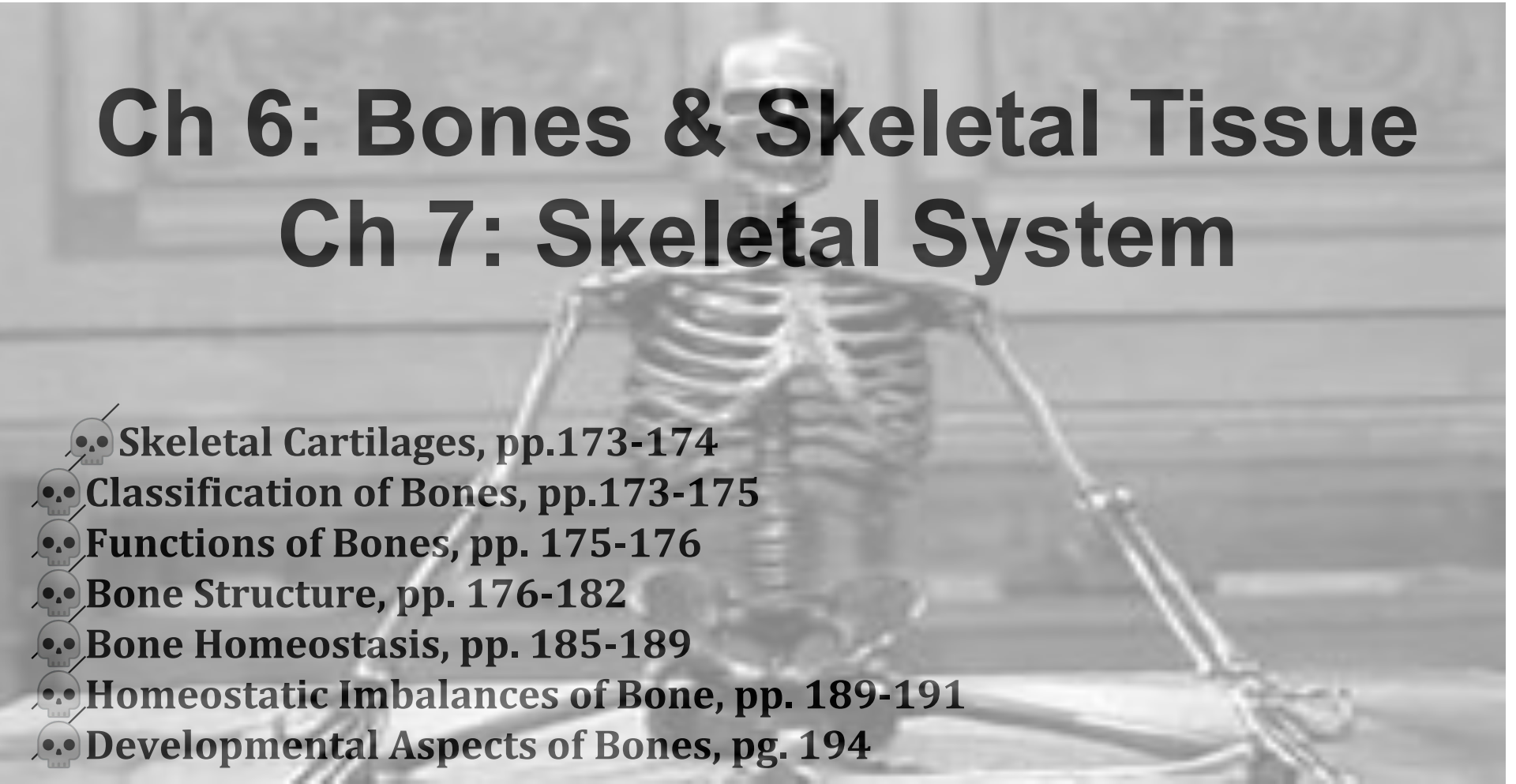
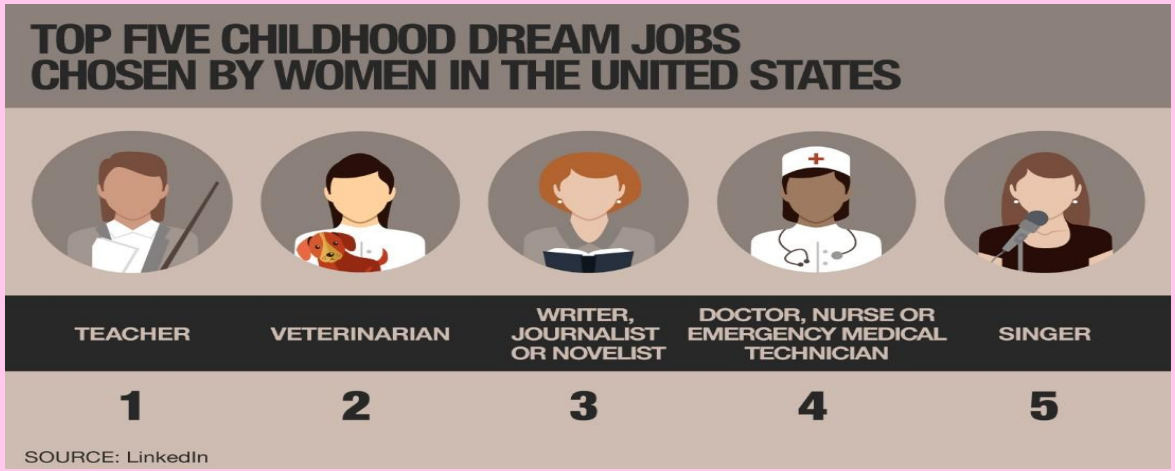
Ch 6: Bones & Skeletal Tissue
Ch 7: Skeletal System



- Skeletal Cartilages, pp.173-174
- Classification of Bones, pp.173-175
- Functions of Bones, pp. 175-176
- Bone Structure, pp. 176-182
- Bone Homeostasis, pp. 185-189
- Homeostatic Imbalances of Bone, pp. 189-191
- Developmental Aspects of Bones, pg. 194

6 Functions of Bones,pp 175-176

1. **Supports** the body & cradles organs
2. **Protects** brain, spine, vital organs
3. **Move**ment possible w/ assistance: tendons, muscles, joints

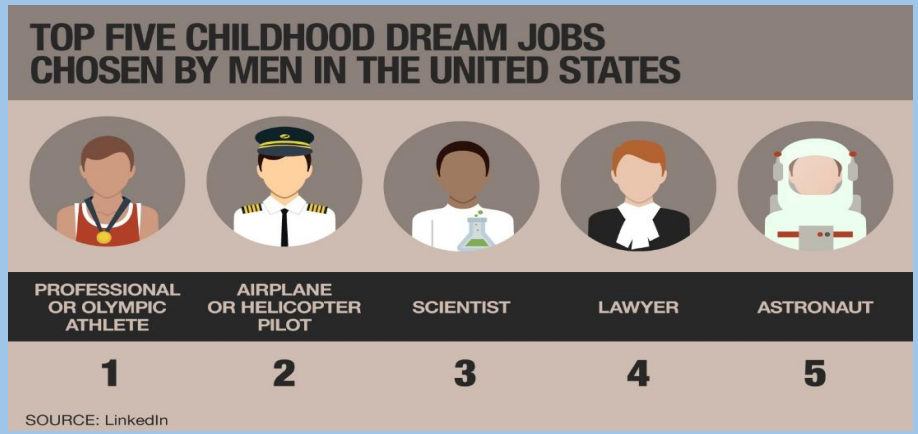


6 Functions of Bones,pp 175-176

4. Mineral and **growth** factor storage: calcium & phosphate

5. **Blood cell form**ation **(hematopoiesis)** occurs in the marrow

6. Triglyceride **(fat) storage** as a source of stored energy



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. passageways
4. Nasal: support external nose

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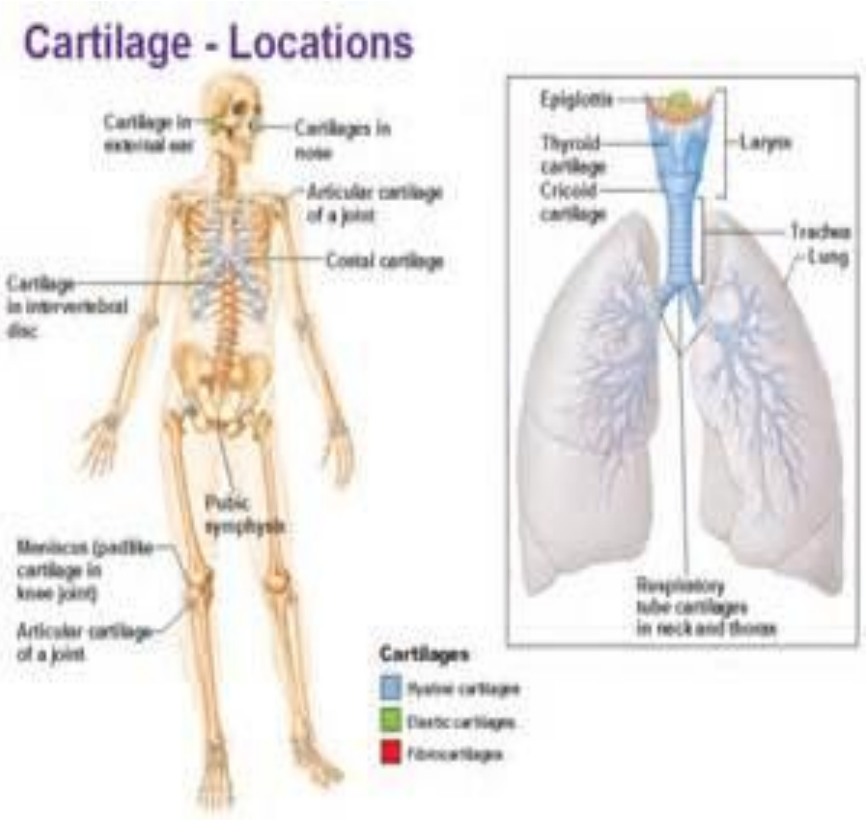
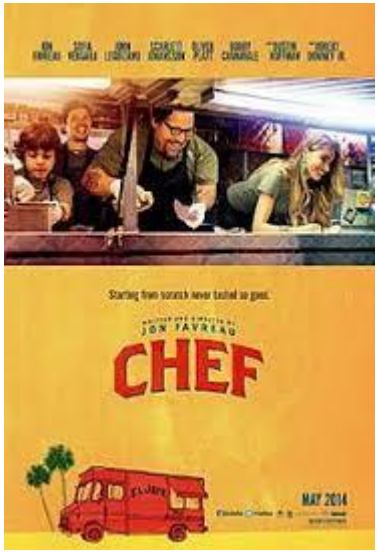


2nd of 3 Types of skeletal cartilage

Elastic: found in the ear and the epiglottis (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

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Classification of Bones, pg. 174

206 bones in adults

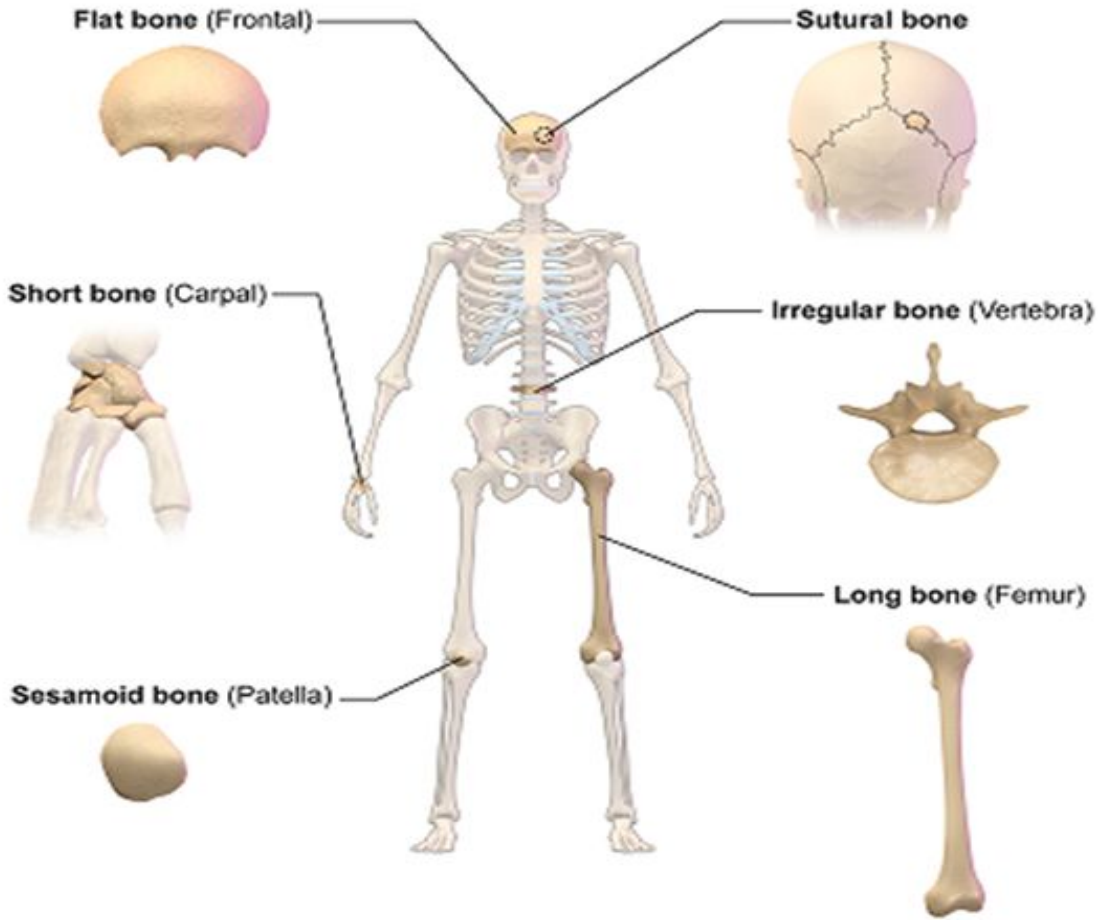
Two groups:

1. **Axial(80)- skull (28), vertebrae(26) & rib cage(26)**
2. **Appendicular (126)- shoulder/arms (32x2), hip/legs (31x2)**

Bone Types

By shape:

- Long bones
- Short bones
- Flat bones
- Sesamoid bones
- Irregular bones



Classification of Bones by Shape

LONG BONES MAKE UP THE APPENDICULAR SKELETON

- ★ **Physiology**
  - **Support weight**
  - **Facilitate movement**

SHORT BONES PROVIDE STABILITY & SOME MOVEMENT

- ★ **Found in the appendicular skeleton**
  - **Carpal**
  - **Tarsal**

FLAT BONES PROTECT INTERNAL ORGANS

Internal Organs

- ★ **Brain**
- ★ **Heart**
- ★ **Lungs**

SESAMOID BONES ARE EMBEDDED IN TENDONS

- ★ Found in appendicular skeleton
  - Pedal
  - Manus
  - Patellar
- ★ Protects tendons from wear & tear (tendons connect muscle to bone)

IRREGULAR BONES PROTECT THE AXIAL & APPENDICULAR SKELETON

- ★ Skull
- ★ Spine
- ★ Pelvic girdle

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

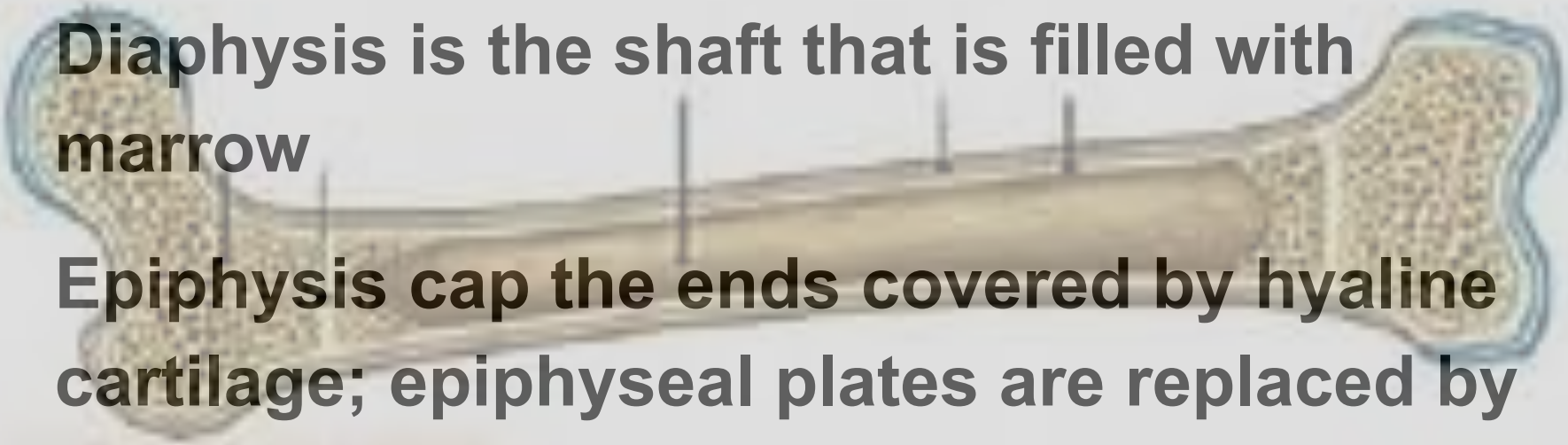
Depressions (Openings) can be indentions/pathways for vessels called: Fossae, Sinuses, Foramina

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.

BONE COVERINGS

1. *Periosteum* = the white outer covering that is vascular and is attached by Sharpey's fibers

2. *Endosteum* = covers the inner part of bone (trabeculae)

Hematopoietic Tissue

*Marrow fills **spongy bone**

2 types of marrow:

a. **RED**
b. **YELLOW**

Red marrow

Infants	All bones
Adults	Irregular, short, flat, epiphysis
Anemic	Red marrow reverts from yellow

Yellow marrow

Adult	**Diaphysis (shaft) and most of epiphysis - femur, humerus**

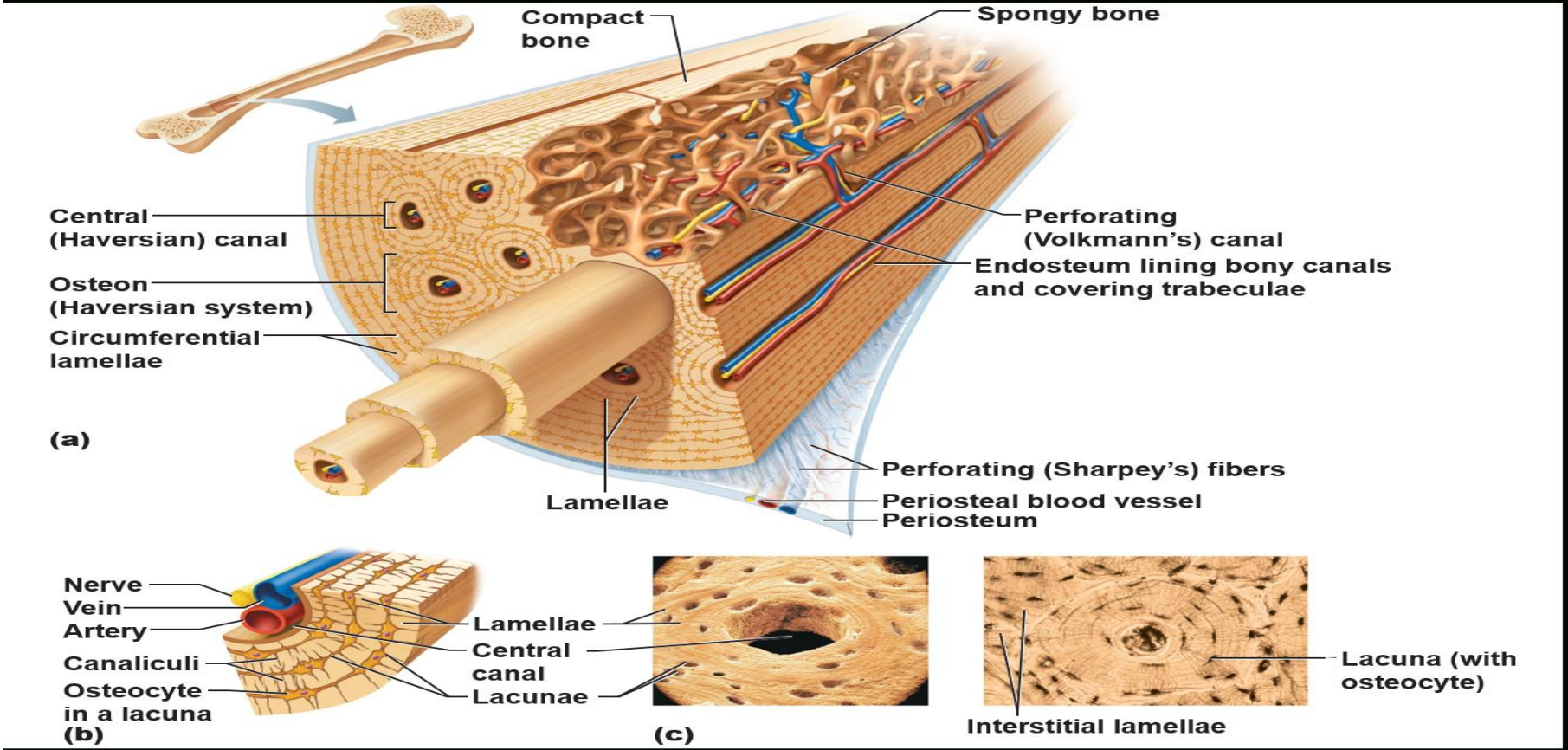
Anatomy of Compact Bone, pg 180

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

Physiology:

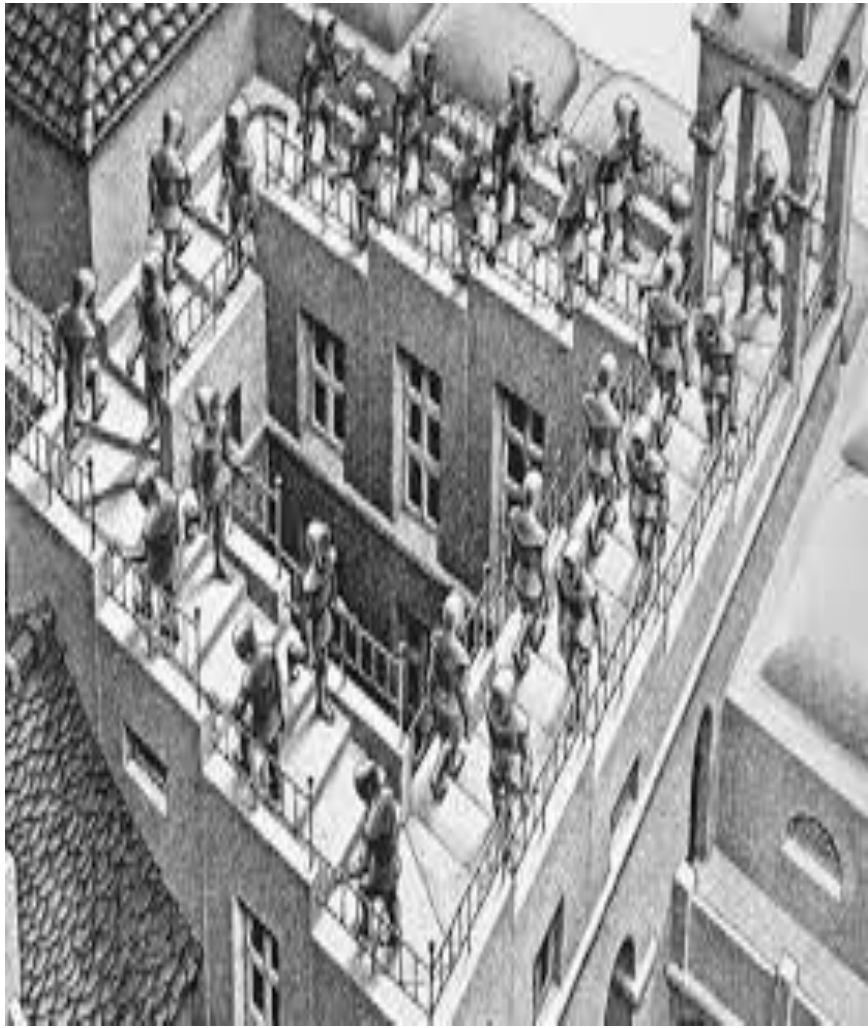
a. **Contains nutrients & waste**
b. **Maintains bone matrix**
c. **Receptors for bone deformation**

Anatomy of Compact Bone, p.181



Anatomy of Compact Bone

1. Vessels/Nerves
2. Central (Haversian) Canal
3. Lamella
4. Canaliculus
5. Lacuna
6. Osteocyte
7. Osteon (Haversian system)
8. Perforating (Volkmann's) Canal
9. Circumferential lamellae
10. Sharpey's fiber
11. Periosteal Vessels/Nerves
12. Periosteum



4 major cell types in osseous tissue, pg 179

Osteogenic cells- mitotic cells found in periosteum & endosteum

Osteoblast- bone forming cells (osteoid)

Osteocyte- distributes nutrients & waste

Osteoclast- bone destroying cells

Chemical Composition of Bone, pg 180

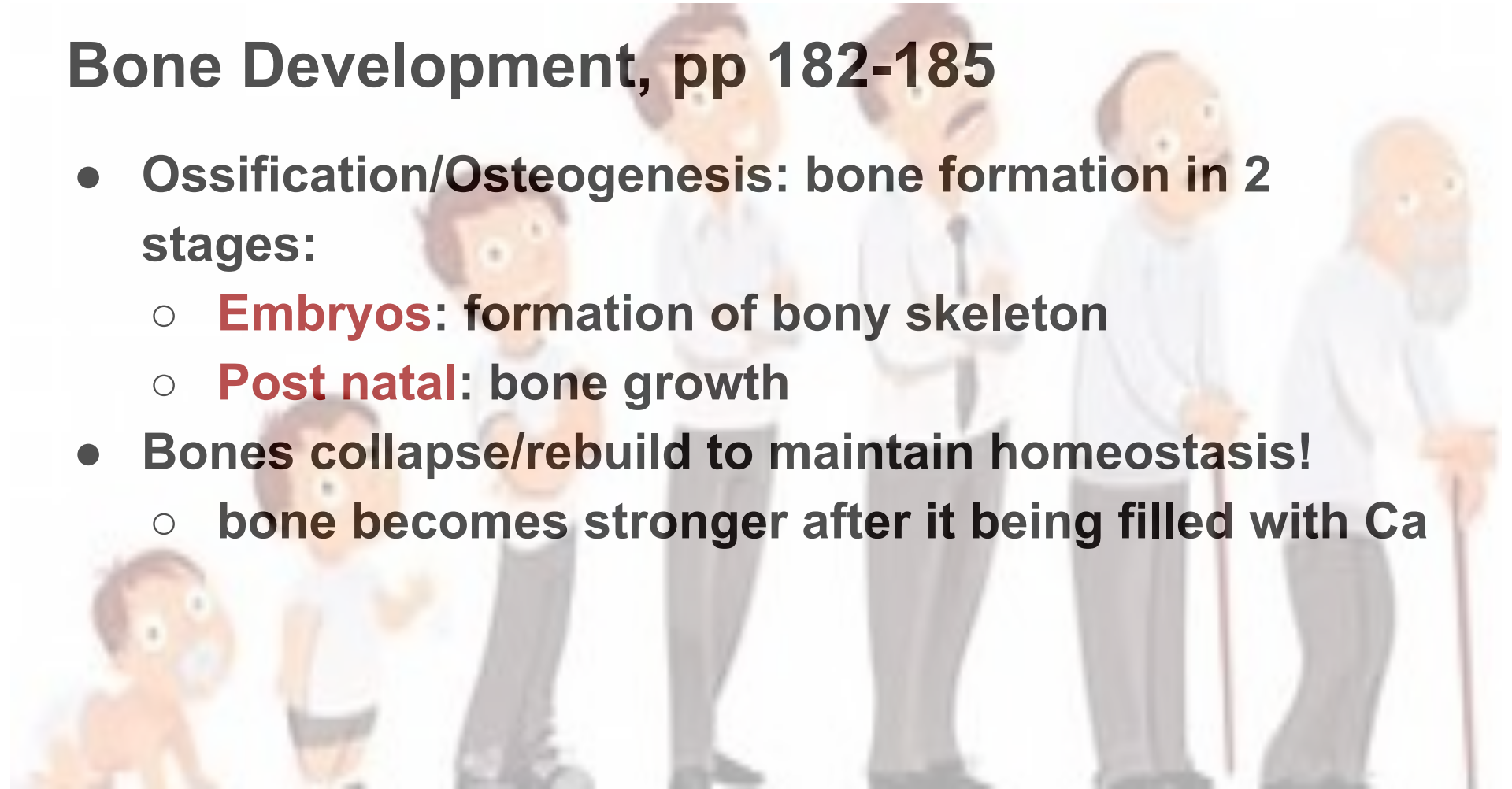
- Made up of 35% organic and 65% inorganic parts
  - Organic: osteocytes, osteoclasts, osteoblast
    - Physiology: give flexibility and tensile strength
  - Inorganic: hydroxyapatites (mineral salts) & calcium phosphates
    - Allows bone to exist after death

How hormones regulate bone growth, pg 185

- WHO is the boss: PITUITARY GLANDS (brain) release gh
- HOW much?: THYROID (neck) hormones
- WHEN? SEX (sperm/egg) hormones
- WHERE? EPIPHYSEAL PLATES

Bone Development, pp 182-185

- Ossification/Osteogenesis: bone formation in 2 stages:
  - Embryos: formation of bony skeleton
  - Post natal: bone growth
- Bones collapse/rebuild to maintain homeostasis!
  - bone becomes stronger after it being filled with Ca



Bone Homeostasis- aka BONE RECOVERY

Remodel- deposit : resorption

- 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

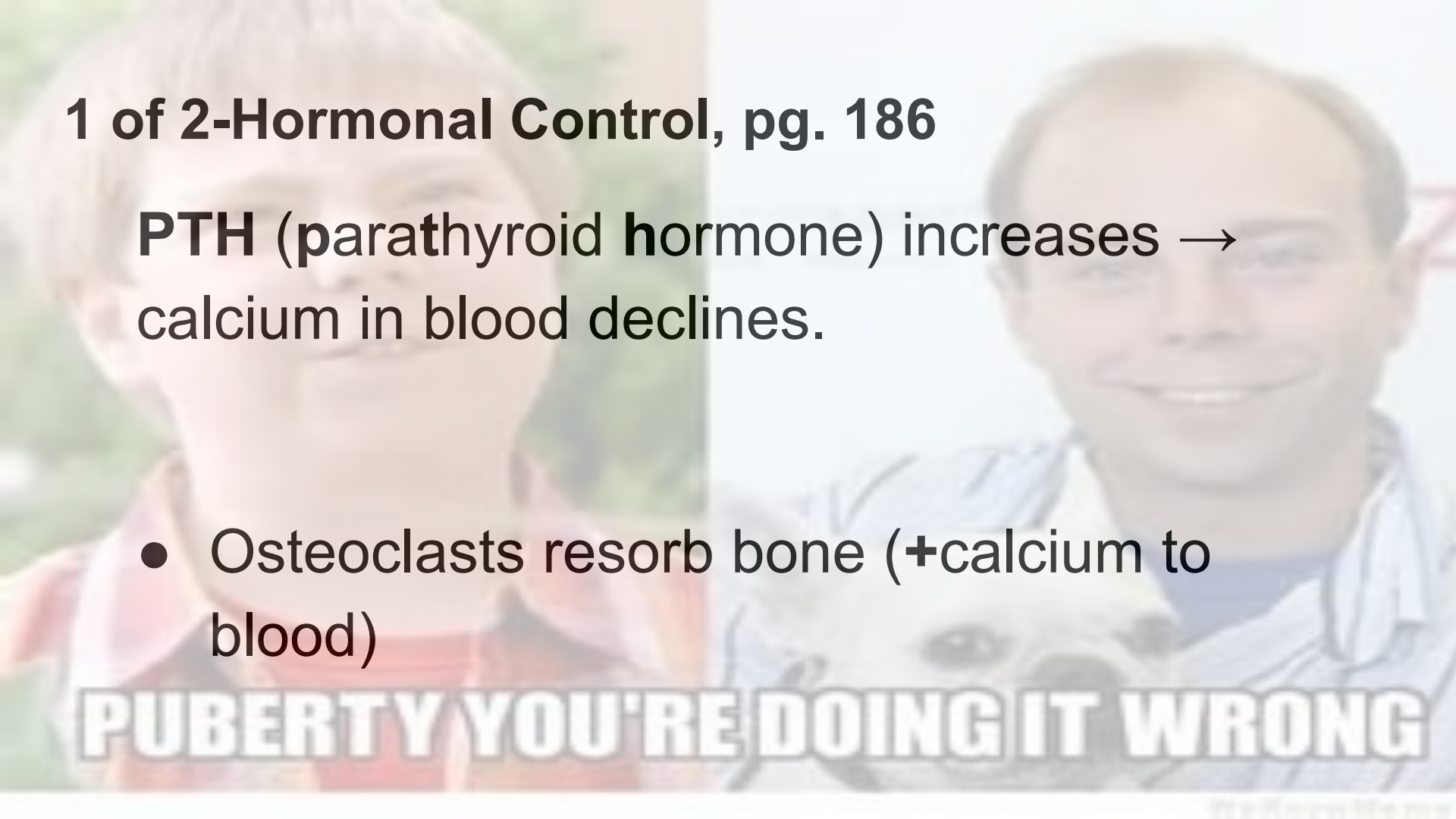
Why does bone remodeling occur?

It is the scheduled time for bones to go thru the cell cycle

1 of 2-Hormonal Control, pg. 186

PTH (**p**ara**t**hyroid **h**ormone) increases → calcium in blood declines.

- Osteoclasts resorb bone (**+**calcium to blood)



2 of 2- Stress, pp. 187-188

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

STRESS bends the bone, having a thick midway point.

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

Jay Leno, former host of The Tonight Show (replaced Johnny Carson

Bone Homeostasis: Bone Repair, pp 188-189

4 stages:

1. Day 1- Blood vessels in bone tear and hemorrhage (hematoma) to form a blood clot
2. Day 3- Fibroblasts & osteoblasts reconstruct bone
3. Day9- new trabeculae form (completes in 2 mo.)
4. Bone remodeling occurs for 2 mo.