



## Graphs and Charts

- Quantitative data can frequently be illustrated in a compelling way using charts and graphs.
  - see [www.gapminder.org](http://www.gapminder.org) for fascinating, interactive charts
- Spreadsheet systems usually provide graphing and charting capabilities.
- Here are some examples.

Lotus added charting to the spreadsheet concept.  
Sometimes a picture is worth 1000 words.

<>	A	B
1	<b>Major</b>	<b>Fall Enrollment 2009</b>
2	Art and Art History	112
3	Asian Studies	53
4	Biology	243
5	Business	511
6	Chemistry	95
7	Classical Languages	27
8	Communications A&S	347
9	Computer Science	81
10	Economics	44
11	Education	608
12	Engineering	366
13	English	198
14	French	26
15	GEO	35
16	Germanic Languages	13
17	History	104
18	HPERDS	164
19	Interdisciplinary	33
20	International Dev.	82
21	Mathematics	70
22	Music	62
23	Nursing	316
24	Philosophy	76
25	Physics	37
26	Political Science	121
27	Psychology	191
28	Religion	65
29	Sociology & Soc. Work	157
30	Spanish	157
31	Undecided	364
32	<b>Total</b>	<b>4758</b>

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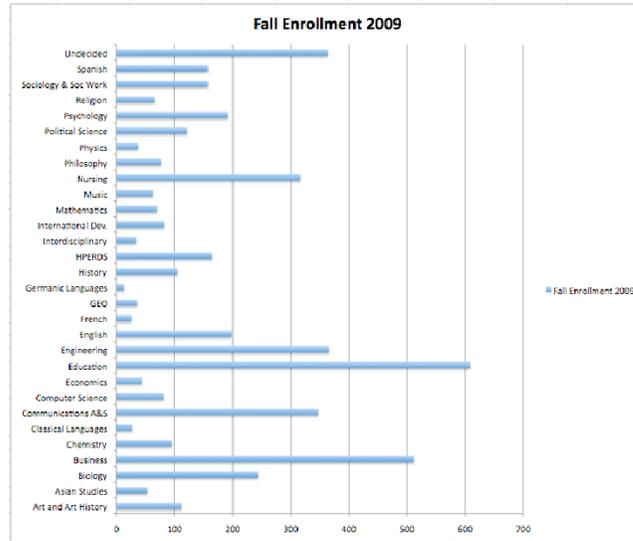
This simple bar chart is much more clear than the raw numbers in the upper left.

Show them how to build this chart.

People are visually oriented, making the chart much easier to understand (provided it is illustrating the right thing the right way).

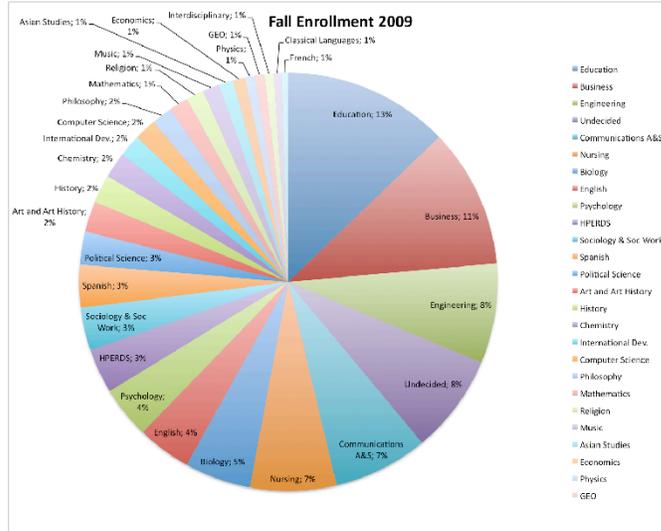


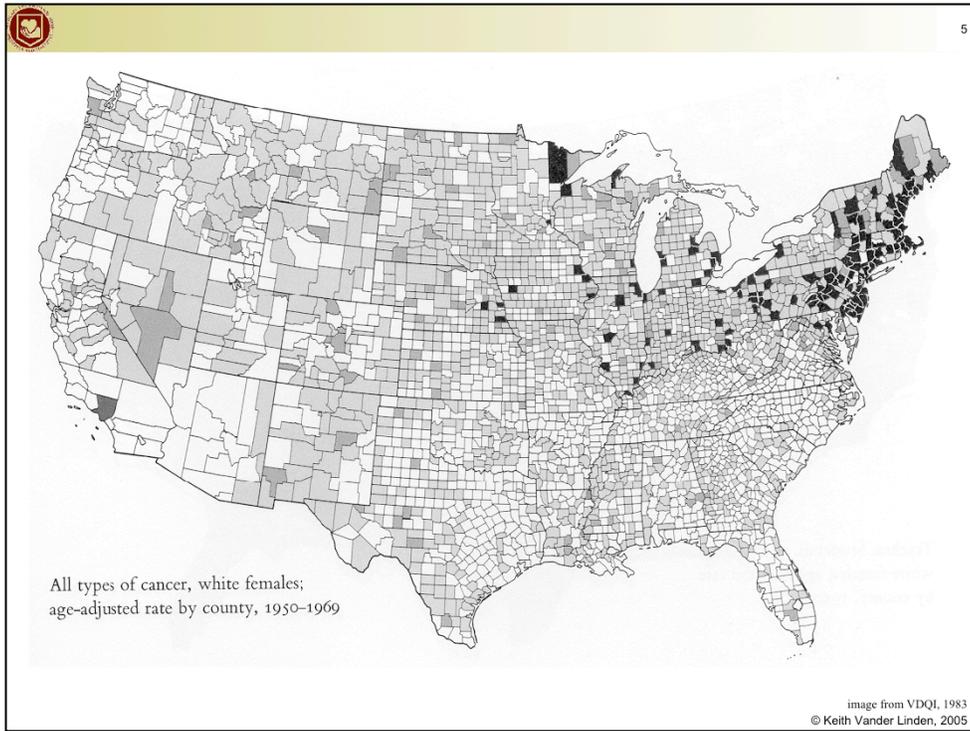
# Bar chart of same data





# Pie chart of same data





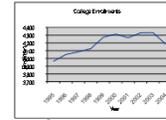
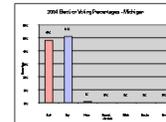
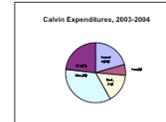
Tufte, page17 top here

This chart displays 21,000 data points very very well.



# Chart Types

- **Pie charts**
  - proportional relationships
- **Column/bar charts**
  - relative numeric information
  - (rather than percentages)
- **Line charts**
  - change in values over time
- **Maps**
  - geographical information
  - spatial relationships



Pie charts - proportional relationships

Column/bar charts - relative numeric information (rather than just percentages)

Line charts – change in values over time

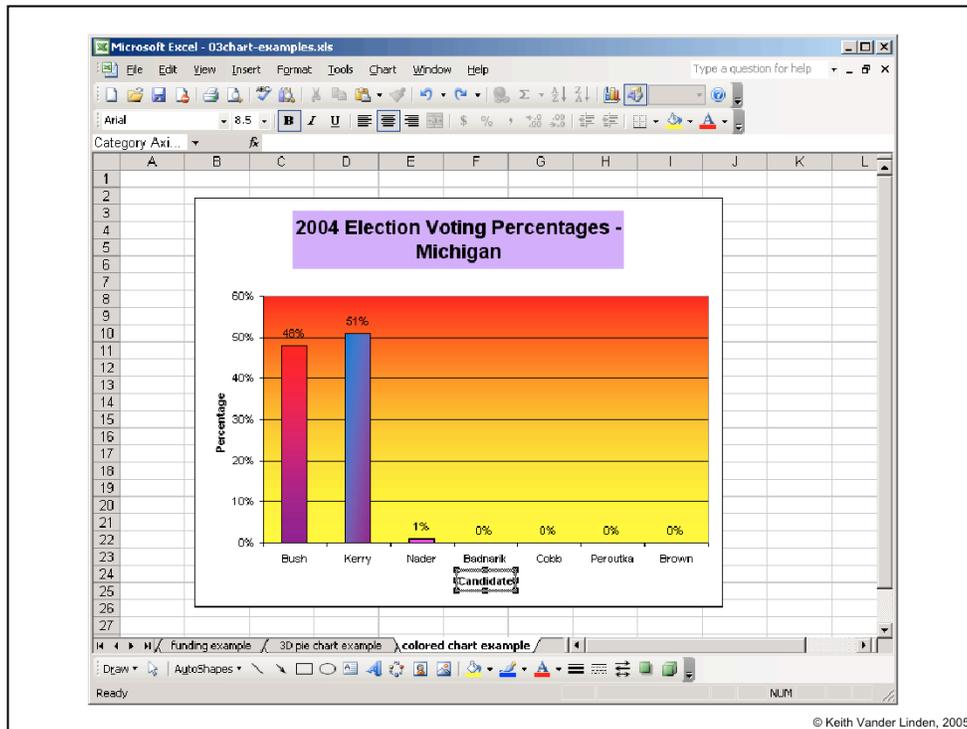
Maps - geographical information (obviously), people are very good at noting spatial relationships.



## Graph/Chart Issues

- Data values can, however, be obscured or misrepresented using charts.
- Here are some examples.

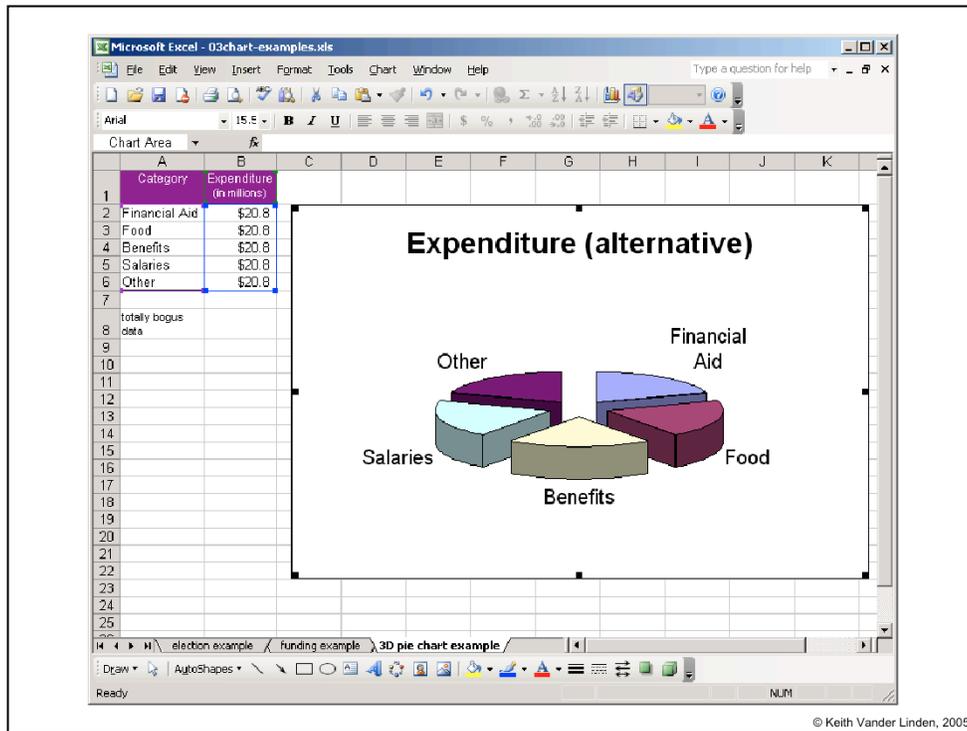
Sometimes a picture is worth 1000 lies.



These colors obscure the real message of the chart, and would basically make it hard to photocopy a legible version.

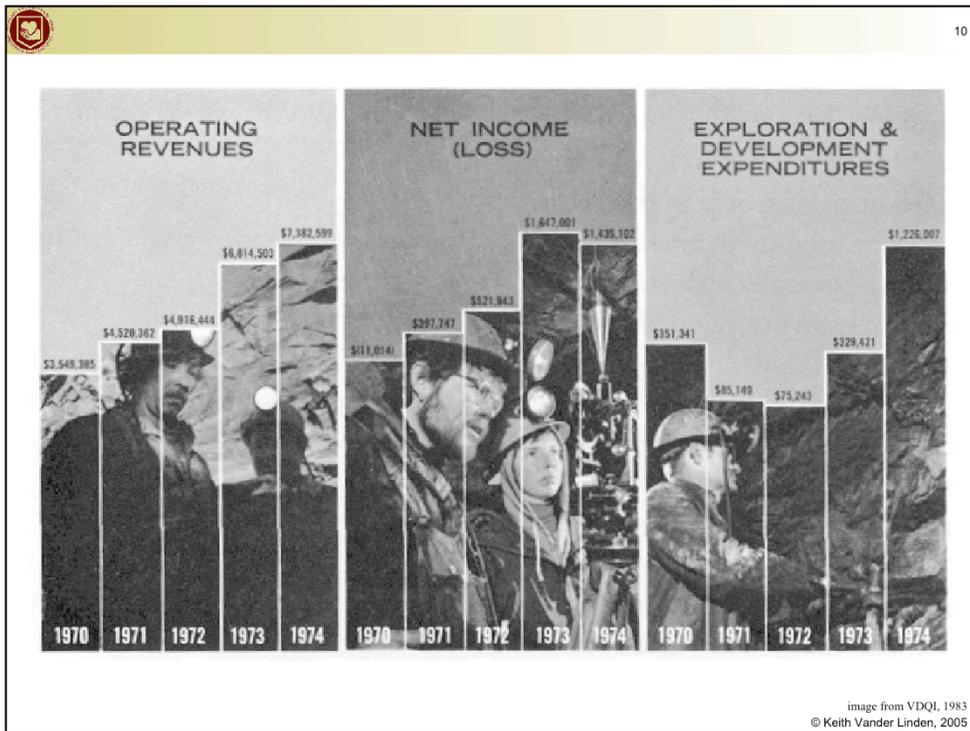
Don't be cute with your slides – KISS!

**KISS** is an acronym for the design principle "**Keep it simple, Stupid!**". Other variations include "**keep it short and simple**", "**keep it simple AND stupid**" or "**keep it simple and straightforward**". The KISS principle states that simplicity should be a key goal in design, and that unnecessary complexity should be avoided.



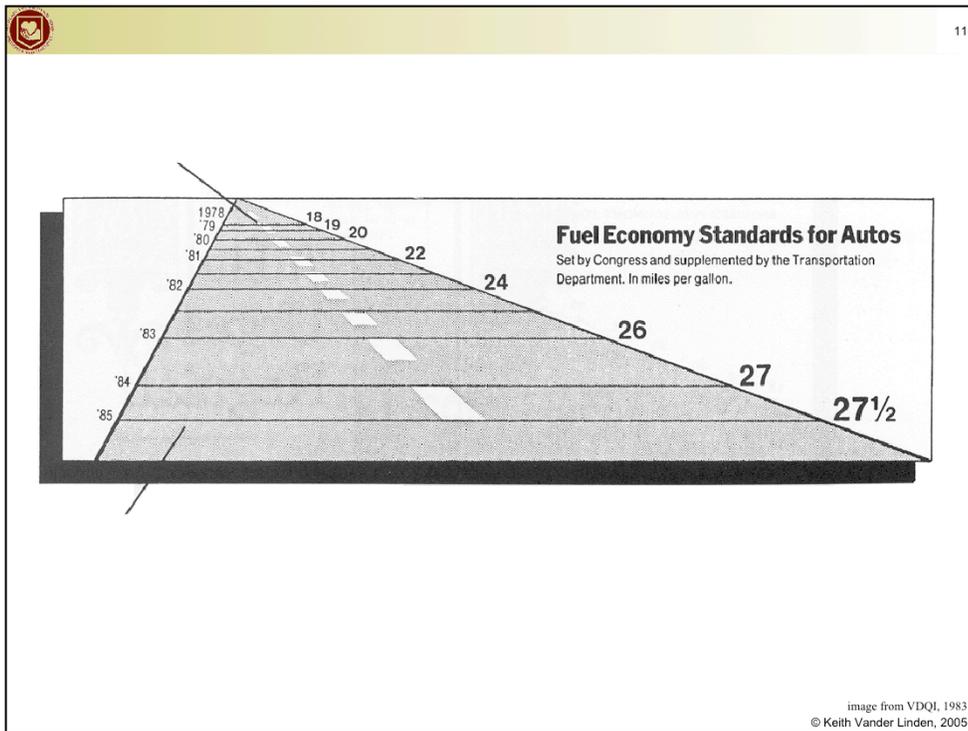
This chart misrepresents the data values in a subtle way - 3D pie charts are evil. See if they can guess what the real proportion is here.

Don't be cute with your slides – KISS!



Tufte, page 54 top here

This chart masks the net loss in 1970. You're looking at the pictures and not at the y-axis manipulations.



Tufte page 57 bottom

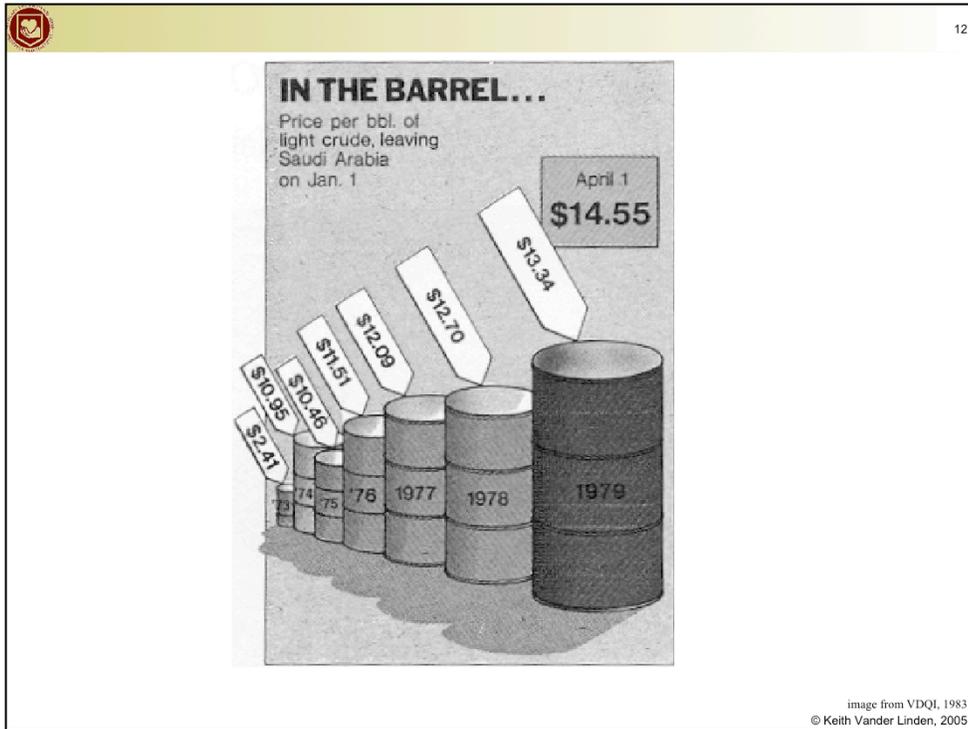
This chart is terrible

high **lie factor** (ratio of spatial change with data change) distance between lines not consistent

time goes from top to bottom (not standard in the west)

text is all the same size, so perspective is lost

bigger numbers on right appear smaller because of perspective



Tufte, page 62

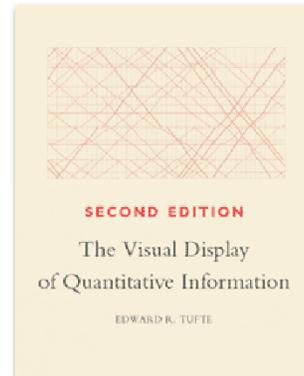
this has a high lie factor with a political intent.

The data variation of 454% is depicted with a surface area variation of 4280% and a volume variation of 27000%



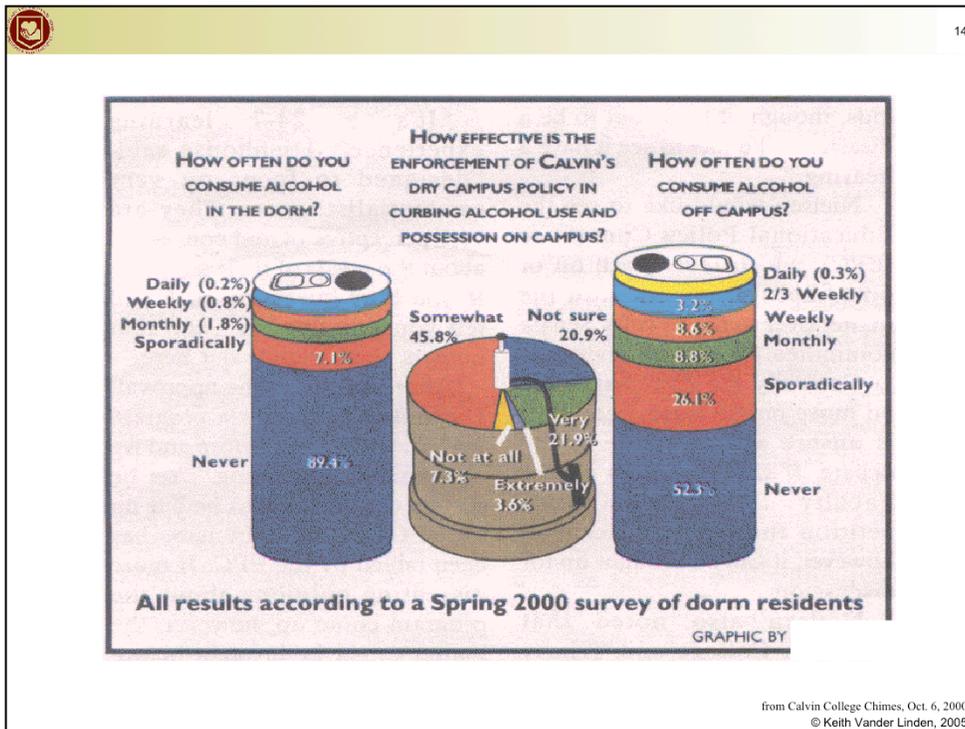
## Edward Tufte (1940-) *VDQI, 1983*

*Lying graphics cheapen the graphical art everywhere ... When a chart on television lies, it lies millions of times over; when a New York Times chart lies, it lies 900,000 times over to a great many important and influential readers. VDQI, p. 53-79*



images from [www.edwardtufte.com](http://www.edwardtufte.com), Oct., 2004  
© Keith Vander Linden, 2005

See <http://www.edwardtufte.com/tufte/>



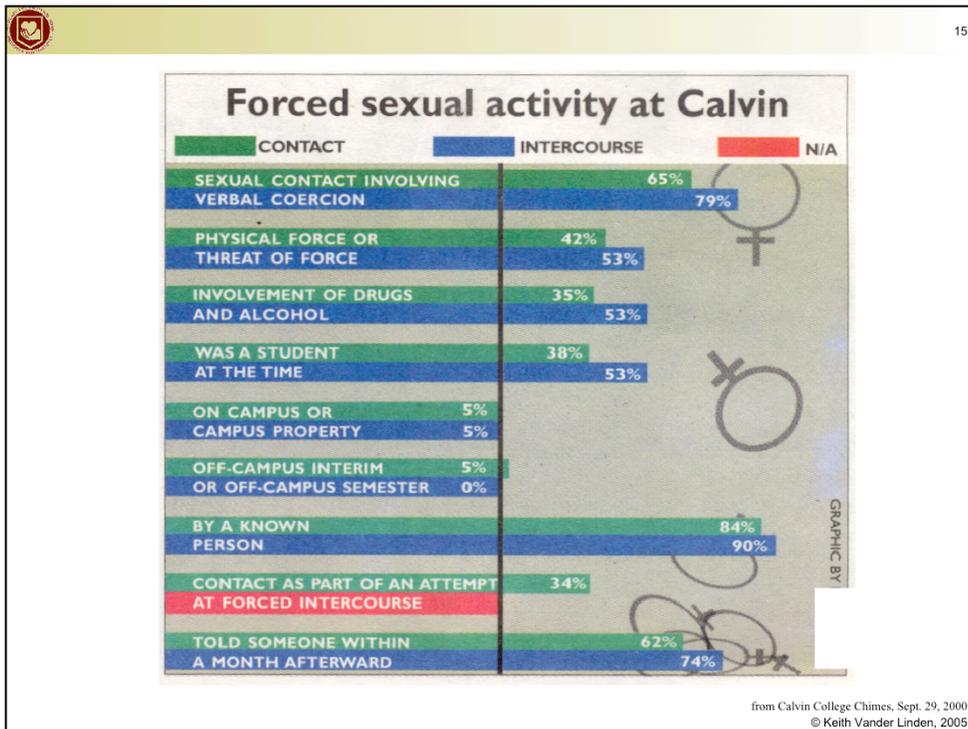
Note the differing scales on the can at left from can at right.

- L can - approx 25% of can is taken up in about 10% of data, making it seem that there's more consumption on campus than there really is.
- R can - blue 3.2% is same size as orange 8.6%

It seems that they've modified the data size in order to get the words on the page properly...

What chart would you really use to display this sort of data?

(These notes from Brenda Vander Linden)

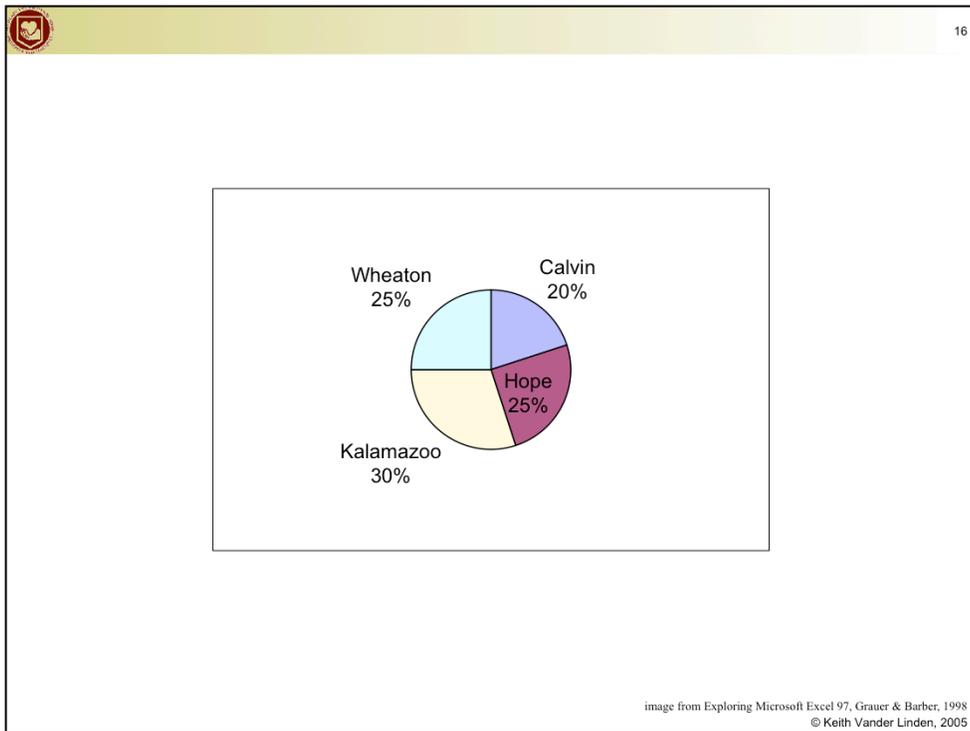


PREFACE: I don't mean to diminish the severity or horror of rape by showing this graphic. It's an awful crime and that should never be made light of.

However, the graphic the Chimes used to present the material is seriously flawed:

- Here, the vertical black line is intended to be ZERO, thus all the lines look much longer than they really should be.
- Unclear whether text on left refers to both bars together, or each individually. In fact, the whole green/blue thing doesn't make any sense to me (e.g., what is the "intercourse" blue line mean on the first pair of bars discussion "contact"?)
- Notice the 5th and 6th sets of bars. Three 5% indicators but not same length. (Incidentally, there is no indication that the rape statistics covered the women from age 14 to the present, which would include activity off campus and even before college. In actuality, only 3% of the 301 women responding had been raped since coming to Calvin, and of those, only one had actually been raped on campus.)

(These notes from Brenda Vander Linden)



Based on Grauer, figure 14.4, page 176

Didn't label the units! Is this percentage of dumb instructors or what?

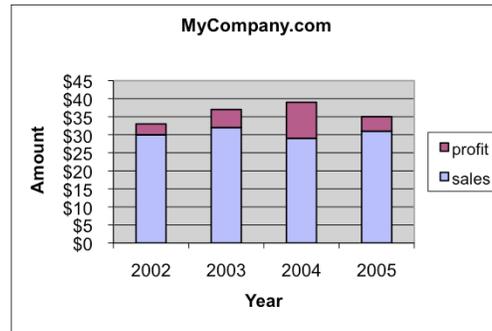


image from Exploring Microsoft Excel 97, Grauer & Barber, 1998  
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Based on Grauer, figure 4.15B, page 177  
Added dissimilar quantities



## Using Charts/Graphs Properly

- Decide what you want to present.
- Present it accurately and unambiguously.
  - Let the graphic values/change accurately depict the data values/change.
  - Clearly label all relevant details.
  - Don't graphically mix dissimilar elements.
  - Use the right type of graph.
  - Don't add "chartjunk".

Be honest. If necessary, have other people look at your work to catch any slant you may have.



## Technology and Lying

- It is as easy to lie or mislead with technology.
  
- “When he lies, he speaks his native language, for he is a liar and the father of lies.” - John 8:44

The