

# CS 5630/6630

## Scientific Visualization

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Elementary Plotting Techniques I

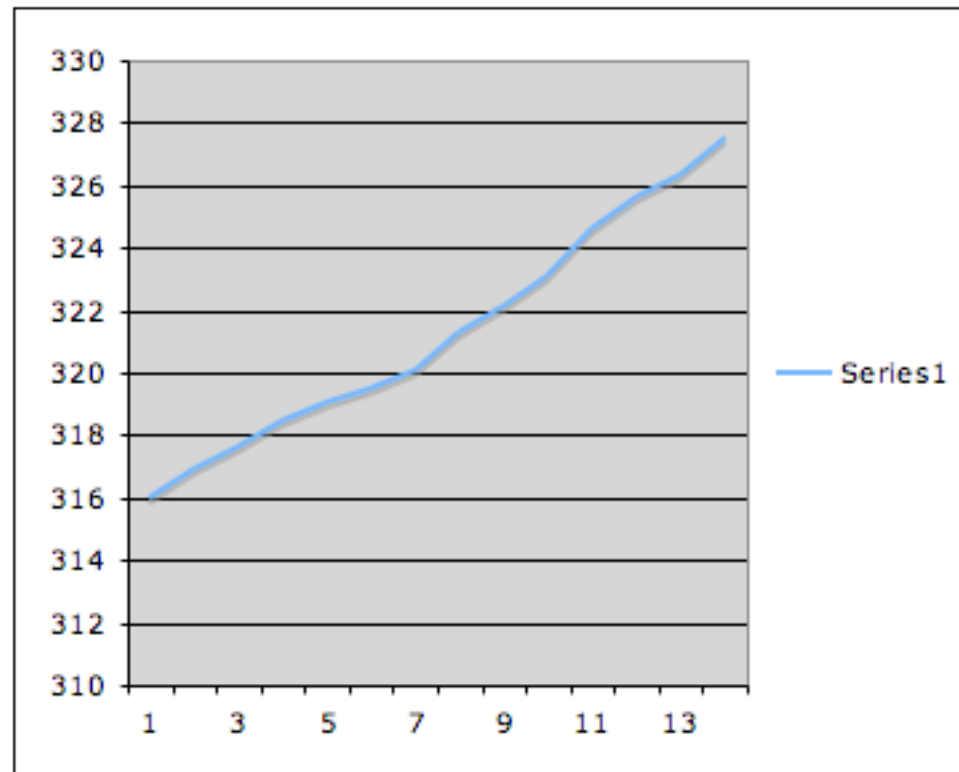
# Motivation

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- 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

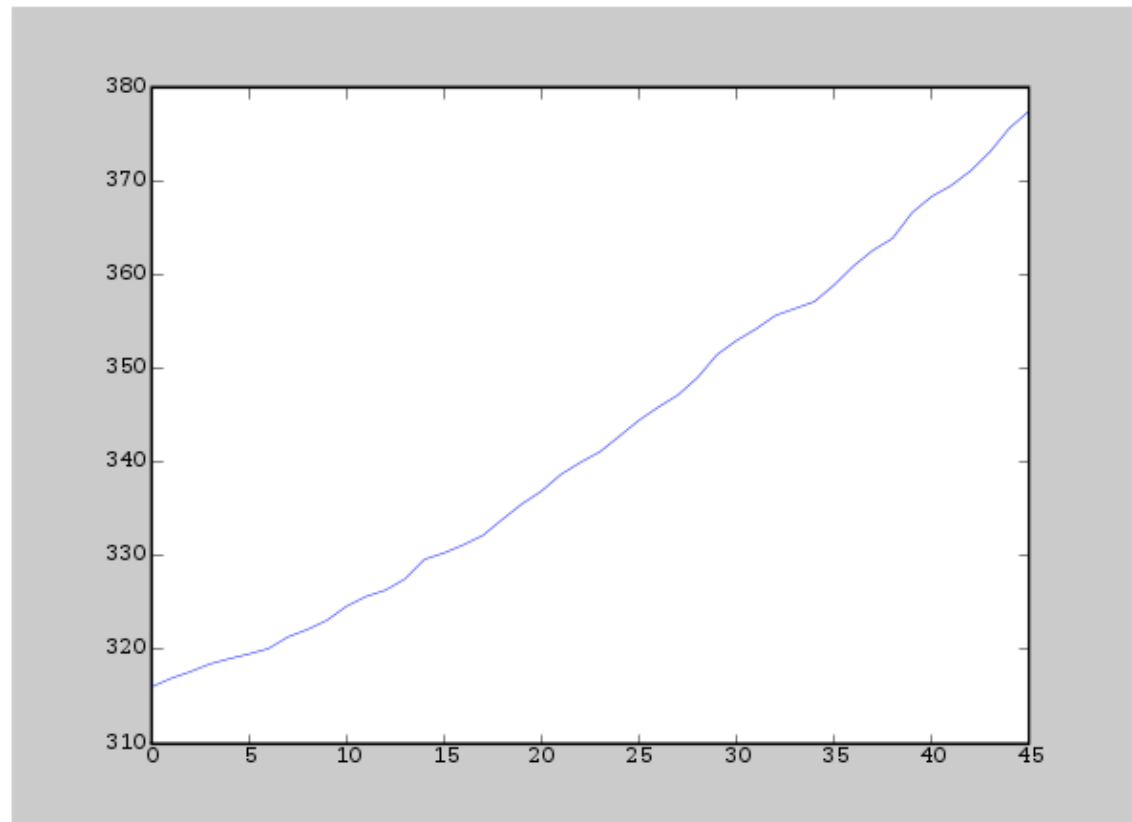
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Default Excel Plot

# Motivation

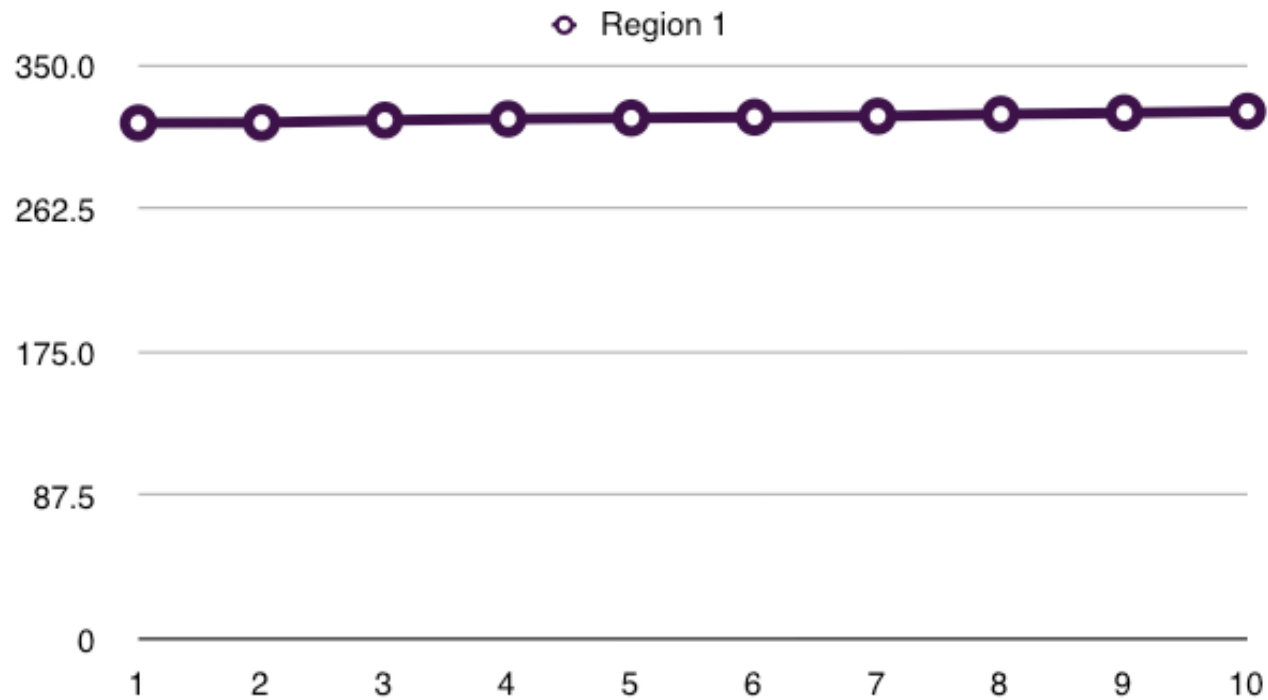
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Default Matplotlib/Matlab Plot

# Motivation

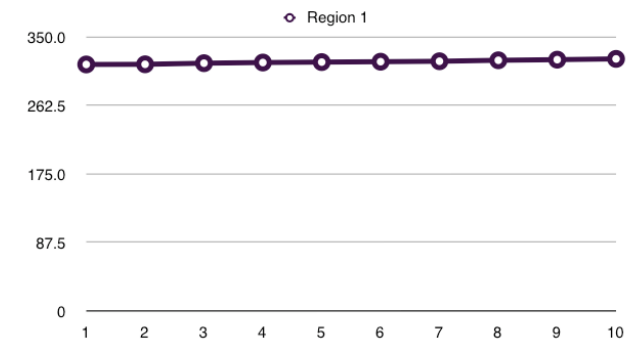
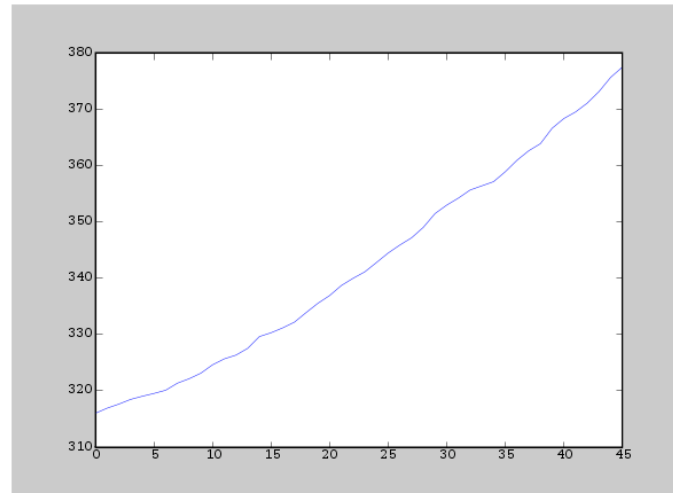
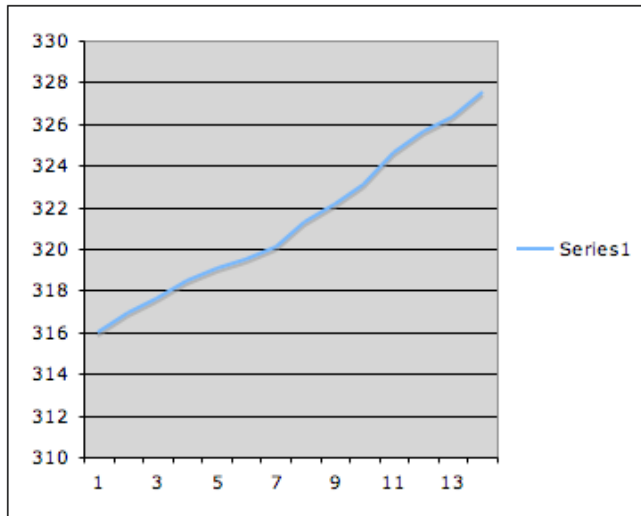
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Default Pages Plot

# Motivation

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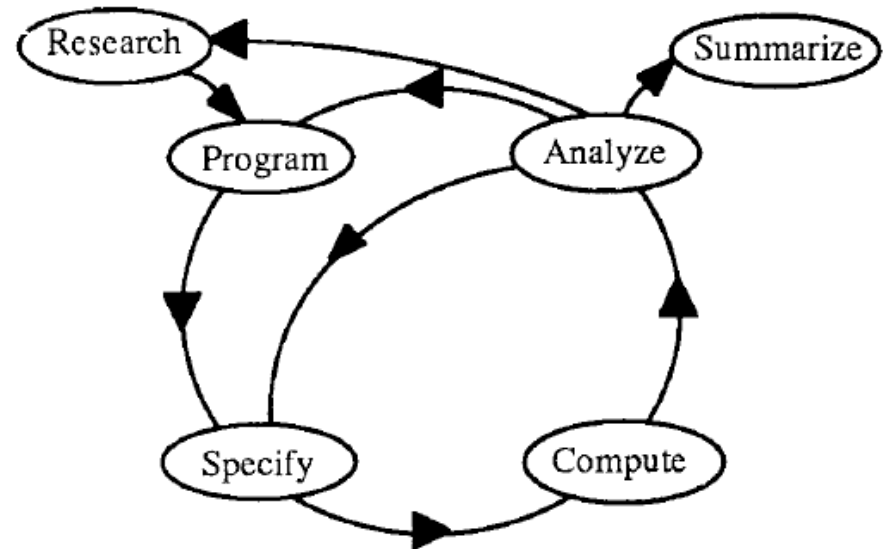


- Why are they all different?
- What is good/bad about each?

# Fundamentals of plotting

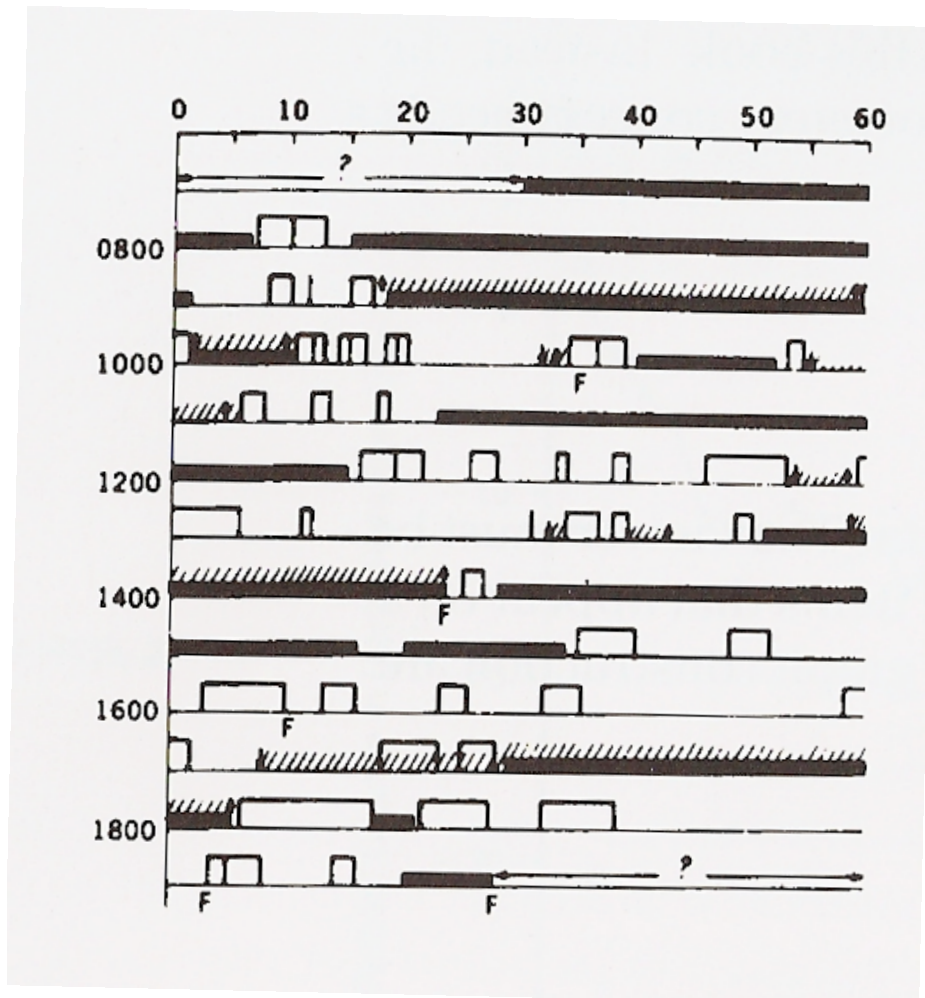
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- Analysis vs. Communication
- Presenting data vs. Presenting correlation
- Vision vs. Understanding



# Clear Vision

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



## Activities of a !Kung woman and her baby

Open Bar and Vertical Lines: Nursing times

Closed Bars: Sleeping

F: Fretting

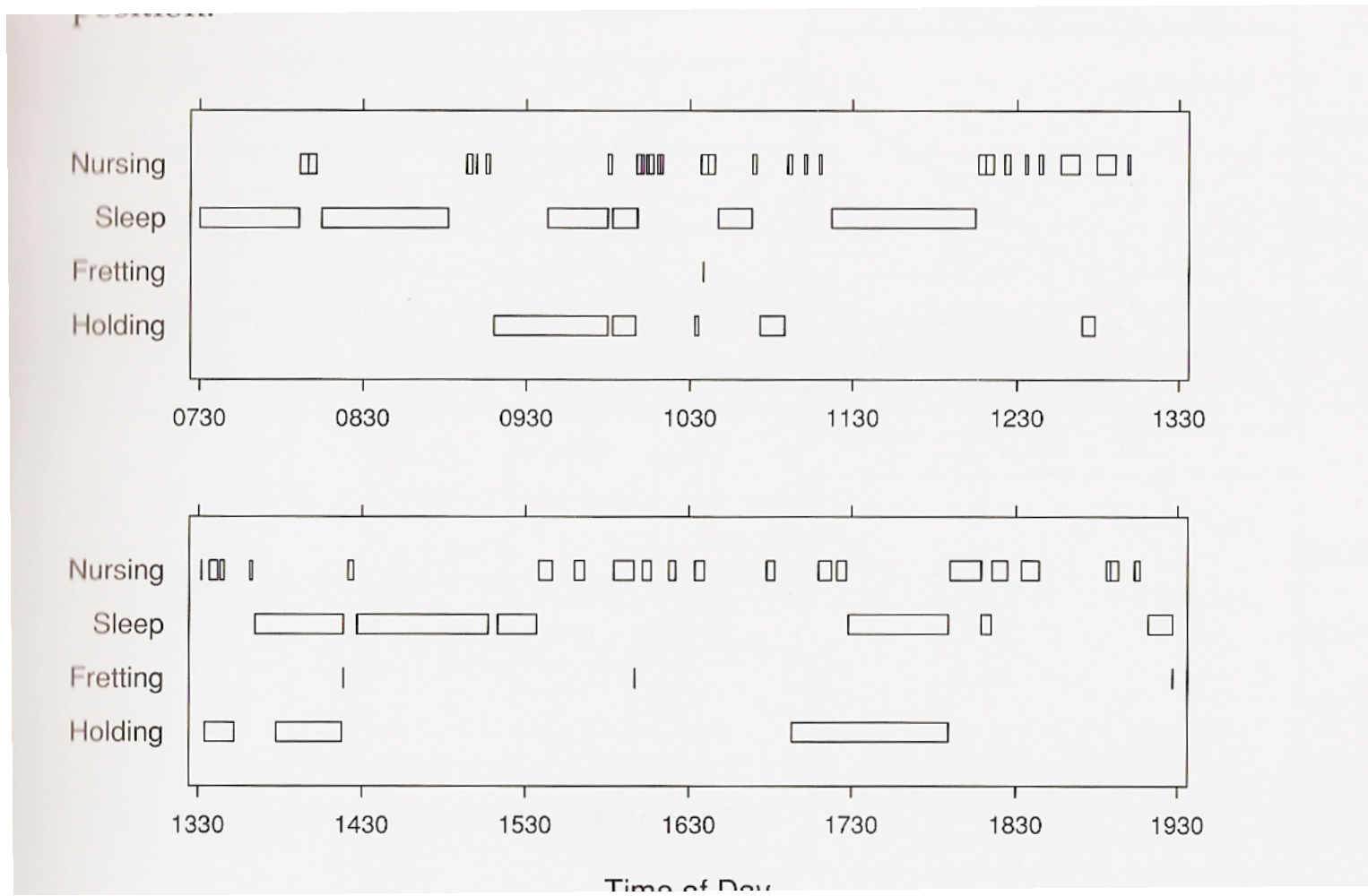
Slashed Lines: Held by mother

Arrows: Picking up and setting down

# Clear Vision

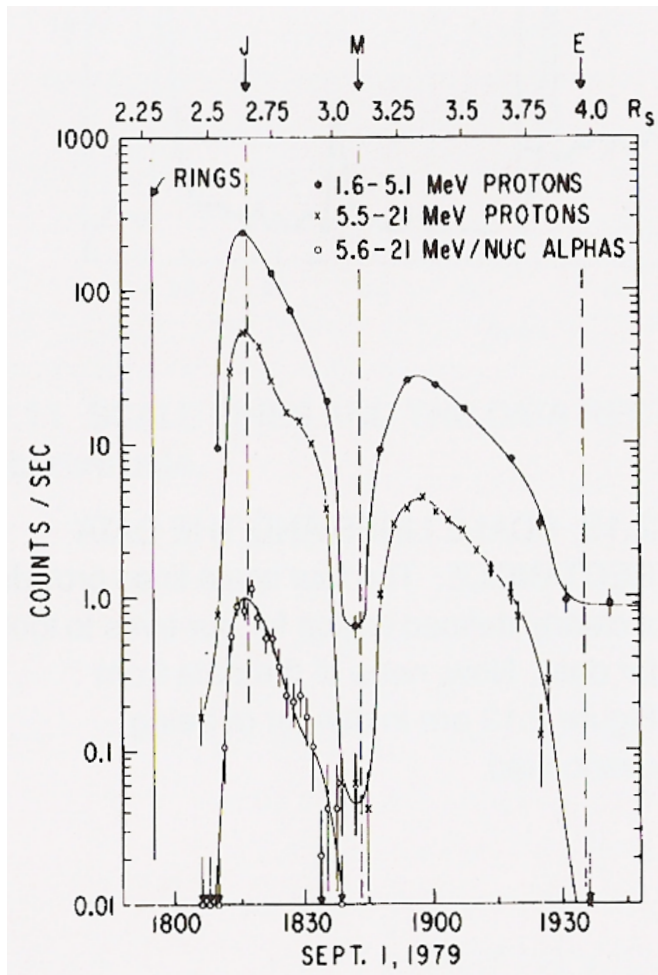
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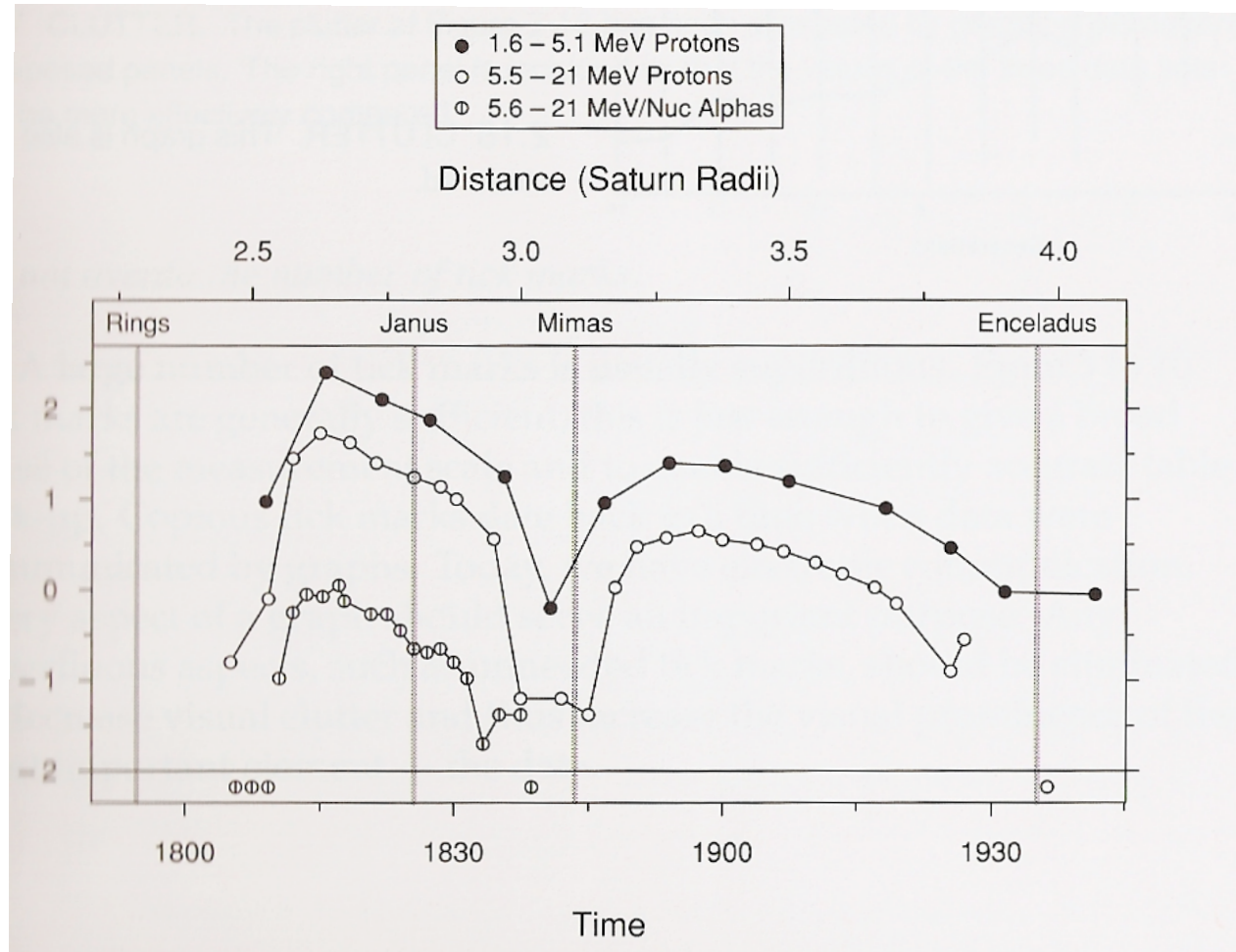
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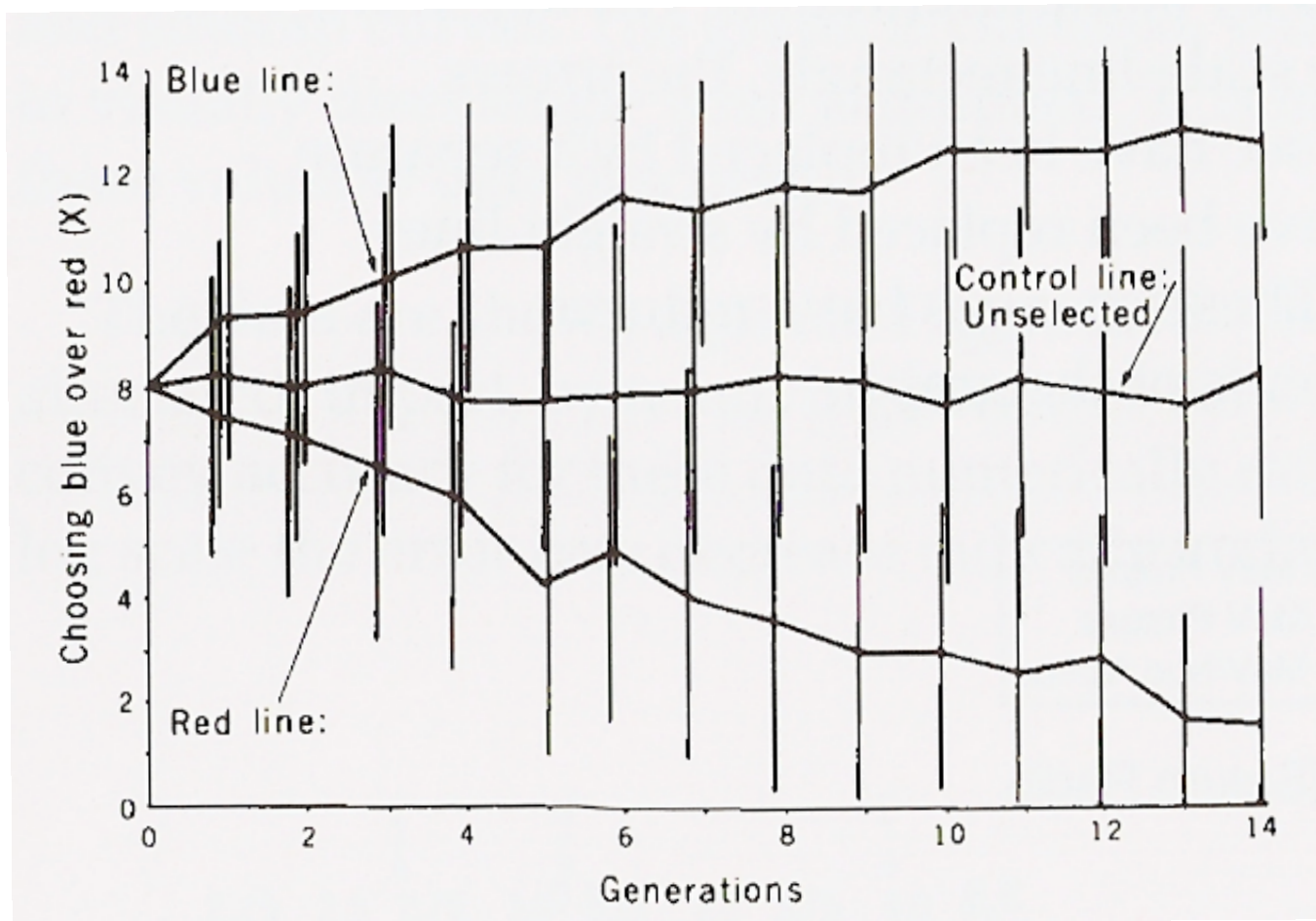
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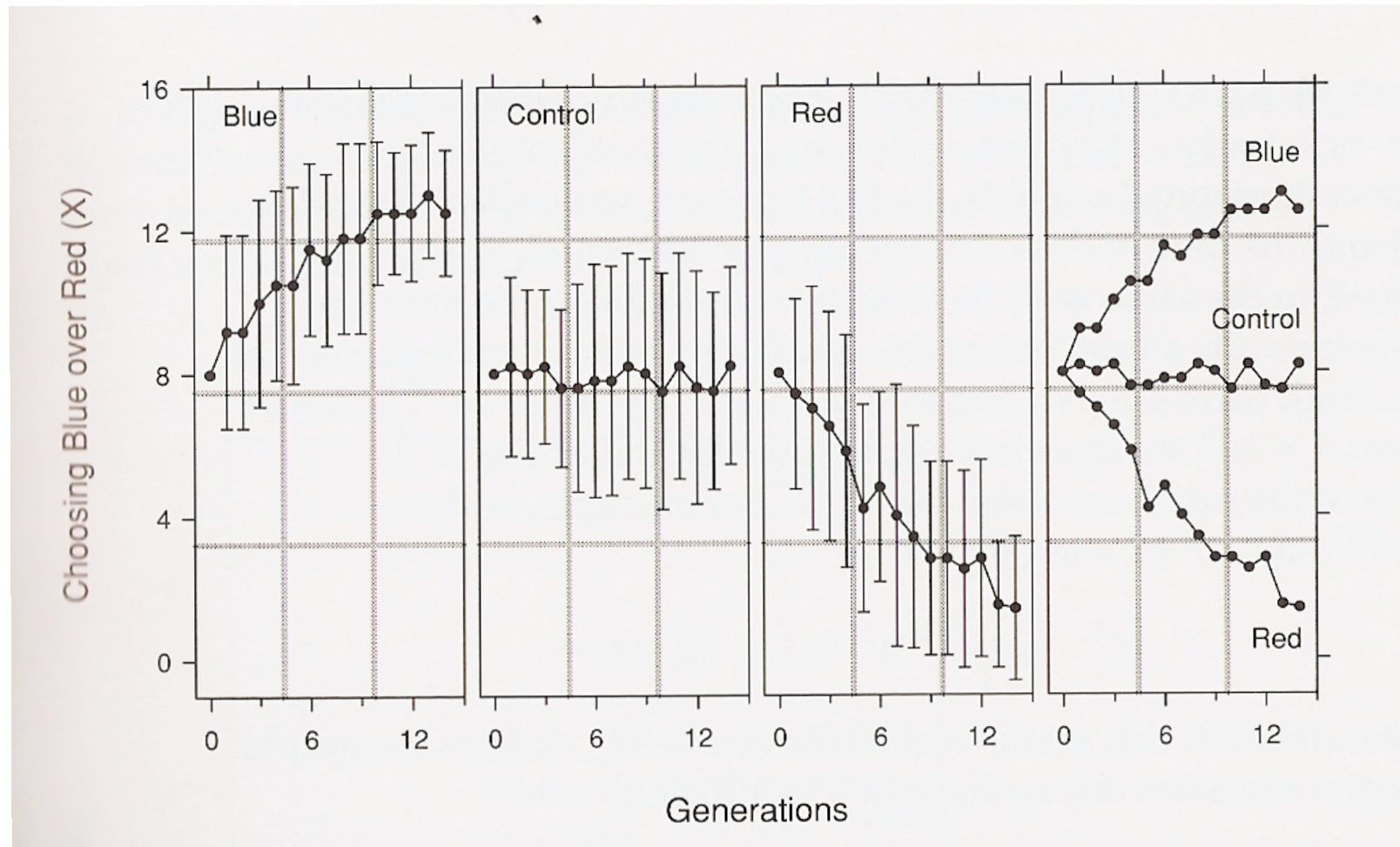
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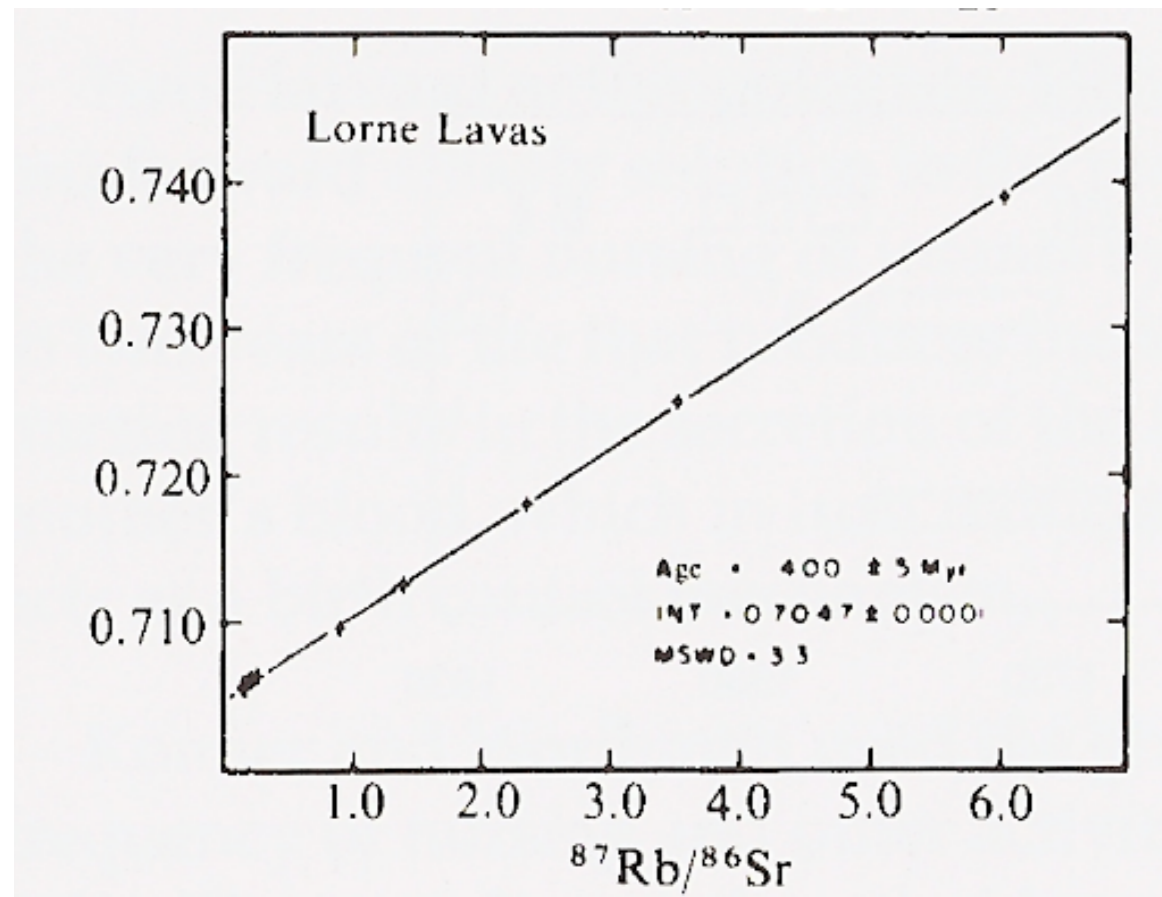
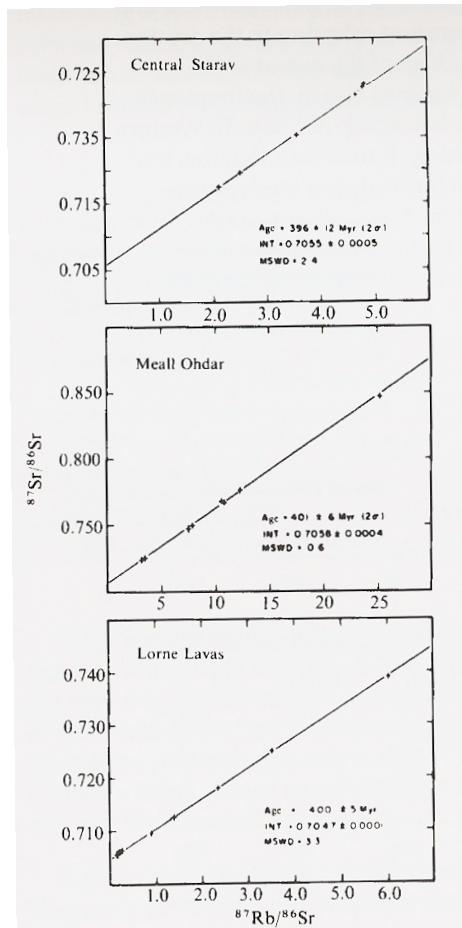
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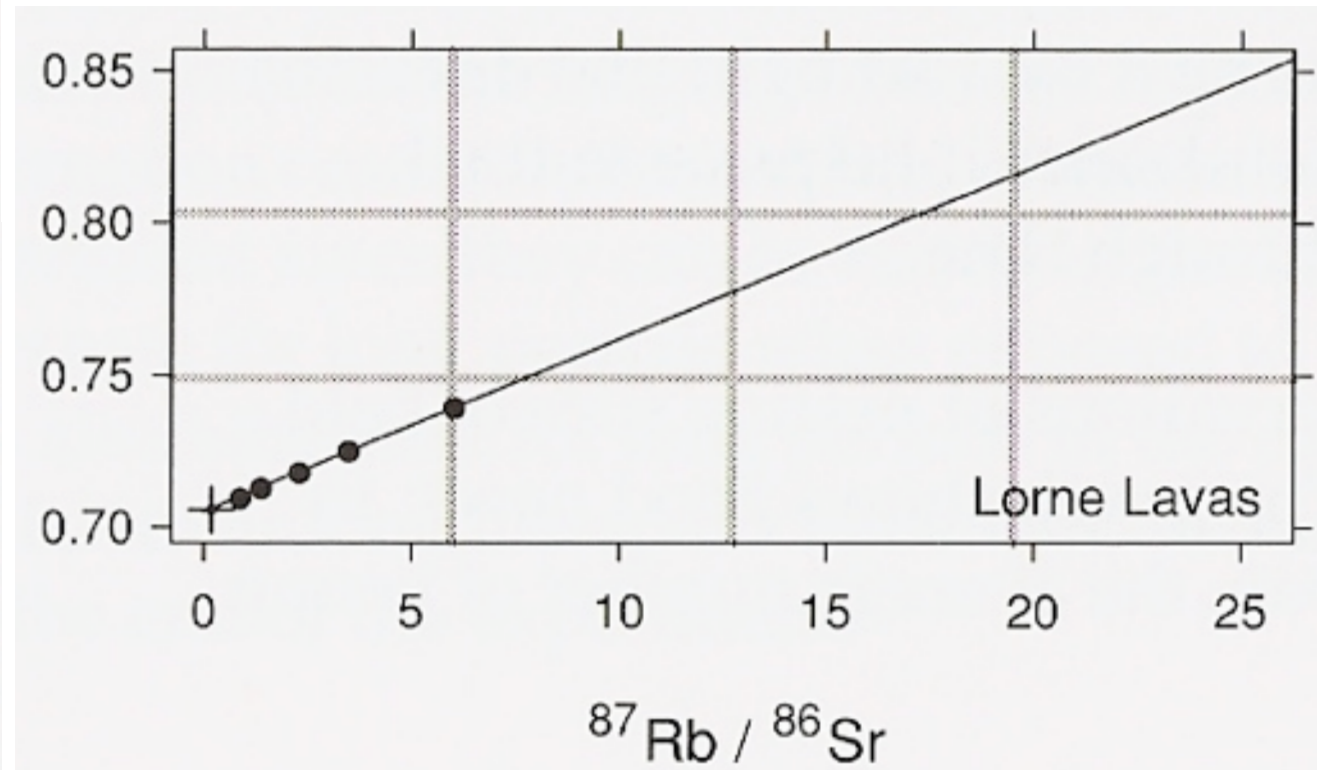
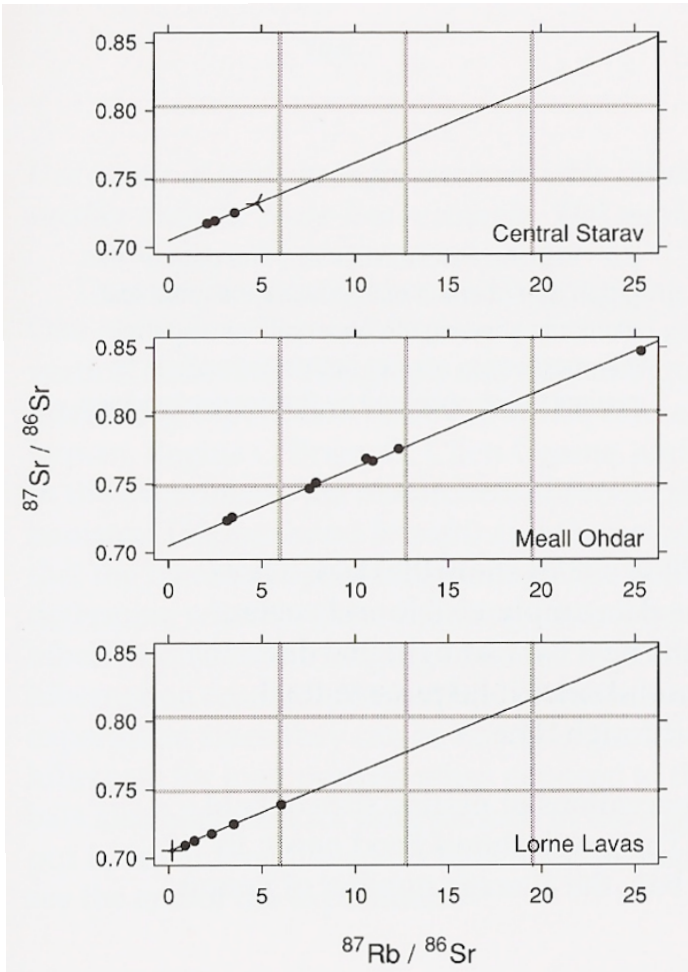
# Clear Vision

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



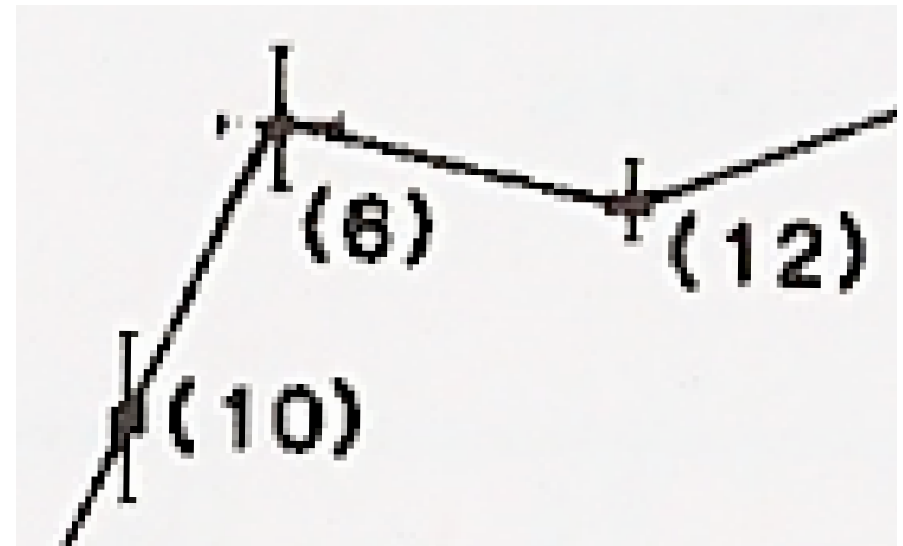
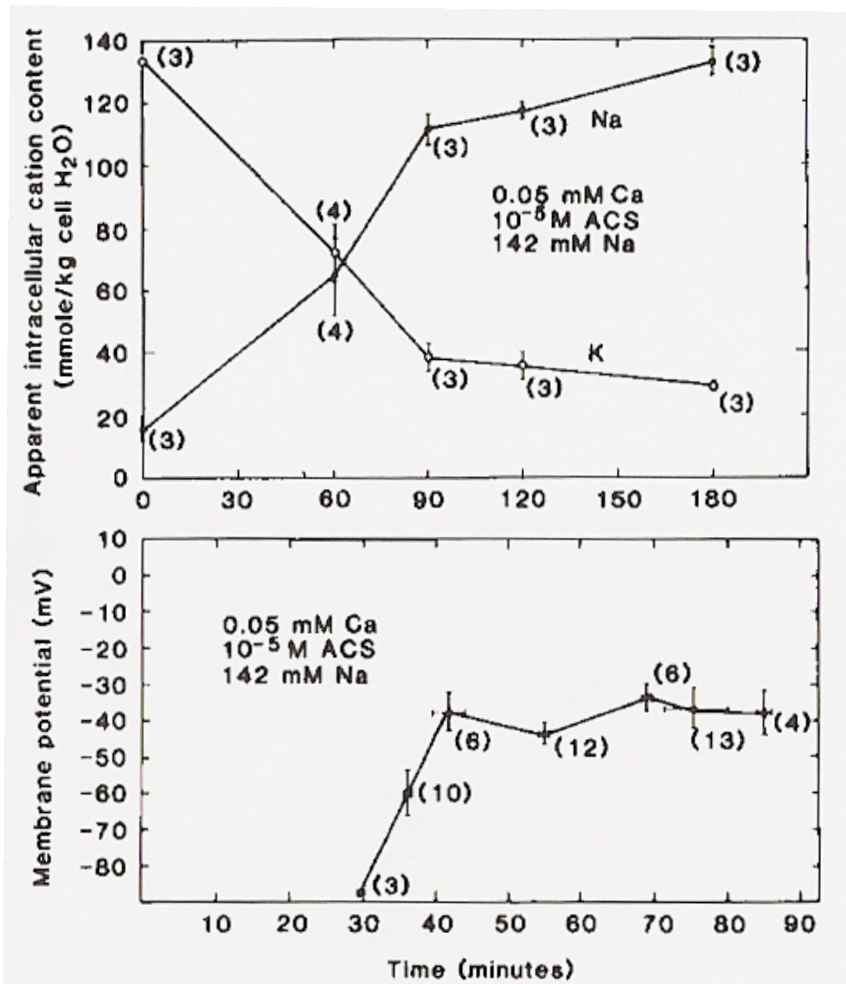
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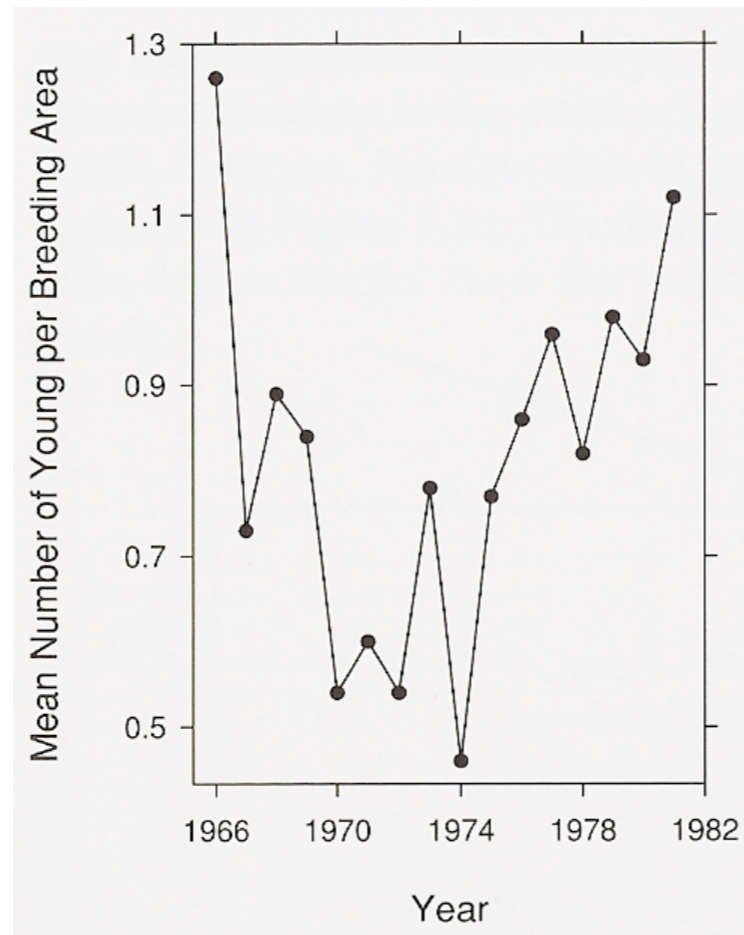
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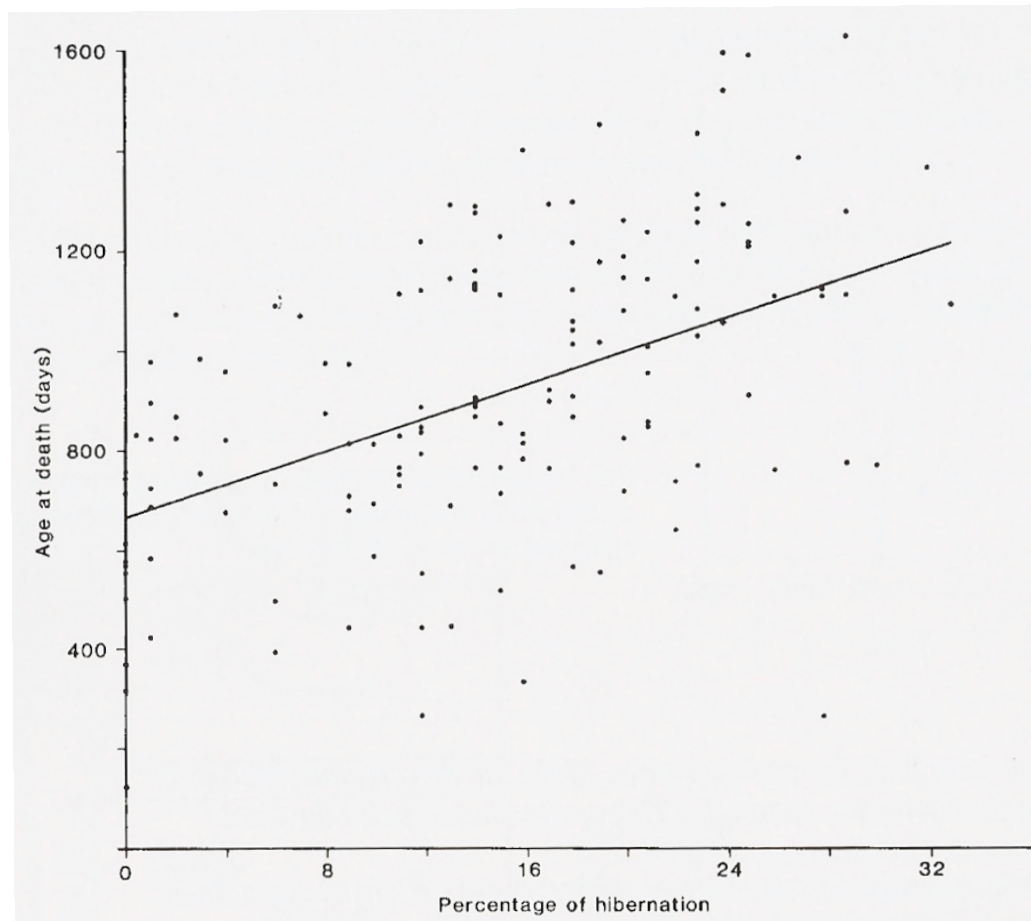
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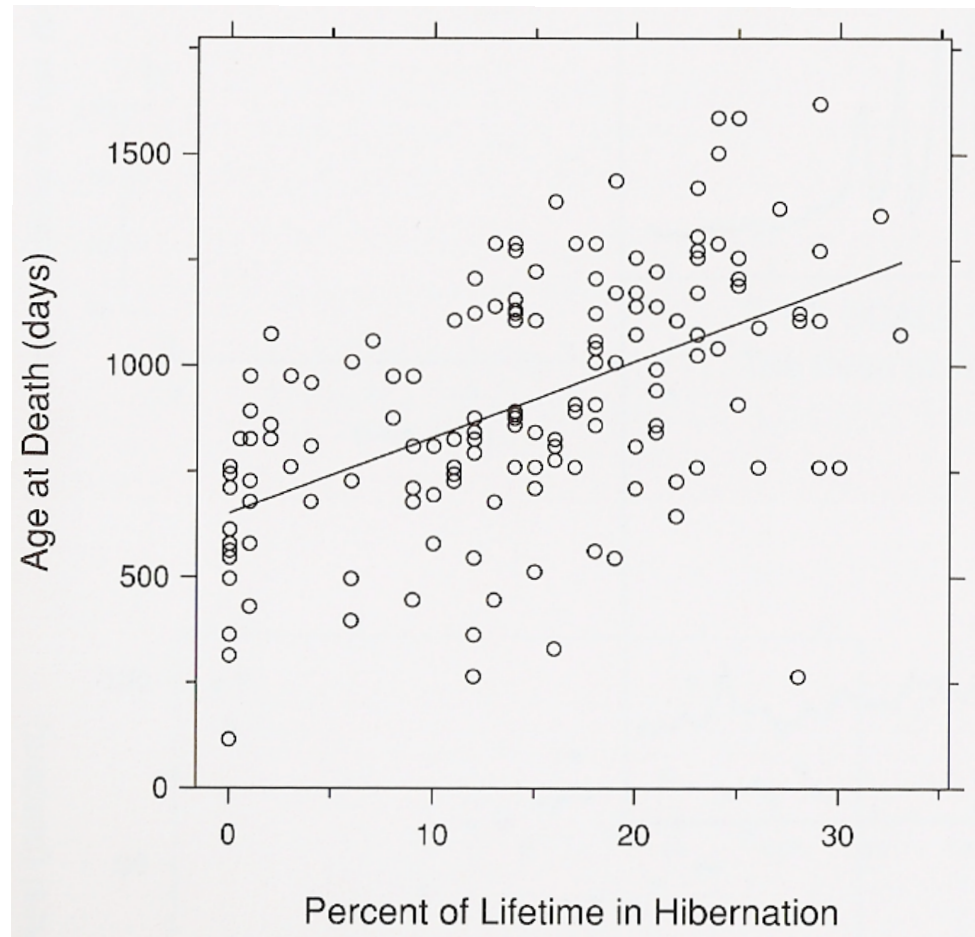
- Principle 3: Scale lines and the data rectangle
- Use two scale lines (box), add margins for data, tick-marks out, 3-10 tick marks.



# Clear Vision

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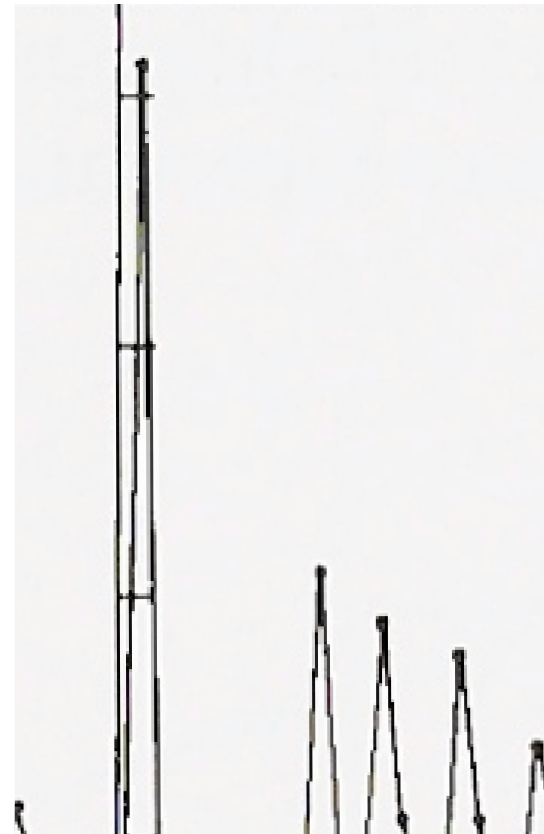
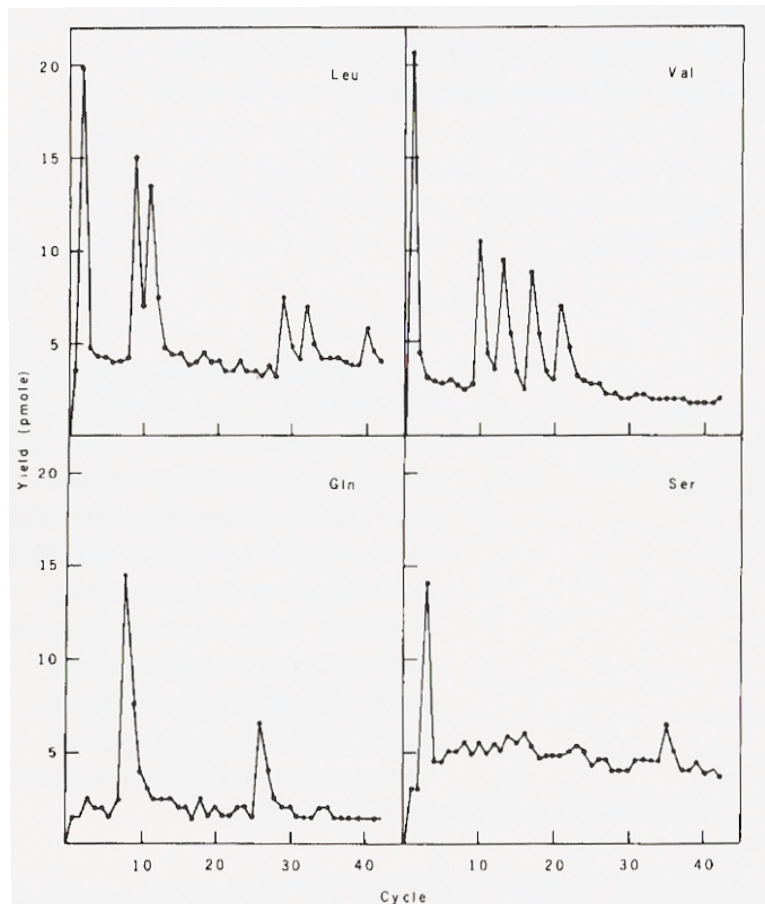
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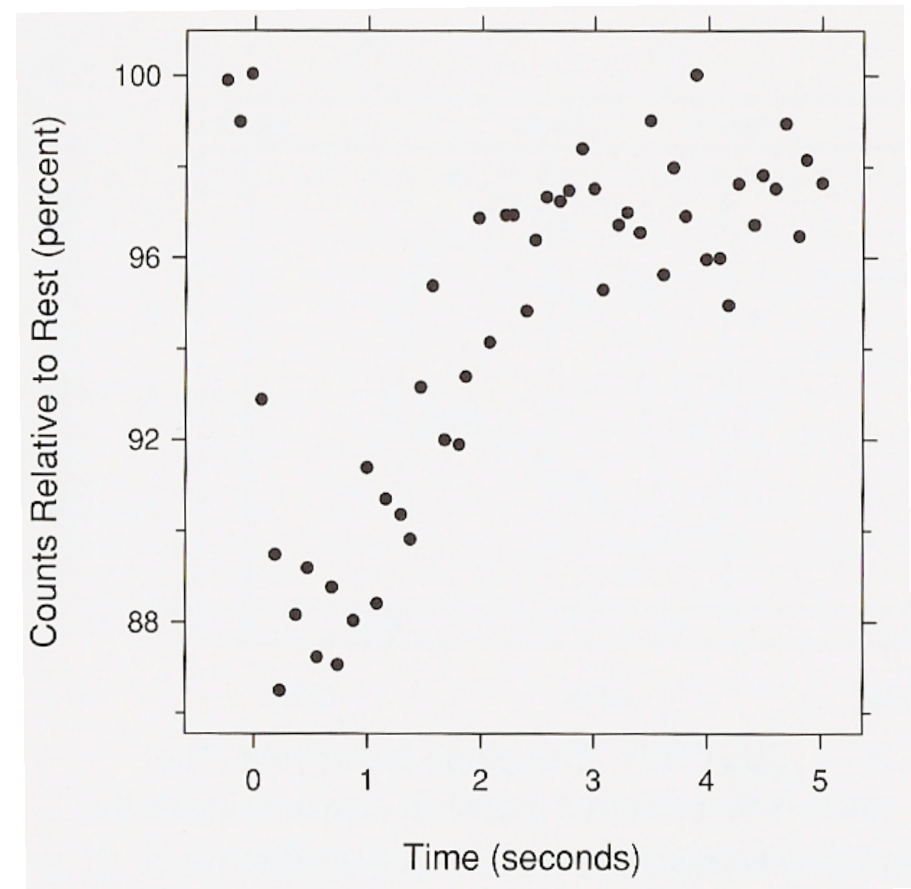
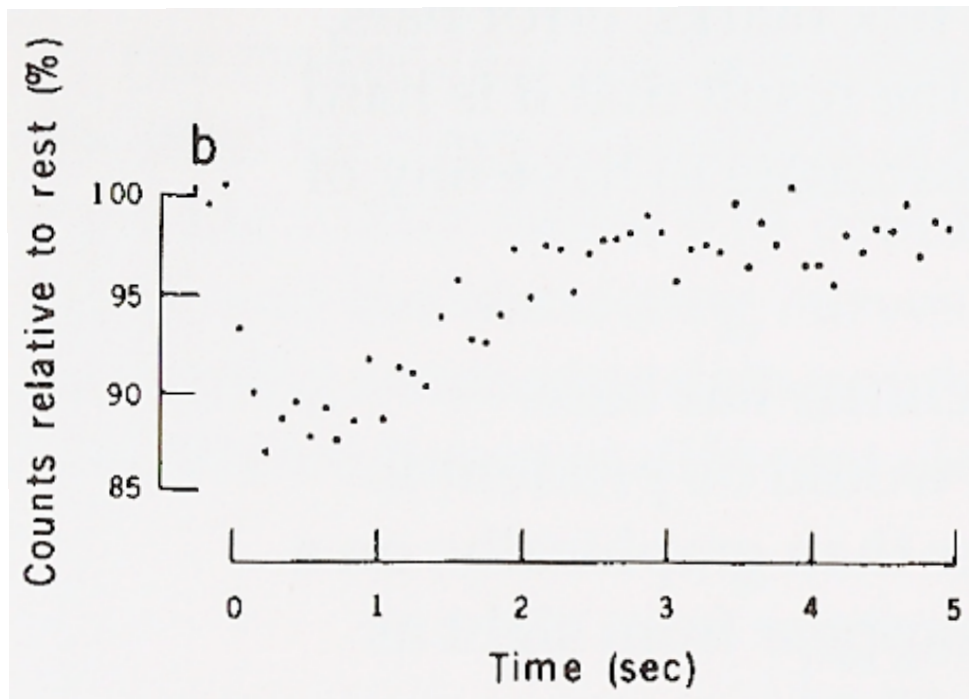
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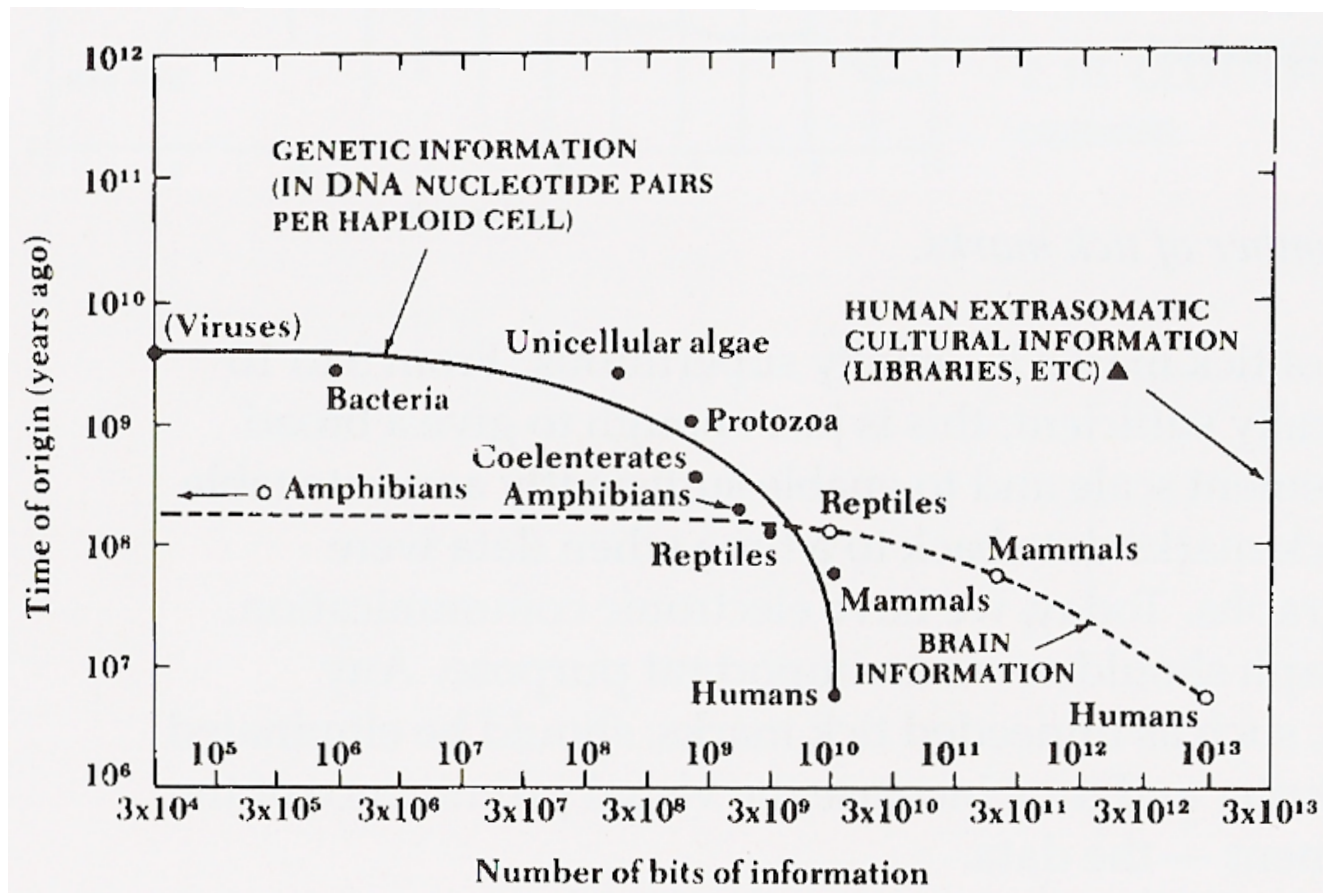
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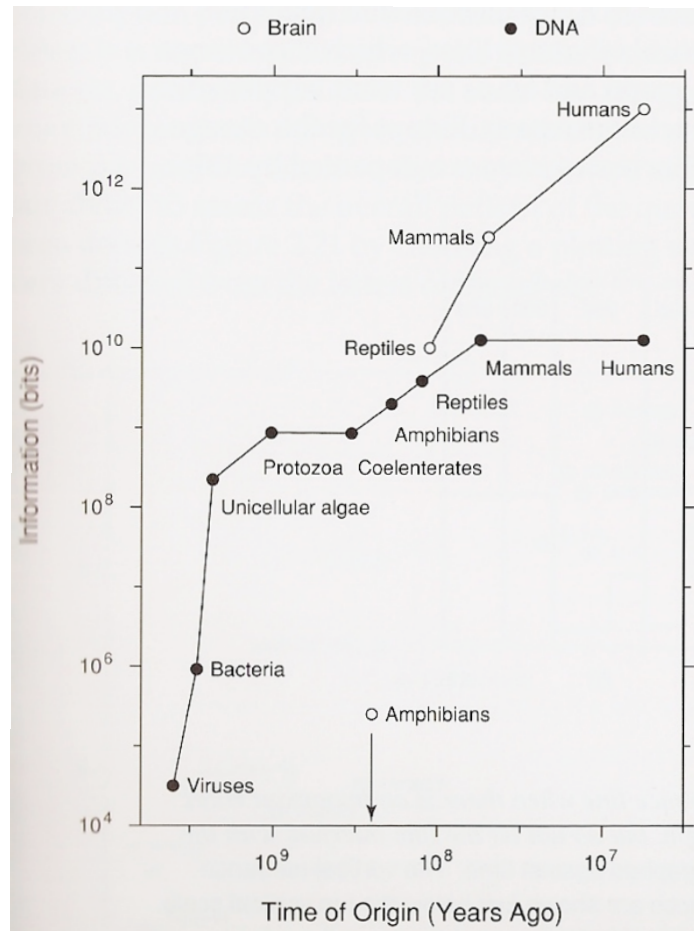
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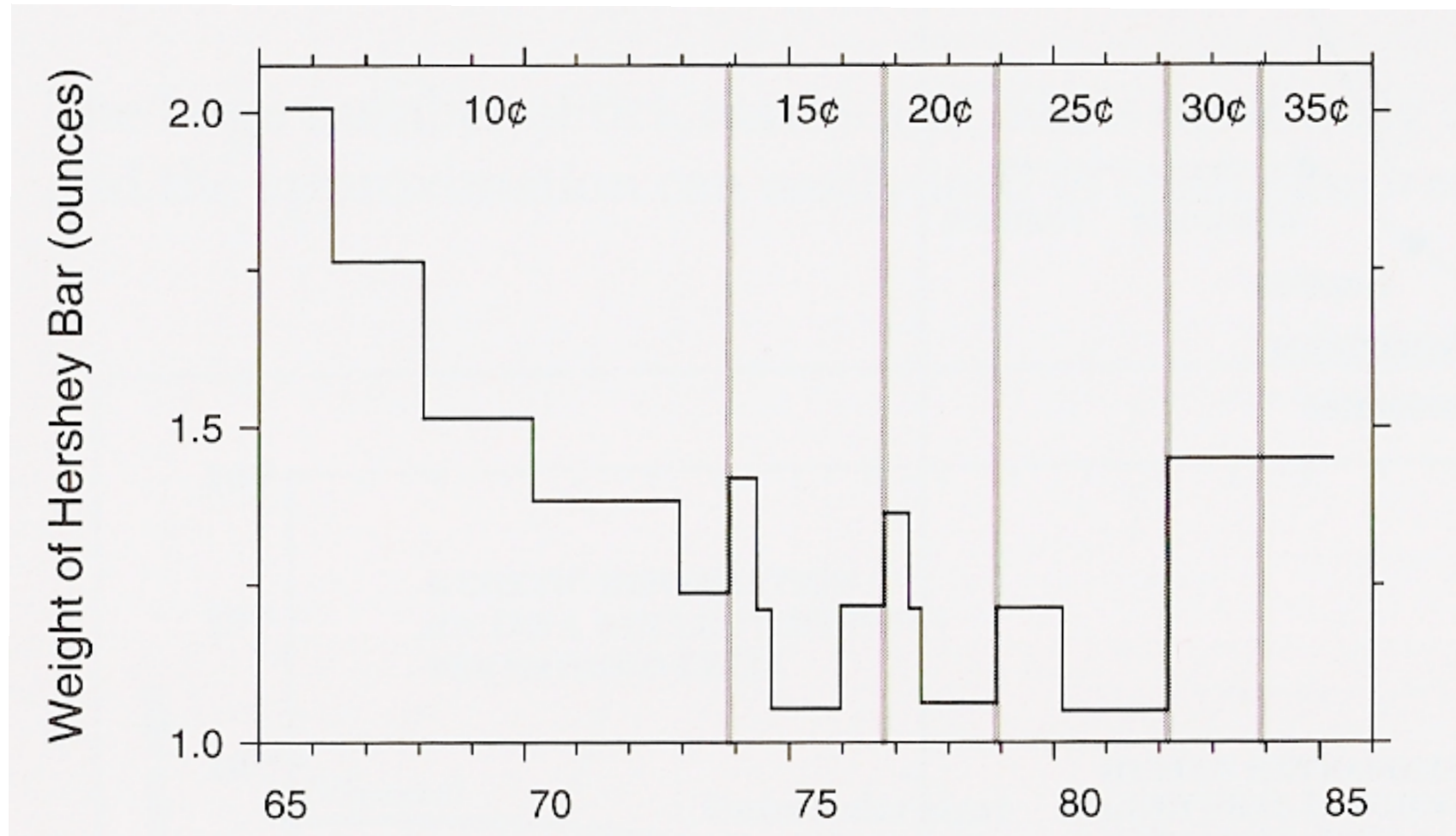
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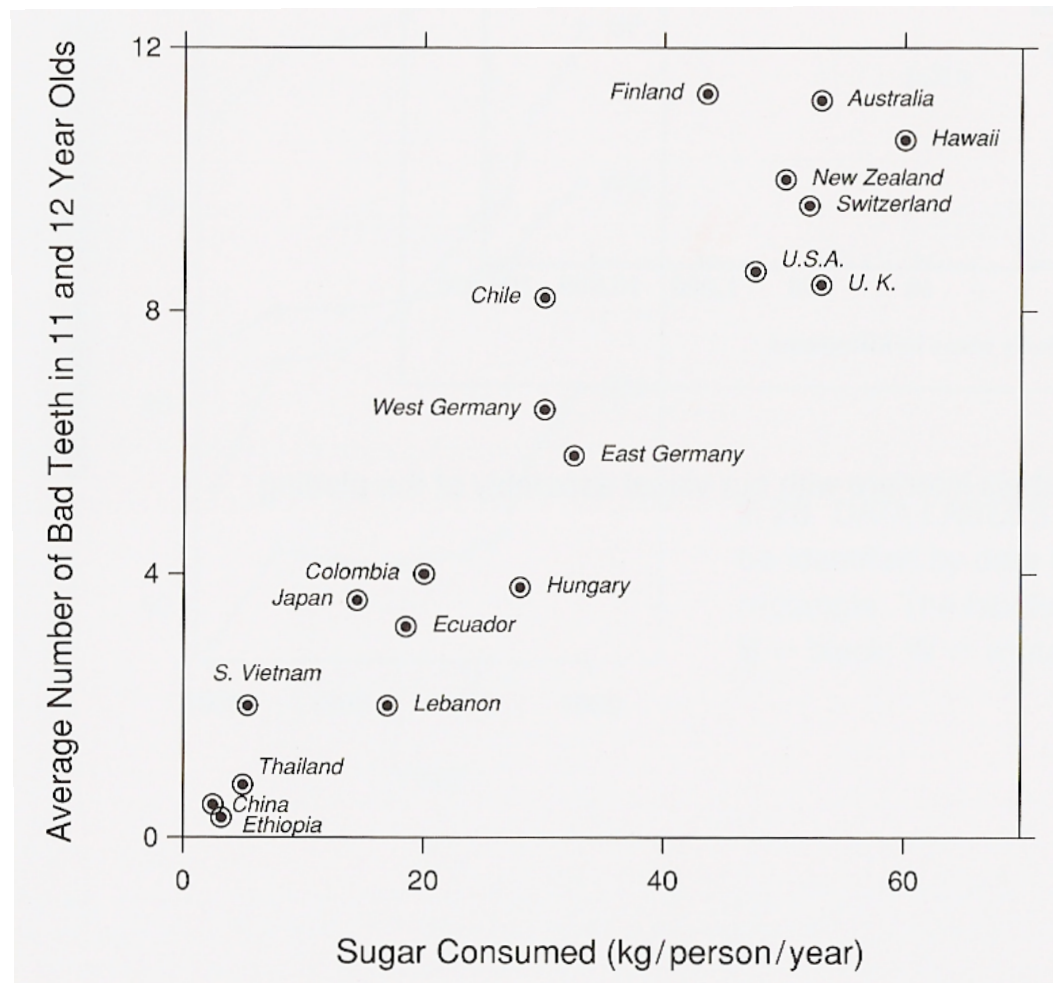
- Principle 4: Reference lines, labels, notes, and keys
  - Only use when necessary and don't let them obscure data.



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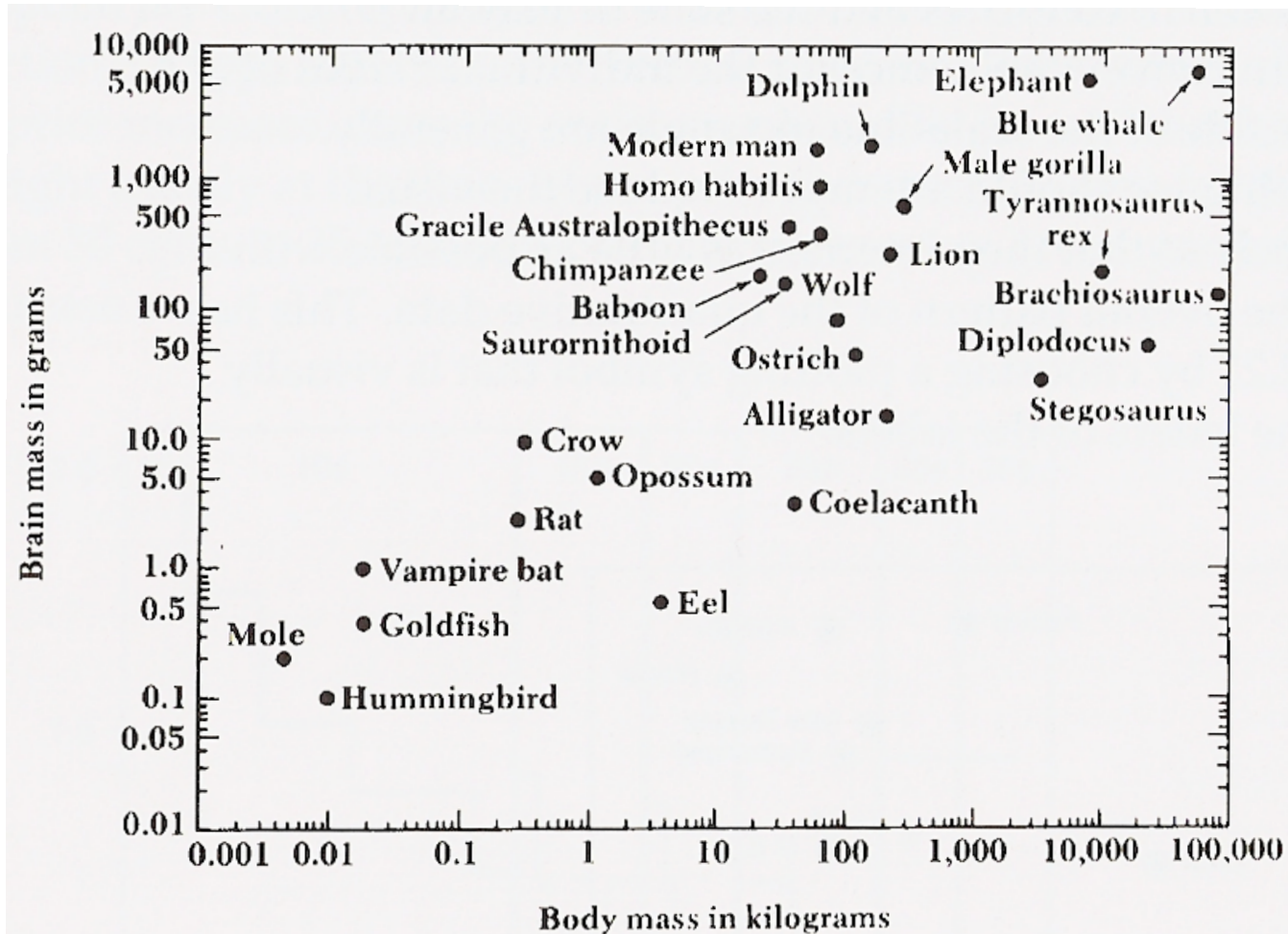
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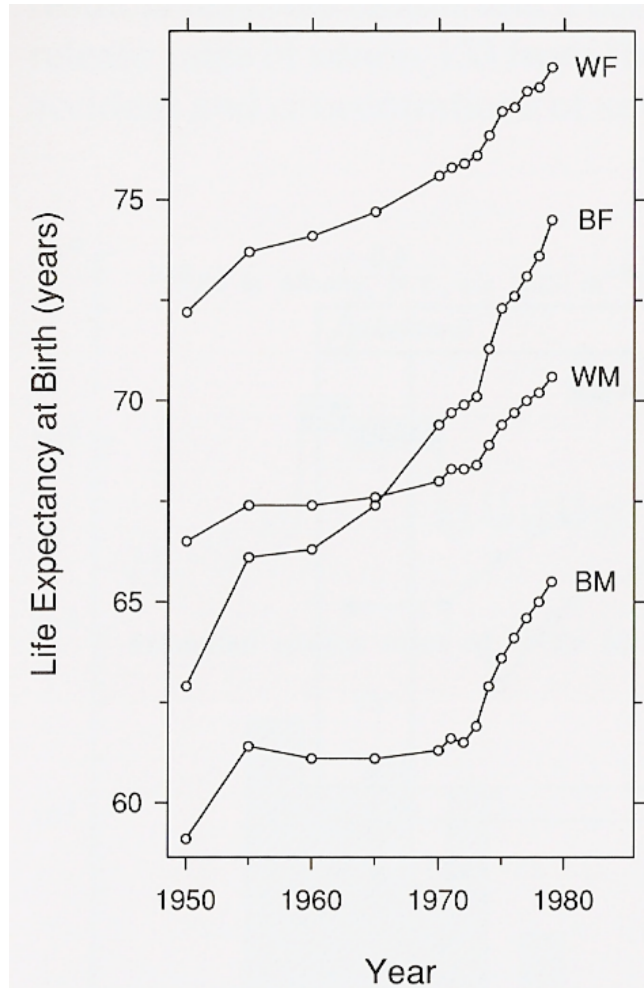
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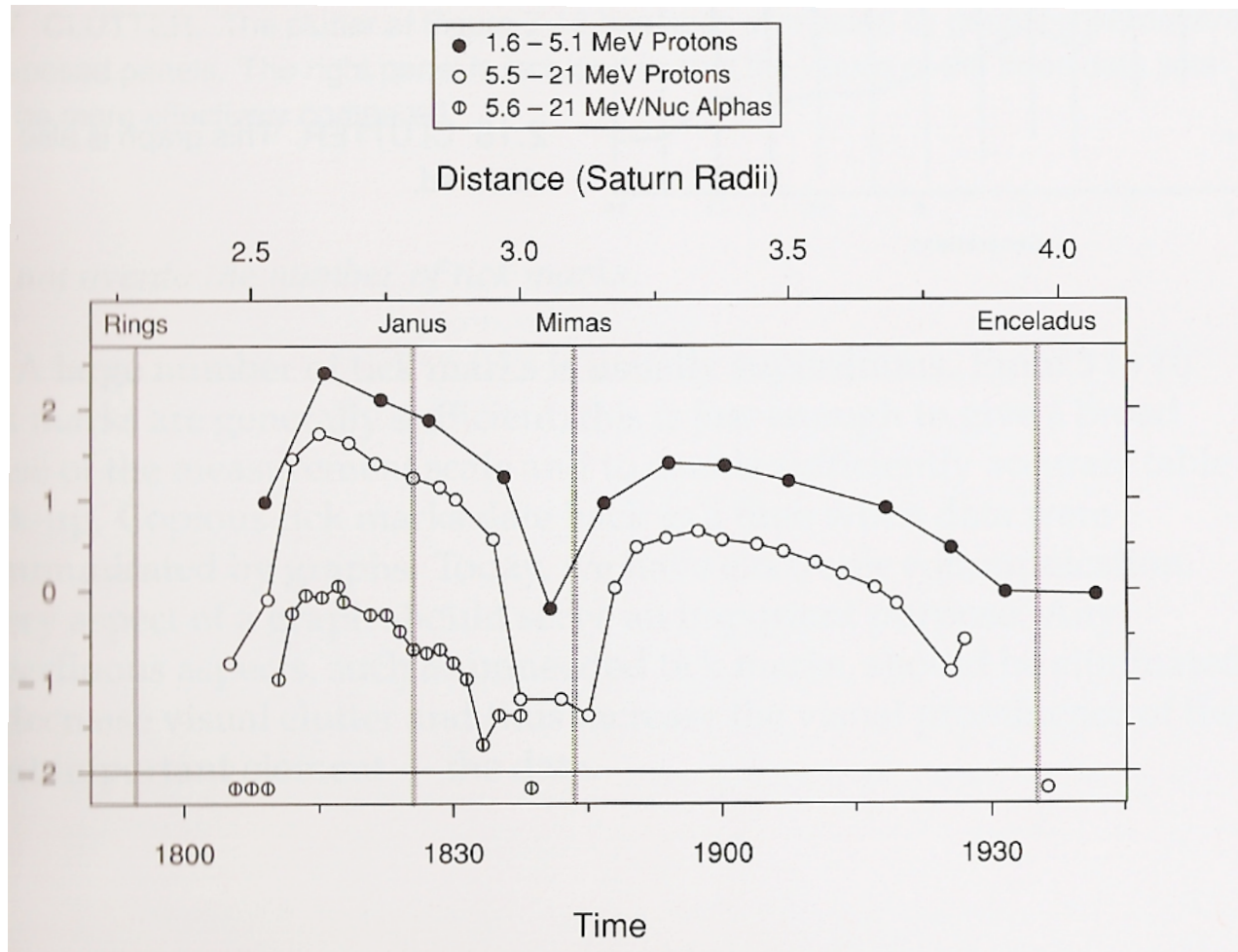
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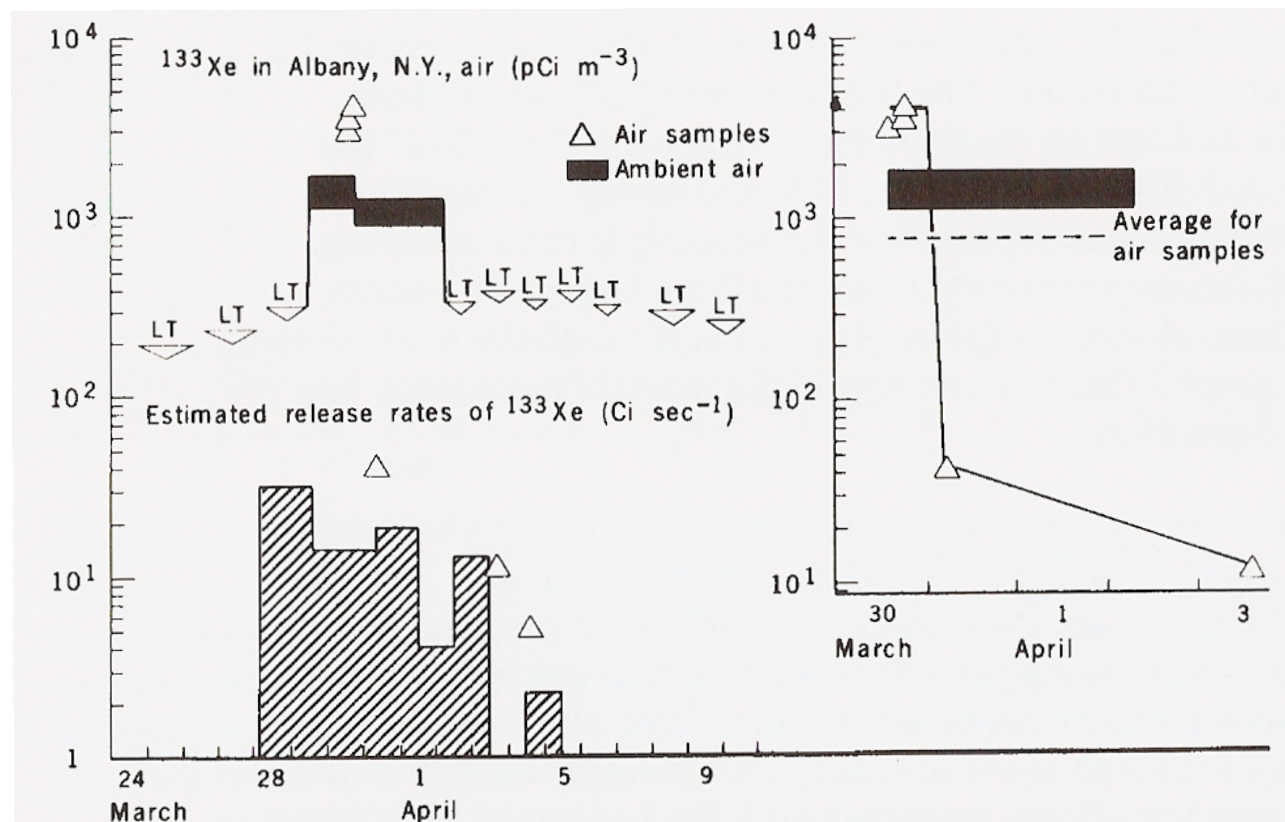
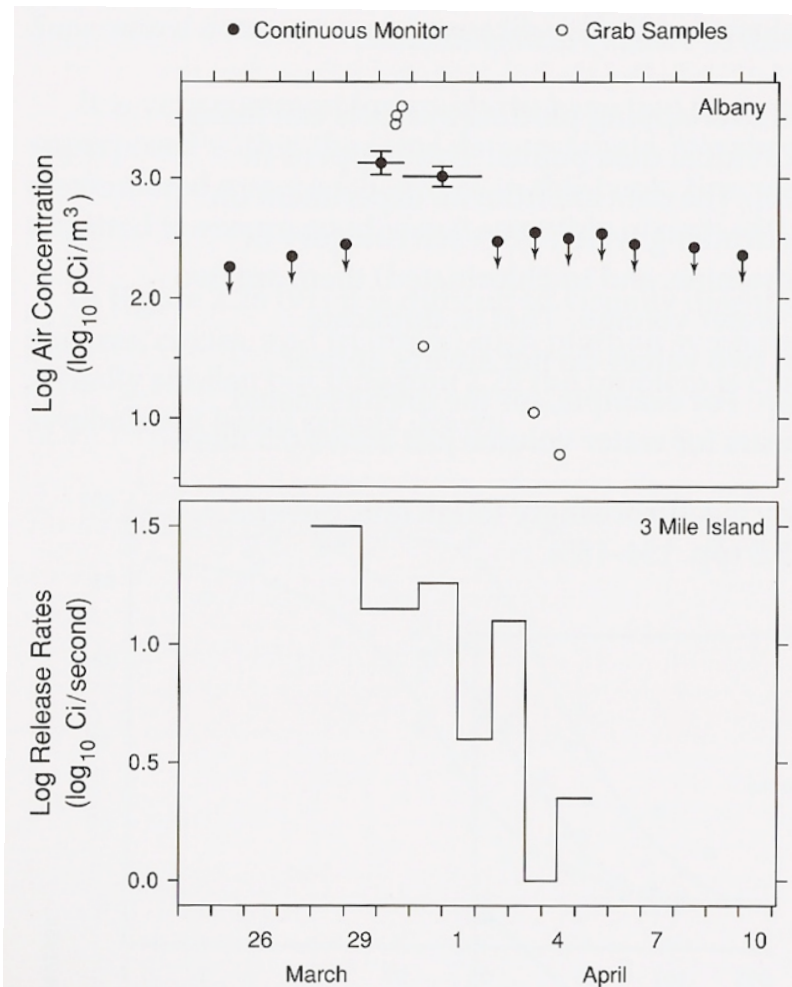


Fig. 1. Xenon-133 activity (picocuries per cubic meter of air) in Albany, New York, for the end of March and early April 1979. The lower trace shows the time-averaged estimates of releases (curies per second) from the Three Mile Island reactor (2). The inset shows detailed values for air samples (gas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

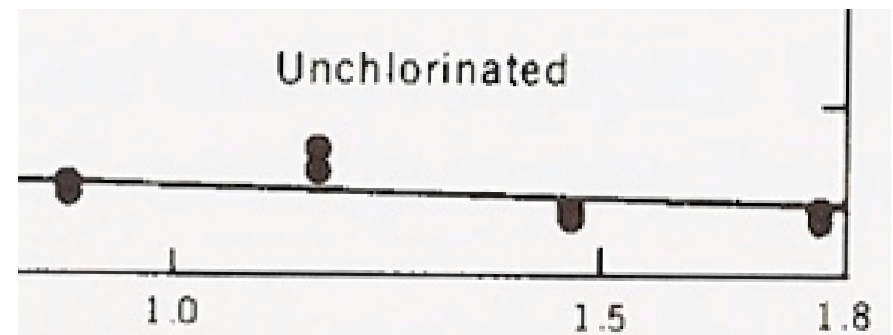
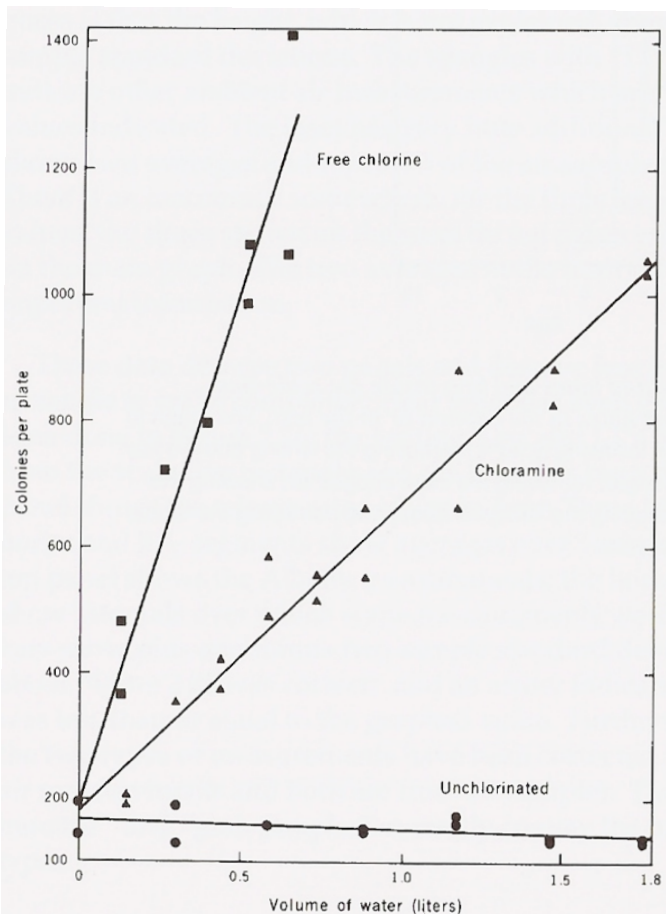
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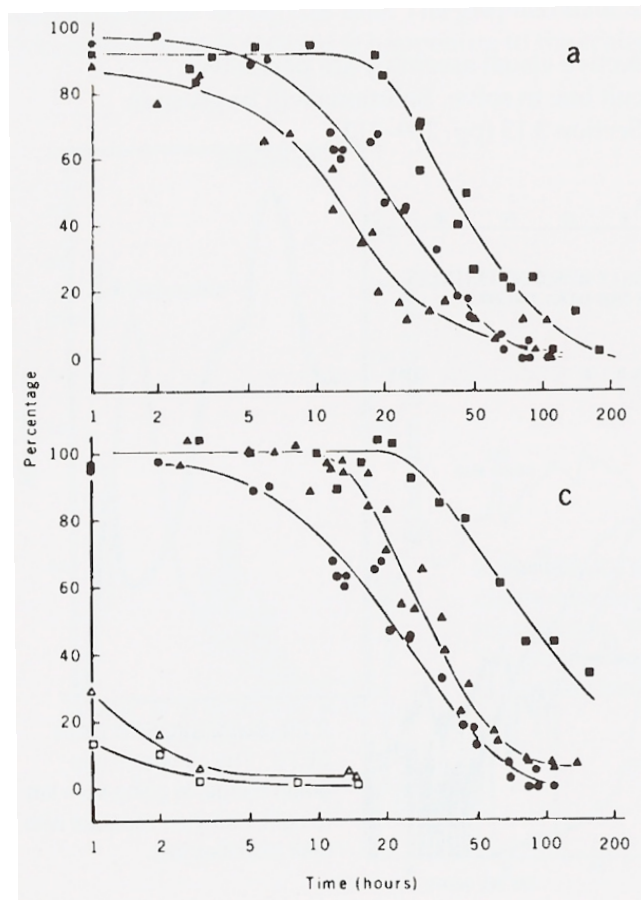
# Clear Vision

- Principle 5: Superposed data sets
  - Symbols should be separable and data sets should be easily visually assembled.



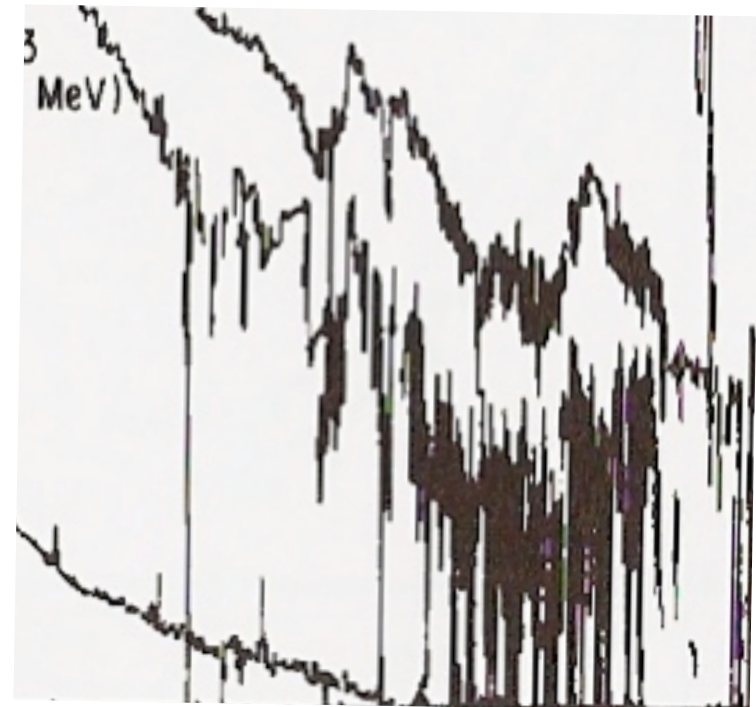
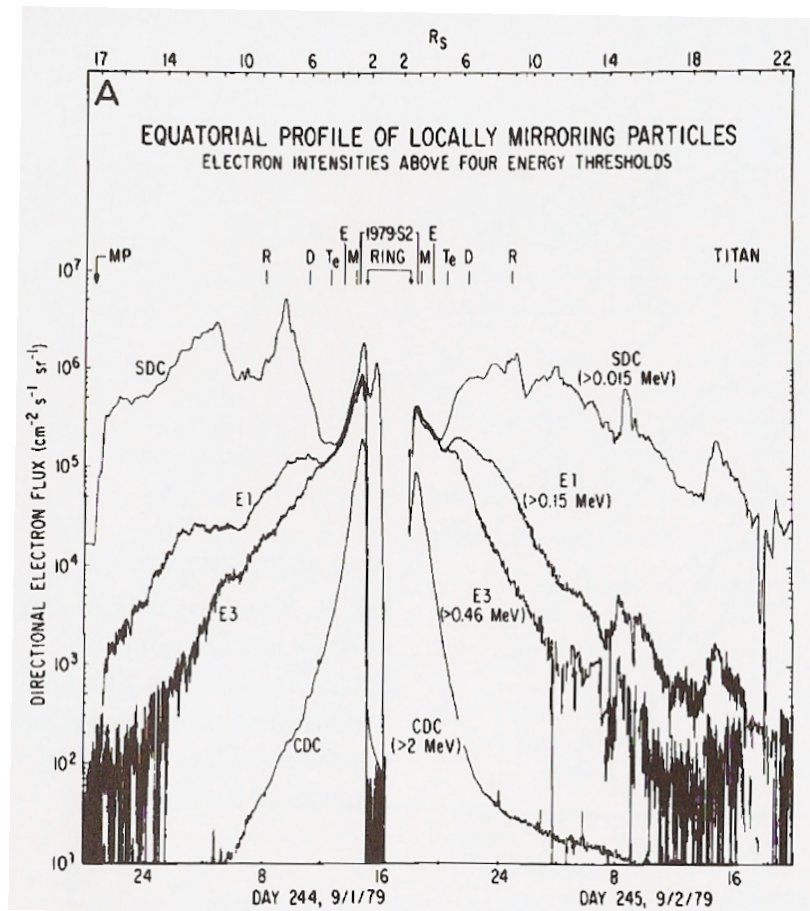
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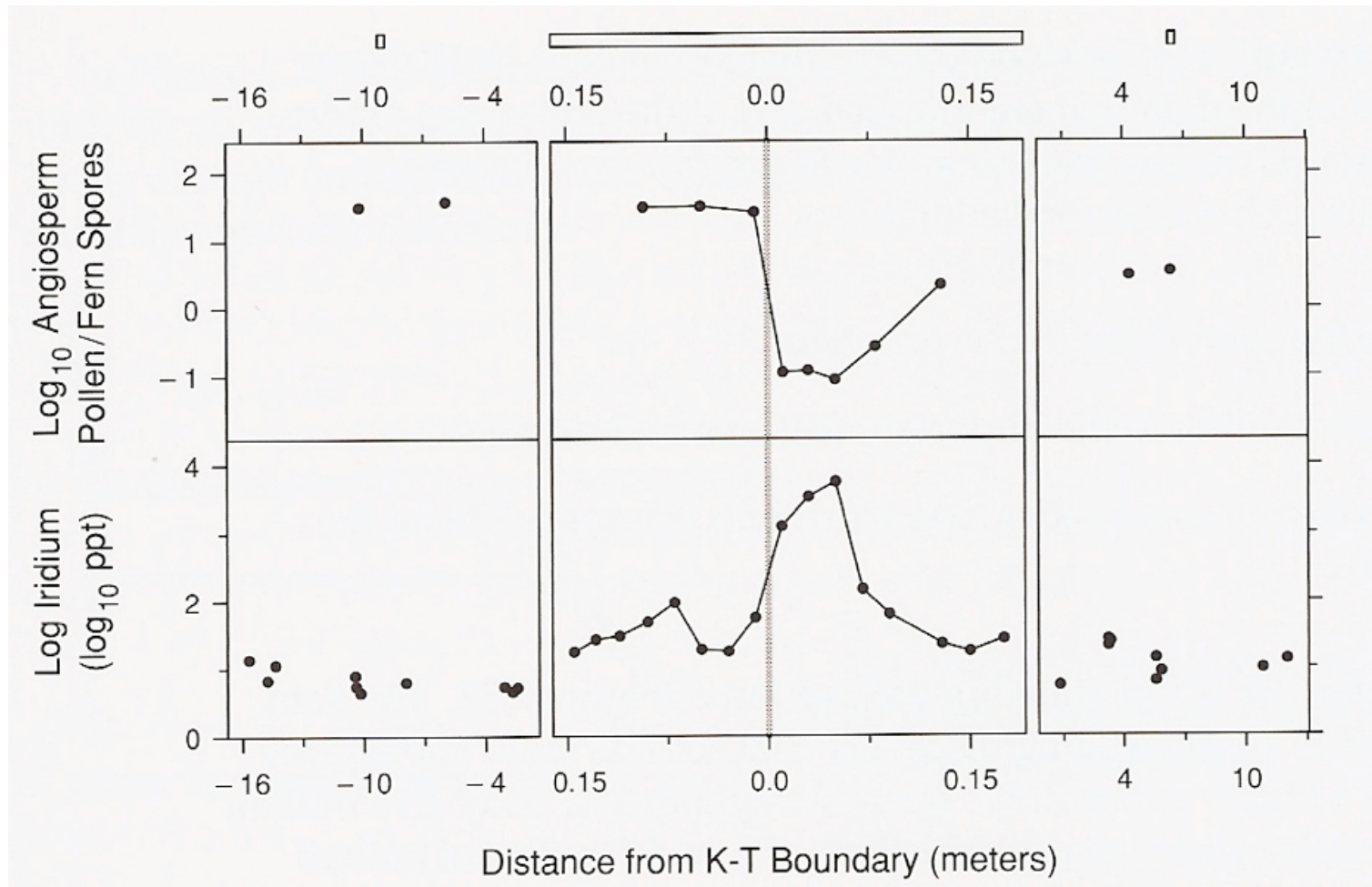
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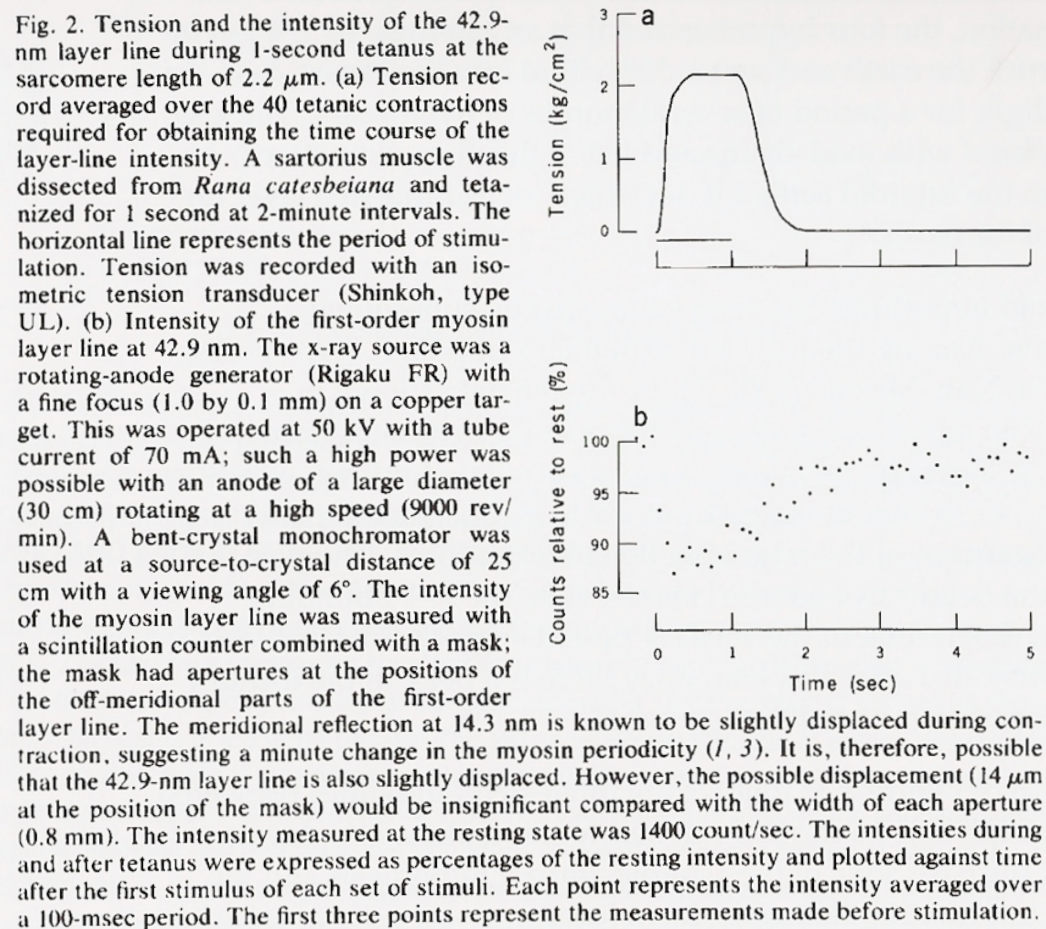
# Clear Understanding

- Principle 1: Explanation and conclusions
  - Describe everything, draw attention to major features, describe conclusions



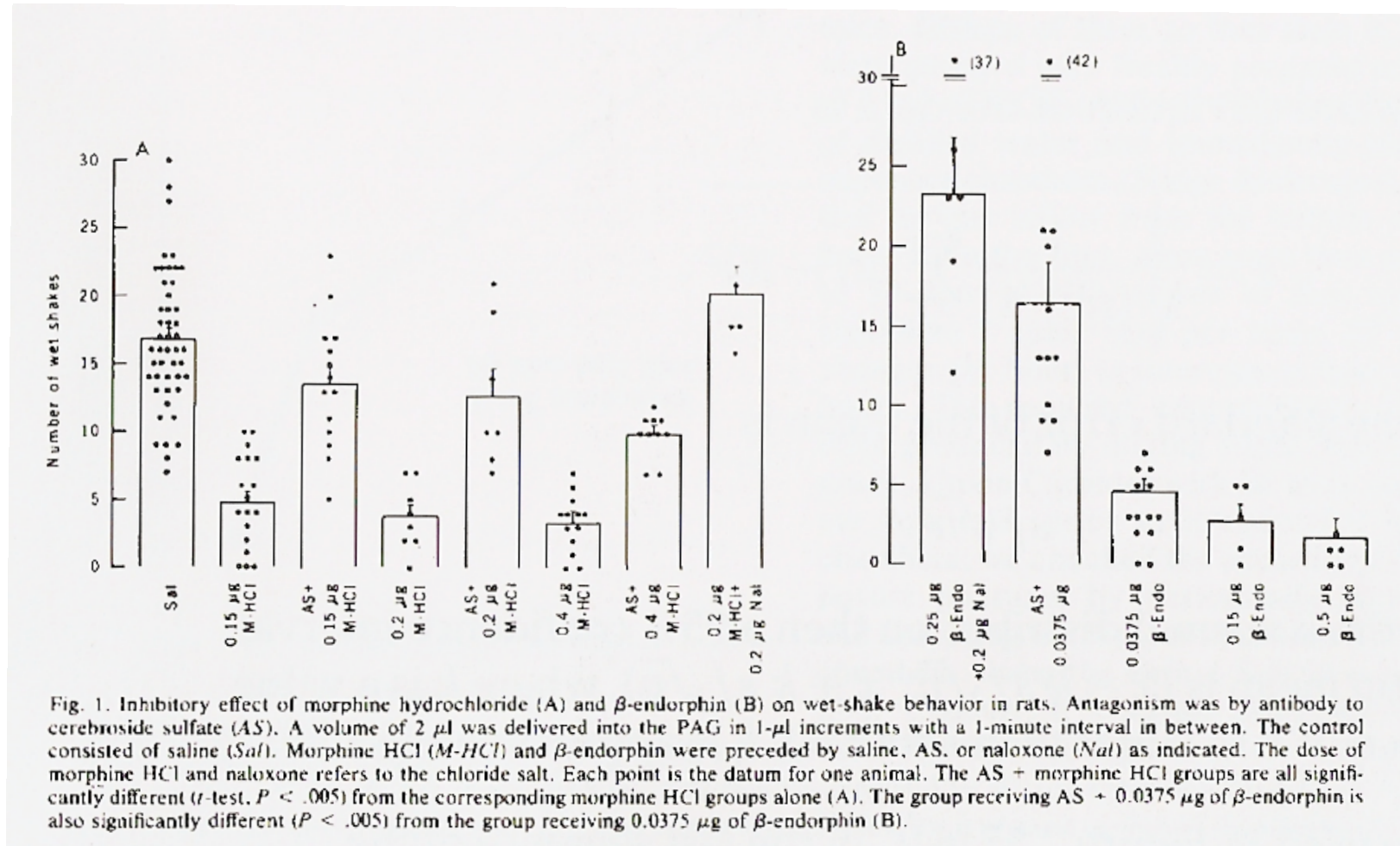
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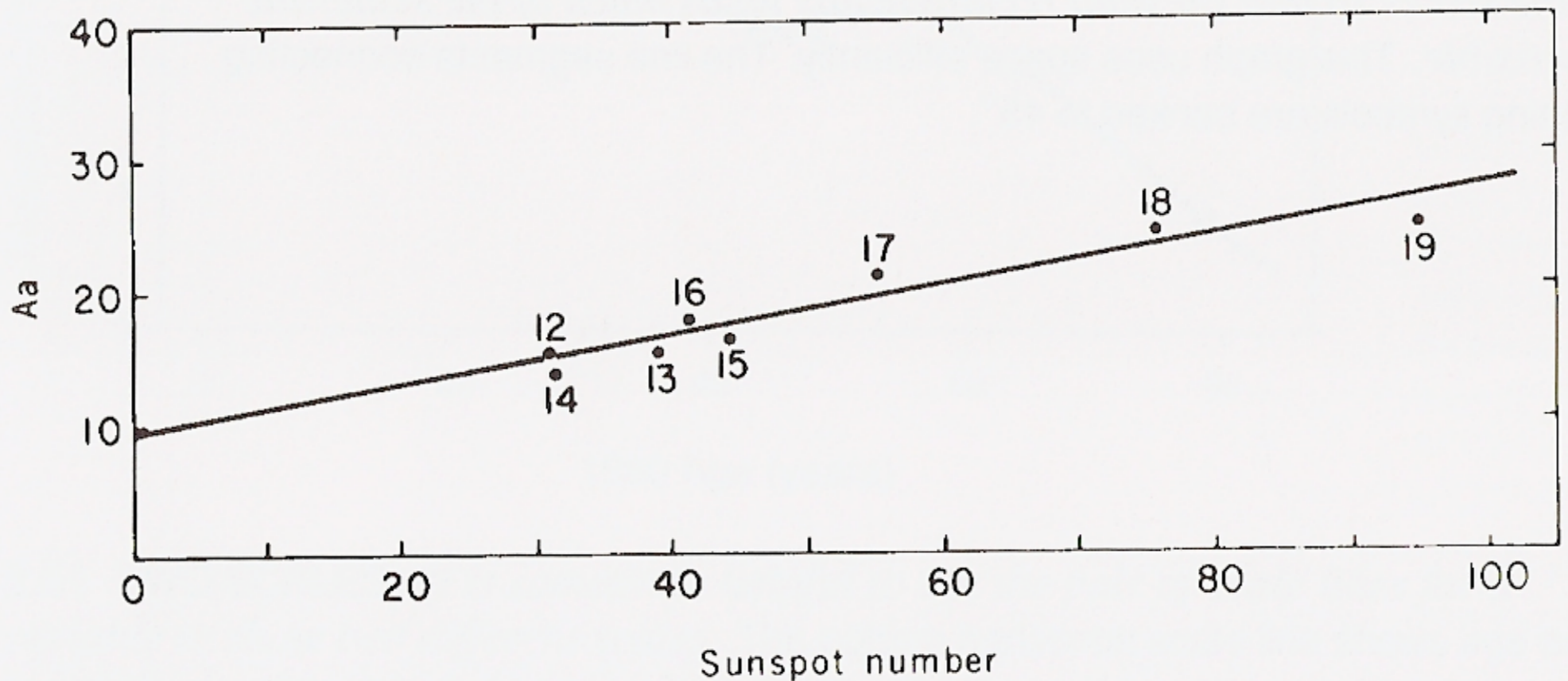
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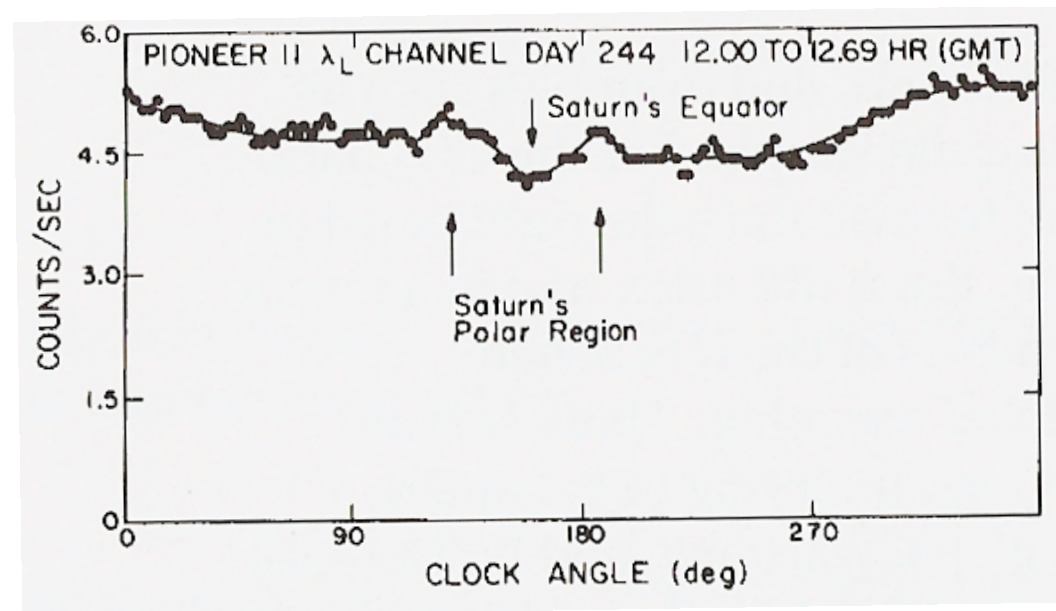
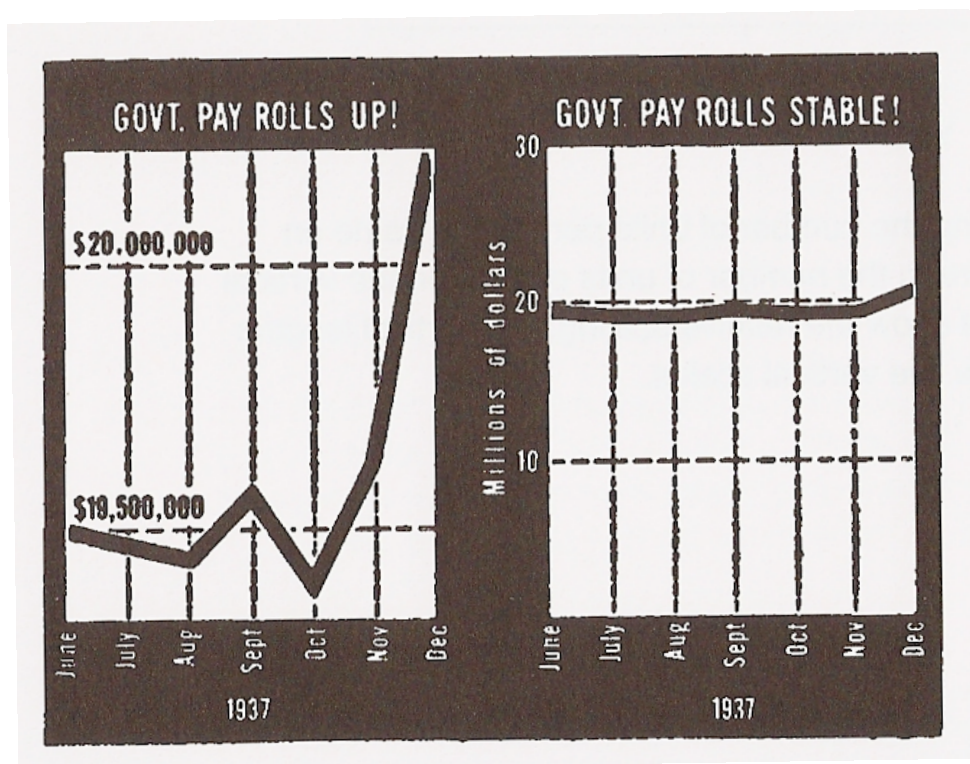
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- Principle 2: Use all of the available space
  - Fill the data rectangle, only use zero if you need it



# Clear Understanding

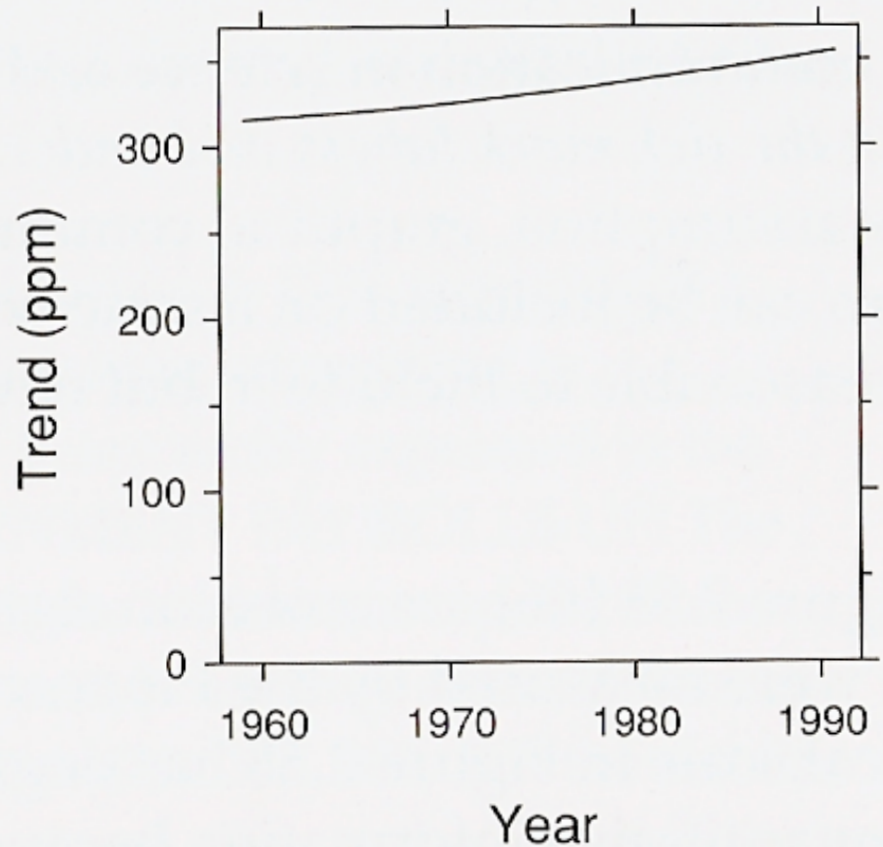
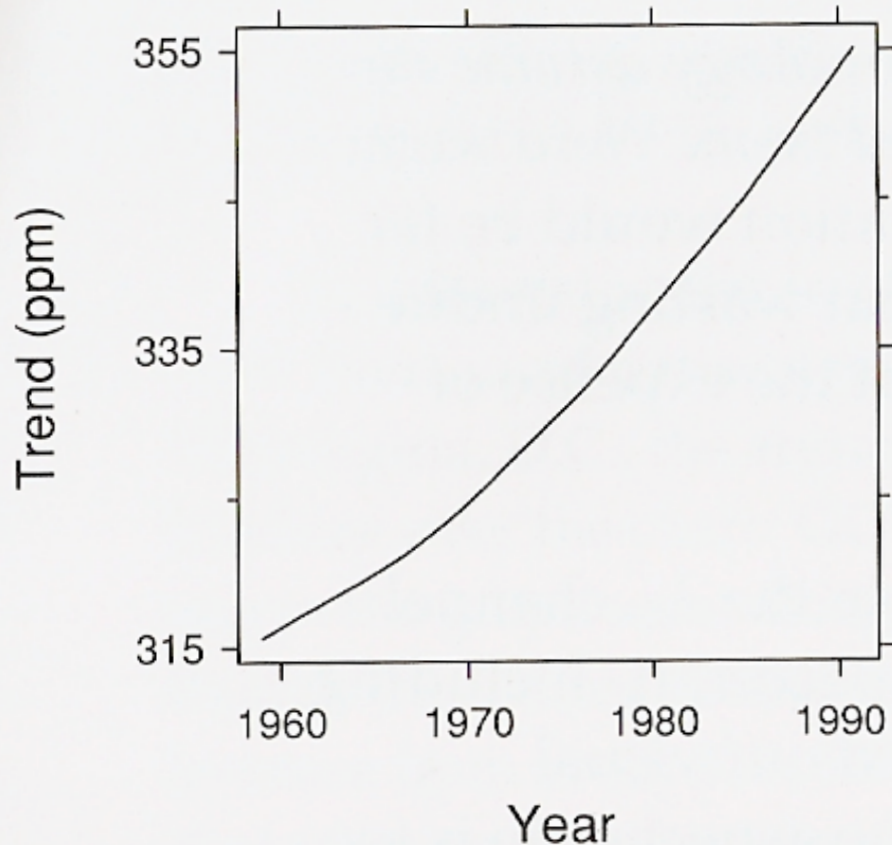
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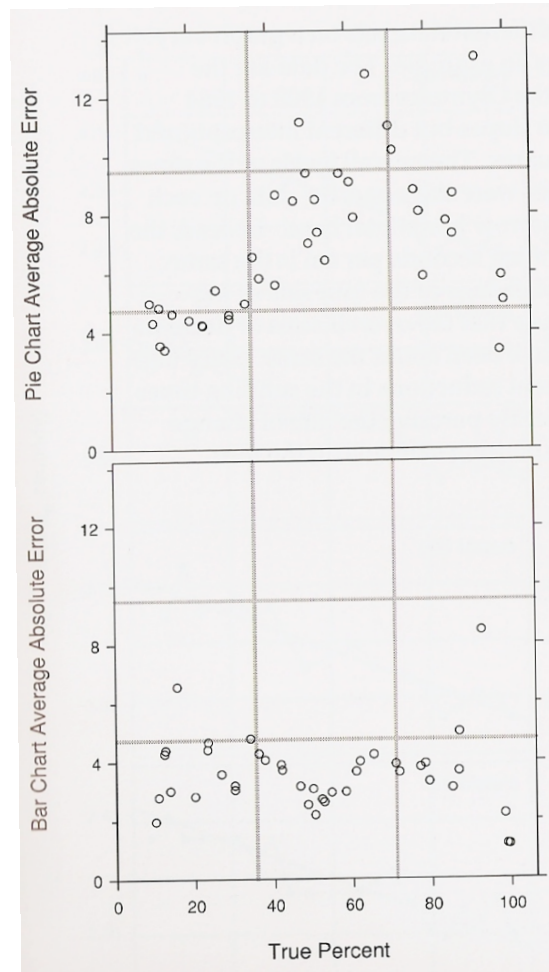


Principle 3: Juxtaposed data sets

# Clear Understanding

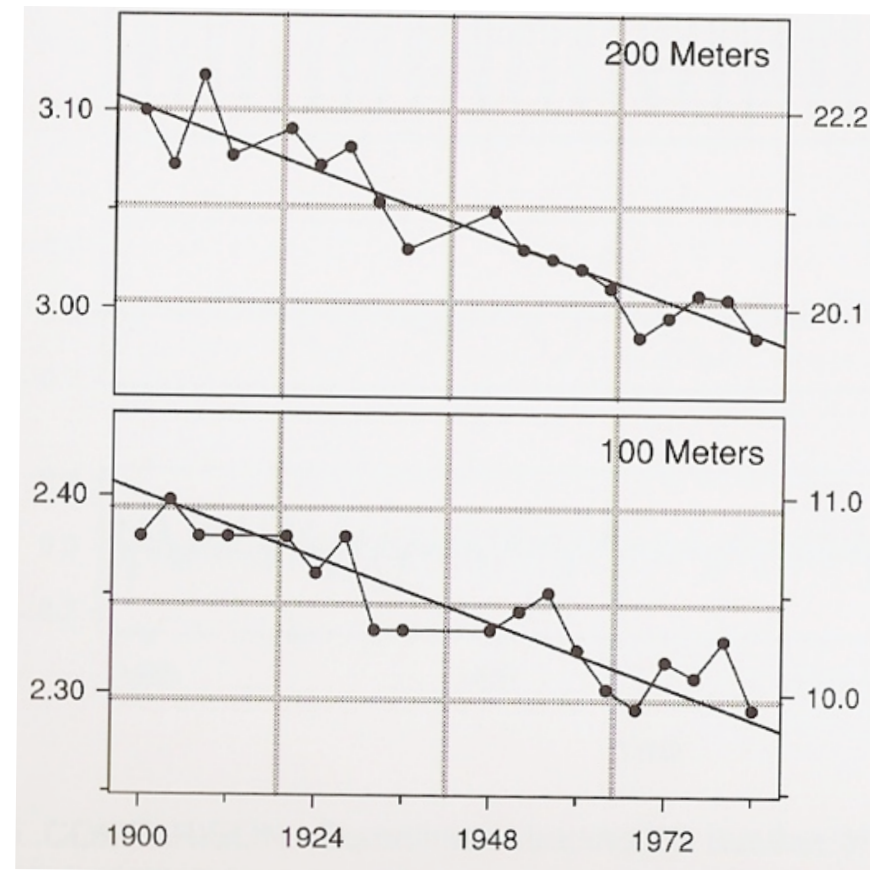
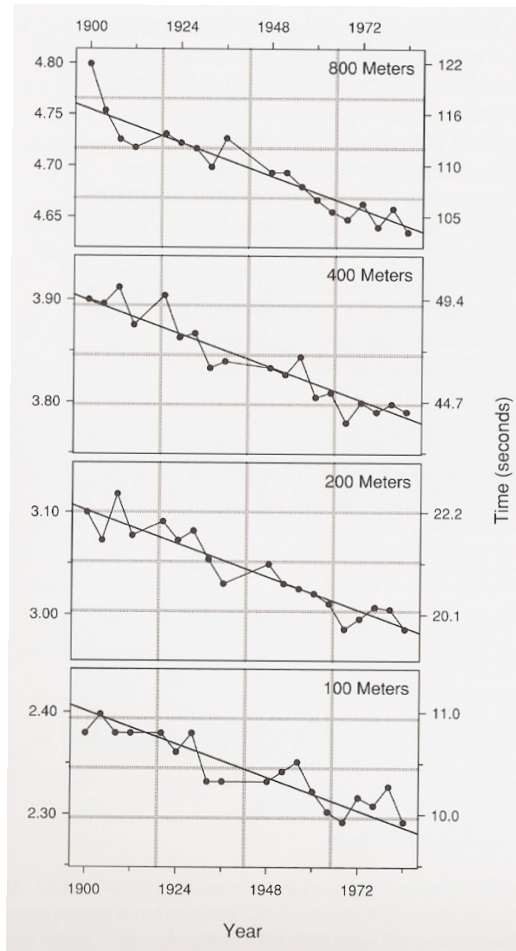
Make sure scales match and graphs are aligned

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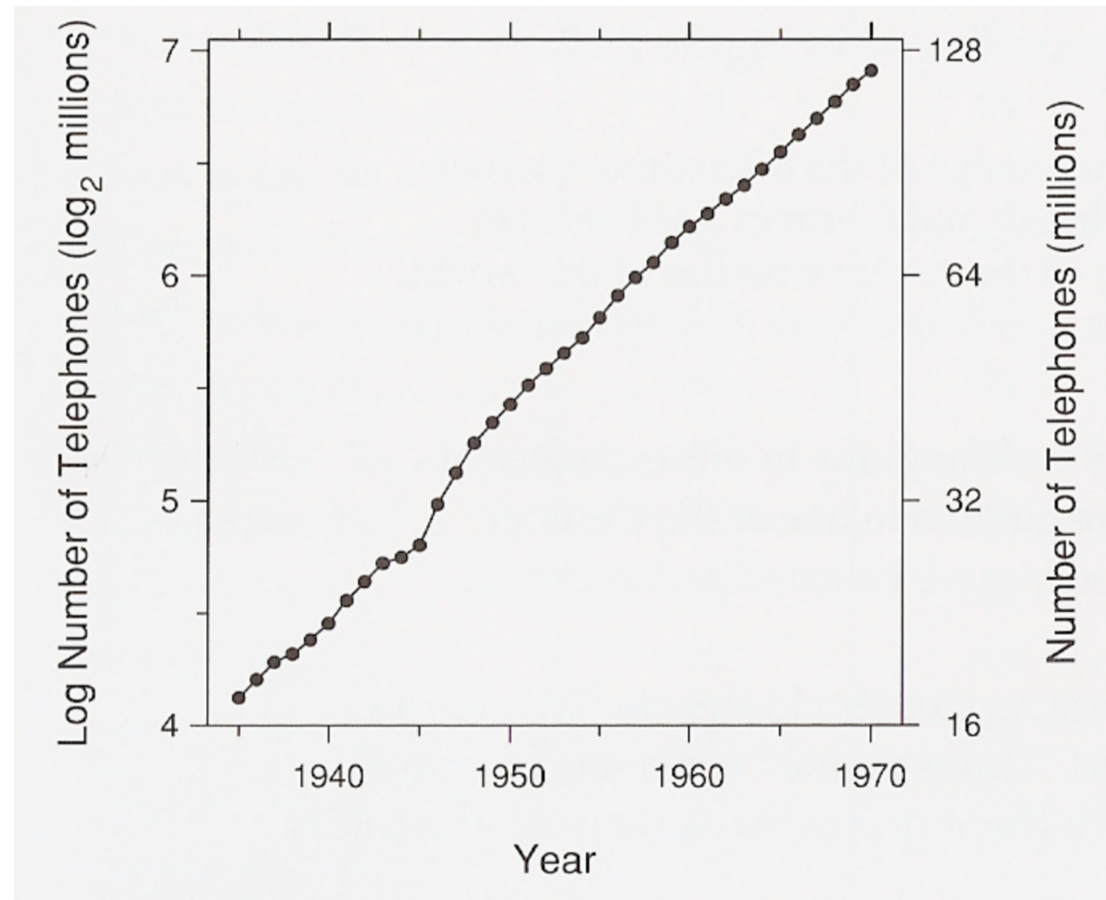
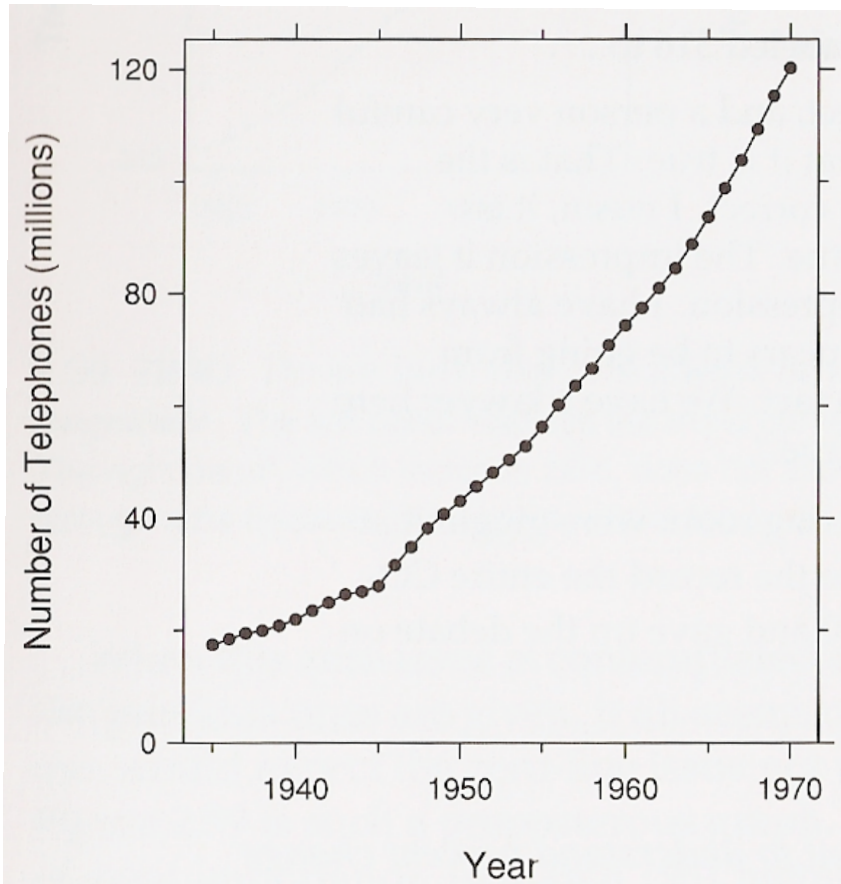
# Clear Understanding

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



# Clear Understanding

- Principle 4: Log scales
  - Used to show percentage change, multiplicative factors and skewness



# Clear Understanding

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- Principle 4: Banking to 45°
  - Aspect ratio is important for judging rate of change

CO2 VisTrails Demo

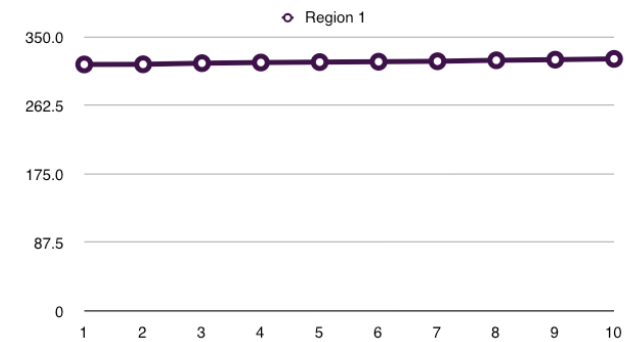
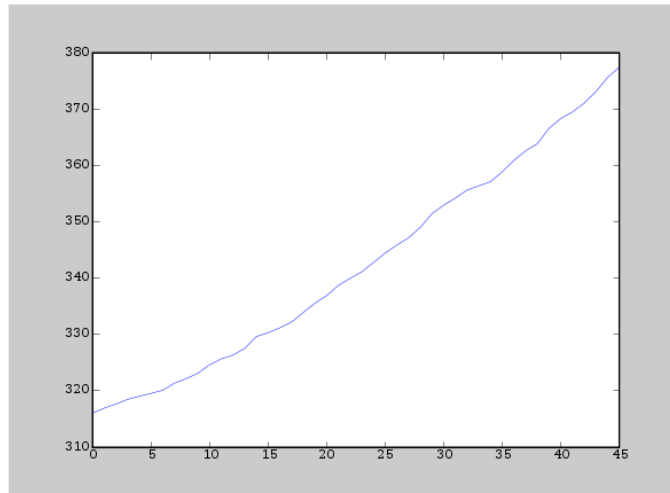
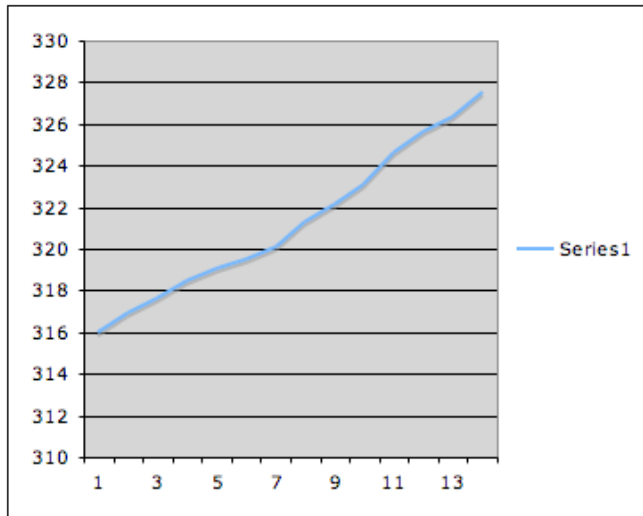
# Summary of Principles

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- 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°

# Summary of Principles

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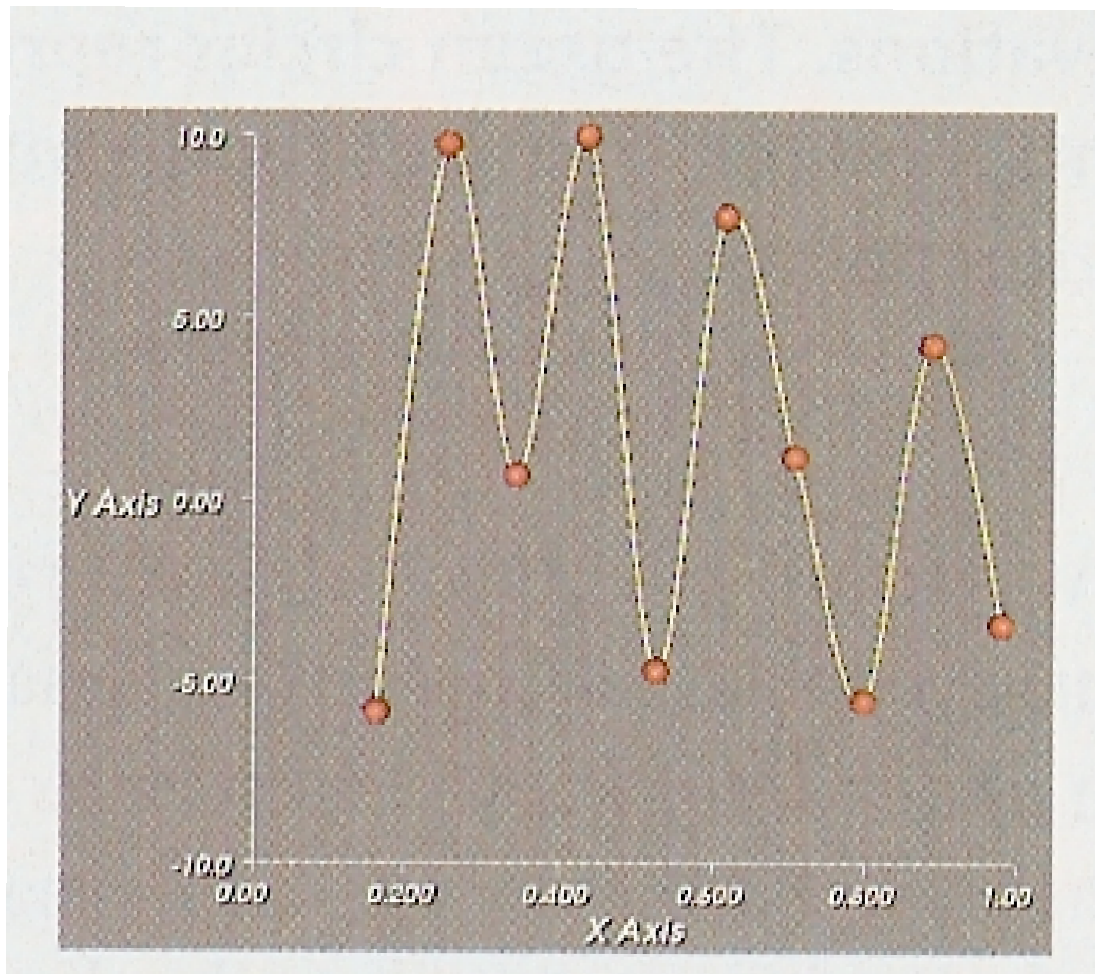


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# Quiz on Principles

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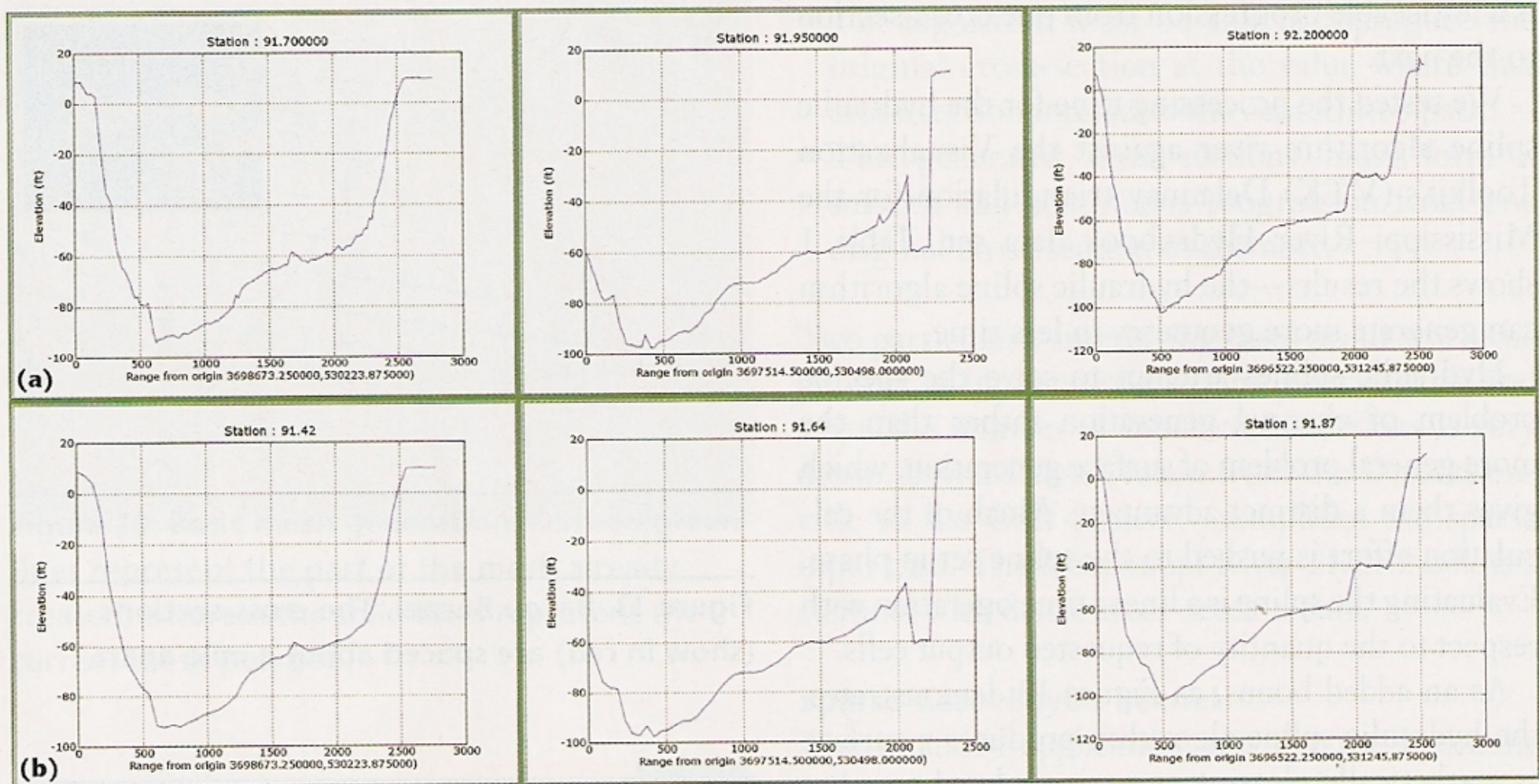
- What is wrong with this plot?



Computing in Science & Engineering  
Sep/Oct 2007  
page 8

# Quiz on Principles

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# Quiz on Principles

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