Hominid Skulls Comparison Lab

Introduction:

In this lab you will learn several anatomical features of the human skull and compare this with replicas of several extinct hominids (other bipedal primates, such as *Australopithecus*). This activity will show that we share most physical traits found in the skull and mandibles, but that there are specific differences between the various hominid species.

The analysis of the anatomical measurements (morphometrics) you make will give you a baseline to compare and try and determine which species share more of the same traits and which ones are more modified. These are the same techniques used in comparison of many physical structures of living and extinct species.

Photo by Jeb Bevers

Methods:

You are to compare several hominid skulls and collect data on them for a comparison and tentative cladogram. Skulls are replicas, but are actual size and quite detailed. Characteristics to be measured are marked with *. All measurements should be made in millimeters (mm). If a skull is missing a specific part, then skip it.

1. Use calipers and ruler to measure the maximum WIDTH of the braincase (cranium).

2. Use calipers and ruler to measure the maximum LENGTH of the braincase (from the bridge of the nose to the base of the cranium).

3. Measure the length of the opening of the Zygomatic arch (where muscles insert for the jaw).

4. Does the skull have a bony ridge on top (saggital crest)?

5. Hold a ruler upright from the bridge of the nose. Does the frontal bone slope back flatly or does it rise more vertically?

6. Is the hole where the spine attaches (**foramen magnum**) directly underneath or angled to the back? Use your fingers or a ruler to determine the slope (direction).

7. Mastoid process: is the bone behind the ear well-developed (easy to see) or is it flat?

8. Does the skull have a brow ridge or bony ridge over the eyes (supraorbital)?

9. Distinguish between skulls if a brow ridge is present. Example: smallest, small, medium, large.

10. Ratio of height to maximum width of nasal opening?

11. Does the face (below eye orbits) stick out in front of the forehead? Compare amounts between skulls.

12. Use calipers and ruler to measure from the bottom of the mandible to the top of the nasal opening.

13. Does the chin stick out or does it slope back?

14. Count the number of incisors, canines, premolars, molars in one-half of the mandible.

15. Is there a gap between the upper incisors and canines (diastema) to accommodate the lower canines?

16. Use a ruler to measure the length of a lower incisor.

17. Use a ruler to measure the length of an exposed upper canine tooth.

18. Use a ruler to measure the combined length of the chewing surface of the molars and premolars.

19. Is there a dental comb (lower incisors and both canines extremely narrow and slant forward, used extensively in grooming).

20. Note any features that seem to be unique to each skull.

Primitive Traits in Hominids

Erect posture, bipedal movement, sagittal crest, diastema (gap between incisors and canines), cranial capacity ~320-380 cc, prognathic face, brow ridge, large canines, foramen magnum angled back, large backward extending zygomatic arch, low flat forehead, large incisors.

Skull Data

Measurements to be done in millimeters (mm) are marked with an * Characteristics followed by a ? are to be answered yes or no.

		A	B	C	D		
	Characteristic / Specimen						
1.	**width of braincase***						
2	**length of braincase***						
3.	**Length of Zygomatic arch**						
4	**sagittal crest?**						
5	**forehead shape – sloping, low, high?**						
6	**foramen magnum location - angle under skull or angled to rear facing?**						
7	**mastoid process shape - pyramidal or low shape**						
8	**brow ridge? Present or not?**						
9	**If ridge, relative size**						
10	**nasal bone shape – ratio of height divided by width ***						
11	**facial prognathism (relative amount) – and length from orbit***						
12	**face height***						
13	**chin shape?**						
14	**Number of incisors, canine, premolars, molars on one side?**						
15	**Canine diastema present?**						
16	**Lower incisor length***						
17	**Upper canine length***						
18	**Molar surface area = length x width ***						
20	**Dental comb present?**						
21	**Unique features**						

Use your data from the skull comparisons to answer the following.

1. List similarities between A and B.

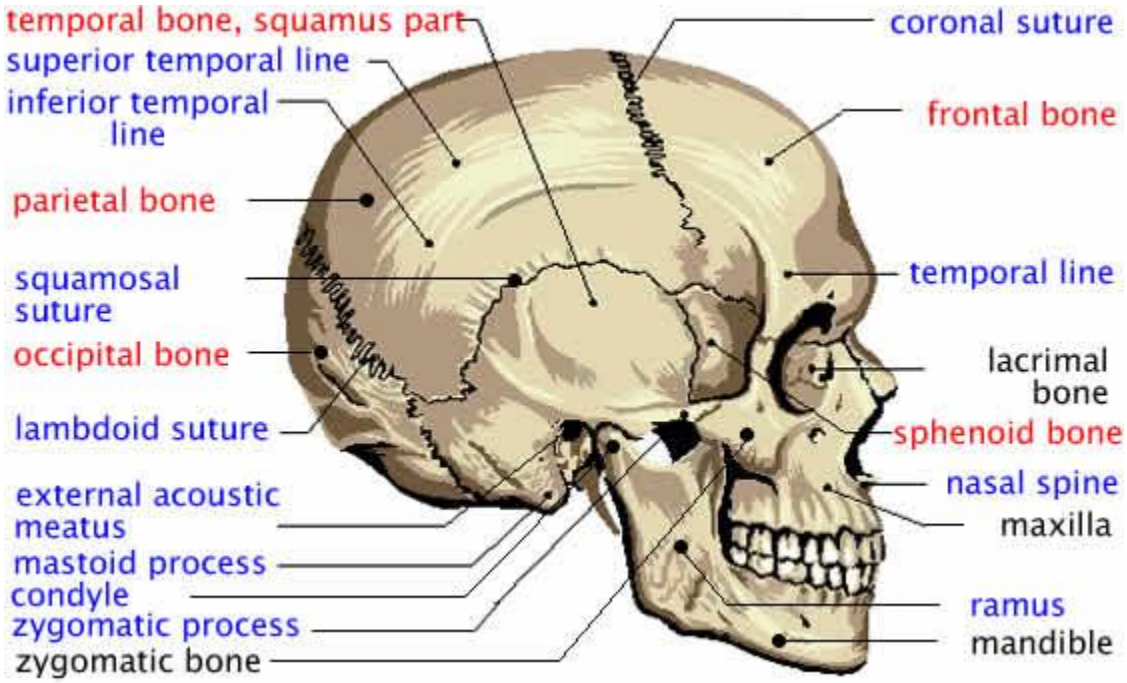
2. Which traits distinguish A from B?

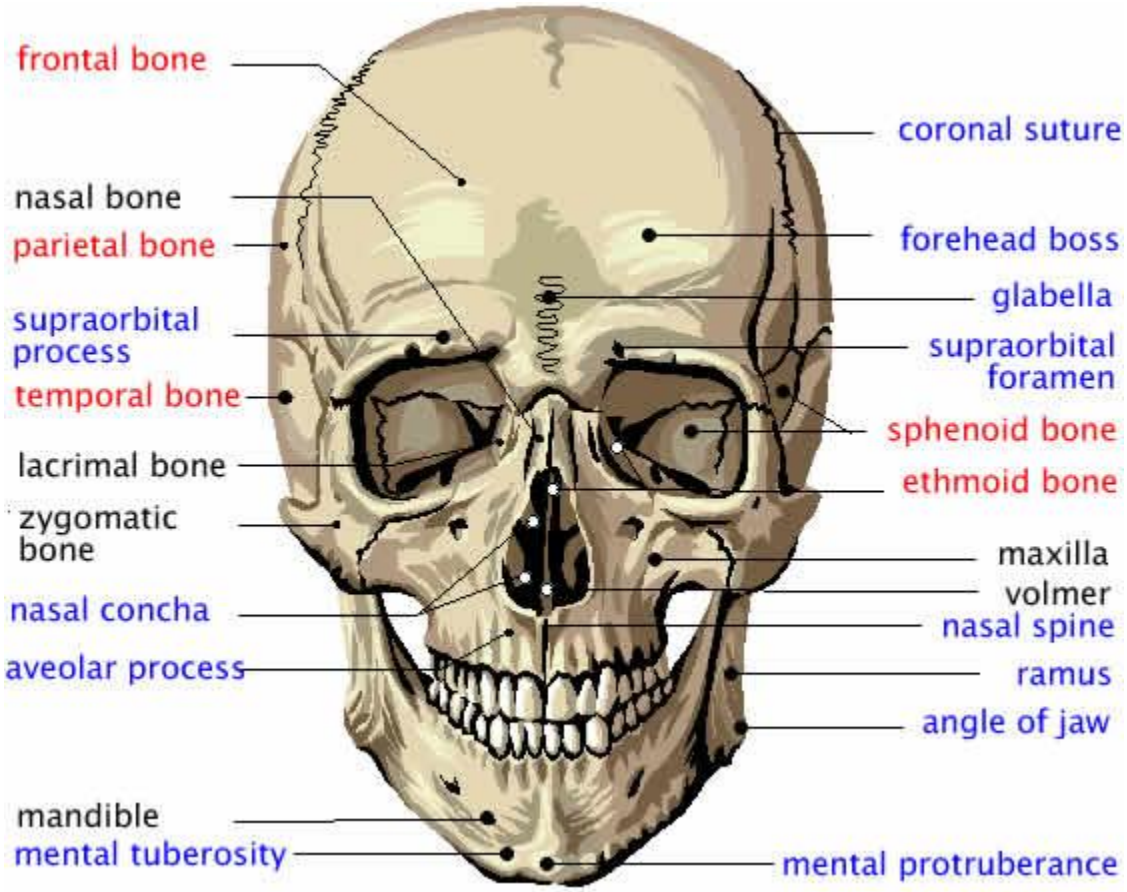
3. How is C different from D?

4. Is A more closely related to B, C, or D? _____

Support for your answer on # 4.

5. You have been on a dig at Olduvai Gorge and were lucky enough to find fragments of a skull that include the lower jaw. List any traits that would indicate the specimen is a hominid and **explain why** those traits would support a hominid as opposed to an ape or other mammal.





Figures from: http://www.face-and-emotion.com/dataface/physiognomy/cranium.jsp