

Biodiversity Notes Week of 8/25/14

Chapter 1

- Biology- scientific study of life and all its forms
- Biodiversity- study of all the variety of forms of life
 - ◆ variety goes from genes to species to ecosystems to landscapes
- ❖ Key Properties of Life
 - Order: highly structured Ex. butterfly is structured because it has structured wings
 - Reproduction: how they replicate..sexually(2 parents) or asexually(1 parent)
 - Growth and Development: cells divide, repair, and replace each other
 - Energy Processing: metabolism is the total of all the chemical reactions in cells; autotrophs are self feeders that produce their own food, use photosynthesis to make their food; heterotrophs rely on organic matter from other organisms
 - Response to the environment
 - Homeostasis: the ability to keep a constant internal environment
 - Adaptation: how the organism adapts to the environment
 - Form fits function: an organism is built in a certain form for a certain function Ex. A bird is built with wings so that it can fly

What do biologists do?

- ❖ Inquire about life
 - Example: studying flying patterns of Monarch butterflies
 - how do they know where to fly when they fly back to where they came from
- ❖ Lake Erie water issue
 - record amounts of dissolved phosphorus that hit the lake
 - Determine the problem
 - too much fertilizer
 - green microorganisms excrete toxins
 - problem is biological and chemical
 - Cyanobacteria: organisms that form bloom...the expansive growth of the microscopic bacteria plant
 - Subsurface drainage: contributor to problem
 - Raingarden: mini version of the wetland (parking lots of cities where rainwater drains)

Levels of Biological Organization

- Biosphere: all living organisms and their abiotic or biotic spheres
- Ecosystem: organisms living in an area and their abiotic environment
- Community: organisms interacting with each other
- Population: group of organisms of the same species living in the same area
- Organisms
- Organs and Organ Systems: make up organisms

- Tissue: makes up organs and organ systems
- Cells: make up tissues, have cell wall, and cell contents
- Organelles: make up cells
- Chloroplasts: contain chlorophyll, reflect green light, use red and white light for photosynthesis
- Molecules
- Atoms
 - Every time you move up a level, that level has more properties than the properties of the atom below combined
 - Ex. Molecules have more properties than atoms combined
 - Each level of Biological organization has properties that are not found at lower levels

Methods of Science

- ❖ Reductionism
 - dissecting the problem into parts to solve it, whole is sum of its parts
- ❖ Holism
 - go from one level to higher levels to solve problem
 - the total is more than sum of its parts
 - Ecologists use Holism
 - Medical Biologists use Reductionism

Discovery Science: Descriptive approach using careful observation and analysis of data (Induction)

Abduction: what positions do (diagnosis based on what you know)

Scientific Method

- 2 methods
 - Science
 1. Observation
 2. Propose explanation for observation (make hypothesis and make prediction)
 3. Test the prediction to see if it comes true
 4. Formulate a new hypothesis that includes the increased knowledge about an observation
 - Engineering
 1. Identify the problem
 2. Propose a tentative solution to the problem
 3. Test a solution in the form of a model (mathematical, physical, or other) to see if it solves the problem
 4. Implement the solution in the real system and monitor its effectiveness
- ❖ A good hypothesis is
 - testable (falsifiable)
 - specific

❖ Core themes in Biology (paradigms)

- all organisms are composed of cells, their basic unit of structure and function
- new properties emerge at each level in biology hierarchy
- structure and function are correlated at all levels of biological organization
- organisms interact with each other, take in energy from the environment, and convert it to useful format
- universal genetic code is shared by all organisms and it transfers between generations
- evolution results in adaptation
 - o What is evolution?
 - genetic changes over time