UNIVERSITY OF SAN FRANCISCO
CHANGE THE WORLD FROM HERE

Map Types

Geospatial Data Visualization

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MAP TYPES

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Map Types

- Physical Maps
  - Shows physical features (mountains, lakes)
- Road Maps
  - Shows road location and names, man-made features
- Topographic Maps
  - Shows 3d topography in 2d often using contour lines

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Map Types

- Thematic Maps
  - Maps for a specific purpose, usually displays a single data attribute in a geographic context
  - Includes choropleth, symbol, dot maps
- Other Maps
  - May distort geography slightly
  - Includes cartograms, transit maps, flow maps

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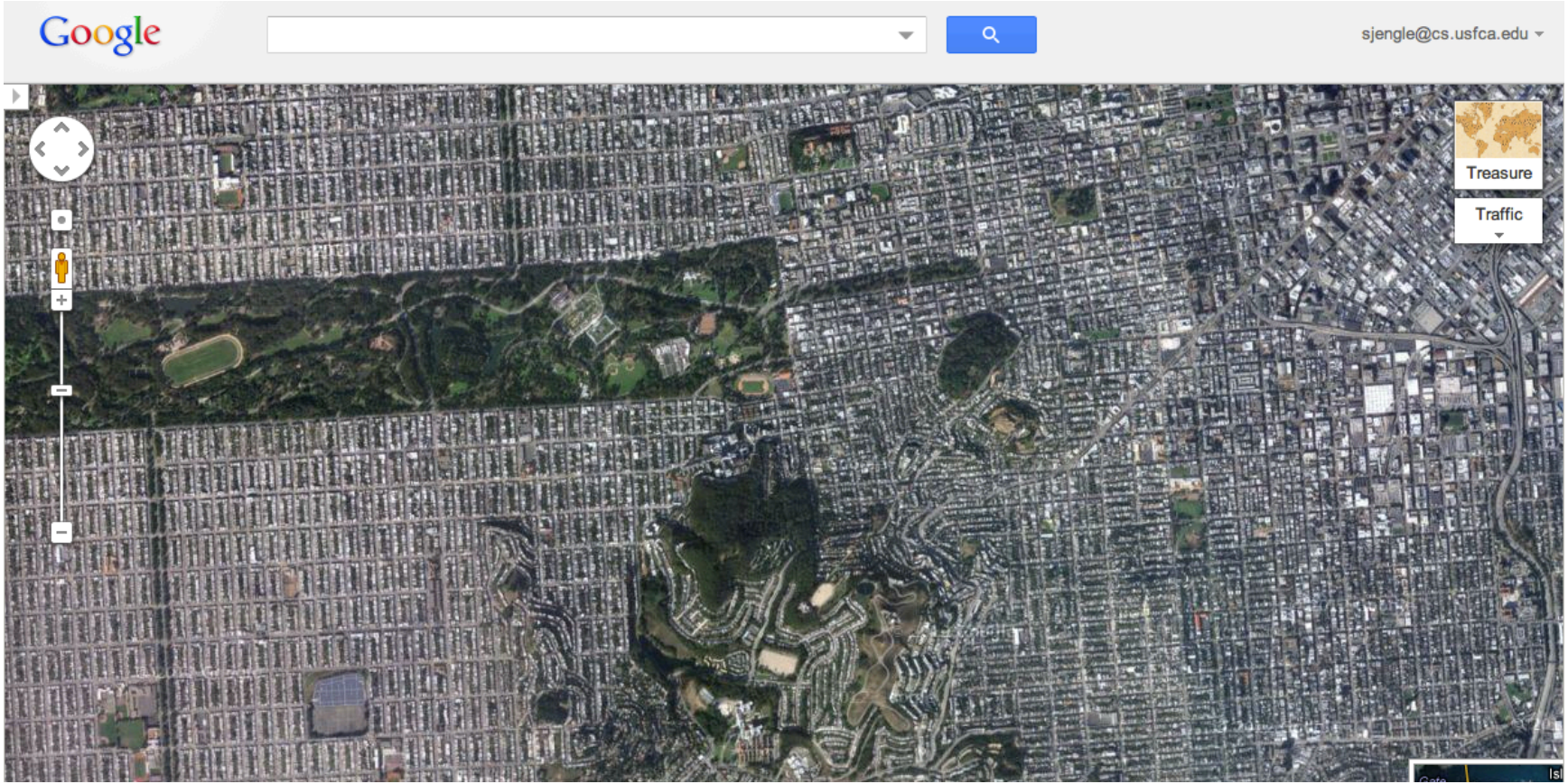
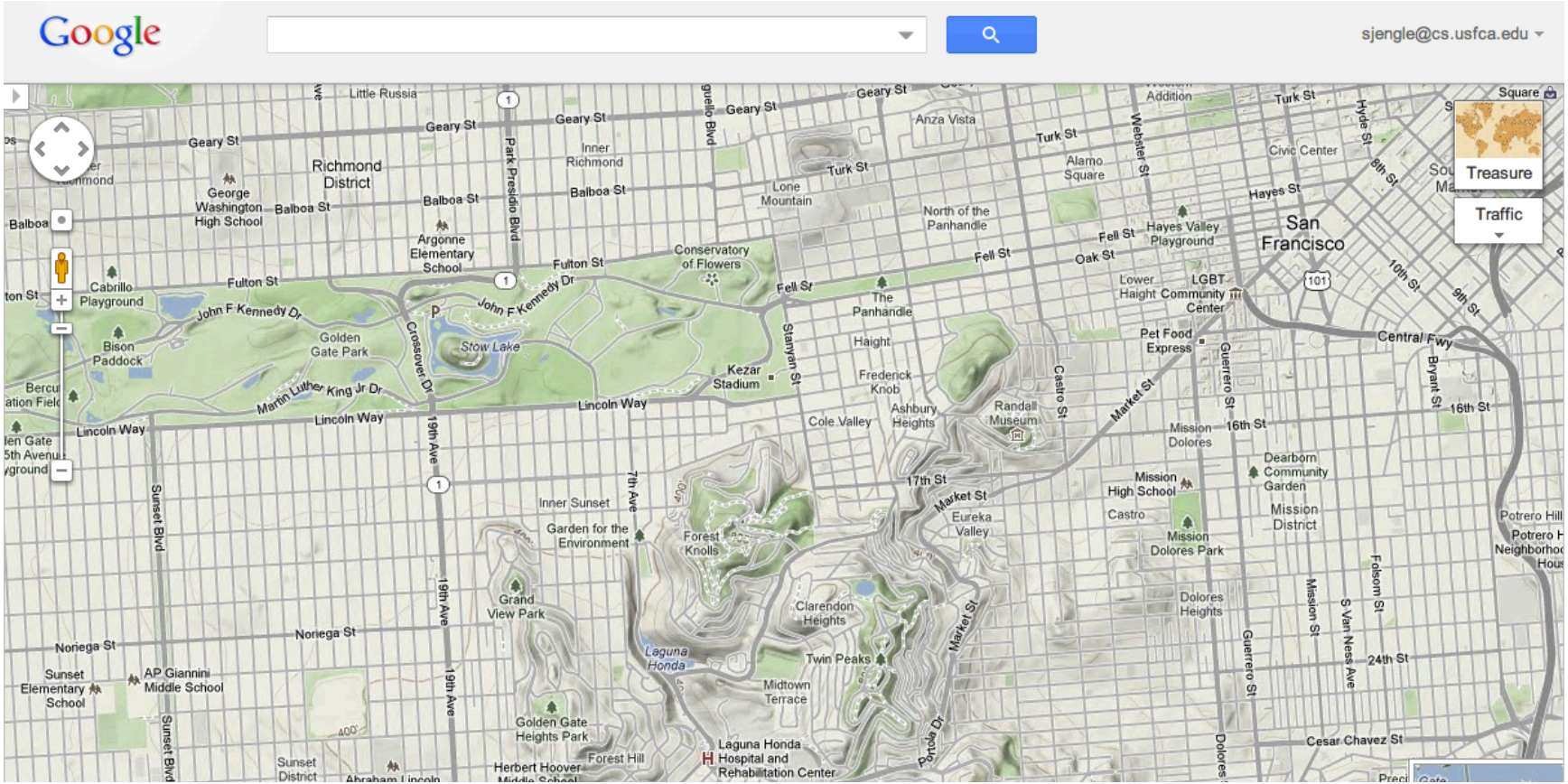


http://maps.google.com/?ll=37.7577,-122.4376&spn=0.164489,0.283241&t=m&z=12



http://maps.google.com/?ll=37.7577,-122.4376&spn=0.164489,0.283241&t=m&z=12

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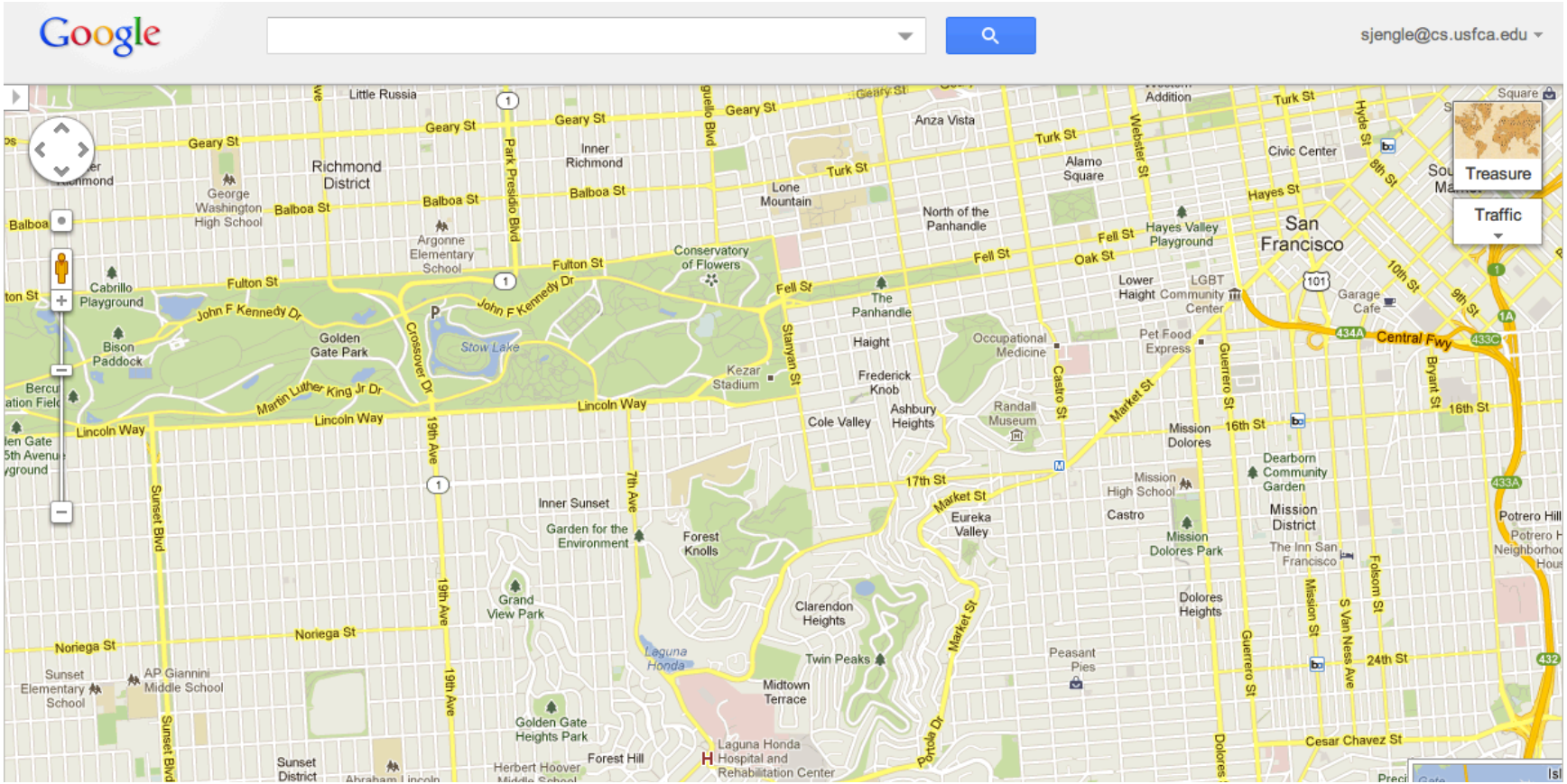

http://maps.google.com/?ll=37.7577,-122.4376&spn=0.164489,0.283241&t=m&z=12

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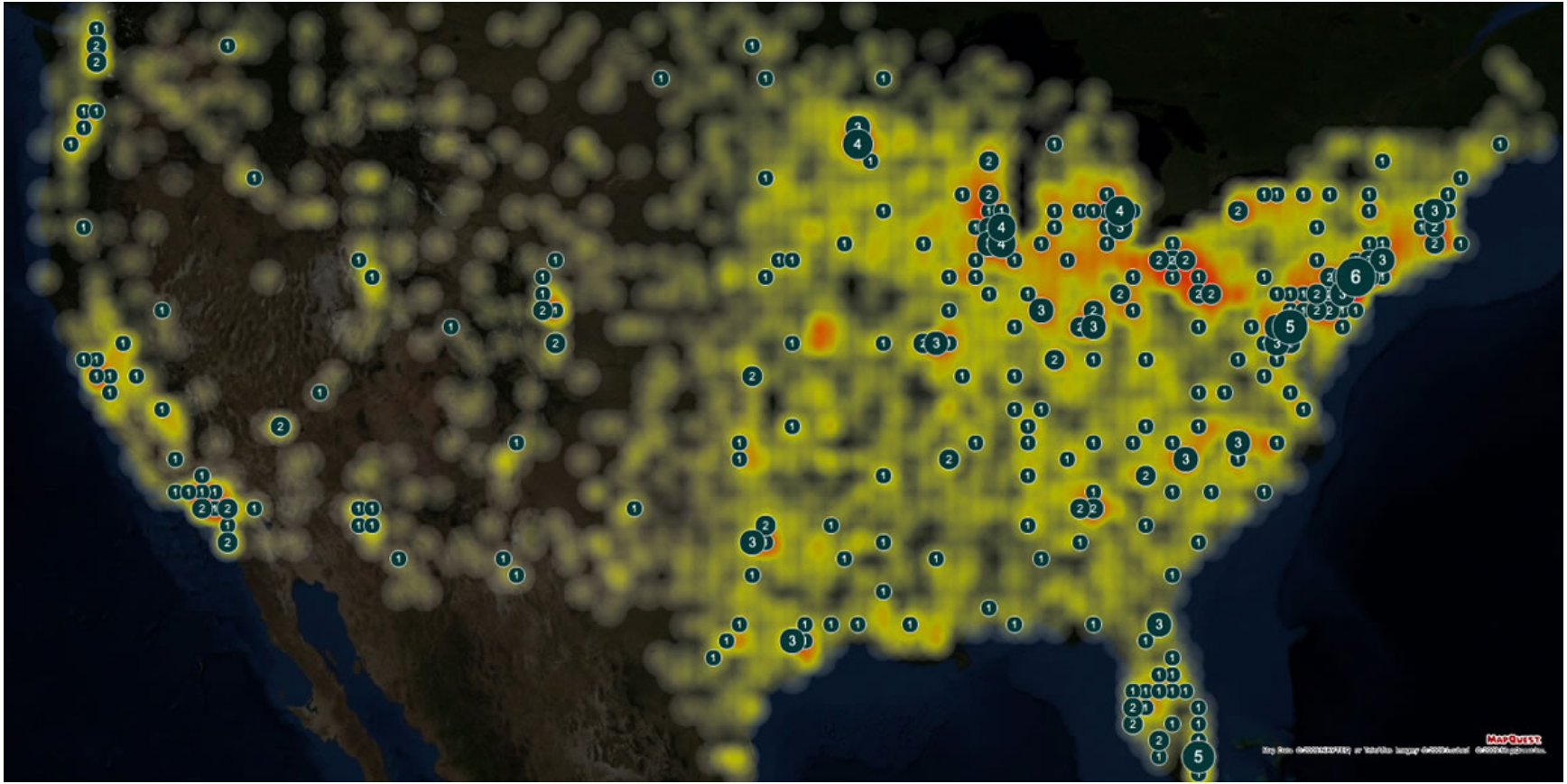

http://blog.spatialkey.com/2009/10/mapping-saturn-and-gm-dealerships-service-is-still-nearby/

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CHOROPLETH MAPS

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Choropleth Maps

- Uses color and intensity to indicate data values
- Data should be normalized
  - Good: Percentages, ratios
  - Bad: Counts, totals
- Must use color wisely
  - Multiple colors, not using intensity
  - Multiple colors, using intensity
  - Monotone, only using intensity

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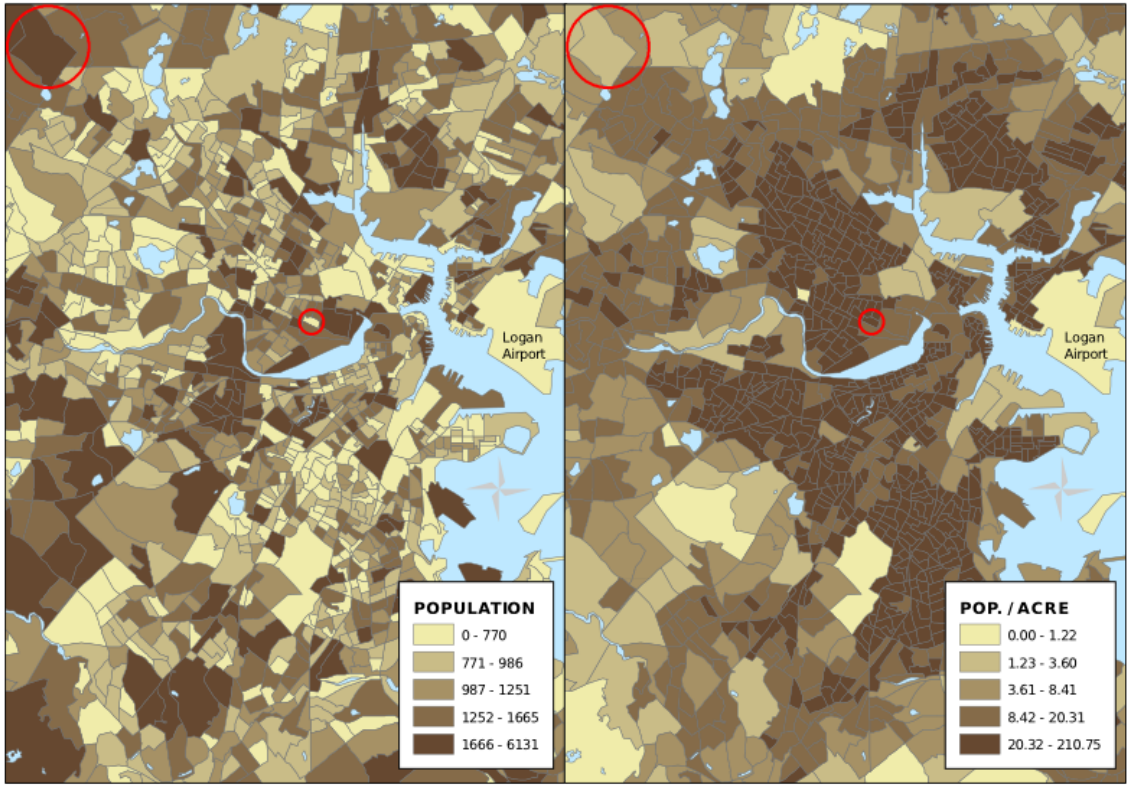
Total Population of 2000 Census Block Groups Population Density of 2000 Census Block Groups



http://en.wikipedia.org/wiki/File:Choropleth-density.png

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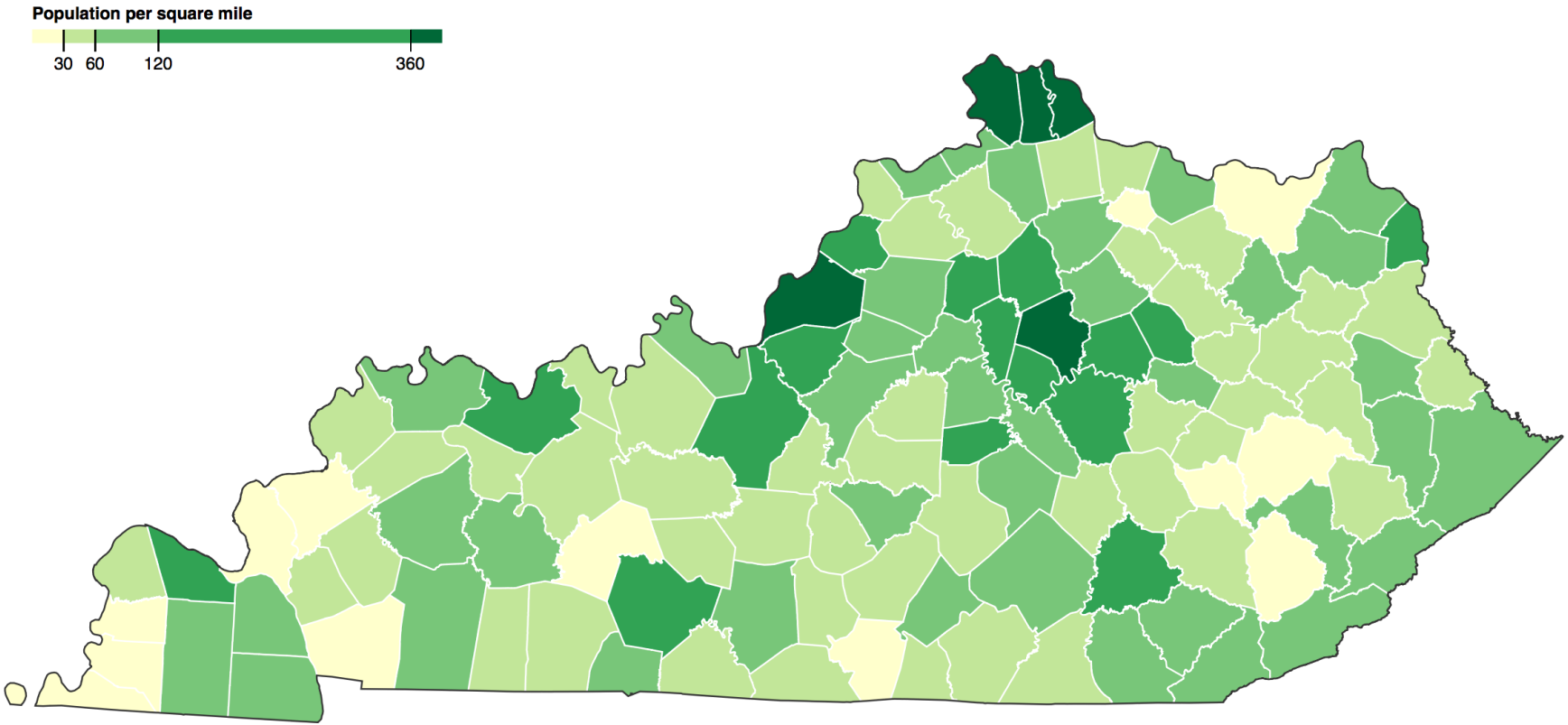

http://bl.ocks.org/mbostock/5144735

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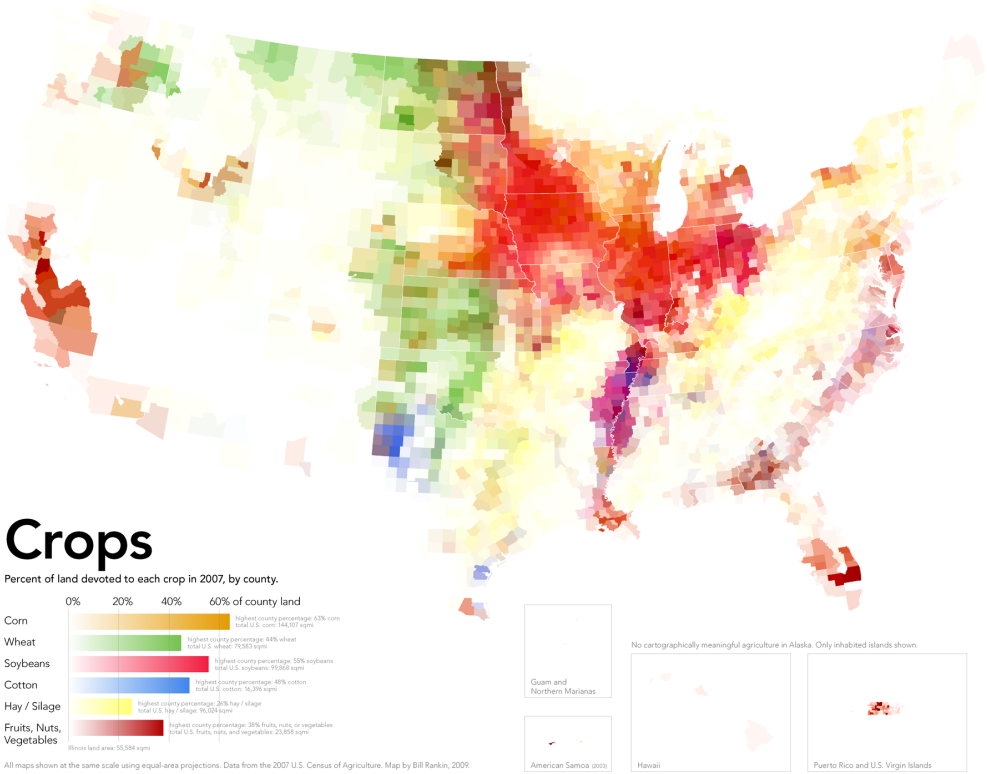

http://www.radicalcartography.net/index.html?crops

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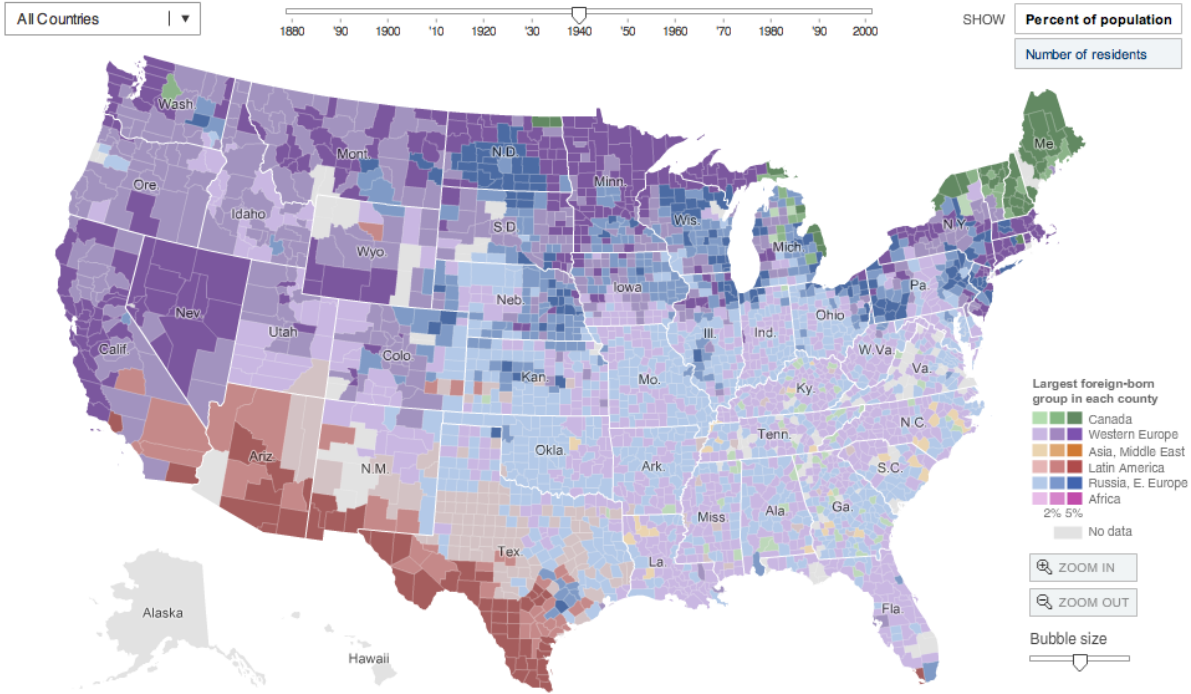
Immigration Explorer

Select a foreign-born group to see how they settled across the United States.



Note: Due to limitations in the Census data, foreign-born populations are not available in all areas for all years.

Sources: Social Explorer, www.socialexplorer.com; Minnesota Population Center; U.S. Census Bureau

Matthew Bloch and Robert Gebeloff/The New York Times

http://www.nytimes.com/interactive/2009/03/10/us/20090310-immigration-explorer.html

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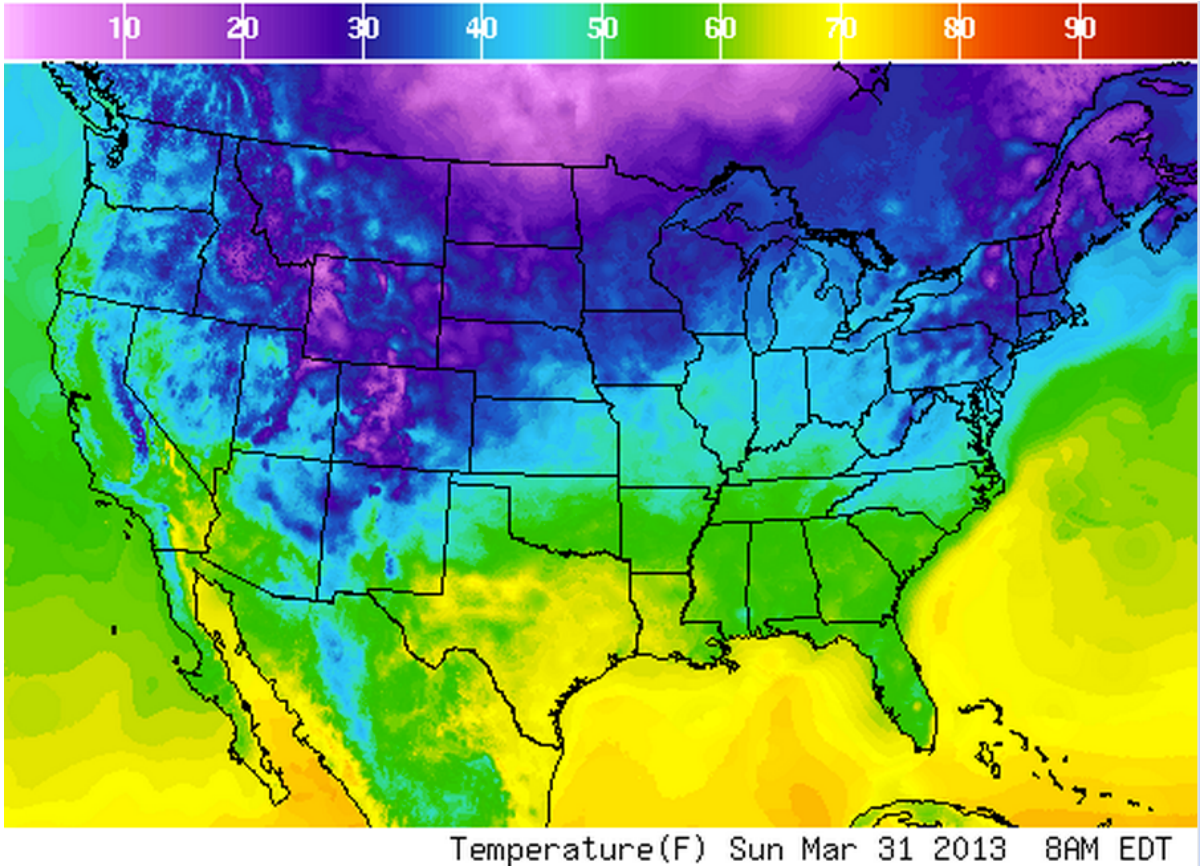

http://graphical.weather.gov/sectors/conus.php?element=T

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SYMBOL MAPS

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Symbol Maps

- Encoding
  - Location, color, size, and type of symbol
- Location
  - Specific latitude and longitude
  - Regional (randomly placed within the region)
- Types
  - Proportional symbol maps
  - Dot maps (approximately one dot per pixel)

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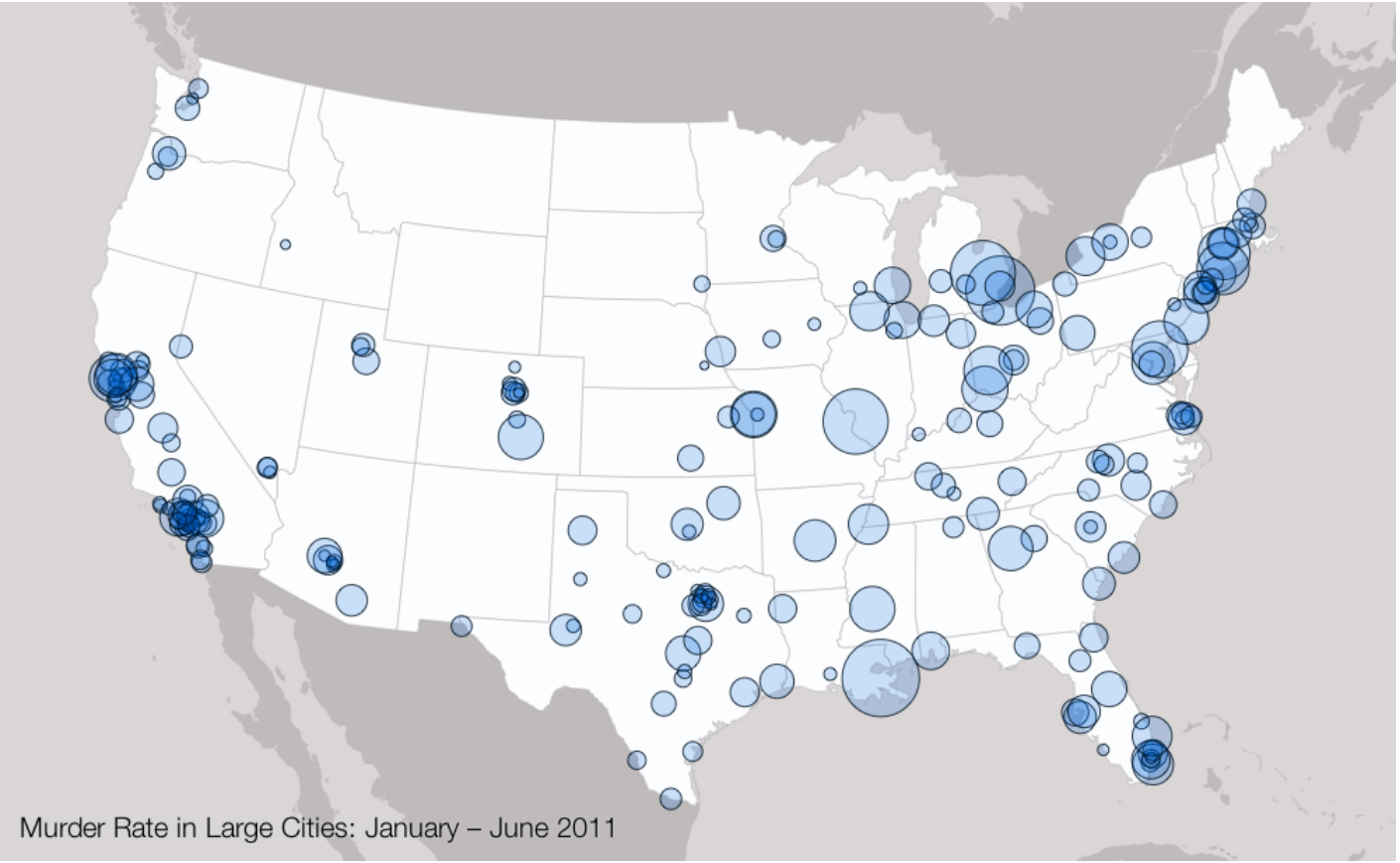

http://vis4.net/blog/posts/clean-your-symbol-maps/

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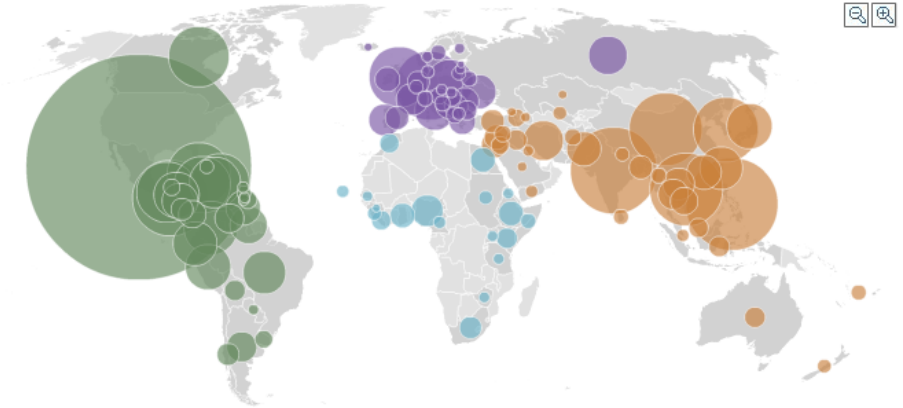
- All occupations
- Business and technical professions
- Health, education and service professions
- Hospitality, maintenance and personal services
- Construction, manufacturing and other labor

All foreign-born workers

Number of workers: 17,553,000 As a percentage of all U.S. workers in this category: 17%



Map shows countries with more than 500 workers for the selected occupation.

Top ten	Number of workers (+/- Margin of error)	
1. Mexico	5,286,400	+/- 1%
2. Philippines	848,800	+/- 2%
3. India	746,200	+/- 2%
4. China	653,000	+/- 2%
5. El Salvador	580,100	+/- 2%
6. Vietnam	526,000	+/- 2%
7. Germany	476,100	+/- 2%
8. South Korea	408,400	+/- 2%
9. Cuba	399,300	+/- 2%
10. Canada	364,900	+/- 2%

http://www.nytimes.com/interactive/2009/04/07/us/20090407-immigration-occupation.html

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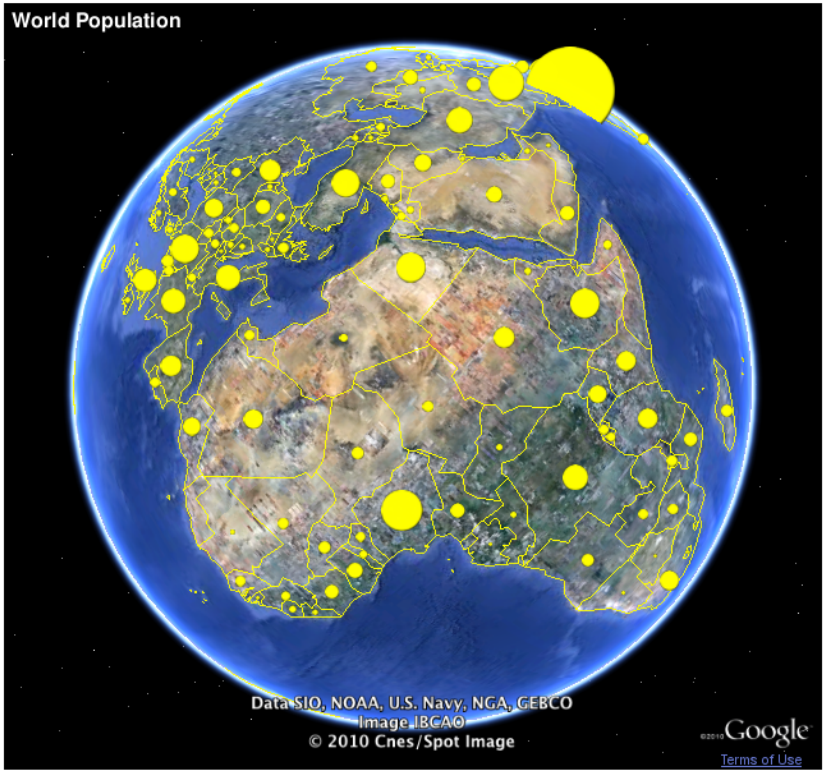
Proportional symbol map (images)

Using Google Visualization API, Google Spreadsheets (**view data**) and Google Earth API.



Statistics from **UNdata**

http://thematicmapping.org/api/symbolimage.php

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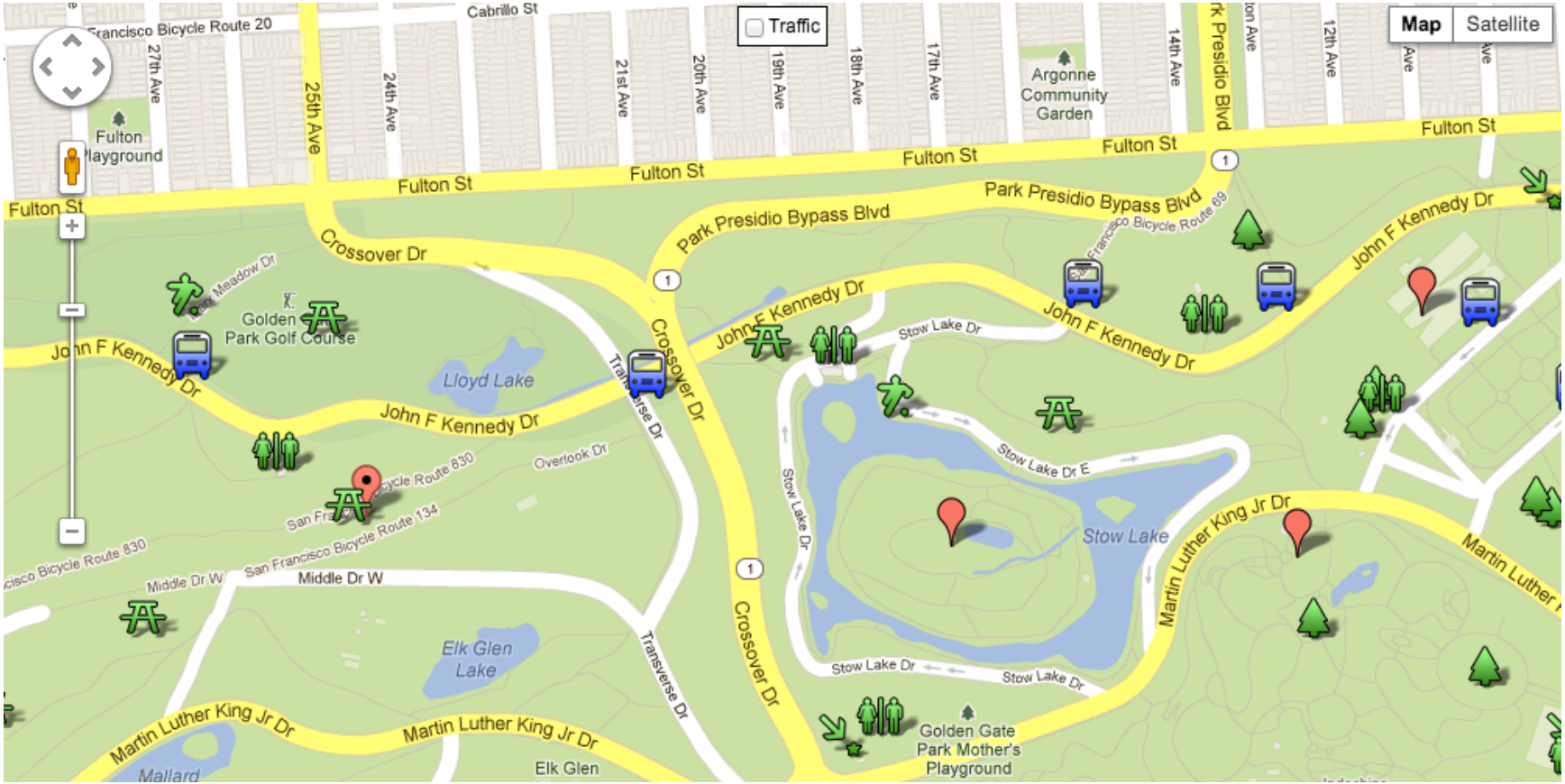

http://www.golden-gate-park.com/interactive-golden-gate-park-map.html

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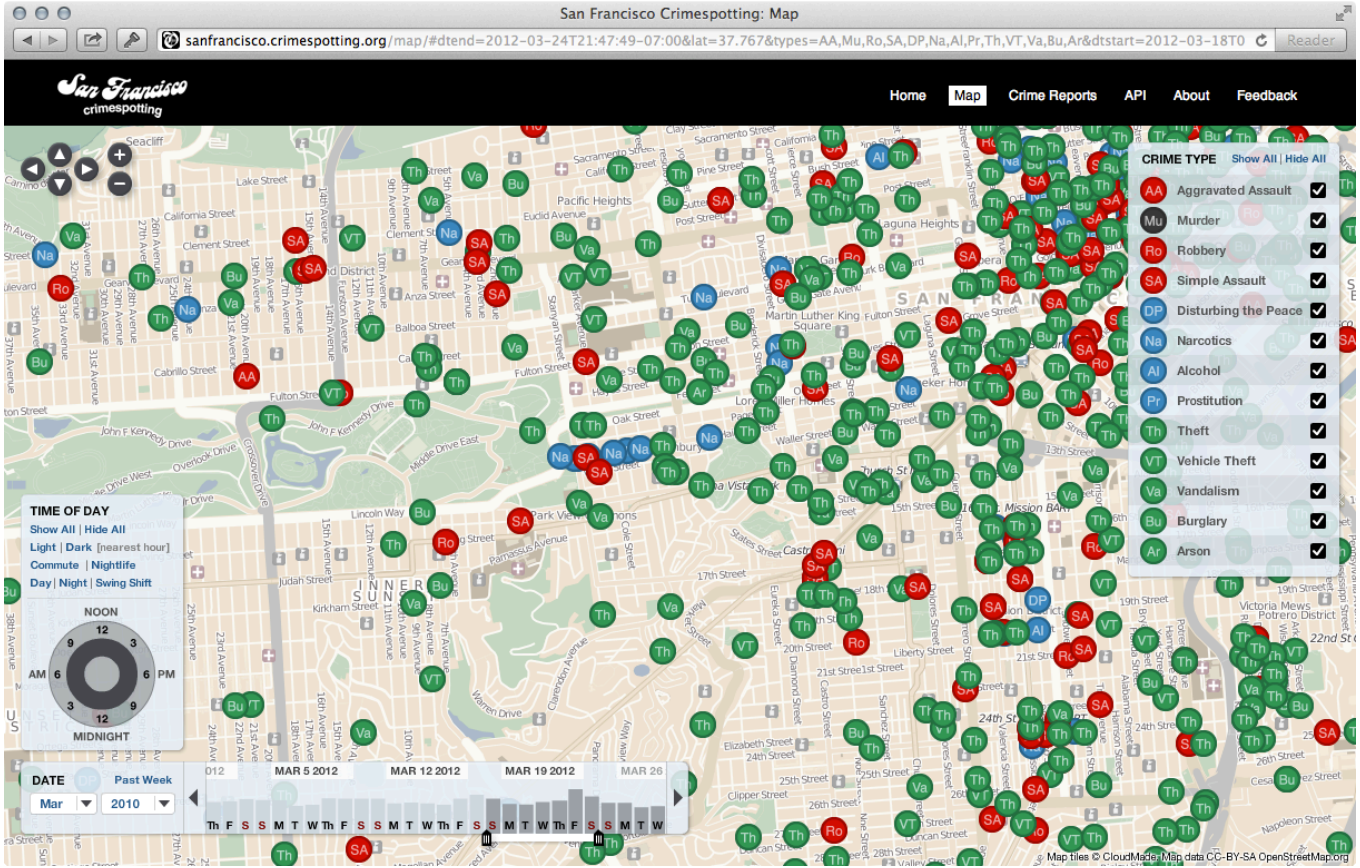

http://sanfrancisco.crimespotting.org

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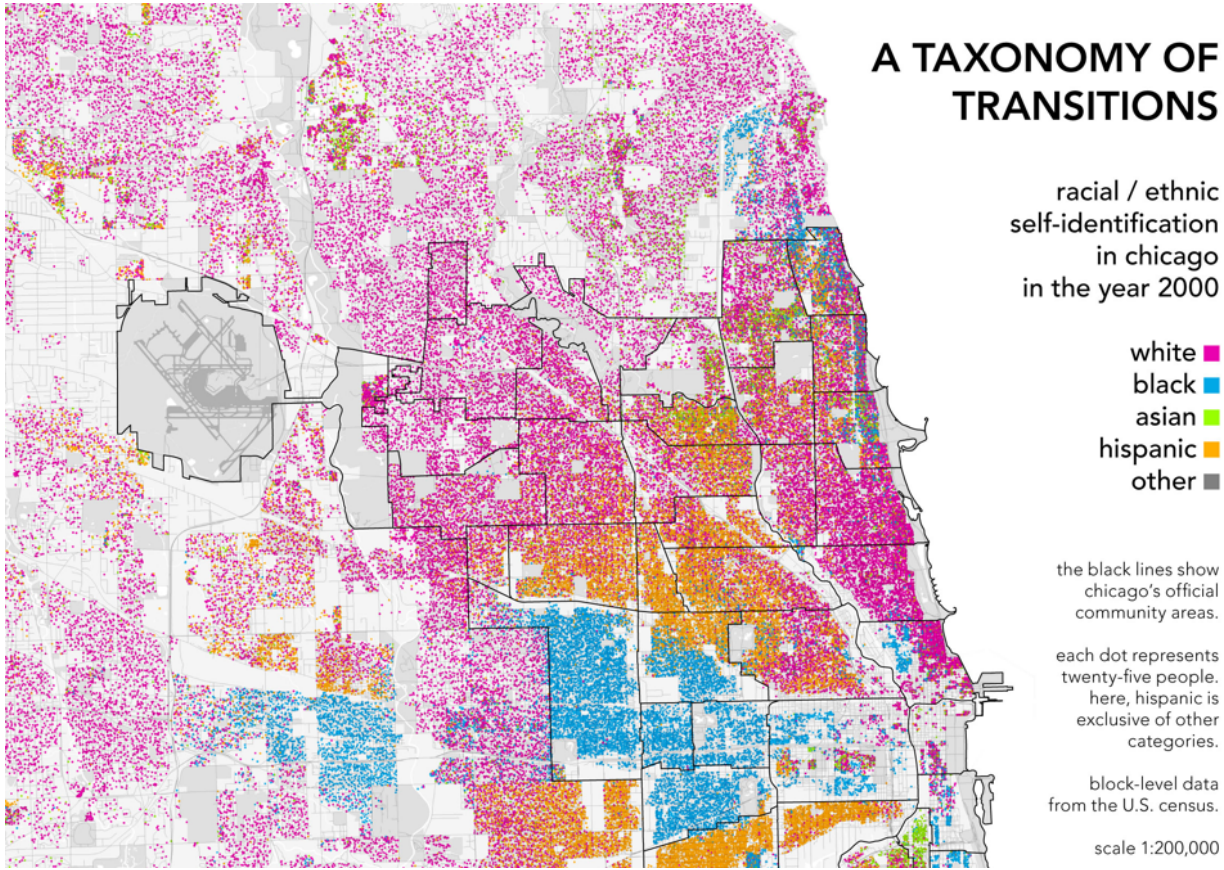

http://www.radicalcartography.net/index.html?chicagodots

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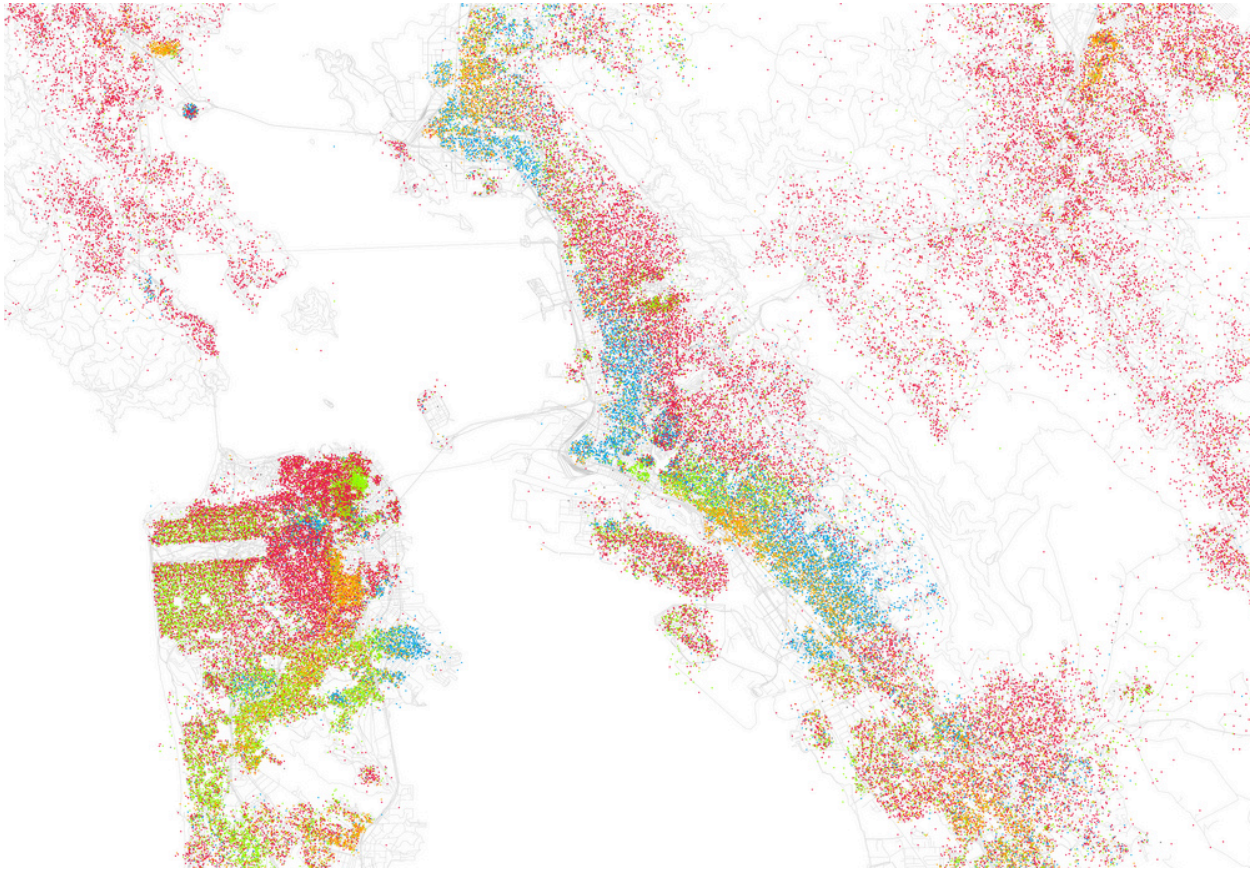

http://www.flickr.com/photos/walkingsf/sets/72157624812674967/with/4981417821/ (SF)

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http://bmander.com/dotmap/index.html

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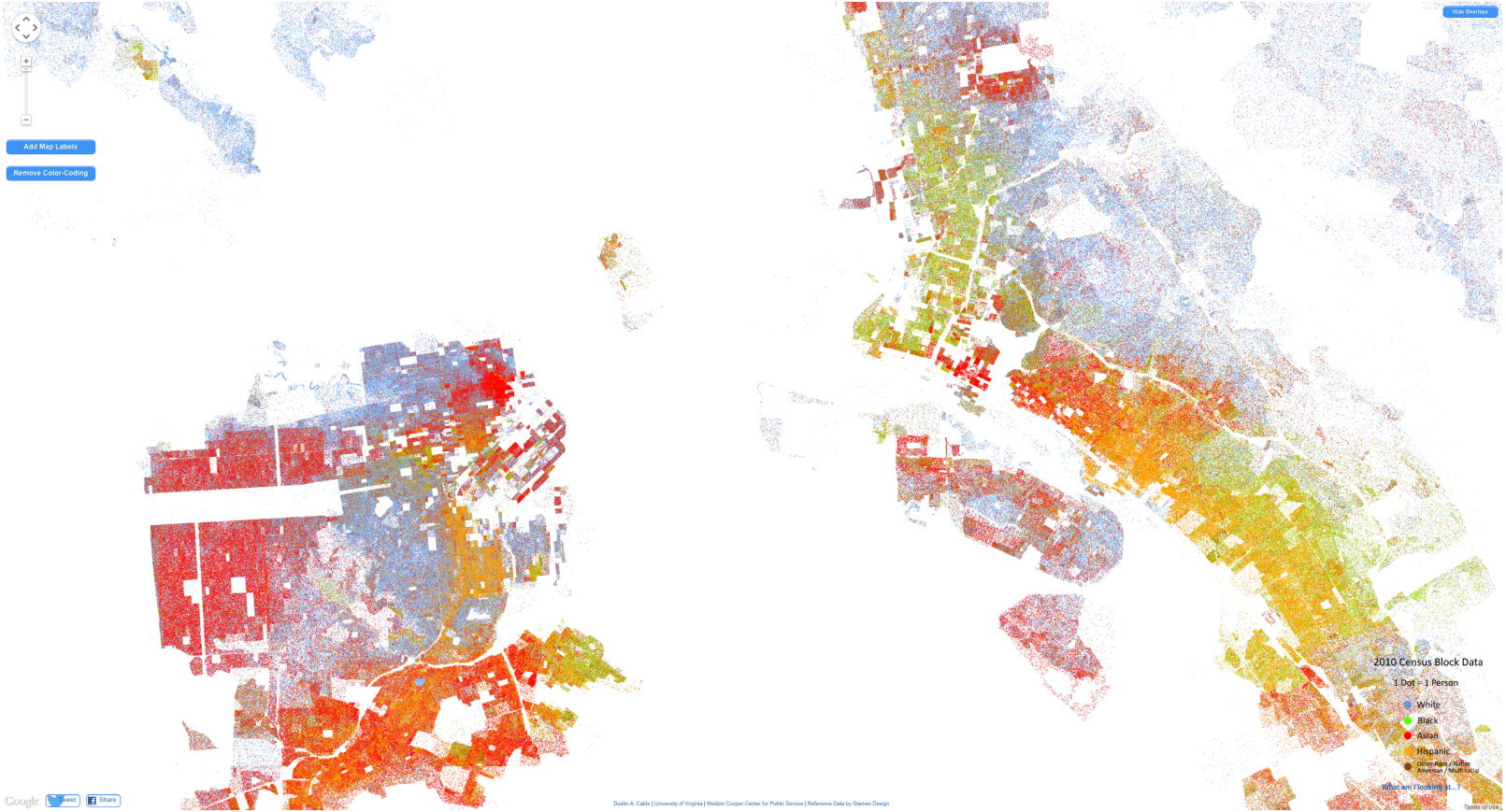

http://demographics.coopercenter.org/DotMap/

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CARTOGRAMS

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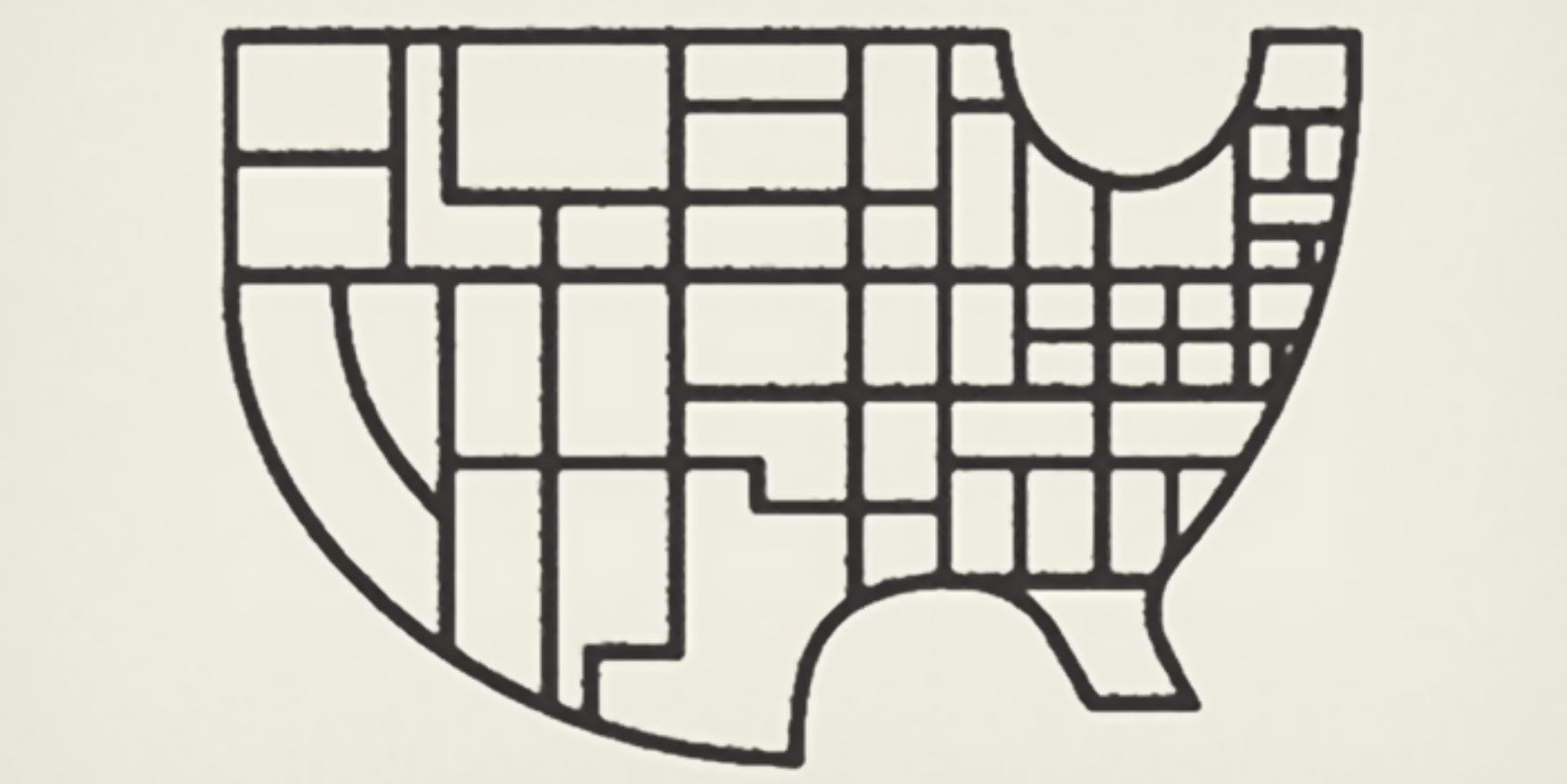

http://drbl.in/xxR

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Cartograms

- Area Cartograms
  - Scale area proportional to data value
  - Regions remain contiguous
- Non-Contiguous Cartograms
  - Scale area proportional to data value
  - Regions become non-contiguous
- Dorling Cartograms
  - Replace region with scaled shape
  - Does not maintain region shape or topology

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http://www-personal.umich.edu/~mejn/cartograms/

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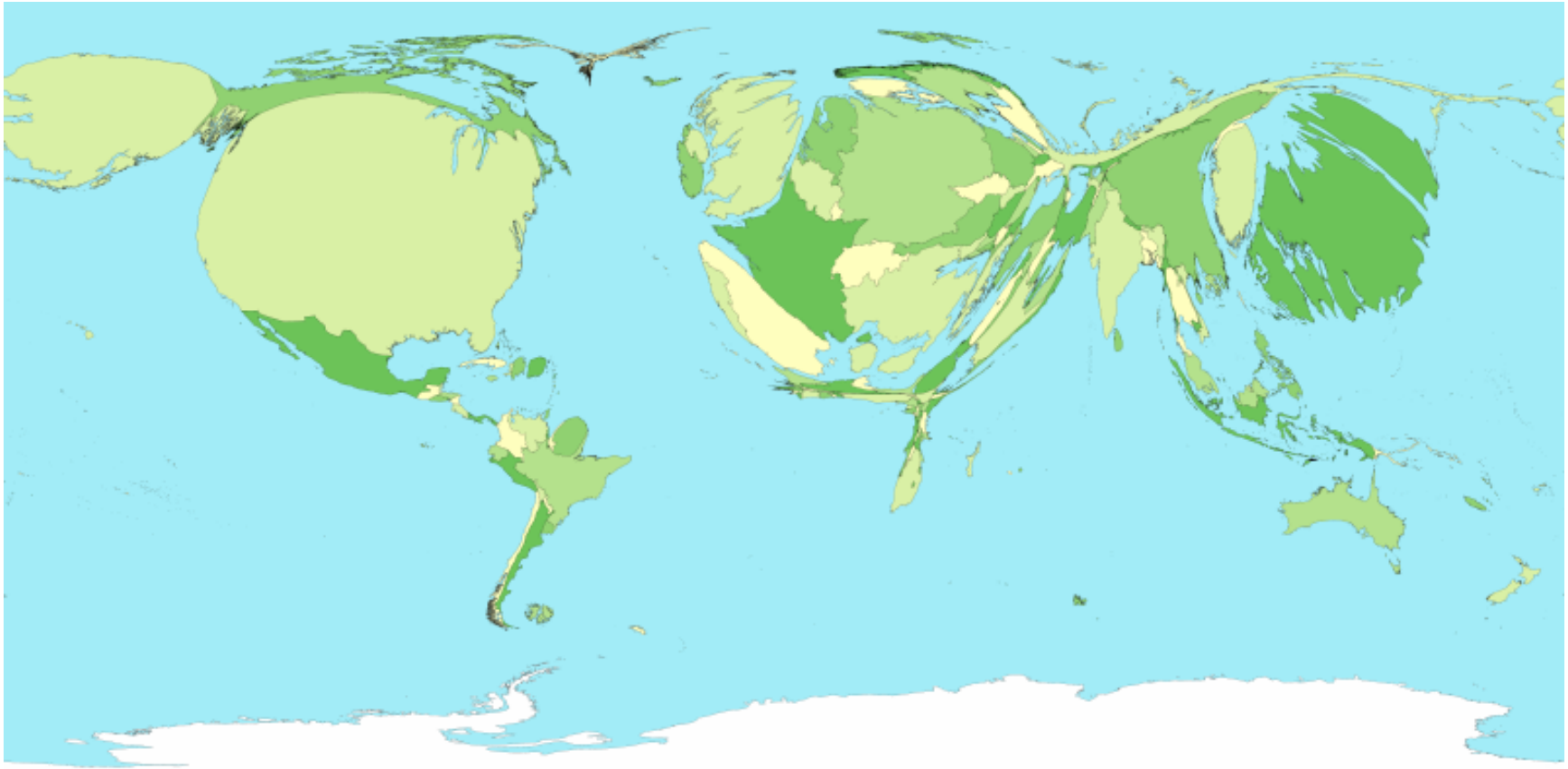

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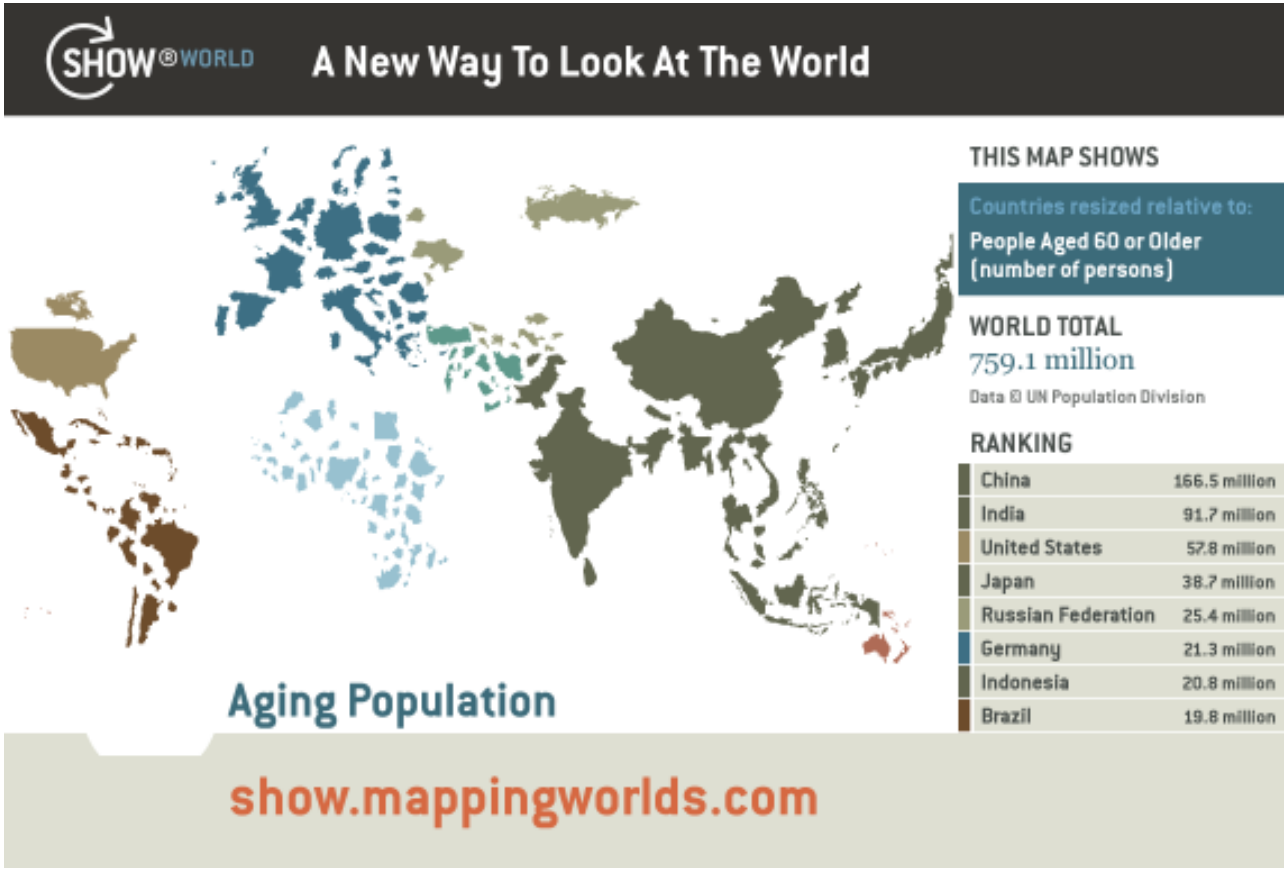

http://show.mappingworlds.com/world/?subject=POPULATIONAGING

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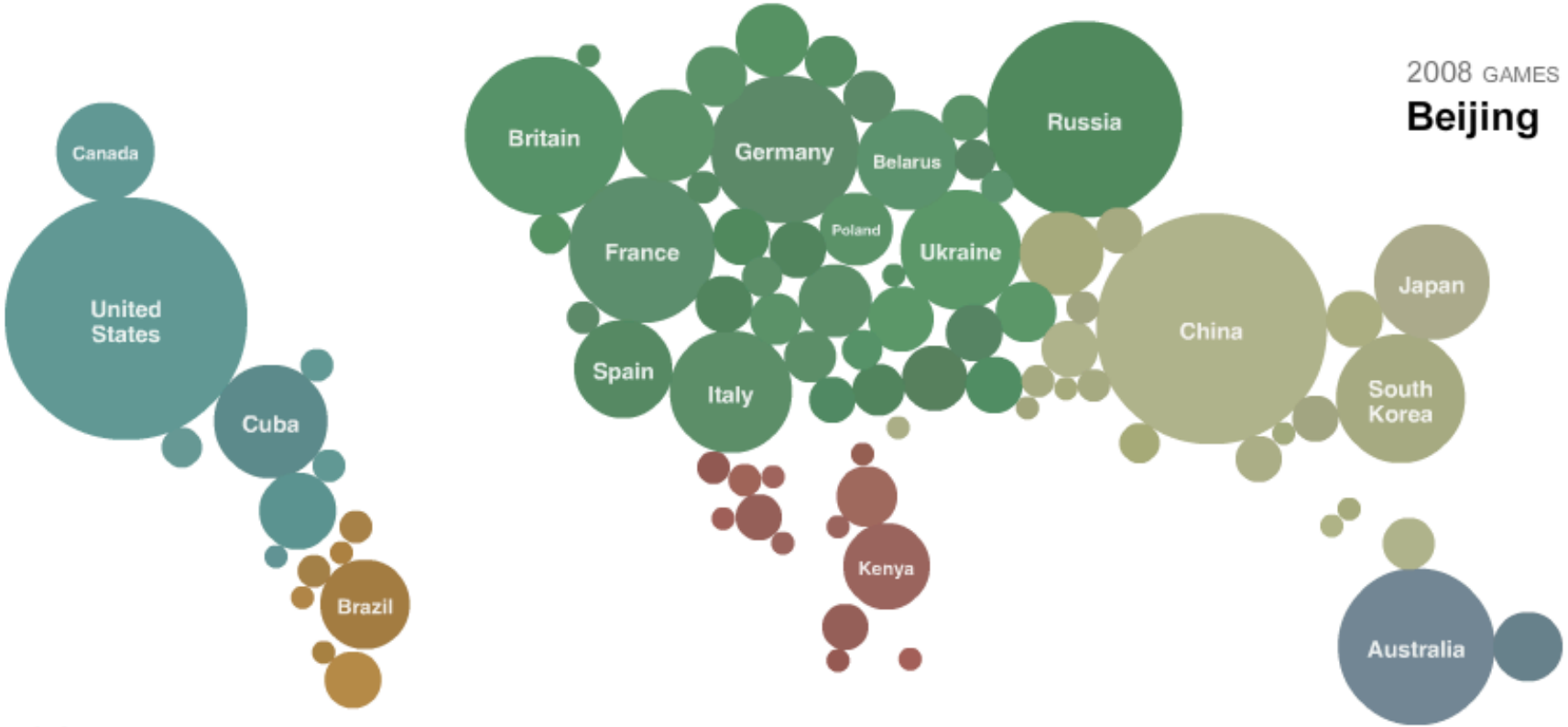

http://www.nytimes.com/interactive/2008/08/04/sports/olympics/20080804_MEDALCOUNT_MAP.html

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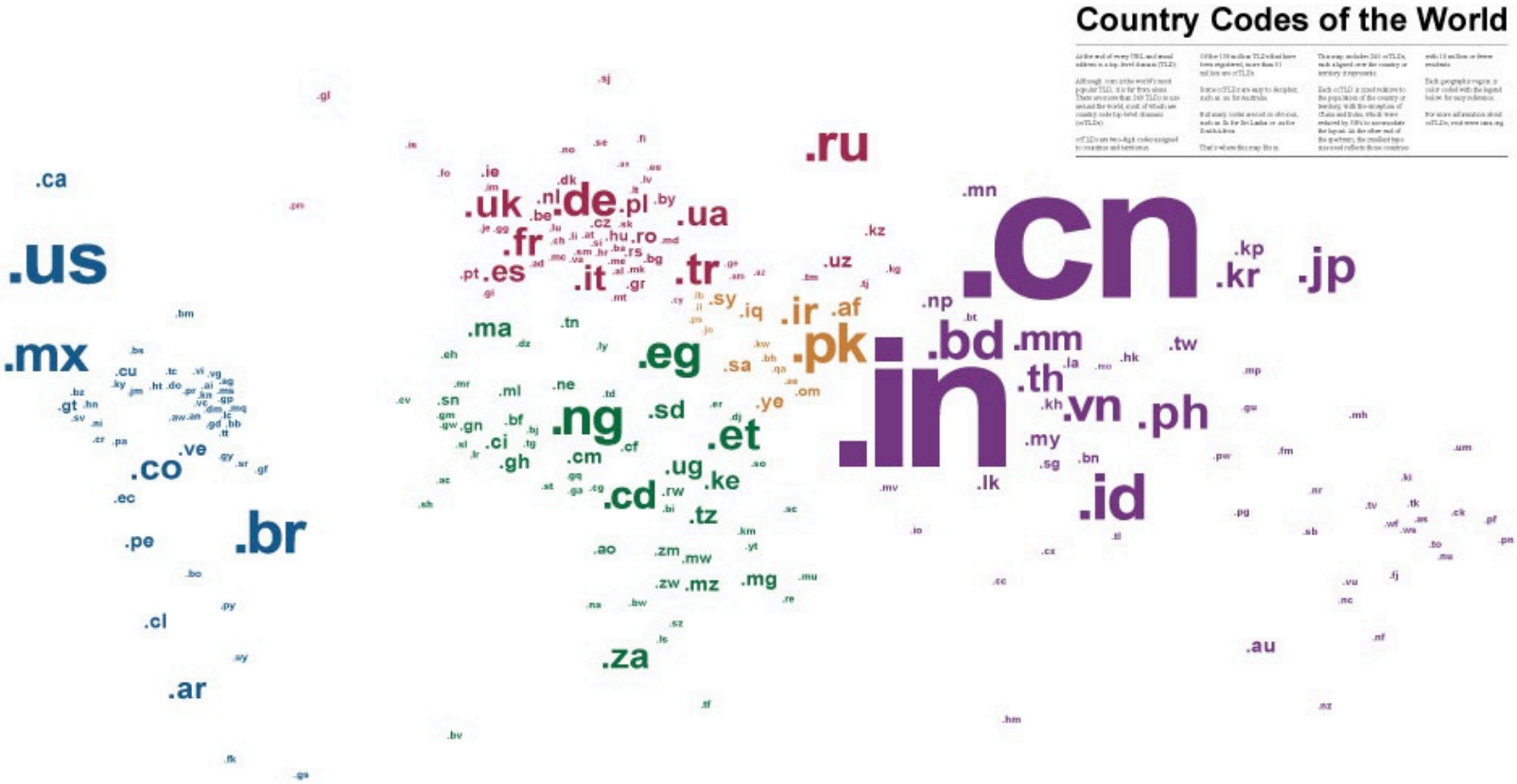

http://www.bytelevel.com/map/ccTLD.html

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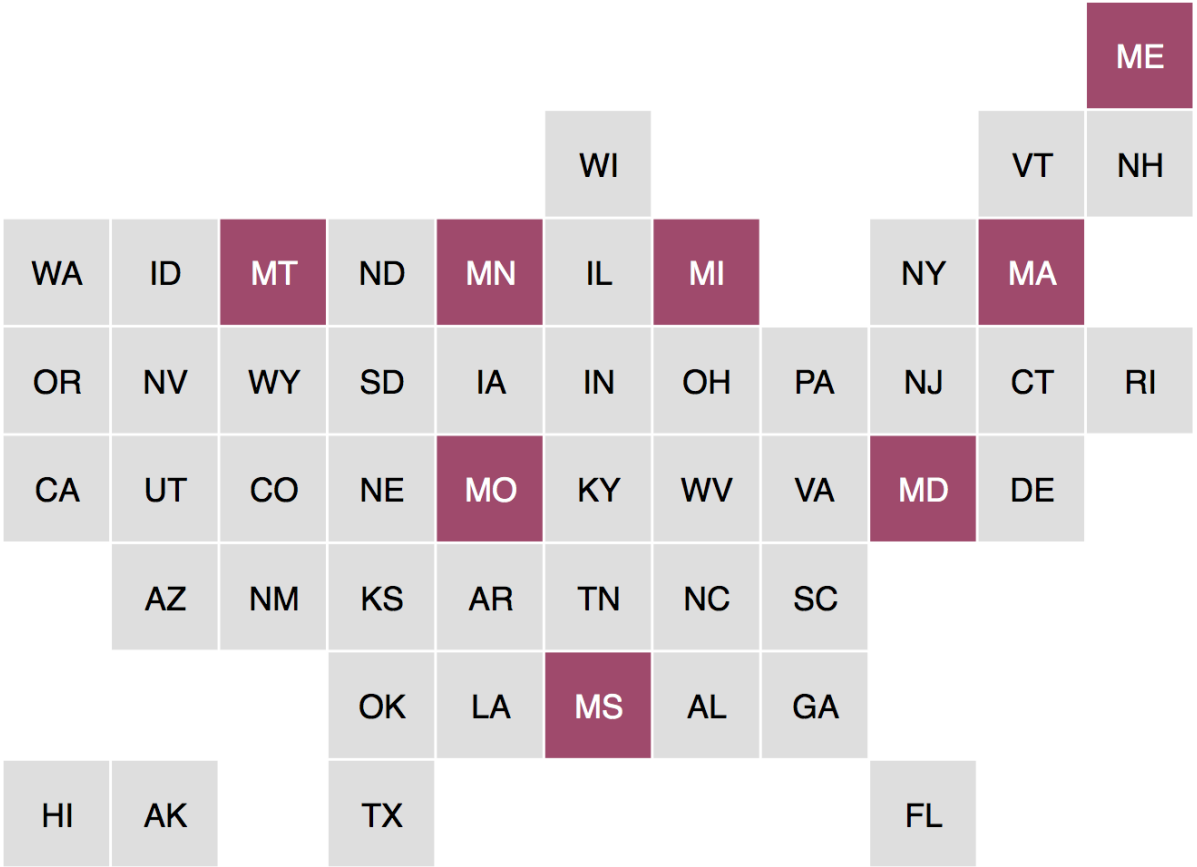

http://bl.ocks.org/mbostock/29cc3cc4078091fd2115

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ELECTION RESULTS 2008

http://elections.nytimes.com/2008/results/president/map.html

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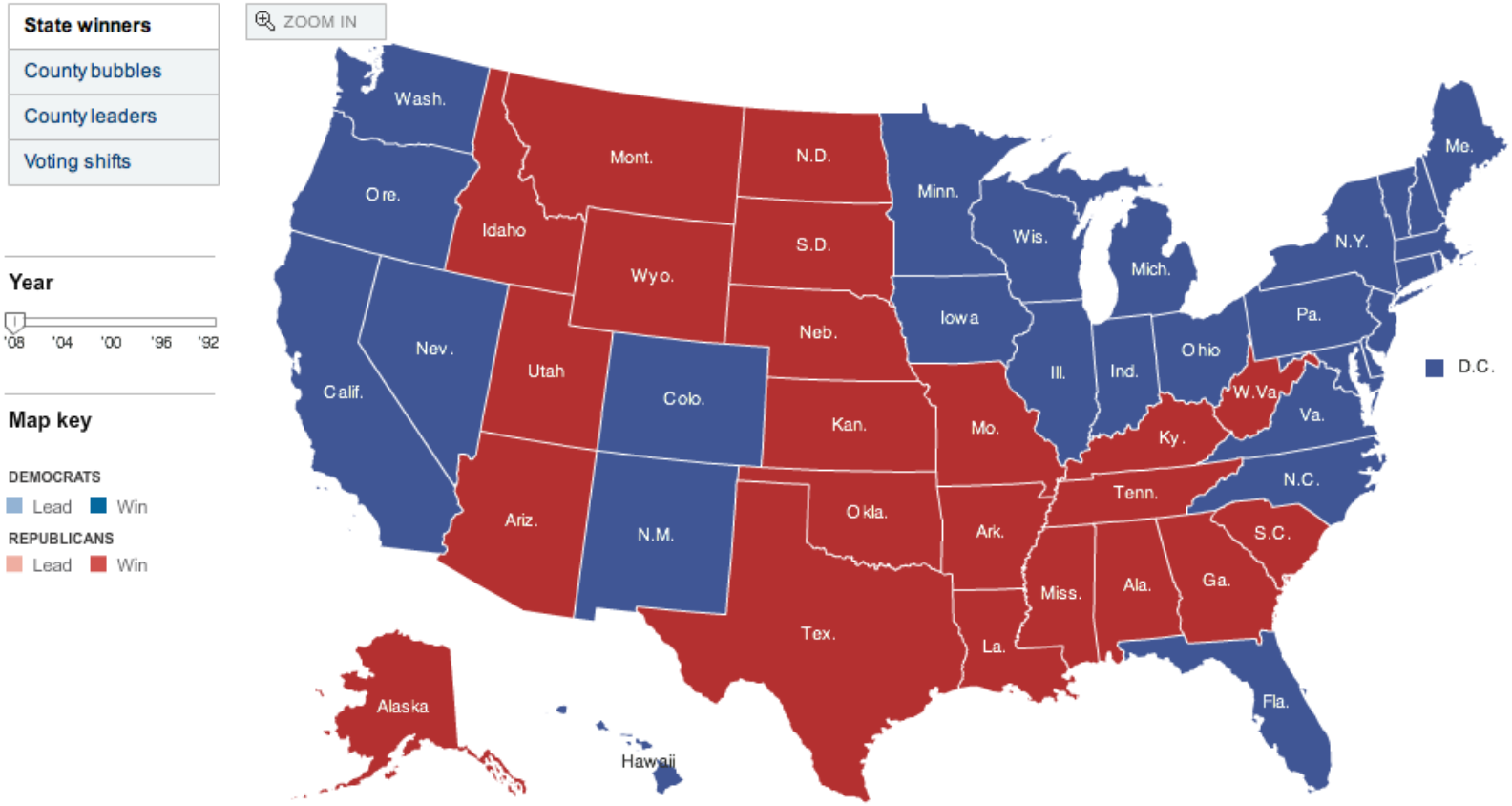

Choropleth Map

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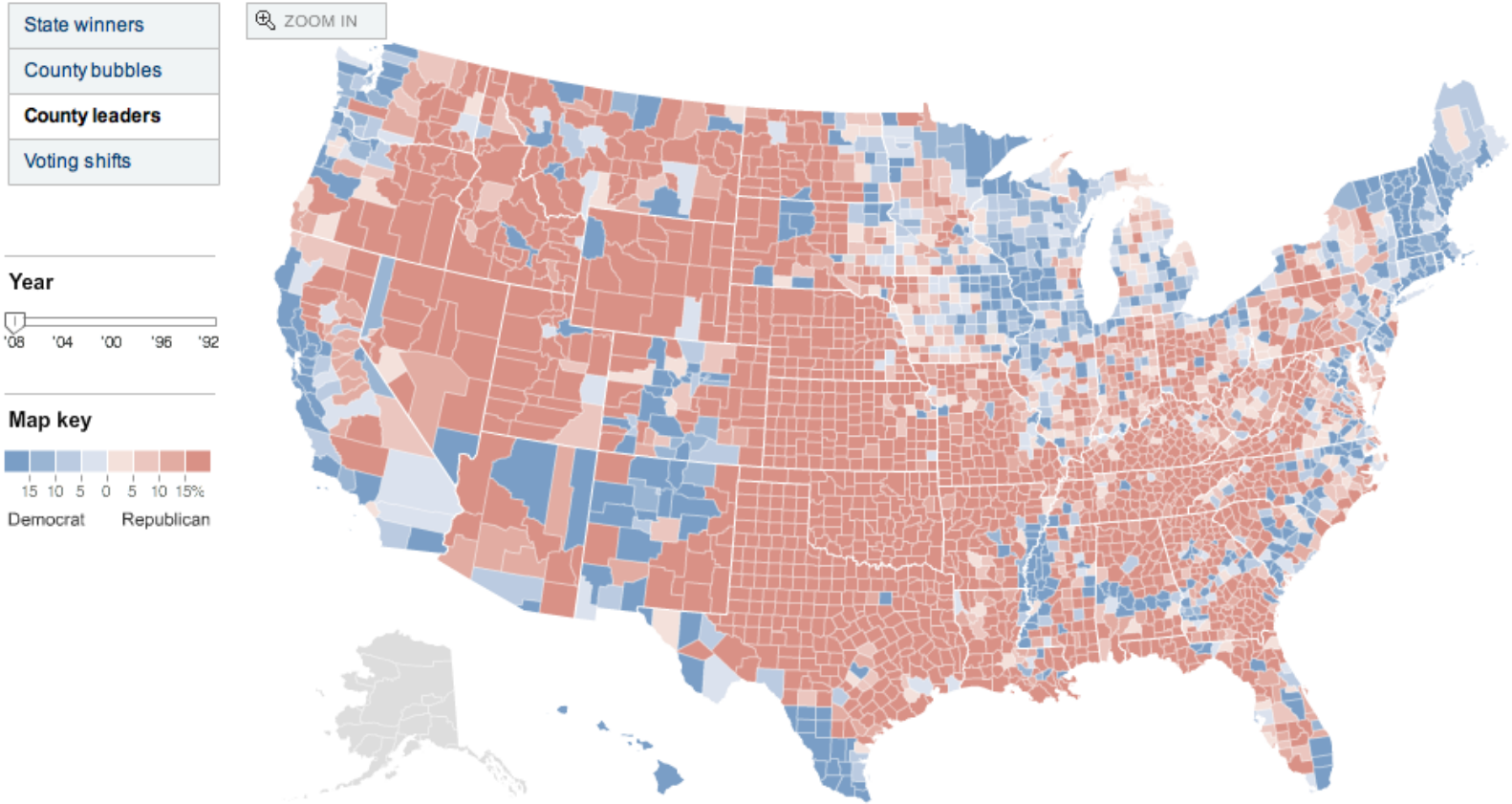

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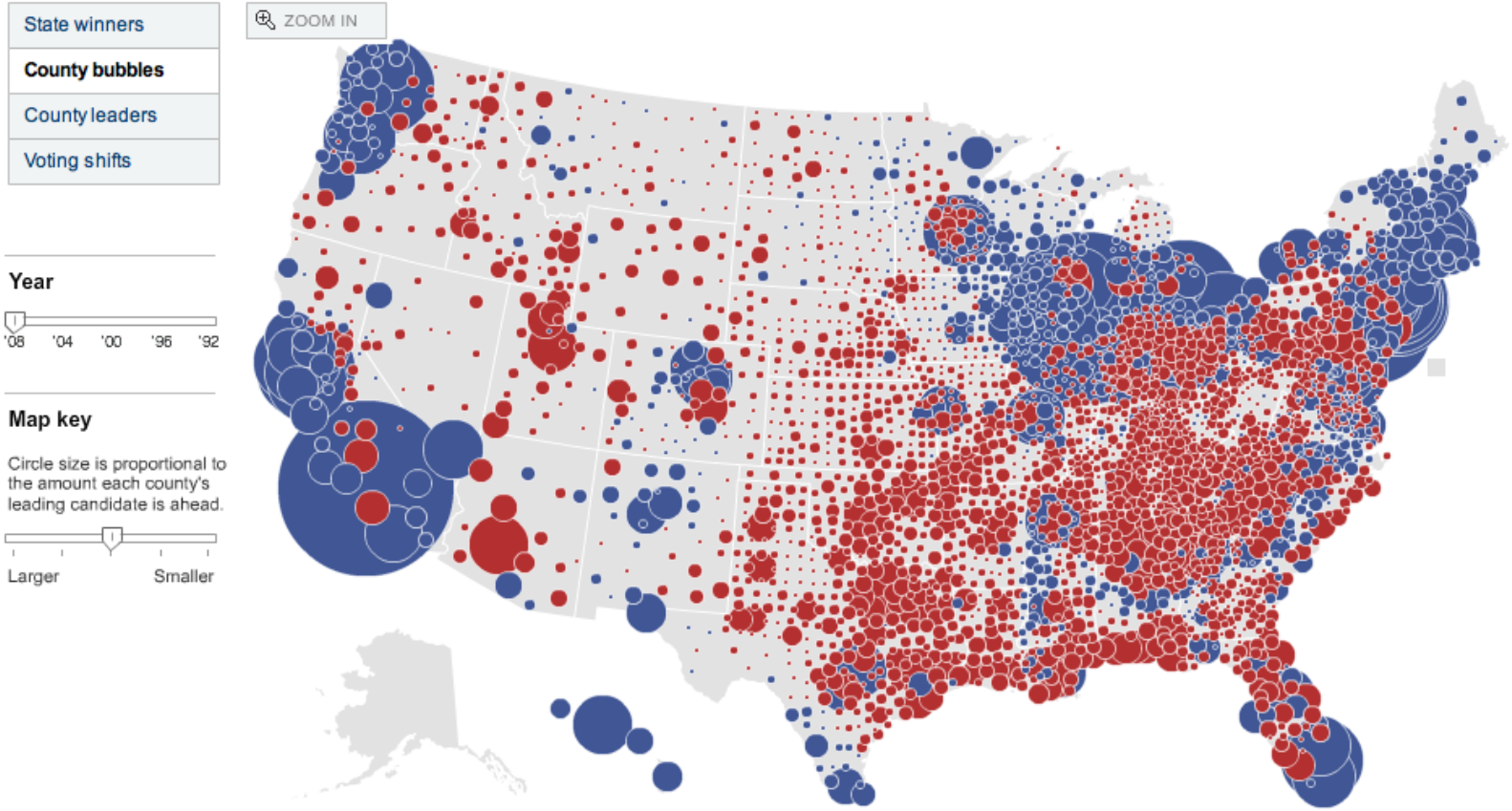

Proportional Symbol Map

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The Electoral Map: Key States

By ADAM NAGOURNEY, JEFF ZELENY AND SHAN CARTER
November 4, 2008

E-MAIL
SHARE
FEEDBACK

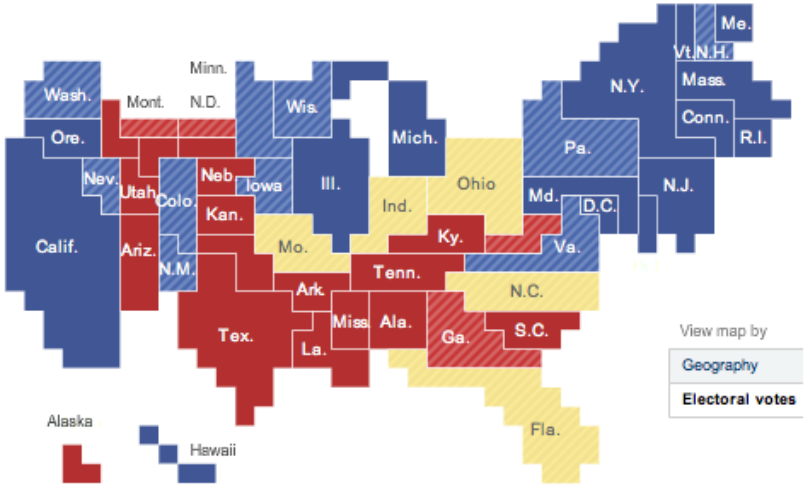
Times map | Your map

Obama 291 **163 McCain**

196 Solid Obama | 95 Leaning Obama | 84 Tossup | 26 | 137 Solid McCain

270 electoral votes needed to win

The colors show the latest breakdown by The New York Times of which states are considered to be in play in the presidential election. This is a snap-shot in time; it is not a prediction of how the race is going to turn out Nov. 4. Ratings are based on a variety of factors, including polling, previous elections results and the political landscape in the state. **Click on a state for more information.**



Dorling Cartogram

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TRANSIT MAPS

Schematic/Diagrammatic Map, Tube Map

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Schematic Diagrams

- Diagram
  - Graphic design that **explains** rather than represents*
- Schematic Diagram
  - Elements are abstracted and simplified
  - Realistic elements not necessary included
  - Unrealistic elements sometimes introduced
- Examples
  - Circuit diagrams, transit maps

* http://www.merriam-webster.com/dictionary/diagram

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Transit Map

- Try to preserve direction and order of stops
  - Distance less important, stops usually equally spaced for readability
- Simply as much as possible actual routes
  - Do not trace actual route taken by subway
- Use straight lines, and 45° angles
- Use color to indicate different transit lines

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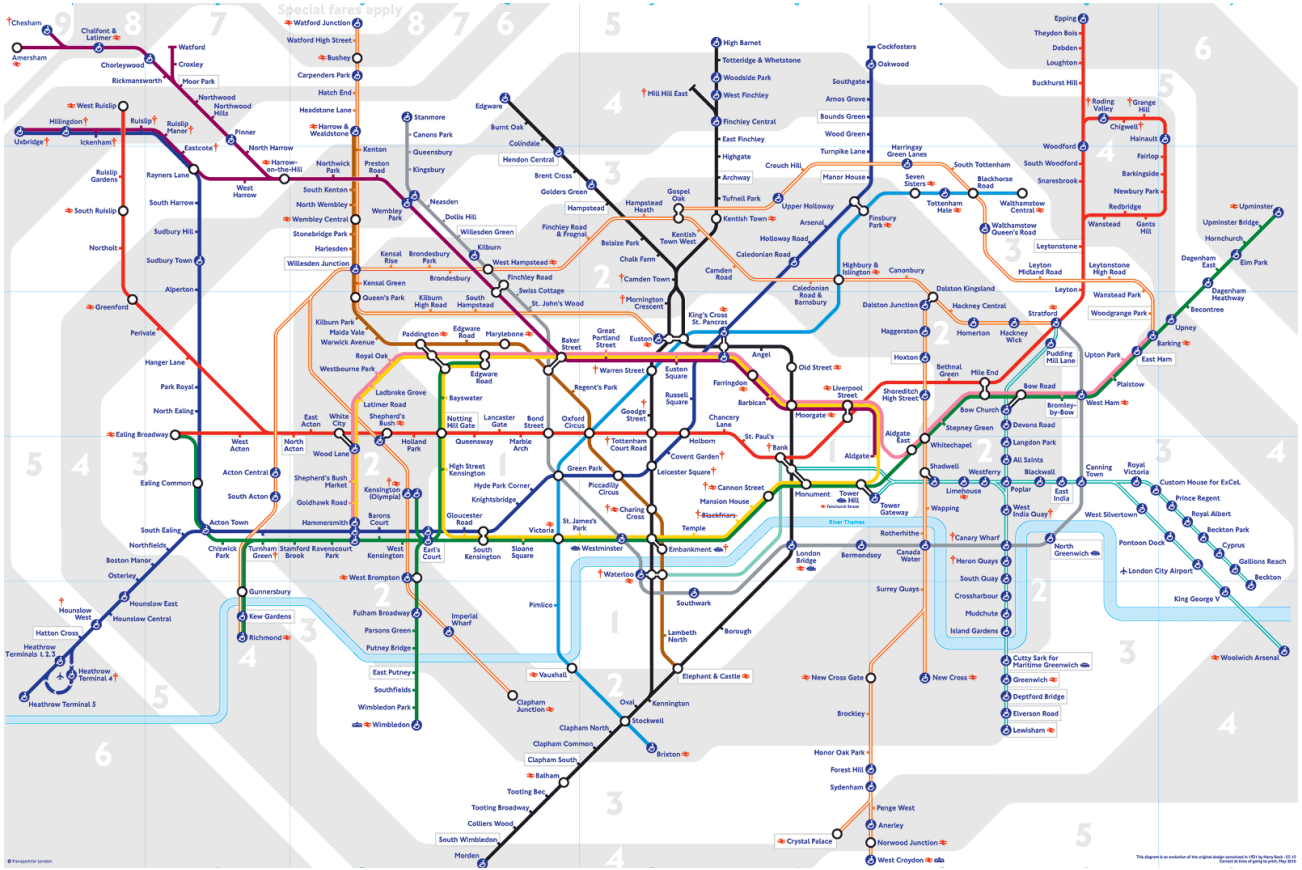
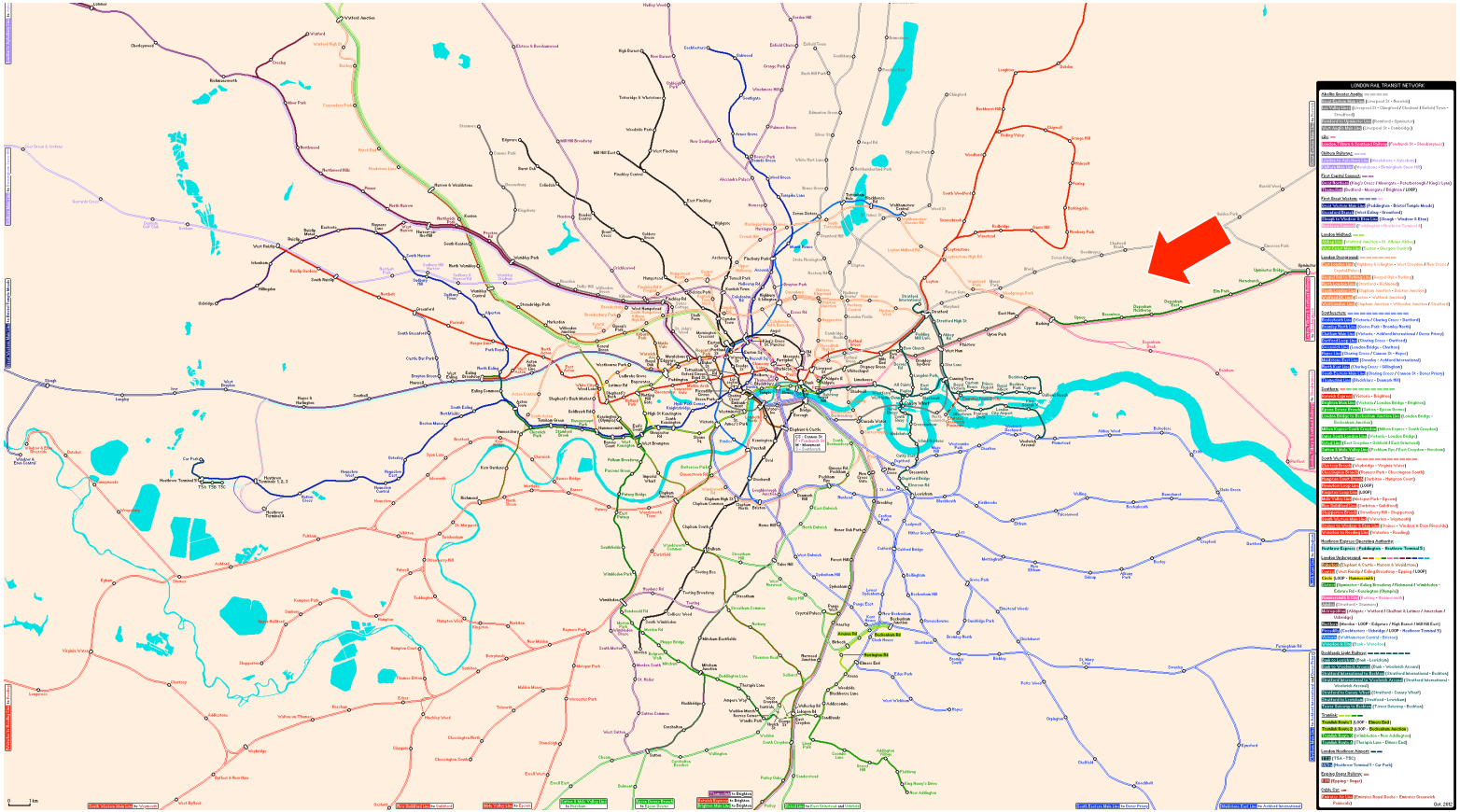


http://www.bbc.co.uk/london/travel/downloads/tube_map.html



http://cityrailtransit.com/maps/london_map.htm

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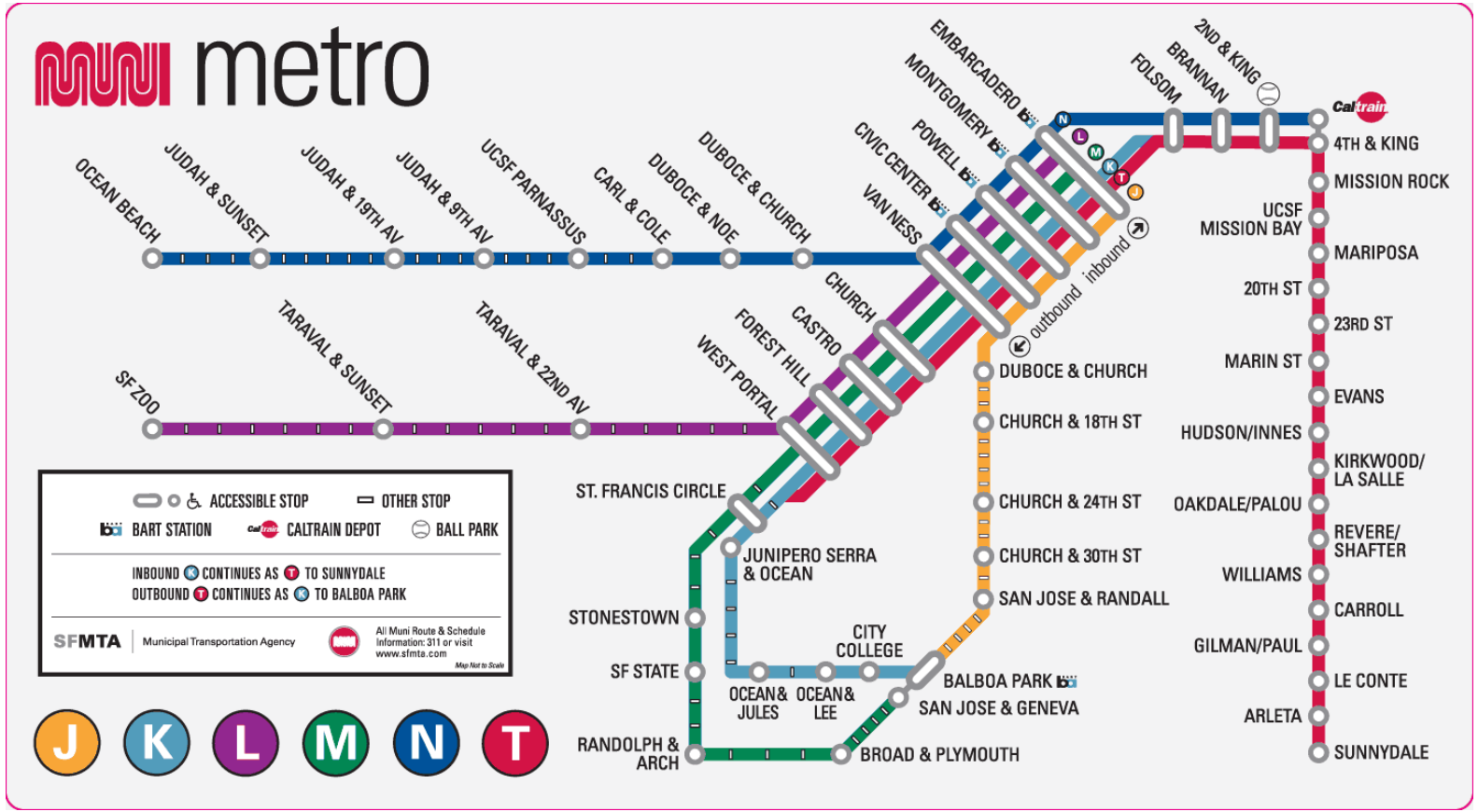

http://www.sfmta.com/cms/mmaps/official.htm

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http://www.sfmta.com/cms/mmaps/official.htm

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http://www.bart.gov/schedules/bystation.aspx

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FLOW MAPS

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Flow Maps

- Encoding
  - Edge between two locations indicates flow between those locations
  - Width of edge proportional to flow
  - Usually wider end of edge is source of flow
- Limitations
  - Can get difficult to compare flows
  - Best flow maps are done by hand

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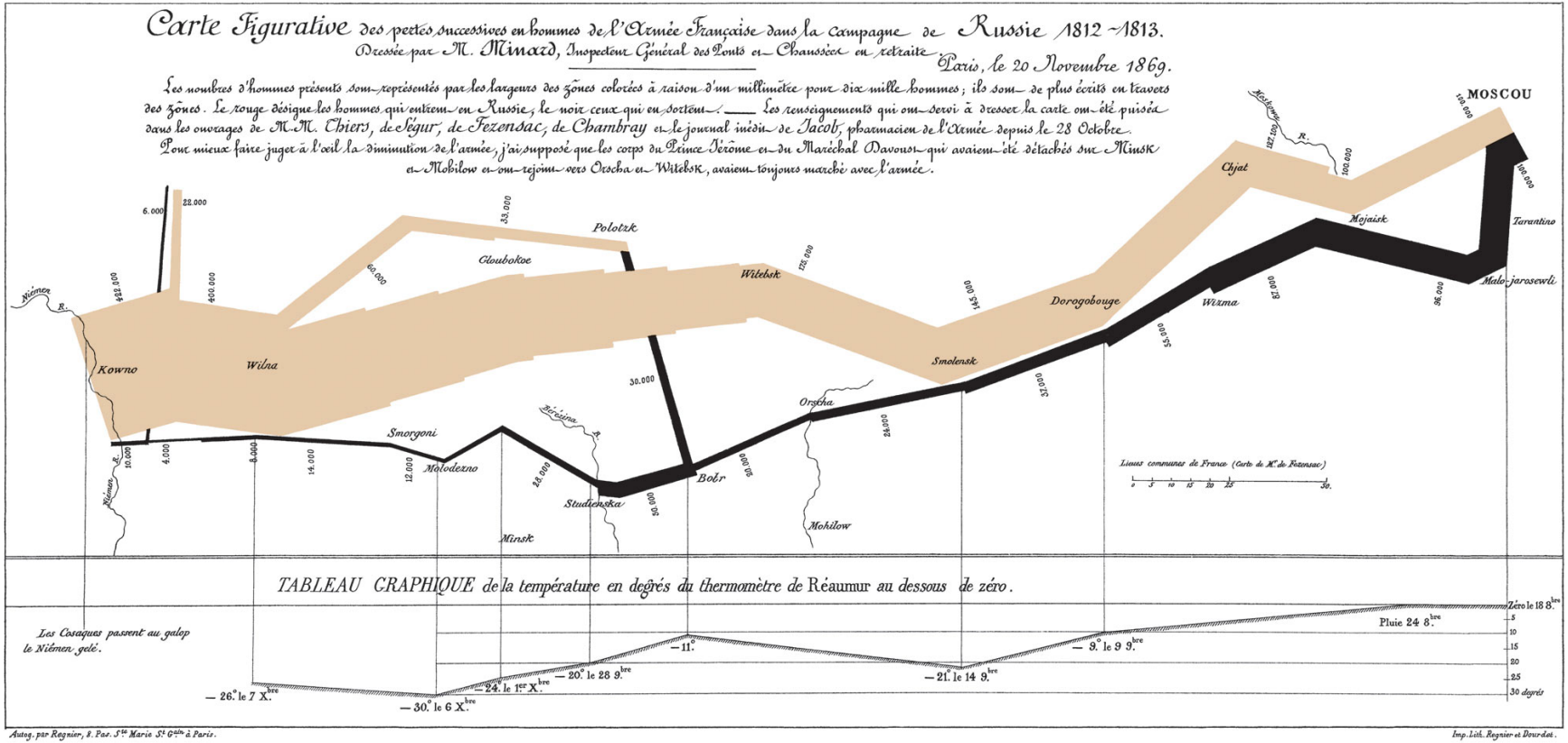

http://en.wikipedia.org/wiki/File:Minard.png

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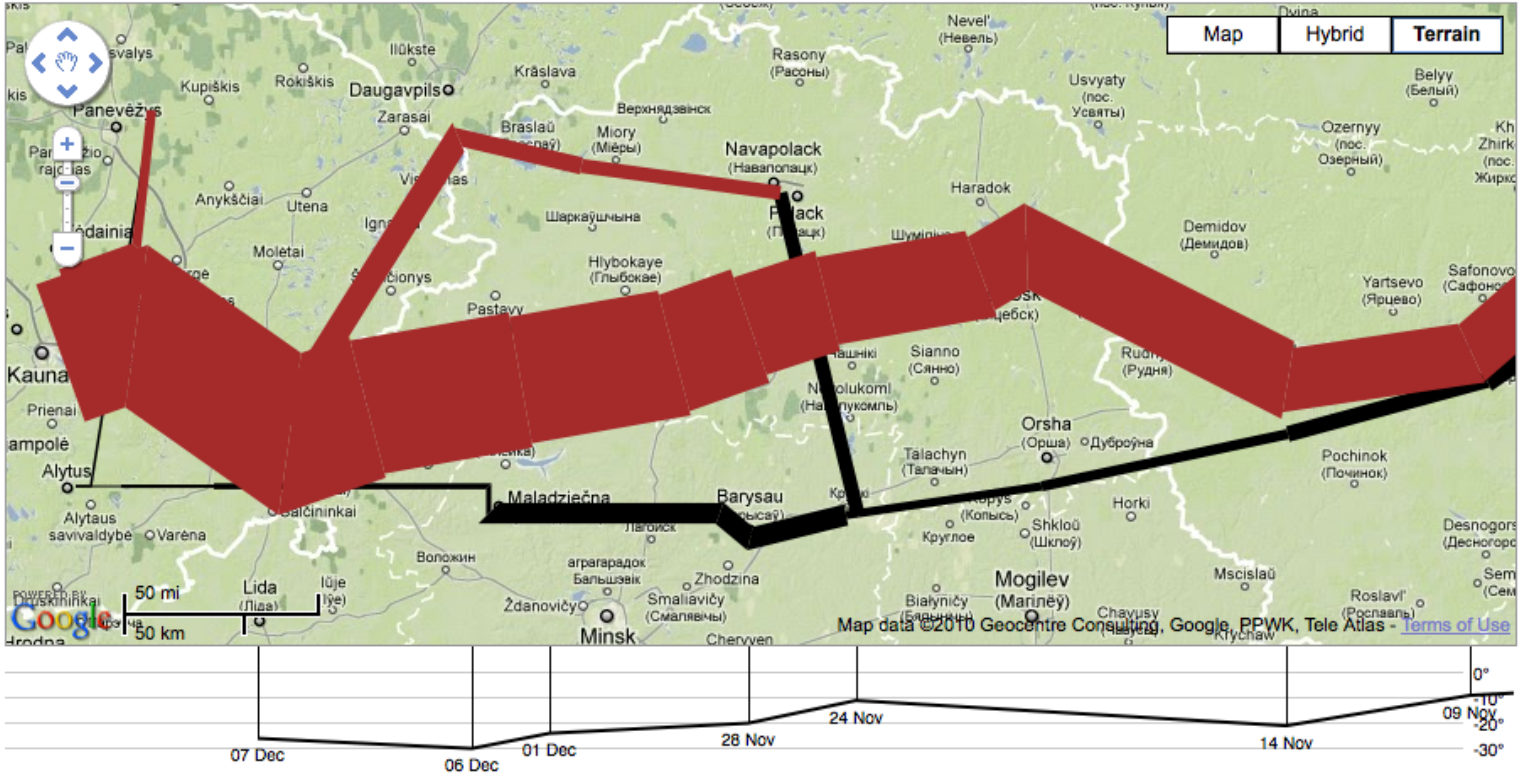
Minard's Napoleon



http://vis.stanford.edu/protovis/ex/napoleon.html

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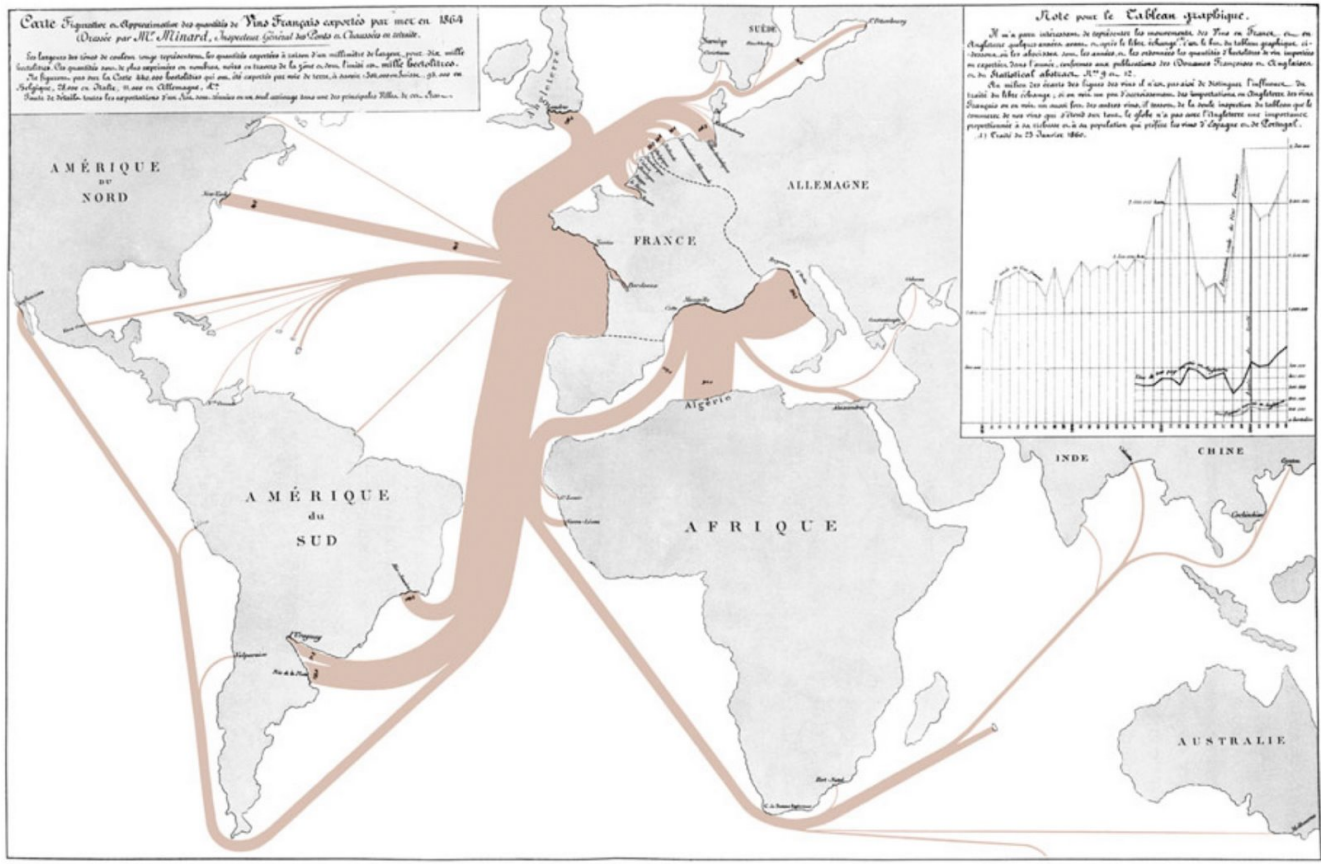

http://lifeingreytones.blogspot.com/2009/04/literature-review-post-1.html

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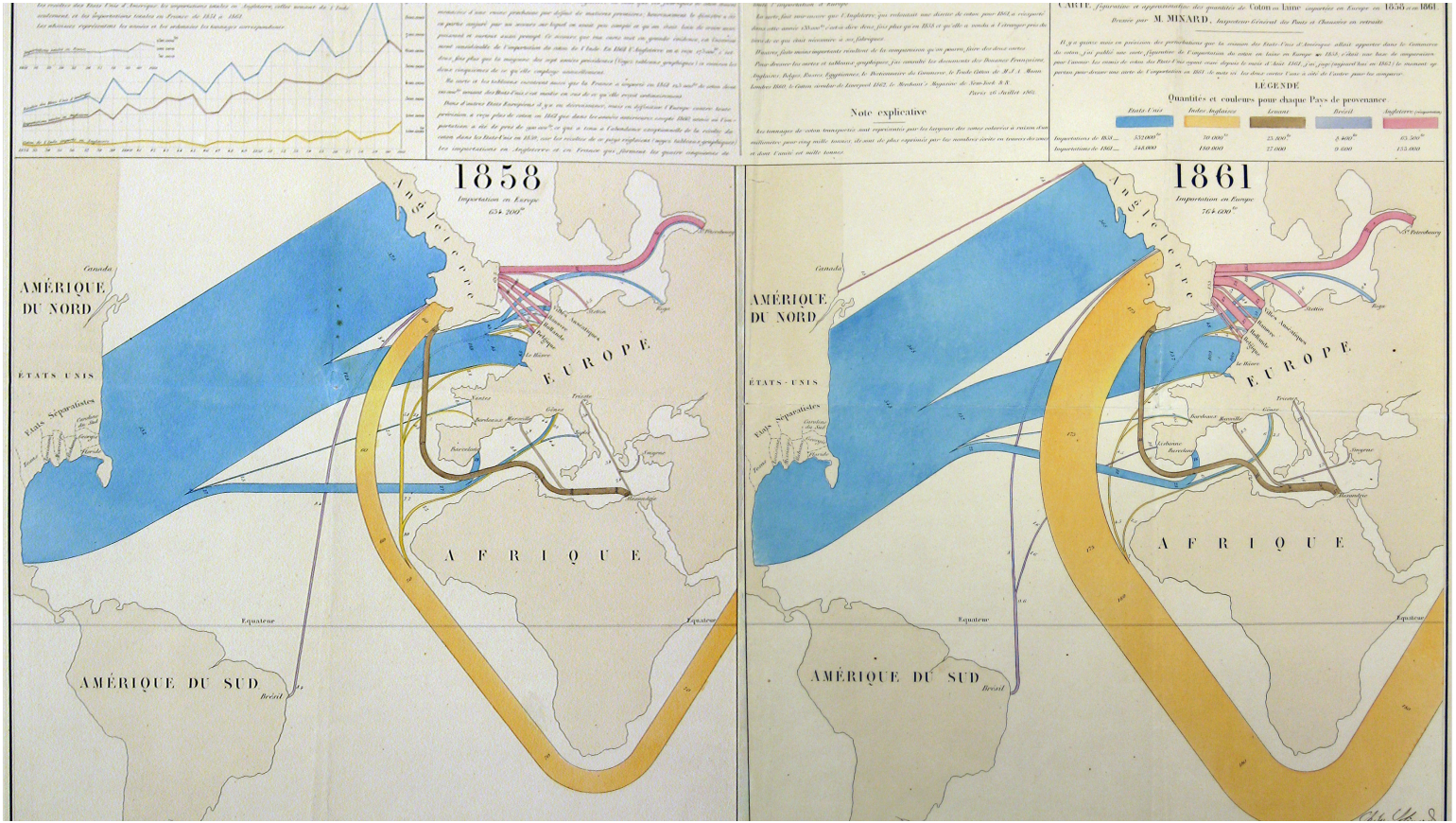

http://cartographia.wordpress.com/2008/06/30/mondays-with-minard-cotton-and-wool-comparisons/

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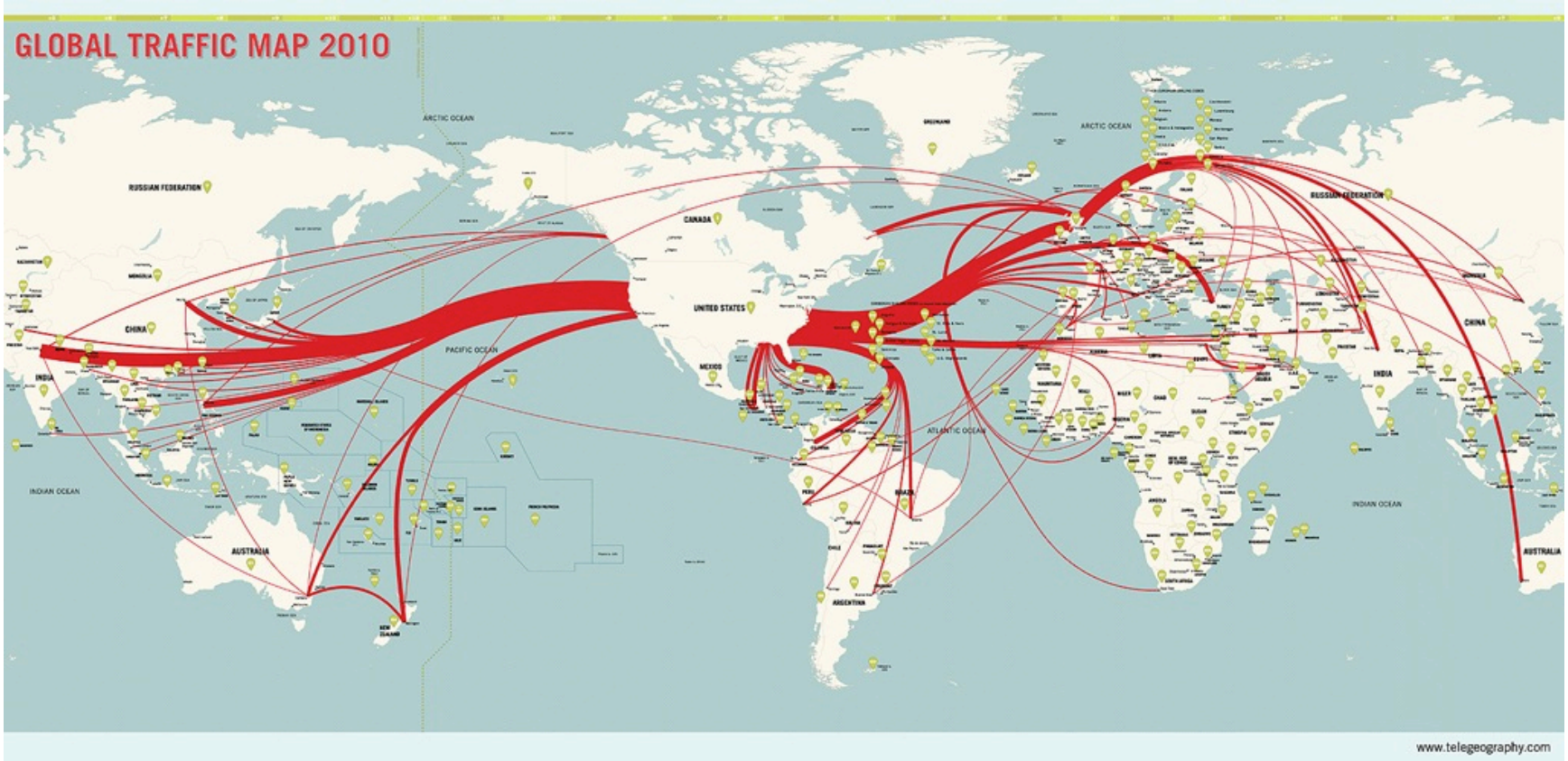

http://www.telegeography.com/product-info/map_traffic/index.php

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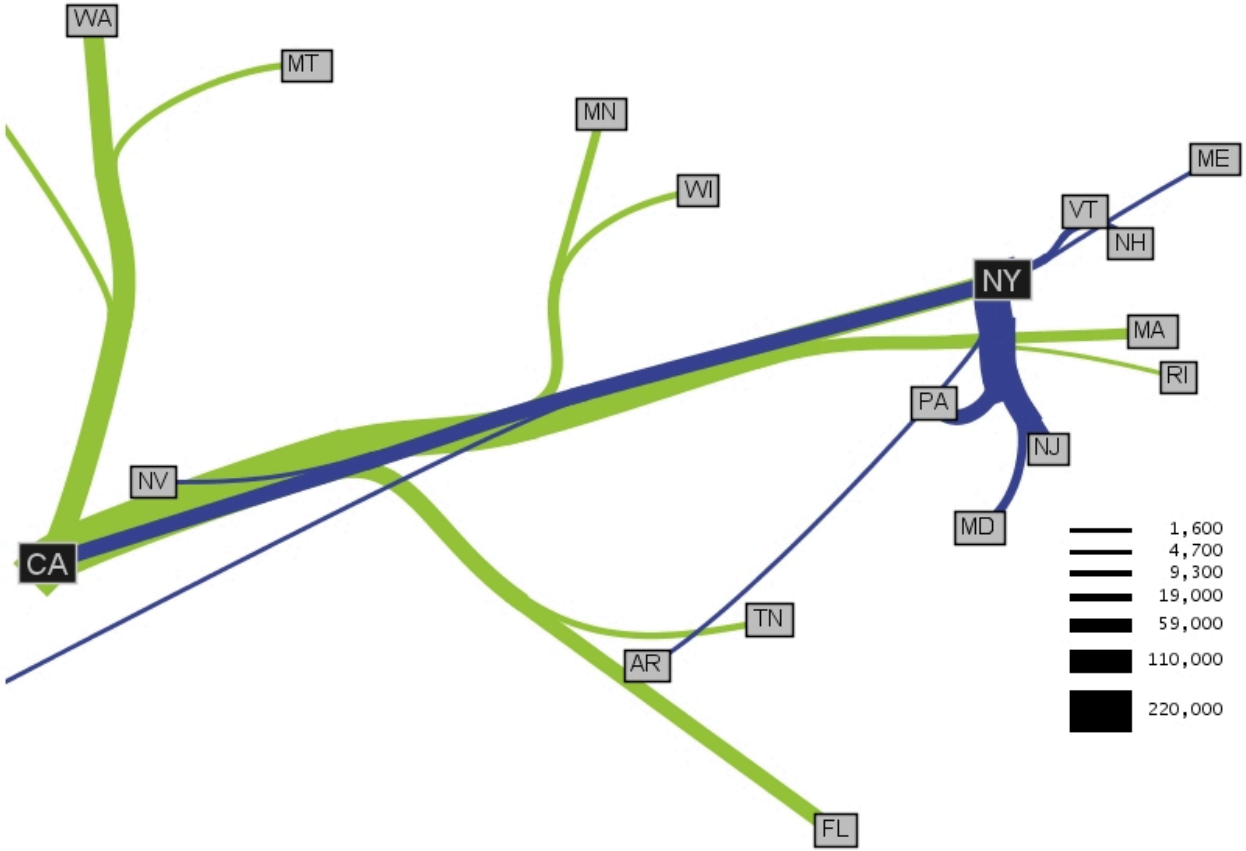

http://graphics.stanford.edu/papers/flow_map_layout/

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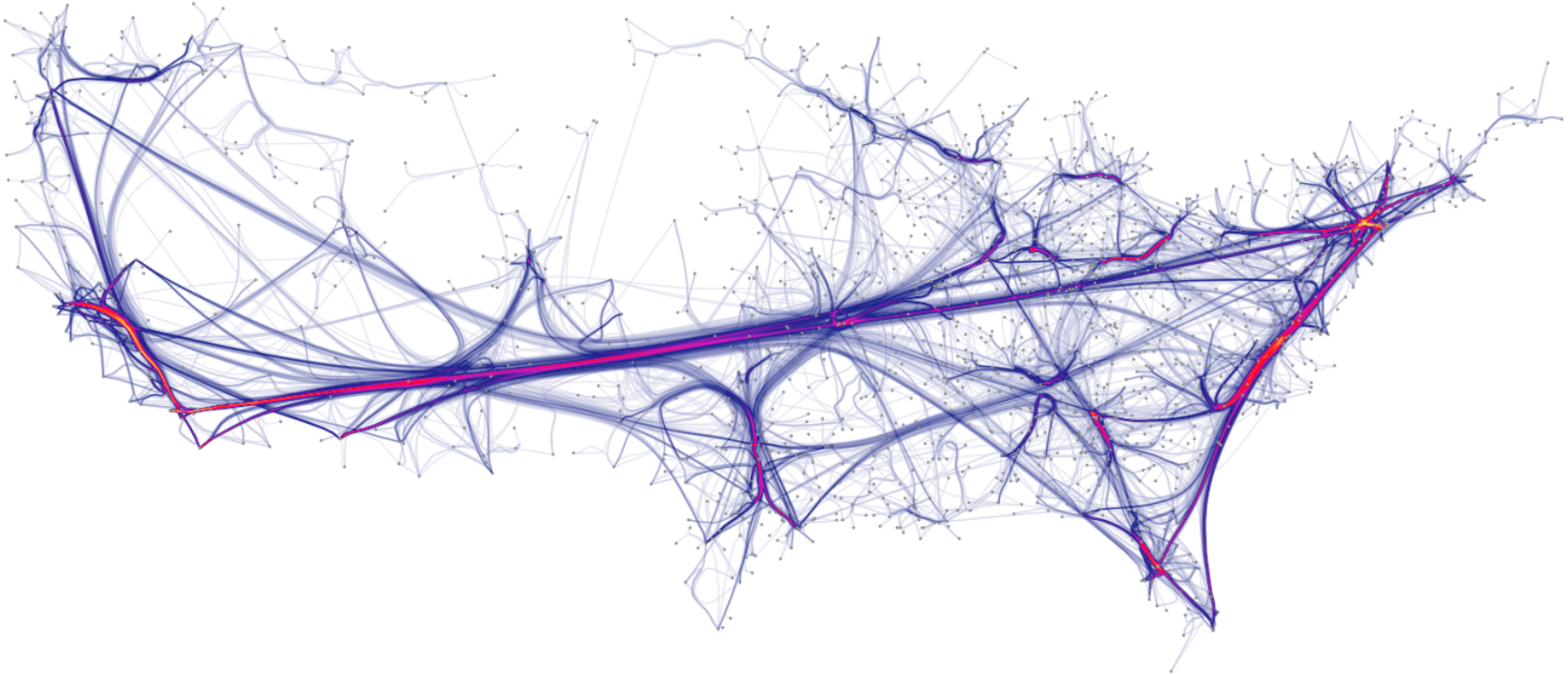

http://www.win.tue.nl/~dholten/

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SANKEY DIAGRAMS

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Sankey Diagrams

- A type of flow map, applied to non-geospatial data
- Width of line indicates amount of flow
- Arrows (optional) indicate direction of flow
- Must apply a simple node layout
  - Usually nodes on left or right
  - Flow travels from left nodes to right nodes
  - No flow between nodes on same side

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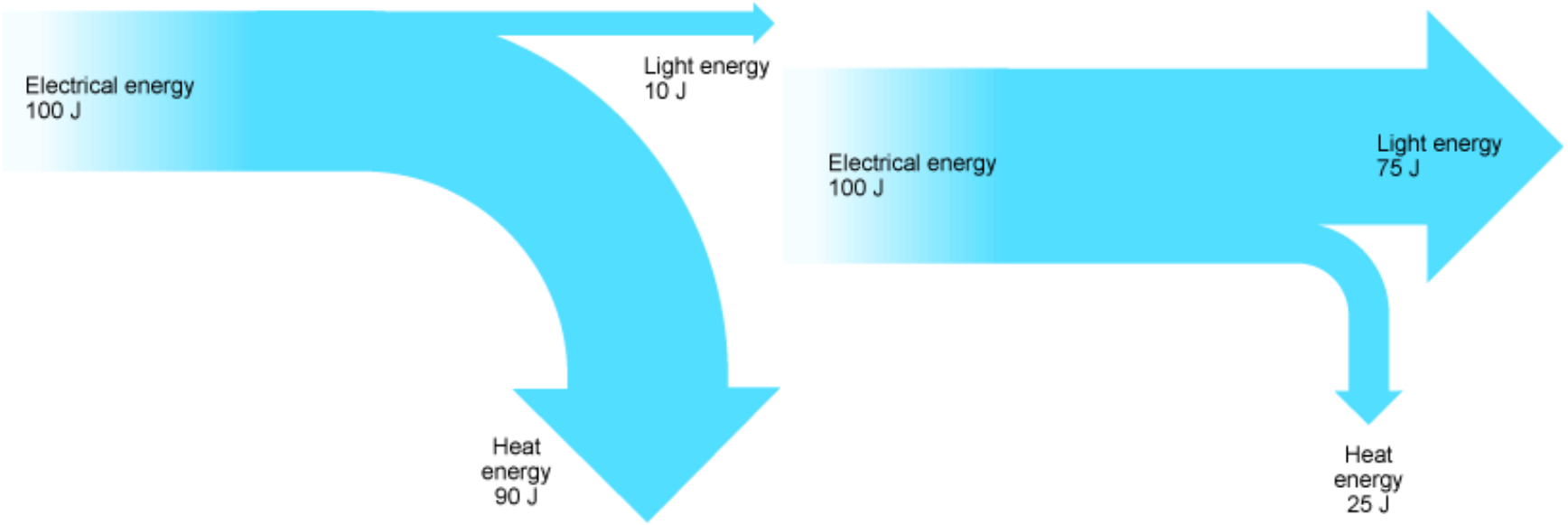

http://www.bbc.co.uk/schools/gcsebitesize/science/aqa_pre_2011/energy/heatrev6.shtml

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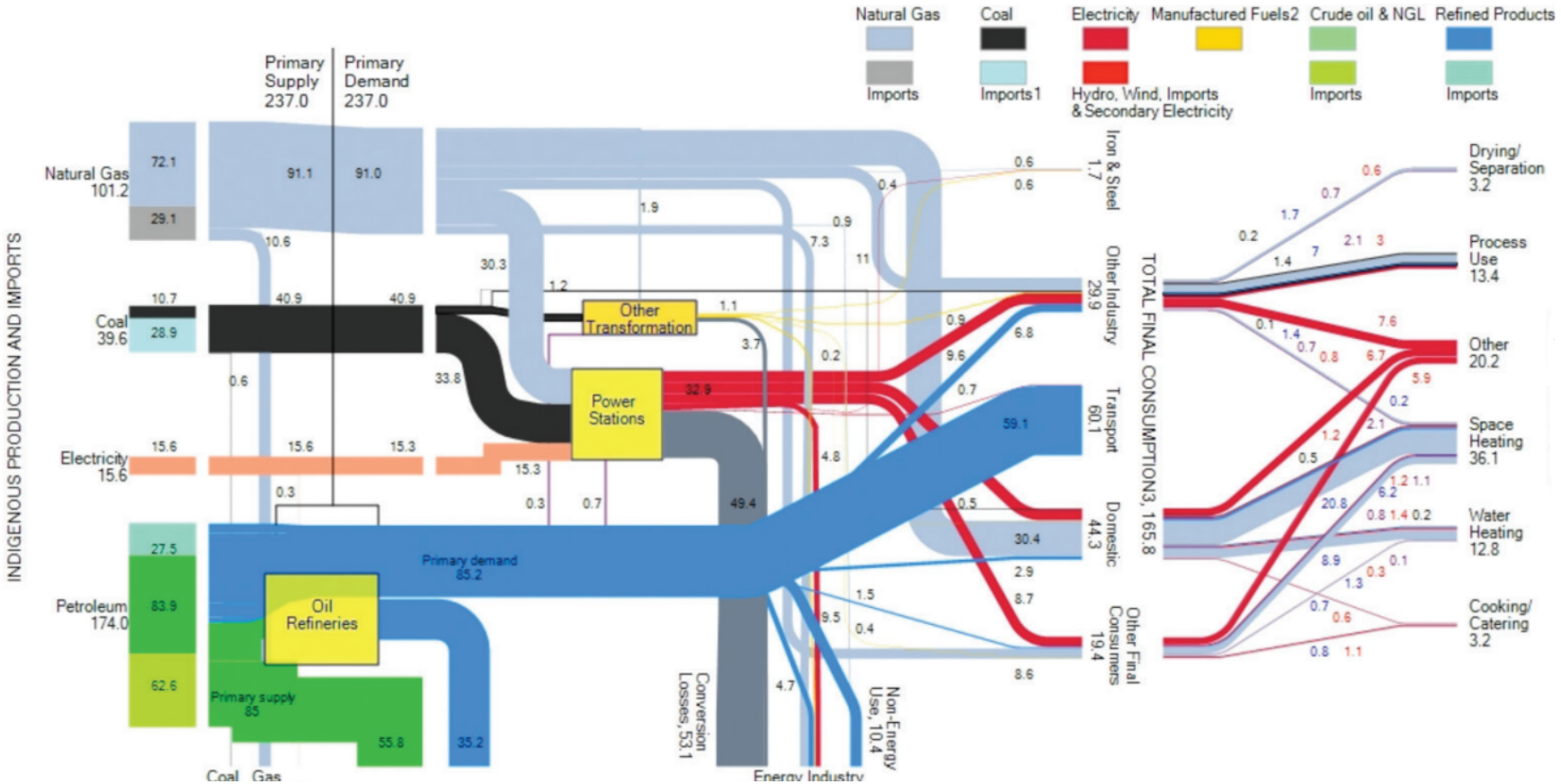

http://www.sankey-diagrams.com/uk-2050-energy-flow-sankey-diagram/

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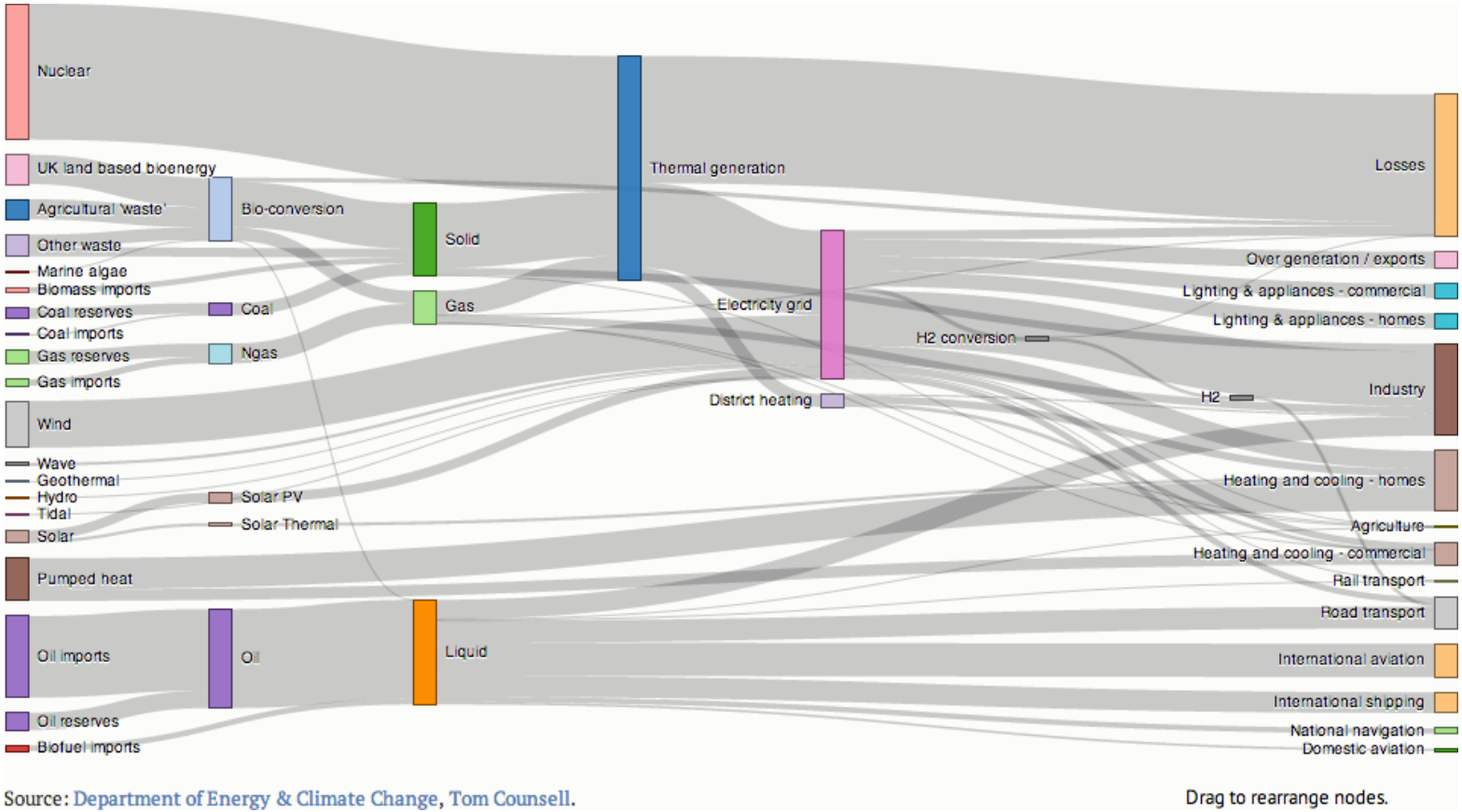

http://bost.ocks.org/mike/sankey/

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RESOURCES

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D3 Examples

- Proportional Symbol Map (no legend): http://bl.ocks.org/mbostock/4342045
- County Bubbles (with circle legend): http://bl.ocks.org/mbostock/9943478
- Unemployment Choropleth (no legend): http://bl.ocks.org/mbostock/5925375
- Kentucky Choropleth (with color legend): http://bl.ocks.org/mbostock/5144735
- Non-Contiguous Cartogram: http://bl.ocks.org/mbostock/4055908
- Hexbin Map: http://bl.ocks.org/mbostock/4330486
- Heatmap: http://bl.ocks.org/mbostock/6264239

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D3 Examples (Other)

- Zoom to Bounding Box II
  http://bl.ocks.org/mbostock/9656675
- TopoJSON Files
  http://bl.ocks.org/mbostock/4090846
- U.S. States TopoJSON Demo
  http://bl.ocks.org/mbostock/4090848

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QUESTIONS?

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