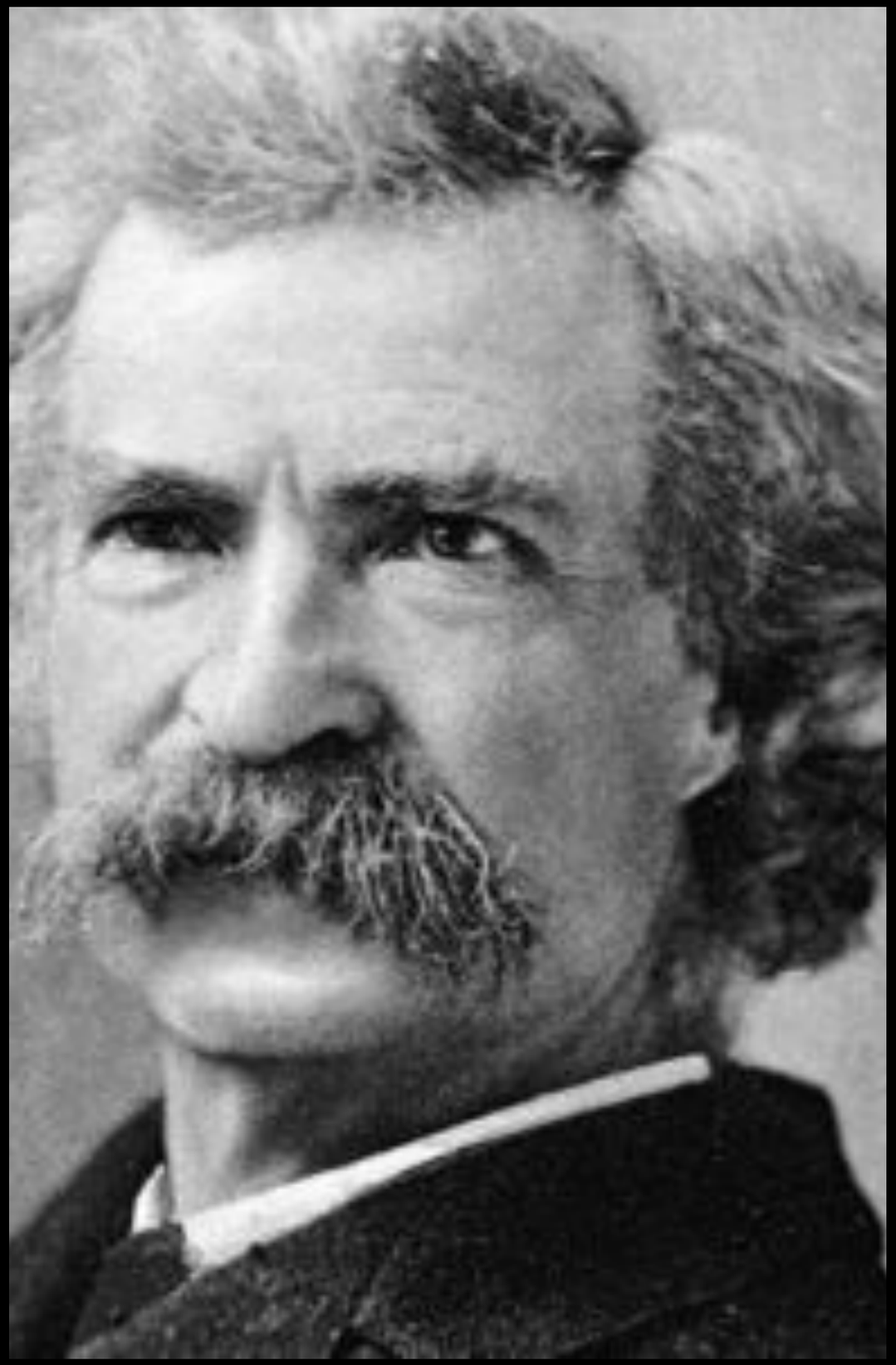
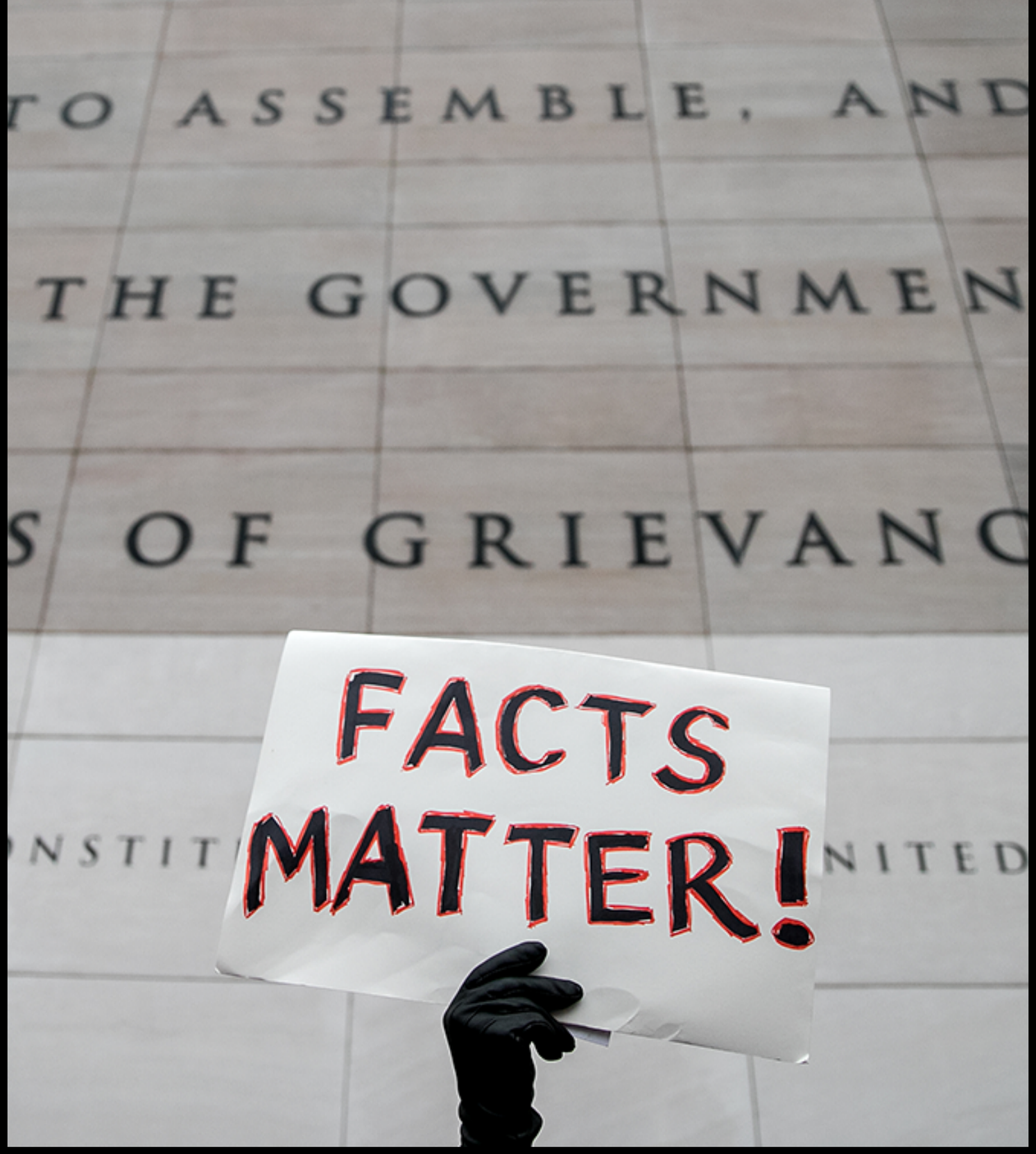
Data Integrity

“There are three kinds of lies: lies, damned lies, and statistics.”

– Mark Twain (or possibly Benjamin Disraeli)





Maybe? ¯_(ツ)_/¯

Weaponized

‘objectivity’

Blinded with science: Trivial graphs and formulas increase ad persuasiveness and belief in product efficacy

Aner Tal

Brian Wansink

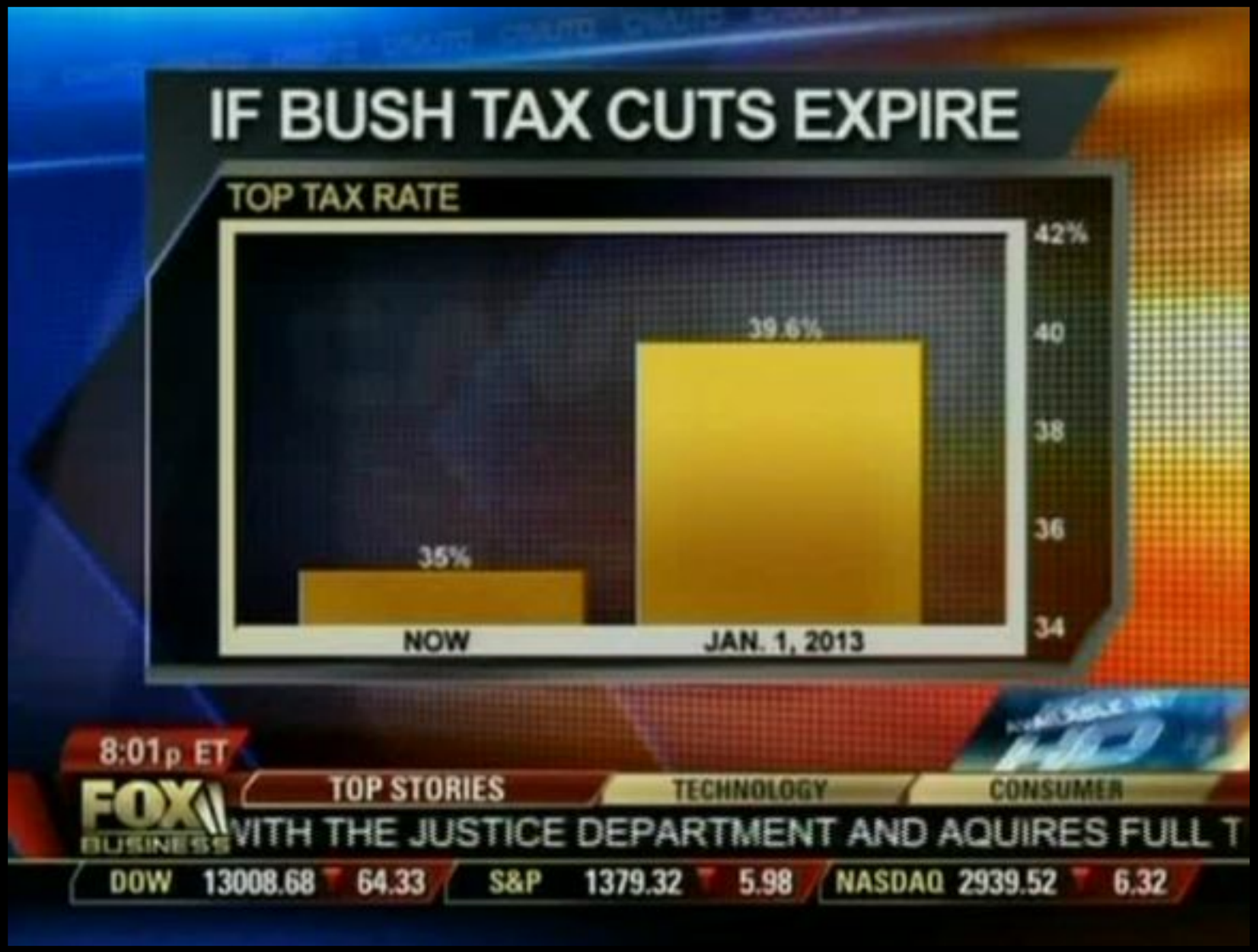
Cornell University, USA

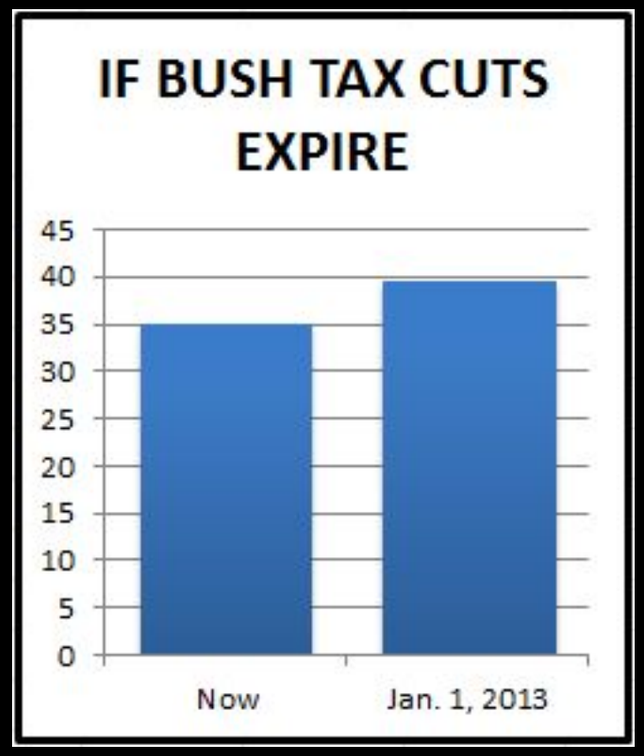
Brian Wansink, Charles H. Dyson School of Applied Economics and Management, Cornell University, 114 Warren Hall, Ithaca, NY 14853, USA. Email: foodandbrandlab@cornell.edu

Abstract

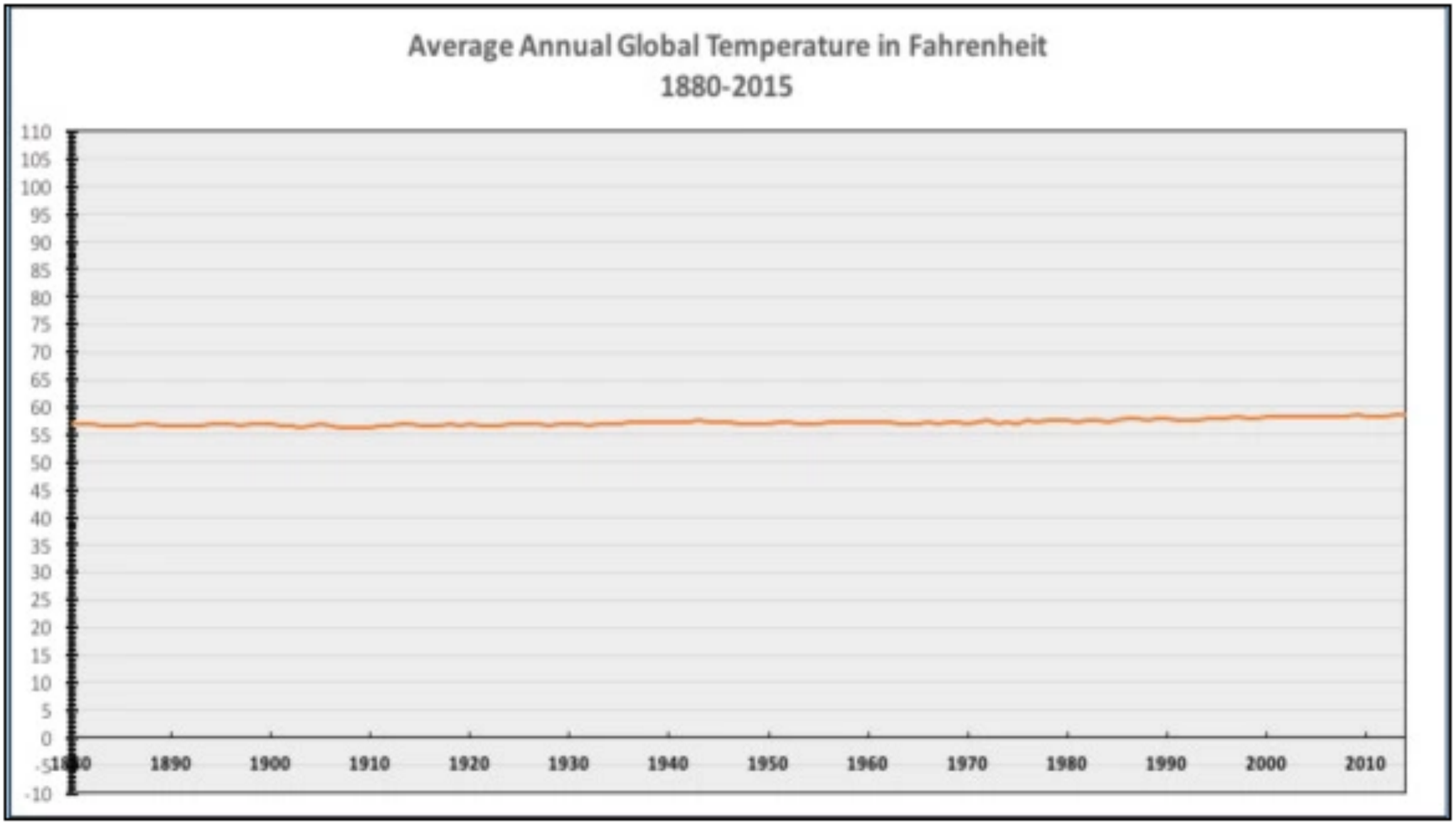
The appearance of being scientific can increase persuasiveness. Even trivial cues can create such an appearance of a scientific basis. In our studies, including simple elements, such as graphs (Studies 1–2) or a chemical formula (Study 3), increased belief in a medication's efficacy. This appears to be due to the association of such elements with science, rather than increased comprehensibility, use of visuals, or recall. Belief in science moderates the persuasive effect of graphs, such that people who have a greater belief in science are more affected by the presence of graphs (Study 2). Overall, the studies contribute to past research by demonstrating that even trivial elements can increase public persuasion despite their not truly indicating scientific expertise or objective support.

Charts ‘read’ as inherently truth-y

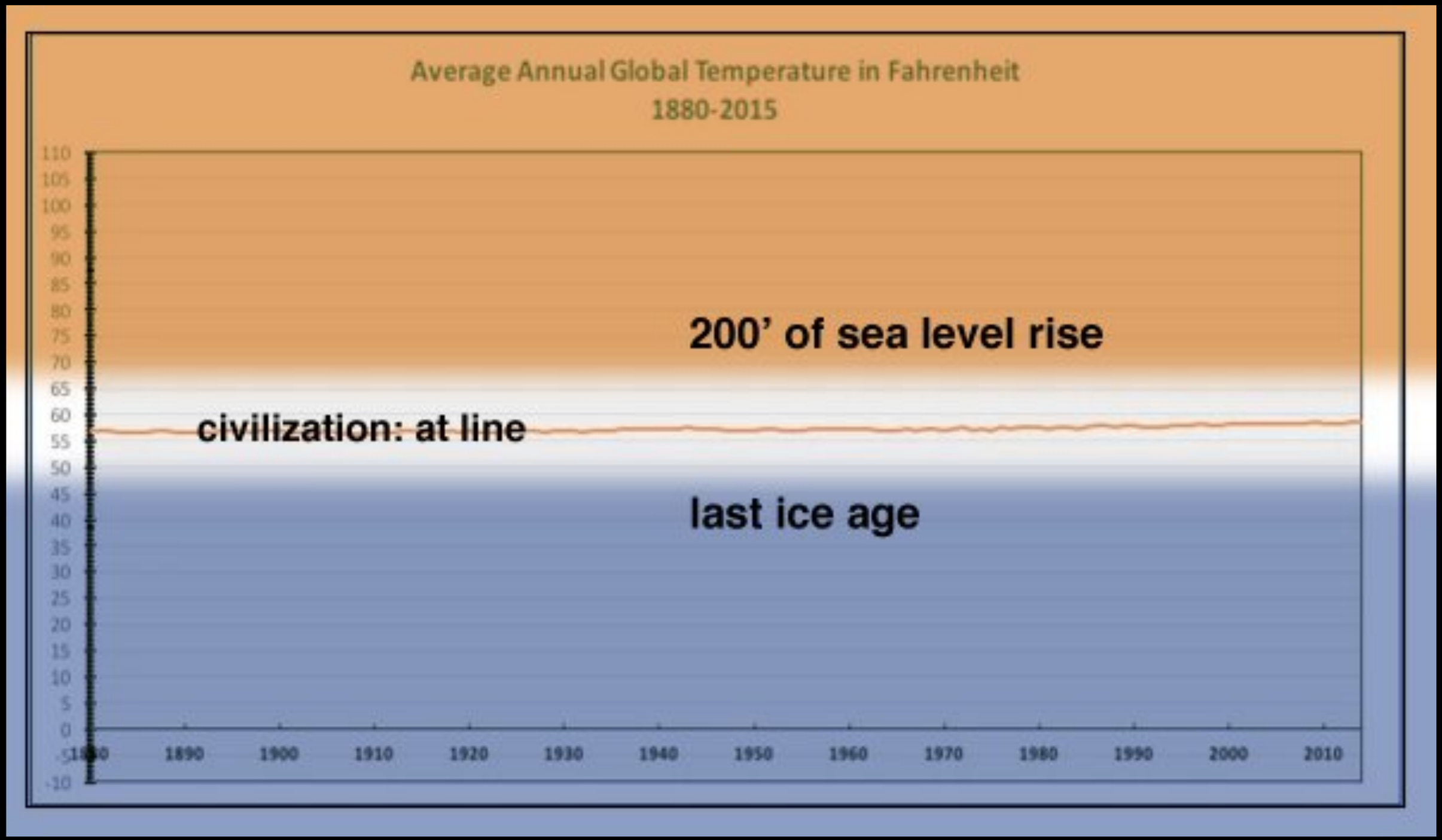




Magnifying small differences…

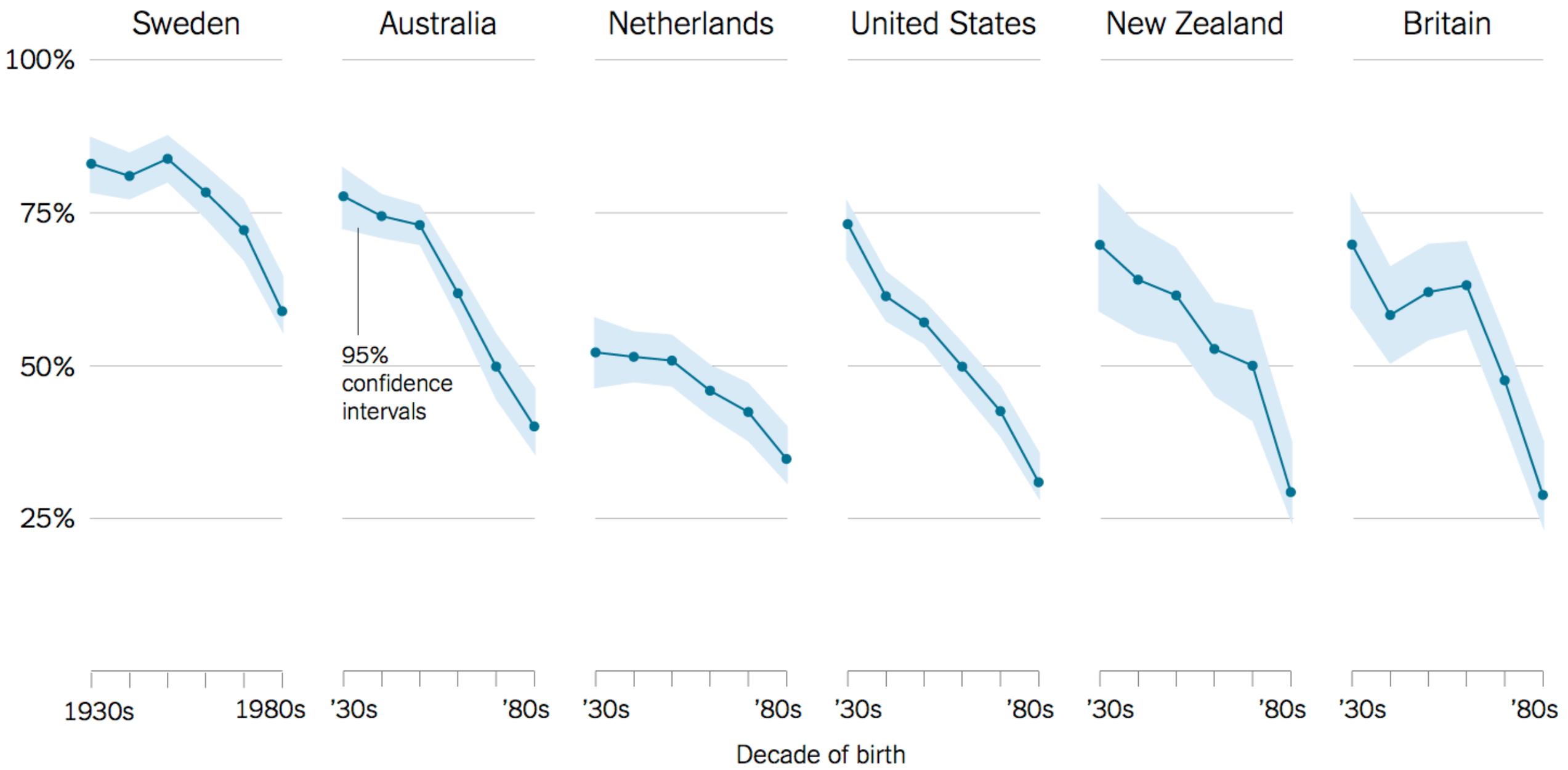


…and minimizing large ones

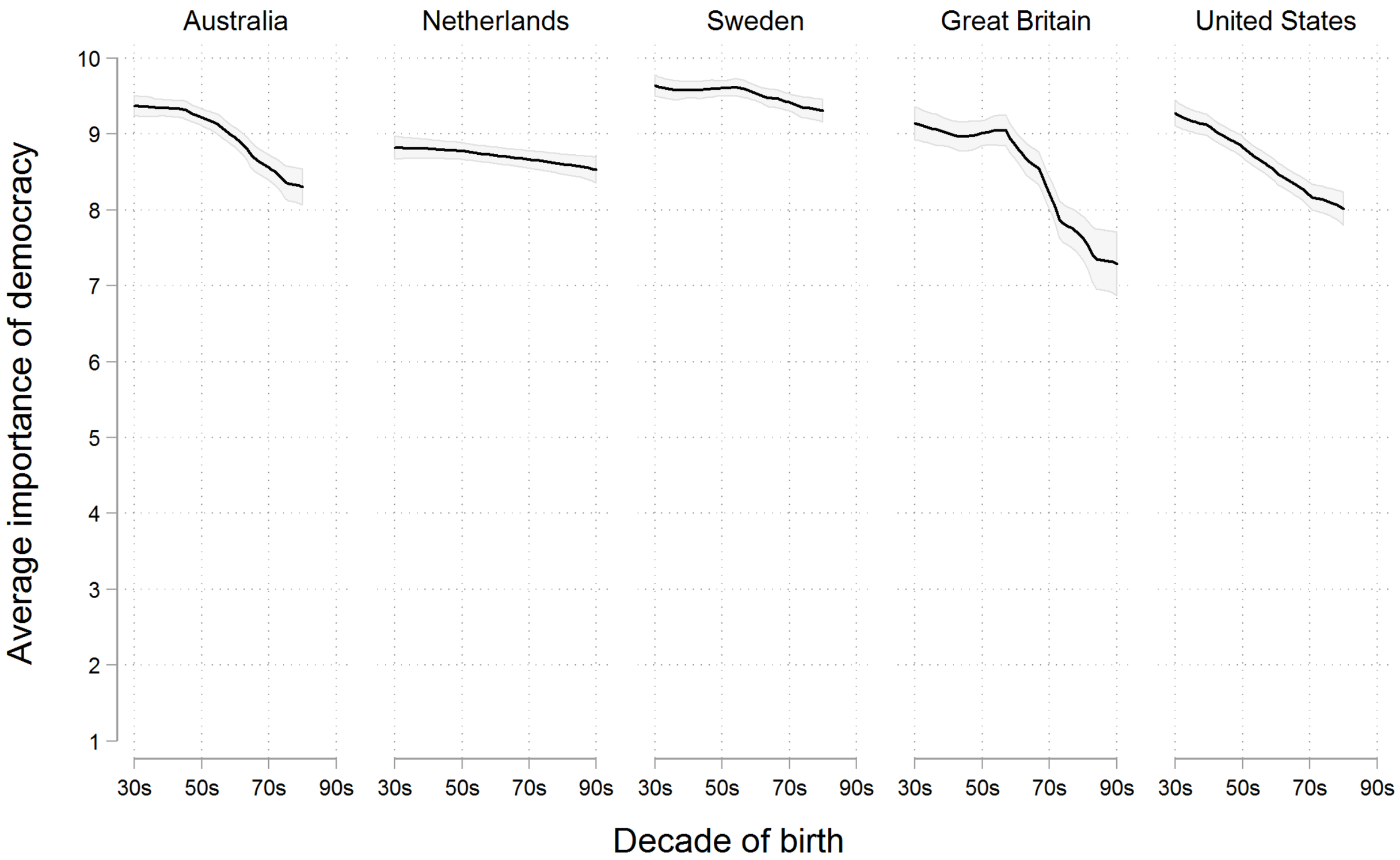


…and minimizing large ones

Percentage of people who say it is “essential” to live in a democracy



Source: Yascha Mounk and Roberto Stefan Foa, “The Signs of Democratic Deconsolidation,” Journal of Democracy | By The New York Times



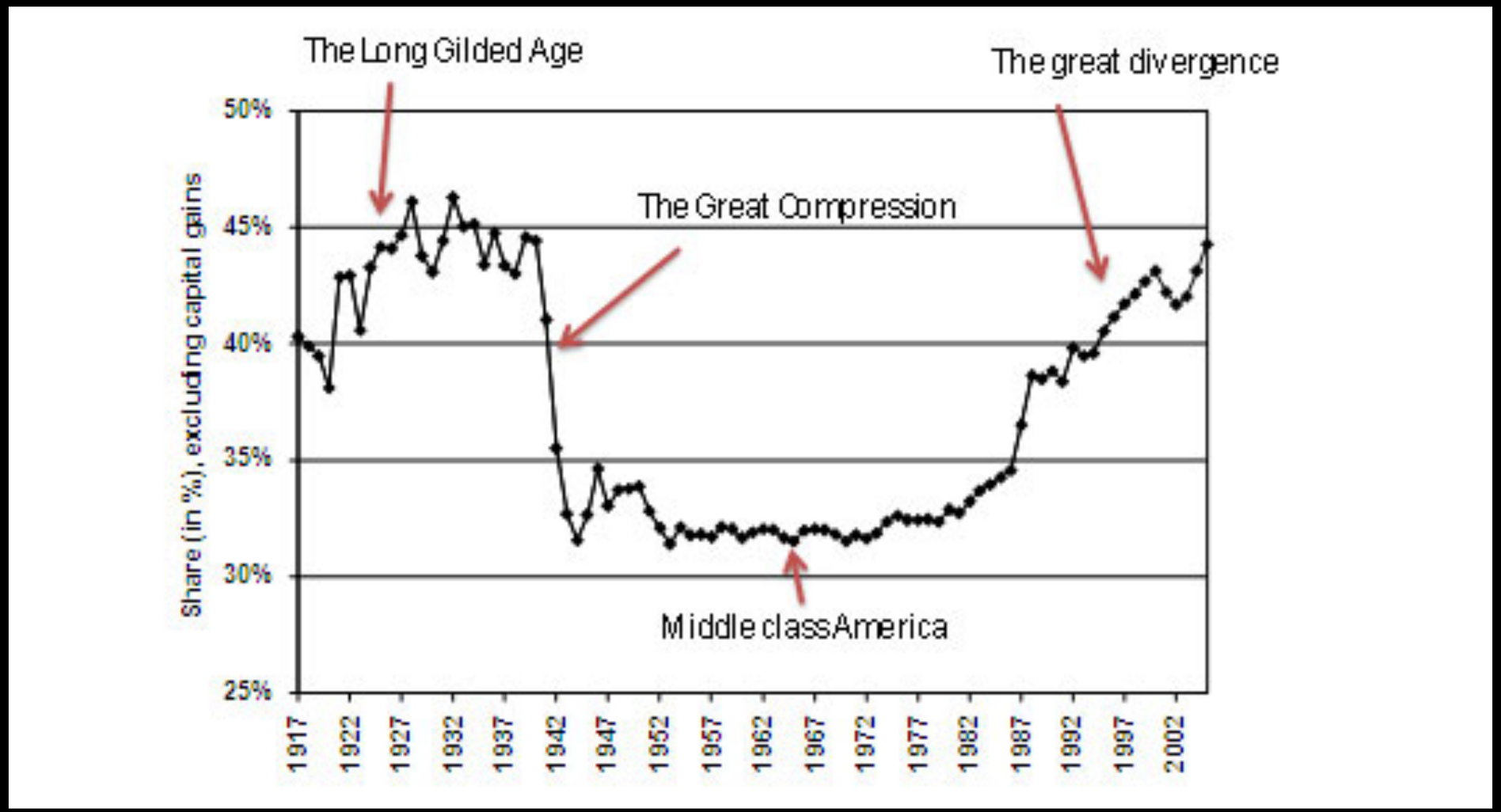
Graph by Erik Voeten, based on WVS 5

Our post-empirical era

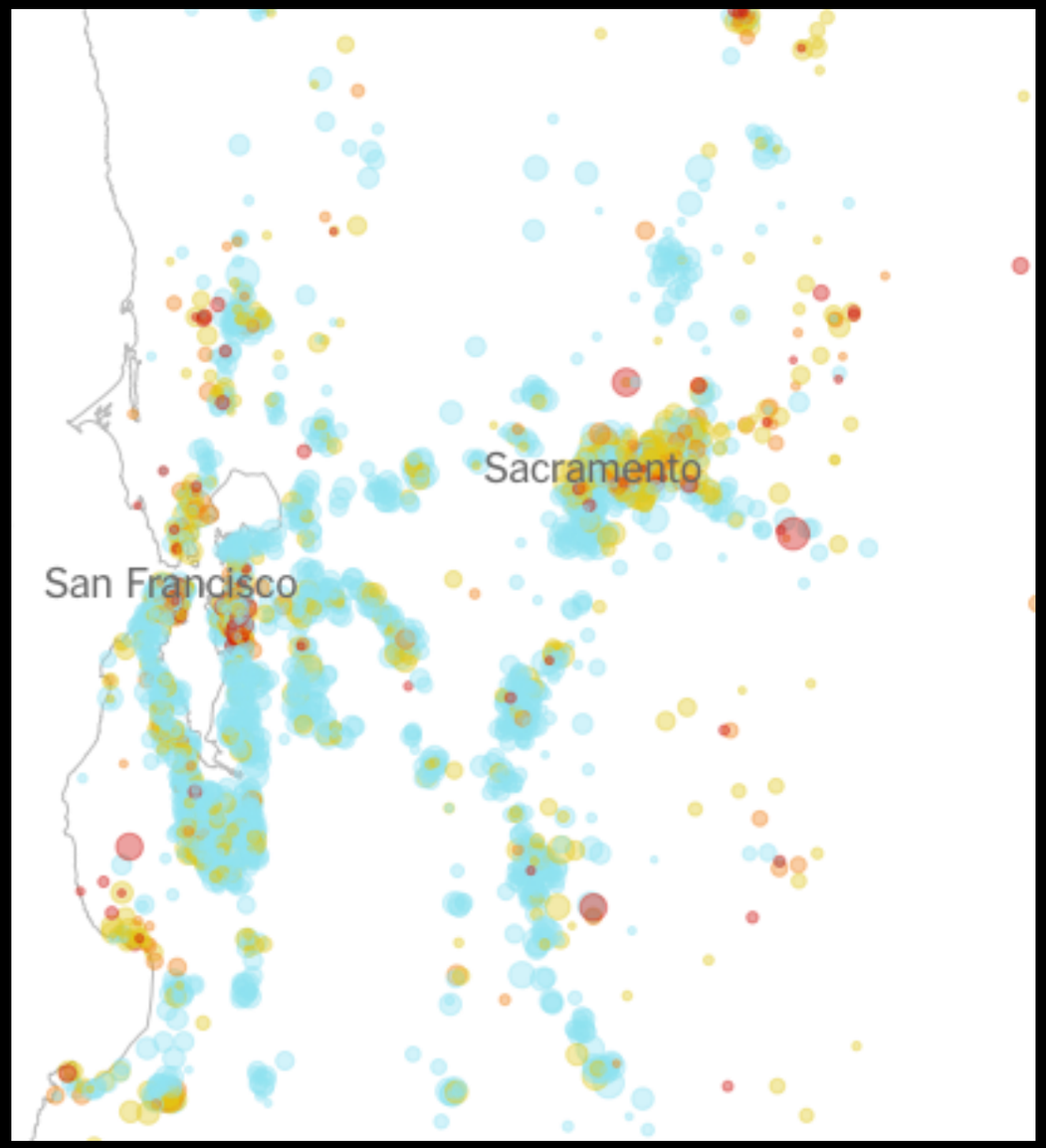
“It is difficult to get a man to understand something, when his salary depends on his not understanding it.”

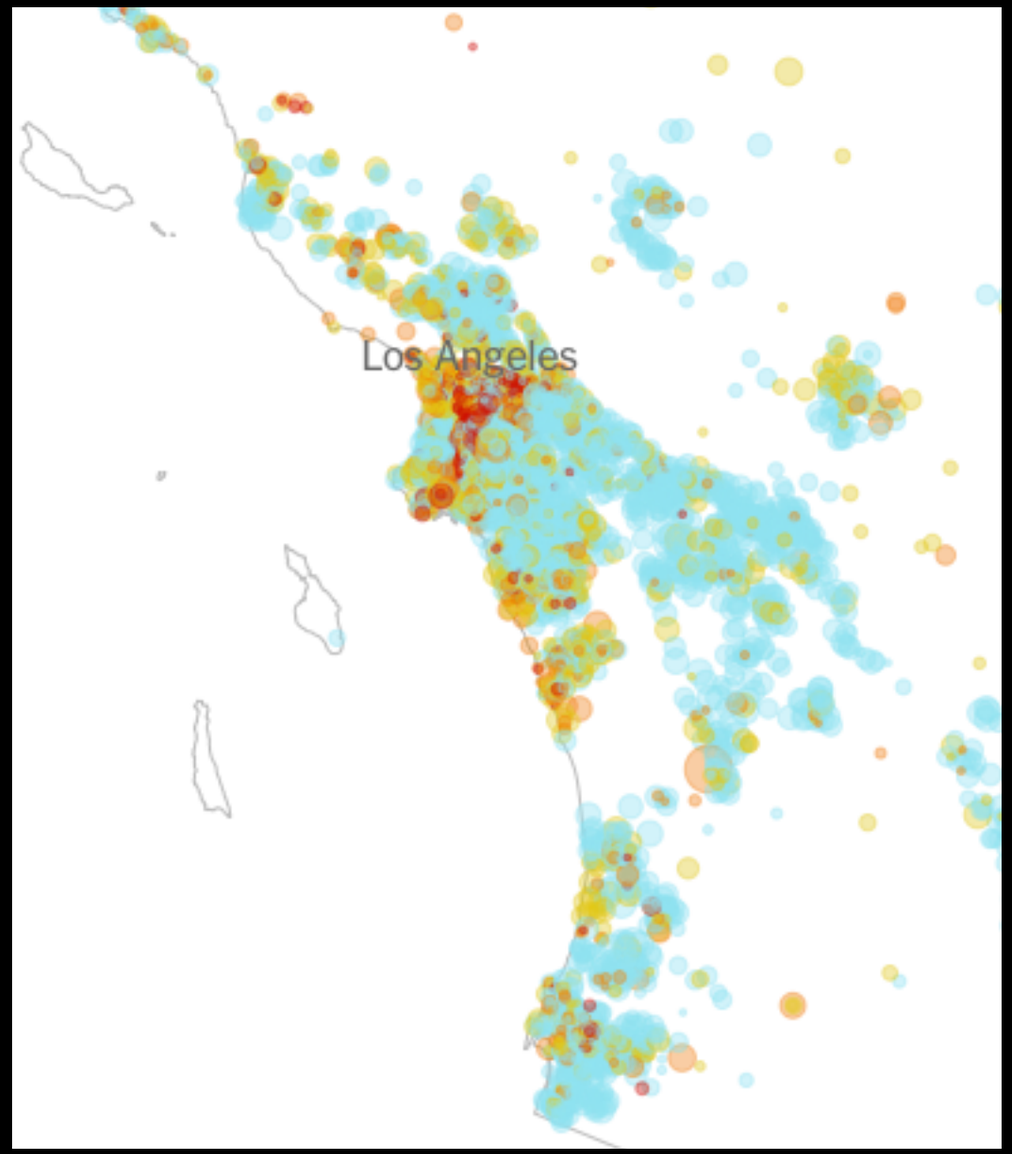
– Upton Sinclair

Evidence shmevidence

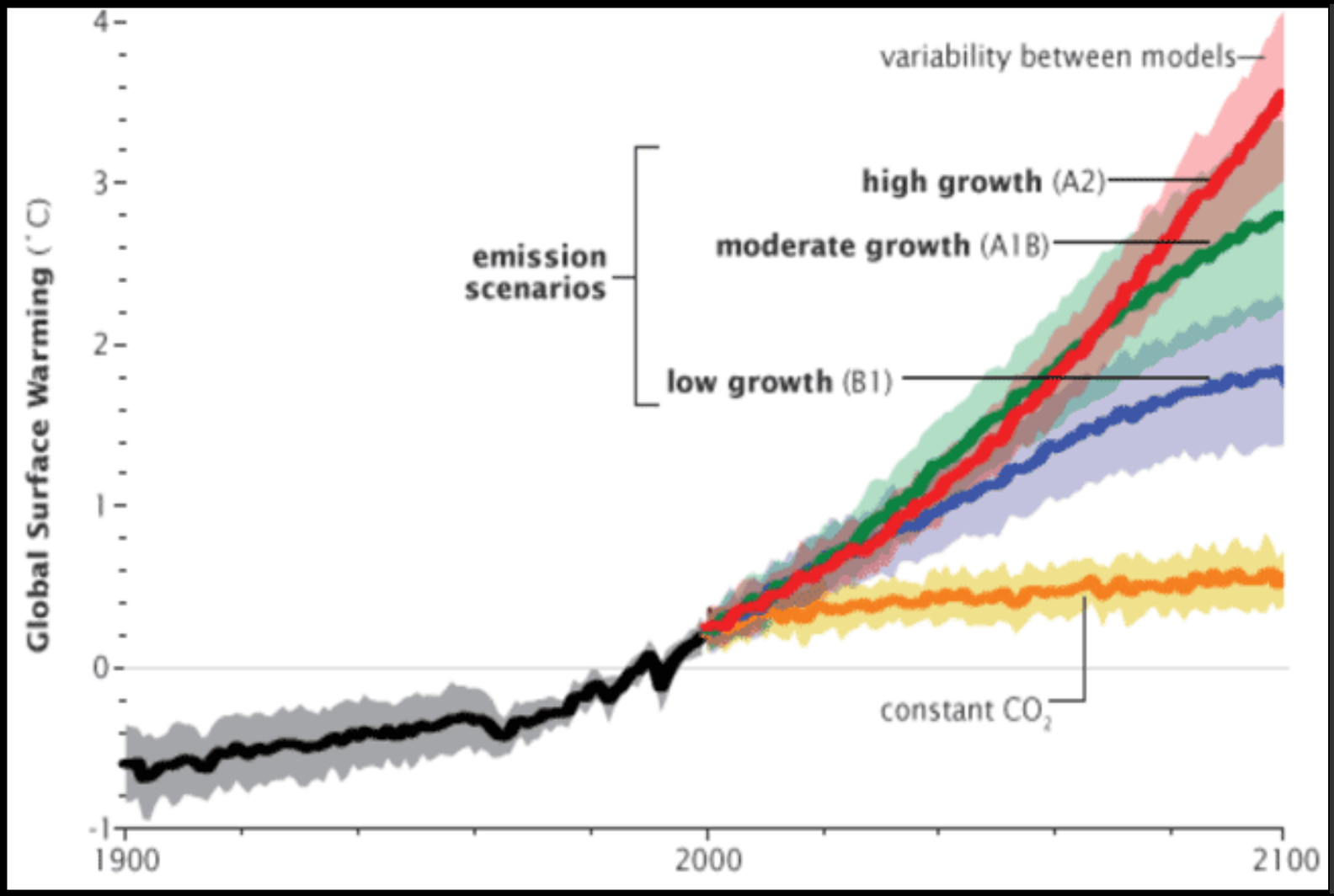


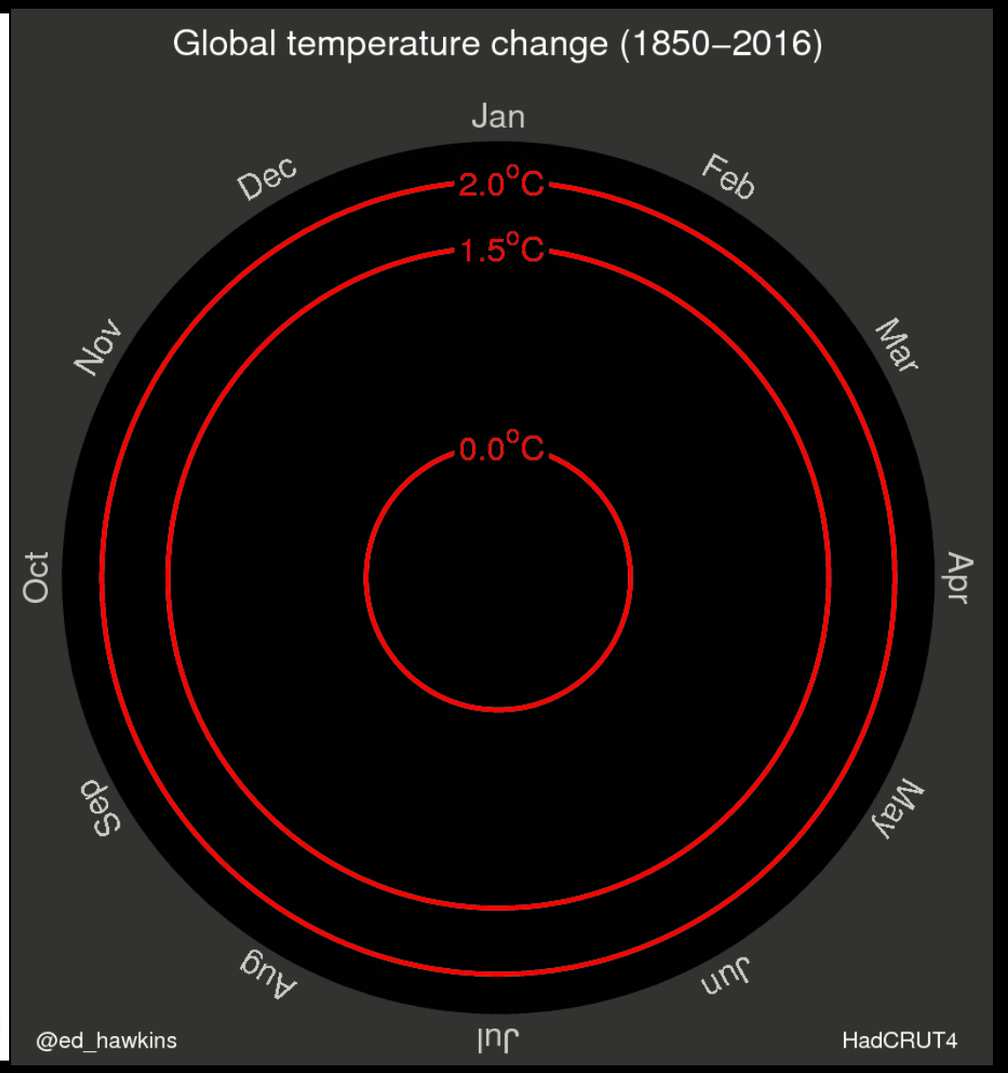
U.S. Income Inequality (cf. Thomas Piketty)





Measles (non)vaccination rates in CA





Climate change scenarios compared

Why bother?

.-- . / .- .-. . / - .... . / .-. ---

- ... .-- . / .- .-. . / - .... . / .-.

-... --- - ... .-- . / .- .-. . / - ..

.-. --- -... --- - ... .-- . / .- .-.

.... . / .-. --- -... --- - ... .-- .

. / - .... . / .-. --- -... --- - ...

.- .-. . / - .... . / .-. --- -... ---

.-- . / .- .-. . / - .... . / .-. ---

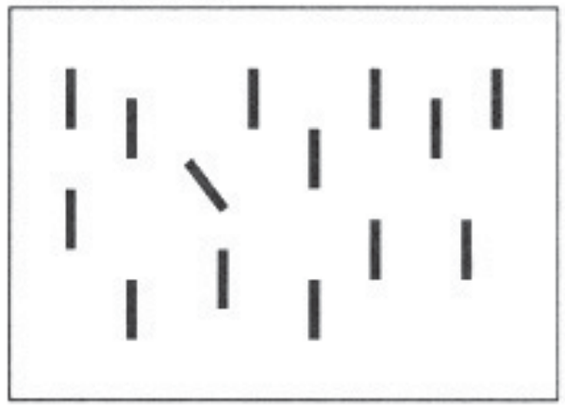
aural / sequential

7±2

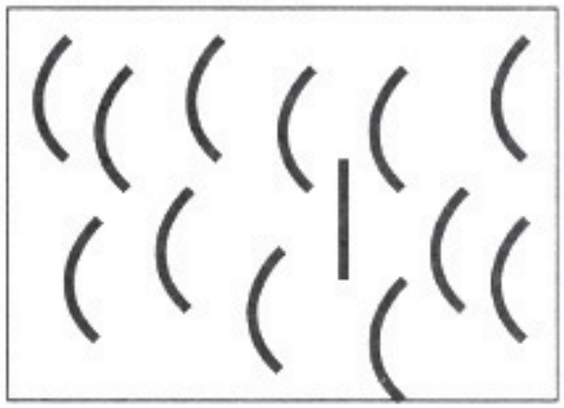
visual / spatial

all-at-once

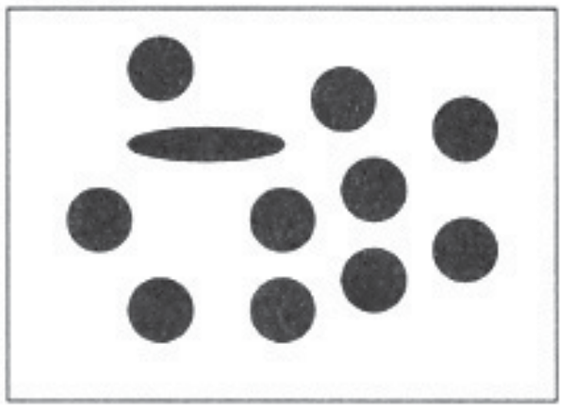
Orientation



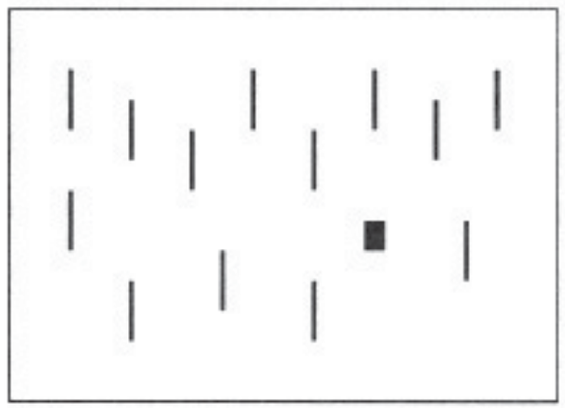
Curved/straight



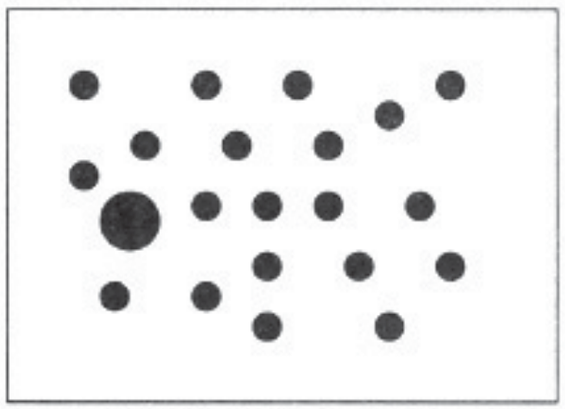
Shape



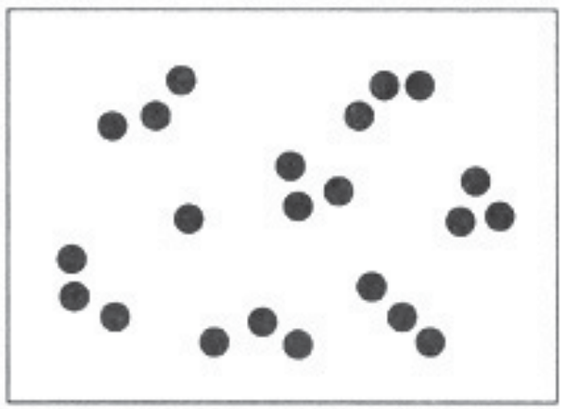
Shape



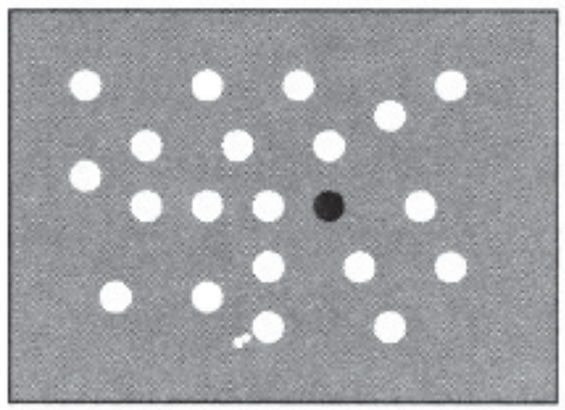
Size



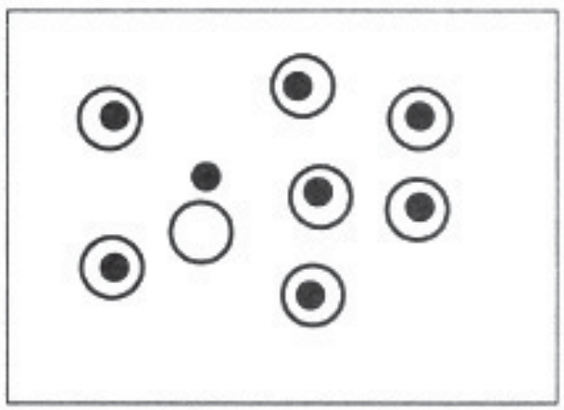
Number



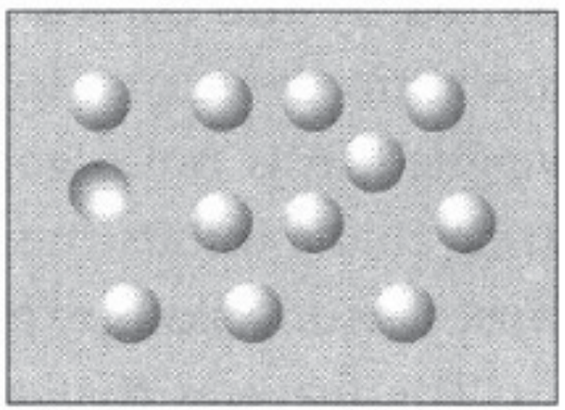
Gray/value



Enclosure



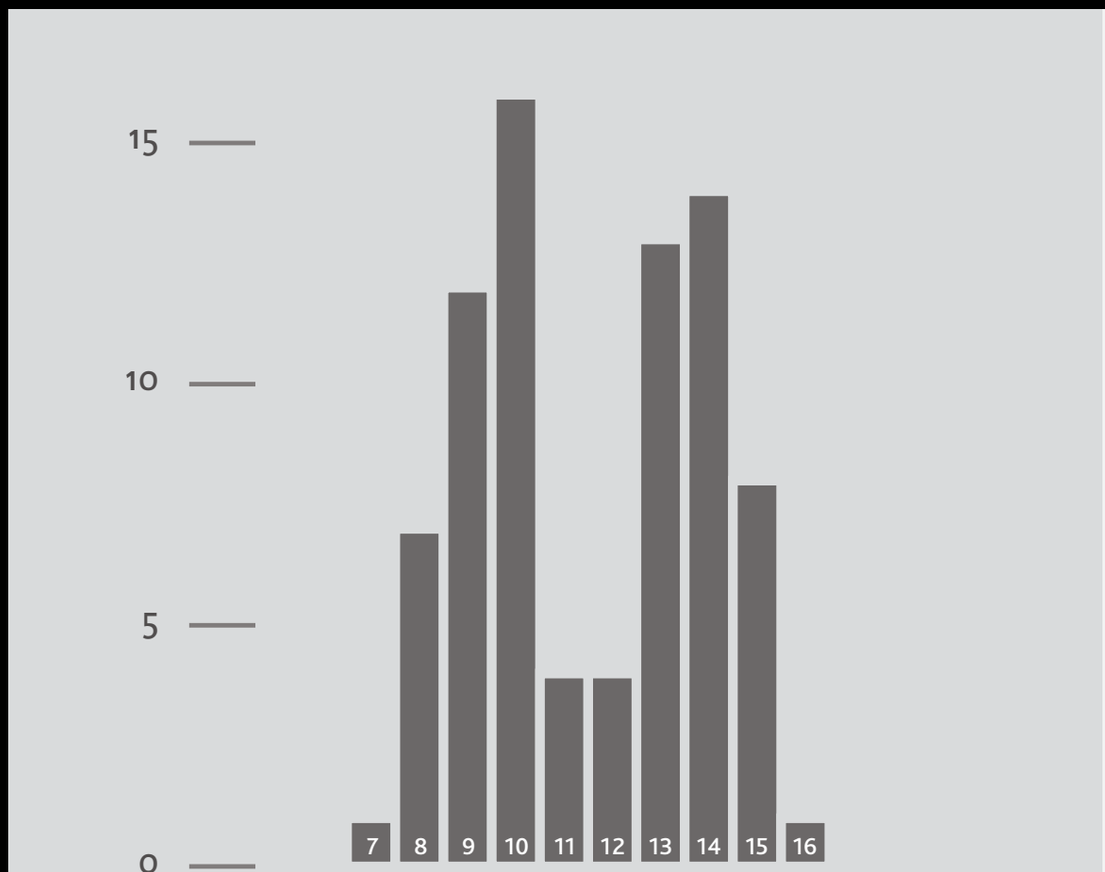
Convexity/concavity



Pre-attentive discrimination: instant & effortless

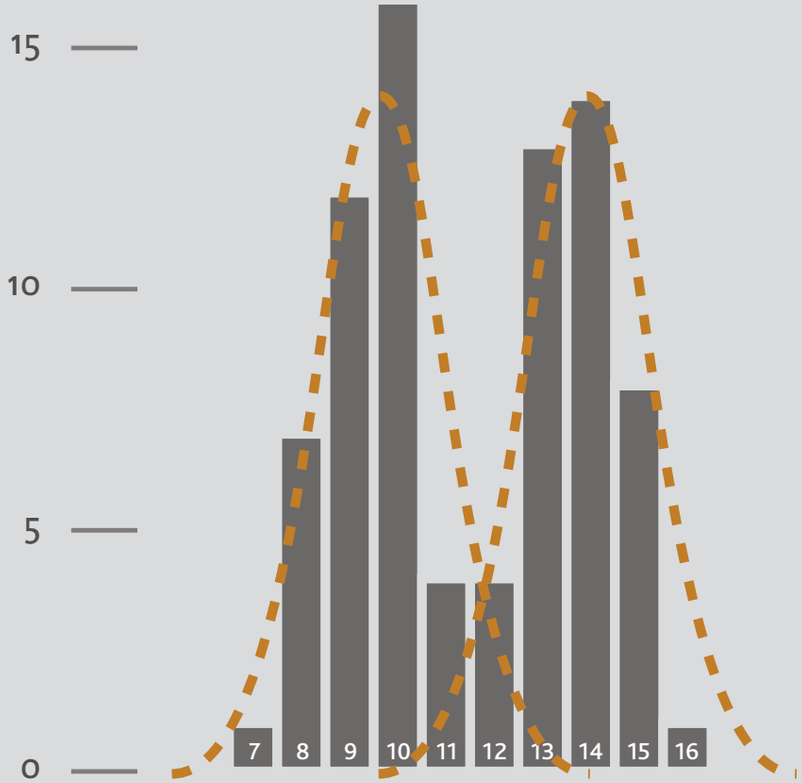
14, 8, 8, 13, 14, 12,
15, 13, 15, 15, 14, 13,
12, 11, 14, 8, 10, 14,
14, 13, 13, 10, 15, 13,
9, 10, 8, 12, 8, 9, 13,
9, 15, 10, 14, 14, 13,
9, 9, 10, 15, 11, 8, 9,
9, 14, 13, 15, 10, 10,
9, 10, 9, 13, 9, 13, 14,
10, 10, 14, 10, 12, 9,
10, 7, 11, 10, 15, 14,
11, 10, 9, 8, 14, 14,
10, 13, 10, 13, 16

From linear strings of ‘verbal’ information…



14, 8, 8, 13, 14, 12,
15, 13, 15, 15, 14, 13,
12, 11, 14, 8, 10, 14,
14, 13, 13, 10, 15, 13,
9, 10, 8, 12, 8, 9, 13,
9, 15, 10, 14, 14, 13,
9, 9, 10, 15, 11, 8, 9,
9, 14, 13, 15, 10, 10,
9, 10, 9, 13, 9, 13, 14,
10, 10, 14, 10, 12, 9,
10, 7, 11, 10, 15, 14,
11, 10, 9, 8, 14, 14,
10, 13, 10, 13, 16

…to a ‘parallelized’ spatial representation…

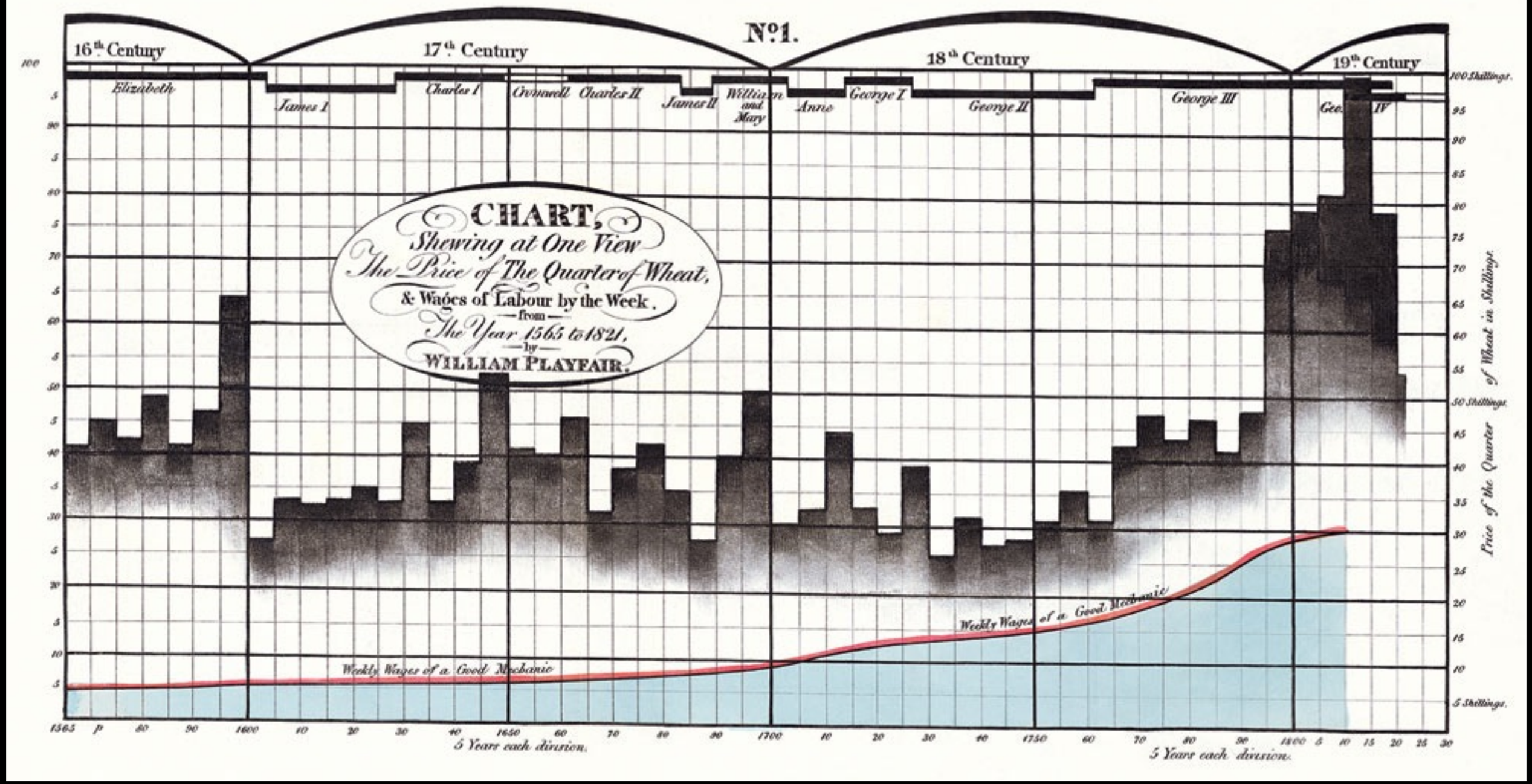


14, 8, 8, 13, 14, 12,
15, 13, 15, 15, 14, 13,
12, 11, 14, 8, 10, 14,
14, 13, 13, 10, 15, 13,
9, 10, 8, 12, 8, 9, 13,
9, 15, 10, 14, 14, 13,
9, 9, 10, 15, 11, 8, 9,
9, 14, 13, 15, 10, 10,
9, 10, 9, 13, 9, 13, 14,
10, 10, 14, 10, 12, 9,
10, 7, 11, 10, 15, 14,
11, 10, 9, 8, 14, 14,
10, 13, 10, 13, 16

…revealing the underlying pattern.

No silver bullet

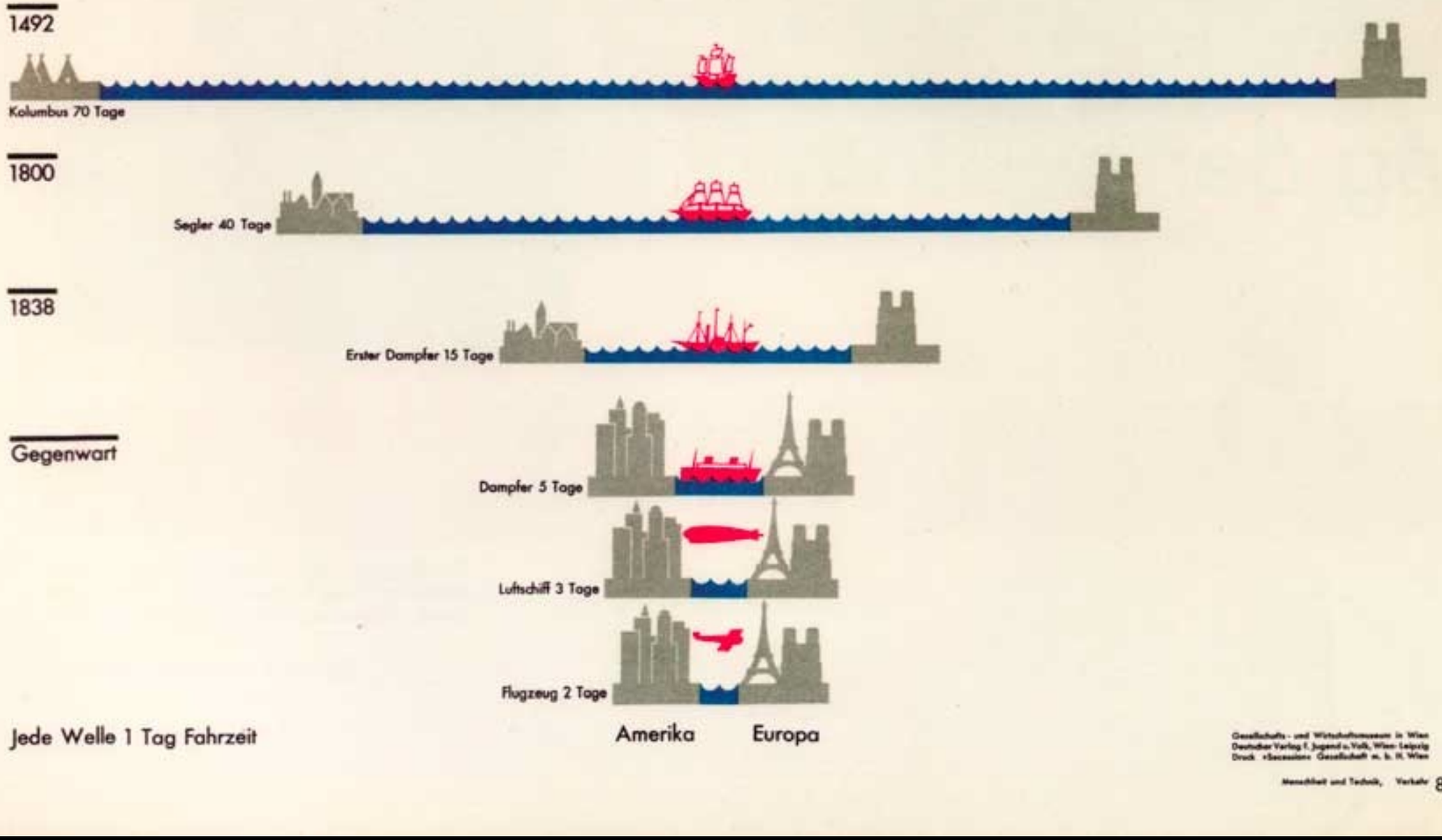
Info-utopianism
(enlightenment for the masses)



William Playfair on the affordability of wheat vs contemporary (c.1820) income increases

Otto Neurath / Isotype

Lines' (top) and 'The Trip to America' (bottom). From *Technology and Humanity* (1932).



ibid.

MAP OF THE

SQUARE AND STATIONARY EARTH.

BY PROF. ORLANDO FERGUSON,

HOT SPRINGS, SOUTH DAKOTA.

Four Hundred Passages in the Bible that Condemn the Globe Theory, or the Flying Earth, and None Sustain It.
This Map is the Bible Map of the World.

COPYRIGHT BY ORLANDO FERGUSON, 1893.

PROF. ORLANDO FERGUSON,
HOT SPRINGS, S. DAKOTA.

These men are flying on the globe at the rate of 65,000 miles per hour around the sun, and 1,042 miles per hour around the center of the earth (in their minds). Think of that speed!

SCRIPTURE THAT CONDEMNS THE GLOBE THEORY.

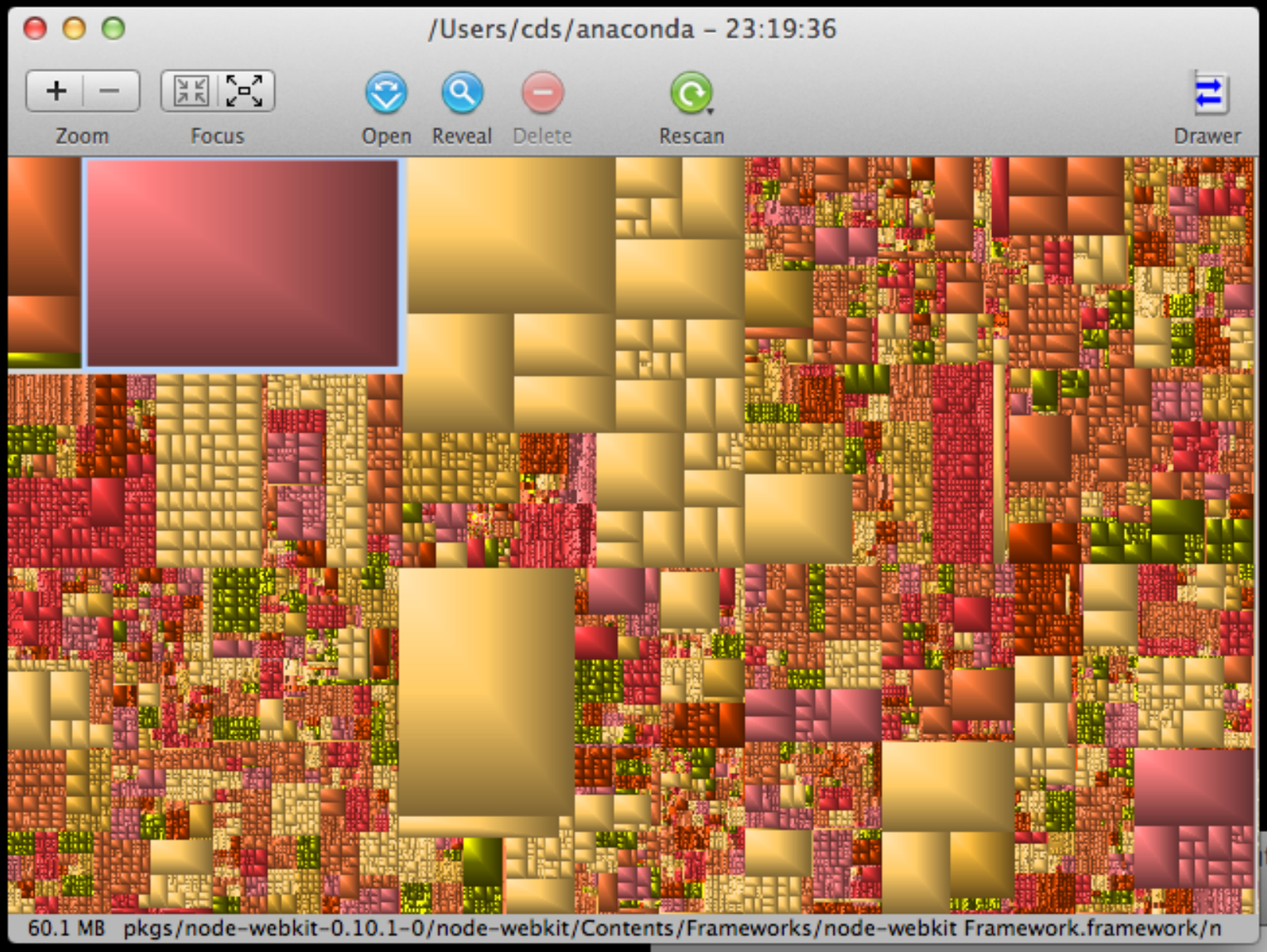
And his hands were steady until the going down of the sun.—Ex. 17: 12. And the sun stood still, and the moon stayed.—Joshua 10: 12–13. The world also shall be stable that it be not moved.—Chron. 16: 30. To him that stretched out the earth, and made great lights (not worlds).—Ps. 136: 6–7. The sun shall be darkened in his going forth.—Isaiah 12: 10. The four corners of the earth.—Isaiah 11: 12. The whole earth is at rest.—Isaiah 14: 7. The prophecy concerning the globe theory.—Isaiah: 29th chapter. Woe to the rebellious children, sayeth the Lord, that take counsel, but not of me.—Isaiah 30: 1. So the sun returned ten degrees.—Isaiah 38: 8–9. It is he that sitteth upon the circle of the earth.—Isaiah 40: 22. He that spread forth the earth.—Isaiah 52: 5. That spreadeth abroad the earth by myself.—Isaiah 54: 24. My hand also hath laid the foundation of the earth.—Isaiah 58: 13. Thus sayeth the Lord, which giveth the sun for a light by day, and the moon and stars for a light by night (not worlds).—Jer. 31: 35–36. The sun shall be turned into darkness, and the moon into blood.—Acts 2: 20.

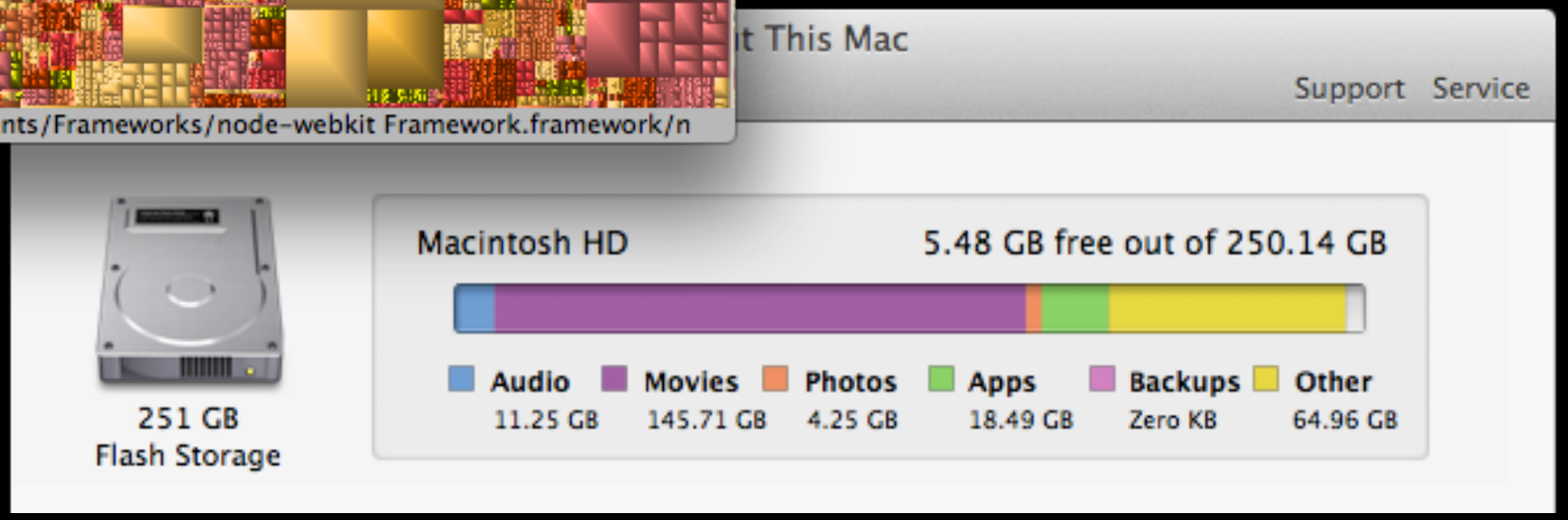
Send 25 Cents to the Author, Prof. Orlando Ferguson, for a book explaining this Square and Stationary Earth. It Knocks the Globe Theory Clean Out. It will Teach You How to Foretell Eclipses. It is Worth Its Weight in Gold.

Orlando Ferguson's cosmology

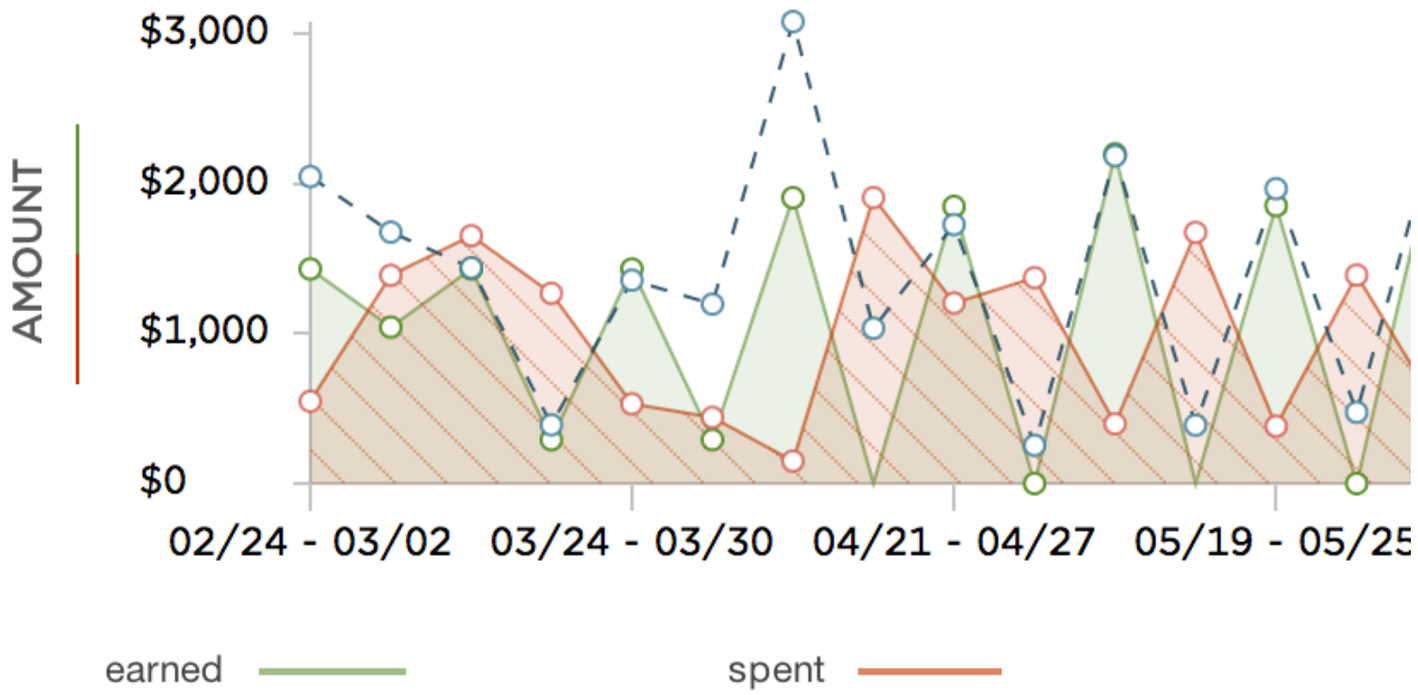
Info-pragmatism
(in three varieties)

Visualization as user interface





Treemaps & thermometers for managing the finite



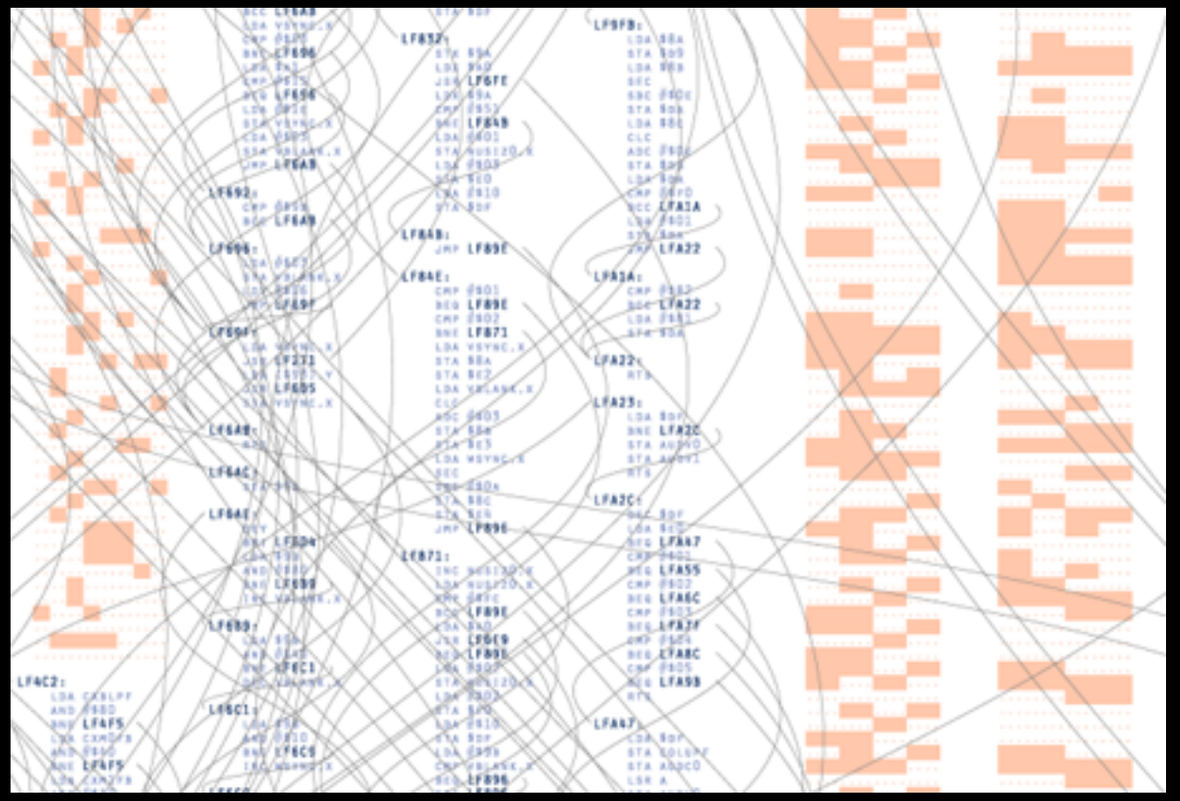
CATEGORY		WEEKLY
Income	100%	1,101.16
Home	31%	340.50
Food & Drink	14%	152.91
Financial	11%	126.95
Transportation	11%	119.33
Utilities	9%	101.70
Travel	7%	75.07
Education	5%	56.49

Cashflows for budgeting

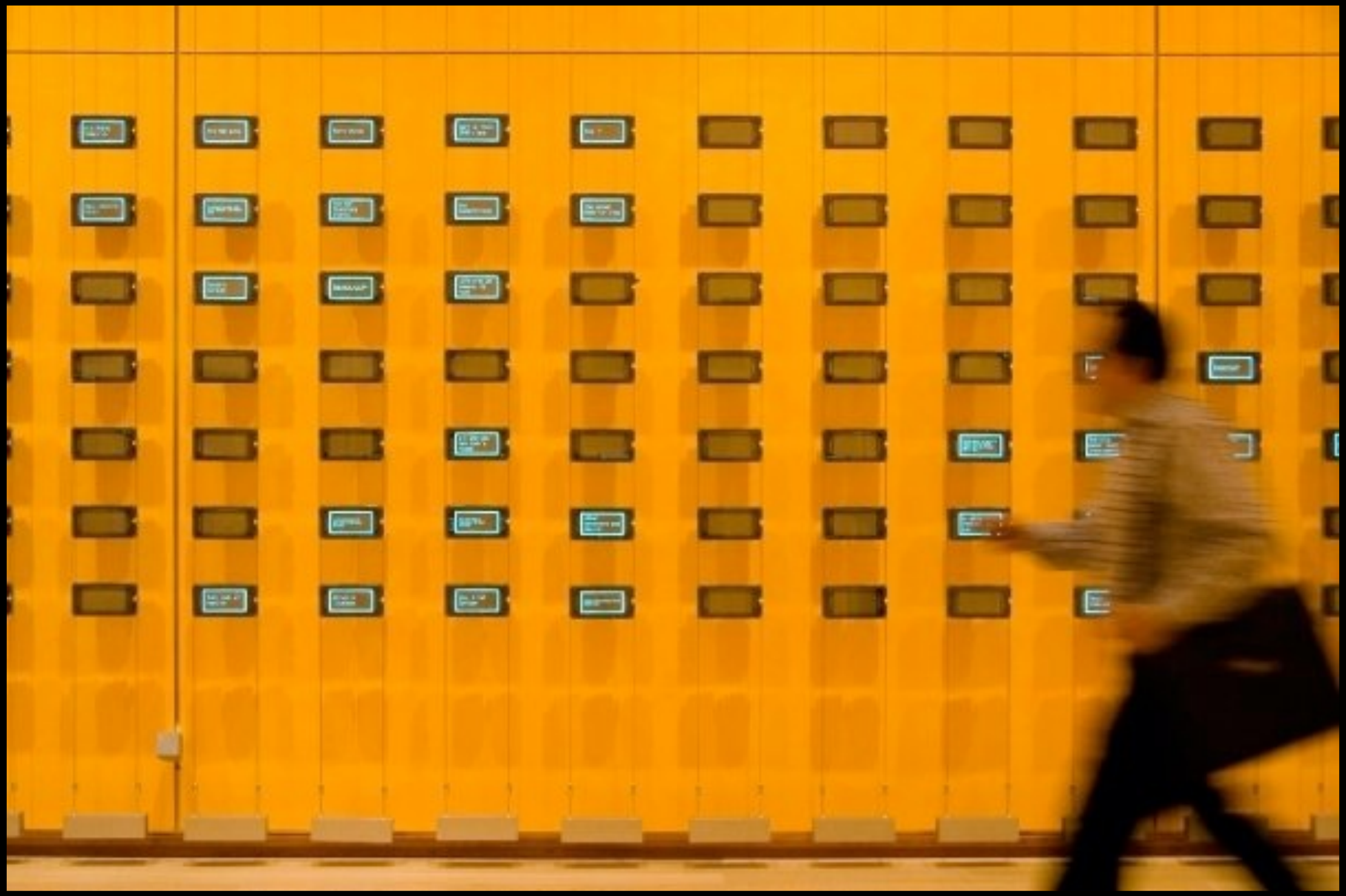
Visualization as art

Berlin Holocaust Memorial

Vietnam War Memorial



ROM image of ‘Adventure’ for the Atari 2600 by Ben Fry



‘Moveable Type’ by Ben Rubin & Mark Hansen

We've been hot then cold, hot then cold.
They say, 'Give up. It's too hard.'
We were lucky she didn't need a mortgage.
They know the area, and they have pride in New York.
We haven't heard from him in years.
They don't care about people.

‘Top Grossing Film of All Time’ by Jason Salavon

113 Homes for Sale, Miami-Dade County
$120,000-$220,000
Fall, 2001

114 Homes for Sale, Dallas/Ft. Worth Metroplex
$100,000-$220,000
Summer, 2001

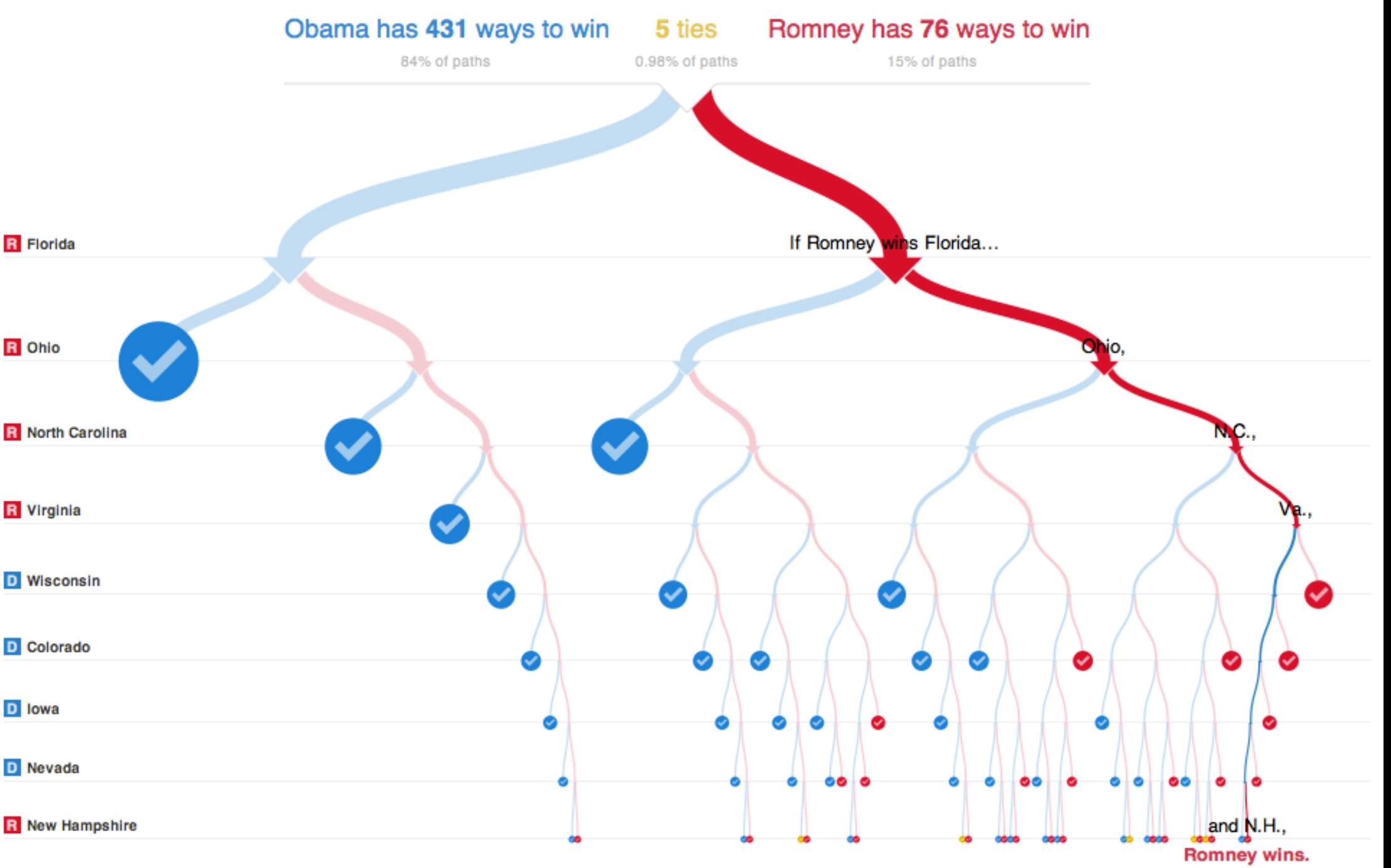
121 Homes for Sale, LA/Orange County
$200,000-$320,000
Fall, 2000

134 Homes for Sale, The 5 Boroughs
$200,000-$320,000
Winter, 2001

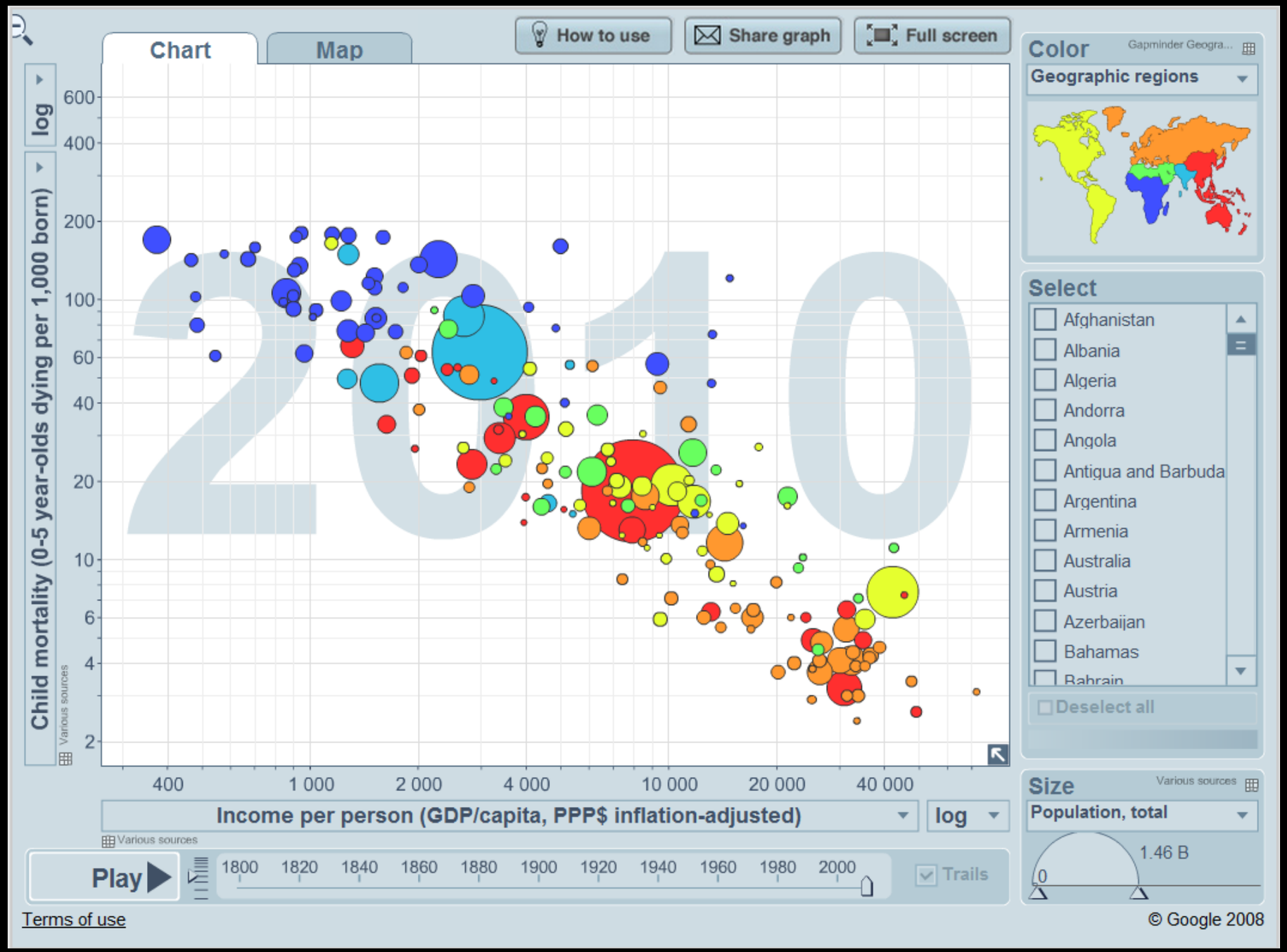
‘Homes for Sale’ by Jason Salavon

Visualization as an intuition enabler

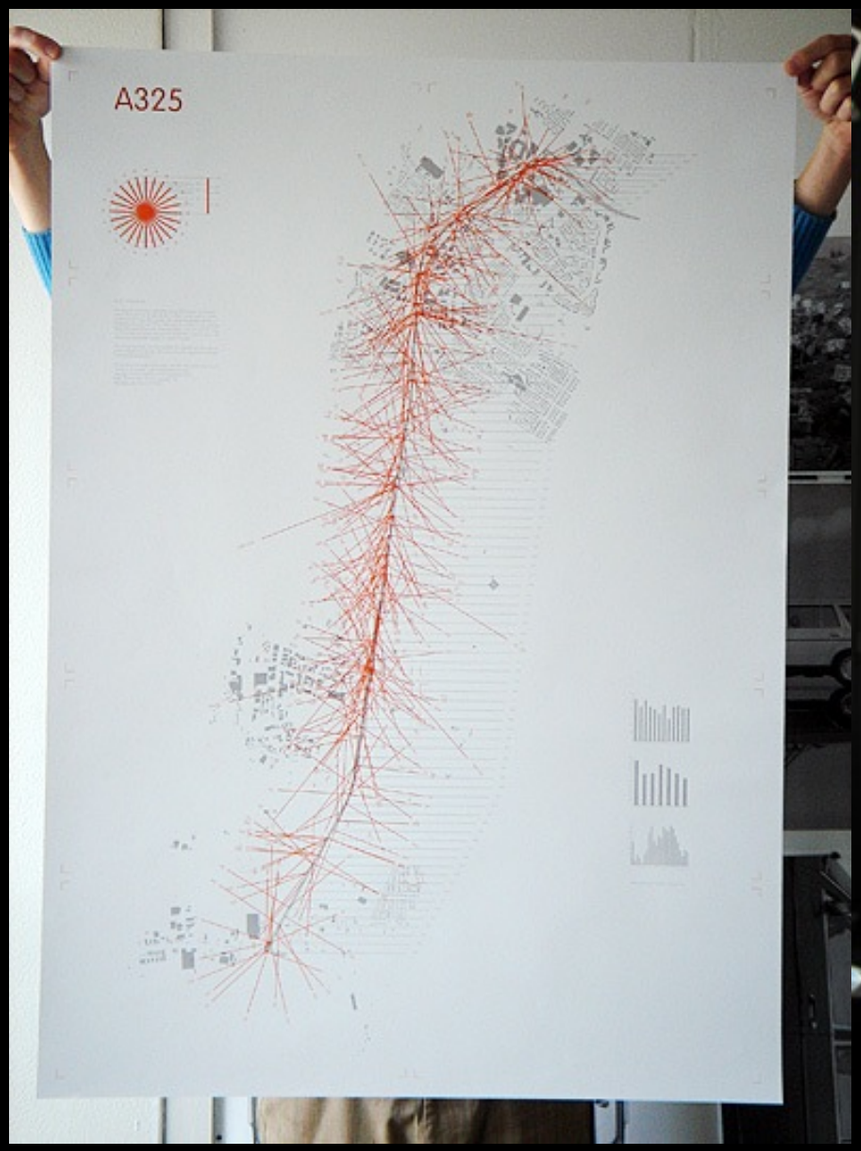
Fla.		Ohio		N.C.		Va.		Wis.		Colo.		Iowa		Nev.		N.H.	
Dem	Rep	Dem	Rep	Dem	Rep	Dem	Rep	Dem	Rep	Dem	Rep	Dem	Rep	Dem	Rep	Dem	Rep
50%	49%	50%	48%	48%	51%	51%	48%	53%	46%	51%	47%	52%	46%	52%	46%	52%	46%

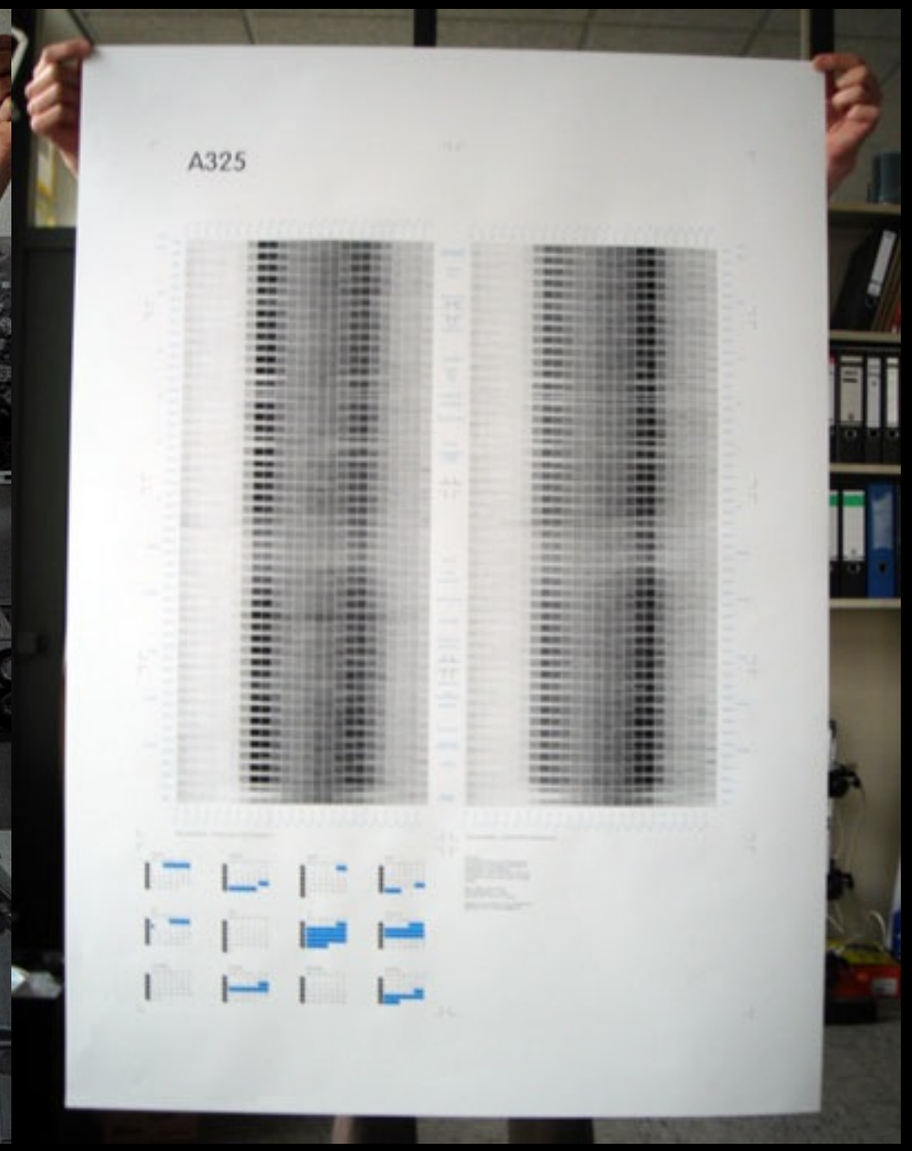


N.Y. Times

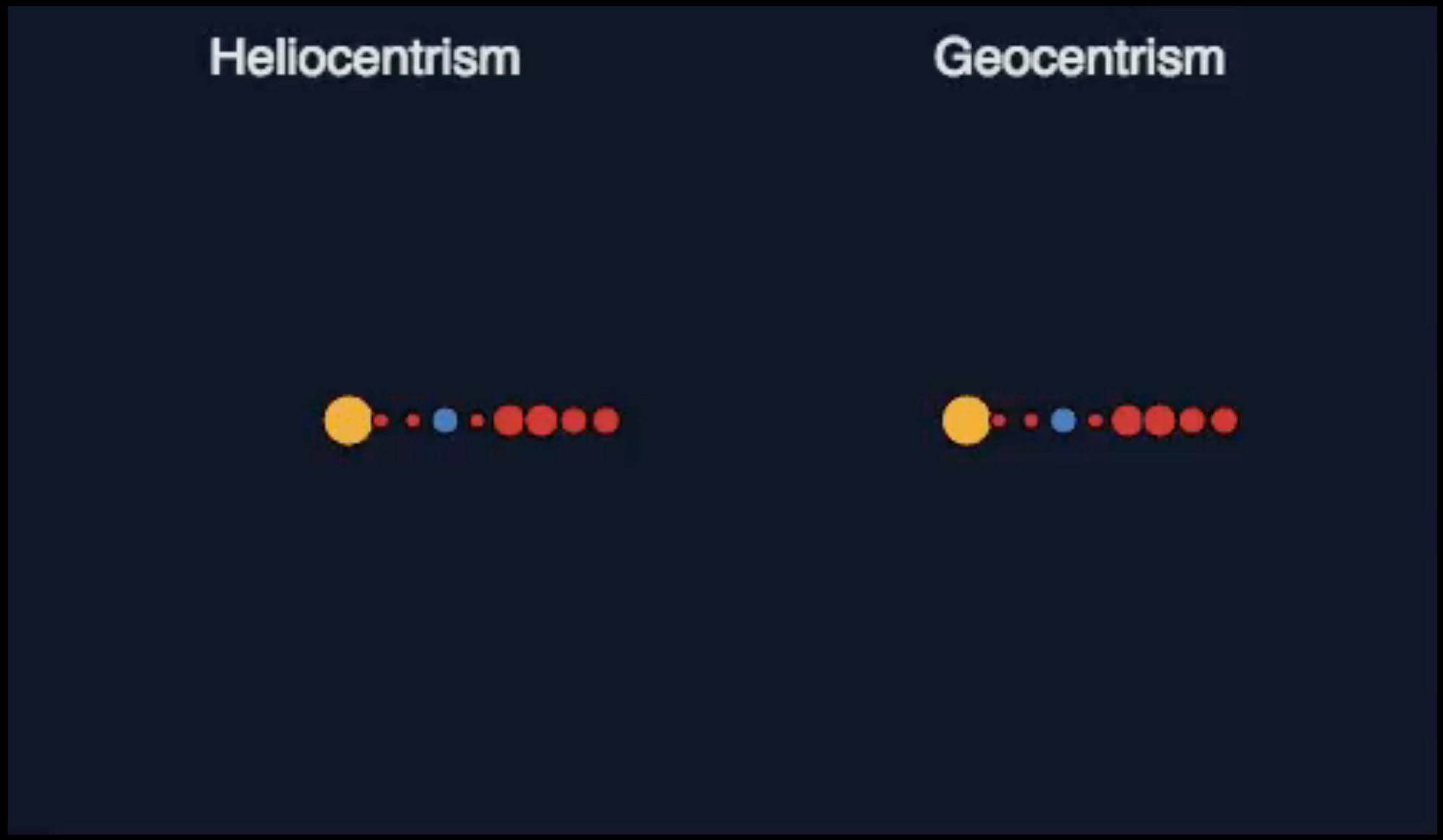


Gapminder (Neurath's revenge)





A325 highway data from Catalogtree

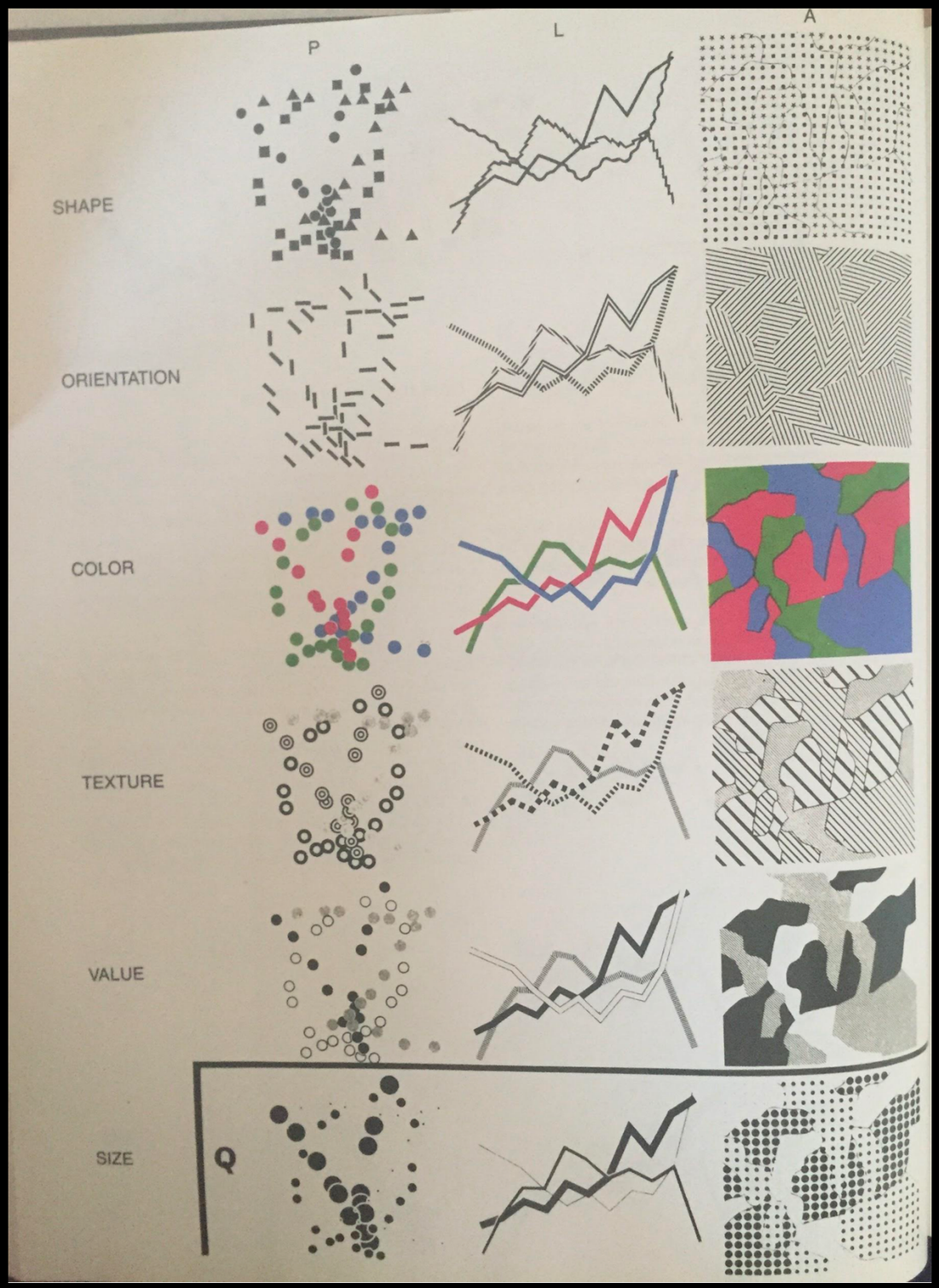


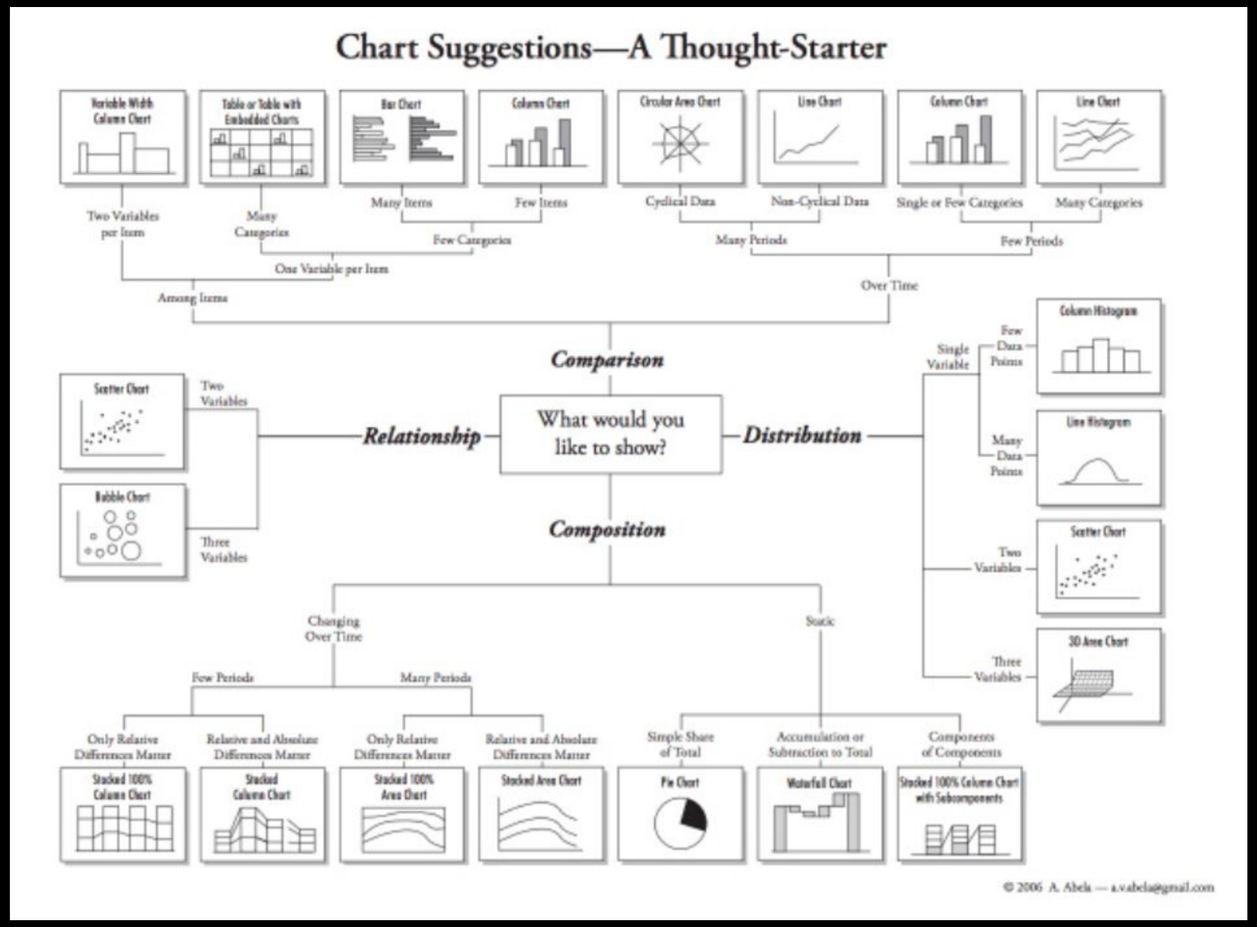
Occam’s Razor in action

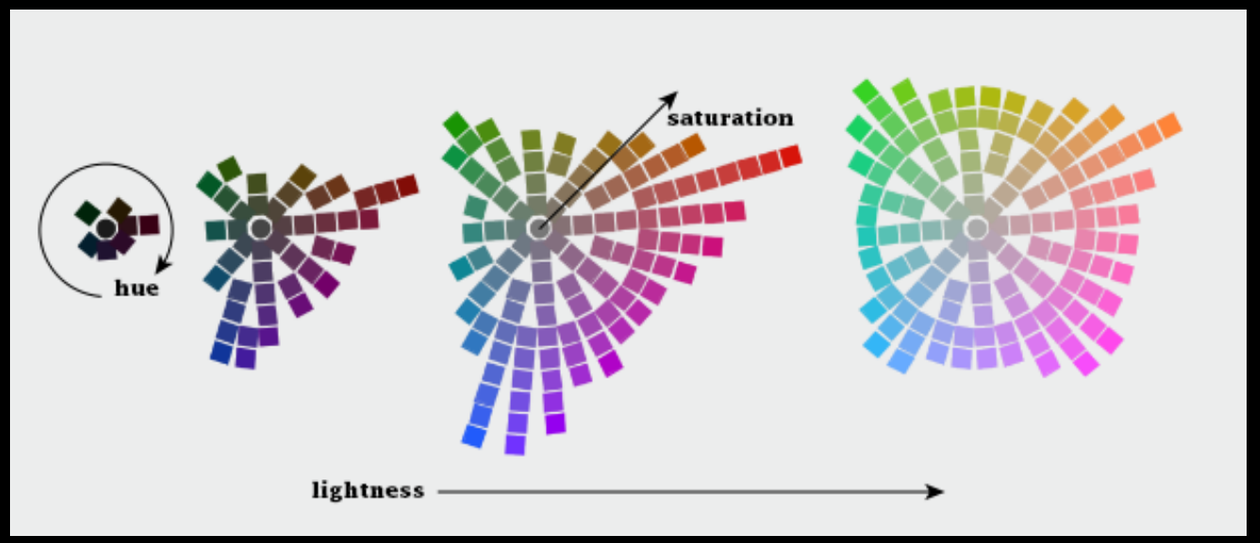
</sermon>

What we'll be doing

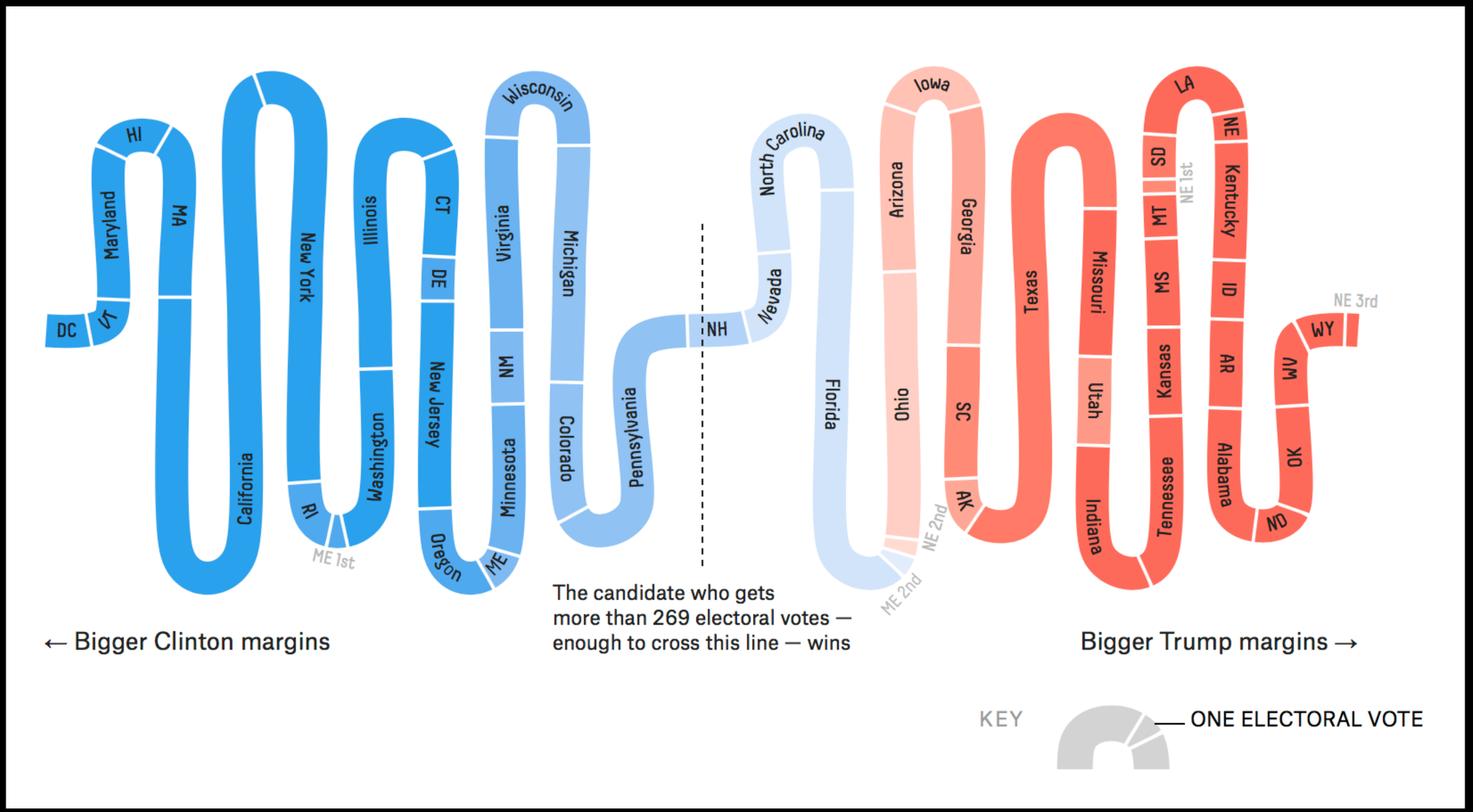
Learning about theory & process







Critiquing the work of other, both good…



…and less so

OBAMACARE ENROLLMENT
7,066,000
6,000,000
AS OF
MARCH 27
MARCH 31
GOAL
SOURCE: HHS
FOX NEWS channel
mediamatters.org
E IN SECOND PLACE WITH $26.5 MIL, WHILE "MUPP
DOW FUT 16,325.00

Processing data with spreadsheets…

Nuclear tests 1945–2013

SIGN IN

File Edit View Insert Format Data Tools Add-ons Help

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100% View only

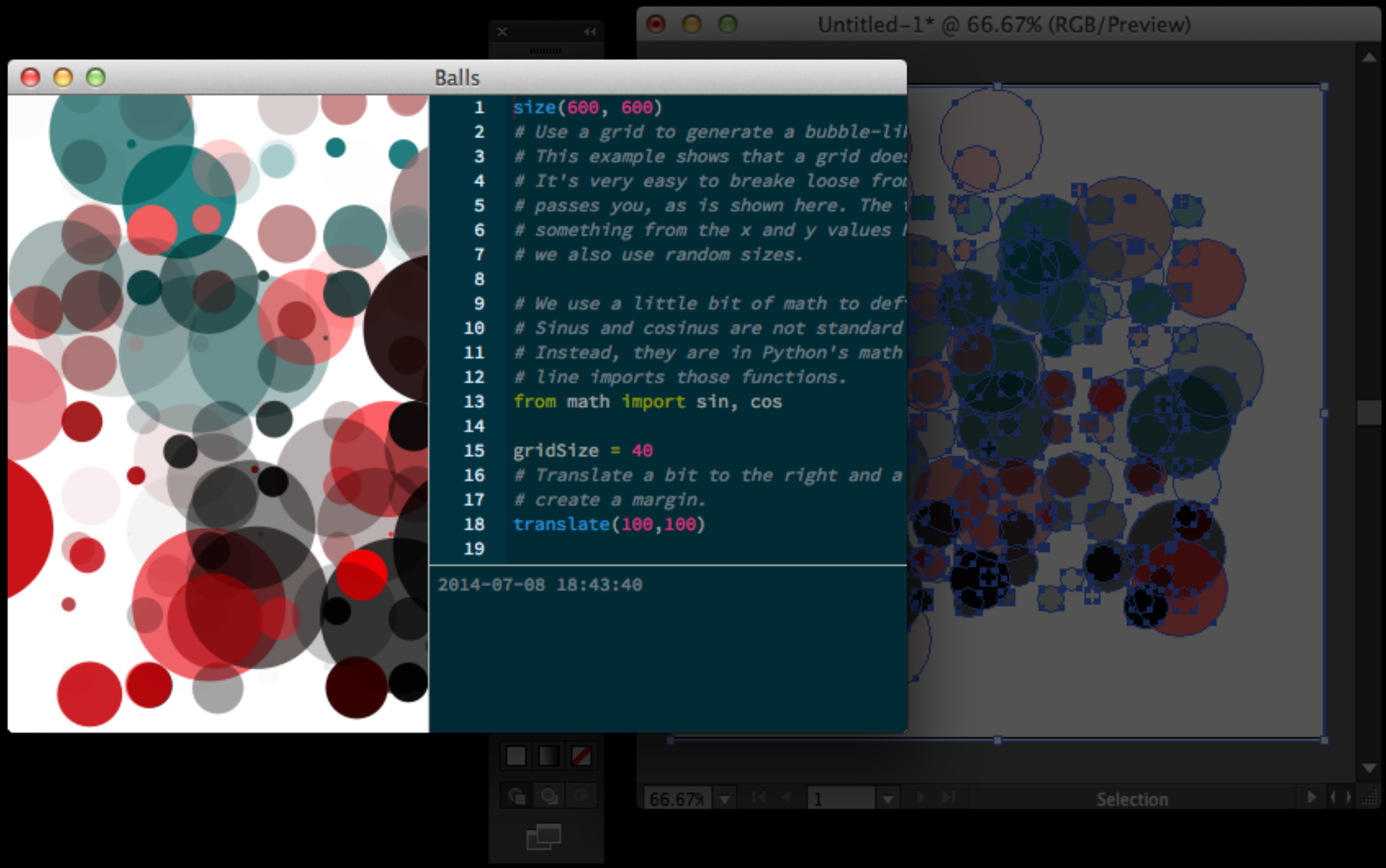
Year

	A	B	C	D	E	F	G	H	I
1	Year	United States	Russia	United Kingdom	France	China	India	Pakistan	North Kor
33	1976	20	21	1	5	4	0		
34	1977	20	24	0	9	1	0		
35	1978	19	31	2	11	3	0		
36	1979	15	31	1	10	1	0		
37	1980	14	24	3	12	1	0		
38	1981	16	21	1	12	0	0		
39	1982	18	19	1	10	1	0		
40	1983	18	25	1	9	2	0		
41	1984	18	27	2	8	2	0		
42	1985	17	10	1	8	0	0		
43	1986	14	0	1	8	0	0		
44	1987	14	23	1	8	1	0		
45	1988	15	16	0	8	1	0		
46	1989	11	7	1	9	0	0		
47	1990	8	1	1	6	2	0		
48	1991	7	0	1	6	0	0		
49	1992	6	0	0	0	2	0		
50	1993	0	0	0	0	1	0		
51	1994	0	0	0	0	2	0		
52	1995	0	0	0	5	2	0		
53	1996	0	0	0	1	2	0		
54	1997	0	0	0	0	0	0		
55	1998	0	0	0	0	0	2	2	

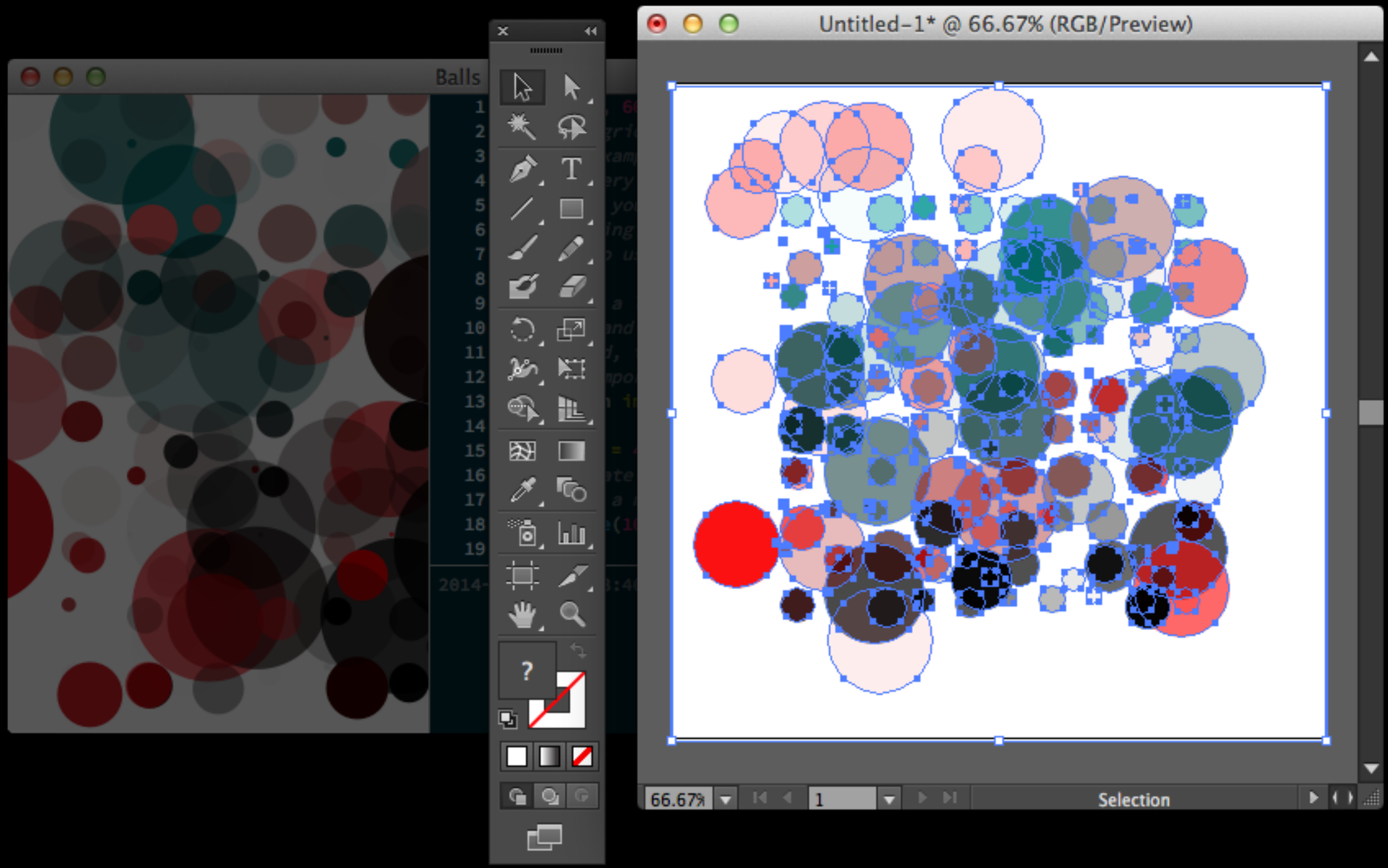
…or even procedurally

```
1  def convert(lat, lon, width=400, height=200):
2      """Convert from lat/lon to x/y coordinates using a mercator projection
3      adapted from: http://stackoverflow.com/questions/14329691/covert-latitude-lo
4      from math import log, tan
5      latRad = float(lat)*pi/180
6      mercN = log(tan((pi/4)+(latRad/2)))
7      y = (height/2)-(width*mercN/(2*pi))
8      x = (float(lon)+180)*(width/360)
9      return x,y
10
11 rows = read('names-and-places.csv', cols=True)
12 layout(align=CENTER)
13 font('Avenir', 4)
14
15 for row in rows:
16     # translate lat/lon strings into floating-point numbers
17     lat = float(row.lat)
18     lon = float(row.lon)
19
20     # convert from lat/lon to x/y
21     x,y = convert(lat, lon, WIDTH, HEIGHT)
22
```

Generating visuals with code…

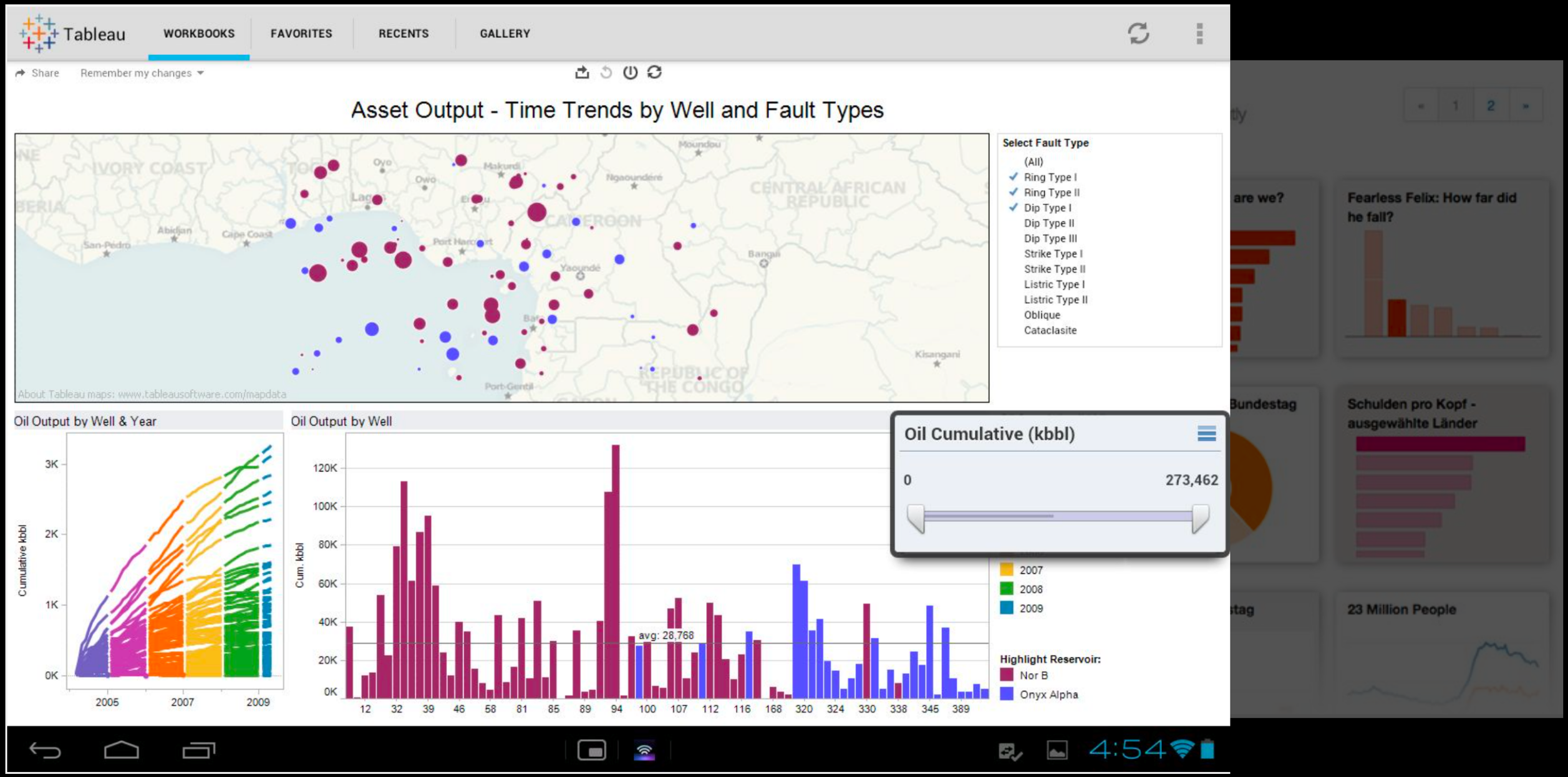


…and fine-tuning them in Illustrator



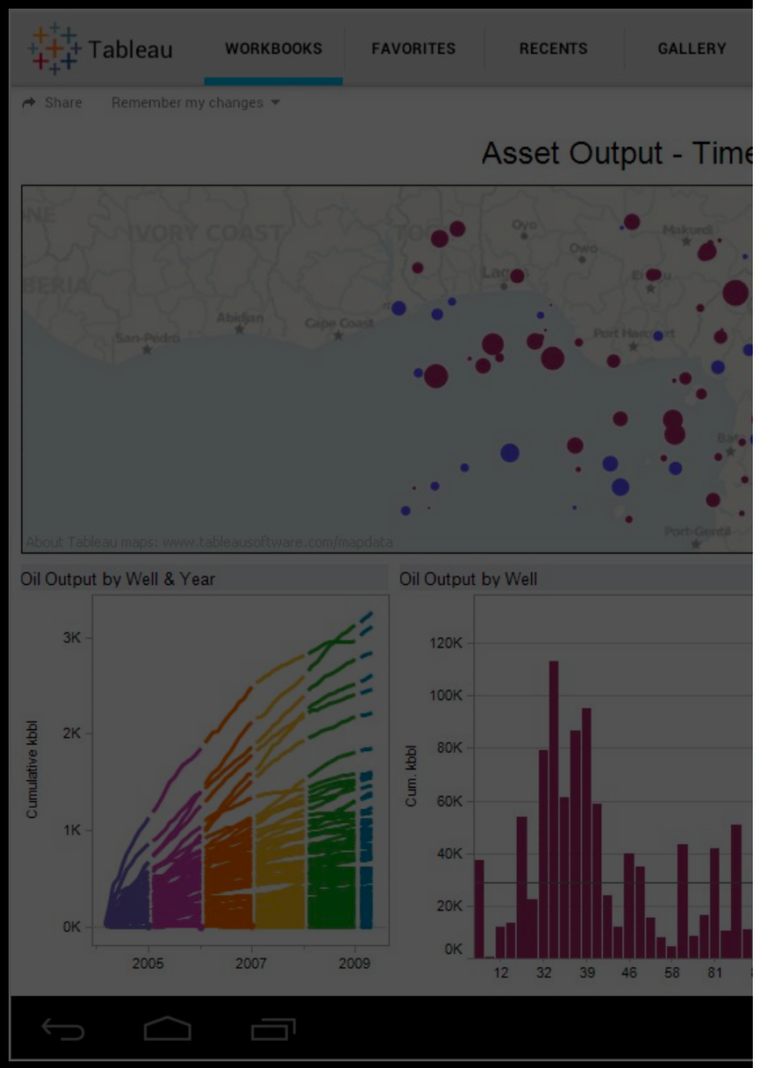
What won’t we be doing?

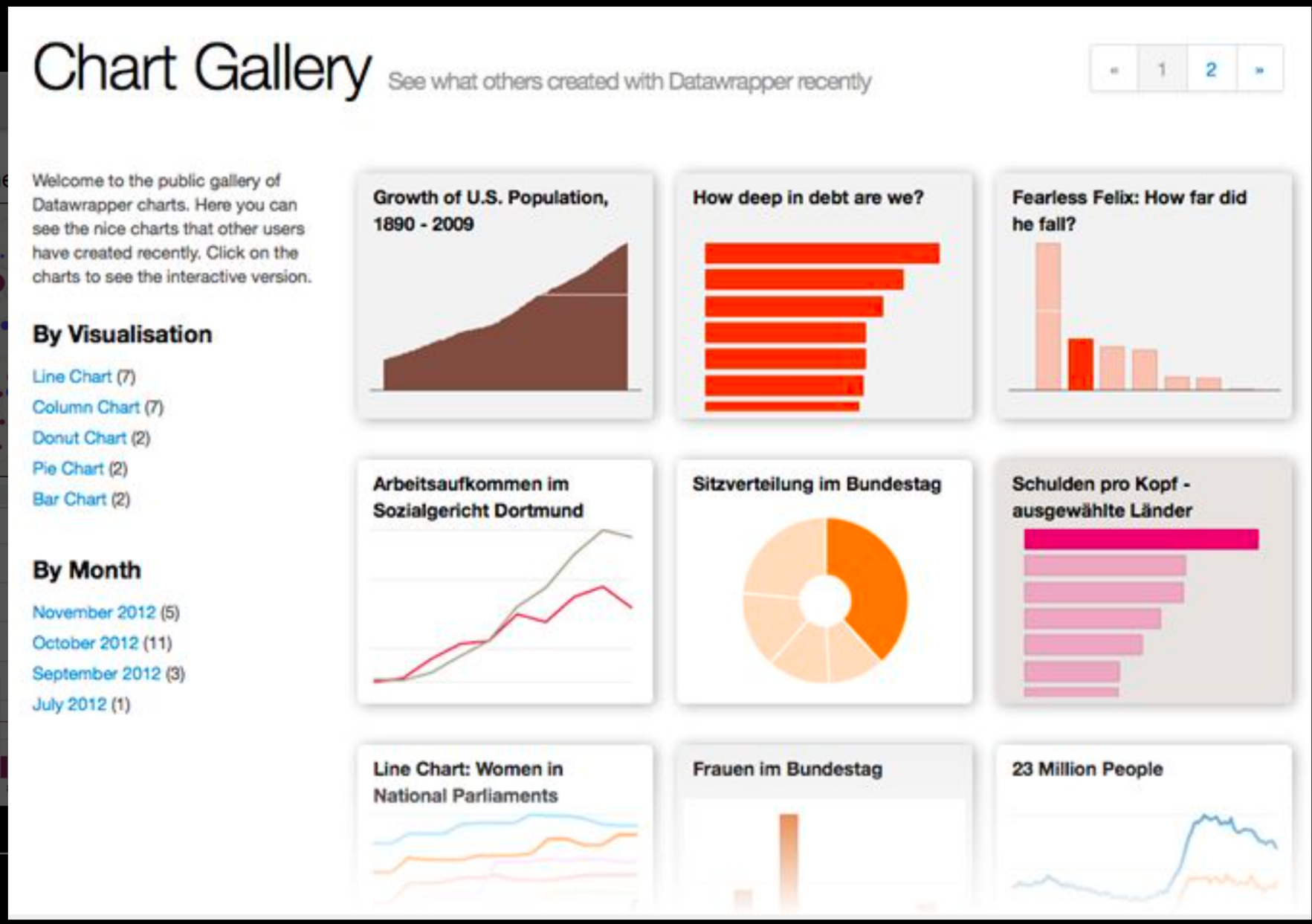
Doing shopping-oriented design



TABLEAU

Doing shopping-oriented design

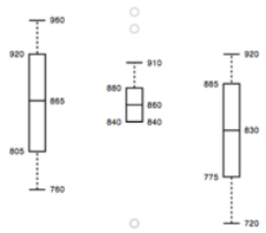




DATAWRAPPER

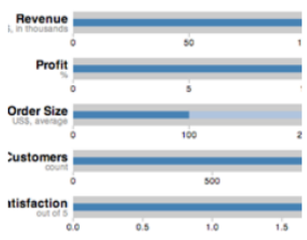
Using D3 or prioritizing interaction

Box Plots

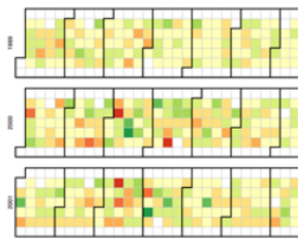


Bubble Chart

Bullet Charts



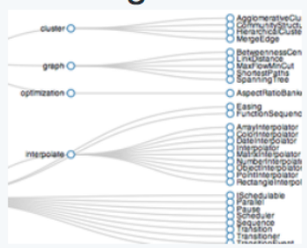
Calendar View



Non-contiguous Cartogram

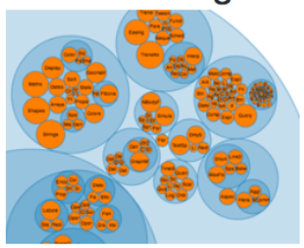
Chord Diagram

Dendrogram

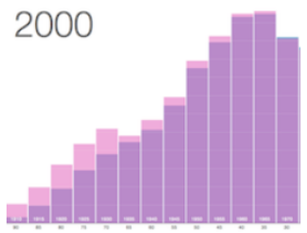


Force-Directed Graph

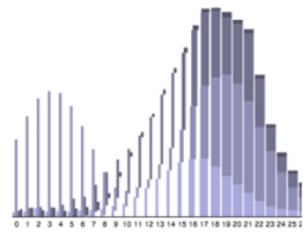
Circle Packing



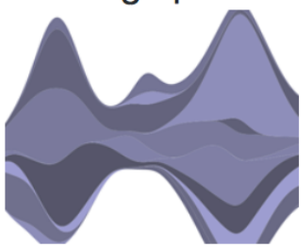
Population Pyramid



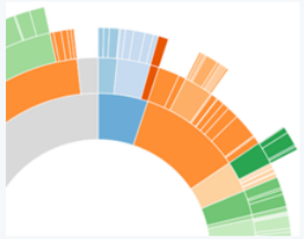
Stacked Bars



Streamgraph



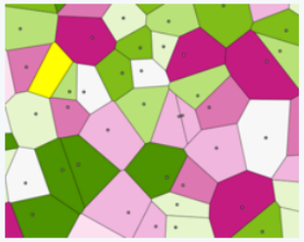
Sunburst



Node-Link Tree

Treemap

Voronoi Diagram



Hierarchical Edge

Voronoi Diagram

Symbol Map

Parallel

Data-Driven Documents

- Home
- Gallery
- Examples
- Tutorials
- Plugins

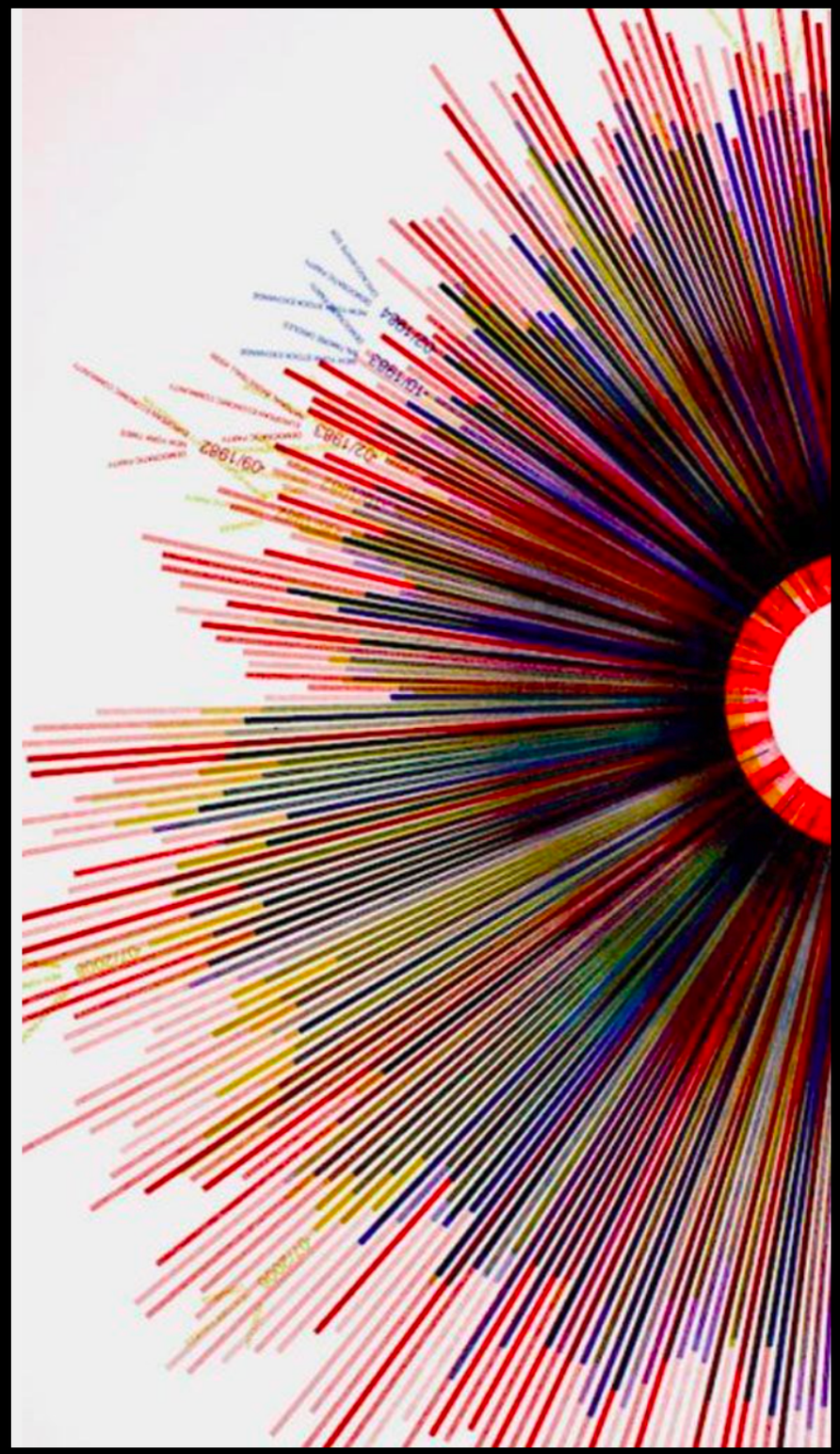
Help

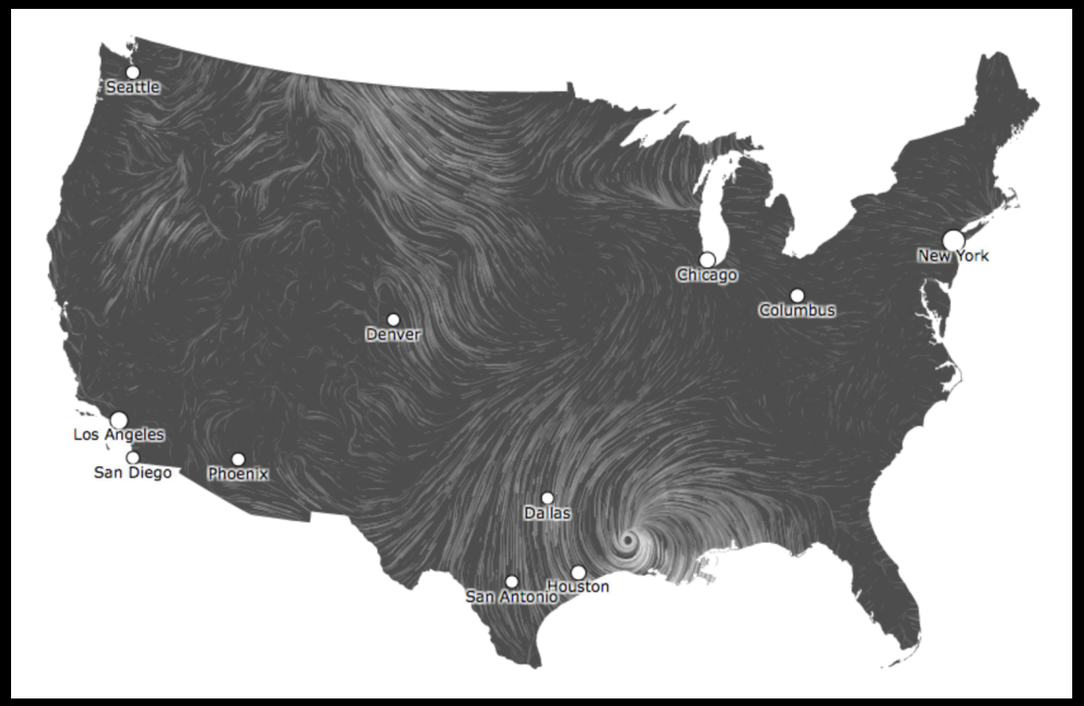
- Stack Overflow
- Slack
- Google Group
- Gitter

API Reference

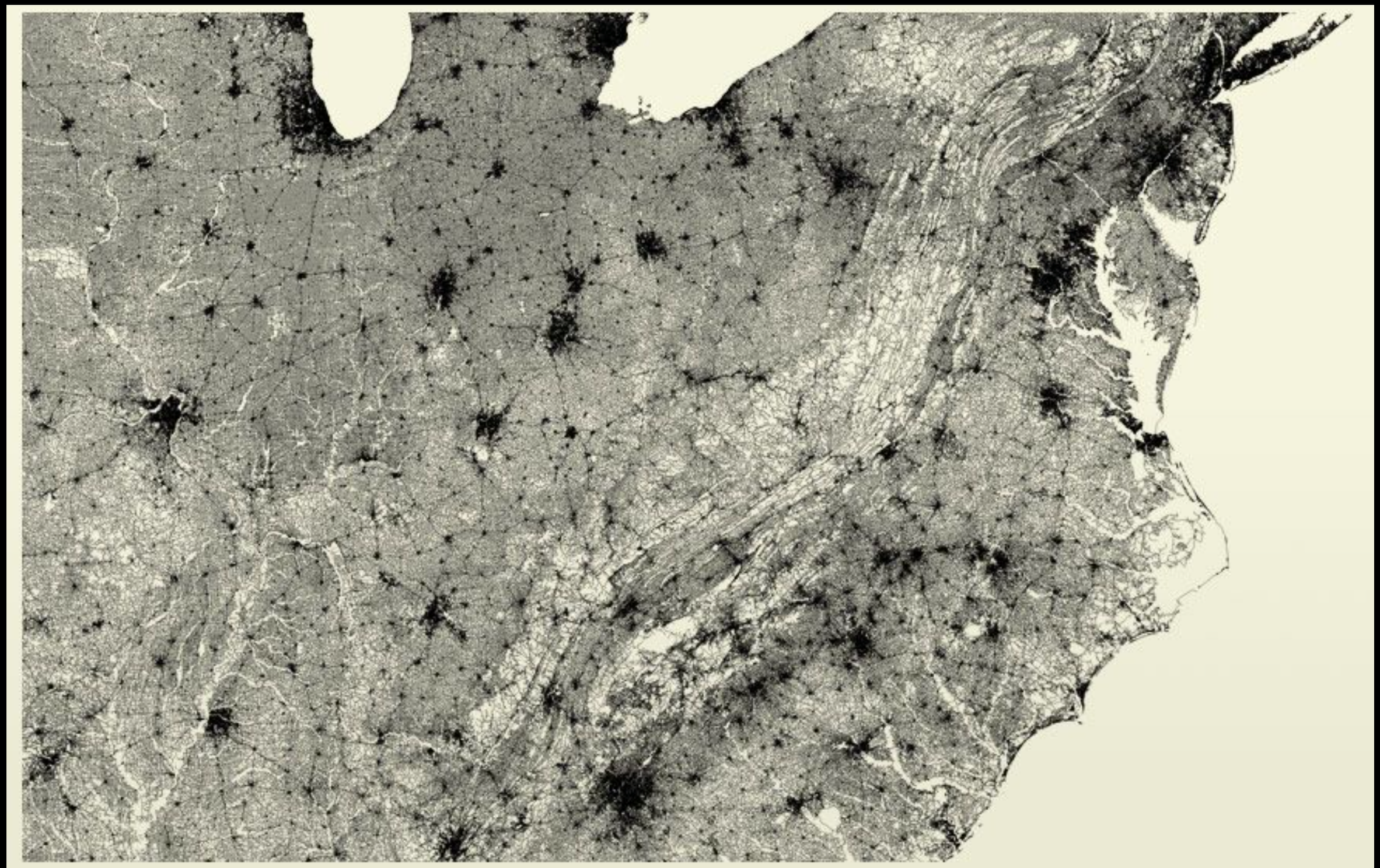
- Arrays

Let’s eschew ‘data art’





and combine the ‘beautiful’ with the ‘enlightening’



‘Beauty is truth, truth beauty,’
– that is all ye know on earth,
and all ye need to know.

– John Keats