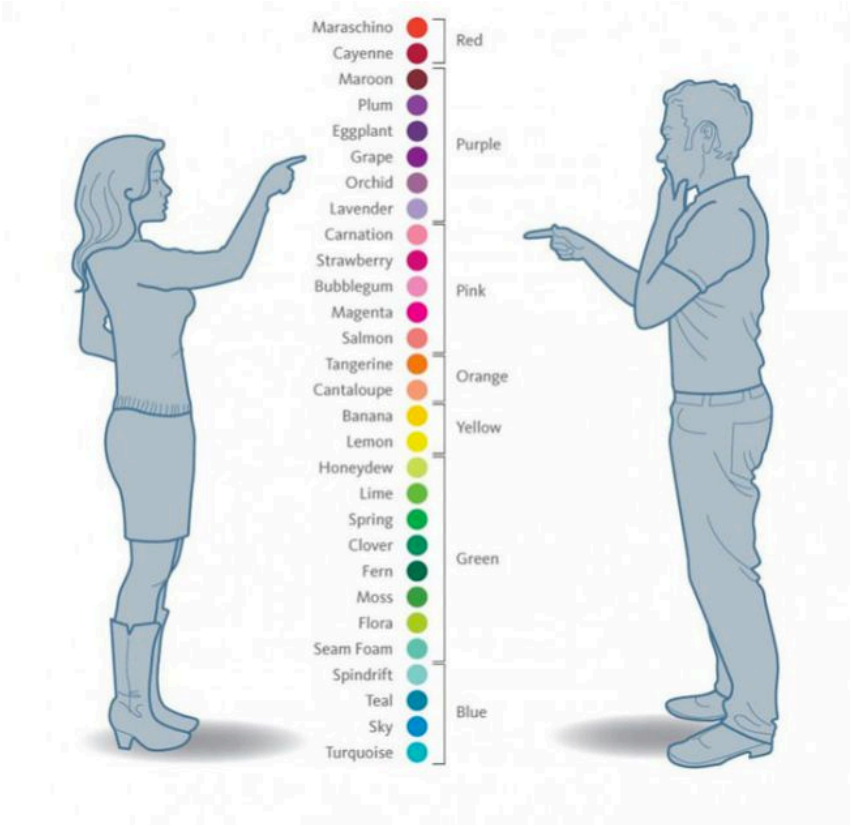
S. Rinzivillo – rinzivillo@isti.cnr.it

DATA VISUALIZATION AND VISUAL ANALYTICS

How many color?

Female



Male

Dog

Programmer

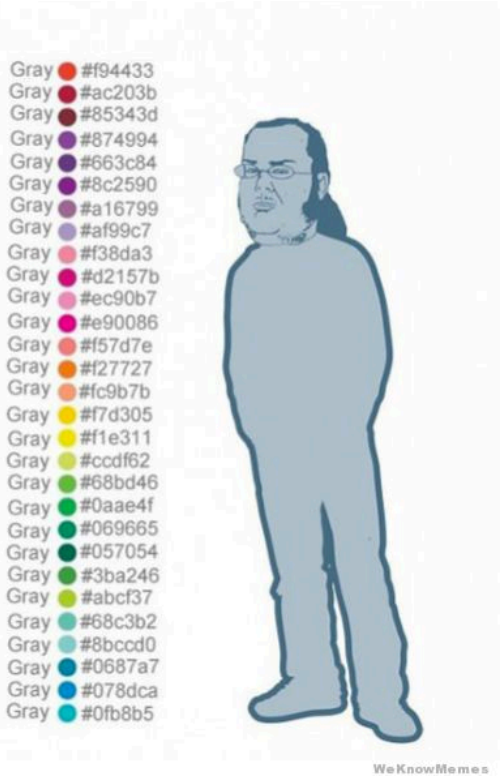


Photo Receptor Cells

- Two types of light sensitive cells
  - Rod Cells (~120M)
    - Provide low-light vision
    - Peripheral vision
    - Almost no role in color vision
  - Cone cells (~6M)
    - Provide normal vision
    - Three sub-types of cells
      - Sensitivity to different light wavelengths
      - Used for colored vision

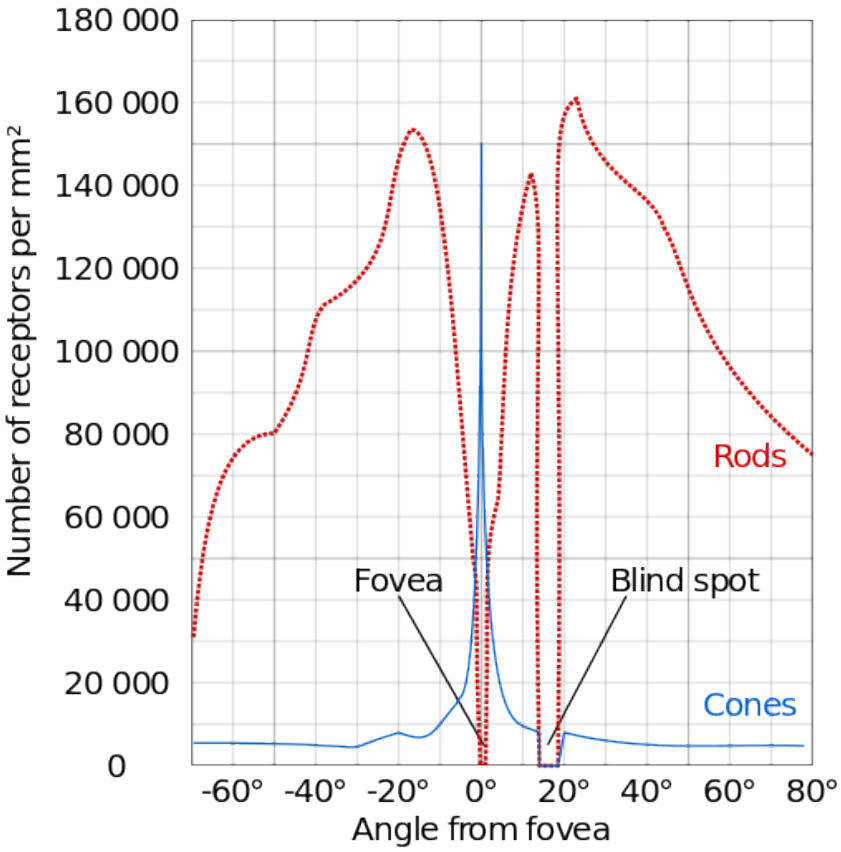
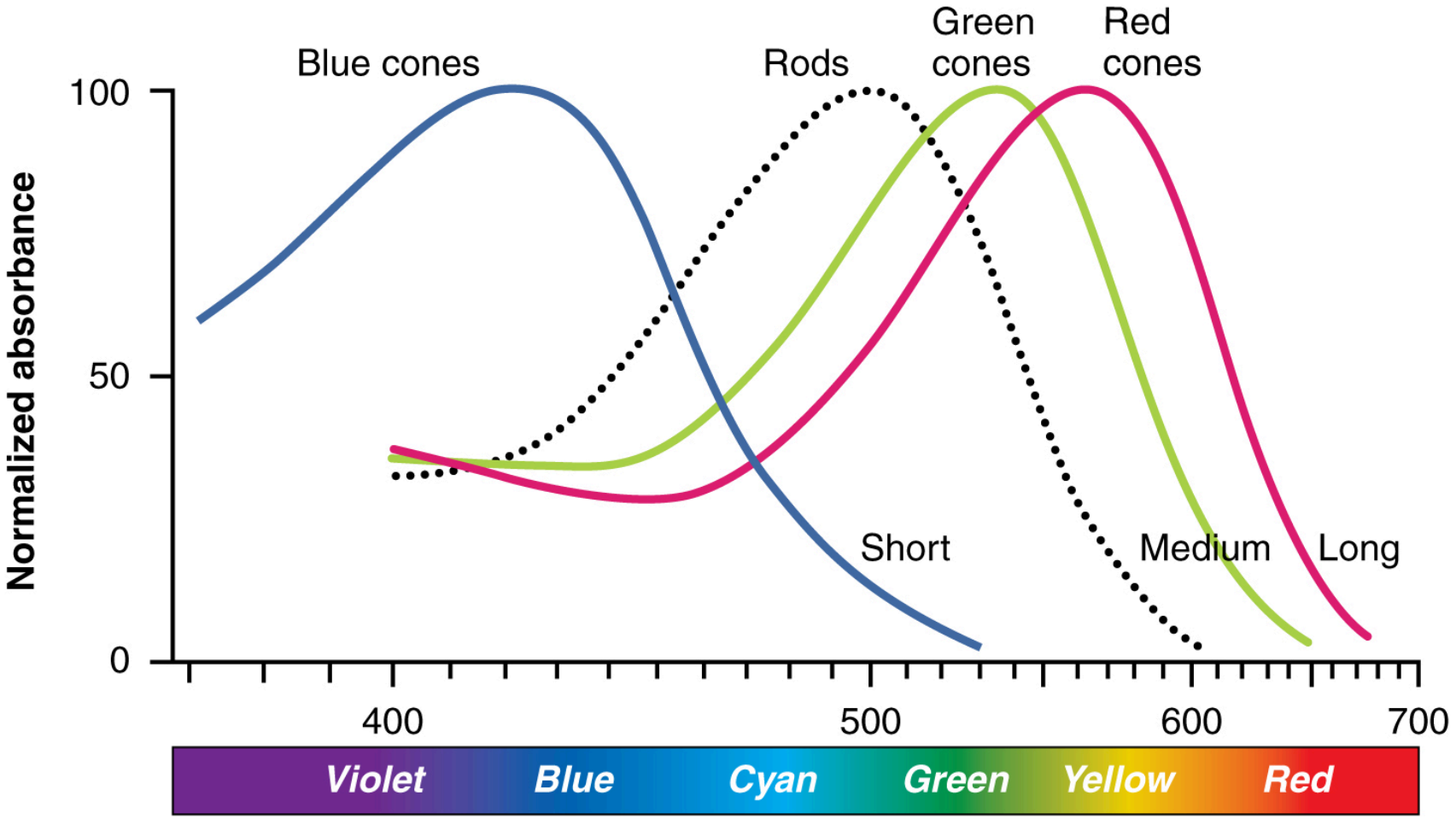


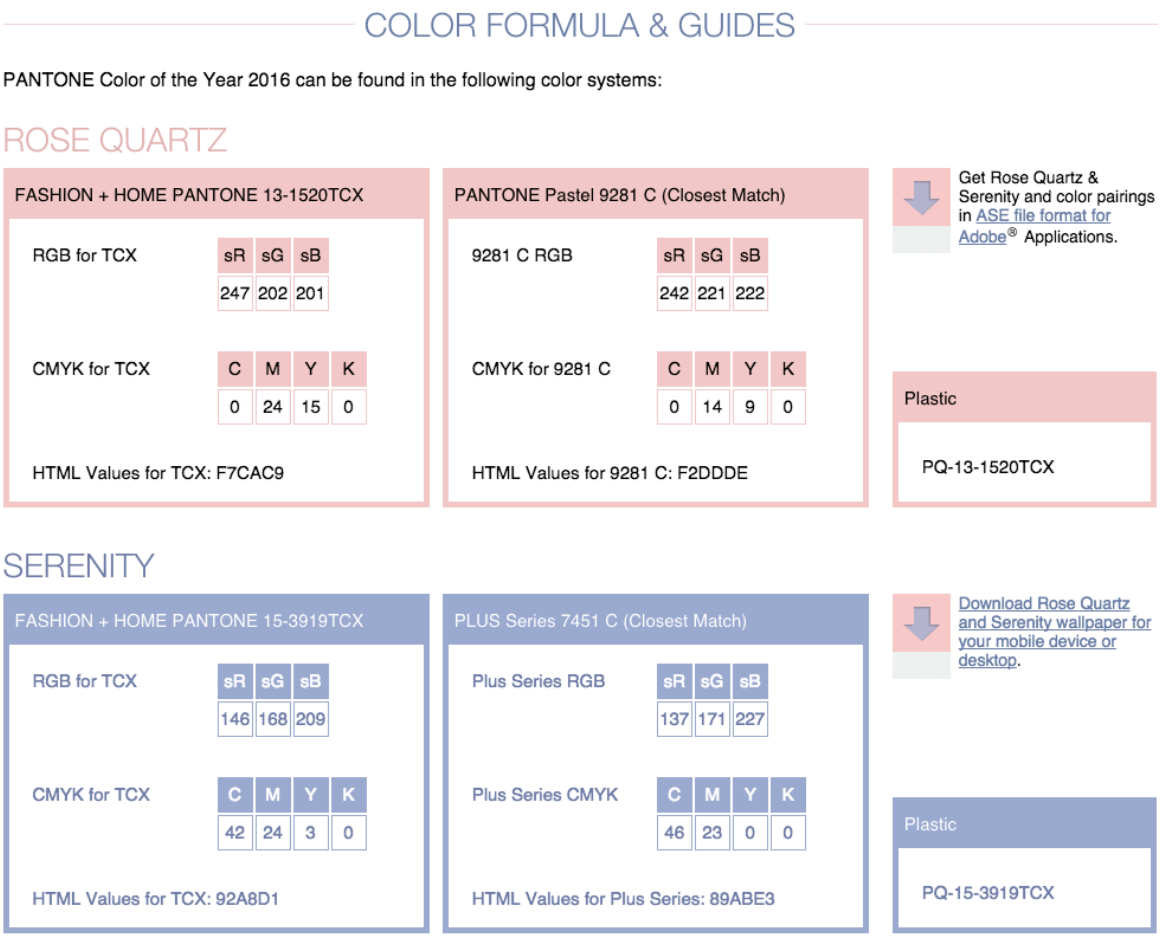
Photo Receptor Cells



Game #6

http://color.method.ac

Color of the Year: 2016



COLOR FORMULA & GUIDES

PANTONE Color of the Year 2016 can be found in the following color systems:

ROSE QUARTZ

FASHION + HOME PANTONE 13-1520TCX

RGB for TCX	sR	sG	sB
	247	202	201

CMYK for TCX	C	M	Y	K
	0	24	15	0

HTML Values for TCX: F7CAC9

PANTONE Pastel 9281 C (Closest Match)

9281 C RGB	sR	sG	sB
	242	221	222

CMYK for 9281 C	C	M	Y	K
	0	14	9	0

HTML Values for 9281 C: F2DDDE

Get Rose Quartz & Serenity and color pairings in ASE file format for Adobe® Applications.

Plastic

PQ-13-1520TCX

SERENITY

FASHION + HOME PANTONE 15-3919TCX

RGB for TCX	sR	sG	sB
	146	168	209

CMYK for TCX	C	M	Y	K
	42	24	3	0

HTML Values for TCX: 92A8D1

PLUS Series 7451 C (Closest Match)

Plus Series RGB	sR	sG	sB
	137	171	227

Plus Series CMYK	C	M	Y	K
	46	23	0	0

HTML Values for Plus Series: 89ABE3

Download Rose Quartz and Serenity wallpaper for your mobile device or desktop.

Plastic

PQ-15-3919TCX

Color of the year 2017

COLOR FORMULAS, GUIDES & STANDARDS

COLOR FORMULA & GUIDES

PANTONE Color of the Year 2017 can be found in the following color systems:

GREENERY

FASHION + HOME PANTONE 15-0343 TCX

RGB for TCX	sR	sG	sB
	136	176	75

CMYK for TCX	C	M	Y	K
	51	9	88	0

HTML Values for TCX: 88B04B

PANTONE 376 C (Closest Match)

PLUS Series RGB	sR	sG	sB
	132	189	0

PLUS Series CMYK	C	M	Y	K
	54	0	100	0

HTML Values for PLUS Series: 84BD00

Get Greenery in ASE file format for Adobe® Applications.

Plastic

PQ-15-0343 TCX

Color of the year 2019

INTRODUZIONE | STRUMENTI PER DESIGNER | PALETTE DI COLORI | ACQUISTA PANTONE LIVING CORAL | PARTNERS

Color Formula & Guides

Il Pantone Color of the Year 2019 è disponibile nei seguenti sistemi cromatici:

FASHION, HOME + INTERIORS (cotone)
PANTONE 16-1546 LIVING CORAL TCX

Simulazione CMYK per PANTONE 16-1546 TCX*:	C	M	Y	K
	0	65	54	0

Simulazione sRGB con l'indicatore di luminosità D65 per il PANTONE 16-1546 TCX:	sR	sG	sB
	255	111	97

HTML per il PANTONE 16-1546 TCX: FF6F61

PLUS SERIES (inchiostro)
PANTONE 2345 C

Simulazione CMYK per PANTONE 2345 C*:	C	M	Y	K
	0	59	50	0

Simulazione sRGB con l'indicatore di luminosità D65 per il PANTONE 2345 C:	sR	sG	sB
	255	109	112

HTML per il PANTONE 2345 C: FF6D70

FASHION, HOME + INTERIORS (plastica)
PQ-16-1546TCX

FASHION, HOME + INTERIORS (METALLIC SHIMMERS)
PANTONE 20-0056 TPM Coralessence

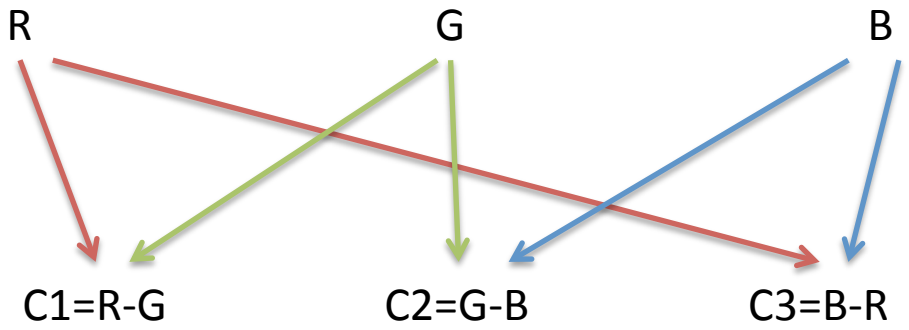
Procuratevi Living Coral nel formato file ASE per le applicazioni Adobe.

Color Model

- Young-Helmotz Theory (19th century)
  - Separate Red, Green, Blue receptors
  - Actually, three receptors type exist
    - Red and Green are located mainly in green-yellow zone
    - Sometimes named as Long, Medium, Short wavelength receptors
  - Eye present different proportions of R,G,B receptors (40:20:1)

Opponent Color Theory

- Based on estimation of opposite readings
  - red-green comparison
  - blue-yellow comparison
  - dark-light comparison



C1+C2+C3=0

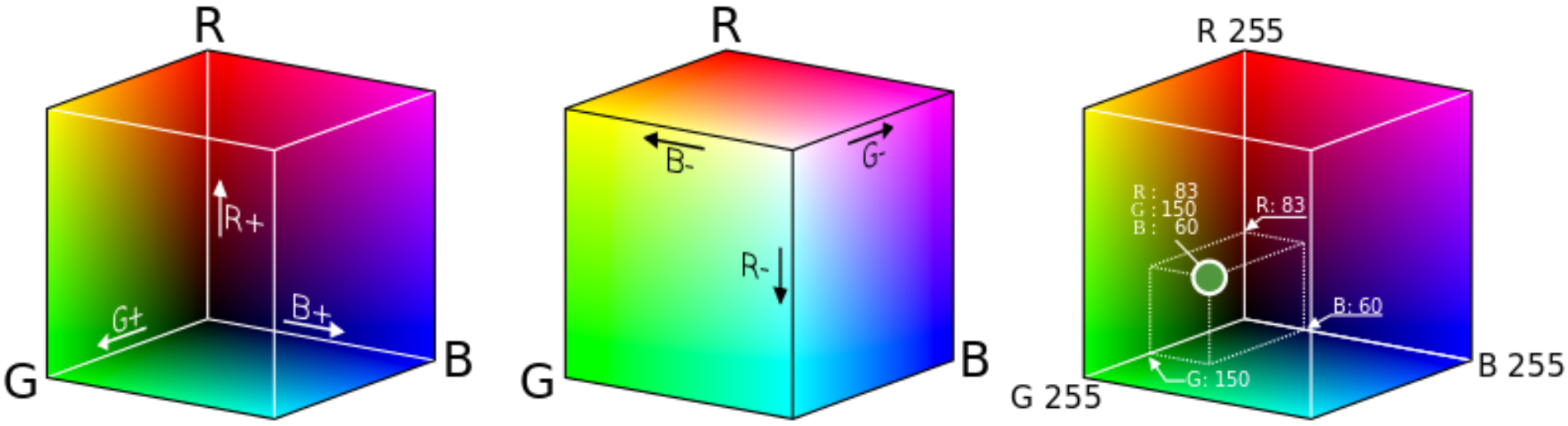
C1=R-G

C3-C2=B-R-G+B=2B-(R+G)

A = 2R+G+B/20

RGB Color Model

- Based on direct specification of three primary colors
- Additive model, each component is summed with the others



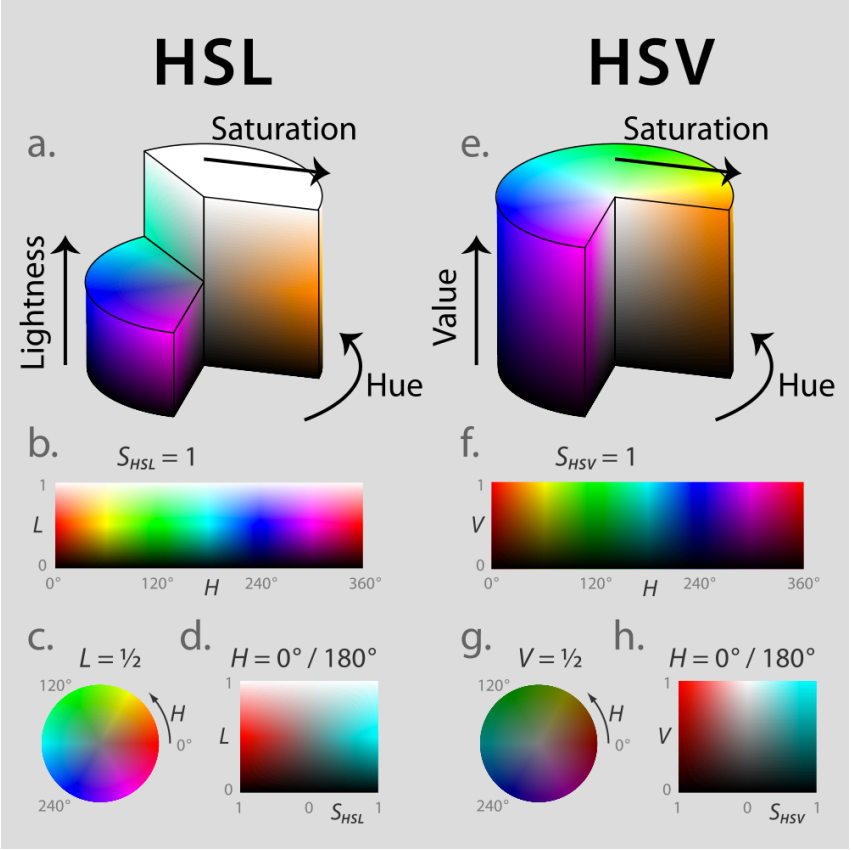
"RGB color cube" by User:Maklaan - Own workbased on:RGB_farbwuerfel.jpg by Horst Frank. Licensed under CC BY-SA 3.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:RGB_color_cube.svg#/media/File:RGB_color_cube.svg

RGB Color Model

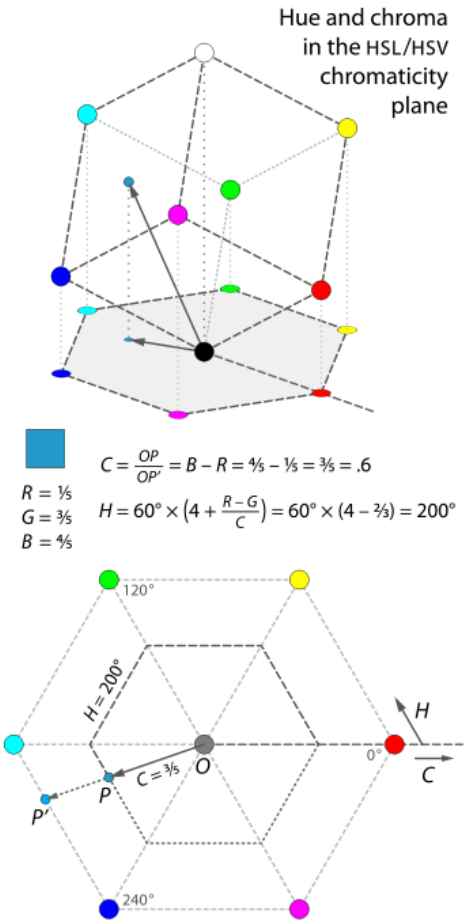
- R,G,B values may be expressed in range [0,1]
- Some applications use the range[0,255]
- Usually a hexadecimal notation is used for range [0,ff]
- Not really intuitive: how to define brown?

HSV Color Model

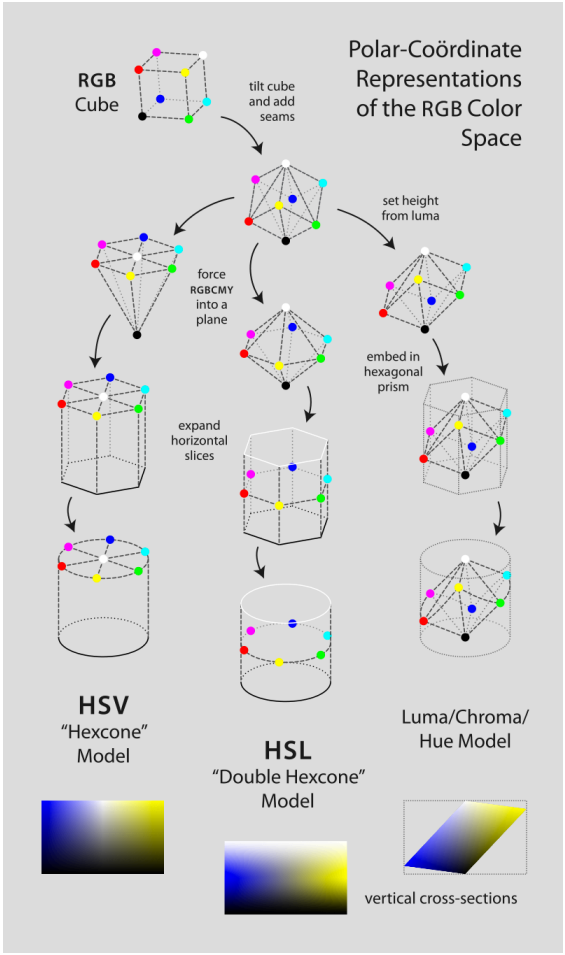
- Based on the intuitive concepts of
  - Hue
  - Saturation
  - Value
- Component values are expressed in ranges [0,1] or [0,255]



RGB and HSV



"HSL-HSV hue and chroma" by Jacob Rus - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:HSL-HSV_hue_and_chroma.svg#/media/File:HSL-HSV_hue_and_chroma.svg



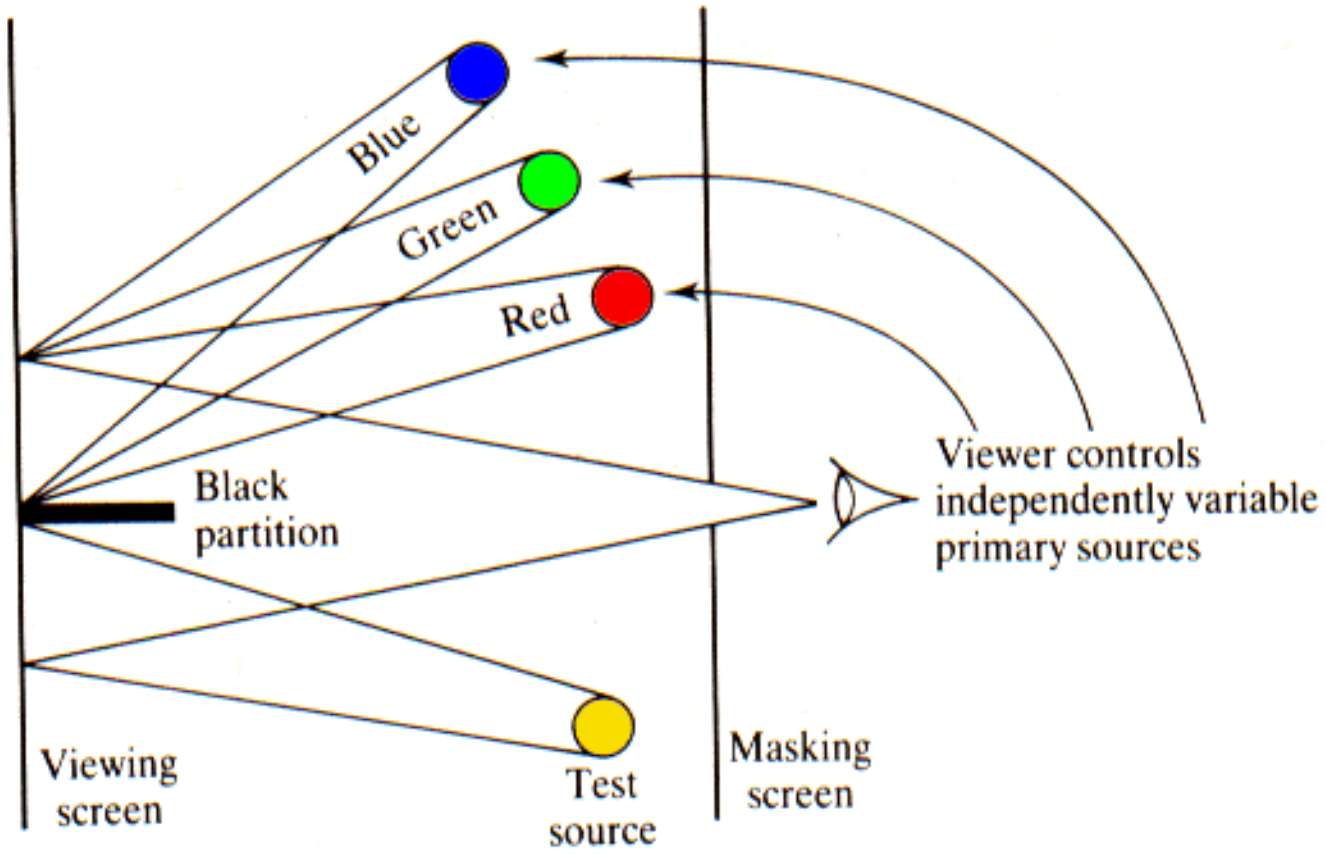
"Hsl-and-hsv" by Jacob Rus - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:Hsl-and-hsv.svg#/media/File:Hsl-and-hsv.svg

COLOURIMETRY

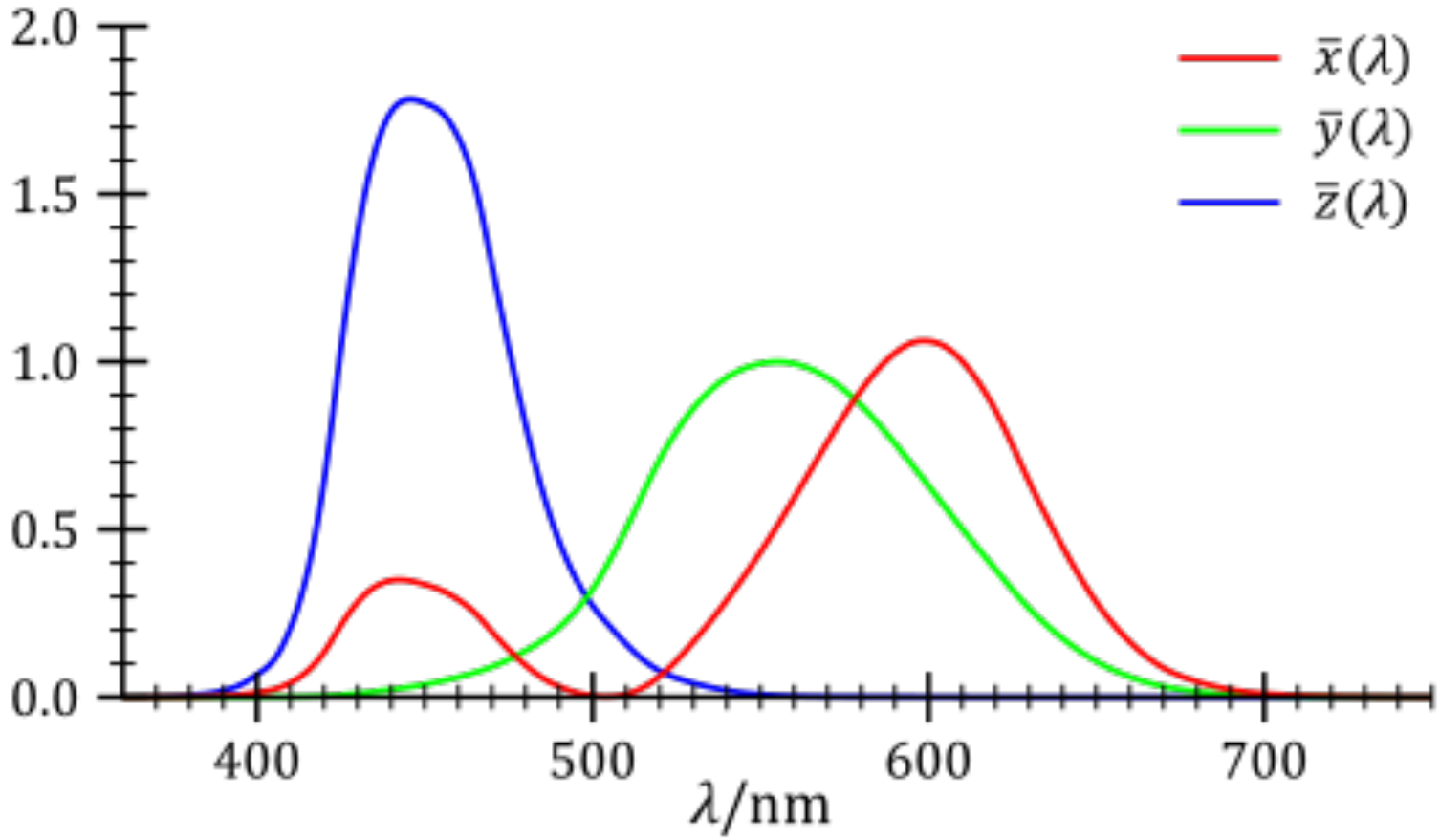
CIE Standard Observer

- CIE: International Commission on Illumination
- Definition of an objective color-mapping function:
  - Standard colorimetric observer
- Experiment
  - An observer is positioned in front of a bipartite screen
  - Observer can manipulate intensities of three primary color beams
  - Task:match the reference color

Standard Observer Experiment

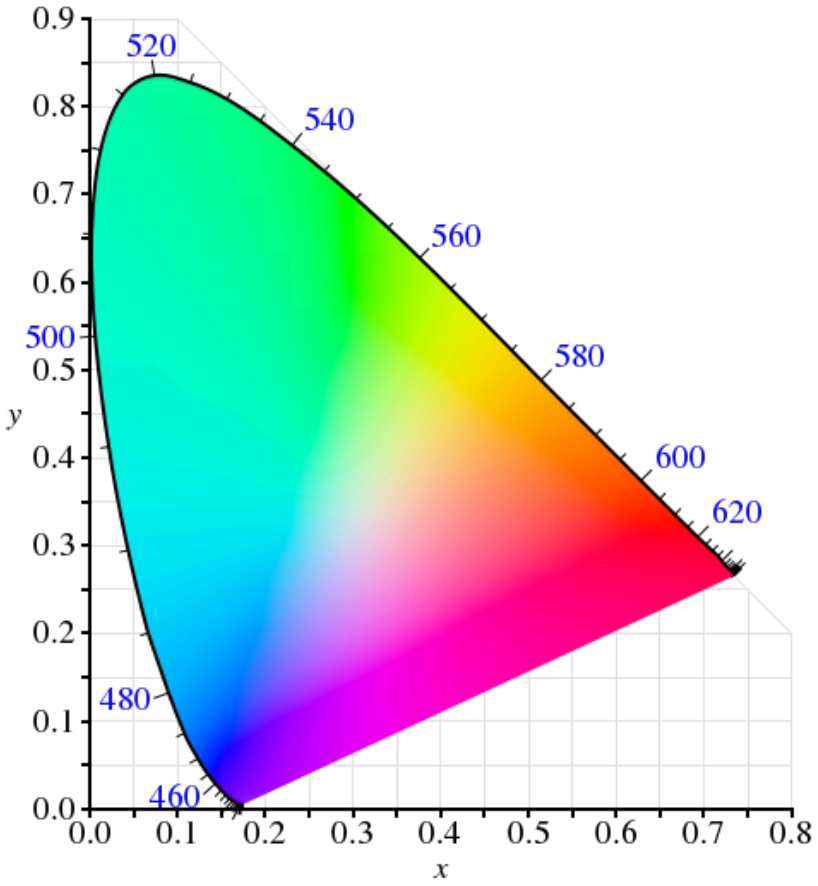


Color Matching Functions: imaginary primary colors



"CIE 1931 XYZ Color Matching Functions" by User:Acdx - Own work. Licensed under GFDL via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:CIE_1931_XYZ_Color_Matching_Functions.svg#/media/File:CIE_1931_XYZ_Color_Matching_Functions.svg

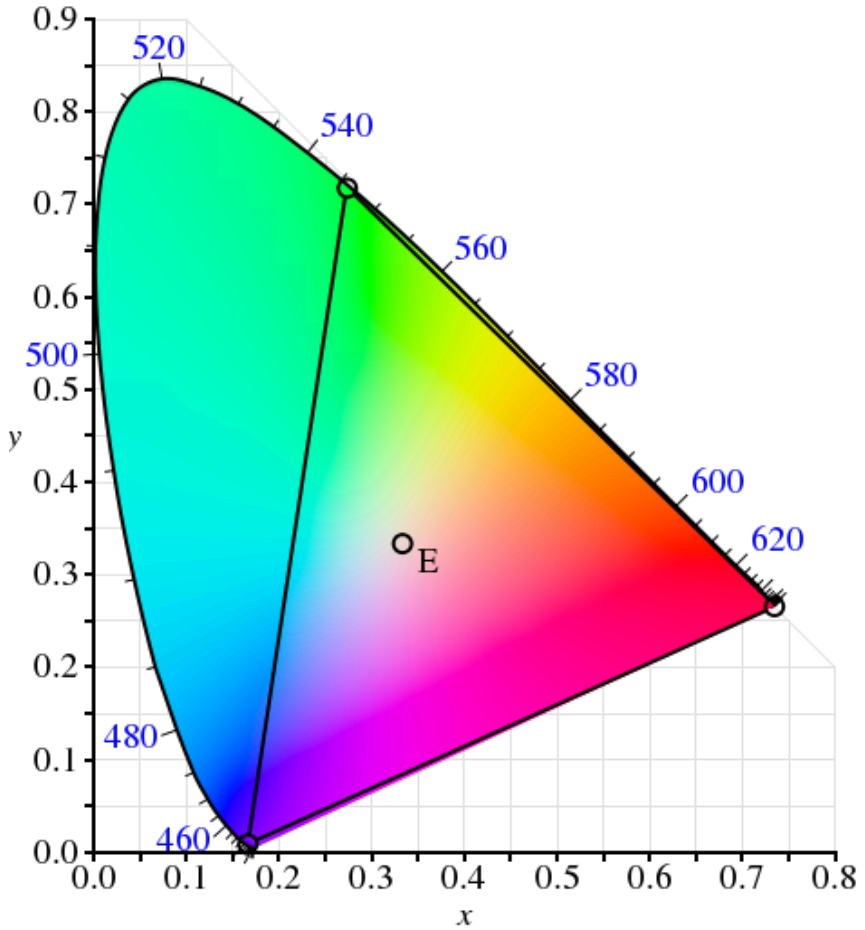
Chromaticity Diagram



- A mixture of two colors lies on the line connecting the two colors
- Chromaticity Diagram (gamut) is convex
- All visible colors are non-negative combination of x, y, and z
- An equal combination of two colors does not lie in the mid-point

Color Mixing

- Given three primary colors, the corresponding triangle cannot cover the whole gamut

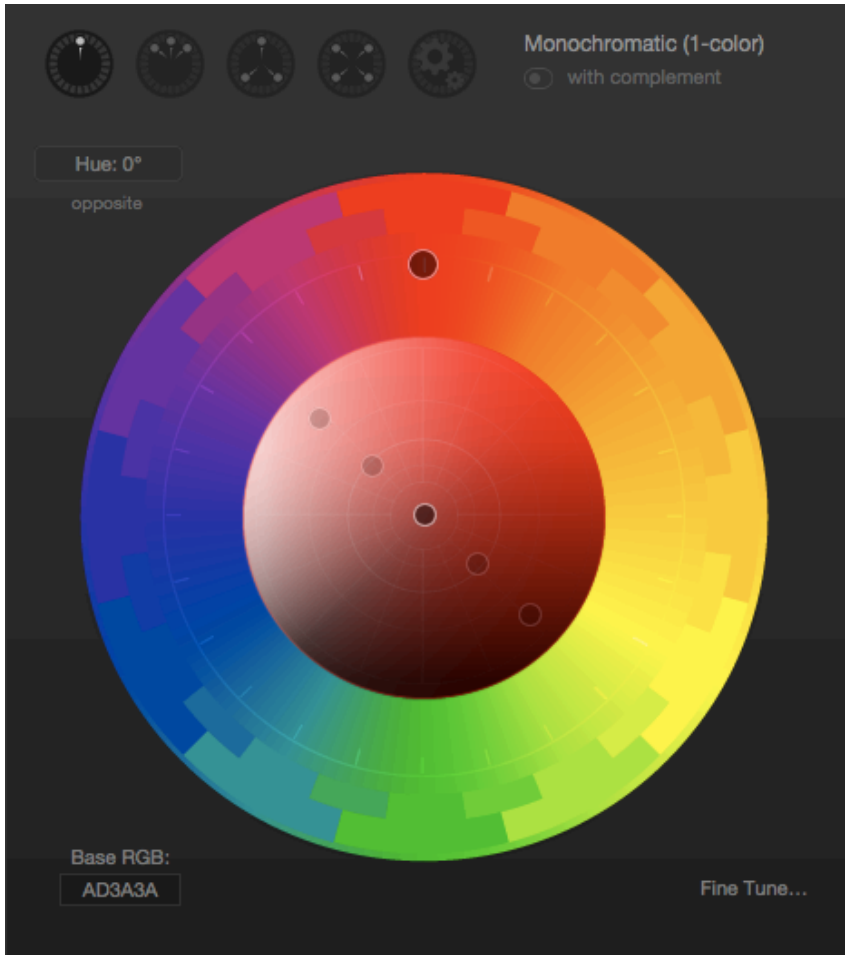


"CIE1931xy CIERGB" by BenRG - Own work, inspired by File:CIExy1931.png. Licensed under Public Domain via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:CIE1931xy_CIERGB.svg#/media/File:CIE1931xy_CIERGB.svg

PALETTE

Color Schemes

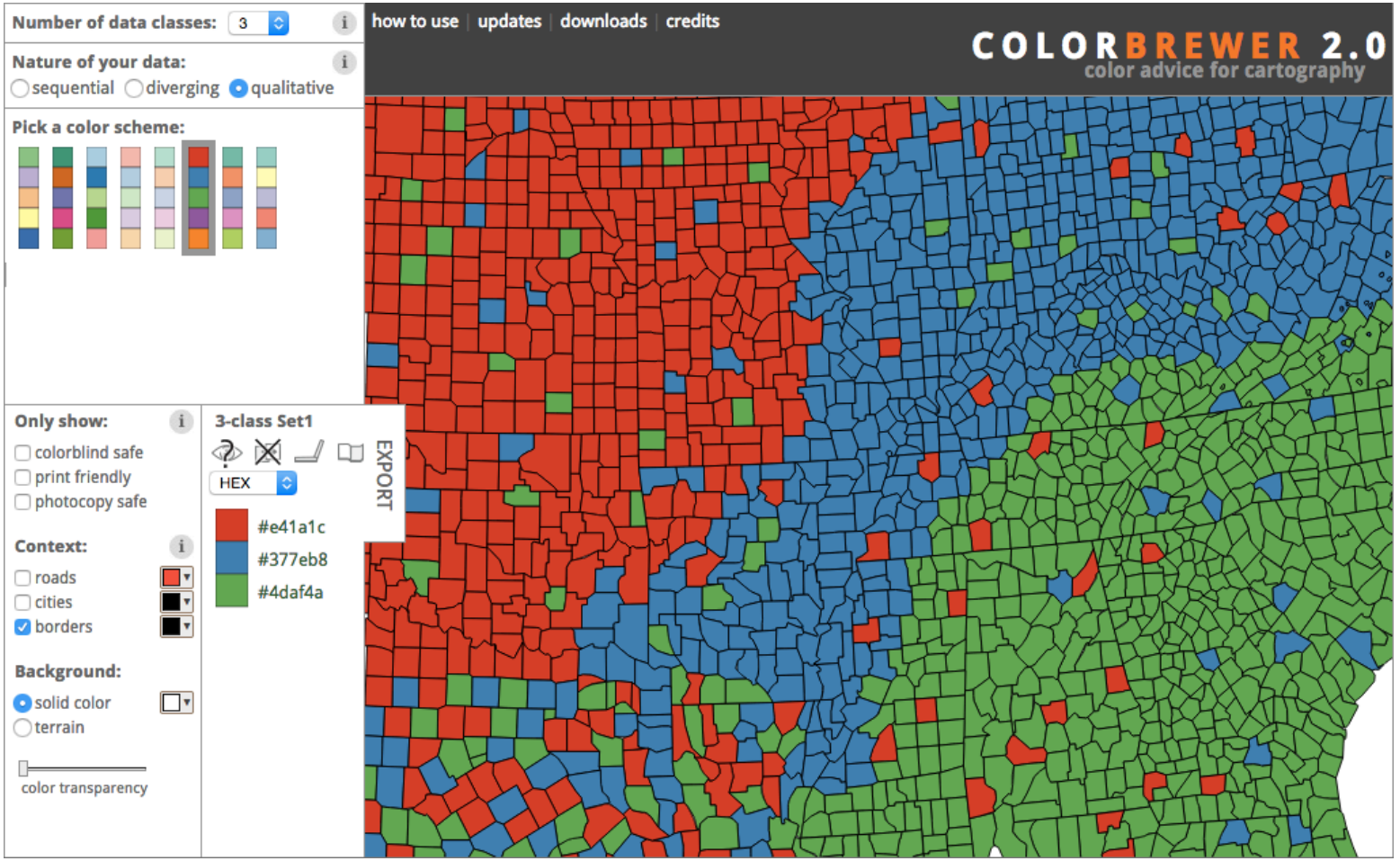
Cold colors



Warm colors

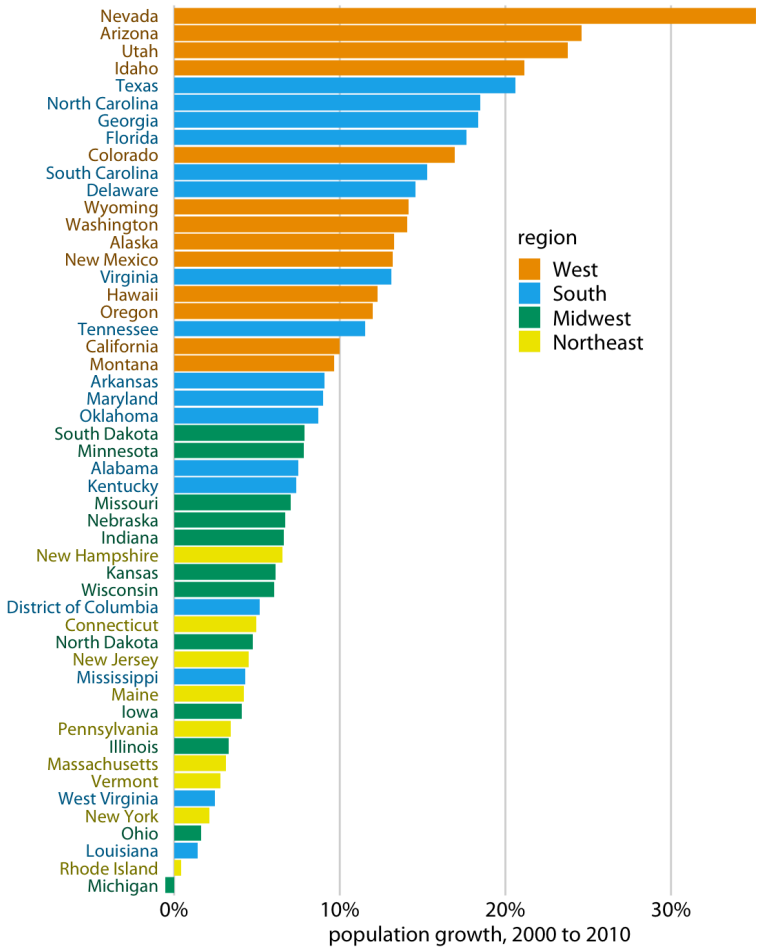
http://paletton.com/

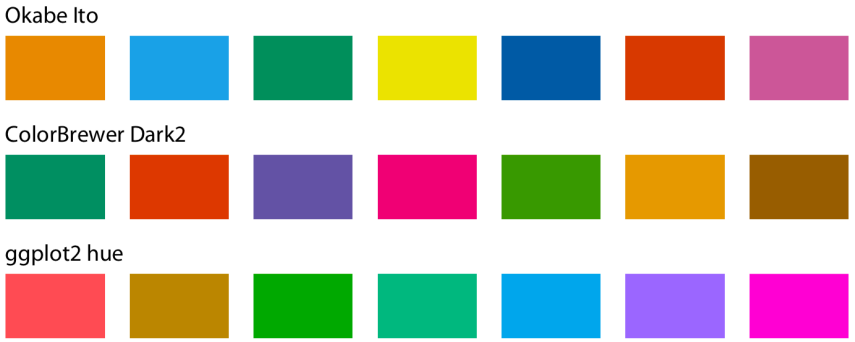
Color Schemes for Cartography



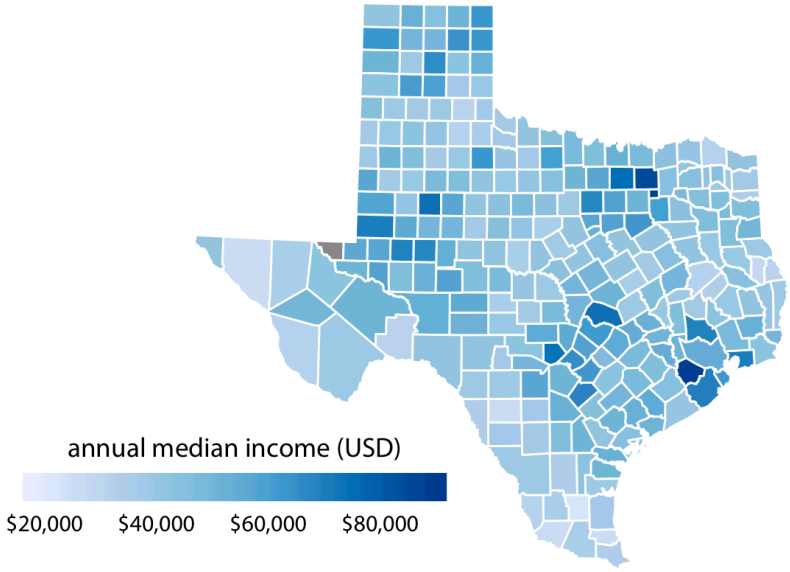
http://colorbrewer2.org/

Color scheme example (nominal)

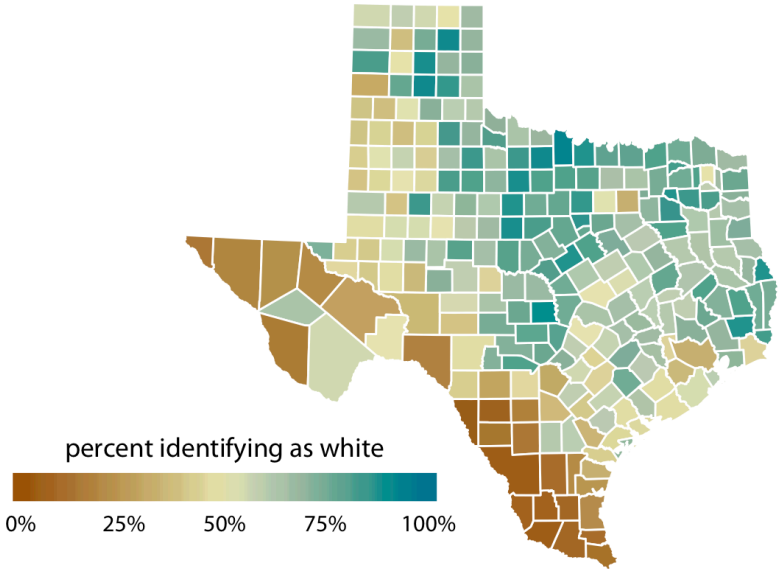


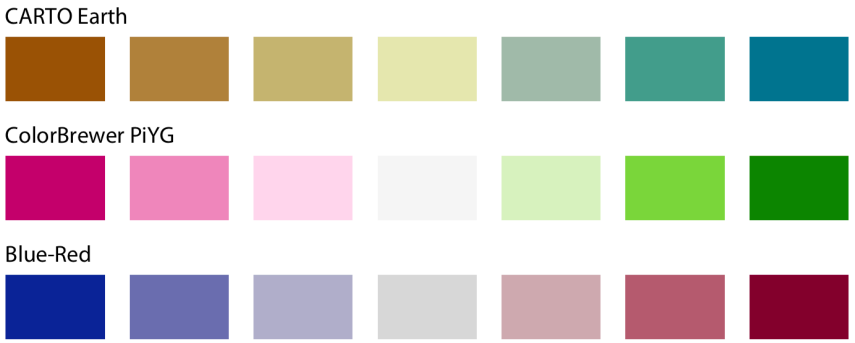


Color scheme example (sequential)



Color scheme example (divergent)





Takeaway Messages

- Different color models and encodings
- Color palettes to represent scales of values