Biology 20
Introduction to Life

What is Biology?

Unifying themes in Biology:

1. A hierarchy of organization & Emergent Properties
2. Interaction of organisms with their environment
3. Cellular basis of life
4. Evolution: The core theme of Biology
5. Heritable information (biological information)
6. Attributes of Life
7. Unity in diversity

1. A HIERARCHY OF ORGANIZATION (p. 2, Fig 1.1)
   - Biological organization is based on structural levels.

   ![Hierarchical Organization Diagram]

   Organization beyond the level of the organism:

   Population
   Community
   Ecosystem
   Biosphere
2. THE INTERACTION OF ORGANISMS WITH THEIR ENVIRONMENT (p. 3 Fig 1.2)
   Producers:
   Consumers:
   Energy lost as?

3. THE CELLULAR BASIS OF LIFE (p. 4, Fig 1.3)
   1)
   2)
   3)
   4)
   5)
   • Two major cell types:
     1. Prokaryotic
     2. Eukaryotic

4. EVOLUTION: THE CORE THEME OF BIOLOGY

5. HERITABLE INFORMATION (p. 5 Fig 1.4A)
   genotype determines phenotype

6. ATTRIBUTES OF LIFE: (p.5, Fig 1.4B)
   a. Order
   b. Reproduction
      Biogenesis:
   c. Growth and Development
   d. Energy utilization & processing:
      Metabolism:
      Anabolism:
      Catabolism:
e. Respond to environmental stimuli

f. Regulation:
   Homeostasis:

   a) Negative Feedback (p. 426, Fig 20.15)

   b) Positive Feedback

5. UNITY IN DIVERSITY

   Estimated:
   1.5 million species identified, of which:
   - 290,000 plant species
   - 59,000 vertebrates
   - 1,200,000 insects

   Taxonomy:
   Taxonomic categories are ranked into a hierarchy from most to least inclusive.

   Whittaker’s Classical 5 Kingdoms scheme
   Monera, Protista, Fungi, Plantae & Animalia
Today:
3 Domains => Archaea, Bacteria and Eukarya

7. Evolution
Acceptable biological definition:

What’s changing?
Unit of evolution?
What causes the change?

Life evolves and species change over time - "A change in the genes (DNA sequence)"
All life is connected and can be traced back 3.5 million years.

Charles Darwin = The Origin of Species

a) Descent with modification

**Similarities** between species:

**Differences** between species:

b) Natural selection and differential reproduction