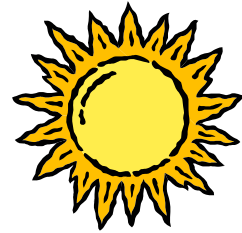




Digital Standards for Automotive and Industrial Coatings

Disadvantages of Visual Color evaluation: Color Perception

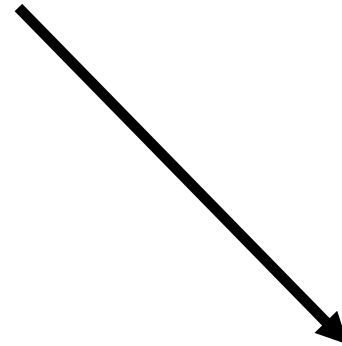
Light Source



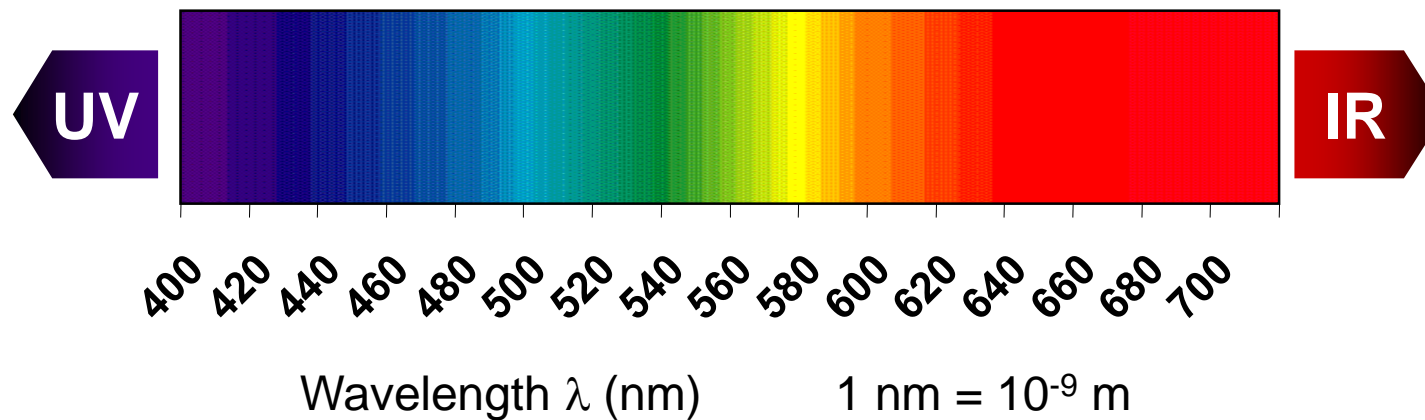
Observer



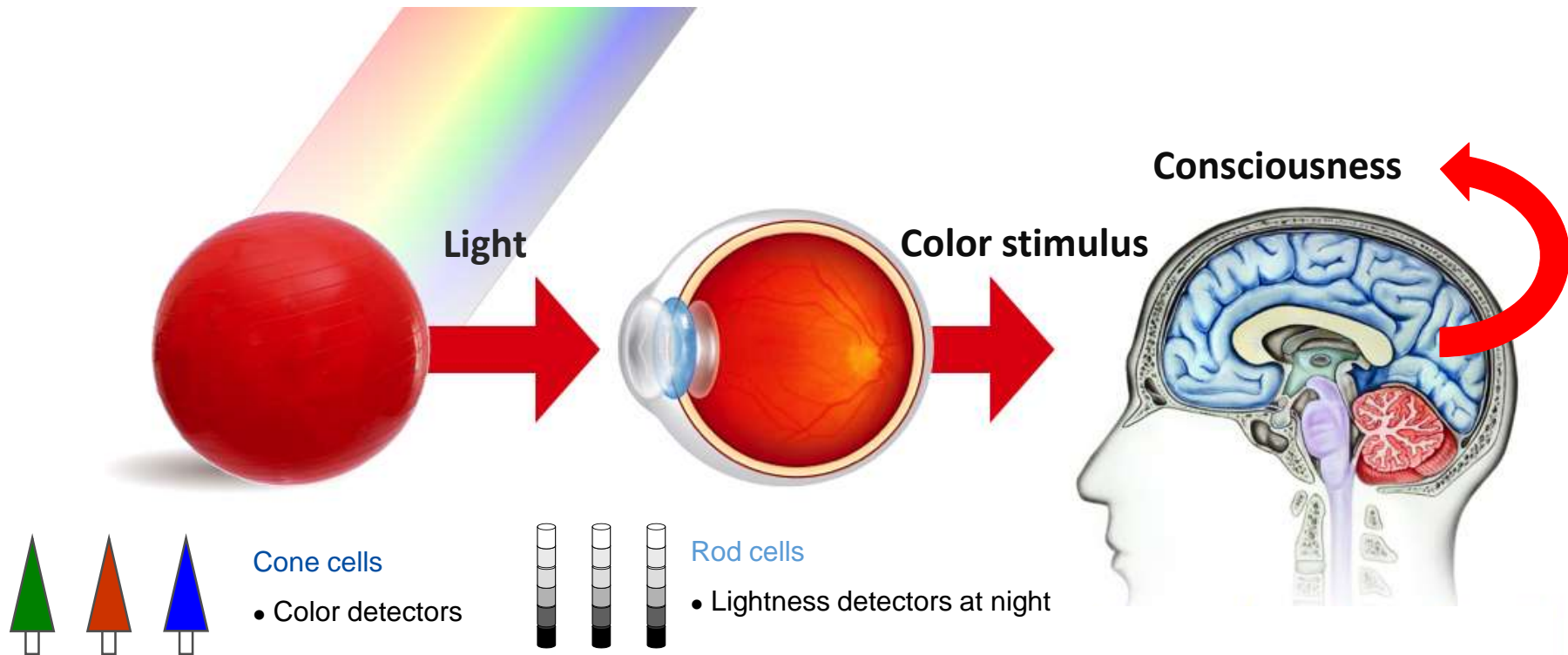
Object



Disadvantages of Visual Color evaluation: Color Perception



Components for Color evaluation:



What could possibly go wrong?

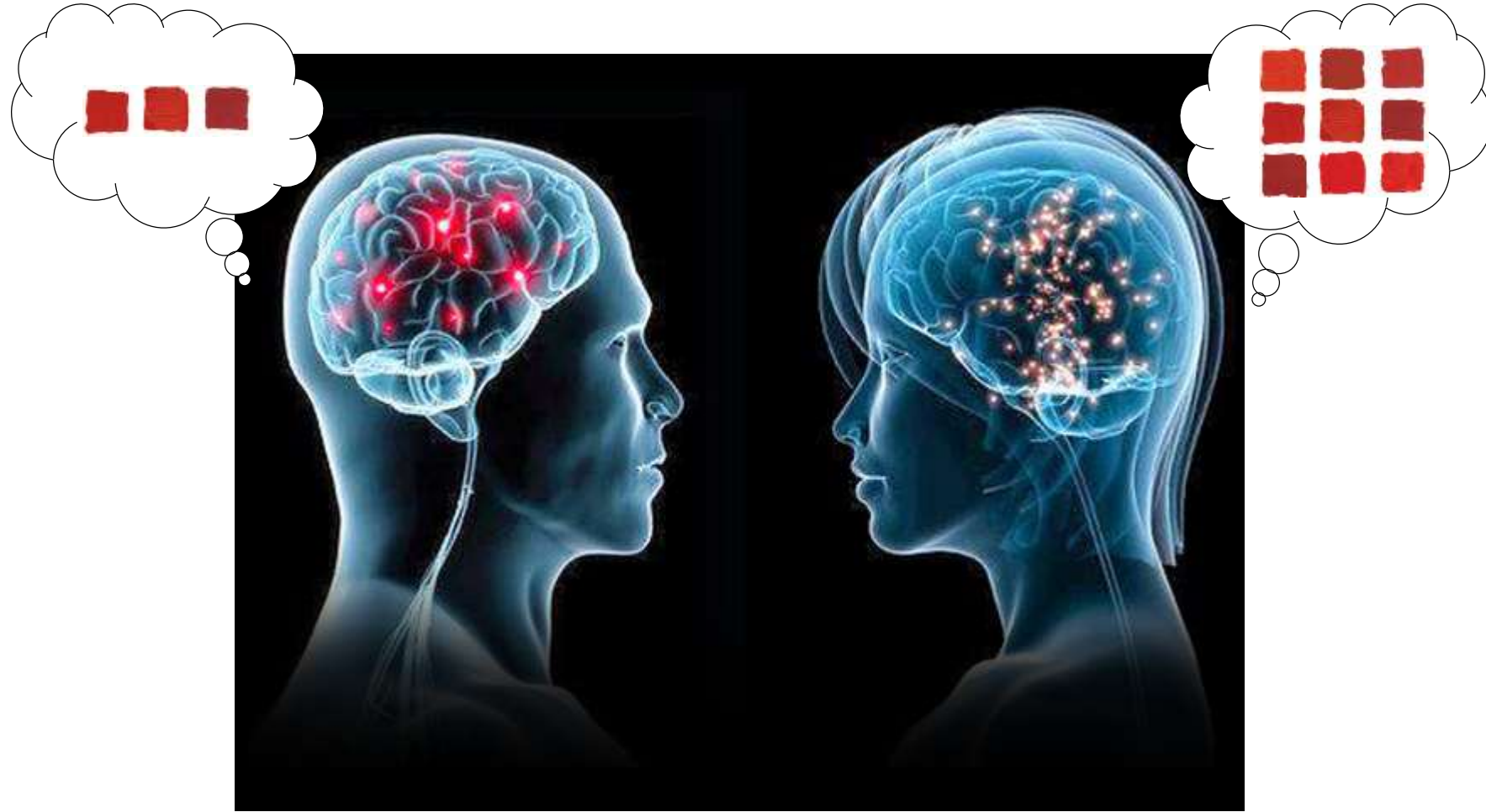
Disadvantages of Visual Color evaluation: Color has meaning, harmony means more



Disadvantages of Visual Color evaluation: Multiple components must match visually



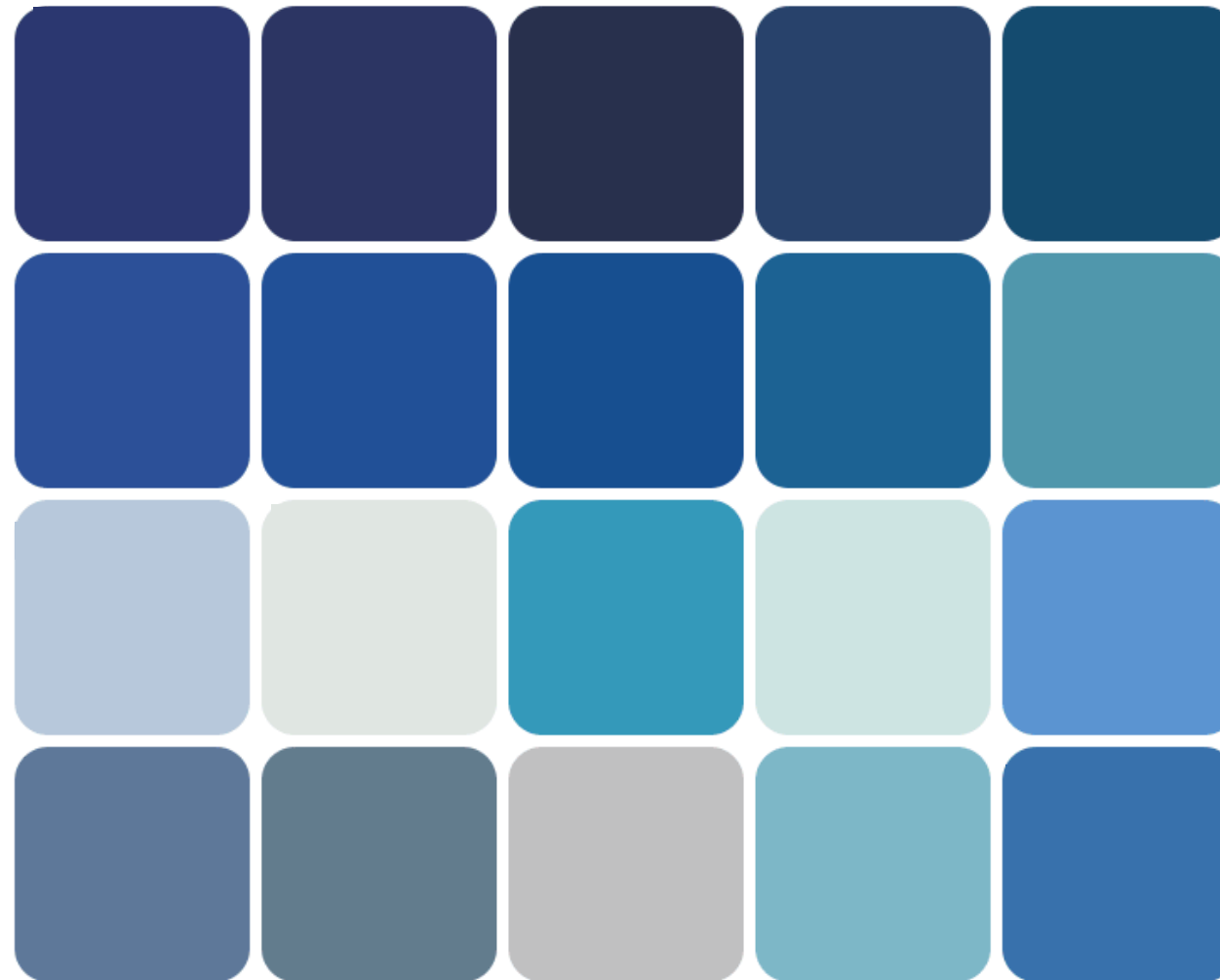
Disadvantages of Visual Color evaluation: Color perception is subjective



Disadvantages of Visual Color evaluation: Color perception depends on surroundings



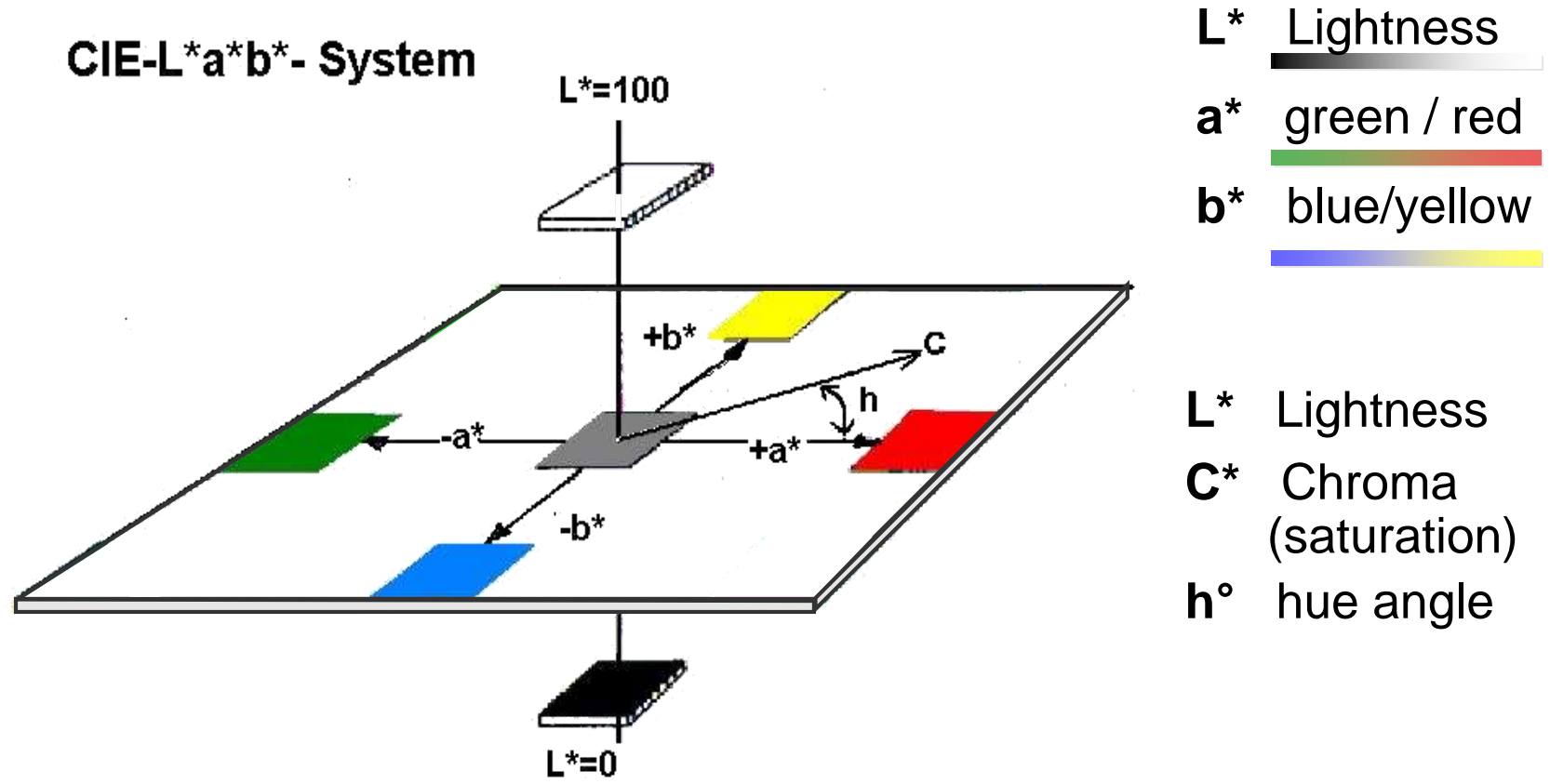
Disadvantages of Visual Color evaluation: We cannot remember color



Disadvantages of Visual Color evaluation: We cannot remember color



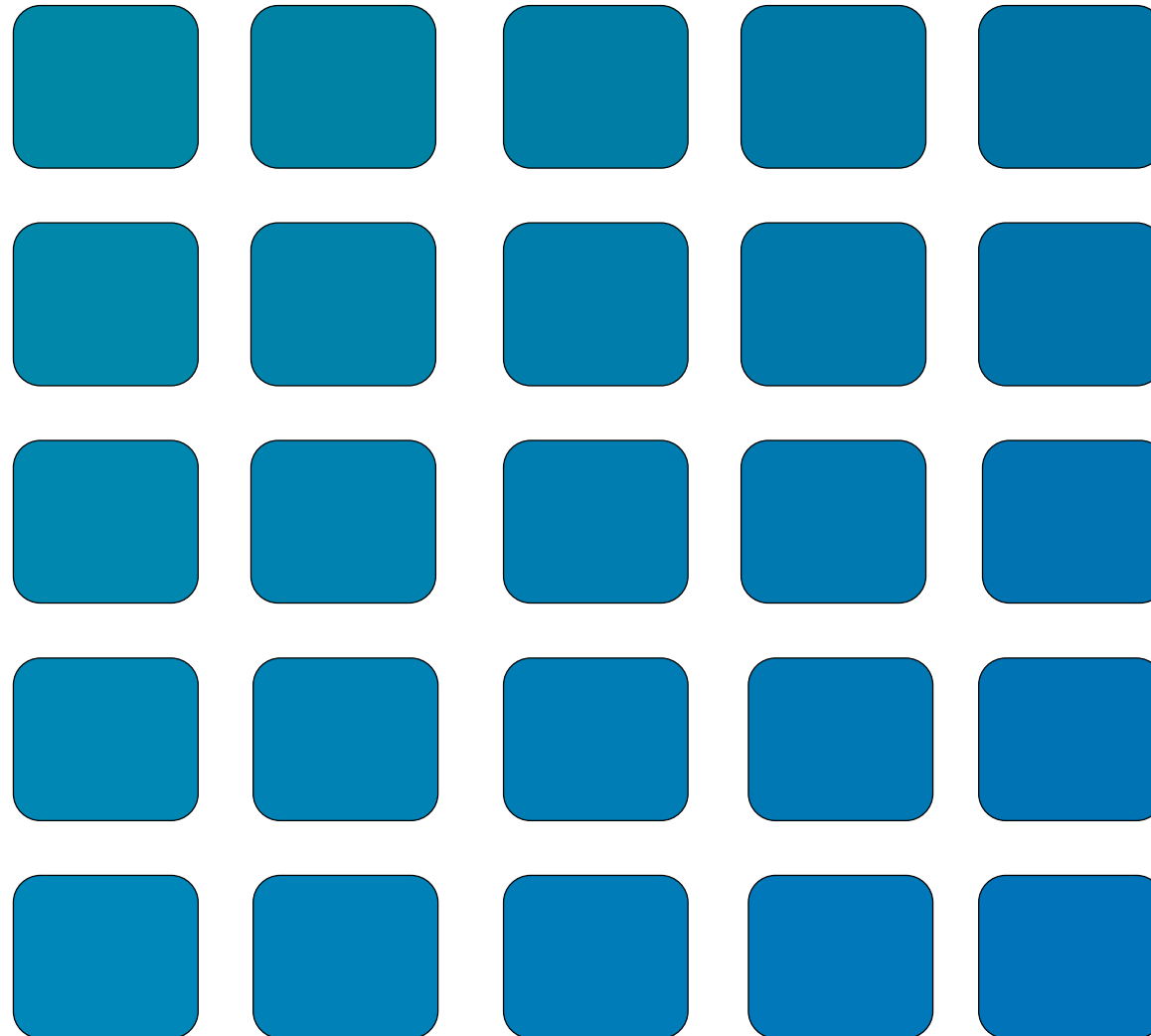
Problems with Physical Standards: Not all color shifts are equal



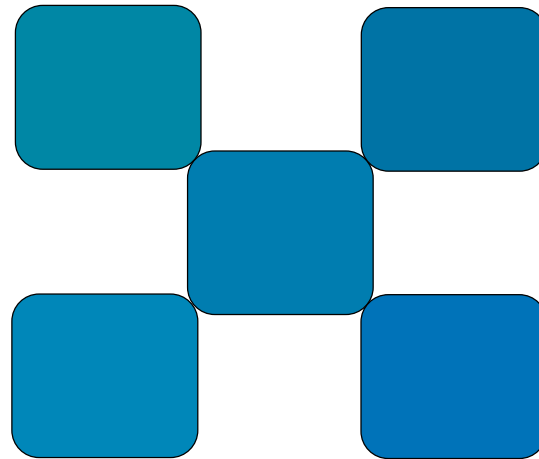
Δ = Sample - Standard

$$\Delta E^* = \sqrt{(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2}$$

Disadvantages of Visual Color evaluation: How much is too much?



Disadvantages of Visual Color evaluation: Harmonize



Disadvantages of Non-Digital Standards: Working Standards; how do they work?



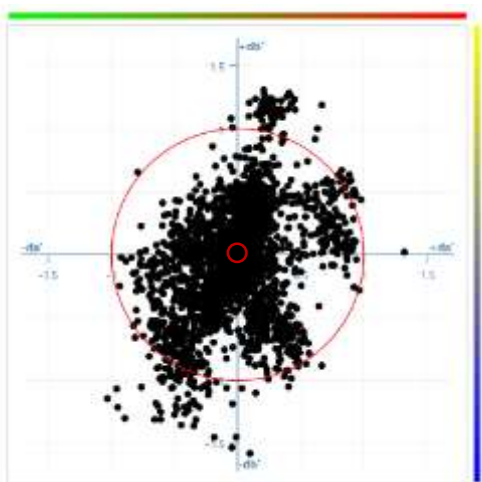
MASTER
Ext. Body Color Paint

MY 2022 Approved Date: 12-Feb-2020
Manufacturer:

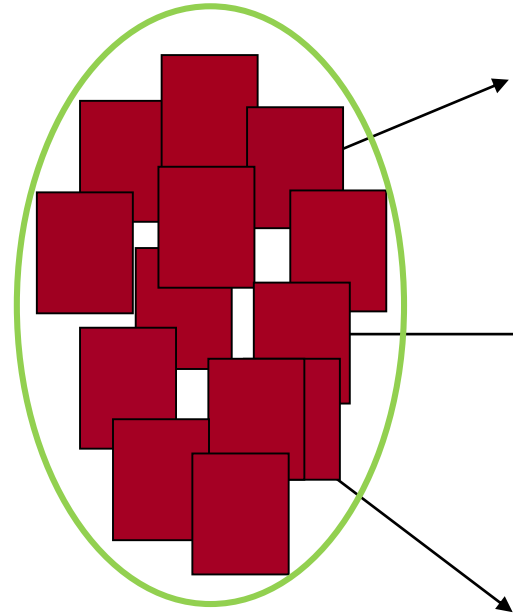
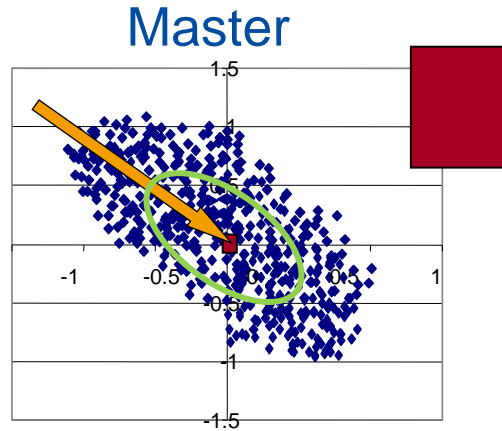
Remarks: Minimum handling will extend the life of this standard which should be rechecked and replaced when necessary.
Panel measured with BYK-Mac 1.

Center Master Panel#	L dL*	a da*	b db*	C dC*	H dH*	dE*
15°	49.65 -0.32	-14.77 0.01	34.37 0.01	37.41 0.01	113.3 -0.01	0.32
25°	35.96 -0.24	-14.64 0.03	22.17 -0.18	26.57 -0.17	123.4 0.07	0.3
45°	19.84 -0.04	-12.44 -0.01	7.84 0.03	14.7 0.03	147.8 -0.02	0.05
75°	12.39 -0.01	-10.31 0.05	0.3 0	10.32 -0.05	178.3 -0.01	0.06
110°	9.21 0.02	-8.74 -0.03	-1.85 0.01	8.95 0.03	192.6 -0.02	0.04

Ident-No.



Disadvantages of Visual Color evaluation: Working Standards; how do they work?



Working Standards



Each plant uses its
own working
standard for color
control

Problems with Physical Standards: Constant wonder

What Standard are you using?

What condition is the Standard?

Who signed the Standard?

How far is it from the Master?

Does it still match the Master?

Where is the Standard?

What instrument are you using?

Summary; Annual Standard Reviews are required

Common Conclusion; Replace the Standard



Problems with Physical Standards: What can be done?

Take care of the Master;
Manila envelopes
Deep freezer storage
Remove only when necessary
Return to freezer immediately

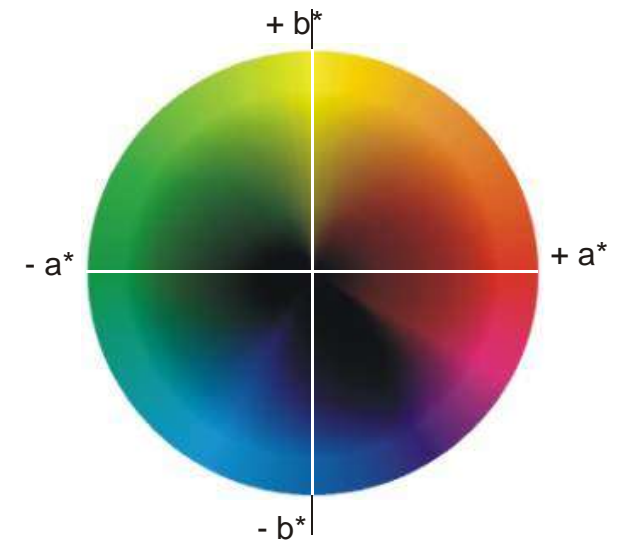
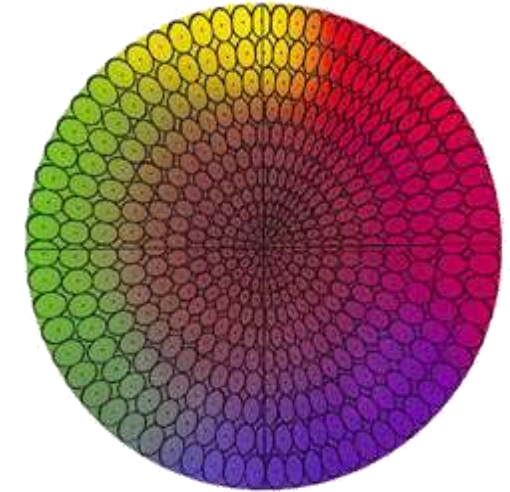
Purchase stable spectrophotometer

Temperature stable
Long term illuminate – no warm up, no degradation
Tight tolerance gage R&R

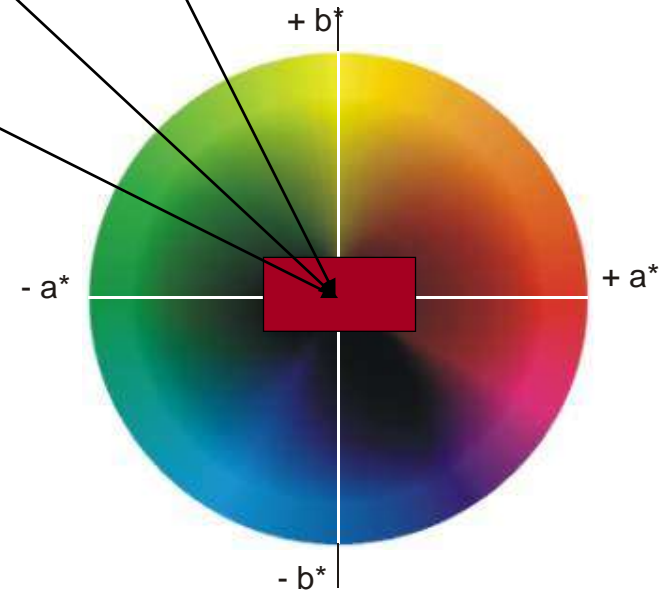
Use an elliptical color difference equation

$$\Delta E_{CMC} \quad \Delta E_{94} \quad \Delta E_{00}$$

Share Standards digitally!



Benefits of Digital Standards: One binding reference



Problems with Physical Standards: No more wonder



What Standard are you using? Digital standards will be obvious on the QC report

What condition is the Standard? It's digital!

Who signed the Standard? The digital Master date and time stamp is the signature

How far is it from the Master? N/A

Does it still match the Master? 100% YES!

Where is the Standard? Working Standards might be lost, but the digital is what matters

What instrument are you using? Only like instruments can share digital standards; 45/0 or d/8

Summary; No more annual Standard reviews!

Conclusion; Keep on truckin'

THANK YOU