

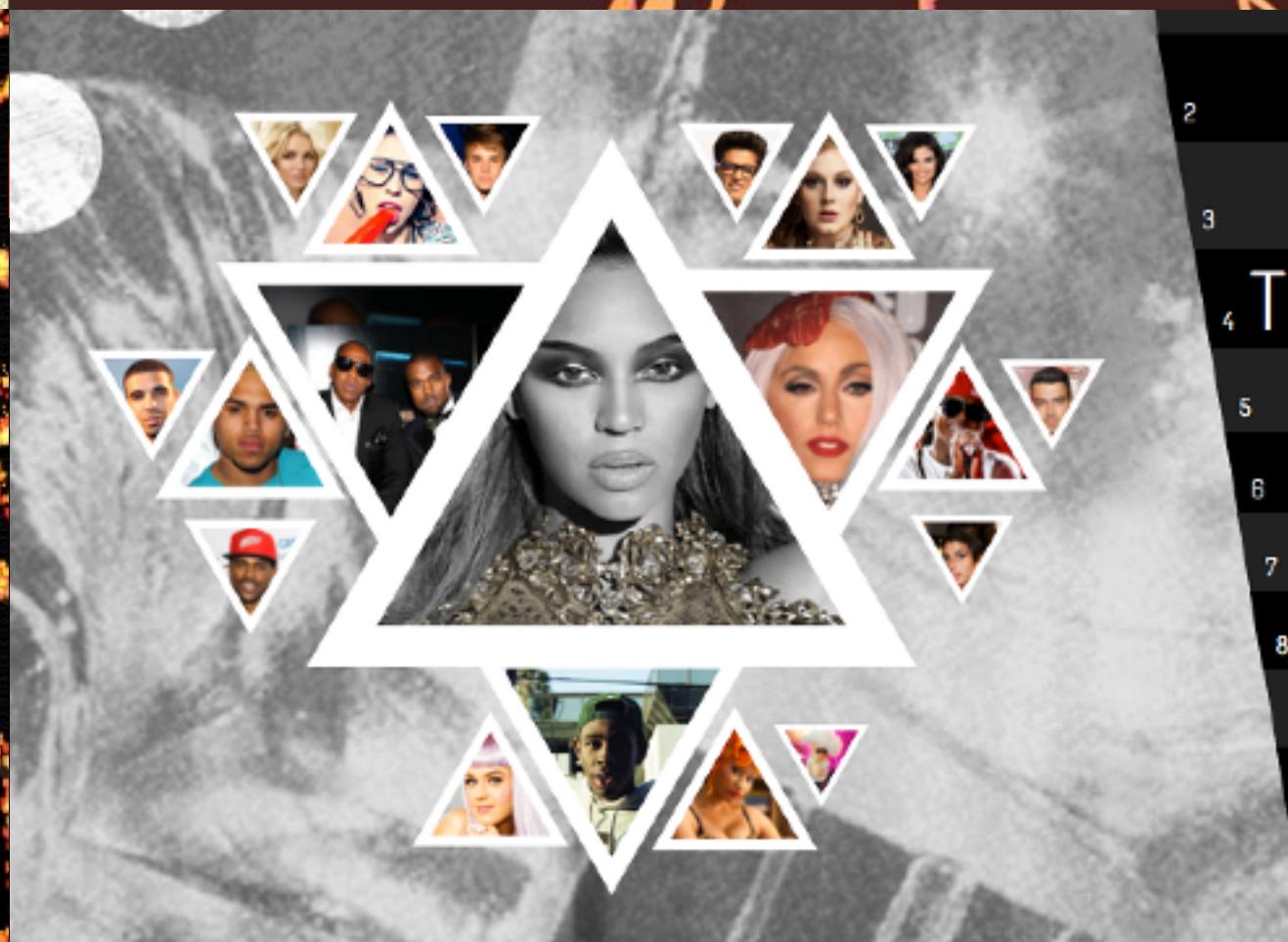
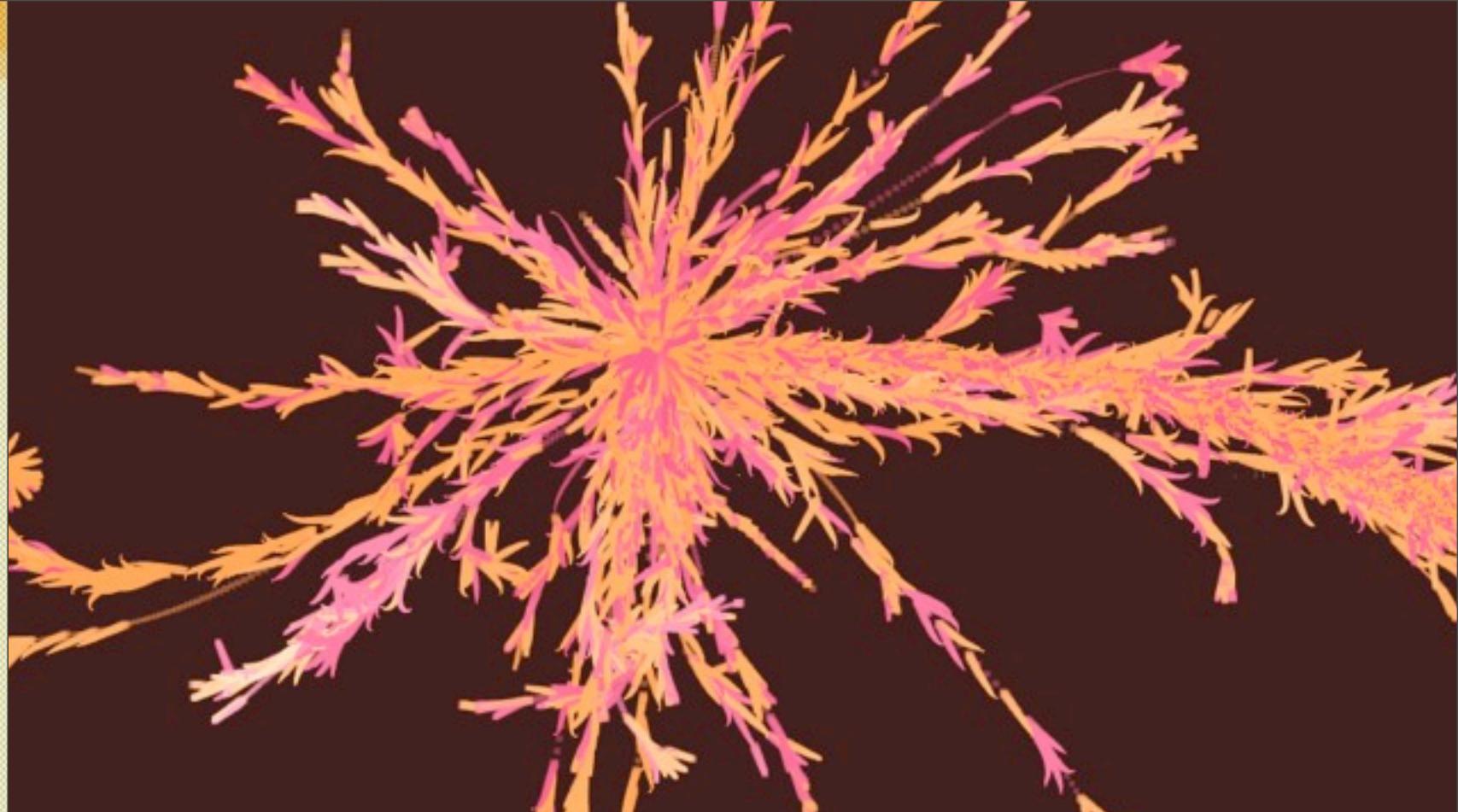
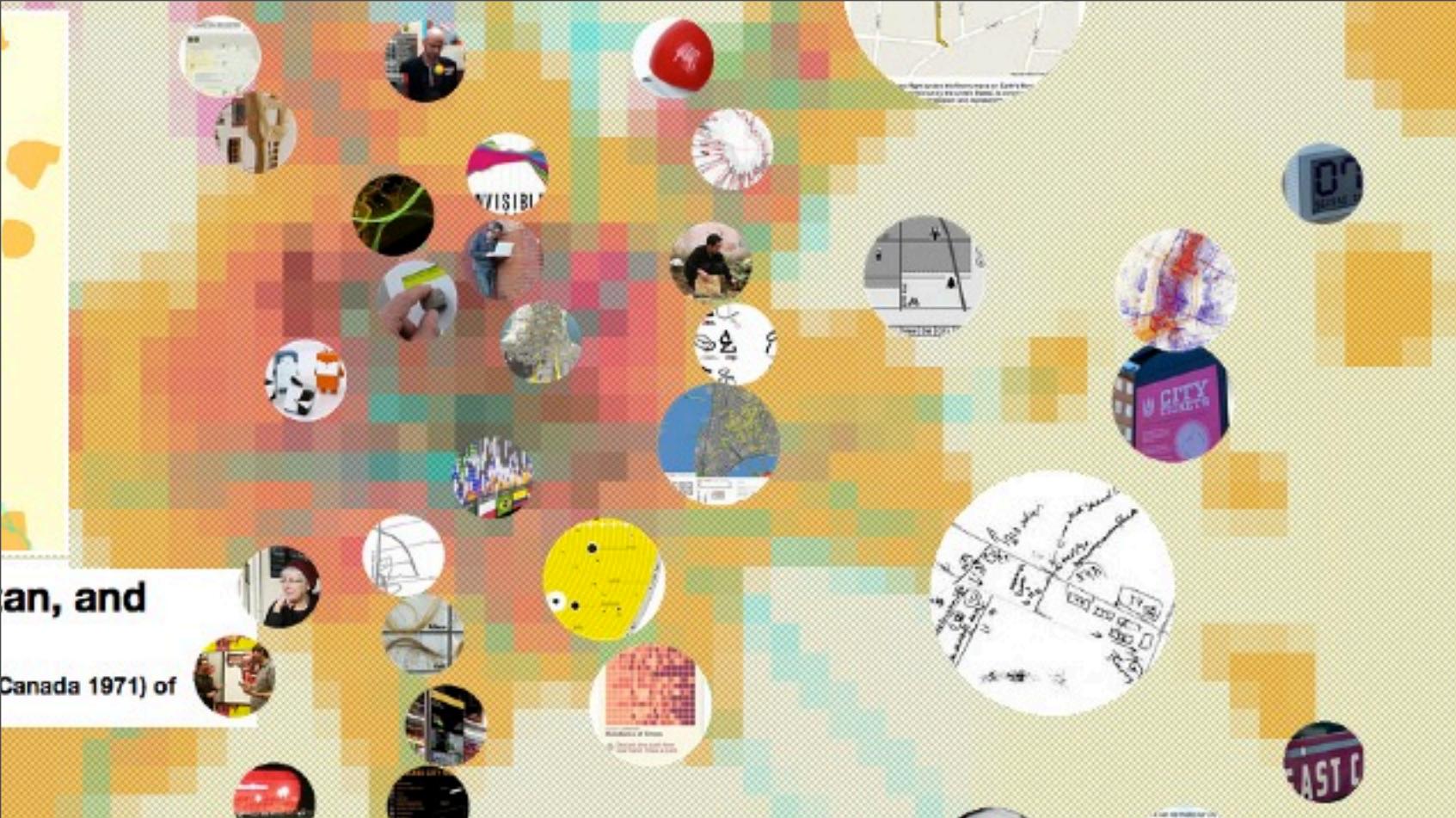
Interactive Data Visualization with d3.js

aww yiss



HTTPSTER

Hi, I'm Rachel Binx



THE
LADY
TYLER, THE C
CHRIS
KREA
L
NICK
KAR

HAYSTACKS

A NEW WAY TO LOOK AT HARVARD'S LIBRARY

[Instructions](#)

death

SUBMIT

SEARCH HISTORY

EXPORT ALL
RESULTS TO CSV

DISPLAY AS

Scatter

List

SCALE BY

Overall Popularity

Graduate Popularity

Undergraduate Popularity

Faculty Popularity

Same Scale For All

The 250 most popular items out of 15,428 about death.

[SHOW MORE MATCHING ITEMS](#)

Philosophy. Psychology. Religion

World history and history of Europe, Asia, Africa, Australia, New Zealand, etc.

Geography. Anthropology. Recreation

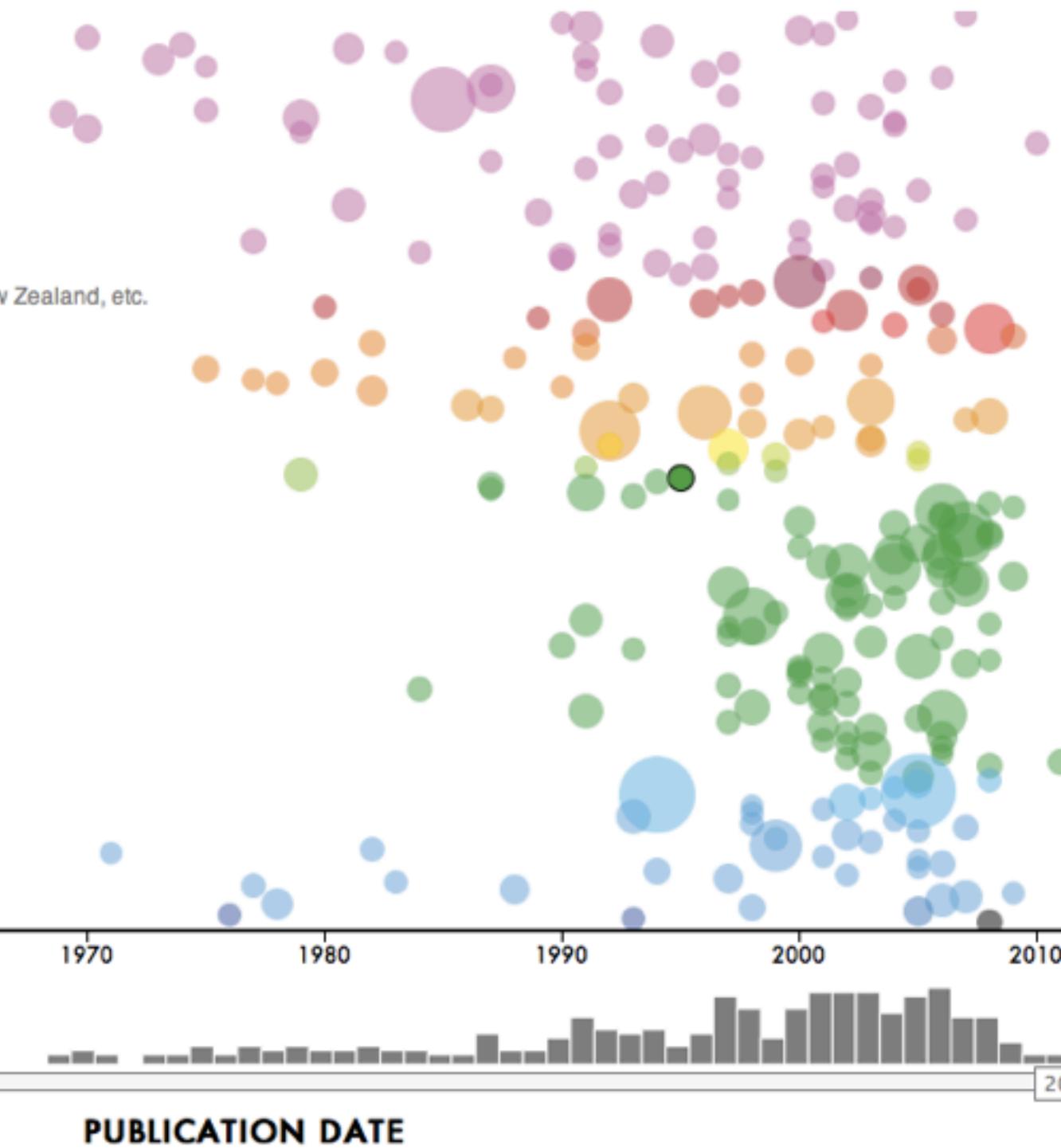
Social sciences

Education

Language and literature

Medicine

SUBJECT



TITLE

"Reading" Greek Death

AUTHORS

Sourvinou-Inwood, Christiane.

PUBLISHING DATE

1995

CALL NUMBER SUBJECT

Language and literature -- Classical literature -- Literary history

LIBRARY OF CONGRESS SUBJECT KEYWORDS

Death Social aspects Greece Historiography.

LIBRARY OF CONGRESS CALL #

PA3015.D43 S65 1995

PAGE COUNT

489

LANGUAGE

English

SHELF RANK: 11

HOLDING LIBRARIES: 2

[ADD THIS ITEM TO YOUR STACK](#)

[VIEW YOUR STACK AS A TABLE](#)

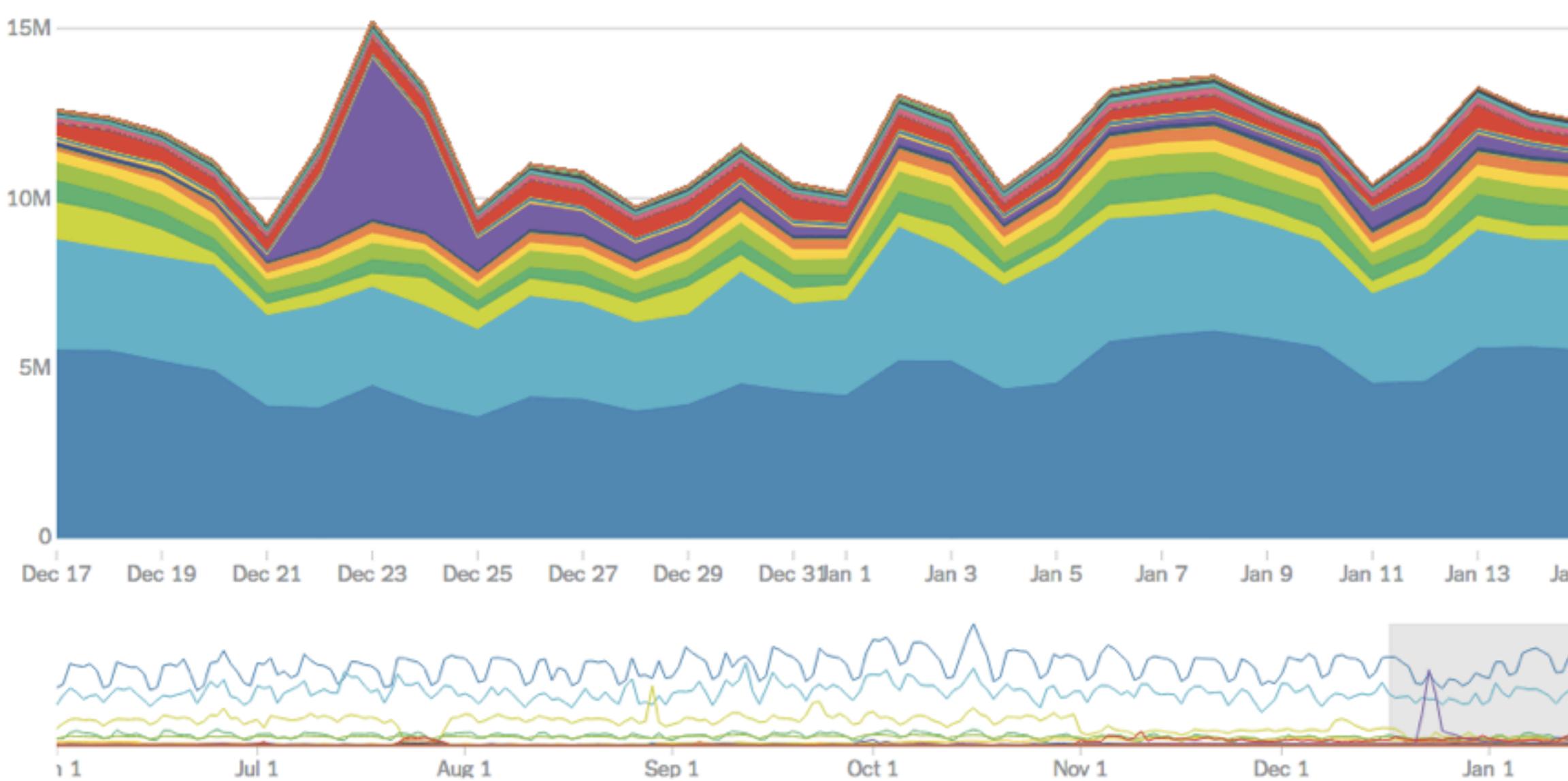
[EXPORT STACK AS A CSV](#)

Page Views - by Page Type - shown by Day -

Number of page views on Web and Mobile Web filtered by page type (based on definition in GLASS)

Showing data from 12/17/2013 to 01/15/2014

Count Stacked % of Total

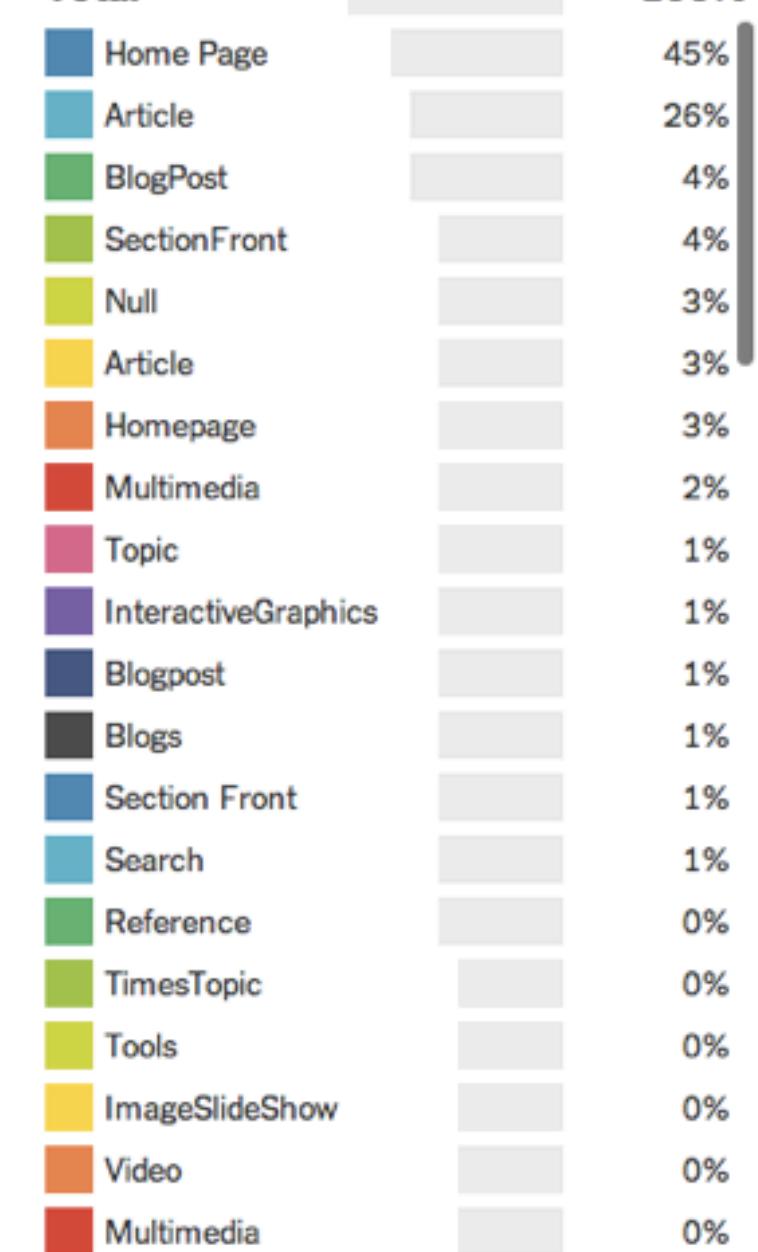


Data source: Event Tracker. Note: Mobile app data from Localytics is not included, but will be included in a future release.

Confidential. For internal use only.

Wed, Jan 15, 2014

Total



Data last updated: Thursday, Jan 16 2014, 01:34:15 PM

Data Visualization

*Exploring and Explaining Data with
the Processing Environment*

Visualizing Data



O'REILLY®

Ben Fry

- 1) Acquire
- 2) Parse
- 3) Filter
- 4) Mine
- 5) Represent
- 6) Refine
- 7) Interact

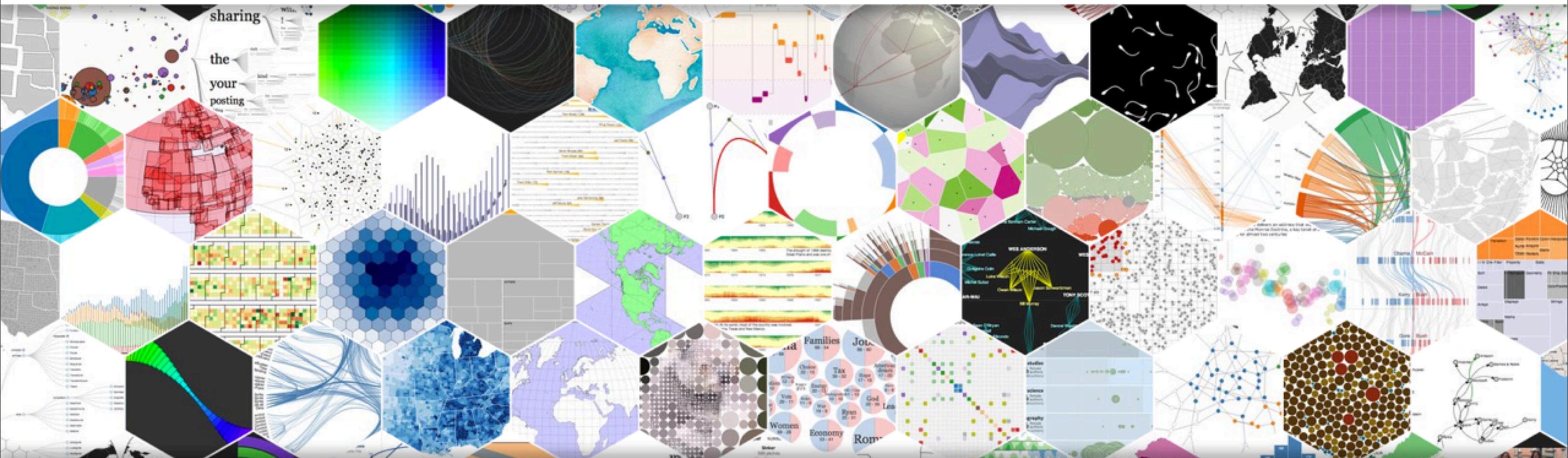
- | | |
|--------------|--------------------------|
| 1) Acquire | 1) hooray, the beginning |
| 2) Parse | 2) gross, data munging |
| 3) Filter | 3) tentative excitement |
| 4) Mine | 4) sweet, sketching time |
| 5) Represent | 5) sexy, sexy, d3.js |
| 6) Refine | 6) the hard part |
| 7) Interact | 7) the really hard part |

- | | |
|--------------|--------------------------|
| 1) Acquire | 1) hooray, the beginning |
| 2) Parse | 2) gross, data munging |
| 3) Filter | 3) tentative excitement |
| 4) Mine | 4) sweet, sketching time |
| 5) Represent | 5) sexy, sexy, d3.js |
| 6) Refine | 6) the hard part |
| 7) Interact | 7) the really hard part |

- | | |
|--------------|--------------------------|
| 1) Acquire | 1) hooray, the beginning |
| 2) Parse | 2) gross, data munging |
| 3) Filter | 3) tentative excitement |
| 4) Mine | 4) sweet, sketching time |
| 5) Represent | 5) sexy, sexy, d3.js |
| 6) Refine | 6) the hard part |
| 7) Interact | 7) the really hard part |

The d3.js Environment

Data-Driven Documents



D3.js is a JavaScript library for manipulating documents based on data. **D3** helps you bring data to life using HTML, SVG and CSS. D3's emphasis on web standards gives you the full capabilities of modern browsers without tying yourself to a proprietary framework, combining powerful visualization components and a data-driven approach to DOM manipulation.

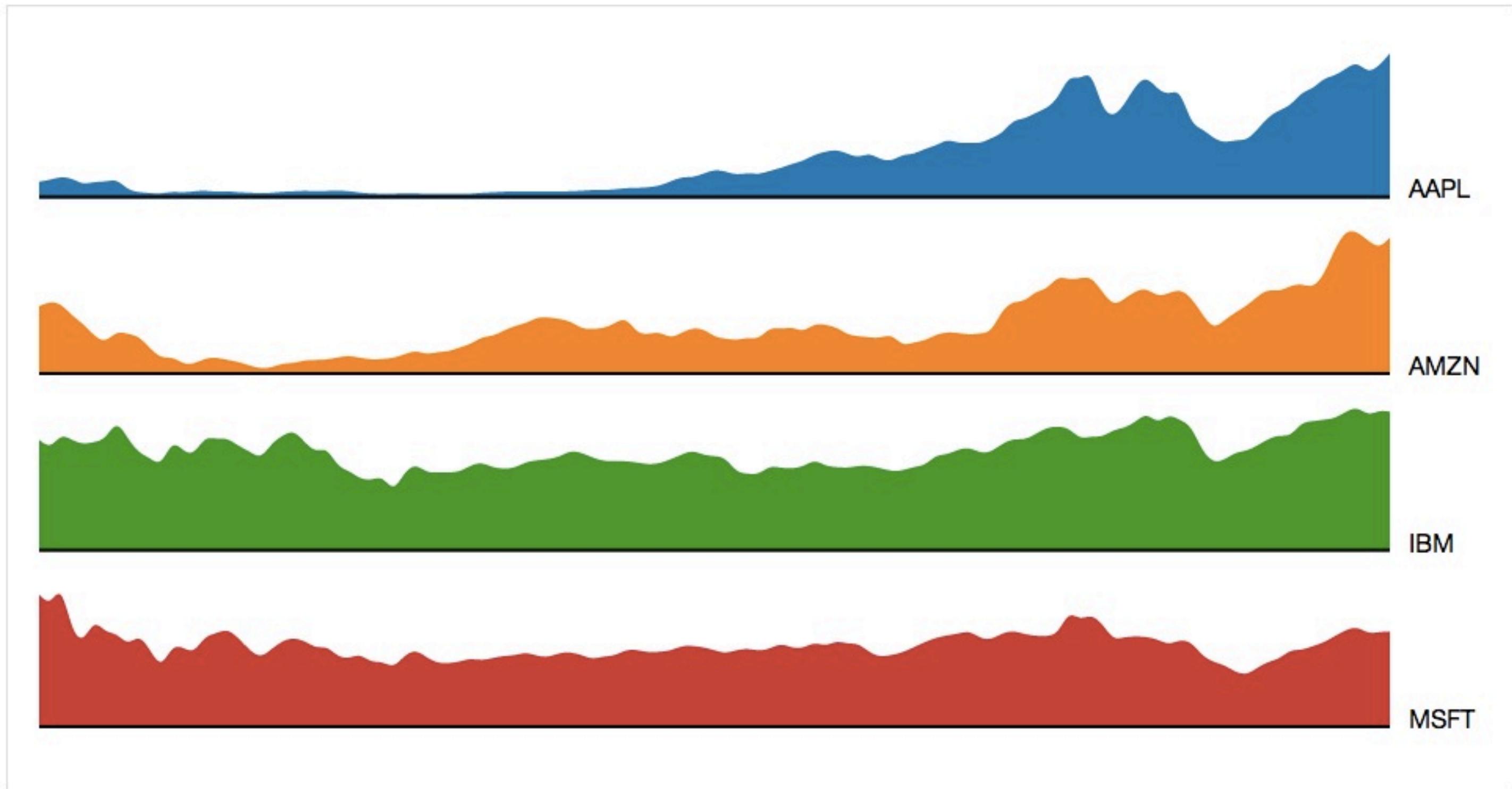
[See more examples.](#)

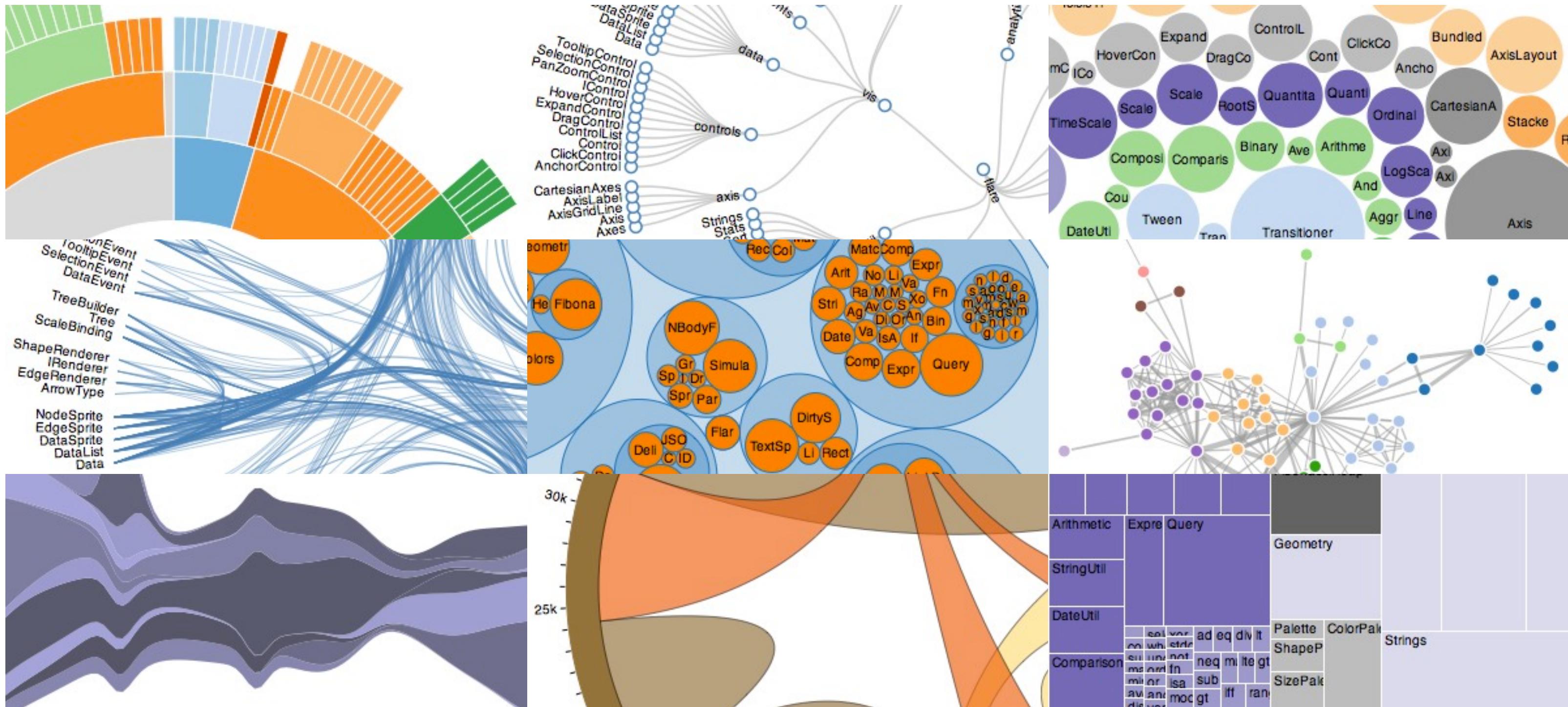
[Download the latest version \(3.4.1\) here.](#)

- d3.v3.zip

Or to link directly to the latest release, copy this snippet:

D3 Show Reel





```
graph LR; A([Excel Charts]); B([d3.js Layouts  
Crossfilter  
Rickshaw  
NVD3  
RAW]); C([Custom Visualization]);
```

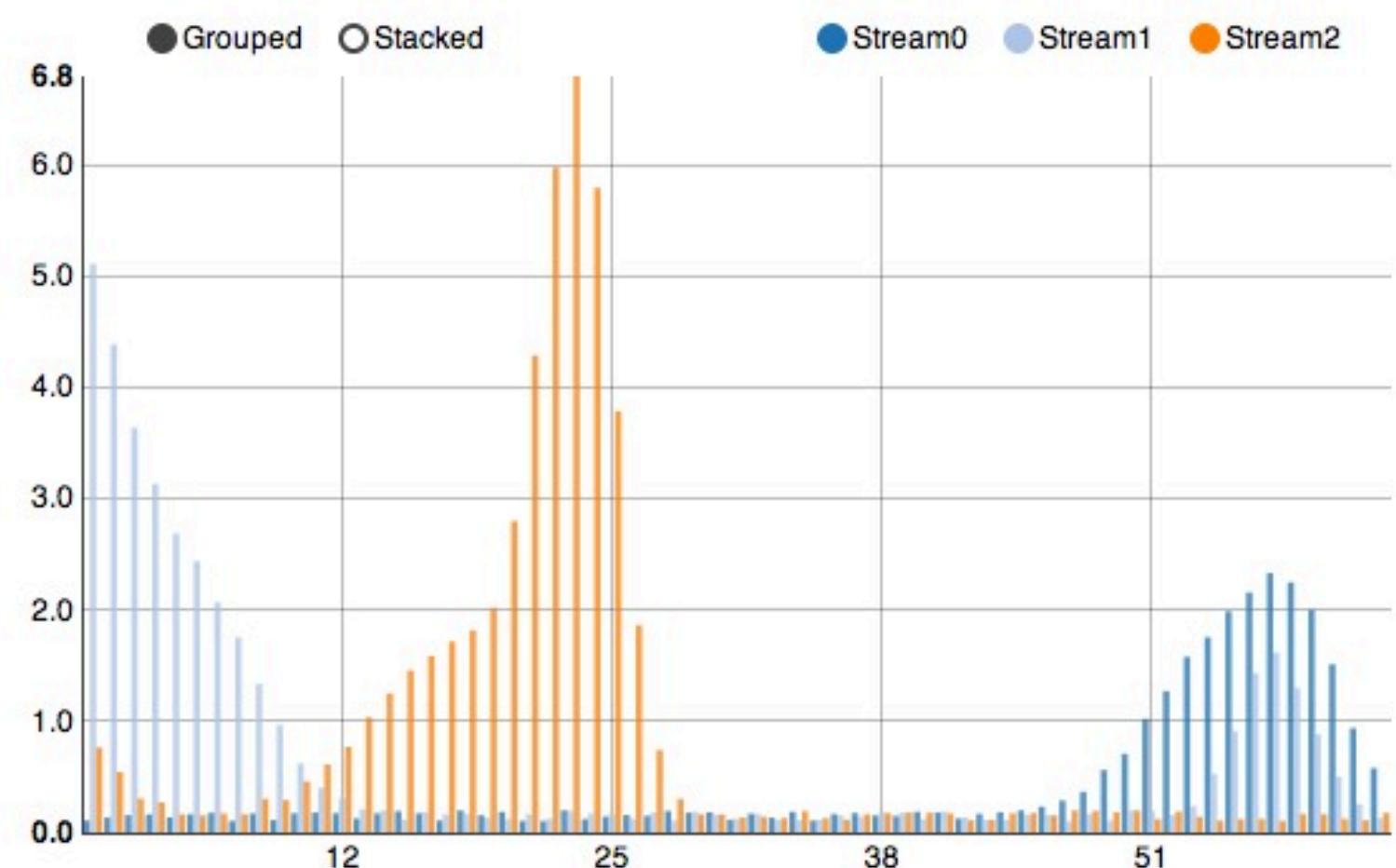
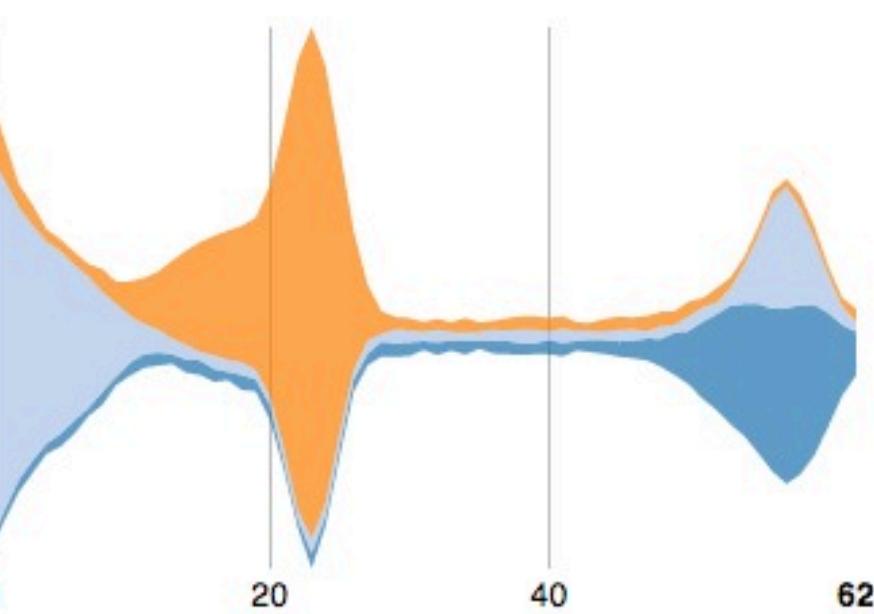
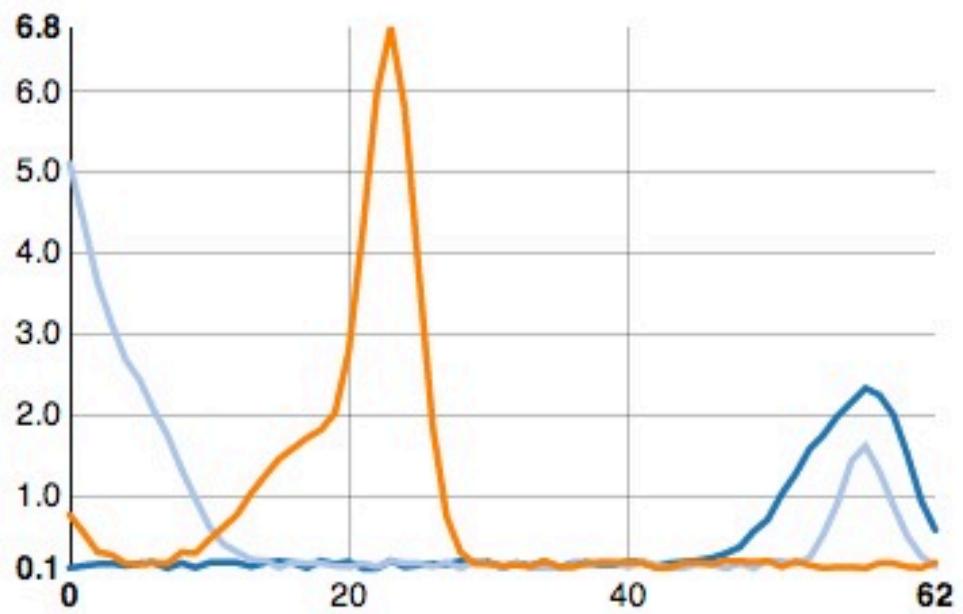
**Excel
Charts**

**d3.js Layouts
Crossfilter
Rickshaw
NVD3
RAW**

**Custom
Visualization**

NVD3 Re-usable charts for d3.js

[View more examples »](#)



Rickshaw

Random Data in the Future

- New York
- London
- Tokyo
- Paris
- Amsterdam
- Shanghai
- Moscow



area



bar



line

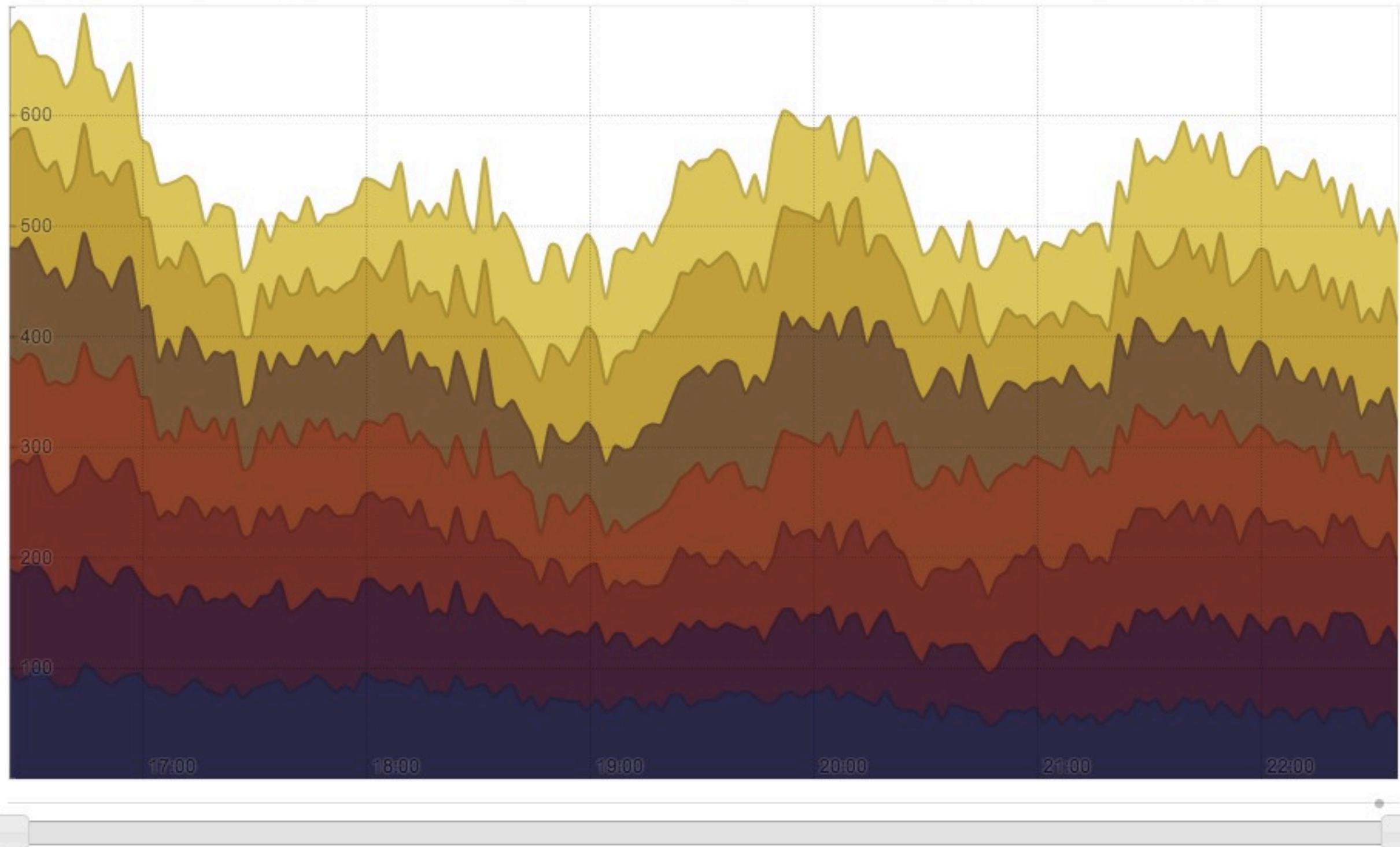


scatter

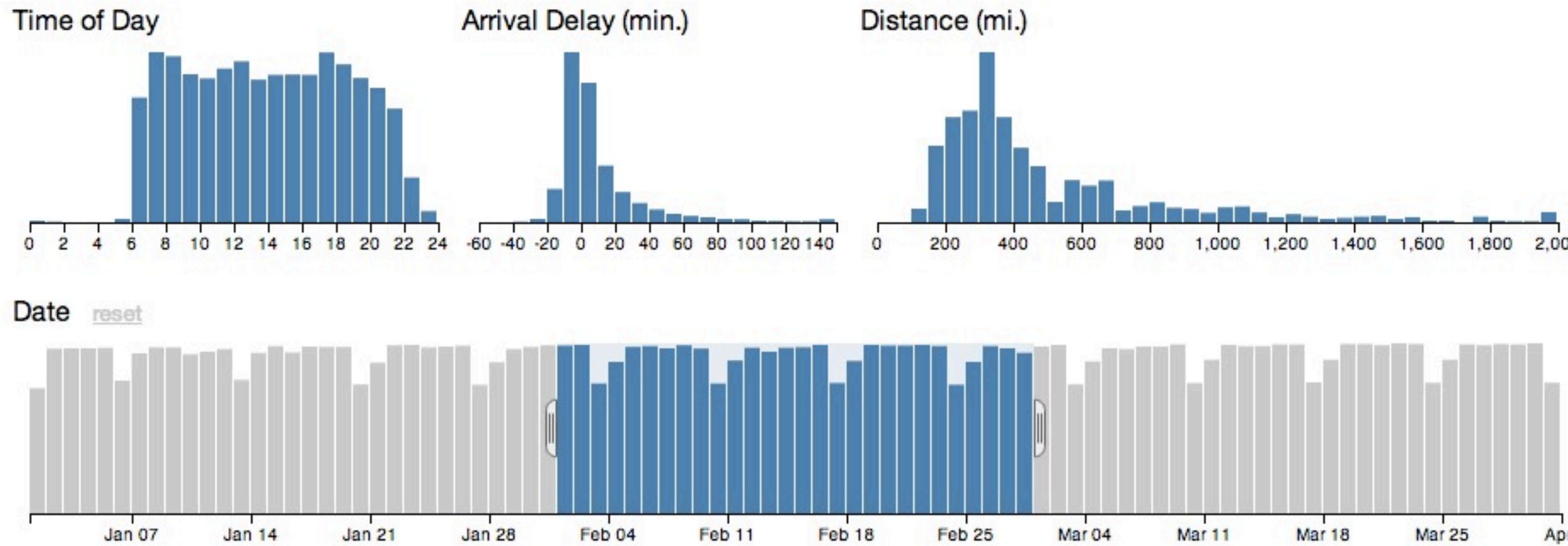
- stack
- stream
- pct
- value

- cardinal
- linear
- step

Smoothing



Crossfilter



February 28, 2001

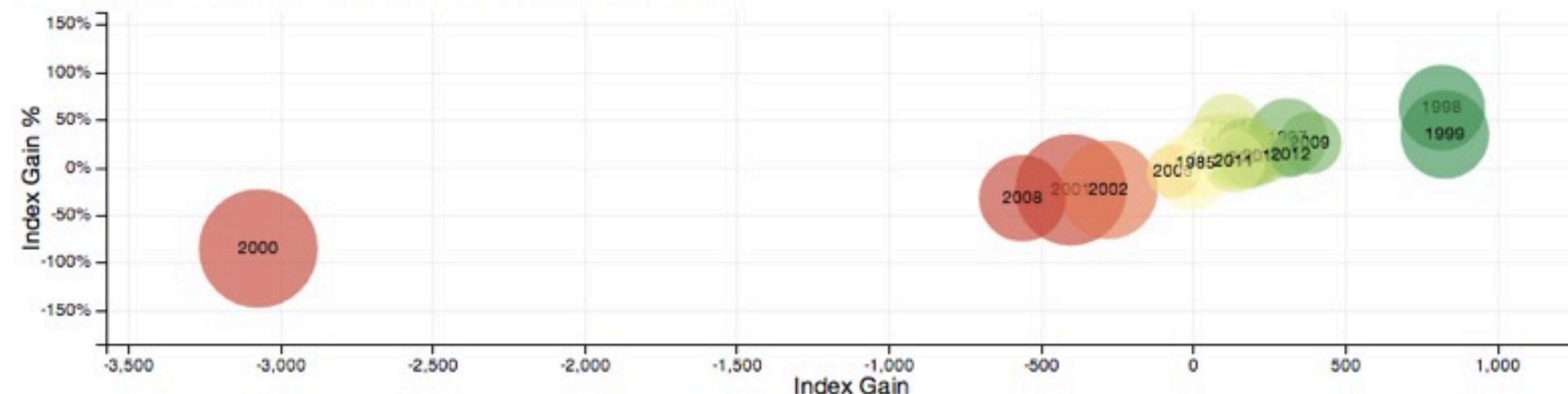
71,818 of 231,083 flights selected.

11:59 PM	LAS	LAX	236 mi.	+139 min.
11:58 PM	PHX	SAN	304 mi.	+83 min.
11:49 PM	SJC	PDX	569 mi.	+172 min.
11:42 PM	PHX	OAK	646 mi.	+97 min.
11:41 PM	PHX	LAX	370 mi.	+73 min.
11:40 PM	PHX	ONT	325 mi.	+92 min.
11:35 PM	PHX	ONT	325 mi.	+16 min.
11:25 PM	ONT	OAK	361 mi.	+75 min.

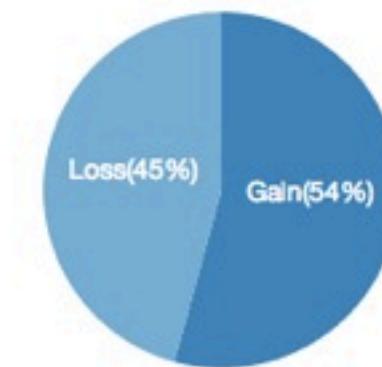
dc.js - Dimensional Charting Javascript Library

Nasdaq 100 Index 1985/11/01-2012/06/29

Yearly Performance (radius: fluctuation/index ratio, color: gain/loss)



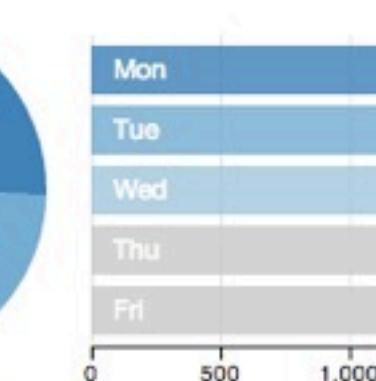
Days by Gain/Loss



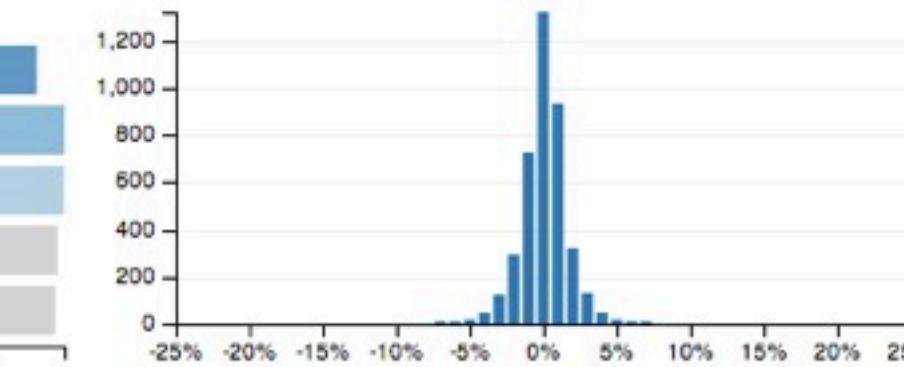
Quarters



Day of Week [reset](#)



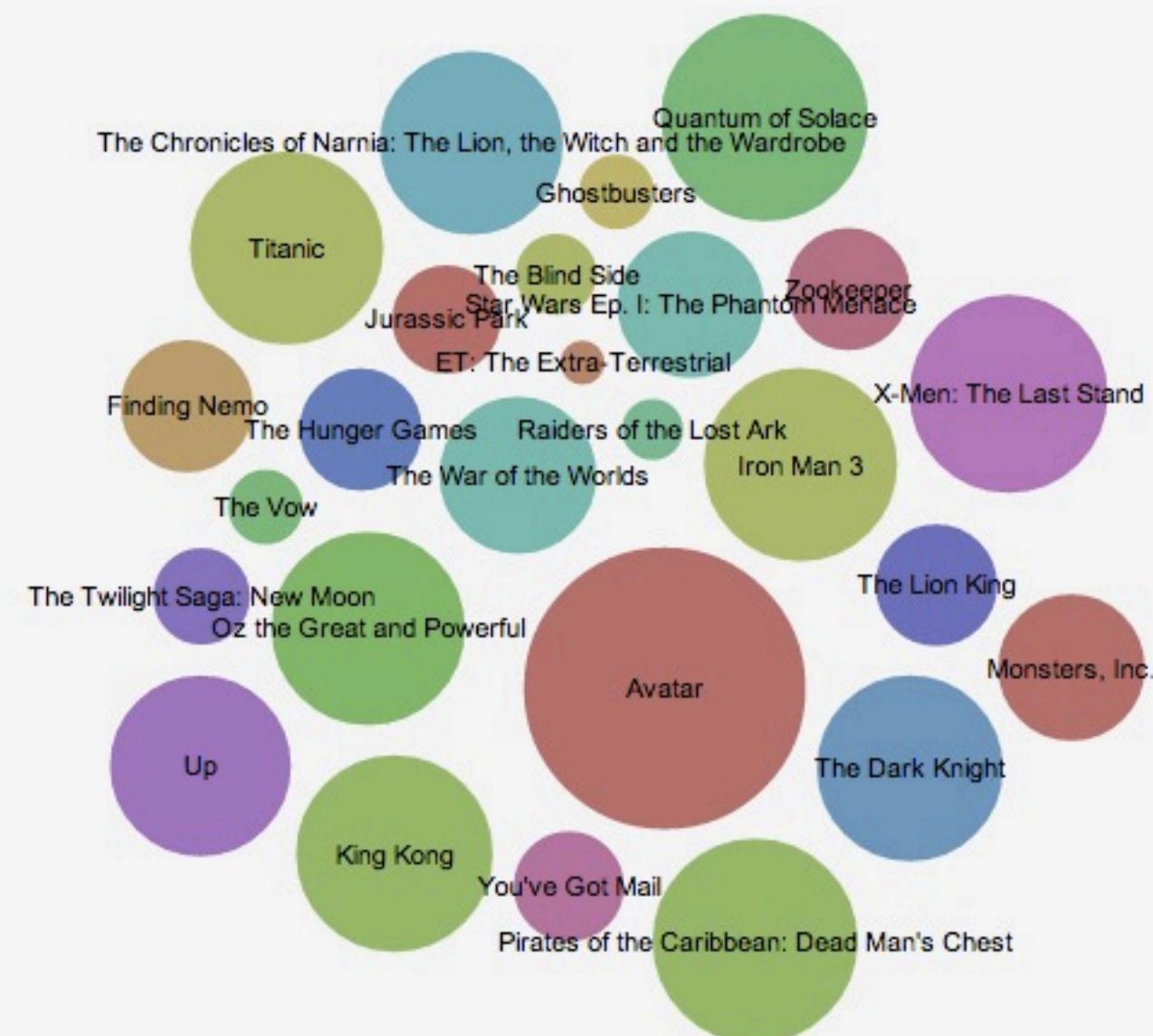
Days by Fluctuation(%)



Monthly Index Abs Move & Volume/500,000 Chart



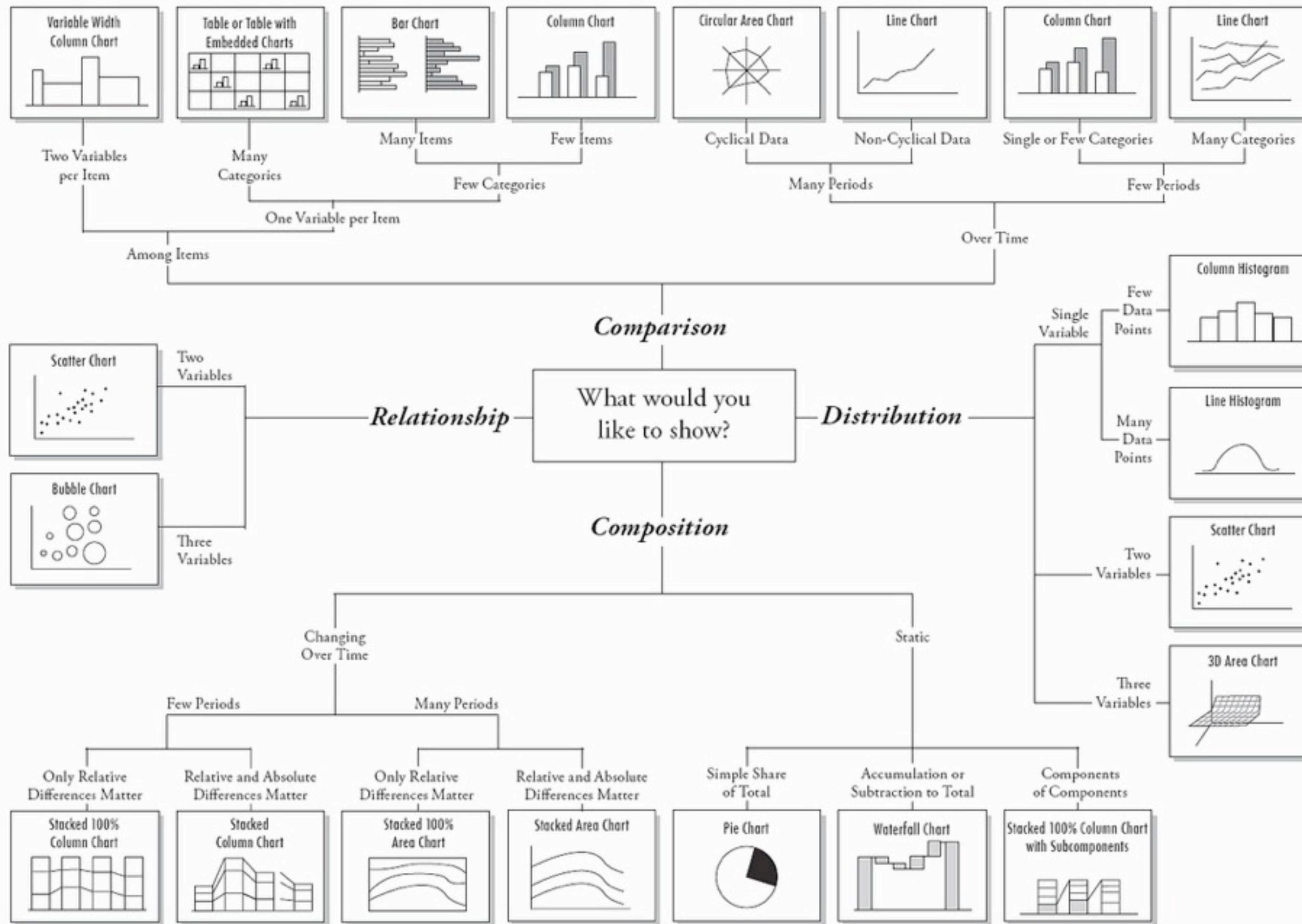
<http://app.raw.densitydesign.org/>



Basic Visualization Concepts

choosing the right chart type

Chart Suggestions—A Thought-Starter



Basic Charts

Area Chart



Line Chart



Bivariate Area

Chart



Multi-Series

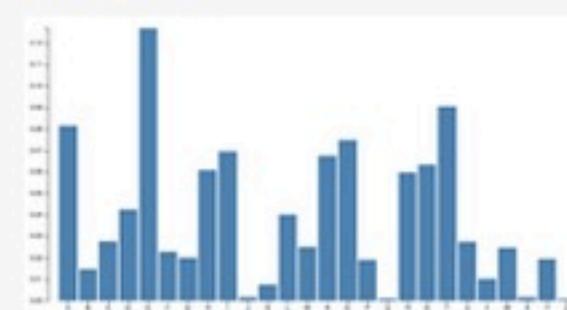
Line Chart



Stacked Area
Chart



Bar Chart



Stacked Bar
Chart



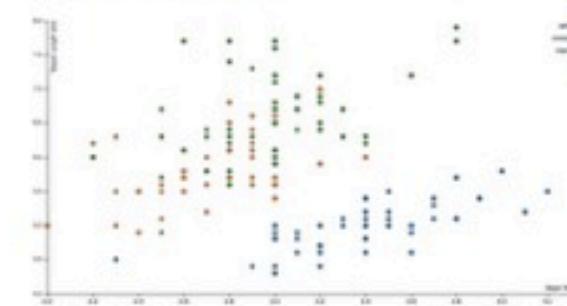
Normalized
Stacked Bar
Chart



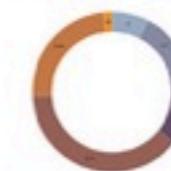
Grouped Bar
Chart



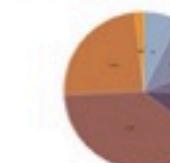
Scatterplot



Donut Chart



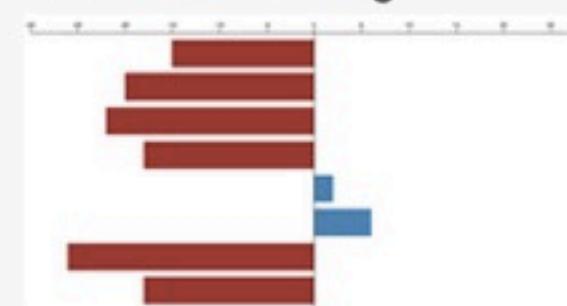
Pie Chart



Donut
Multiples



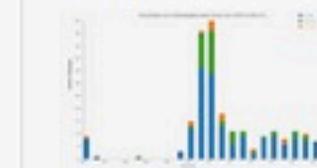
Bar Chart with Negative Values



Animated Donut
Chart with
Labels



Stacked Bar
Charts on time
scale



attribute encoding



Intensity

Size

Shape

Rotation

Enclosure



Colour

Mark

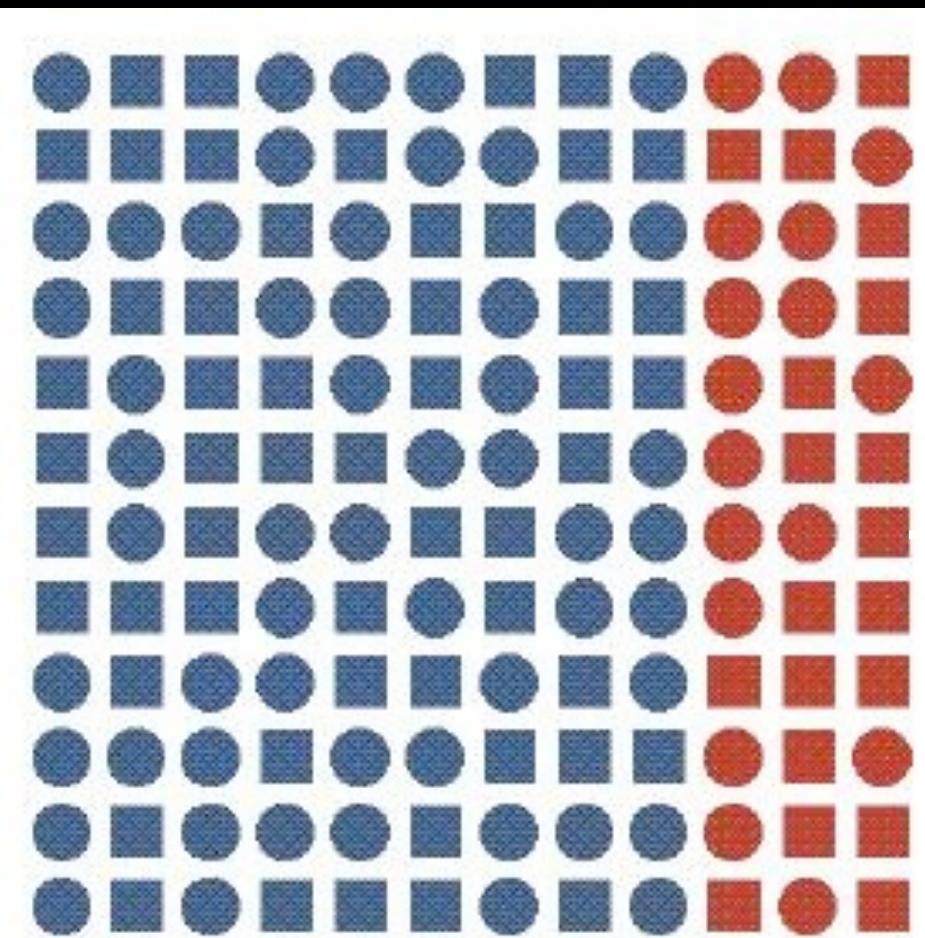
Line weight

Length

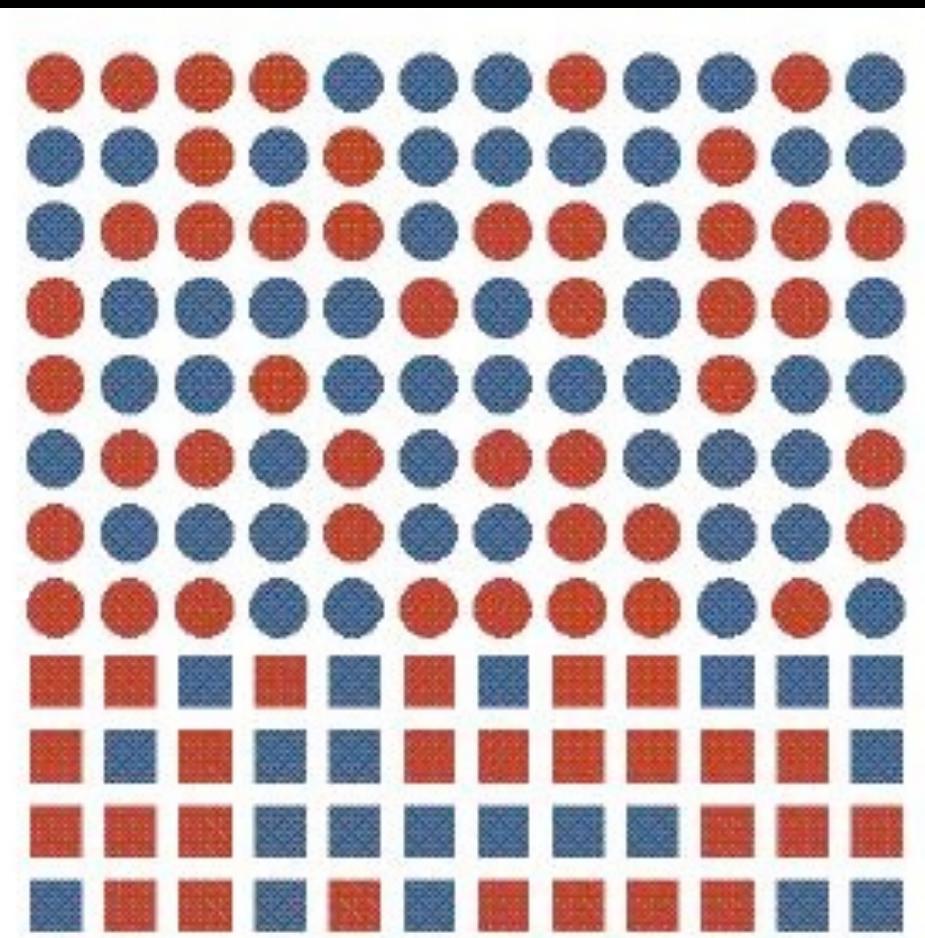
Displacement

pre-attentive processing

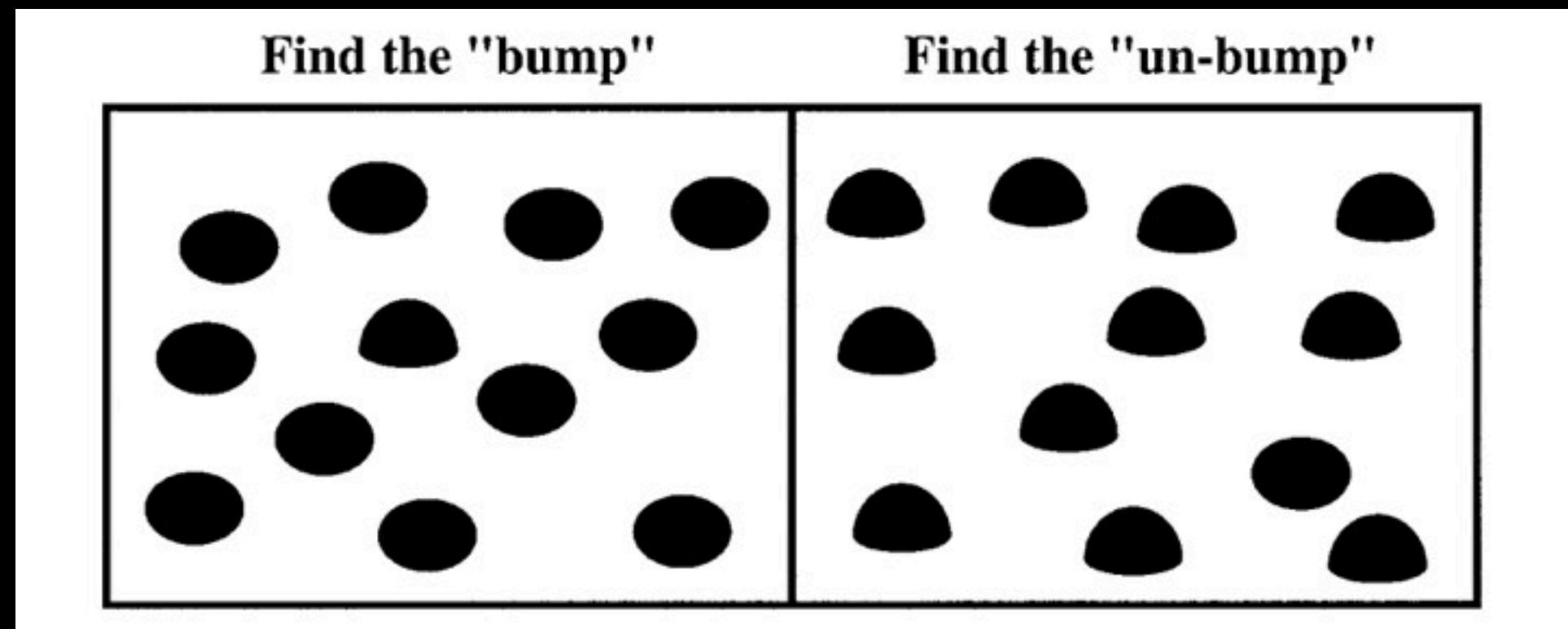
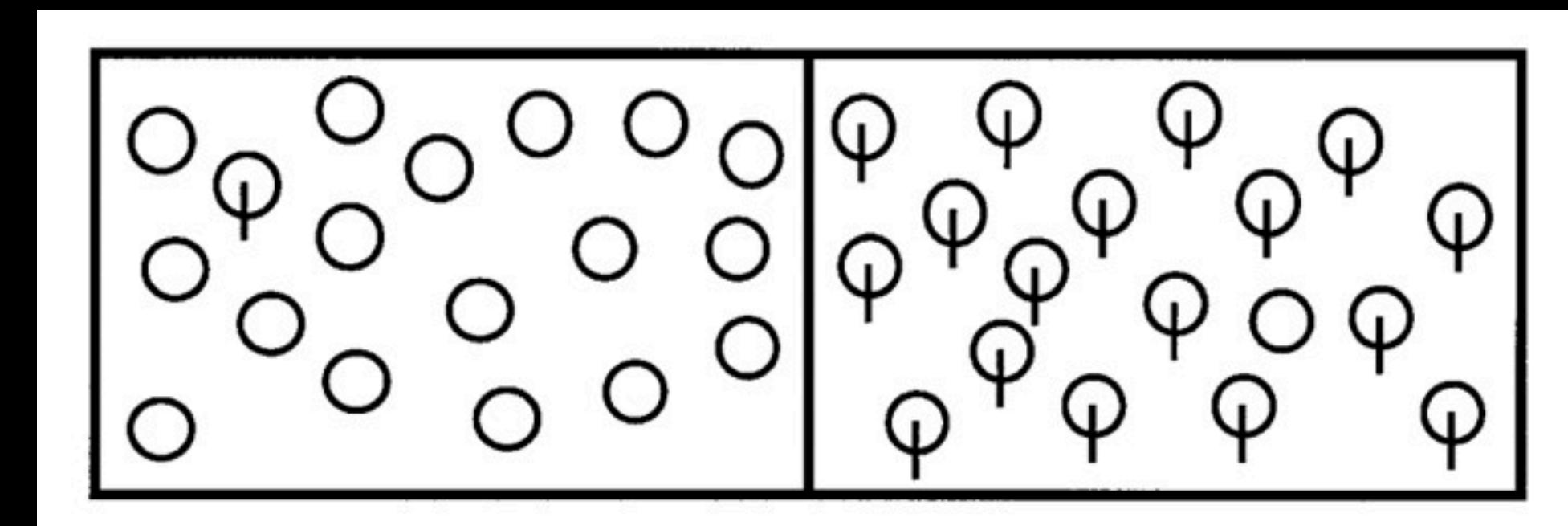
“...simple features are extracted from the visual display in the preattentive system and later joined in the focused attention system into coherent objects.”



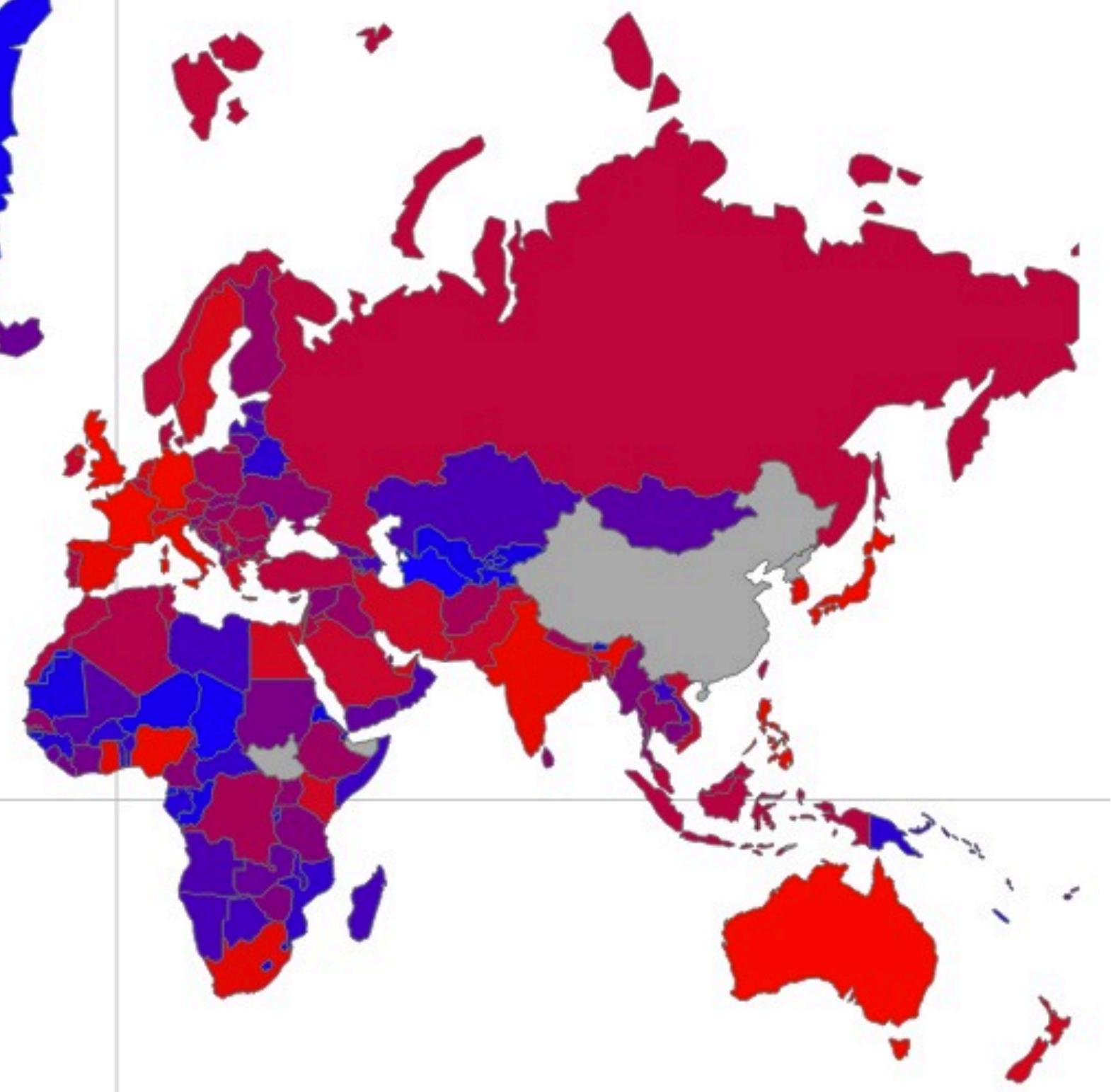
(a)



(b)



color vs.
size & position



Overlapping



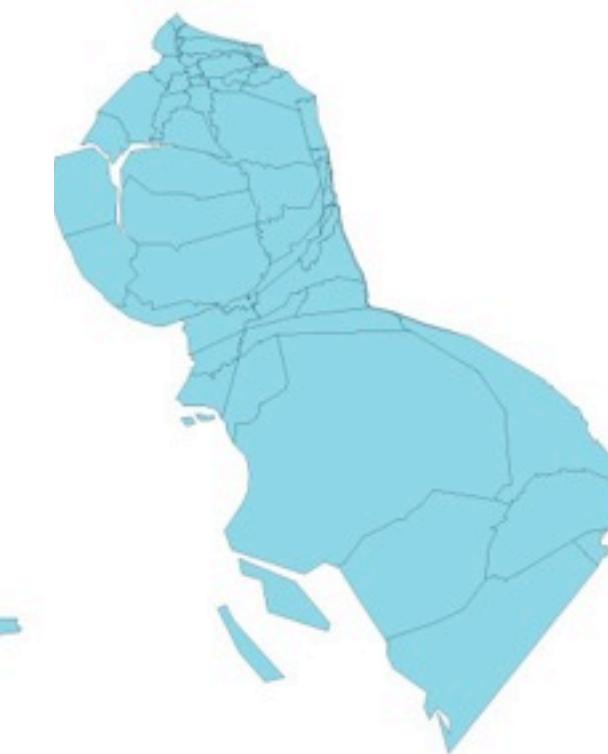
Graduated Symbol Map

Non-Overlapping

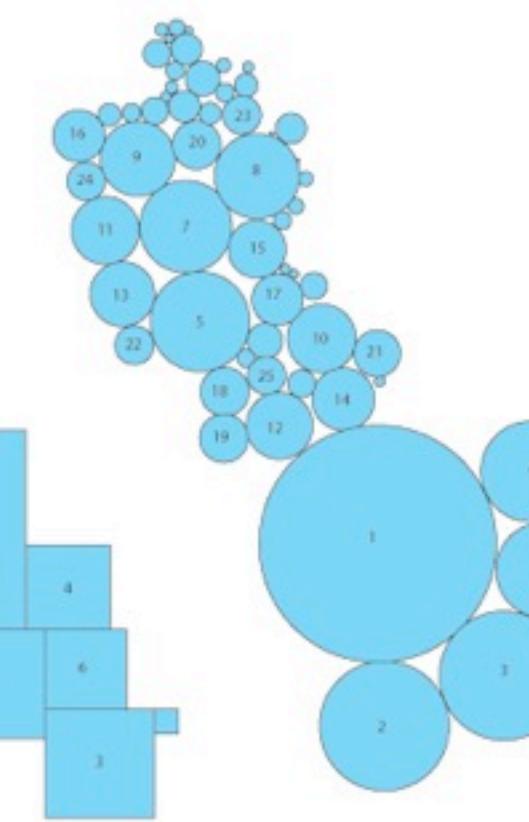


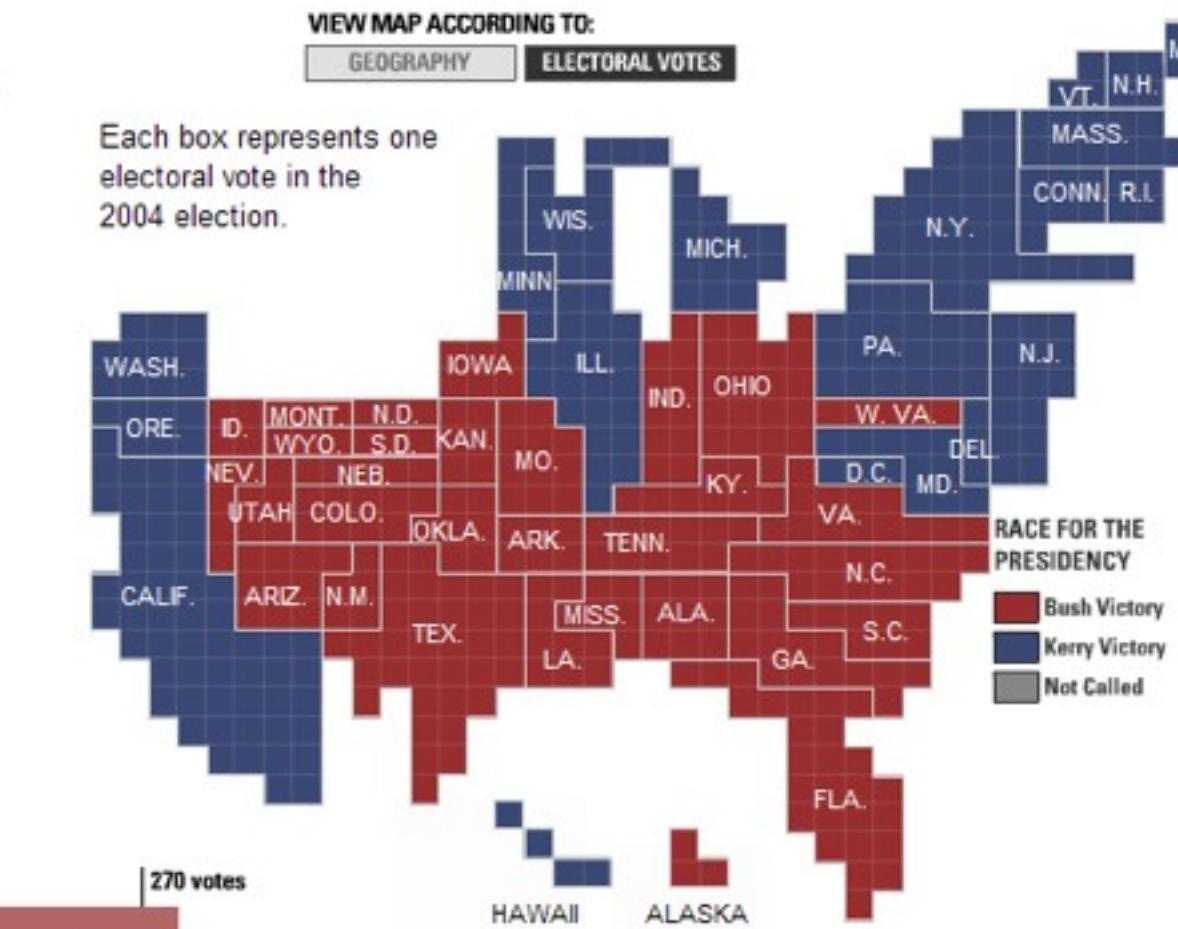
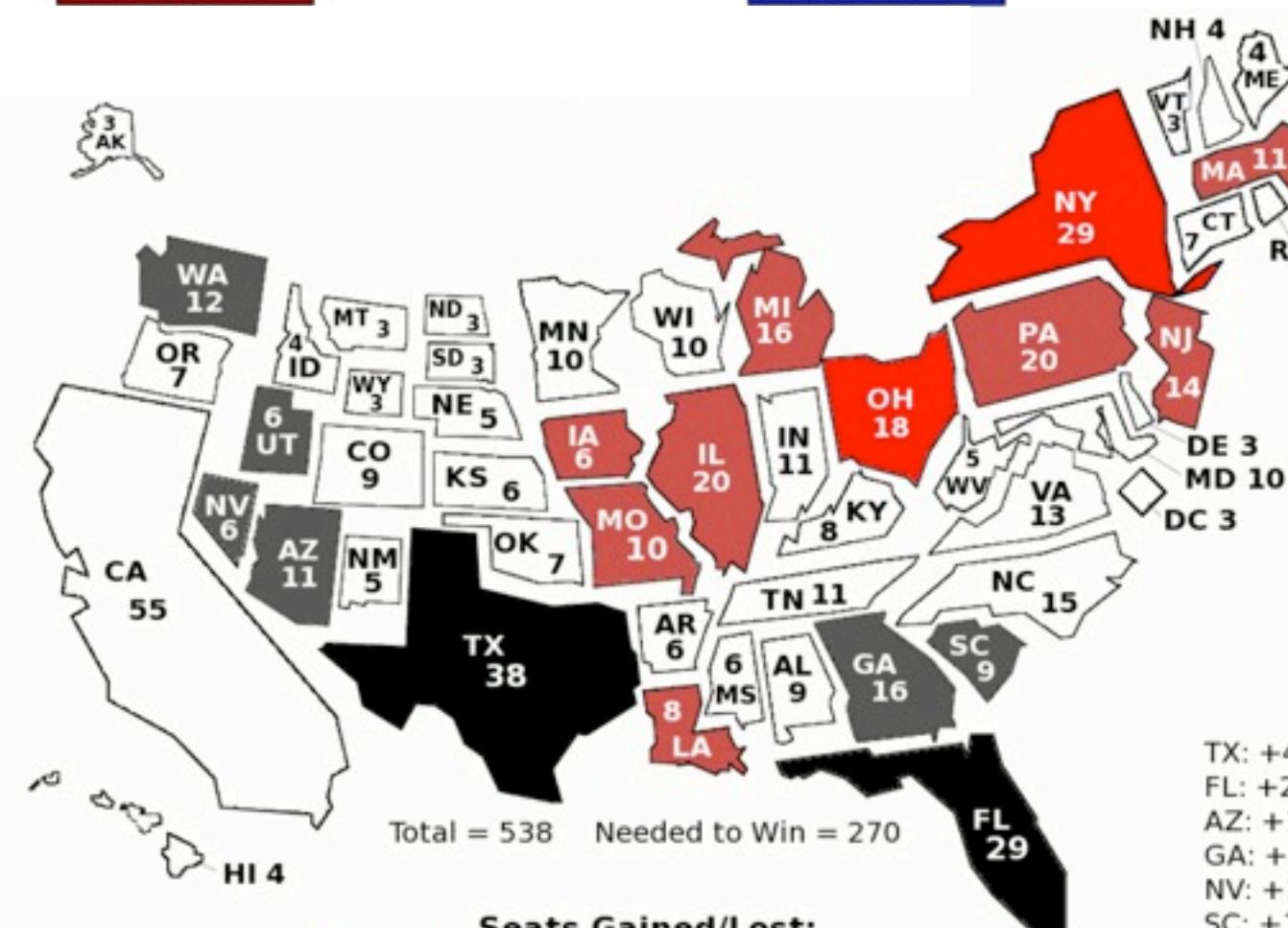
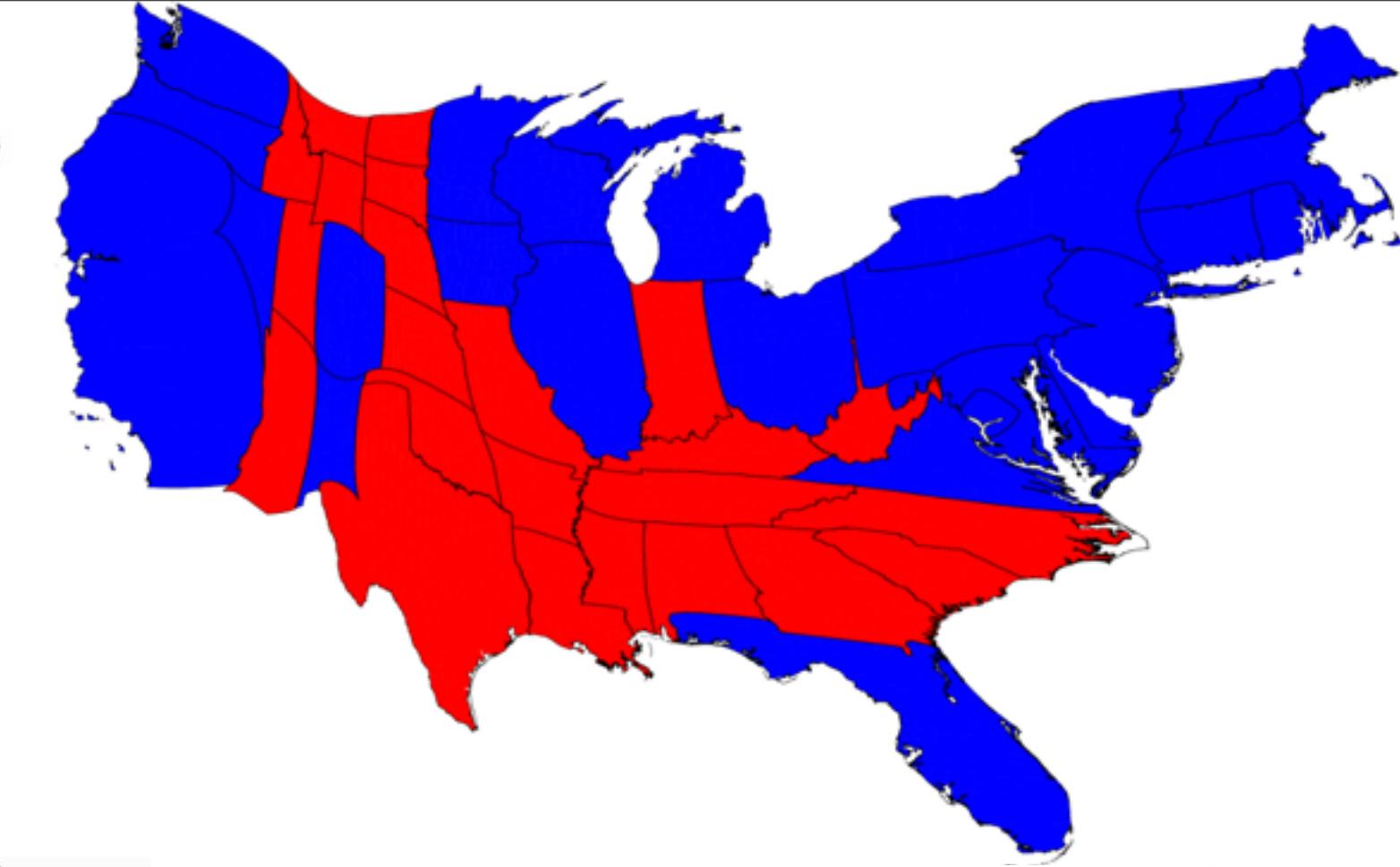
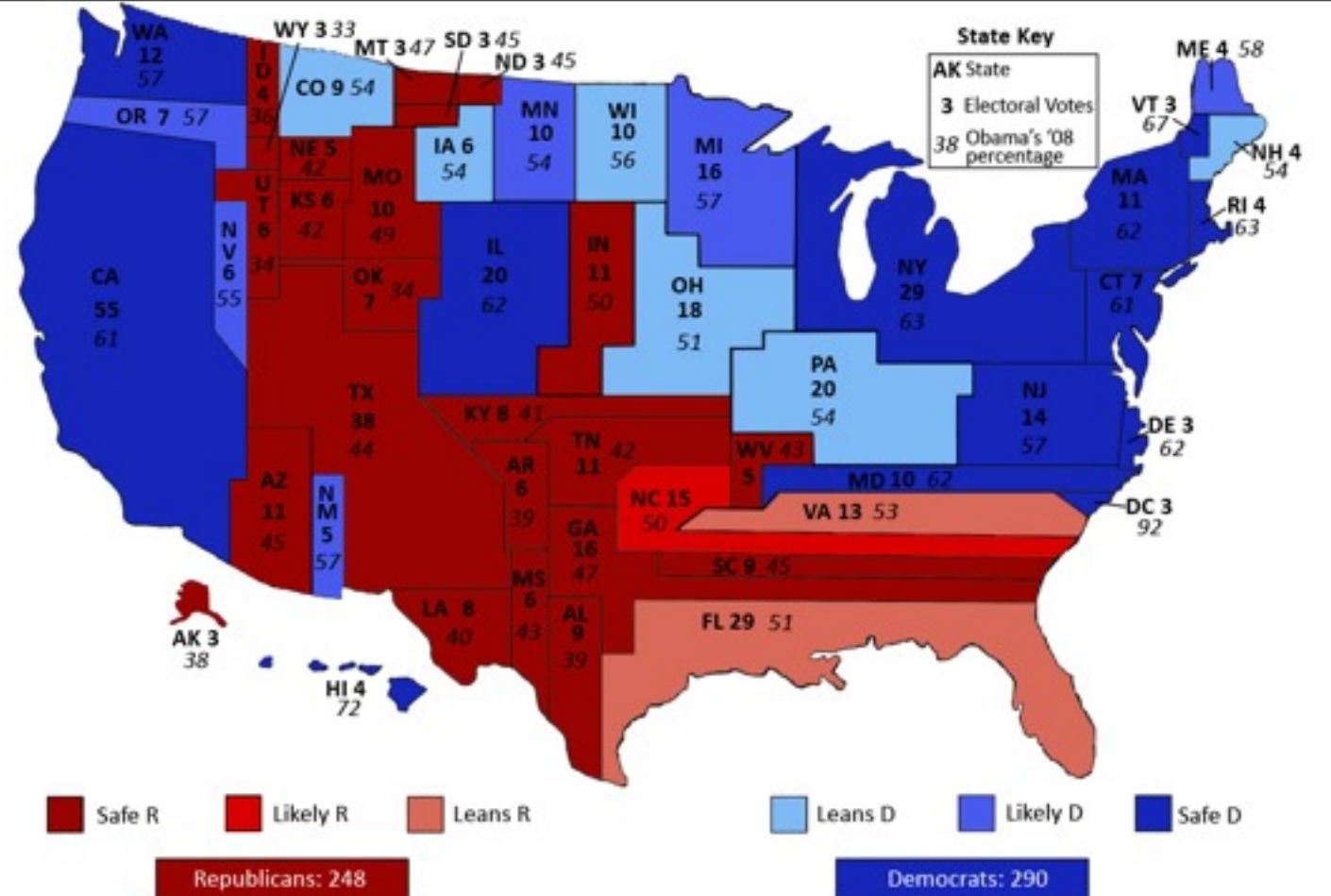
Demers Cartogram

Contiguous Cartogram



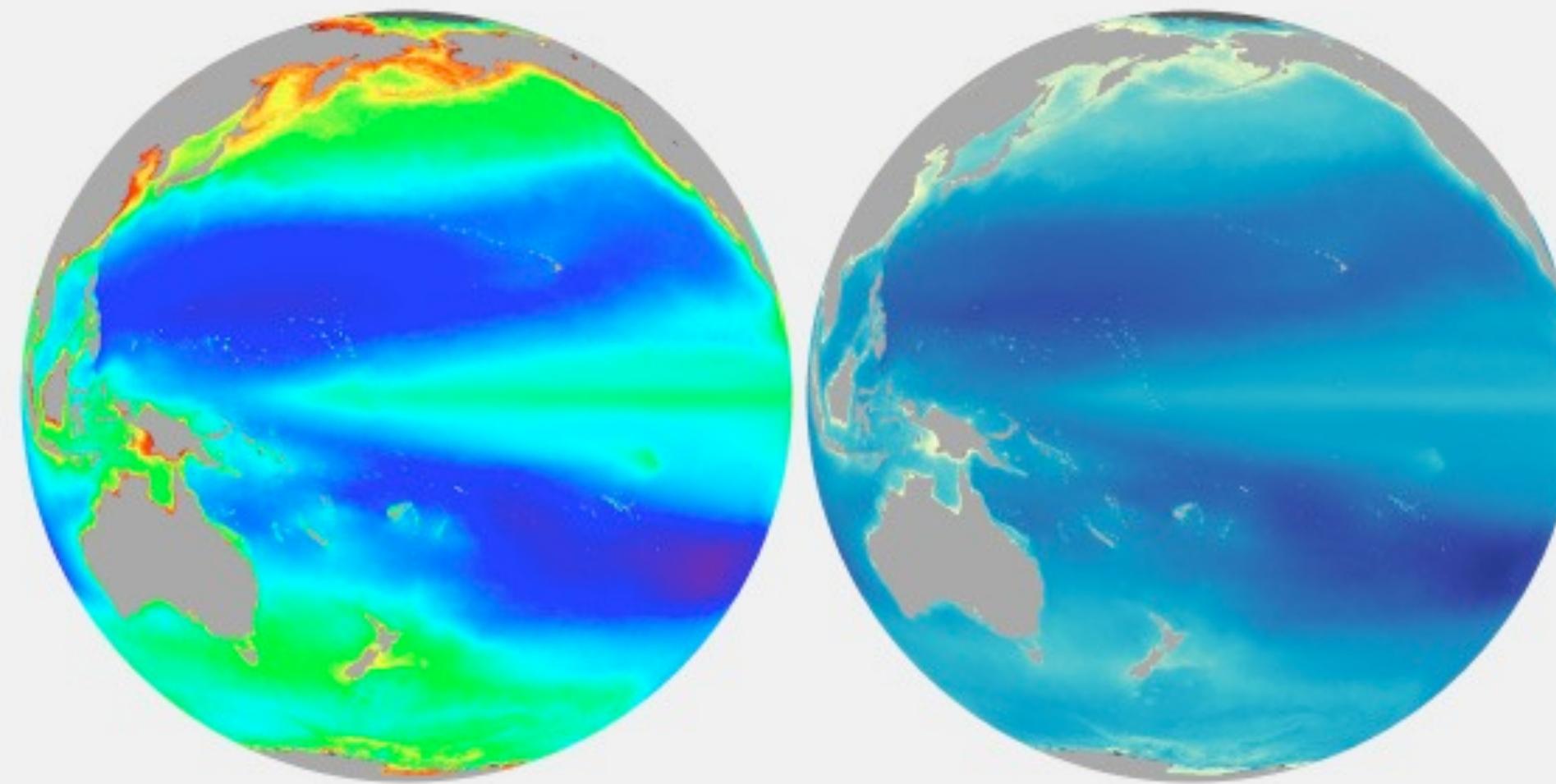
Dorling Cartogram

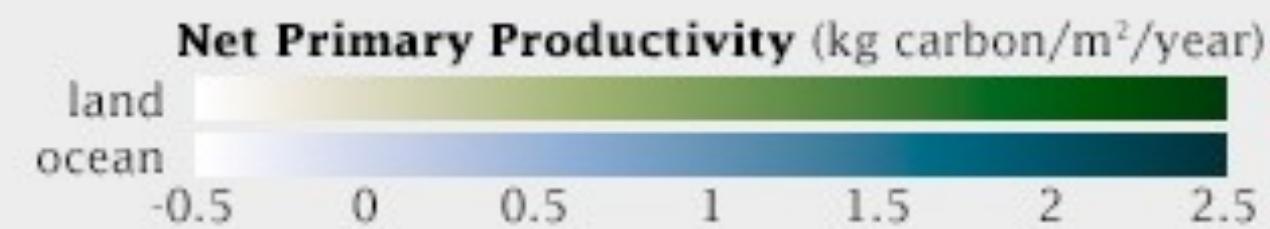
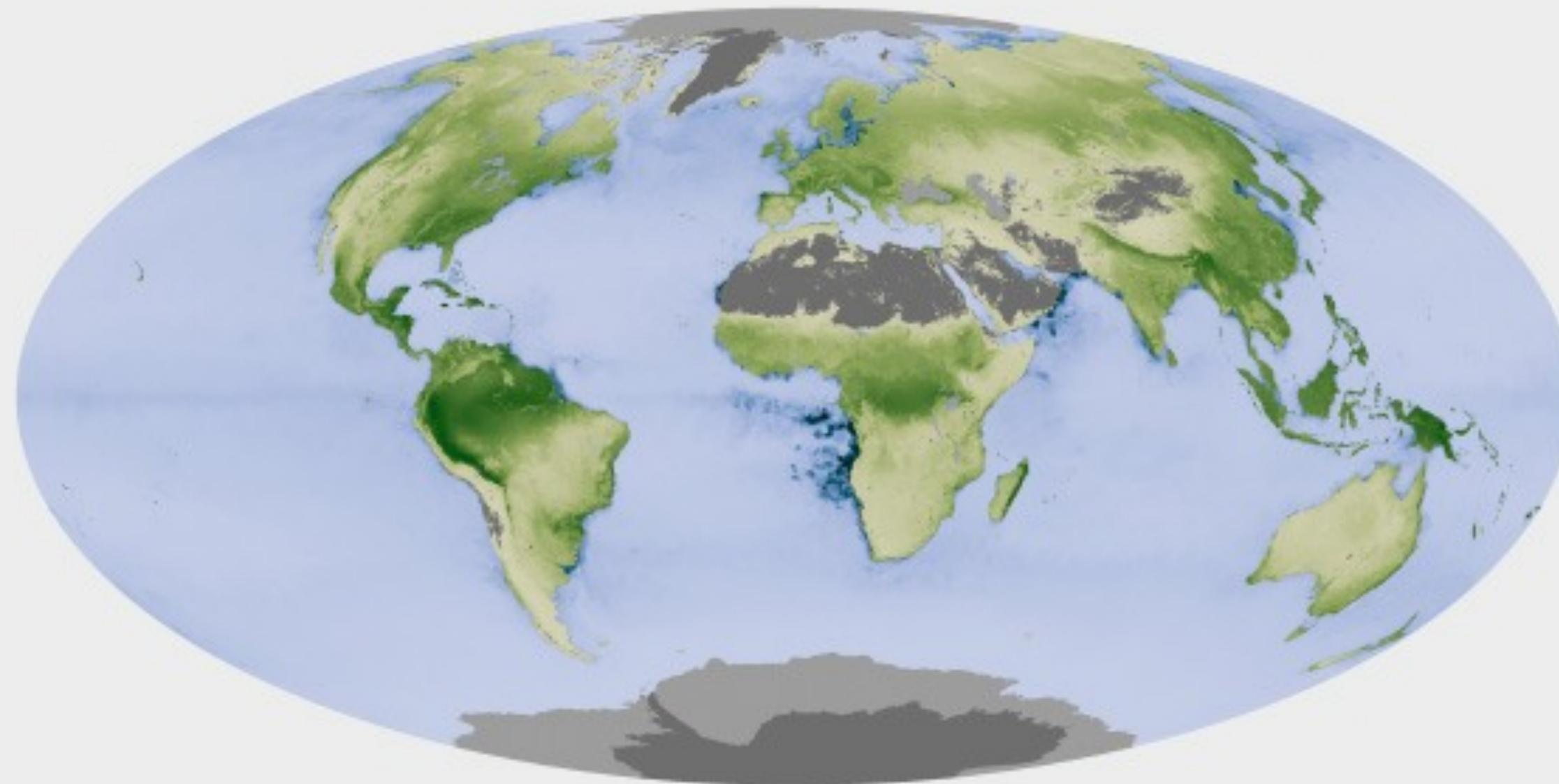


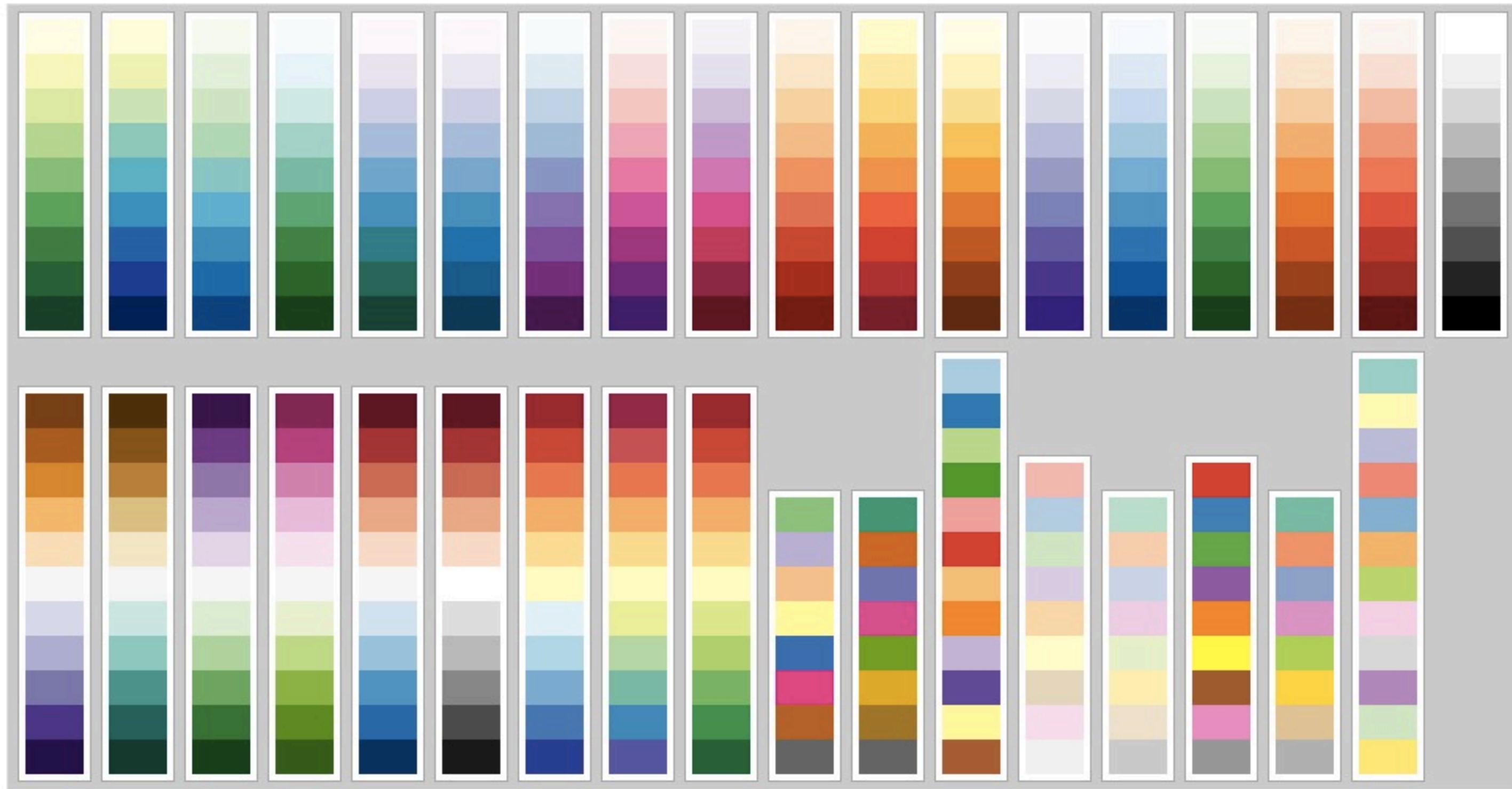


**double-encoding
is your friend**

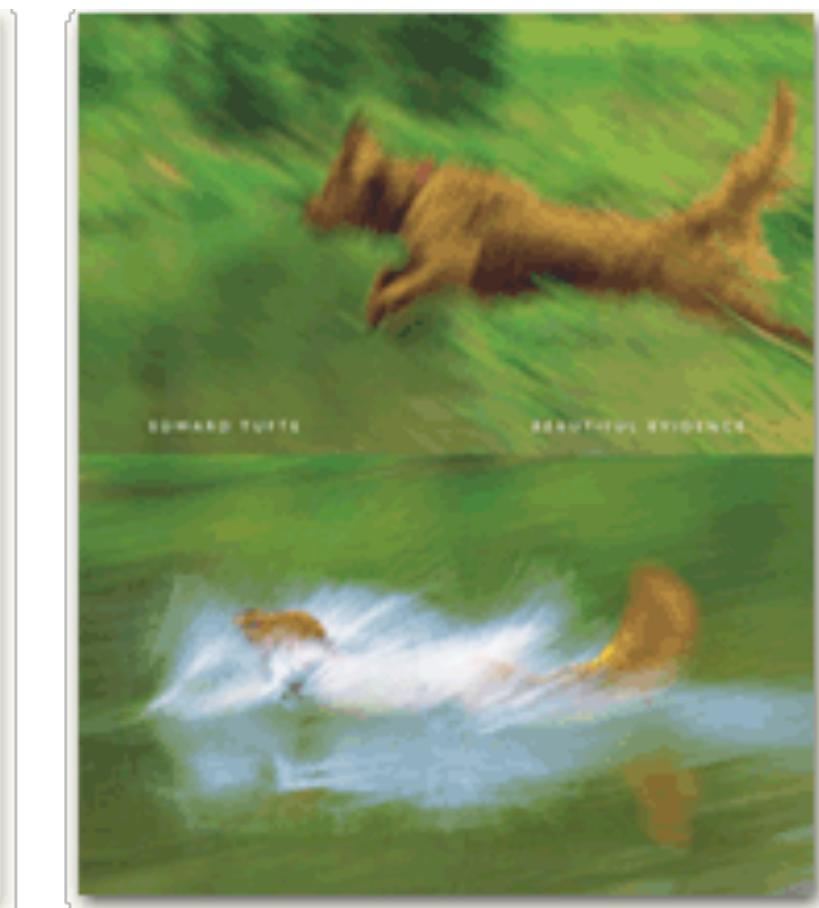
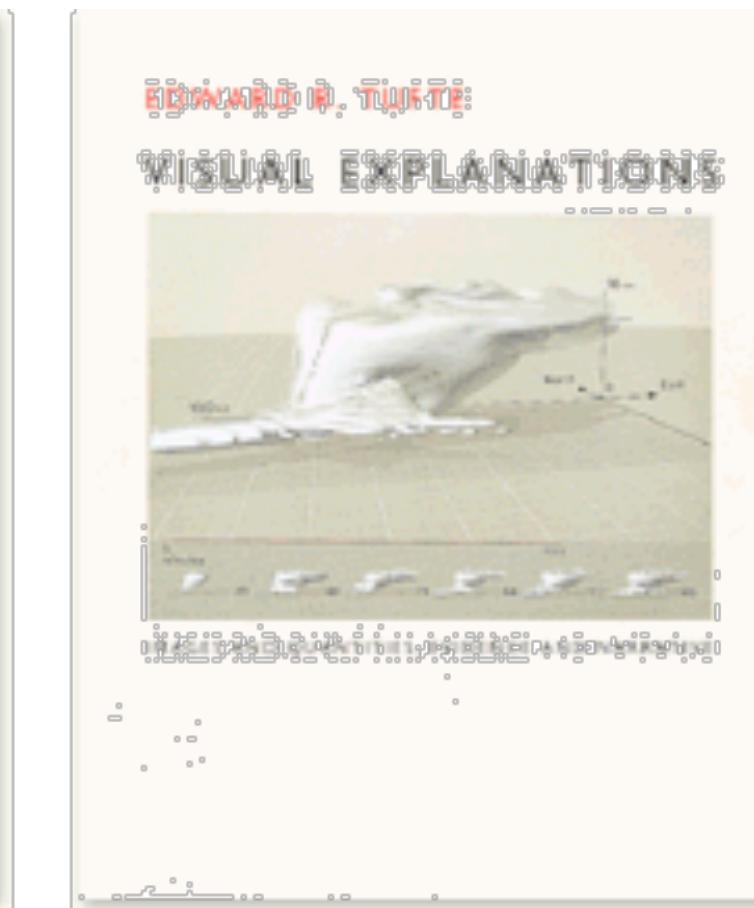
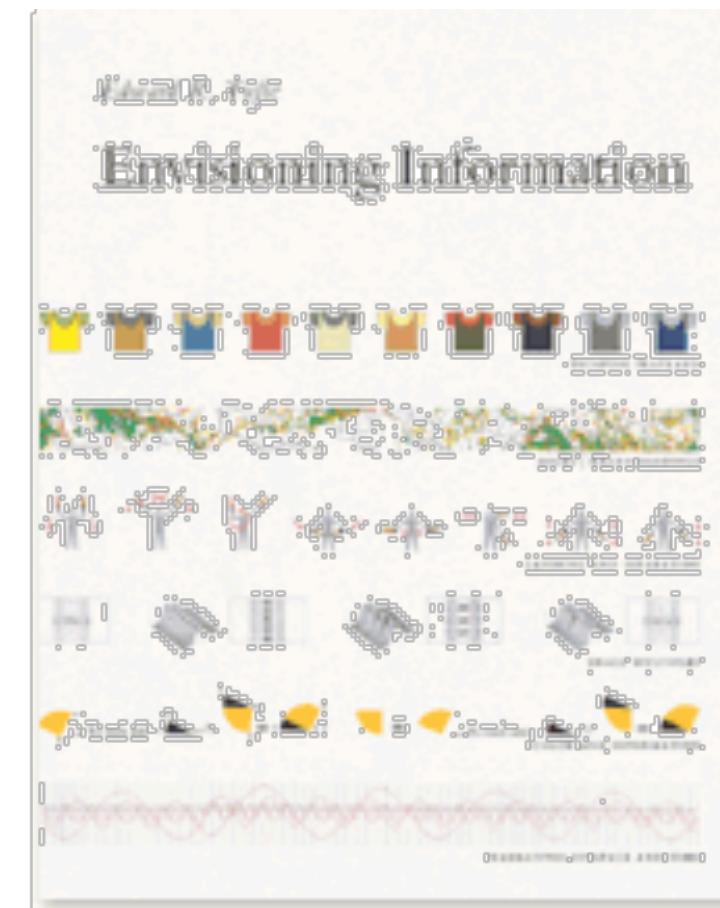
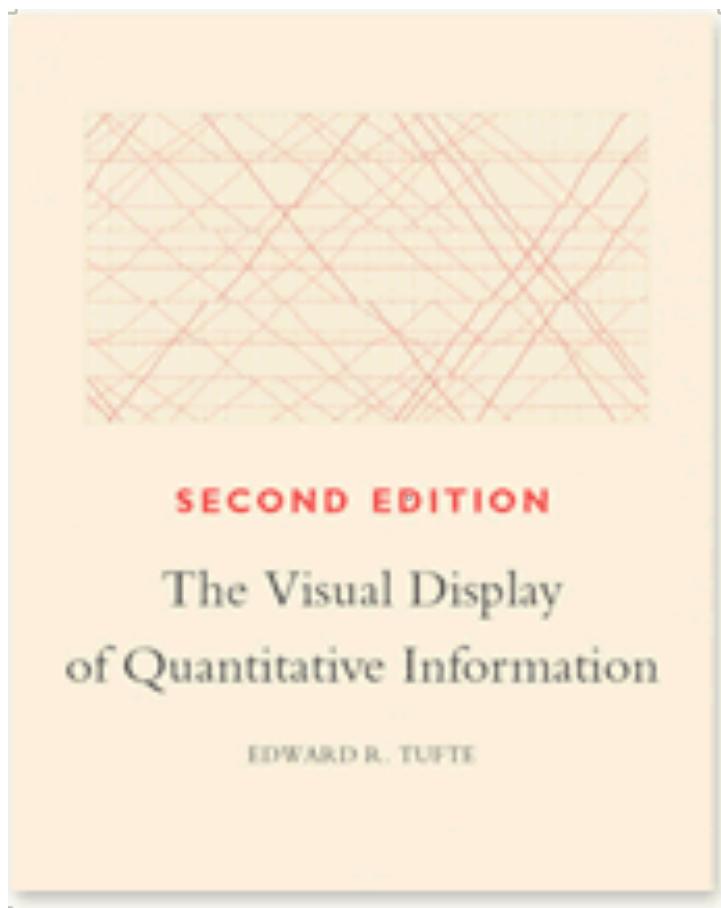
color encoding





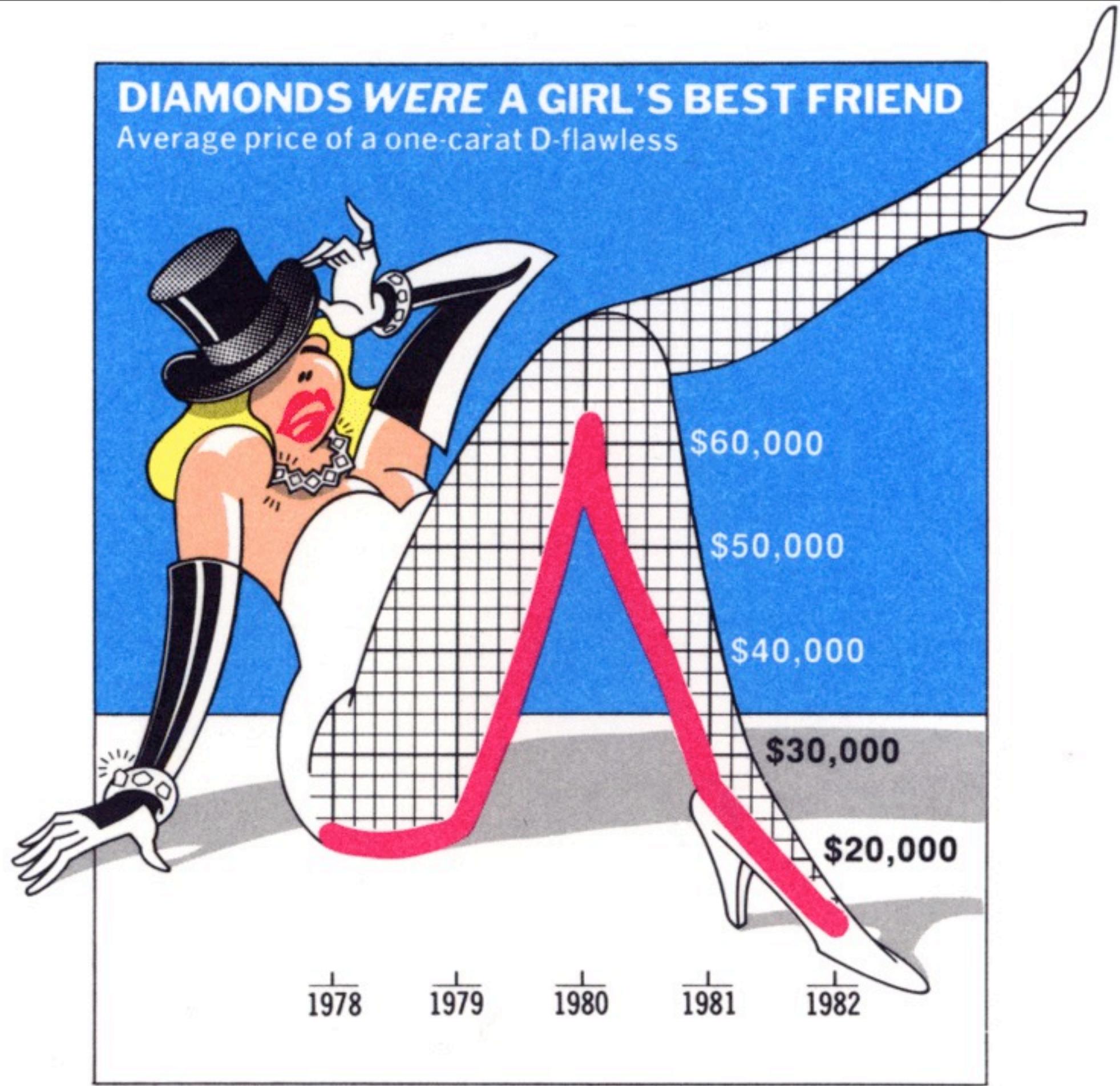


chartjunk



DIAMONDS WERE A GIRL'S BEST FRIEND

Average price of a one-carat D-flawless



Remove
to improve
(the **data-ink** ratio)

Created by Darkhorse Analytics

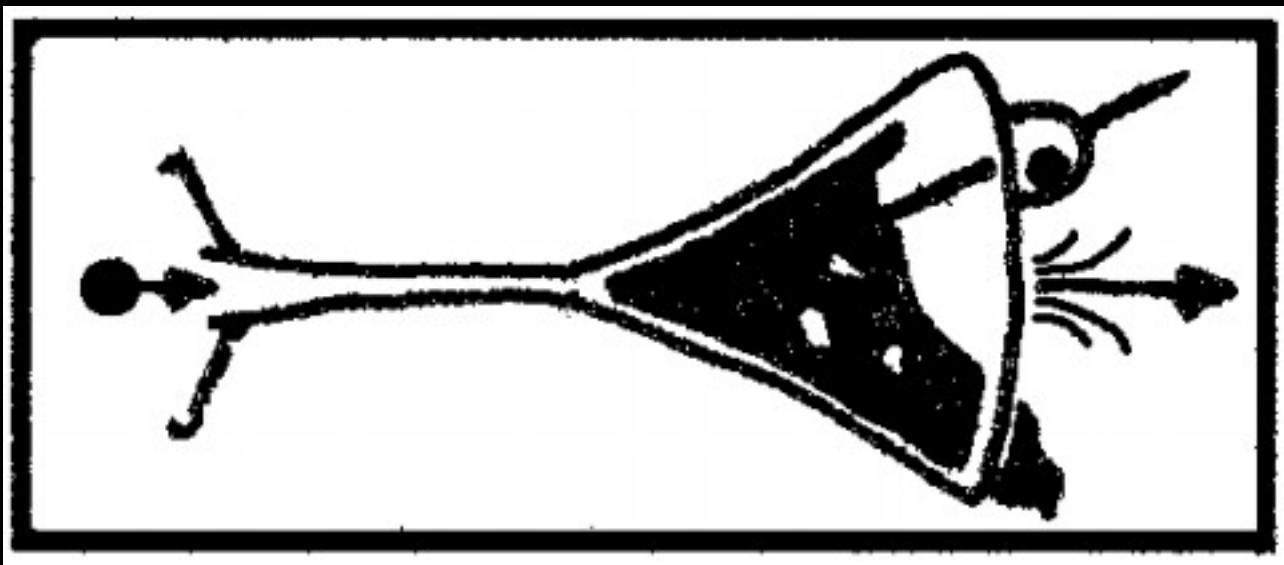
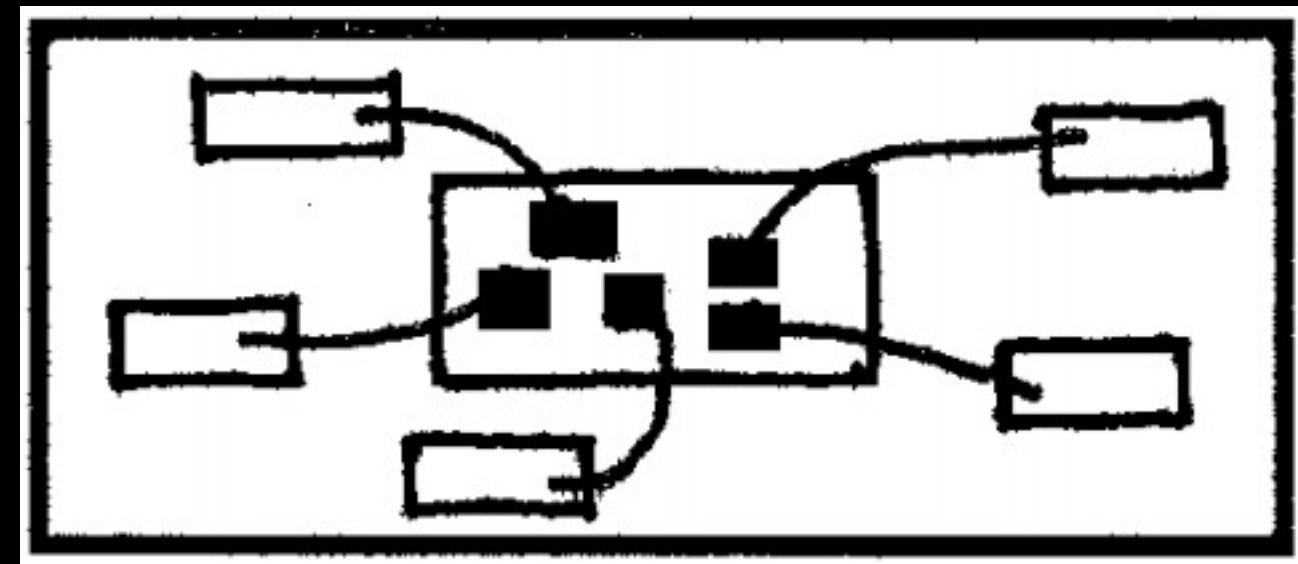
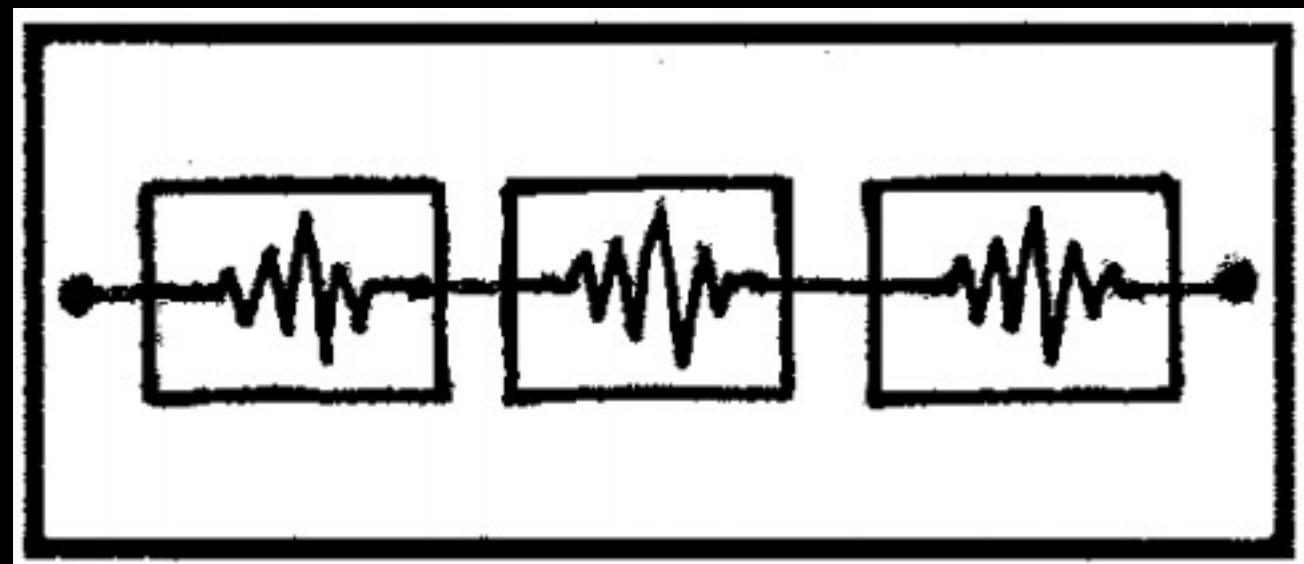
www.darkhorseanalytics.com

Narrative Structures

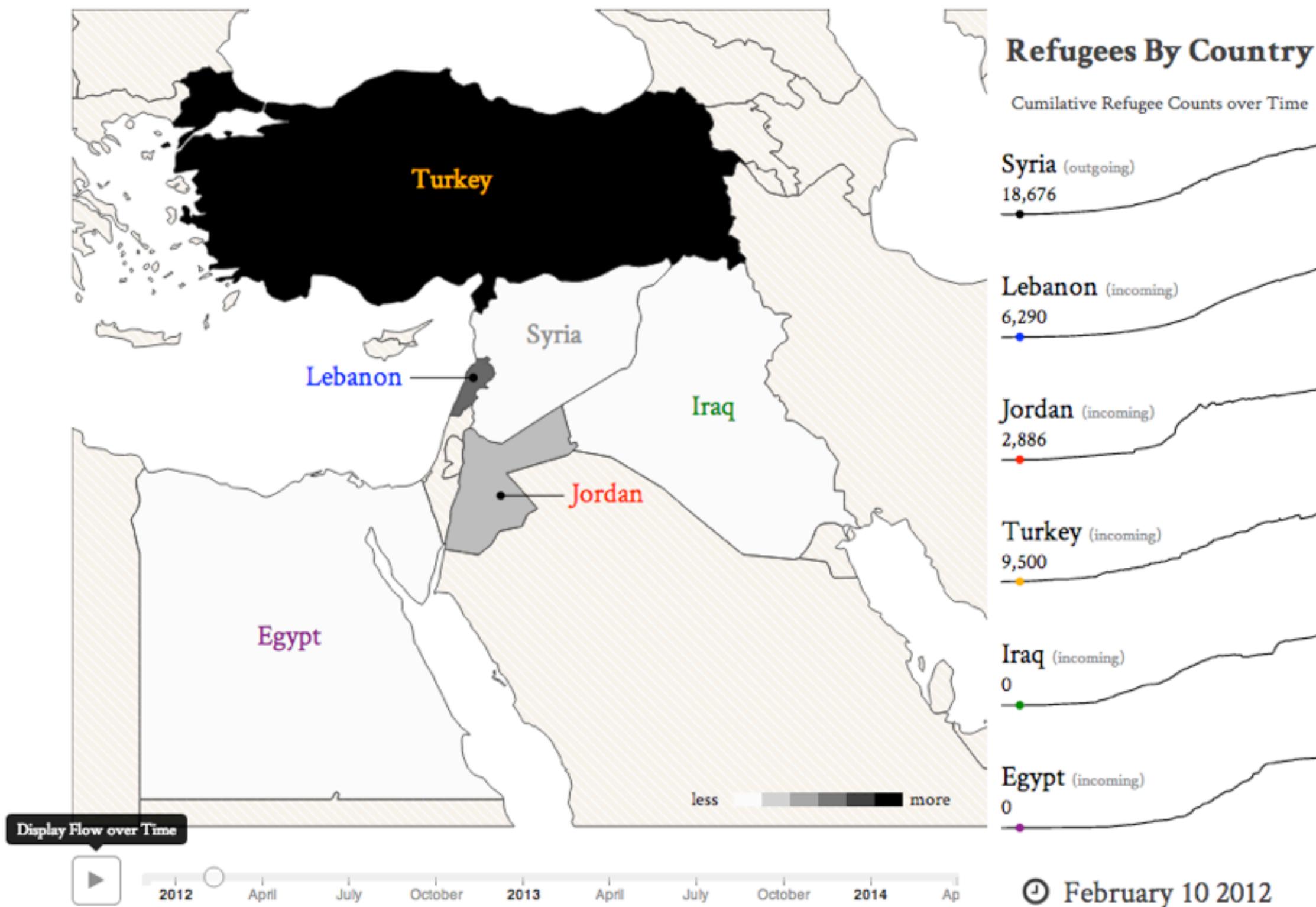
DATA SATISFY THE ANALYTICAL PART OF OUR BRAINS. 
BUT STORIES TOUCH OUR HEARTS. 

author-driven

viewer-driven



author-driven



The interactive figure above visualizes the flow of Syrian refugees over time using data obtained from the [UN Refugee Agency](#). The flow is only shown for countries with available data.

Data Sources

The Facebook Offering: How It Compares

[◀ Prev](#)[Next ▶](#)

1 2 3 4 5

Find a company

Company value
In billions of today's dollars

25 —

20 —

15 —

10 —

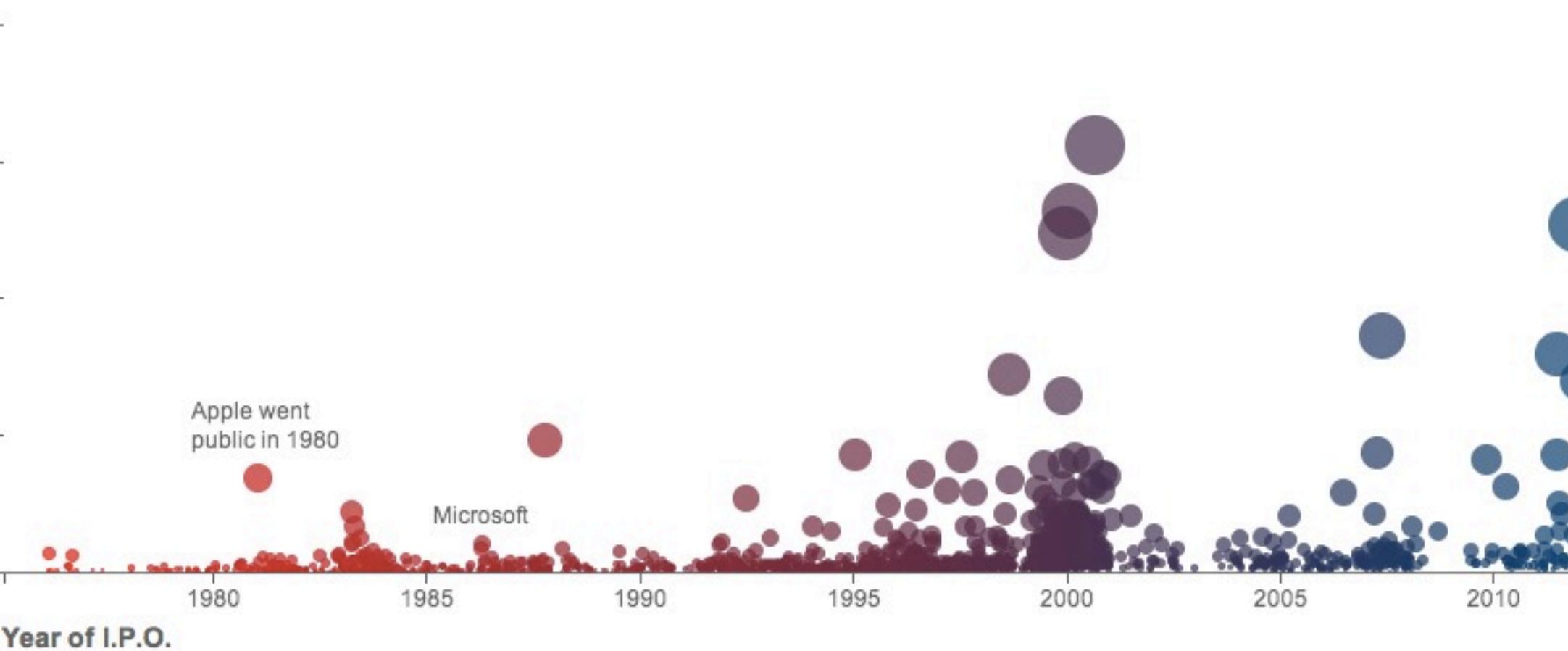
5 —

0 —

The Tech I.P.O.'s

Since 1980, there have been about 2,400 technology, Internet and telecom initial public offerings. Until this week, the largest by market capitalization was Google, which was valued at \$23 billion, or about \$28 billion in today's dollars.

Google went public in 2004



viewer-driven


TIME OF DAY
[Show All](#) | [Hide All](#)
[Light](#) | [Dark](#) [nearest hour]

[Commute](#) | [Nightlife](#)
[Day](#) | [Night](#) | [Swing Shift](#)

DATE
[Past Week](#)
[Apr](#) [▼](#)
[2010](#) [▼](#)
[MAR 31 2014](#)
[APR 7 2014](#)
[APR 14 2014](#)
[APR 21 2014](#)

S	M	T	W	Th	F	S	S	M	T	W	Th	F	S
---	---	---	---	----	---	---	---	---	---	---	----	---	---

Notice anything different?

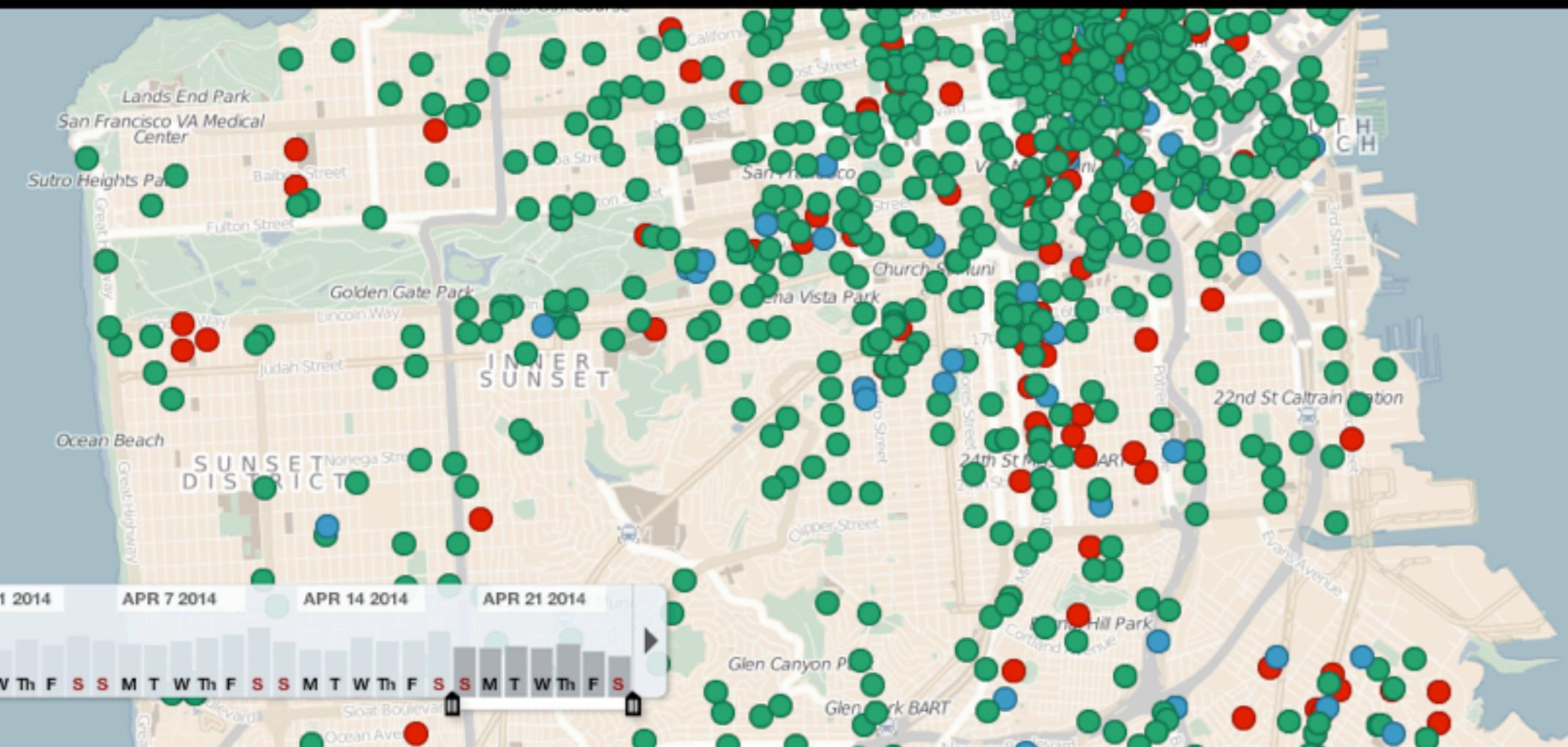
We've been working on the interface design, [read more about it on the blog](#).

San Francisco Crimespotting is an interactive map of crimes in San Francisco and a tool for understanding crime in cities.

If you hear sirens in your neighborhood, you should know why. *Crimespotting* makes this possible with interactive maps and [RSS feeds](#) of crimes in areas that you care about.

We've found ourselves frustrated by the proprietary systems and long disclaimers that ultimately limit information available to the public. As citizens we have a right to public information. A clear understanding of our environment is essential to an informed citizenry.

Instead of simply knowing where a crime took place, we would like to investigate questions like: Is there more crime this week than last week? More this month than last? Do robberies tend to happen close to murders? We're interested in everything from



Map tiles © CloudMade. Map data CC-BY-SA OpenStreetMap.org

A note about map symbols

The names used here are based on [Oakland's](#) categorization of its crime statistics on the [Crime Watch](#) website. We have additionally grouped them into violent crimes (red), property crimes (green), and "quality of life" crimes (blue).

CRIME TYPE		Show All	Hide All
AA	Aggravated Assault	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Mu	Murder	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ro	Robbery	<input checked="" type="checkbox"/>	<input type="checkbox"/>
SA	Simple Assault	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DP	Disturbing the Peace	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Na	Narcotics	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Al	Alcohol	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pr	Prostitution	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Th	Theft	<input checked="" type="checkbox"/>	<input type="checkbox"/>
VT	Vehicle Theft	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Va	Vandalism	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Bu	Burglary	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ar	Arson	<input checked="" type="checkbox"/>	<input type="checkbox"/>

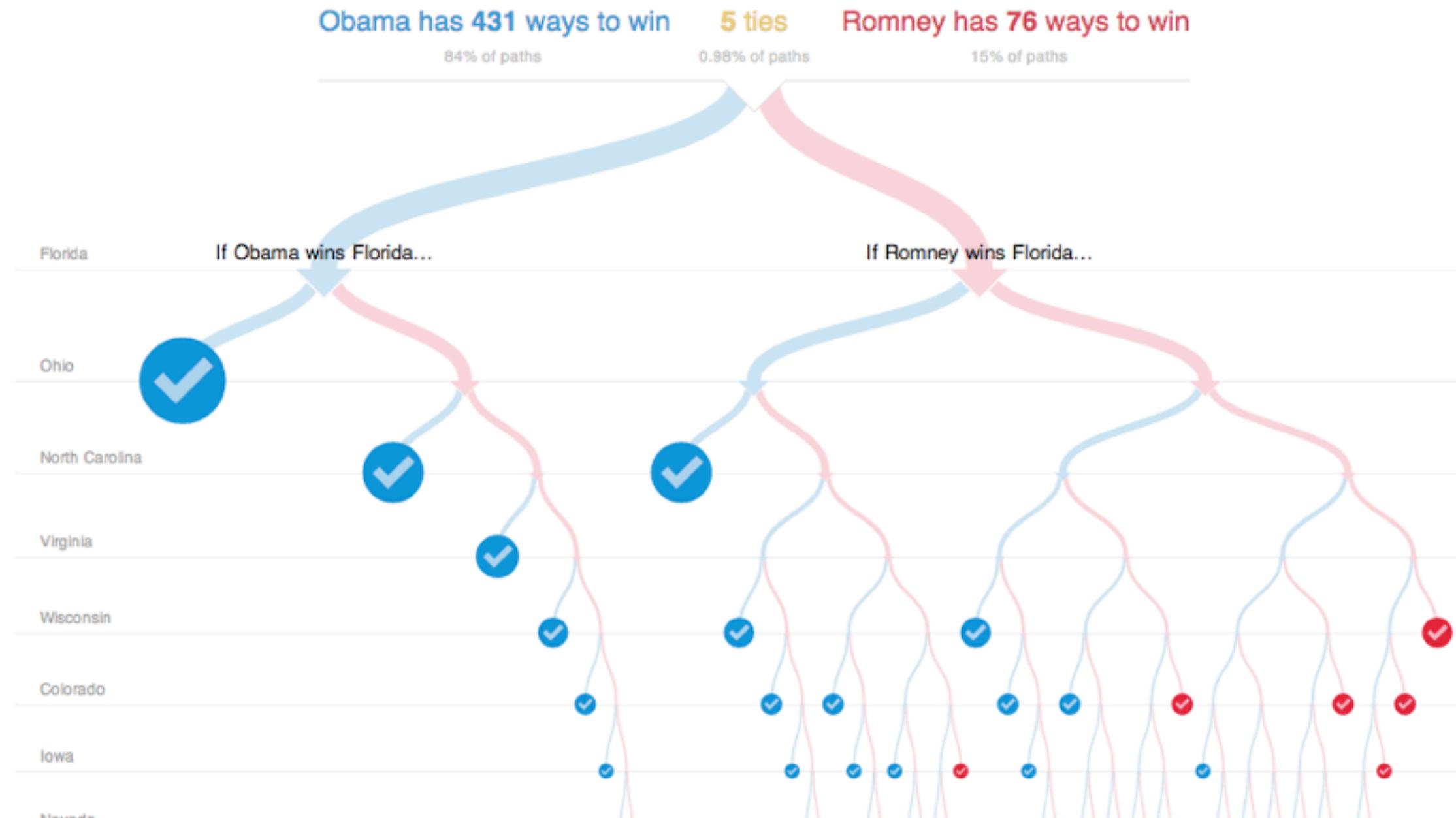
Paths to the White House

[FACEBOOK](#) [TWITTER](#)

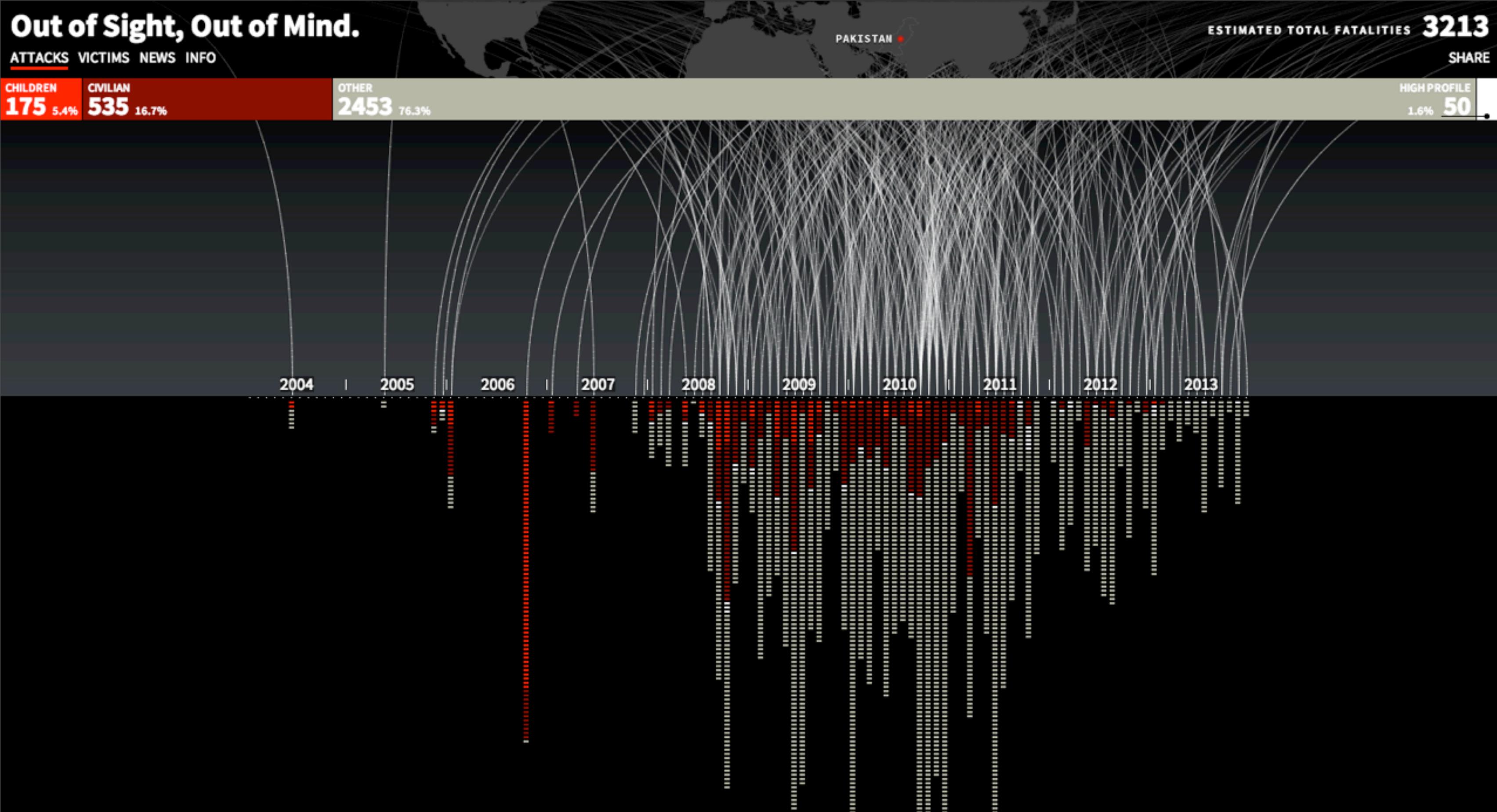
[Map](#) | [Big Board](#) | [Scenarios](#) | [Exit Polls](#)

President Obama won a clear victory, but his popular vote margin in several battleground states was very thin. Select a winner in the most competitive states below to explore alternate electoral outcomes.

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



martini glass



U.S. GUN DEATHS IN

2013 2010

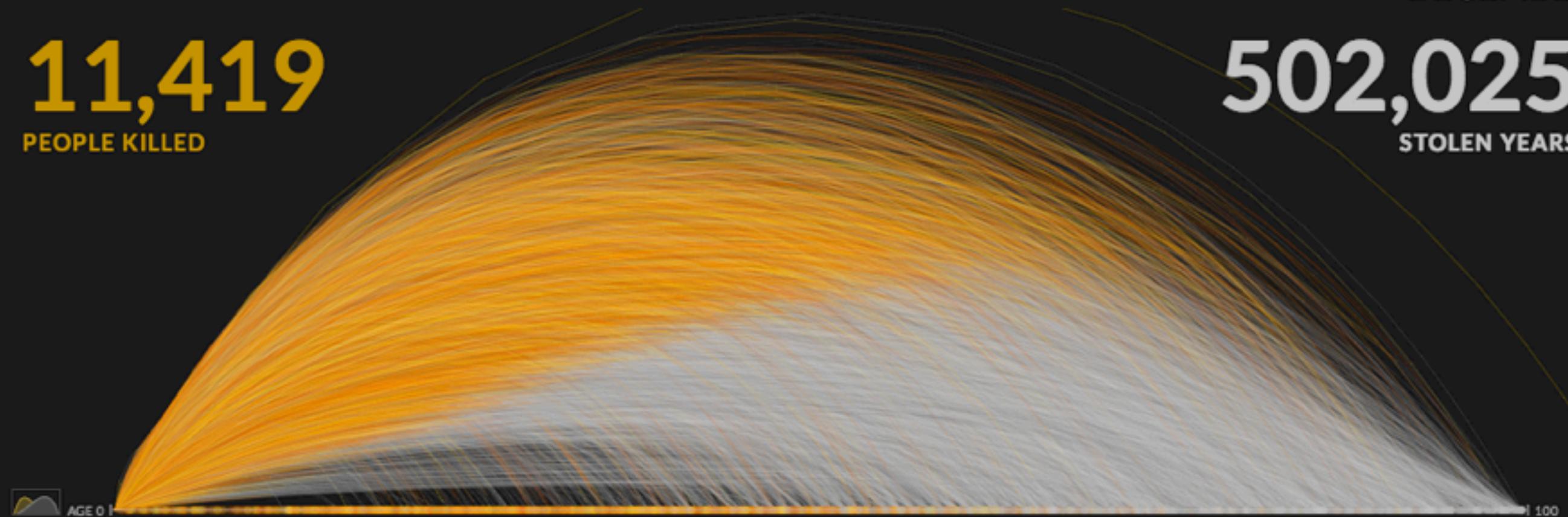
11,419

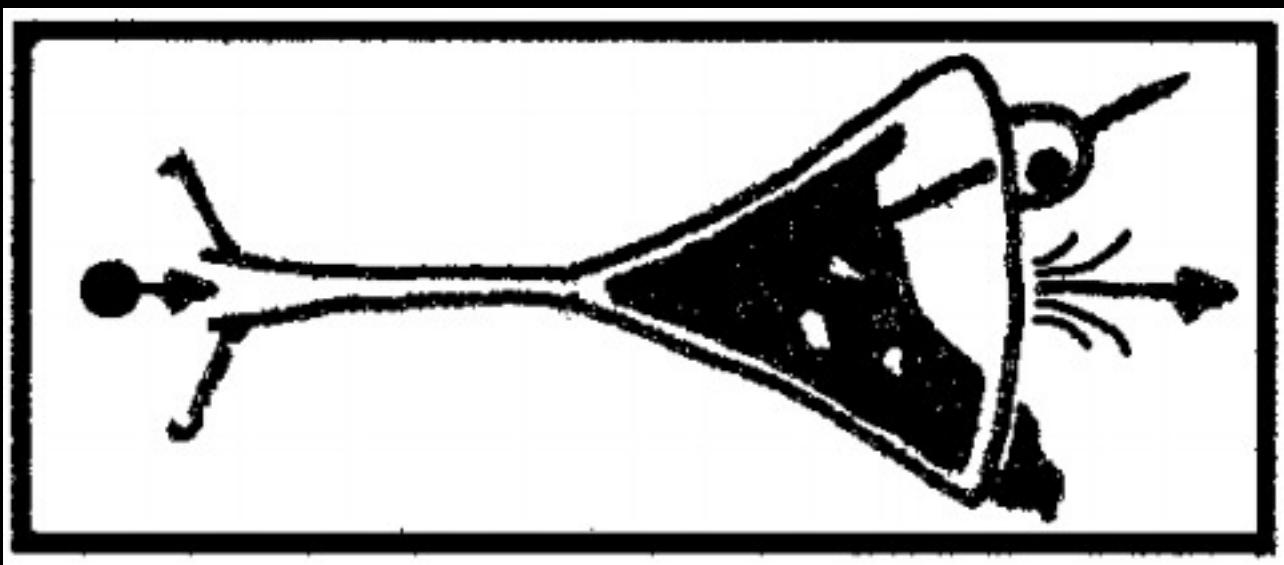
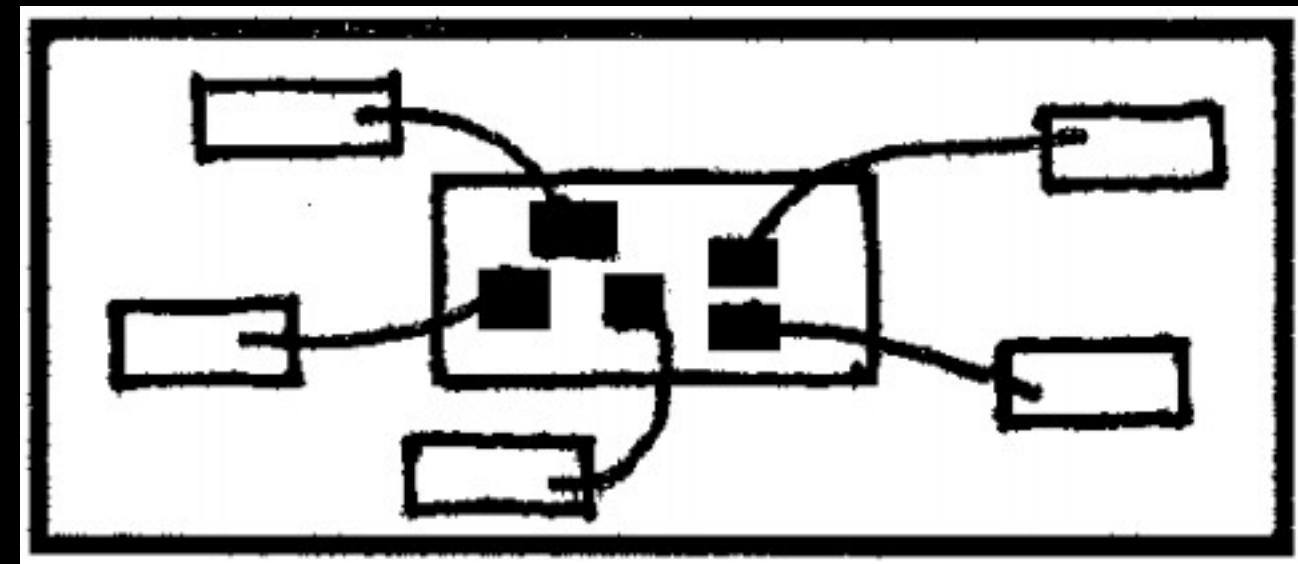
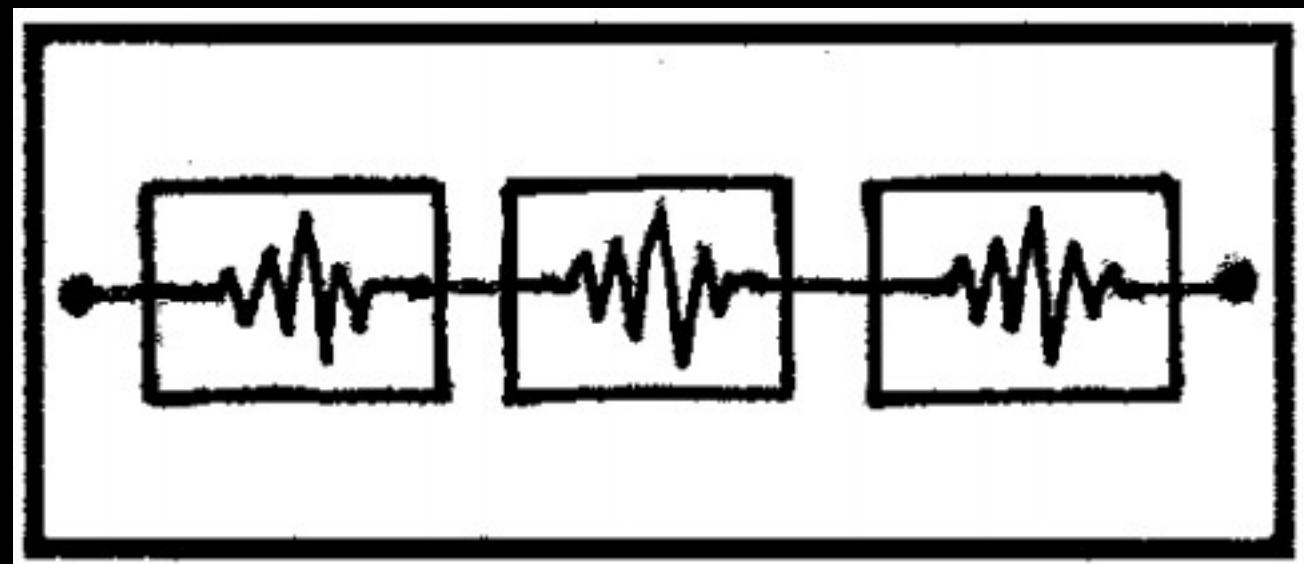
PEOPLE KILLED

DECEMBER

502,025

STOLEN YEARS ?





START

Ending 1

Ending 2

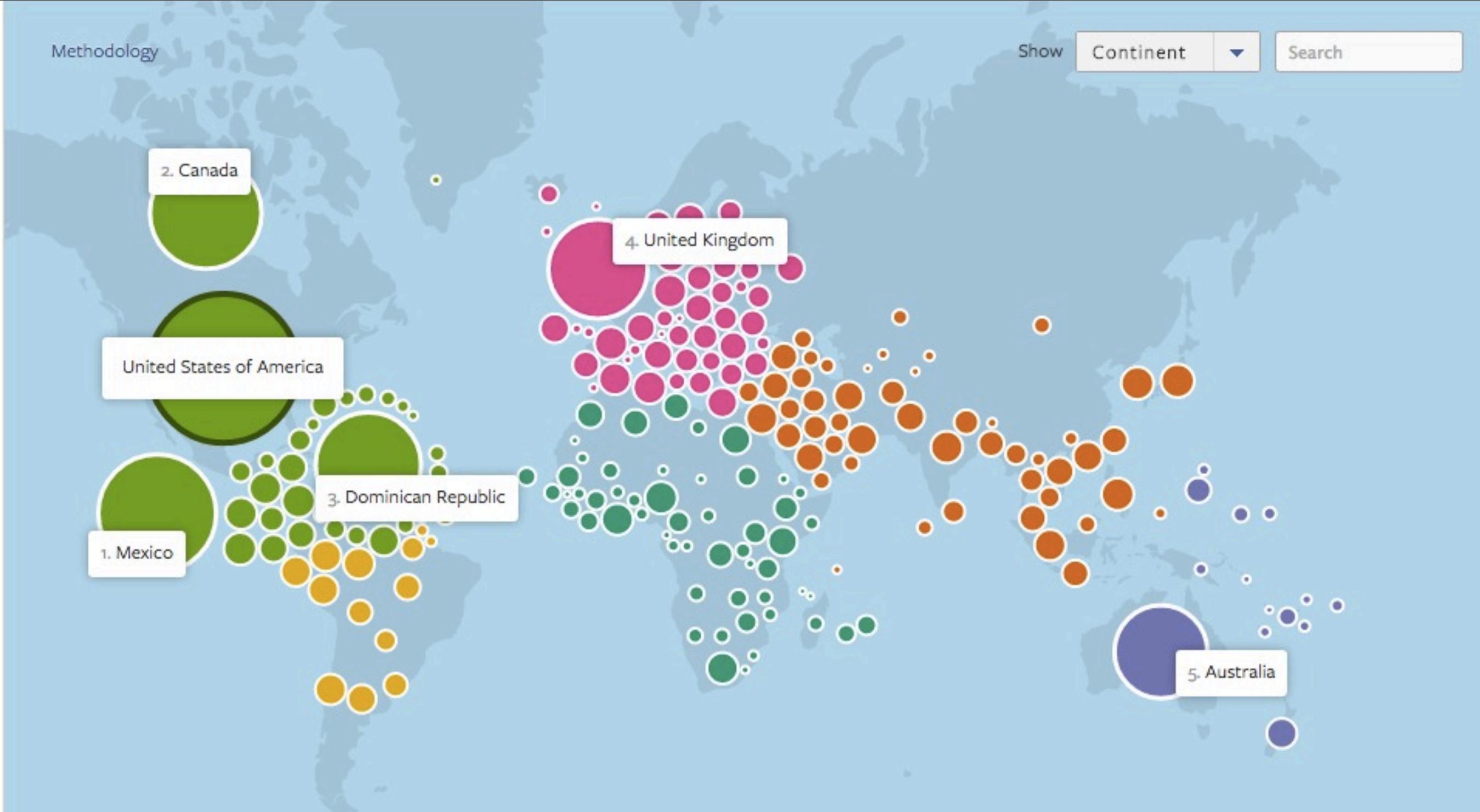
Ending 3

Ending 4

Ending 5

Ending 6

Ending 7



A Closer Look: United States & Mexico 1/5

As of 2009, approximately 30% of the foreign-born population in the U.S. was from Mexico, the most by far compared to the immigration rates of any other single country. Source



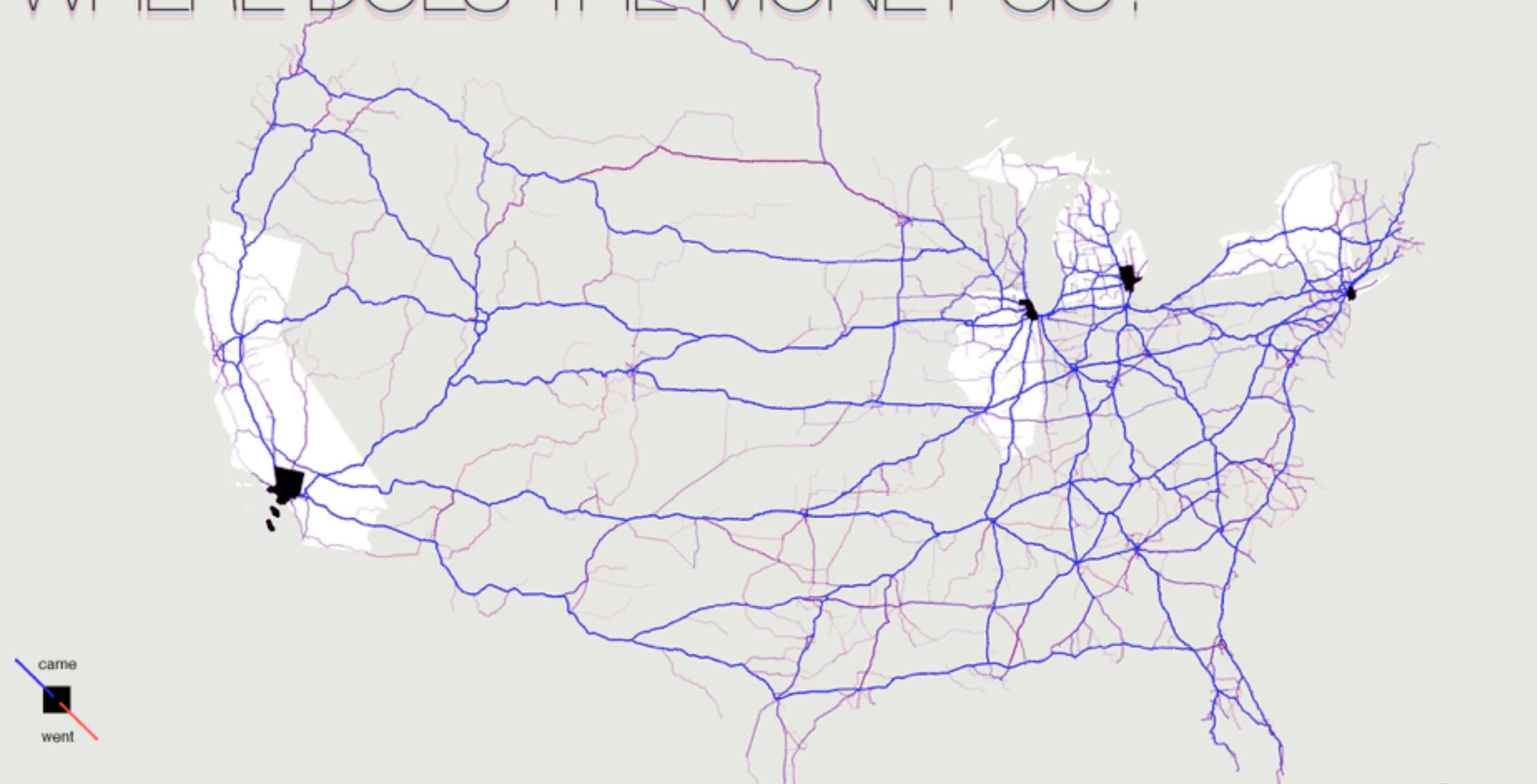
exercise:

Analyzing the Narrative Structures of Visualizations

- 1) What is the narrative structure?
- 2) How does the visualization lead you through the data?
- 3) What is the story being told?
- 4) How could this have been improved?

WHERE DOES THE MONEY GO?

County Search



Lost by county

Gained



Los Angeles -\$1.6 billion	New York -\$1.3 billion	Cook -\$775 million	Wayne -\$661 million	Queens -\$547 million	Oakland -\$381 million	Bronx -\$371 million	Kings -\$340 million
Population -55k	Population -15k	Population -21k	Population -25k	Population -9,412	Population -4,140	Population -13k	Population -14k

187k 242k 95k 110k 120k 141k 42k 67k 76k 85k 50k 54k 53k 66k 79k 93k

Word Frequency Comparison Between the Bible and the Quran

?

HTML



WAR

GO

 EXACT FIT CONTAINS

SYNONYMS: WARRED, WARRING, CONTEND, FIGHT, AWARE, FORCES, ARMY, WAGE, WARE, ENMITY, HOSTILITY, WARFARE

480
OCCURRENCES

IN 446
VERSES

31102
TOTAL VERSES

4.08%

194
OCCURRENCES

IN 165
VERSES

6236
TOTAL VERSES

OLD TESTAMENT



NEW TESTAMENT

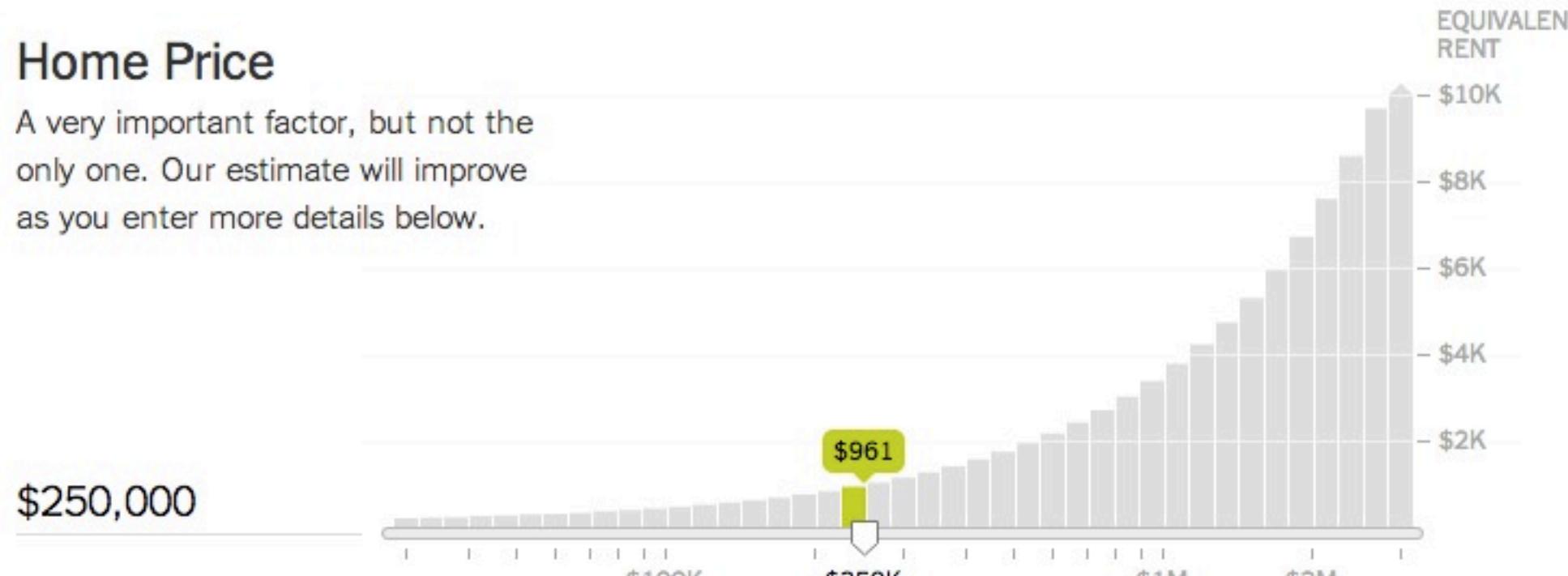
PERCENTAGE
OF VERSES 1.4%

2.6% PERCENTAGE
OF VERSES (AYAT)

QURAN

Home Price

A very important factor, but not the only one. Our estimate will improve as you enter more details below.



If you can rent a similar home for less than ...

\$961 PER MONTH

... then renting is better.

Costs after 9 years	Rent	Buy
Initial costs	\$961	\$60,000
Recurring costs	\$116,288	\$169,889
Opportunity costs	\$16,742	\$45,506
Net proceeds	-\$961	-\$142,366
Total	\$133,029	\$133,029

How Long Do You Plan to Stay?

Buying tends to be better the longer you stay because the upfront fees are spread out over many years.

9 years



How to Read the Charts Charts that are relatively flat indicate factors that are not particularly important to the outcome. Conversely, the factors that have steep slopes have a large impact.



What Are Your Mortgage Details?

In addition to the interest rate and down payment, the calculator takes into account the mortgage-interest tax deduction.

EQUIV.
RENT
\$4K



The precise numbers presented below are based solely on estimates derived from the Poverty Tracker survey sample. Exact population numbers in New York City are subject to sampling variability and a margin of error around the sample estimate.

↑
Introduction

THE OFFICIAL POVERTY MEASURE IS WRONG



The federal government developed the Official Poverty Measure (OPM) in the 1960s, and it doesn't reflect the massive changes to the American family over the past 50 years. The Official measure is based solely on minimum income level needed to afford food and meet daily needs. Yet the measure doesn't account for the rising costs of living expenses, the geographic variation in costs of living, or the full spectrum of income sources families use to meet daily needs.

How many New Yorkers
are actually in poverty?



21%

• ARE UNDER THE OFFICIAL POVERTY
LINE

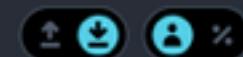
• 1,737,434 people



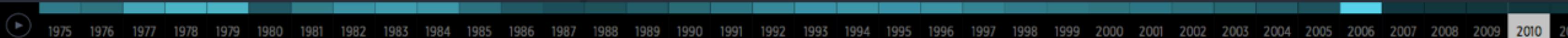
21% are under OPM line
1,737,434 people

2010 | United States

VIEWING

RESIDING IN
UNITED STATES**264,569**POPULATION
309,349,689REFUGEES / POPULATION
1 of 1,169TOP 3 OF 179 ORIGINS
CHINA
54,599COLOMBIA
25,607HAITI
18,487

264,569
refugees reside in United States
(9th of 148 asylums)



exercise:
Let's dig into our dataset!

National Crime Dataset (for 2005)

of reported crimes per 100,000 population.

7 categories of crime, across 50 states

State	Murder	Forcible Rape	Robbery	Aggravated Ass	Burglary	Larceny Theft	Motor Vehicle T
Alabama	8.2	34.3	141.4	247.8	953.8	2650	288.3
Alaska	4.8	81.1	80.9	465.1	622.5	2599.1	391
Arizona	7.5	33.8	144.4	327.4	948.4	2965.2	924.4
Arkansas	6.7	42.9	91.1	386.8	1084.6	2711.2	262.1
California	6.9	26	176.1	317.3	693.3	1916.5	712.8
Colorado	3.7	43.4	84.6	264.7	744.8	2735.2	559.5
Connecticut	2.9	20	113	138.6	437.1	1824.1	296.8
Delaware	4.4	44.7	154.8	428.2	688.9	2144	278.5
District of Colur	35.4	30.2	672.1	721.3	649.7	2694.9	1402.3
Florida	5	37.1	169.4	496.6	926.3	2658.3	423.3
Georgia	6.2	23.6	154.8	264.3	931	2751.1	490.2
Hawaii	1.9	26.9	78.5	147.8	767.9	3308.4	716.4
Idaho	2.4	40.4	18.6	195.4	564.4	1931.7	201.8
Illinois	6	33.7	181.7	330.2	606.9	2164.8	308.6
Indiana	5.7	29.6	108.6	179.9	697.6	2412	346.7
Iowa	1.3	27.9	38.9	223.3	606.4	2042.7	184.6
Kansas	3.7	38.4	65.3	280	689.2	2758.1	339.6
Kentucky	4.6	34	88.4	139.8	634	1685.8	210.8
Louisiana	9.9	31.4	118	435.1	870.6	2494.5	318.1
Maine	1.4	24.7	24.4	61.7	478.5	1832.6	102
Maryland	9.9	22.6	256.7	413.8	641.4	2294.3	608.4
Massachusetts	2.7	27.1	119	308.1	541.1	1527.4	295.1
Michigan	6.1	51.3	131.8	362.9	696.8	1917.8	476.5
Minnesota	2.2	44	92	158.7	578.9	2226.9	278.2
Mississippi	7.3	39.3	82.3	149.4	919.7	2083.9	256.5
Missouri	6.9	28	124.1	366.4	738.3	2746.2	443.1
Montana	1.9	32.2	18.9	228.5	389.2	2543	210.7
Nebraska	2.5	32.9	59.1	192.5	532.4	2574.3	316.5
Nevada	8.5	42.1	194.7	361.5	972.4	2153.9	1115.2
New Hampshire	1.4	30.9	27.4	72.3	317	1377.3	102.1

**Violent Crime:
Murder, Rape, Aggravated Assault, Robbery**

**Property Crime:
Burglary, Larceny Theft, Motor Vehicle Theft**

**1) Come up with three
questions to ask the data**

**2) Sketch two visualization
types to explore each question**

symbol map, cartogram

bar chart of each type

scatterplot of different types

deviation from mean

calling out outliers

drill-down into individual states

comparing two states

So, d3.js

Protovis

<http://sta.mn/mcz>

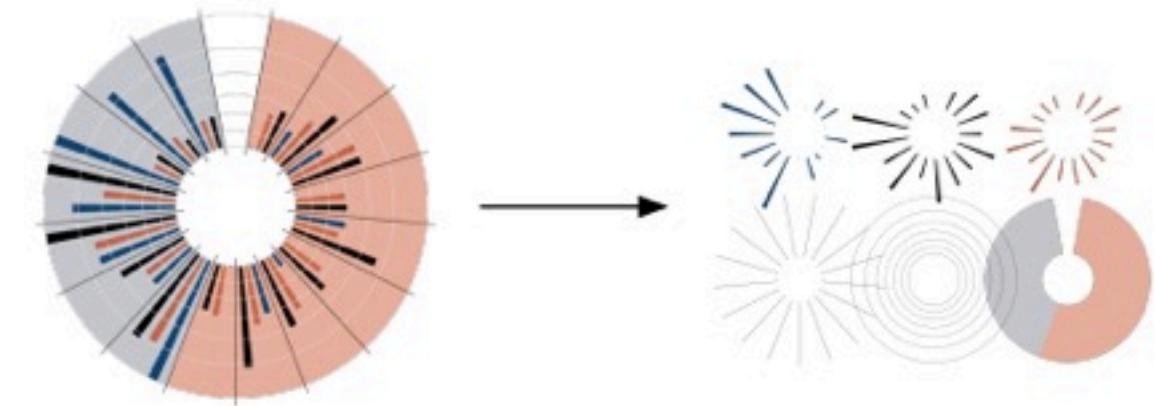


Fig. 1. Decomposing a visualization into marks.

```
new pv.Panel().canvas("fig3a")
  .add(pv.Bar)
  .data([1, 1.2, 1.7, 1.5, .7, .2])
  .bottom(0).width(20)
  .height(function(d) d * 80)
  .left(function() this.index * 25)
  .root.render();

new pv.Panel().canvas("fig3b")
  .data([[1, 1.2, 1.7, 1.5, .7],
         [.5, 1, .8, 1.1, 1.3],
         [.2, .5, .8, .9, 1]])
  .add(pv.Area)
  .data(function(d) d)
  .fillStyle(pv.Colors.category19.parent)
  .bottom(function() let (c = this.cousin())
    c ? (c.bottom + c.height) : 0)
  .height(function(d) d * 40)
  .left(function() this.index * 35)
  .root.render();
```

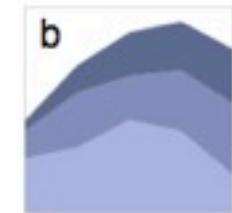
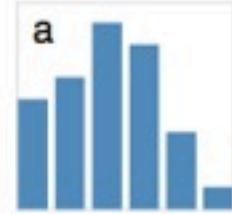
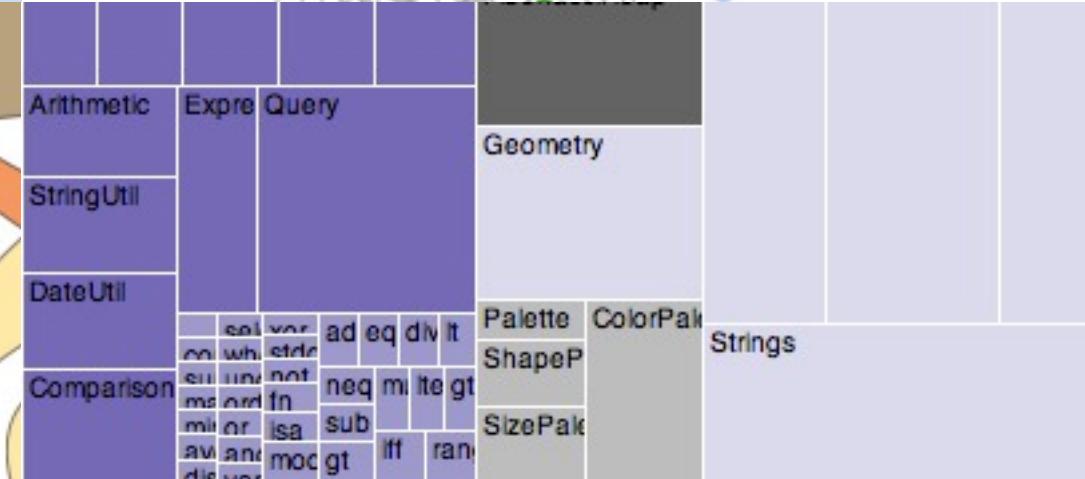
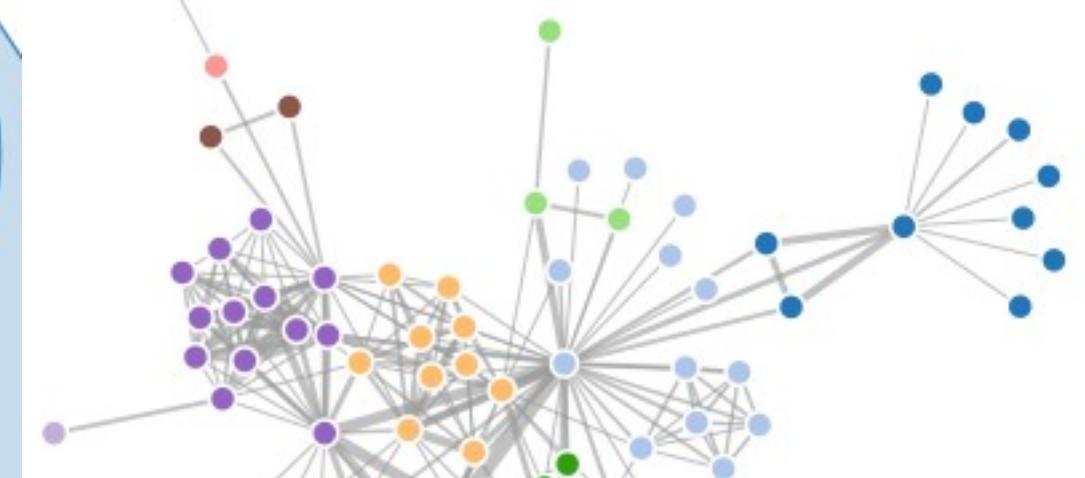
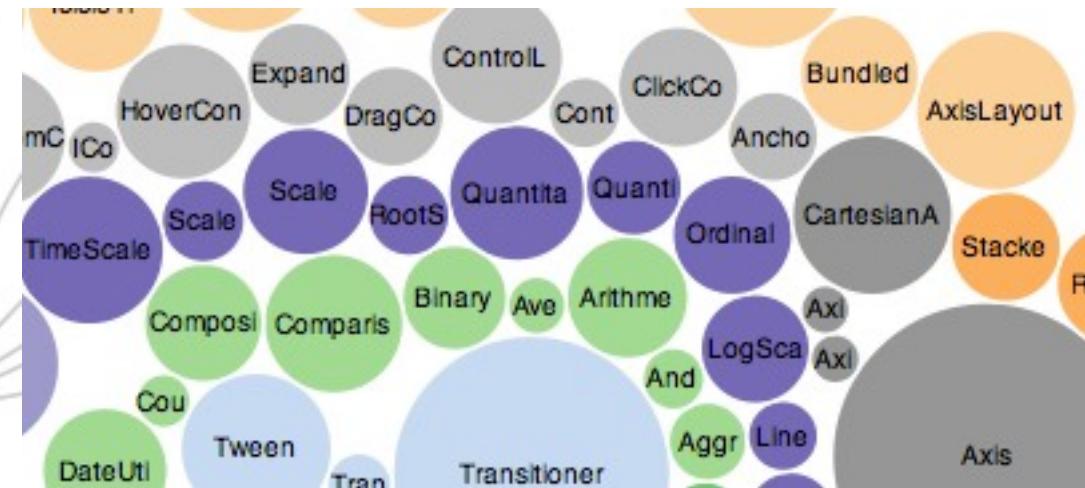
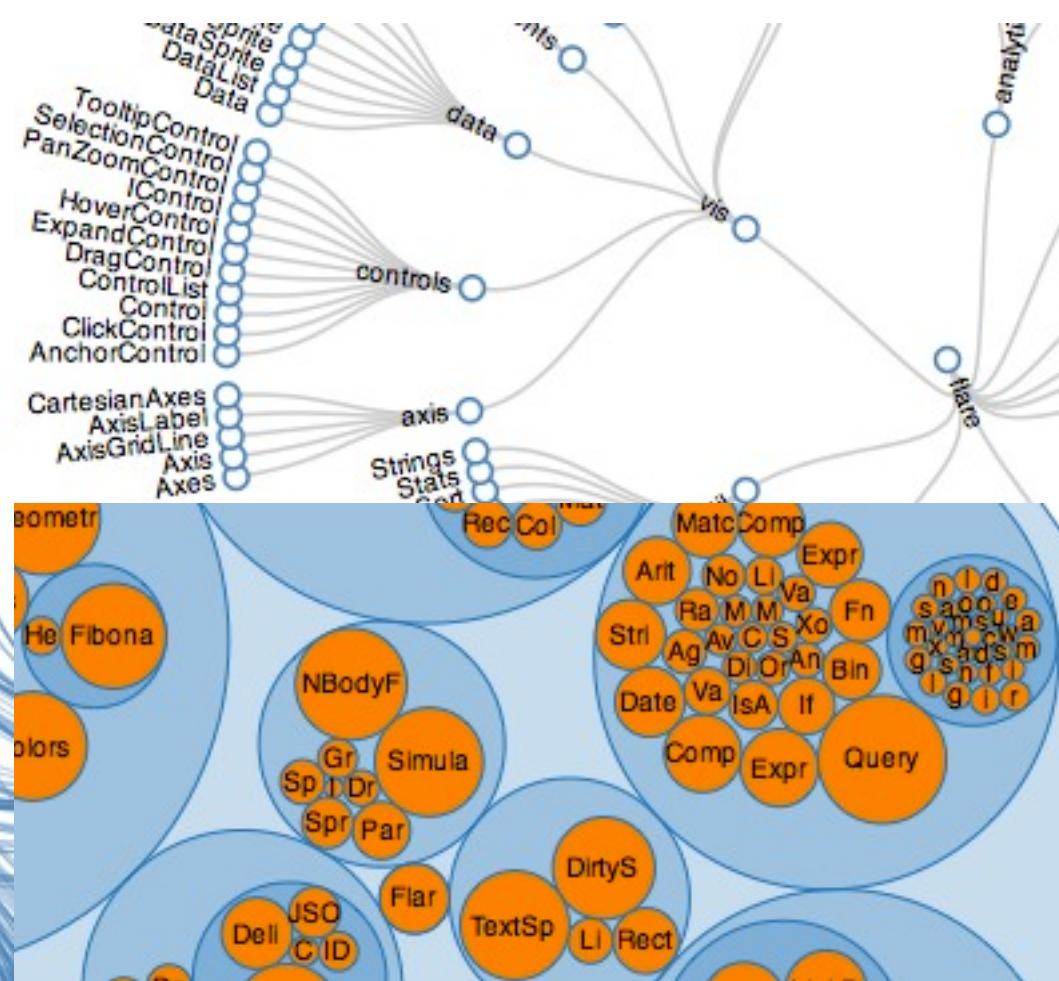
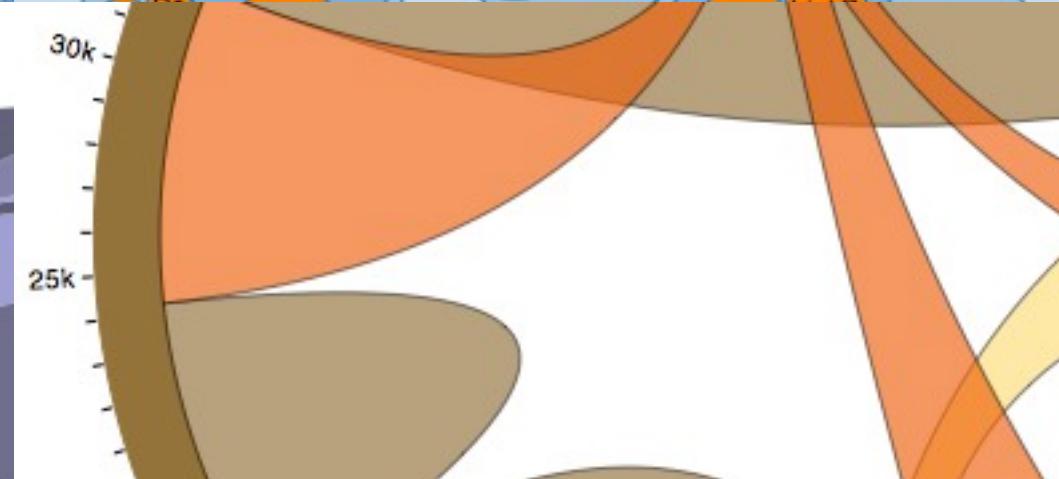
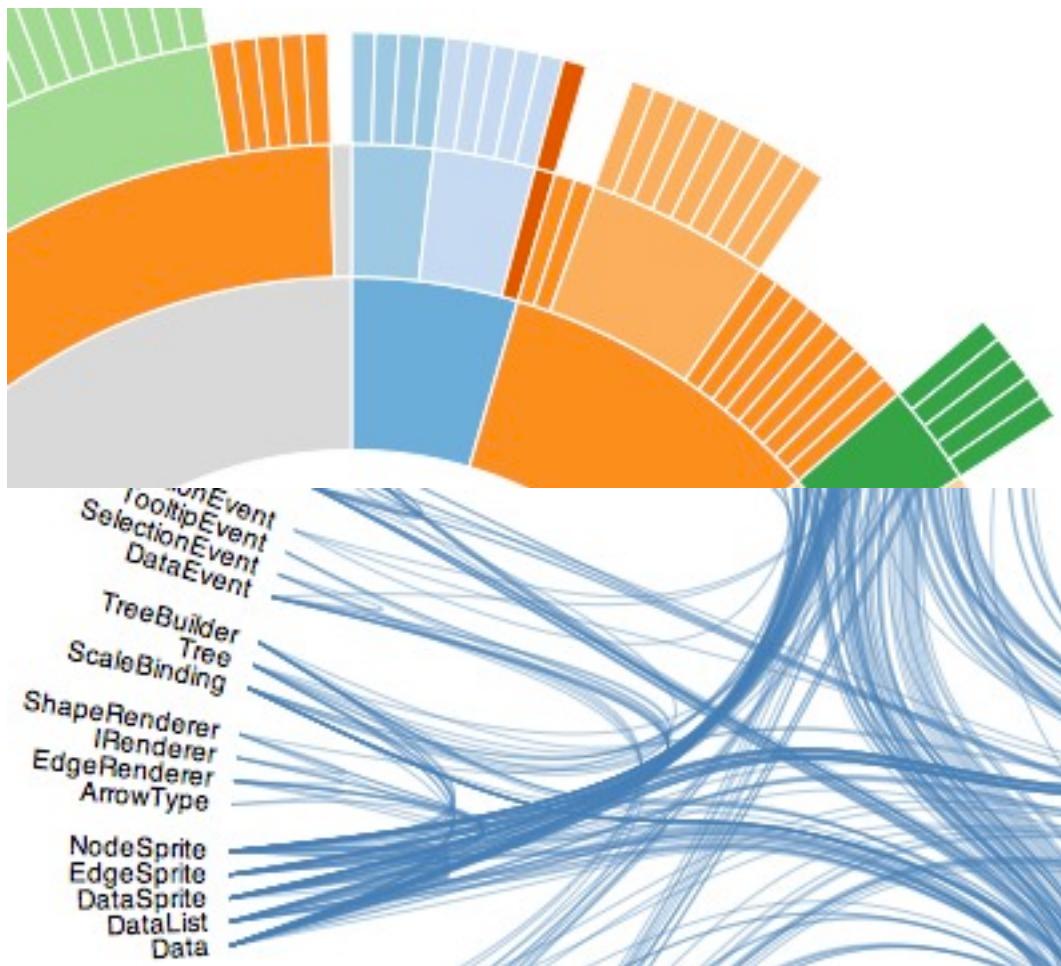
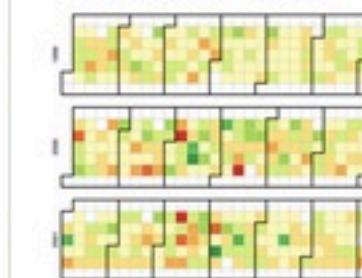
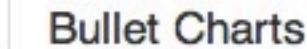
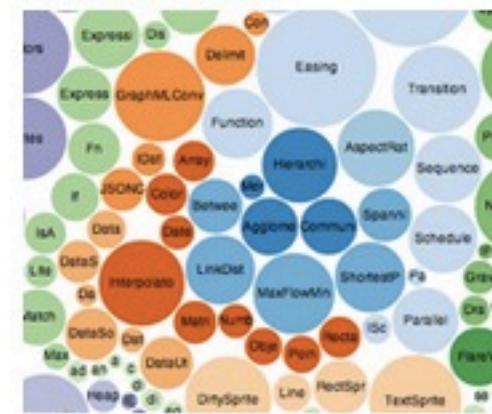
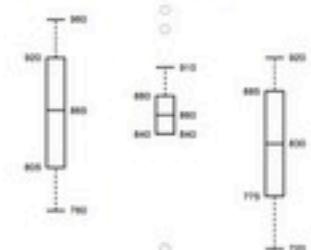


Fig. 2. Specifying two simple charts. (a) Bar. (b) Stacked area.



Visual Index



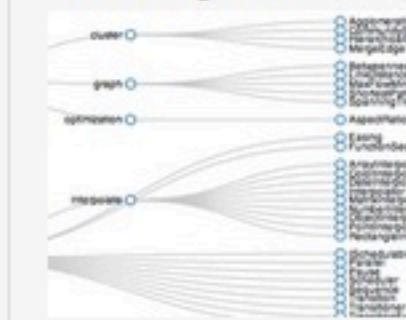
Non-contiguous Cartogram



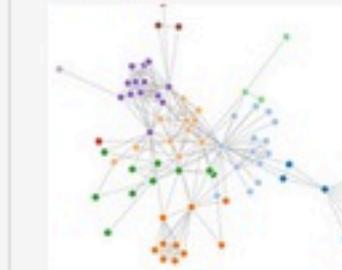
Chord Diagram



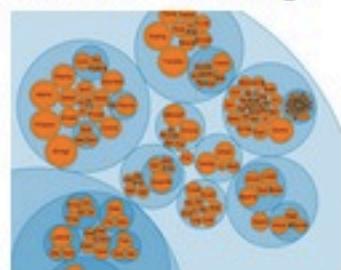
Dendrogram



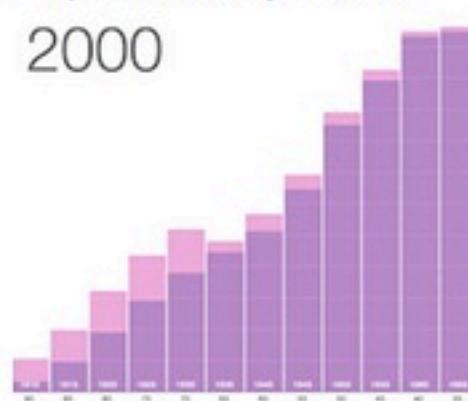
Force-Directed Graph



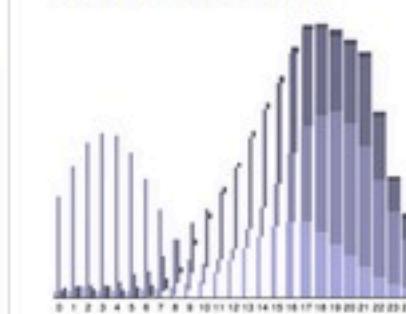
Circle Packing



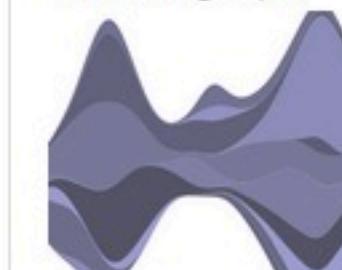
Population Pyramid



Stacked Bars



Streamgraph



Let's Build a Chart!

1) Get the data on the screen

State	Murder	Forcible Rape	Robbery	Aggravated Ass	Burglary	Larceny Theft	Motor Vehicle T
Alabama	8.2	34.3	141.4	247.8	953.8	2650	288.3
Alaska	4.8	81.1	80.9	465.1	622.5	2599.1	391
Arizona	7.5	33.8	144.4	327.4	948.4	2965.2	924.4
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California	6.9	26	176.1	317.3	693.3	1916.5	712.8
Colorado	3.7	43.4	84.6	264.7	744.8	2735.2	559.5
Connecticut	2.9	20	113	138.6	437.1	1824.1	296.8
Delaware	4.4	44.7	154.8	428.2	688.9	2144	278.5
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Idaho	2.4	40.4	18.6	195.4	564.4	1931.7	201.8
Illinois	6	33.7	181.7	330.2	606.9	2164.8	308.6
Indiana	5.7	29.6	108.6	179.9	697.6	2412	346.7
Iowa	1.3	27.9	38.9	223.3	606.4	2042.7	184.6
Kansas	3.7	38.4	65.3	280	689.2	2758.1	339.6
Kentucky	4.6	34	88.4	139.8	634	1685.8	210.8
Louisiana	9.9	31.4	118	435.1	870.6	2494.5	318.1
Maine	1.4	24.7	24.4	61.7	478.5	1832.6	102
Maryland	9.9	22.6	256.7	413.8	641.4	2294.3	608.4
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Mississippi	7.3	39.3	82.3	149.4	919.7	2083.9	256.5
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Nebraska	2.5	32.9	59.1	192.5	532.4	2574.3	316.5
Nevada	8.5	42.1	194.7	361.5	972.4	2153.9	1115.2
New Hampshire	1.4	30.9	27.4	72.3	317	1377.3	102.1

.data()
binding data to SVG elements

.enter()
.exit()
**elements being added to or
removed from the page**

SVG coordinate space

2) .scale()

3) .axis()

.transform()

translate(x, y)

scale(x, y)

rotate(a, x, y)

skew(a)

4) changing the data

5) basic user interaction