The Scientific Method

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Session's Outline

- Who developed the scientific method?

- What do we mean by the scientific method?

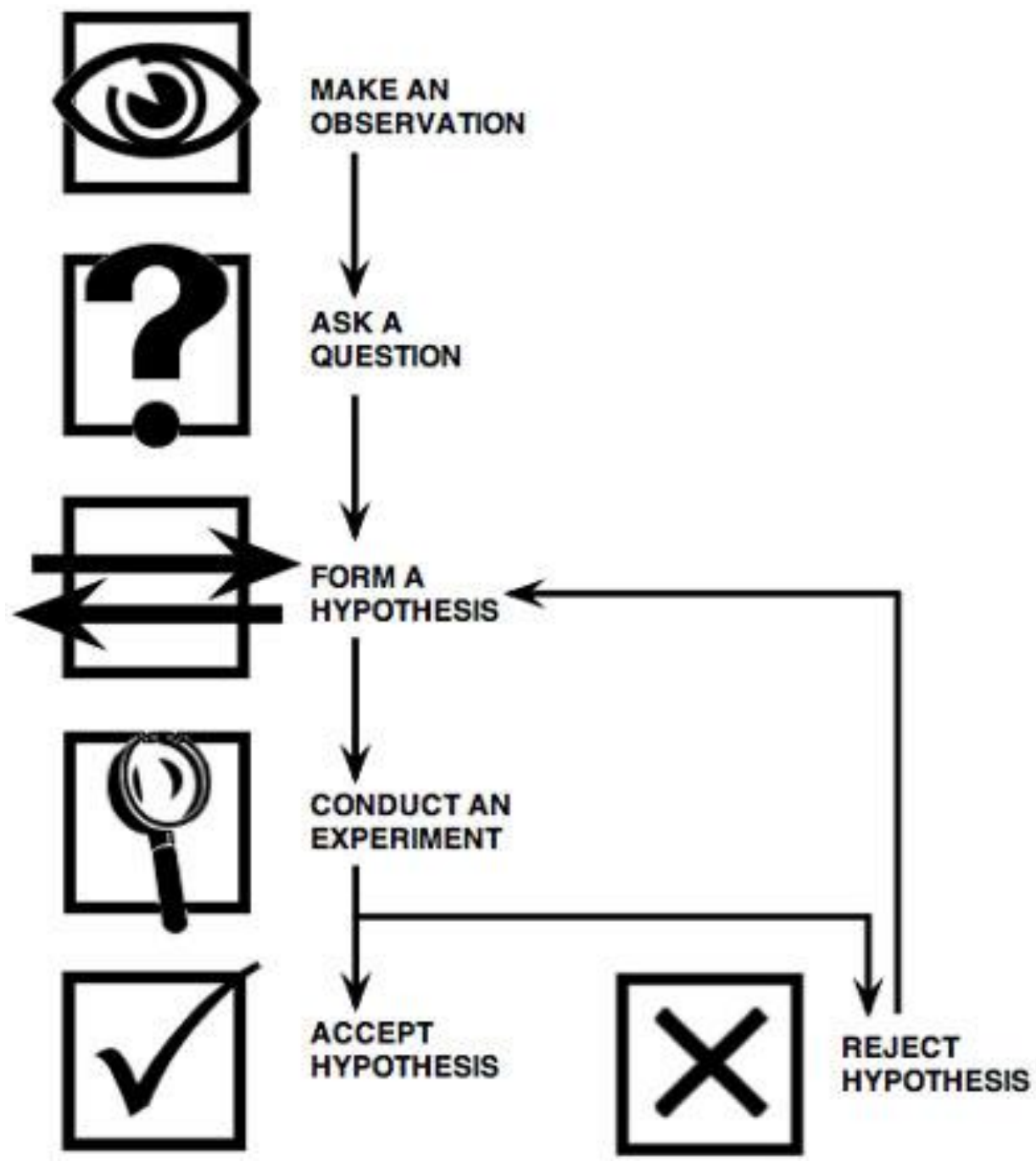- What are the components of the method?

What makes Knowledge Scientific?
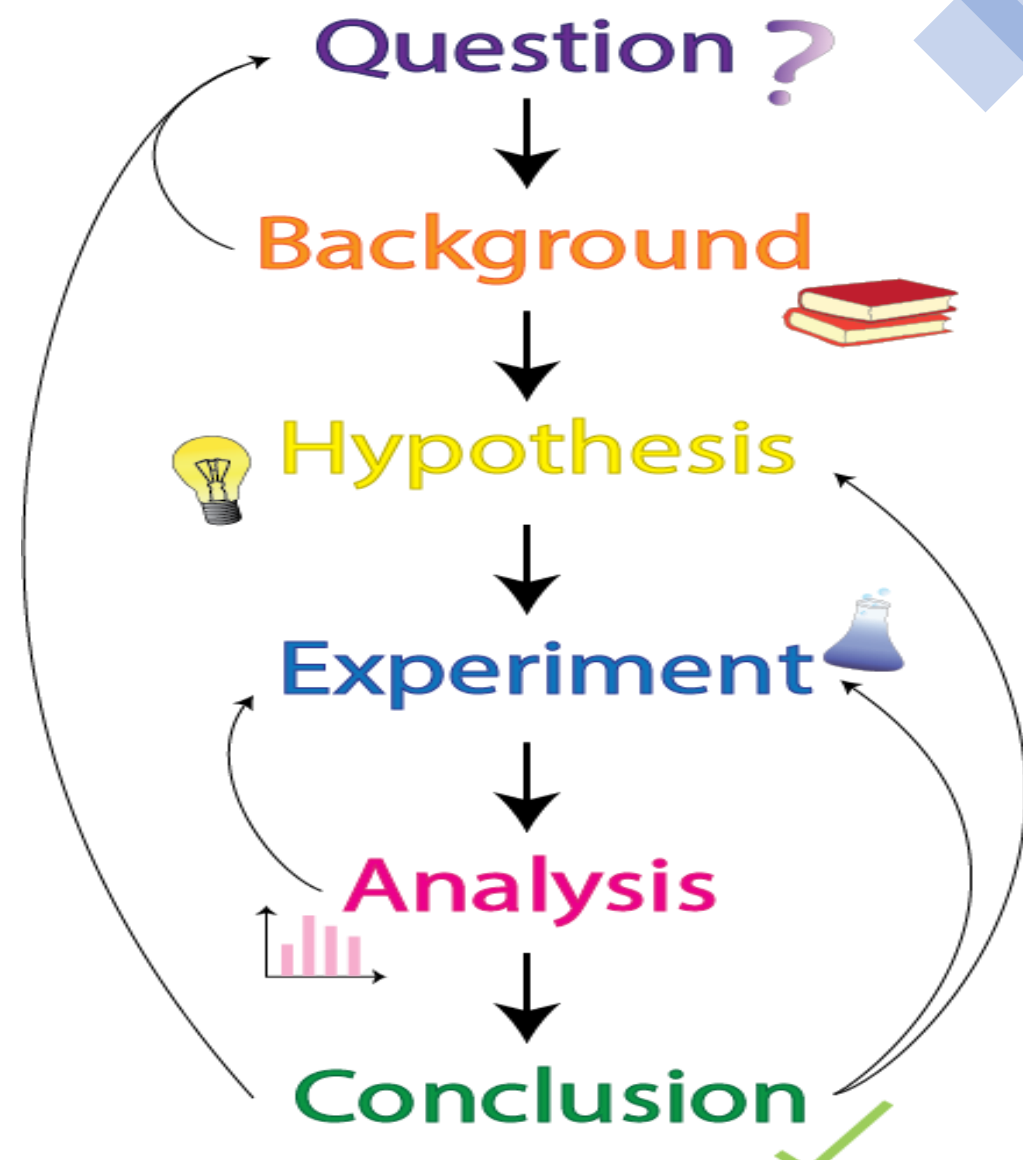
A very Short Origin Story

- Sir Francis Bacon in 1620.
- Aristotle or Galileo first utilised the scientific method.
- Ibn al-Haytham first outlined a series of steps long before Bacon in the early 1000s.
- Issac Newton helped refine the process after Bacon in the later 1600s.

What is the scientific method?

- The **scientific method** is a procedure used to provide scientific explanations for questions about the world. It outlines the way a scientist can perform an **experiment** to collect **empirical data** which can be used to answer a **question**. The scientist plans their experiment based on **background** research that allows them to form a **hypothesis** predicting what may happen. When the experiment is complete, they will use their data to form a **conclusion**.

MAKE AN OBSERVATION

ASK A QUESTION

FORM A HYPOTHESIS

CONDUCT AN EXPERIMENT

ACCEPT HYPOTHESIS

REJECT HYPOTHESIS

The Scientific Method

Question ?

Background

Hypothesis

Experiment

Analysis

Conclusion

Examples

- That question may be about why the phenomenon happens, how it occurs, what it is, how it relates to other things, etc.

- Examples:

    - What action should social networking sites like MySpace and Facebook take to protect users' personal information and privacy?

    - What main environmental, behavioral, and genetic factors predict whether Algerians will develop diabetes?

Hypothesis

- Written by the researcher to **explain** the phenomenon of interest.
- The researcher's **prediction** of the relationship that exists among the variables being investigated.
- stated **before** collecting the data.

If you wrote a research question, the hypothesis will be your **tentative** answer to your question.

Framing hypothesis

- typically phrased as "**if-then**" statements.
Example: *If* people exercise for 30 minutes per day at least three days per week, *then* their cholesterol levels will be reduced."

- This hypothesis makes a **prediction** about the effects of exercising on levels of cholesterol, and the prediction can be **tested** by gathering and analysing data.

Other Examples

- H_1: Masters students from different subject specialisms will hold significantly different levels of knowledge of climate change.

- H2: Masters students aged 25 and under will hold significantly different attitudes towards climate change than Masters students aged 26 and over.

- H3: Masters students' knowledge of climate change will correlate significantly with their attitude towards climate change.

Experiment

- Experiments must be controlled in all ways except for the **Independent Variable** (IV), or the change that is being tested. The **Dependent Variable** (DV) is the thing that will be measured in the experiment. Its correlation to the independent variable will be what the scientist is looking for.

Analysis

- After the data has been collected, it must be analysed to determine if any differences are **significant**.
- **Significance** is very important in science; it is determined through statistical testing and it tells the scientist whether the differences they observe are truly due to the independent variable, or if they may be due to chance.

conclusion

After the data analysis, the researcher supports or rejects the suggested hypothesis.

Bibliography and References

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