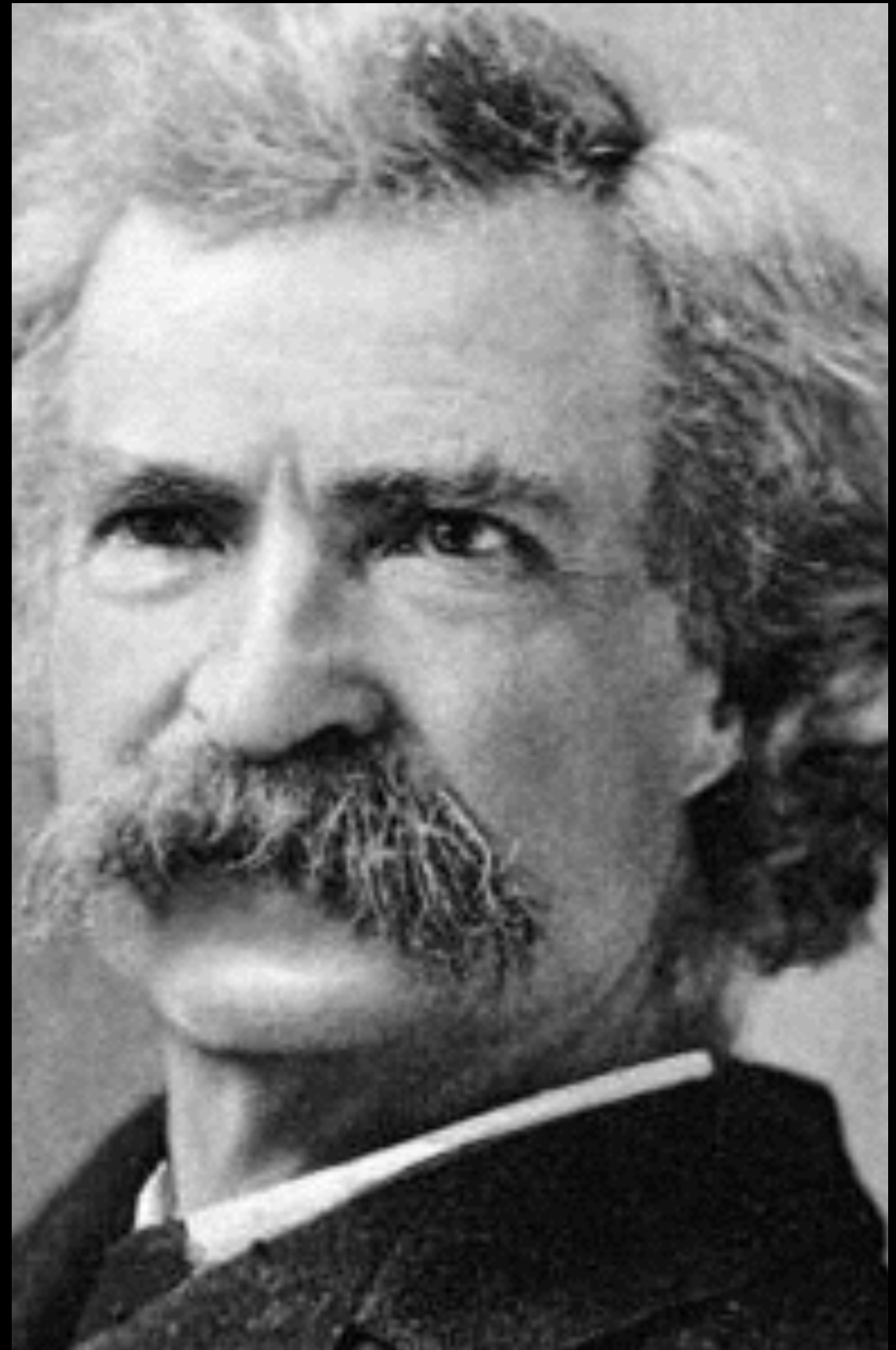
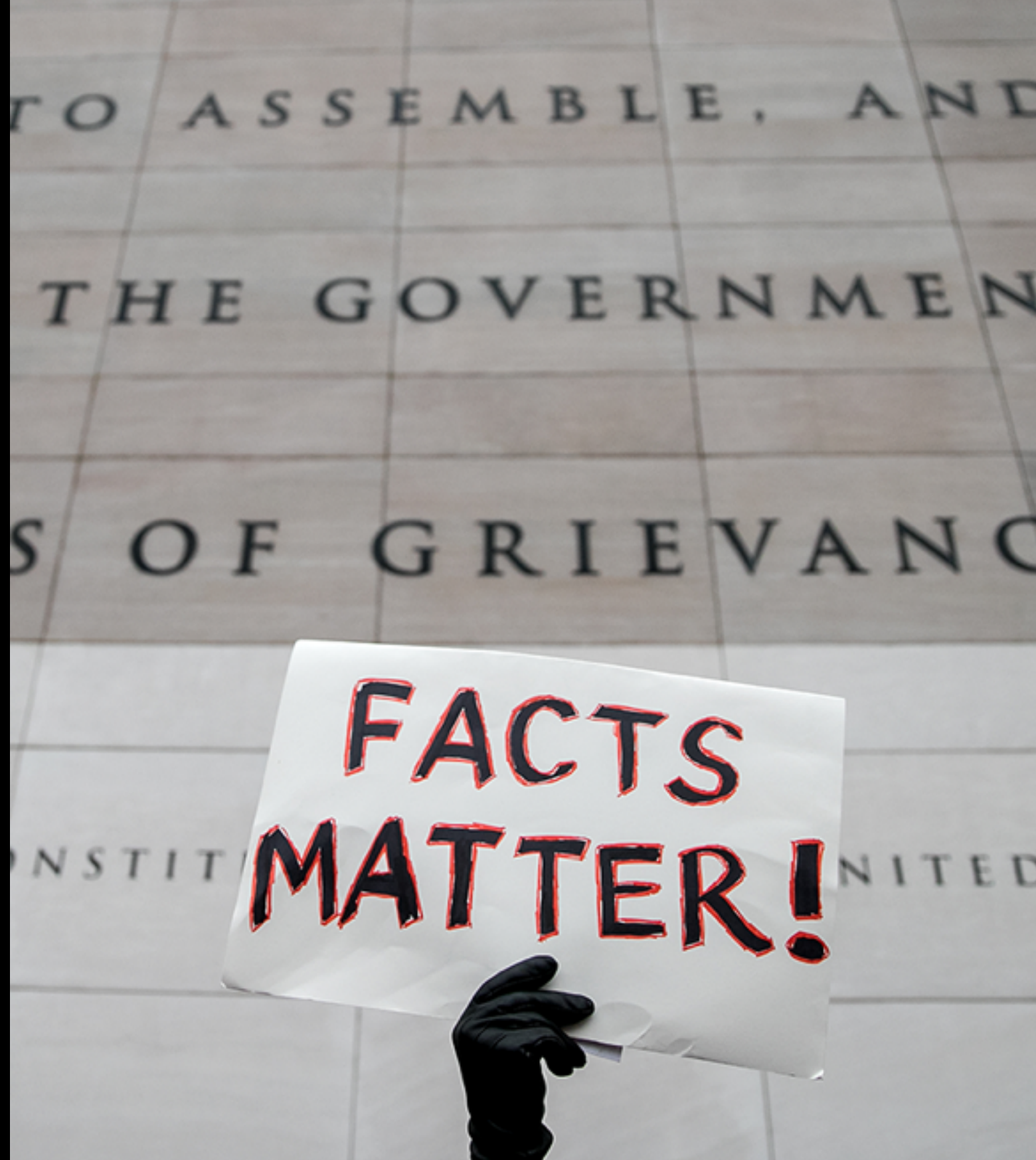


Data Visualization & Information Aesthetics

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

– Mark Twain (or possibly
Benjamin Disraeli)





Maybe? ㄟ(ˉ_ˉ)ㄏ

Weaponized
'objectivity'

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

Aner Tal

Brian Wansink

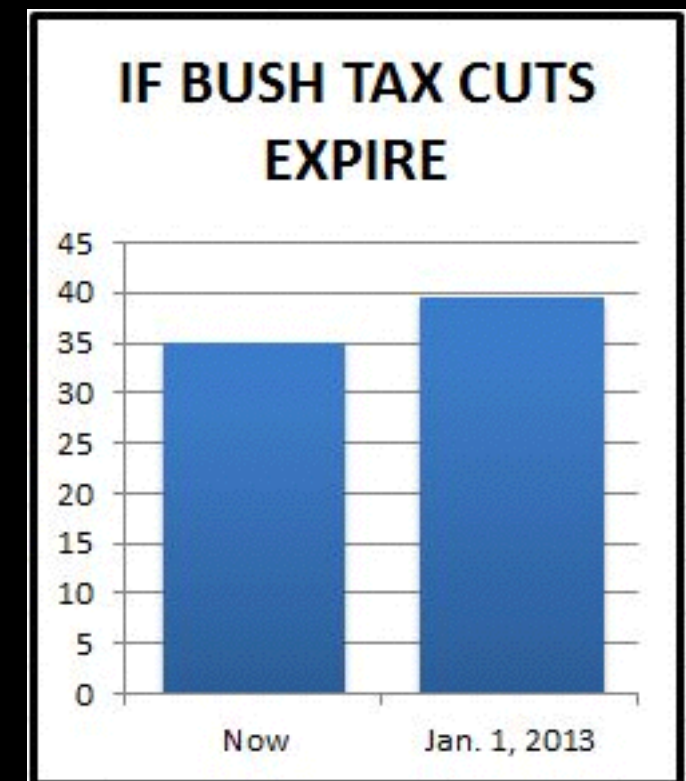
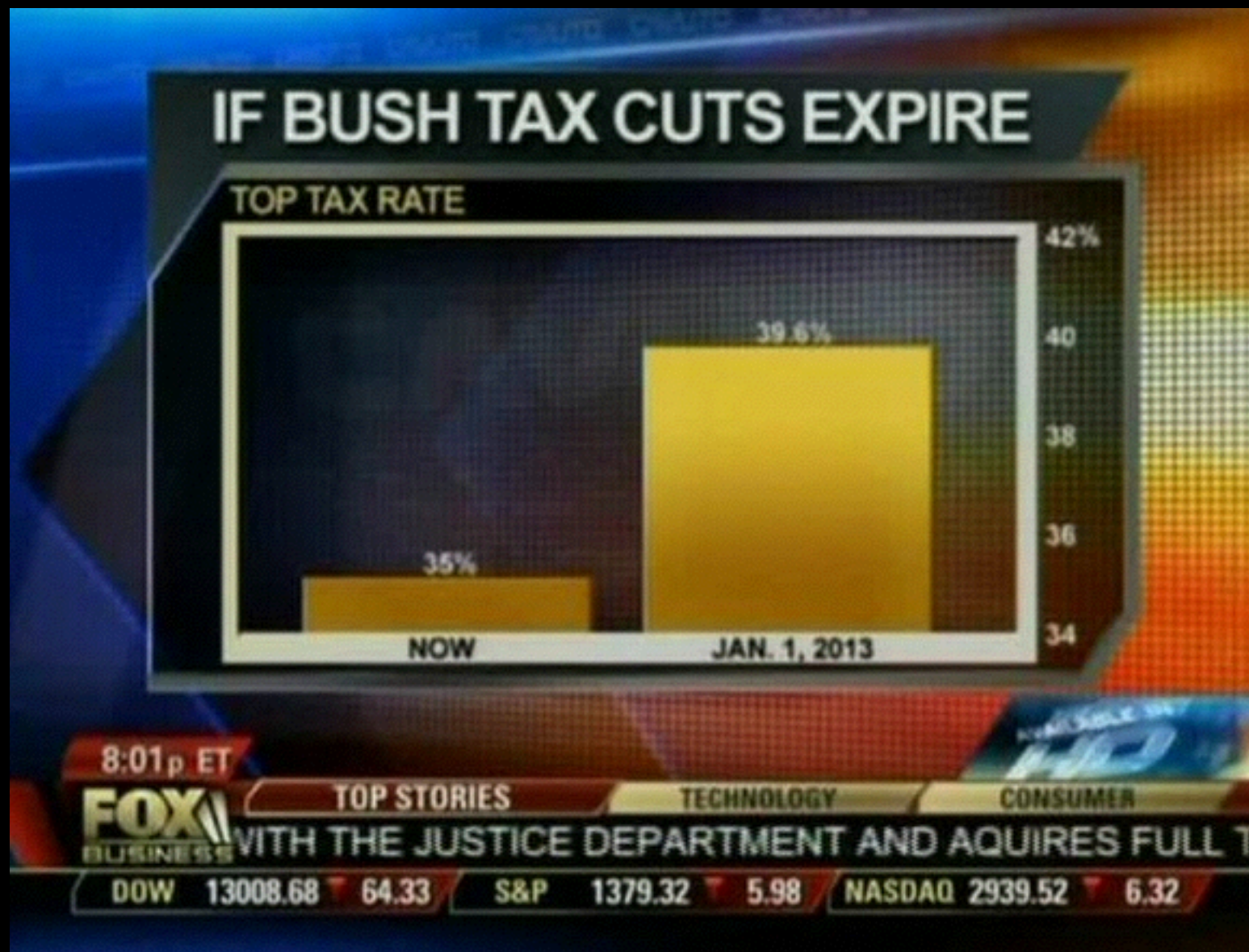
Cornell University, USA

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

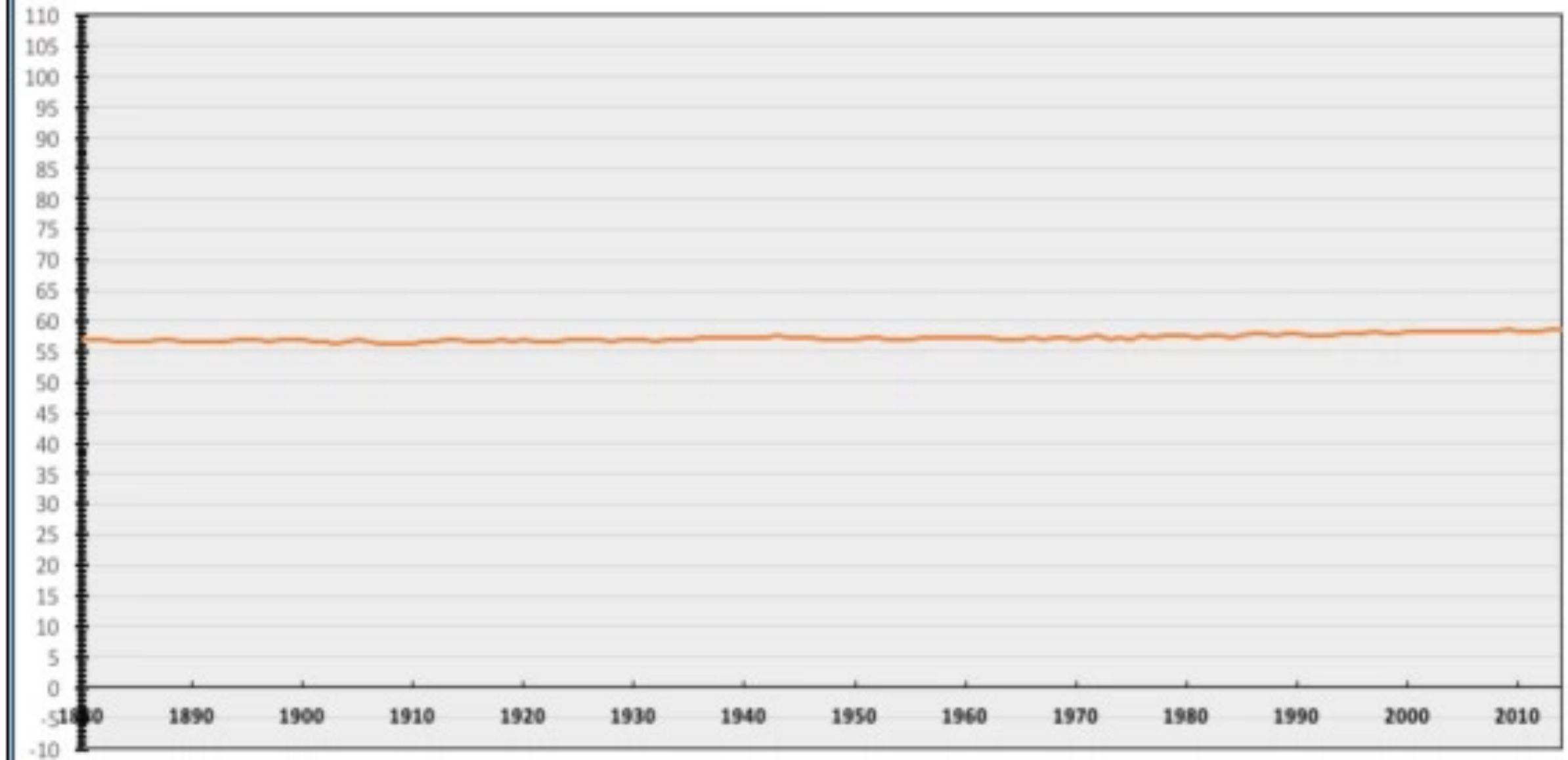
The appearance of being scientific can increase persuasiveness. Even trivial cues can create such an appearance of a scientific basis. In our studies, including simple elements, such as graphs (Studies 1–2) or a chemical formula (Study 3), increased belief in a medication's efficacy. This appears to 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

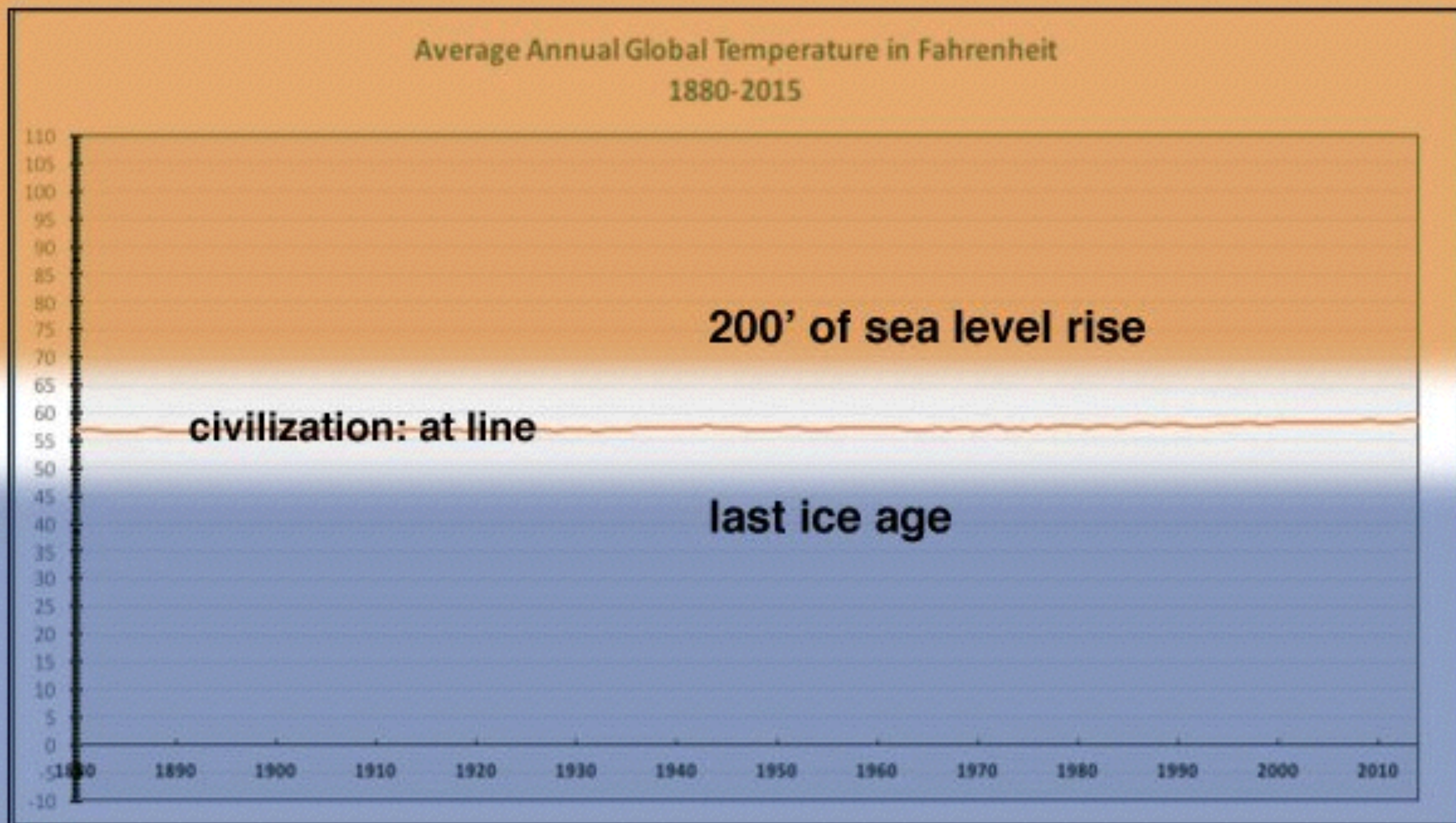


Magnifying small differences...

Average Annual Global Temperature in Fahrenheit
1880-2015

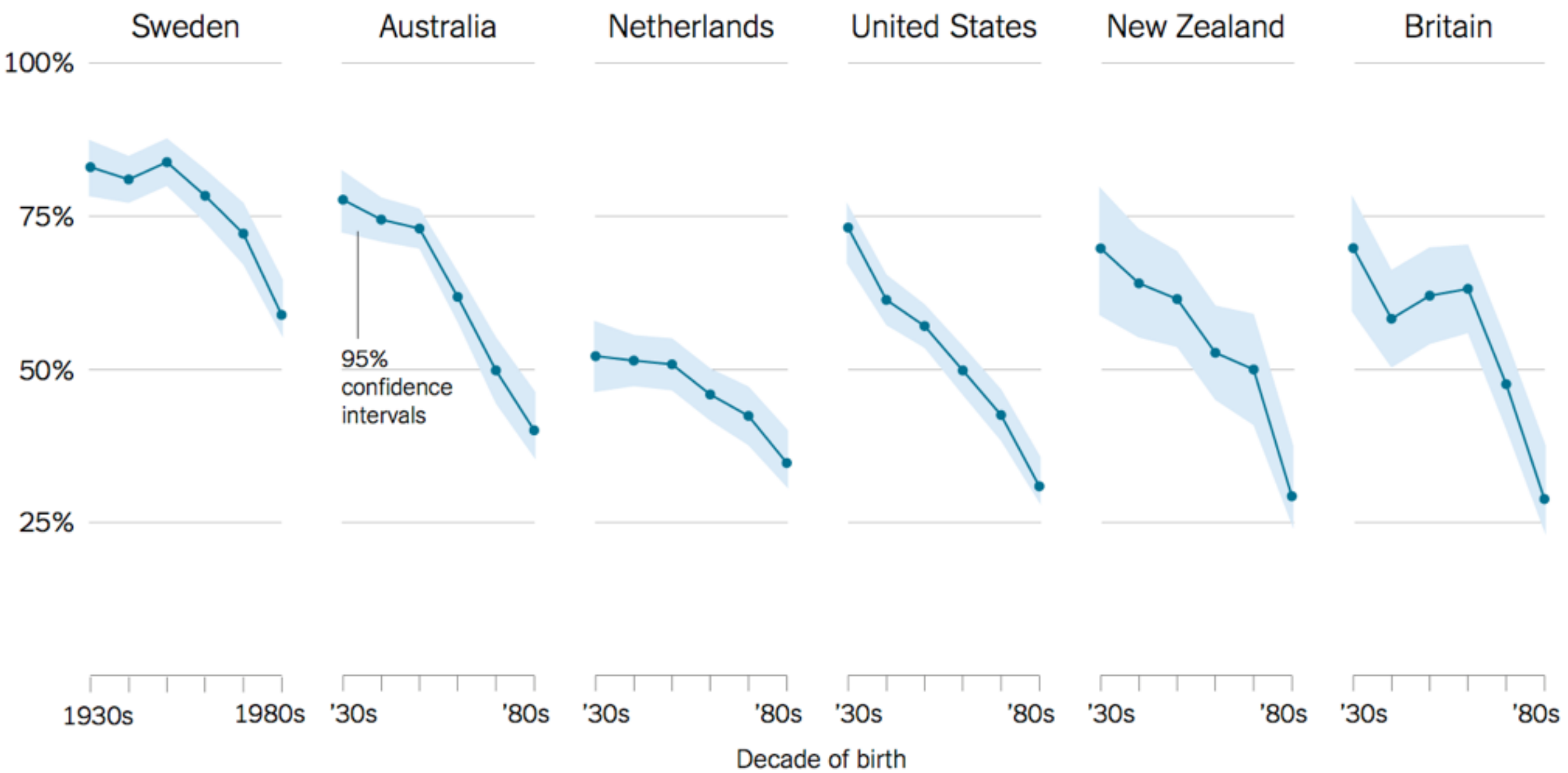


...and minimizing large ones

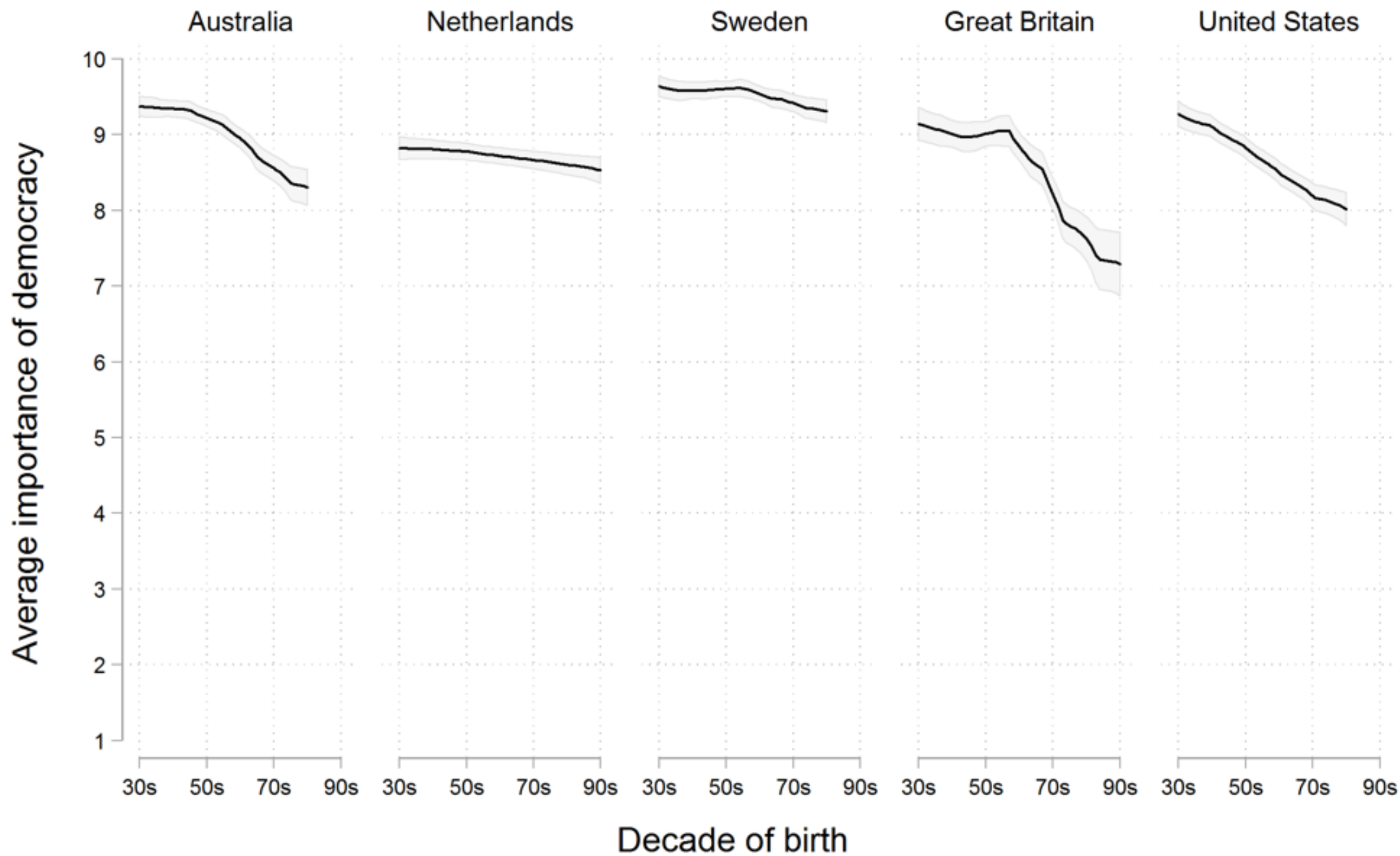


...and minimizing large ones

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

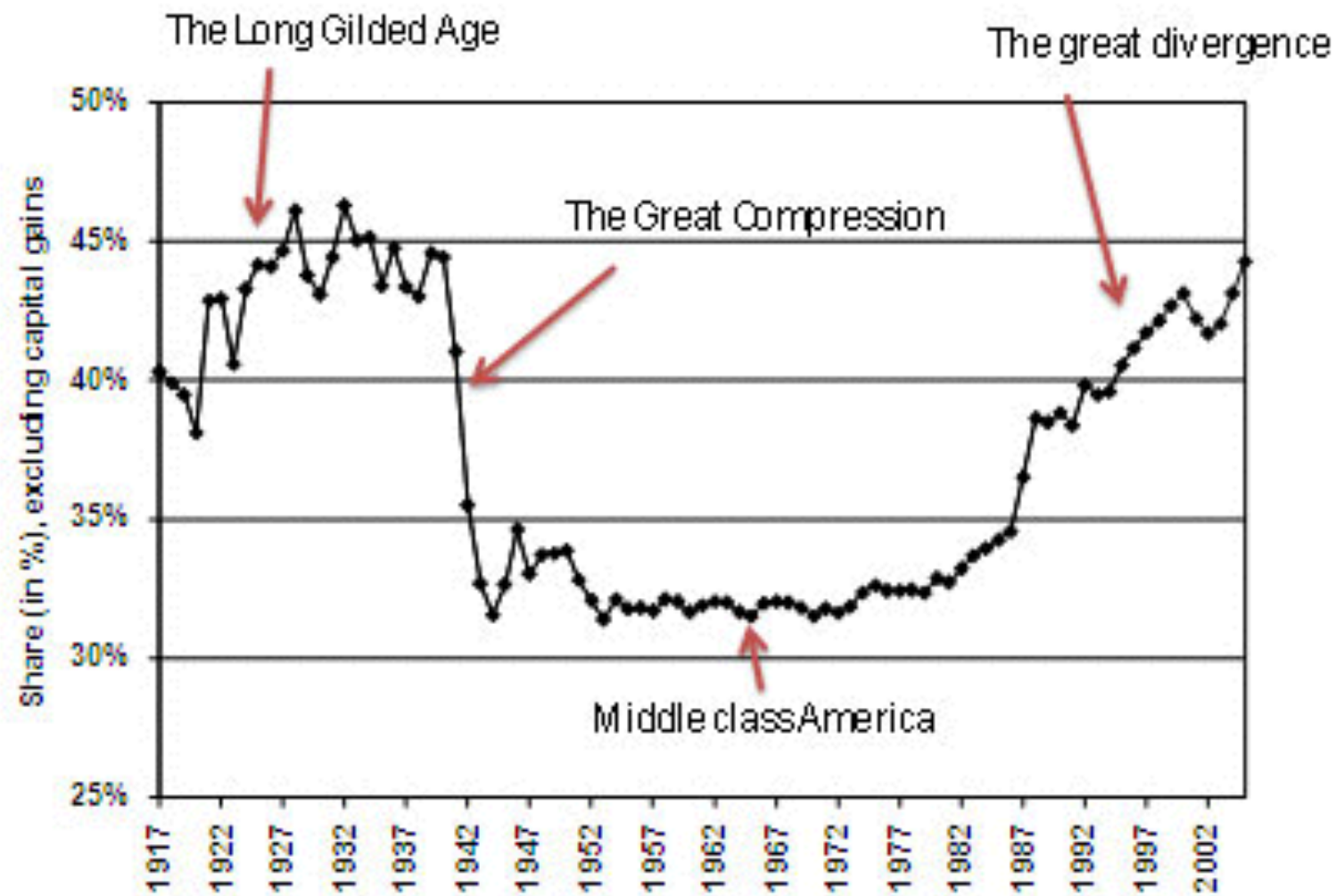
“It is difficult to get a man to understand something, when his salary depends on his not understanding it.”

– Upton Sinclair

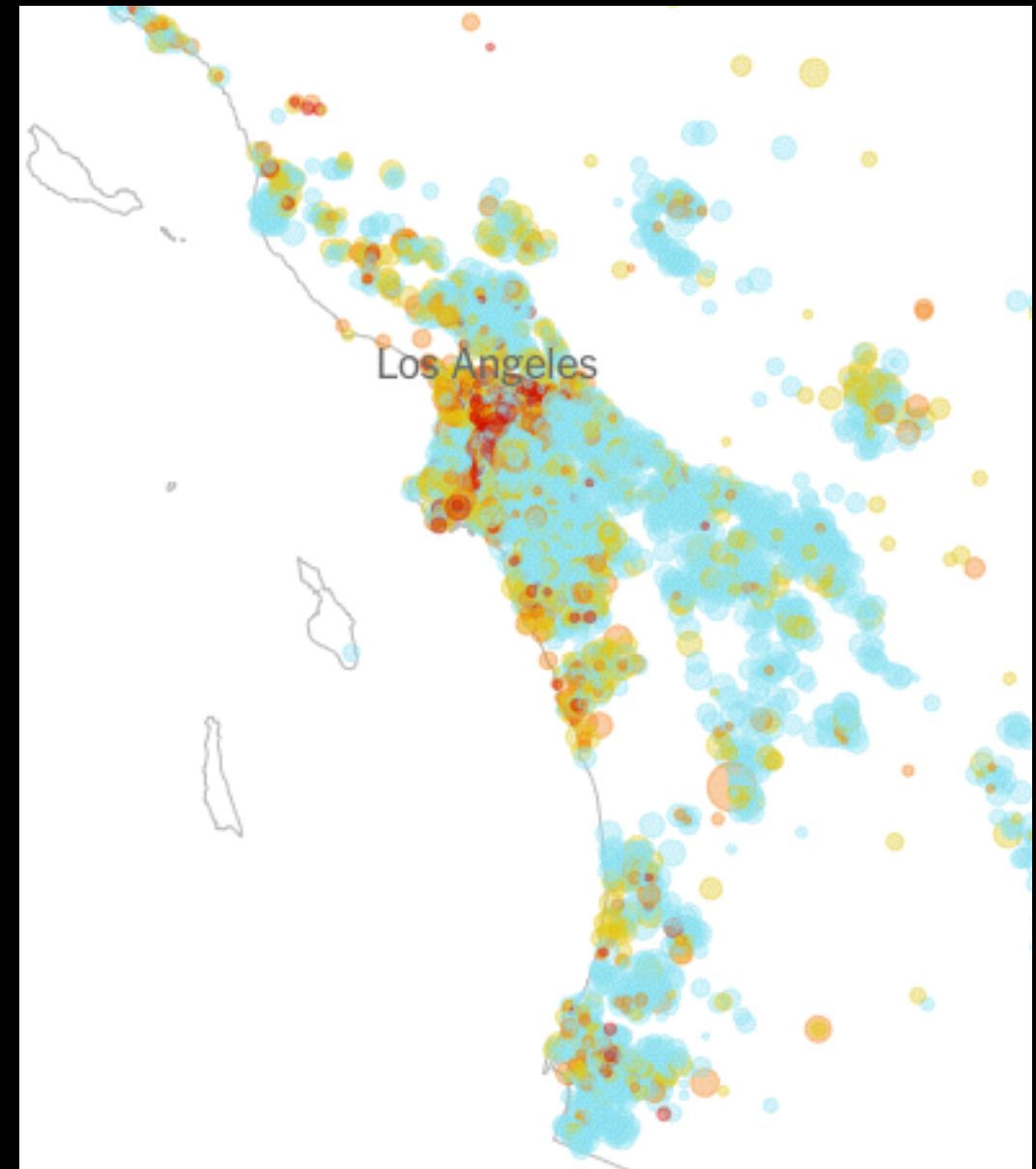
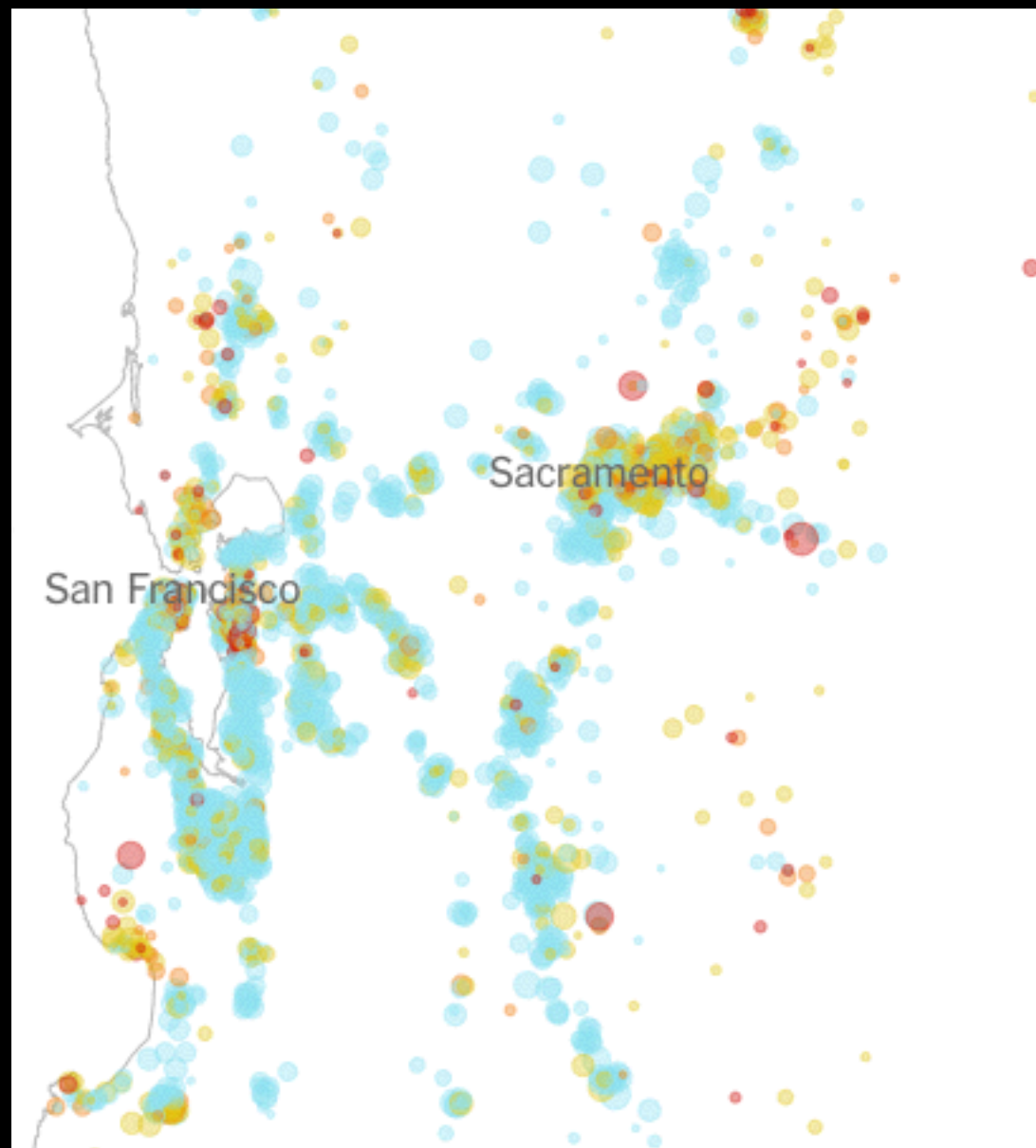




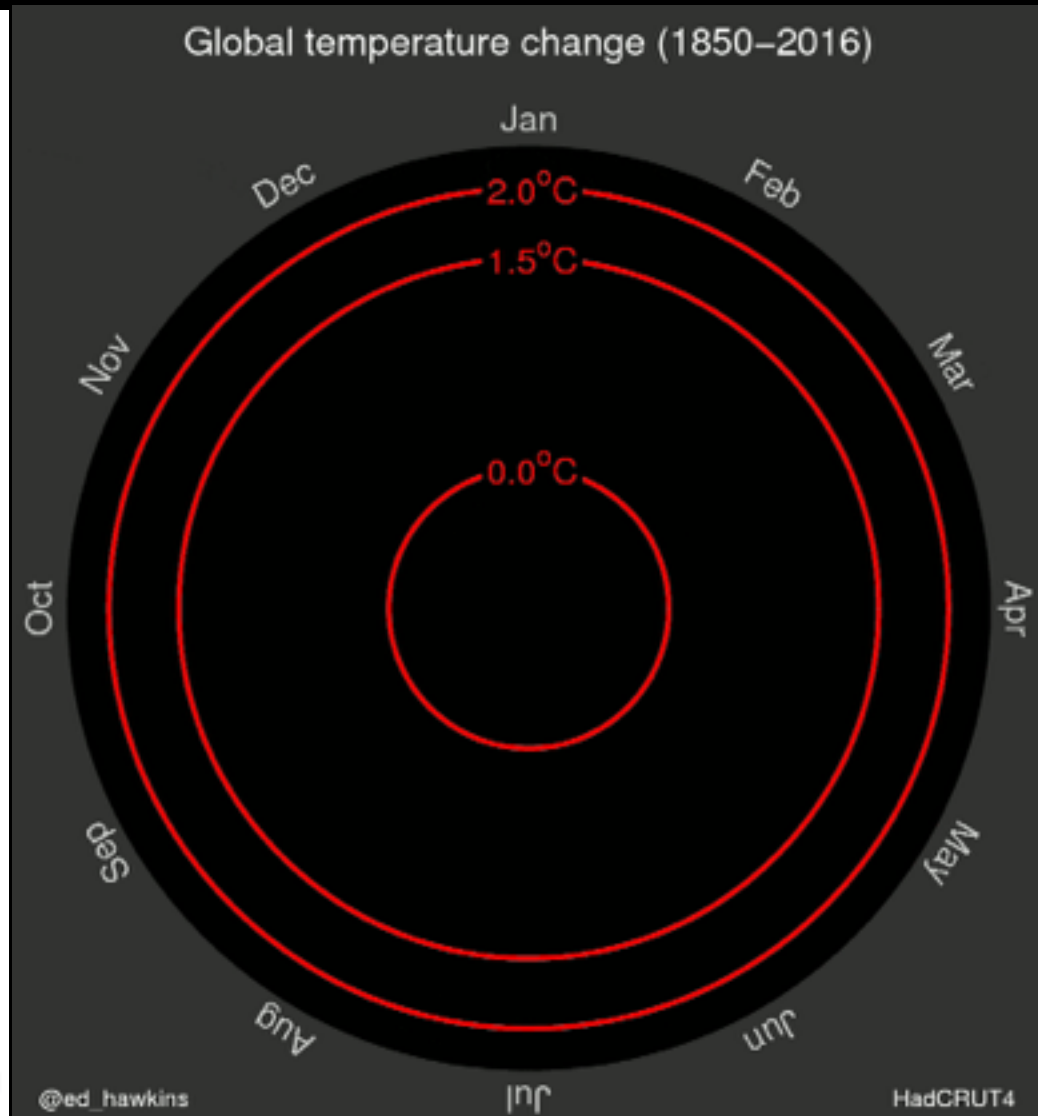
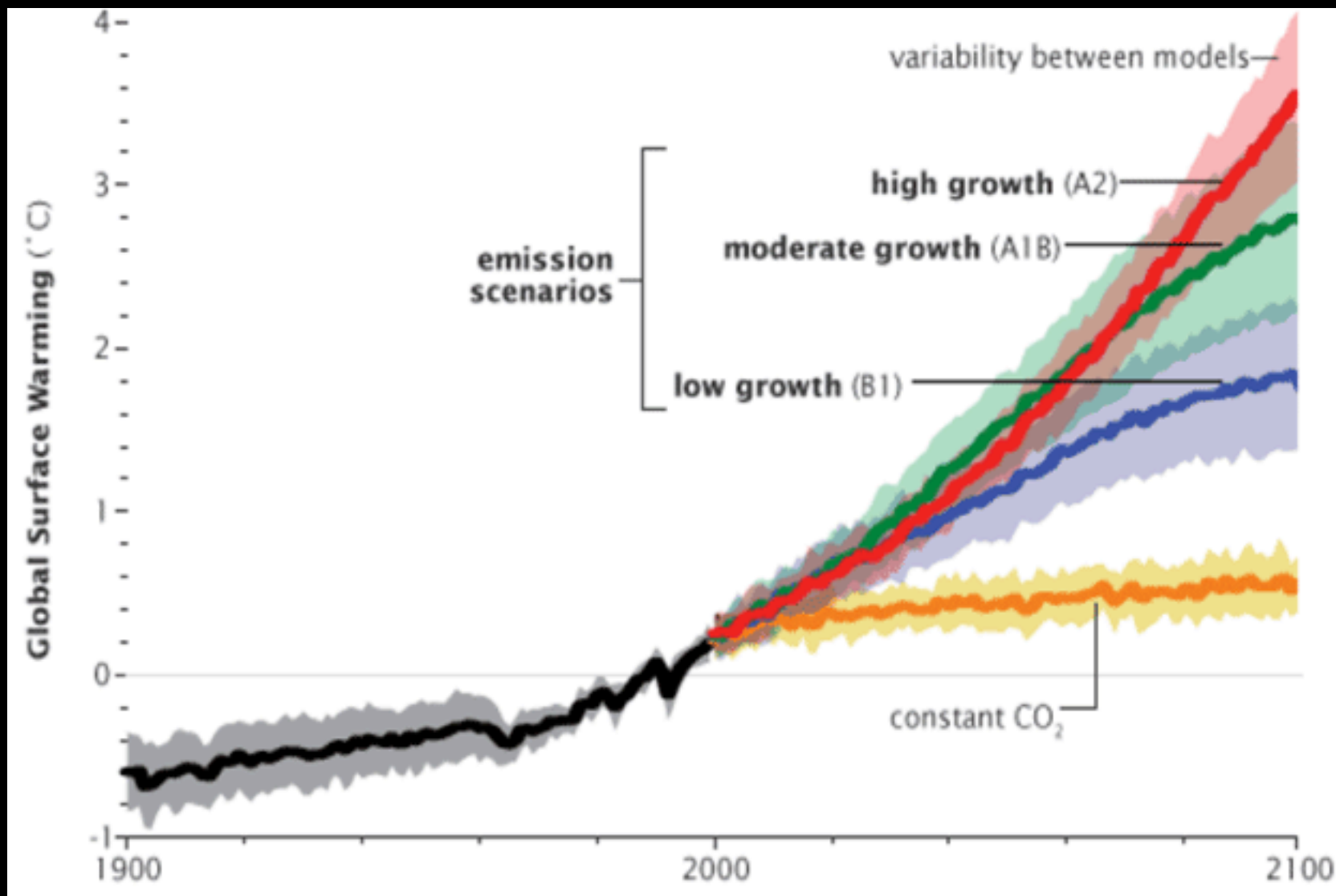
Evidence shmevidence



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

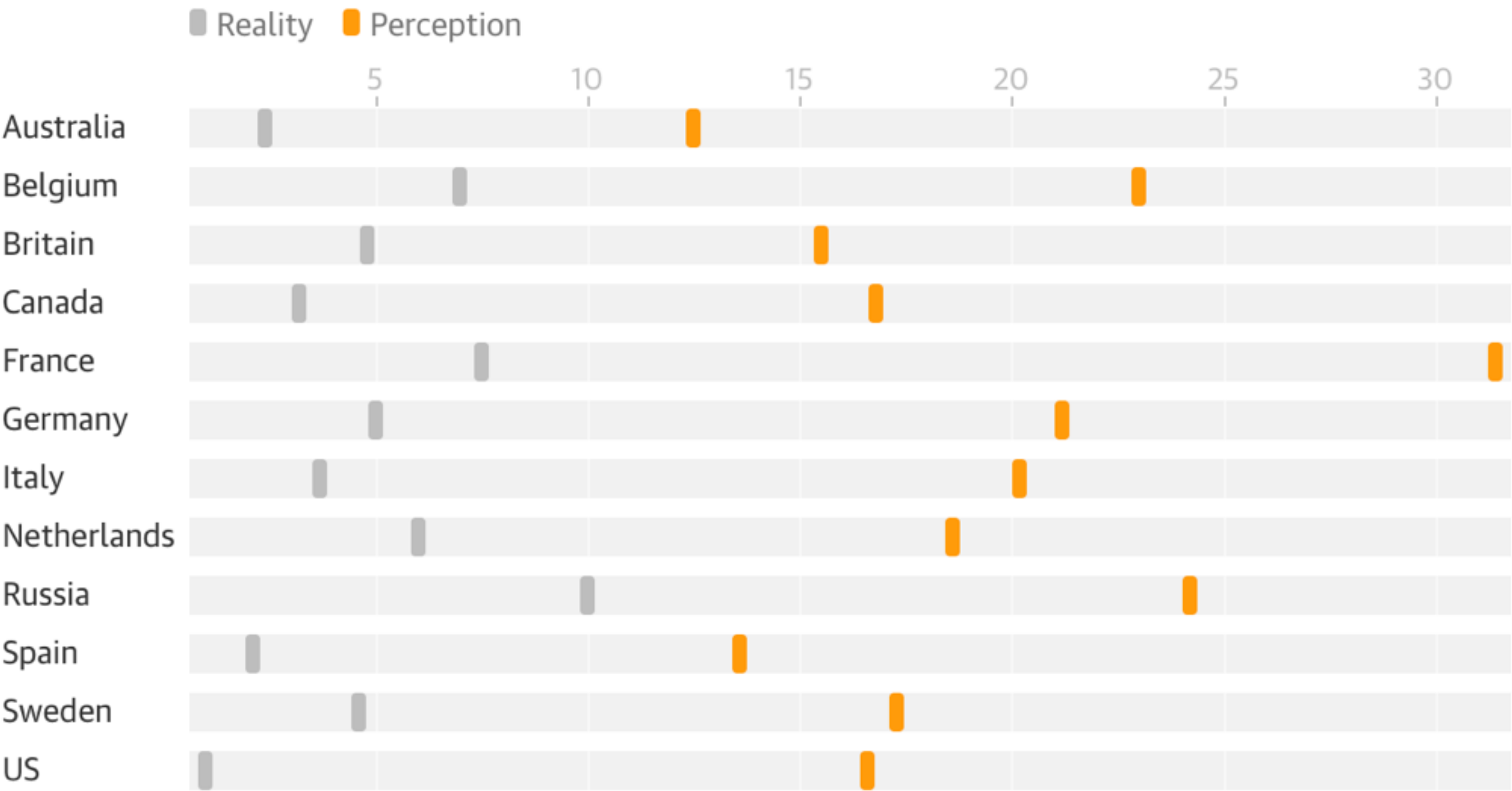


Measles (non)vaccination rates in CA



Climate change scenarios compared

Responses to the question: 'Out of every 100 people in your country about how many do you think are Muslim?'



Guardian graphic | Source: Selected countries, IPSOS MORI Perils of Perception 2016, Pew Research/De Standaard (Belgium)/Statistics Canada

Public perception of crime rate at odds with reality

% saying there is more crime in the U.S. than a year ago



Violent crimes per 1,000 persons ages 12 and older

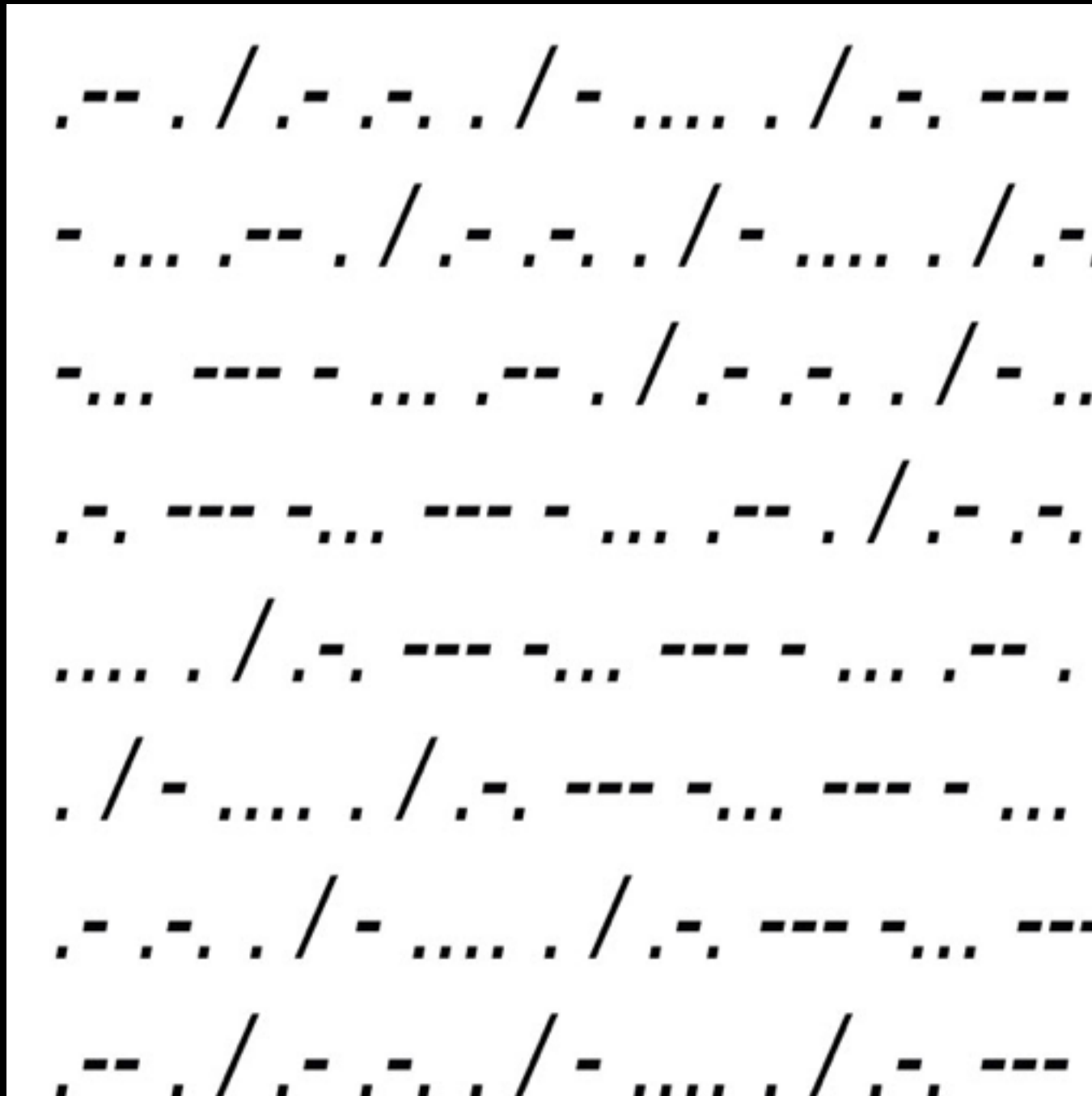


Note: 2006 BJS estimates are not comparable with those in other years.

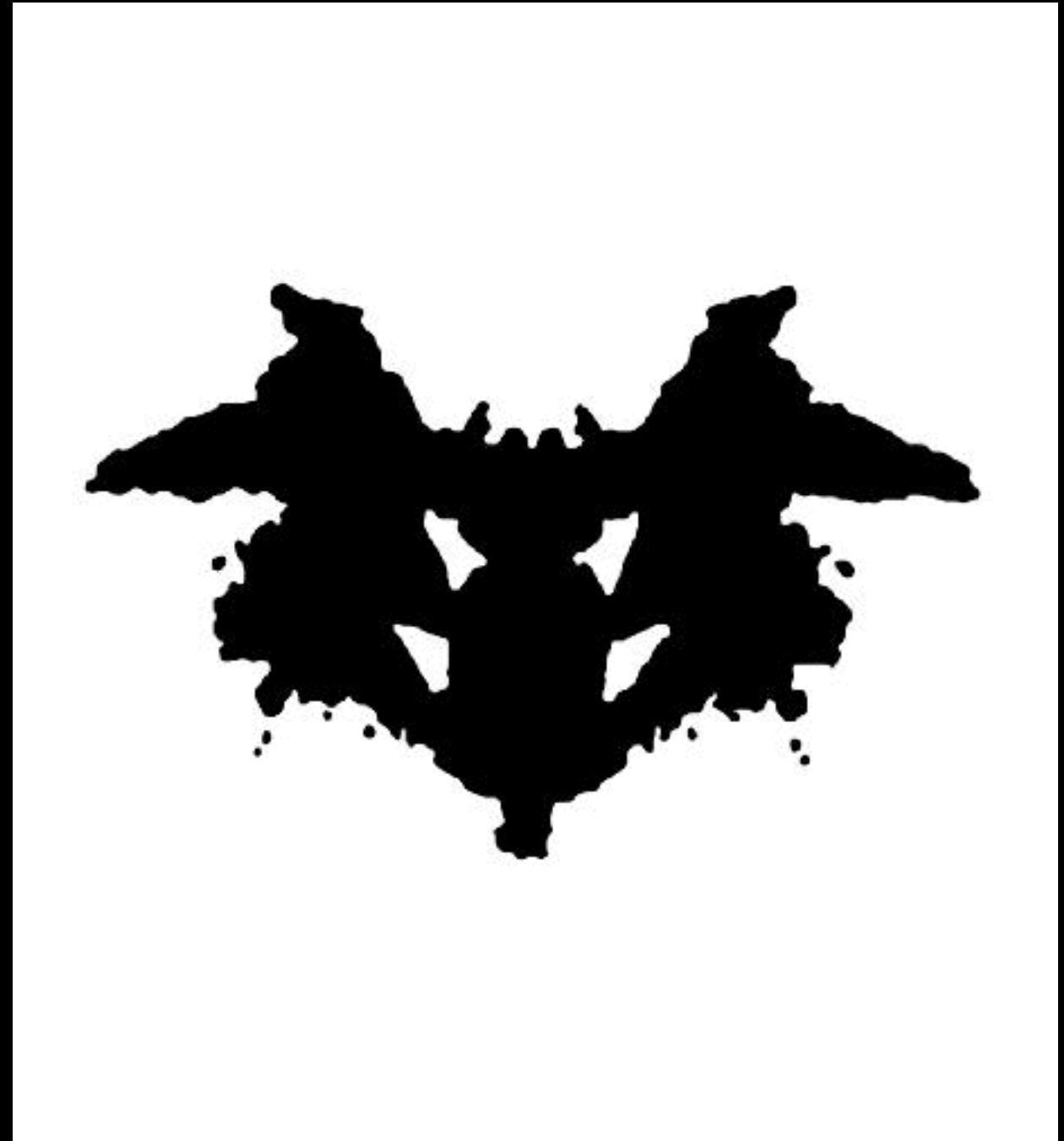
Source: Gallup, Bureau of Justice Statistics.

PEW RESEARCH CENTER

Why bother?

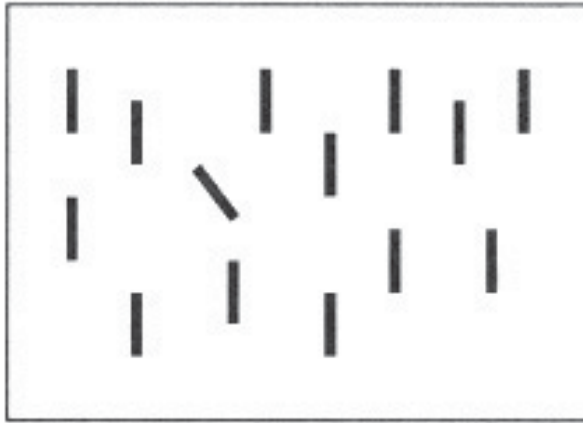


aural / sequential
 7 ± 2

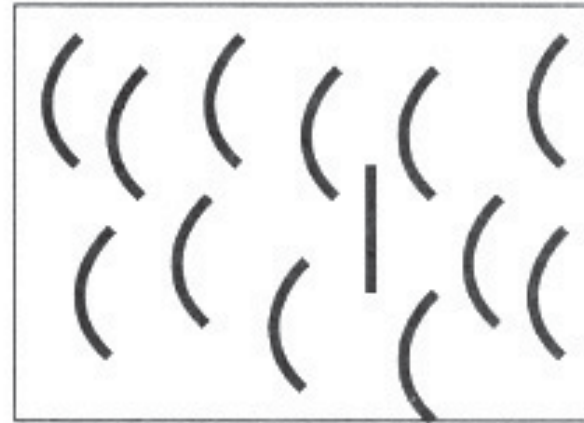


visual / spatial
all-at-once

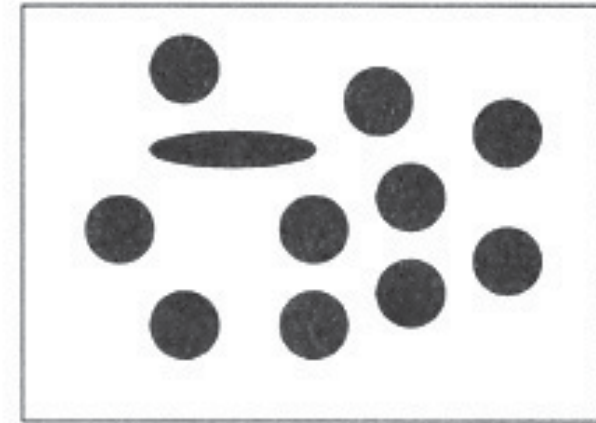
Orientation



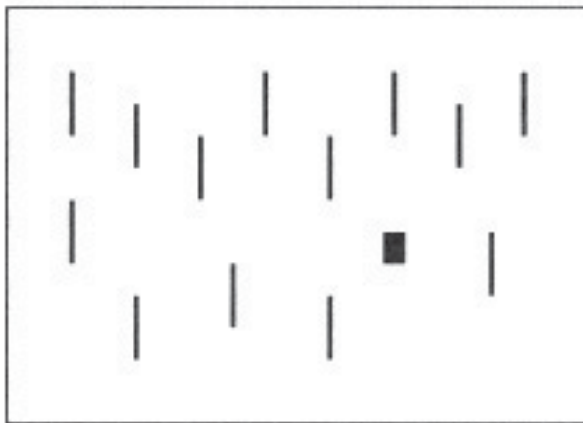
Curved/straight



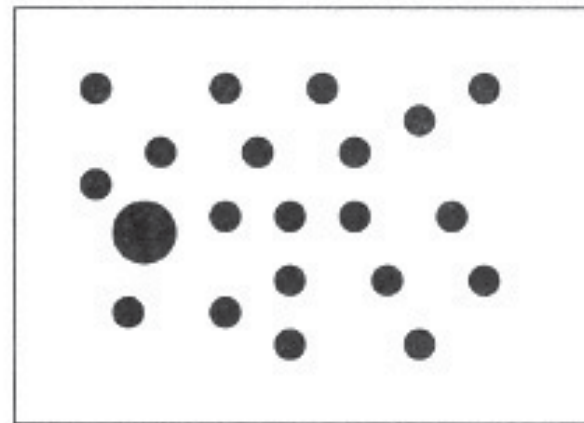
Shape



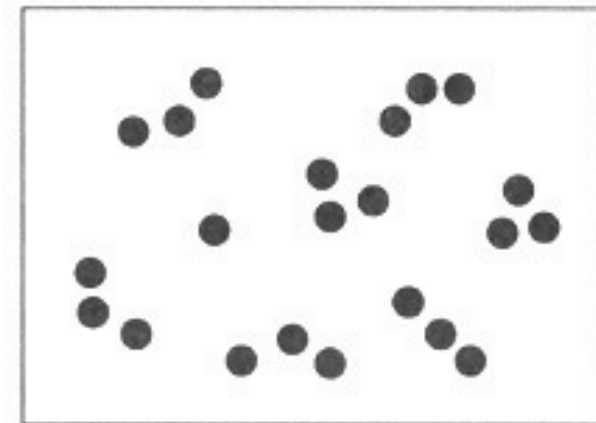
Shape



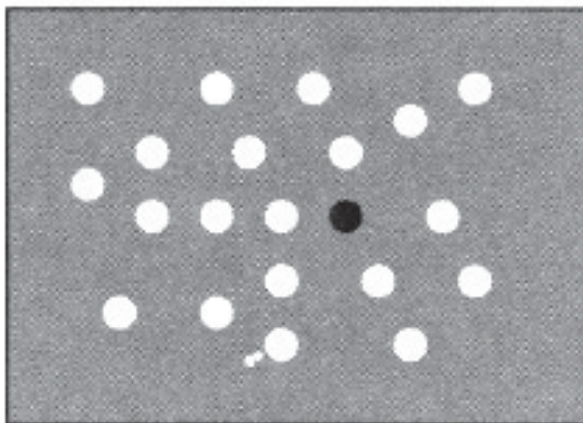
Size



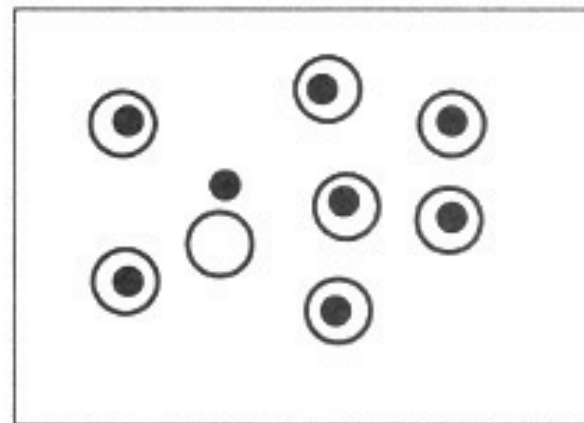
Number



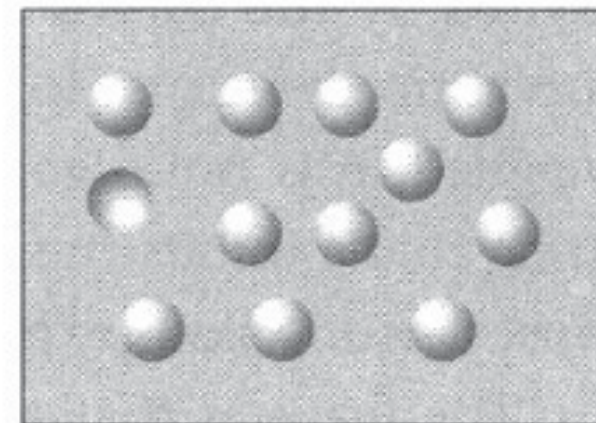
Gray/value



Enclosure



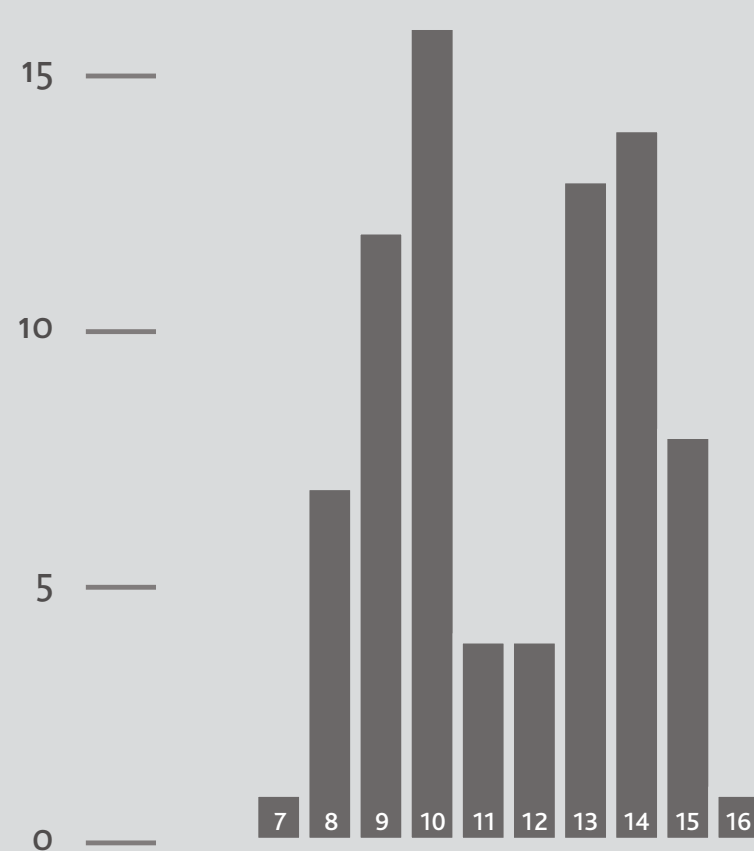
Convexity/concavity



Pre-attentive discrimination: instant & effortless

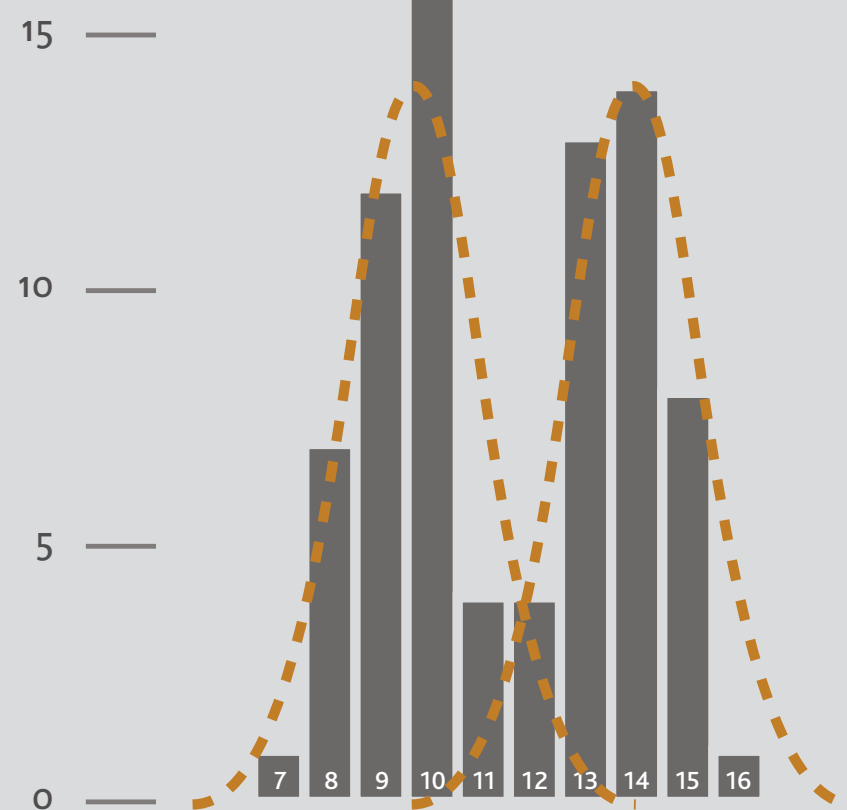
14, 8, 8, 13, 14, 12,
15, 13, 15, 15, 14, 13,
12, 11, 14, 8, 10, 14,
14, 13, 13, 10, 15, 13,
9, 10, 8, 12, 8, 9, 13,
9, 15, 10, 14, 14, 13,
9, 9, 10, 15, 11, 8, 9,
9, 14, 13, 15, 10, 10,
9, 10, 9, 13, 9, 13, 14,
10, 10, 14, 10, 12, 9,
10, 7, 11, 10, 15, 14,
11, 10, 9, 8, 14, 14,
10, 13, 10, 13, 16

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...



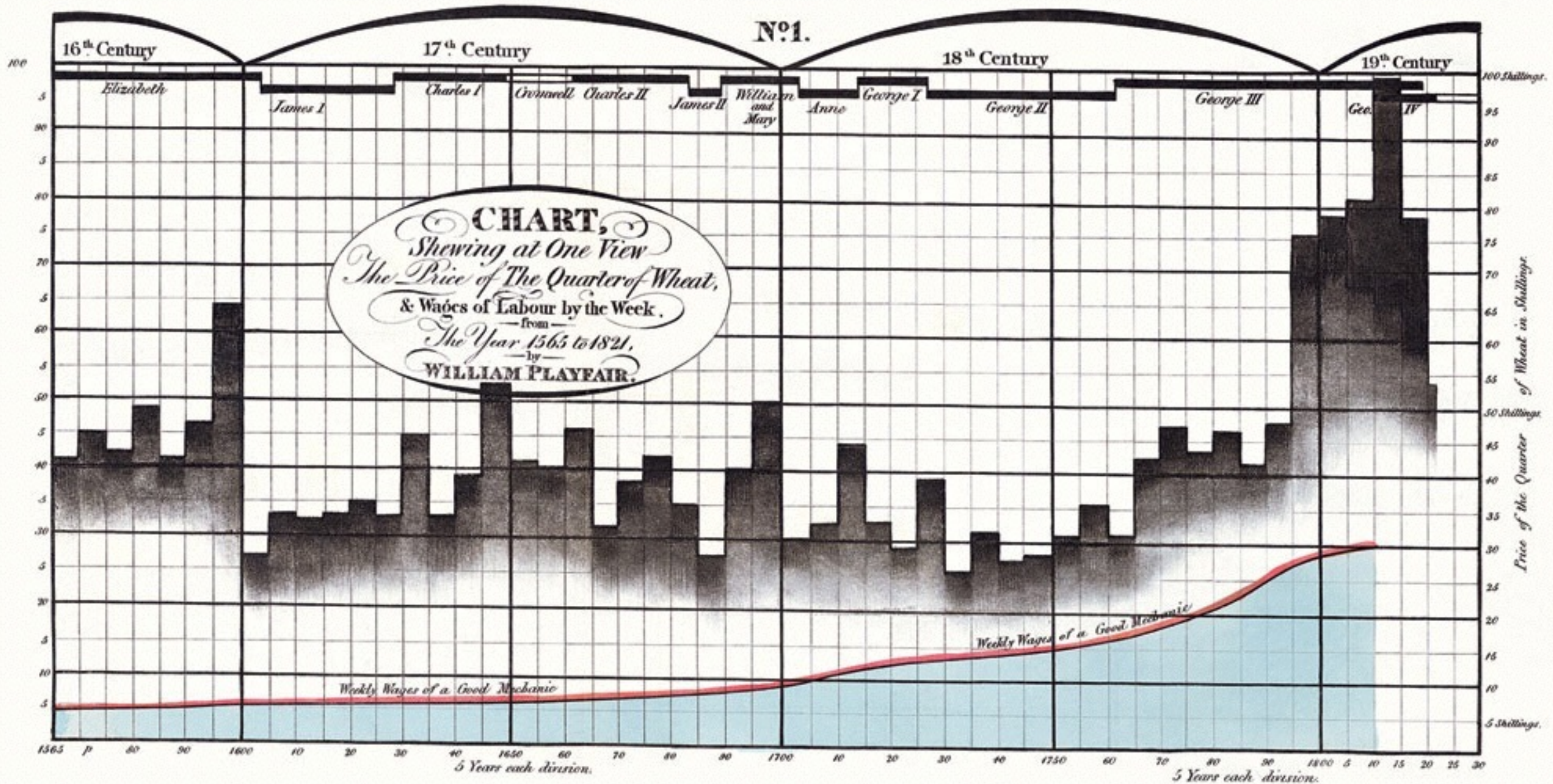
14, 8, 8, 13, 14, 12,
 15, 13, 15, 15, 14, 13,
 12, 11, 14, 8, 10, 14,
 14, 13, 13, 10, 15, 13,
 9, 10, 8, 12, 8, 9, 13,
 9, 15, 10, 14, 14, 13,
 9, 9, 10, 15, 11, 8, 9,
 9, 14, 13, 15, 10, 10,
 9, 10, 9, 13, 9, 13, 14,
 10, 10, 14, 10, 12, 9,
 10, 7, 11, 10, 15, 14,
 11, 10, 9, 8, 14, 14,
 10, 13, 10, 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).

Die Reise nach Amerika

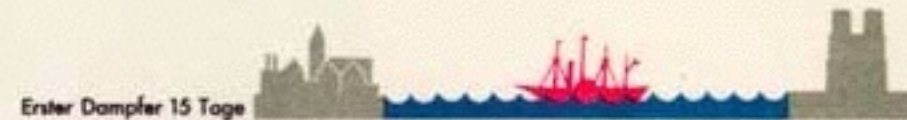
1492



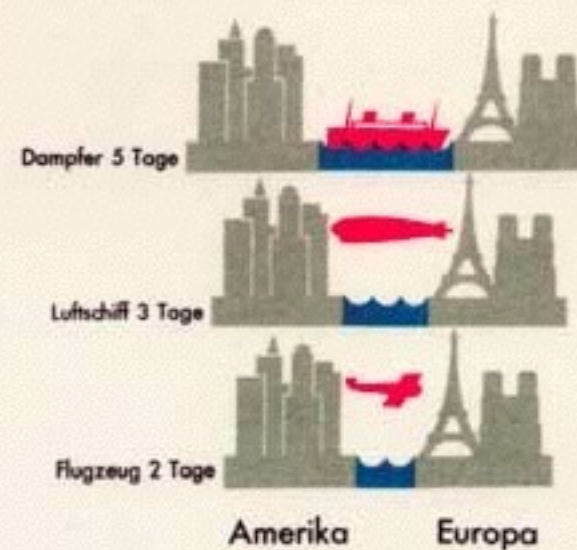
1800



1838



Gegenwart



Jede Welle 1 Tag Fahrzeit

Gesellschafts- und Wirtschaftsmuseum in Wien
Deutscher Verlag f. Jugend u. Volk, Wien-Leipzig
Druck: »Secessione« Gesellschaft m. b. H. Wien

Menschen und Technik, Verkehr 8

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.

Four Angels standing on the four
corners of the Earth.—Isaiah 37: 36.

Four Angels standing on the four
corners of the Earth.—Isaiah 37: 36.



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 1,040
miles per hour around the center
of the earth (in their minds).
Think of that speed!

Four Angels standing on the four
corners of the Earth.—Isaiah 37: 36.

Four Angels standing on the four
corners of the Earth.—Isaiah 37: 36.



SCRIPTURE THAT CONDEMNS THE GLOBE THEORY.

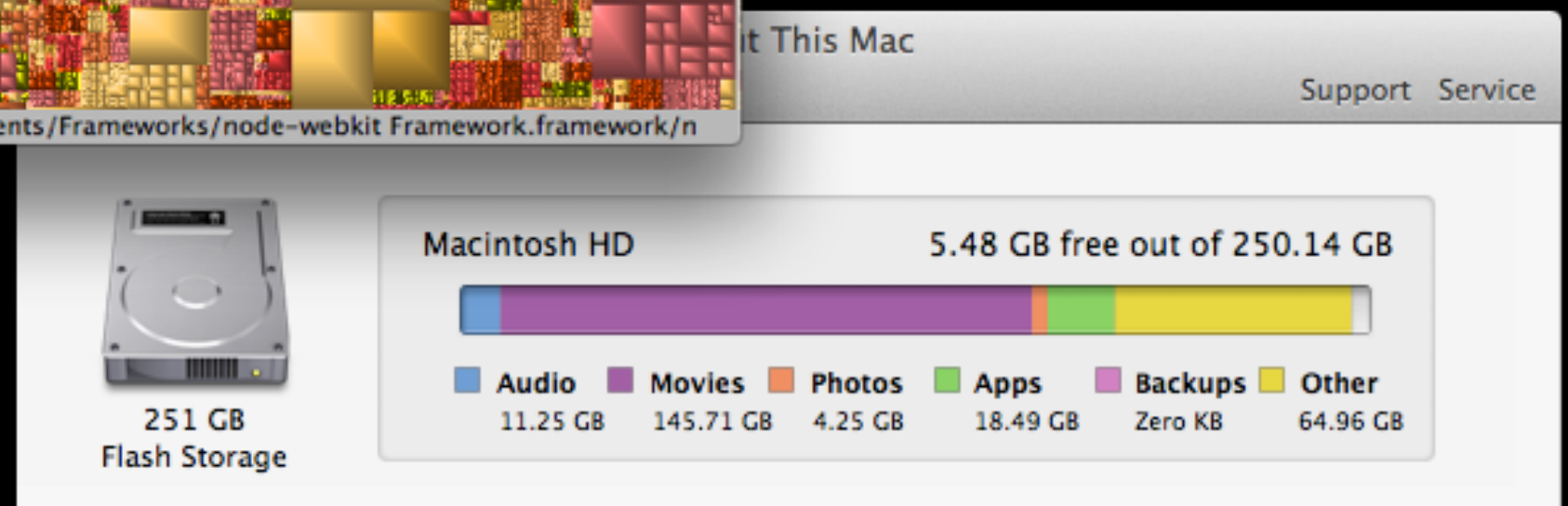
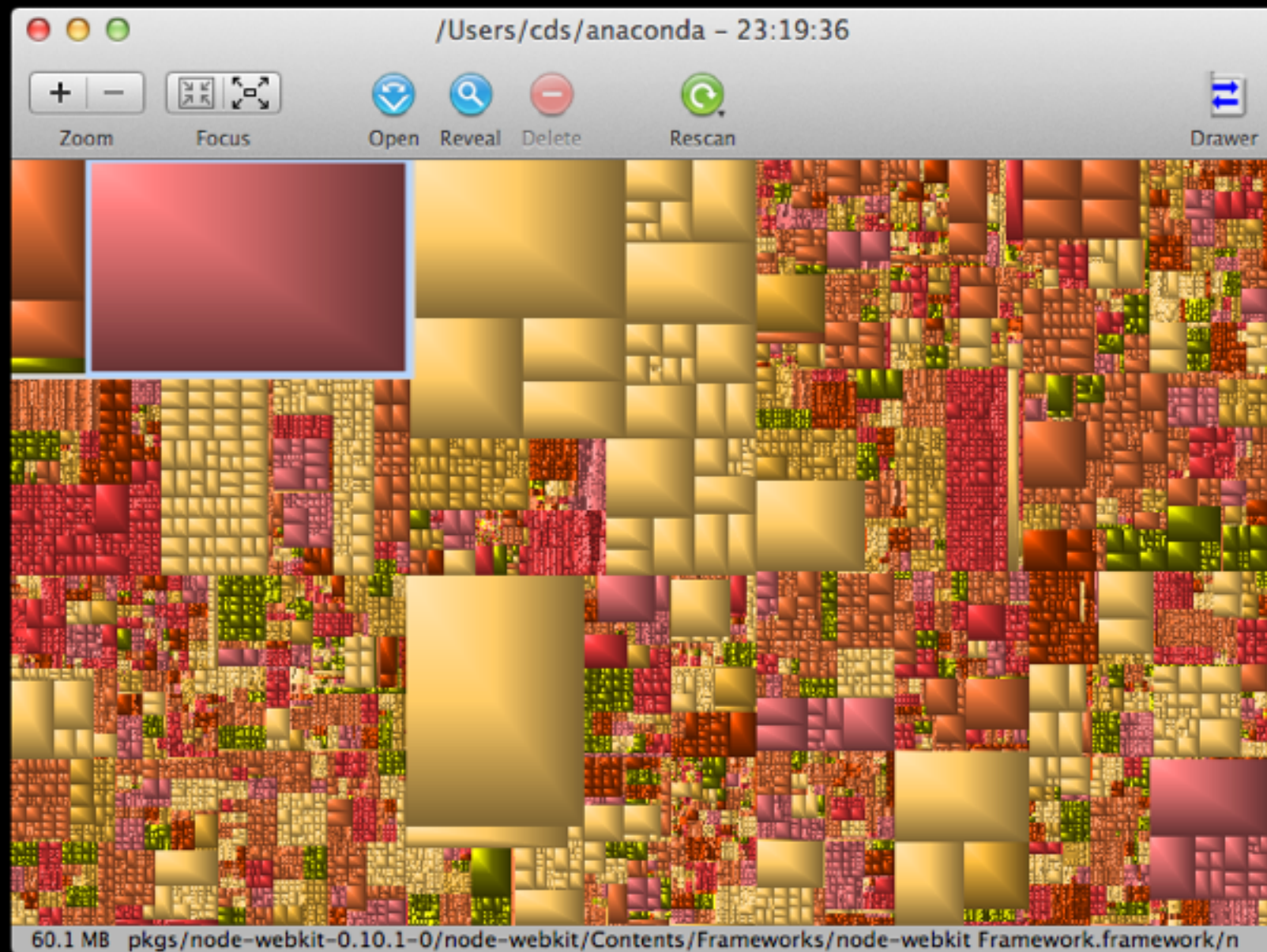
And his hands were steady until the going down of the sun.—Ex. 17: 12. And the sun stood still, and the moon stayed.—Joshua 10: 12-13. The world also shall be stable that it be not moved.—Chron. 16: 30. To him that stretched out the earth, and made great lights (not worlds).—Ps. 136: 6-7. The sun shall be darkened in his going forth.—Isaiah 13: 10. The four corners of the earth.—Isaiah 11: 12. The whole earth depren.—Isaiah 38: 4-9. It is he that stretcheth 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 saith 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.

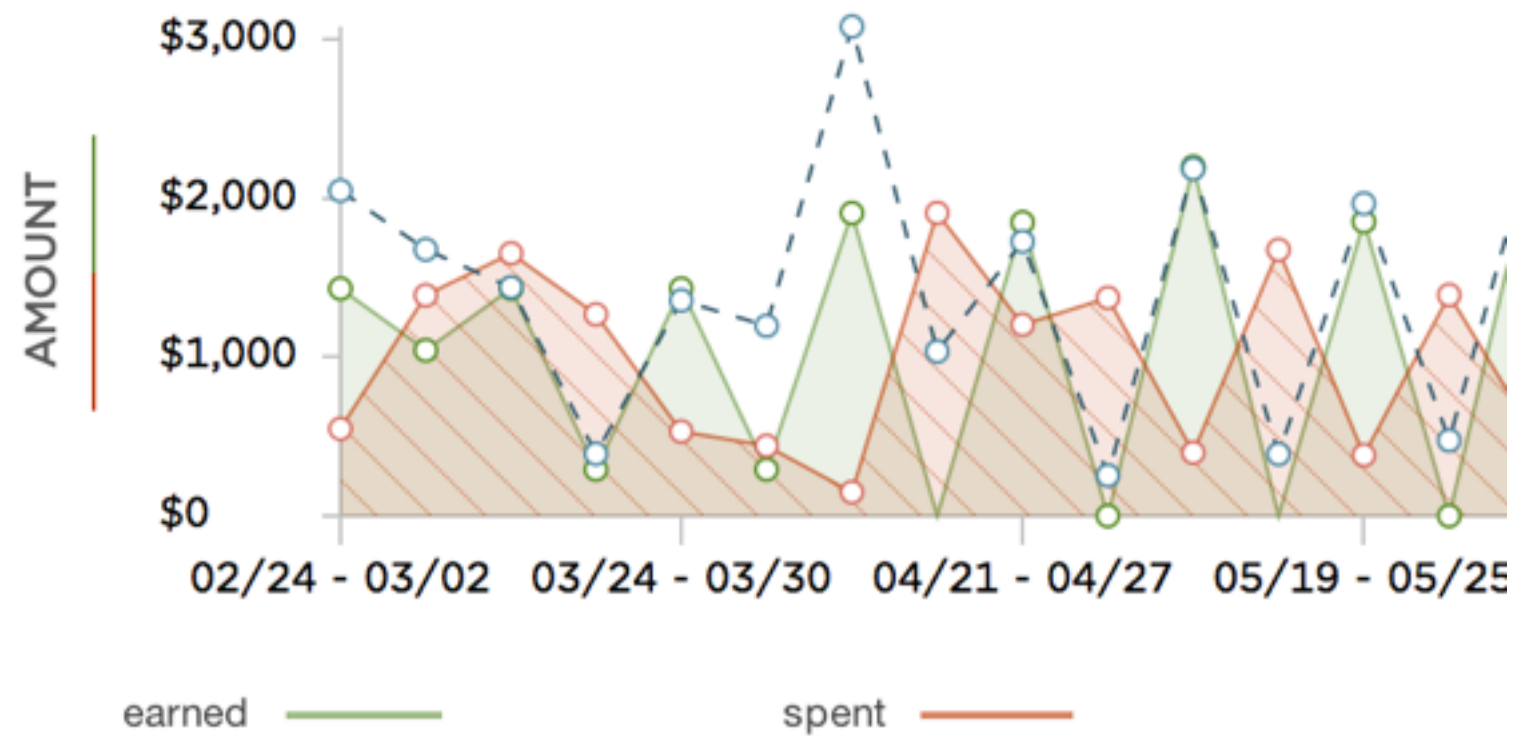
Orlando Ferguson's cosmology

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



Supply & Demand in 8 bits



STATUS #1 SMITHORE



SELL

SELL

85



PUSH STICK
TO DECLARE AS
BUYER OR SELLER



50



BUY

MONEY 1151
UNITS 0

286
4

291
4



BUY

1030
0

MONEY
UNITS

STORE HAS 8 UNITS



AUCTION #1 SMITHORE



68

68

85



50



BUY

MONEY
UNITS

1151
0

286
0

291
0

50
1030
0

MONEY
TRADED





AUCTION #1 SMITHORE



54

54

85



50



BUY

MONEY 1151
UNITS 0



286
0

291
0

54
1030
0

MONEY
TRADED

UNITS TRADED



AUCTION #1 SMITHORE



66

66

85



50



BUY

MONEY
UNITS

1151
0

286
0

291
0

60
1030
0

MONEY
TRADED

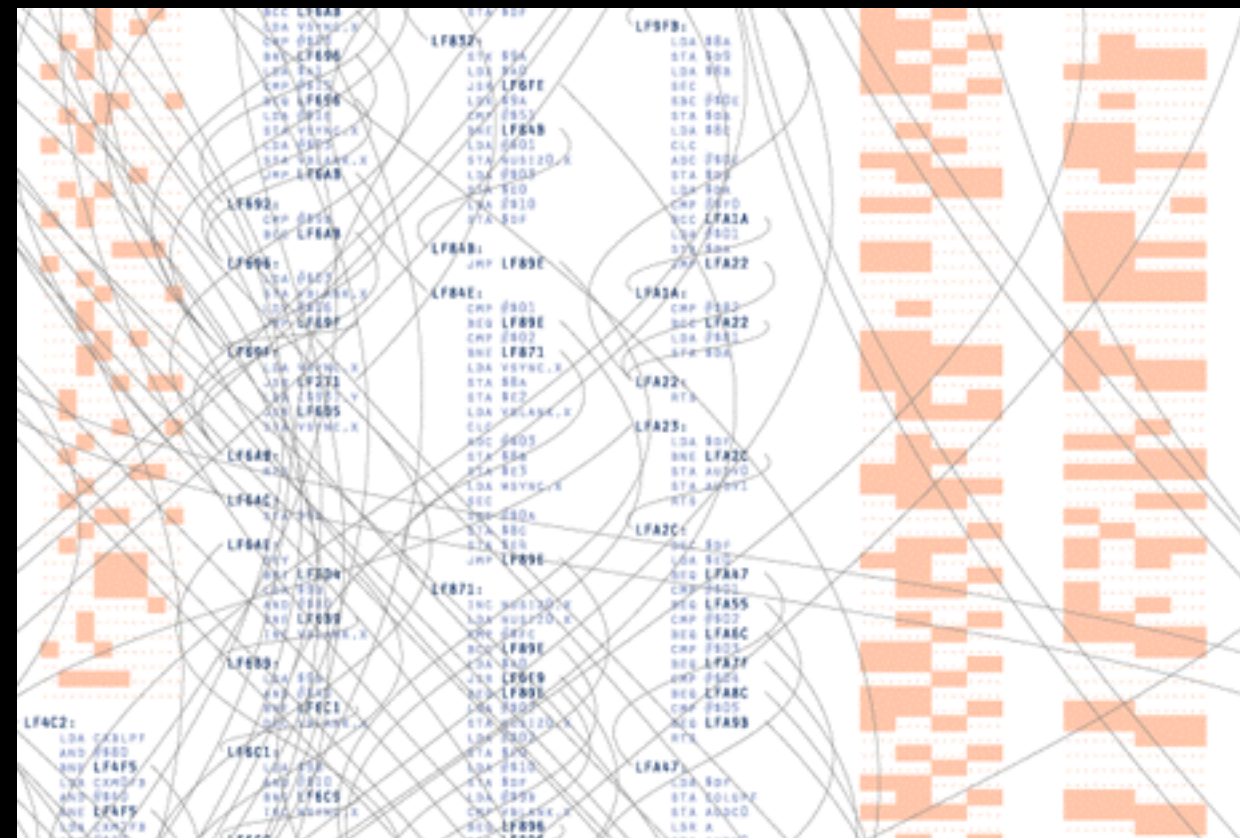
Visualization
as art



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

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.

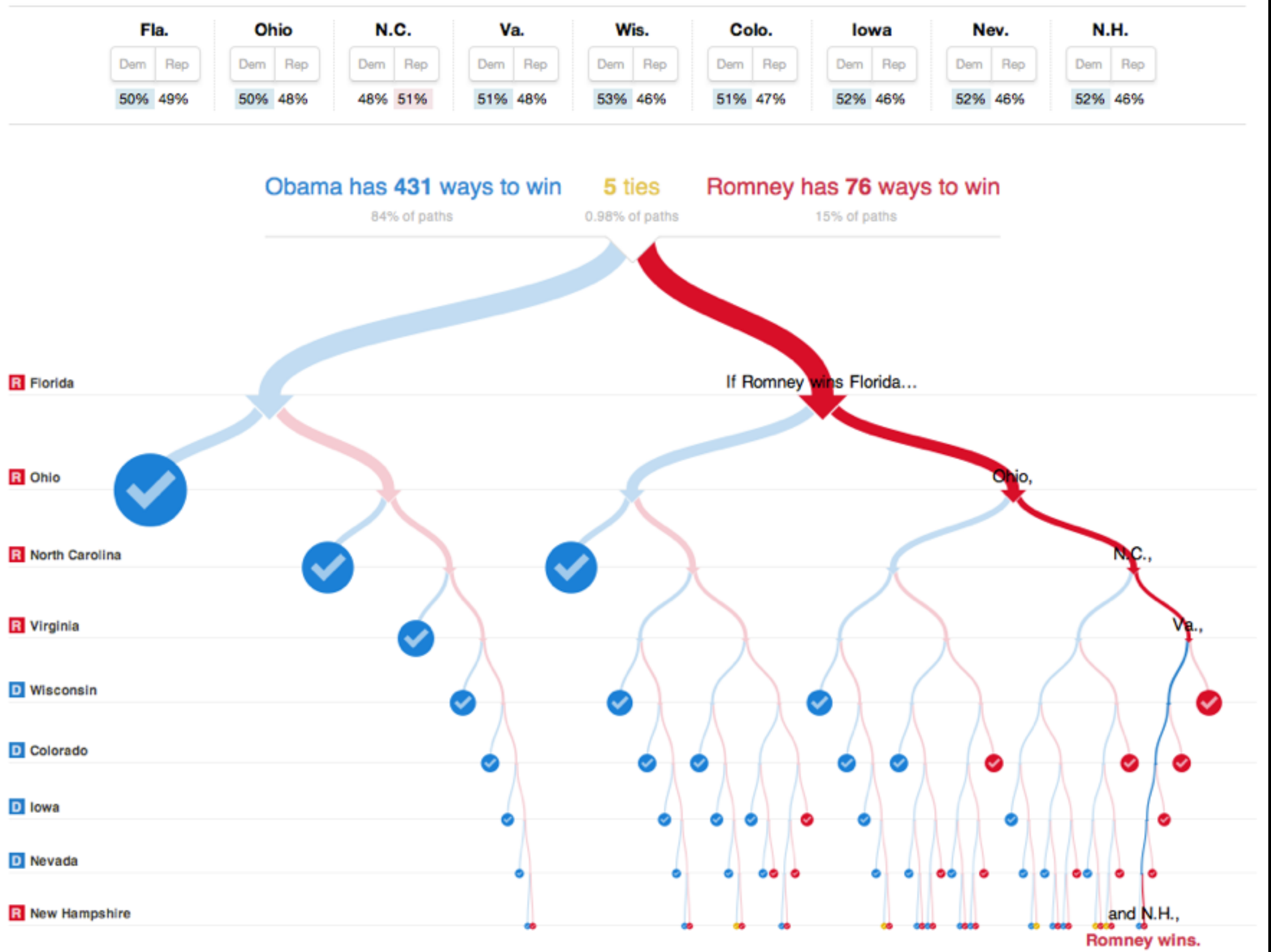


‘Top Grossing Film of All Time’ by Jason Salavon

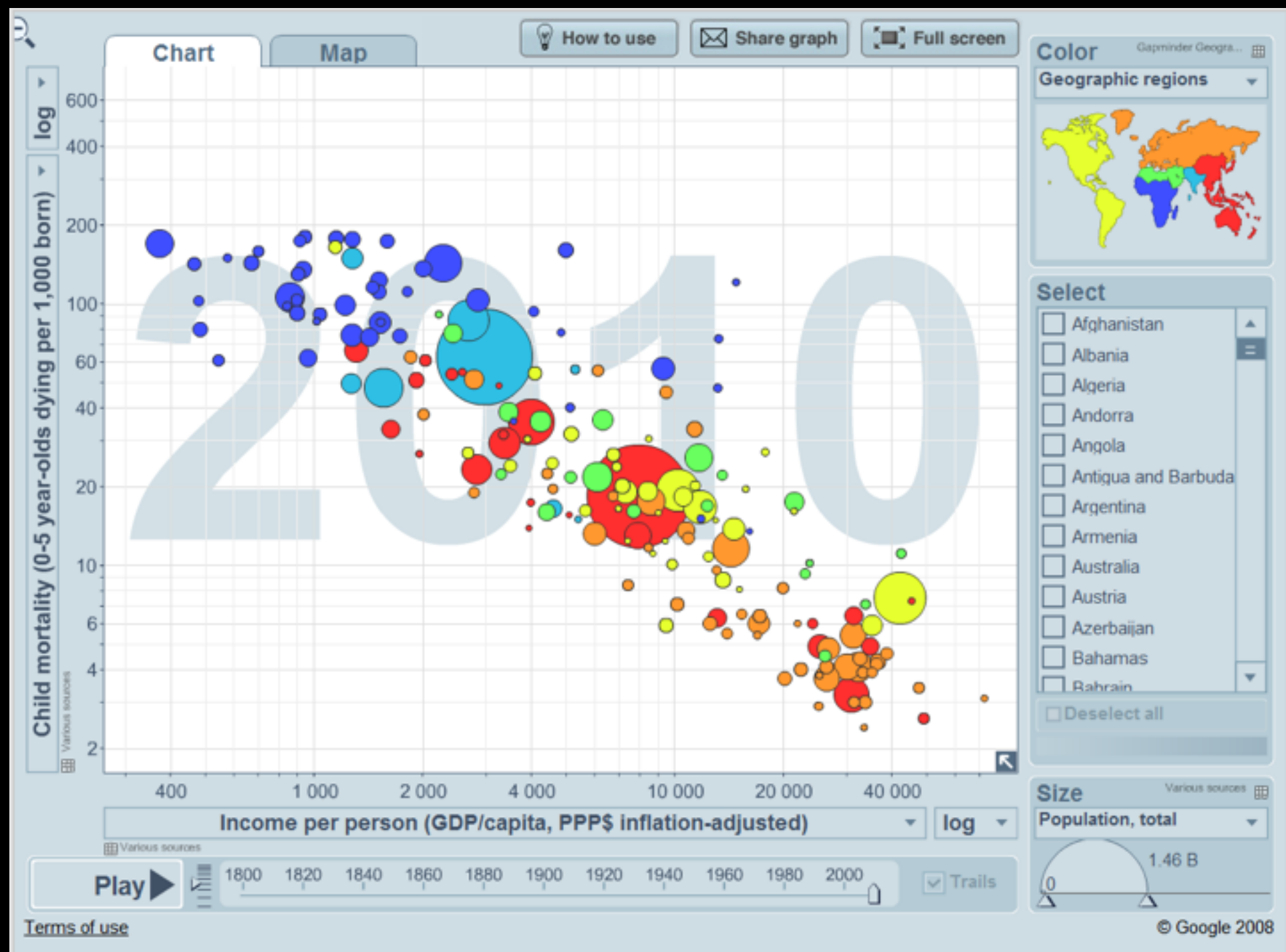


‘Homes for Sale’ by Jason Salavon

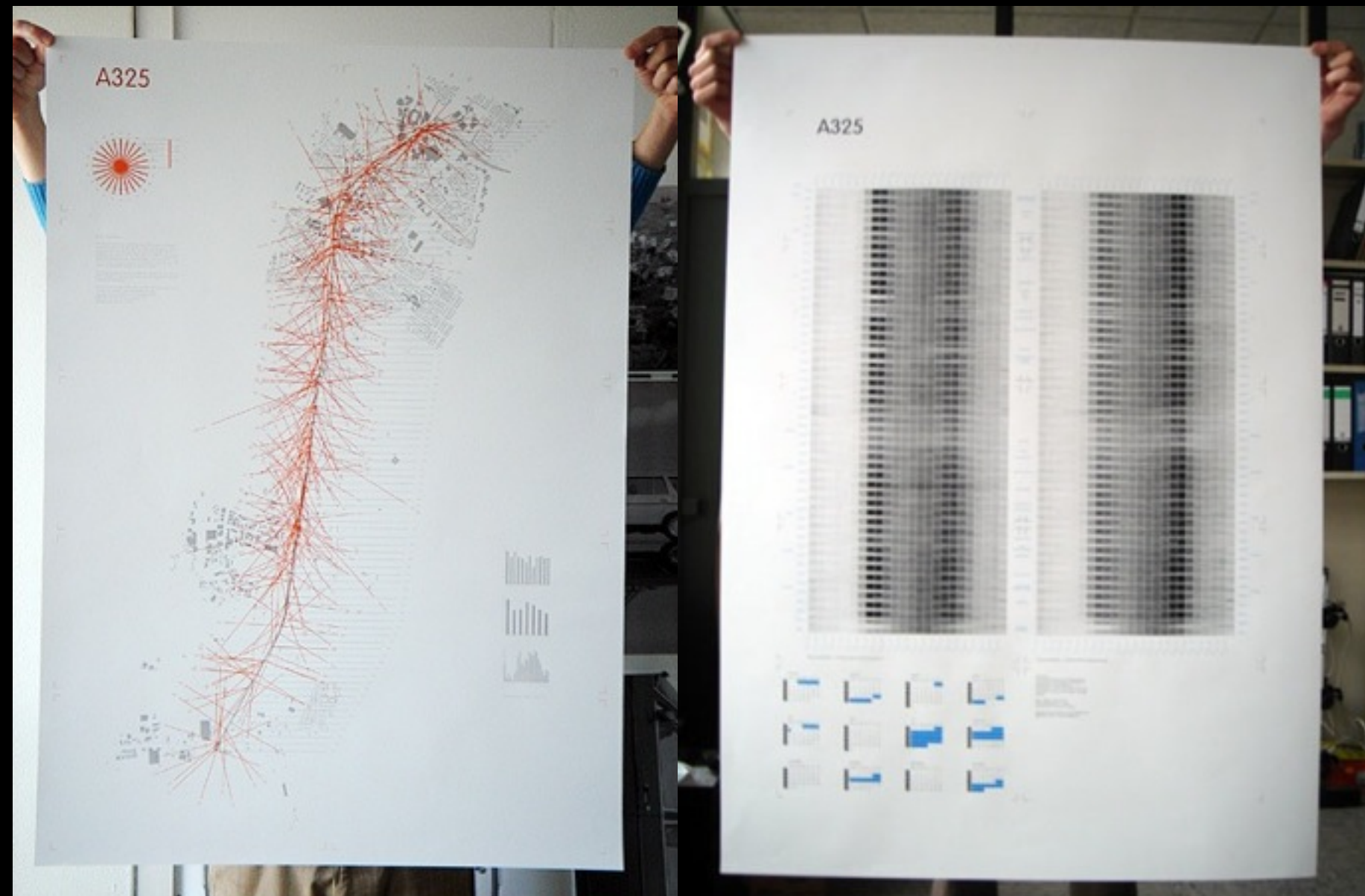
Visualization as an
intuition enabler



N.Y. Times



Gapminder (Neurath's revenge)



A325 highway data from Catalogtree

Heliocentrism



Geocentrism

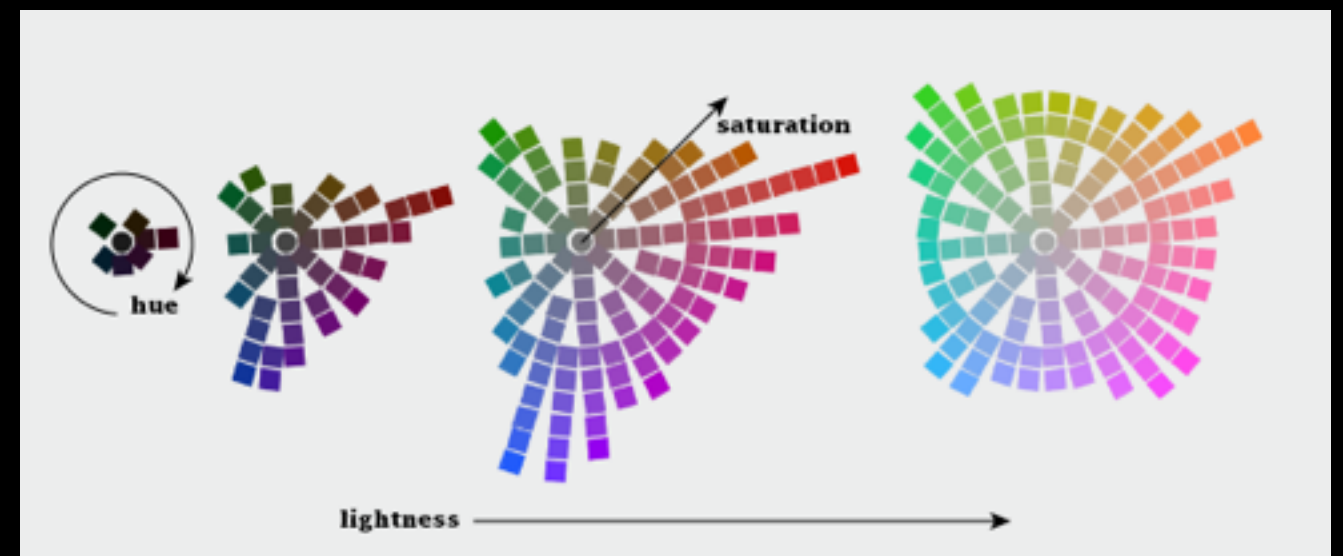
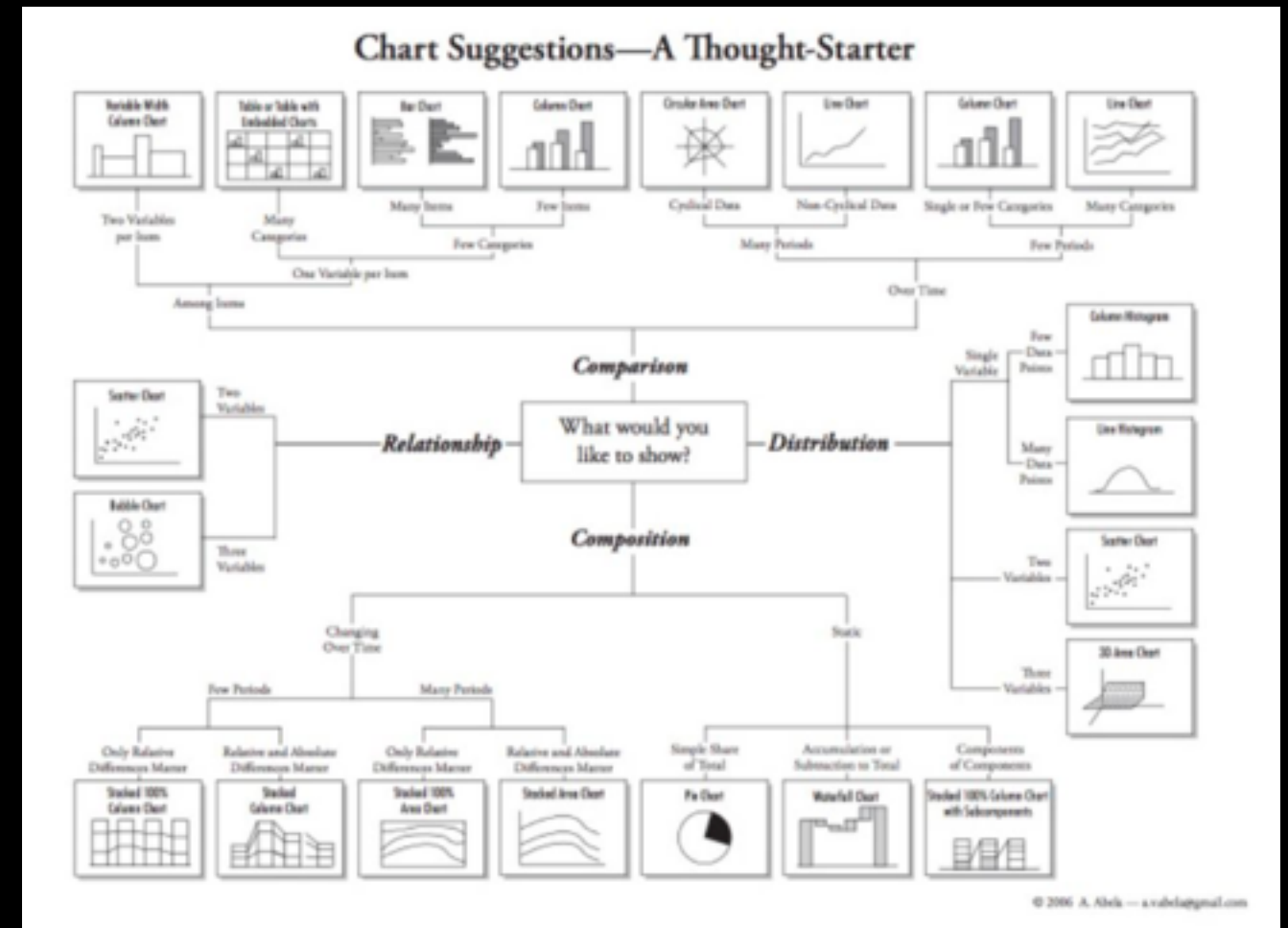
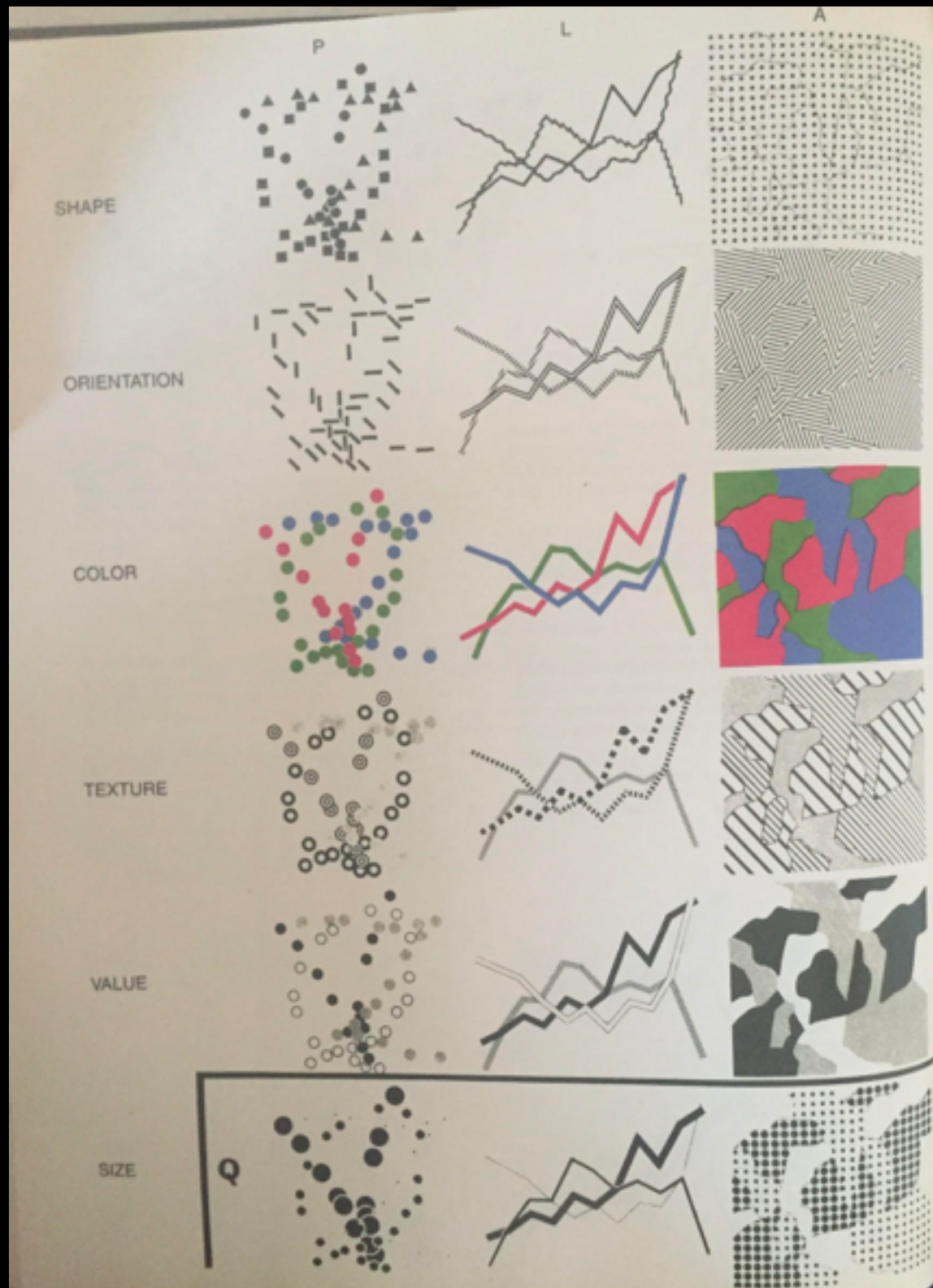


Occam's Razor in action

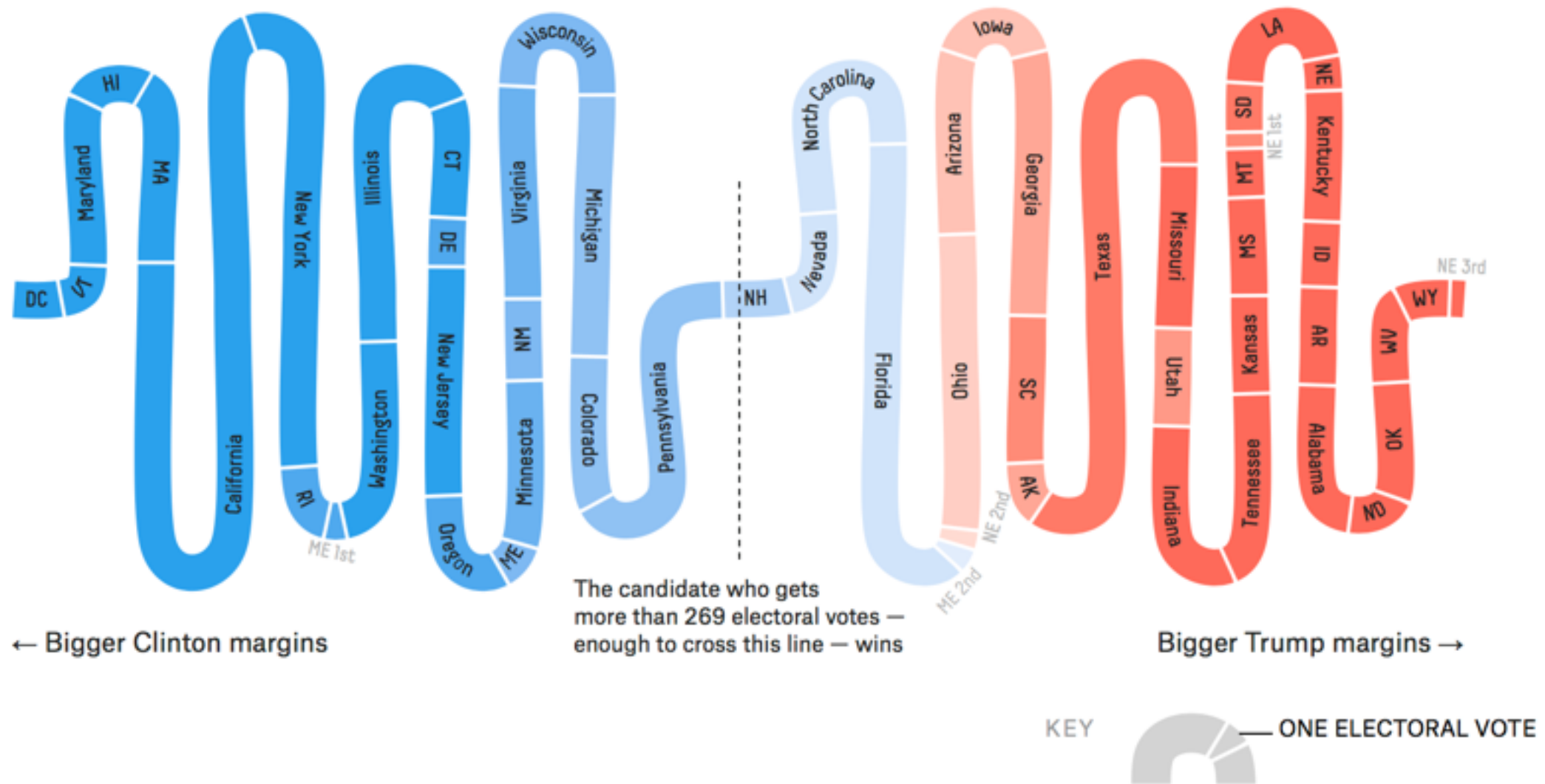
</sermon>

What we'll be doing

Learning about theory & process



Critiquing the work of other, both good...



...and less so



Processing data with spreadsheets...

Nuclear tests 1945–2013 SIGN IN

File Edit View Insert Format Data Tools Add-ons Help Share

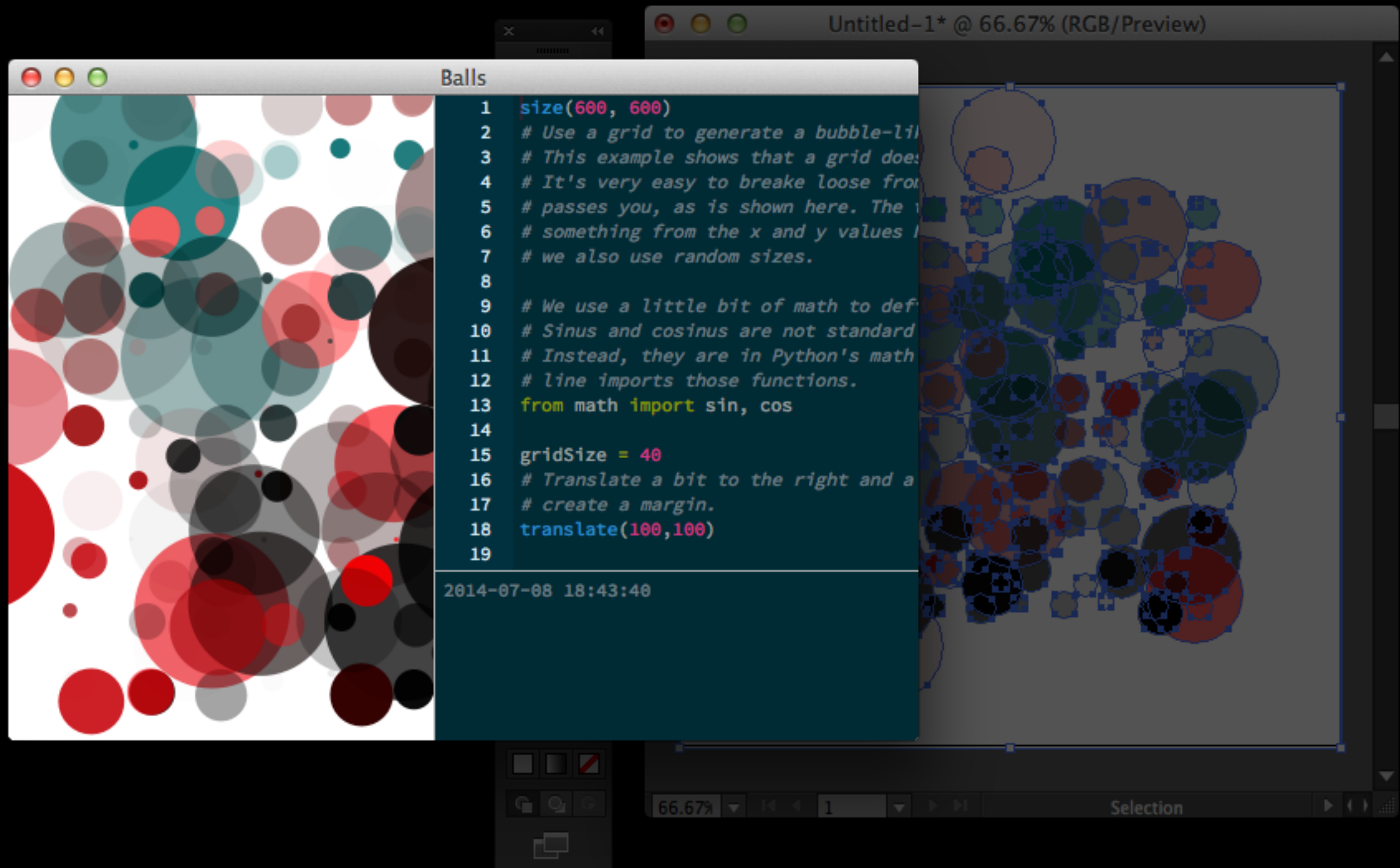
100% View only

	Year								
	A	B	C	D	E	F	G	H	I
1	Year	United States	Russia	United Kingdom	France	China	India	Pakistan	North Korea
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	

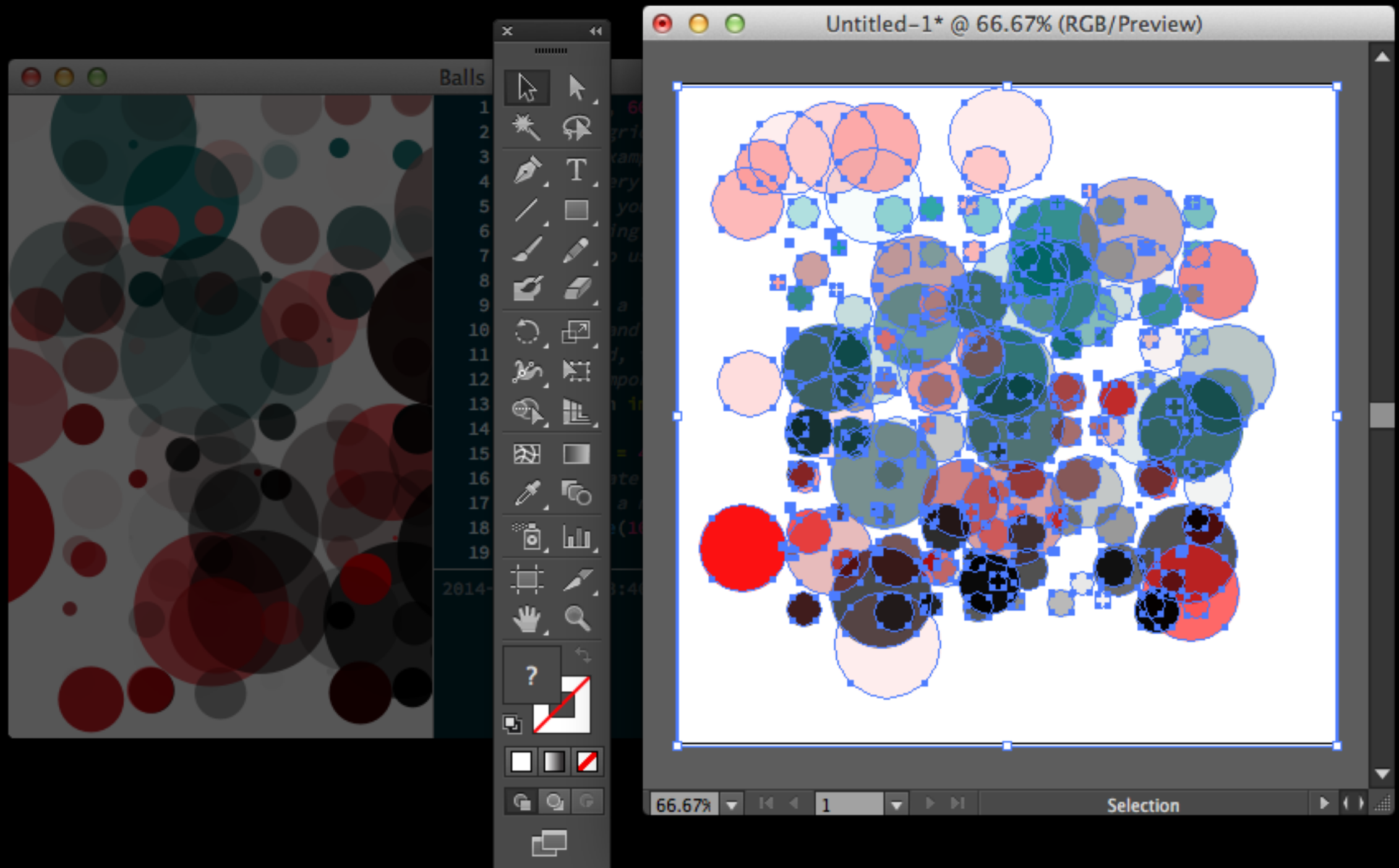
...or even procedurally

```
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-lc
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(aligned=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...

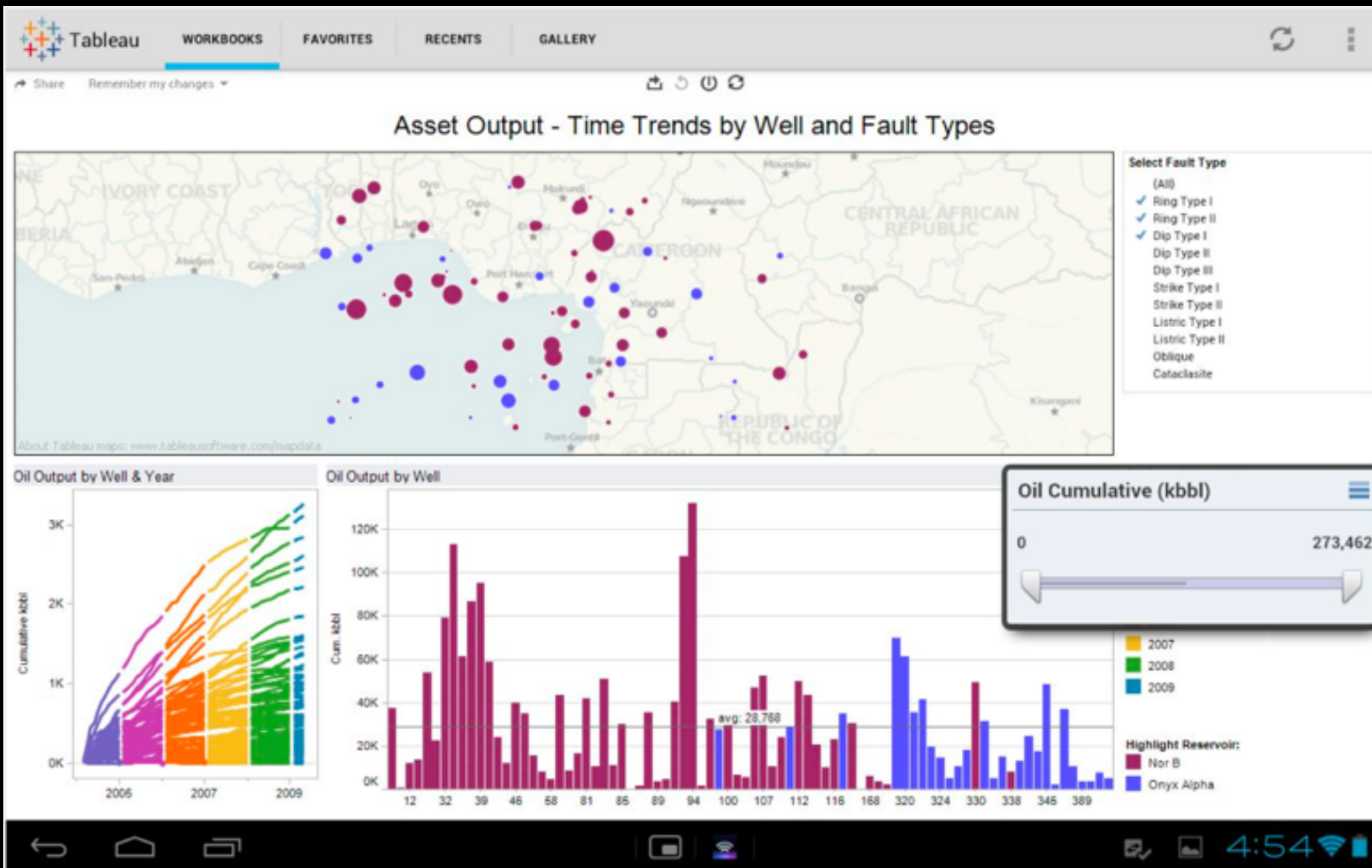


...and fine-tuning them in Illustrator



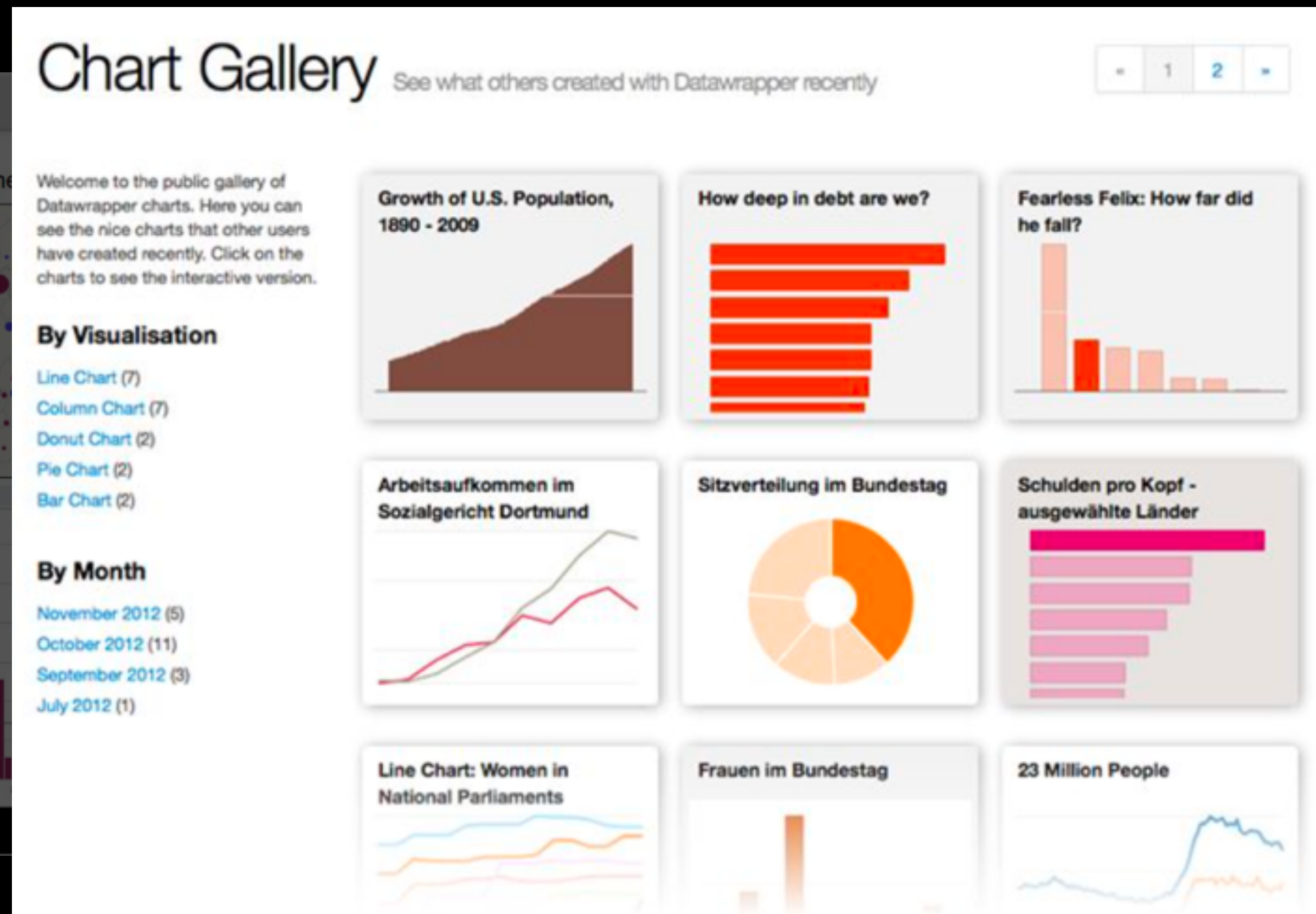
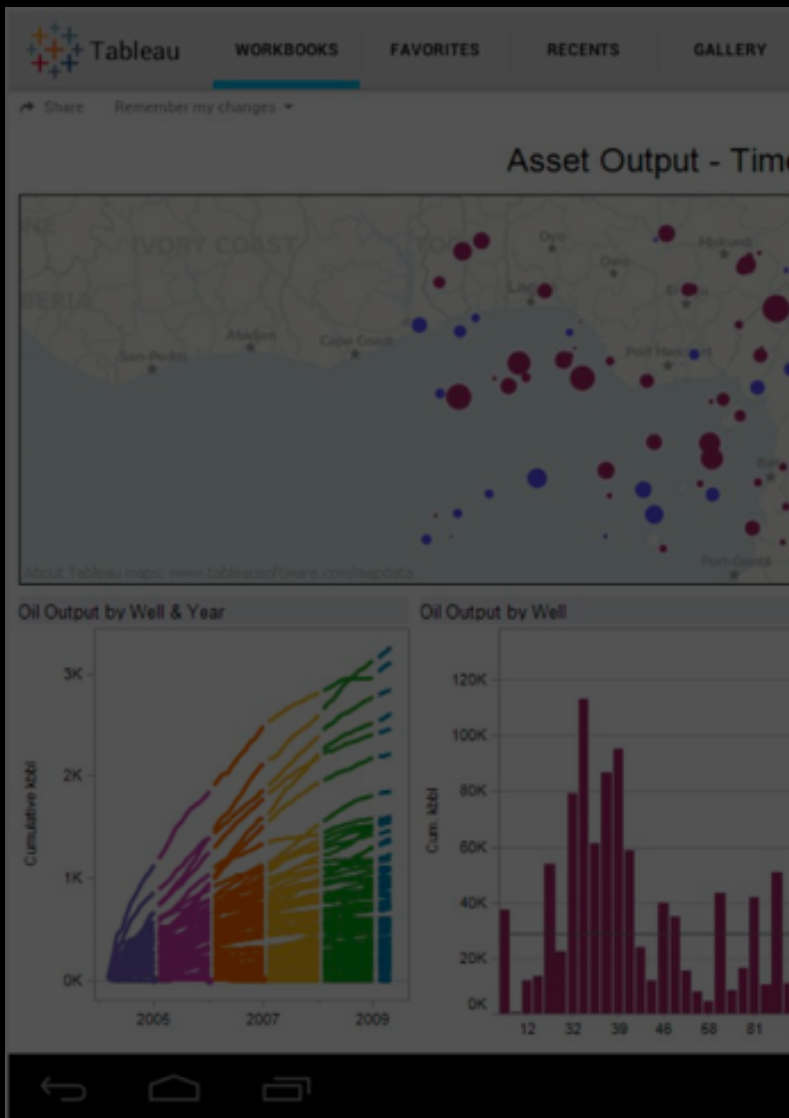
What won't we be
doing?

Doing shopping-oriented design



TABLEAU

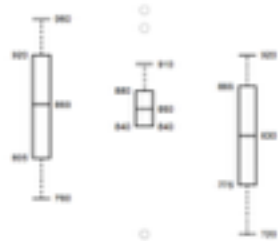
Doing shopping-oriented design



DATAWRAPPER

Using D3 or prioritizing interaction

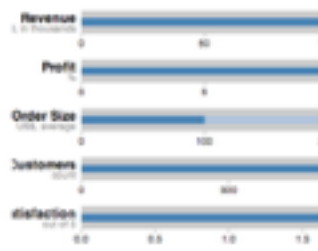
Box Plots



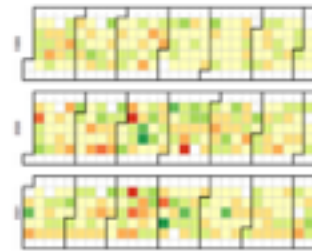
Bubble Chart



Bullet Charts



Calendar View



Non-contiguous
Cartogram



Chord Diagram



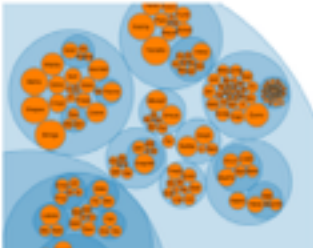
Dendrogram



Force-Directed
Graph



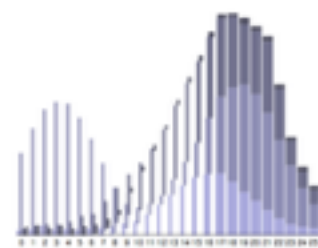
Circle Packing



Population
Pyramid
2000



Stacked Bars



Streamgraph



Sunburst



Node-Link Tree



Treemap



Voronoi Diagram



Data-Driven Documents

- [Home](#)
- [Gallery](#)
- [Examples](#)
- [Tutorials](#)
- [Plugins](#)

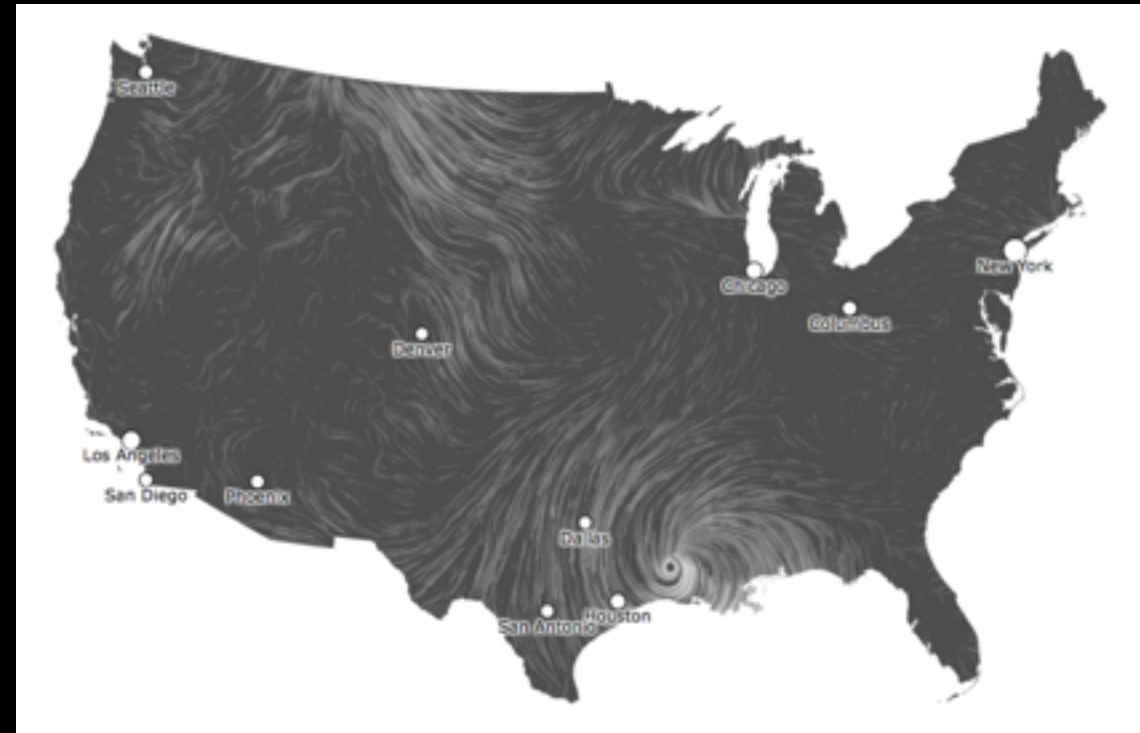
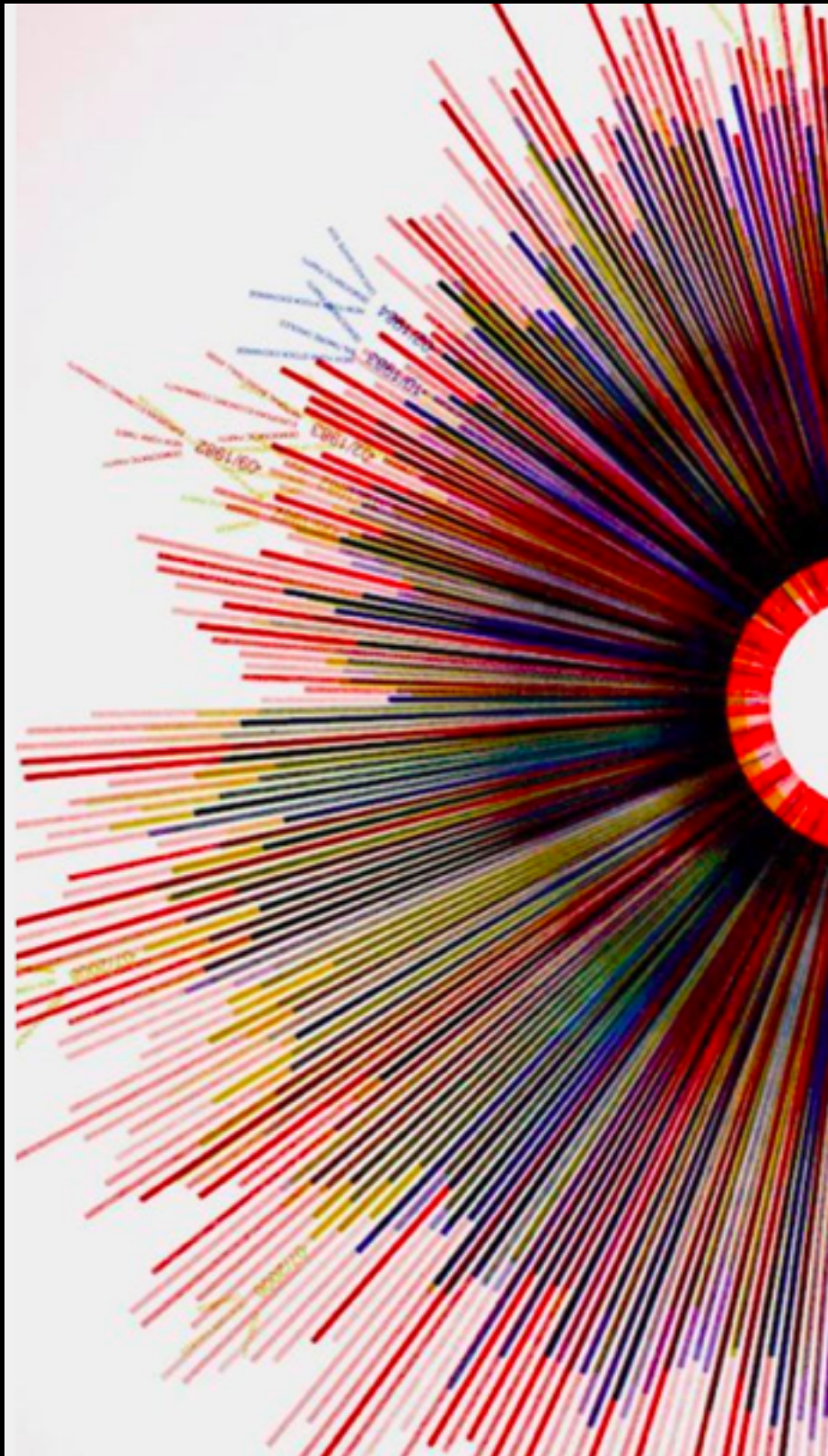
Help

- [Stack Overflow](#)
- [Slack](#)
- [Google Group](#)
- [Gitter](#)

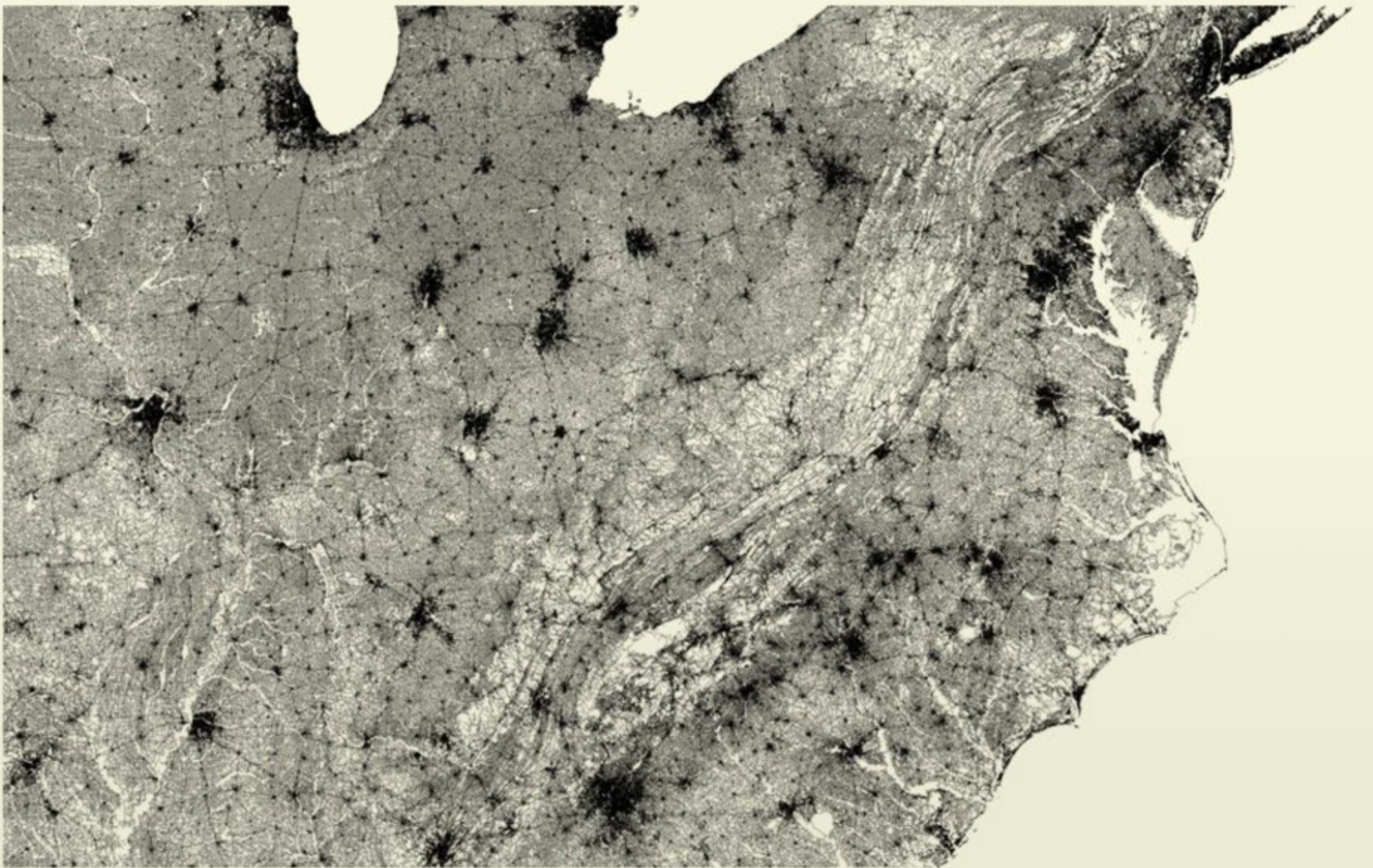
API Reference

- [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.

