The Scientific Method

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Inquiry

- The inquiry must be:
  - **empirical**
    -
  - **measurable**
    - able to be measured!
  - **reproducible**
    - results must be able to be reproduced!

The “Method”

- The method of the scientific method
  - observe phenomena
  - postulate hypothesis
  - make predictions
  - experiment
  - repeat as necessary
- The point is to **disprove** your hypothesis

The “Method” continued

Karl Popper:

- The scientific method never proves a hypothesis correct; the method attempts to disprove hypothesis by showing that predictions stemming from hypothesis fail.
- The role of experiment is to show a hypothesis is false.
- A hypothesis can be scientific or non-scientific. If it is scientific it is falsifiable

Falsifiable Statements

- All swans are white
- No human lives longer than 150 years
- It will rain here on Tuesday
- Aliens never visited the Earth in the past

Not-Falsifiable Statements

- Purple polka-dotted swans exist
- No humans live forever
- It will rain here on Tuesday in 1M years
- Aliens have visited the Earth every year for the past 1000 years

Crazy Talk

Falsifiability has nothing to do with whether a statement is actually true or not. Unfalsifiable statements may be shown to be true but can also be shown to be false.

Theories vs Hypotheses

- Theories are hypotheses that have graduated by becoming universally accepted and are thought very unlikely to be proven false.

Experiments

Experiments are the core of the scientific method. Scientists attempt to control an experiment as much as possible:

- control error
- control confounding factors
- control bias