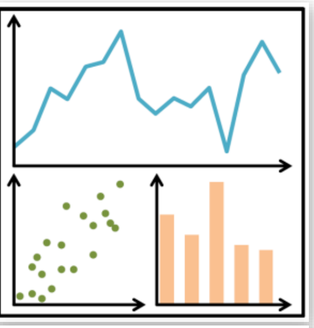
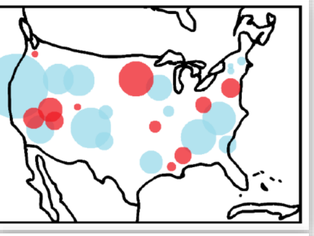
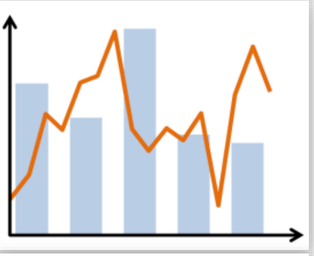
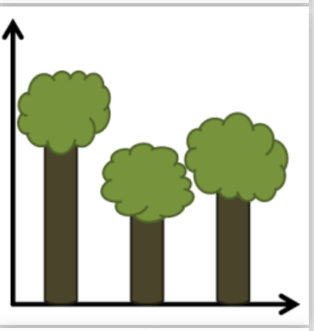
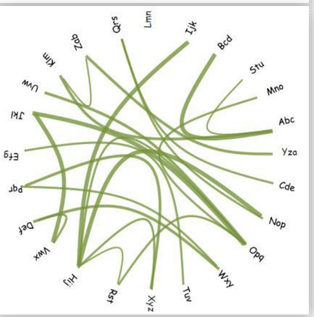






Design Rules of Thumb — Continued 3

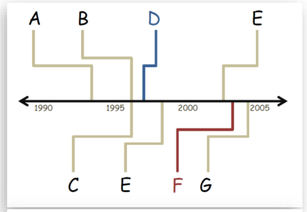
CS 7250

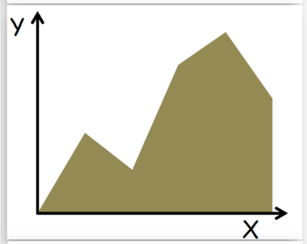
SPRING 2020

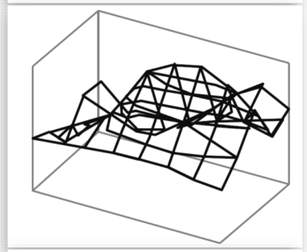
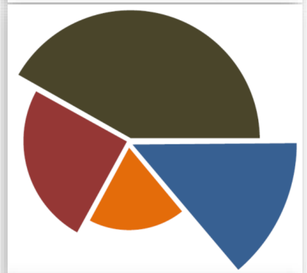
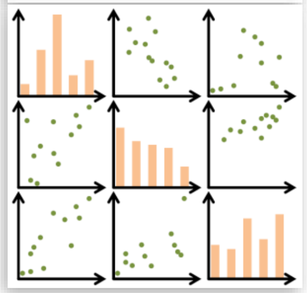
Prof. Cody Dunne

NORTHEASTERN UNIVERSITY

Slides and inspiration from Michelle Borkin, Krzysztof Gajos, Hanspeter Pfister, Miriah Meyer, Jonathan Schwabish, and David Sprague





READING QUIZ

3 min

Previously, on CS 7250…

Lie Factor

Lie Factor = $\frac{\text{(Size of effect in graphic)}}{\text{(Size of effect in data)}}$

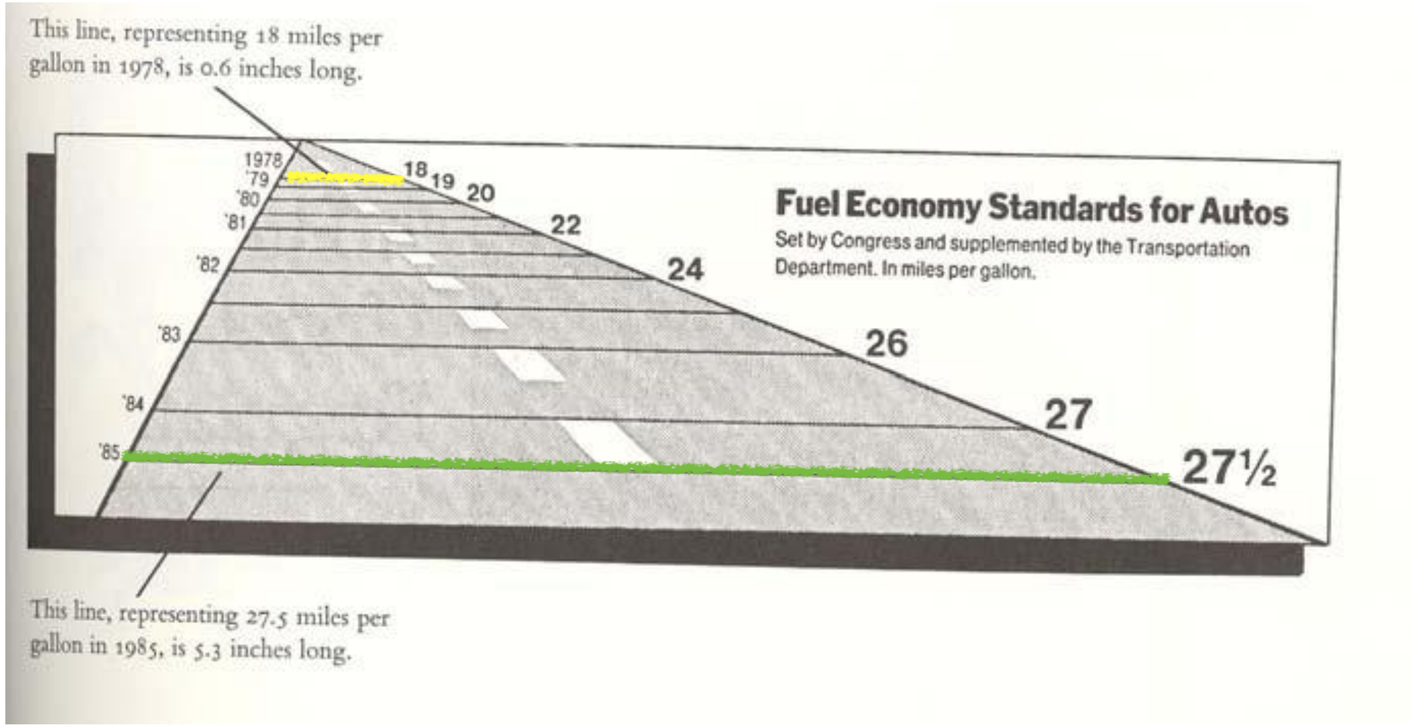


Image = $\frac{5.3" - 0.6"}{0.6"}$ = 7.83 = 783%

Data = $\frac{27.5 - 18}{18}$ = 0.53 = 53%

Lie Factor = $\frac{783\%}{53\%}$ = 14.8

Lie Factor = >1, overstating

"The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the numerical quantities measured."

Tufte, "Visual Display of Quantitative Information" (1983)

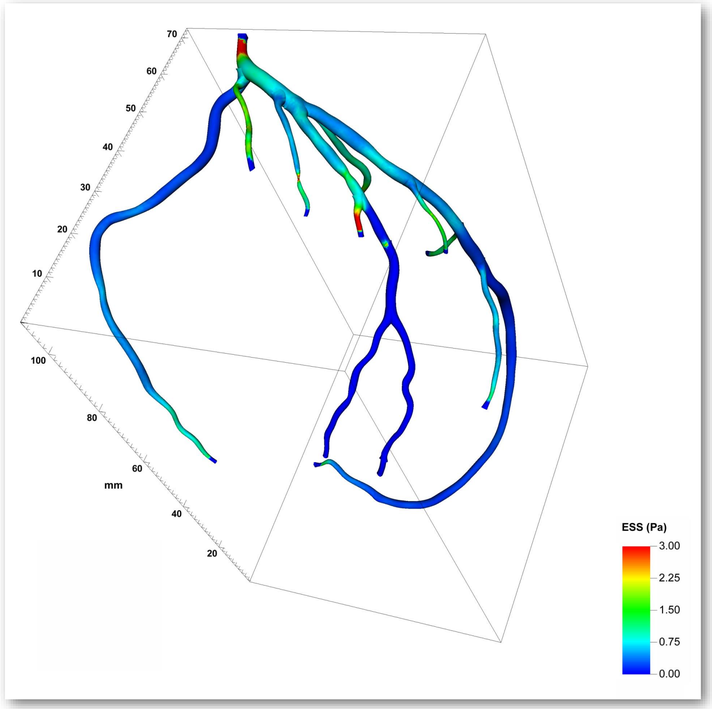
ACCURACY

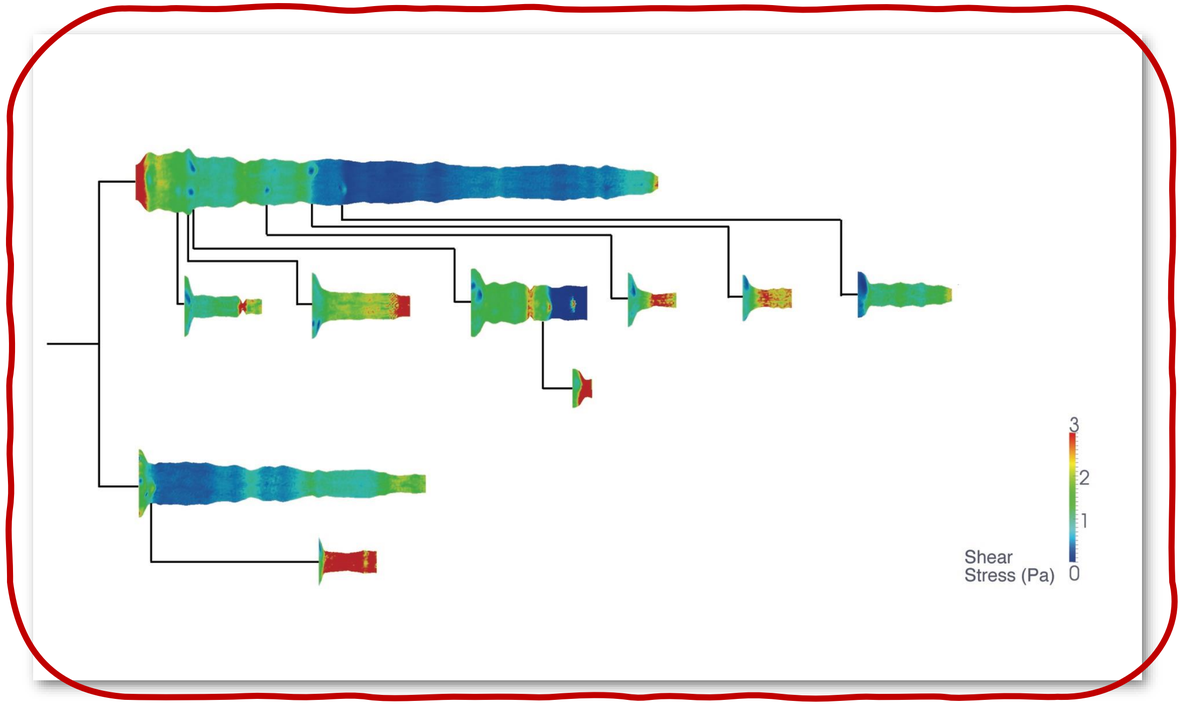
Strong effect of **dimensionality** on accuracy

39%

How many diseased regions found?

62%





[Borkin, et al. (2011)]

Now, on CS 7250…

“Graphical Integrity”

To achieve graphical “excellence” according to Tufte:

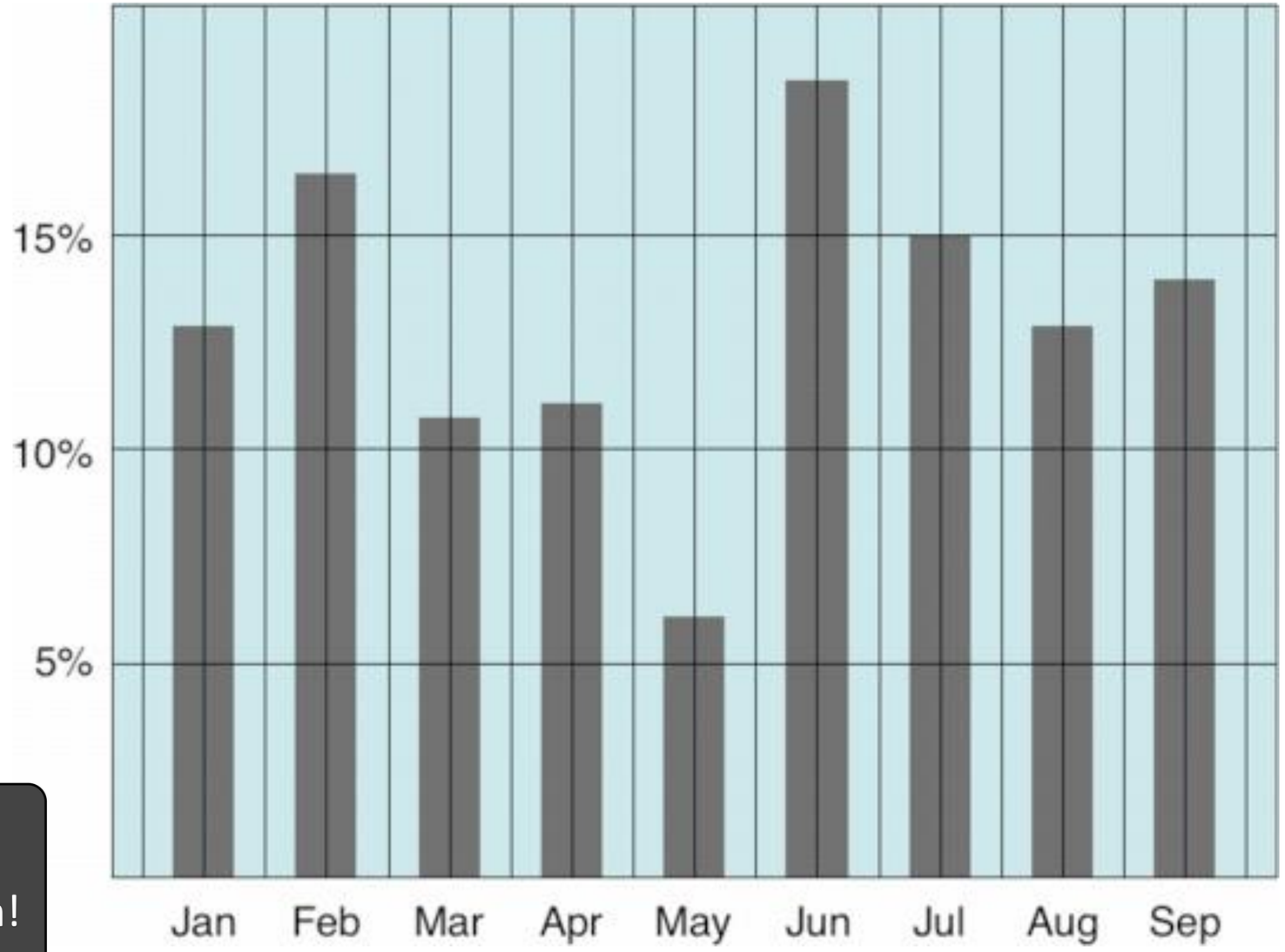
1. Above all else show the data.
2. Maximize the data-ink ratio.
3. Erase non-data ink.
4. Erase redundant data ink.
5. Revise and edit.

Tufte, “Visual Display of Quantitative Information” (1983)

In-Class Exercise

In-Class Sketching — “Graphical Integrity”

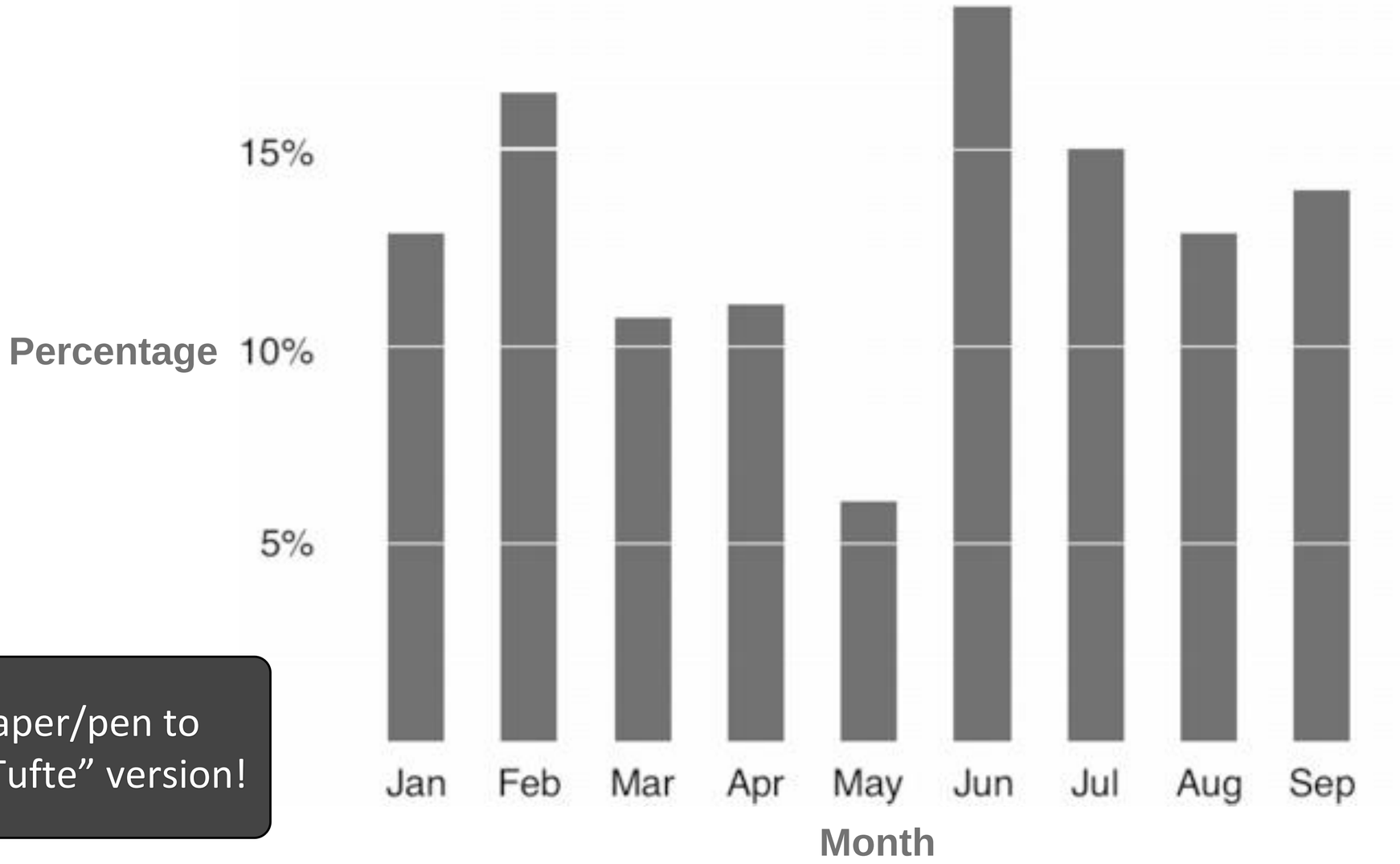
~8 min



Use paper/pen to sketch “Tufte” version!

In-Class Sketching — “Graphical Integrity”

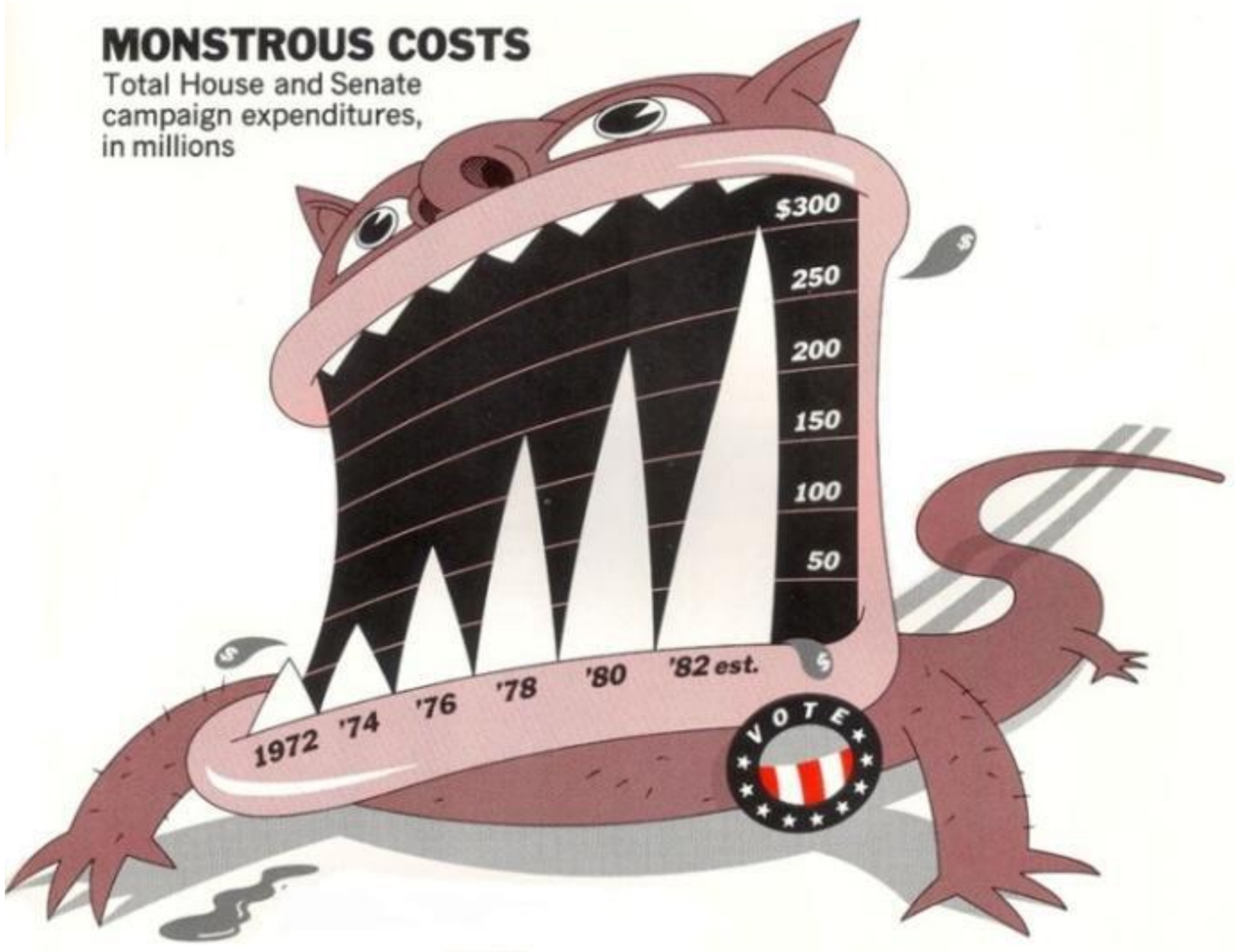
~8 min

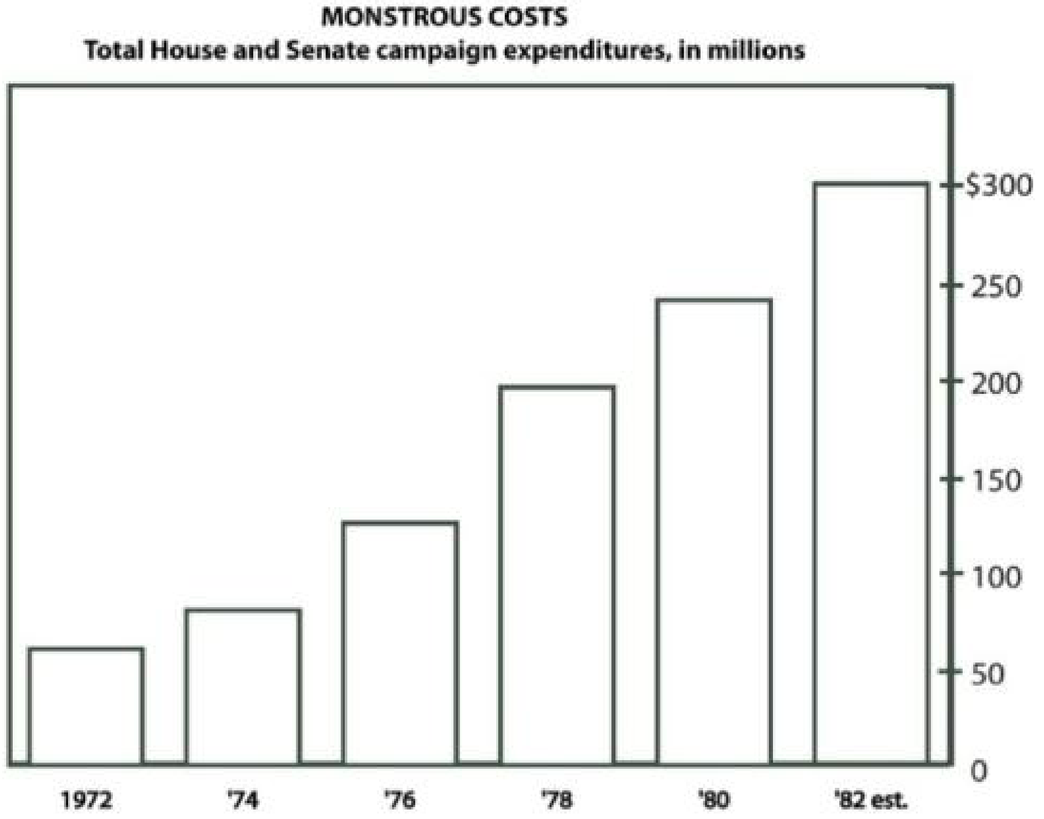


Use paper/pen to sketch “Tufte” version!

CHART JUNK

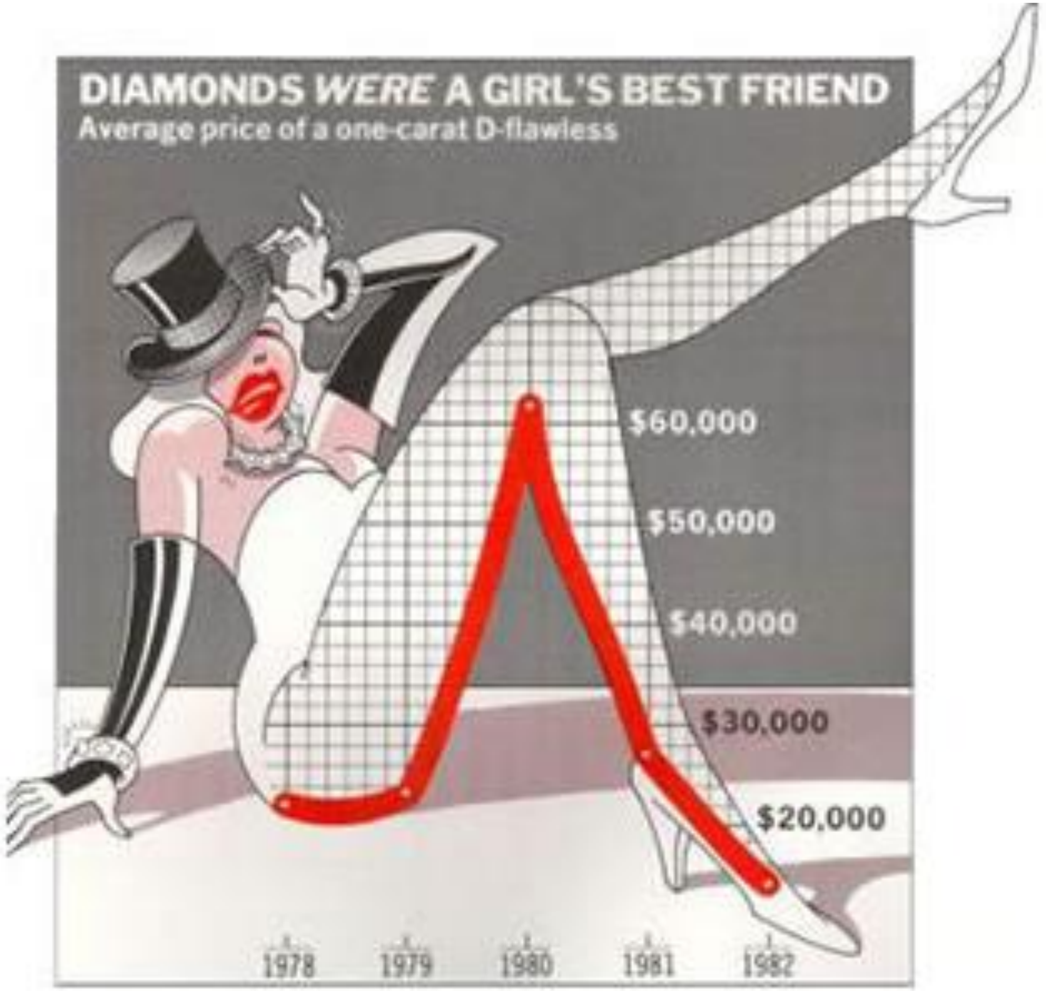
“Chart Junk”

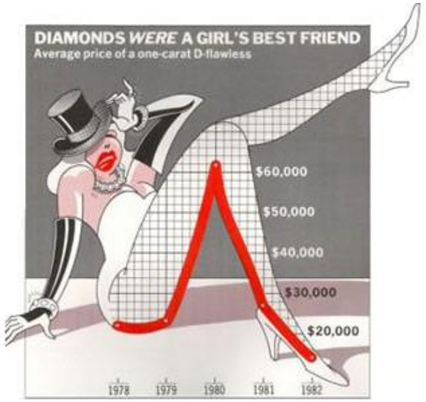


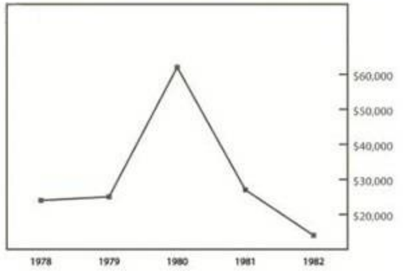


Bateman, et al. (2010)

“Chart Junk”



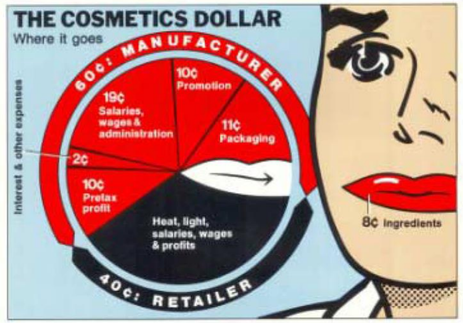


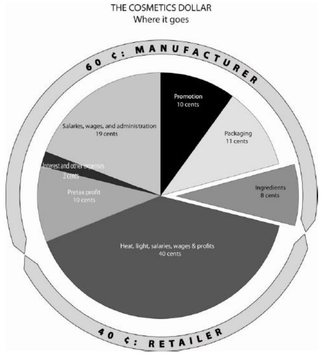


Bateman, et al. (2005)

“Chart Junk Debate”

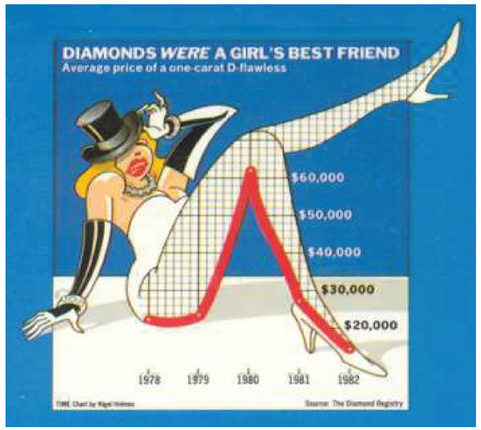
Useful Junk? The Effects of Visual Embellishment on Comprehension and Memorability of Charts





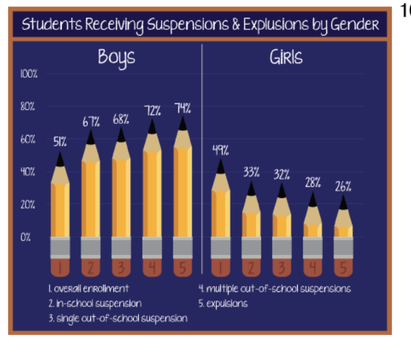
Bateman, et al. (2010)

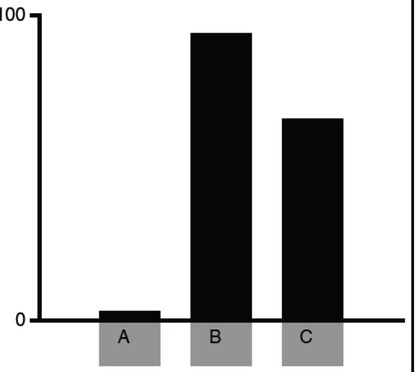
Benefitting InfoVis with Visual Difficulties



Hullman, et al. (2011)

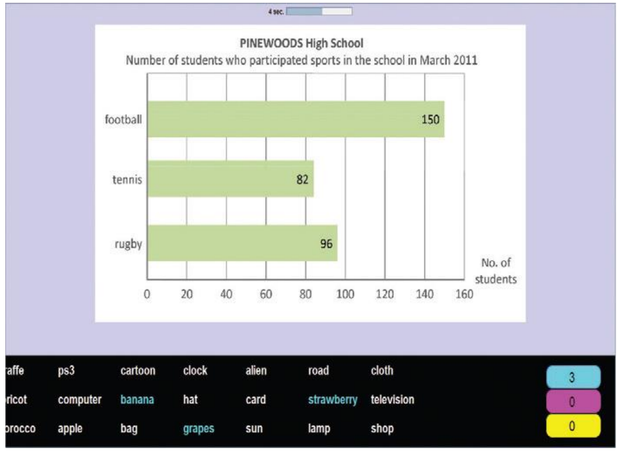
An Evaluation of the Impact of Visual Embellishments in Bar Charts





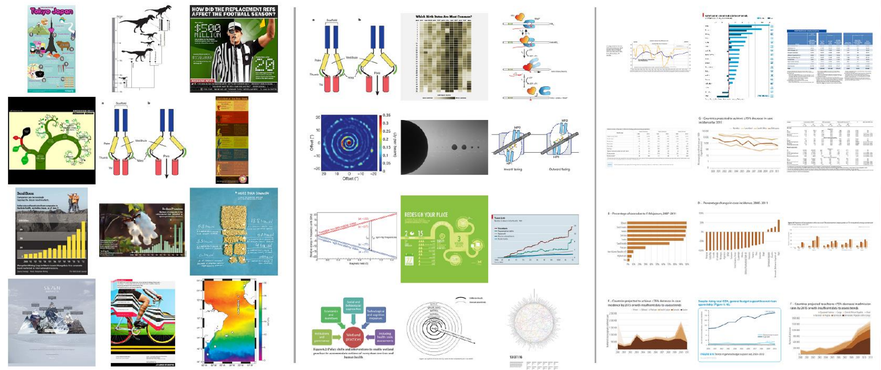
Skau, et al. (2015)

An Empirical Study on Using Visual Embellishments in Visualization



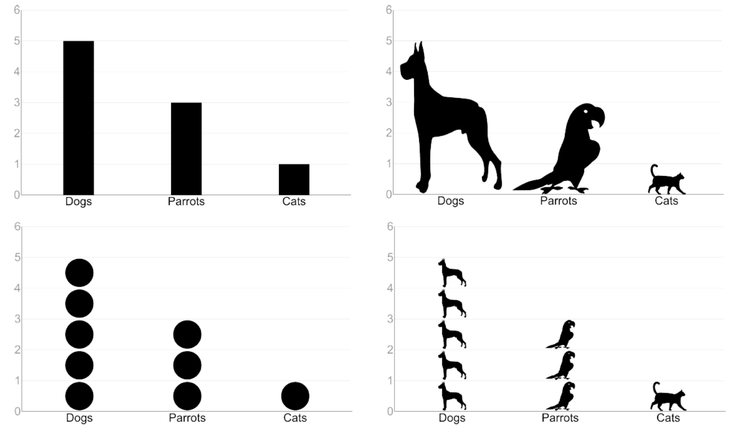
Borgo, et al. (2012)

What makes a visualization memorable?



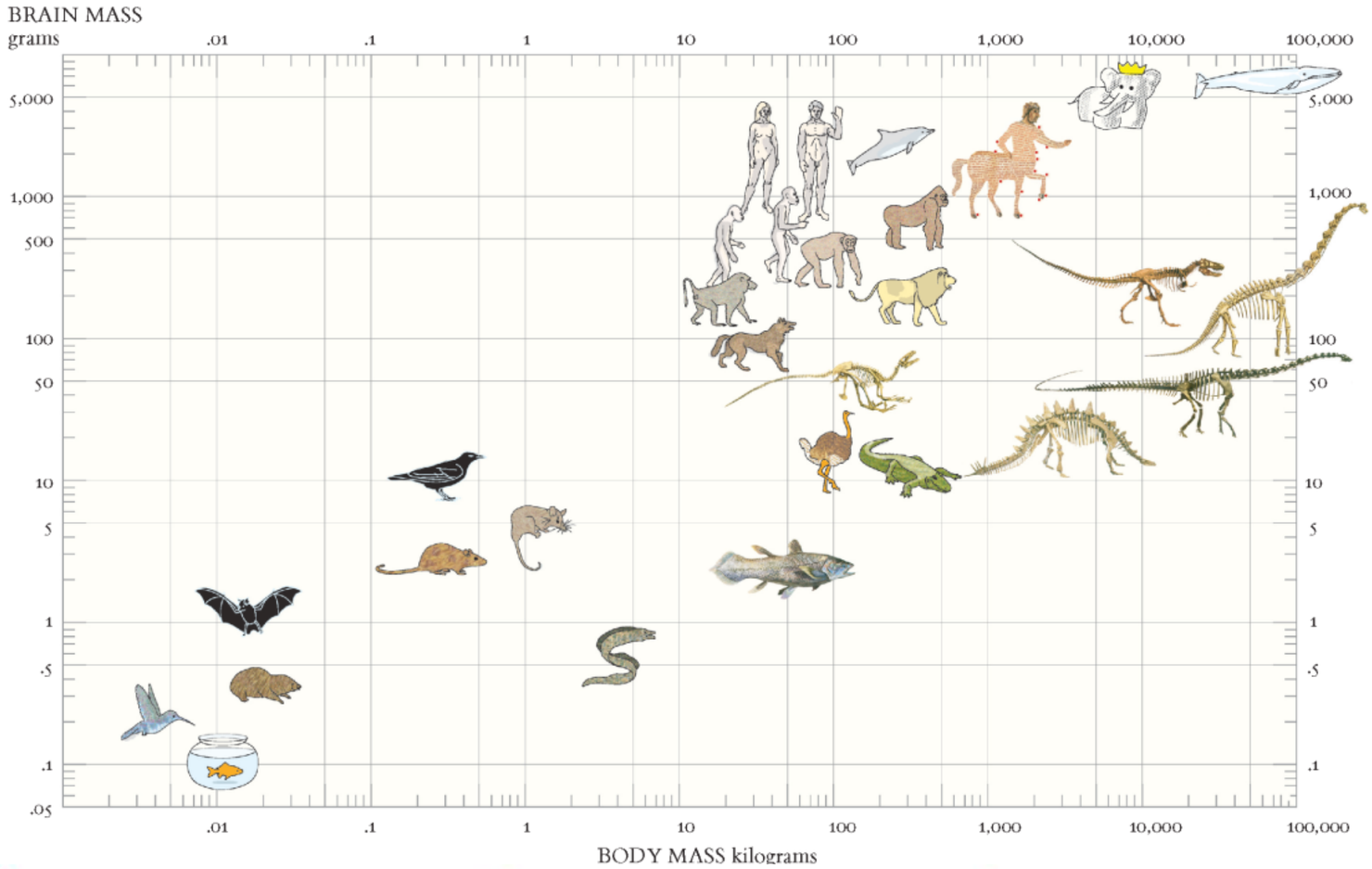
Borkin, et al. (2013)
Borkin, et al. (2015)

ISOTYPE Visualization – Working Memory, Performance, and Engagement with Pictographs



Haroz, et al. (2015)

Not all “visual embellishments” are “chart junk”!



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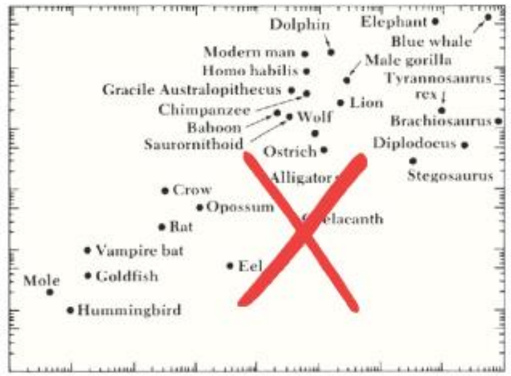

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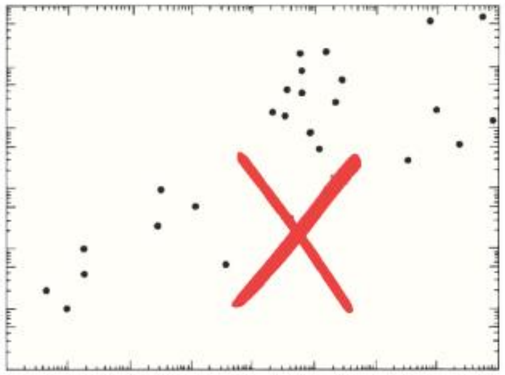

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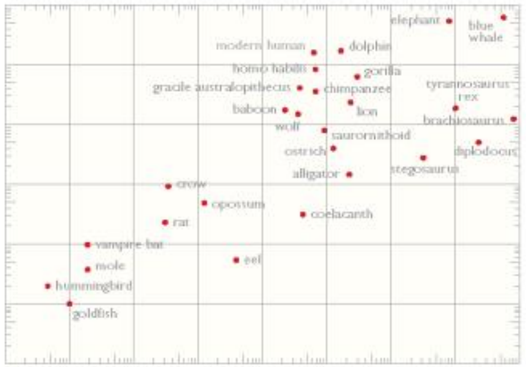


Tufte, “Beautiful Evidence” (2006)

“Chart Junk”

Chart junk can... persuade, help with memorability, engage

... bias, limit data-ink ratio, clutter, lower trust

<u>Take-away</u>: it depends on your audience, task, and context...

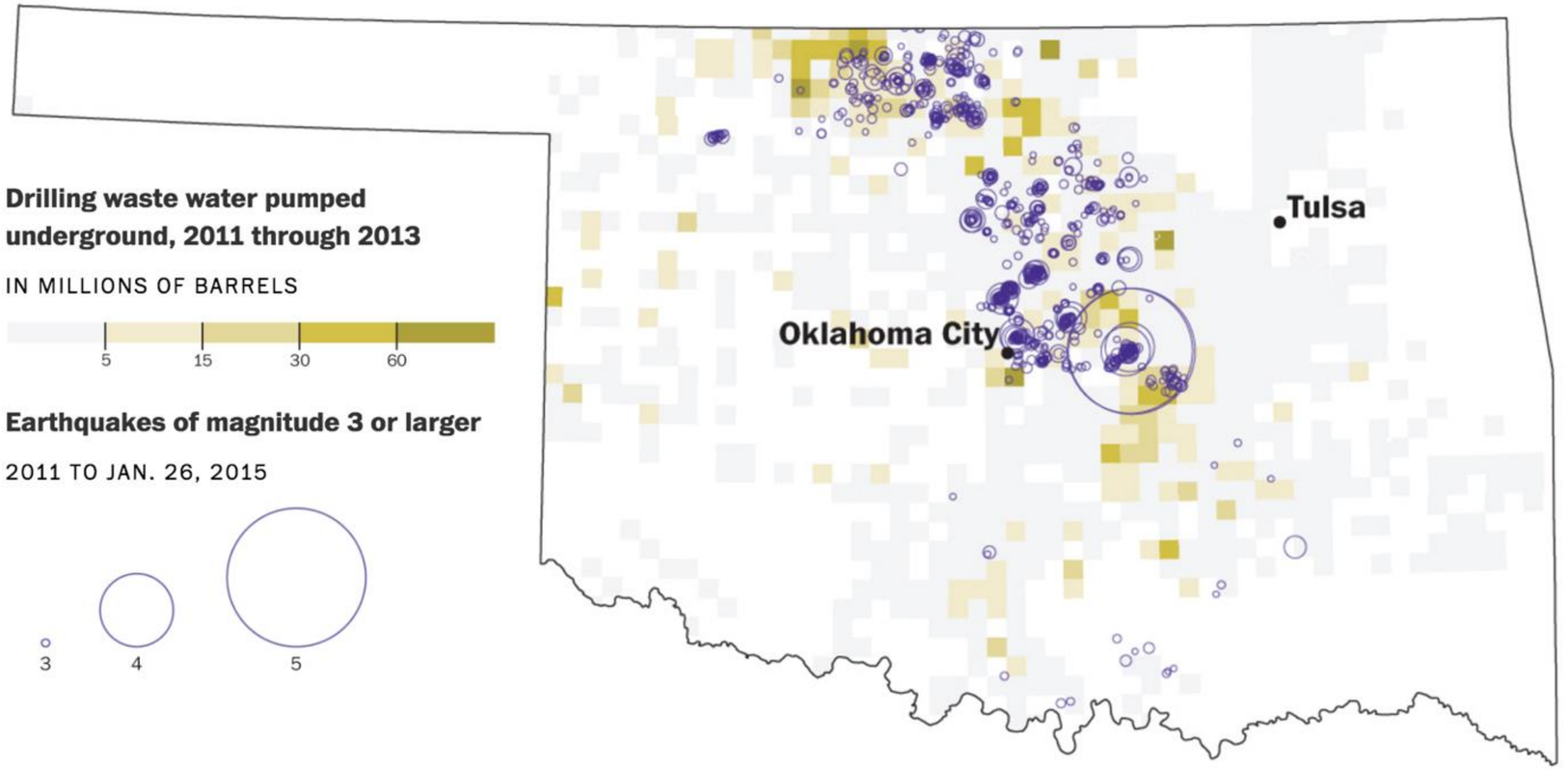
Hall of Fame or Hall of Shame

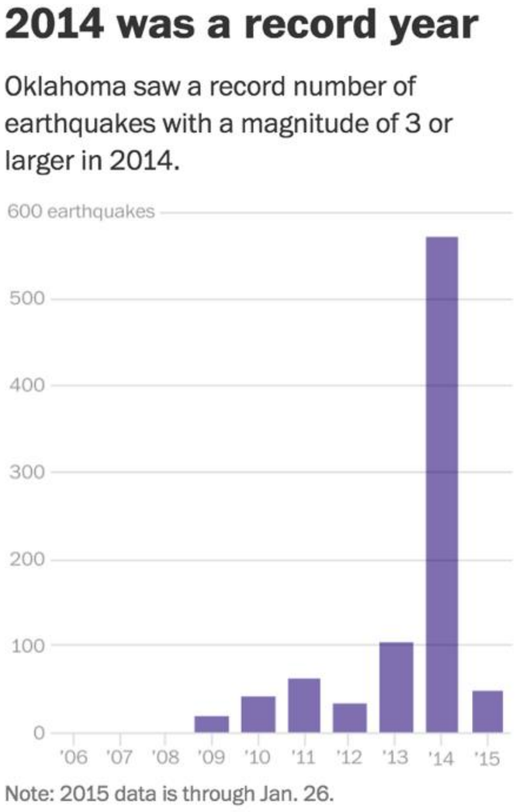
Damaging quakes in Oklahoma

A lawsuit claims that Oklahoma's great increase in earthquake activity has been caused by pumping waste from drilling operations back underground. The suit involves the largest measured quake in the history of the state, a 5.6 tremor that happened in Prague, east of Oklahoma City in November 2011. The pace of quakes with magnitude 3 or higher has increased since then, with 567 in 2014, and 52 in less than four weeks this month. Read related article.

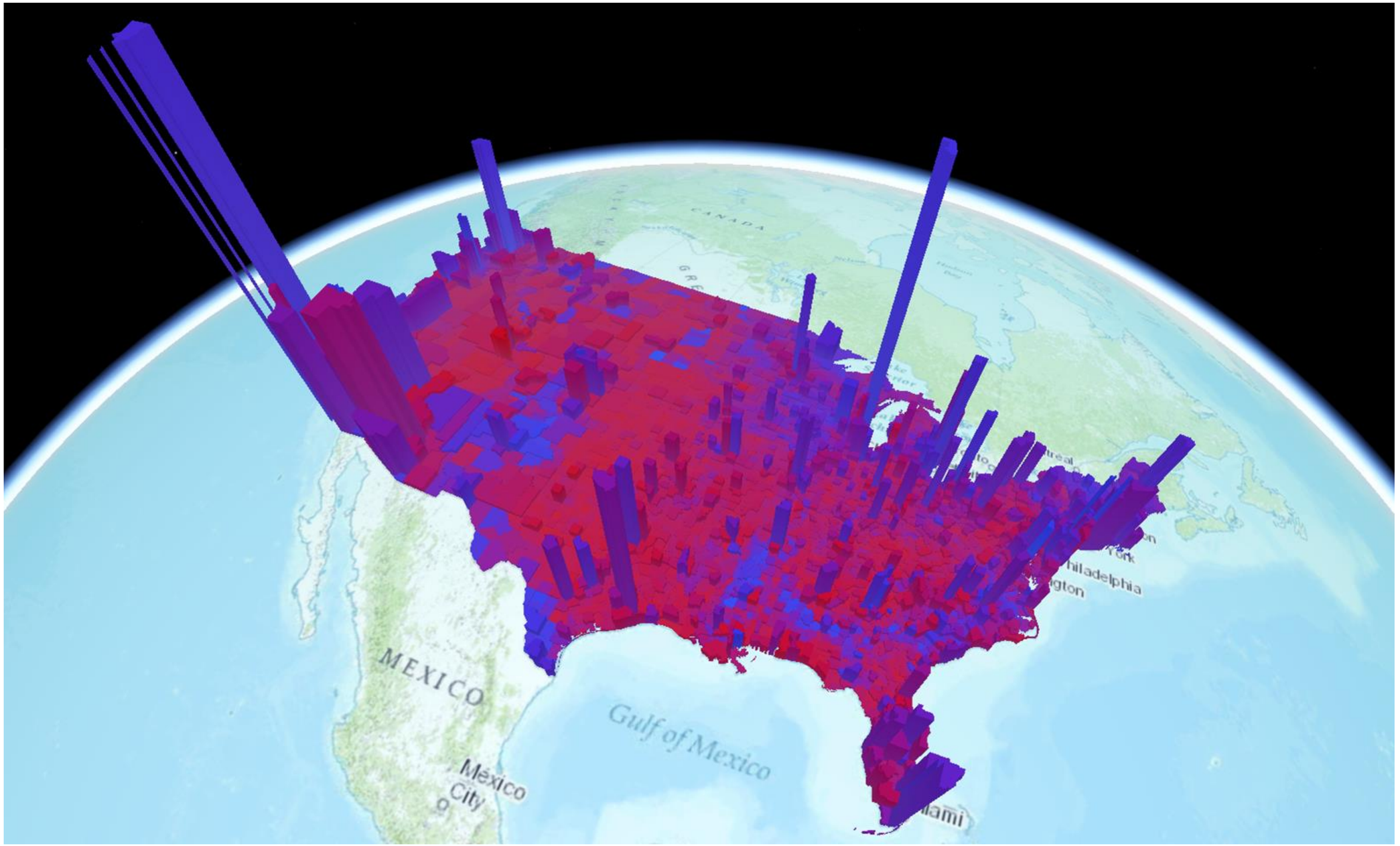
By Dan Keating and Darla Cameron

Published: Jan. 28, 2015



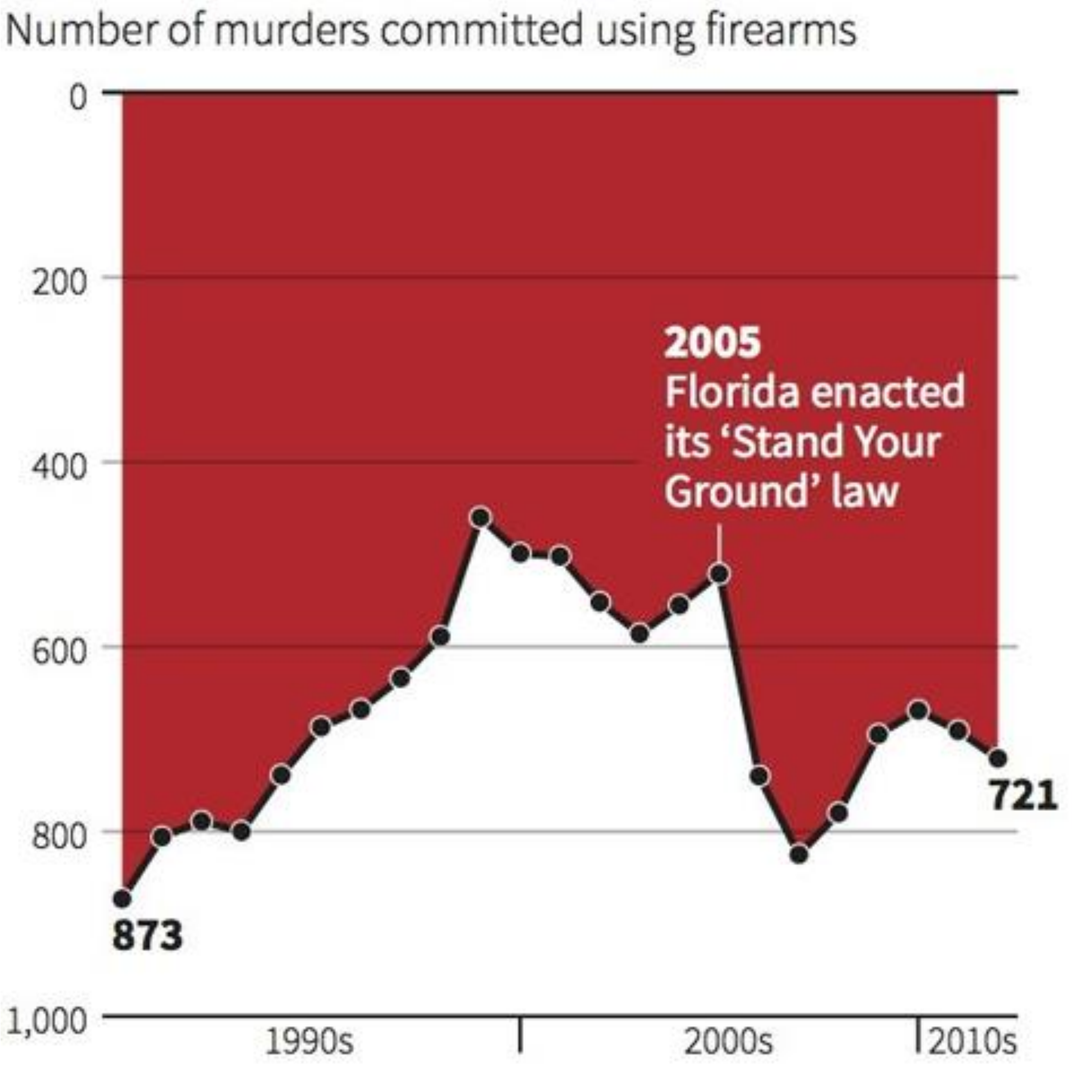


https://www.washingtonpost.com/graphics/national/oklahoma-earthquakes/



http://cartonerd.blogspot.com/2014/08/three-dee-thematics.html

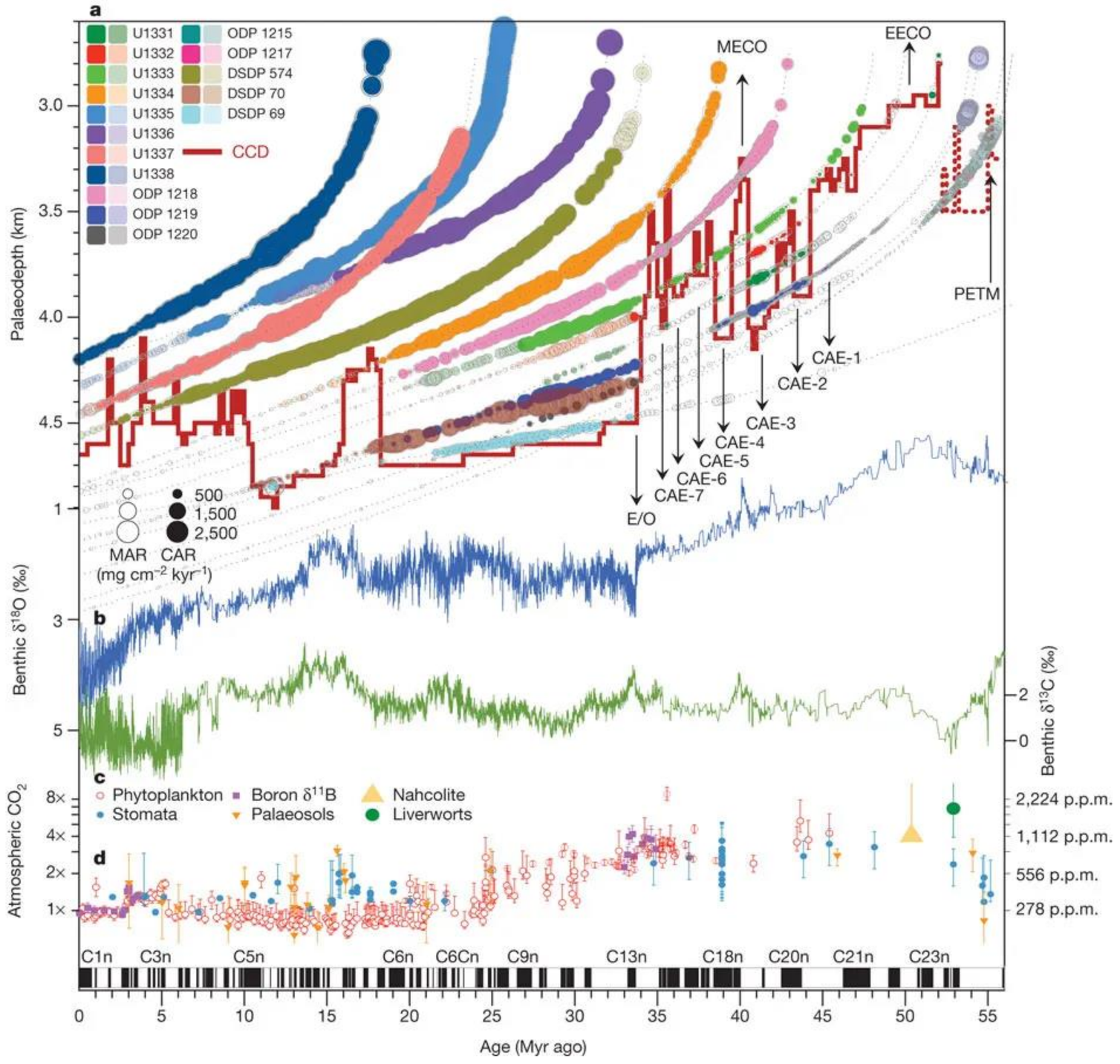
Gun deaths in Florida



Source: Florida Department of Law Enforcement

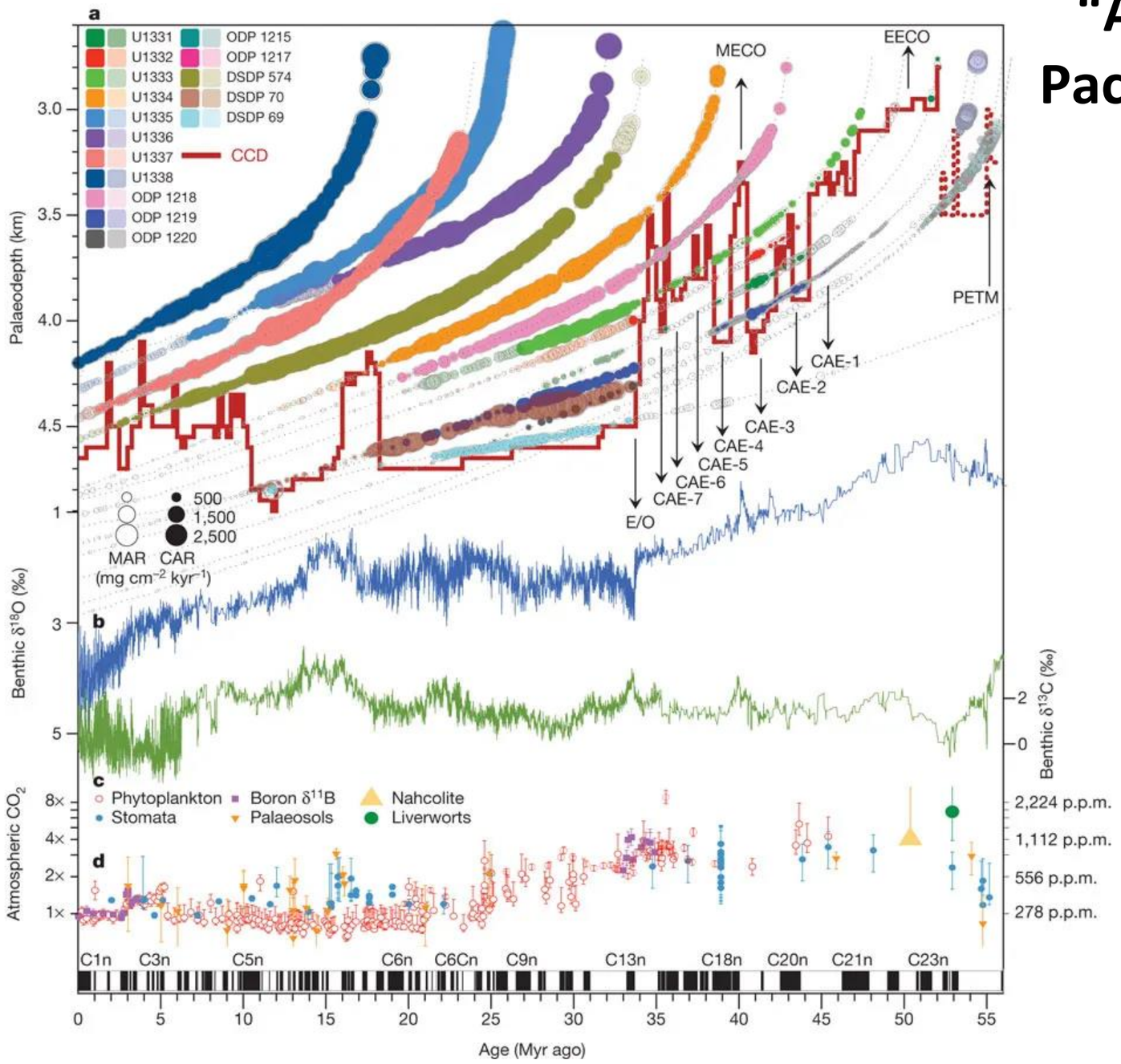
C. Chan 16/02/2014

REUTERS



Pälike et al. (2012)

“A Cenozoic record of the equatorial Pacific carbonate compensation depth”



a, Equatorial Pacific accumulation rate history as a function of geological age at the backtracked and unloaded palaeo-water depth, and using a palaeomagnetic polarity age scheme[2] plotted as black and white bars below the figure. Circle area is scaled by accumulation rate: carbonate accumulation rate (CAR; filled circles), total mass accumulation rate (MAR; open circles). Data are plotted with a lighter colour outside a ±3.5° band around the palaeo-equator. The position of the equatorial Pacific CCD is indicated by a solid red line (dashed red line marks reconstruction from off-equatorial sites). See text for abbreviations. **b**, **c**, Benthic oxygen (**b**; blue curve, left-hand vertical axis) and carbon (**c**; green curve, right-hand vertical axis) isotope values from a global compilation[9], reported relative to the VPDB (Vienna Pee Dee Belemnite) standard. **d**, Atmospheric CO_2 compilation and error bars from refs 16, 40; left-hand vertical axis, log CO_2 scale relative to pre-industrial CO_2 (1× = 278 p.p.m.v.); right-hand vertical axis, log CO_2 scale in absolute values. Error bars are as in ref. 16; for example, for boron $\delta^{11}B$ error bars reflect long-term analytical reproducibility or internal precision, whichever is larger (at 95% confidence). PETM, Palaeocene-Eocene Thermal Maximum.

Pälike et al. (2012)

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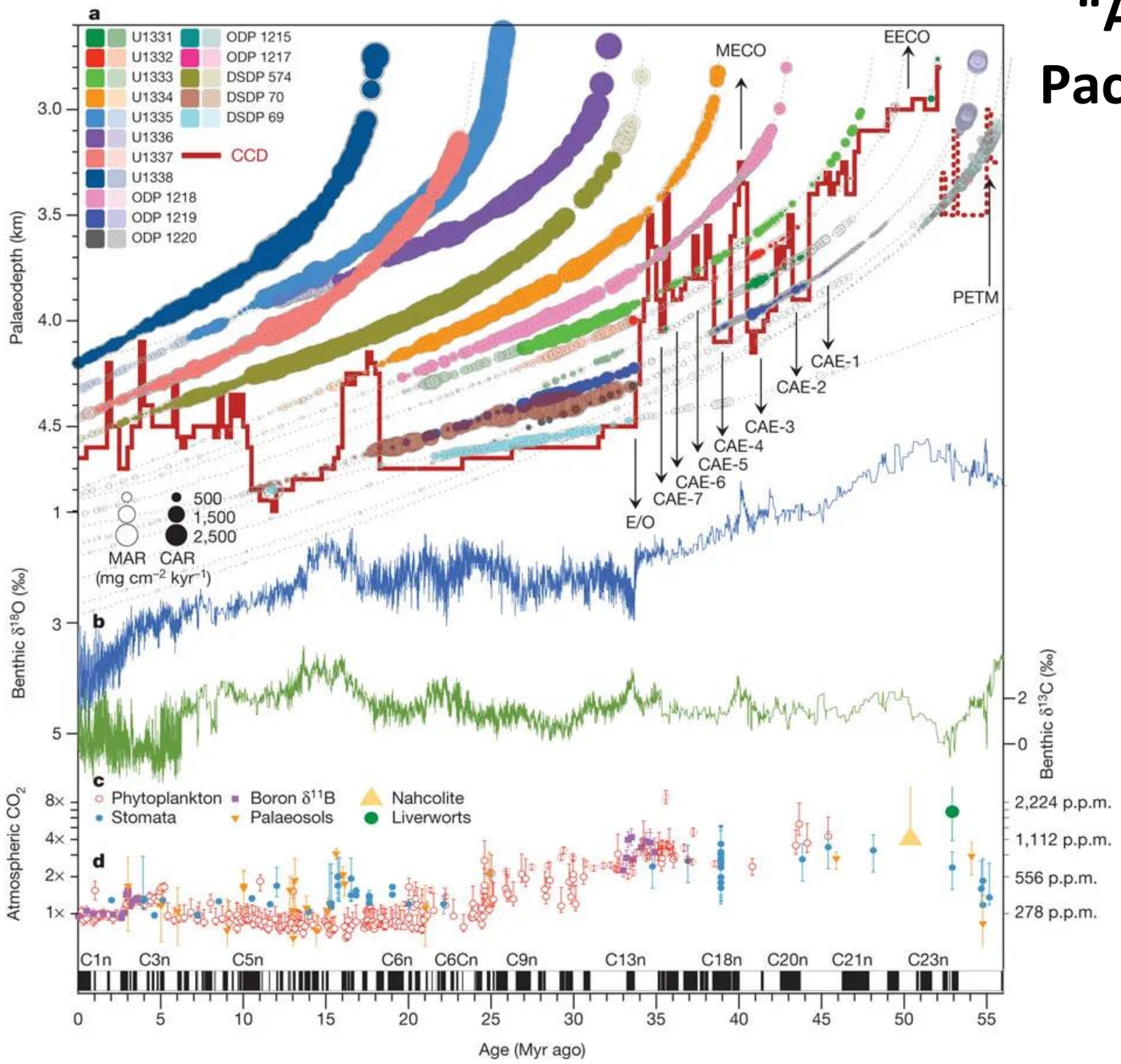

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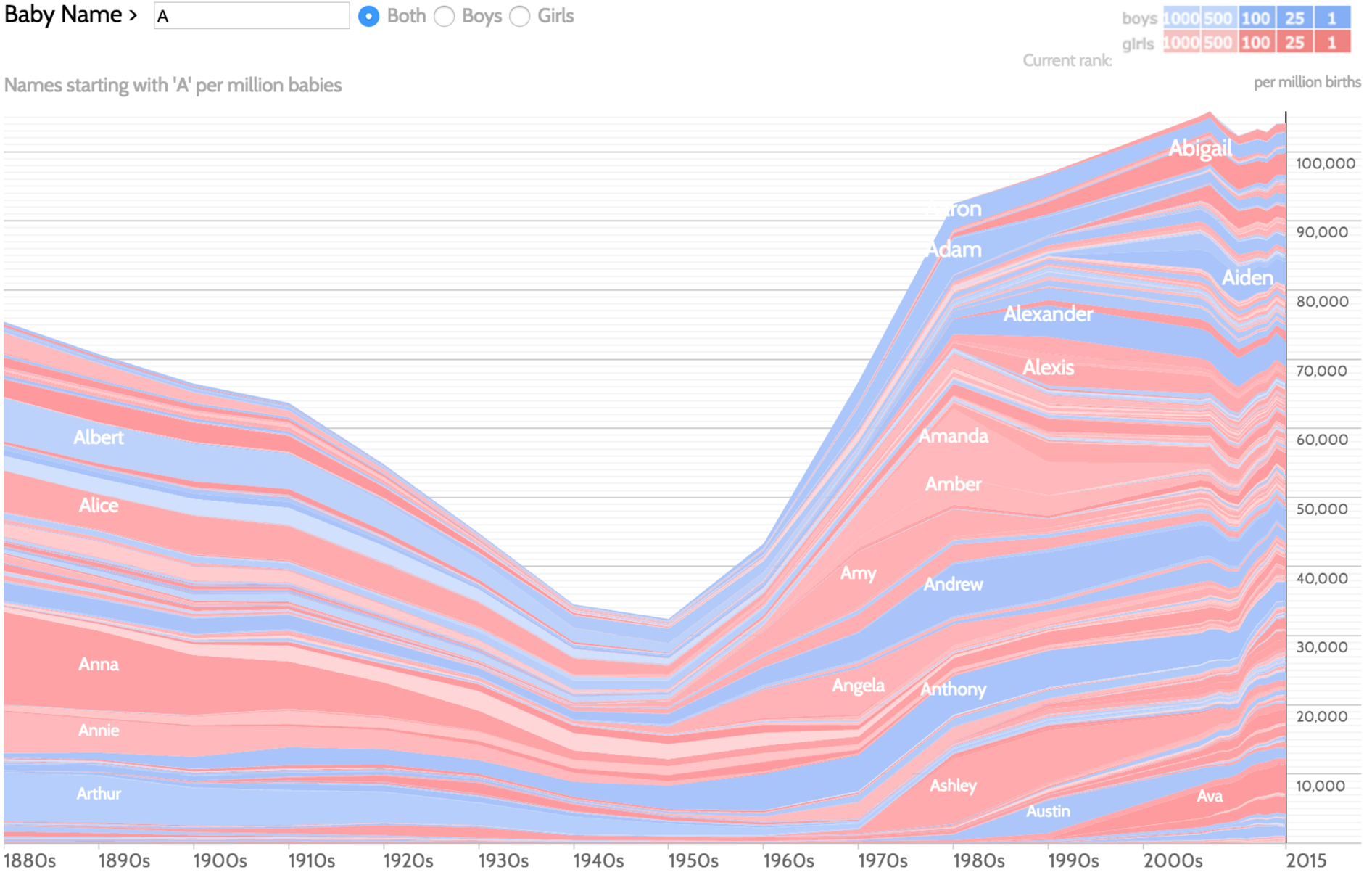
Yellow = explicit encodings Olive = implicit encodings

Pälike et al. (2012)



http://www.babynamewizard.com/voyager