Name _____ Lab section _____

Lab 4

Comparative anatomy: humans as peculiar primates

The emphasis in this lab will be on: (a) the ways in which humans share characteristics with other primates, and (b) the ways in which humans differ from other primates. We will look at skeletal specimens of mammals to see where humans fit in the order Primates. The following exercises will encourage you to think deductively about how we use comparative anatomy to classify organisms and how these classifications illustrate the terms of evolutionary history.

Station 1

At this station, you will compare four different skeletons: an opossum (representing **non-primate** mammals), a squirrel monkey and a chimpanzee (both non-human primates), and a human. Please note that some of these features (snout length, brain size) are relative: e.g., you should think about snout length as shortest to longest rather than short or long.

Table 1.

Traits	opossum	squirrel monkey	chimpanzee	human
How many digits (fingers)?				
Is there a clavicle (collar bone)? Y/N				
Is the pollex (thumb) opposable? Y/N				
Nails or claws?				
Relative snout length? (long/short)				
Which direction do the eyes face?				
Is the brain size big or small for body size? *				

* The concept of brain size relative to body size is complex, and the trait is hard to determine visually. When evaluating this feature, pretend you are comparing two animals of similar body size and then predict which would have the larger brain size.

1. Based on your table, what features do primates share with non-primates (like the opossum)? We term such traits **ancestral** because they are inherited from a common ancestor (in this case an ancestor shared between primates and opossums).

2. Based on your table, what features are unique to primates (squirrel monkey, chimpanzee, and human) to the exclusion of the opossum? These traits are called **derived** traits.

Station 2

At this station you will compare the orbit (eye) and teeth of a **lemur** (a strepsirhine), a **tarsier** and a **macaque** (haplorhines), and a **human**.

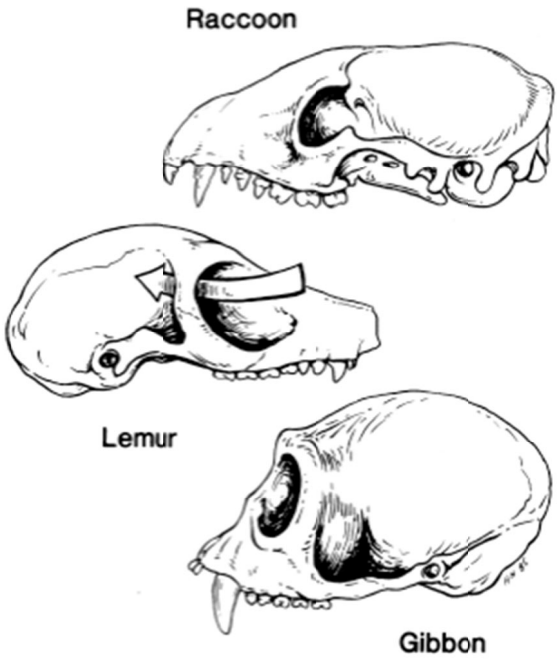


Figure 1

Use this figure to guide your observations of the orbital region. Note the lack of any postorbital closure on the raccoon, the presence of a postorbital bar on the lemur, and the presence of a combined postorbital bar and plate on the gibbon.

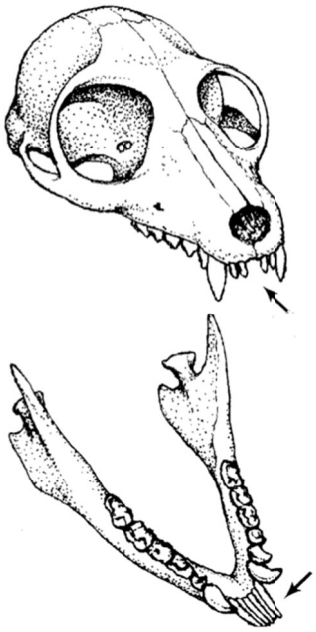


Figure 2

Note the tooth comb on the mandible and the space between the upper incisors. A tooth comb is a modification of the lower incisors and canines that aids in grooming and feeding.

Table 2.

Traits	lemur	tarsier	macaque	human
Is a dental comb present? Y/N				
Does the postorbital region have a bar? Y/N				
Does the postorbital region have a bony plate (post-orbital closure)?				

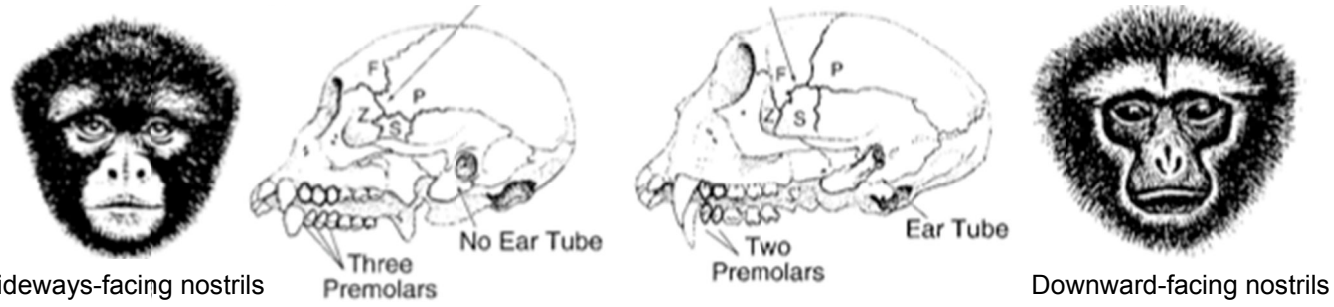
3. Based on your chart, are humans haplorhines or strepsirhines? What characters can you use to support your answer?

Station 3

Haplorhines are divided into two groups: platyrrhines (New World monkeys) and catarrhines (Old World monkeys and apes). At this station you will compare the skull and face of a platyrrhine, catarrhine, and human.

Figure 3.

The main features that differ between platyrrhines and catarrhines.



Sideways-facing nostrils

Downward-facing nostrils

Figure 4.

black howler monkey (platyrrhine) olive baboon (catarrhine)

Table 3. Complete the following table using the specimens and the illustrations.

Traits	howler monkey	baboon	human
Is the bony ear (the ectotympanic region) ring-like or tube-like?			
How many premolars are there?			
Which way do nostrils face? (refer to the photos above)			

4. Based on your chart, are humans platyrrhines or catarrhines? What characters can you use to support your answer?

Station 4

At this station you will compare the skulls of an Old World monkey, great ape, and a human. Although the emphasis for these stations is on the differences between these taxa, remember that they are all catarrhines, and furthermore, humans and all of the apes belong to the superfamily Hominoidea, and therefore share many morphological traits.

Table 4.

Traits	mandrill	gorilla	human
Is the foramen magnum centrally or more posteriorly placed?			
Do the molars have a Y-5 pattern or bilophodont cusps?			
Is the canine relatively long or short?			
Is there a diastema (gap) between upper incisors and canine? Y/N			
Is the lower first premolar single-cusped or two-cusped?			
Is the palate rectangular or parabolic (arched)?			
Is the frontal bone tall and vertical or sloping?			
Is the face projecting (prognathic) or vertical (orthognathic)?			
Is the relative brain size large or small?			

5. Which traits appear to be characteristic of hominoids (apes); in other words, which features are shared by both the gorilla and the human? Which derived trait is characteristic of cercopithecoids (Old World monkeys)?

6. What are the features that differ between the great ape and human skulls?

Lab 4 review questions

DO THIS SECTION **AFTER** COMPLETING THE WORK AT ALL THE STATIONS.

7. To review, note for each of the following groups of primates whether they are haplorhines (H) or strepsirhines (S):

lemurs _____ apes _____

Old World monkeys _____ tarsiers _____

New World monkeys _____

8. To review, note for each of the following groups of primates whether they are platyrrhines (P) or catarrhines (C):

apes	Old World monkeys	New World monkeys
_____	_____	_____

9. To review, based on the stations above humans are (circle one for each pair):

primates	OR	not primates	catarrhines	OR	platyrrhines
strepsirhines	OR	haplorhines	hominoids	OR	cercopithecoids

10. Lack of a tail is a trait shared by all apes to the exclusion of other primates. Given the definitions in Station 1, is lack of a tail for apes a derived or ancestral trait? (circle one)

derived OR ancestral

11. Based on your results in the first three stations, make a list of the traits that define the order *Primates*, and specify whether these features are ancestral (shared with mammals) or derived (unique to primates). Only list the traits that all primates have.