

Chapter 32 Mammals

Comparing Primates

Introduction

In *The Descent of Man*, the English naturalist Charles Darwin formulated the hypothesis that humans and other primates have a common ancestor. All scientific hypotheses, including this one, are tested by observations. For example, observations of fossils lend support to Darwin's hypothesis of human origins.

Darwin observed that despite common ancestry, human beings and other primates differ in many important ways. Although all primates have opposable thumbs, the human hand is capable of more refined and exact movements than those of other primates. The human braincase, or cranium, has more volume than those of other primates. Human beings are bipedal, or able to walk on two limbs. Other primates use all four limbs for locomotion. Being bipedal frees the arms and hands for other tasks, such as toolmaking. Darwin regarded these human traits as adaptations, resulting from natural selection. The adaptations of other primates, he suggested, evolved differently.

In this investigation, you will examine the skeletal features of different primates in order to understand the evolutionary relationships among them.

Problem

How can skeletal evidence be used to understand the evolutionary relationships of primates?

Pre-Lab Discussion

Read through the entire investigation. Then, work with a partner to answer the following questions.

1. What hypothesis did Charles Darwin formulate about evolutionary relationships between humans and other primates?

2. What characteristics of primates will be examined in this investigation?

3. How do the hand and cranium of humans differ from those of other primates? Suggest what behaviors these traits might allow.

4. What does it mean to be bipedal and how might it benefit a primate?

5. What determines the characteristics of organisms like those examined in this investigation?

Materials (per student)

metric ruler

protractor

Procedure

1. In Figure 1 measure the length in millimeters of lines ab and bc , the lower jaw of each primate. Record these lengths in Data Table 1 on page 234. Record the product of these lengths in Data Table 1.
2. Use a protractor to measure the angle xy in each primate skull in Figure 1. Record your observations in Data Table 1.

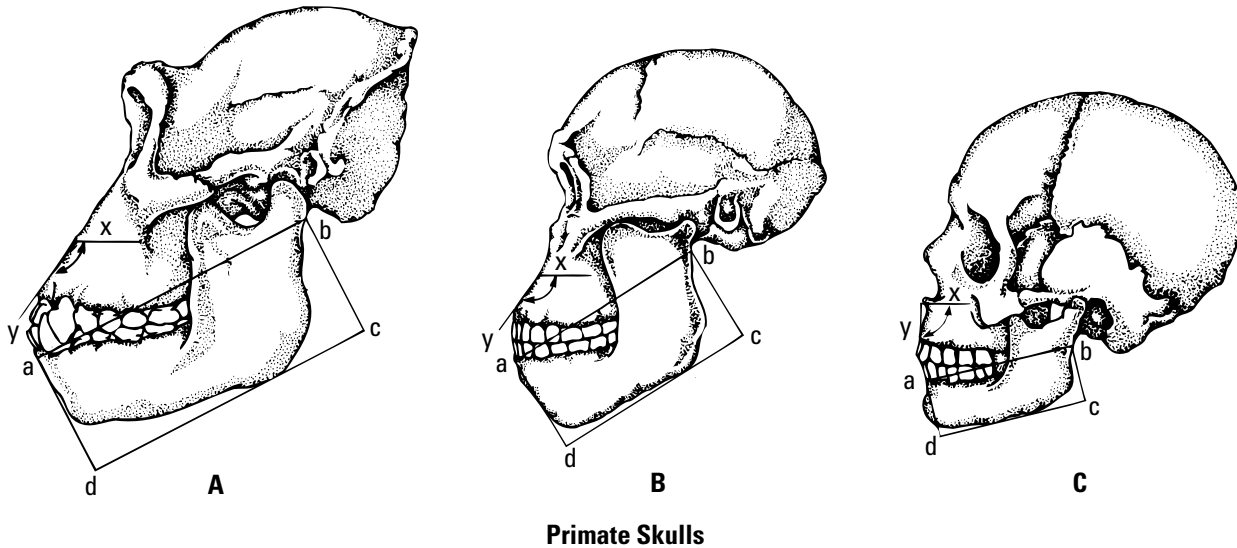


Figure 1

3. Examine the teeth of each of the three primates in Figure 2 on page 233.
4. Count the number of incisors, canines, premolars, and molars of each primate jaw in Figure 2. Record your observations in the appropriate columns in Data Table 2 on page 234.

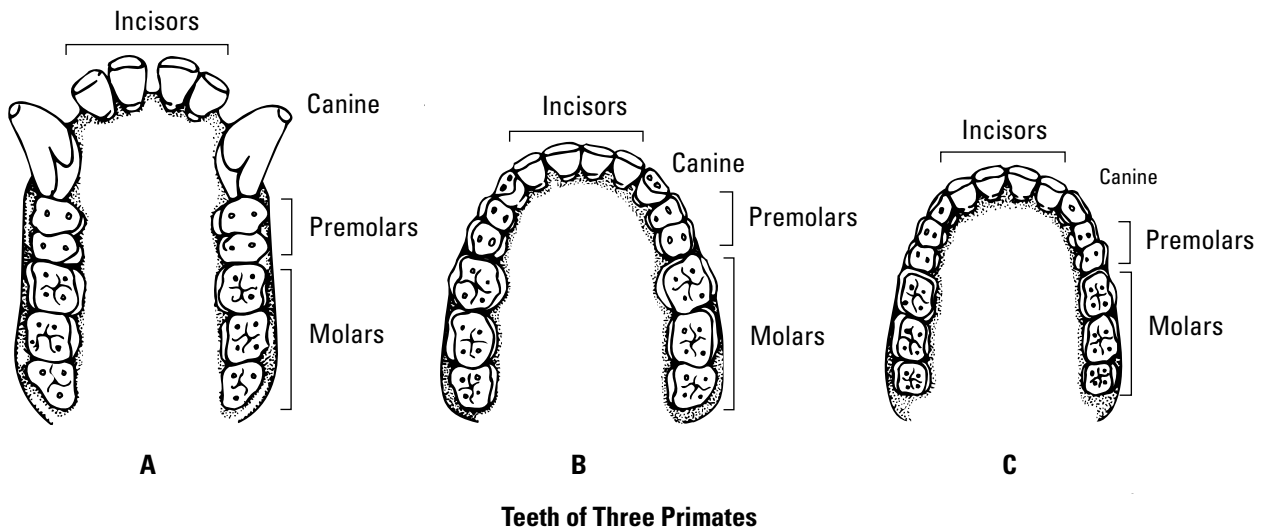


Figure 2

5. Examine the two skeletons in Figure 3.

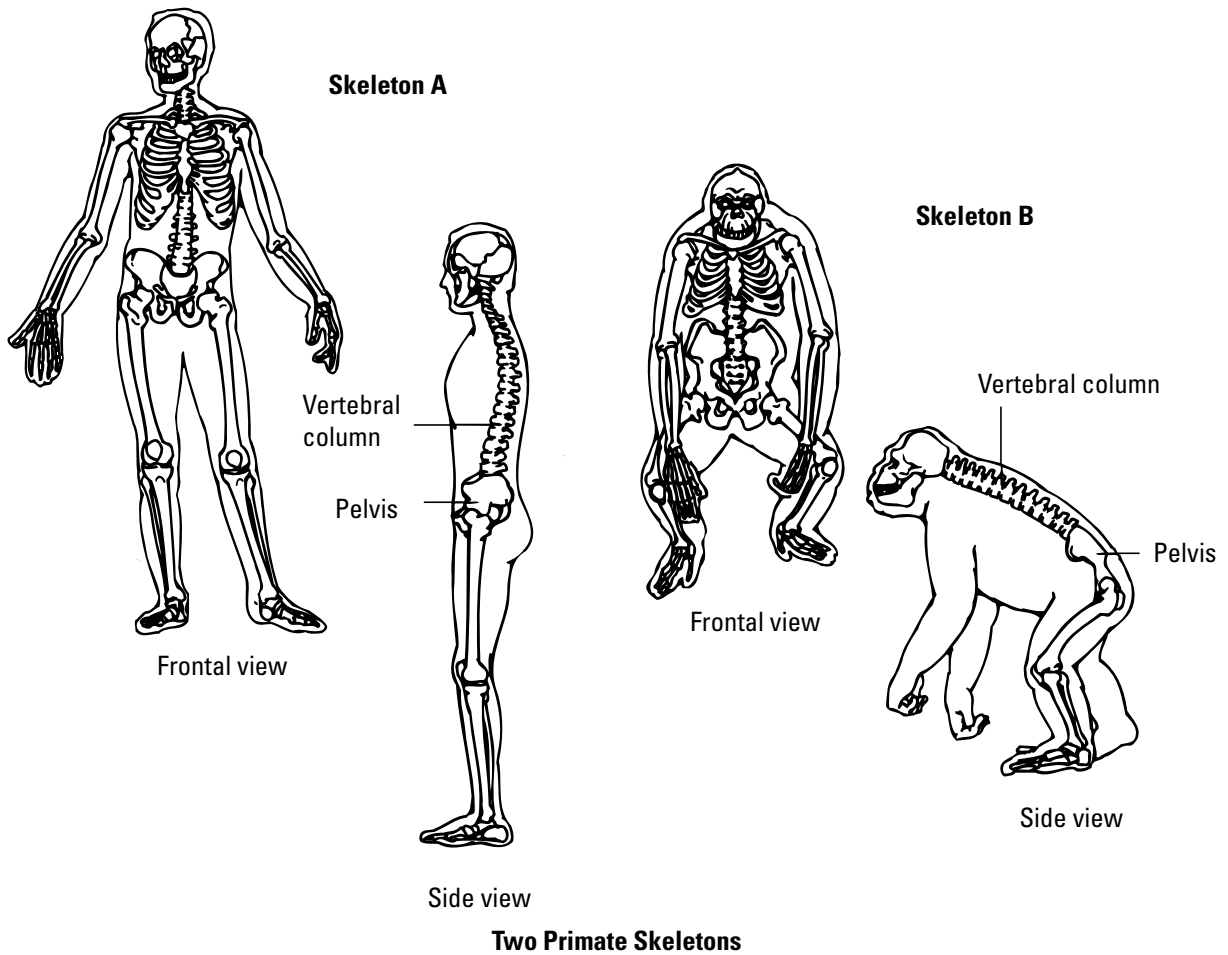


Figure 3

6. Compare both views of Skeleton A with those of Skeleton B. Answer questions 1 and 2 below. Describe three differences between Skeleton A and Skeleton B.

7. Determine which primate skeleton in Figure 3 is bipedal. Record your conclusion below.

Data Table 1

Comparison of Three Primate Skulls				
Skull	Length of Lower Jaw (mm) (<i>ab</i>)	Depth of Lower Jaw (mm) (<i>bc</i>)	Area of Lower Jaw (mm ²) (<i>ab</i> × <i>bc</i>)	Angle of Jaw
A				
B				
C				

Data Table 2

Comparison of Primate Teeth			
Type of Teeth	Number of Teeth		
	A	B	C
Incisors			
Canines			
Premolars			
Molars			

Analysis and Conclusions

1. **Analyzing Data** Discuss the observations you made about the jaws and teeth of primates in Data Tables 1 and 2.

2. Analyzing Data Discuss the observations you made about the two primate skeletons shown in Figure 3.

3. Drawing Conclusions Based upon your observations of Figures 1 and 2, identify primates A to C as gorilla, chimpanzee, or human. Explain your answers.

4. Drawing Conclusions Based upon the skulls and teeth, which two primates are most different from one another? Does one primate seem intermediate between the other two?

5. Drawing Conclusions Which of the two types of primates shown in Figure 3 is human? What conclusion can be made about its mode of locomotion and what would be the benefits of this mode?

6. Inferring Based on teeth structure, tell how the diet of primate A might differ from that of primate C.

7. Evaluating Do you think the observations you made in this investigation support Darwin's hypothesis? Explain why or why not.

Going Further

Visit a local zoo to observe the behavior of gorillas, chimpanzees, baboons, and other primates. Observe the ways in which the animals communicate and interact with one another. What similarities and differences do you observe between the behaviors of the primates you studied and those of human beings? Use a notebook to record your observations.