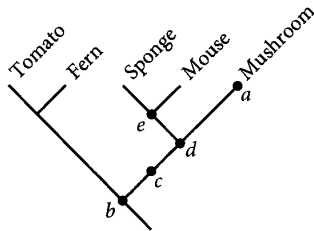


FURTHER READING

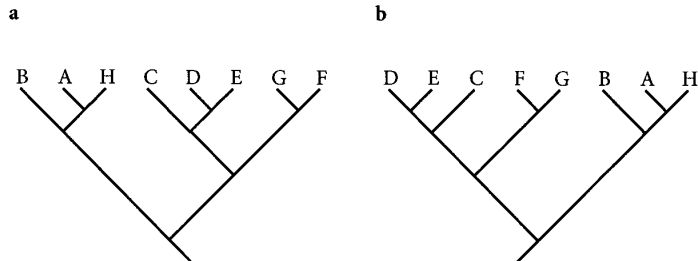
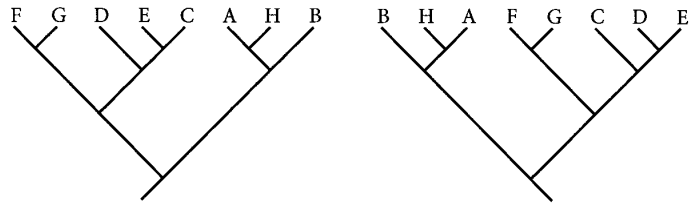
Interpretation of a phylogenetic tree: Maddison and Maddison 2000  
 Common problems in reading trees: Baum et al. 2005; Baum and Offner 2008; Gregory 2008; Catley and Novick 2008, 2009  
 Rooting trees: Maddison et al. 1984

CHAPTER 3 QUIZ

1. Which of the five labelled nodes in the tree corresponds to the most recent common ancestor of a mushroom and a sponge?

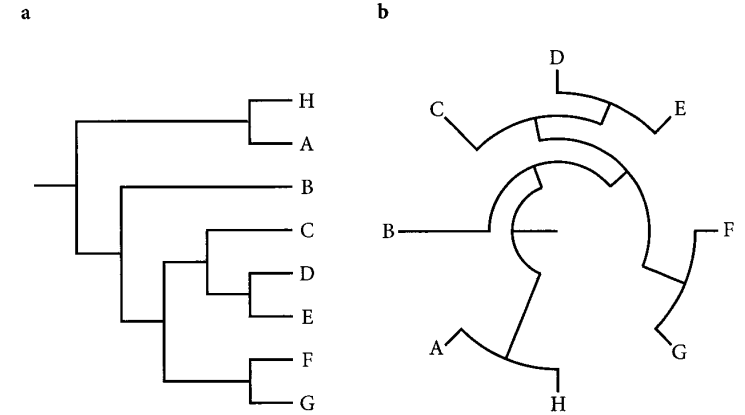
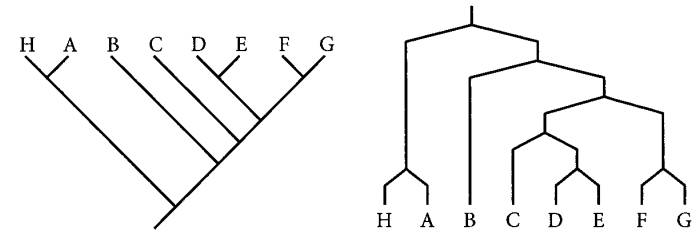


2. Which of the four trees depicts a different pattern of relationships than the others?



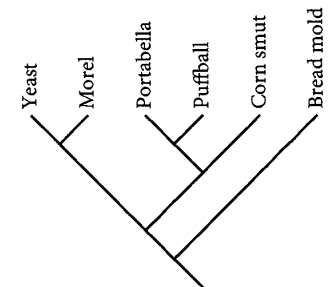
c d

3. Which of the four trees depicts a different pattern of relationships than the others?



c d

4. The clade with the name Dikaryomycota comprises all the descendants of the last common ancestor of morel and puffball. Which taxa on this tree are *not* in Dikaryomycota?

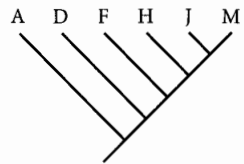
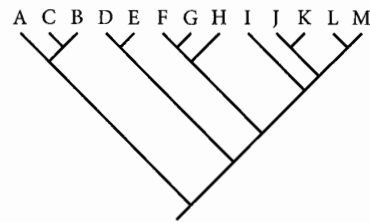


- a. Bread mold      b. Corn smut  
 c. Yeast, bread mold  
 d. Yeast, portabella, corn smut, bread mold  
 e. Yeast, corn smut, puffball

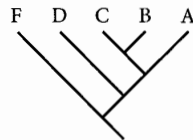
5. On the tree, which of the following sets do *not* form a clade?

- a. Yeast, morel      b. Portabella, puffball      c. Portabella, puffball, corn smut  
 d. Portabella, puffball, corn smut, bread mold      e. All taxa except bread mold

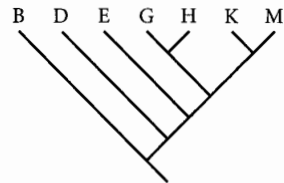
6. Which of the five smaller trees is compatible with the larger tree once the extra taxa are pruned?



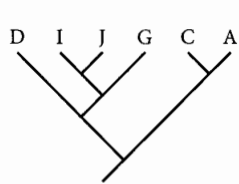
a



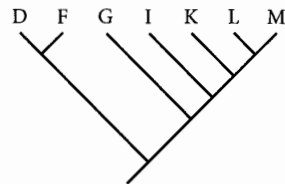
b



c



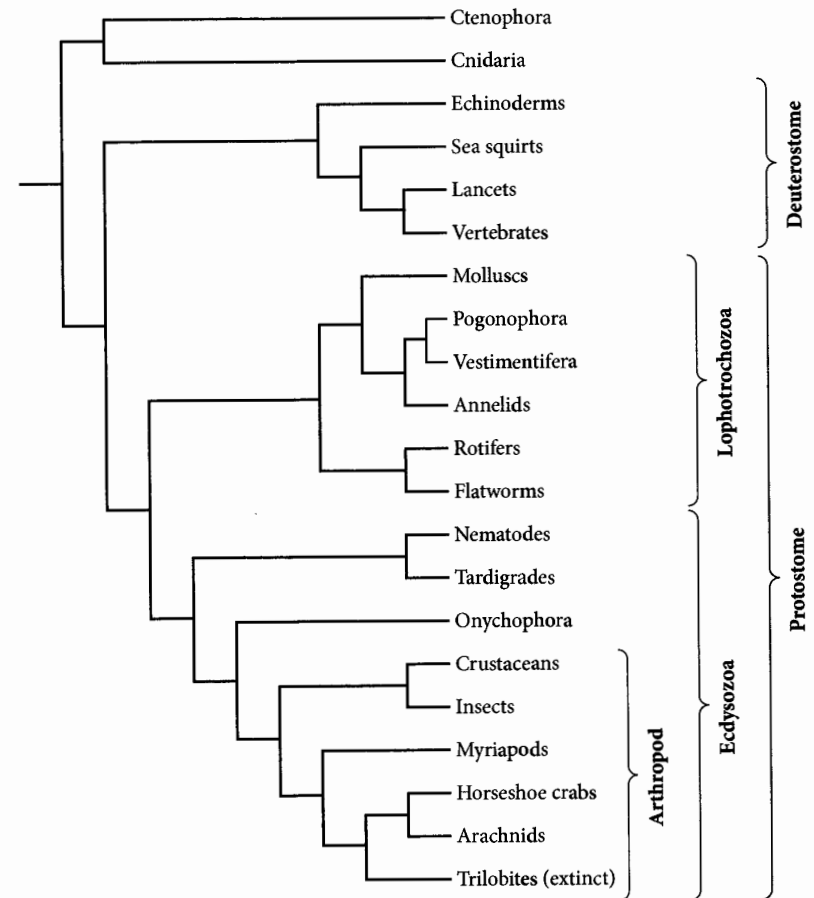
d



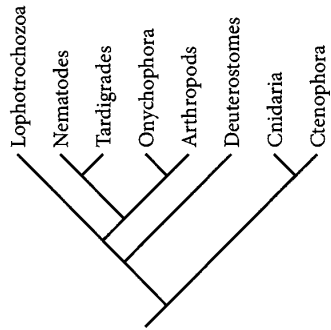
e

Questions 7–9. The tree on the facing page shows some hypothesized relationships among the major animal groups. Some major clades are named. You do not need to know these organisms to answer the questions.

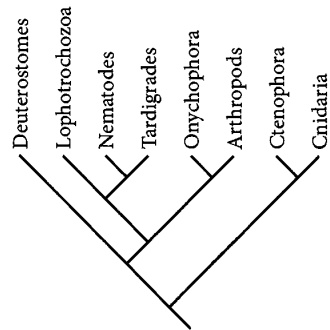
7. Which of the following organisms are in Ecdysozoa but are not arthropods?
  - a. Molluscs
  - b. Flatworms
  - c. Onychophora
  - d. Crustaceans
  - e. Arachnids
8. Each node on this tree is ancestral to somewhere between two and twenty-one of the tips. Which of the following nodes does not exist on this tree?
  - a. Ancestral to annelids but not flatworms
  - b. Ancestral to trilobites and ctenophora
  - c. Ancestral to rotifers and echinoderms, but not cnidaria
  - d. Ancestral to sea squirts and lancets, but not molluscs
  - e. Ancestral to crustaceans and tardigrades, but not myriapods



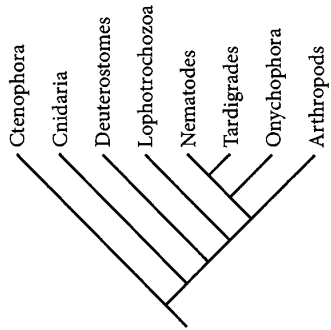
9. Supposing you merge each of the arthropod, Lophotrochozoa, and deuterostome clades into a single tip. Which of these trees would result?



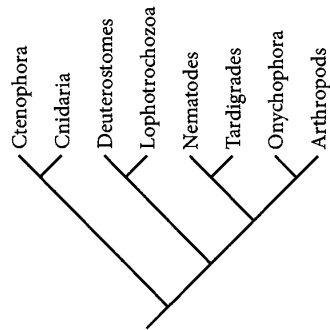
a



b



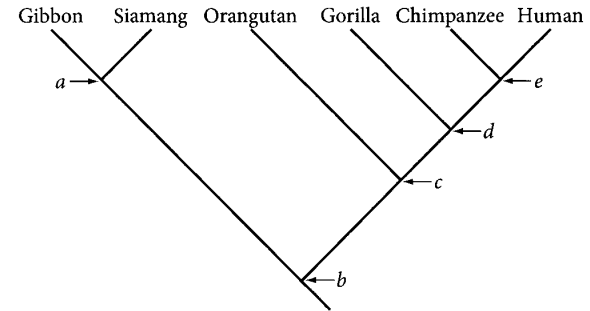
c



d

10. Given the tree shown on the next page, which (if any) of the following living species are ancestors of humans?

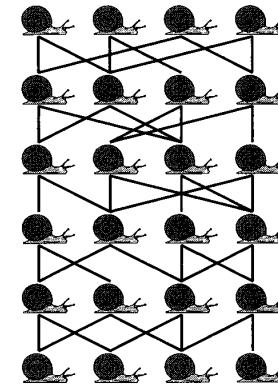
- a. Chimpanzee
- b. Orangutan
- c. White-handed gibbon
- d. All of the above
- e. None of the above (no living species)



11. On the same tree, which of the following is not necessarily true (cannot be assumed from the information given)?

- a. *a* is a descendant of *b*
- b. *d* is a descendant of *b*
- c. *e* lived after *b*
- d. *a* lived after *c*
- e. *c* lived before *d*

12. This figure shows a population lineage with six generations of snails (which, like most snails, are hermaphrodites). Which way is the time axis pointing in this lineage and how do you know?



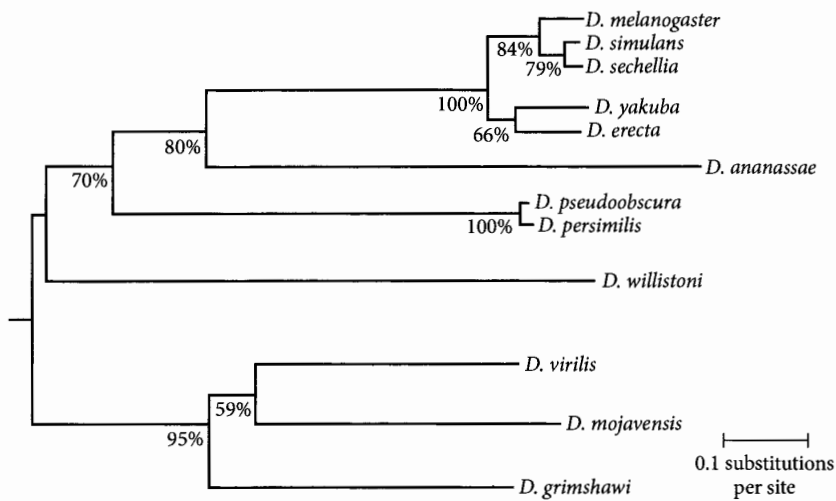
13. Show your ability to manipulate trees.

- a. Draw an 8-taxon tree in a diagonal format.
- b. Redraw the same topology in rectangular format, with some branches rotated so that the taxon names are in a different order.
- c. Draw two different 5-taxon trees that are each compatible with the 8-taxon tree.

14. Draw the tree that is provided here in parenthetical notation:

(1,((2,(3,4)),((5,(7,8)),6),(9,((10,11),12))))).

Questions 15–19. The phylogram is based on a tree by the Drosophila 12 genomes consortium (2007) and depicts the relationships inferred for twelve species of fruit fly (*Drosophila*) whose genomes were completely sequenced. Assume that the tree is correctly rooted.



- The branches are drawn proportional to the number of mutations estimated to have happened along that branch. Assuming the tree and branch lengths are accurate, which species has accumulated the fewest evolutionary changes since the last common ancestor of all twelve species?
- Which species has accumulated the most evolutionary changes?
- The tree is annotated with bootstrap values that are over 50%. Which tips constitute a clade with an 84% bootstrap?
- Of the annotated clades on this tree, which is the weakest (most uncertain)?
- Suppose you decided that internal branches with bootstraps of less than or equal to 79% are not reliably resolved and you wanted to represent them as polytomies. Draw the resulting tree.

20. How many SPR events separate these two trees, and which taxa are involved?

