CHAPTER 1
WHAT IS LIFE ANYWAY?

LIFE IS ORGANIZED AT MANY DIFFERENT LEVELS
ATOMS, ORGANELLES, CELLS, TISSUES, ORGANS, ORGAN SYSTEMS, ORGANISMS, SPECIES POPULATION, COMMUNITIES, ECOSYSTEMS, BIOME, BIOSPHERE

THE HIERARCHY OF LIFE

Figure 1.2: The hierarchy of biological organization
EMERGENT PROPERTIES OF BIO ORGANIZATION

- ORDER
- REPRODUCTION
- GROWTH AND DEVELOPMENT
- ENERGY UTILIZATION
- RESPONSE TO THE ENVIRONMENT
- HOMEOSTASIS
- EVOLUTIONARY ADAPTATION

CELLS AS THE BASIC UNITS OF STRUCTURE

- CELL THEORY OF HOOKE, SCHLEIDEN, SCHWANN AND LEEVENHOEK
- COMPOUND AND ELECTRON MICROSCOPES
- PRO AND EUKARYOTIC CELLS
- WHERE DO VIRUSES FIT IN?
CONTINUITY OF LIFE/DNA

- WHAT IS DNA AND HOW DOES IT WORK?
- WHEN IS DNA TOLD TO WORK?
- HOW DOES M-RNA COPY FROM DNA?
- WHERE DOES ALL OF THIS TAKE PLACE IN THE CELL?
- WHAT IS THE END PRODUCT?
HOW SCIENCE WORKS

- DEVELOPING A FEEL FOR AN ORGANISM.
- DR. BARBARA MCCLINTOCK
- INDIAN CORN/JUMPING GENES
- 1993 NOBEL PRIZE
- THEORY APPLIED TO OTHER ORGANISMS, BACTERIA, MICE, ETC.

CORRELATING STRUCTURE/FUNCTION

- OCCURS AT ALL LEVELS OF LIFE
- MITOCHONDRIA/ATP/DNA
- HORSHOE CRAB/LIMULUS/NERVES
- PLASTIDS/ATP/DNA
- HEART AND A HEARTBEAT
- SURVIVAL
INTERACTING ENVIRONMENTS

- Occurs with all organisms
- There are living and non-living parts of all environments
- Biotic is the living part
- Abiotic is the non-living part such as water, light, humidity

UNITY AND LIFE DIVERSITY

- Three domains: Bacteria, Archaea, and Eukarya
- 5 Kingdoms: Monera, Protista, Fungi, Plantae, Animalia
- Bacteria and Archaea are prokaryotes
- Eukarya are eukaryotes

Figure 1.11: Three domains of life
EVOLUTION: THE CORE THEME OF BIOLOGY

- CHANGE OVER TIME
- CHARLES DARWIN, LATE 1800’S
- INDIVIDUAL VARIATION
- STRUGGLE TO SURVIVE
- ADAPTATION: EDITING PROCESS WITH HERITABLE VARIATION
- DESCENT WITH MODIFICATION

Figure 1.14  Charles Darwin (1809–1882)

Figure 1.17b  Diversification of finches on the Galápagos Islands

(b) The Galápagos finches
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THE SCIENTIFIC METHOD

- Hypothesis
- Experimentation
- Predictable Results
- Discussion of Data
- Conclusion
- Proof or Disproof
- Control/Null Hypothesis

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Figure 1.21: Controlled experiments to test the hypothesis that selective predation affects the evolution of guppy populations.

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SOME CHARACTERISTICS OF LIFE

- DNA/What is it?
- Goal of DNA/Protein Synthesis
- Transcription with mRNA in the Nucleus
- A codon from DNA is then translated in the ribosomes
- Assembles amino acids into proteins
PROTEIN TYPES

- Structural/Hemoglobin
- Enzymatic/Salivary Amylase
- Immunoglobulin/Antibodies
- Hormone/Insulin
- Ionic/CARRIER PROTEIN
- Cell Membrane Receptor PROTEIN: GLYCOPROTEIN, LI POPROTEIN.
- TRANSCRIPTION/TRANSLATION HAS GIVEN US GENES

Figure 1.7 An introduction to energy flow and energy transformation in an ecosystem.

BIOMES

- Desert/Dry, HOT WITH CACTI
- Prairie/Flat/RICH SOIL WITH GRASS
- Tropical Rainforests/PLANT AND ANIMAL DIVERSITY
- Tundra/Permafrost/LichenS
- Deciduous forests/Trees
- Vertical Stratification
HOMEOSTASIS

- Balance with external and internal environment
- Nervous system (stimuli and response)
- Hormones/endocrine system and negative feedback
- Kidney/excretory system with water balance

REPRODUCTION

- Shared characteristics
- Perpetuation of the species
- Allows for diversity
- Mutations/change in the gene
- Gametes/egg/sperm
- Zygote/embryo/fetus

LIFE’S LITTLE PROBLEMS