

# AP1, Lab 4 – The Axial Skeleton

(Consisting of the skull, vertebral column, and thoracic cage.)

Resources:

Images in your text. Bones in the lab.

A Brief Atlas of the Human Body that came with the textbook.

<http://www.gwc.maricopa.edu/class/bio201/skull/skulltt.htm> - website for reference.

## I. BONES AND BONE FEATURES OF THE CRANIUM (the skull)

- A. Learn the following "whole" bones without any features. (text Pg. 205, 206 / 202, 203) or (Pg. 27-43 of Bone Atlas that came with your text)

No description necessary. Just be able to name these bones on sight (in any order):

### Paired Cranial Bones:

- **Parietal** – (Pronounced “pah-RY-eh-tal”) -
- **Temporal** –

### Unpaired Cranial Bones:

- **Occipital** – (“ock-SIP-pih-tal”)
- **Frontal**
- **Sphenoid** (“sss-fen-oid”) - This is an oddly shaped bone. Best view is superior looking down into the anterior floor of the skull. In 8<sup>th</sup> Ed. See pg. 208 and 206. Pg. 202 and 203 show that the sphenoid also forms part of the posterior wall of the orbits and the posterior roof of the mouth.
- **Ethmoid** This one is hard to visualize as well. In 8<sup>th</sup> ed. Pg. 209. Place a finger on the medial surface of each eye orbit. Everything between your fingers is ethmoid bone. Look up into the nasal cavity to see most of the ethmoid. Look in the anterior floor of the cranium to see the top of the ethmoid between the eye orbits. It appears as two shallow grooves with perforations. The neurons for the sense of smell pass through here from the nasal cavity and brain.

### Paired Facial Bones

- **Lacrimal**
- **Nasal**
- **Zygomatic** (“zy-go-MAT-tic”)
- **Maxillae**
- **Palatine**
- **Nasal Conchae**

### Unpaired Facial Bones:

- **Vomer**
- **Mandible**
- **Hyoid**

What are **Sutures** or **suture lines** on the skull?

Look at the infant skull in lab and identify the “soft spot” known as the fontanel. Explain how it came to be and why adults don’t have this feature. \_\_\_\_\_

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**Confirm identification of the above with your instructor.**

**B.** Learn the following generic features found on bones. Don't try to memorize examples yet. You will see many examples on many different bones over the next two weeks. There will be many examples on many different bones.

- **Condyle** – A smooth, usually rounded surface of a bone that articulates with another bone at a joint. On fresh bones it would be covered with smooth articular cartilage.
- **Process** – usually a prominent feature that projects well away from the rest of the bone.
- **Foramen** (pronounced “fo-RAY-men” or “fo-RAH-men”) (**Foramina** is plural)
  - An opening often described as a hole. Usually, it's blood vessels and nerves that pass through foramina. In the coxal bones of the hip muscles pass through the unusually large foramen.
- **Fossa** – a shallow depression on the surface of a bone or bony feature.

From the inside front and back cover of your text learn the prefixes:

- **osteo-**
- **peri-**
- **epi-**
- **chondr-**

**C.** Identify the following features on selected bones. Descriptions may be helpful here.

1. On the **Temporal Bone** (pg. 206, 209 / 203, 207) find:

- **Zygomatic process** [palpate (feel) this on yourself] –
- **Mastoid process** (palpate this on yourself – just posterior to acoustic meatus)
- **Mandibular fossa-** (p. 207 / 209, 212) (What bone fits here?)

2. On the **Occipital Bone** find: p. 202-205 / 205-208

- **Occipital condyles**  
With what feature of which bone do these articulate? \_\_\_\_\_  
(Hint: You will be able to answer this question after your study of the vertebral column.)
- **Foramen magnum** p.206  
What structure passes through here? \_\_\_\_\_

3. **Sphenoid** (“sss-fen-oid”) – Description on first page.

On the **sphenoid bone** (pg. 208 8<sup>th</sup> ed.) find:

- **Optic Canals. What passes through these canals?** \_\_\_\_\_
- **Superior Orbital Fissure (long slit). What passes through this?**  
\_\_\_\_\_
- **What structure is nestled in the hypophyseal fossa?** \_\_\_\_\_

4. **Ethmoid** – Described on first page.

On the Ethmoid bone (pg. 209 8<sup>th</sup> Ed.) find **orbital plates** and **nasal conchae**.

5. On the **Mandible** bone find: p. 206, 212 / 202, 203

- **Mandibular condyles (2)**
- **Mandibular Angle (2)** (palpate this on yourself)
- **Mandibular foramina(2)** and **mental foramina (2)**

What structures pass through these foramina? \_\_\_\_\_

How does a dentist use this knowledge? \_\_\_\_\_

What drug is most often used? \_\_\_\_\_

How does this drug prevent pain? \_\_\_\_\_

OYO – Not in Text: In cases of severe head trauma, some patients experience a “**basilar skull fracture**”.

What bones might be fractured? \_\_\_\_\_

\_\_\_\_\_

**Confirm identification of all of section C with your instructor.**

## II. BONES AND FEATURES OF THE VERTEBRAL COLUMN

Identify the following on the

- 1) real vertebral columns at your table,
- 2) vertebral column model,
- 3) a full hanging skeleton.

A. Identify the following **curvatures** and the number of **vertebrae** per curvature. p. 217

(Remember meal times!! 7, 12, and 5)

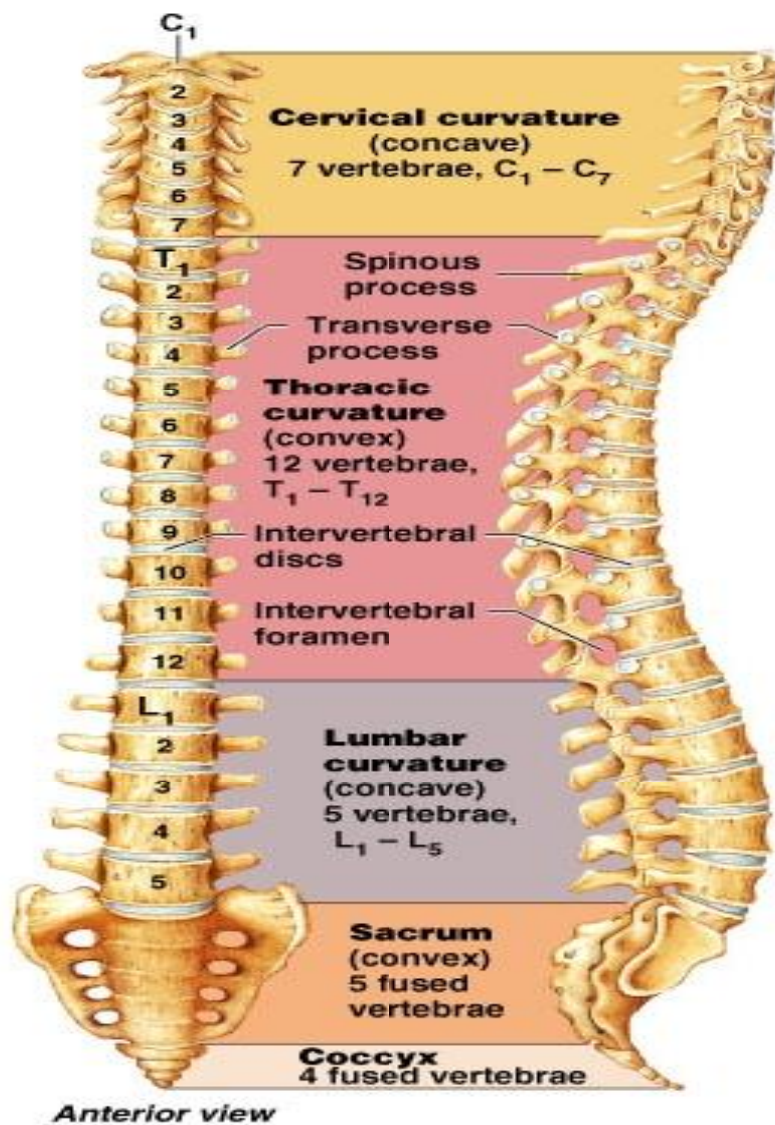
**CERVICAL CURVATURE** \_\_\_\_\_ **THORACIC CURVATURE** \_\_\_\_\_ **LUMBAR CURVATURE** \_\_\_\_\_  
**Sacral** \_\_\_\_\_ **Coccygeal** \_\_\_\_\_

Put a finger on C7, T1, T12, and L4.

Why are the lumbar vertebrae more massive than cervical and thoracic?

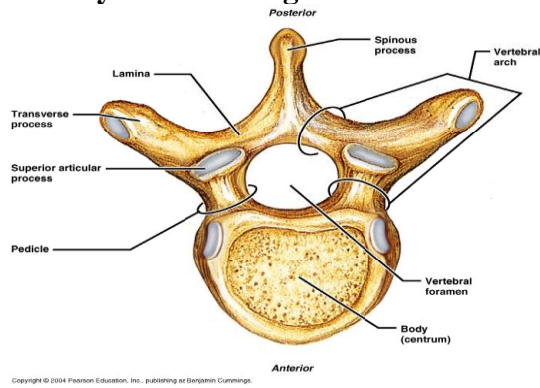
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Identify the following on some individual vertebrae. p. 221-222 / 219-220



**B.** Identify the following generic features on several individual **vertebrae** from different **curvatures**. p. 221-222 / 219-221. Most vertebrae have these features in common. Notice how the shapes of these features vary considerably in the different curvatures.

The thickest, heaviest portion is the **centrum** (or body). Except for the centrum, the circle of bone surrounding the **vertebral foramen** is the **vertebral arch**. It consists of 2 **pedicles** and 2 **lamina** supporting a total of 7 **processes**. On the **vertebral arch** identify:

- **2 Pedicles**
- **2 Lamina**
- **2 Transverse processes**
- **1 Spinous process**
- **1 Vertebral foramen** (pronounced “VER-teh-bral”) What passes through here?
- **2 Superior and 2 inferior articular processes**

The **centrums** of adjacent vertebrae do not contact each other because they are separated by **intervertebral disks**. The only places where adjacent vertebrae contact each other is where the **superior articular processes** of one vertebra touch the **inferior processes** of the vertebra above (and vice versa.) **Look at the articular processes on vertebrae from each of the three curvatures. They will look very differently.**

- Describe the disorder **Spina Bifida** (P. 483-484 / 477-478): What is missing from the vertebral column, and in what curvature? What is the cause of most cases?

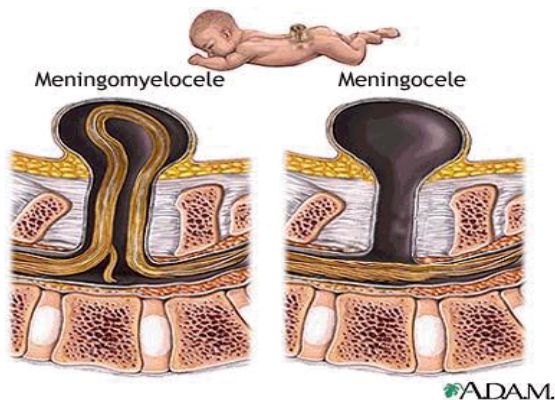
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**Confirm accuracy with the instructor**

C. Among the cervical vertebrae, identify:

- **Atlas and Axis** (C1 and C2) p. 220
- **Dens** (or odontoid process) on the axis. Only C2 has this feature.
- **Transverse Foramina.** Only cervical vertebrae have these features.

What passes through the transverse foramina? \_\_\_\_\_

D. Identify also the:

- **Sacrum** (pronounced “sac-crum”) p. 217 & 221
- **Coccyx** (pronounced “KOK-six”) p. 217 & 221

E. What is **Scoliosis**? p. 217, 243 \_\_\_\_\_

F. On the hanging spinal column model ID the pads of cartilage called **intervertebral disks** made of **fibrocartilage**.

What are the 2 main components of an intervertebral disc? p. 220 / 217-218  
\_\_\_\_\_ and \_\_\_\_\_

On the model one disk is **herniated** – What might be some causes of this? p. 220 / 218  
\_\_\_\_\_

Also notice the 31 pairs of:

- **Spinal Nerves.**

Can you see how they might easily be compressed or “pinched” by a herniated disc or surrounding bony structures?

H. The **thoracic cage** p. 226 / 224

Identify the following on one of the hanging skeletons.

- **Sternum**
- **Manubrium**
- **Sternal angle**
- **Body**
- **Xiphoid process** (pronounced “ZIF-foid”)

Clinical significance of **sternal angle**? \_\_\_\_\_

Significance of **xiphoid process** in CPR? (not in text) \_\_\_\_\_

How many pairs of ribs are there? \_\_\_\_\_

What is meant by the term **true** or **Vertebrosteral ribs**? pg. 224 \_\_\_\_\_

I. OYO - Whiplash **Injuries**- Go online and identify at least four distinctly different structures or tissues that may be injured as a result of whiplash. Whiplash involves severe hyperflexion and hyperextension of the cervical vertebrae. Identify 4 structures or tissues that might be bruised, pinched, torn, or broken.

- 1.
- 2.
- 3.
- 4.

**Confirm accuracy with the instructor**

### **III. Microscopic Anatomy of Bone**

Your instructor will guide you through a series of bone tissue images. Comparable images are available in your text p. 180-183 / 176-182 as well as on your instructor's web page.

#### **Distinguish:**

- **Compact bone**
  
  
  
  
  
  
  
  
  
  
- **Cancellous bone (a.k.a. spongy bone, a.k.a. trabecular bone)**

On images of **compact bone** identify and discuss the functions of:

- **Haversian systems (a.k.a. Osteons)**
  
  
  
  
  
  
  
  
  
  
- **Haversian canals containing blood vessels.**
  
  
  
  
  
  
  
  
  
  
- **Lamellae (plural of lamella)**
  
  
  
  
  
  
  
  
  
  
- **Lacunae (plural of lacuna)**
  
  
  
  
  
  
  
  
  
  
- **Osteocytes**
  
  
  
  
  
  
  
  
  
  
- **Canaliculi**
  
  
  
  
  
  
  
  
  
  
- **Intercellular Matrix**

On images of **cancellous bone** identify:

- **Trabeculae**