Grace

http://plasma-gate.weizmann.ac.il/Grace/

gnuplot homepage

http://www.gnuplot.info/

QtiPlot

http://soft.proindependent.com/pricing.html

Excel 2007

http://office.microsoft.com/en-us/excel/default.aspx

The MathWorks™
Accelerating the pace of engineering and science

http://www.mathworks.com/

AptPlot - Java Graphing & Data Analysis Software

http://www.aptplot.com/

SigmaPlot
Exact Graphs and Data Analysis

http://www.sigmaplot.com/products/sigmaplot/sigmaplot-details.php

matplotlib

http://matplotlib.sourceforge.net/
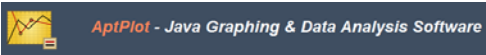
WOLFRAMRESEARCH

http://www.wolfram.com/
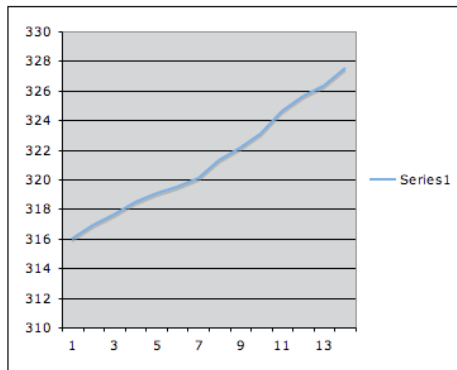

CS 5630/6630
Scientific Visualization

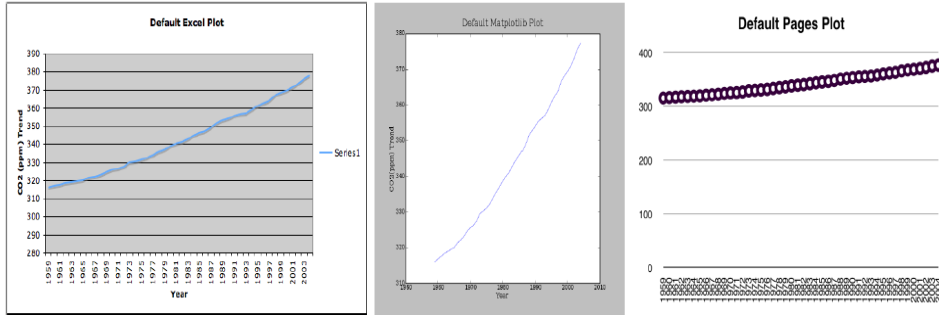Elementary Plotting Techniques I

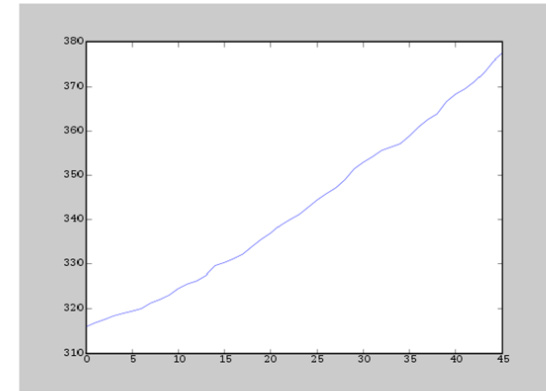
Motivation

Default Excel Plot

Motivation

• Everyone uses plotting

• It is easy to lie or to deceive people with bad plots

• Default plotting tools are terrible

• Most people ignore or are unaware of simple principles

Motivation

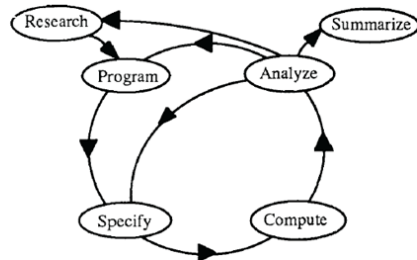- Why are they all different?

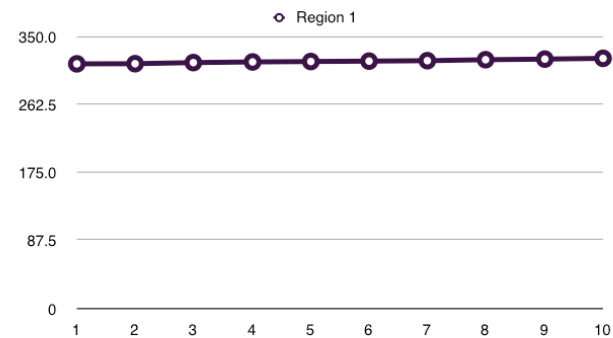- What is good/bad about each?

Motivation

Default Matplotlib/Matlab Plot

Fundamentals of plotting

- Analysis vs. Communication

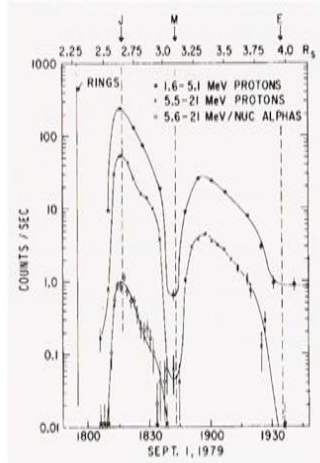- Presenting data vs. Presenting correlation

- Vision vs. Understanding
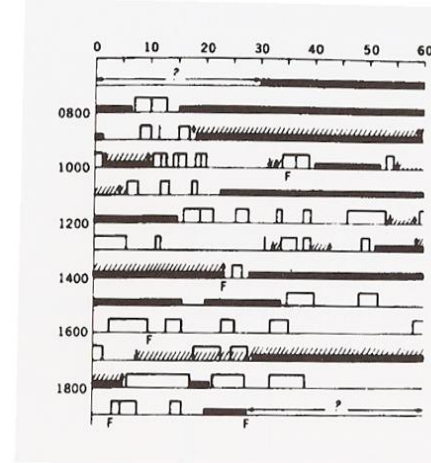

Motivation

Default Pages Plot

Clear Vision

- Principle 1: Make data stand out

  - Avoid superfluidity, clutter, or chartjunk.
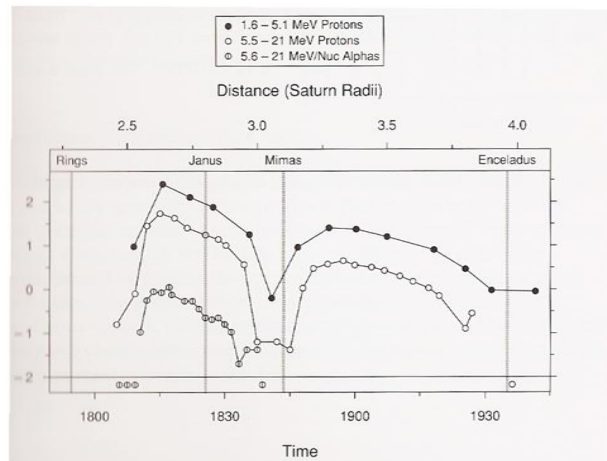

Clear Vision

- Principle 1: Make data stand out

  - Avoid superfluidity, clutter, or chartjunk.

Activities of a !Kung woman and her baby
Open Bar and Vertical Lines: Nursing times
Closed Bars: Sleeping
F: Fretting
Slashed Lines: Held by mother
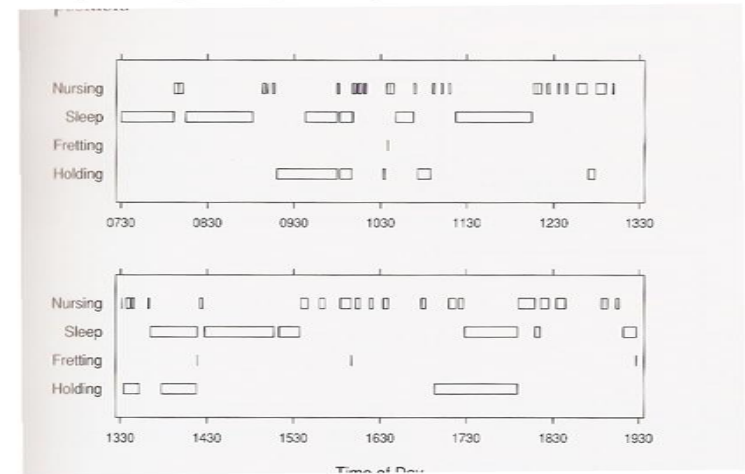Arrows: Picking up and setting down

Clear Vision

- Principle 1: Make data stand out

  - Avoid superfluidity, clutter, or chartjunk.
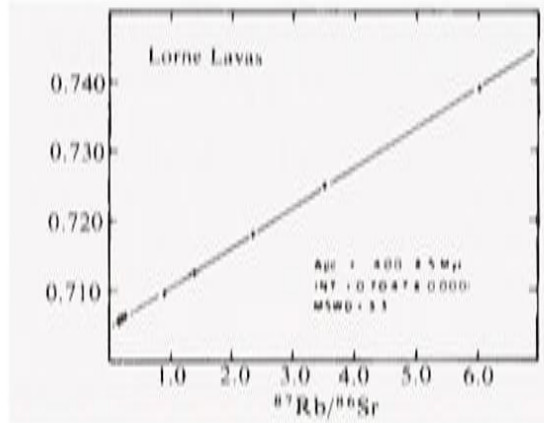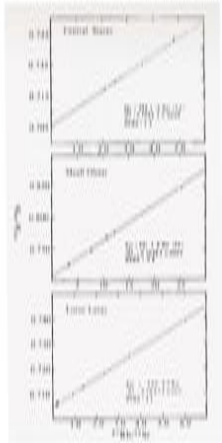

Clear Vision

- Principle 1: Make data stand out

  - Avoid superfluidity, clutter, or chartjunk.

Clear Vision

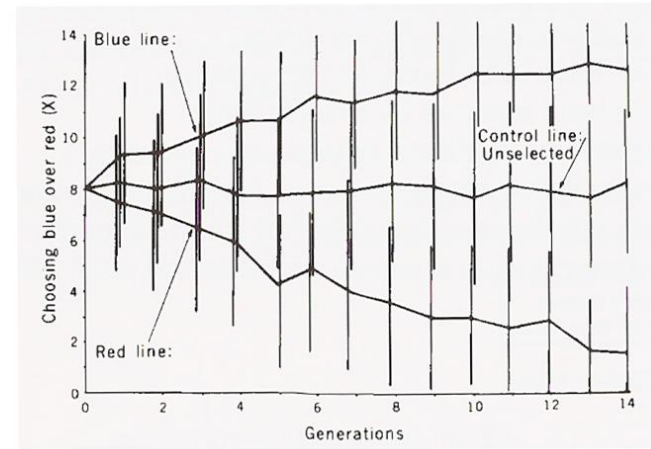- Principle 2: Visual prominence
  - Use visually prominent graphical elements to show the data.

Clear Vision

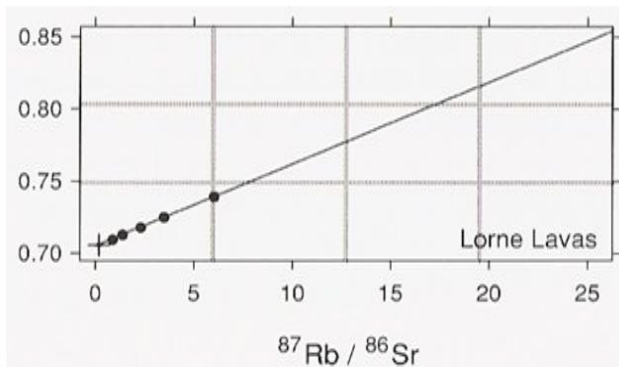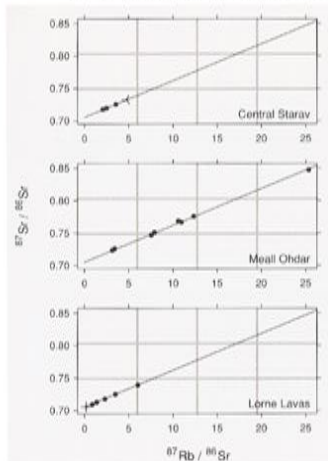- Principle 1: Make data stand out
  - Avoid superfluidity, clutter, or chartjunk.

Clear Vision
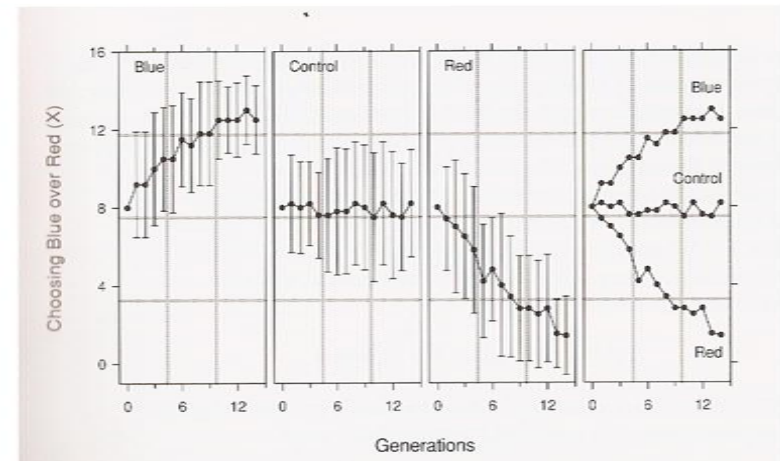
- Principle 2: Visual prominence
  - Use visually prominent graphical elements to show the data.
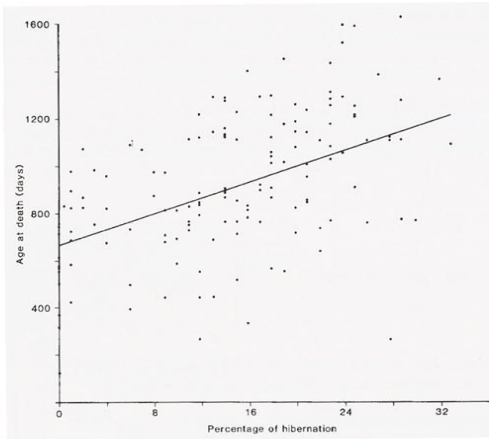

Clear Vision

- Principle 1: Make data stand out
  - Avoid superfluidity, clutter, or chartjunk.

Clear Vision

- Principle 3: Scale lines and the data rectangle

  - Use two scale lines (box), add margins for data, tick-marks out, 3-10 tick marks.

Clear Vision

- Principle 2: Visual prominence

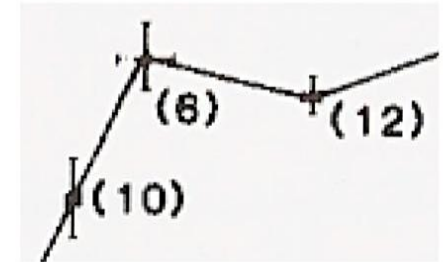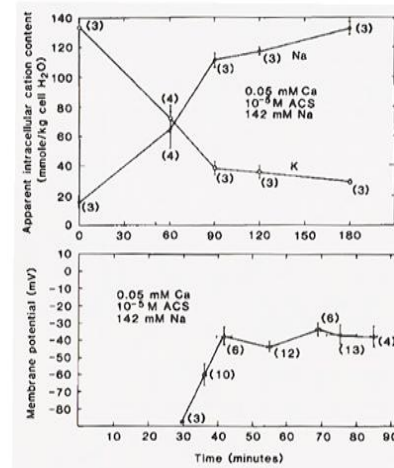 - Use visually prominent graphical elements to show the data.

Clear Vision

- Principle 3: Scale lines and the data rectangle

  - Use two scale lines (box), add margins for data, tick-marks out, 3-10 tick marks.

Clear Vision

- Principle 2: Visual prominence

  - Use visually prominent graphical elements to show the data.

Clear Vision

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Clear Vision

- Principle 3: Scale lines and the data rectangle

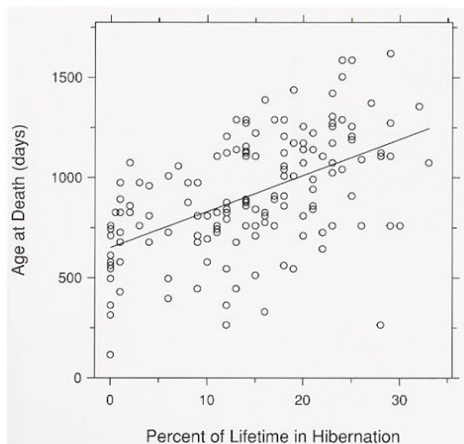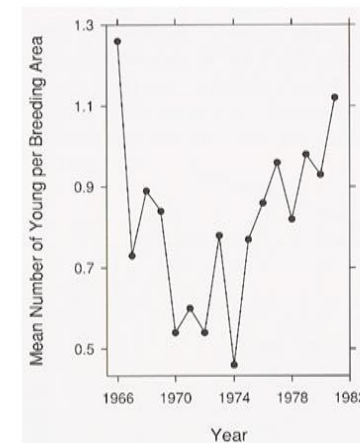 - Use two scale lines (box), add margins for data, tick-marks out, 3-10 tick marks.

Clear Vision

- Principle 3: Scale lines and the data rectangle

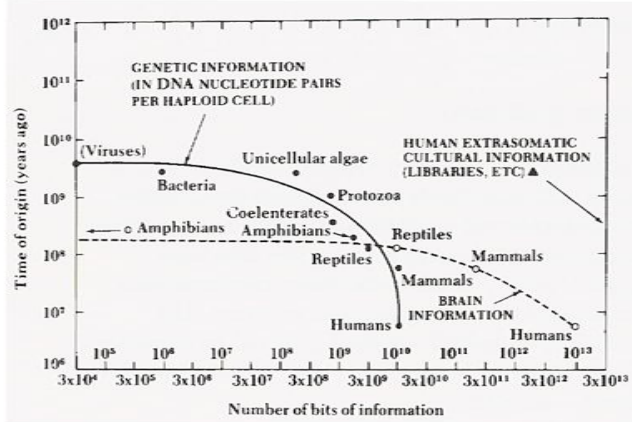 - Use two scale lines (box), add margins for data, tick-marks out, 3-10 tick marks.
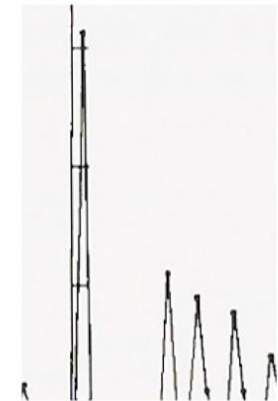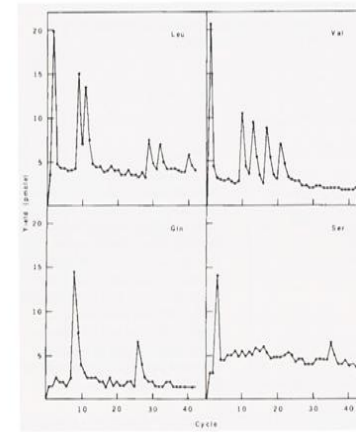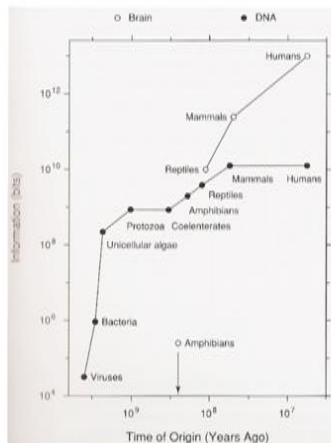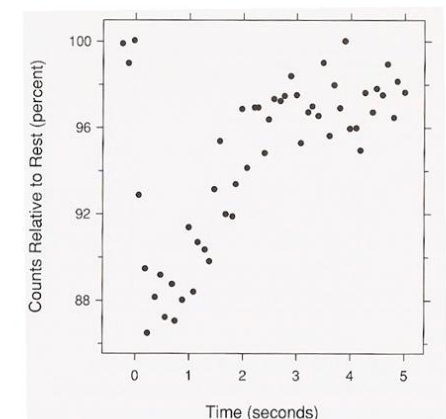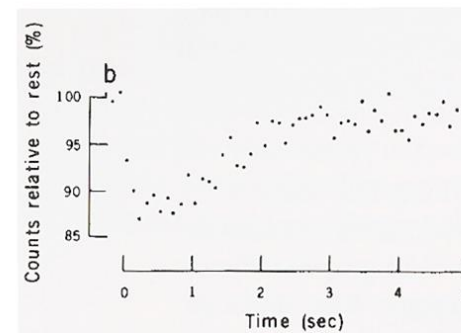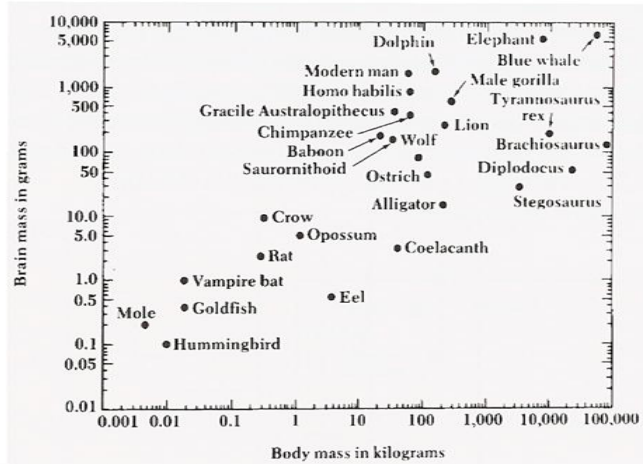

Clear Vision

- Principle 3: Scale lines and the data rectangle

  - Use two scale lines (box), add margins for data, tick-marks out, 3-10 tick marks.

Clear Vision

- Principle 4: Reference lines, labels, notes, and keys
  - Only use when necessary and don't let them obscure data.

Clear Vision

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Clear Vision

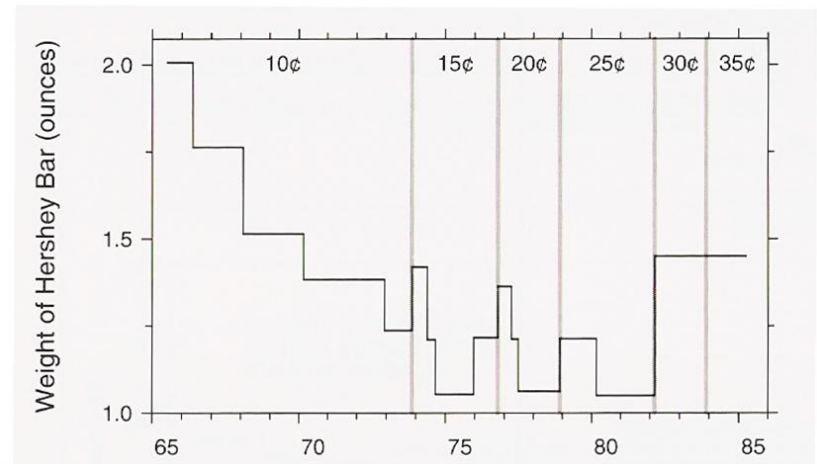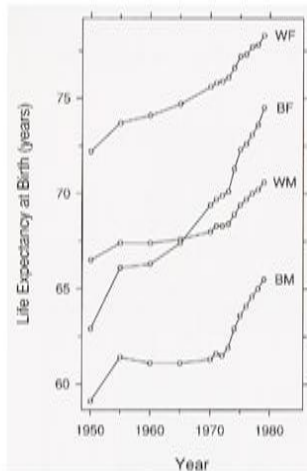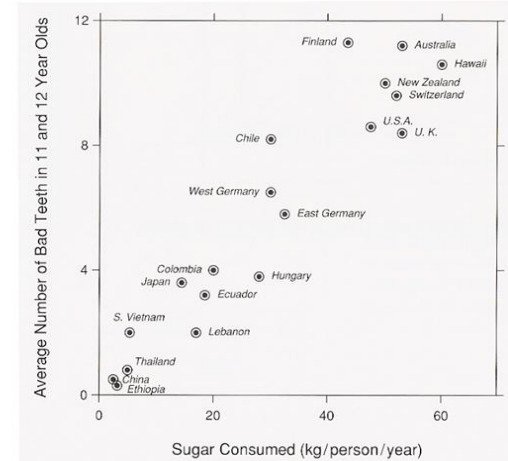- Principle 4: Reference lines, labels, notes, and keys
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Clear Vision

- Principle 4: Reference lines, labels, notes, and keys

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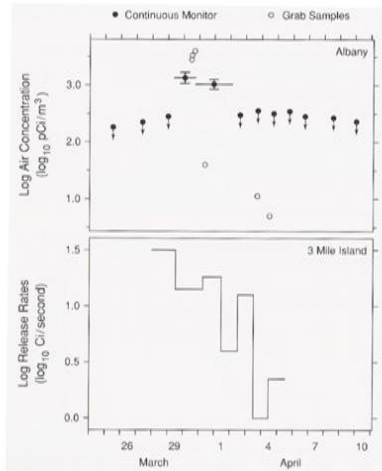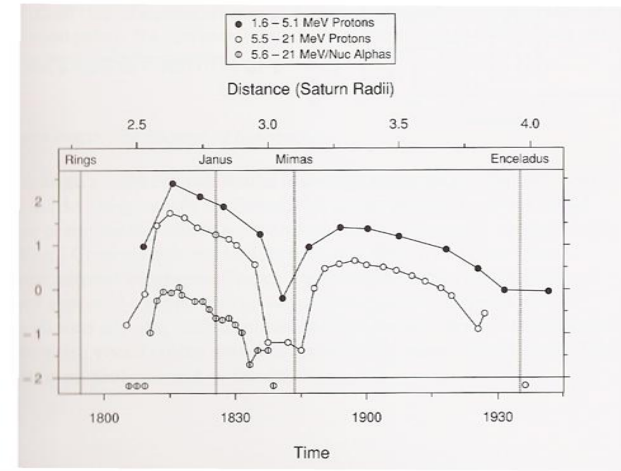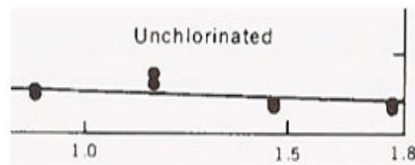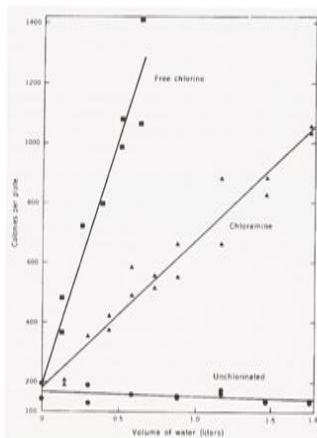
Clear Vision

- Principle 4: Reference lines, labels, notes, and keys

  - Only use when necessary and don't let them obscure data.

Clear Vision

- Principle 5: Superposed data sets

  - Symbols should be separable and data sets should be easily visually assembled.

Clear Vision

- Principle 4: Reference lines, labels, notes, and keys

  - Only use when necessary and don't let them obscure data.

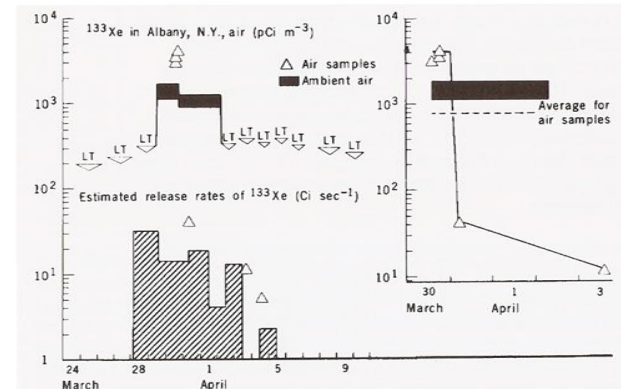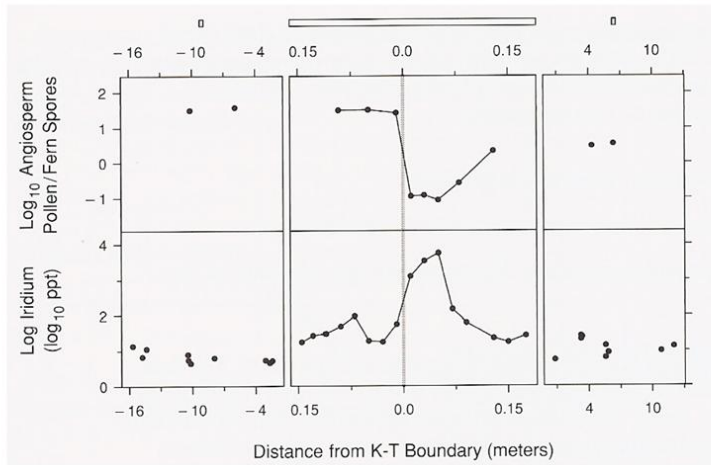Fig. 1. Xenon-133 activity (picocuries per cubic meter of air) in Albany, New York, for the end of March and early April 1979. The lower trace shows the time-averaged estimates of releases (curies per second) from the Three Mile Island reactor (2). The inset shows detailed values for air samples (gas counting) and concurrent average values for ambient air (Ge diode). Abbreviation: LT, less than.

Clear Understanding

- Principle 1: Explanation and conclusions

  - Describe everything, draw attention to major features, describe conclusions

Clear Vision

- Principle 5: Superposed data sets

  - Symbols should be separable and data sets should be easily visually assembled.

Clear Understanding

- Principle 1: Explanation and conclusions

  - Describe everything, draw attention to major features, describe conclusions

Clear Vision

- Principle 5: Superposed data sets

  - Symbols should be separable and data sets should be easily visually assembled.

Clear Understanding

- Principle 2: Use all of the available space

  - Fill the data rectangle, only use zero if you need it

GOVT. PAY ROLLS UP!

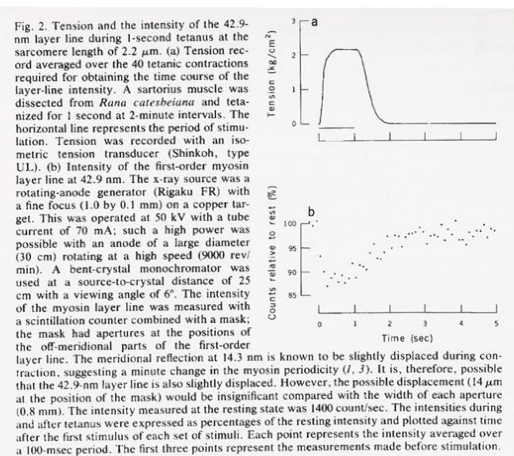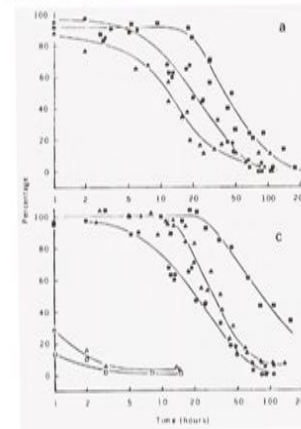$20,000,000

$19,500,000

June July Aug Sept Oct Nov Dec

1937

Clear Understanding

- Principle 1: Explanation and conclusions

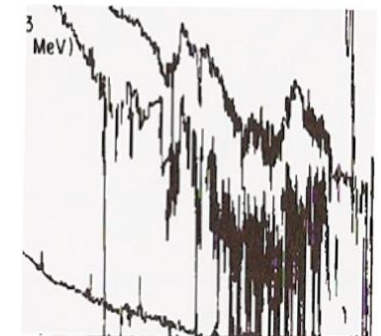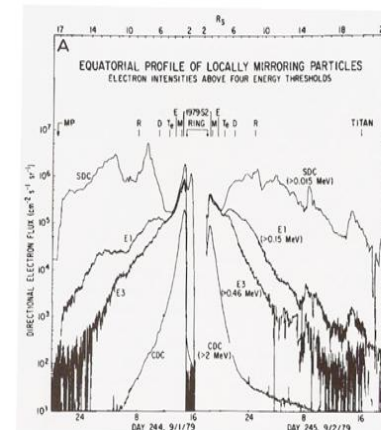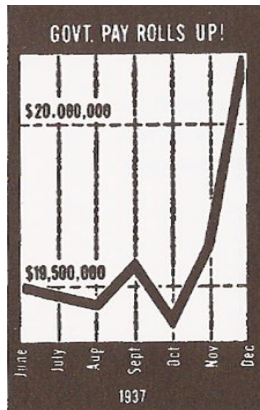 - Describe everything, draw attention to major features, describe conclusions

Fig. 1. Inhibitory effect of morphine hydrochloride (A) and β-endorphin (B) on wet-shake behavior in rats. Antagonism was by antibody to cerebroside sulfate (AS). A volume of 2 μl was delivered into the PAG in 1-μl increments with a 1-minute interval in between. The control consisted of saline (Sal). Morphine HCl (M-HCl) and β-endorphin were preceded by saline, AS, or naloxone (Nal) as indicated. The dose of morphine HCl and naloxone refers to the chloride salt. Each point is the datum for one animal. The AS + morphine HCl groups are all significantly different (t-test, $P < .005$) from the corresponding morphine HCl groups alone (A). The group receiving AS + 0.0375 μg of β-endorphin is also significantly different ($P < .005$) from the group receiving 0.0375 μg of β-endorphin (B).

Clear Understanding

- Principle 2: Use all of the available space

  - Fill the data rectangle, only use zero if you need it

GOVT. PAY ROLLS STABLE!

Millions of dollars

June July Aug Sept Oct Nov Dec

1937

Clear Understanding

- Principle 2: Use all of the available space

  - Fill the data rectangle, only use zero if you need it

Aa

Sunspot number

Principle 3: Juxtaposed data sets
Clear Understanding
Make sure scales match and graphs are aligned
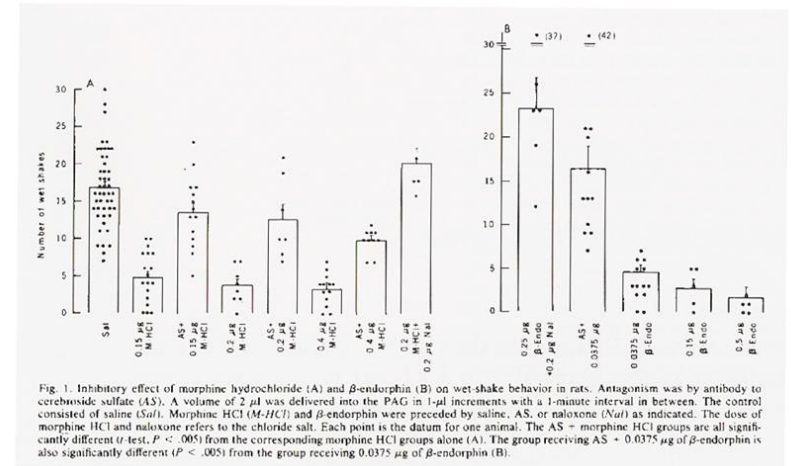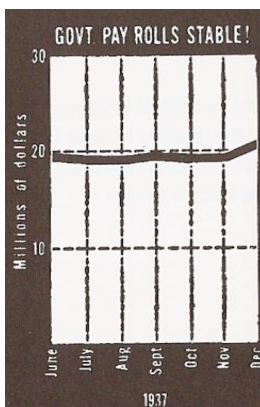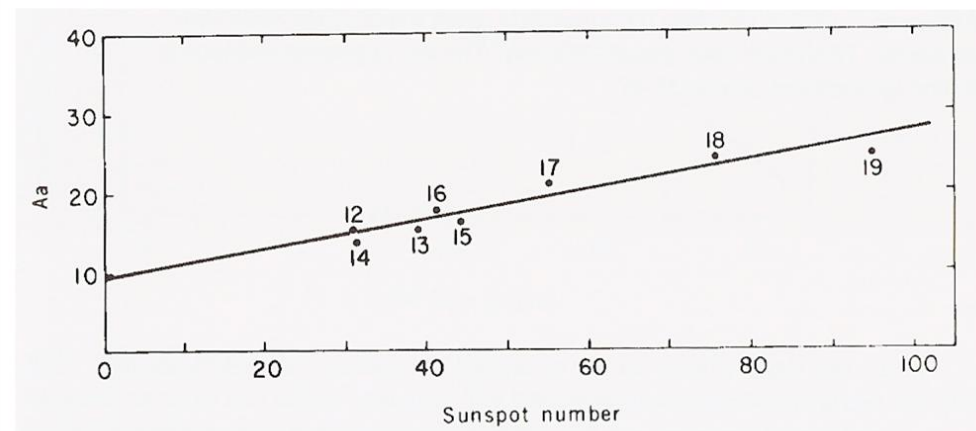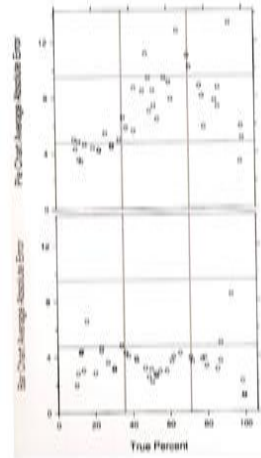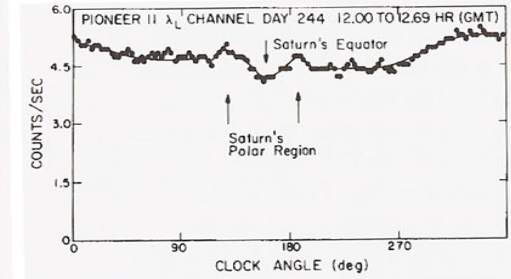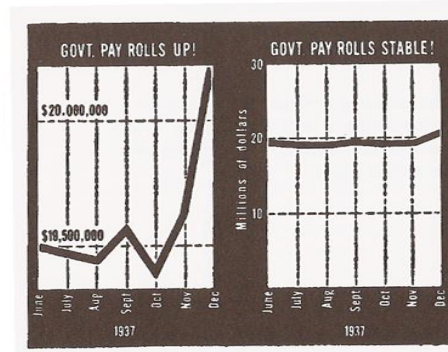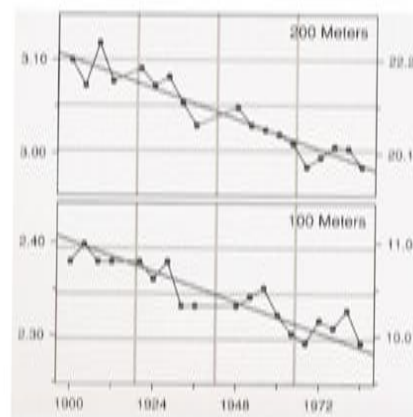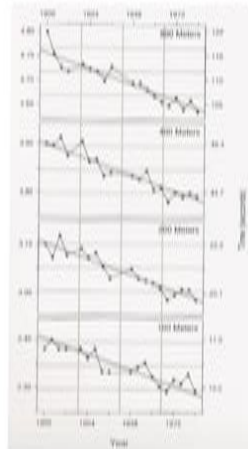

Clear Understanding

• Principle 2: Use all of the available space

  • Fill the data rectangle, only use zero if you need it

Clear Understanding

• Principle 3: Juxtaposed data sets

  • Make sure scales match and graphs are aligned

Clear Understanding

• Principle 2: Use all of the available space

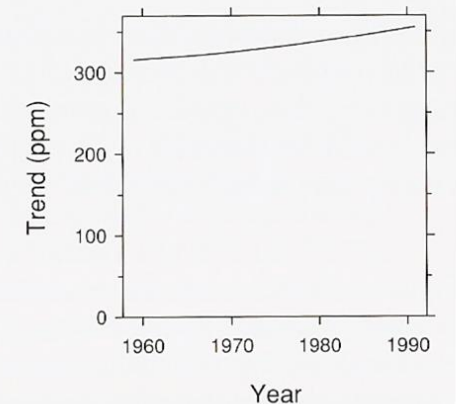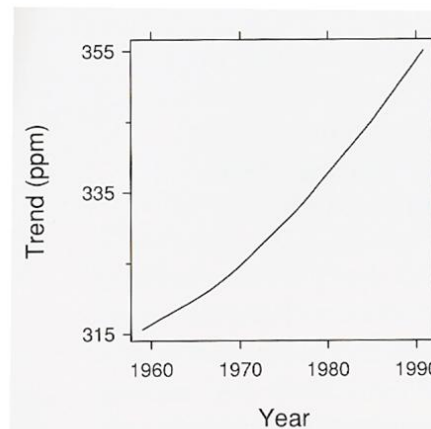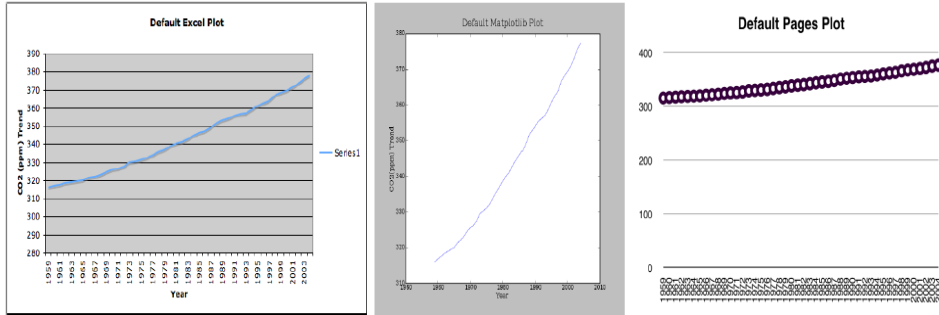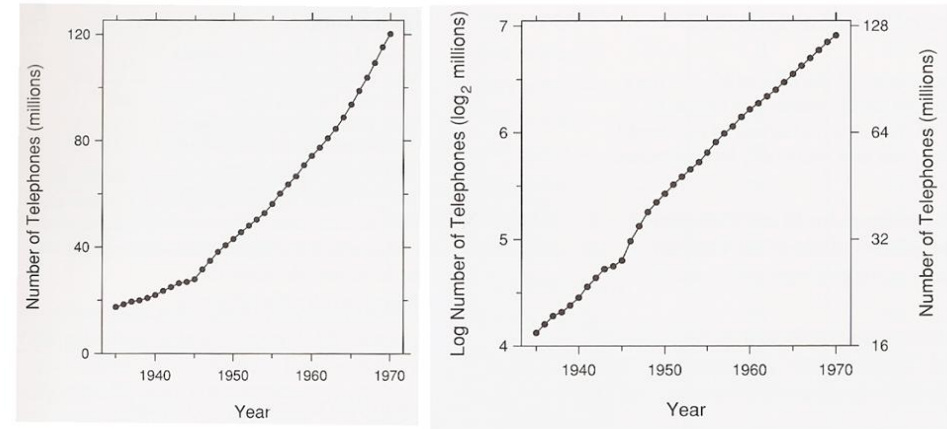 • Fill the data rectangle, only use zero if you need it

Summary of Principles

- Why are they all different?
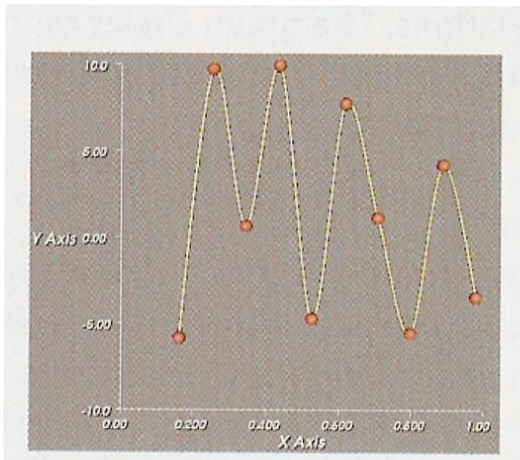
- What is good/bad about each?

Clear Understanding

- Principle 4: Log scales

  - Used to show percentage change, multiplicative factors and skewness

Quiz on Principles

- What is wrong with this plot?

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Summary of Principles

- Clear Vision
  1. Make data stand out
  2. Visual prominence
  3. Scale lines and data rectangle
  4. Superposed data sets

- Clear Understanding
  1. Explanations and conclusions
  2. Use all available space
  3. Juxtaposed data sets
  4. Log scaling
  5. Banking to 45°

Quiz on Principles

- What is wrong with this plot?