

An anatomical illustration of the human skeletal system, showing the skull, spine, and ribcage. The bones are rendered in a realistic, textured style with various shades of brown, tan, and grey. The text "Skeletal System" is overlaid in the center in a white, serif font.

# Skeletal System



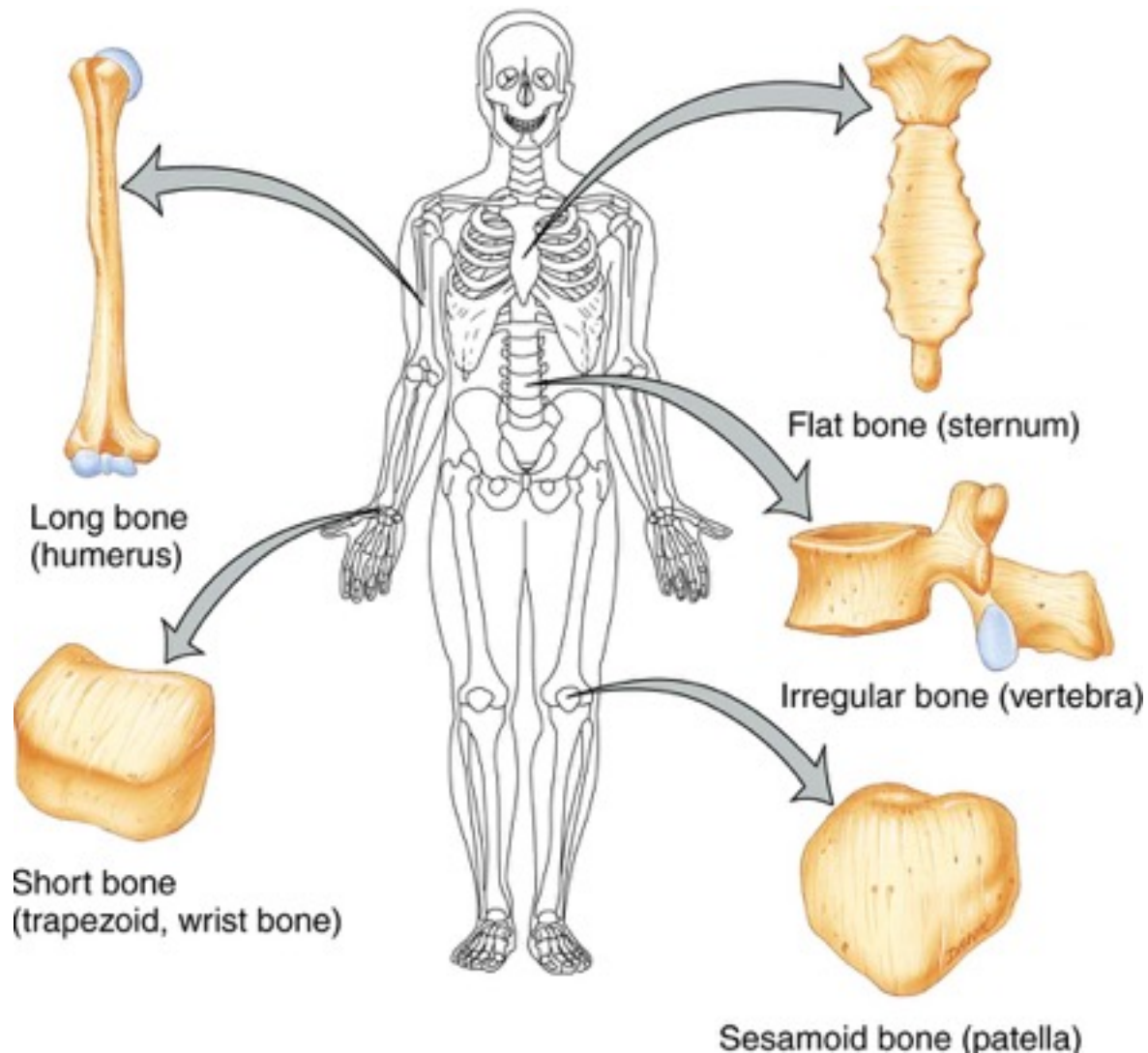
If I didn't have any  
Joints

I would be a Jiggler  
and Jello and I could  
not move and do stuff.

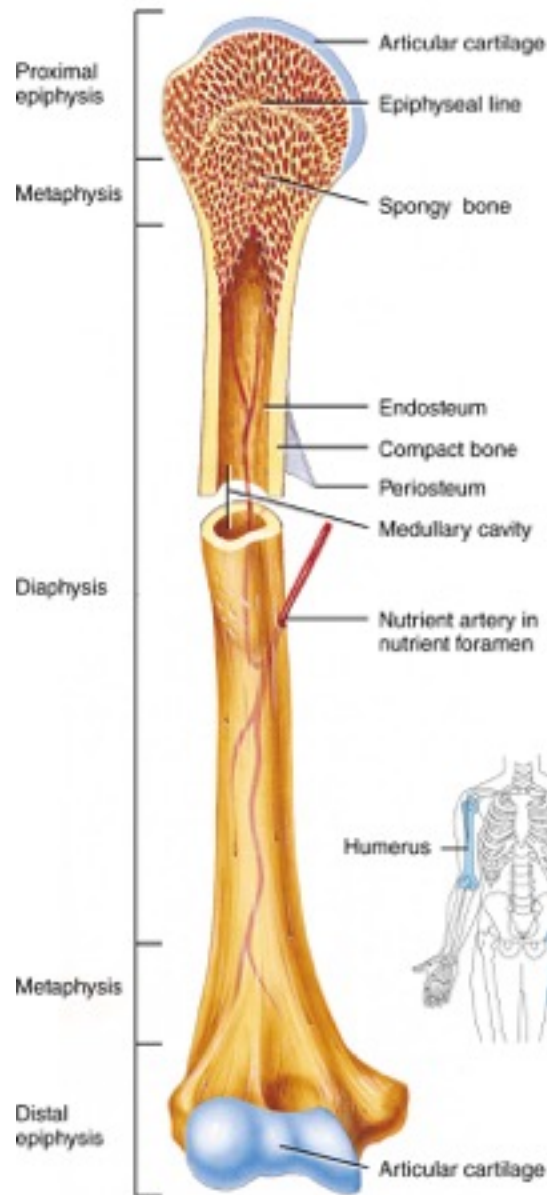
by Anna



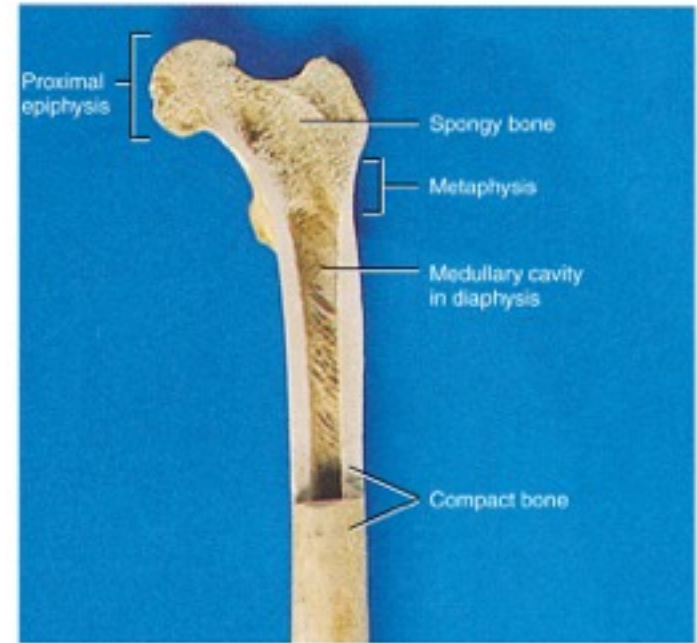
# Bone Classification by Shape



# Anatomy of a Typical Long Bone



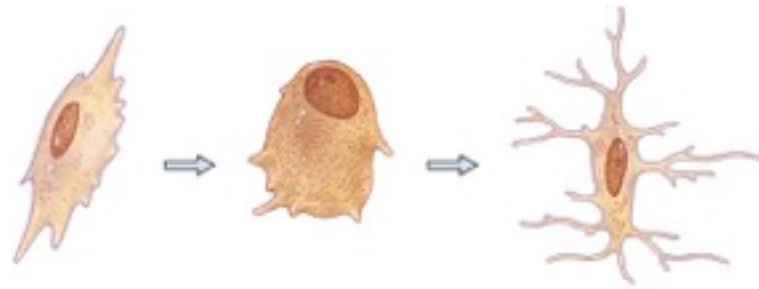
(a) Partially sectioned humerus (arm bone)



(b) Partially sectioned femur (thigh bone)

*What tissue makes up articular cartilage?*

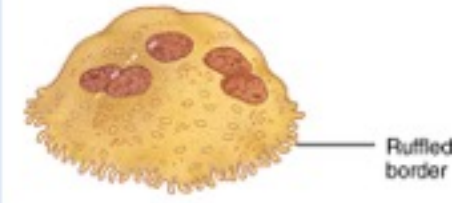
*Describe the functions of the periosteum.*



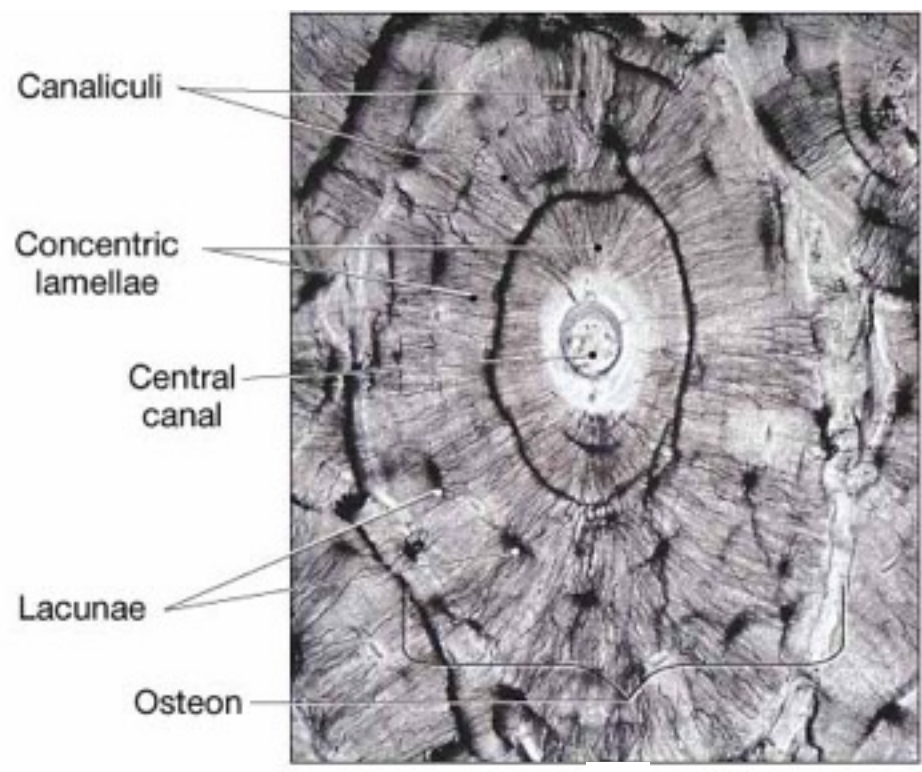
Osteogenic cell  
(develops into an  
osteoblast)

Osteoblast  
(forms bone  
matrix)

Osteocyte  
(maintains  
bone tissue)



Osteoclast  
(functions in resorption, the  
destruction of bone matrix)



# Bone Tissue

*What is osteoid?*

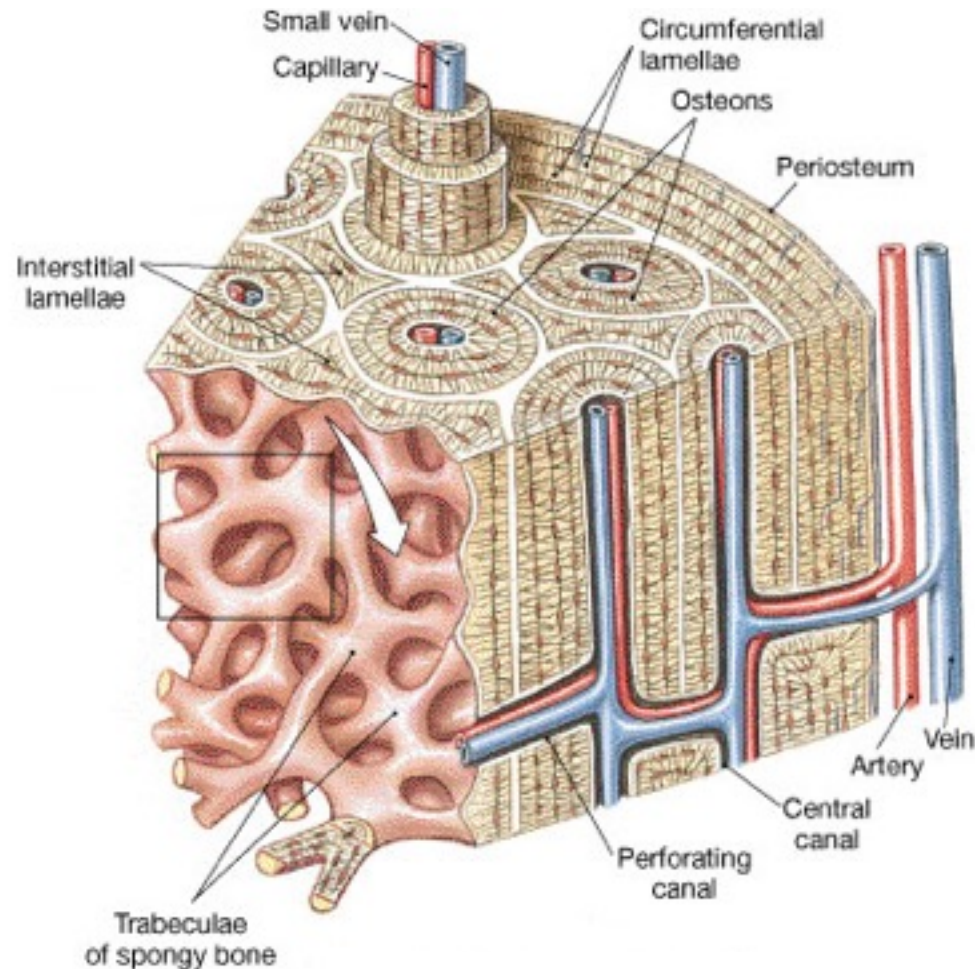
*Differentiate between the organic and inorganic components of the bony matrix (structure and function).*

# Histology of Bone Tissue

*Which cells lay down fresh bone matrix?*

*Which cells “recycle” bone matrix?*

*Where are these cells located in bone tissue?*

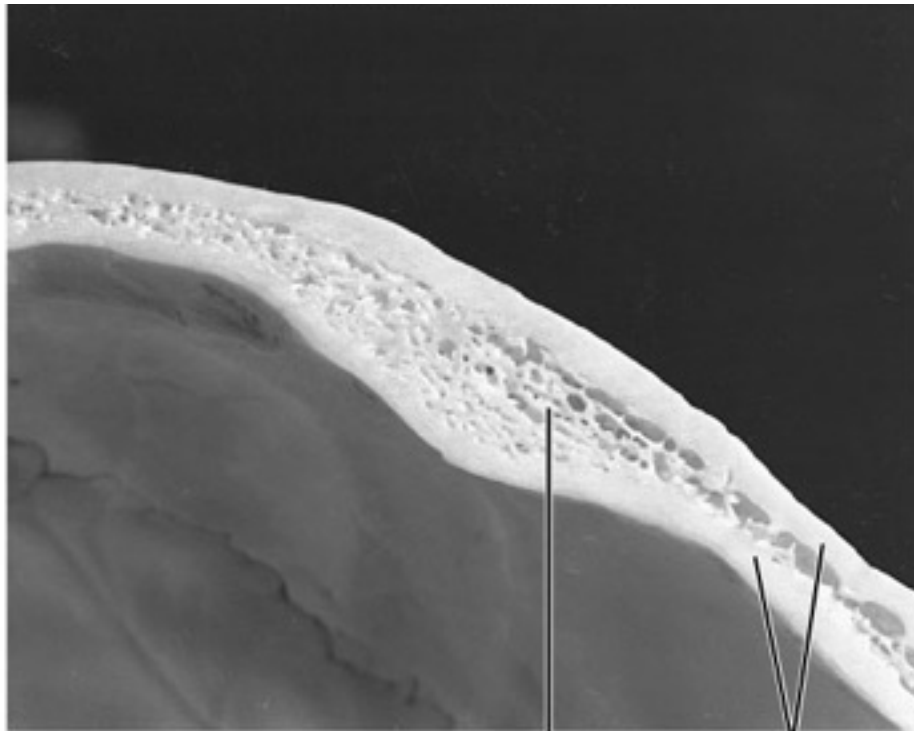


# Compact and Spongy Bone Tissue Organization

Bones of the skeleton contain a combination of both types of bone tissue organization.

*Which region of the skeleton is the bone at left from?*

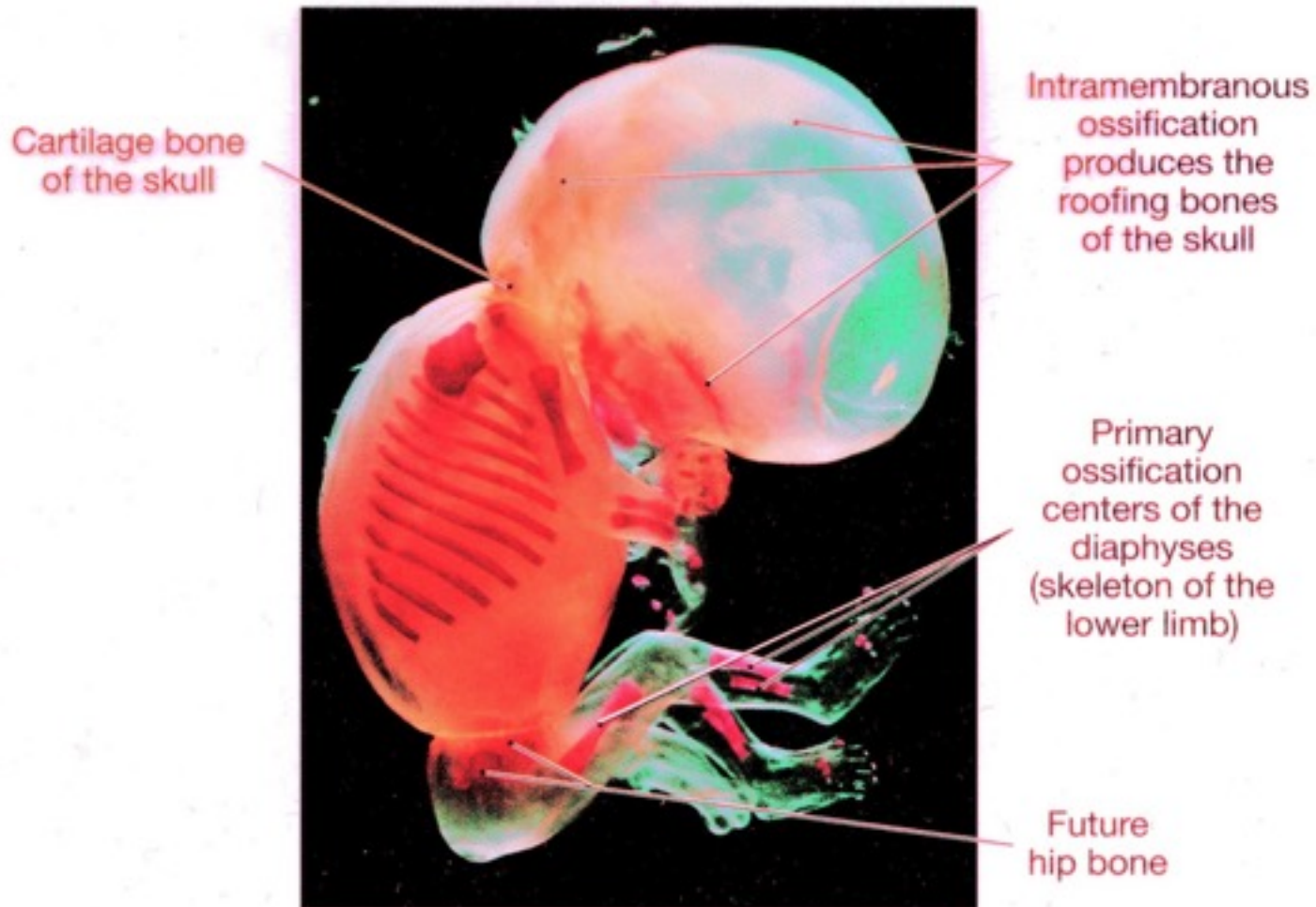
*What type of bone marrow is found within the spaces of spongy bone?*



**Spongy bone Compact bone**

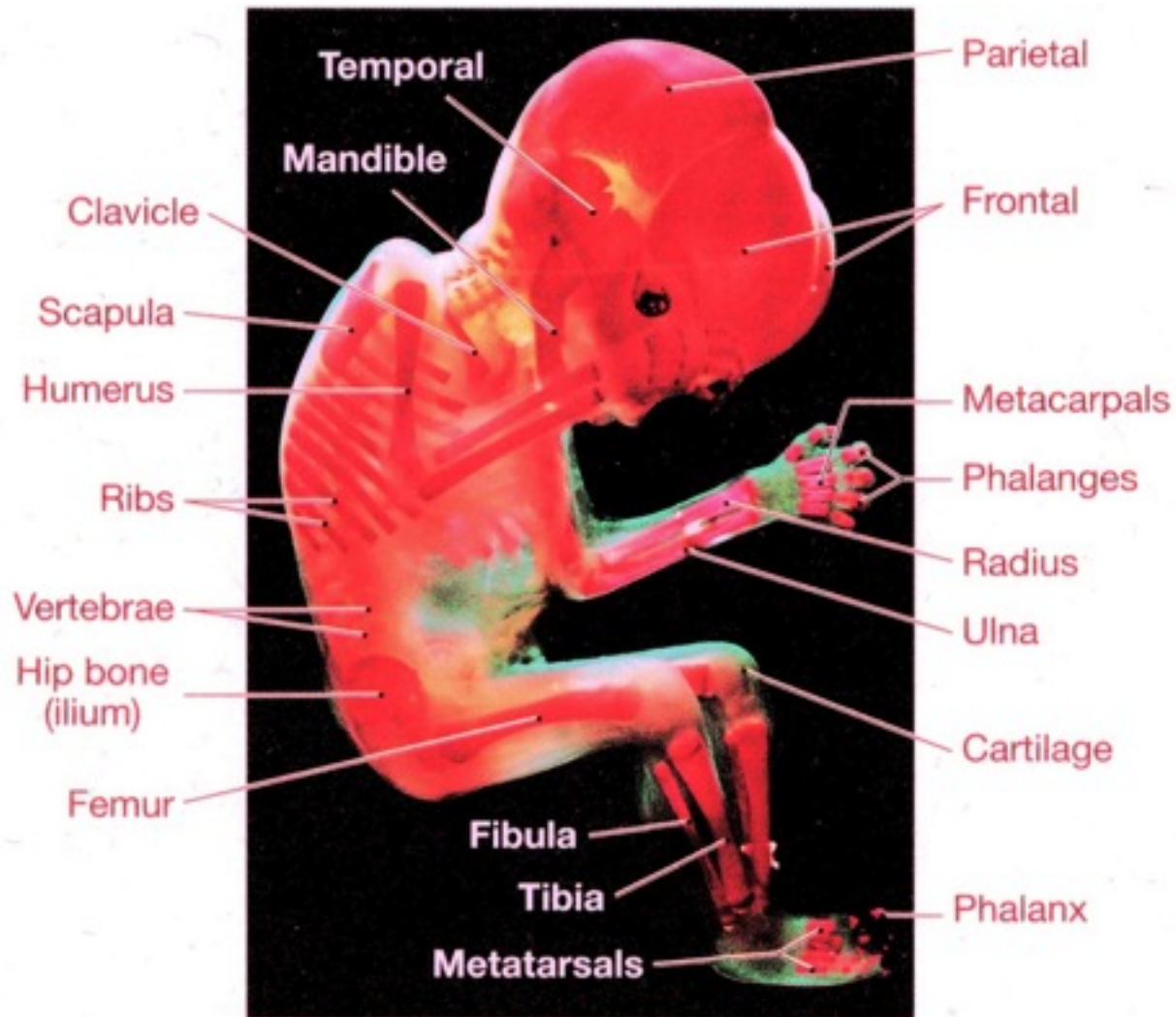
Courtesy of John W. Hole Jr.

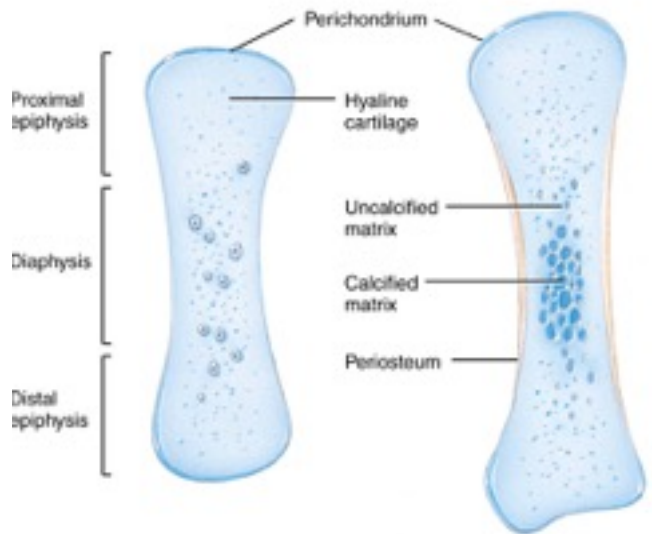
# Osteogenesis - 10 week fetus



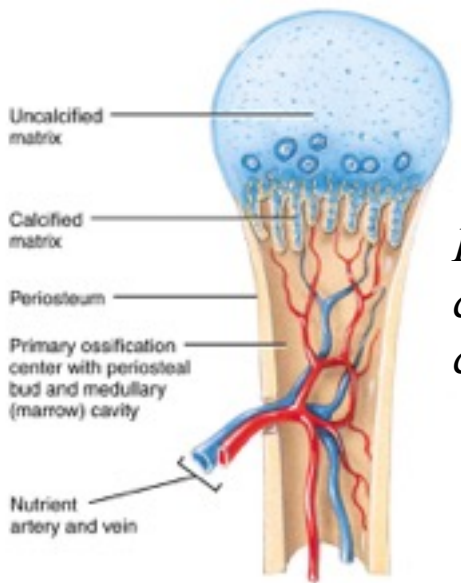


# Osteogenesis - 16 week fetus





1 Development of cartilage model

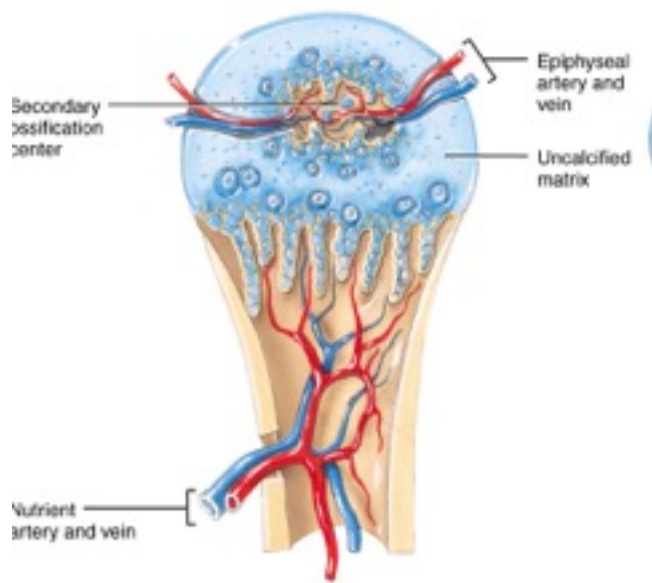


2 Growth of cartilage model

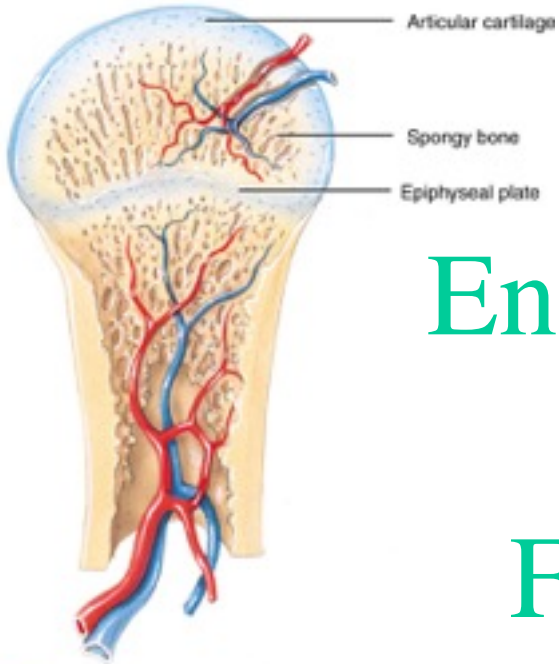


3 Development of primary ossification center

*How is it possible that blood vessels can invade the cartilage pattern if cartilage is avascular?*

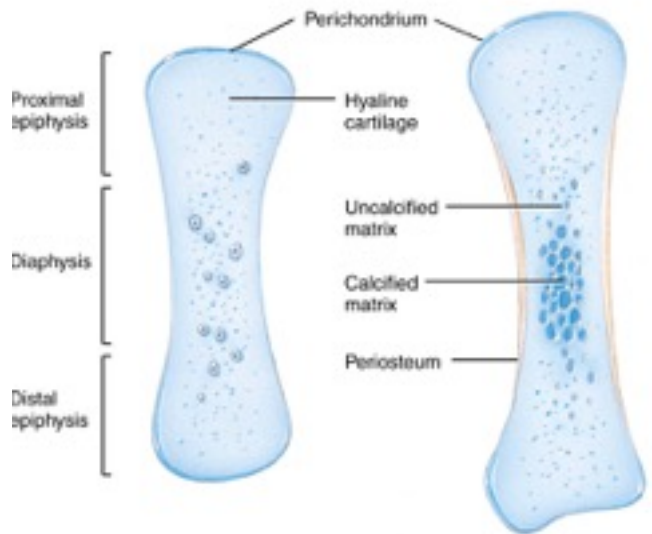


4 Development of secondary ossification center

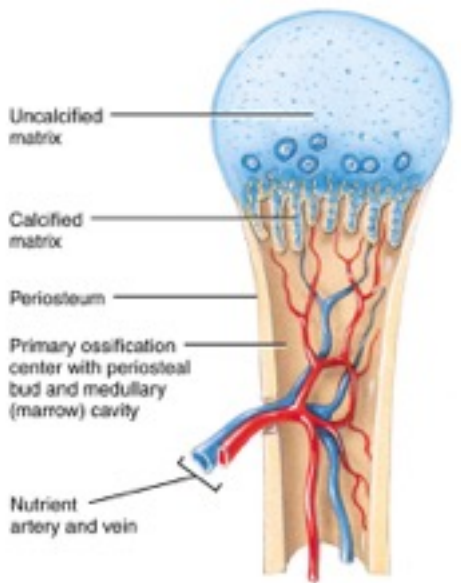


5 Formation of articular cartilage and epiphyseal plate

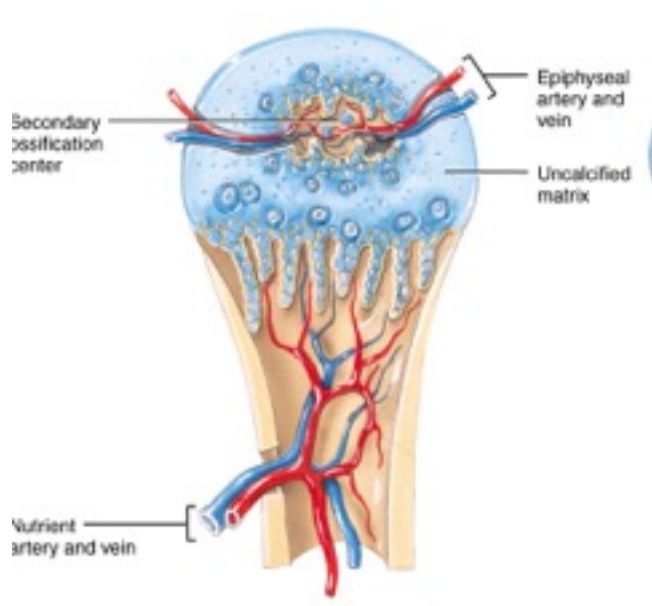
# Endochondral Bone Formation



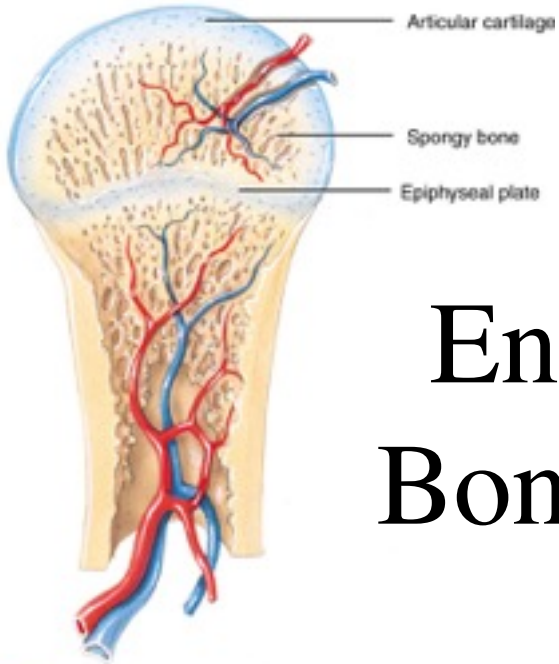
1 Development of cartilage model



2 Growth of cartilage model



3 Development of primary ossification center

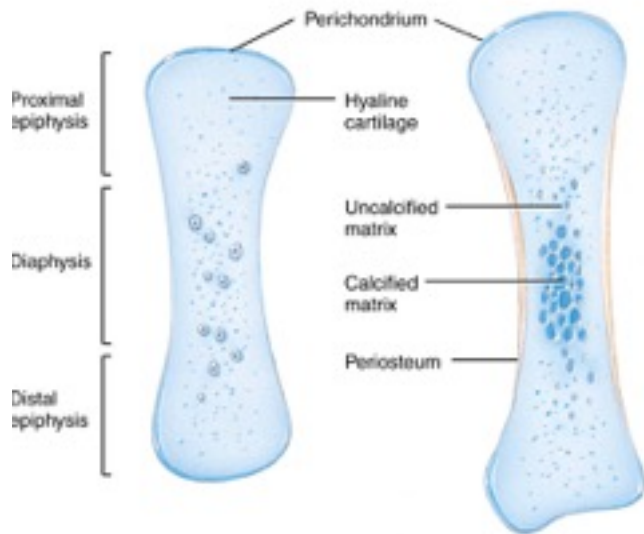


4 Formation of articular cartilage and epiphyseal plate

*Differentiate between the primary ossification center and secondary ossification centers.*

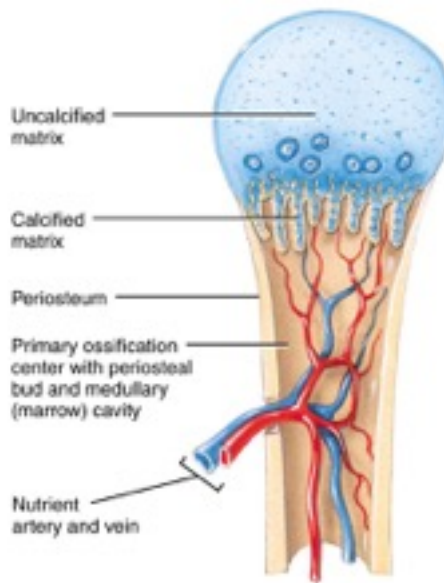
# Endochondral Bone Formation

(continued)



1 Development of cartilage model

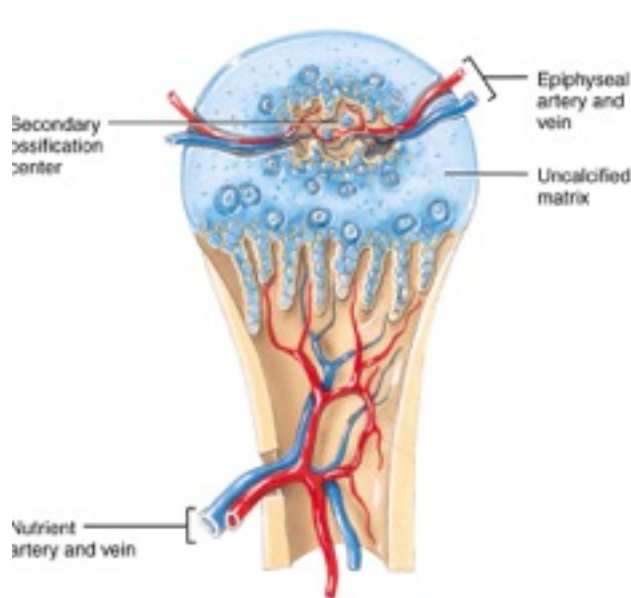
2 Growth of cartilage model



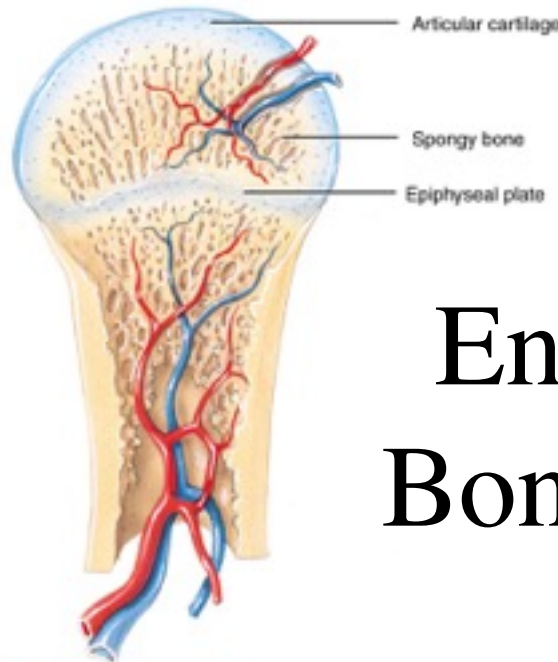
3 Development of primary ossification center

*From which embryonic germ layer are the tissues of bone derived?*

*Which bone tissue organization do you think is stronger (and why): spongy bone or compact bone?*



4 Development of secondary ossification center



5 Formation of articular cartilage and epiphyseal plate

# Endochondral Bone Formation

(continued)

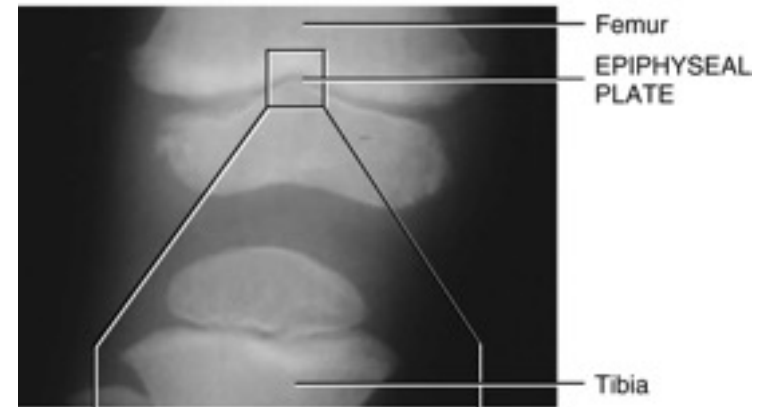
# Bone Growth in Length

*Which joint is shown in the x-ray at right?*

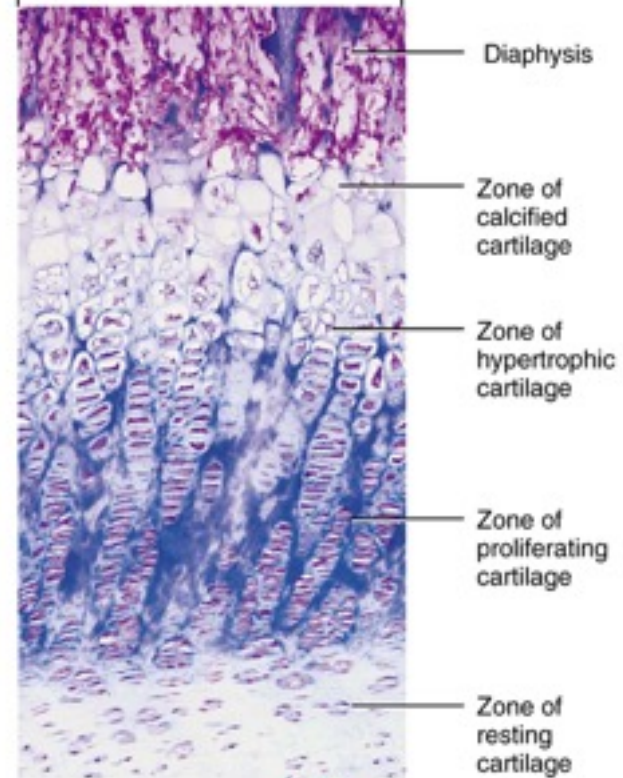
*Indicate the direction(s) of ossification in the x-ray.*

*What factors influence the longitudinal growth of bone? (see page 165 of your packet)*

(a) Radiograph showing the epiphyseal plate of the femur of a 3-year-old



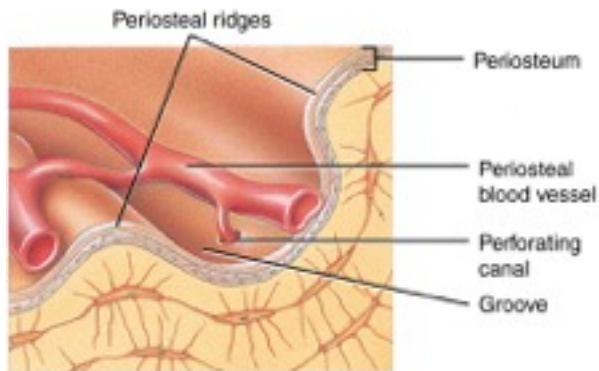
Diaphyseal side



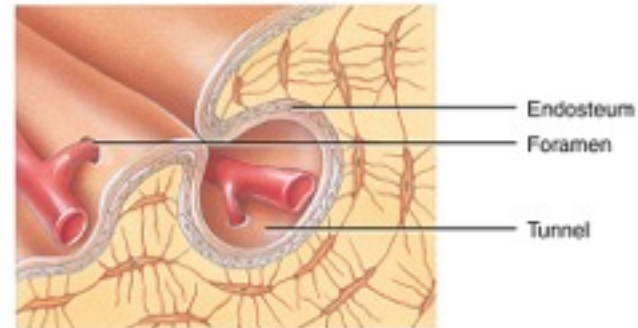
Epiphyseal side **LM** 360x

(b) Histology of the epiphyseal plate

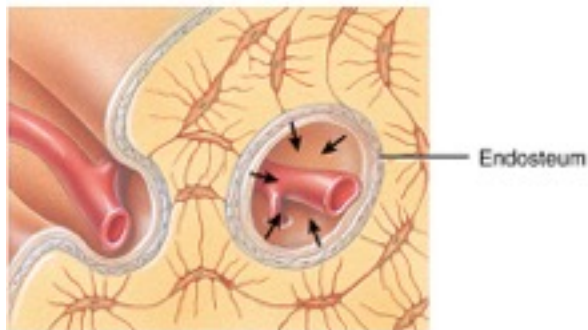
# Bone Growth in Width



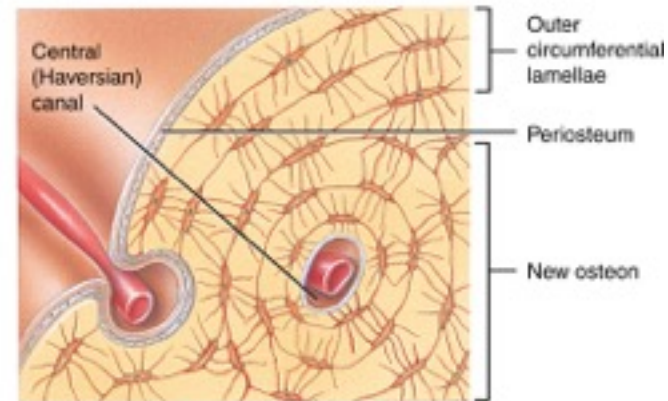
- 1 Ridges in periosteum create groove for periosteal blood vessel.



- 2 Periosteal ridges fuse, forming an endosteum-lined tunnel.

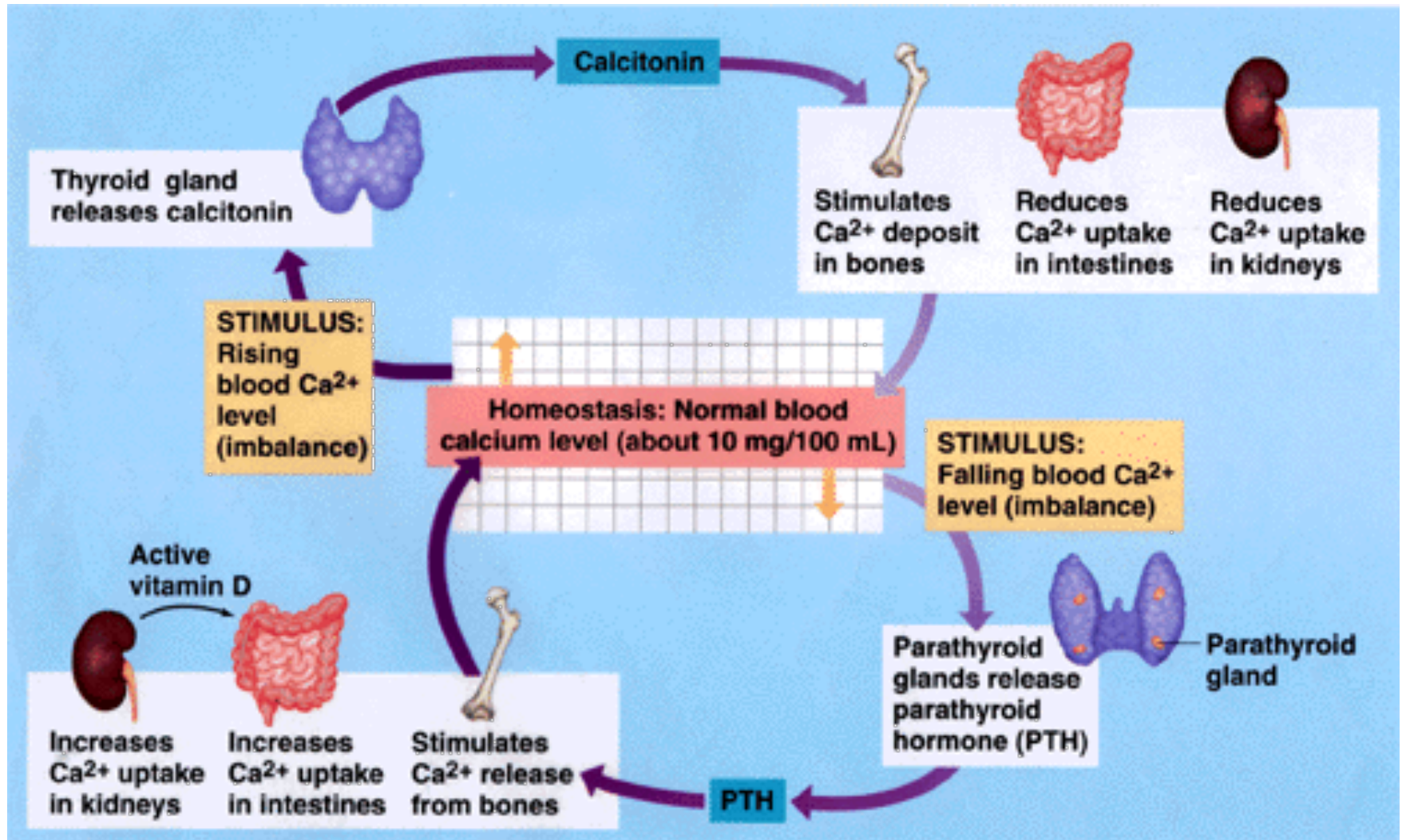


- 3 Osteoblasts in endosteum build new concentric lamellae inward toward center of tunnel, forming a new osteon.

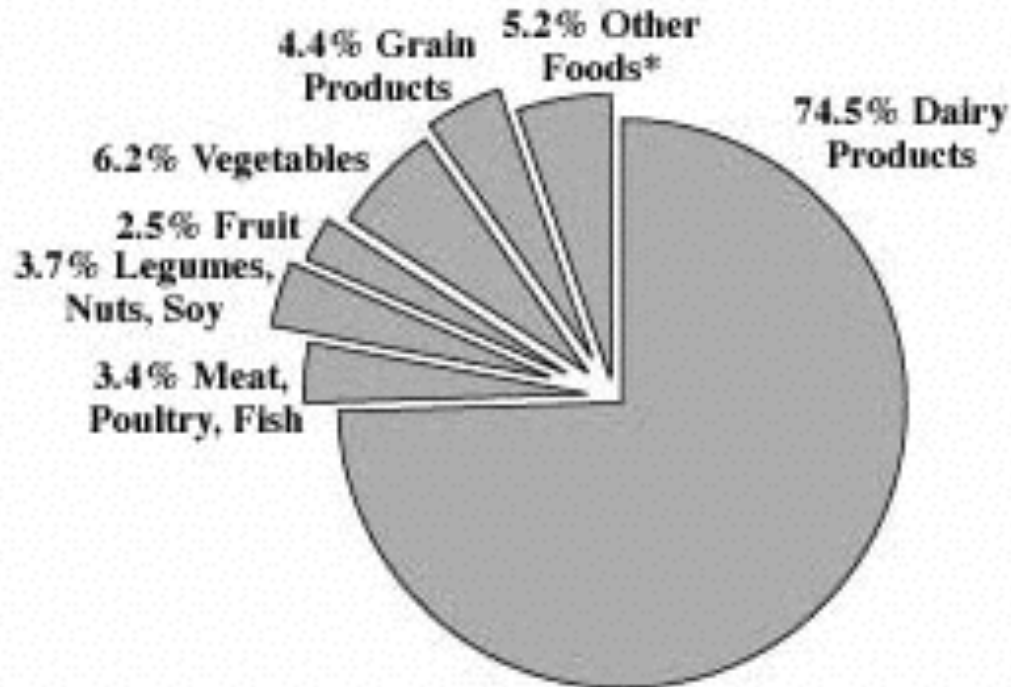


- 4 Bone grows outward as osteoblasts in periosteum build new outer circumferential lamellae. Osteon formation repeats as new periosteal ridges fold over blood vessels.

# Calcium Homeostasis



# Average Intake of Calcium in the Typical American Diet



\* The "Other foods" category includes eggs (1.7%), fats and oils (0.1%), sugars and sweeteners (0.8%), and miscellaneous foods (2.6%).

Source: Gerrior SA, Zizza C., 1994. *Nutrient Content of the U.S. Food Supply, 1909 - 1990*. Home Economics Research Report No. 52. U.S. Department of Agriculture, Washington, D.C.



# Some Types of Fractures



(a) Open fracture



(b) Comminuted fracture



(c) Greenstick fracture



(d) Impacted fracture



(e) Pott's fracture



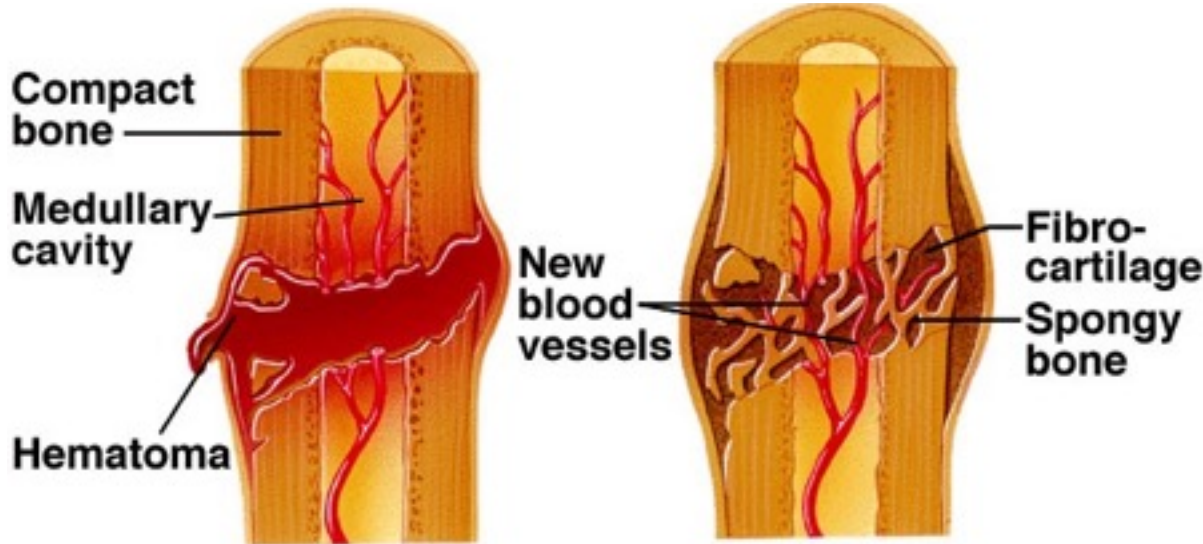
(f) Colles' fracture

There are several types of fractures represented in the collection of x-rays posted in the lab.

Read and answer the questions on each x-ray.

*For a typical long bone, where do most fractures occur, and why?*

# Bone Fracture Repair



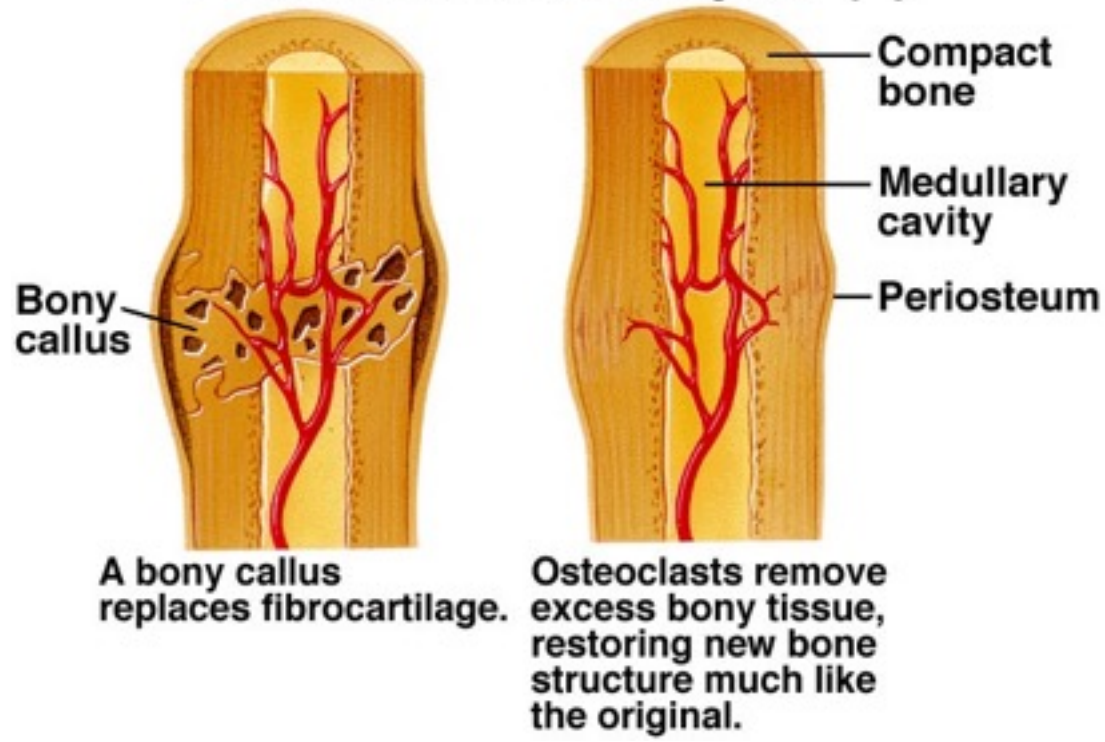
**Blood escapes from ruptured blood vessels and forms a hematoma.**

**Spongy bone forms in regions close to developing blood vessels, and fibrocartilage forms in more distant regions.**

*Describe the roles of platelets and fibroblasts in the early stages of fracture repair.*

*Where do the osteoblasts come from to form the bony callus?*

# Bone Fracture Repair (cont'd)



*Describe how the repair of bone fractures is similar to embryonic bone formation?*