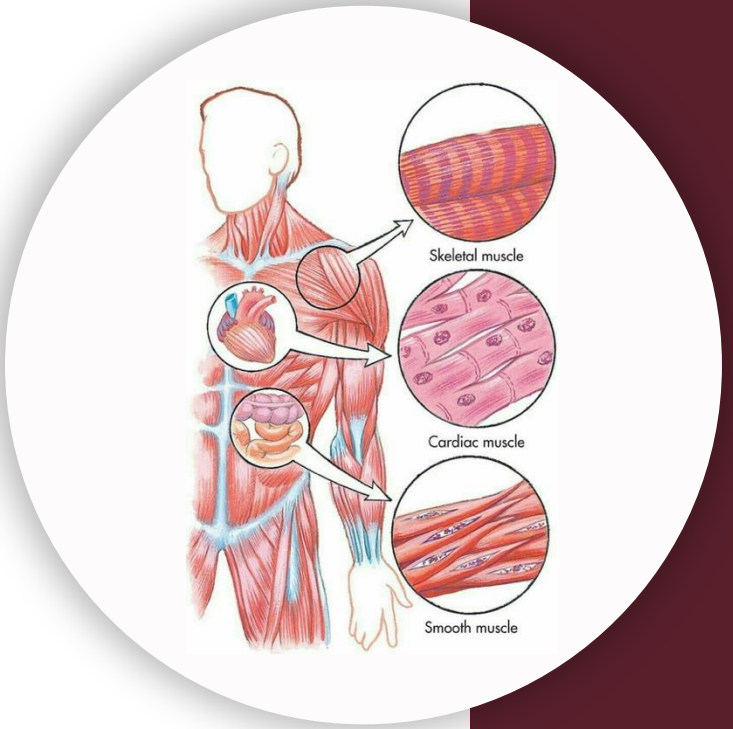
بسم الله الرحمن الرحيم

Histology | Final lab

Muscles & Nerves Lab



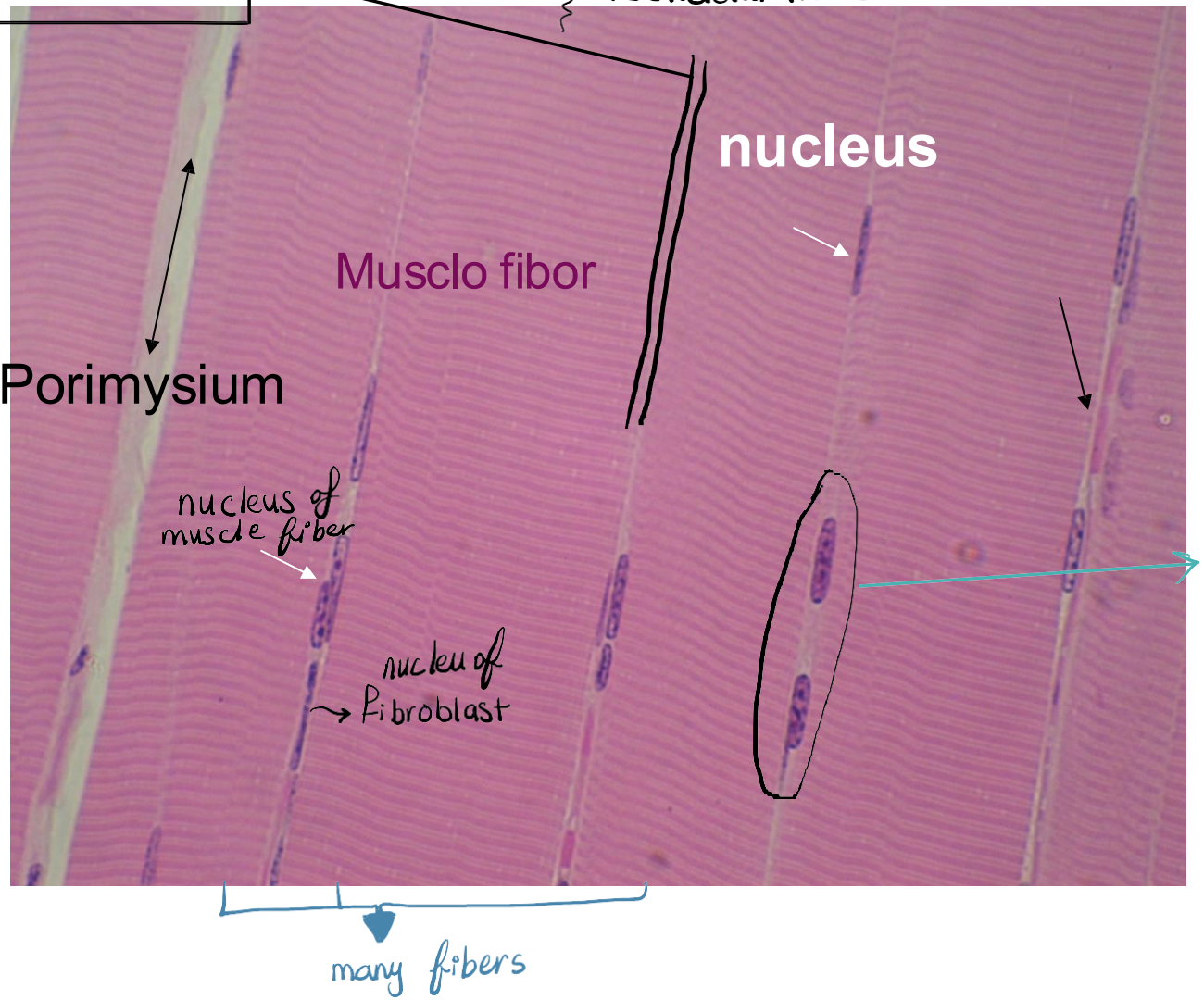
Written by : Dopamine Scientific Team 023
Lujain Al-Najdawi
Jannat Al-Ahmad

Muscle tissue

SKELETAL

Longitudinal section (LS) of skeletal muscle.

We expect to find endomysium, the most inner C.T , covering skeletal



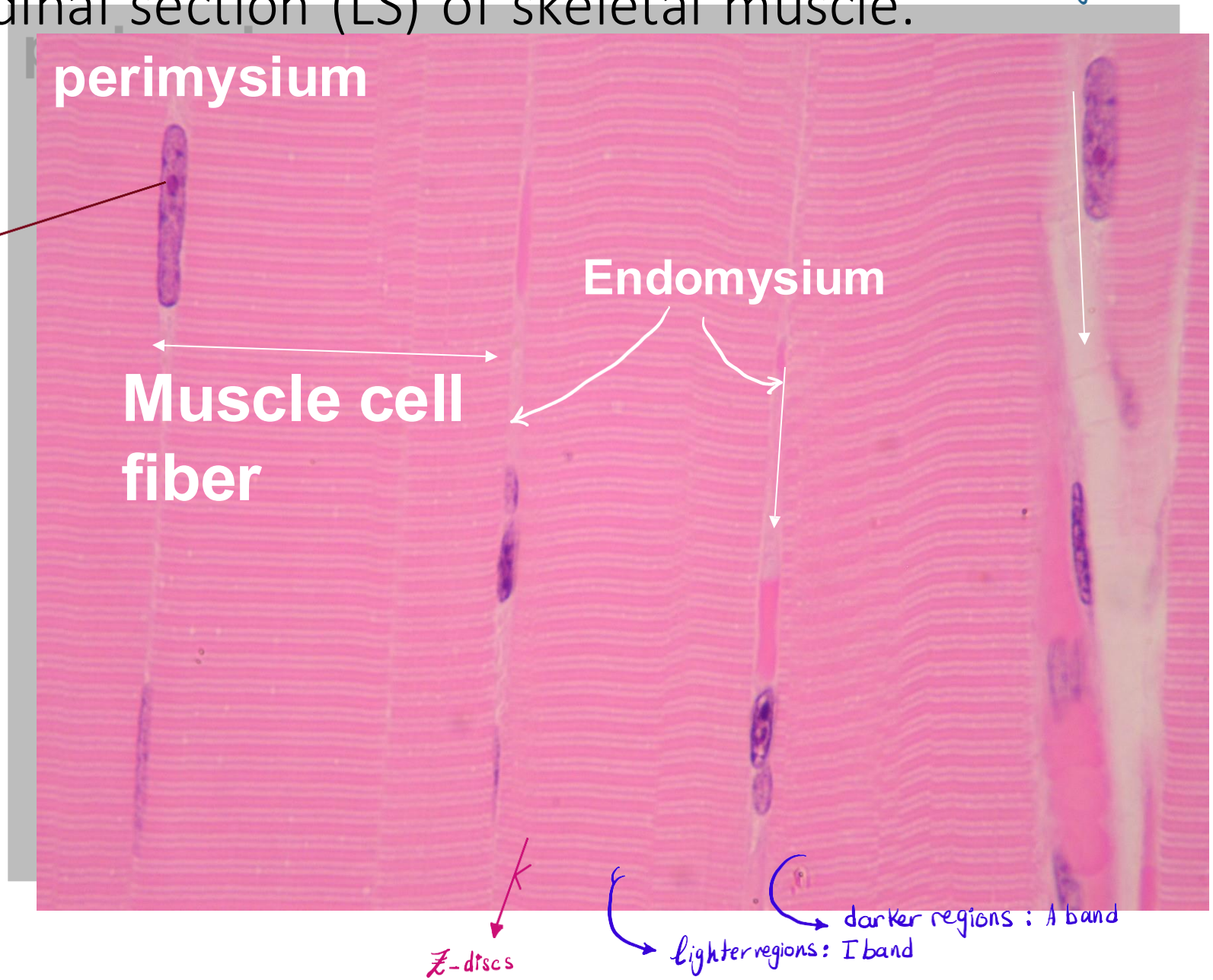
H&E

we can see dinucl aligned in rows because they are located in the periphery.

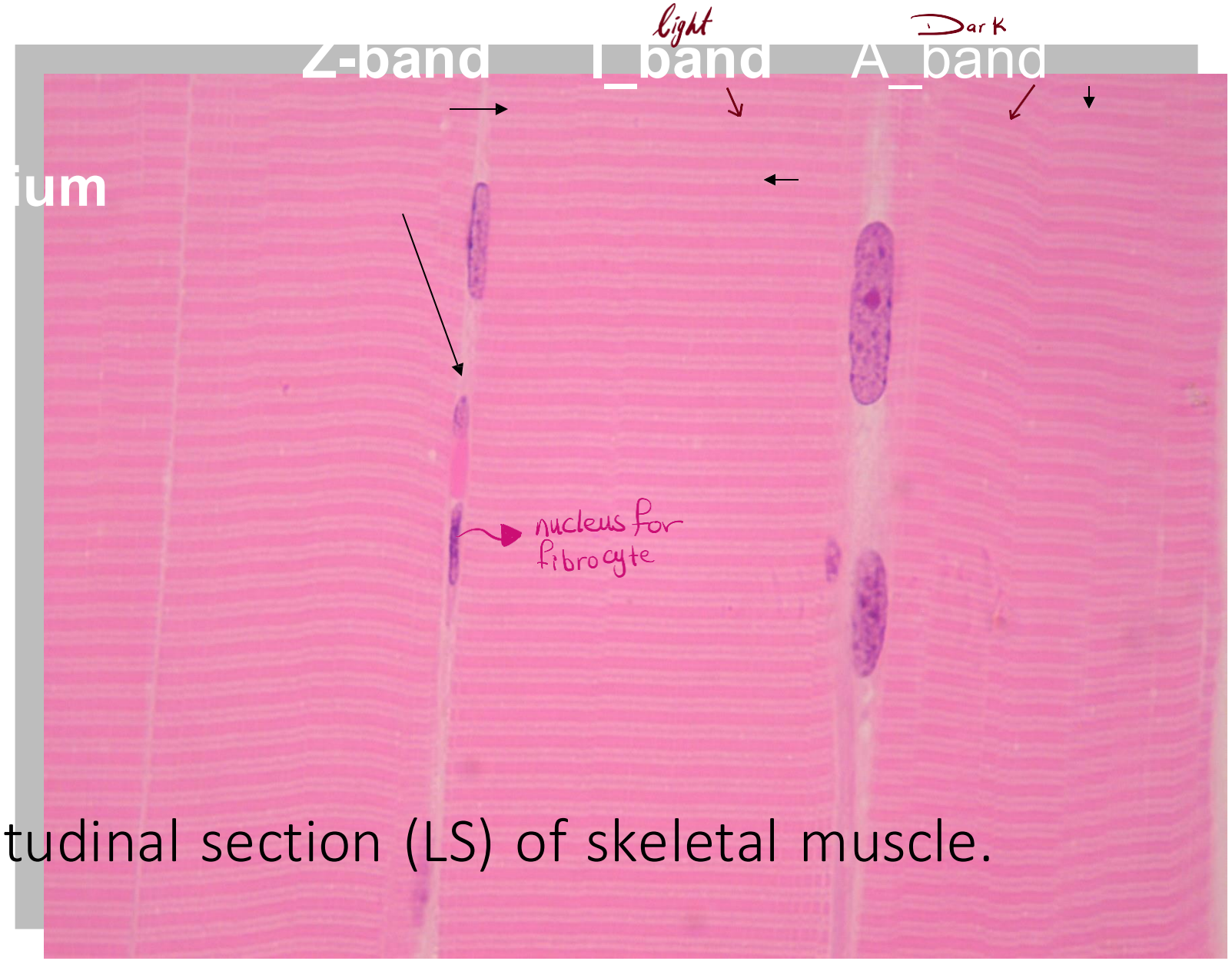
The striations are evidence that this is L.S , and it isn't considered cross-section because the cells are not rounded.

Longitudinal section (LS) of skeletal muscle.

To visualize endomysium you should have special stains
- silver salts
- PAS stains
- immune staining ---> for reticular fibers



The nucleus appears more elongated, flattened, and squeezed to the periphery.



Longitudinal section (LS) of skeletal muscle.

Cross section (CS) of skeletal muscle.

* How to identify them from cardiac or smooth muscles ?

1) Big skeletal muscle fibers than other

2) nuclei are all peripherally located, doesn't happen in cardiac nor smooth muscles (they have central located nucleus)

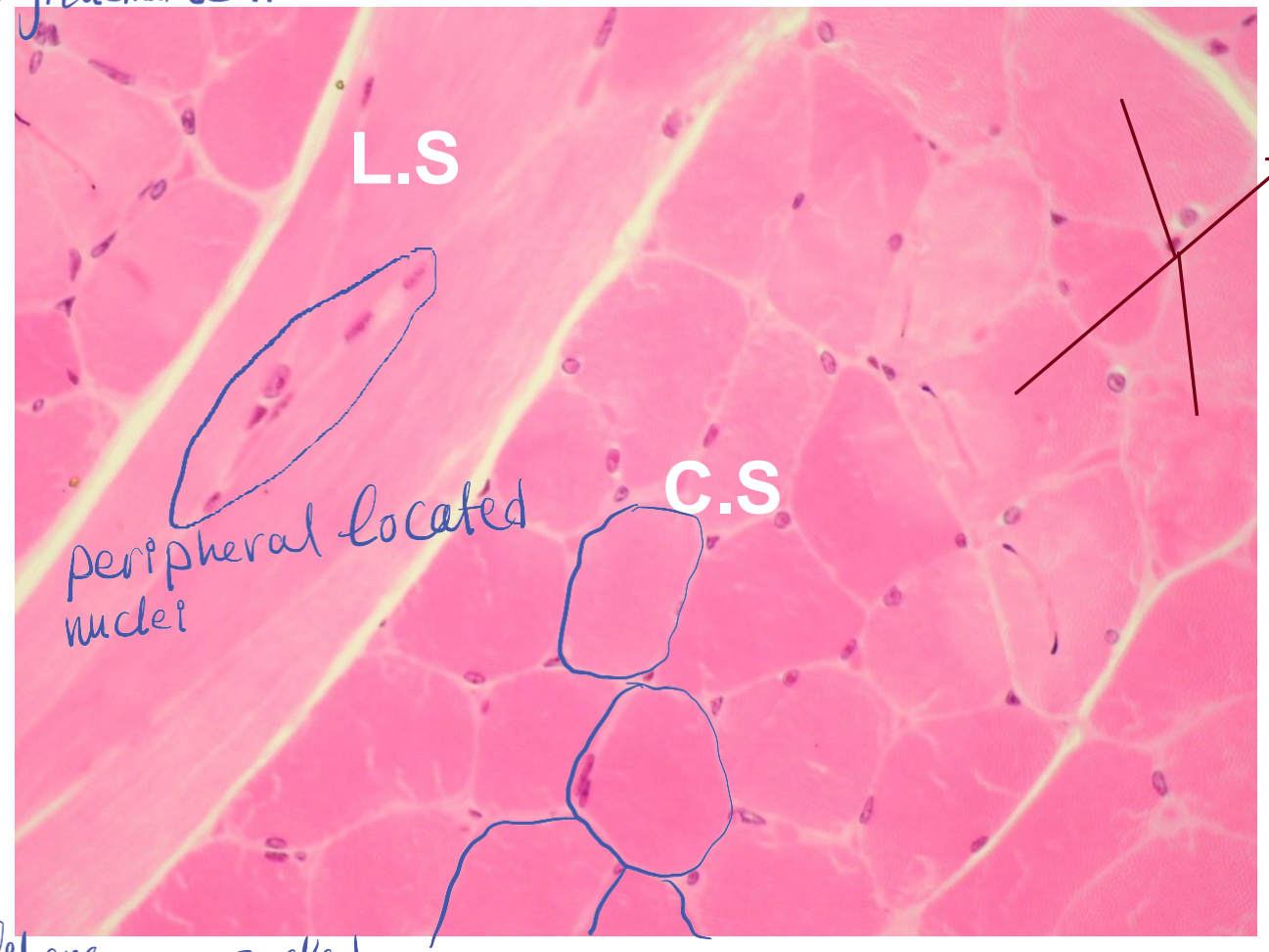
3) How compact muscle fibers are in cardiac and smooth it would be much looser than this

Skeletal muscle fibers are relatively large, how do we know that?!🤔

→ look at the nuclei and the site of them around the whole muscle , they are relatively tiny, so the ratio of fibers will be large .

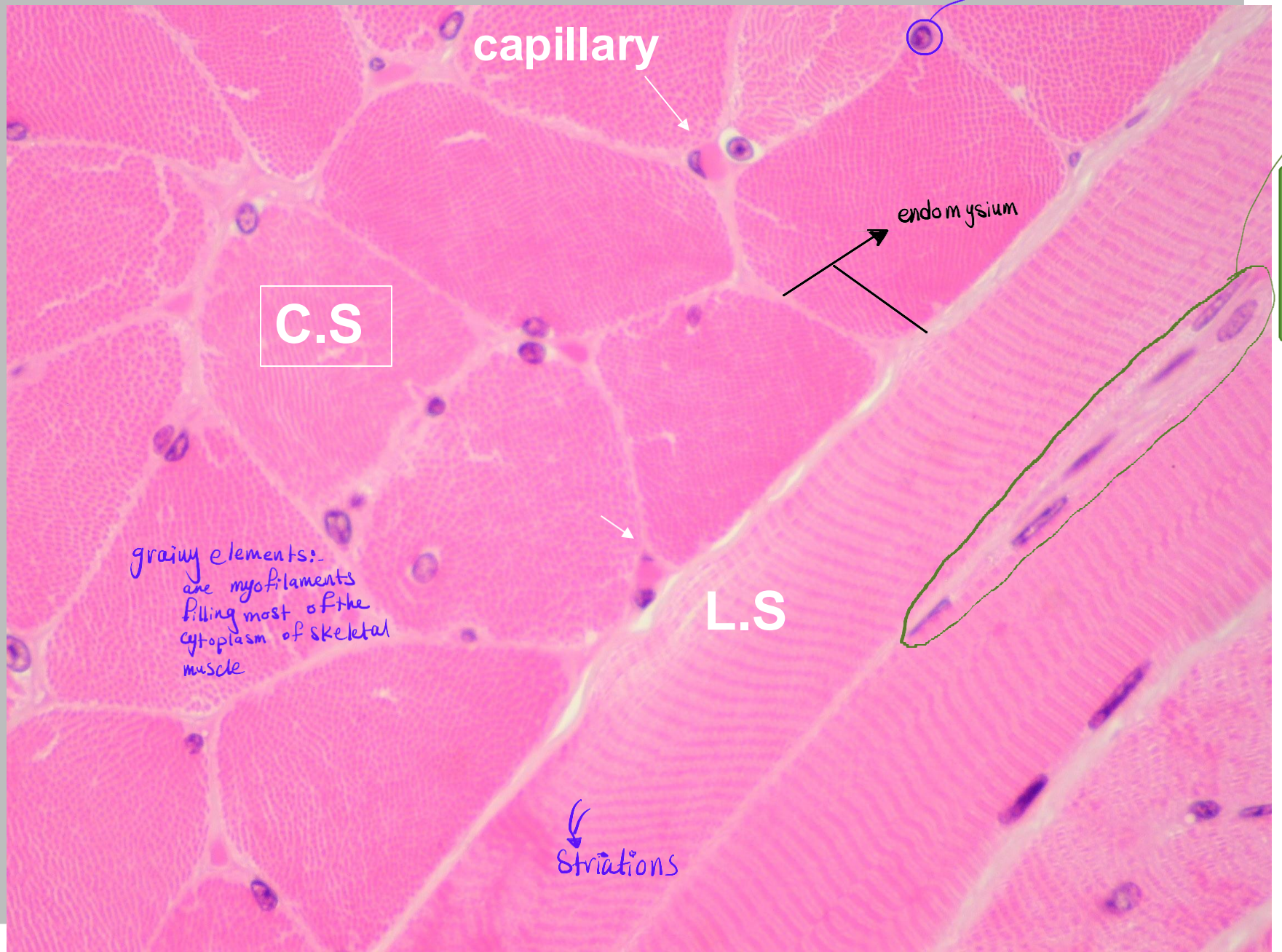
C.S& L.S skeletal(e.g Tongue)

Cross Section & longitudinal Section



There is some uniformity, the muscle fibers are beside each other, and their sizes are relatively closed.

* muscle fibers are packed
* peripheral located nuclei, it's not so th we see in the cardiac nor Smooth



In C.S, the nuclei are arranged around the muscle fiber(around sacroplasm)

In L.S, the nucl
are arranged
rov

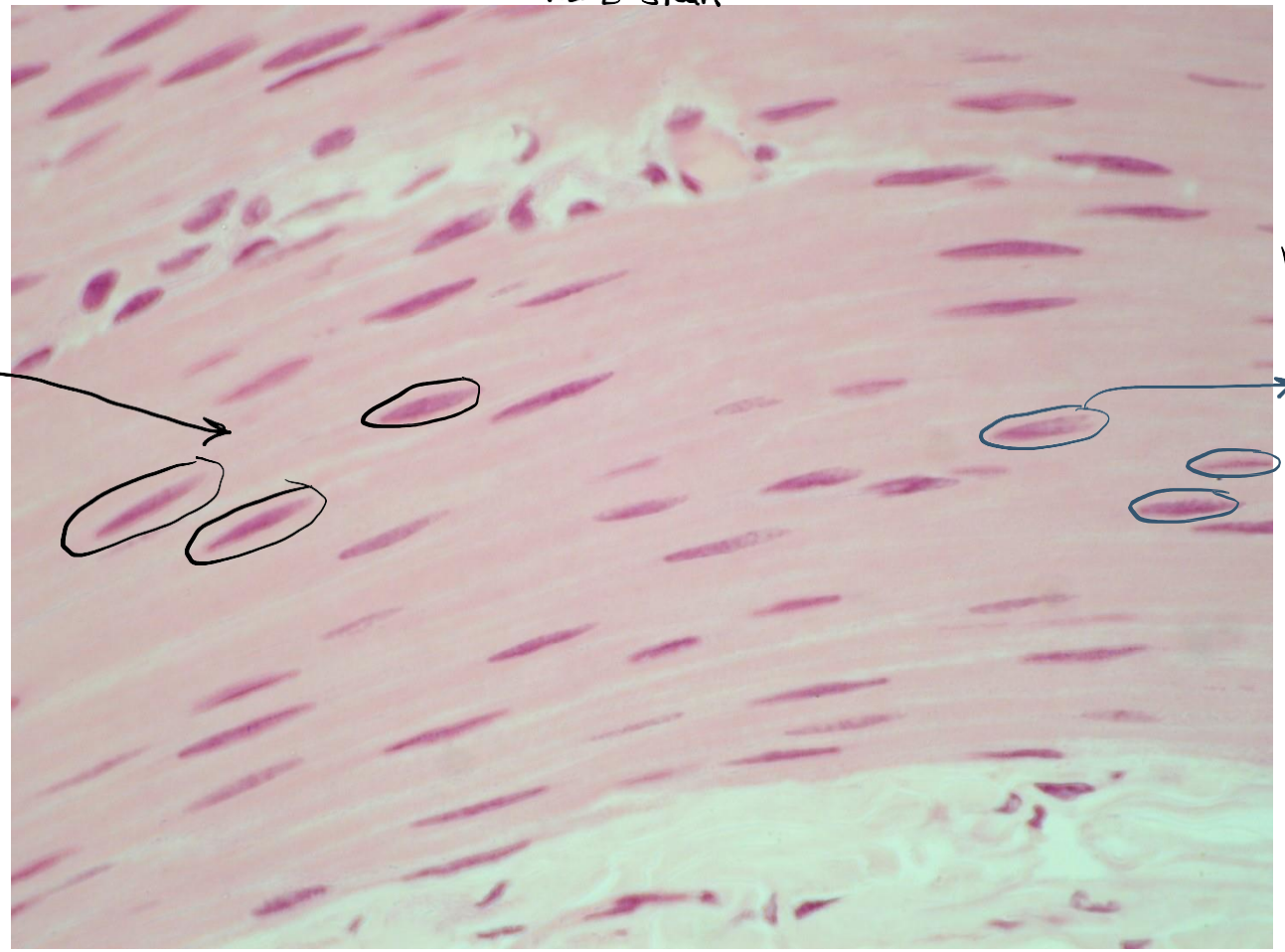
SMOOTH

Longitudinal section (LS)- Smooth muscle

We aren't able to see the boundaries of the cell because the membranes are lipid, and they will dissolve , so we can only recognize the cell by appearance of their nuclei.

* Full length of nucleus & full length of the cells
- it's like S-th running or flowing

H&E stain



The nuclei are running in all the fields because they are tiny cells , spindle shaped, and relatively long . Most of the cell volume is around the nucleus.

* long spindle shaped cells running side by side in a contiguous fashion

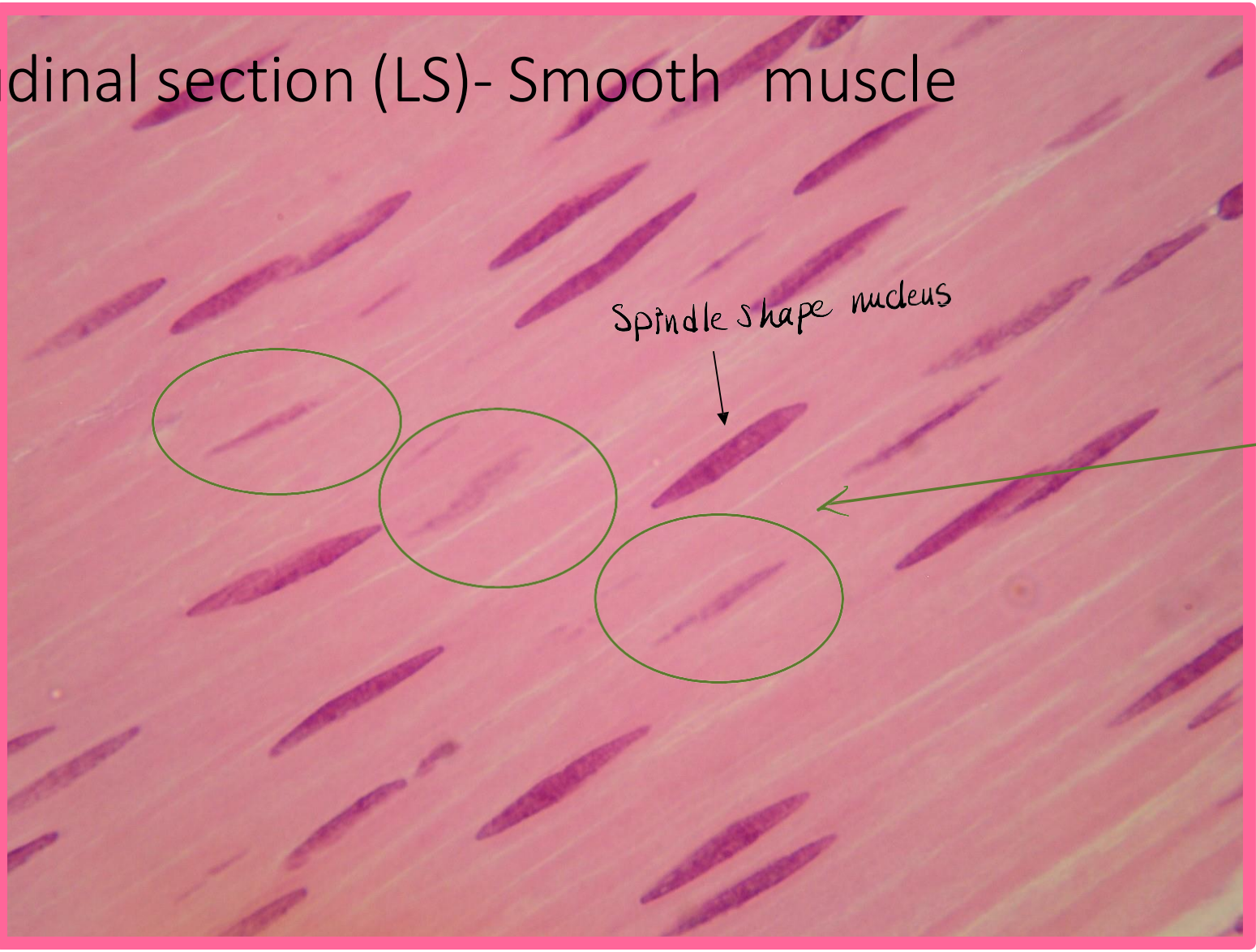
⇒ No striation, the nuclei are running every where they're not located peripherally ----> So, it's not skeletal tissue.

How do nuclei look like?
They are spindle and elongated

Longitudinal section (LS)- Smooth muscle

How can we distinguish them from the skeletal muscle ?

The skeletal fibers are organized in rows in the periphery, and they were striated in the center.



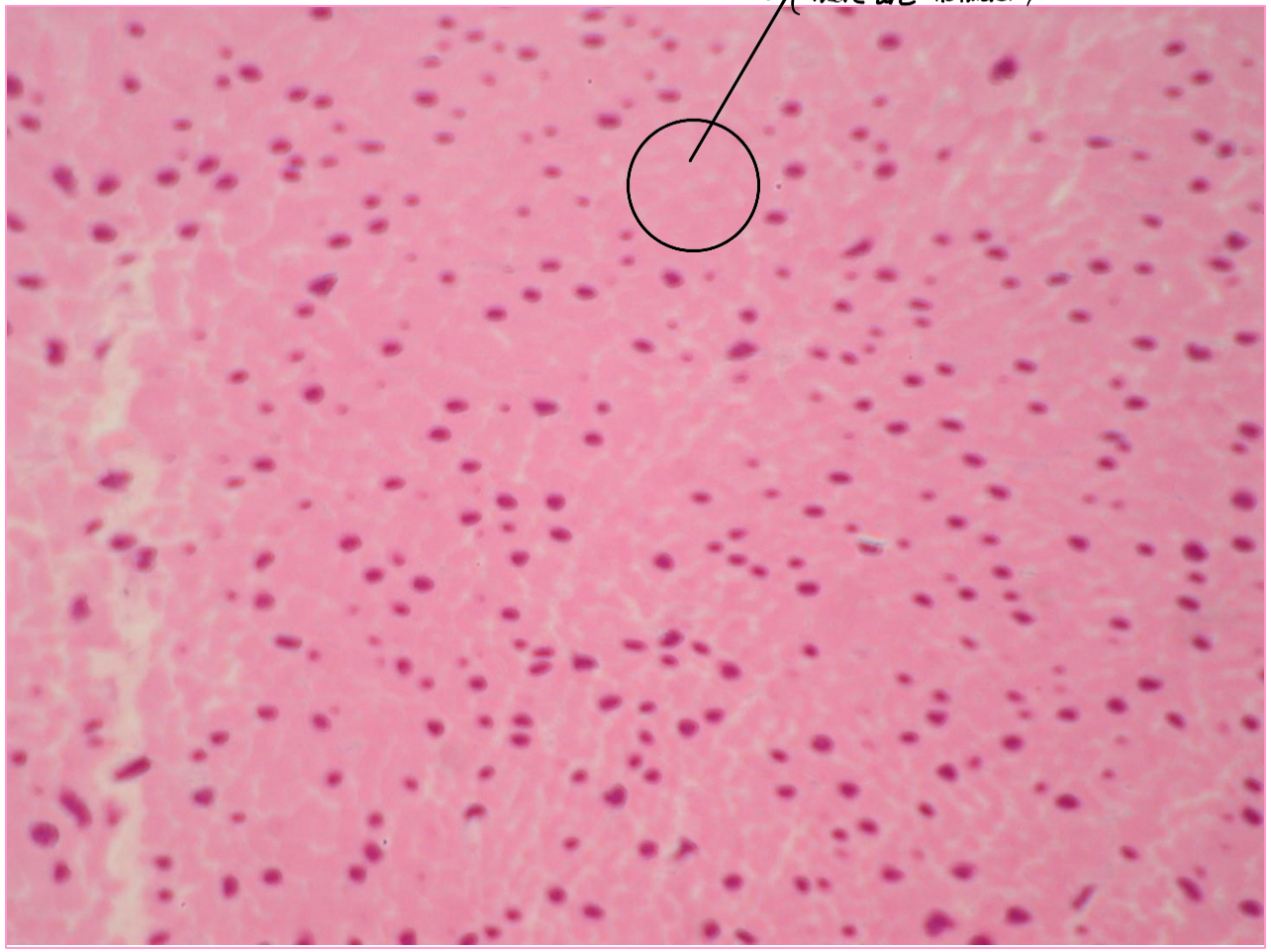
They are also nuclei, but the section doesn't pass through the full length and the thickness of them (so they appeared as a shadow).

Cross section (CS)- Smooth muscle

⇒ longitudinal section:-
spindle nuclei

⇒ cross section:-
tiny circle nuclei

→ Many nuclei, and their sizes are very small



Cross sec. of smooth muscle

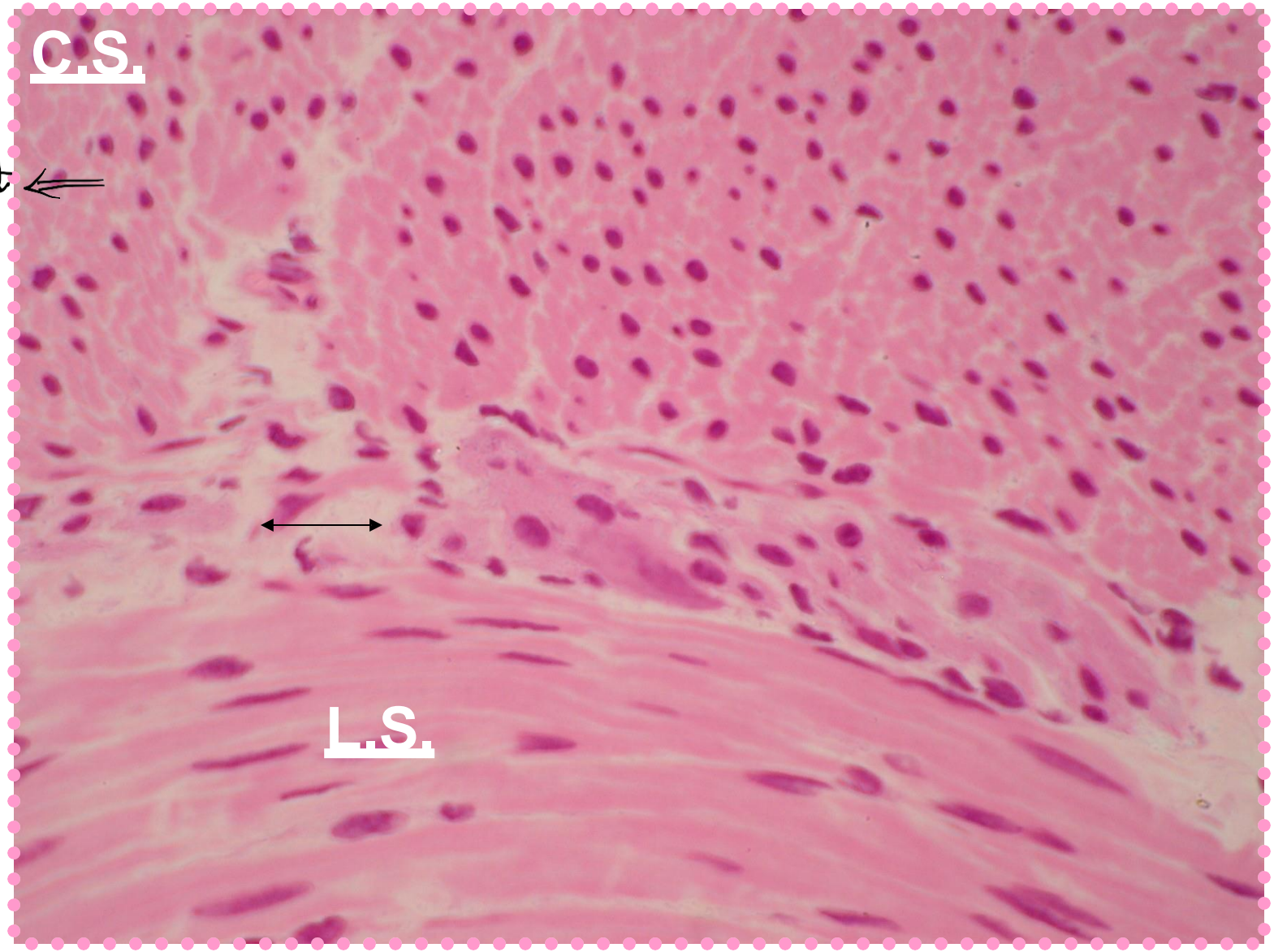
The nucleus is larger than the cytoplasm

- why there's no nuclei in each cell of them?

empty cytoplasmic region → cuz the section might not pass through the nucleus at all

Pay attention to the propotion between the nucleus and cytoplasm!

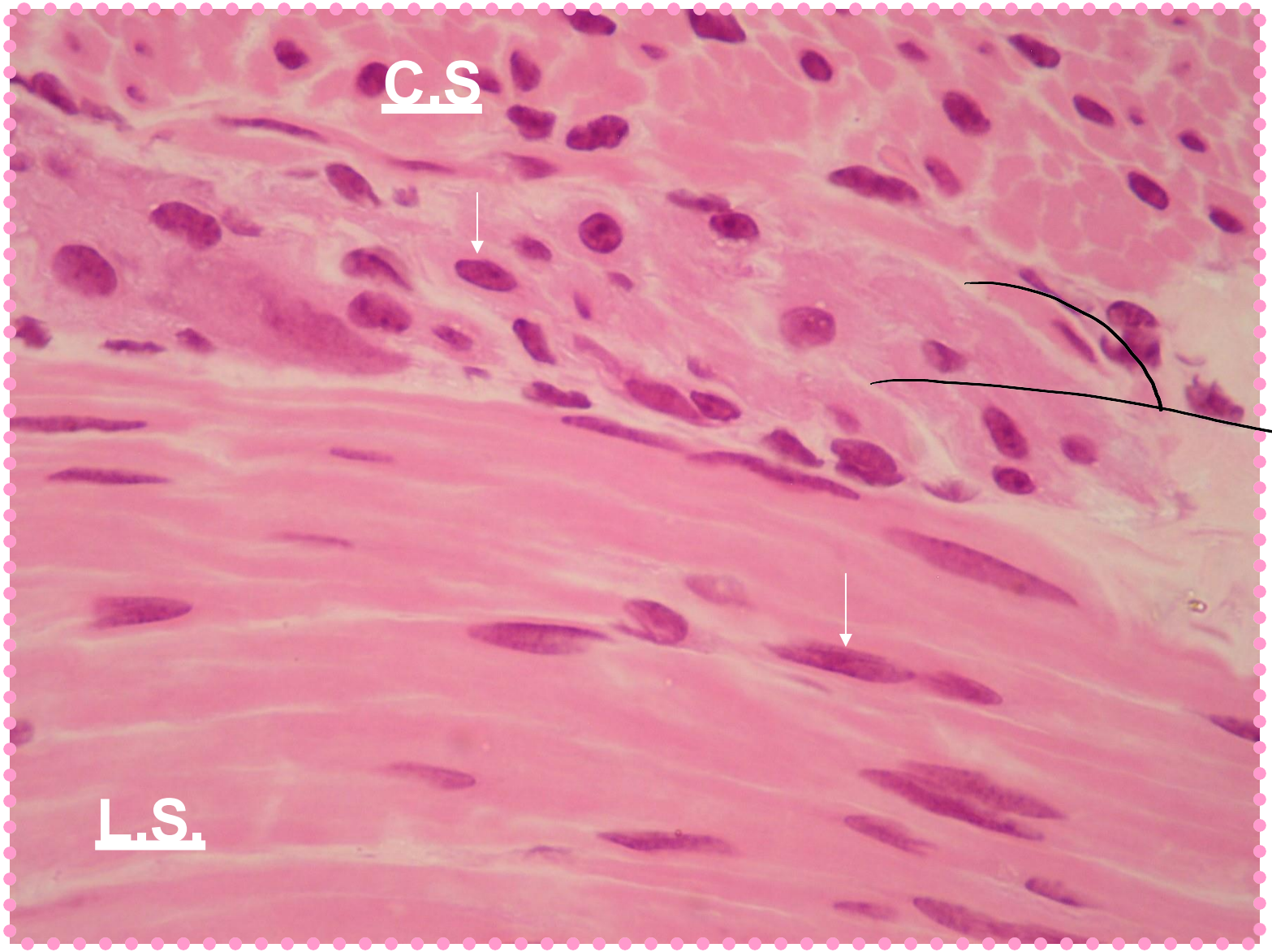
we don't have nucleus at each single cytoplasm that appears here



nuclei at C.S & L.S

In L.S, the spindle shape nuclei are running or flowing.

Whereas in C.S, there are rounded nuclei throughout the section, but as we said, not all nuclei passed in the section.


C.S
L.S.
we have endomysium around each single cell

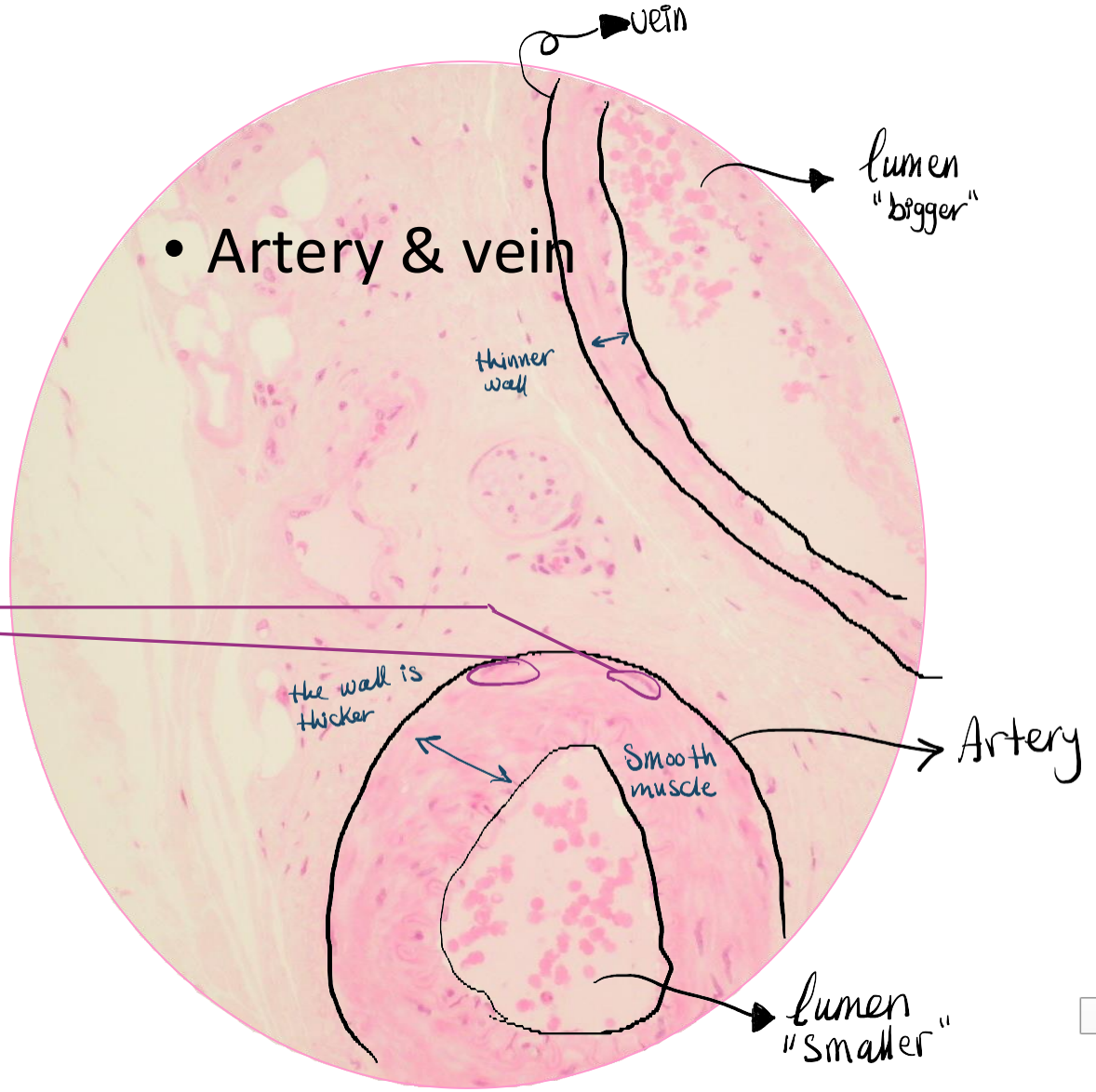
⇒ where can we find smooth muscles?

1 Wall of blood vessel

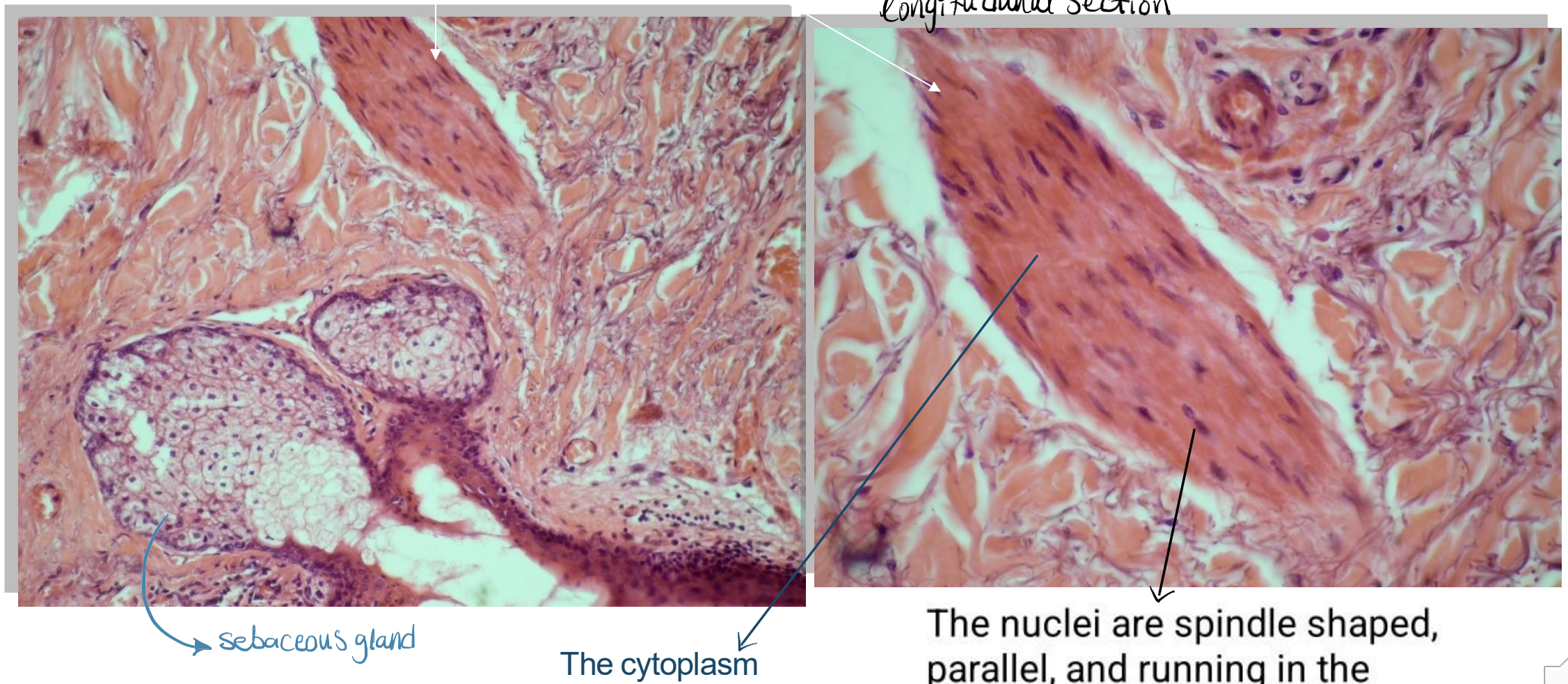
- Artery & vein

vessel

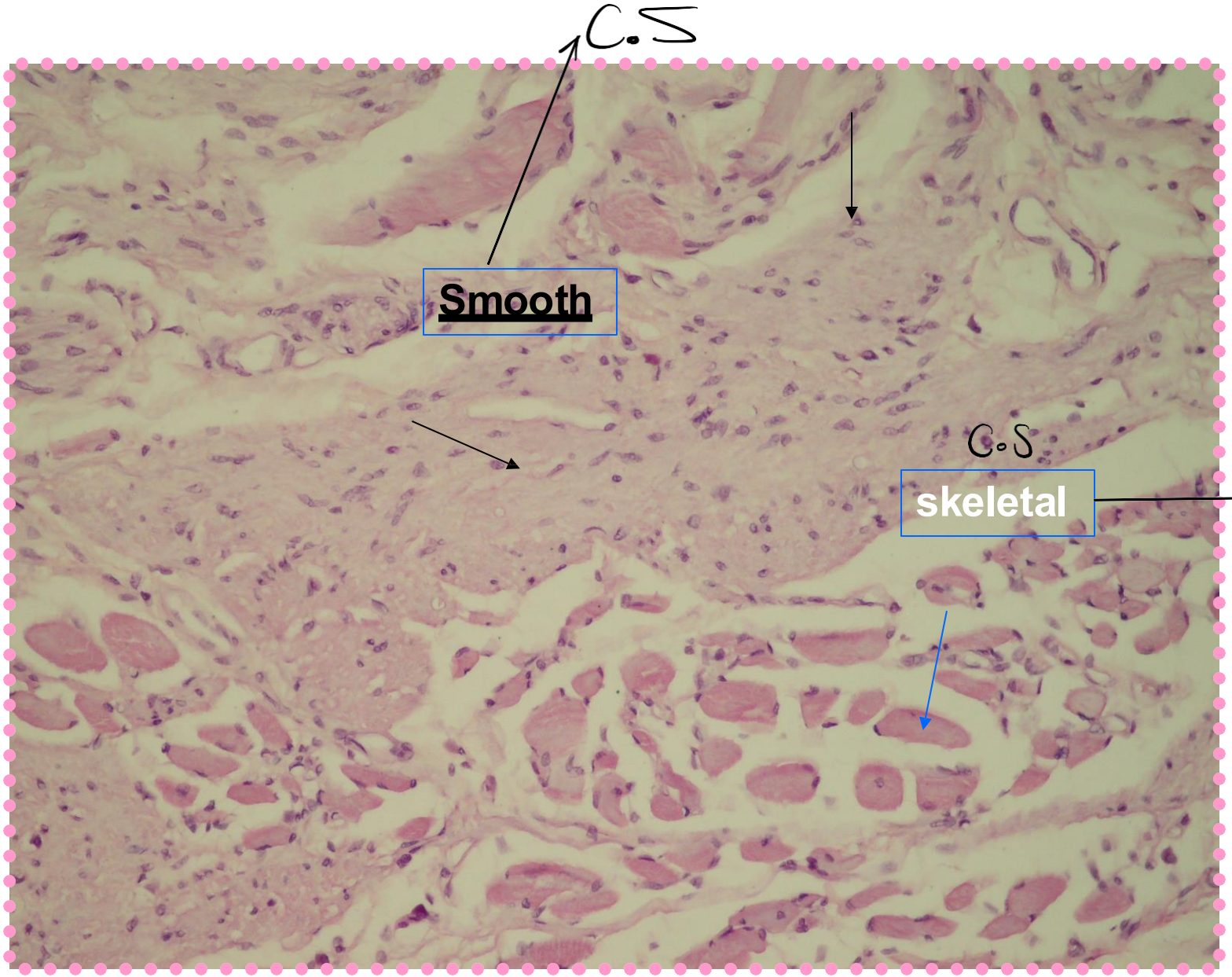
How can we identify them ?
By the shape of the nuclei, they are elongated and running in this field.



② Arrector pili muscle -thin skin → Tiny smooth muscles associated with hair follicles



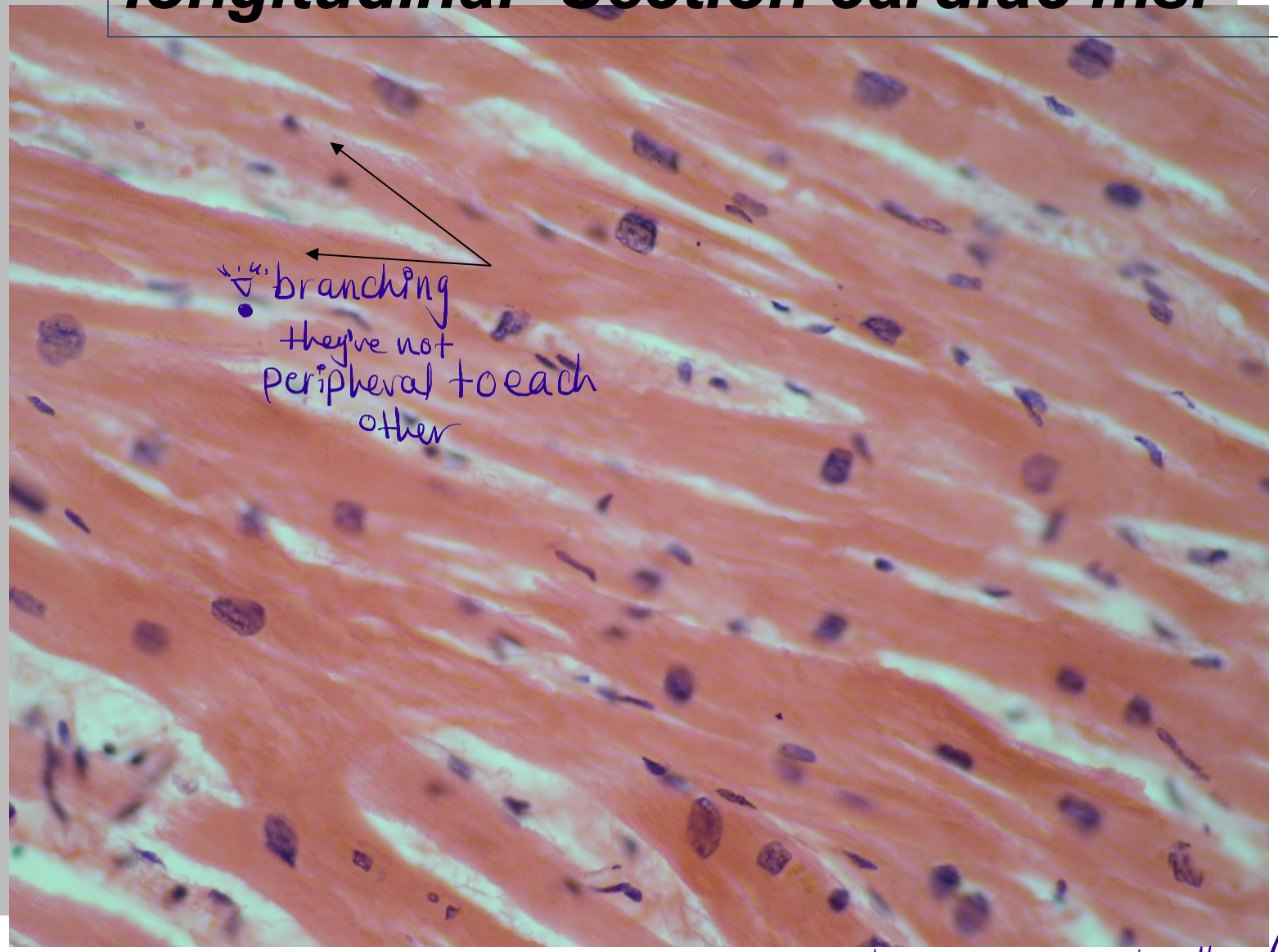
Here, the smooth muscle fibers are not perfectly running in one direction, so you will see elongated nuclei and others rounded , which make the smooth muscle disorganized.



Cardiac

longitudinal Section cardiac ms.

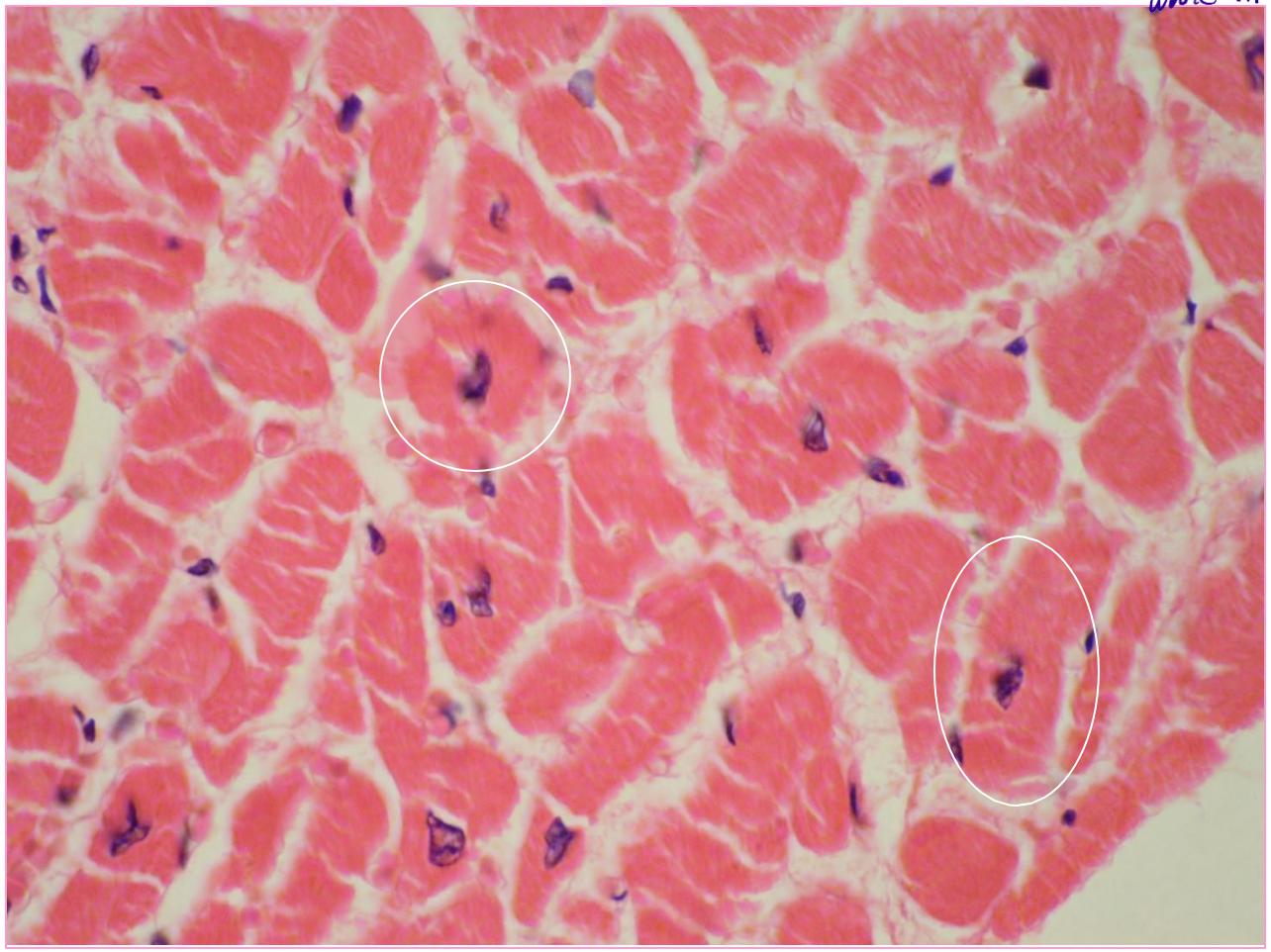
It has a unique characteristic, which is the branching .



H&E

⇒ Nuclei move centrally located

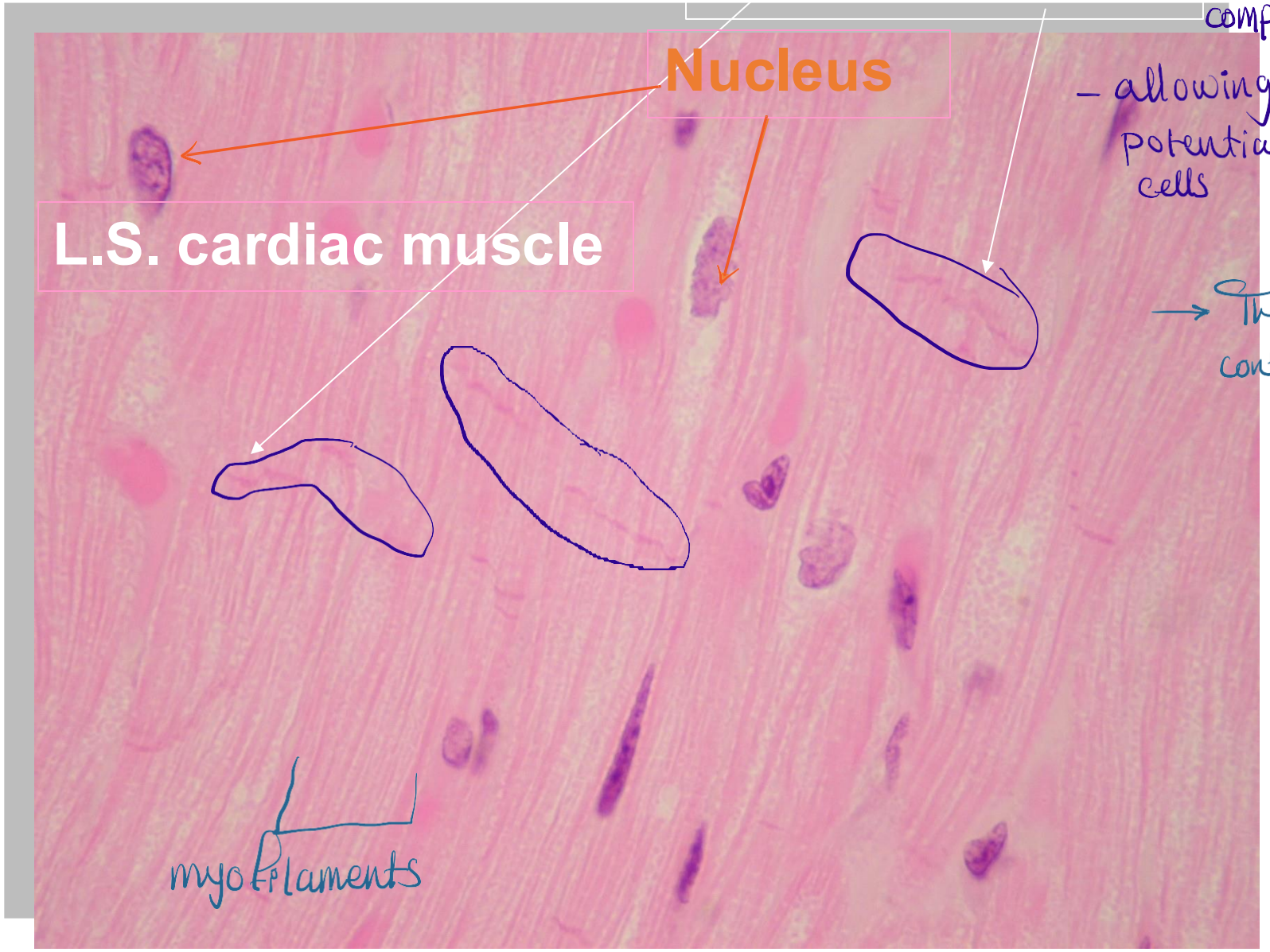
Cross section -cardiac muscle

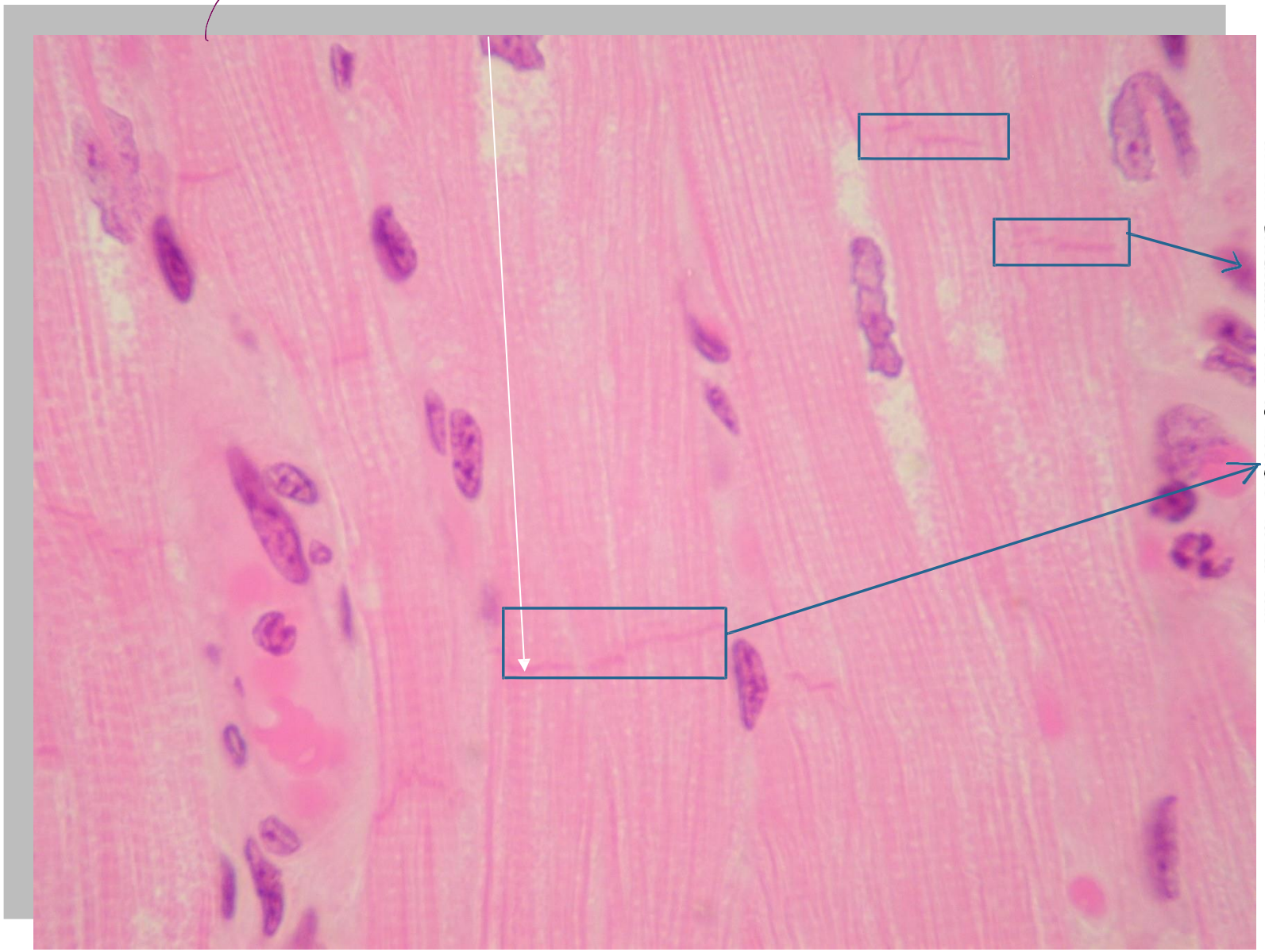


Skeletal muscle ما يميزها عن

1- nuclei are centrally located, while in skeletal they are peripherally located.

2- Not uniform in structure «no order due to the branches» while in skeletal it was uniform «close in size and shape»


Intercalated disc
rich with junctional complexes ≪ gap junctions≫
- allowing passing of action potential through cardiac cells
Nucleus
L.S. cardiac muscle
→ There's a delay between contraction of atria & ventricles
myofilaments



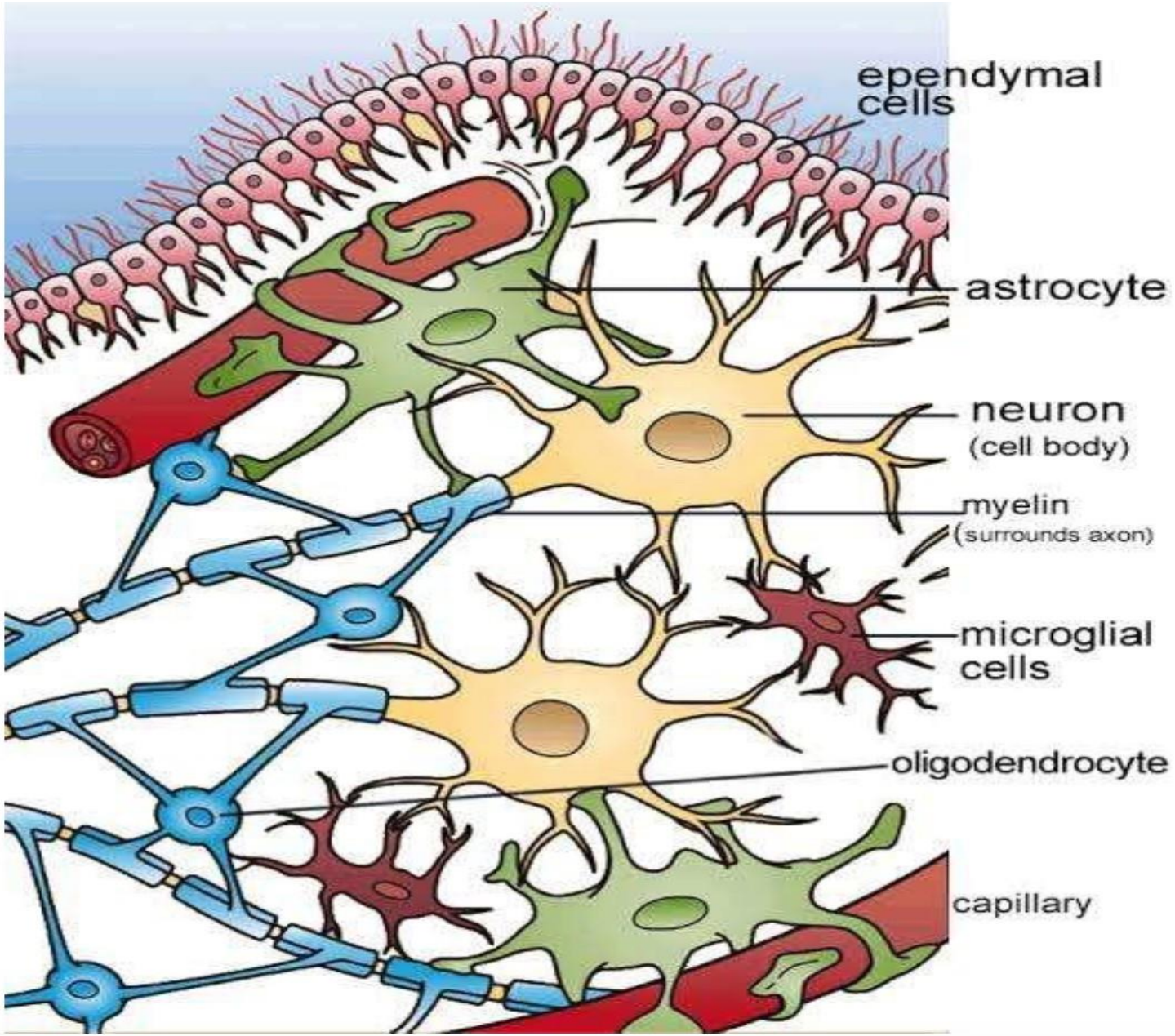
Usually, when you see a dark eosinophilic structure, this is telling you that there is a condensation of something.

Nervous tissue

Nervous tissue

Two images from Theoretical material

According to the picture we will notice that the supporting neuroglial cell is the astrocyte not the satellite cell and that will determine the location of this tissue which is from the CNS not the PNS



In the cns as you see in this picture we will see two groups of cells which are the neurons and the neuroglial cells
1- starting with the astrocytes which supports and protects the neuron and it maintains and participate in the formation of the BBB
2-the second neuroglial cell the microglial cell (the macrophage of the CNS)derived from monocytes
3-the oligodentocyte which is considered the Maylin forming cell in the CNS ,we notice that one cell sends many processes to wrap different axons different segments (while the shwan cells in the PNS each cell wraps one segment in one axon in one neuron)
4-the ependymal cells ,they are important for the protection of the CNS,CSF and maintaining the CSFsome of them can show long microvilli they resemble epithilium but they do not have basal lamina ,between these cells there are junction complexes to maintain the CSF (wherever you have CSF you will find the ependymal cells lining it)

NEUROGLIA

We have spaces within the brain called ventricles while the long space within the spinal cord is called the central canal filled with CSF and lined with ependymal cells
Manenges are layers surrounding the CNS which are the dura ,arachnoid ,and the pia matter

TEM

We are looking at a shwan cell next to an axon

The nucleus of the shwan cell

Layers of the cell membrane wrapping the axon

The axon

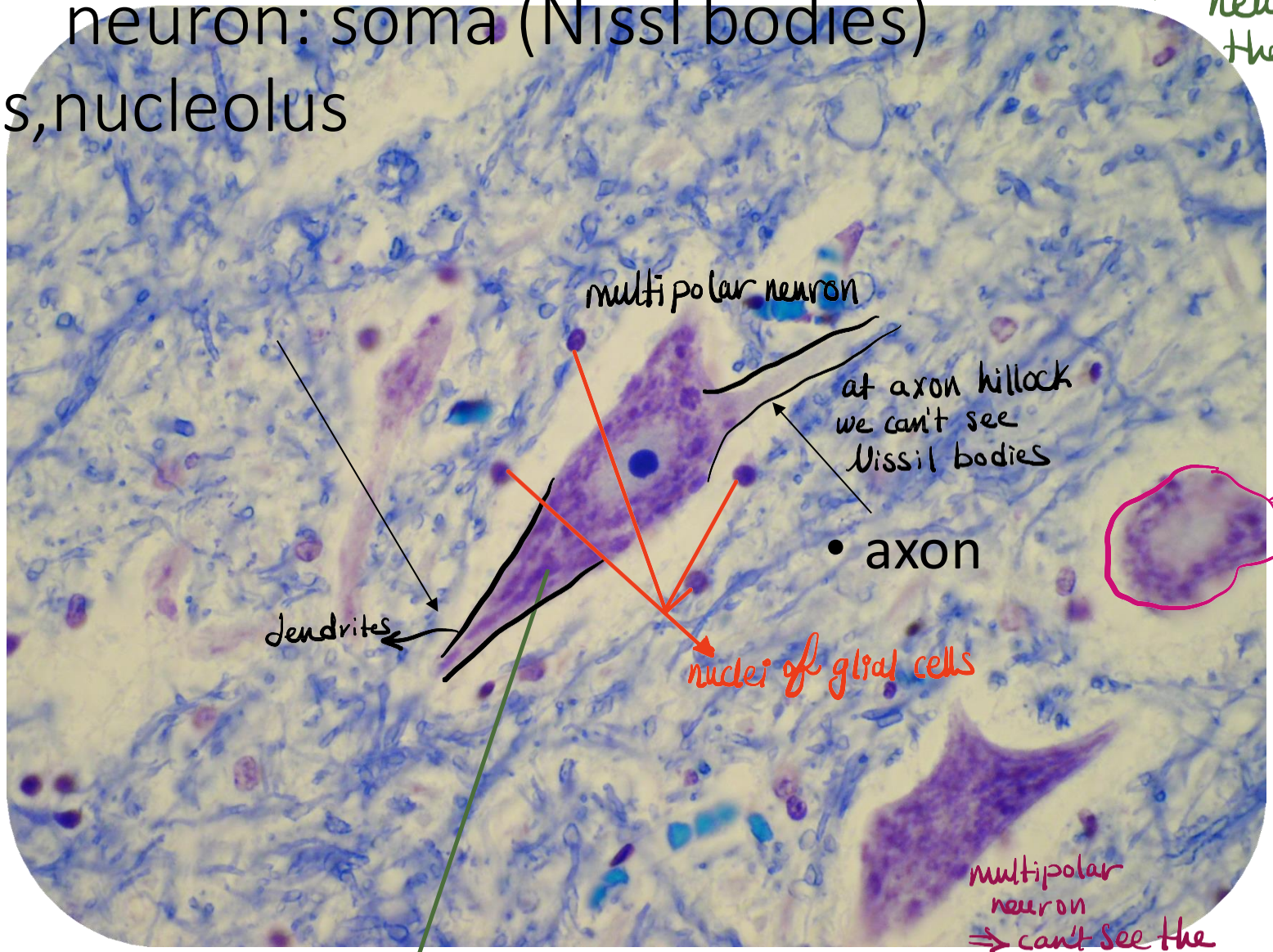
There are some axons considered lightly myelinated and others unmyelinated (unmyelinated are not zero myelin wrap but zero complete wrapping because one cell is wrapping many axons) not complete wrapping of the axon for the unmyelinated means they did not fully insulate the signals and that they lack nodes of Ranvier so the axon surface is exposed ,the distribution of ion channels is even therfor the action potintial is slow .

Nervous tissue

It looks like eye

neuron: soma (Nissl bodies)

nucleous,nucleolus



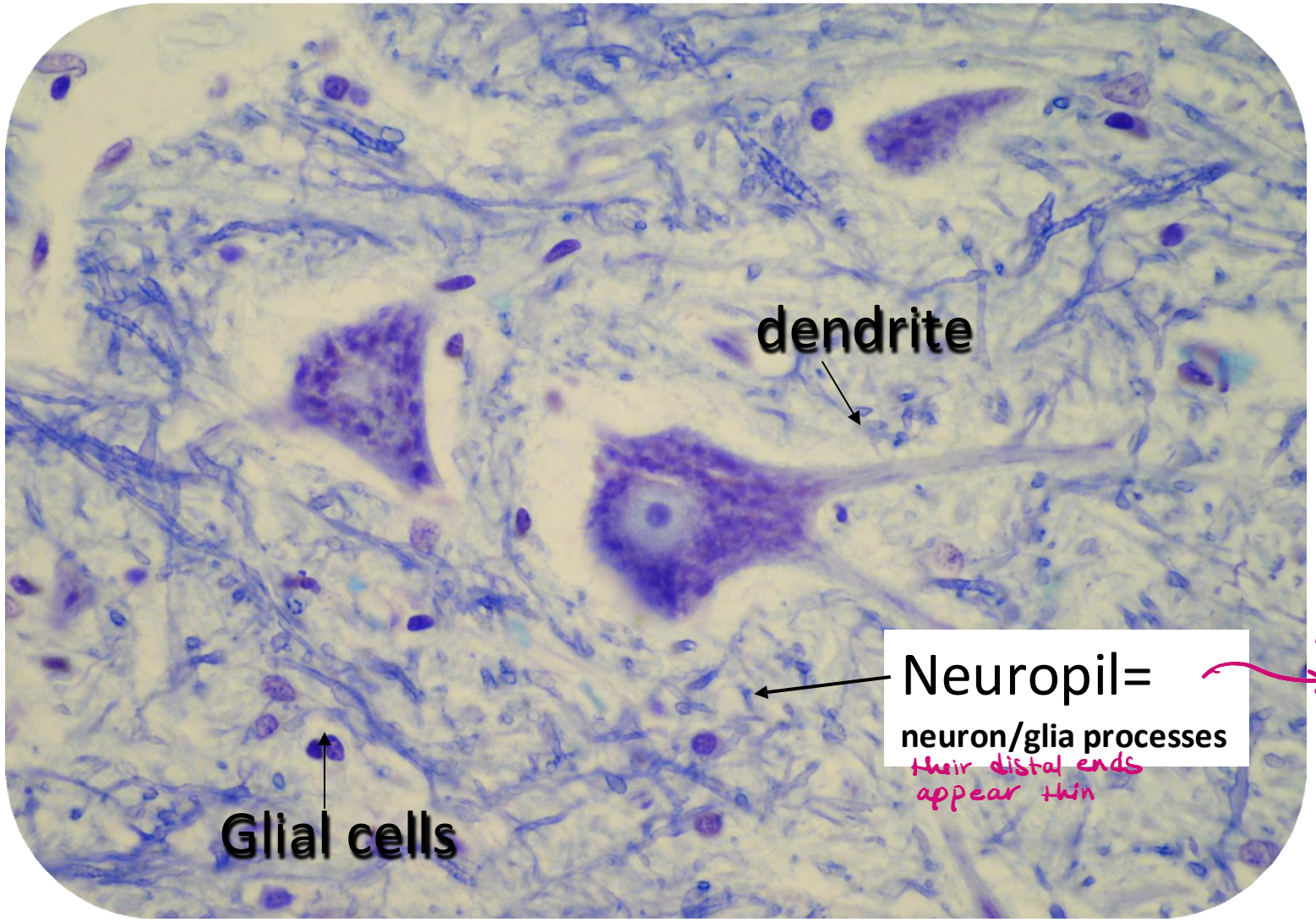
⇒ we can recognize neurons, because it's the biggest in the section

multipolar neuron

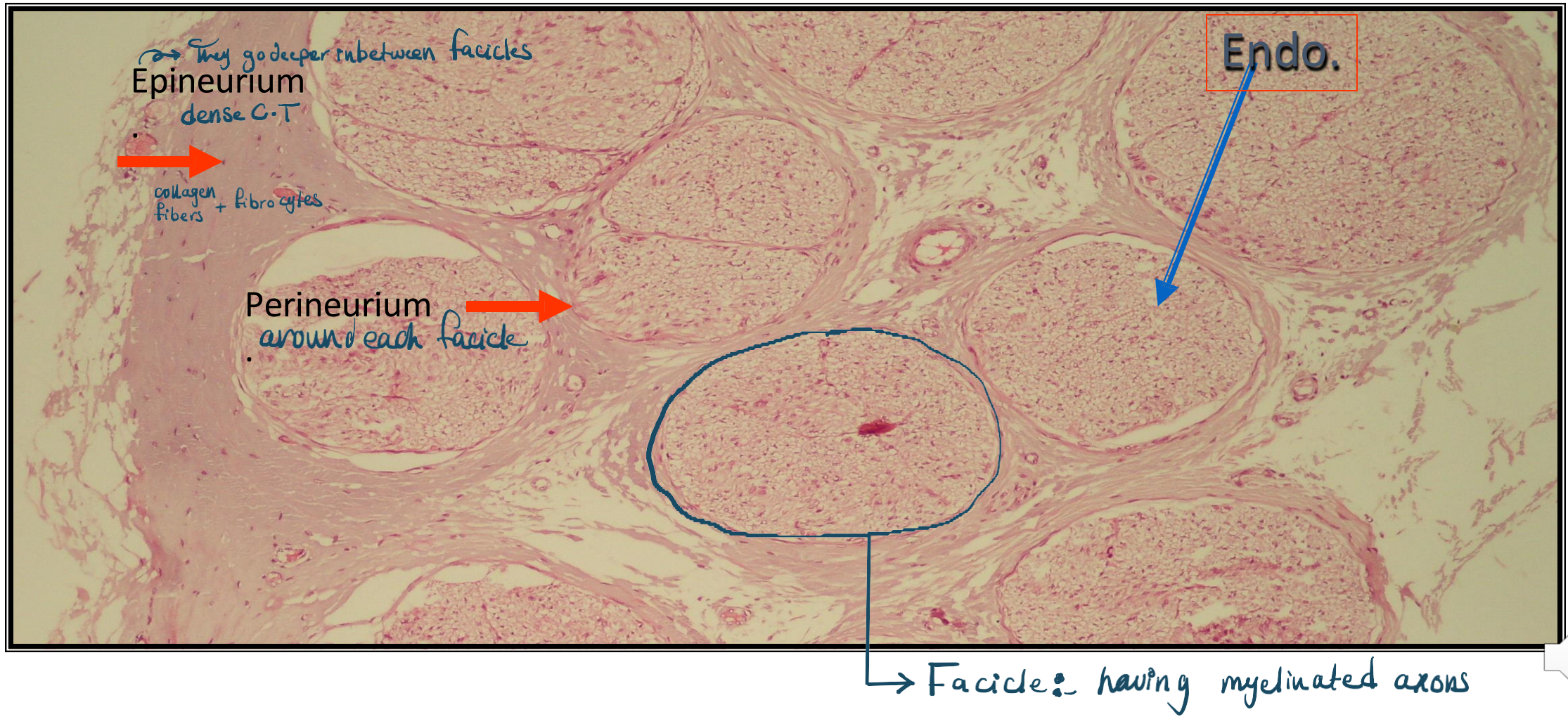
The section passed through the nucleus but didn't pass through the nucleolus.

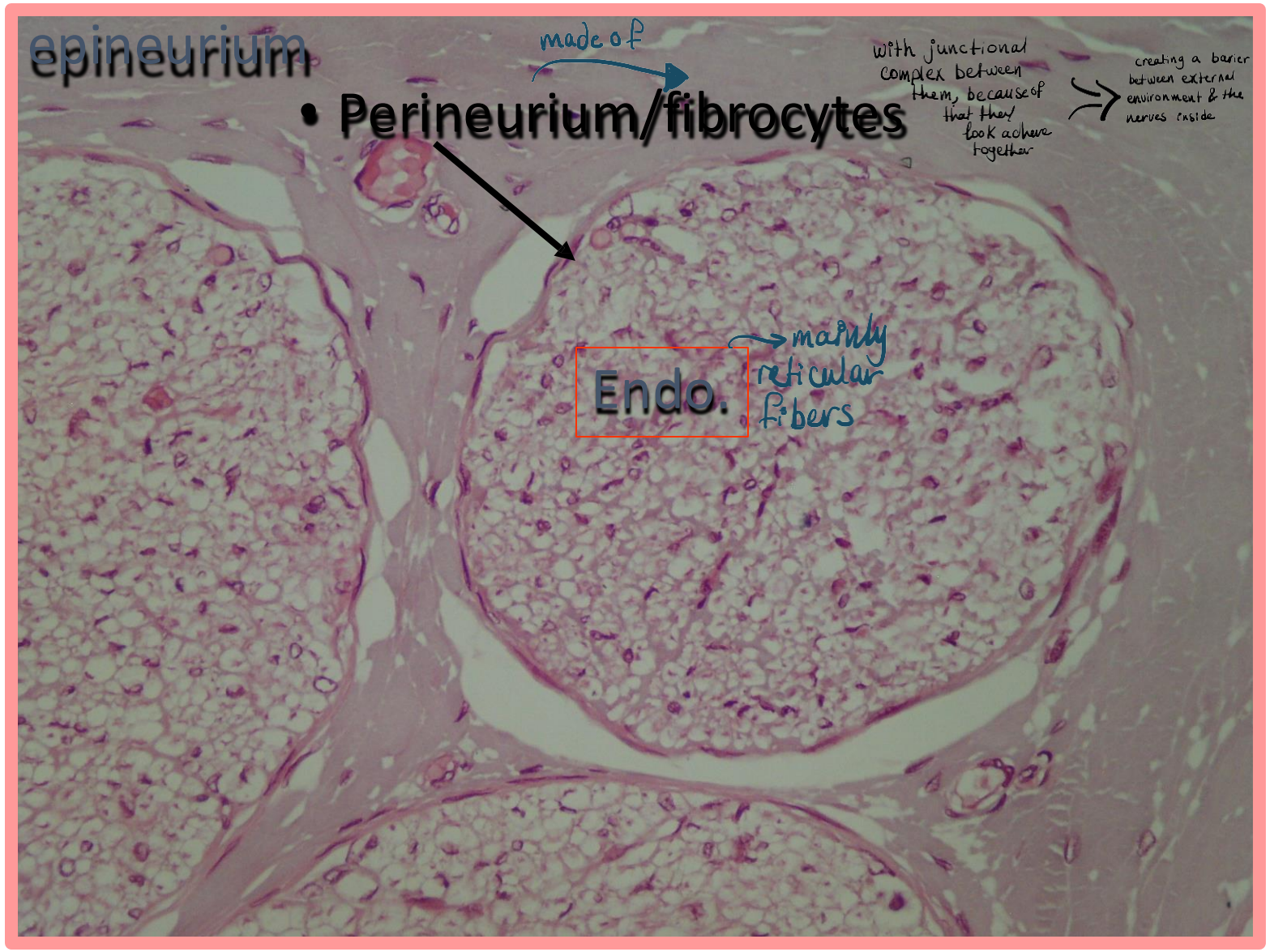
multipolar neuron ⇒ can't see the nucleus

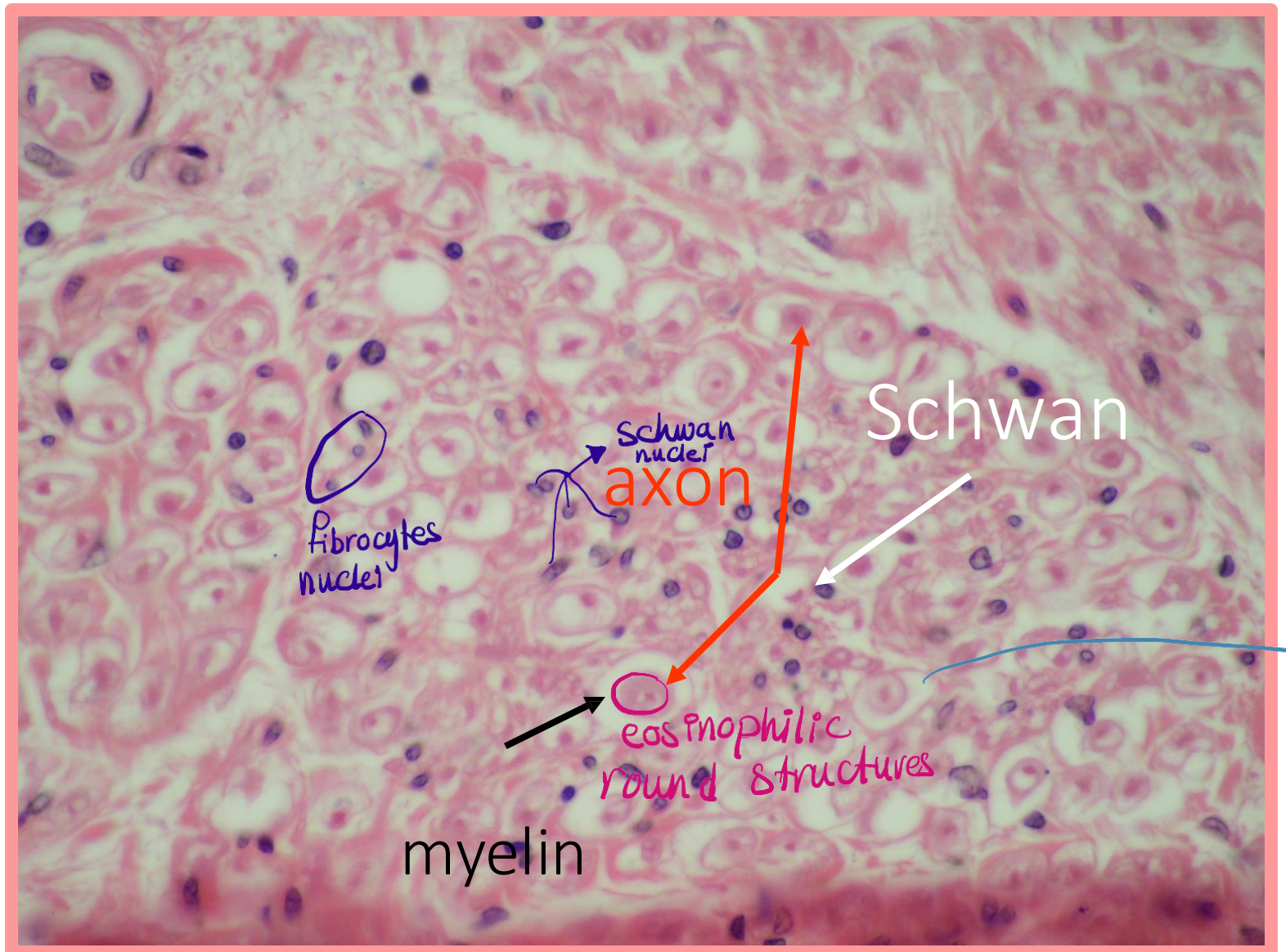
multipolar neuron (toluidine blue stain)



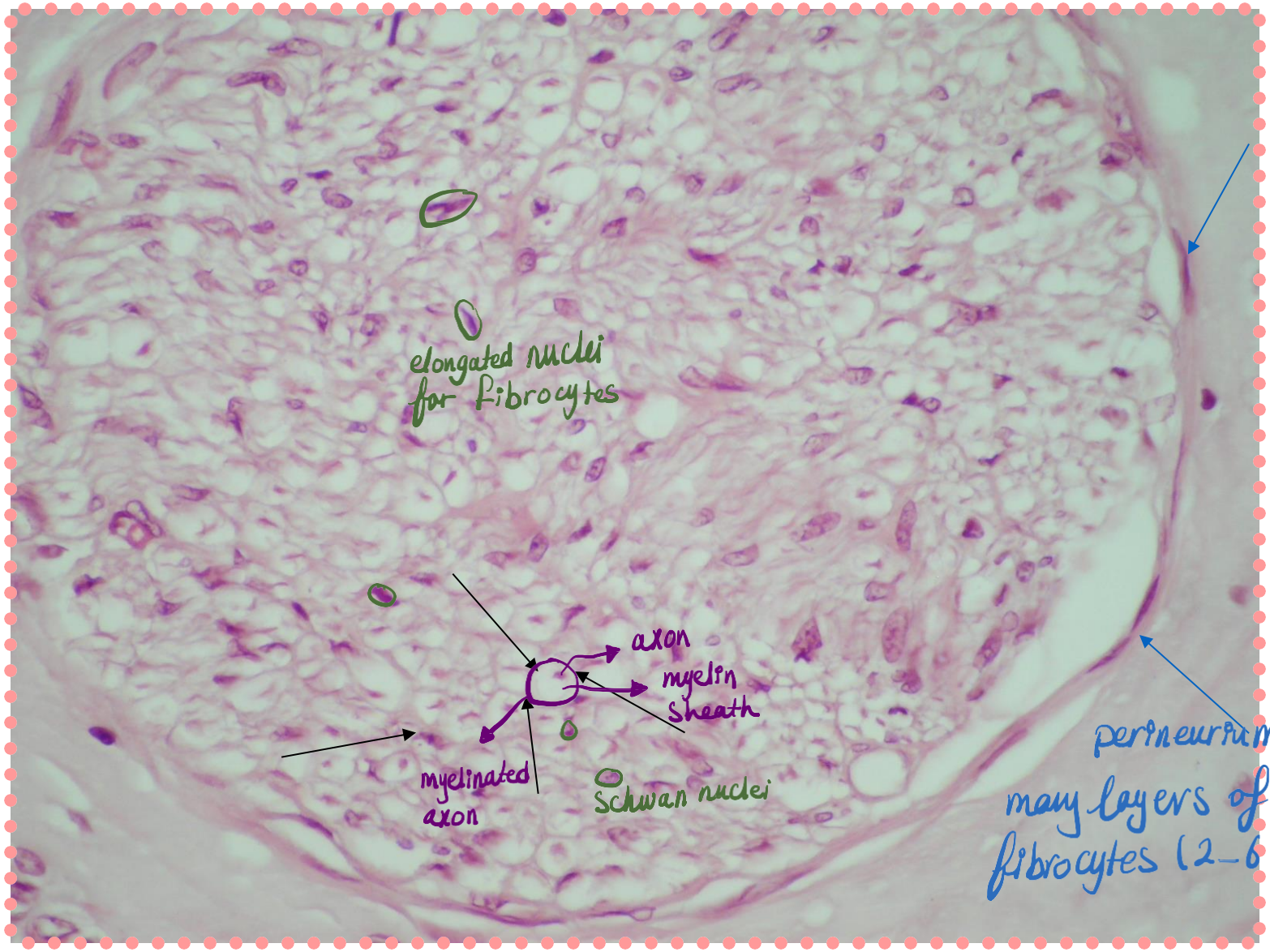
H&E- Fascicles of nerve fibers

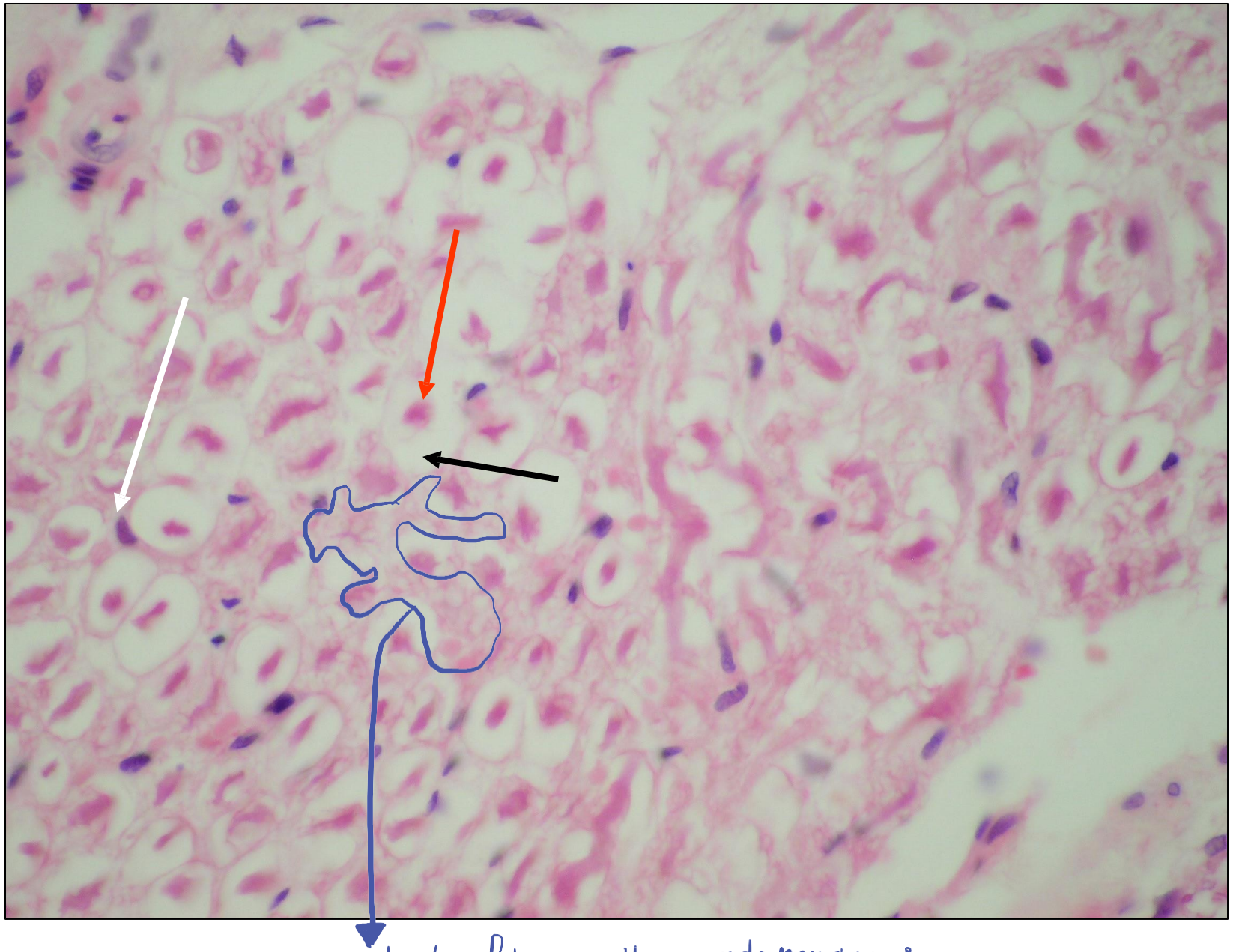



epineurium
made of
• Perineurium/fibrocytes
with junctional complex between them, because of that they look adhere together
creating a barier between external environment & the nerves inside
Endo.
mainly reticular fibers

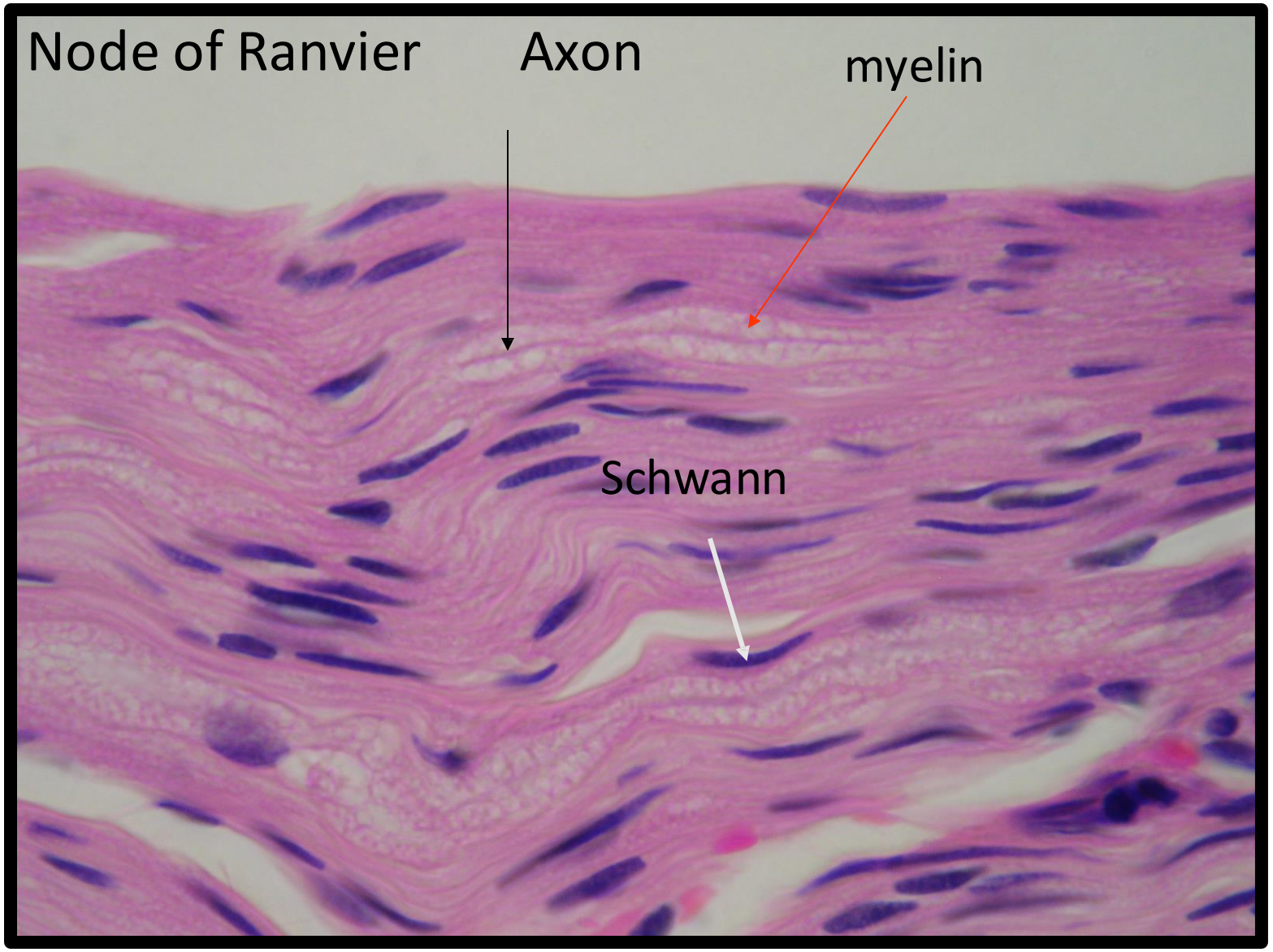

Schwan
Schwan nuclei
axon
fibrocytes nuclei
eosinophilic round structures
myelin
whitish area where myelin sheath is used to be « fats dissolved during histological preparation »

cross section through Facicle:-



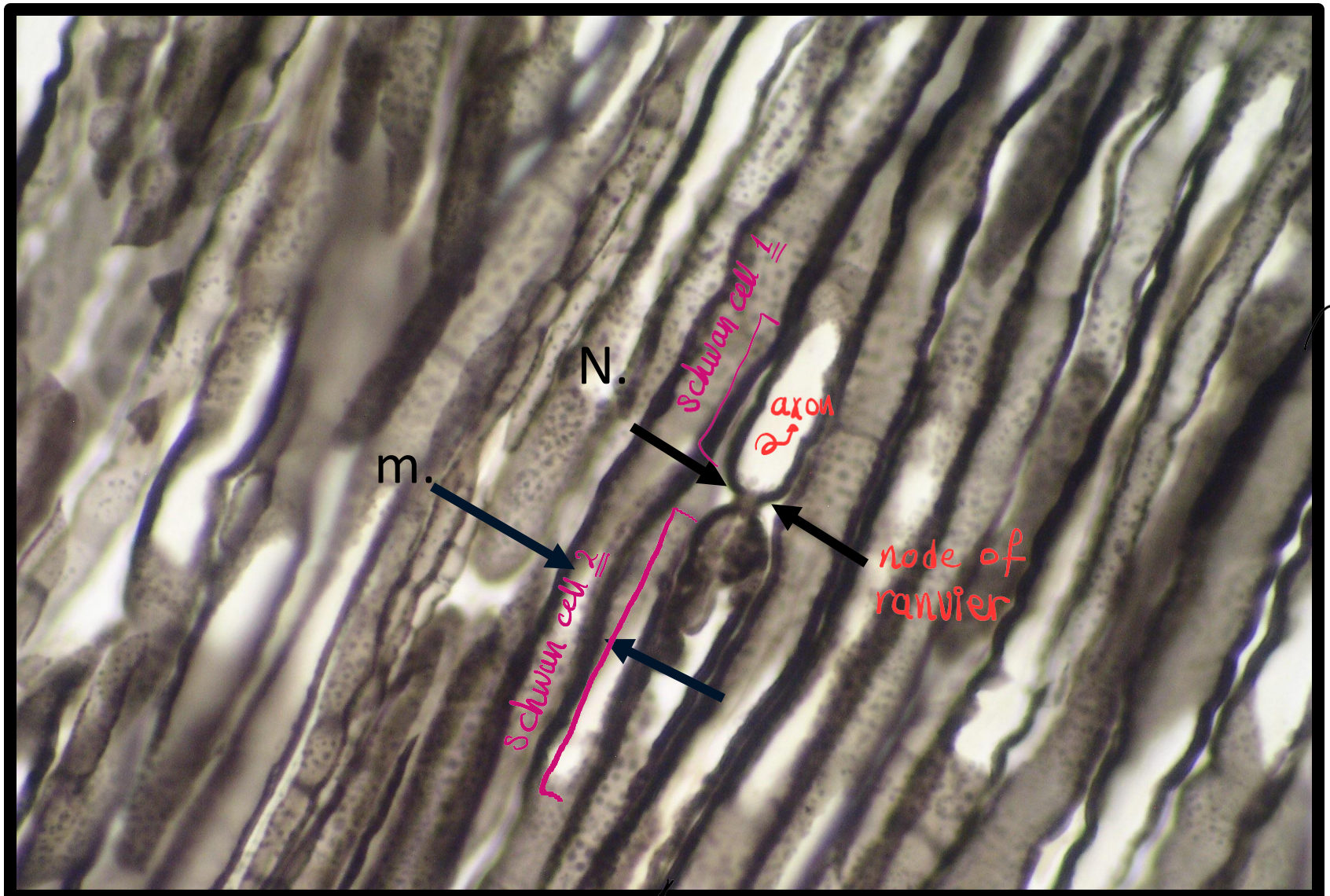

reticular fibers , where endo neurium is

L.S. in nerve fibers



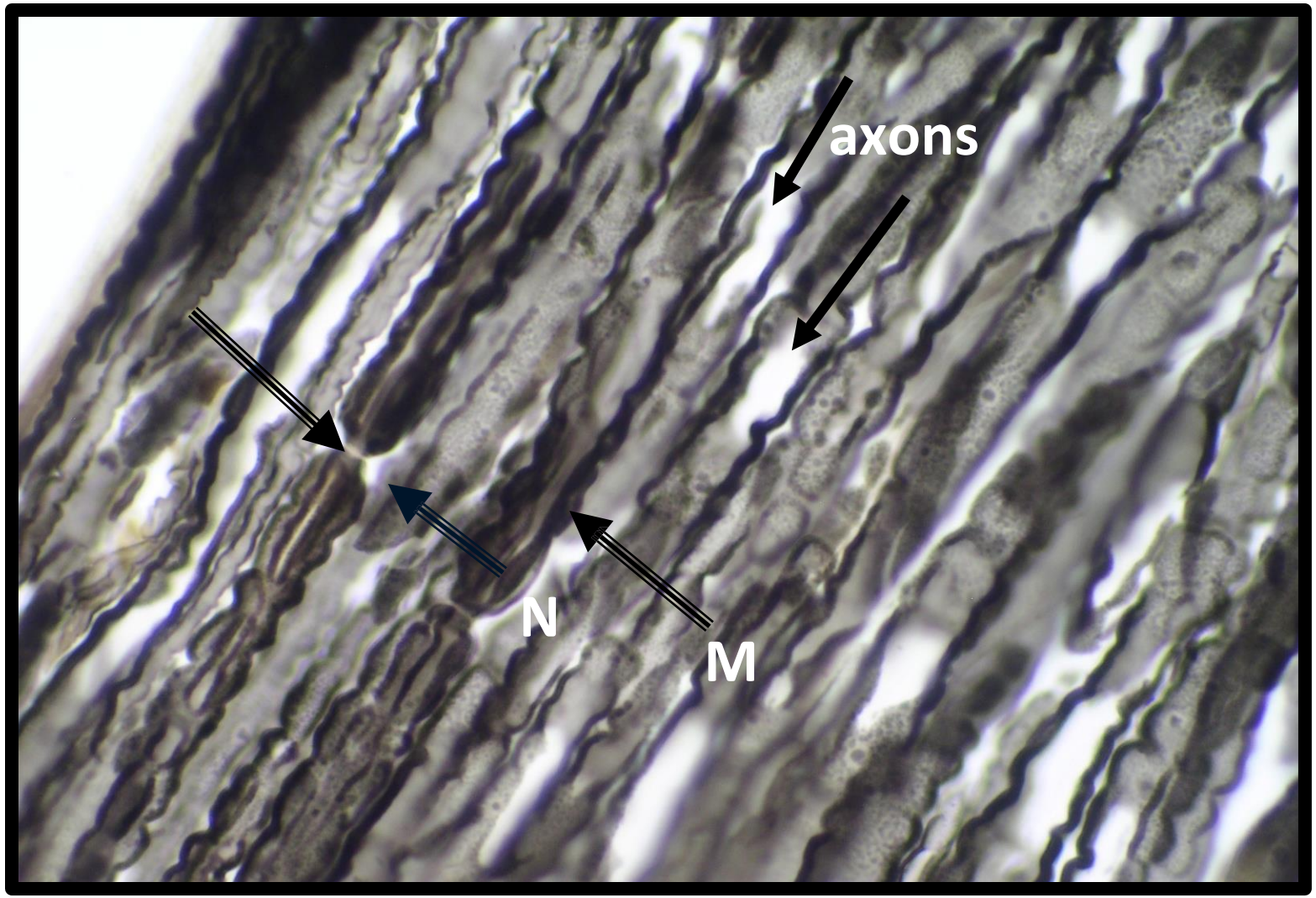
L.S. in nerve fibers (osmium tetraoxide) myelin- Node of Ranvier

special stain
it's soluble in fats, forming black reduction compounds



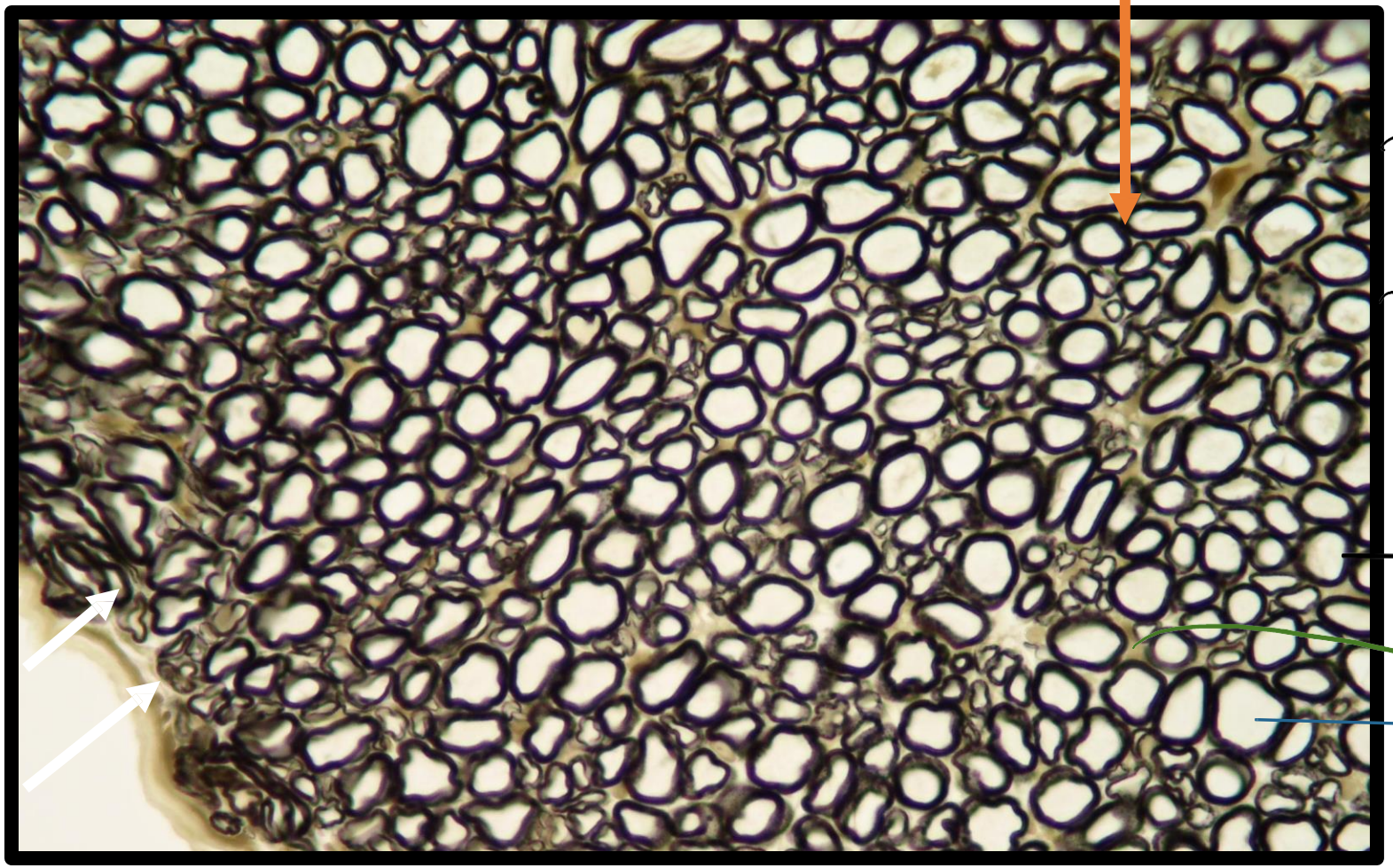
* blackish structures
→ myelin

Axon cylinder

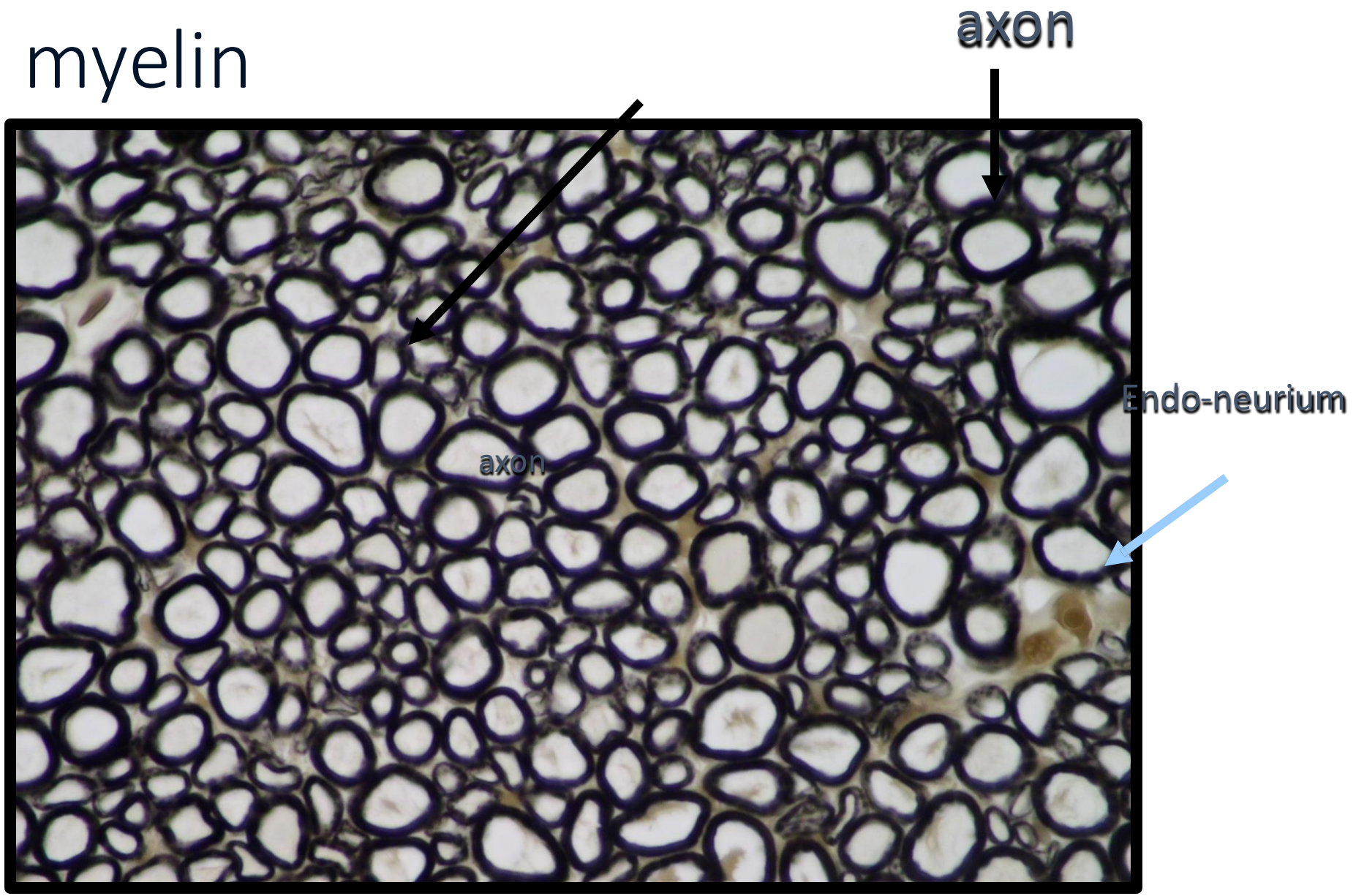


T.s.in nerve fibers

endoneurium perineurium

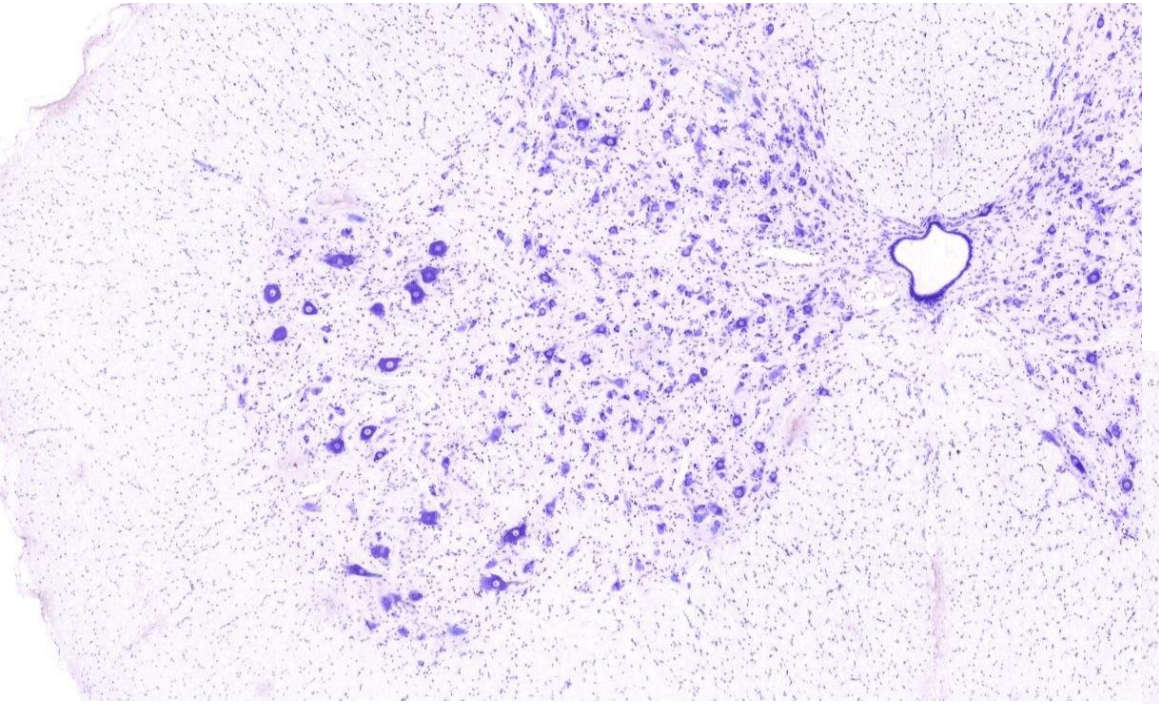


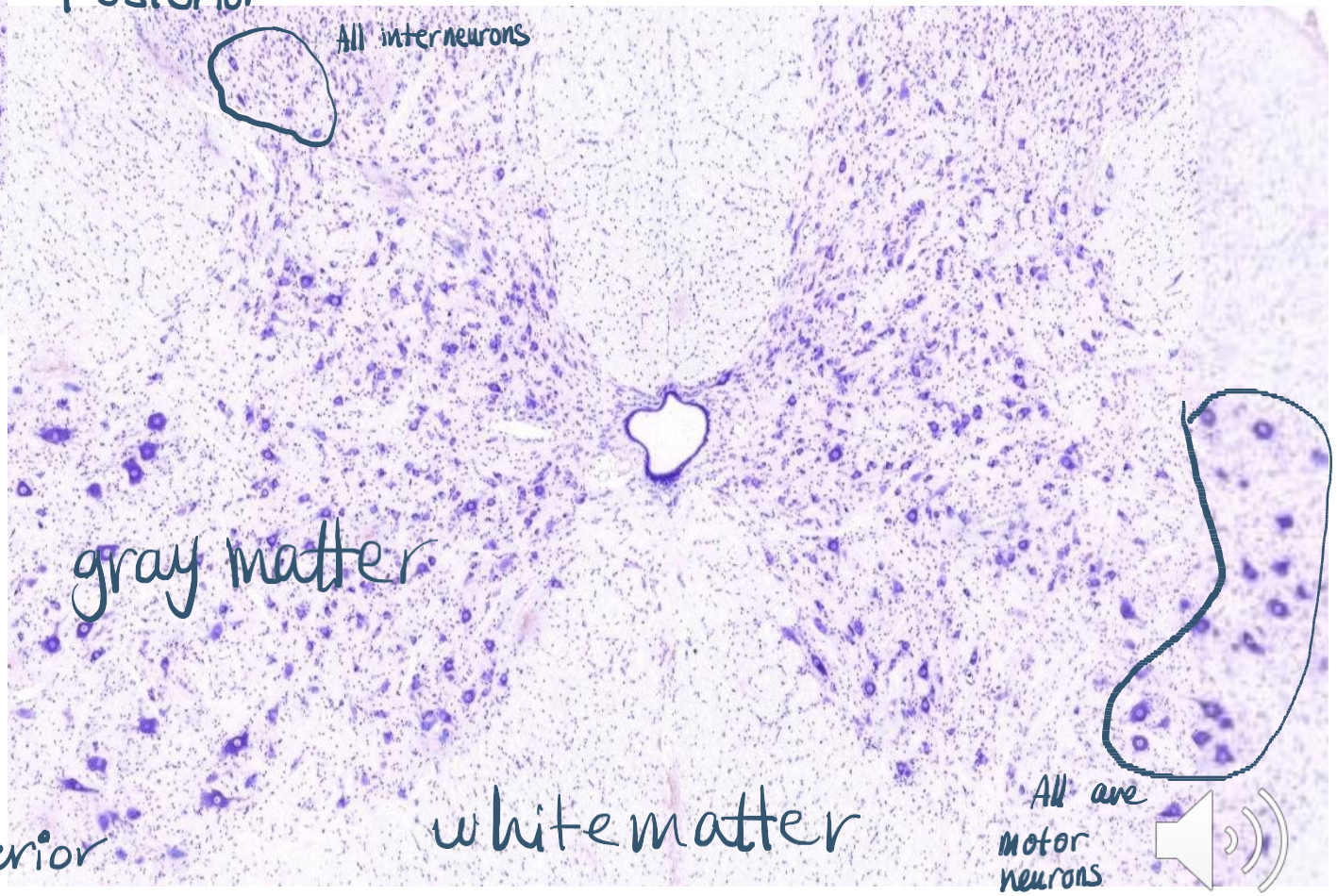
myelin



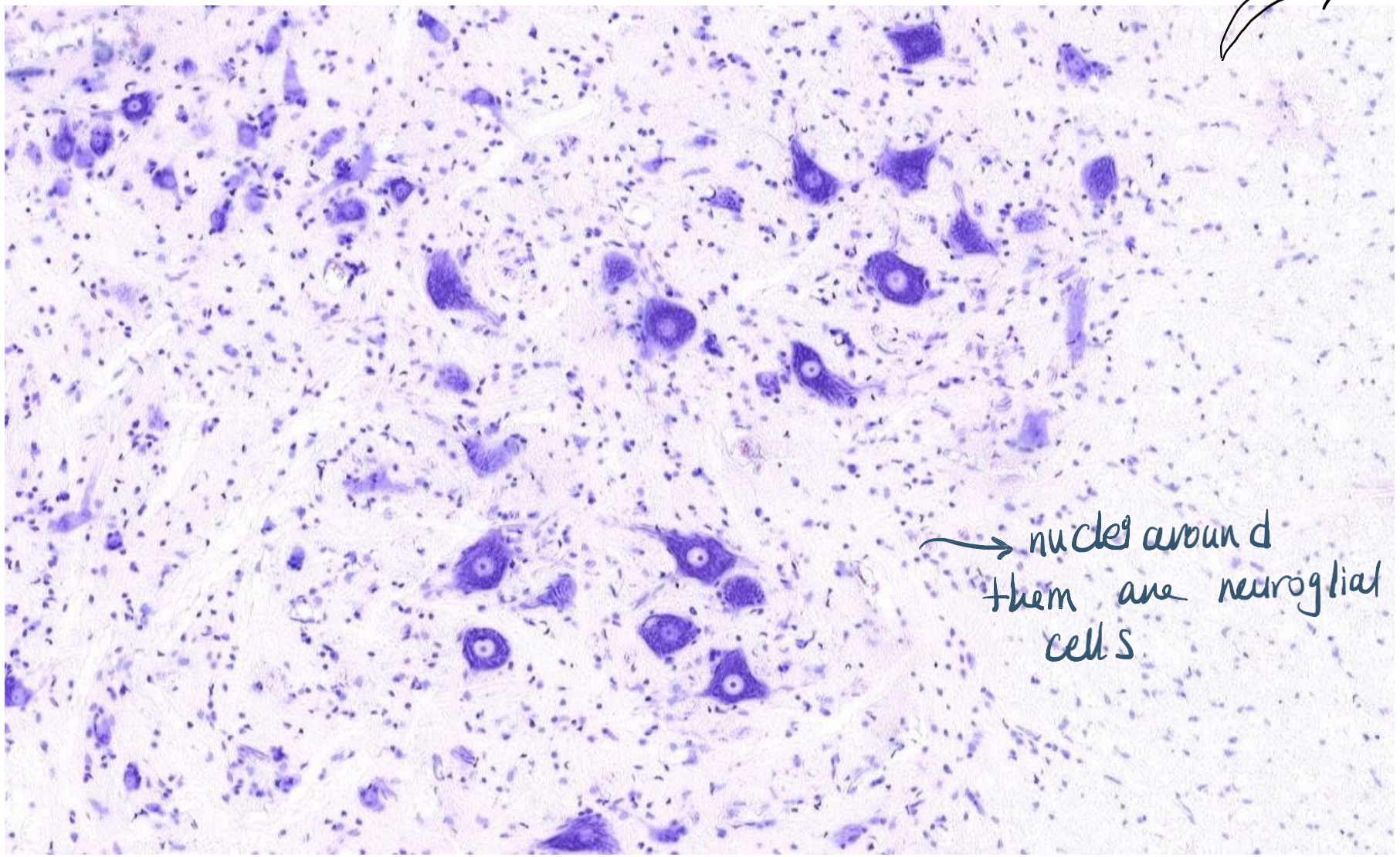
[Crystal stain]

Spinal cord

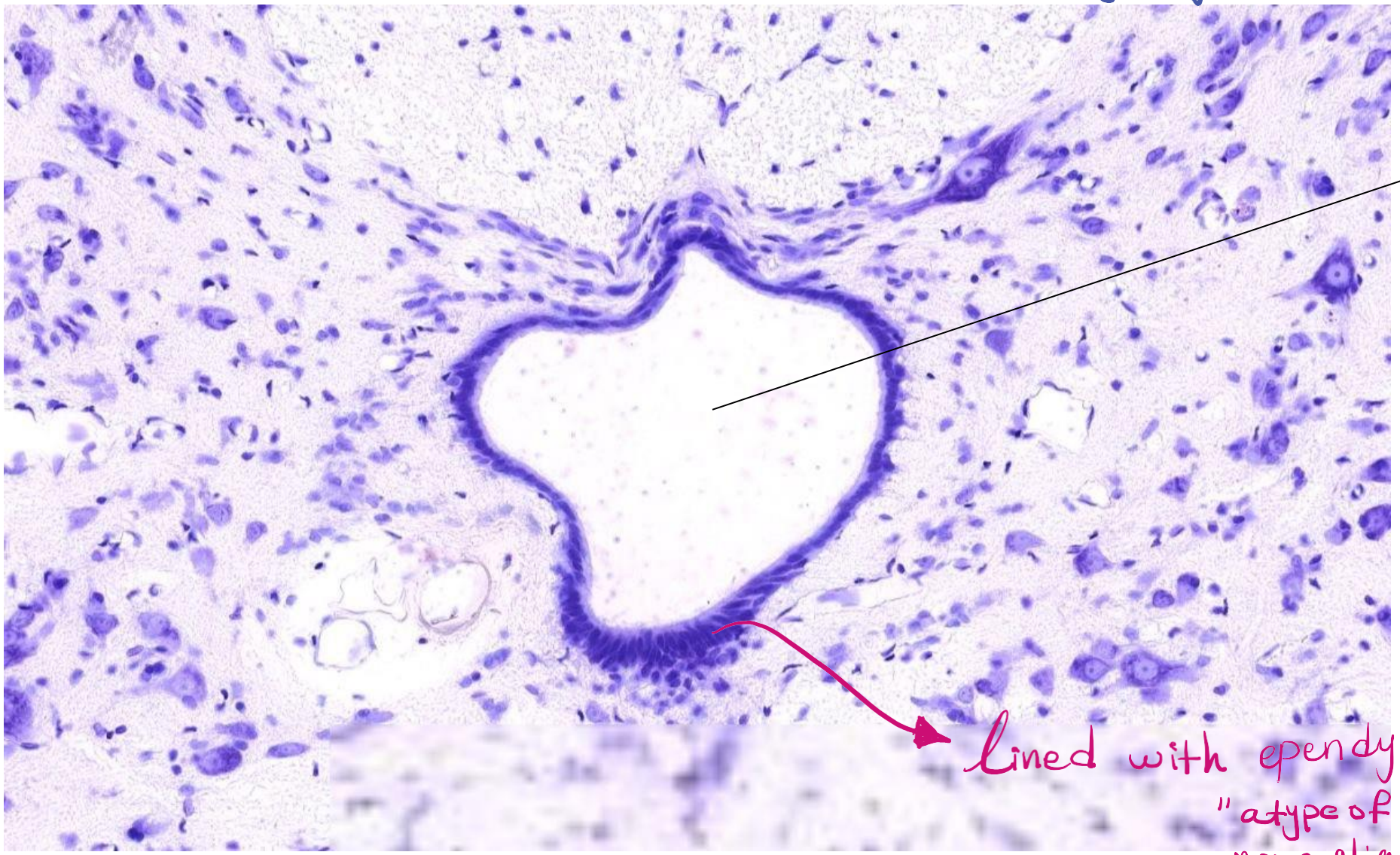




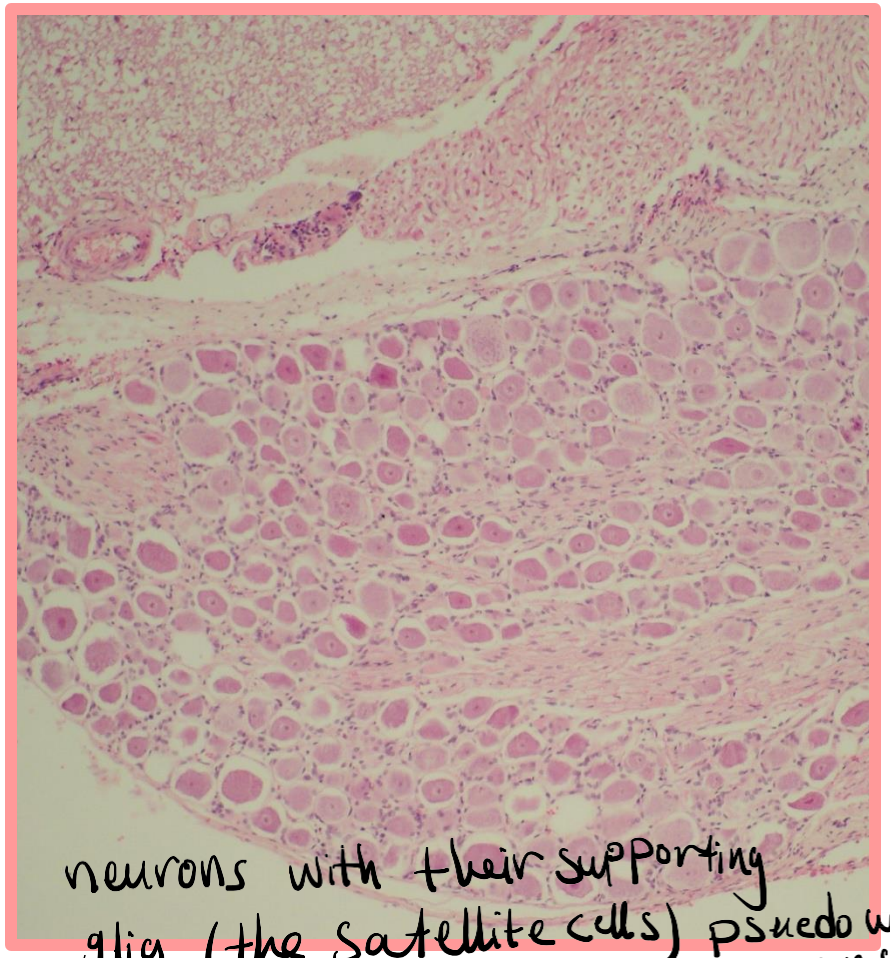
Anterior horns-spinal cord



Central canal-spinal cord in the gray matter



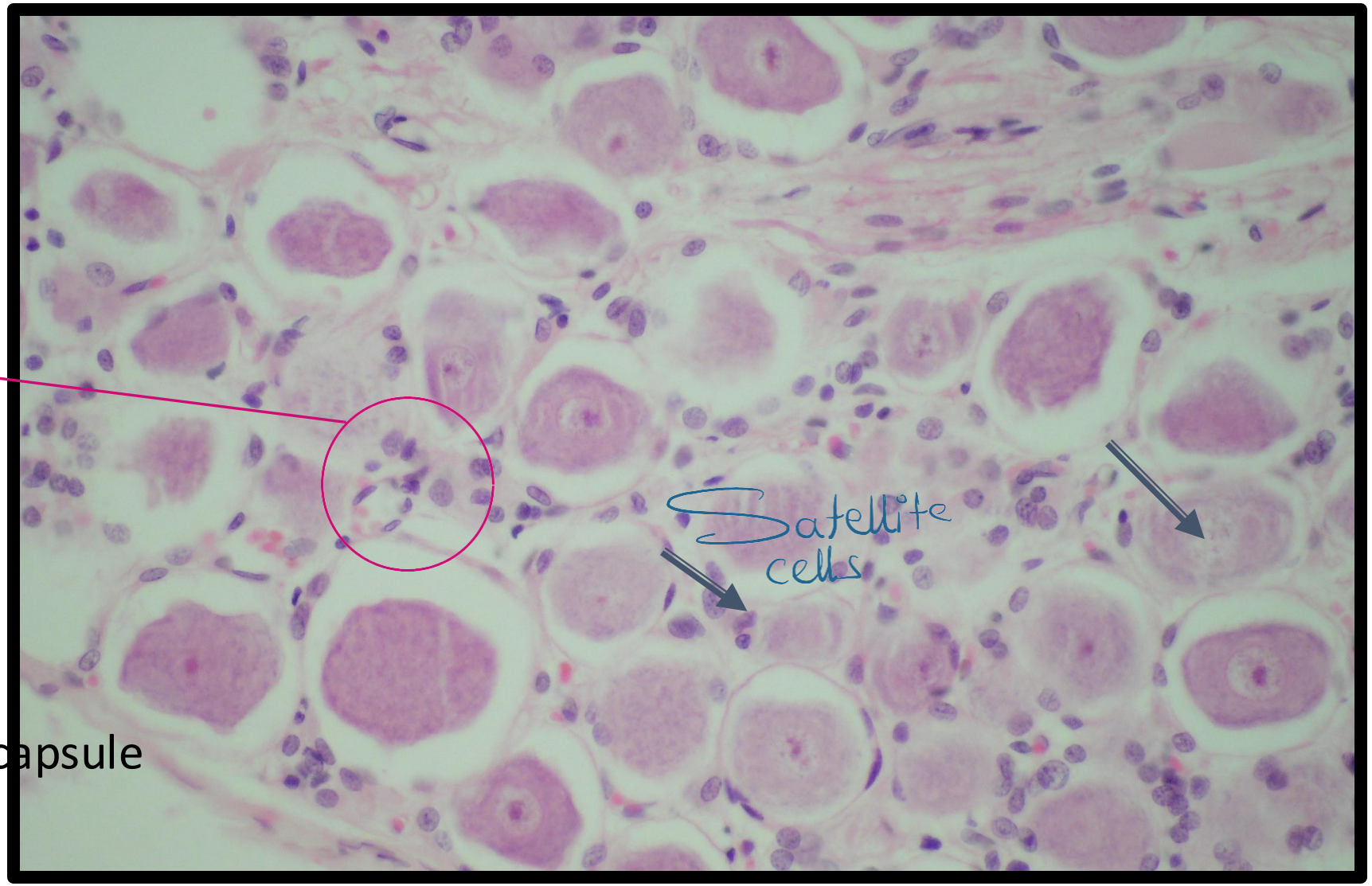
Spinal (dorsal) root ganglia



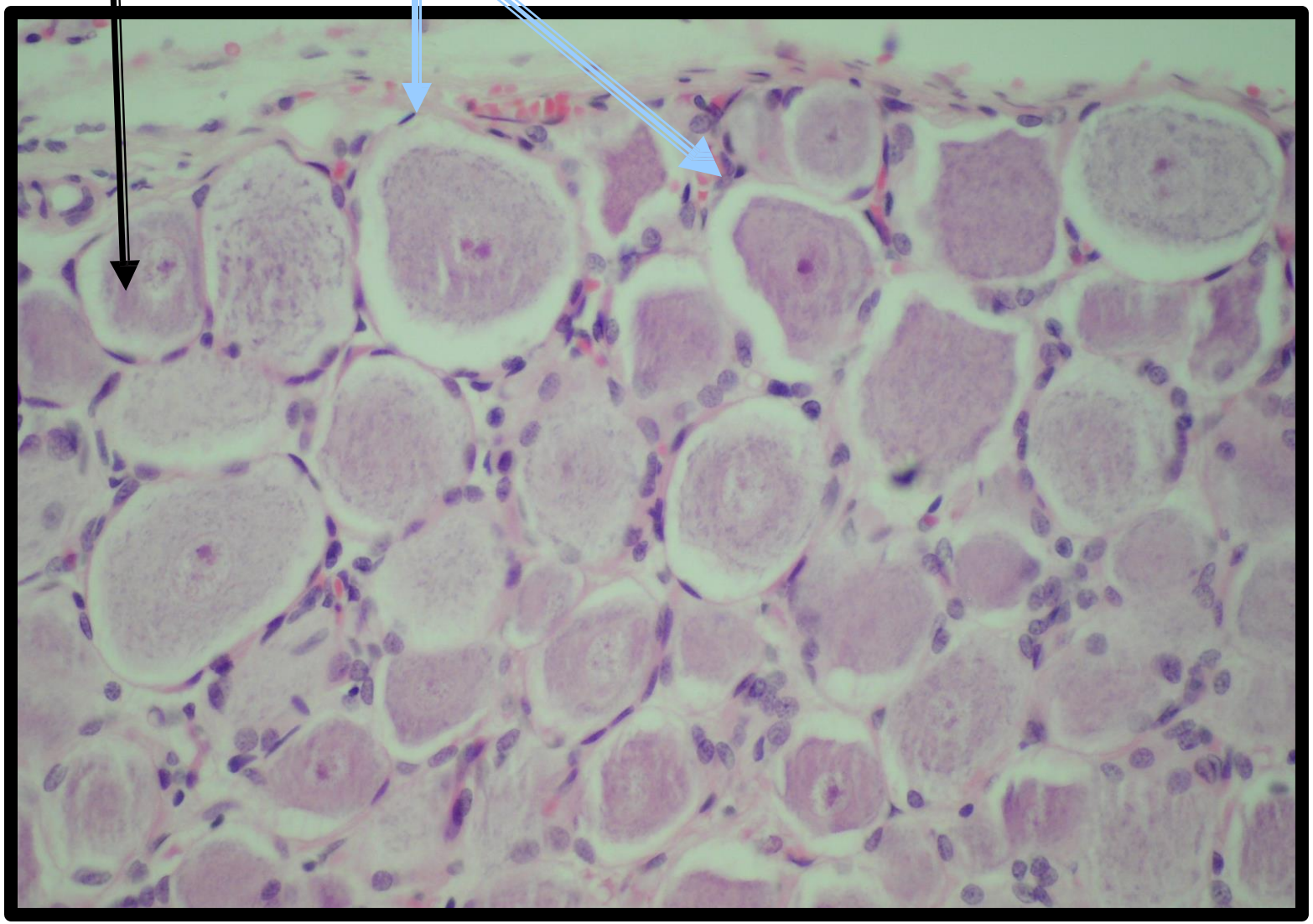
Unipolar neurons

Sensory ganglion.
: neuronal cell bodies

Surrounding cells ⇒ Glial cells



cell bodies satellite cells

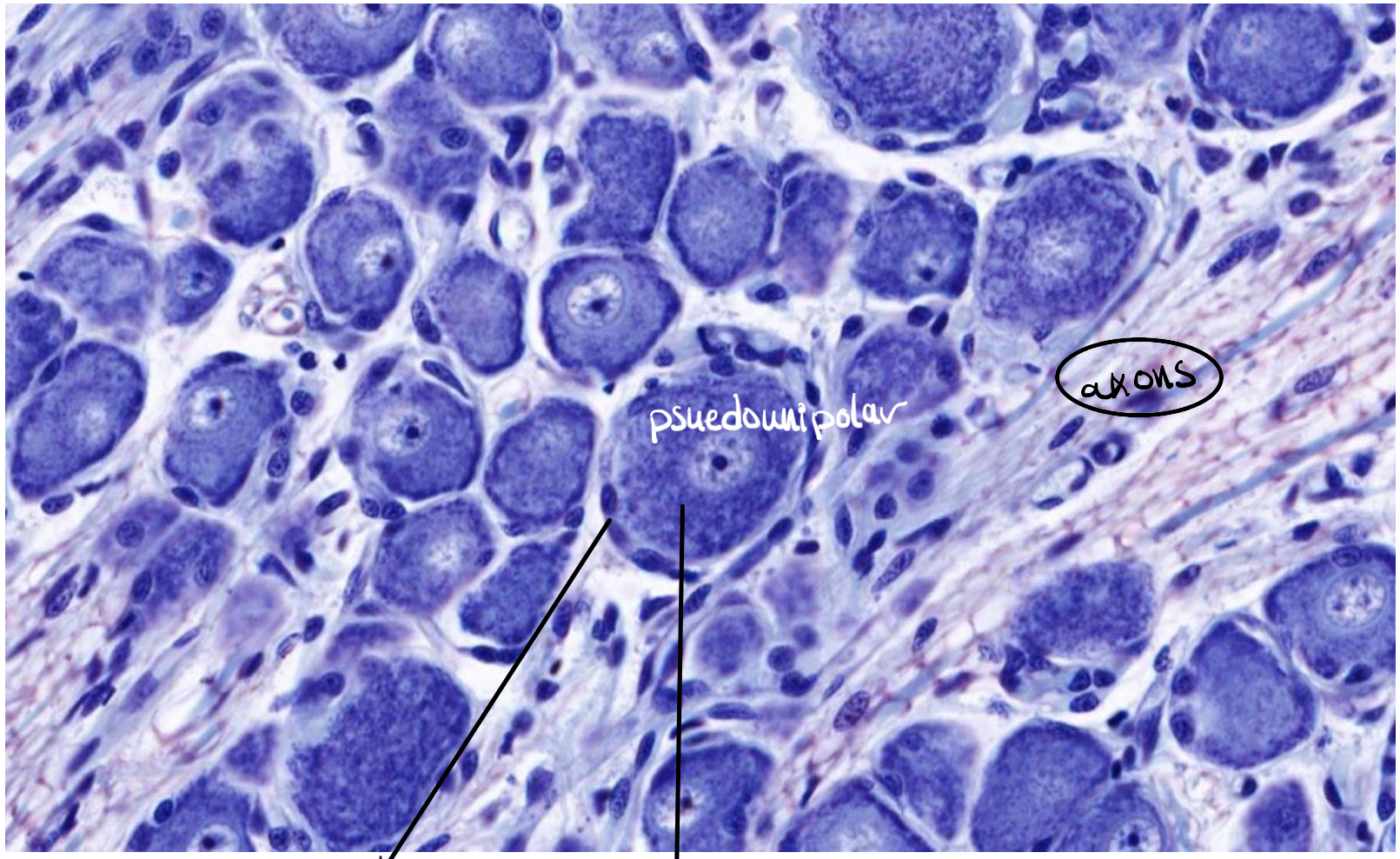


Dorsal root ganglia

Even in low magnification we can recognize neurons because they're exceptionally large

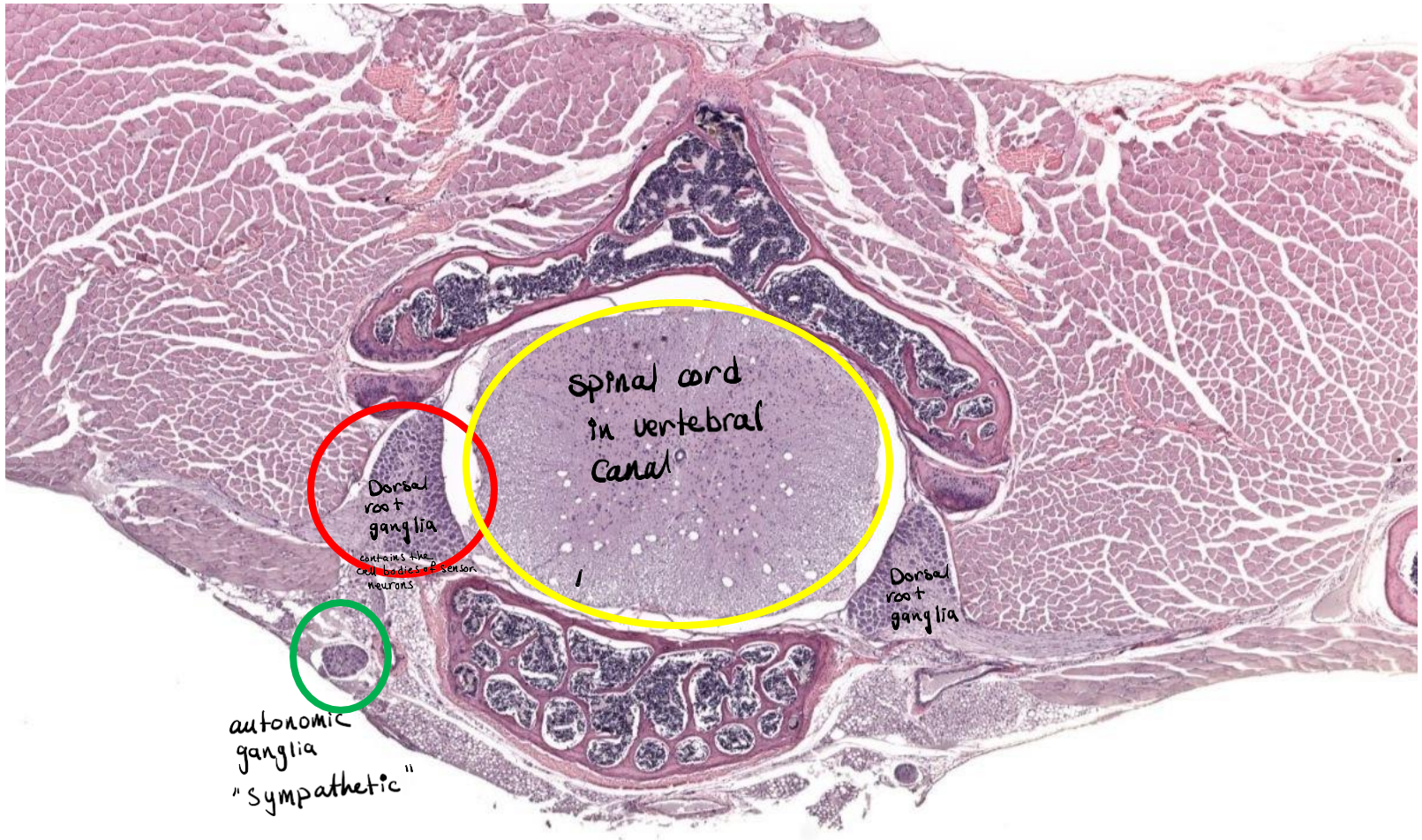
Dorsal root ganglia

Higher magnification

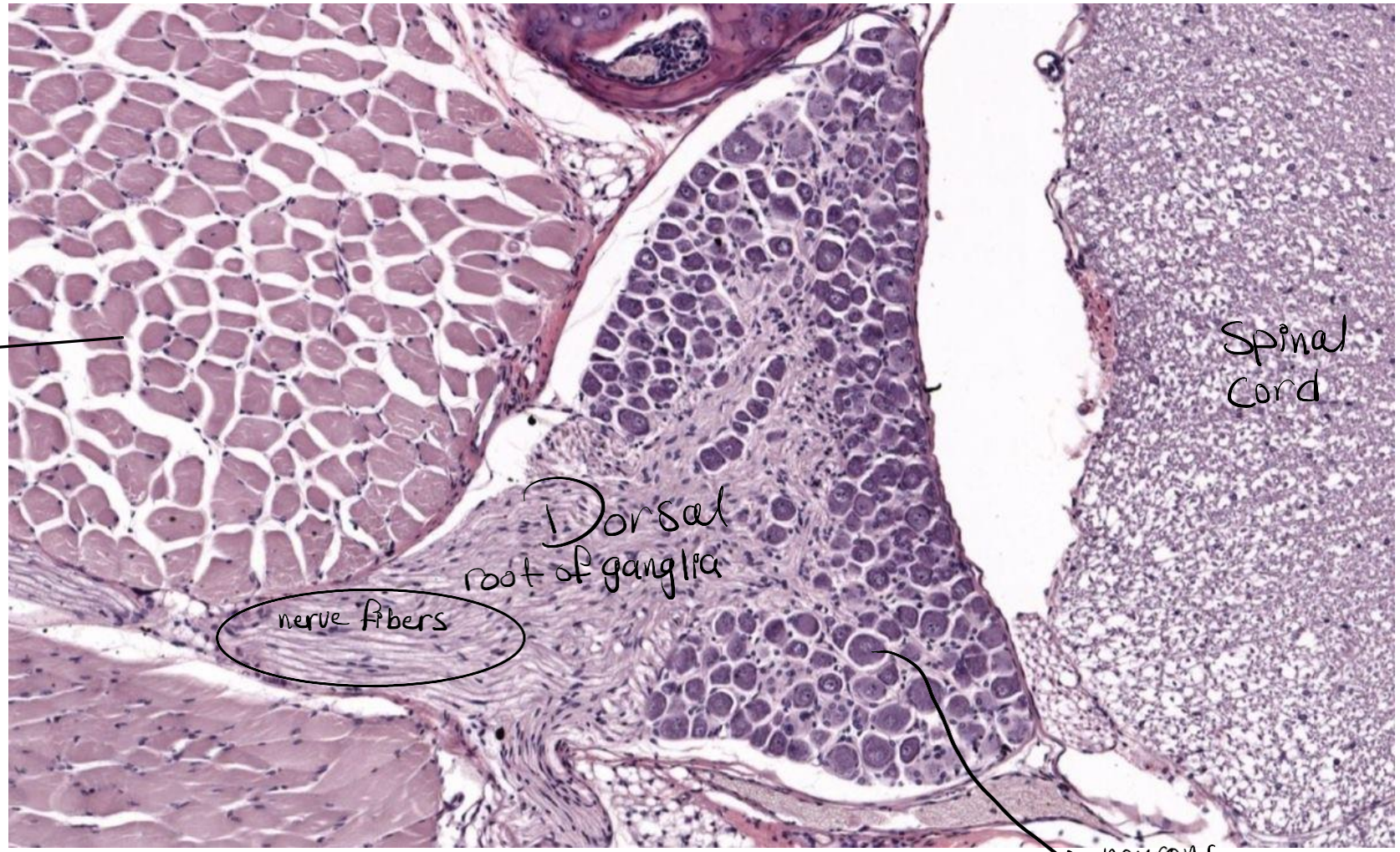


Section through vertebrae

Spinal cord



The image is a histological section showing the relationship between muscle tissue, sensory neurons in the dorsal root ganglion, and the spinal cord.



Autonomic ganglia

with it's C.T covering

post ganglionic sympathetic neurons

recall...

⇒ preganglionic cells are located at spinal cord

→ psuedounipolar neurons

⇒ post ganglionic cells are located outside

→ multipolar neurons

This version contains histology lab images for nervous tissue, with explanations from the in-person lecture. Please review it briefly to catch any additional info not mentioned in the recorded lecture, including comments on images from the theoretical file.

Good luck,
NST

For any feedback, scan the code or click on it.

Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			Mentioned in the last slide
V1 → V2			

رسالة من الفريق العلمي:

عن جابر رضي الله عنه أن رسول الله صلى الله عليه وسلم
قال: **يا أهل القرآن أوتروا فإن الله وتر يحب الوتر**

فيديو قصير عن فضل صلاة الوتر :

صلاة الوتر

اختم يومك بصلاة الوتر