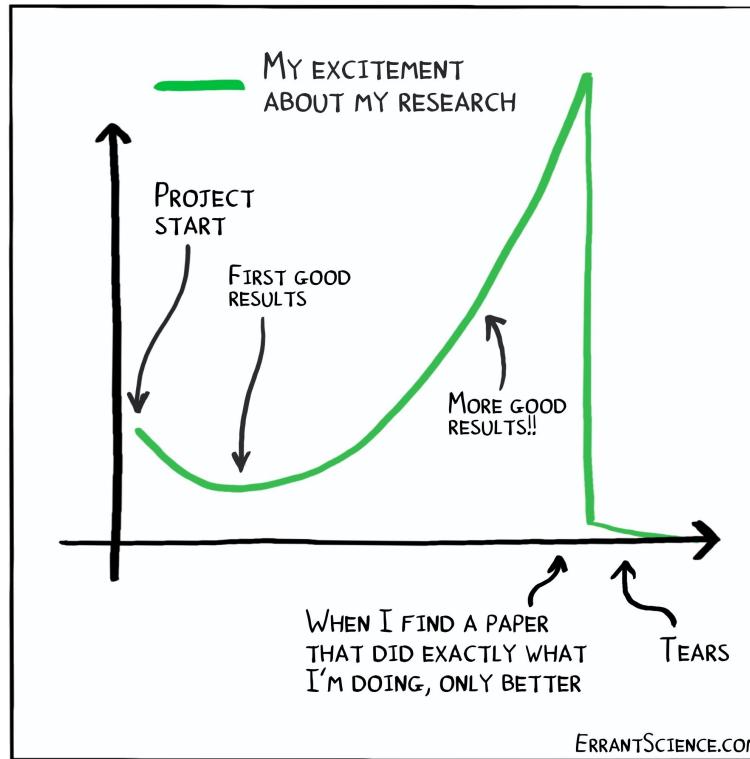


Your data is what *you* make of it

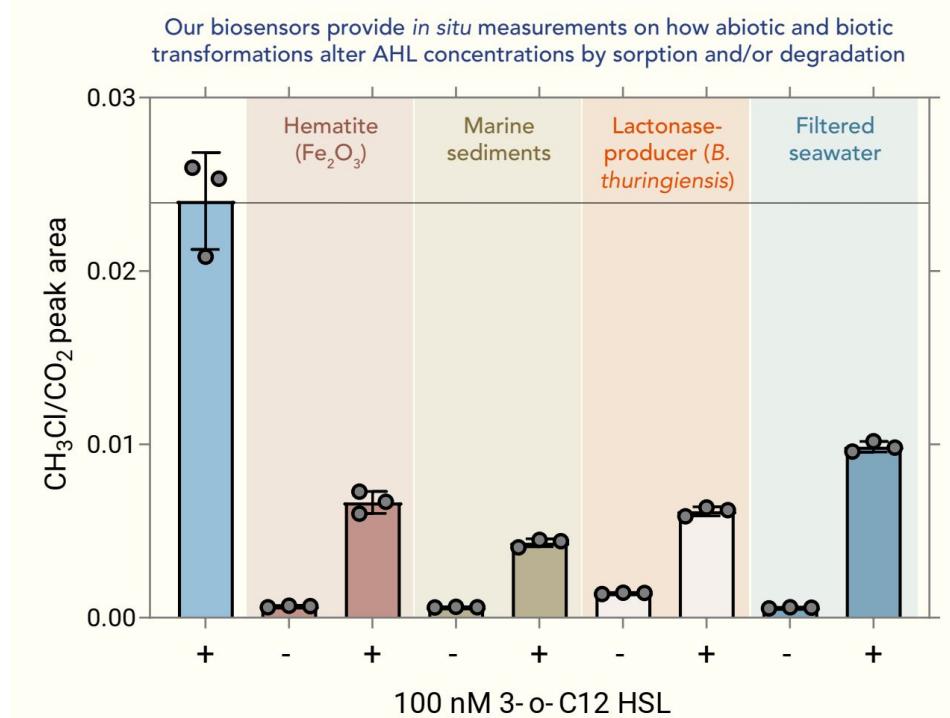
Swetha Sridhar

# Working with data is essential for us



# So why should I be telling you this?

I am passionate about design



# So why should I be telling you this?

I obsessively collect design inspiration



[109]



[121]

[122]

[123]

A Collection Of Food Can Labels Made In Japan

# So why should I be telling you this?

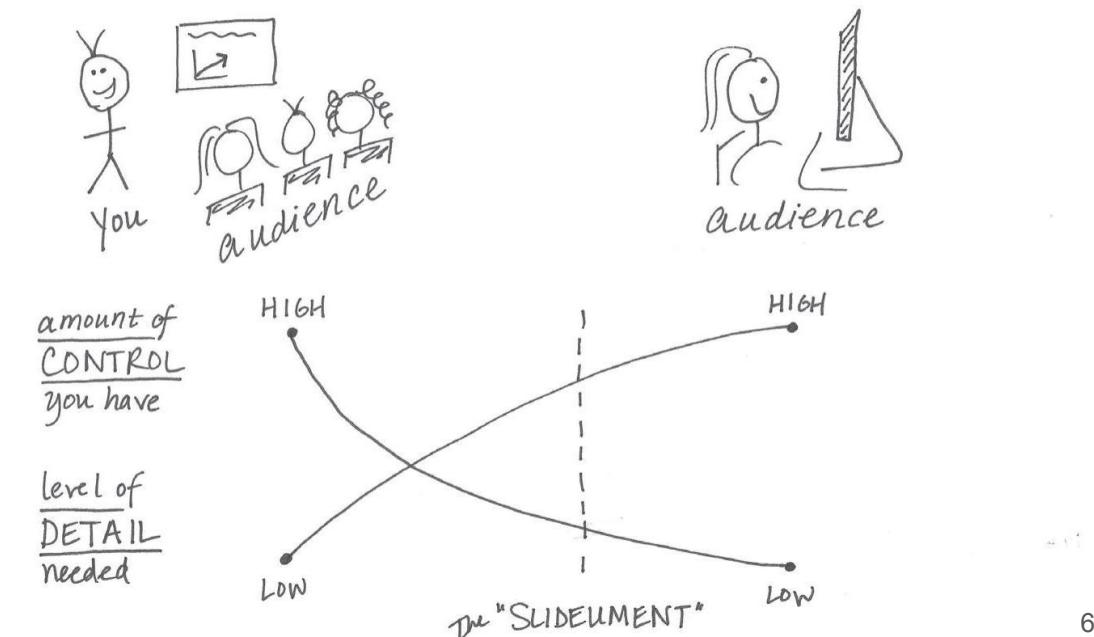
I am disabled - good design enables people like me to interact with science

Color Palette

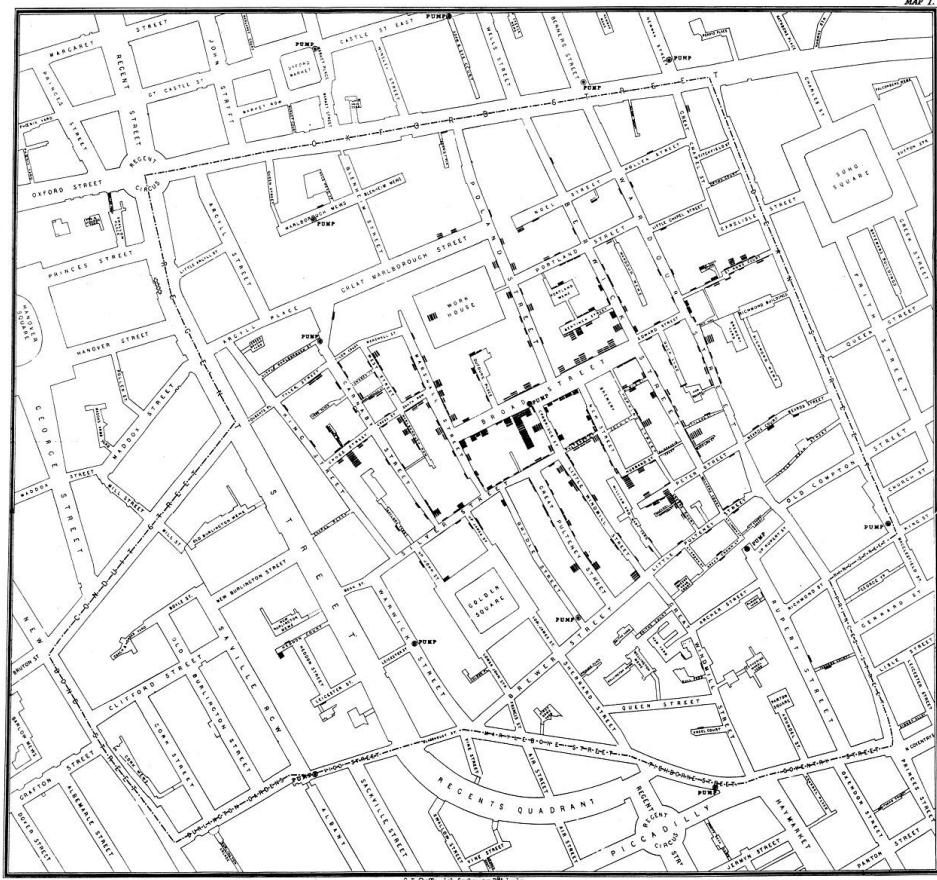


# Why should a scientist care about displaying data?

LIVE PRESENTATION . . . . . WRITTEN DOC OR EMAIL



# Why should a scientist care about displaying data?



# What does design have to do with scientific data?

Dieter Rams' principles for good design:

- Is innovative.
- Makes a product **useful**.
- Is aesthetic.
- Makes a product **understandable**.
- Is **unobtrusive**.
- Is **honest**.
- Is long-lasting.
- Is **thorough** down to the last detail.
- Is environmentally friendly.
- Involves **as little design** as possible.

# Good data representation ...

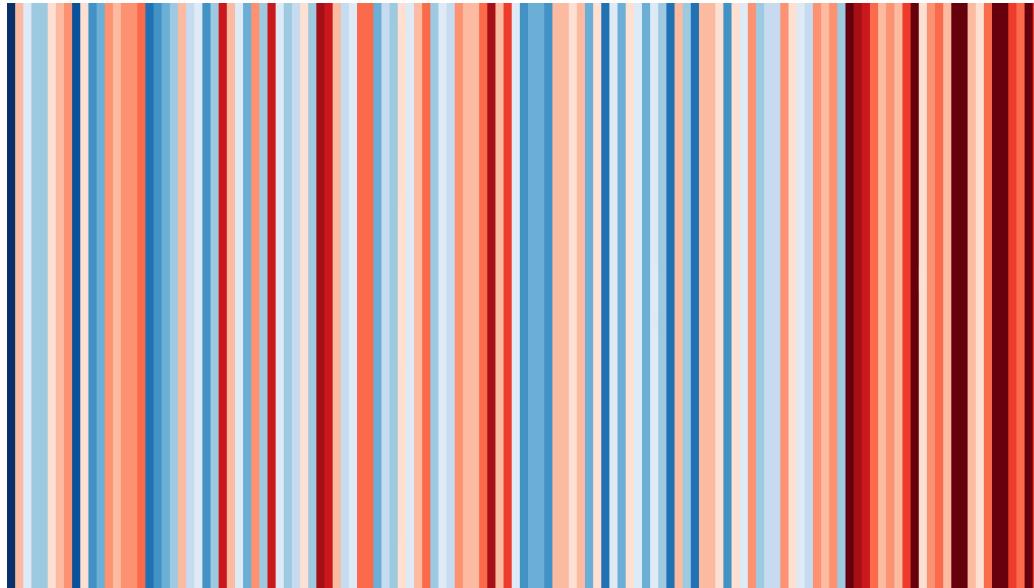
- Is innovative.
- Makes *data* **useful**.
- Is aesthetic.
- Makes *data* **understandable**.
- Is **unobtrusive**.
- Is **honest**.
- Is long-lasting.
- Is **thorough** down to the last detail.
- Is environmentally friendly.
- Involves **as little design** as possible.

Think about the **story** you want your data to tell

Let us work with an example

# Think about the story you want your data to tell

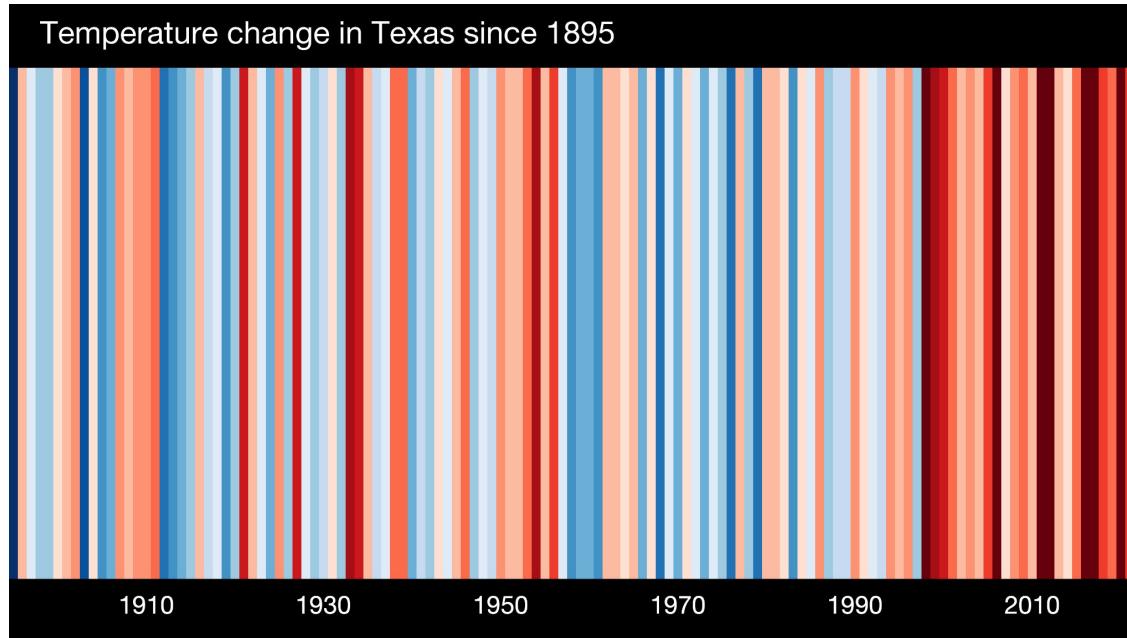
Let us work with an example



#showyourstripes

# Think about the story you want your data to tell

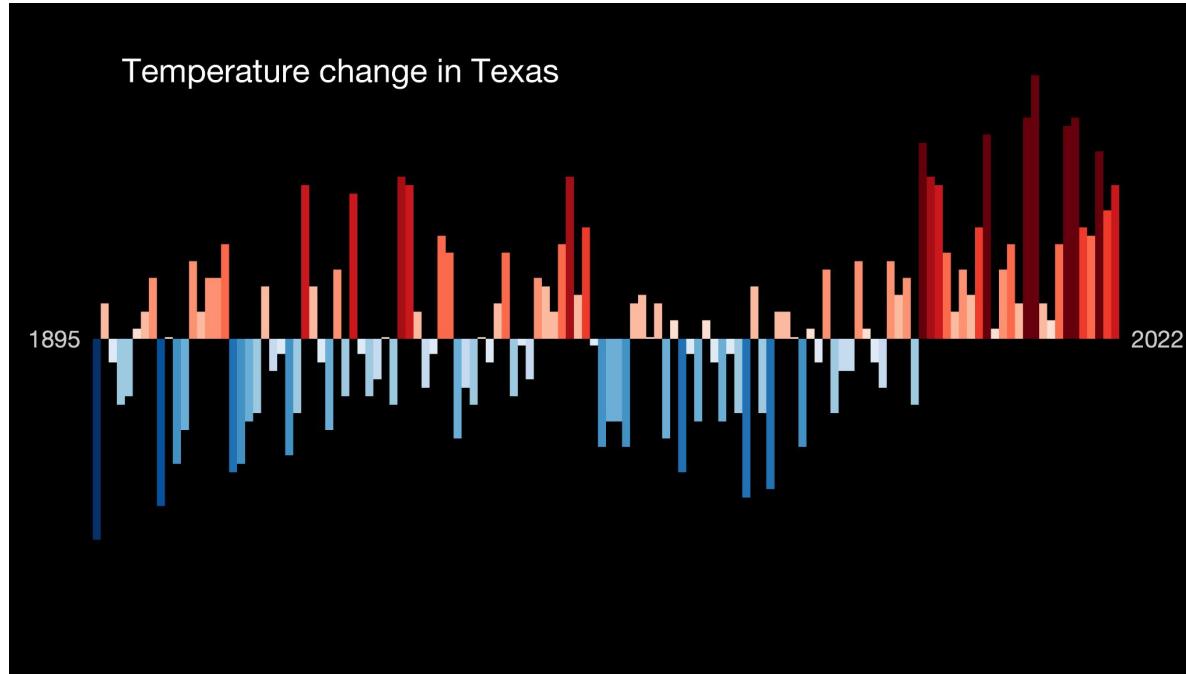
Let us work with an example



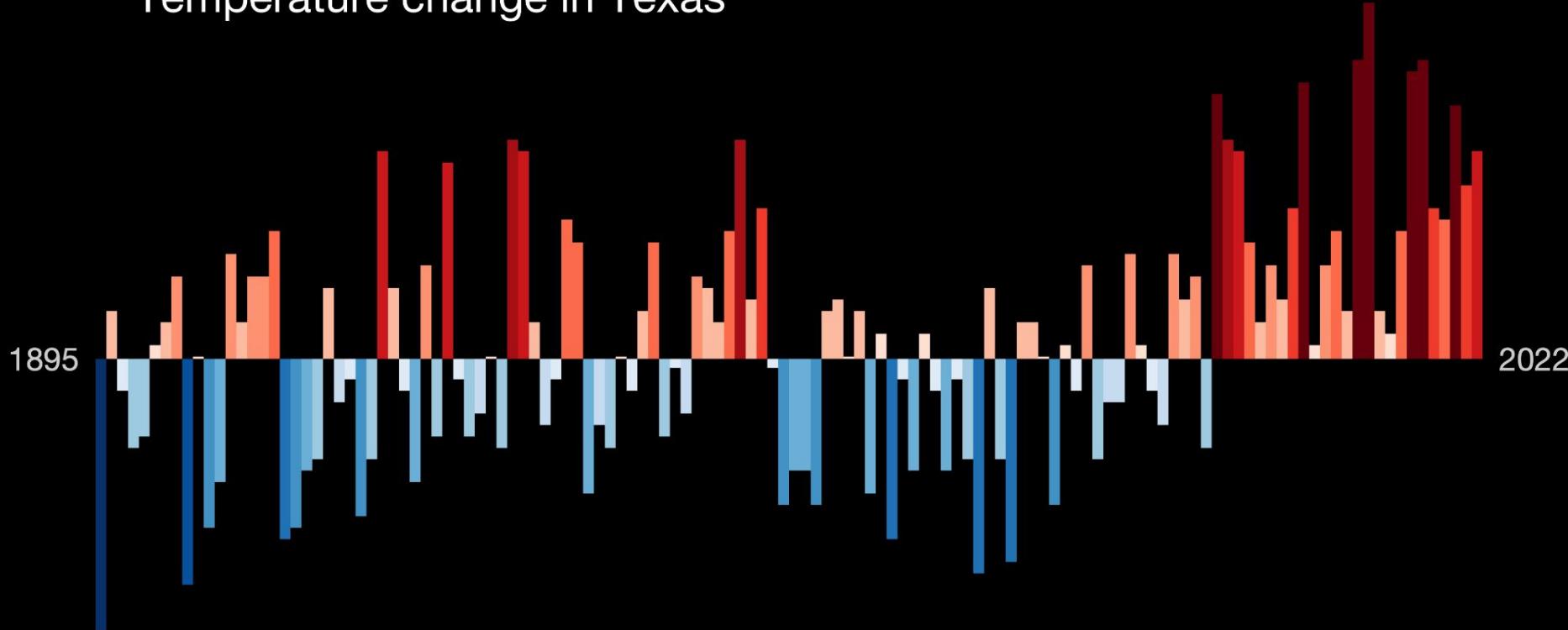
#showyourstripes

# Think about the story you want your data to tell

Let us work with an example



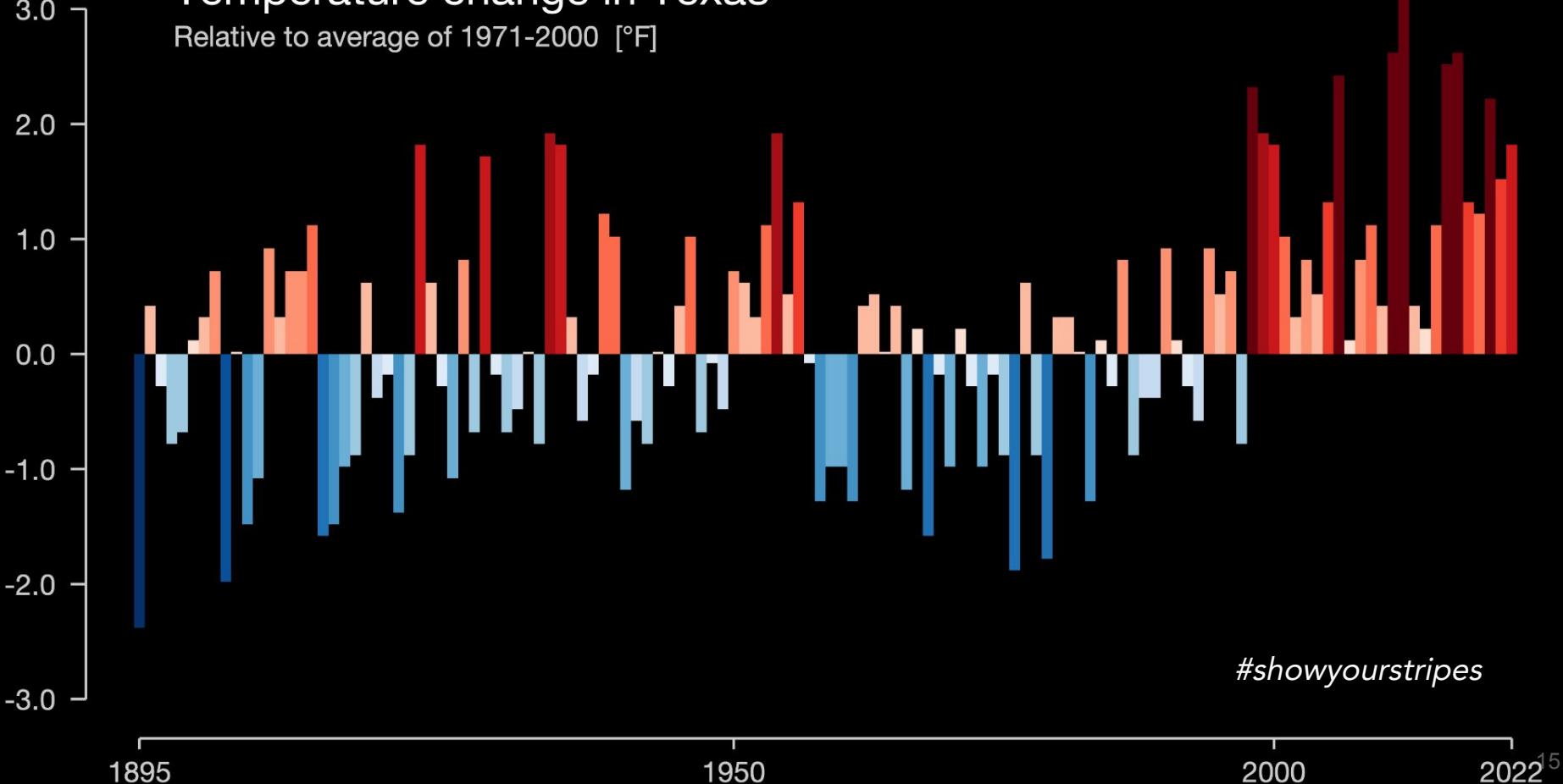
# Temperature change in Texas



#showyourstripes

# Temperature change in Texas

Relative to average of 1971-2000 [°F]



#showyourstripes

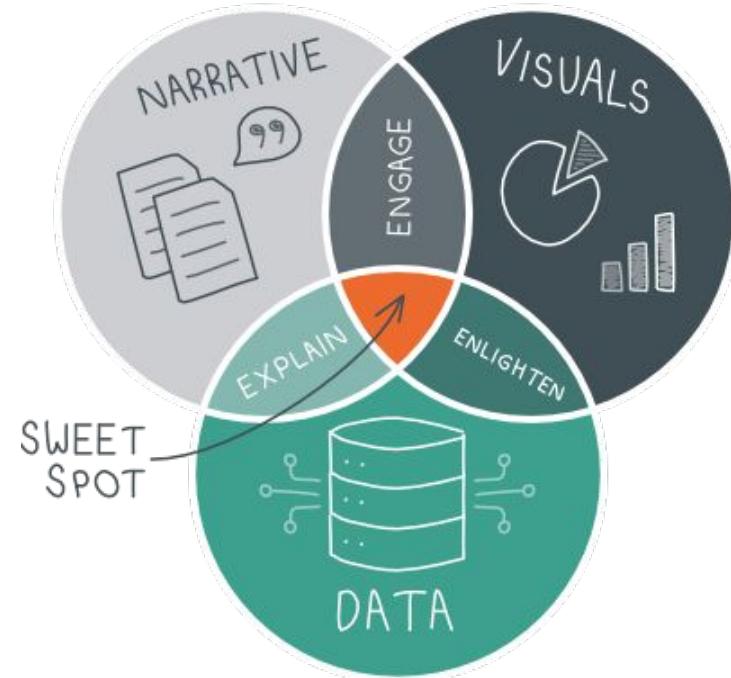
# Think about the **story** you want your data to tell

**Audience:** Specialists, students, public

**Settings:** Paper, poster, talk

**Types:** Graph, diagram, image

**Challenges:** How to use a visual to ...

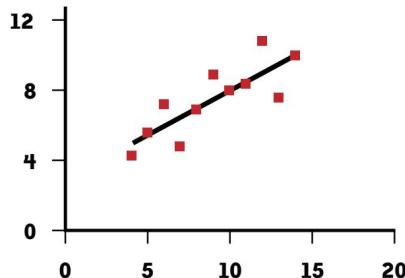


Ok enough theory, give me some pointers!

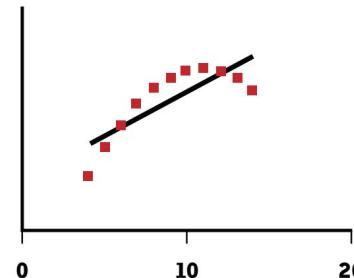
statistical

# Show your data

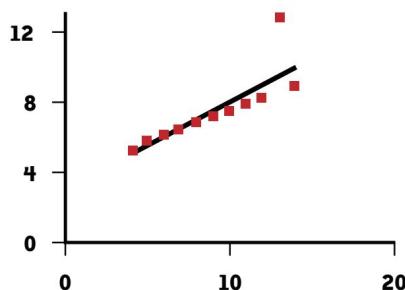
I



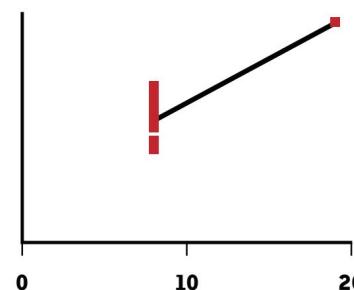
II



III



IV



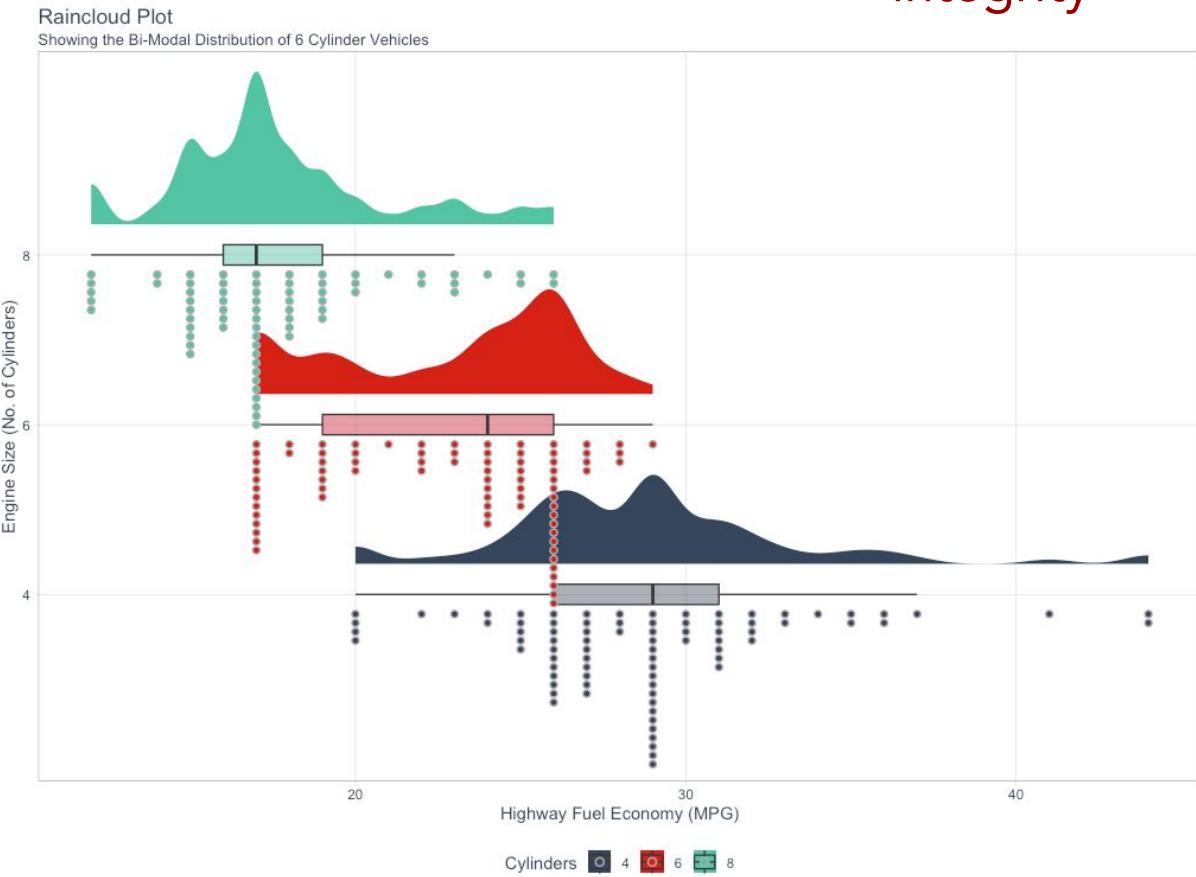
Beautiful data

FIGURE 13-5. Anscombe's quartet: each data set has the same mean and variance.

integrity

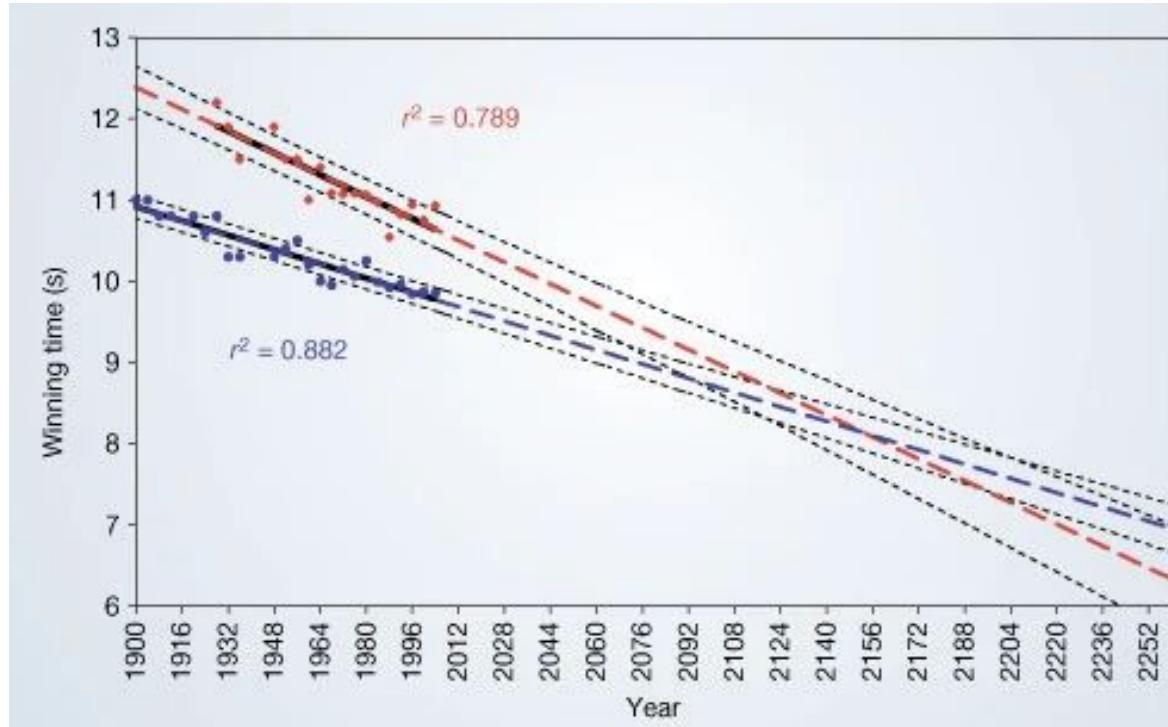
# Show your data

ggdist layers each plot type



statistical

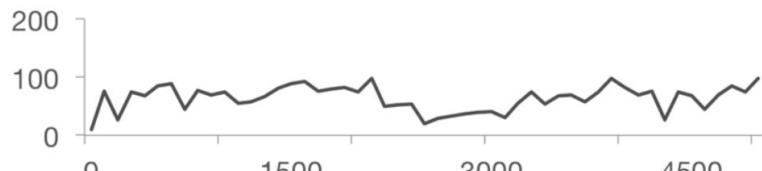
But do not over-extrapolate!



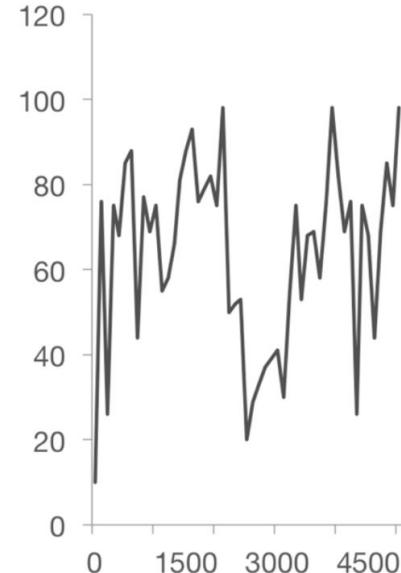
Momentous sprint at the 2156 Olympics? Blue - men, Red - women

integrity

# Be wary of aspect ratios



Long X axis flattens variation

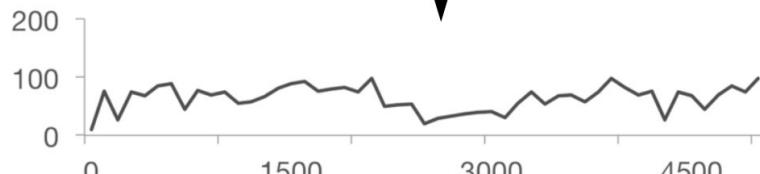
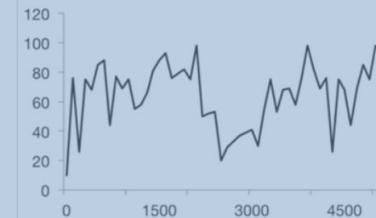


Tall Y axis  
minimizes trends

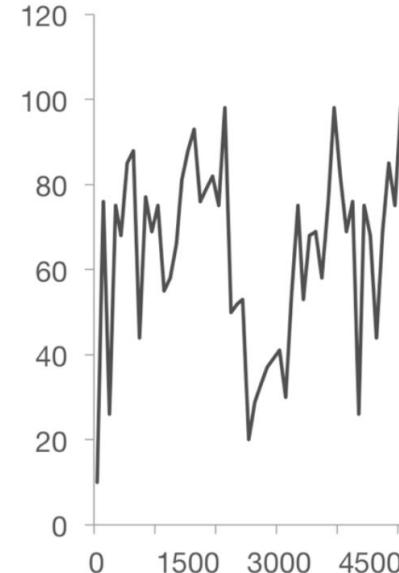
integrity

# Be wary of aspect ratios

Key trends at 45°

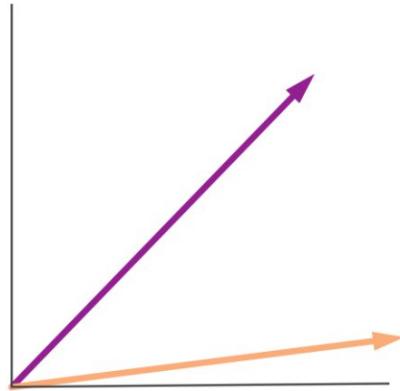


Long X axis flattens variation

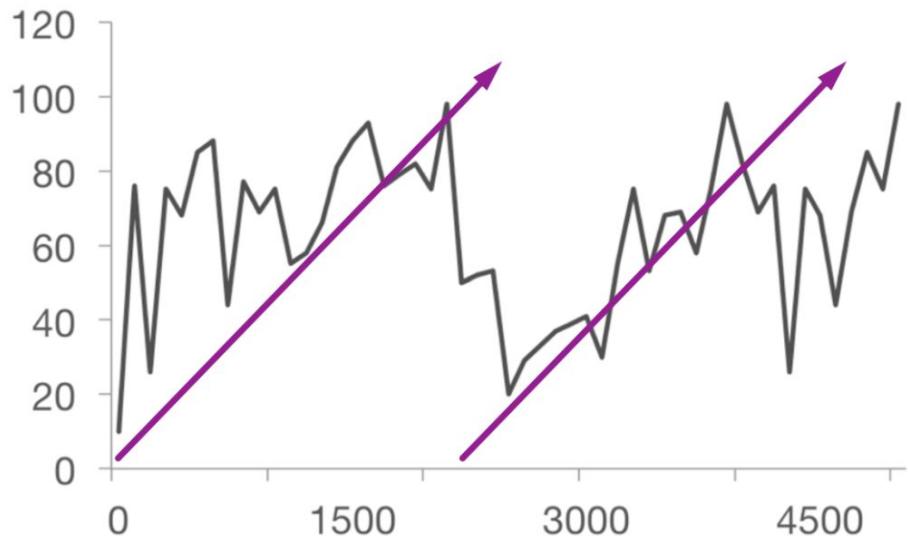


Tall Y axis  
minimizes trends

Angles around  $45^\circ$  are perceived accurately

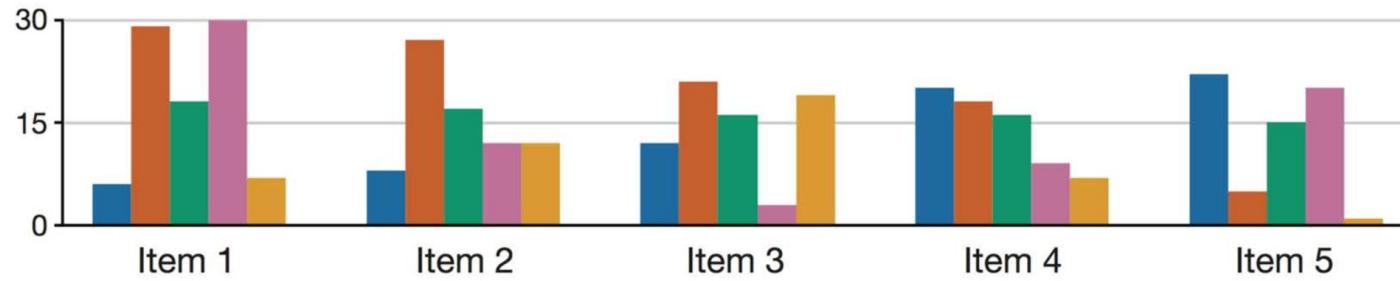


Small angles are more difficult to assess/compare



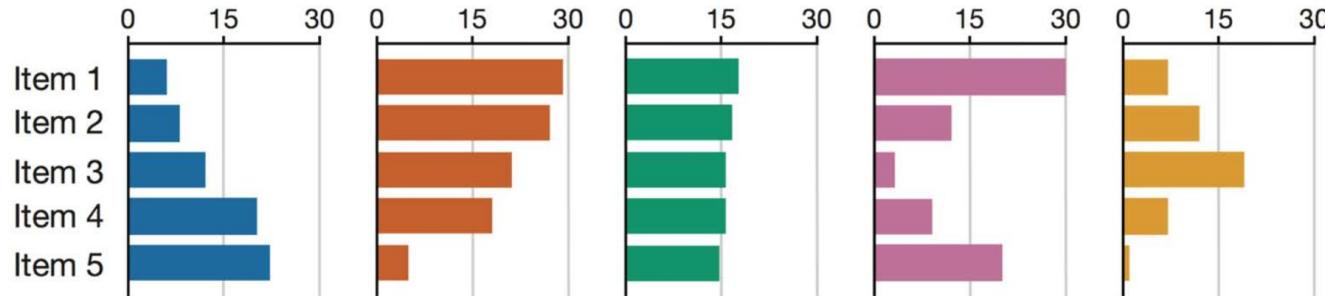
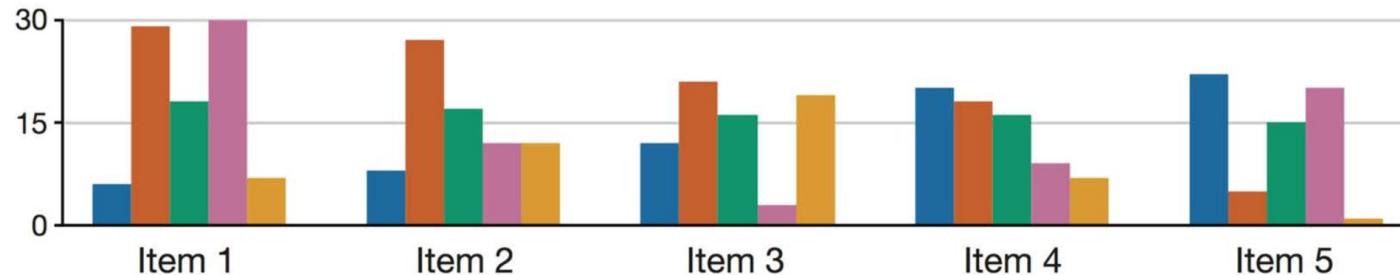
# Cluster data based on groups

clarity



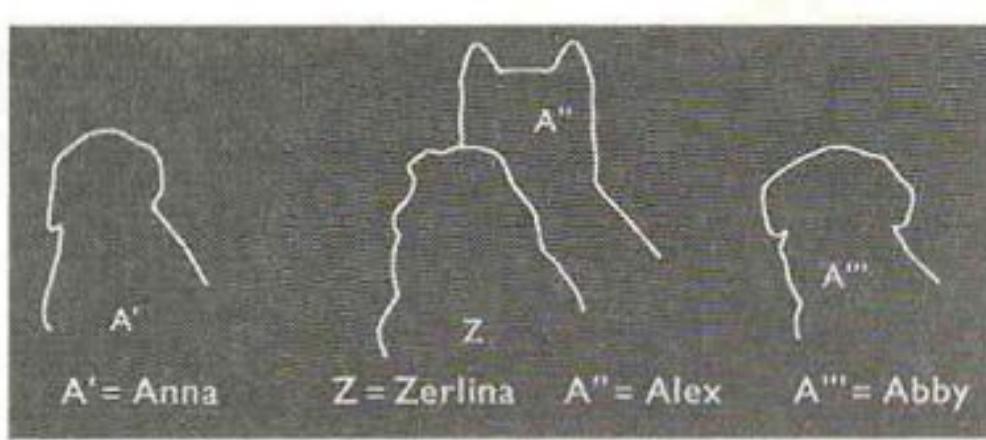
# Cluster data based on groups

clarity



clarity

Label graphs closer to the actual data



clarity

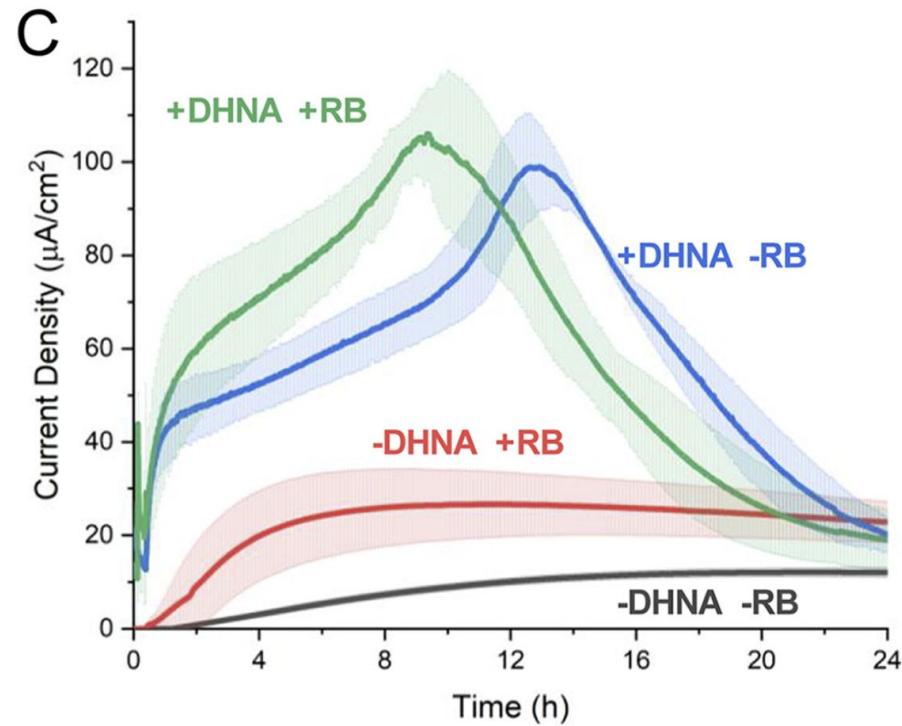
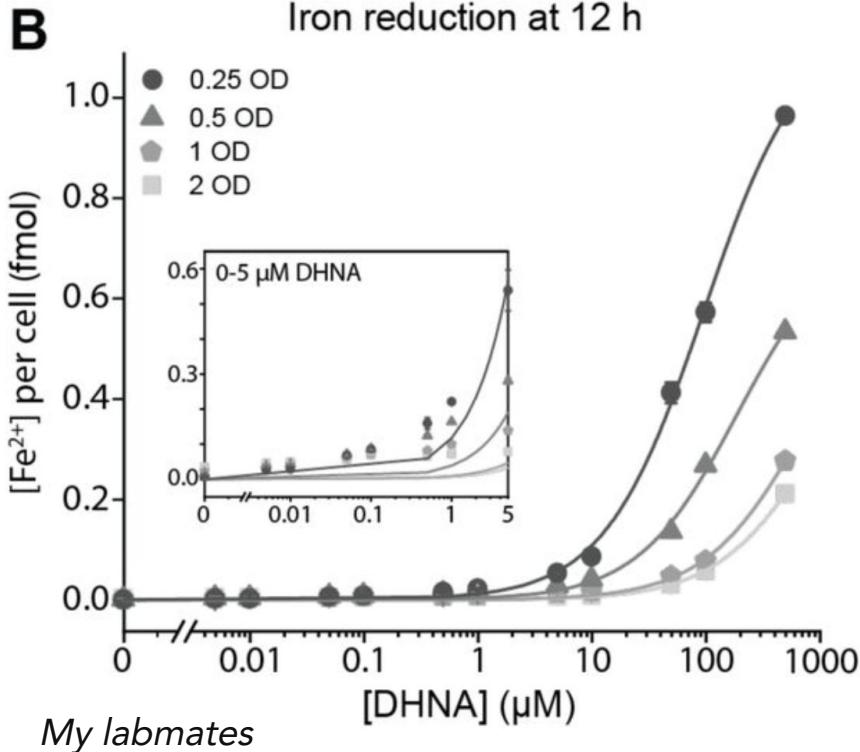
# Label graphs closer to the actual data



*Beautiful evidence*

clarity

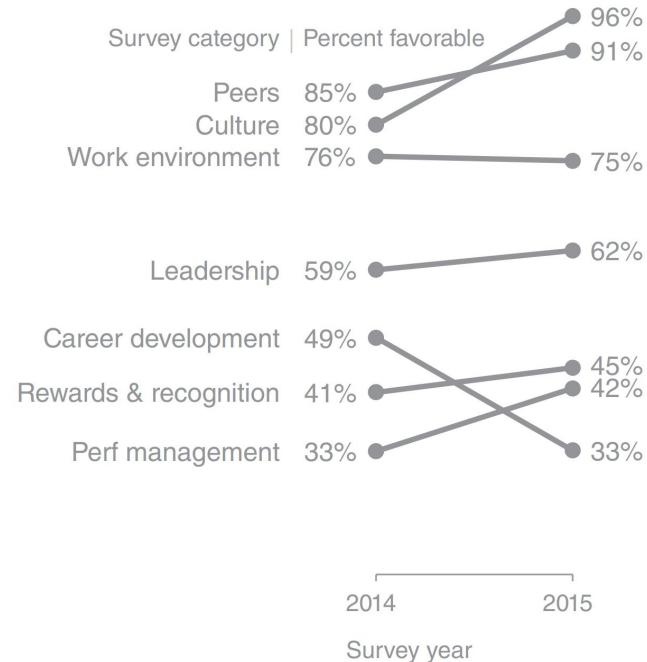
# Label graphs closer to the actual data



clarity

# Highlight important data (specifically for talks)

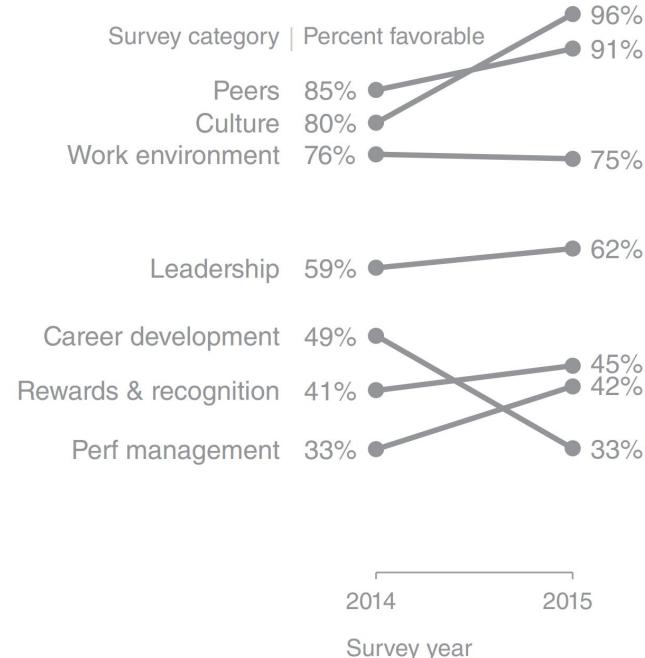
Employee feedback over time



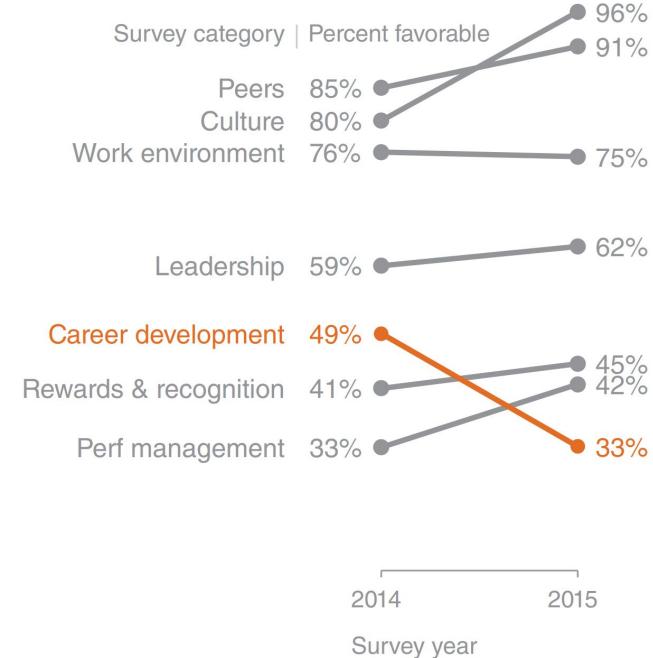
# Highlight important data (specifically for talks)

clarity

Employee feedback over time

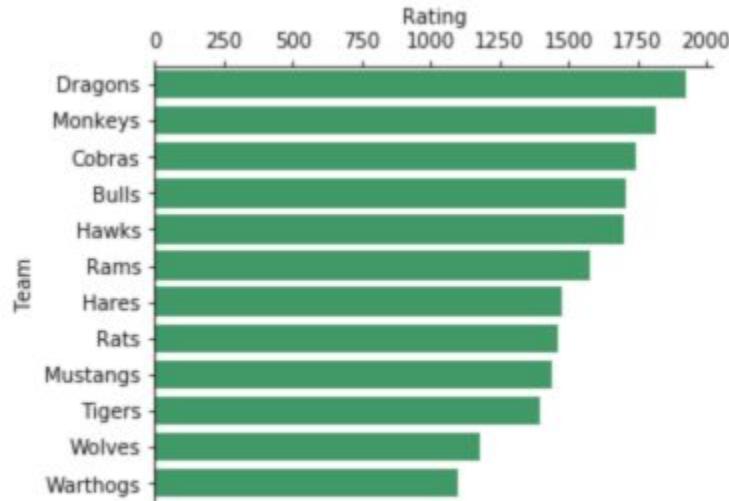
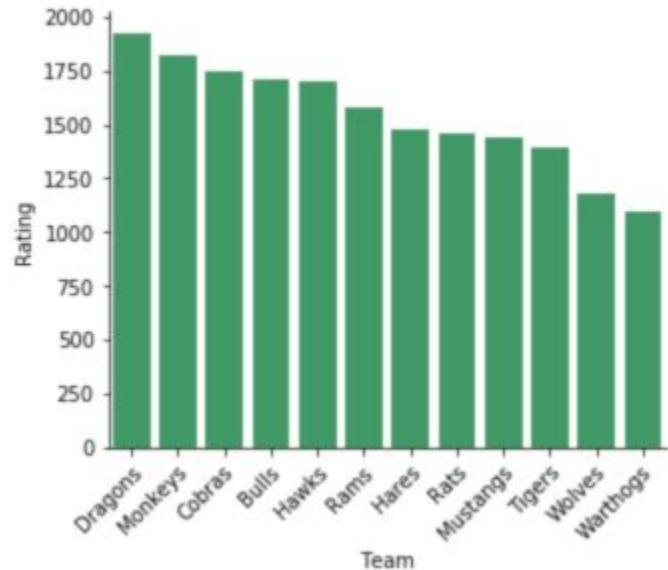


Employee feedback over time



clarity

# Ensure that your labels are legible - flip if needed



integrity  
and clarity

# Thou shalt not use pie charts. Ever.

Supplier Market Share

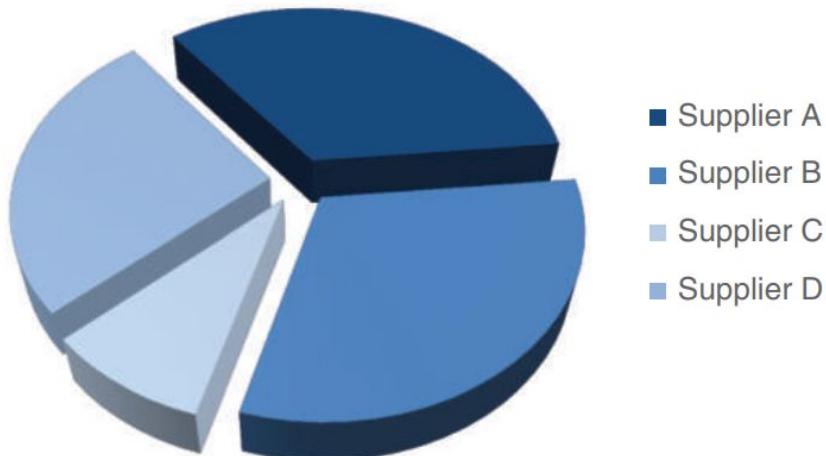


FIGURE 2.21 Pie chart

# Thou shalt not use pie charts. Ever.

integrity  
and clarity

Supplier Market Share

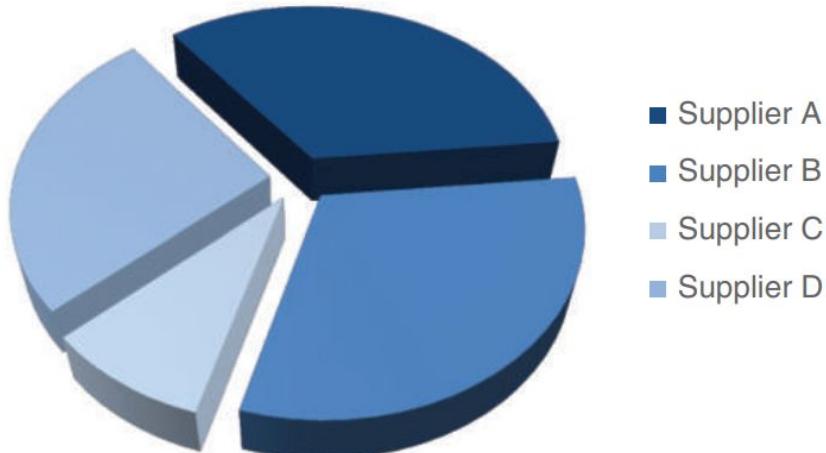


FIGURE 2.21 Pie chart

Supplier Market Share

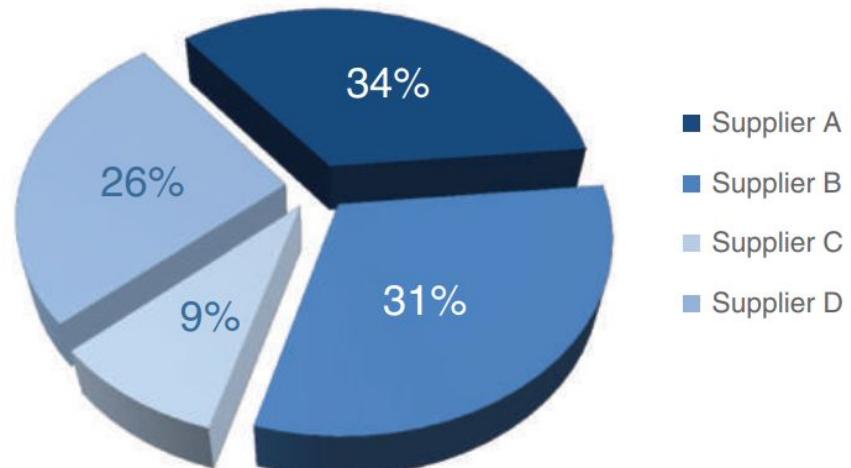


FIGURE 2.22 Pie chart with labeled segments

# Thou shalt not use pie charts. Ever.

integrity  
and clarity

Supplier Market Share

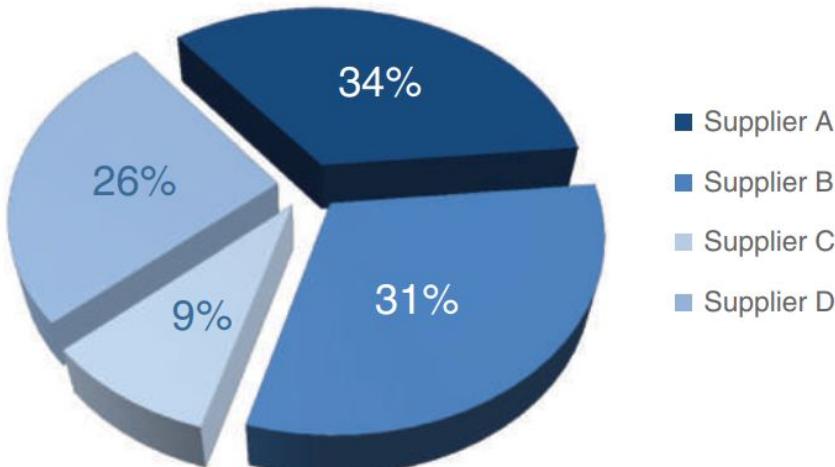


FIGURE 2.22 Pie chart with labeled segments

Supplier Market Share

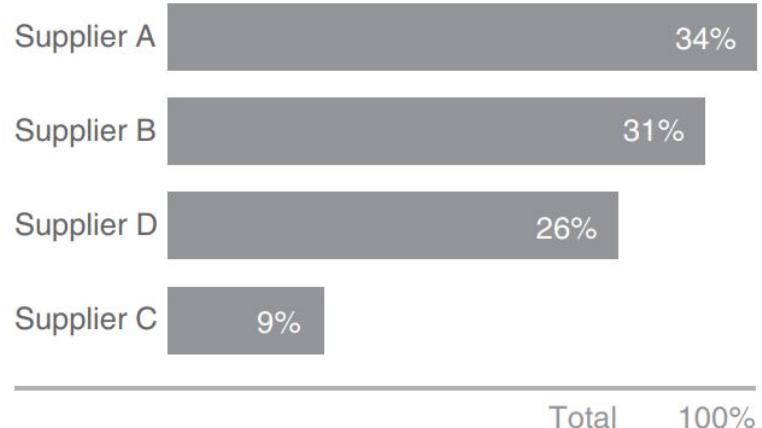
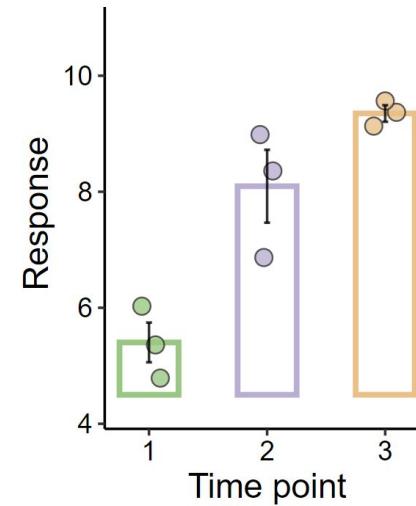
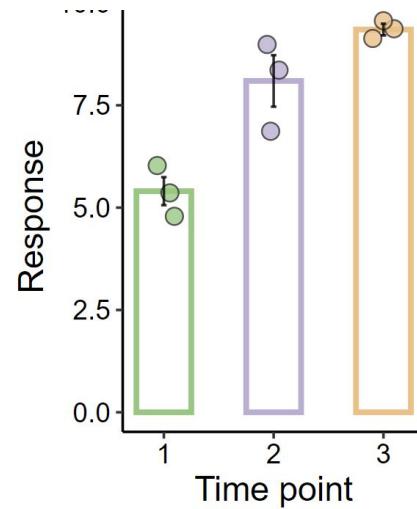
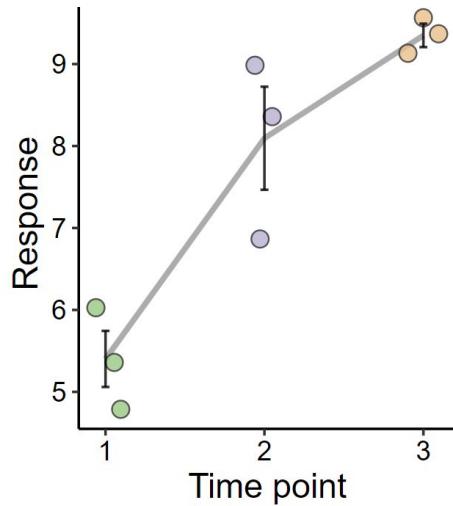


FIGURE 2.23 An alternative to the pie chart

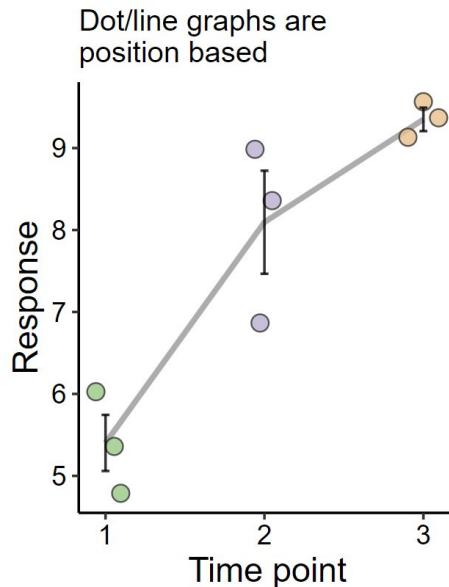
integrity

Someone is lying here...

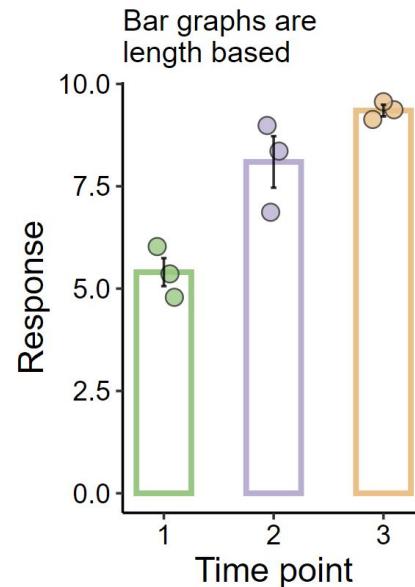


integrity

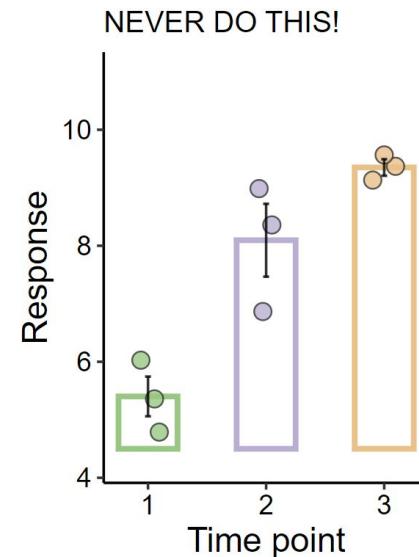
# Someone is lying here...



Values represented by positions along x & y axis



Values represented by distance from x axis



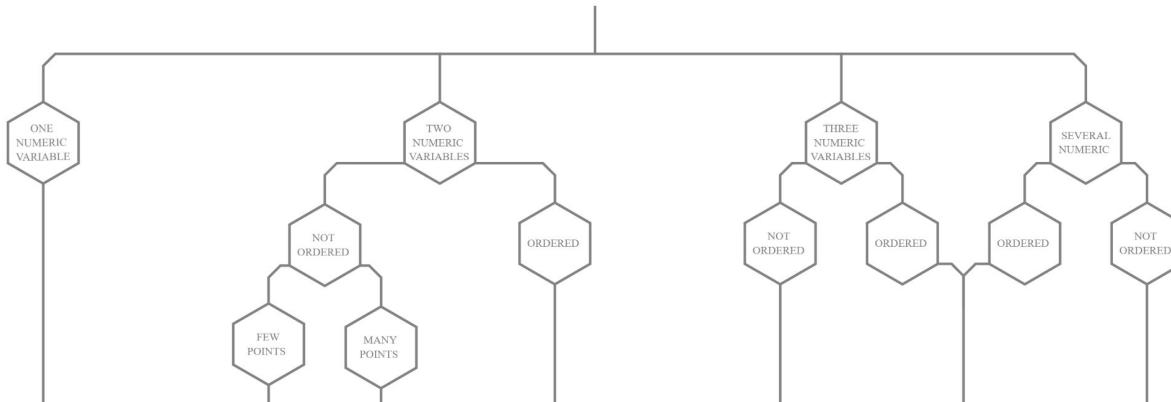
Bar lengths are misleading

# How can I choose the right graph type?!



What kind of data do you have? Pick the main type using the buttons below. Then let the decision tree guide you toward your graphic possibilities.

Numeric Categoric Num & Cat Maps Network Time series



Integrity  
and clarity

# Color: subjective objectivity

Country Level Sales Rank Top 5 Drugs

Rainbow distribution in color indicates sales rank in given country from #1 (red) to #10 or higher (dark purple)

Country	A	B	C	D	E
AUS	1	2	3	6	7
BRA	1	3	4	5	6
CAN	2	3	6	12	8
CHI	1	2	8	4	7
FRA	3	2	4	8	10
GER	3	1	6	5	4
IND	4	1	8	10	5
ITA	2	4	10	9	8
MEX	1	5	4	6	3
RUS	4	3	7	9	12
SPA	2	3	4	5	11
TUR	7	2	3	4	8
UK	1	2	3	6	7
US	1	2	4	3	5

# Color: subjective objectivity

Country Level Sales Rank Top 5 Drugs

Rainbow distribution in color indicates sales rank in given country from #1 (red) to #10 or higher (dark purple)

Country	A	B	C	D	E
AUS	1	2	3	6	7
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CHI	1	2	8	4	7
FRA	3	2	4	8	10
GER	3	1	6	5	4
IND	4	1	8	10	5
ITA	2	4	10	9	8
MEX	1	5	4	6	3
RUS	4	3	7	9	12
SPA	2	3	4	5	11
TUR	7	2	3	4	8
UK	1	2	3	6	7
US	1	2	4	3	5

**Top 5 drugs:** country-level sales rank

RANK	1	2	3	4	5+
COUNTRY   DRUG	A	B	C	D	E
Australia	1	2	3	6	7
Brazil	1	3	4	5	6
Canada	2	3	6	12	8
China	1	2	8	4	7
France	3	2	4	8	10
Germany	3	1	6	5	4
India	4	1	8	10	5
Italy	2	4	10	9	8
Mexico	1	5	4	6	3
Russia	4	3	7	9	12
Spain	2	3	4	5	11
Turkey	7	2	3	4	8
United Kingdom	1	2	3	6	7
United States	1	2	4	3	5

FIGURE 4.15 Use color sparingly

# Somewhere over the rainbow ...

Integrity  
and clarity

Rainbow



Parula



Perceptually ordered colour maps

UNIVERSAL COLOUR KEY FOR  
SCIENTIFIC GRAPHS

ERANISCIENCE.COM



DATA I LIKE



DATA ON FREEZING EXPERIMENTS



EVIL DATA THAT DISAGREES WITH ME



THIS IS DATA I'M UNSURE ABOUT BUT  
WANT TO MAKE LOOK PRETTY

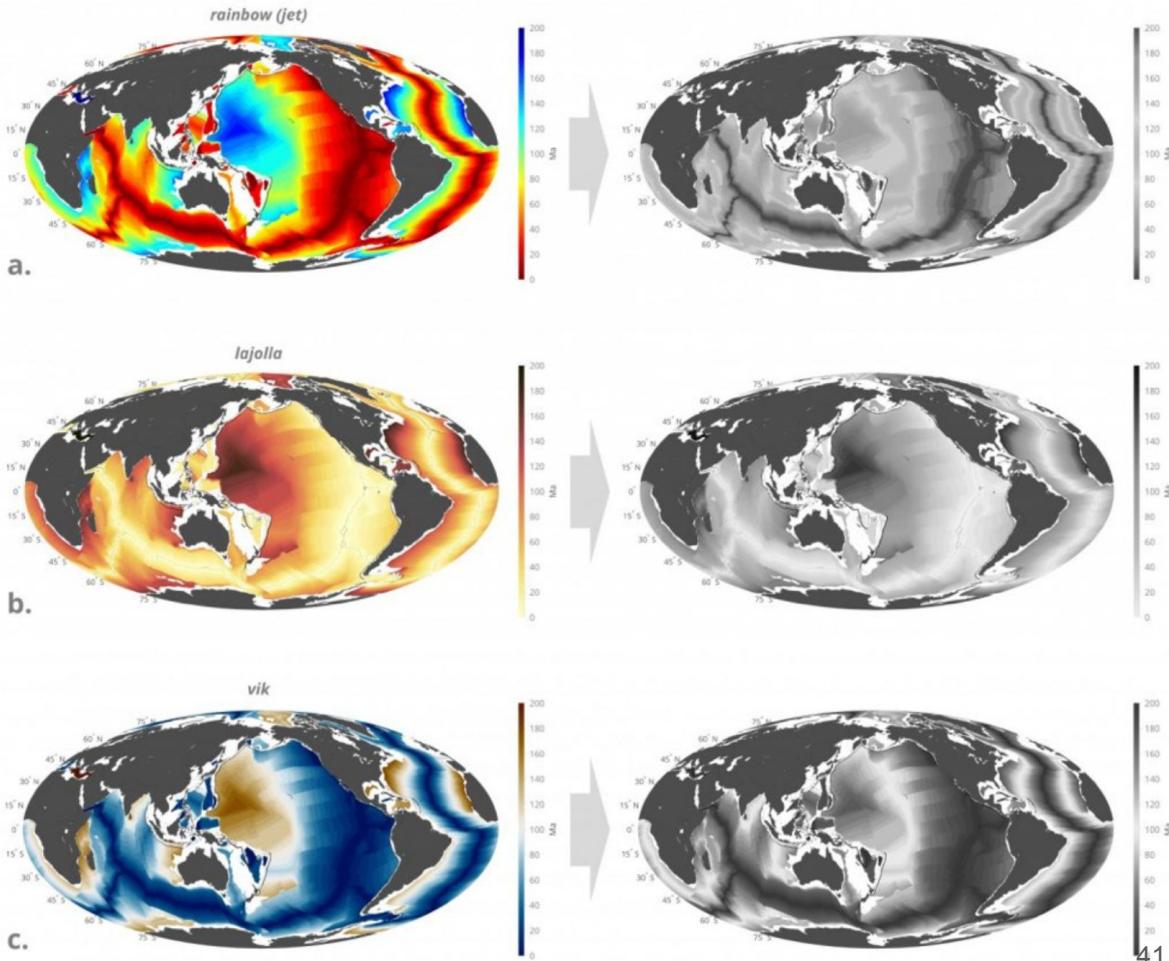


DATA I WANT TO MAKE UNREADABLE  
ON A WHITE BACKGROUND



UNICORN RELATED DATA

... there is always  
another rainbow  
(graph)!



# You can simulate your graphs through a filter: Colblindor

Drag and drop or paste your file in the area below or:  No file chosen

*Trichromatic view: Anomalous Trichromacy:*      *Dichromatic view:*      *Monochromatic view:*

Normal       Red-Weak/Protanomaly       Red-Blind/Protanopia       Monochromacy/Achromatopsia  
 Green-Weak/Deutanomaly       Green-Blind/Deutanopia       Blue Cone Monochromacy  
 Blue-Weak/Tritanomaly       Blue-Blind/Tritanopia

Use lens to compare with normal view:  No Lens     Normal Lens     Inverse Lens  
[Reset View](#)



Zoom, move and lens functionality only with your own images available.

Ultimately, listen to Rams: Less, but better

Perfection is achieved, not when there is nothing more to add, but when there is nothing left to take away.

Antoine de Saint-Exupéry