Fossil Primate Phylogeny

Objectives:

- Practice creating and interpreting cladograms.
- Become more familiar with primate skulls.
- Apply what you've learned about modern primate skulls to fossil specimens.
- Better understand the evidence for human evolution.

Introduction: Last week you made a cladogram of modern organisms, including modern primates, in order to understand the evidence that supports the evolutionary relationship between humans and other primates. However, it is worth remembering that all modern organisms are relatives. Humans are not descended from chimpanzees nor are chimpanzees descended from humans. Both species are descended from a common ancestor. While we can make educated guesses about ancestors, to investigate what they really may have been like, we need to examine fossils.

Preparation: Examine the printout for Lab Exercise number 1: Primate Phylogeny. Review the following terms and be sure you know what they are before you come to lab.

Brow ridge

Canine diastema

Canine teeth

Foramen magnum

Incisor teeth

Lambdoidal crest

Sagittal crest

Review how to tell if the molars and premolars are parallel or arched.

Also, examine the picture of the human skull in Lab Exercise number 1 (Figure 2). Find the zygomatic bone and notice where it joins the bone behind it. Together these two bones form the zygomatic arch, which stands out from the side of the skull. In life, muscles run through the space behind the zygomatic arch. Be able to identify this arch on a skull.

Methods: We will use models of six skulls, five of which are known only from fossils. Examine each skull and fill in the appropriate sections of Table 1.

Caution: **These models are made out of plaster and are breakable. Do not carry them from one table to another, or hand them from one table to another. Leave the skulls in their location, and move around the room to each skull.**

Table 1: Characteristics of six skulls

CHARACTERS	Skull 1	Skull 2	Skull 3	Skull 4	Skull 5	Skull 6
Sagittal crest present? (note relative size)						
Lambdoidal crest present? (note relative size)						
Brow ridge present? (note relative size)						
Position of foramen magnum (center or towards back)						
Relative size of snout (how far jaw projects in front of eyes)						
Relative size of zygomatic arch						
Relative size of canines (compared to incisors)						
Relative size of incisors (compared to canines)						
Canine diastema present?						
Molars and premolars parallel or arched?						
Cranial capacity, cubic centimeters (cc)	460	650	1050	460	1450	400

Results: Draw a cladogram of the six taxa that you think is best supported by the data that you have collected from these six skulls. Indicate the characters you feel support the branches on the cladogram in the appropriate places as you did in last week's lab.

Have someone from your group draw your cladogram on the board. As you see other groups put up their cladograms, note if they agree with you. If not, you may wish to change yours, but keep your original. If you choose not to change yours, be ready to say why yours is better. Remember that cladograms are not facts; they are hypotheses. Some hypotheses are better supported than others.

As a class you will decide on one cladogram that best represents the data. After you have done this the instructor will identify the skulls for you, and explain how biologists currently hypothesize they are related.

Discussion and Conclusions: On a separate piece of paper, write the answers to the following questions.

1. Include your original cladogram and any revised ones you make.

2. Did you change your original cladogram when you saw the rest of the class's cladograms? Explain how and why you changed it.

3. Write a paragraph describing how the data fit the cladogram the class decided on.

4. When you learned the identity of the skulls were you surprised? Why or why not?

5. Describe something you found particularly interesting about the skulls.