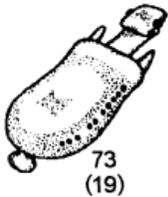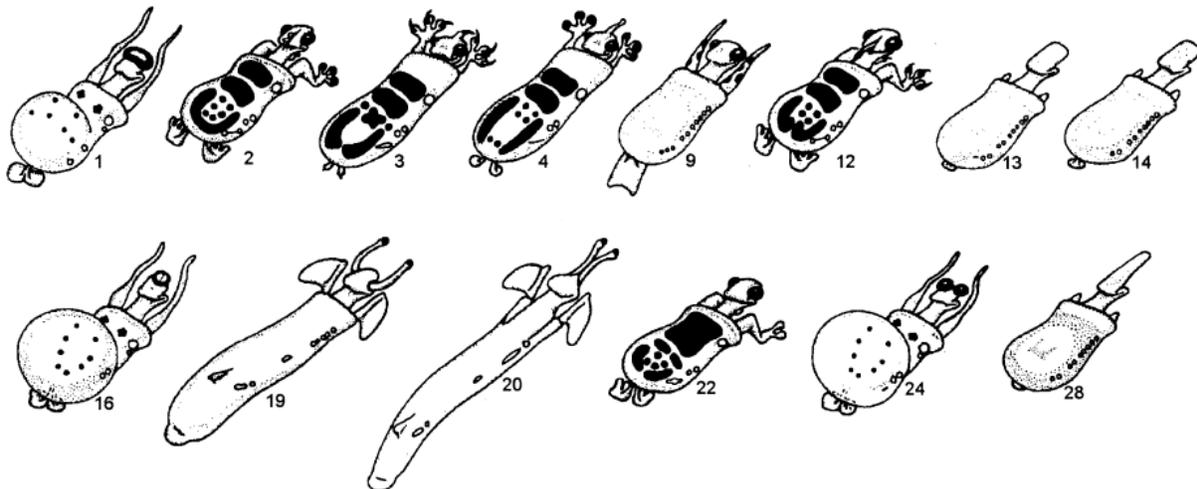# Constructing a Phylogeny

The creatures pictured below are caminalcules, imaginary animals created by Dr. Joseph H. Camin with a complete phylogeny of living and fossil species.

The fossil ancestor of all caminalcules. This **extinct** species is the ancestor of the 14 **extant** species. It has eyes.

*Fourteen **extant** species of caminalcules.*

1. Define **extant** and **extinct**.

2. Examine the 14 species of caminalcules above. Arrange the species into genera using the criterion that members of a genus should resemble each other more closely than they resemble members of other genera.

3. Make a character table for the 14 species of caminalcules with a different row for each character and a different column for each species.

Tip: It will be easier to fill in the table if you group similar species and genera in neighboring columns (e.g. Fig. 20.11 in *Campbell in Focus*). Add any characters you think will be useful in distinguishing your **clades**.

	Species													
Body shape														
Head shape														
eyes														
Front appendages														
Rear appendage(s)														
Coloration														

4. Construct a phylogenetic tree using your character table.
    - The eyeless group of caminalcules should be the outgroup.
    - Use the criterion that if 2 species are in the same genus, they share a common ancestor not shared by other genera. If there are 3 or more species in any of your genera, you must decide which 2 species in that genus are most closely related.

Additional information to consider:

The fossil ancestor shared by 1, 2, 3, 4, 9, 12, 16, 19, 20, 22, 24.

The fossil ancestor shared by 1, 2, 3, 4, 9, 12, 16, 22, and 24.

Draw the tree using a dichotomous branching pattern. Use the blank page to draw your phylogenetic hypothesis.

Teaching Tips for Peer Mentors

<u>Grouping into genera</u>: Let students make an attempt before giving them any pointers. If students are having trouble, have them look at the kinds of characters listed in the character table (item 3) to get ideas about what to look for.

<u>Character table.</u> The cells should be filled with descriptions of the character state. This is not intended to be a 0/1 table. Students should come up with their own descriptions of the characters. For example, however they choose to describe the body shape of each group is fine.   Encourage them to abbreviate so that their descriptions will fit into the tiny boxes.

<u>Drawing the phylogeny.</u> Remind students that each branch can only have 2 arms. Encourage them to start with species in a single genus and draw the branch pattern for a single genus, then they can link backward to the common ancestor shared with another genus.

Because this is an imaginary group of organisms that was created to represent a completely known phylogeny, there is a correct phylogenetic tree (shown in your answer key). Remind students that phylogenetic trees of real organisms are always hypotheses of evolutionary relationships based on morphology, biochemistry, developmental patterns, and DNA sequence data. As new information is discovered about living organisms or previously unknown fossils are found, the phylogeny can change to accommodate the new information.

Notes to Faculty
Reference

Gendron, R.P. 2000.   The classification and evolution of caminalcules. The American Biology Teacher 62:570-576.

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20
19
9
4
3
22
12
2
24
16
1
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28