Laboratory Six

Phylogenies II: Reading Phylogenetic Trees

Prelab

Study this Reading Phylogenetic Trees lab description and review the Phylogenies I lab readings, then do the Lab 6 Prelab linked to the course website. The next week's prelab link is posted each Thursday afternoon. See "Submitting Catalyst Exercises" in this course manual; prelabs are due by Tuesday at 8:00 AM. (2 points)

Learning Objectives

In addition to the Phylogenies I learning goals, by the end of this lab, you should be able to:

- Identify and interpret the roots, nodes, branches, and tips of a phylogenetic tree.
- Use a knowledge of character states in known taxa and parsimony to infer character states in ancestors.
- Map the origin of synapomorphies on a phylogenetic tree.

Exercise: Answering questions by reading phylogenetic trees

Biologists invest time and effort into reconstructing phylogenetic trees partly because such trees allow them to classify organisms according to their actual evolutionary relationships and name them accordingly. But reconstructing phylogenies can also help researchers answer questions about how evolution occurred. In many cases these studies have important practical implications. For example, biomedical researchers use phylogenies to identify the origin of emerging diseases and to predict which treatments might be effective against them. Conservation biologists use phylogenetic trees to identify the most important species or groups to save when many are threatened with extinction. Other researchers use phylogenetic trees to answer interesting questions about the history of life.

Although learning how to read evolutionary trees takes some effort, there is a pay-off. Learning how to reconstruct and interpret phylogenetic trees can help you answer some interesting questions. In this exercise, you'll assume the role of a biologist who must answer a question by interpreting a phylogenetic trees. The question and evolutionary tree you will consider are taken from the scientific literature.

Procedure:

1) Obtain one of the tree-and-question case studies from your T.A. Each study has several specific questions that you should answer in writing, as well as a more general question.

2) With your lab partners (a group of 4), discuss how the tree provided suggests answers to the questions posed. Write your answers on the case.

3) Decide how you want to introduce the question, the tree, and your proposed answers to the class in a 3-minute oral presentation. See the "Presentation Suggestions" below.

4) Give your presentation, and answer questions from your classmates. (4 pts)

5) Hand in your written answers. (4 pts)

Presentation Suggestions:

Giving an effective presentation is a skill that requires insight and practice. You will give presentations in many upper division courses, so experience here is beneficial.

Your TA might suggest additional or alternate guidelines, but here are a few suggestions that will improve most presentations:

1) Speak loudly and clearly. Everyone must hear what you are saying without making an effort.

2) Make eye contact and speak to everyone. Don't talk to just one or a few individuals (such as the TA). Talk to the audience, not to the screen or the floor. Be interested—it will help your audience be interested, too. And never read a presentation.

3) In organizing your presentation, think like an audience member.

- What information do they need to understand what you have to say? In what order?
- Make sure that your presentation has an introduction, a middle, and a conclusion.
- When a member of your audience is asked about your presentation 30 minutes later, what do you want them to say or be able to recall? Organize your presentation in a way that will meet this goal.

4) Use visual aids effectively. You will be given a transparency of the phylogeny for your case study. It's usually better to write one item at a time, during your presentation, than to write everything on the transparency in advance; the latter will be too cluttered. If appropriate, use different colors for different topics or questions.

5) Everyone in the group must speak.

6) Encourage questions, discussion, or other forms of interaction. When you get a question, repeat it so that everyone has heard. Address the entire group when answering—not just the questioner. And ask questions of your audience. Their responses are your best indicator that they understand what is going on.