

Figure 1.1

Introduction to Biology



Biology is the study of LIFE!

DNA changed

(a) Domain Bacteria

single cell -

pro



2 μ m

(b) Domain Archaea

simple -

mix



2 μ m

(c) Domain Eukarya

complex organism

eukaryotic
(nucleus)



▶ Kingdom Plantae



▶ Kingdom Fungi



▶ Kingdom Animalia

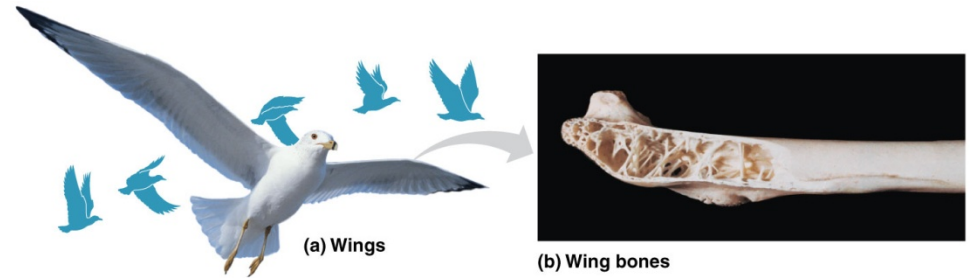
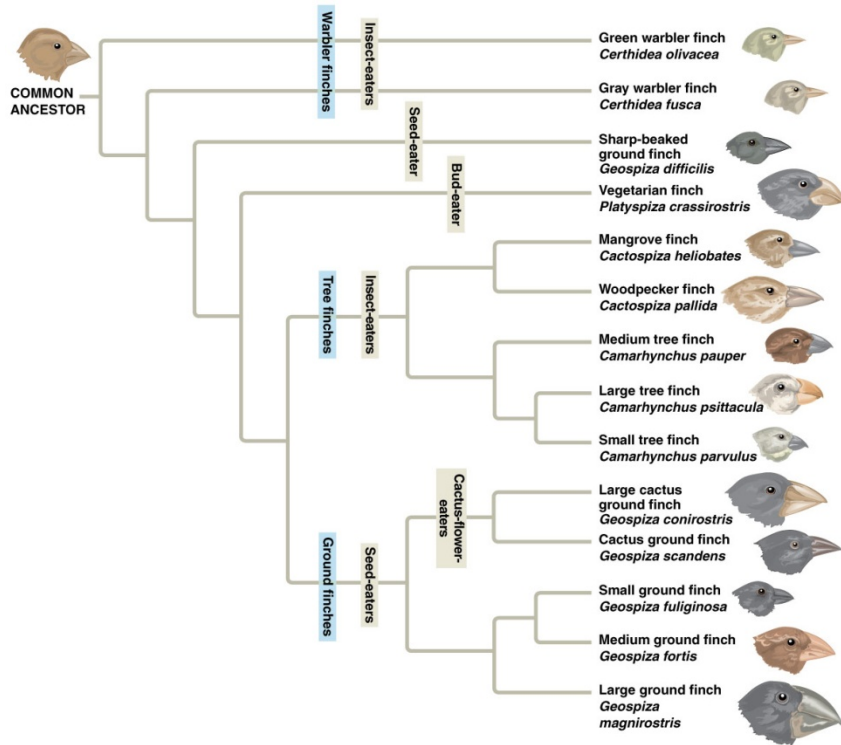
100 μ m

▶ Protists



Big Ideas in Biology

Big Idea 1: The process of evolution drives the diversity and unity of life.



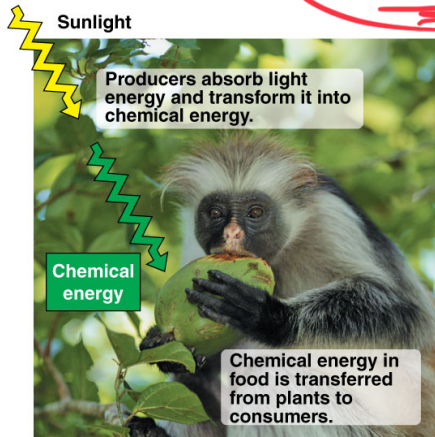
Big Ideas in Biology

Deal with changes in energy

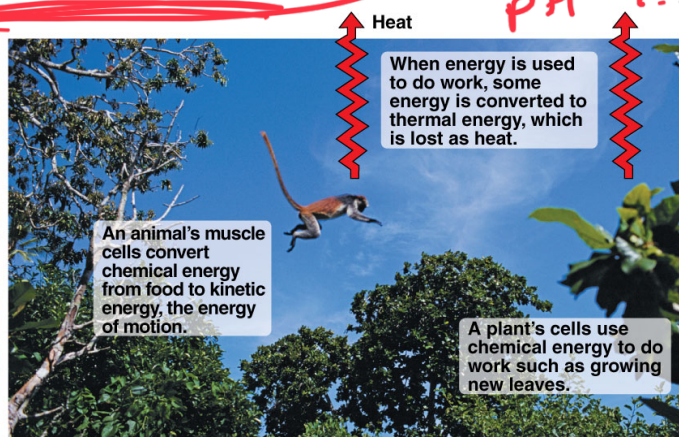
Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis.

"set point"

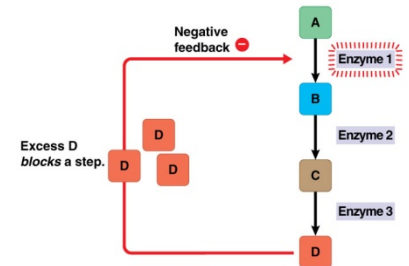
*98.6 °F
pH 7.35-7.45*



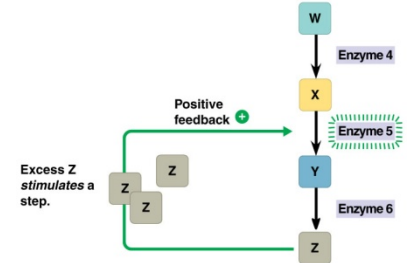
(a) Energy flow from sunlight to producers to consumers



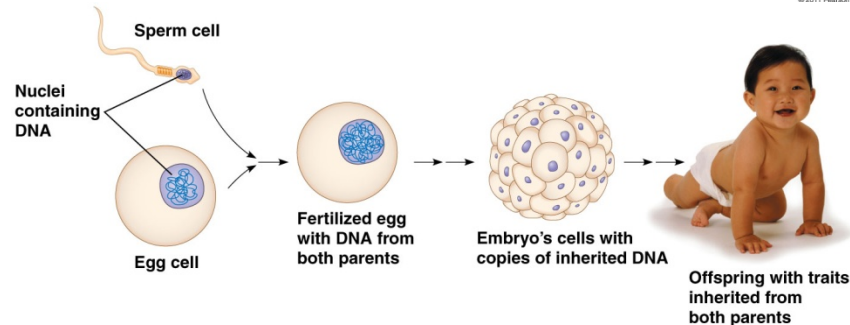
(b) Using energy to do work



(a) Negative feedback



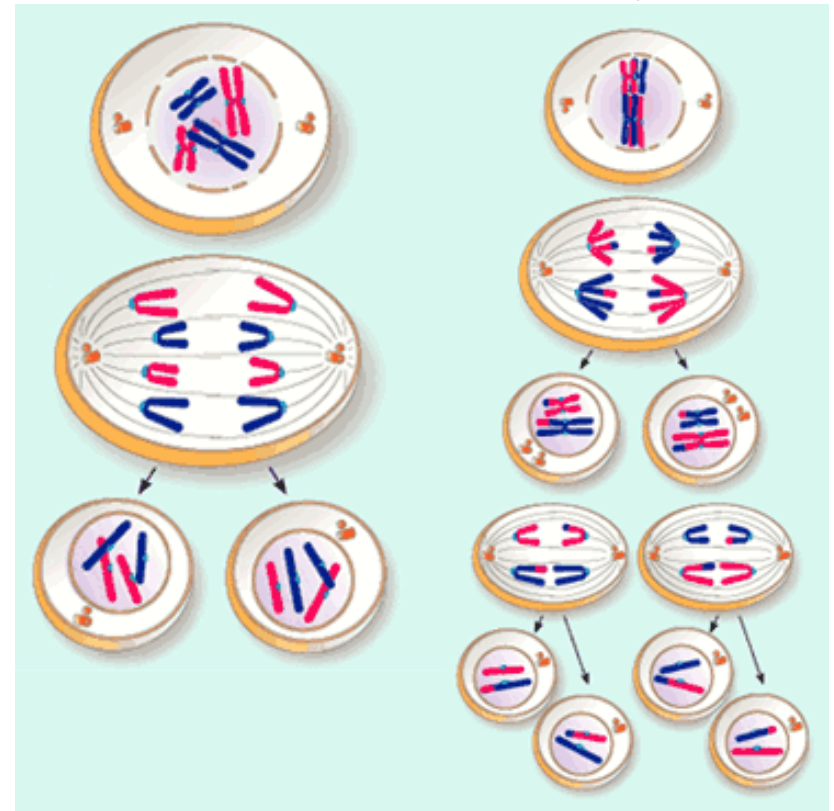
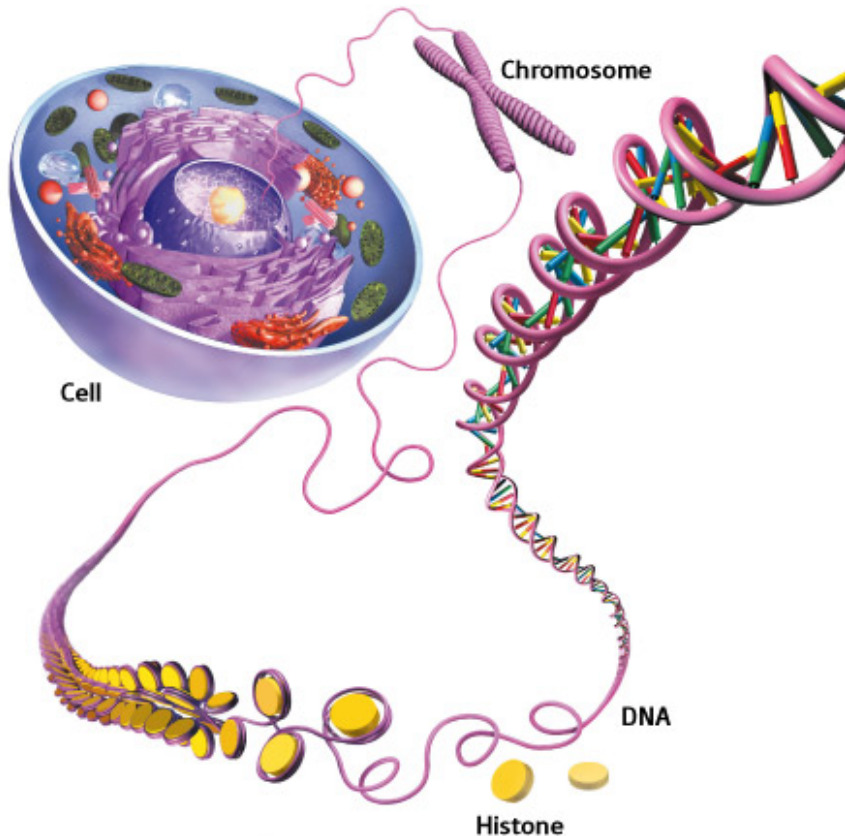
(b) Positive feedback



Big Ideas in Biology

Big Idea 3: Living systems store, retrieve, transmit and respond to information essential to life processes.

*genetic hereditary material
DNA*



What is Science?



What is Science?

- ◆ *Science* = Latin “to know”

Inquiry is at the heart of science.

- ◆ Inquiry: search for information and explanation

Two main processes:

1. Discovery science
2. Hypothesis-based science

Discovery Science

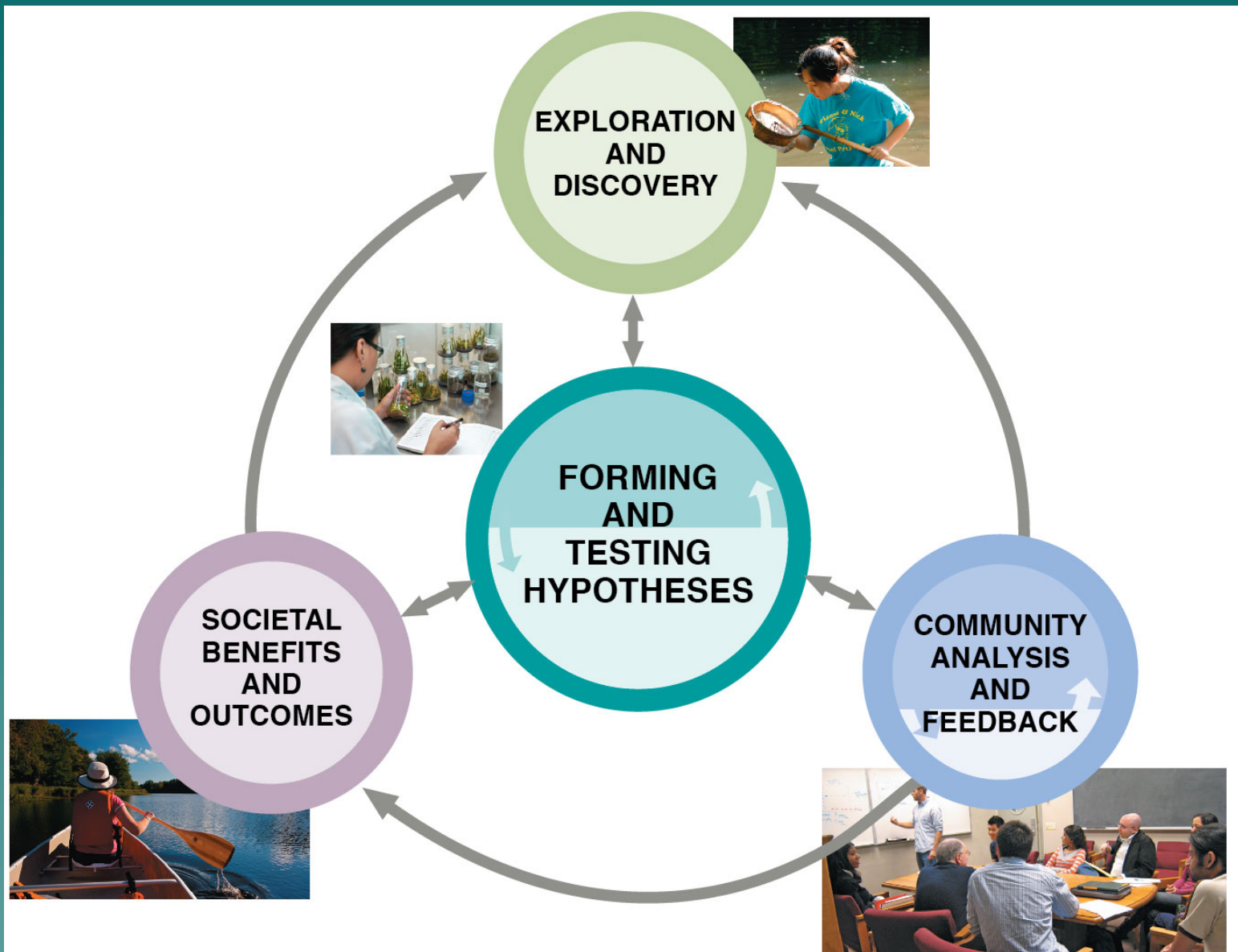
- ◆ Describes nature through **observation** and analysis of **data**
- ◆ Data = recorded observations
 - **Qualitative** and **quantitative**
- ◆ Inductive reasoning: derive generalizations based on specific observations

Hypothesis-Based Science

good hypothesis → testable

- ◆ Hypothesis: makes predictions that can be tested by recording more observations or experiments
- ◆ **AP Biology**: “If ... , then ... because...”
- ◆ Results can either support or refute the hypothesis
 - Not “My hypothesis is correct”

Model of the Scientific Process



FORMING AND TESTING HYPOTHESES

Testing Ideas

- Forming hypotheses
- Predicting results
- Doing experiments and/or making observations
- Gathering data
- Analyzing results

Interpreting Results

Data may...

- Support a hypothesis
- Contradict a hypothesis
- Inspire a revised or new hypothesis



EXPLORATION AND DISCOVERY

- Observing nature
- Asking questions
- Reading the scientific literature



SOCIETAL BENEFITS AND OUTCOMES

- Developing technology
- Informing policy
- Solving problems
- Building knowledge

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Theories in Science

Law → Math

- ◆ Broader in scope than a hypothesis
- ◆ Generates new hypotheses
- ◆ Supported by a large body of evidence
- ◆ Can be modified or rejected with new research evidence

Difference between hypothesis and theory
theory is established knowledge that has survived countless tests.

Examples:

- Theory of evolution by natural selection
- Theory of gravity
- Theory of plate tectonics