

**University of Cihan-Sulaimaniya**  
**College of Science**  
**Department of ANS**  
**Second year students**



# **Human Anatomy**

## **Second Lecture**

21-9-2024

# **Skeletal system**

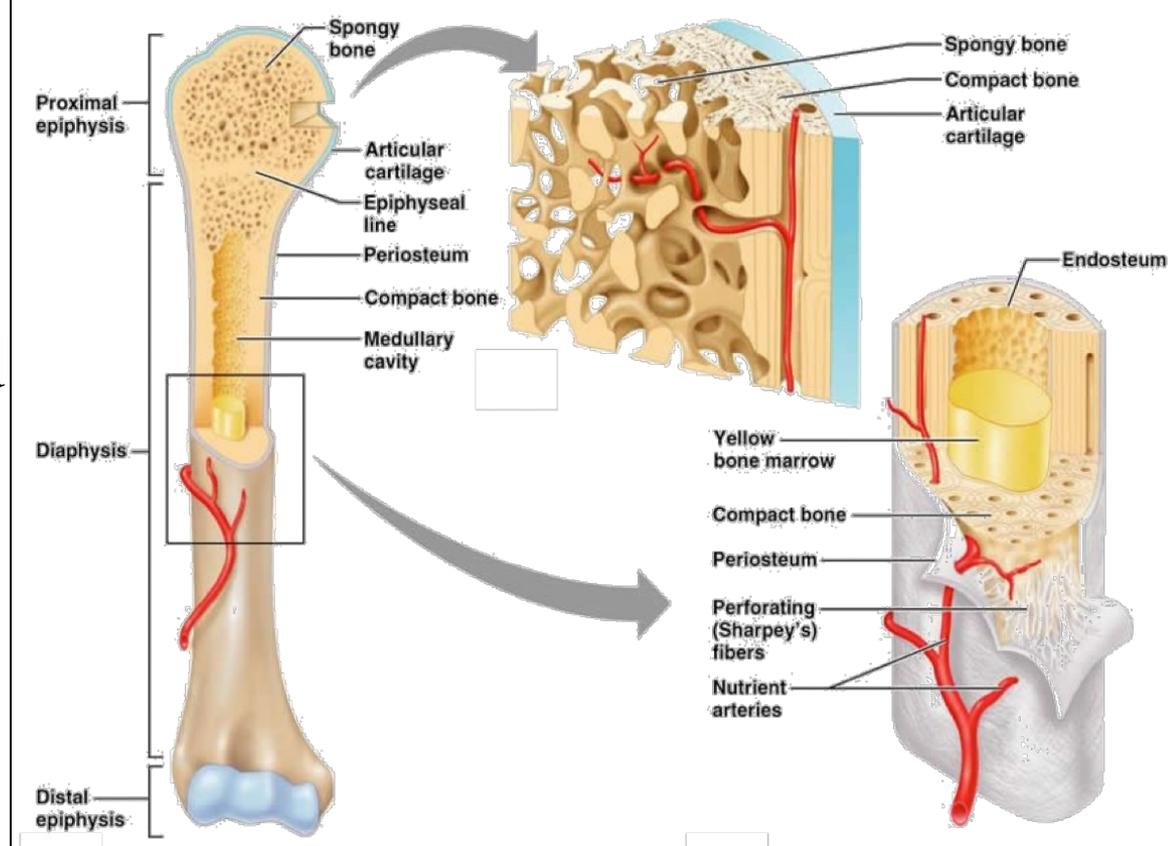
The skeleton serves as a support or framework of the human body.

It is a combination of bones joined together.

- Hyaline cartilage is the most abundant cartilage
- By age 25 the skeleton is completely hardened growth ceases
- 206 bones make up the adult skeleton (20% of body mass)
  - 80 bones of the axial skeleton
  - 126 bones of the appendicular skeleton

# Structure of bones

- Bone is a living substance with blood vessels and nerves.
- It grows, it is subject to disease and when fractured it heals.



- It becomes thinner and weaker from disuse, and when bones have increased weight to support they hypertrophy.
- Bones have an organic framework of fibrous tissue and cells.
- Inorganic salts give the bones rigidity and make them opaque to x-ray.

# CHEMICAL COMPOSITION OF BONE

- Dried bone consists of **organic** and **inorganic** matter in the ratio of 1: 2 approximately.

Gelatin.....	33.30
Phosphate of lime.....	57.35
Carbonate of lime.....	3.85
Phosphate of magnesia.....	2.05
Carbonate and chloride of sodium.....	<u>3.45</u>
	100

# DEVELOPMENT OF AN INDIVIDUAL BONE

The primitive embryonal skeleton consists of cartilage and fibrous tissue, in which the bones develop.

The process is termed ossification or osteogenesis, and is affected essentially by bone-producing cells, called osteoblasts.

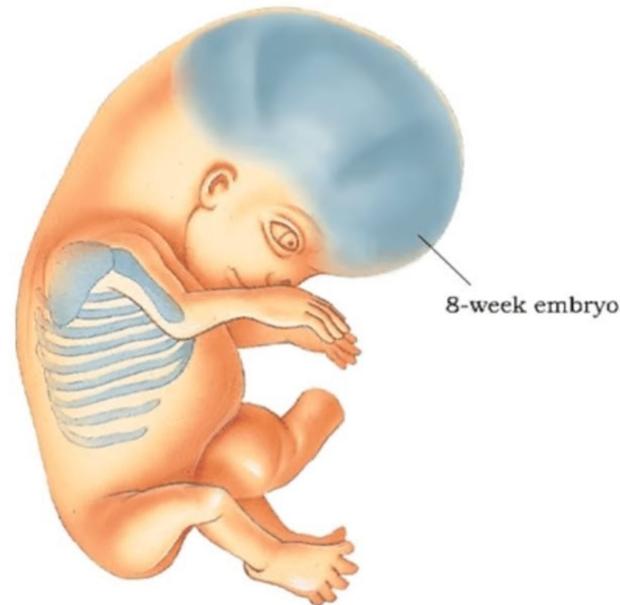
## 1- Membranous bones.

The outer skull bones are an example of membranous bones.

Osteoblasts invade a membrane to form a center of ossification (formation of bone). Bone-forming activity spreads out from this center until a full bone plate is formed.

## 2- Cartilage bones.

In the fetus, many bones, for example, long bones, exist first as models formed of cartilage.



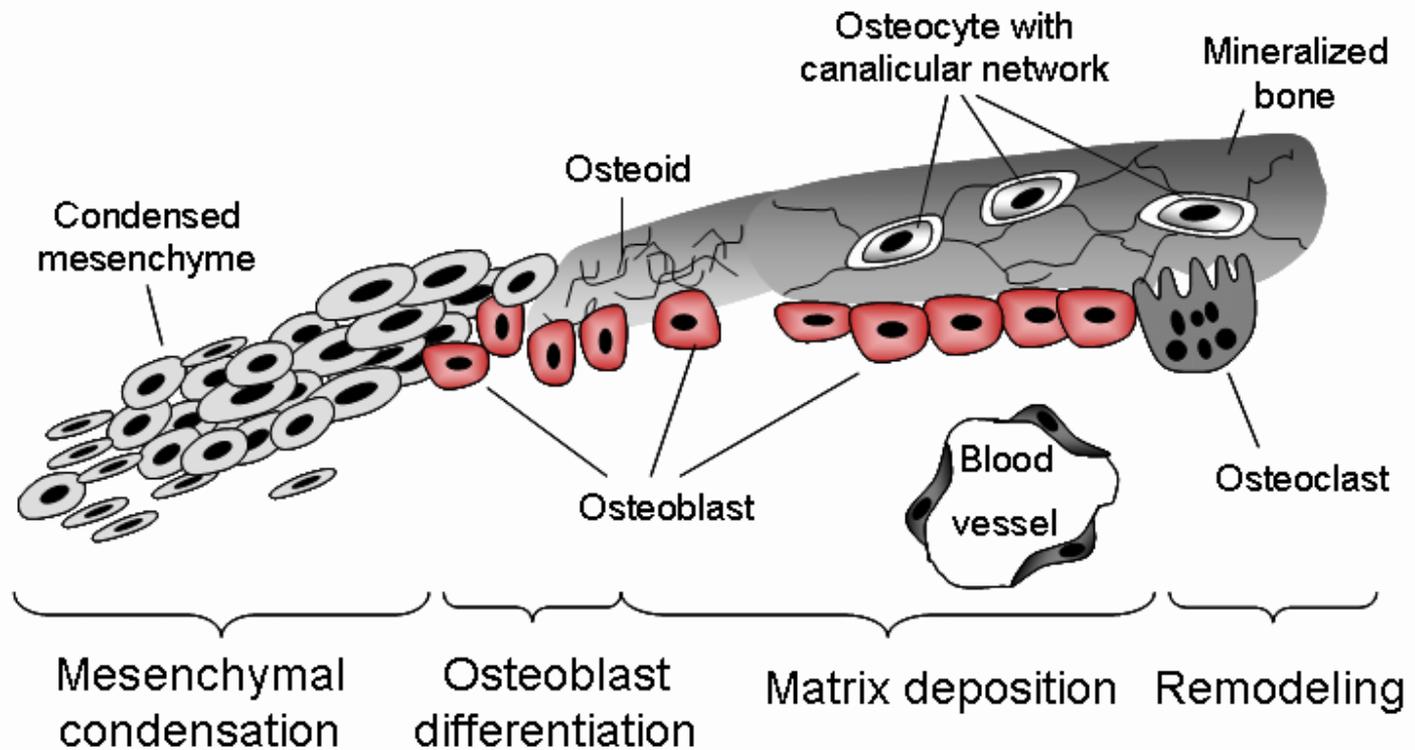
### Ossification - types

- Bone formation (or ossification) is the process that produces new bone tissue.
- Bone tissue replaces a precursor embryonic tissue to form the skeleton.

# Intramembranous ossification

The process begins at a definite center of ossification (**Punctum ossifications**), where the osteoblasts surround themselves with a deposit of bone.

directly converts the mesenchymal tissue to bone and forms the flat bones of the skull, clavicle, and most of the cranial bones



# Endochondral Ossification

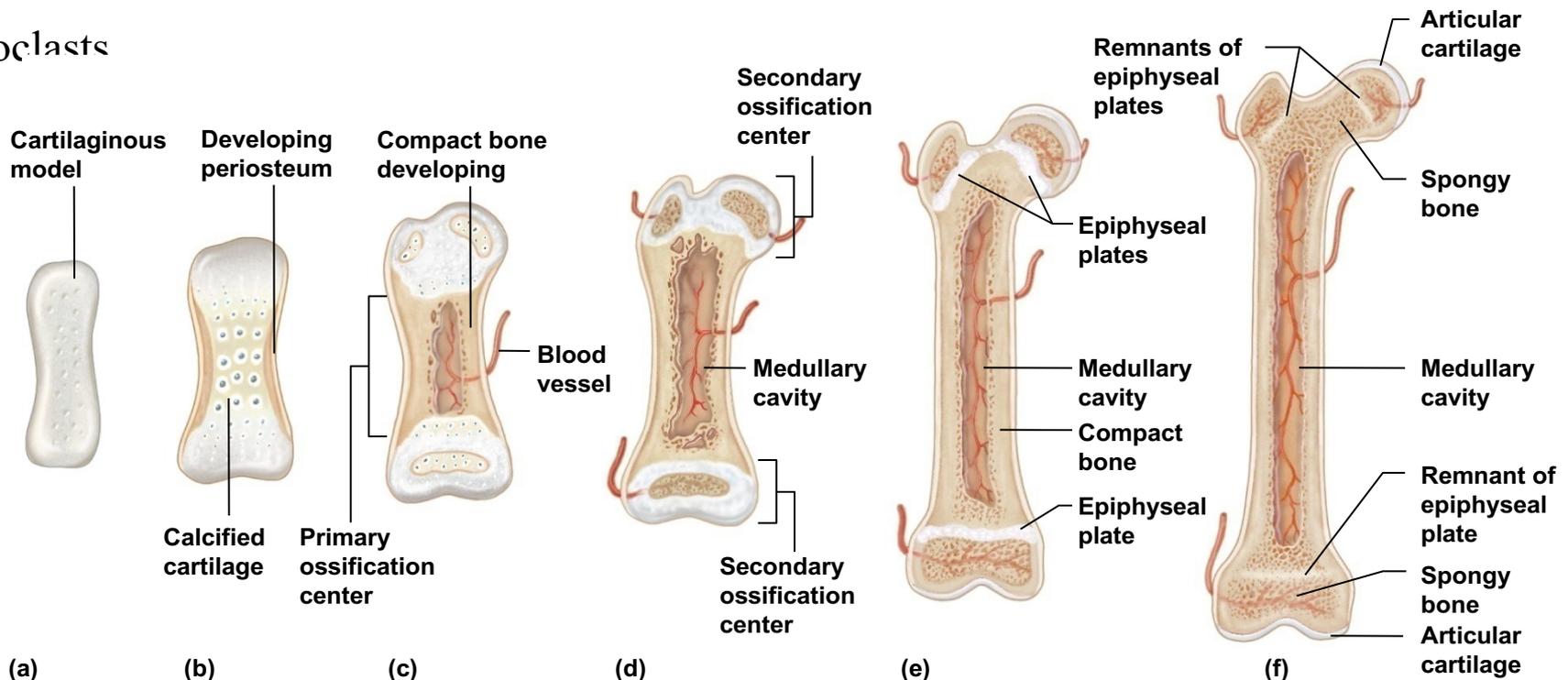
The process is fundamentally the same, but not quite so simple.

- Osteoblasts emigrate from the deep face of the perichondrium or primitive periosteum into the cartilage and cause calcification of the matrix or ground substance.

- Vessels extend into the calcifying area; the cartilage cells shrink and disappear, forming primary marrow cavities which are occupied by processes of the osteogenic tissue.

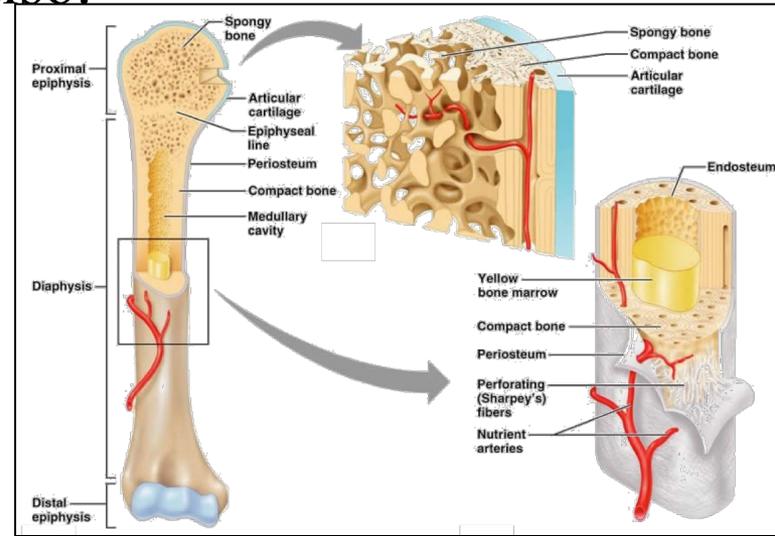
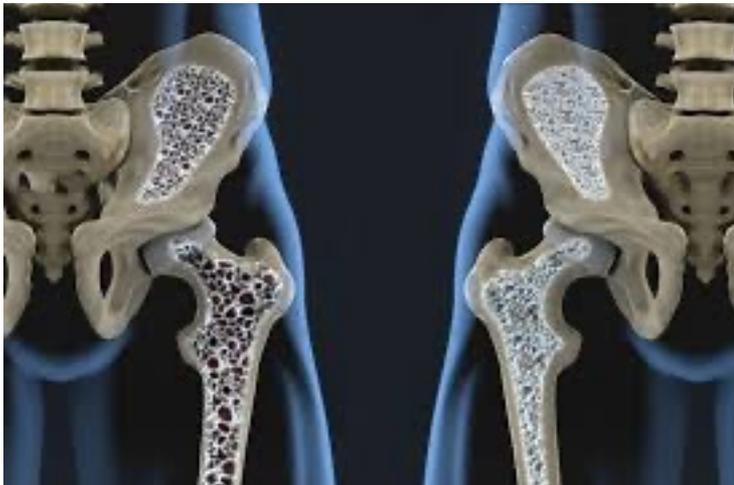
- perichondral bone is formed by the osteoblasts of the primitive periosteum.

- The calcified cartilage is broken down and absorbed through the agency of large cells called the osteoclasts



**The spongy substance** consists of delicate bony plates and spicules which run in various directions and intercross. These are definitely arranged with regard to mechanical requirements, so that systems of pressure and tension plates.

The intervals between the plates are occupied by marrow and are termed **marrow spaces**. The spongy substance forms the bulk of short bones and extremities of long bones; in the latter it is not confined to the ends but extends a variable distance along the shaft also.

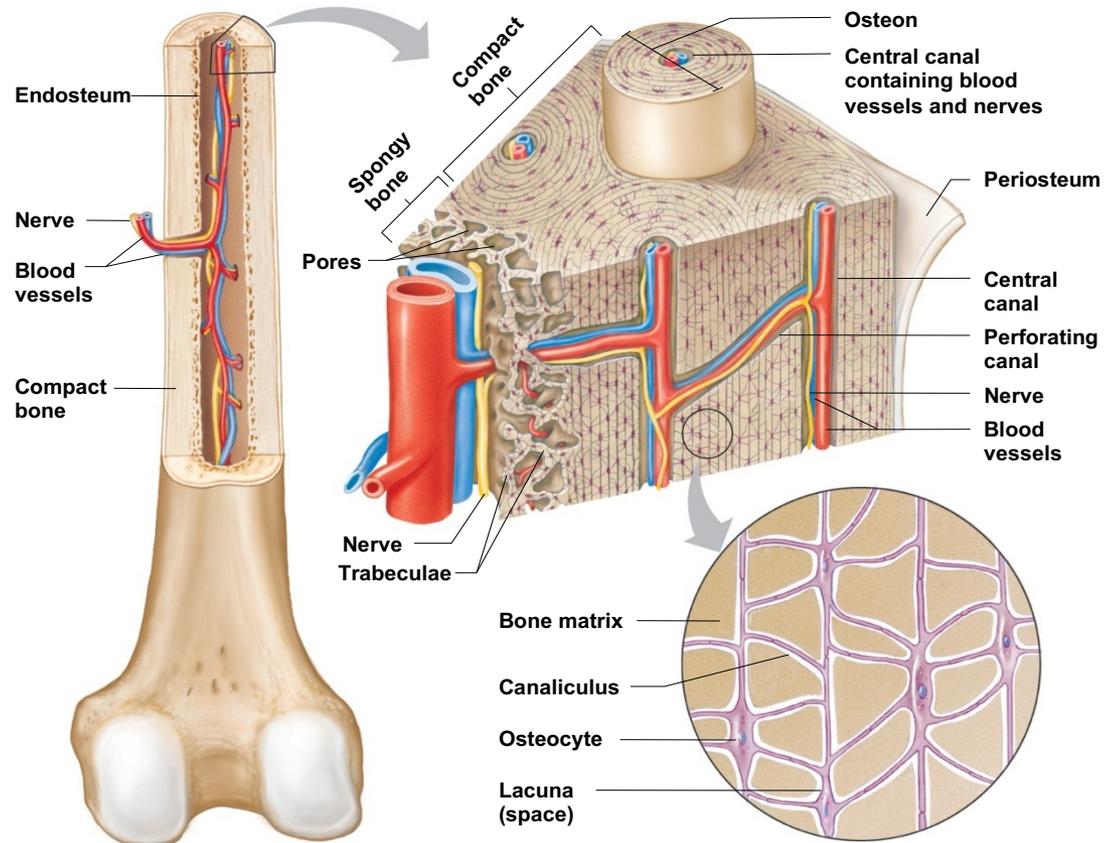


# Compact Bone

**Compact bone** is composed largely of calcified interstitial substance, **bone matrix**, deposited in layers called **lamellae**.

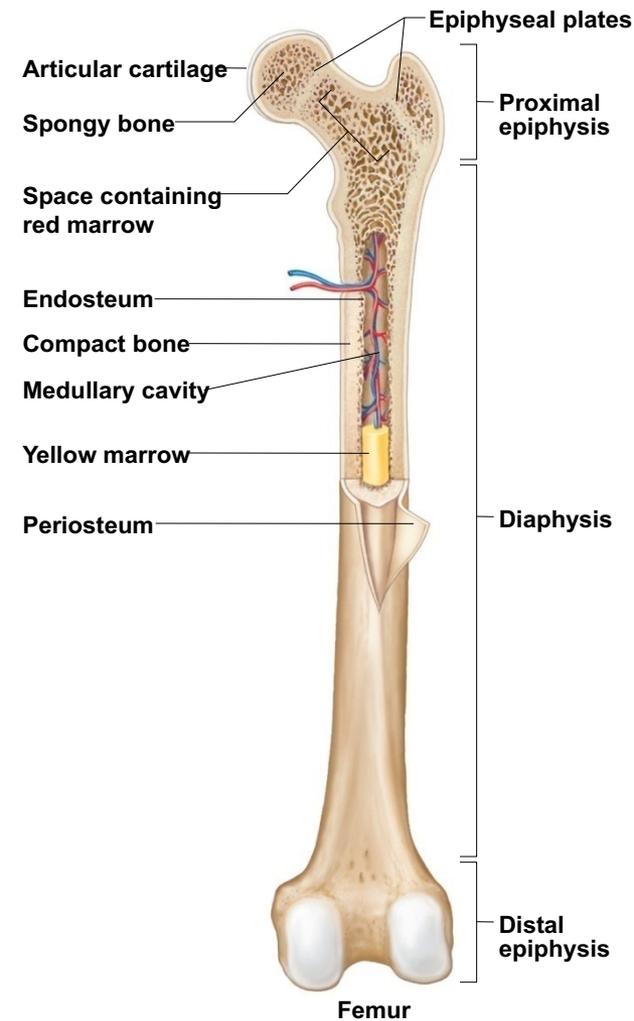
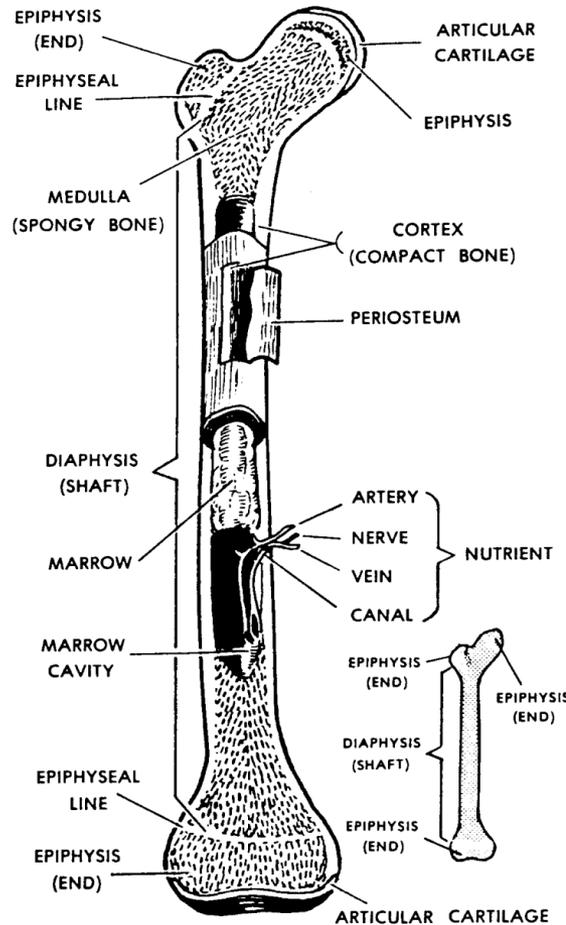
The great majority of lamellae of compact bone are arranged concentrically around the longitudinal vascular channel. These cylindrical units of structure are called the **haversian system** or **osteons**.

- Osteon
- **Haversian System**
- Central canal
- Perforating canal
- **Volkman's canal**
- Osteocytes
- Lamellae
- Lacunae
- Bone matrix
- Canaliculi



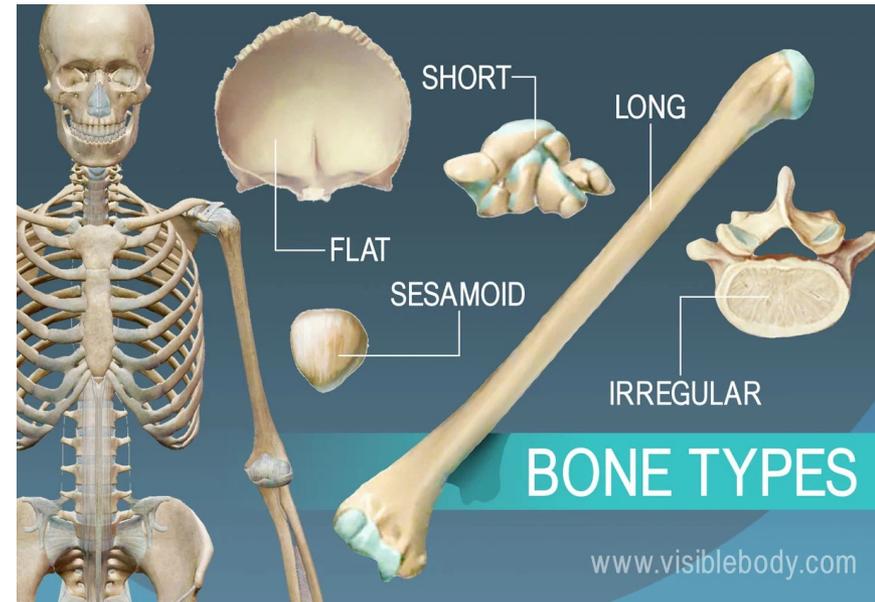
# Structures of bones

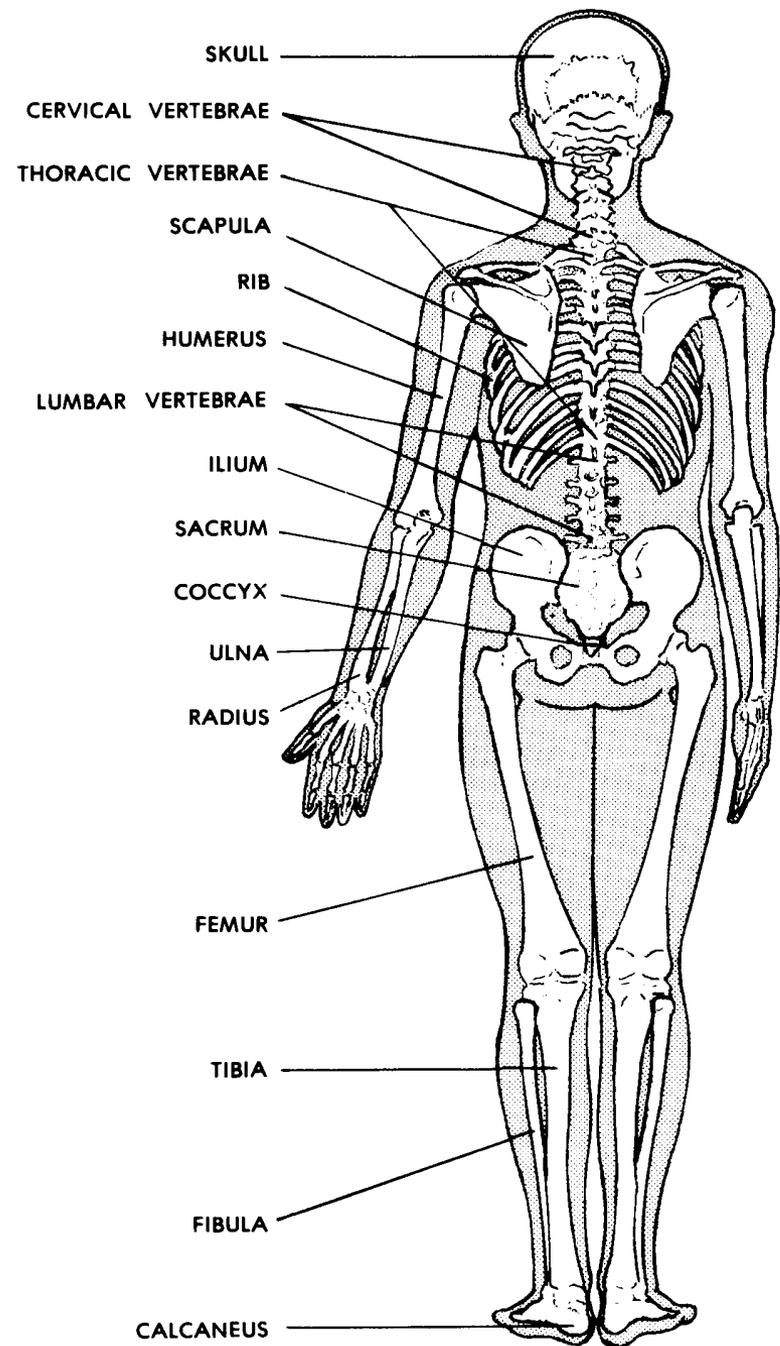
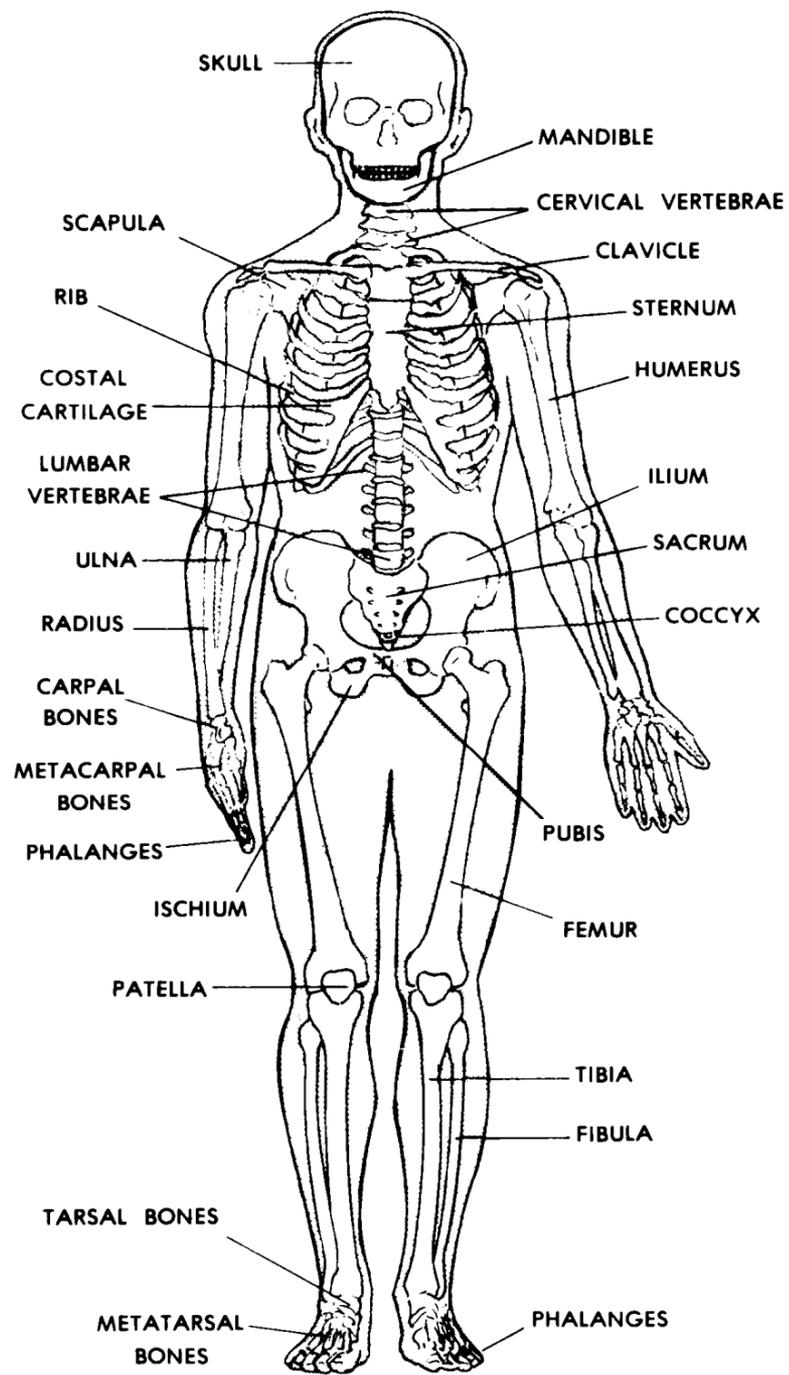
- Body or shaft or Diaphysis-  
Compact bone
- Proximal extremity or Epiphysis
- Distal extremity or Epiphysis
- Epiphyseal line or growth plate
- Medulla - Spongy bone
- Marrow cavity
- Marrow
- Spongy bone
- Compact bone
- Periosteum
- Endosteum
- Nutrient artery
- Periosteal artery

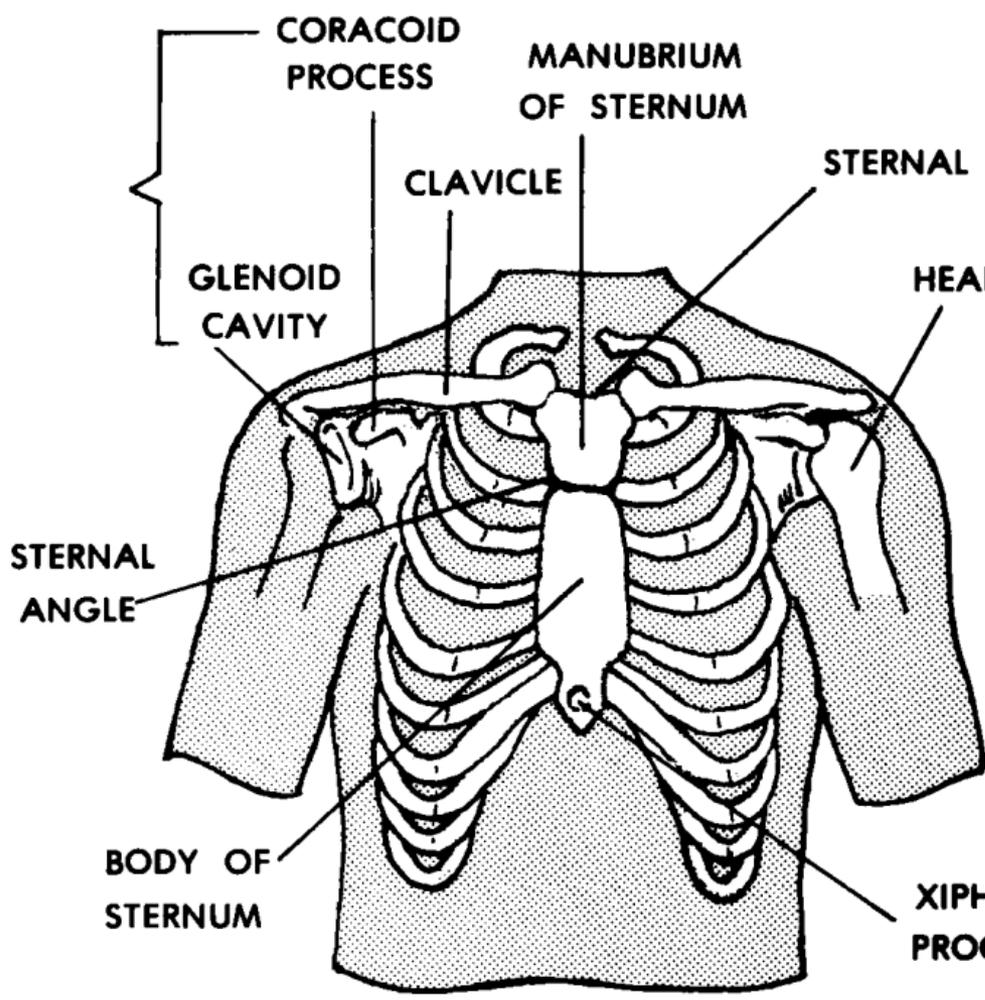


- Bones of the skeletal system vary greatly in size and shape
- There is similarity in structure, development, and function
- Bones are classified into 4 main types according to their shapes:

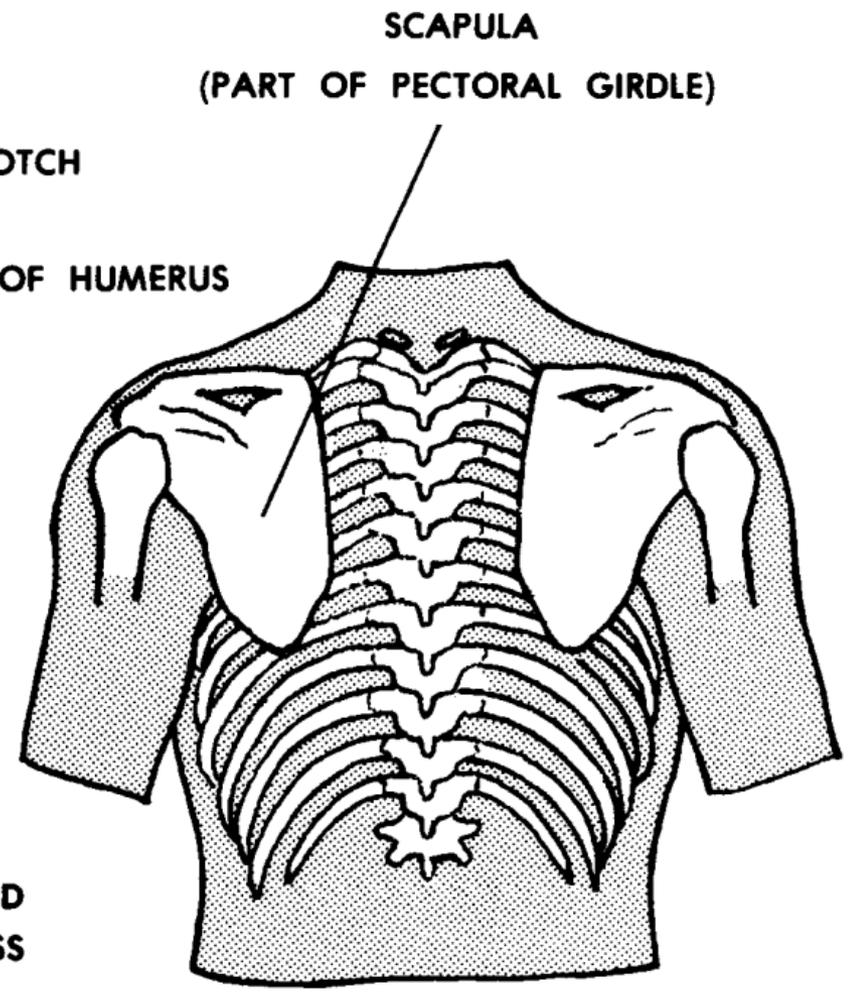
- 1- **Long bones**, example femur
- 2- **Short bones**, example carpal or wrist bones
- 3- **Flat bones**, example cranial frontal bone
- 4- **Irregular bones**, example vertebra





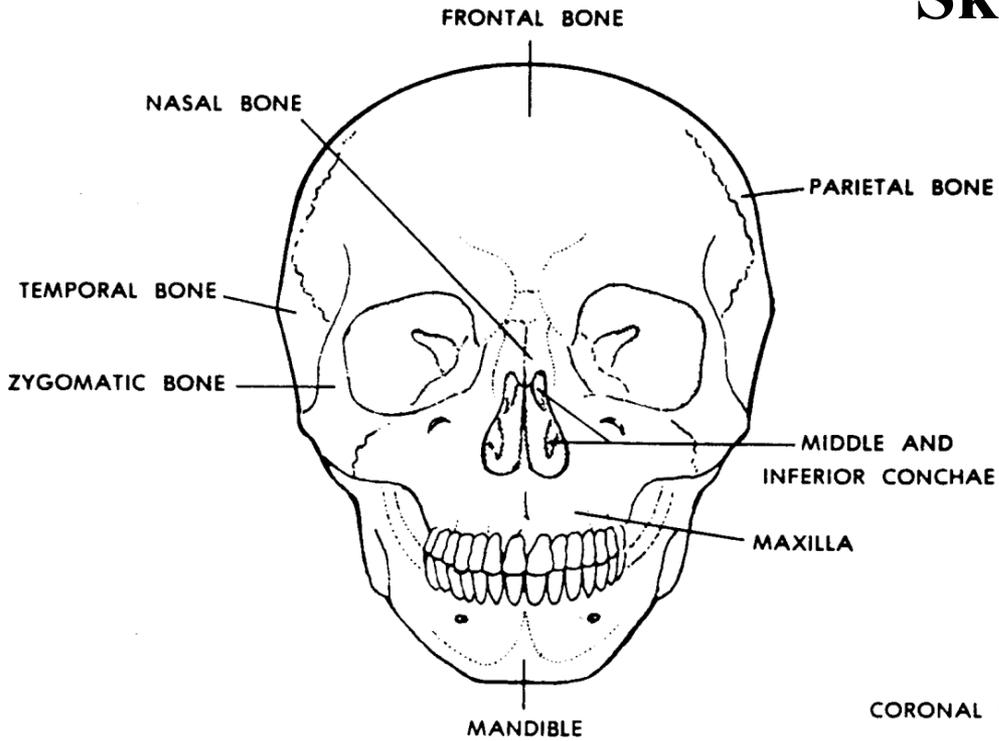


**ANTERIOR VIEW**



**POSTERIOR VIEW**

# Skull



## Anterior View

## Lateral View

