

# Connective Tissue part 2

Descriptive Histology 222

# Cells of connective Tissue

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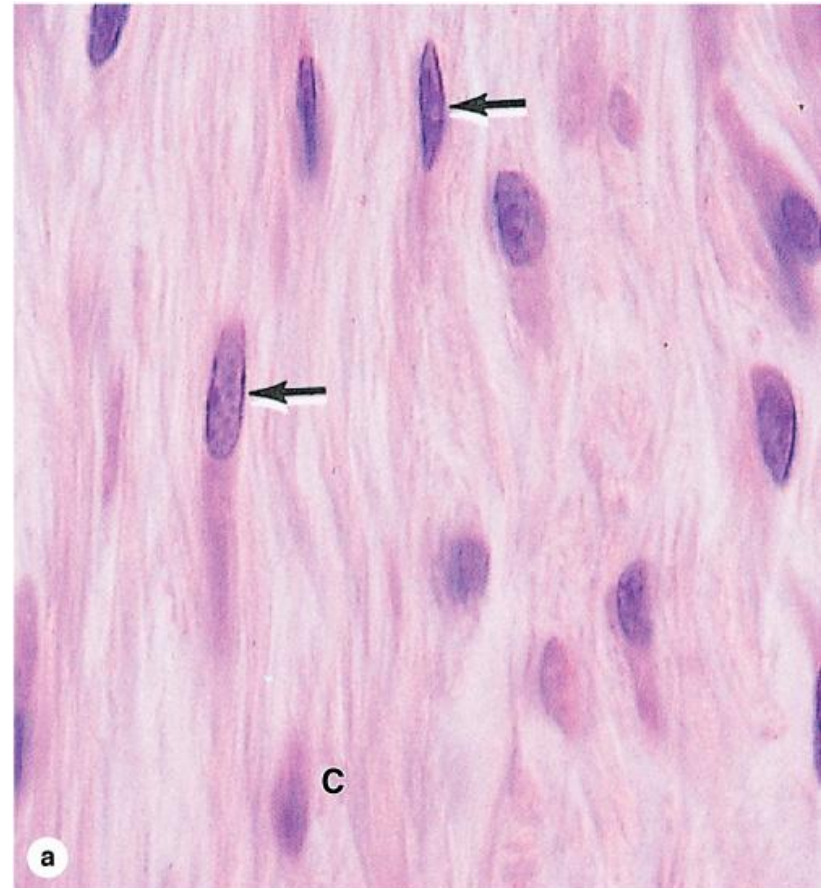
- ▶ Fibroblasts
- ▶ Adipocytes
- ▶ Macrophages
- ▶ Mast Cells
- ▶ Plasma Cells
- ▶ Leukocytes



# Fibroblasts

Fibroblasts synthesize

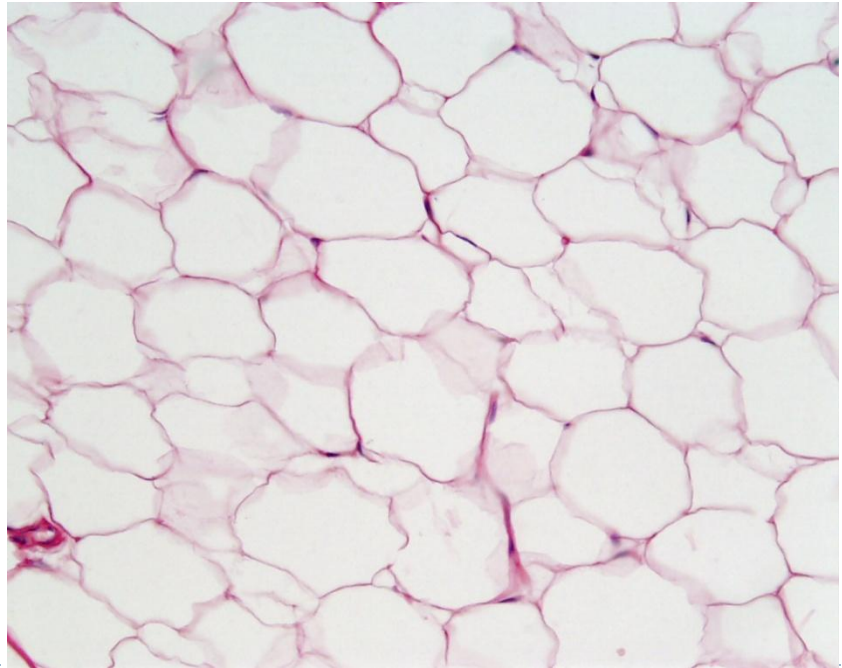
- ▶ Collagen,
- ▶ Elastin,
- ▶ Glycosaminoglycans,
- ▶ Proteoglycans
- ▶ Multiadhesive glycoproteins.



# Adipocytes

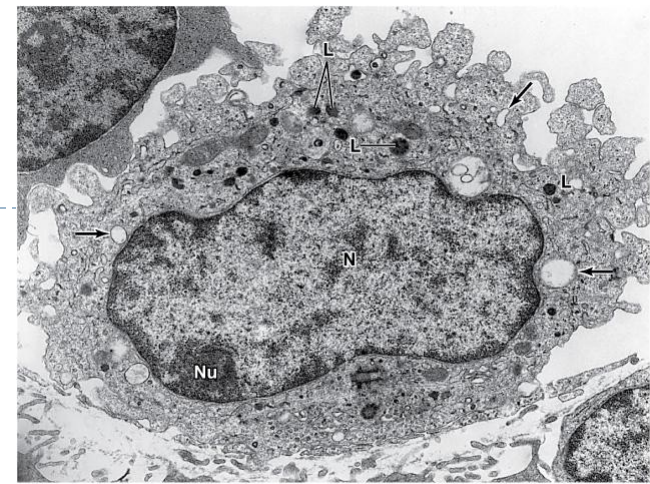
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- ▶ Adipocytes are connective tissue cells that have become specialized for storage of neutral fats or for the production of heat. often called **fat cells**



# Macrophages

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Source: Mescher AL: Junqueira's Basic Histology: Text and Atlas, 12th Edition: <http://www.accessmedicine.com>  
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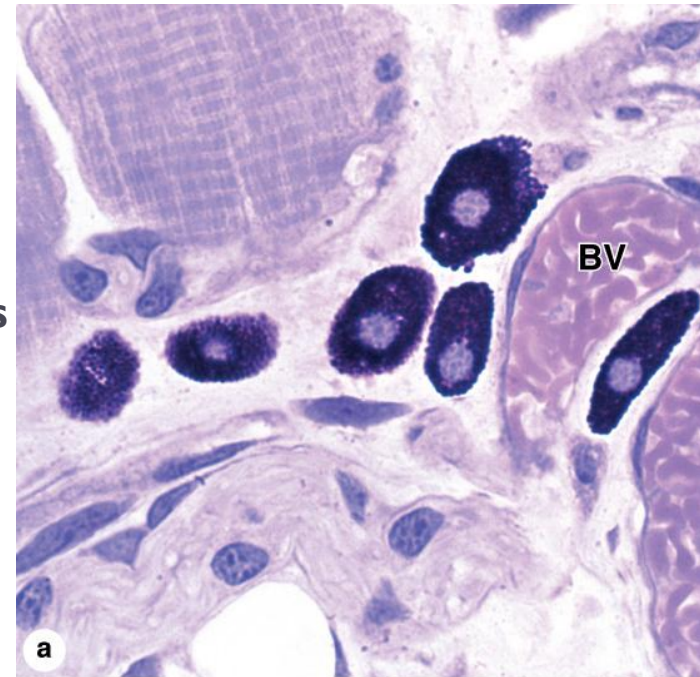
- ▶ Macrophages derive from bone marrow precursor cells that divide, producing **monocytes** which circulate in the blood.
- ▶ Therefore, monocytes and macrophages are the same cell in different stages of maturation.
- ▶ Macrophages act as defense elements
- ▶ Macrophages are also antigen-presenting cells that participate in the processes of partial digestion and presentation of antigen to other cells



# Mast Cells

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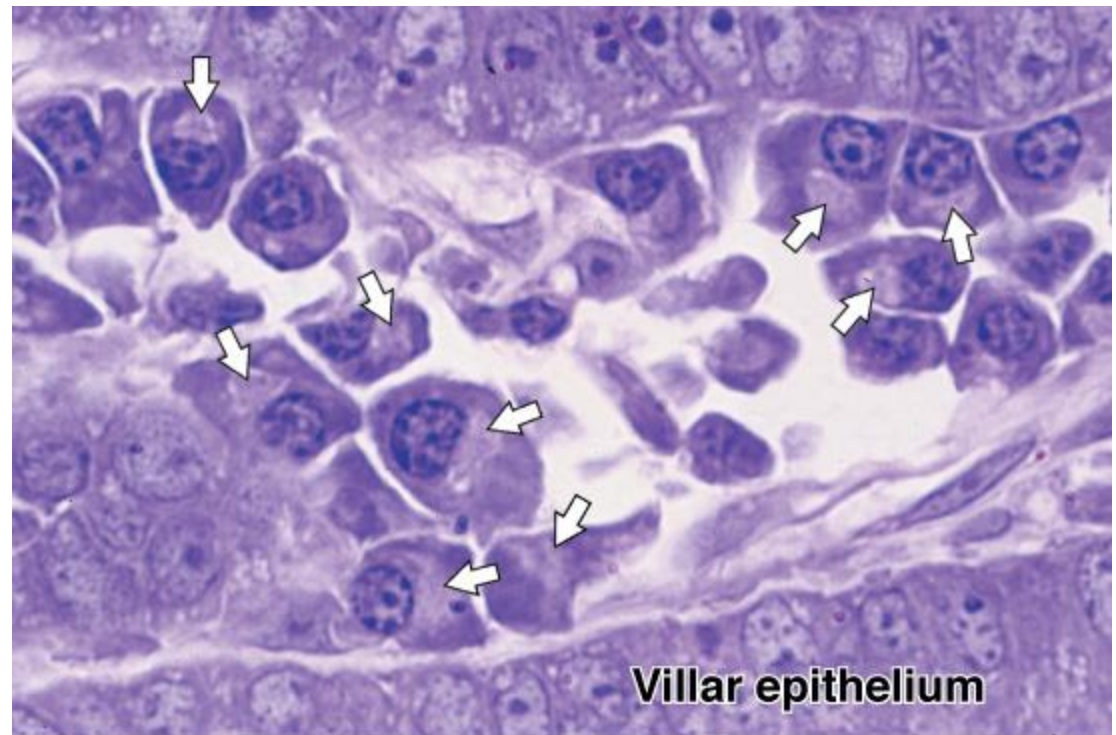
- ▶ Mast cells function in the localized release of many bioactive substances with roles in the inflammatory response, innate immunity, and tissue repair.
- ▶ A partial list of important molecules released from these granules includes:
  - ▶ **Heparin**
  - ▶ **Histamine**
  - ▶ **Serine proteases**
  - ▶ **Eosinophil and neutrophil chemotactic factors**
  - ▶ **Leukotrienes C<sub>4</sub>, D<sub>4</sub>, and E<sub>4</sub>**



Source: Mescher AL: *Junqueira's Basic Histology: Text and Atlas*, 12th Edition: <http://www.accessmedicine.com>  
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# Plasma Cells

- ▶ Plasma cells are derived from B lymphocytes and are responsible for the synthesis of antibodies



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# Fibers of connective tissue

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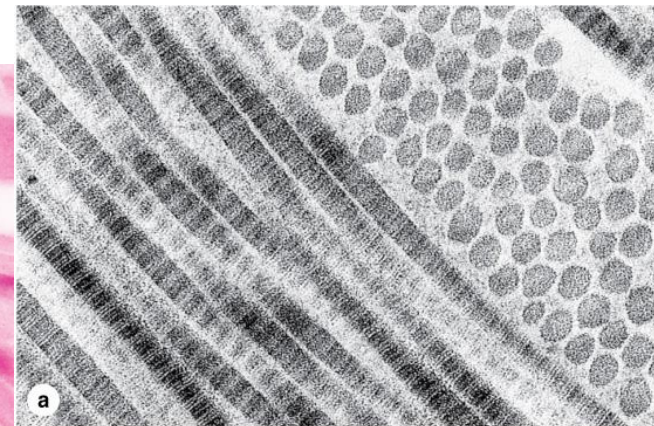
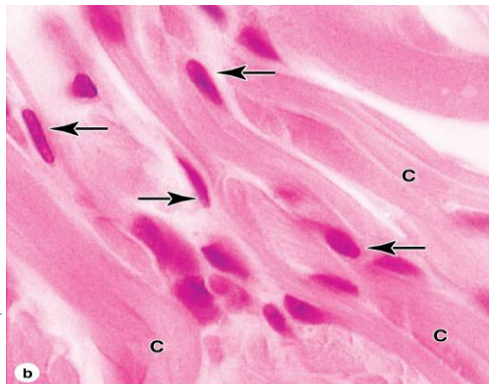
- ▶ **Collagen fibers** present main tensile strength, and are the stuff of scars.
- ▶ **Elastic fibers** present elasticity.
- ▶ **Reticular fibers** (really, a special form of collagen) provide a delicate supporting framework for loose cells.



# Collagen fibers

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- ▶ Collagen types I, II and III are the major fibrous collagens
- ▶ Type I collagen is the most abundant structural component of skin, tendons and bones. It represents 90 % of the total collagen content.
- ▶ Type II collagen makes the structural framework of cartilage and intervertebral disks.



# Collagen fibers

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- ▶ Type **III** collagen is present in many tissues: 1 to 2 % in tendons, 10 % in the skin and even 50 % in the vascular system
- ▶ Type **IV** collagen is the structural framework of the non-fibrous basement membranes which act as an underlying support for epithelial and endothelial cells, a protective sheath for myofibrils and the filtration membrane of the glomeruli



# Elastic fibers

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- ▶ **Elastin** is another fibrous protein.
- ▶ As the name suggests, elastin is elastic.
- ▶ In ordinary connective tissue, elastic fibers help restore normal shape after distortion.
- ▶ Elastic fibers can deteriorate with age and exposure to sun



# Reticular fibers

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- ▶ Made from type III collagen, provide a very delicate network (hence the name) supporting individual cells in certain organs (lymph nodes, spleen, liver).
- ▶ Reticular fibers do not show up in routine H&E stained specimens, but they can be demonstrated with silver salts.



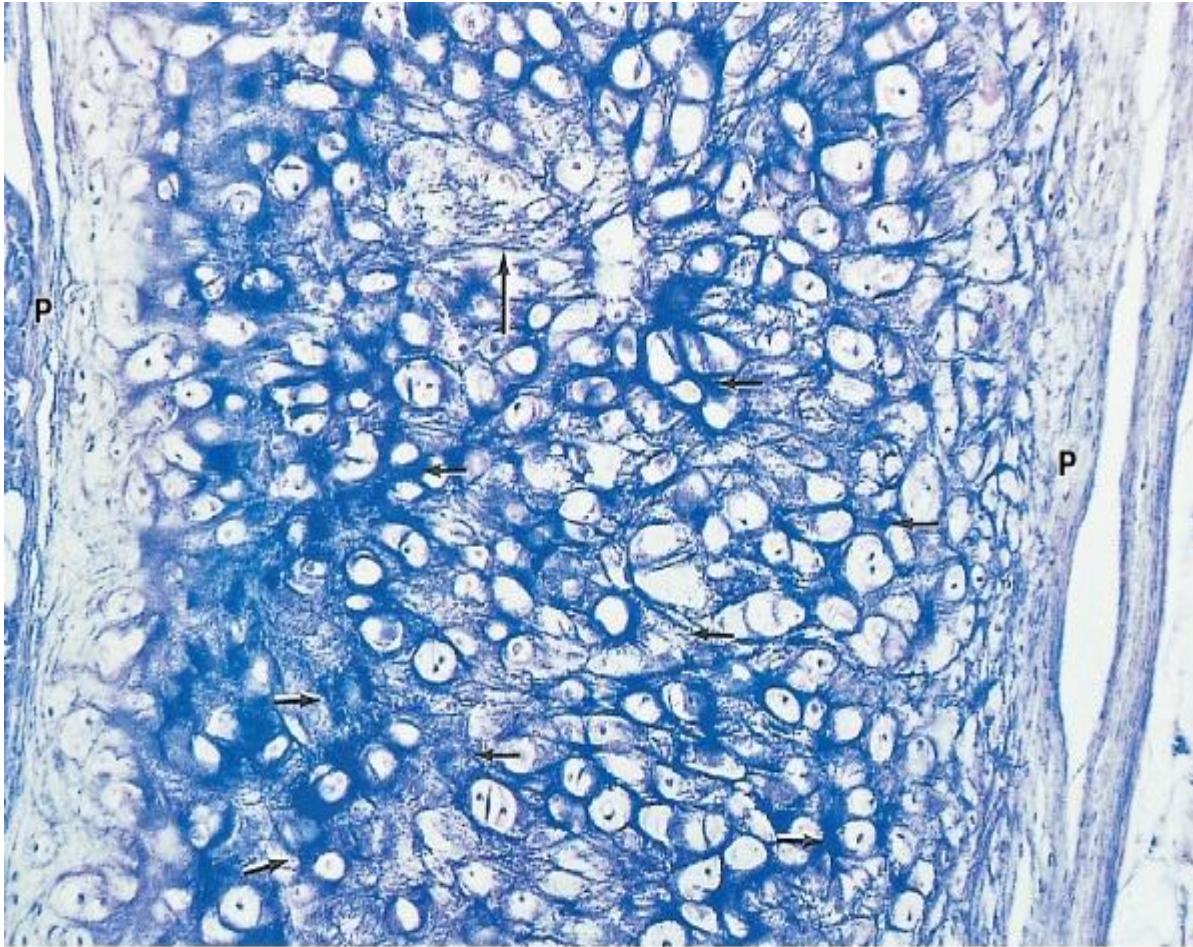
# Supportive Connective Tissue

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## CARTILAGE

- ▶ Jelly-like matrix (chondroitin sulfate) containing collagen and elastic fibers and chondrocytes surrounded by a membrane called the perichondrium.
- ▶ Unlike other CT, cartilage avascular (has NO blood vessels) or nerves except in the perichondrium.
- ▶ The strength of cartilage is due to collagen fibers and the resilience is due to the presence of chondroitin sulfate.
- ▶ Chondrocytes occur within spaces in the matrix called lacunae.





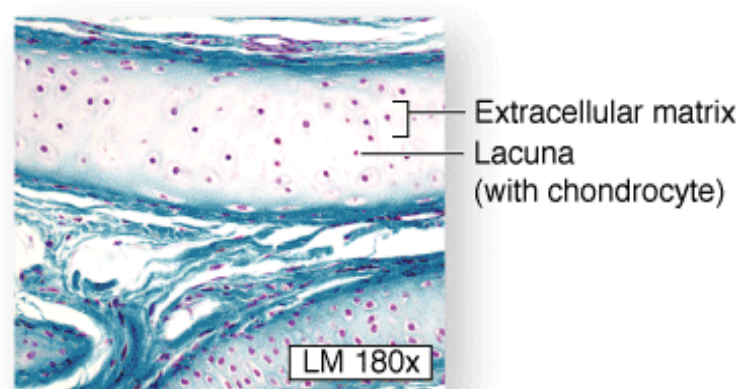
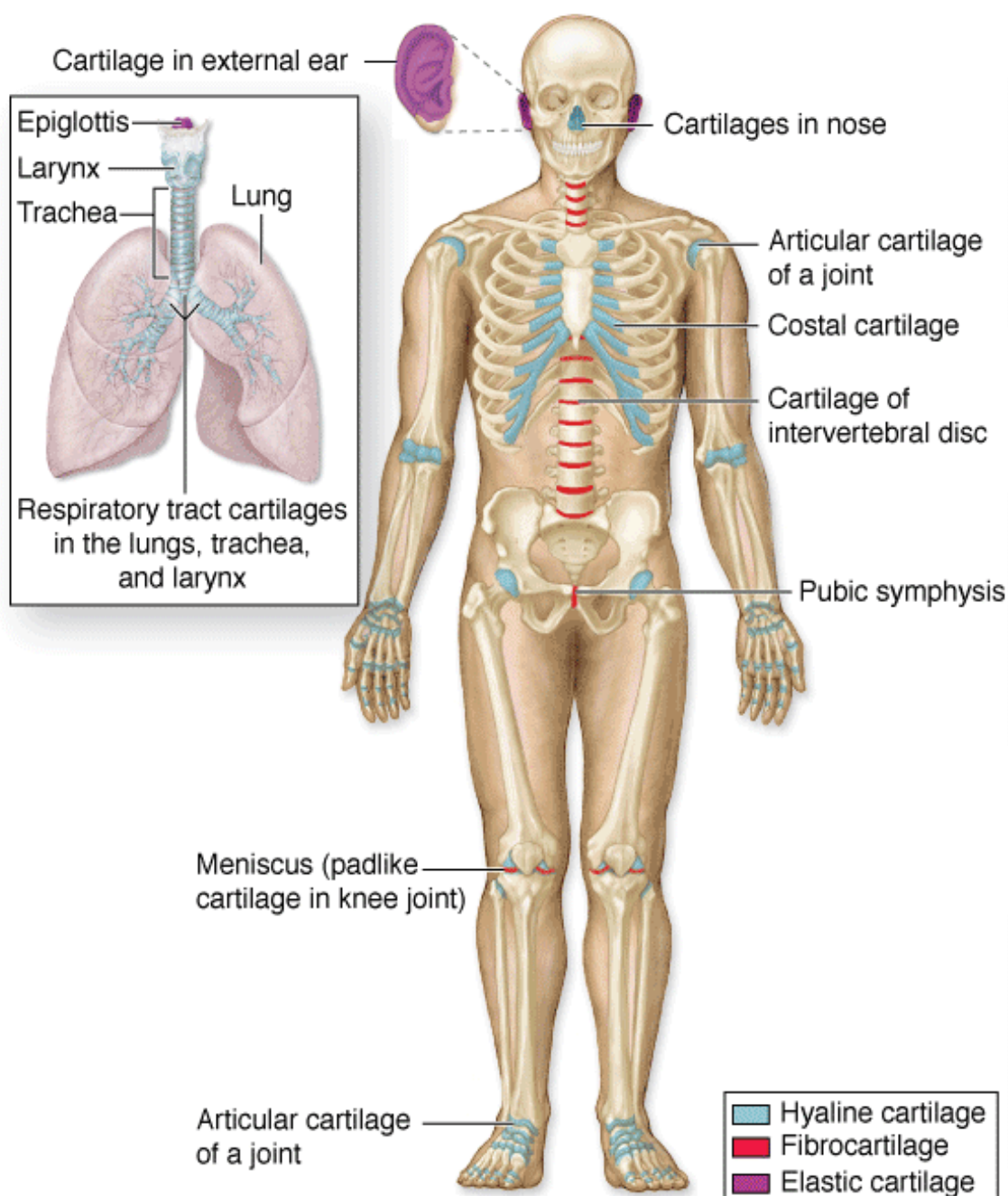
**perichondrium (P)**

# Supportive Connective Tissue

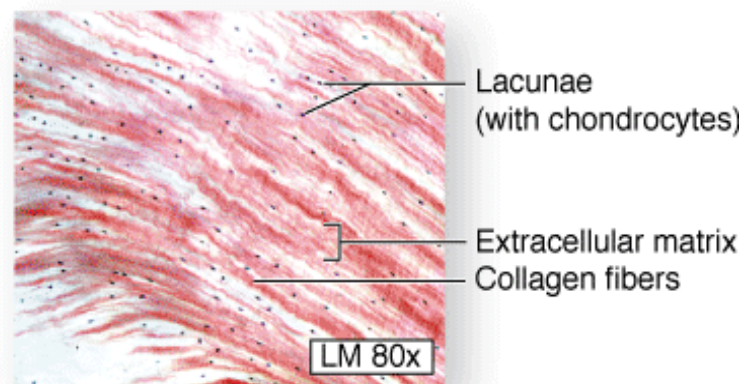
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1. **Hyaline cartilage**
2. **Fibrocartilage**
3. **Elastic cartilage**

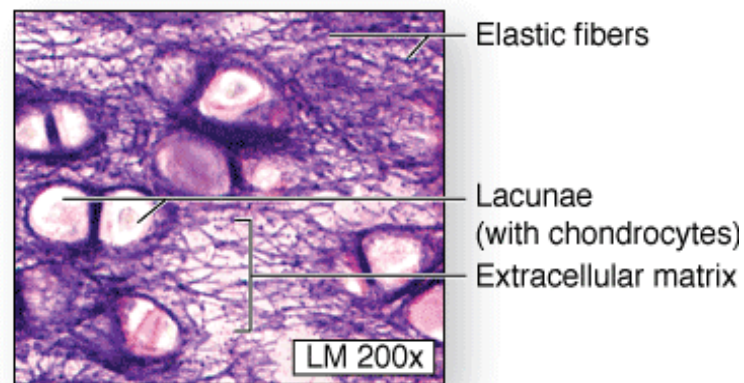




**b Hyaline cartilage**



**c Fibrocartilage**



**d Elastic cartilage**

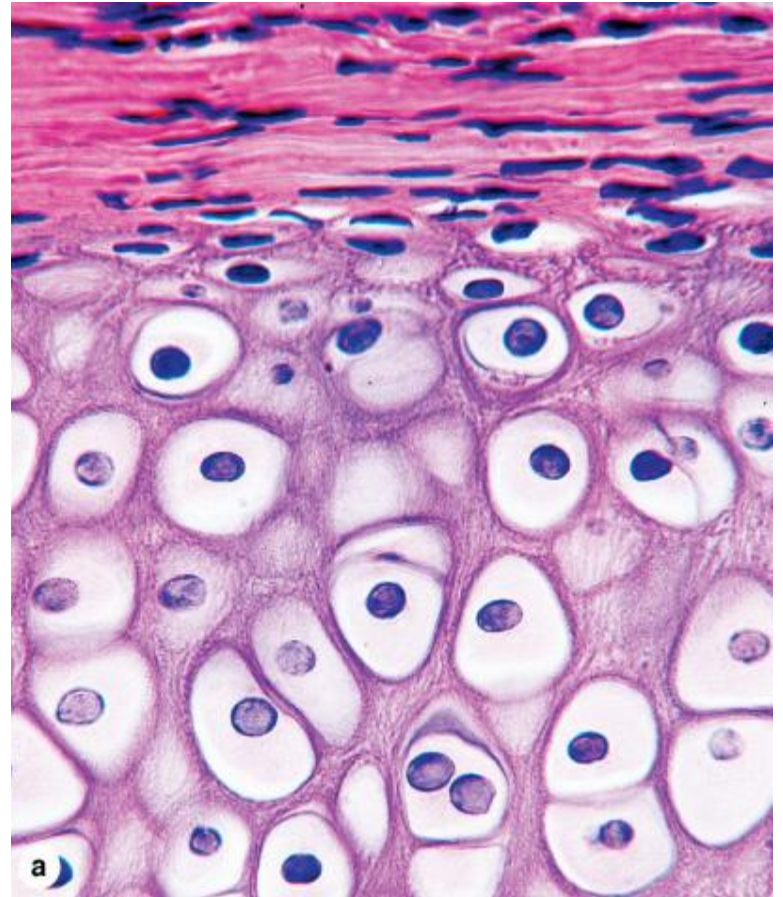
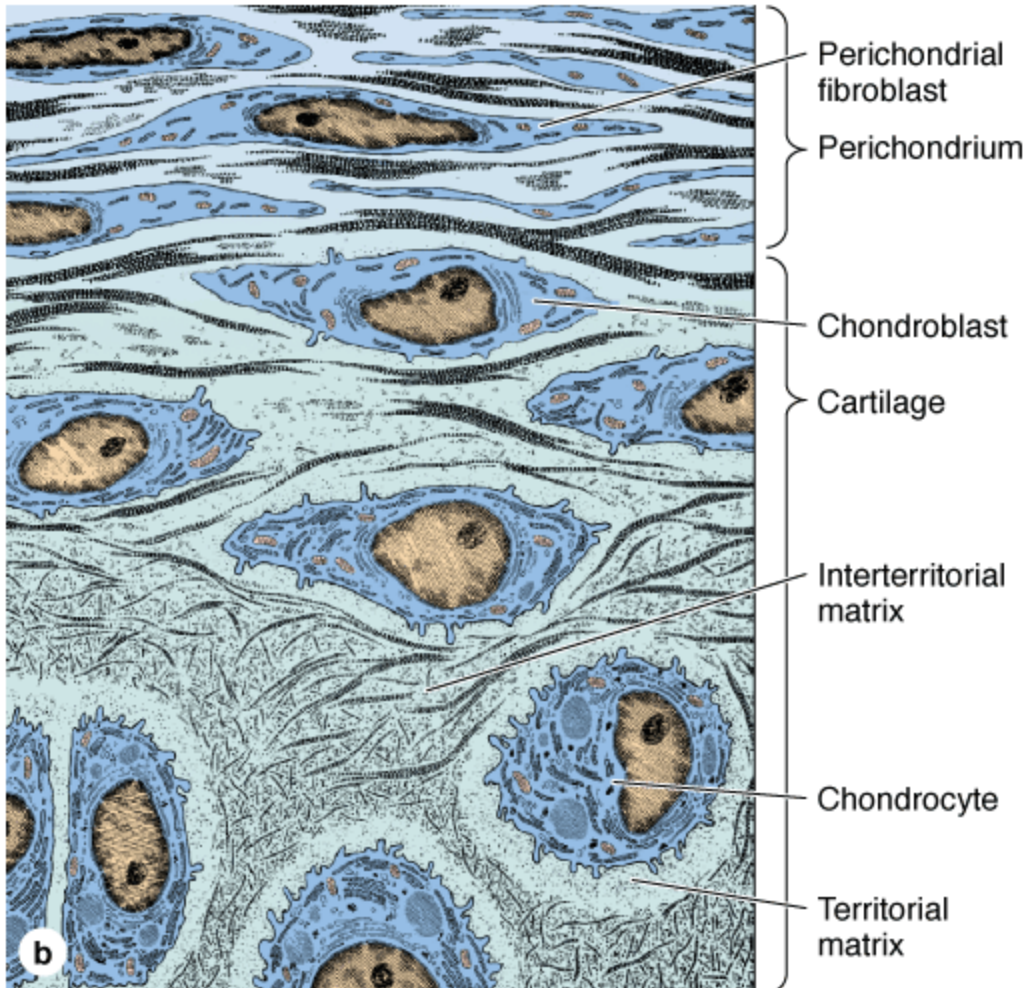
# Supportive Connective Tissue:

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## Hyaline Cartilage (most abundant type)

- ▶ fine collagen fibers embedded in a gel-type matrix. Occasional chondrocytes inside lacunae.
- ▶ Found in embryonic skeleton, at the ends of long bones, in the nose and in respiratory structures.
- ▶ Function= flexible, provides support, allows movement at joints



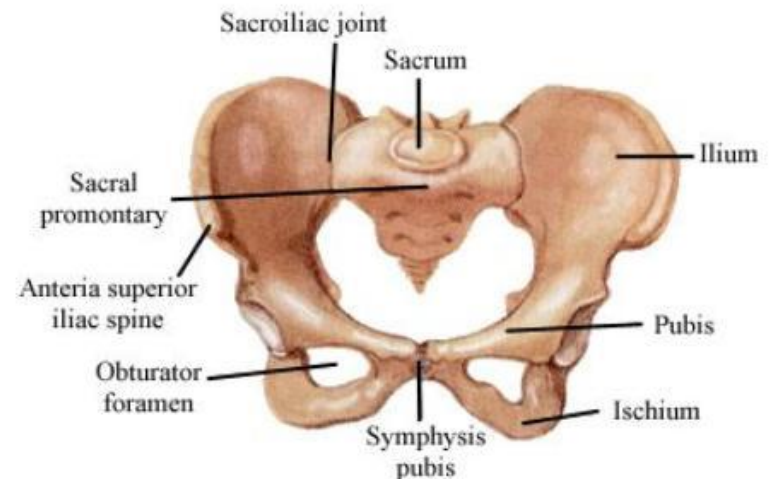


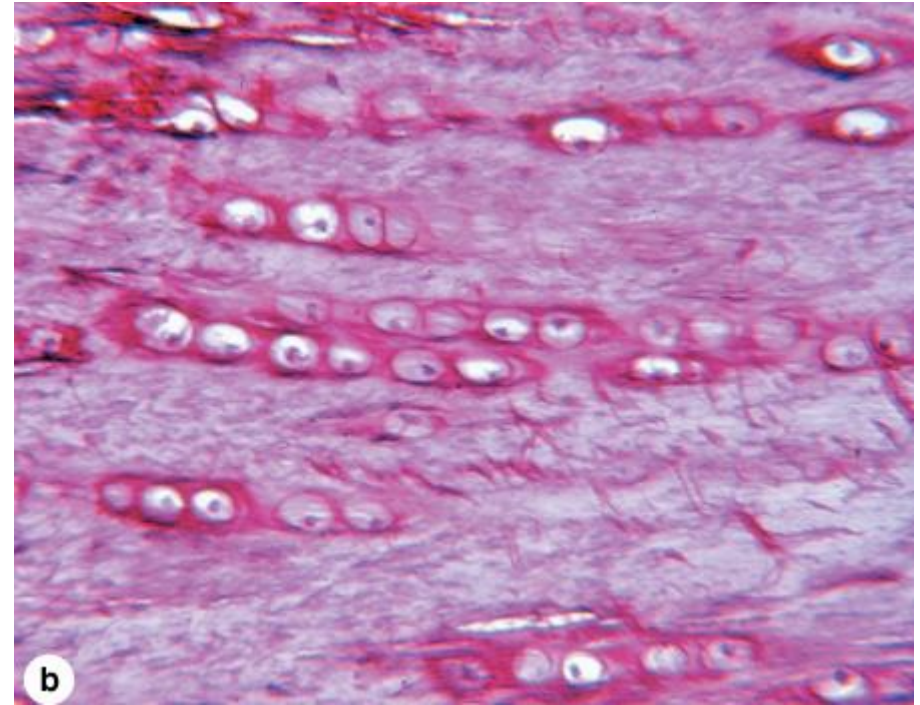
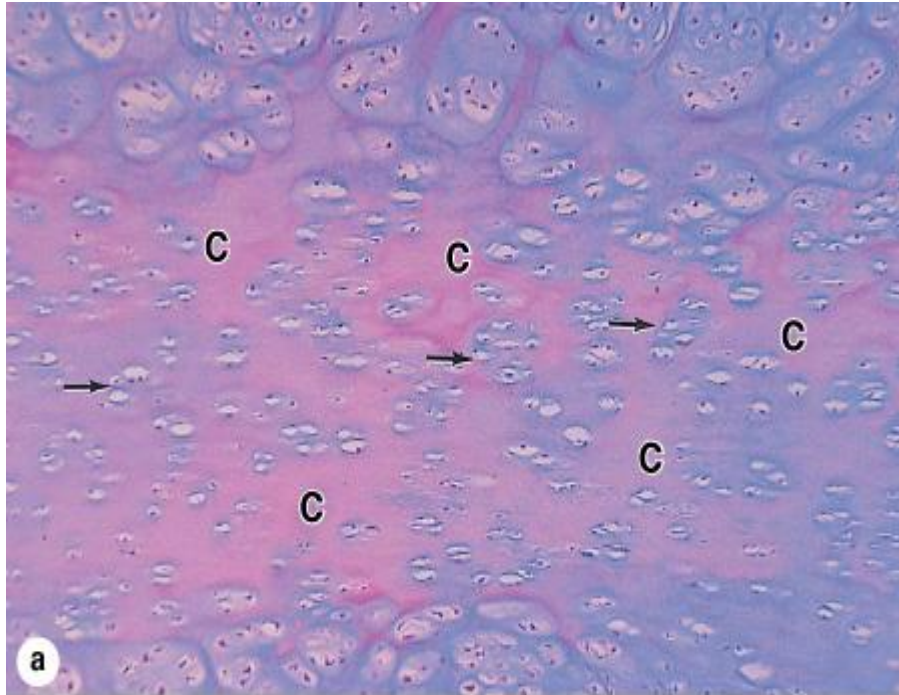
# Supportive Connective Tissue:

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## Fibrocartilage

- ▶ contains bundles of collagen in the matrix that are usually more visible under microscopy.
- ▶ Found in the pubic symphysis, intervertebral discs, and menisci of the knee.
- ▶ Function = support and fusion, and absorbs shocks.

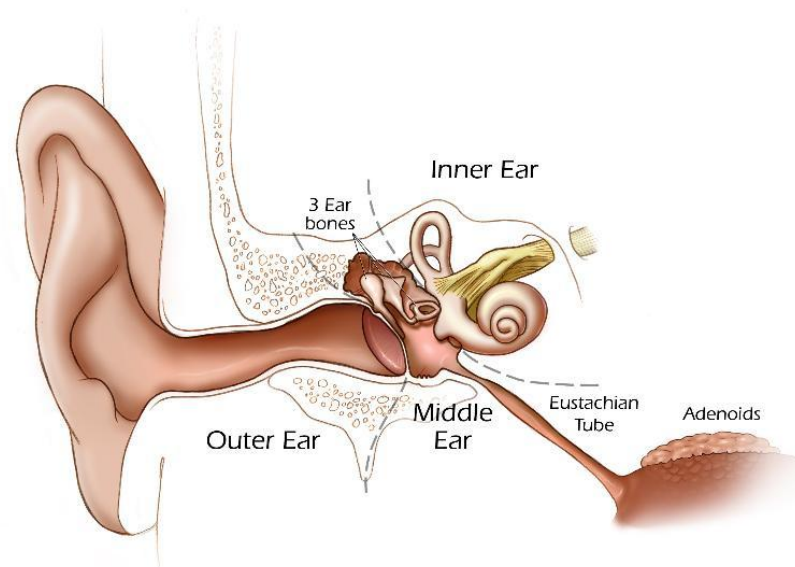




# Supportive Connective Tissue:

## Elastic Cartilage

- ▶ threadlike network of elastic fibers within the matrix.
- ▶ found in external ear, auditory tubes, epiglottis.
- ▶ function = gives support, maintains shape, allows flexibility

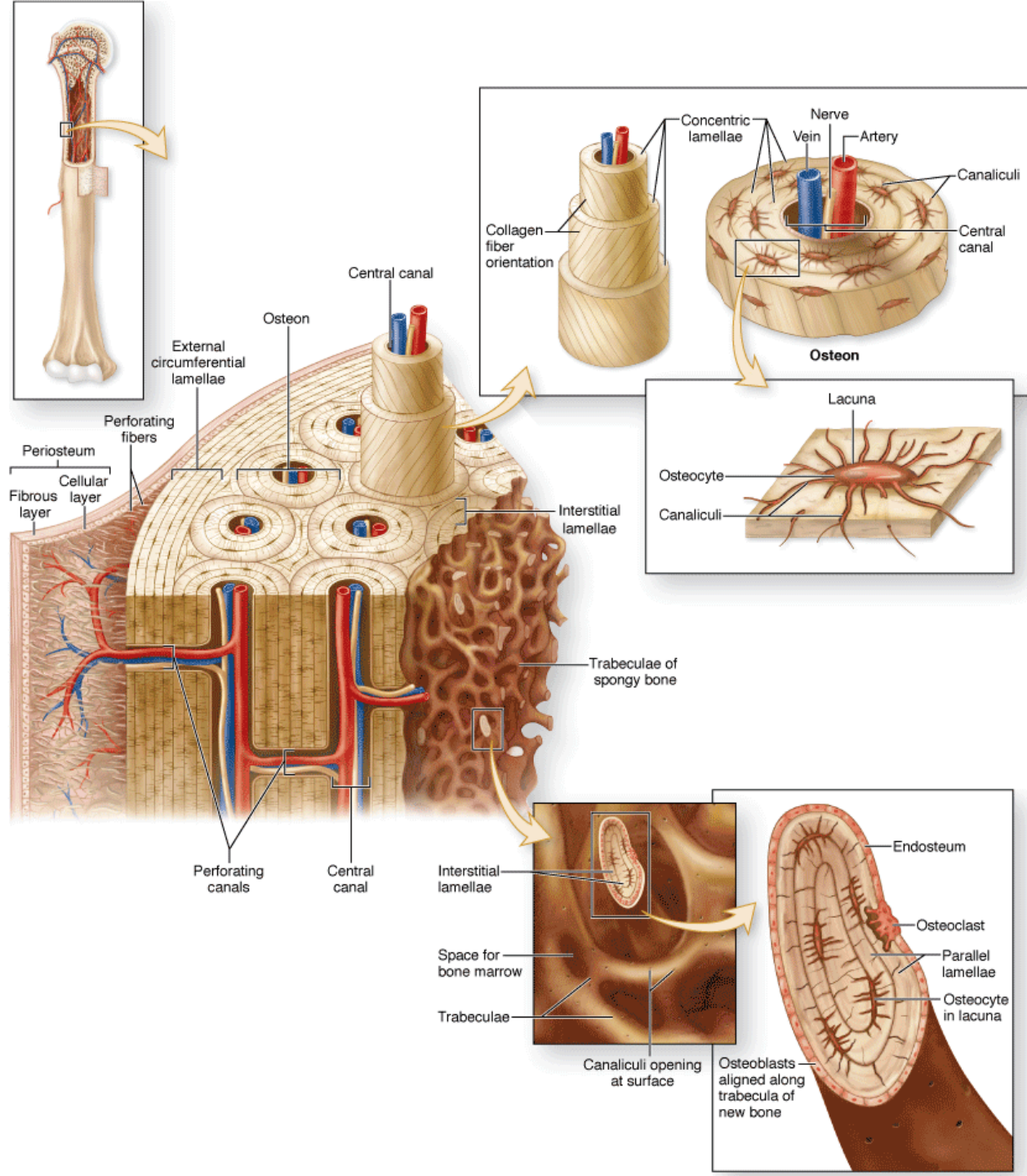


# Bone

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- ▶ **Osteocytes** (Gr. *osteon*, bone + *kytos*, cell), which are found in cavities (**lacunae**) between layers (lamellae) of bone matrix
  - ▶ **Osteoblasts** (*osteon* + Gr. *blastos*, germ), which synthesize the organic components of the matrix
  - ▶ **Osteoclasts** (*osteon* + Gr. *klastos*, broken), which are multi-nucleated giant cells involved in the resorption and remodeling of bone tissue.
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<http://www.youtube.com/watch?v=yFJ4iswRiu4>

<http://www.youtube.com/watch?v=Tkf8-xbWeHY>

<http://www.youtube.com/watch?v=RluwQ7f8zSw>

