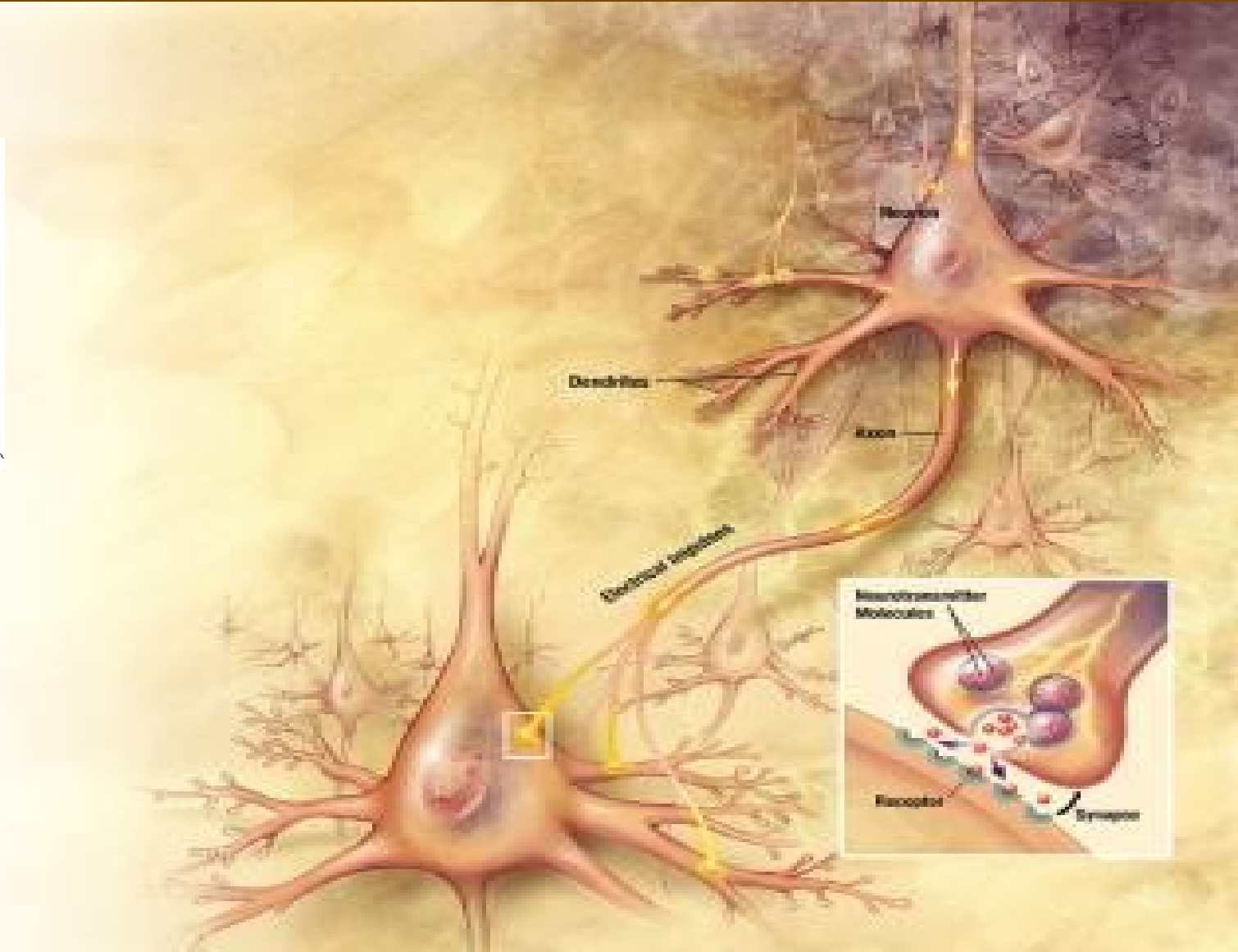
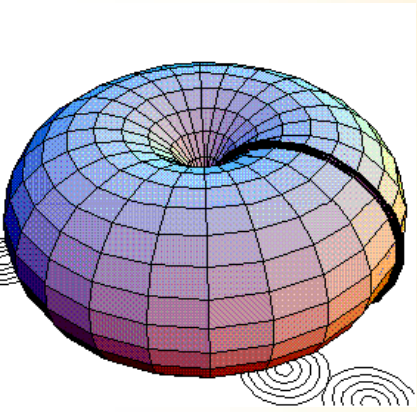


# Nervová tkáň



# Obecné vlastnosti nervové tkáně a její složky

dráždivost a vodivost přivedena k absolutní dokonalosti

původ: ektoderm

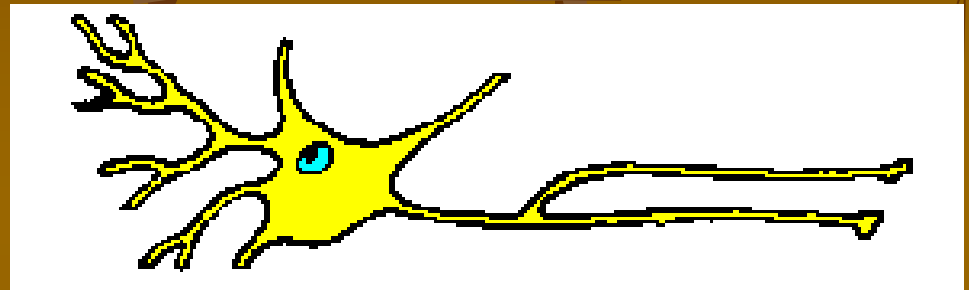
funkce: nervová regulace

- přesná analýza změn
- rychlý převod informace do ústředí
- cílená a místně diferencovaná odpověď

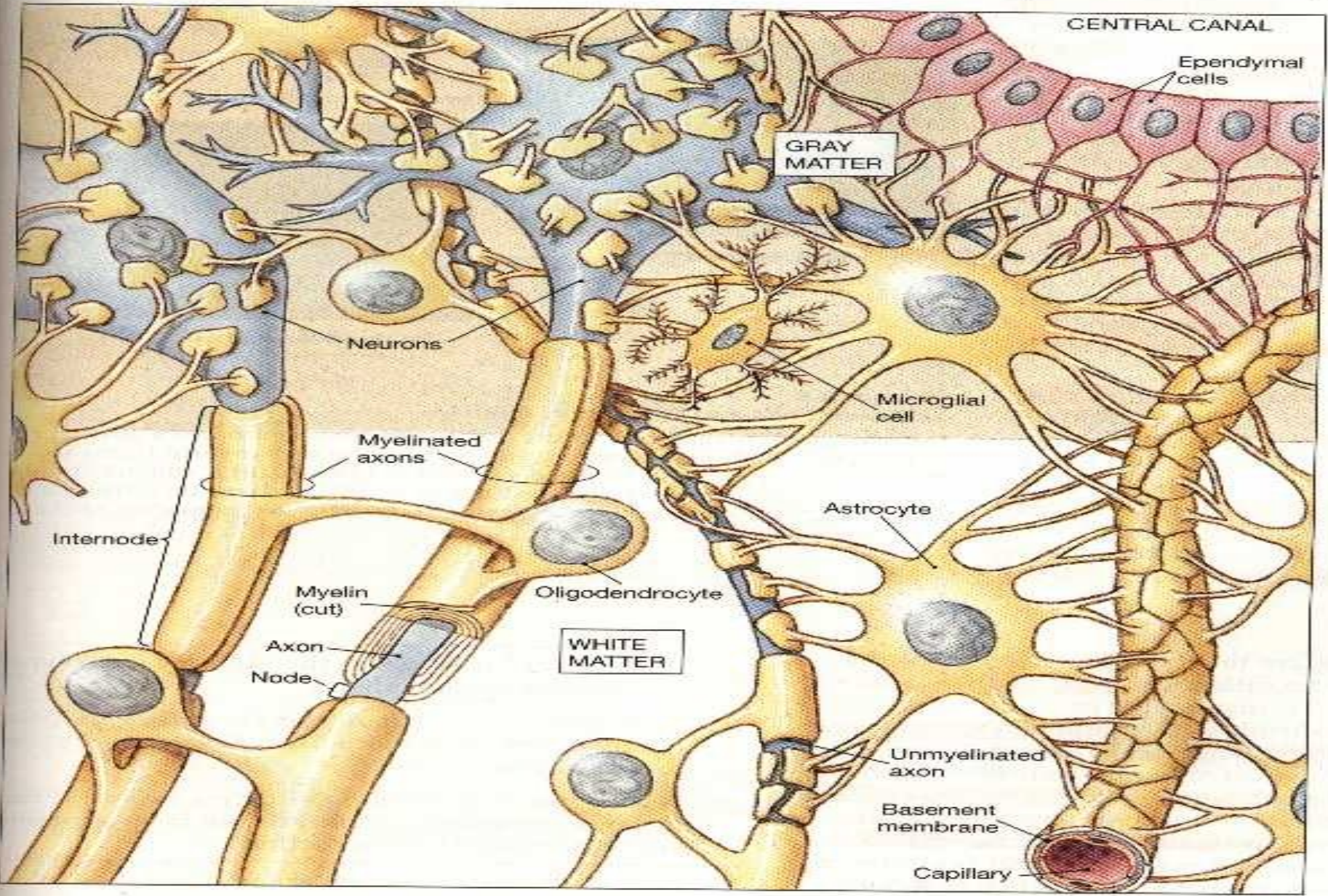
Složení: **neurony a neuroglie** (buňky podpůrné)

**CNS + PNS**

**šedá + bílá hmota v CNS**



NS – struktura:  
Neurony + gliové buňky



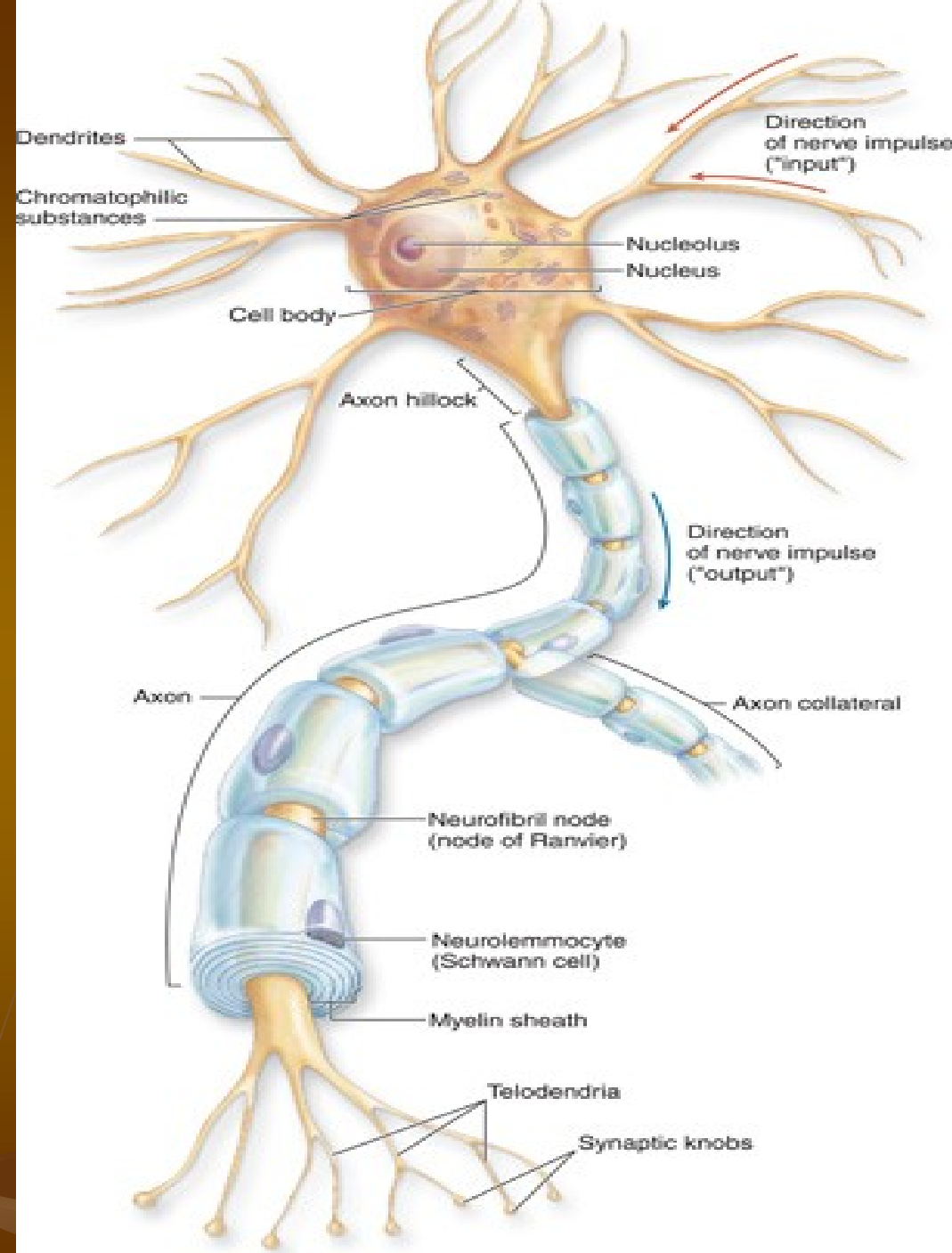
# Neuron

Perikaryon (tělo)

Dendrit(y)

Axon – pouze 1  
odstupový konus  
(axonový hrbol)

Telodendrie

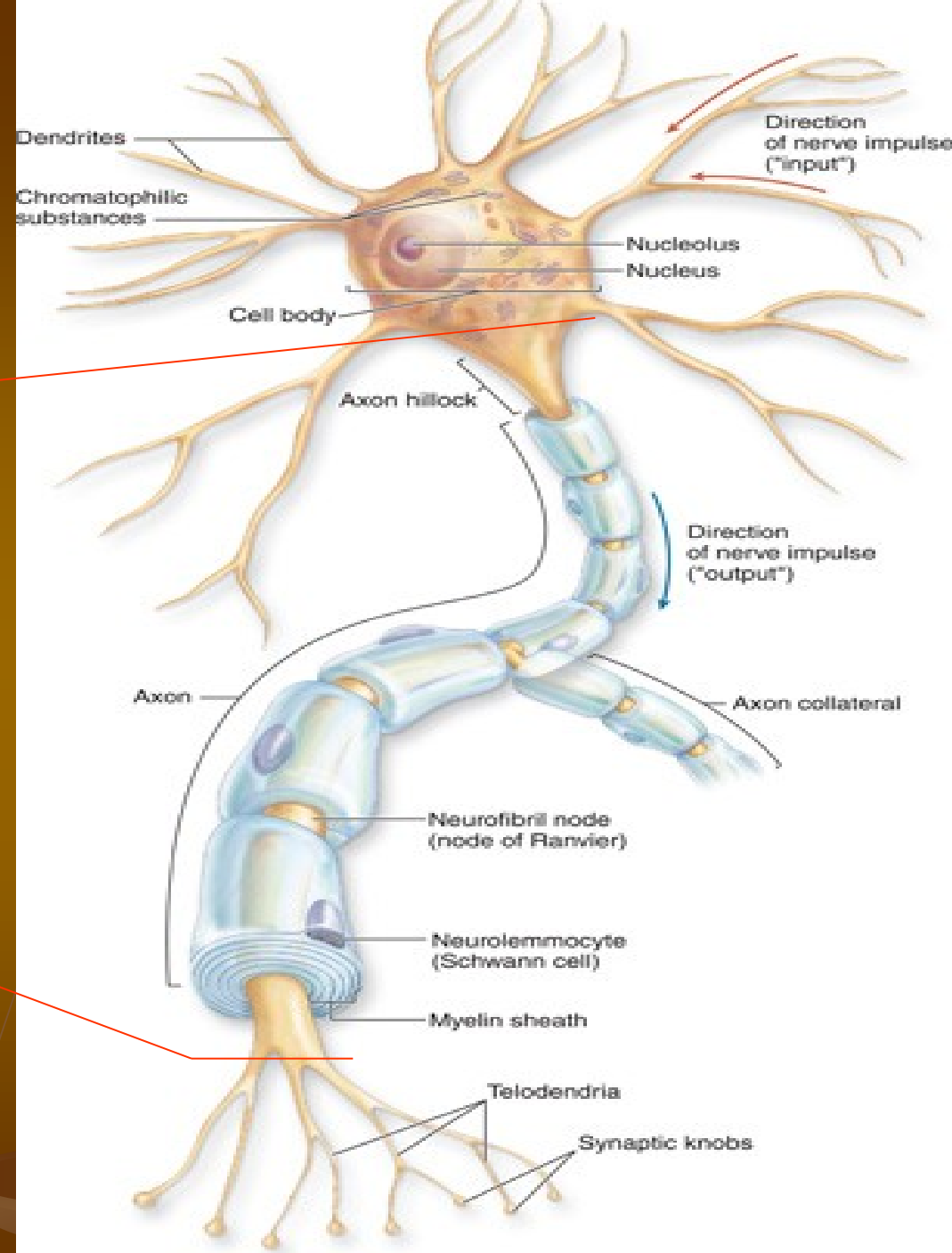


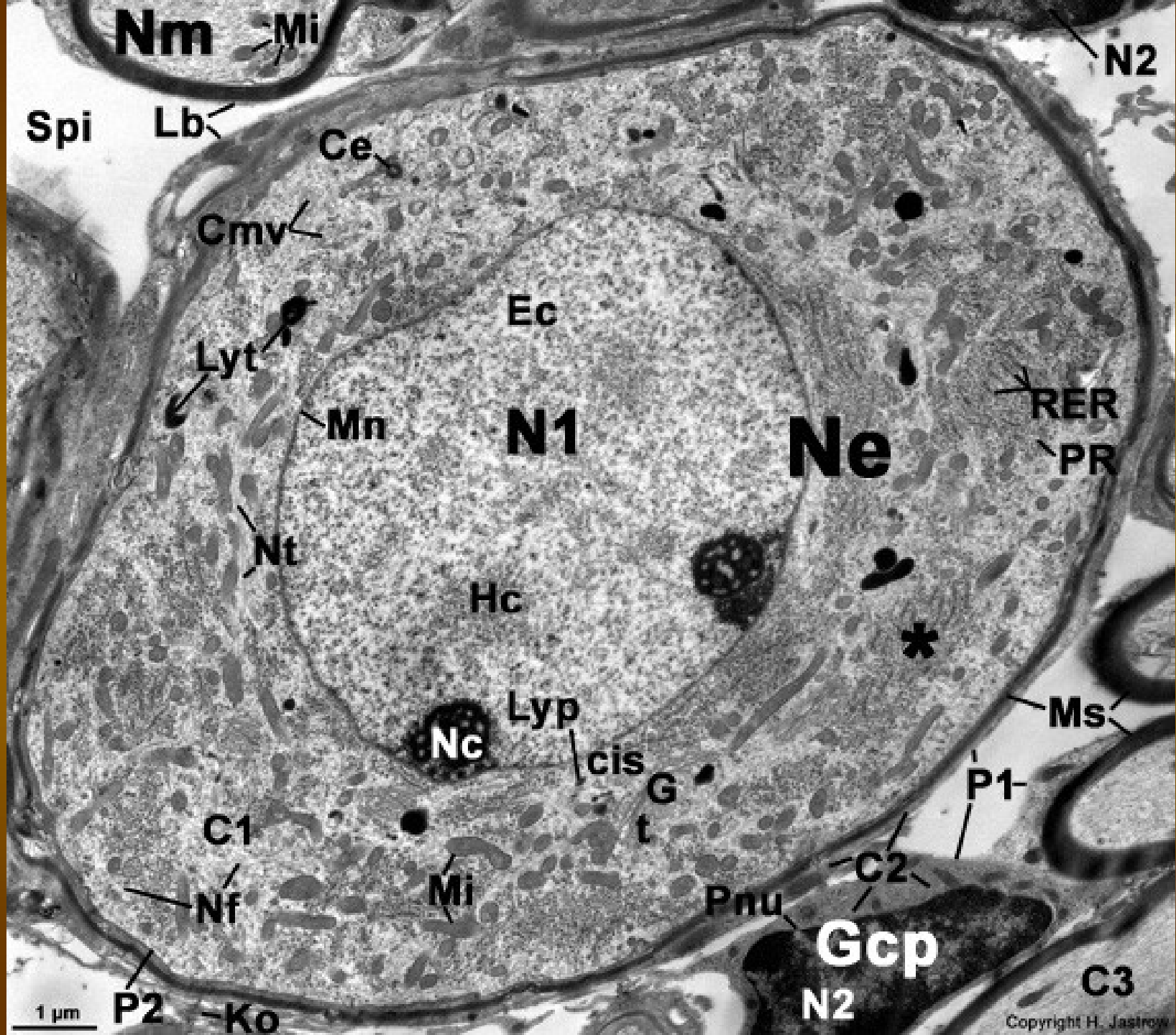
# ČÁSTI NEURONU

Recepční oddíl

Transmisní oddíl

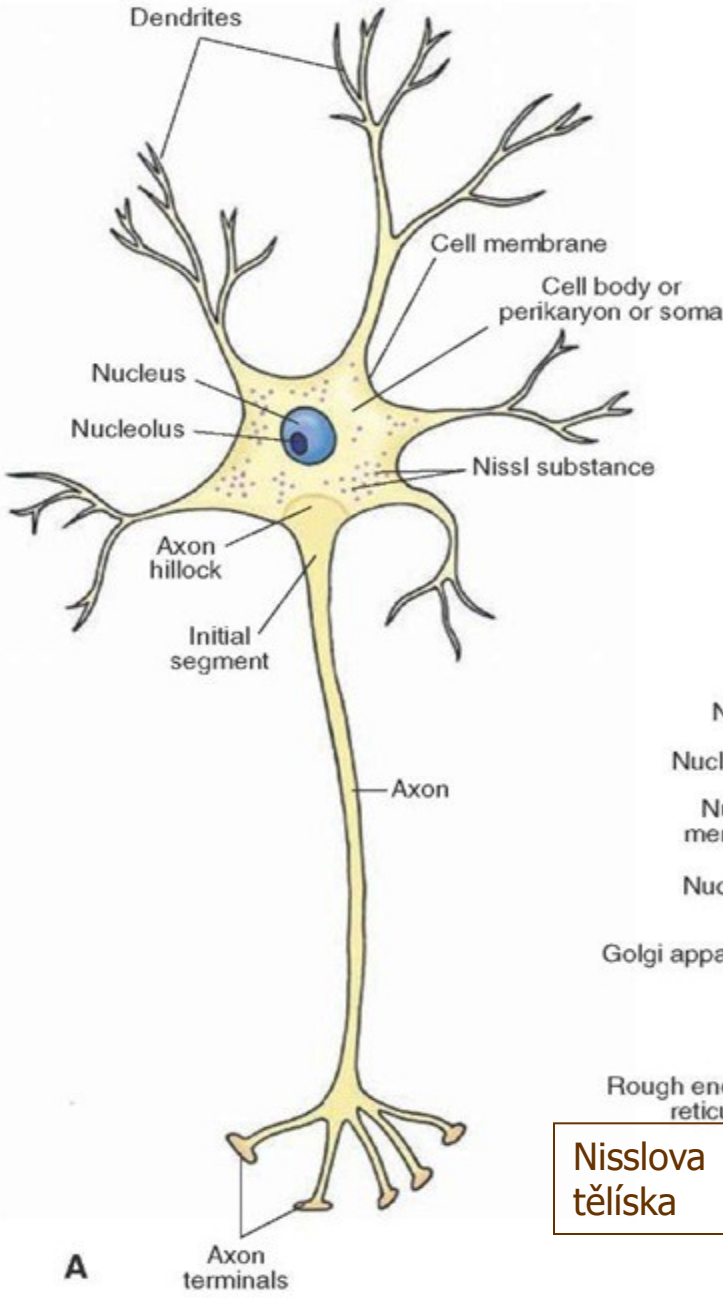
Sekreční oddíl





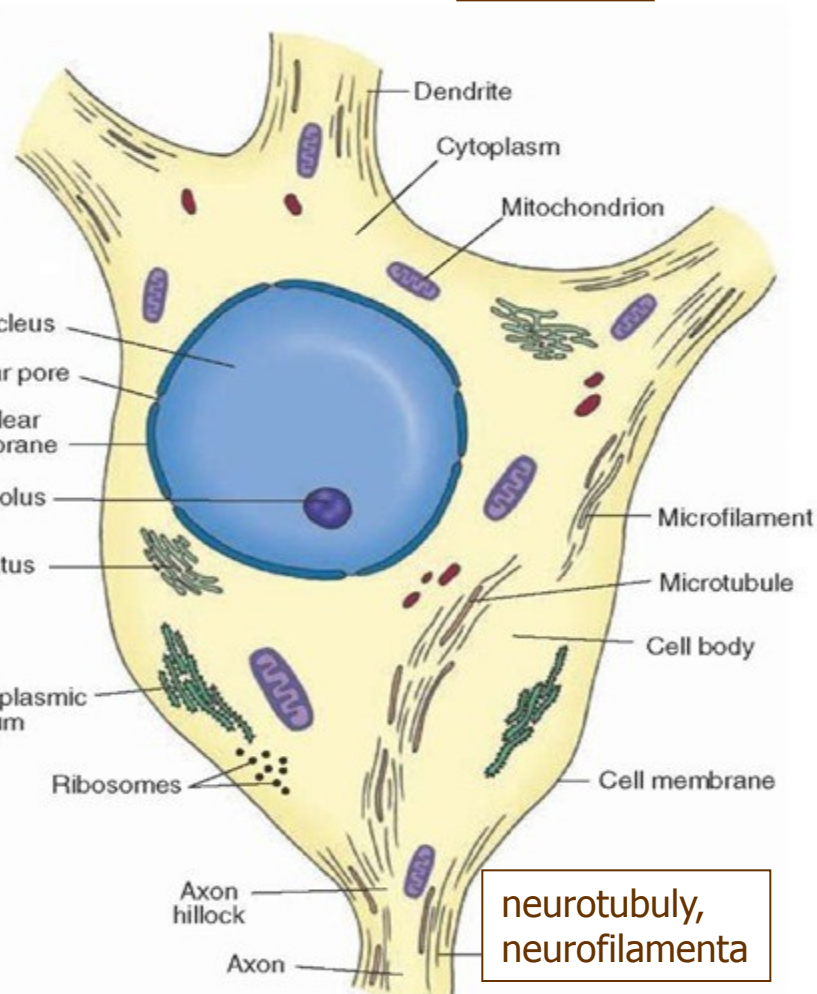
# NEURON

4 – 100  $\mu\text{m}$   $\varnothing$



lipofuscin

Nisslova tělíska

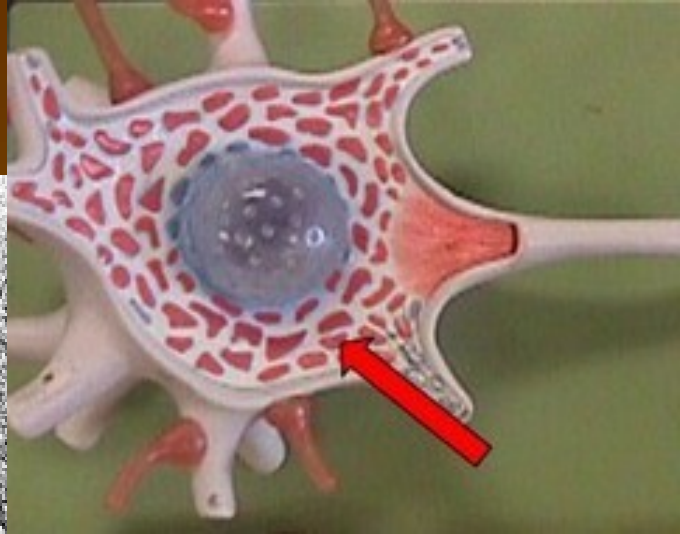
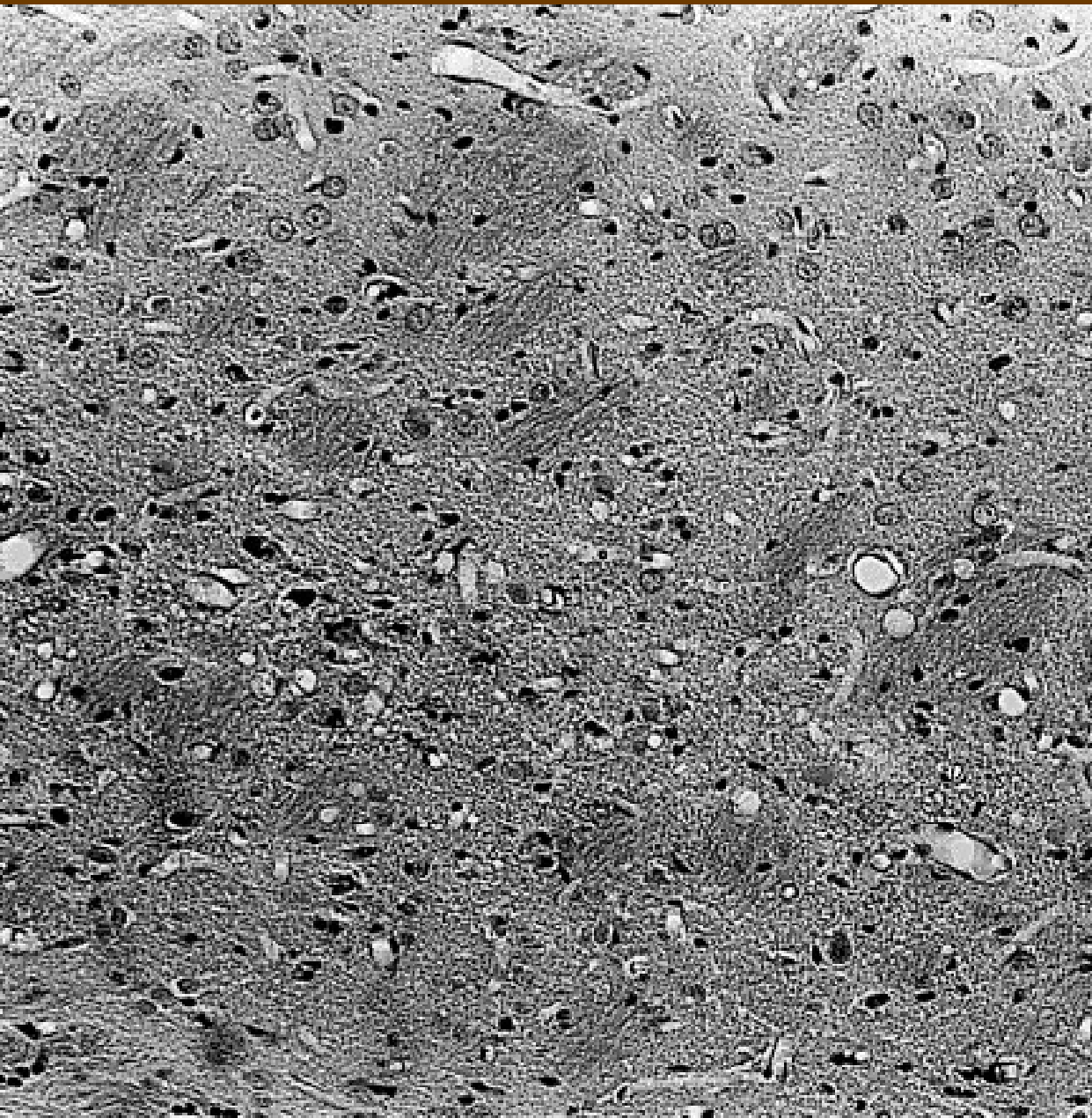


neurotubuly, neurofilamenta

A

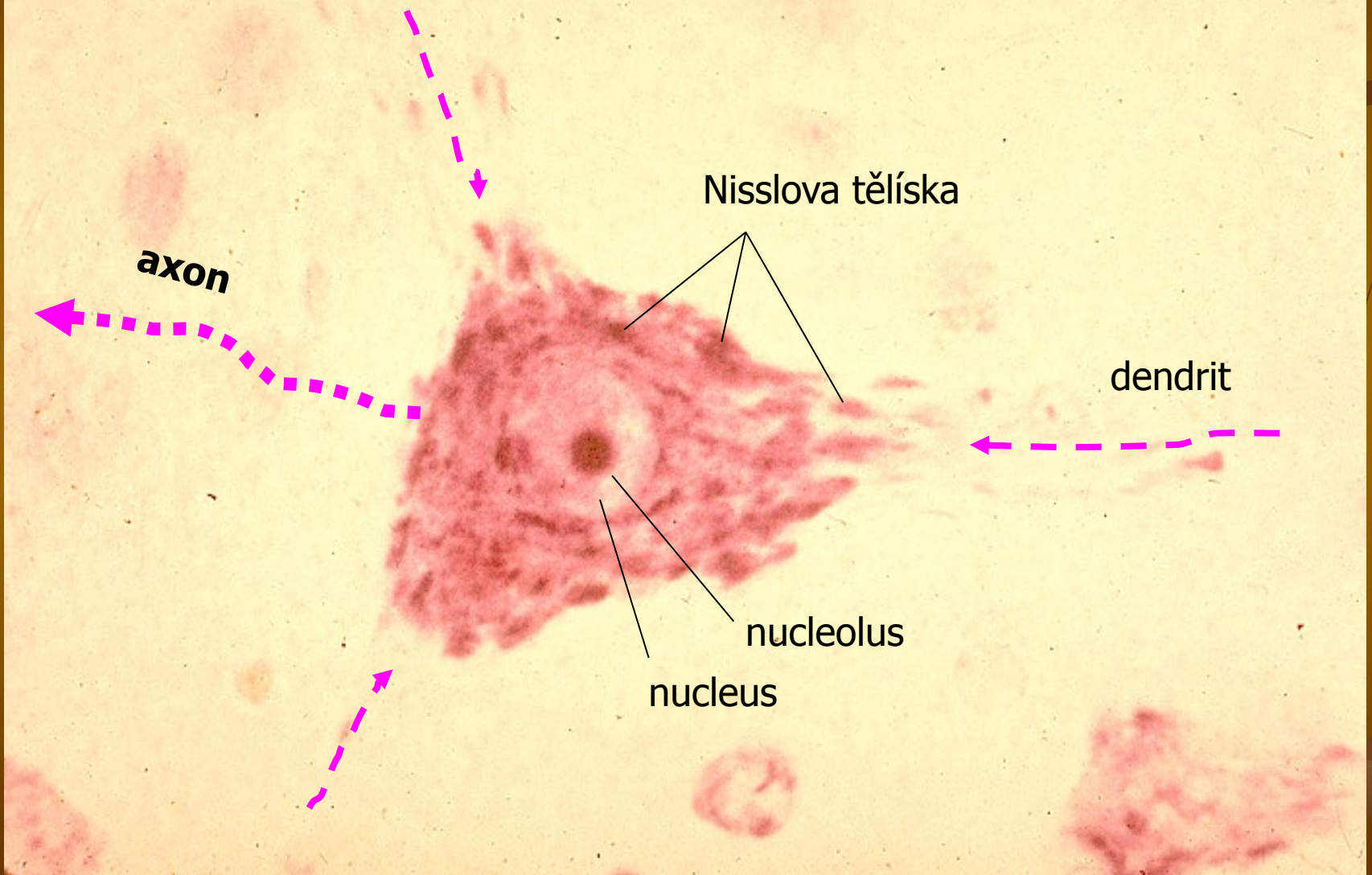
B

# Nisslova tělíska (substance)

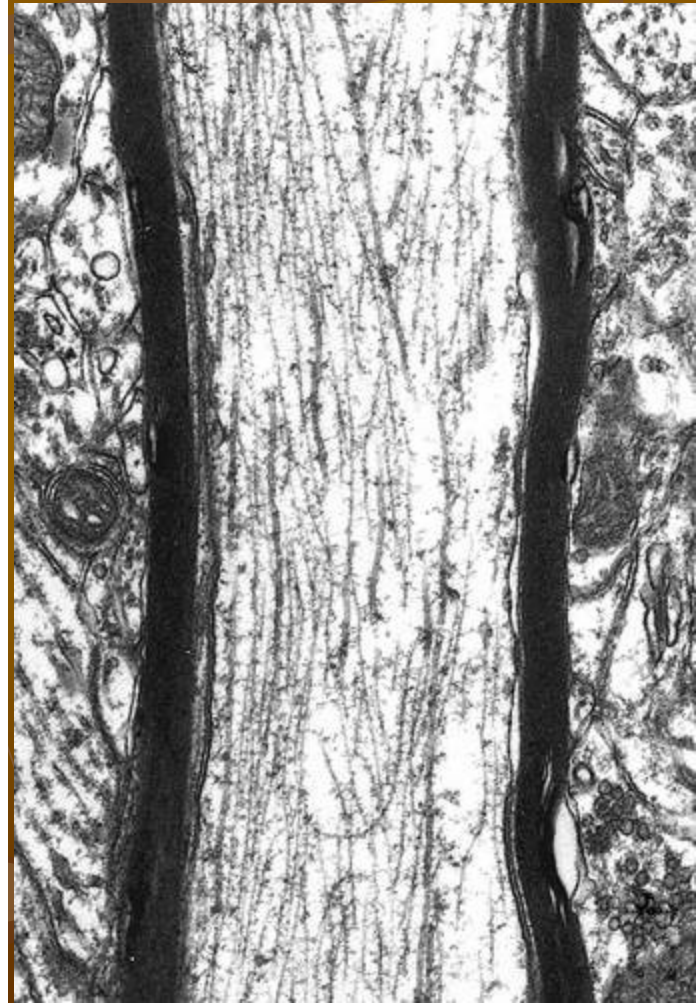
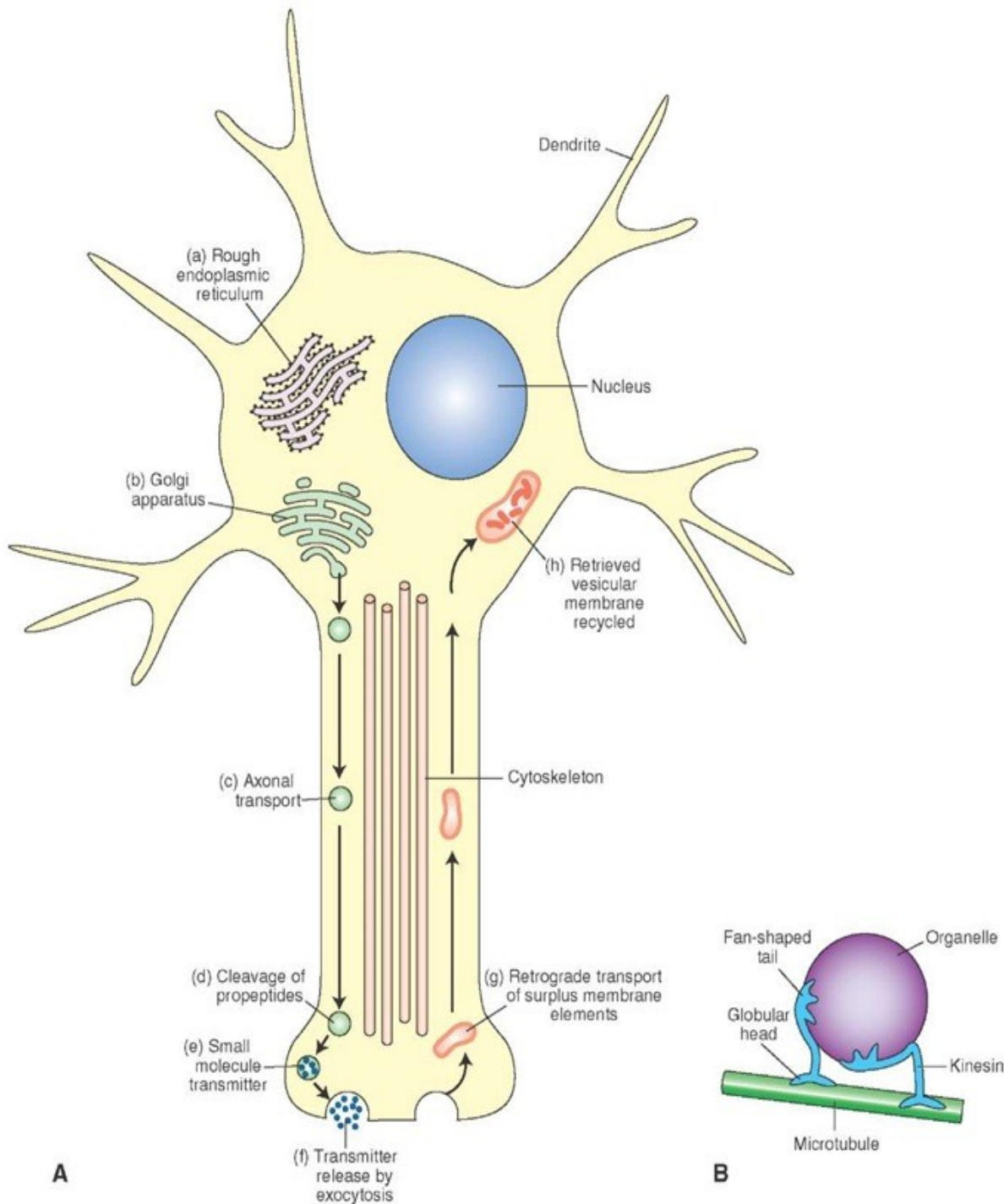




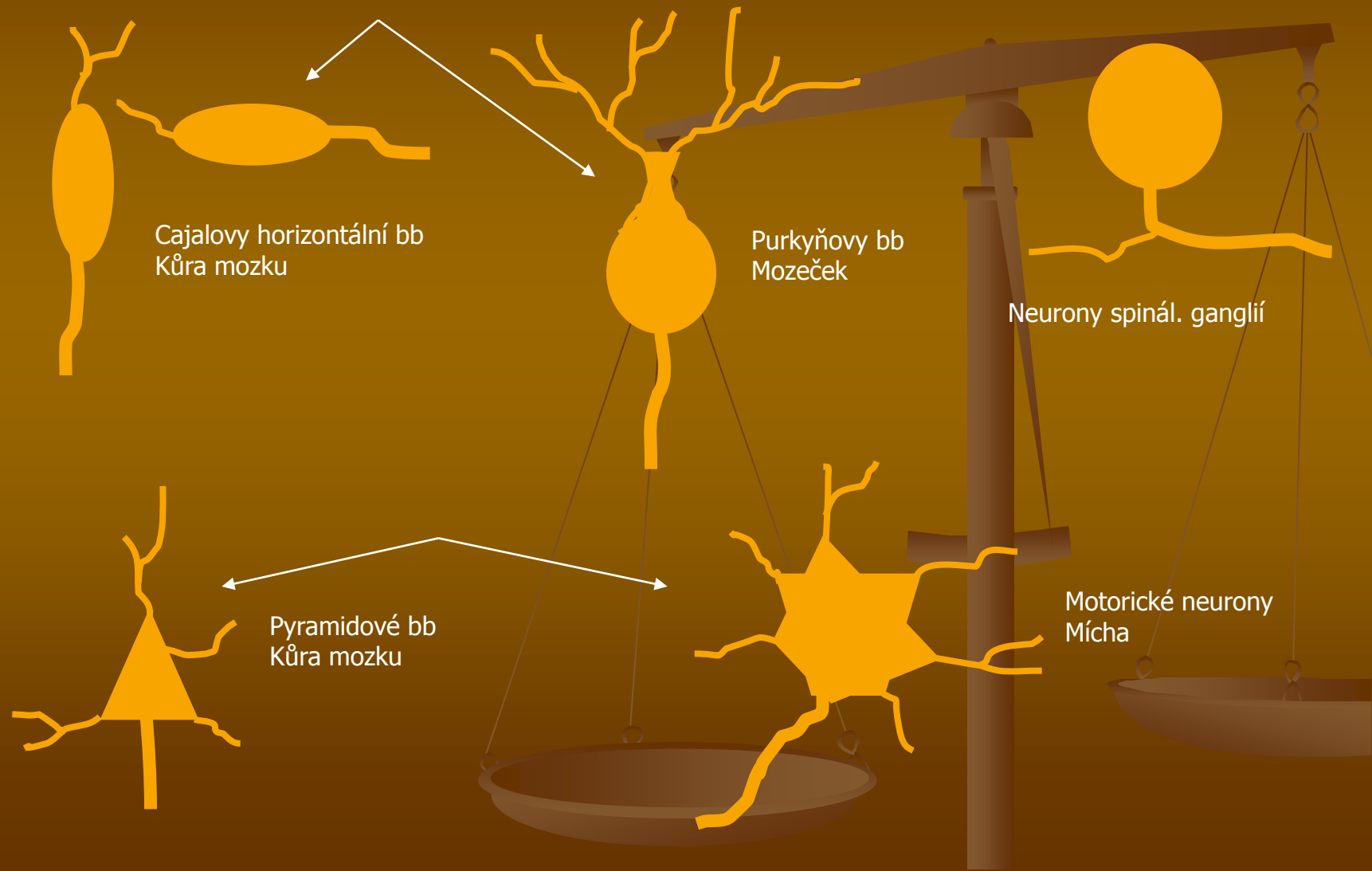
△ perikaryon (pyramidová buňka z cortex cerebri)

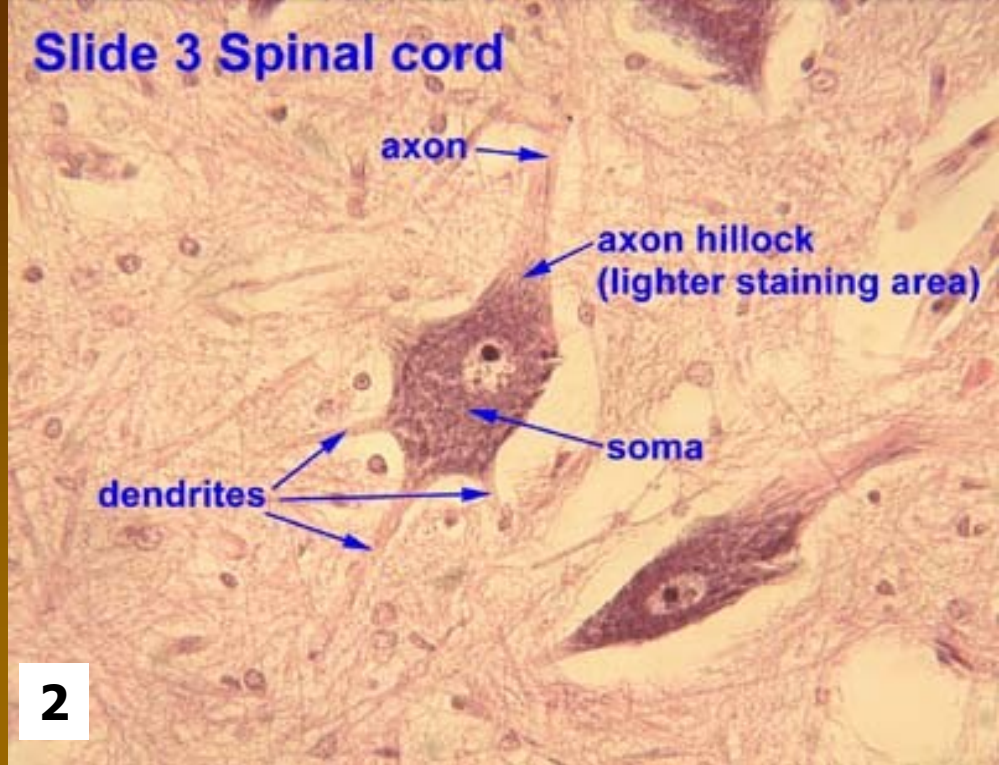
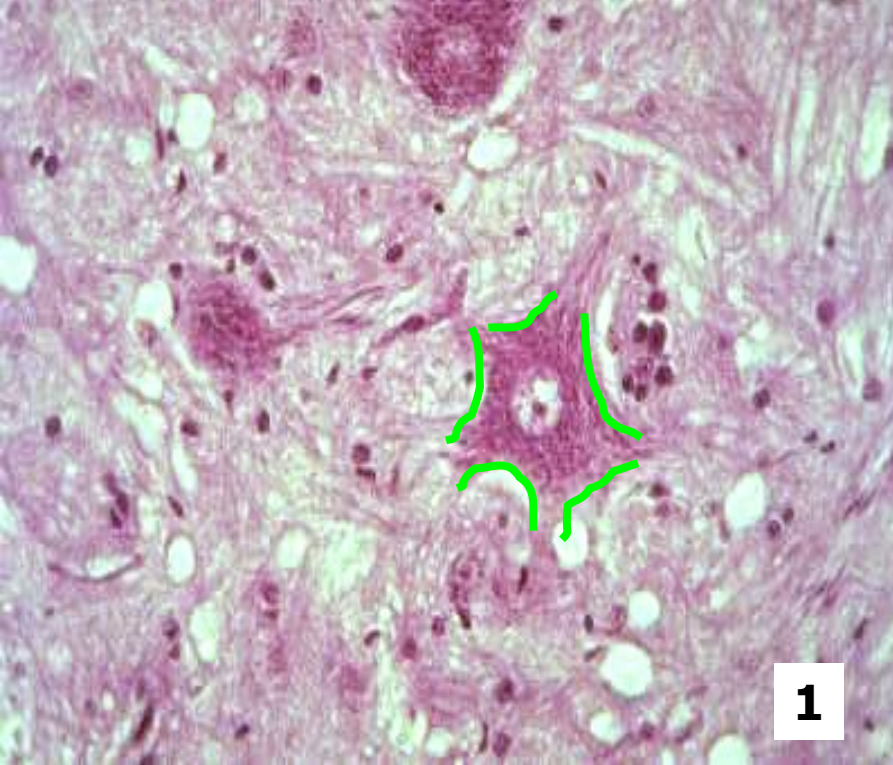


# neurotubuly neurofilamenta

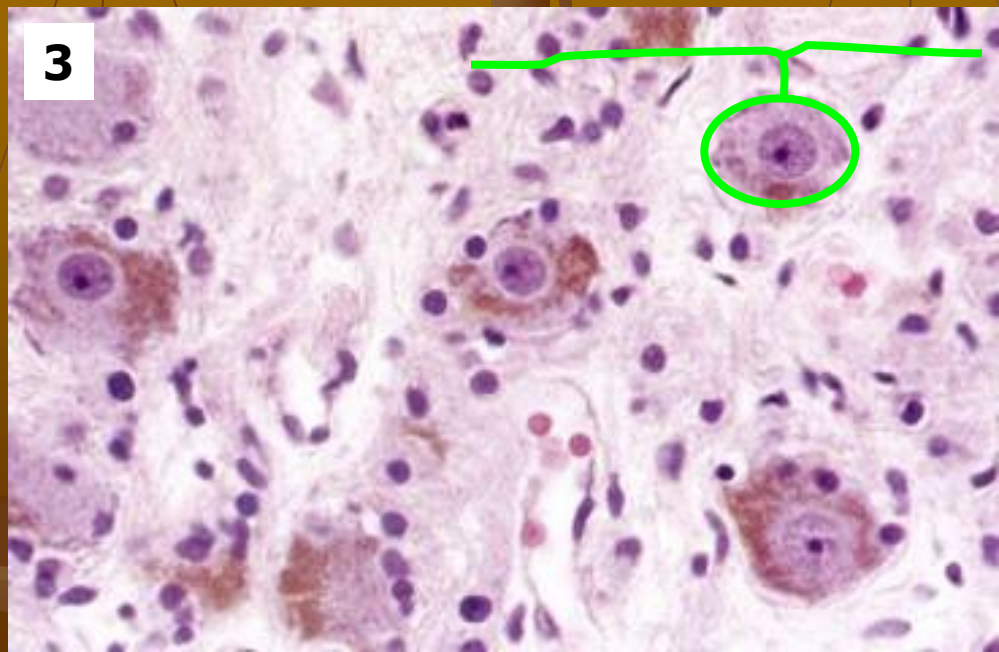


# Tvar perikarya



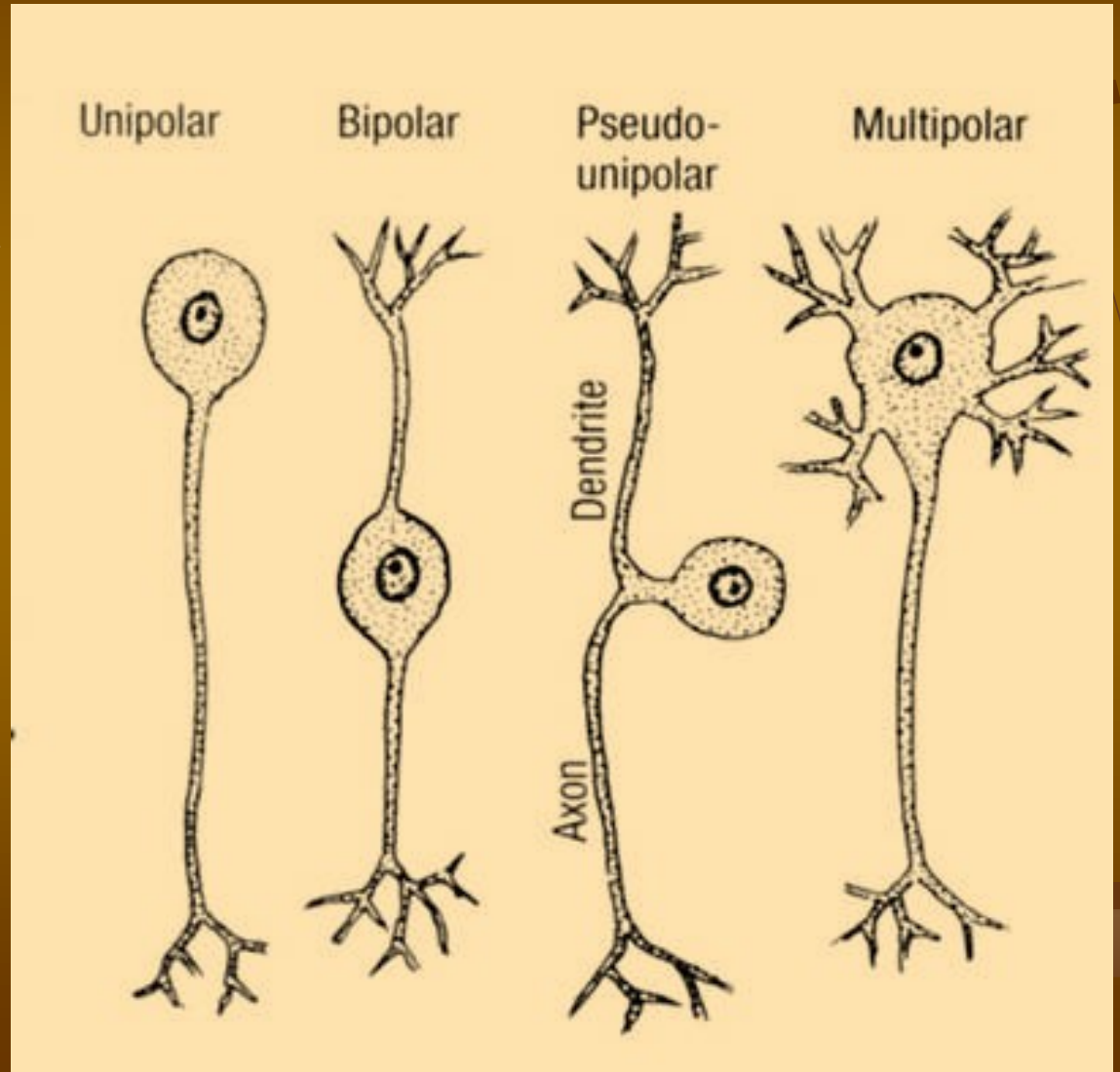


**1, 2** – multipolár. neurony: Nisslova tělíska  
**3** – pseudounipolár. neurony: lipofuscin



# Klasifikace neuronů (dle počtu výběžků)

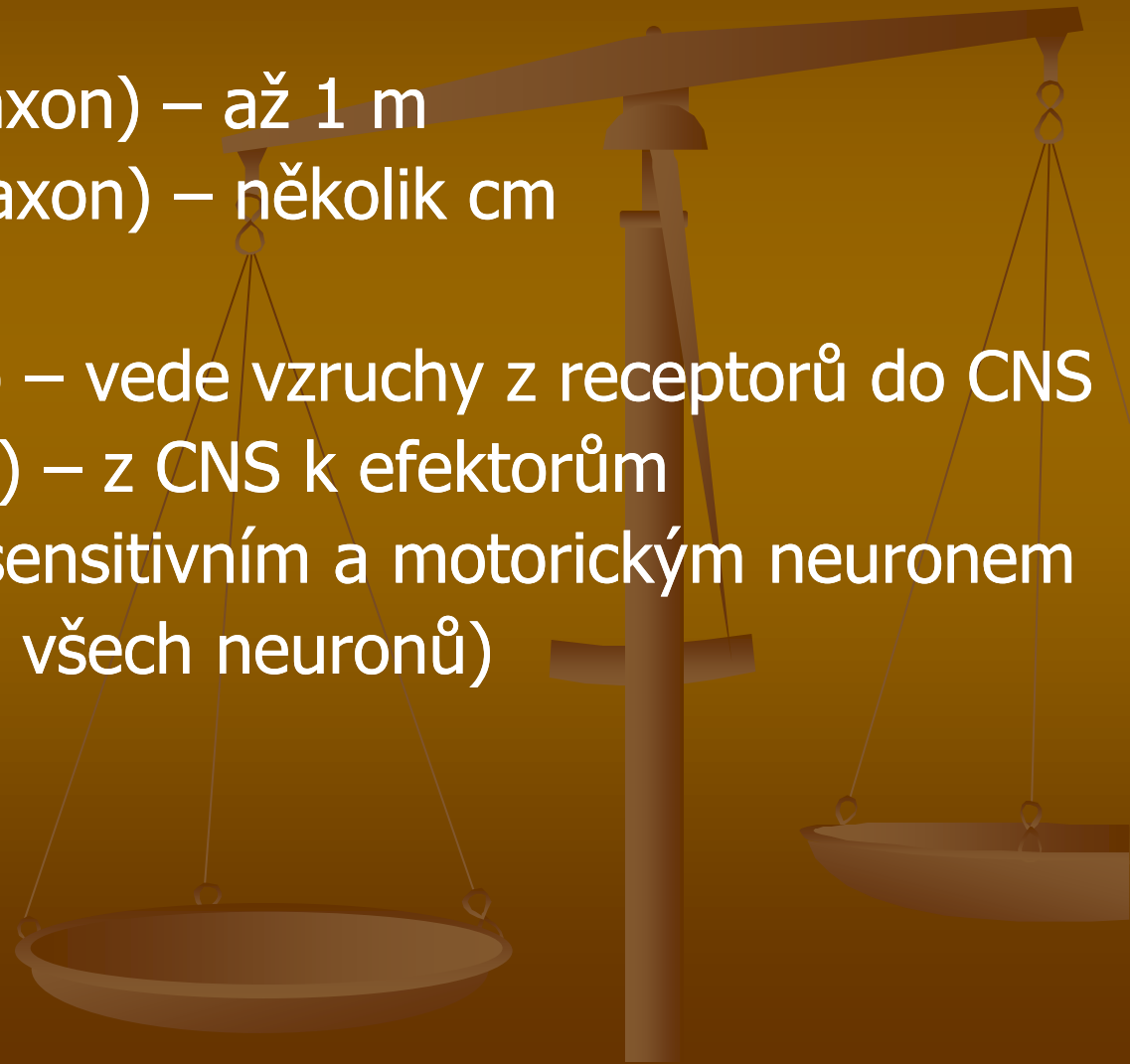
- Unipolární
- Bipolární
- Pseudounipolární
- Multipolární
- (Amakrinní)



# Další dělení neuronů

(podle ...)

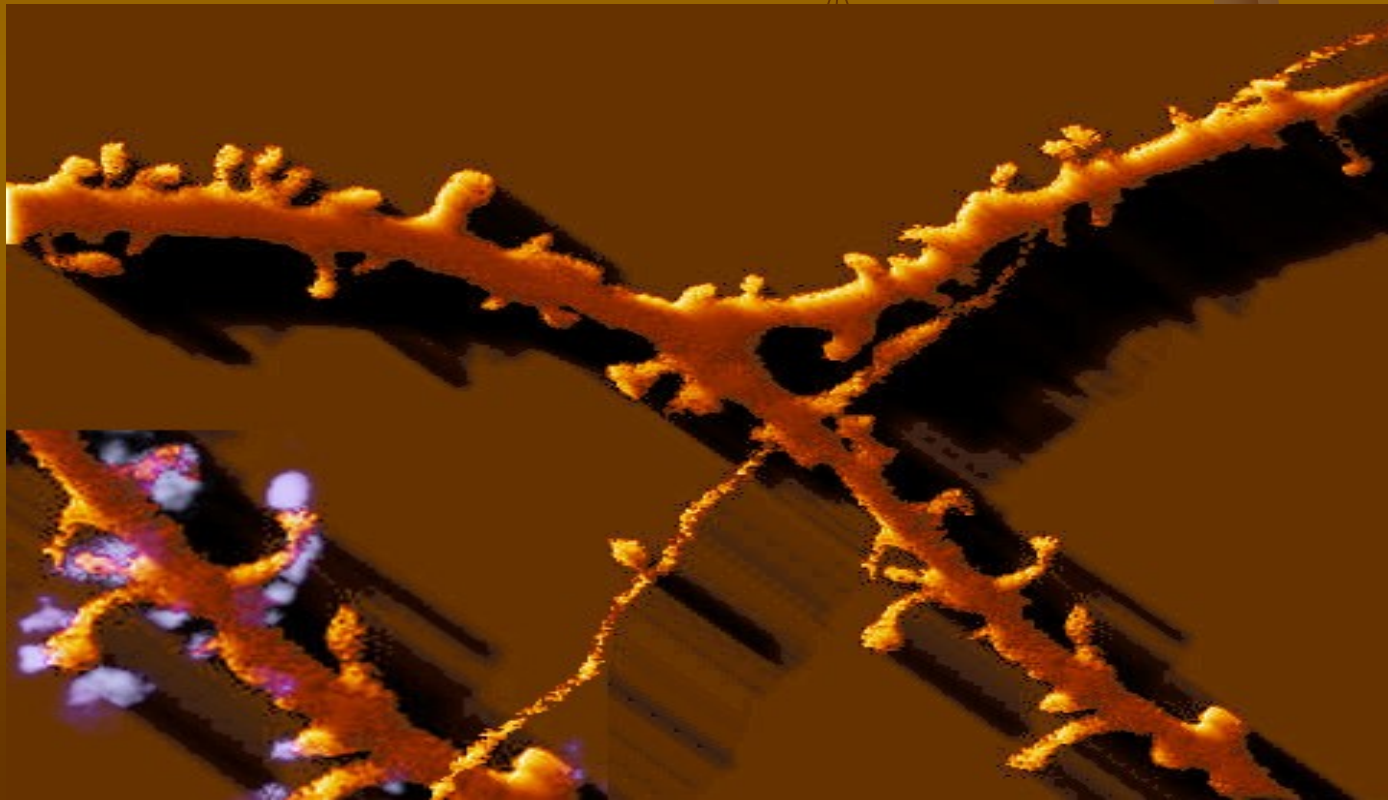
- délky axonu:
  - Golgi typ I (dlouhý axon) – až 1 m
  - Golgi typ II (krátký axon) – několik cm
- funkce:
  - senzitivní (aferentní) – vede vzruchy z receptorů do CNS
  - motorický (eferentní) – z CNS k efektorům
  - interneuron – mezi senzitivním a motorickým neuronem (97 % všech neuronů)



# Dendrity

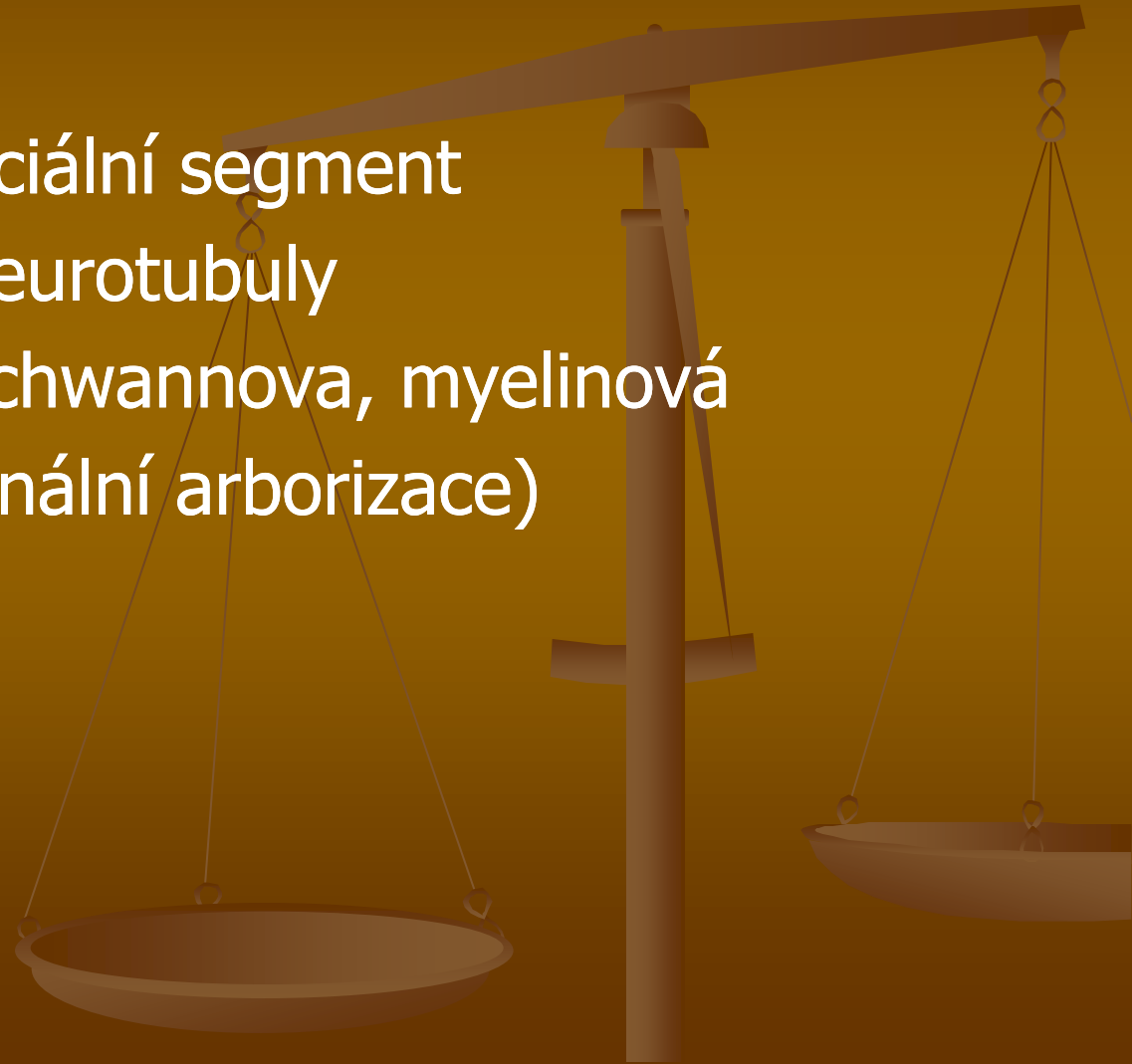
(ř. *dendron*, “strom”)

- krátké, větvené výběžky cytoplazmy,
- centripetální
- **dendritické trny** (součást synapsí)



# Axon (neurit)

- dlouhý, hladký, jen oj. kolaterály
- centrifugální
- axonový hrbol, iniciální segment
- neurofilamenta, neurotubuly
- obaly (pochvy): Schwannova, myelinová
- telodendrie (terminální arborizace)





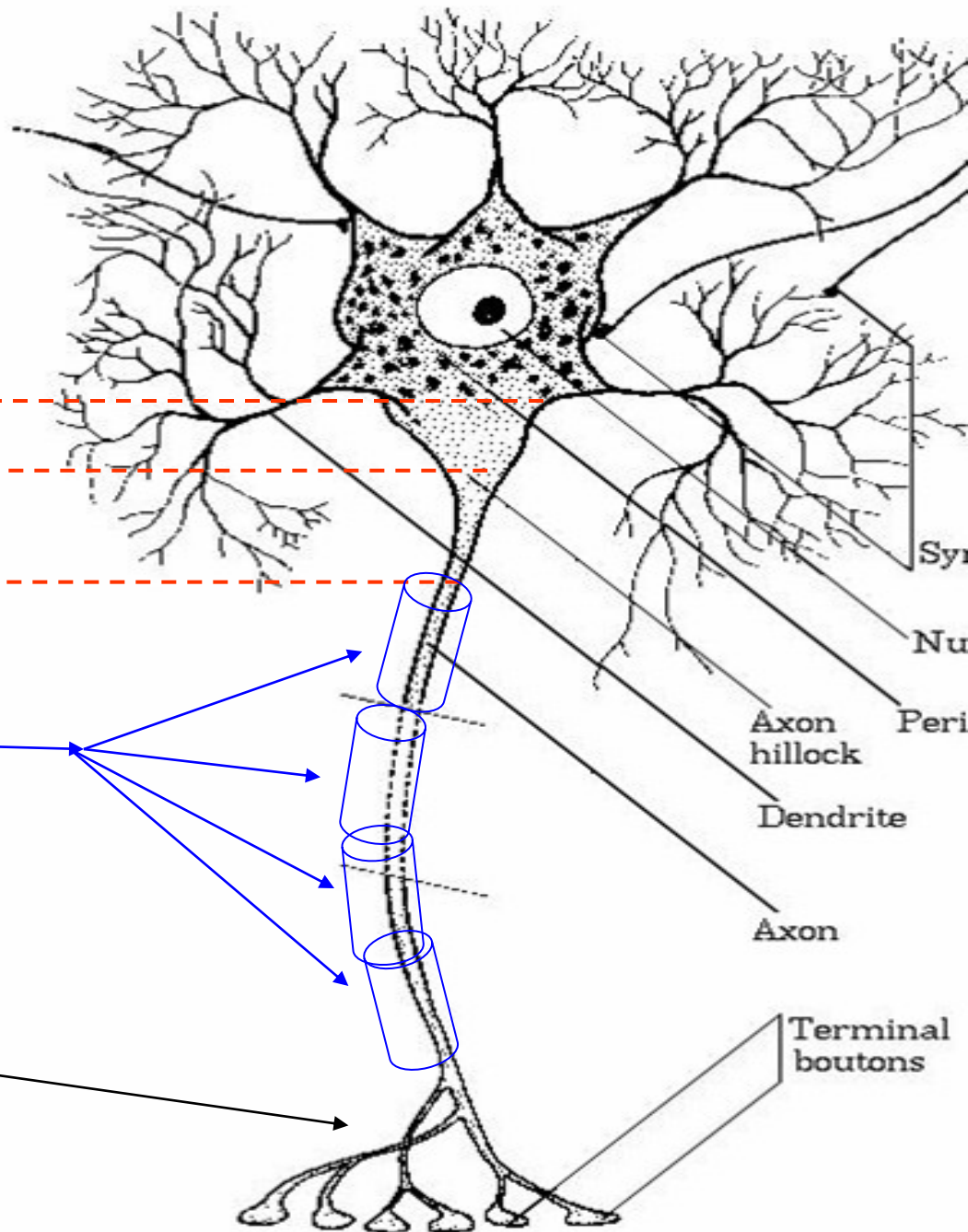
# STAVBA AXONU

Axonový hrbol

Iniciální segment

Schwannovy bb

Axonterminály (telodendrion)

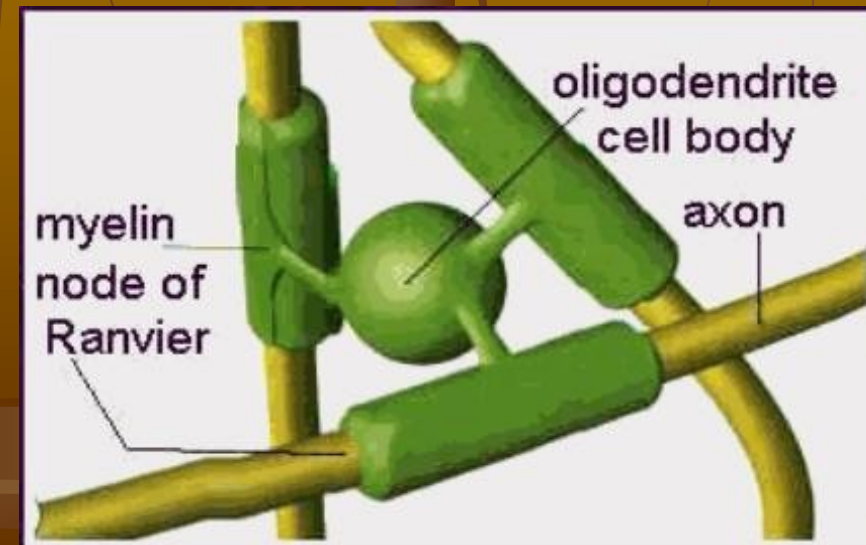
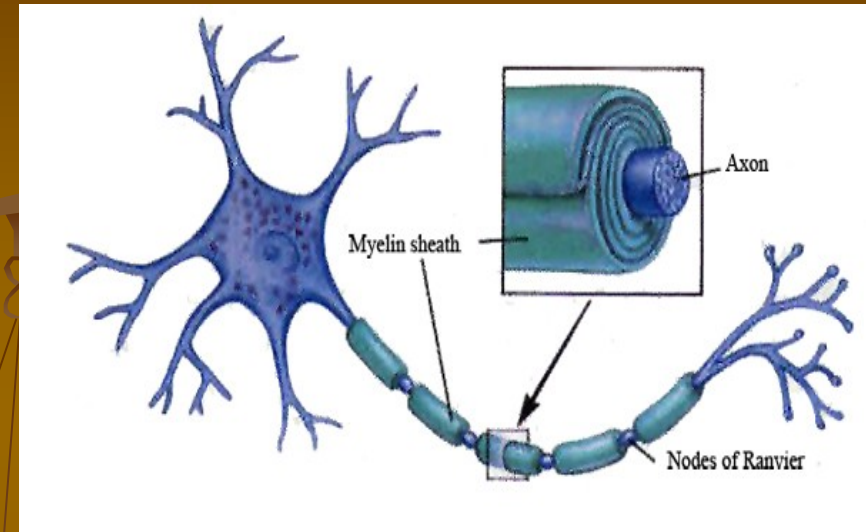


# obaly axonů (neuritů)

**Schwannovy b. (v PNS)**

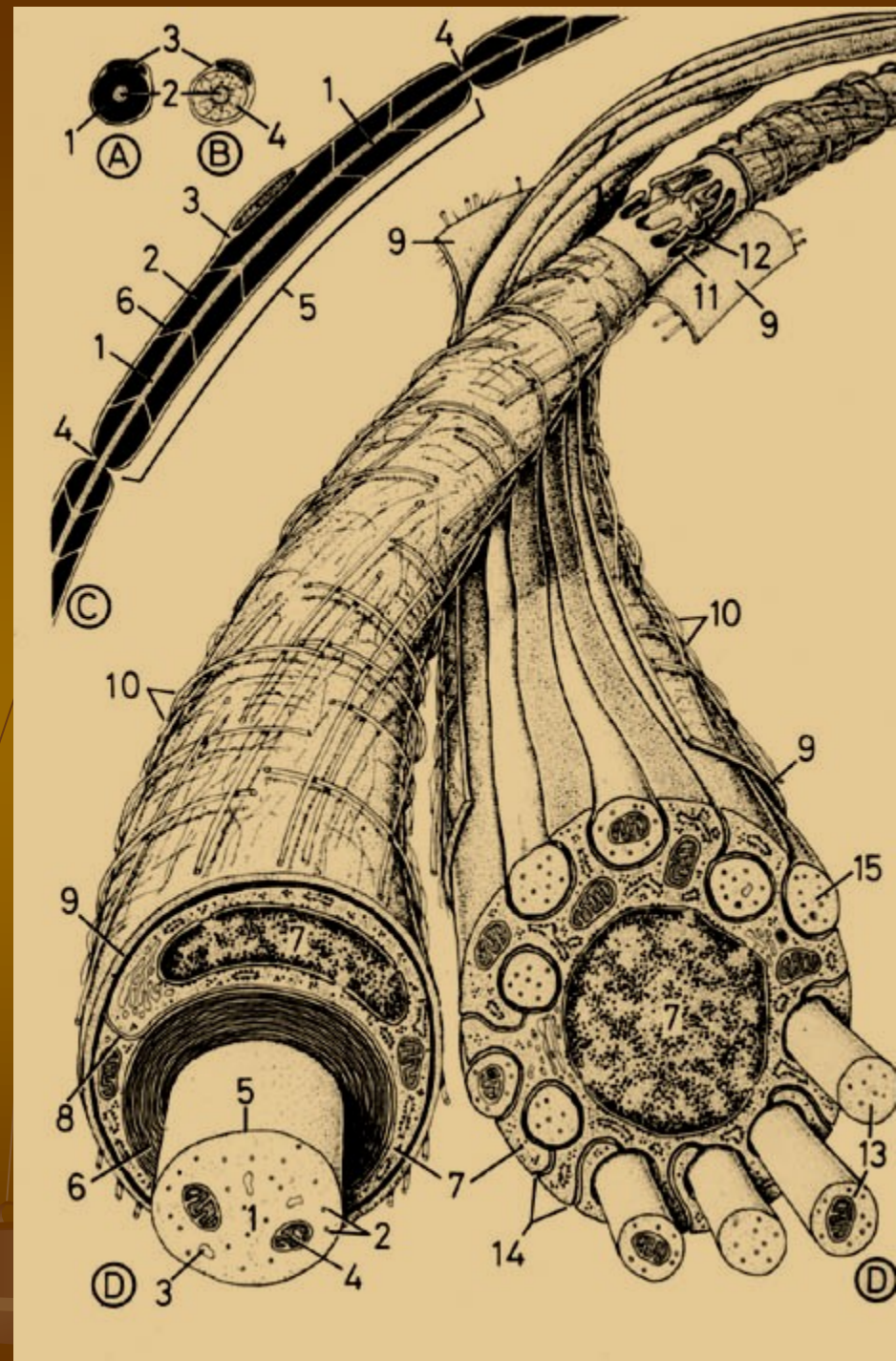
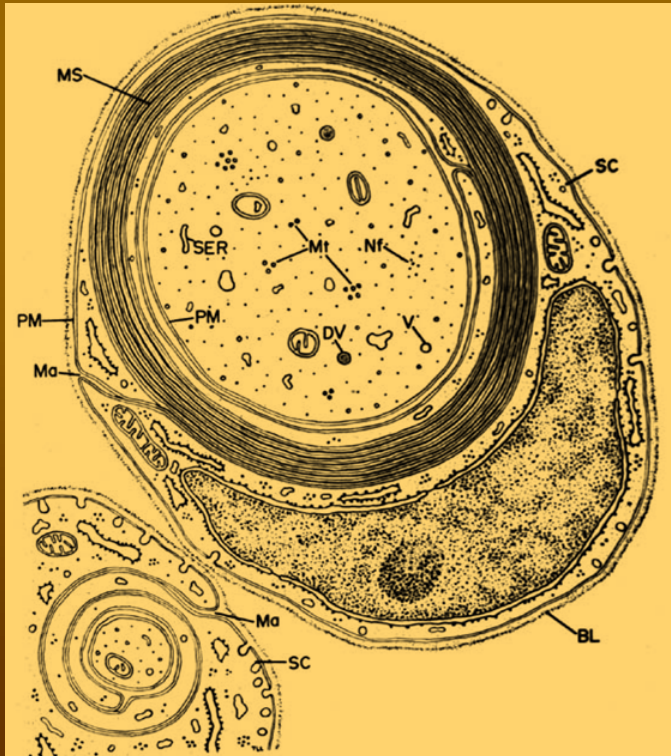
**Myelin**

**Oligodendrocyty (v CNS)**



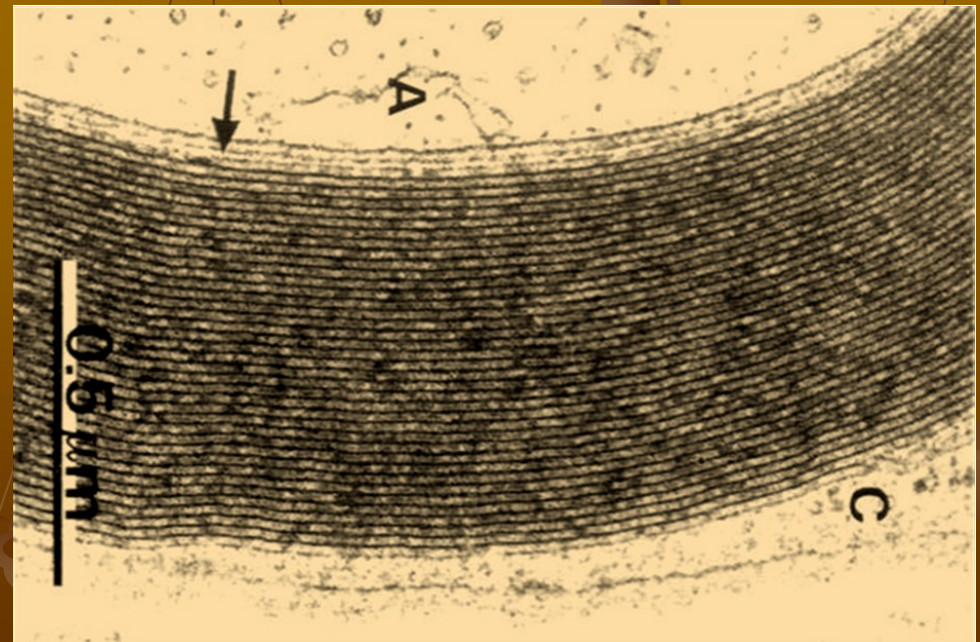
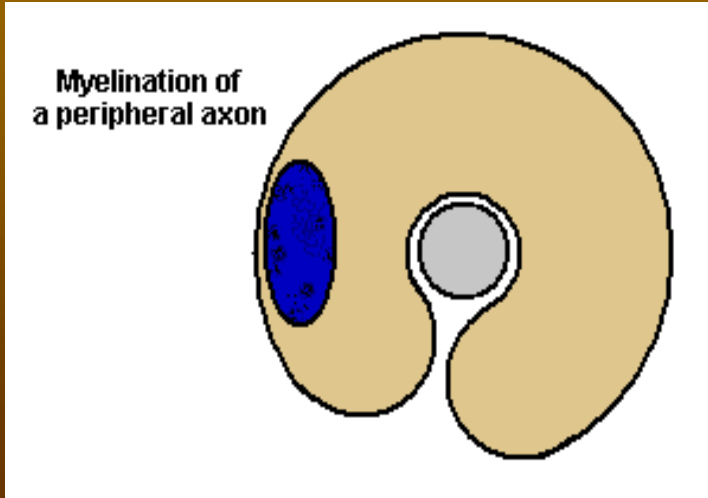
# obaly

- myelinová pochva
- Schwannova pochva (v PNS)
- oligodendrocyty (v CNS)



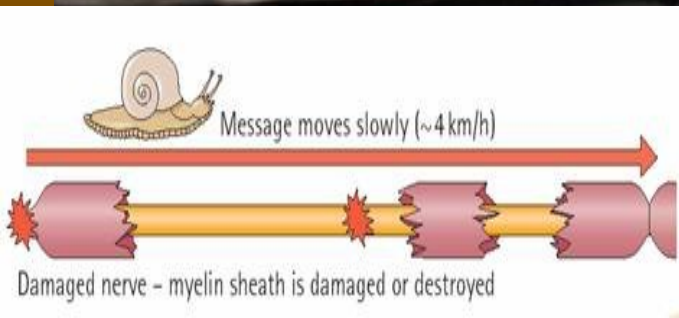
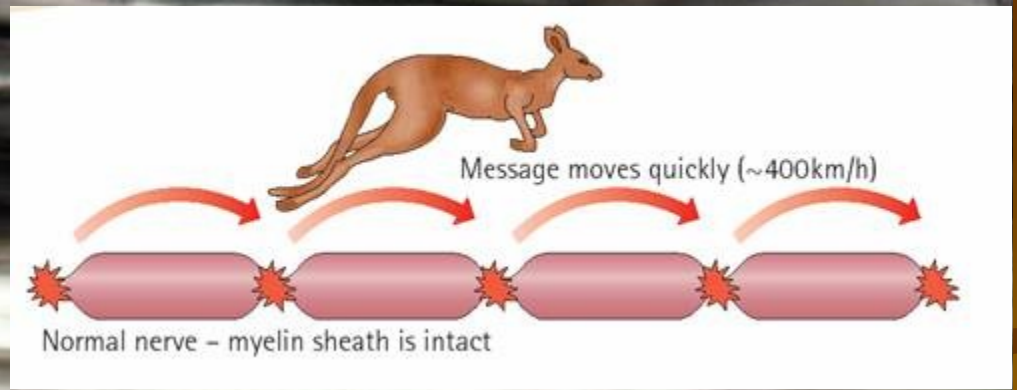
# Myelinová pochva

- 1 - 20  $\mu\text{m}$   $\leftrightarrow$
- 70 %  $\text{H}_2\text{O}$ , lipidy, proteiny
- koncentricky uspořádané lamely lipoproteinů
- Ranvierovy zářezy; internodia (Ranvier. segmenty, 0,6–2,0 mm  $\leftrightarrow$ )

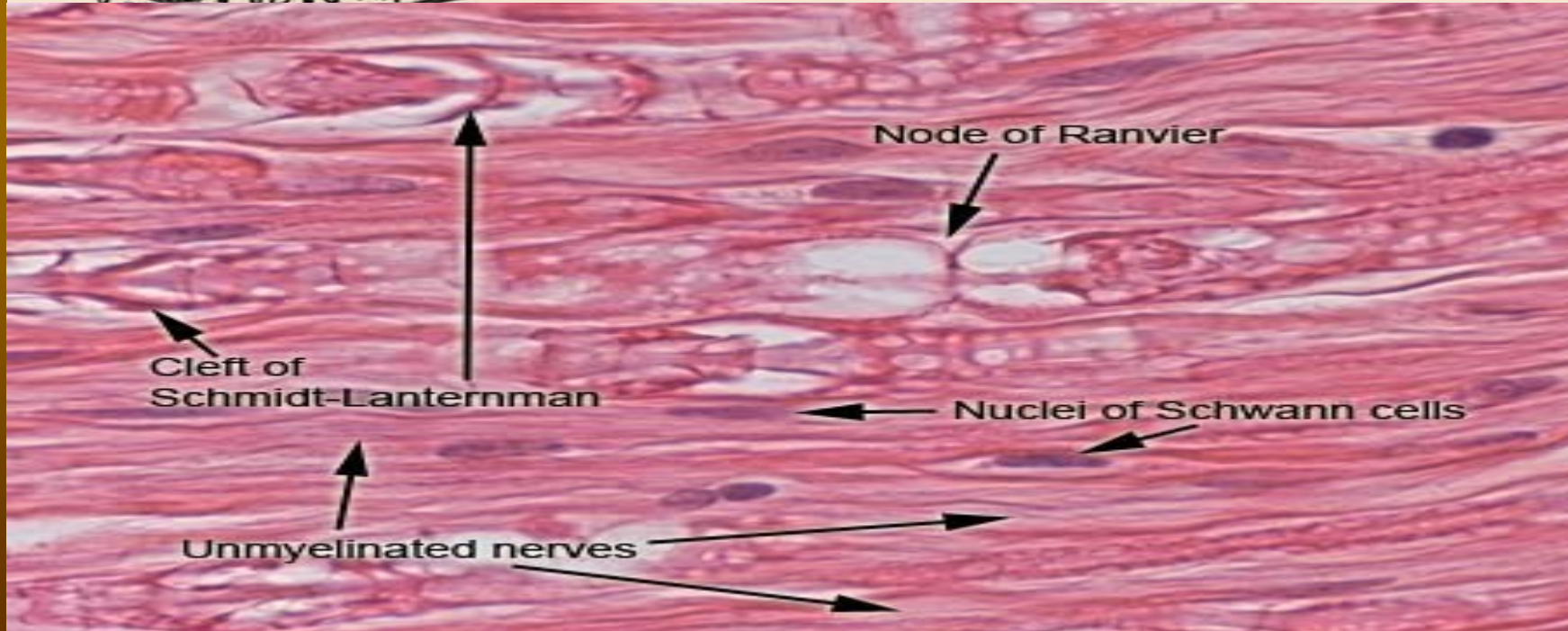
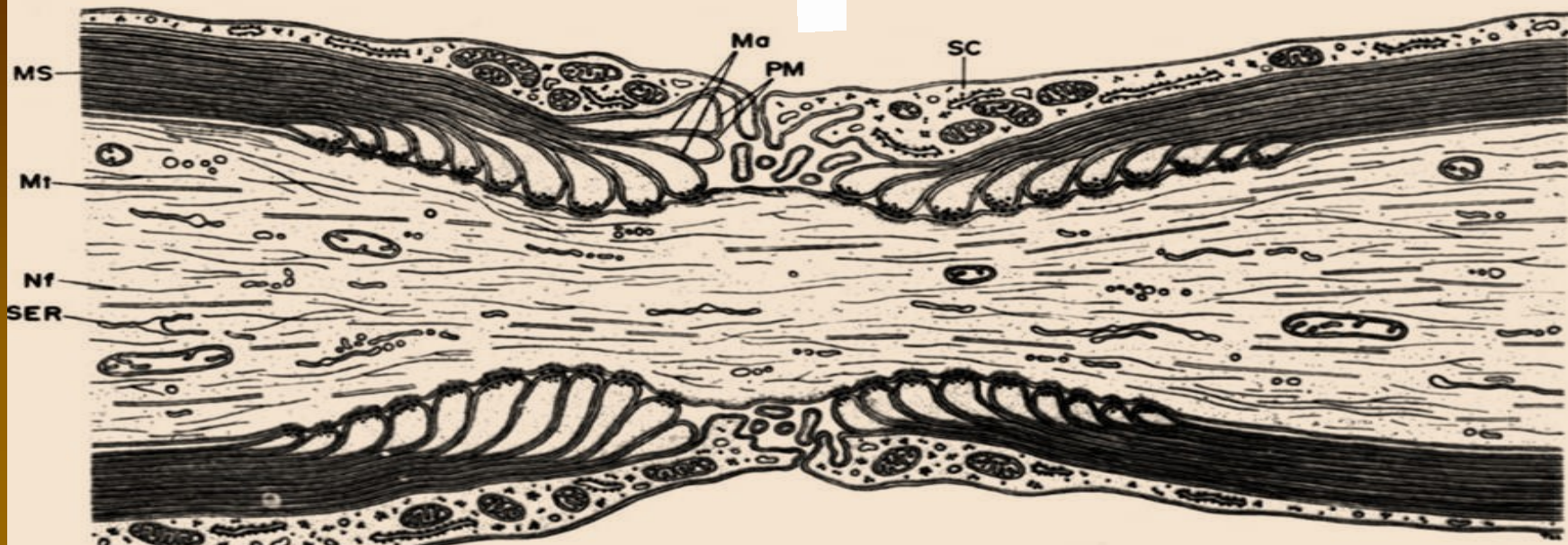


# Ranvierovy zářezy

- saltatorní vedení (skokem)

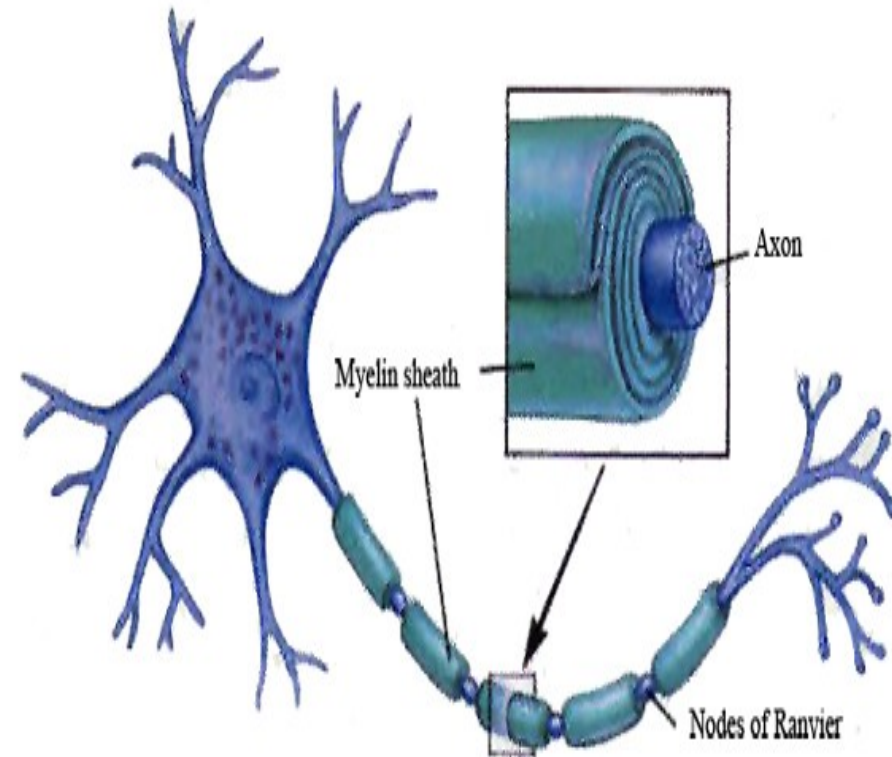
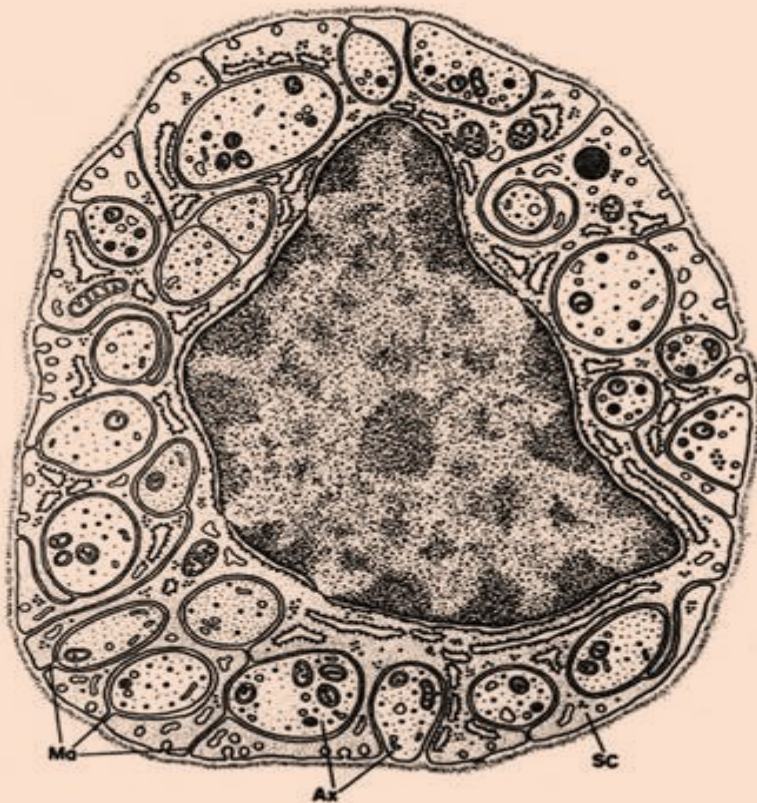


20  $\mu\text{m}$

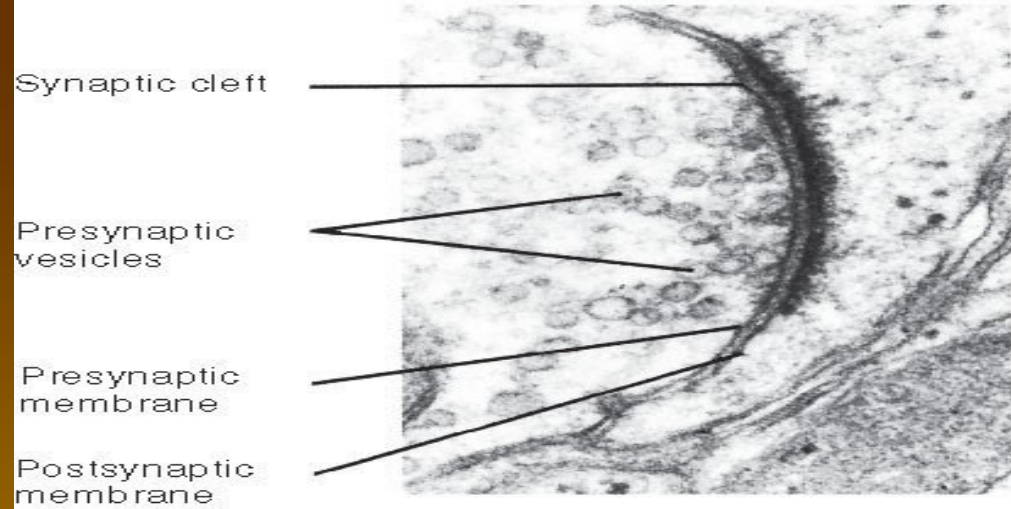


# Neurilema = Schwannovy bb.

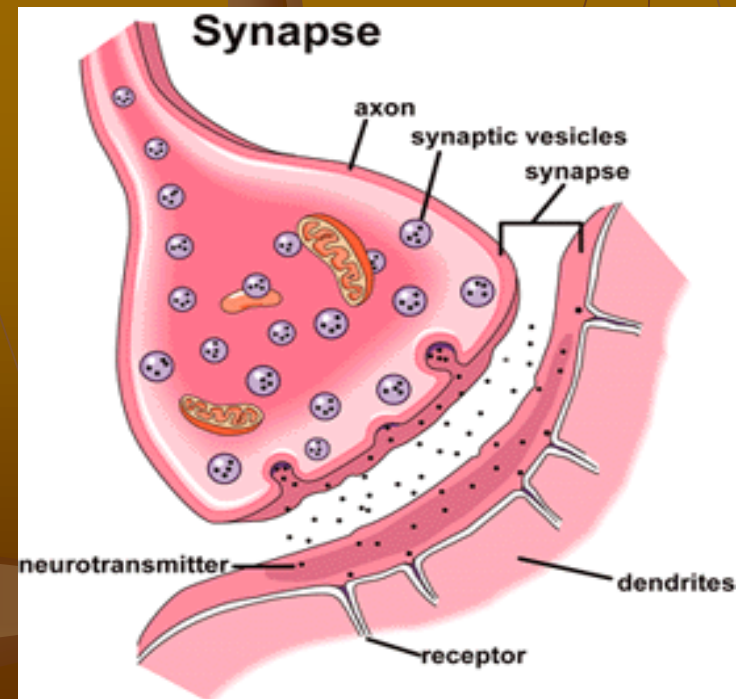
- vlákna bez myelin. pochvy – (jen Schwannovy bb. kolem axonu
- myelinizovaná vlákna – každé internodium má „svou“ Schwannovu b.



# Synapse

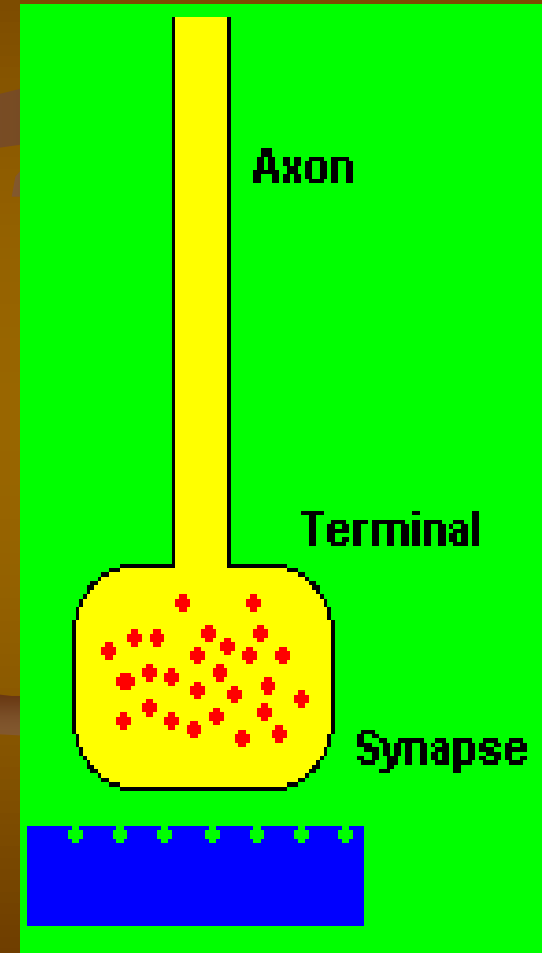
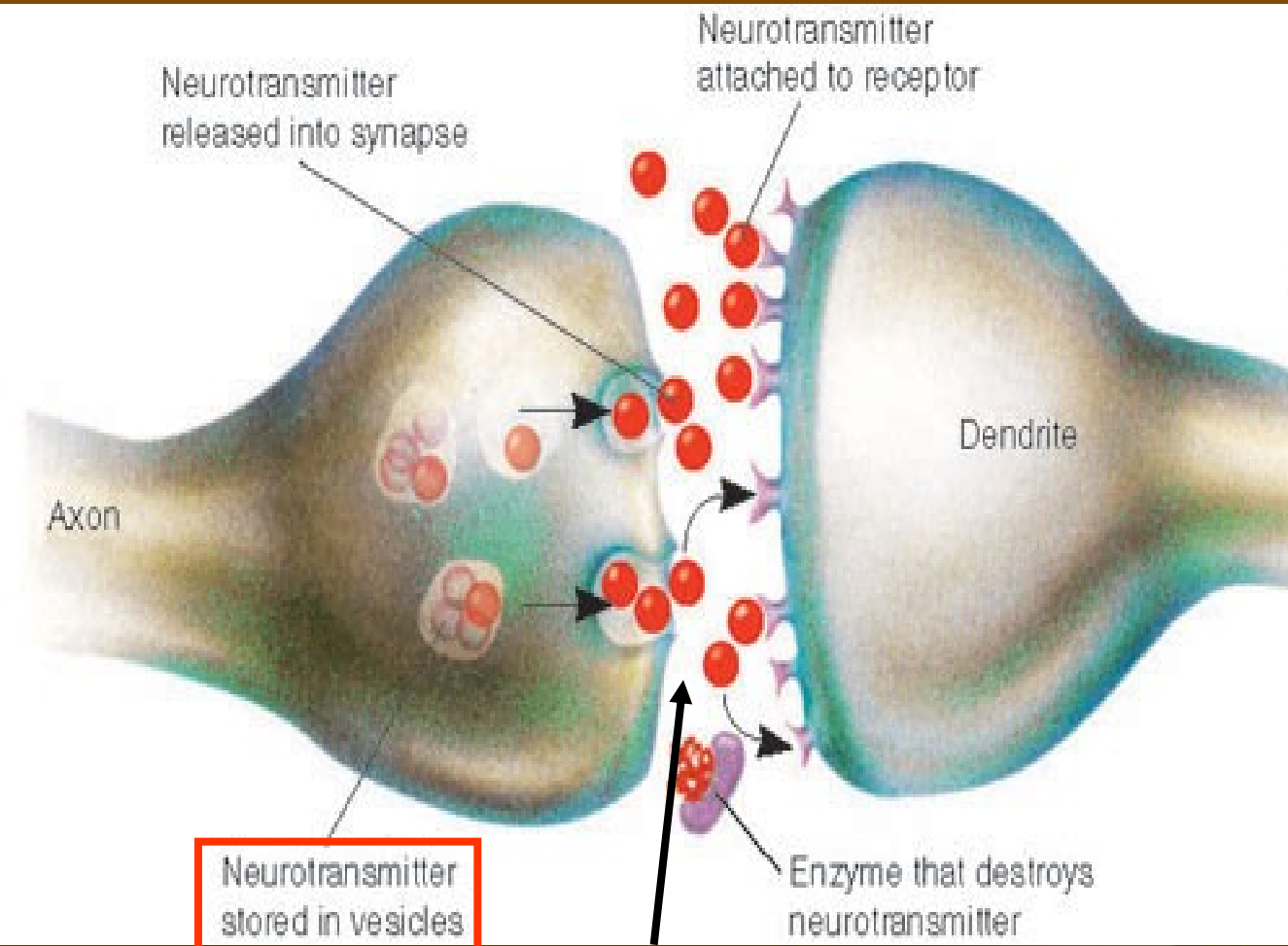


- pro převod vzruchu mezi 2 neurony nebo neuronem a efektorovou b.,
- chemická nebo elektrická synapse,
- úseky synapse:
  - 1) presynaptické zakončení
  - 2) synaptická štěrbina
  - 3) postsynaptická membrána

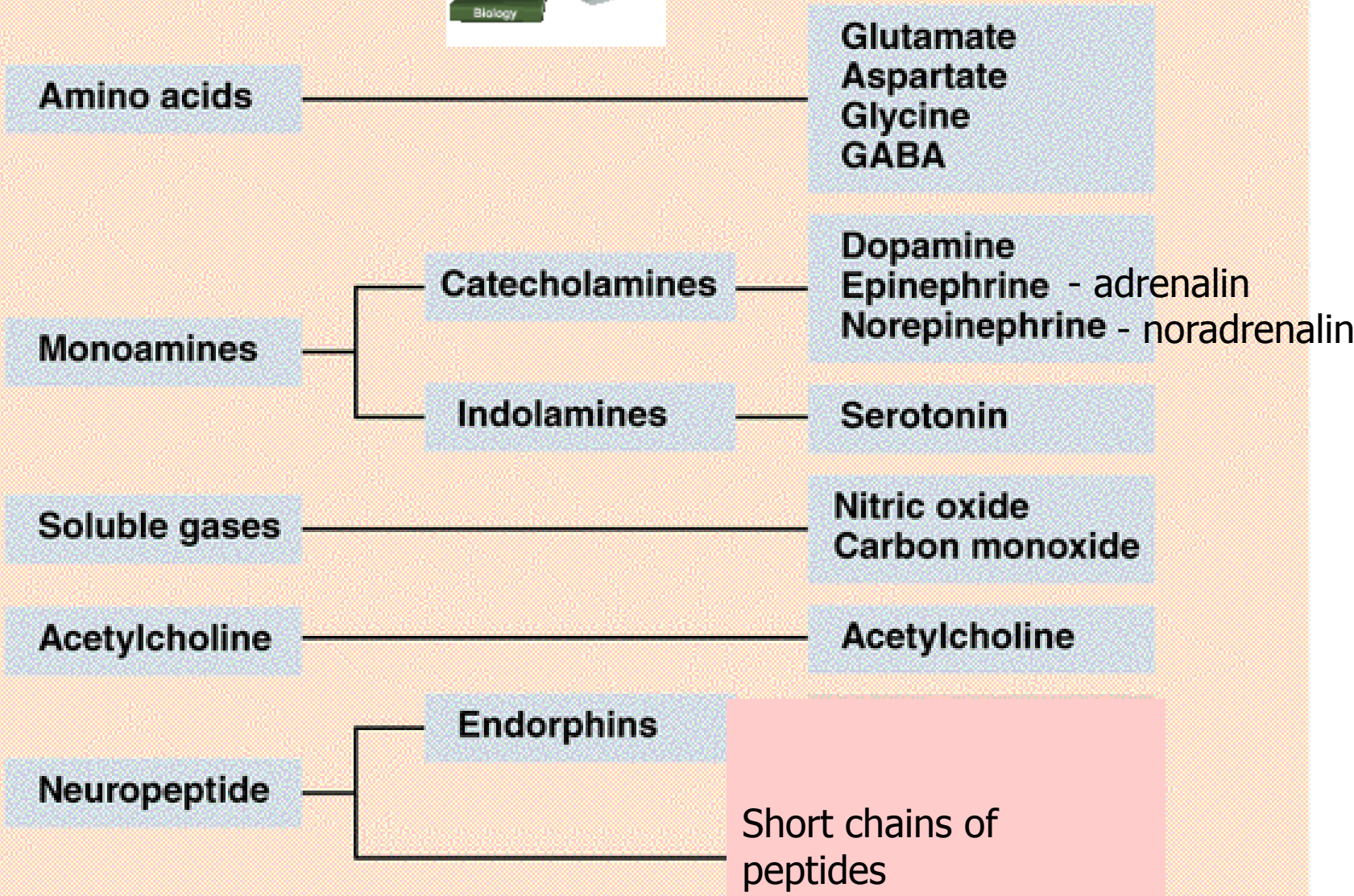
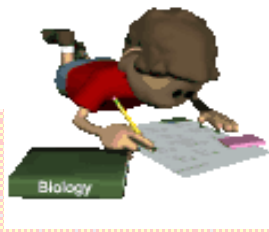




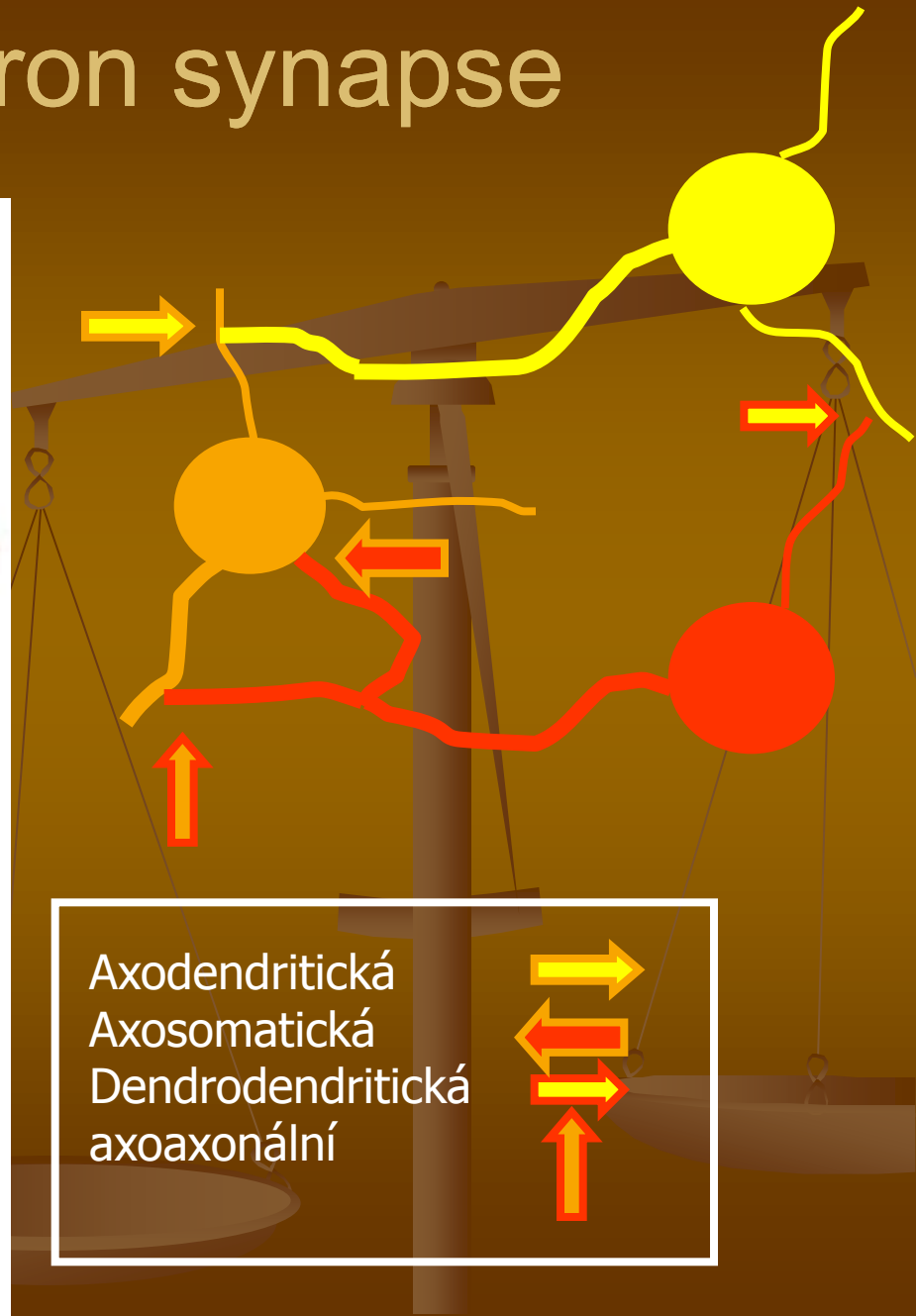
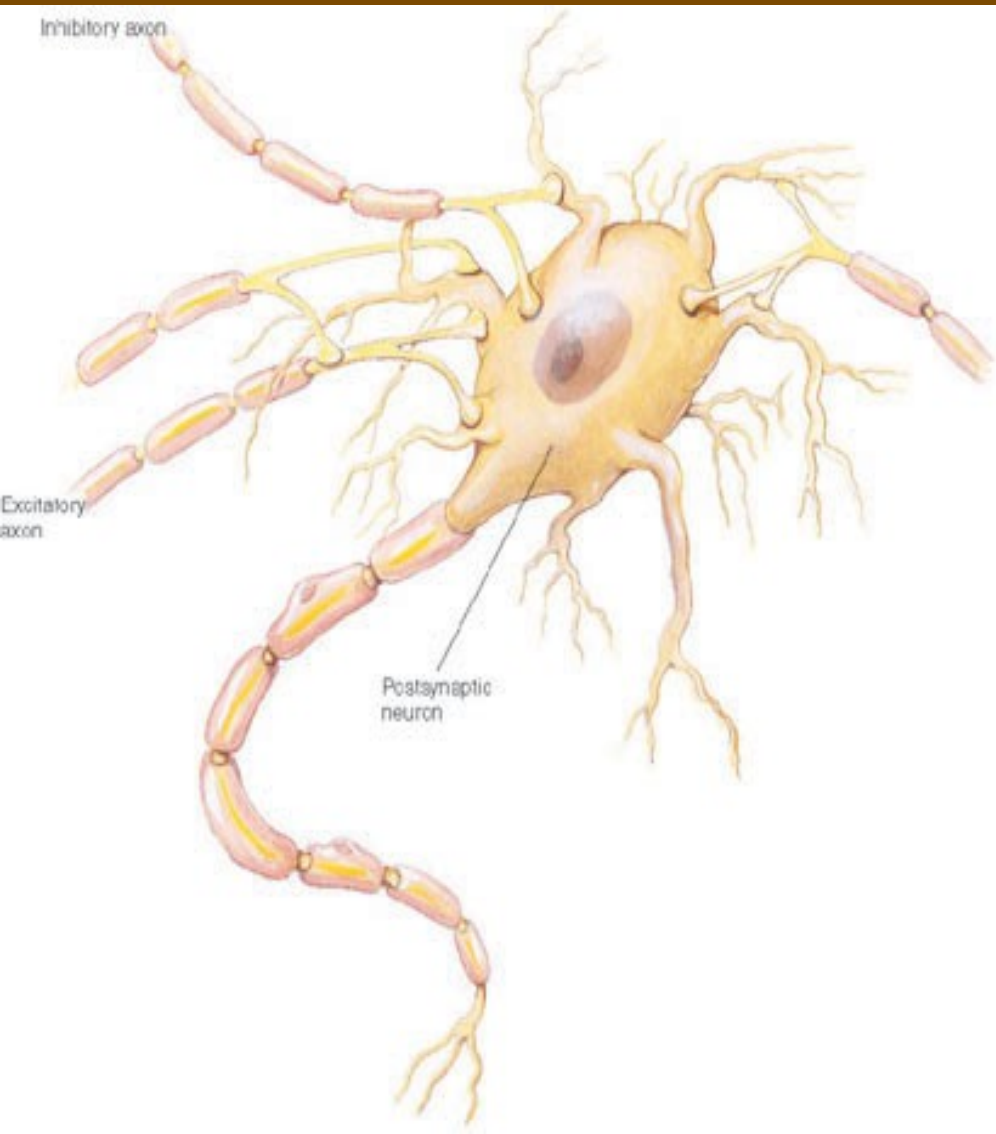
# Funkce synapse



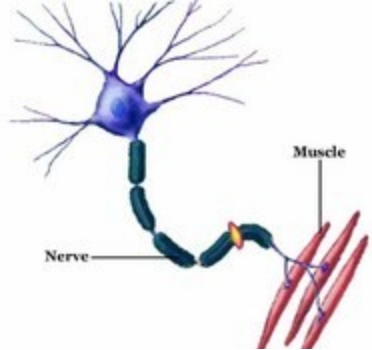
## ► Classes of Neurotransmitters



# neuron – neuron synapse

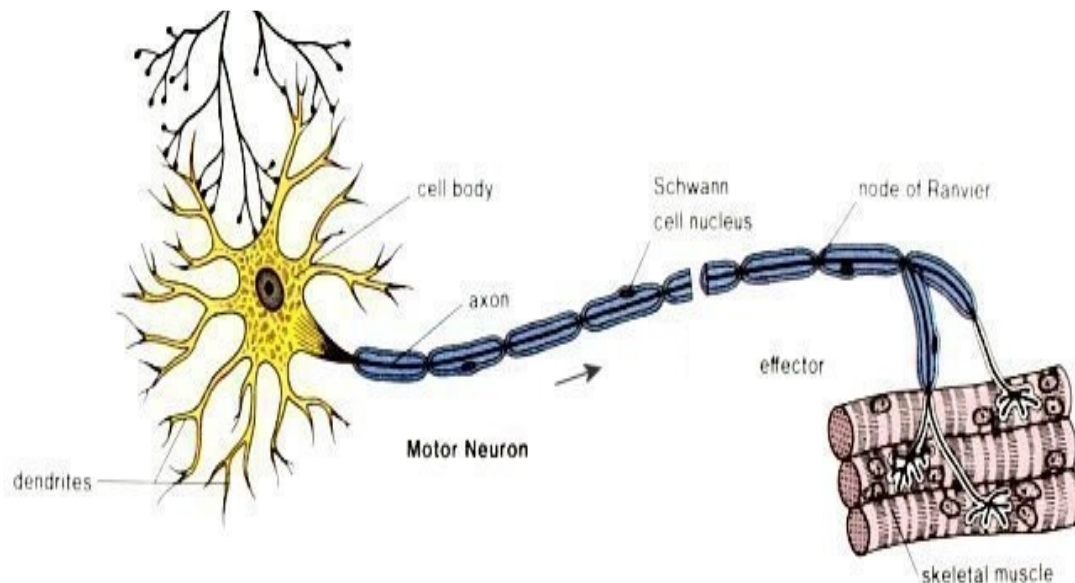
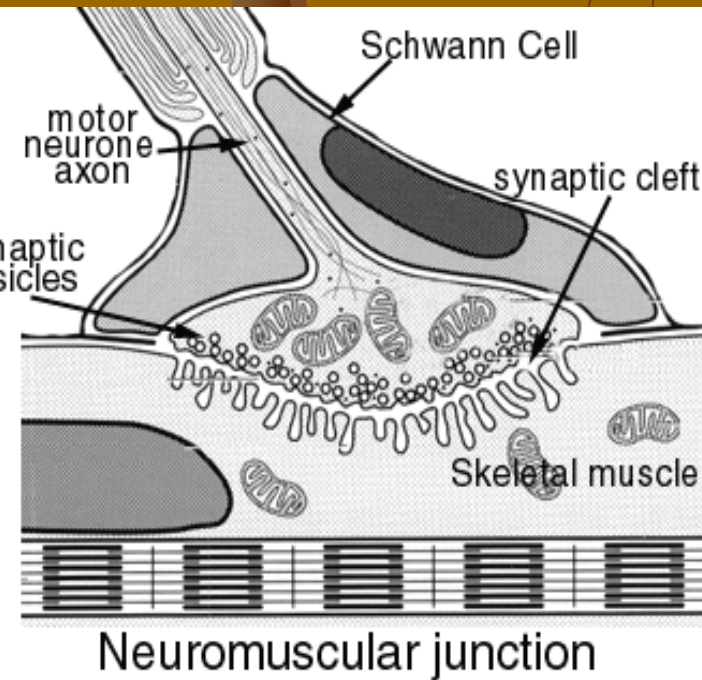


# Periferní synapse neuron – efektor



## Efektorové buňky:

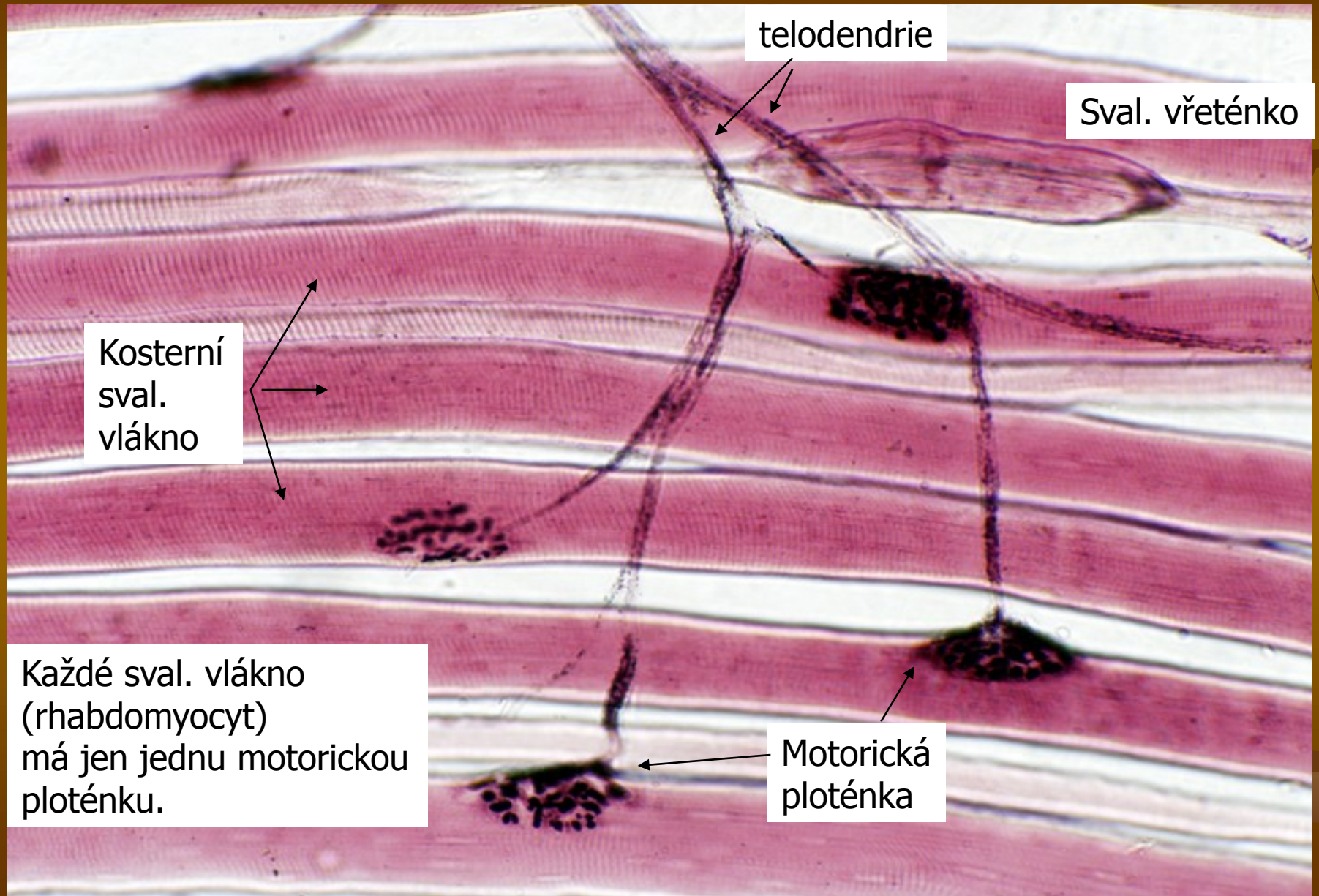
žlázové, svalové (hladká, kosterní, srdeční)  
*jejich plazmalema představuje postsynaptickou membránu*





# Motorické ploténky v motorické jednotce

Tato svalová vlákna s kontrahují současně



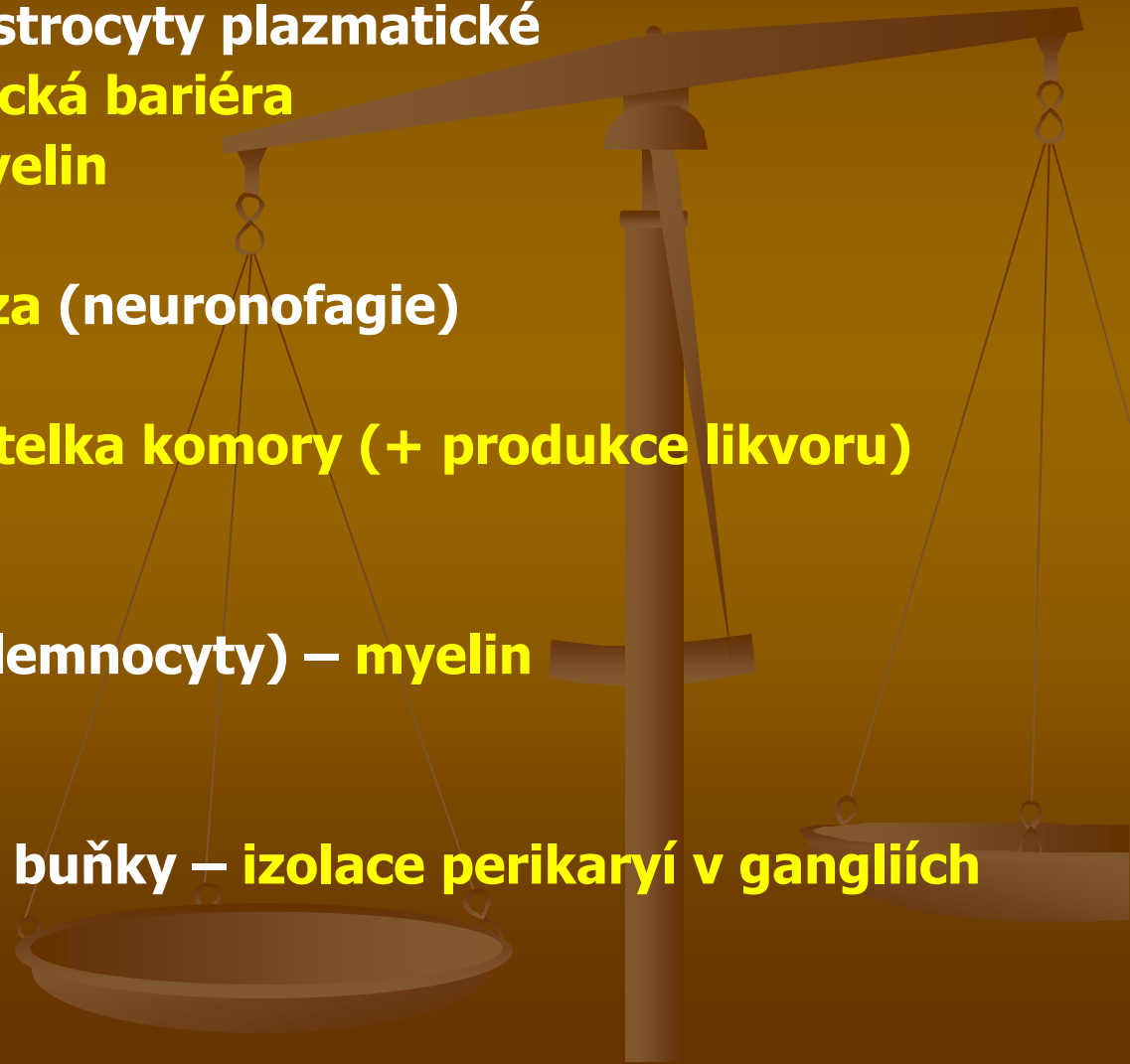
# Neuroglie

## Centrální glie

- astrocyty fibrilární/astrocyty plazmatické  
**hematoencefalická bariéra**
- oligodendrocyty – **myelin**
- mikroglie – **fagocytóza (neuronofagie)**
- ependymocyty – **výstelka komory (+ produkce likvoru)**

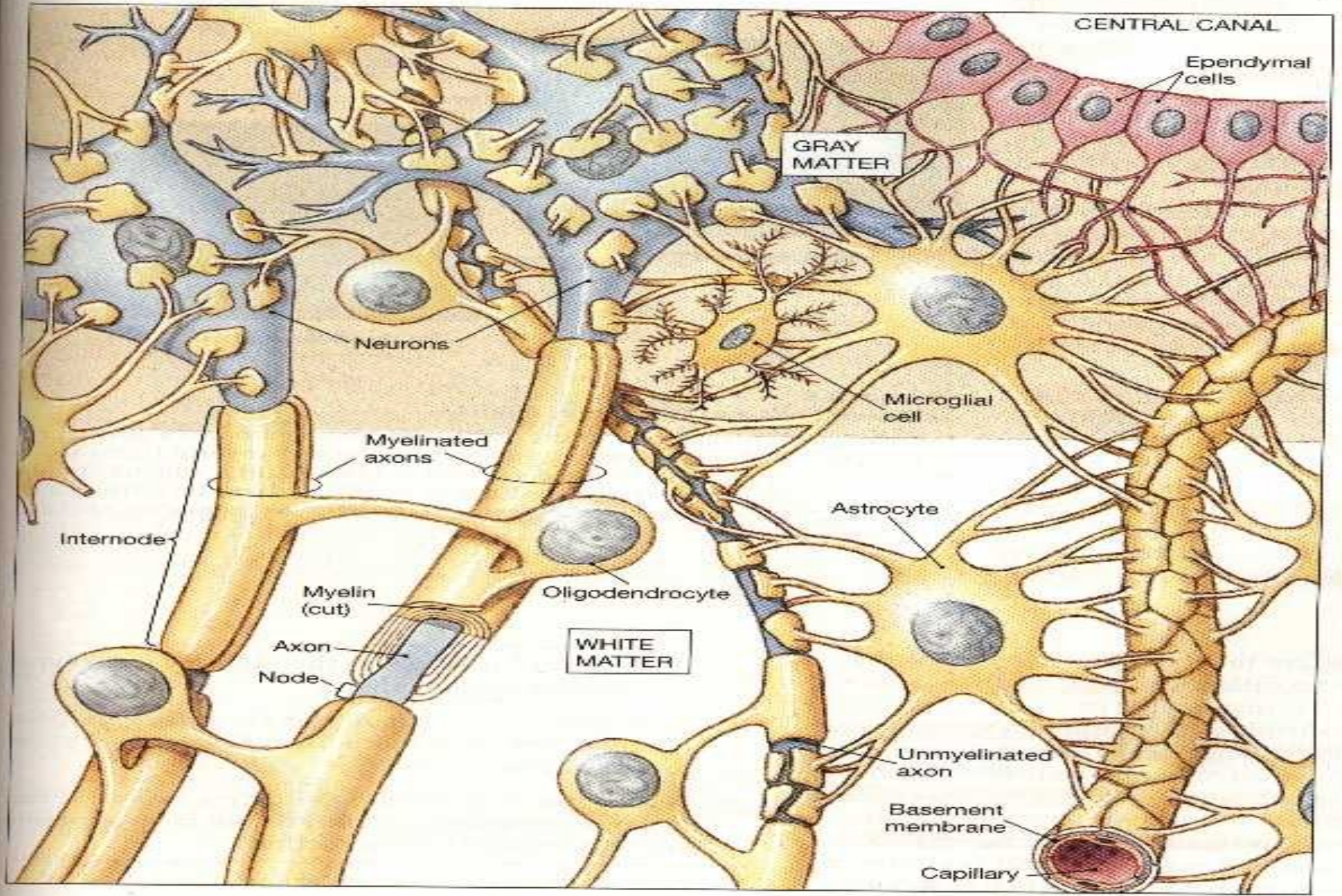
## Periferní glie

- Schwannovy buňky (lemnocyty) – **myelin neurilemma**
- satelitové (plášťové) buňky – **izolace perikaryí v gangliích**



# NS – struktura:

## Neurony + gliové buňky





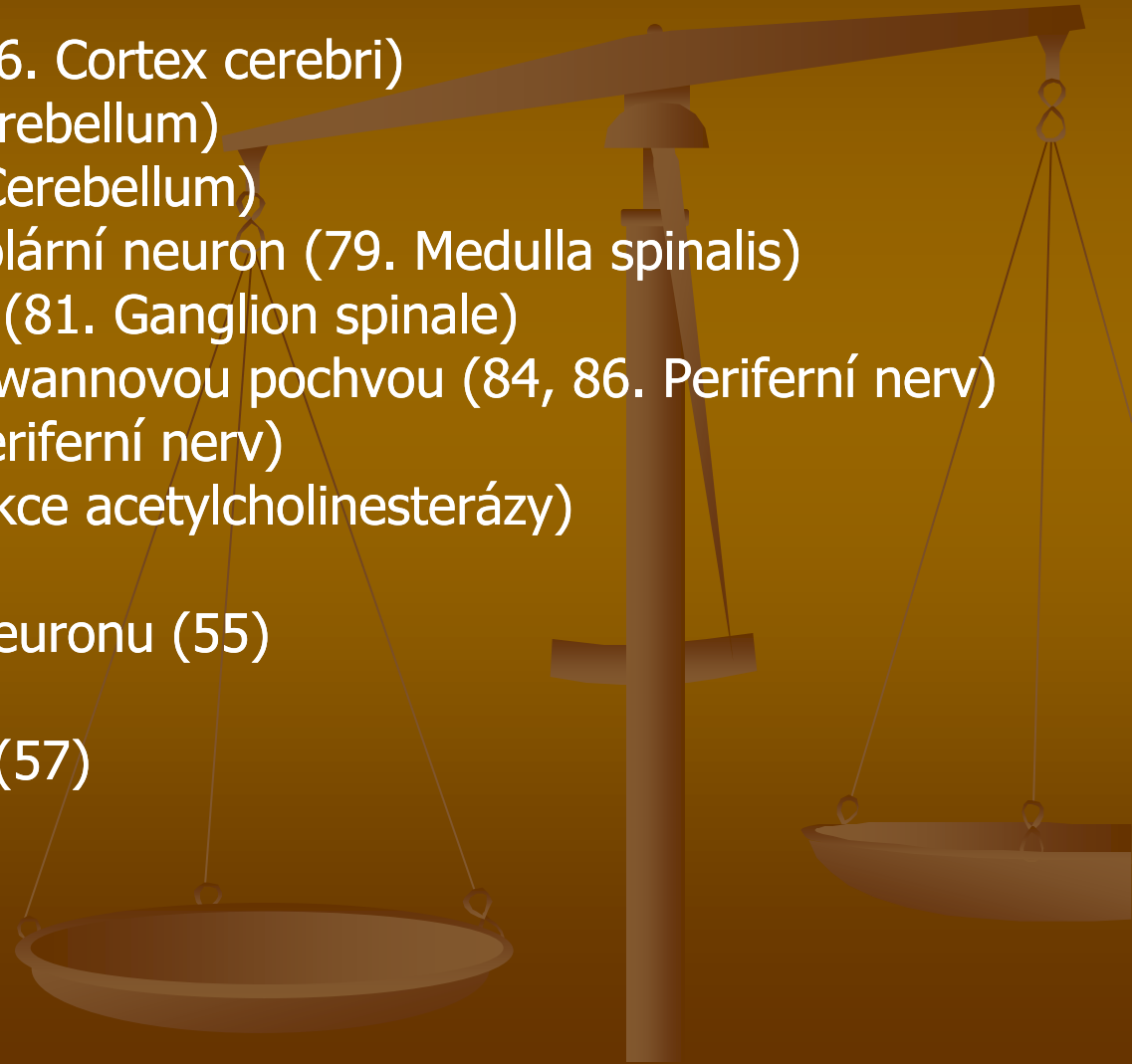
# NERVOVÁ TKÁŇ

## Preparáty:

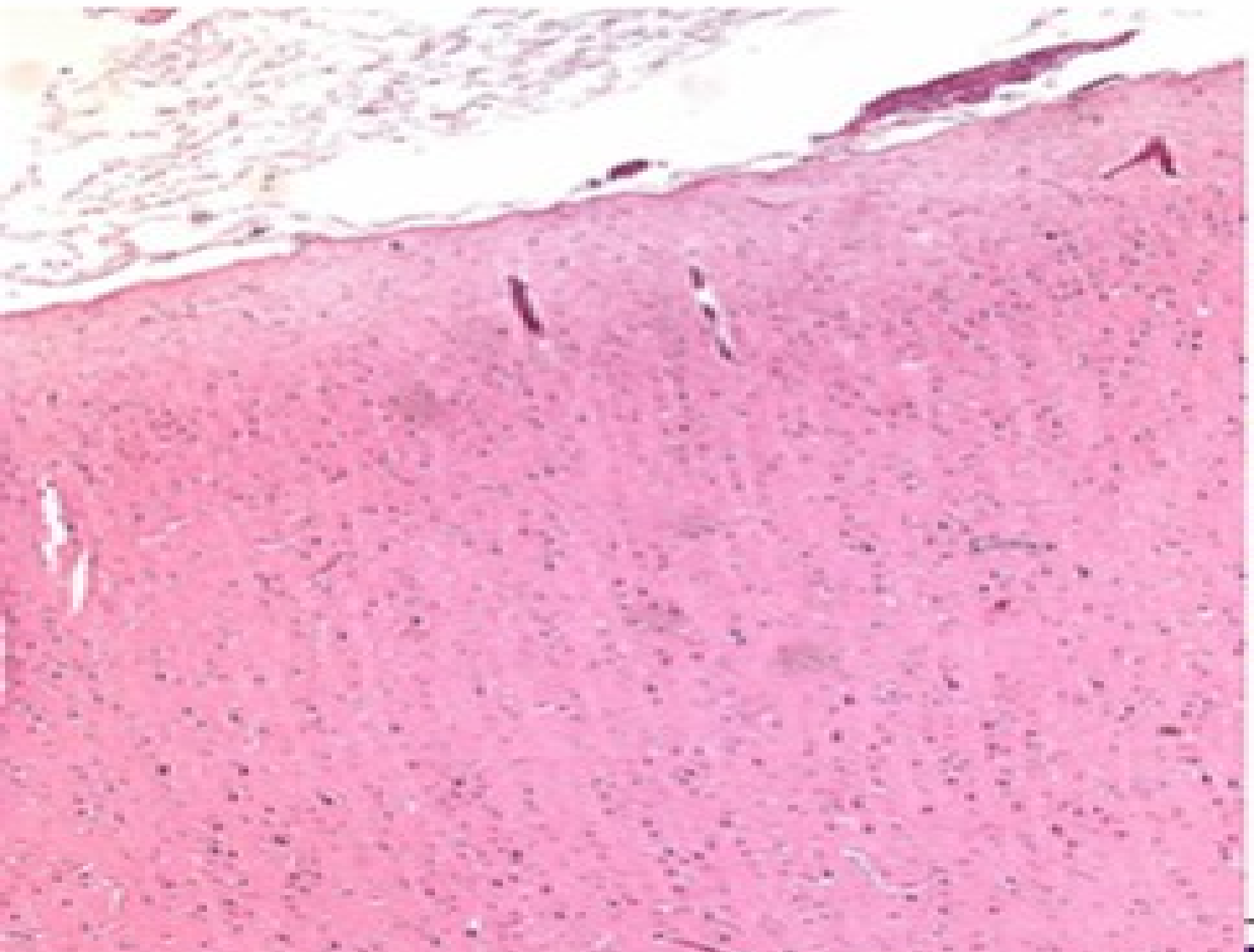
- Pyramidová buňka (75, 76. Cortex cerebri)
- Purkyňova buňka (77. Cerebellum)
- Nisslova substance (78. Cerebellum)
- Somatomotorický multipolární neuron (79. Medulla spinalis)
- Pseudounipolární neuron (81. Ganglion spinale)
- Axon s myelinovou a Schwannovou pochvou (84, 86. Periferní nerv)
- Myelinová pochva (87. Periferní nerv)
- Motorická ploténka (detekce acetylcholinesterázy)

## Atlas EM:

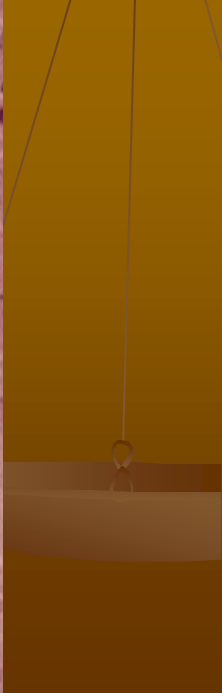
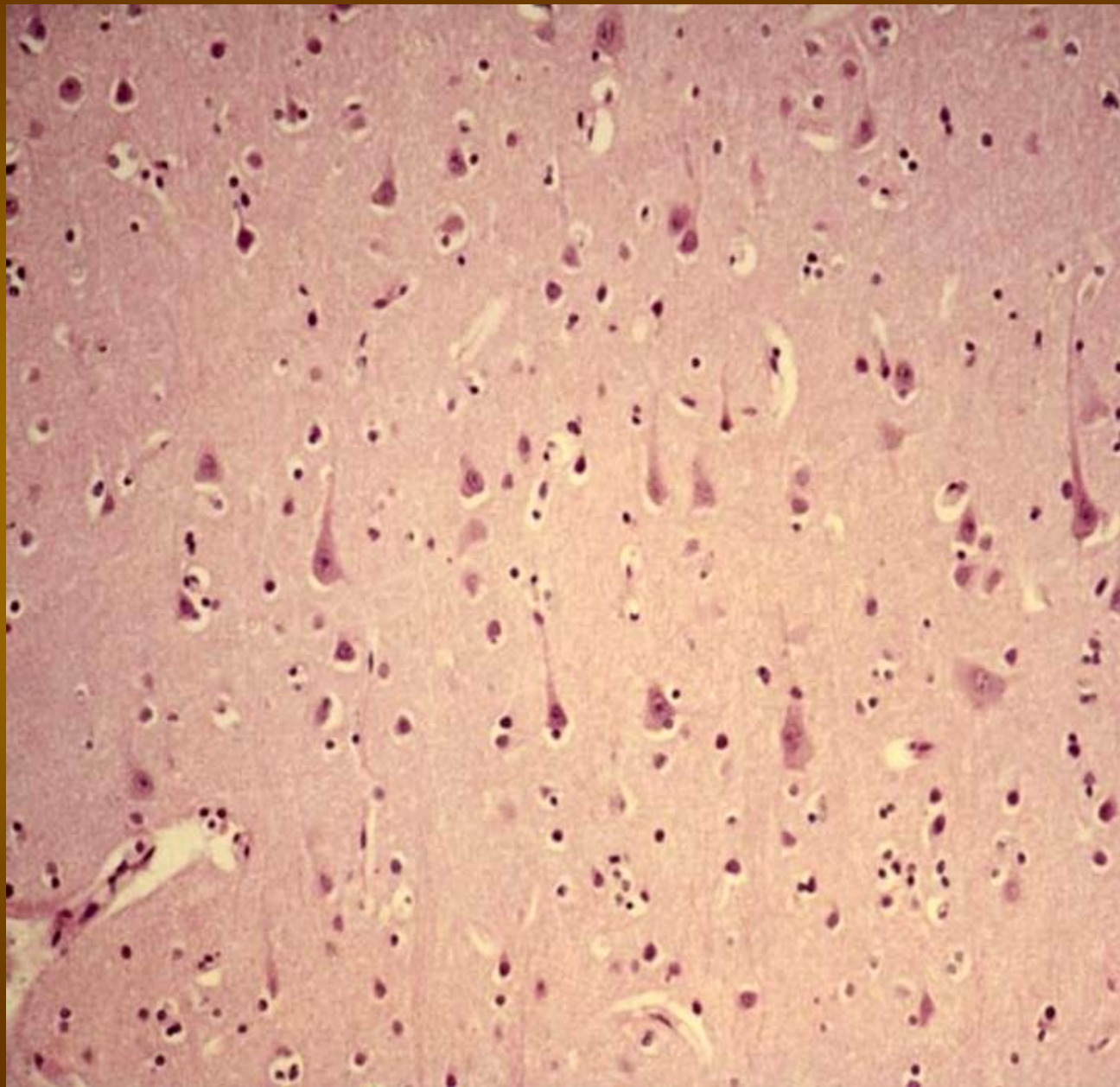
- Jádro (3) a cytoplazma neuronu (55)
- Axony s obaly (56, 58)
- Presynaptické zakončení (57)



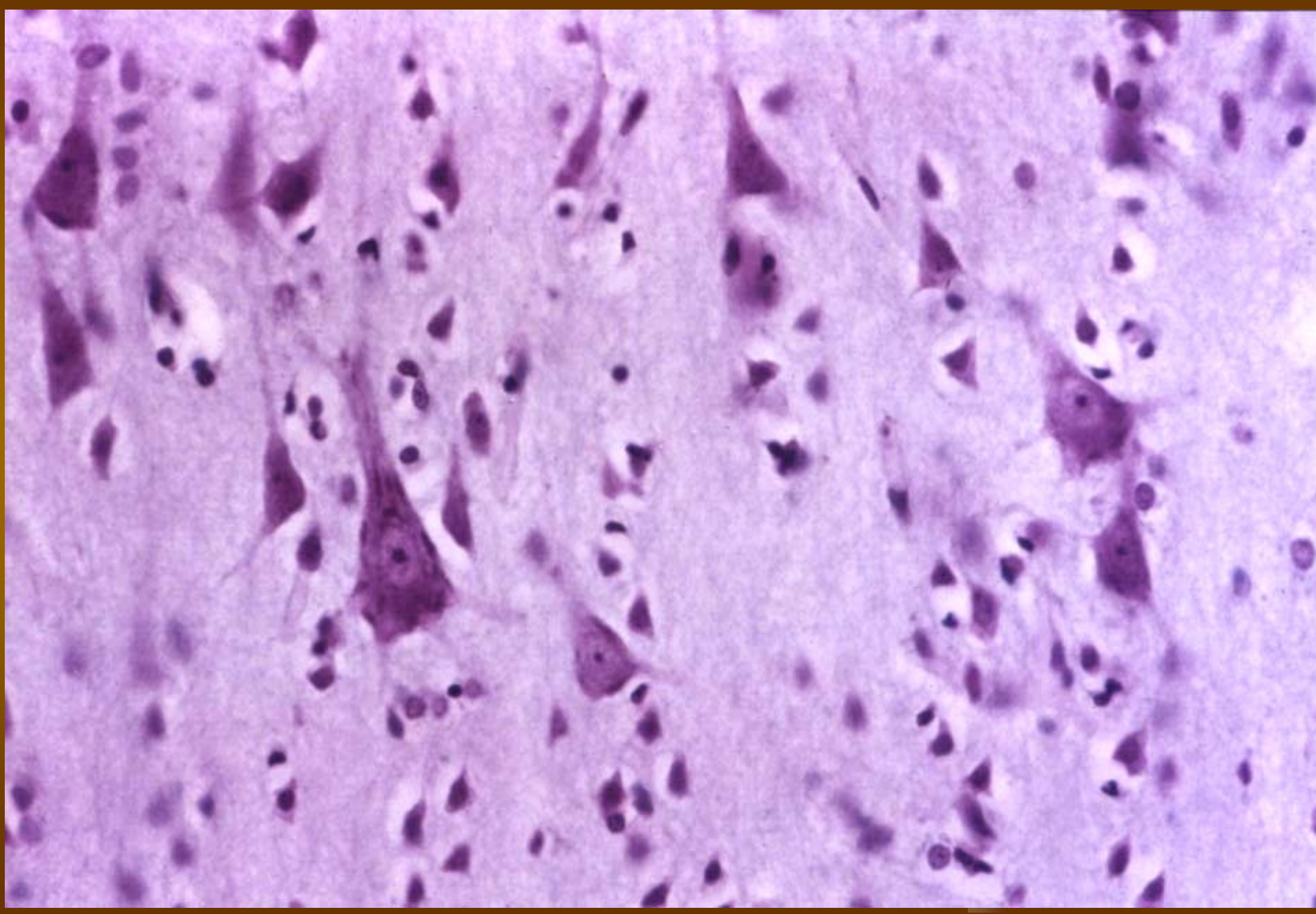
# Cortex cerebri



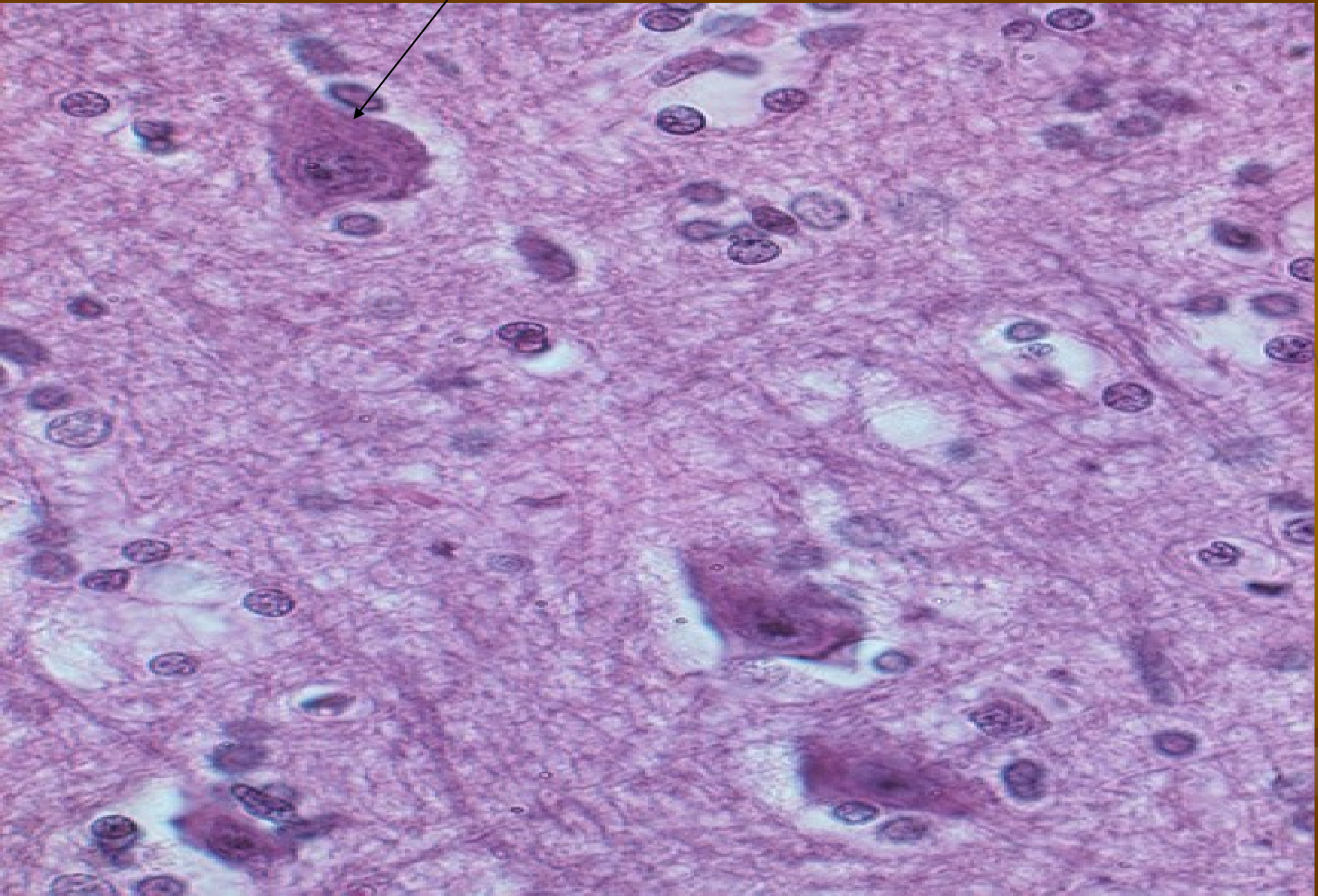
Cortex cerebri (HE) – lamina pyramidalis



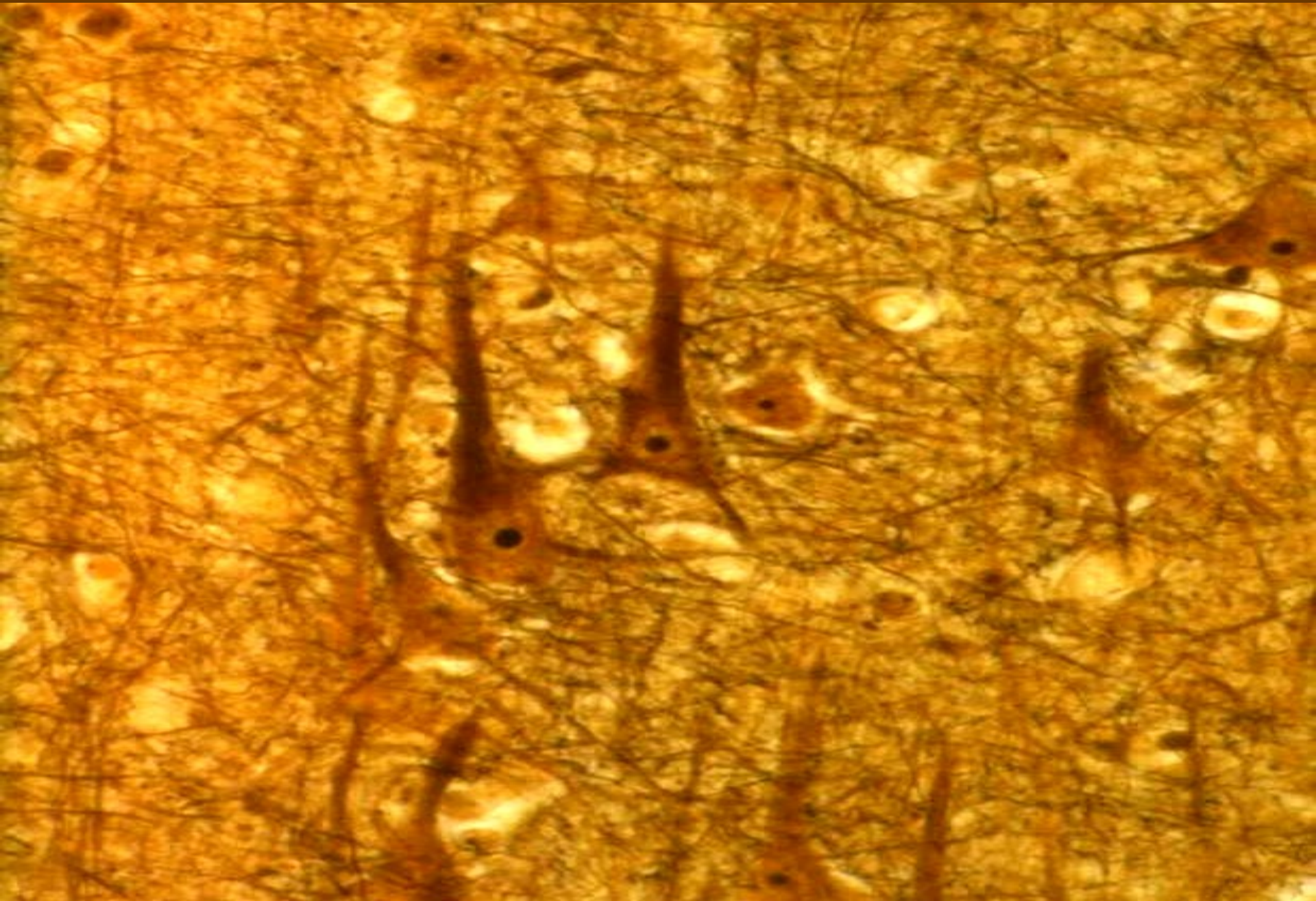
Cortex cerebri (HE) – velké pyramidové buňky = multipolární neurony



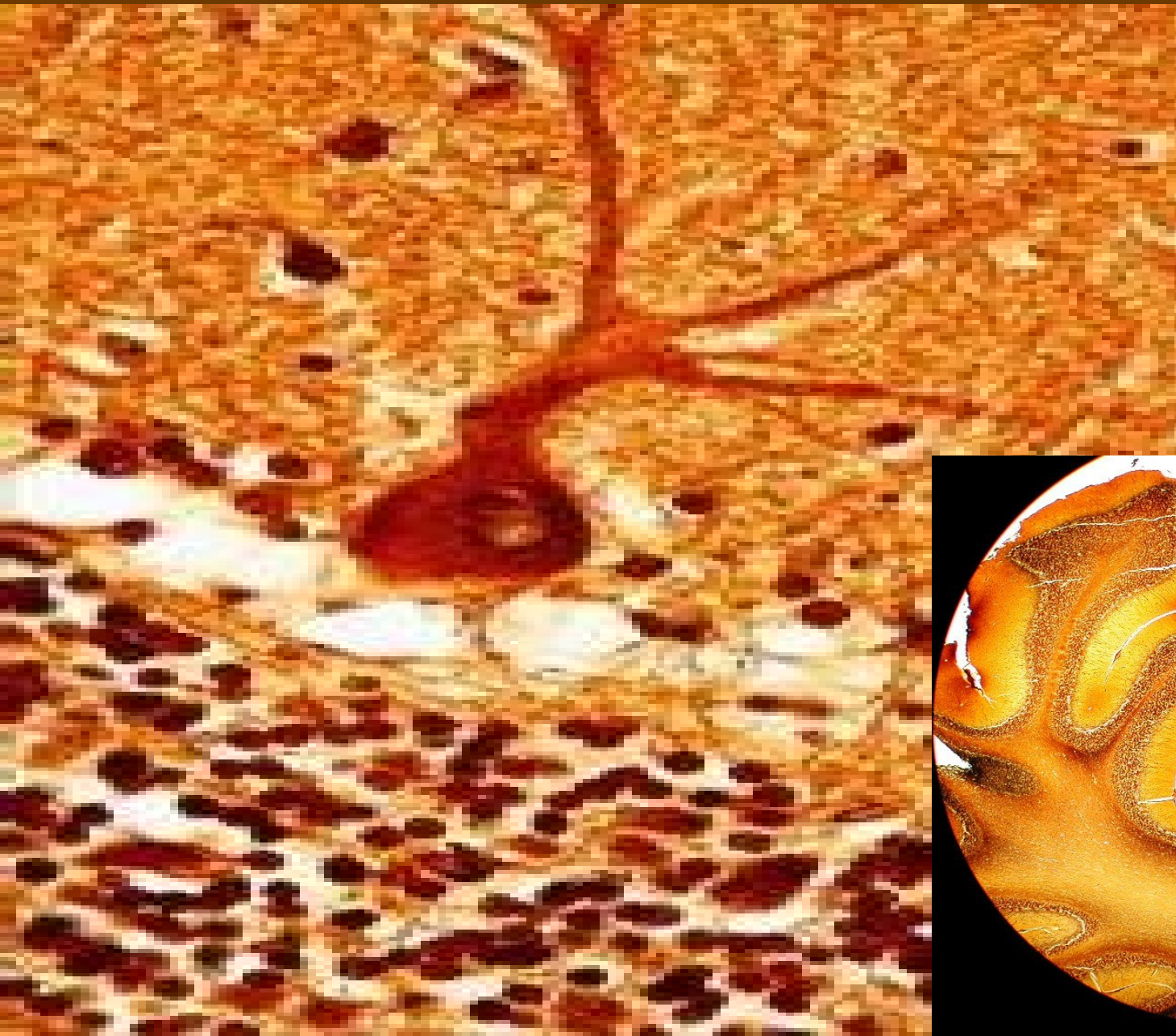
Cortex cerebri (HE) – pyramidové buňky



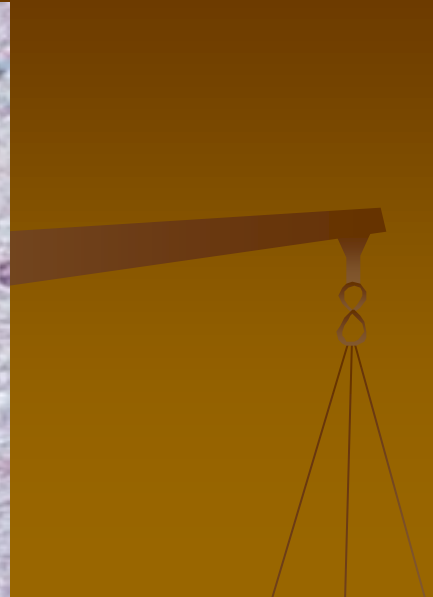
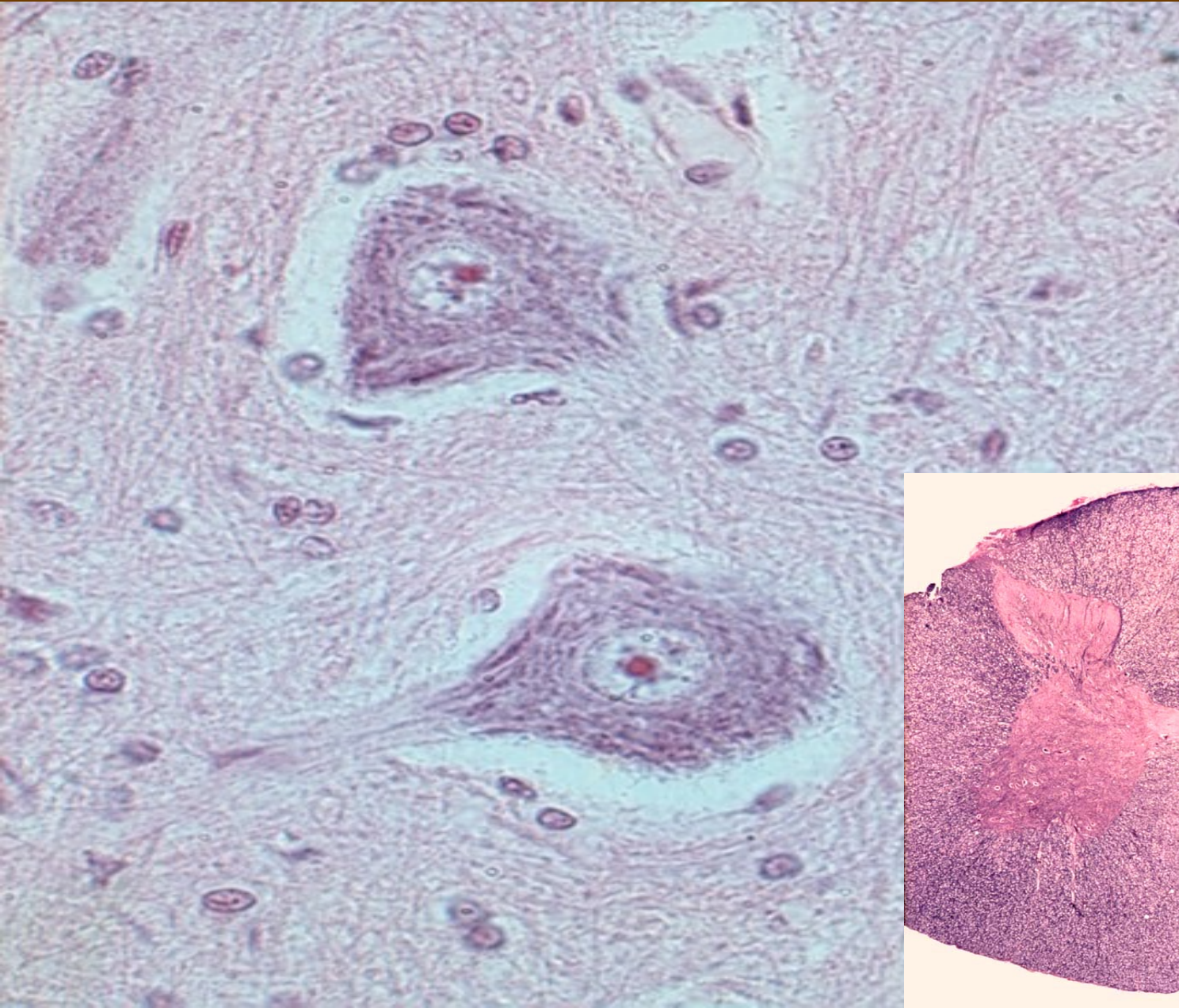
Cortex cerebri (impregnace) – pyramidové buňky



Cerebellum (impregnace) – Purkyňovy buňky = bipolární neurony



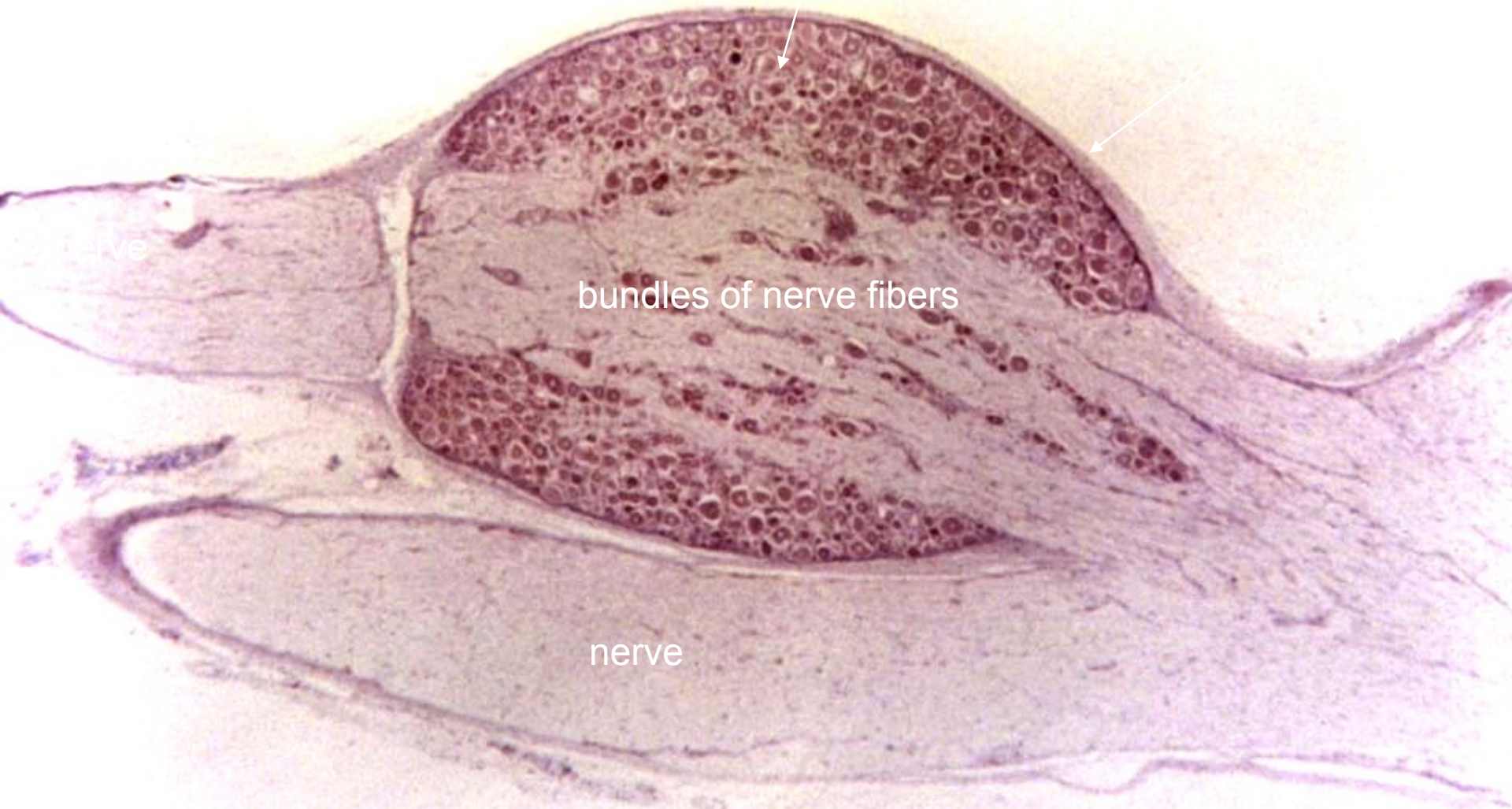
Medulla spinalis (HE) – somatomotorické neuron = multipolární





Spinalní ganglion (HE)

pseudounipolární neurony

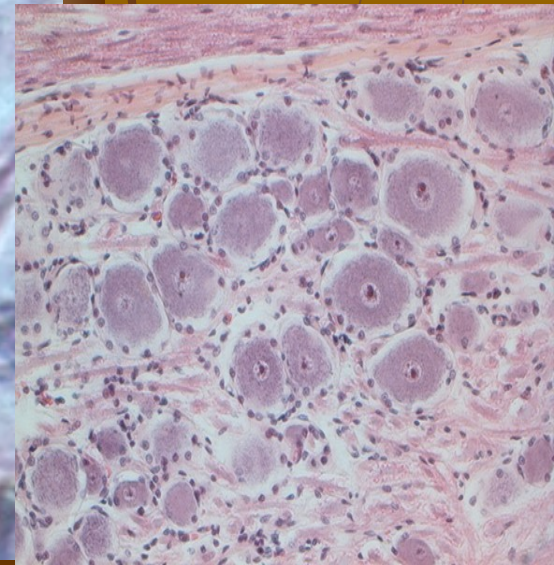
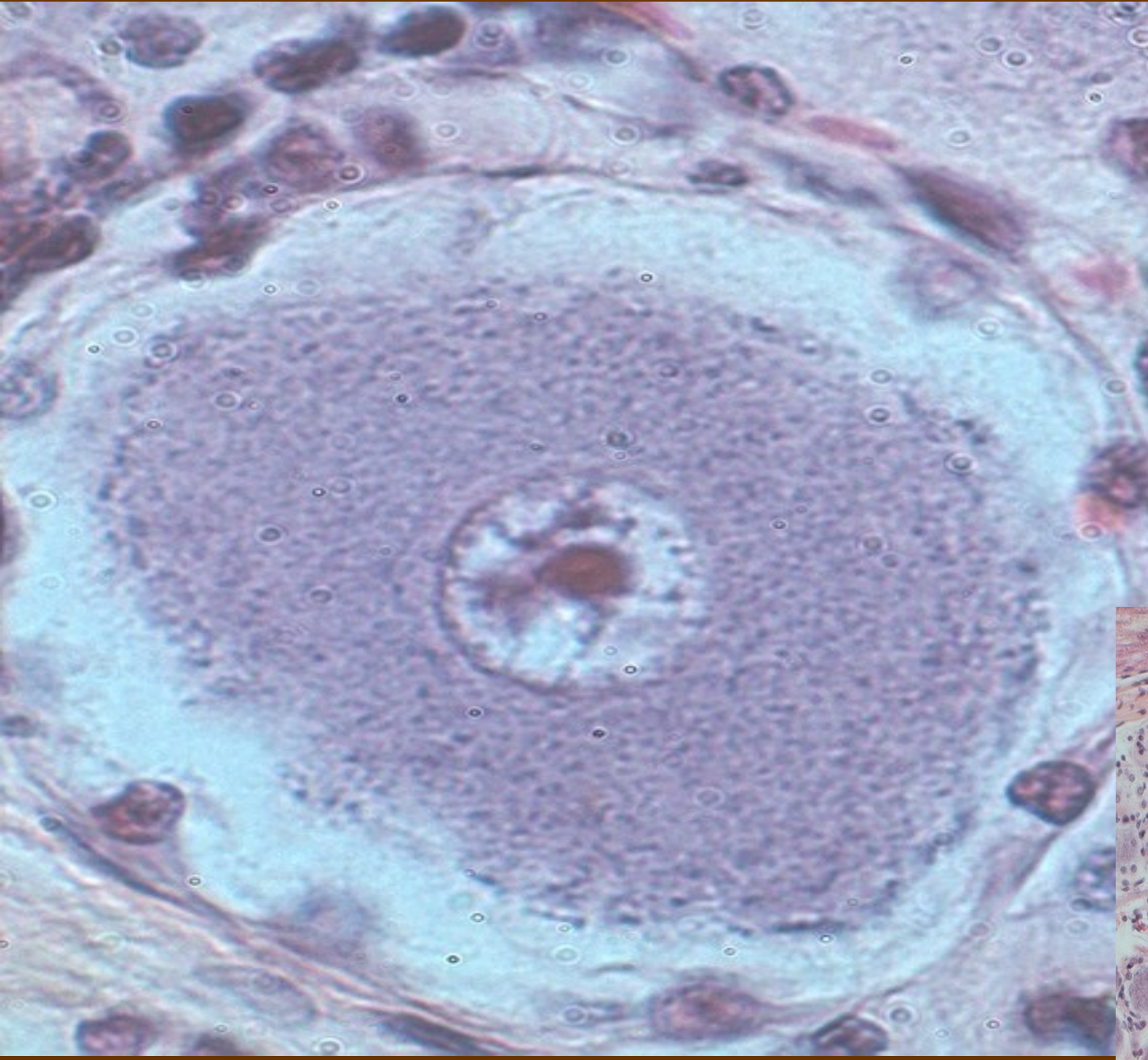


bundles of nerve fibers

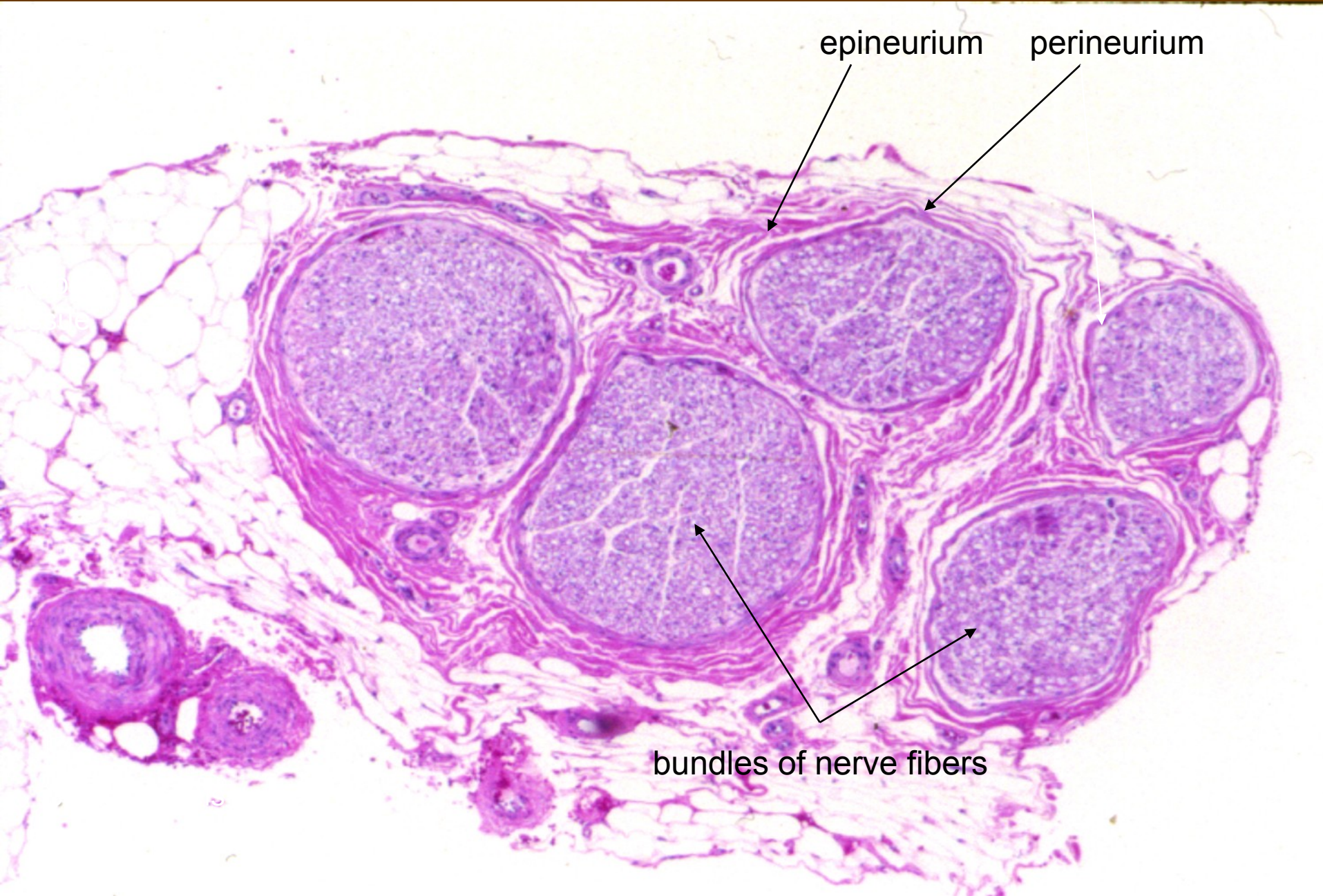
nerve

nerve

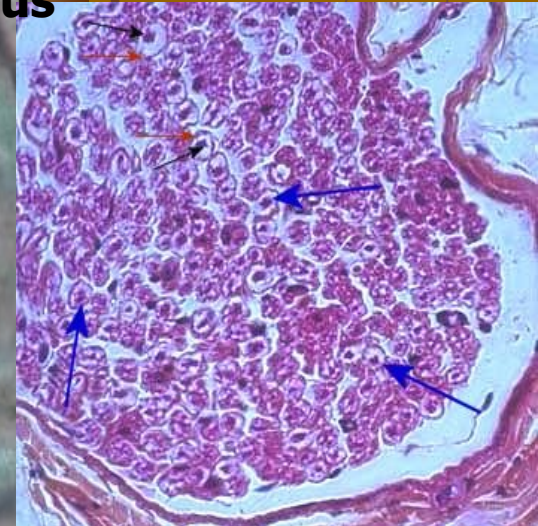
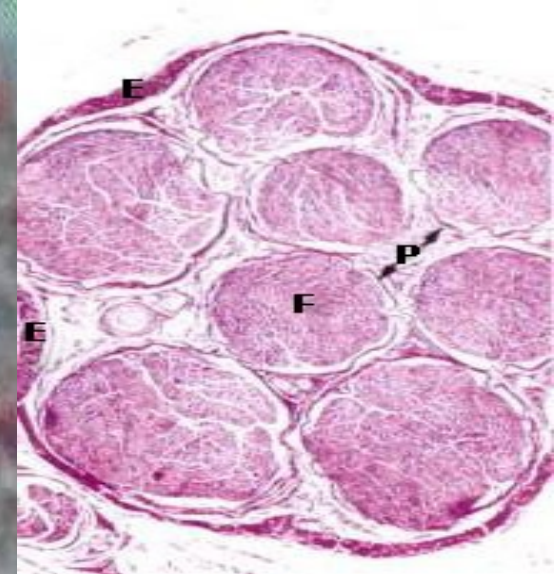
Gangliové buňky = pseudounipolární neurony + satelitní bb



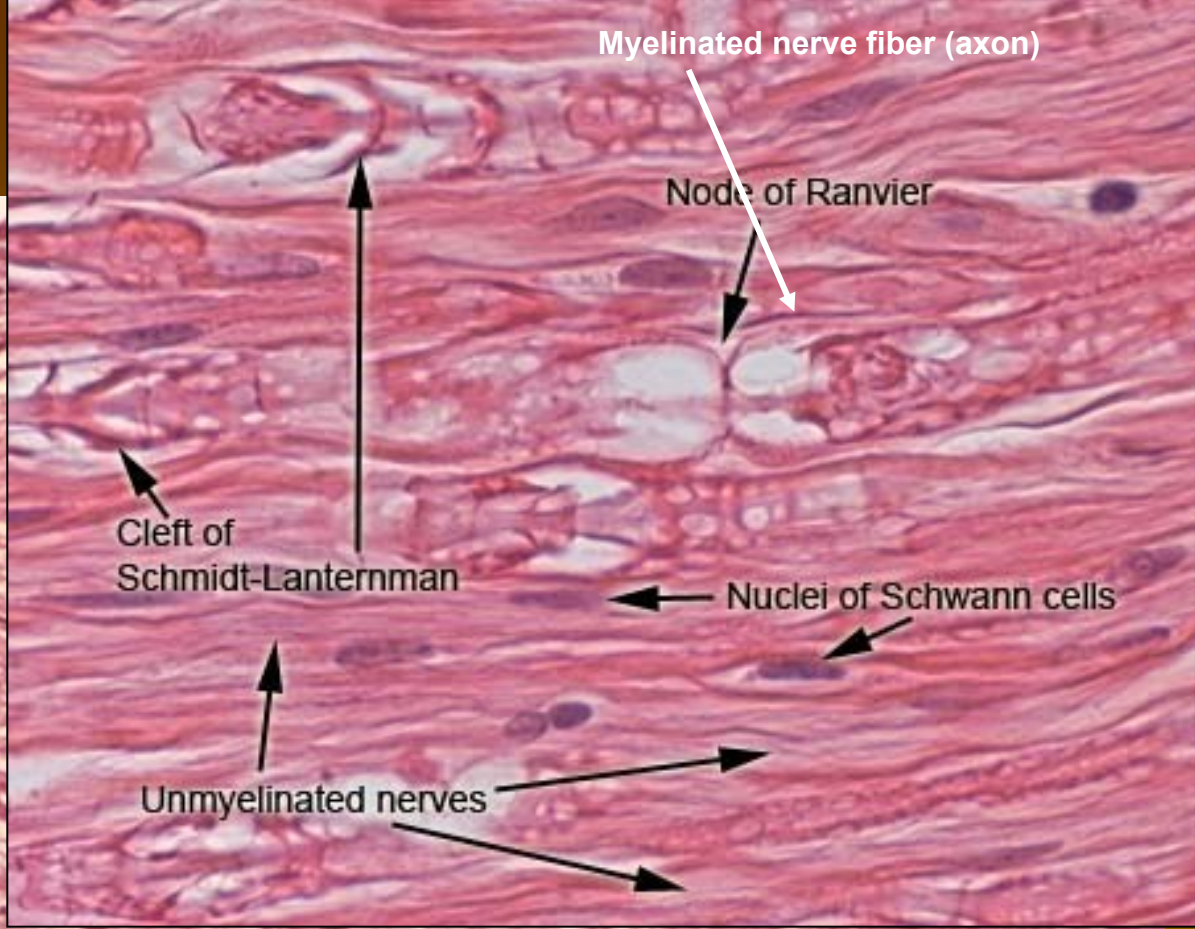
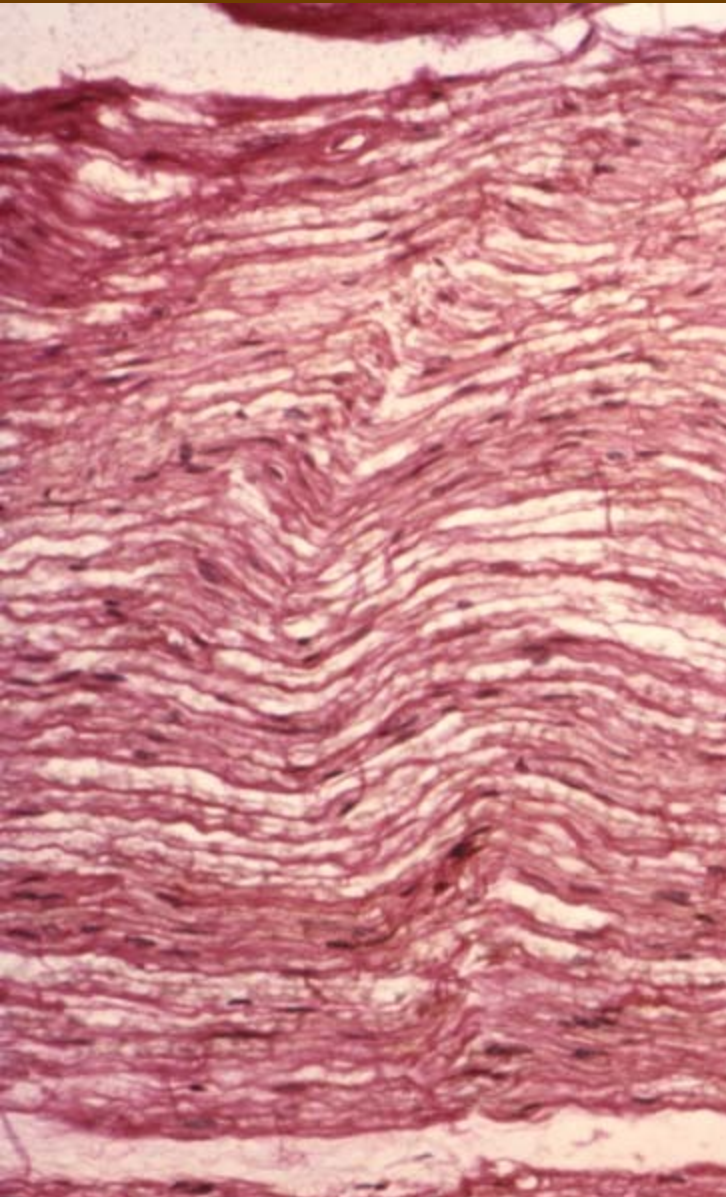
# Periferní nerv (HE) – příčně



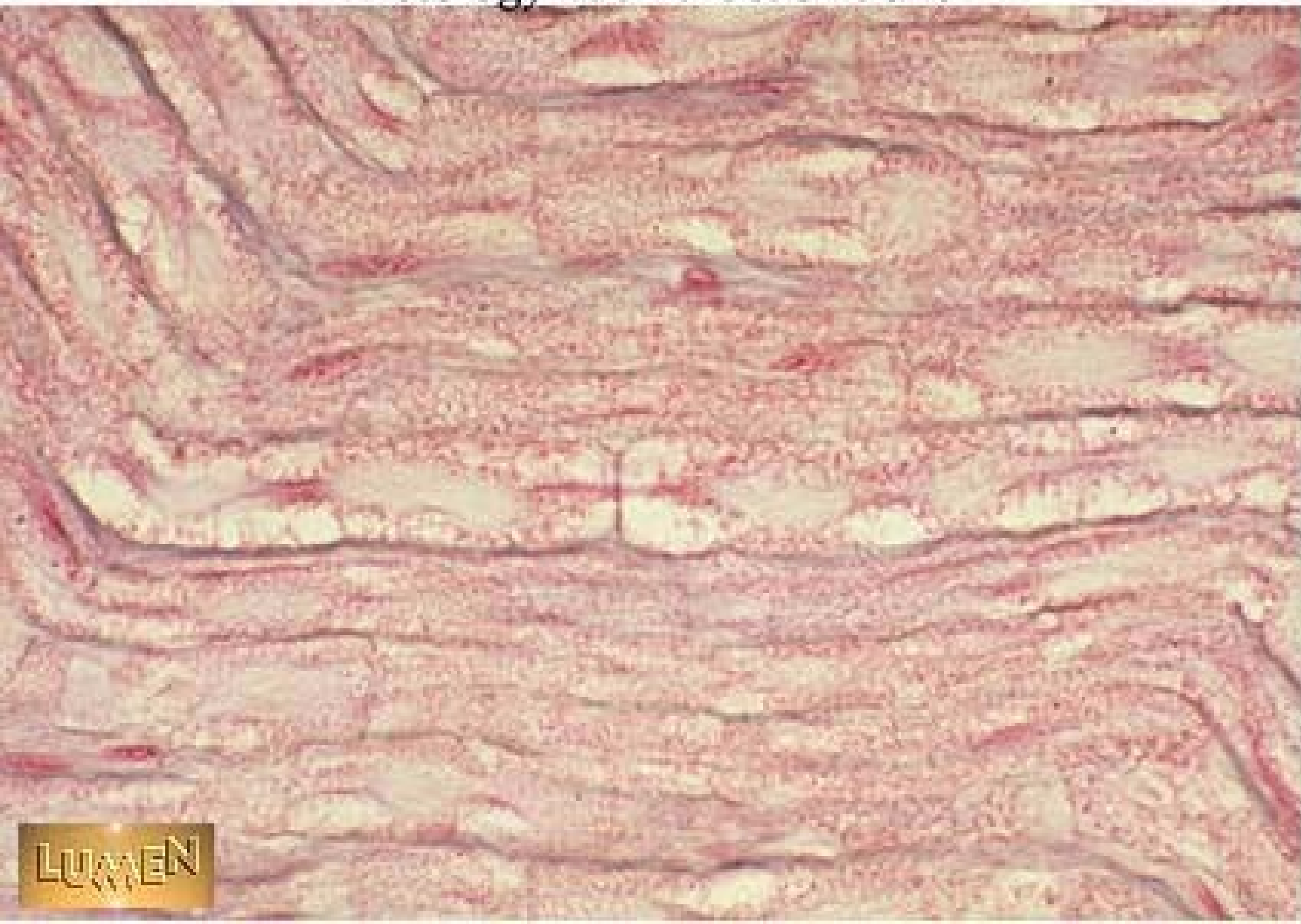
# Periferní nerv (HE)



# Periferní nerv (HE) podélně



# Histology Lab Part 6: Slide 15



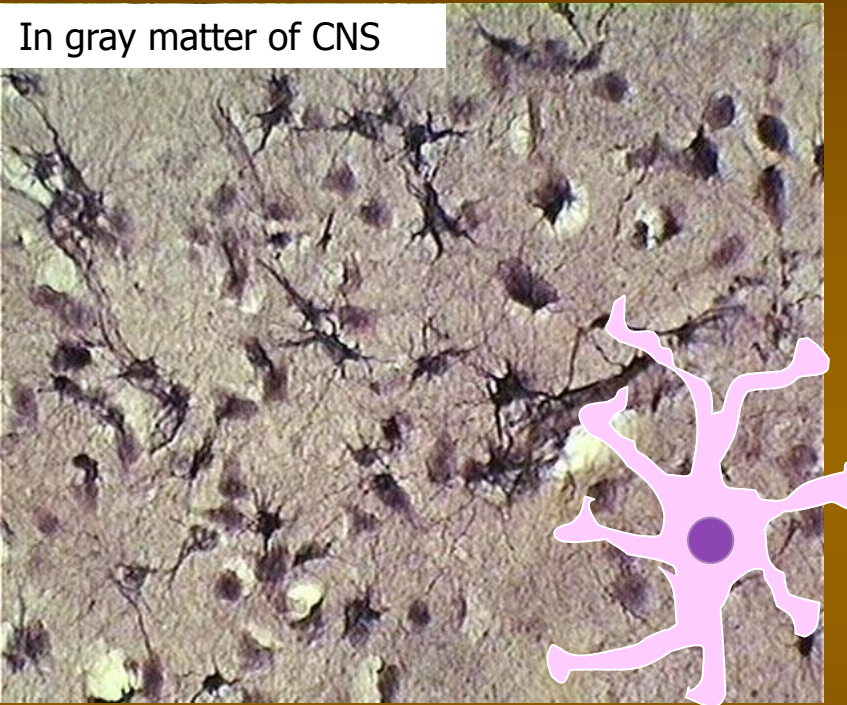


© Shaikera

# Astrocytes (macroglia)

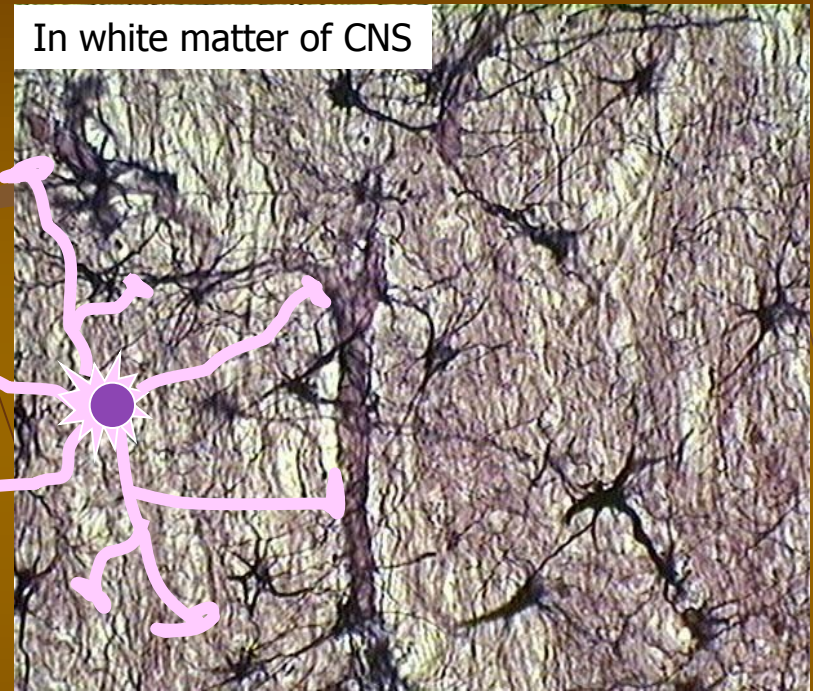
## ■ Protoplasmic astrocytes

In gray matter of CNS



## Fibrous astrocytes

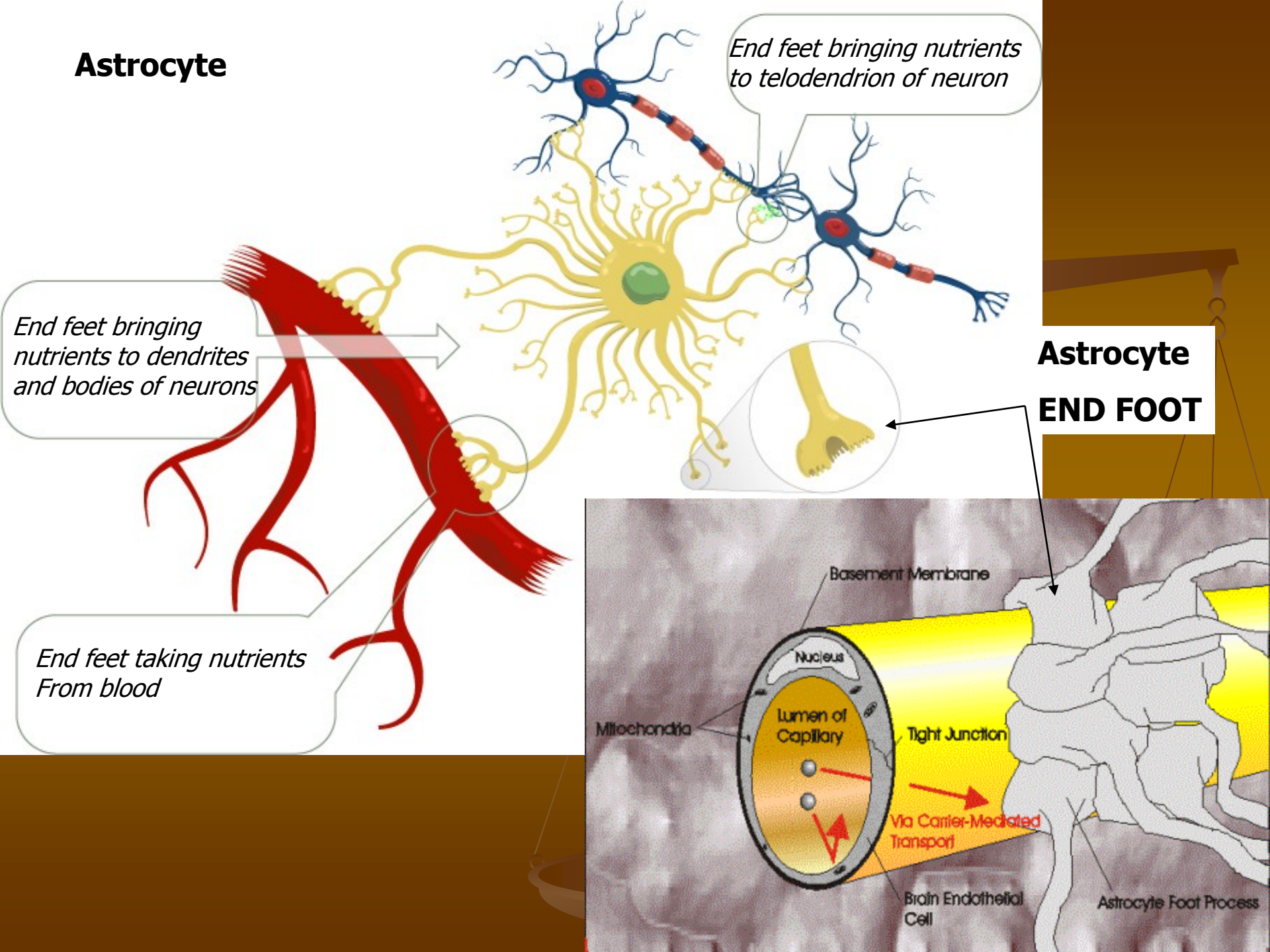
In white matter of CNS

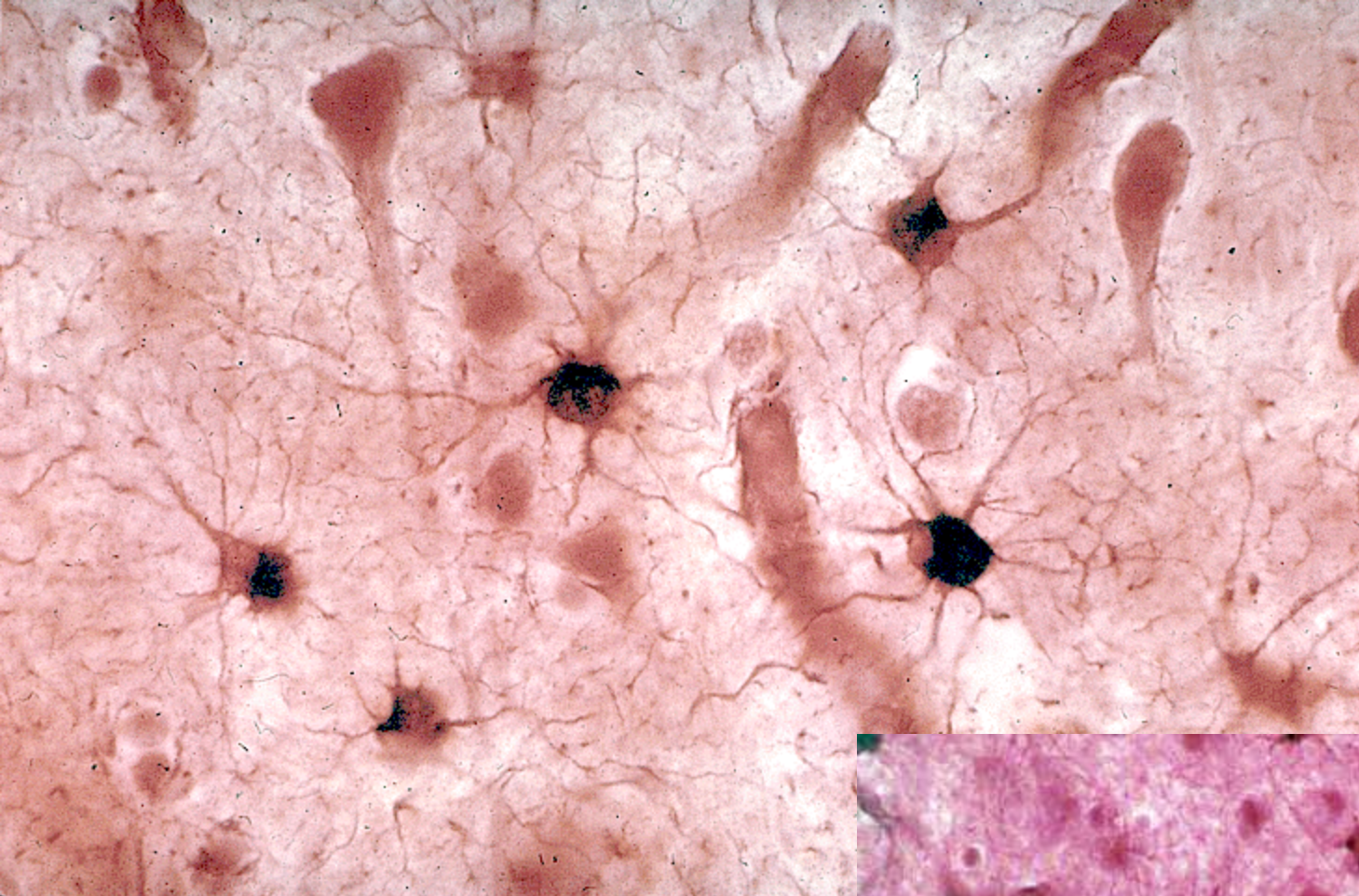


- Functions: cytoplasmic processes are ended by **end feet**, which form continuous layer – limiting membranes on the surface of:
  - 1) blood capillaries (*membrana limitans gliae perivascularis*; together with endothelium it forms **blood-brain barrier**,
  - 2) brain (*membrana limitans gliae superficialis*)Astrocytes have protective and nutritive function

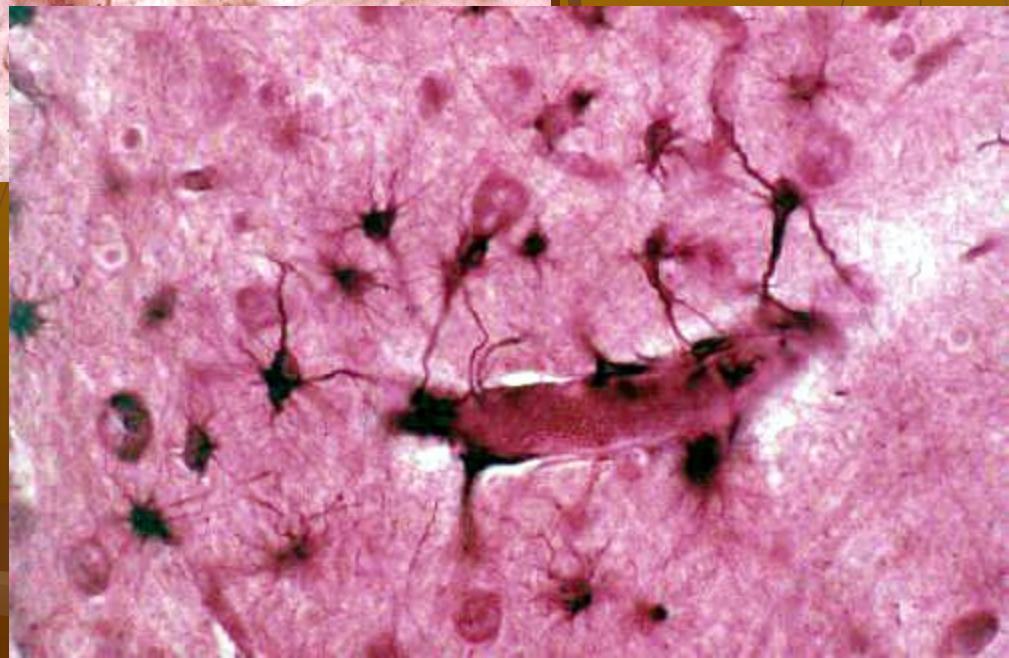


# Astrocyte

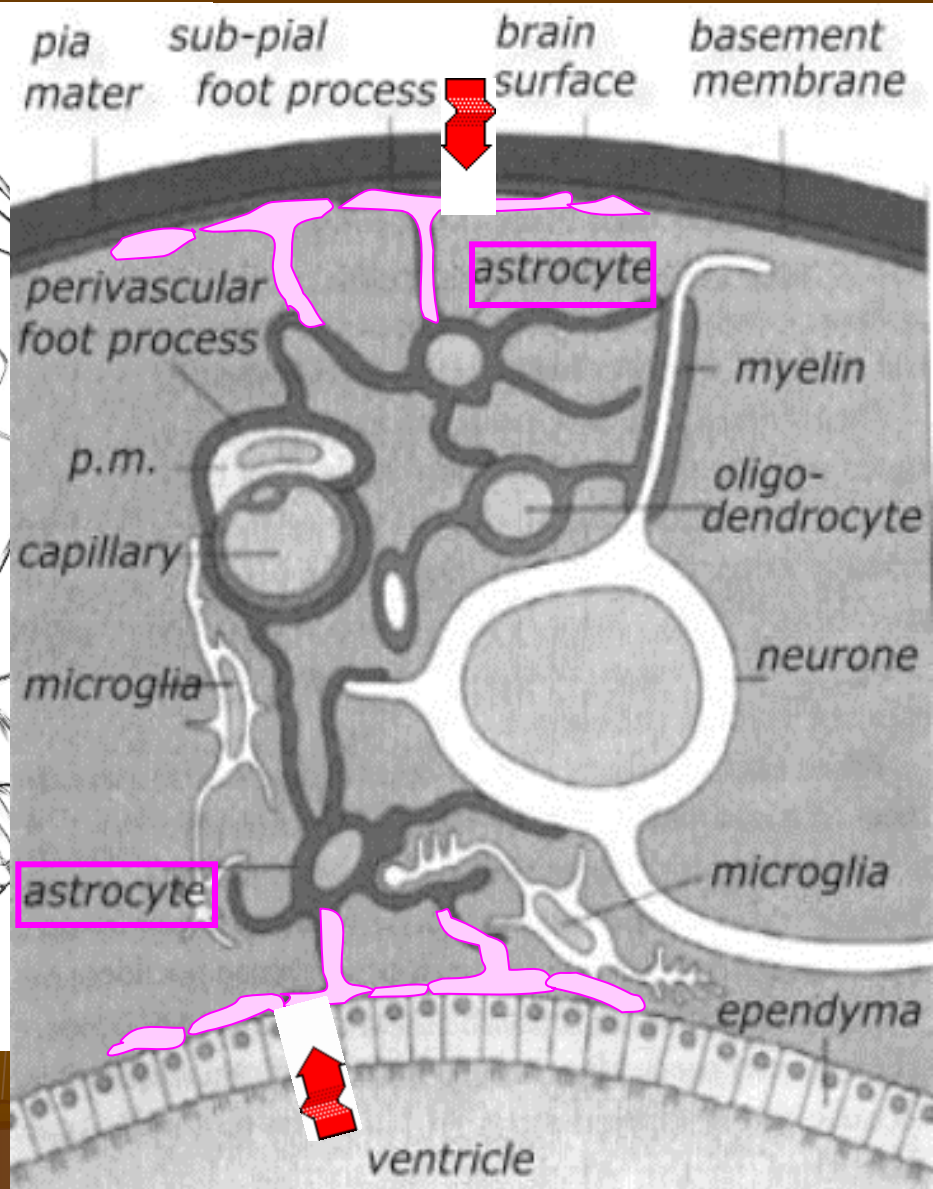
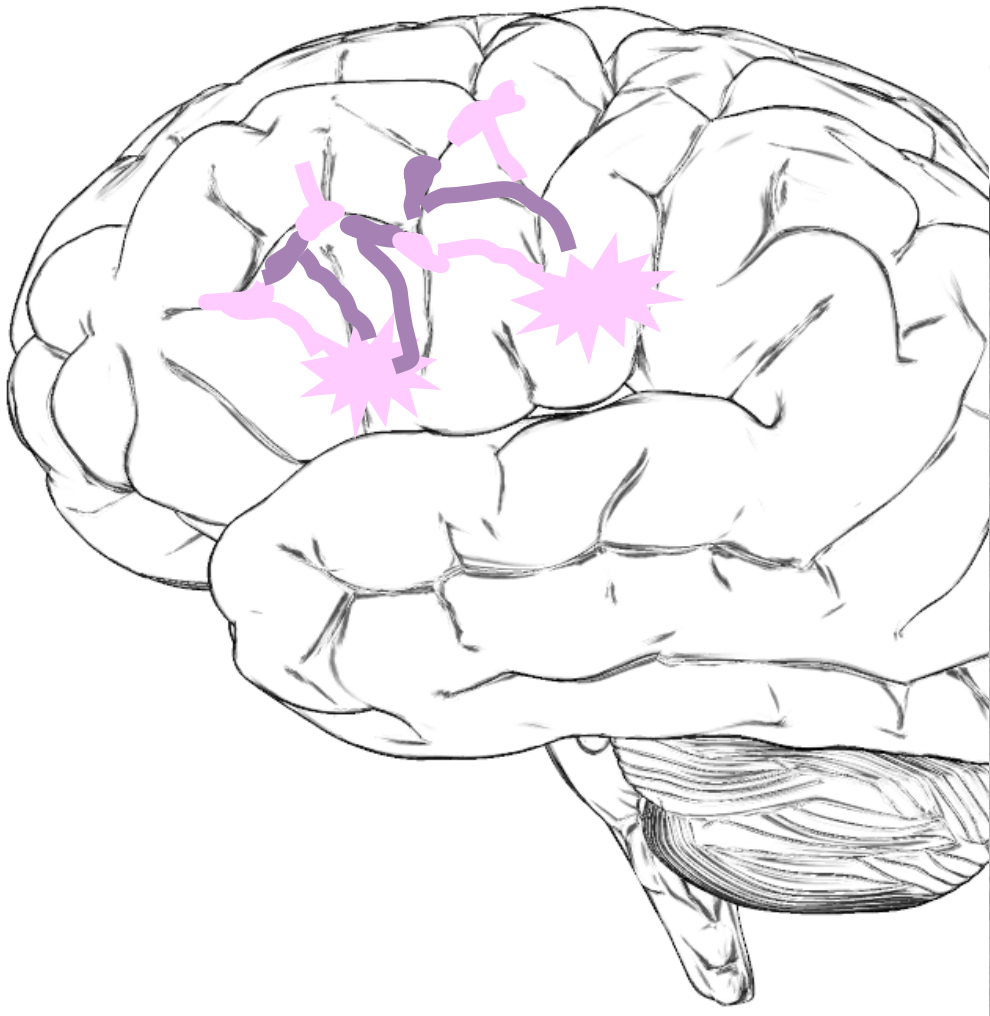


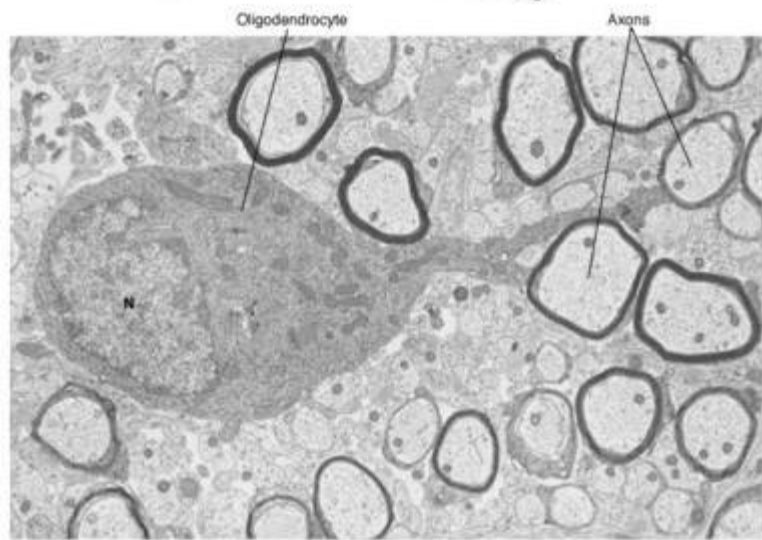
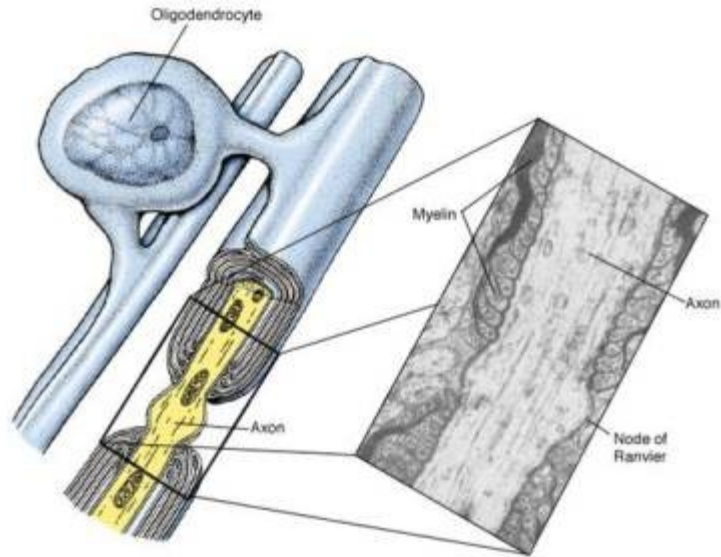


**Astrocytes**

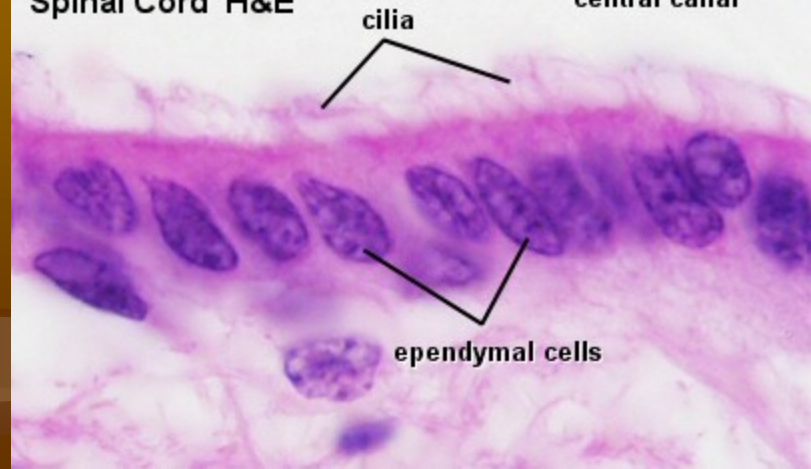


# Membrana limitans gliae superficialis

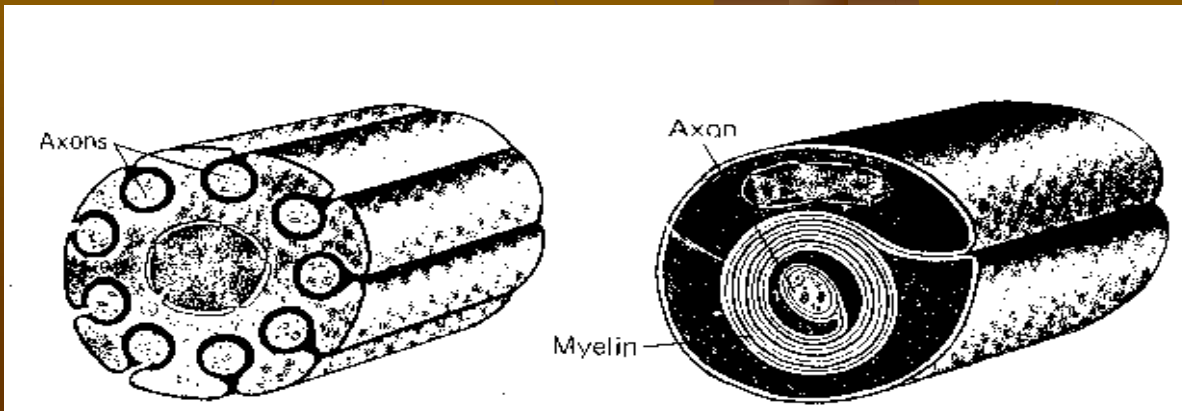
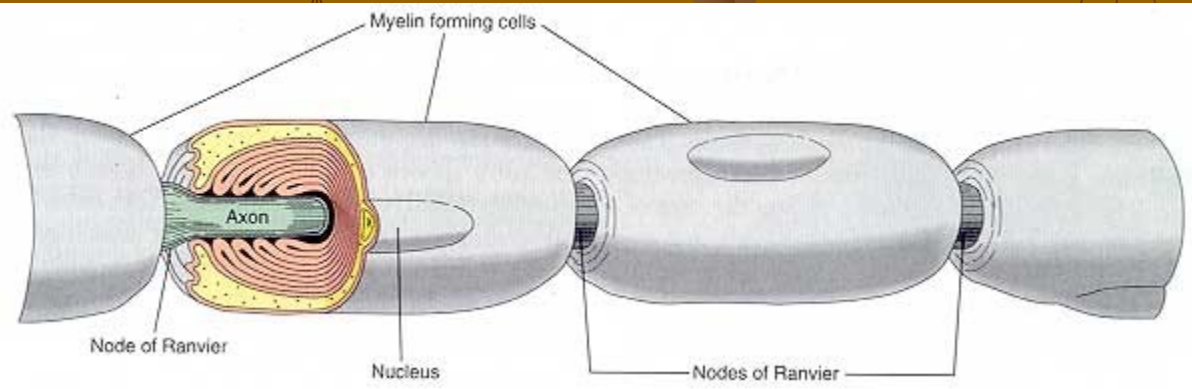
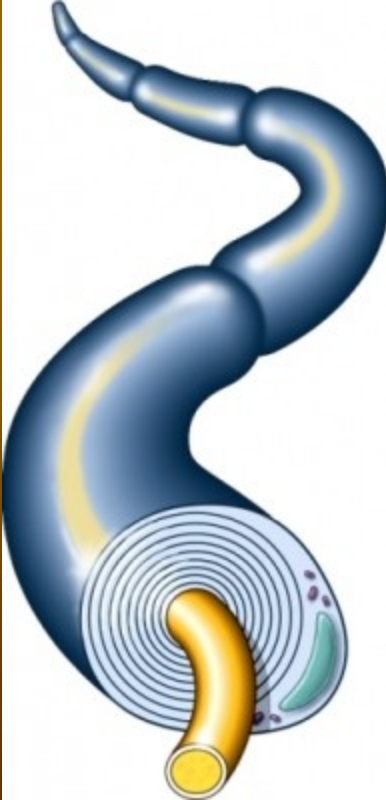
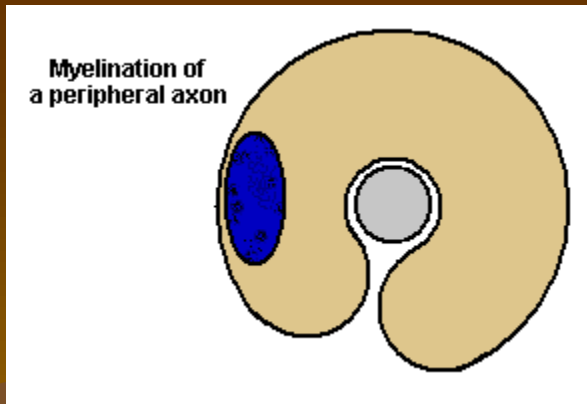
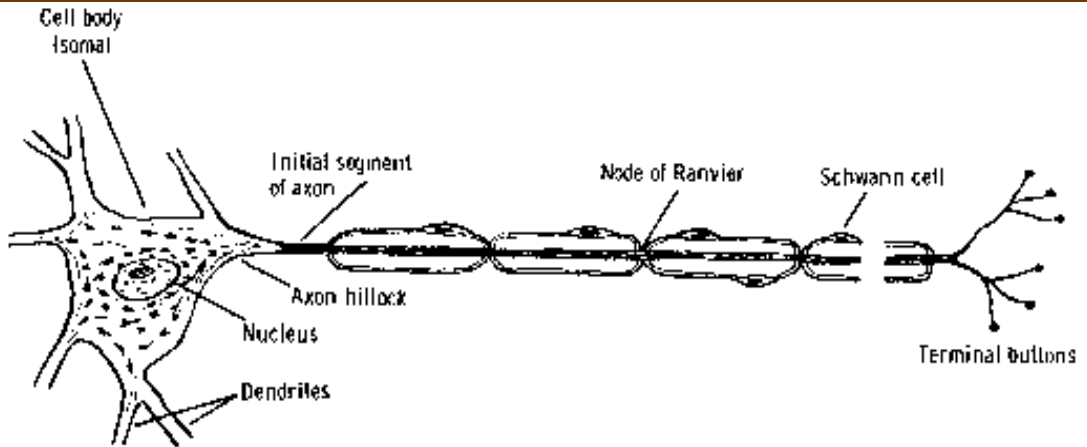


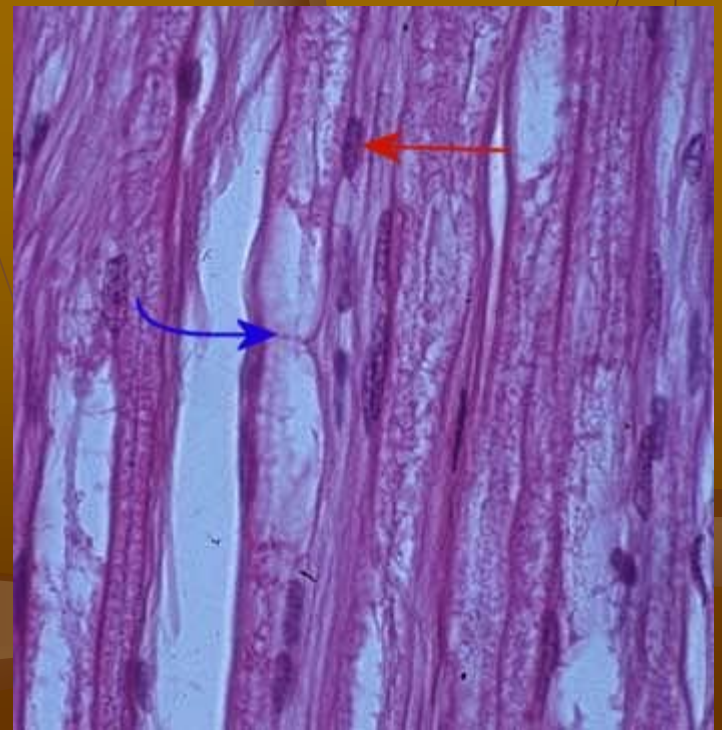
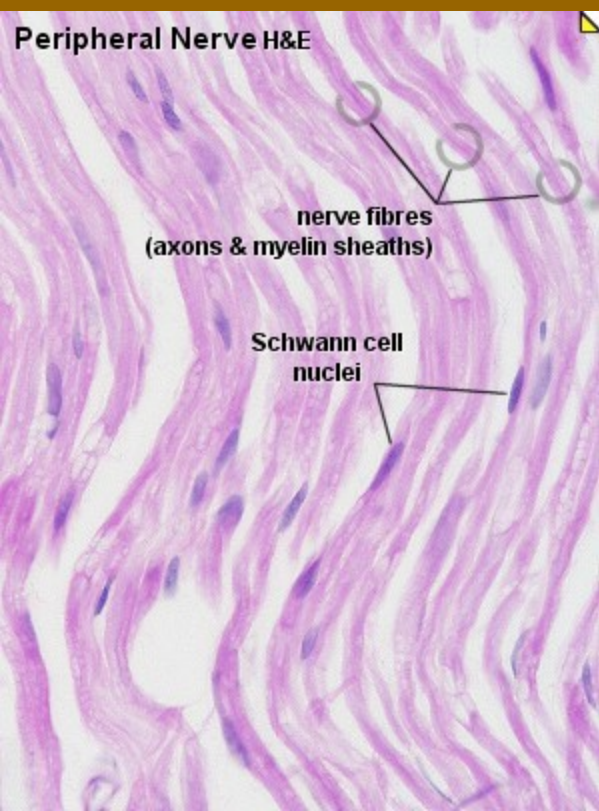
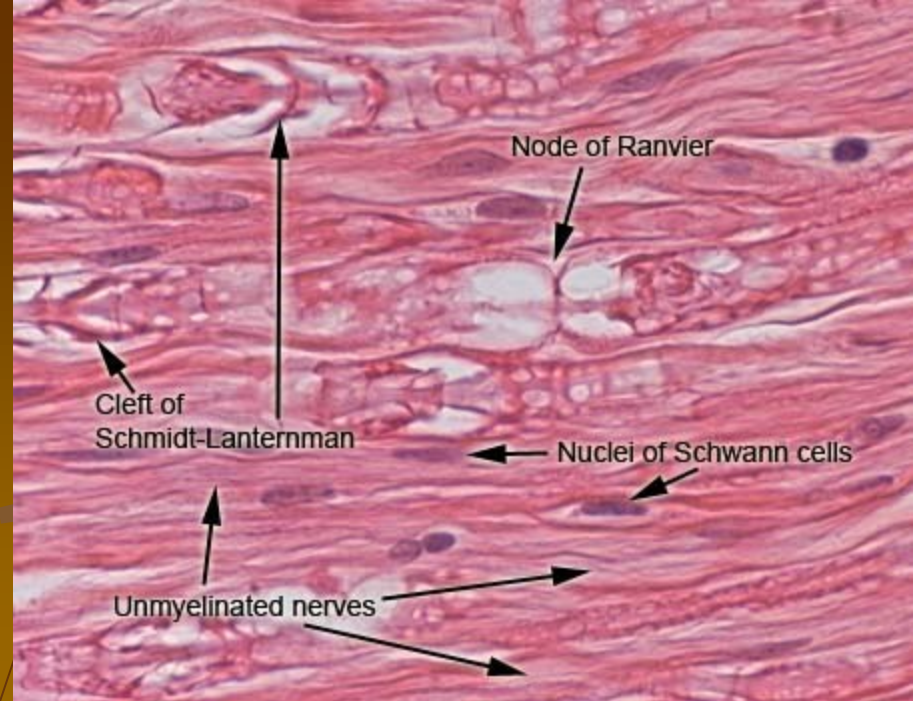
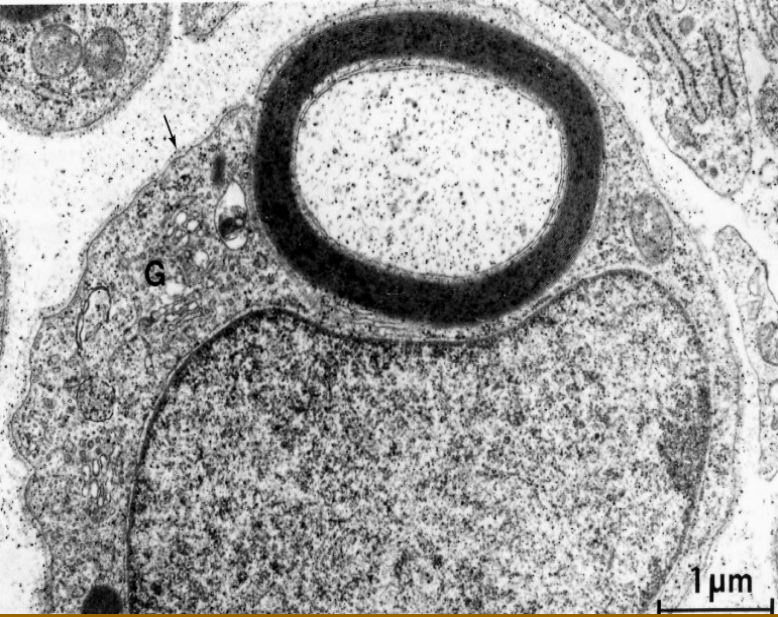


Spinal Cord H&E



# PERIFERNÍ GLIE: SCHWANNOVY BUŇKY





### Dorsal Root Ganglion H&E

ganglion cell nuclei

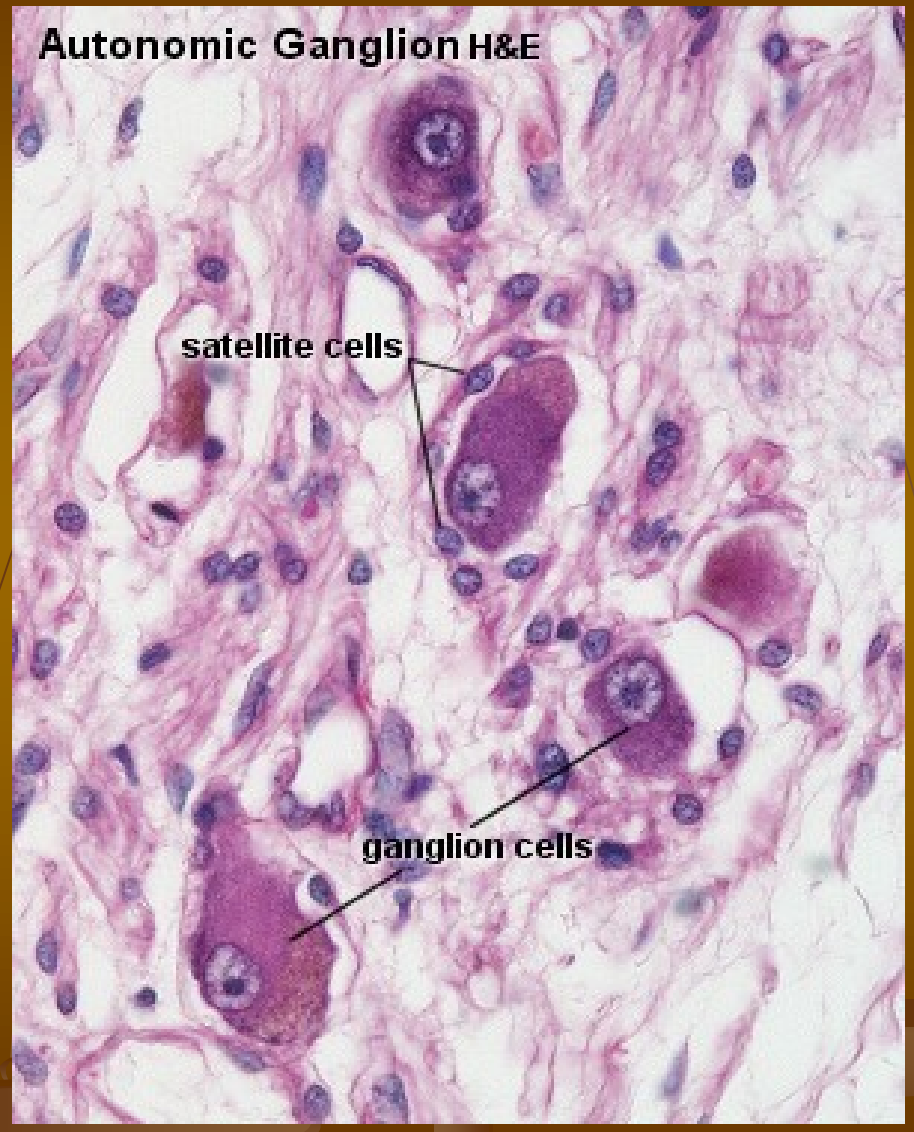
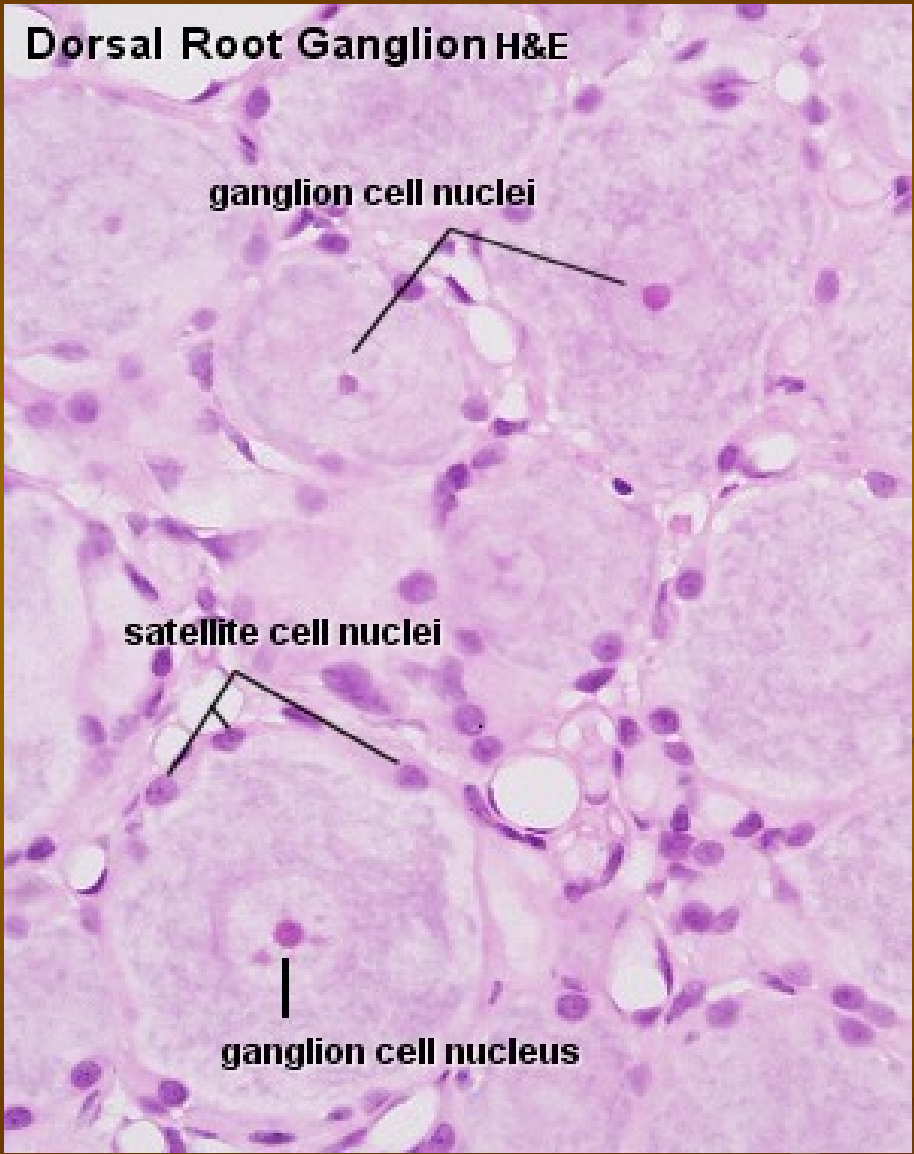
satellite cell nuclei

ganglion cell nucleus

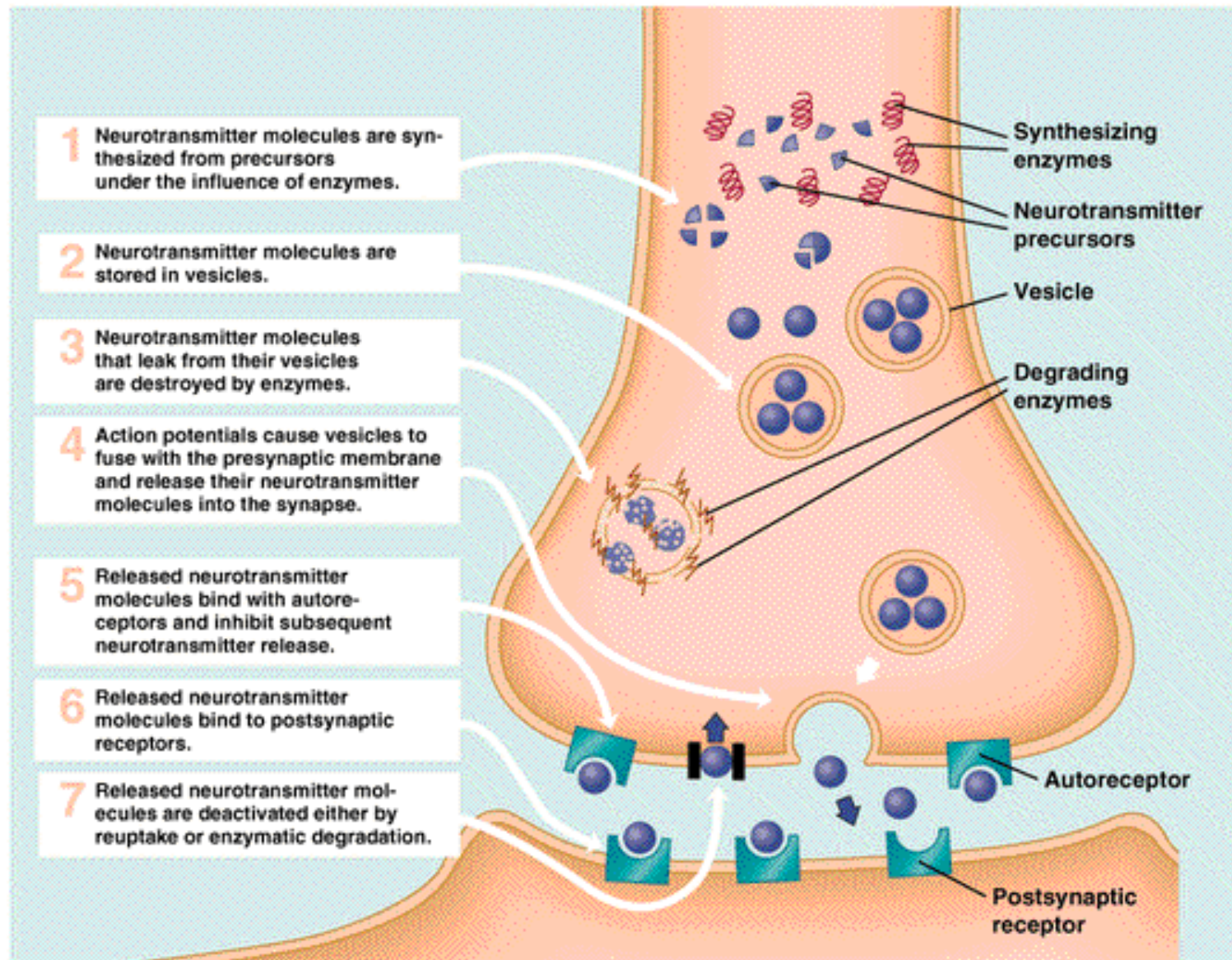
### Autonomic Ganglion H&E

satellite cells

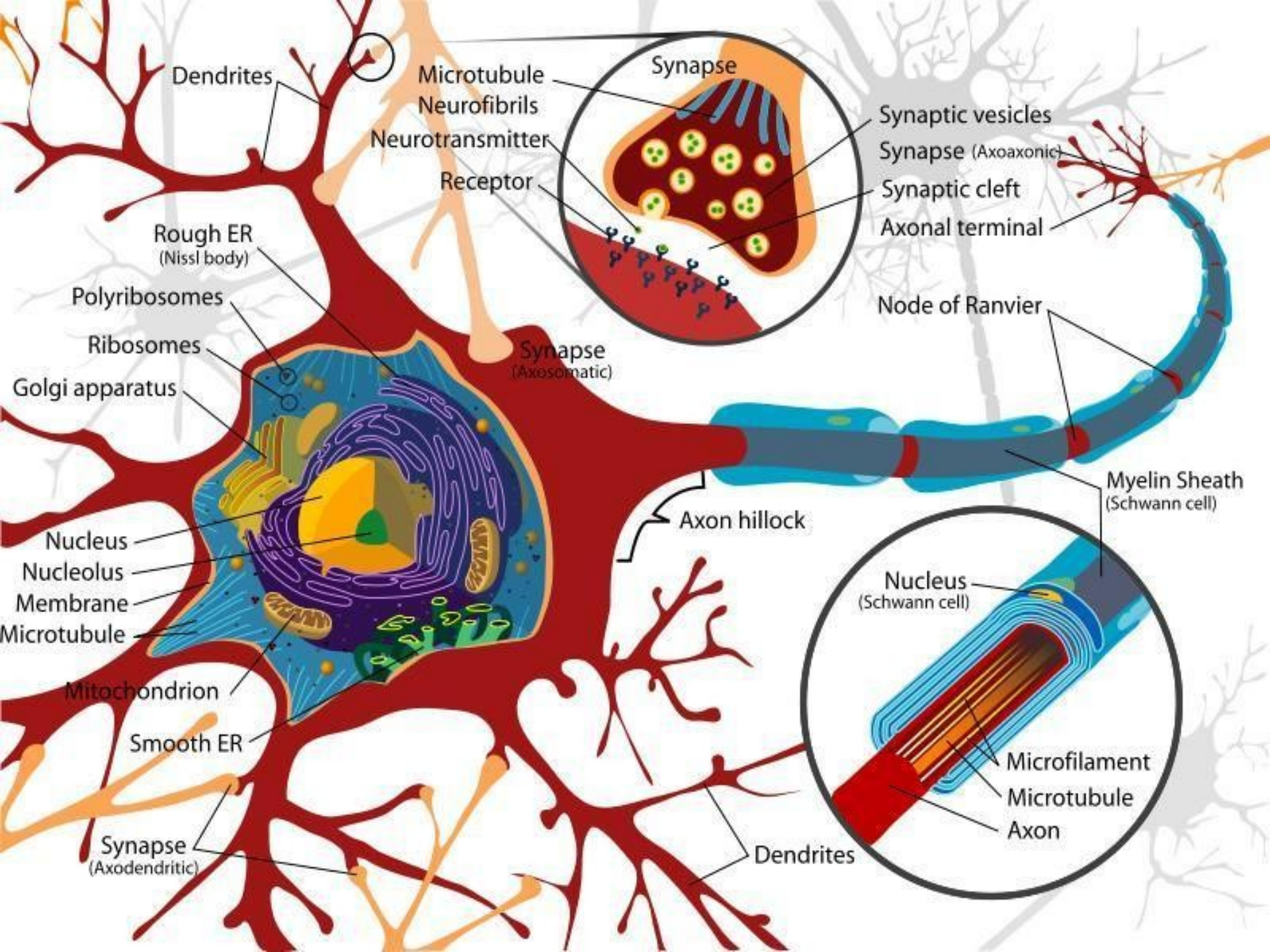
ganglion cells

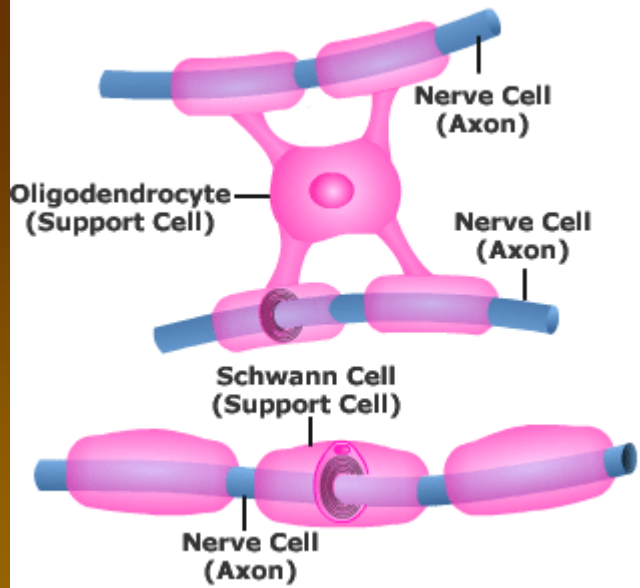


## ► Seven Processes in Neurotransmitter Action

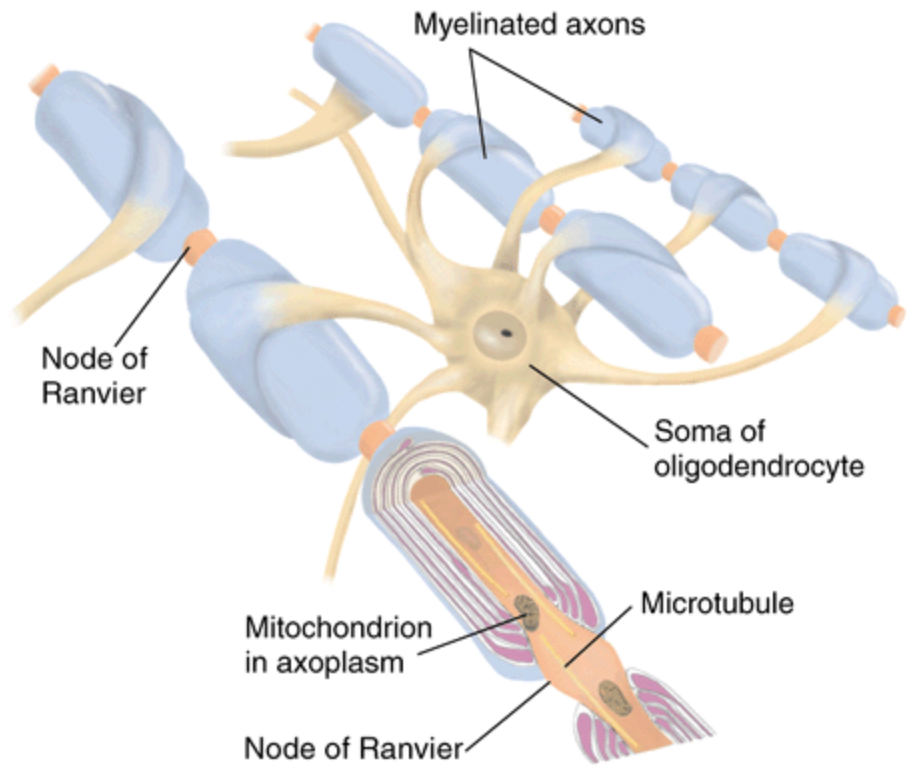


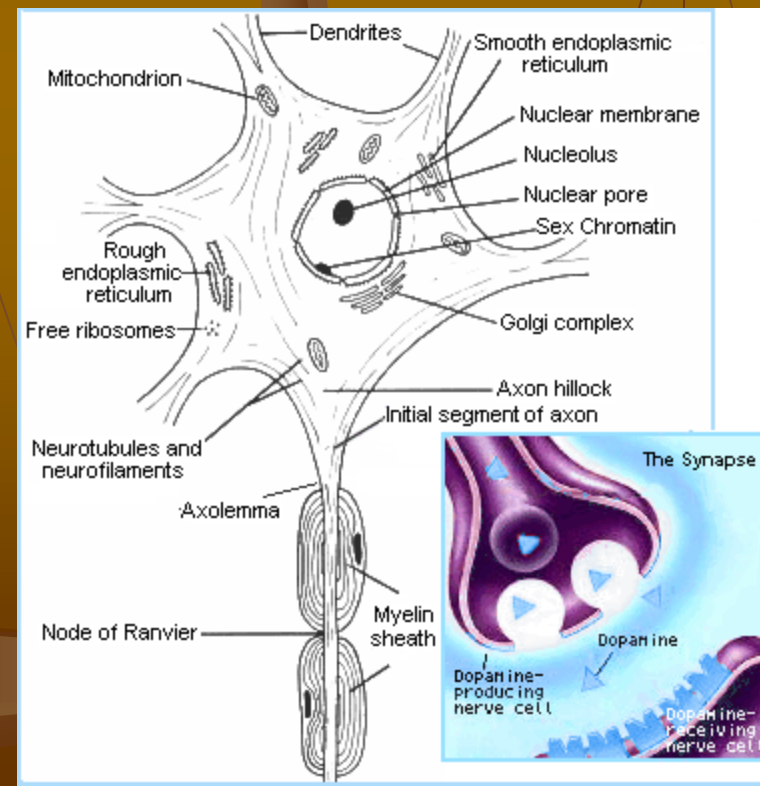
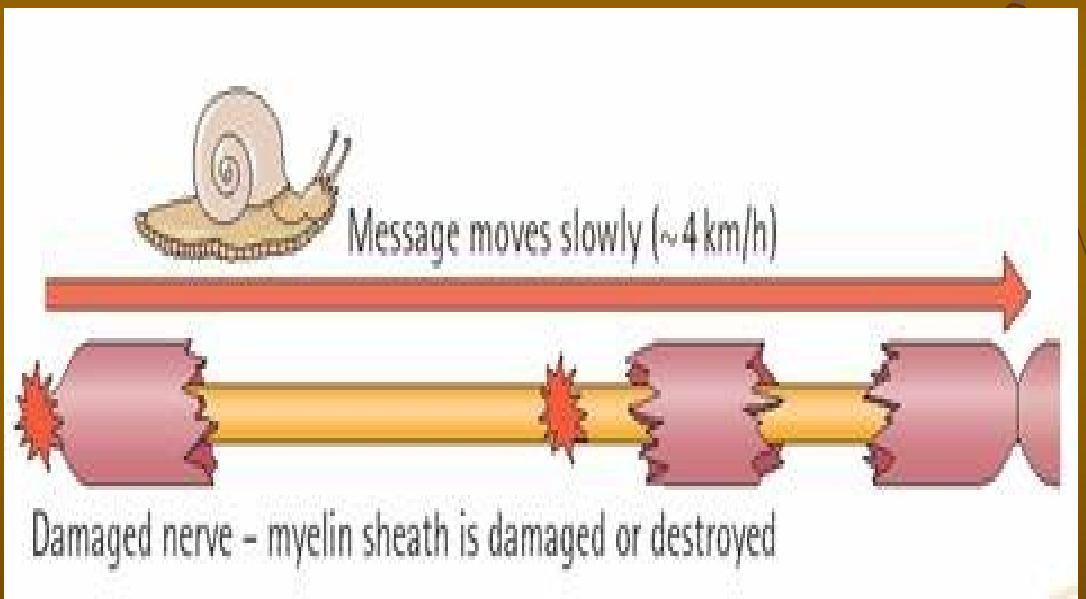
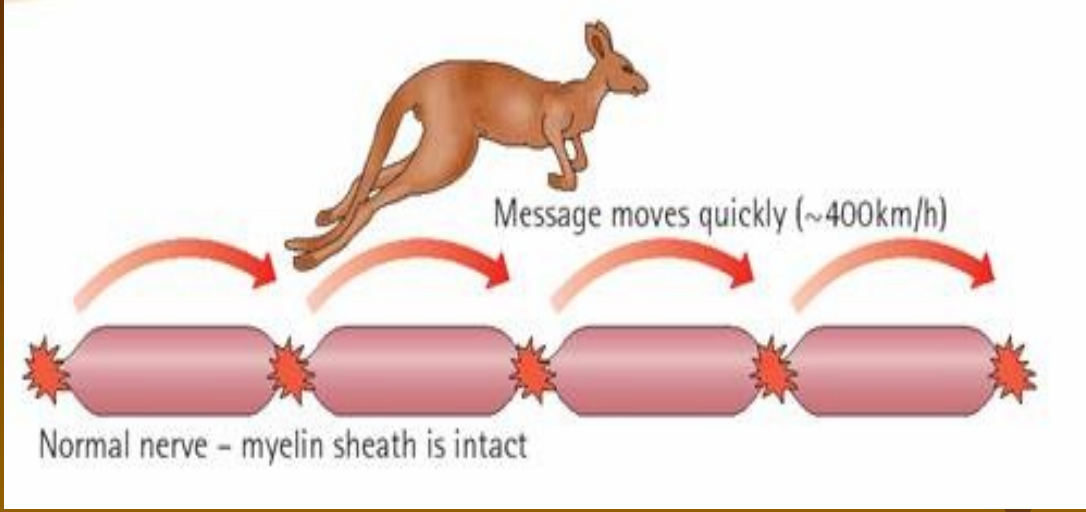






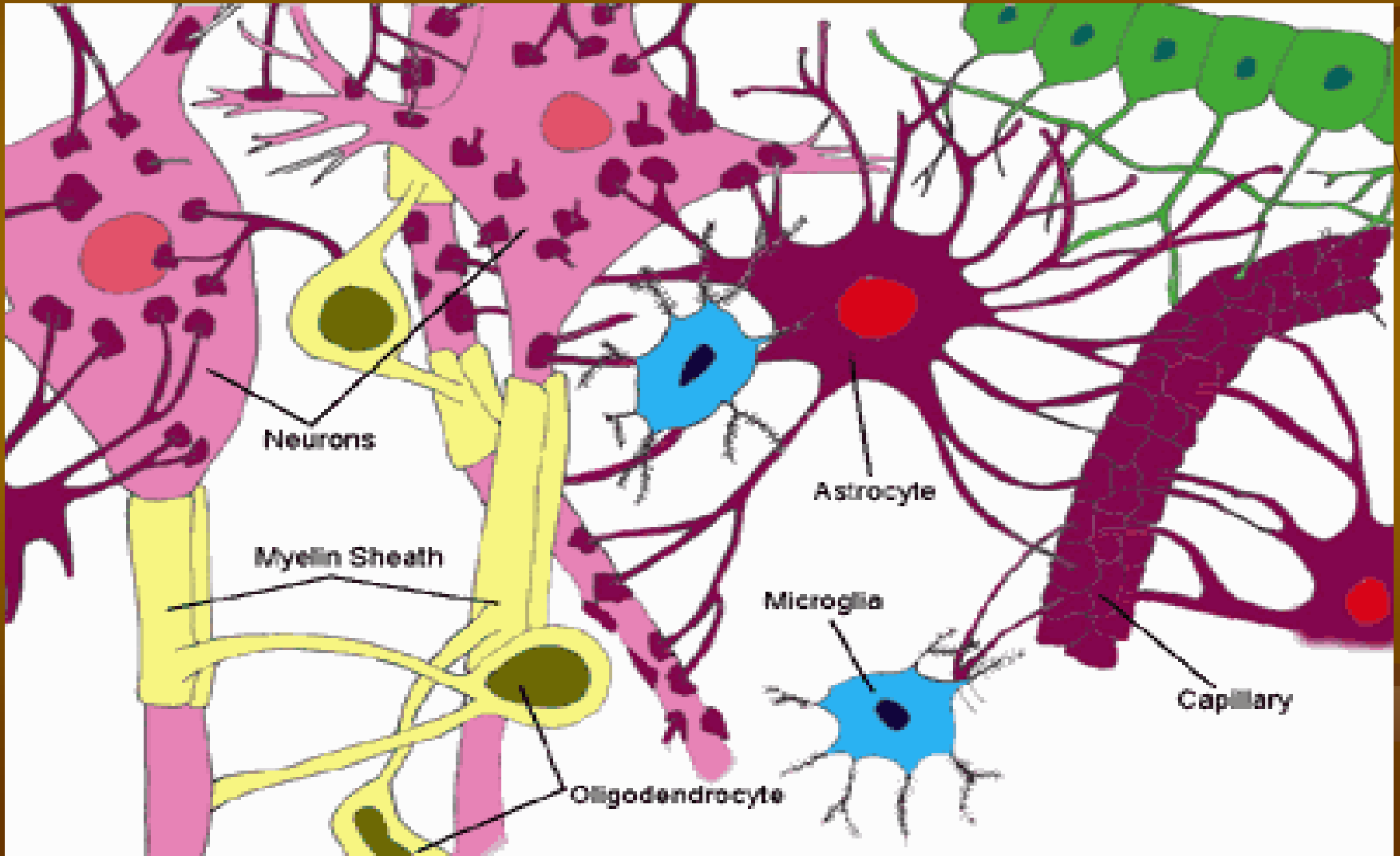
► An Oligodendrocyte

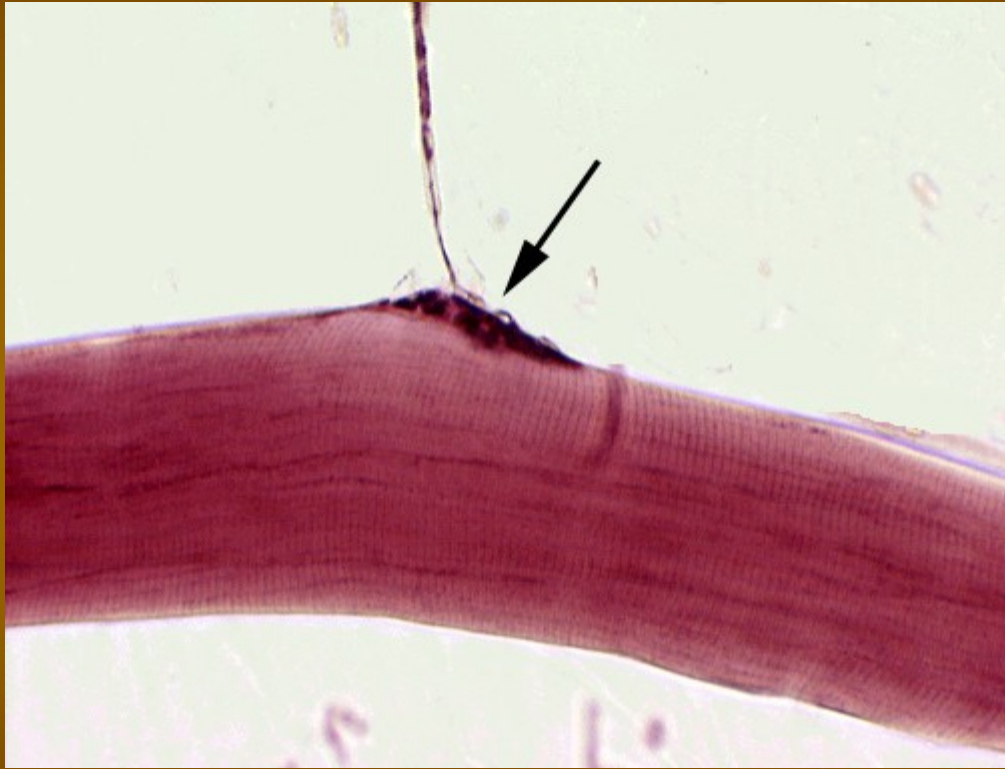


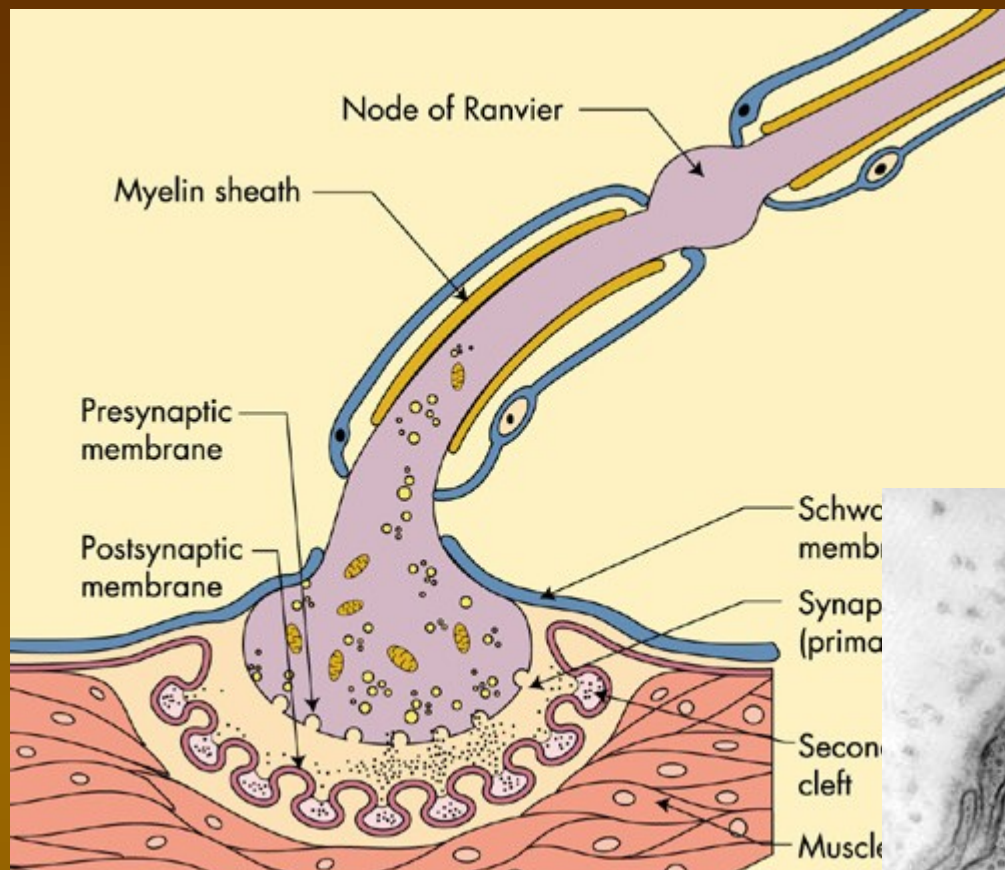


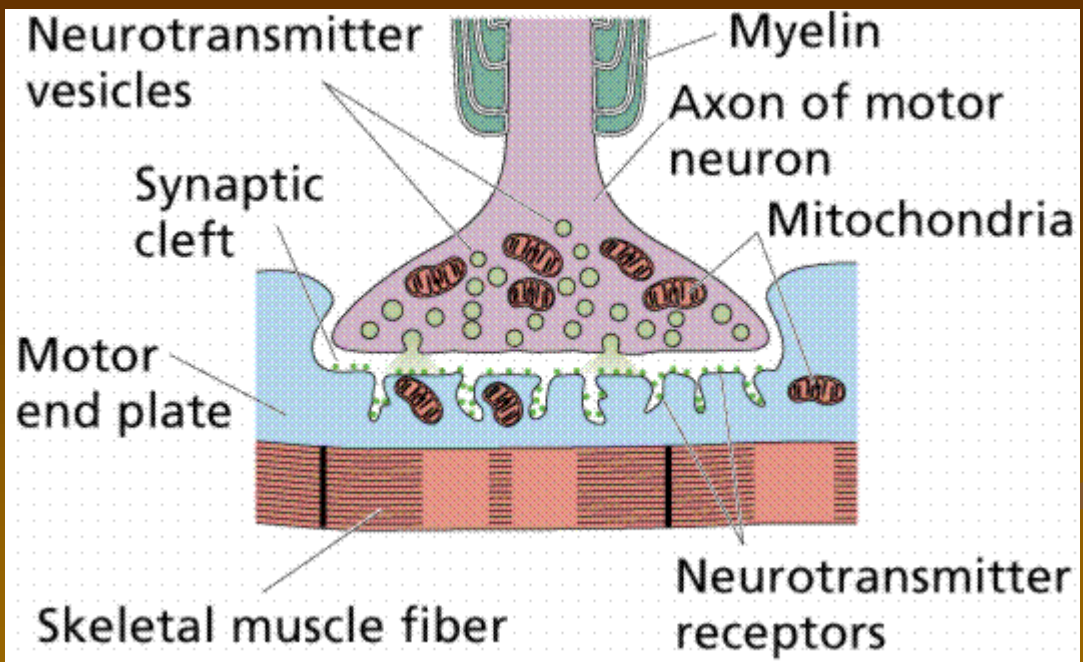
# Nervous tissue structure

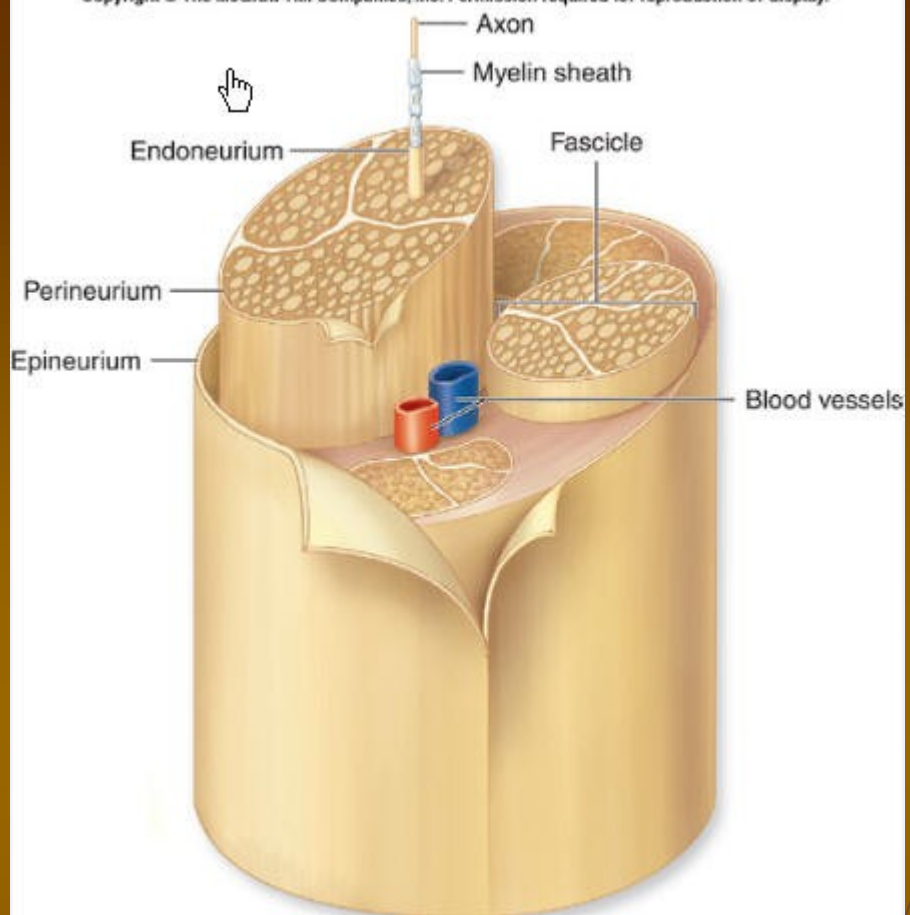
➡ nerve cells (neurons) + supporting cells (glia)



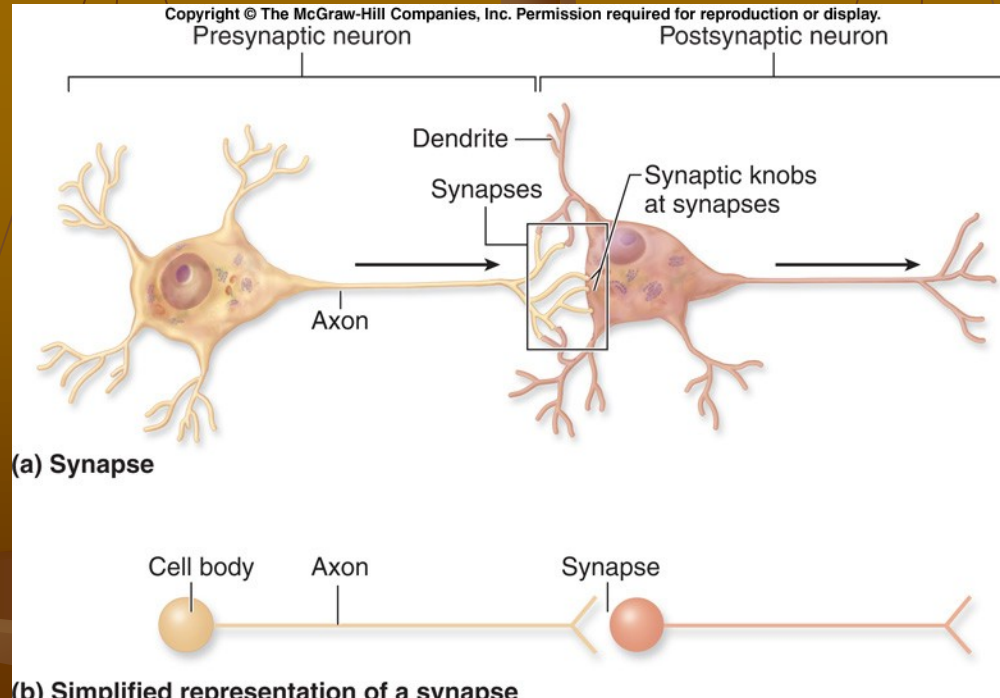
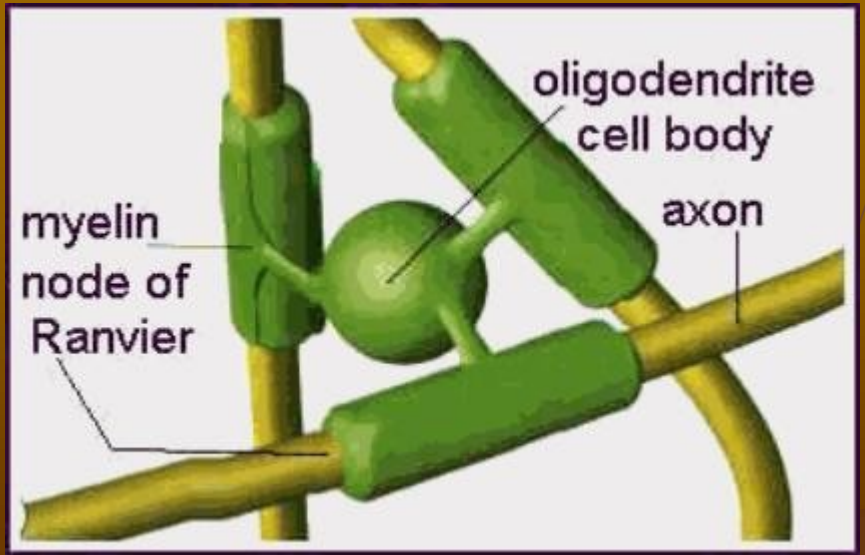
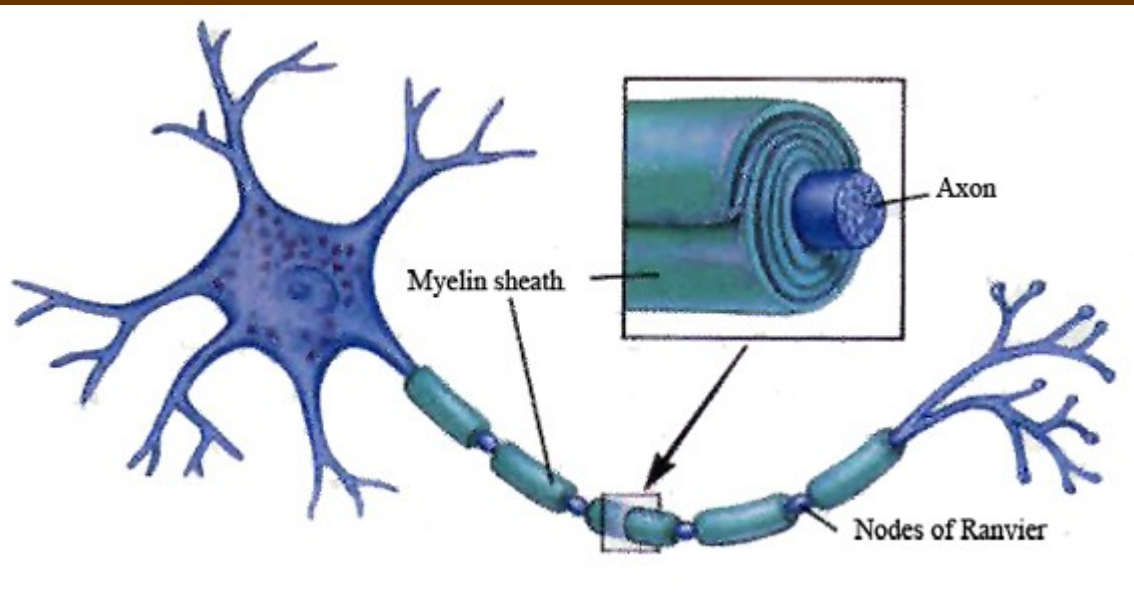


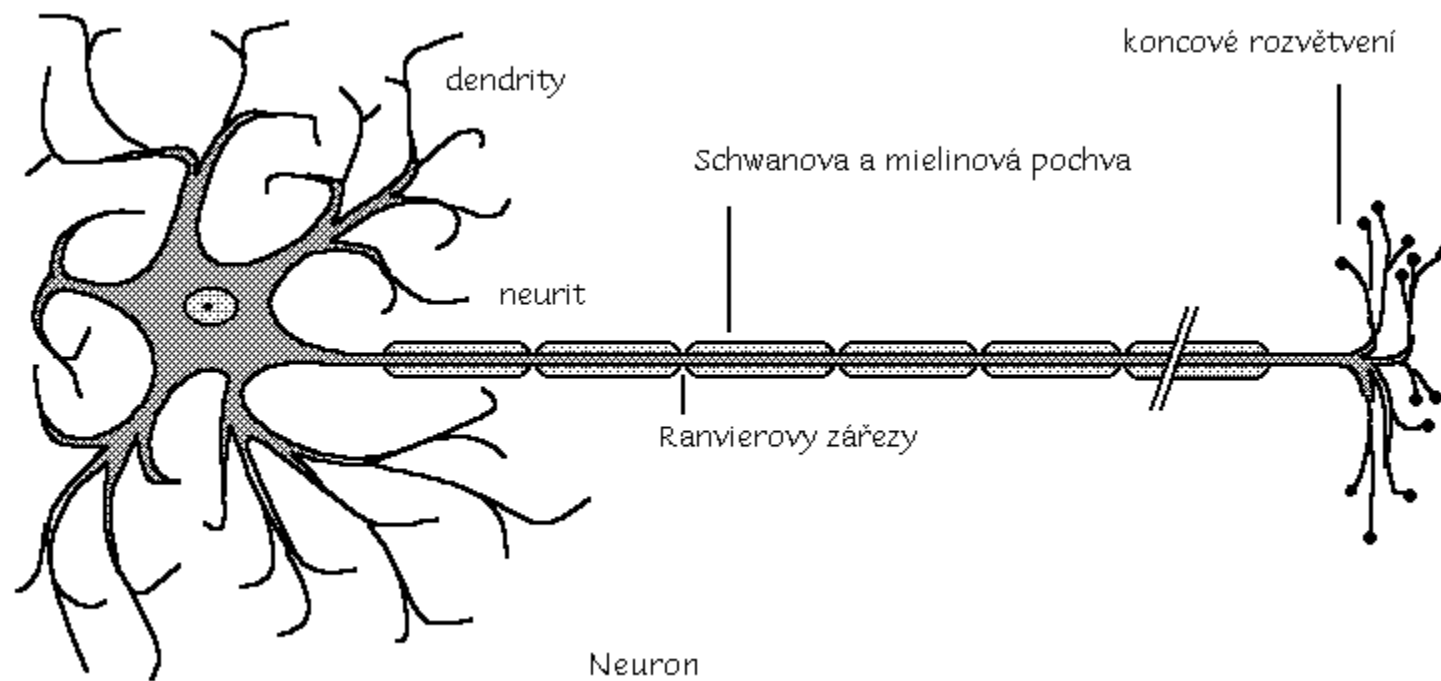


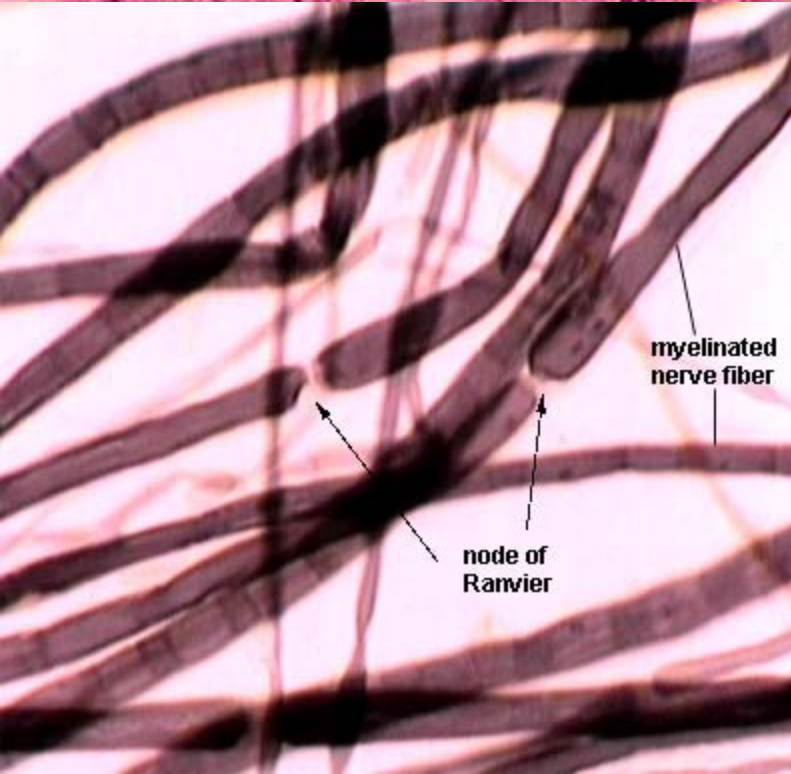
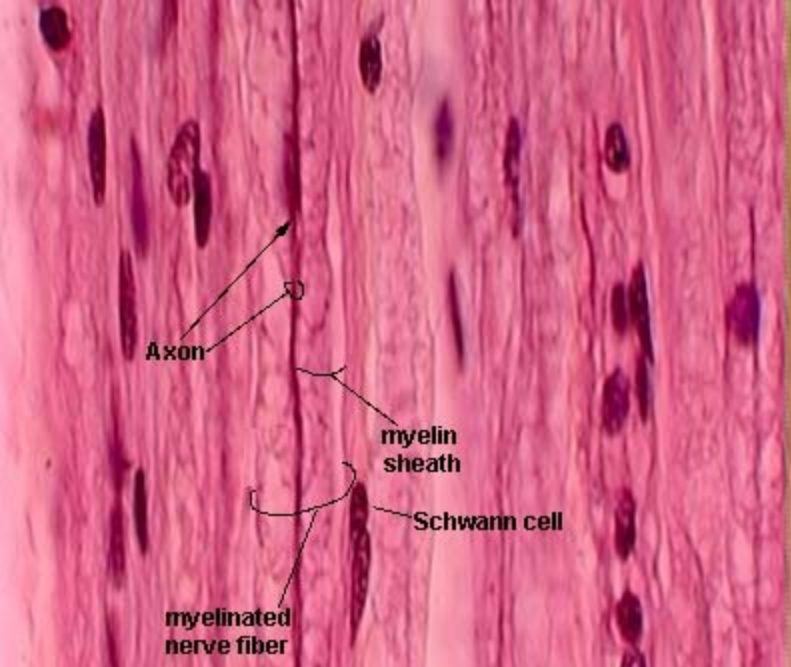


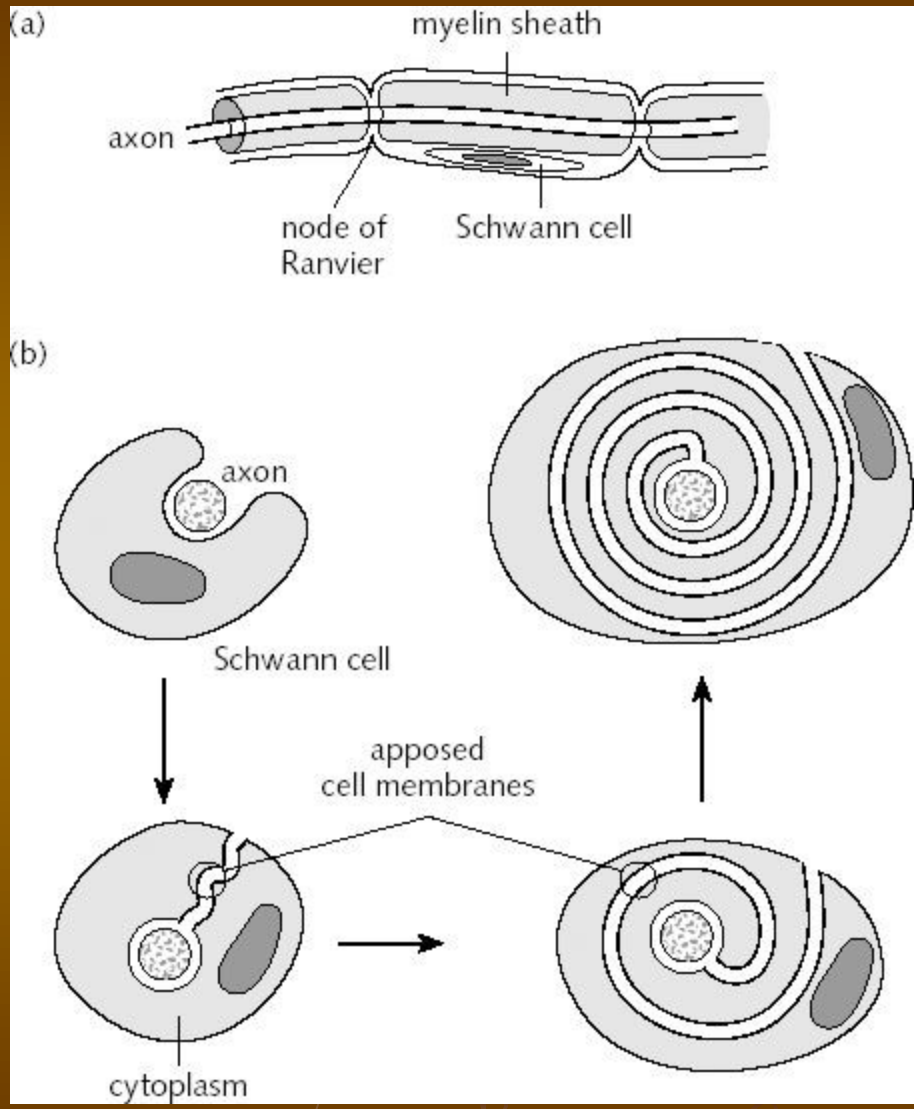


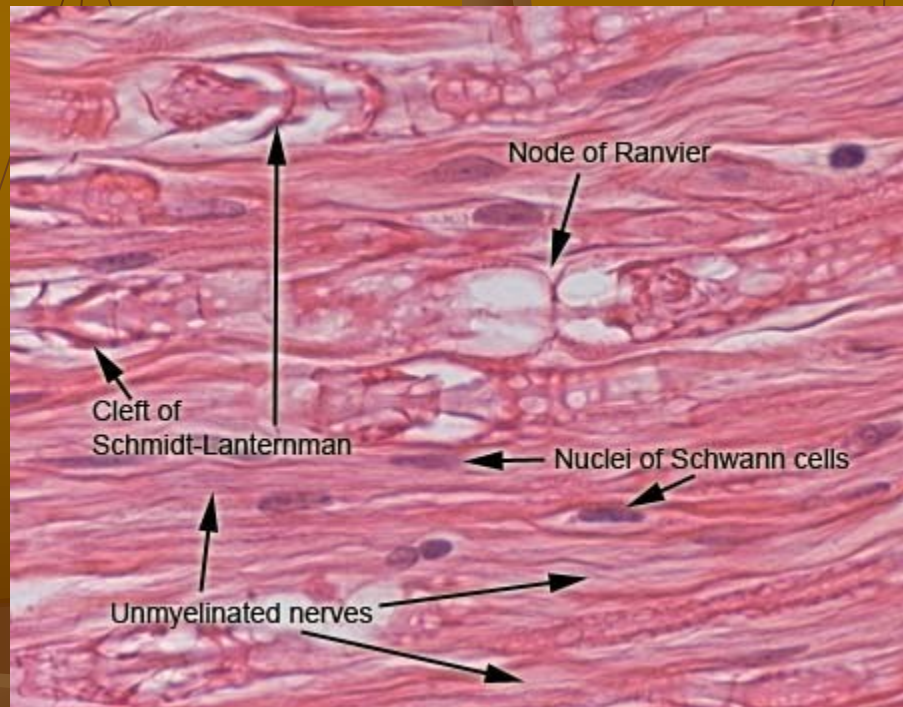
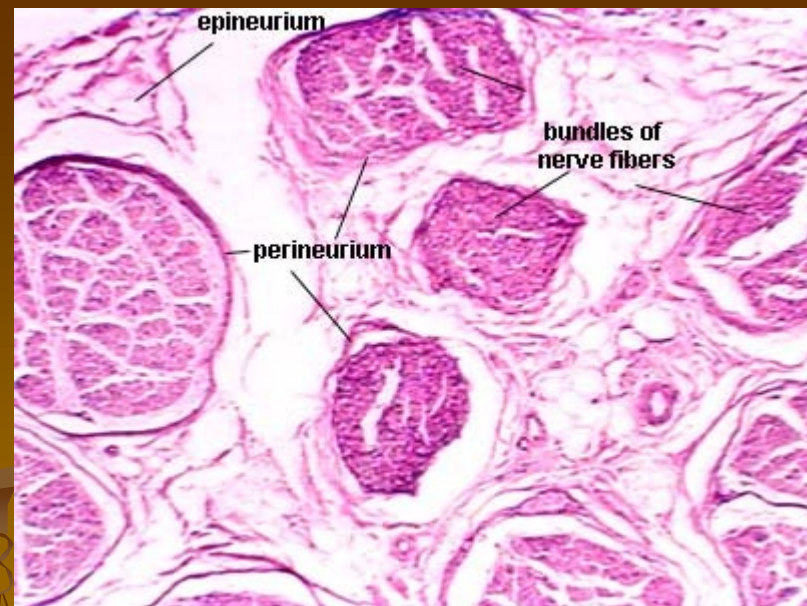
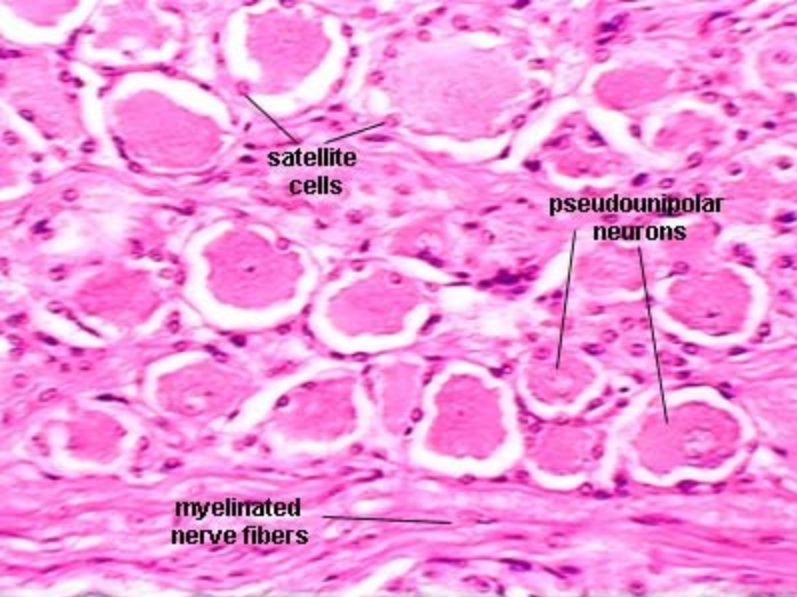


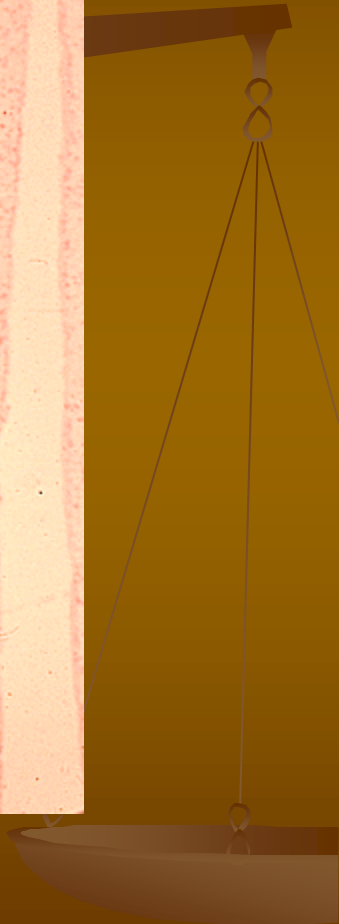


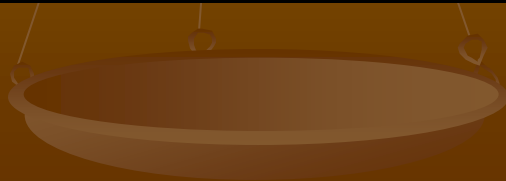
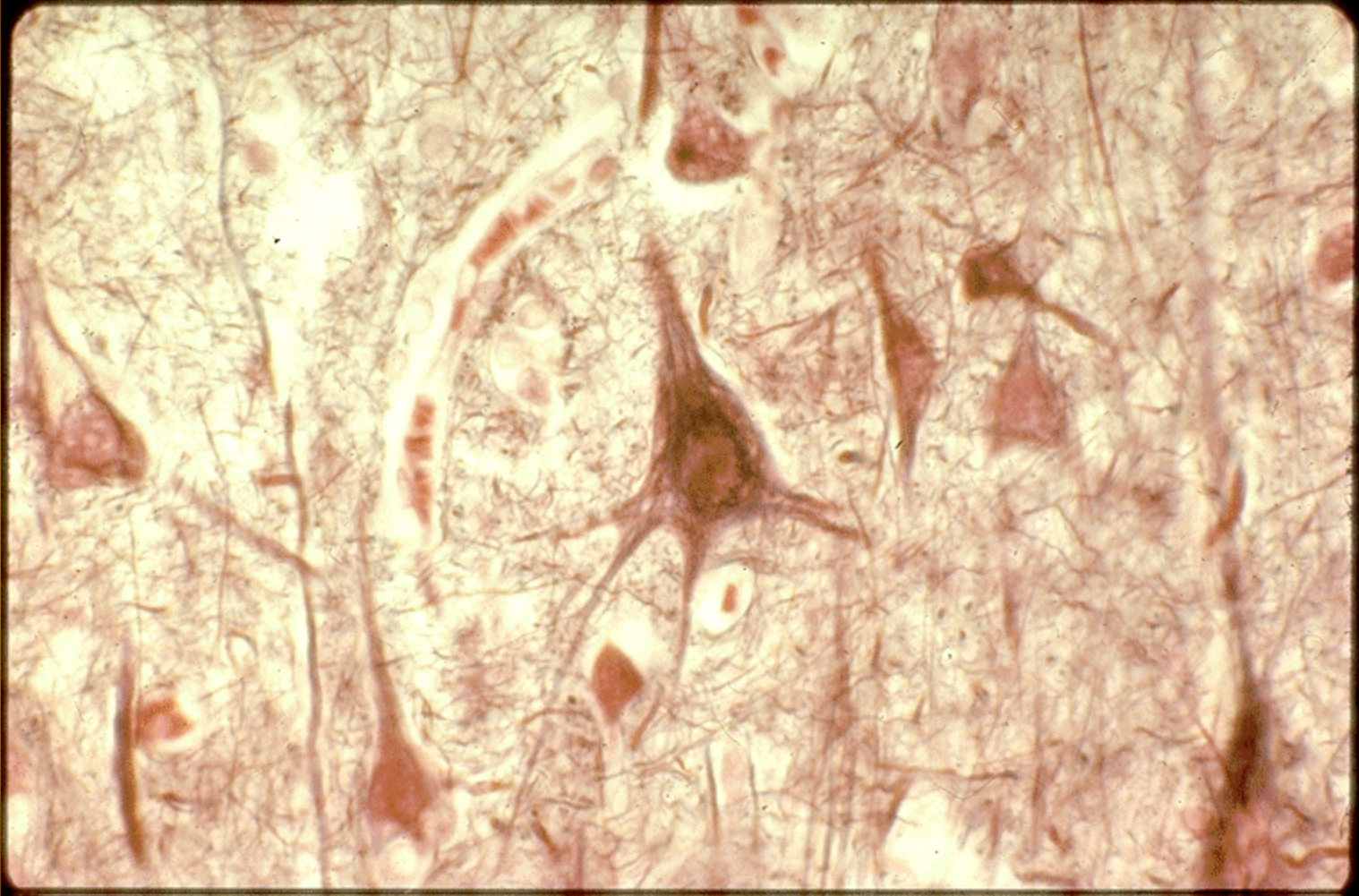














# CENTRAL GLIA

Oligodendrocyte

Myelinated axon

Myelin sheath (cut)

Microglia

Neuron

Astrocyte

Capillary

Ependyma cells

ventricle of brain

