

# 36-315: Statistical Graphics and Visualization

## Handout 7

Date: February 5, 2003

---

Visual encodings, ranked:

1. Position, length with common baseline (*best*)
2. Solid shading (for qualitative ordering)
3. Non-aligned lengths
4. Angle, slope
5. Area
6. Shading (for quantitative value)
7. Texture, density (non-solid shading) (*worst*)

Perception is enhanced by **visual connection**, ranked:

1. Proximity and alignment
2. Trends (e.g. sorting)
3. Connecting lines
4. Matching colors
5. Matching symbols

Approximate timeline: 1801 William Playfair (England) invents pie, area, bar, and line charts  
1870 Playfair's charts become widely accepted (US Census Bureau)  
1910 Playfair's charts appear in US textbooks

In his own words:

“A man who has carefully investigated a printed table, finds when done, that he has only a very faint and partial idea of what he has read.”

“The advantages proposed by [the graphical] mode of representation, are to facilitate the attainment of information, and aid the memory in retaining it.”

## Depicting error

- Standard error = (Standard deviation)/ $\sqrt{\text{sample size}}$
- Error bar =  $1.64 \times$  Standard error (for 95% confidence in a bar-to-bar comparison)

## List of figures:

1. Graphical excellence (Tufté, 1983)
2. Mosaic plot vs. line chart
3. Sieve diagram (Friendly, 2000)
4. Nobel prizes line chart (Wainer, 1984)
5. Government spending bar chart vs. line chart (Tufté, 1983)

## References

- [1] Michael Friendly. *Visualizing Categorical Data*. Cary, NC: SAS Institute Inc., 2000.
- [2] Michael Friendly and Daniel J. Denis. *Milestones in the History of Thematic Cartography, Statistical Graphics, and Data Visualization*.  
<http://www.math.yorku.ca/SCS/Gallery/milestone/>
- [3] Ian Spence and Howard Wainer. *Who was Playfair?* *Chance* 10:35-37, 1997.  
[http://www.psych.utoronto.ca/~spence/Research\\_WP.html](http://www.psych.utoronto.ca/~spence/Research_WP.html)
- [4] Edward R. Tufté. *The Visual Display of Quantitative Information*. Graphics Press, Cheshire, CT 1983.
- [5] Howard Wainer. How to display data badly. *Chance Workshop Lectures*.  
<http://www.dartmouth.edu/chance/ChanceLecture/AudioVideo.html> Also an article in *The American Statistician* 38:137–147, 1984.

Mosaic plot versus line chart:





