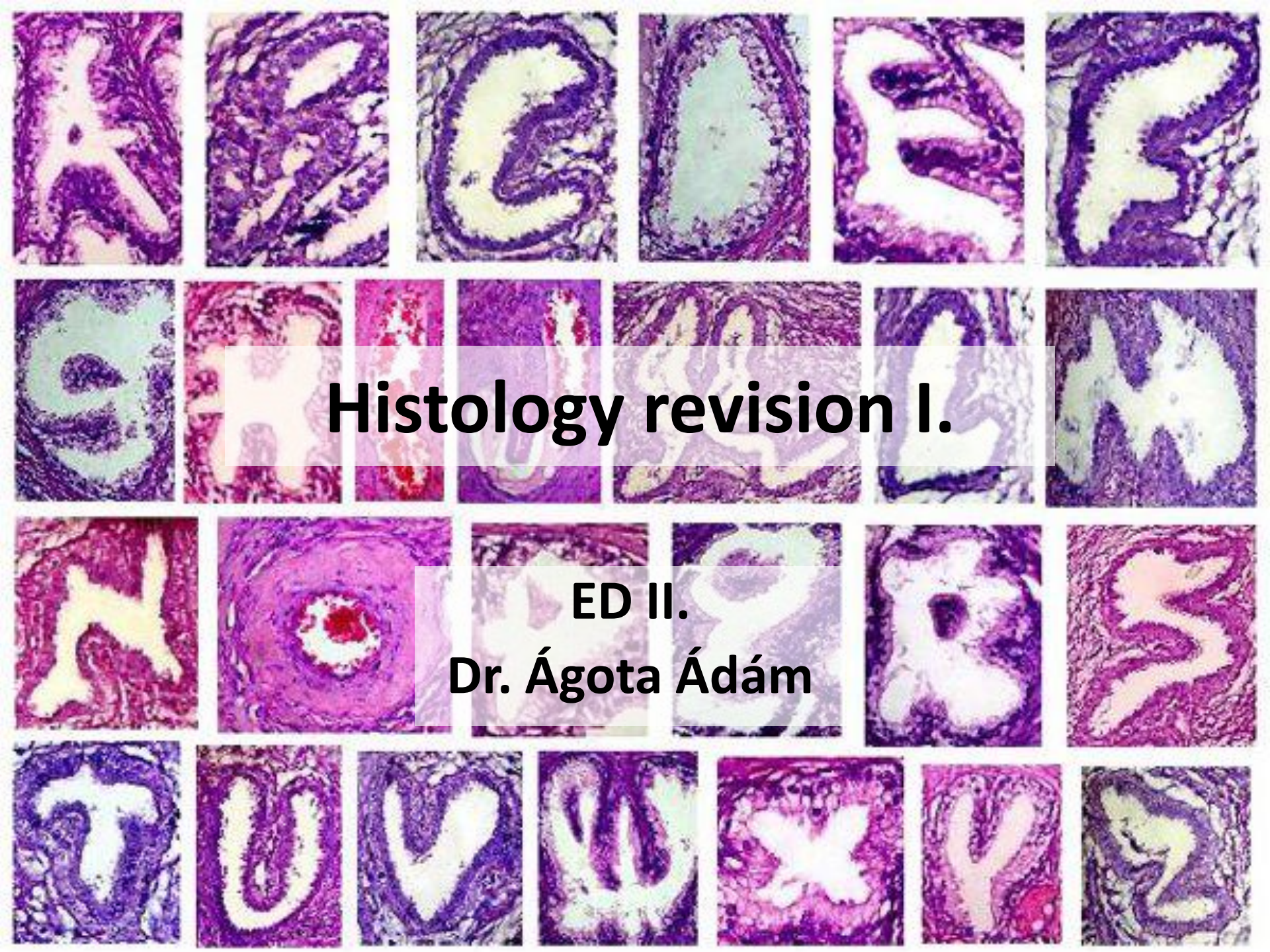


Histology revision I.

ED II.

Dr. Ágota Ádám

Final exam: How to start the histo part?

1. Take a look with low magnification– shape of the organ? Is it a parenchymal organ or does it have a lumen?
2. Can we identify an epithelium?
   If there is a lumen, there is always an epithelium.
3. What can we say about the staining?
4. What kind of basic tissue can we identify within the specimen?
5. Can we see anything special? – ~~ALWAYS~~ check the whole slide!

~~Panic.~~

~~Give up.~~

What to do, if we have no idea what it is:

1. Try to identify the tissue parts
   eg.: there is skeletal muscle, adipose tissue, etc.
2. Use the previously memorized differential-diagnostic scheme! (see later)
3. Be honest. Believe your eyes and try to describe precisely what you see.

Eosinophilic (acidophilic) and basophilic cells

eosin – „acid-liking”, „protein-rich” structures (most proteins are ⊕ charged): membranes (membrane proteins), mitochondria, lysosomes, cytoplasm (soluble proteins), erythrocytes (haemoglobin), muscle tissue (actin-myosin, myoglobin), collagen fibers

hematoxylin – „alkaline-liking”, structures with rich acidic content, eg.: DNA, RNA (intense protein sythesis), proteoglycans, glycosaminoglycans

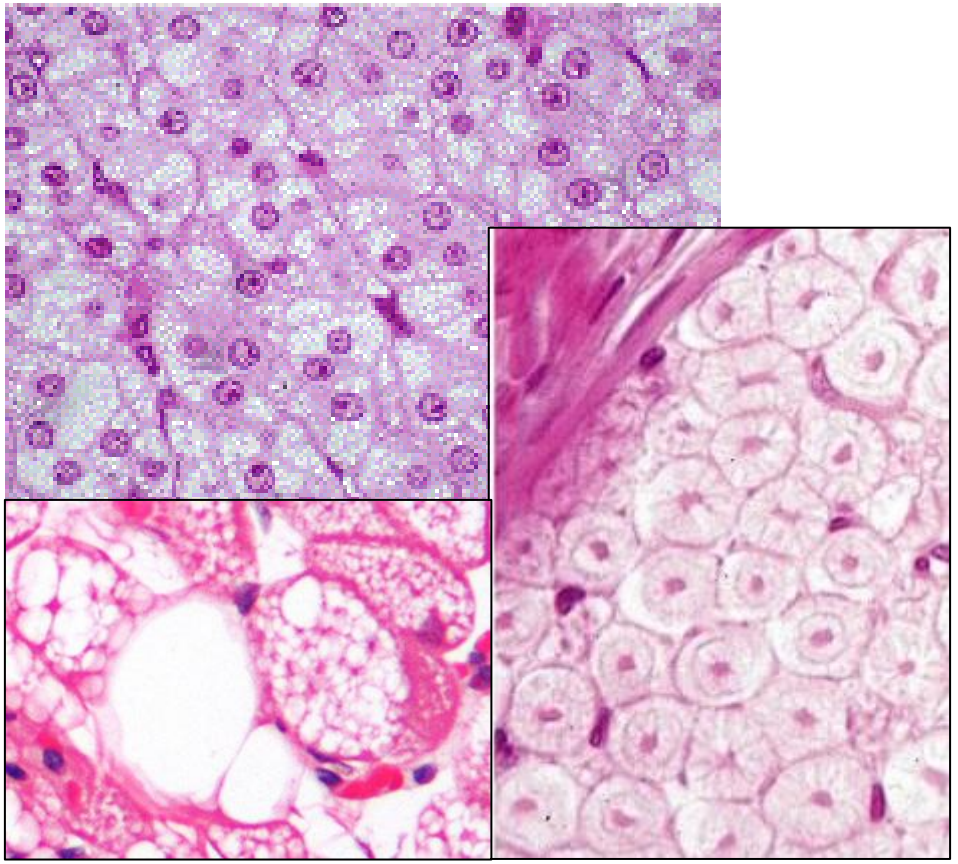
Nucleus is always basophilic + cytoplasm of cells having active protein synthesis:
- plasma cell
- serous acini
- chief cell in stomach
- neurons

How can a cell appear ‘unstained’?

1. The content of the cytoplasm is <u>dissolved out</u>

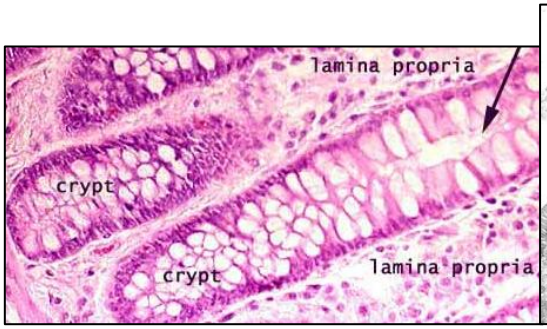
   Lipids – adipocyte, cells containing large amount of *steroids* (eg. theca interna, cortex of adrenal gland), myelin sheath, cytoplasm of chondrocytes

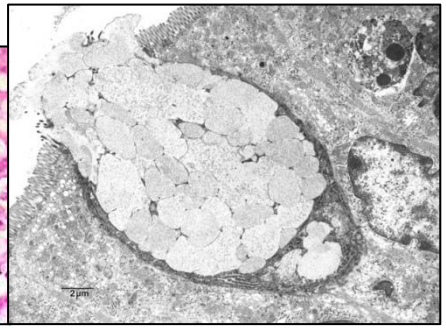
   visualization: on frozen specimen, with special staining procedures



2. <u>Does not stain</u> with regular methods (H.E.)

   Mucin (can be stained with: mucicarmin, PAS-reaction) – goblet cells, mucous neck cells of the stomach, mucous acini, crypts of Lieberkühn

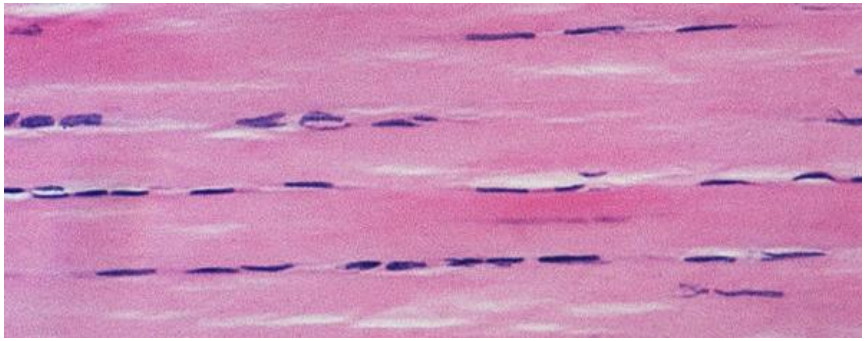


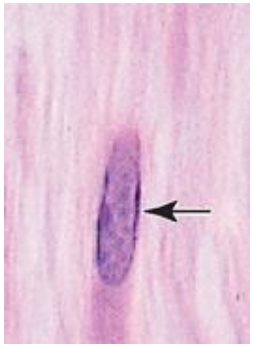


Eucromatin- vs. **heterocromatin-rich** nuclei

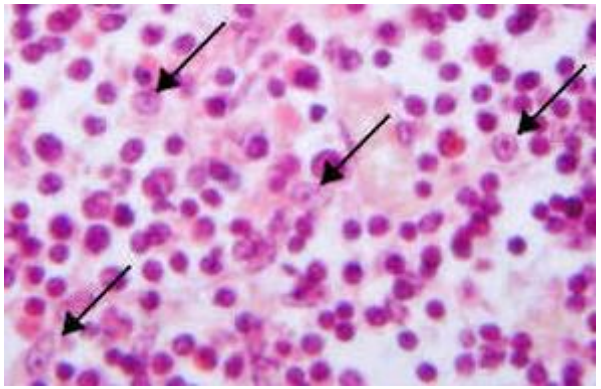
Eucromatin:
loose DNA
Dividing cells or cells with intense synthesis
Eg.:
- neurons (neurotansmitter synthesis)
- fibroblast (fiber production)
- reticular cell (reticular fiber production)
- Sertoli-cell (hormon production, MIF…)

Heterocromatin:
Densely packed DNA
Cells in resting state

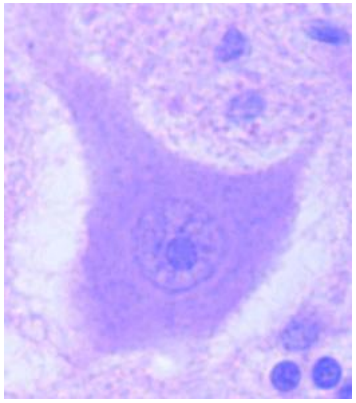




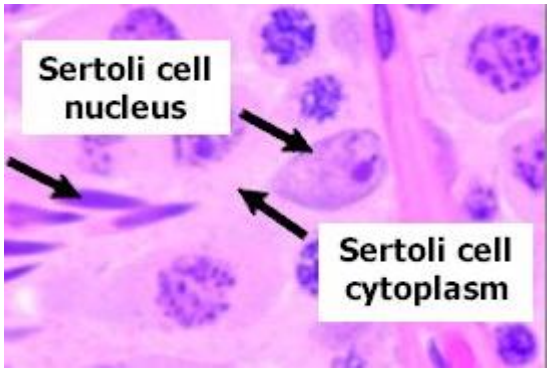
fibroblast



Reticular cell in a lymph node



neuron



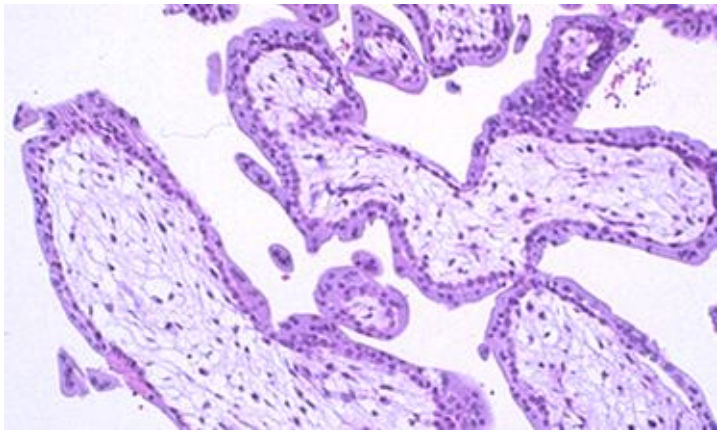
Sertoli-cells

Cells with multiple nuclei

Origin:

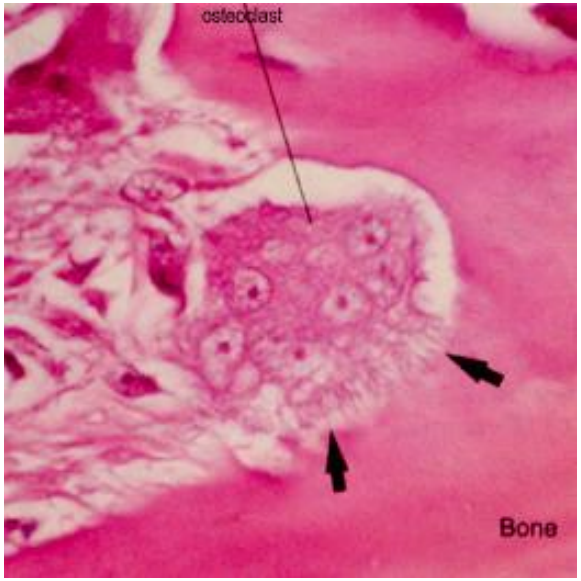
1. From multiple cells, with fusion of the cytoplasms:
SYNTITIUM

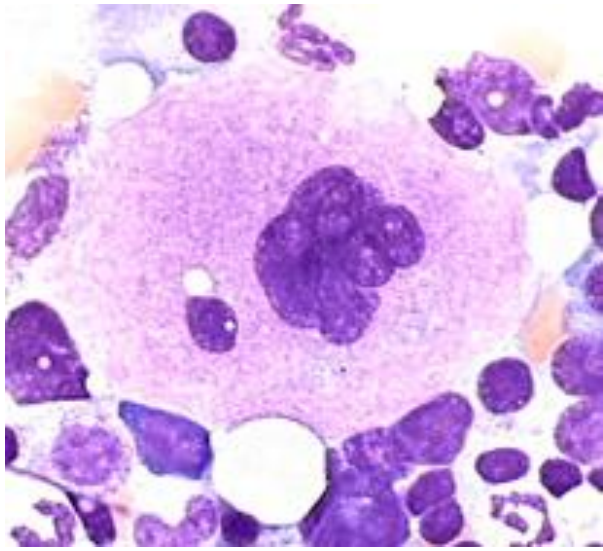
eg.: **muscle fiber**, syntitiotrophoblast



2. Division of nuclei (without the division of the cell)

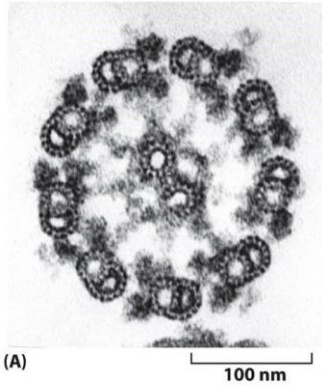
eg.: osteoclast, megakaryocyte, (umbrella cell)

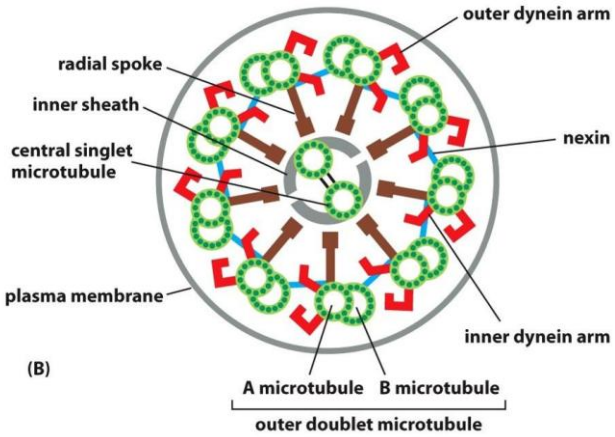


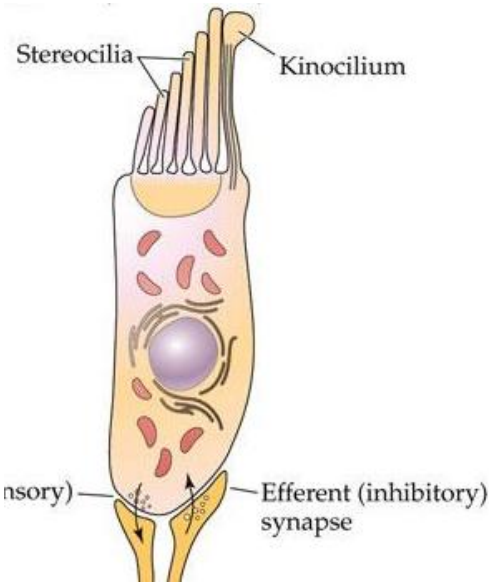


Surface specializations

	Characteristics	Prevalence
kinocilia	Active movement; 9+2 microtubular structure	„respiratory epithelium”, uterine tube
stereocilia	NO active movement	ductus epididymidis, vas deferens, hair cells of organ of Corti
microvilli (brush border)	Cytoplasmal process; surface enlargement	Small and large intestine, proximal convoluted tubules of the kidney







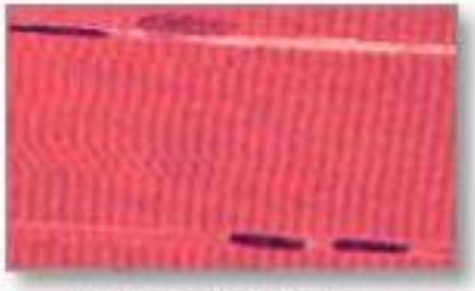
Hair cells of vestibular receptors: 1 kinocilium + multiple stereocilia

The 4 basic tissue:

1. Epithelial
2. Connective and supporting
3. Muscle
4. Nervous


Connective tissue


Epithelial tissue


Muscle tissue


Nervous tissue

Epithelial tissues

- Below always: basal membrane + connective tissue
- avascular (exception: stria vascularis in the inner ear)
- low amount of extracellular matrix
- cells are in strong contact

Simple: All cells reach the surface (lumen)
Pseudostratified: All cells are located on the basal membrane, but not all reach the surface
Stratified: Cells are present in multiple layers. The shape of the uppermost layer defines the type of the epithelium.

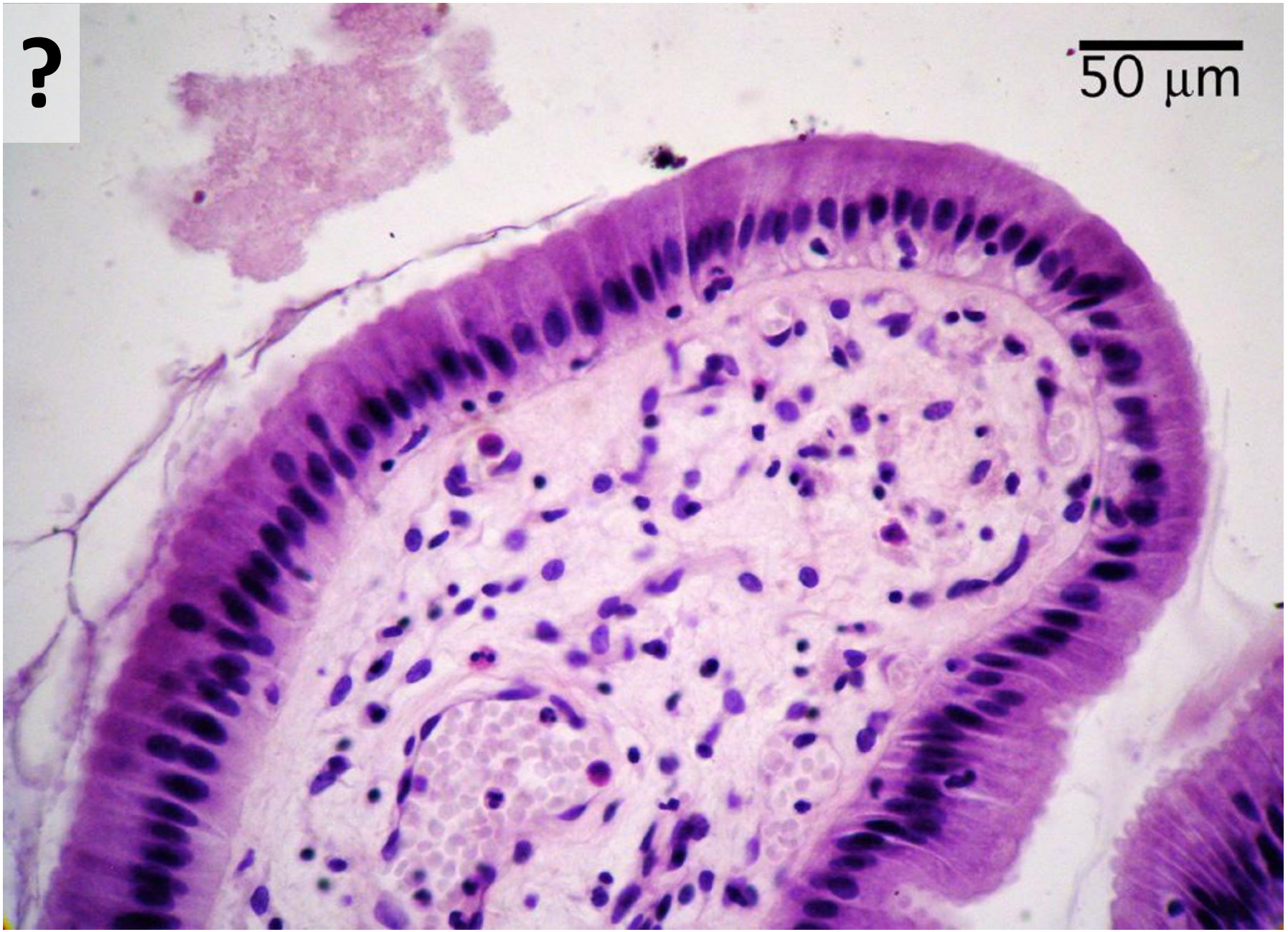
Simple squamous:
- vessels (endothel)
- serous membranes (mesothel)
- Bowman's capsule
- lung alveoli
- thin limb of loop of Henle
- endothelium camerae anterioris

Simple columnar:
- gut
- gall baldder
- uterine tube
- uterus
- ductuli efferentes testis

Stratified columnar:
-pars spongiosa urethrae
- fornix conjunctivae

Pseudostratified columnar:
- respiratory tract
- ductus epididymidis
- vas deferens
- seminal vesicle

Urothelium:
- renal pelvis
- ureter
- urinary bladder
- urethra, proximal part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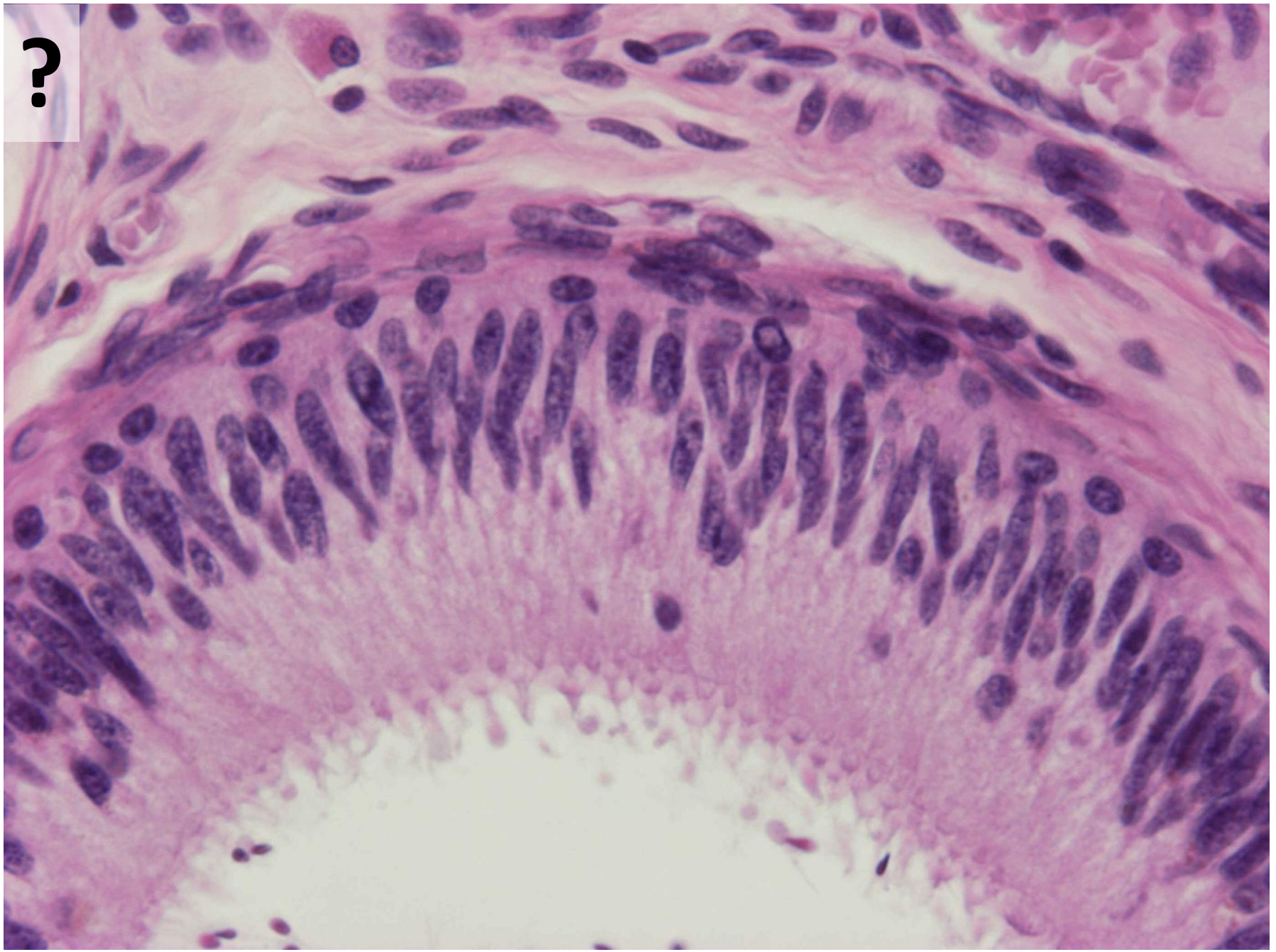
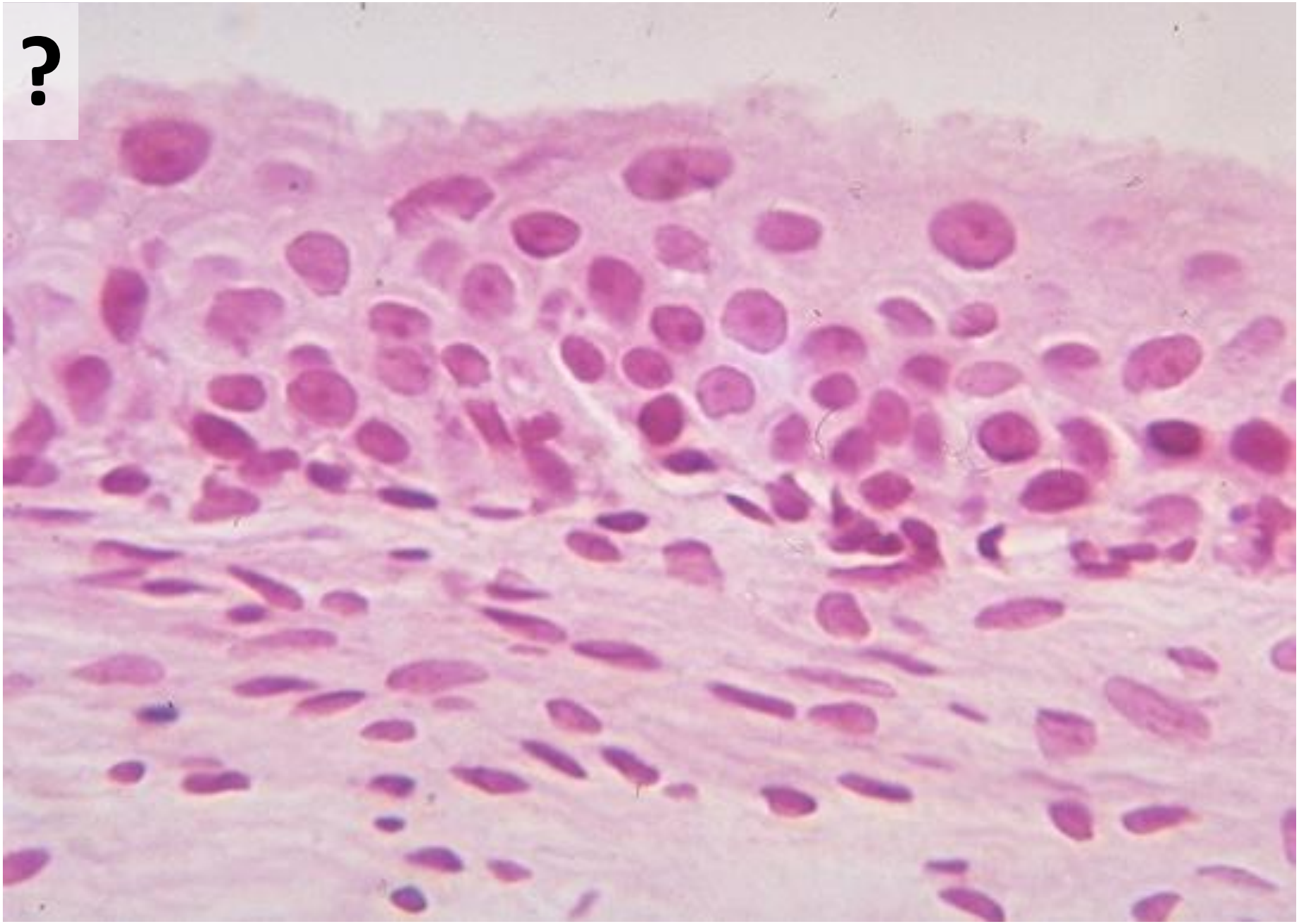
50 µm





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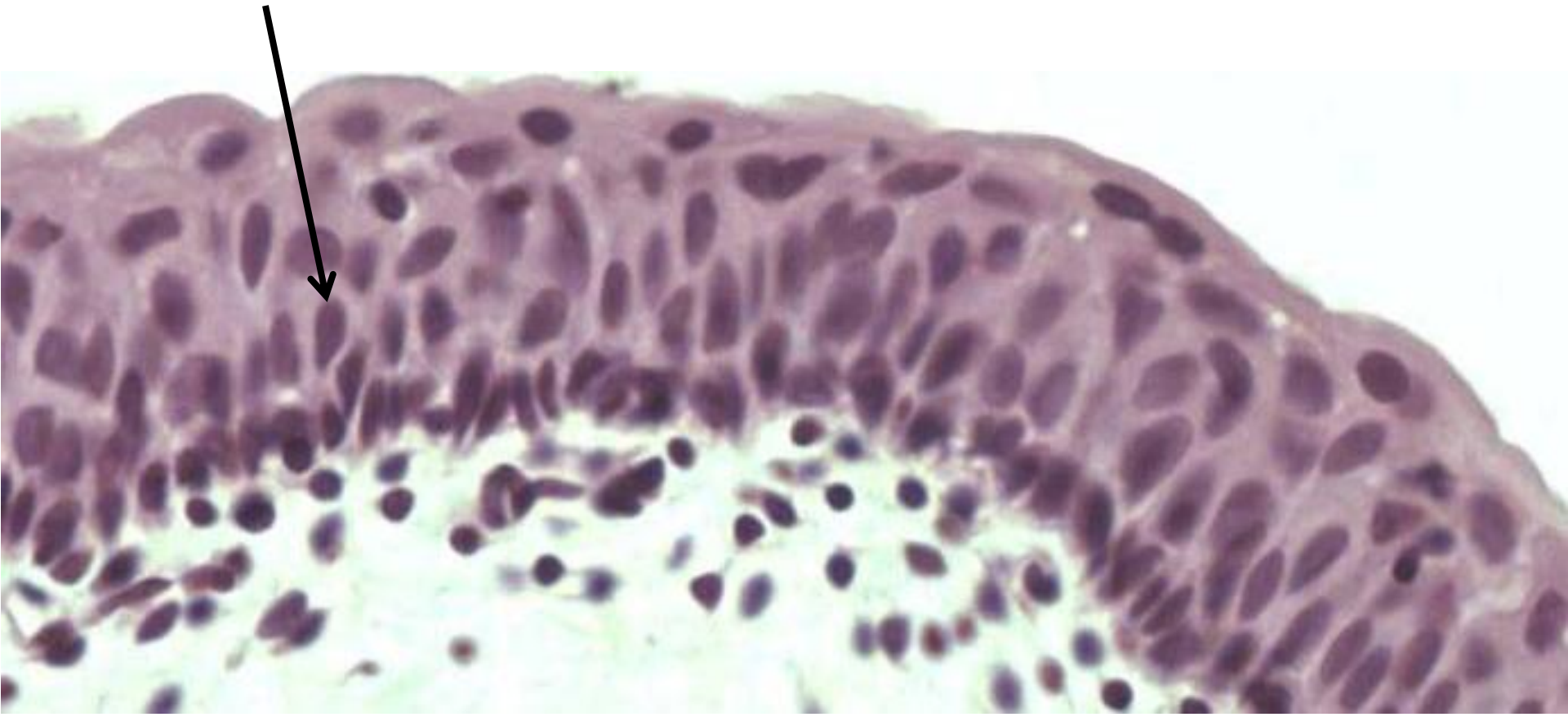


Glandular epithelium

Merocrine:

EXOCYTOSIS
Most common
- goblet cell
- serous and mucous glands
- salivary glands
- lacrimal gland
- breast: secretion of milk proteins
- sweat glands
- pancreas

Apocrine:

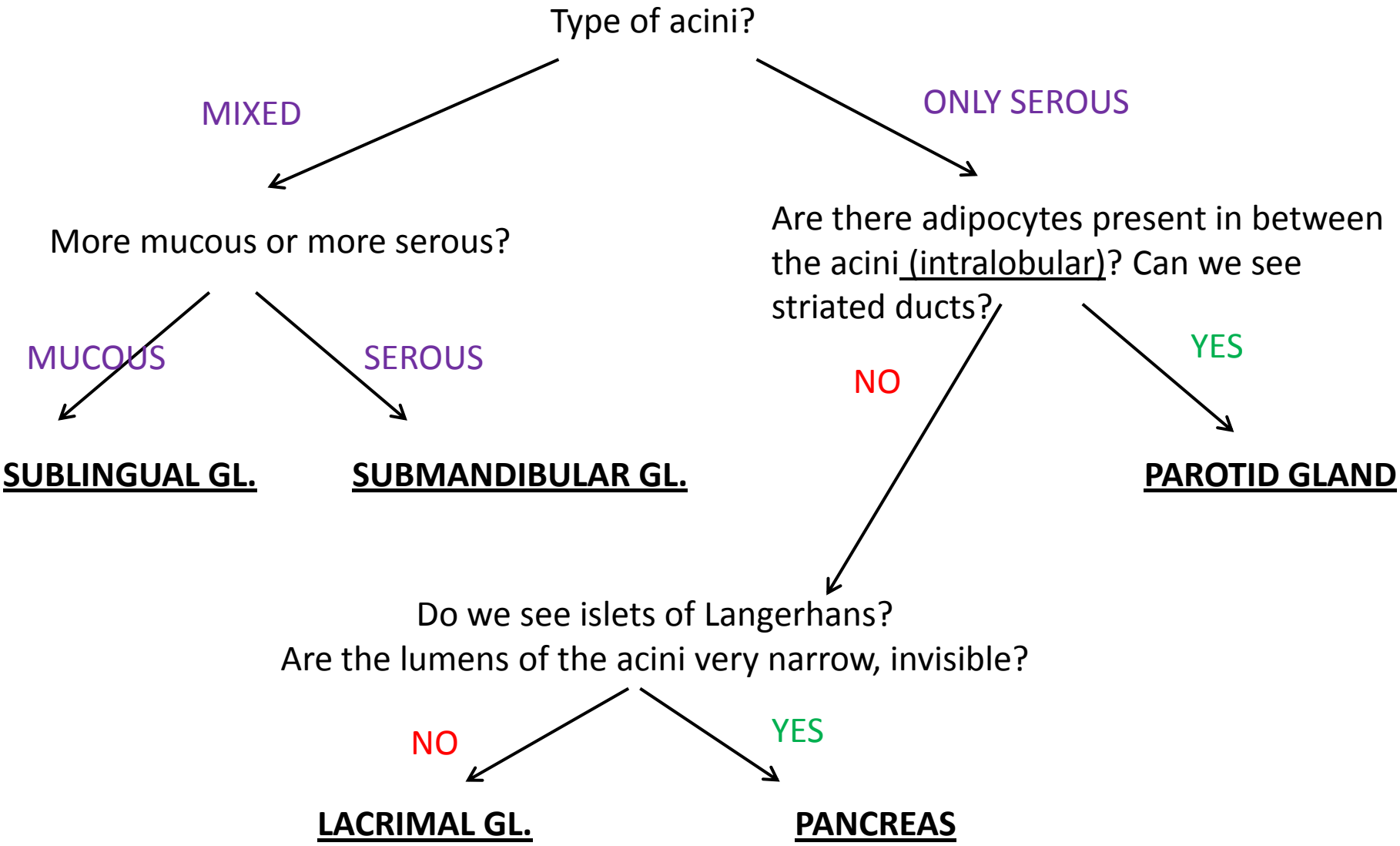
- breast: lipids
- Moll-glands

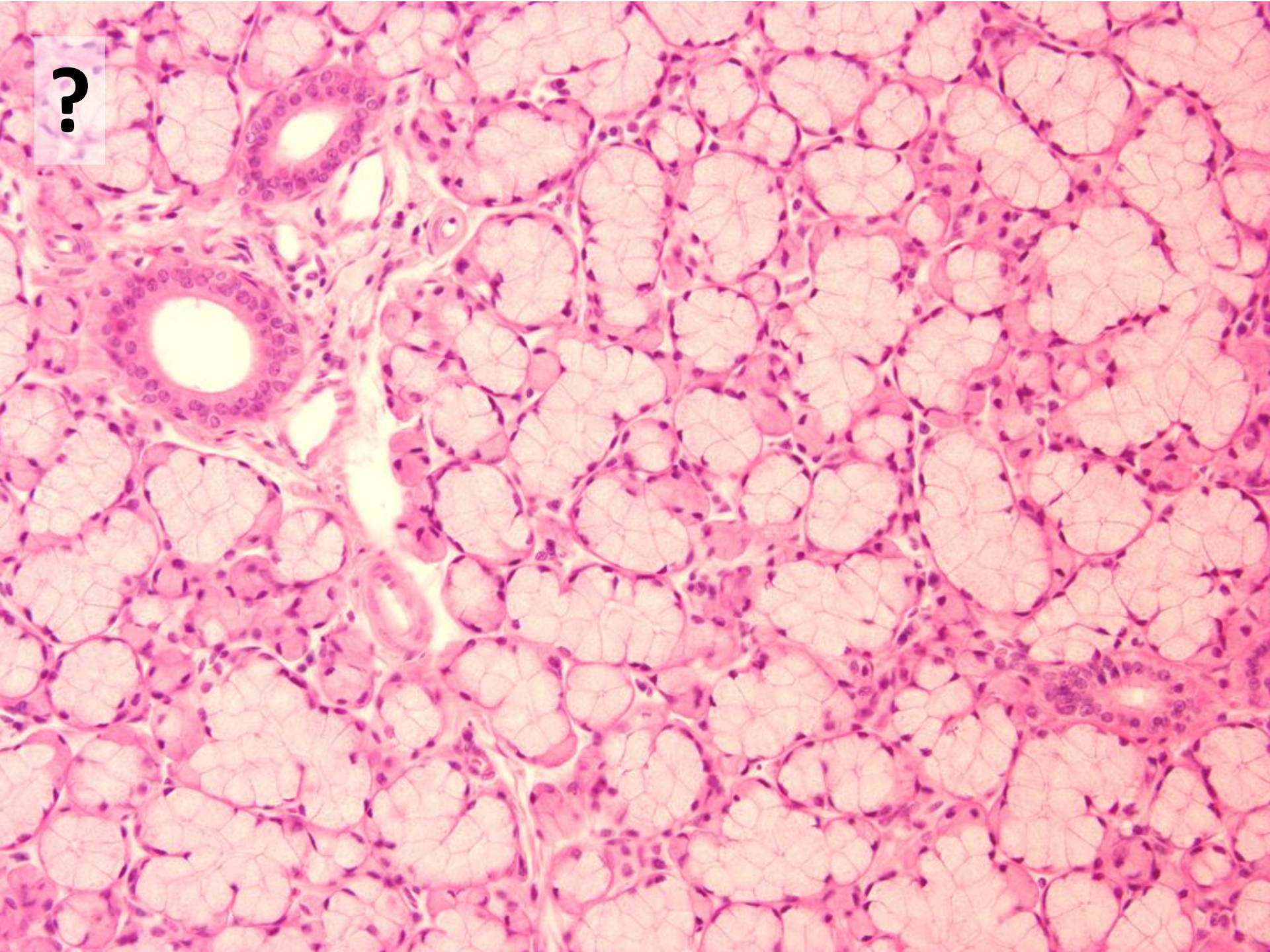
Holocrine:

- sebaceous glands
- Meibom-glands

Prostate: „pseudoapocrin”

Differential diagnosis of glands





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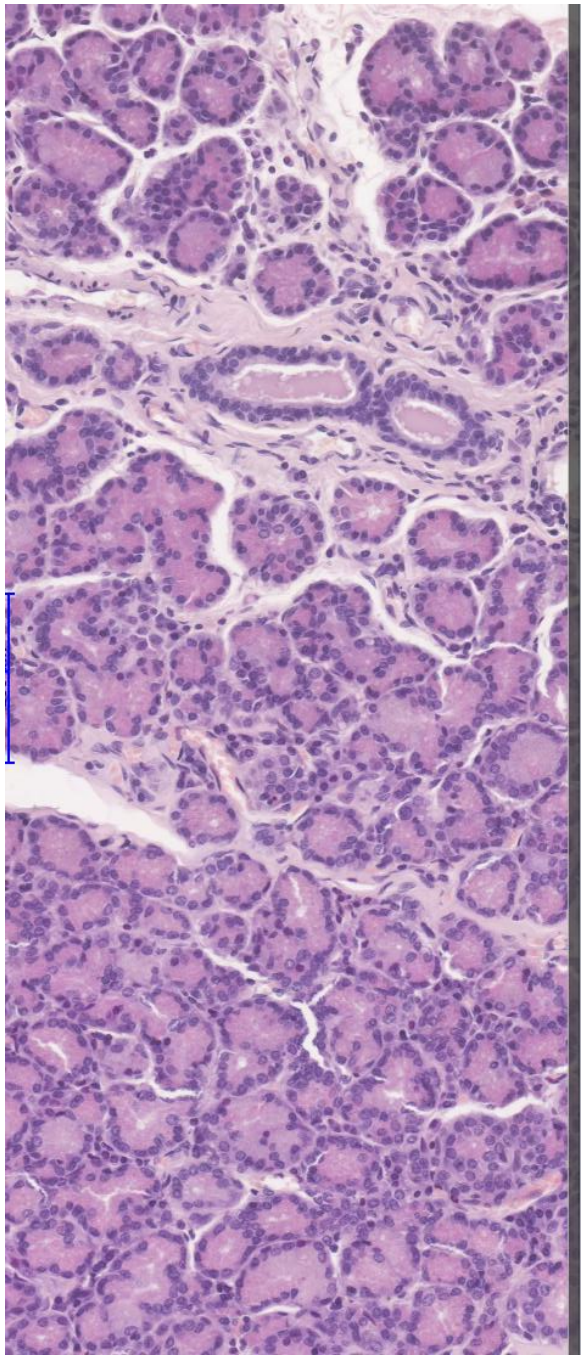

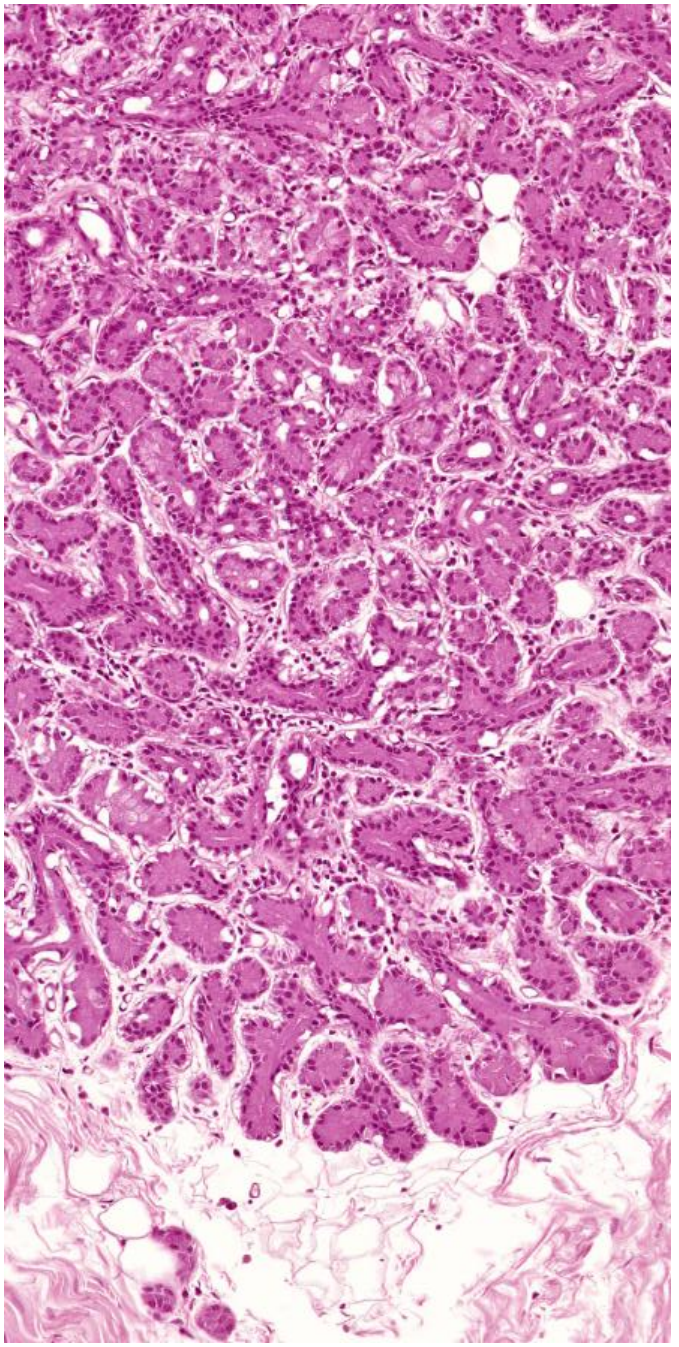

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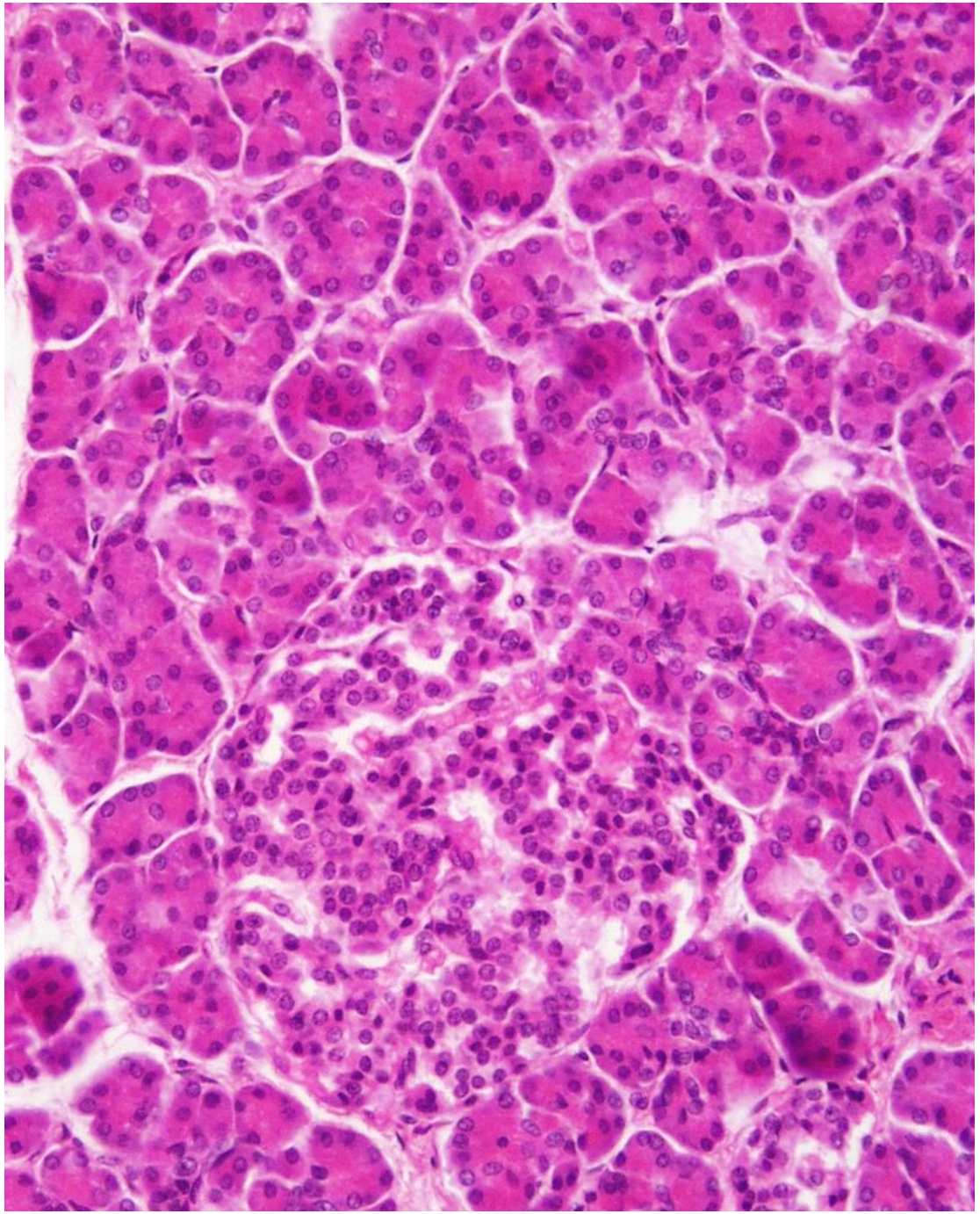
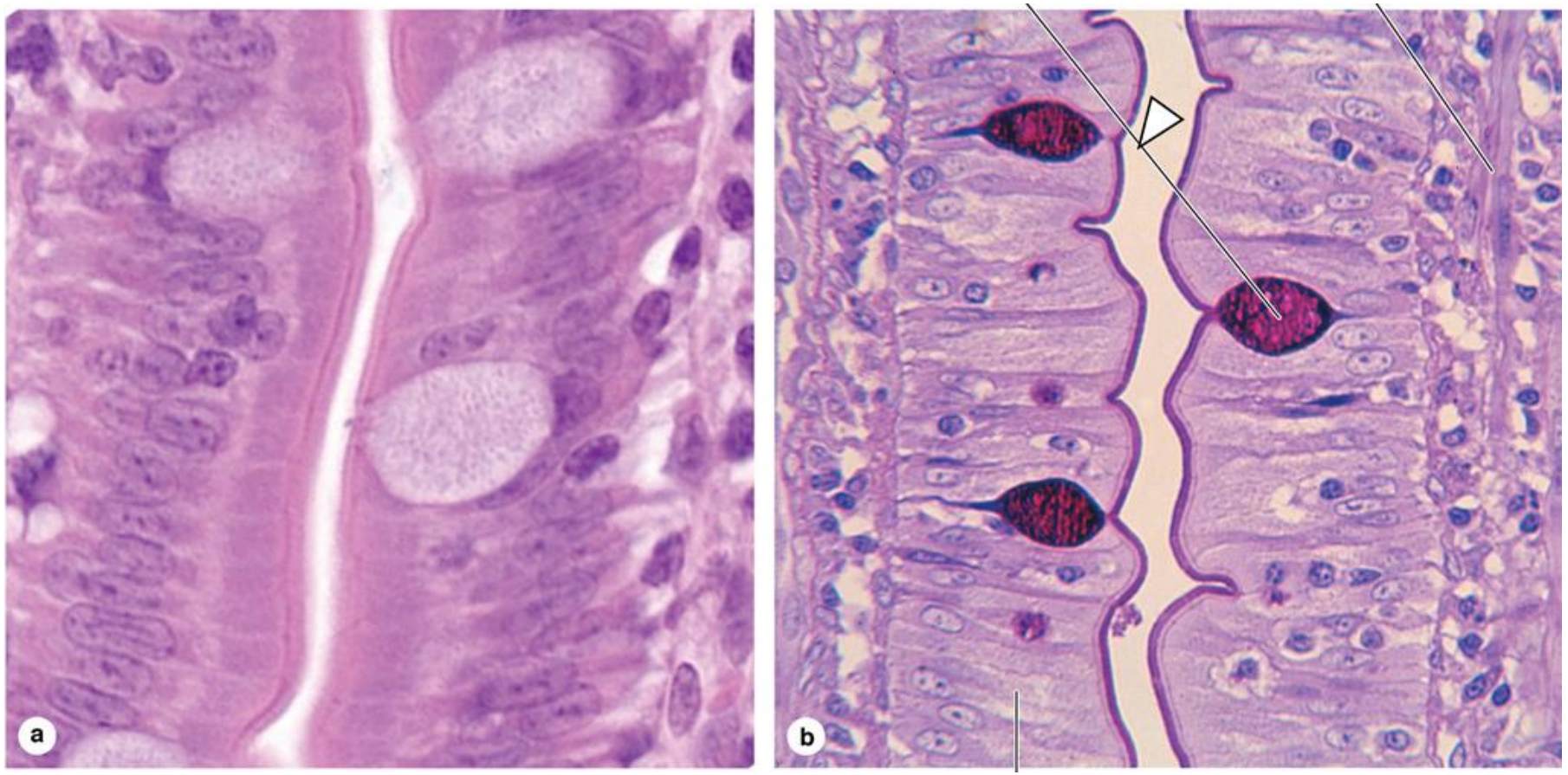
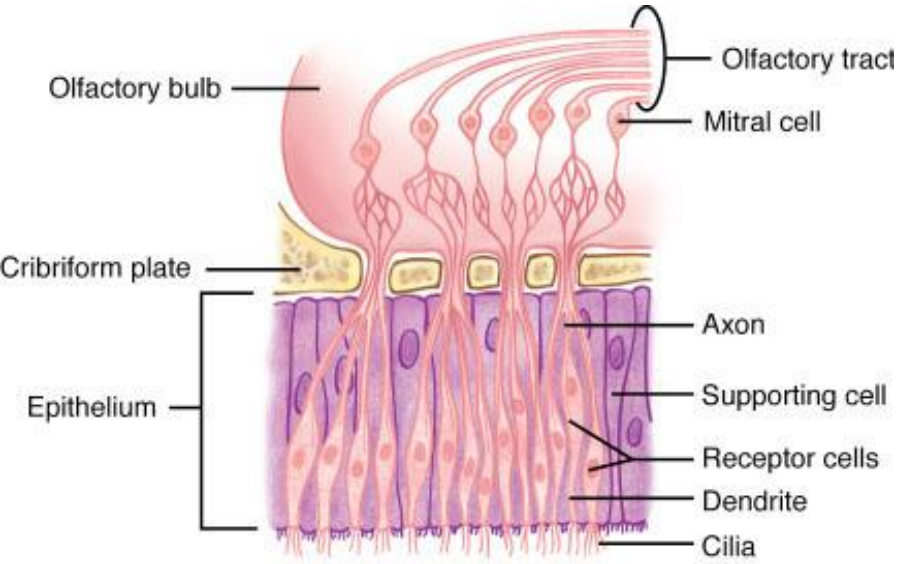


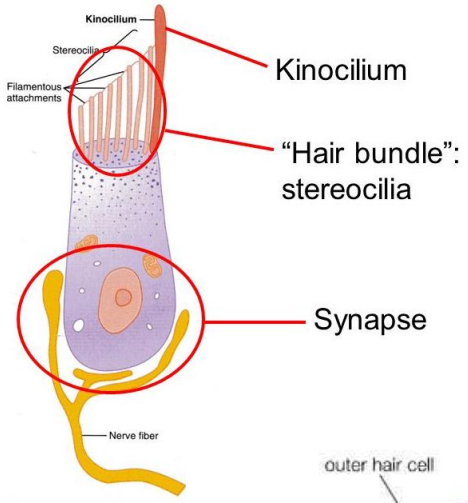

a
b

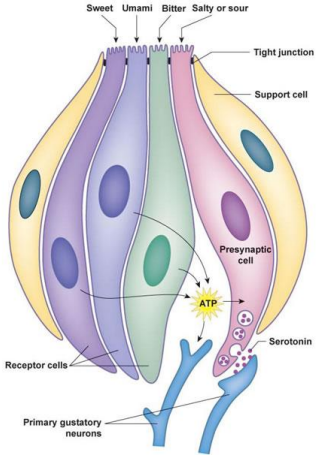
Sensory epithelium

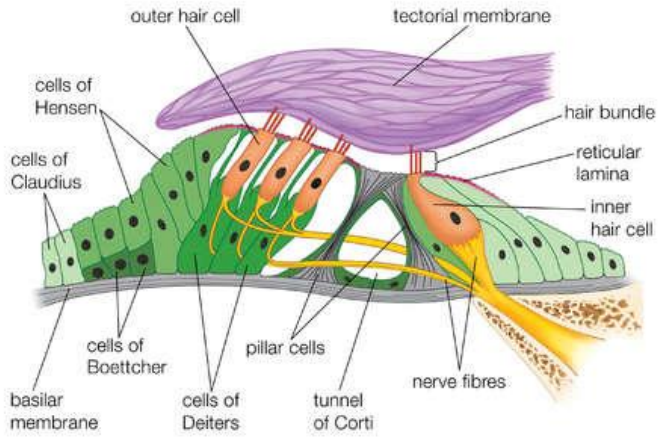
Primary sensory epithelium:
The own process of the sensory cell delivers the signal to the CNS – OLFACTORY EPITHELIUM



Secondary sensory epithelium: An axon from the CNS arrives and transfers the signal to the center – ORGAN of HEARING AND EQUILIBRIUM, TASTE SENSATION

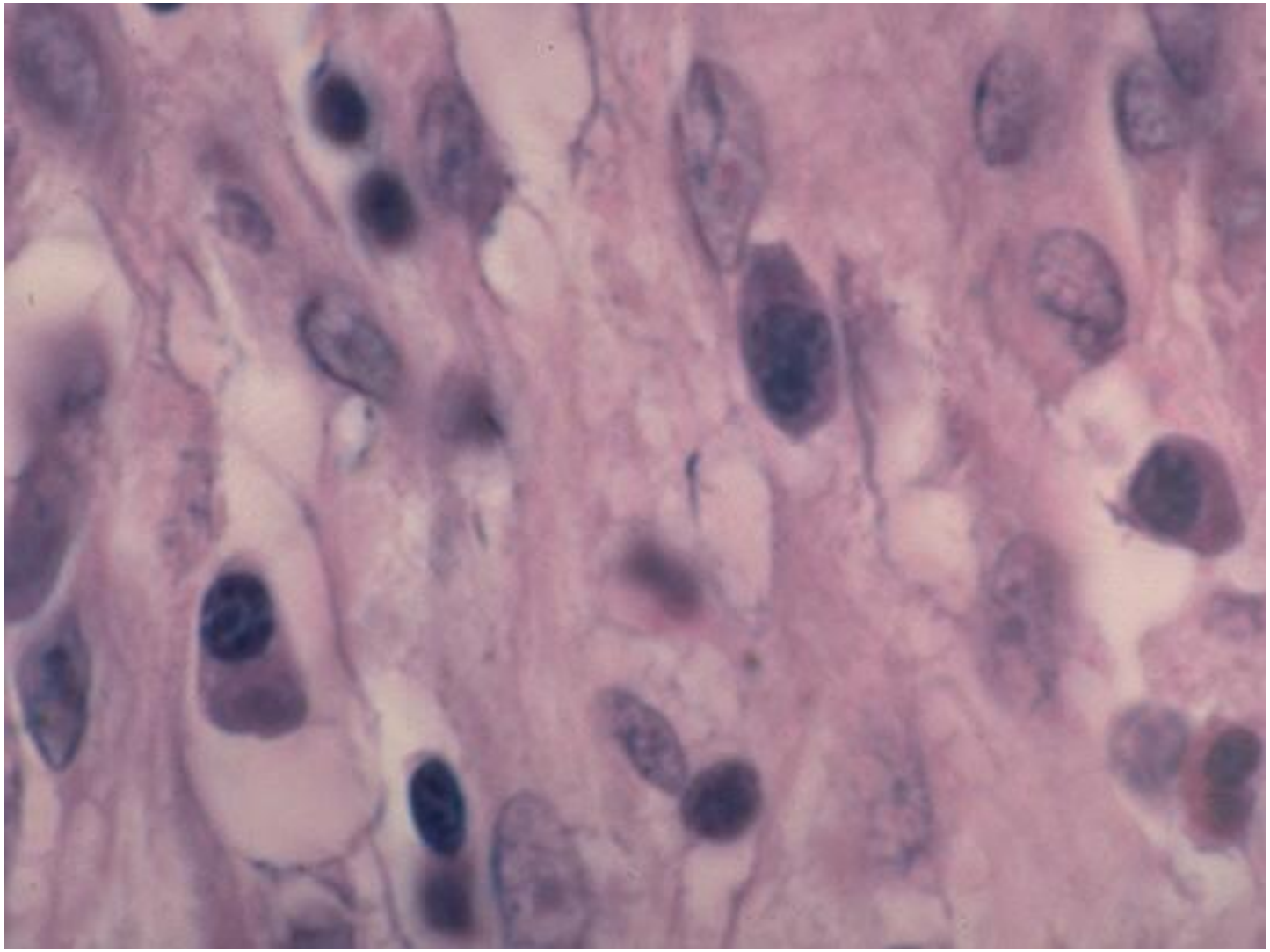


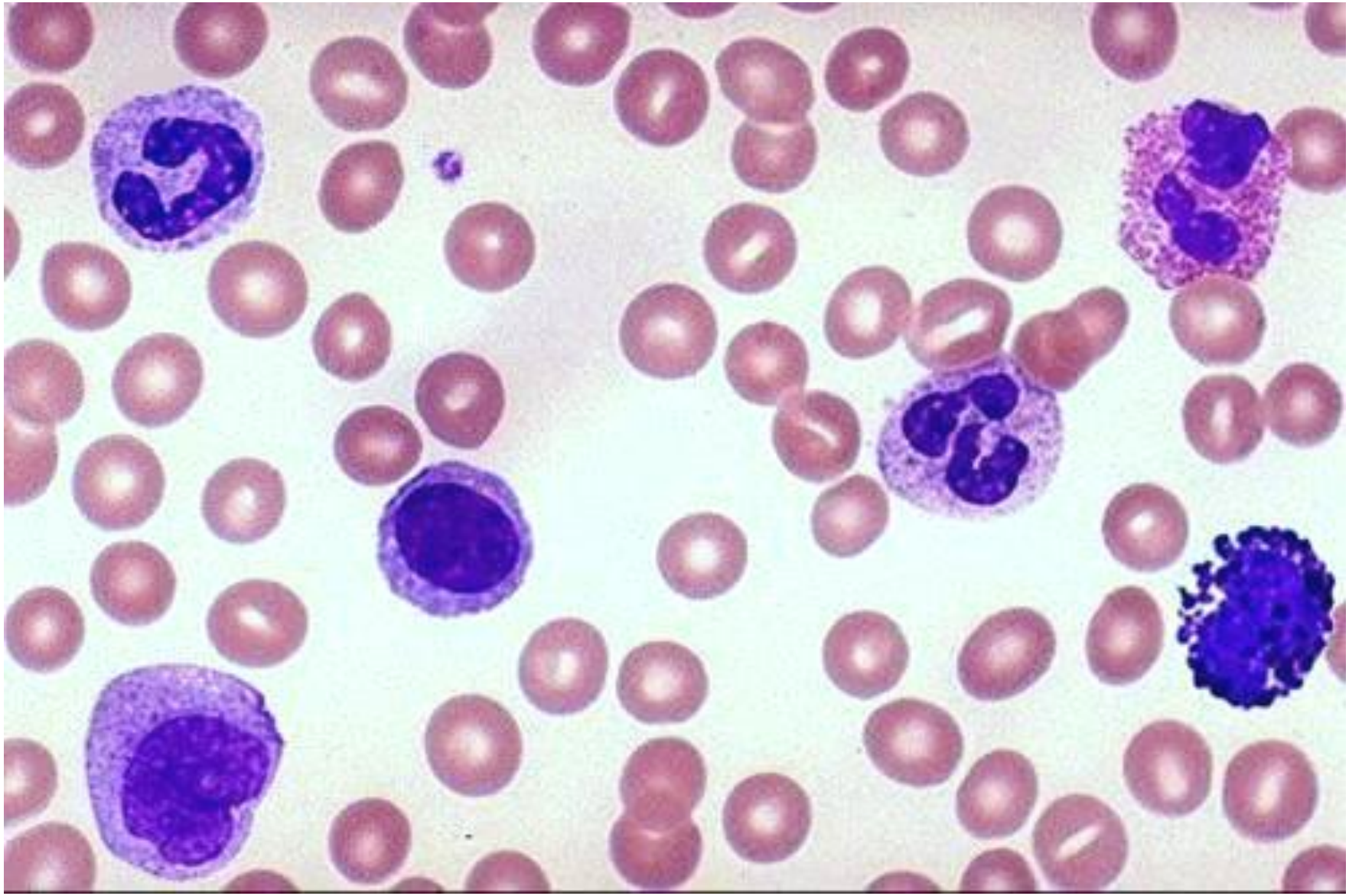


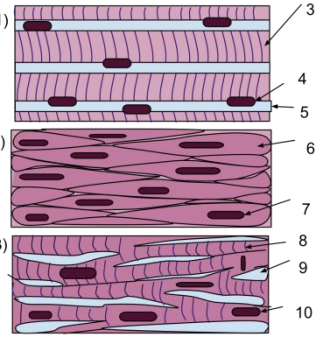


Connective tissue
Cells

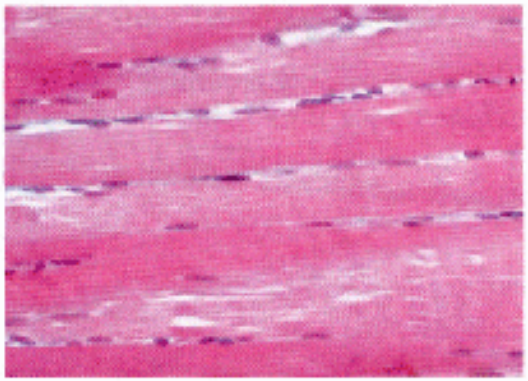
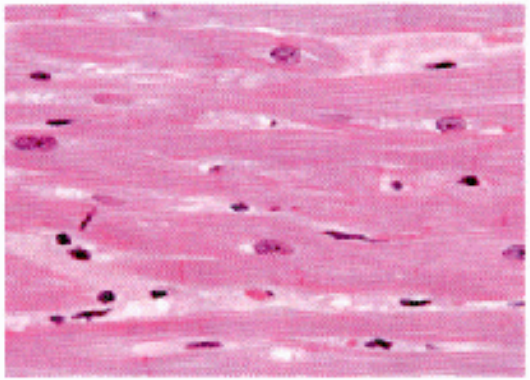
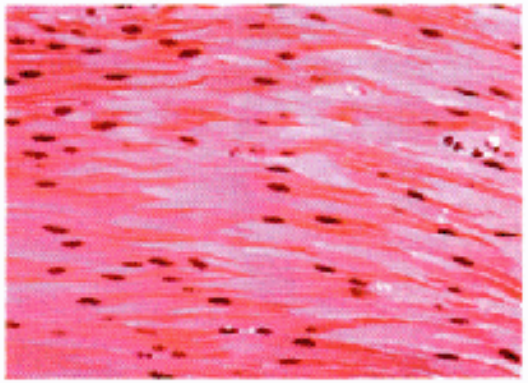
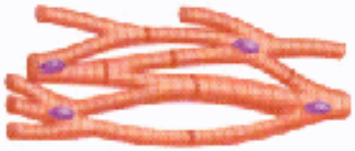
Always look at the nuclei!







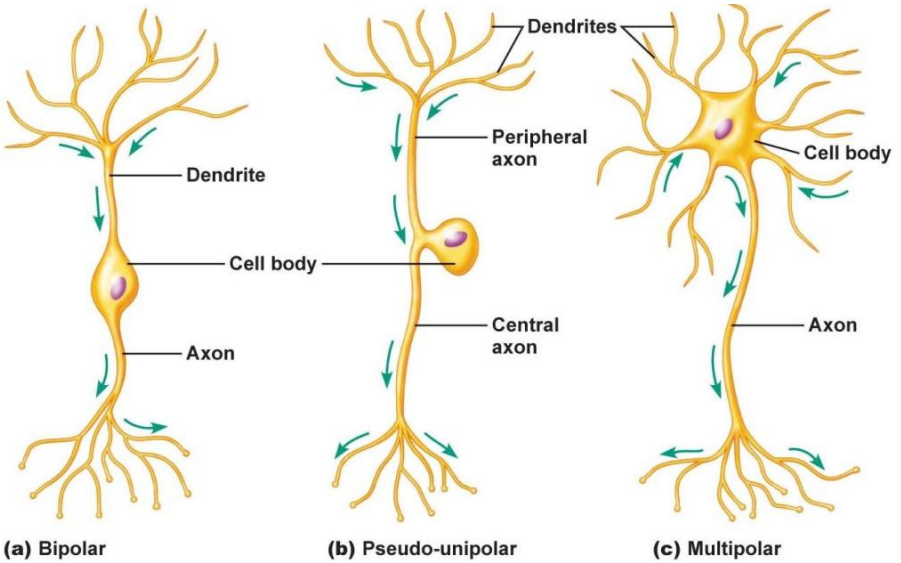
Muscle tissue

	Skeletal	Cardiac	Smooth
			
			
Histological unit:	Muscle fiber	Cardiac muscle cell	Smooth muscle cell
Identification:	Nuclei at the periphery Important in cross section!	Relatively lot of CT among the cells; lines of Eberth (intercalated discs)	Centrally located nucleus

Nervous tissue I. - Neurons

Neuron types:

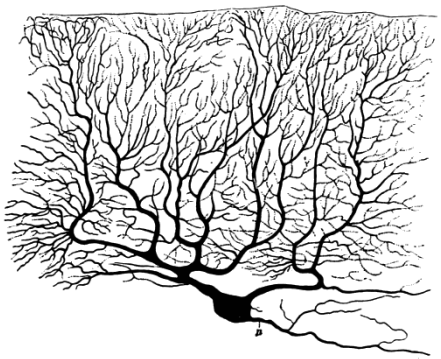
1. Unipolar – not present in humans
2. Bipolar – spiral ggl., vestibular ggl.(Scarpa), bipolar cell of retina
3. Pseudounipolar – sensory ganglia (trigeminal ggl, geniculate ggl., dorsal root ggl., etc. + 1 place in the brain: mesencephalic trigeminal nucl. – proprioception)
4. Multipolar - most common; vegetative ganglia (eg.: coeliac, otic, etc.) spinal cord, cerebral cortex



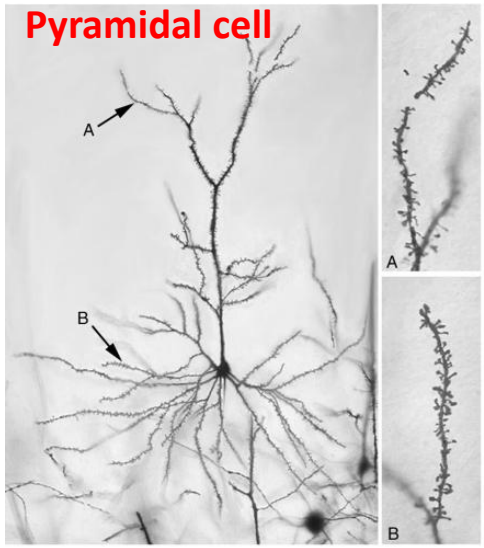
Special neurons studied:

Purkinje cell – cerebellum

Pyramidal cell – cerebral cortex, hippocampus – apical dendrite (1) with spines, basal dendrites (multiple), axon (1)



Purkinje cell

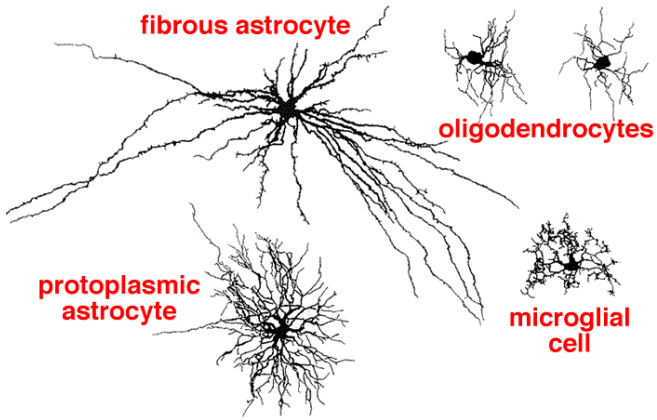


Nervous tissue II. – glia cells, fibers

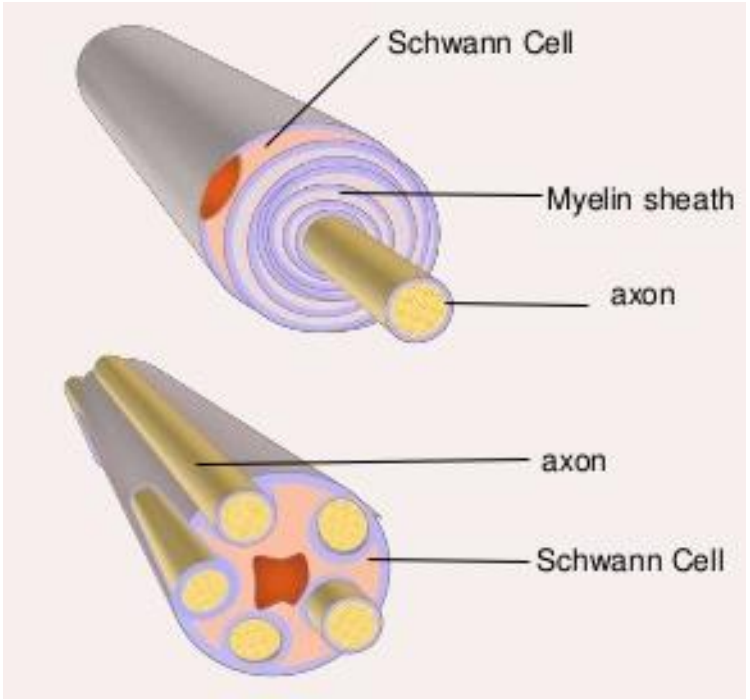
• astrocyte (GFAP +) – fibrous and protoplasmic
• oligodendroglia (myelin sheath in the CNS)
• ependyme – lining of the central canal and brain ventricles
• Schwann-cell (myelin sheath in the PNS)
• Satellite-cell (in ganglia)

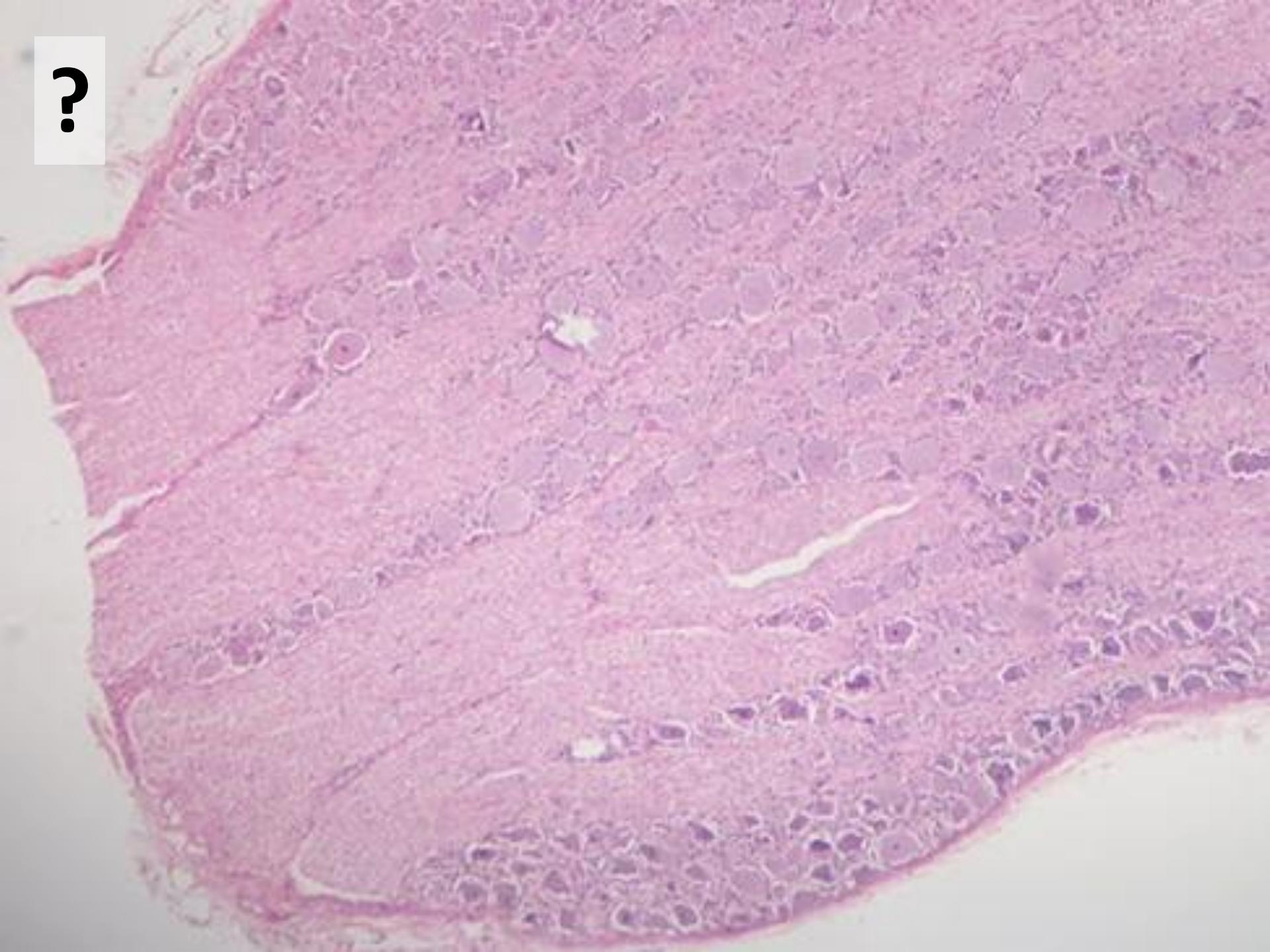
(microglia: immune cell!)

Special glia cells:
Bergmann-glia – cerebellum
Müller-glia - retina



myelinhüvelyes vs. myelinhüvely nélküli





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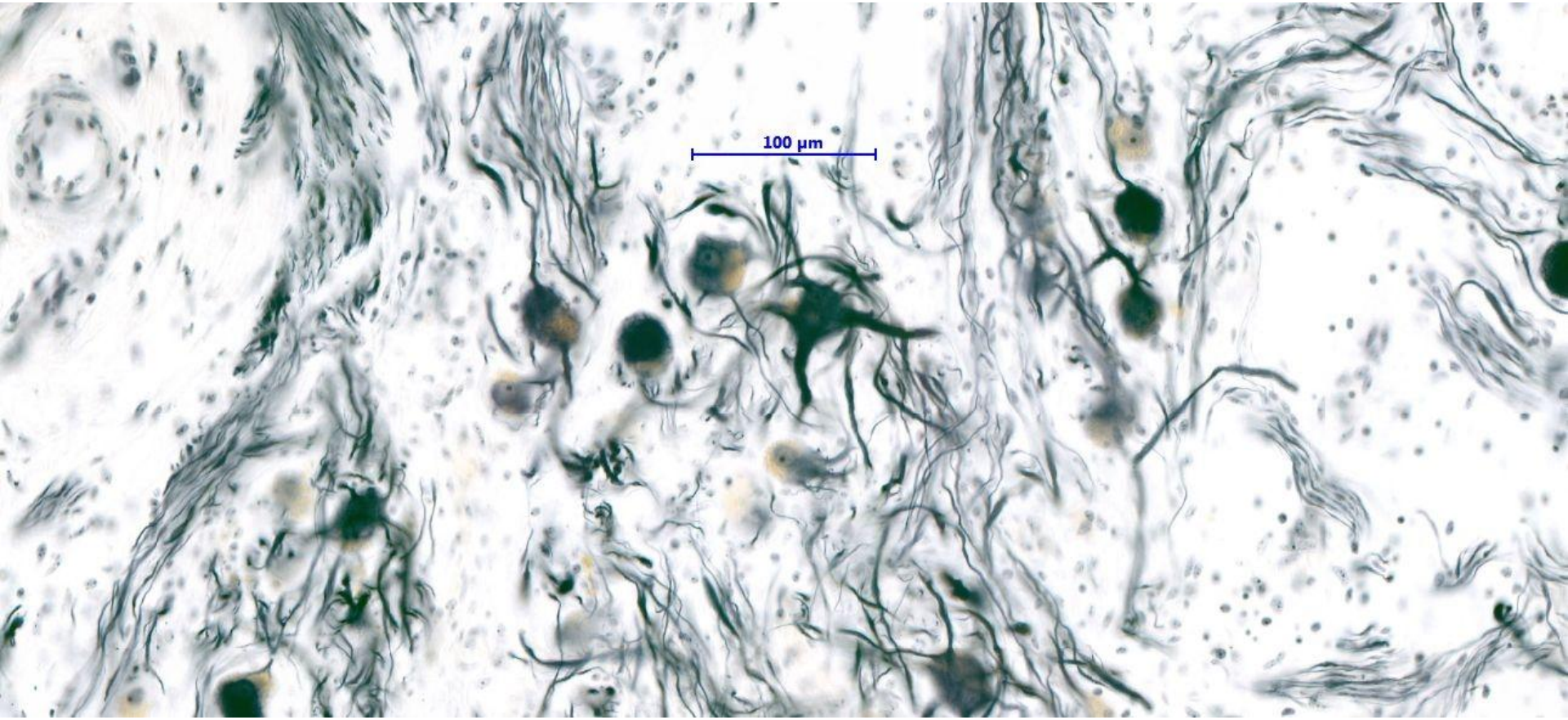
100 µm

To be continued…