# Data Visualization W3-2

# Key dates

Project proposal presentation: 10 Oct in class

Exam: 14 Nov in class

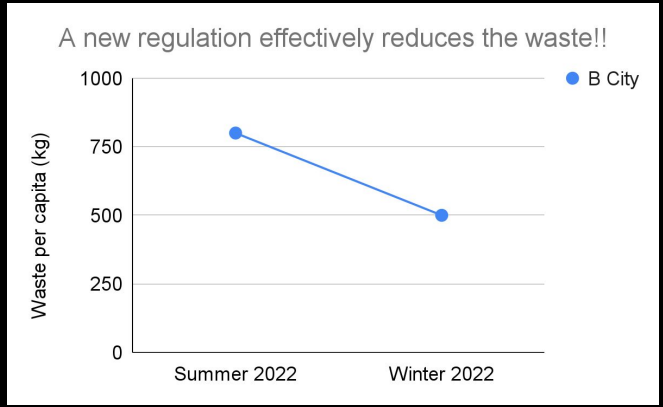
Final presentation video upload: 11:59 PM, 3 Dec (Sun)

Final report submission: 11:59 PM, 10 Dec (Sun)

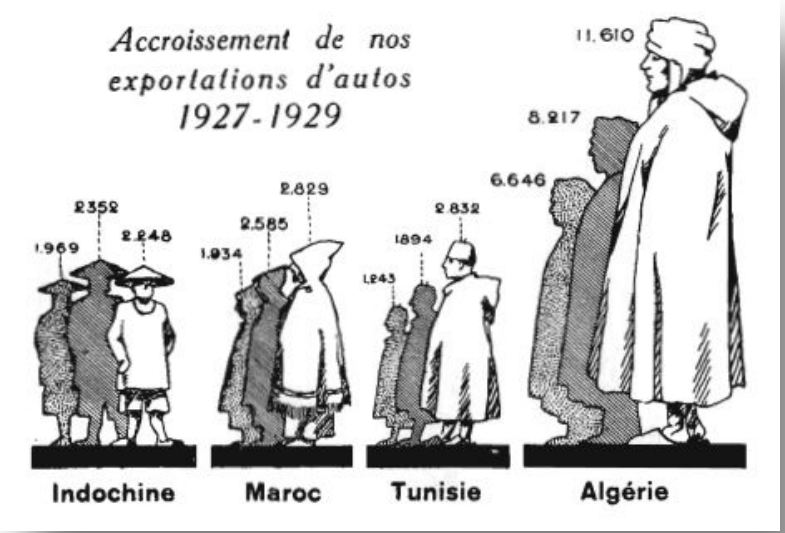
# Visualization of the week

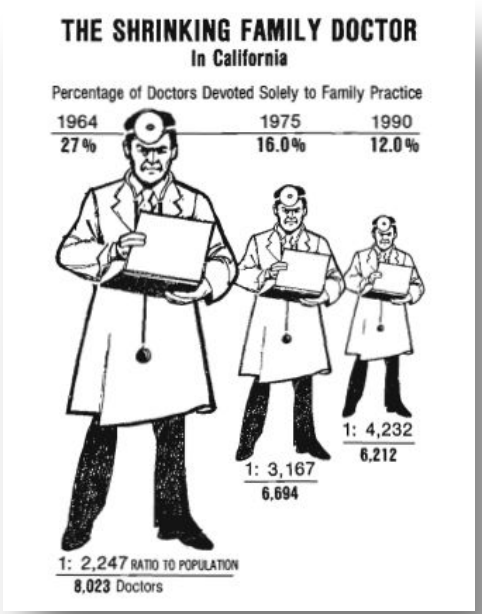
# Quiz

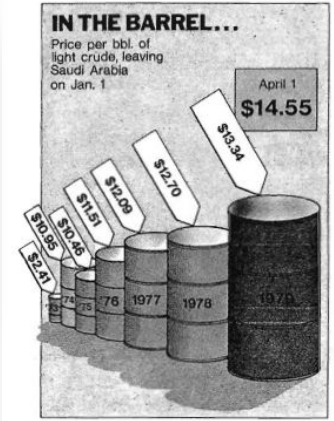
- What do you find interesting in today's VotW?
- Is the graph below sufficient to argue that the new regulation (effective on October 2022) reduces waste in B City? Why or why not?
- Explain when it is good to use a y-axis that doesn't start from zero.

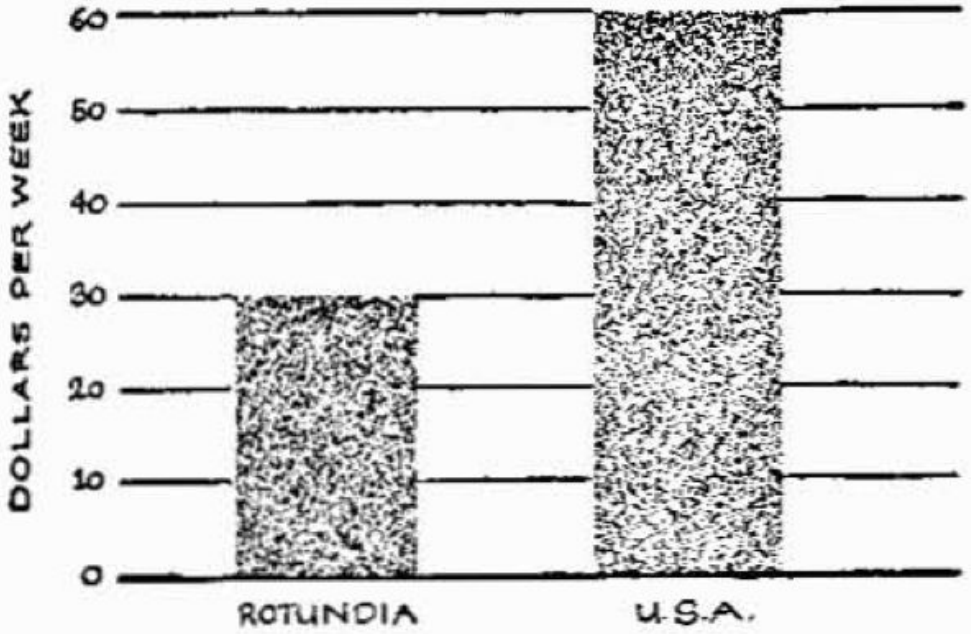


# MISLEADING VISUALS


Accroissement de nos exportations d'autos 1927-1929
1.969
2.352
2.248
1.934
2.585
2.829
1.243
1.894
2.832
6.646
8.217
11.610
Indochine
Maroc
Tunisie
Algérie


THE SHRINKING FAMILY DOCTOR
In California
Percentage of Doctors Devoted Solely to Family Practice
1964
27%
1975
16.0%
1990
12.0%
1: 2,247 RATIO TO POPULATION
8,023 Doctors
1: 3,167
6,694
1: 4,232
6,212


IN THE BARREL...
Price per bbl. of light crude, leaving Saudi Arabia on Jan. 1
April 1
$14.55
$13.34
$12.70
$12.09
$11.51
$10.46
$10.85
$2.41
74
75
76
1977
1978
1979


DOLLARS PER WEEK
60
50
40
30
20
10
0
ROTUNDIA
U.S.A.

I think I see that area B
is 3.14 times bigger than
area A. Is that correct?

Do not mislead!

Don’t be misled!

# Assignment 3 (~next Wed)

## Fix it or break it!

In this assignment, you choose to be either a good 😇 or a bad 😈 person. Follow the instruction below and submit your paper to Canvas.

😇

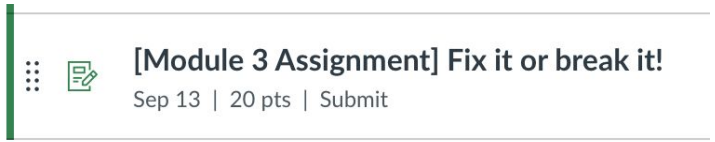
Find a couple of highly misleading visualizations. Write a short paper (also feel free to publish in your blog or something) that

- dissects and explains why the visualizations are misleading.
- explains how can the visualization be fixed.
- provides a fixed visualization (either hand-drawn or plotted with any tool)

😈

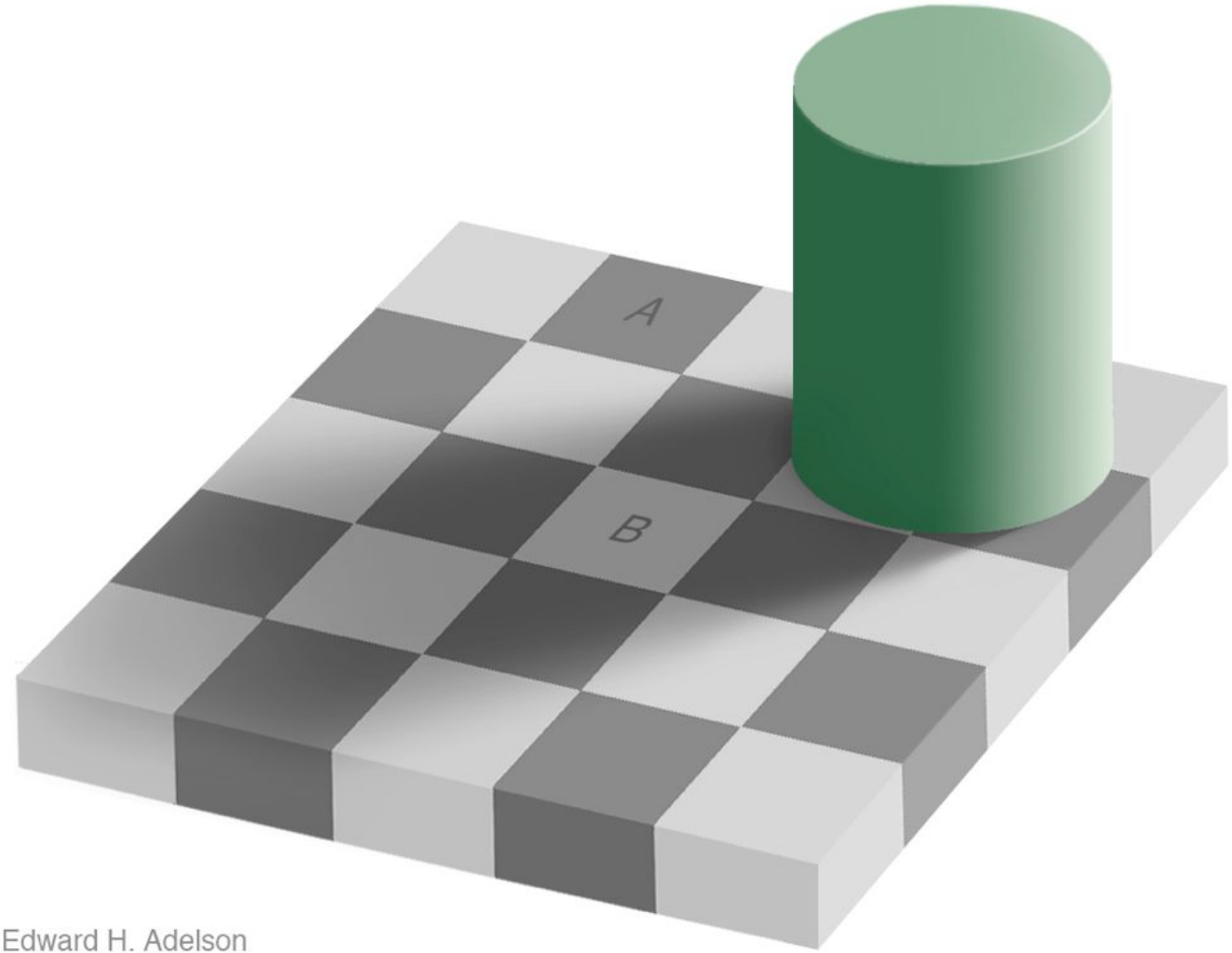
Find a couple of perfectly fine visualizations. Write a short paper that

- how can those visualization can be manipulated to mislead one way or the other
- provides a manipulated version of the visualization (either hand-drawn or plotted with any tool) - the more malicious and subtle it is, the better!

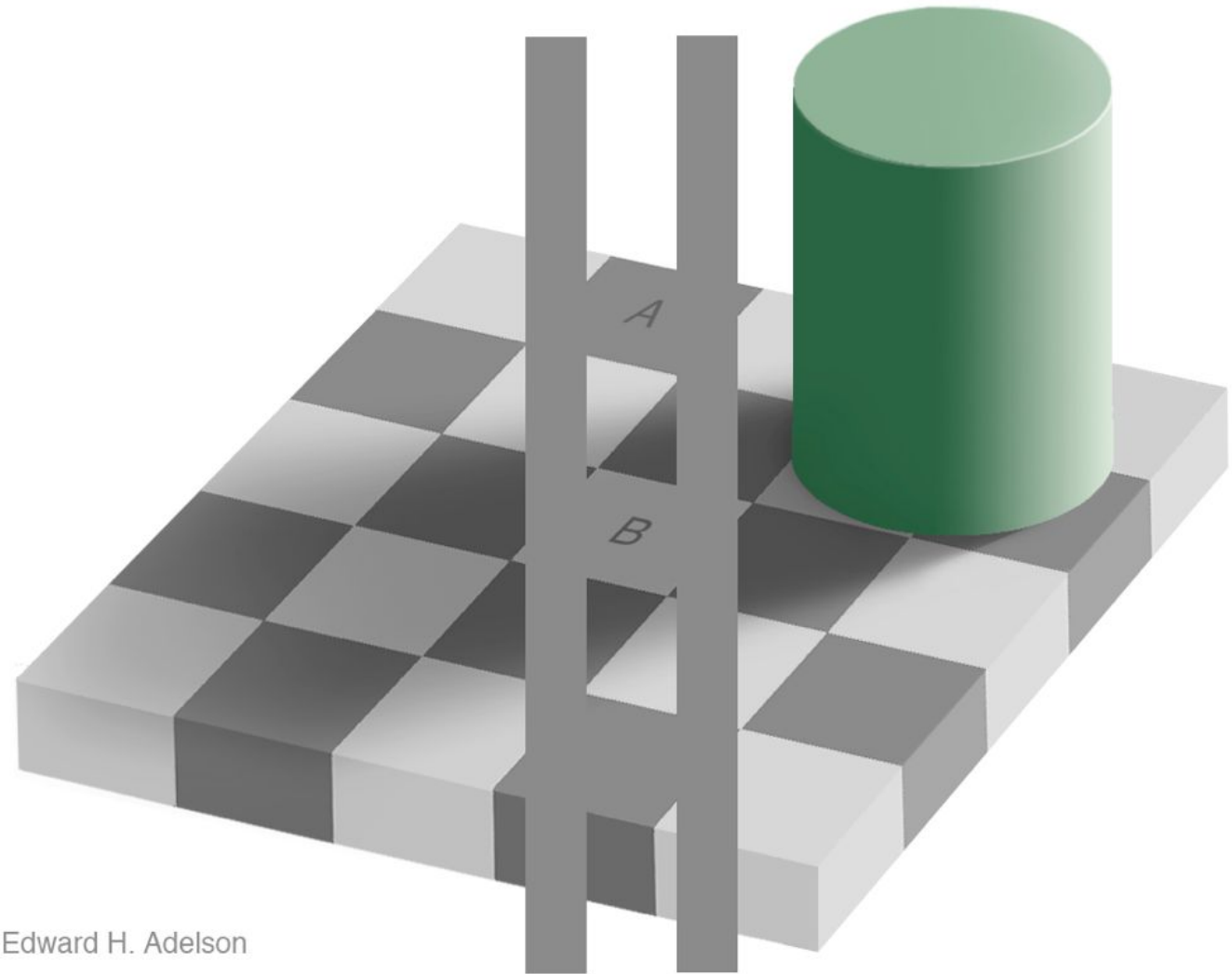


# Perception

## Why should we care?




Edward H. Adelson




Edward H. Adelson

#dressgate

**Kim Kardashian West**
@KimKardashian

Follow

What color is that dress? I see white & gold. Kanye sees black & blue, who is color blind?

RETWEETS 24,859

FAVORITES 37,966

3:41 PM - 27 Feb 2015

**Kim Kardashian West**
@KimKardashian

Follow

What color is that dress? I see white & gold. Kanye sees black & blue, who is color blind?

**Justin Bieber**
@justinbieber

Follow

And for everyone asking I see blue and black

11:21 PM - 26 Feb 2015

**71,215** RETWEETS **83,915** FAVORITES

**Kim Kardashian West**
@KimKardashian

Follow

What color is that dress? I see white & gold.
Kanye sees black & blue, who is color blind?

**Justin Bieber**
@justinbieber

Follow

And for everyone asking I see blue and black

**Taylor Swift**
@taylorswift13

Seguir

I don't understand this odd dress debate and I feel like it's a trick somehow.
I'm confused and scared.
PS it's OBVIOUSLY BLUE AND BLACK

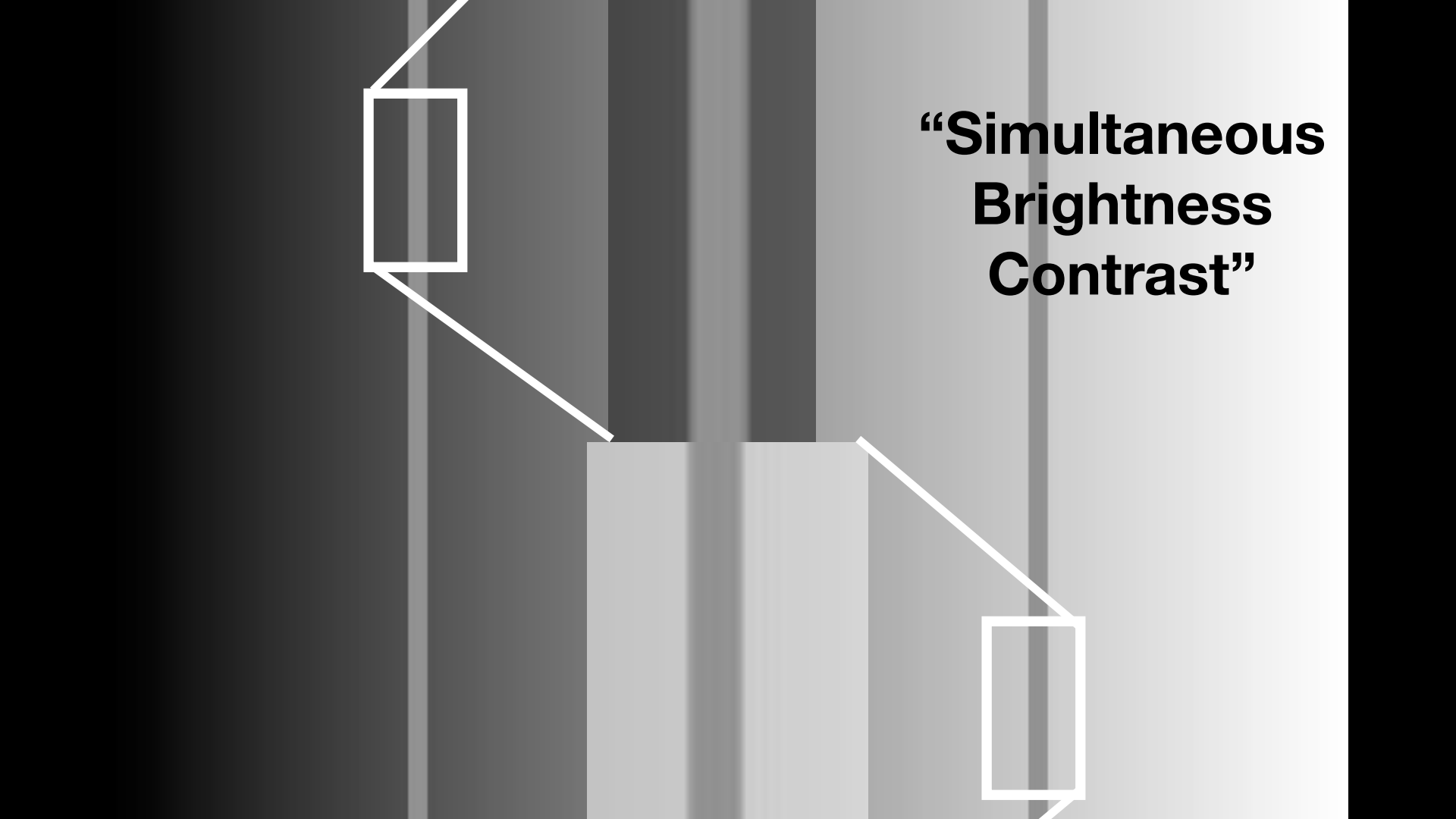
03:14 - 27 feb 2015

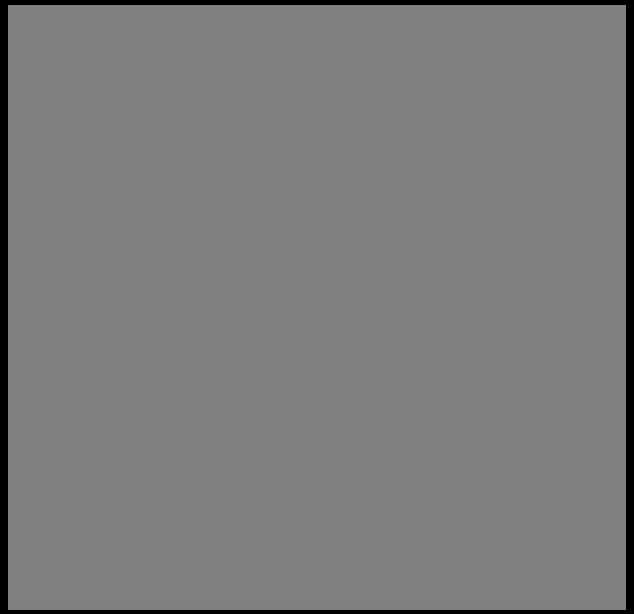
**81.015** RETWEETS **111.714** FAVORITOS

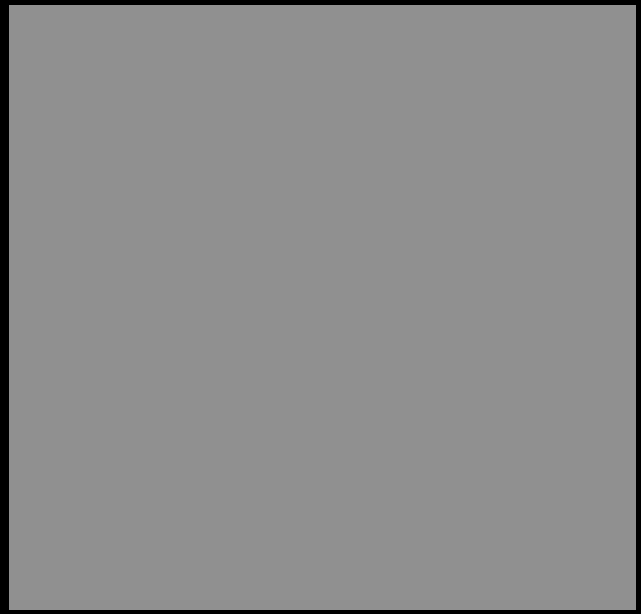
https://twitter.com/kscottz/status/873726218344050688

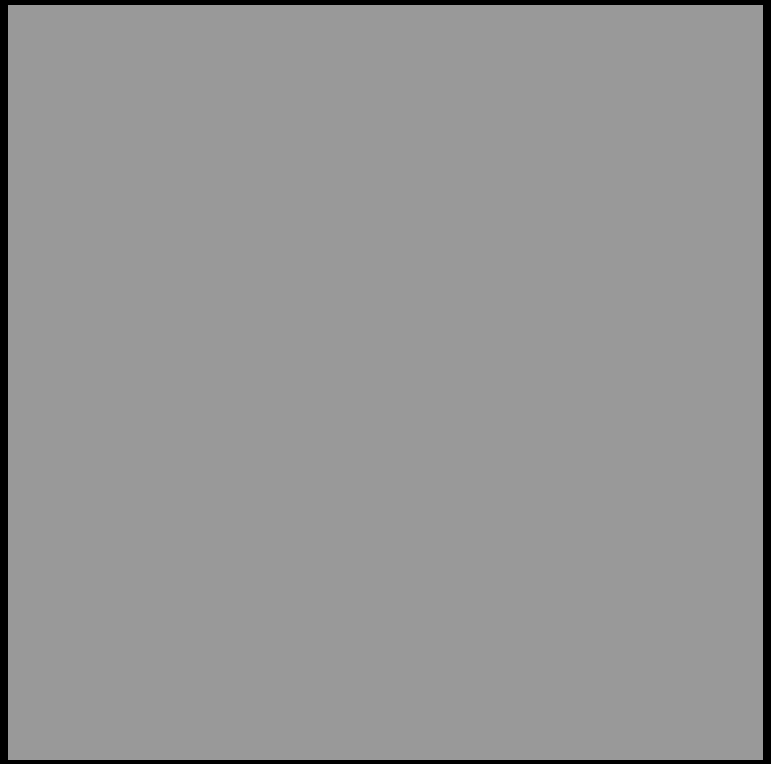
# Our perception is funky

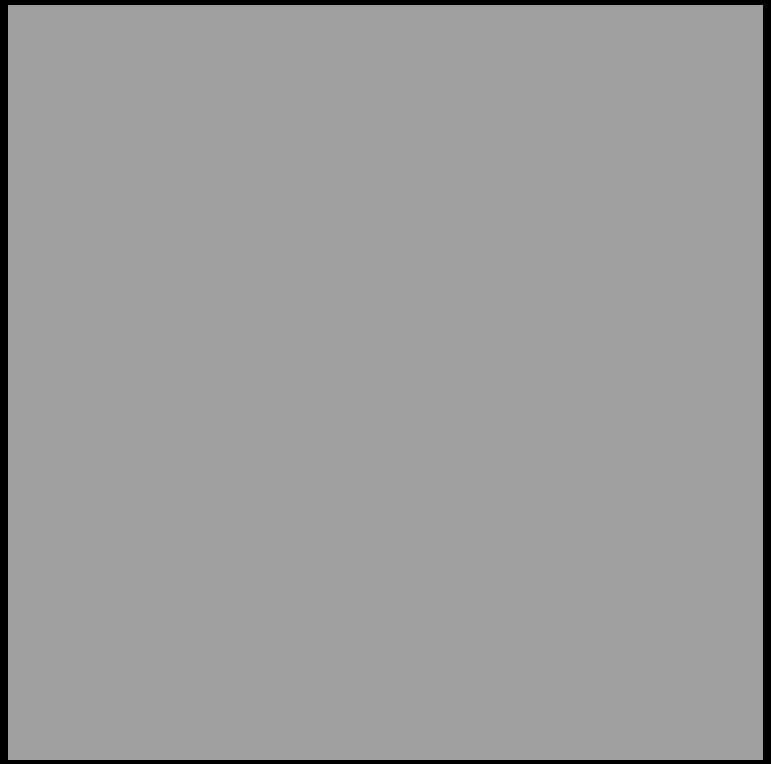
# Lightness

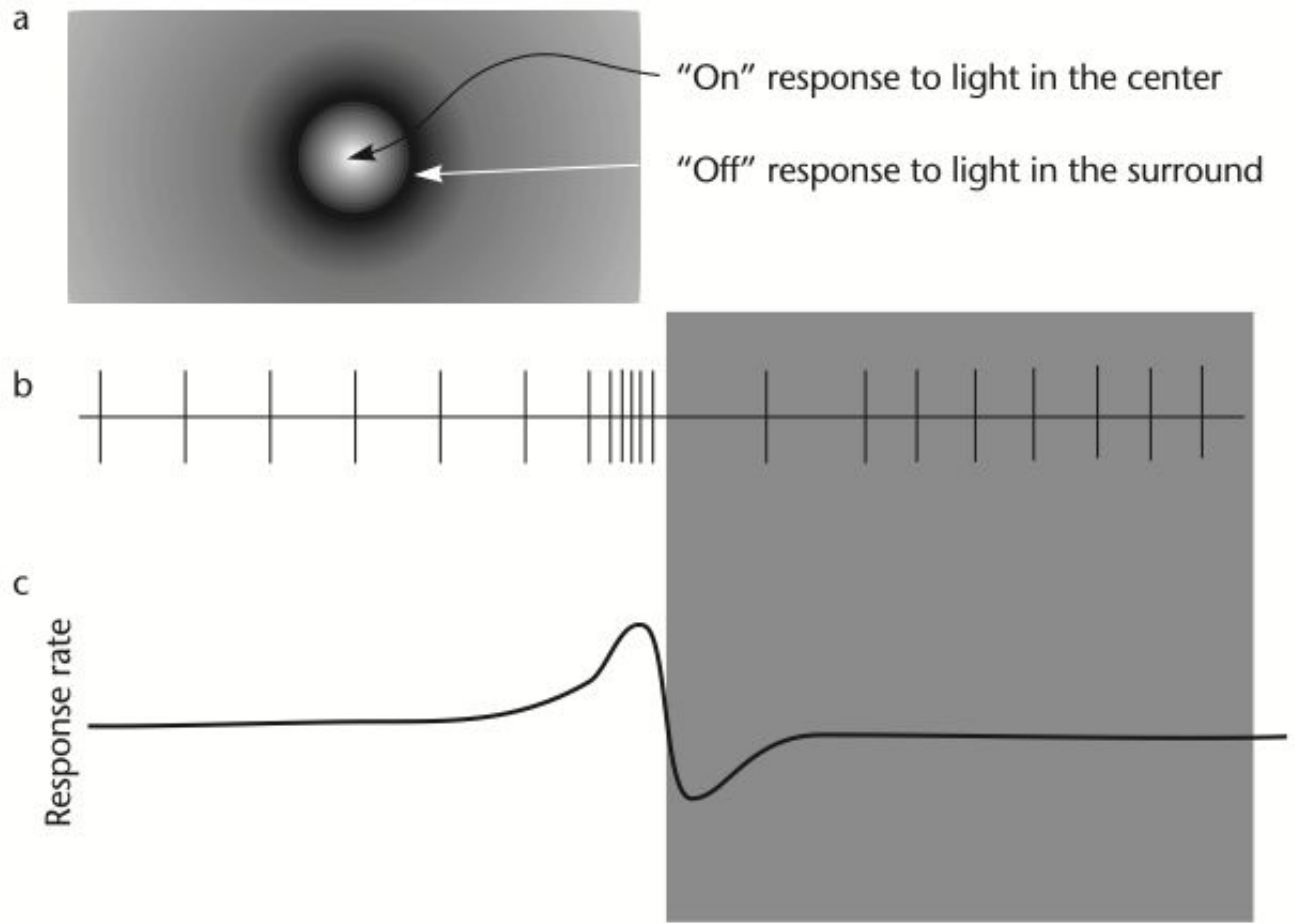

“Simultaneous
Brightness
Contrast”



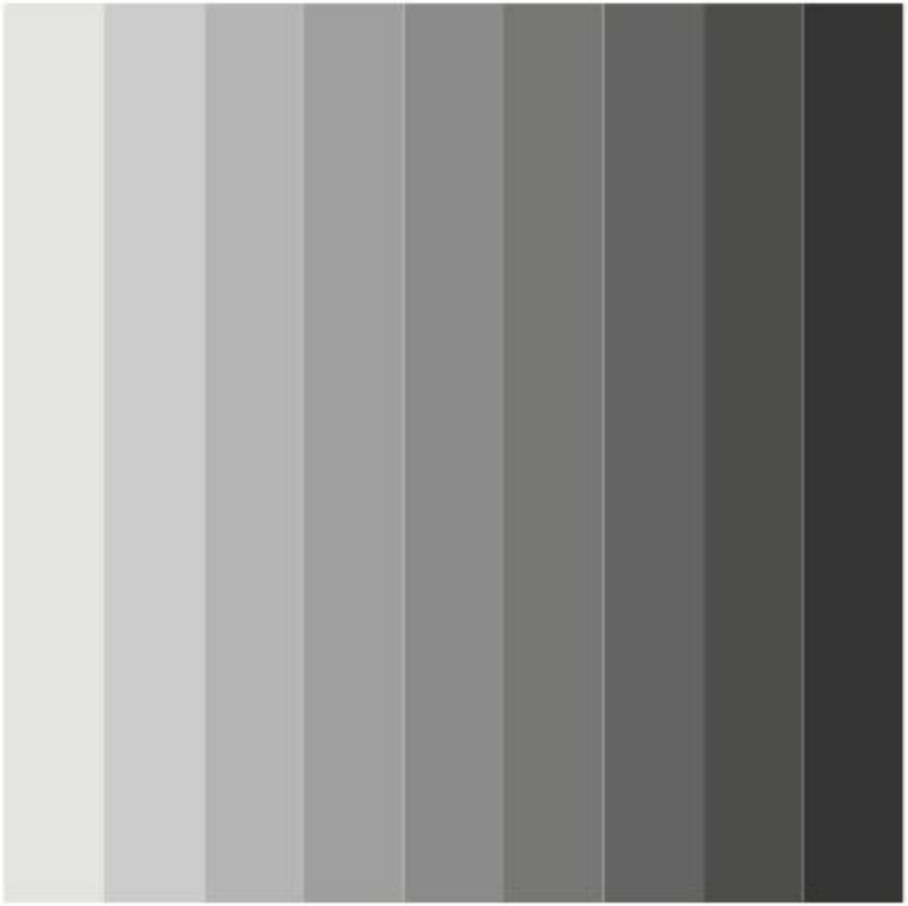


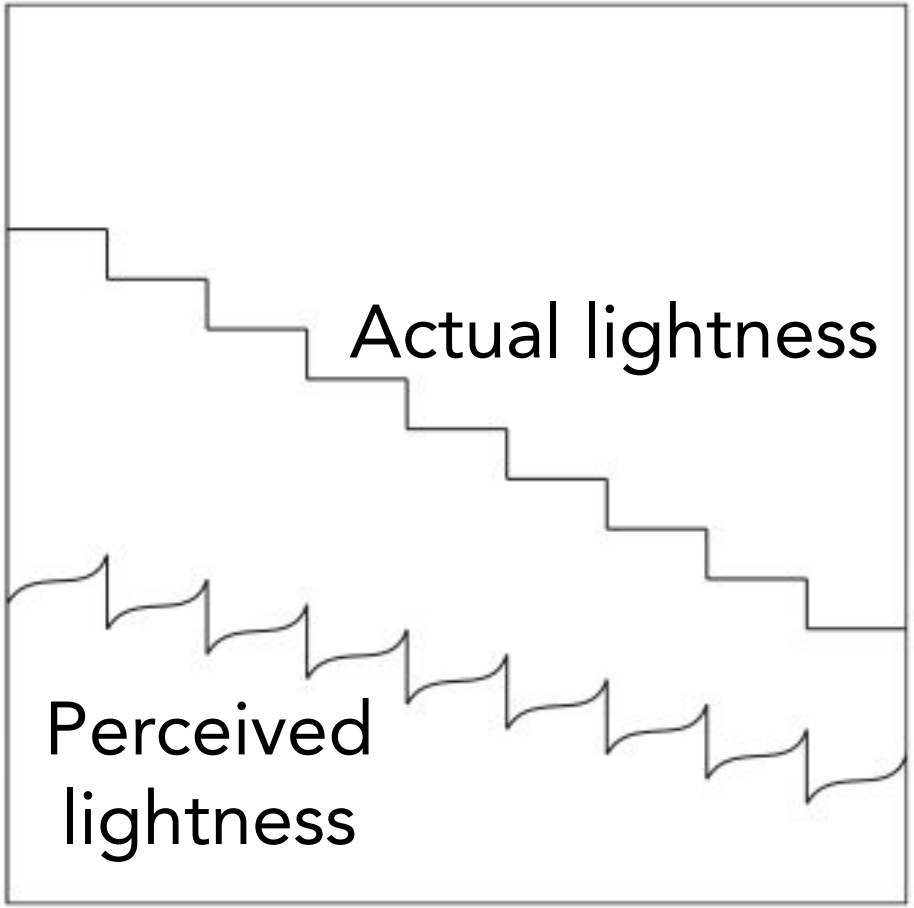






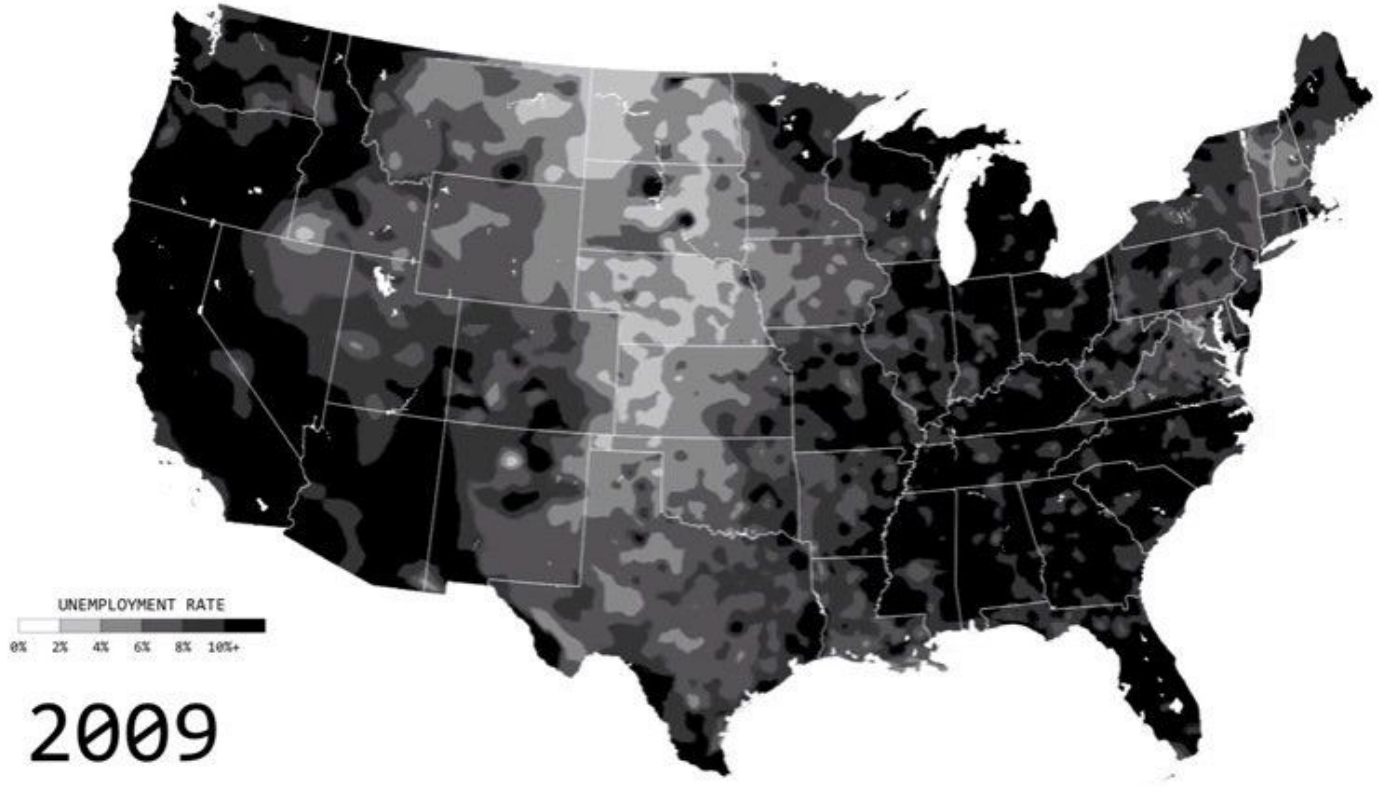

C. Ware, Information visualization



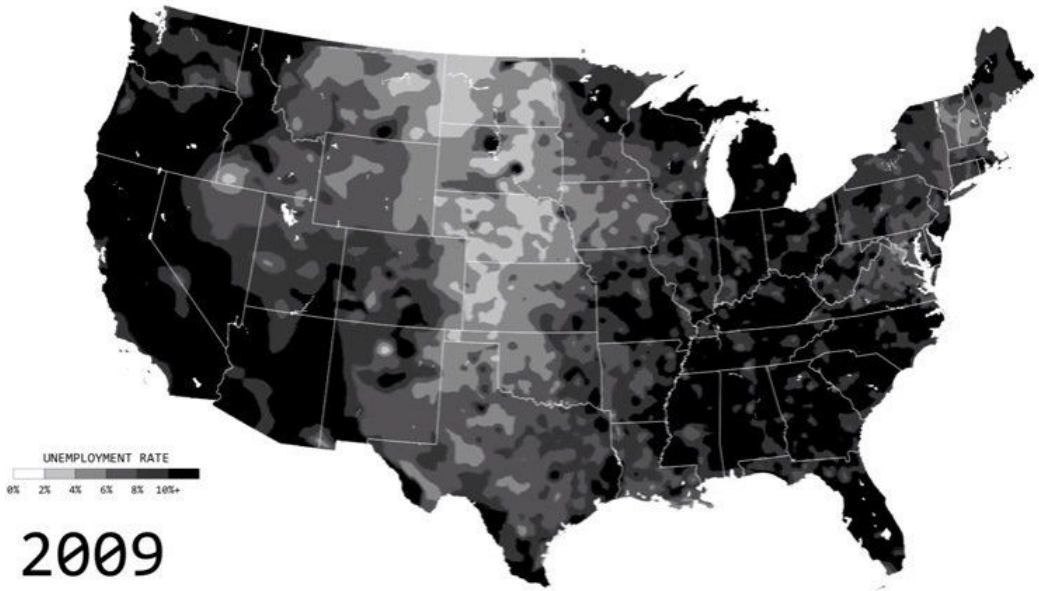

Actual lightness
Perceived lightness

# What is the lesson?

What would be the implications in data visualization?




http://www.businessinsider.com/an-animated-map-shows-us-unemployment-over-time-2017-5

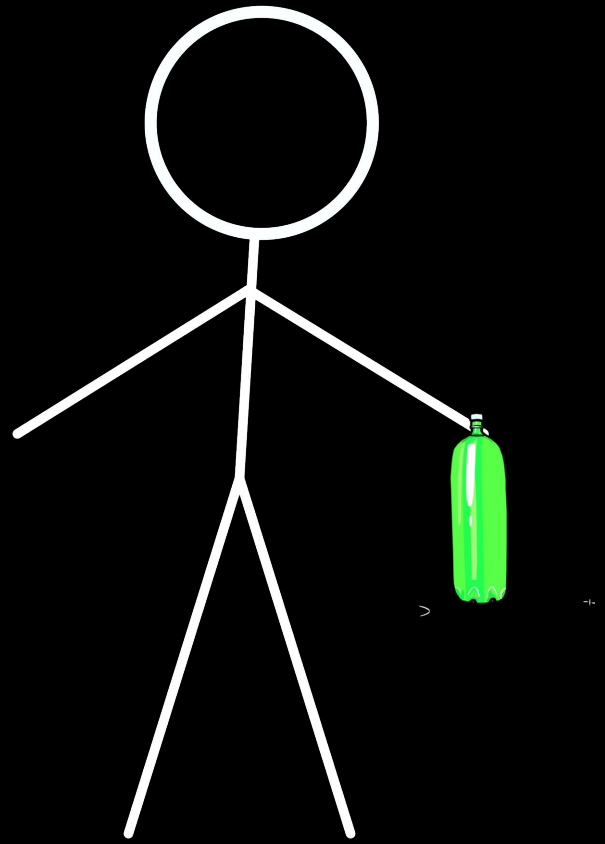


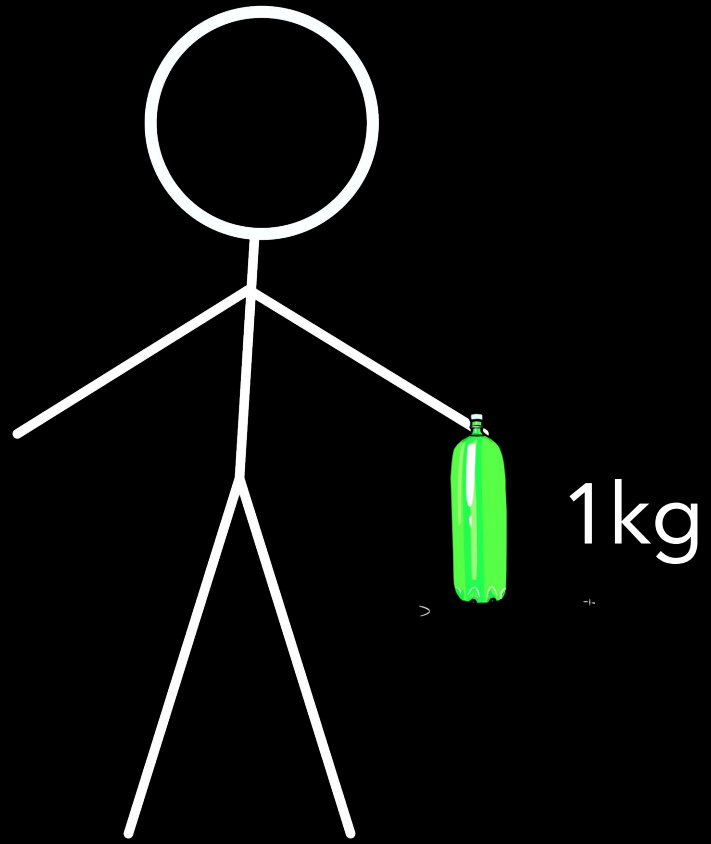

If you use lightness to represent the data, the perception of the quantity will be distorted by the surroundings.

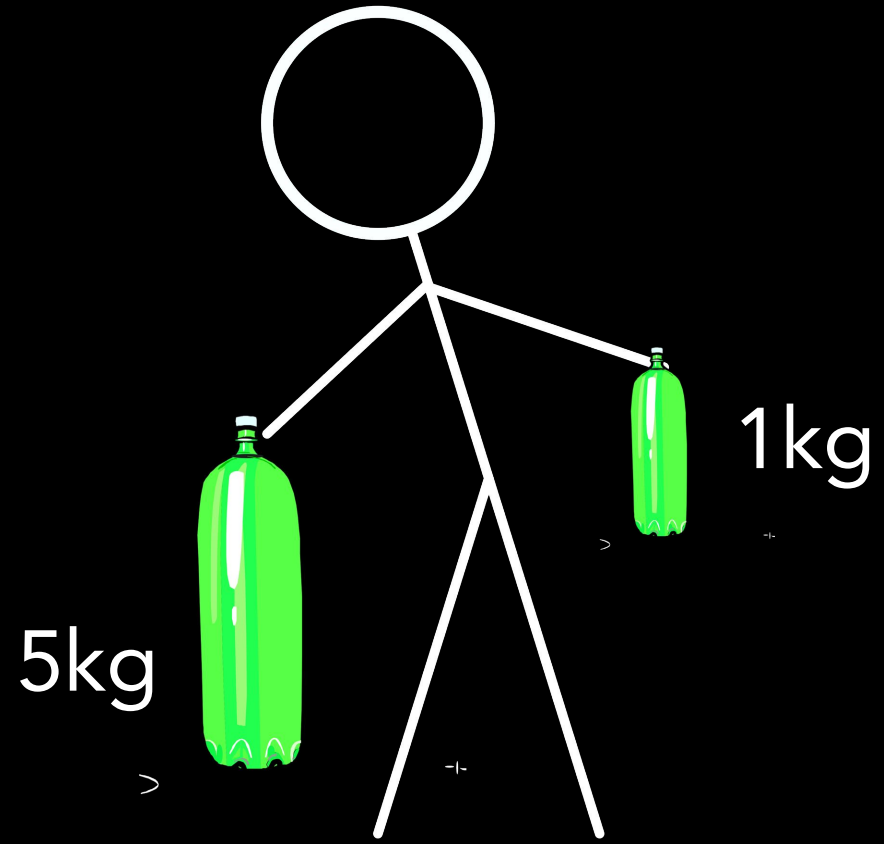
http://www.businessinsider.com/an-animated-map-shows-us-unemployment-over-time-2017-5

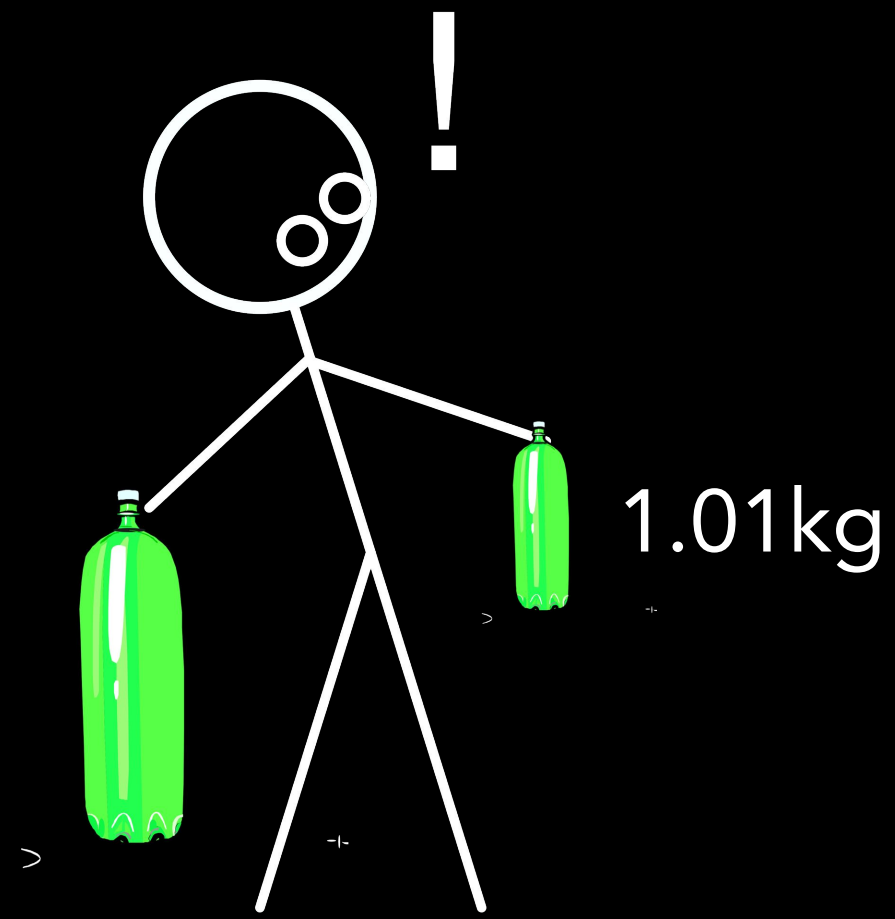
# Psychophysics

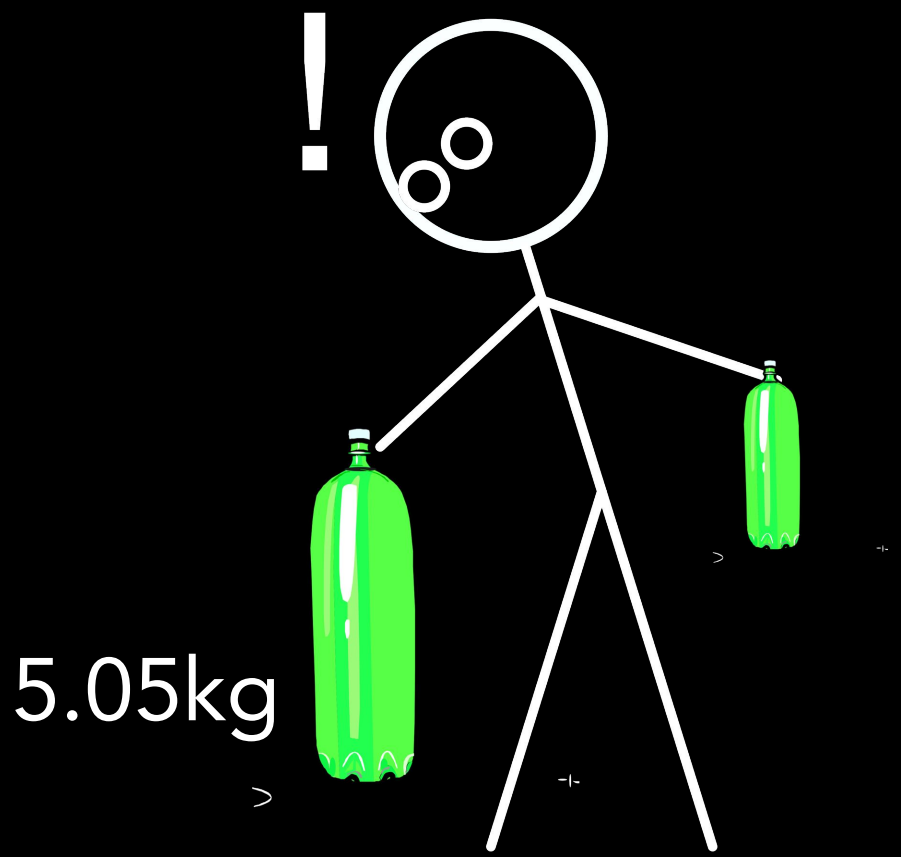
# Weber's law




1kg


1kg
5kg


!
1.01kg

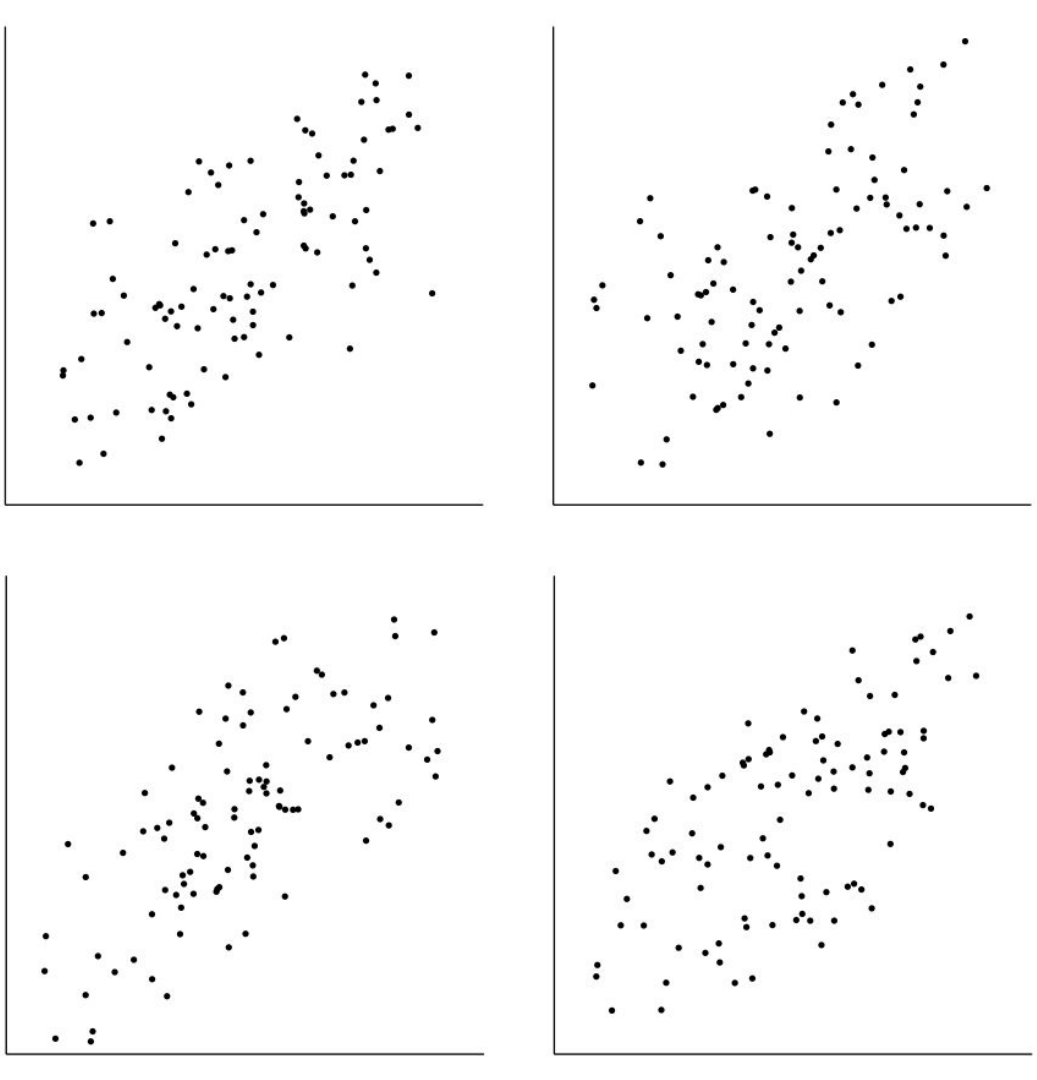

!
5.05kg

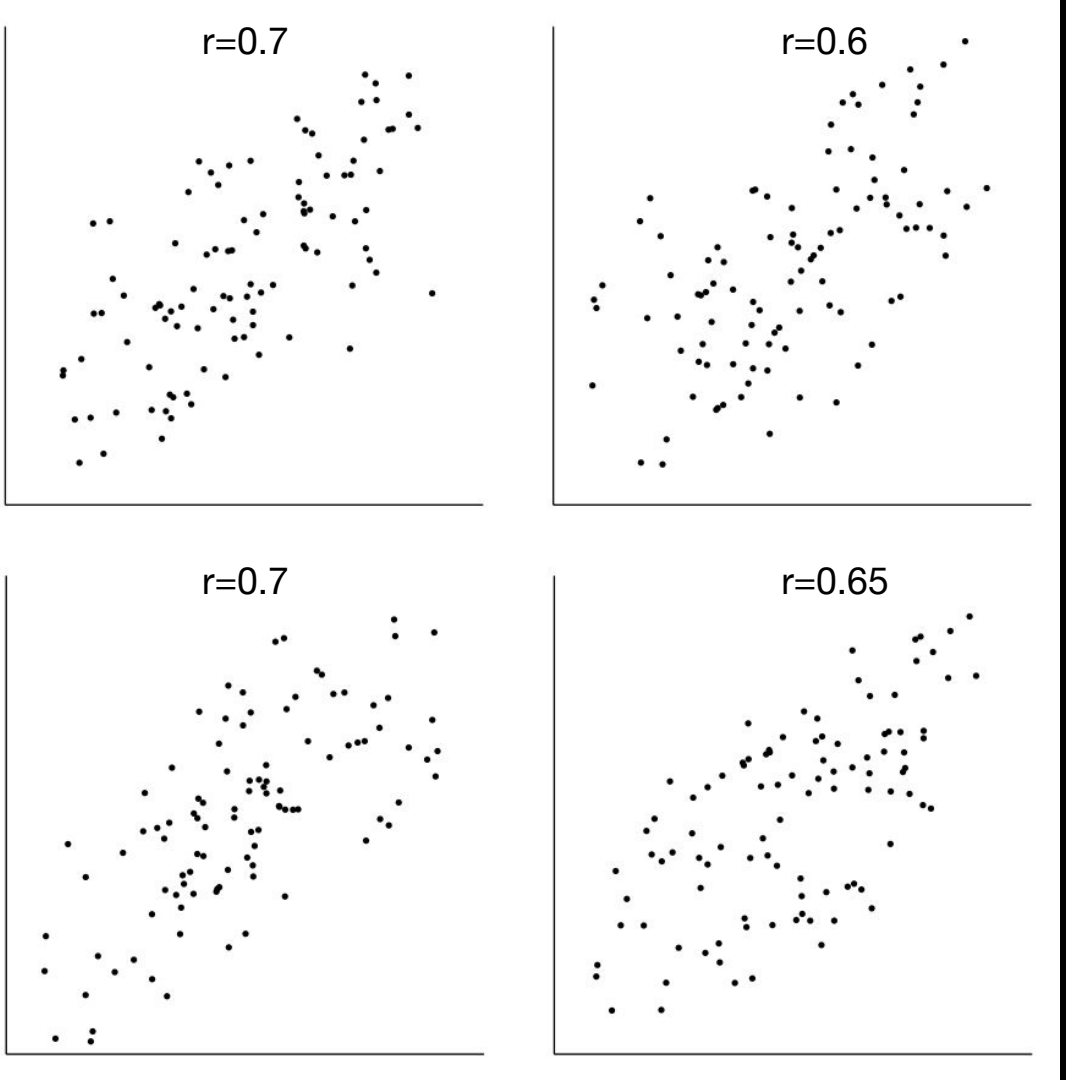
# Weber's law

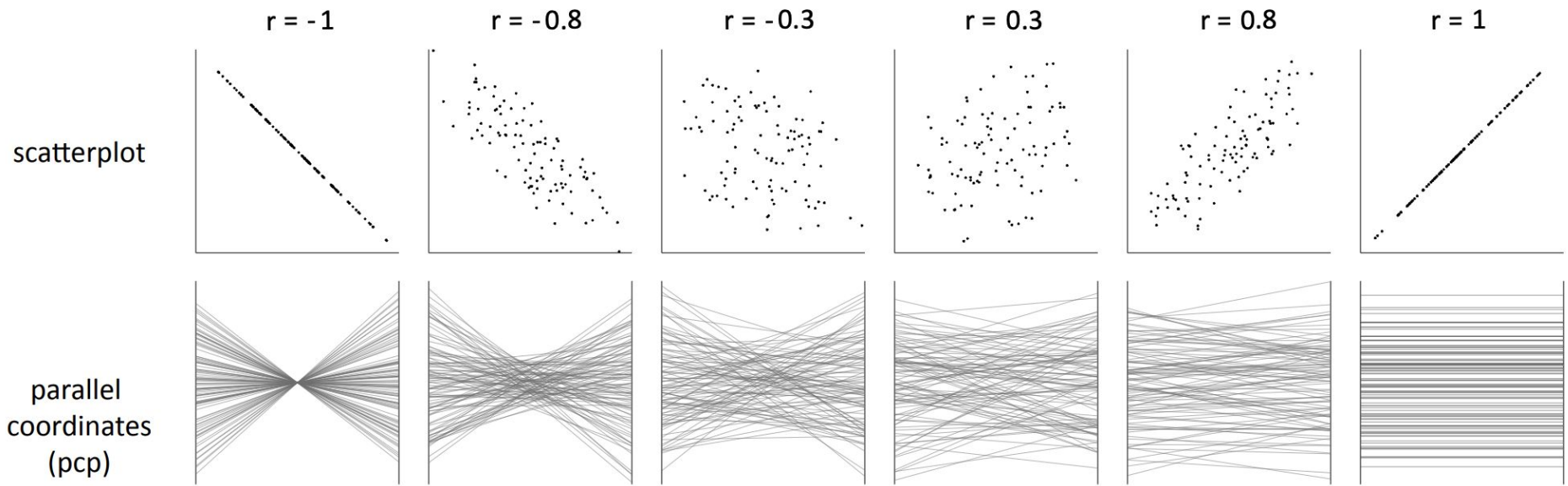
$$k = \frac{\Delta I}{I}$$

# Weber's law

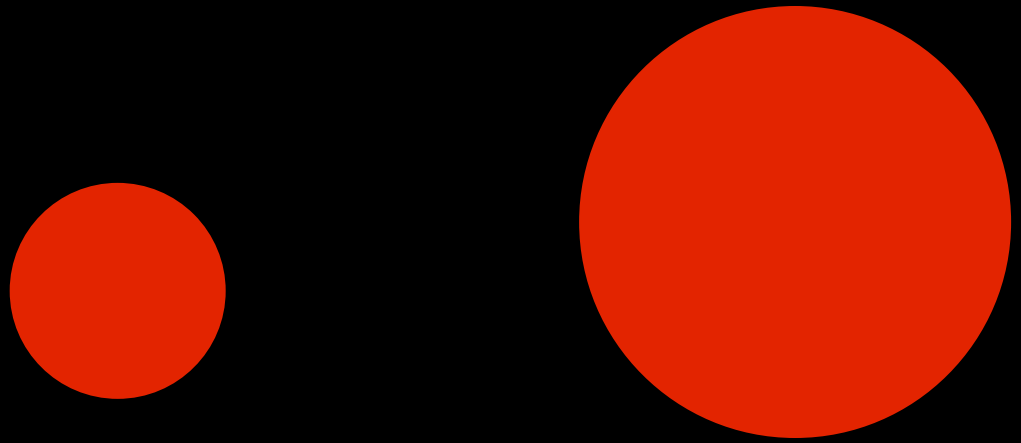
$$k = \frac{\Delta I}{I}$$ (JND)

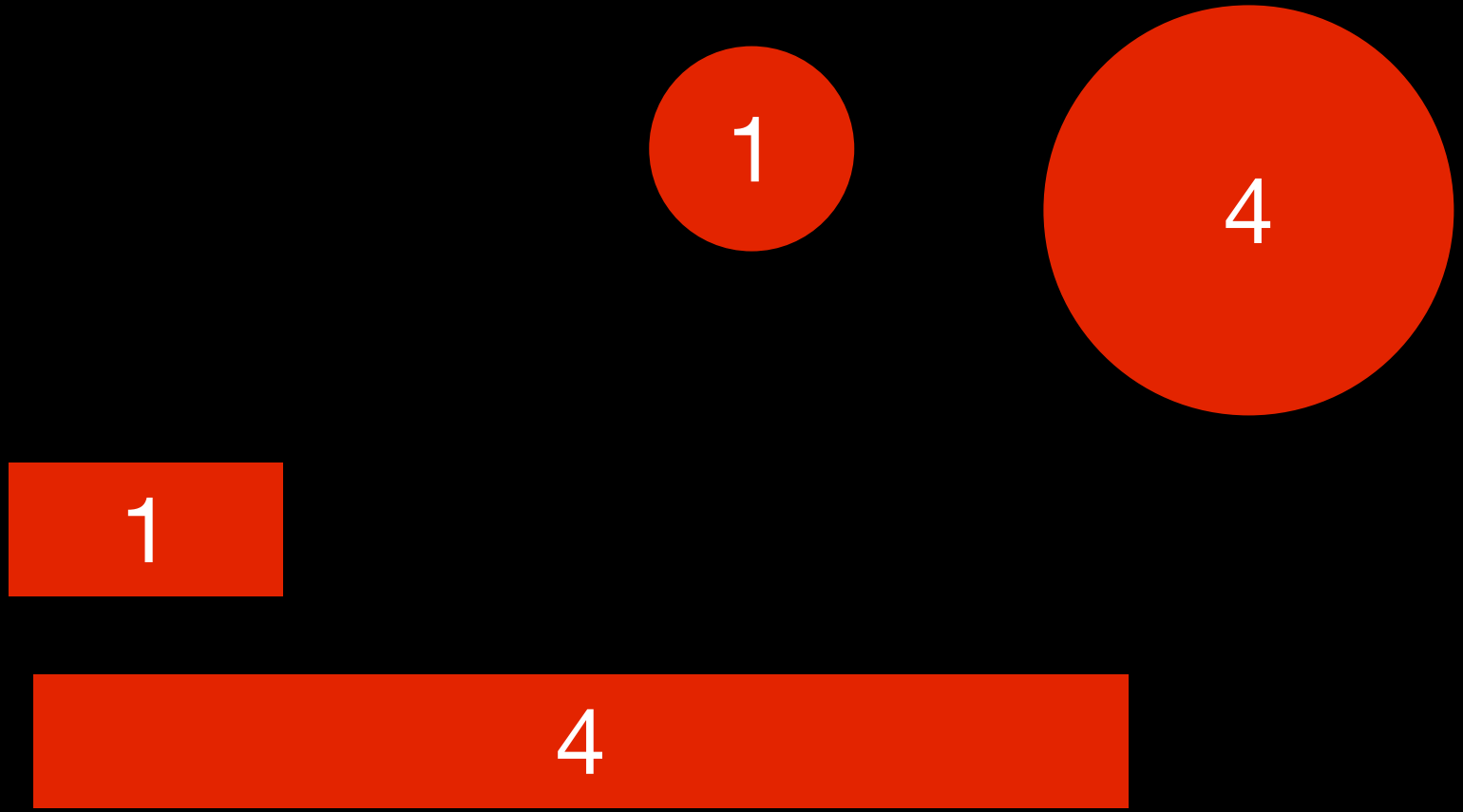



r=0.7
r=0.6
r=0.7
r=0.65


r = -1
r = -0.8
r = -0.3
r = 0.3
r = 0.8
r = 1
scatterplot
parallel coordinates (pcp)

# Stevens's power law




1
4
1
4

# In-class exercise

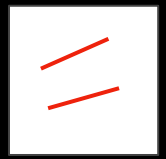
(it will be fun! 🥳)

Which one allows people to most accurately estimate relative magnitudes? And which one is the least accurate? Let's rank all!

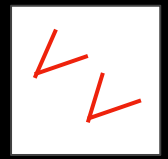
Length

Area

Slope

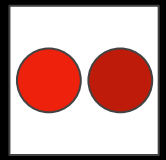


Angle

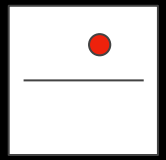


Volume

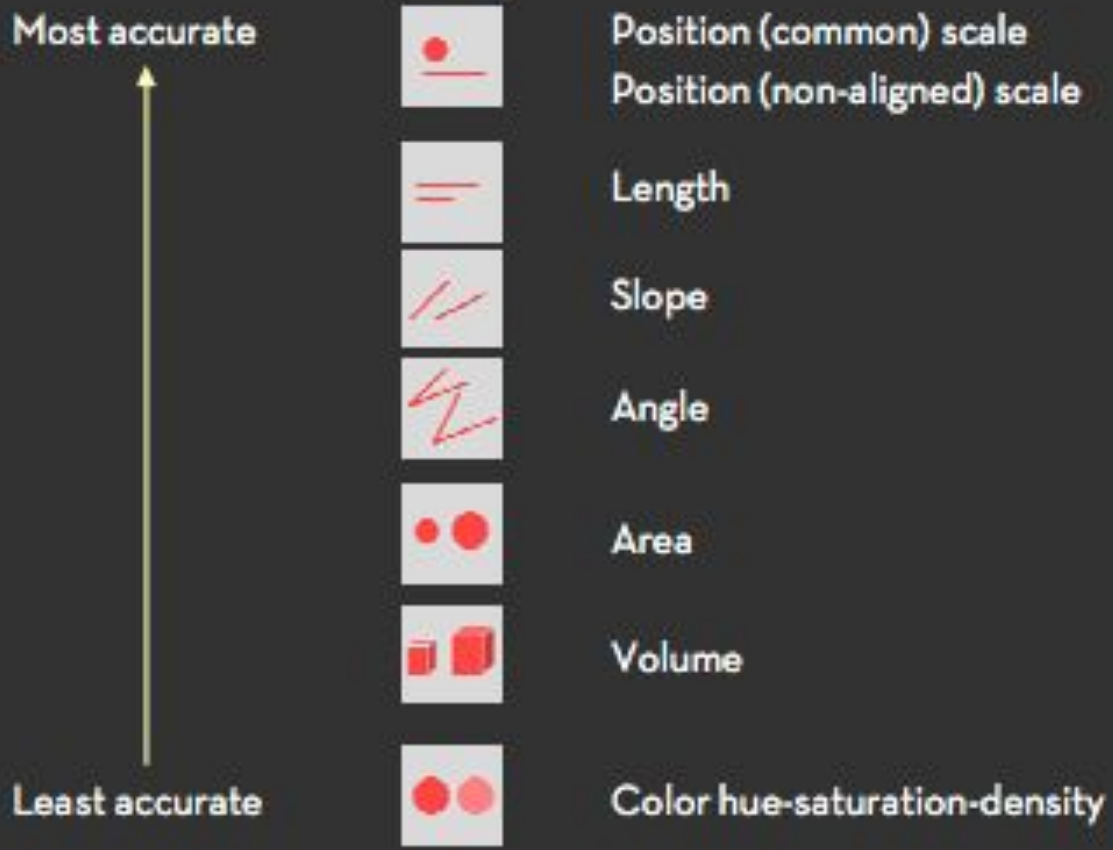
Color



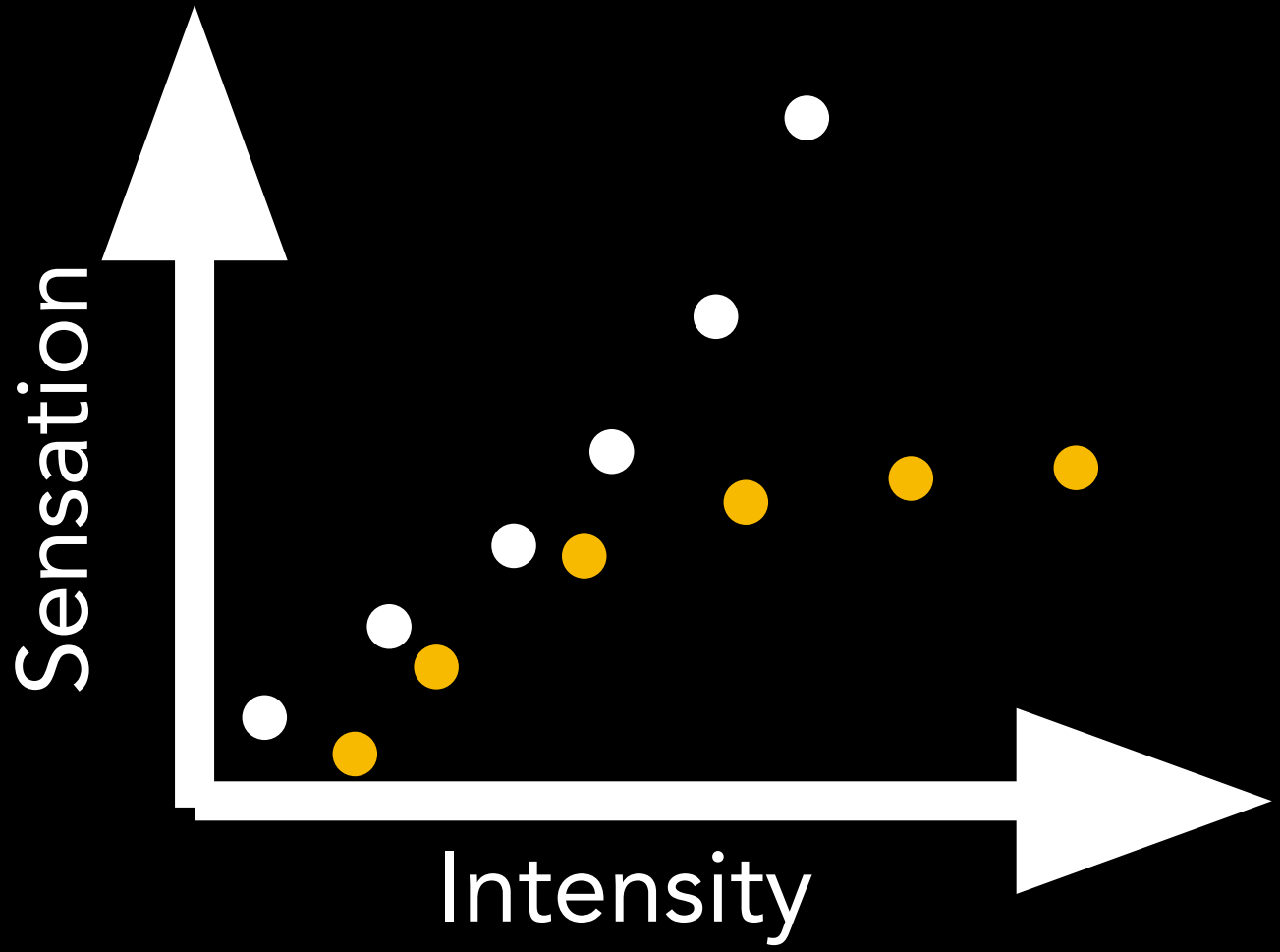
Position



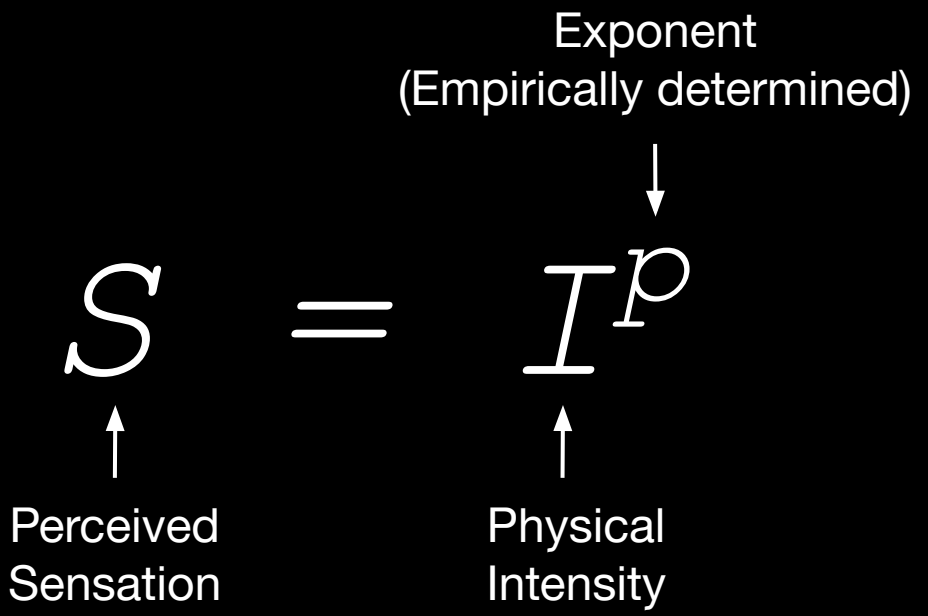
# Relative magnitude estimation

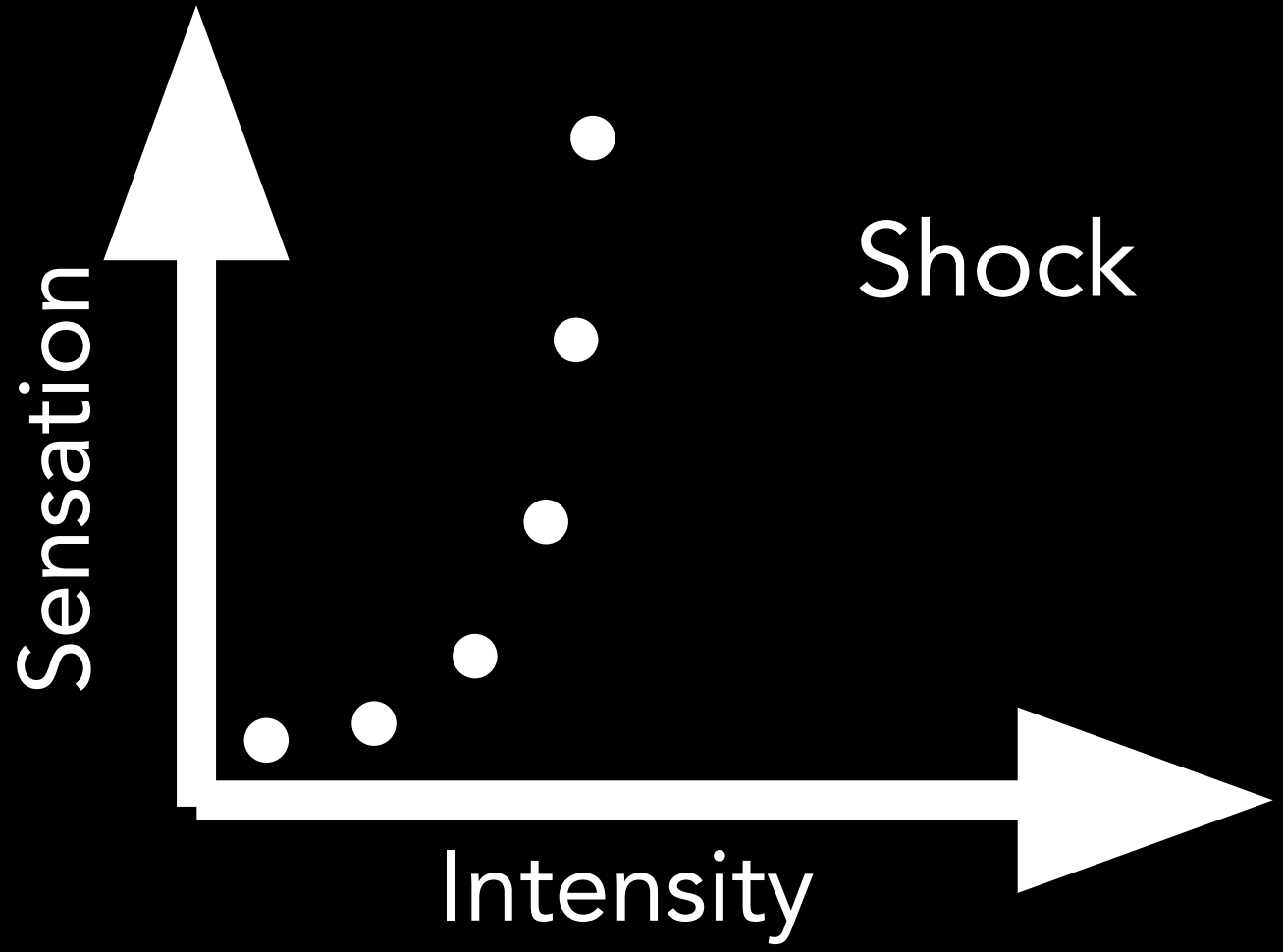


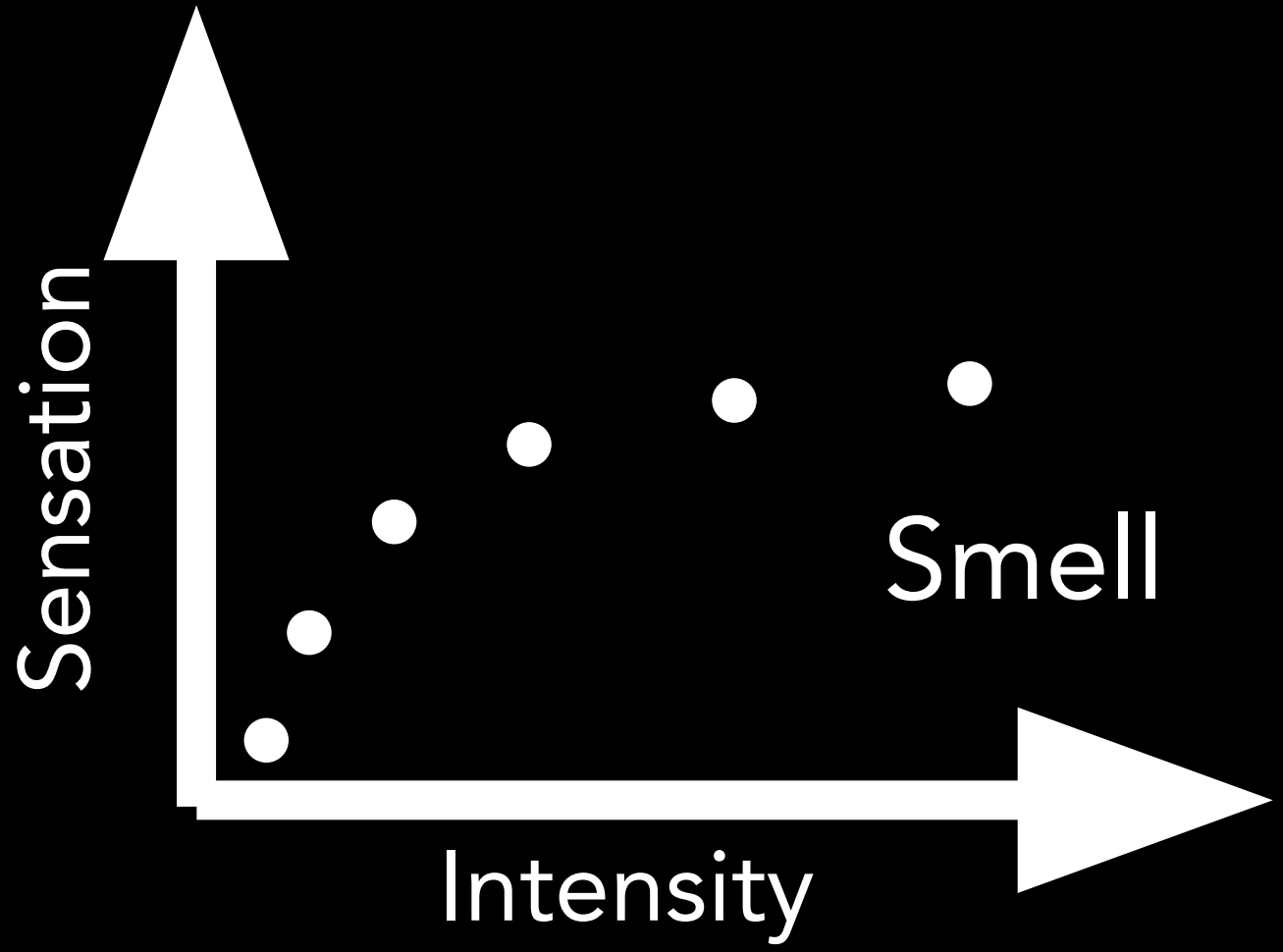
# What did you find?

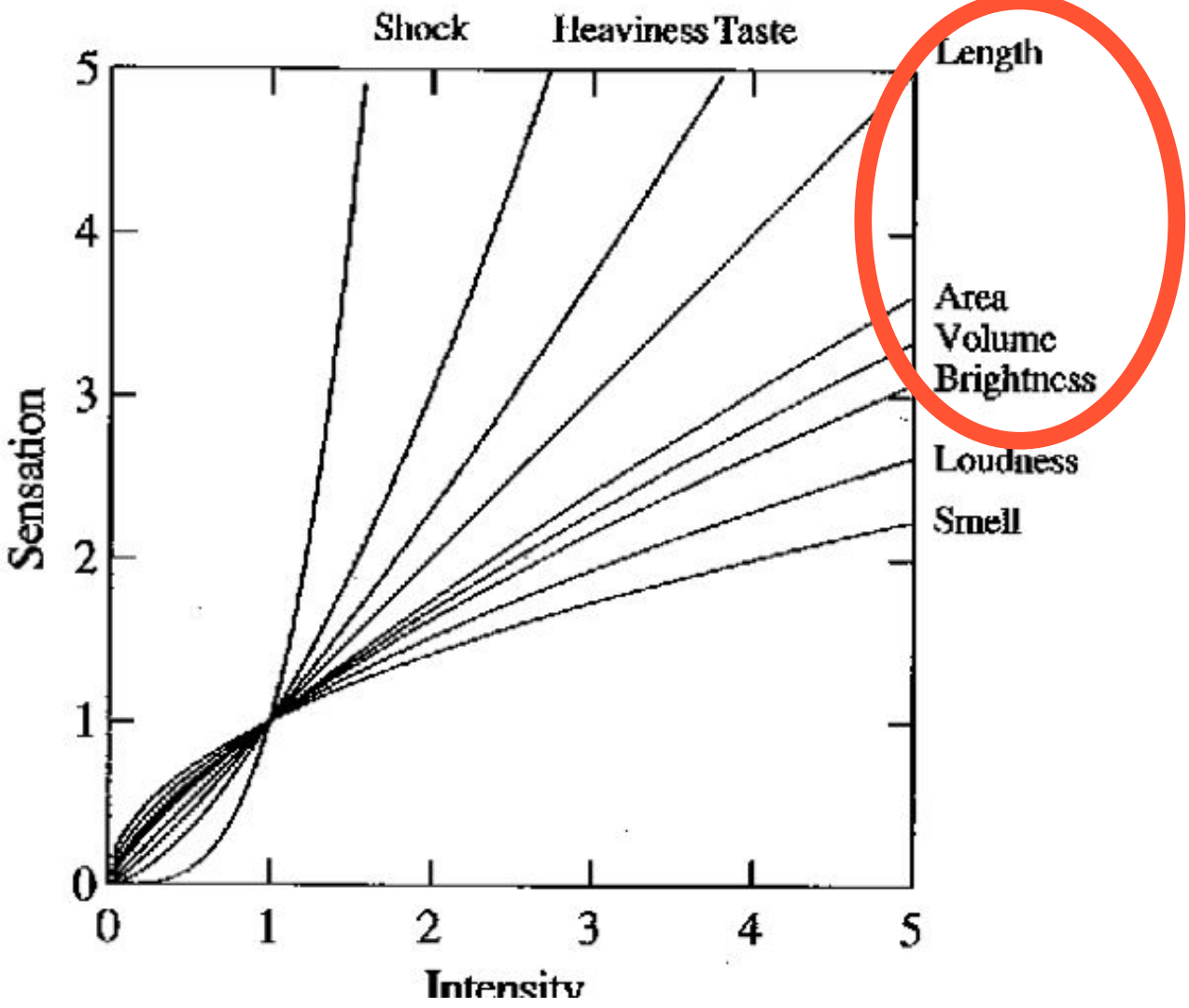

Sensation
Intensity

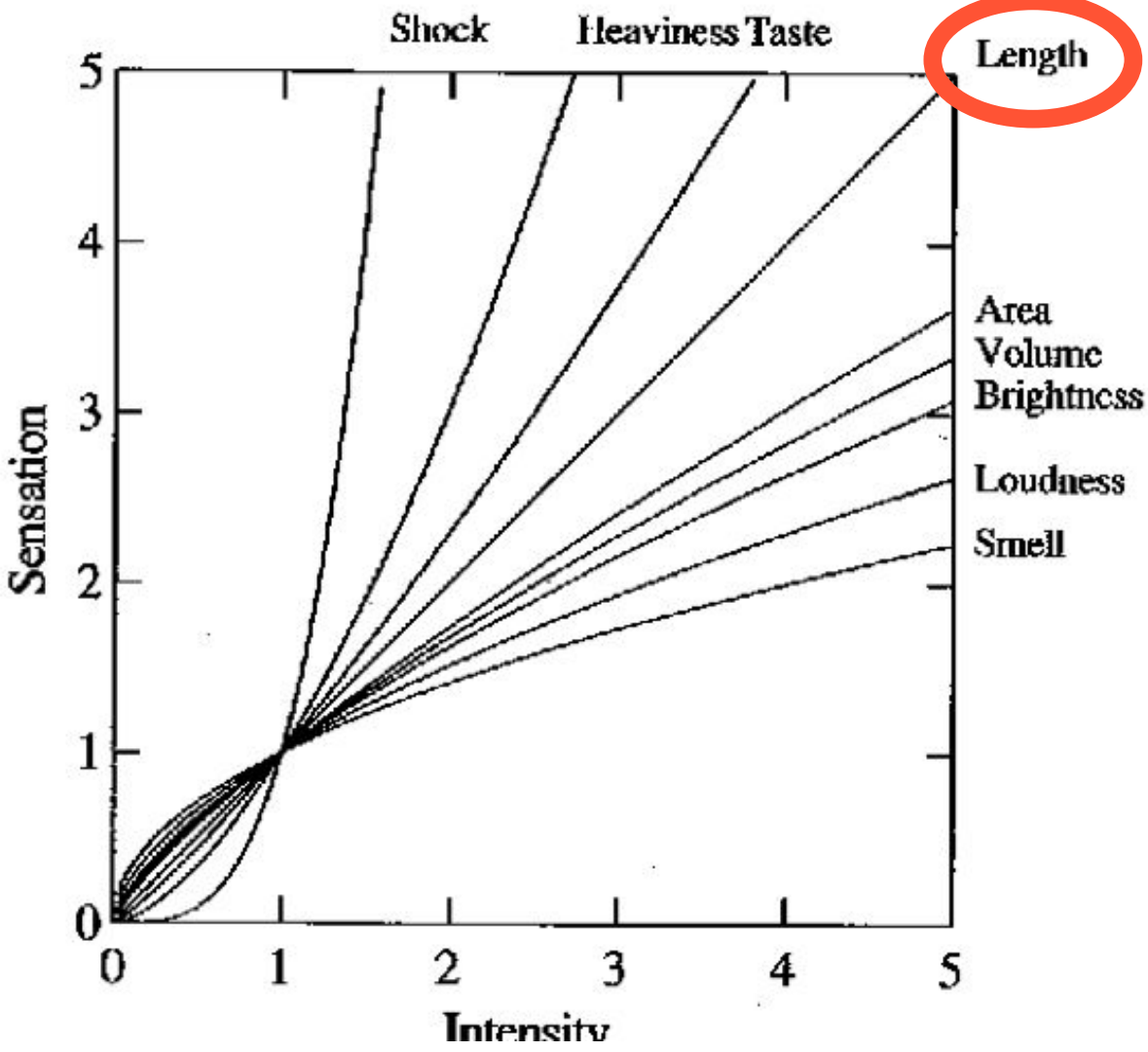
# Stevens's power law

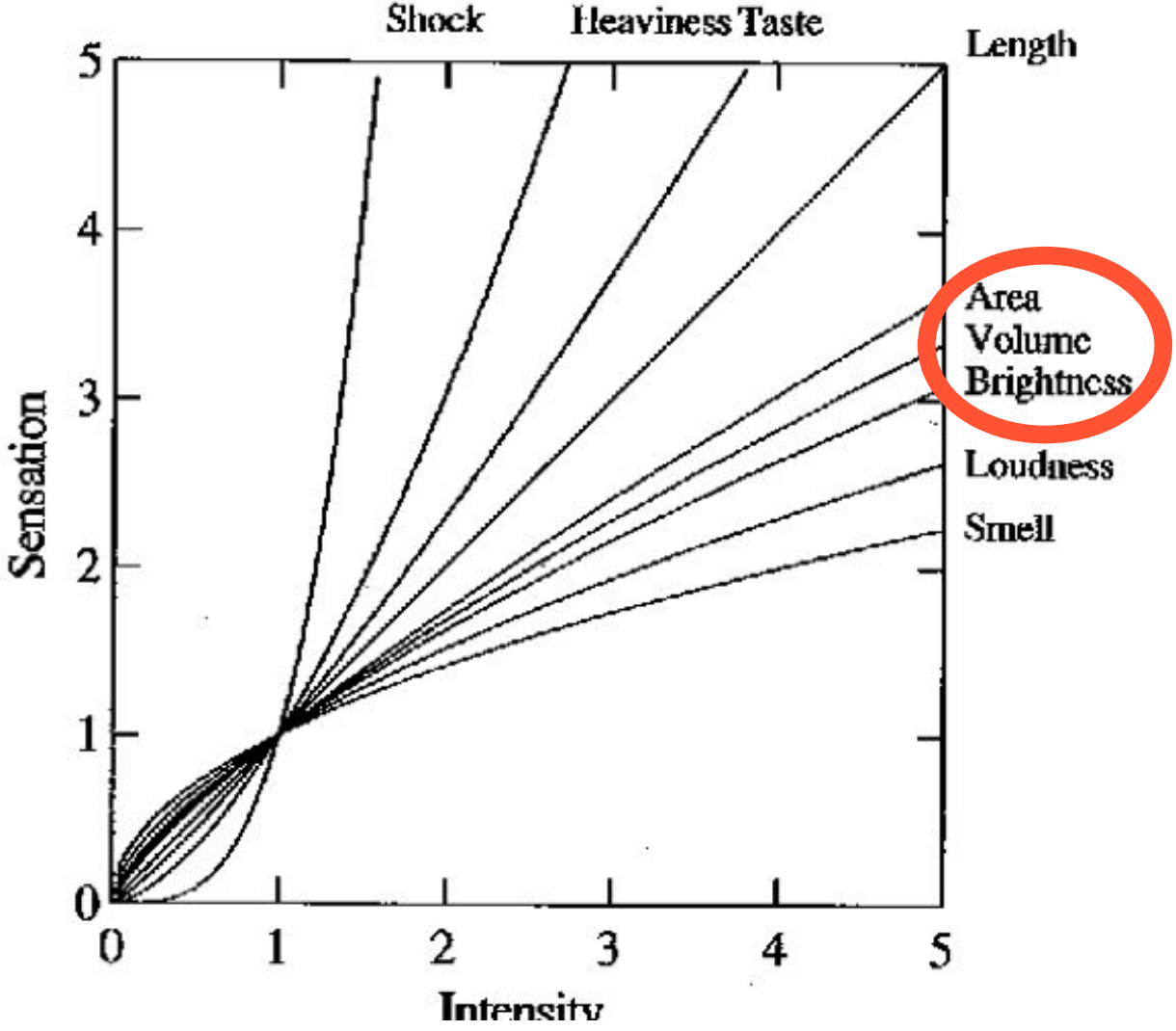



Shock
Sensation
Intensity


Sensation
Smell
Intensity


Shock
Heaviness
Taste
Length
Area
Volume
Brightness
Loudness
Smell
Sensation
Intensity
0
1
2
3
4
5


Shock
Heaviness Taste
Length
Area
Volume
Brightness
Loudness
Smell
Sensation
Intensity
0
1
2
3
4
5


Shock
Heaviness
Taste
Length
Area
Volume
Brightness
Loudness
Smell
Sensation
Intensity
0
1
2
3
4
5


Pie I have eaten
Pie I have not yet eaten

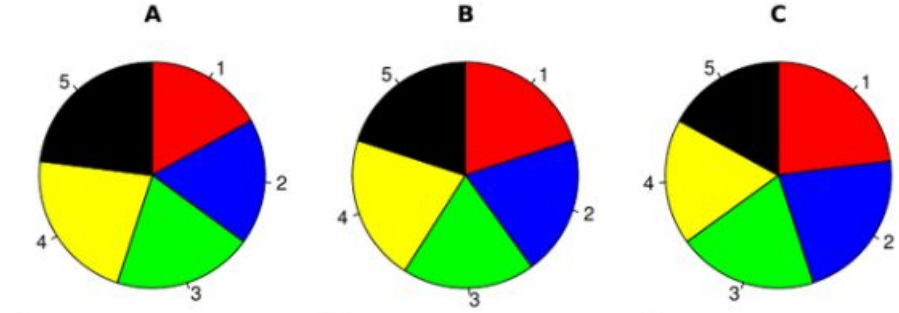

Pie I have eaten
Pie I have not yet eaten


Pie I have eaten
Pie I have not yet eaten

**Max Roser**
@MaxCRoser

Following

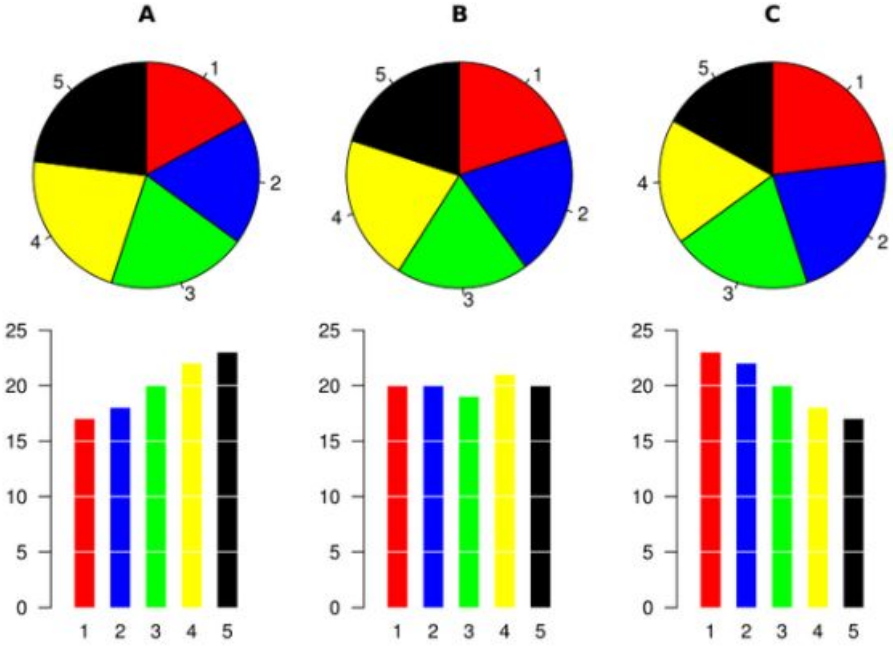
Don’t use pie charts.



**Max Roser**
@MaxCRoser

Following

Don’t use pie charts.




RETWEETS 2,182 FAVORITES 1,448

5:27 PM - 10 Jun 2015

According to Stevens' power law, our perception of area is not accurate. Then why not *rescale areas according to Stevens' power law?*