

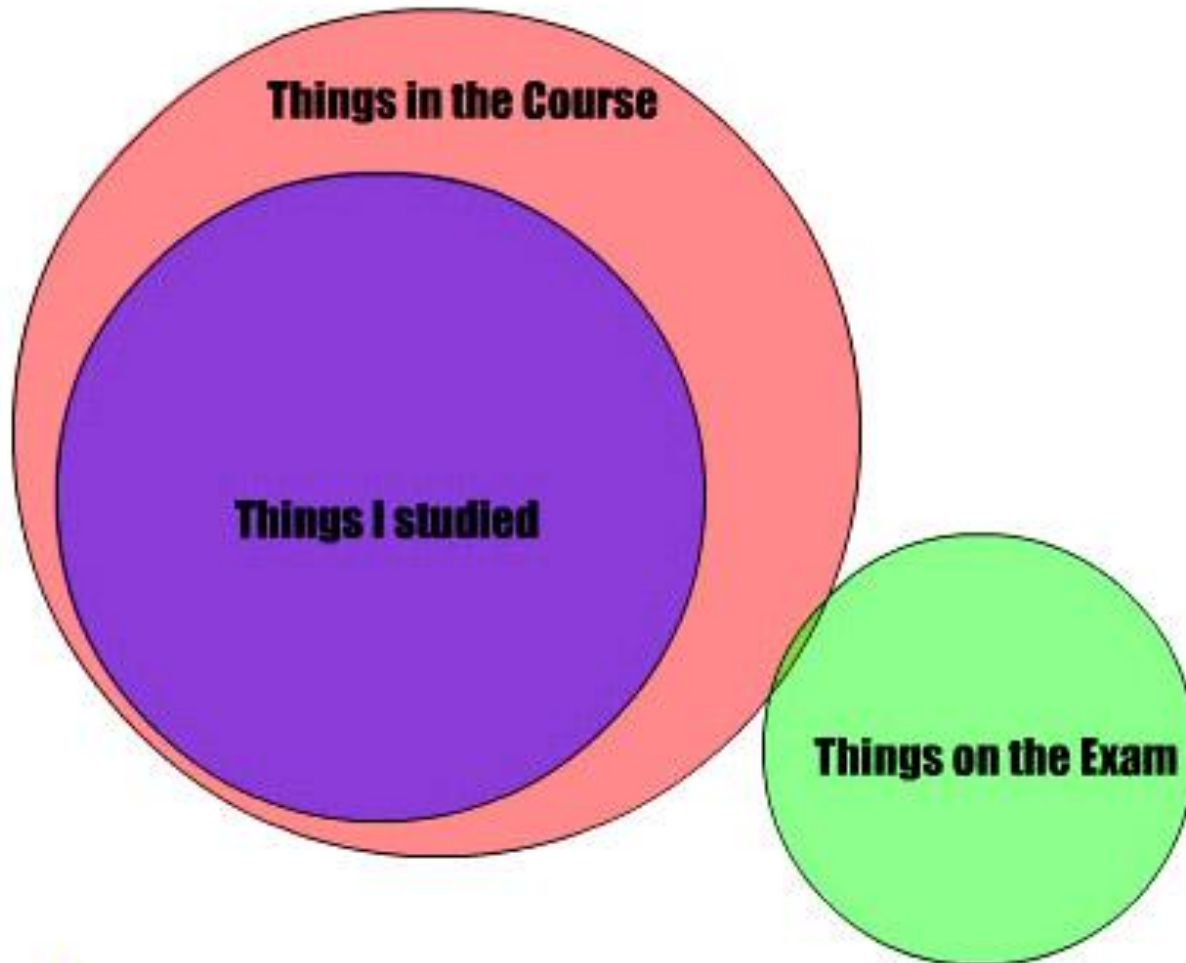


Visualization

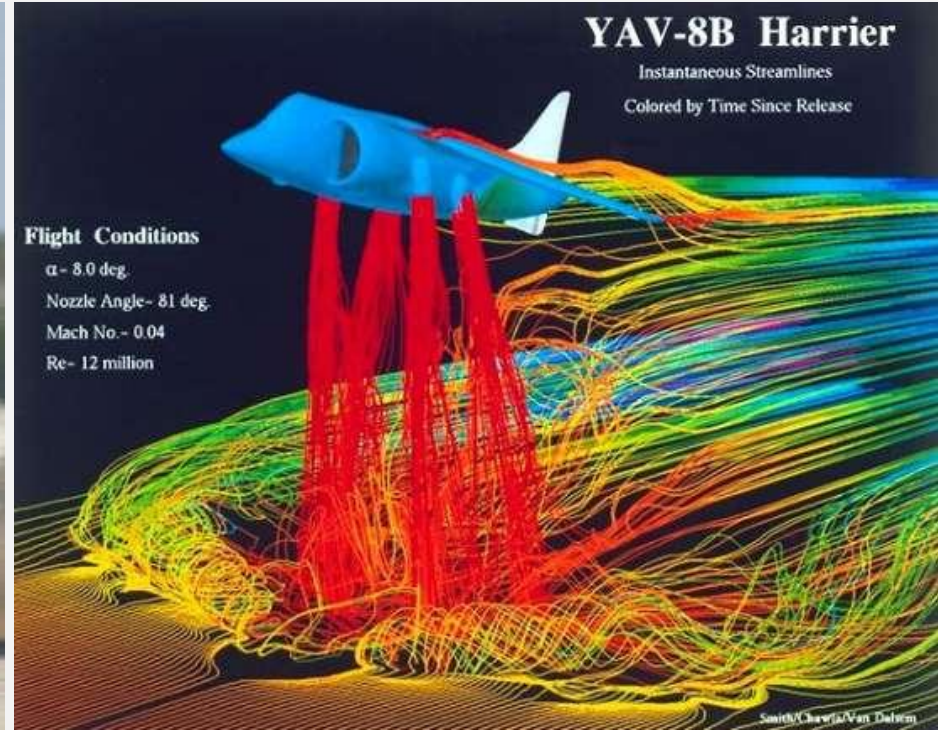
What's the point at all?



Final Exams



What is visualization?



Ordinary" computer graphics

- Show things we know
- Most realistic way

Visualization

- Show things we don't know (yet)
- Most understandable way

Also called *visualization*



- Rendering of architectural models
- Not our topic today



So what is visualization?



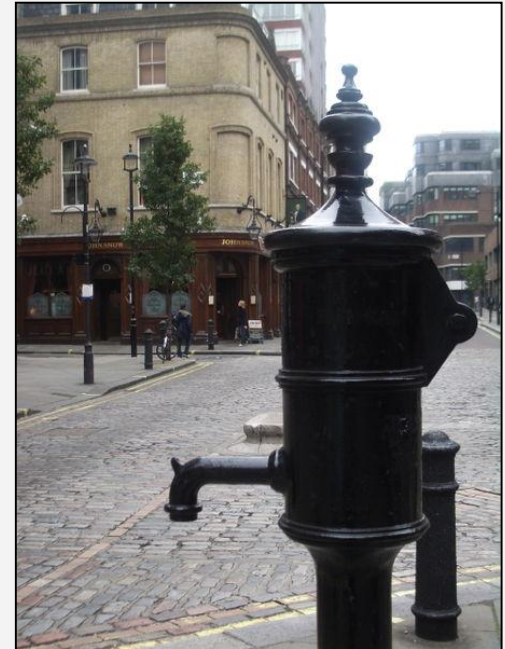
- Giving to data a graphical form that is different from their original form.
- Often the data has no geometry / graphical form itself
- Sometimes it does and we want a different form

- That is visualization

Success story



Dr. John Snow (1813-1858)



Success story



Benefits of visualization



John Snow Pub (near former Broad Street)

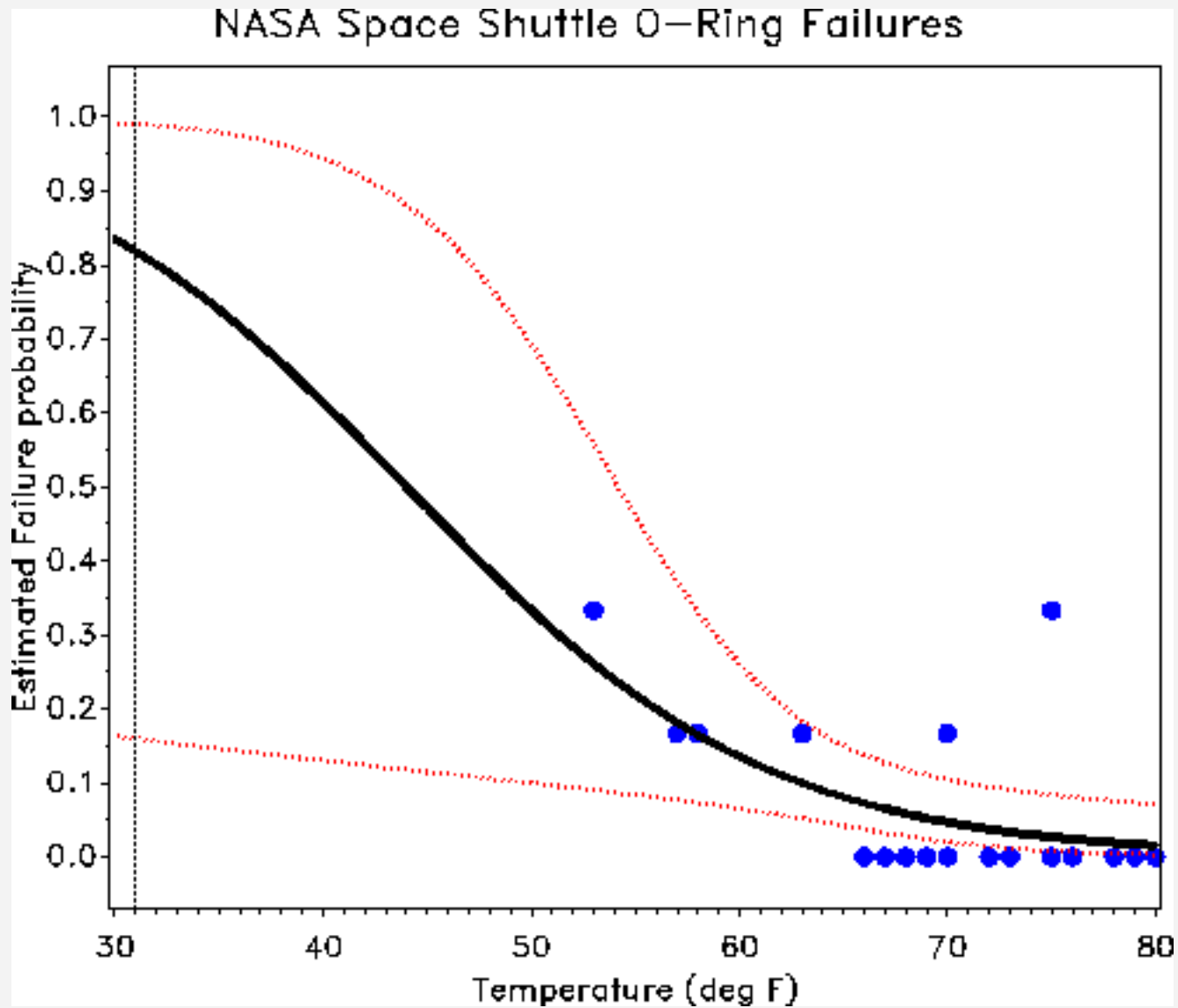
Failure story



Challenger space shuttle (28/01/1986)



O-Ring failure probability

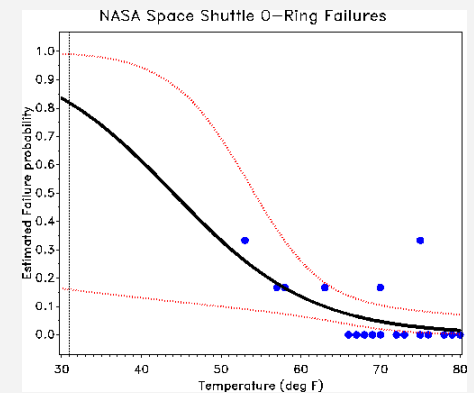
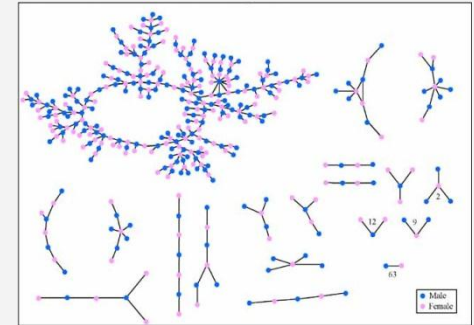


Challenger crash



Purposes of visualization

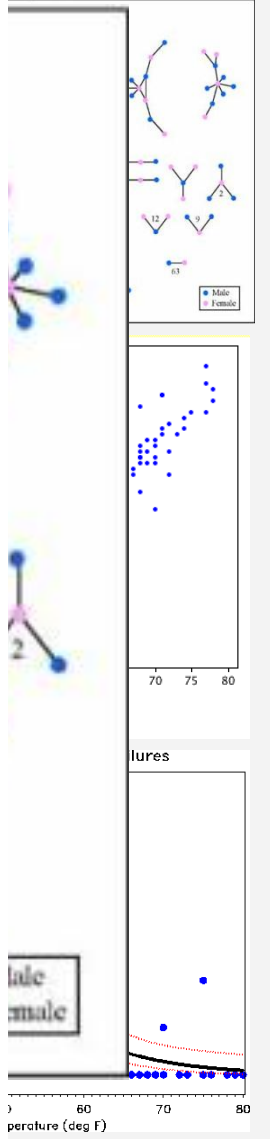
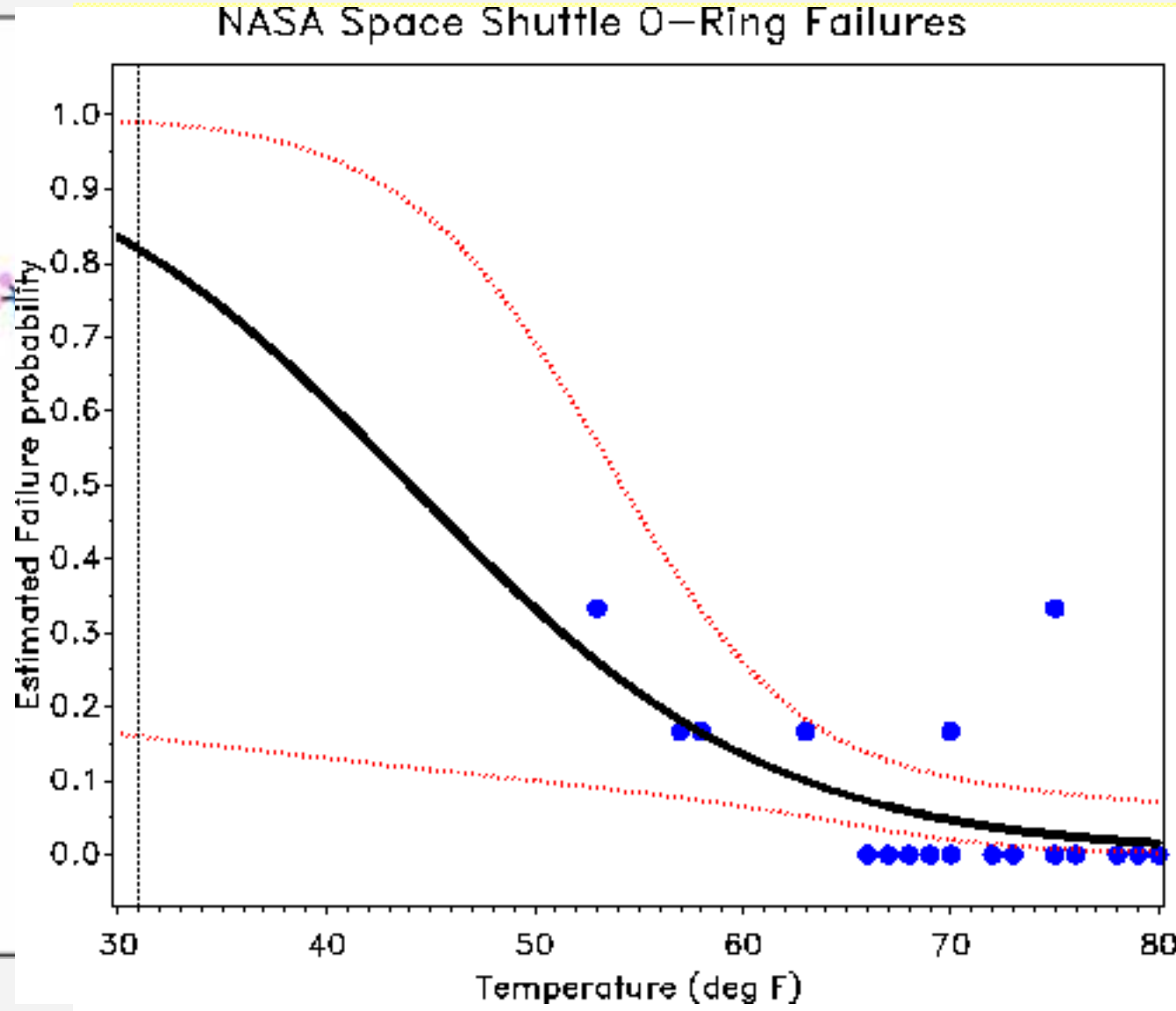
- Exploration
 - “Discover the unexpected”
- Confirmation
 - “Detect the expected”
- Presentation
 - Communicate knowledge



Purposes of visualization

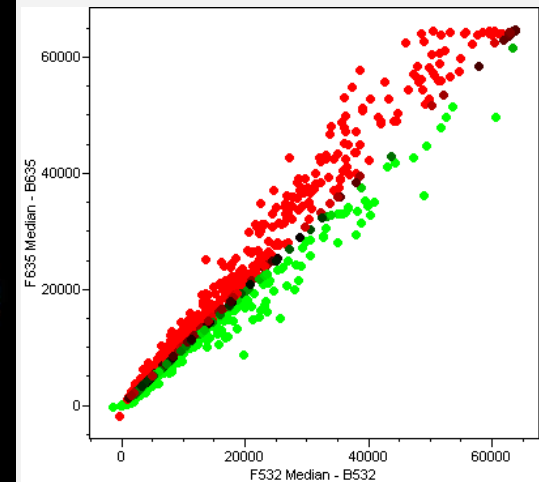
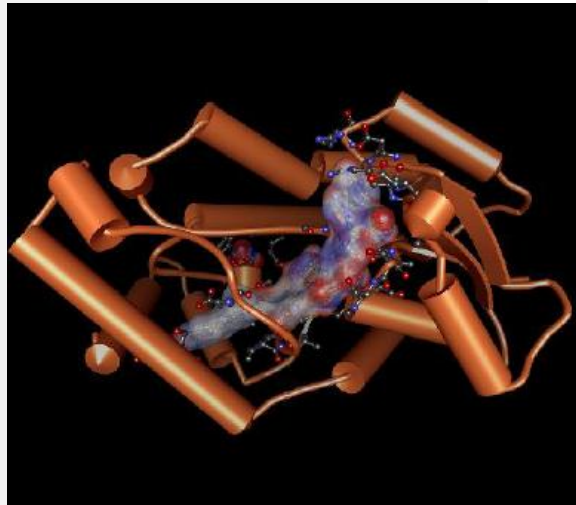
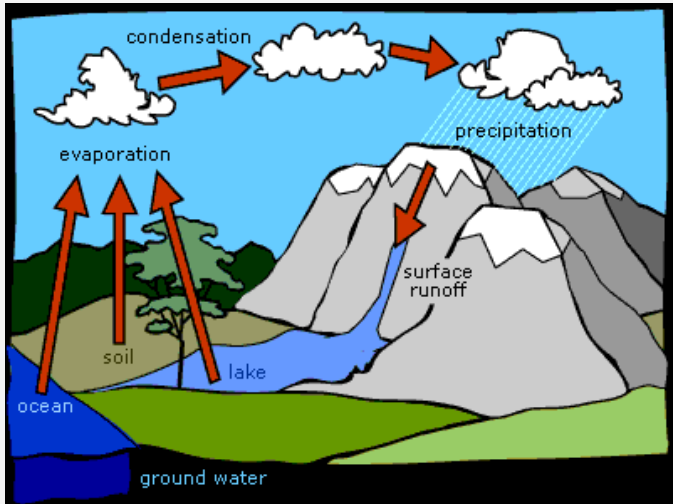
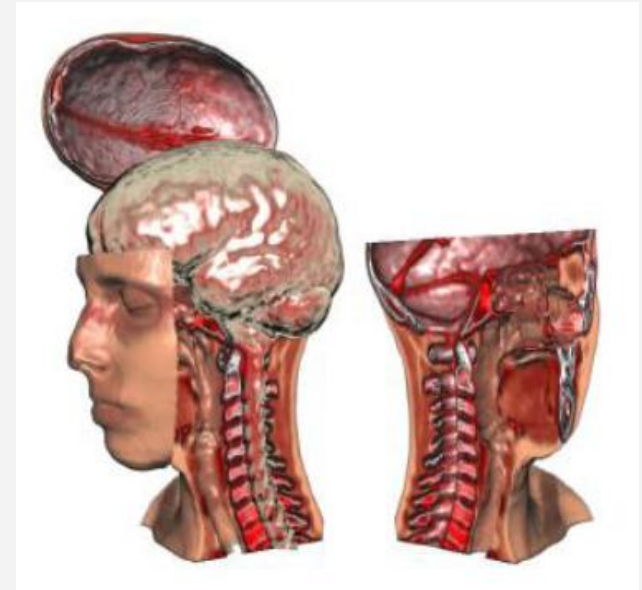


- Ex
- Co
- Pr



Types of visualization

- Medical visualization
- Scientific visualization
- Information visualization
- *Info graphics*



Some basic visual attributes



- Length
- Area, Volume
- Color
- Angle

- Connectivity
- Hierarchy

Length

- Can't perceive absolute value
 - only relative
- Compare to seen items
- Compare to scale



Area, volume



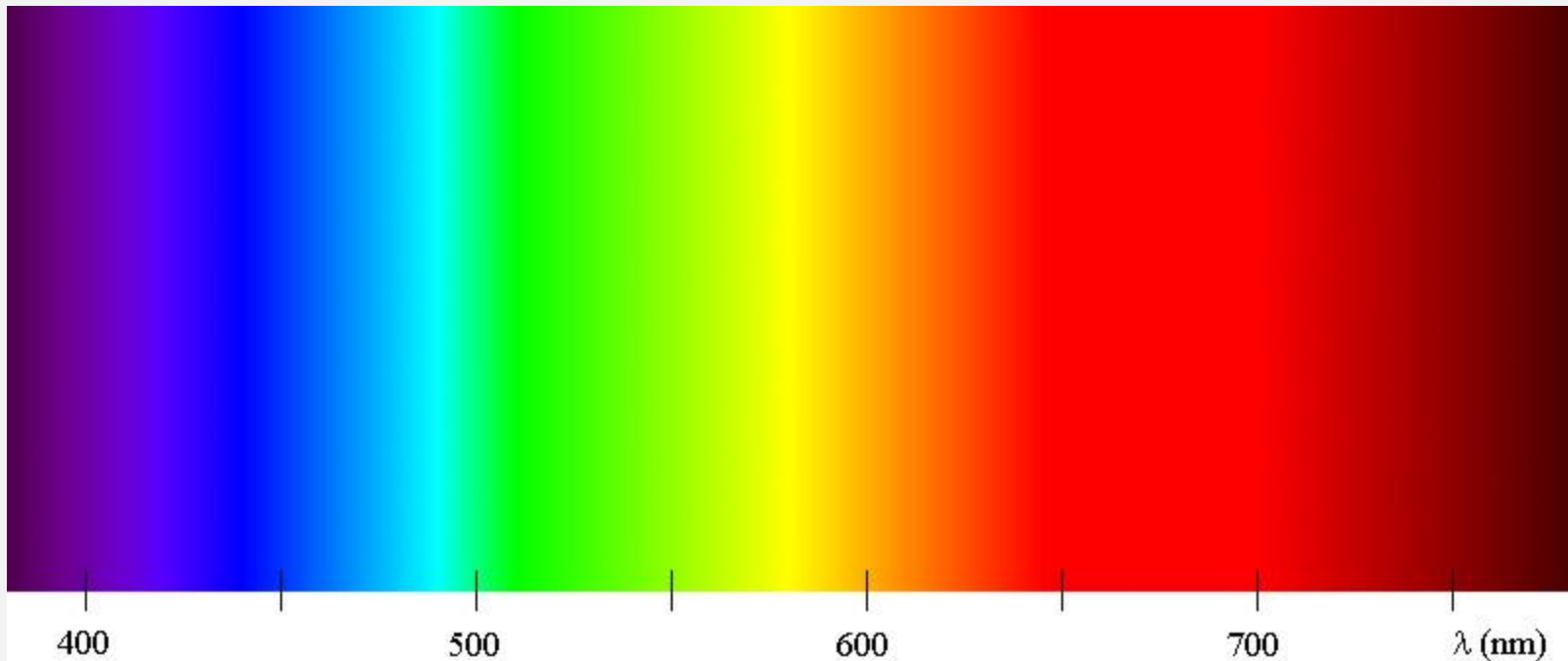
- Perceived as quadratic (x^2) - area
cubic (x^3) – volume
- Advantage when displaying very wide range of values (e.g. 1:100:100000)



Color in visualization



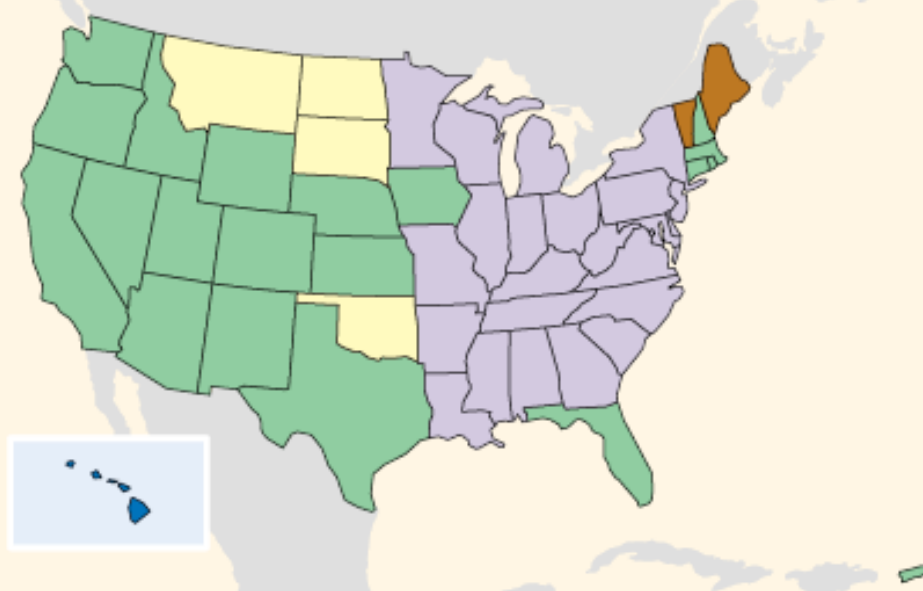
- Visible light = infinite number of colors
- Monitor = ~millions of colors
- Our perception = ?



Colors for categories

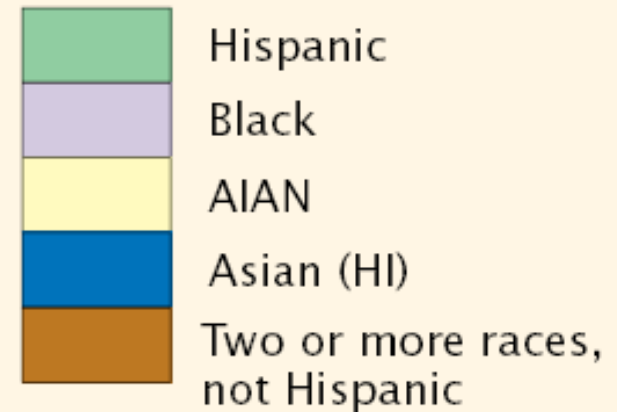


- Category distinction
 - Limited number (<10 preattentively)



Minority group with
highest percent of
state population

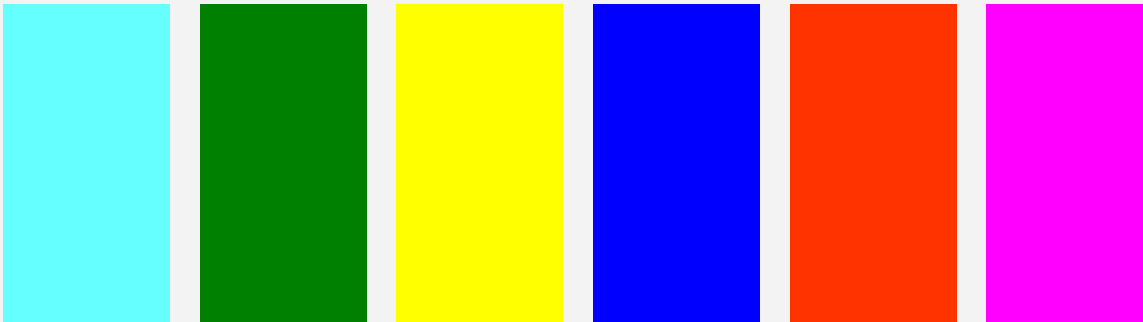
Excludes White, not Hispanic



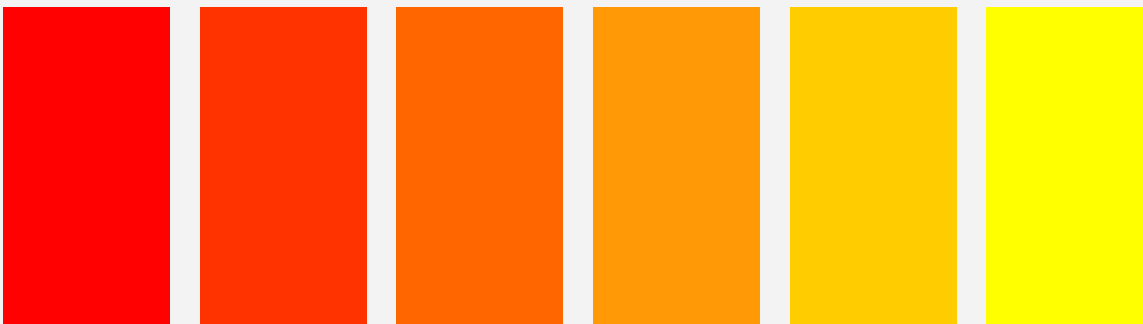
Colors for sequential values



- Categorical colors



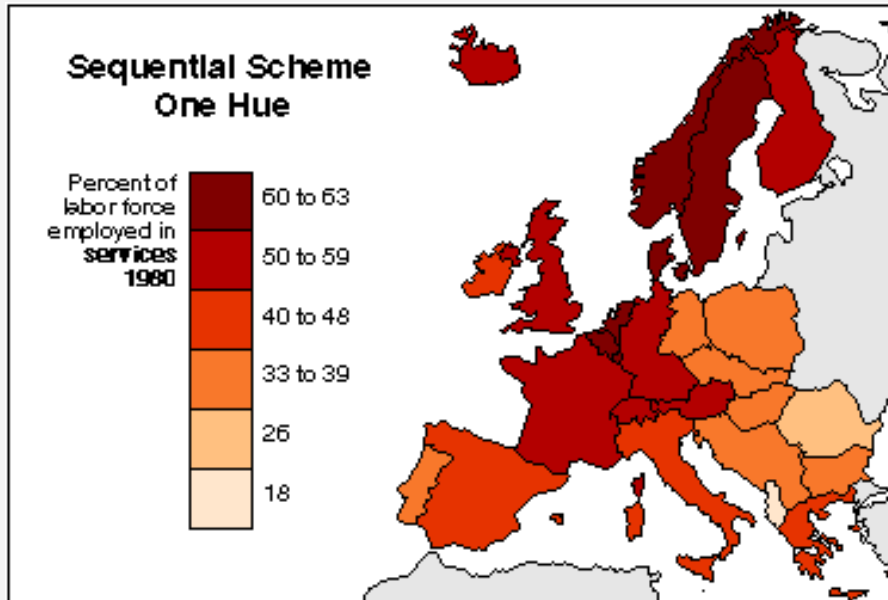
- Sequential colors



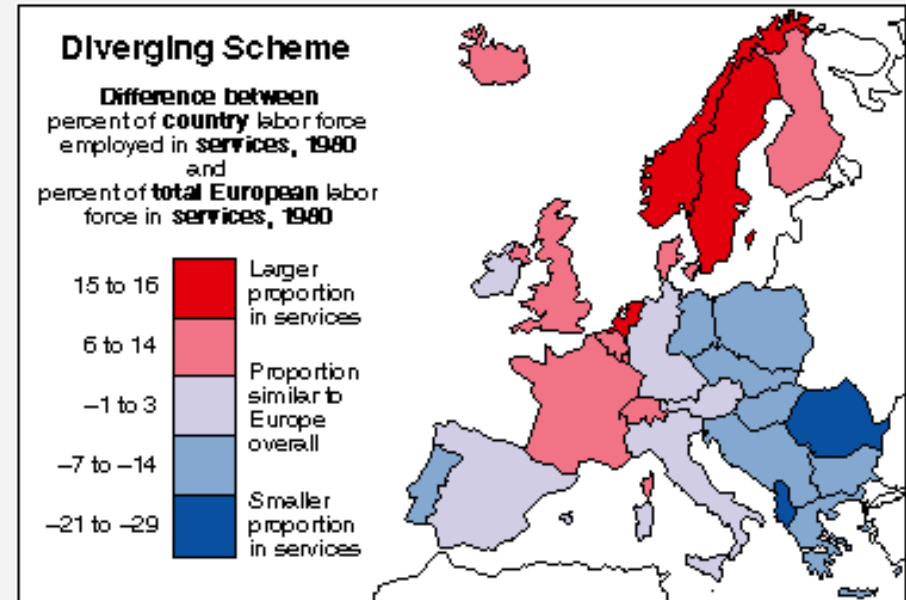
Sequential vs. diverging



- Ordinal rather than categorical values



sequential



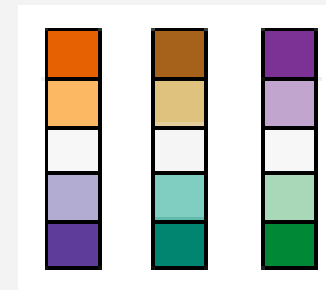
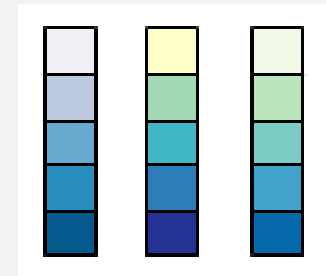
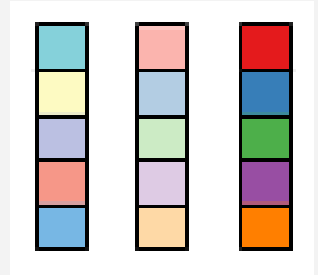
diverging

- Only few distinct levels.
Continuous values will not be read properly.

Color scales



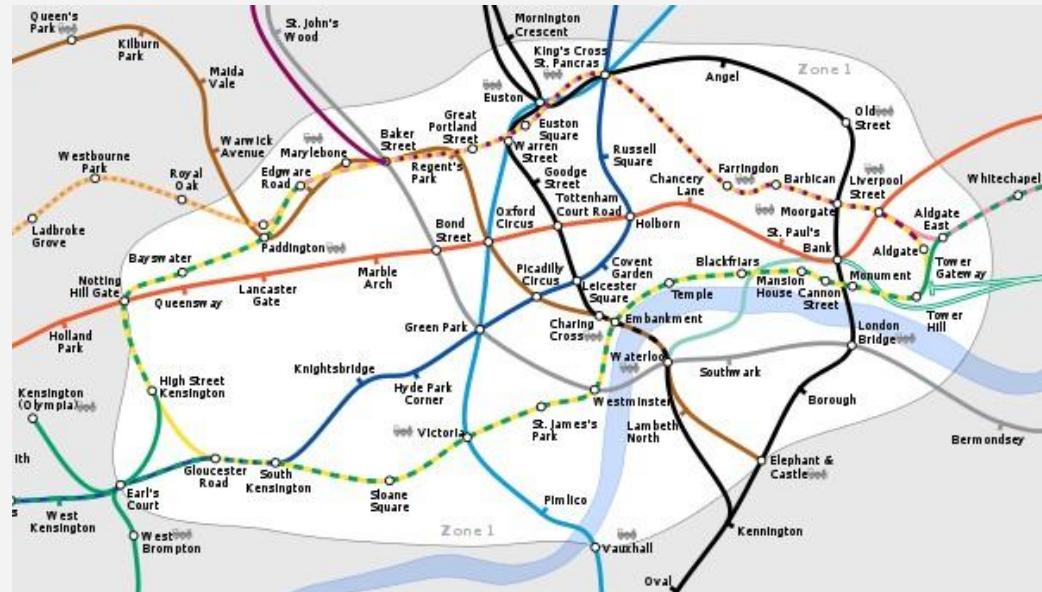
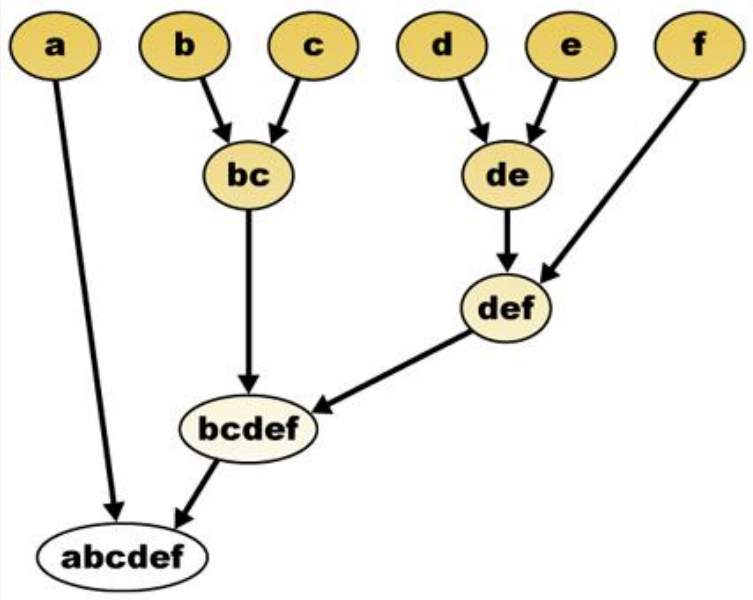
- For categories
 - Qualitative color schemes
- For ordinal values
 - Sequential color schemes
 - Diverging color schemes
- For small number of values
 - Can be increased e.g. by using texture



Connectivity, orientation

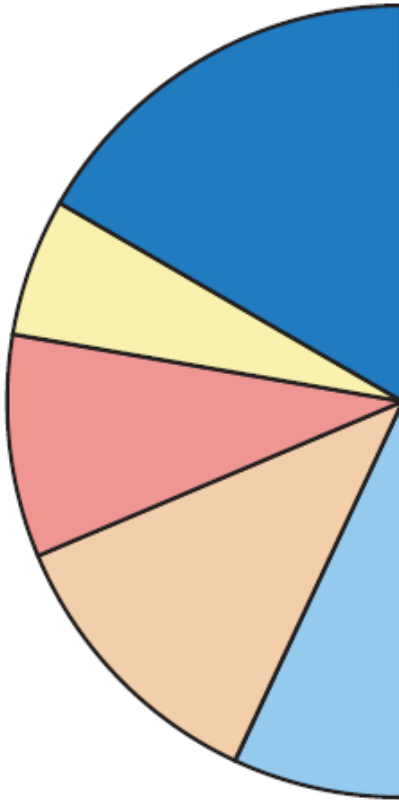


- Glaws (connectivity)
- Orientation (arrows, gravity)

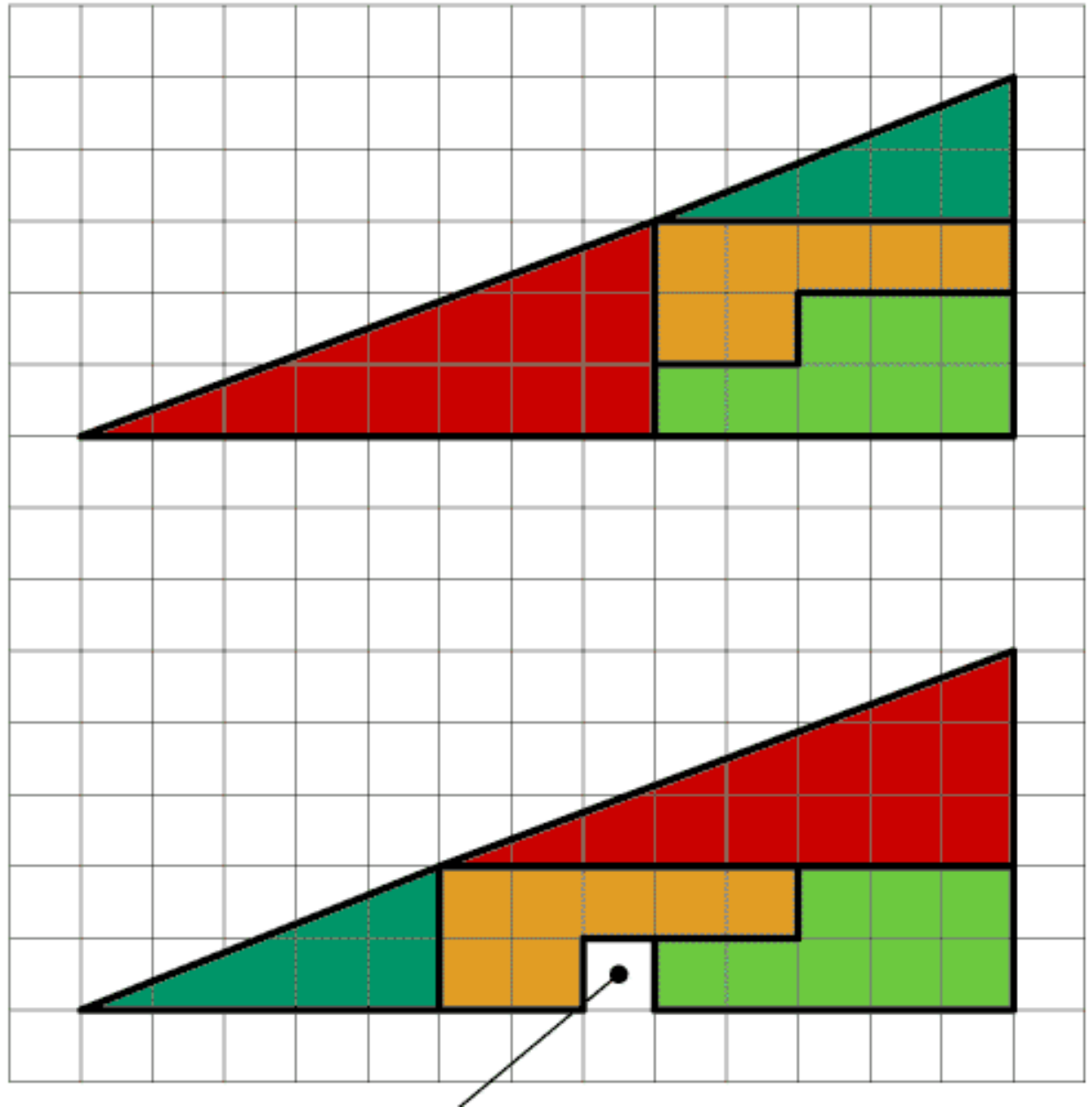


Angles

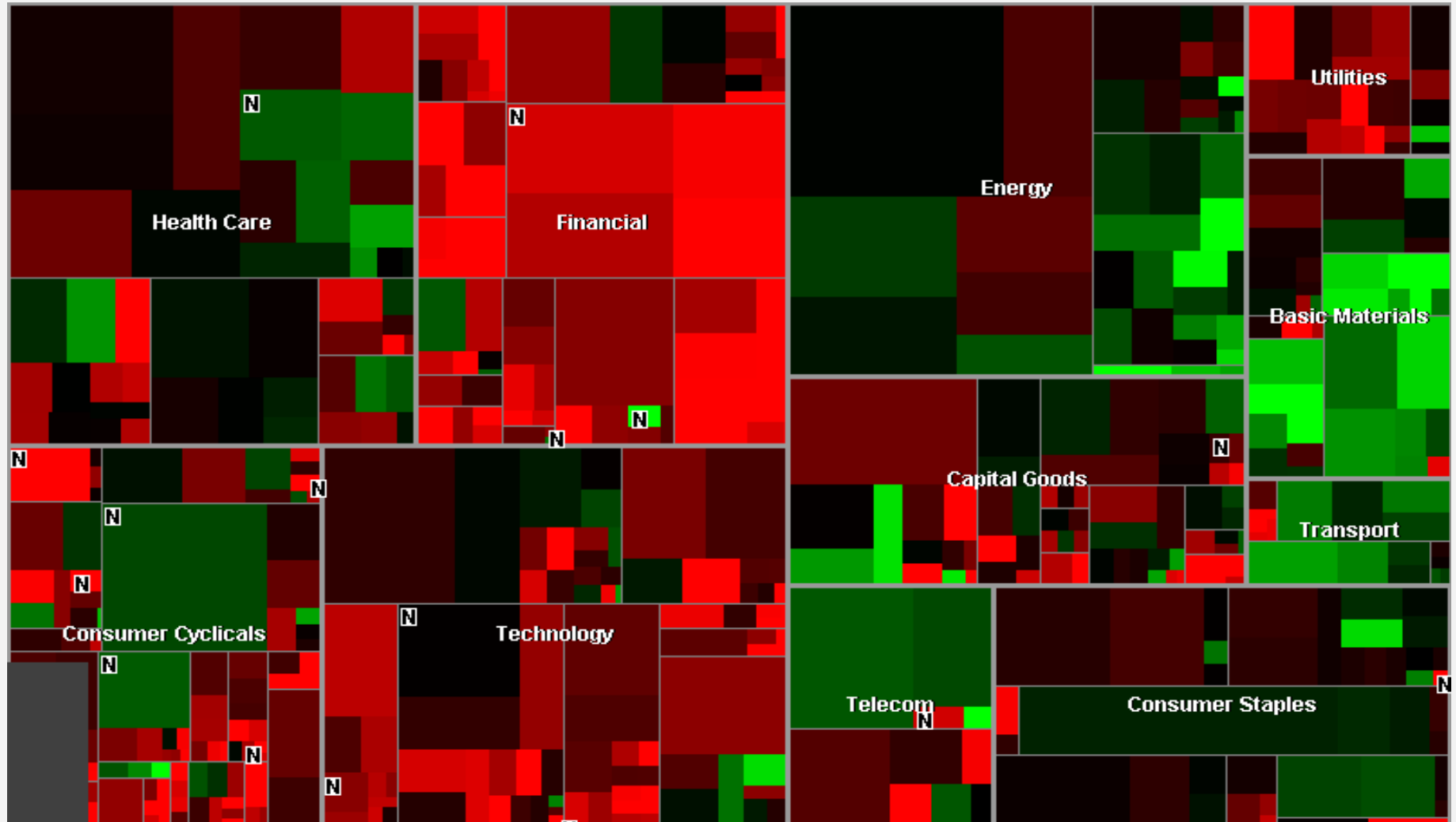
- Our angle p



- Find the 3 la



Hierarchy, insetting



<http://www.smartmoney.com/marketmap/>

Hierarchy, insetting



ZOOM IN ZOOM OUT

Food and beverages 15%

The high price of oil is a factor that has made food prices rise quickly.

Miscellaneous 3%

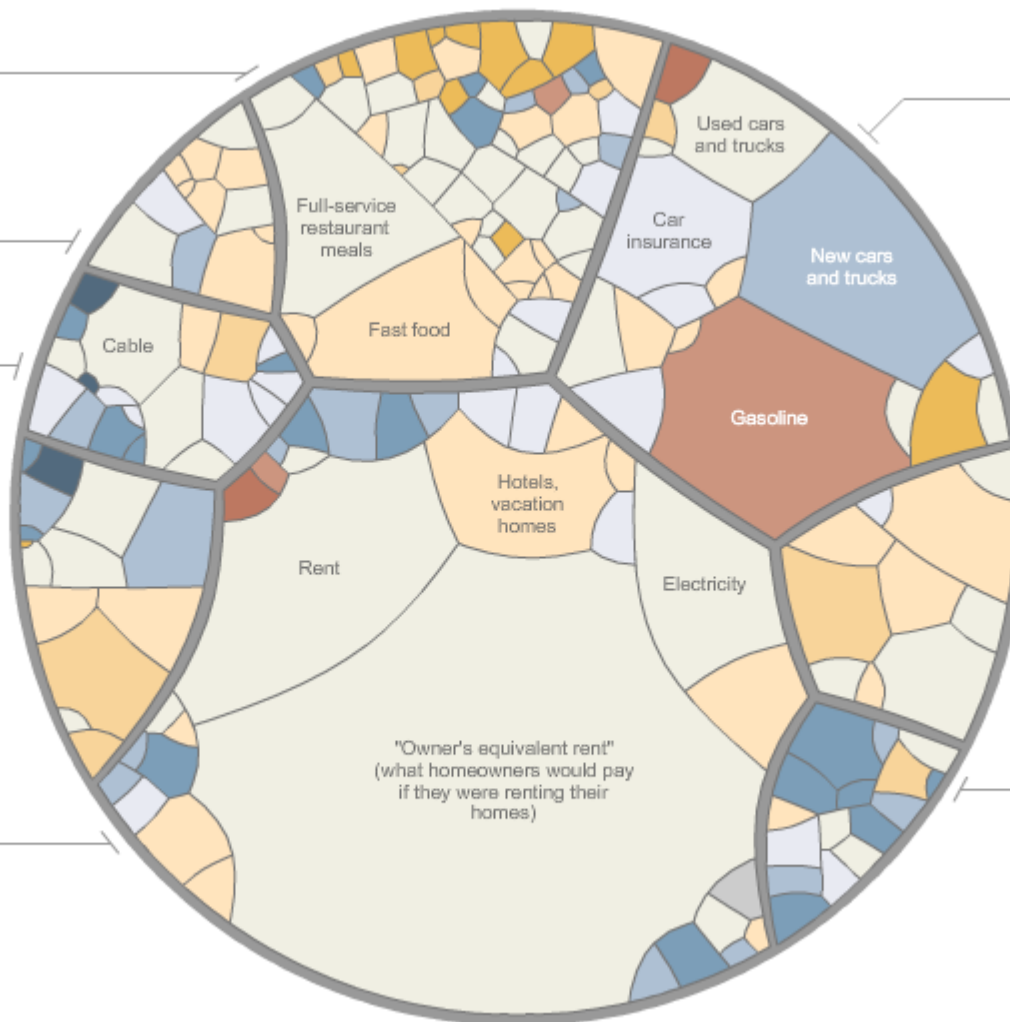
Recreation 6%

Education/Communication 6%

Cellphones were added to the index in 1997. Because the Consumer Price Index can be slow to add new goods, which are often cheaper, it may overstate parts of inflation.

Housing 42%

In the C.P.I., home ownership costs track rent prices more closely than housing prices. This means inflation may have been understated when home prices were rising faster than rents.



Transportation 18%

Gas is 5.2 percent of spending nationwide, but only 3.8 percent in the New York area.

Health care 6%

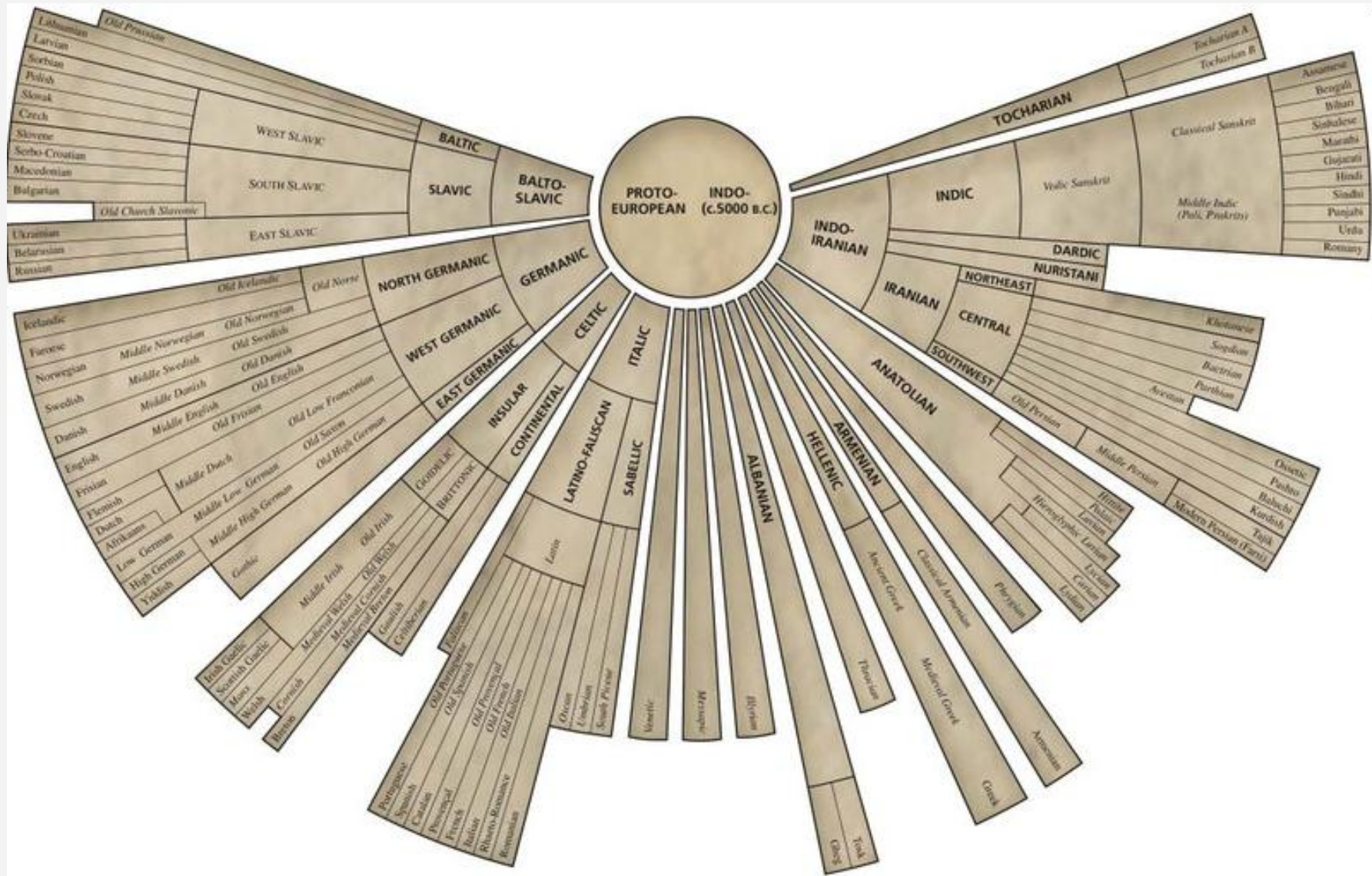
As a group, the elderly spend about twice as much of their budget on medical care.

Apparel 4%

The ratio of spending on women's clothes to that on men's clothes is about 2 to 1.

http://www.nytimes.com/interactive/2008/05/03/business/20080403_SPENDING_GRAPHIC.html

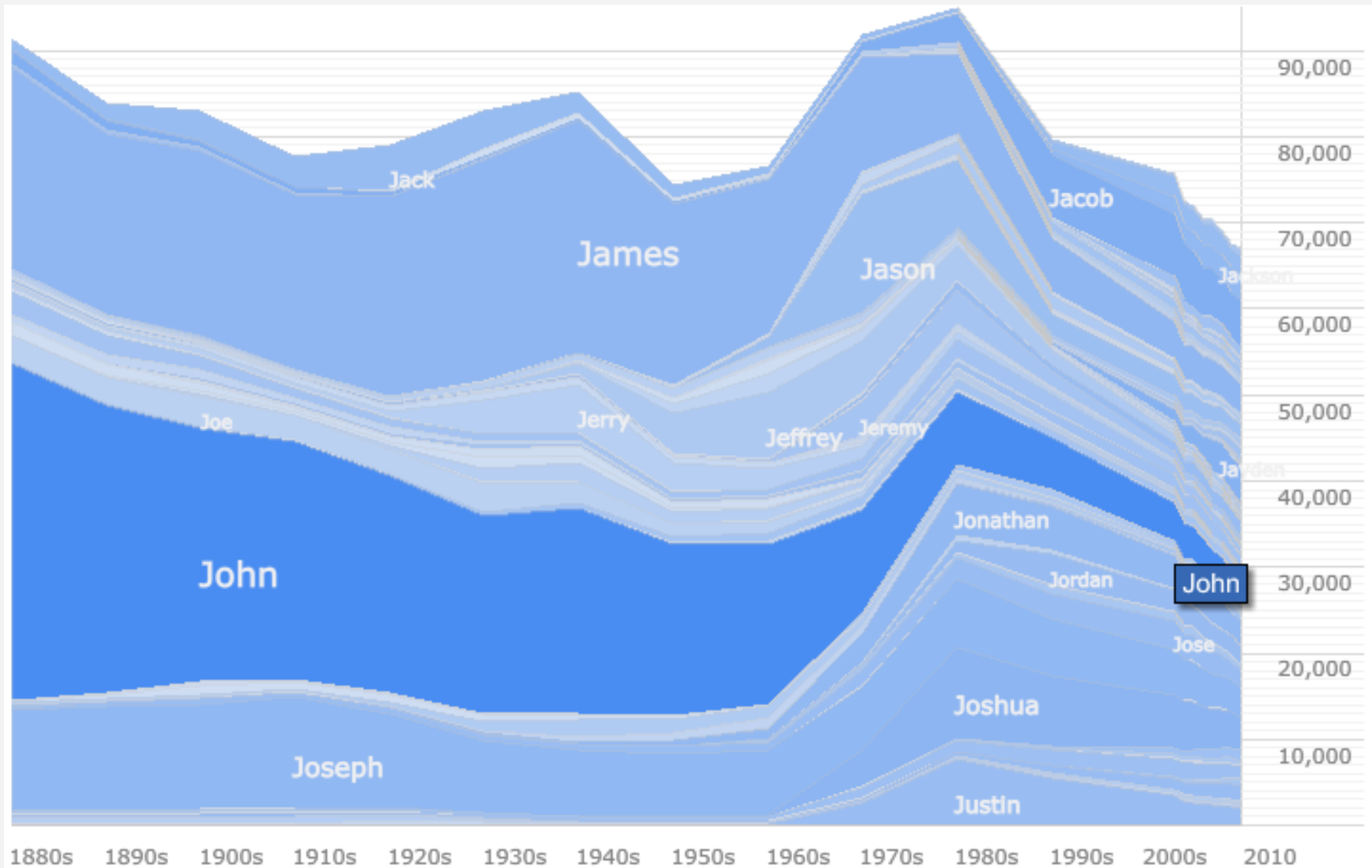
Hierarchy, insetting



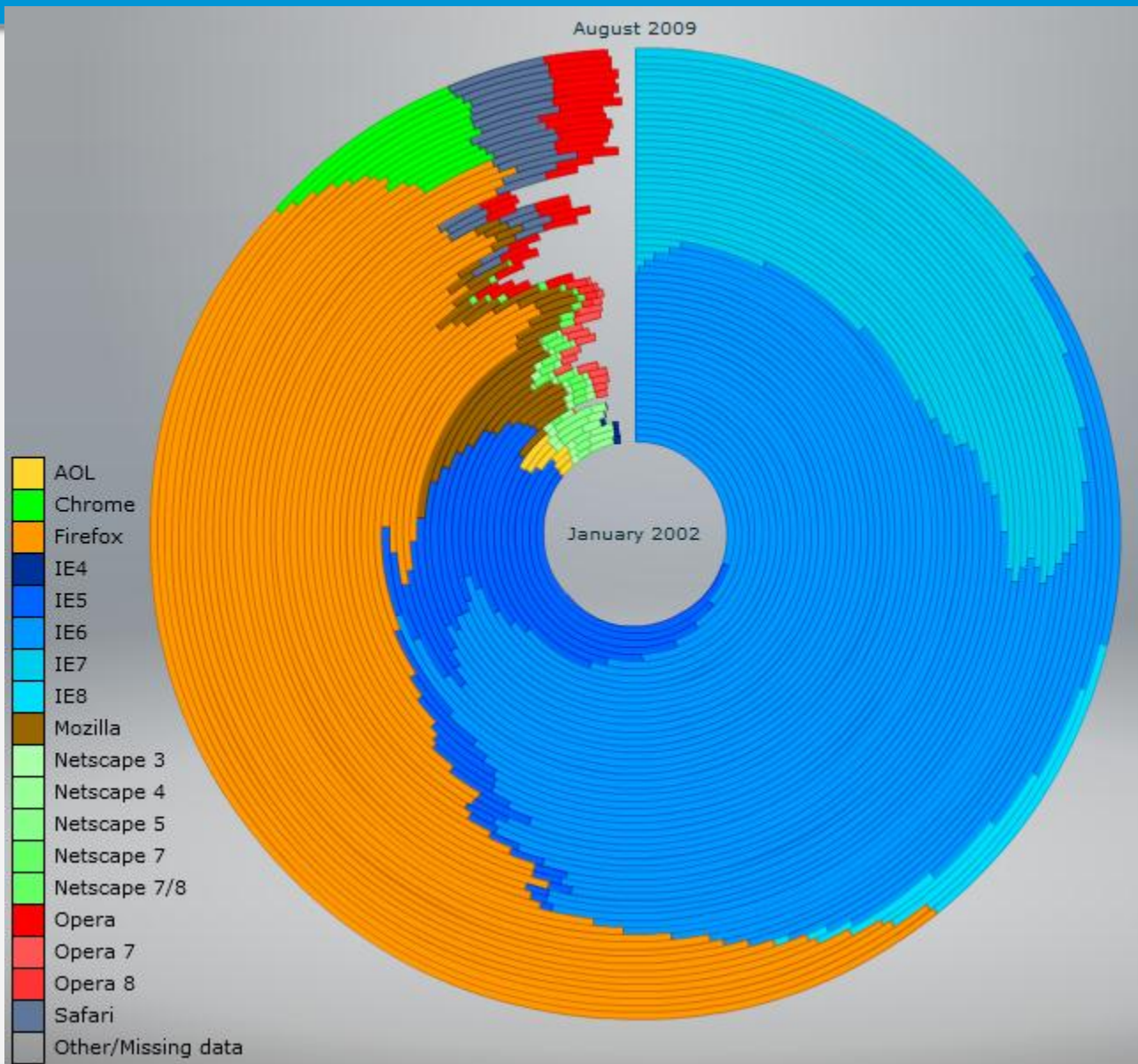


Examples
(good and bad)

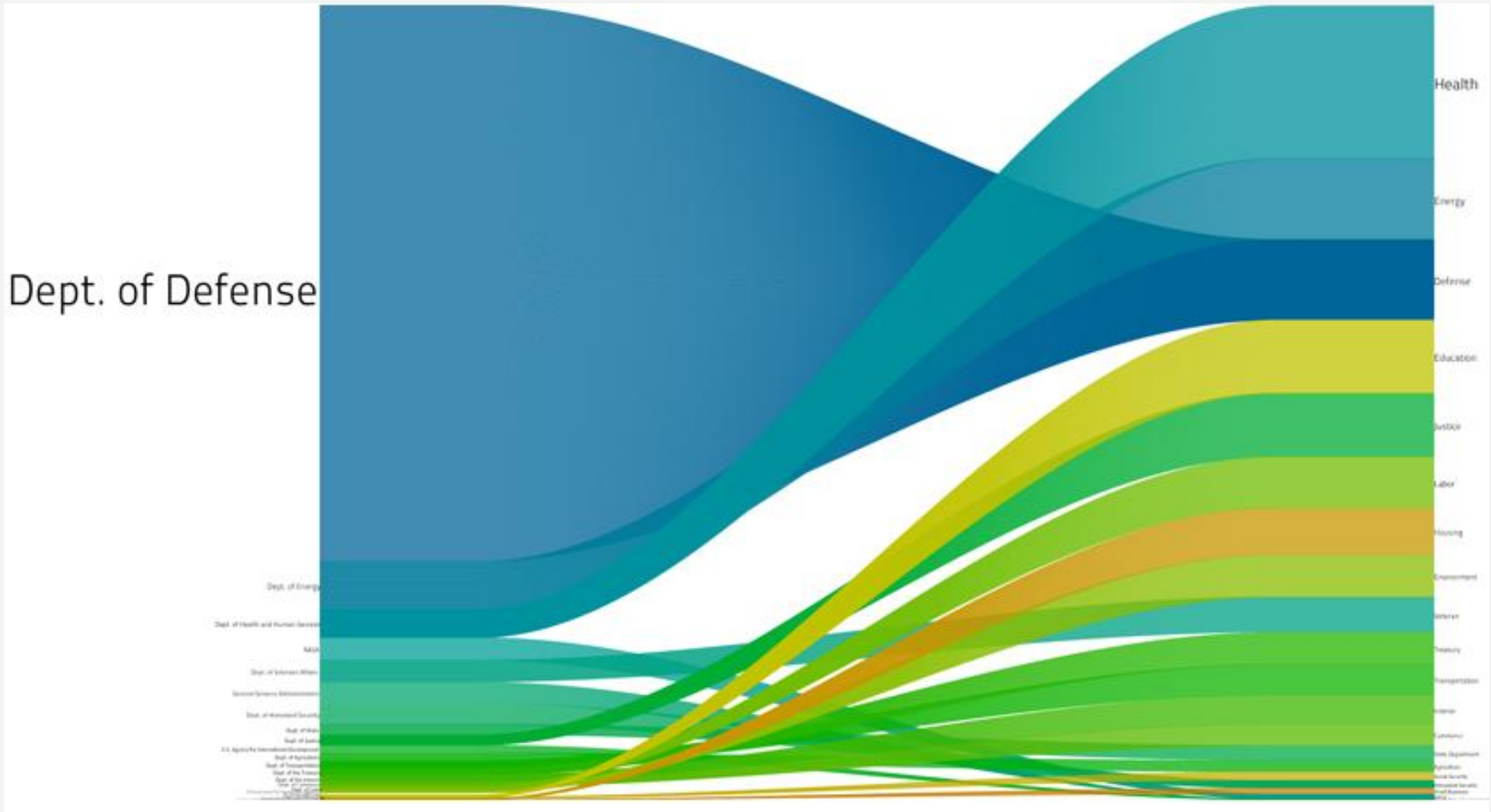
Baby Name Voyager



Browser Market Share

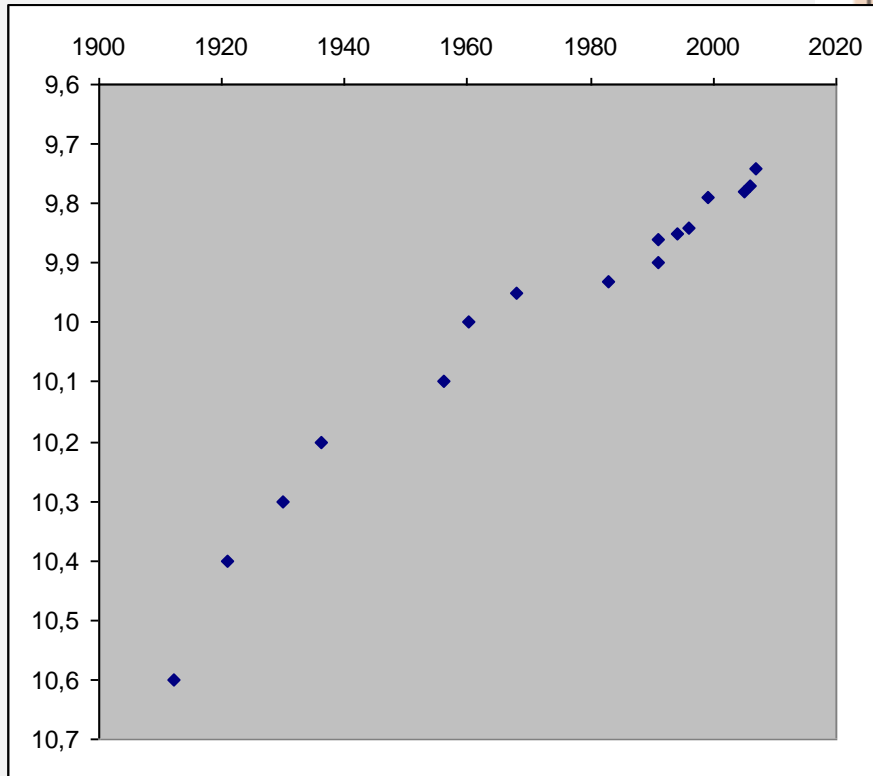


U.S. federal spending



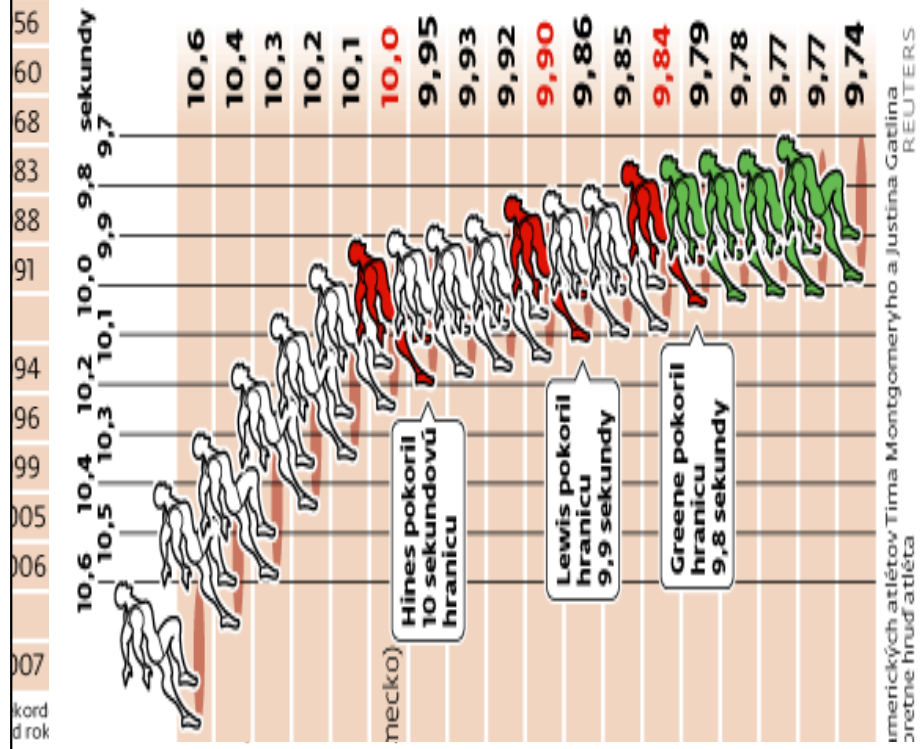
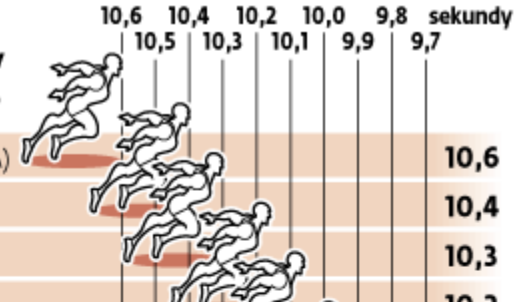
Lying/errors in visualization

- 100m record evolution



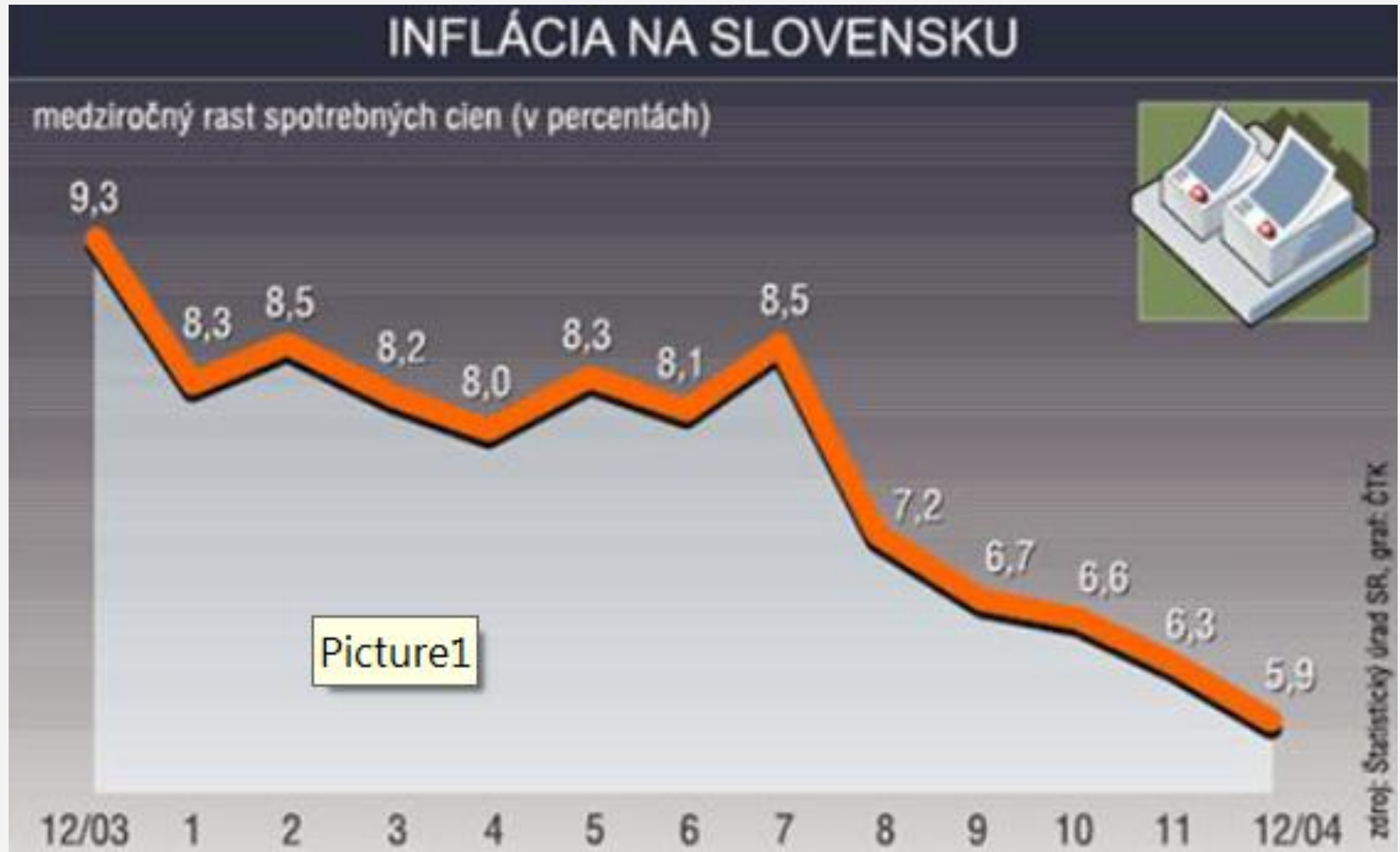
Asafa Powell prekonal svoj svetový rekord na 100 metrov v nedeľu časom 9,74 sekundy.

Year	Date	Record Holder	Record (seconds)
1912	6. júl	Donald Lippincott (U S A)	10,6
1921	23. apr.	Charles Paddock (U S A)	10,4
1930	9. aug.	Percy Williams (Kanada)	10,3
1936	20. máj	Jesse Owens (U S A)	10,2



amerických atlétov Tima Montgomeryho a Justina Gatlina
preťme hrud' atléťa
REUTERS

Lying/errors in visualization

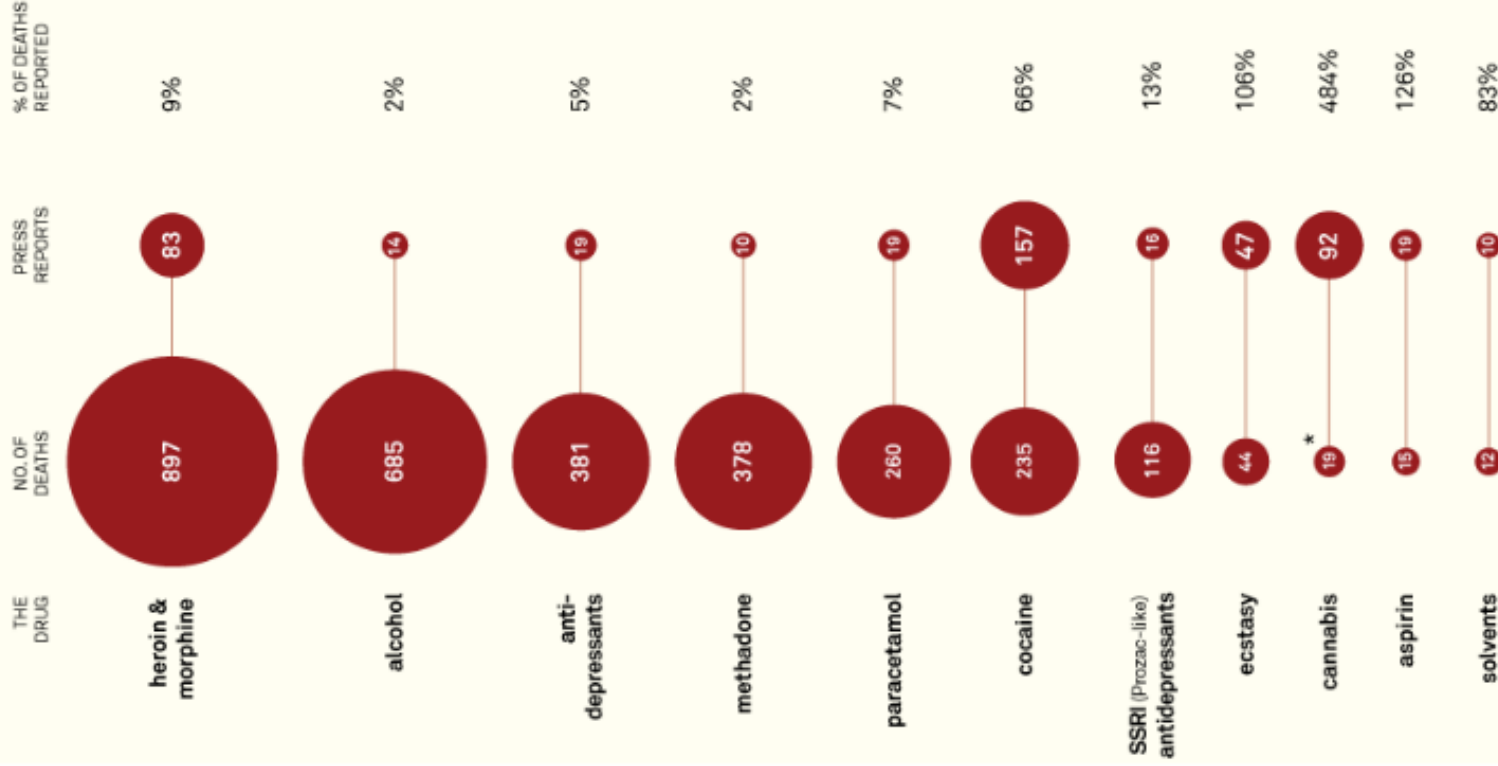


Deadliest drugs (are they?)



Deadliest Drugs

UK drug poisoning deaths 2008 vs. popular press coverage



source: Guardian Database, Office Of National Statistics, Google News Timeline, DailyMail.co.uk
 * Cannabis fatality figures highly questionable

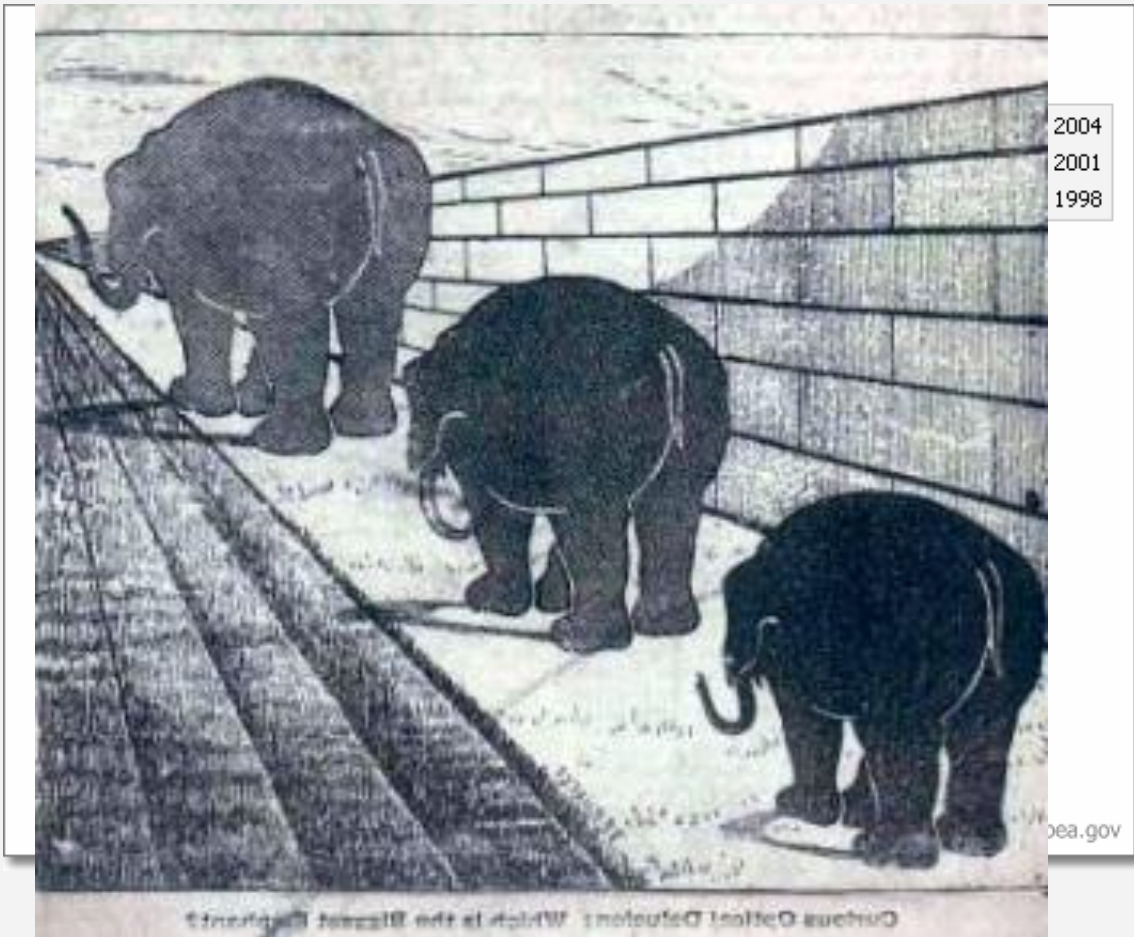
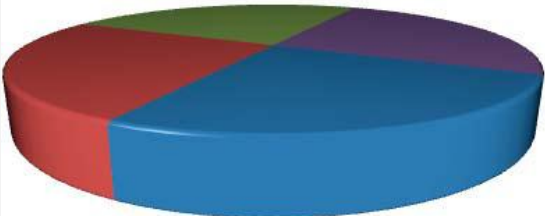
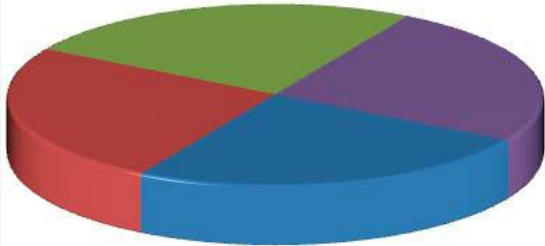
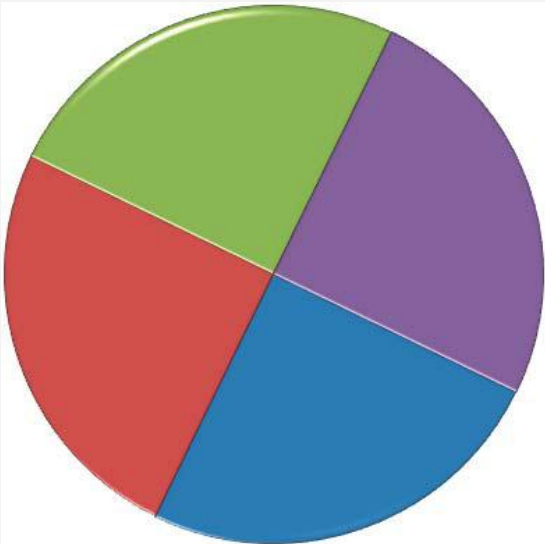
David McCandless

informationisbeautiful.net

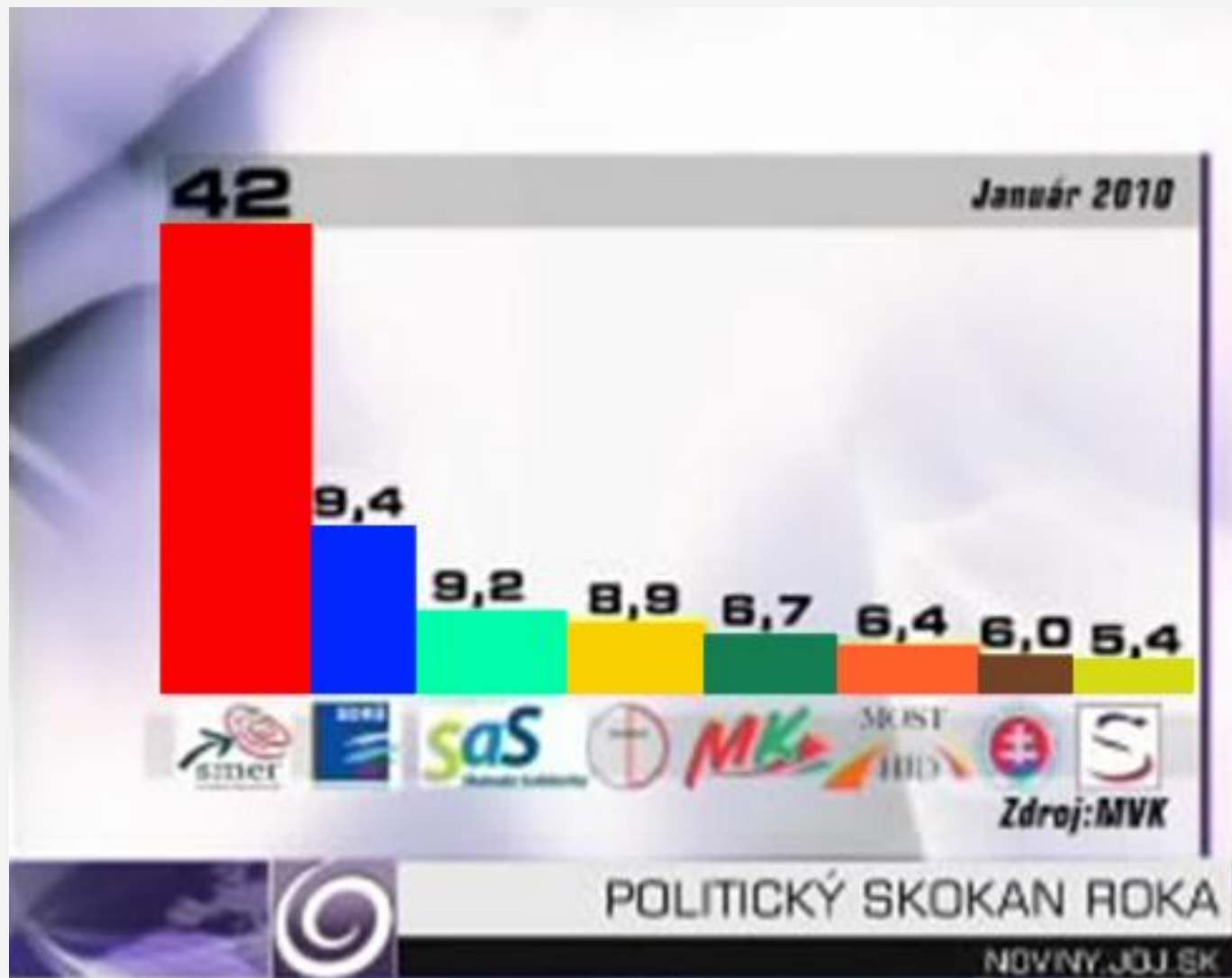
How to lie with visualization



Perspective/3D is risky



Bar chart gone wild



Benefits of visualization



- Image is perceived faster than text
- Language independence
- Better perception of data
- (psssst.... A way to ~~lie~~ improve reality)
- Find errors in data
- Gain new insights into the data

Detect the expected, discover the unexpected