**Hominid Cranium Comparison Lab**[**[1]**](https://docs.google.com/document/u/1/d/1lX0akYCKNvJDwR5Oo-QgACGfRgDA_yA3XyzNbvi6pWI/pub#ftnt1)

*Name:                                                                          Date:*

Homo sapiens are the only living species of the Homo genus.  However, the fossil record provides a means to compare related species for clues of similarities and differences between the species.  Additionally, such comparison provides an opportunity to view how ancestral human species lived and their physical characteristics that give clues to the evolution of humans.  This lab will use 1/2 scale cranium replicas of the following hominid species to examine differences between them:

* *Australopithecus afarensis*
* *Australopithecus boisei*
* *Homo erectus*
* *Homo neanderthalensis*
* *Homo sapiens (Human)*
* *Pan troglodytes (Chimpanzee)*
* *Gorilla gorilla*

**Please be extremely careful with both the cranium replicas and calipers; both are very expensive.**

**Procedure:**

1. Work in groups so that everyone can be involved in the activity.
2. TAKE TURNS doing different measurements and observations.
3. When taking a measurement, use the calipers and ALWAYS MEASURE IN MILLIMETERS [mm] and round off to whole numbers.
4. PLEASE DO NOT ADD ANY PENCIL OR PEN MARK "TATTOOS" TO THESE CRANIA
5. You may need to look up some of the terms in the following directions.
6. **For each of the following portions of the replica cranium, complete the following observations and measurements with each replica.  Record all data in Table 1 below.**

**Part A: Braincase**

1. Does the FOREHEAD (frontal bone) look more vertical OR flatter when i.e., with the eyes oriented forward?
2. Is a SUPRAORBITAL BROWRIDGE present?
3. If present, is the BROWRIDGE DIVIDED in the middle, or CONTINUOUS?
4. What is the SHAPE OF THE BRAINCASE (front to back) when viewed from above?
5. Is a SAGITTAL CREST present?
6. What is the size of the FORAMEN MAGNUM?
7. Is the MASTOID process relatively flat OR does it noticeably protrude (project)?

**Part B: Face**

1. Are the NASAL BONES raised (arched) OR flat?
2. Measure the MAXIMUM BREADTH (width) of the NASAL OPENING [mm].
3. Measure the MAXIMUM HEIGHT of the NASAL OPENING [mm].
4. Measure the LENGTH of the MAXILLA (the upper jaw) [mm]. (Measure down the middle of the palate from the front edge of the foramen magnum to either between or just in front of the two central incisors to determine how much the face projects forward.)
5. Measure the BIZYGOMATIC BREADTH [mm] (This is the width or breadth of the face from the widest part of one zygomatic arch to the widest part of the other zygomatic arch).

**Part C. Dentition**

1. SHAPE OF THE DENTAL ARCADE: Do the tooth rows diverge towards the back OR are they more straight-sided and parallel to one another?
2. Does the CANINE tooth project above the chewing surfaces of the other teeth?
3. What is the length of the CANINEtooth?
4. Is a CANINE DIASTEMA present?
5. Measure the COMBINED LENGTH of the LEFT 2 PREMOLARS and 3 MOLARS together by measuring from the back of the last molar to the front of the first premolar to determine the length of the chewing surface of the "cheek teeth"  [mm] (NOTE: Measure the right side if the left side is missing any of these 5 teeth).

**Analysis**:

1. Why do you think the face flattens over time in hominids?
2. How does the position of the foramen magnum relate to the body posture and locomotor pattern of the organism?
3. What areas or portions of the braincase enlarge first and which later in hominids?
4. What behavioral and cognitive functions are associated with cerebral areas?
5. Why might have the canine tooth reduced in comparison between late and early hominids.

***Table 1. Comparison of cranial features of hominid species***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **A. afarensis** | **A. boisei** | **Chimp** | **Gorilla** | **H. erectus** | **Human** | **Neanderthal** |
| **FOREHEAD** |  |  |  |  |  |  |  |
| FOREHEAD: Vertical or flat |  |  |  |  |  |  |  |
| SUPRAORBITAL BROWRIDGE PRESENT |  |  |  |  |  |  |  |
| BROWRIDGE DIVIDED |  |  |  |  |  |  |  |
| BRAINCASE SHAPE |  |  |  |  |  |  |  |
| SAGITTAL CREST PRESENT |  |  |  |  |  |  |  |
| FORAMEN MAGNUM SIZE (mm) |  |  |  |  |  |  |  |
| MASTOID |  |  |  |  |  |  |  |
| **NASAL** |  |  |  |  |  |  |  |
| BREADTH OPENING (mm) |  |  |  |  |  |  |  |
| HEIGHT OPENING (mm) |  |  |  |  |  |  |  |
| MAXILLA (mm) |  |  |  |  |  |  |  |
| BIZYGOMATIC BREADTH (mm) |  |  |  |  |  |  |  |
| **DENTAL** ARCADE |  |  |  |  |  |  |  |
| CANINE |  |  |  |  |  |  |  |
| CANINE SIZE (mm) |  |  |  |  |  |  |  |
| DIASTEMA |  |  |  |  |  |  |  |
| COMBINED LENGTH |  |  |  |  |  |  |  |

[[1]](https://docs.google.com/document/u/1/d/1lX0akYCKNvJDwR5Oo-QgACGfRgDA_yA3XyzNbvi6pWI/pub#ftnt_ref1) Adapted from the [*Hominid Cranium Comparison Lab*](https://www.google.com/url?q=http://www.indiana.edu/~ensiweb/lessons/hom.cran.html&sa=D&ust=1509048519200000&usg=AFQjCNEcNwtRdoo1jBnudFptFiSA2CQong)by Martin Nickles