

DATA VISUALIZATION

9.28.2020

RECAP

- * `matplotlib!`
 - * `plt.plot`
 - * `plt.hist`
 - * `plt.imshow / plt.matshow`

RECAP

- * `plt.plot`
 - * format strings (line? points?)
- * `plt.xlim`
- * `plt.ylim`

RECAP

- * `plt.imshow` / `plt.matshow`
 - * color limits (`vmin` & `vmax`)
 - * colormaps

“Above all else,
show the data”

–Edward Tufte

EDWARD TUFTE

- * *The Visual Display of Quantitative Information*
(1983)



DATA VISUALIZATION

- * The goal is to **communicate data**
- * Avoid *distraction*
- * Avoid *deception*

AVOID DISTRACTION

- * Tufte: “**data-ink ratio**”
- * Maximize the amount of data communicated per drop of ink used

Remove to improve the **data tables** edition

Created by **Darkhorse Analytics**

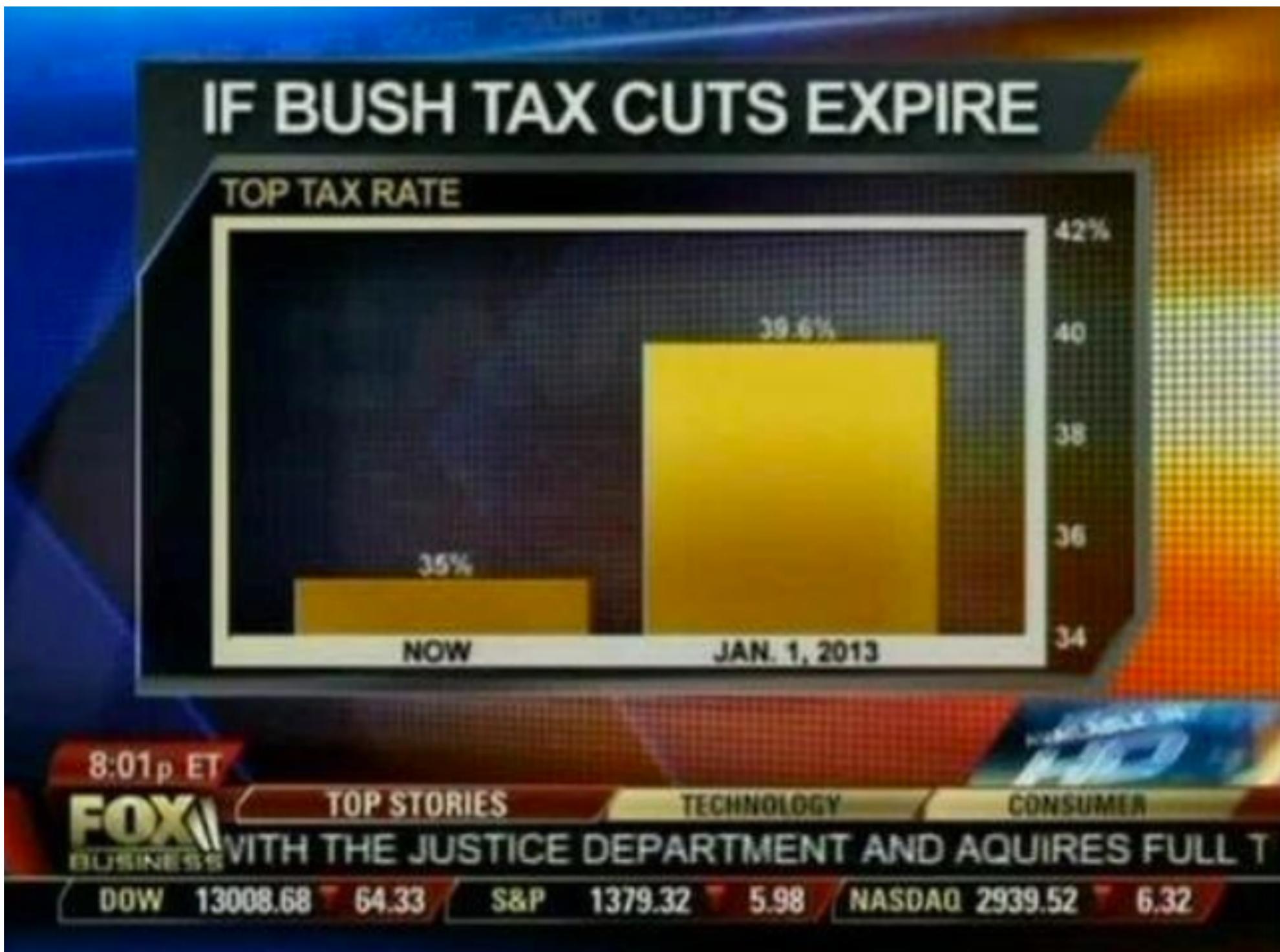
www.darkhorseanalytics.com

<https://www.darkhorseanalytics.com/blog/clear-off-the-table>

AVOID DISTRACTION

- * ... but don't take it too far!
- * Don't sacrifice *understandability* for *beauty*

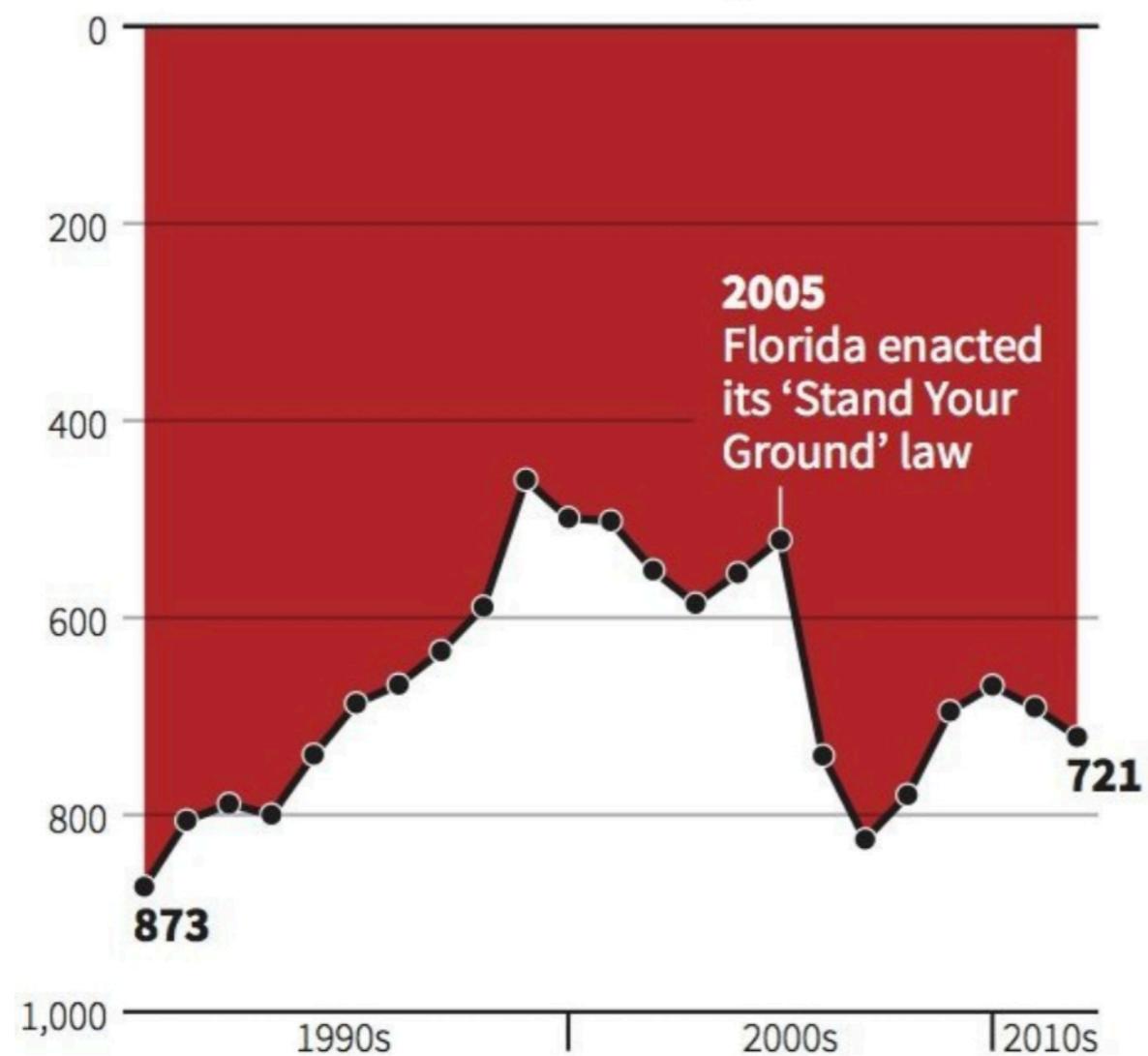
AVOID DECEPTION



AVOID DECEPTION

Gun deaths in Florida

Number of murders committed using firearms



Source: Florida Department of Law Enforcement

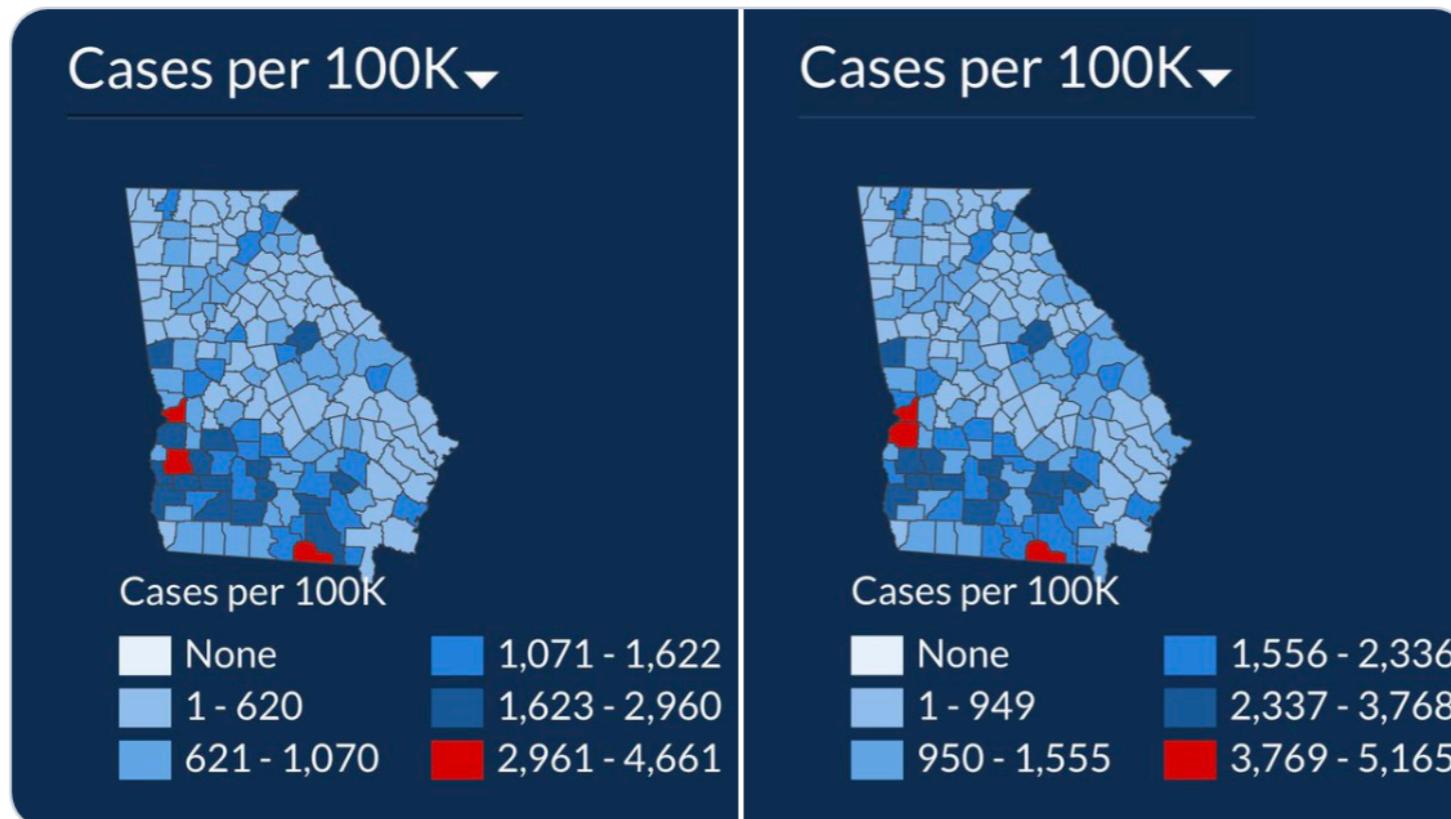
AVOID DECEPTION



Andisheh Nouraei
@andishehnouraei

▼

In just 15 days the total number of **#COVID19** cases in Georgia is up 49%, but you wouldn't know it from looking at the state's data visualization map of cases. The first map is July 2. The second is today. Do you see a 50% case increase? Can you spot how they're hiding it? 1/



SET REASONABLE LIMITS

- * don't zoom in to magnify effects
- * the *first impression* that someone would get from looking at a plot should be *correct*

USE THE RIGHT PLOT TYPE

- * suppose we've done an experiment that measured 2 different things about each of 192 brain areas
- * we want to compare those two things. how should we plot this data?
- * (demo)

COLORMAPS

KENNETH MORELAND

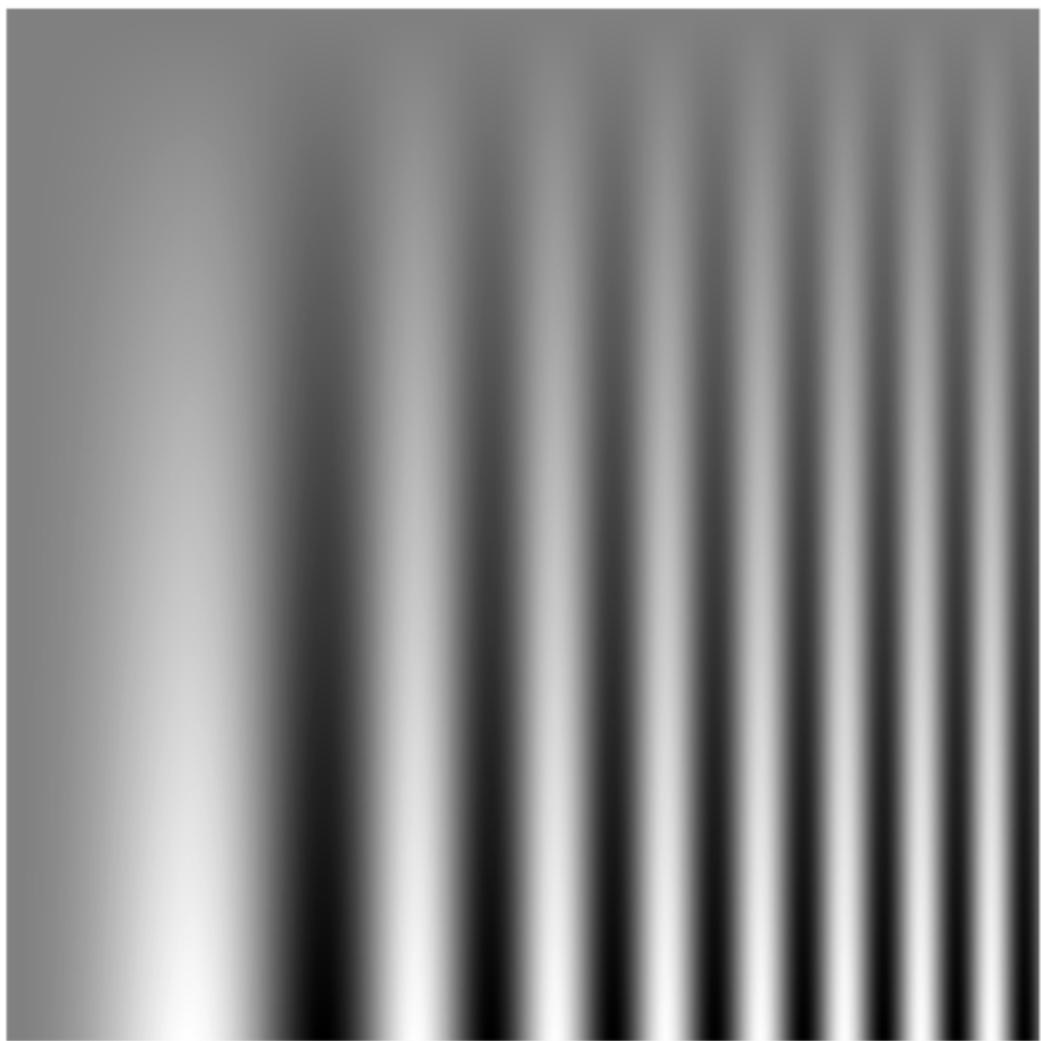
- * *Diverging Color Maps for Scientific Visualization*



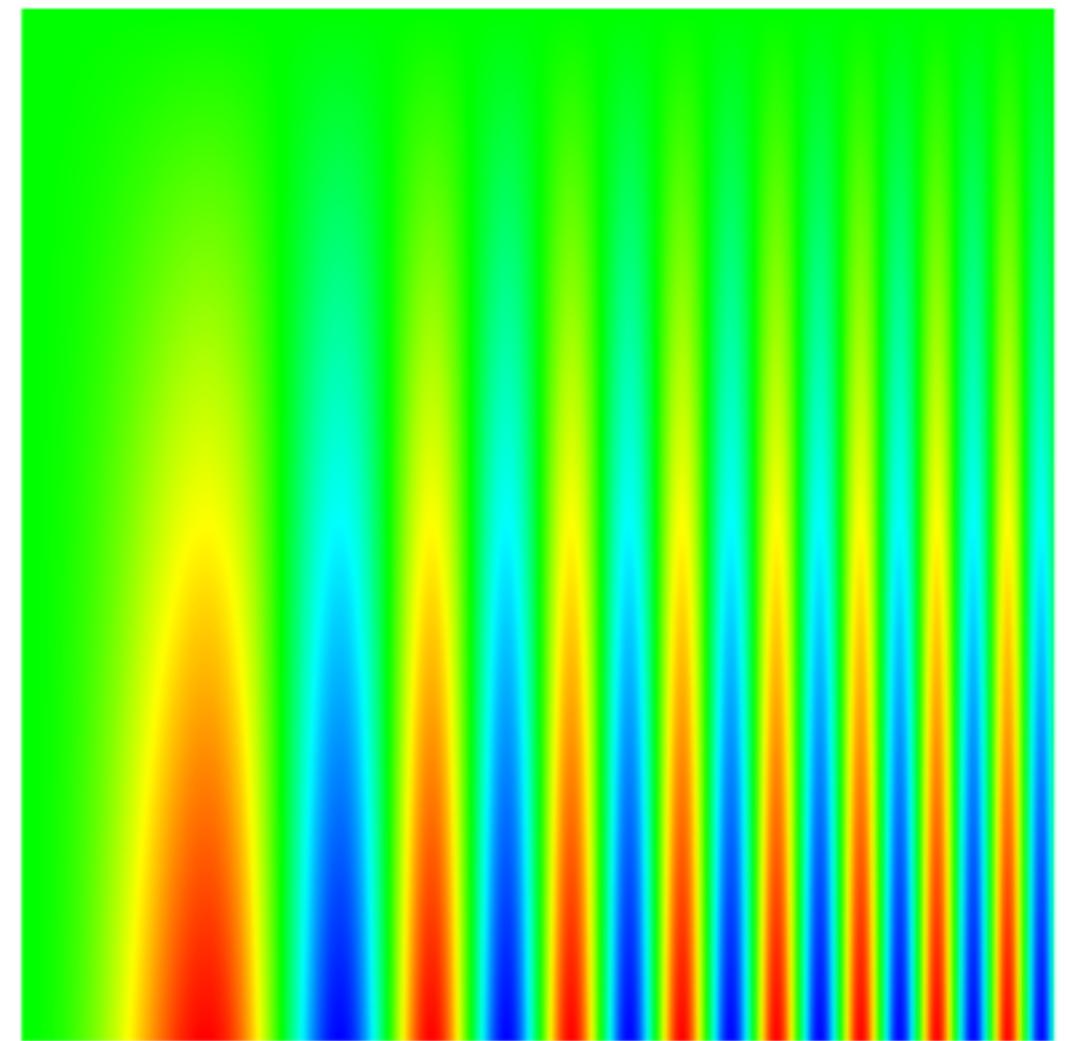
Fig. 1. The rainbow color map. Know thy enemy.

COLORMAPS

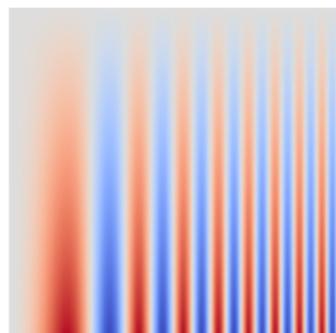
grayscale



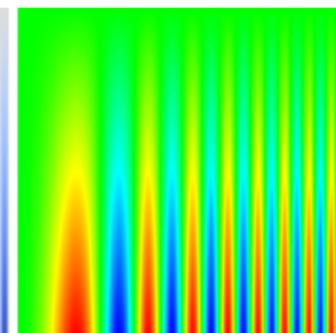
rainbow/jet



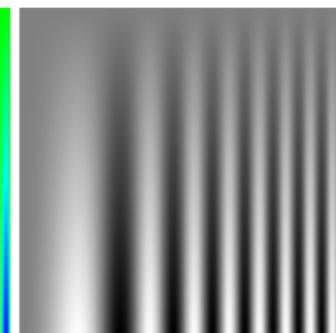
red-blue



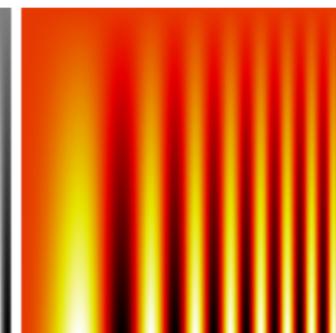
rainbow/jet



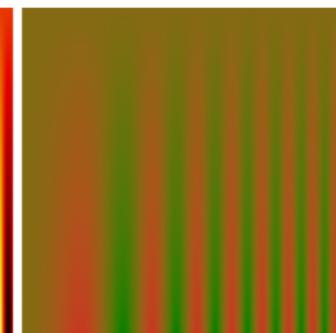
grayscale



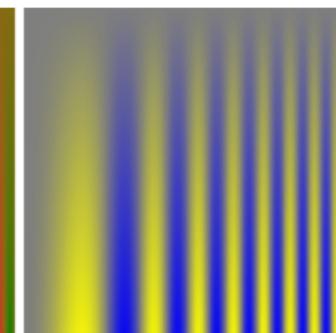
heat/hot



isoluminant



blue-yellow



sine
grating

2D sine
grating

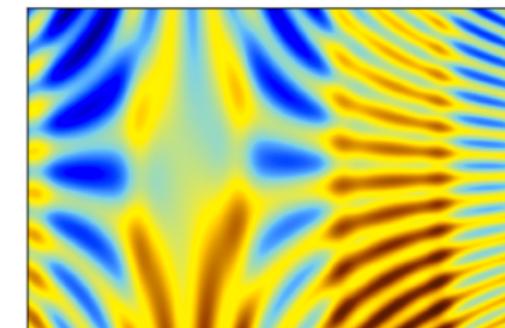
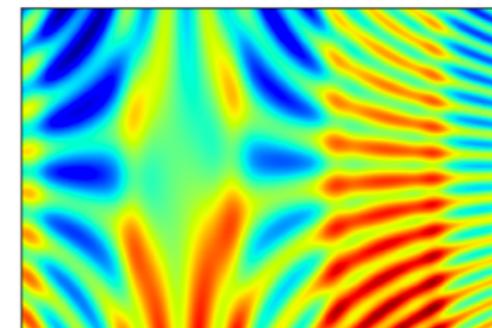
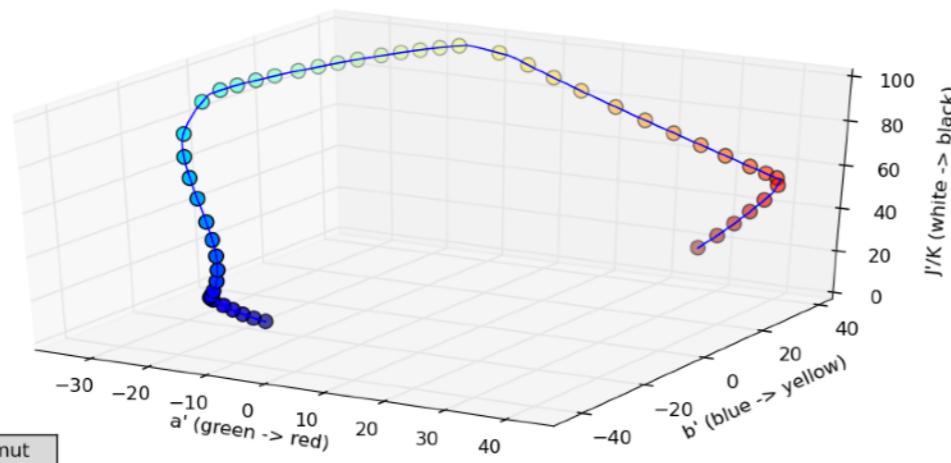
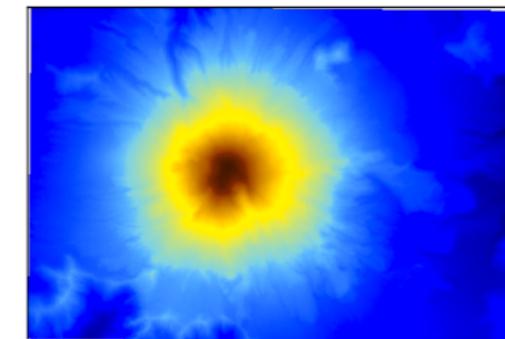
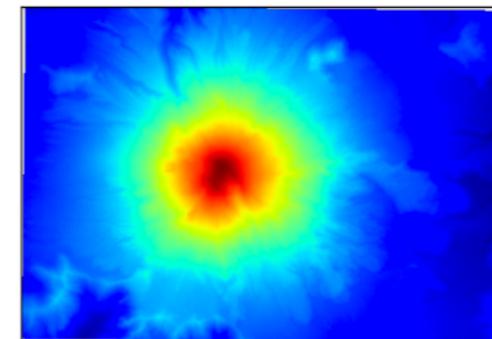
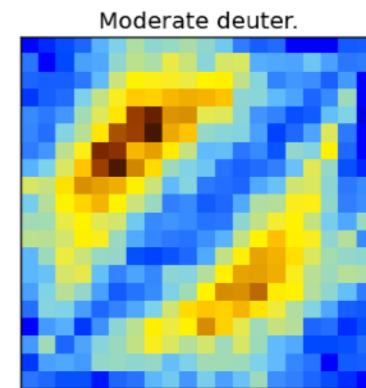
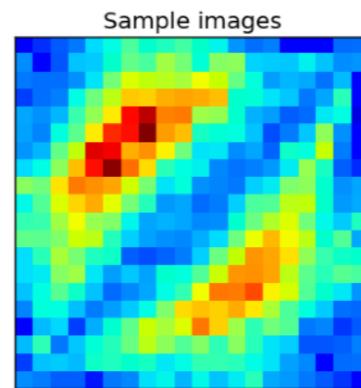
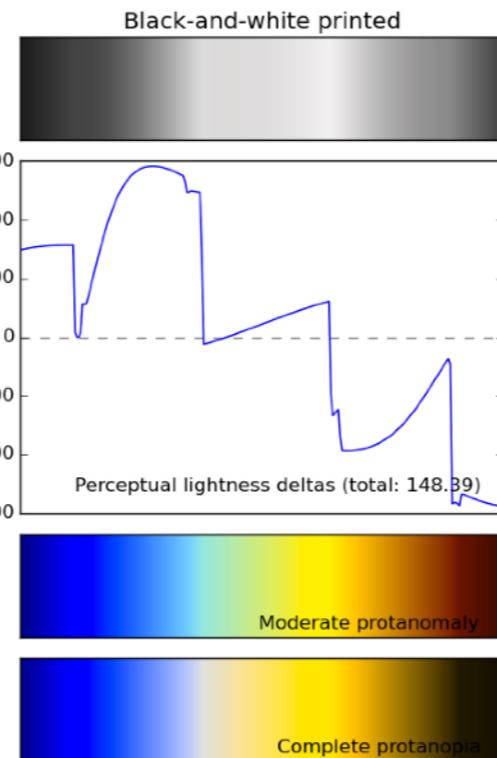
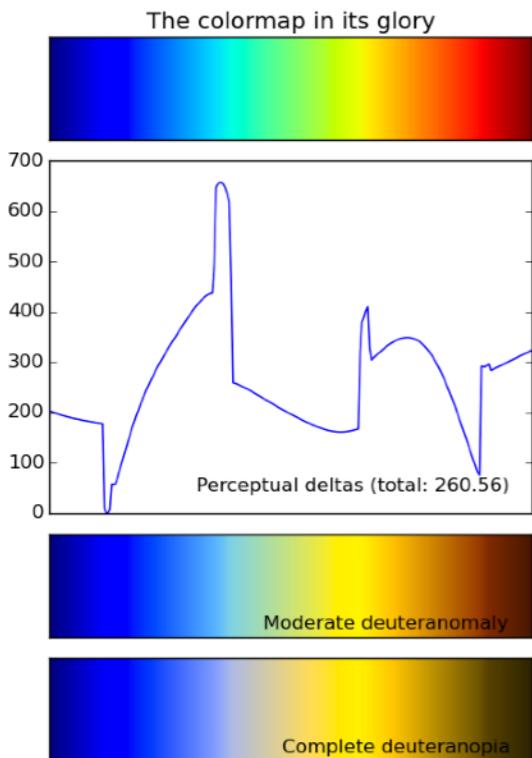
gradient

colorblind
simulation

3D
shading

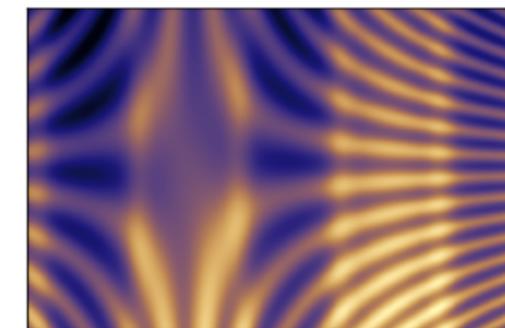
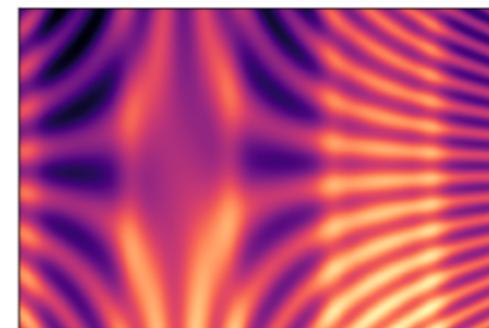
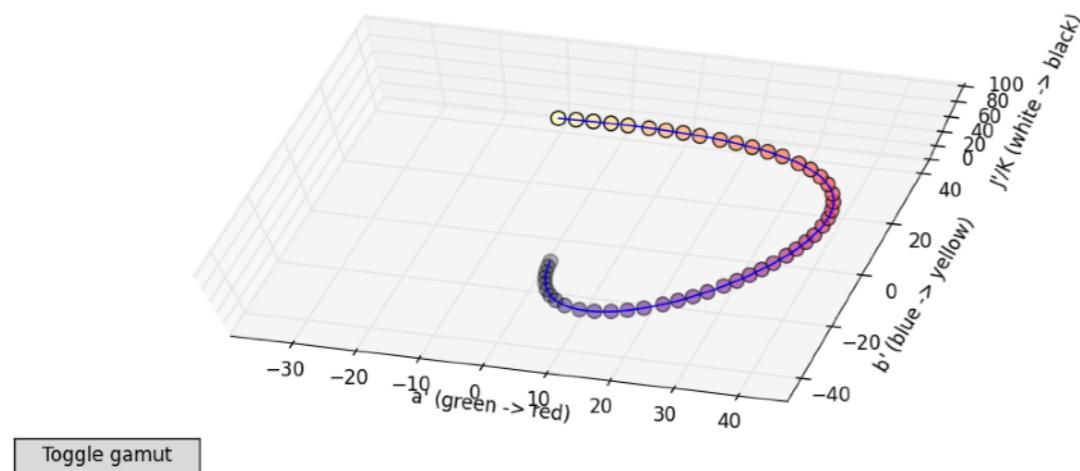
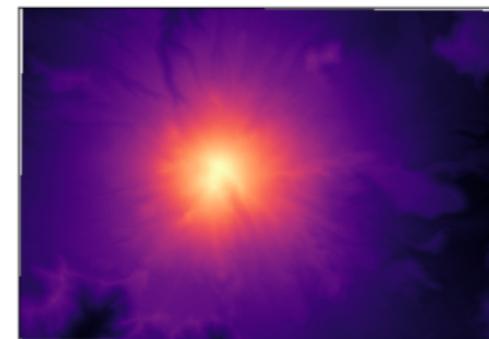
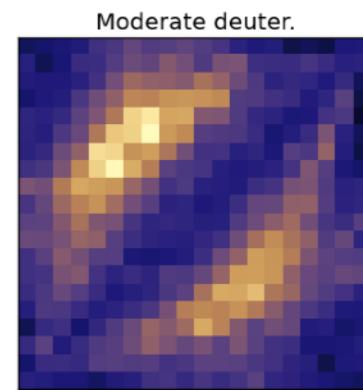
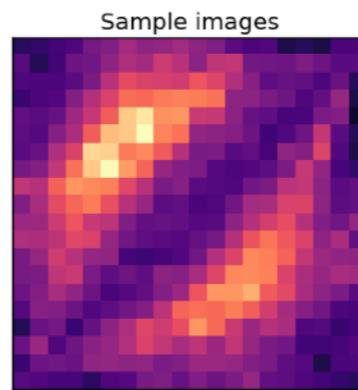
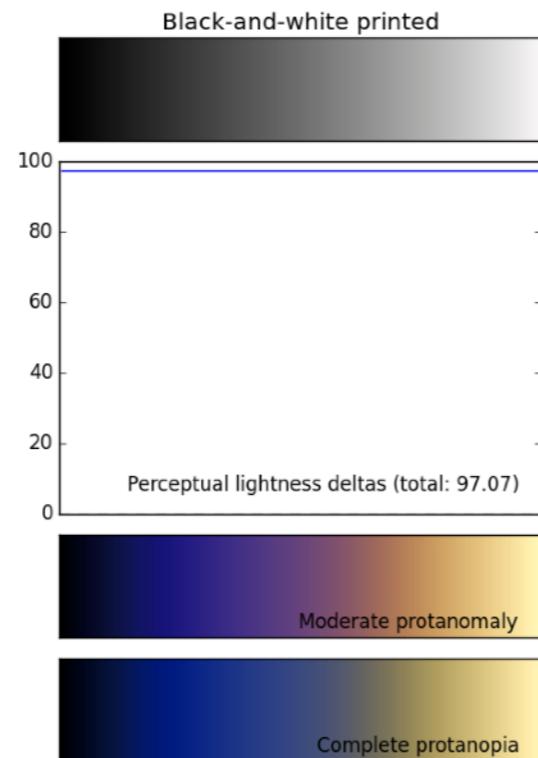
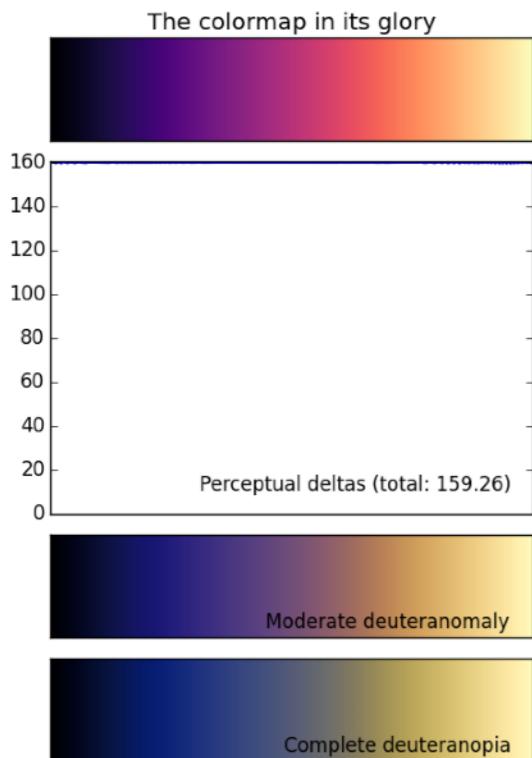
PERCEPTUAL UNIFORMITY

Colormap evaluation: jet



PERCEPTUAL UNIFORMITY

Colormap evaluation: **magma**



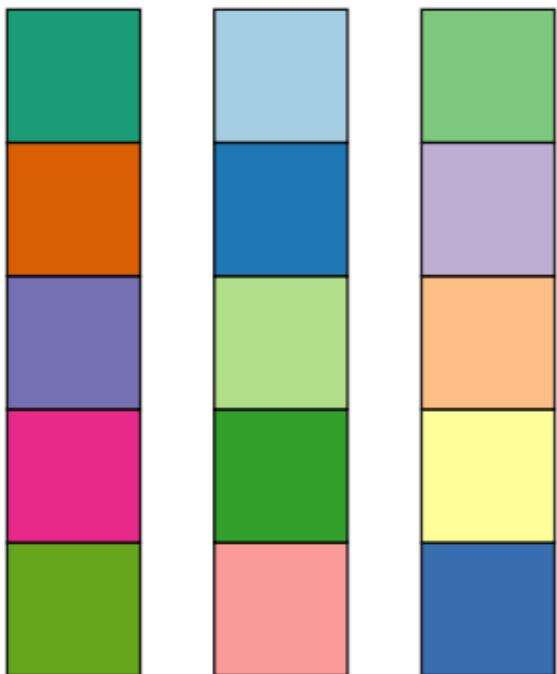
CYNTHIA BREWER

- * *ColorBrewer.org: An Online Tool for Selecting Colour Schemes for Maps*
- * Colormaps available in matplotlib (python) and as package for MATLAB

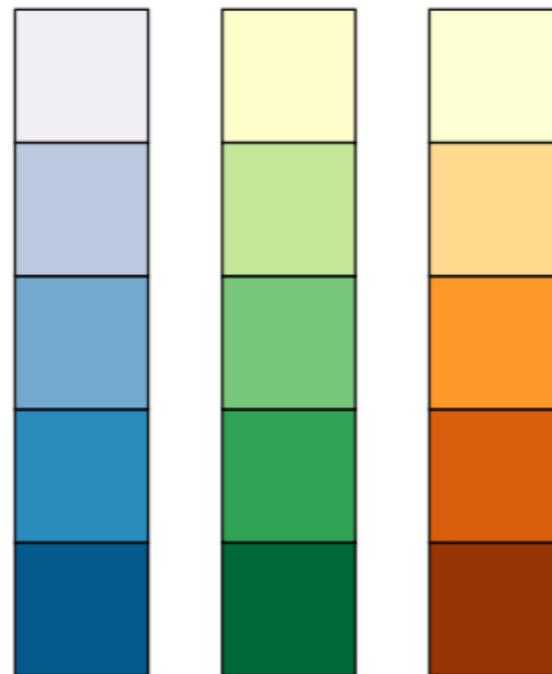


<https://pdfs.semanticscholar.org/8c9a/f5bd12b36e450ba564f644008b871dba5cdf.pdf>

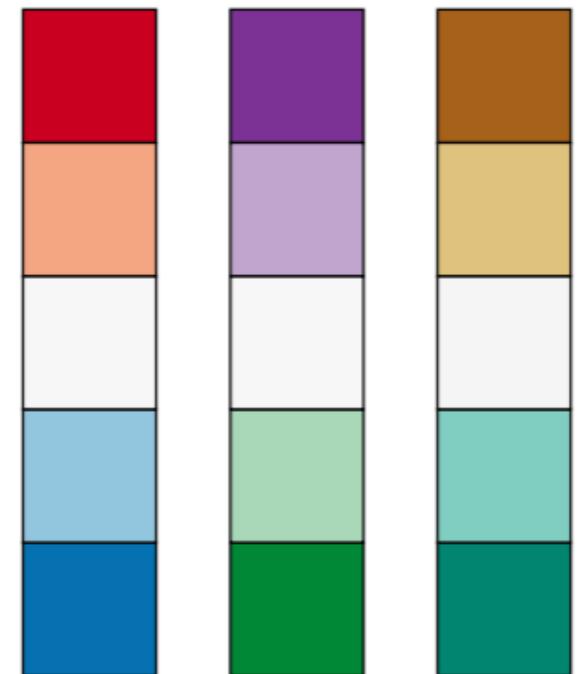
CHOOSE THE RIGHT TYPE OF COLORMAP



(a) Qualitative



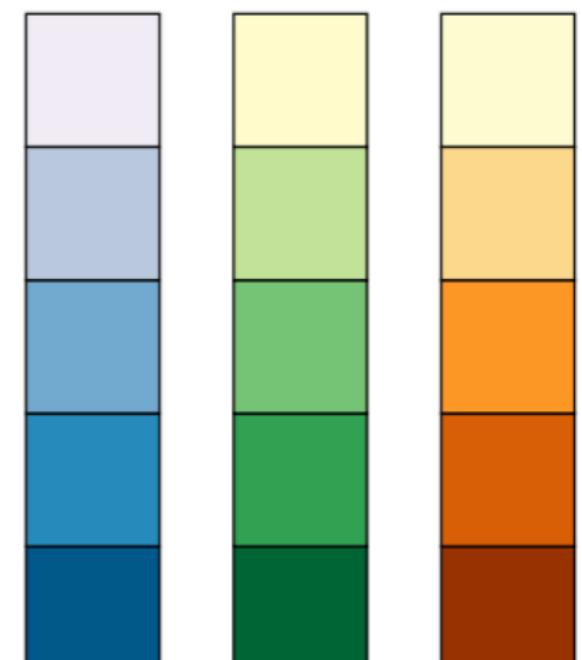
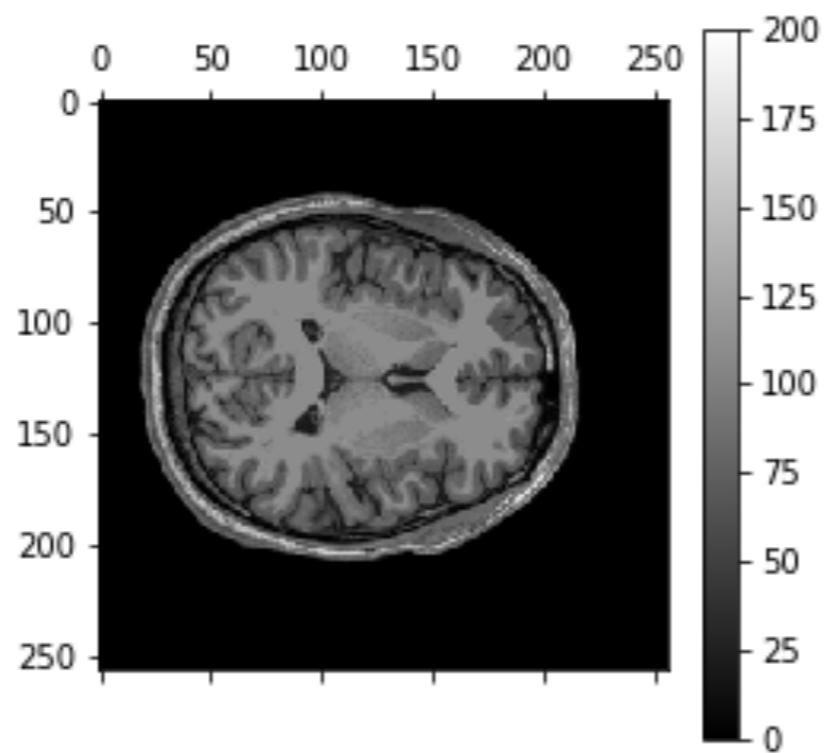
(b) Sequential



(c) Diverging

SEQUENTIAL COLORMAPS

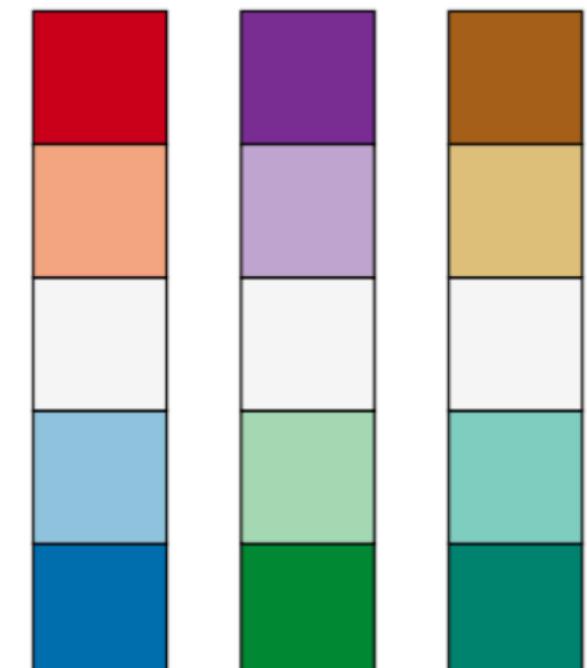
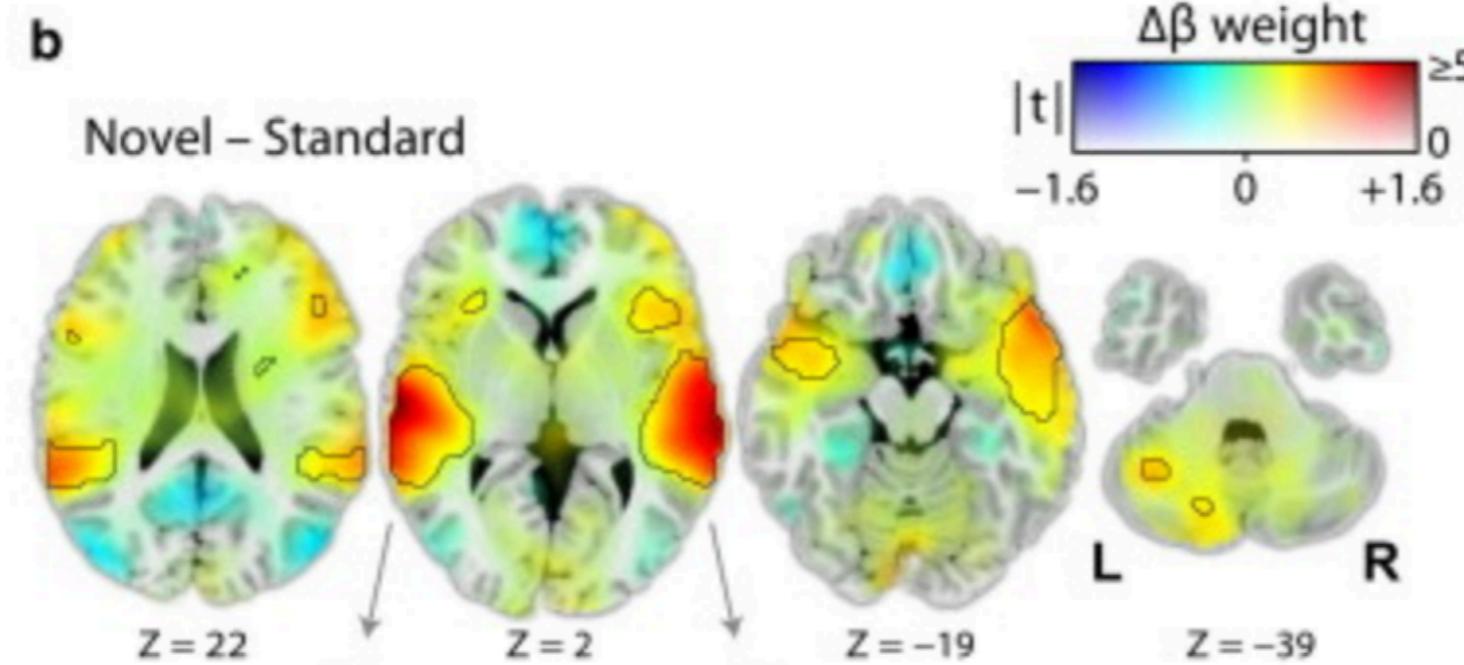
- * for data that is **ordered** but only goes in **one direction** from zero
- * e.g. number of spikes from a neuron



(b) Sequential

DIVERGING COLORMAPS

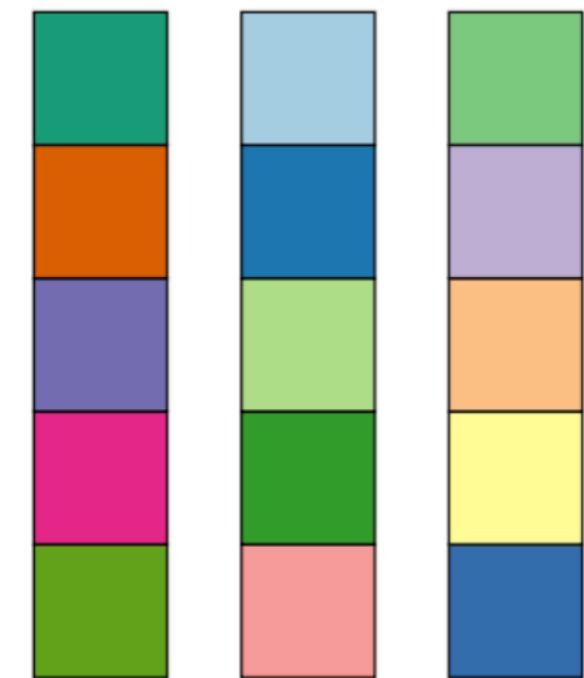
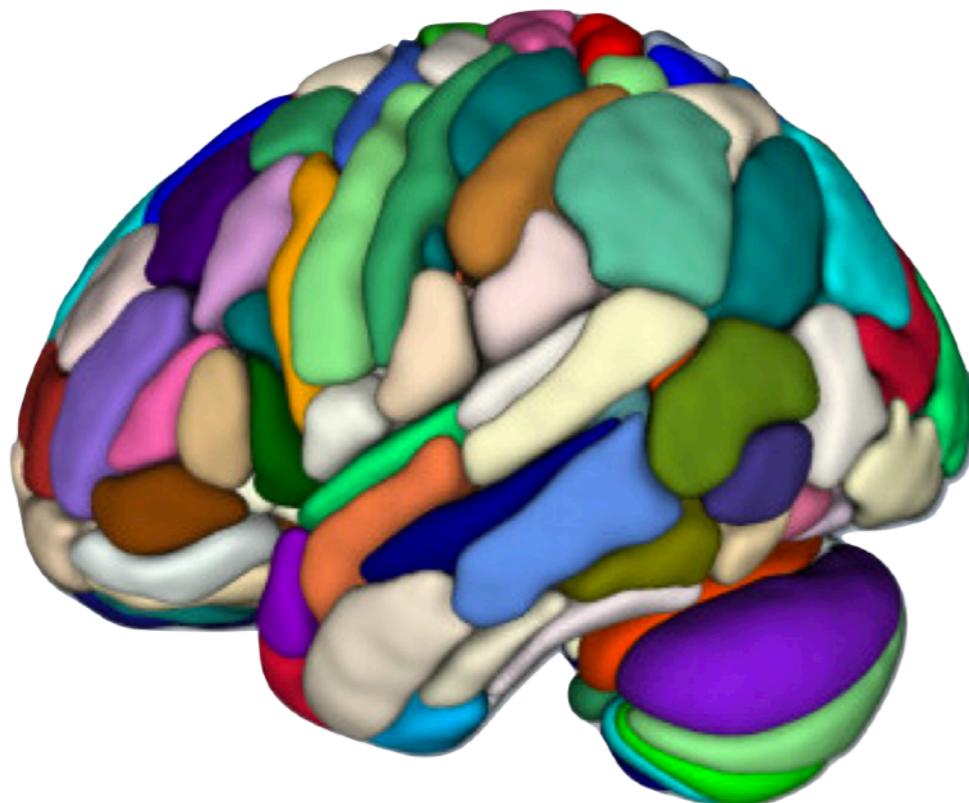
- * for data that is ordered but only goes in **both directions** from zero
- * e.g. differences



QUALITATIVE COLORMAPS

- * for data that is **unordered**

- * e.g. different groups



(a) Qualitative

**THERE'S NO EXCUSE
TO USE A BAD
COLORMAP**

END