Lab 19   Skull evolution

Name _____   Seat number ____

Objectives:

A. *Background on hominids*
B. *Measuring skulls*

A. Background on hominids

Hominid refers to our branch of the evolutionary tree. A fossil is in the hominid lineage if it is closer to us than to the African apes. Australopithecines were one of the early groups of hominids, arising almost 3 MYA (million years ago). (There are 2 species of Australopithecines in the lab today, *Australopithicus afarensis* 3.6-2.9 MYA and *Australopithicus boisei*, 1.8 MYA) Species in this group had a large supra-orbital brow-ridge (bone over the eyes), a face that protruded forwards, and dentition (teeth) suited for a course diet of leaves, fruits and nuts.
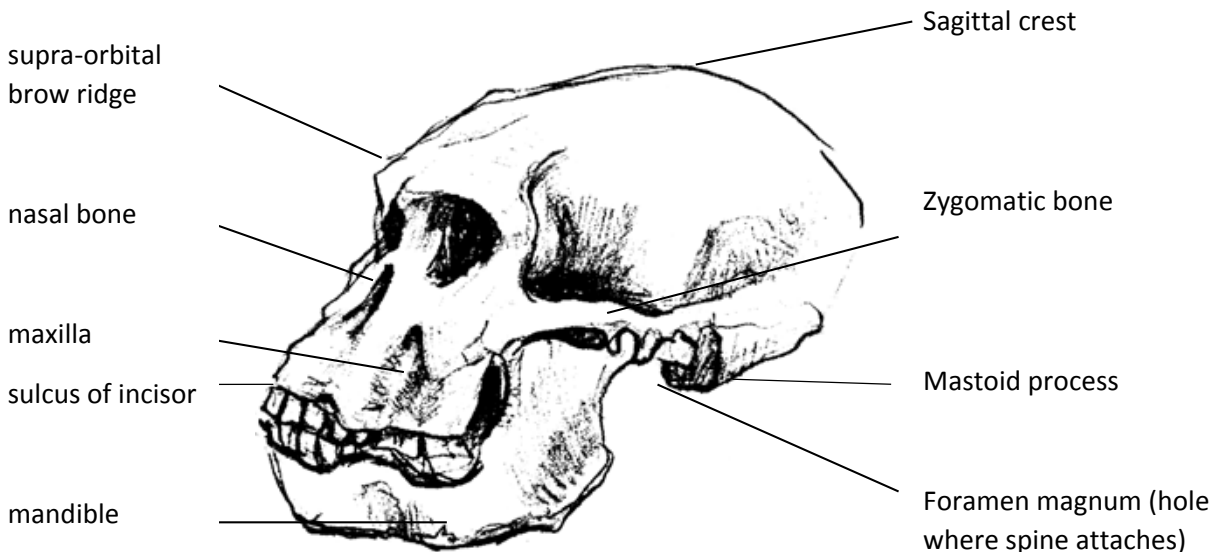
About 2 million year ago, the earliest species in the human genus arose, that being *Homo habilis* (handy man). *Homo habilis* gradually transformed into *Homo erectus* (upright man) between 2 million and 400,000 years ago. *Homo erectus* was gradually replaced by (at least) two lines: the Neanderthal branch, *Homo neanderthalensis* (Neanderthal man), and the human species *Homo sapiens* (wise man). Genetic evidence tells us that *H. sapiens* and *H. neanderthalensis* began to diverge about 500,000 years ago, but *H. sapiens* is traditionally dated to begin 200,000 years ago, with the appearance of fossil remains with distinctive anatomical features. There are many remaining controversies about the precise dating and classification of early human remains, but it is clear that there were many different groups of early humans once.

B. Measuring skulls

1. Bring any full size skull cast to your desk, and work with lab partners to identify   parts of the skull. Make a simple sketch of this skull and label the parts identified above.

2. Using the half-size skulls, using 1 ape, 1 *Australopithecus*, 1 *Homo sapiens* and 2 other skulls (for a total of 5) determine how ancient skulls are by recording numbers for the cranium, face and dentition. When there are uncertain questions, make your best guess. Start at Cranium below and work through to Dentition. Do this for all 5 skulls.

3. Graph your results. I have started the chart for you below

1. Cranium	*A. Boisei*	*H. erectus*	*H. sapiens*		
frontal bone	1	2	2		
supra-orbital brow	1	1	2		
brow continuous	1				
sagittal crest					
foramen oriented					
mastoid process					

2. Face					
Nasal flat or arch					
Nasal width					
Maxilla height					
Face protrude					
Zygomatic breadth					

3. Dentition					
tooth rows					
incisors					
chewing surface					

1. **Cranium** (brain case)

    a. Does the frontal bone (superior to the brow ridge, to the coronal suture) appear more sloped (1) or vertical (2)?

    b. Is the supra-orbital browridge large (1) or mostly absent (2)?

    c. Is the supra-orbital browridge continuous across the forehead (1) or divided in the middle (2)

    d. Is the sagittal crest (ridge on top of skull) present (1) or absent (2)?

    e. Place a pointer, over the foramen magnum from anterior to posterior (between the occipital condyles) and place a second pointer on the plane of the face vertically from the frontal bone to the mandible. Are the 2 pointers approximately parallel to one another (1) or are they are mostly perpendicular (2)?

2. **Face**

   a. Are the nasal bones mostly flat (1) or are raised or arched (2)?

   b. Opening of nasal bone (nasal opening where nose is when alive) ≥ 1.25 cm at its greatest width (1) or less than 1.25 cm at its greatest width (2)?

   c. Is the height of maxilla, from the base of the nasal opening to the sulcus of incisor greater than 0.75 cm (1) or less than or equal to 0.75 cm (2)?

   d. Does the face protrudes forwards so that the distance between the front edge of the foramen magnum and the base of a maxillary incisor (measure across the palate) is more than 4 cm (1) or equal to 4 cm (2)?

   e. Is the zygomatic breadth (widest part of the face from one zygomatic arch to the other) more than 6 cm (1) or less than or equal to 6 cm (2)?

3. **Dentition**

   a. Tooth rows diverge toward back of mouth (2 points) (look at homo sapiens) or are mostly parallel (1 point) (look at gorilla)

   b. Compare the size of the canine relative to the incisors. Relatively equal size (2 points), canines 1.5X length of incisors (1 point)

   c. Length of chewing surface (combined length of grinding surface of one side of the jaw) is greater than 1.5 cm (1) or less than or equal to 1.5 cm (2 points).

4. Draw a graph like the one shown below that demonstrate the differences among 3 of your 5 skulls. Label both the vertical and horizontal axes. Divides your vertical axis between 0 and 12 and label it **scores**.

5. Write a brief discussion of your results by stating 2 features that you feel all *Homo* specimens (ancient and modern) have in common, and 2 features that are very different among them. Be very specific.

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Primitive vs. Modern Skulls

Ape   *Australopithicus*   *Homo*

Primitive   vs   Modern human skulls