BIOG 002

Study Questions for BioG 102, Week 13, April 16-21, 2008

16 April (Lecture 76, Phylogeny and Systematics)

1. What is the distinction between phylogeny and systematics?

2. How are fossils used to determine evolutionary history? What are the limitations of fossil evidence?

3. What types of fossils have been found in the Burgess Shale in Canada? Who discovered them, and how were they interpreted by Stephen Jay Gould? Is his interpretation widely accepted today?

4. In general terms, what are the two possible reasons for the similarities of characteristics of organisms? In your answer, distinguish between the terms *homology* and *analogy*, and define *convergent evolution*.

5. Explain how comparisons of macromolecules such as proteins and nucleic acids are useful in establishing evolutionary relationships. Also explain the concept of a "molecular clock." (See the text for more information.)

6. Define, and be able to illustrate via phylogenetic tree diagrams, the following types of taxonomic groups (taxa): *monophyletic*, *polyphyletic*, and *paraphyletic*.

7. Explain the basic method of cladistic analysis. What is meant by "shared derived characteristics? What is the antonym to "derived"? What is an outgroup? Why is it necessary to have one? Be able to construct a phylogenetic tree from a data set such as the one in Fig. 25.11 on p. 499.

8. How do phylograms and ultrametric trees differ from cladograms?

9. What is the *principle of parsimony* and how is it applied to the problem of constructing cladograms? (Dr. Walcott also mentioned the *maximum likelihood* principle, which you can read about in the textbook.

10. Contrast *orthologous* and *paralogous* genes. Which result from gene duplication? Cite an example.

11. Compare the rates of gene evolution through duplication and the rate of evolution of phenotypic complexity.

12. Explain the concept of the "molecular clock" and how it is used in evolutionary studies. How is the clock calibrated?

18 April (Lecture 77, Lab Lecture by Dr. Chen)

21 April (Lecture 78, Ecology)

13. What is the derivation of the term *ecology*? Describe the levels of organization studied by ecologists.

14. Dr. Walcott discussed physical parameters (such as temperature and moisture) that can limit the distribution of organisms. Describe examples of these limiting effects and examples of adaptations that enable organisms, in some cases, to survive despite adverse physical conditions.

15. What causes the seasons?

16. Draw a diagram that illustrates and explains global air circulation patterns. Account for the fact that equatorial regions have wet climates, whereas regions about 30 degrees north and south of the equator are typically deserts.

17. Describe and diagram the effect of mountains on rainfall. What is a "rain shadow"?

18. How do vegetation zones respond to changes in climate? In particular, how have zones found on mountains responded to the warming trend that has occurred in the last 15,000 years?

19. What is a *biome***?** What are the two major climatic factors that are most important in determining the locations of the Earth's biomes? Learn the locations of the biomes found in N. America.

20. Describe the factors that influence the distribution of organisms. In your answer describe several examples of human influence on animal distributions. Also distinguish between abiotic and biotic factors.

21. Describe the major characteristics of bogs. Why are insectivorous plants frequently found in bogs? Describe three examples.