HOW THE RAINBOW COLOR MAP MISLEADS

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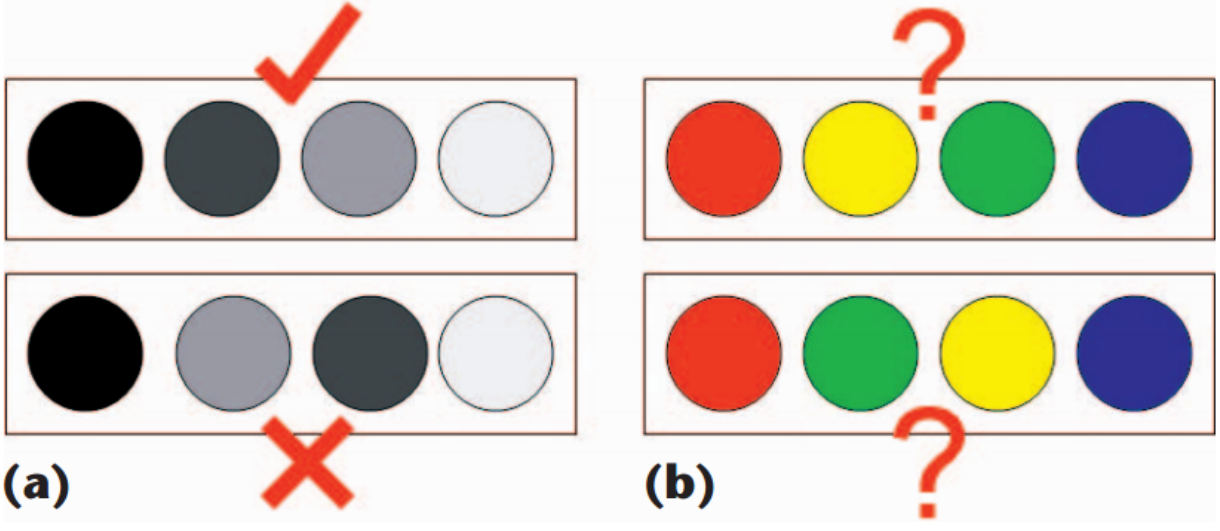
NATURAL ORDERING?

(a) We can easily place the gray paint chips in order based on perception,
(b) but cannot do this with the colored chips.

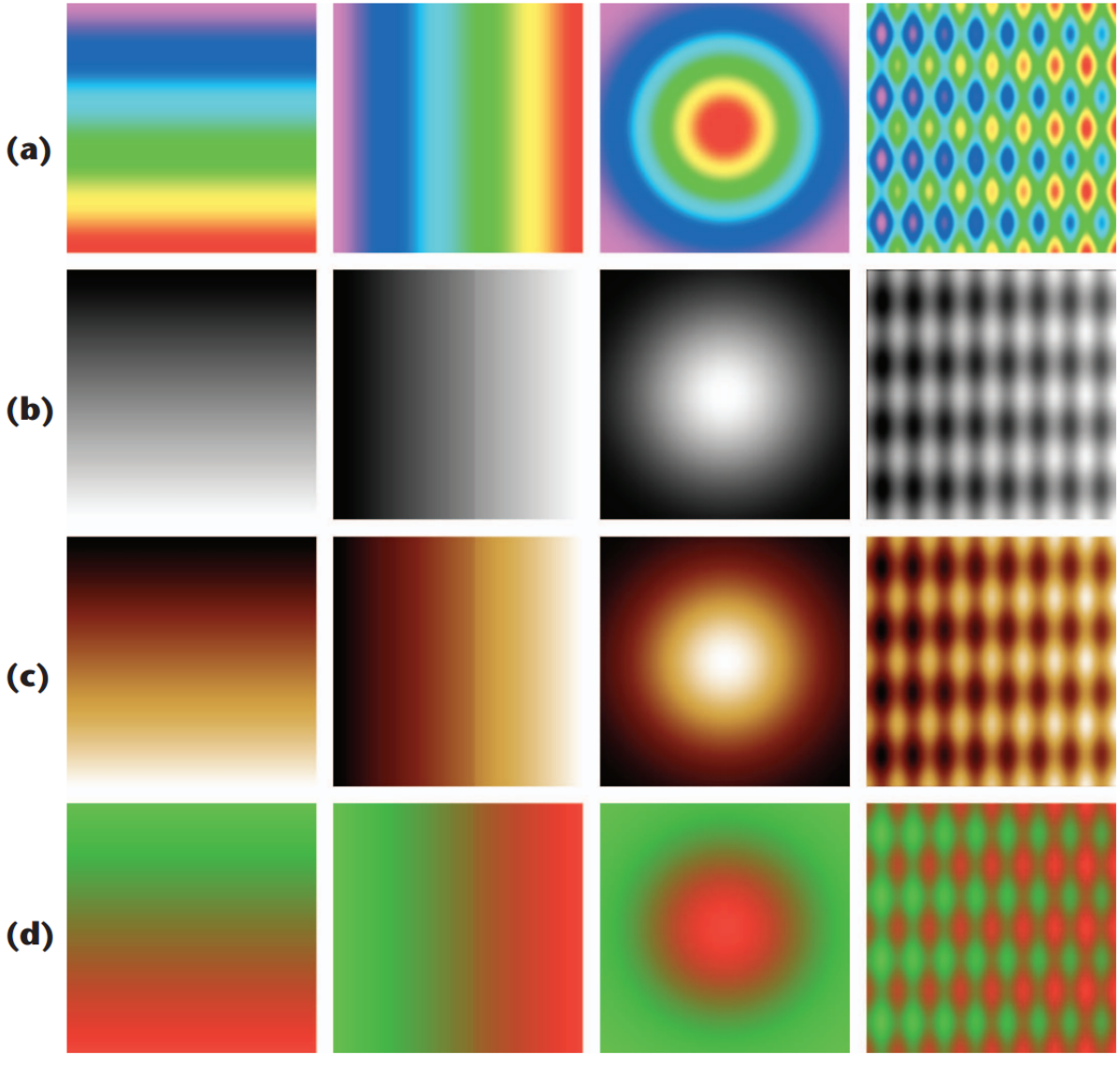


There is of course order in there (shorter to longer wavelength of light), but it's not perceptually ordered [1]

[1] D. Borland and R. M. Taylor, "Rainbow Color Map (Still) Considered Harmful," Apr. 2007

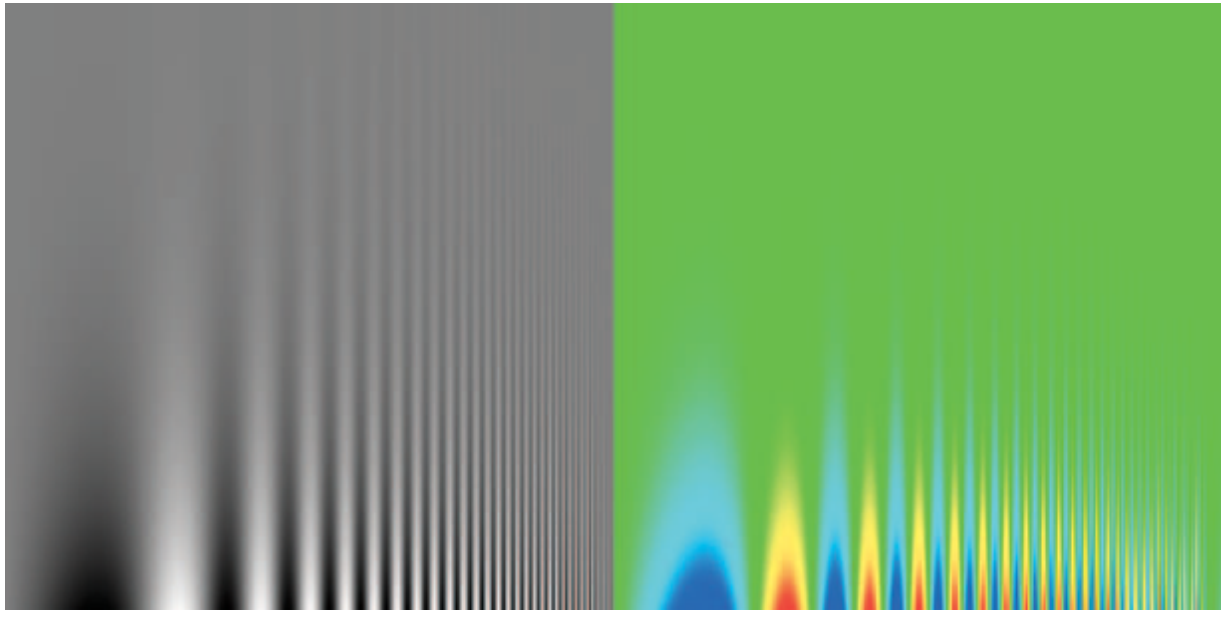
IT INTRODUCES ARTIFACTS

There are perceived sharp transitions in data at the sharp transitions between hues [1]. This effect is clearly visible on an artificial dataset.



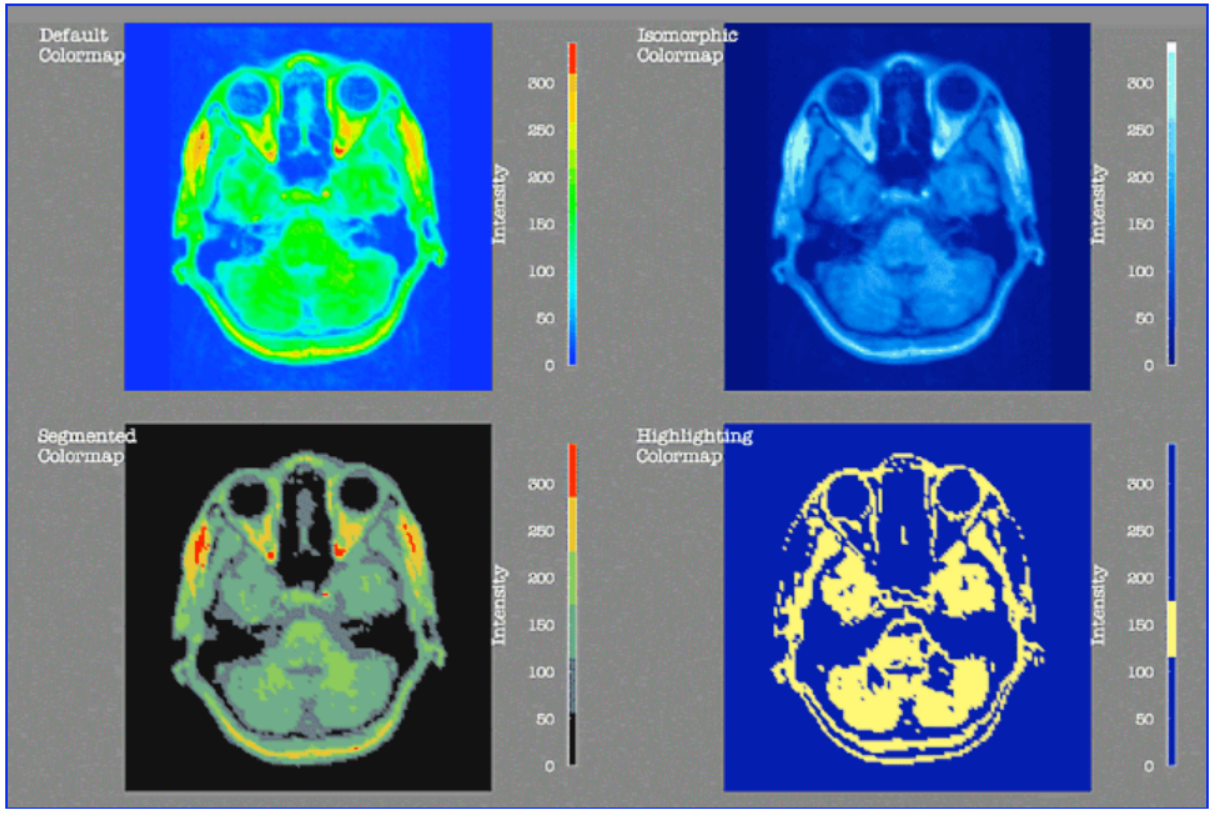
DETAIL IS ACTUALLY HARDER TO SEE IN A RAINBOW

The logic that it is easier to see detail in a range when you add colors seems to make sense, but in reality, more detail can be seen in a single hue image with a high brightness range



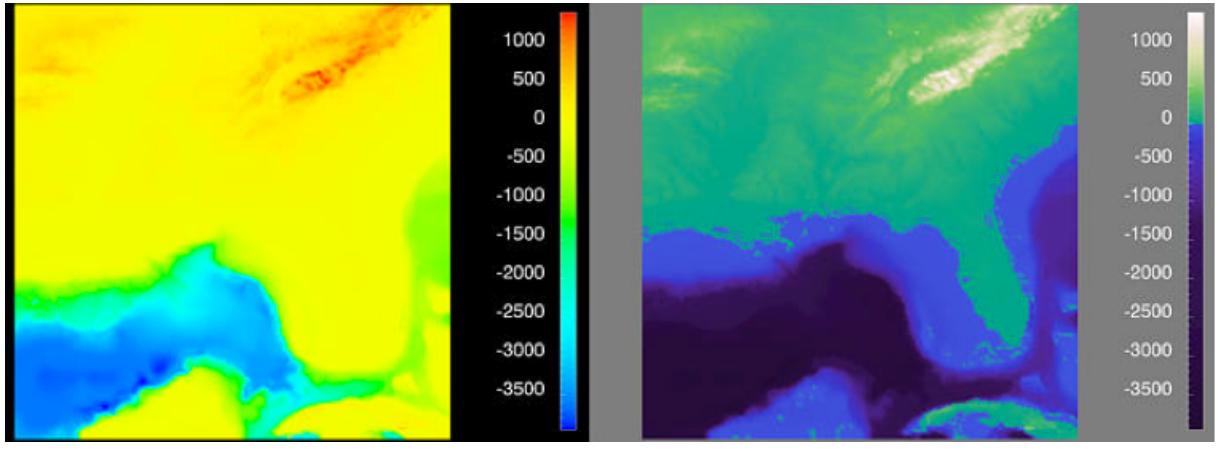
EXAMPLES (1)

Four colormaps applied to a slice of an MRI scan of a human head. They demonstrate how the representation can influence the interpretation of the data



EXAMPLES (2)

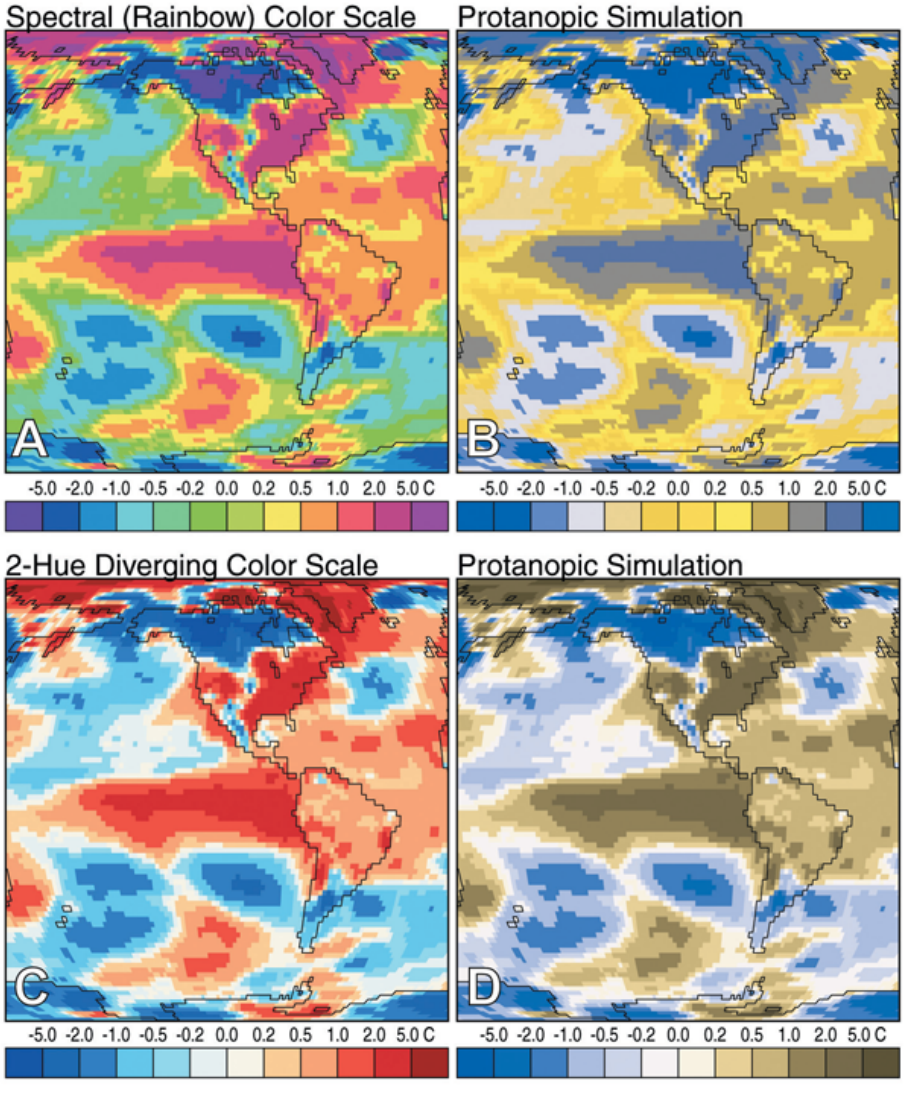
Same data, but with different colormaps.The "Perceptual" colormap provides a more faithful representation of the structures in the data.



RAINBOW COLOR MAP PROBLEMS

As it is explain in several visualisation articles the rainbow color map can be misleading when visualising data. The main issues with this kind of color map are:

- It is confusing because it doesn't have a monotonic perceptual ordering
- structures in the data can be hidden, since not all data variations are represented visually
- the fact the luminance is not controlled can hide data
- it introduces gradients not related to the data
- it artificially divides the data into a small number of categories, one for each color



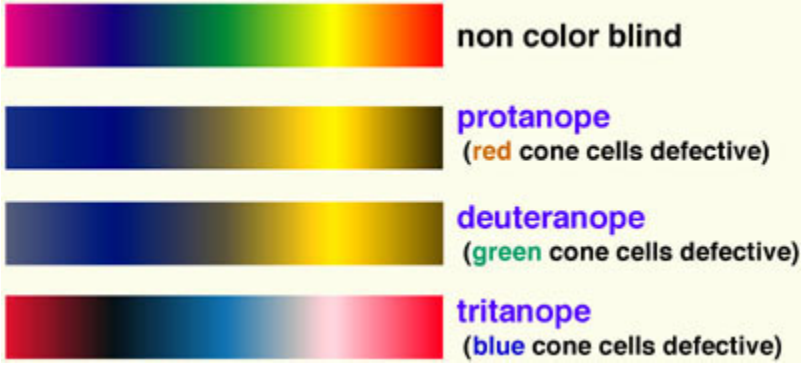
COLORBLIND PEOPLE CANNOT USE THEM

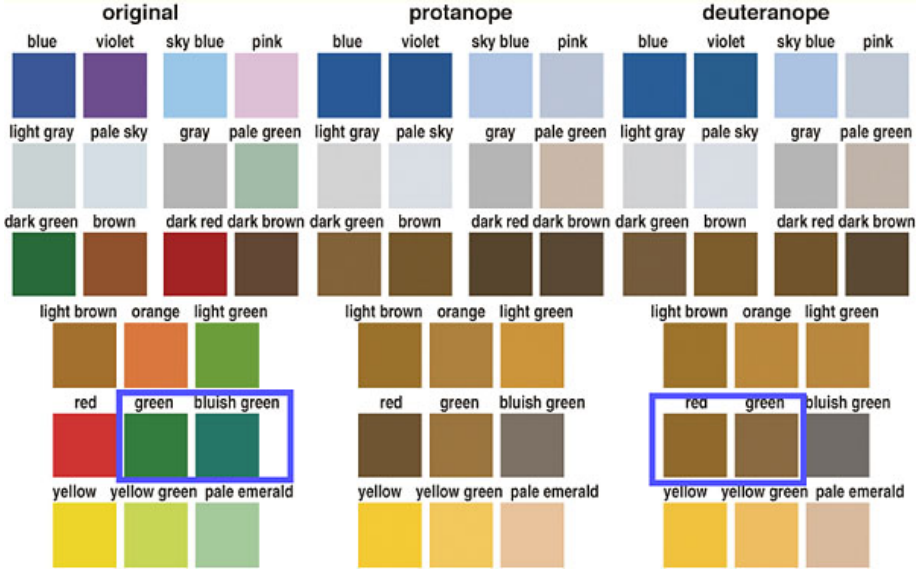
This image shows simulated views of what someone with Protanopia would see for two different color scales.

Clearly, the diverging color scale is better for Protanopes because there are no repeat colors.

HOW COLORBLIND PEOPLE SEE COLORS ?

Simulation of colorblind vision





Some combination of colors are confusing for red-green colorblinds

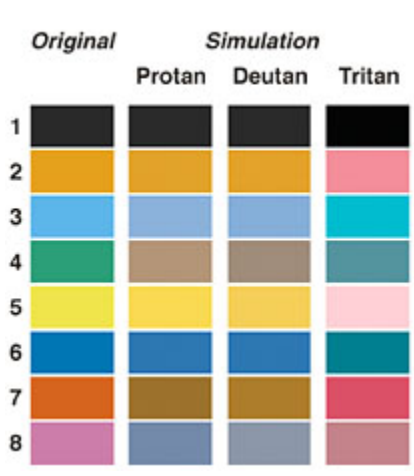
MAKING FIGURES COMPREHENSIBLE FOR COLOUR-BLIND READERS

There is a good chance that the paper you submit may go to colorblind reviewers. Supposing that your paper will be reviewed by three white males (which is not unlikely considering the current population in science), the probability that at least one of them is colorblind is whopping 22%!

- Choose color schemes that can be easily identified by people with all types of color vision, in consideration with the actual lighting conditions and usage environment.
- Use not only different colors but also a combination of different shapes, positions, line types and coloring patterns, to ensure that information is conveyed to all users including those who cannot distinguish differences in color.
- Clearly state color names where users are expected to use color names in communication.

COLORBLIND BARRIER-FREE COLOR PALLET

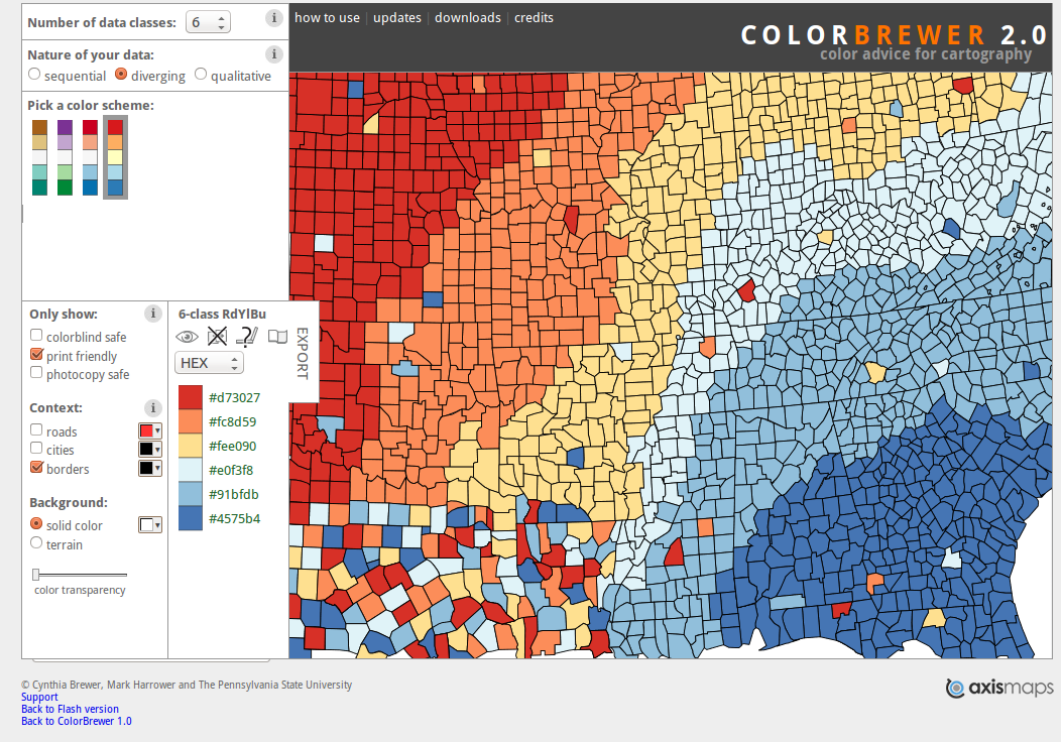
Set of colors that is unambiguous both to colorblinds and non-colorblinds (http://jfly.iam.u-tokyo.ac.jp/color/index.html)



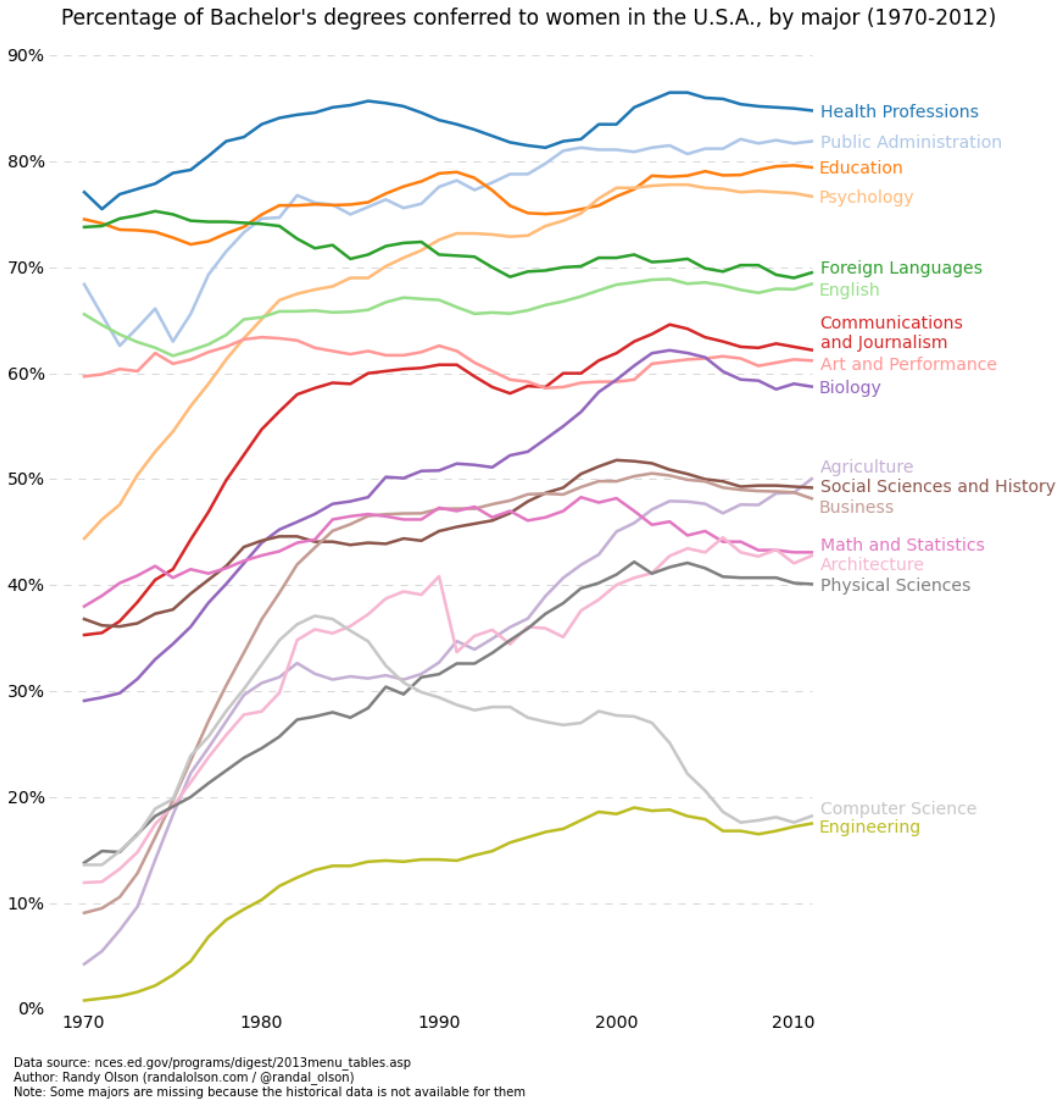
	Hue	for Photoshop, Illustrator, Freehand, etc. C,M,Y,K (%)	for Photoshop, Illustrator, Freehand, etc. R,G,B (0-255)	for Word, Power Point, Canvas, etc. R,G,B (%)
Black	– °	(0,0,0,100)	(0,0,0)	(0,0,0)
Orange	41°	(0,50,100,0)	(230,159,0)	(90,60,0)
Sky Blue	202°	(80,0,0,0)	(86,180,233)	(35,70,90)
bluish Green	164°	(97,0,75,0)	(0,158,115)	(0,60,50)
Yellow	56°	(10,5,90,0)	(240,228,66)	(95,90,25)
Blue	202°	(100,50,0,0)	(0,114,178)	(0,45,70)
Vermilion	27°	(0,80,100,0)	(213,94,0)	(80,40,0)
reddish Purple	326°	(10,70,0,0)	(204,121,167)	(80,60,70)

COLORBLIND SAFE, PRINT FRIENDLY, PHOTOCOPY SAFE?

ColorBrewer is an online tool designed to help people select good color schemes for maps and other graphics. It is free to use. (http://colorbrewer2.org/)

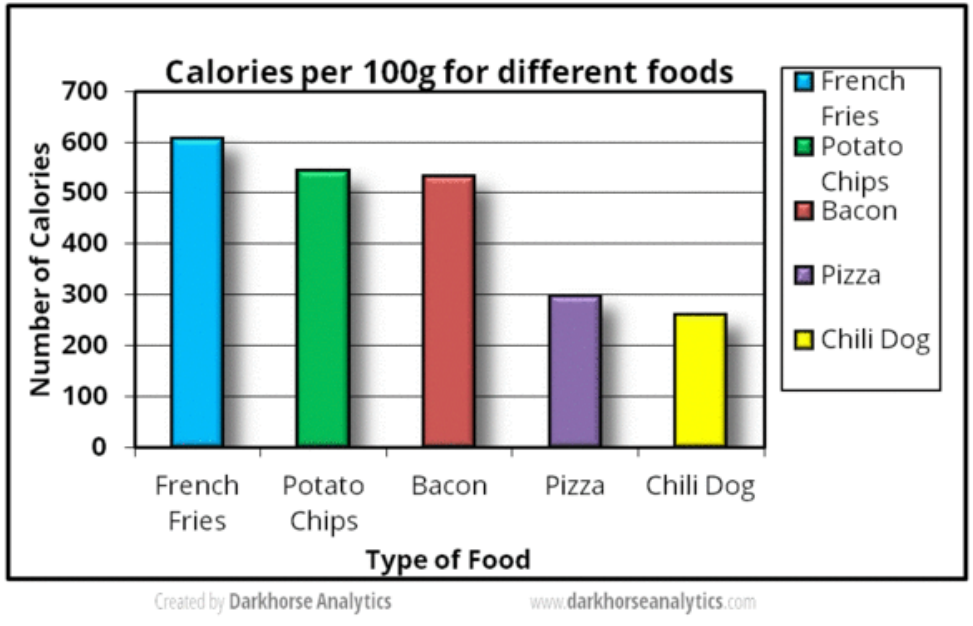


AVOID SEPARATE KEYS



LESS IS MORE

Remove redundant labels



http://fat.gfycat.com/ImprobableFemaleBasenji.gif