



**Ch 6: Bones & Skeletal Tissue**  
**Ch 7: Skeletal System**

**TEST DATE:**  
**Nov 16&17**

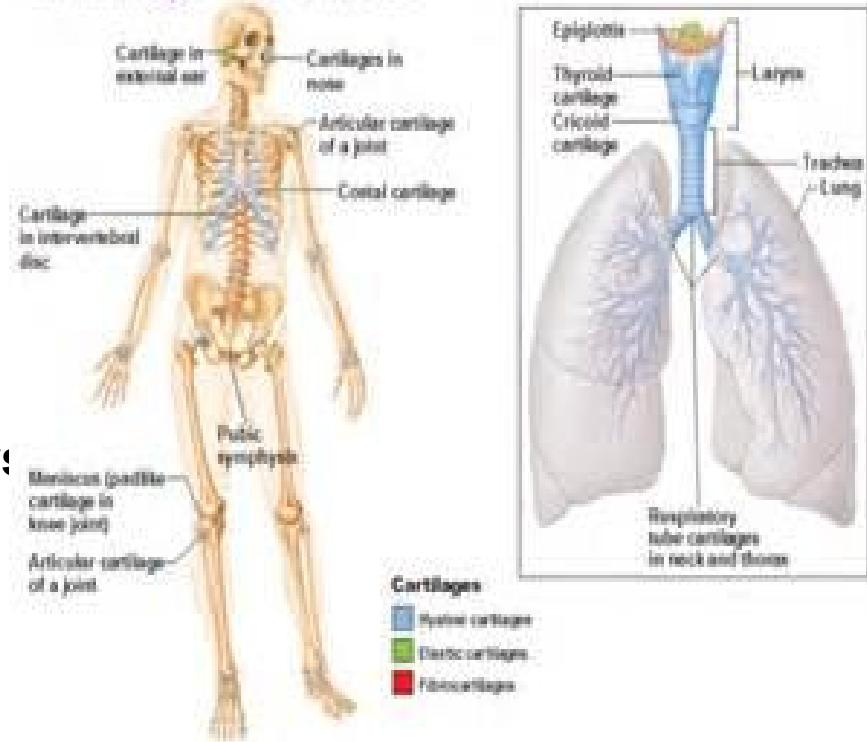
# 1st of 3 Types of skeletal cartilage

## Hyaline: most abundant

1. Articular: cover ends of most bones at moveable joints
2. Costal: connect ribs to sternum
3. Respiratory: forms larynx (voicebox) & reinforces other resp. passageway:
4. Nasal: support external nose

Pp. 173-174

### Cartilage - Locations



## 2nd of 3 Types of skeletal cartilage

**Elastic:** found in the **e**ar and the **e**piglottis (flap that bends to cover the opening of the larynx each time we swallow)

Pg. 173



## 3rd of 3 Types of skeletal cartilage

**Fibrocartilage:** highly compressible; found in knees and discs between the vertebrae

Pg. 173



personality  
begins  
where comparison  
ends

- karl lagerfeld

# Classification of Bones, pg. 174

206 bones in adults

Two groups:

1. Axial- skull, vertebrae & rib cage
2. Appendicular- shoulder, arms, hip and legs

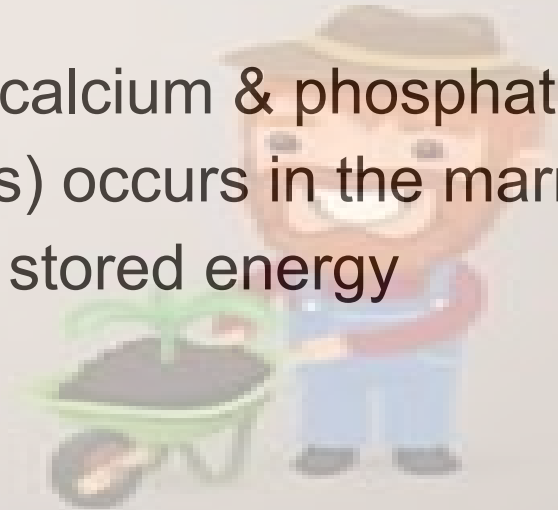
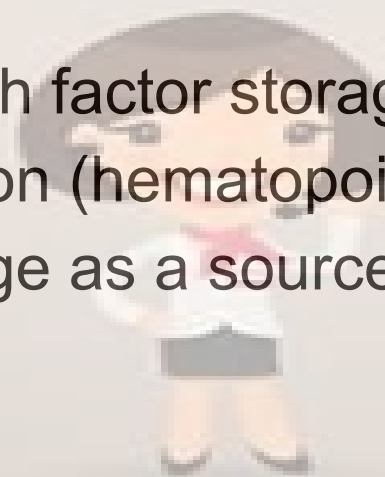
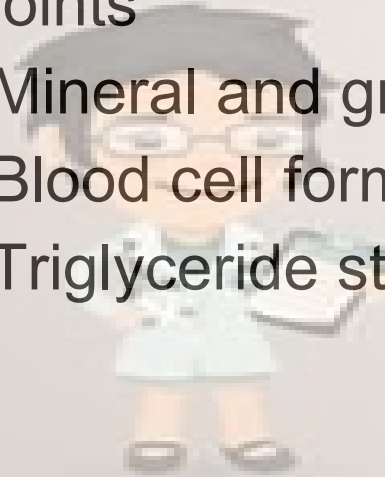
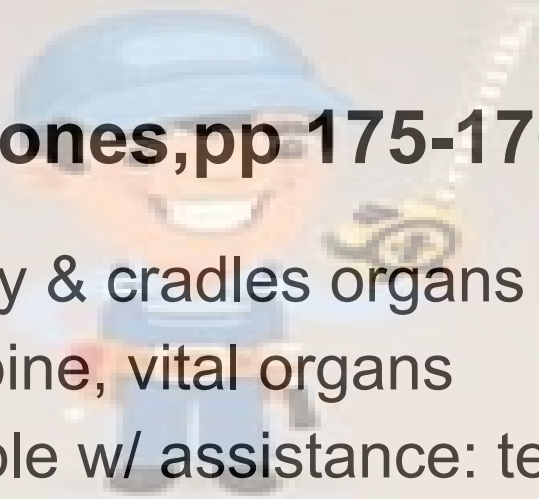
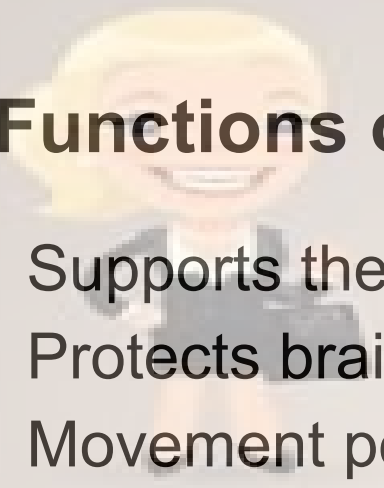


# Bone Shapes, fig 6.2: pp 174-175



## 6 Functions of Bones, pp 175-176

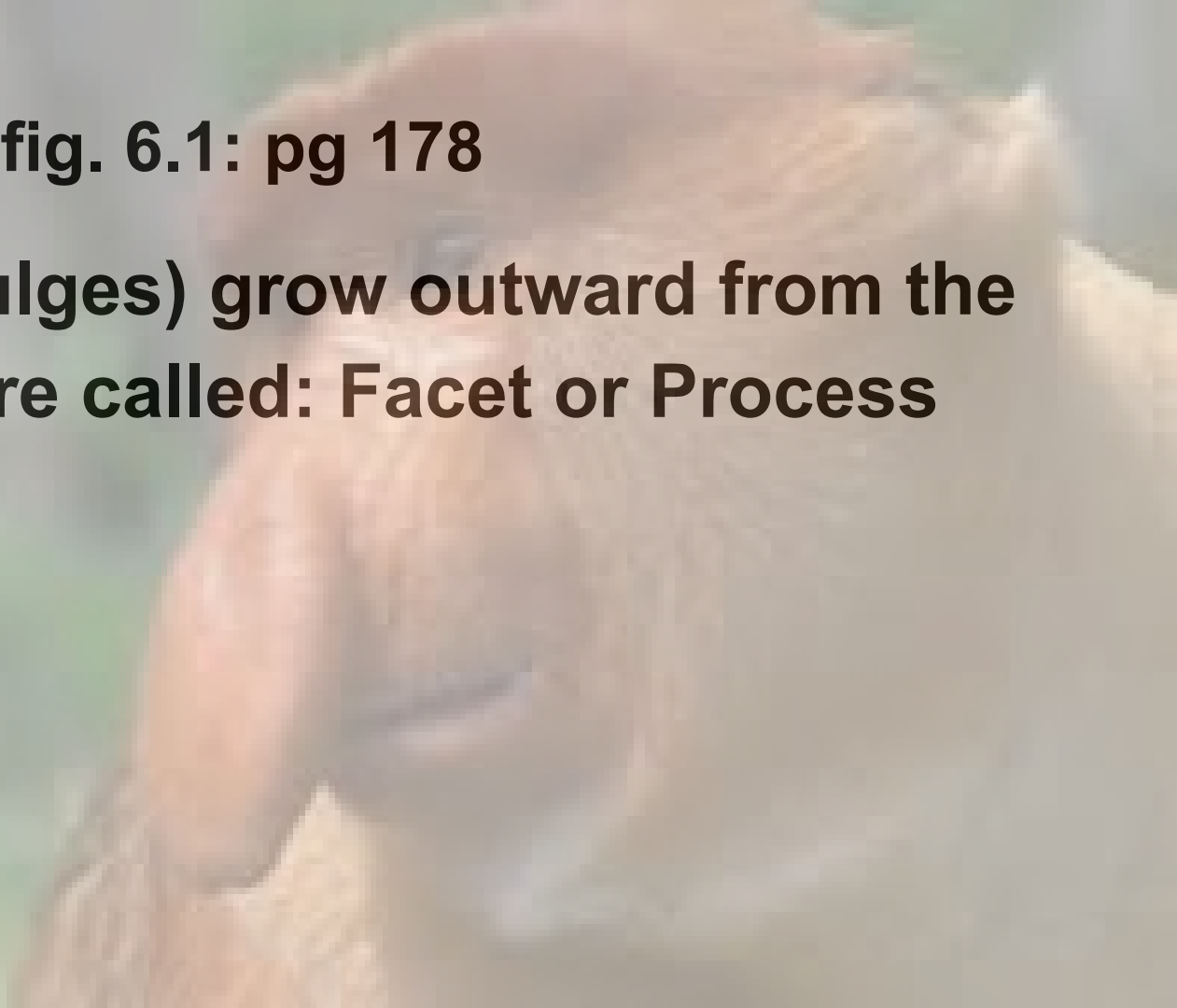
1. Supports the body & cradles organs
2. Protects brain, spine, vital organs
3. Movement possible w/ assistance: tendons, muscles, joints
4. Mineral and growth factor storage: calcium & phosphate
5. Blood cell formation (hematopoiesis) occurs in the marrow
6. Triglyceride storage as a source of stored energy





**Bone Markings, fig. 6.1: pg 178**

**Projections (Bulges) grow outward from the bone surface are called: Facet or Process**



**Bone Markings, fig. 6.1: pg 178**

**Depressions (Openings) can be indentions/pathways for vessels called:  
Fossae, Sinuses, Foramina**

**Bone Texture, fig. 6.3: pp176-177**

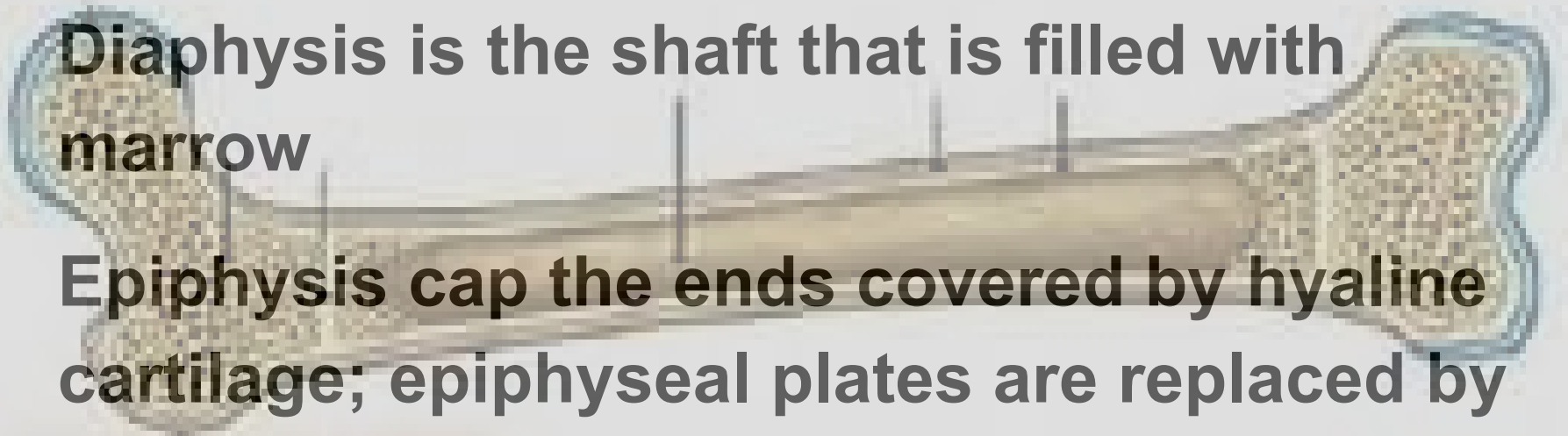
**Compact: dense, smooth external layer**

**Spongy: (cancellous) marrow fills the spaces in a honeycomb structure called trabeculae preventing fractures/stress on the bone**

## **Anatomy of a Long Bone, pp 176-177**

**Diaphysis is the shaft that is filled with marrow**

**Epiphysis cap the ends covered by hyaline cartilage; epiphyseal plates are replaced by epiphyseal lines present in adults.**



**COVERINGS contain osteoblasts & osteoclasts**

**Periosteum is the white covering that is vascular and attaches Sharpey's fibers to compact bone.**

**Endosteum covers the trabeculae**

# Hematopoietic Tissue

**\*Marrow fills spongy bone**

**2 types of marrow:**

**\*Red marrow**

**\*infants all bones, incl. diaphysis**

**\* adults: irregular, short, flat, ends of the femur and humerus**

**\*anemic people can have the red marrow revert from yellow**

**\*Yellow marrow**

**\* diaphysis of adults**



A microscopic image of bone tissue, showing a complex network of fibers and cells. The image is overlaid with a semi-transparent purple filter. The text is positioned on the left side of the image.

## **4 major cell types in bone tissue, pg 179**

**Osteogenic cells- mitotic cells found in periosteum & endosteum**

**Osteoblast- bone forming cells (osteoid)**

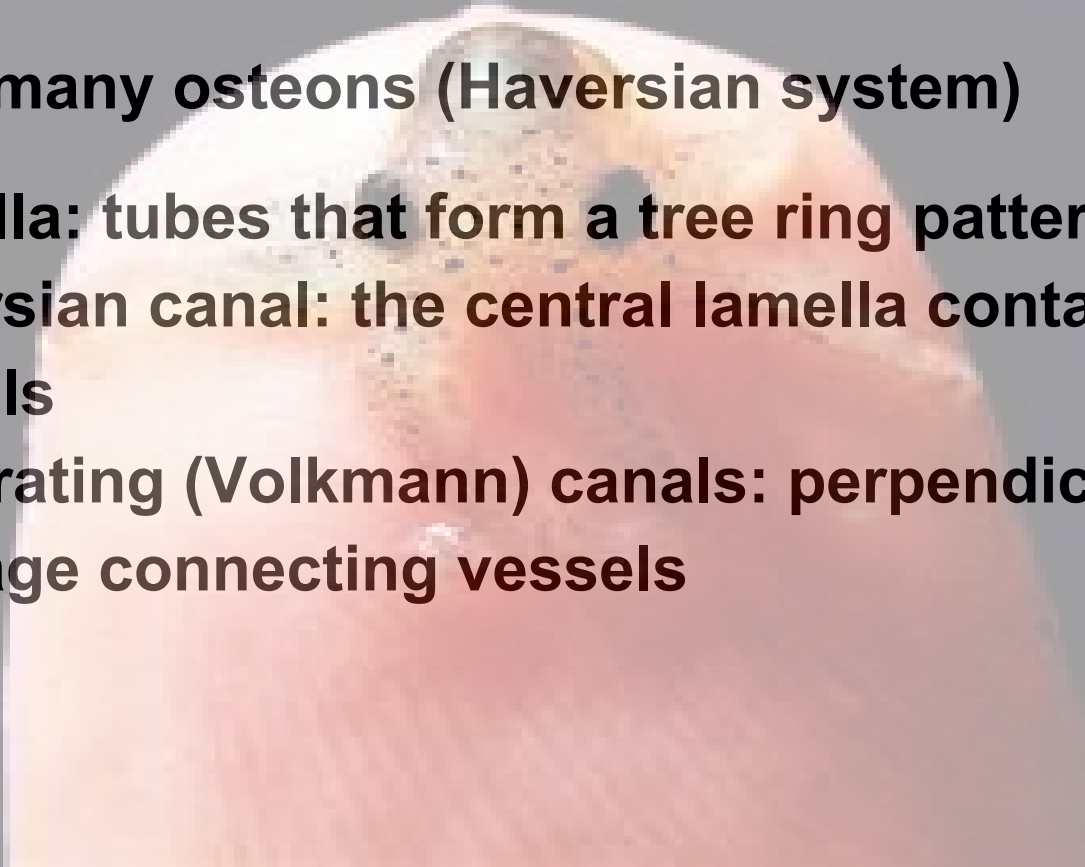
**Osteocyte- distributes nutrients & waste**

**Osteoclast- bone destroying cells**

# Anatomy of Compact Bone, pp. 179-180

Made up of many osteons (Haversian system)

- **Lamella:** tubes that form a tree ring pattern
- **Haversian canal:** the central lamella containing vessels
- **Perforating (Volkmann) canals:** perpendicular passage connecting vessels





# **Anatomy of Compact Bone, pg 180**

**Osteocytes: fills lacunae (pores) connecting many osteons with canaliculi (canals)**

**Physiology:**

- a. Passageway for nutrients & waste**
- b. Maintains bone matrix**
- c. Receptors for bone deformation**



## Chemical Composition of Bone, pg 180

- Made up of 35% organic and 65% inorganic parts
  - Organic: osteocytes, osteoclasts, osteoblast
    - Physiology: give flexibility and tensile strength
  - Inorganic: hydroxyapatites (mineral salts) & calcium phosphates
    - Allows bone to exist after death

# Bone Development, pp 182-185

- **Ossification/Osteogenesis:** process of bone formation we go through twice:
  - **Embryos:** formation of bony skeleton
  - **Post natal:** bone growth



## **Formation of Bony Skeleton, pp182**

- **<8 weeks: INTRAMEMBRANOUS OSSIFICATION**  
**(skeleton is formed from fibrous membranes and hyaline cartilage)**
- **At this stage, bone is called MEMBRANE BONE**
- **BENEFIT: mitosis can easily occur**

# Postnatal Bone Growth, pp 184-188

- Long bones grow in infancy & youth
- Most bones stop growing during adolescence
- Some facial bones: nose and lower jaw grow throughout life



# How hormones regulate bone growth, pg 185

- Growth hormone is released by pituitary glands
- Thyroid hormones regulate the gh to form proper proportions
- Sex hormones promote growth spurt, influencing the skeleton
- Hormones close the epiphyseal plates, ending long bone growth



# Bone Homeostasis

## Remodel: balancing deposit:resorption

- occurs at the surface of periosteum and surface of endosteum
- Bone Deposit: calcium & phosphate are added where the bone is injured or added strength is needed
- Bone Resorption: osteoclasts break down bone matrix

# How is bone remodeling controlled?

**Two ways:**

- 1. Hormonal**
- 2. Mechanical stress**





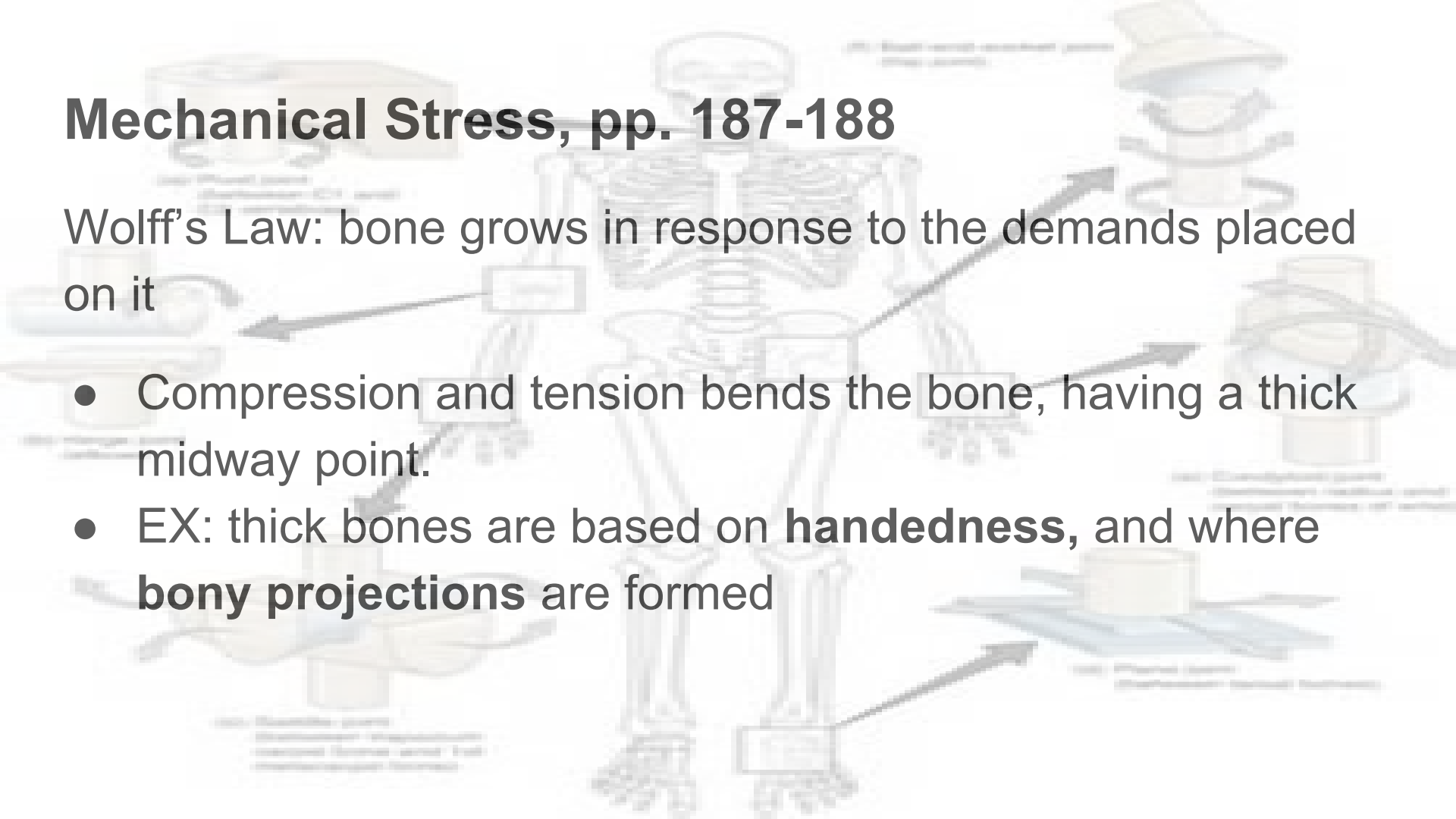
## Hormonal Control, pg. 186

1. **PTH** (parathyroid hormone) is stimulated when calcium in blood declines.
2. Osteoclasts resorb bone to add in calcium to blood
3. PTH stops secreting when the calcium levels are leveled.

# Mechanical Stress, pp. 187-188

Wolff's Law: bone grows in response to the demands placed on it

- Compression and tension bends the bone, having a thick midway point.
- EX: thick bones are based on **handedness**, and where **bony projections** are formed



# Bone Homeostasis: Bone Repair, pp 188-189

## 4 stages:

1. Blood vessels in bone tear and hemorrhage (hematoma) forming a blood clot
2. In a few days, phagocytes clean the area fibroblasts & osteoblasts reconstruct bone
3. In a week, new trabeculae form and completes in 2 mo.
4. Bone remodeling occurs for 2 mo.

## **6 Common Fractures, Table 6.2, pg. 190**


- 1. Comminuted: >3 bone pieces in brittle bones of old people**
- 2. Compression: crushed from a fall**
- 3. Spiral: excessive twisting in a sport injury**
- 4. Epiphyseal: epiphysis breaks from diaphysis**
- 5. Depressed: bone smashes in**
- 6. Greenstick: incomplete break, hairline**

# Osteoporosis, pg. 191

- Bone resorption not balanced with bone deposit, resulting in porous and light bones
- Compression fractures in the spine and broken hips are common injuries
- People at risk:
  - Estrogen maintains healthy bone density → postmenopausal women are at risk
  - Petite bodied people
  - Inactive &/or immobile people (atrophy)
  - Diet lacking in calcium and protein
  - Low PTH
- Treatment: calcium & vita D supplements, weight training, prescriptions, drink fluoridated water, stay away from carbonated drinks

## **Paget's Disease, pg. 191**

- **Pagetic bone (Excessive bone deposit and resorption, forming high ratio of spongy to compact bone) fills the marrow and has areas of unequal thickness**
- **Osteoclast minimize, osteoblasts continue to work**



# Ch. 7

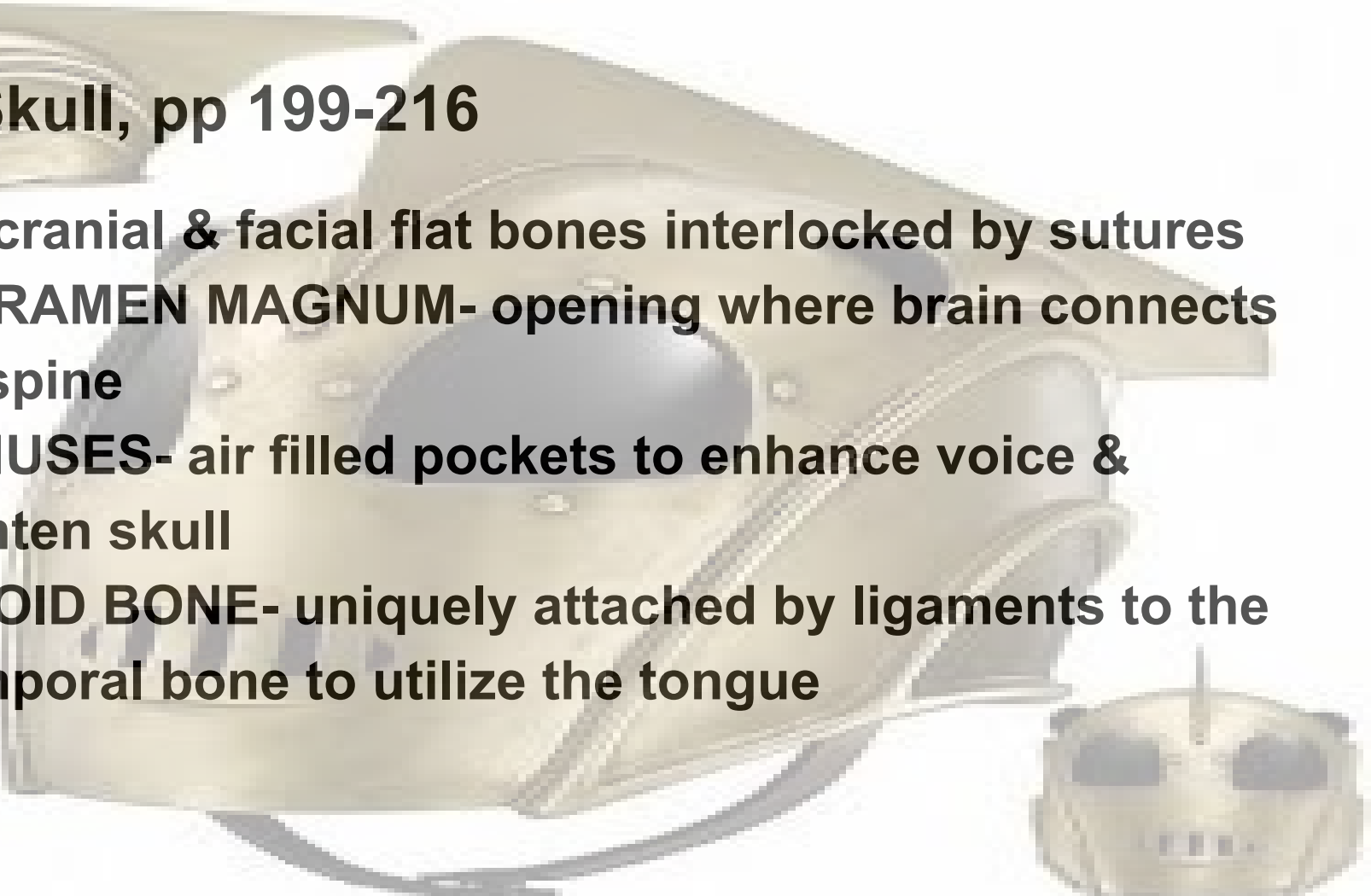
## The Skeleton

Axial Skeleton, pp 200-225

Appendicular Skeleton, pp 225-242

## **The Skull, pp 199-216**

- **22 cranial & facial flat bones interlocked by sutures**
- **FORAMEN MAGNUM-** opening where brain connects to spine
- **SINUSES-** air filled pockets to enhance voice & lighten skull
- **HYOID BONE-** uniquely attached by ligaments to the temporal bone to utilize the tongue





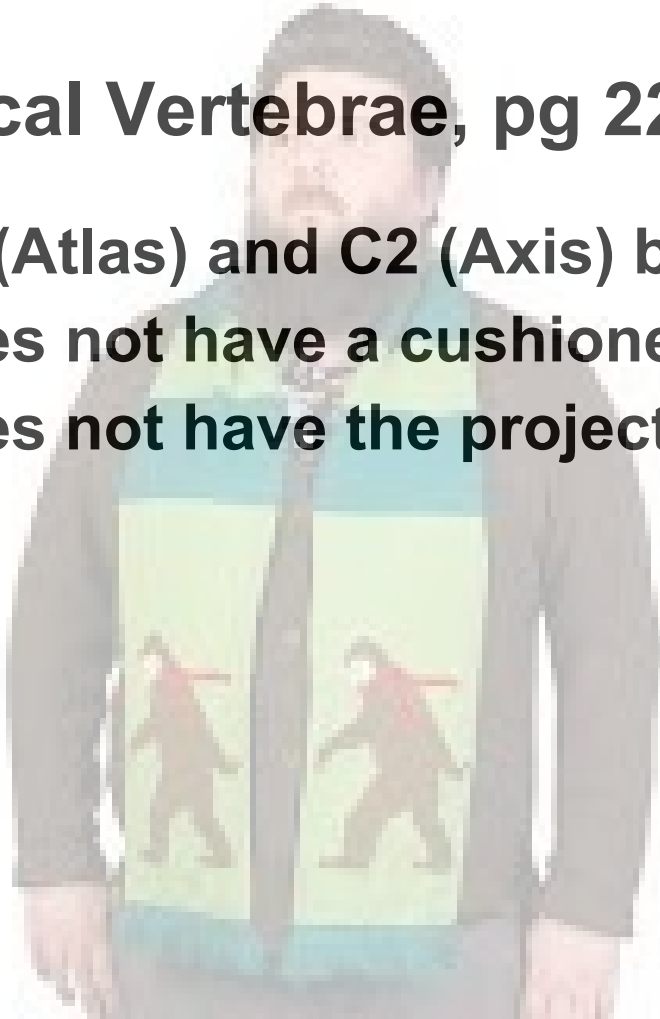
# The Vertebral Column, pp. 216-221

- 26 irregular bones
- 5 major regions
  - C1-7: (cervical)
  - T1-12: (thoracic)
  - L1-5: (lumbar)
  - Sacrum: 5 fused
  - Coccyx: 4 fused tailbone
- **LIGAMENTS:** prevent the spine from hyperflex/tension



## Cervical Vertebrae, pg 220, fig 7.19

- C1 (Atlas) and C2 (Axis) both support the head
- Does not have a cushioned disc in between
- Does not have the projections like the others



## Thoracic Cage, pp223-225, fig 7.22-7.23

- **Known as the bony thorax**
- **Consists of: sternum, ribs and costal cartilage**
- **Sternum: (breastbone) 6 inches long, in 3 fused bones: : manubrium, body and xiphoid process**
  - **Manubrium articulates with clavicle & rib 1- 2**
  - **Body articulates with costal cartilage of ribs 2-7**
  - **XIPHOID PROCESS forms inferior end, ossifies until age 40; attaches to major muscles**

## Thoracic Cage, pp223-225, fig 7.22-7.23

- **Ribs: 12 pairs attached posteriorly to thoracic vertebrae & curve toward anterior body surface**
- **1-7: TRUE RIBS attach to sternum via costal cartilage**
- **8-10: FALSE RIBS attach to rib 7 and the rest attach to each other**
- **11-12: FLOATING RIBS does not attach anteriorly**

## **The Pectoral Girdle, pp 225-228, fig. 7.24-7.25**

- **Shoulder girdle consists of**
  - **Clavicle articulates to manubrium and braces the scapulae to move arms laterally**
  - **Scapula anchors biceps, helps lower/lift arm**

## Upper Limb, pp 228-233, fig 7.26-7.28

- **Arm: shoulder to elbow supported by the humerus**
- **Forearm: humerus articulates radius and ulna (elbow)**
- **Hand: carpal has short bones & metacarpal made of small, long bones**
- **Phalanges: 14 bones**
  - **Thumb**
  - **Fingers 2-5**

## **Pelvic Girdle, pp 233-237, fig. 7.29-7.30**

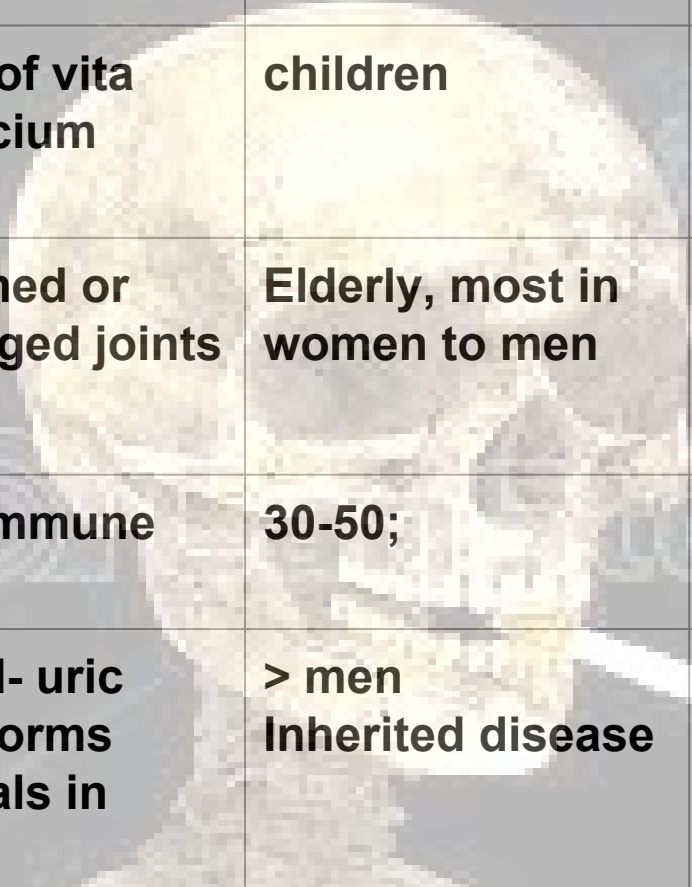
- **Attaches lower limbs to axial skeleton using ligaments**
- **Thighs get closer to knees for balance**
- **A pair of COXAL bones made of 3 bones, fused as adults**
  - **Ilium**
  - **Pubic**
  - **Ishium**



## Lower Limbs, pp 237-241, figs. 7.31-7.34

- **Thigh: between hip & knee supported by femur**
- **Patella: triangular bone articulates with femur**
- **Leg: between knee and ankle made by tibia (weight bearing) and fibula**
- **Foot (PEEDAL) includes the arch: combo of foot bones, ligaments, tendons. Distributes half of our standing/walking weight evenly to the foot**





<b>Disease</b>	<b>Cause</b>	<b>Affects:</b>	<b>Symptoms</b>
<b>Rickets</b>	<b>Lack of vita D/calcium</b>	<b>children</b>	<b>Bowed legs Deformed pelvis Epiphyses are wide</b>
<b>osteoarthritis</b>	<b>Inflamed or damaged joints</b>	<b>Elderly, most in women to men</b>	<b>‘Wear and tear’ articular cartilage breaks down</b>
<b>Rheumatoid arth</b>	<b>autoimmune</b>	<b>30-50;</b>	<b>Joints are stiff and tender</b>
<b>Gouty arth</b>	<b>Blood- uric acid forms crystals in joints</b>	<b>&gt; men Inherited disease</b>	<b>Epiphyses fuse and immobilize joint</b>