SCIENTIFIC STUDY OF LIFE

Objectives

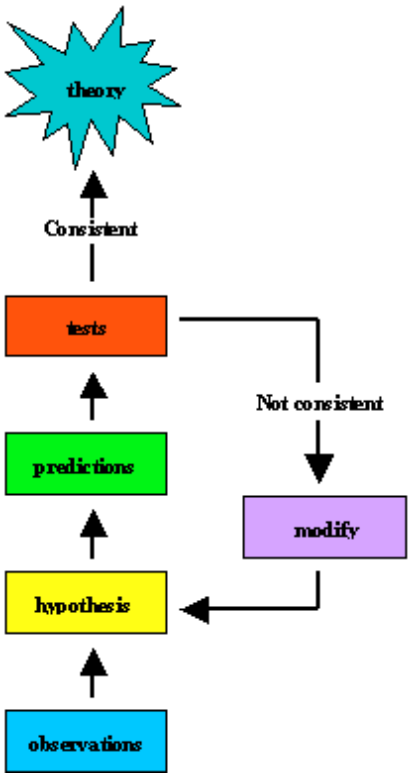
1. Describe the purpose and steps of the scientific method.
2. Differentiate hypothesis and theory.
3. Differentiate between control and experimental groups.
4. Design an experiment using the scientific method.
5. List at least six features that characterize living organisms.
6. Differentiate the three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

Outline

A. What is Science?
   1. The Scientific Method
   2. Theory
B. What is Biology?
   1. What is Life?
   2. Some Characteristics of Life
   3. Classification System
      a. Hierarchy of Classification
      b. Naming Organisms
   4. Variety of Life Forms
   5. Levels of Biological Organization
C. Disciplines in Biology
   1. Based on Processes
   2. Based on Organisms
   3. Based on Application

A. What is Science?

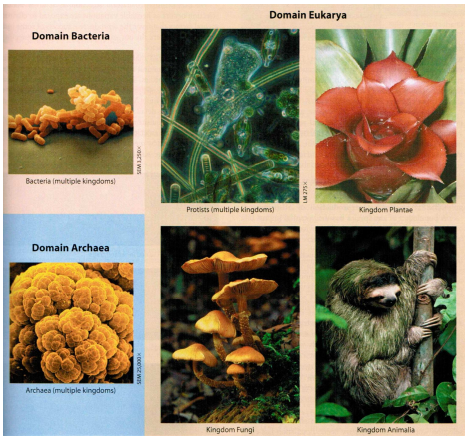
1. The Scientific Method



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

2. Theory

B. What is Biology?

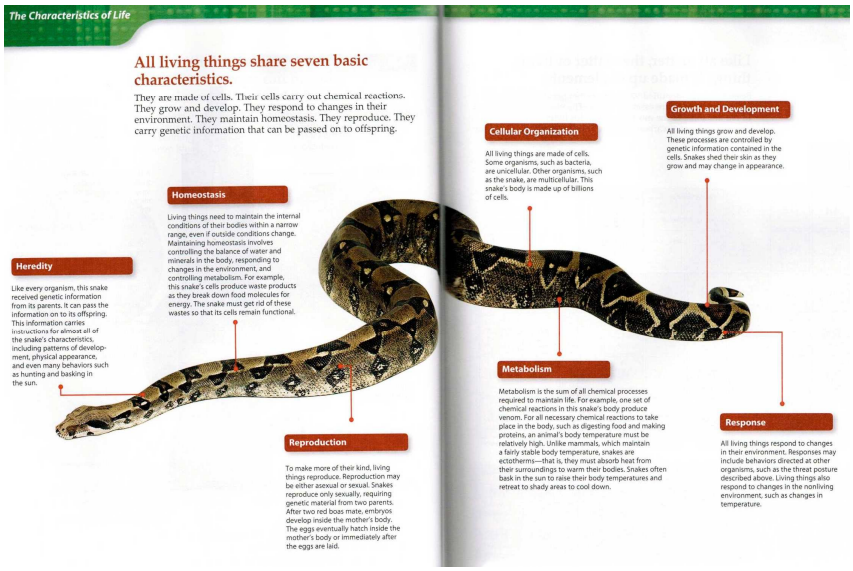


1. What is Life?

- Animal, Vegetable or Mineral?

2. Some Characteristics of Life

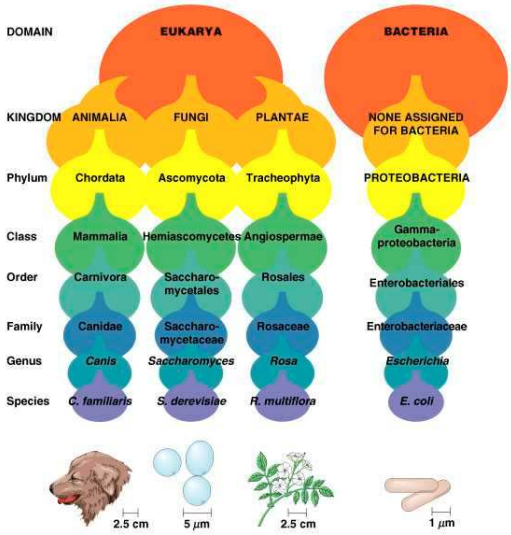
- Ordered
  - Cells
- Regulated
  - Homeostasis
- Grow and Develop
- Utilize Energy
  - Metabolism
- Respond to environment
- Reproduce
- Evolve (not individual, but population)



3. Classification System

a. Hierarchy of Classification

- Domain
- Kingdom
- Phylum
  - (Division)
- Genus
- Species

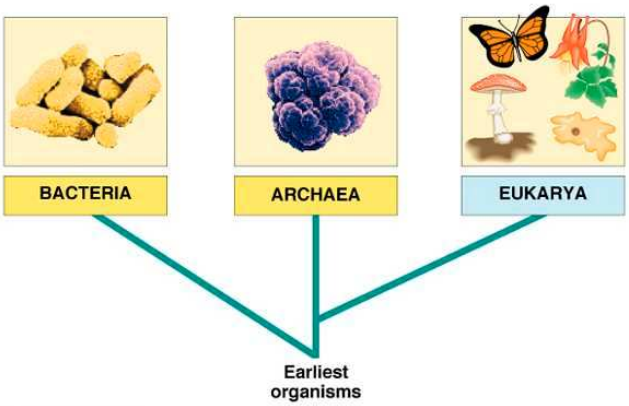


b. Naming Organisms

- Binomial Nomenclature
  - Genus
  - specific epithet
  - Species

4. Variety of Life Forms

- Three Domains



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

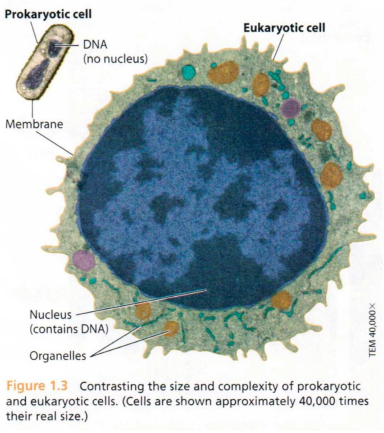
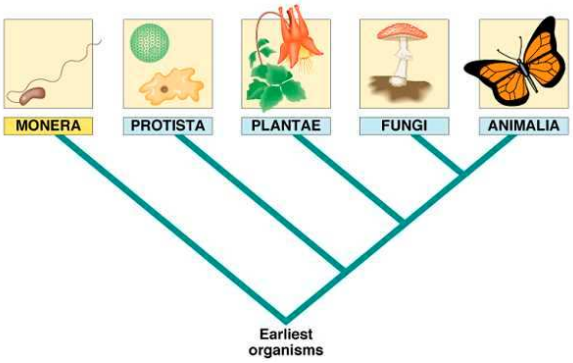


Figure 1.3 Contrasting the size and complexity of prokaryotic and eukaryotic cells. (Cells are shown approximately 40,000 times their real size.)

  - Four Kingdoms of Eukarya

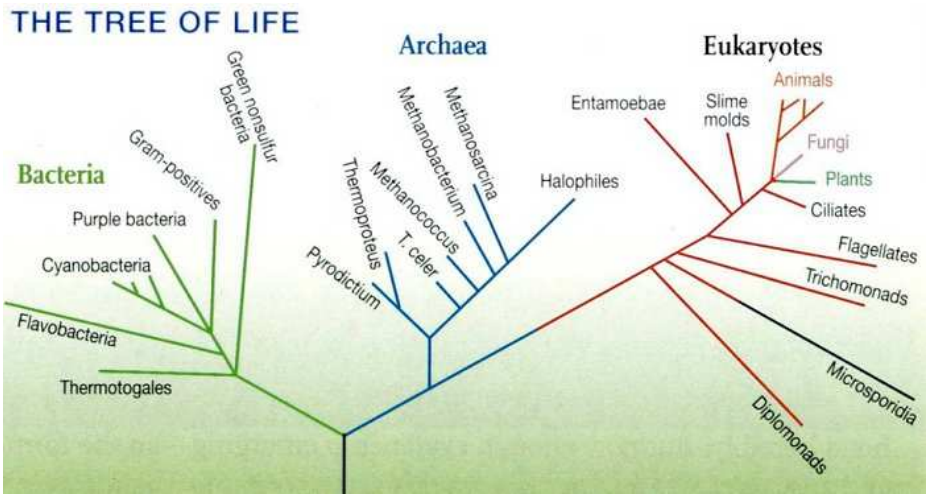


- Plantae

- Fungi

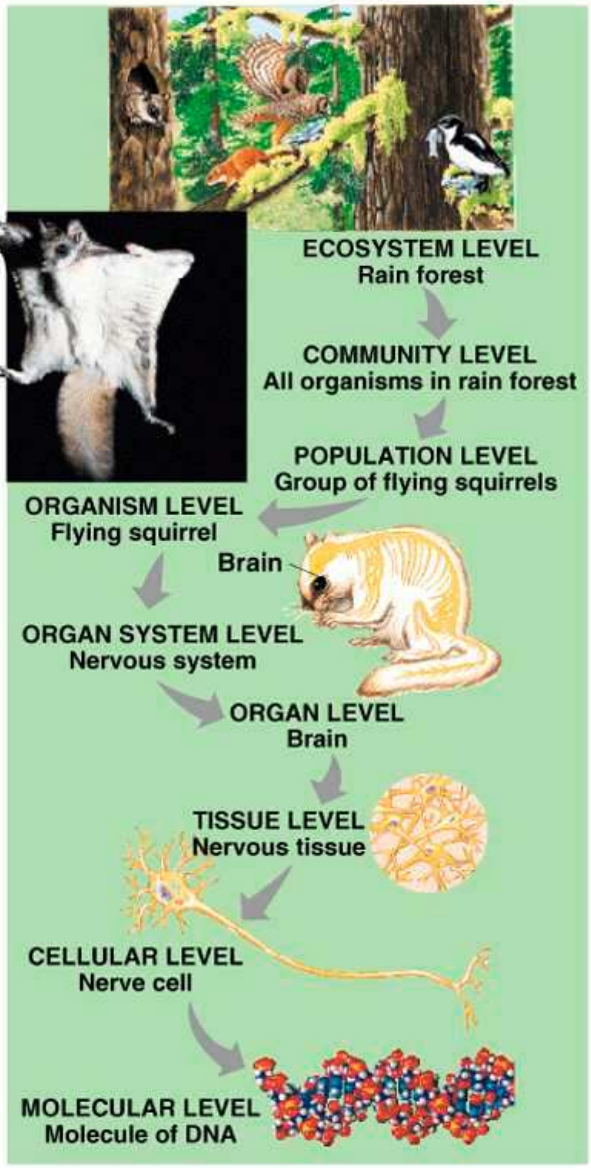
- Animalia

- Protista (3-8 kingdoms)



5. Levels of Biological Organization

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



C. Disciplines in Biology

1. Based on Processes

- Ecology
- Ethology
- Population Biology
- Anatomy
- Physiology
- Cytology
- Genetics
- Molecular Biology
- Biochemistry
- Evolutionary Biology

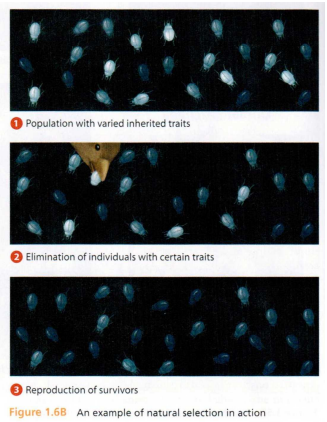


Figure 1.6B An example of natural selection in action

2. Based of Organisms

- Microbiology
    - Bacteriology
    - Mycology
    - Virology
- Botany
- Zoology
    - Entomology
    - Mammalogy

3. Based on Application

- Pathology
- Horticulture
- Animal Breeding
- Biotechnology