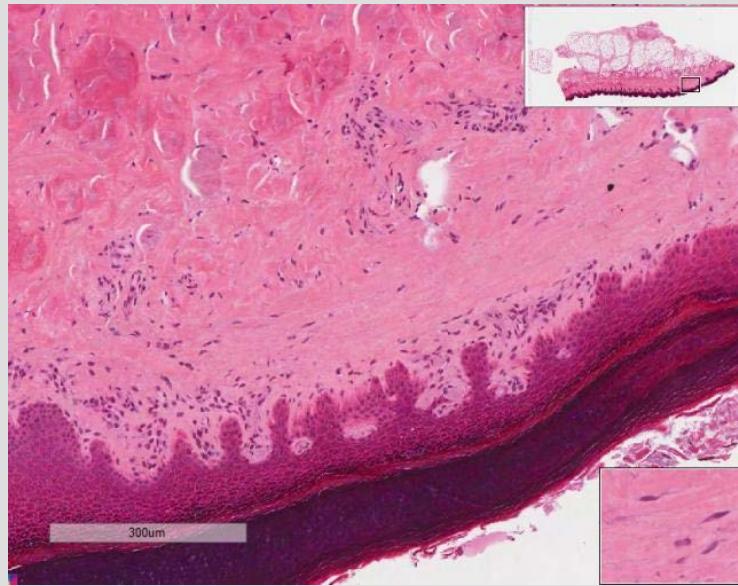
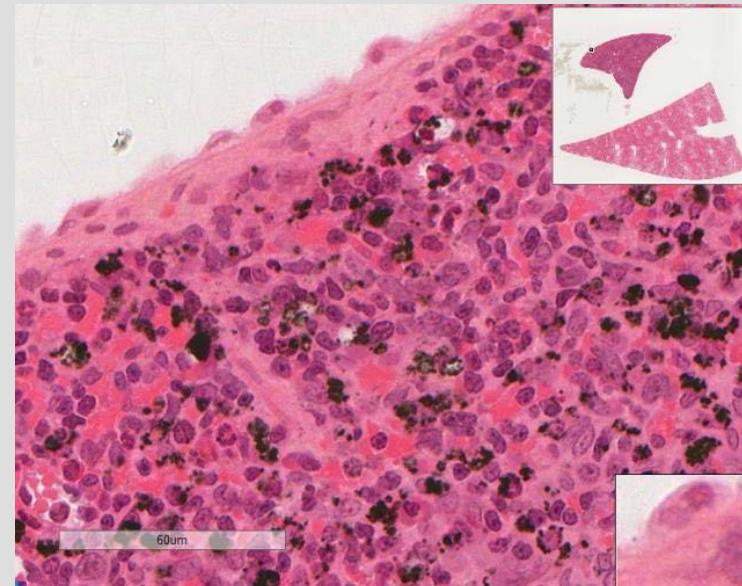


# Medical School Histology Basics: Connective Tissue

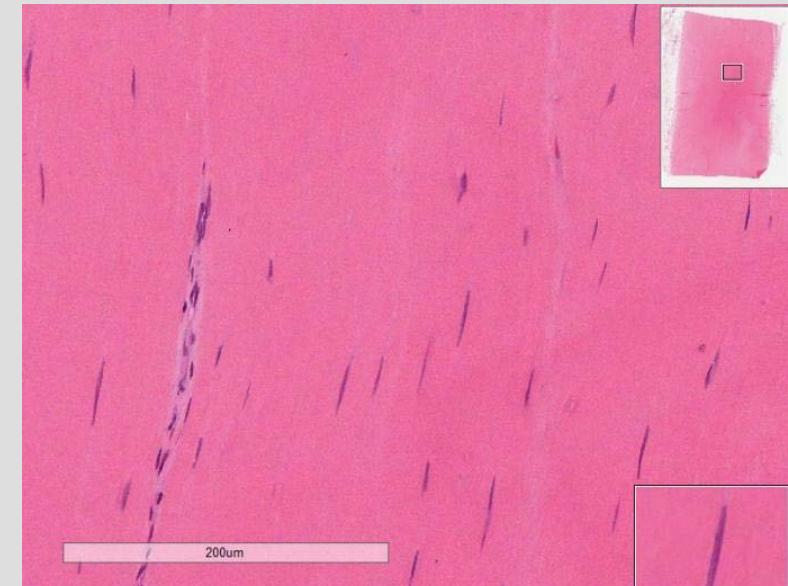
VIBS 243



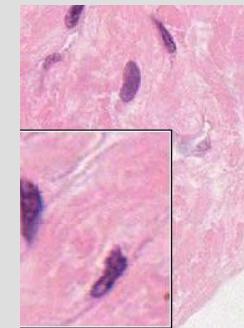
Mast cell



Macrophage



Fibroblasts



Fibroblasts



Plasma cell



Fat cells



Larry Johnson

Texas A&M University

# Function of Connective Tissue

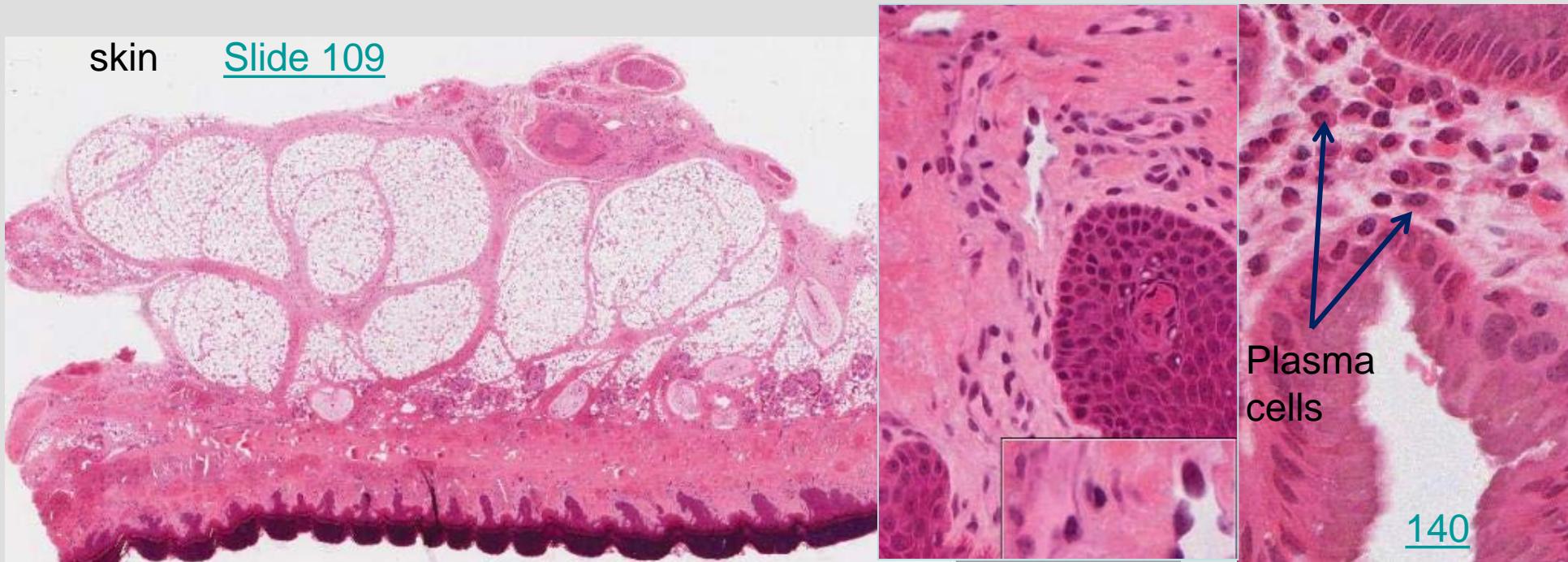
The histological glue which binds the other tissues together to form organs

Mechanical support - stroma below epithelium, skeleton

Metabolite exchange - vascular beds

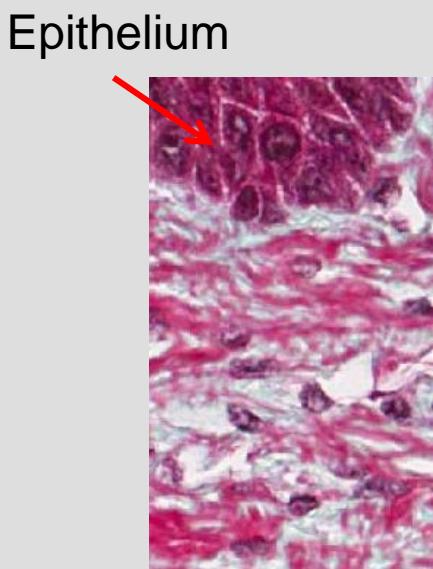
Energy storage - adipose tissue

Inflammation - site of action for blood borne immune cells

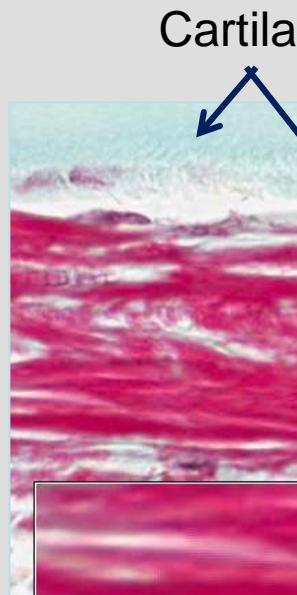


# Distinguishing features and histological identification

- **Loose connective tissue** – sparse collagen and elastic fibers, plentiful cells including fibroblasts, leukocytes
- **Dense connective tissue** – concentrated collagen, few cells
- **Cartilage** – avascular homogeneous matrix of collagen and protein-polysaccharides with few cells
- **Bone** – calcified collagen matrix with few cells trapped in the caves of bone



Loose connective tissue



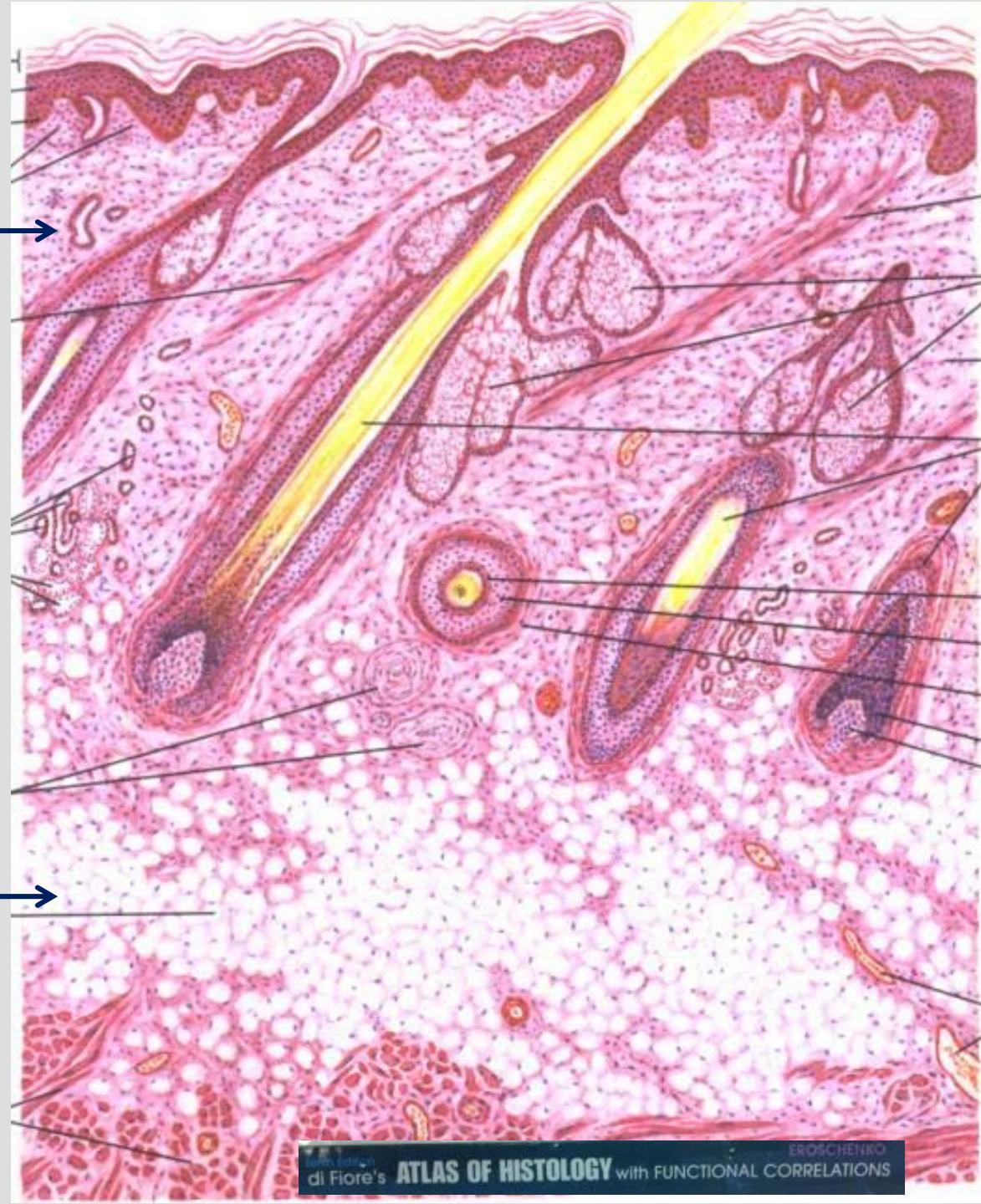
Dense connective tissue



Bone

# SKIN

Dense irregular connective tissue  
(few cells and lots of fibers)



Loose connective tissue  
(lots of cells and few fibers)

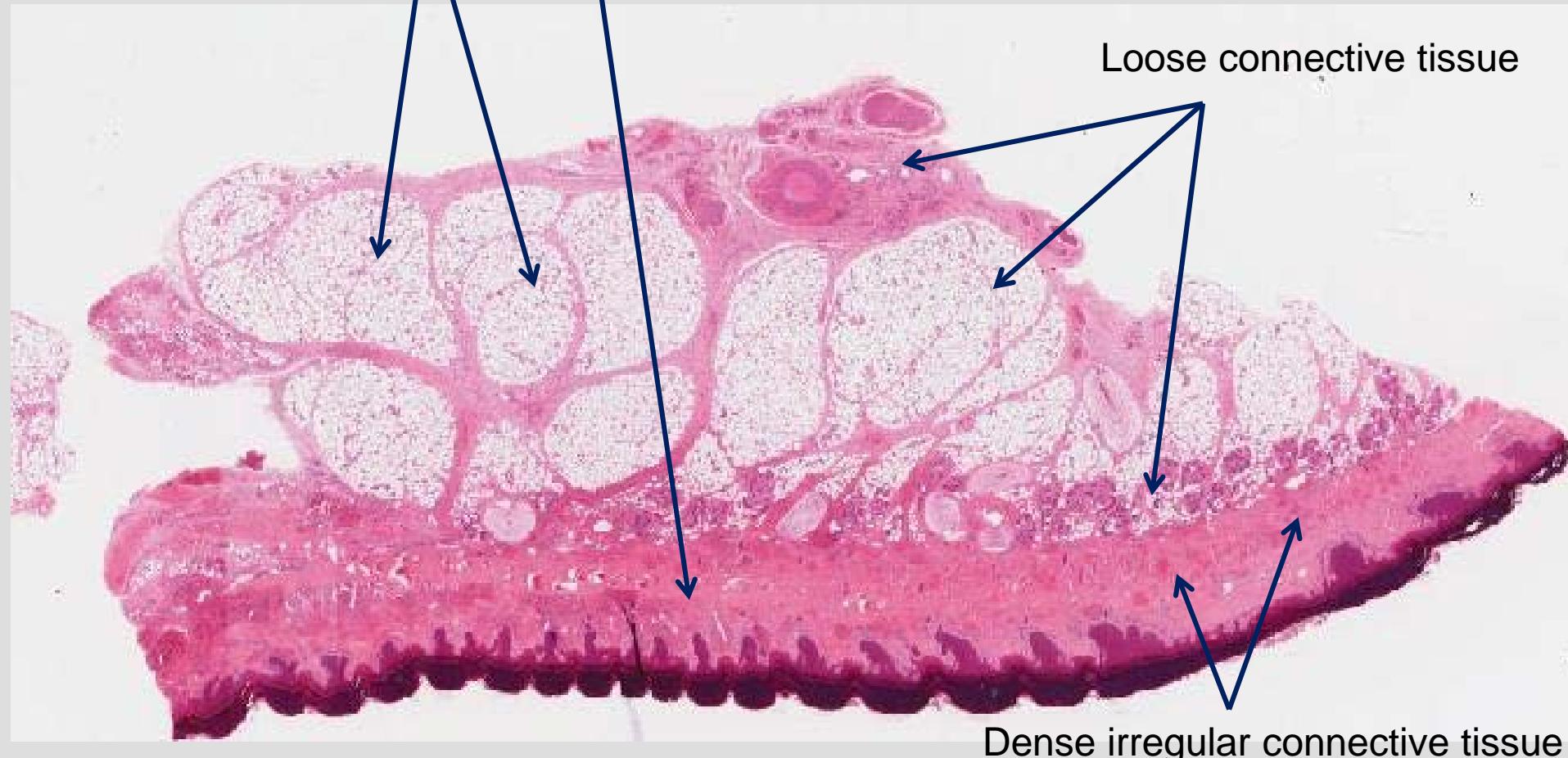


# Slide 109: Skin, hand, monkey

- Irregular connective tissue, dense surface region and loose subdermal region

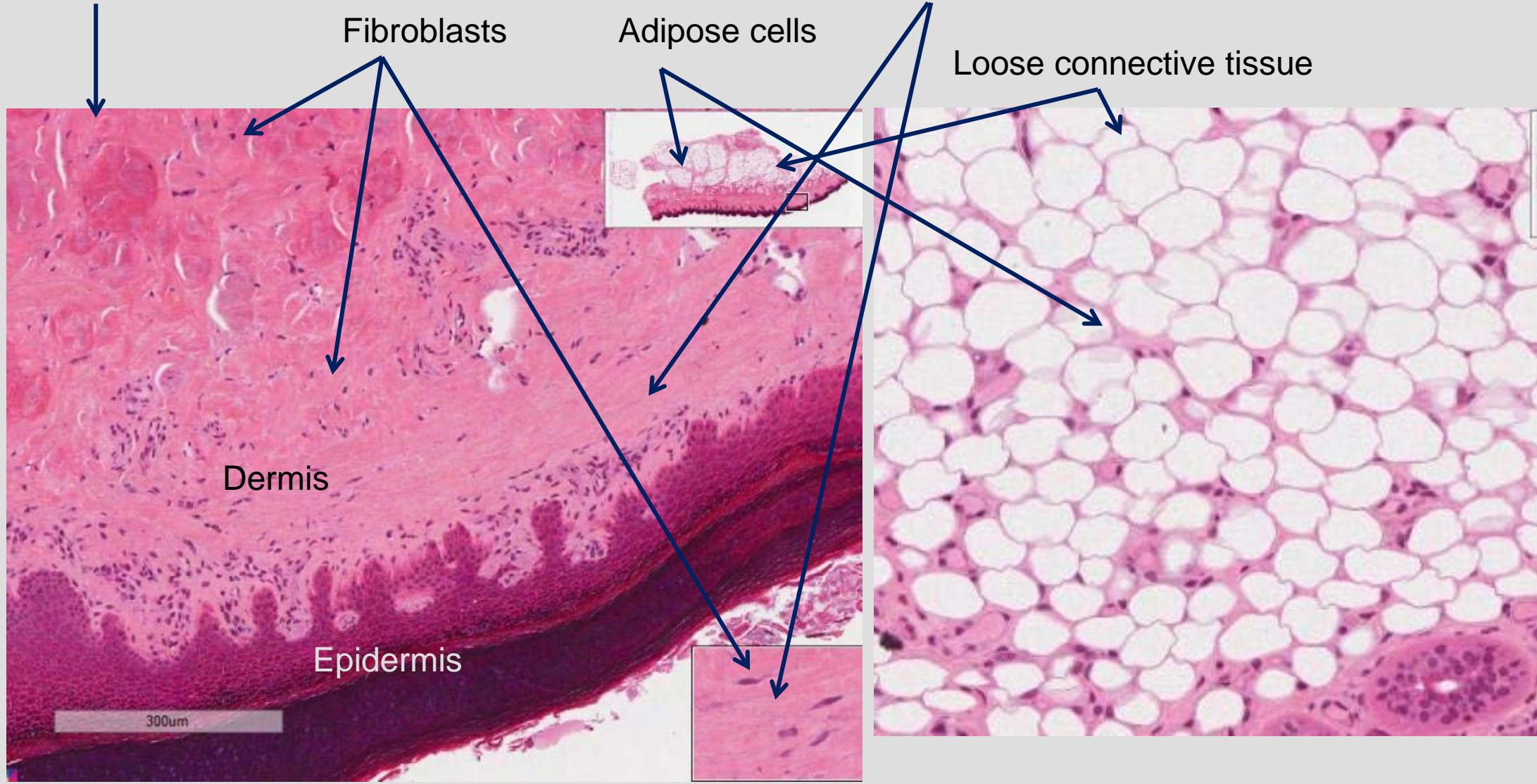
Adipose cells,

Location of a high density of collagen fibers



# Slide 109: Skin, hand, monkey

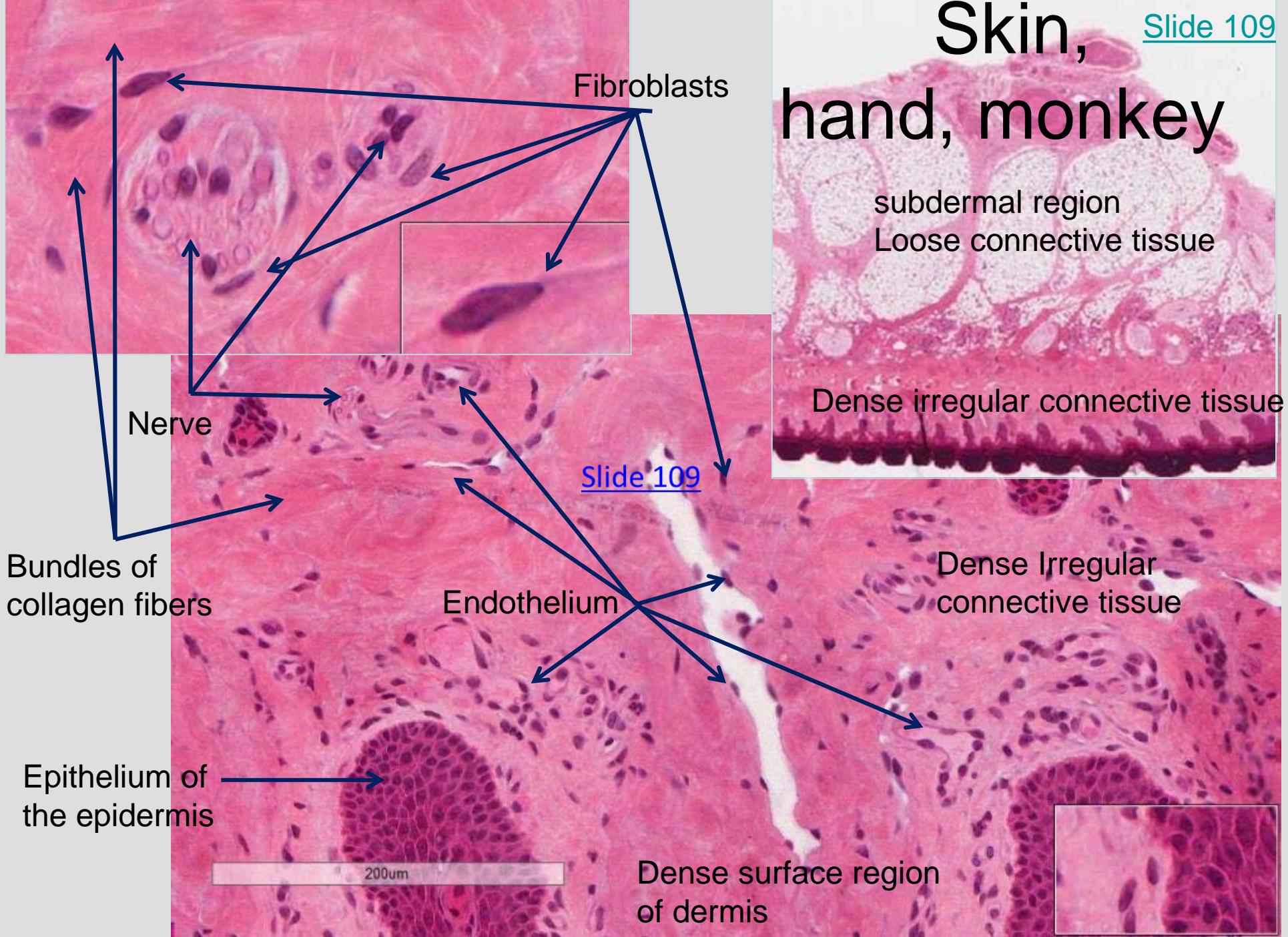
Dense Irregular  
connective tissue



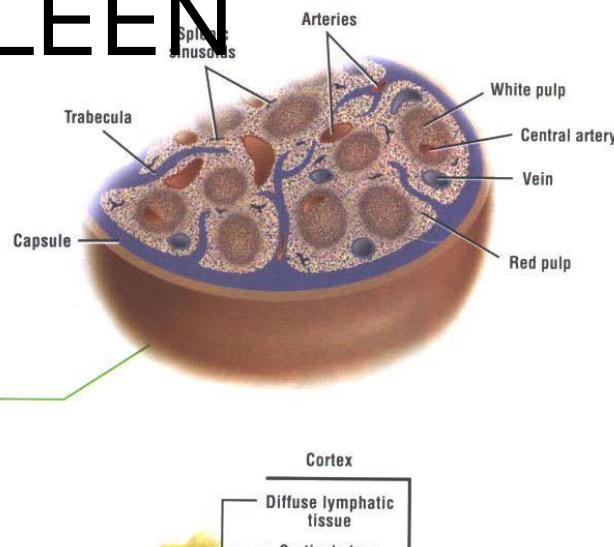
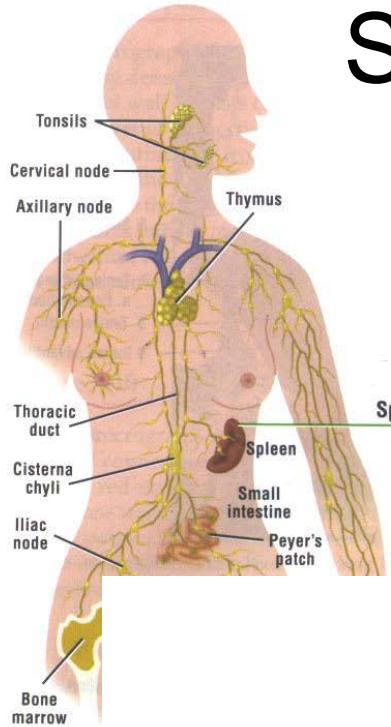
# Skin,

Slide 109

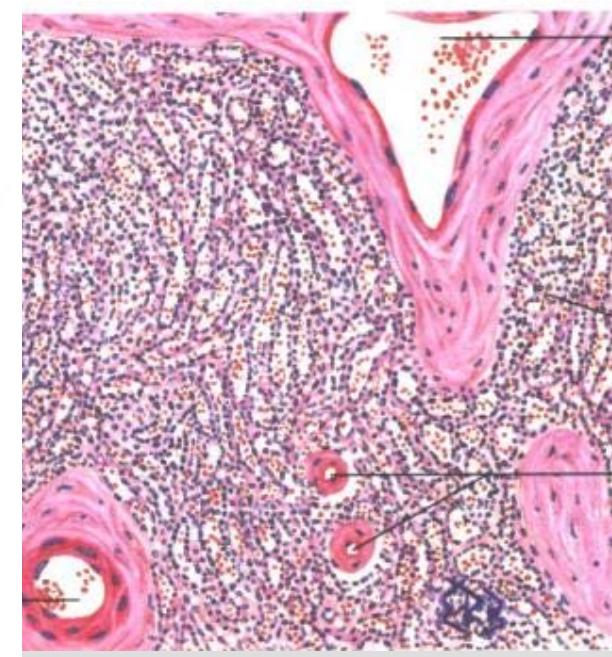
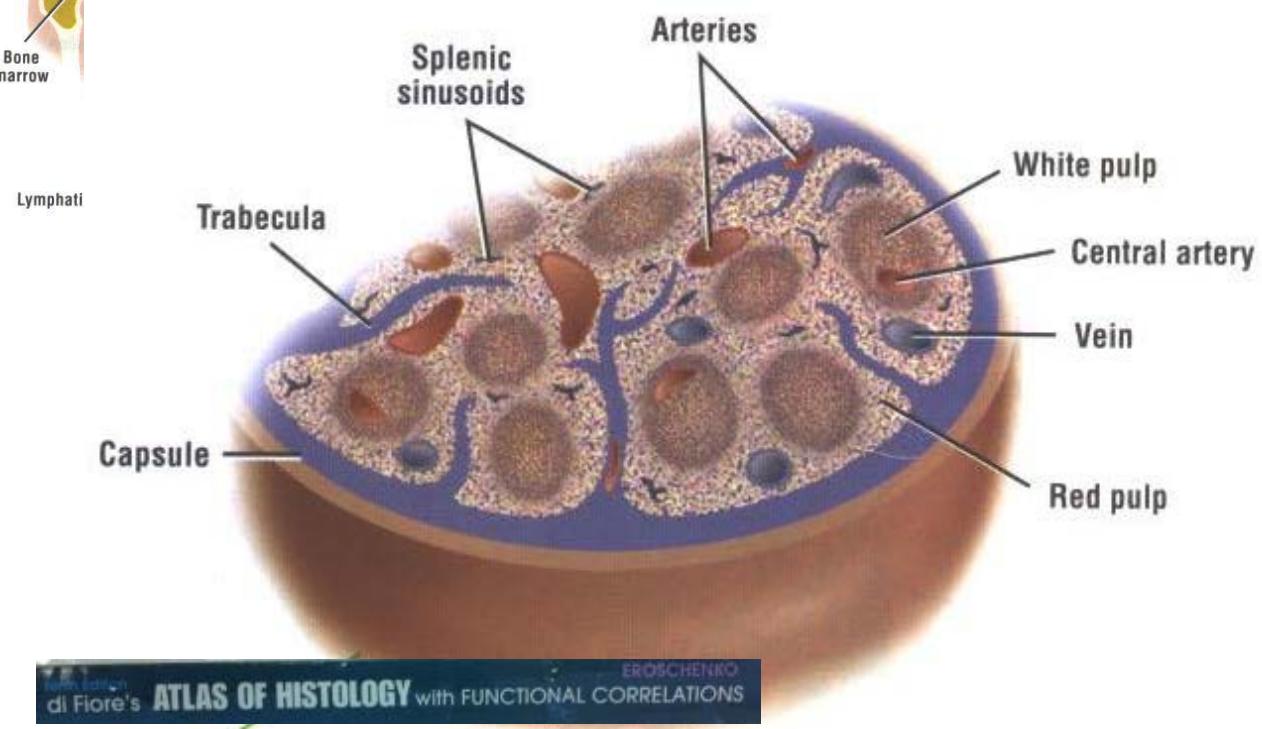
## hand, monkey



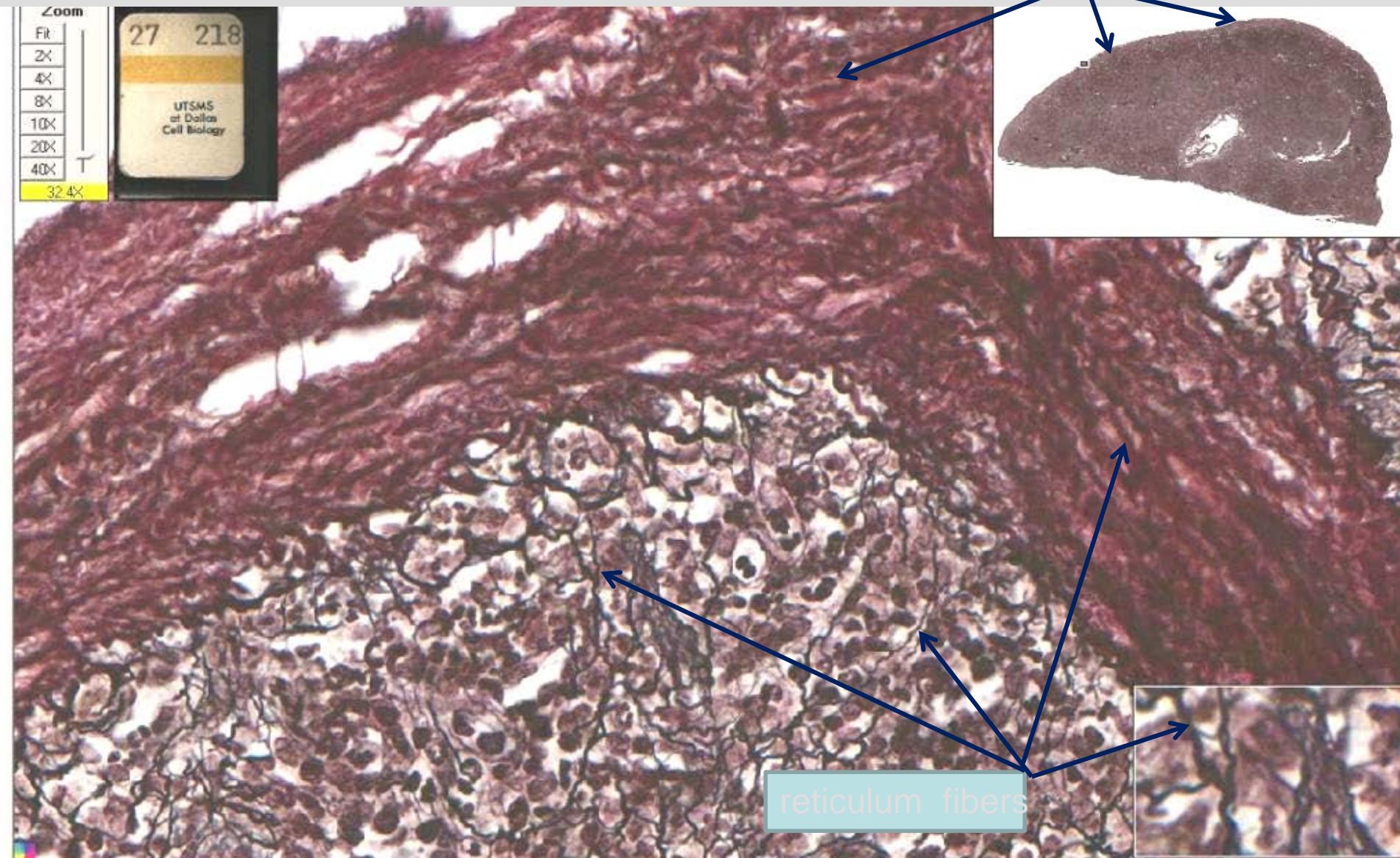
# SPLEEN



Ref code  
# 5

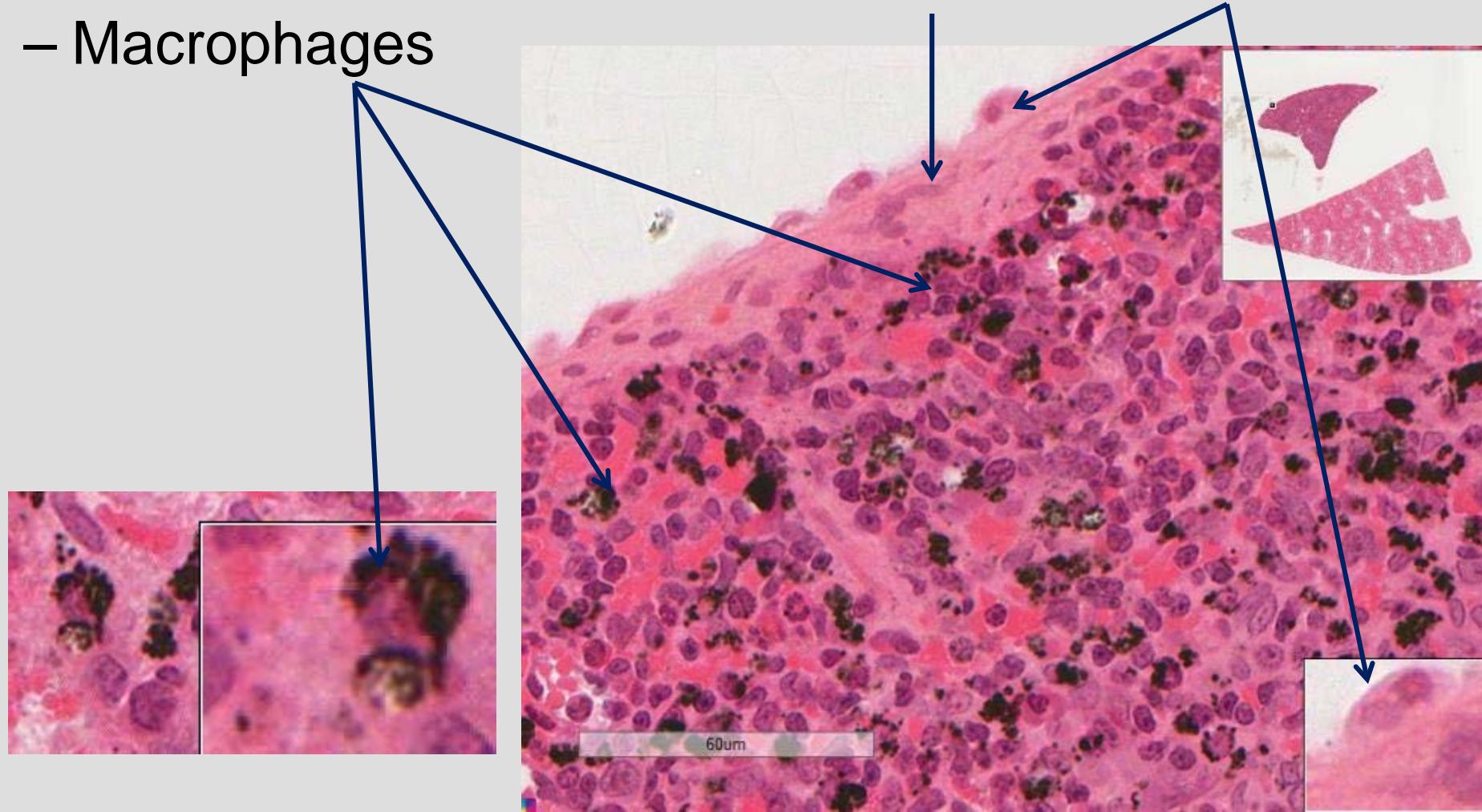


# 218 Spleen (reticulum stain)- capsule and reticulum fibers



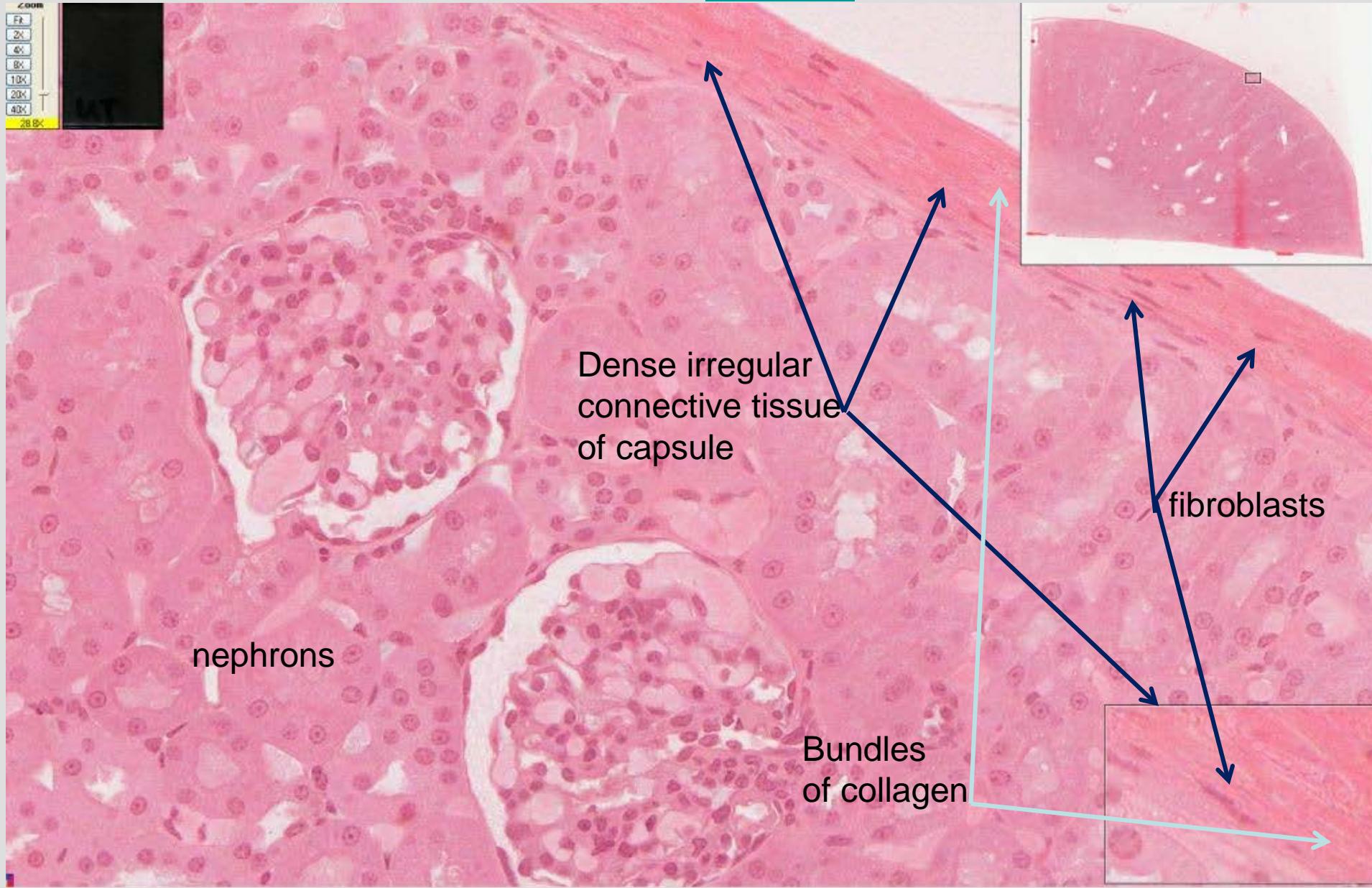
# Slide 118: Liver & spleen with colloidal carbon, rat

- Dense irregular connective tissue capsule<sub>mesothelium</sub>
- Macrophages

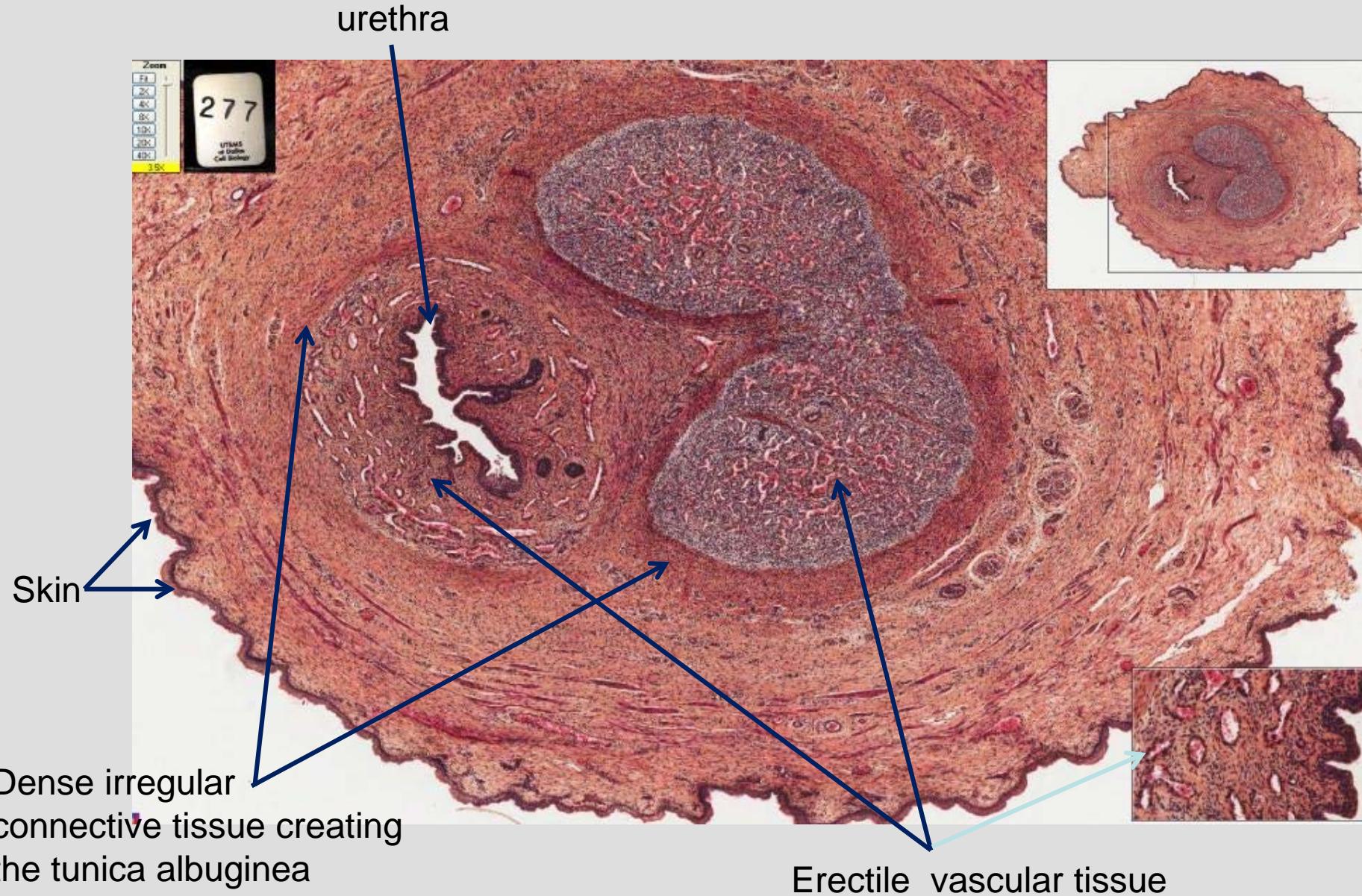


# Kidney Capsule, urinary vascular poles

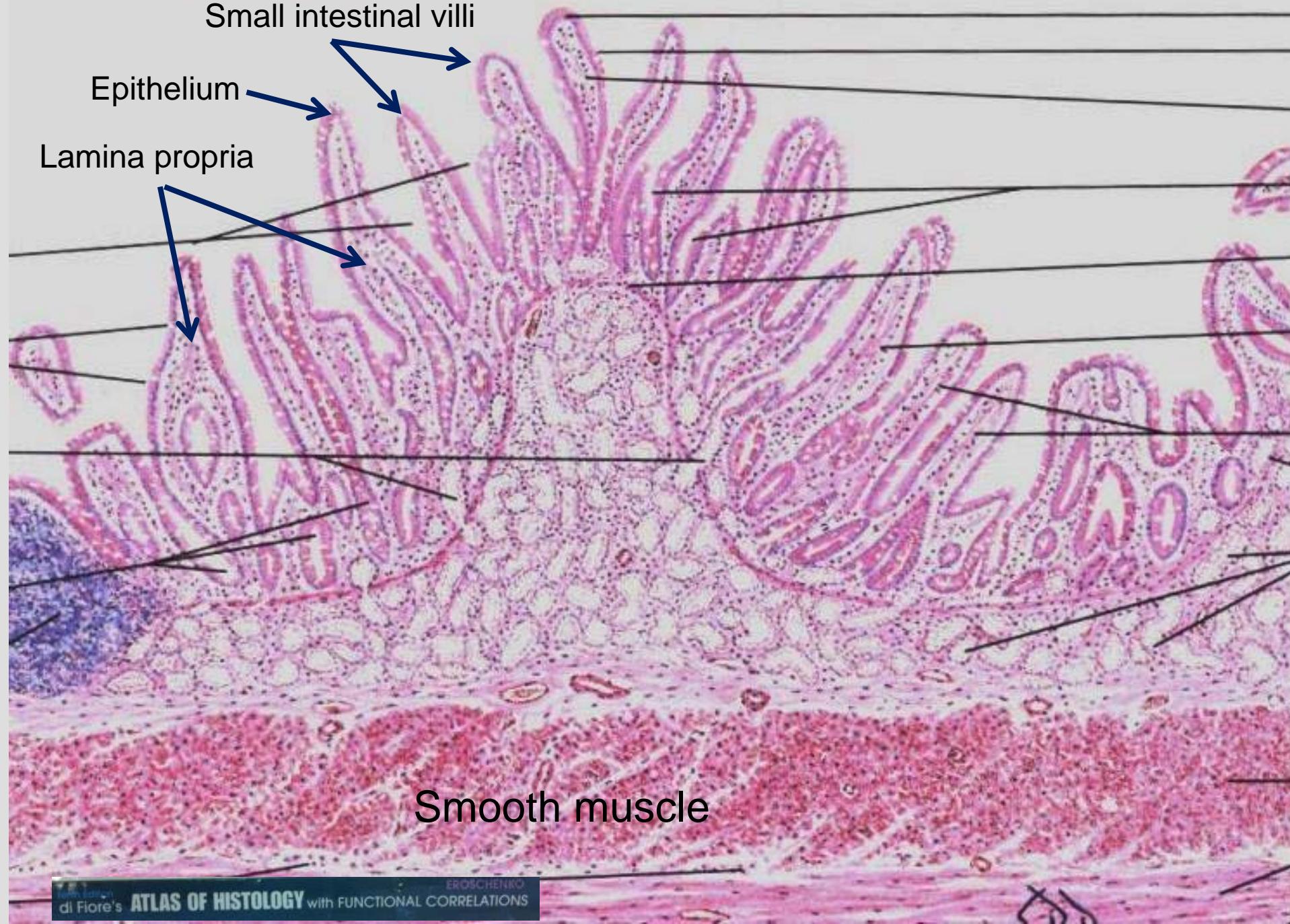
slide #19713



# Penis – transitional epithelium and surrounding slide 277 spongy cavernous of penal urethra

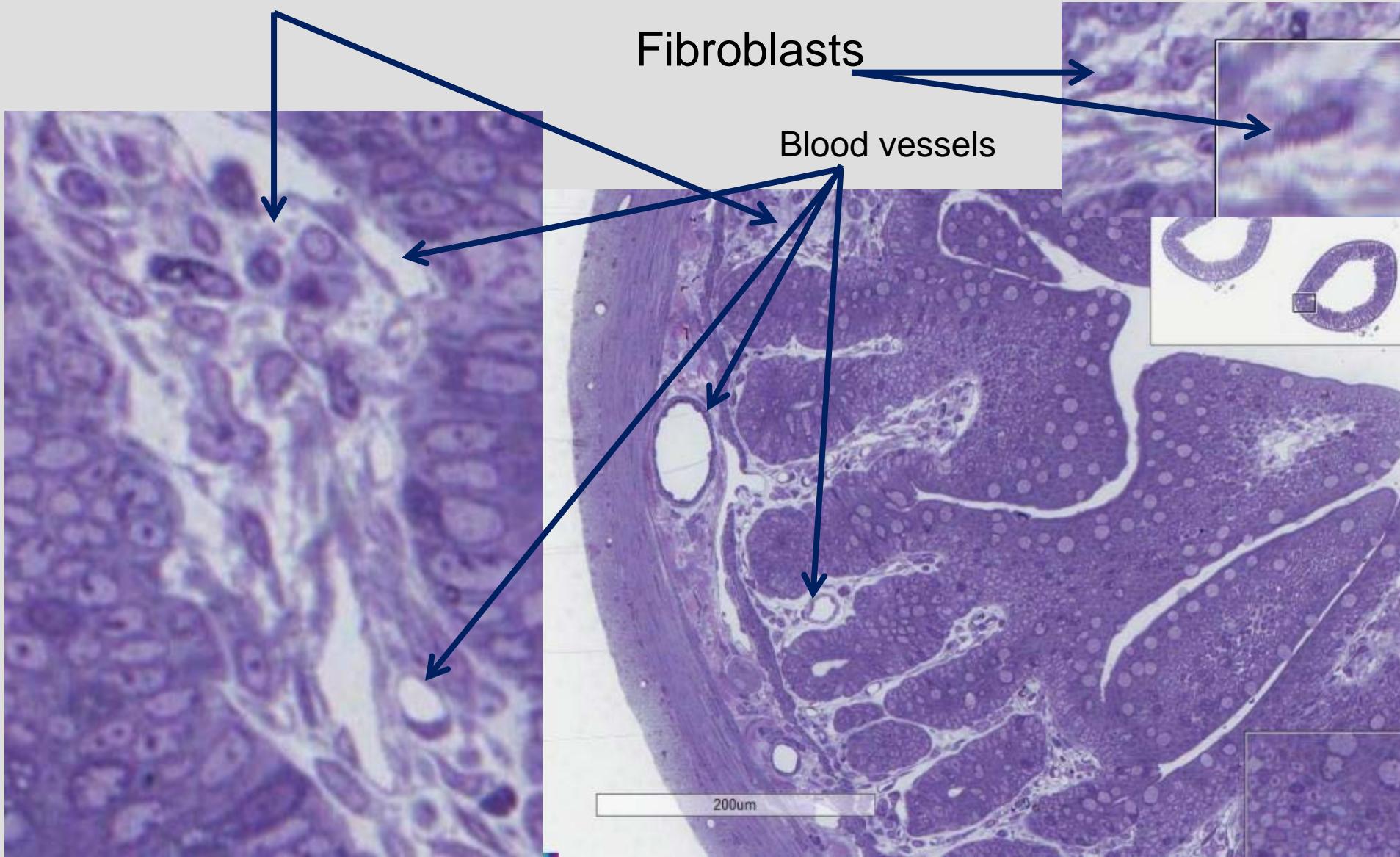


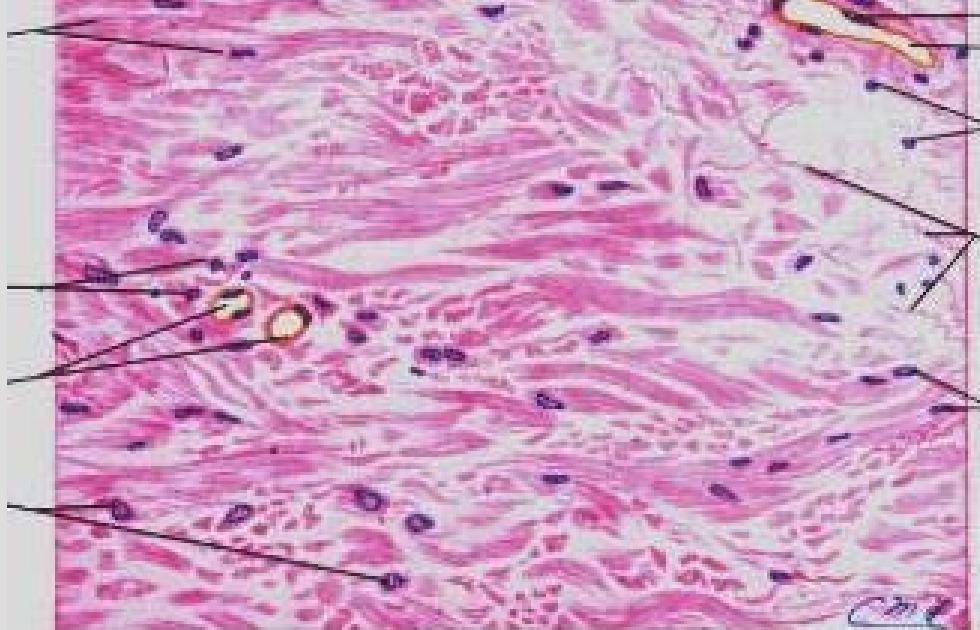
Ref code  
# 5



# Slide 32409: Rat intestine (toluidine blue)

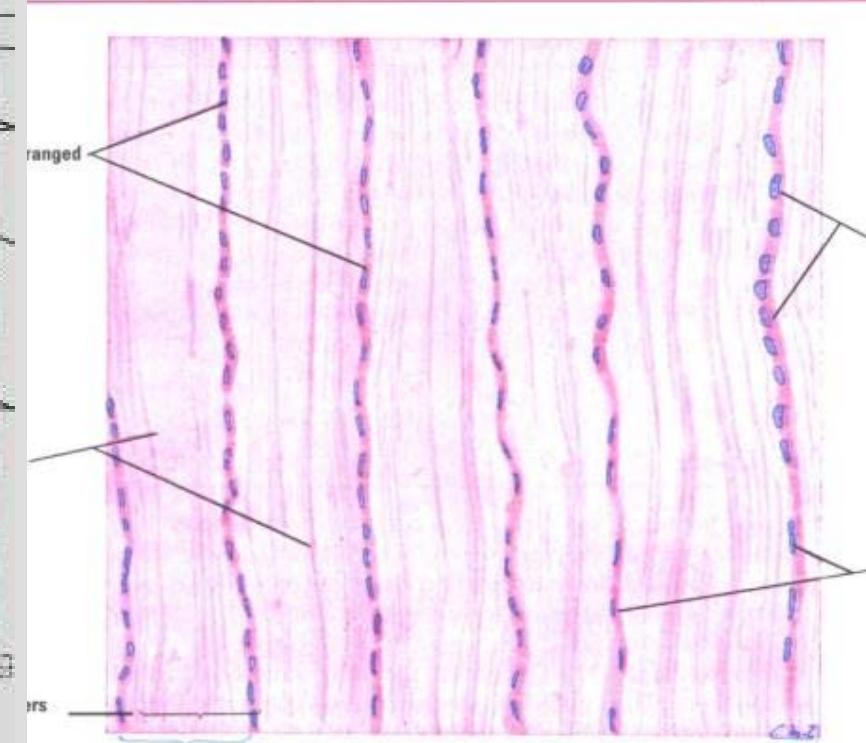
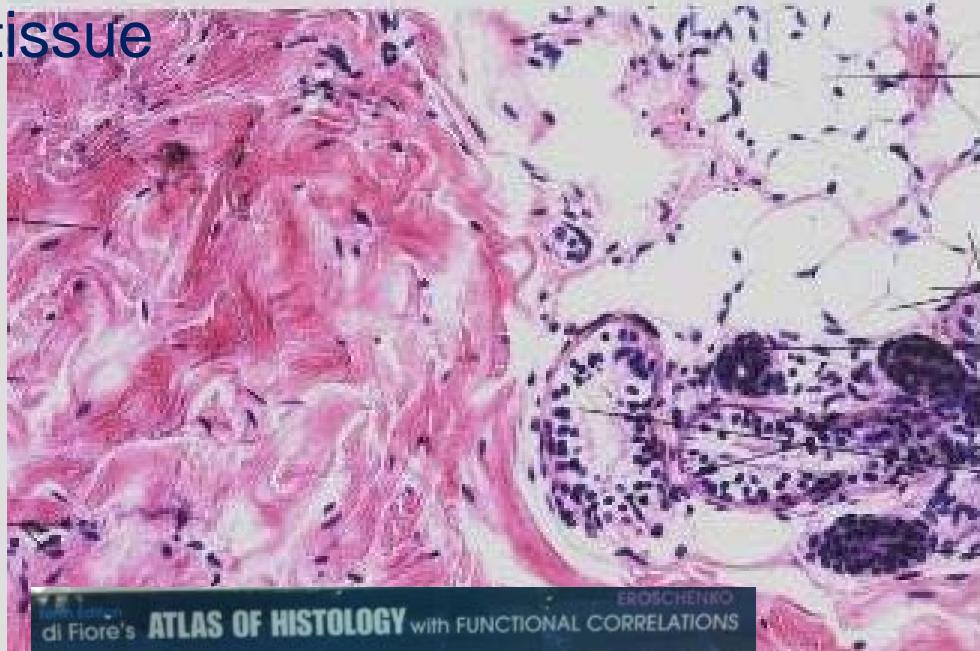
– Loose connective tissue (e.g., lamina propria)





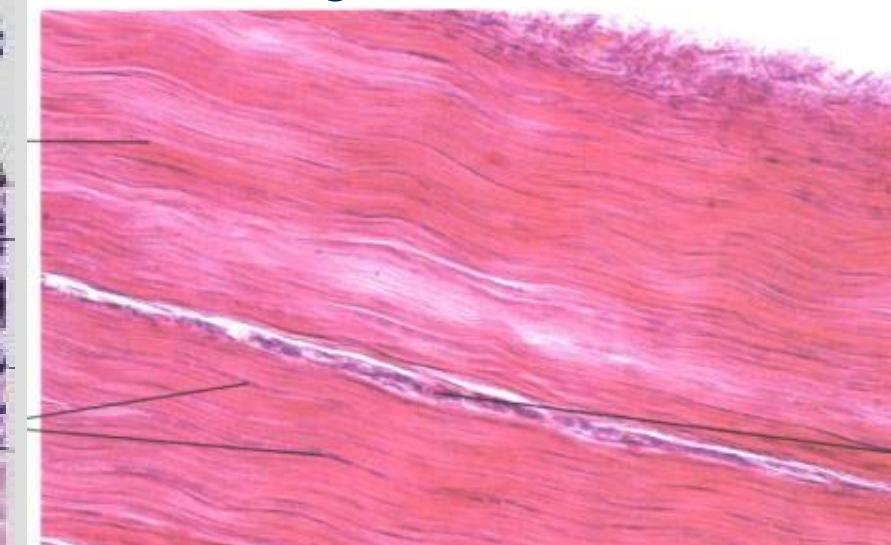
Dense Irregular Connective Tissue. Stain: hematoxylin-eosin. High mag.

## Dense irregular connective tissue



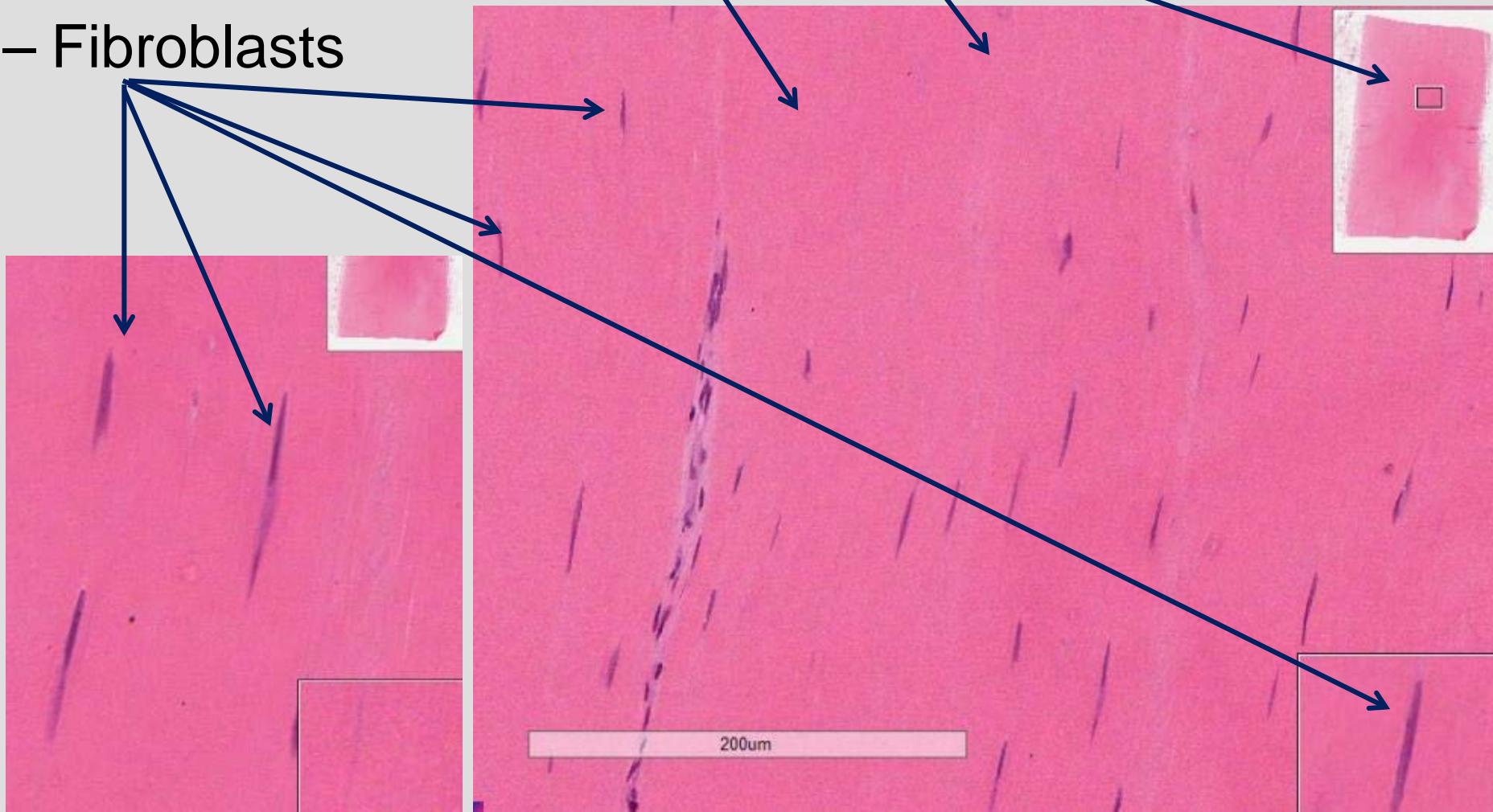
Regular Connective Tissue: Tendon (longitudinal section). Stain: hematoxylin-eosin.

## Dense regular connective tissue



## Slide 202: Tendon

- Dense regular connective tissue
- High density of collagen fibers
- Fibroblasts

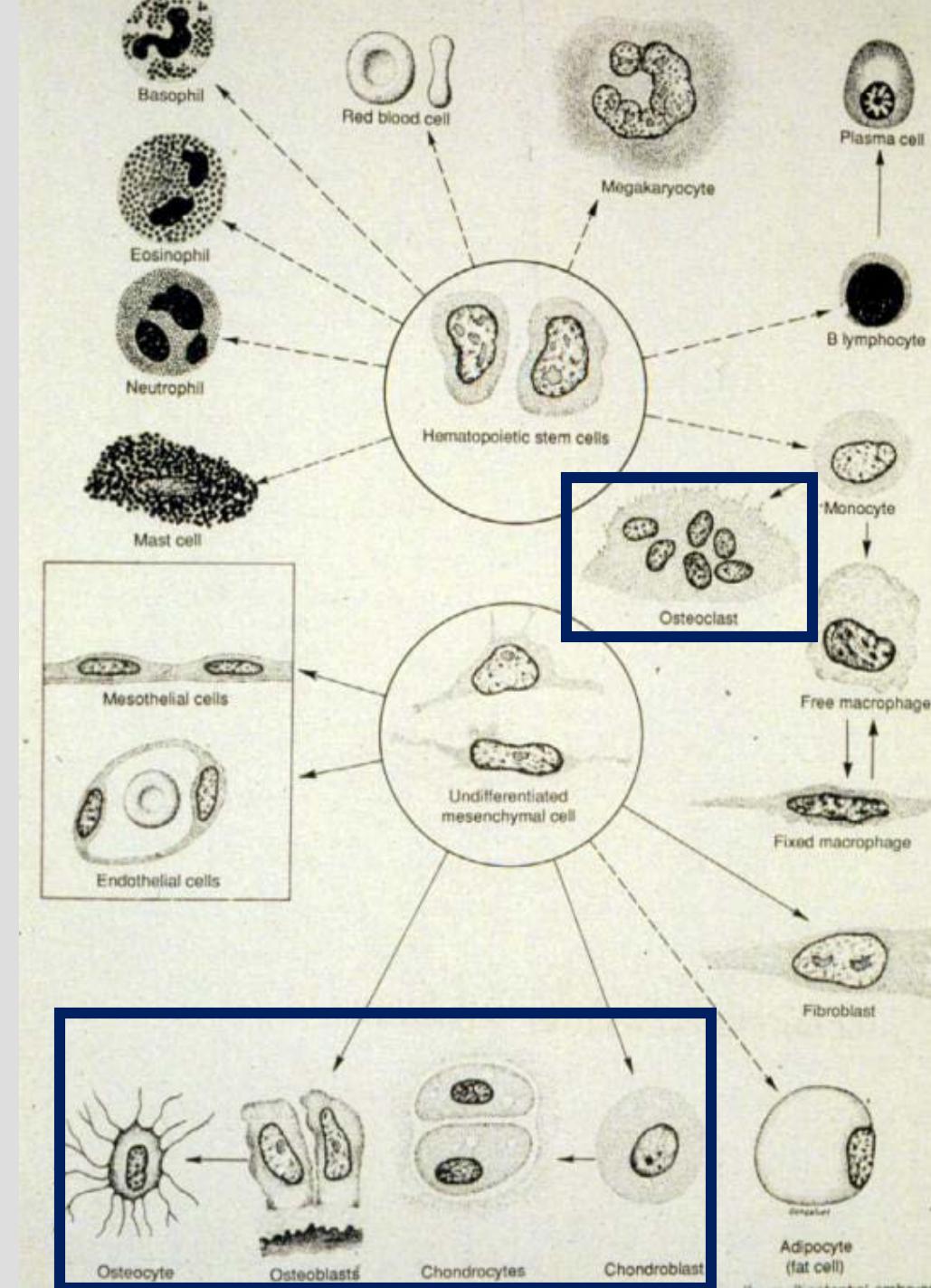


# CELLS OF CT

FIBROBLASTS  
MESENCHYMAL  
CELLS and RBC  
ADIPOSE CELLS  
MACROPHAGE  
PLASMA CELLS  
MAST CELLS and  
WBC

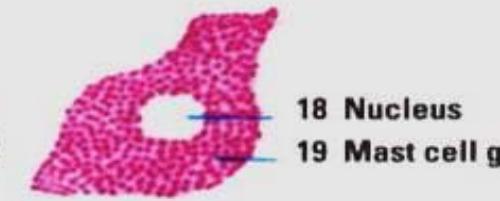
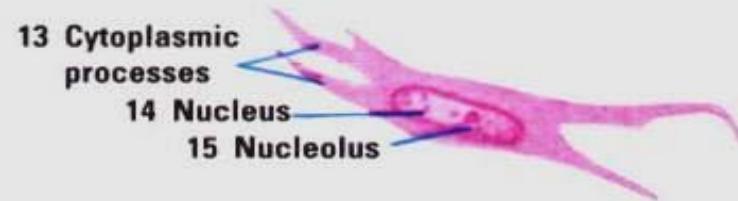
CHONDROBLASTS  
CHONDROCYTES

OSTEOBLASTS  
OSTEOCYTES  
OSTEOCLASTS





## Cells of connective tissue



**Fig. 2-1 Loose Connective Tissue (spread).** Supravital staining with neutral red. Upper: high magnification. Lower: low magnification.

di Fiore's **ATLAS OF HISTOLOGY** with FUNCTIONAL CORRELATIONS

Mast cell



Macrophage



Fibroblasts



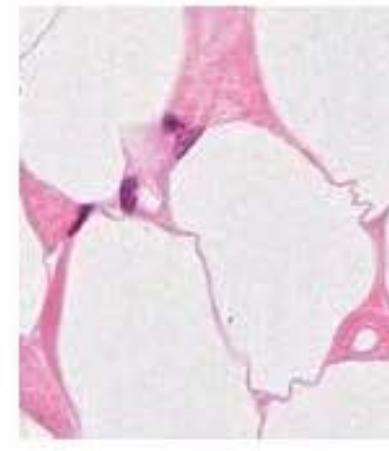
Fibroblasts



Plasma cell



Fat cells

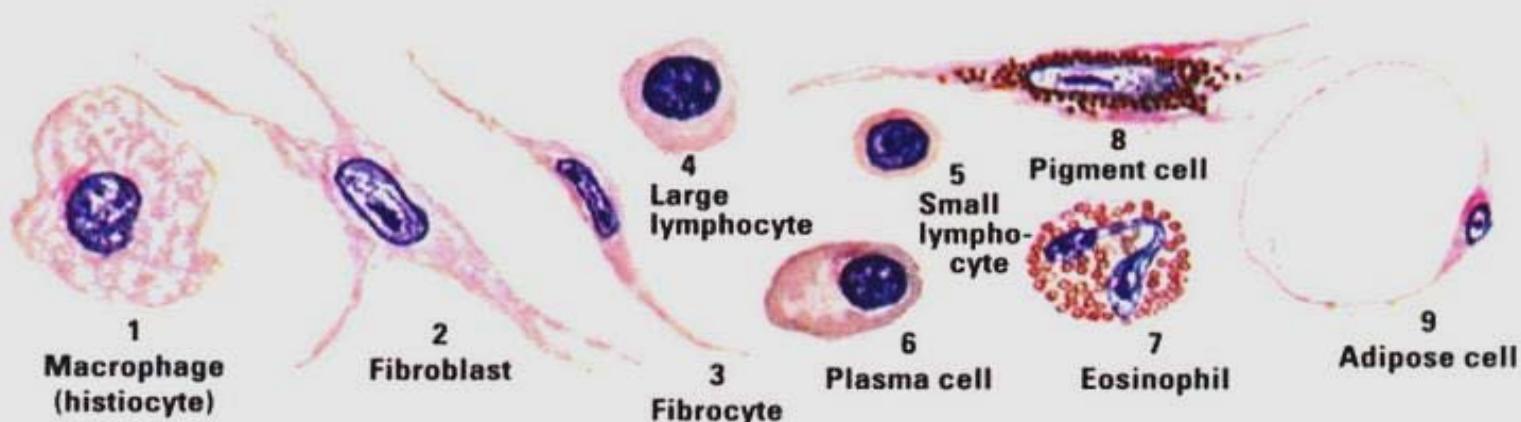




## Cells of connective tissue

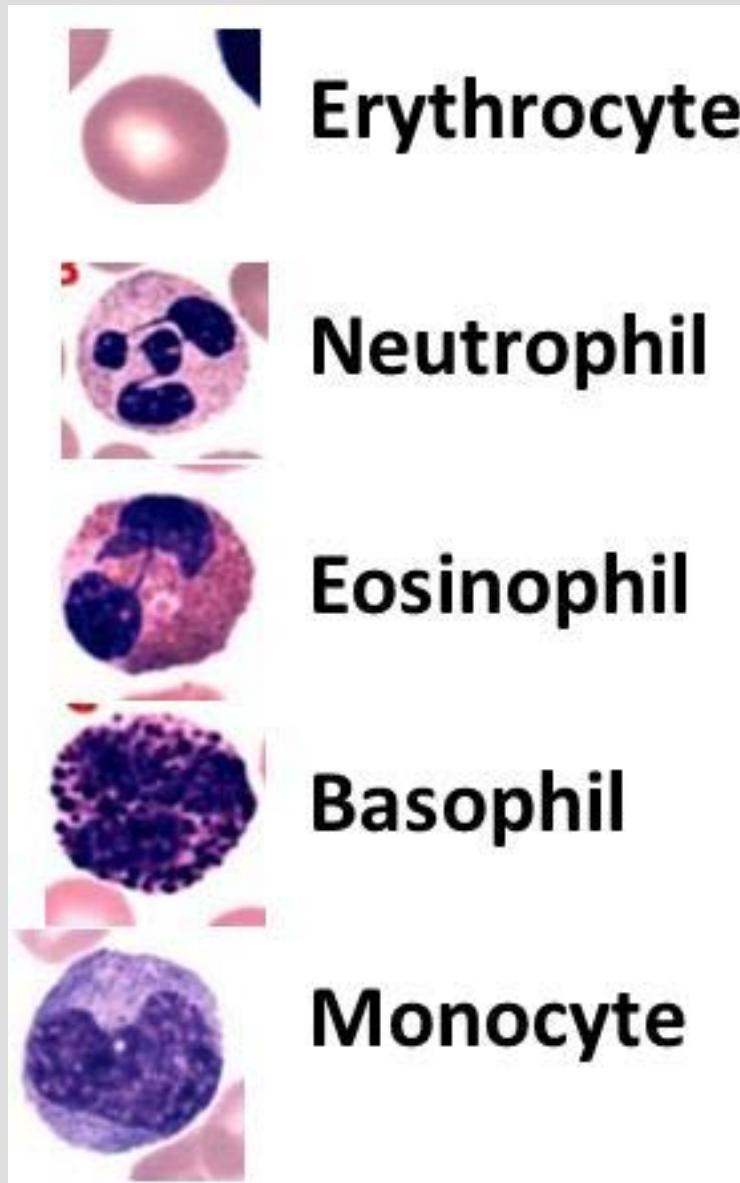


**Fig. 2-1 Loose Connective Tissue (spread).** Supravital staining with neutral red. Upper: high magnification.

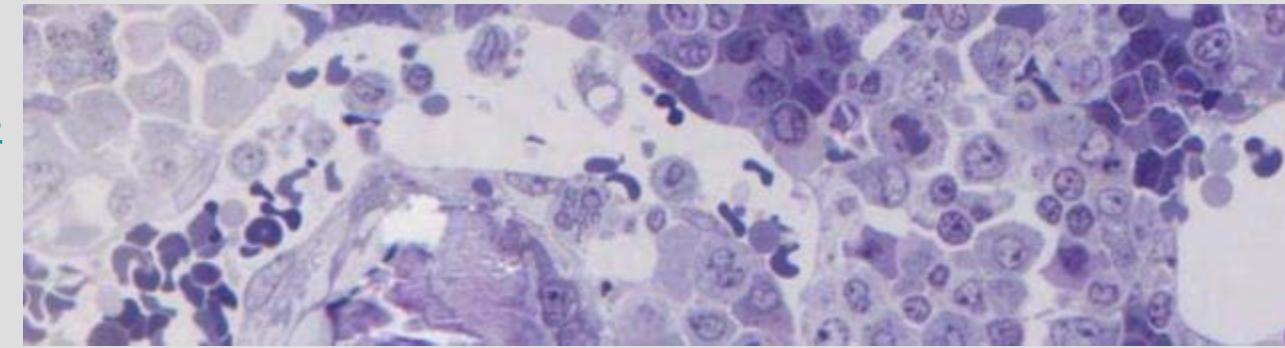


# Blood cells are connective tissue cells

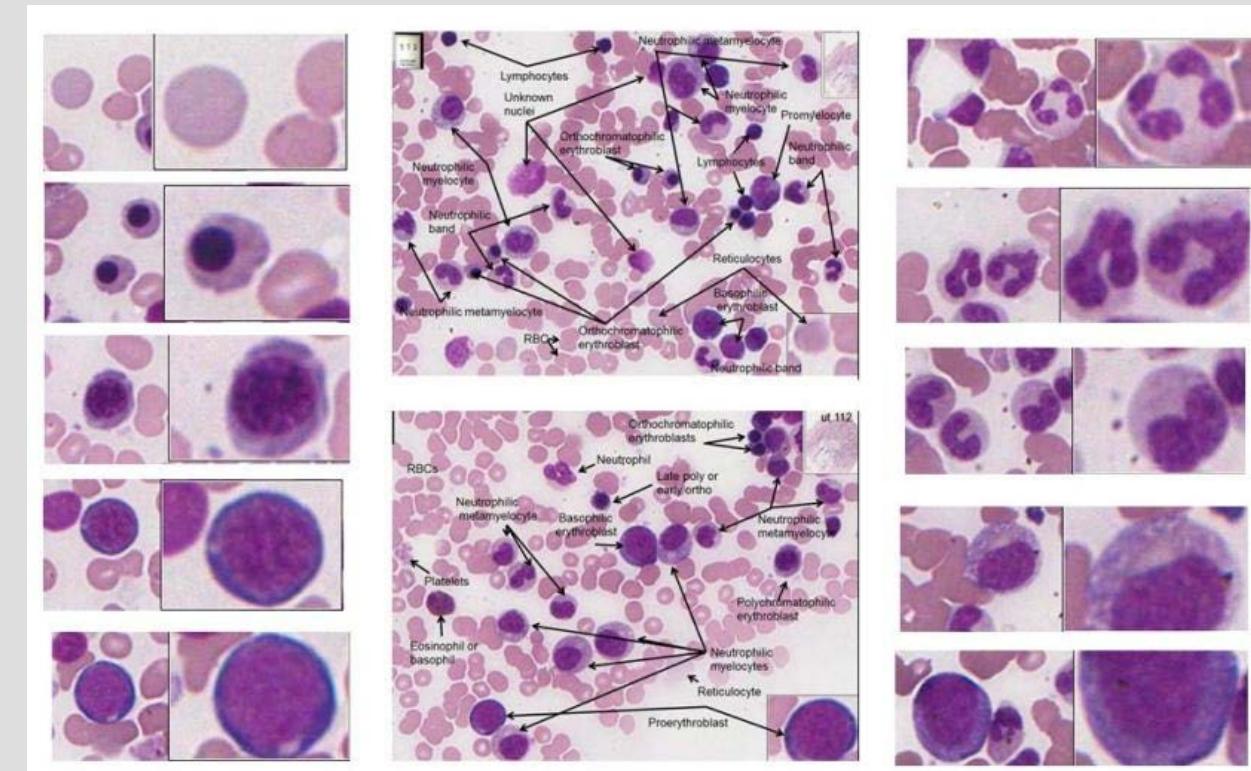
## Blood cells



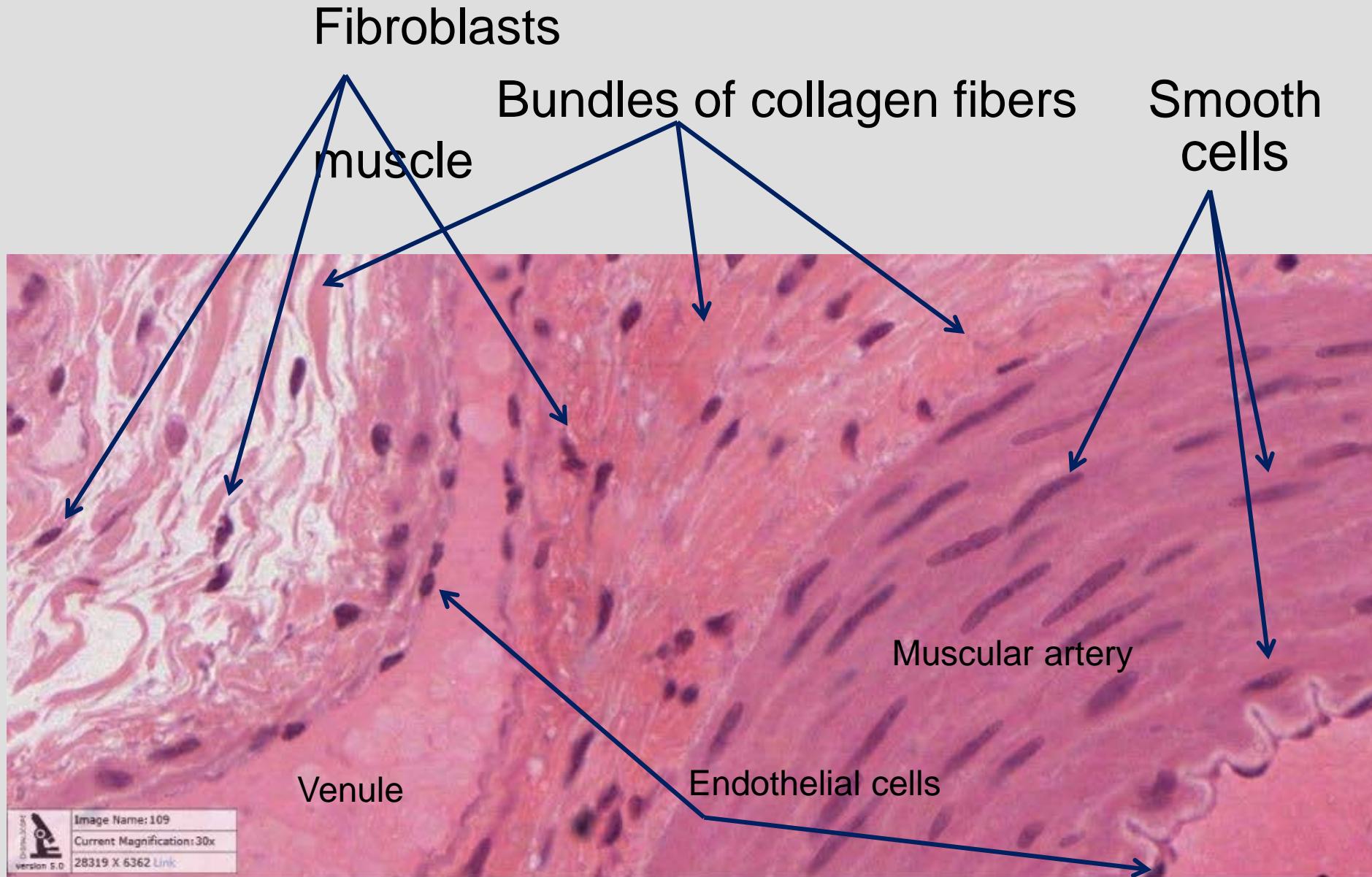
[32583](#)



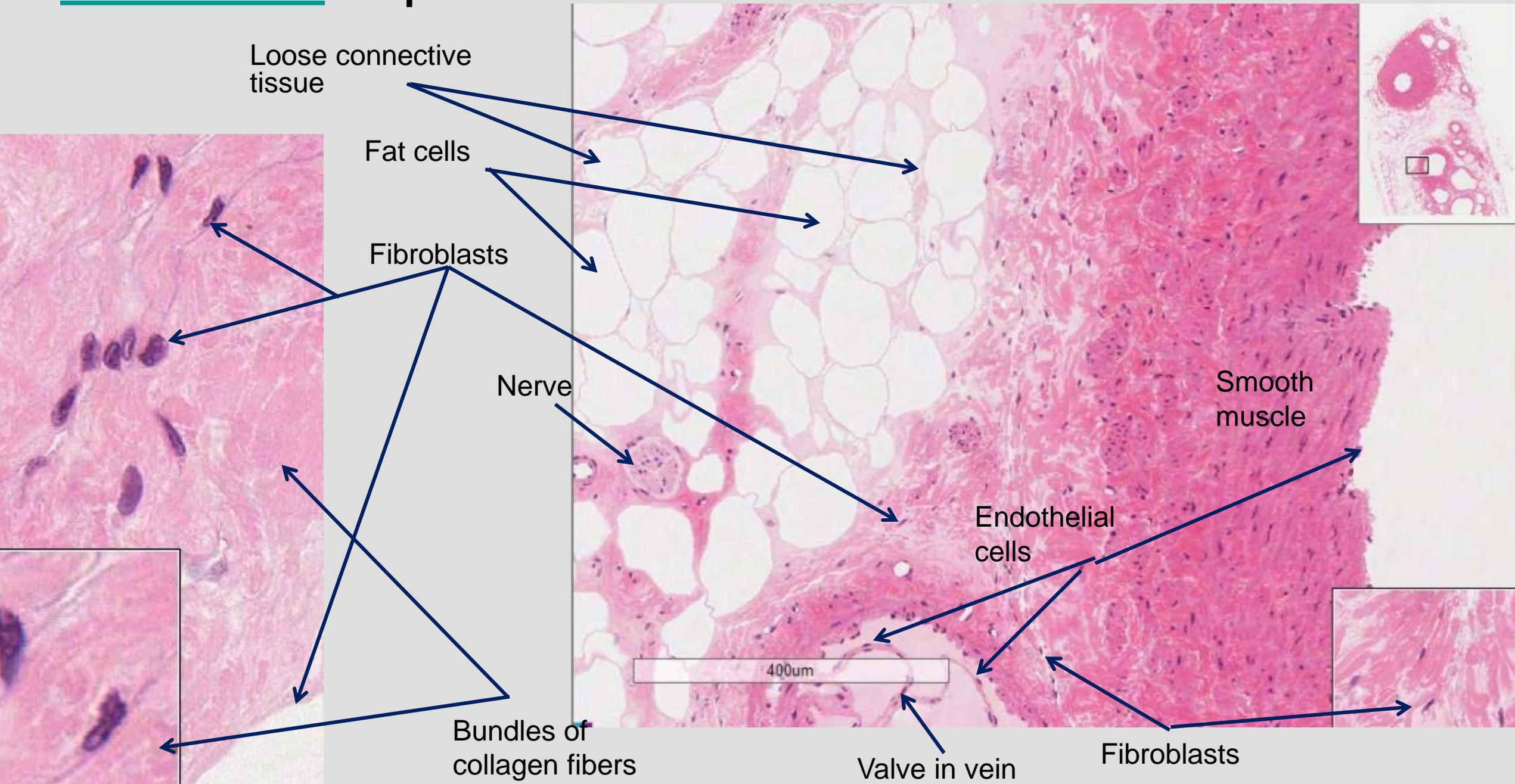
## Bone marrow cells



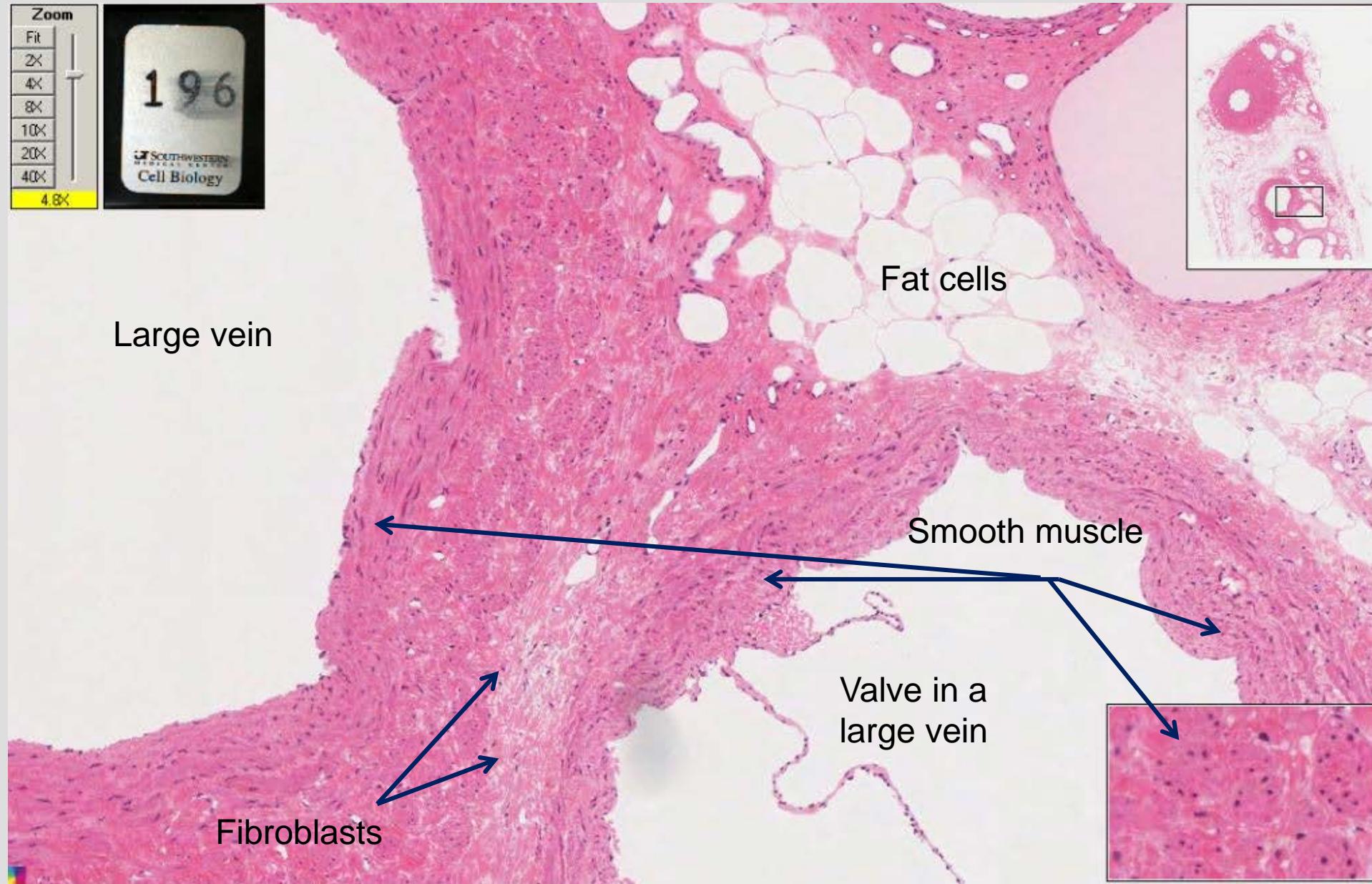
# Slide 109: Skin, hand, monkey



# Slide 196: Spermatic cord

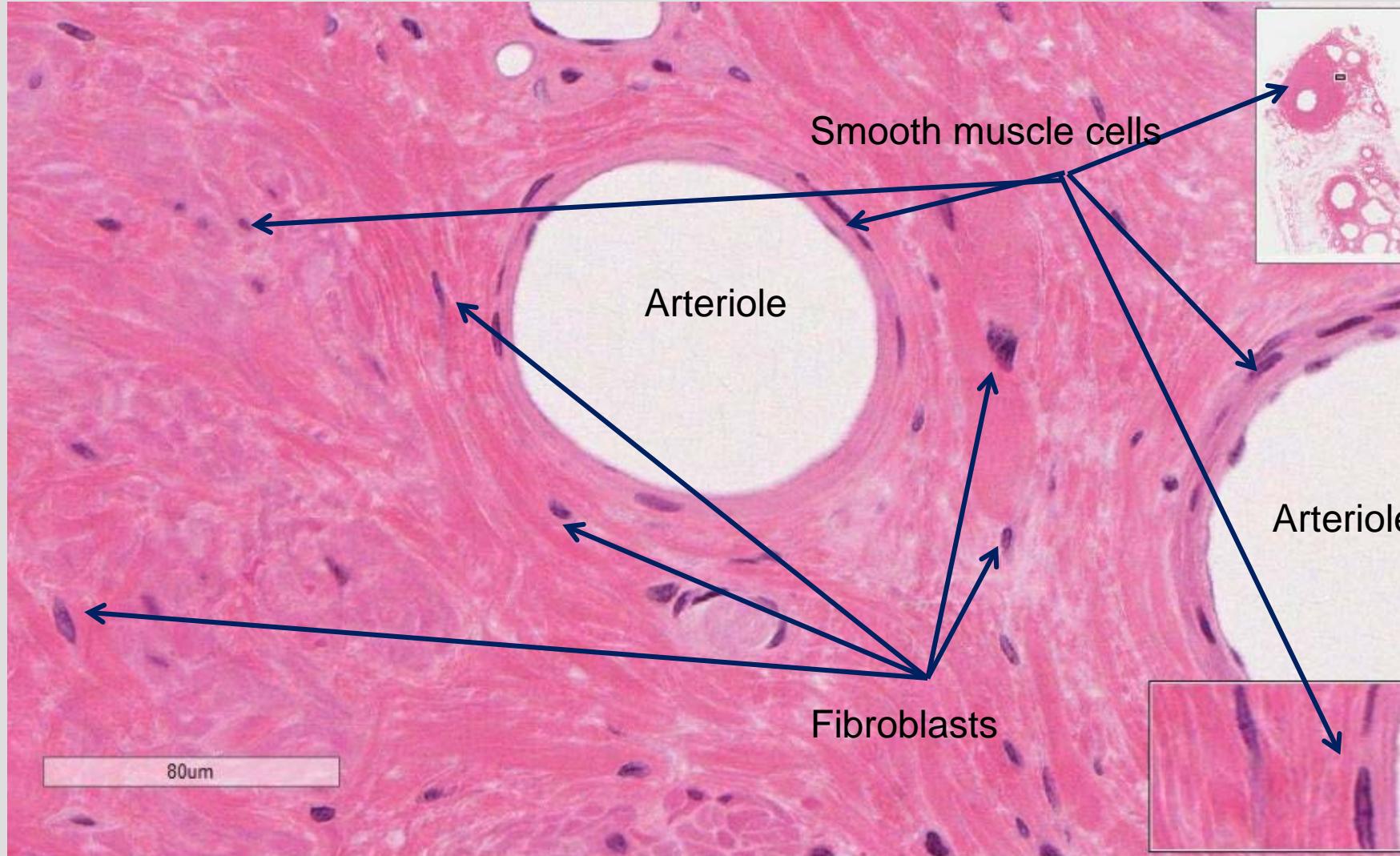


# Slide 196 Vein of Spermatic cord

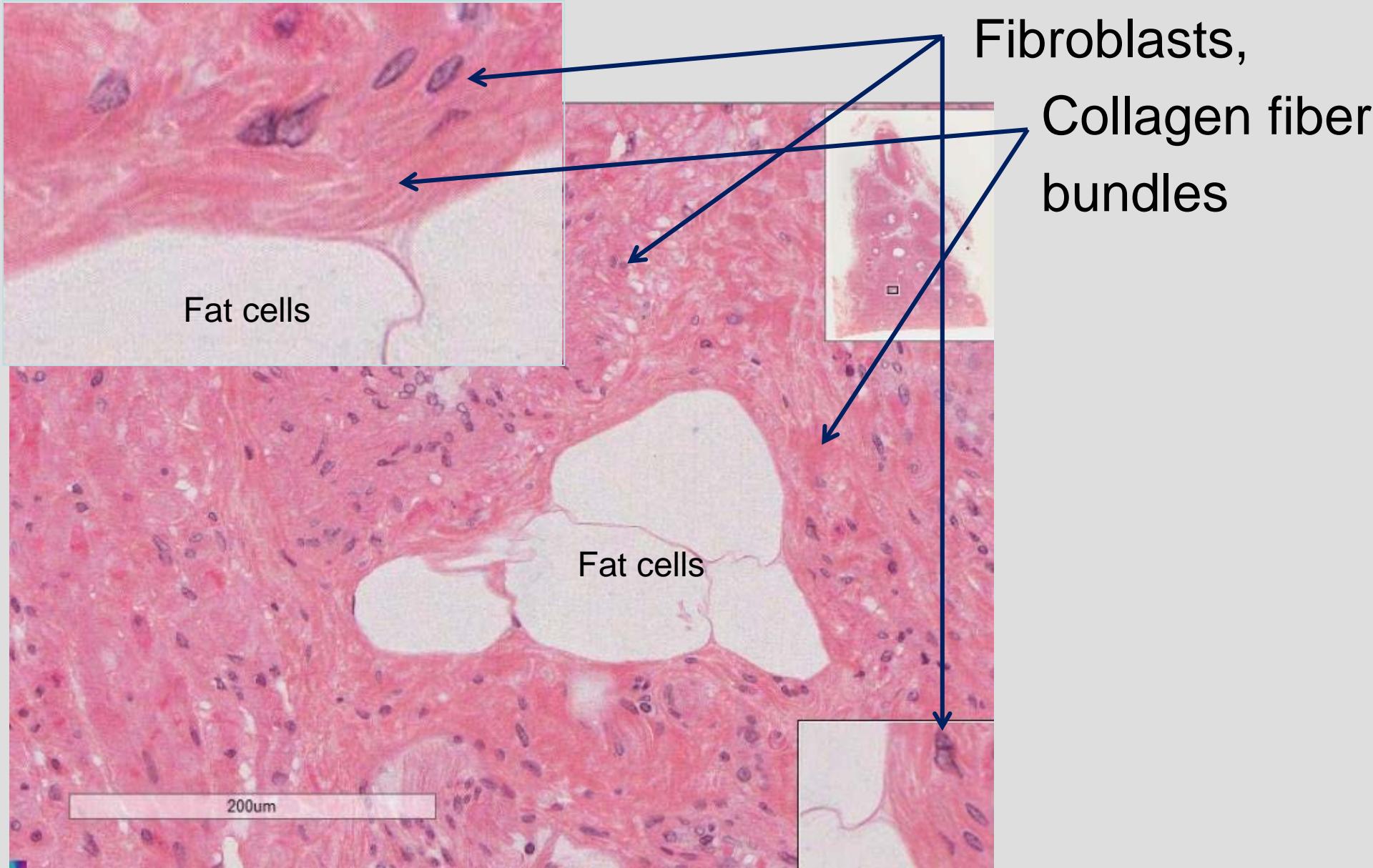


Slide 196

# Vein of Spermatic cord

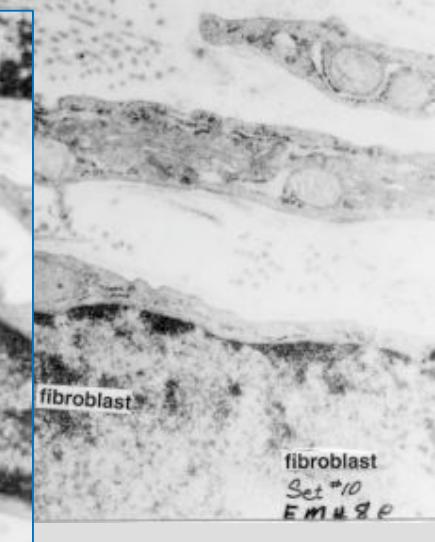
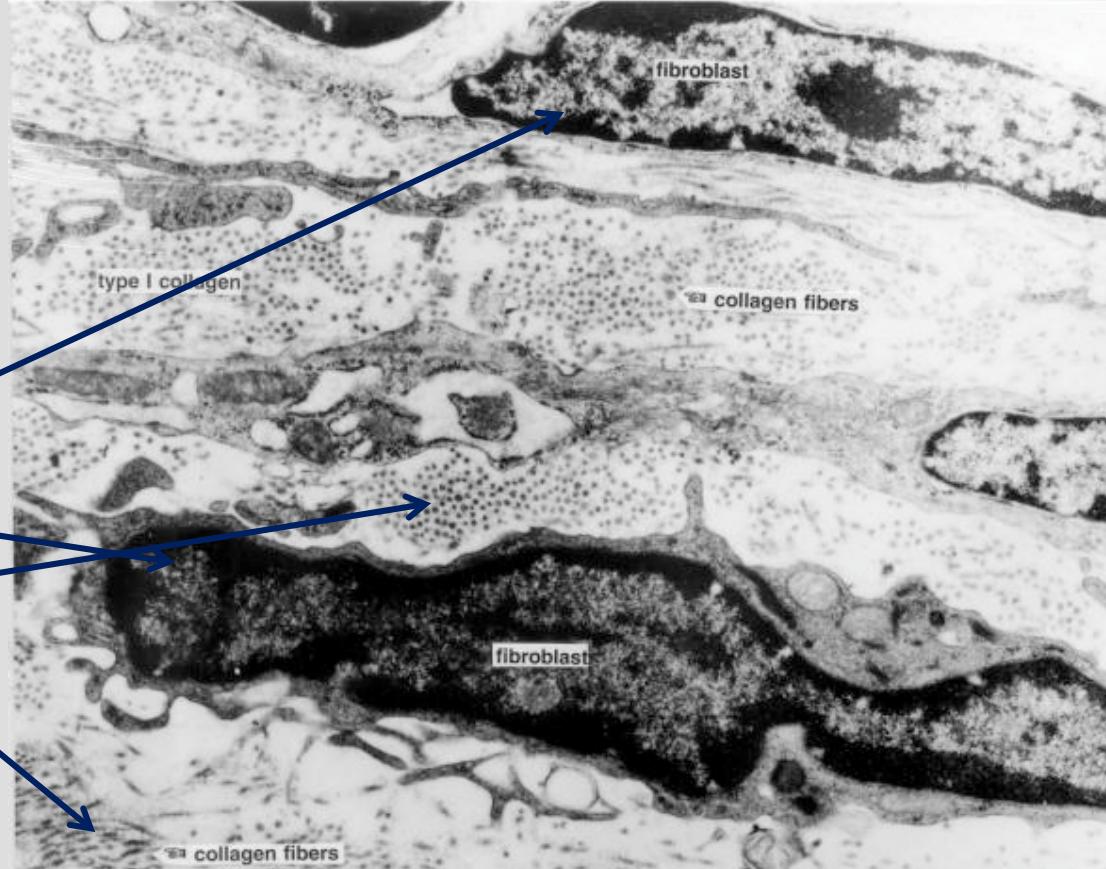


# Slide 19716: Tail of epididymis



# EM 8e: Fibroblasts

Fibroblasts  
Collagen fibers

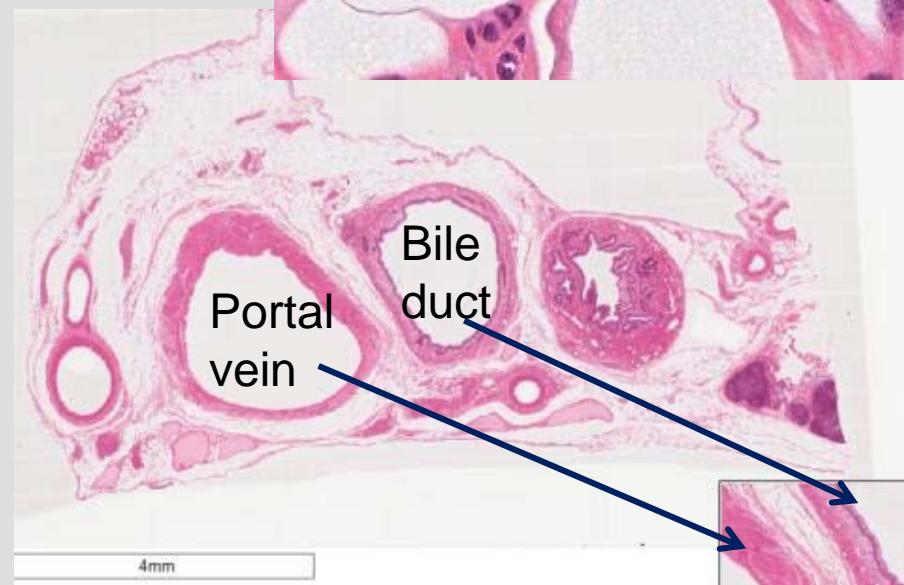
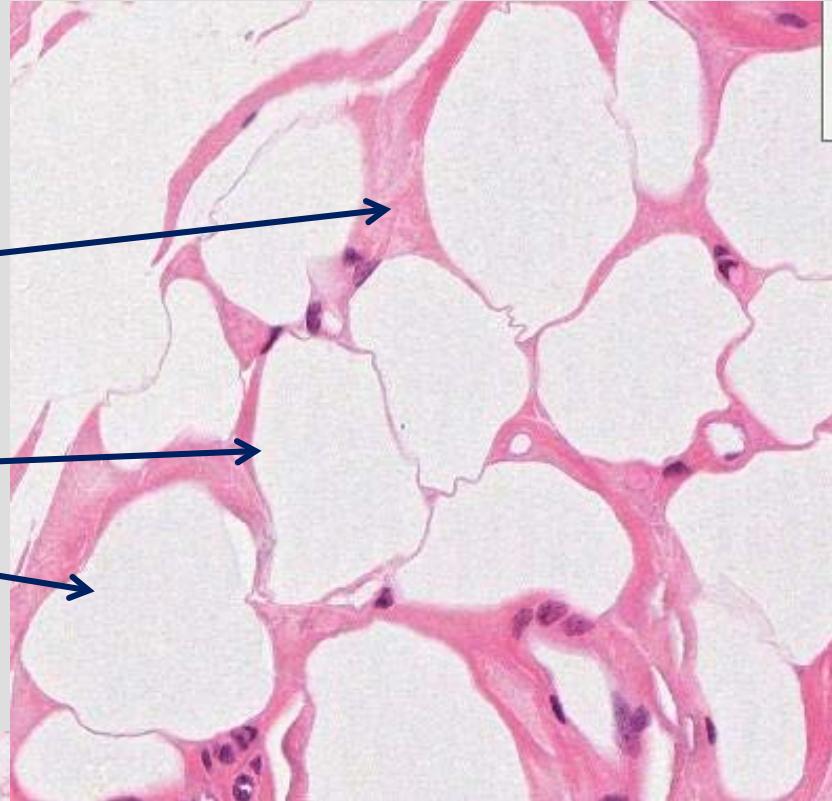
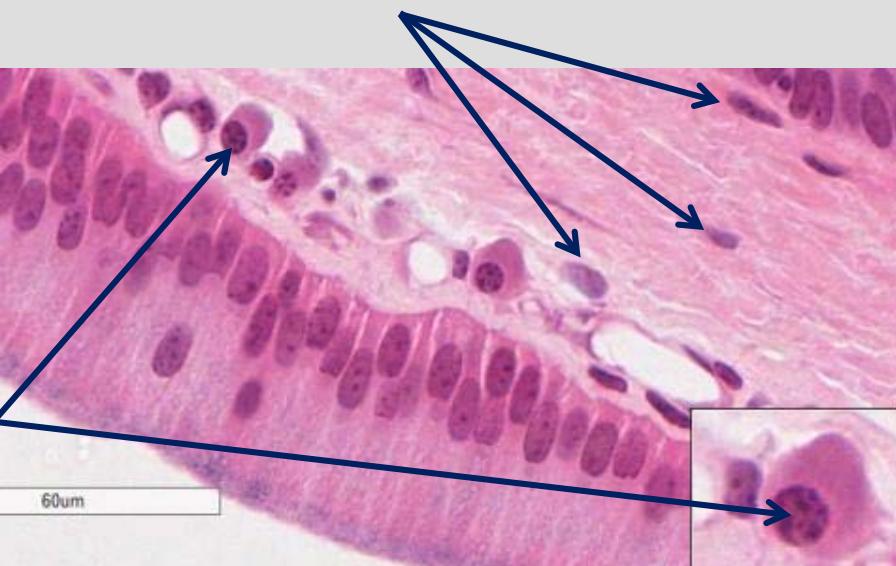


# Slide 126:Bile duct with portal vein, monkey

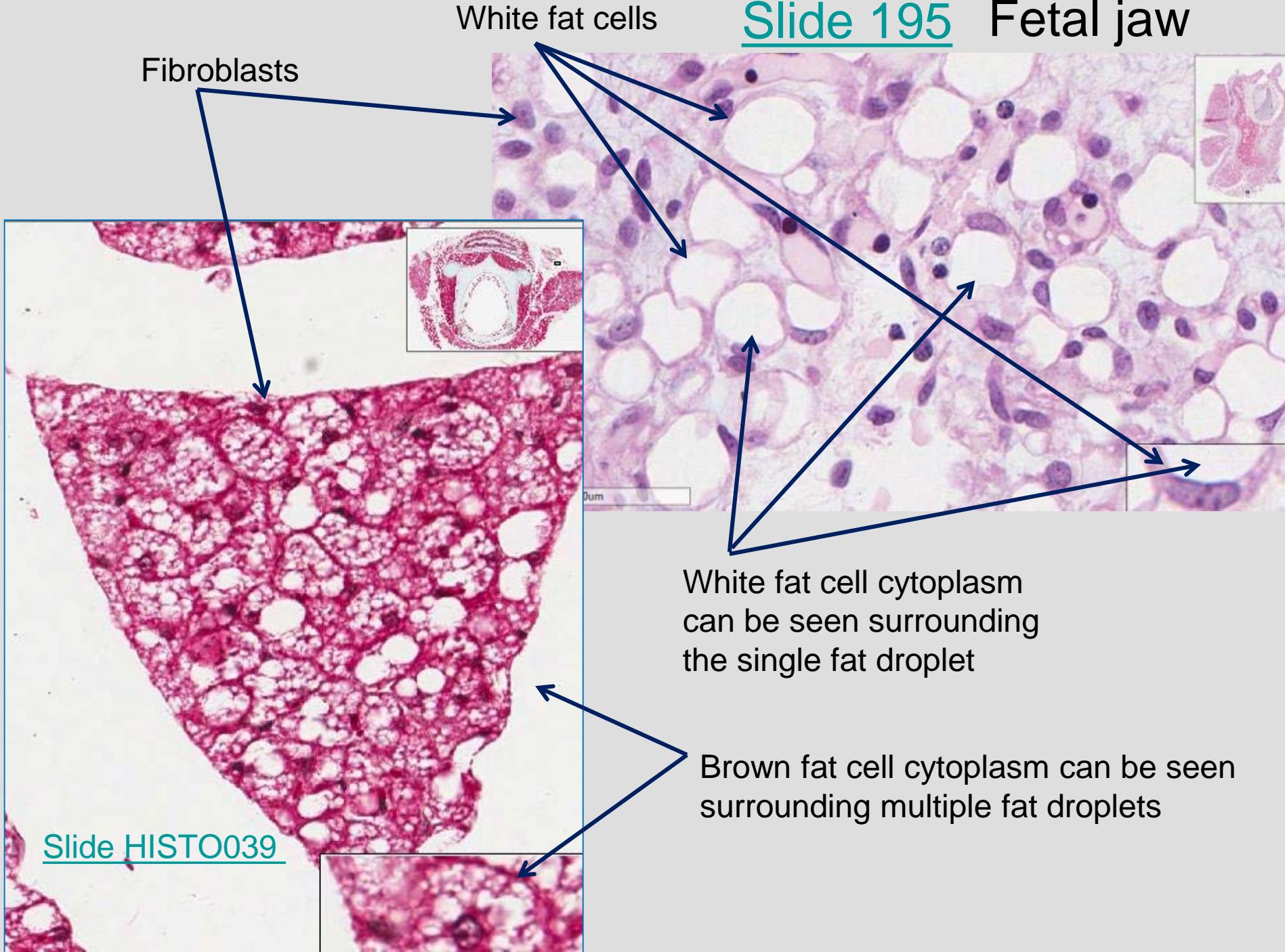
- Loose connective tissue (many cells and few fibers),
- Adipose cells,

- Fibroblasts

Plasma cells

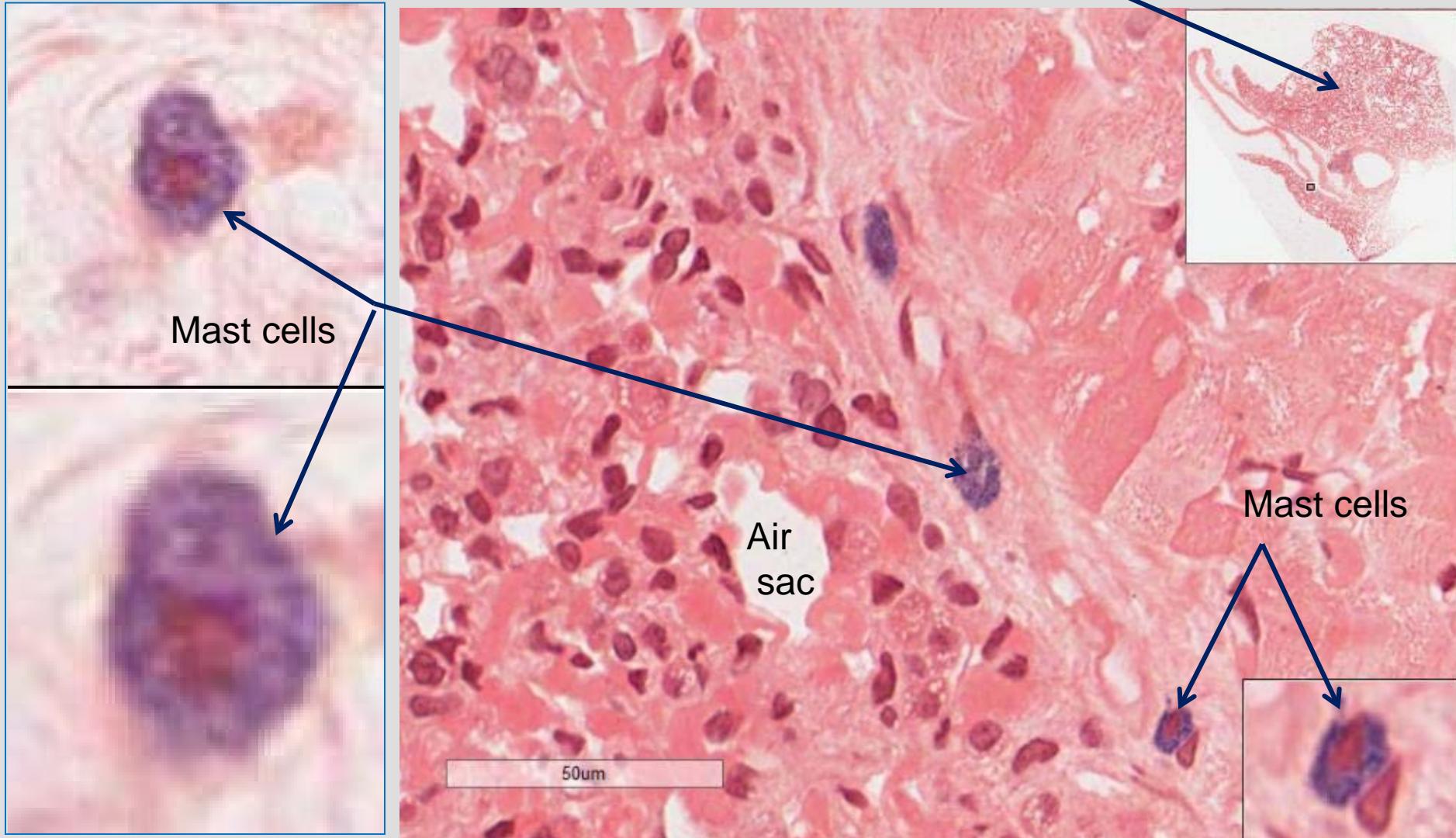


# Slide 195 Fetal jaw

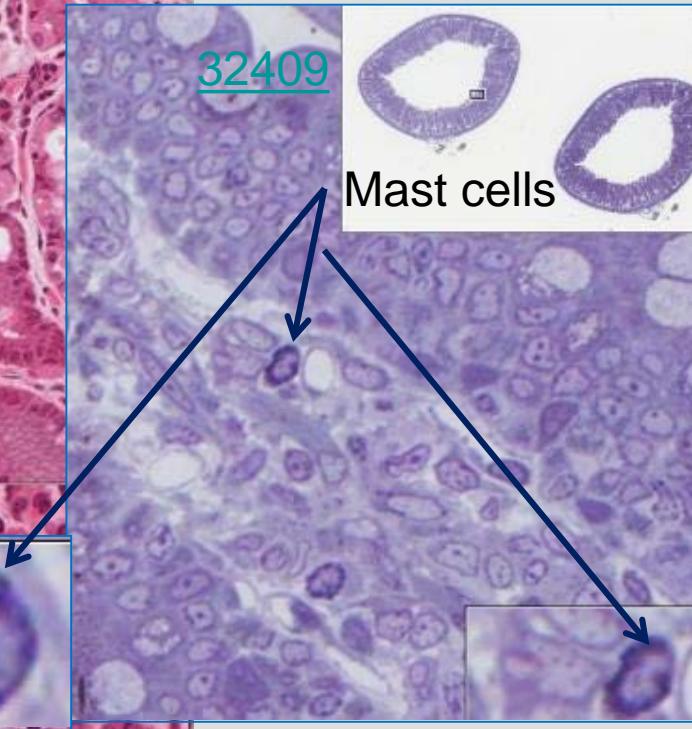
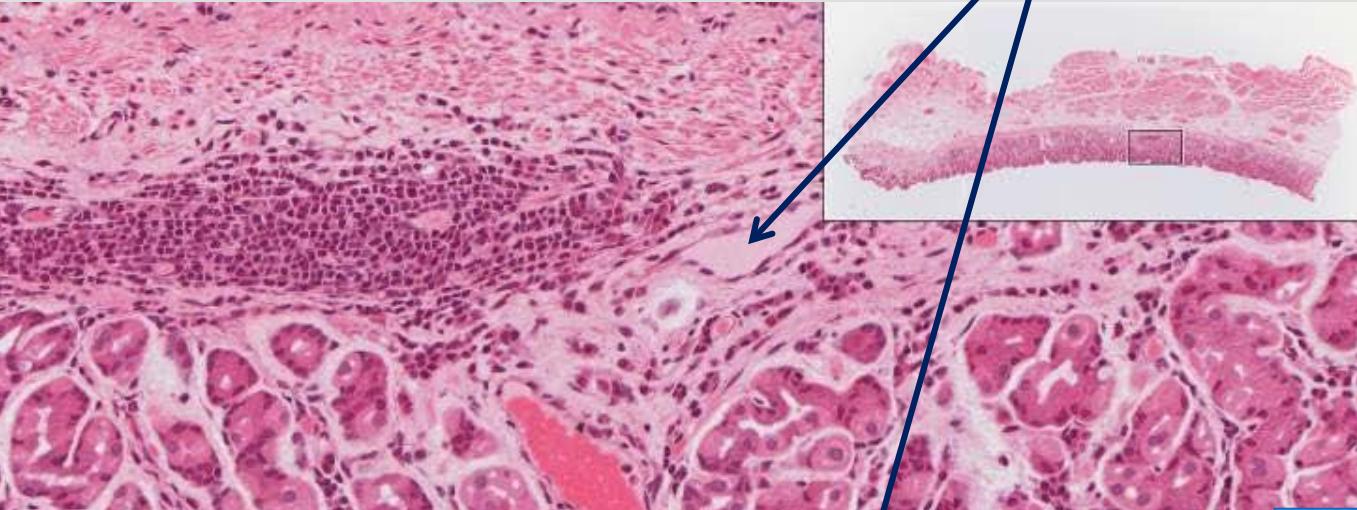
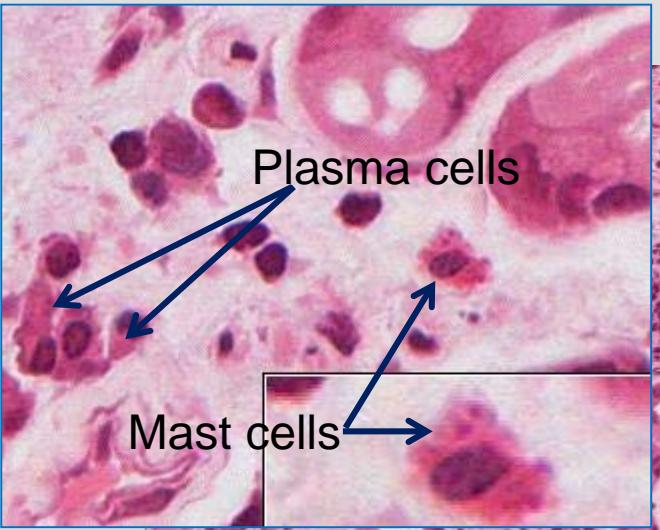


# Slide HISTO42: Lung Mast cell

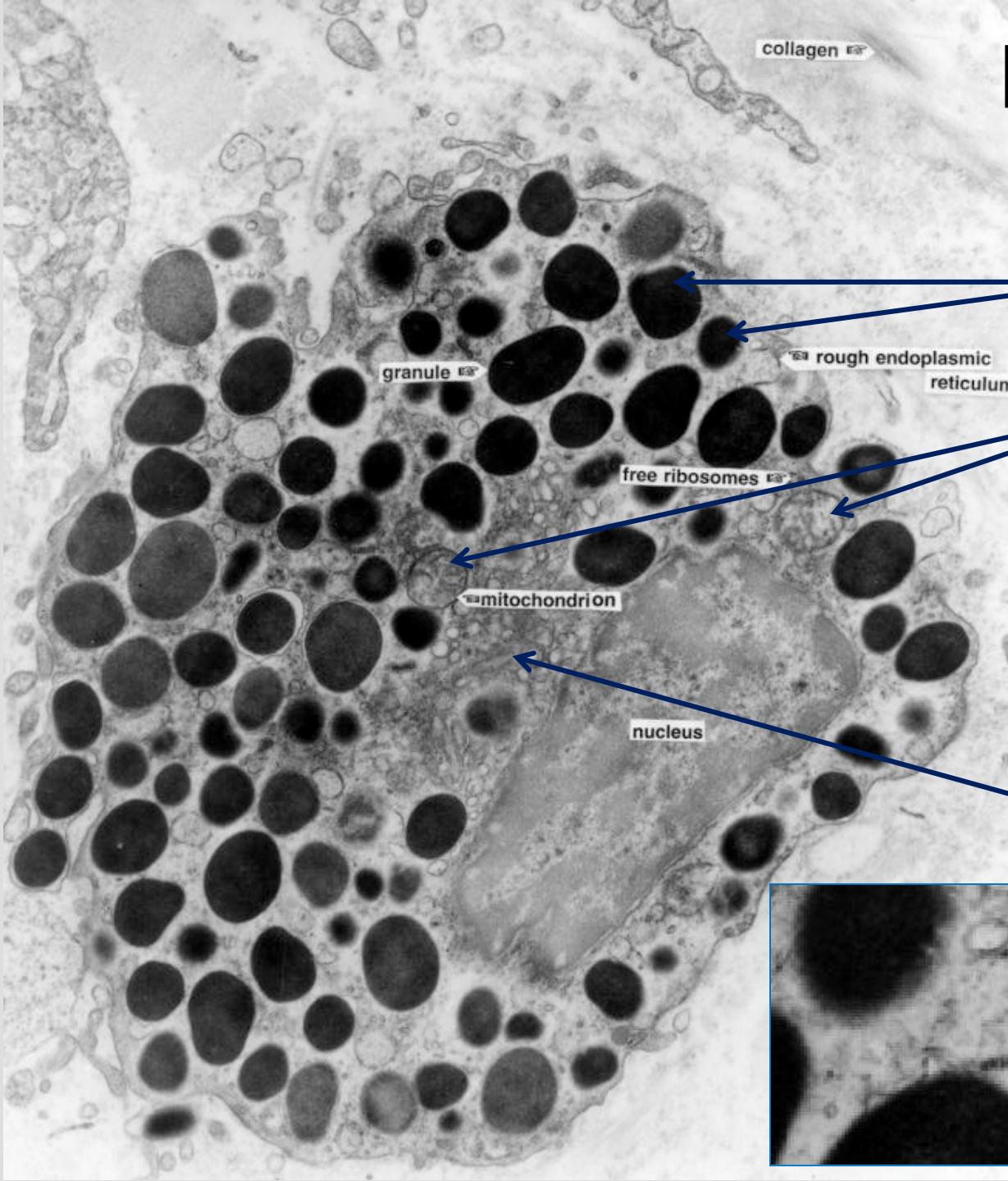
– Light blue granules



# 140 Cardiac stomach w/chronic infection



# EM 8d: Mast cell



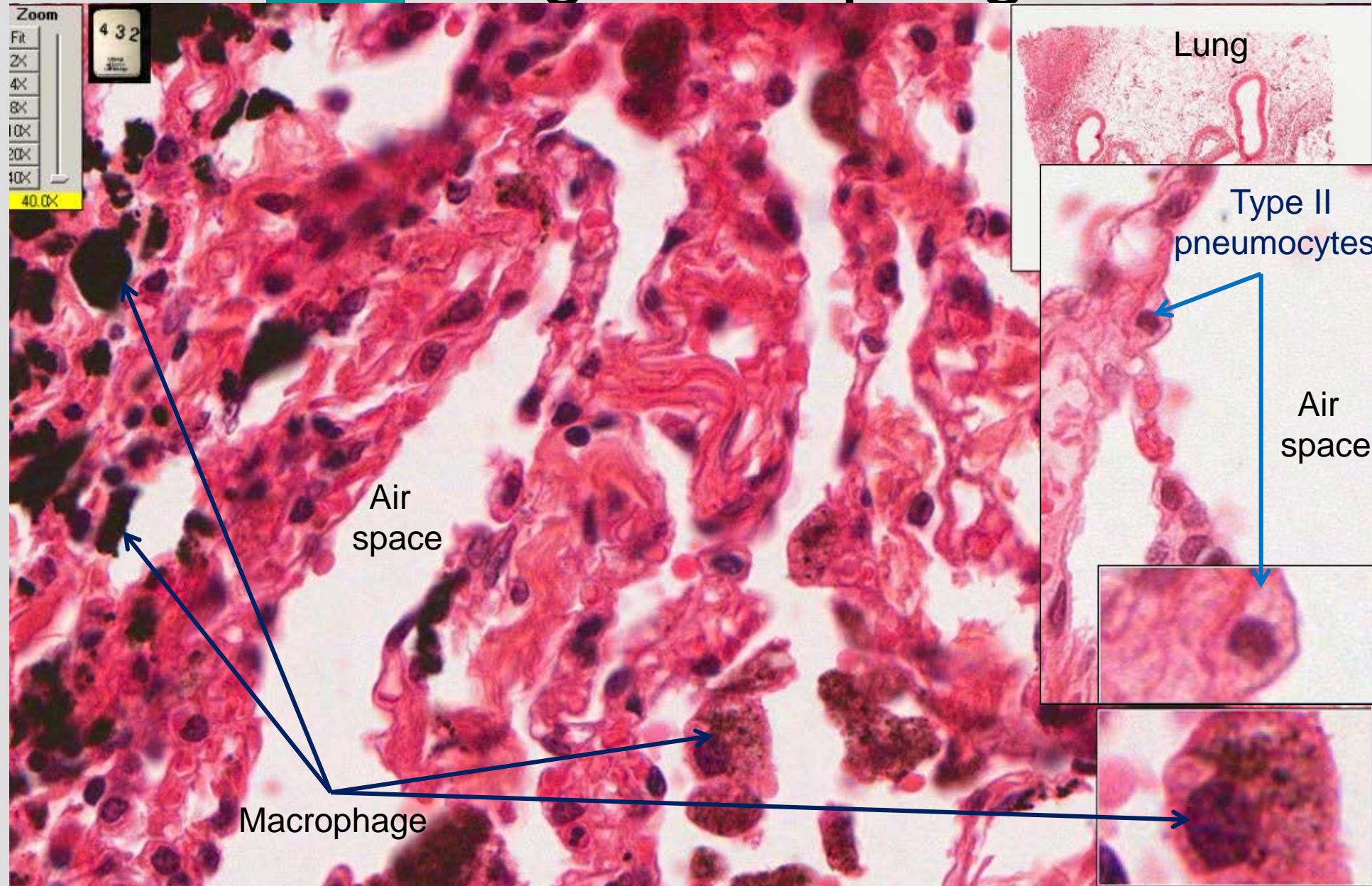
Granules,

Mitochondria,

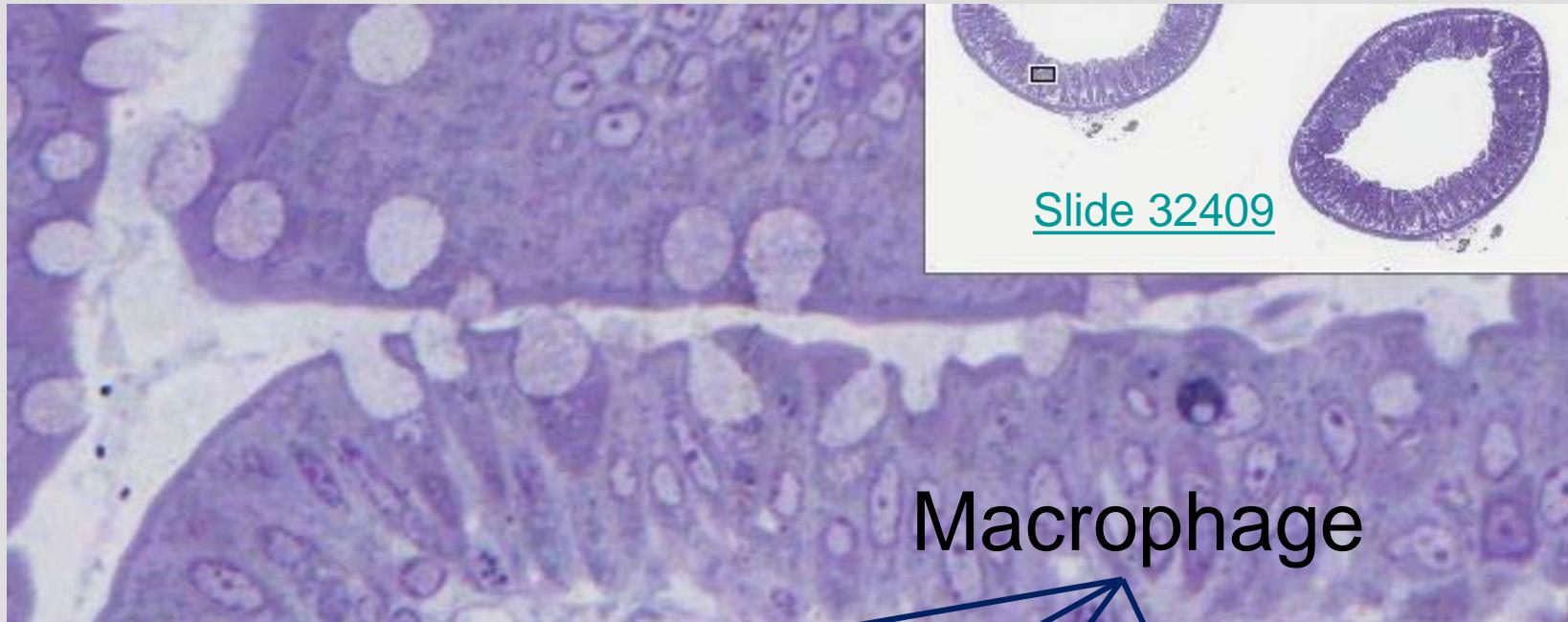
Golgi region

rough endoplasmic  
reticulum

# 432 lung macrophages



# Macrophage in lamina propria of rat intestine



Slide 32409

Macrophage



Slide 109



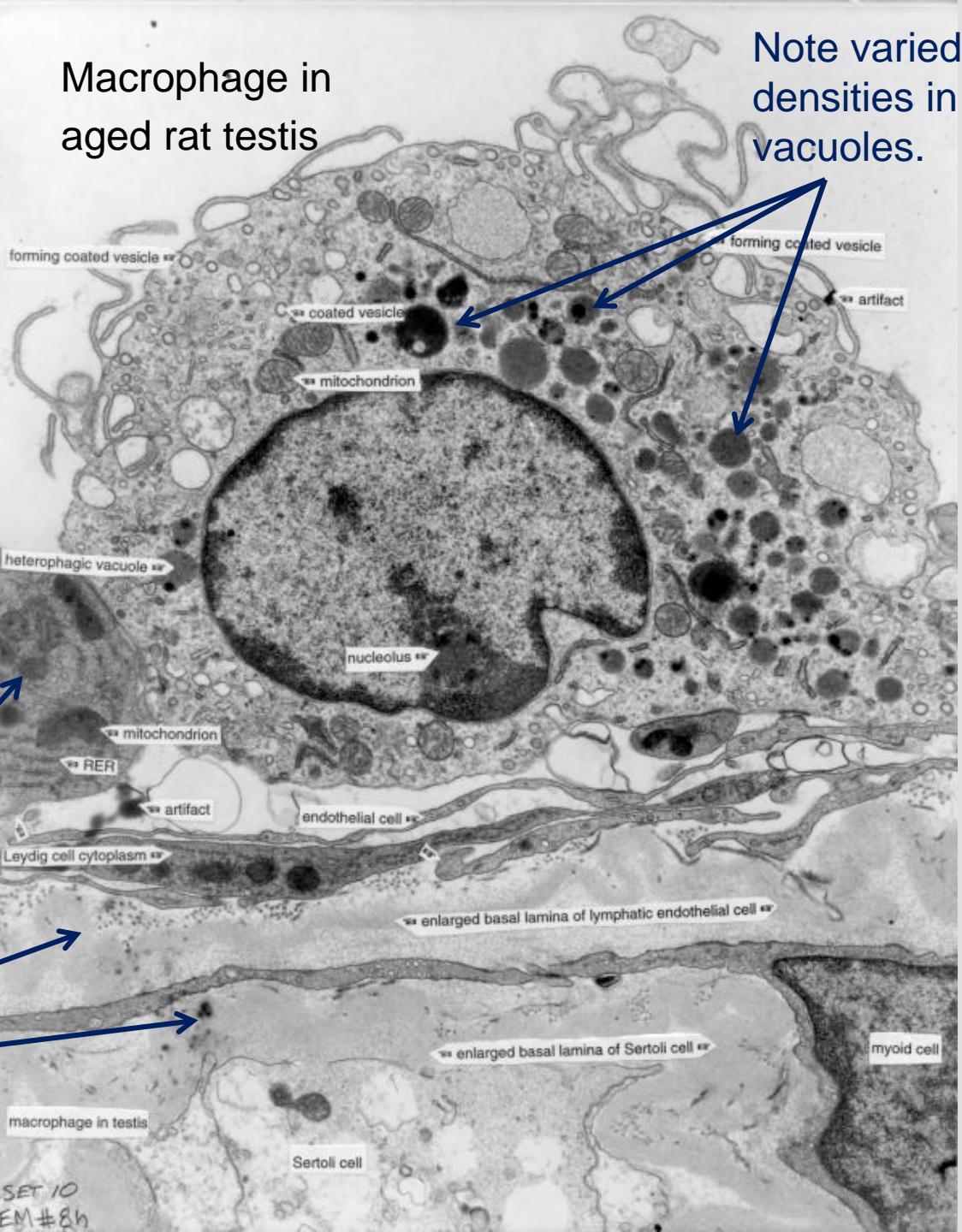
EM 8h: Macrophage in aged testis;  
30,000x

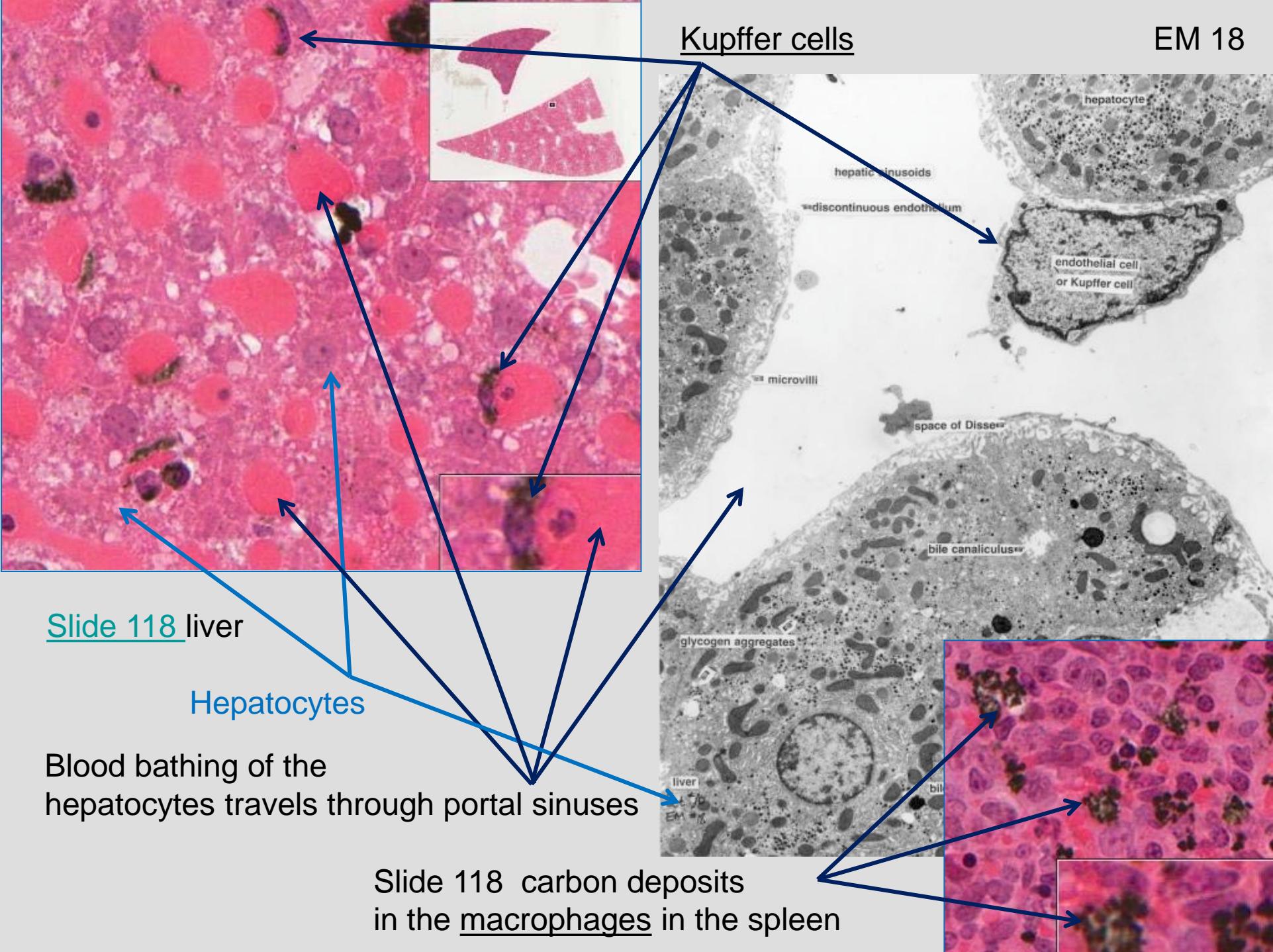
Enlarged basal lamina

Heterophagic vacuoles

Leydig cell cytoplasm

Myoid cell



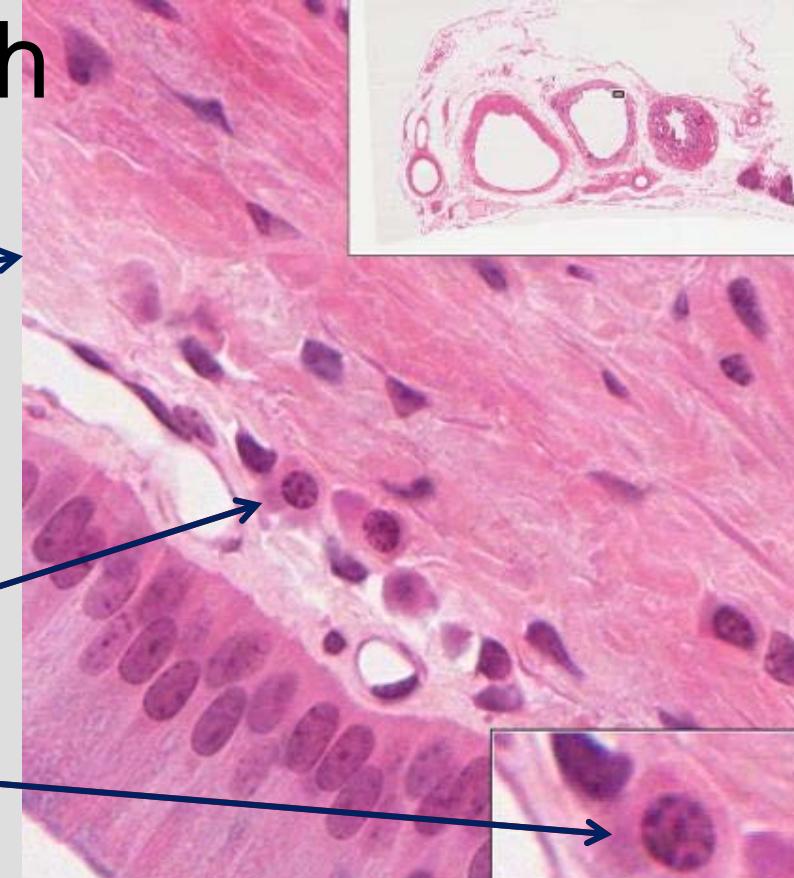
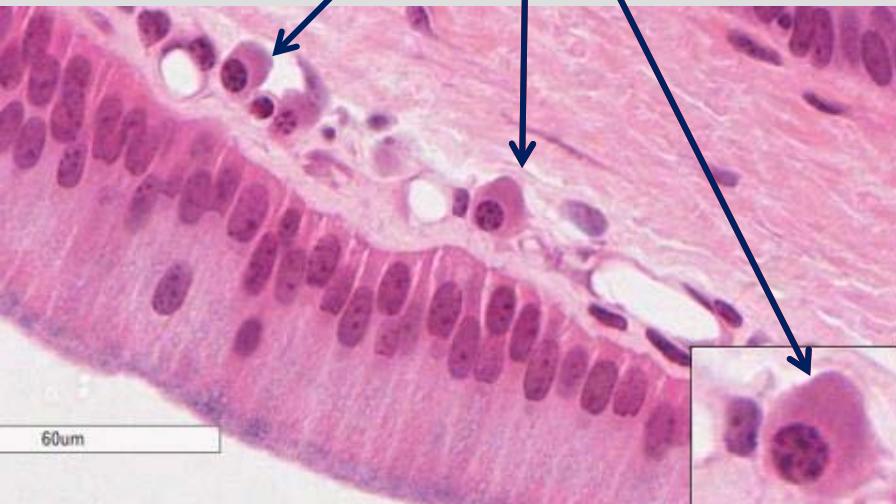


# Slide 126: Bile duct with portal vein, monkey

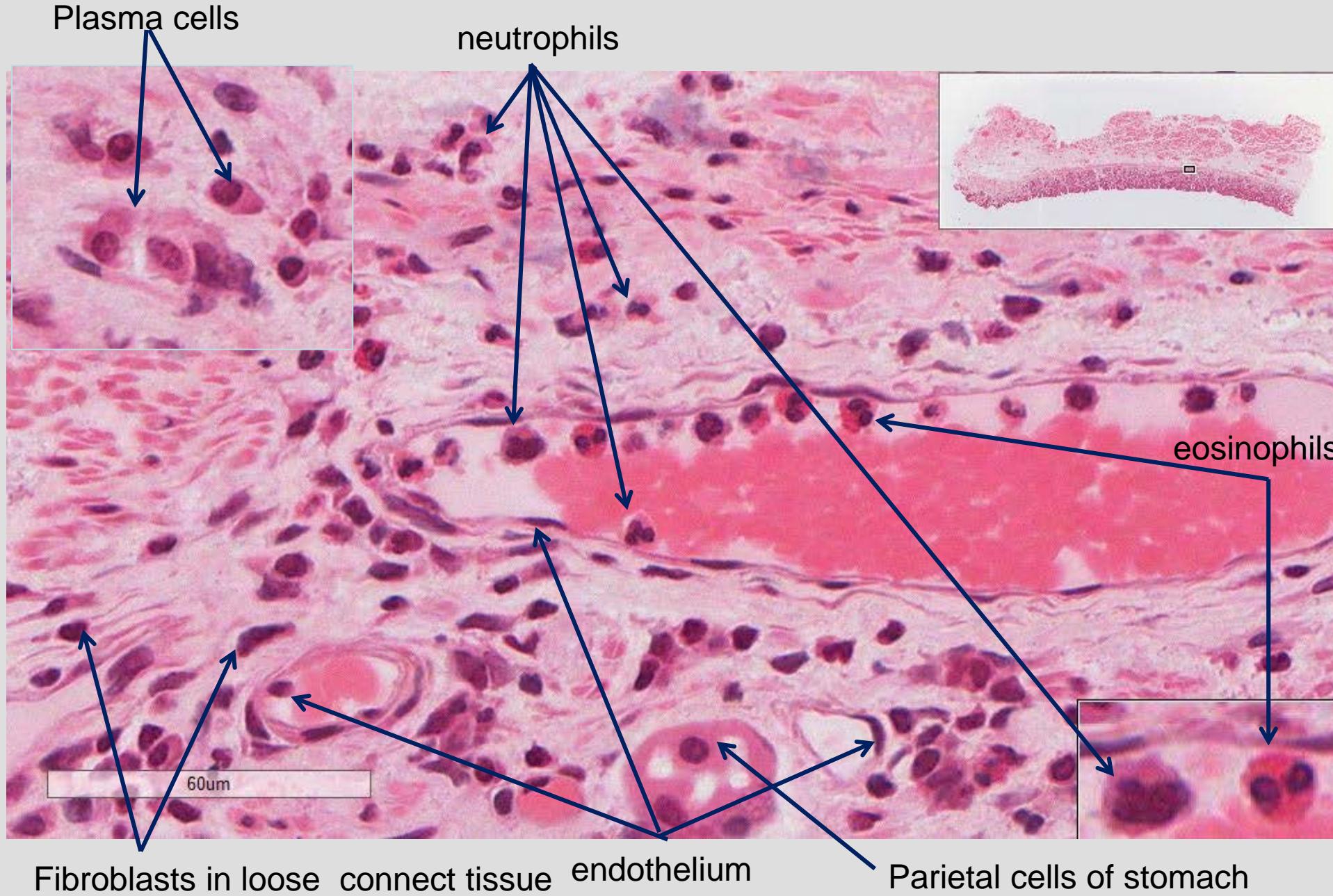
– Loose connective

tissue,

– plasma cells

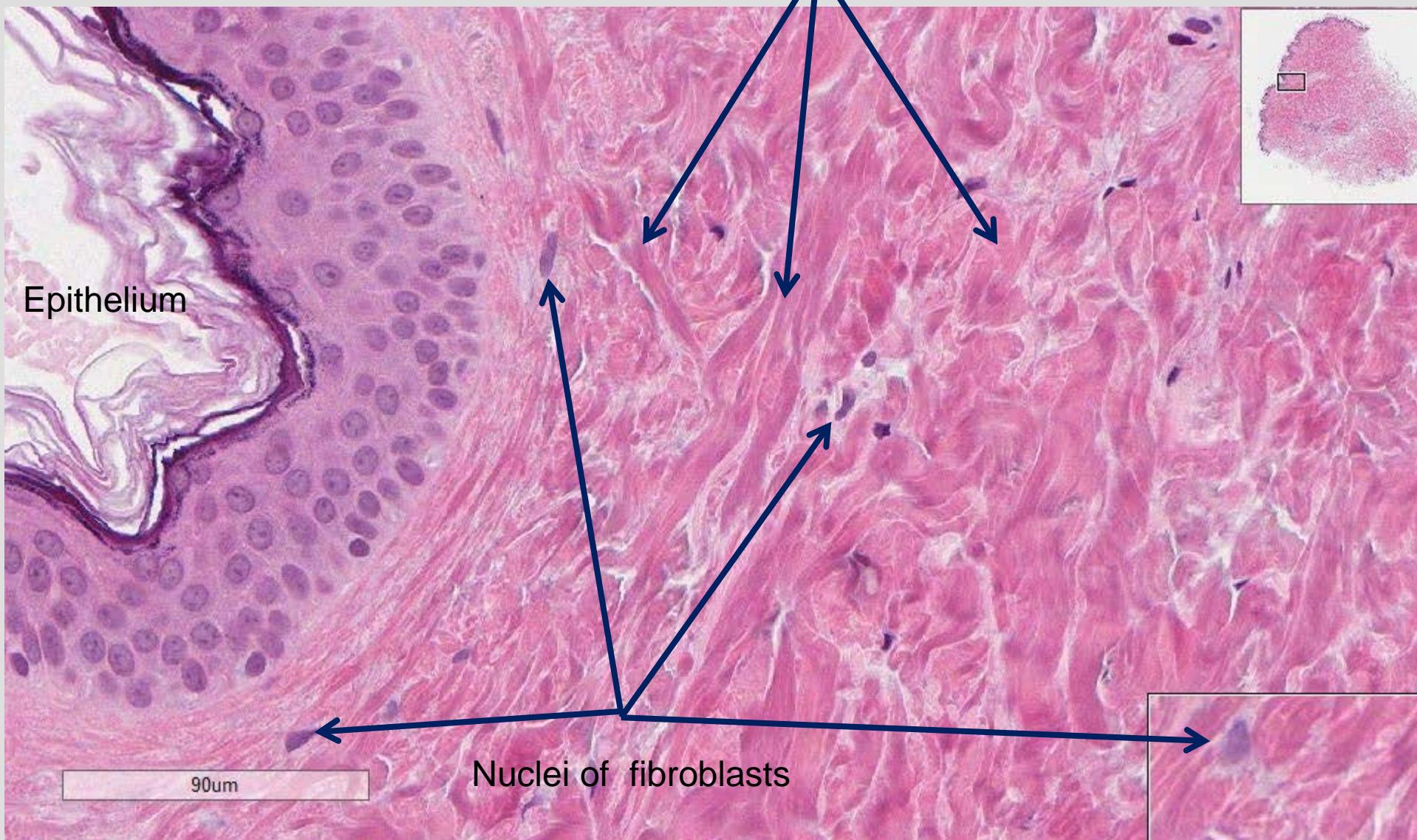


# 140 Cardiac stomach w/chronic infection



# 111 Skin

Large bundles of collagen fibers running in different directions (irregular) and of high density (dense) = dense irregular connective tissue in the dermis of skin

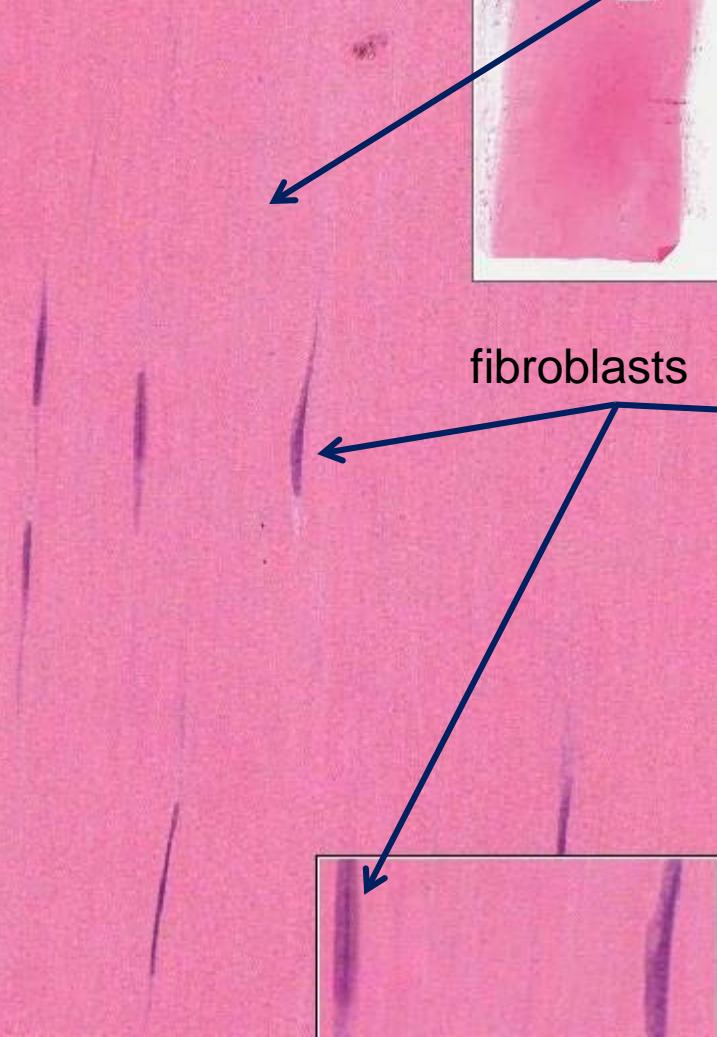


[Slide 202](#) tendon

High density of collagen fibers  
regularly or irregularly arranged

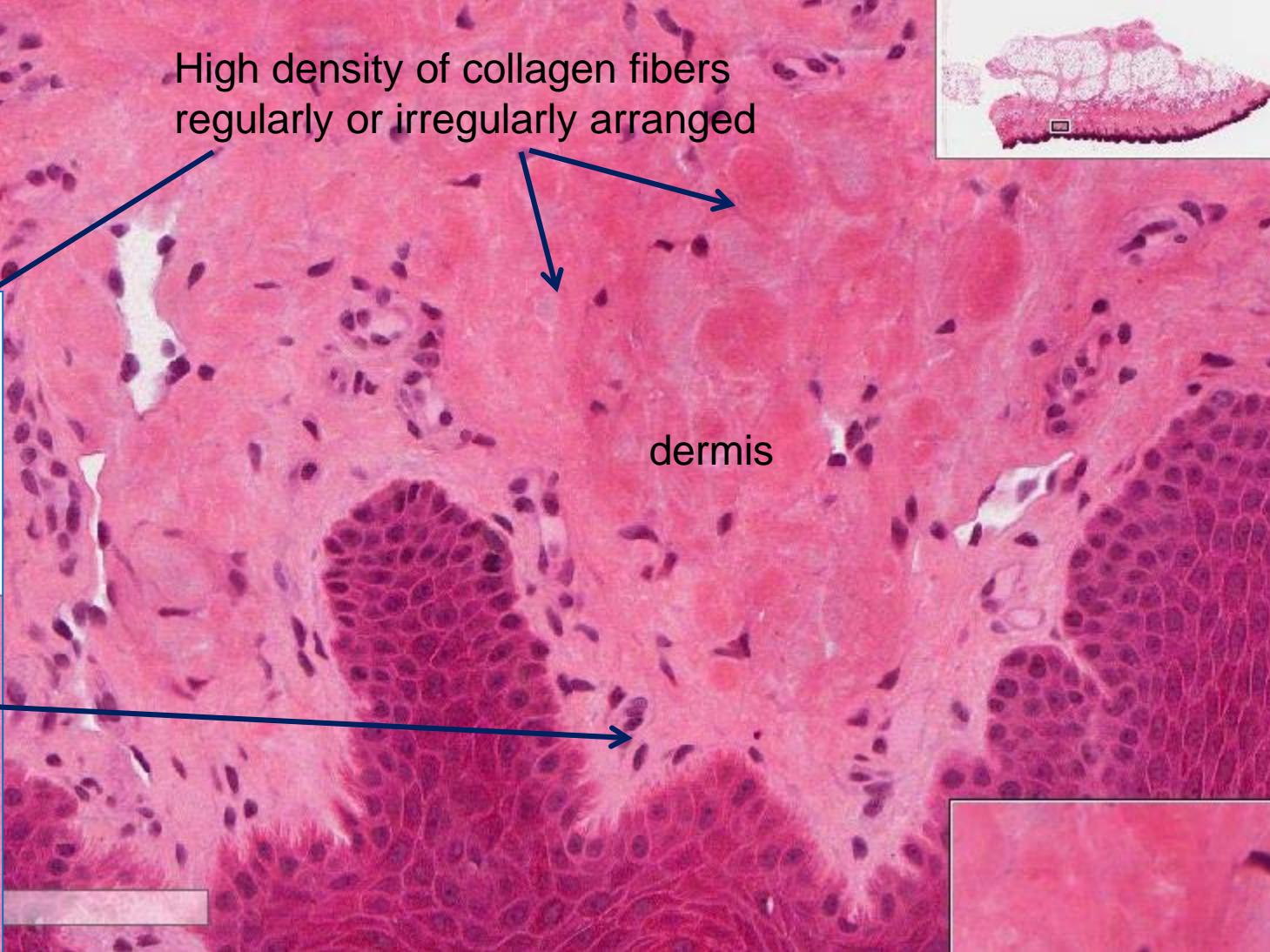


[Slide 109](#) skin



fibroblasts

dermis

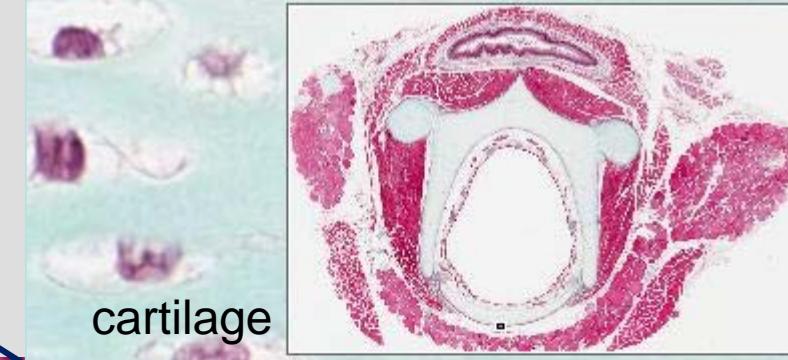
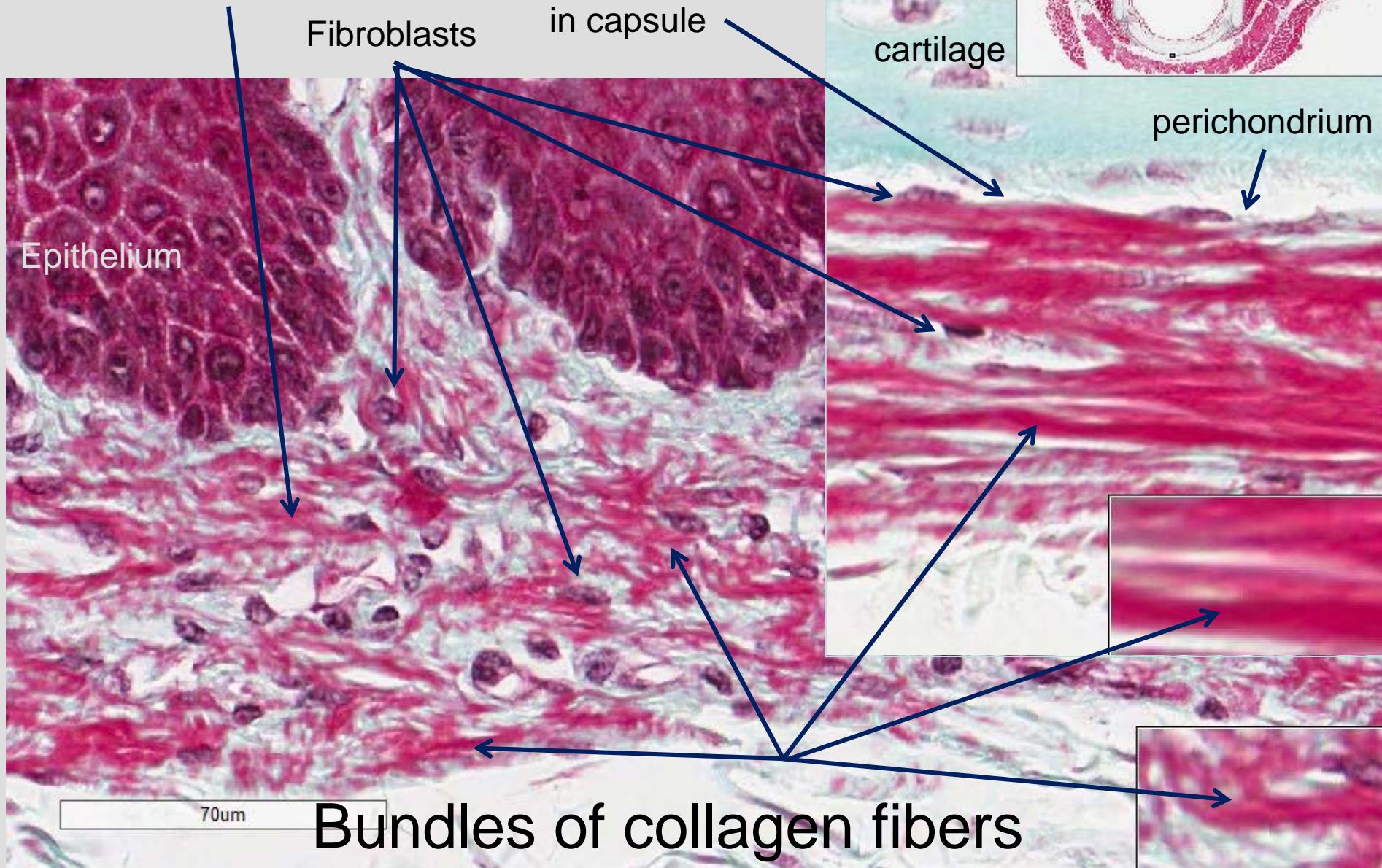


With flexibility, high tensile strength, and impressive resistance to stretch, concentrations of these fibers are found where these attributes are crucially important.

# Slide HISTO039: Larynx

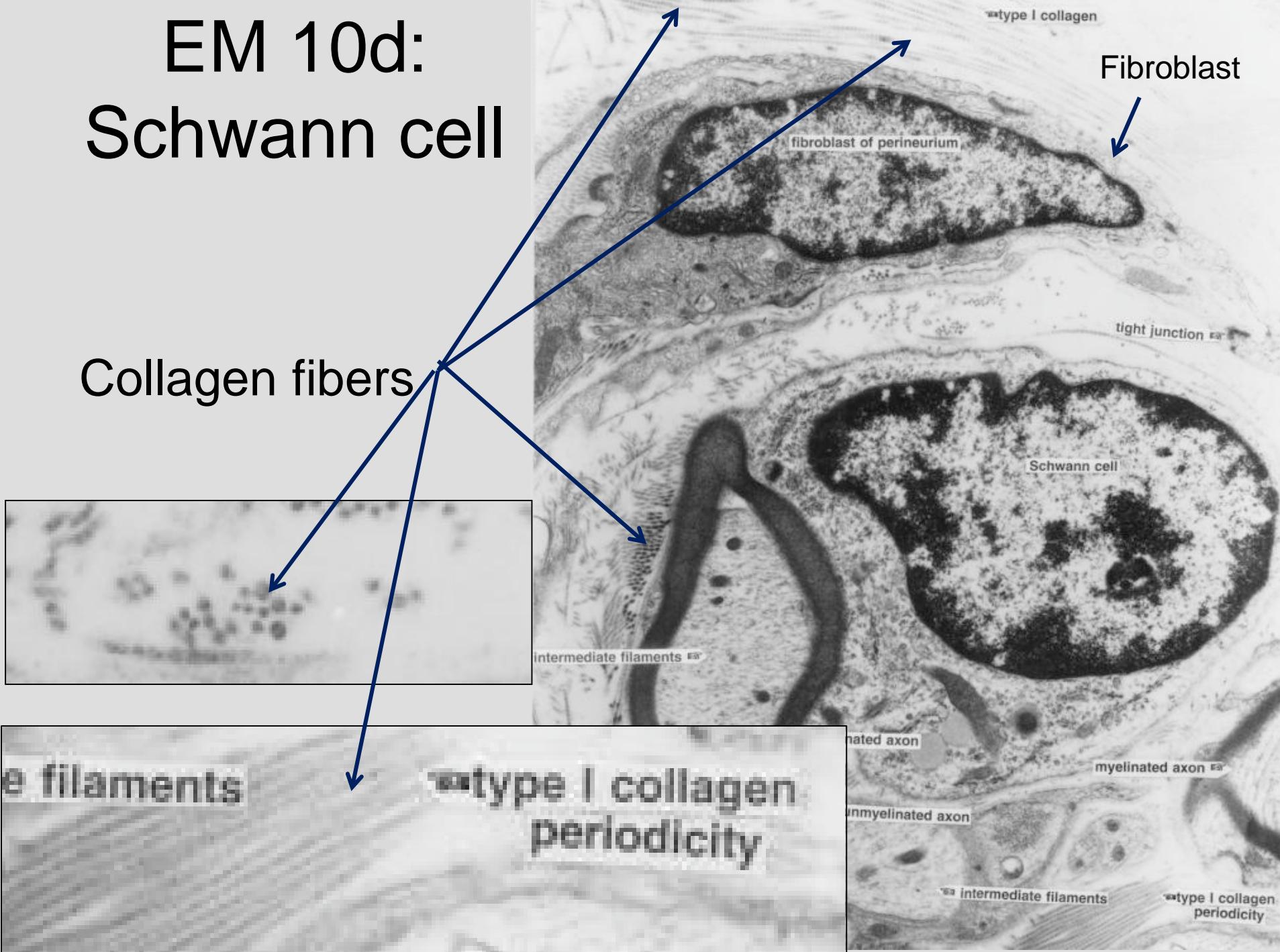
Loose connective tissue  
of the lamina propria

Dense irregular  
connective tissue  
in capsule



perichondrium

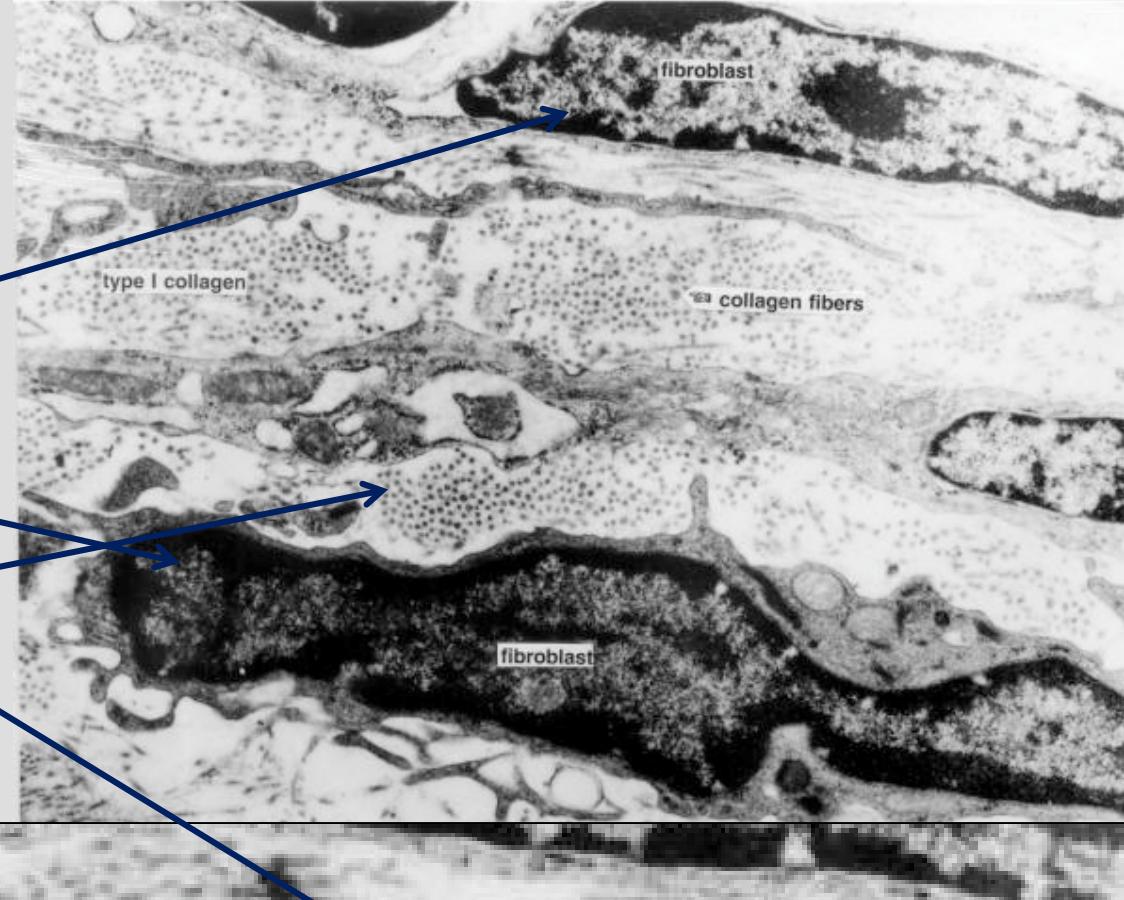
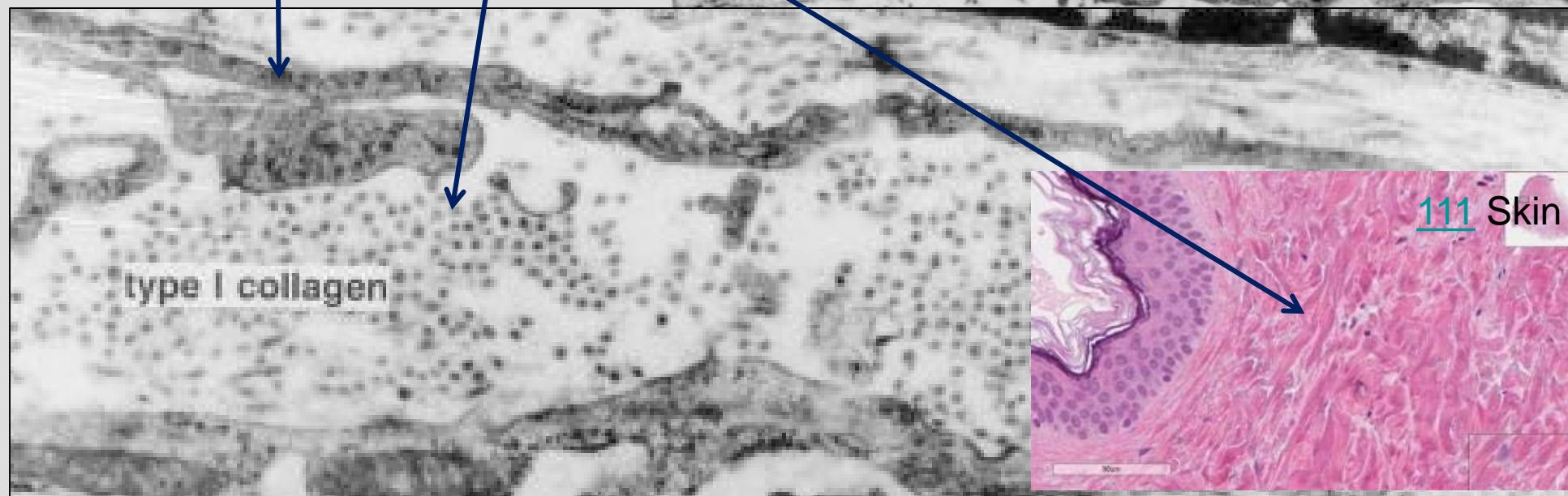
# EM 10d: Schwann cell



# EM 8e: Fibroblasts

Fibroblasts

Bundles of  
collagen  
fibers



# Slide 218 spleen with dark, branched reticular fibers

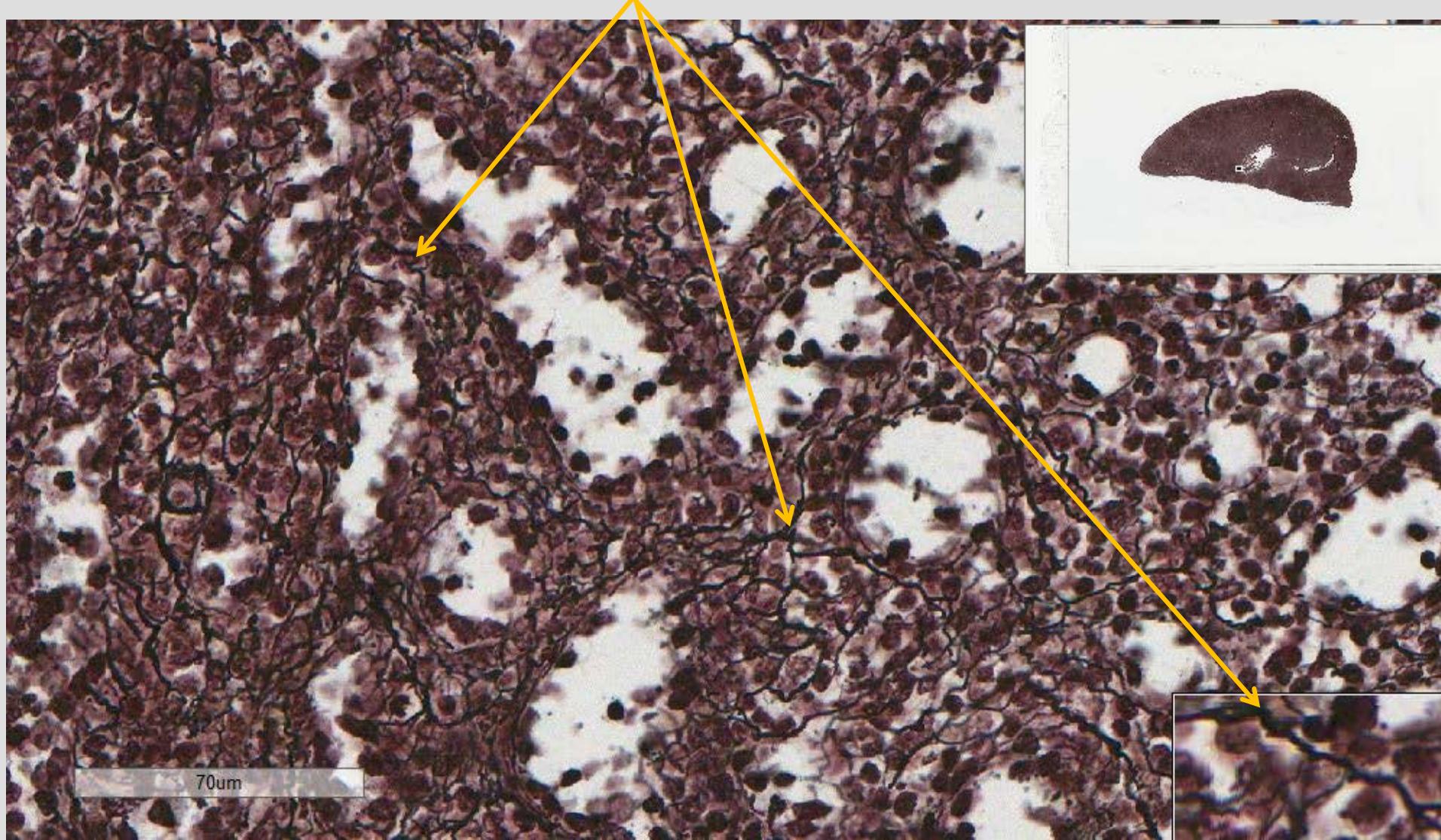
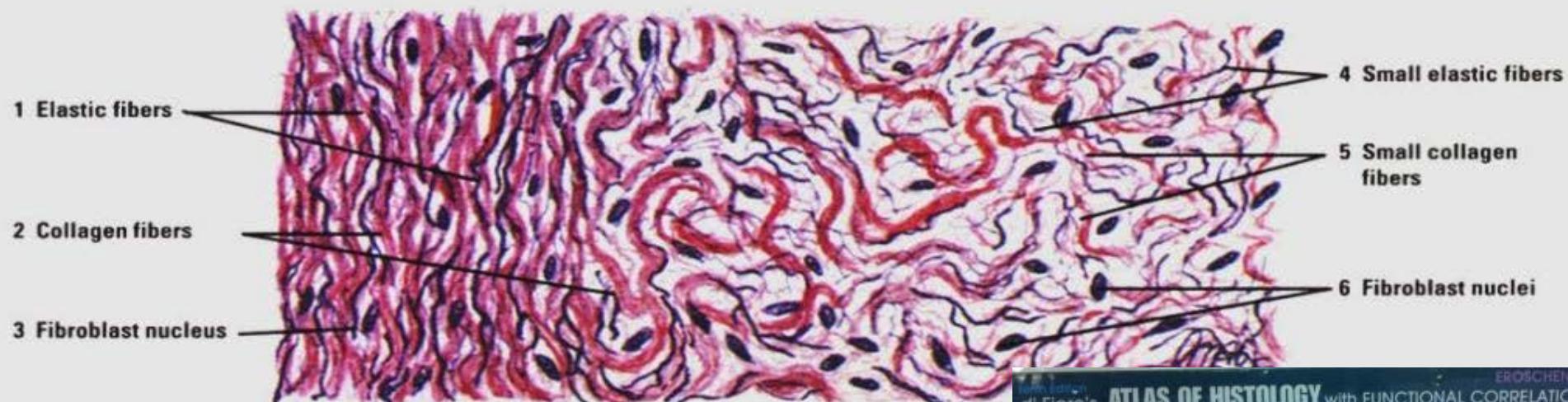
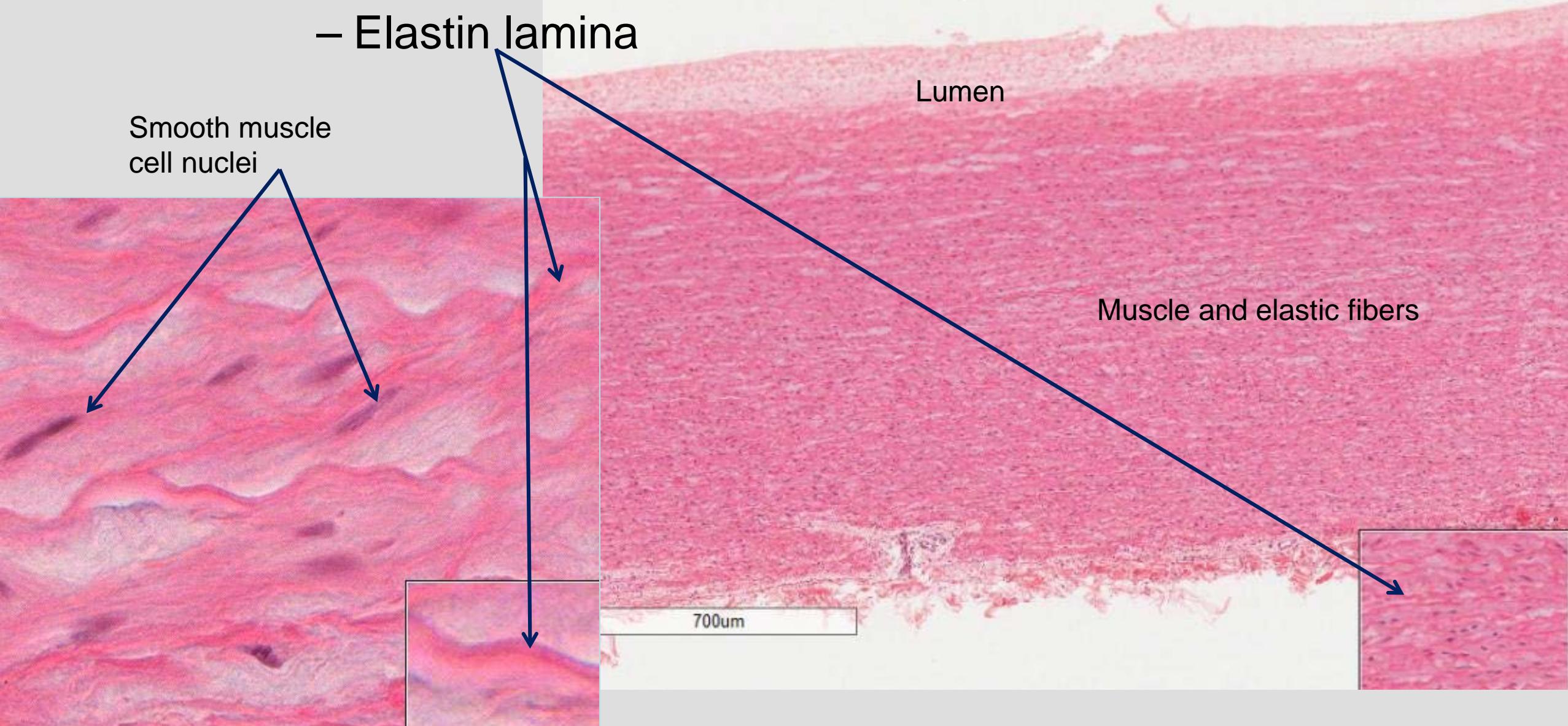
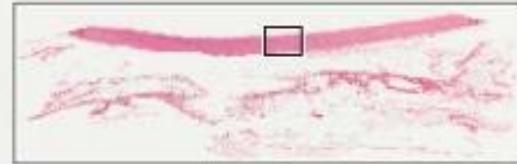




Fig. 2-4 Loose Connective Tissue. Stain: hematoxylin-eosin. High magnification.

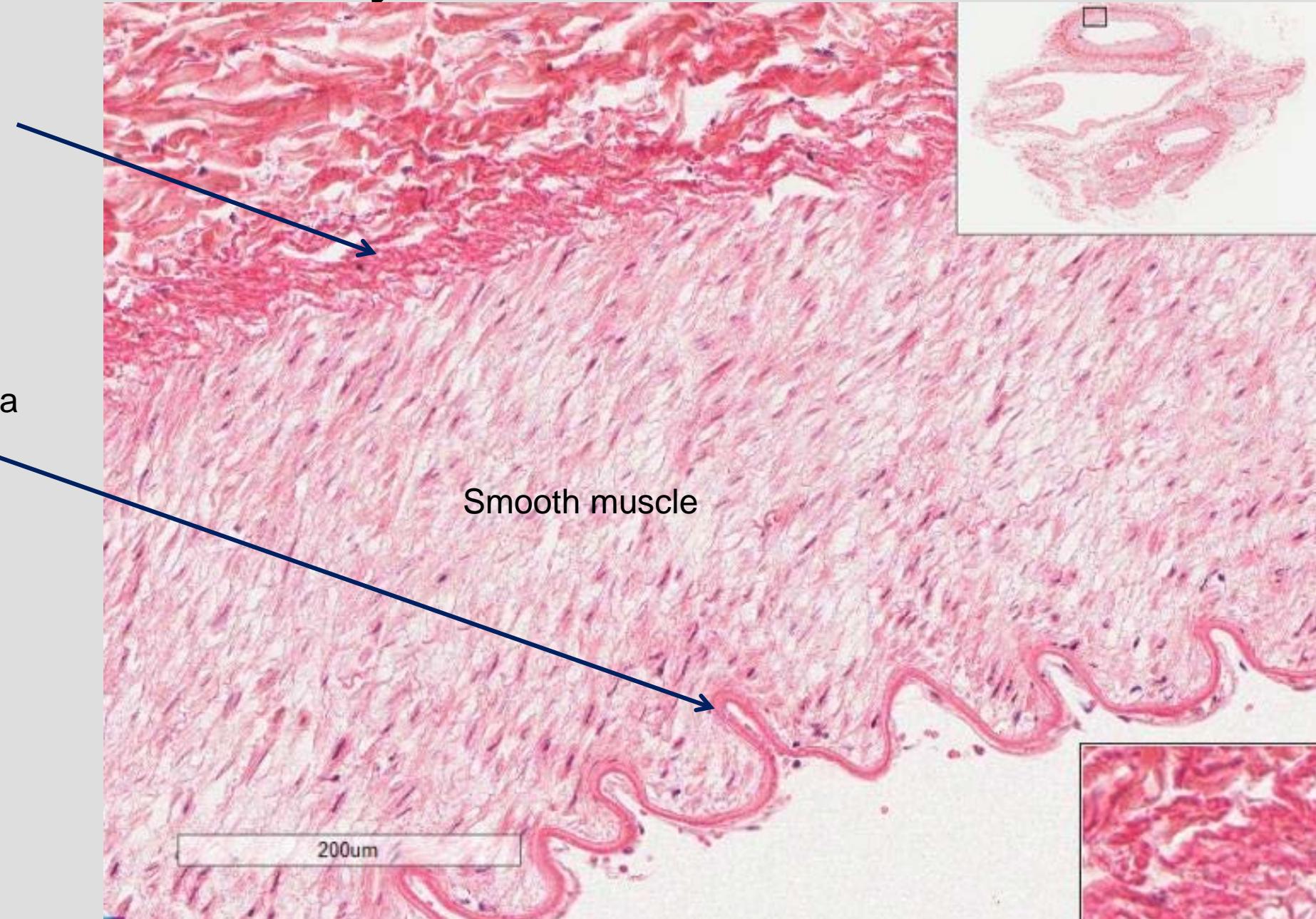


# Slide 427: Aorta



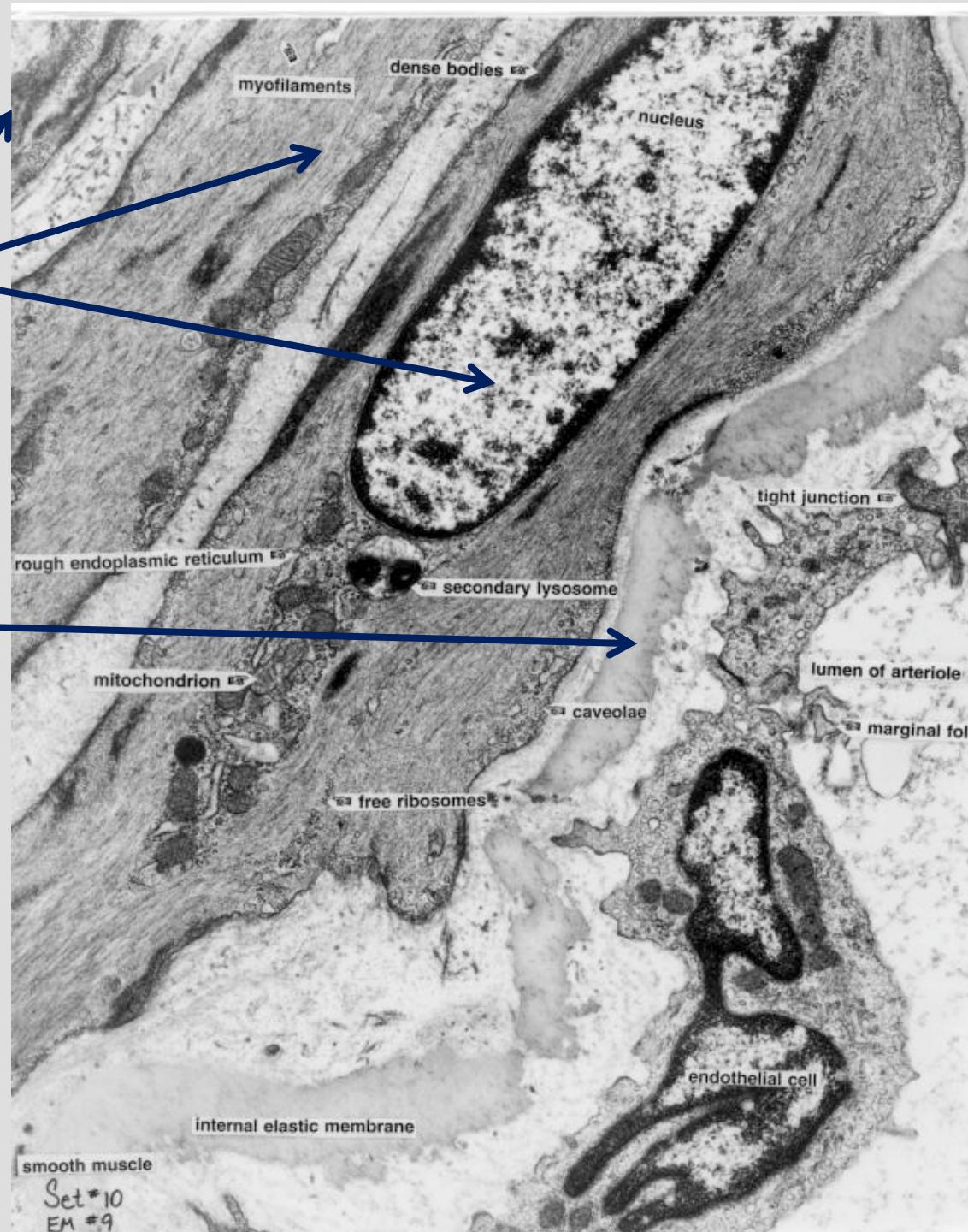
# Slide 426: Renal artery and vein with nerves

Elastin fibers



# EM 9: Smooth muscle cells

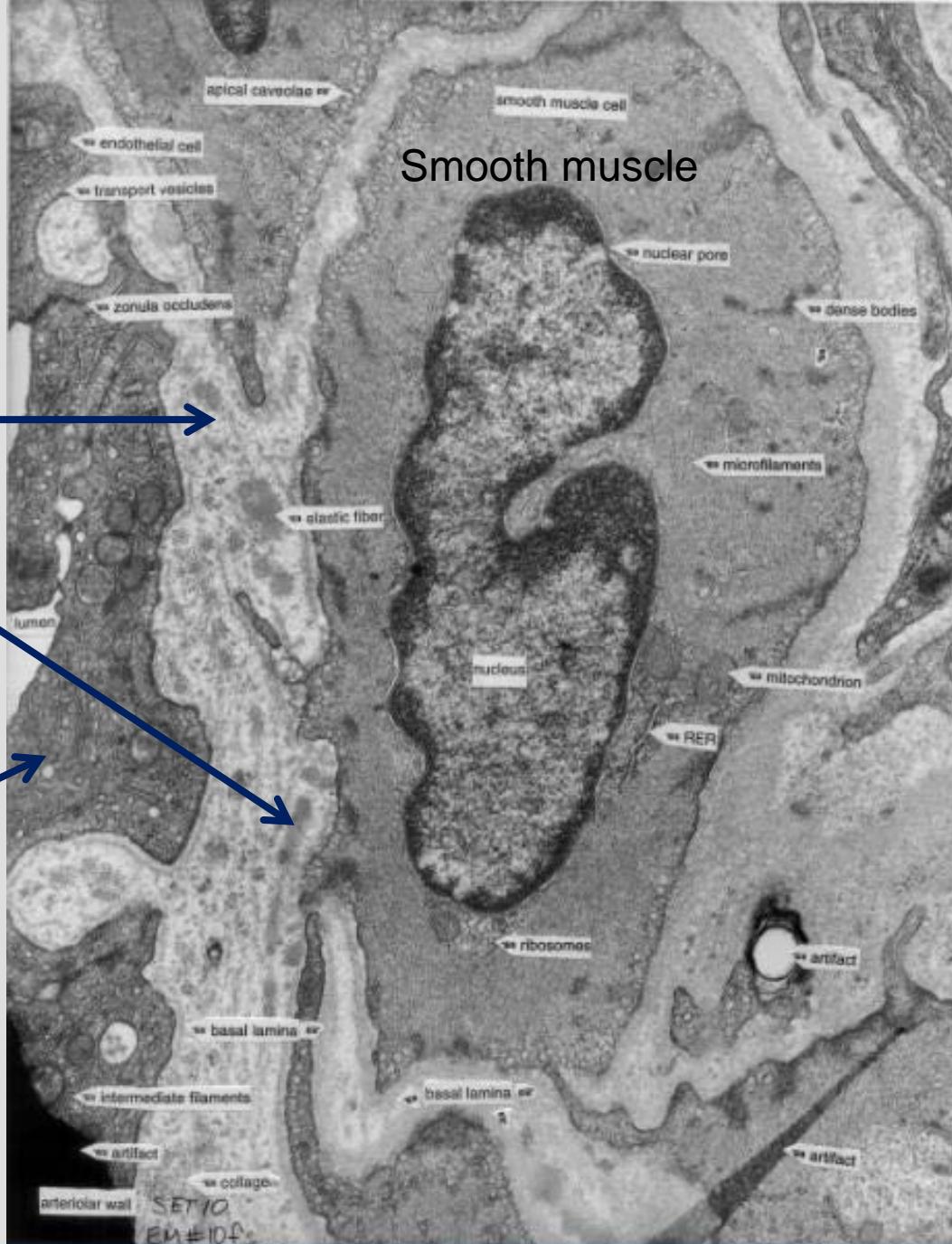
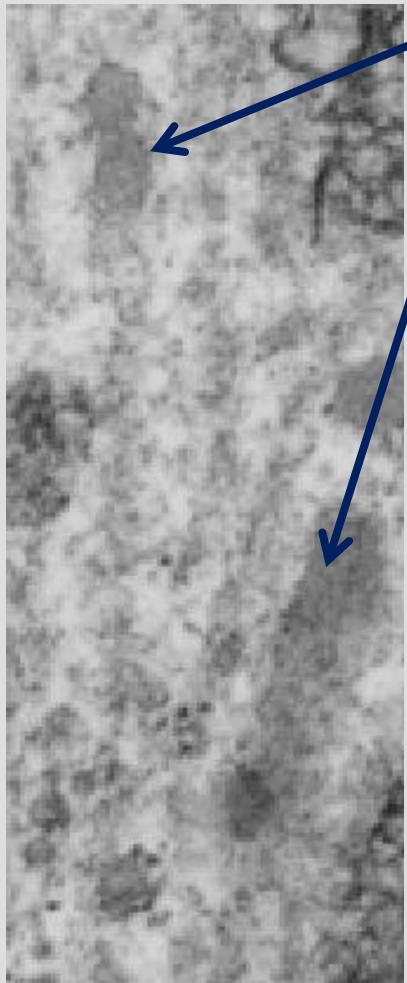
Elastic lamina



# EM 10f:

## Arteriolar Wall

# Elastic fibers



# Slide 32409 Intestine: Connective Cells

Mast cell



Macrophage



Fibroblasts



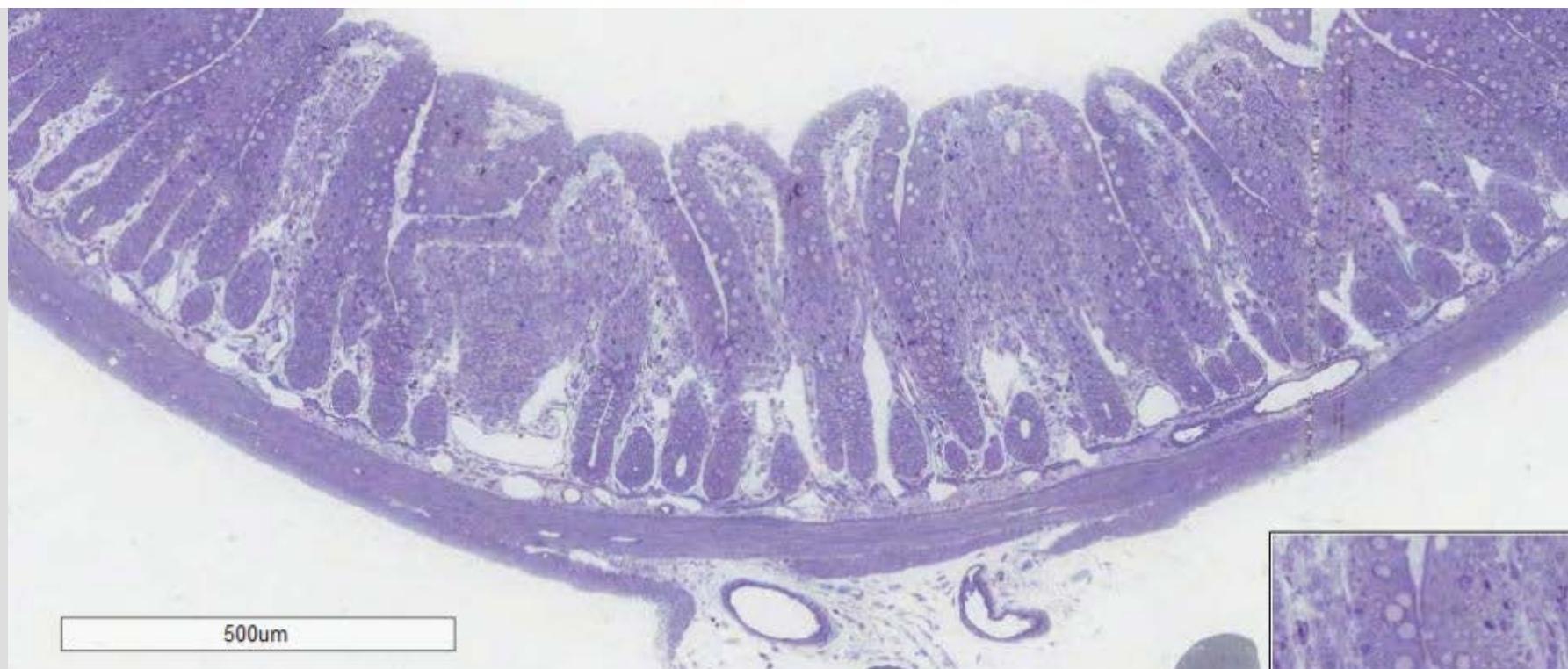
Fibroblasts



Plasma cell



Fat cells



500um

# In summary

## Function of Connective Tissue

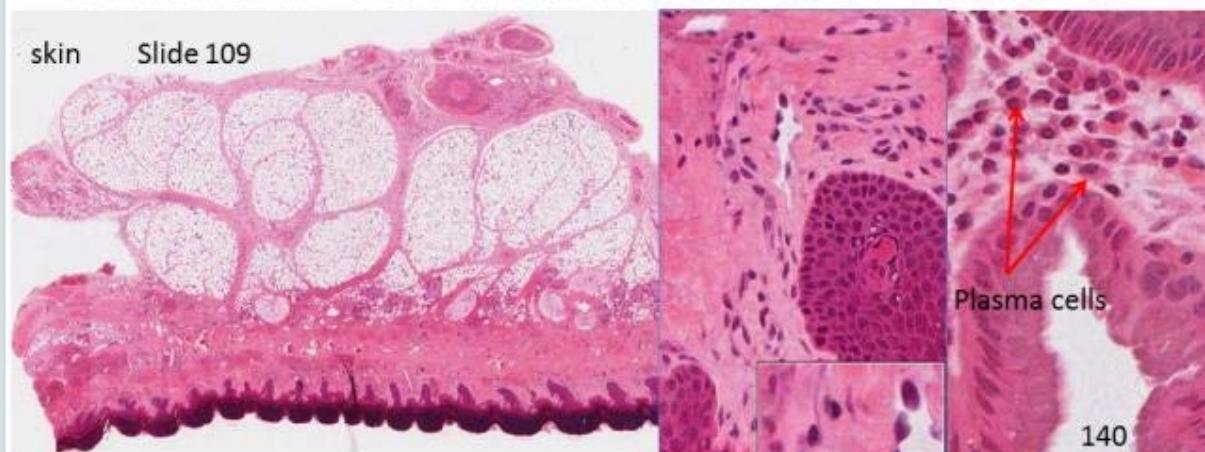
The histological glue which binds the other tissues together to form organs

Mechanical support - stroma below epithelium, skeleton

Metabolite exchange - vascular beds

Energy storage - adipose tissue

Inflammation - site of action for blood borne immune cells



Mast cell



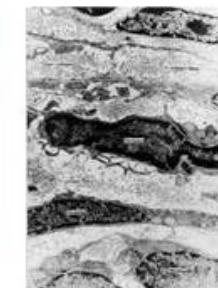
Macrophage



Fibroblasts



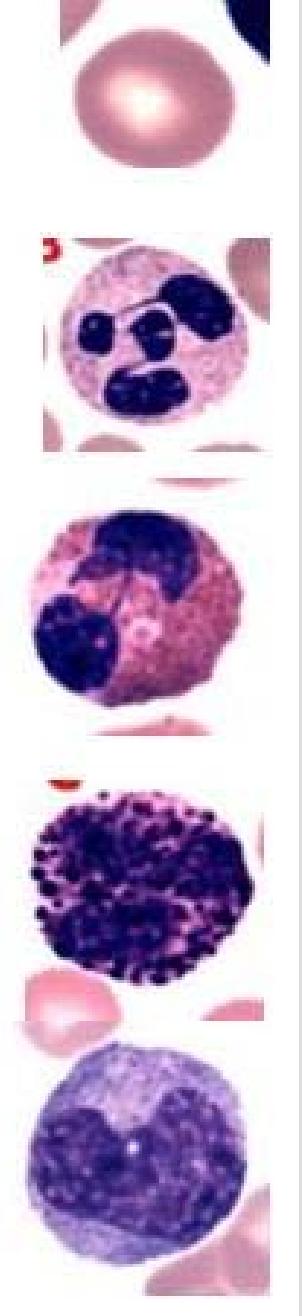
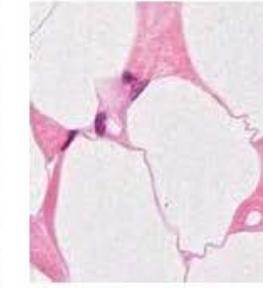
Fibroblasts



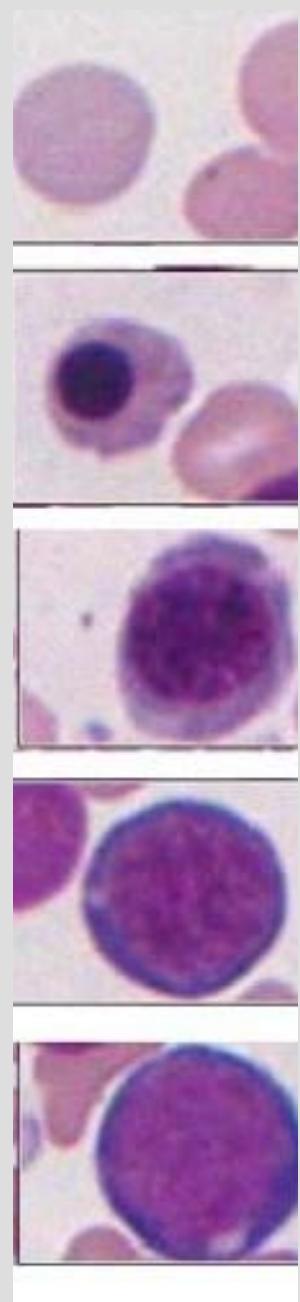
Plasma cell



Fat cells



Blood cells



Marrow cells

Many illustrations in these VIBS Histology YouTube videos were modified from the following books and sources: Many thanks to original sources!

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# Questions on Connective Tissue

Connective tissue:

- a. provides mechanical support and metabolic exchange for epithelia
- b. provides site of battle for blood borne immune cells
- c. stores energy in striated muscle cells
- d. **a and b**
- e. a, b, and c

Classification of connective tissue proper is based on:

- a. ratio of cells to extracellular matrix
- b. arrangement of fibers
- c. the density of fibers in the extracellular matrix
- d. a and b
- e. **a, b, and c**

Cells of connective tissue that are progenitor (stem) cells are:

- a. adipose cells
- b. macrophages
- c. plasma cells
- d. **fibroblasts**
- e. mast cells

Ocotillo plant

Mexico

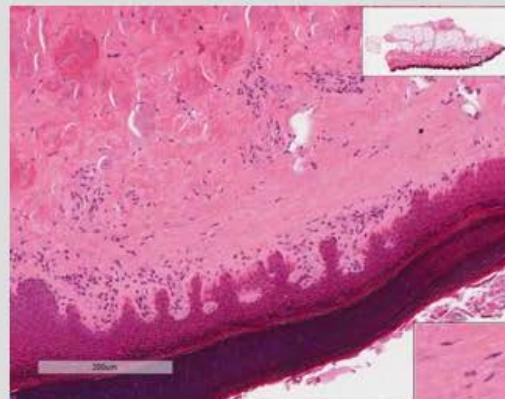


Big Bend TX, USA

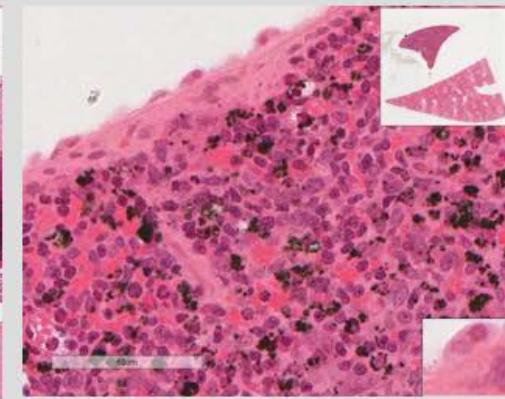
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## Medical School Histology Basics Connective Tissue

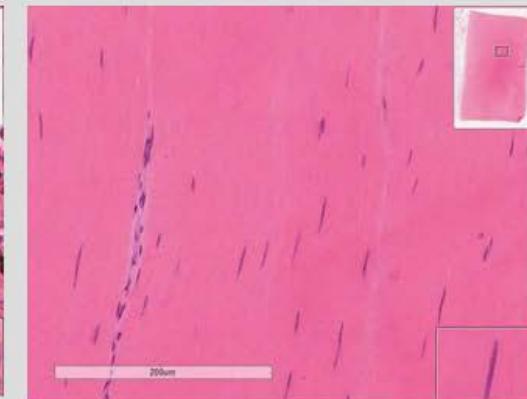
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Mast cell

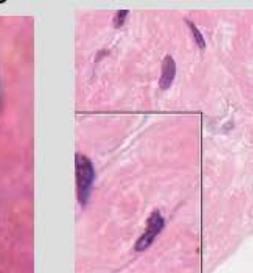


Macrophage



Fibroblasts

Plasma cell

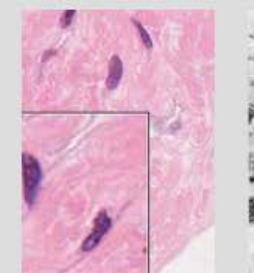


Fibroblasts

Fat cells



Larry Johnson



Texas A&M University