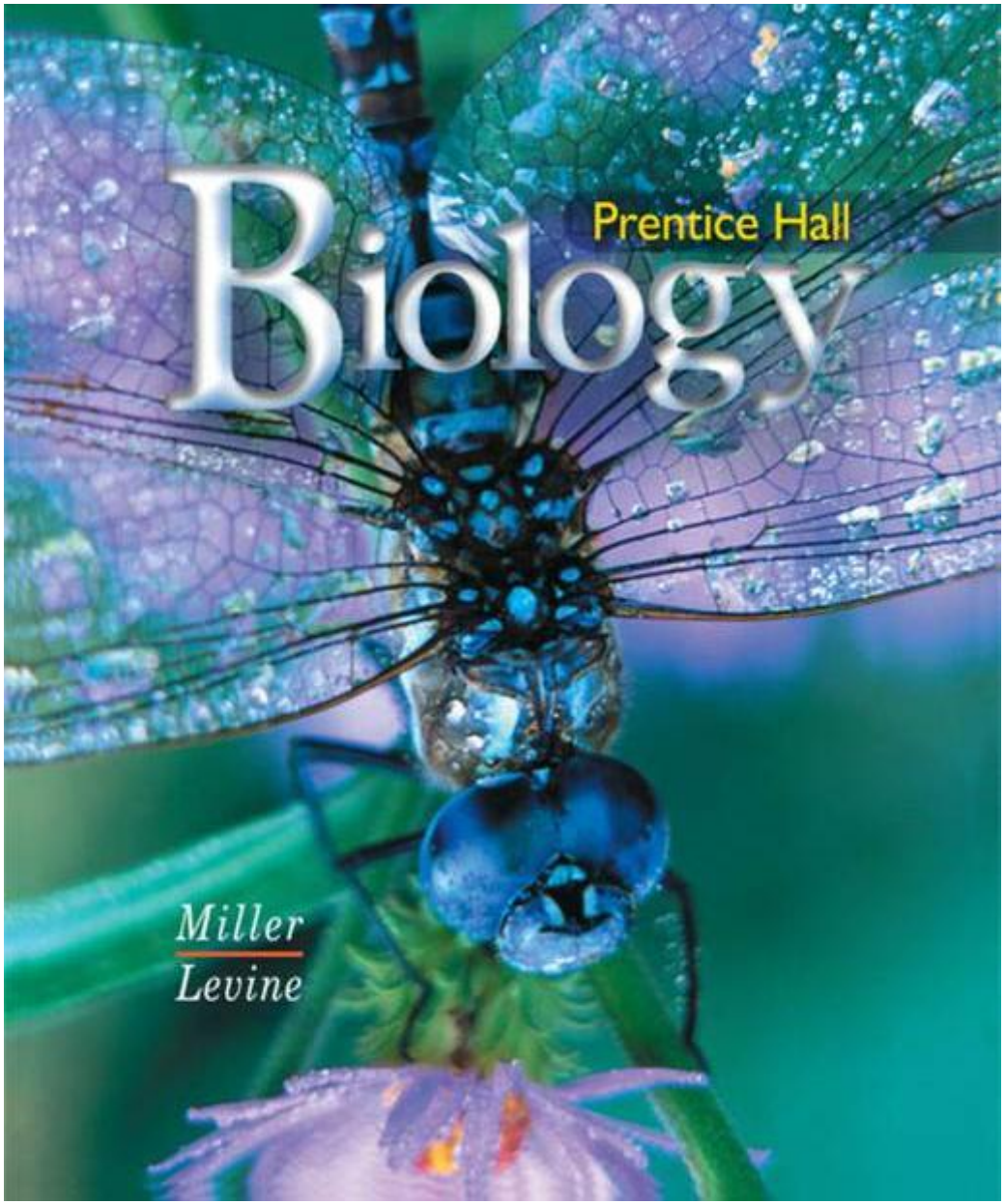
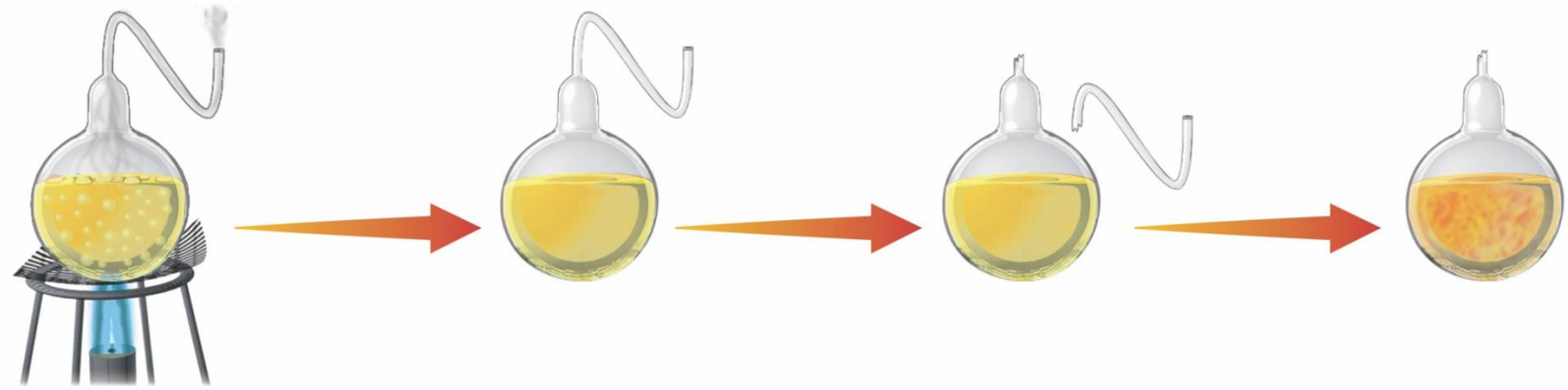


End Show

1-2 How Scientists Work



How do scientists test hypotheses?

A hypothesis should be tested by an experiment in which only one variable is changed at a time.

Designing an Experiment

The process of testing a hypothesis includes:

- Asking a question
- Forming a hypothesis
- Setting up a controlled experiment
- Recording and analyzing results
- Drawing a conclusion

Asking a Question

Many years ago, people wanted to know how living things came into existence. They asked:

How do organisms come into being?

Forming a Hypothesis

One early hypothesis was **spontaneous generation**.

For example, most people thought that maggots spontaneously appeared on meat.

In 1668, **Redi** proposed a different hypothesis: *that maggots came from eggs that flies laid on meat.*

Setting Up a Controlled Experiment

manipulated variable

responding variable

active art click to start

Redi's Experiment

Redi's Experiment on Spontaneous Generation

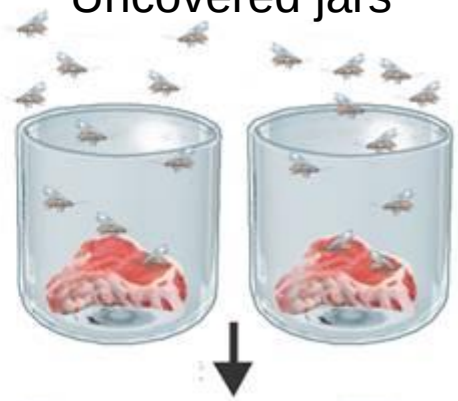
OBSERVATIONS: Flies land on meat that is left uncovered. Later, maggots appear on the meat.

HYPOTHESIS: Flies produce maggots.

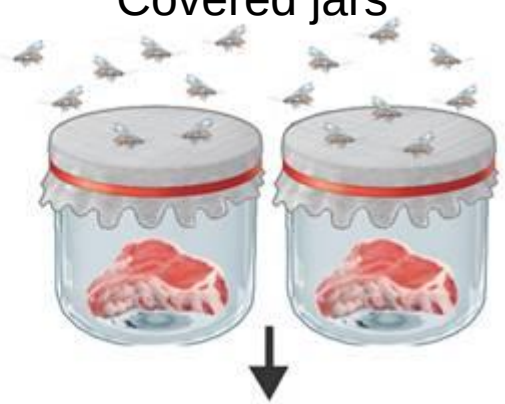
PROCEDURE

Controlled Variables: jars, type of meat, Location, temperature, time

Uncovered jars



Covered jars

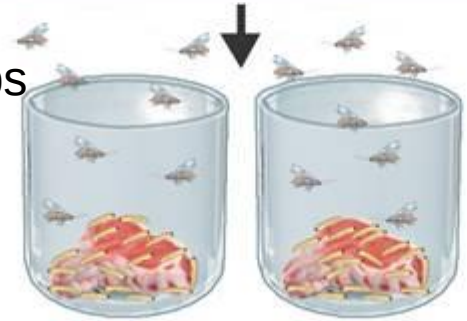


Redi's Experiment

Redi's Experiment on Spontaneous Generation

Manipulated Variable:
Gauze covering that keeps flies away from meat

Responding Variable:
whether maggots appear



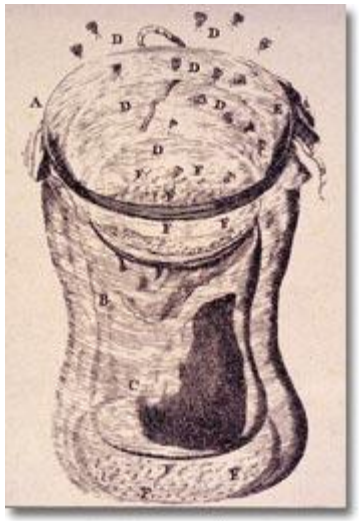
Maggots appear.

Several days pass.

No maggots appear.

Drawing a Conclusion

Scientists use the data from an experiment to evaluate a hypothesis and draw a **valid conclusion**.



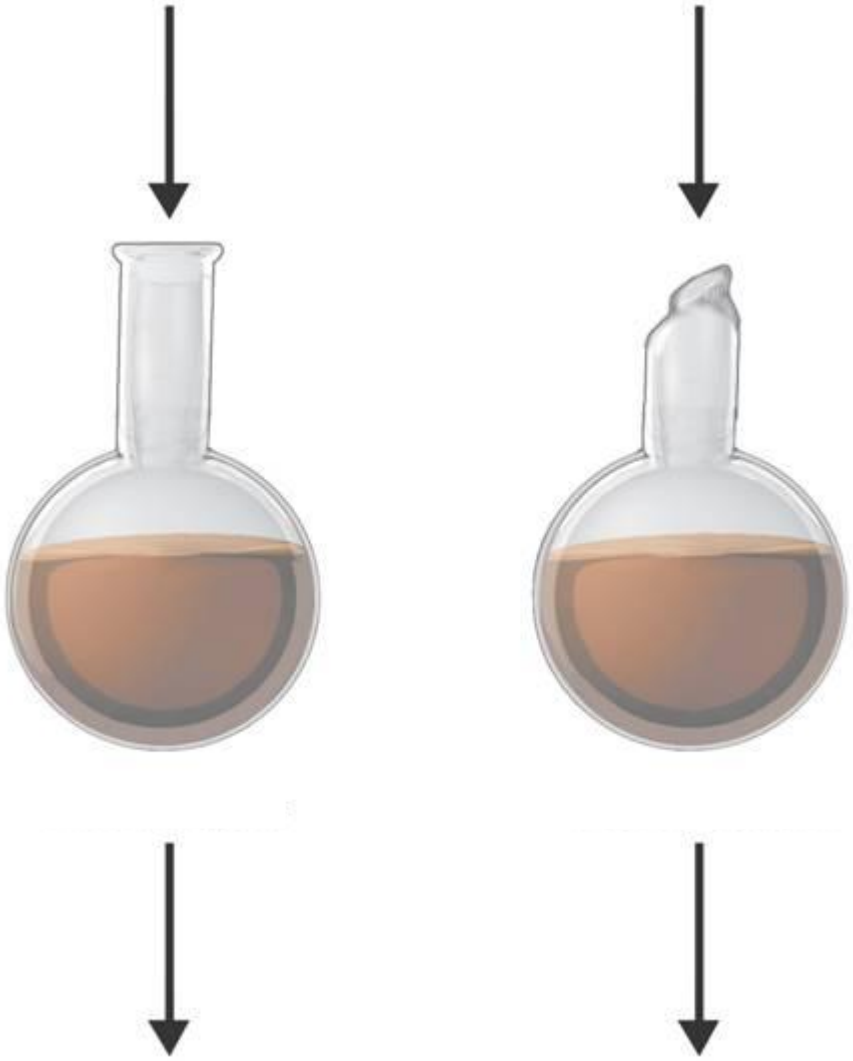
Spallanzani's Test of Redi's Findings

Gravy is boiled.

Gravy is boiled.

Spallanzani's Test of Redi's Findings

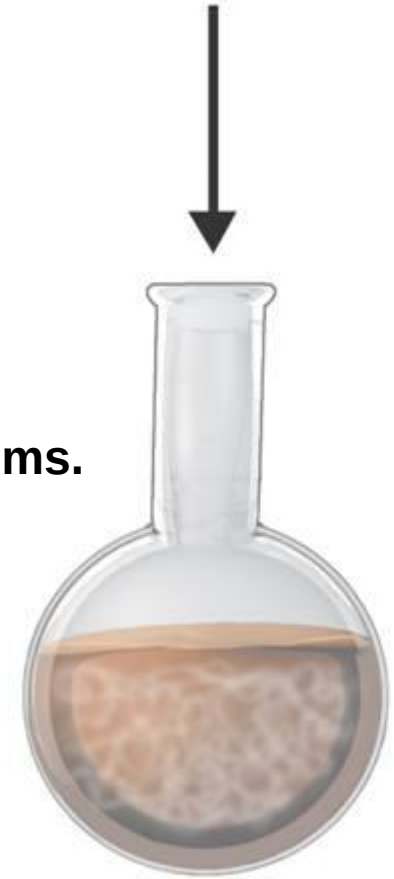
Flask is open.



Flask is sealed.

Spallanzani's Test of Redi's Findings

Gravy is teeming with microorganisms.



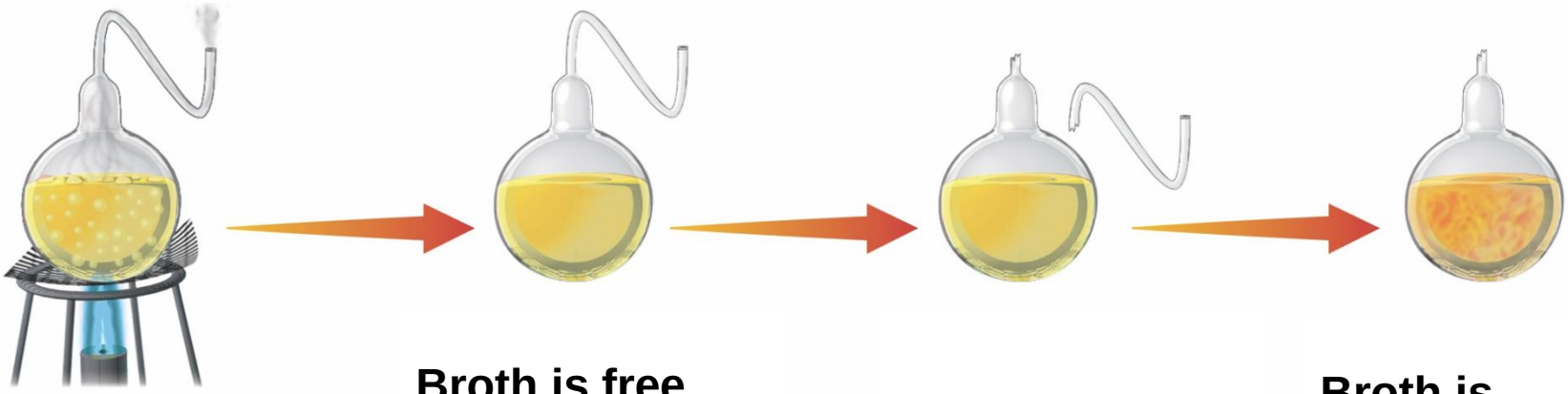
Gravy is free of microorganisms.

Pasteur's Test of Spontaneous Generation

- **Louis Pasteur** conclusively disproved the hypothesis of spontaneous generation.
- Pasteur showed that all living things come from other living things.

active art click to start

Pasteur's Experiment



Broth is boiled

Broth is free of microorganisms for a year.

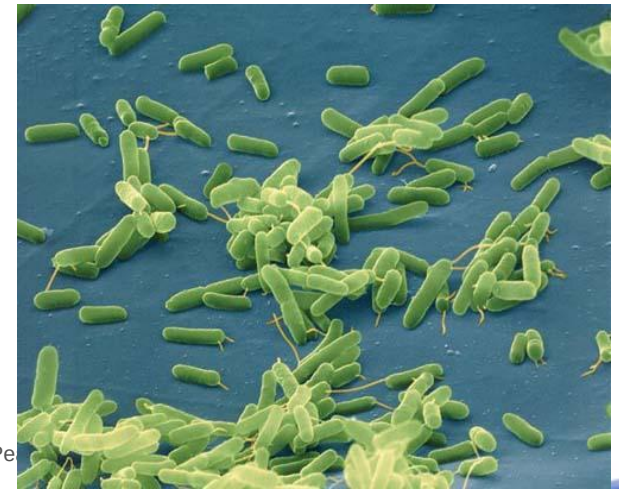
Curved neck is removed.

Broth is teeming with microorganisms.

The Impact of Pasteur's Work

Pasteur saved the French wine industry, which was troubled by unexplained souring of wine.

He began to uncover the nature of infectious diseases, showing that they were the result of microorganisms.



How does a scientific theory develop?

How a Theory Develops

As evidence from numerous investigations builds up, a hypothesis may become so well supported that scientists consider it a theory.

In science, the word *theory* applies to a <u>well-tested explanation that unifies a broad range of observations</u>.

Major Theories in Biology

- Germ Theory
- Evolutionary Theory
- Cell Theory
- Gene Theory

1–2 Section QUIZ

Continue to:

Section QUIZ

- or -

Click to Launch:

ExamView® QuickTake

End Show

1–2 Section QUIZ

1 In an experiment, the variable that is deliberately changed is called the

a. control.

b. manipulated variable.

c. responding variable.

d. constant control

2 The mistaken belief that living organisms can arise from nonliving matter is called

a. biogenesis.

b. Pasteur's theory.

c. spontaneous generation.

d. Spallanzani’s hypothesis.

3 Which of the following was the manipulated variable in Redi's experiment?

a. the kind of meat used

b. the temperature the jars were kept at

c. the gauze covering on some jars

d. the kind of fly that visited the jars

4 A well-tested explanation that unifies a broad range of observations is a

a. hypothesis.

b. variable.

c. control.

d. theory.

5 A scientific explanation does not become a theory until

a. a majority of scientists agree with it.

b. it has been supported by evidence from numerous investigations and observations.

c. it is first proposed as an explanation.

d. it is published in a textbook.

END OF SECTION