THEMES IN THE STUDY OF LIFE

Objectives

1. Describe the purpose and steps of the scientific method.
2. Differentiate hypothesis and theory.
3. Differentiate between control and experimental groups.
4. Design an experiment using the scientific method.
5. List at least six features that characterize living organisms.
6. Differentiate the three domains and five kingdoms of life.
7. Properly name living things.
8. Recognize terms for levels of biological organization.

Outline

A. What is Science?
   1. The Scientific Method
   2. Theory

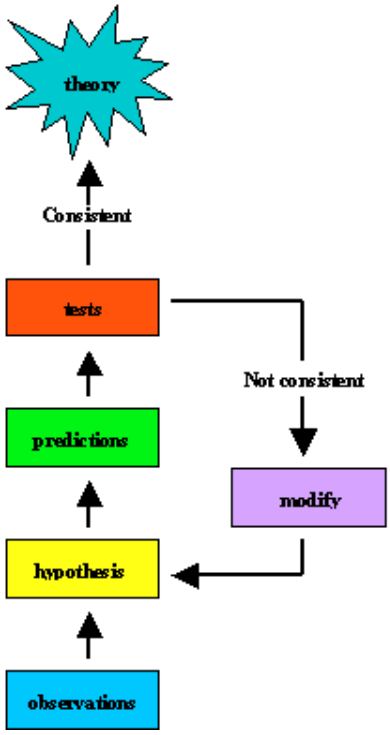
B. What is Biology?
   1. What is Life?
   2. Some Characteristics of Life

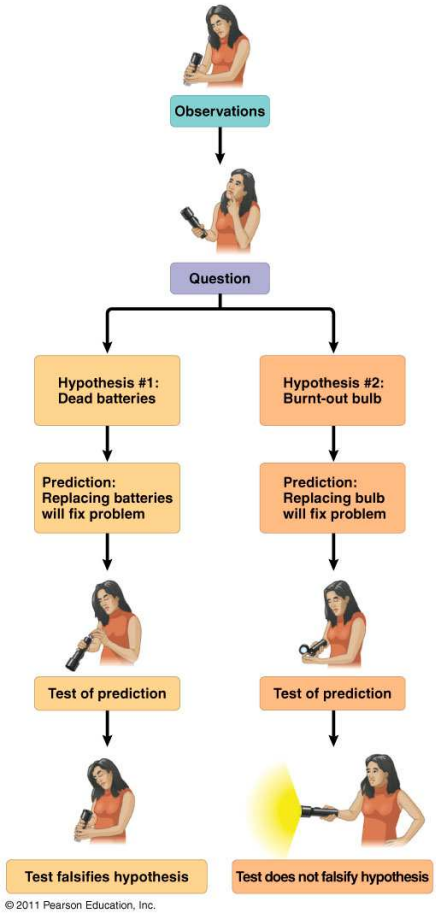
C. Relationships Among Life
   1. Evolution of Populations
      a. Key Factors
      b. Dynamics
   2. Naming Organisms
   3. Variety of Life Forms
   4. Levels of Biological Organization

A. What is Science?

1. The Scientific Method

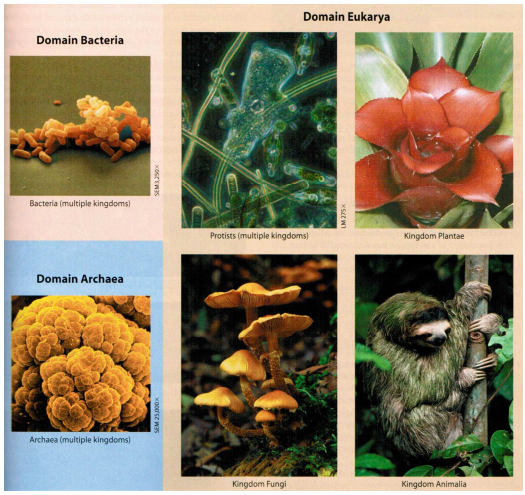
- Observation
- Question
- Hypothesis
  - Testable
- Prediction
- Test (Experiment)
  - Variables
  - Control
- Data Collection
  - Falsify
  - Support
- Parsimony (Okkam's Razor)





2. Theory

B. What is Biology?

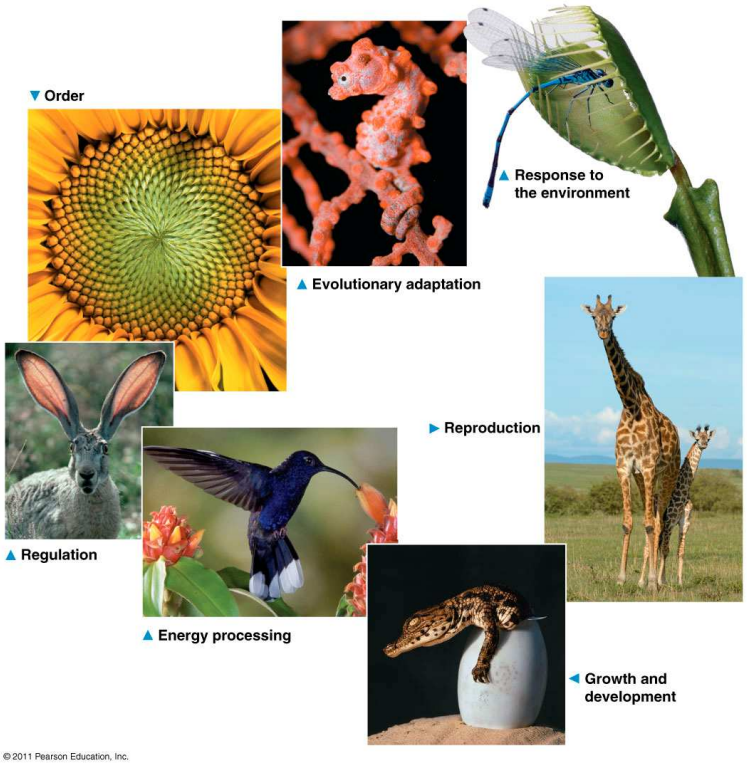


1. What is Life?

- Animal, Vegetable or Mineral?

2. Some Characteristics of Life

- Ordered
  - Cells
- Regulated
  - Homeostasis
- Grow and Develop
- Harvest/Process Energy
  - Metabolism
- Respond to environment
- Reproduce
- Evolve (not individual, but population)



C. Relationships Among Life
1. Evolution of Populations

- Descent with modification (Darwin)

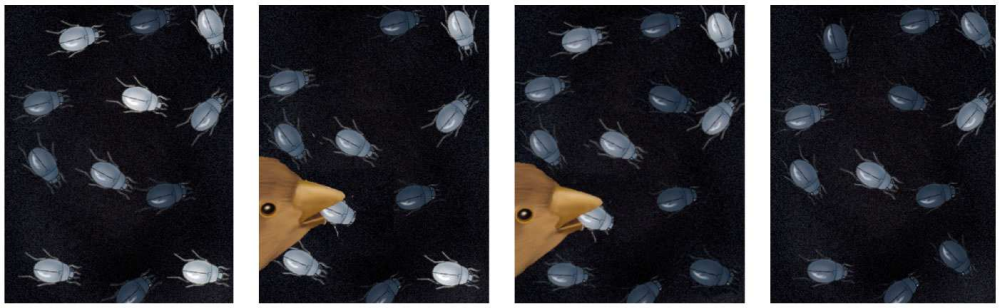
- Change in populations over time

- **Individuals do NOT evolve**

a. Key Factors for Natural Selection
- Expression of trait varies

- Variation in trait is heritable

- Trait effects fitness



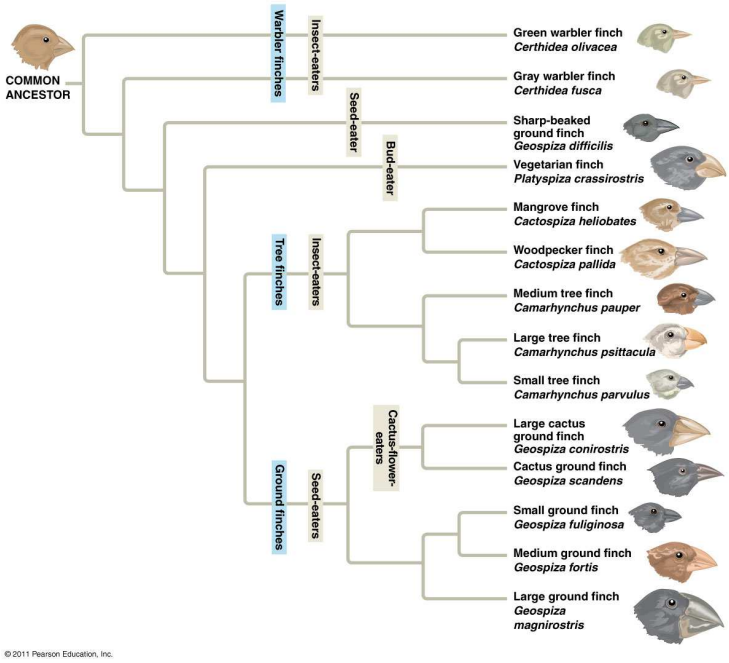
b. Dynamics for Natural Selection

- Populations produce more individuals than the environment can sustain

  - Some are more successful than others
    - find food better
    - survive poor times better
    - impress the other sex better

  - Pass more of their genes to the next generation

- Repeat over billions of years



b. Naming Organisms

- Binomial Nomenclature

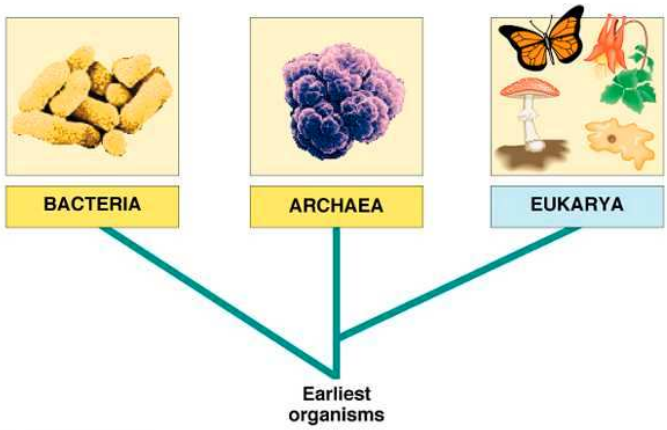
  - Genus

  - specific epithet

  - Species

3. Variety of Life Forms

- Three Domains



  - Bacteria (Eubacteria)
  - Archaea (Archaebacteria)
  - Eukarya

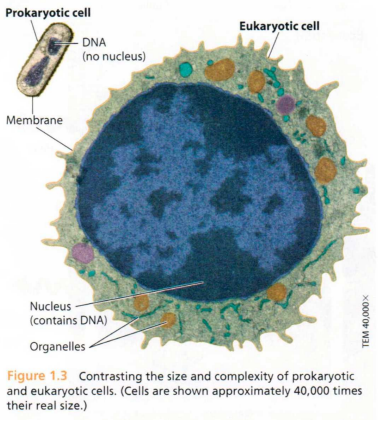
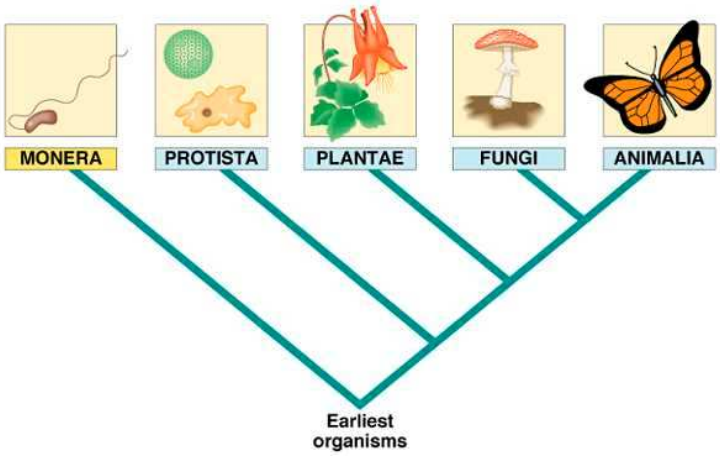


Figure 1.3 Contrasting the size and complexity of prokaryotic and eukaryotic cells. (Cells are shown approximately 40,000 times their real size.)

    - Four Kingdoms of Eukarya

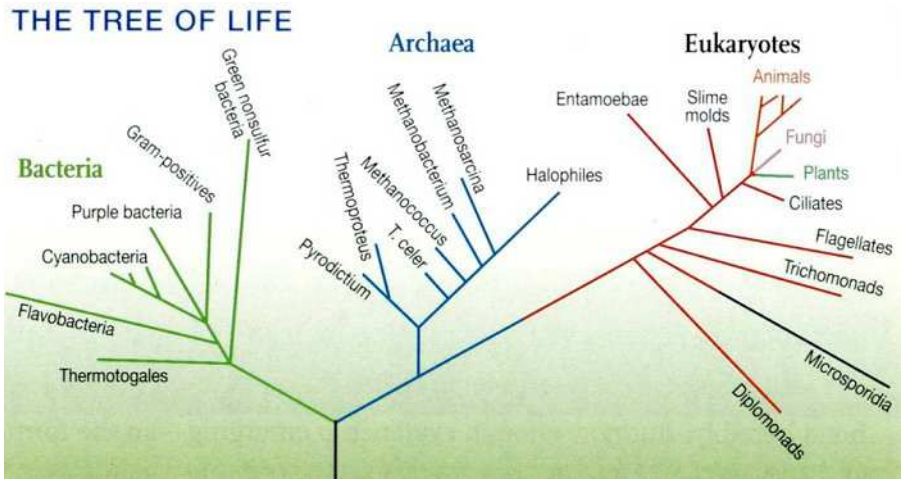


- Plantae

- Fungi

- Animalia

- Protists (3-12 kingdoms)



4. Levels of Biological Organization

- biosphere
- ecosystem
- community
- population
- organism
- organ system
- organ
- tissue
- cell
- organelle
- molecule
- emergent properties