

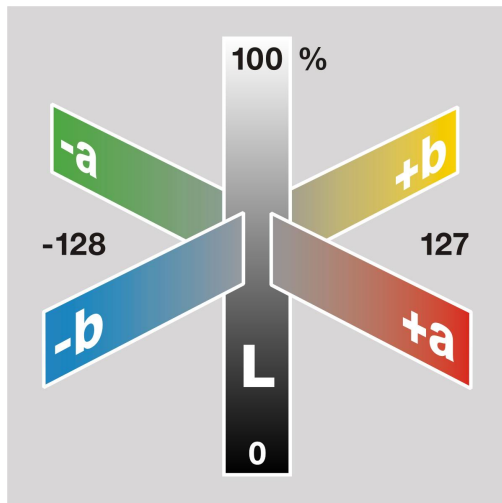
Perceptions of Matplotlib colormaps

Kristen M. Thyng

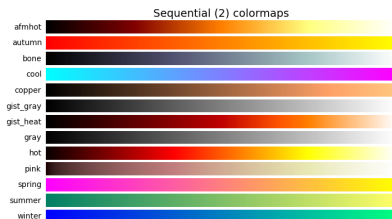
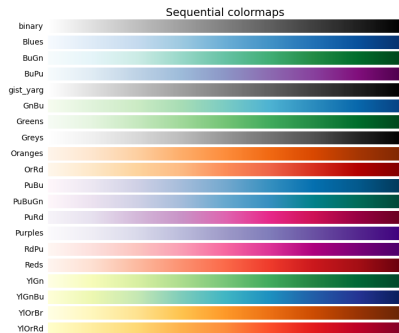
Texas A&M University

July 10, 2014

CIELAB Color Model

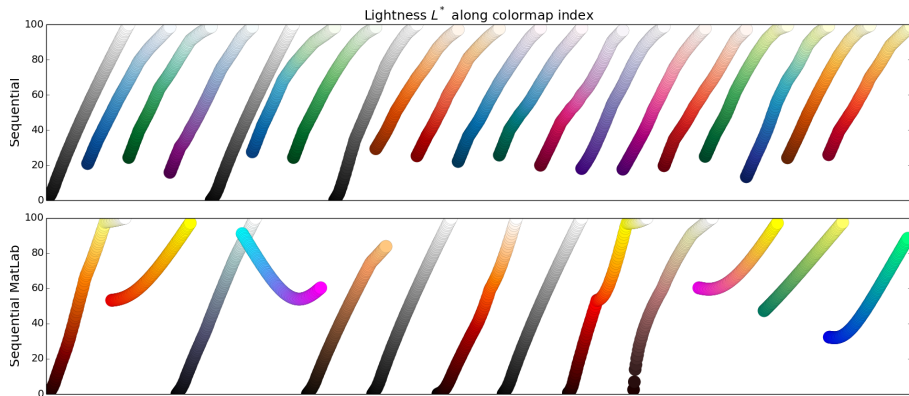


Lightness of matplotlib Colormaps

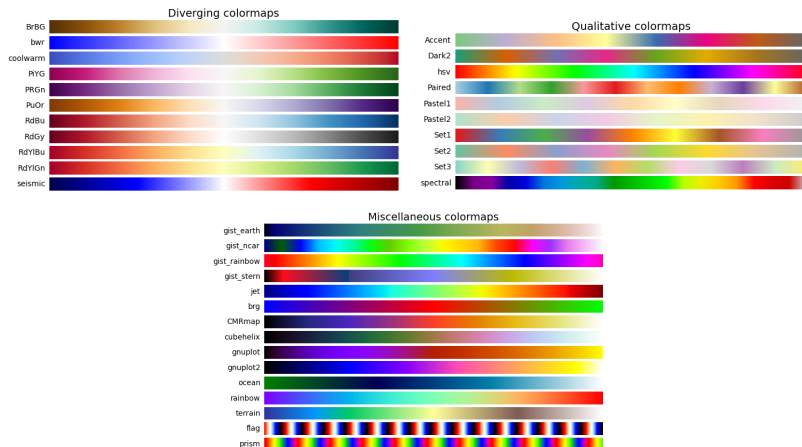


http://matplotlib.org/examples/color/colormaps_reference.html

Lightness of matplotlib Colormaps

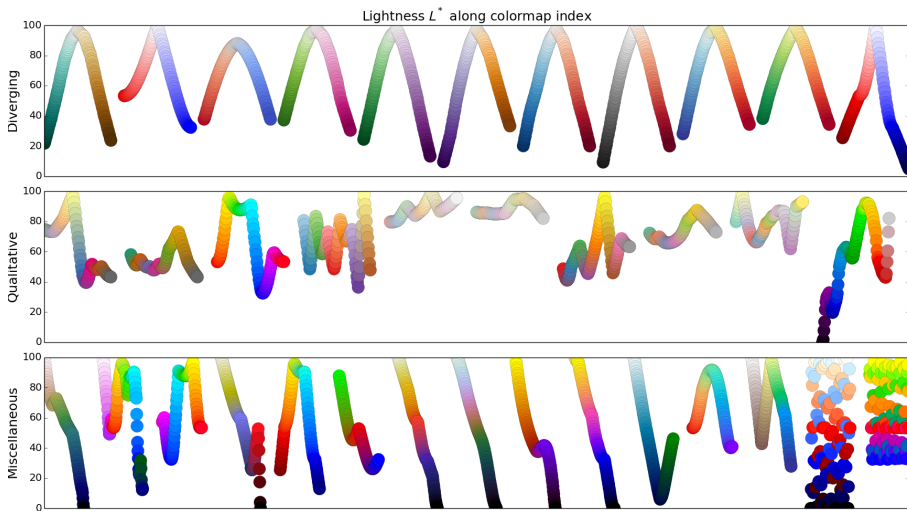


Lightness of matplotlib Colormaps

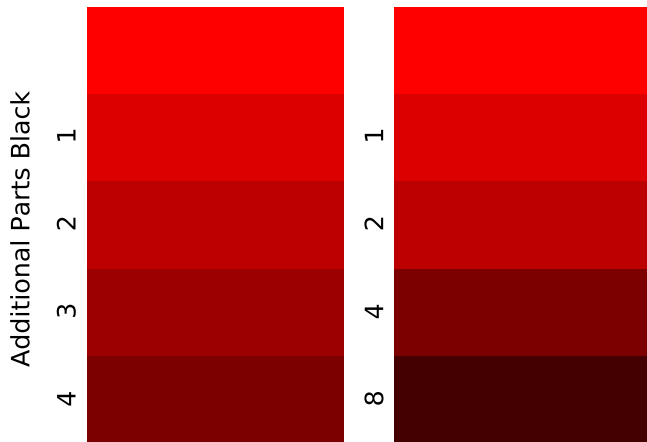


http://matplotlib.org/examples/color/colormaps_reference.html

Lightness of matplotlib Colormaps

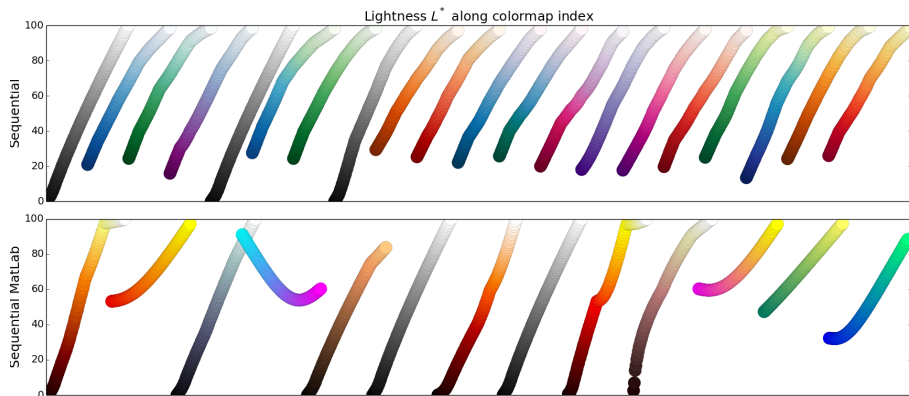


Perceived Lightness: Weber-Fechner Law (and Stevens)

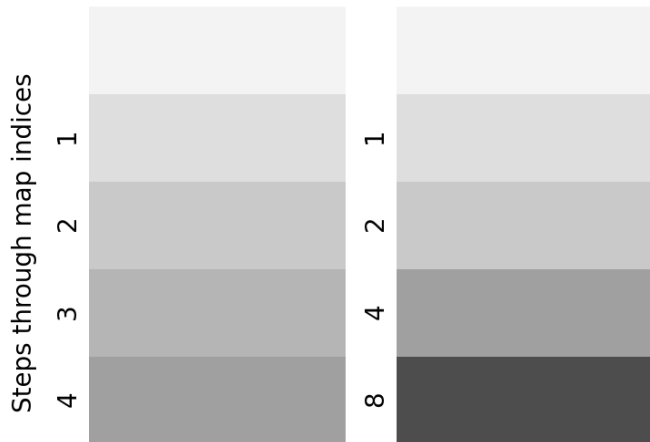


Albers, J. (1975). Interaction of color. Yale University Press.

Improvement to Binary Colormap?



Improvement to Binary Colormap?



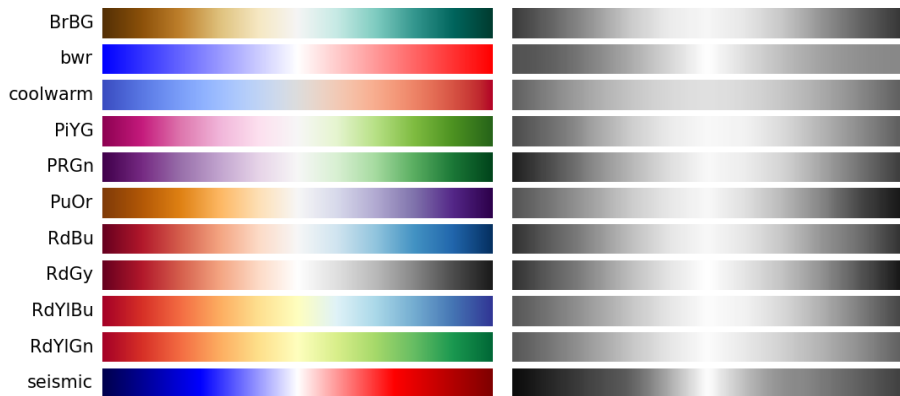
Printing to Grayscale

- Lots of ways to convert to grayscale
- $\text{Gray} = (\text{Red} * 0.2126 + \text{Green} * 0.7152 + \text{Blue} * 0.0722)$ (or similar*)
- Use luminance

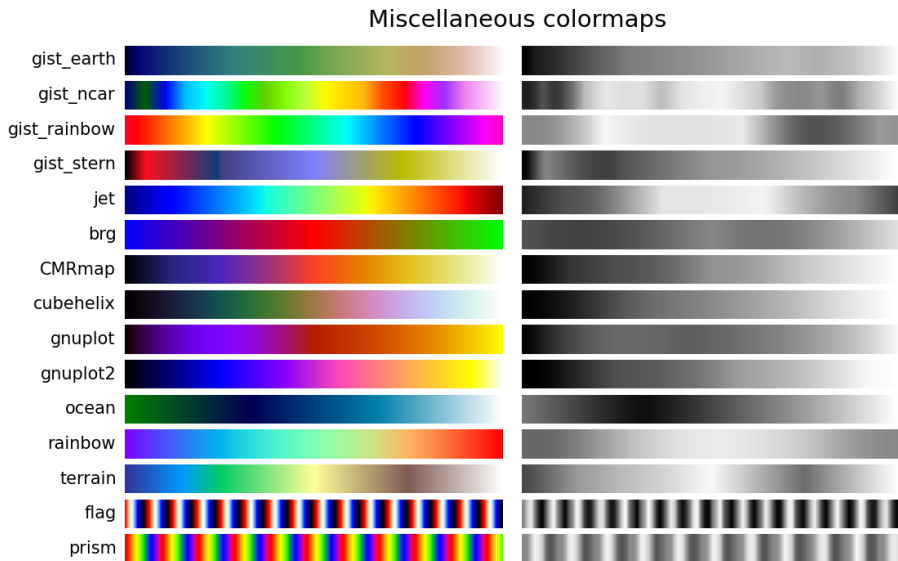
* <http://www.tannerhelland.com/3643/grayscale-image-algorithm-vb6/>

matplotlib Colormaps in Grey Scale

Diverging colormaps

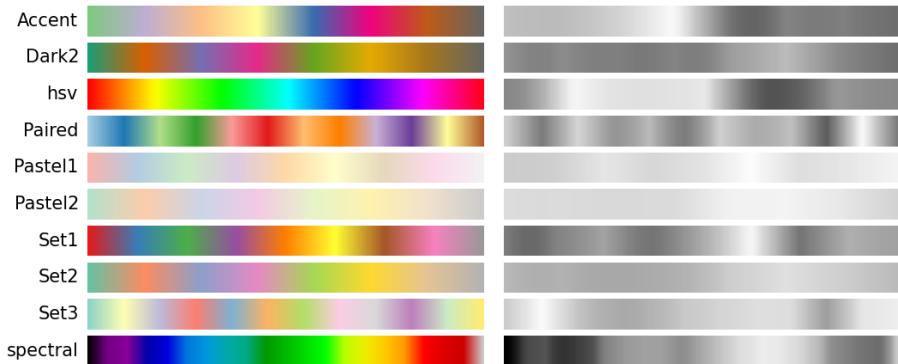


matplotlib Colormaps in Grey Scale

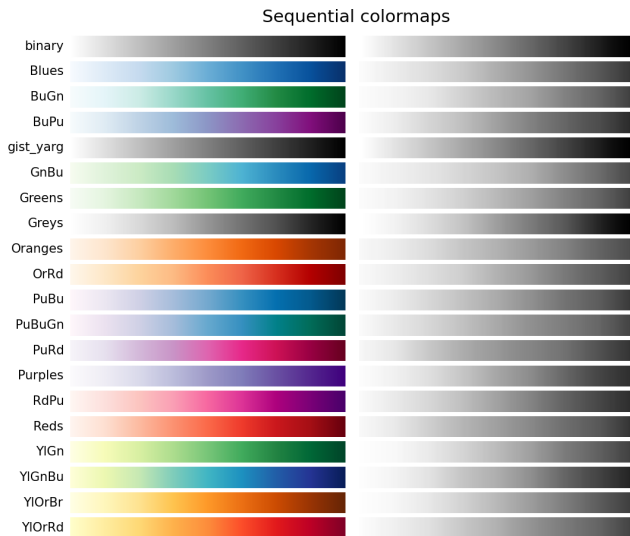


matplotlib Colormaps in Grey Scale

Qualitative colormaps

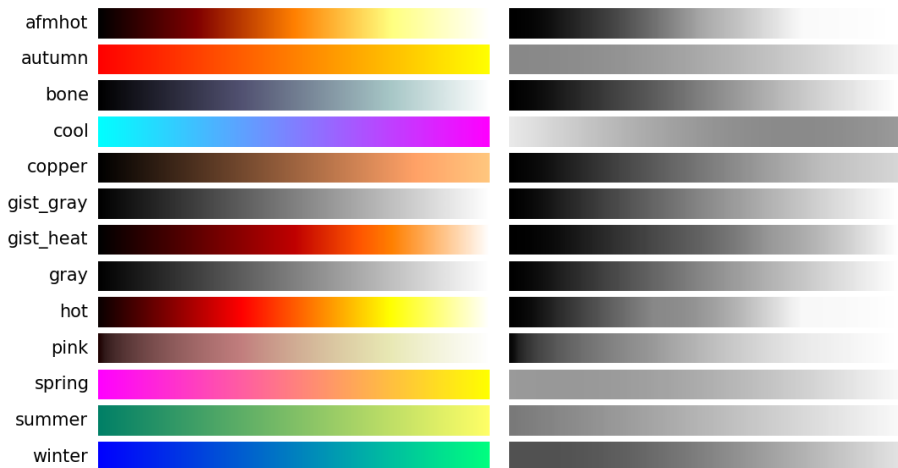


matplotlib Colormaps in Grey Scale



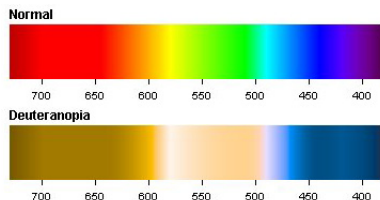
matplotlib Colormaps in Grey Scale

Sequential (2) colormaps

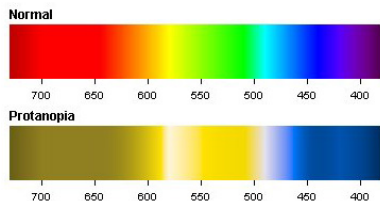


Color Blindness

Protanopia (2% male population, half mild form)

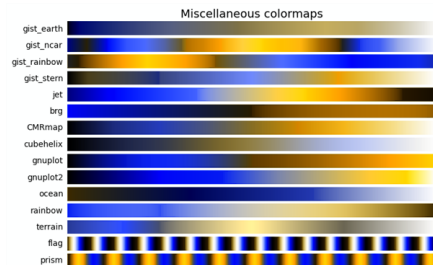
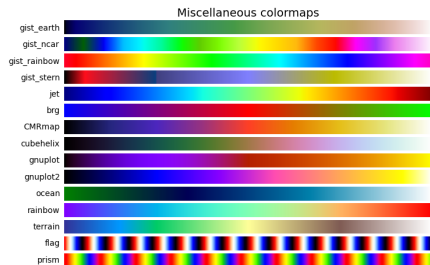


Deuteranopia (6% male population, mostly mild form)



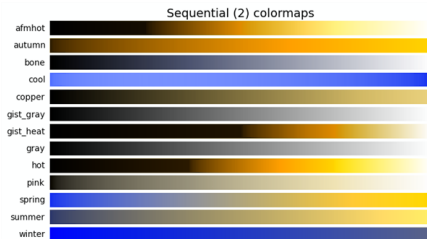
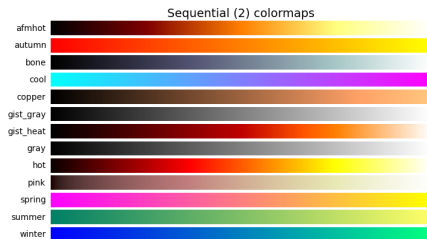
<http://www.color-blindness.com>

Color Blindness

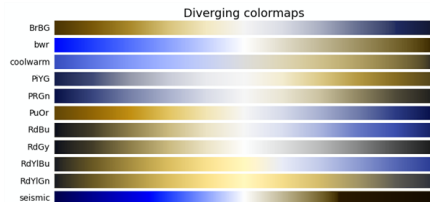
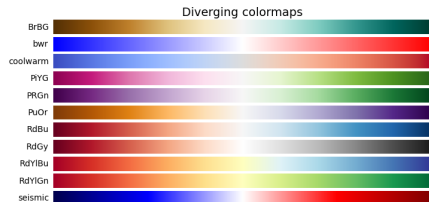


<http://aspnetresources.com/tools/colorBlindness>

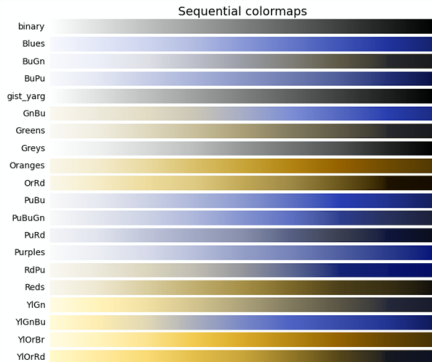
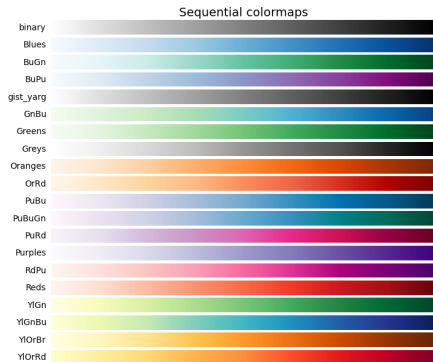
Color Blindness



Color Blindness



Color Blindness



Recommendations

- Best colormap depends on application, but for form information, perceptual colormaps are best
- Perceptual colormaps monotonically increase with lightness
- Not clear (to me) what functional relationship with L is best
- Many ways to convert to grayscale — luminance is a good proxy to decide on a good map
- Most common color blindness problem is red-green — try to avoid for reaching audiences most effectively

All around helpful information on colormaps:

Matteo Niccoli: <http://mycarta.wordpress.com/2012/05/29/the-rainbow-is-dead-long-live-the-rainbow-series-outline/>

Comparison of 7 methods of converting to grayscale:

<http://www.tannerhelland.com/3643/grayscale-image-algorithm-vb6/>

Color blindness: <http://www.color-blindness.com>

Link to slides:

<https://github.com/dmcdougall/scipy14-colormaps>