INTRODUCTION TO THE SKULL

The skull is certainly one of the most fascinating structures of the entire body. Most of its features support and protect the various parts of the brain, eye, and ear. The close association between soft and hard tissue never fails to amaze— for example, the sella turcica that cradles the pituitary gland, or the cribiform plate, perforated with tiny foramina through which pass the cranial nerves I. (That’s why we have studied the brain first— so that we can appreciate these relationships better.)

We are fortunate to have a number of real human skulls as well as the less delicate plastic models. Please handle all skulls— but especially our irreplaceable real ones— with extra care. Set them down carefully. Use wooden pointers, not pens or pencils, as you point to small areas.

Incidentally, the vocabulary list is not nearly as long as it looks. Instead, most structures appear 2 to 4 times as we examine the skull from all angles. See page 56 for a summary of skull vocabulary.

I. ADULT HUMAN SKULL

A. Superior view of the skull (Fig. 7.2, 7.3, pp. 204-207 [207-208]) Use skull models or real human skulls. Note that the sutures are fibrous joints.

<table>
<thead>
<tr>
<th>Frontal bone</th>
<th>Coronal suture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parietal bone</td>
<td>Sagittal suture</td>
</tr>
<tr>
<td>Occipital bone</td>
<td>Lambdoid suture</td>
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</table>

B. Lateral view of the skull (Fig. 7.4] Use skull models or real human skulls. Use the disarticulated skull to understand the sphenoid bone.

<table>
<thead>
<tr>
<th>Parietal bone</th>
<th>Lacrimal bone</th>
</tr>
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<tbody>
<tr>
<td>Temporal bone</td>
<td>Nasolacrimal canal</td>
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<td>Mandible</td>
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<tr>
<td>Mastoid process</td>
<td>Coronoid process</td>
</tr>
<tr>
<td>Styloid process</td>
<td>Mandibular ramus</td>
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<tr>
<td>Zygomatic arch</td>
<td>Angle of mandible</td>
</tr>
<tr>
<td>Frontal bone</td>
<td>Mandibular condyle</td>
</tr>
<tr>
<td>Nasal bone</td>
<td>Sphenoid bone</td>
</tr>
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</table>
C. Anterior view of the skull (Fig. 7.6)

Supraorbital margin  Body of mandible
Nasal bone  Frontal bone
Zygomatic bone  Sphenoid bone
Nasal septum  Lacrimal bone
Nasal cavity  Middle nasal concha (conk-a)
Maxilla  Inferior nasal concha (plural is conchae (“conk-ee”))
Alveolar processes

D. The mandible (Fig. 7.4, 7.6)

Mandibular condyle  Mental foramen
Coronoid process  Alveolar process
Mandibular ramus  Body of mandible
Angle of mandible

E. Bones of the orbits (Fig. 7.8)

Optic foramen  Frontal bone
Sphenoid bone  Lacrimal bone
Ethmoid bone  Maxilla
Zygomatic bone

F. Floor of the cranial cavity (Fig. 7.11) Also look at the disarticulated skull to understand the sphenoid bone.

Sphenoid bone  Ethmoid bone
Petrous portion of temporal bone  Crista galli
Internal auditory meatus  Cribriform plate
Foramen magnum  Optic foramen
Frontal sinuses  Sella turcica (“tur-sick-a”)
  Jugular foramen
  Occipital bone
G. Inferior view of skull (Fig. 7.12)

- Sphenoid bone
- Jugular foramen
- Occipital condyle
- Foramen magnum
- Hard palate
- Palatine process of maxillary bone
- Palatine bone
- Zygomatic arch
- Styloid process
- Mastoid process
- Mandibular fossa
- Temporal bone
- Occipital bone

H. Bones of the nasal cavity (Fig. 7.9a, b) In addition to the skull models, the half-head models and midsagittally sectioned skull are helpful.

- Frontal bone
- Frontal sinus
- Nasal septum
- Vomer
- Perpendicular plate of ethmoid
- Crista galli
- Cribriform plate
- Sphenoidal sinus
- Sphenoid bone
- Palatine bone
- Palatine process of maxilla
- Superior nasal concha
- Middle nasal concha
- Inferior nasal concha

I. Paranasal sinuses (Fig. 7.10) These are the air spaces of the skull that give resonance to the voice. Study the half-head models, including those of the torso models, and the midsagittally sectioned skull.

- Frontal sinus
- Sphenoidal sinus
- Maxillary sinus

II. THE FETAL SKULL

A. The fontanel (Fig 8.1) After birth these are the baby’s “soft spots.” Here, fibrous connective tissue has not yet been replaced with bone. The name mean “little fountain” because of the pulse felt in them. The fetal skull models are typical of a child of 7-8 months’ gestation. Identify the coronal, sagittal, and lambdoid sutures of the skull on the fetal skull.

- Anterior fontanel
- Posterior fontanel
B. Note that the **frontal bone, maxilla** and **mandible** each forms as two bones which fuse. The **nasal septum** is particularly easy to see in the fetal skull.

III. **HELPFUL TIPS FOR STUDYING THE SKULL**

A. Here are some word meanings that may assist your learning:  
  - **parietal**—wall;  
  - **lambdoid**—shaped like lambda, the Greek L;  
  - **mastoid**—breast-like;  
  - **styloid**—sharp like a stylus;  
  - **lacrimal**—tears;  
  - **coronoid**—crown-like;  
  - **ramus**—branch;  
  - **vomer**—plowshare;  
  - **crista galli**—cock’s comb;  
  - **sella turcica**—Turk’s saddle;  
  - **petrous**—rocklike.

B. The **nasolacrimal canal** is not open on the plastic skulls. On the real human skulls, it is usually easily broken. Try looking for it on the real human skull of the **real articulated skeleton** which is painted red and blue. Put a wooden probe in it and you will see how tears drain from the eye to the nose.

C. Observe the temporomandibular joint. The ________________  
  ________________ of the **mandible** articulates with the  
  ________________  ________________ of the **temporal bone**.

D. Examine the **disarticulated skull** to understand the anatomy of the **sphenoid bone**, as well as other irregularly shaped bones of the skull.

E. See the illustration at the top right of p. 217 [220] to appreciate the anatomy of the delicate **ethmoid bone**.

F. Push two wooden probes through the two **optic foramina**. Can you see how the **optic nerves** criss-cross as they pass through?

G. The **petrous portion of the temporal bone** is the hardest bone of the body. Within it, the organs of hearing and balance are “carved out.” Notice the **internal auditory meatus**. The cranial nerves VIII (hearing and balance) pass through the internal meatuses, carrying messages that the brain will interpret as sound or head movements.

H. The **styloid process** of the temporal bone is the origin of several muscles that move the tongue and larynx.
IV. **SKULL SUMMARY**

Here are the names of all of the bones and bone markings that we will learn on the skull.

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Optional notes on the skull

1. Look at the alveolar processes on some of the real human skulls. If a tooth was lost from wear and tear in the lab, a socket remains. If no socket is found, the tooth was lost during life and bone replaced the socket.

2. For preparation of mummies in ancient Egypt, the brain was removed through the nose. Notice that the cribriform plate of the ethmoid bone, between nasal cavity and cranial cavity, is thin, perforated with holes, and quite delicate.

3. A severe blow to the head can cause swelling of the brain which drives the medulla oblongata through the foramen magnum. Damage caused to the medulla in this way can cause death rapidly.

4. The crista galli serves as the anchor for the dura mater.

5. The nasal cavity is an “air-conditioner” that stirs up the air over the warm, moist mucus membranes that line the nasal conchae.

6. The paranasal sinuses empty via small openings inferior to the nasal conchae. If these do not drain due to infection or inflammation, the fluid pressure can cause a sinus headache.

7. “Brain freeze” from eating ice cream too fast occurs when the sphenoidal sinus is affected by the cold. Observe the half-head model to see how a large swallow of an ice-cold food can affect that sinus.

8. Cleft palate is a congenital defect that occurs when the maxillary and/or palatine bones fail to fuse on the midline early in prenatal development.

9. "Molding" of a baby's head is often observed at birth, particularly if labor is long. The bones of the skull are pushed to overlapping positions as the uterine contractions presses the head against the cervix. The child’s head may have a gnarled appearance, which usually disappears in a few hours or days.

10. The fontanels of a baby's skull can be felt during a vaginal exam during labor and can be used to determine if the child’s head is turned “occiput anterior” (face toward the mother’s sacrum, which is usual), or “occiput posterior” (face toward the mother’s pubic bone, which is less common). Notice that if you realize that “occiput” refers to the occipital bone of the fetus, the terms make sense. The term “posterior” is often used as a short way to say that a fetus is occiput posterior, and birth attendants sometimes say such a child is born “sunny side up,” meaning face up.
IV. MUSCLES OF THE HEAD AND NECK

A. Muscles that act on the head (Fig. 10.6, 10.7, p. 324 [328]) Use the torso models. Perform the actions on yourself as you learn them.

1. Sternocleidomastoid Actions (2): Both flex head; each one turns head to opposite side
   Insertion: Mastoid process

2. Splenius capitis Action: Extends head

3. Trapezius Action: Extends head

B. Muscles of facial expression (Fig. 10.9) Use the half head models, including the half-heads of the torso models. These muscles are unusual in that they insert into the skin, and so move the skin.

1. Occipitofrontalis Action: Elevates eyebrows

2. Orbicularis oculi Action: Closes eye (winking)

3. Zygomaticus major Action: Smiling

4. Buccinator (buck-sin-a-tor) Action: Compresses cheek

5. Orbicularis oris Action: Purses lips

C. Muscles that act on the mandible (Fig. 10.9) Use the half-head models, including the half-heads of the torso models. On yourself, feel these muscles with your fingers as you clench your teeth.

1. Temporalis Insertion: Coronoid process
   Actions (2): Elevates and retracts mandible

2. Masseter Origin: Zygomatic arch
   Action (2): Elevates and protracts mandible
Wrinkles on the face which occur as a part of aging form at right angles to the direction of the fibers of the facial muscles which underlie them. Thus, the vertical fibers of the occipitofrontalis explains the horizontal “washboard” of the forehead. “Crow’s feet” that radiate from the corners of the eyes are at right angles to the fibers of the circular orbicularis oculi. Radial “whistle marks” develop in smokers, who must pucker the circular orbicularis oris to inhale. “Laugh lines” which circle the mouth form in response to contraction of the radiating zygomaticus major muscles.

Notes and Sketches