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 hiearchy
  - 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
    - What is evolution?
      - genetic changes over time