

Ecology

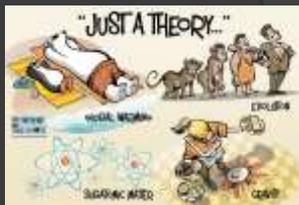
THE SCIENTIFIC METHOD IN ENVIRONMENTAL SCIENCE

Question of the Day

- Define in your own words: what is a "theory"?
- Discuss with a partner. Write a new definition that you both agree on.

- Theory: A well-supported explanation for a phenomenon in the natural world.
- A theory is NOT a guess or a speculation

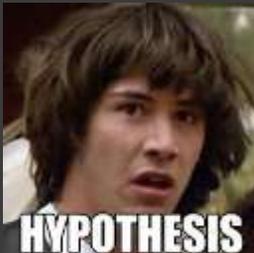
Scientific Theory



The Scientific Method



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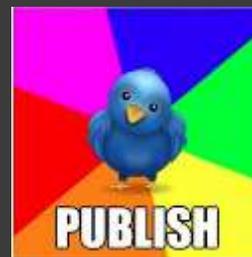
Scientific Method



Scientific Method



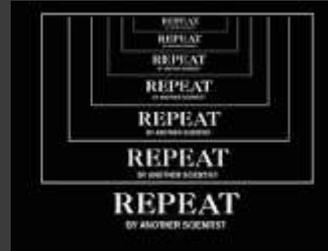
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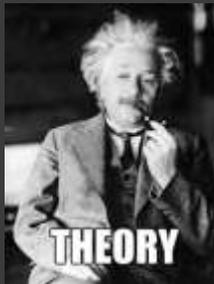
Scientific Method



Scientific Method

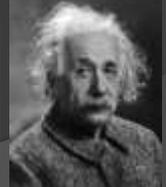
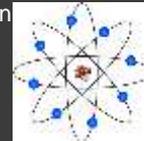
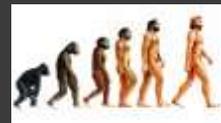


Scientific Method



Examples of Scientific Theories

- Theory of Gravity
- Theory of Relativity
- Atomic Theory
- Cell Theory
- Theory of Evolution



The Scientific Community

- Scientists communicate to each other and to the public through peer-review
- Research is carefully criticized and analyzed

Obokata: Research retracted due to poor lab notes, unable to replicate study, doctored images



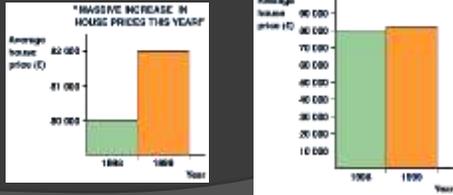
Misuse of Data

- Data can be used to intentionally mislead the audience
- Some common examples:
 - Misleading graphics
 - Correlation, not causation

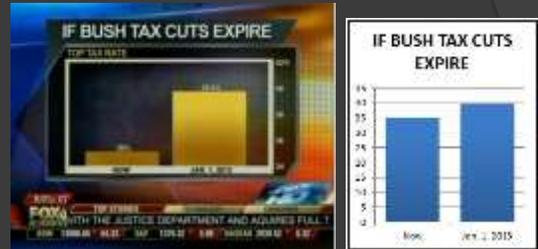


Misleading Graphics

- Axes with no units or labels
- Misleading axis
- Misleading titles or labels
- Visually confusing



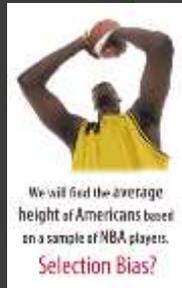
Misleading graphic



Source: FOX news

Biased Data

- **Selection bias:** The groups that were selected change the outcome of the study.
- **Confirmation bias:** Searching for evidence that confirms what you already believe.



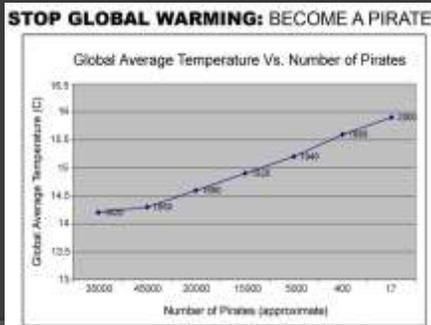
Funding Bias?

- The results of a study may favor the financial sponsors of the research.
- Examples:
 - 1996: Research supported by the tobacco industry more likely to show nicotine has health "benefits".
 - 2008: [FDA determines BPA is safe based on studies conducted by... the plastics industry.](#)



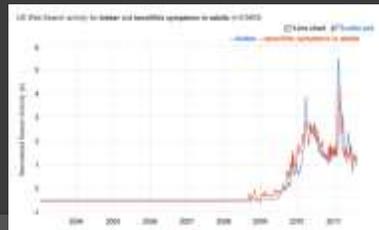
Sticker Question:

Explain the problem(s) with the following graph.



Correlation

- Two variables are _____ when they change together
- MAY indicate that there is a _____ relationship



Correlation does not imply causation

- Just because two variables are correlated does NOT mean that one causes the other.



Recap: Trustworthy Science

- Follows the scientific method
- Free of bias
- Confirmed by repeated investigation
- Objective



Evaluating Sources

- Be sure to evaluate scientific information carefully.
- The internet and TV are full of "pseudoscience" (fake science)!

