Biology 100 #24:
Evolution: What is it? What is the evidence?

Terms you should know:

evolution
common ancestor
descent with modification
natural selection
fossils
strata
radiometric dating
homologous structures
molecular clock
species

Questions you should be able to answer:

- How would you define evolution, in your own words?
- What were Darwin's two key principles?
- What is natural selection? Can you give an example of how it operates?
- What are some lines of evidence for evolution?

Lecture outline:

I. Evolution

A. Lamarck

1. Proposed that offspring inherit parents' acquired characteristics
2. Lamarck's theory was scientific, but wrong

B. Darwin

1. Observed variation among species
2. Proposed descent with modification from a common ancestor (evolution)
3. Proposed natural selection as a mechanism of evolution
    a. Organisms better adapted to their environment will have more offspring
    b. Environmental conditions select for particular sets of characteristics
    c. In the whole population, alleles from better-adapted organisms increase

II. Evidence for evolution

A. Fossils: remains of specific organisms are found in specific strata

B. Radiometric dating: use decay of radioactive elements to determine age of strata

C. Comparative anatomy: homologous structures in related organisms

D. Embryology: embryonic structures suggest descent from a common ancestor

E. Genetics and molecular biology

1. Mutations provide a "molecular clock" - occur at a relatively constant rate
2. Compare gene sequences: more mutations = longer time since common ancestor

F. Experimental evidence

1. Small-scale evolution in the laboratory, such as evolution of antibiotic resistance
2. Natural selection experiments, such as populations exposed to predators or not

G. All of the "family trees" based on different lines of evidence agree very well

III. What is a species?

A. Not necessarily easy to define

B. Reasonable definition: organisms that interbreed and have fertile offspring are the same species