# Your data is what *you* make of it

Swetha Sridhar
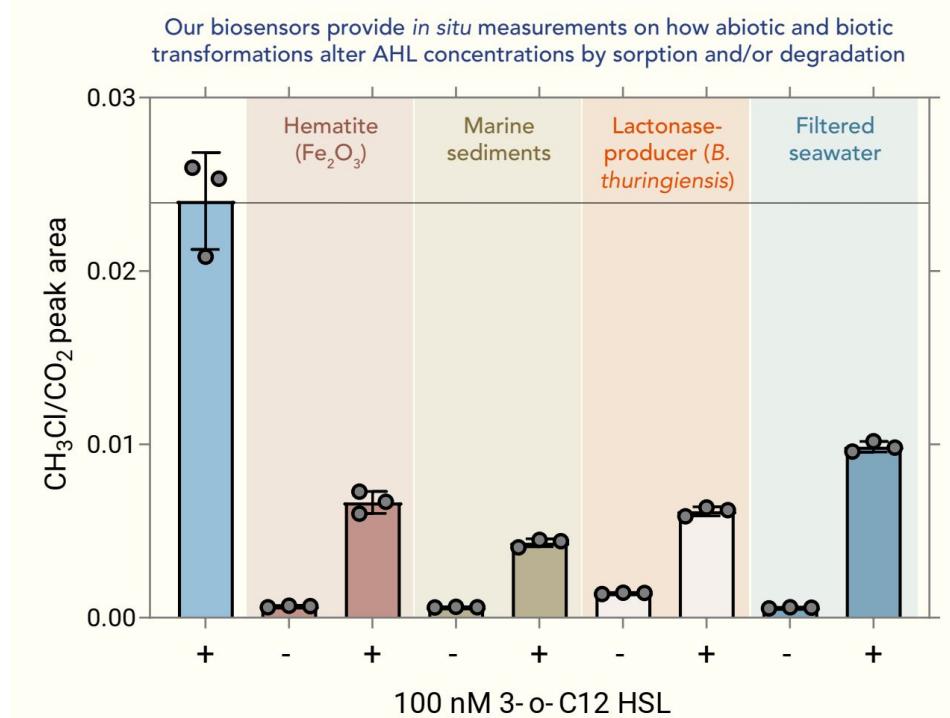
Conctact details : ss113 [yat] rice <doot> edu
If you want any more resources on visualization

Working with data is essential for us

So why should *I* be telling you this?

I am passionate about design

Our biosensors provide *in situ* measurements on how abiotic and biotic transformations alter AHL concentrations by sorption and/or degradation

So why should *I* be telling you this?

I obsessively collect design inspiration

A Collection Of Food Can Labels Made In Japan

So why should *I* be telling you this?
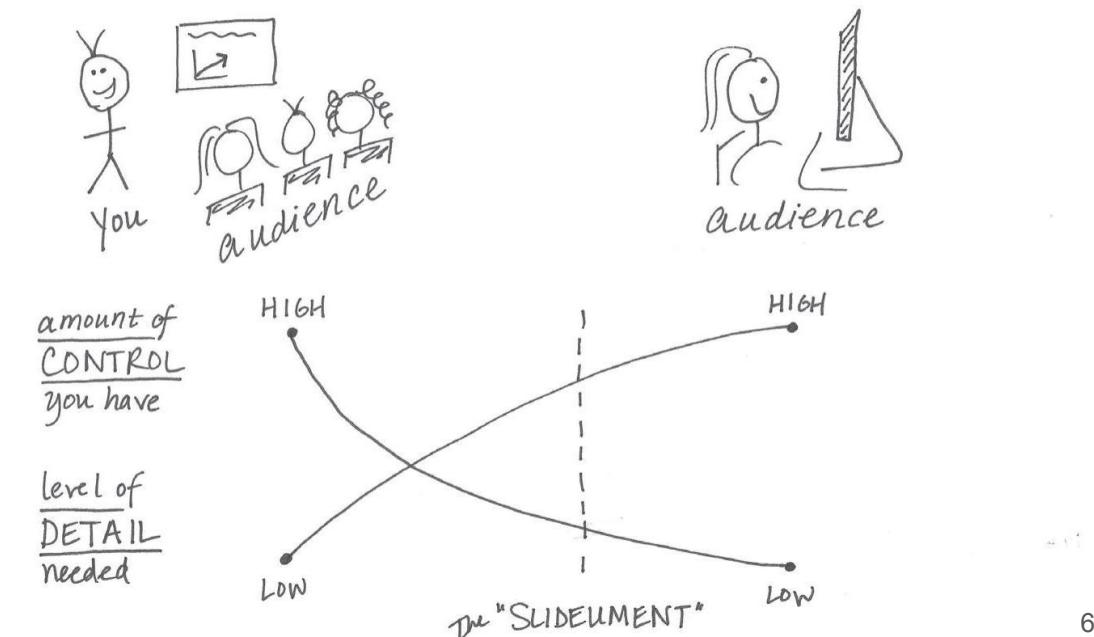
I am disabled - good design enables people like me to interact with science

Color Palette

True	Prot.	Deut.	Trit.
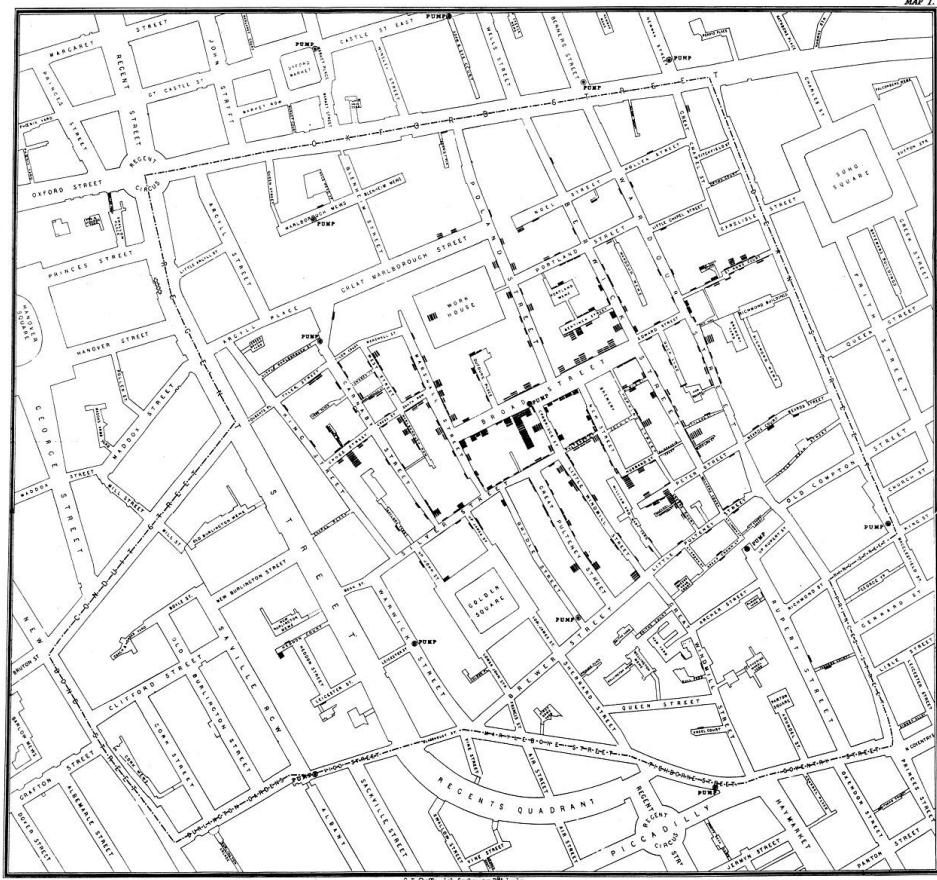
Why should a scientist care about displaying data?

LIVE PRESENTATION . . . . WRITTEN DOC or EMAIL

You

audience

audience

amount of CONTROL you have

level of DETAIL needed

HIGH

HIGH

LOW

LOW

The "SLIDEUMENT"

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 …
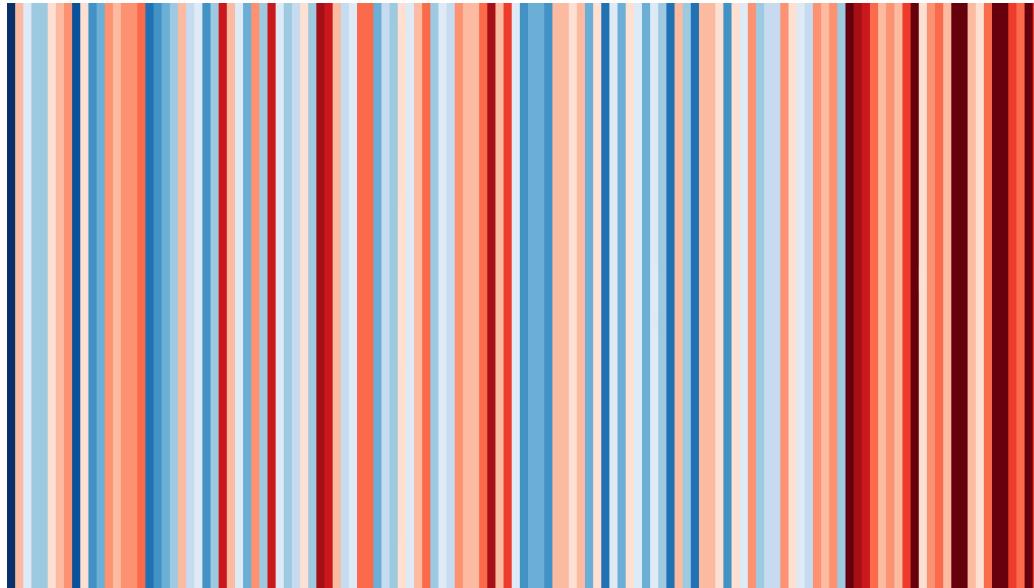
- Is innovative.

- 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

Think about the story you want your data to tell

Let us work with an example

Temperature change in Texas since 1895

Think about the story you want your data to tell

Let us work with an example

Temperature change in Texas

1895   2022

Temperature change in Texas

1895   2022

#showyourstripes   14

Temperature change in Texas
Relative to average of 1971-2000 [°F]
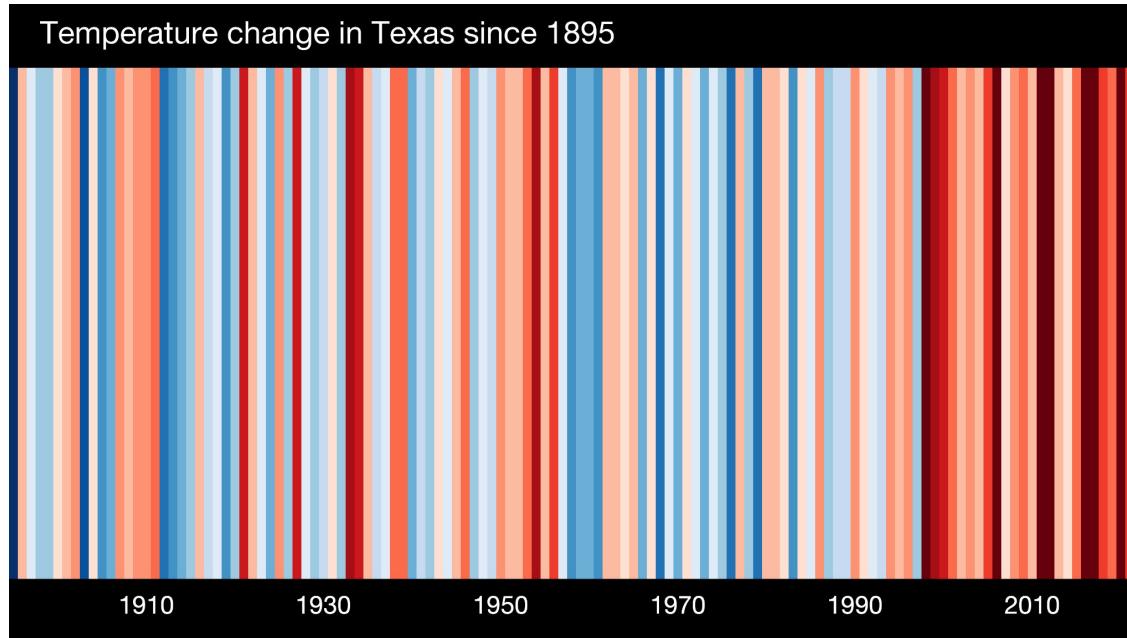
#showyourstripes
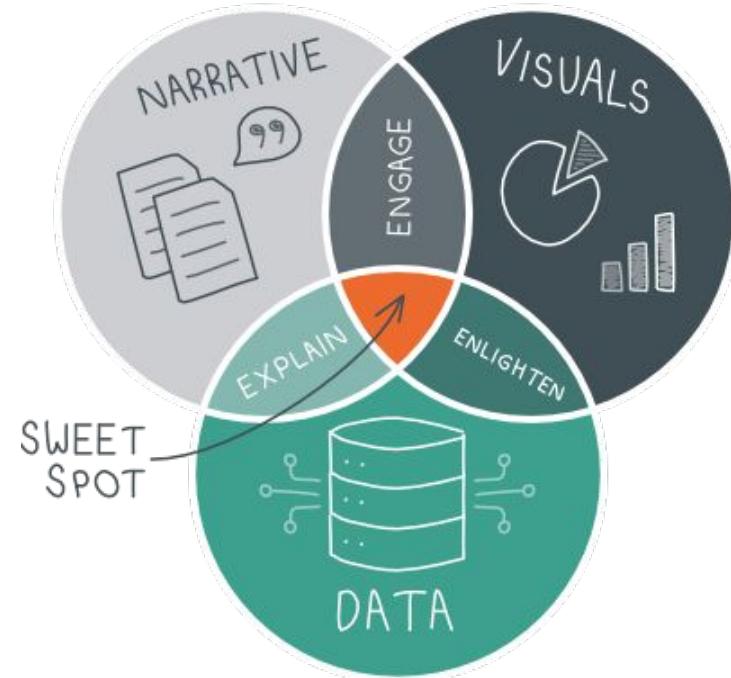
Think about the story you want your data to tell

Audience: Specialists, students, public

Settings: Paper, poster, talk

Types: Graph, diagram, image

Challenges: How to use a visual to …

Adrian Lenardic; some Data Science presentation
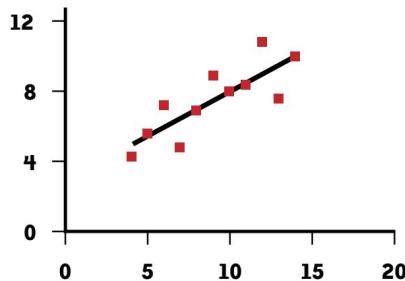
Ok enough theory, give me some pointers!
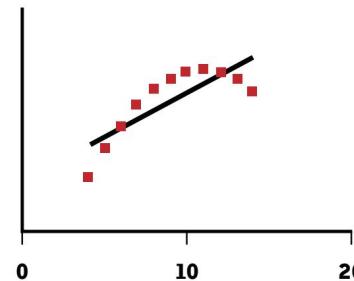
Show your data
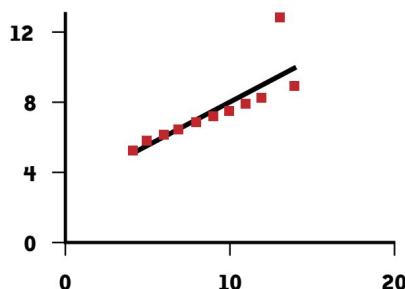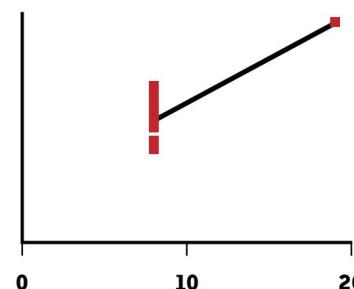
I II III IV
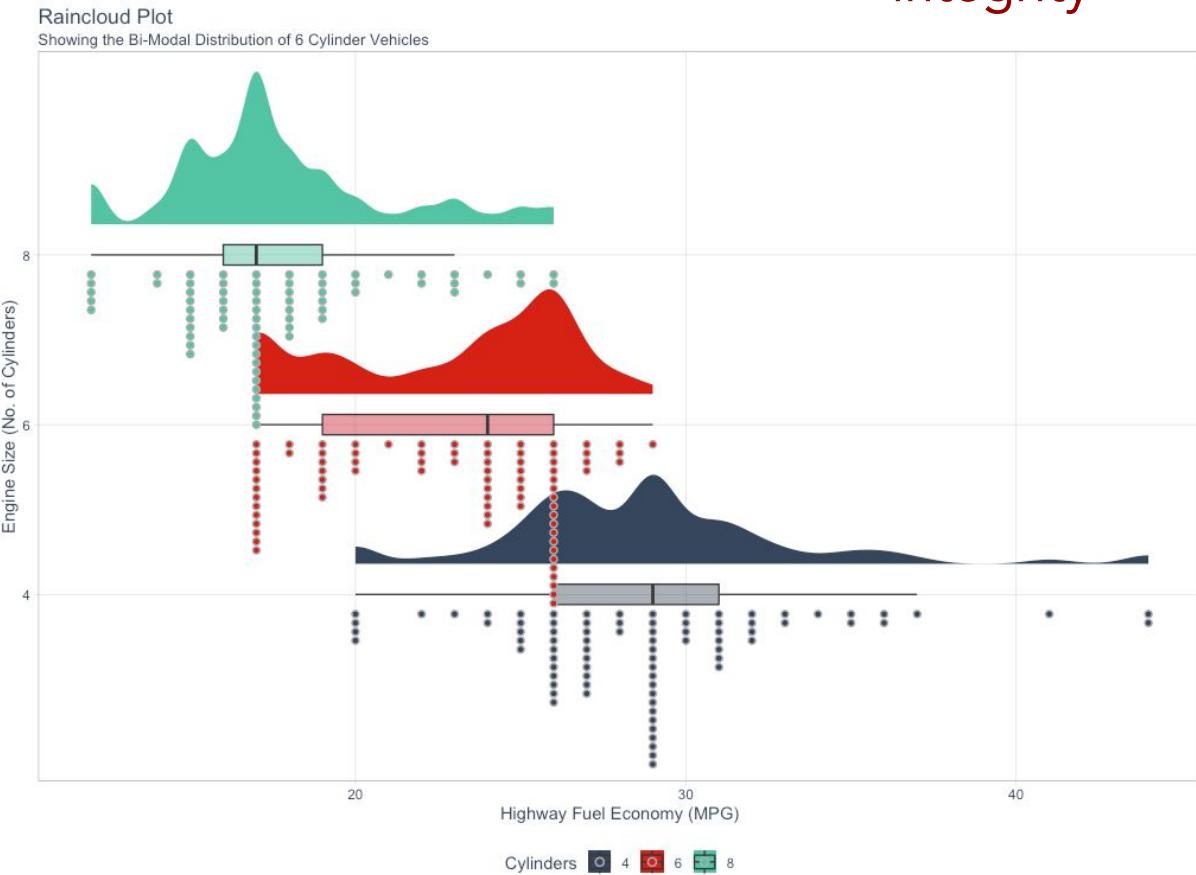
*Beautiful data*   F I G U R E 1 3 - 5 . *Anscombe's quartet: each data set has the same mean and variance.*
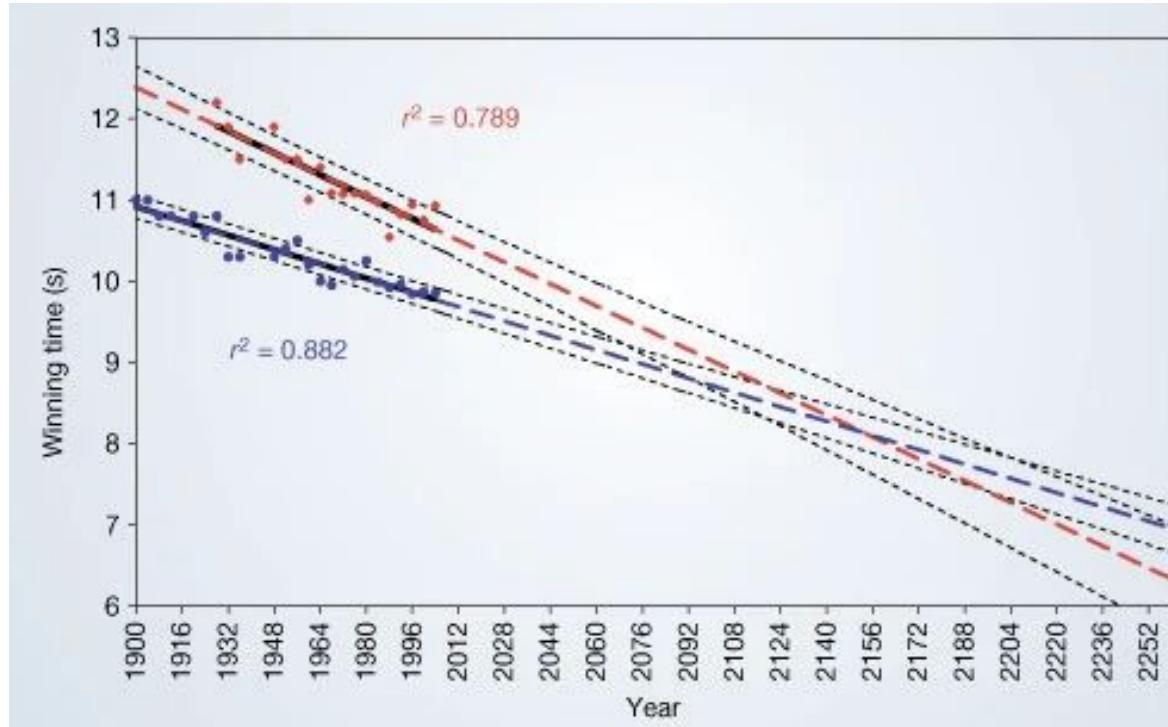
Show your data

ggdist layers each
plot type

ggdist
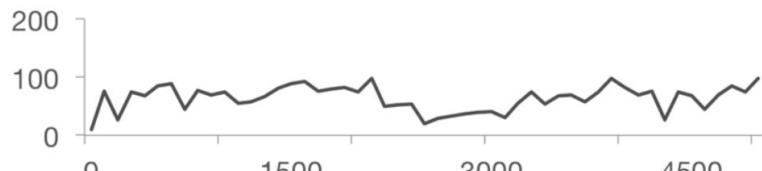
But do not over-extrapolate!
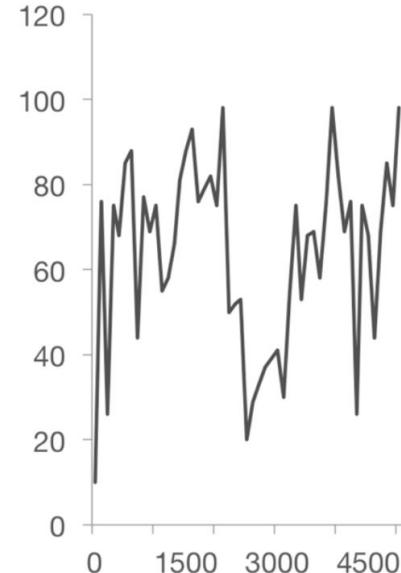
Momentous sprint at the 2156 Olympics? Blue - men, Red - women

Be wary of aspect ratios

Long X axis flattens variation

Tall Y axis
minimizes trends

Anneli Joplin
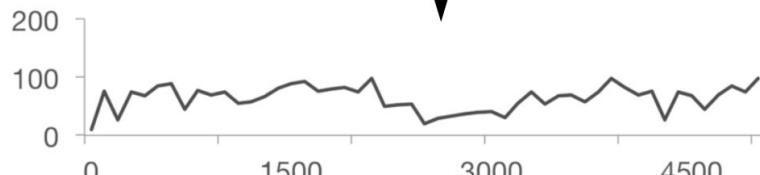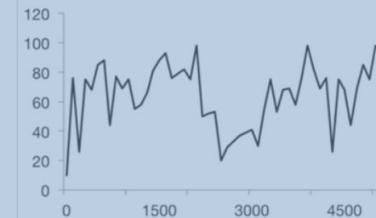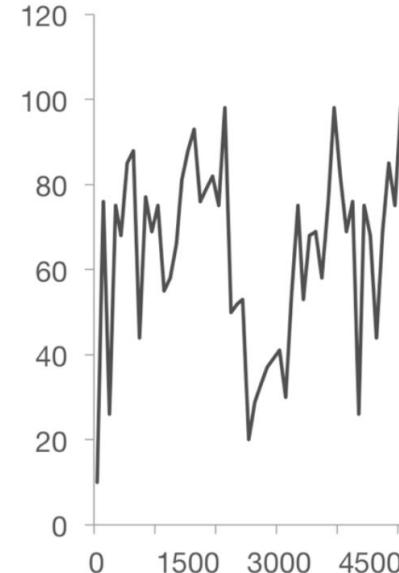
Be wary of aspect ratios

Key trends at 45°

Long X axis flattens variation

Tall Y axis minimizes trends

Anneli Joplin
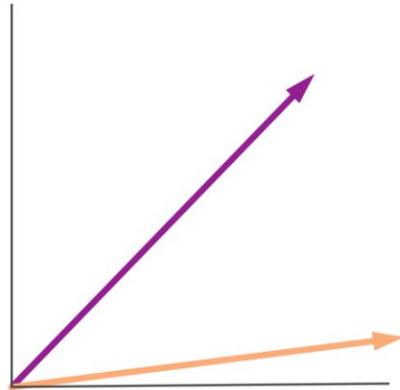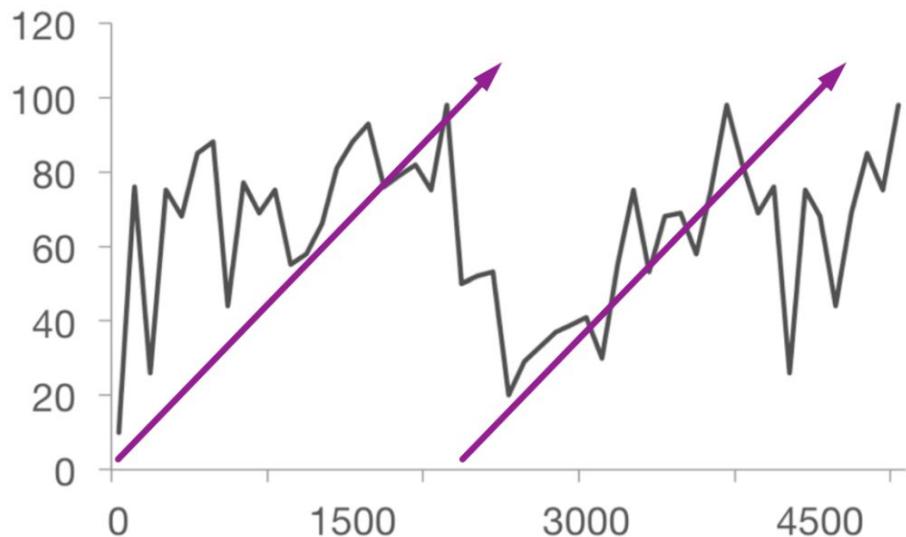
Angles around 45° are perceived accurately
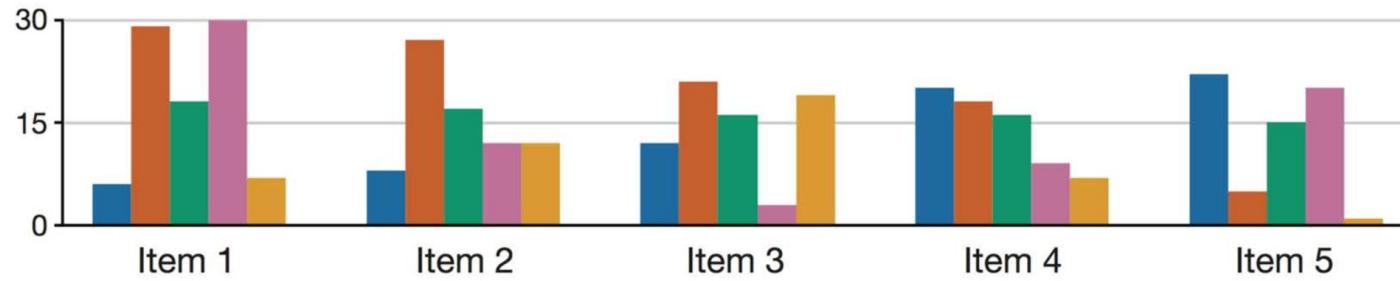
Small angles are more difficult to assess/compare
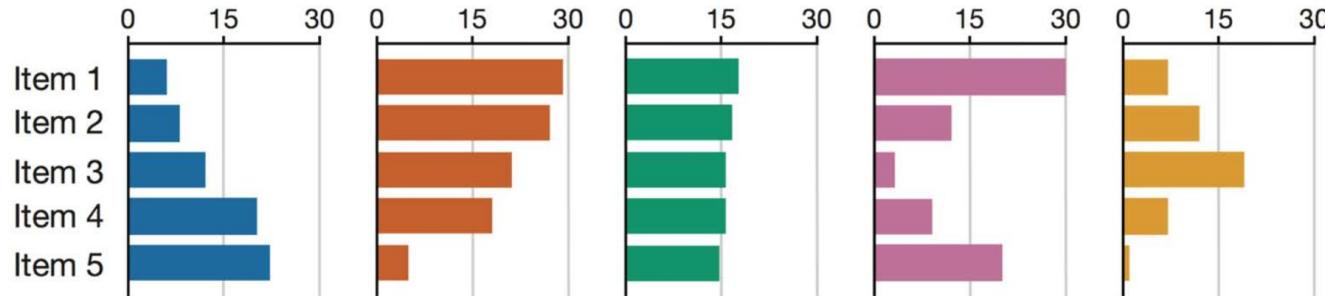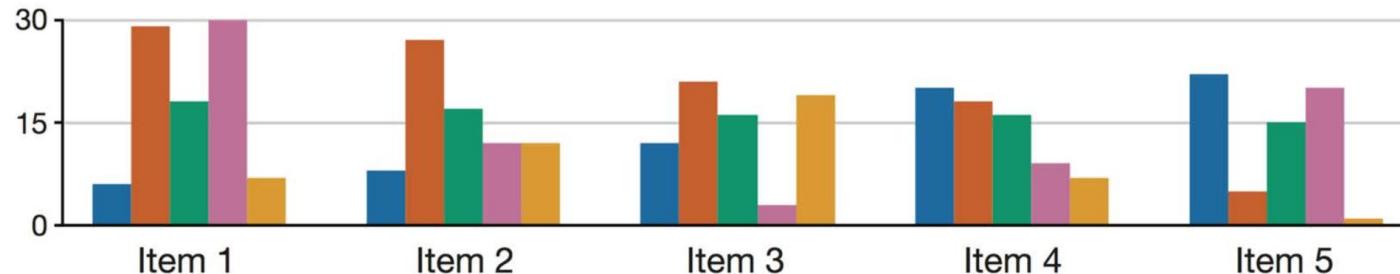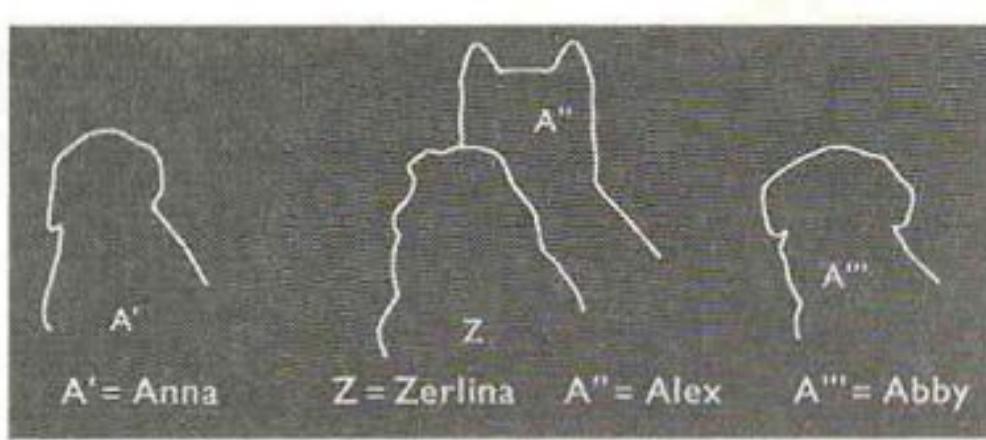
Anneli Joplin

Cluster data based on groups

Anneli Joplin

Cluster data based on groups

Label graphs closer to the actual data

A' = Anna   Z = Zerlina   A" = Alex   A''' = Abby

Beautiful evidence
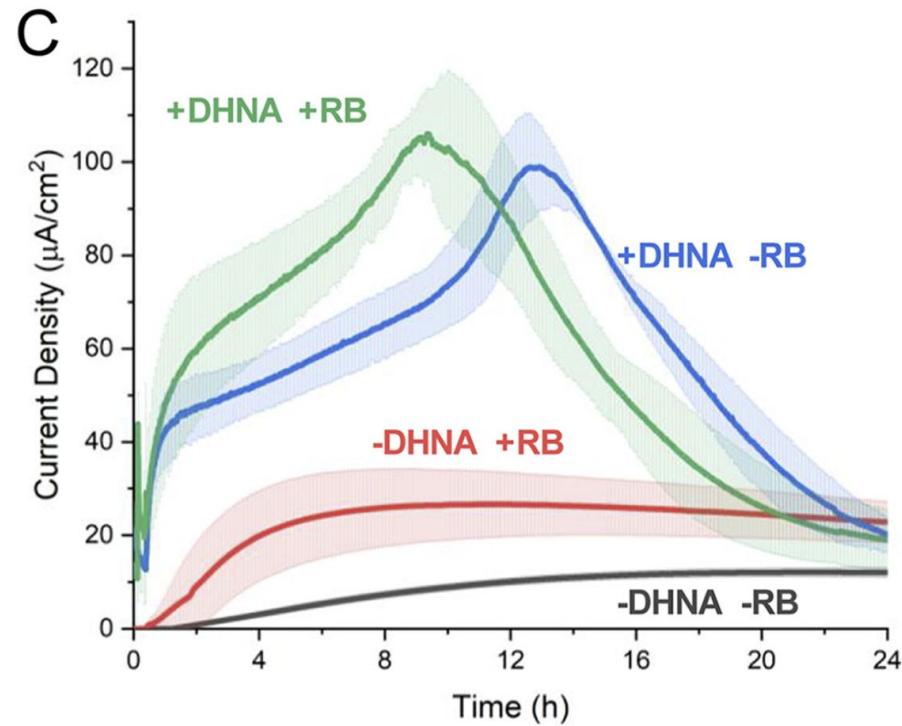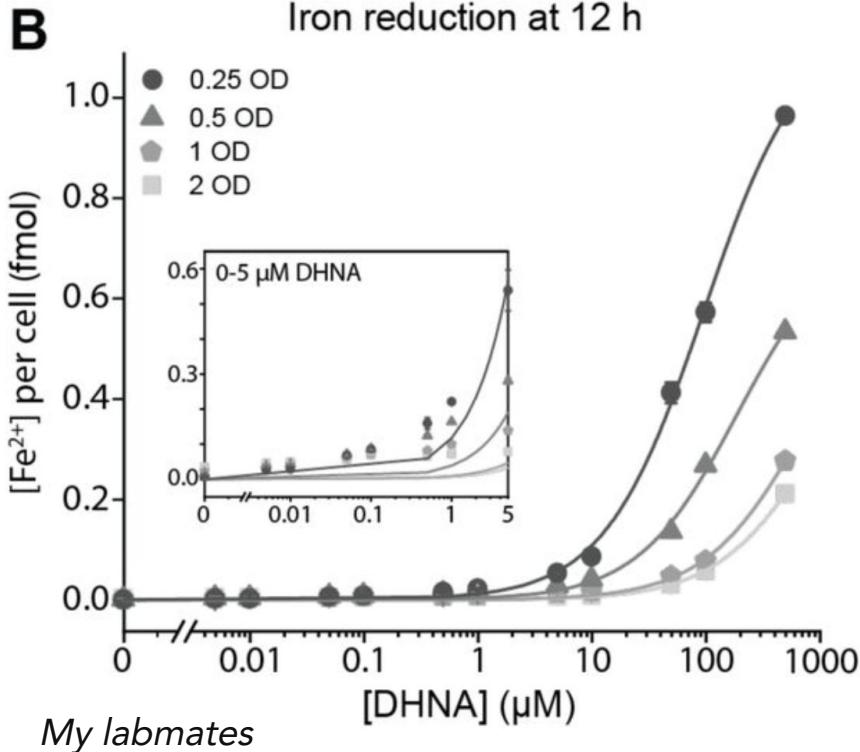
Label graphs closer to the actual data

Beautiful evidence

Label graphs closer to the actual data

My labmates

Highlight important data (specifically for talks) ^{clarity}

Employee feedback over time

Survey category	Percent favorable		2015
			96%
			91%
Peers	85%		
Culture	80%		
Work environment	76%		75%
Leadership	59%		62%
Career development	49%		45%
Rewards & recognition	41%		42%
Perf management	33%		33%

2014   2015

Survey year

Storytelling with Data

29

Highlight important data (specifically for talks) clarity

Employee feedback over time

Survey category	Percent favorable
Peers	85%
Culture	80%
Work environment	76%

96%
91%
75%

Leadership 59% — 62%

Career development 49%
Rewards & recognition 41%
Perf management 33%

45%
42%
33%

2014   2015
Survey year

Employee feedback over time

Survey category	Percent favorable
Peers	85%
Culture	80%
Work environment	76%

96%
91%
75%

Leadership 59% — 62%

Career development 49%
Rewards & recognition 41%
Perf management 33%

45%
42%
33%

2014   2015
Survey year

Storytelling with Data

Ensure that your labels are legible - flip if needed clarity

Thou shalt not use pie charts. Ever.
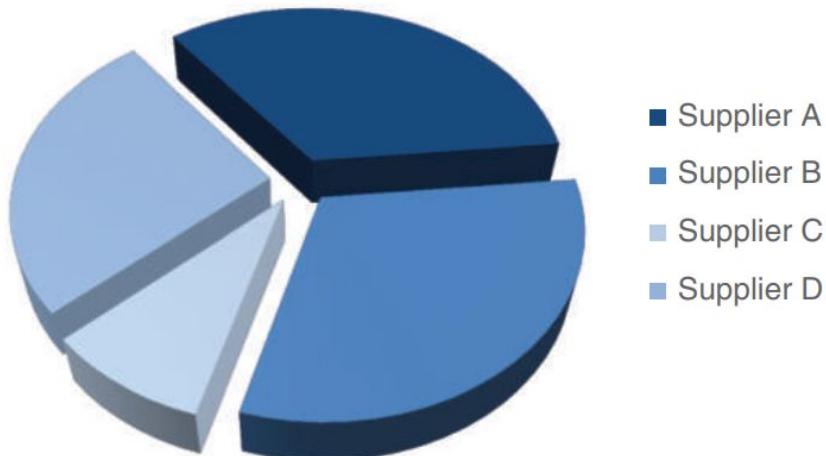
Supplier Market Share

- Supplier A
- Supplier B
- Supplier C
- Supplier D

FIGURE 2.21 Pie chart

Storytelling with Data

Thou shalt not use pie charts. Ever.

Supplier Market Share
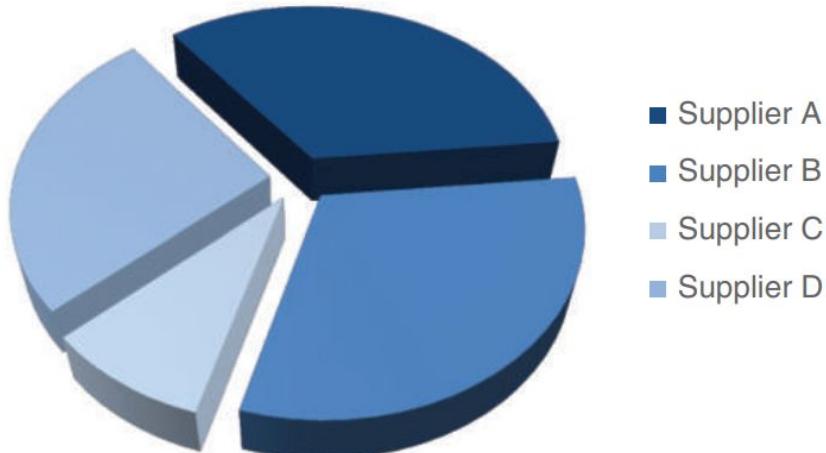
FIGURE 2.21   Pie chart

- Supplier A
- Supplier B
- Supplier C
- Supplier D

Supplier Market Share

34%

26%

9%

31%

- Supplier A
- Supplier B
- Supplier C
- Supplier D

FIGURE 2.22   Pie chart with labeled segments

Storytelling with Data

Thou shalt not use pie charts. Ever.

Supplier Market Share

34% Supplier A
31% Supplier B
26% Supplier C
9% Supplier D
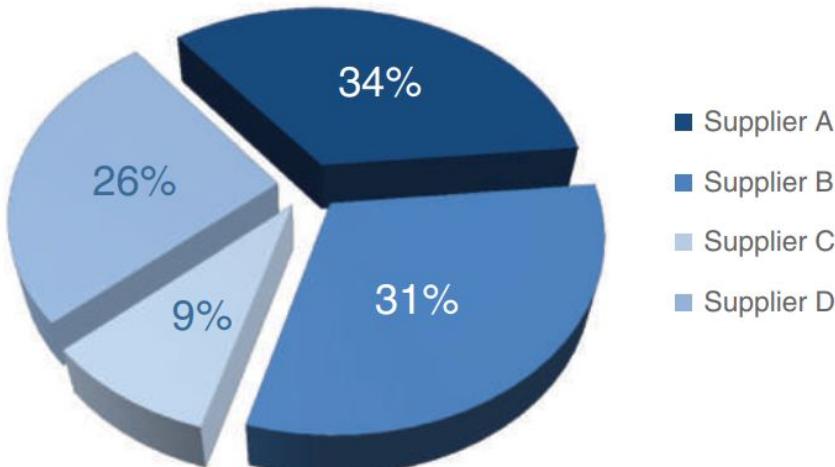
FIGURE 2.22 Pie chart with labeled segments

Supplier Market Share

Supplier A	34%
Supplier B	31%
Supplier D	26%
Supplier C	9%
Total	100%
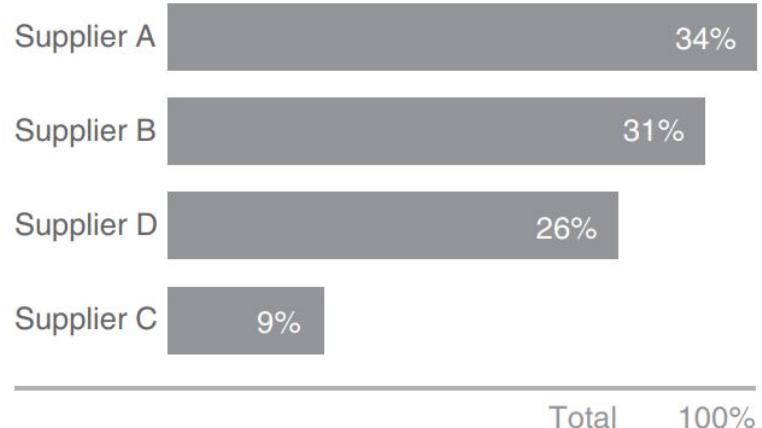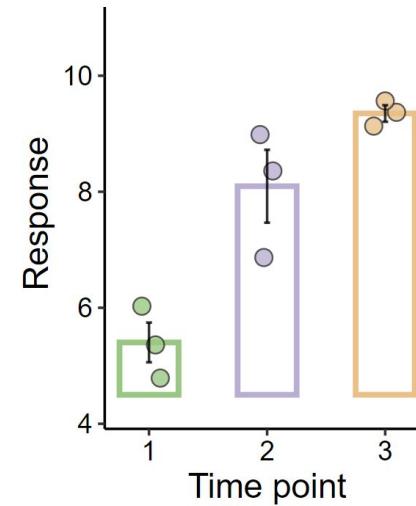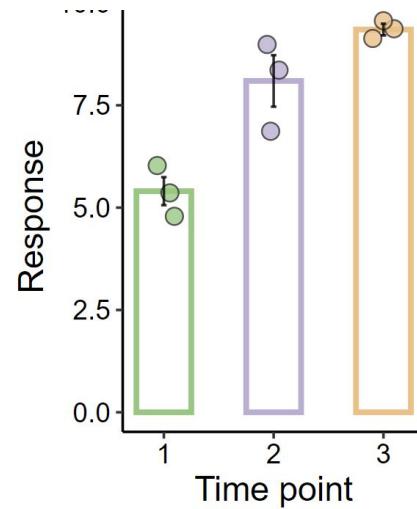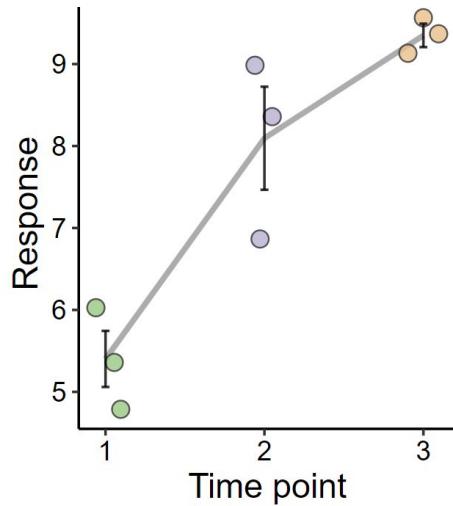
FIGURE 2.23 An alternative to the pie chart

Storytelling with Data

34

Someone is lying here…

Someone is lying here...

Dot/line graphs are position based
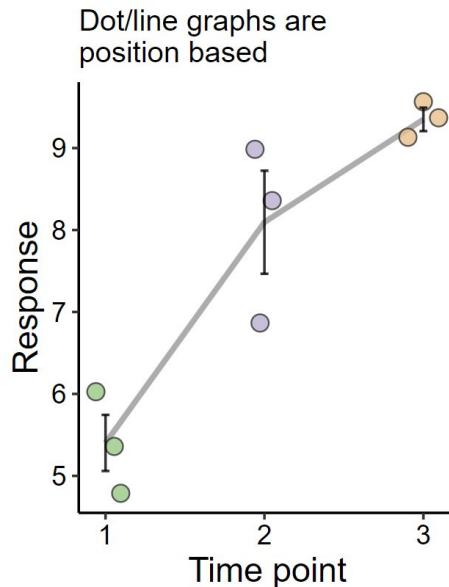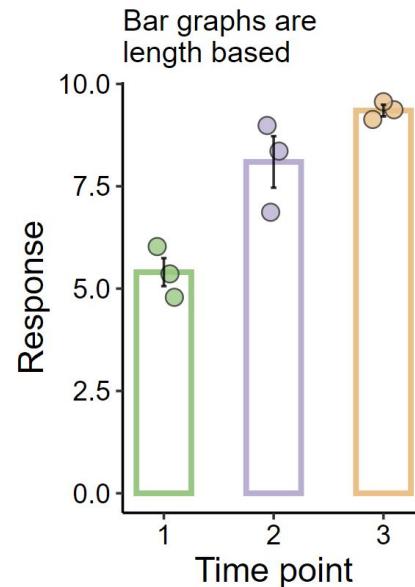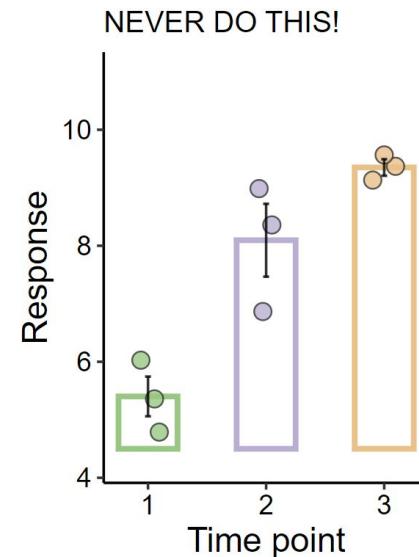
Values represented by positions along x & y axis

Bar graphs are length based

Values represented by distance from x axis

NEVER DO THIS!
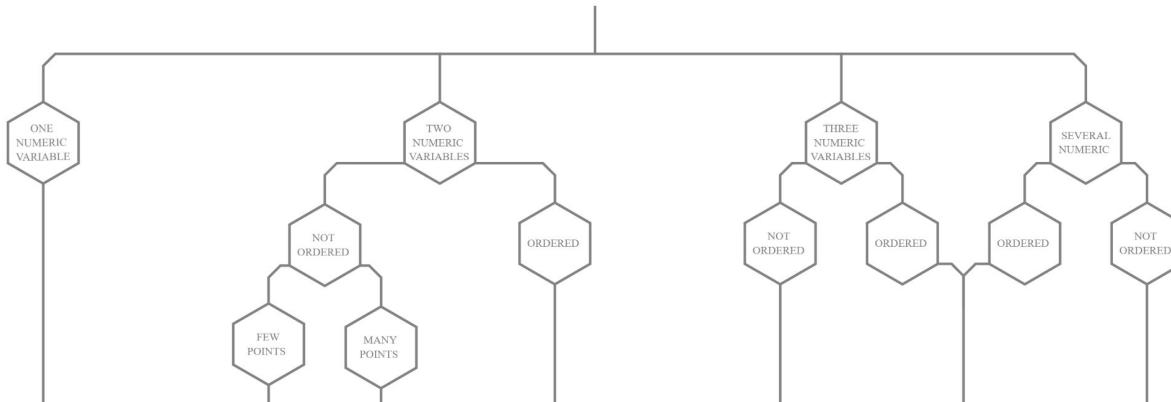
Bar lengths are misleading

Chenxin Li: Friends don't let friends...

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

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
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

FIGURE 4.15   Use color sparingly

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

39

Somewhere over the rainbow ...

Rainbow

Parula

Perceptually ordered colour maps

UNIVERSAL COLOUR KEY FOR SCIENTIFIC GRAPHS
ErrantScience.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
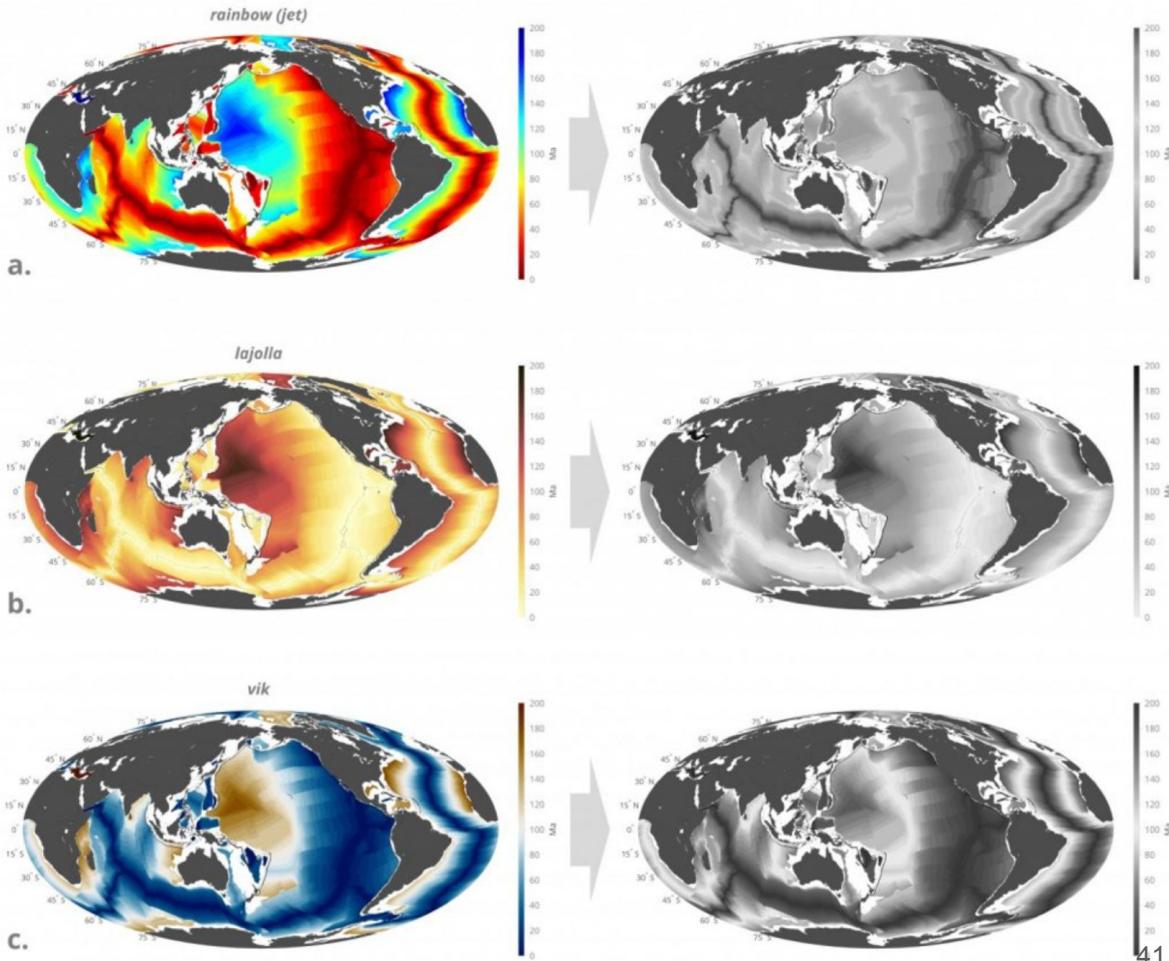
DATA I WANT TO MAKE UNREADABLE ON A WHITE BACKGROUND

UNICORN RELATED DATA

… there is always another rainbow (graph)!

rainbow (jet)

a.

lajolla

b.

vik

c.

You can simulate your graphs through a filter: Colblindor

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

Trichromatic view: | Anomalous Trichromacy: | Dichromatic view: | Monochromatic view:
- ● Normal
- ○ Red-Weak/Protanomaly | ○ Red-Blind/Protanopia | ○ Monochromacy/Achromatopsia
- ○ Green-Weak/Deuteranomaly | ○ Green-Blind/Deuteranopia | ○ 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