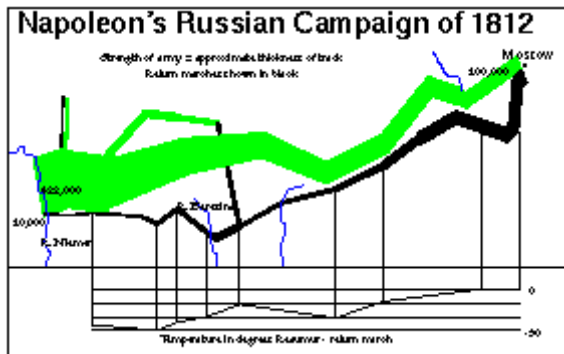
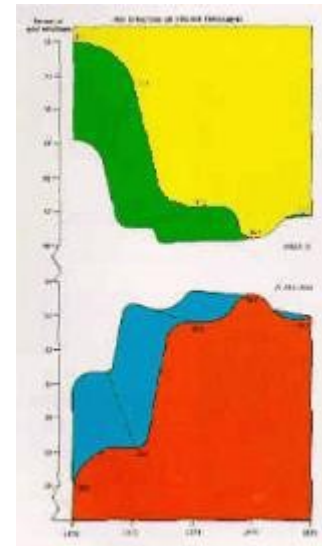


# The Visual Display of Quantitative Information



VS.



# Excellence!

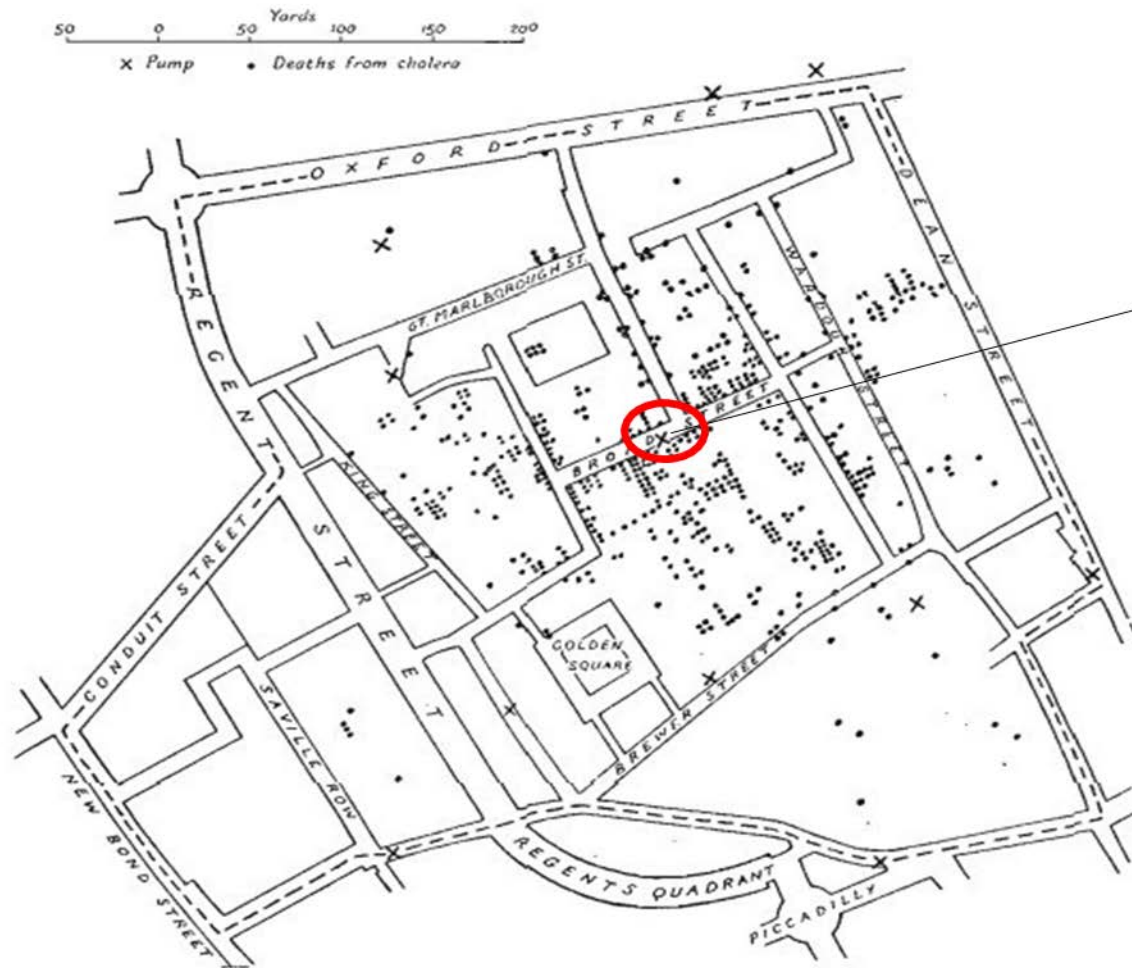
Excellence in statistical graphics consists of complex ideas communicated with:

- clarity,
- precision,
- efficiency.

# Graphical displays should:

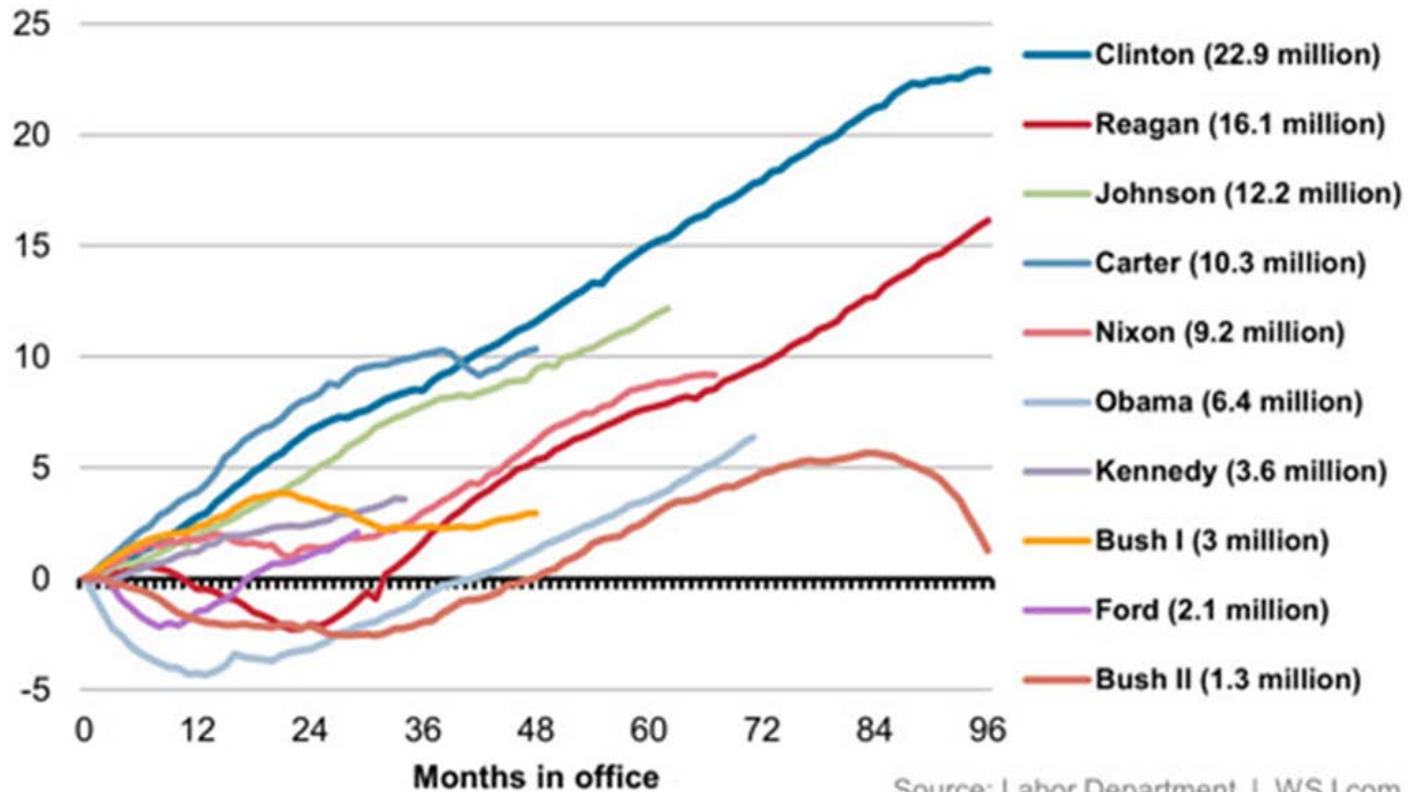
- Show the data
- Make the viewer think about the substance (not the methods/design/technology)
- Avoid distorting the data
- Present many numbers in a small space
- Make large datasets coherent
- Encourage the eye to compare different pieces of data
- Reveal data structure at different levels
- Serve a clear purpose: description, exploration, tabulation, decoration

## Deaths from cholera in central London, 1854



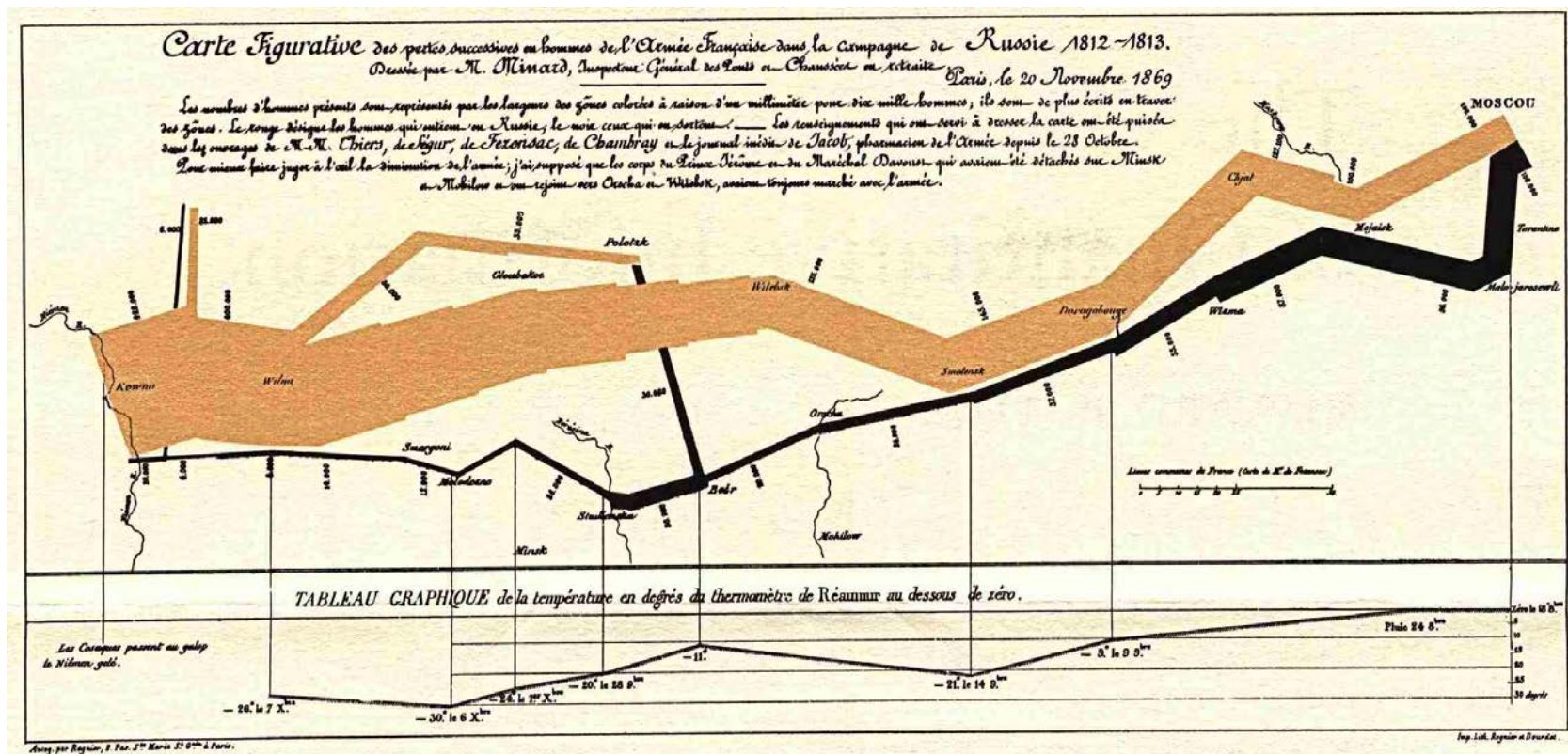
# Job Gains by President

Millions of jobs added since each president took office



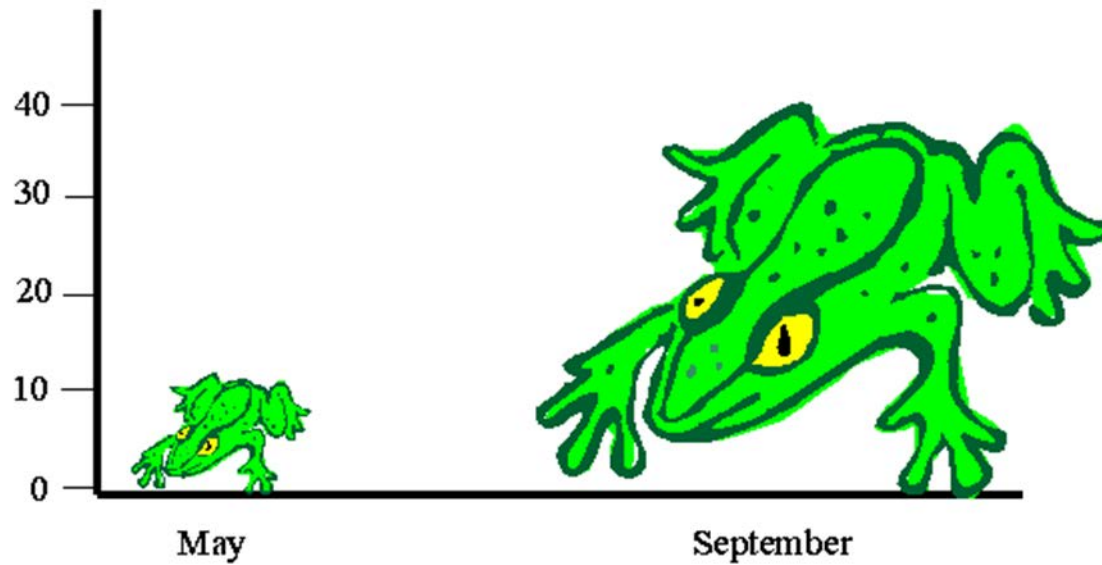
<http://blogs.wsj.com/economics/2015/01/19/the-state-of-the-economy-in-eight-charts/?mod=e2tw>  
Employment changes, in millions of jobs, over the months of recent Presidencies.

# The Fate of Napoleon's Army in Russia (1812)



Since the graphic is in French, please note it was drawn in 1861. It is a time series moving left to right and then right to left. The width of the brown band indicates the size of the army (422,000 men) starting at the Polish-Russian border and at intermediate points along the way to Moscow. The black band represents the size of the army in retreat from Moscow. If the chart is overlaid on a map, it shows the routes taken. The lower graph shows the temperature at various points in the retreat. The comparison of the widths of the brown and black bands at the far left reveals the shrinkage in the size of the army.

## Number of Adult Frogs in South Pond

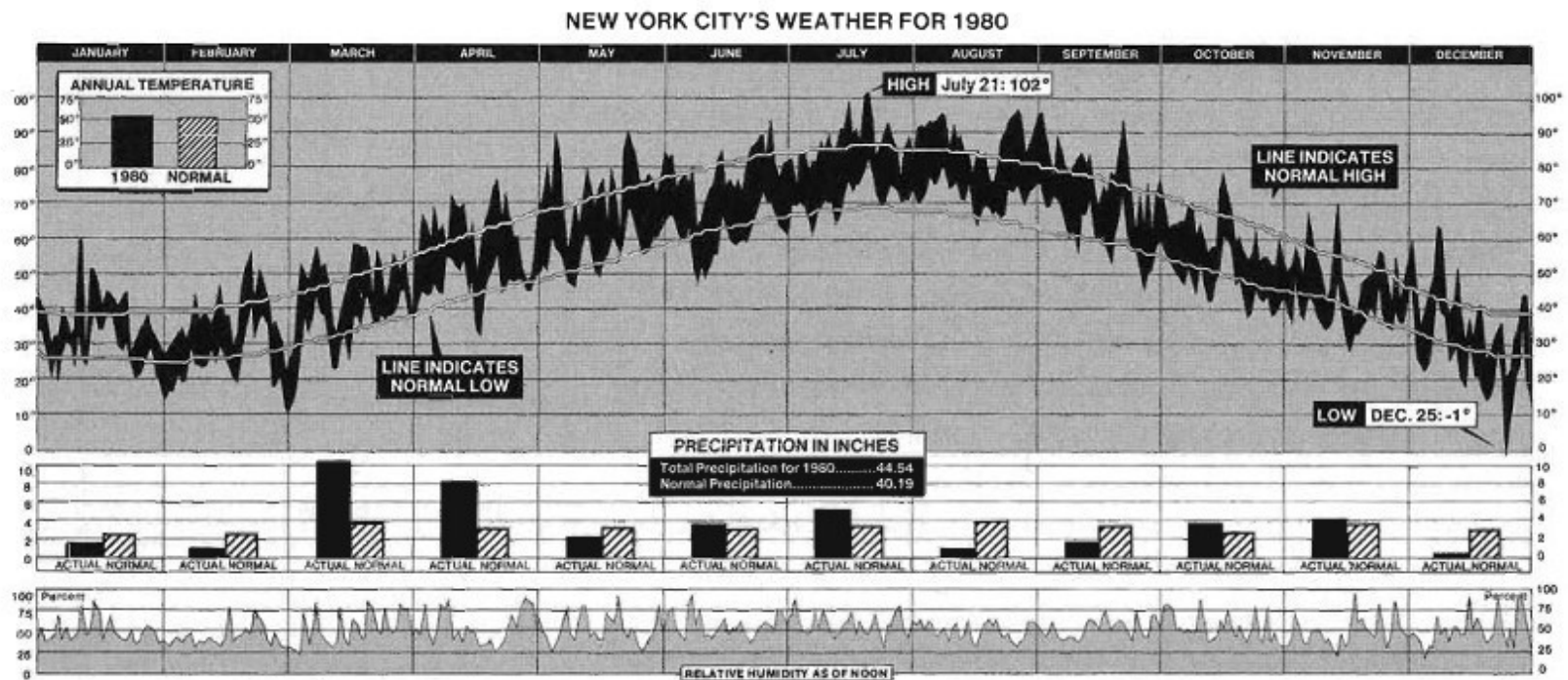


<http://www.physics.csbsju.edu/stats/display.html>

Comparative count of frogs observed in a particular pond in May and September.



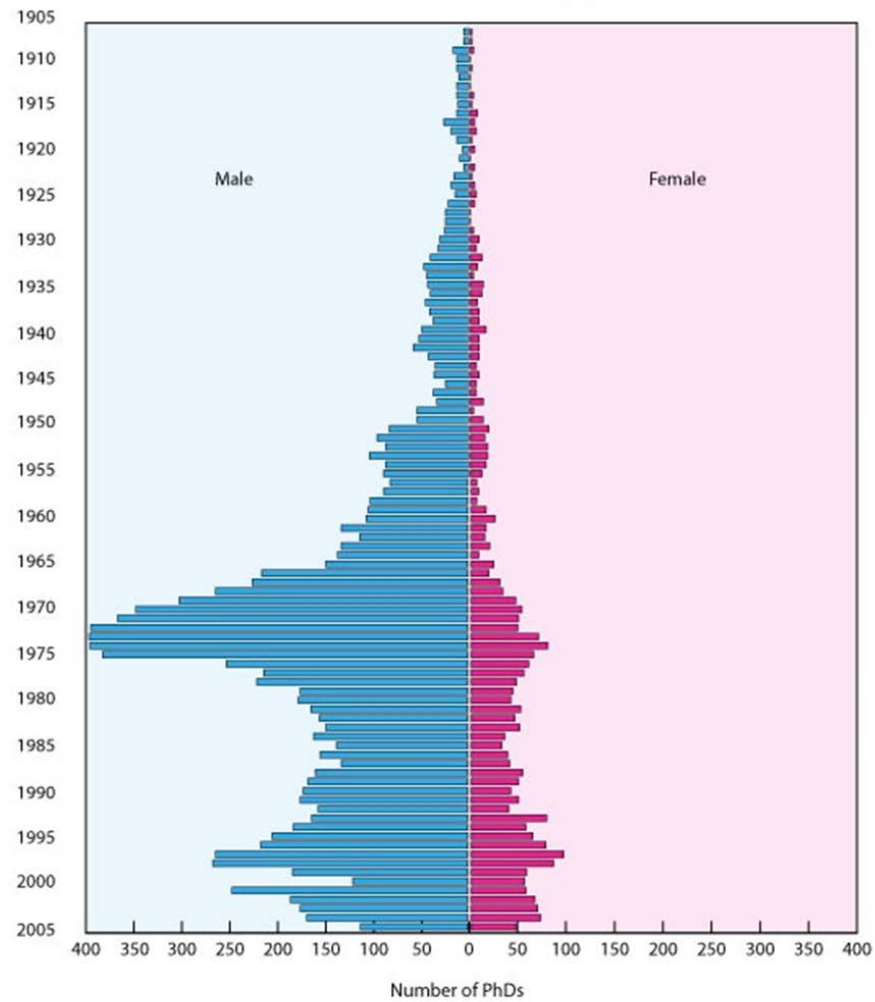
# New York City weather



*New York Times*, January 11, 1981, p. 32.



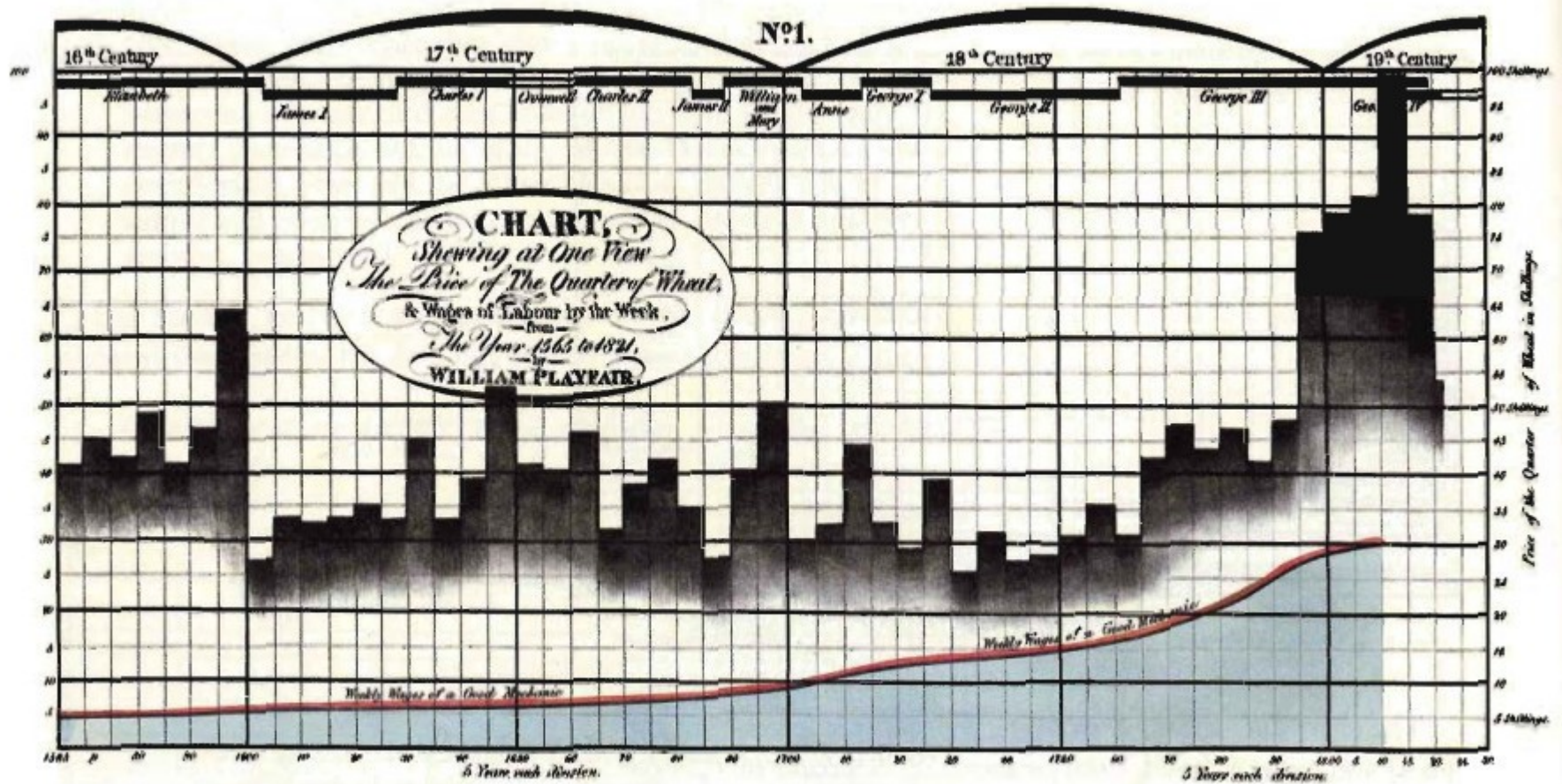
### North American PhDs in Philosophy, 1905–2005



<http://chrisalensula.org/project/the-demography-of-philosophy/>

Comparative number of Philosophy PhDs awarded, per year, to males and females.

# Wheat prices and wages in the UK



## *Economic Confidence Index Components -- Weekly Averages From Jan. 2014*

Latest results for week ending Jan. 18, 2015

■ Current conditions    ■ Economic outlook



Gallup Daily tracking

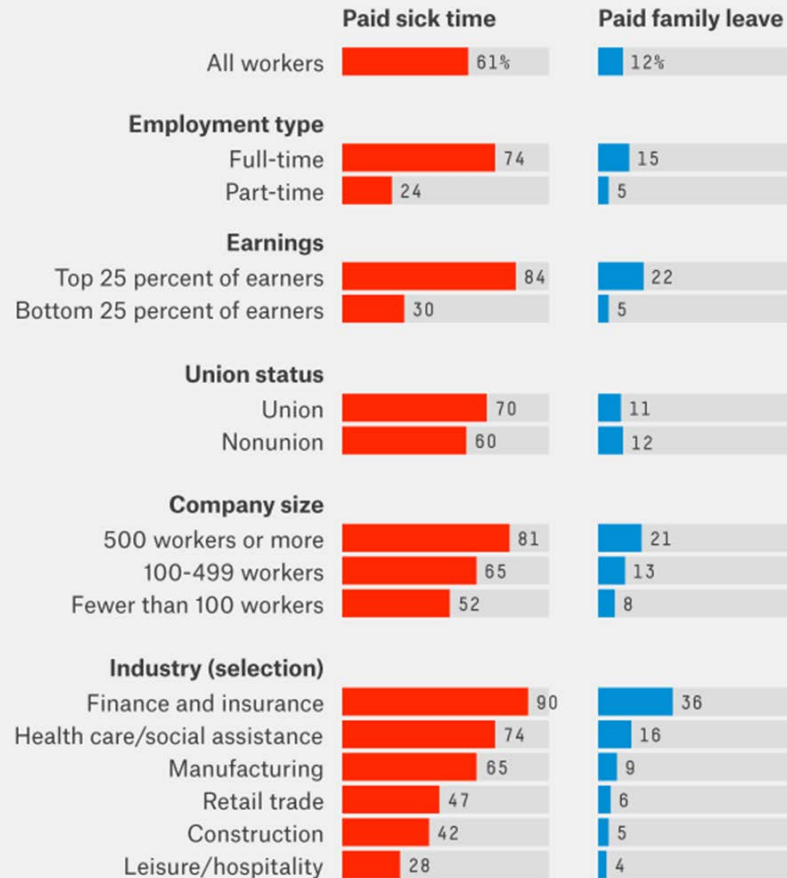
GALLUP®

[http://www.gallup.com/poll/181193/economic-confidence-index-positive-barely.aspx?utm\\_source=All](http://www.gallup.com/poll/181193/economic-confidence-index-positive-barely.aspx?utm_source=All)

Comparison of Economic Confidence Index "current conditions" and "economic outlook." Interesting to note some periods where movement is synchronous; others where it is not.

## Who Gets Paid Time Off?

Percentage of U.S. private-sector workers with paid leave



FIVETHIRTYEIGHT

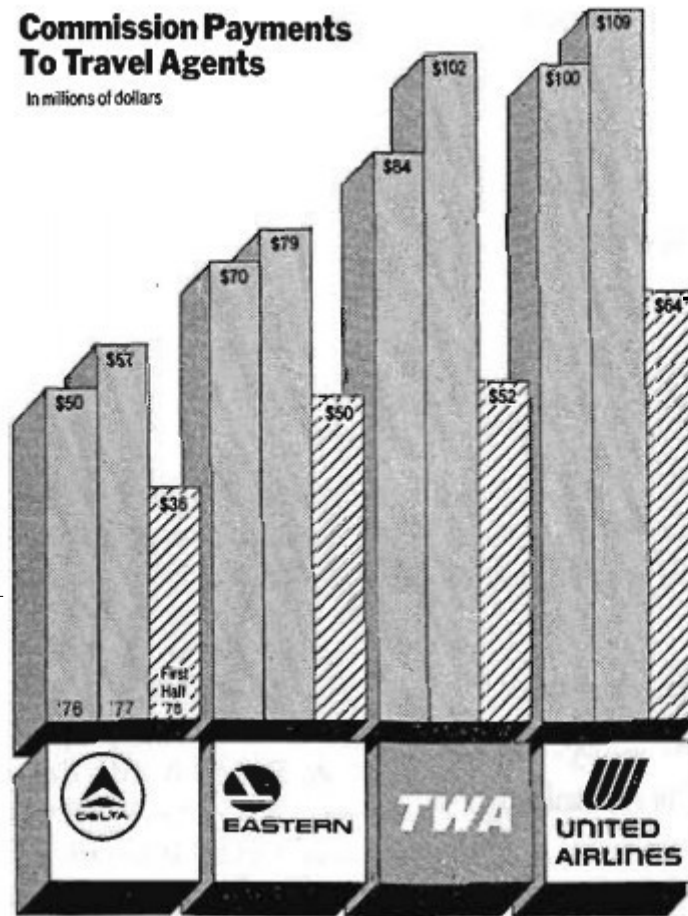
SOURCE: BUREAU OF LABOR STATISTICS

<http://fivethirtyeight.com/datalab/few-new-parents-get-paid-time-off/>

Percentage of US private-sector workers receiving sick time and family leave across employment demographics.

### Commission Payments To Travel Agents

In millions of dollars



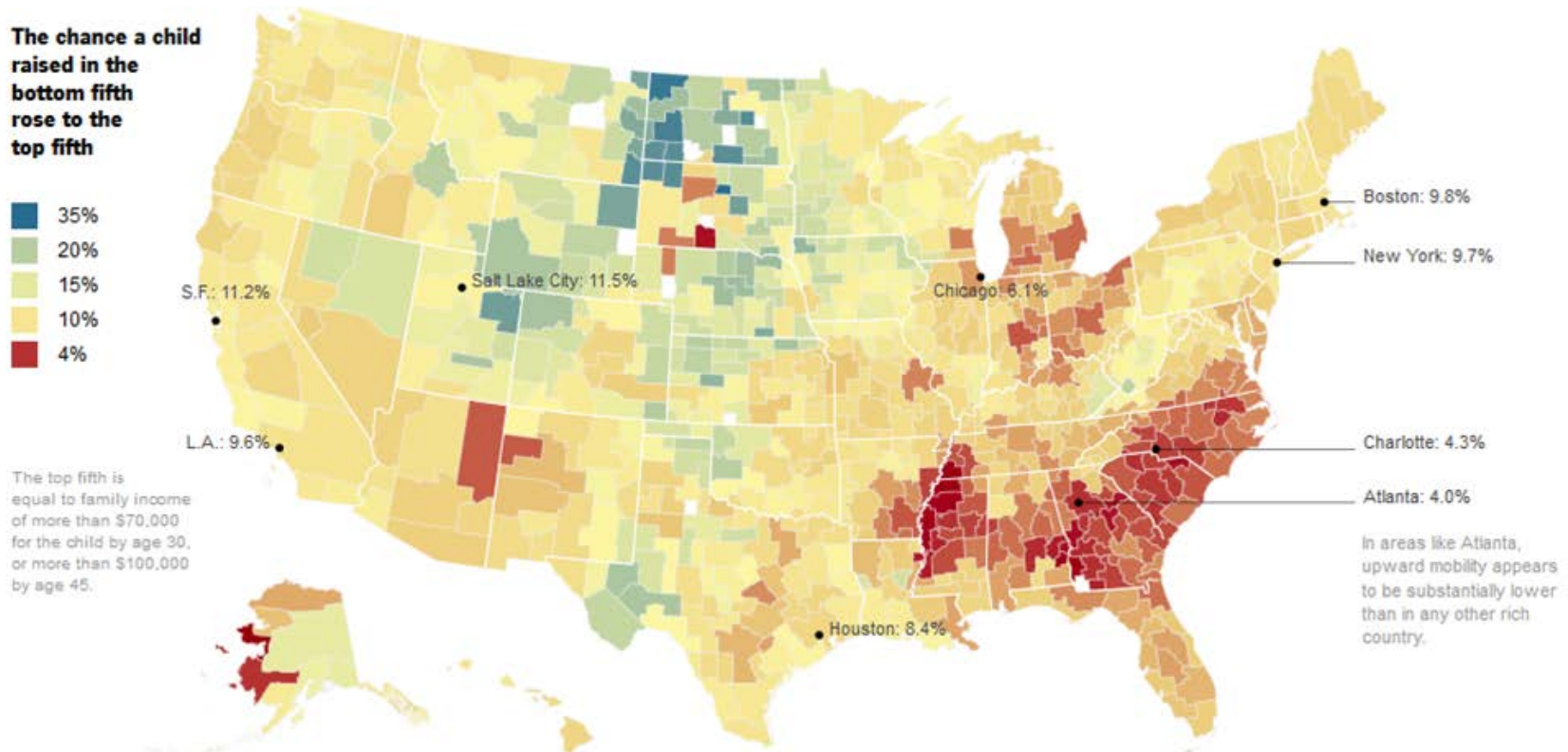
3D = no extra  
information

Latest results from  
only 6 months



# In Climbing Income Ladder, Location Matters

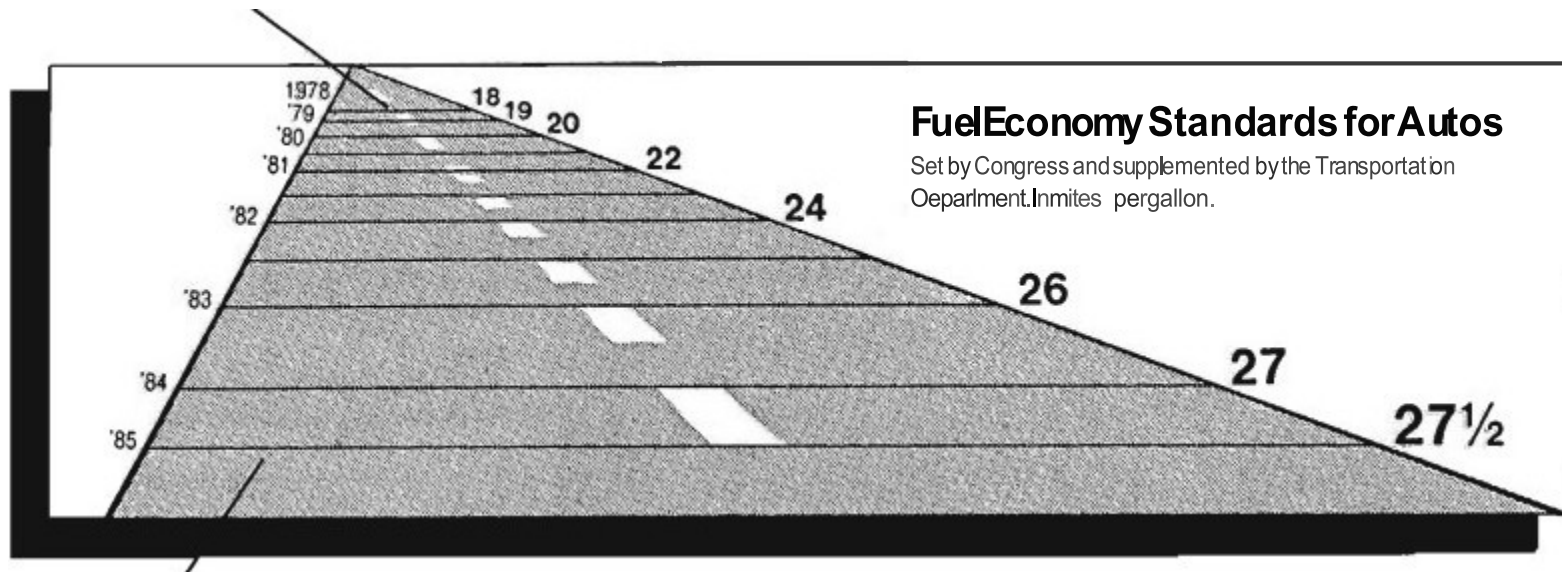
*A study finds the odds of rising to another income level are notably low in certain cities, like Atlanta and Charlotte, and much higher in New York and Boston.*



[http://www.nytimes.com/2013/07/22/business/in-climbing-income-ladder-location-matters.html?\\_r=1&](http://www.nytimes.com/2013/07/22/business/in-climbing-income-ladder-location-matters.html?_r=1&)

Percent chance a child raised in the bottom fifth rose to the top fifth, based on area. Hovering over a defined area gives the area name and percent chance.

This line, representing 18 miles per gallon in 1978, is 0.6 inches long.

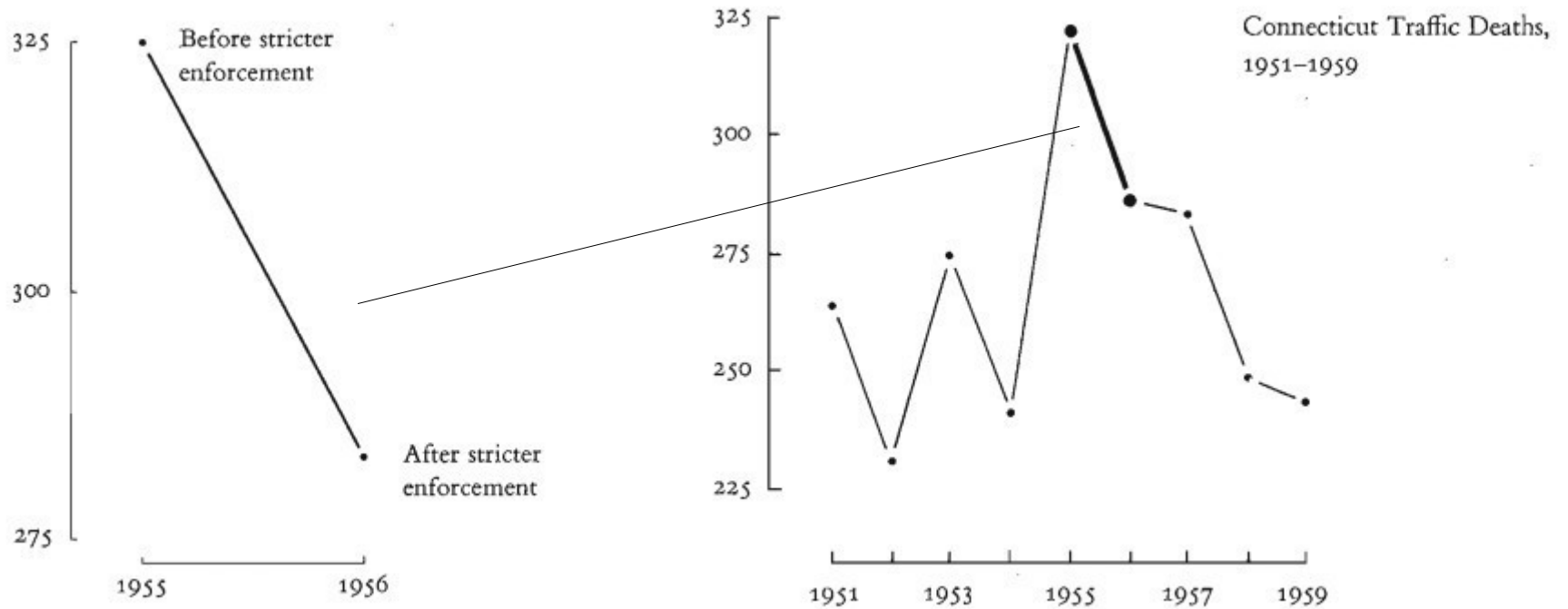


REQUIRED FUEL ECONOMY STANDARDS:

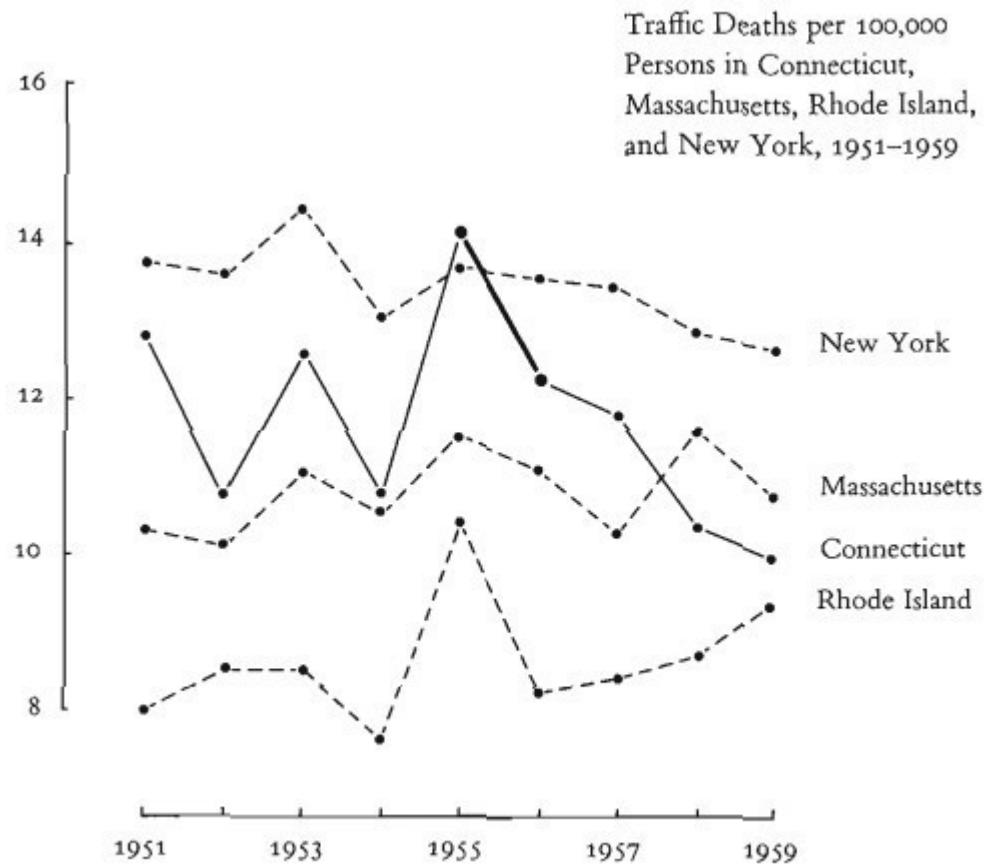
This line, representing 27.5 miles per gallon in 1985, is 5.3 inches long.



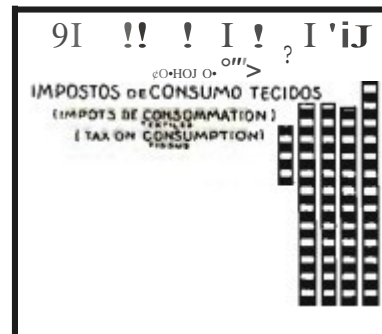
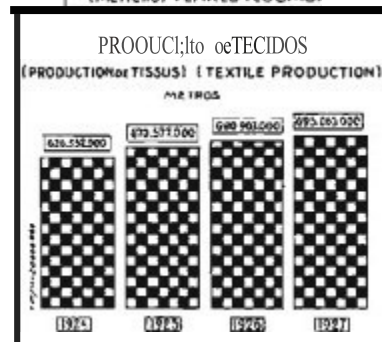
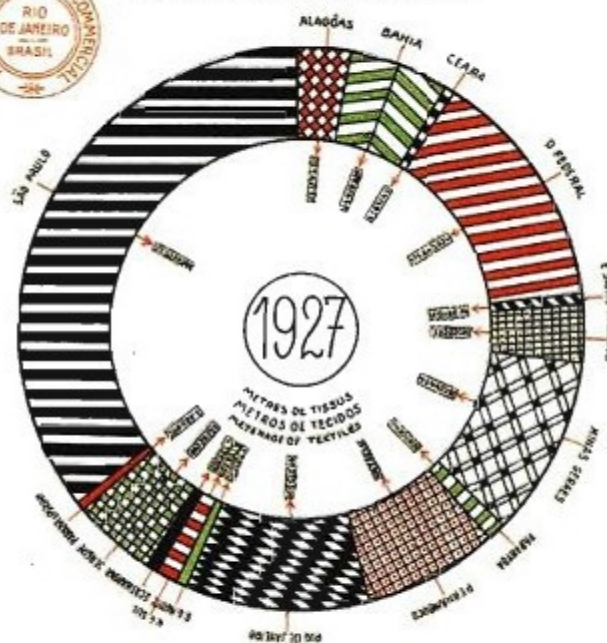
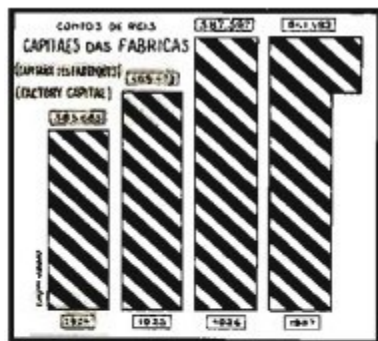
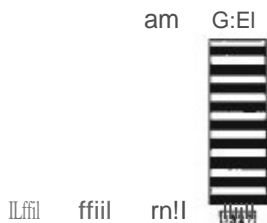
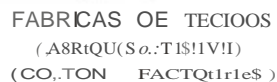
# Traffic deaths



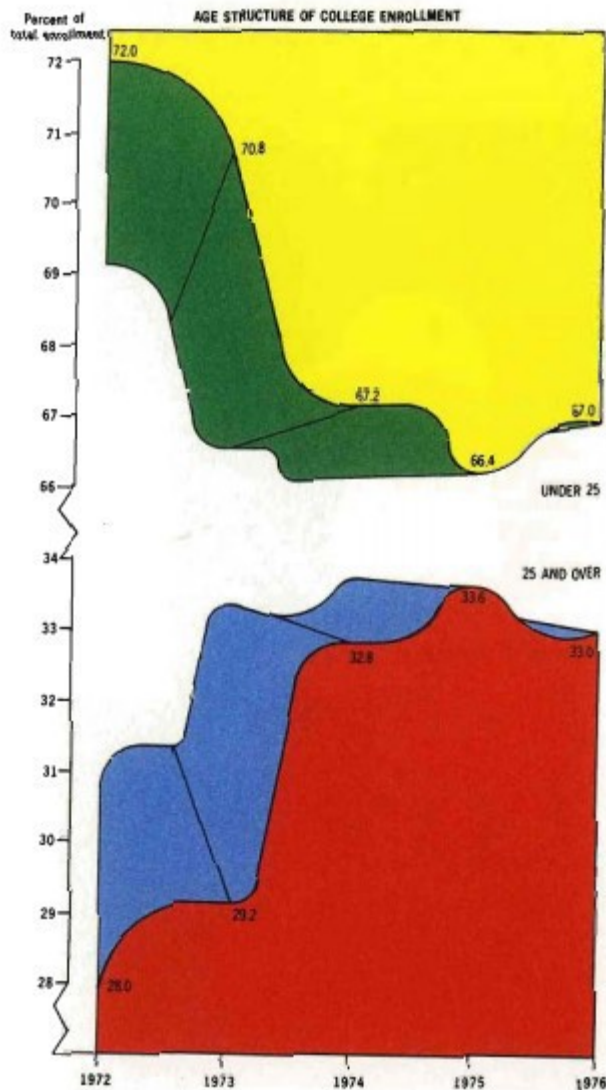
# Traffic deaths



**TECIDOS De ALGODAO**  
(COTONNADES) (COTTON TEXTILE5)



Tufte (1983, p.118) says, *"This may well be the worst graphic ever to find its way into print."*



Substance? NO!

ONLY 5 NUMBERS!!

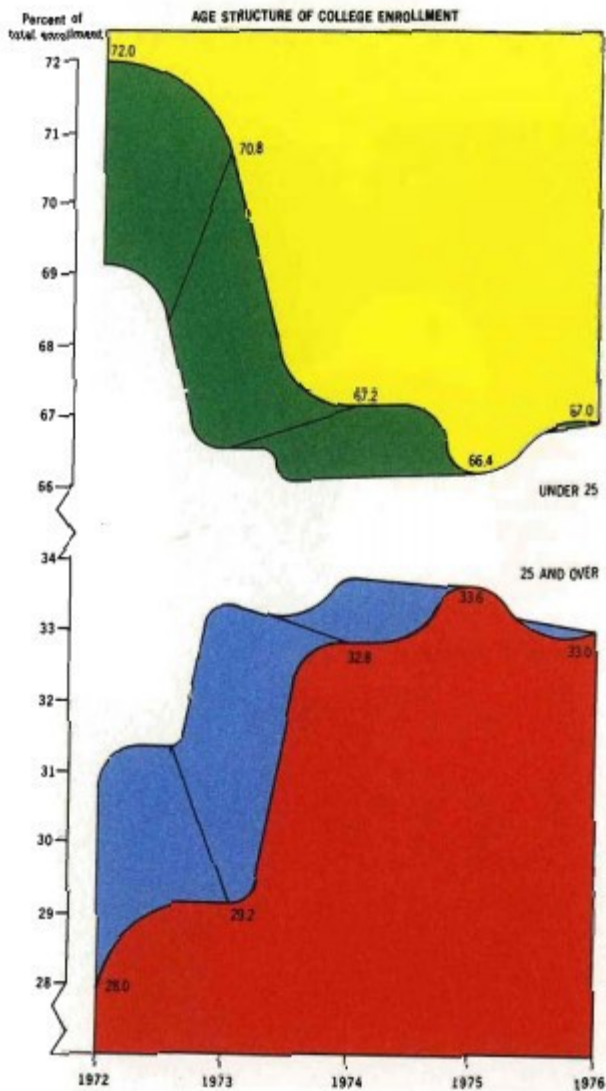
Colours.. YES

3D effects... YES

Disguised redundancy...YES:

mirror imaging  
curved lines

Tufte (1983, p.118) says, "This may well be the worst graphic ever to find its way into print."



### AGE STRUCTURE OF COLLEGE ENROLLMENT

Percent of Total Enrollment 25 and Over

1972	.....●	28.0
1973	.....●	29.2
1974	.....●	32.8
1975	.....●	33.6
1976	.....●	33.0

# The Most Charitable Nations in the World

% of the population who participated in giving behavior during month prior to interview\*



\* based on nationally representative surveys conducted in 2013

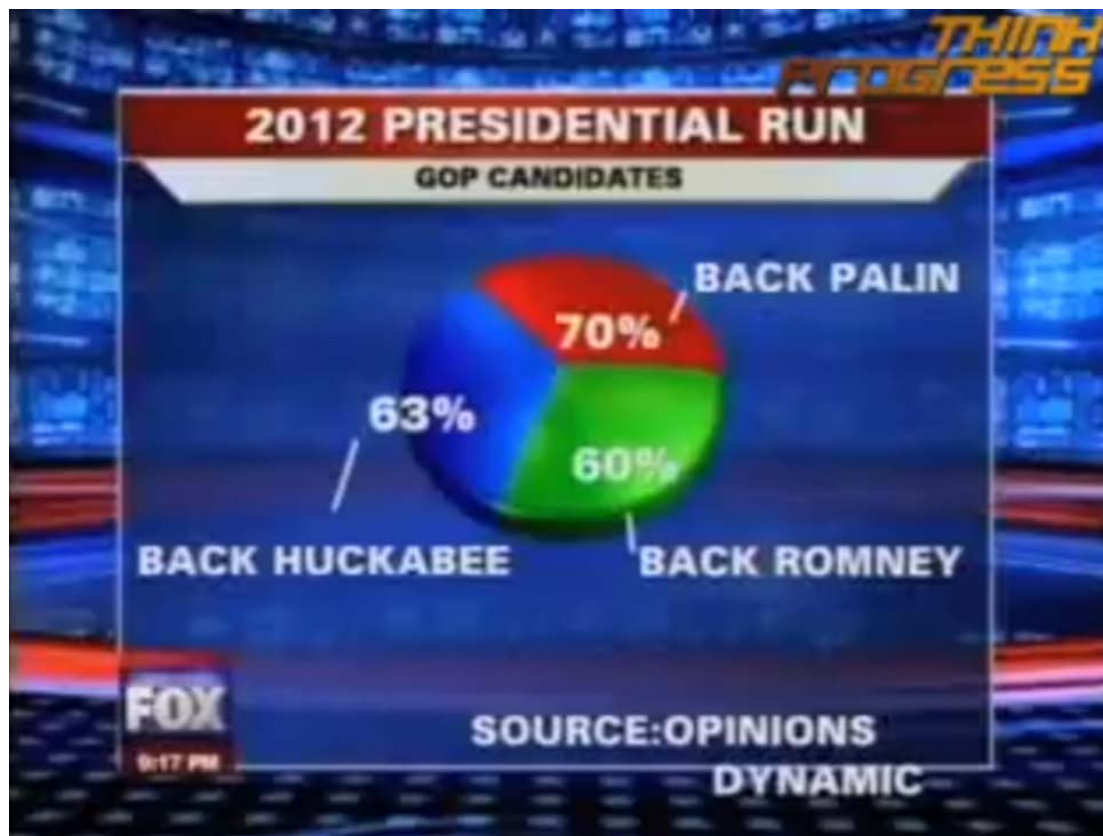
Sources: CAF, Gallup



**Mashable** **statista** 

<http://www.statista.com/chart/3063/most-charitable-nations/>

Percent of nation population who 1) donated money to a charity, 2) did volunteer work or 3) helped a stranger.



<http://flowingdata.com/2009/11/26/fox-news-makes-the-best-pie-chart-ever/>

Pie chart of support for 2012 GOP Presidential candidates.



**A**pprehension:

Ability to correctly perceive relations among variables.

*Does the graph maximize apprehension of the relations among variables?*

**C**larity:

Ability to visually distinguish all the elements of a graph.

*Are the most important elements or relations visually most prominent?*

**C**onsistency:

Ability to interpret a graph based on similarity to previous graphs.

*Are the elements, symbol shapes and colors consistent with their use in previous graphs*

**E**fficiency:

Ability to portray a possibly complex relation in as simple a way as possible.

*Are the elements of the graph economically used?*

*Is the graph easy to interpret?*

**N**ecessity:

The need for the graph, and the graphical elements.

*Is the graph a more useful way to represent the data than alternatives (table, text)?*

*Are all the graph elements necessary to convey the relations?*

**T**ruthfulness:

Ability to determine the true value represented by any graphical element by its magnitude relative to the implicit or explicit scale.

*Are the graph elements accurately positioned and scaled?*