Maps

DSC 106: Data Visualization

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UC San Diego

Announcements

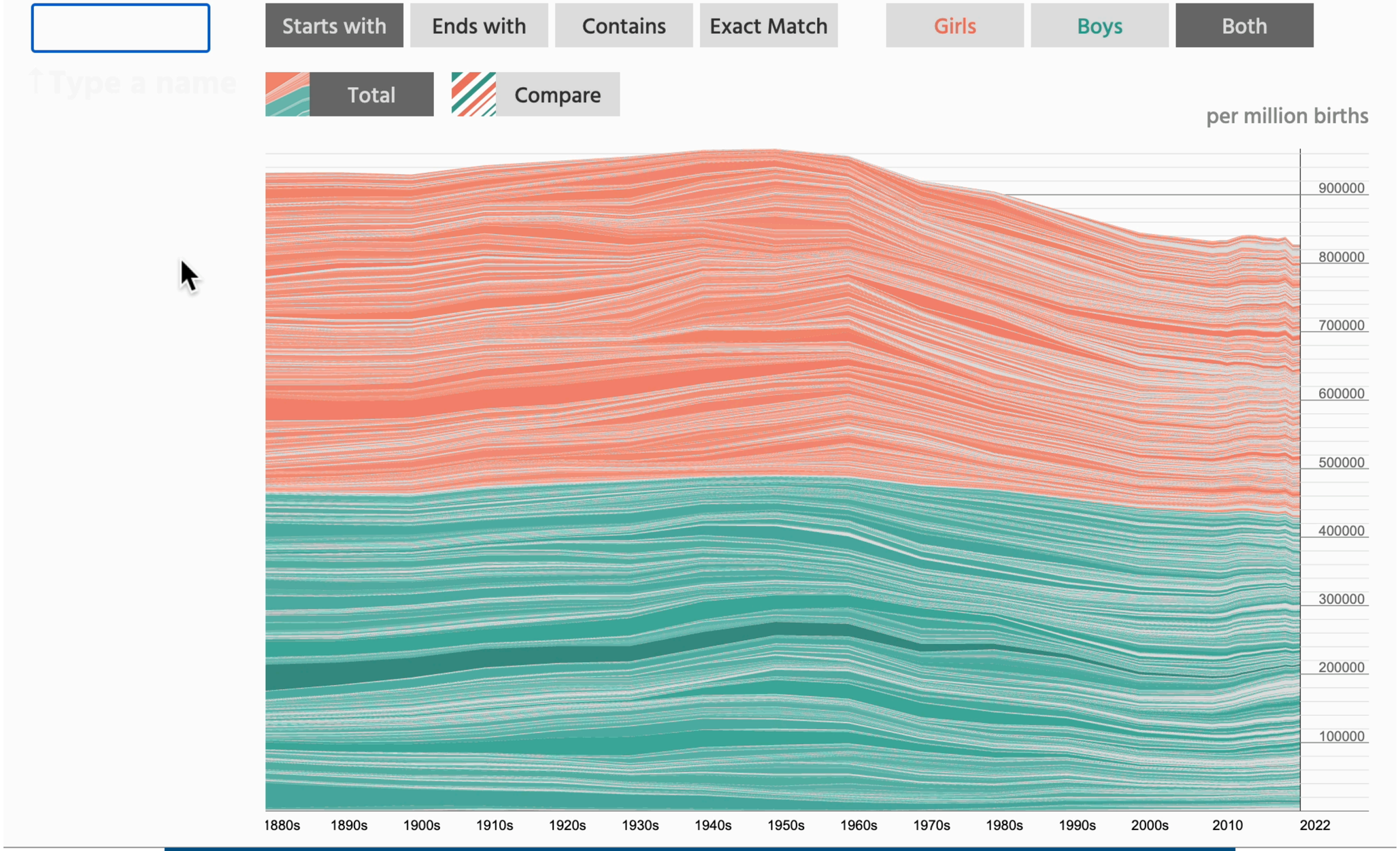
Lab 5 out, due Friday.

Project 2 peer feedback due Friday.

Project 3 out, due on 2/16.

FAQs:

1. Help, I don't understand D3?? Start by understanding basic examples: scatter plot, line plot, bar plot.
2. How complicated does my Project 3 need to be? Interaction can be basic. More importantly: how does your interaction help user explore interesting pieces of data?



https://namerology.com/baby-name-grapher/

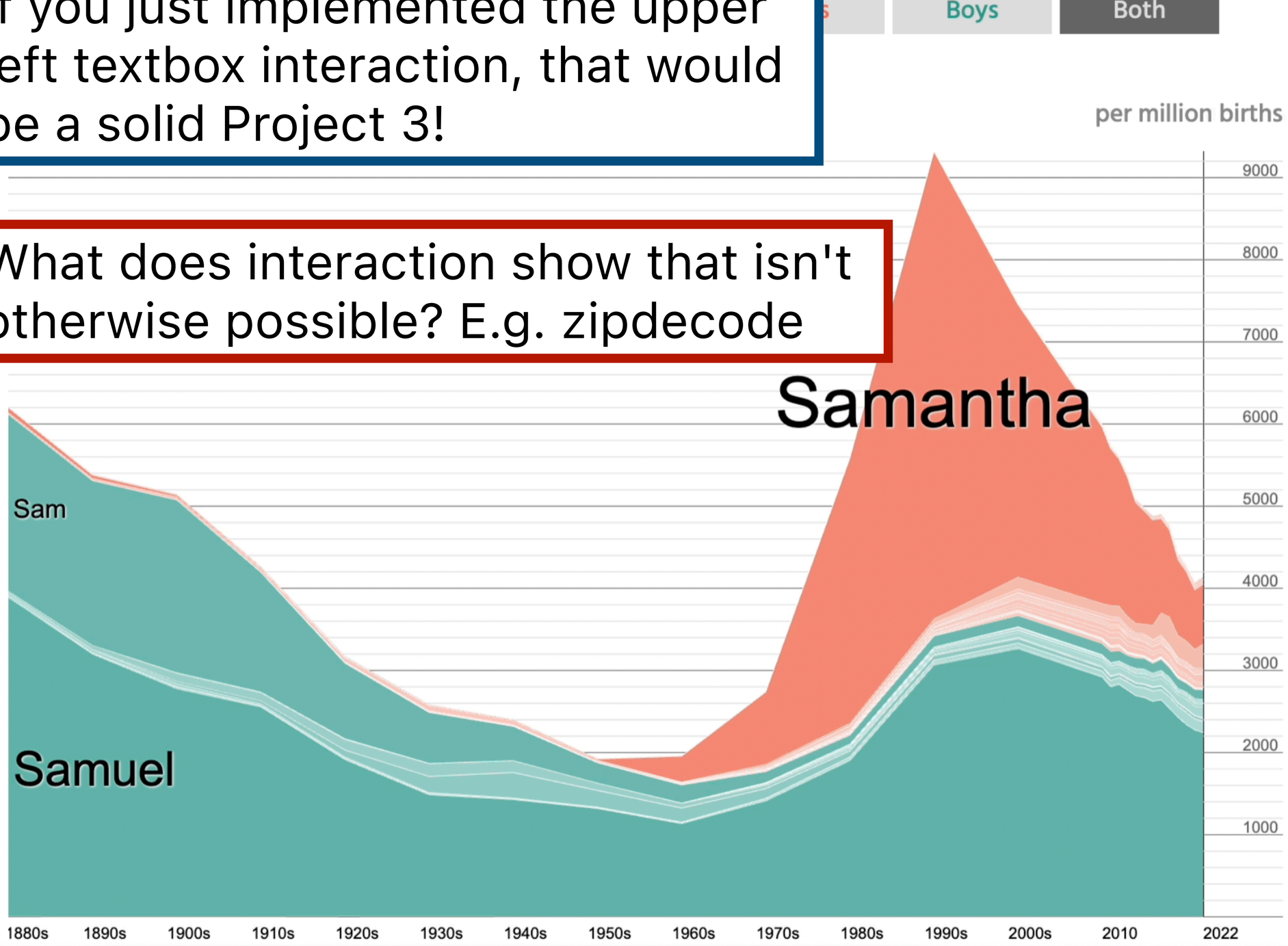
sam

Sam M
Sam F
Samuel M
Samantha F
Samara F
Sammy M
Samson M
Samir M
Samira F
Sammie M
Samiyah F
Samiya F
Sami M
Sammie F
Samaya F

And 24 more...

If you just implemented the upper left textbox interaction, that would be a solid Project 3!

What does interaction show that isn't otherwise possible? E.g. zipdecode



Example: Horizontal Bar Chart

https://observablehq.com/@d3/horizontal-bar-chart/2

Observable gotchas

Creates all elements in d3

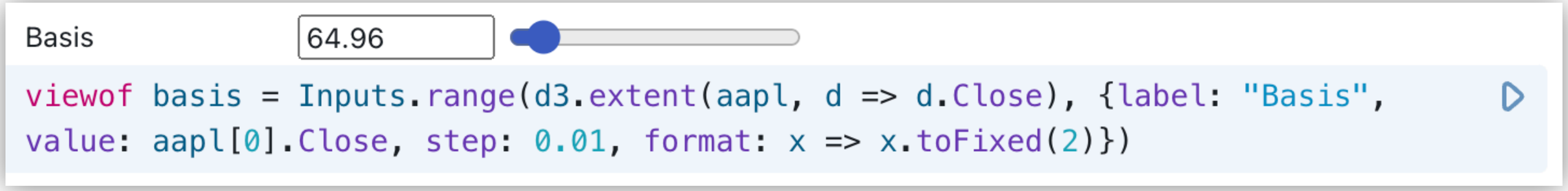
```
// Append a rect for each letter.
svg.append("g")
    .attr("fill", "steelblue")
  .selectAll()
  .data(alphabet)
  .join("rect")
    .attr("x", x(0))
    .attr("y", (d) => y(d.letter))
    .attr("width", (d) => x(d.frequency) - x(0))
    .attr("height", y.bandwidth());
```

Equivalent code in svelte

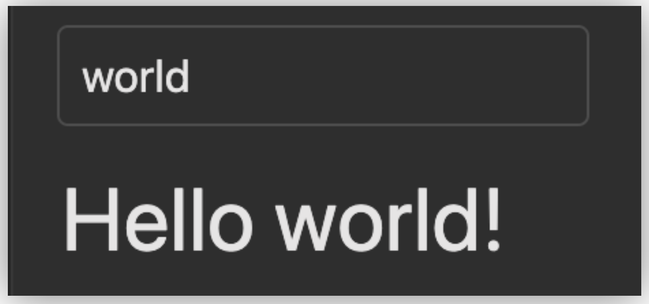
```
<g fill="steelblue">
  {#each data as d, i}
    <rect
      key={i}
      x={x(0)}
      y={y(d.letter)}
      width={x(d.frequency) - x(0)}
      height={y.bandwidth()}
    />
  {/each}
</g>
```

Observable gotchas

Input elements use Observable-specific code

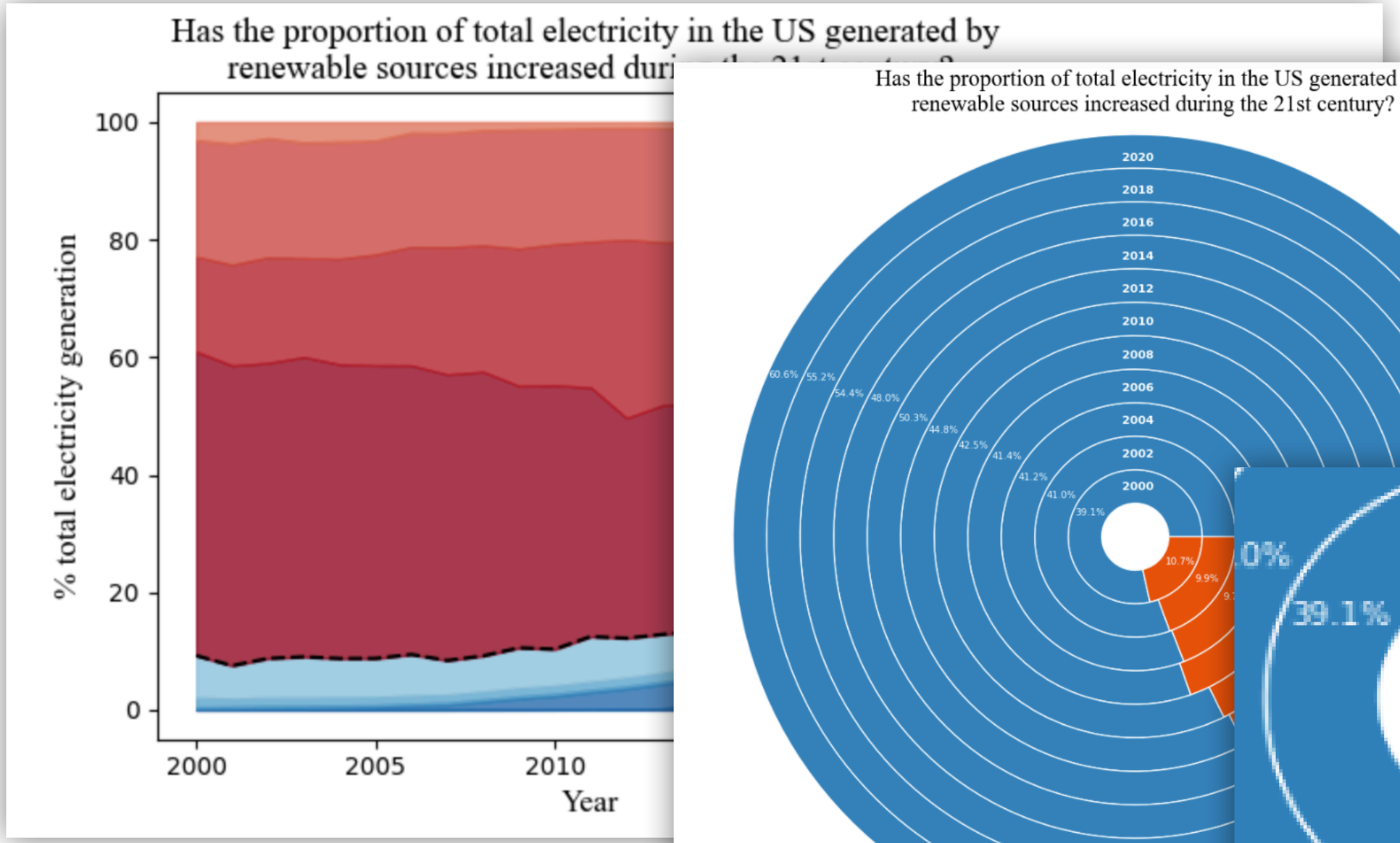


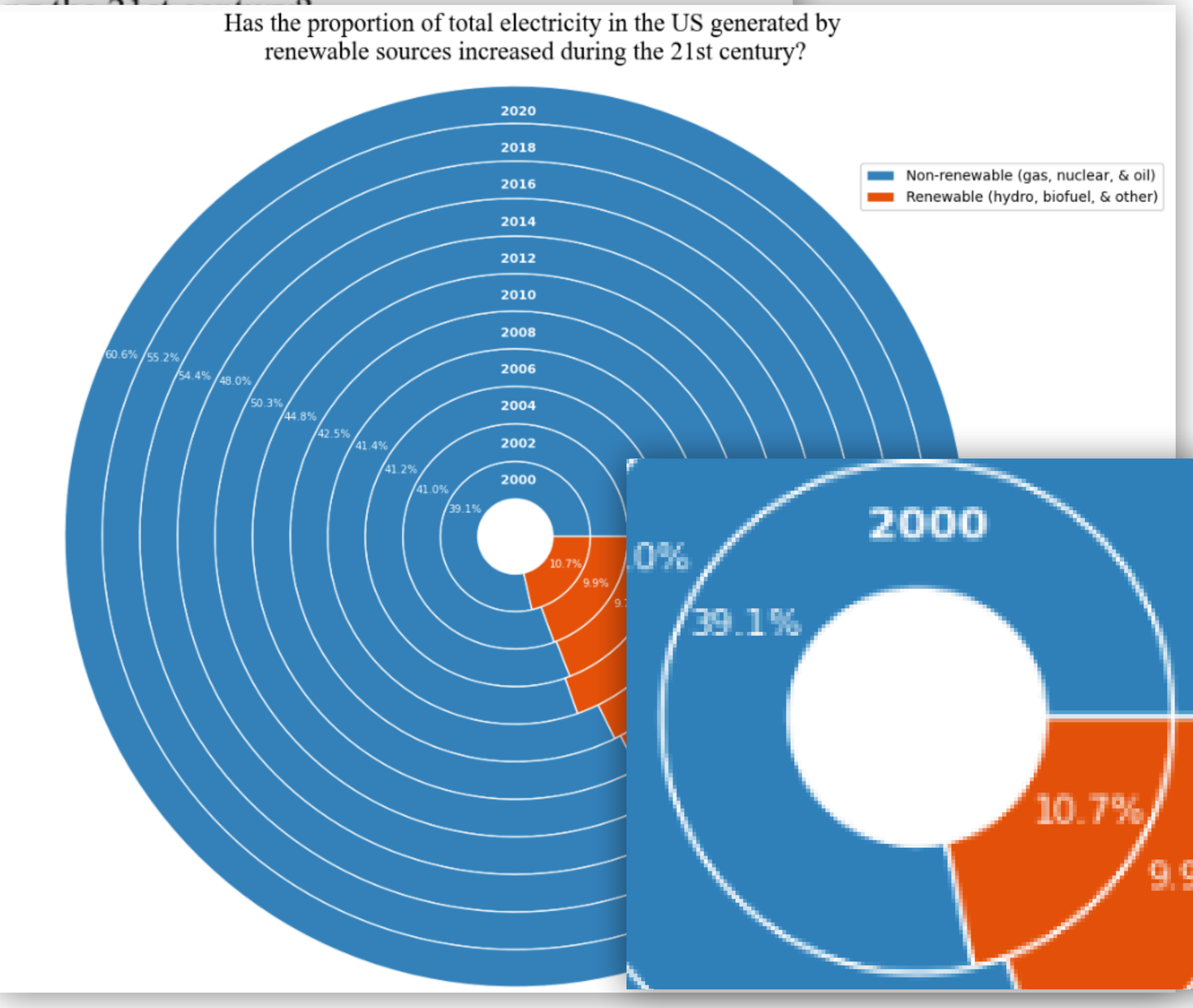
Svelte: Use standard HTML form inputs with svelte bindings

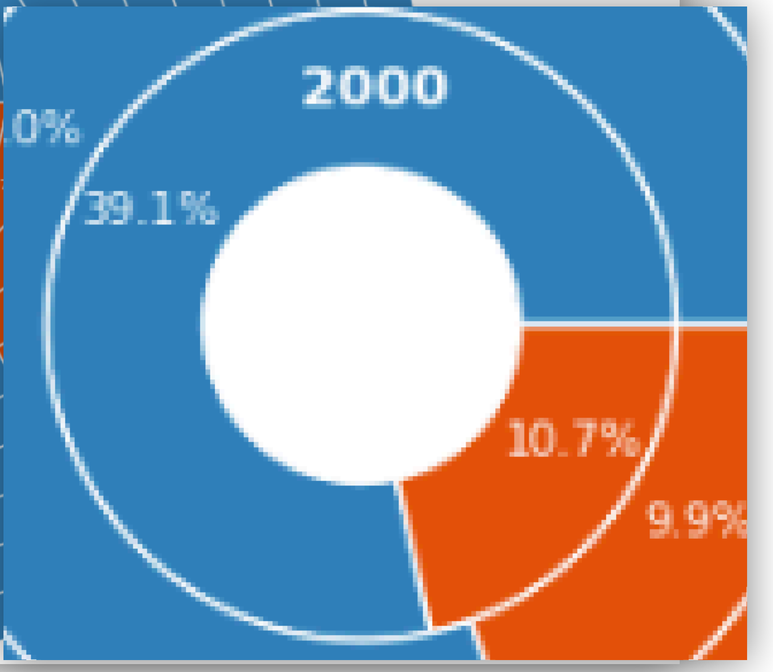



```
<script>
  let name = 'world';
</script>

<input bind:value={name} />

<h1>Hello {name}!</h1>
```

Neat Project 2 Submissions!



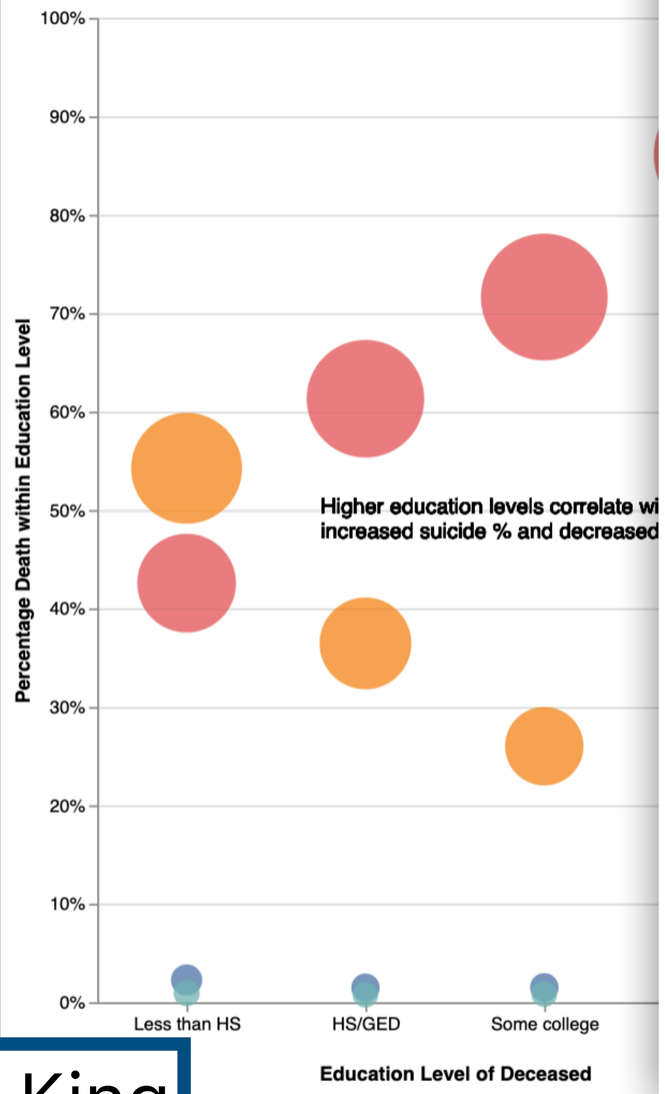




Saathvik Dirisala

Lessons in Loss:
Understanding Reasons for Gun Mortalitie

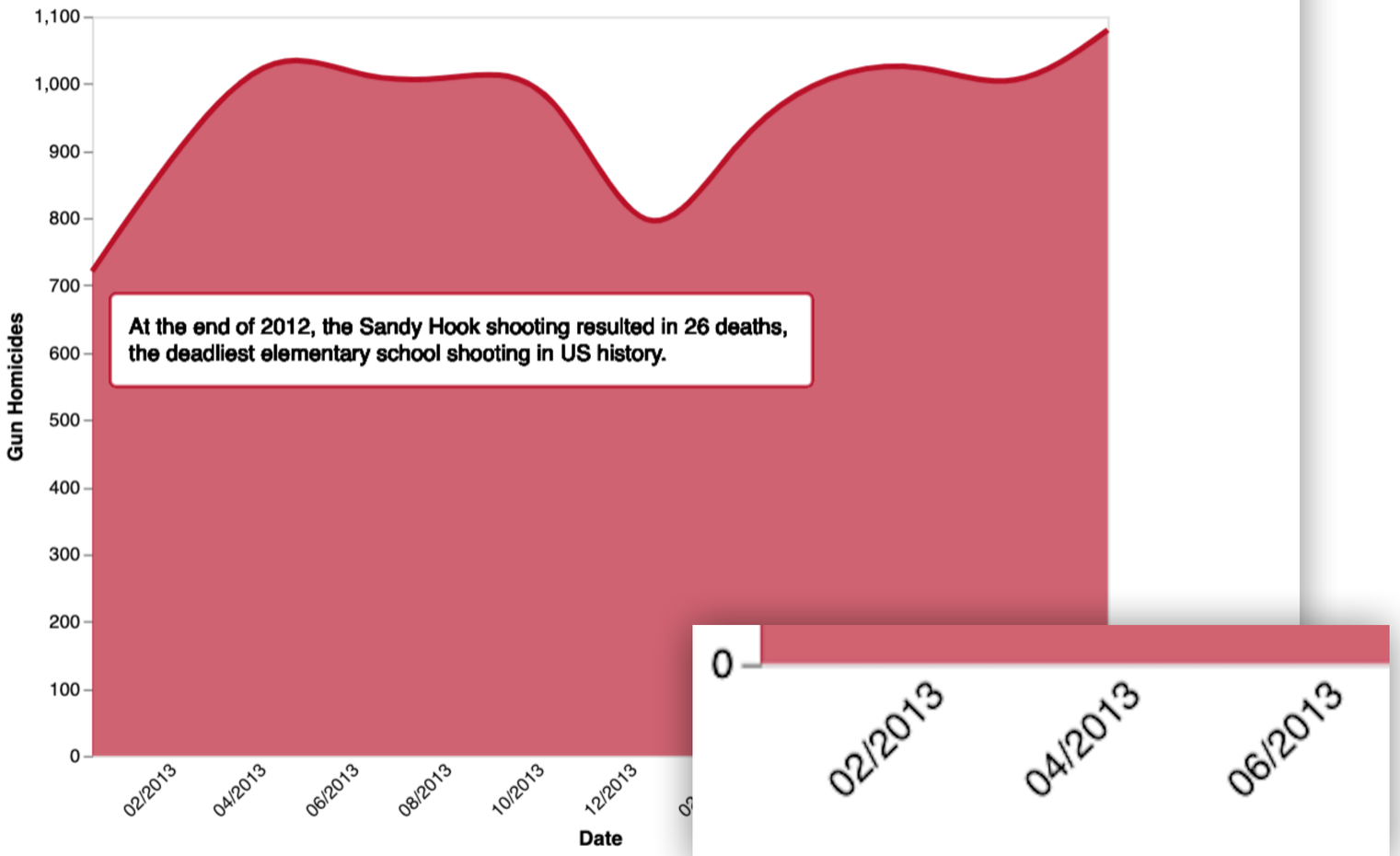
Are there notable differences in the distribution of gun death causes
How does gun fatalies vary across different educational backgrounds



m the CDC by Masood Ahmed – "Gun Deaths in America" (2012-2014)

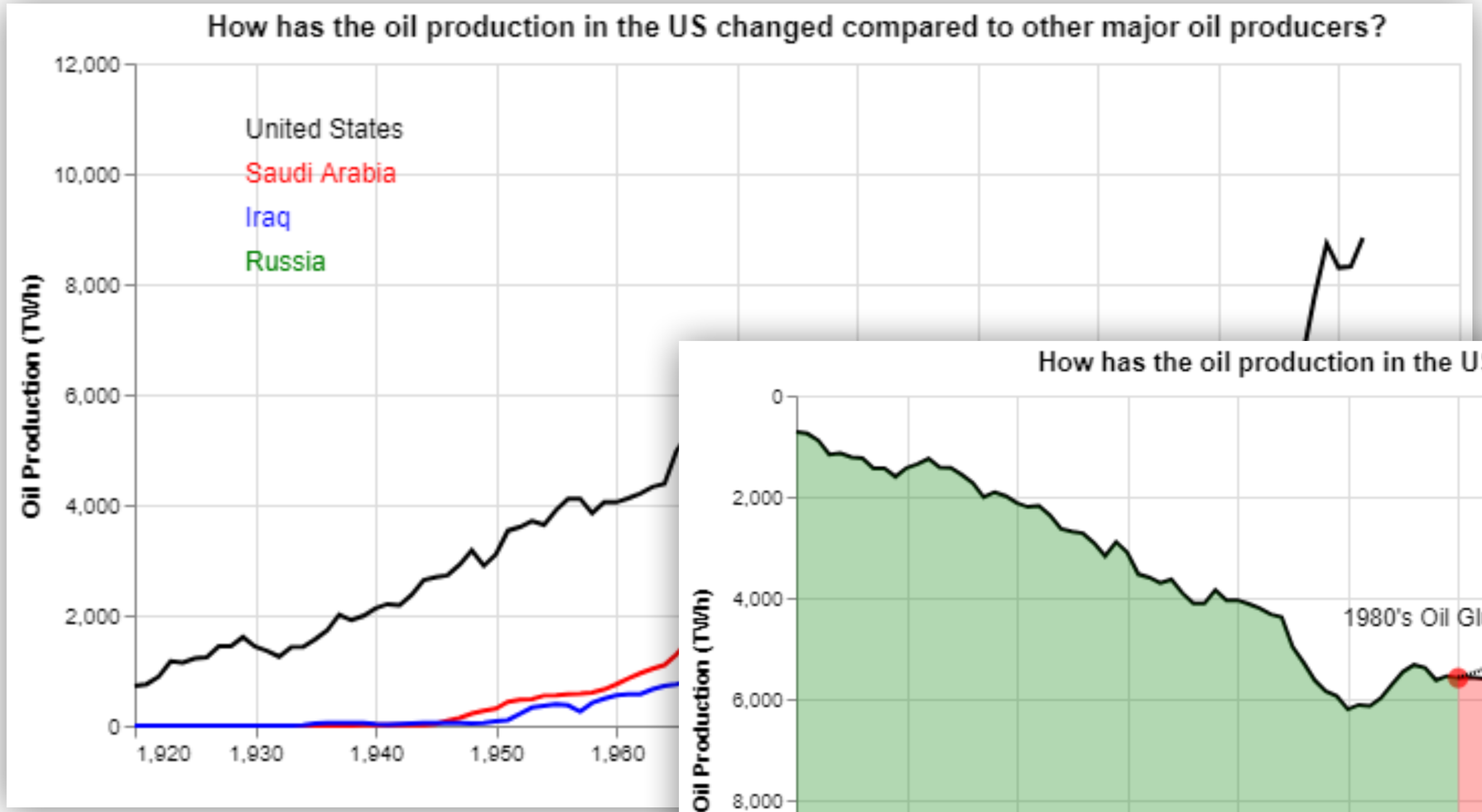
"Deadly Publicity"
Rising Trend in US gun homicides after Sandy Hook Elementary School Shooting

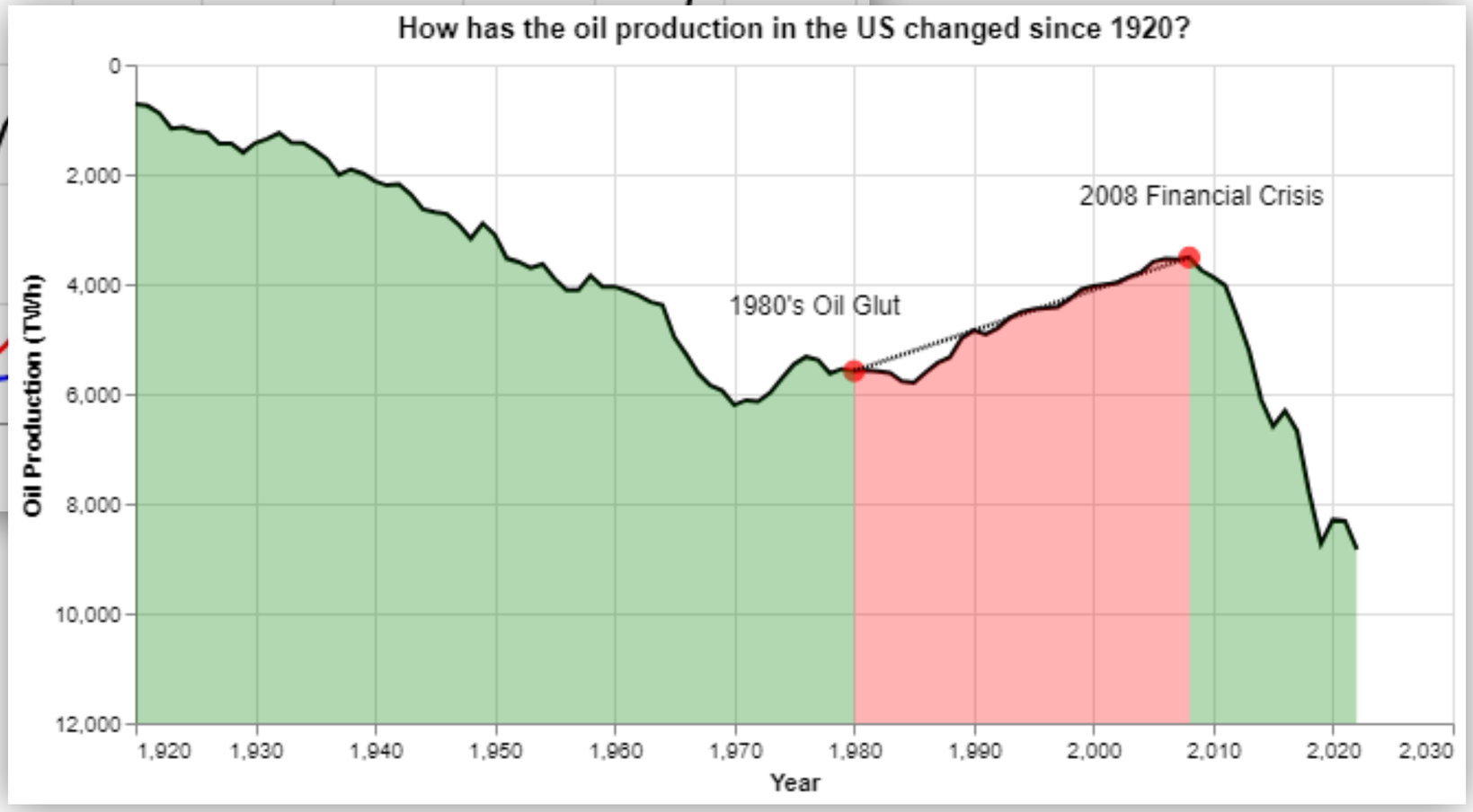
"Did the heightened media attention on Sandy Hook correlate with an observed increase in gun homicides in the US?"
The Sandy Hook shooting was one of the deadliest American shooting homicides, publicizing gun violence on a new scale.
Has its notoriety triggered more gun homicides since?



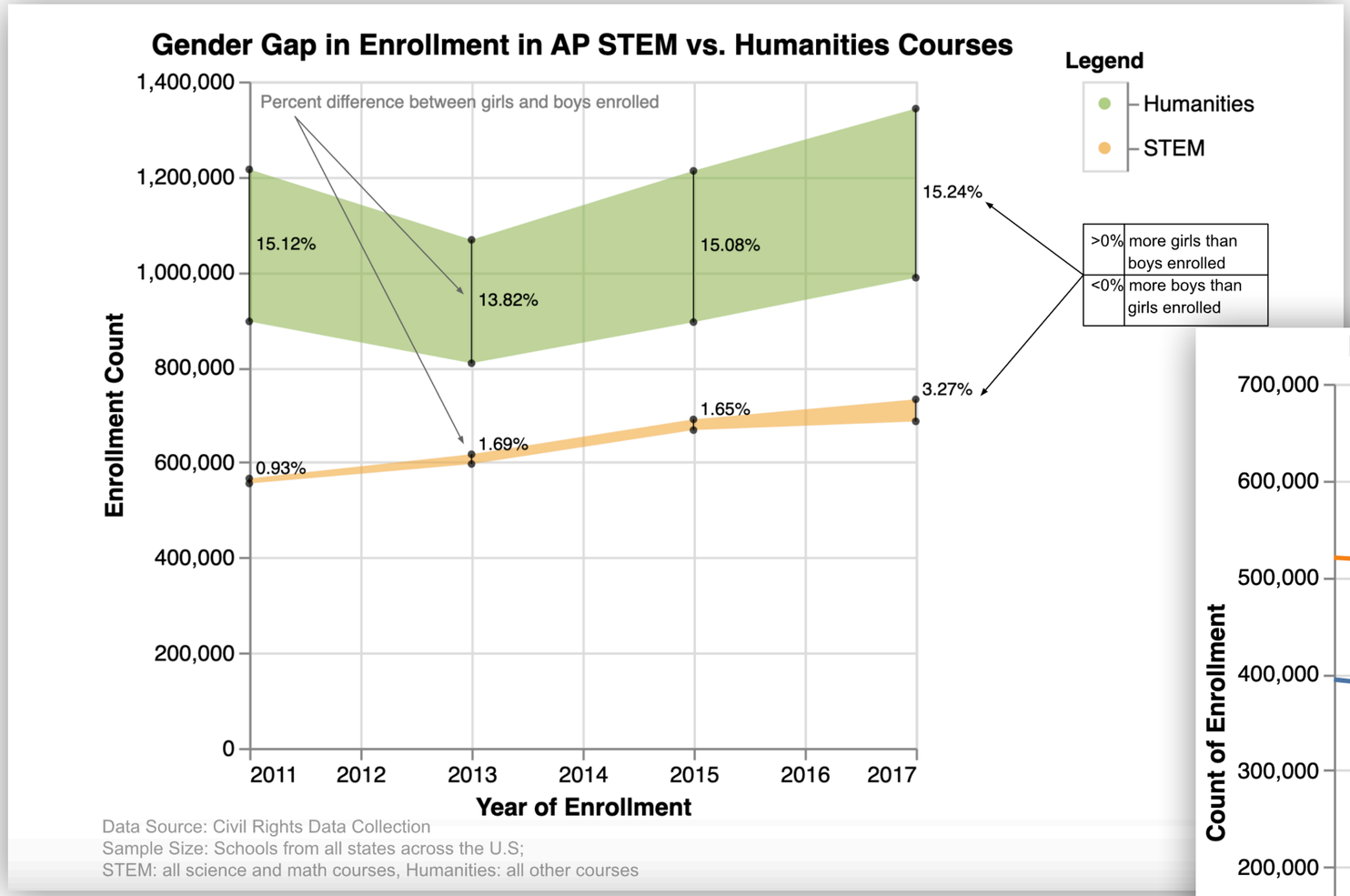
Data scraped from the CDC by Masood Ahmed – "Gun Deaths in America" (2012-2014)

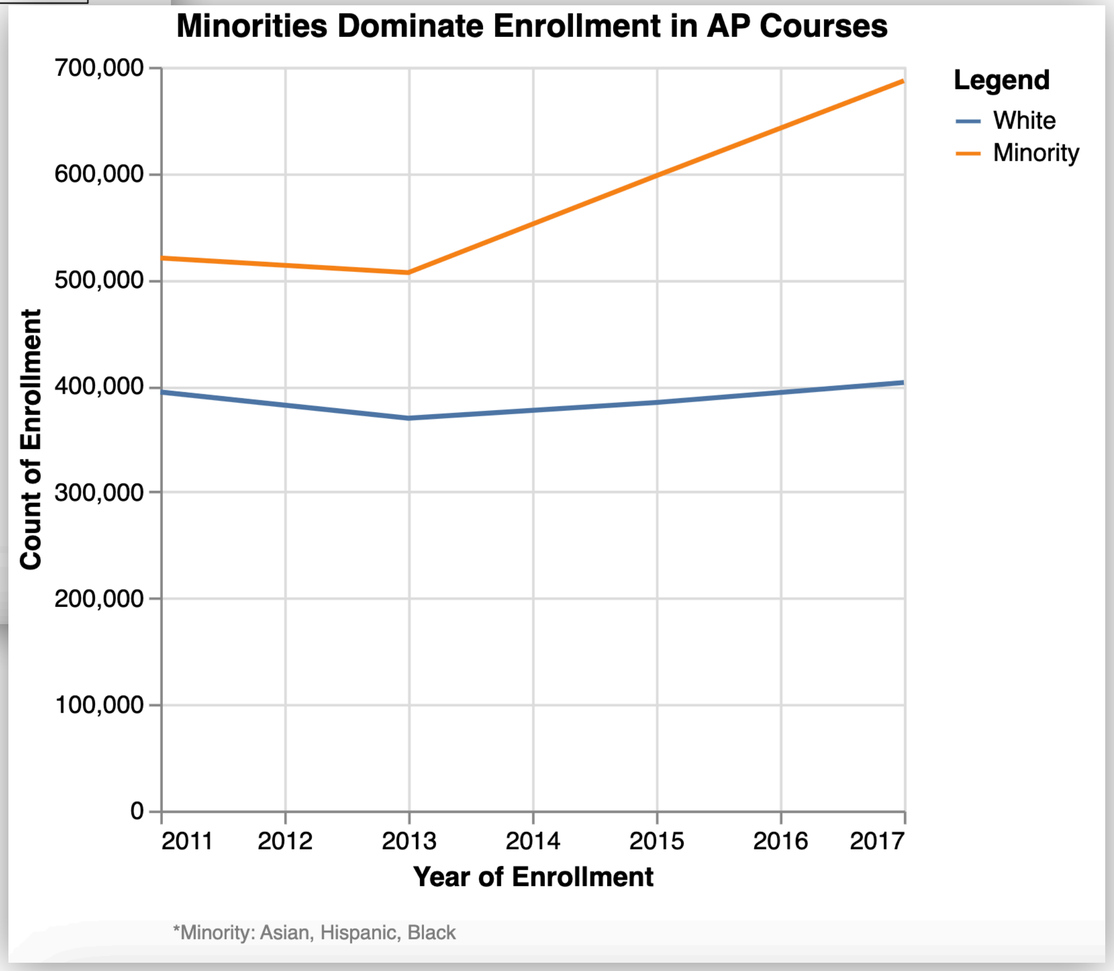
Penny King



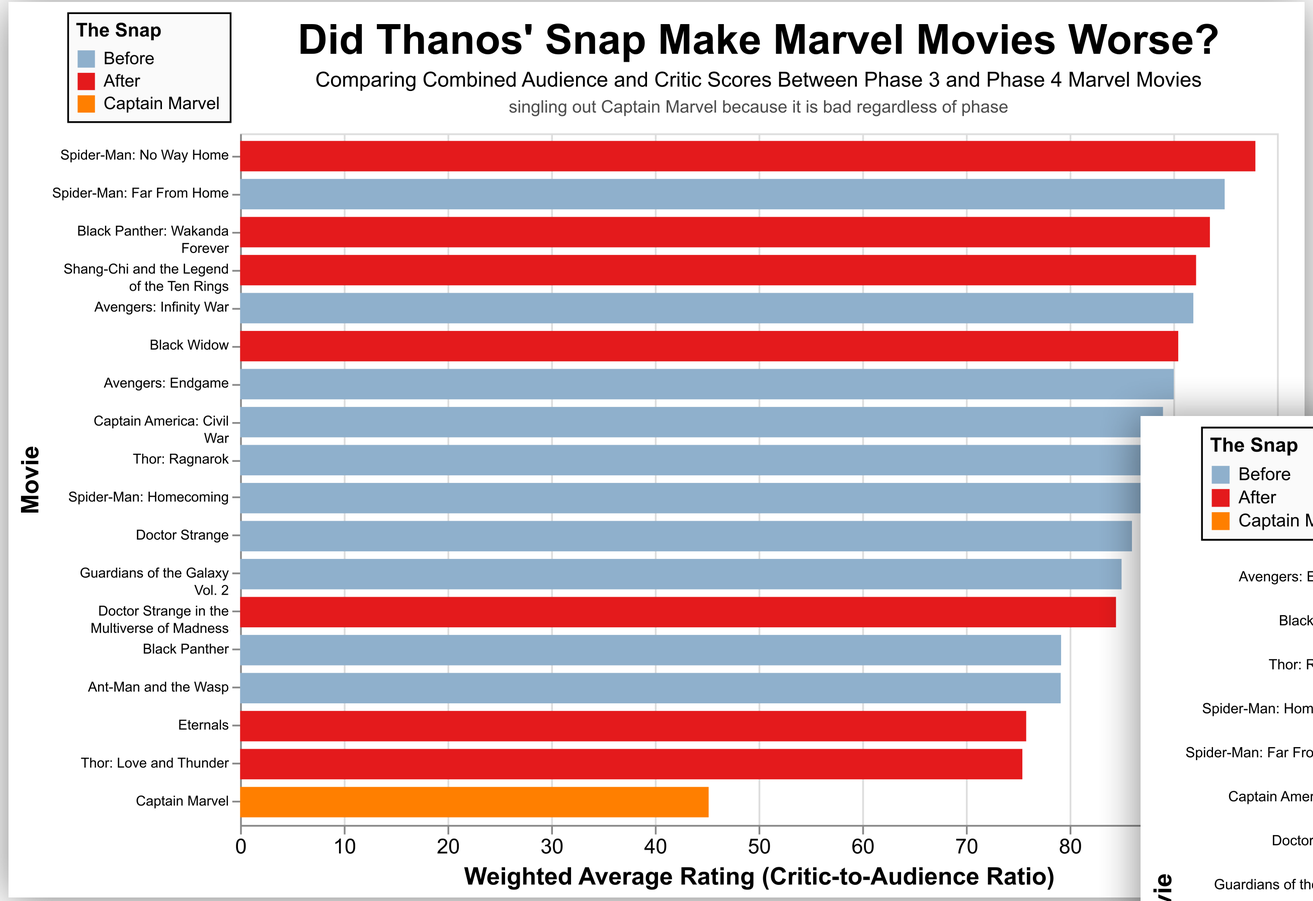


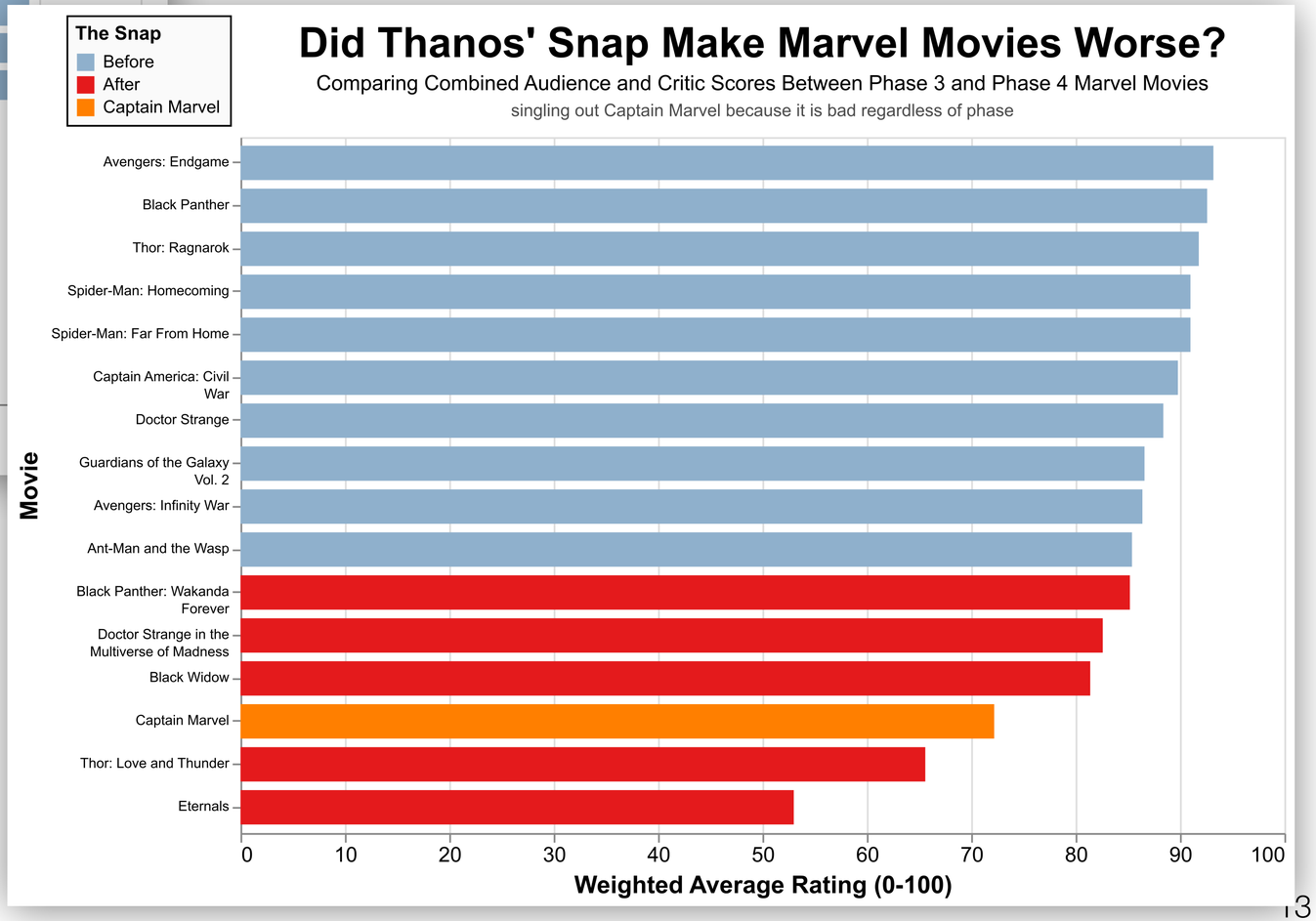
Haakon K. Garfjell





Anastasiya Markova


The Snap
Before
After
Captain Marvel
Did Thanos' Snap Make Marvel Movies Worse?
Comparing Combined Audience and Critic Scores Between Phase 3 and Phase 4 Marvel Movies
singling out Captain Marvel because it is bad regardless of phase
Spider-Man: No Way Home
Spider-Man: Far From Home
Black Panther: Wakanda Forever
Shang-Chi and the Legend of the Ten Rings
Avengers: Infinity War
Black Widow
Avengers: Endgame
Captain America: Civil War
Thor: Ragnarok
Spider-Man: Homecoming
Doctor Strange
Guardians of the Galaxy Vol. 2
Doctor Strange in the Multiverse of Madness
Black Panther
Ant-Man and the Wasp
Eternals
Thor: Love and Thunder
Captain Marvel
Movie
0
10
20
30
40
50
60
70
80
Weighted Average Rating (Critic-to-Audience Ratio)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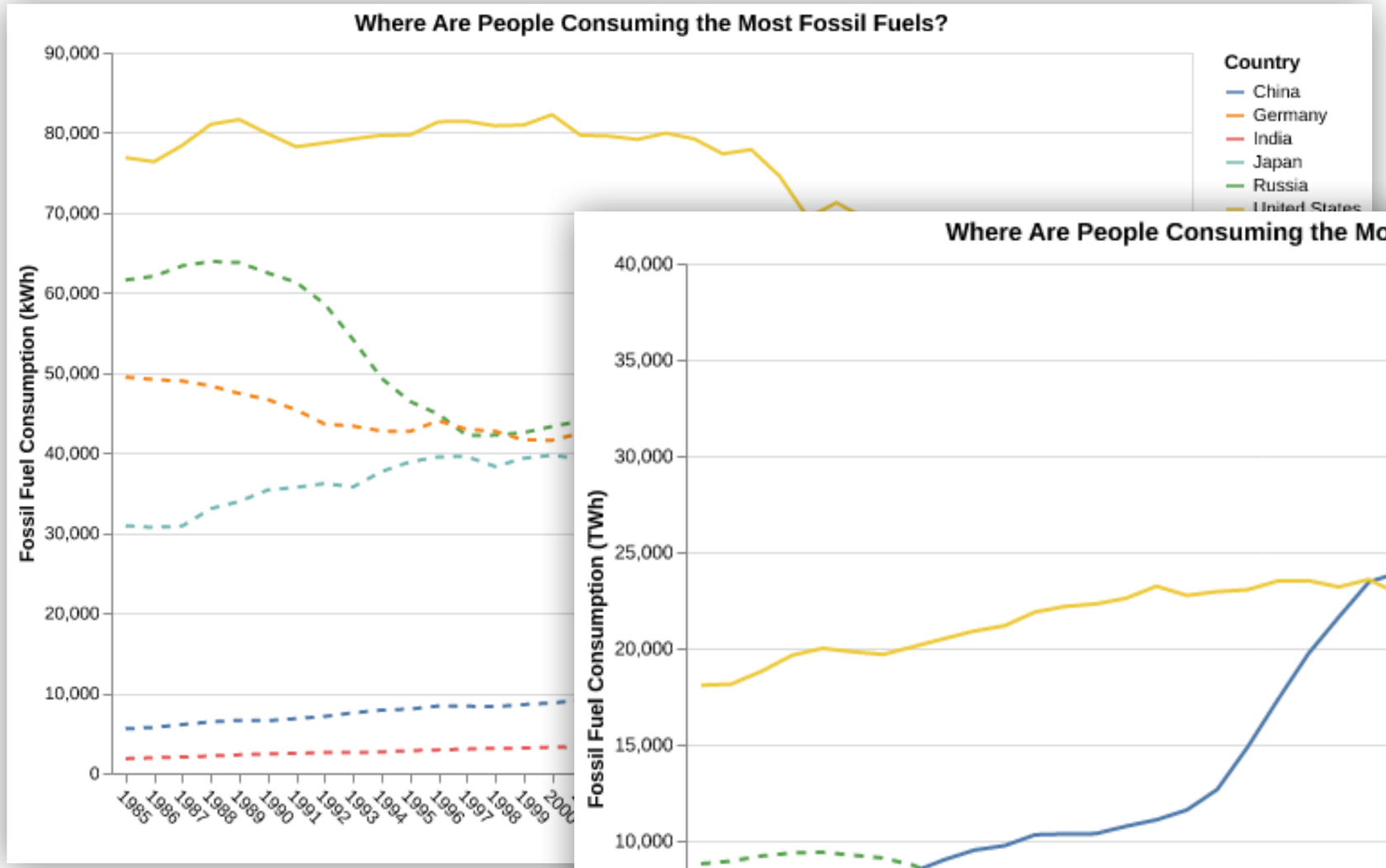
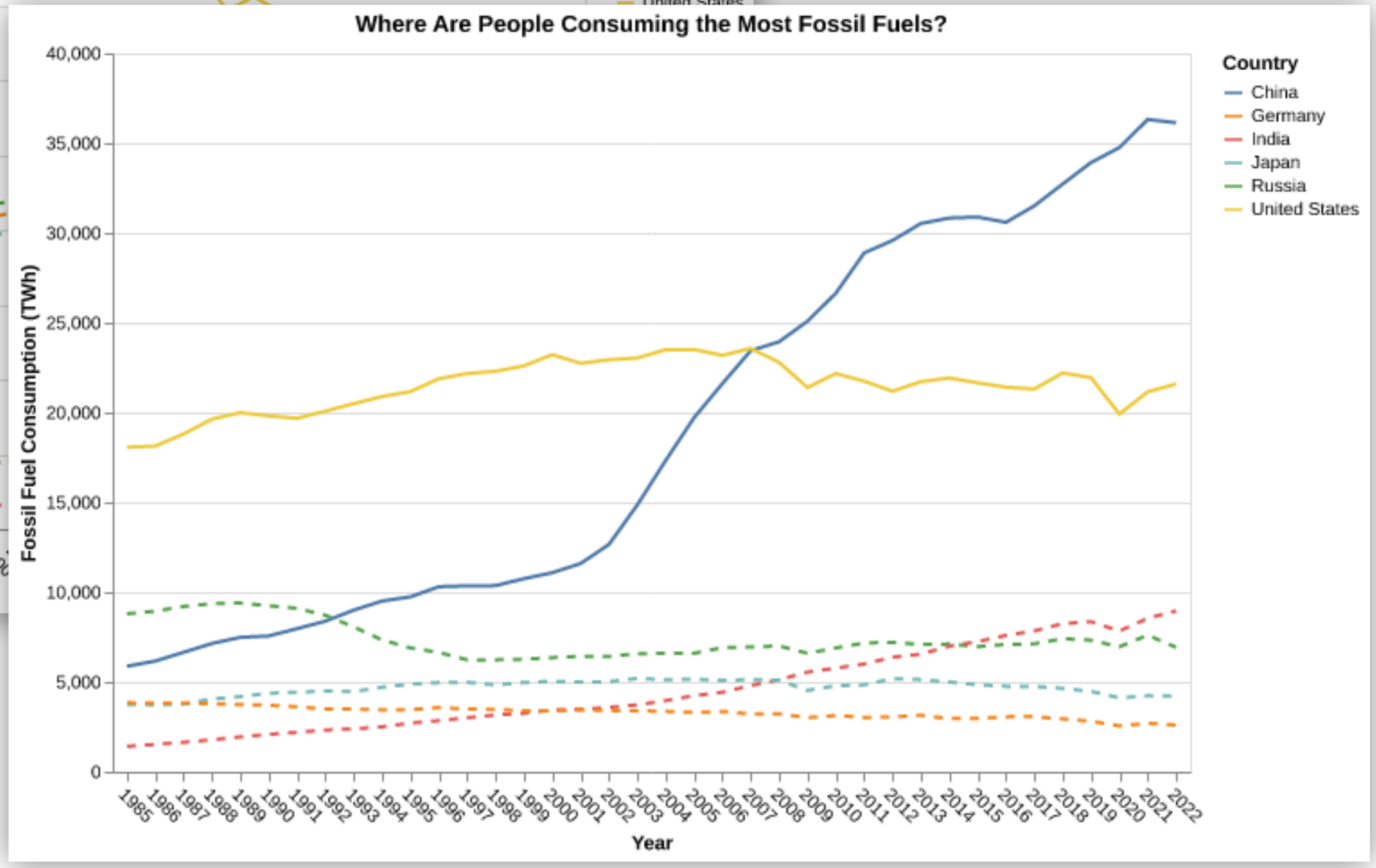
Avengers: Endgame
Black Panther
Thor: Ragnarok
Spider-Man: Homecoming
Spider-Man: Far From Home
Captain America: Civil War
Doctor Strange
Guardians of the Galaxy Vol. 2
Avengers: Infinity War
Ant-Man and the Wasp
Black Panther: Wakanda Forever
Doctor Strange in the Multiverse of Madness
Black Widow
Captain Marvel
Thor: Love and Thunder
Eternals
Movie
0
10
20
30
40
50
60
70
80
90
100
Weighted Average Rating (0-100)

Andrew Yang


Where Are People Consuming the Most Fossil Fuels?
Fossil Fuel Consumption (kWh)
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
Country
China
Germany
India
Japan
Russia
United States


Where Are People Consuming the Most Fossil Fuels?
Fossil Fuel Consumption (TWh)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
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2011
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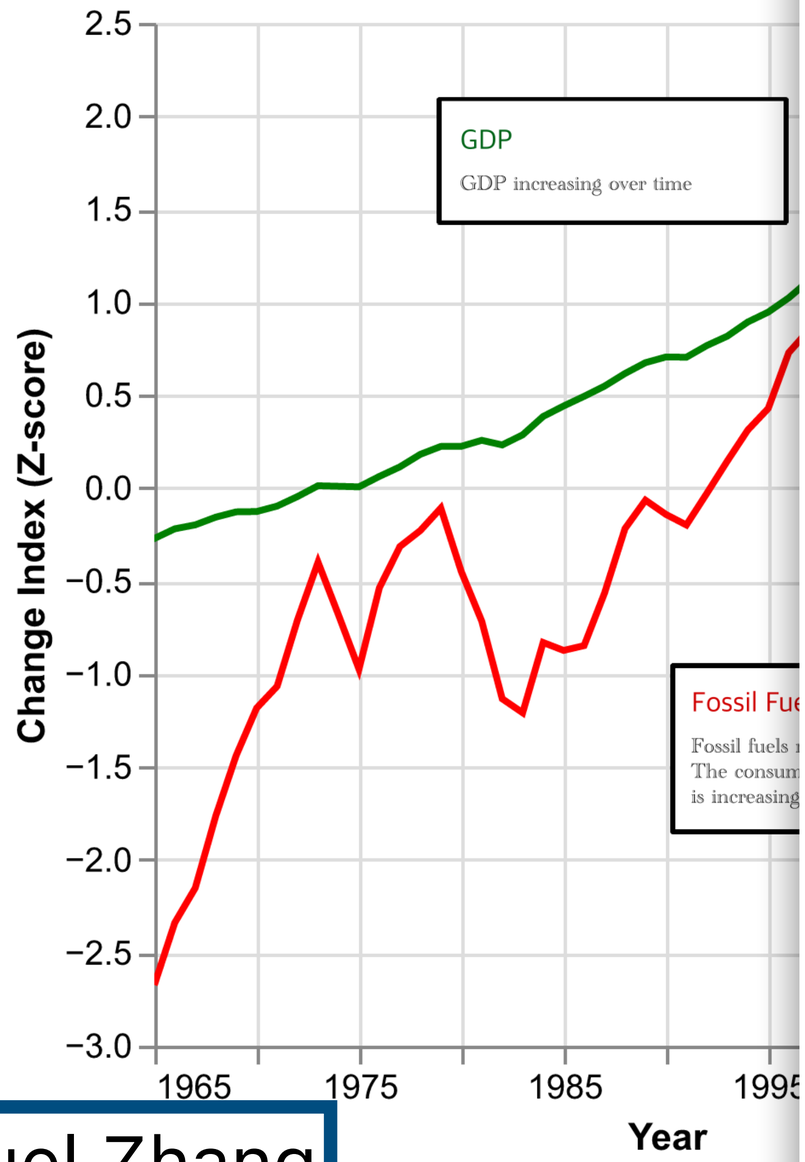
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year
Country
China
Germany
India
Japan
Russia
United States

Maya Que

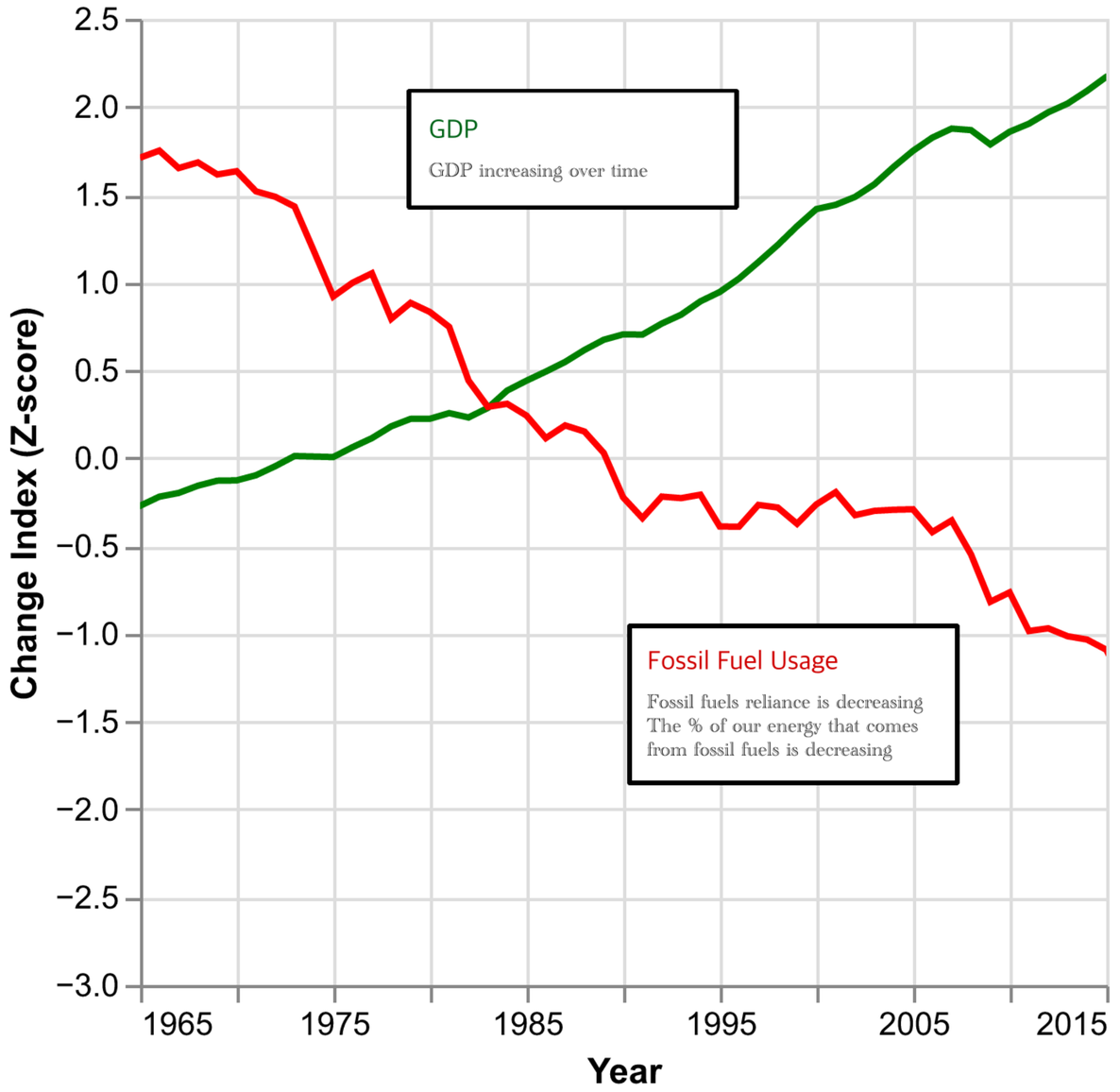
THE ECONOMY NEEDS F

How are US GDP & Fossil Fuel U



THE ECONOMY DOESN'T NEED FOSSIL FUELS

How are US GDP & Fossil Fuel Usage Related?

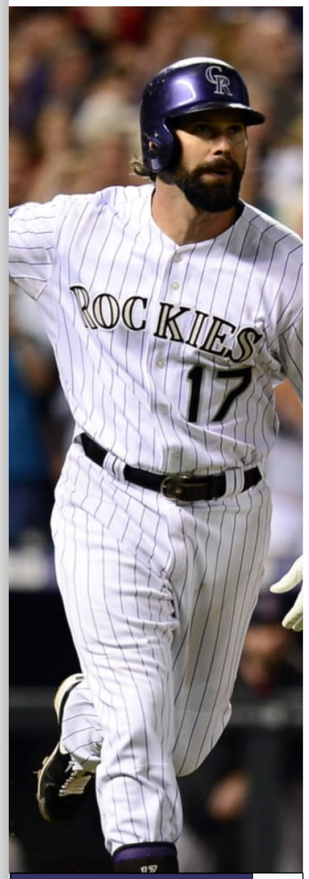


Samuel Zhang

TODD HELTON VS KEN GRIFFEY JR:

WHO'S THE GREATEST LEFTY OF THE GENERATION?

Justin Chou

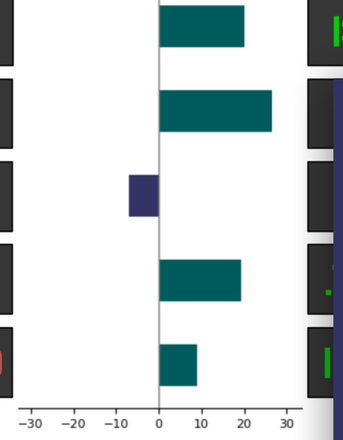


TODD HELTON

Career Stats (at Coor's Field)

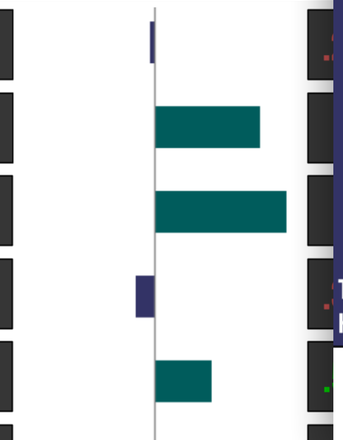
TODD HELTON

	TODD HELTON	KEN GRIFFEY JR.
BA	.345	.289
R / 600 PA	108	132
RBI / 600 PA	106	
OBP	.441	
SLG	.607	
OPS	1.059	



Career Stats (outside Coor's Field)

	TODD HELTON	KEN GRIFFEY JR.
BA	.287	
R / 600 PA	69	
RBI / 600 PA	71	
OBP	.386	
SLG	.469	
OPS	.855	.905



DATA FROM BASEBALLREFERENCE.COM

TODD HELTON:

GREATEST LEFTY OF THE GENERATION?

TODD HELTON WINS 5 OF 6 MAJOR CATEGORIES, INCLUDING OPS, ACROSS THEIR CAREERS

Career Stats

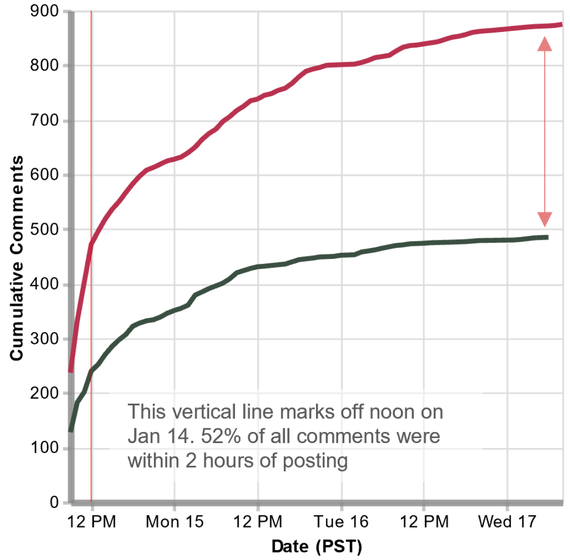
TODD HELTON		KEN GRIFFEY JR.
.316	BA	.284
89	R / 600 PA	88
89	RBI / 600 PA	97
.414	OBP	.369
.539	SLG	.538
.953	OPS	.907

KEN GRIFFEY JR.

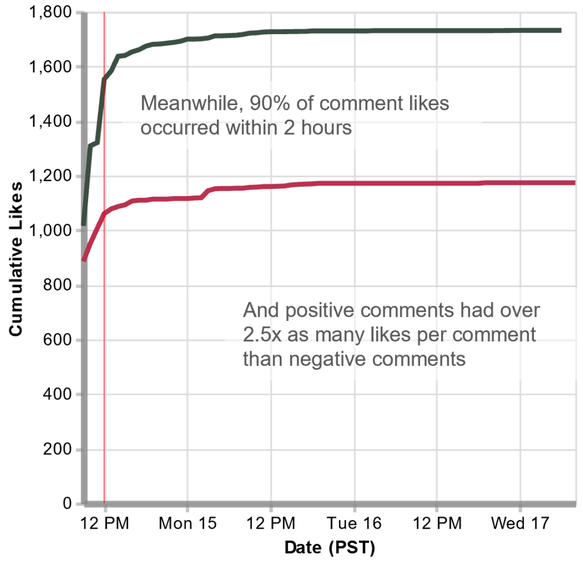
DATA FROM BASEBALLREFERENCE.COM

Digital Engagement in Politics: Diving into a Facebook Comment Section

Early January, President Biden announced he created 14 million new jobs while in office. 1,360 Facebook comments on the POTUS Facebook post were analyzed with Hugging Face sentiment analysis

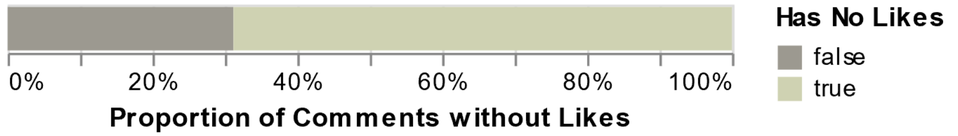


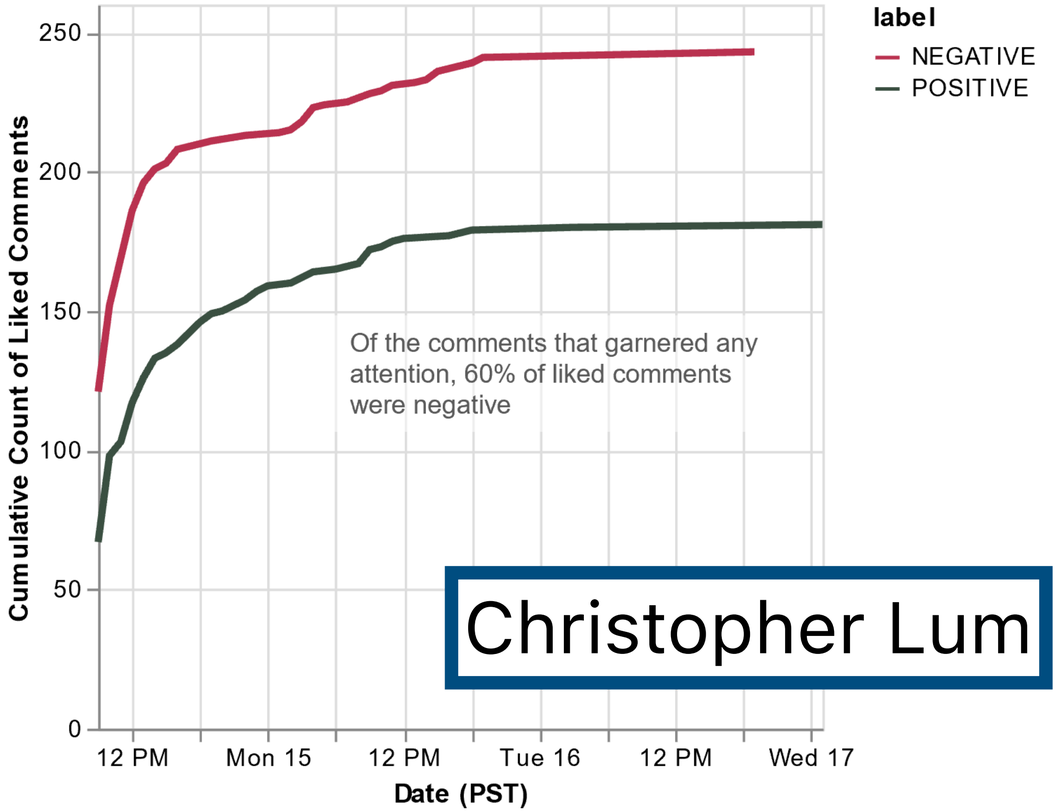
Negative comments flooded the post, reaching a peak 386 more negative comments than positive



No One Likes Biden: Diving into a Facebook comment section

Early January, President Biden announced he created 14 million new jobs while in office. 1,360 Facebook comments on the POTUS Facebook post were analyzed with Hugging Face sentiment analysis. Most comments weren't liked. Let's look at what was.





Christopher Lum

Maps

When to use a map?

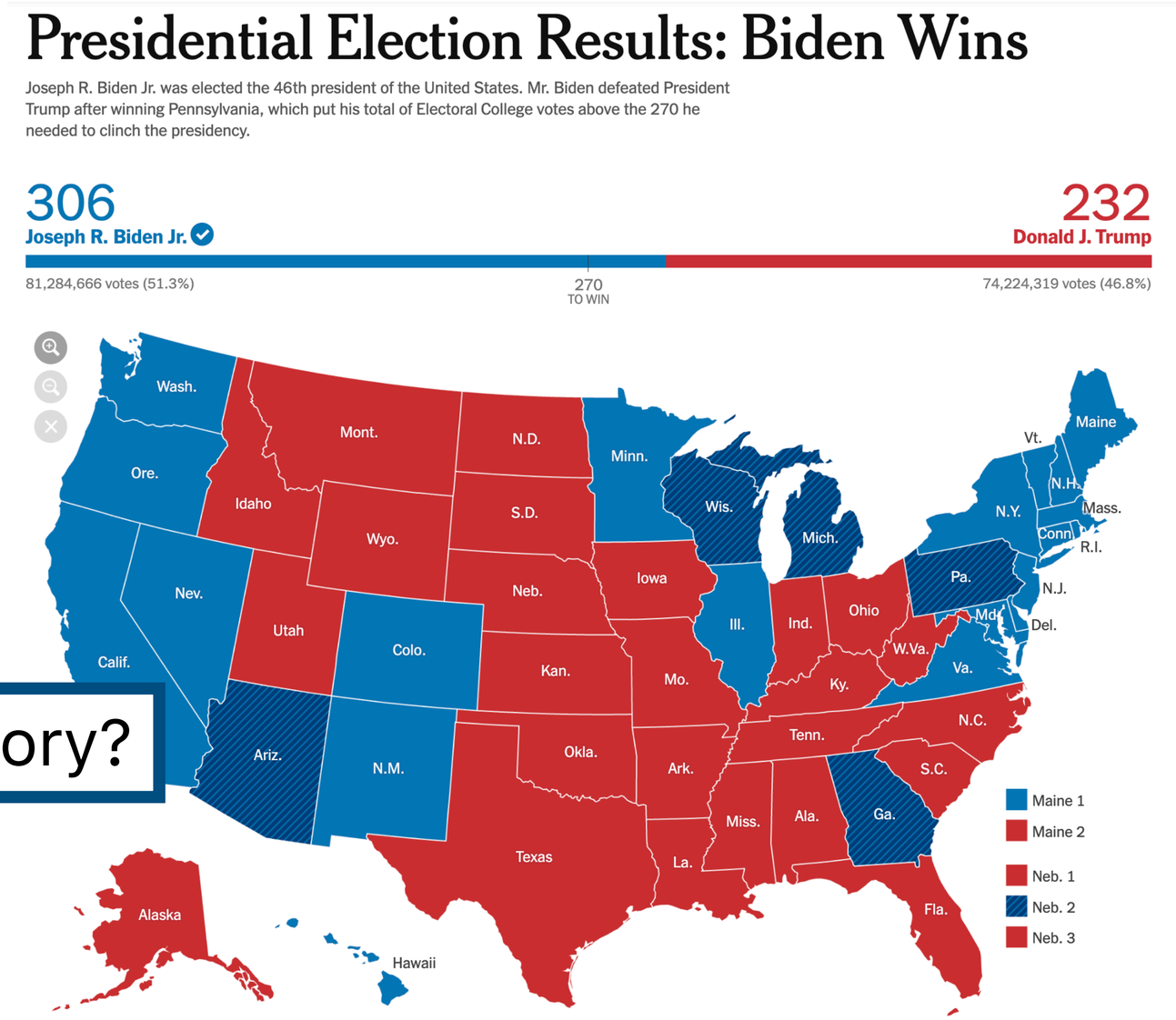
1. When data contains geographical attributes (e.g., latitude, longitude, city, state, country, etc.).
2. When you want to emphasize **geographic relationship**.

Geographic Relationships

✅ Who's winning my state?

❌ Is it a landslide?

❌ What are the paths to victory?



Geographic Relationships

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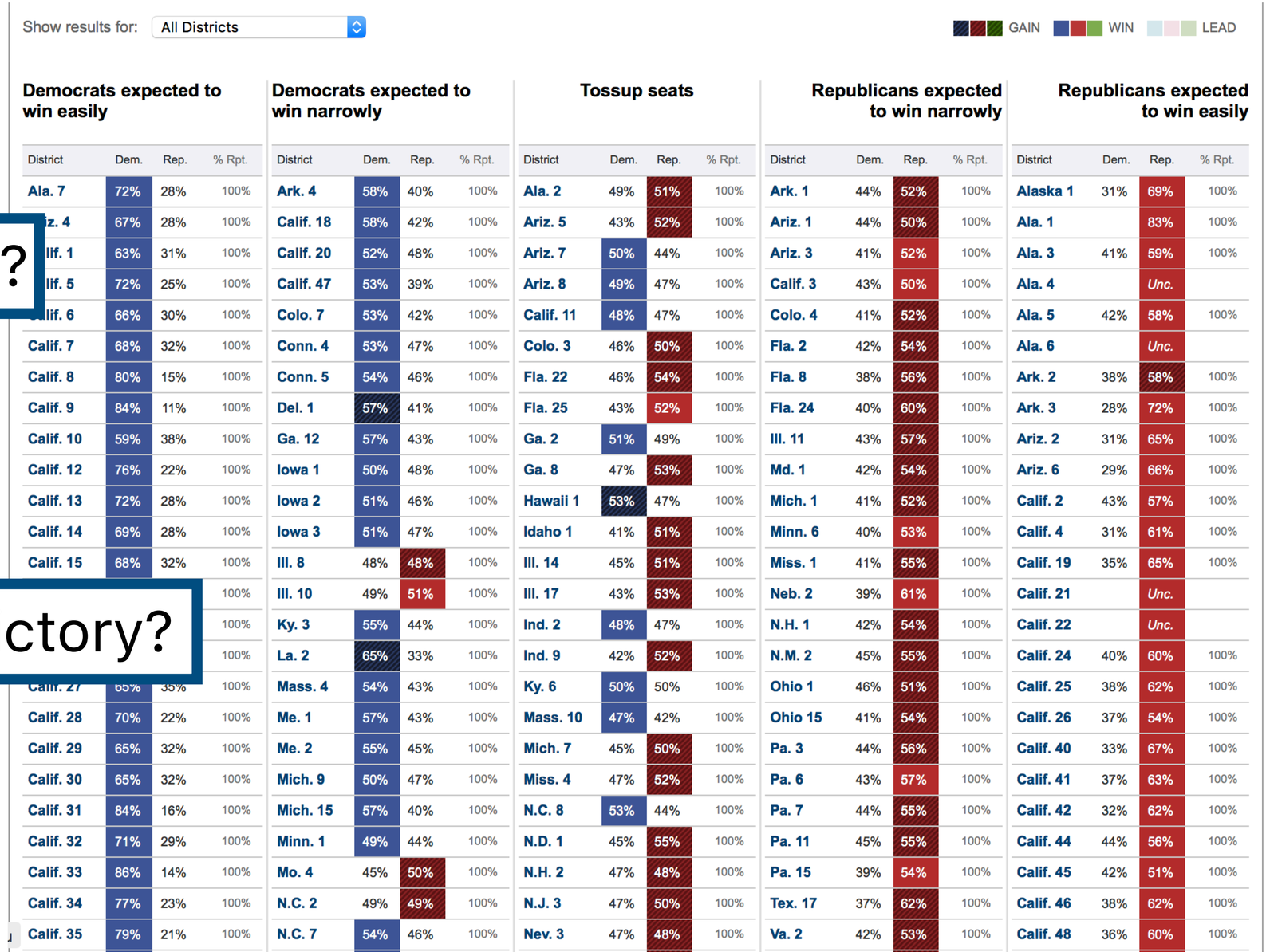


Show results for: All Districts

GAIN WIN LEAD

Democrats expected to win easily

District	Dem.	Rep.	% Rpt.
Ala. 7	72%	28%	100%
[illegible]z. 4	67%	28%	100%
[illegible]lif. 1	63%	31%	100%
[illegible]lif. 5	72%	25%	100%
[illegible]lif. 6	66%	30%	100%
Calif. 7	68%	32%	100%
Calif. 8	80%	15%	100%
Calif. 9	84%	11%	100%
Calif. 10	59%	38%	100%
Calif. 12	76%	22%	100%
Calif. 13	72%	28%	100%
Calif. 14	69%	28%	100%
Calif. 15	68%	32%	100%
[illegible]			100%
[illegible]			100%
[illegible]			100%
[illegible]			100%
Calif. 28	70%	22%	100%
Calif. 29	65%	32%	100%
Calif. 30	65%	32%	100%
Calif. 31	84%	16%	100%
Calif. 32	71%	29%	100%
Calif. 33	86%	14%	100%
Calif. 34	77%	23%	100%
Calif. 35	79%	21%	100%

Democrats expected to win narrowly

District	Dem.	Rep.	% Rpt.
Ark. 4	58%	40%	100%
Calif. 18	58%	42%	100%
Calif. 20	52%	48%	100%
Calif. 47	53%	39%	100%
Colo. 7	53%	42%	100%
Conn. 4	53%	47%	100%
Conn. 5	54%	46%	100%
Del. 1	57%	41%	100%
Ga. 12	57%	43%	100%
Iowa 1	50%	48%	100%
Iowa 2	51%	46%	100%
Iowa 3	51%	47%	100%
Ill. 8	48%	48%	100%
Ill. 10	49%	51%	100%
Ky. 3	55%	44%	100%
La. 2	65%	33%	100%
Mass. 4	54%	43%	100%
Me. 1	57%	43%	100%
Me. 2	55%	45%	100%
Mich. 9	50%	47%	100%
Mich. 15	57%	40%	100%
Minn. 1	49%	44%	100%
Mo. 4	45%	50%	100%
N.C. 2	49%	49%	100%
N.C. 7	54%	46%	100%

Tossup seats

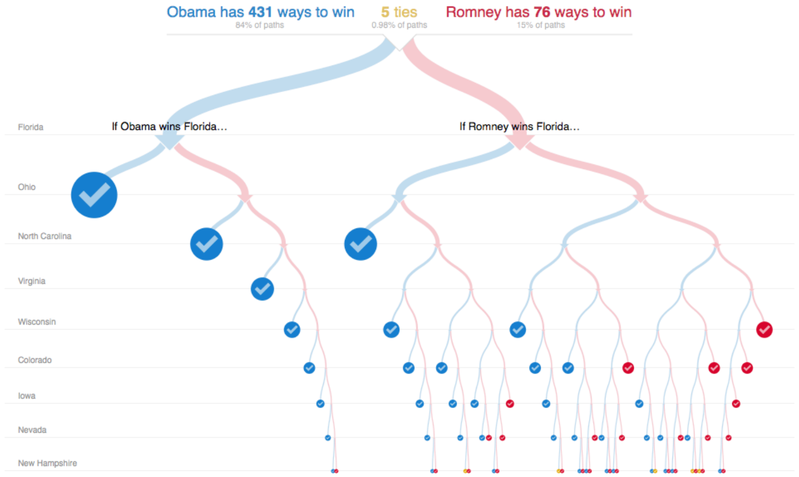
District	Dem.	Rep.	% Rpt.
Ala. 2	49%	51%	100%
Ariz. 5	43%	52%	100%
Ariz. 7	50%	44%	100%
Ariz. 8	49%	47%	100%
Calif. 11	48%	47%	100%
Colo. 3	46%	50%	100%
Fla. 22	46%	54%	100%
Fla. 25	43%	52%	100%
Ga. 2	51%	49%	100%
Ga. 8	47%	53%	100%
Hawaii 1	53%	47%	100%
Idaho 1	41%	51%	100%
Ill. 14	45%	51%	100%
Ill. 17	43%	53%	100%
Ind. 2	48%	47%	100%
Ind. 9	42%	52%	100%
Ky. 6	50%	50%	100%
Mass. 10	47%	42%	100%
Mich. 7	45%	50%	100%
Miss. 4	47%	52%	100%
N.C. 8	53%	44%	100%
N.D. 1	45%	55%	100%
N.H. 2	47%	48%	100%
N.J. 3	47%	50%	100%
Nev. 3	47%	48%	100%

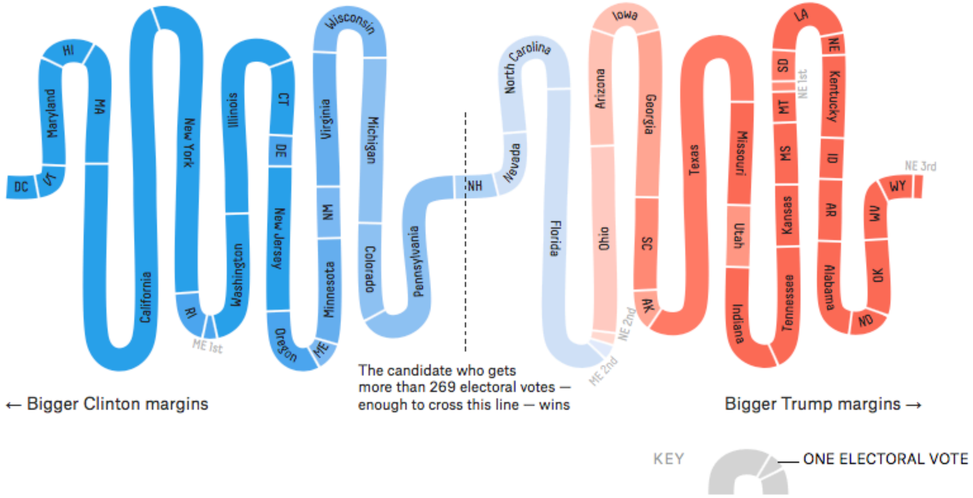
Republicans expected to win narrowly

District	Dem.	Rep.	% Rpt.
Ark. 1	44%	52%	100%
Ariz. 1	44%	50%	100%
Ariz. 3	41%	52%	100%
Calif. 3	43%	50%	100%
Colo. 4	41%	52%	100%
Fla. 2	42%	54%	100%
Fla. 8	38%	56%	100%
Fla. 24	40%	60%	100%
Ill. 11	43%	57%	100%
Md. 1	42%	54%	100%
Mich. 1	41%	52%	100%
Minn. 6	40%	53%	100%
Miss. 1	41%	55%	100%
Neb. 2	39%	61%	100%
N.H. 1	42%	54%	100%
N.M. 2	45%	55%	100%
Ohio 1	46%	51%	100%
Ohio 15	41%	54%	100%
Pa. 3	44%	56%	100%
Pa. 6	43%	57%	100%
Pa. 7	44%	55%	100%
Pa. 11	45%	55%	100%
Pa. 15	39%	54%	100%
Tex. 17	37%	62%	100%
Va. 2	42%	53%	100%

Republicans expected to win easily

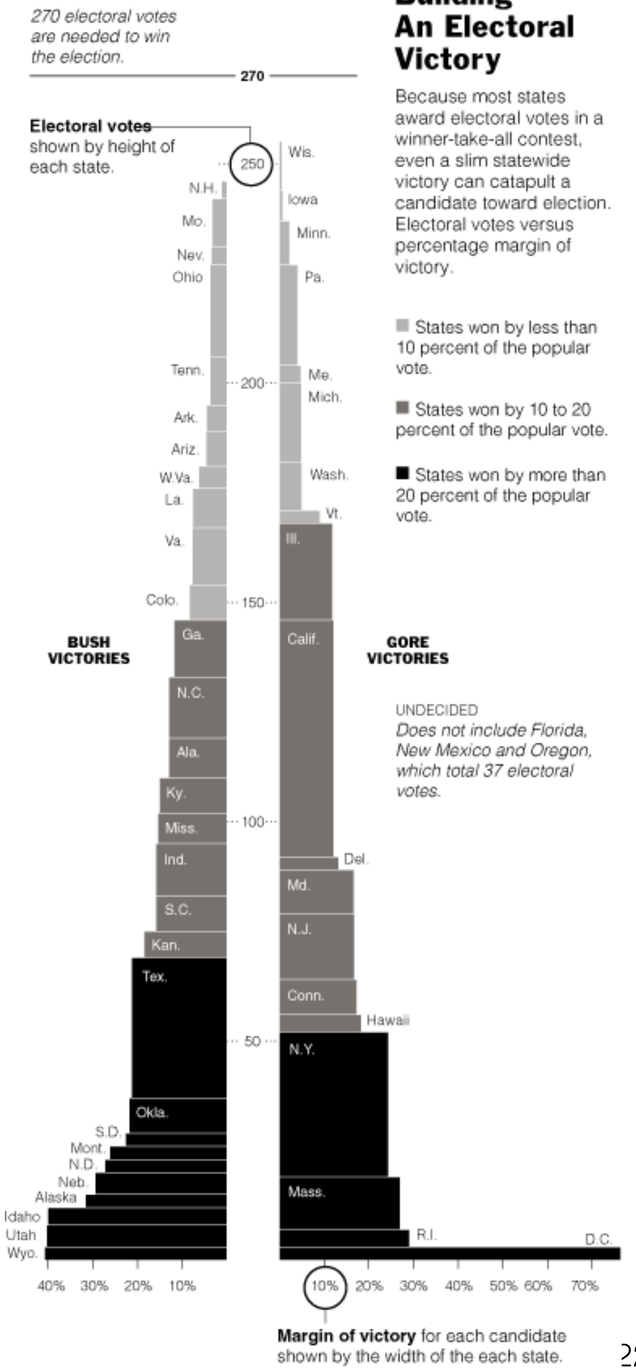
District	Dem.	Rep.	% Rpt.
Alaska 1	31%	69%	100%
Ala. 1		83%	100%
Ala. 3	41%	59%	100%
Ala. 4		Unc.	
Ala. 5	42%	58%	100%
Ala. 6		Unc.	
Ark. 2	38%	58%	100%
Ark. 3	28%	72%	100%
Ariz. 2	31%	65%	100%
Ariz. 6	29%	66%	100%
Calif. 2	43%	57%	100%
Calif. 4	31%	61%	100%
Calif. 19	35%	65%	100%
Calif. 21		Unc.	
Calif. 22		Unc.	
Calif. 24	40%	60%	100%
Calif. 25	38%	62%	100%
Calif. 26	37%	54%	100%
Calif. 40	33%	67%	100%
Calif. 41	37%	63%	100%
Calif. 42	32%	62%	100%
Calif. 44	44%	56%	100%
Calif. 45	42%	51%	100%
Calif. 46	38%	62%	100%
Calif. 48	36%	60%	100%





KEY AVERAGE — 80% CHANCE OUTCOME FALLS IN THIS RANGE

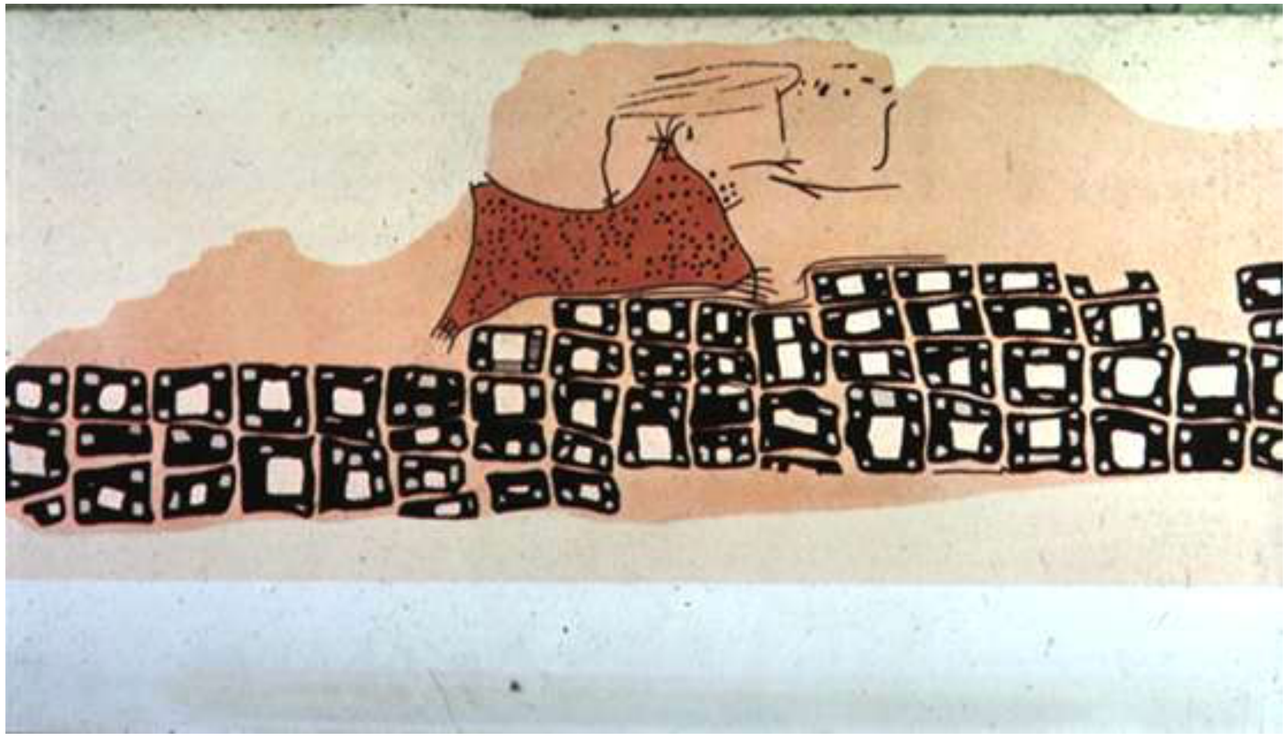
	Expected margin of victory (+75 +50 +25	+25 +50 +75)	Chance of tipping election
Florida		D+0.7	17.6%
Pennsylvania		D+3.7	12.3%
Michigan		D+4.2	11.7%
North Carolina		D+0.7	11.2%
Virginia		D+5.6	6.0%
Colorado		D+4.0	6.0%
Ohio		R+1.9	5.2%
Wisconsin		D+5.3	4.8%
Minnesota		D+5.8	3.8%
Nevada		D+1.2	3.7%
Arizona		R+2.2	2.8%
New Mexico		D+5.8	2.8%
New Hampshire		D+3.6	2.3%
Georgia		R+4.0	2.3%

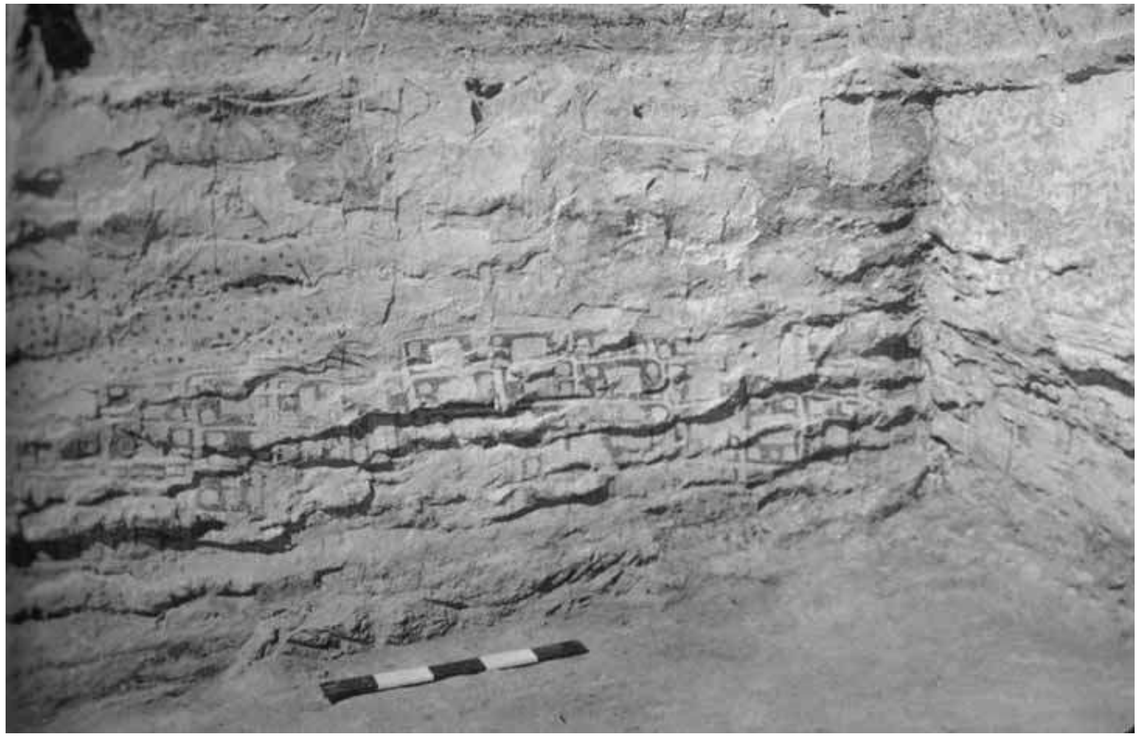


Cartography

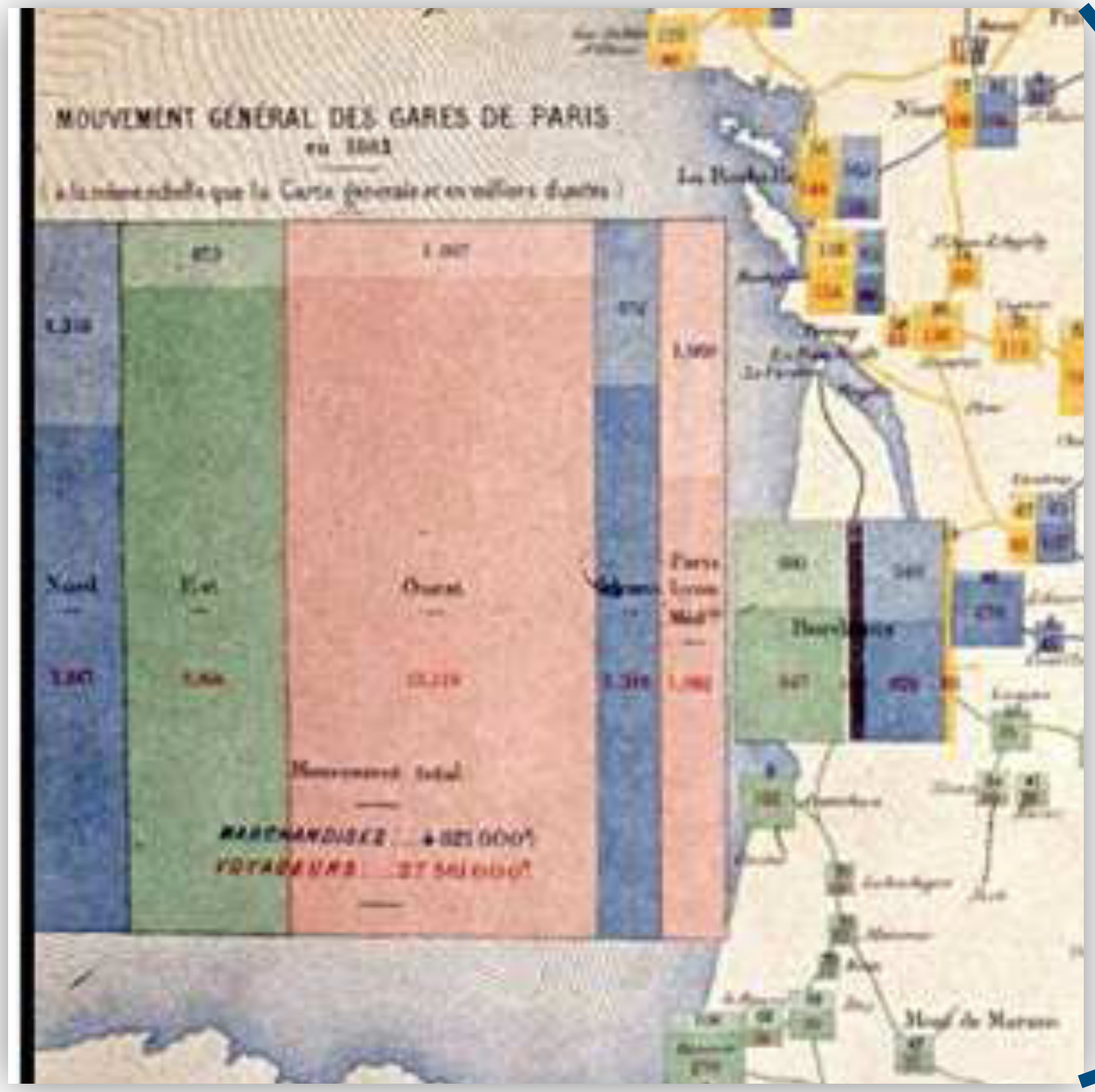
(Map Making)

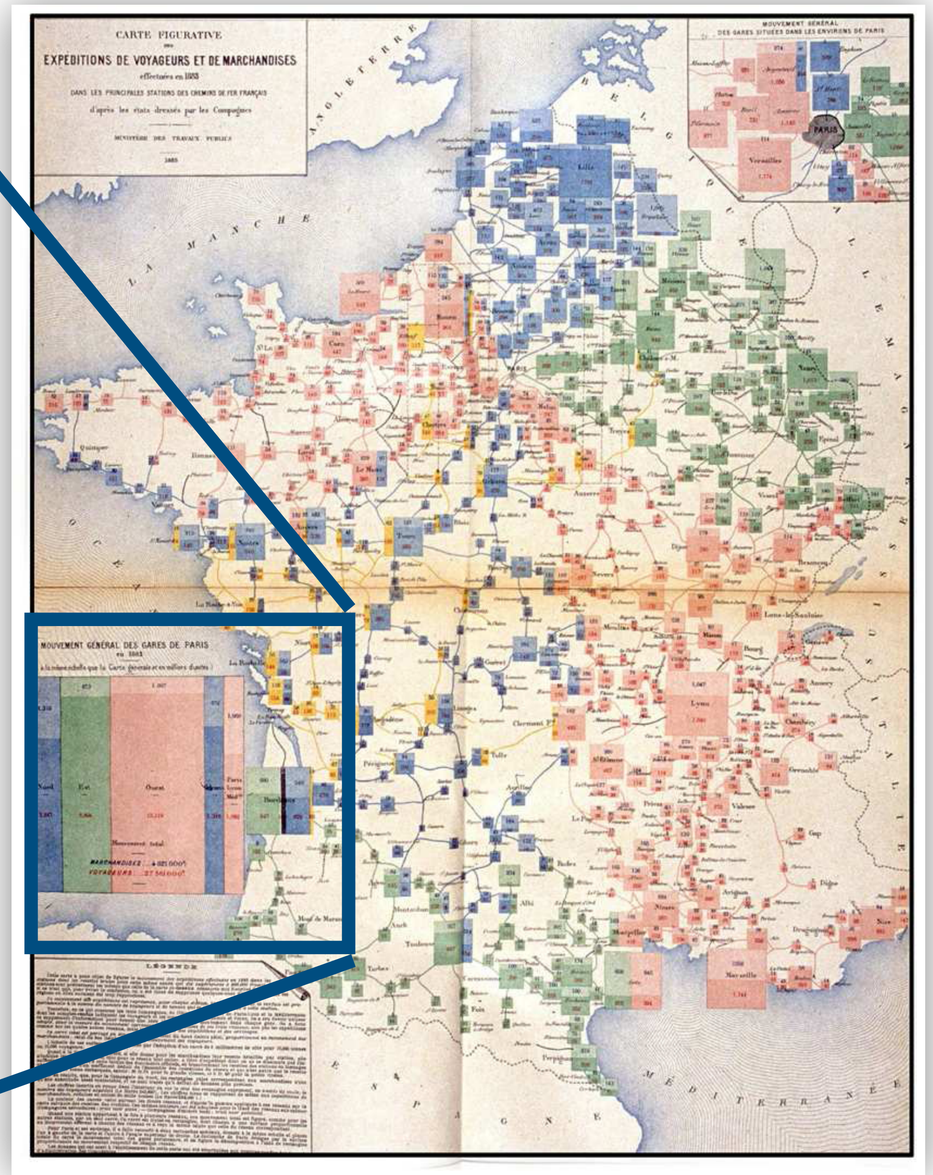
Oldest Known Map: Konya, Turkey (~6200 BC)



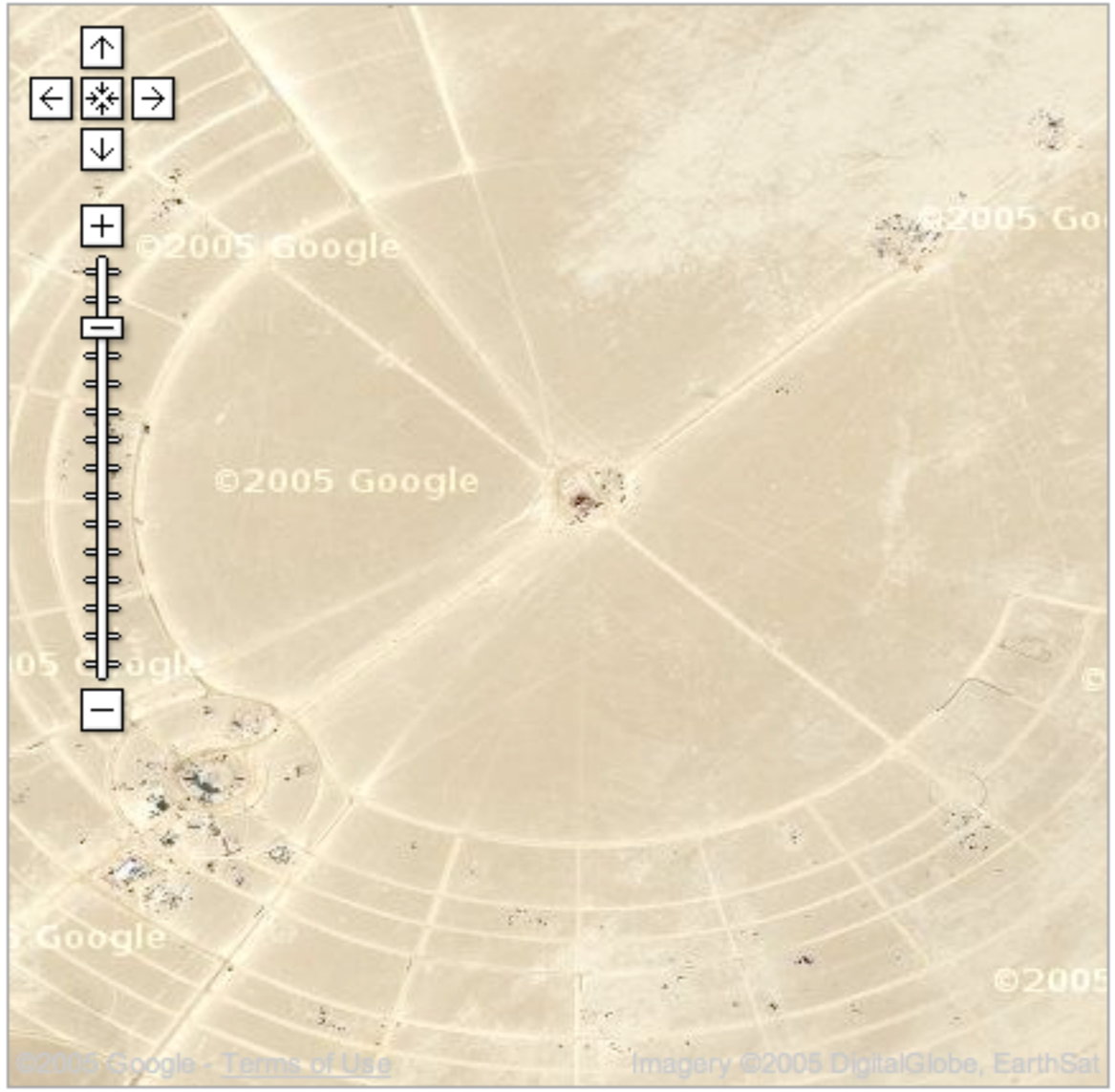


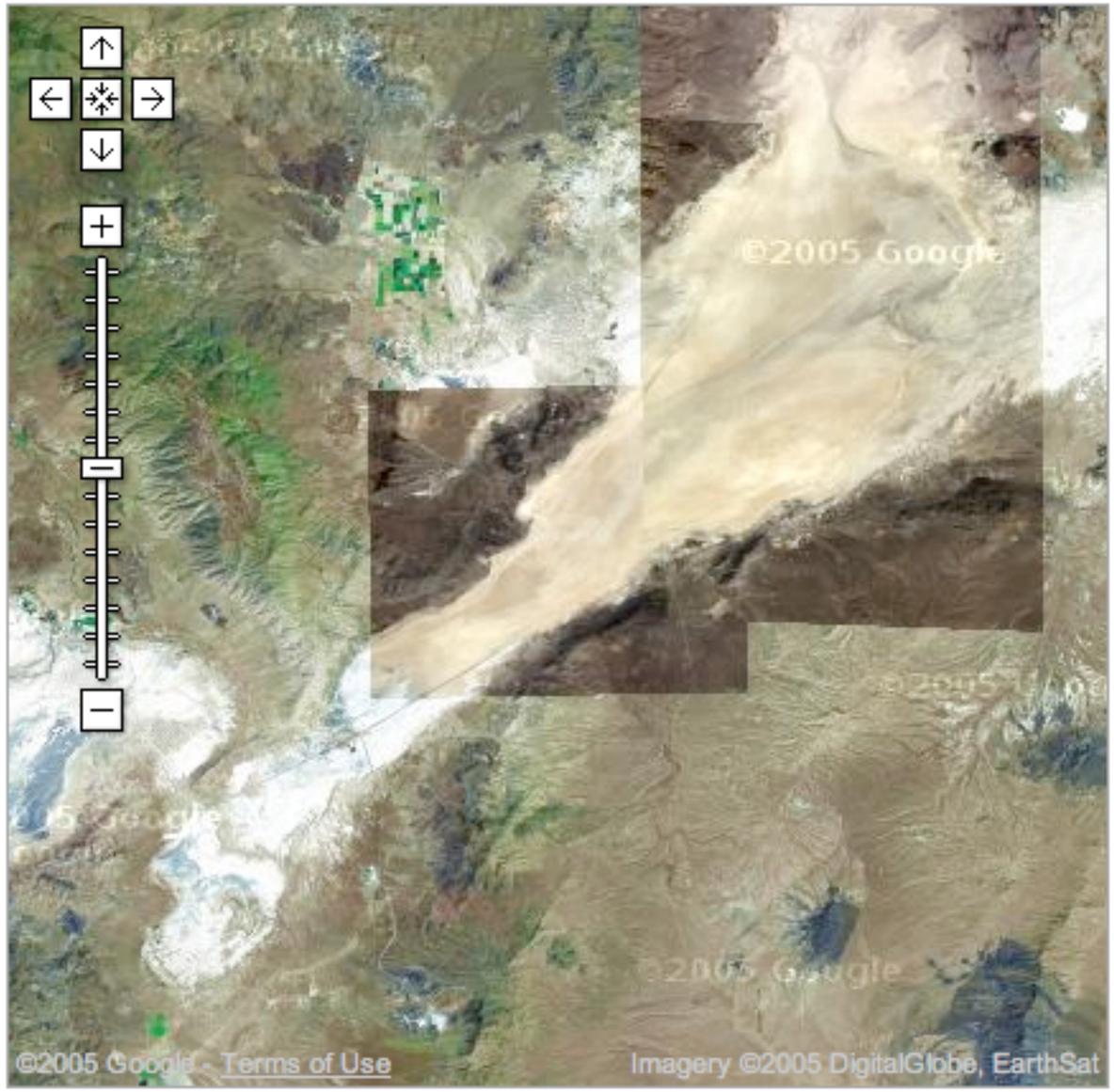
Rail Passengers and Freight from Paris 1884

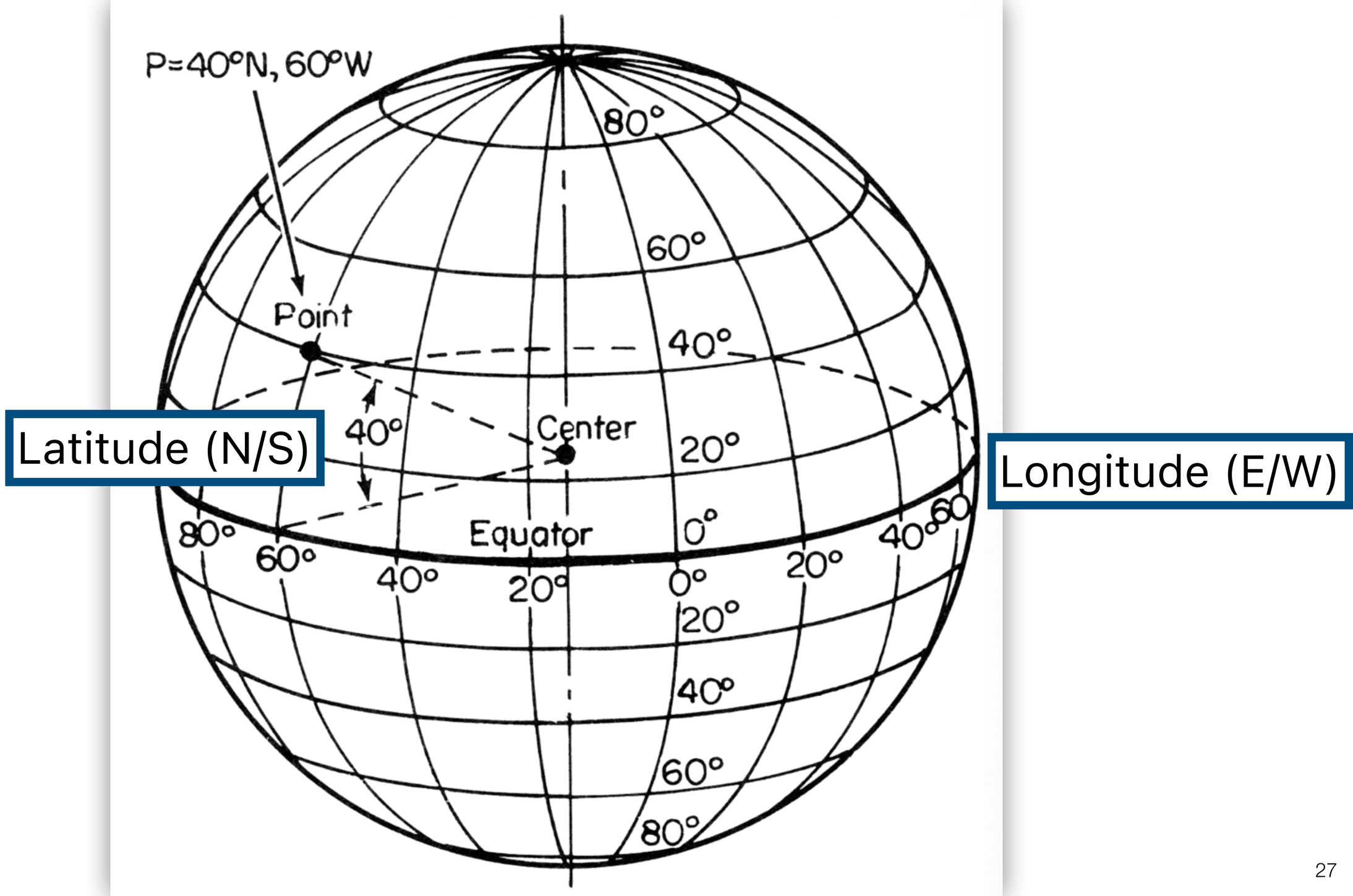




Google Maps, 2005

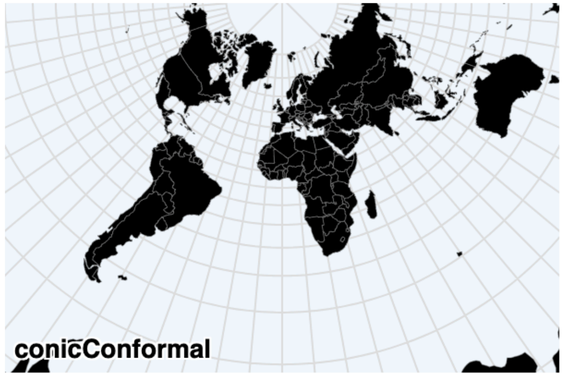


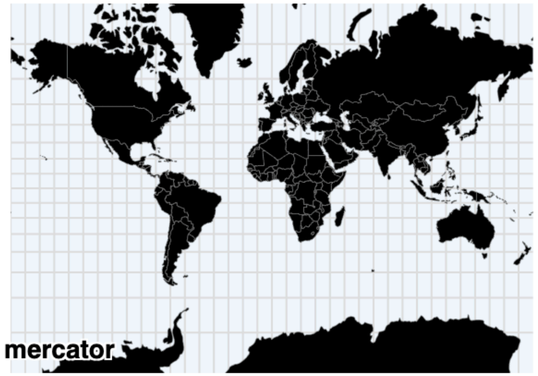


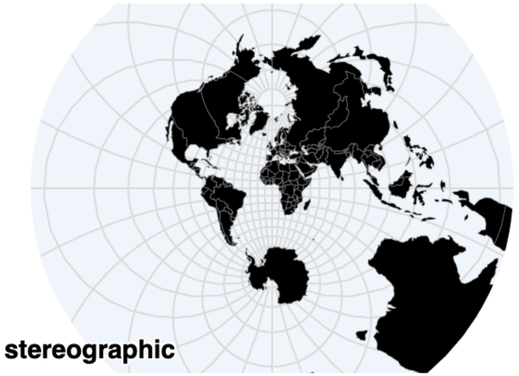

P=40°N, 60°W
Point
Center
Equator
80°
60°
40°
20°
0°
Latitude (N/S)
Longitude (E/W)

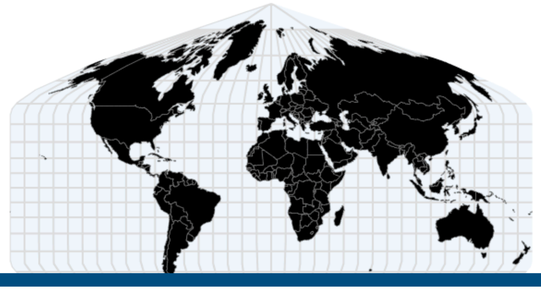

A sphere tears
when you flatten it

Exploring Projections





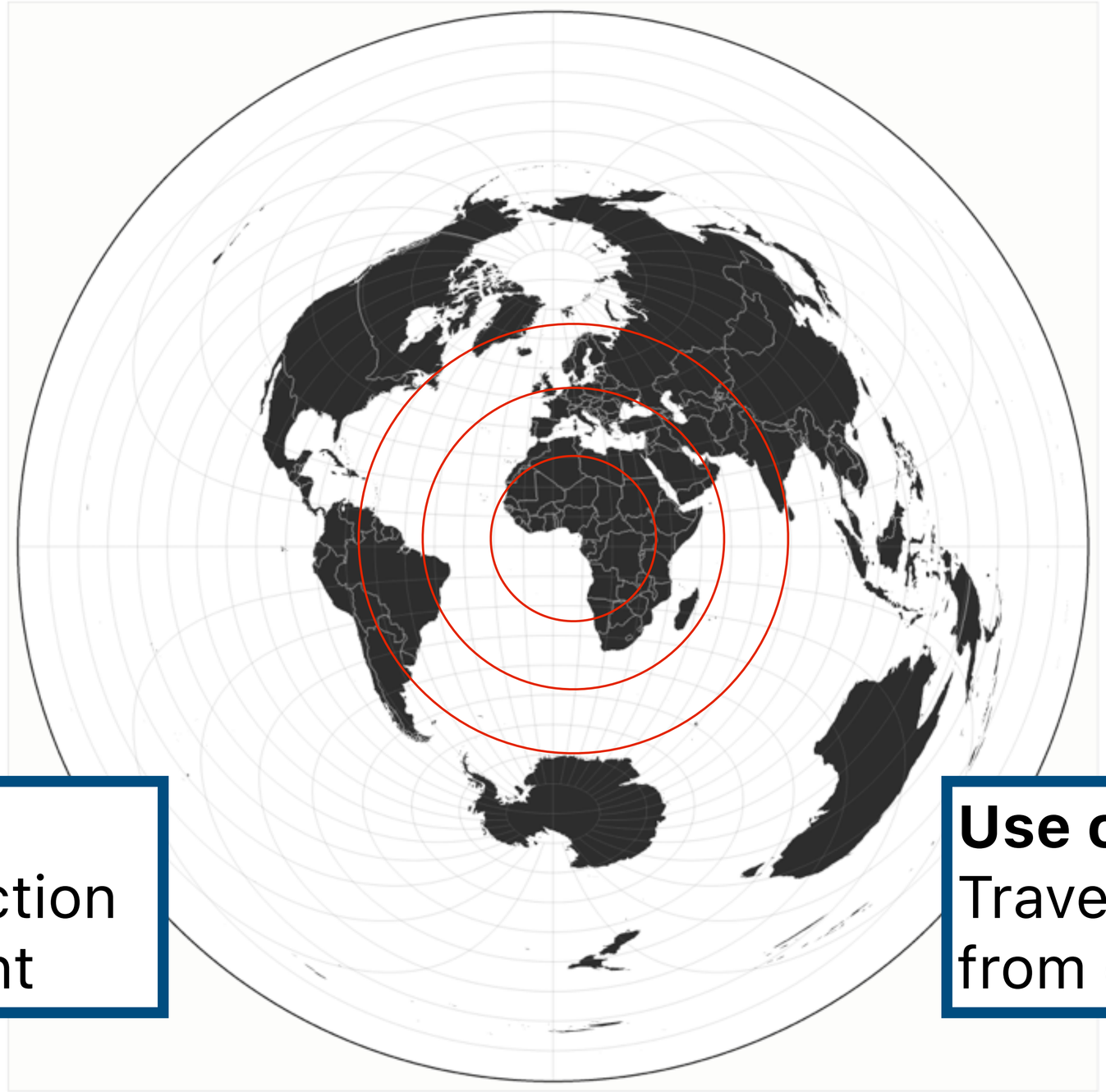




https://vega.github.io/vega/examples/projections/

Projections preserve some metrics, distort others

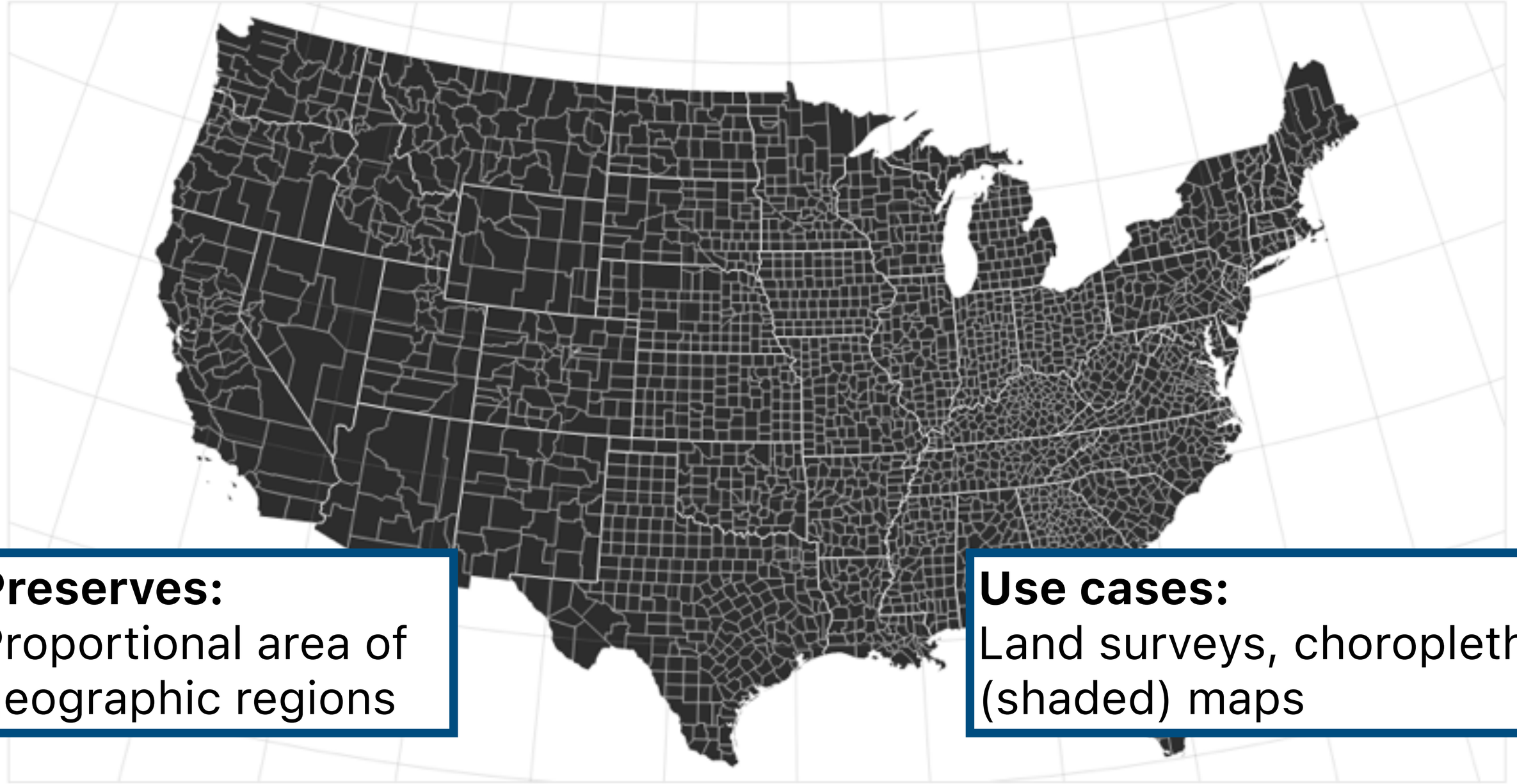
Azimuthal Equidistant



Preserves:
Distance & direction from center point

Use cases:
Travel / propagation from center point

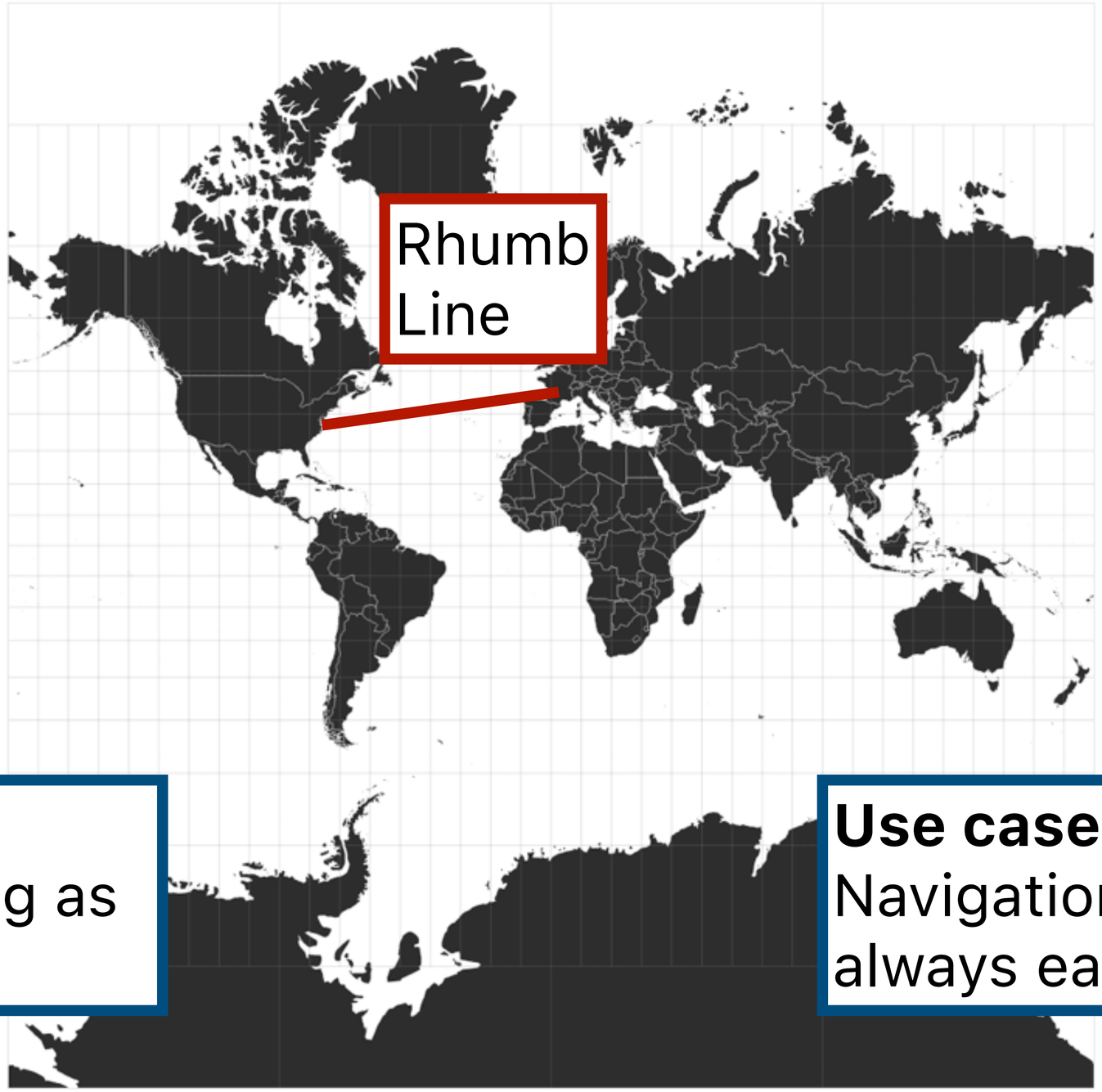
Albers Equal-Area Conic



Preserves:
Proportional area of geographic regions

Use cases:
Land surveys, choropleth (shaded) maps

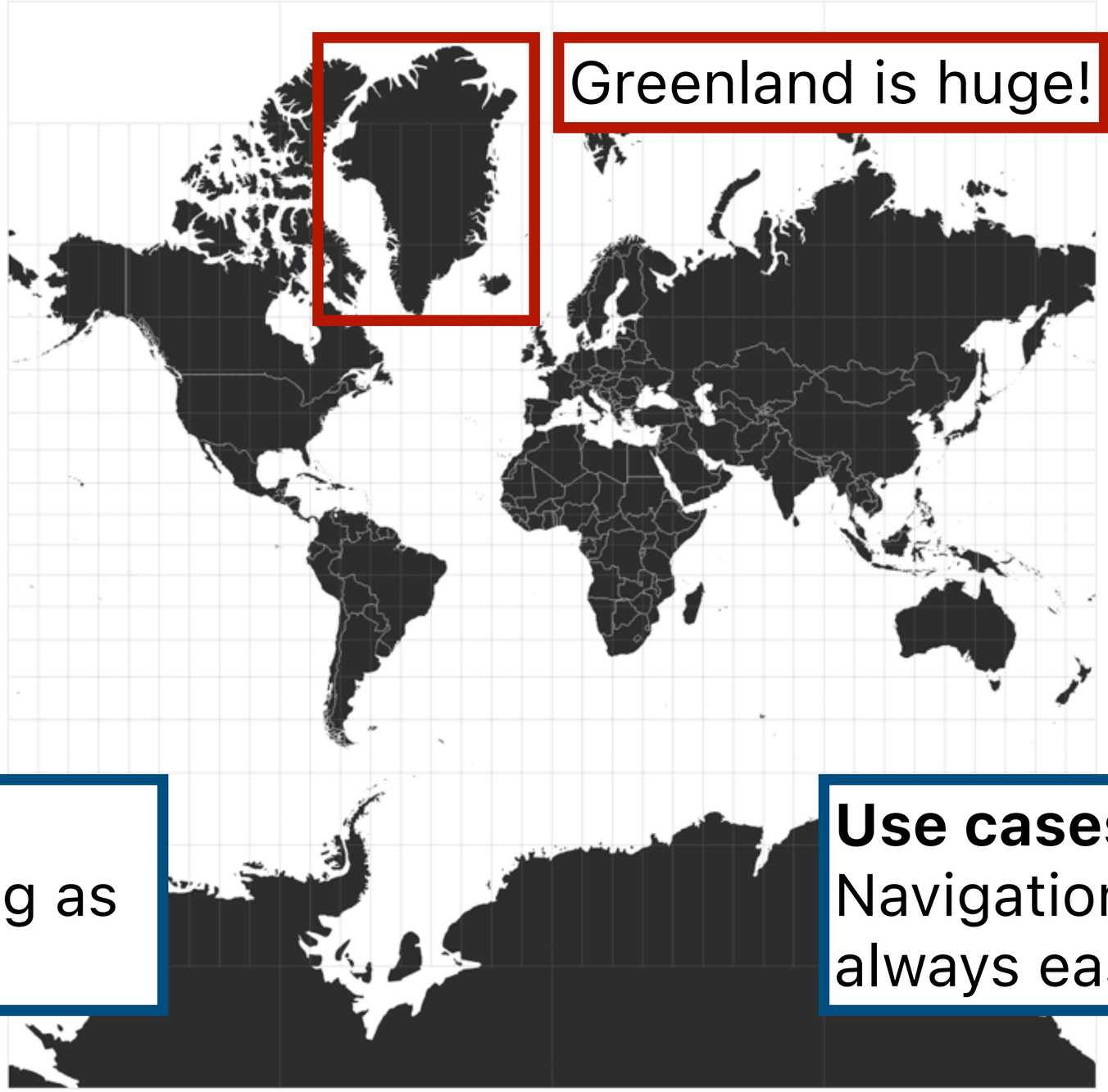
Spherical Mercator



Preserves:
Compass bearing as straight line

Use cases:
Navigation (left / right is always east / west)

Spherical Mercator

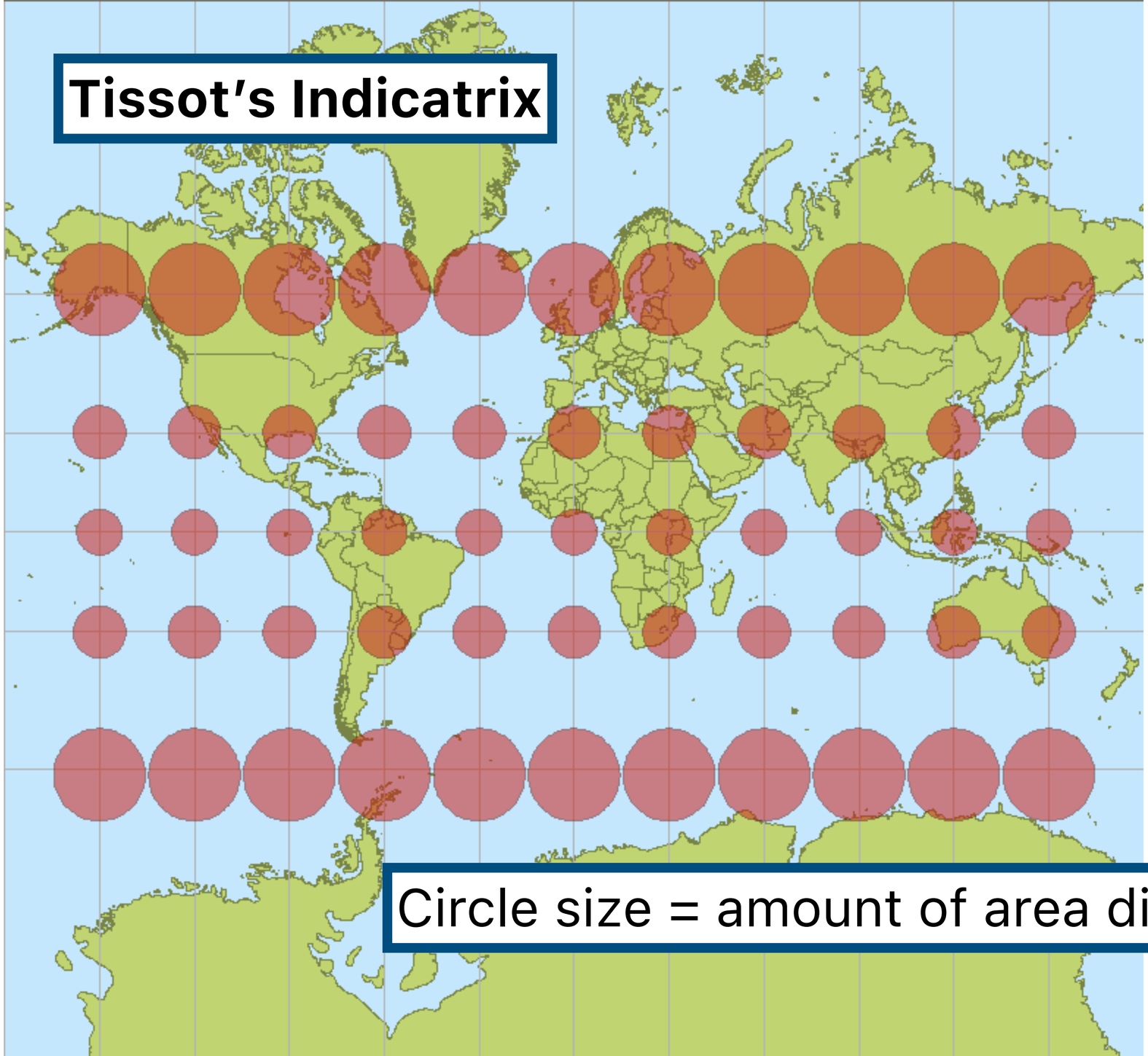


Greenland is huge!

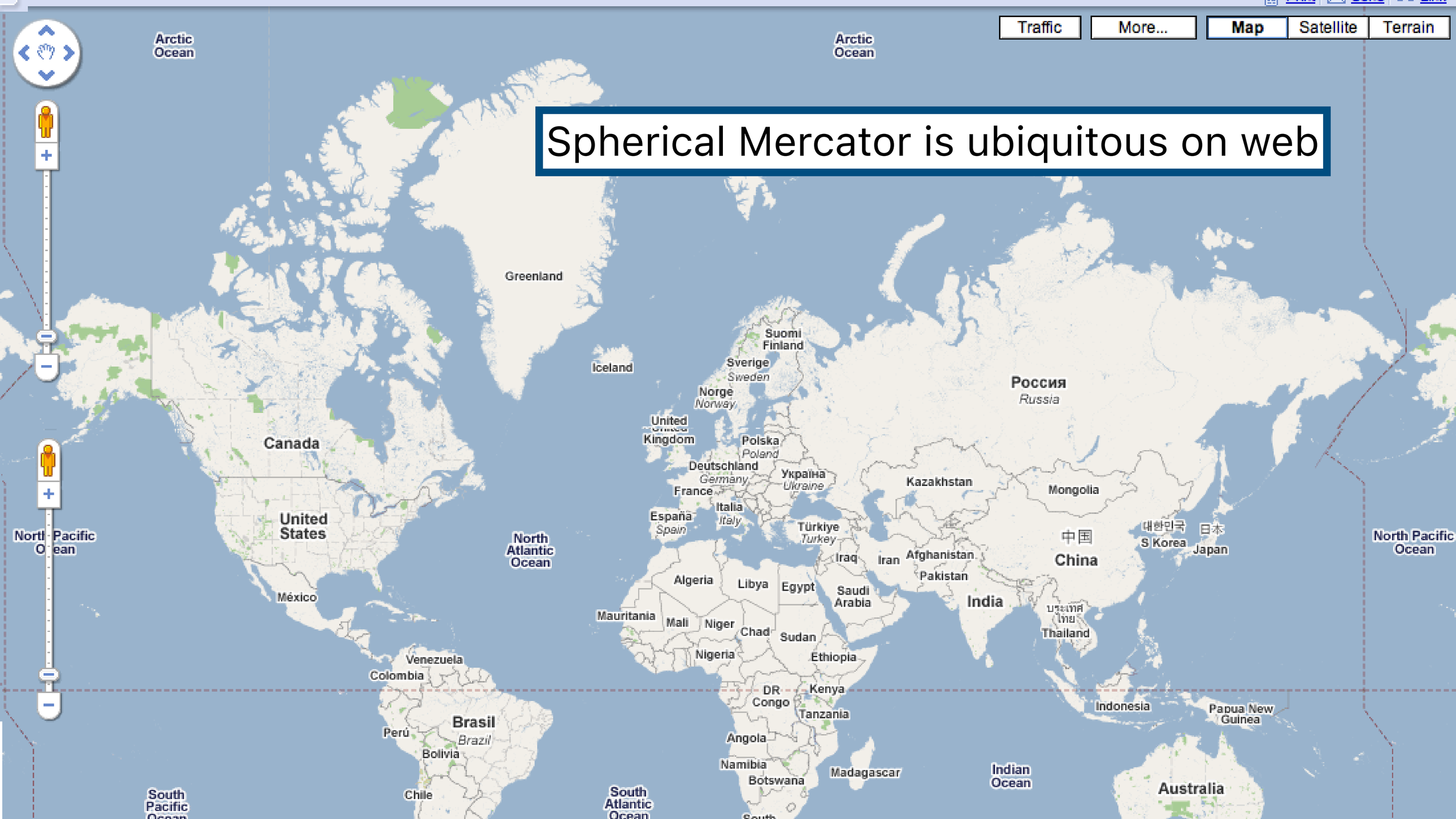
Preserves:
Compass bearing as straight line

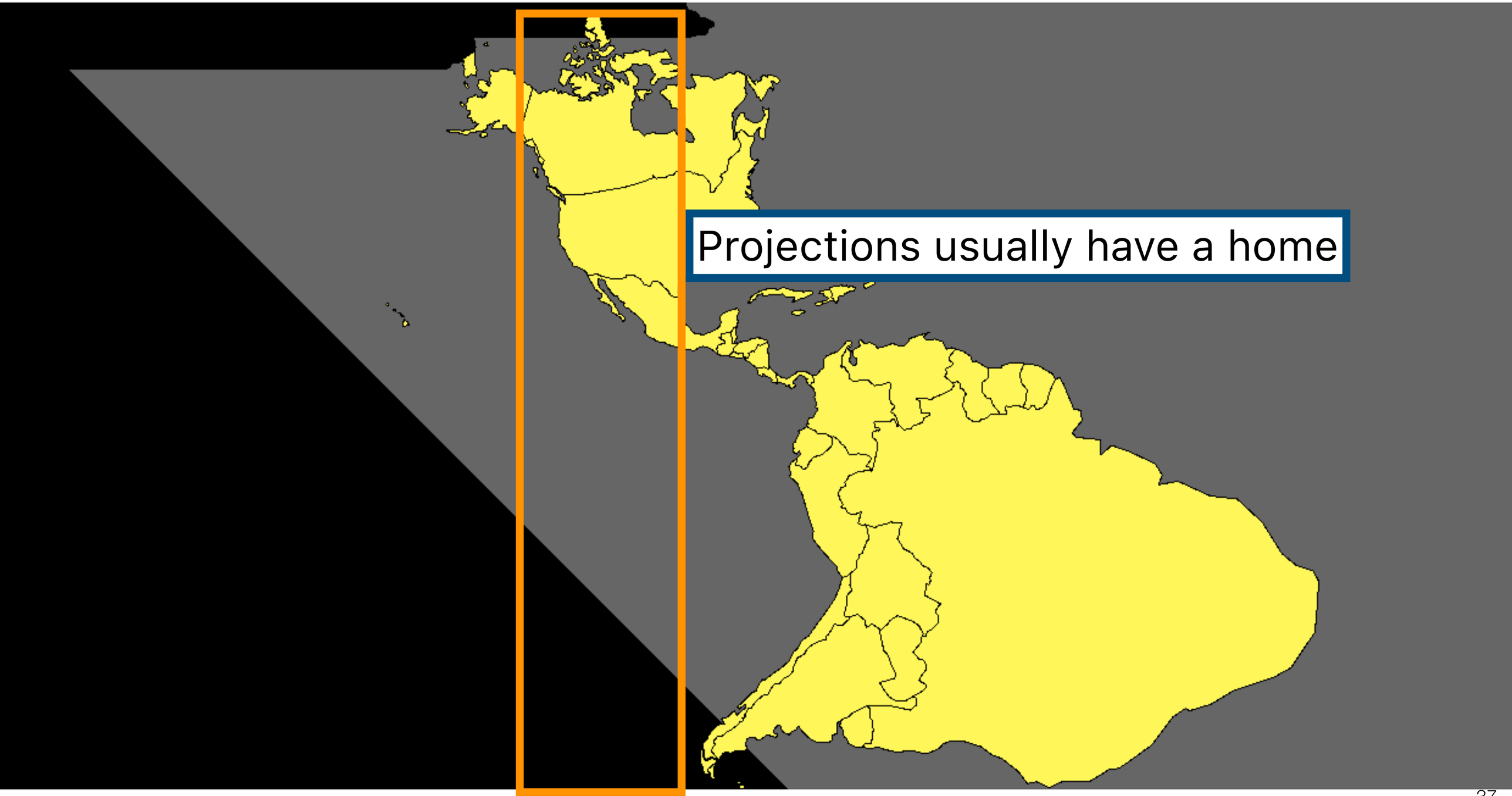
Use cases:
Navigation (left / right is always east / west)

Tissot’s Indicatrix



Circle size = amount of area distortion

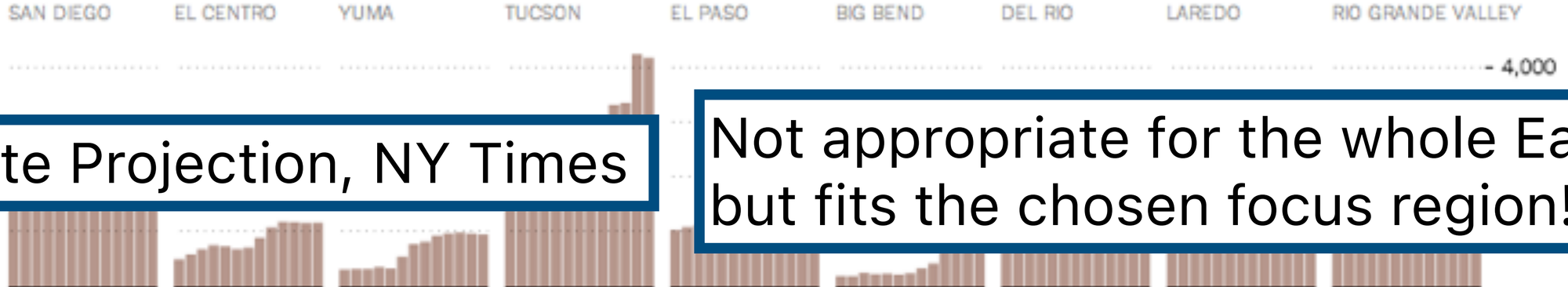

Traffic
More...
Map
Satellite
Terrain
Spherical Mercator is ubiquitous on web
Arctic Ocean
Arctic Ocean
Greenland
Iceland
Suomi Finland
Sverige Sweden
Norge Norway
United Kingdom
Polska Poland
Deutschland Germany
France
Україна Ukraine
España Spain
Italia Italy
Türkiye Turkey
Россия Russia
Kazakhstan
Mongolia
中国 China
대한민국 S Korea
日本 Japan
Iraq
Iran
Afghanistan
Pakistan
India
Saudi Arabia
Canada
United States
México
North Atlantic Ocean
North Pacific Ocean
North Pacific Ocean
Algeria
Libya
Egypt
Mauritania
Mali
Niger
Chad
Sudan
Nigeria
Ethiopia
Kenya
DR Congo
Tanzania
Angola
Namibia
Botswana
Madagascar
Venezuela
Colombia
Brasil Brazil
Perú
Bolivia
Chile
South Pacific Ocean
South Atlantic Ocean
Indian Ocean
Indonesia
Papua New Guinea
Australia
Thailand


Projections usually have a home

Increased Border Enforcement, With Varying Results

There are now more agents along the 1,954 mile-long border than ever before...

Border agents per sector.



Satellite Projection, NY Times

Not appropriate for the whole Earth, but fits the chosen focus region!

WHAT YOUR FAVORITE

MAP PROJECTION

SAYS ABOUT YOU

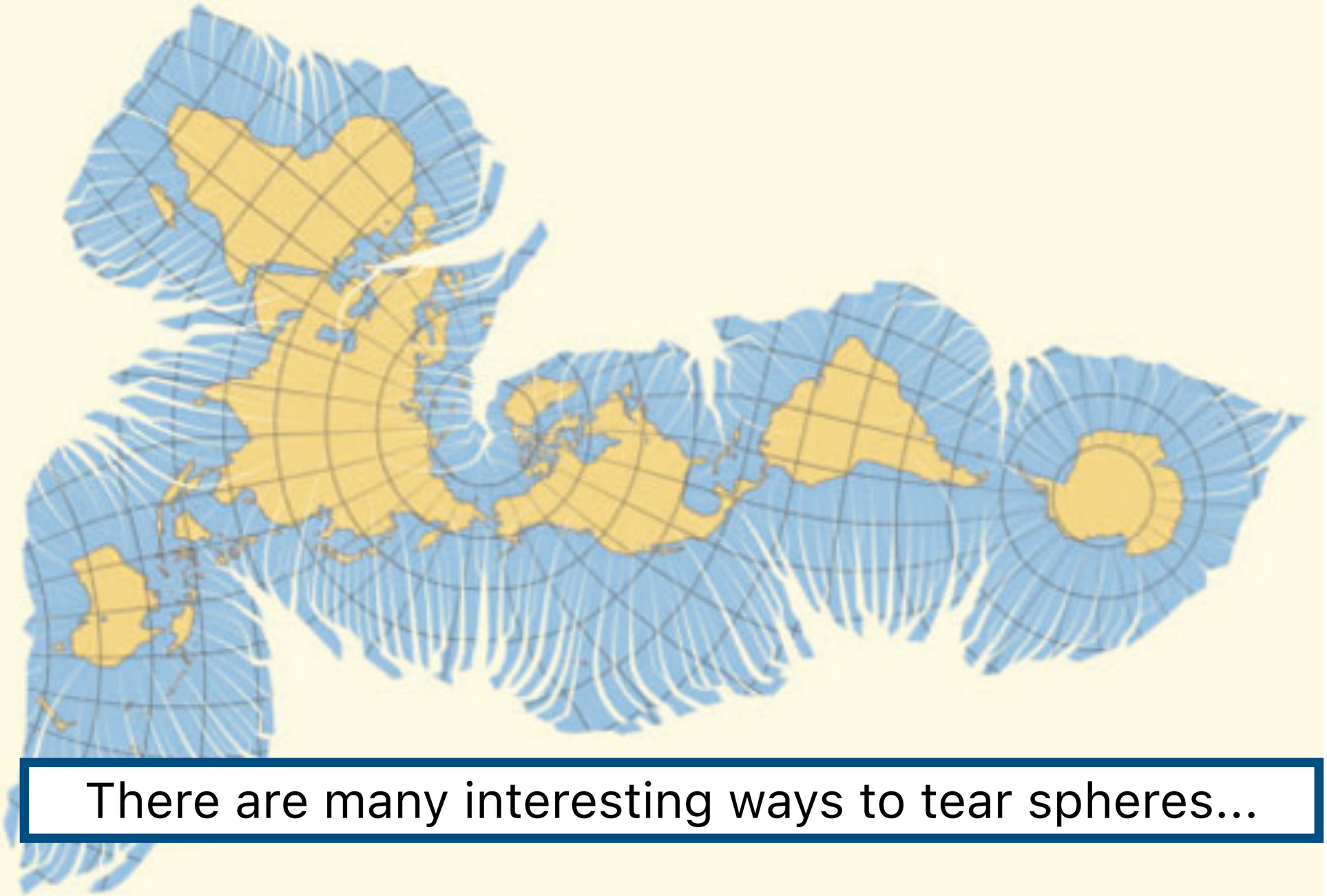
http://xkcd.com/977

MERCATOR

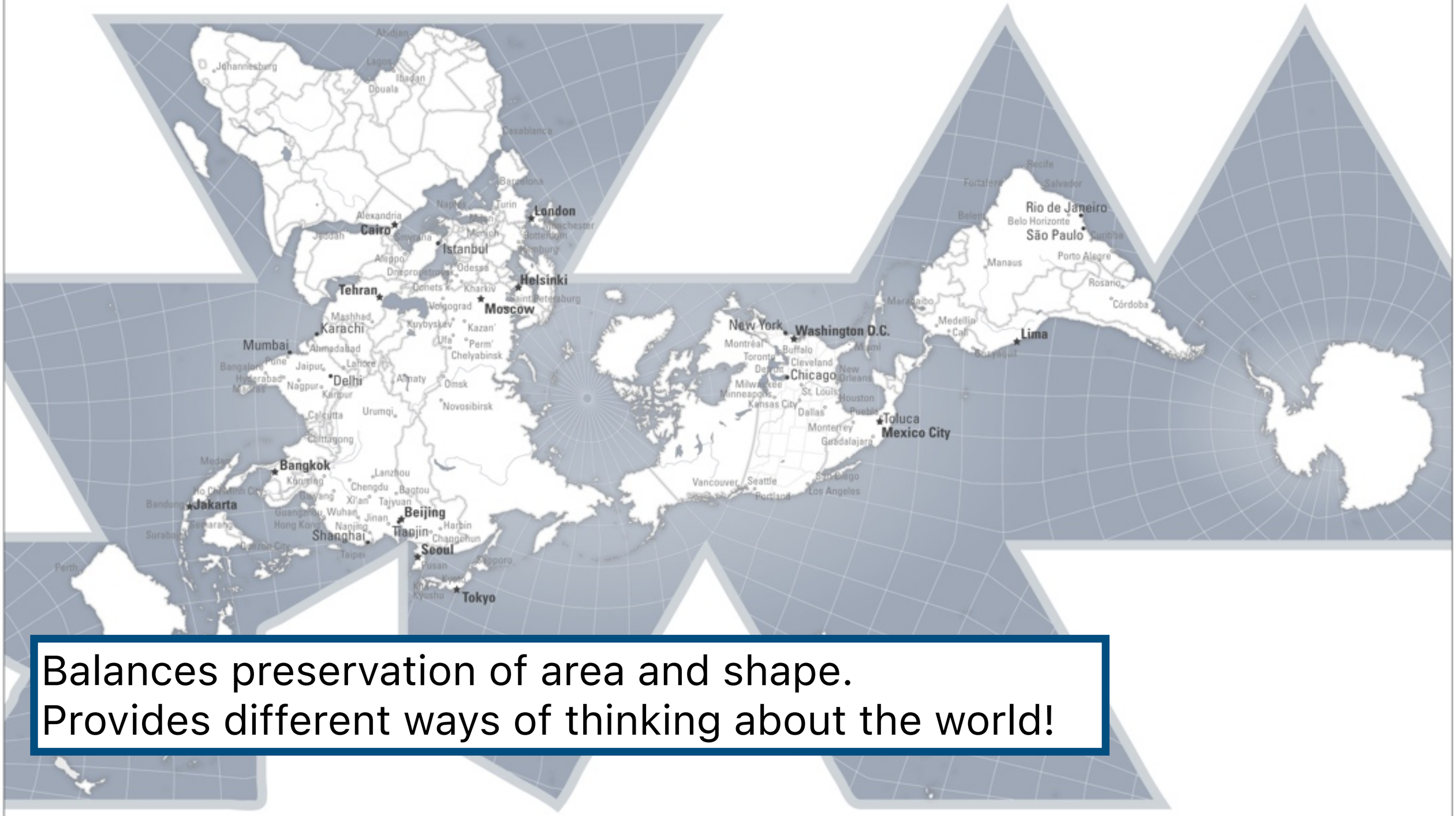
YOU'RE NOT REALLY INTO MAPS.

VAN DER GRINTEN

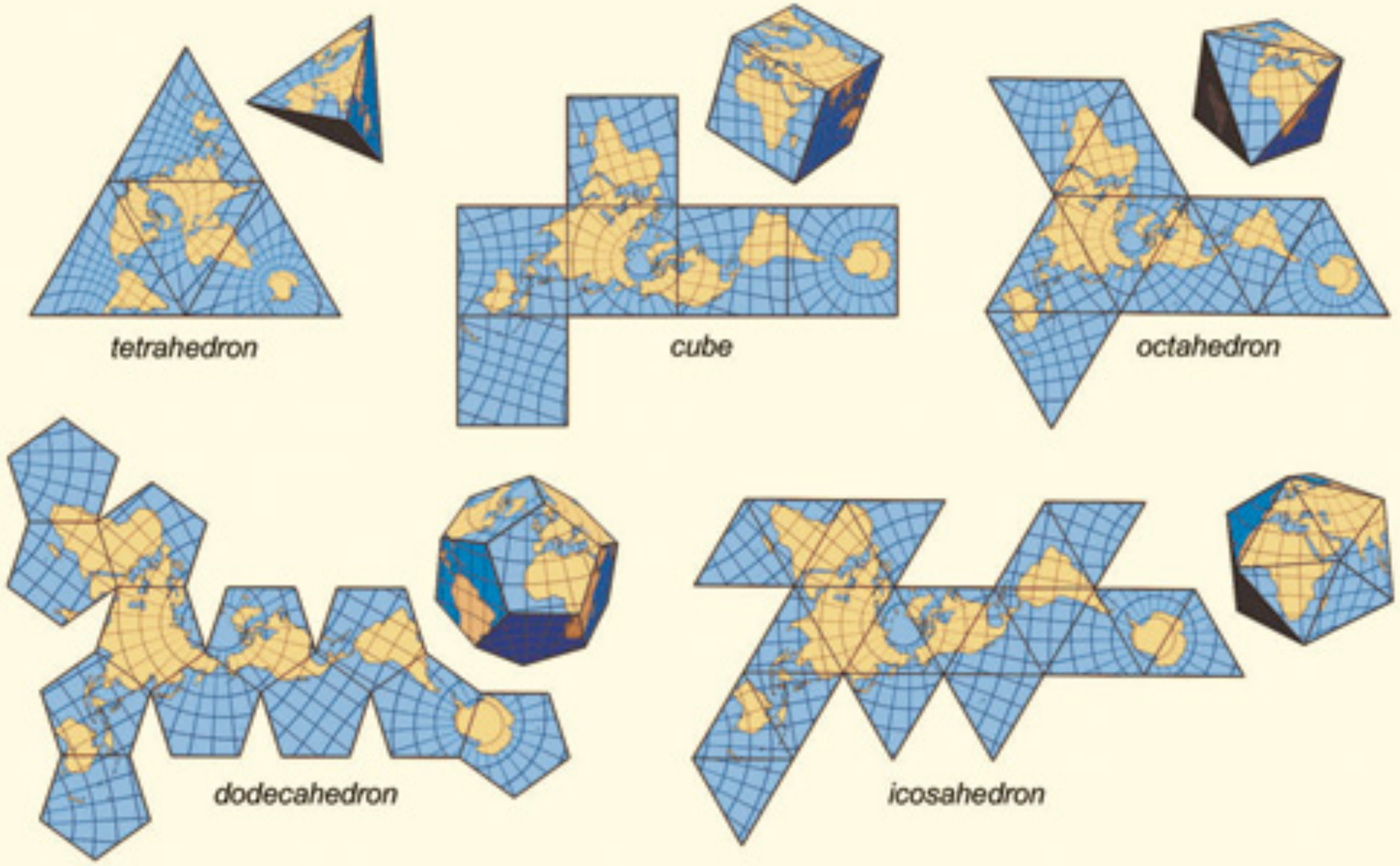
YOU'RE NOT A COMPLICATED PERSON. YOU LOVE THE MERCATOR PROJECTION; YOU JUST WISH IT WEREN'T SQUARE. THE EARTH'S NOT A SQUARE, IT'S A CIRCLE. YOU LIKE CIRCLES. TODAY IS GONNA BE A GOOD DAY!



There are many interesting ways to tear spheres...



Balances preservation of area and shape.
Provides different ways of thinking about the world!


tetrahedron
cube
octahedron
dodecahedron
icosahedron

Oregon State University OSU

CARTO GROUP GRAPHY & GEOVISUALIZATION

ADAPTIVE COMPOSITE MAP PROJECTIONS

Idea: switch between projections by location and zoom level

Mapping
(Visualizing Geospatial Data)

How does the data change?

Where does the data occur?

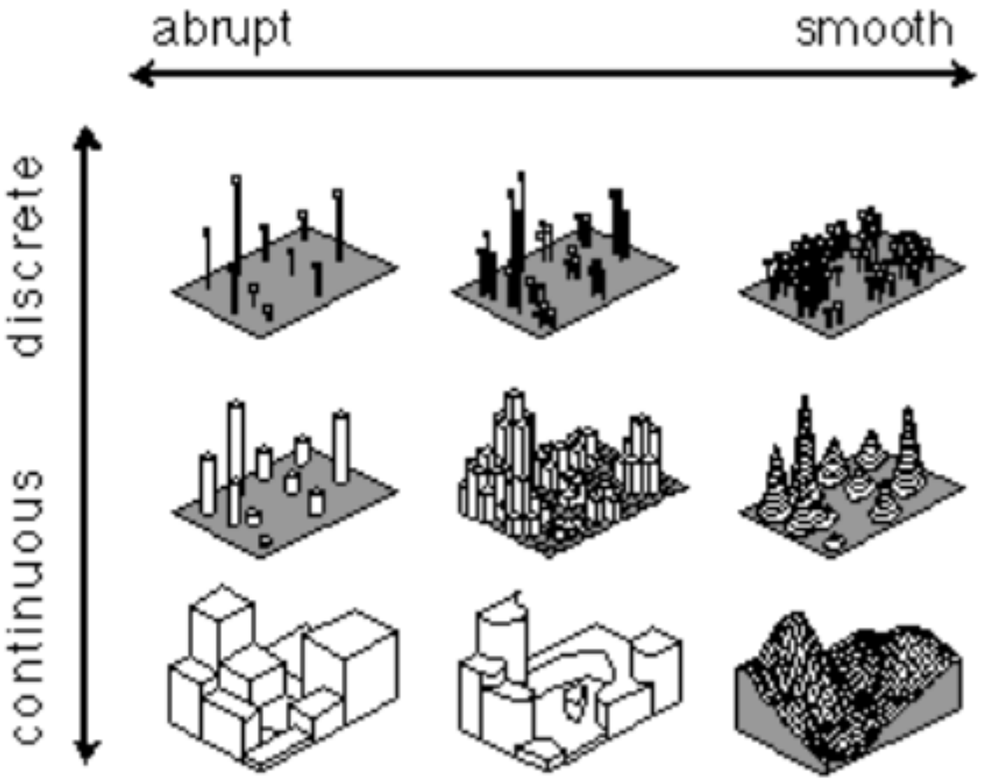


Fig. 8. Data models representing points in the continuity-abruptness phenomena space.

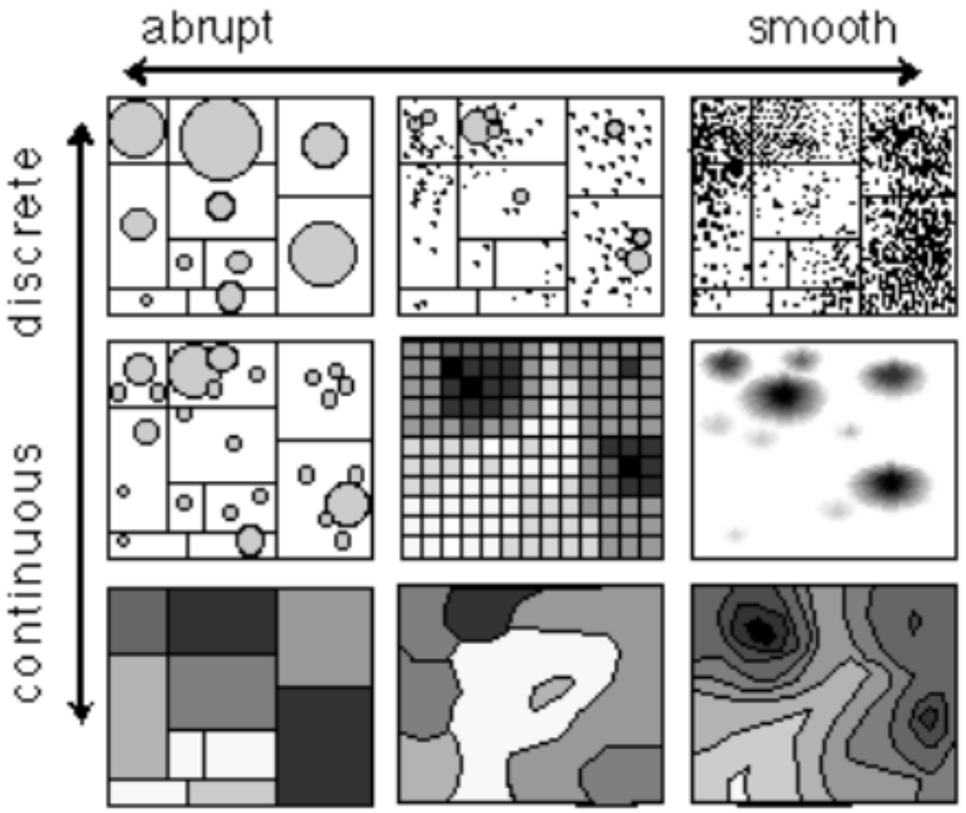
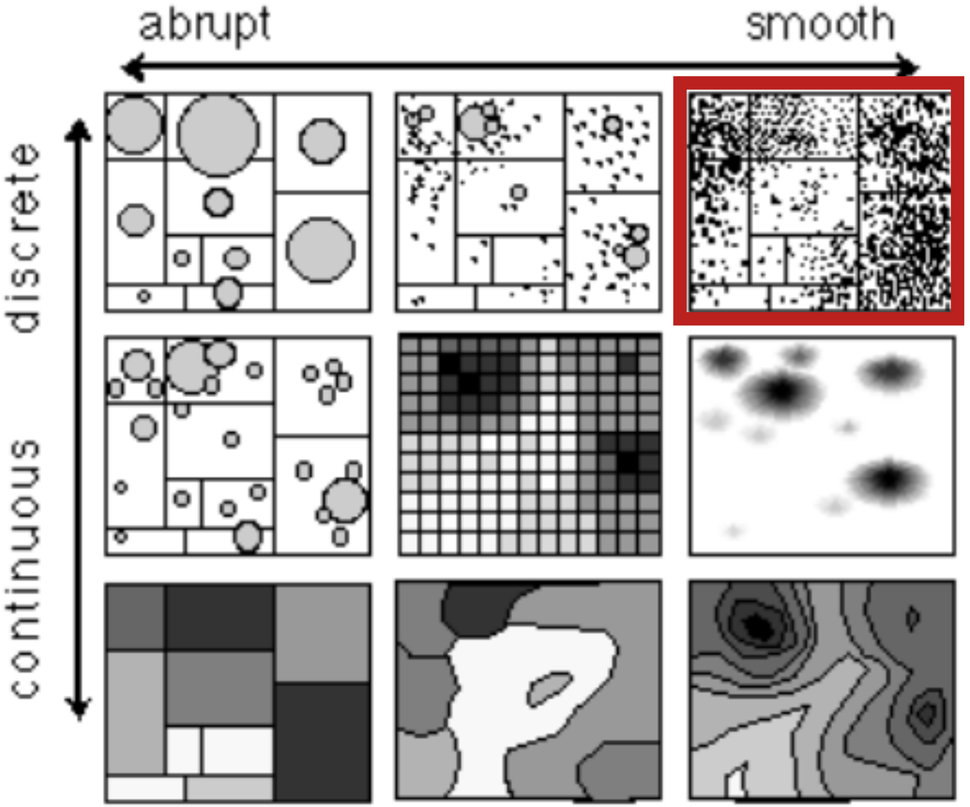


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.

[MacEachren. Visualizing Uncertain Information. 1992]

Dot Distribution Map



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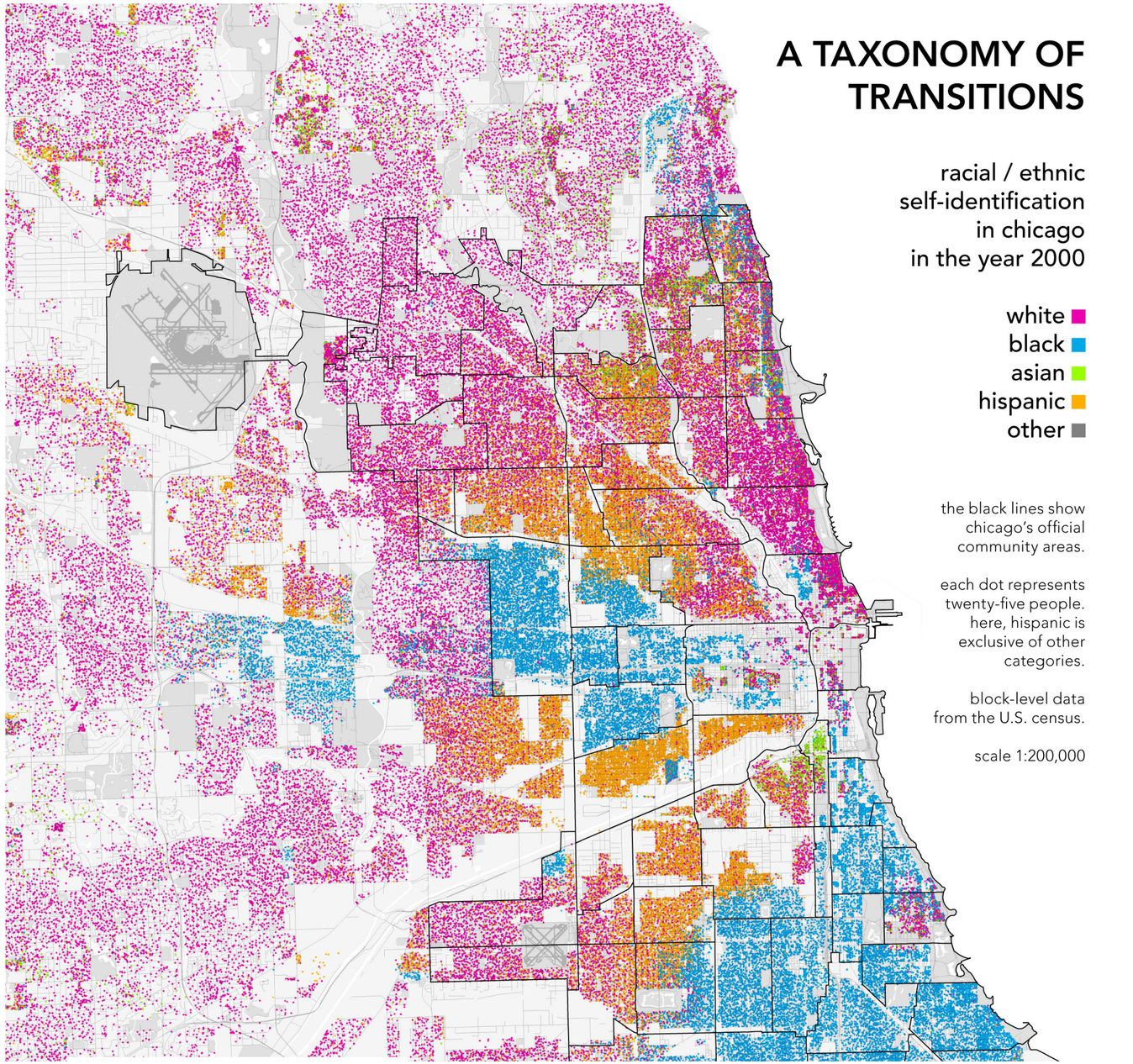
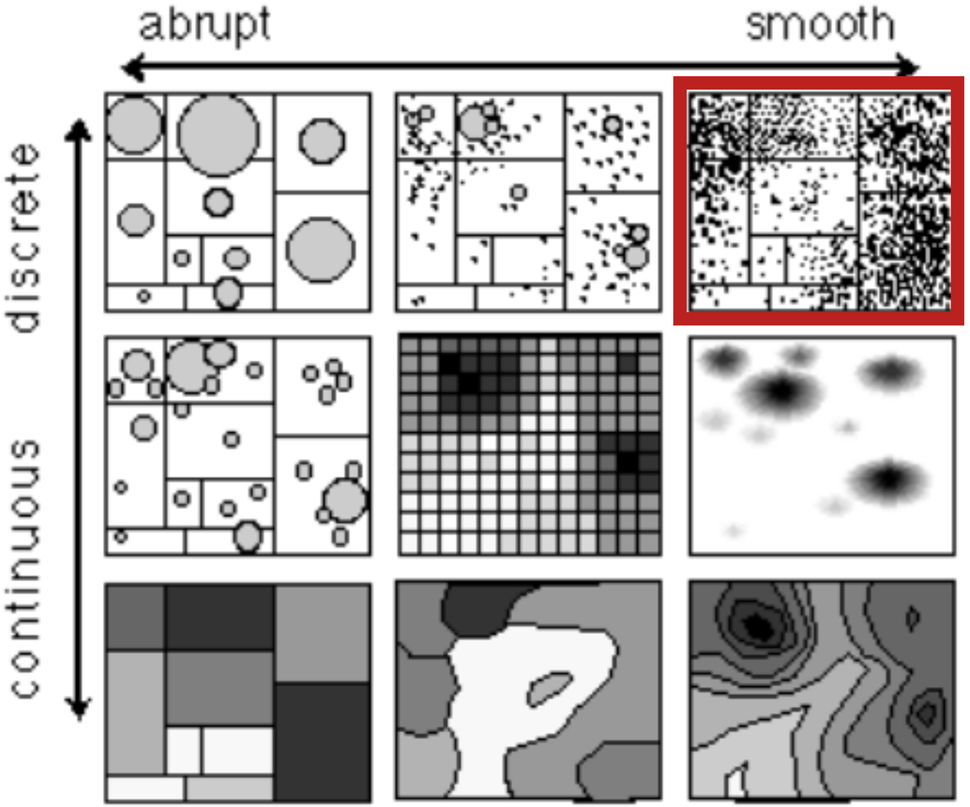


Dot Distribution Map



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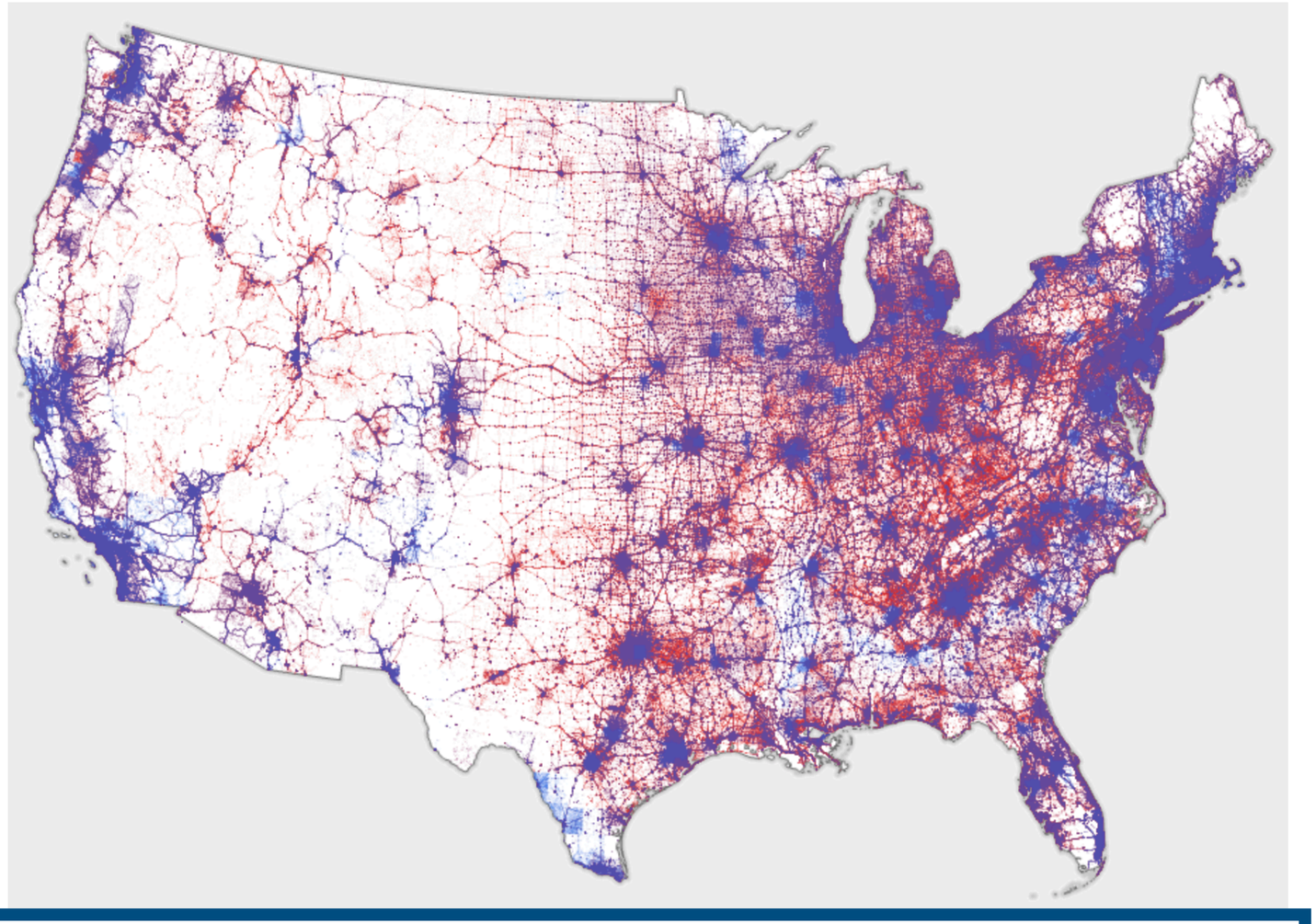
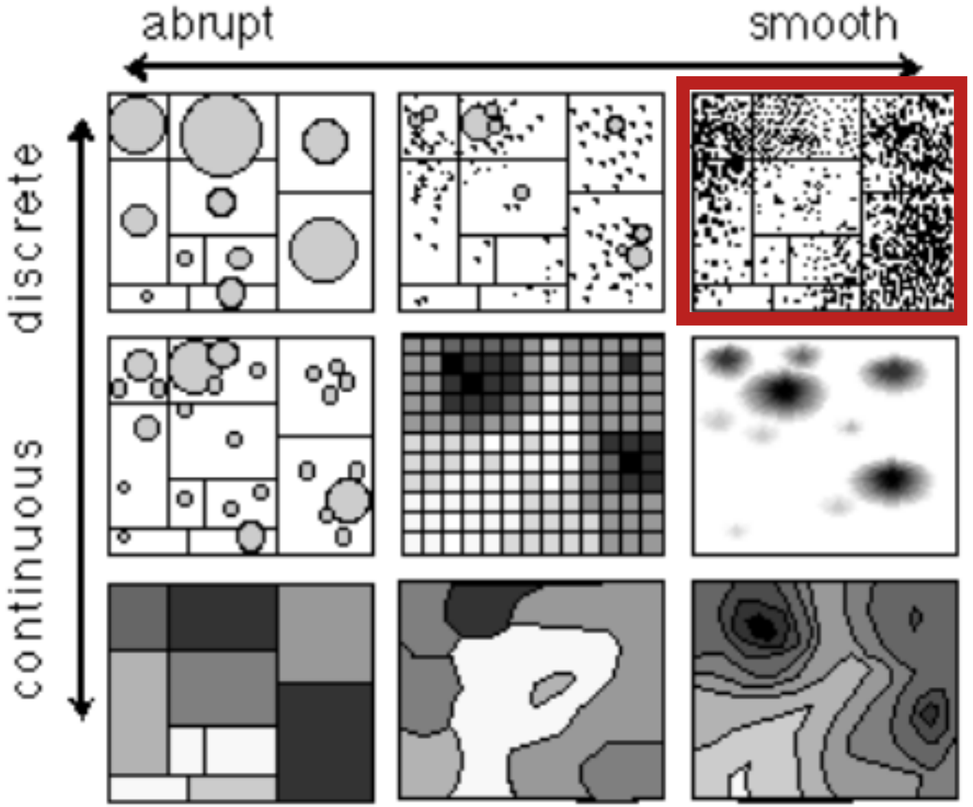


Votes cast in the 2016 Presidential Election

Dot Distribution Map



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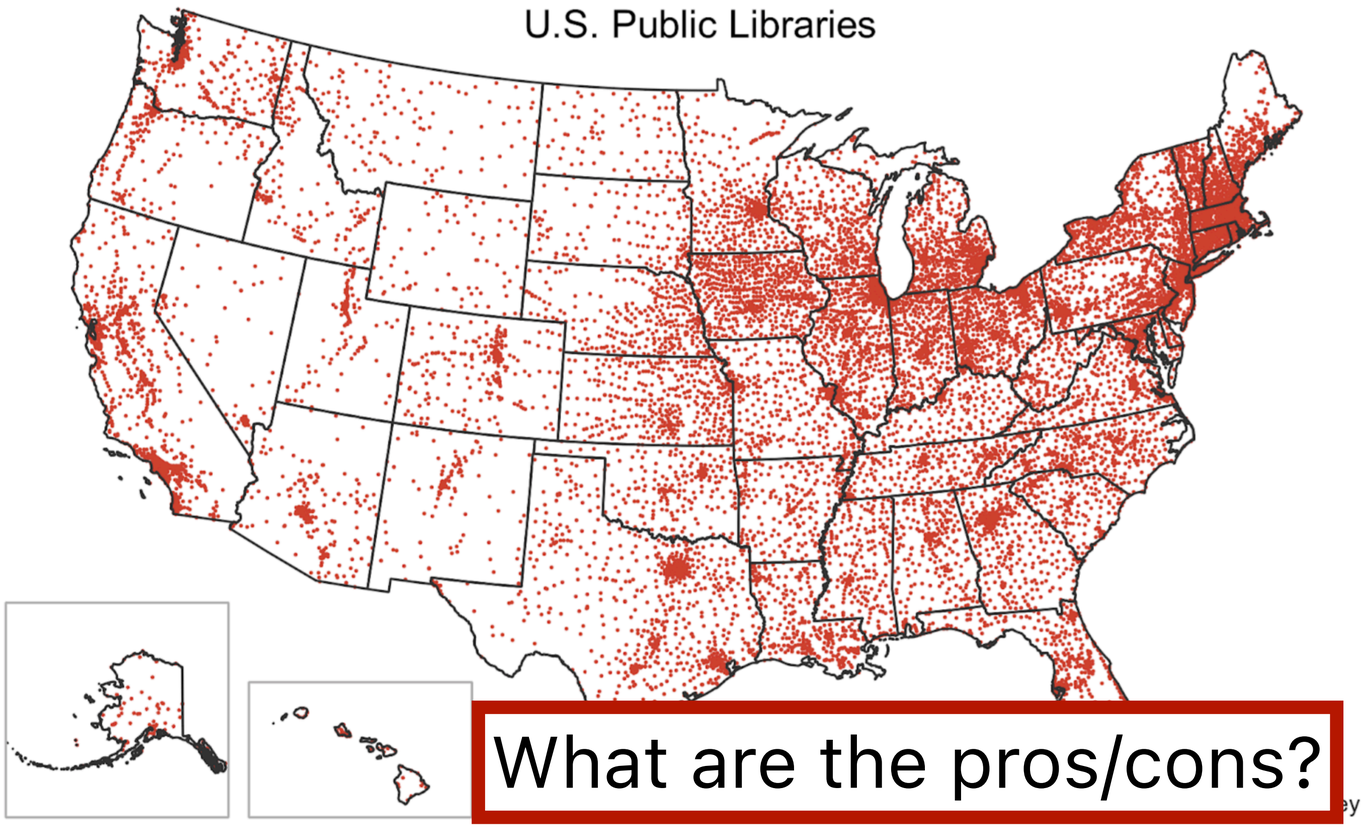
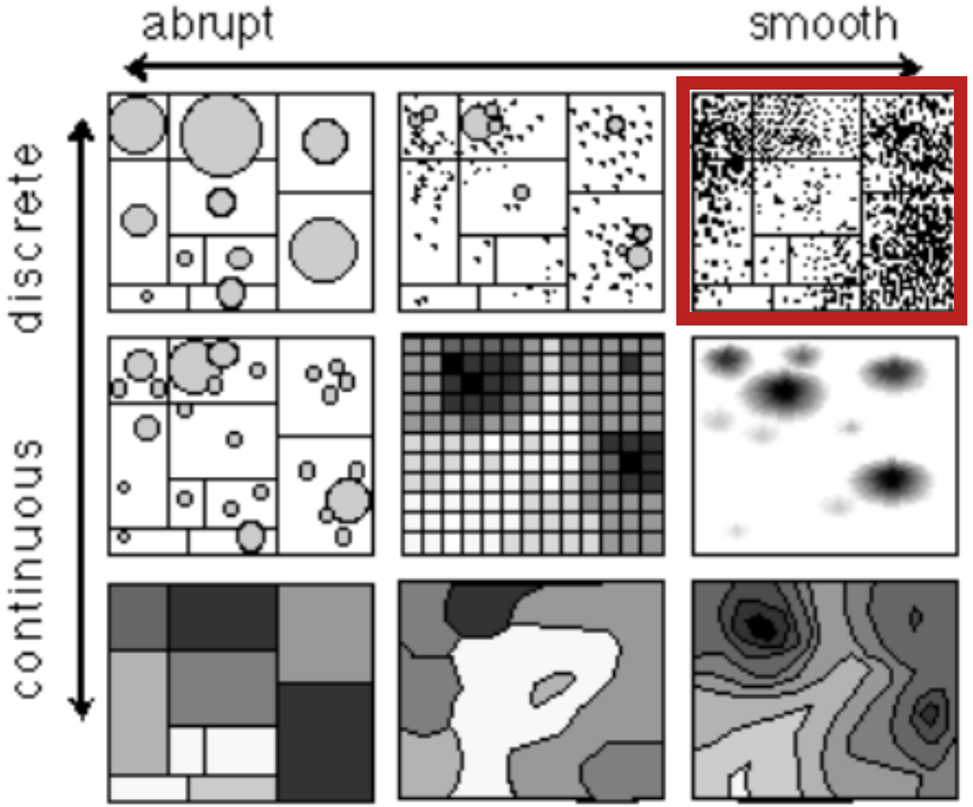


What are the pros/cons?

Join at
slido.com
#1050

Dot Distribution Map



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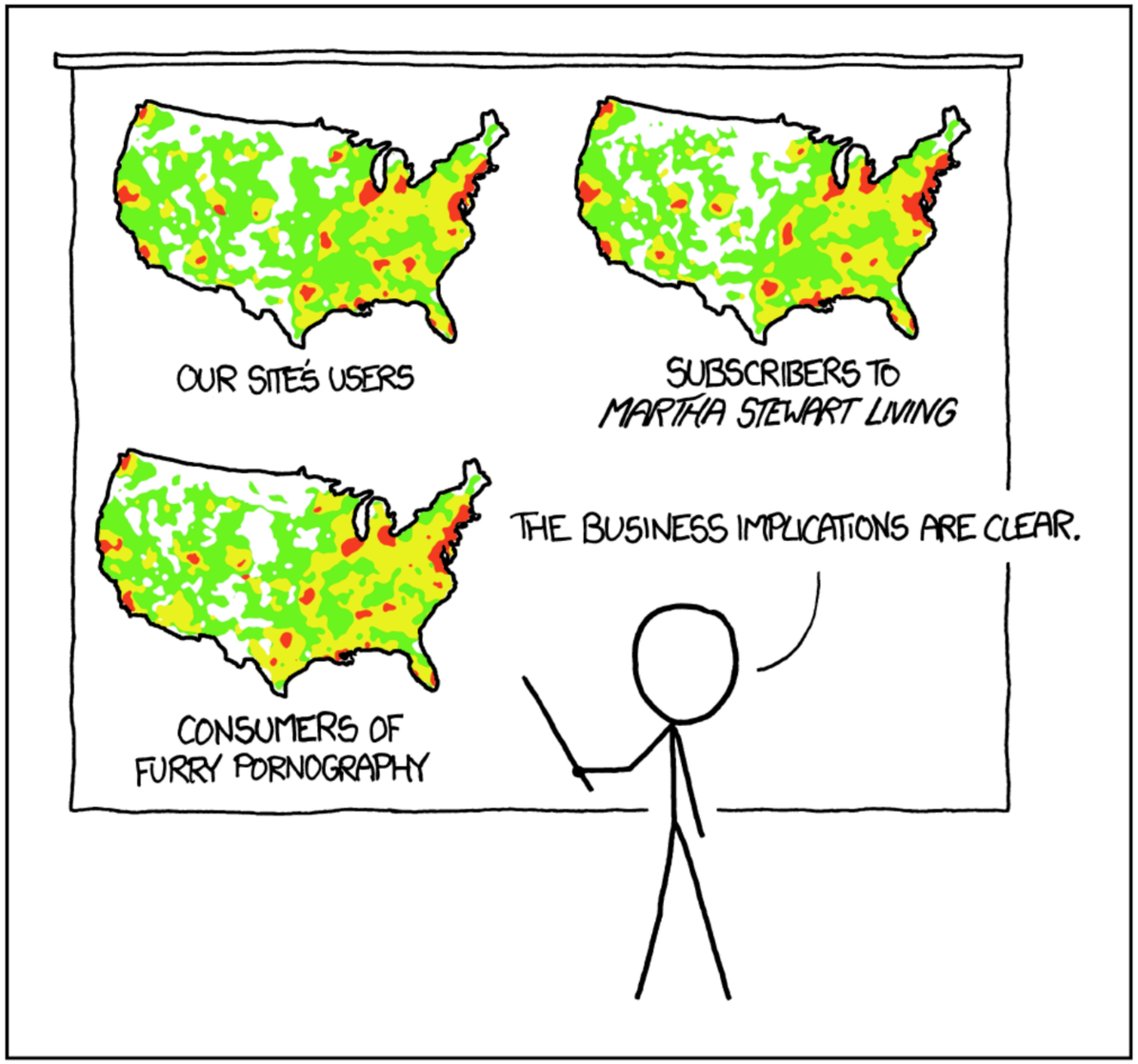
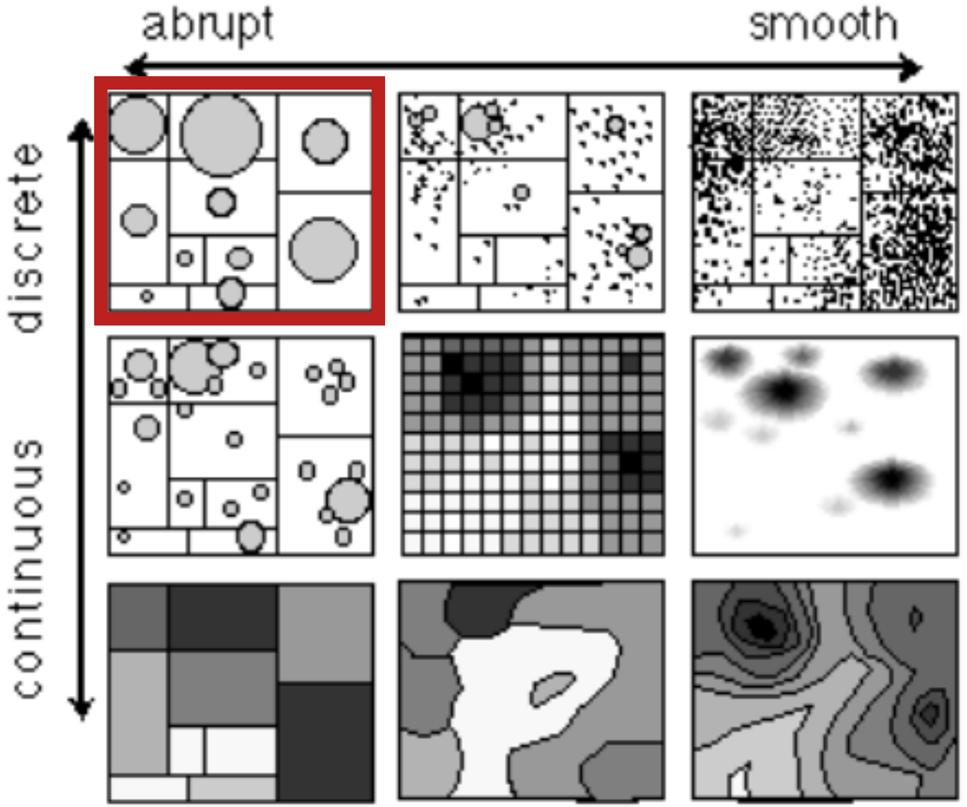


PET PEEVE #208:
GEOGRAPHIC PROFILE MAPS WHICH ARE BASICALLY JUST POPULATION MAPS

Proportional Symbol Map



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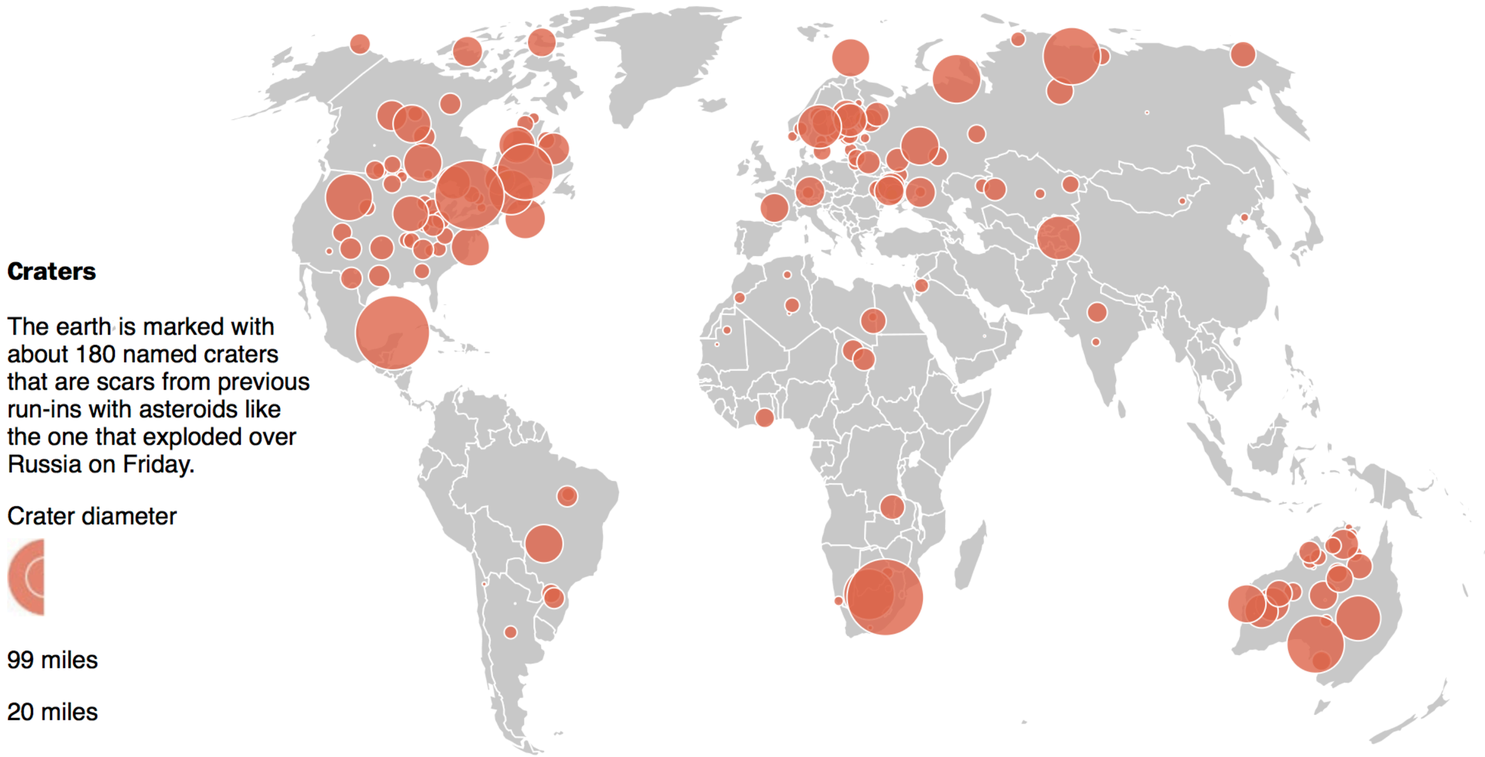
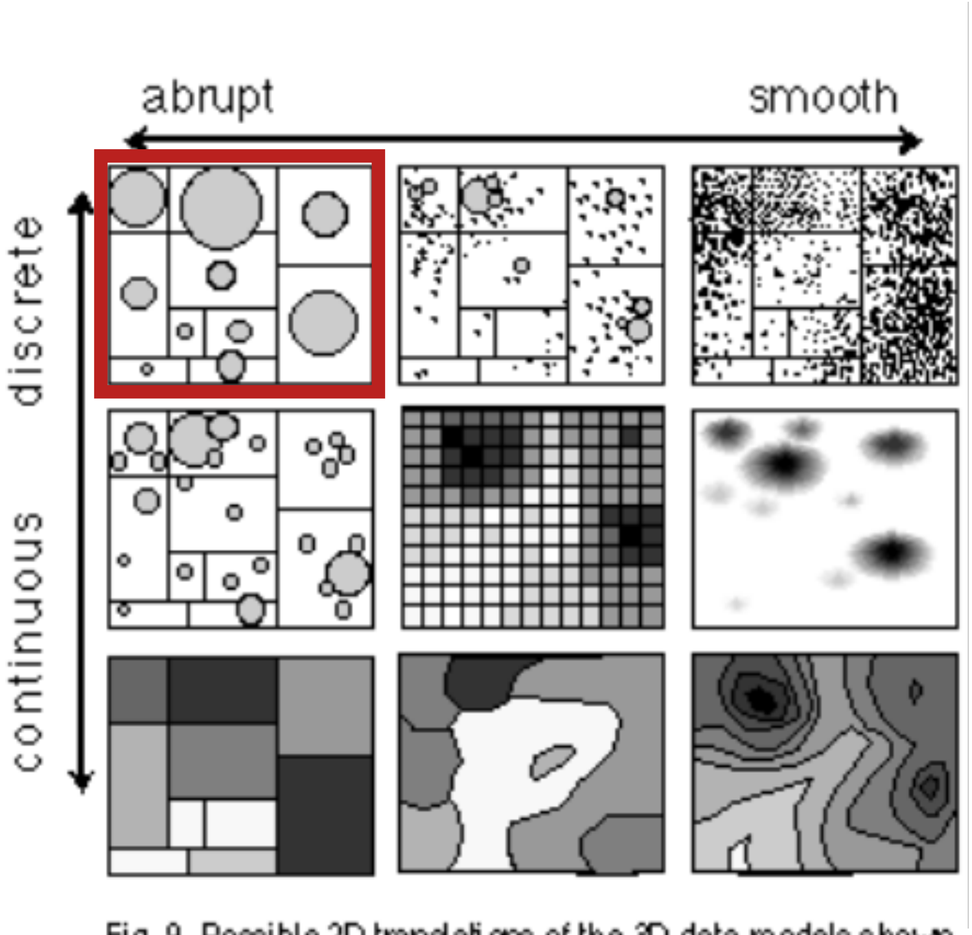


http://www.washingtonpost.com/wp-srv/special/world/russia-meteor/index.html

Proportional Symbol Map



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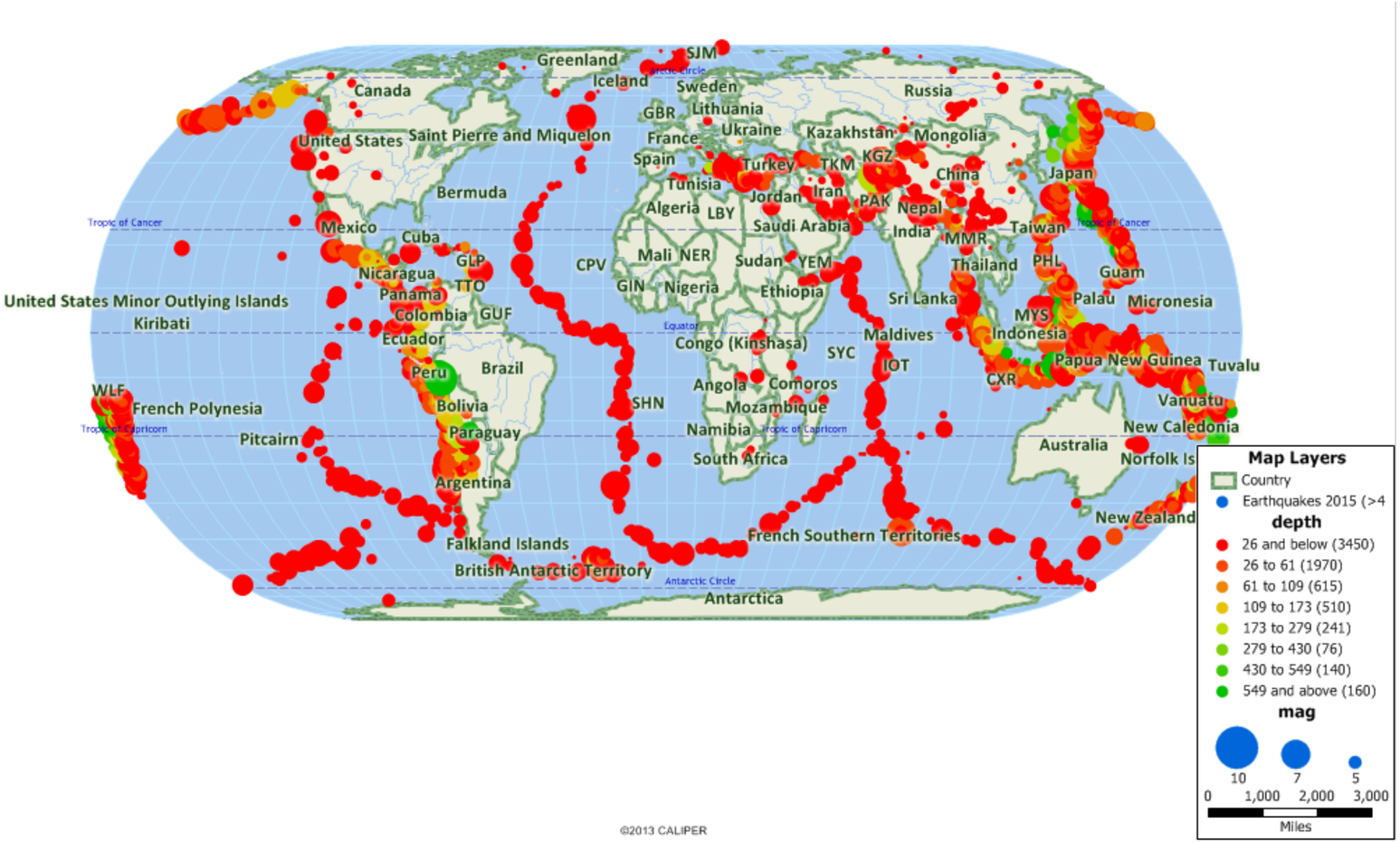
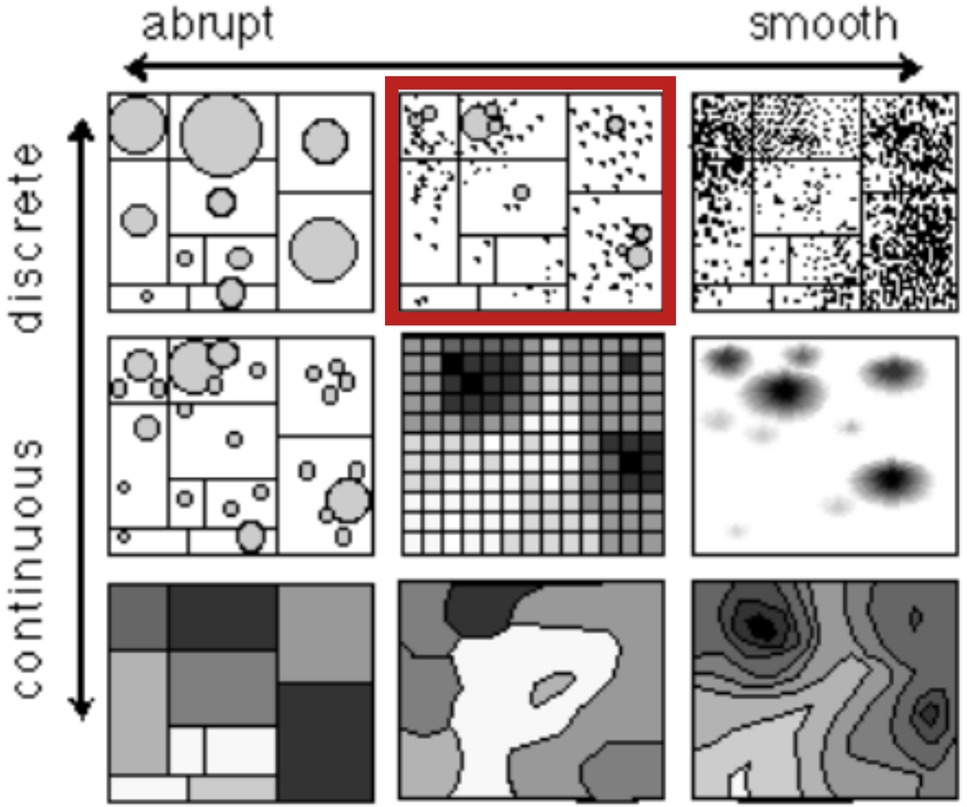


Graduated Symbol Map



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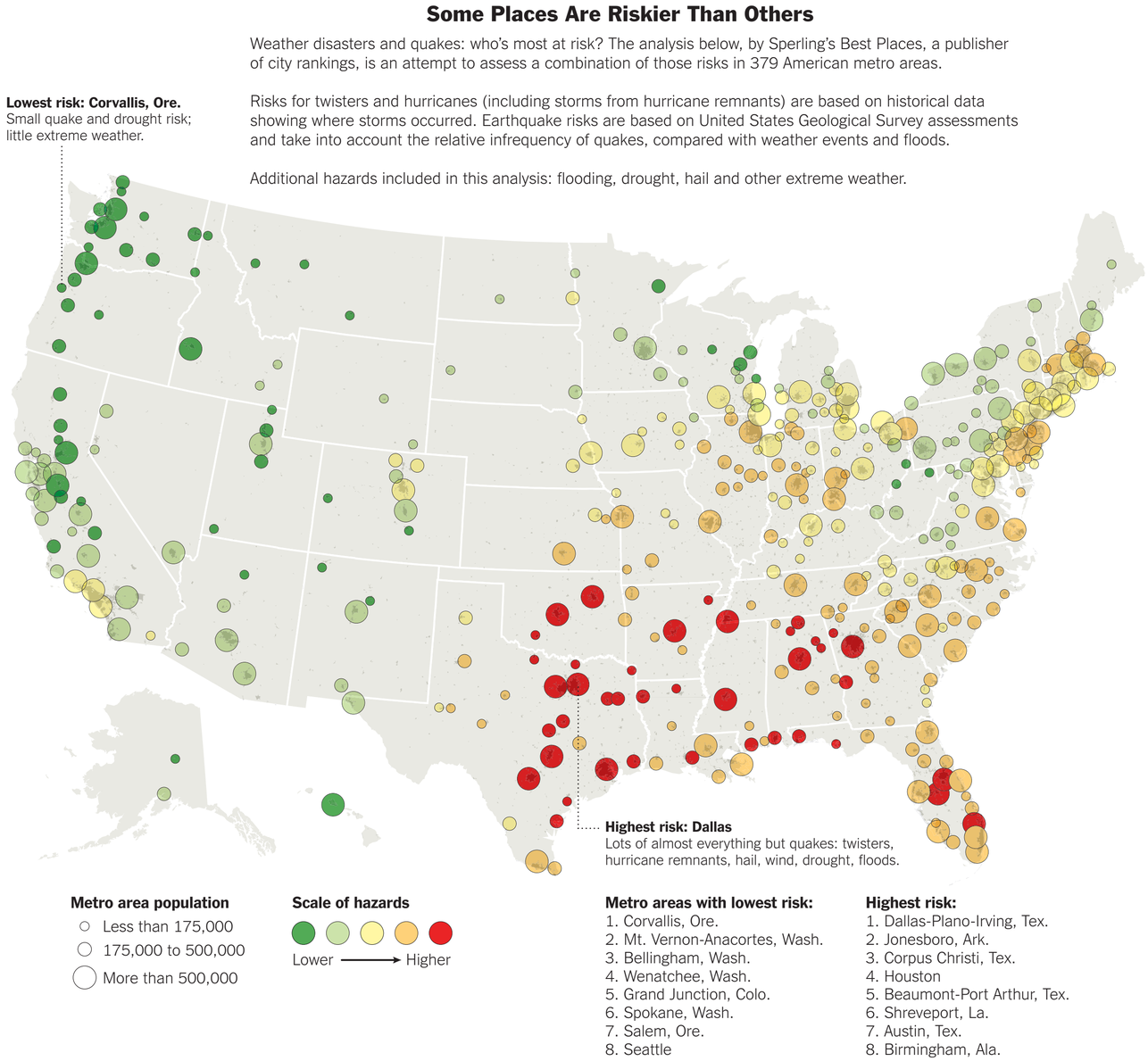
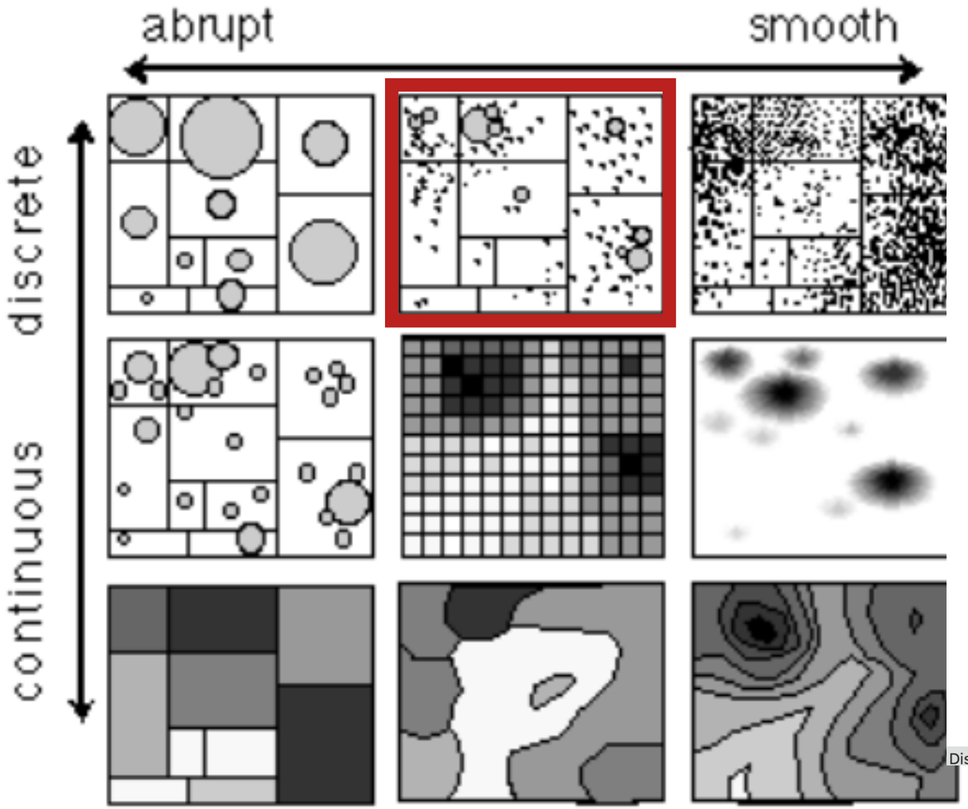


https://archive.nytimes.com/www.nytimes.com/interactive/2011/05/01/weekinreview/01safe.html?_r=0

Graduated Symbol Map



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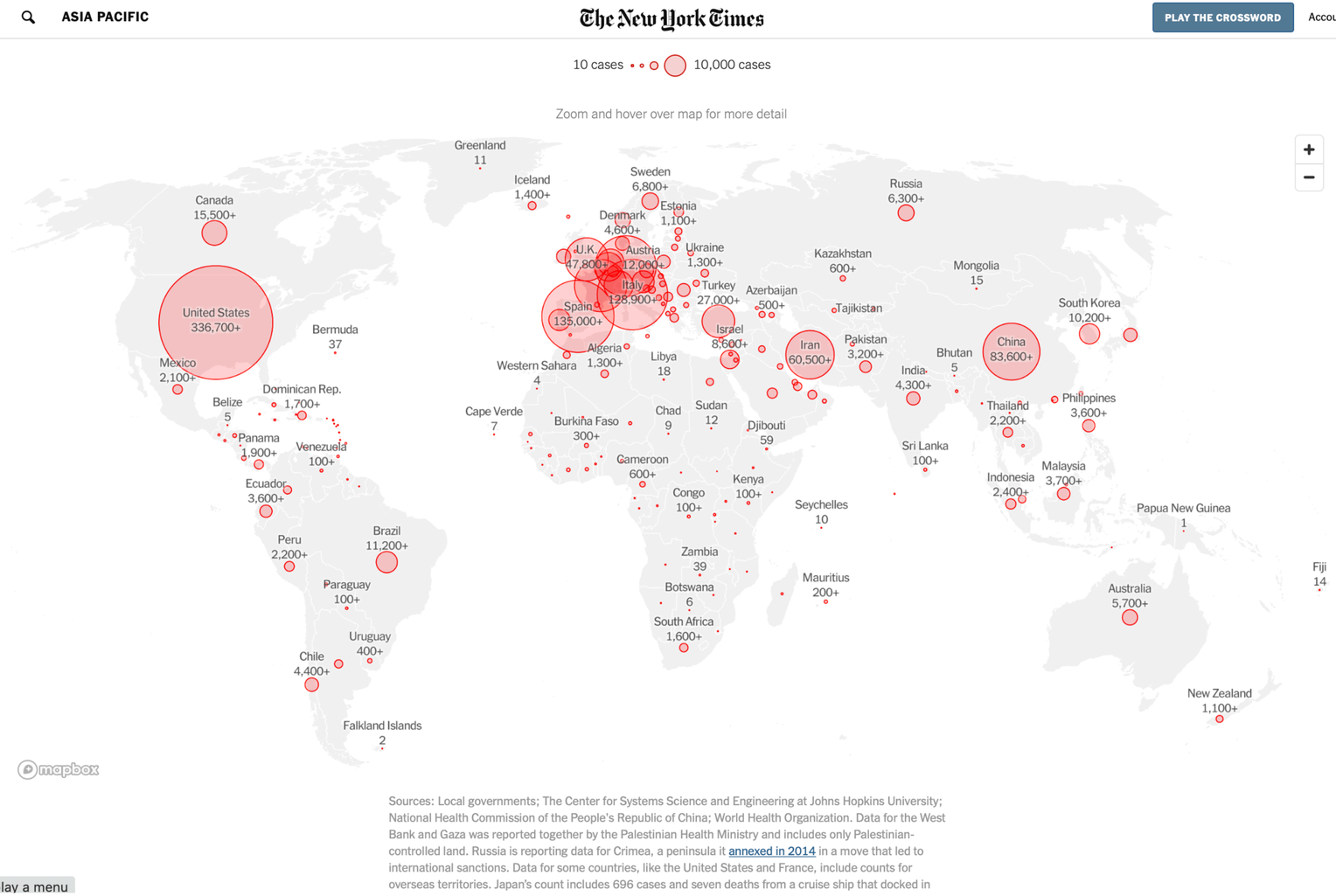
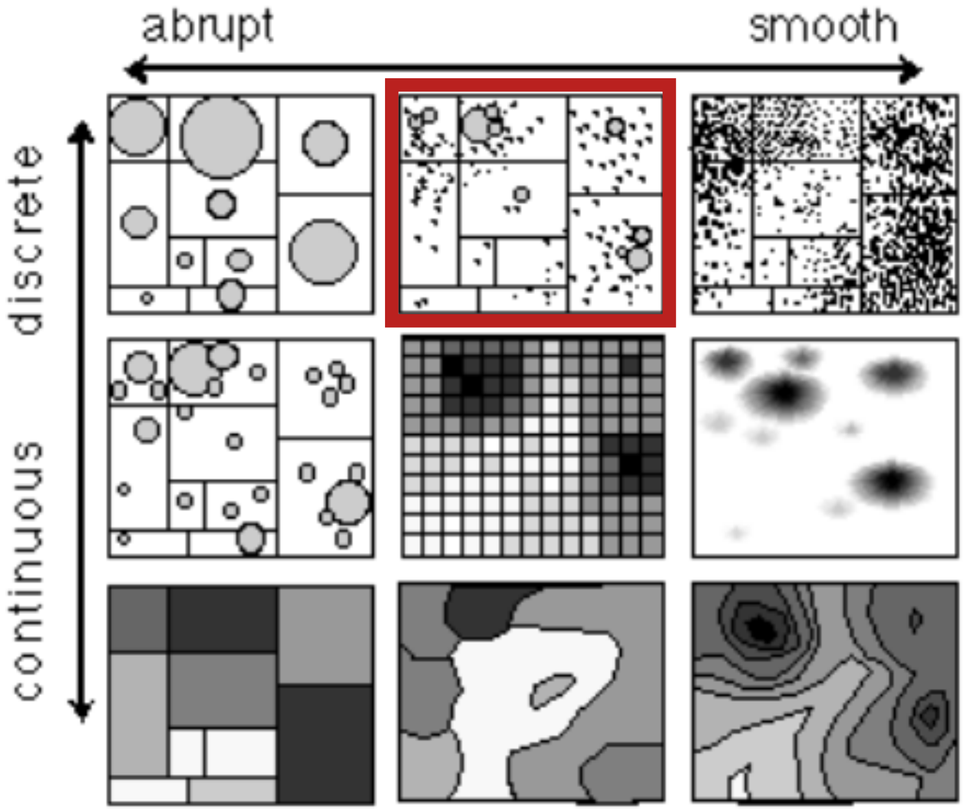


Display a menu

https://www.nytimes.com/interactive/2021/world/covid-cases.html

Graduated Symbol Map?



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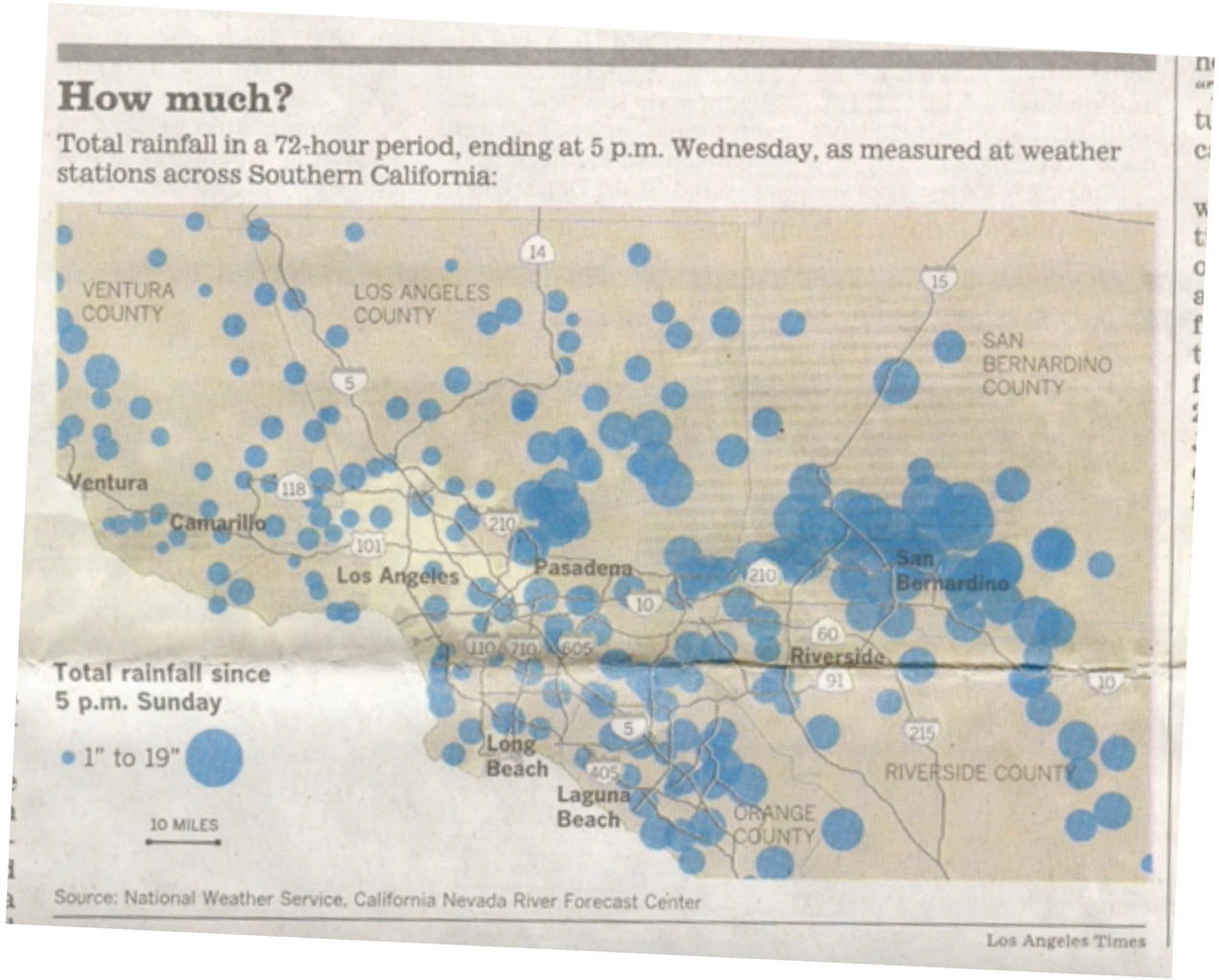
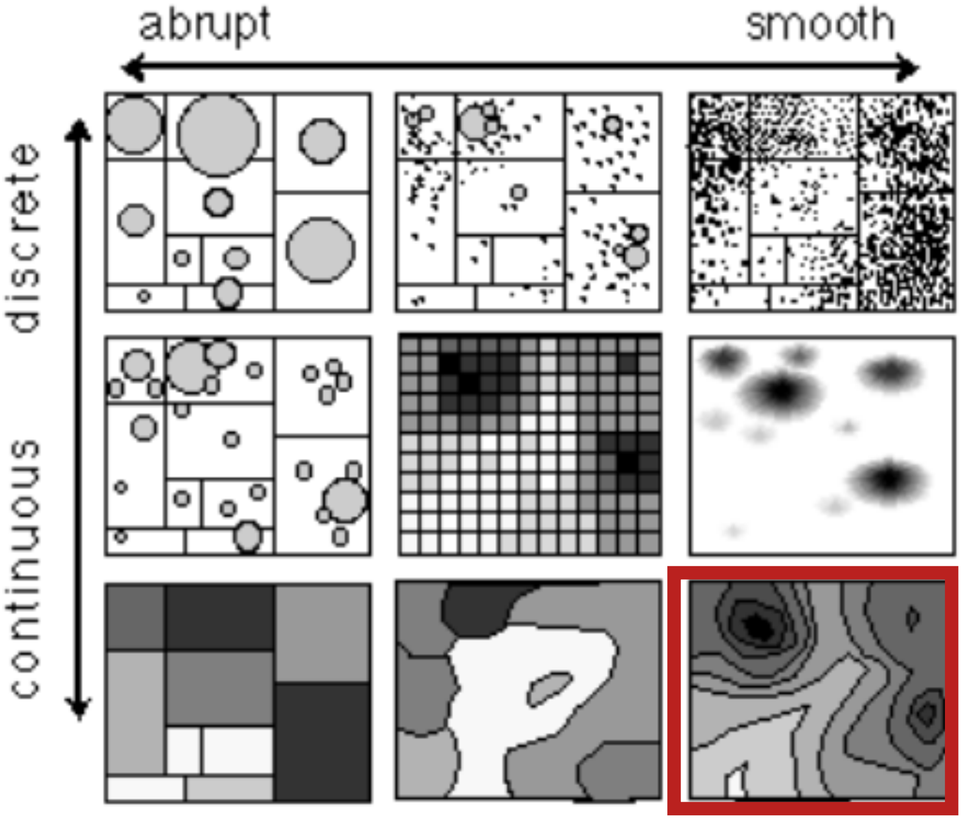


Isopleth / Heat Map



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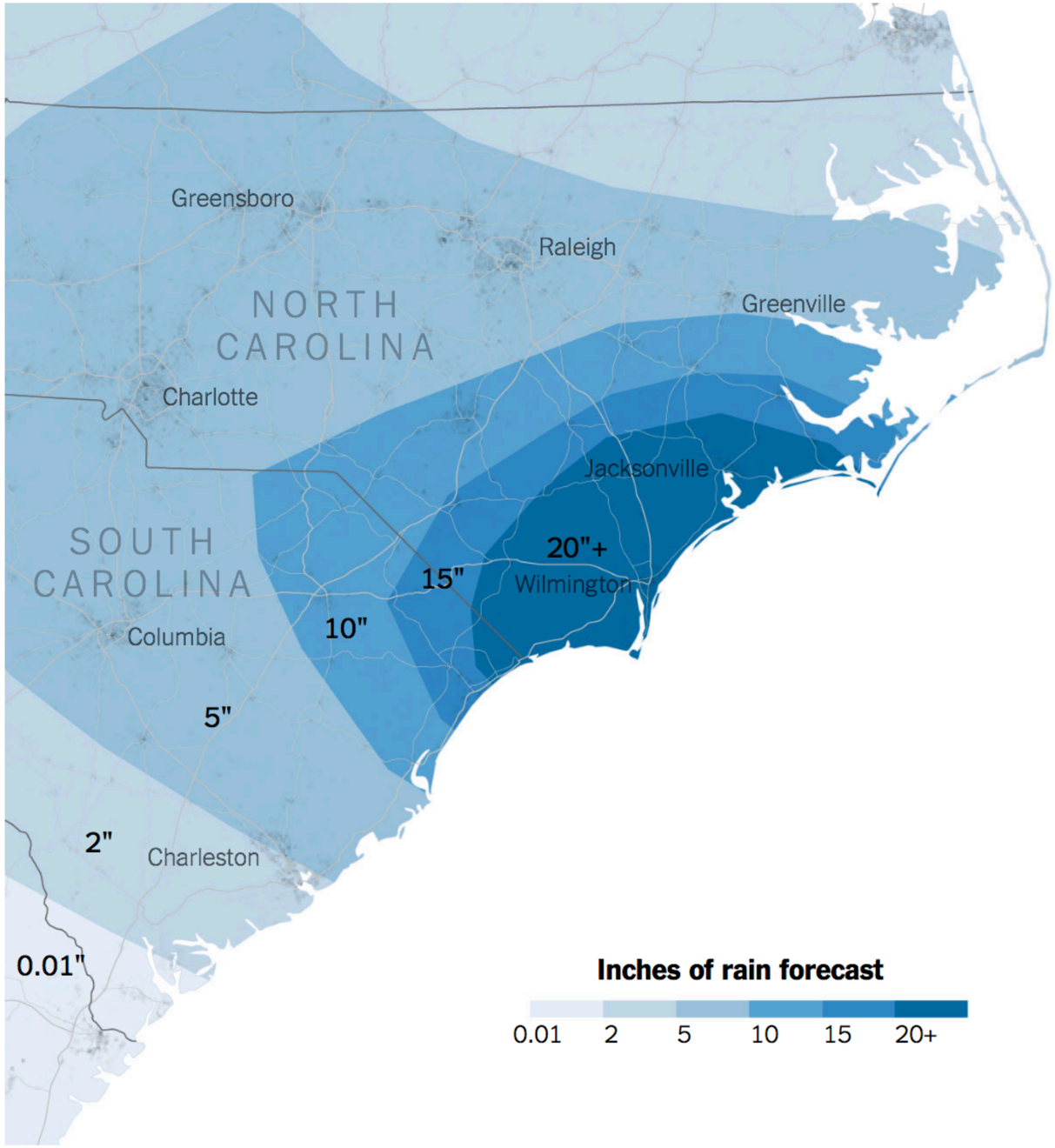


Source: National Weather Service

Choropleth

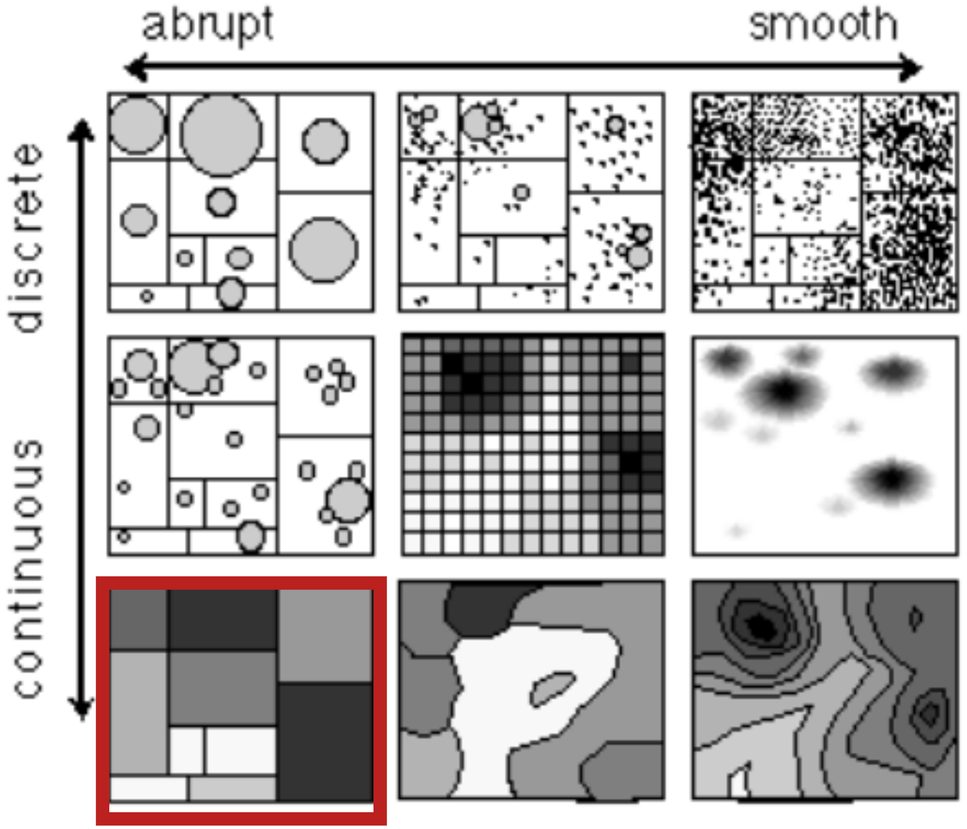
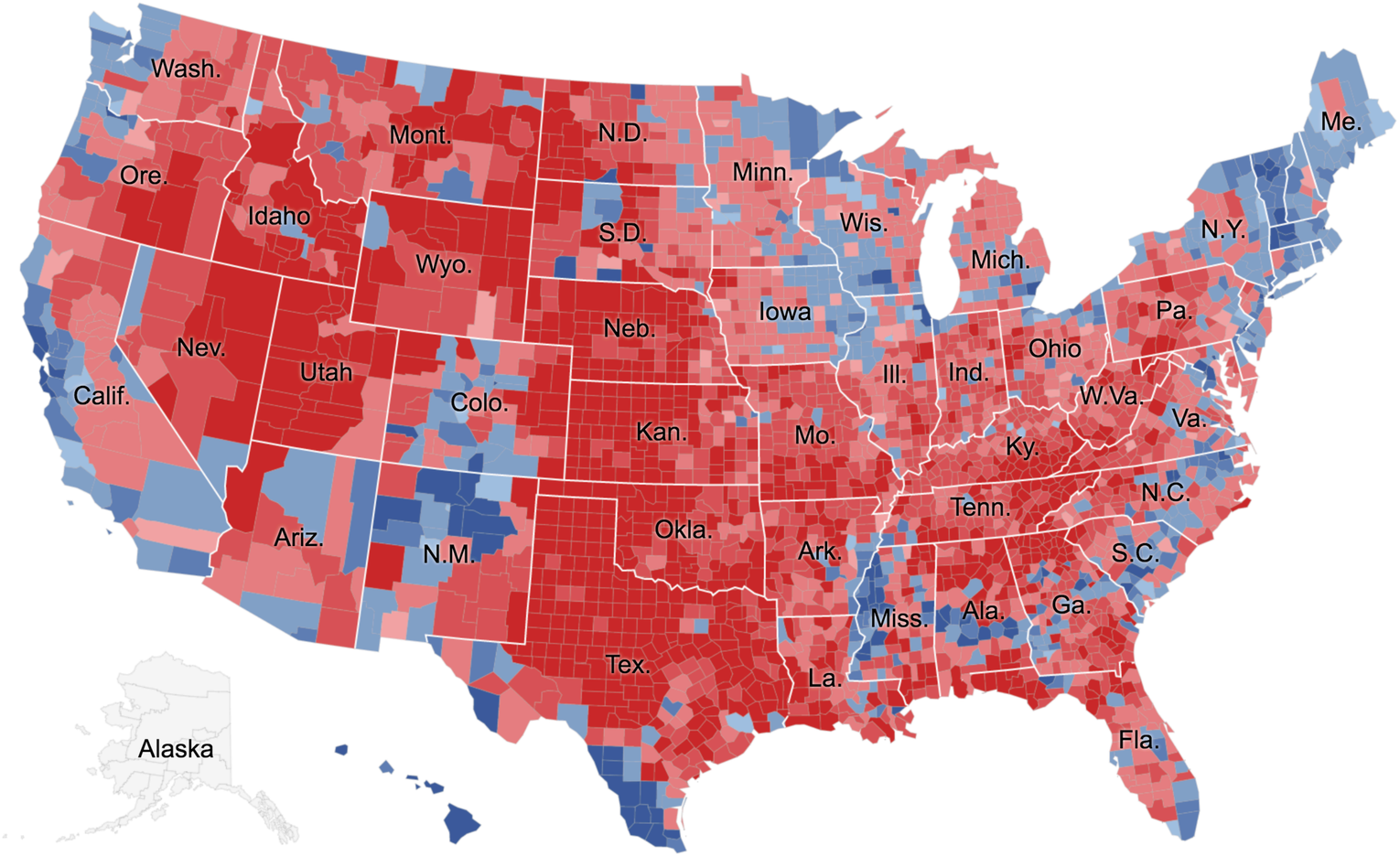
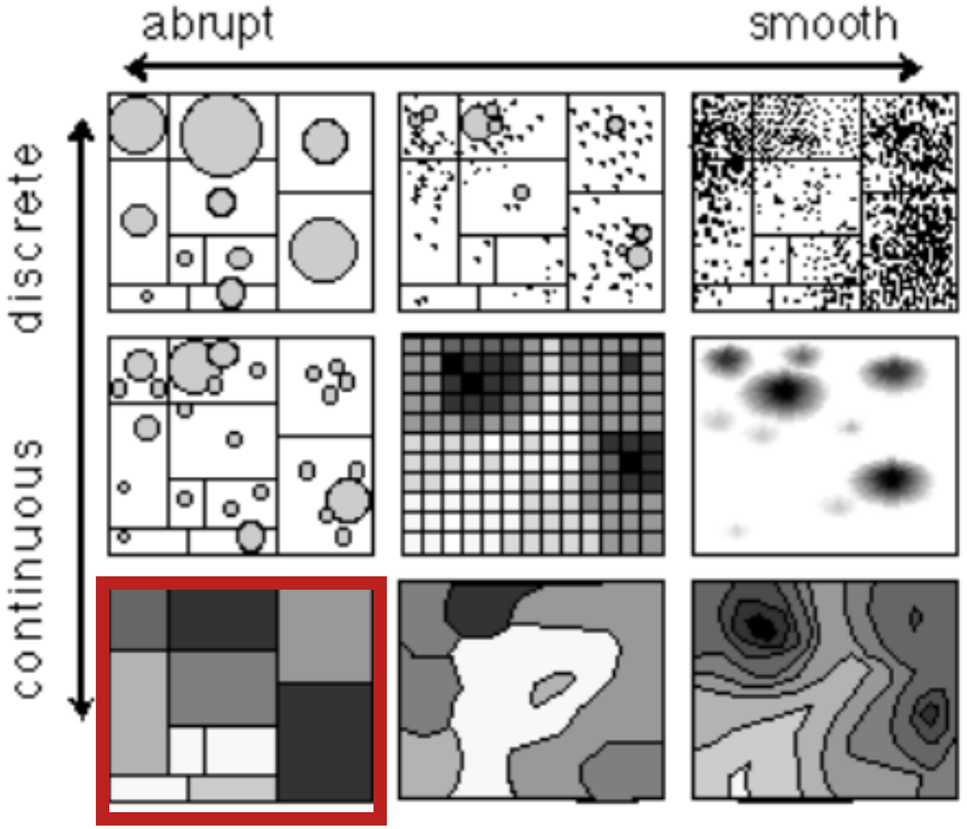


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.



https://www.nytimes.com/interactive/2016/11/01/upshot/many-ways-to-map-election-results.html

Choropleth



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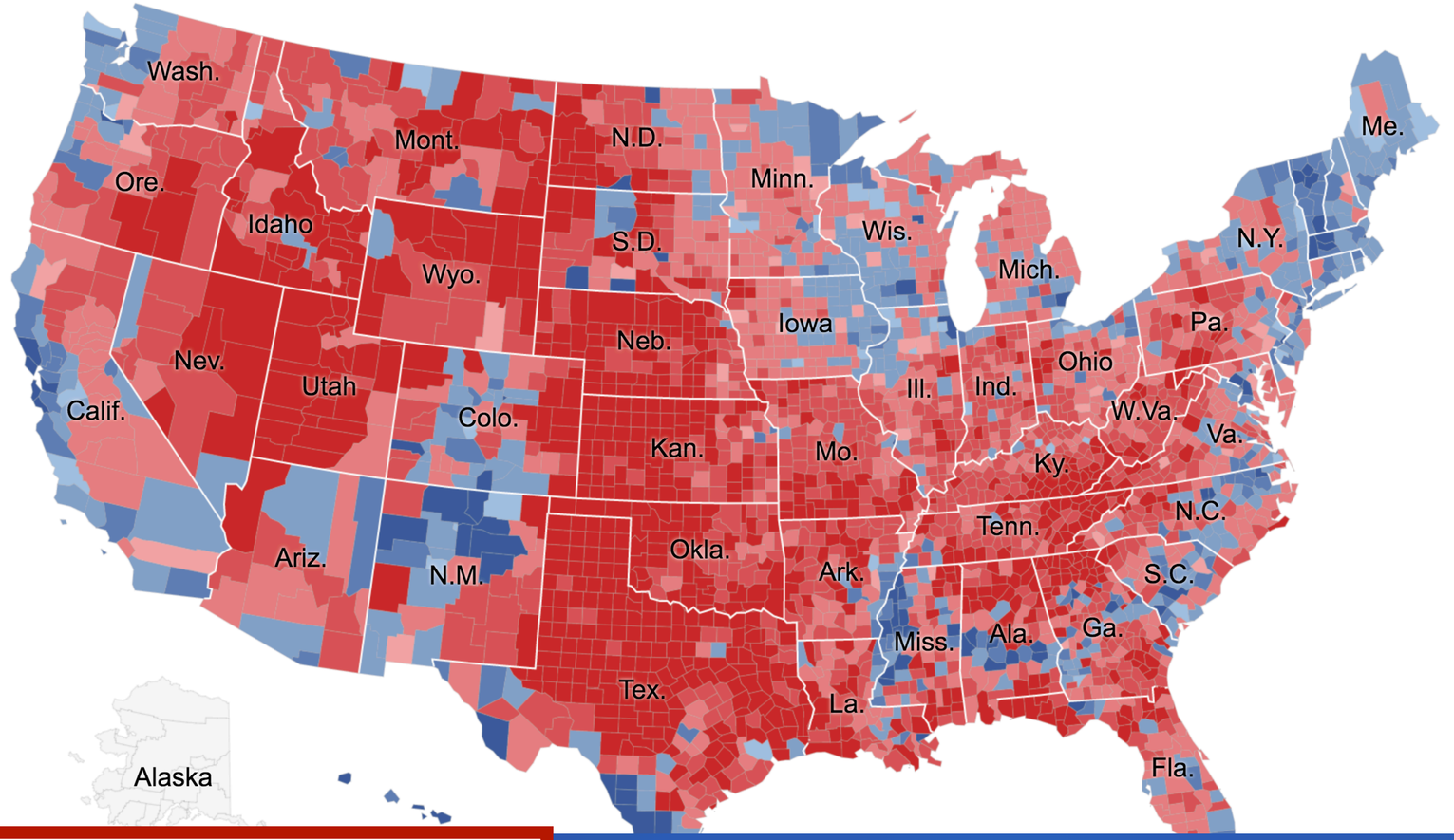

What are the pros/cons of this display?

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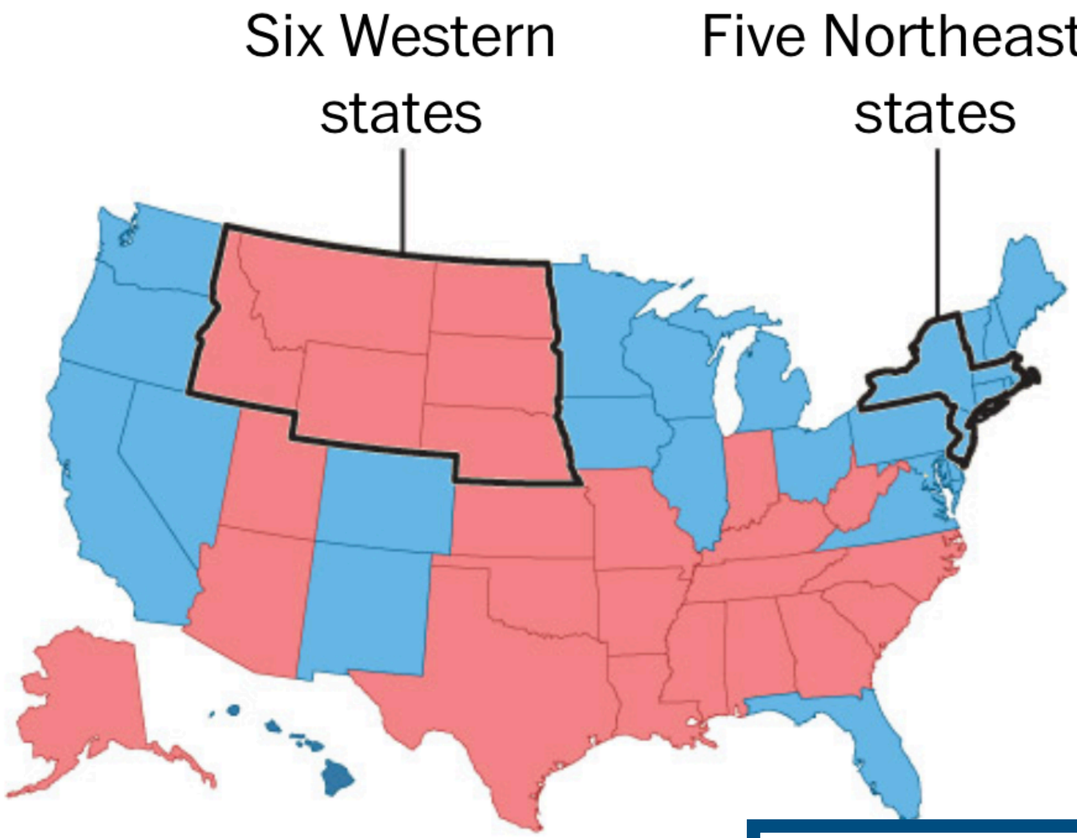
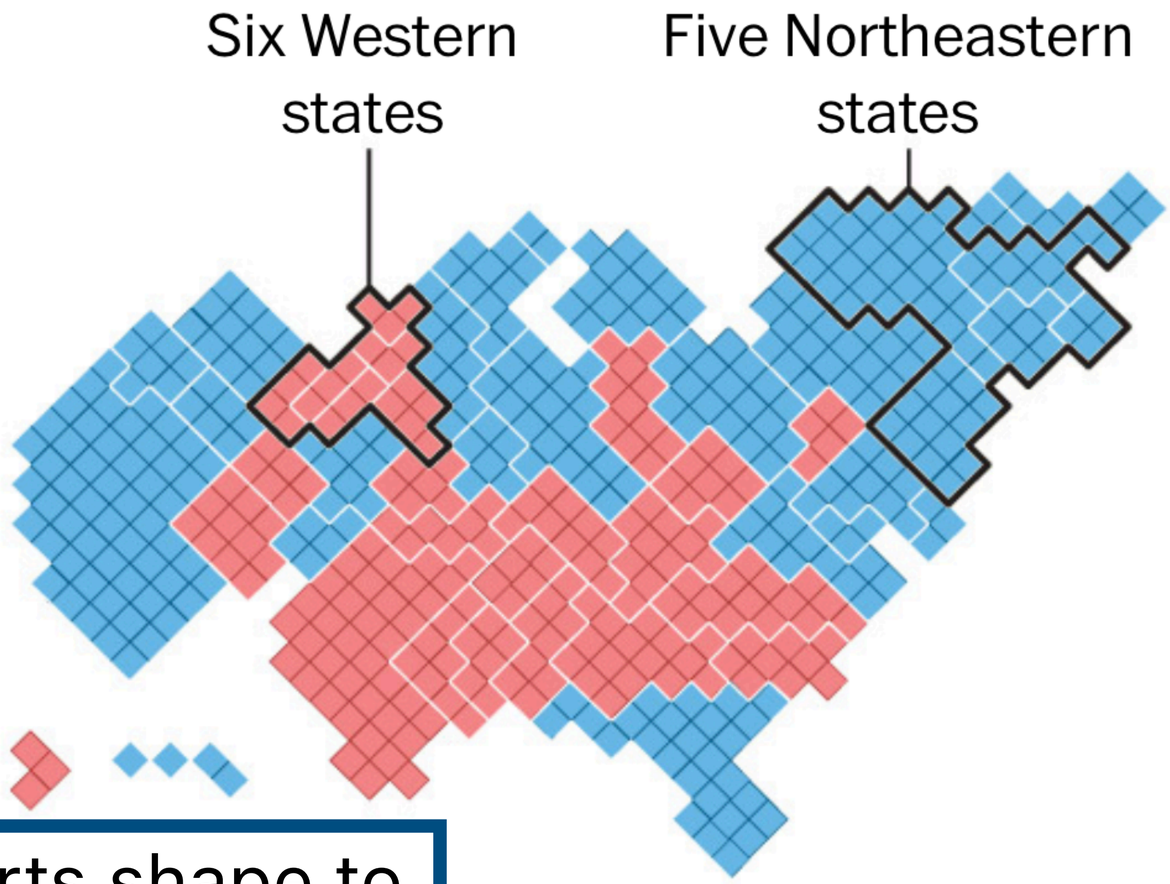
GEOGRAPHIC MAP → **CARTOGRAM OF ELECTORAL VOTES**





Cartogram: Distorts shape to convey quantity

What are the pros/ cons of this display?

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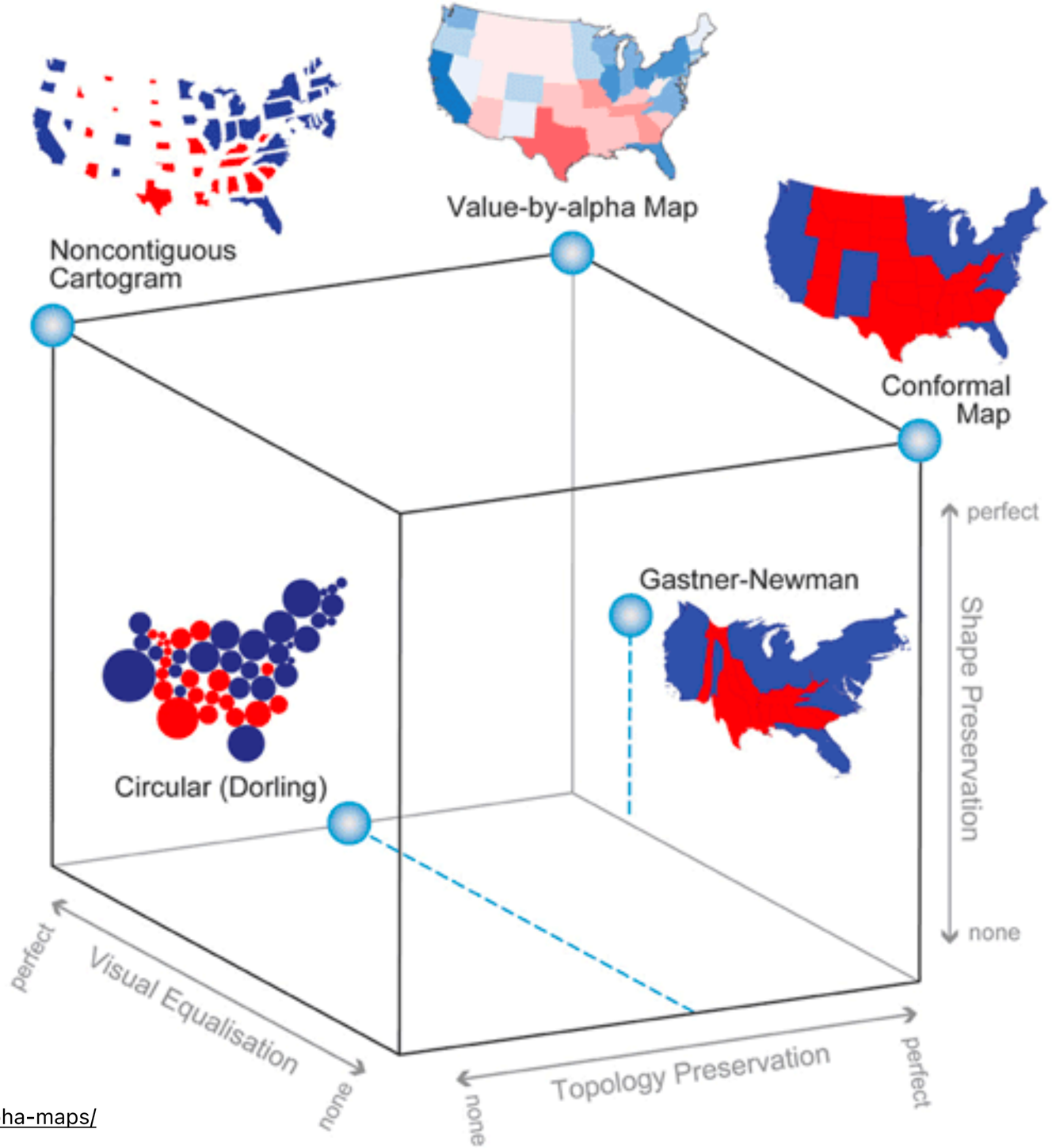
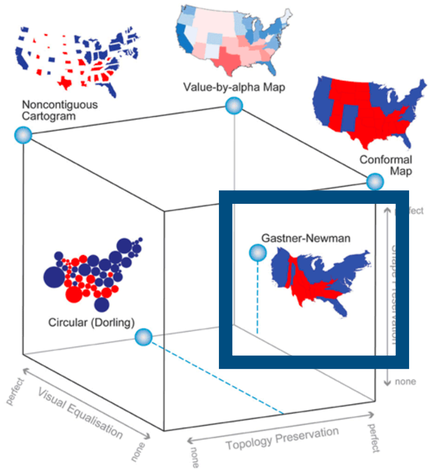


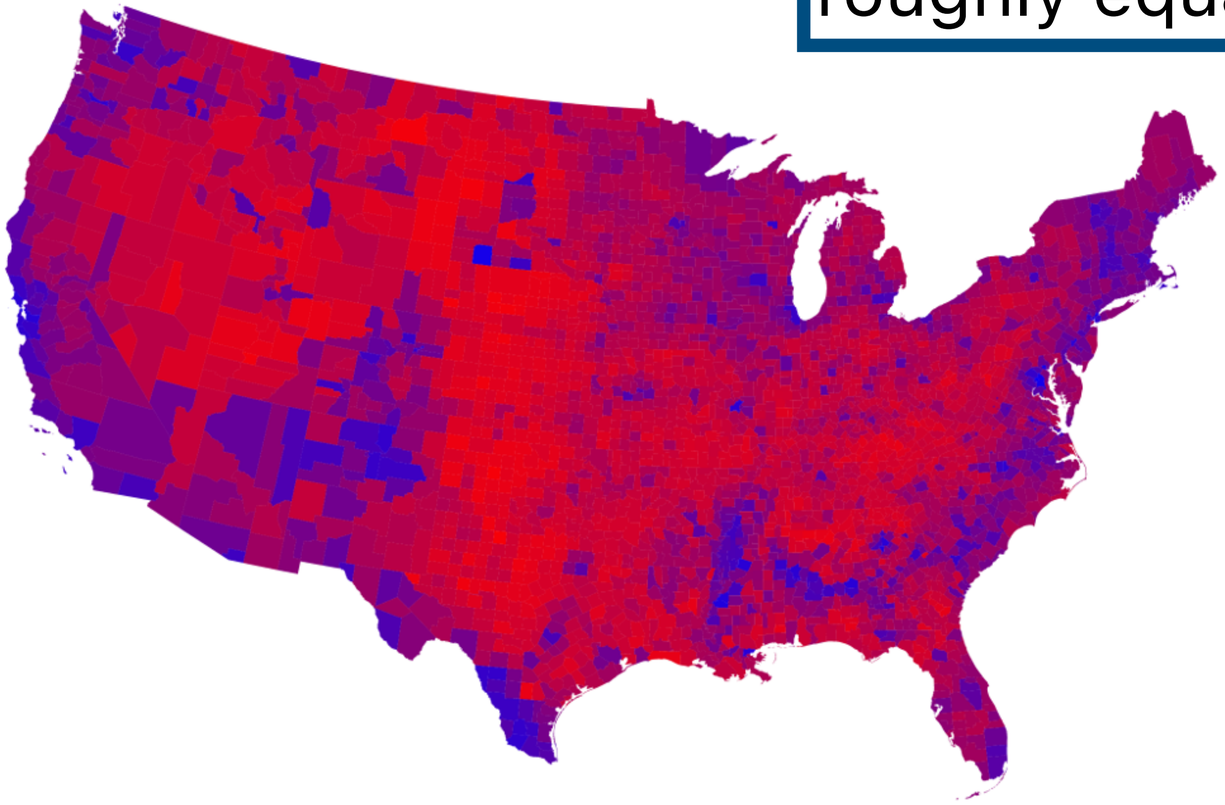
https://andywoodruff.com/blog/value-by-alpha-maps/

Gaster-Newman

Physical diffusion model.

Population "flows" from high-density areas to low-density areas until density is roughly equal everywhere.





China Still Dominates, but Some Manufacturers Look Elsewhere

While China maintains its overwhelming dominance in manufacturing, multinational companies are looking for ways to limit their reliance on factories there. Related Article »

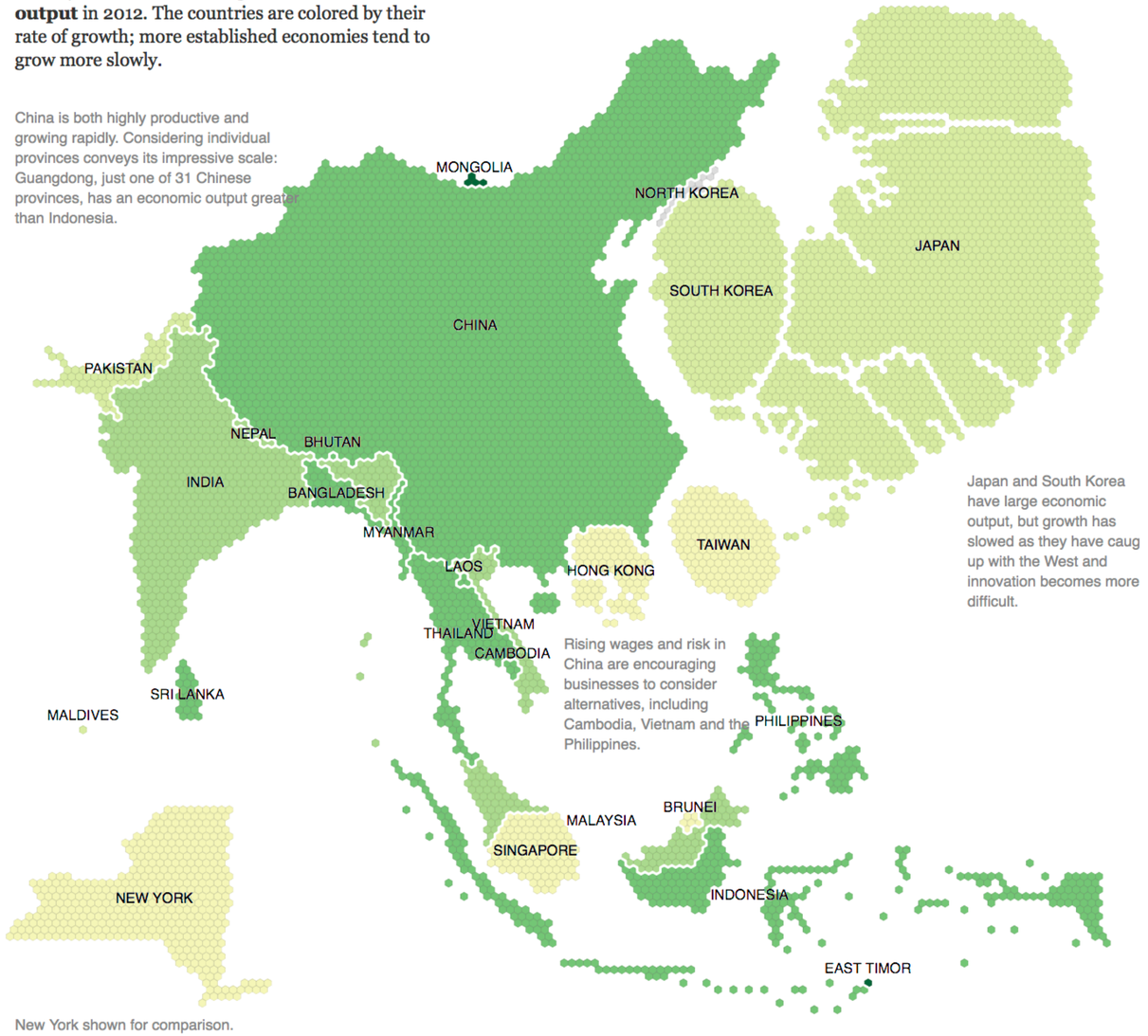
Economic Output

In this map, geography is distorted so that each country is **sized according to its economic output** in 2012. The countries are colored by their rate of growth; more established economies tend to grow more slowly.

Each hexagon represents $2.7 billion in G.D.P.

G.D.P. growth, 2011 to 2012: 2 4 6 8 +10%

China is both highly productive and growing rapidly. Considering individual provinces conveys its impressive scale: Guangdong, just one of 31 Chinese provinces, has an economic output greater than Indonesia.



Japan and South Korea have large economic output, but growth has slowed as they have caug up with the West and innovation becomes more difficult.

Rising wages and risk in China are encouraging businesses to consider alternatives, including Cambodia, Vietnam and the Philippines.

New York shown for comparison.

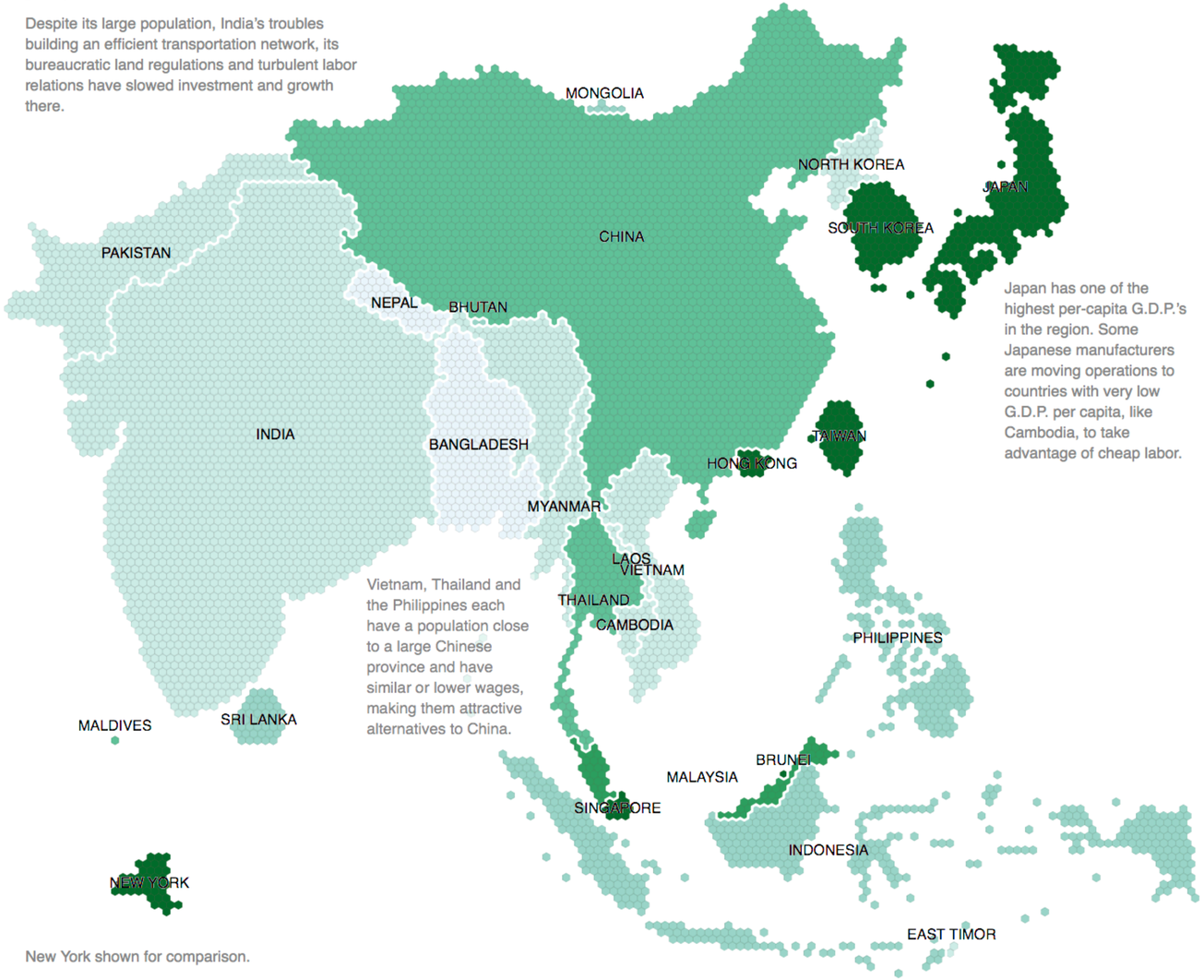
Population

Sizing by population instead gives an estimate of a country's economic potential, at least for labor-based manufacturing. The color here shows the economic output per capita: a measure of how effectively that potential has been realized, and a proxy for labor cost.

Each hexagon represents 500,000 people

G.D.P. per capita, 2012: 1 2 5 10 $20K

Despite its large population, India's troubles building an efficient transportation network, its bureaucratic land regulations and turbulent labor relations have slowed investment and growth there.



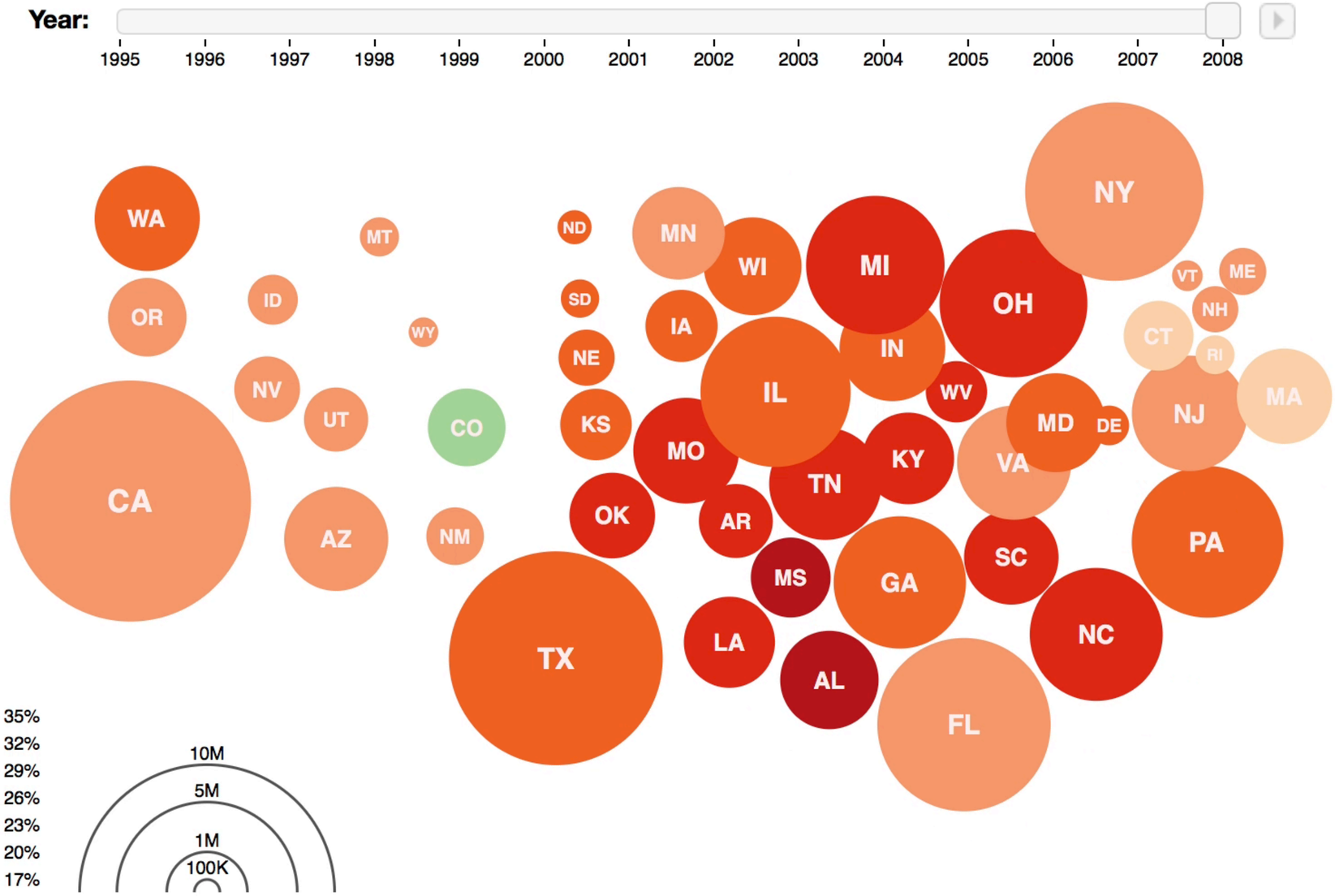
Japan has one of the highest per-capita G.D.P.'s in the region. Some Japanese manufacturers are moving operations to countries with very low G.D.P. per capita, like Cambodia, to take advantage of cheap labor.

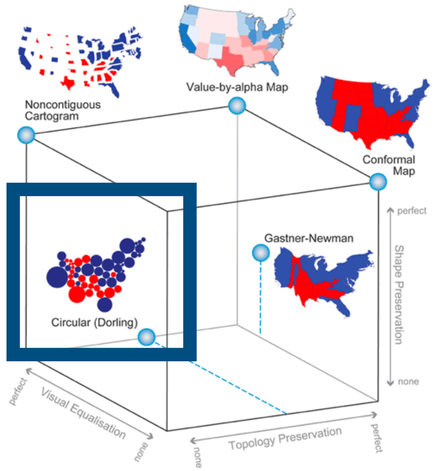
Vietnam, Thailand and the Philippines each have a population close to a large Chinese province and have similar or lower wages, making them attractive alternatives to China.

New York shown for comparison.

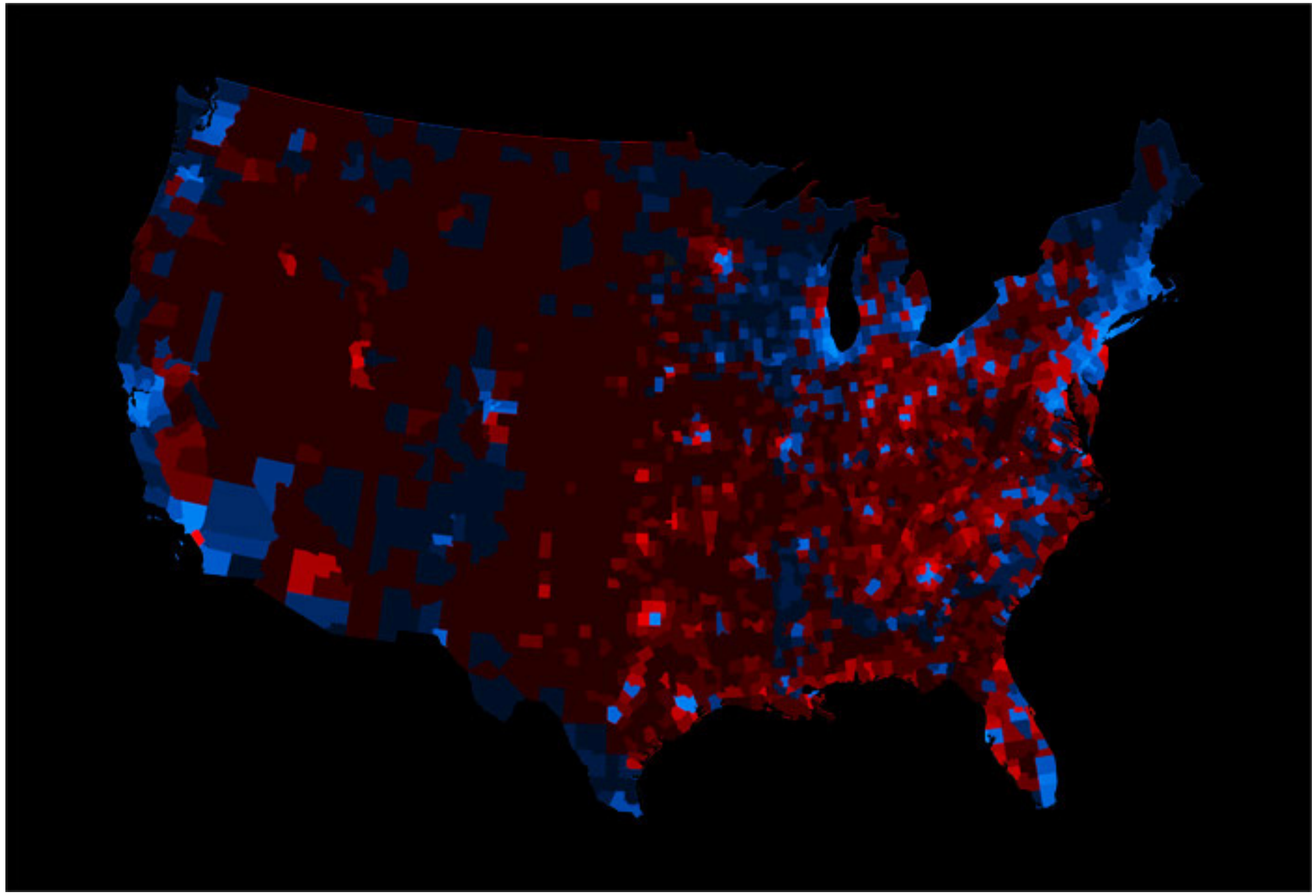
By MIKE BOSTOCK; Additional reporting by KEITH BRADSHER

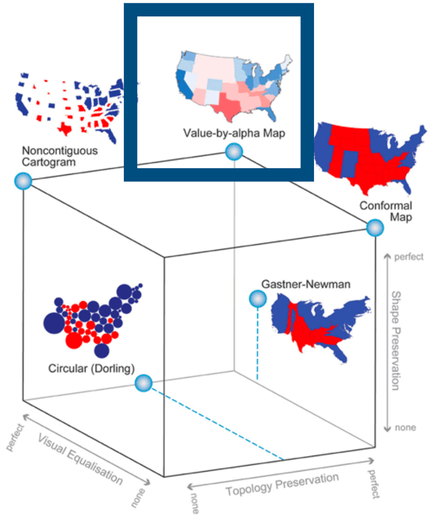
Dorling Cartograms





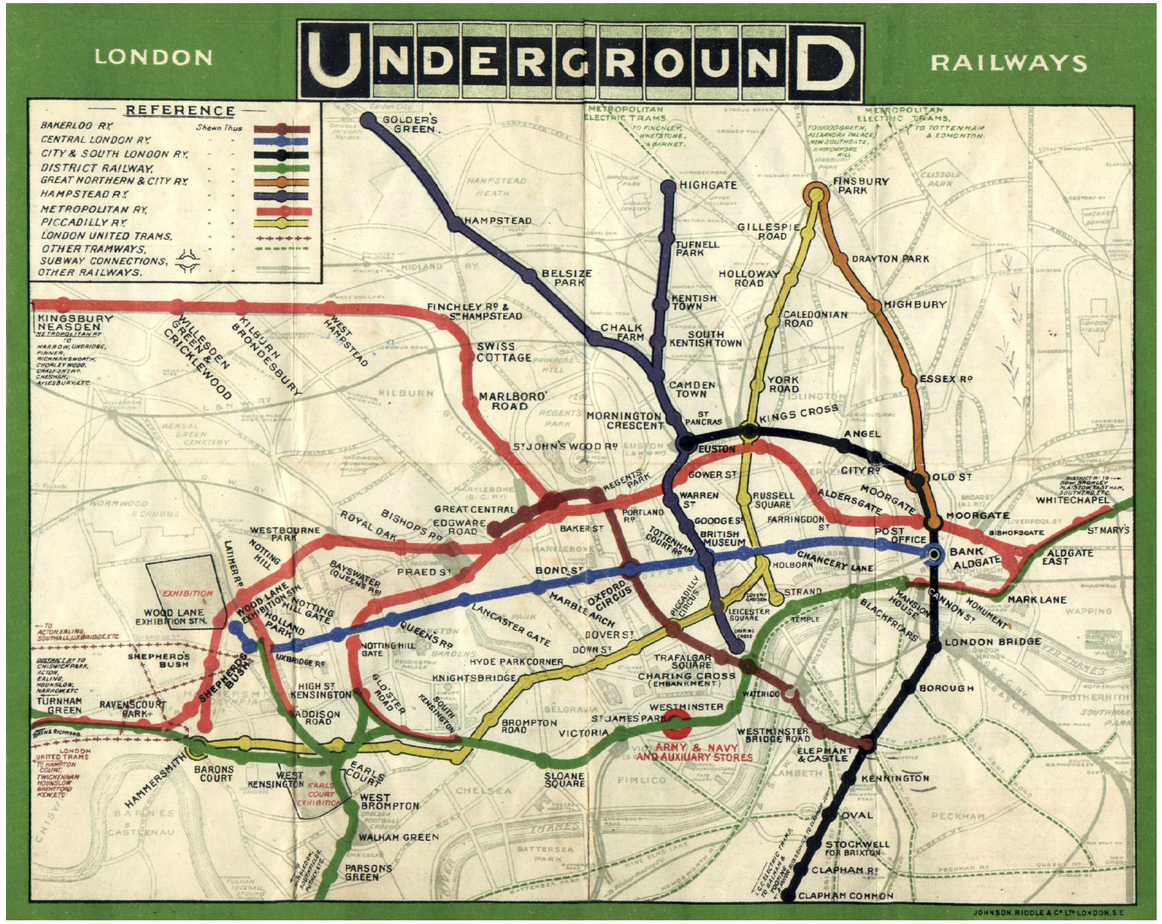
Value-By-Alpha





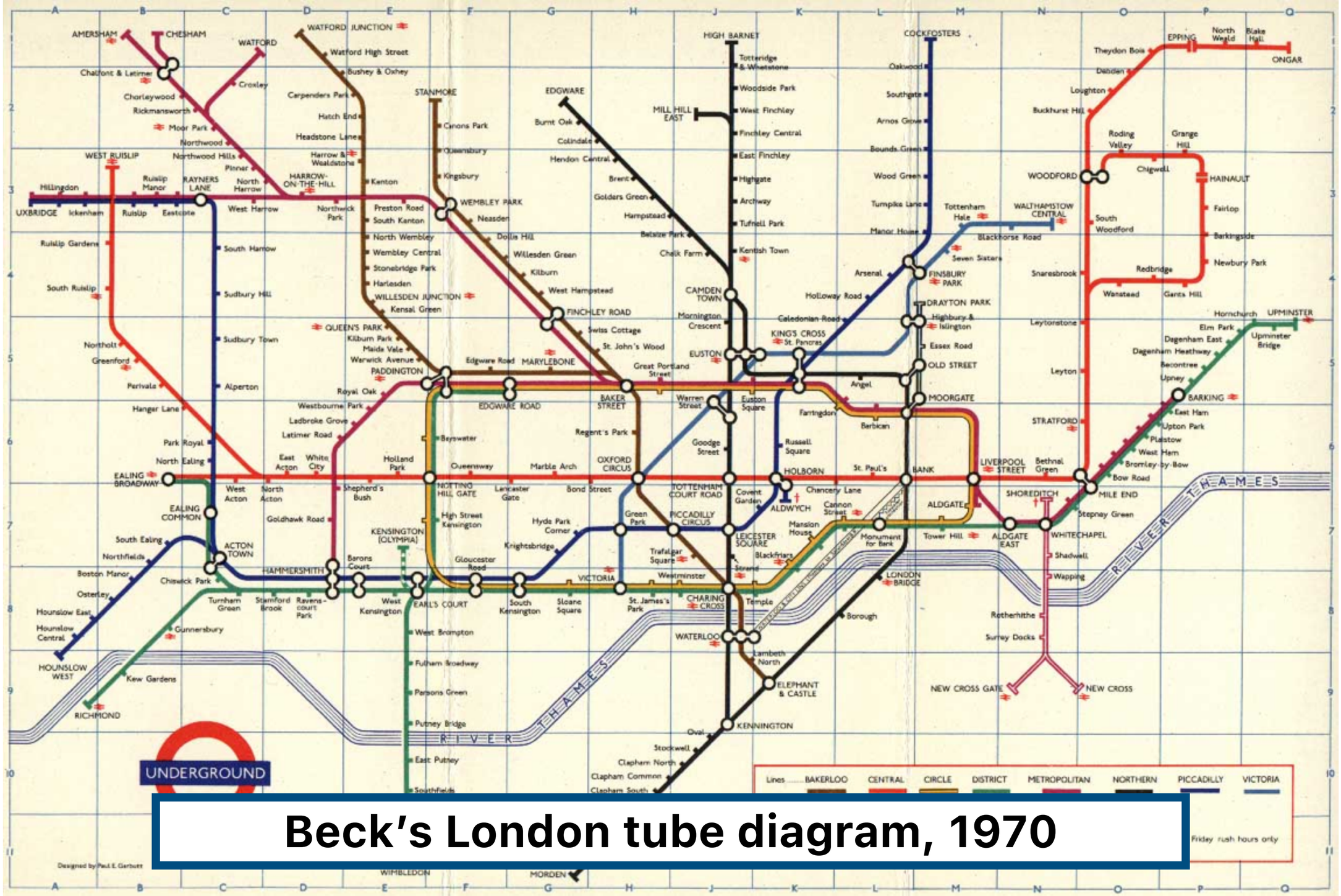
https://andywoodruff.com/blog/value-by-alpha-maps/

Route Maps

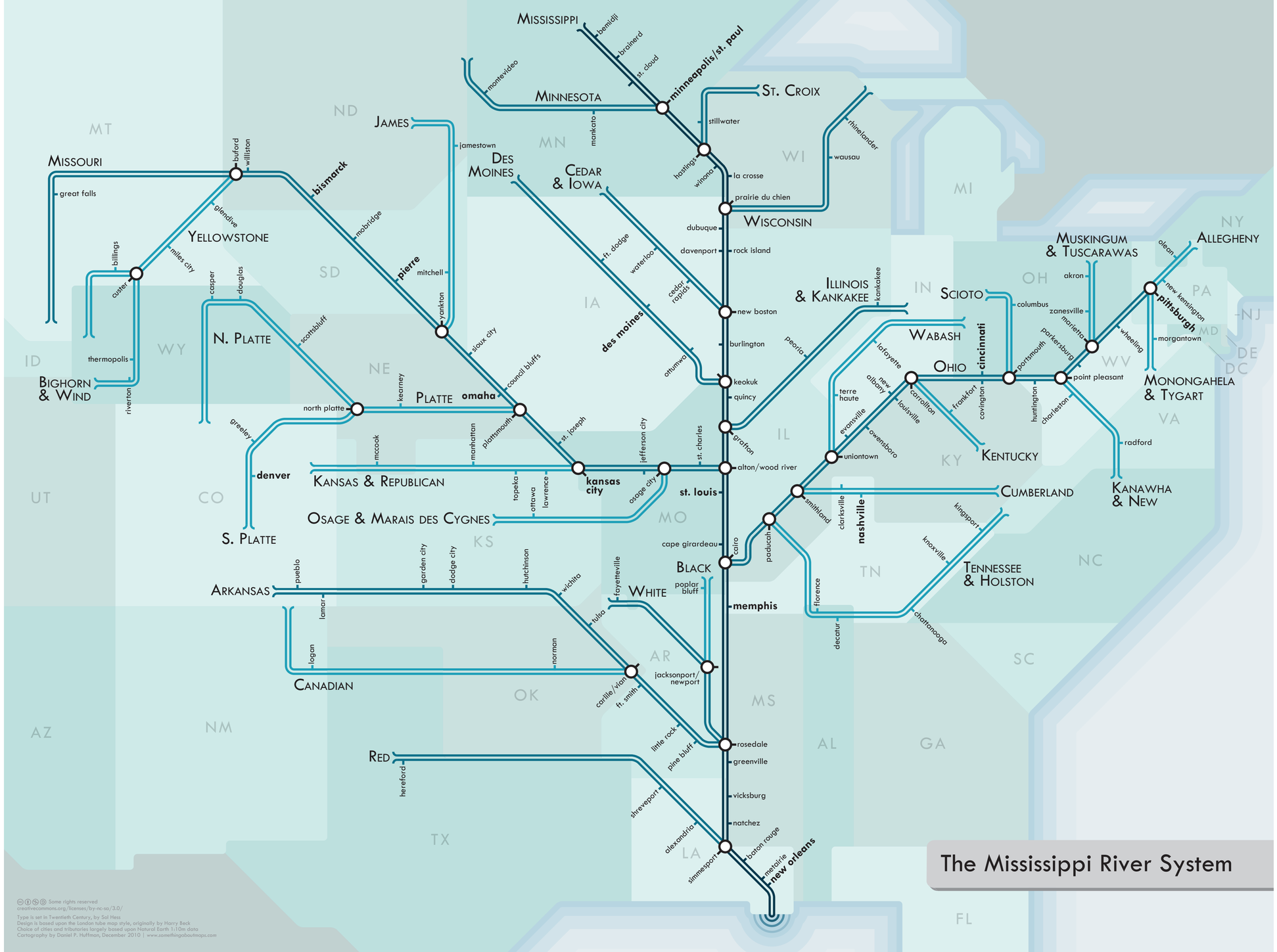


Geographic version of map

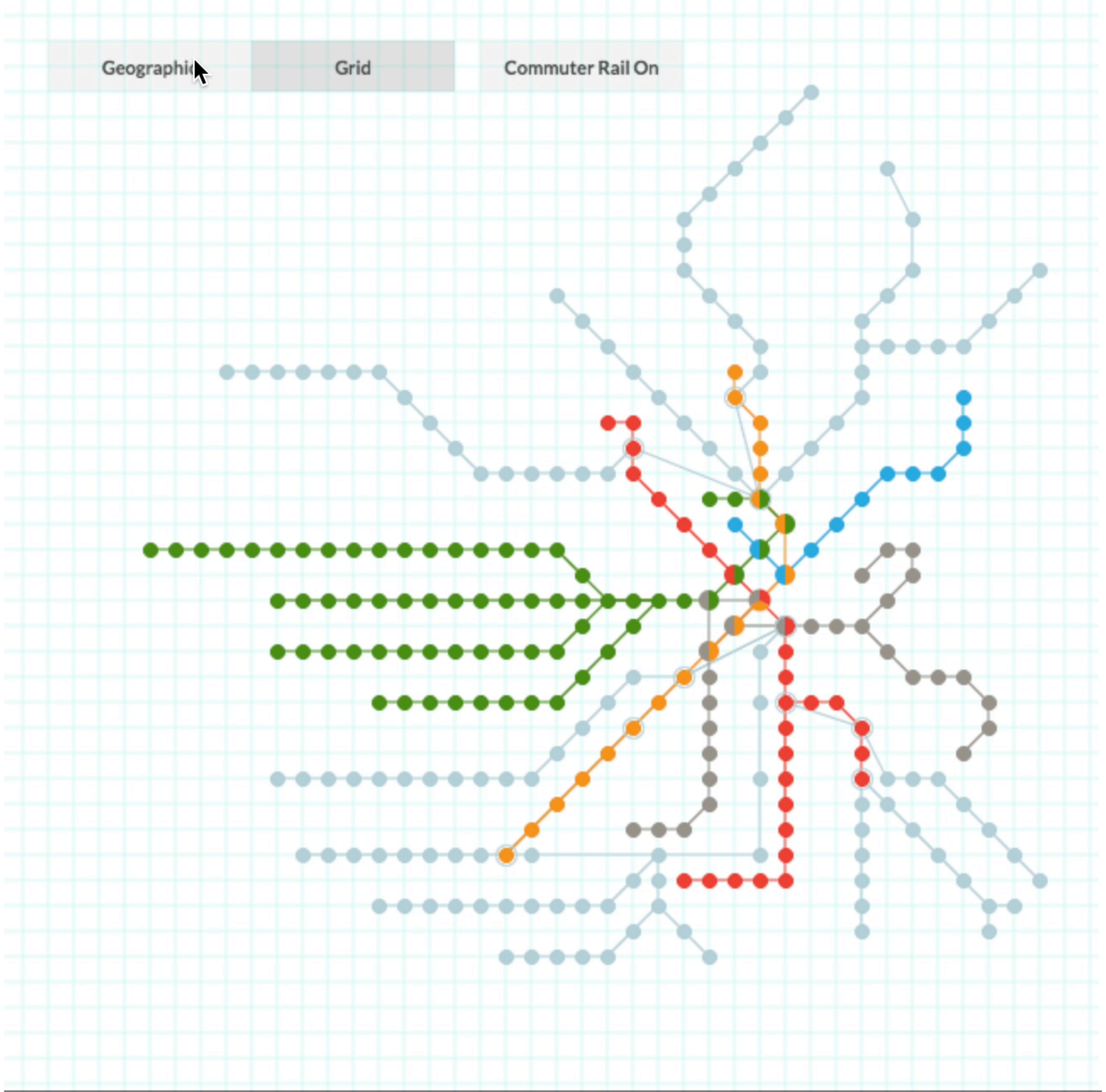
London Underground [Beck 33]



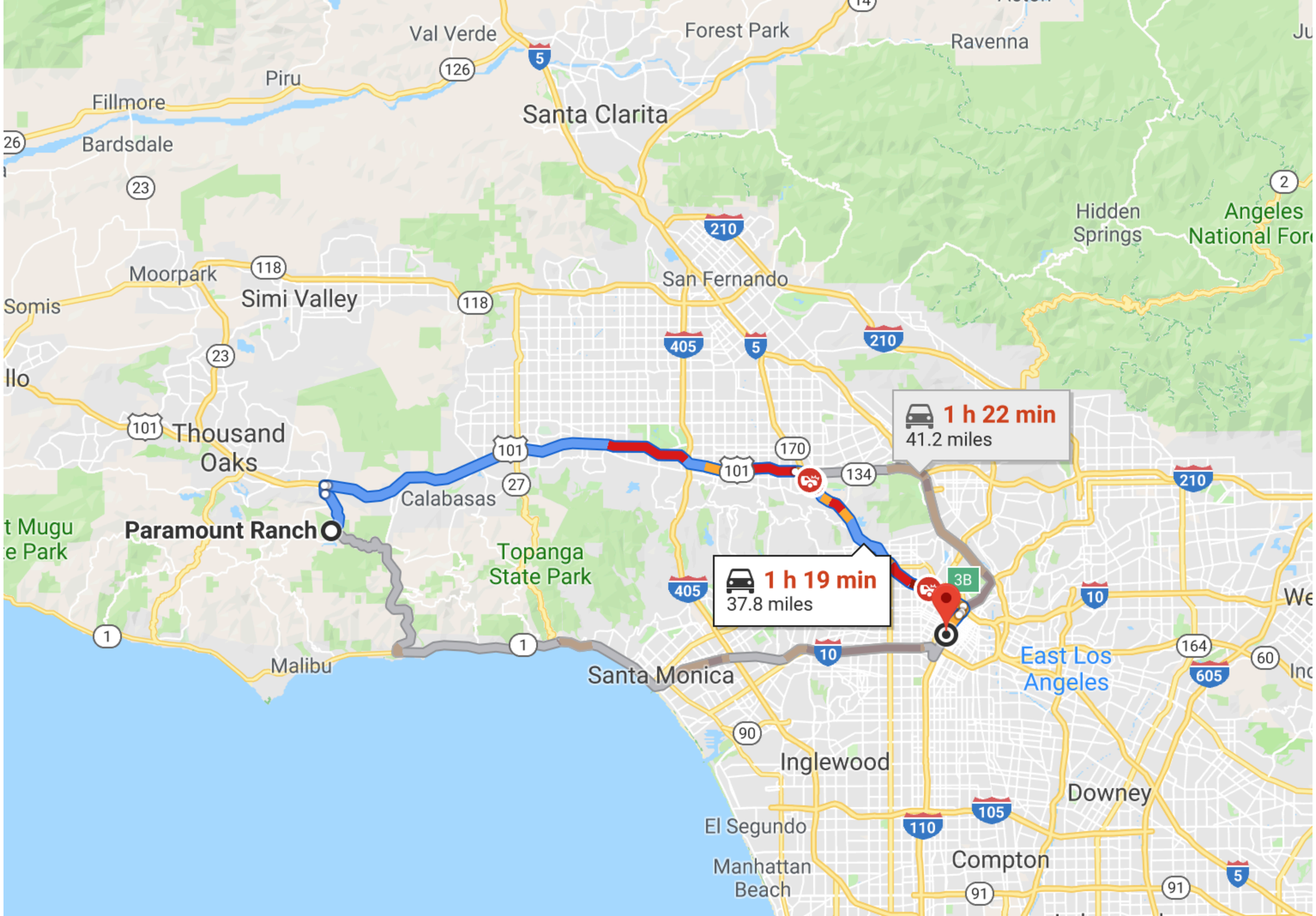
Beck's London tube diagram, 1970

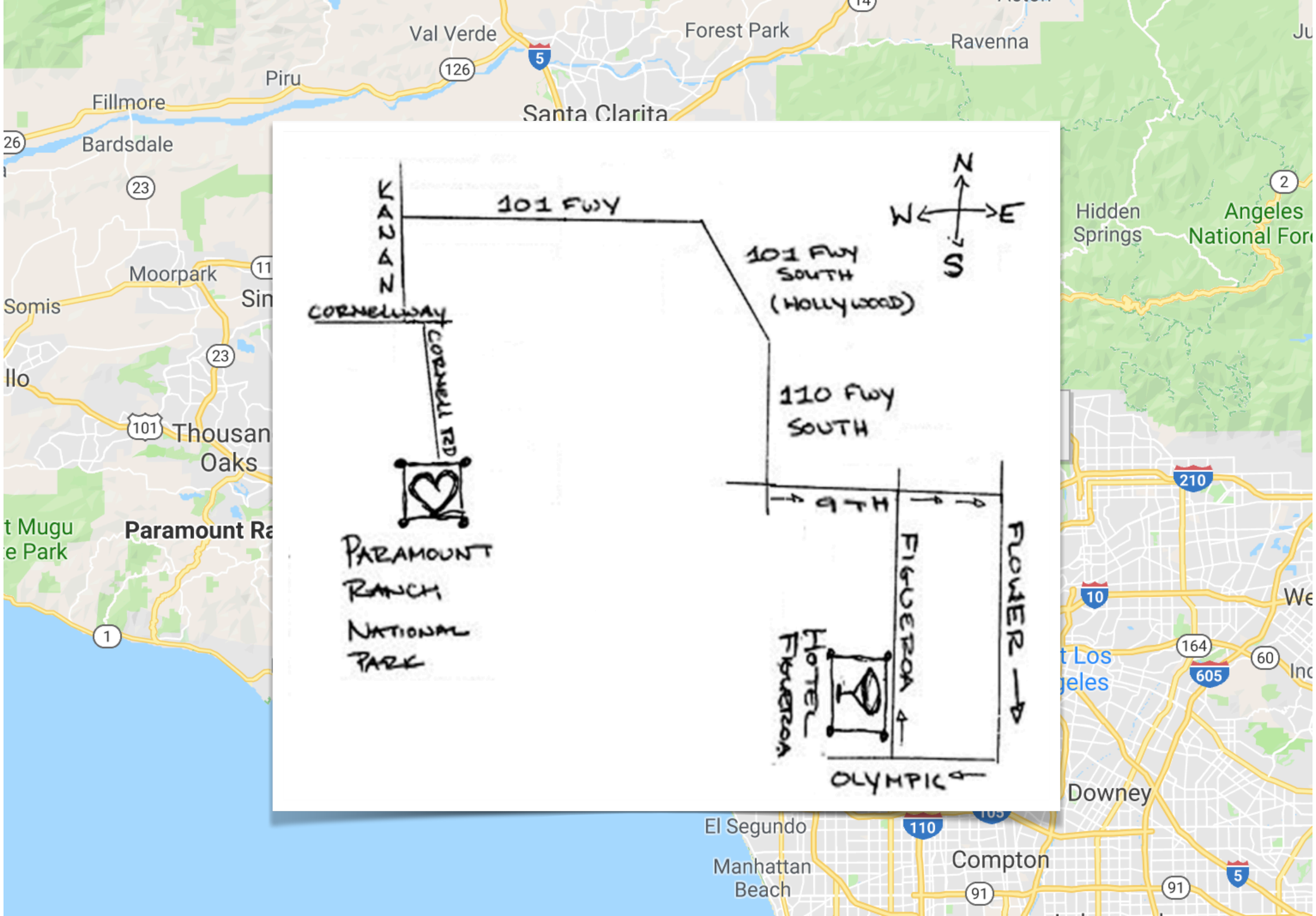


The Mississippi River System

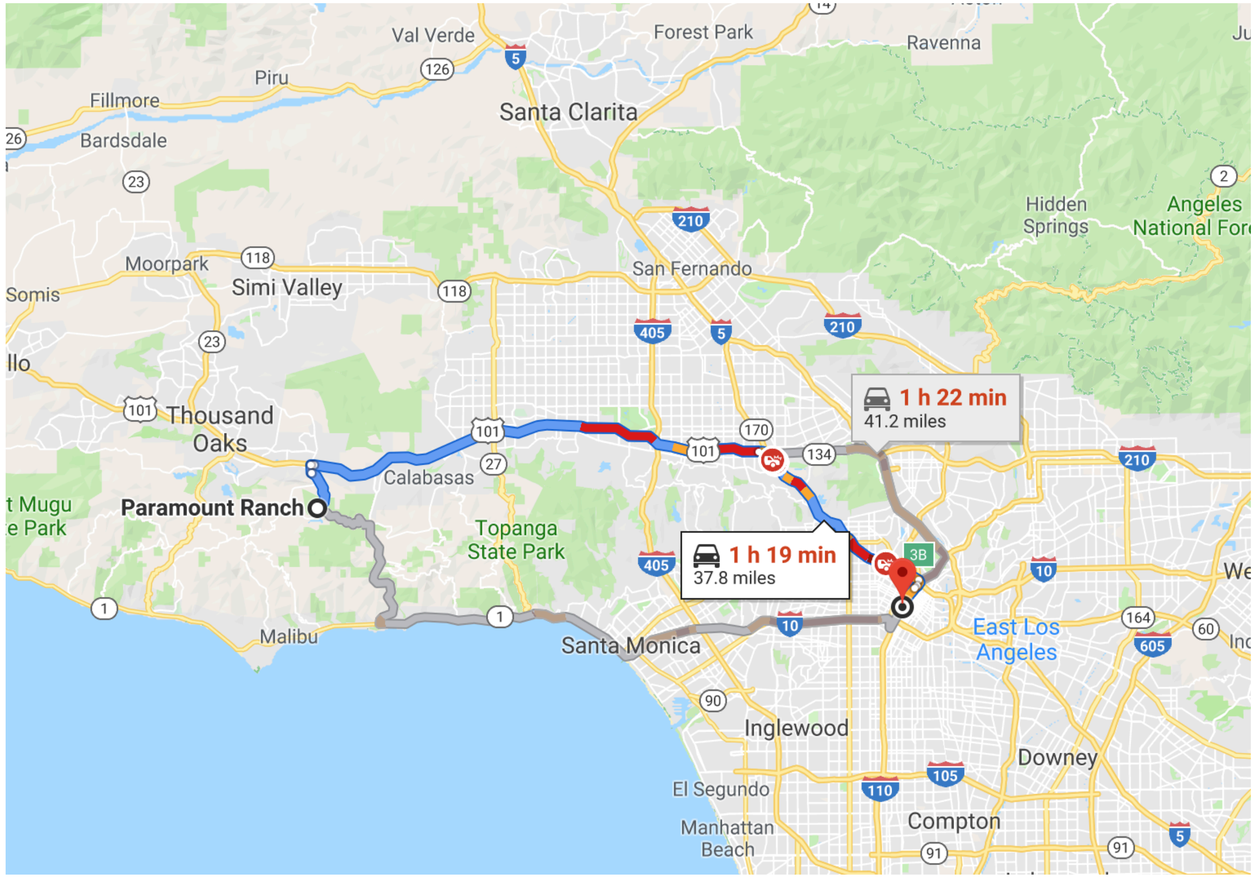


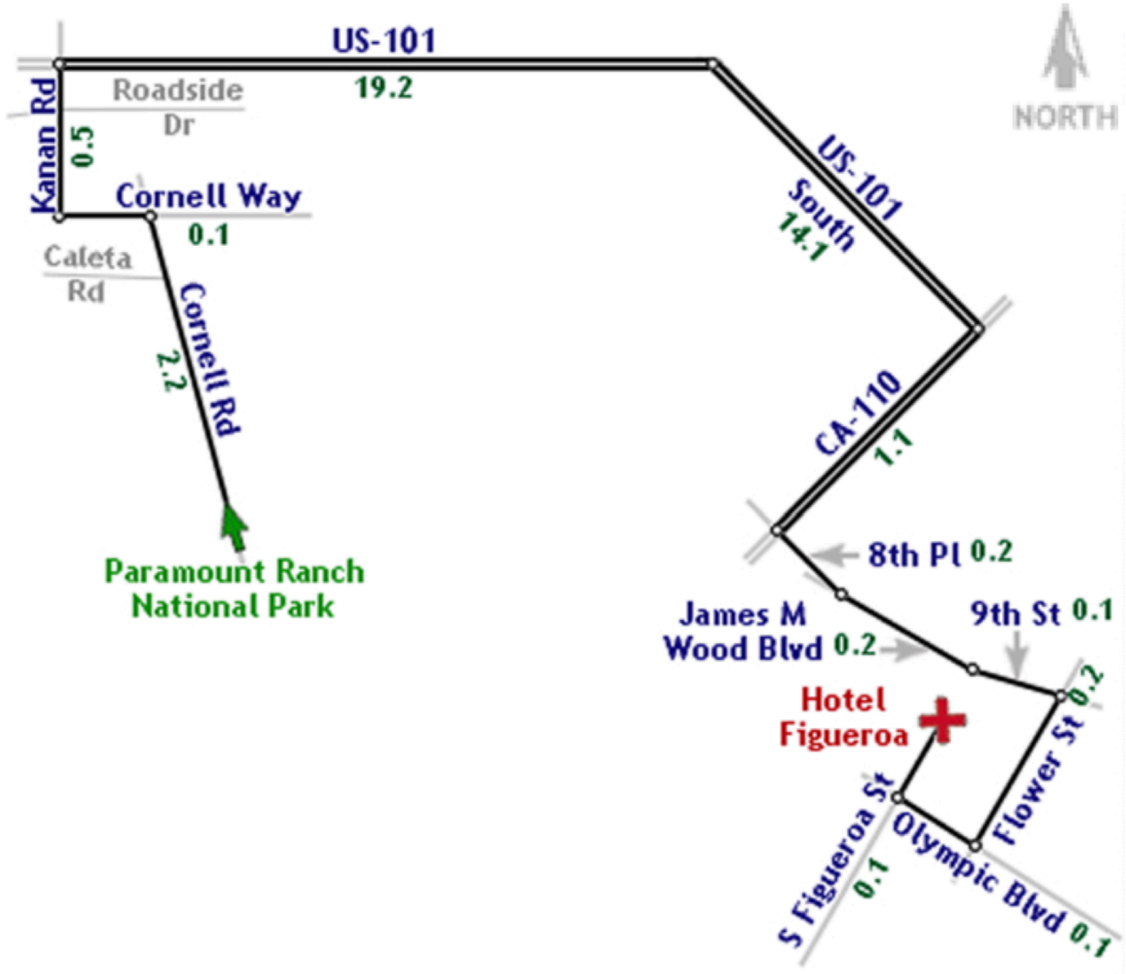
https://fathom.info/notebook/4756/


Val Verde
Forest Park
Ravenna
Piru
Fillmore
Bardsdale
Santa Clarita
Hidden Springs
Angeles National Fore
Moorpark
Simi Valley
San Fernando
Somis
Thousand Oaks
Calabasas
Paramount Ranch
Topanga State Park
1 h 22 min
41.2 miles
1 h 19 min
37.8 miles
Malibu
Santa Monica
East Los Angeles
Inglewood
Downey
El Segundo
Manhattan Beach
Compton


Val Verde
Forest Park
Ravenna
Piru
Fillmore
Bardsdale
Santa Clarita
Hidden Springs
Angeles National Fore
Moorpark
Somis
Thousand Oaks
Paramount Ranch
Mugu Park
Downey
El Segundo
Manhattan Beach
Compton
KANAN
101 FWY
CORNELL WAY
CORNELL RD
PARAMOUNT RANCH, NATIONAL PARK
101 FWY SOUTH (HOLLYWOOD)
110 FWY SOUTH
9TH
FIGUEROA
HOTEL FIGUEROA
FLOWER
OLYMPIC
N
W
E
S

Line Drive





Agrawala, Maneesh, and Chris Stolte. "Rendering effective route maps: Improving usability through generalization." SIGGRAPH 2001

Tooling for Maps

Web Tools

D3/Vega/Vega-Lite: Projections, paths, graticules
GeoJSON: JSON format for geo data.
TopoJSON: Topology → compressed GeoJSON.
Leaflet: open-source, customizable map tile system.
Mapbox: commercial map tile system

Data Resources

Natural Earth Data: naturalearthdata.com
OpenStreetMap: openstreetmap.org
U.S. Government: nationalatlas.gov, usgs.gov

Tutorials

Command Line Cartography, by Mike Bostock
https://medium.com/@mbostock/command-line-cartography-part-1-897aa8f8ca2c