Fall 2009

Lecture #2 – Darwin's Ideas Today I

I. Scientific Method
- A. Experimental Method
- B. Comparative Method

II. Evolution as a science
- A. Perpetual change
  - 1. **Fossil record**
  - 2. **Deep time**
- B. Common Descent
  - 1. Genealogy and **Phylogeny**
    - a. Nested hierarchy
- C. Multiplication of Species
  - 1. Reproductive barriers
  - 2. **Allopatric speciation**
- D. Gradualism
  - 1. Phyletic gradualism
  - 2. Genes responsible for major phentotypic change
- E. Natural Selection
  - 1. Non-random process of sorting
  - 2. Genetic Drift

III. **Systematics**
- A. Phylogenetic Trees
  - 1. Willi Hennig
    - a. Founder of modern day Cladistics
  - 2. **Cladogram**–evolutionary relationships among organisms.
    - a. **Lineage**
    - b. **Monophyletic** vs. **paraphyletic** groups.
      - 1) Taxonomic groups previously named may be found to be natural or unnatural.
      - 2) Remember, taxonomy predated evolution.
    - c. Branching points are **speciation** events.
  - 3. Phylogenetic trees
    - a. Characters and character states
    - b. Direction of evolution: determining **derived** character states.
      - 1) Outgroup method for determining **ancestral** state.
    - c. **Cladogram**–evolutionary relationships among organisms
      - 1) **Lineage**
      - 2) **Monophyletic groups**
      - 3) Branching points are **speciation** events.
  - 4. Comparative biology
    - a. Similarities in species may reflect genealogy
  - 5. Problem: Two types of similarities
    - a. **Convergence**–similarity due to ecological conditions
    - b. **Homology**–similarity due to shared common ancestry

Reading: Chapter 4 – pages 72-88
Questions: Page 87 – 1, 2, 3, 4, 5, 6, 7, 8, and 9.