Effective Graphing

GEOG380 FA 2018

Contents

- Typographics
- Charts and graphs

Typographics

- Map lettering is a functional symbol
  - Aesthetics is secondary

- Symbolization is expressed through
  - Type style — *Italic* **Bold** **Roman**
  - Type category — Serif Sans Serif
  - Type size — Large small medium
  - L e t t e r s p a c i n g
  - Placement — Placement

Typeface – family and style

- Hundreds of type families can be grouped in
  - Serif (e.g. Times & Garamond)
  - Sans serif (e.g. Arial & Lucida Sans)
- Can be used to symbolize qualitative difference
- Style guidelines
  - Only use one or two different type-families
    - If two they should be serif and sans serif
  - Use *italics for hydrographic features*
  - Avoid decorative styles, they are difficult to read on a map

Size and Weight

- Type size
  - Size variation imply ordering
    - Larger size for more important, larger quantities
    - Smaller size for less important, smaller quantities
- Type weight
  - Weight variation imply ordering
    - Bold for more **important, larger quantities (use with caution!)**
    - Regular for less important, smaller quantities
- Keep within 6-24 point for page-size maps
- Use 2-3 point difference and no more than five categories

8 pt.
10 pt.
14 pt.
18 pt.
24 pt.

Form and Placement

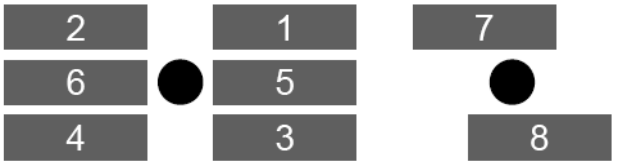
- Type form
  - Spacing (Kerning)
    - Use for a r e a f e a t u r e s, to fill the area
  - Upper case
    - Use for MOUNTAIN RANGES, STATE NAMES

Form and Placement (cont.)

- Type placement
  - Should clarify the relationship between a label and the symbol
  - Placement can reflect characteristics of the feature
    - Label port and harbor towns on the sea
    - Label inland towns on the land
    - Label towns on the side of a river or a road they are located
    - Align with graticules if they are included

Labeling

- Point features
  - Work outward from the center of the map
  - Position priorities
    - Slightly different between books



- Line features
  - Curve the type to follow the symbol
  - Position priorities
    - Keep it above and horizontal if available
    - Repeat label for very long features

- Areal features
  - Curve and fit text to the area
    - To create a clear association between text and area
  - Keep labels horizontal if possible and away from borders
  - Avoid hyphenation
  - If area is too small to fit text inside – use point conventions

http://www.typebrewer.org
(Map source: http://maps.google.com)

Group Activity: let's label the map

- Relocate the labels below on the map

Cooperton

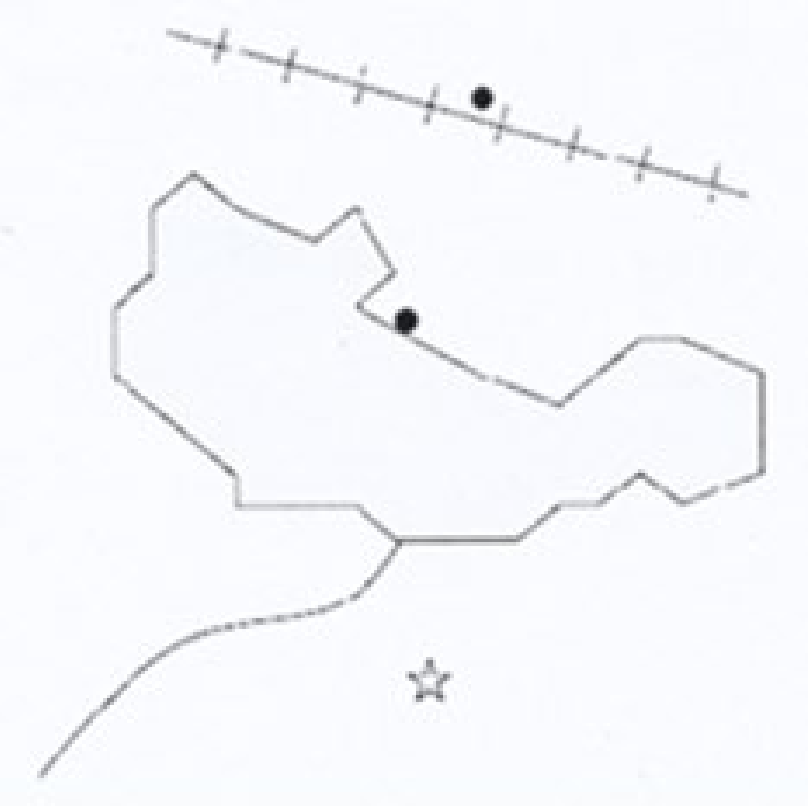
Frantz Railway

Harriston

Lake Jones

Oldport

Jones river



A recap of why we are here…

- *"In short, maps and other graphics comprise one of three major modes of communication, together with words and numbers. Because of the distinctive subject matter of geography, the language of maps is the distinctive language of geography. Hence sophistication in map reading and composition, and ability to translate between the languages of maps, words and numbers are fundamental to the study and practice of geography"*

  (John Borchert)

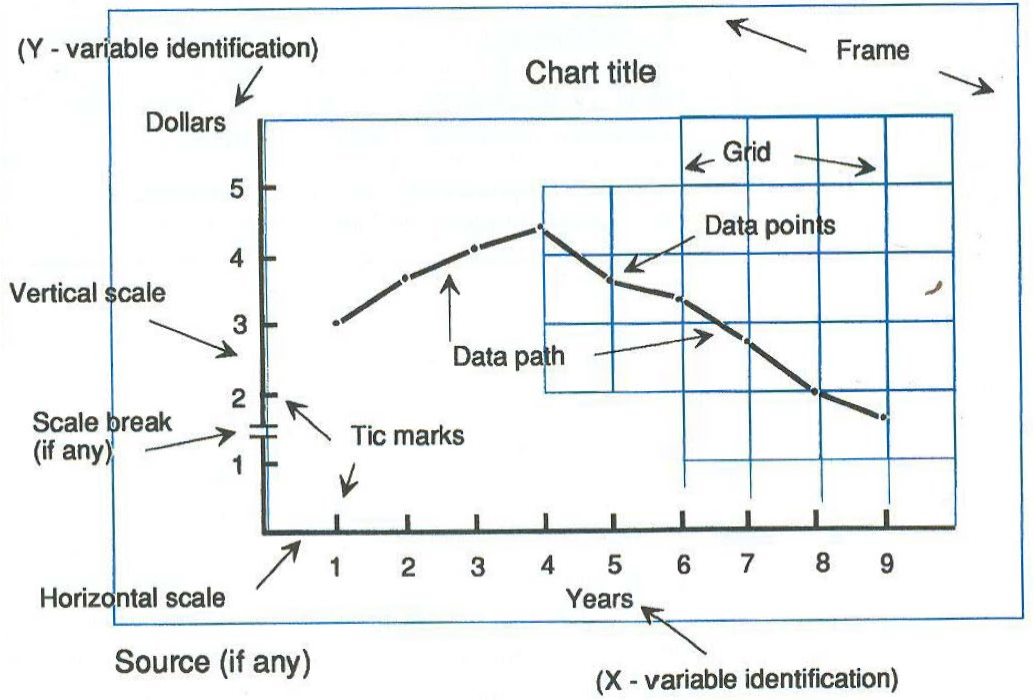
Graphical excellence

- *"Excellence in statistical graphics consists of complex ideas communicated with clarity, precision, and efficiency."* *Edward R. Tufte (statistician)*

- As a cartographer you need graphs to visualize non-spatial aspects of geographic info effectively:
  - A graph is an integral part of the map
  - Graphs can…
    - show the data intuitively
    - avoid distorting what the data have to say
    - present many numbers in a small space
    - encourage visual comparison
    - serve a purpose

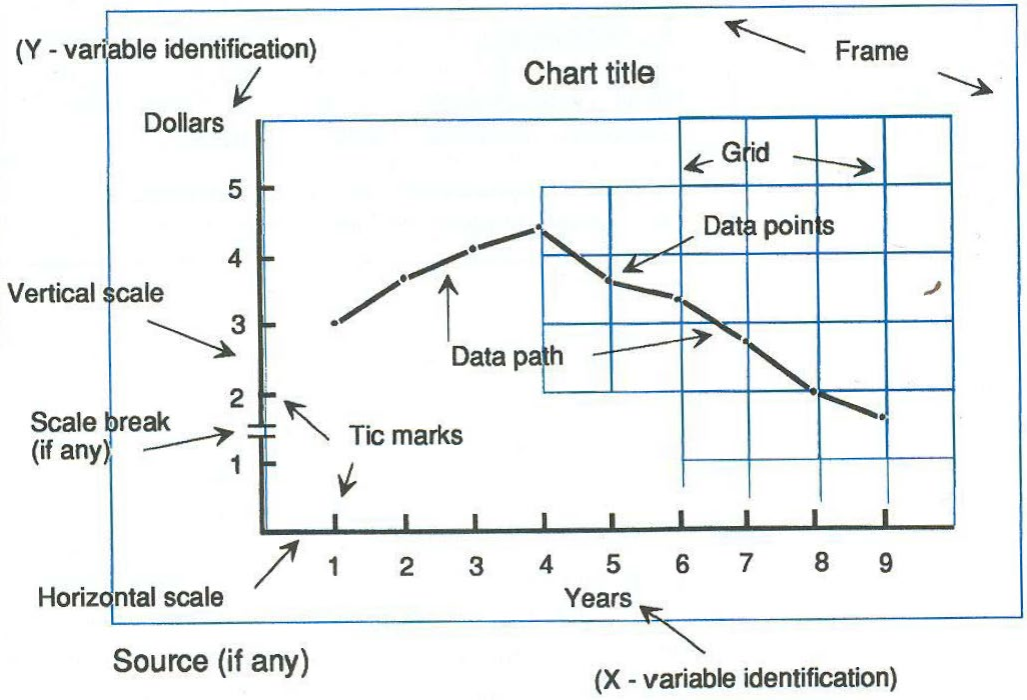
Graph elements

- Similar to map elements
  - Title or purpose of the graph
- What each axis, bar, pie, … denotes
- Scale of axes including starting points
- Source, if not given elsewhere
- Legend / key



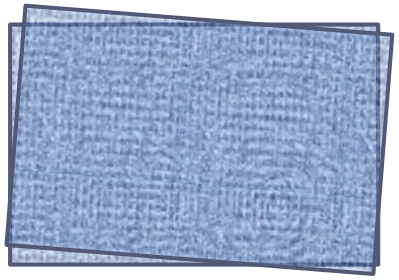
General remarks about charts

- Match the type of chart with data and its purpose
  - Ex. a table or list of data
- Visual hierarchy
  1. Symbols (lines, bars), axes, and variable labels
  2. Grids, tick marks, and other labels
  3. Background



Things to beware: chartjunk (Tufte, 1983)

- Data-ink
  - How large proportion of the "ink" used in the graph is actually devoted to data, non-redundant? (effectiveness of materials used)
- The grid and graph area
  - Grids often not necessary for the purpose – think critically before including
  - Gray shades of graph background typically not helpful, especially in print
- Moire effects
  - Many hatch-patterns create unwanted noise
- 3D and perspective views
- Check any misleading units, scaling, and cutting axes



http://www.youtube.com/watch?v=mzPIWHDwBFo

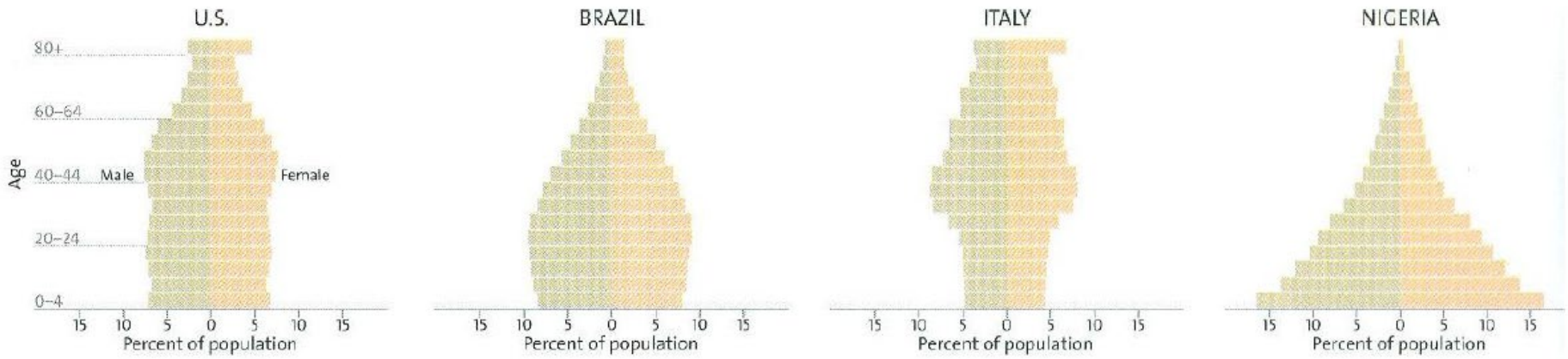
Purposes of using Graphs and major types

- How much of different things, proportions, and distributions
  - Histograms, frequency polygons/curves
  - Box plots
  - Bar graphs
  - Trilinear graph
  - Sector graphs – "Pie charts"
- Trends and relations
  - Line graphs
  - Scatterplots

Histogram – frequency curves

- A visual description of a data distribution
  - Often a good complement to the map
  - E.g., population pyramids
- Things to remember
  - Bars of equal width
  - No gaps between bars

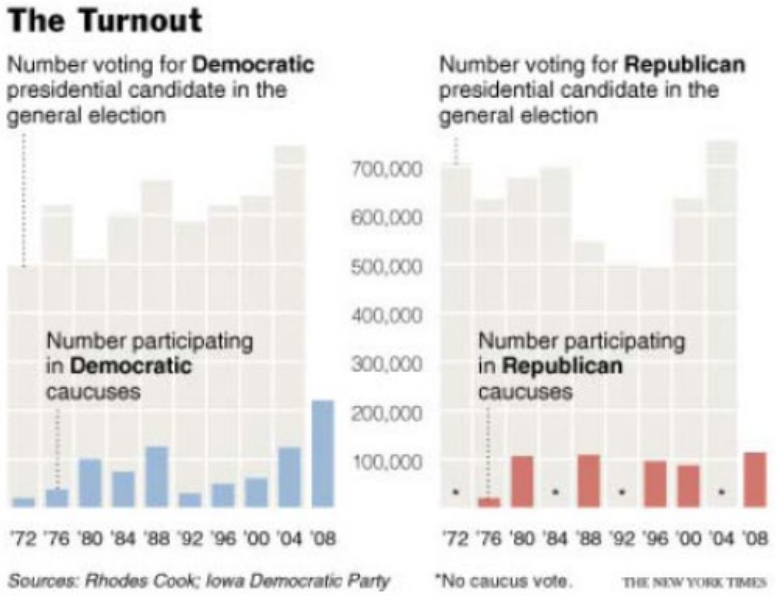
Group Activity: let's try to interpret the histograms below.
How are population groups in each country distributed?

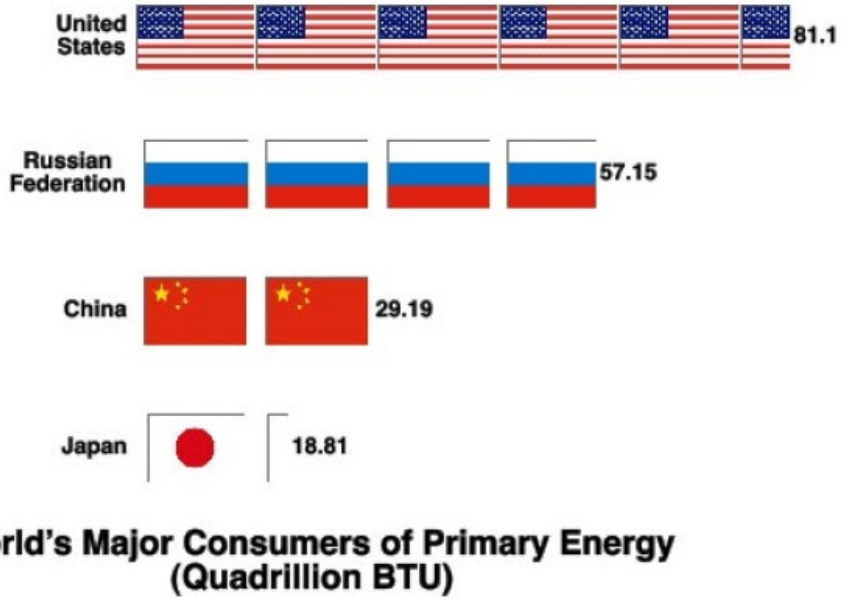


(source: Wiley College Atlas of the World)

Bar graphs

- Very flexible design compared to histogram
  - Ex. Pictogram
- Things to remember
  - Always start at zero
  - Arrange bars by size or some ordering
  - Gaps between bars



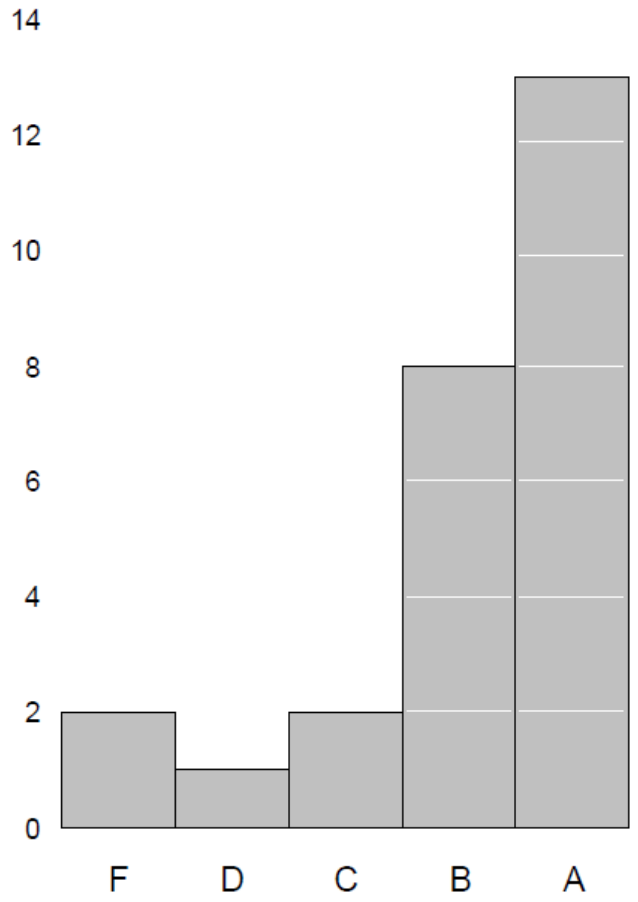


Source: http://www.intesoft.com/produits/tech/delt/images/mac/chart_types/Pictograph.jpg

Bar graph/histogram design

- Again, challenge the default settings!

- From a standard Excel output of a graph,
  - frame can be erased
  - box can be white and gridlines erased
  - color may not be necessary and tick marks can be replaced by white lines



Box Plot: Constructing a box plot

- The box covers the 1st quartile ~ the 3rd quartile of data values
- The fences cover Min and Max
- The whiskers extend to the fences, which are at the last actual value within 1.5 x IQR (Inter Quartile Range, the middle 50%) from the box
- Any observations outside this range are outliers and are plotted individually

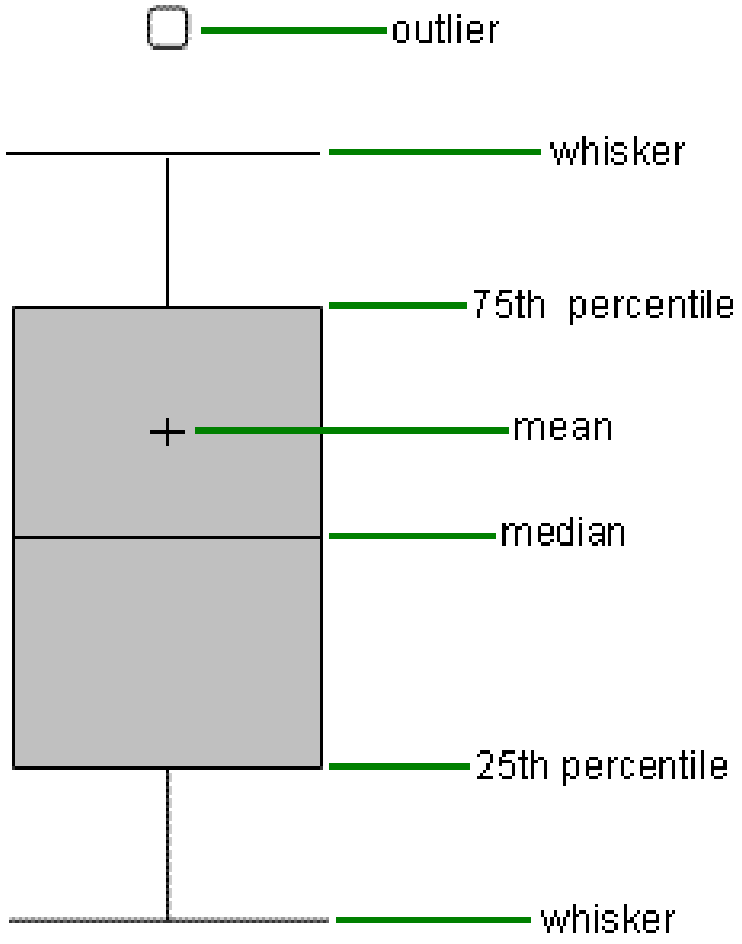
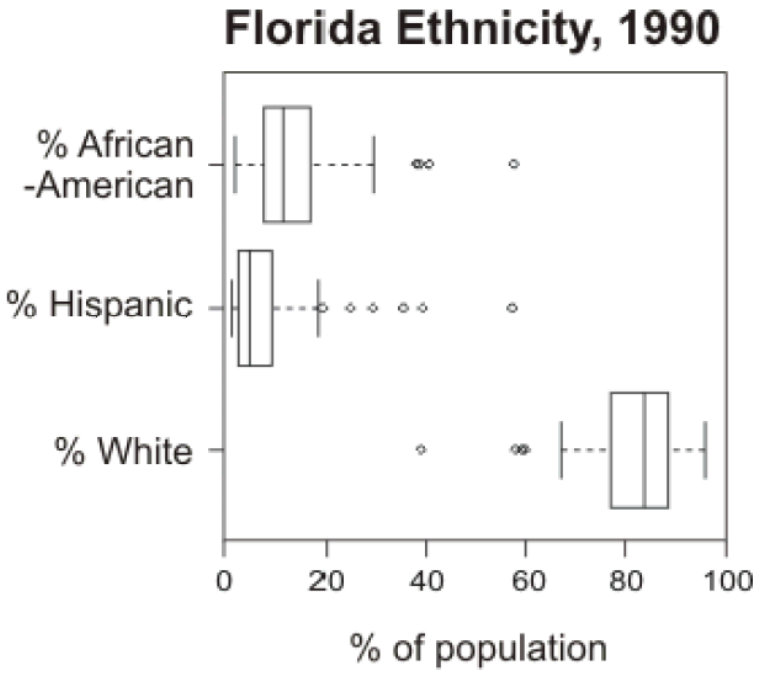


Image source: admin-apps.webofknowledge.com

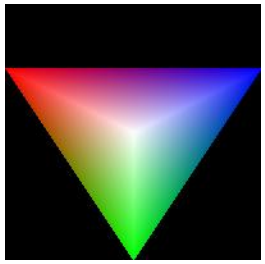
Group Activity:
how to interpret the box plots below?

- These are based on the five-number summary of a data set.
  - Max, Min, Median, Q1, Q3 (next slide)
- They convey similar information as a histogram, but also make it possible to compare two or more datasets visually

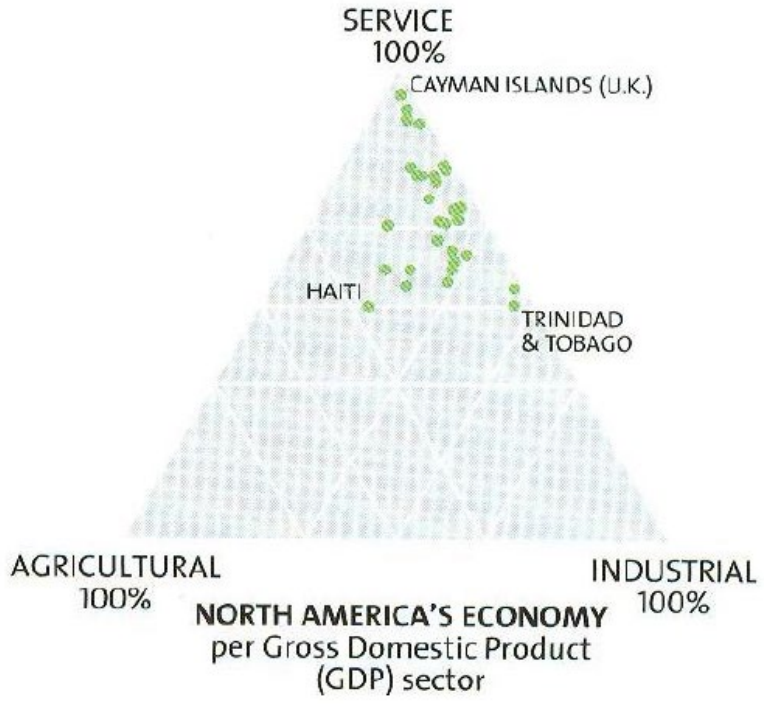


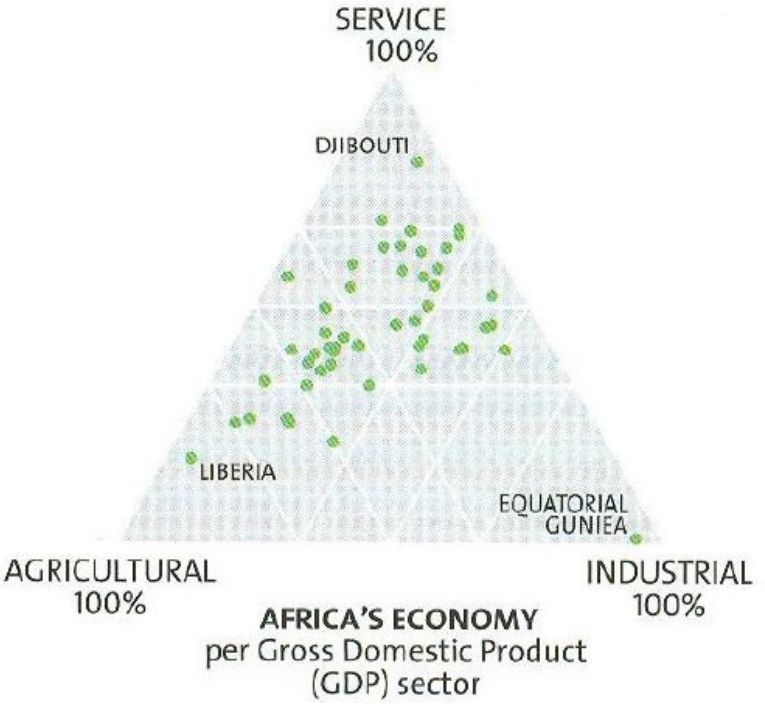
Trilinear graphs

- Similar to the scatterplot idea
- Plot each object in relation to three components that make up a sum (100%)
  - Recall the RGB colors…



- The graphs on the right side show countries in North America and Africa based on their economy structure consists of agricultural, industrial, and service aspects
  - Cf. Geographical distribution of the countries?

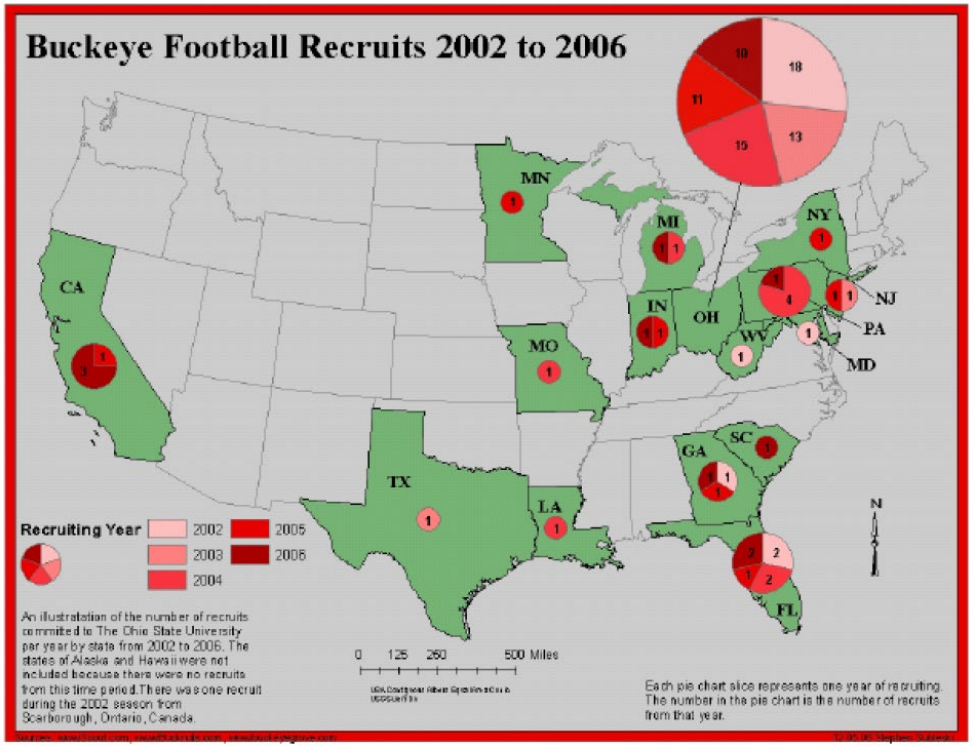


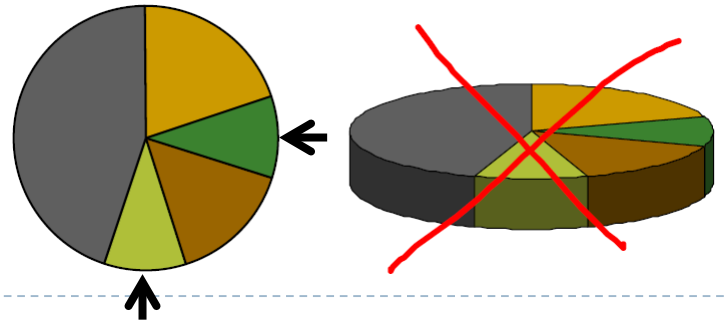


(image source: http://www.ccs.neu.edu/home/fell/COM3370/W97prog0images.html)

Sector graphs

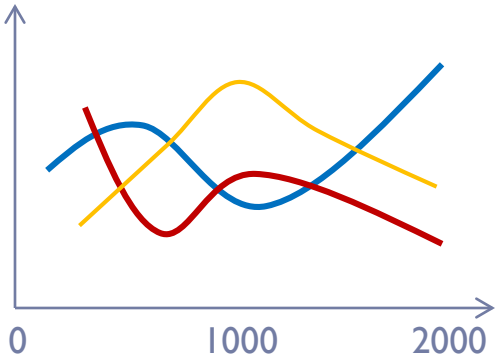
- Used for relative proportions of a whole
  - Can take more than three categories
- Guidelines
  - Use on map units with caution!
  - Never use perspective view - Why?
    - Compare the green and dark green slices





Line graphs

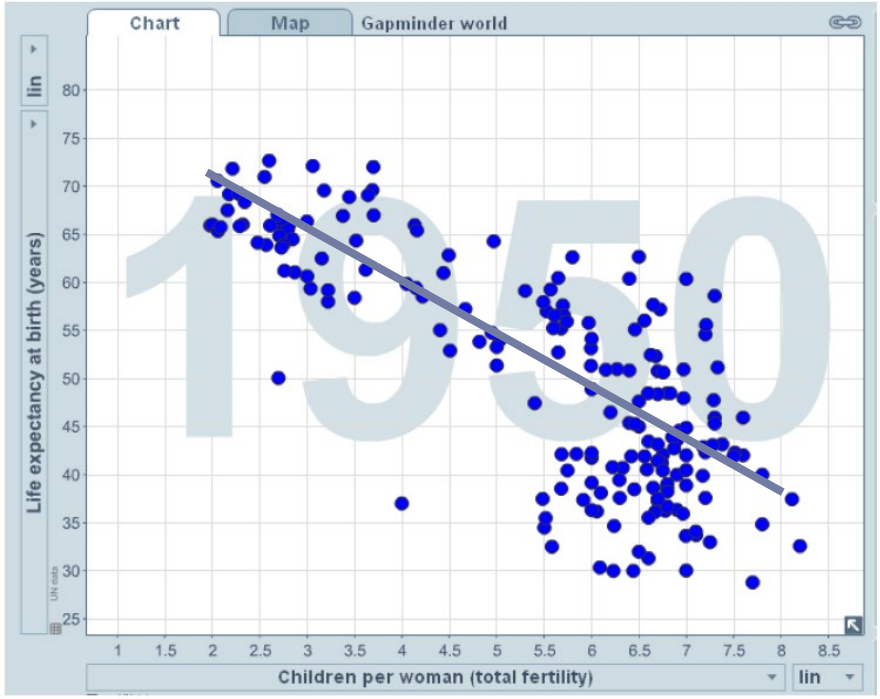
- Typically to show trends over time
  - Multiple lines for multiple variables can show differences in trends



- Guidelines
  - Show zero if possible
  - If cause-effect relationship exists
    - Lines should be represented to be understood as independent on x-axis (usually affected by other variables not time)
    - Ex) elevation, aspect, and soil type on X-axis, flooding on Y-axis
  - Several lines require nominal line symbology
  - Avoid multiple scales on a single graph

Scatterplots

- Shows co-variation of two variables on x, and y axis)
  - Not necessarily a cause-effect relation!



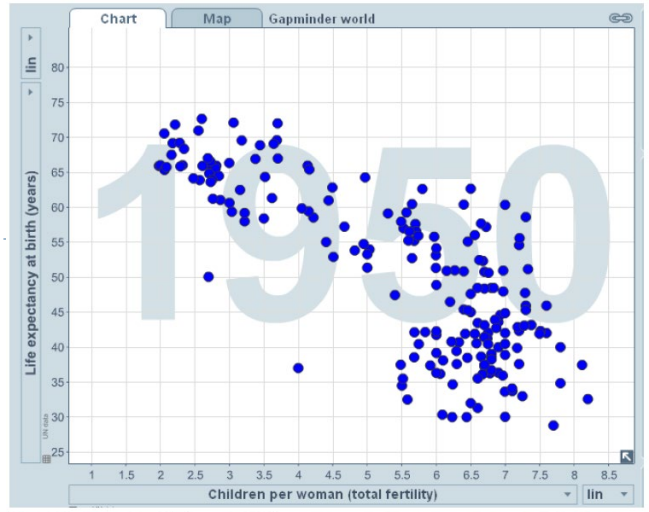
- Things to remember
  - Never connect dots!
  - Be careful with adding a trend line
  - One dot = one instance in scatterplots
    - Cf. dot density maps

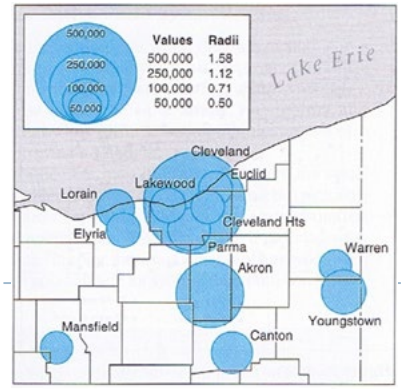
Bubblegraph

- Adding one more variable to the scatterplot, size
  - E.g. population

- Can add a fourth and a fifth variables, too
  - Color symbolization
  - Time sequence
  - Etc…

- Cf. proportional symbol maps (spatial)





(source: http://tools.google.com/gapminder/)

Summary

- Graphs often provide useful complement to map
  - Further insight into mapped or other variables
- Need to follow many design guidelines of mapping
  - Figure-ground
  - Symbolization, labeling

For next time…

- Reading
  - Ch. 1, 20, 23
- PM1 due Oct. 30
- Test2 on Nov. 6
  - During the first 40 minutes
  - Study guide will be on the Beachboard
- Lab3 after Test2