Human Anatomy Lab #4:
Human Anatomy in Perspective

Lab #4 Table of Contents:

• Expected Learning Outcomes . . . 1
• Introduction . . . . . . . . . 2
• Part A: Functions of the Skull . . . 2
• Part B: The Cranium . . . . . . 2
• Part C: The Face . . . . . . 6
• Part D: Ear Ossicles and Associated Structures 8

Expected Learning Outcomes
At the end of this lab, you will be able to
• list functions of the skull and associated structures;
• identify bones of the cranium and face;
• identify the specific features on the bones of the skull; and
• examine and know the ear ossicles.

Fig. 4.1 Andreas Vesalius
Skull Contemplating Skull,1542
Introduction
The skull is part of the axial skeleton. It is the most complex region of the skeleton because it is associated with numerous, diverse functions. It is shaped by growth and development, as you can see when you compare the infant and adult skulls. The skull consists of at least 25 separate bones that fit together like a complex, 3-dimensional jigsaw puzzle. This lab will offer in-depth exploration of the skull.

Note: Always place skulls on mats and use bamboo sticks to point out features.

Part A: Functions of the Skull

The complexity of the vertebrate skull is associated with functions of the head. With a partner, examine the skull on the table in front of you or on the skeletons around the room.

1. List at least five functions of the skull and one structure associated with each.

<table>
<thead>
<tr>
<th>Function</th>
<th>Related Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>A.</td>
</tr>
<tr>
<td>B.</td>
<td>B.</td>
</tr>
<tr>
<td>C.</td>
<td>C.</td>
</tr>
<tr>
<td>D.</td>
<td>D.</td>
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<tr>
<td>E.</td>
<td>E.</td>
</tr>
</tbody>
</table>

Part B: The Cranium

Bones of the skull are divided into two main groups: the cranium (or cranial vault) and the face. In addition, there is a third group, the tiny ear ossicles (ear bones). First, we will examine the cranium.

2. Identify the bones of the cranial vault on both articulated and disarticulated skulls. (Articulated skulls are complete. Disarticulated skulls are in pieces; the bones have been gently separated.) (On the
practical exam, you would be expected to identify individual bones on the articulated skull, except for the sphenoid, which you should be able to identify even if it is disarticulated.)

**Cranial Vault Bones:**
- Frontal
- Parietal
- Temporal
- Sphenoid
- Ethmoid
- Occipital

3. Label the frontal, parietal, temporal, occipital, sphenoid, and ethmoid bones on lateral skull image in figure 4.2.

*Figure 4.2 Lateral View of the Skull from Saladin, K. *Human Anatomy*
4. Which bones are single (e.g. there is only one rather than a pair)? (There are four.)

Which bones are paired? (There are two.)

5. Identify the following sutures on the articulated skulls. (Sutures are immovable joints between the bones.) Note the names and briefly explain why each is named as it is.

- coronal suture
- sagittal suture
- lambdoidal suture
- squamous suture

Label the coronal, squamous, and lambdoidal sutures on figure 4.2.

6. Remove the top of the cranial vault from the articulated skull. Carefully unhook the latches on the sides of the temporal bones and gently remove the top of the cranial vault to obtain an “inside view.”
Identify the three regions of the **cranial cavity**, 1) the **anterior cranial fossa**, 2) the **middle cranial fossa**, and 3) the **posterior cranial fossa**. Label them on Figure 4.3.

7. On the articulated skull, identify the following structures. You will be searching the exterior of the skull as well as the cranial cavity from the superior aspect.

Note: You will find it helpful to review Table 7.2 on page 178 in Saladin 2nd ed., and Figure 6.17 on page 167 in McKinley to review general terms for features. An important one for the skull is the Latin word “foramen.”

What does “foramen” mean in English? ______________

**Frontal Bone**

- supraorbital notch/foramen

**Parietal Bones**

- temporal lines (superior and inferior)

**Temporal Bones**

- styloid process
- external acoustic meatus
- mastoid process
- mandibular fossa
- zygomatic process
- petrous portion (or part)
- internal acoustic meatus
- carotid canal
- jugular foramen

**Sphenoid**

- lesser wings
- greater wings
• sella turcica
• optic foramen
• superior orbital fissure
• foramen rotundum
• foramen ovale
• foramen spinosum
• medial pterygoid plates
• lateral pterygoid plates

**Ethmoid**

• cribriform plate
• crista galli
• perpendicular plate

**Occipital Bone**

• occipital condyles

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**Check Your Understanding**

*Try to answer the following questions without looking at your notes.*

1. List at least three features of the skull that are associated with a specific function.
2. Name the bones of the cranial vault and point them out to a partner using a bamboo stick.
3. Identify four sutures.
4. (True/False) There are two cranial fossa.
5. (True/False) The cribriform plate is found on the sphenoid.

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**Part C: The Face**

The bones of the face form the anterior part of the skull.

8. Locate the following facial bones on the articulated and disarticulated
skulls. (On the practical exam, you would be expected to name individual bones on the articulated skull.)

- **Maxilla**
- **Zygomatic**
- **Nasal**
- **Lacrimal**
- **Inferior nasal concha (plural, conchae)**
- **Vomer**
- **Palatine**
- **Mandible**

10. a. Which bones are paired? (There are six.)

b. Which are not paired? (There are two.)
11. Label the following on figure 4.4: maxilla, zygomatic, vomer, nasal, lacrimal bone, inferior nasal concha, and mandible.

12. On the articulated skull, identify the following structures.
   • nasal aperture

   **Lacrimal Bone**
   • nasolacrimal canal

   **Maxilla**
   • infraorbital foramen

   **Mandible**
   • mandibular condyle
   • coronoid process
   • mental foramen
   • mandibular foramen

**Check Your Understanding**

*Try to answer the following questions without looking at your notes.*
Circle the Statements that are False, and explain why they are not True.

1. The infraorbital foramen is found on the zygomatic bone.
2. The zygomatic bone articulates with the temporal bone and maxilla.
3. The teeth are located on the maxilla, mandible, and palatine bones.
4. The nasal bones form the “bridge” of the nose.

**Part D: The Ear Ossicles and Associated Structures**

The smallest skull bones, the **ossicles**, are buried in the petrous portion of the temporal bone, along with other structures of the inner and middle ear.
13. Examine the articulated skull and locate the temporal bone. Identify the *external auditory meatus*, the *petrous portion* of the temporal bone, and the *internal auditory meatus*.

![Temporal bone](Image)

**Figure 4.5.** The position of the ear structures within the petrous part of the temporal bone. *from Saladin, K. Human Anatomy*

14. Next, examine the ear model.

The small ear bones amplify sound waves that pass through the auditory canal and vibrate the tympanic membrane. The wave is passed through the ossicles; the stapes then pushes on fluid in the inner ear, stimulating neurons. They pass information about sound through the vestibulocochlear nerve, which passes through the internal auditory meatus on its way to the brain.
Identify the following structures on the model:

- external acoustic meatus, leading to the auditory canal
- tympanic membrane
- malleus
- incus
- stapes
- cochlea
- vestibulocochlear nerve (Cranial Nerve VIII)
- internal auditory meatus

15. Finally, examine the real ear ossicles that are embedded in plastic. This gives you an idea of how small these tiny bones are.

**Check Your Understanding**

*Try to answer the following questions without looking at your notes.*

1. The order of the ossicles from lateral to medial is malleus, incus, and stapes. (True, False)
2. Point out the external auditory meatus and the internal auditory meatus.
3. What structure passes through the internal auditory meatus?