

The "Phylogeny and Cladograms" exercise was contributed by

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Phylogeny and Cladograms

Introduction:

Cladograms differ from traditional keys based on systematics. They are increasingly important to modern biological studies. They are a key area where computers are used heavily by today's researchers. But they reflect the nature of science because they only propose possible relationships, and as such they are hypotheses. As hypotheses, however, they can make predictions. Remember that the study of evolution conducts tests that don't always fit into nice laboratory experiments.

We are going to start with a paper exercise, then move to a computer program that constructs trees, then take a look at a research site for phylogenetics. I have copied the directions for the computer program called *Phylogenetic Investigator* for all lab groups. The problem is based on some different data, however. I want you to apply the problem to the invertebrate chart that you work on during the first part of this assignment.

To Do list for today:

1. Fill in the scrambled invertebrate chart based on your knowledge from last term (or your group's collective knowledge).
2. Determine **derived** and **ancestral** characteristics. Describe these in a key on the back of the chart.
3. Code the boxes in a table based on a binomial system: 0 = absent or none, 1 = present
4. Using the packet of instructions, enter this data into the computer program.
5. Manipulate the groups and traits according to the instructions. Create a table based on **parsimony**.
6. Build a tree based on the table. Follow the directions in the model problem.
7. Check in with Stacey after you have created your tree. You will have to describe your tree and defend your choices.
8. After you have created your tree, try the first problem within the program by starting "New" under the File menu. This problem has some fossil evidence and asks you to construct a tree based on binomial evidence only (no traits attached).
9. Finally, go to the internet and look up the phylogenetic tree for chordates on the Tree of Life web site: <http://phylogeny.arizona.edu/tree/life.html>. Draw out the phylogenetic tree from the original root on a blank piece of paper.
10. Answer the questions about phylogeny and cladograms.

Questions:

1. What types of evidence do scientists use to construct phylogenies?
2. How would you rank the above evidence? What evidence do you think is best in terms of evolution? Which is worst?
3. Why? Give your basis for deciding upon the rankings.
4. Briefly describe how a cladogram represents a hypothesis with predictive powers.

