How to Make a Cladogram

(Adapted from ENSI/SENSI lesson plan: Making Cladograms
http://www.indiana.edu/~ensiweb/home.html)

Cladograms are diagrams which depict the relationships between different groups of taxa called "clades". By depicting these relationships, cladograms reconstruct the evolutionary history (phylogeny) of the taxa. Cladograms can also be called "phylogenies" or "trees".

Cladograms are constructed by grouping organisms together based on their shared derived characteristics.

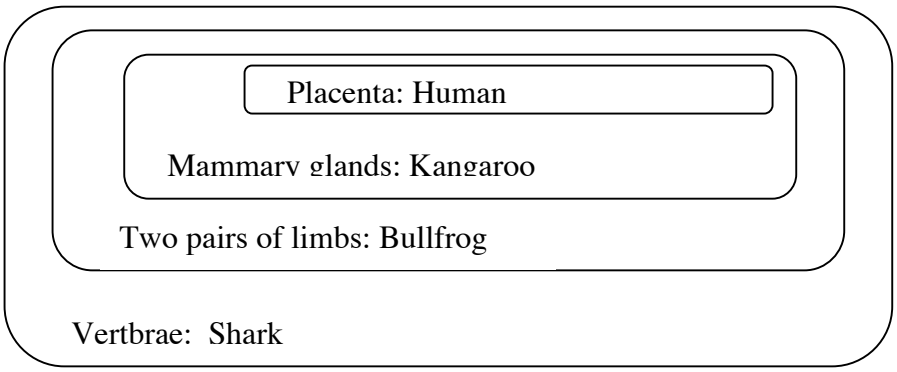
Example:

1. Given these characters and taxa:

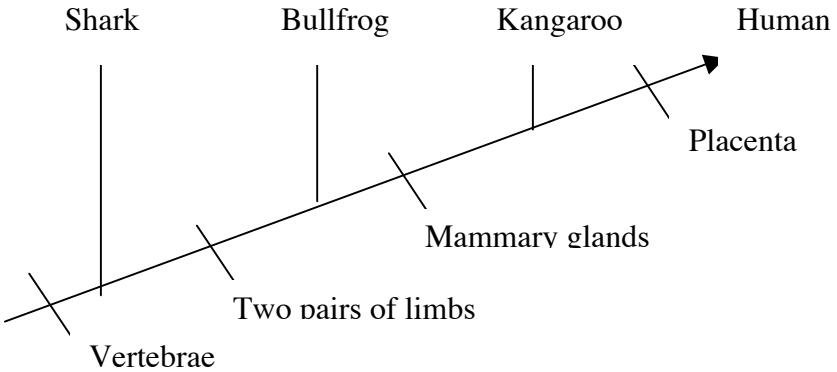
Taxa

Characters	Shark	Bullfrog	Kangaroo	Human
Vertebrae	X	X	X	X
Two pairs of limbs		X	X	X
Mammary glands			X	X
Placenta				X

2. Draw a Venn diagram. Start with the <u>character</u> that is shared by all the taxa on the outside. Inside each box, write the taxa that have <u>only</u> that set of characters.



3. Convert the Venn diagram into a cladogram like so:



Name:_____ Period:_____ Date_____

Cladogram Worksheet

Convert the following data table into a venn diagram, and then into a cladogram:

Characters	Sponge	Jellyfish	Flatworm	Earthworm	Snail	Fruitfly	Starfish	Human
Cells with flagella	X	X	X	X	X	X	X	X
Symmetry		X	X	X	X	X	X	X
Bilateral symmetry			X	X	X	X	(X)	X
Mesoderm				X	X	X	X	X
Head develops first				X	X	X		
Anus develops first							X	X
Segmented body				X		X		
Calcified Shell					X			
Chitonous Exoskeleton						X		
Water-vascular system							X	
Vertebrae								X

Venn Diagram (Draw your cladogram on the back):

Class: Zoology **Date:** October 8, 2003
Unit: Phylogeny
Lesson Topic: Cladistics: Phylogenetic Systematics

Objectives

1. The student will learn the difference between traditional classification and cladistic classification, and why cladistic classification is preferred by modern biologists.
2. The student will learn about monophyletic, paraphyletic and polyphyletic taxa, and why proper clades can only be monophyletic.
3. The studnt will learn how a cladogram illustrates an evolutionary hypothesis and makes predictions about evolutionary events. (i.e. the scientific method)
4. The student will learn how cladograms depict relationships between taxa, and represent a "family tree" of life.
5. The student will learn how to construct a cladogram from morphological data

Instructional techniques

Lecture, Cladogram construction activity

Instructional material

Powerpoint projector/computer

Content

Instructor will use a powerpoint presentation to introduce objectives 1-4.

Instructor will guide students as a group through cladogram activity, leaving incomplete work as homework.