

08/26/2014

## CHAPTER ONE

### Biodiversity Notes

"A lecture is a process in which information passes from the notes of the professor into the notes of the student without passing through the minds of either."

#### I. **BIODIVERSITY**

- A. **Biodiversity**- scientific study of all varieties of life.
  - Example: variety of genes, populations, species, ecosystems, landscapes, biomes.
- B. **Properties of life**: order, reproduction (asexually, sexually, or both), organisms utilize energy, adaptation, growth and development, homeostasis, form fits function. Highly organized structure.
- C. **Scientific methods used**: Emergent properties, Holism vs. Reduction.
  - **Dandelion facts**: palatable, ingredient in root beer, in herbal medicine to treat infections, bile, liver problems, and as a diuretic.
  - **Biologist Questions**:
    - What is the evolutionary origin of dandelions?
    - Why do they grow in certain places and not in others?
    - How do they grow from a single cell to a flowering plant?
  - 1. **Bloom nutrients**- cyanobacteria= blue-green algae.
  - 2. **Subsurface**- runoff drainage, rain garden (mini version of a wetland) designed to attract runoff.
    - Every three days the inner lining of stomach replaces.
    - Cell division occurs because of growth and reproduction, and maintenance and repair.
    - Energy processing- metabolism ( total of all chemical reactions in a cell)
    - Sunlight for energy, lunch for energy, and flowers for energy.

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- **Photosynthesis**:  $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{CH}_2\text{O} + \text{O}_2$
- A. Surface area increases while total volume stays constant
  - Increase in size results in decrease in the surface area/volume ration
- B. **What are the levels of biological organization?**
- C. **What methods of science are used?**
  - Emergent properties
  - Holism vs. reduction
- D. Levels of biological organization :
  - a. Biosphere
  - b. Ecosystems
  - c. Communities
  - d. Populations

- e. Organisms
- f. Organ and organ systems
- g. Cells
- h. Organelles
- i. Molecules

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- A. **Reductionism**- natural objects and processes can be explained by studying their parts. (the whole is the sum of its parts)
- B. **Holism**- Living nature is a scheme of interactions whereby the whole is **MORE** than the sum of its parts.
  - **Chain reaction of DDT**- kills mosquitoes, roaches -> reduces lizards -> reduces cats -> increases rats -> increases fleas -> increase bubonic plague
    - o The reduction of lizards increase straw-eating insects -> destroys homes
- C. **Scientific method**- Hypothesis-based inquiry (cause and effect) [deduction]
- D. **Discovery science**- Descriptive approach using careful observations and analysis of data [induction]
- E. Two parallel approaches :

<b>Science</b>	<b>Engineering</b>
Make an observation	Identify the problem
Propose an explanation for this observation (hypothesis) and make a prediction based on that hypothesis	Propose a tentative solution to the problem
Test this prediction to see if it comes true	Test this solution in the form of a model (mathematical, physical, or other) and see if it solves the problem.
Formulate a new hypothesis, that includes the increased knowledge about the observation.	Implement the solution in the real system and watch its effectiveness
	Collect \$

- Example test question: What is the primary reason for including a control within the design of an experiment?
  - a. To provide more data so that one can perform more sophisticated statistical analysis.
  - b. To test the effect of more than one variable.
  - c. To accumulate more facts that can be reported to other scientists.
  - d. To insure that the results obtained are due to a difference in only one variable.
  - e. To demonstrate in what way the experiment was performed incorrectly.
- Answer: D
- F. **Some paradigms in Biology**-

- a. All organisms are composed of cells, their basic unit of structure and function. These cells "do" chemistry
  - b. New properties emerge at each level in the biological hierarchy.
  - c. Structure and function are correlated at all levels of biological organization
  - d. Organisms interact with each other, take in energy from their environment and convert it into a useful format
  - e. There is a universal genetic code shared by all organisms and this code transmits information between generations.
  - f. Evolution by natural selection results in adaptation
- **Evolution**- Changes in genetics over time.

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- Evolutionary adaptation is a product of natural selection
- A. Classifying all diversities-
- **Taxonomy**- method of naming and classifying the diverse forms of life
  - **Systematics**- scientific study of the diversity of life
  - **Phylogenetics**- study of evolutionary history of a species or group of species
- B. Domains of life-
- Domain Bacteria
  - Domain Archaea
  - Domain Eukarya