Does the tint machine consistently shoot the same amount of colorant at the same strength?

- Is the tint machine cleaned on a regular basis
- Are the nozzles obstructed with dried colorant
- Is the tint machine calibrated regularly
- How old are the colorants in the machine
- Are the colorants mixed regularly
- Are the colorants over-mixed

Formula Accuracy

- Although all MLC tint formulas are double checked for accuracy, we cannot completely eliminate the possibility of printing errors.

Color Accuracy



- Colors may change with age and use of deck
- In most cases, color accuracy is very good
- Subject to the limitations of the printing operation
  - Range of acceptability

Base Consistency

- Every MLC base is evaluated visually and digitally

Base Color Acceptance

- All MLC bases are formulated and tested to the same level of whiteness
- Different solvents in the various bases can influence color acceptance of some colorants
- Different levels of solids can influence dispersion of colorants
- Different resins can impact actual color
- These factors may result in slight cross line variations

Chemical Reaction

- Some colorants are unstable in an acidic environment.
- As such, tinted Magnamax or similar pre-cat coatings, once catalyzed, may experience a color change or “seeding out” over time.
- Magnamax, un-catalyzed, has excellent color stability

Fill Level

- ML Campbell fills tint base containers by actual batch weight per gallon. (i.e. 8.59 lb/gal X 0.9375)
- As such, there is no significant variation in MLC fill levels
- Removal of imprecise amounts of base to accommodate tinting (non-short filled products)
- Was base mixed well prior to removal of portion

Mixing

- The method and extent of mixing can influence color dispersion
- Shaking may render different results than blending or stirring

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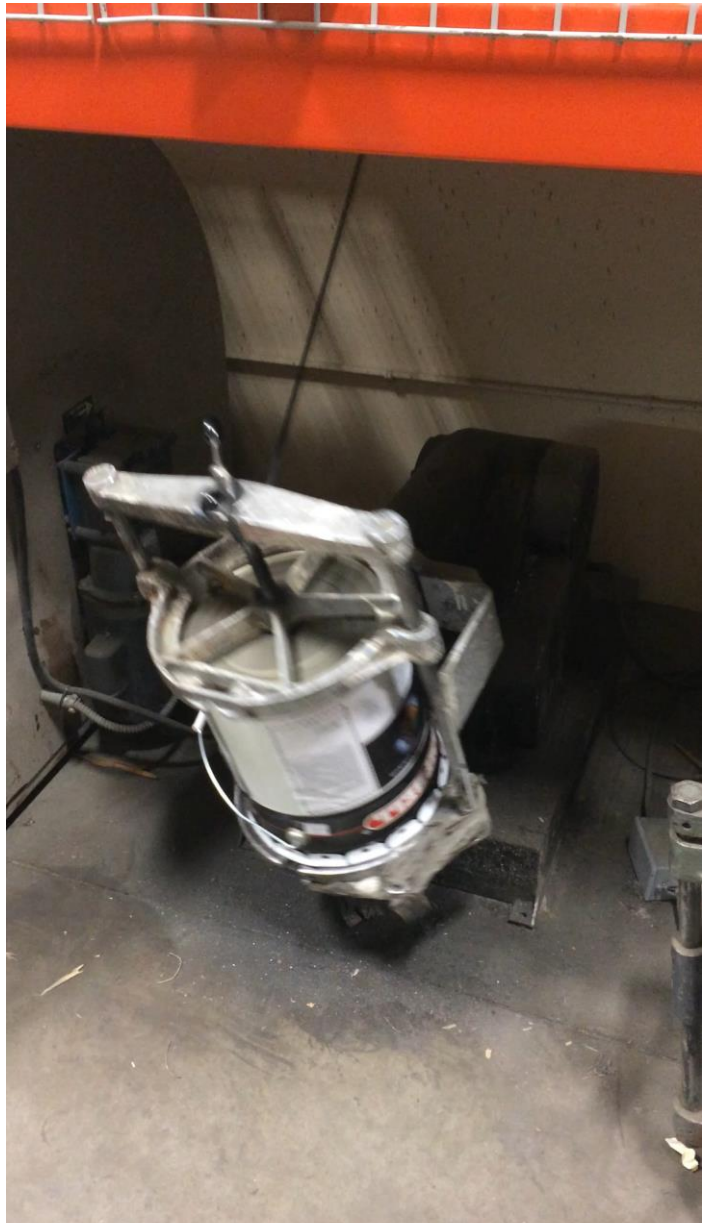
WOOD FINISHING SYSTEMS



Mixing

Mixing

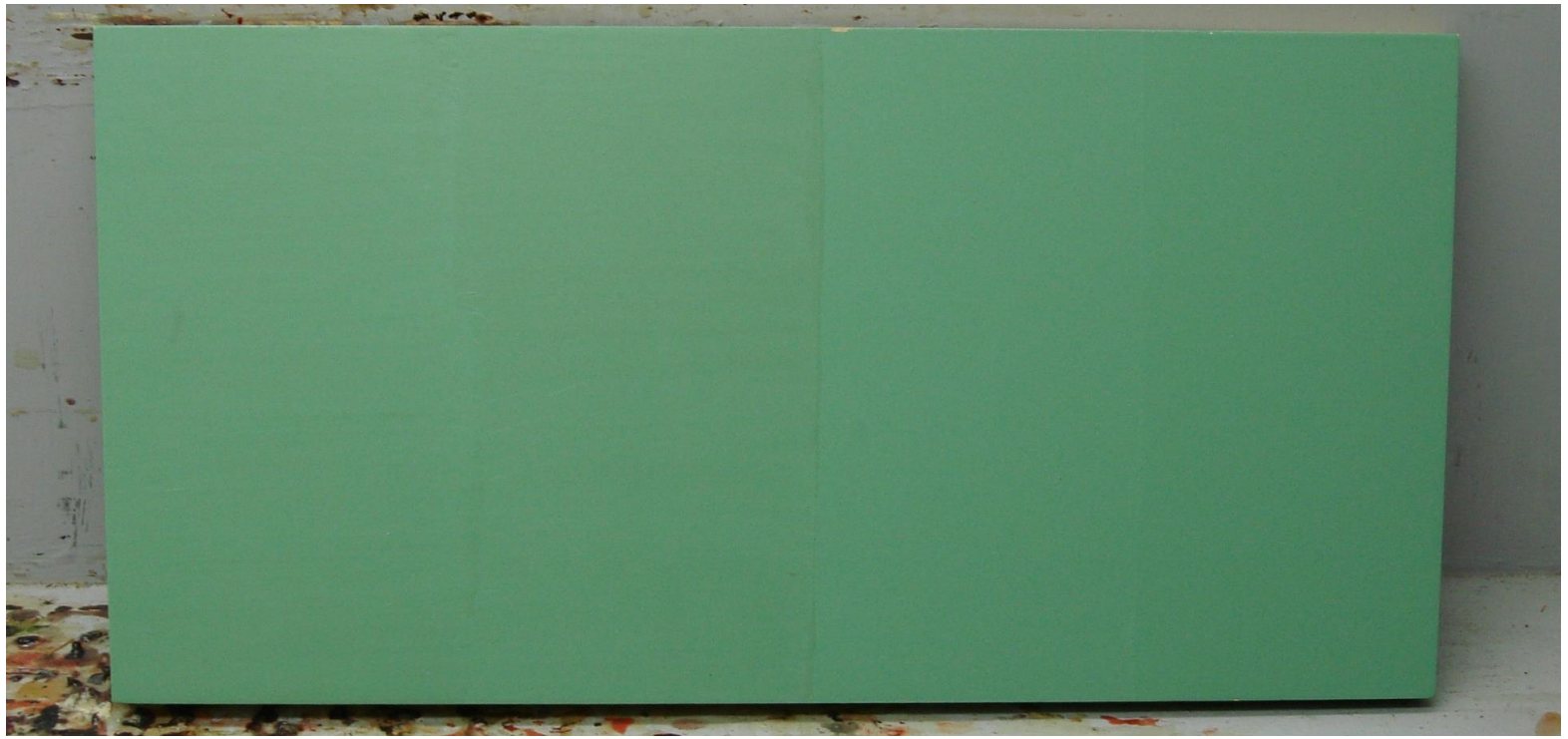
- The method and extent of mixing can influence color dispersion
- Shaking may render different results than blending or stirring

Application Method

- Spray application may render different results than draw-down, brush-out, or “dip” application

Film Thickness

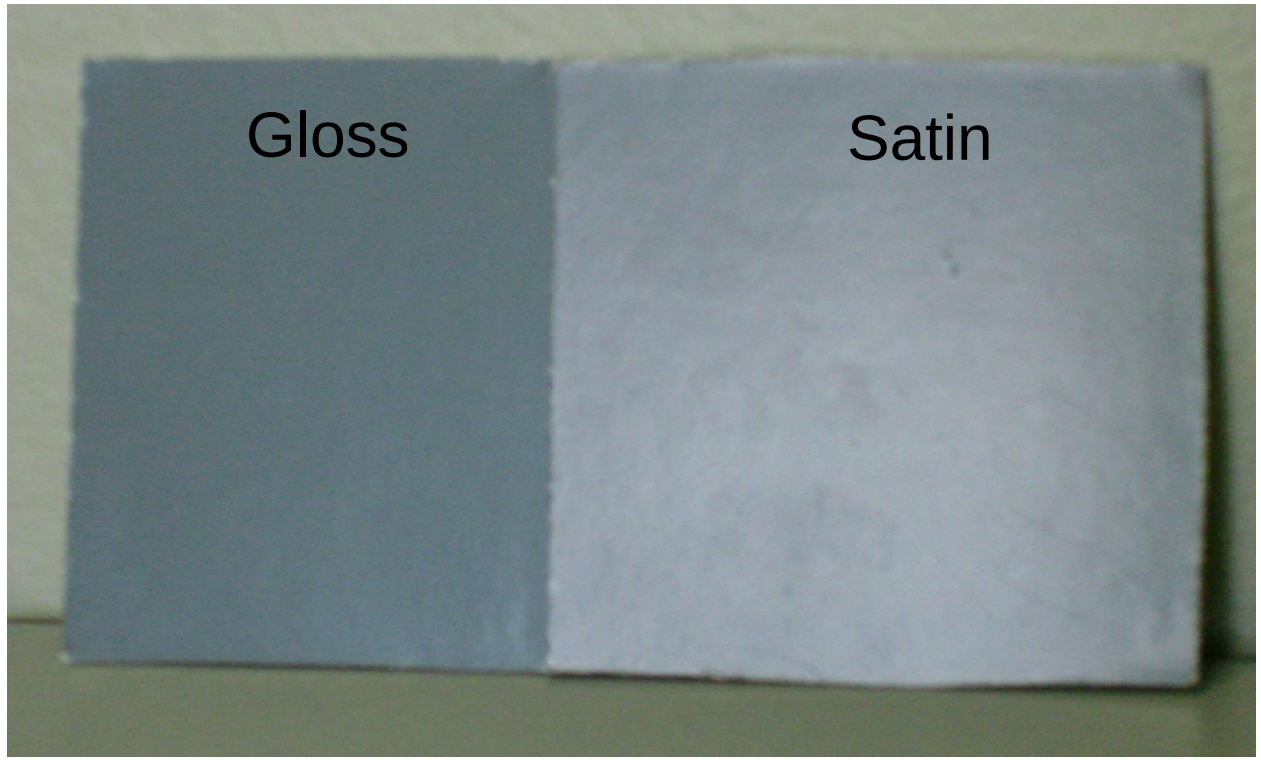
- Variation in film thickness may influence color
- Color matching procedures must be strictly defined, and followed



Drying

- Force drying in an oven or with a hair dryer may produce a different result than air drying
- Different methods of drying may lead to sheen variation
- Be consistent with the method of drying

Sheen Variation



- Sheen affects the perception of color
- Generally, the higher the sheen, the darker the color.

Summary

- Color Perception
- Metamerism
- Colorant Spec Range
- Tint machine accuracy
- Tint formula accuracy
- Color Card Accuracy
- Base consistency
- Base color acceptance
- Fill Level
- Mixing
- Application method
- Film thickness
- Method of Drying
- Sheen Variation

Summary

- Color consistency is the function of many factors
- The best we can do is to try and control all of the variables
- Be aware that published and computer-generated formulas are starting points only.
- All mixes should be evaluated before shipping.
- All MLC custom colors are evaluated and adjusted prior to shipping

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WOOD FINISHING SYSTEMS

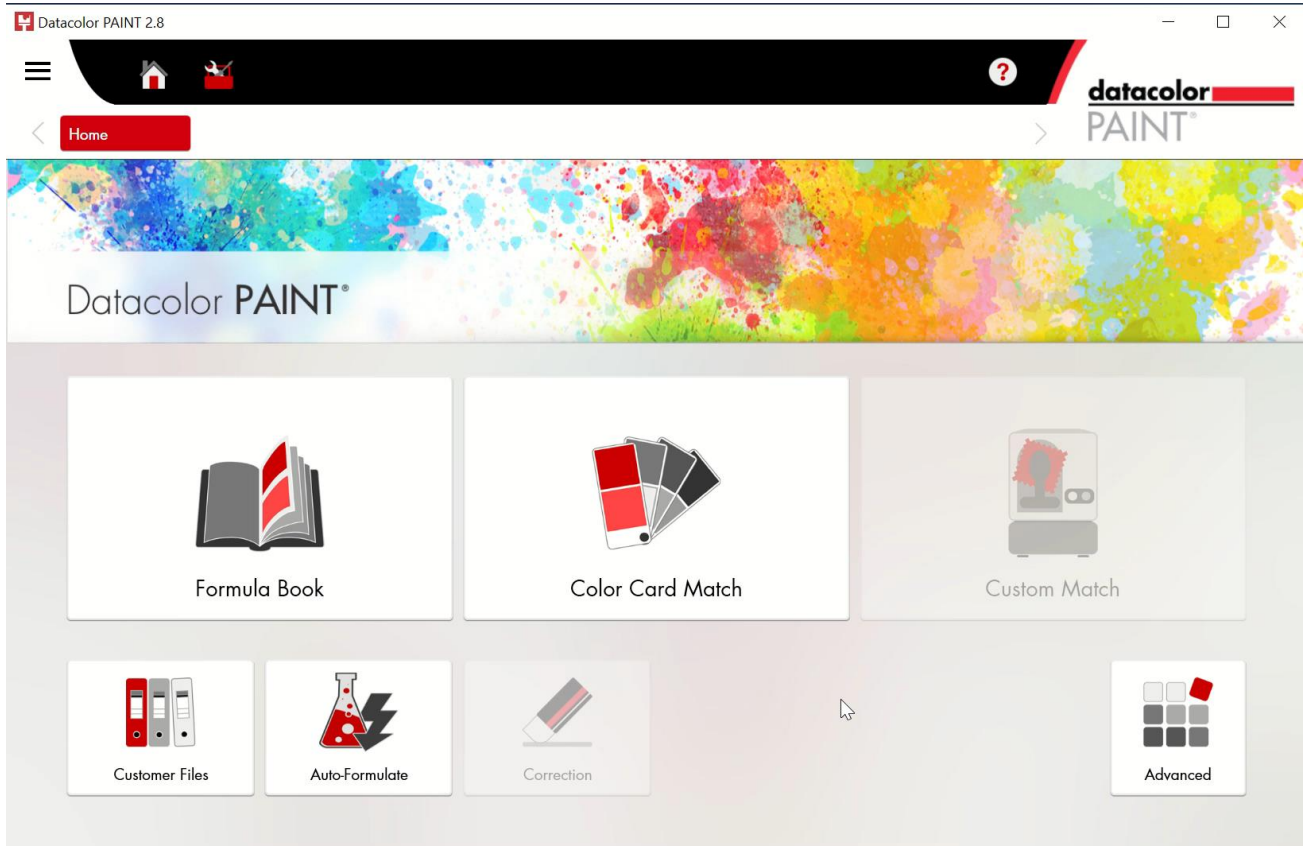
Color Tools

Color Tools

Colorant Chip

Color Tools

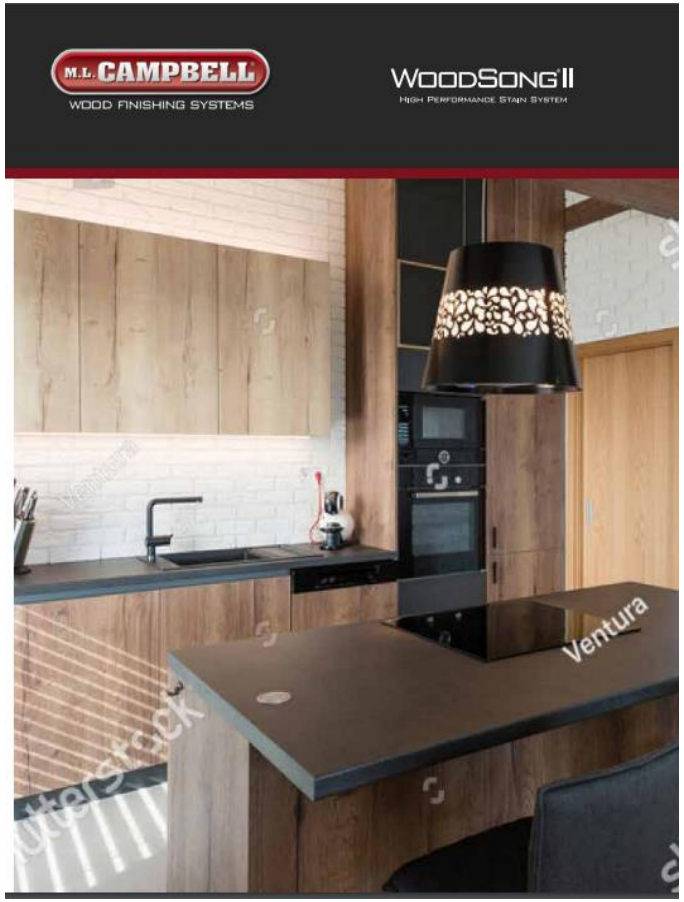
Datacolor



Color Tools

Fan Decks

WoodSong II Color Card



Colors updated to match new stain box

Fresh new look to match current branding

Color Tools

Stain Box

Color Tools

Stain Box
Color Variants

Merchandising Updates

- Cabinet and Furniture Trends

Color Tools

ColorReader Pro

DataColor ColorReaderPRO

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What's in the Box

- ColorReaderPRO
- Case
- Charging Cord
- Calibration Tile

DataColor ColorReaderPRO

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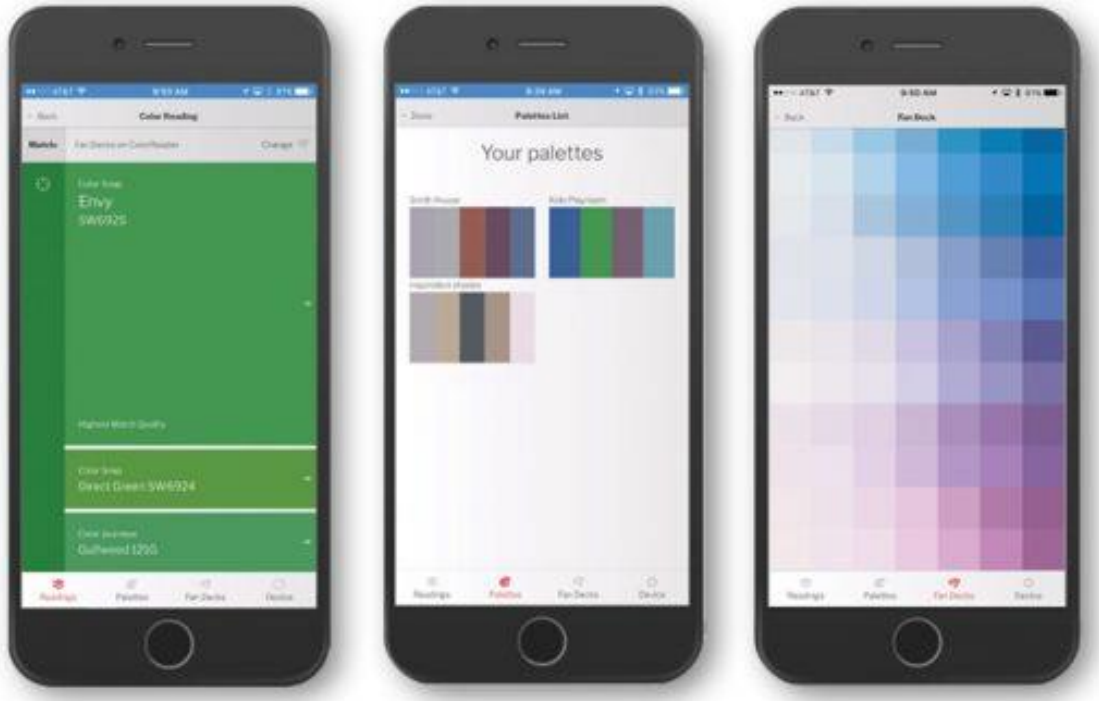
What does it Do

- Connects by Bluetooth to Apple App or Android App
- Or can be used as a stand alone unit
- The App displays the unit's information and color readings
- The App can store as many fan deck colors as the phone can storage can handle
- The ColorReaderPRO unit stand alone can store up to 10000 colors



DataColor ColorReaderPRO

What Does It Do?

- In stand-alone mode – no fan decks loaded, display L*A*B* coordinates of color measured
- In stand-alone mode-with fan decks loaded, scrolls the name and number of the best three matches

DataColor ColorReaderPRO

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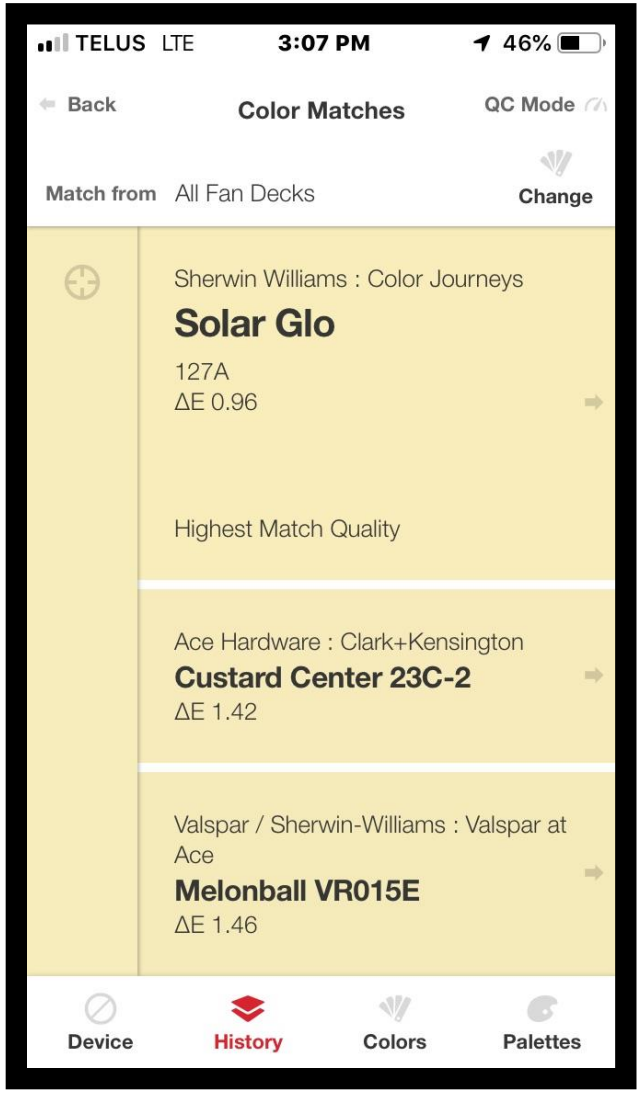
What Does It Do?

- When synced, shows a representation of the color on your phone or tablet screen
- Also shows three best matches from fan decks on board
- Shows the Delta E of each match
- Tap the color representation on the left



DataColor ColorReaderPRO

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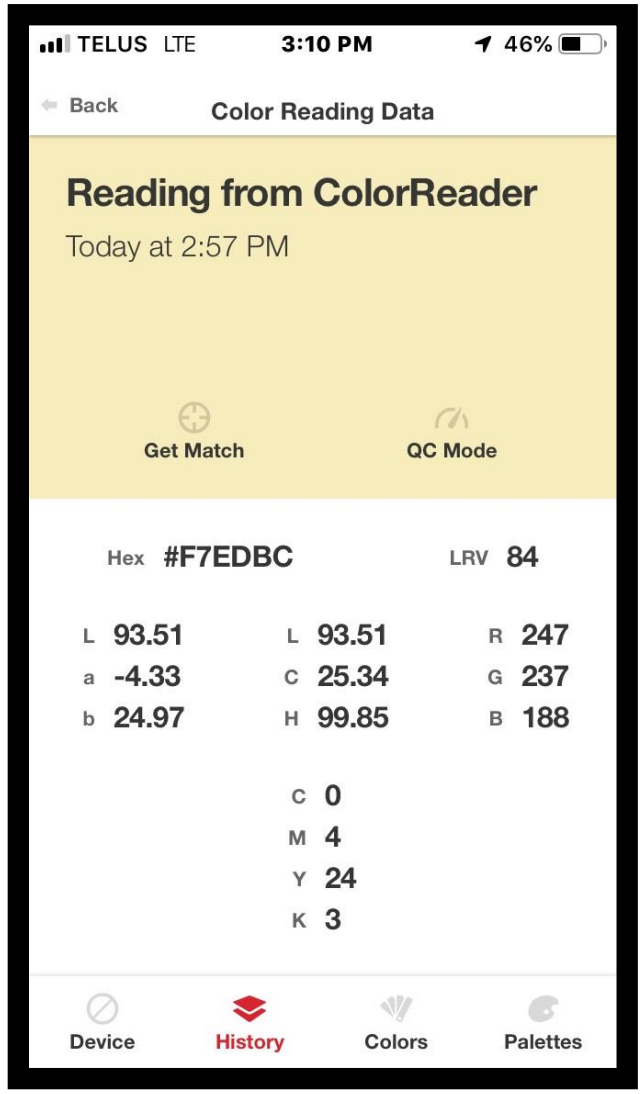
What Does It Do?

- Tapping the color representation on the left will show you the Color Data for your choice
- Tapping QC Mode allows you to compare a spray out of your color match to the standard that you measured



DataColor ColorReaderPRO

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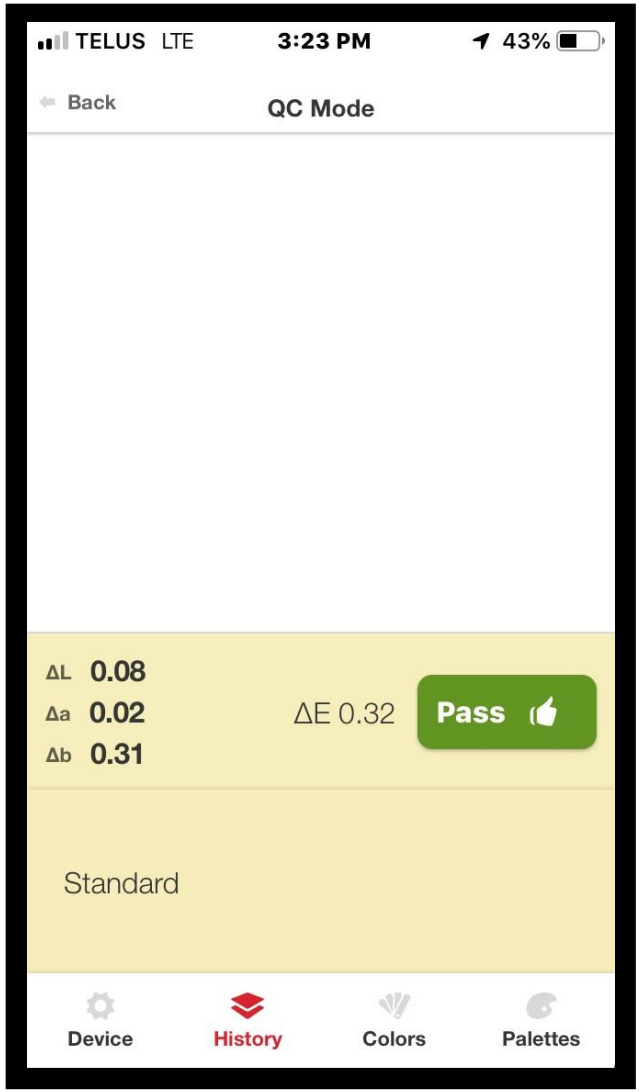
What Does It Do?

- Tapping the color representation will show you the Color Data for your choice
- QC Mode allows you to compare a spray out of your color match to the standard that you measured
- Delta E of 1 or less is a pass



DataColor ColorReaderPRO

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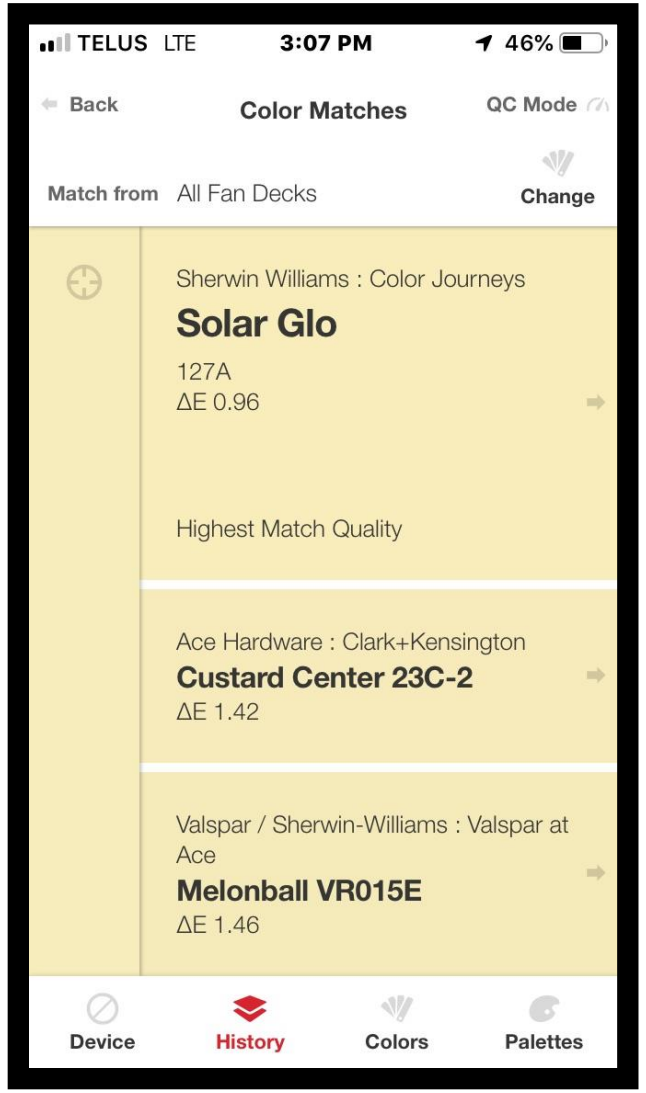
What Does It Do?

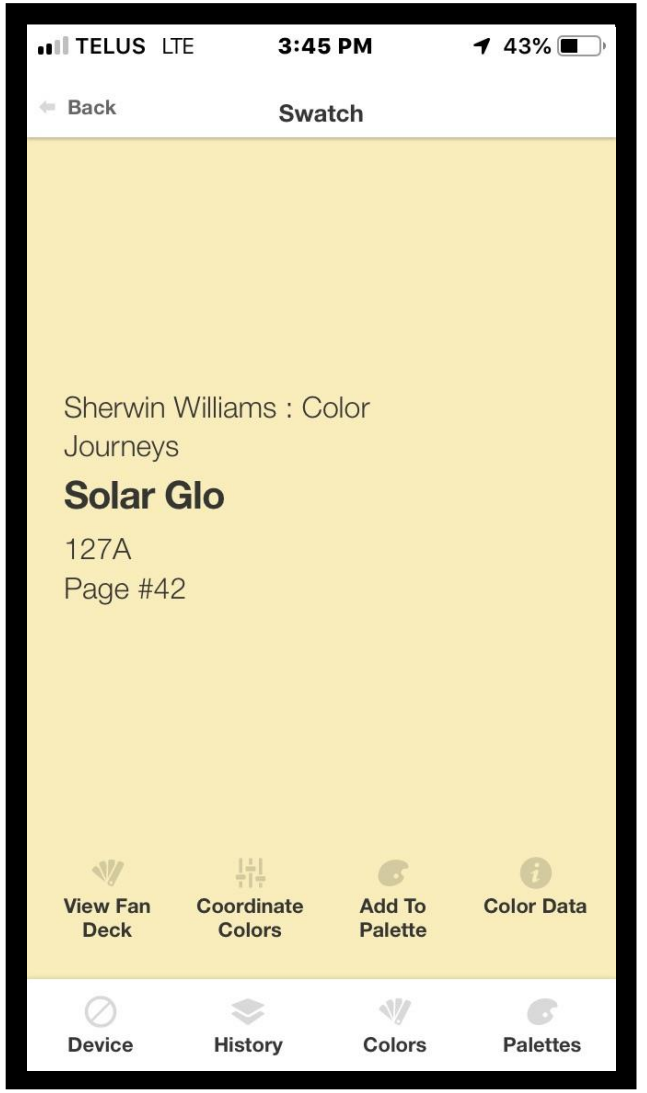
- Tapping one of the three color matches brings up more options



DataColor ColorReaderPRO

What Does It Do?

- Tapping one of the three color matches brings up more options
- If you choose to formulate this color, search the color in Datacolor Paint and formulate as usual



DataColor ColorReaderPRO

M.L. CAMPBELL WOOD FINISHING SYSTEMS

What Does It Do?

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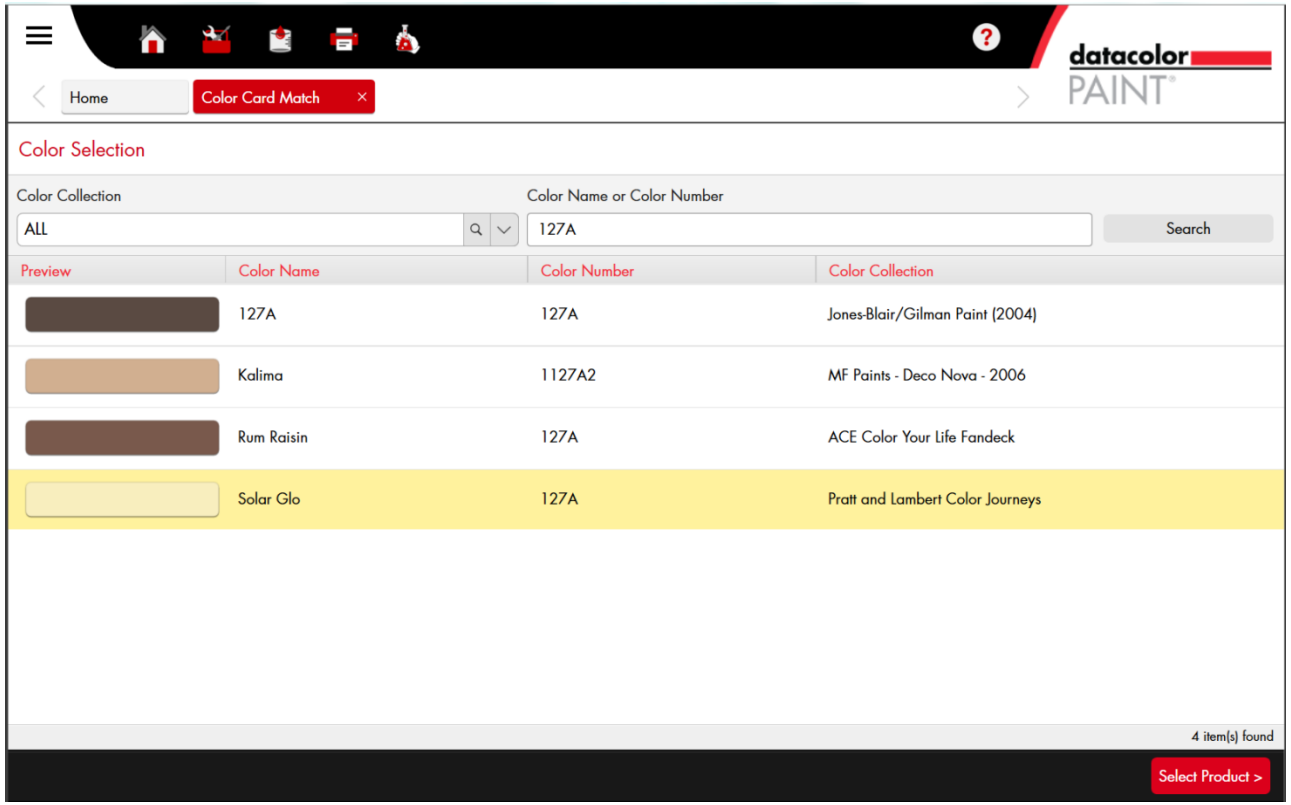

DataColor ColorReaderPRO

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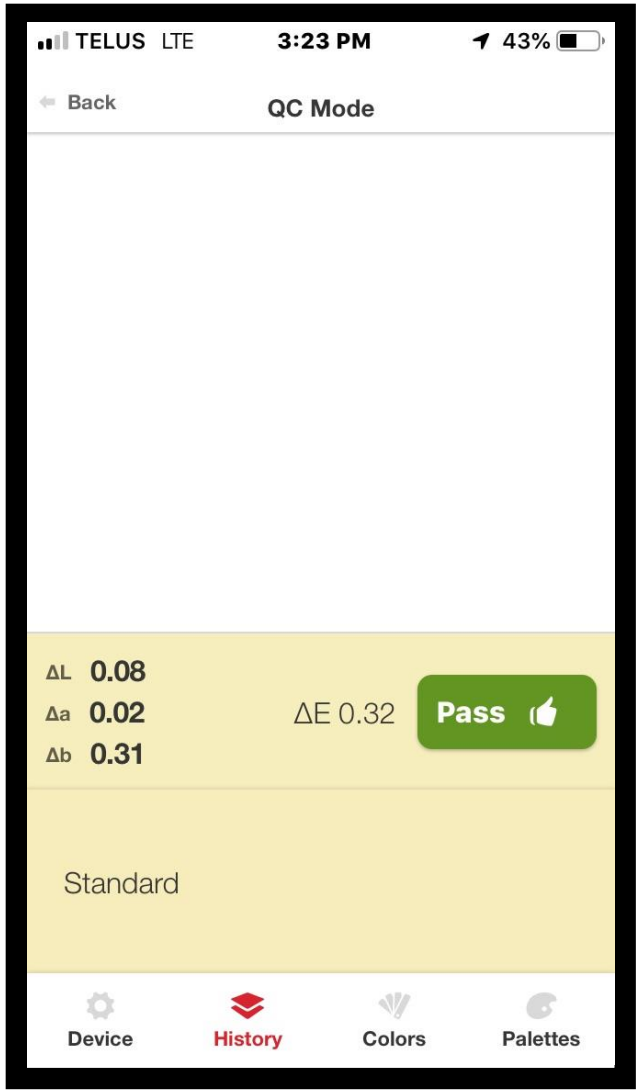
What Does It Do?

- Once you formulate the color you can verify the quality of the match using the QC function on the ColorReaderPRO



DataColor ColorReaderPRO

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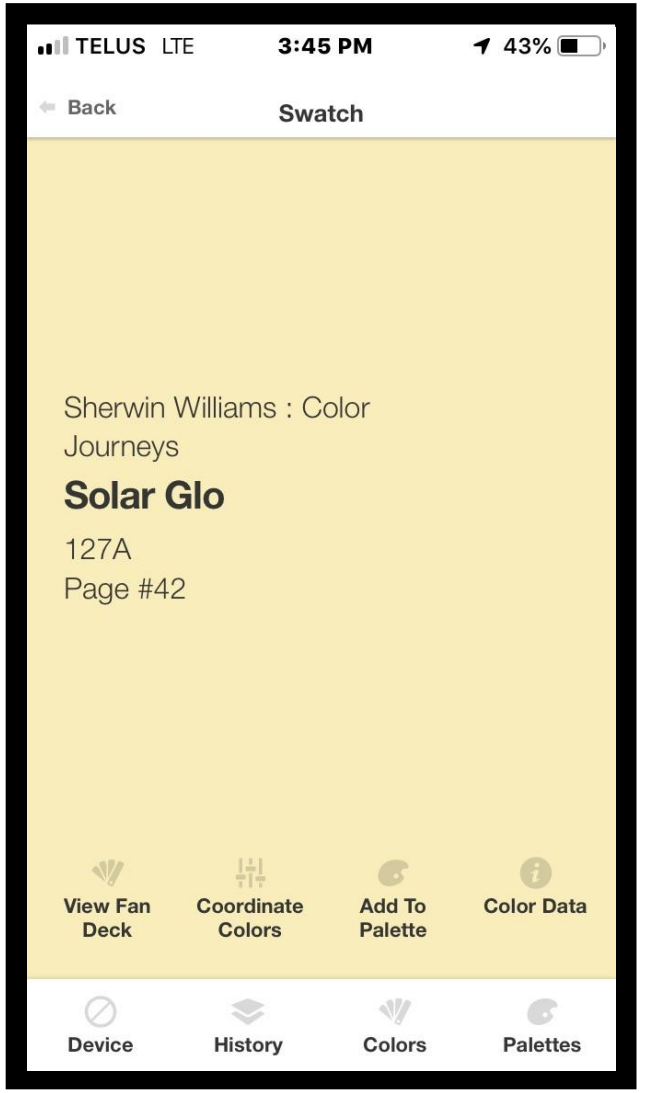
Other Great Functions:

- View Fan Deck
- Coordinate Colors
- Add To Palette
- History
- Colors
- Palettes
- Devise

Switching now to screen shot on projector to explore these other functions



DataColor ColorReaderPRO

M.L. CAMPBELL
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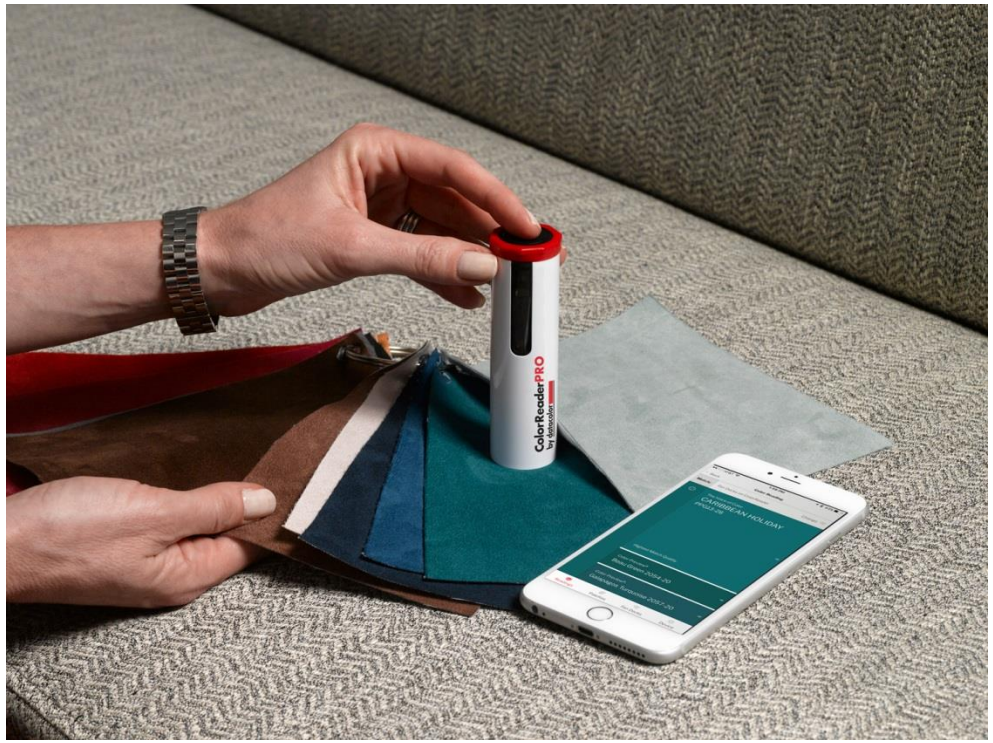
What's in the Box

- Very powerful package for a very reasonable price



Review

ML Campbell Level Two
Color Development Specialist

Length:	4 Days
Pre-requisite:	Level I or Level I OLT
Instructor:	Darrel Young (darrel.s.young@mlcampbell.com)

Gilsonite can be added to which of these stain bases?

A. WS2WB29
B. WS2VB6
C. WS2WB3
D. WS2B10

The Maximum Tint Load for Magnamax White Opaque Base:

A. 2 Ounces

B. 8 Ounces

C. 10 Ounces

D. 12 Ounces

The Maximum Tint Load for Clawlock II White Primer:

A. 6 Ounces

B. 8 Ounces

C. 10 Ounces

D. 12 Ounces

WS2 WB3 is an example of what type of stain?

A. Spray Only Stain
B. NGR Stain
C. Sap Stain
D. Spray and Wipe Stain

What are the three characteristics of color?

A. Tint, shade and tone
B. Chroma value and hue
C. Blows dust off the work prior to coating application
D. Shapes the fan pattern

The Maximum Tint Load for Magnamax Clear Tint Base:

A. 2 Ounces
B. 8 Ounces
C. 10 Ounces
D. 12 Ounces

The Maximum Tint Load for WS2B10 Stain Base is:

A. 7.5 Ounces
B. 12 Ounces
C. 16 Ounces
D. 19 Ounces

The Maximum Tint Load for WS2VB6 Stain Base is:

A. 7.5 Ounces

B. 12 Ounces

C. 16 Ounces

D. 19 Ounces

Microton is an example of what type of stain?

A. Spray Only Stain

B. NGR Stain

C. Sap Stain

D. Spray and Wipe Stain

Amazing Stain is an example of what type of stain?

A. Spray Only Stain
B. NGR Stain
C. Sap Stain
D. Spray and Wipe Stain

WS2B10 is an example of what type of stain?

A. Spray Only Stain
B. NGR Stain
C. Sap Stain
D. Spray and Wipe Stain

WS2 WB29 is an example of what type of stain?

A. Spray Only Stain
B. NGR Stain
C. Sap Stain
D. Spray and Wipe Stain

WS2 NB4 is an example of what type of stain?

A. Spray Only Stain

B. NGR Stain

C. Sap Stain

D. Spray and Wipe Stain

WS2 DPS10 is an example of what type of stain?

A. Spray Only Stain
B. NGR Stain
C. Sap Stain
D. Spray and Wipe Stain

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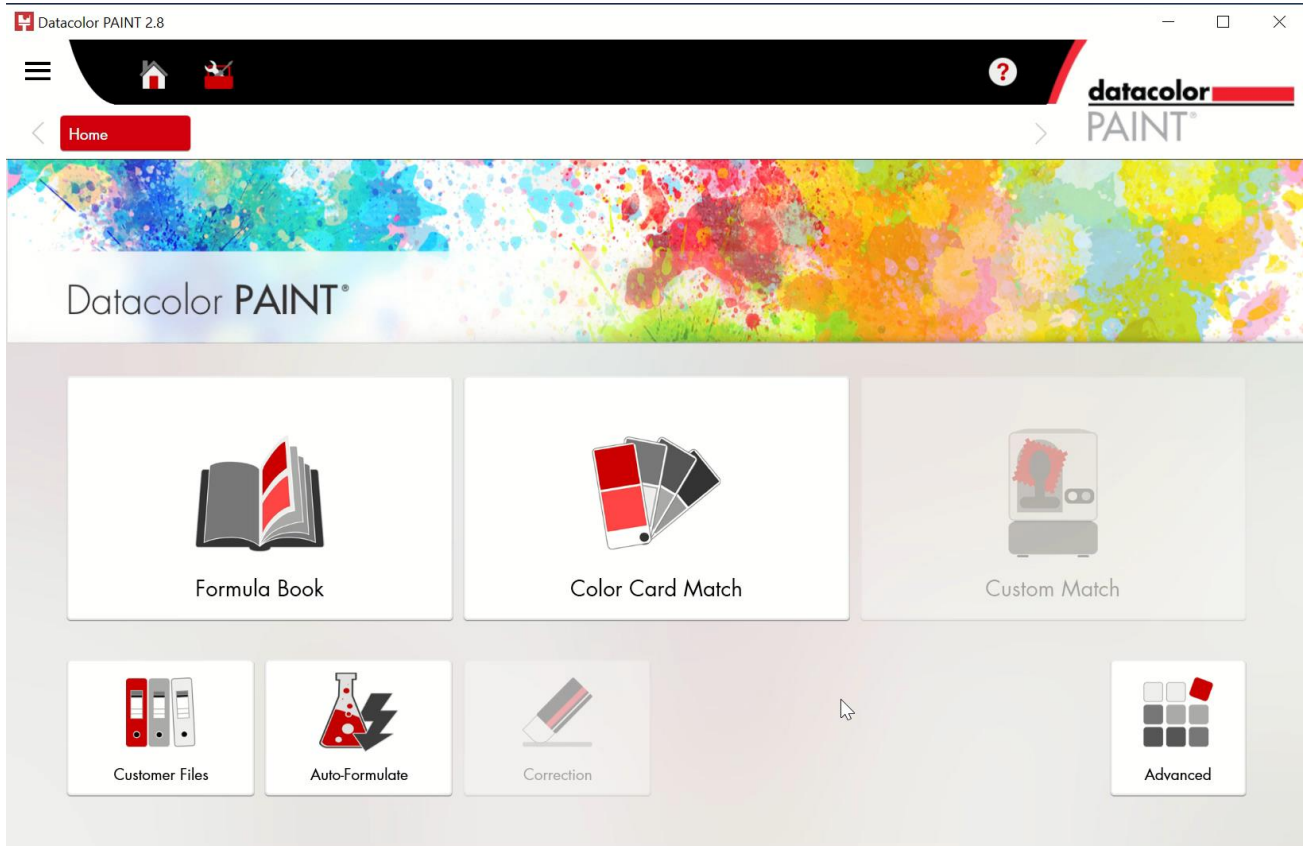
WOOD FINISHING SYSTEMS

The Datacolor System

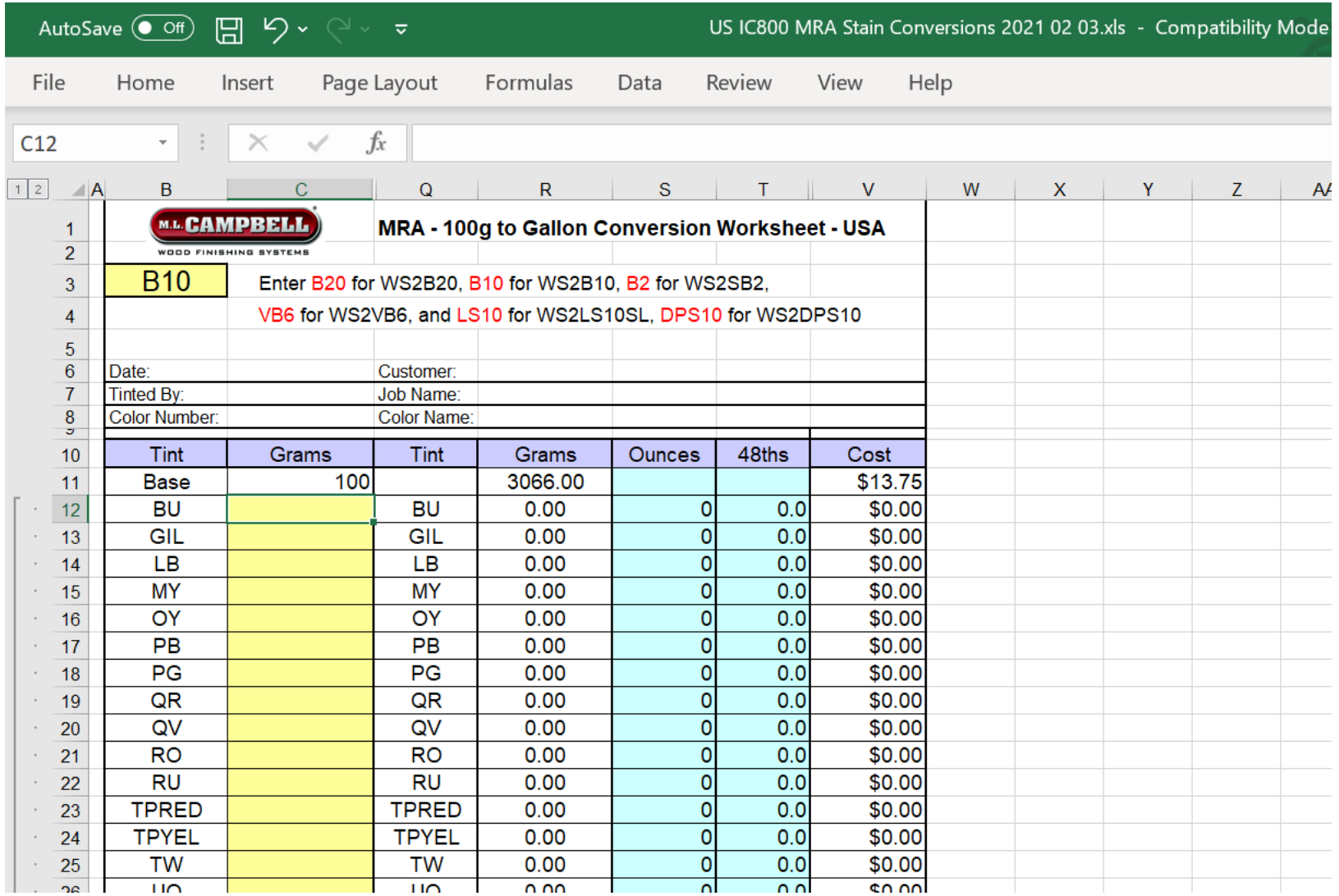
M.L. CAMPBELL WOOD FINISHING SYSTEMS

Datacolor



Color Tools

Conversion Spreadsheets



AutoSave Off — US IC800 MRA Stain Conversions 2021 02 03.xls - Compatibility Mode

File Home Insert Page Layout Formulas Data Review View Help

C12

MRA - 100g to Gallon Conversion Worksheet - USA

B10

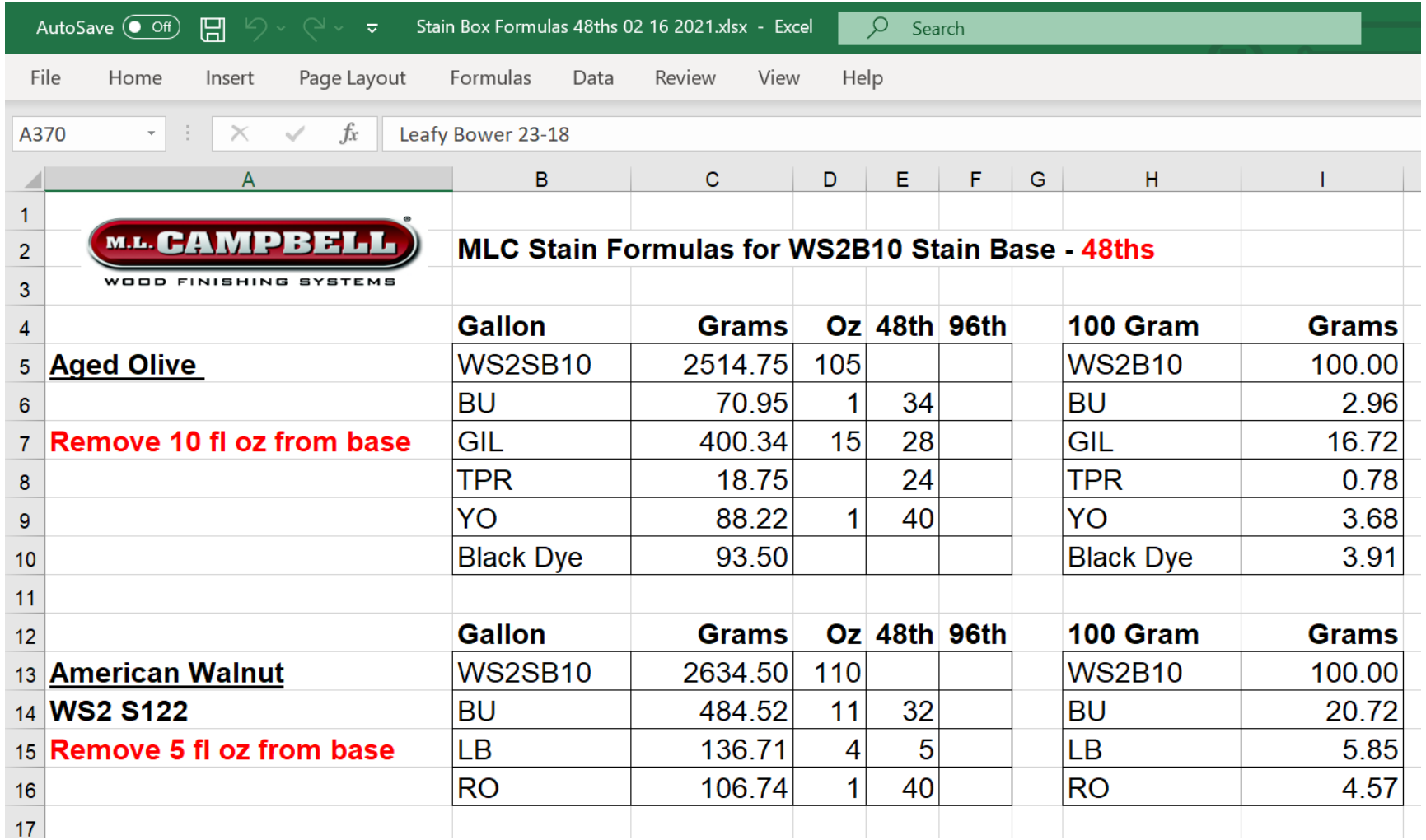
Enter B20 for WS2B20, B10 for WS2B10, B2 for WS2SB2,
VB6 for WS2VB6, and LS10 for WS2LS10SL, DPS10 for WS2DPS10

Date:		Customer:				
Tinted By:		Job Name:				
Color Number:		Color Name:				

Tint	Grams	Tint	Grams	Ounces	48ths	Cost
Base	100		3066.00			$13.75
BU		BU	0.00	0	0.0	$0.00
GIL		GIL	0.00	0	0.0	$0.00
LB		LB	0.00	0	0.0	$0.00
MY		MY	0.00	0	0.0	$0.00
OY		OY	0.00	0	0.0	$0.00
PB		PB	0.00	0	0.0	$0.00
PG		PG	0.00	0	0.0	$0.00
QR		QR	0.00	0	0.0	$0.00
QV		QV	0.00	0	0.0	$0.00
RO		RO	0.00	0	0.0	$0.00
RU		RU	0.00	0	0.0	$0.00
TPRED		TPRED	0.00	0	0.0	$0.00
TPYEL		TPYEL	0.00	0	0.0	$0.00
TW		TW	0.00	0	0.0	$0.00

Color Tools

Color Formula Spreadsheets



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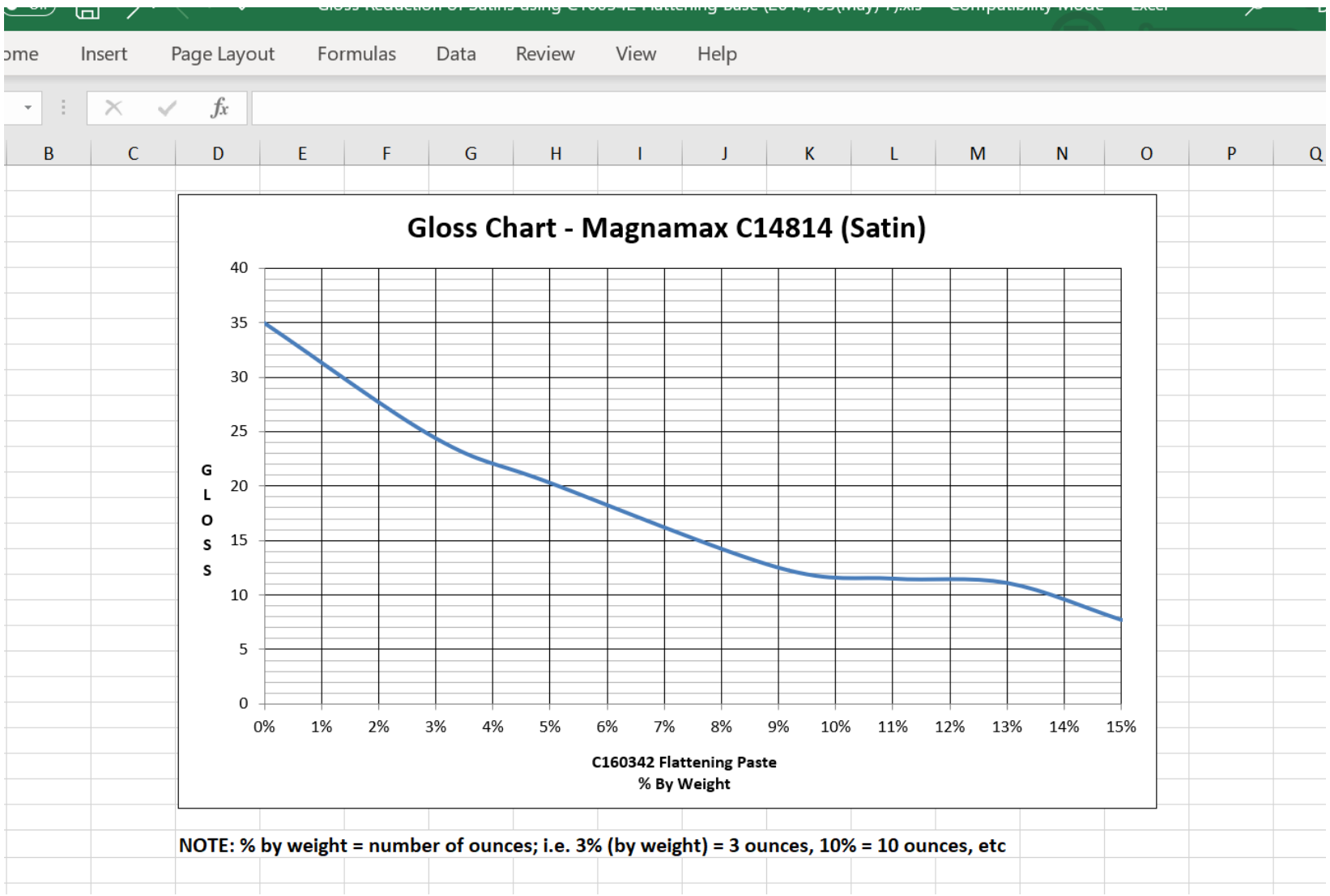
MLC Stain Formulas for WS2B10 Stain Base - 48ths

	Gallon	Grams	Oz	48th	96th		100 Gram	Grams
Aged Olive	WS2SB10	2514.75	105				WS2B10	100.00
	BU	70.95	1	34			BU	2.96
Remove 10 fl oz from base	GIL	400.34	15	28			GIL	16.72
	TPR	18.75		24			TPR	0.78
	YO	88.22	1	40			YO	3.68
	Black Dye	93.50					Black Dye	3.91
	Gallon	**Grams**	**Oz**	**48th**	**96th**		**100 Gram**	**Grams**
American Walnut	WS2SB10	2634.50	110				WS2B10	100.00
WS2 S122	BU	484.52	11	32			BU	20.72
Remove 5 fl oz from base	LB	136.71	4	5			LB	5.85
	RO	106.74	1	40			RO	4.57

Color Tools

Flattening Spreadsheets



ML Campbell

ML Campbell Level Two
Color Development Specialist

Length:	4 Days
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