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Integrative Biology 200A "PRINCIPLES OF PHYLOGENETICS" Spring 2004

Quiz 2

You may use any books, notes, or references, but you must work independently of other people. To keep the amount of writing under control, please confine the answers to the space provided (but write clearly and large enough to see!); outlines are fine.

1. Short Answers **(5 pts. each):**

A. Compare and contrast Bremer support, Bootstrap support, and Bayesian posterior probability measures.

B. Give an example of a step matrix you might use in a parsimony analysis, and why you would use it?

C. Describe two methods that are unique to Bayesian inference to avoid being trapped on a local optimum.

D. Why and how would you incorporate user-defined constraint trees in a phylogenetic analysis?

E. Explain the difference between ACCTRAN and DELTRAN optimizations. Contrast them in terms of two biological processes. Why is it important to consider how characters are optimized?

F. Why is the gamma distribution used to model among-site rate variation among nucleotides?

G. What are the pros and cons of selecting a single tree from a set of equally optimal trees? Why or why not do so?

H. In regard to treating widespread taxa and redundant areas in biogeographic analysis, how do the standard assumption (Assum. 0,1,2) of component analysis differ?

I. What is Maddison's Test? When might you want to use it in an analysis?

J. Describe the use of the likelihood ratio test as it applies to model selection.

2. (10 pts.) Define three alternative species definitions from the literature and explain how they compare to your own preferred definition of a species (continue on next page)

3. (10 pts.) How might the use of paraphyletic groups effect an analysis of taxon diversity through time? How would you better assess comparisons of diversity through time?

4. (10 pts.) What is significance and/or meaning of dispersal events in vicariance biogeography?

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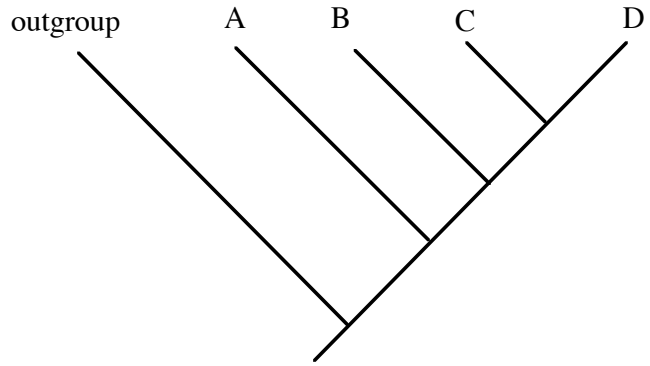
5. (10 pts.) How can/should the historical, phylogenetic perspective contribute to the decision making process in conservation biology?

6. (10 pts.) Assume the correctness of the tree below, consider the following functional characteristics:



FUNCTIONAL CHARACTERISTICS:

TAXON:	leaves:	aphid predation:	habitat:	presence of toxic chemical:
A	smooth	no	forest	yes
B	smooth	yes	forest	yes
C	hairy	yes	desert	yes
D	hairy	yes	desert	yes
outgroup	smooth	no	forest	no

Which of the following adaptive scenarios are supported by these data? Which can be rejected? *Give your reasons.*

a. Hairy leaves evolved to deter aphid predation.

b. Hairy leaves evolved to insulate leaves in desert environments.

c. The toxic chemical evolved to deter aphid predation.

d. Smooth leaves evolved to gather more light in shady forest environments.