



Design and Color I



GEOG380 FA 2018

Contents

- ▶ **Design and Color**
 - ▶ Color perception and theory
 - ▶ Color models
 - ▶ Cartographic conventions
 - ▶ Design strategies



Design and Color

- ▶ **A continuing theme from Map Design I and Map Design II**
 - ▶ Map elements and map layout
 - ▶ Design principles
 - ▶ Gestalt principles, visual hierarchy, contrast, visual balance, internal organization



Now, about color

- ▶ Seeing is believing – color: powerful but complicated



RED
GREEN
BLUE
RED
YELLOW
GREEN
BLUE
RED
BLUE
YELLOW

Color theory and practice

“Color in thematic mapping is perhaps the most fascinating and least understood of the design elements”

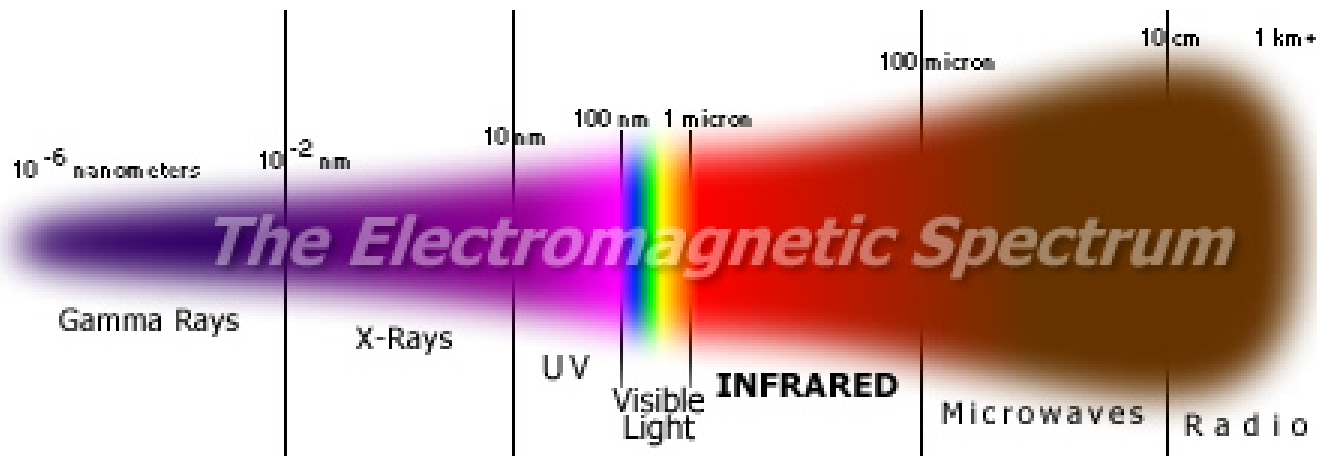
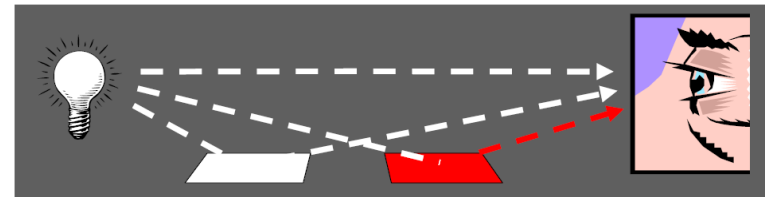
B. Dent, 1999

- ▶ Color is **subjective** rather than objective
- ▶ It is almost impossible to set color rules ... and still we try.



What is seeing?

- ▶ We pick up any emitted or reflected visible electromagnetic waves and “see” them as colors
- ▶ Depends on
 - ▶ Light source (sun, lamp, candle...)
 - ▶ A reflecting object (material)
 - ▶ Eye-brain system of the viewer



What is color? – Color models

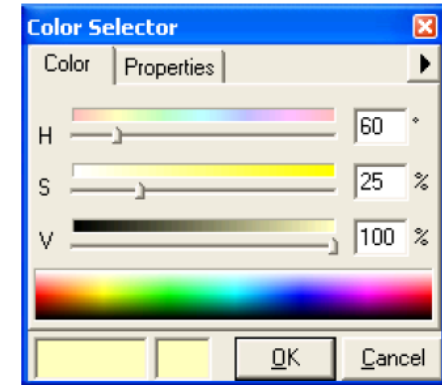
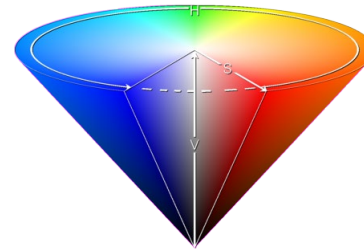
- ▶ **Perceptual color systems**
 - ▶ Ex. HSV (hue, saturation, value), Munsell
- ▶ **Process color systems**
 - ▶ For commercial printing
 - ▶ Ex. CMYK
 - ▶ For computer monitor
 - ▶ Ex. RGB
- ▶ **Predefined color systems**
 - ▶ Ex. “Spot”-color, the PANTONE® system color-guide sets
 - Ex) metallic, fluorescent, or varnish colors



Color models – perceptual systems

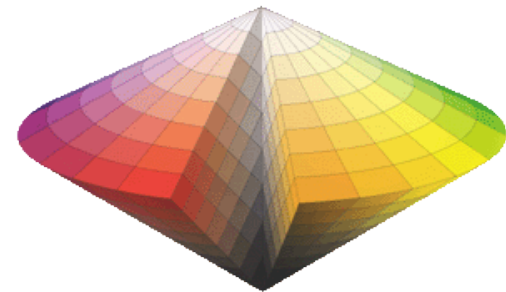
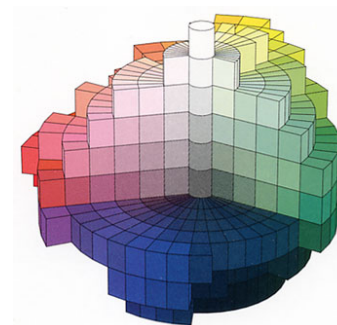
▶ Hue, saturation, value (HSV)

- ▶ Hue (color) distributed 0-360°
- ▶ Saturation (pigment) 0-100%
- ▶ Value (lightness) 0-100%



▶ Munsell, Ostwald

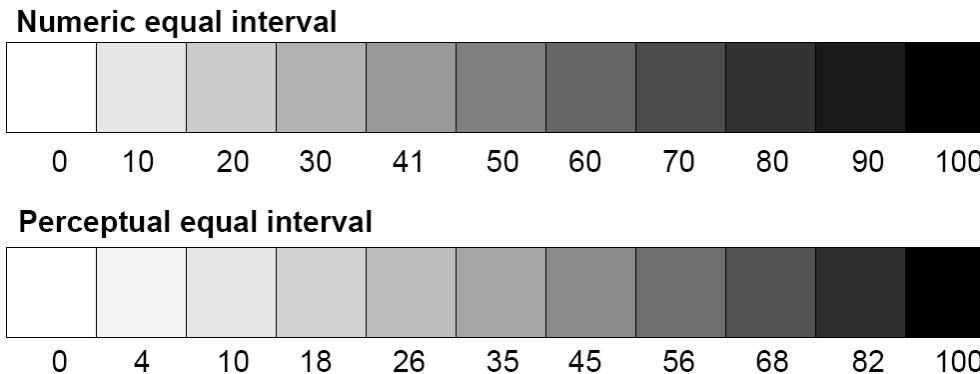
- ▶ Similar to HSV, but more user-oriented
- ▶ Each color is perceptually different (ex. next slide)
- ▶ One step “equally” different



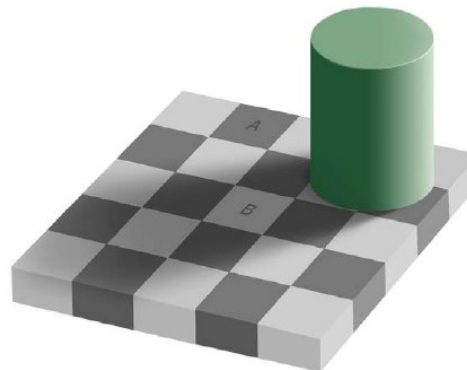
(sources: http://andrewharvey4.files.wordpress.com/2009/08/450px-hsv_color_cone.png, Slocum et al. 2009,
http://3.bp.blogspot.com/_jNfLasUQDFg/R4sP2suLg4I/AAAAAAAAAgU/joKqubbLKbA/s400/munsell.jpg,
[http://3.bp.blogspot.com/_UvYtTQ2owUw/SwVW_NcSCA2I/AAAAAAAAAGE/ZI-l dxXiH70/s320/c_ostwald\[1\].gif](http://3.bp.blogspot.com/_UvYtTQ2owUw/SwVW_NcSCA2I/AAAAAAAAAGE/ZI-l dxXiH70/s320/c_ostwald[1].gif).)

Perceptual effects

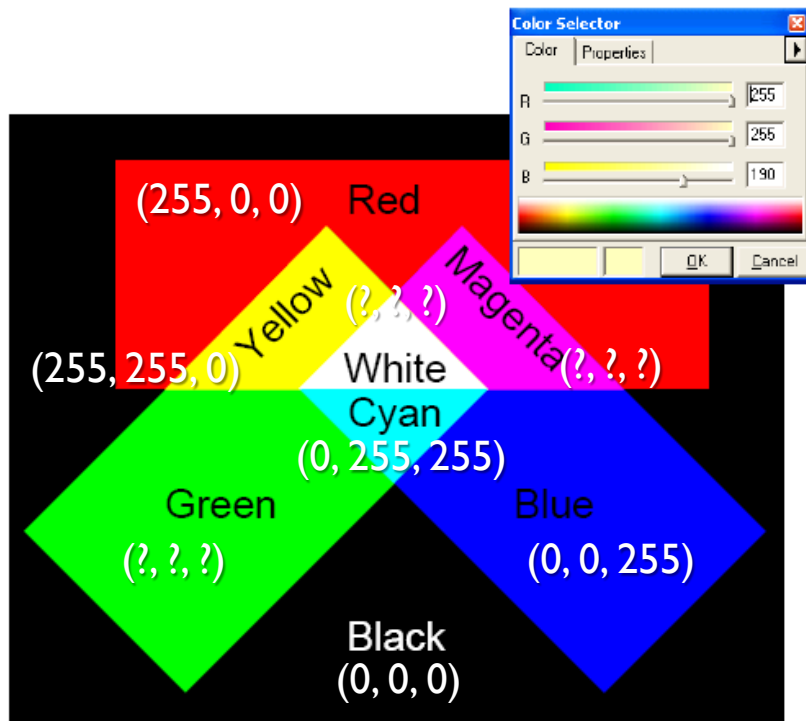
- ▶ Determine a gray scale **based on perception**



- ▶ The simultaneous contrast illusion
 - ▶ Surrounding colors affect perception of areas

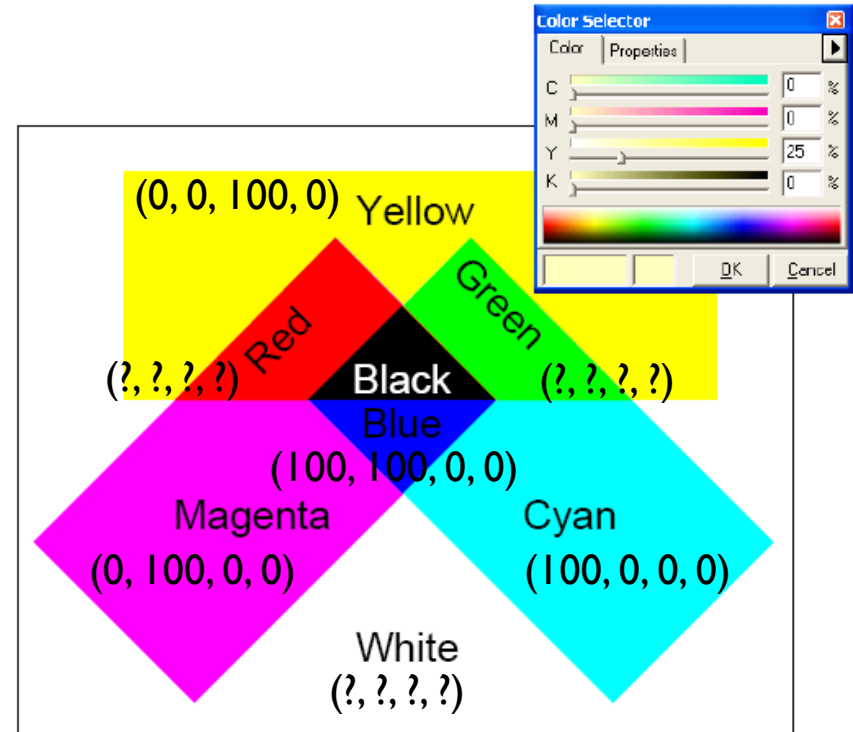


Color models – process systems



Additive colors (RGB)

(start adding from black: 0, 0, 0)

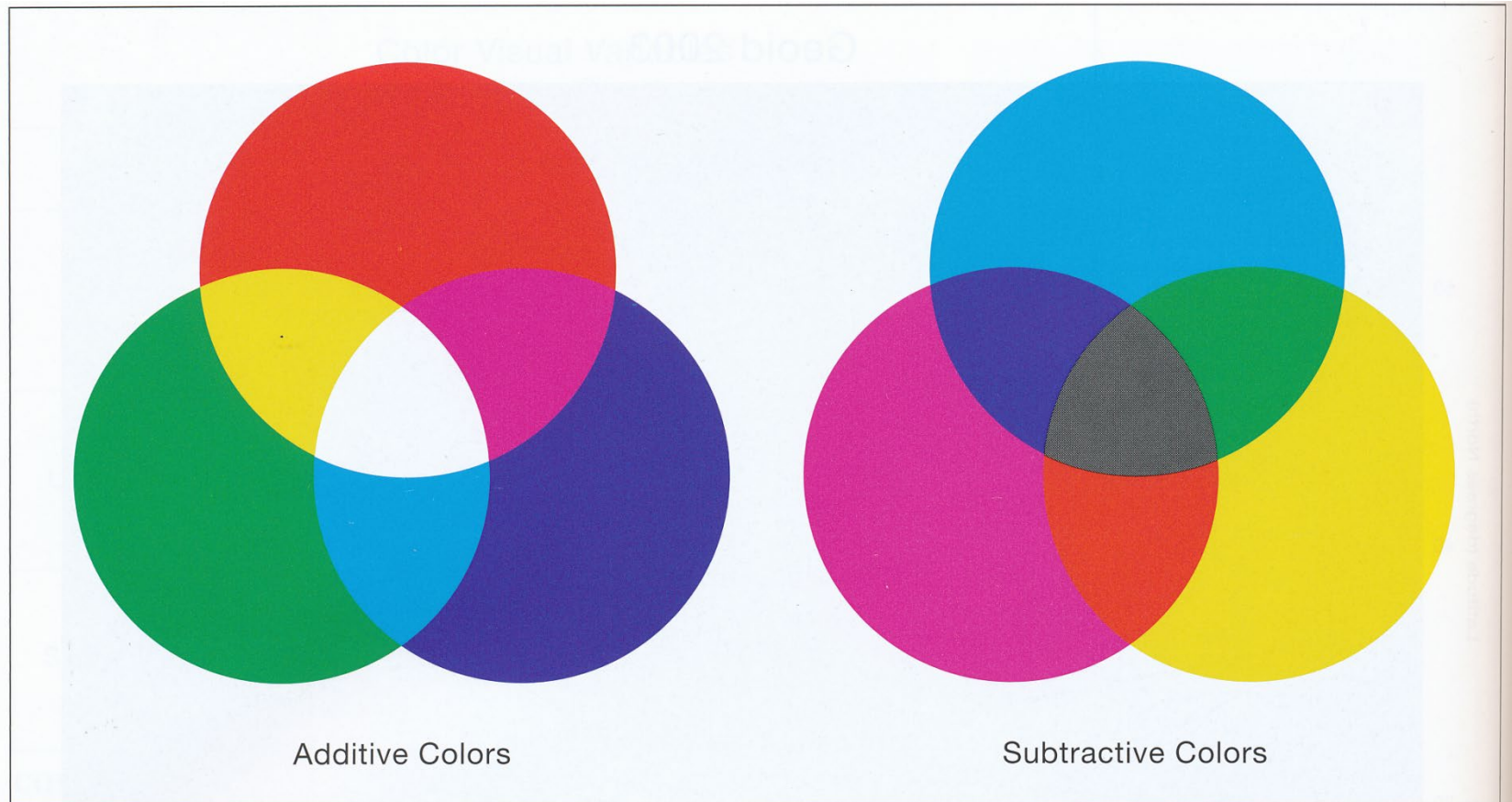


Subtractive colors (CMYK)

(start subtracting from black: 100, 100, 100, 100)

- These are either mixed or dithered

Color models – RGB vs. CMYK

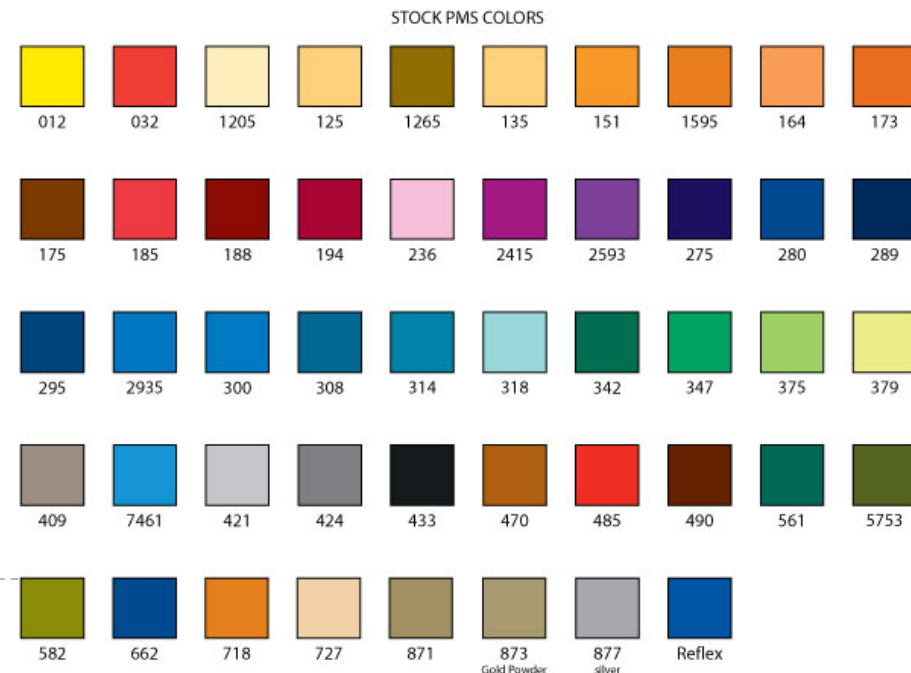


COLOR PLATE 10.1 Principles of additive and subtractive color. For additive color, overlapping red, green, and blue lights reveal how cyan, magenta, yellow, and white can be created. For subtractive color, the reverse is the case: cyan, magenta, and yellow combine to produce red, green, blue, and black. To obtain a true black with subtractive colors, it is often necessary to add a black layer.

So, it is CMY"K"

Color models – spot colors

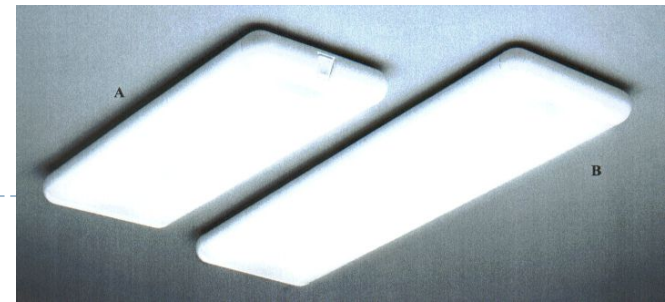
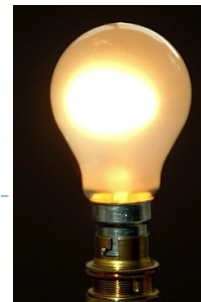
- ▶ Should give you *WYSIWIP*, or
*What You Select Is What Is **Printed***
- ▶ No dithering → **less impact** of screen-matching mistakes
 - ▶ E.g., washed-out colors on a screen due to a projector and/or lighting
- ▶ Can produce **special colors**
 - ▶ E.g., metallic gold, silver, and neon-like colors
- ▶ **PANTON** color system



▶ ([source: http://www.giftvipcards.com/vipcardpricing.asp](http://www.giftvipcards.com/vipcardpricing.asp))

Some guidelines – light source

- ▶ Same printed-color will look different when viewed under **different conditions**
- ▶ Light source
 - ▶ Intensity
 - ▶ **Low-intensity**: use intense, saturated colors
 - ▶ **High-intensity**: use less intense, less saturated colors
 - ▶ Incandescent vs. fluorescent lights
 - ▶ Look critically under lighting conditions similar to what your **target audience** will have
 - E.g., presentation using a projector and a screen



Some guidelines – map surface

- ▶ Paper type
 - ▶ Glossy paper – bring out colors intense, vibrant
 - ▶ Matte paper – makes colors less intense, dulled
- ▶ Media
 - ▶ Computer monitor
 - ▶ makes colors intense, vibrant
 - ▶ usually does not rely on reflection
 - ▶ Projector
 - ▶ can be unpredictable
 - ▶ depends on the projector
 - ▶ relies on neutral reflection

▶ <http://colorbrewer.org> could be helpful for more guidelines and tips

Color associations?

▶ What do you think about when you see:

▶ Red:



▶ Blue:










▶ Black:



▶ White:



Some color connotations

-  ▶ **Yellow** – cheerfulness, dishonesty, youth, light, hate, cowardice, brightness, warning
-  ▶ **Red** – action, life, blood, heat, passion, danger, power, anger, excitement, warning
-  ▶ **Blue** – coldness, serenity, truth, purity, depth, restraint, formality
-  ▶ **Orange** – harvest, fall, middle life, abundance, fire, attention, warning
-  ▶ **Green** – immaturity, youth, spring, envy, greed, ignorance, peace, subdued
-  ▶ **Black** – mystery, strength, mourning, heaviness
-  ▶ **White** – cleanliness, faith, purity, sickness

Qualitative conventions

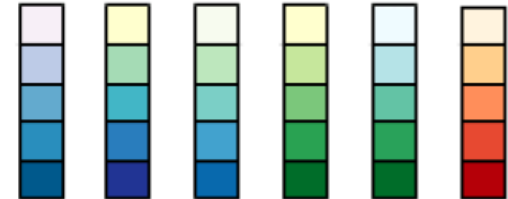
- ▶ **Blue** for water
- ▶ **Red** = warm, **Blue** = cold temperature
- ▶ **Yellow** and **Tan** for dry and sparse vegetation
- ▶ **Brown** for land surfaces, also contours
- ▶ **Green** for thick, lush vegetation





Quantitative suggestions

- ▶ Binary color scheme
 - ▶ One hue and lightness step
 - ▶ Ex. is or not
- ▶ Qualitative color scheme
 - ▶ Hues of similar lightness
 - ▶ Ex. state names
- ▶ Sequential color scheme
 - ▶ Lightness of grays
 - ▶ Lightness of one hue
 - ▶ Lightness with spectral transition
 - ▶ Ex. age
- ▶ Diverging color scheme
 - ▶ Two hues diverging from midpoint
 - ▶ Ex. temperature



- ▶ Example: https://www.washingtonpost.com/news/wonk/wp/2016/04/11/the-dirty-little-secret-that-data-journalists-arent-telling-you/?tid=sm_fb

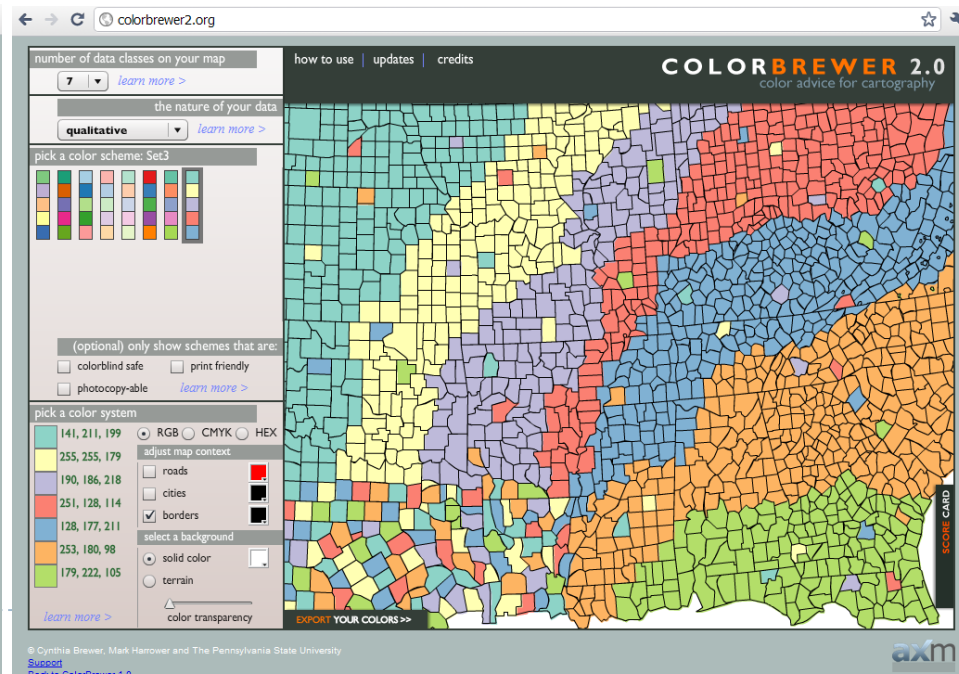
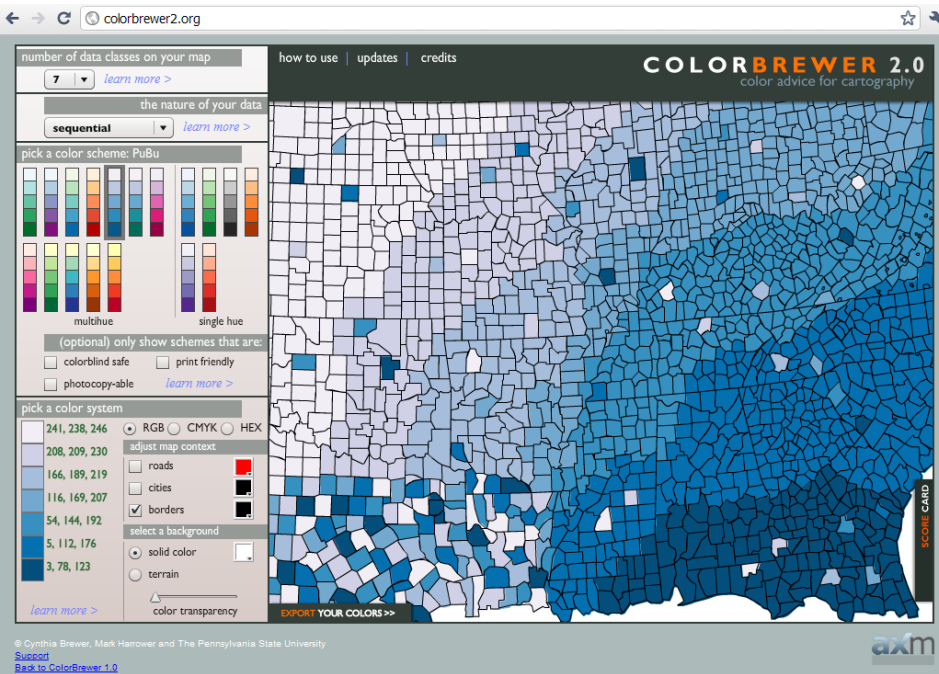
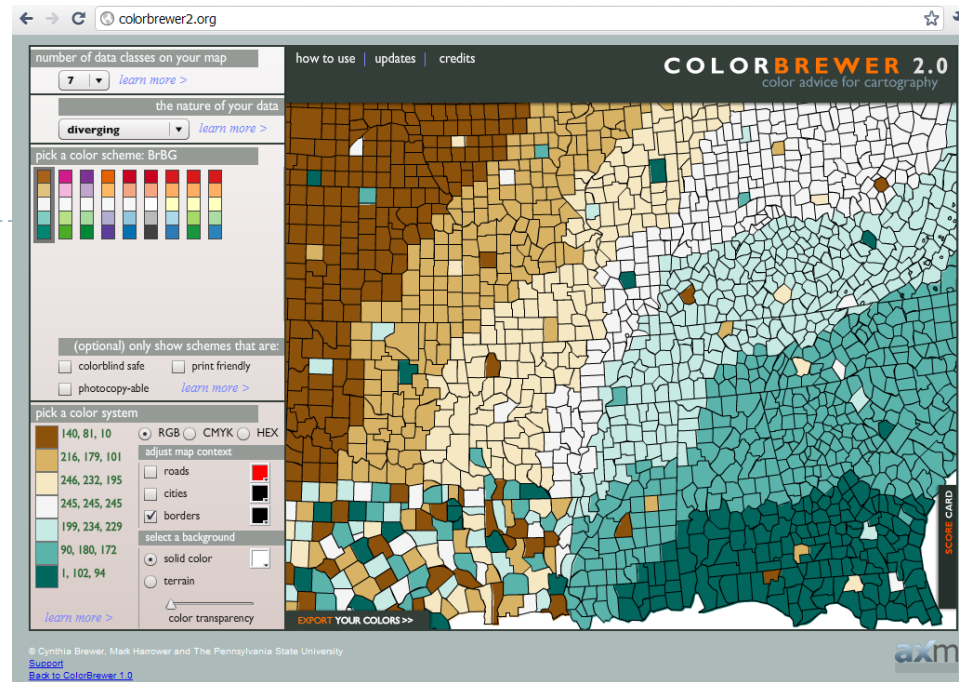


Exercise

► Colorbrewer

<http://colorbrewer2.org/>

- Try various number of classes, nature of data, color schemes, etc.



Group Activity

- ▶ Form a group with 2~3 people around you.
- ▶ Find a good/bad example map for each of qualitative, sequential, and diverging schemes.
- ▶ Share your group's findings with other groups.



Summary

- ▶ **Map elements combine to make a useful map**
 - ▶ Design, color, and typography
 - ▶ Require appropriate selection and use of Title, Legend, Orientation, Explanatory Text, Scale, Source, Inset / Location Map, Borders
- ▶ **Map layout**
 - ▶ Optical center, eye movement, sightlines, balance
- ▶ **Questions?**



For next time...

- ▶ Reading
 - ▶ Ch. 10 & 18

