

Scientific Method



Scientific Method

The scientific method consists of a set of steps used to investigate and solve problems in nature.



Spontaneous Generation or Abiogenesis

Make an Observation



Francesco Redi
1668

In 1668, an Italian Scientist named Francesco Redi, observed that flies were also found around rotting meat.

Observation

Act of noticing and describing events in a carefully, orderly way.

Form an Hypothesis



Redi hypothesized if maggots come from flies, then if the meat was kept covered, no maggots would appear.

Inference

Logically explanation based on what scientists already know

Hypothesis

Scientific explanation for a set of observations that can be tested

Test the Hypothesis



Redi placed meat inside two sets of jars.

One set of jars he left uncovered, while covering the other set of jars with cheese cloth.

Controlled Experiment

Experiment in which only one variable is changed or tested, while all the other variables are kept unchanged

Variables



In an experiment, anything that can be changed, or can vary, is called a variable.

- **Type of meat**

- **Type of jar**

- **Temperature**

- **Exposure to Flies**

Independent Variable



The one variable that Redi changed was exposure to flies

Independent Variable

The variable that is deliberately changed or is being tested

Dependent Variable



Redi observed, measured, and recorded the amount of maggots present on the meat.

Dependent Variable

The variable that is observed and that changes in response to the independent variable

Control Group

In order to be sure covering the jar actually made a difference, Redi kept one jar uncovered.

**Control
Group**



**Experimental
Group**

Control Group

Group that is exposed to all of the same conditions except the independent variable (variable being tested)

Collecting Analyzing the Data

Redi recorded how many maggots developed in each of the jars over a period of several weeks

Several
Maggots



No
Maggots

Data

Information collected during an experiment which can be quantitative or qualitative

Graphs

Graphs are used to visually display the data in order to help with analyzing the data

Line Graphs

**Presence of Maggots
Overtime**

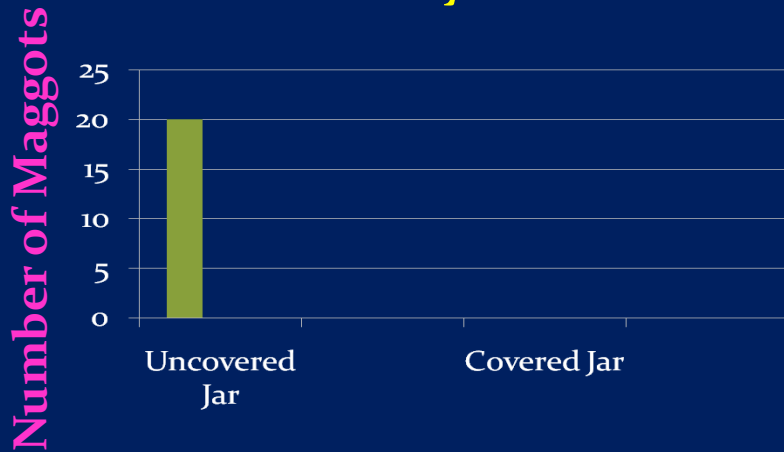


Line Graphs are used to show a change over time

Dependent Variable
Y Axis

Bar Graphs

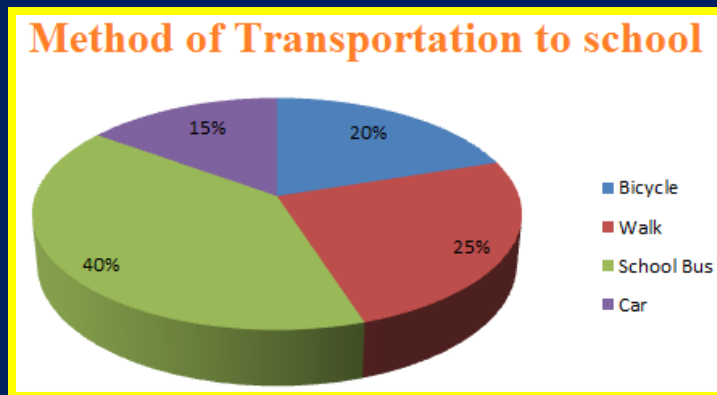
Presence of Maggots After Ten Days



Bar Graphs are used when comparing fixed quantities

Dependent Variable
Y Axis

Circle Graphs



Circle graphs or pie charts are used to show percentages

Drawing Conclusions

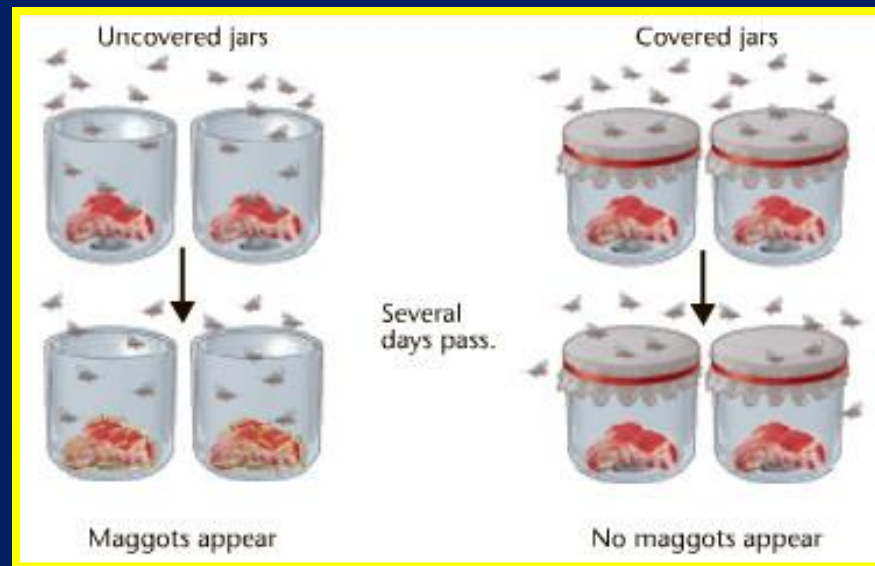
After analyzing the data, Redi concluded that maggots appeared on meat as a result of exposure to flies



- Experimental data is used as evidence to either
- Support the hypothesis
 - Refute the hypothesis
 - Revise the hypothesis

Hypothesis Supported

If the hypothesis is supported, then it may be shared with others.

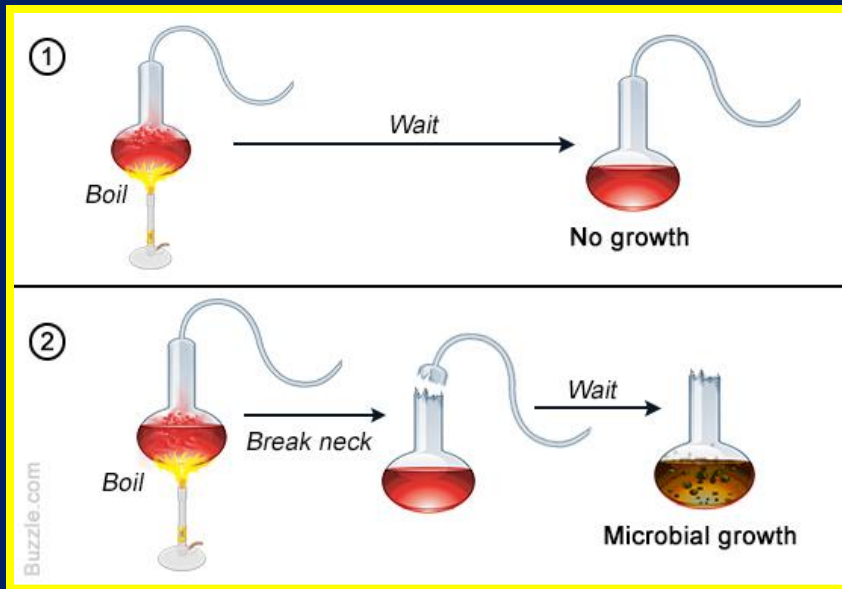


If others perform the same experiment and get the same results, the hypothesis can then be considered valid.

Sharing Information

Once a valid hypothesis is published and shared with the scientific community, other scientists can relate their own work to the experiment.

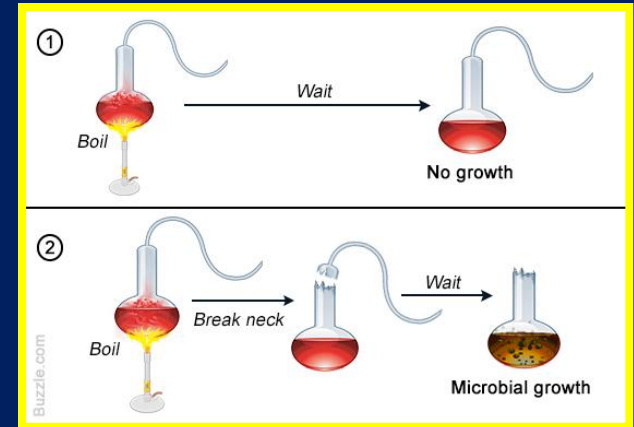
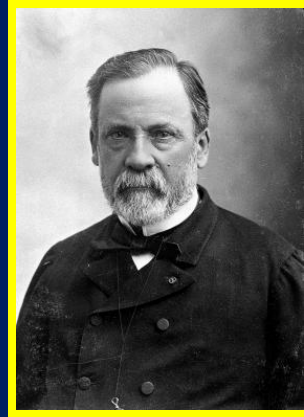
Redi published his results in 1668.



In 1860, a French scientist, Louis Pasteur, performed a similar experiment with beef broth and bacteria.

Scientific Theory

A hypothesis that is supported by many separate observations and experiments can become a scientific theory.



Both Redi's and Pasteur's experiments helped form the theory called biogenesis which explains that life must come from other life.

Scientific Theory

A theory is an explanation of natural events based on evidence gained through multiple observations and investigations.

Biogenesis explains that life comes from other life.

In order to get a bacterial infection, you have to be exposed to the bacteria.



Scientific Law

A scientific law is a statement about what happens in the natural world which seems to be true all of the time. Laws do not explain how or why anything happens.

Mendel's Law of Simple Dominance states that when there is a dominant and a recessive "factor" present for one trait, the dominant trait will be seen.



Freckles = Dominant

No Freckles = Recessive

The End

