



*color*



Color is...

*Complex*



Color is...

*Confusing*



Color is...

*Important*



Color helps you

*Explore*



3	3	0	3	0	1	8	7	6	8	2	1	4	0	3	8	3	7	7	2	0	5	2	3	2	7	0	2	0
7	1	4	6	0	2	1	3	2	7	6	0	2	5	6	3	2	5	7	6	3	3	0	2	0	3	0	7	2
8	7	5	7	2	8	3	8	7	7	8	2	0	7	7	5	2	3	1	1	5	6	3	8	4	7	8	2	0
0	5	0	5	1	6	1	7	5	6	8	0	4	4	6	7	4	7	1	4	0	0	8	4	4	3	0	3	2
2	4	3	1	3	5	4	9	5	0	7	6	0	7	4	3	1	8	2	7	3	4	6	0	2	4	8	2	3
8	6	2	2	6	5	4	6	7	0	7	6	0	0	3	9	0	2	4	7	1	7	2	3	3	5	8	7	0
0	8	4	5	1	3	1	7	6	4	5	4	1	2	4	5	3	3	5	4	9	6	7	7	6	3	4	2	5
4	7	7	0	2	2	0	1	1	7	7	7	0	2	6	6	4	7	5	8	6	1	4	3	7	8	5	4	6
4	3	6	6	4	6	6	2	8	4	8	5	3	7	8	8	1	3	8	5	4	5	7	4	0	3	2	8	4
5	5	0	3	5	3	5	3	8	3	2	3	8	2	3	1	6	2	7	2	4	6	3	6	4	4	3	2	5
4	4	0	2	1	7	2	4	4	7	4	1	9	2	4	5	2	5	0	4	0	0	5	3	6	3	3	6	7
7	4	6	6	8	7	5	7	9	2	0	2	8	8	8	8	3	2	4	2	6	4	0	4	6	3	7	2	1
0	1	7	1	5	9	1	4	2	8	7	3	7	1	4	5	1	8	7	8	0	5	1	7	0	5	8	8	1
2	8	5	2	1	2	8	7	7	6	2	5	6	2	6	4	1	5	1	6	1	2	1	1	0	5	6	4	0
2	1	1	7	7	2	0	0	1	8	7	0	2	9	0	2	8	5	7	8	4	6	0	6	5	0	7	1	2
0	5	2	4	1	5	3	3	1	5	5	1	4	0	1	6	4	3	3	9	8	8	3	4	6	8	4	8	6
7	3	7	5	2	4	0	2	7	6	3	8	5	5	4	5	8	8	7	5	5	6	5	6	7	9	7	7	4
0	3	2	8	1	4	4	6	0	8	2	3	0	1	3	4	6	2	0	5	7	7	3	6	1	8	7	3	5
4	4	8	3	3	3	5	0	1	0	3	8	6	3	2	0	5	0	6	1	3	3	4	3	6	1	5	8	6
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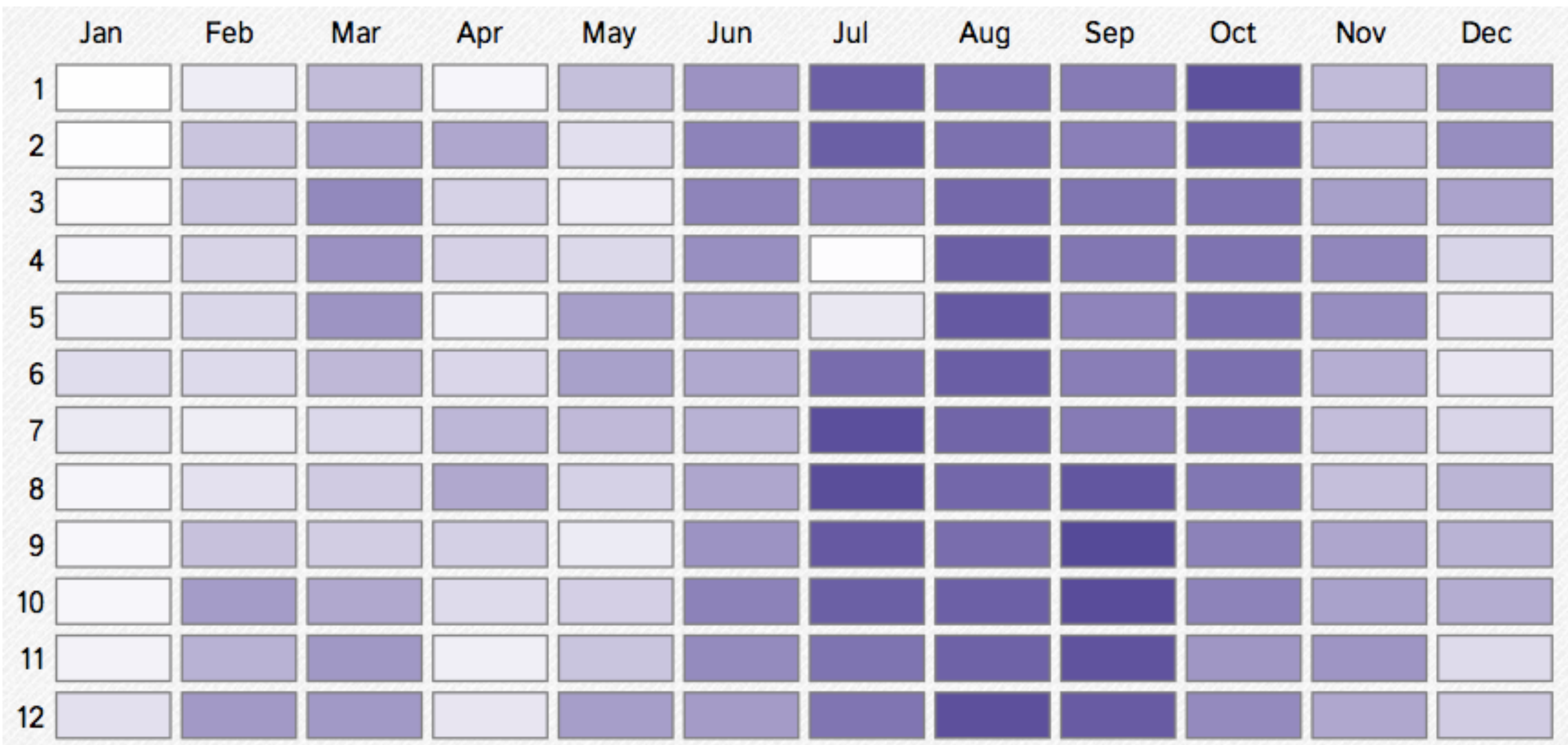


3	3	0	3	0	1	8	7	6	8	2	1	4	0	3	8	3	7	7	2	0	5	2	3	2	7	0	2	0
7	1	4	6	0	2	1	3	2	7	6	0	2	5	6	3	2	5	7	6	3	3	0	2	0	3	0	7	2
8	7	5	7	2	8	3	8	7	7	8	2	0	7	7	5	2	3	1	1	5	6	3	8	4	7	8	2	0
0	5	0	5	1	6	1	7	5	6	8	0	4	4	6	7	4	7	1	4	0	0	8	4	4	3	0	3	2
2	4	3	1	3	5	4	9	5	0	7	6	0	7	4	3	1	8	2	7	3	4	6	0	2	4	8	2	3
8	6	2	2	6	5	4	6	7	0	7	6	0	0	3	9	0	2	4	7	1	7	2	3	3	5	8	7	0
0	8	4	5	1	3	1	7	6	4	5	4	1	2	4	5	3	3	5	4	9	6	7	7	6	3	4	2	5
4	7	7	0	2	2	0	1	1	7	7	7	0	2	6	6	4	7	5	8	6	1	4	3	7	8	5	4	6
4	3	6	6	4	6	6	2	8	4	8	5	3	7	8	8	1	3	8	5	4	5	7	4	0	3	2	8	4
5	5	0	3	5	3	5	3	8	3	2	3	8	2	3	1	6	2	7	2	4	6	3	6	4	4	3	2	5
4	4	0	2	1	7	2	4	4	7	4	1	9	2	4	5	2	5	0	4	0	0	5	3	6	3	3	6	7
7	4	6	6	8	7	5	7	9	2	0	2	8	8	8	8	3	2	4	2	6	4	0	4	6	3	7	2	1
0	1	7	1	5	9	1	4	2	8	7	3	7	1	4	5	1	8	7	8	0	5	1	7	0	5	8	8	1
2	8	5	2	1	2	8	7	7	6	2	5	6	2	6	4	1	5	1	6	1	2	1	1	0	5	6	4	0
2	1	1	7	7	2	0	0	1	8	7	0	2	9	0	2	8	5	7	8	4	6	0	6	5	0	7	1	2
0	5	2	4	1	5	3	3	1	5	5	1	4	0	1	6	4	3	3	9	8	8	3	4	6	8	4	8	6
7	3	7	5	2	4	0	2	7	6	3	8	5	5	4	5	8	8	7	5	5	6	5	6	7	9	7	7	4
0	3	2	8	1	4	4	6	0	8	2	3	0	1	3	4	6	2	0	5	7	7	3	6	1	8	7	3	5
4	4	8	3	3	3	5	0	1	0	3	8	6	3	2	0	5	0	6	1	3	3	4	3	6	1	5	8	6
1	0	2	2	7	6	3	3	0	8	8	0	3	1	8	8	1	2	1	7	5	2	9	3	5	8	3	2	5

Color helps you

*Measure*





Color helps you

*Engage*

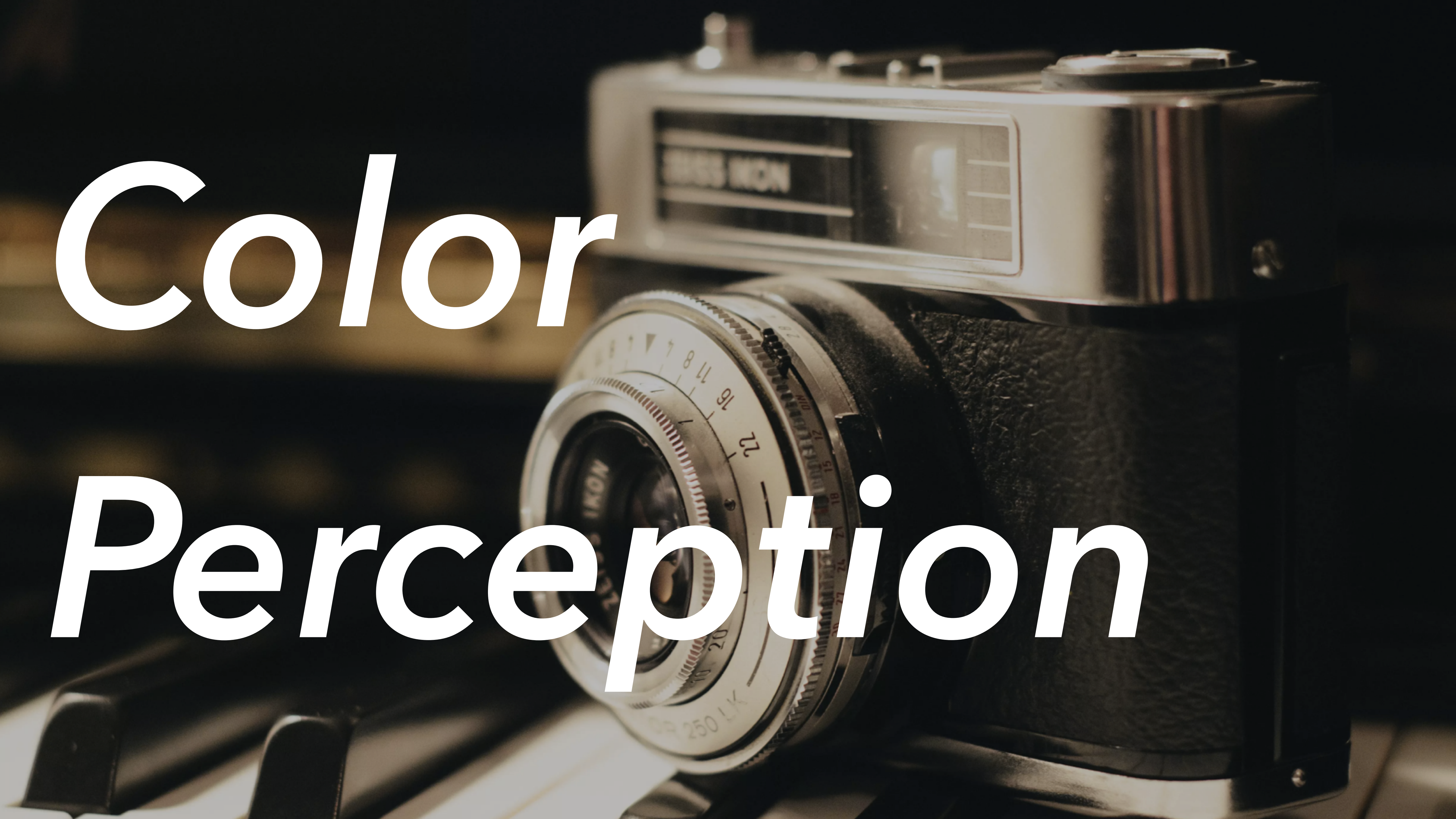












# *Color Perception*



*Light*

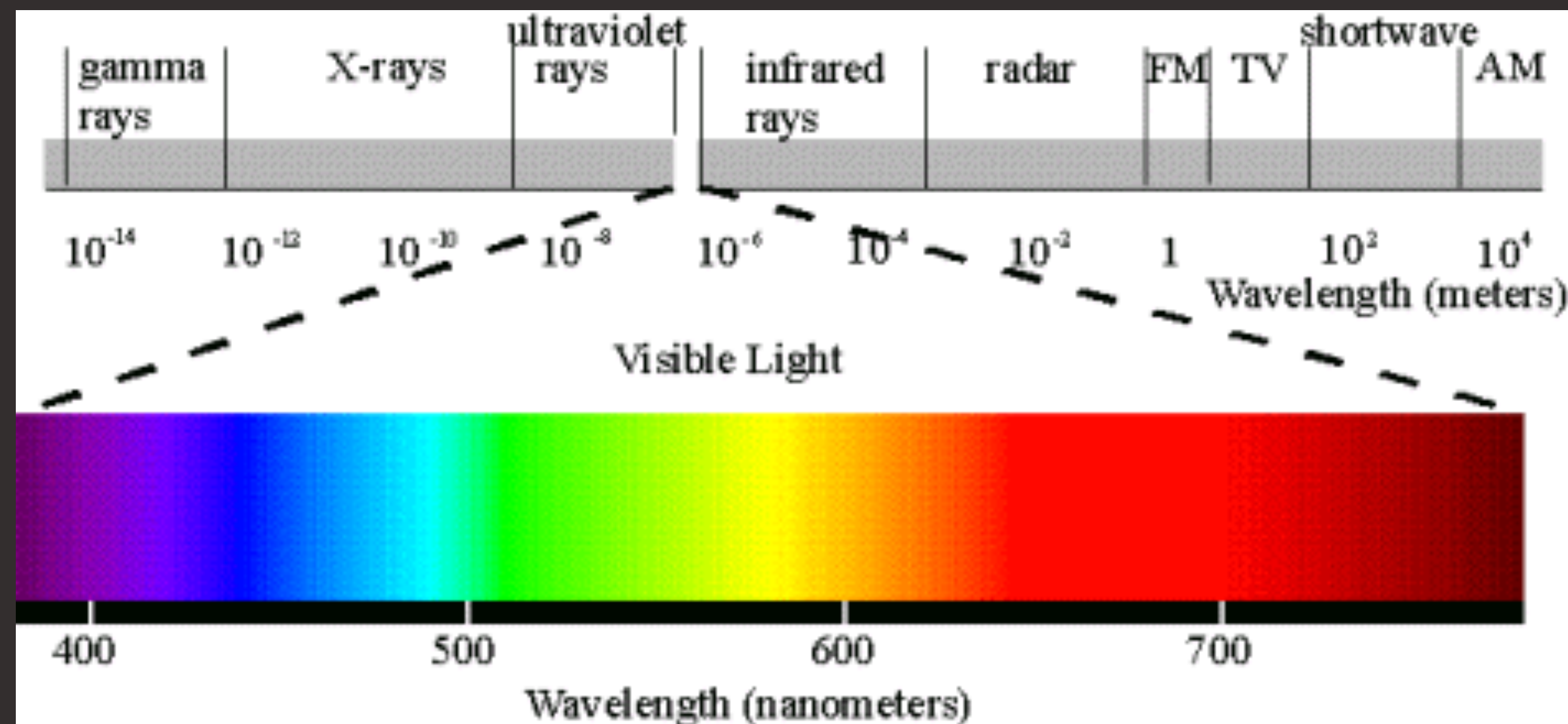
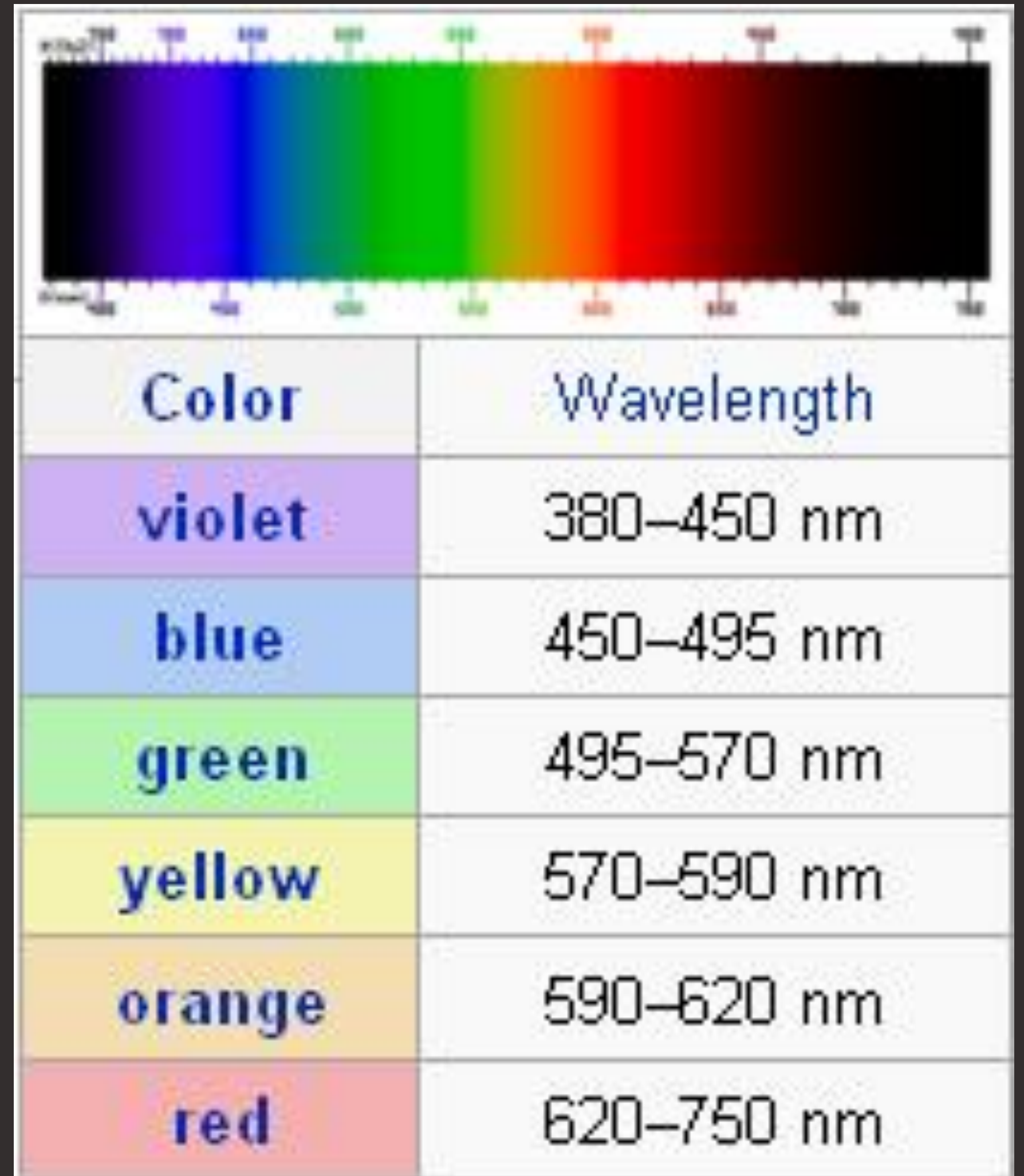
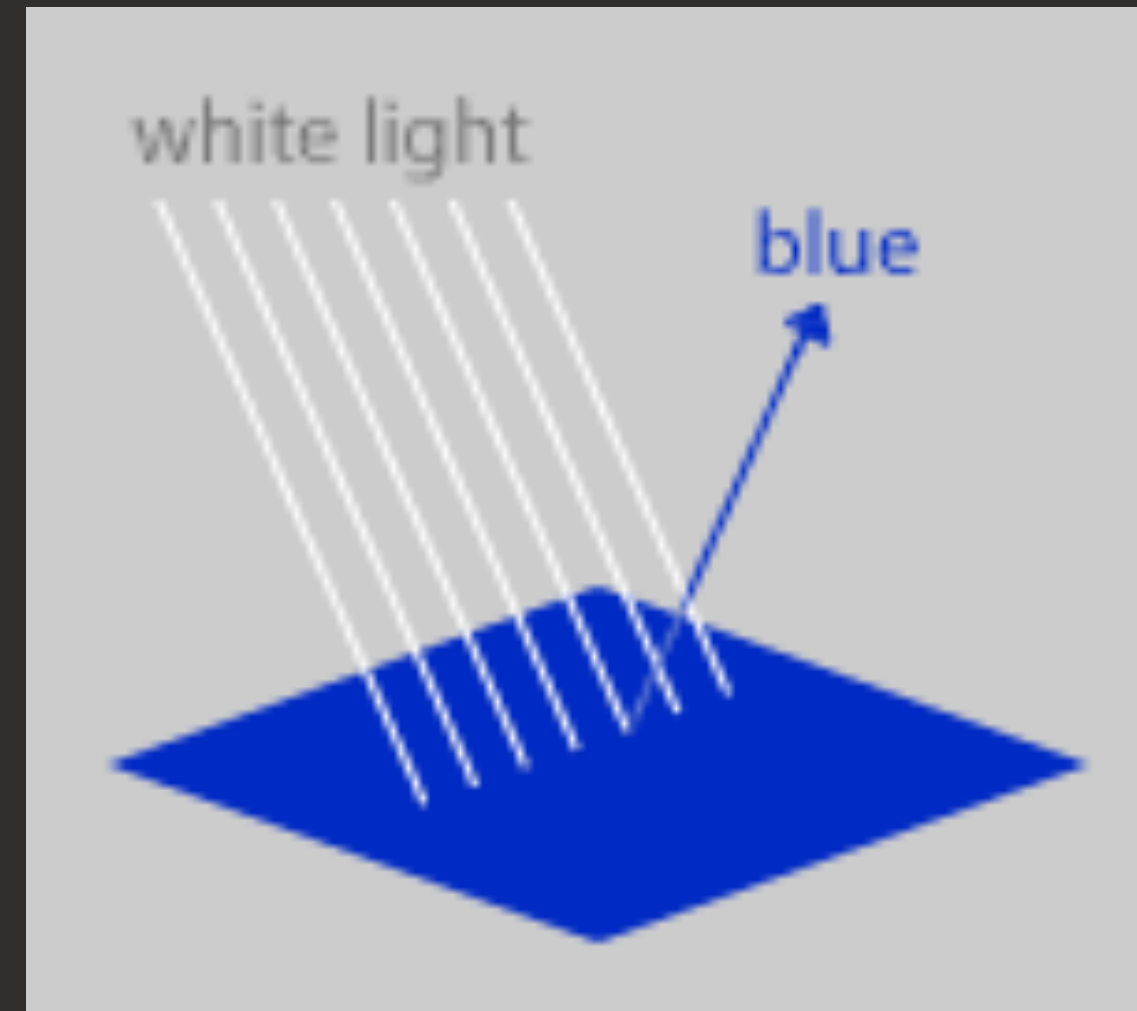
*Eyes*

*Mind*





# Light





# Light + color “types”



# Subtractive





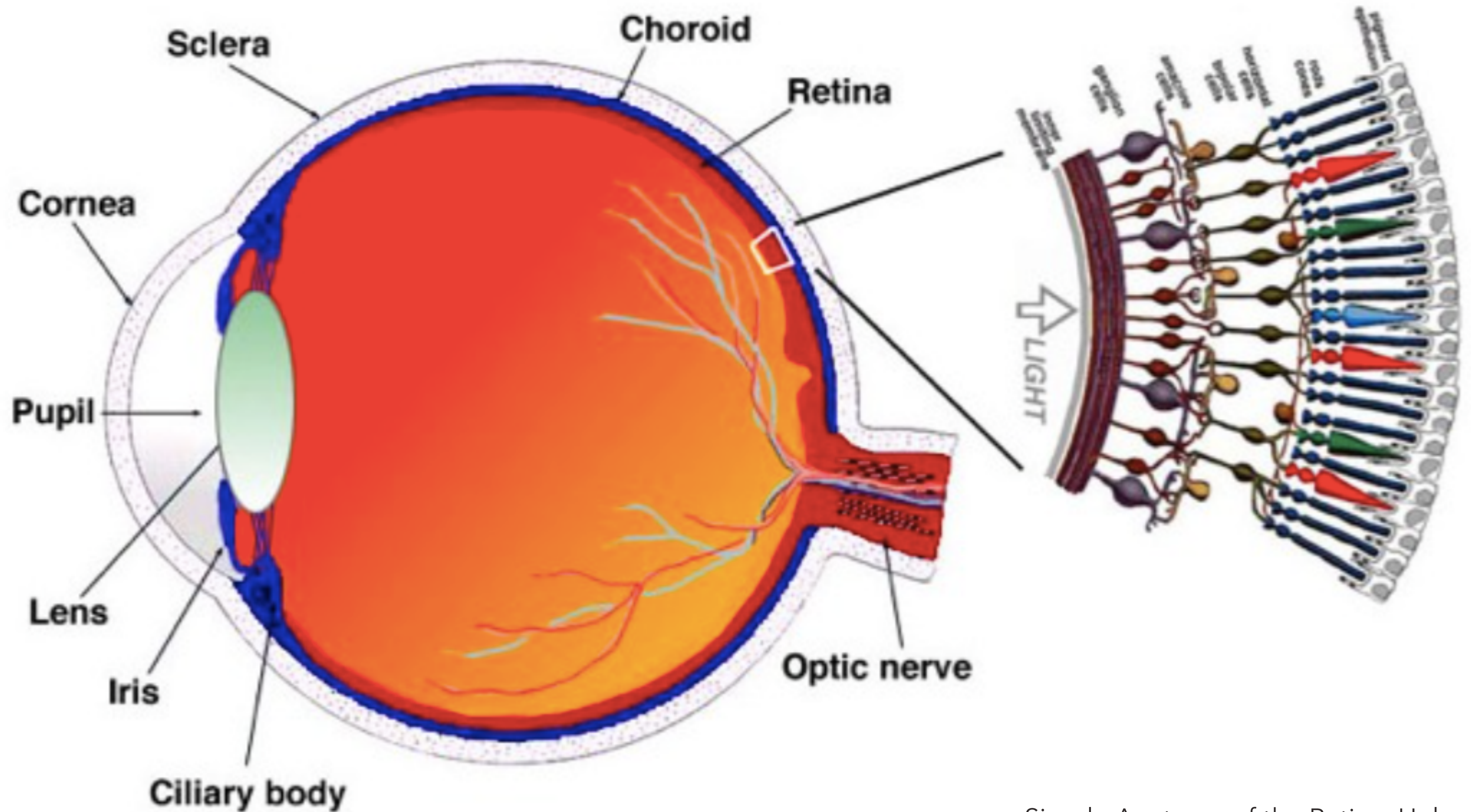
# Additive





*Eyes*





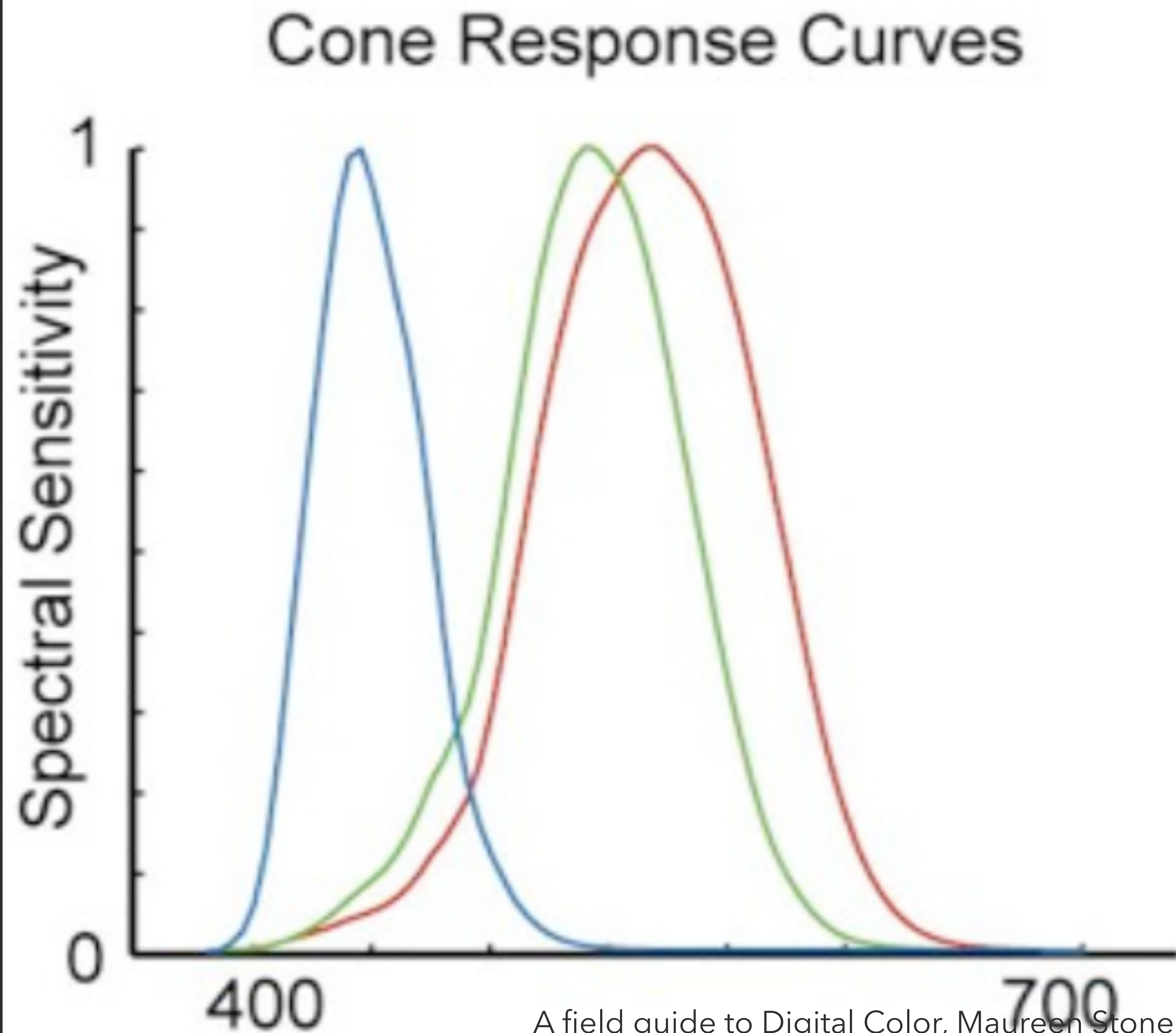


# Cones

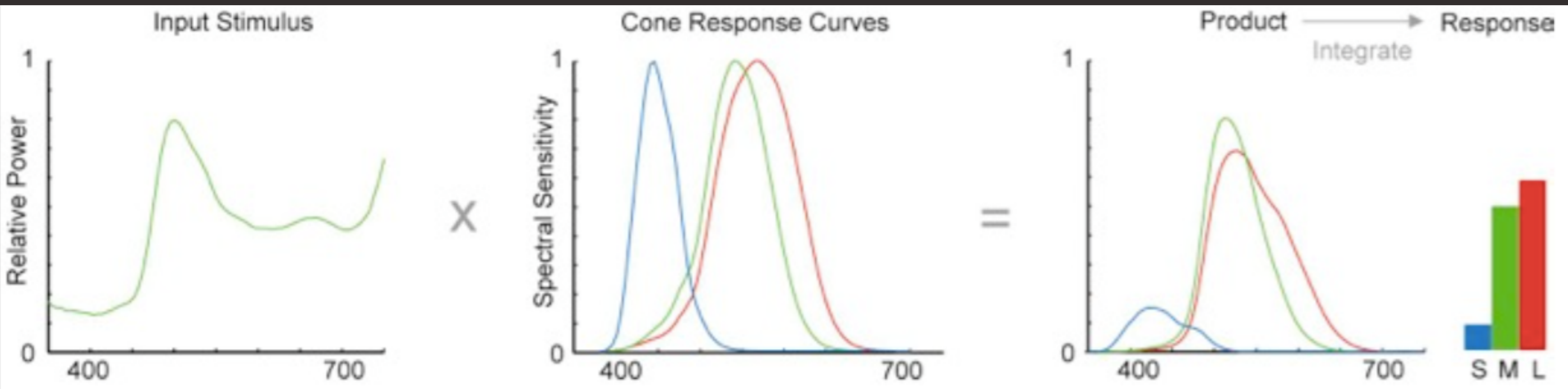
Long

Middle

Short



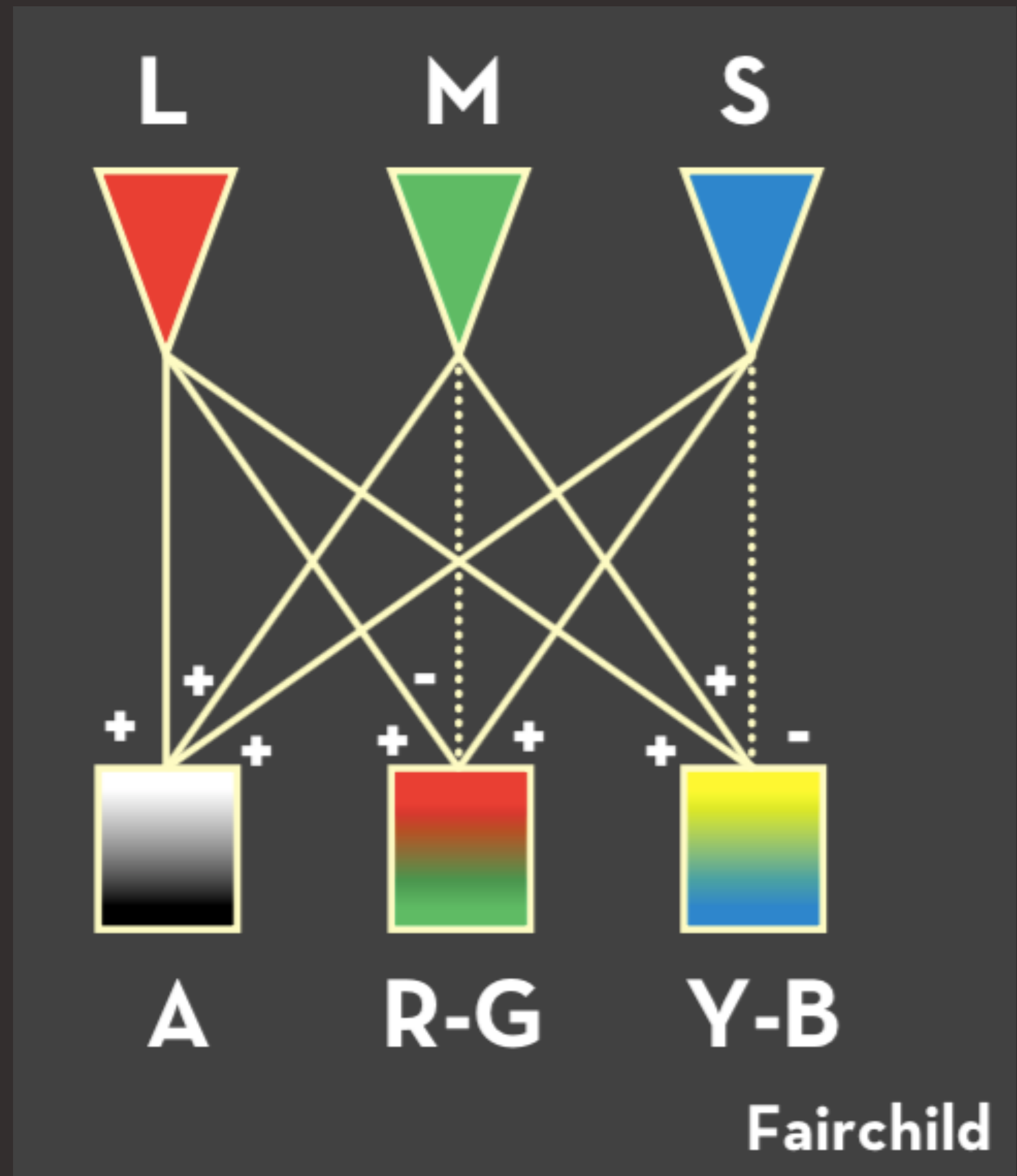
# Integration





“Opponent Processing”

Long  
Middle  
Short



*Mind*



*What color...*

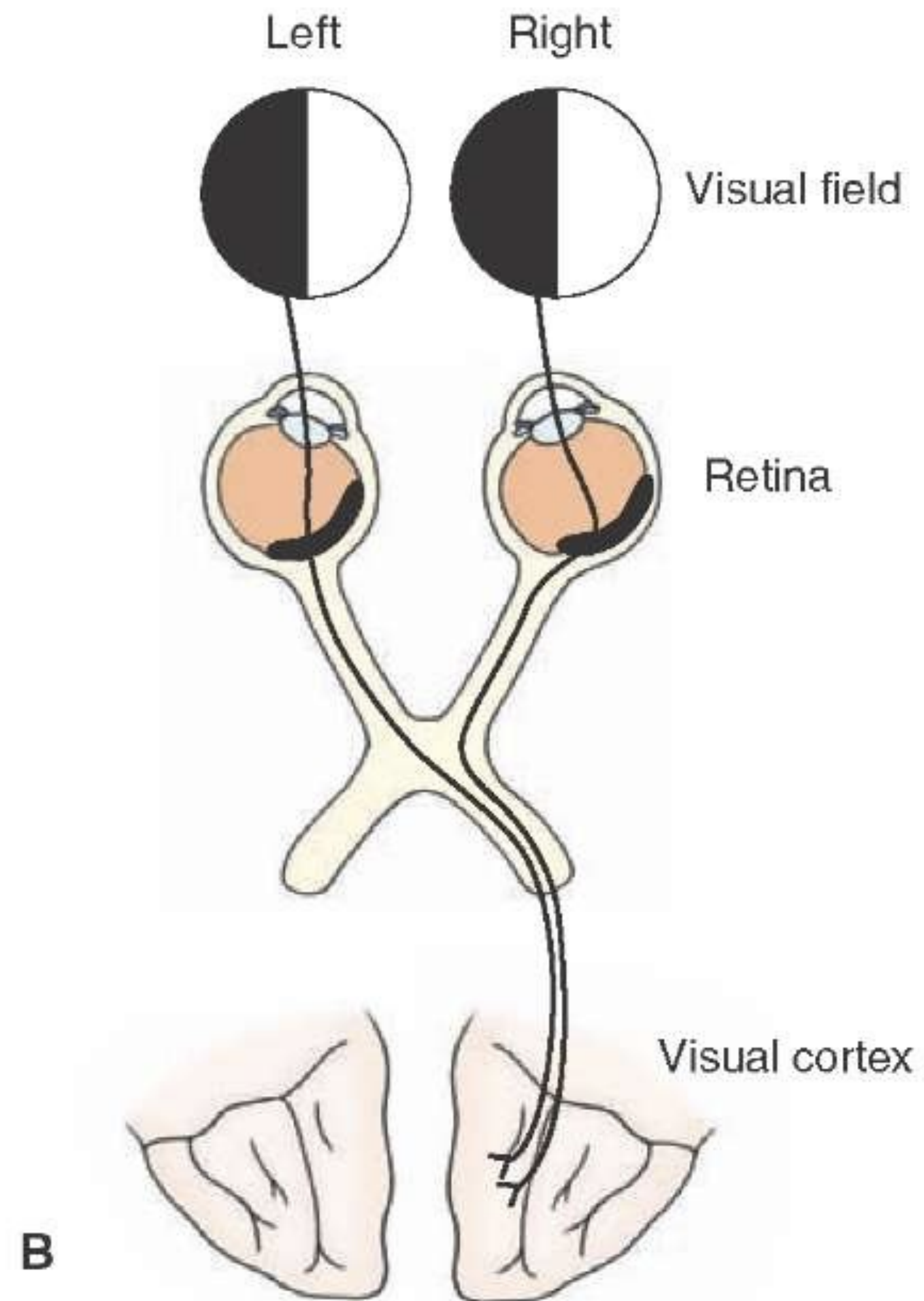
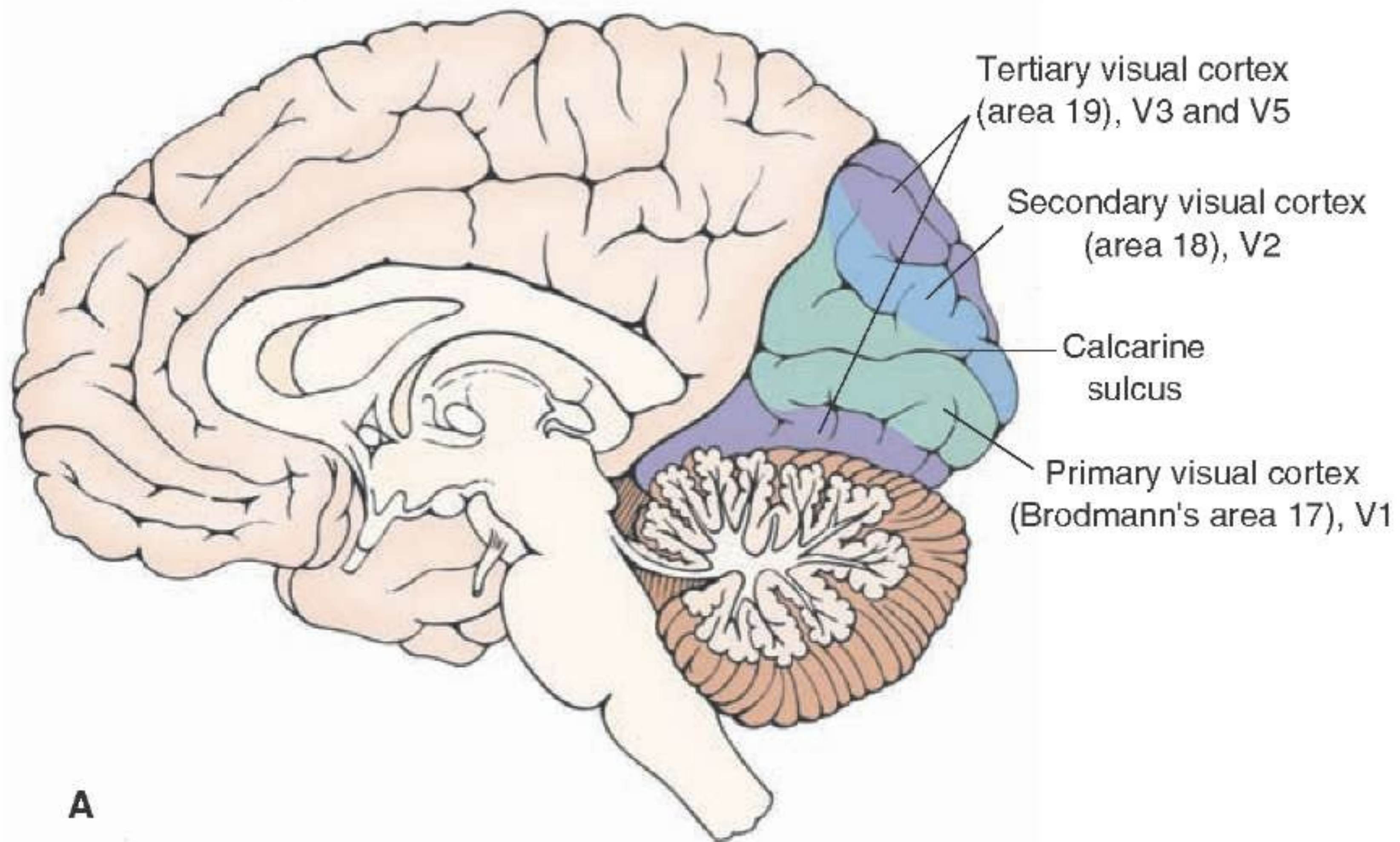




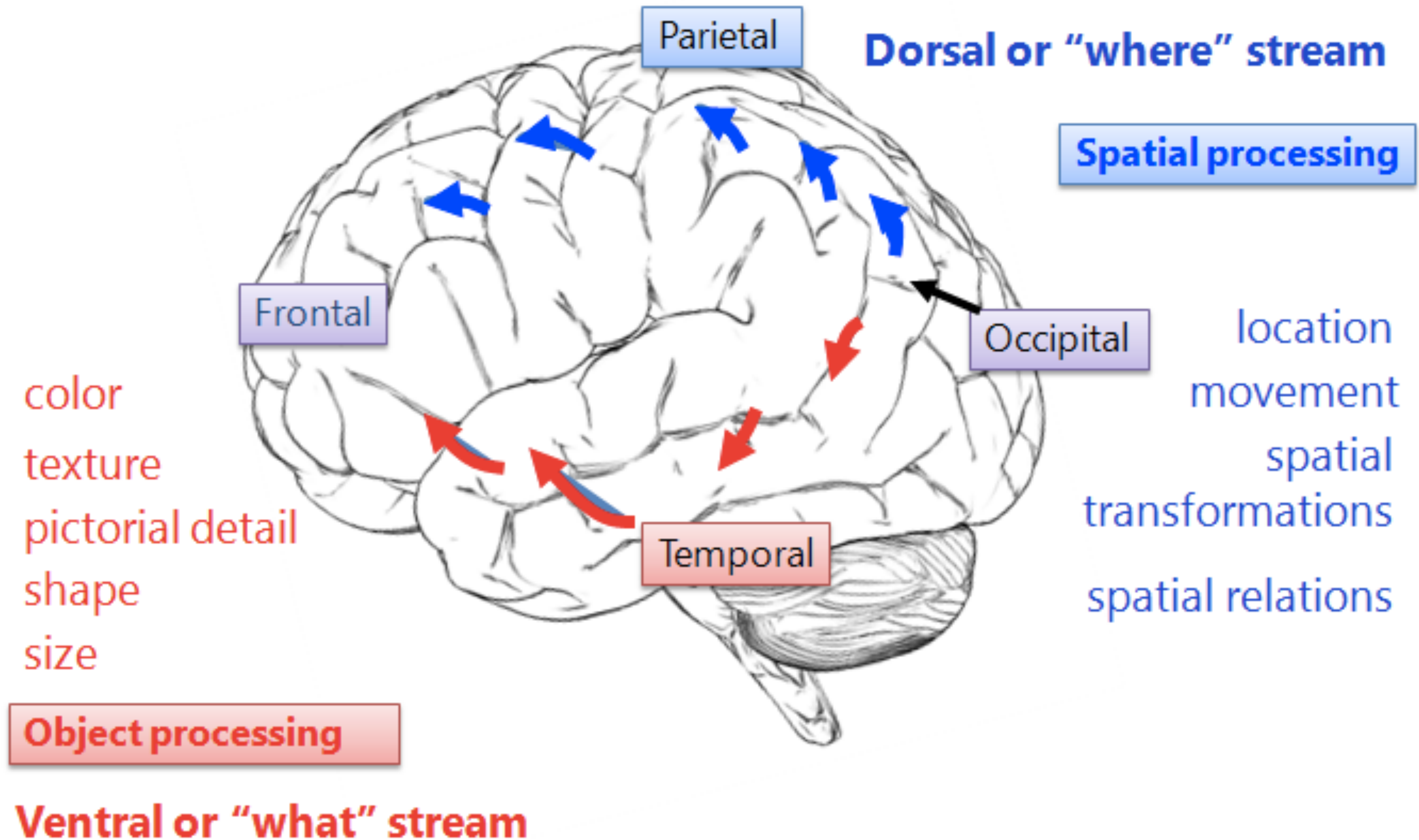












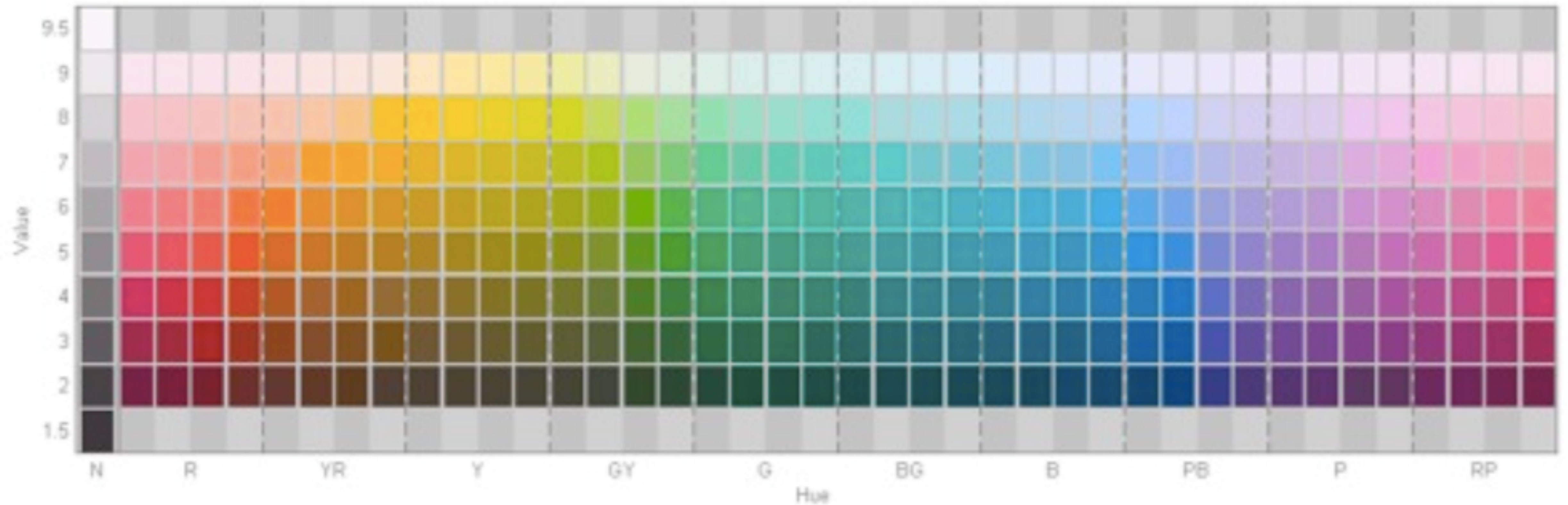


*Color is*  
*perceptual*  
**AND** *cognitive*

*World color  
survey*

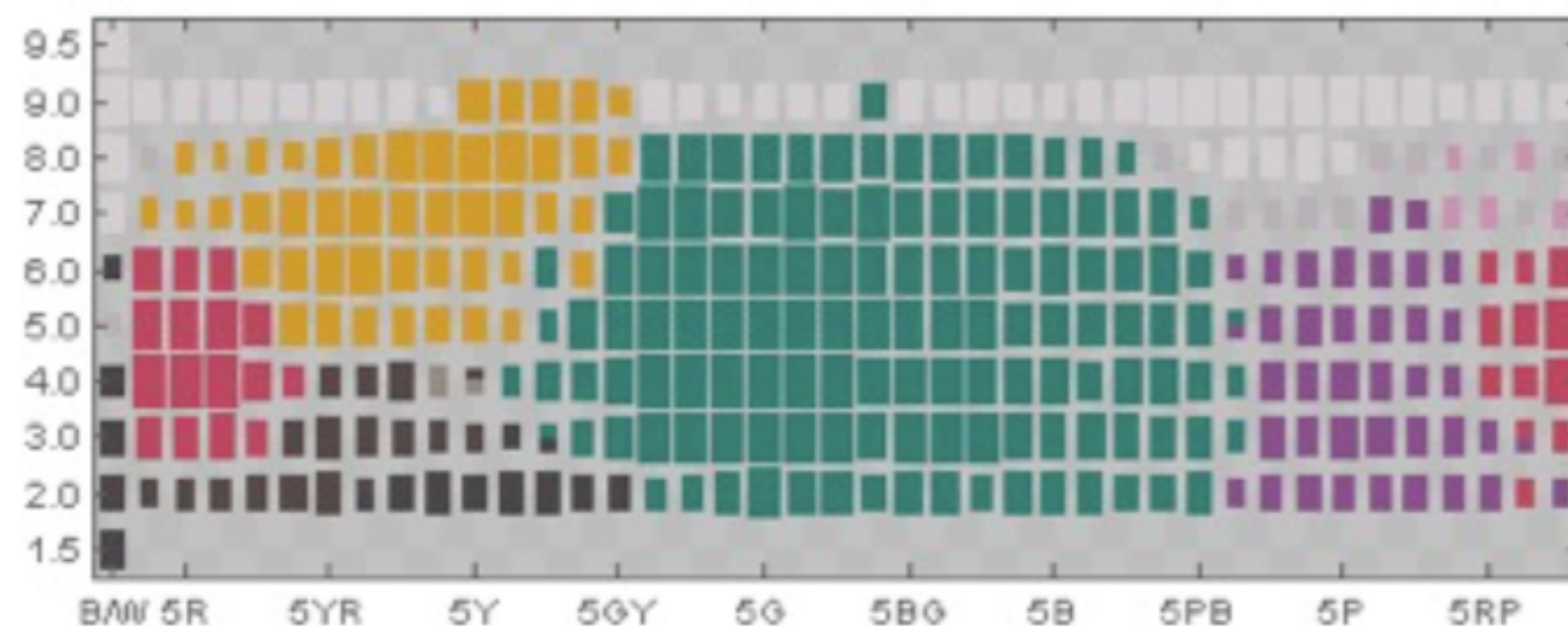


*How do people around the world name these colors?*

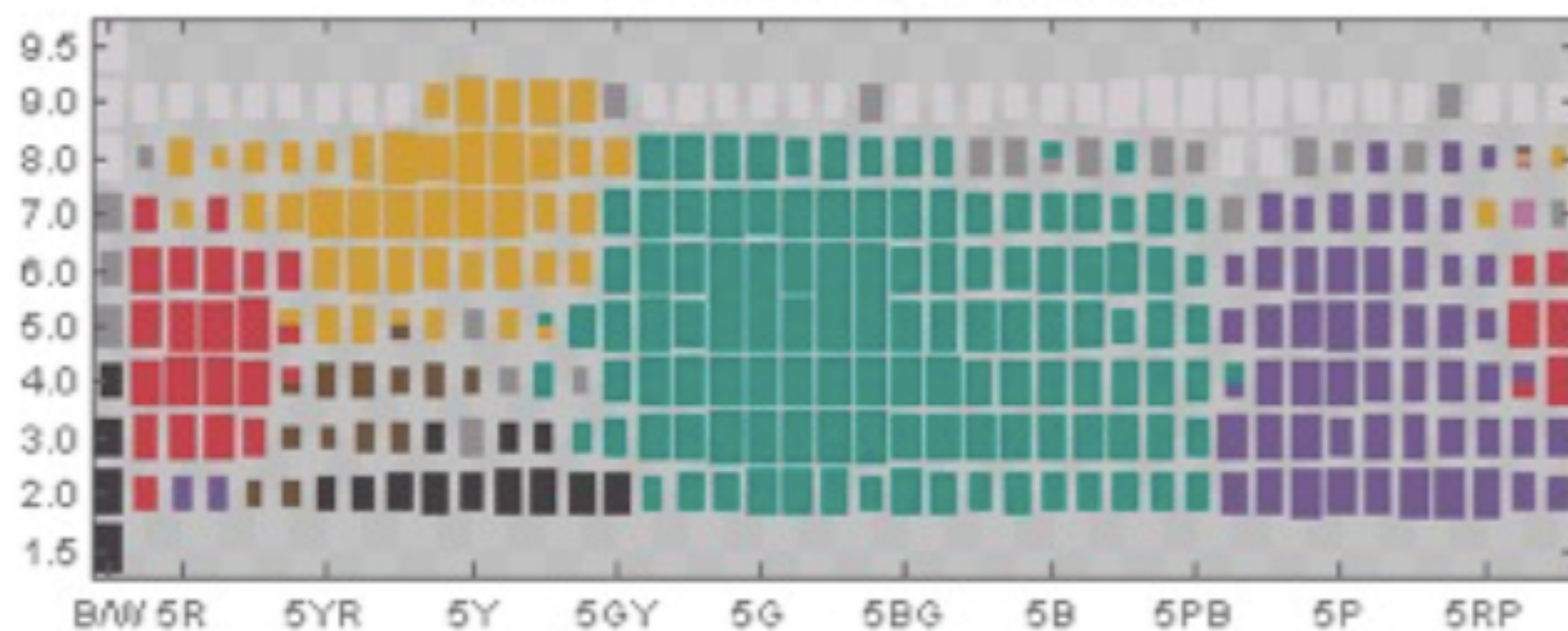




Language #72 (Mideco)  
Mutual info = 0.942 / Contribution = 0.476

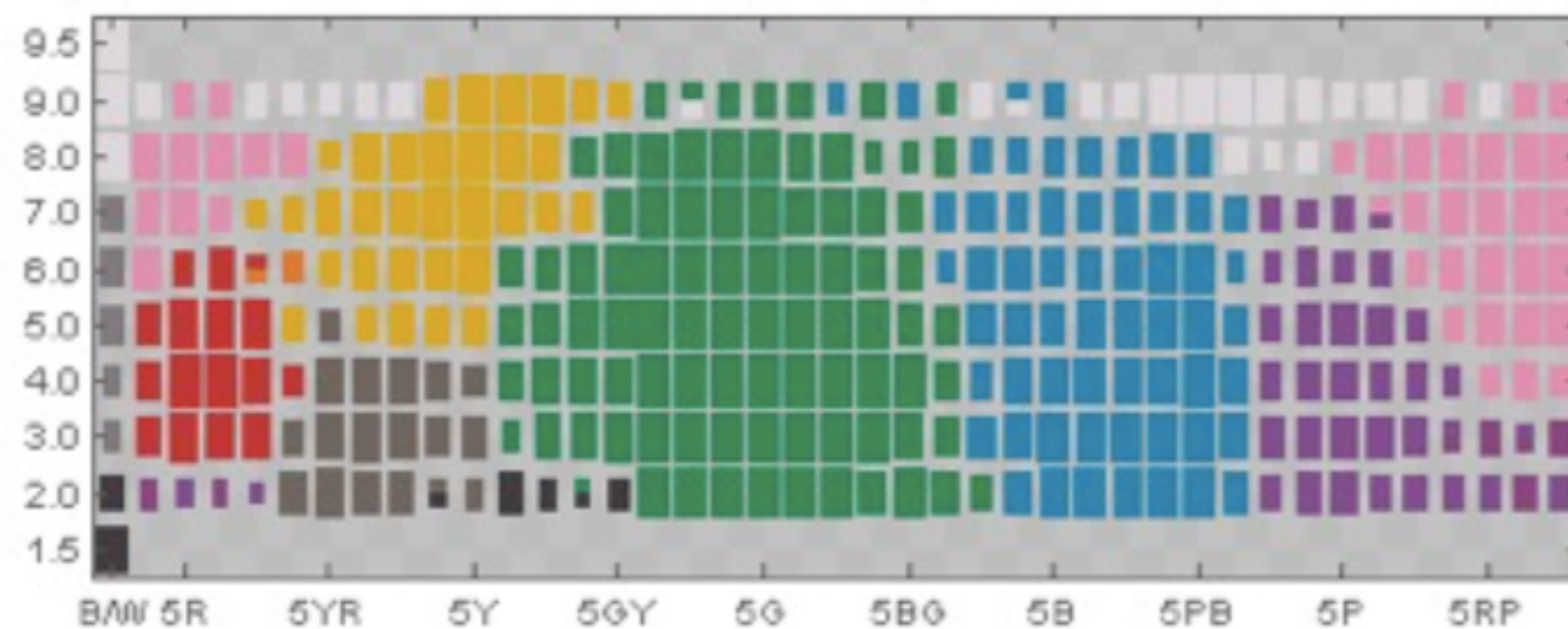


Language #98 (Tlapaneco)  
Mutual info = 0.942 / Contribution = 0.524

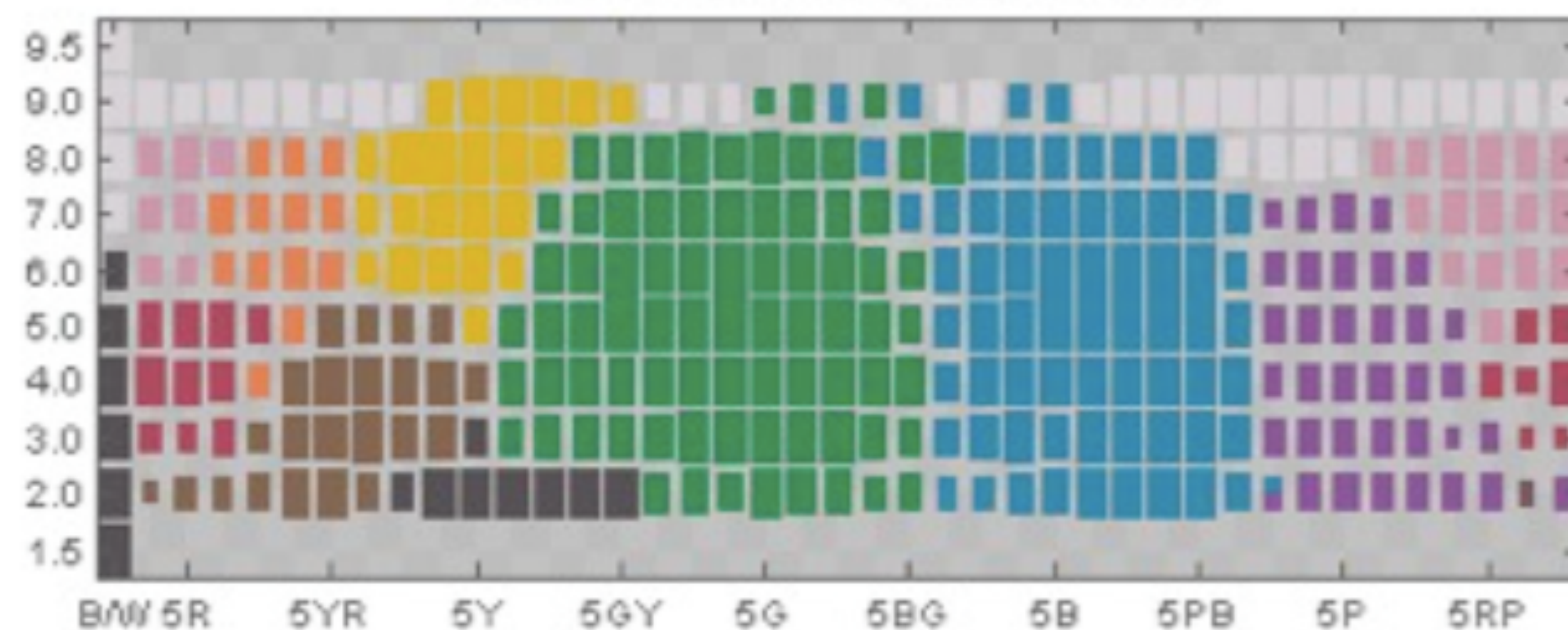




Language #19 (Camsa)  
Mutual info = 0.939 / Contribution = 0.487



Language #24 (Chavacano)  
Mutual info = 0.939 / Contribution = 0.513



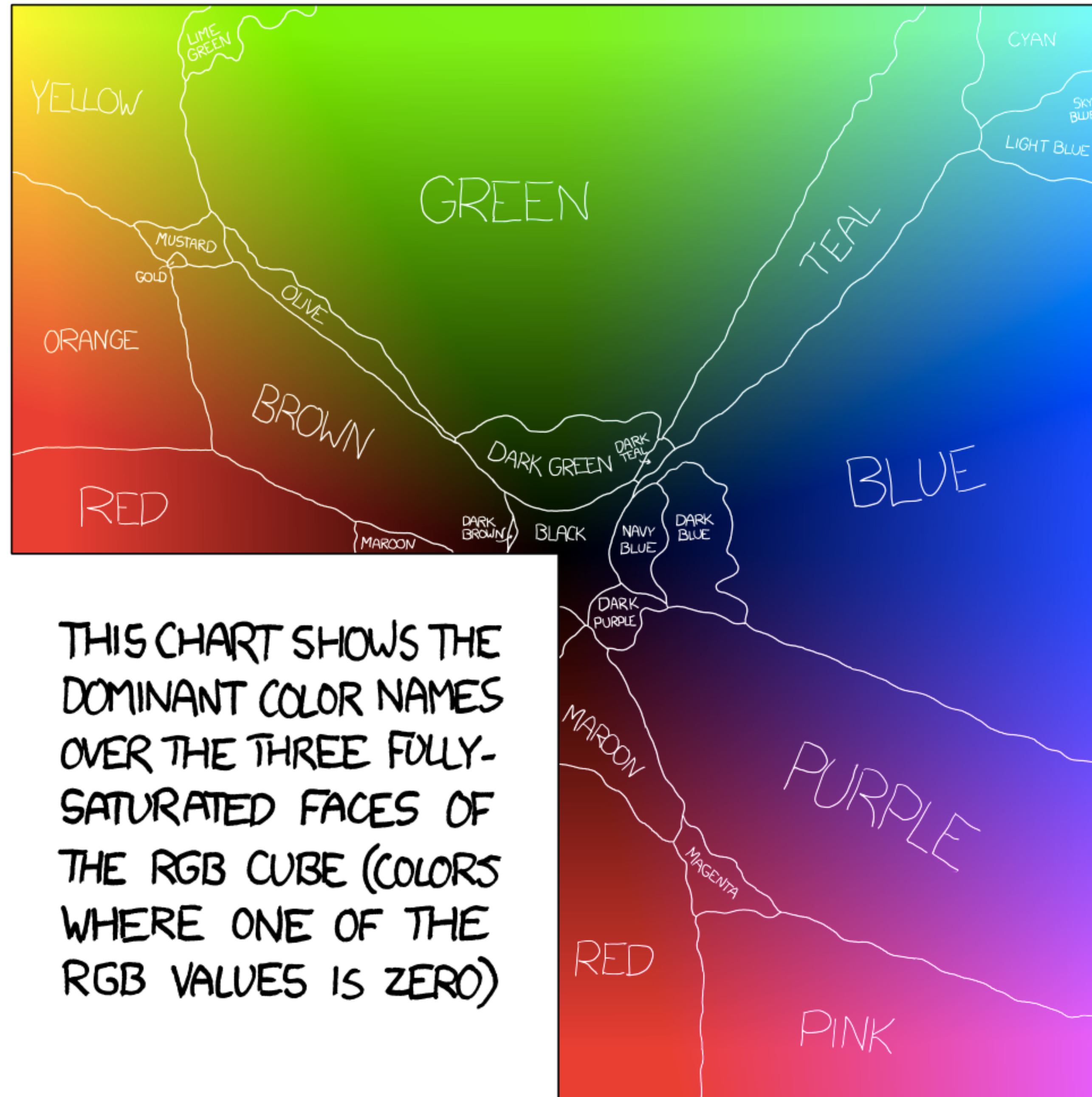
*Slightly less  
scientific...*



Color names if  
you're a girl...

Maraschino		Red
Cayenne		Purple
Maroon		
Plum		
Eggplant		
Grape		
Orchid		Pink
Lavender		
Carnation		
Strawberry		
Bubblegum		
Magenta		Orange
Salmon		
Tangerine		
Cantaloupe		Yellow
Banana		
Lemon		Green
Honeydew		
Lime		
Spring		
Clover		
Fern		Blue
Moss		
Flora		
Sea Foam		
Spindrift		
Teal		
Sky		
Turquoise		

Color names if  
you're a guy...



THIS CHART SHOWS THE  
DOMINANT COLOR NAMES  
OVER THE THREE FULLY-  
SATURATED FACES OF  
THE RGB CUBE (COLORS  
WHERE ONE OF THE  
RGB VALUES IS ZERO)





# *Color Spaces*

*Tension*



# *Tension*

*good for  
machines*

---

# *Tension*

*good for  
machines*

*good for  
people*

---



# *rgb*



**Red**

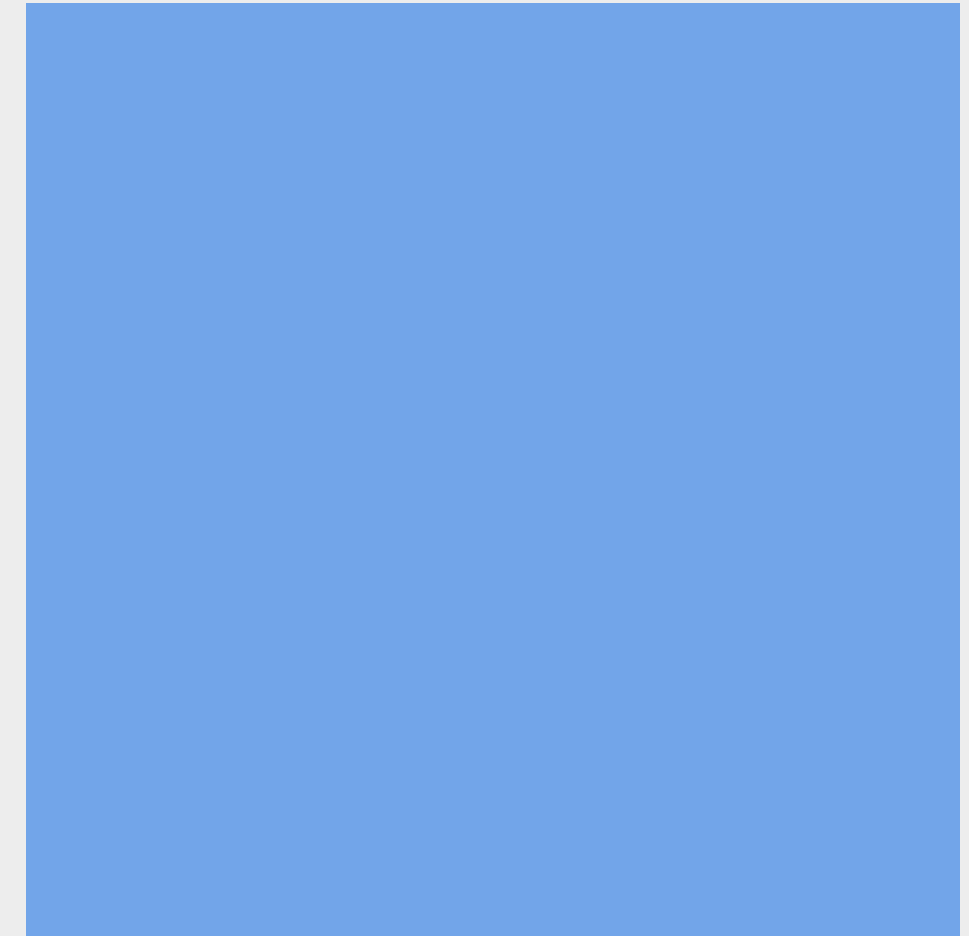
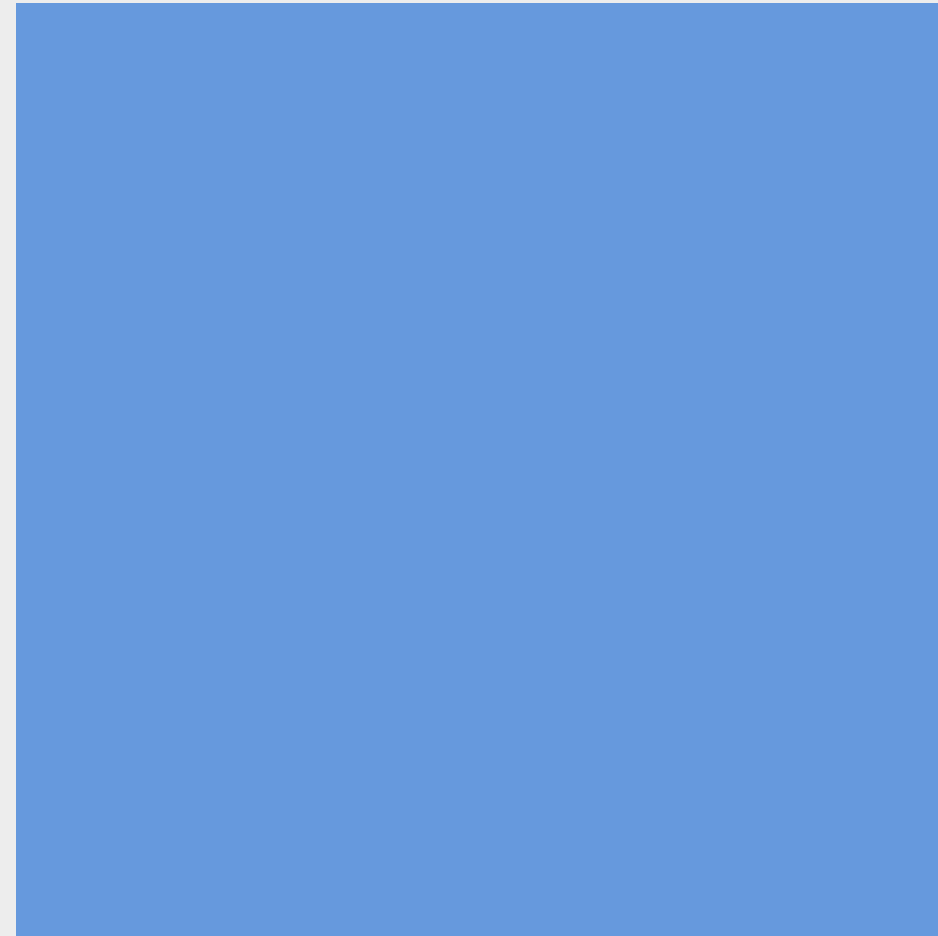
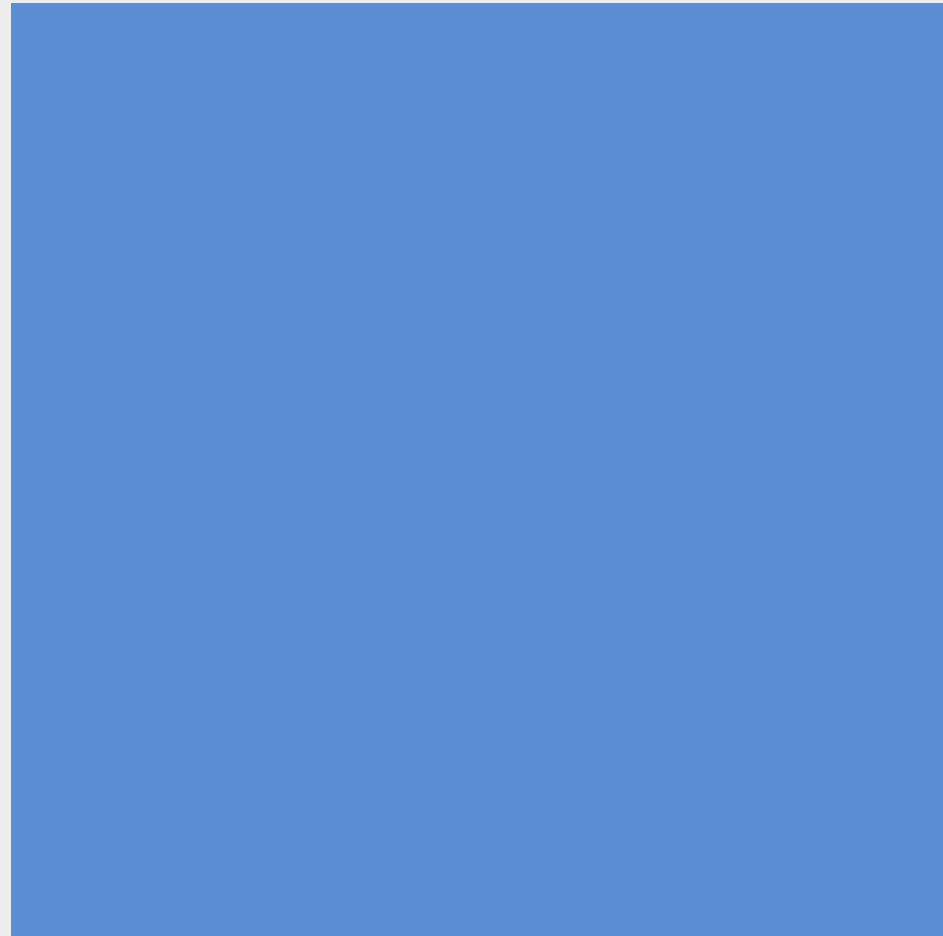


**Green**



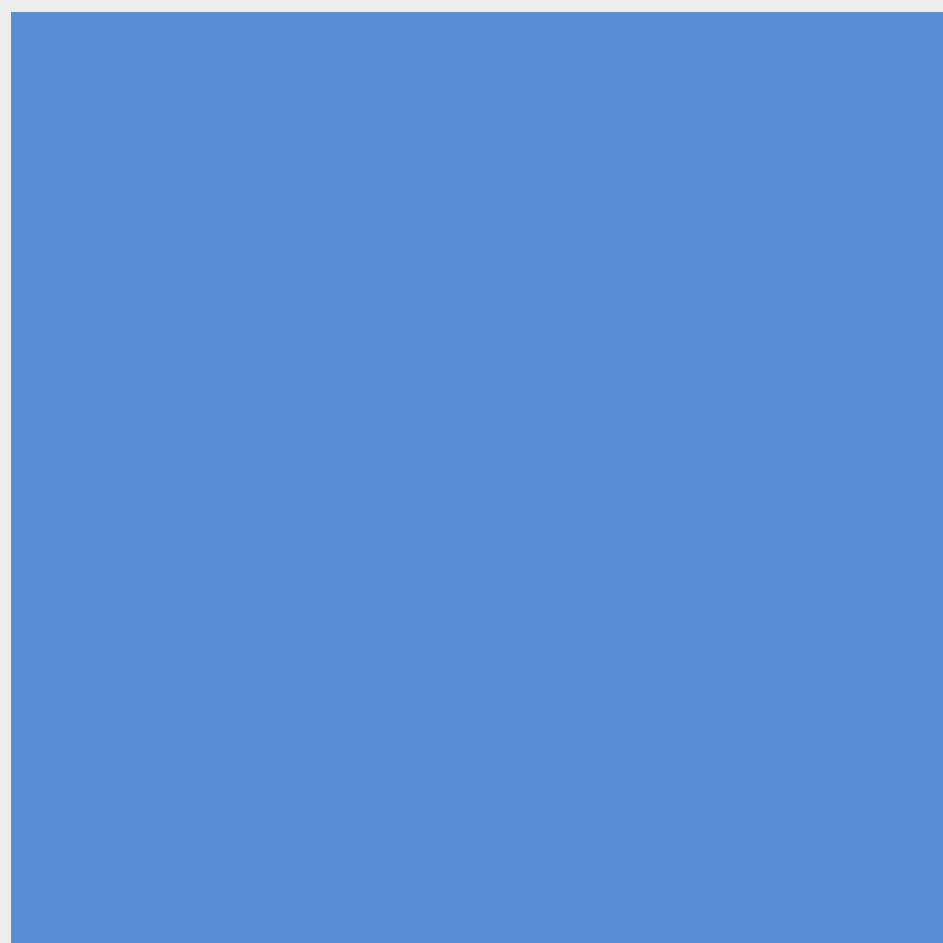
**Blue**

*rgb*

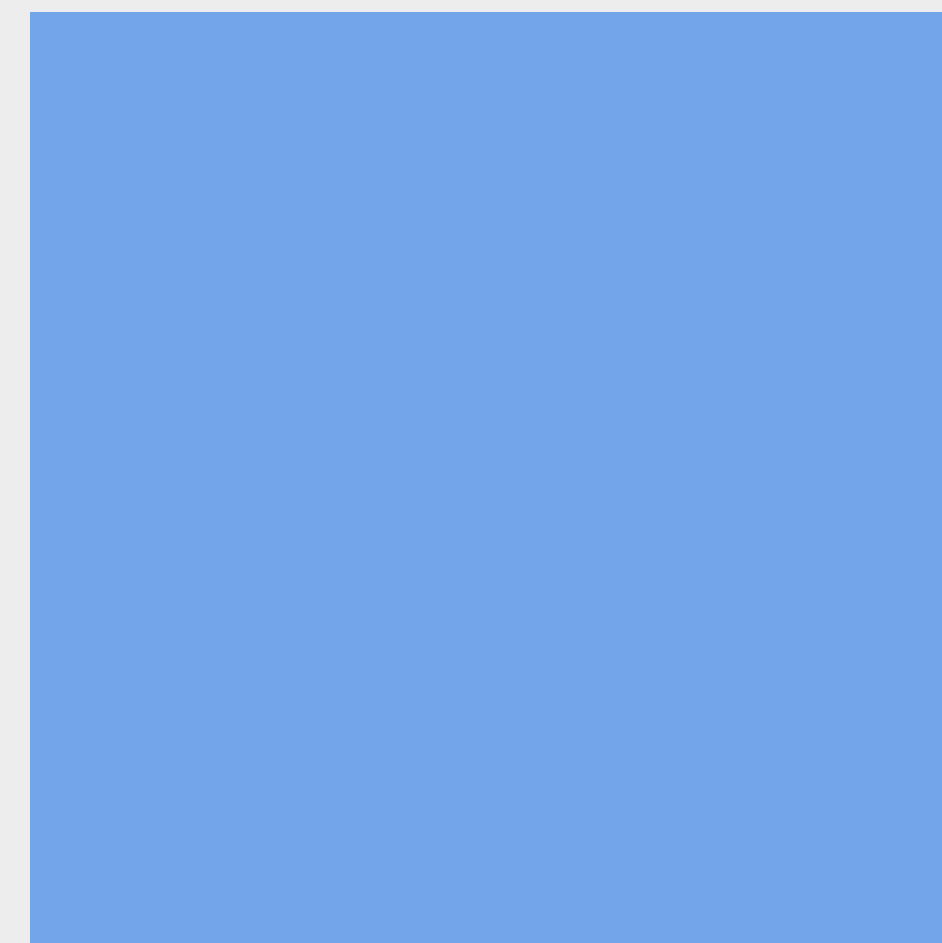
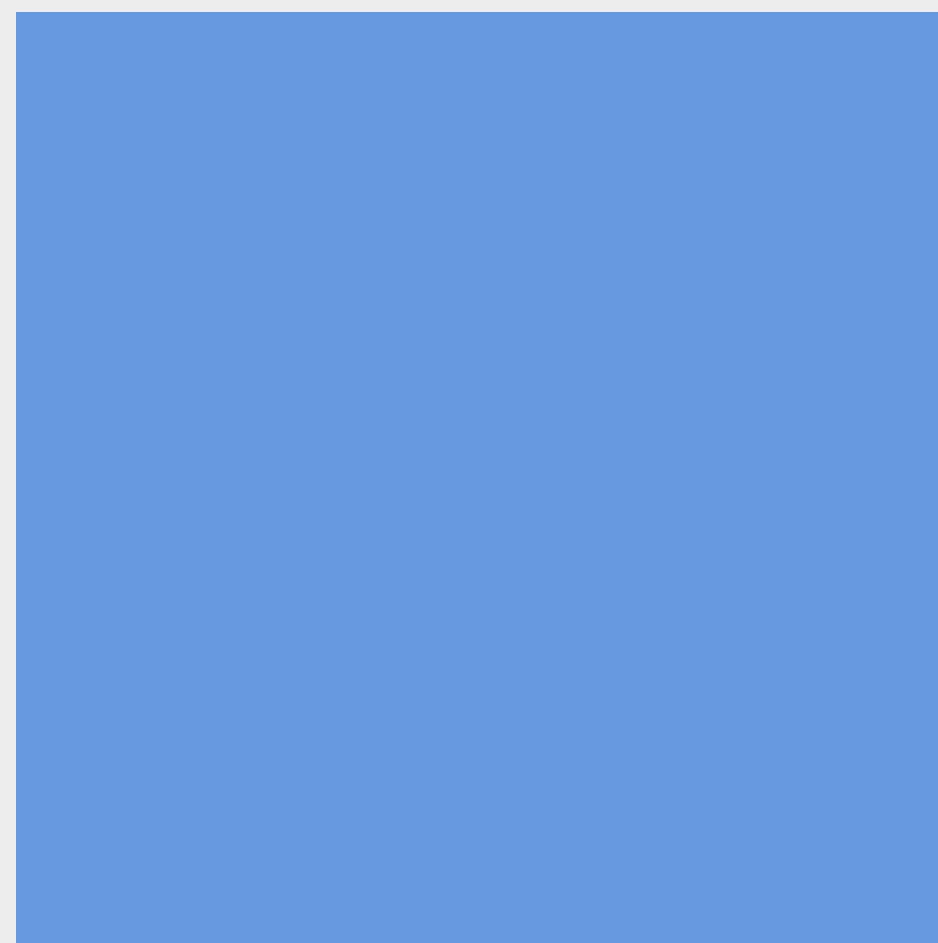




*rgb*



**-5%**



**+5%**

*good for  
machines*

*good for  
people*

---

*rgb*



# *hsv*



**Lightness**

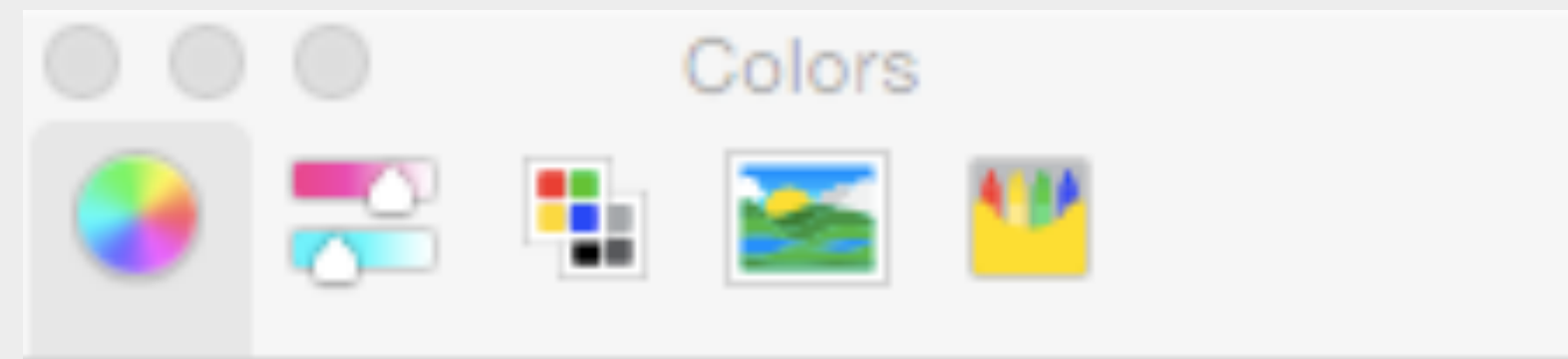


**Hue**



**Saturation** (Chroma)

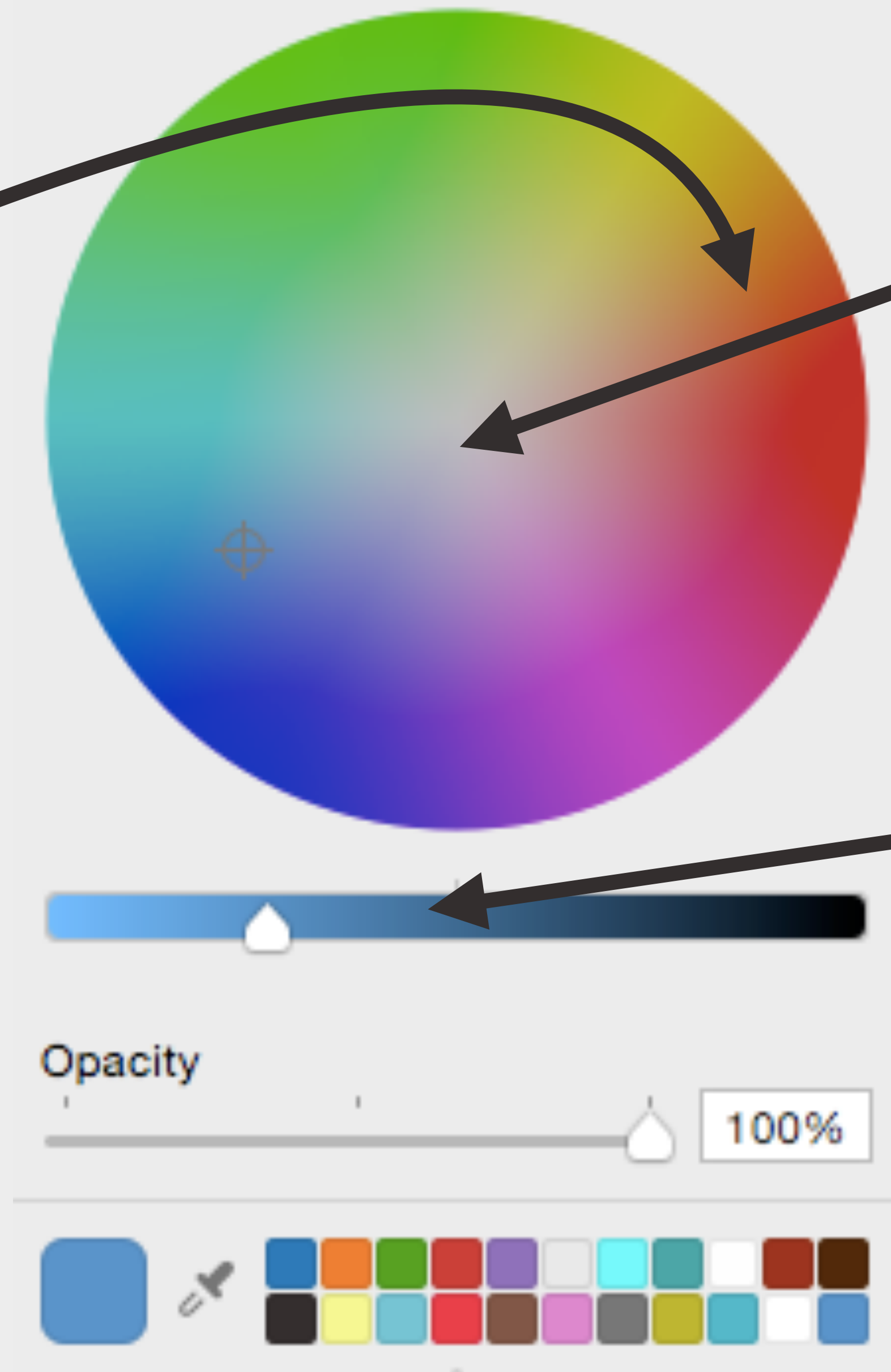
*hsv*



*hue*

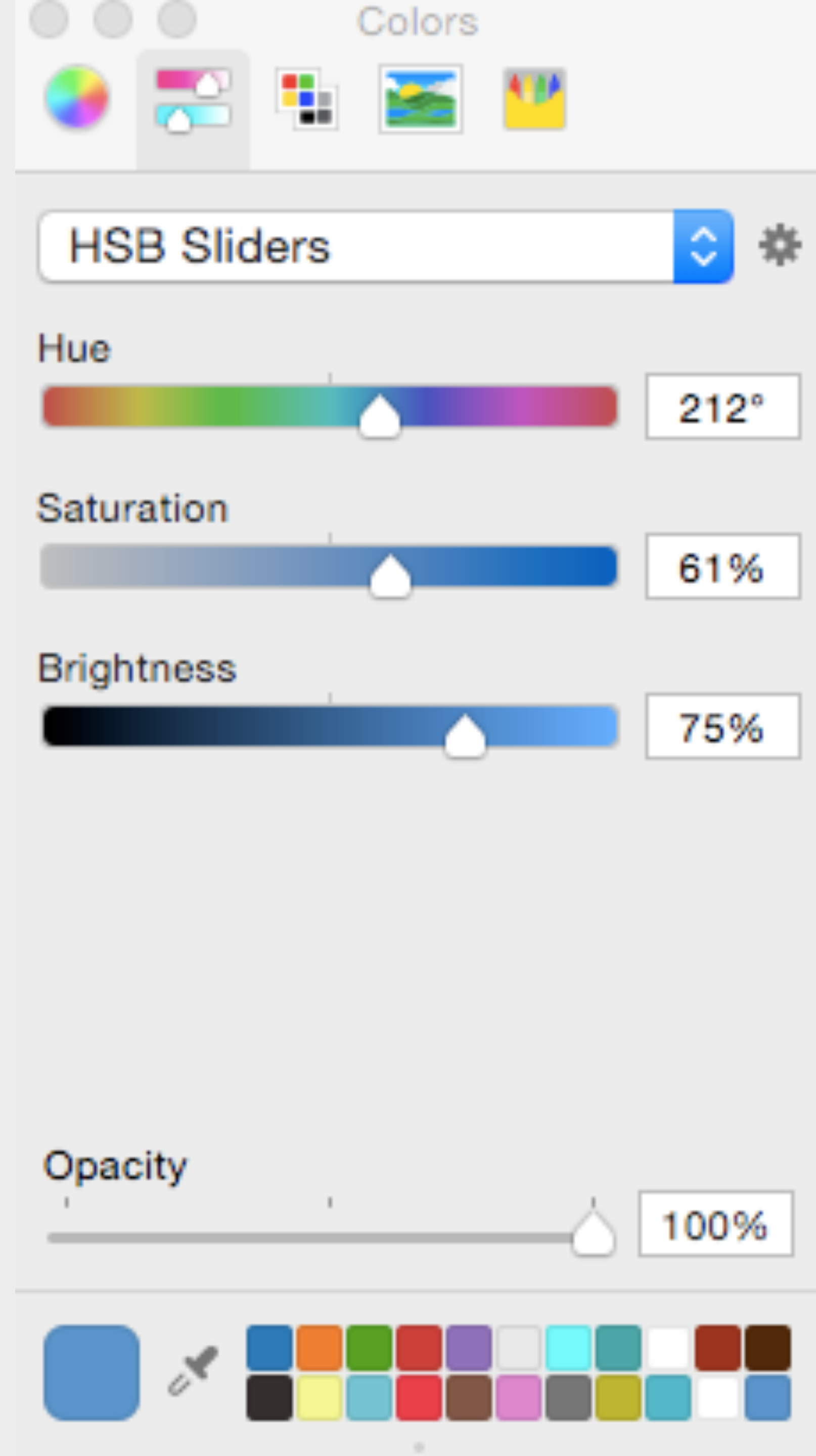
*saturation*

*value*

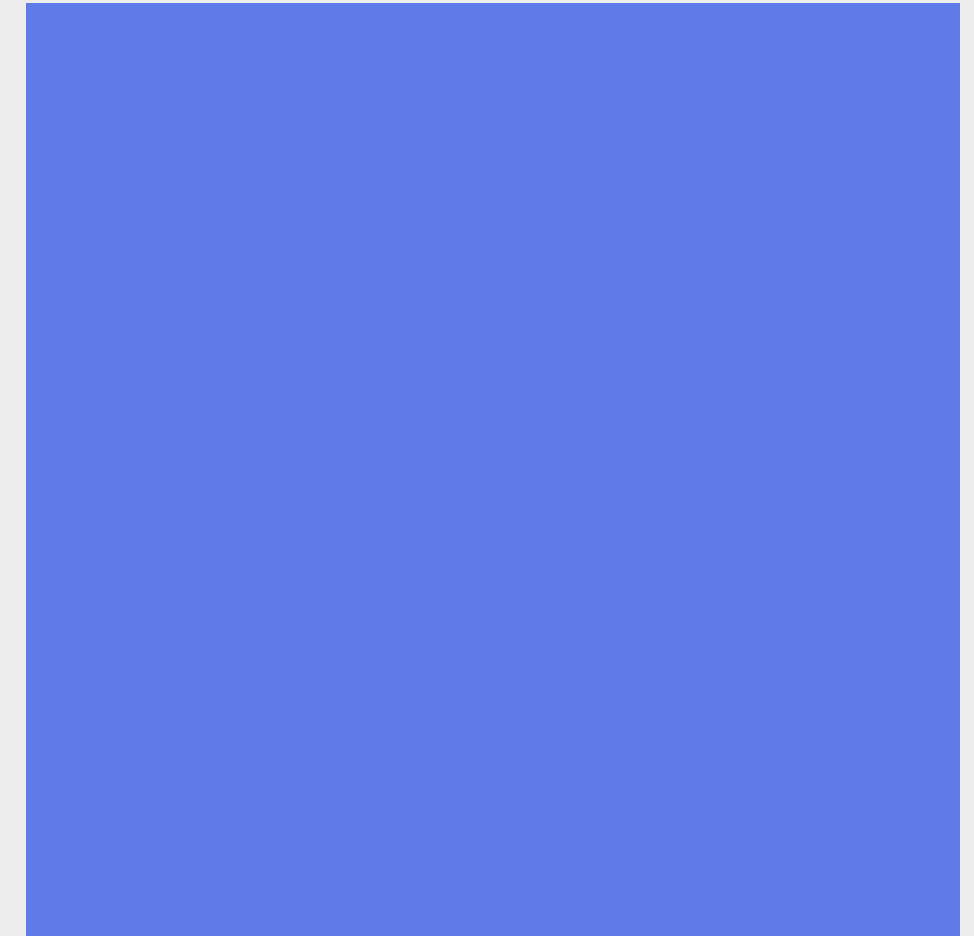
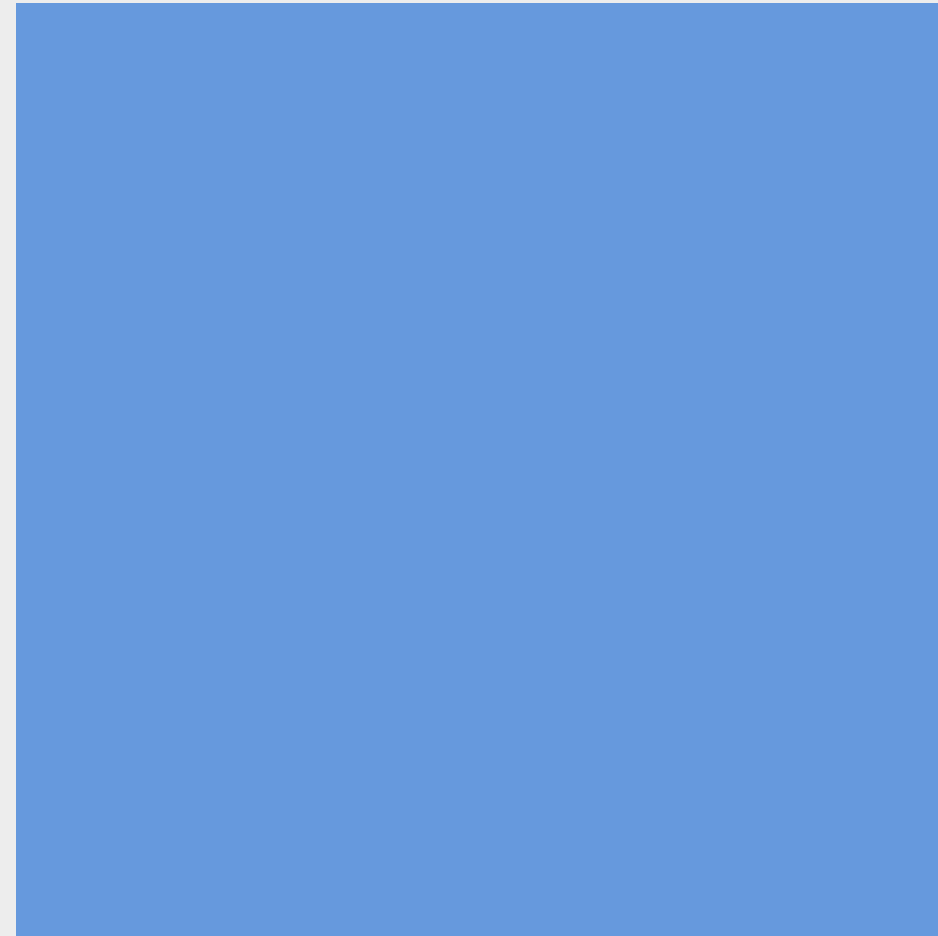
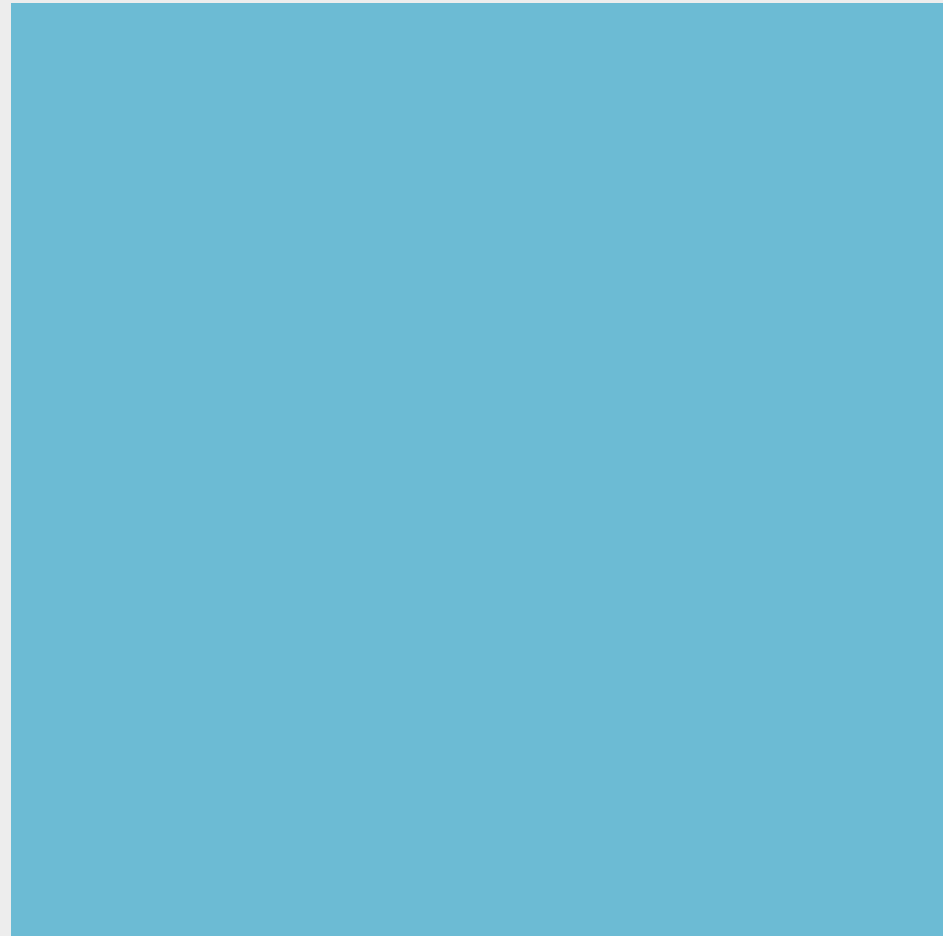




# *hsv*

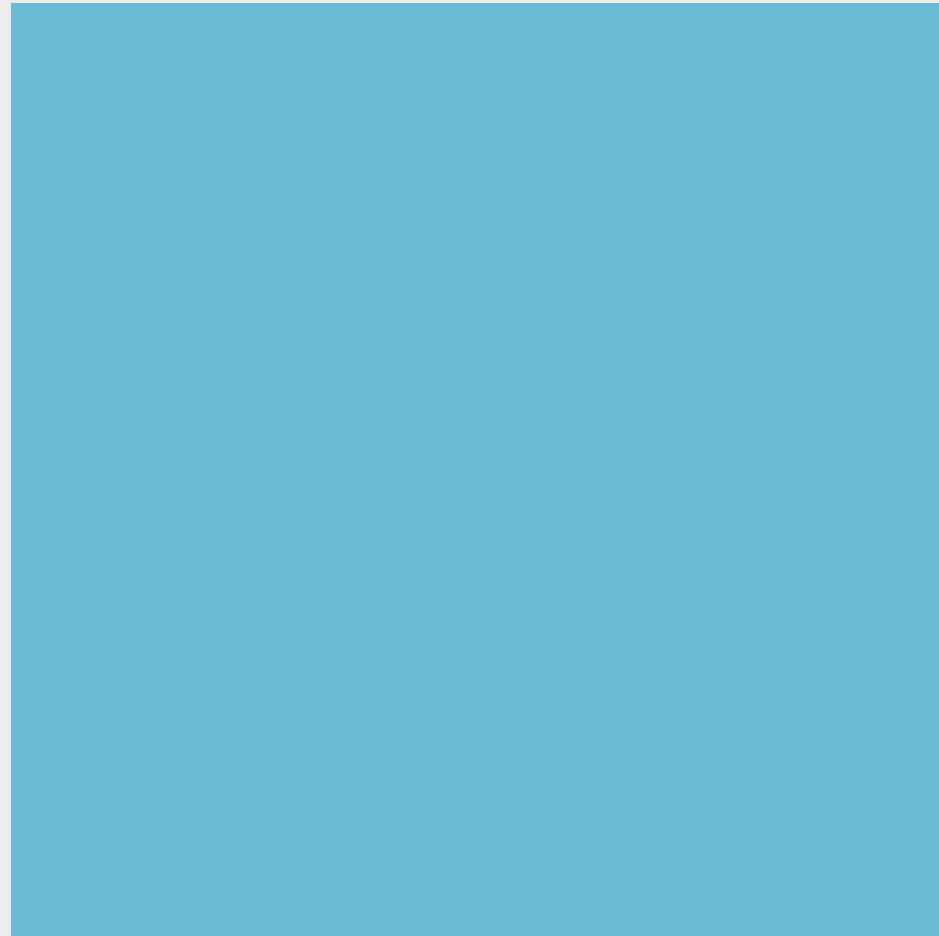


*hsv*

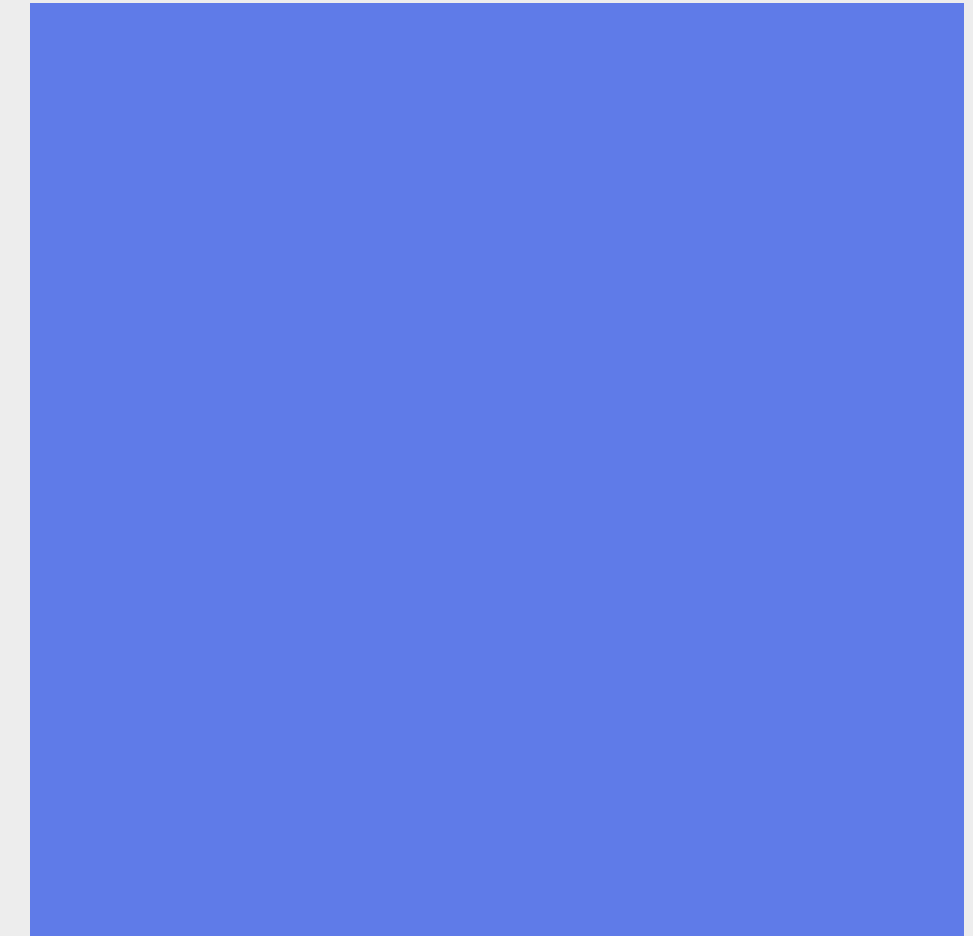
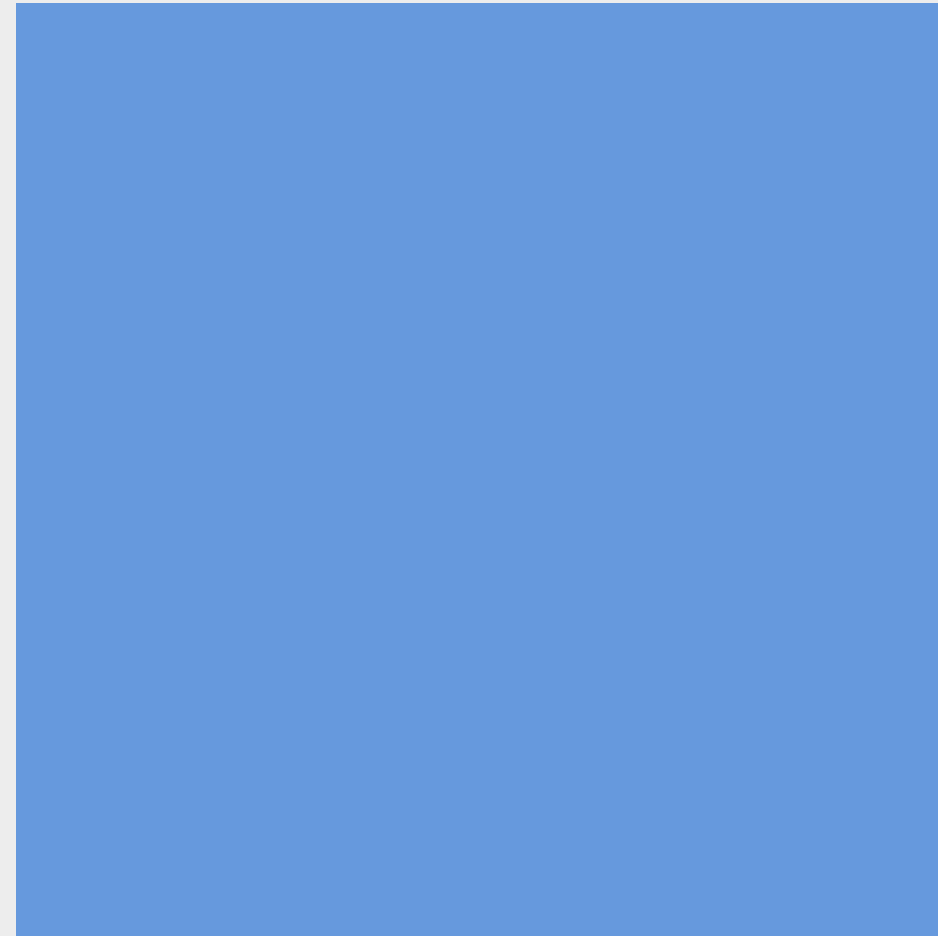




*hsv*



**-5%**



**+5%**

*good for  
machines*

*good for  
people*

---

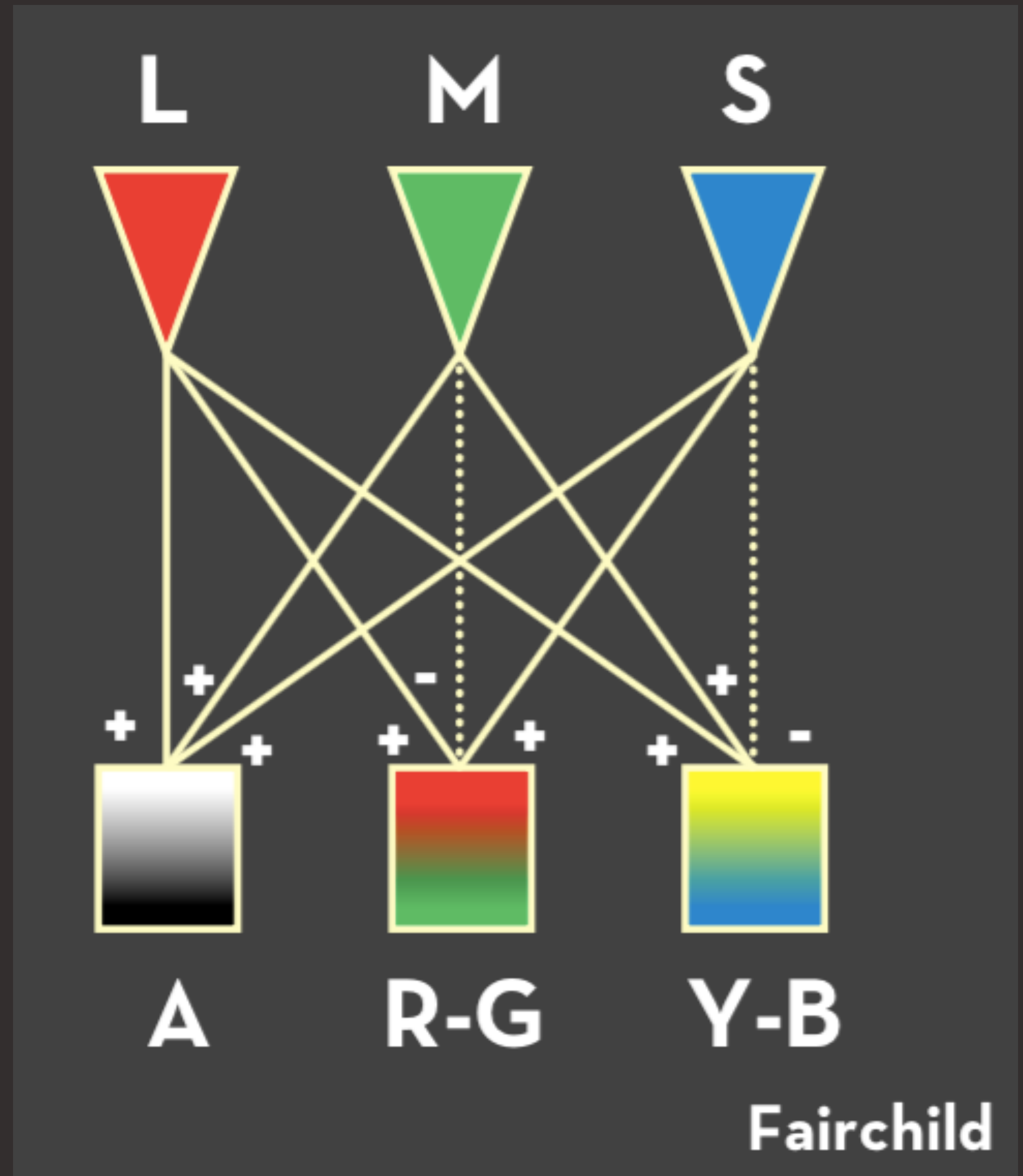
*rgb*

*hsv*

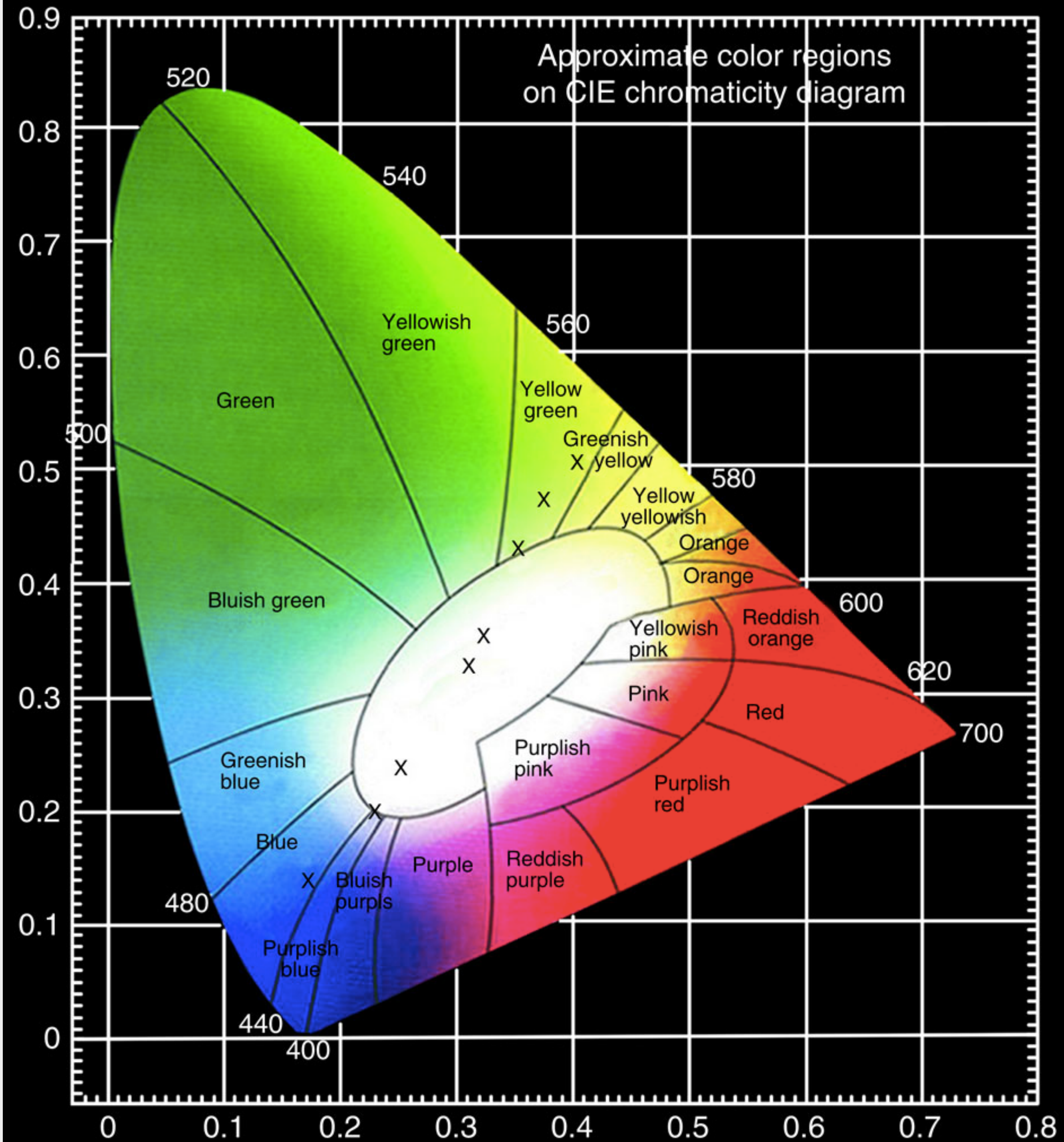


Remember?

Long  
Middle  
Short

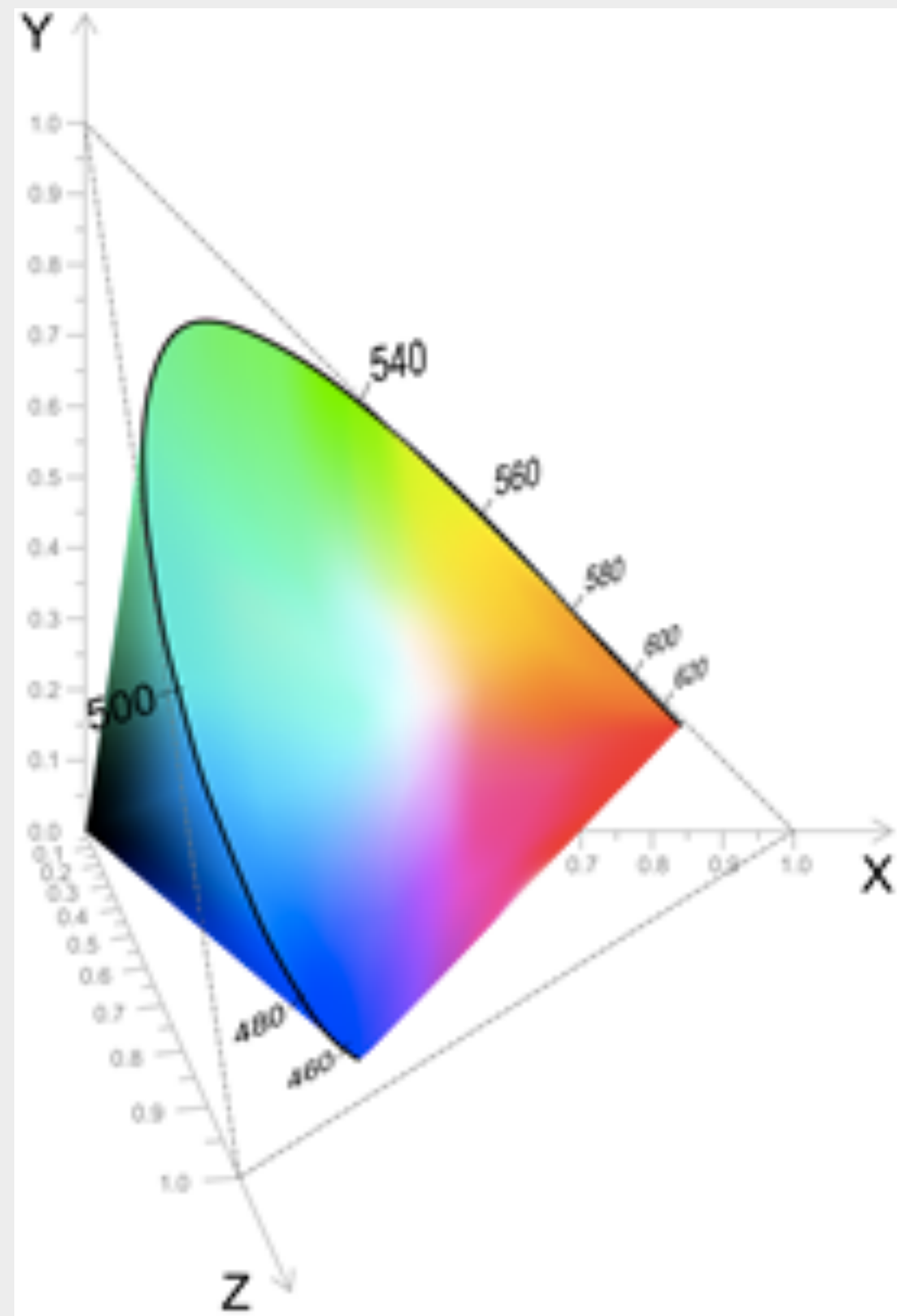


# CIE XYZ





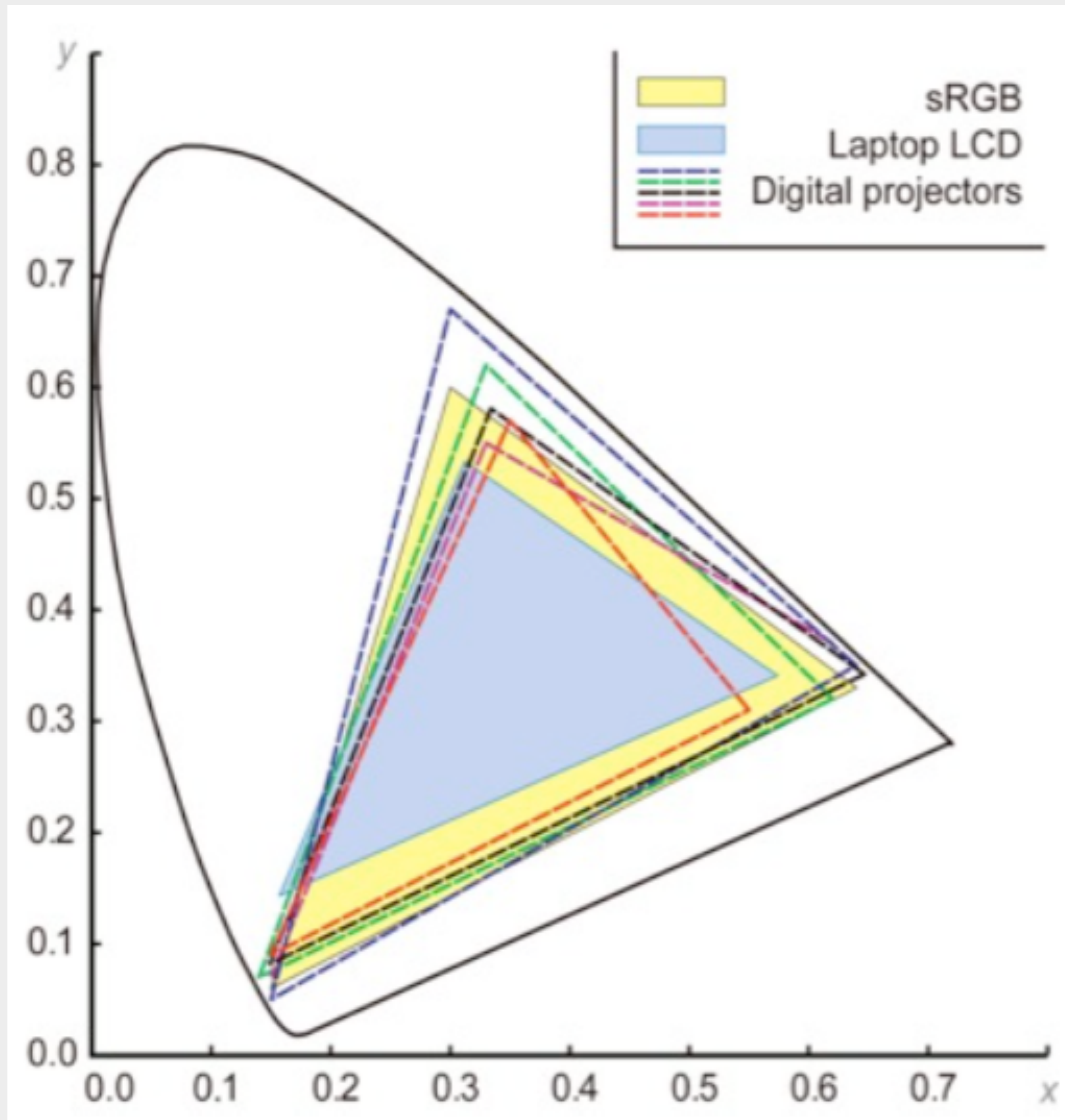
# *CIE XYZ*





# CIE XYZ

*displays are an  
embedding*

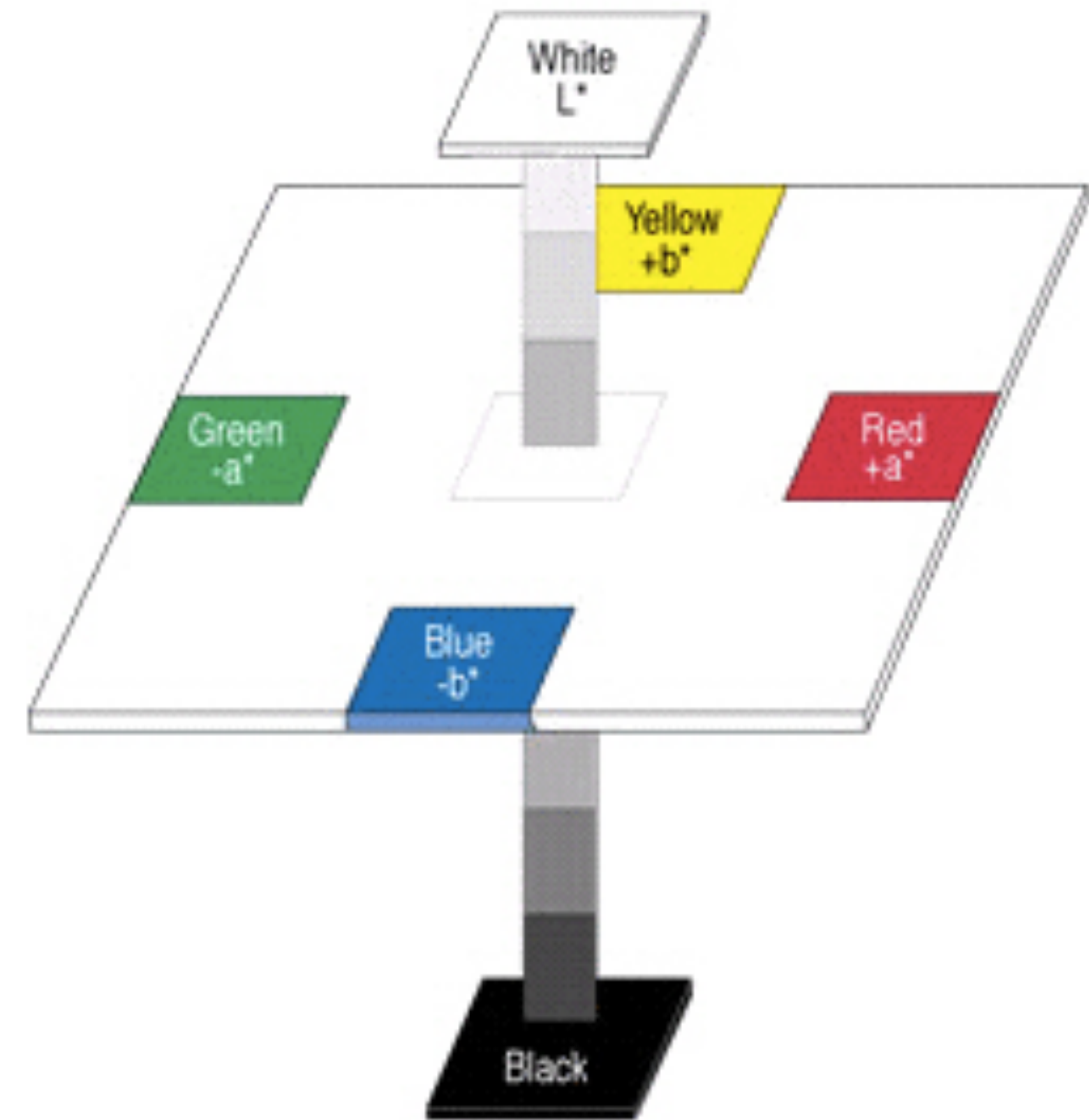


# CIE Lab

*Luminance*

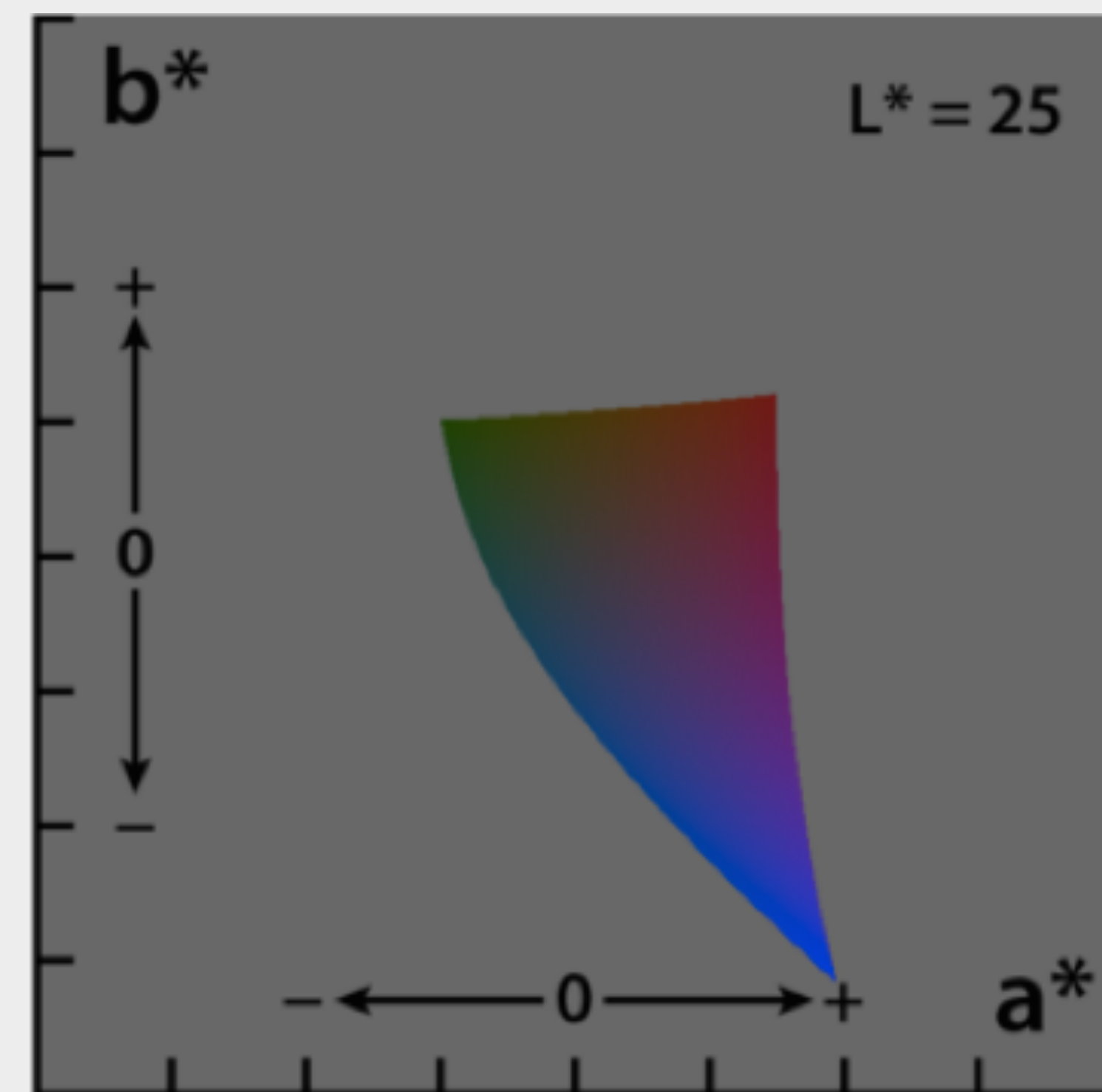
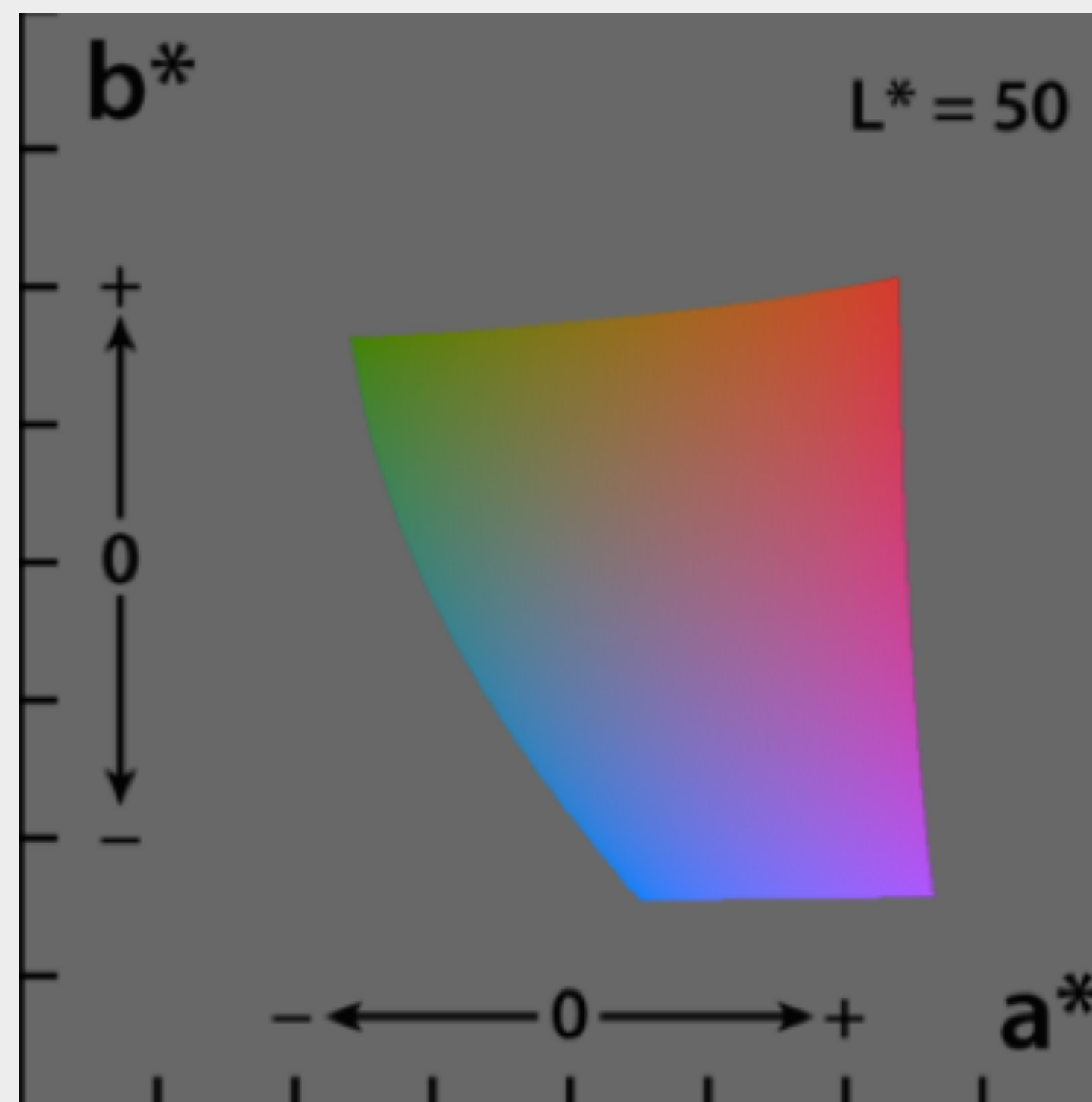
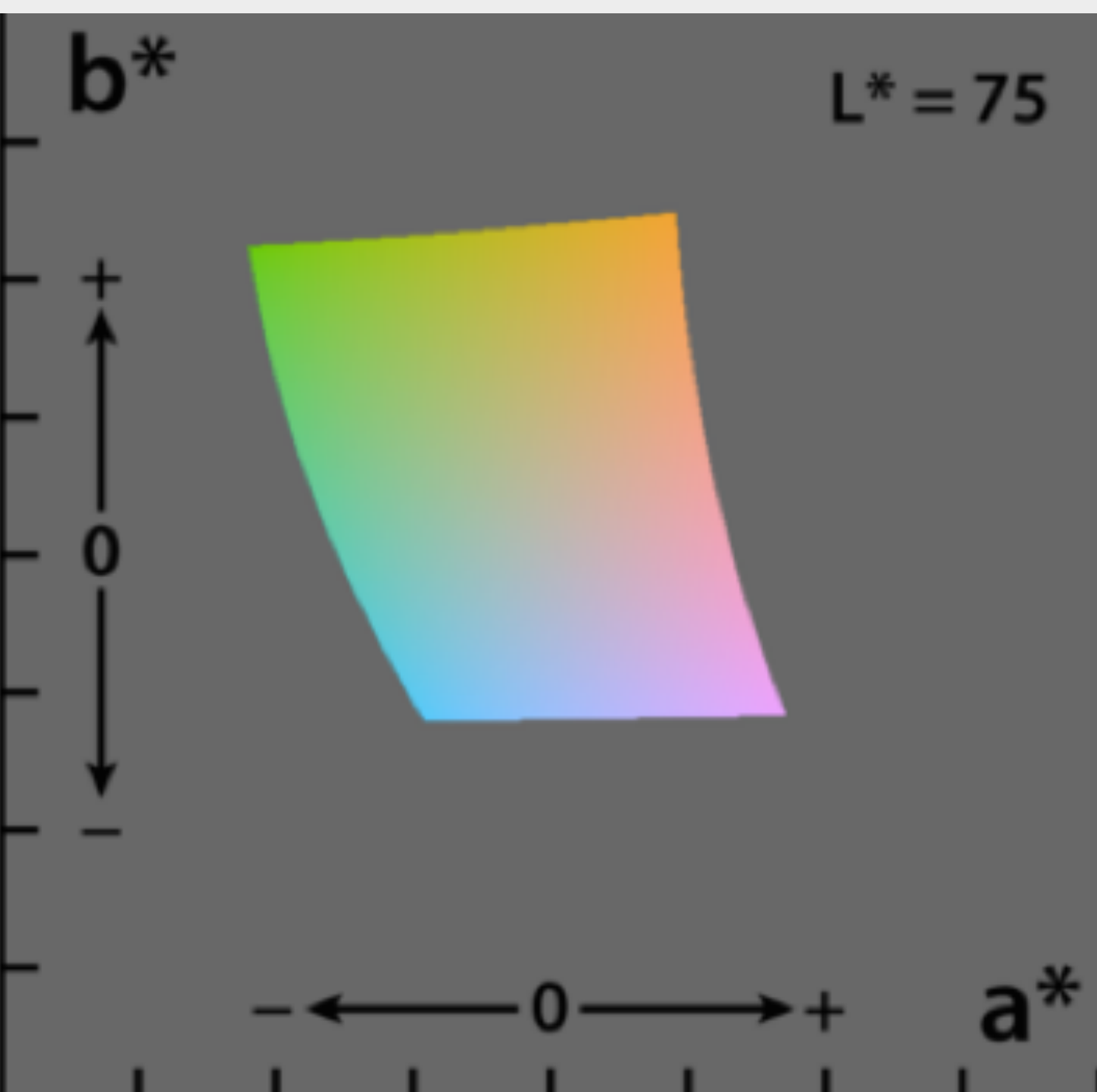
*a (red green)*

*b (blue yellow)*



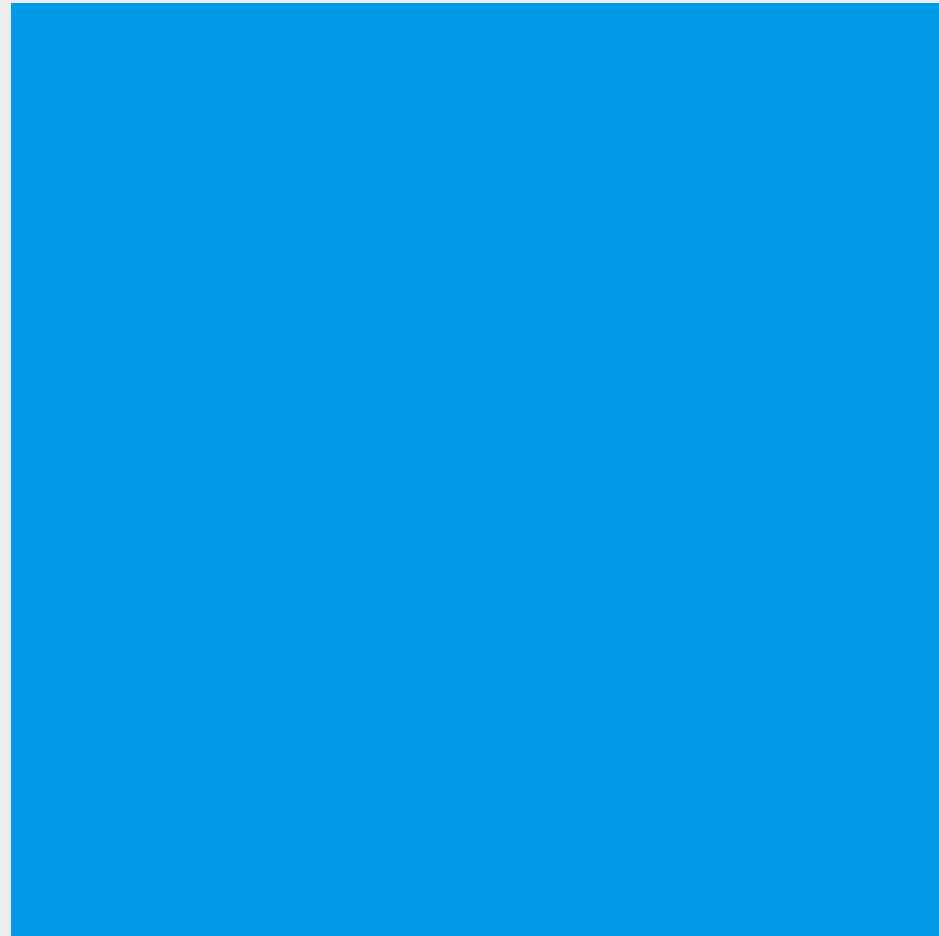
Example	L*	a*	b*
Pale Gray (nearly white)	83.70	-0.50	0.05
Medium Gray	59.60	0.00	0.50
Brilliant Red	43.70	37.10	18.70
Brilliant Yellow	83.30	1.90	77.00
Green	56.80	-30.00	15.40
Deep Blue	29.30	8.0	-17.90

# *CIE Lab*

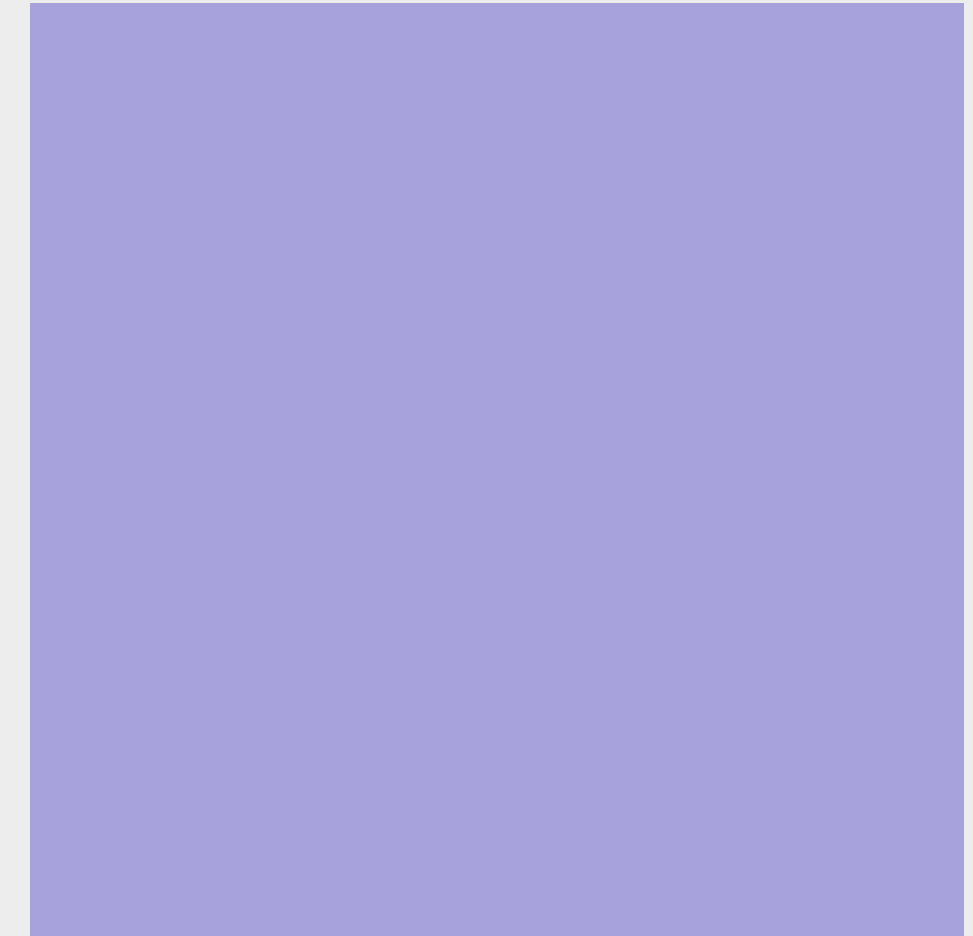
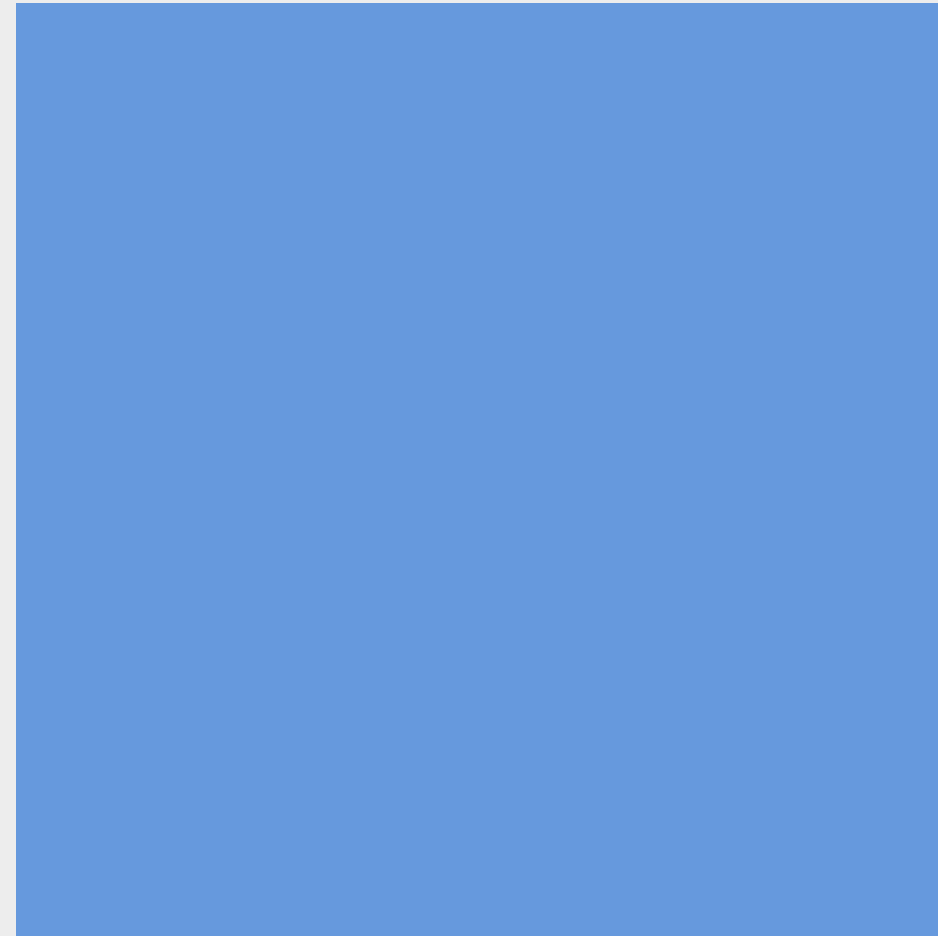




*Lab*



**-5%**



**+5%**

*good for  
machines*

*good for  
people*

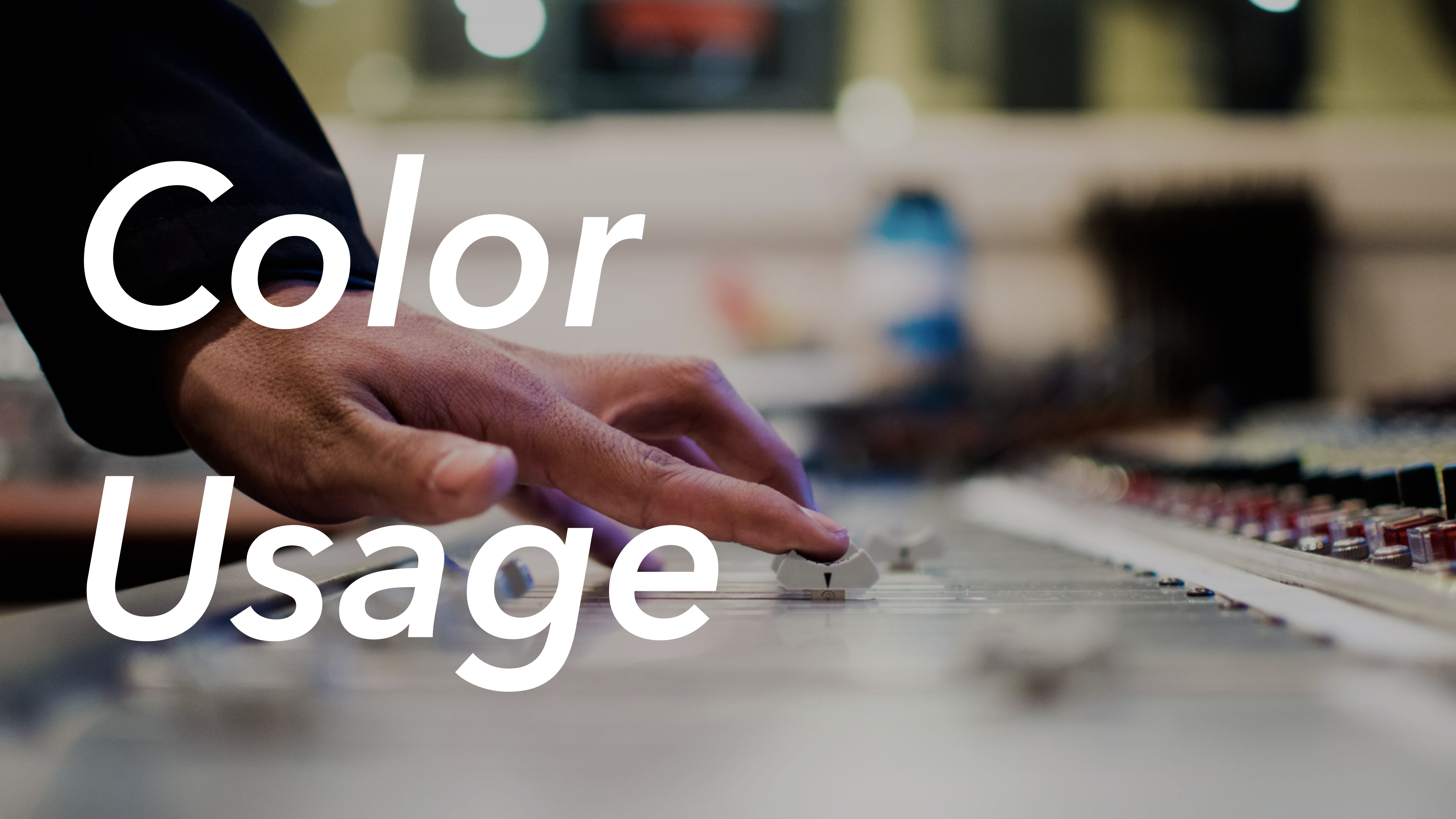
---

*rgb*

*hsv*

*Lab*





# *Color Usage*



*Map Data*

*To Color*

*Nominal*



# UNITED STATES FREQUENCY ALLOCATIONS THE RADIO SPECTRUM

## RADIO SERVICES COLOR LEGEND

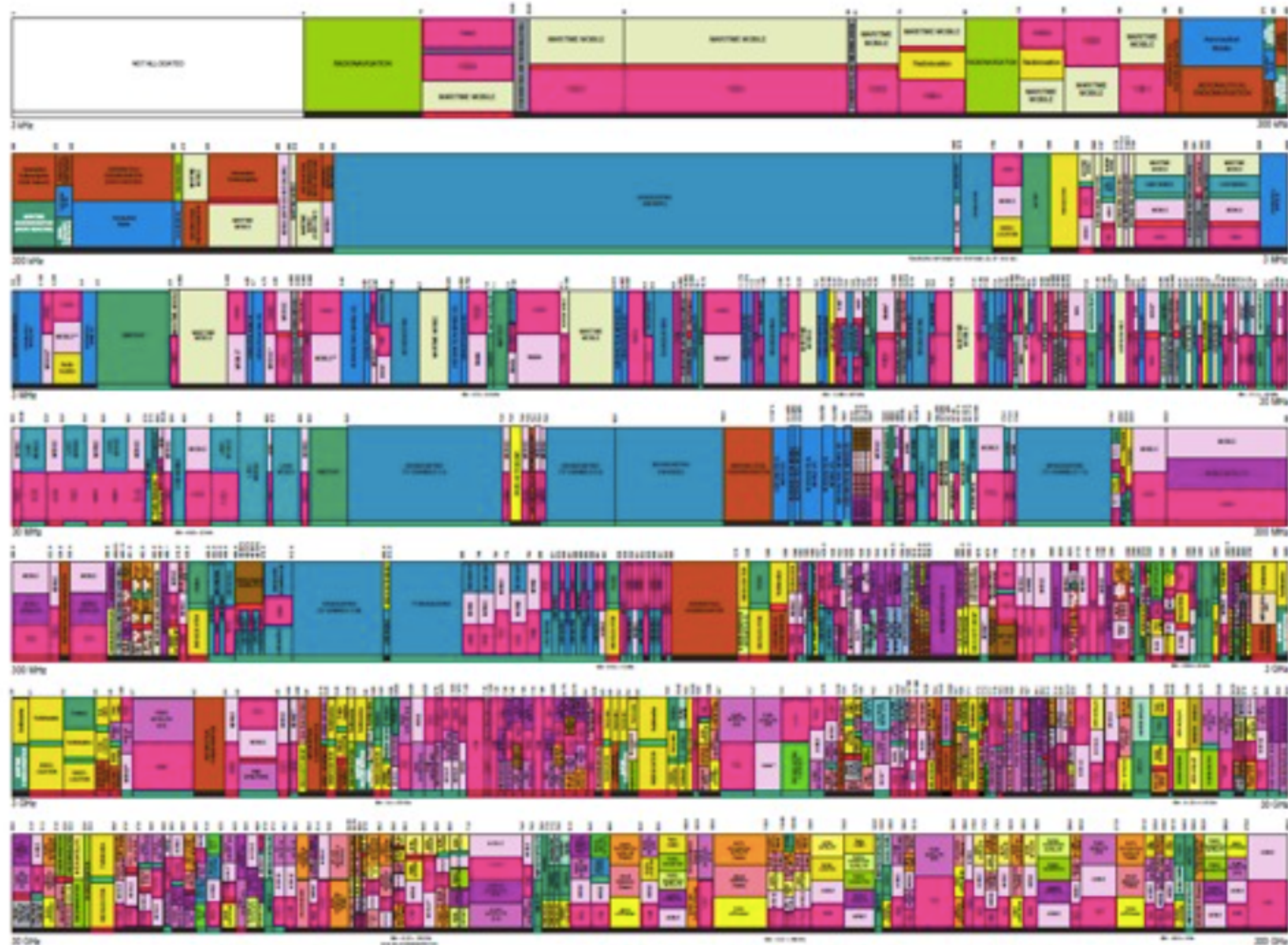
AIRCRAFT	METEOROLOGICAL	TELEVISION
AIRCRAFT (SATELLITE)	JET	RADIOASTRONOMY
AIRCRAFT (NAVIGATION)	JET (SATELLITE)	TELEVISION
MARITIME	MARITIME (SATELLITE)	TELEVISION
MARITIME (SATELLITE)	MARITIME (NAVIGATION)	TELEVISION
SPACE	SPACE (SATELLITE)	TELEVISION
SPACE (SATELLITE)	SPACE (NAVIGATION)	TELEVISION
SPACE (NAVIGATION)	SPACE (NAVIGATION)	TELEVISION
FID	FID (SATELLITE)	TELEVISION
FID (SATELLITE)	FID (SATELLITE)	TELEVISION
STANDARD FREQUENCY	STANDARD FREQUENCY	TELEVISION

## ACTIVITY CODE

GOVERNMENT	GOVERNMENT (GOVERNMENT)
NON-GOVERNMENT	

## ALLOCATION USAGE DESIGNATION

Primary	Secondary	Co-primary
---------	-----------	------------





# UNITED STATES FREQUENCY ALLOCATIONS THE RADIO SPECTRUM

## RADIO SERVICES COLOR LEGEND

AERONAUTICAL MOBILE	INTER-SATELLITE	RADIO ASTRONOMY
AERONAUTICAL MOBILE SATELLITE	LAND MOBILE	RADIO DETERMINATION SATELLITE
AERONAUTICAL RADIONAVIGATION	LAND MOBILE SATELLITE	RADIOLOCATION
AMATEUR	MARITIME MOBILE	RADIOLOCATION SATELLITE
AMATEUR SATELLITE	MARITIME MOBILE SATELLITE	RADIONAVIGATION
BROADCASTING	MARITIME RADIONAVIGATION	RADIONAVIGATION SATELLITE
BROADCASTING SATELLITE	METEOROLOGICAL AIDS	SPACE OPERATION
EARTH EXPLORATION SATELLITE	METEOROLOGICAL SATELLITE	SPACE RESEARCH
FIXED	MOBILE	STANDARD FREQUENCY AND TIME SIGNAL
FIXED SATELLITE	MOBILE SATELLITE	STANDARD FREQUENCY AND TIME SIGNAL SATELLITE

## ACTIVITY CODE

GOVERNMENT EXCLUSIVE	GOVERNMENT NON-EXCLUSIVE SHARED
NON-GOVERNMENT EXCLUSIVE	

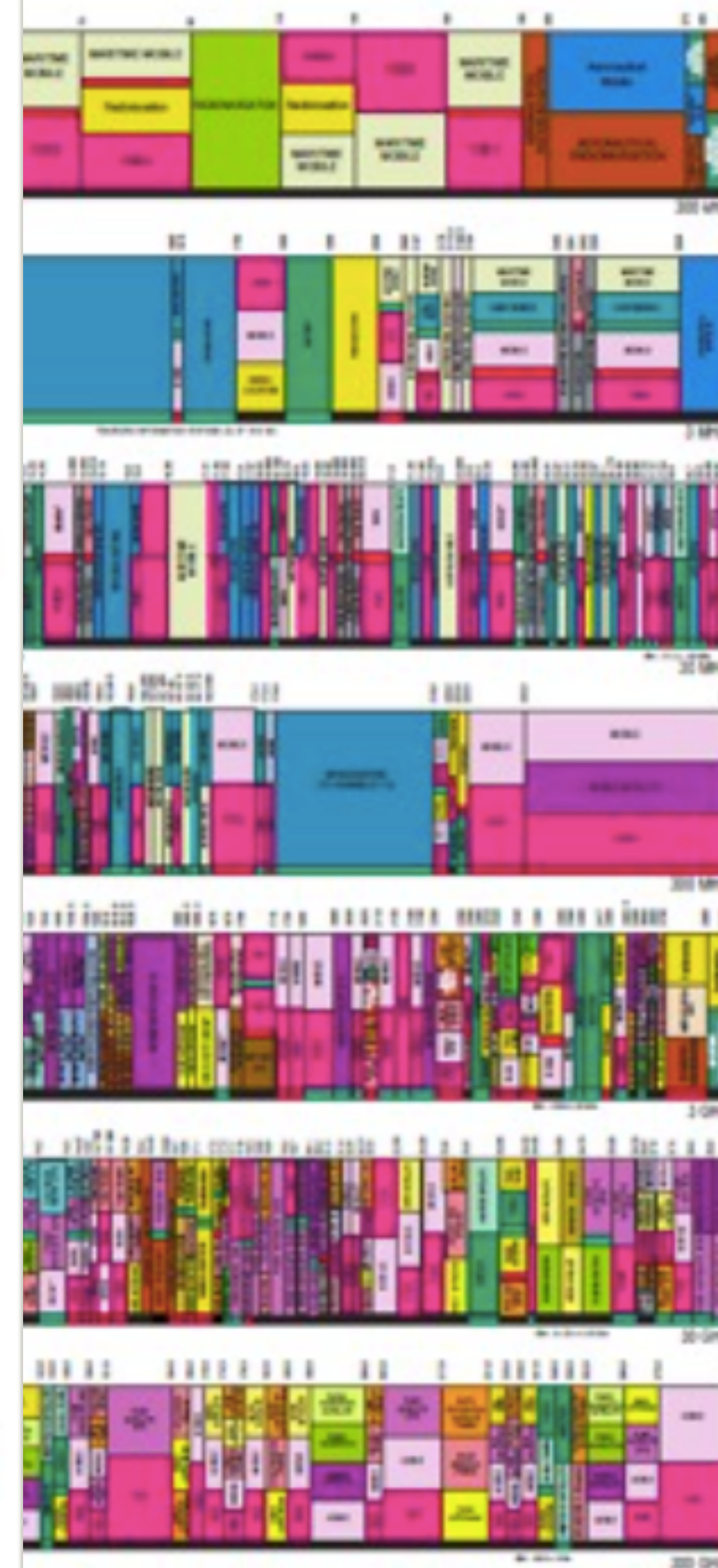
## ALLOCATION USAGE DESIGNATION

SERVICE	EXAMPLE	DESCRIPTION
Primary	F1.2.3	Color: Letters

## RADIO SERVICES COLOR LEGEND

AERONAUTICAL MOBILE	INTER-SATELLITE	RADIO ASTRONOMY
AERONAUTICAL MOBILE SATELLITE	LAND MOBILE	RADIO DETERMINATION SATELLITE
AERONAUTICAL RADIONAVIGATION	LAND MOBILE SATELLITE	RADIOLOCATION
AMATEUR	MARITIME MOBILE	RADIOLOCATION SATELLITE
AMATEUR SATELLITE	MARITIME MOBILE SATELLITE	RADIONAVIGATION
BROADCASTING	MARITIME RADIONAVIGATION	RADIONAVIGATION SATELLITE
BROADCASTING SATELLITE	METEOROLOGICAL AIDS	SPACE OPERATION
EARTH EXPLORATION SATELLITE	METEOROLOGICAL SATELLITE	SPACE RESEARCH
FIXED	MOBILE	STANDARD FREQUENCY AND TIME SIGNAL
FIXED SATELLITE	MOBILE SATELLITE	STANDARD FREQUENCY AND TIME SIGNAL SATELLITE

## ACTIVITY CODE





UNITED

STATES

FREQUENCY

ALLOCATION

THE RADIO SPECTRUM

RADIO SERVICES COLOR LEGEND



RADIO SERVICES COLOR LEGEND





UNITED

STATES

FREQUENCY

ALLOCATION

THE RADIO SPECTRUM

RADIO SERVICES COLOR LEGEND

AERONAUTICAL MOBILE	INTER-SATELLITE	RADIO ASTRONOMY
AERONAUTICAL MOBILE SATELLITE	LAND MOBILE	RADIO DETERMINATION SATELLITE
AERONAUTICAL RADIOMETER	LAND MOBILE SATELLITE	RADIO LOCATION
AMATEUR	MARITIME MOBILE	RADIO LOCATION SATELLITE
AMATEUR SATELLITE	MARITIME MOBILE SATELLITE	RADIONAVIGATION
BROADCASTING	MARITIME RADIONAVIGATION	RADIONAVIGATION SATELLITE
BROADCASTING SATELLITE	METEOROLOGICAL AIDS	SPACE OPERATION
EXPLOSIVE DETECTION SATELLITE	METEOROLOGICAL SATELLITE	SPACE RESEARCH
FIXED	MOBILE	STANDARD FREQUENCY AND TIME SIGNAL
FIXED SATELLITE	MOBILE SATELLITE	STANDARD FREQUENCY AND TIME SIGNAL SATELLITE

ACTIVITY CODE

GOVERNMENT EXCLUSIVE	GOVERNMENT NON-EXCLUSIVE (SAR)
NON-EXCLUSIVE	

ALLOCATION USAGE DESIGNATION

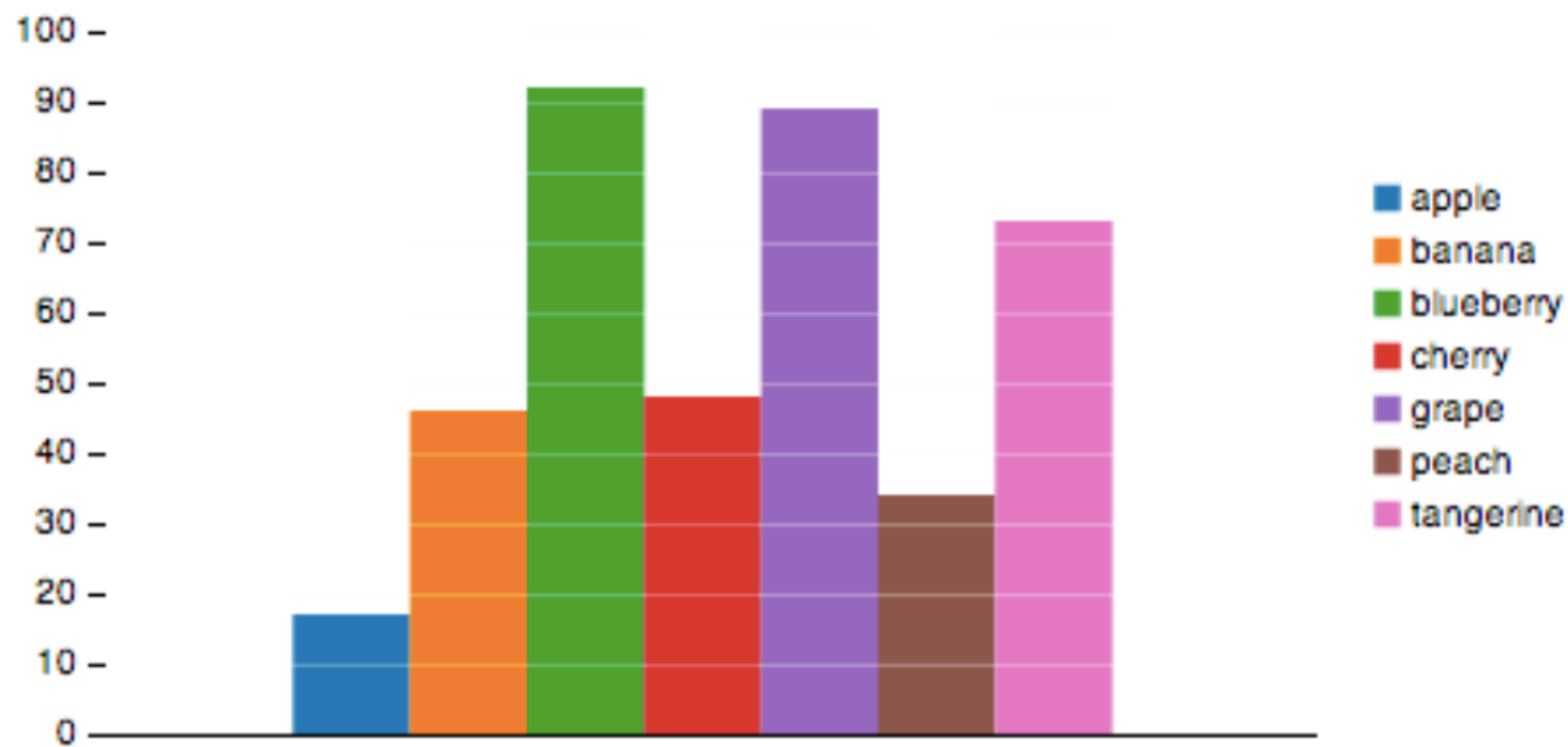
Primary	Secondary	Reserved
Primary	Secondary	Reserved

RADIO SERVICES COLOR LEGEND

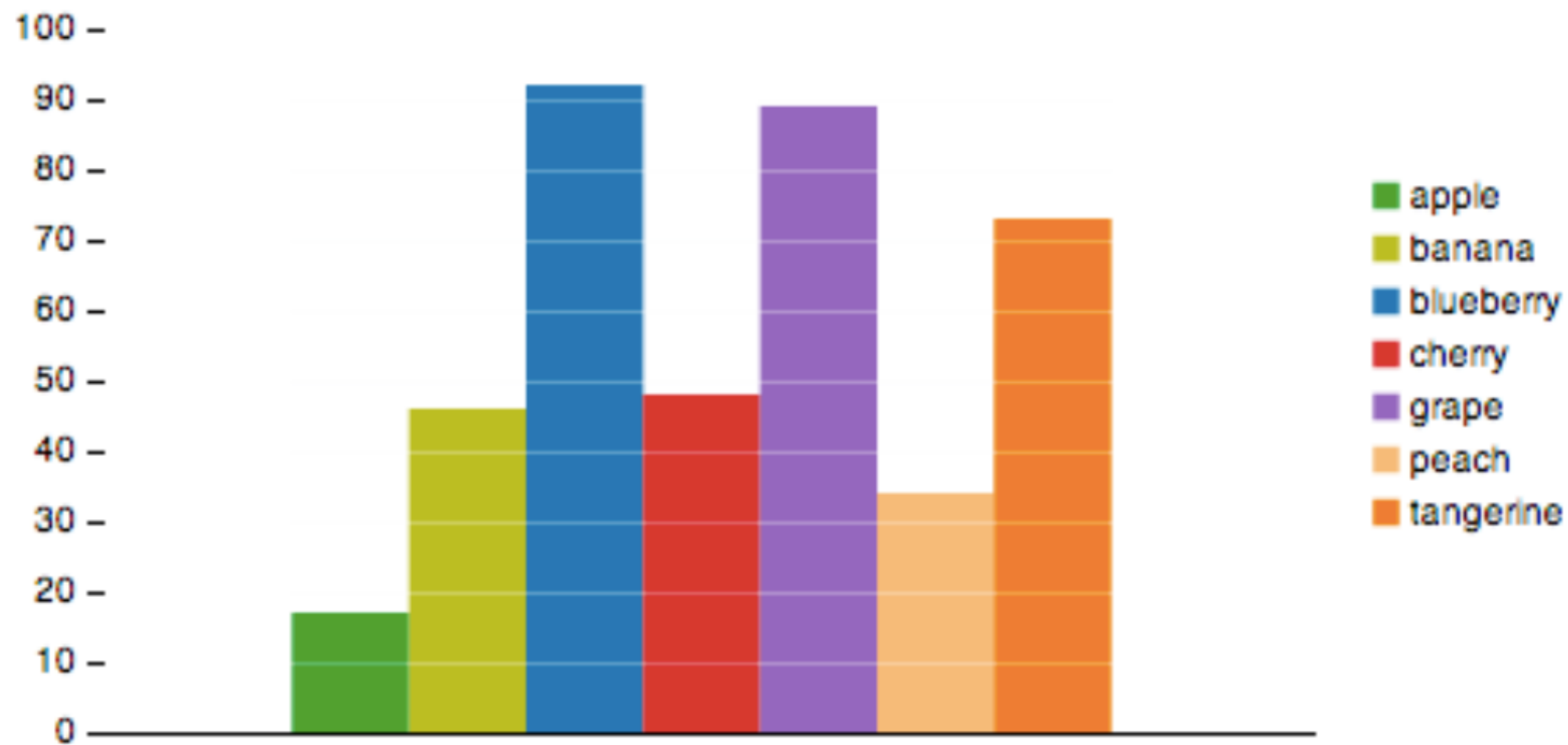
AERONAUTICAL MOBILE	INTER-SATELLITE	RADIO ASTRONOMY
AERONAUTICAL MOBILE SATELLITE	LAND MOBILE	RADIO DETERMINATION SATELLITE
AERONAUTICAL RADIOMETER	LAND MOBILE SATELLITE	RADIO LOCATION
AMATEUR	MARITIME MOBILE	RADIO LOCATION SATELLITE
AMATEUR SATELLITE	MARITIME MOBILE SATELLITE	RADIONAVIGATION
BROADCASTING	MARITIME RADIONAVIGATION	RADIONAVIGATION SATELLITE
BROADCASTING SATELLITE	METEOROLOGICAL AIDS	SPACE OPERATION
EXPLOSIVE DETECTION SATELLITE	METEOROLOGICAL SATELLITE	SPACE RESEARCH
FIXED	MOBILE	STANDARD FREQUENCY AND TIME SIGNAL
FIXED SATELLITE	MOBILE SATELLITE	STANDARD FREQUENCY AND TIME SIGNAL SATELLITE

ACTIVITY CODE

Use distinct colors







**Fruits**

Apple

Banana

Blueberry

Cherry

Grape

Peach

Tangerine

A

E

**Vegetables**

Carrot

Celery

Corn

Eggplant

Mushroom

Olive

Tomato

A

E

**Drinks**

A&amp;W Root Beer

Coca-Cola

Dr. Pepper

Pepsi

Sprite

Sunkist

Welch's Grape

A

E

**Brands**

Apple

AT&amp;T

Home Depot

Kodak

Starbucks

Target

Yahoo!

A

E



# Semantic

# Naming

## Fruits

Apple

Banana

Blueberry

Cherry

Apple

Pear

Tangerine

A

E

## Vegetables

Carrot

Celery

Corn

Eggplant

Mushroom

Olive

Tomato

A

E

## Drinks

A&W Root Beer

Coca-Cola

Fruit Pepper

Fanta

Sprite

Sunkist

Welch's Grape

A

E

## Brands

Apple

AT&T

Home Depot

Kodak

Sears

Target

Yahoo!

A

E

*Ordinal*



Luminance



Luminance

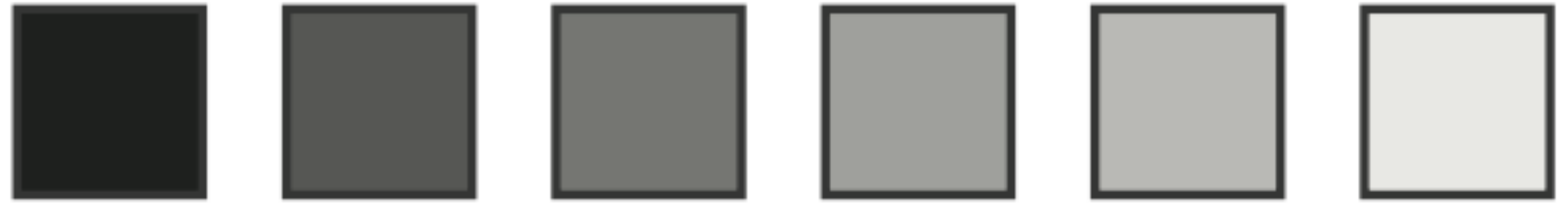


Saturation

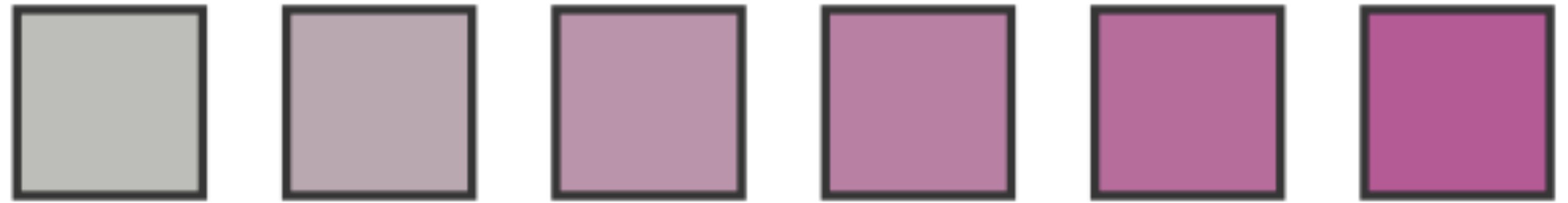




Luminance



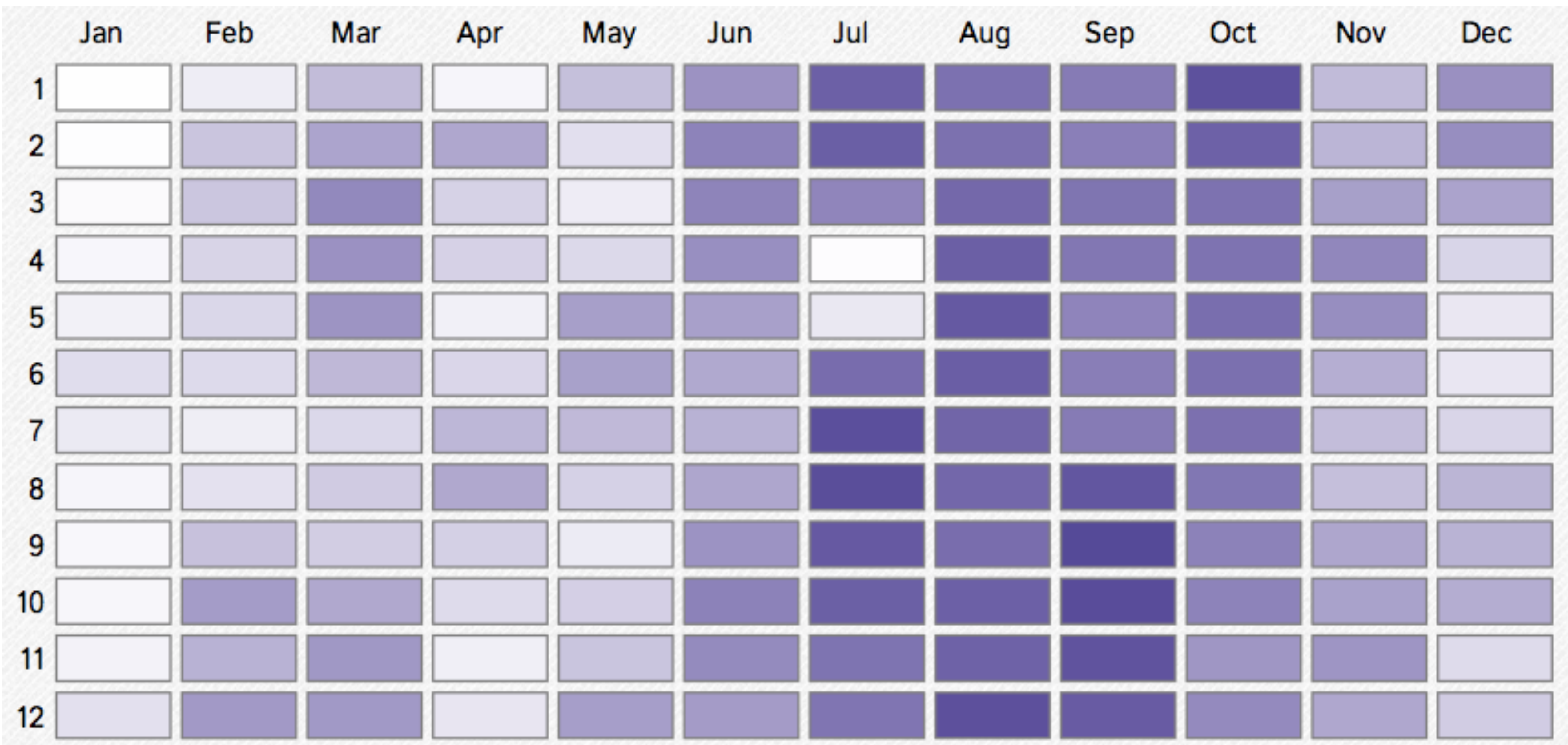
Saturation



Hue

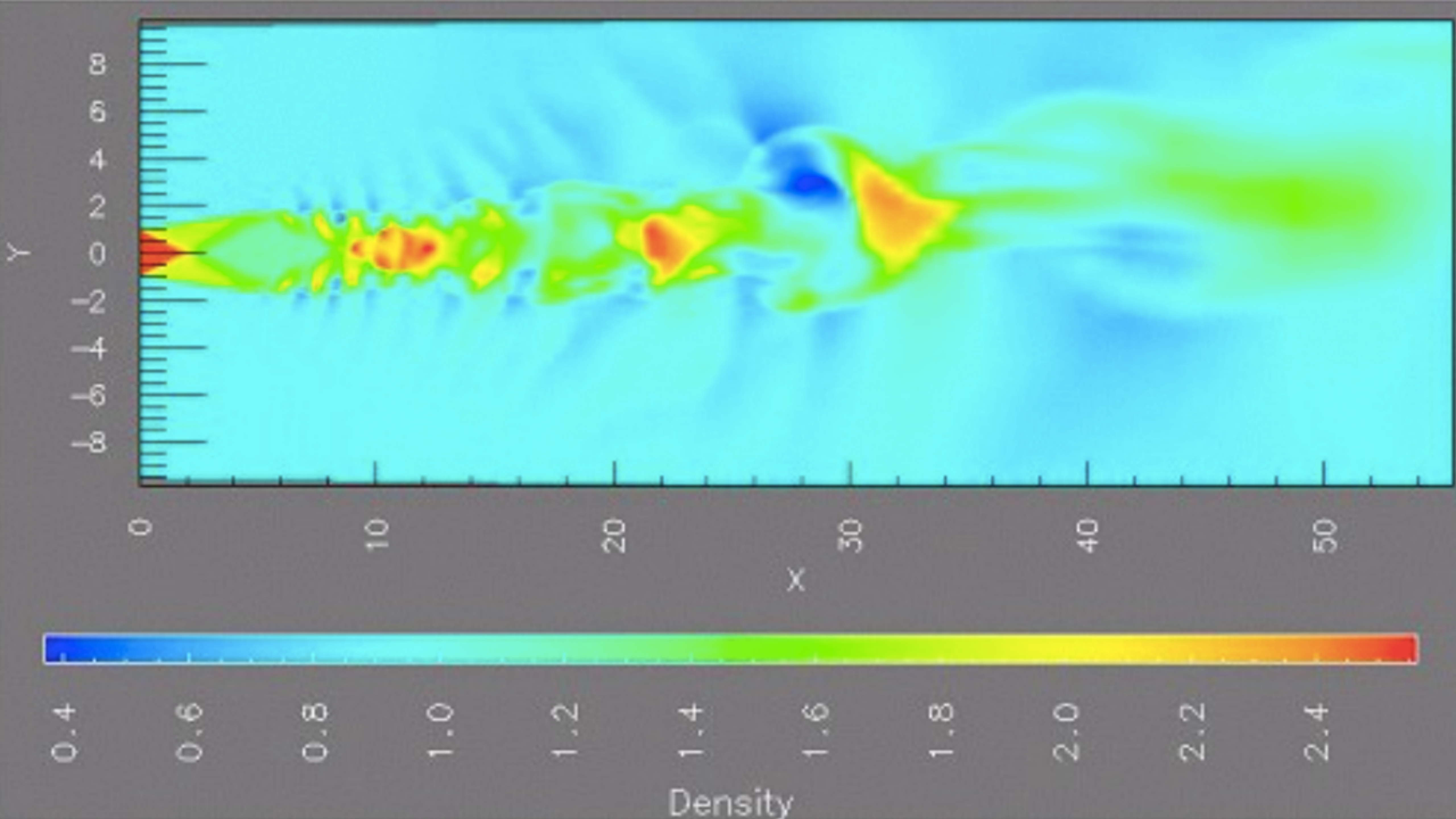


*hue is not naturally ordered*

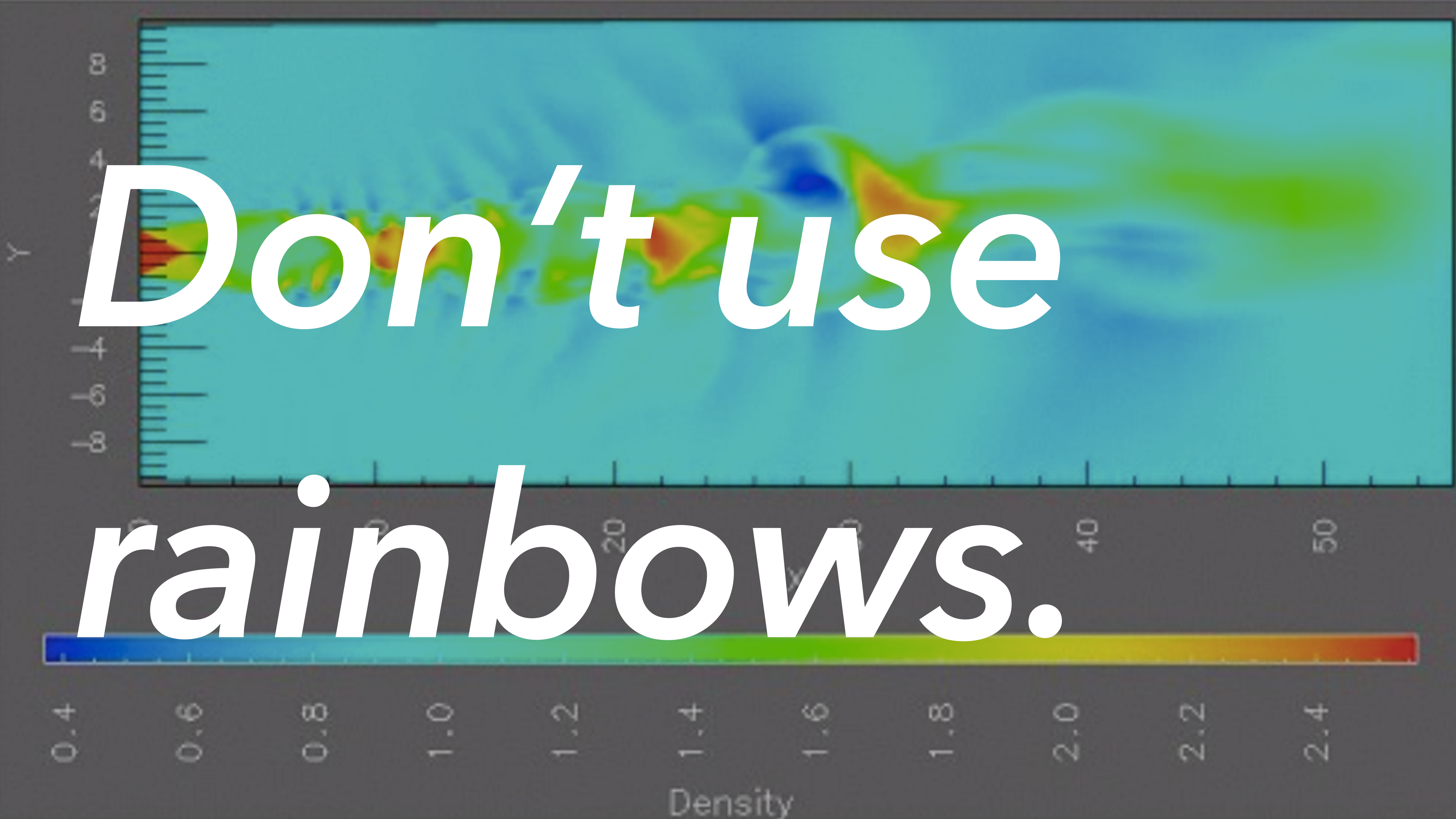


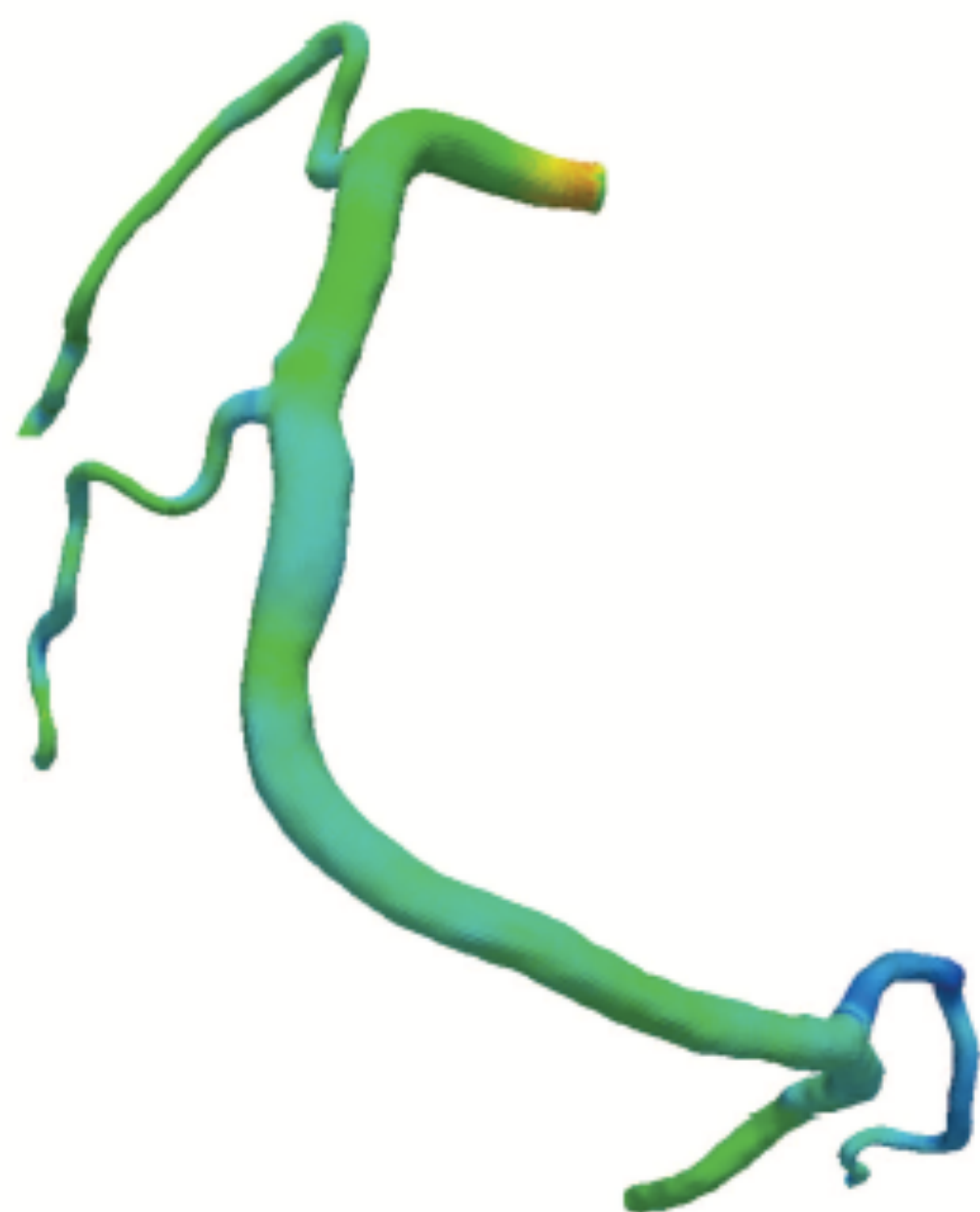
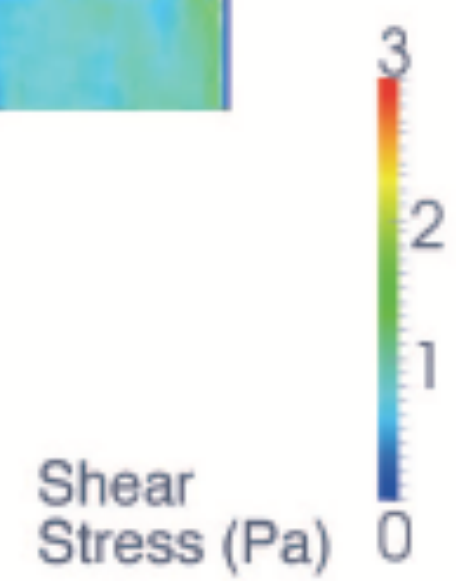
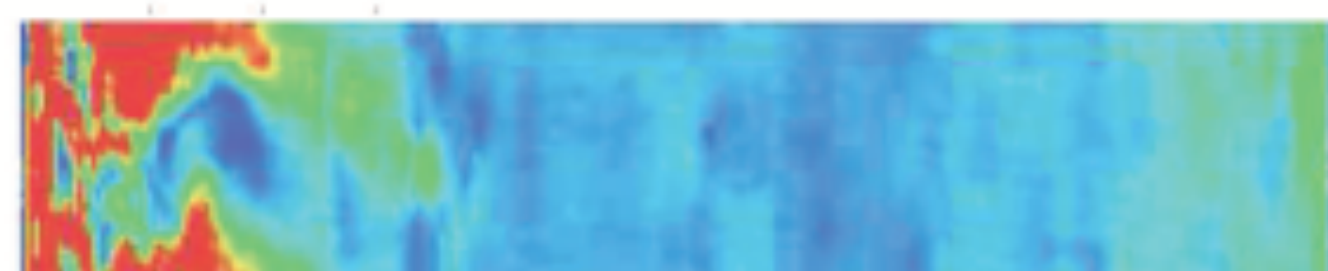


*Continuous*

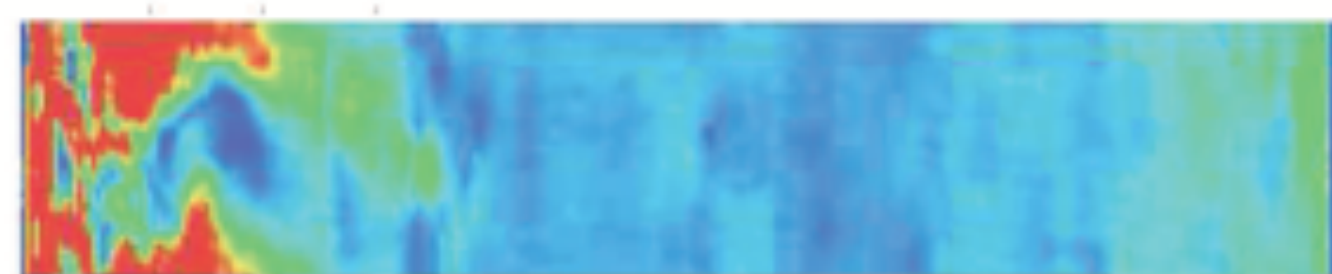






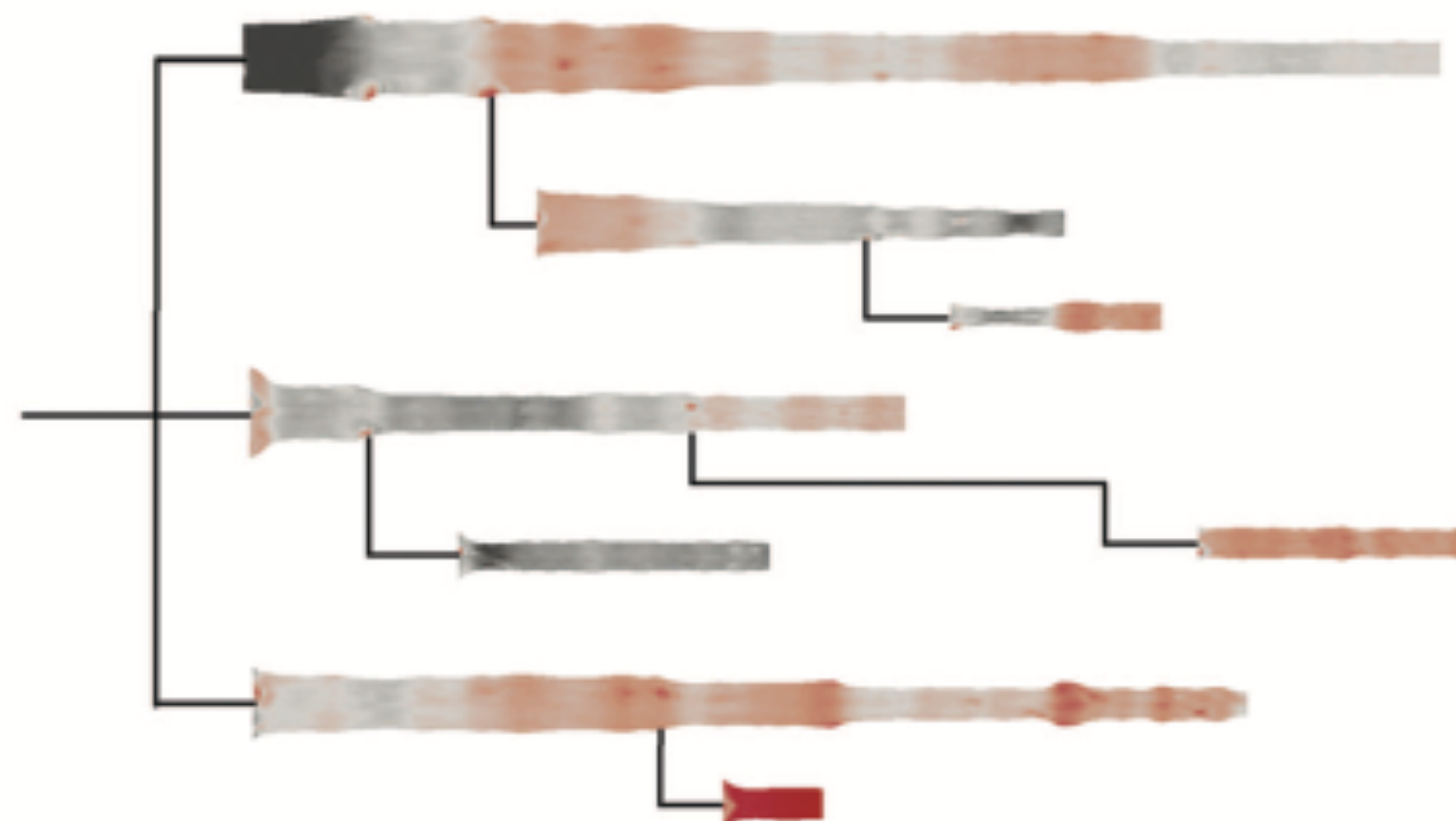
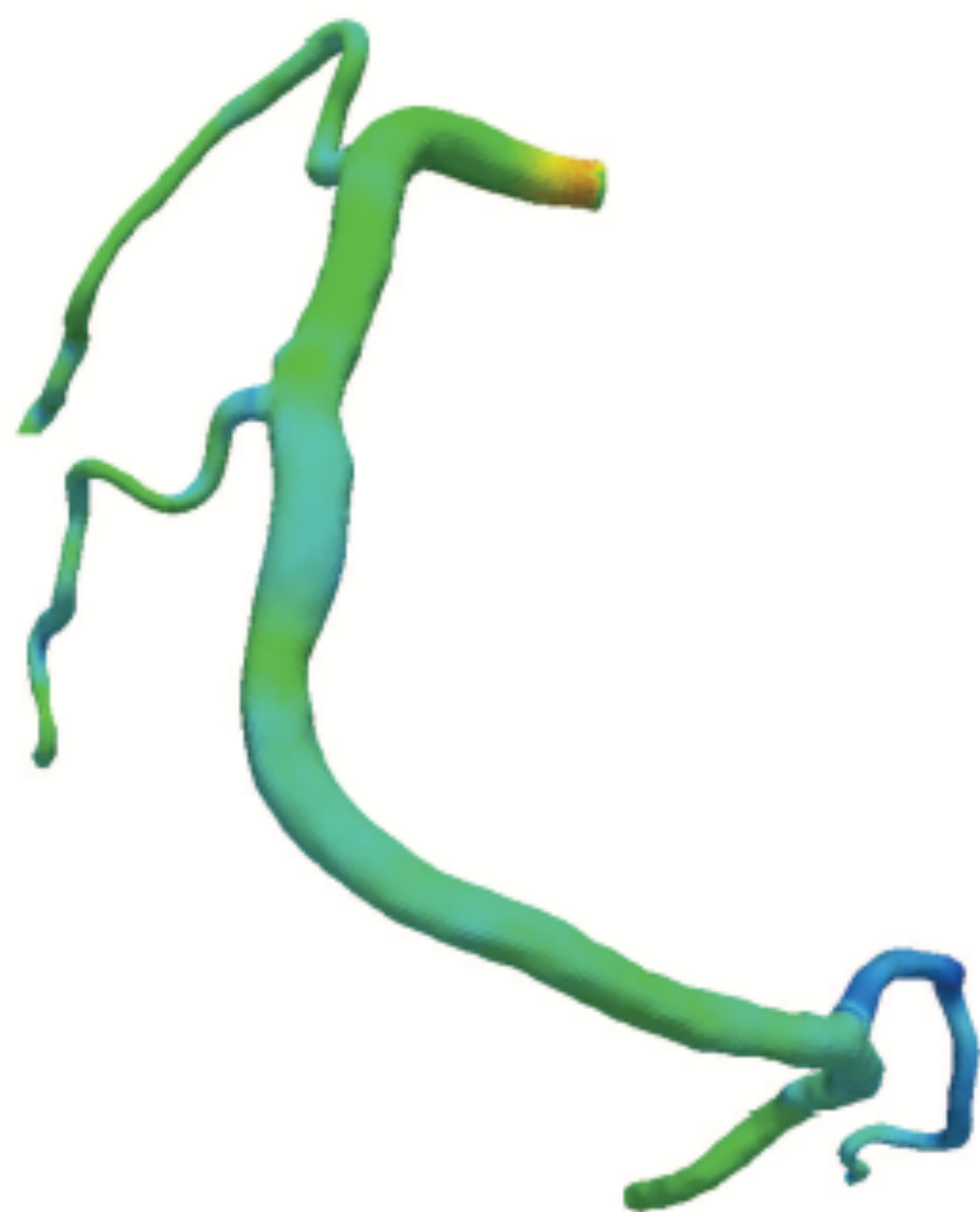






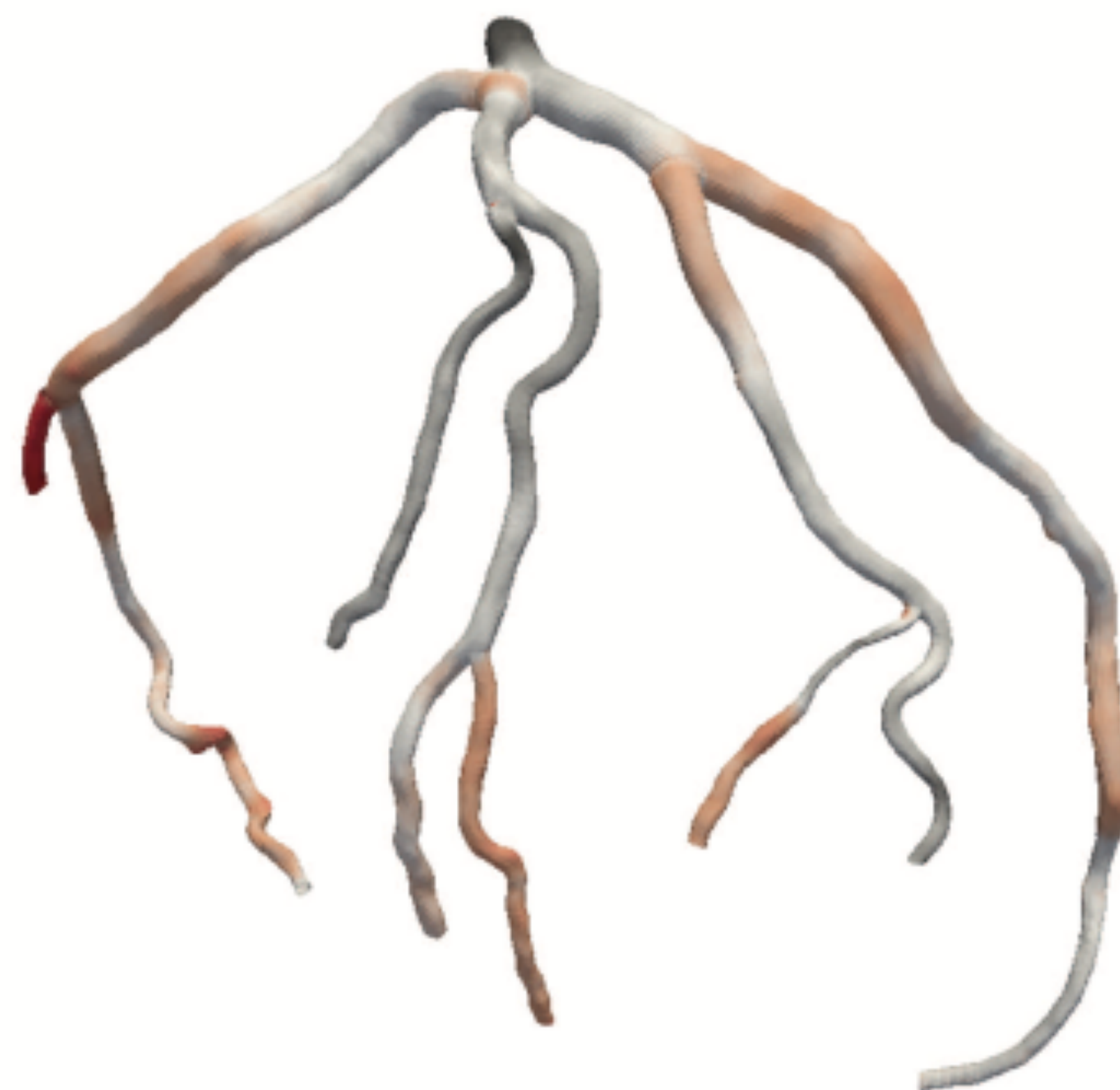
Shear  
Stress (Pa)

3  
2  
1  
0

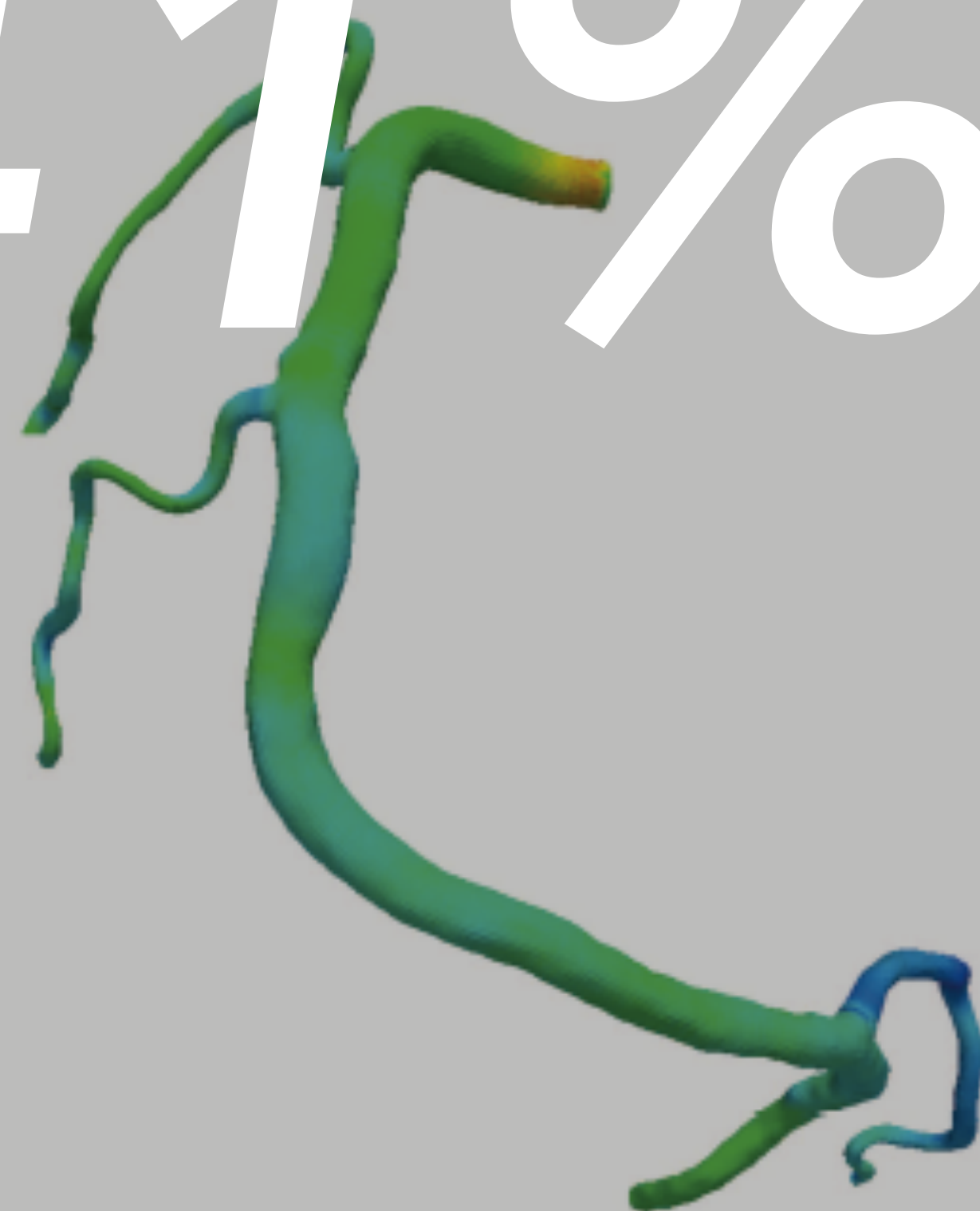
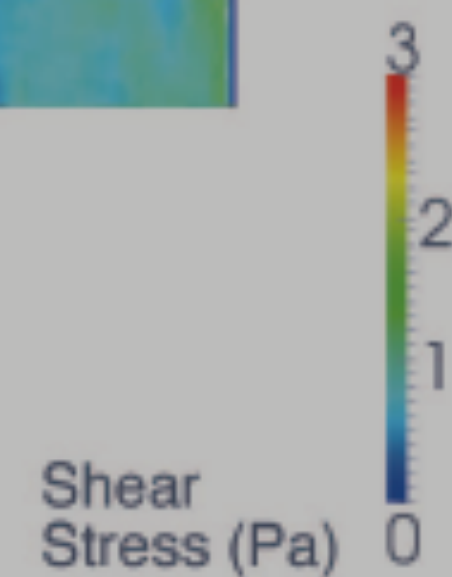


Shear  
Stress (Pa)

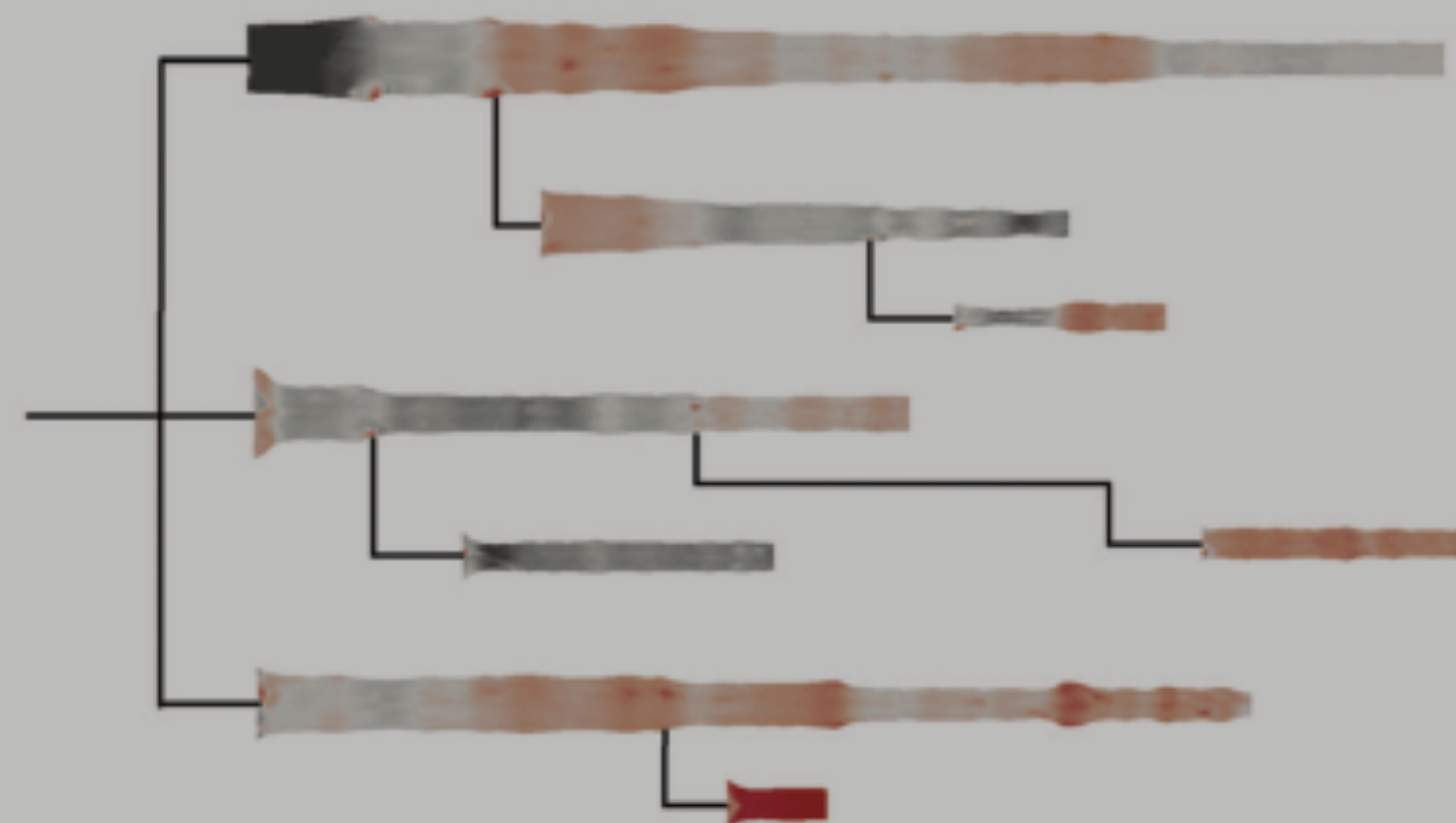
3  
2  
1  
0



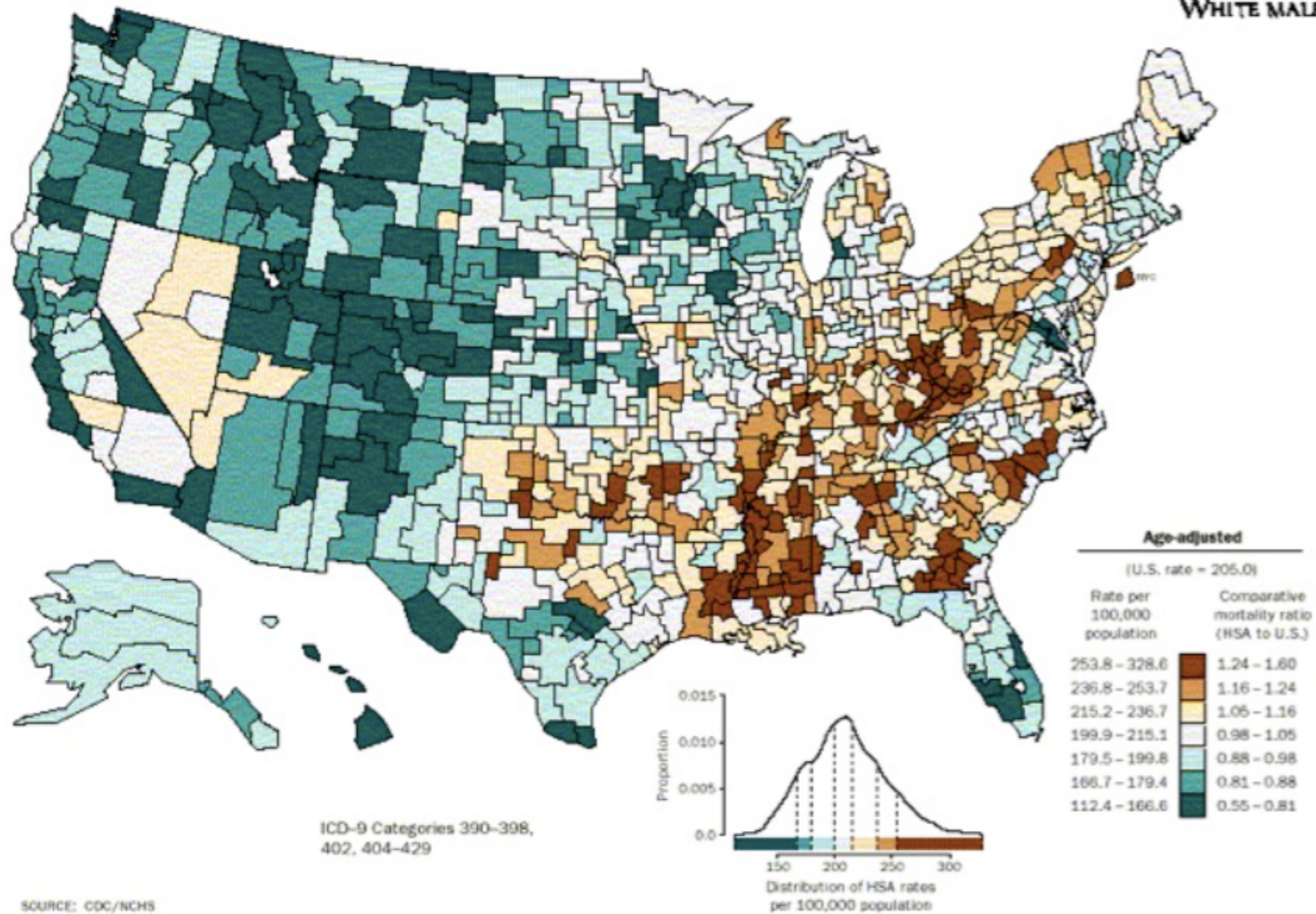
41%



91%
















### Age-adjusted

(U.S. rate = 205.0)

Rate per  
100,000  
population

Comparative  
mortality ratio  
(HSA to U.S.)

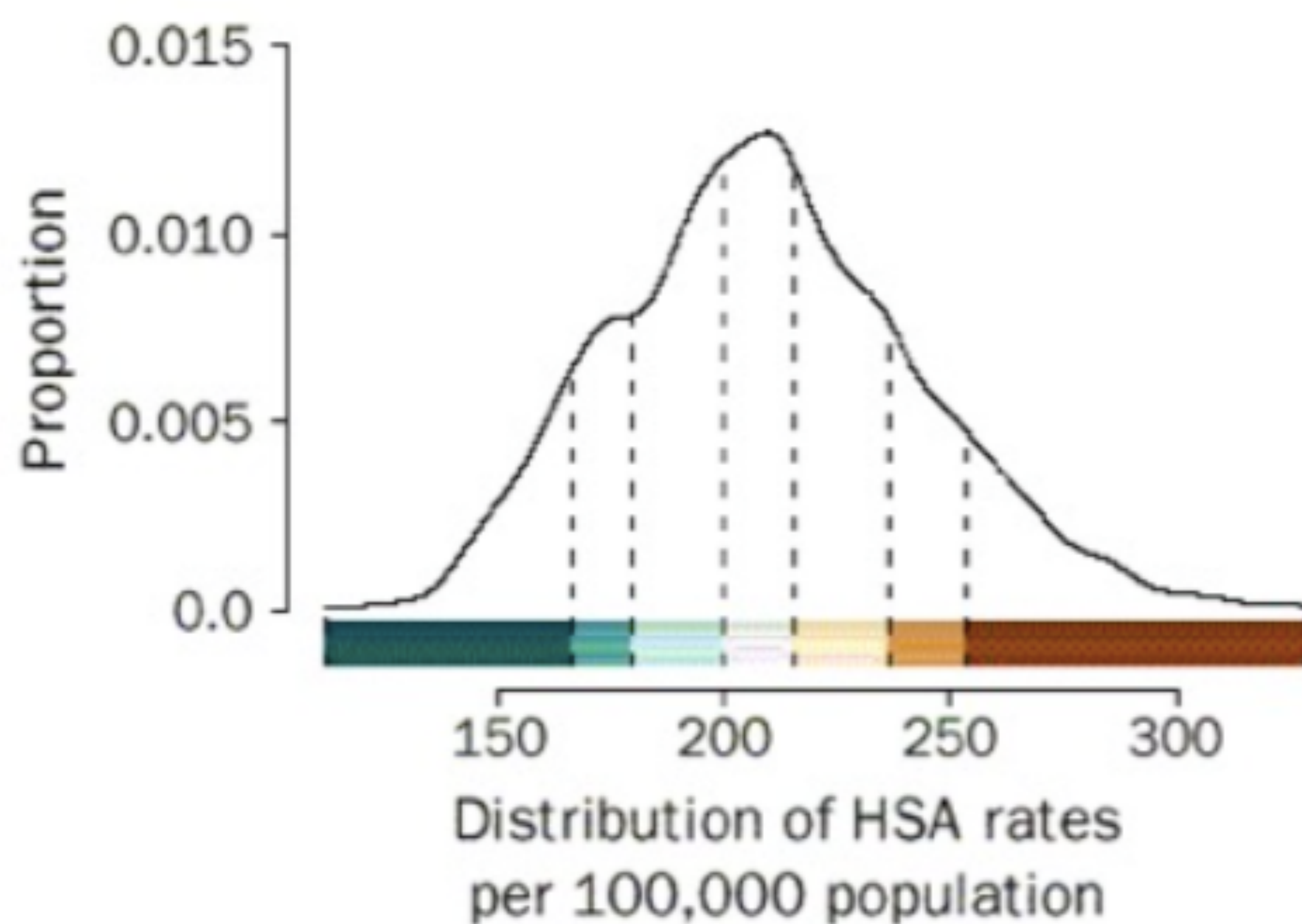
253.8 – 328.6		1.24 – 1.60
236.8 – 253.7		1.16 – 1.24
215.2 – 236.7		1.05 – 1.16
199.9 – 215.1		0.98 – 1.05
179.5 – 199.8		0.88 – 0.98
166.7 – 179.4		0.81 – 0.88
112.4 – 166.6		0.55 – 0.81

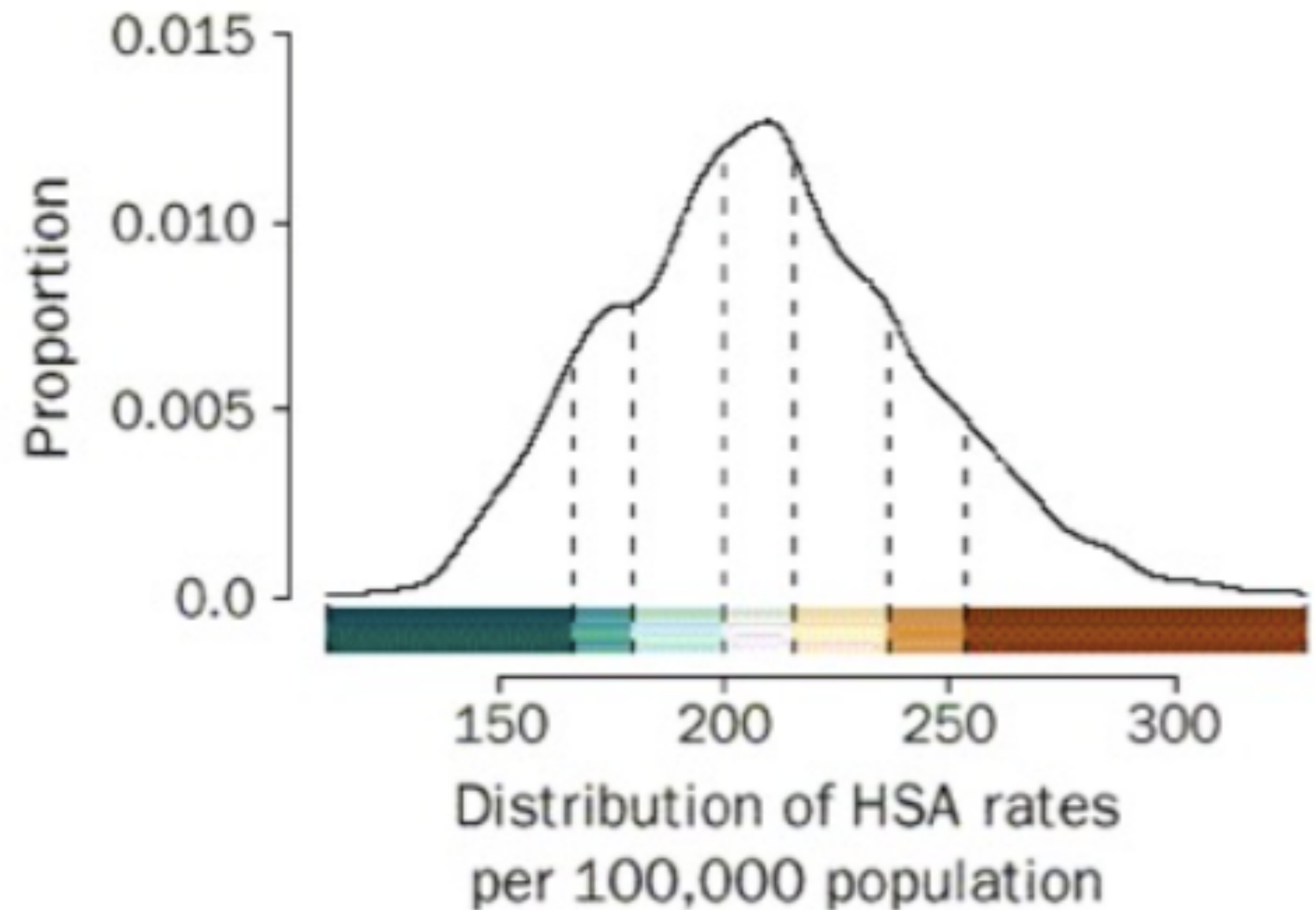
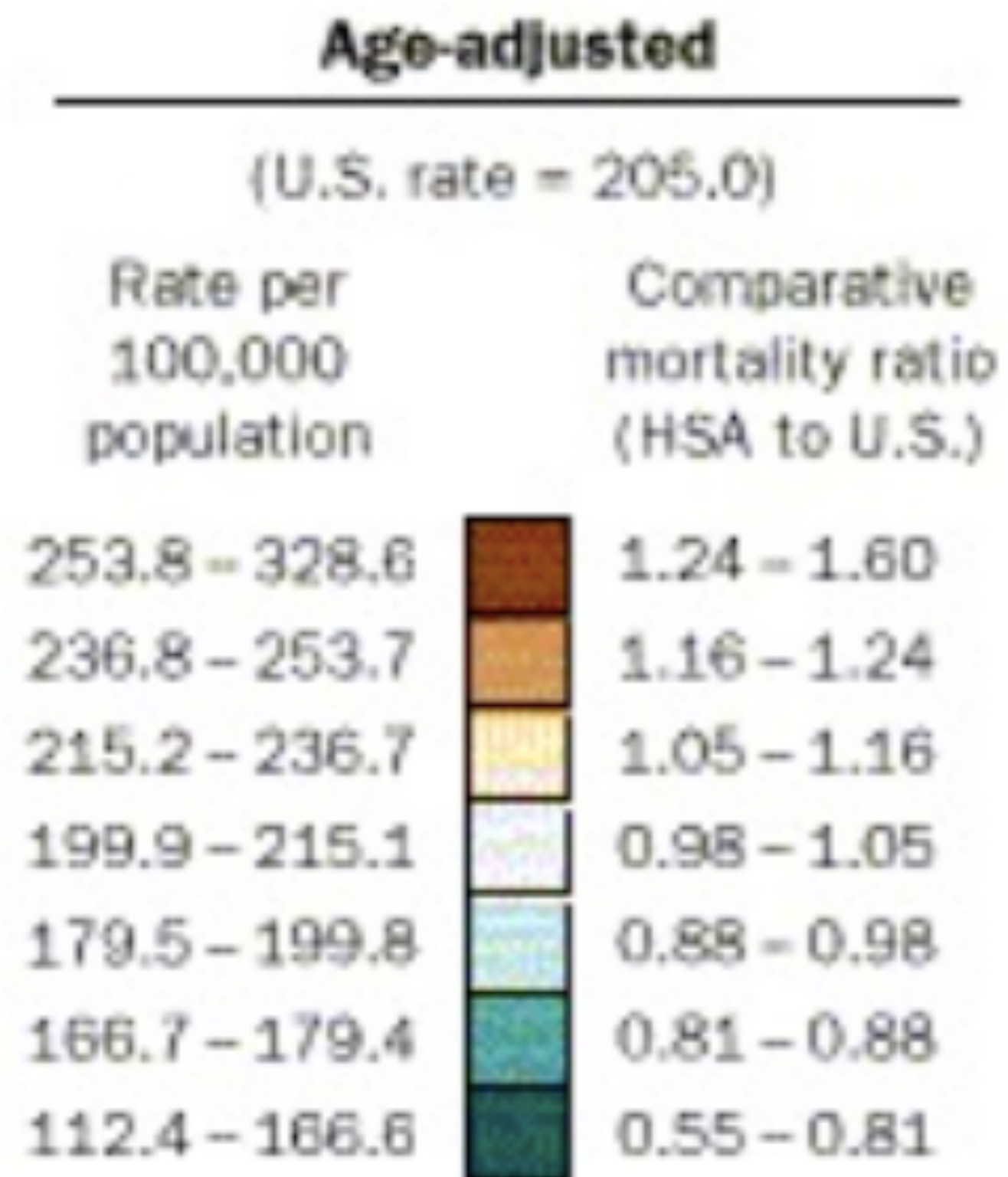


### Age-adjusted

(U.S. rate = 205.0)

Rate per 100,000 population		Comparative mortality ratio (HSA to U.S.)
253.8 – 328.6		1.24 – 1.60
236.8 – 253.7		1.16 – 1.24
215.2 – 236.7		1.05 – 1.16
199.9 – 215.1		0.98 – 1.05
179.5 – 199.8		0.88 – 0.98
166.7 – 179.4		0.81 – 0.88
112.4 – 166.6		0.55 – 0.81





*awesome* ^

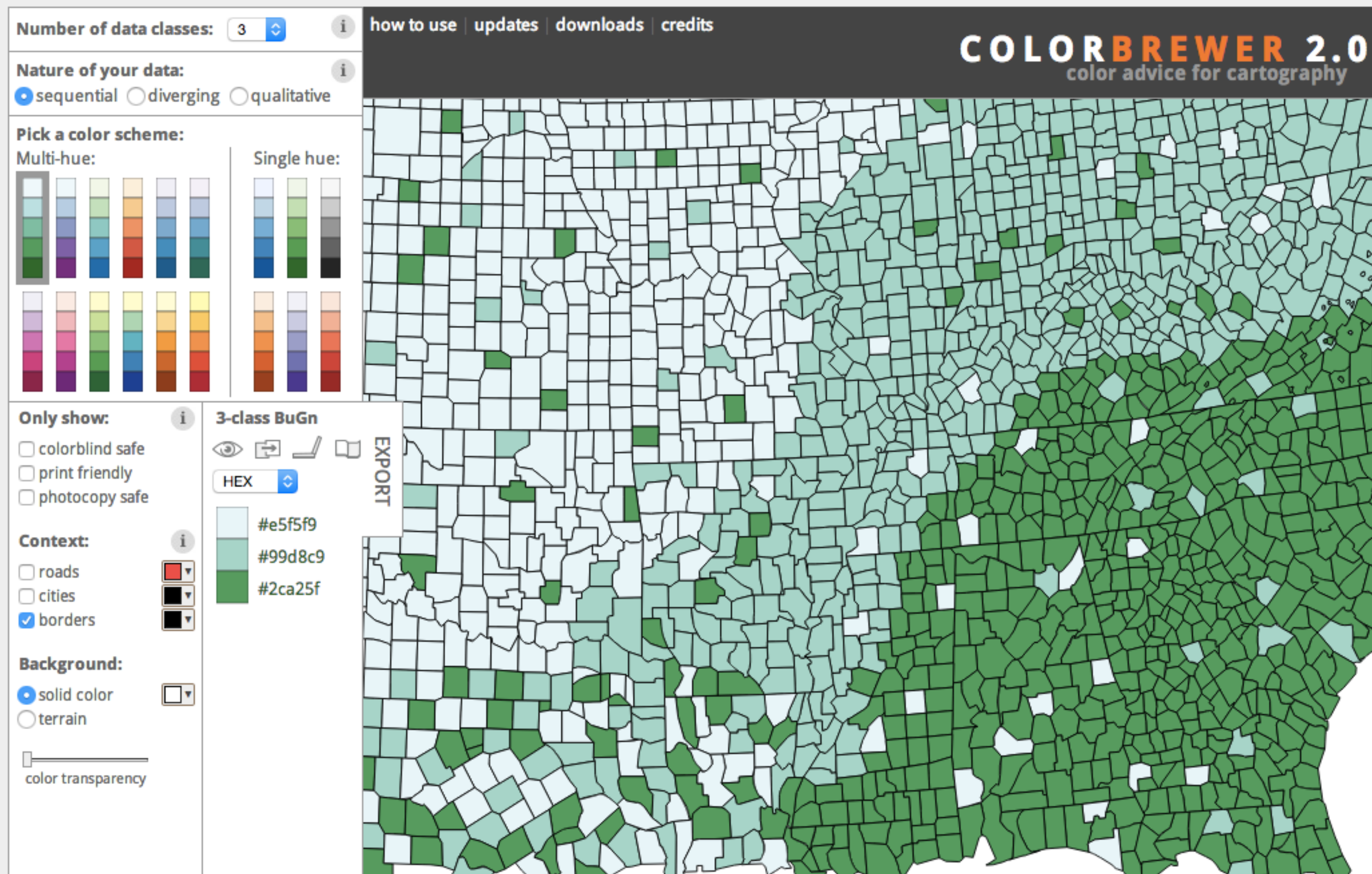




*Color*


*Tools*






<http://colorbrewer2.org/>



View


All Themes

























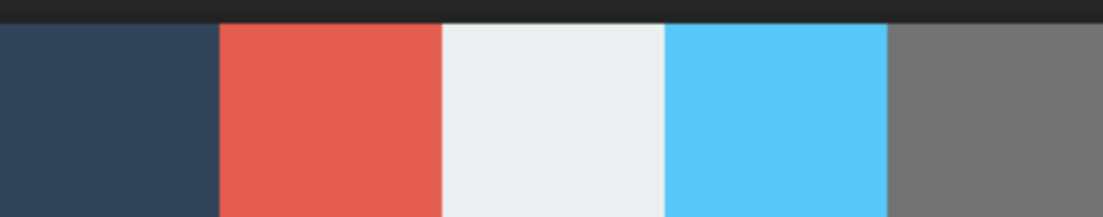







































 Most Popular

WeekMonthAll

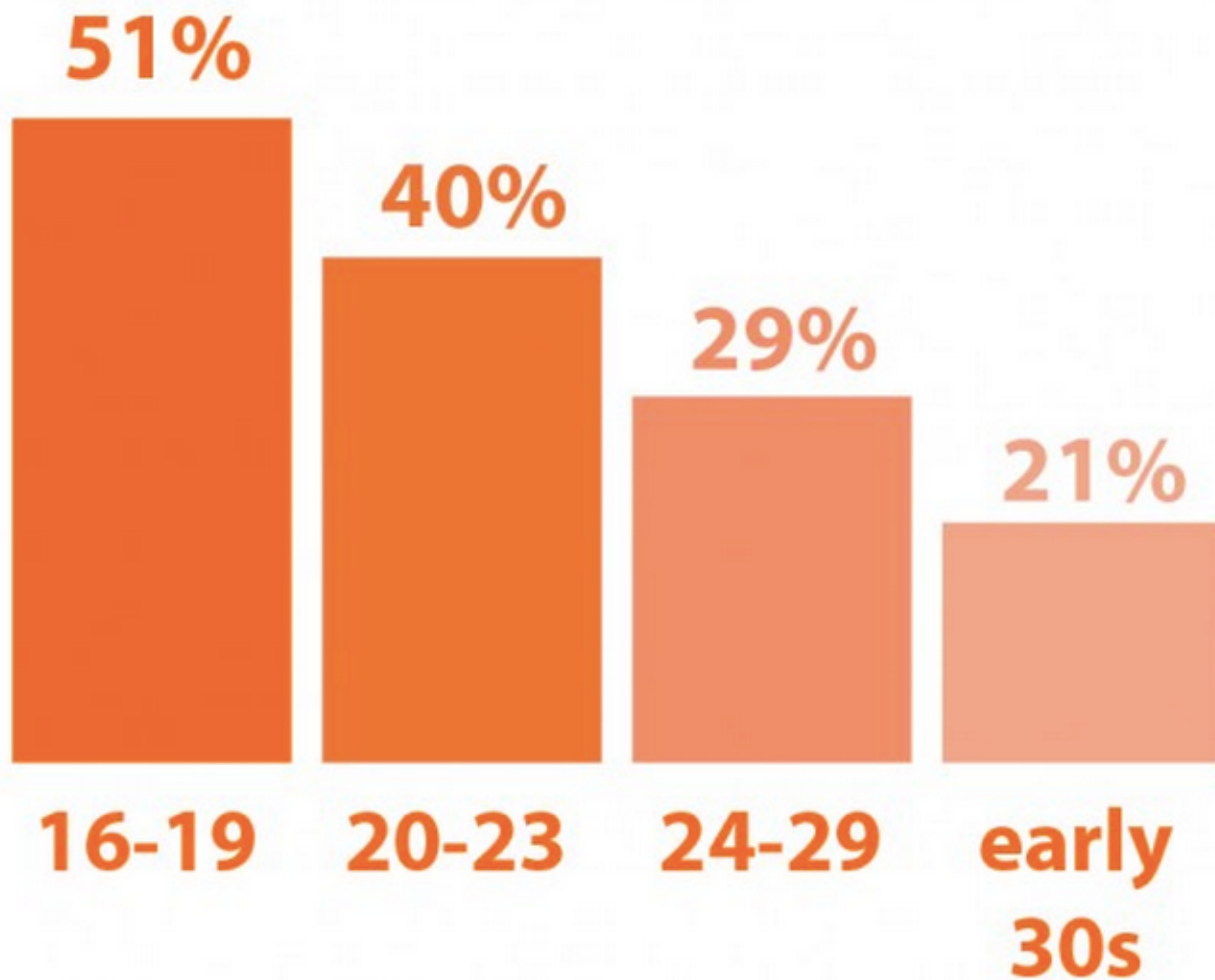
Most Used

Random



 <div>QB Studio<div> 550 413 0</div></div>	 <div>Copy of CC02<div> 273 242 0</div></div>	 <div>Deep Under the ...<div> 218 188 0</div></div>
 <div>Modern Executive<div> 343 188 0</div></div>	 <div>Summer Beach<div> 140 136 1</div></div>	 <div>friends<div> 146 130 0</div></div>
 <div>Copy of A Creati...<div> 197 128 0</div></div>	 <div>Annie Colour Sc...<div> 135 115 0</div></div>	 <div>HAI IN THE SEA<div> 158 105 1</div></div>
 <div>Copy of Copy of ...<div> 132 101 0</div></div>	 <div>Warm<div> 107 97 0</div></div>	 <div>Man Pink<div> 104 92 0</div></div>
 <div>Pastel Range<div> 85 83 0</div></div>	 <div>MY GL<div> 65 75 0</div></div>	 <div>Copy of Capri<div> 58 74 0</div></div>
		 <div>Efendi<div> 90 70 0</div></div>

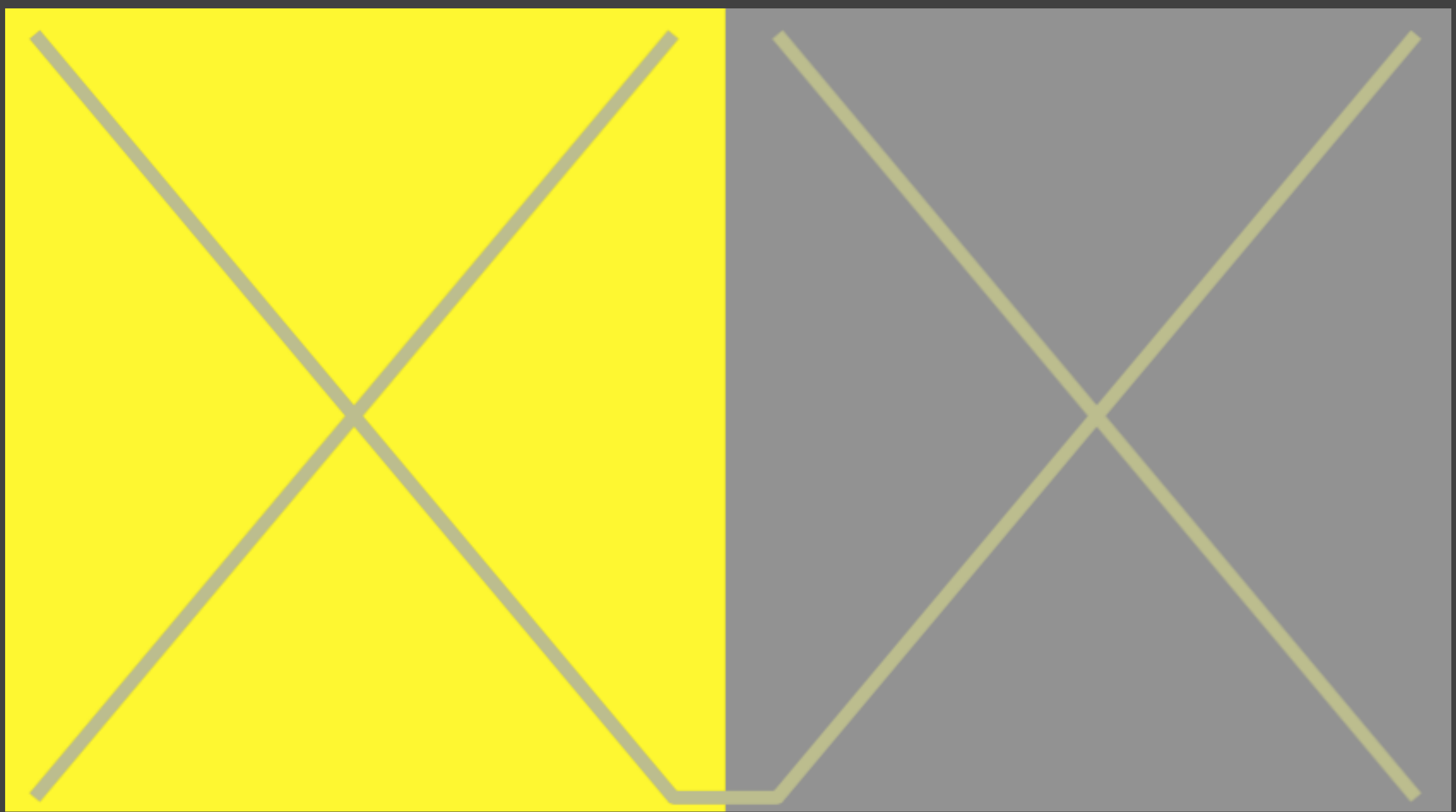
[kuler.adobe.com/explore/](https://kuler.adobe.com/explore/)



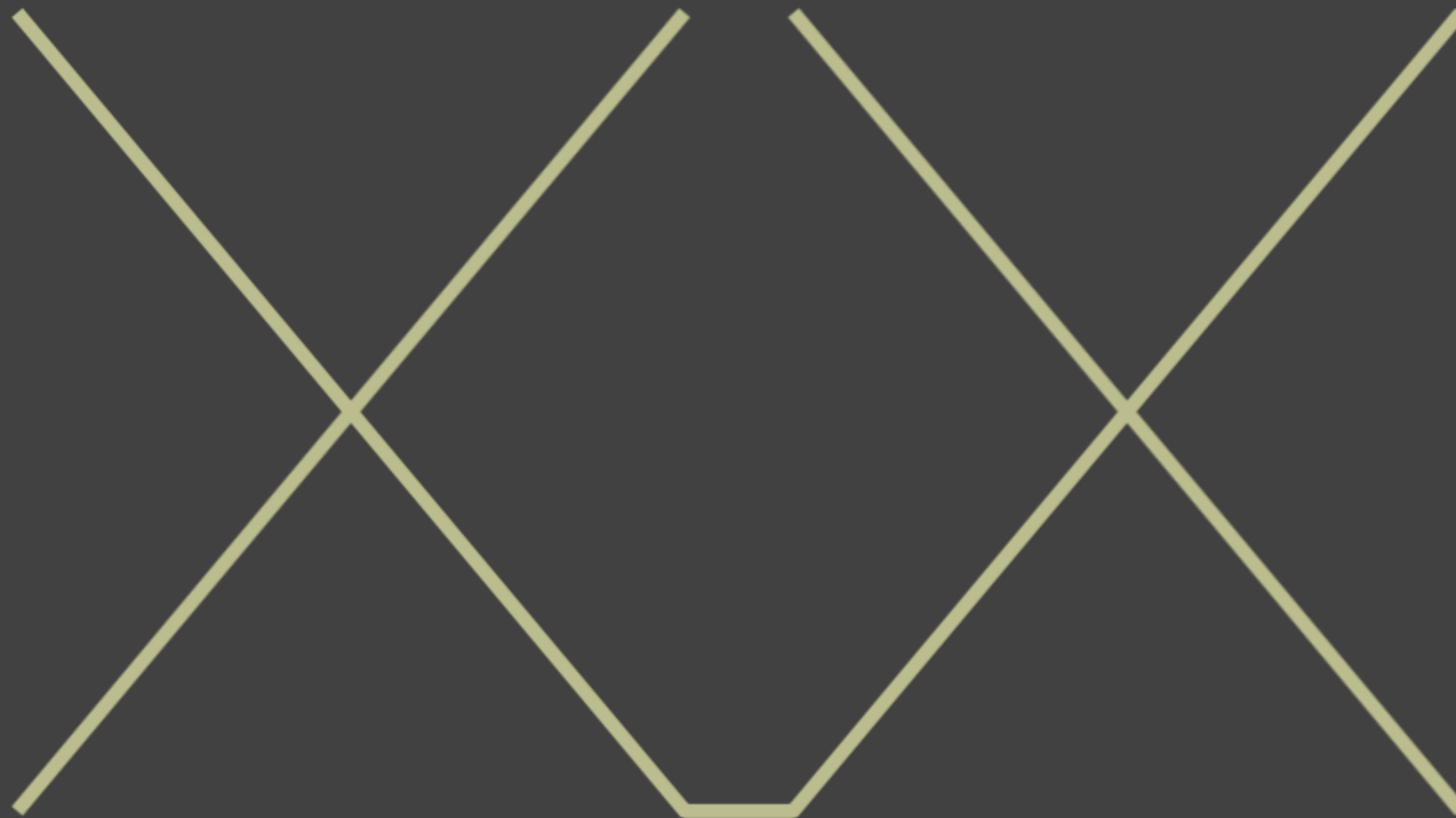




# *Color Caveats*







*Contrast*

*Effects*

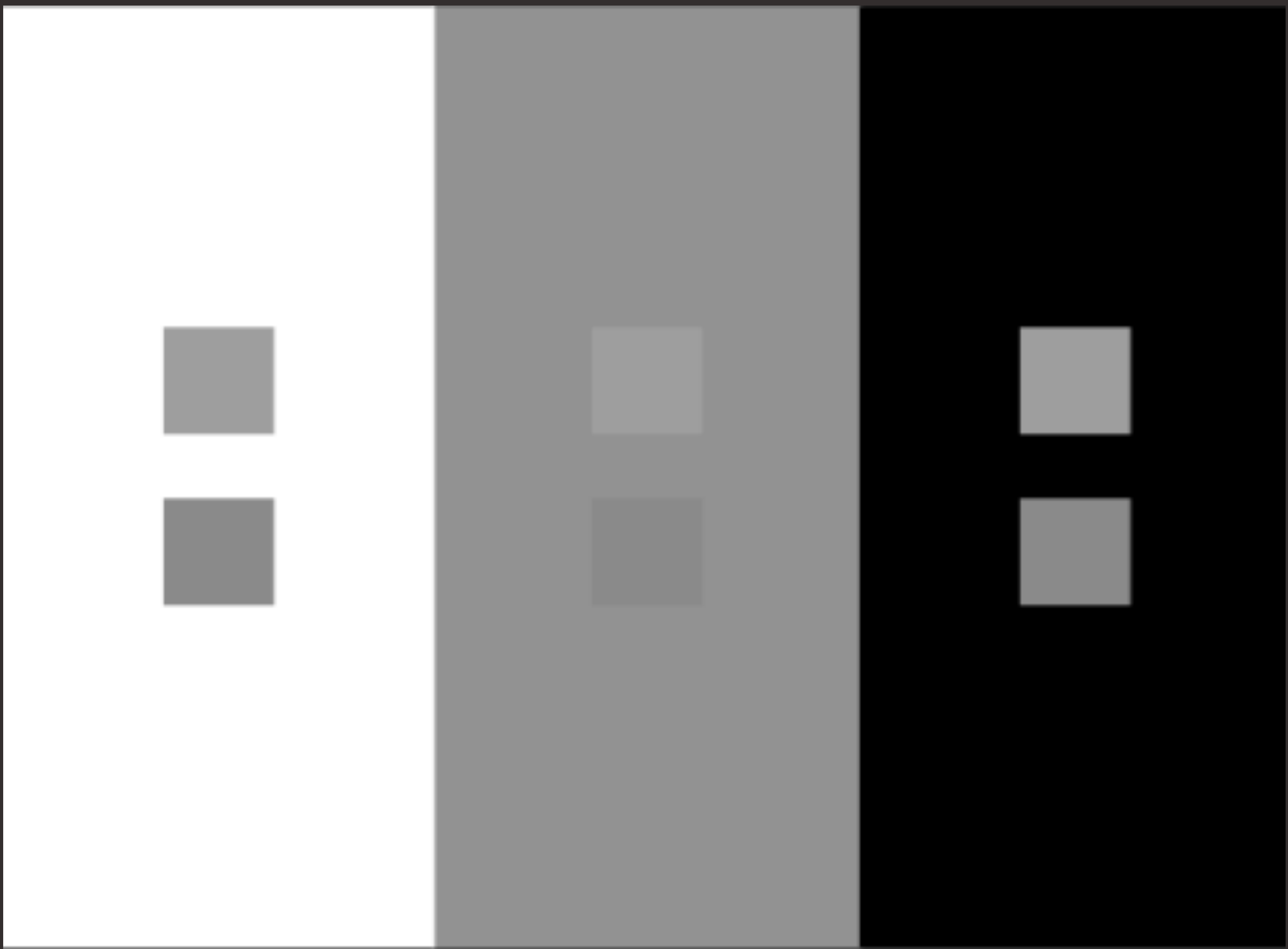




*Bezold*

*Effect*





***"Crispening"***



Legibility and readability are very important

Legibility and readability are very important

Legibility and readability are very important

Legibility and readability are very important

Legibility and readability are very important

Legibility and readability are very important

Legibility and readability are very important

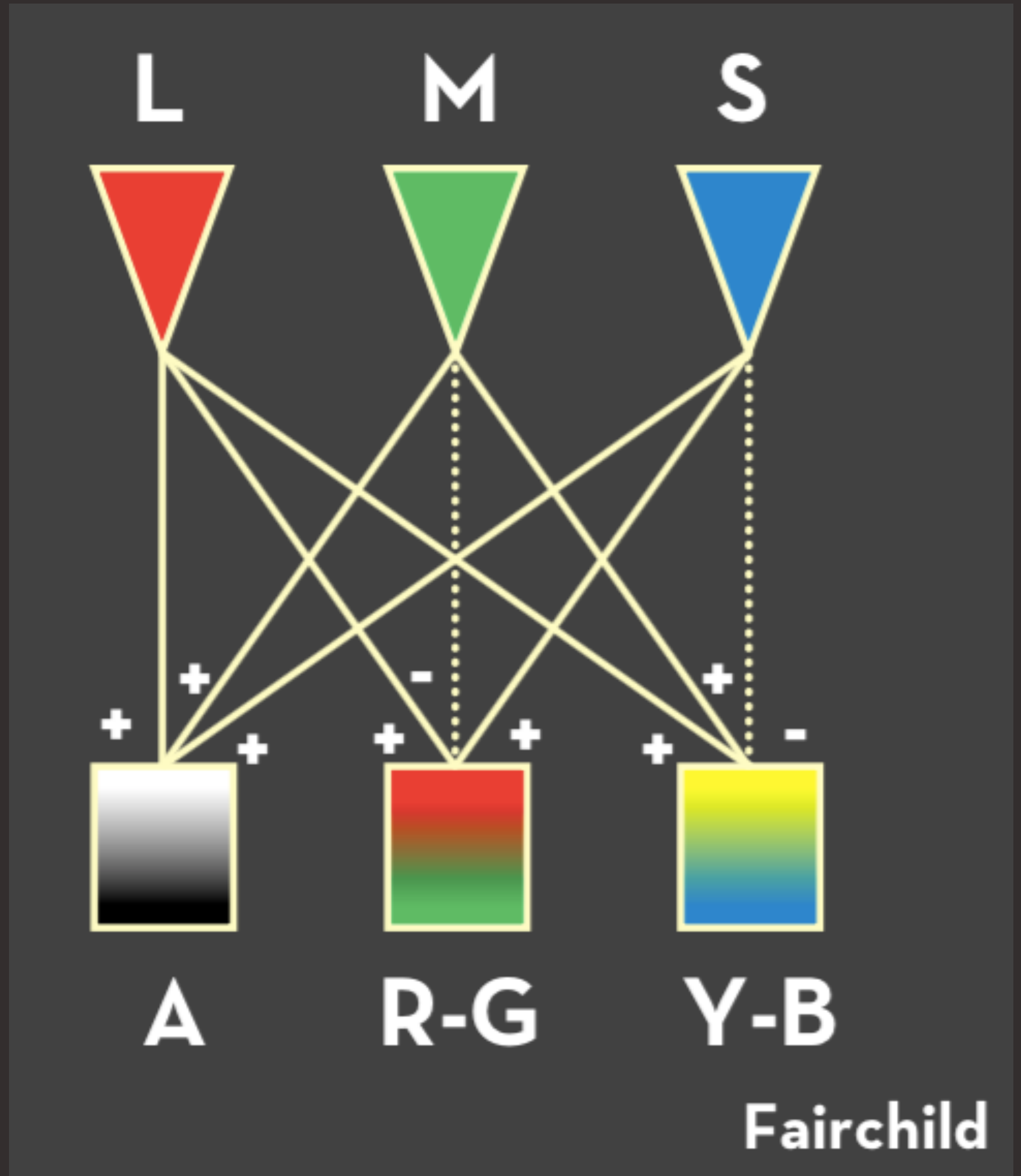
Legibility and readability are very important

# *Color Blindness*



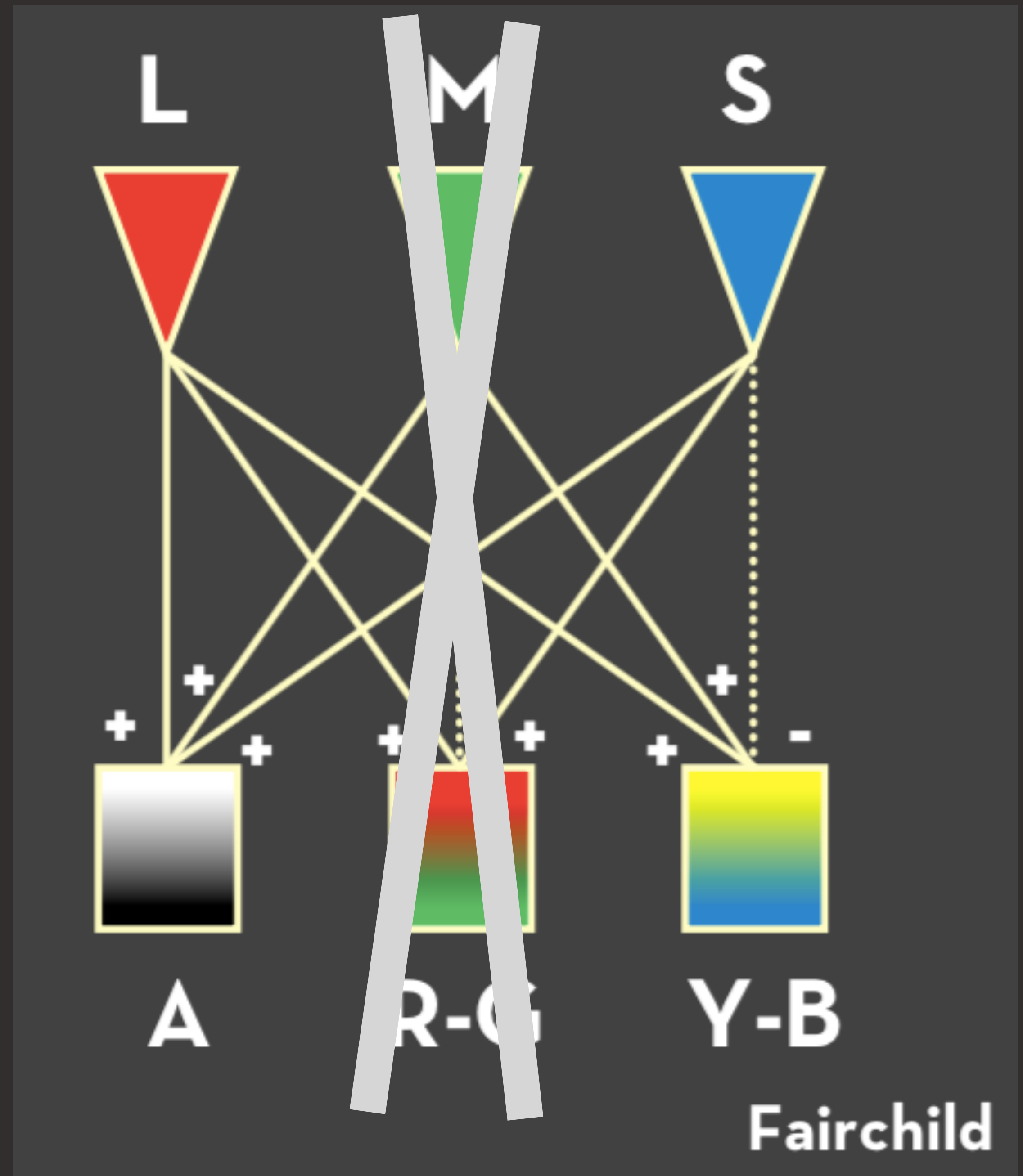
Remember?

Long  
Middle  
Short



What if you're missing  
medium cones?

Long  
~~Middle~~  
Short





# Colorblindness Types

normal



red-green



Deuteranope

yellow-blue



Protanope



Tritanope



*Supporting*

*CB*



# Color Oracle

Design for the Color Impaired



Color Oracle is a free color blindness simulator for Window, Mac and Linux. It takes the guesswork out of designing for color blindness by showing you in real time what people with common color vision impairments will see.

Color Oracle applies a full screen color filter to art you are designing – independently of the software in use. Eight percent of all males are affected by color vision impairment – make sure that your graphical work is readable by the widest possible audience.

Read this article for more information: [Color Design for the Color Vision Impaired](#)

## Free Download

Version 1.2.1 for [Windows](#)  
Requires [Java 6 or 7](#).

Version 1.1.4 for [Mac OS X](#)  
10.4 or higher now supports  
Retina displays and OS X  
10.8 or higher.

**Important for Mac users:**  
If upon launching Color Oracle you get the error message "Color Oracle can't be opened because it is from an unidentified developer", right-click the Color Oracle icon and choose Open. Then click the "Open" button at the next dialog to launch Color Oracle. See [here](#) to permanently turn this feature off.

# Vischeck



Home

[Vischeck](#)

[Daltonize](#)

[Examples](#)

[Downloads](#)

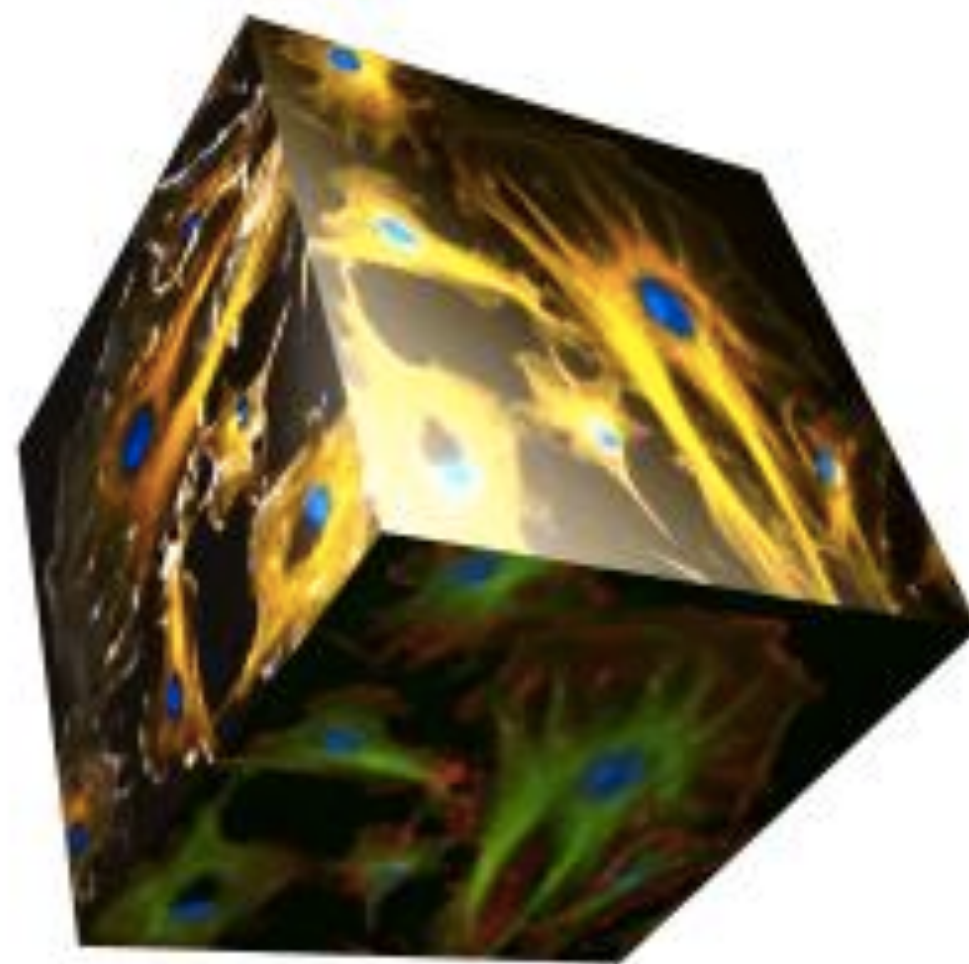
[Info & Links](#)

[FAQ](#)

[About Us](#)

**Vischeck [simulates](#) colorblind vision.**

**Daltonize [corrects](#) images for colorblind viewers.**



How do babies see the world? Visit [TinyEyes](#).

## User quotes:

I was browsing the net looking for a program that would define colours on my computer screen when I came across your site. I am myself totally colour blind and, although I try to be patient, I find it hard work trying to explain to people what it is like. I am going to bookmark your site and send it to





*“Good painting, good coloring, is comparable to good cooking.*

*Even a good cooking recipe demands tasting and repeated tasting while it is being followed.*

*And the best tasting still depends on a cook with taste.”*

*- Josef Albers*