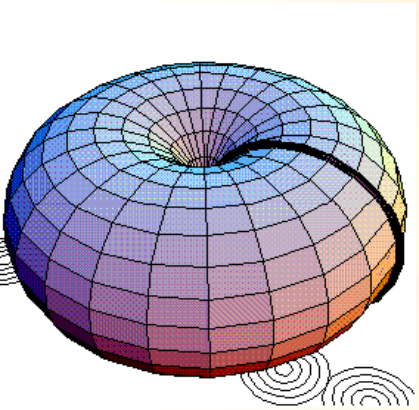
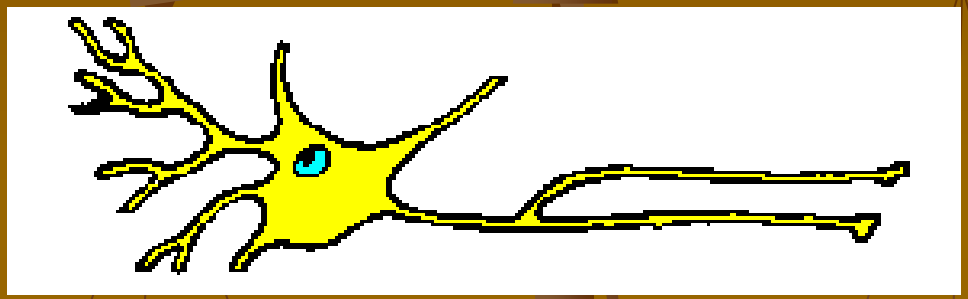
Nervová tkáň



Obecné vlastnosti nervové tkáně a její složky

dráždivost a vodivost

původ: neuroektoderm



funkce: nervová regulace

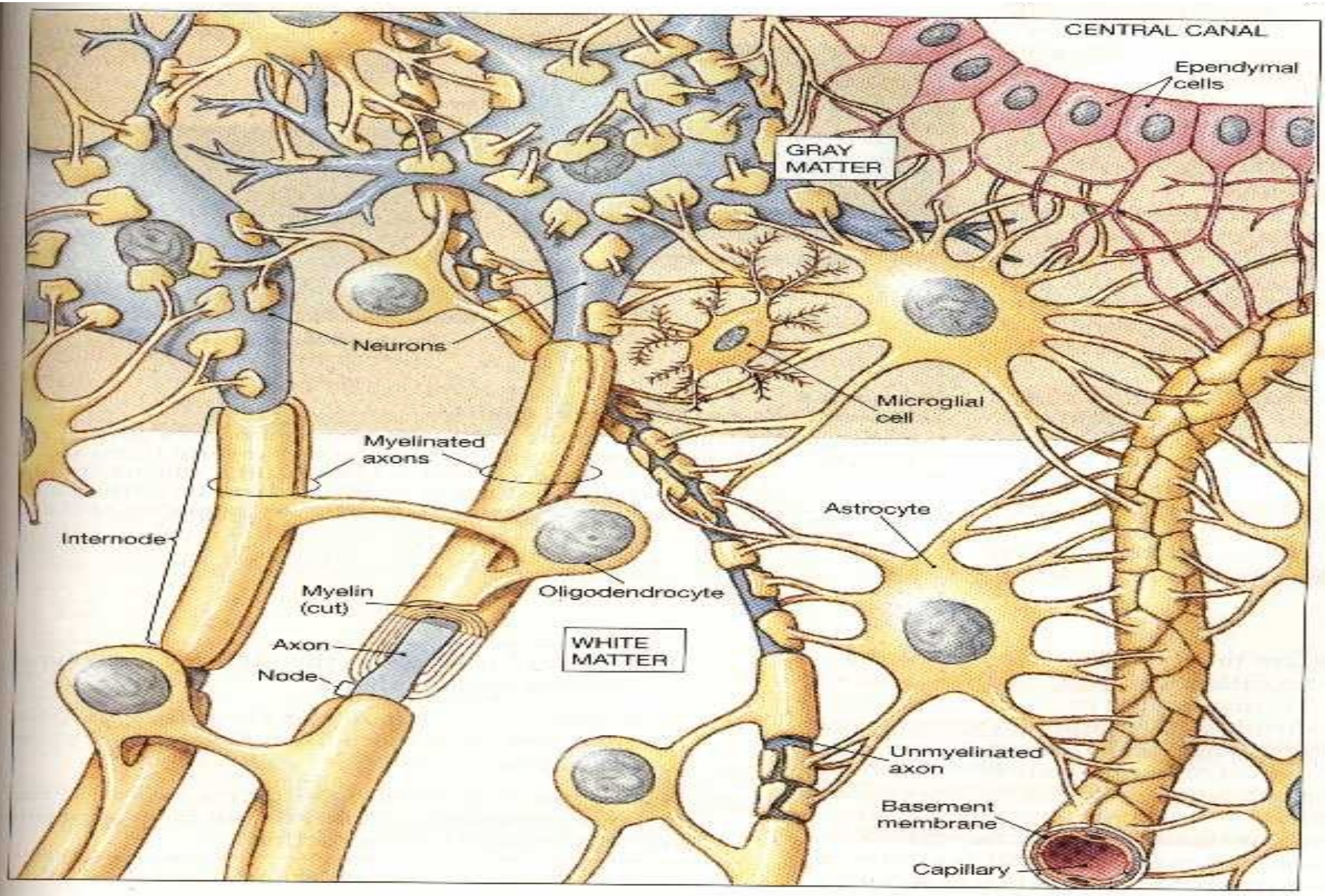
- přesná analýza změn
- rychlý převod informace do ústředí
- cílená a místně diferencovaná odpověď

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

PNS + CNS → **šedá hmota**
bílá hmota

NS – struktura:

Neurony + gliové buňky



Neuron

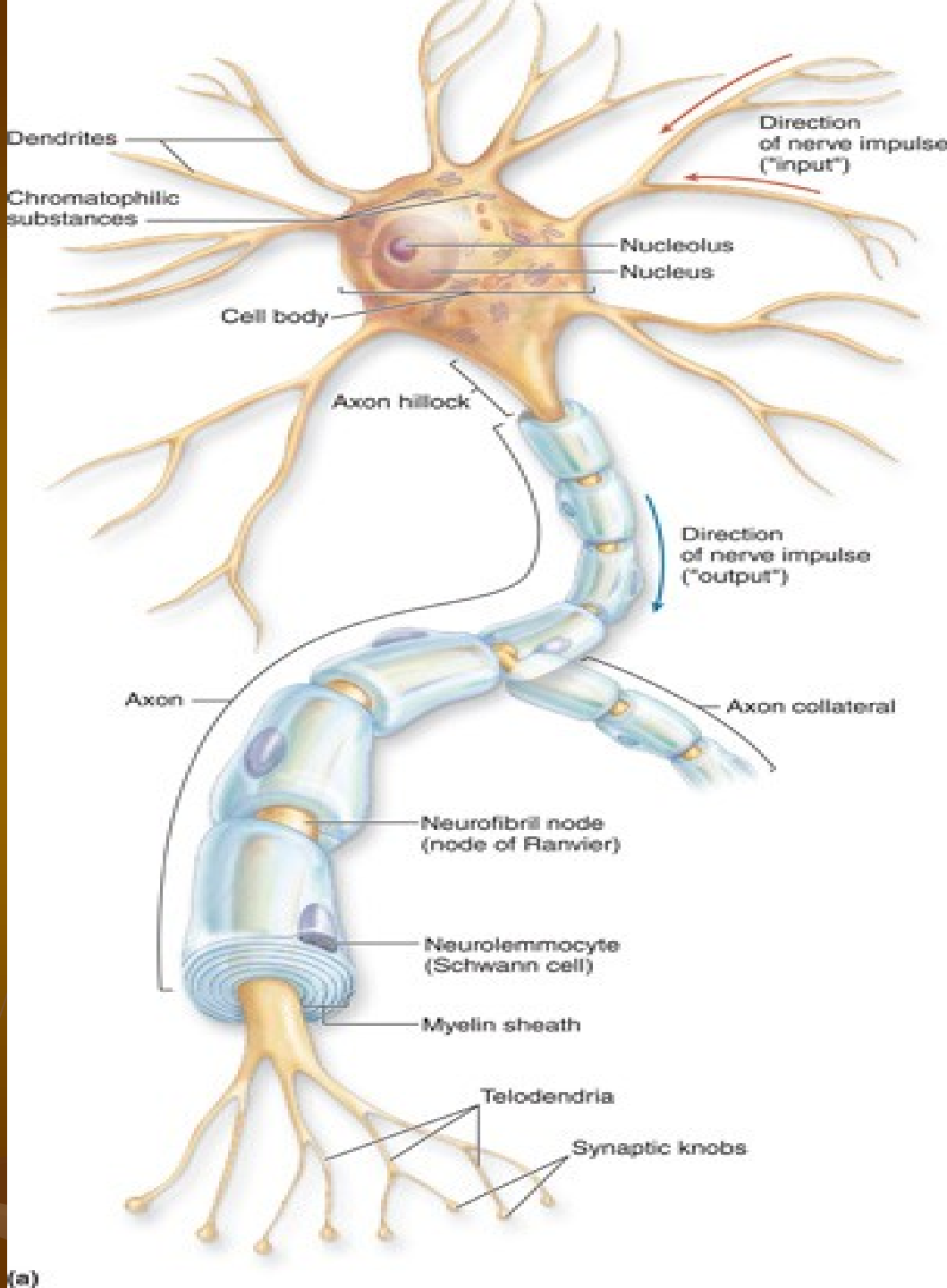
morfologické části

Perikaryon (tělo)

Dendrit(y)

Neurit/Axon (1)
- odstupový konus (axonový hrbol)
- iniciální segment

Telodendrie



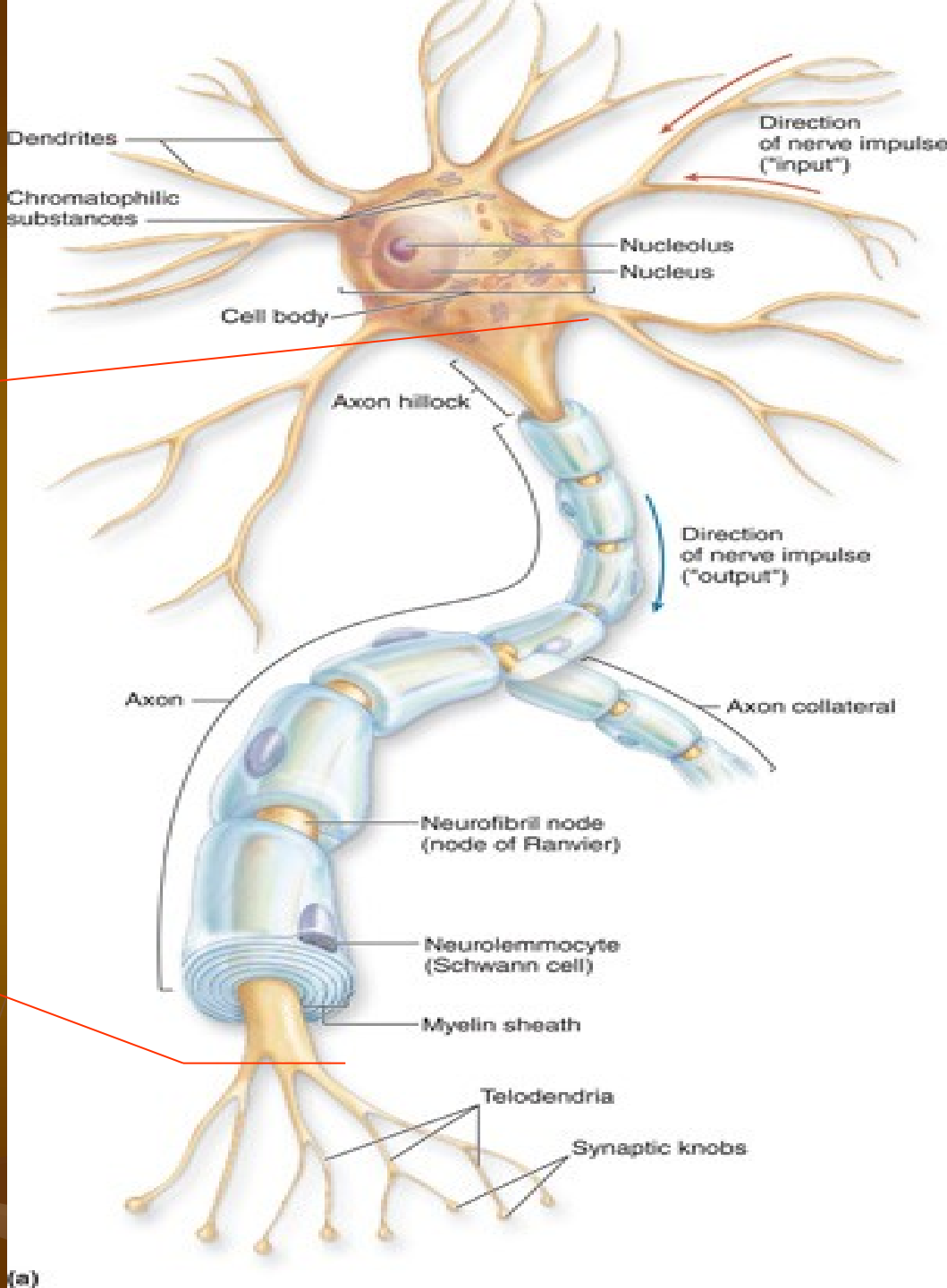
Neuron

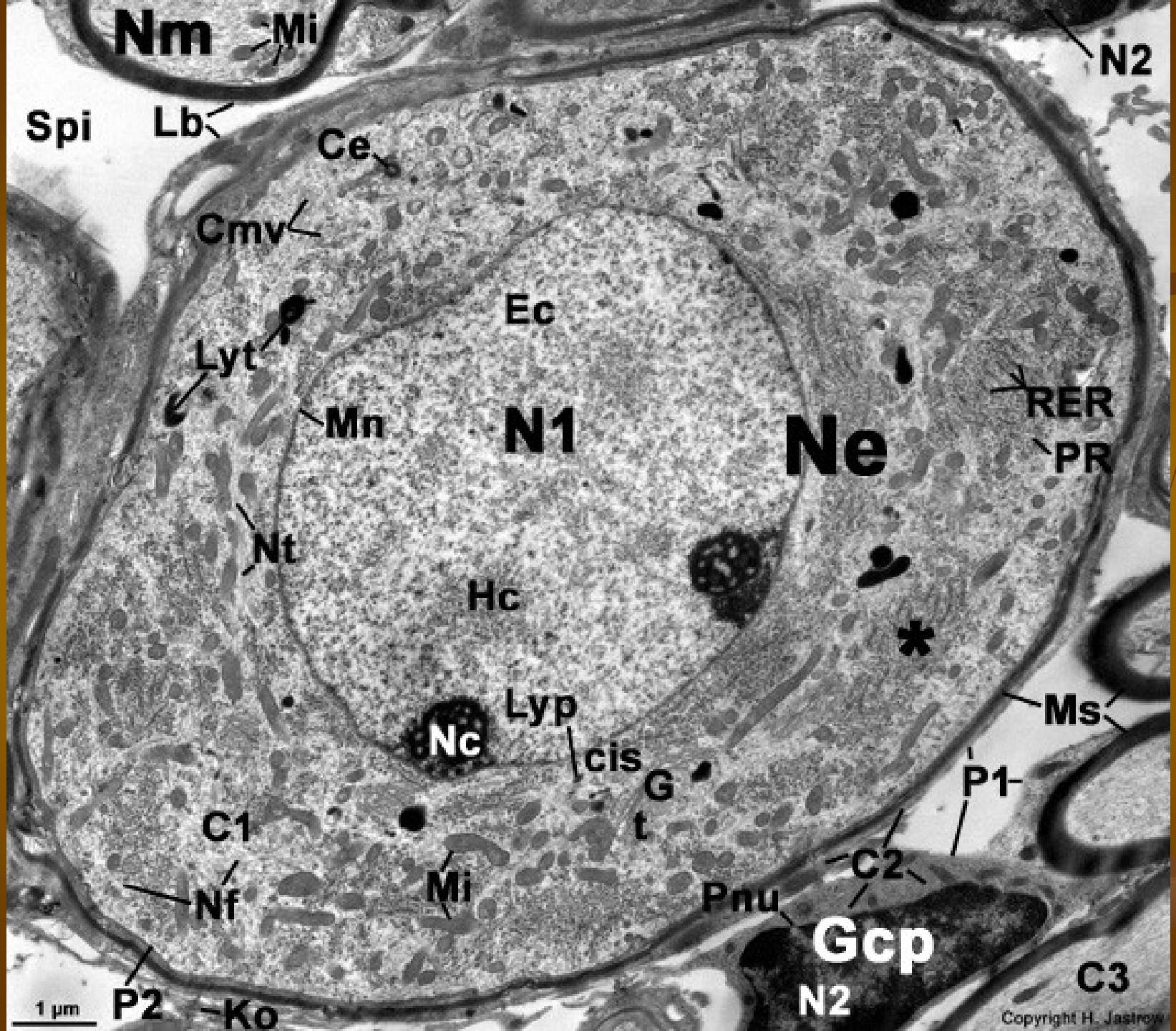
funkční části

Recepční oddíl

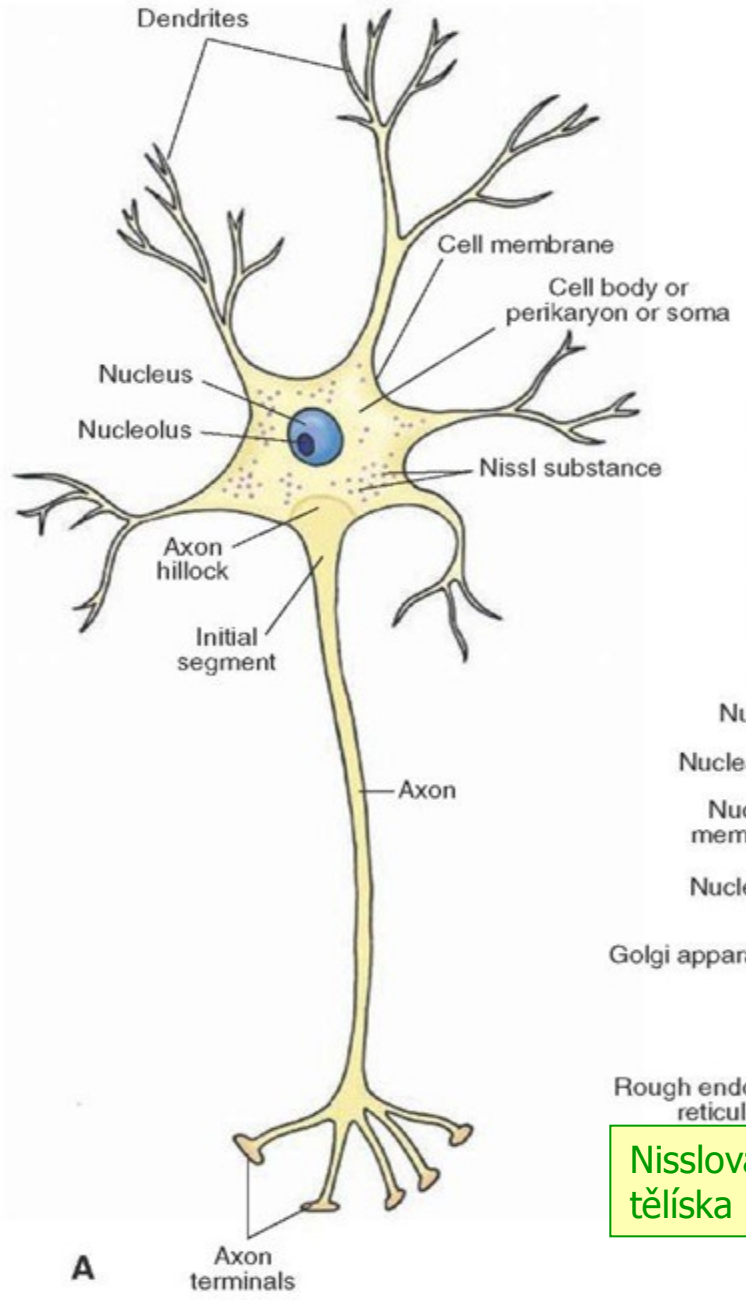
Transmisní oddíl

Sekreční oddíl

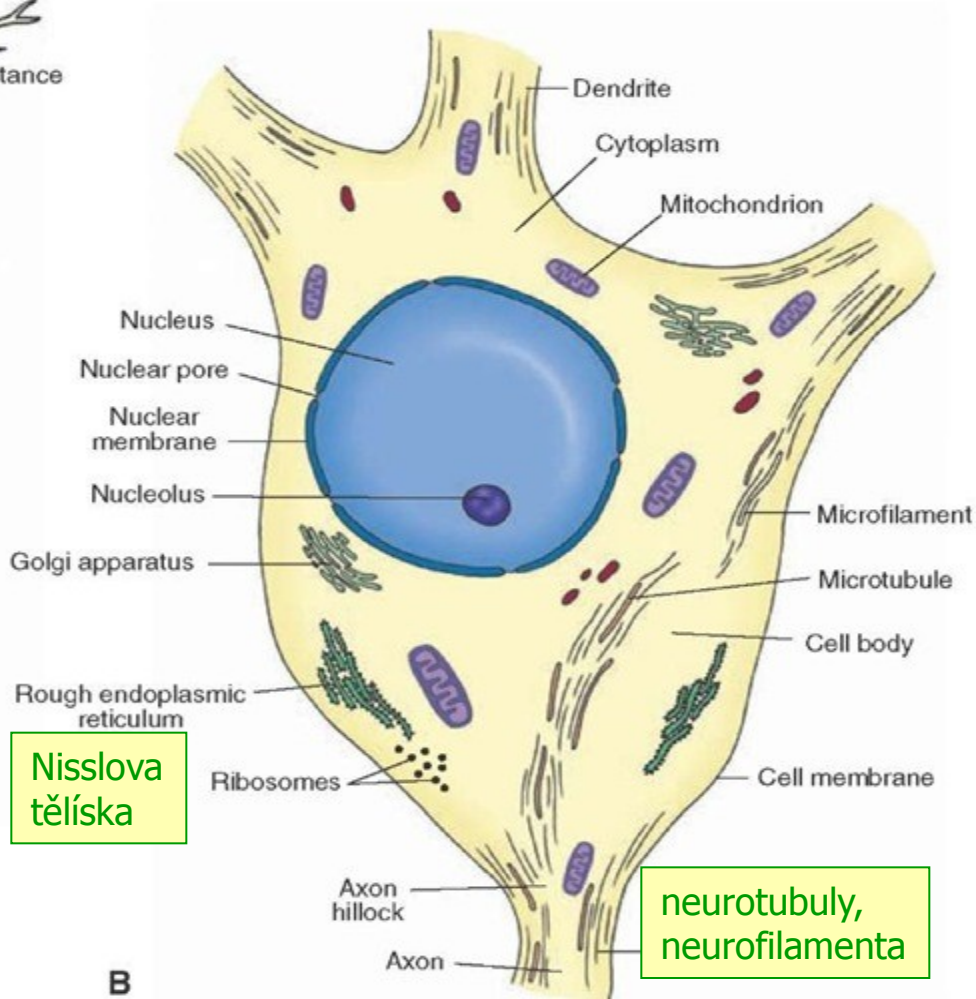



Nm
Mi
N2
Spi
Lb
Ce
Cmv
Ec
Lyt
Mn
N1
Ne
RER
PR
Nt
Hc
Lyp
Nc
cis
G
t
Ms
P1
C1
C2
Nf
Mi
Pnu
Gcp
C3
P2
Ko
N2
1 µm
Copyright H. Jastrow

NEURON
4 – 100 μm ∅



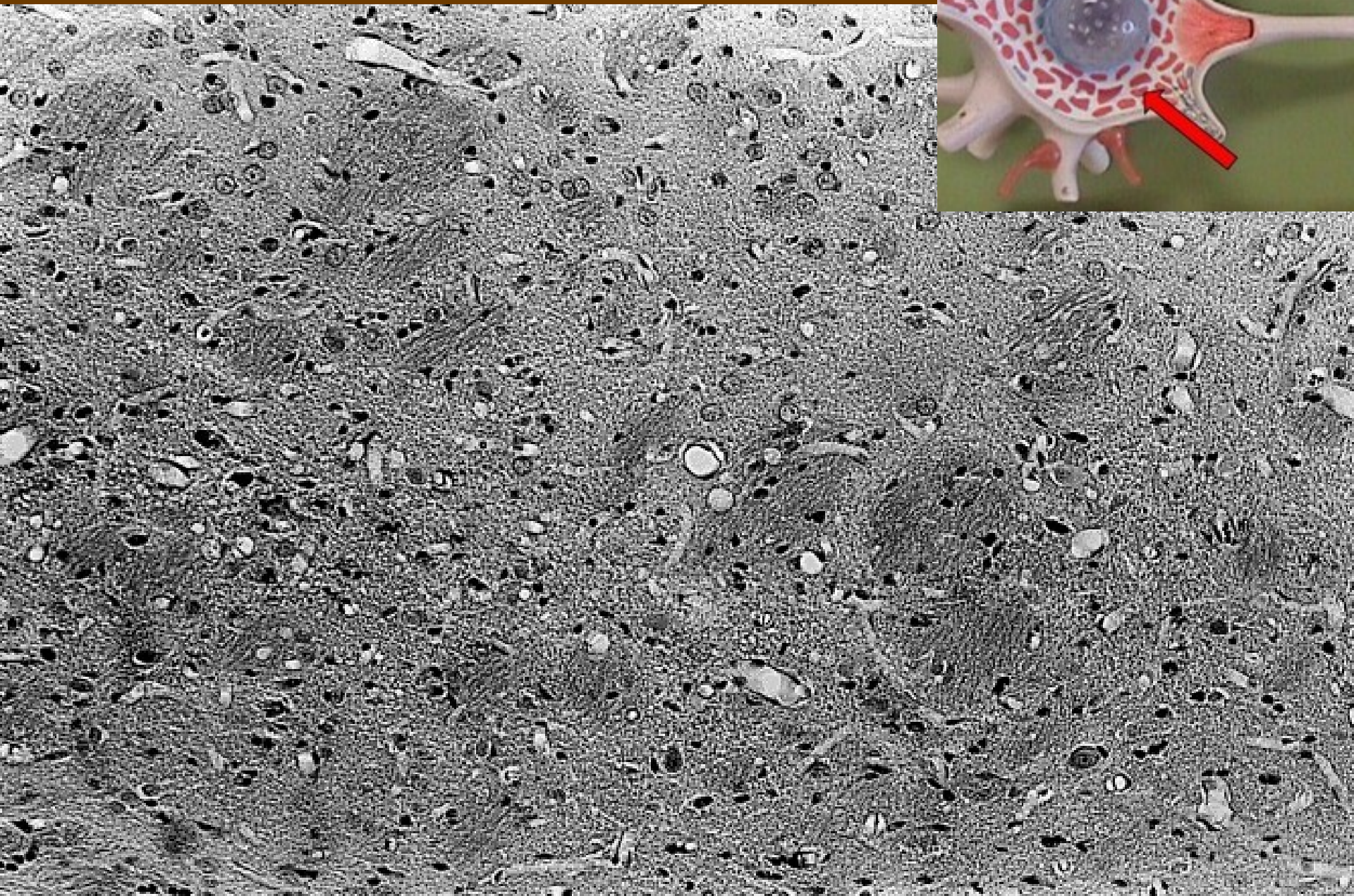
lipofuscin

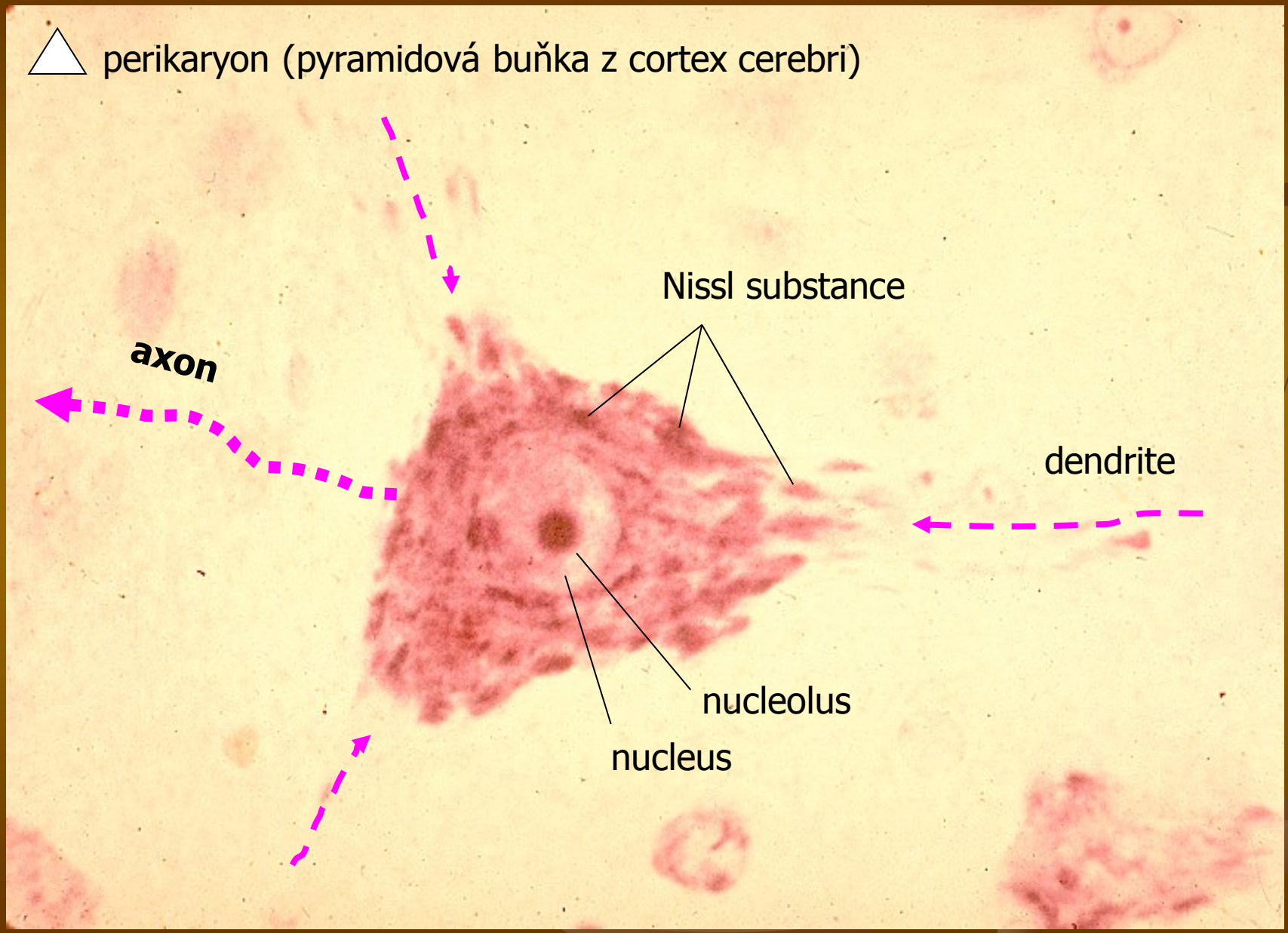


Nisslova tělíska

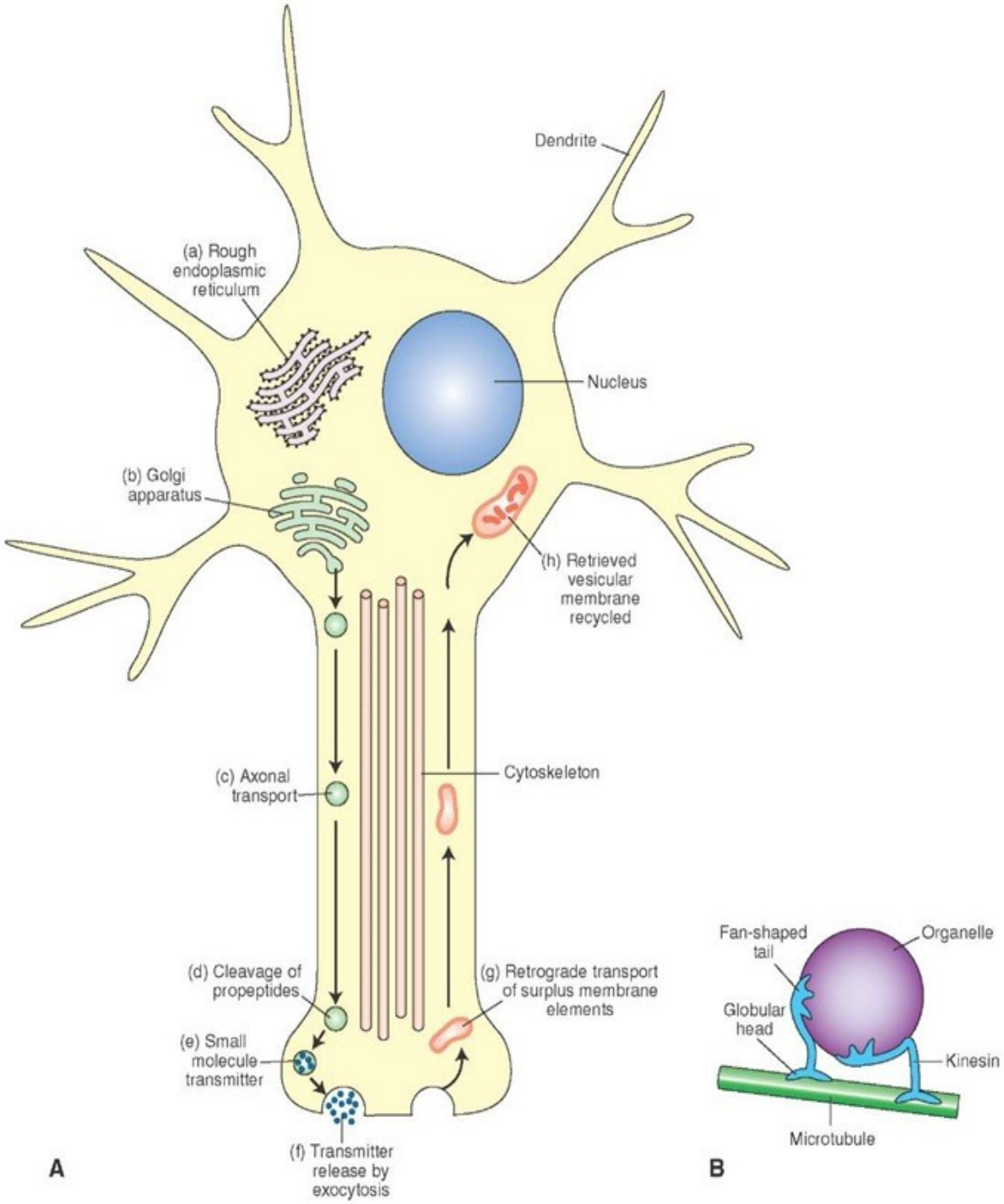
neurotubuly, neurofilamenta

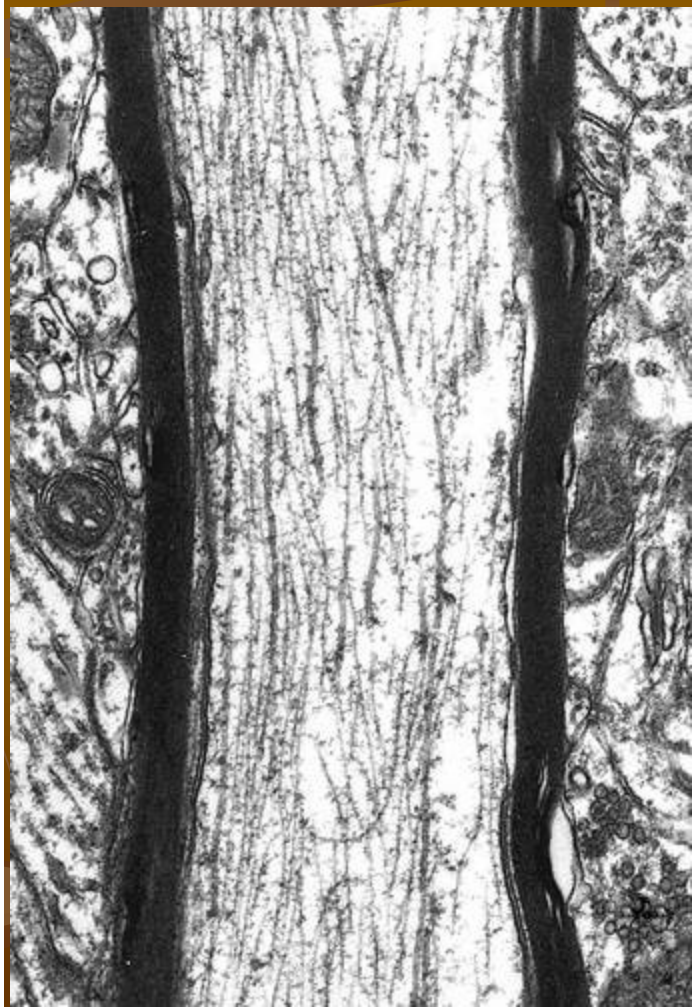
Nisslova tělíska (substance)



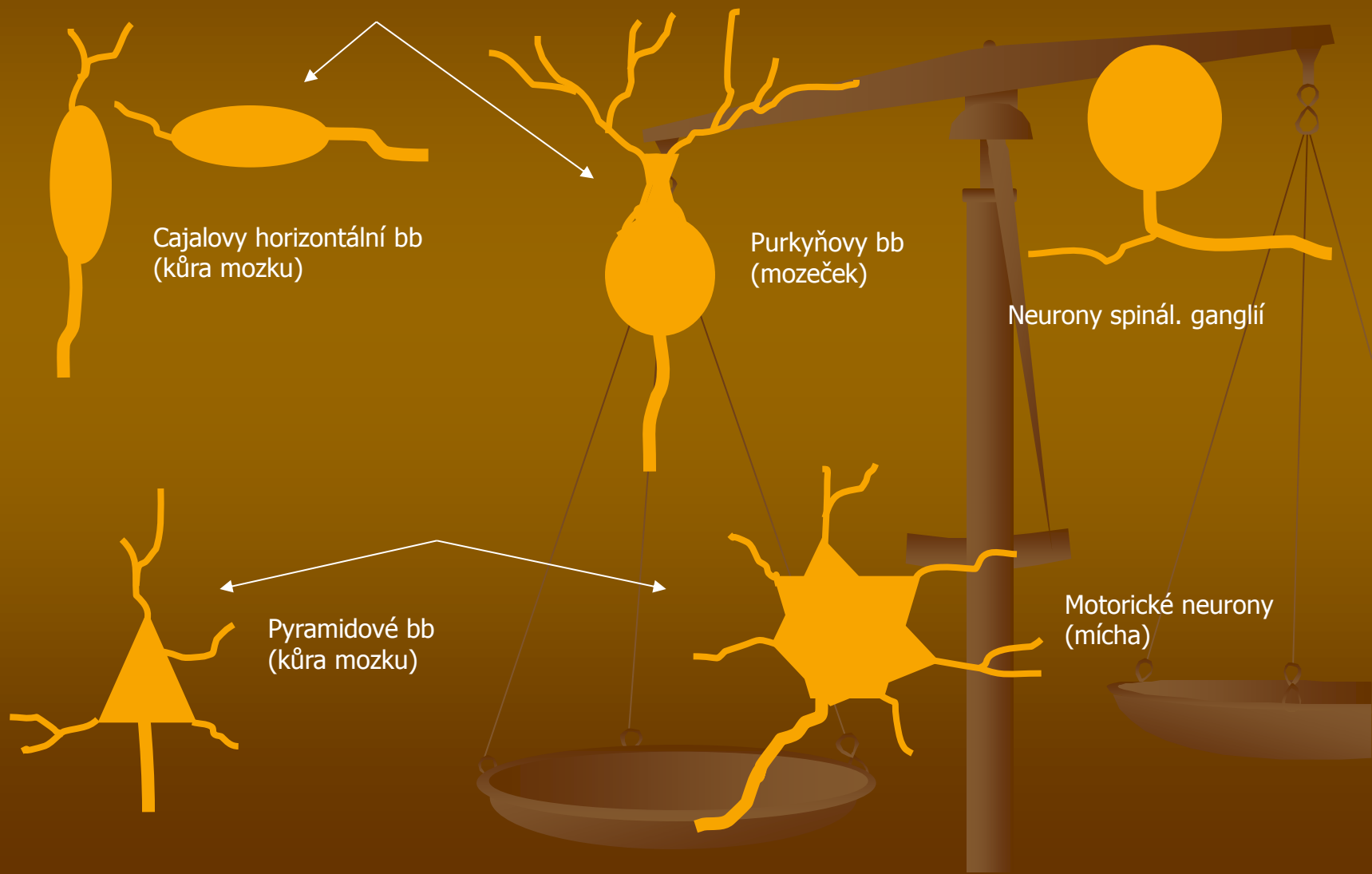

perikaryon (pyramidová buňka z cortex cerebri)
Nissl substance
axon
dendrite
nucleolus
nucleus

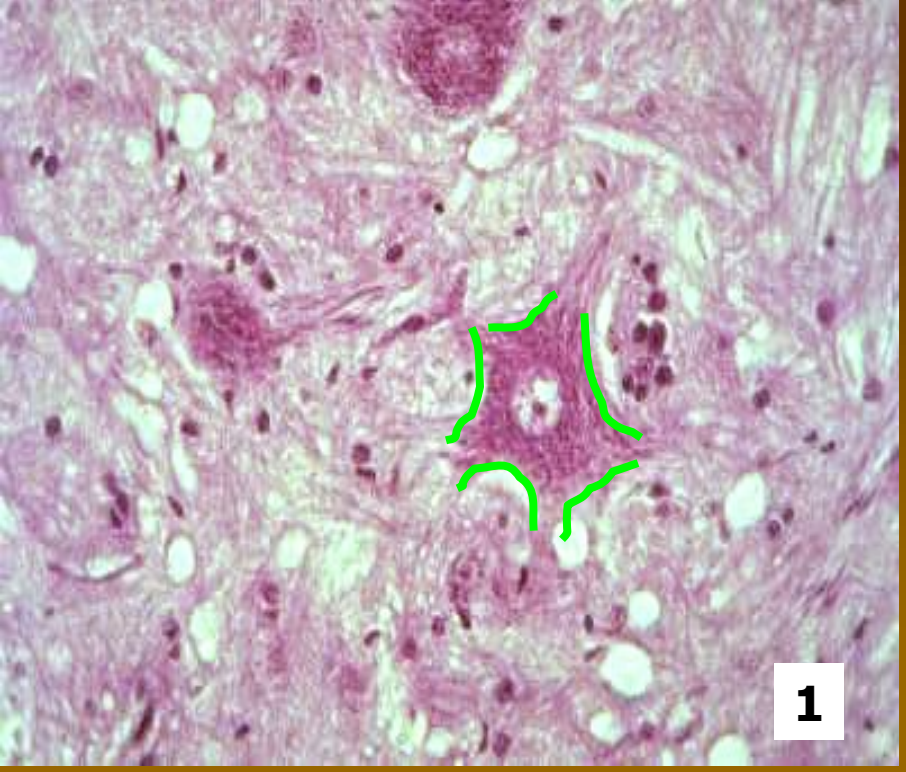
neurotubuly
neurofilamenta

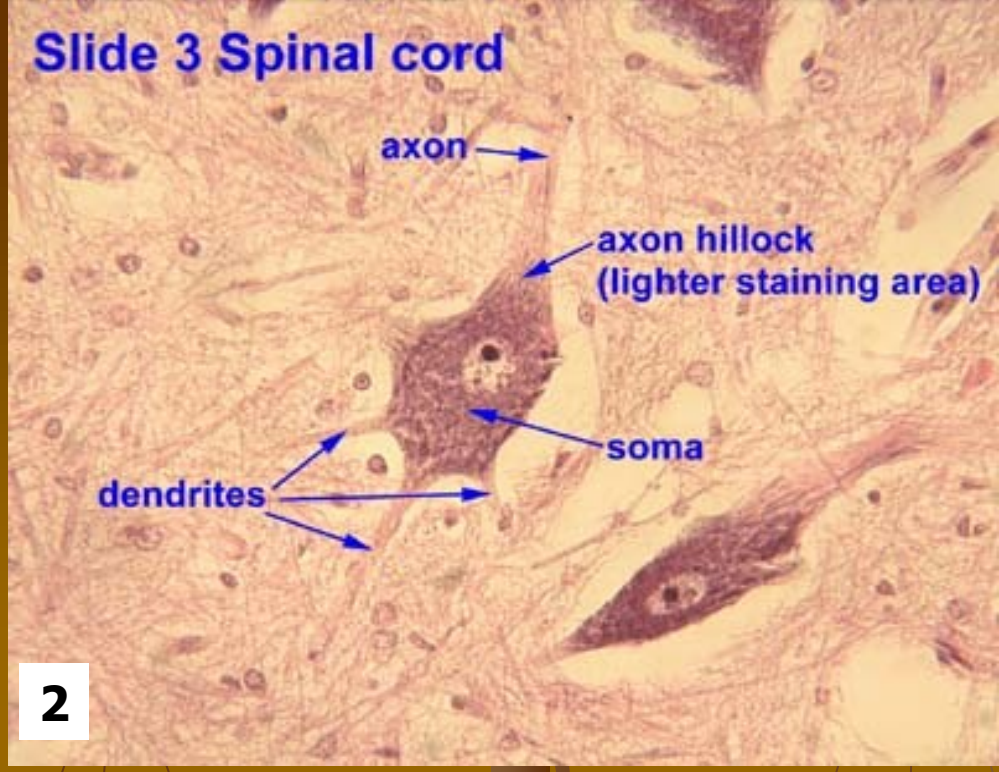




Tvar perikarya

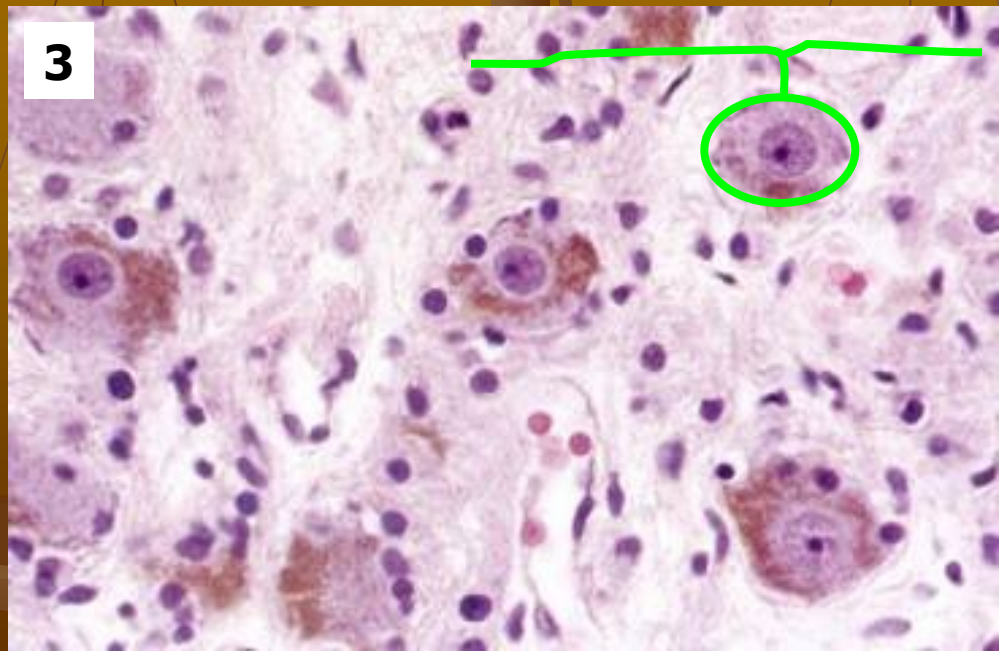






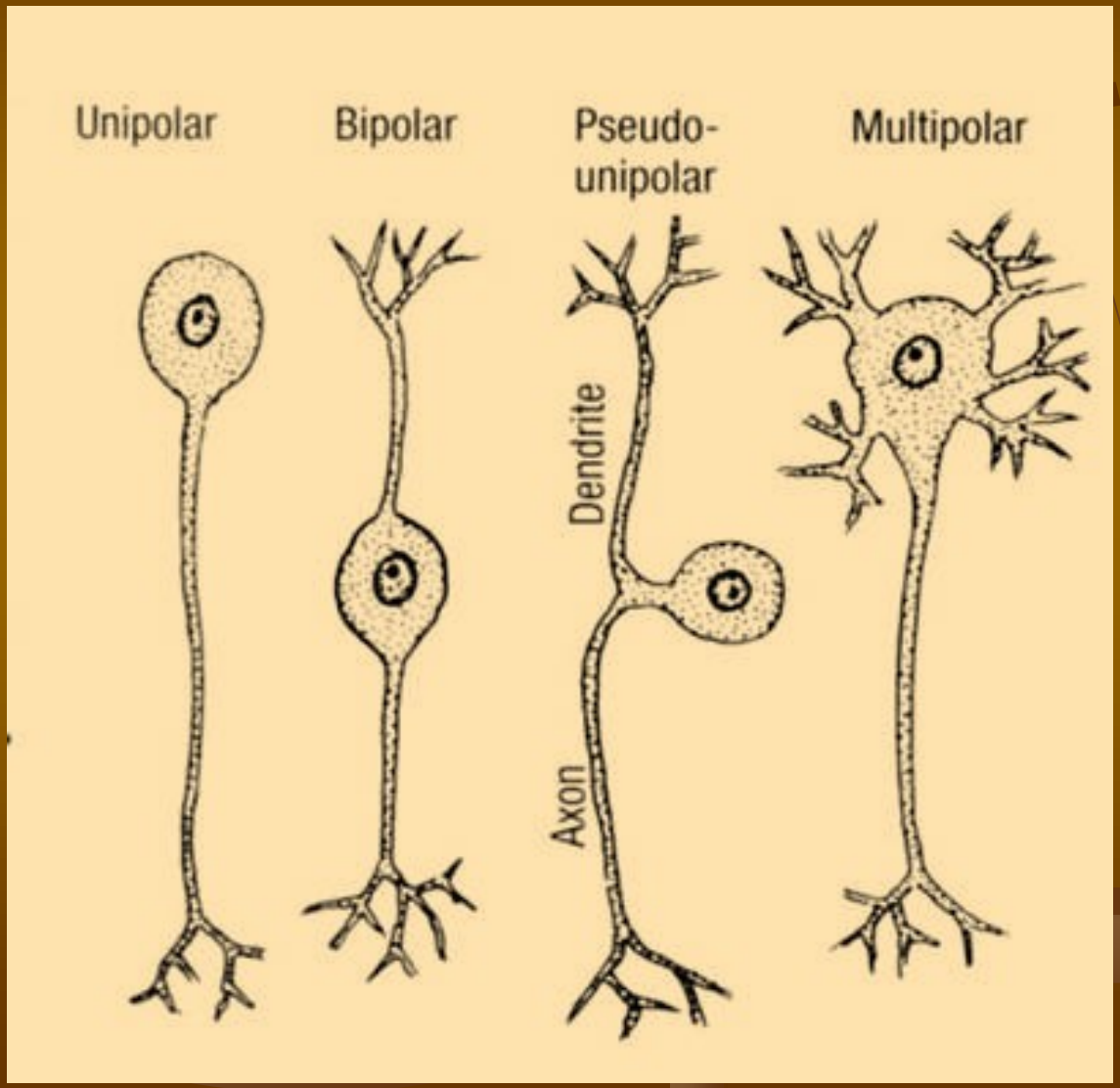
1, 2 – multipolár. neurony: Nisslova tělíska

3 – pseudounipolár. neurony: lipofuscin



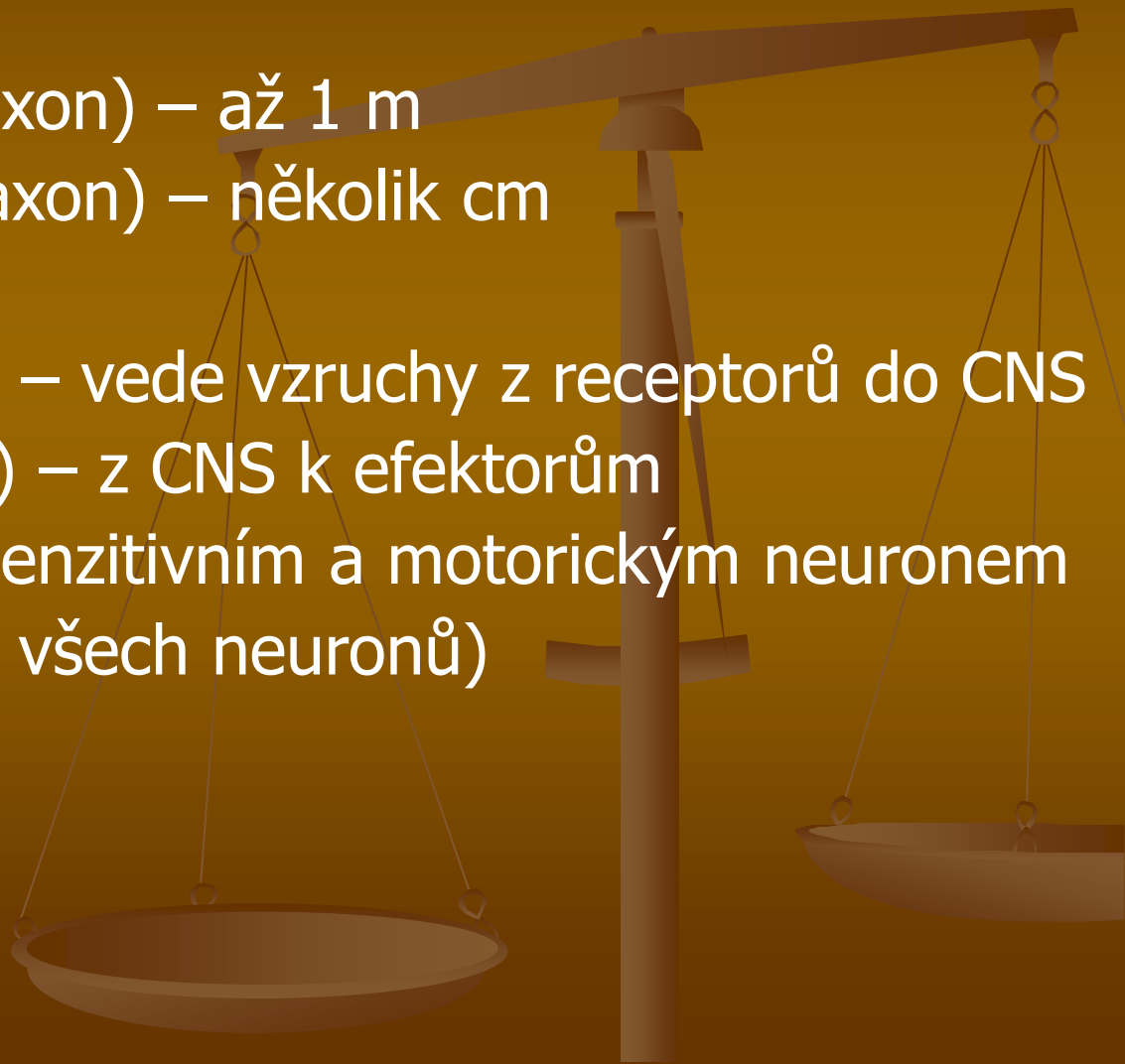
Klasifikace neuronů
(dle počtu výběžků)

- (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)

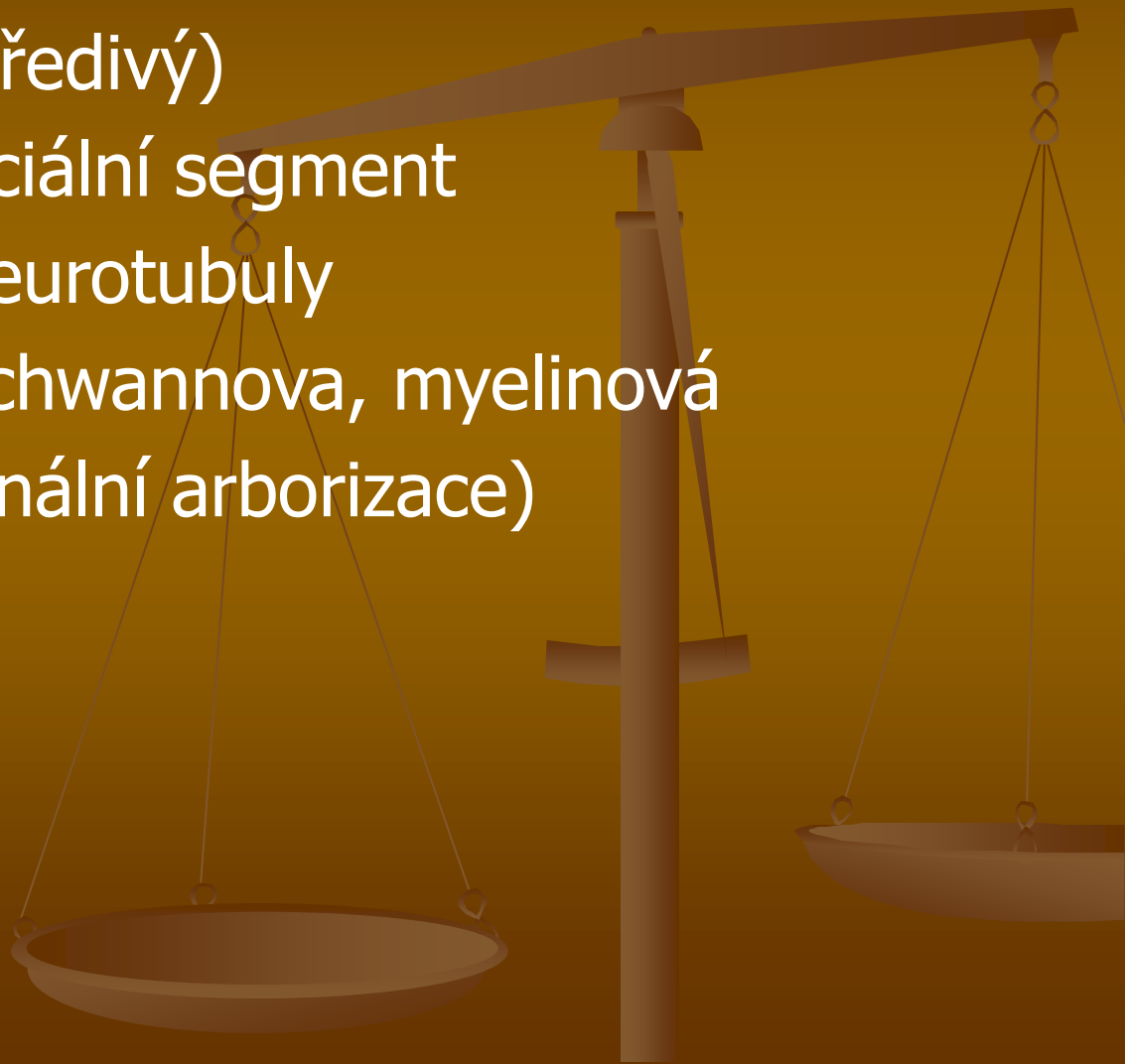


Dendrity
(ř. *dendron*, “strom”)

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

Axon (neurit)

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



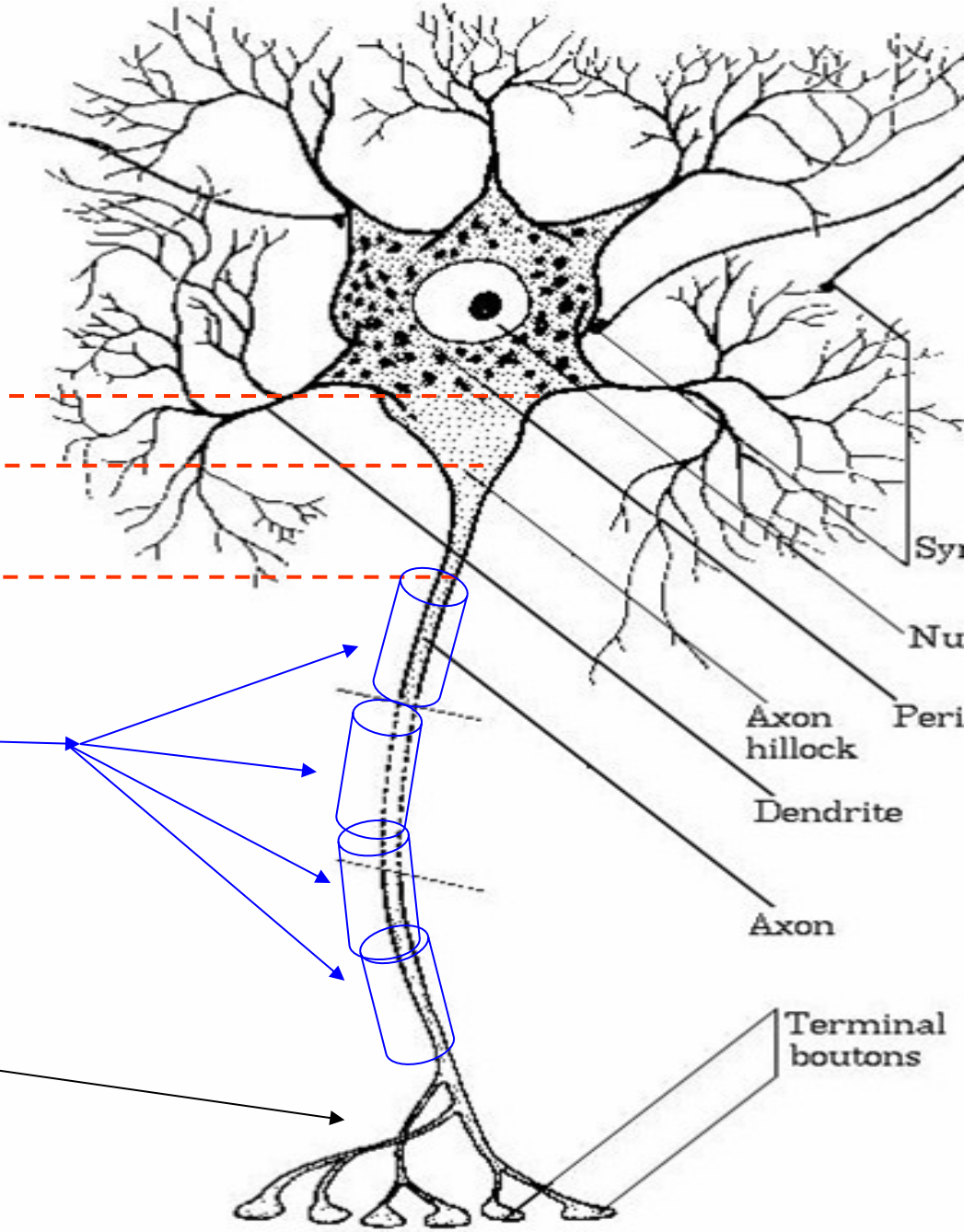
STAVBA AXONU

Axonový hrbol

Iniciální segment

Schwannovy bb

Axonterminály (telodendrion)

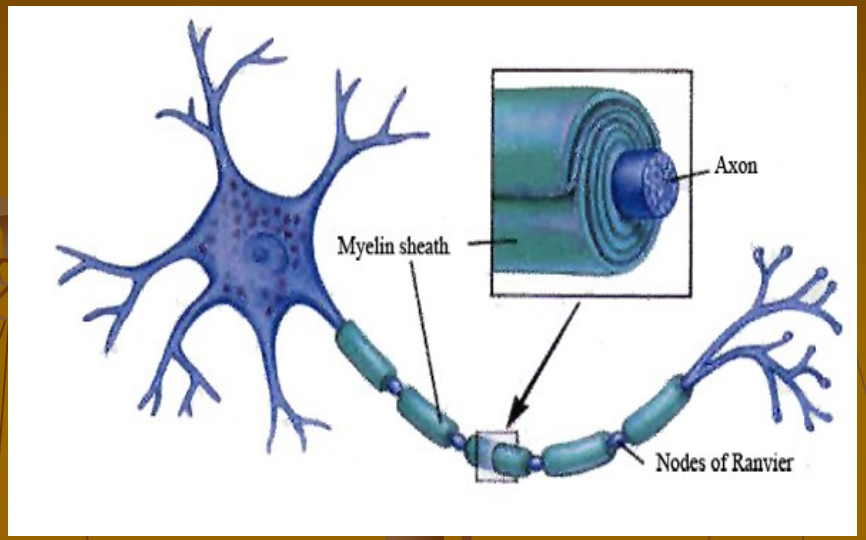


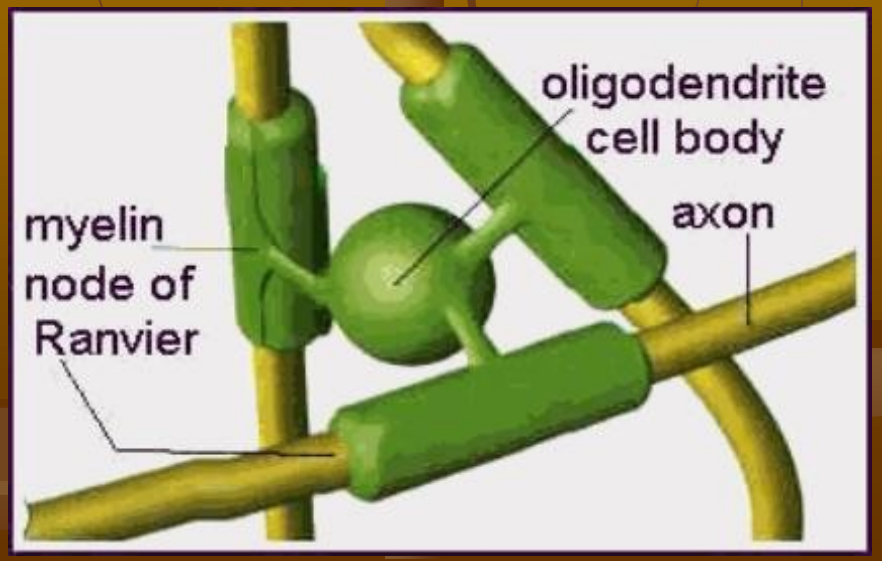
obaly axonů (neuritů)

Schwannovy b. (v PNS)

Myelin

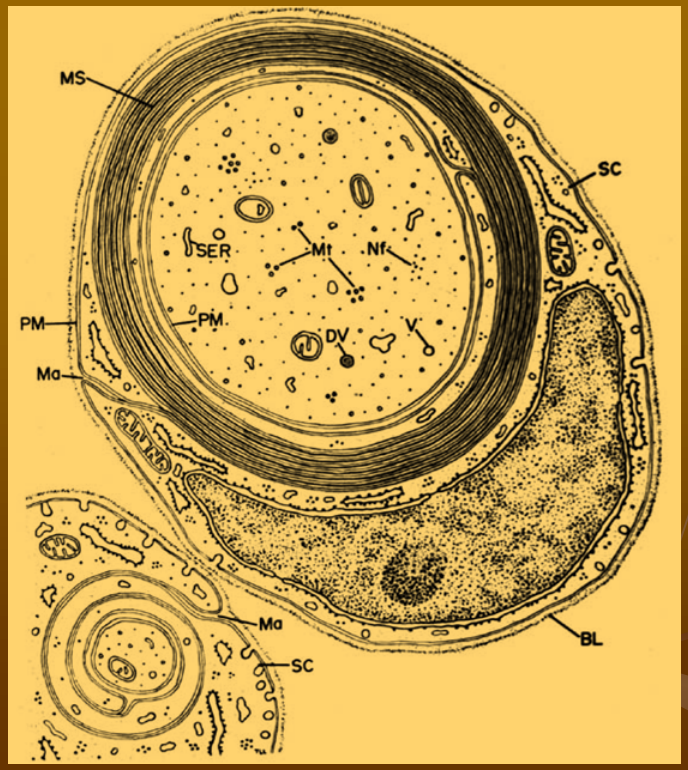
Oligodendrocyty (v CNS)

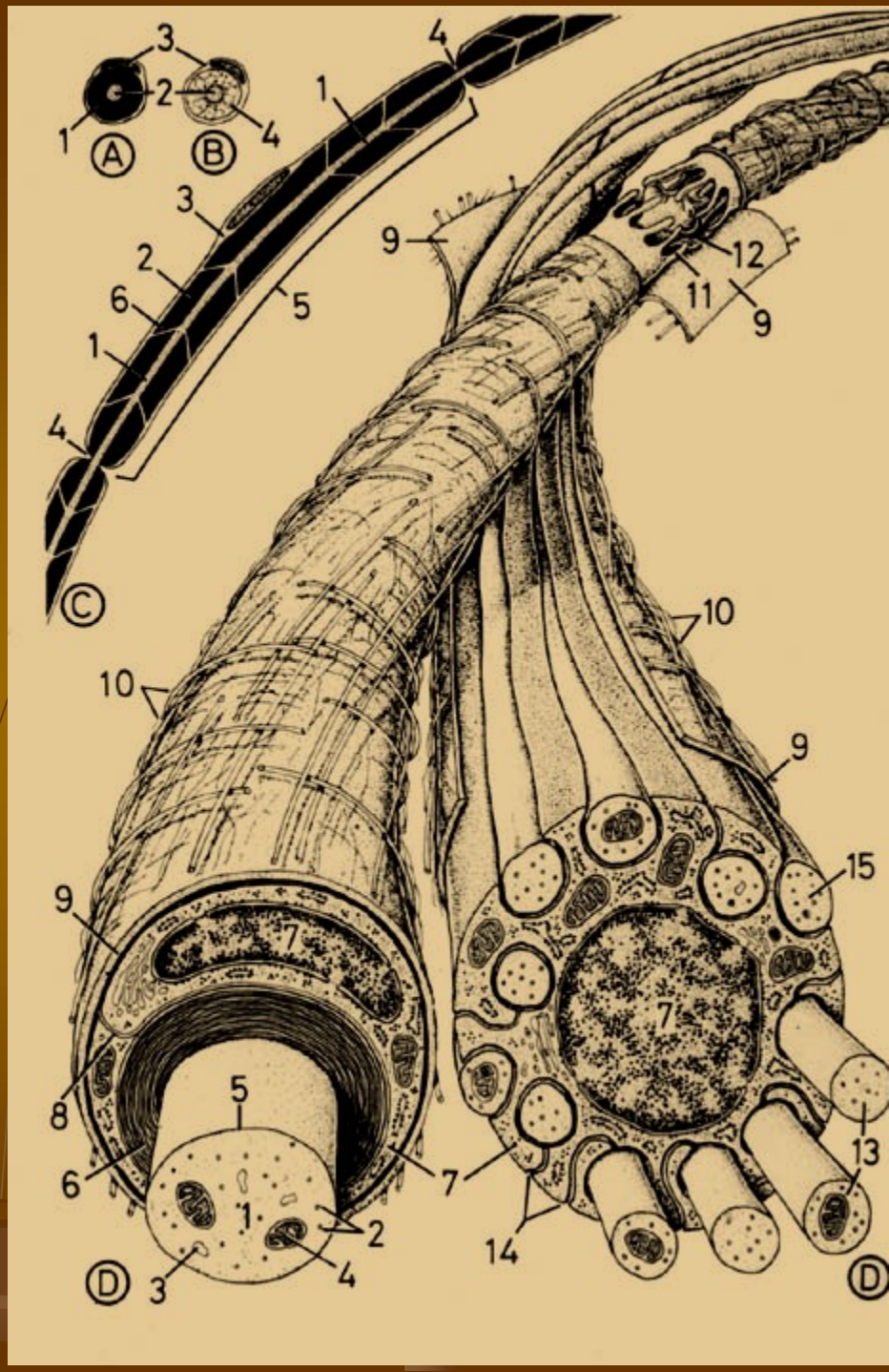




obaly

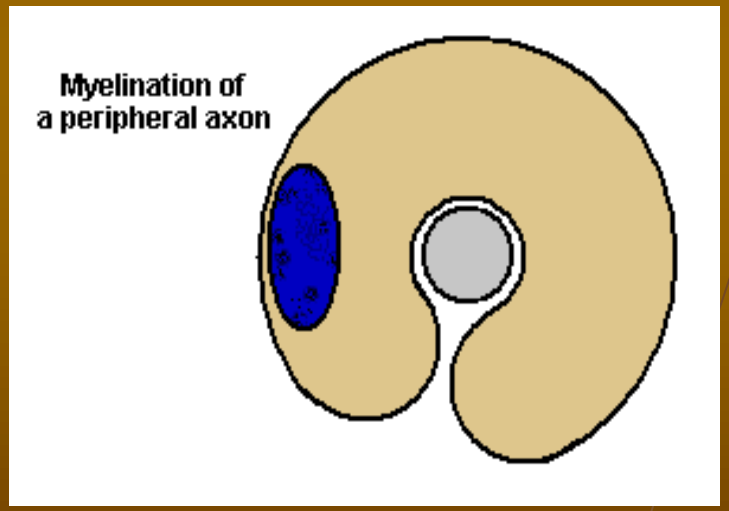
- **myelinová pochva**
- **Schwannova pochva** (v PNS)
- **oligodendrocyty** (v CNS)

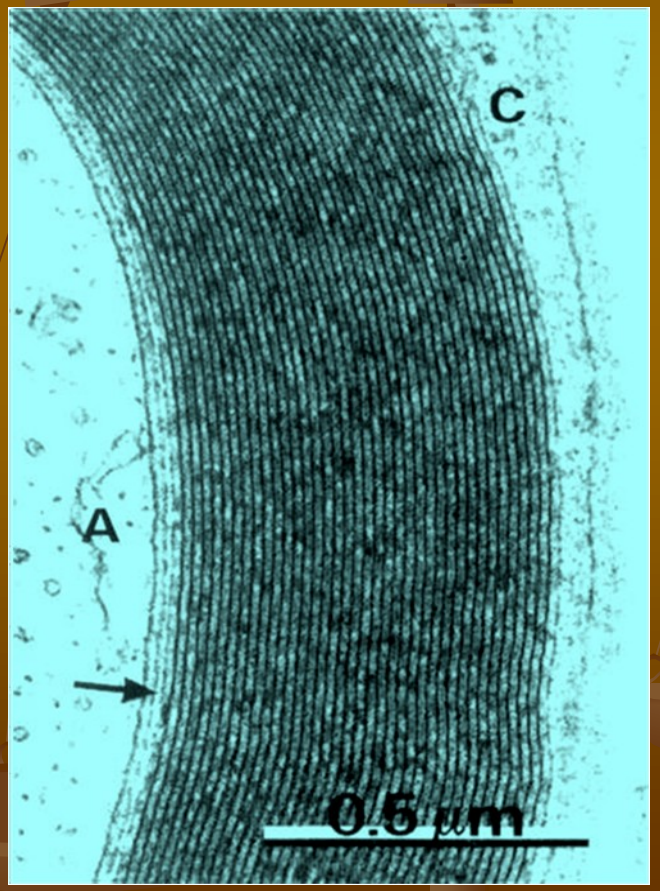




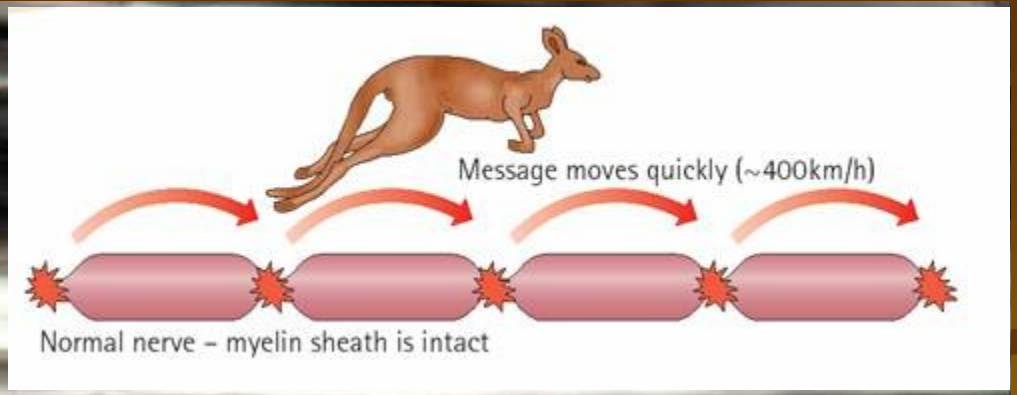
Myelinová pochva

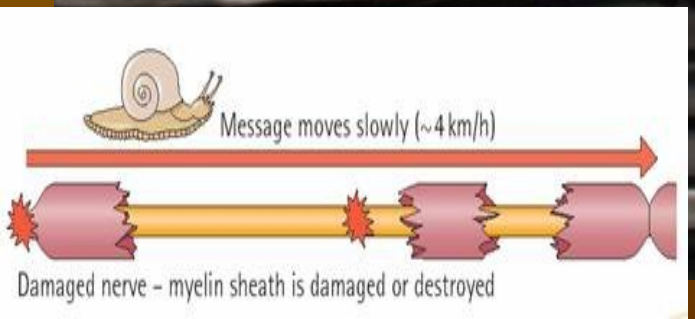
- 1 - 20 μm ↔
- 70 % H_2O, lipidy, proteiny
- koncentricky uspořádané lamely lipoproteinu
- Ranvierovy zářezy; internodia (Ranvier. segmenty, 0,6–2,0 mm ↔)



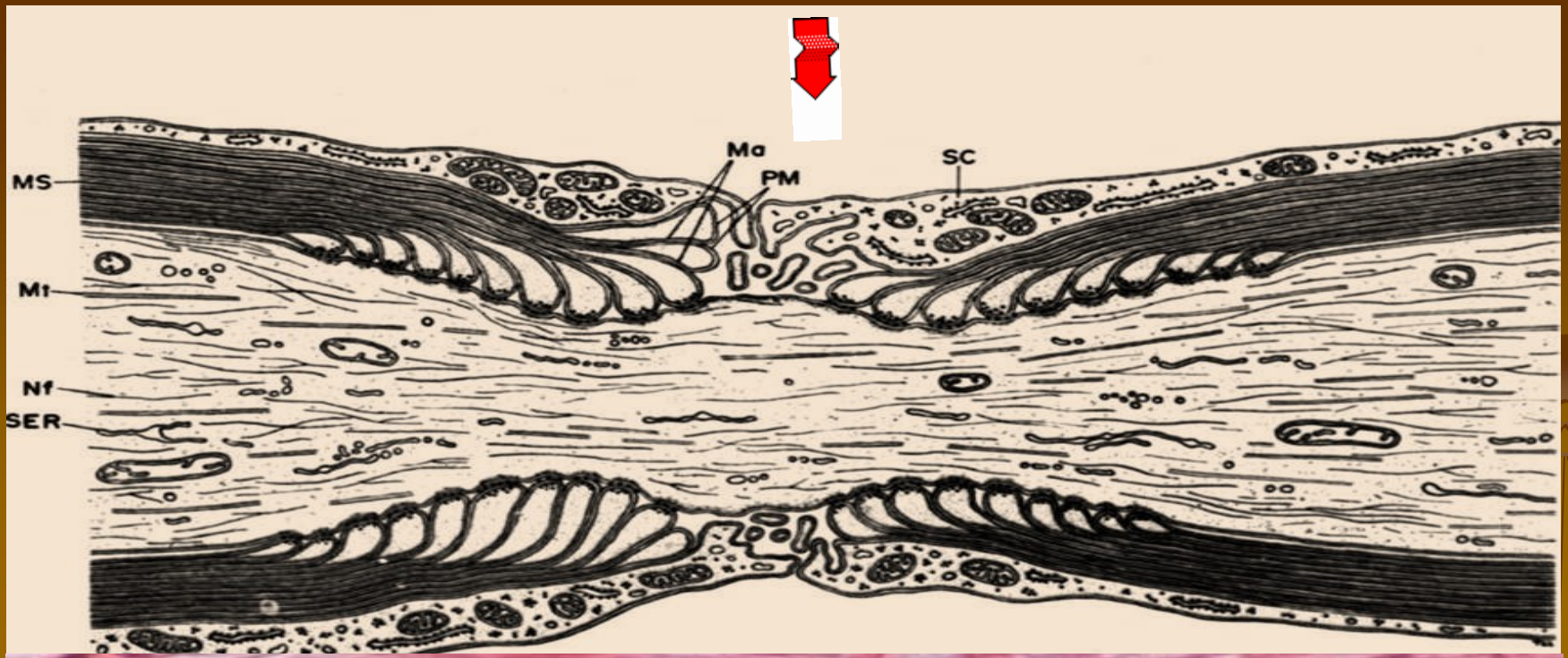


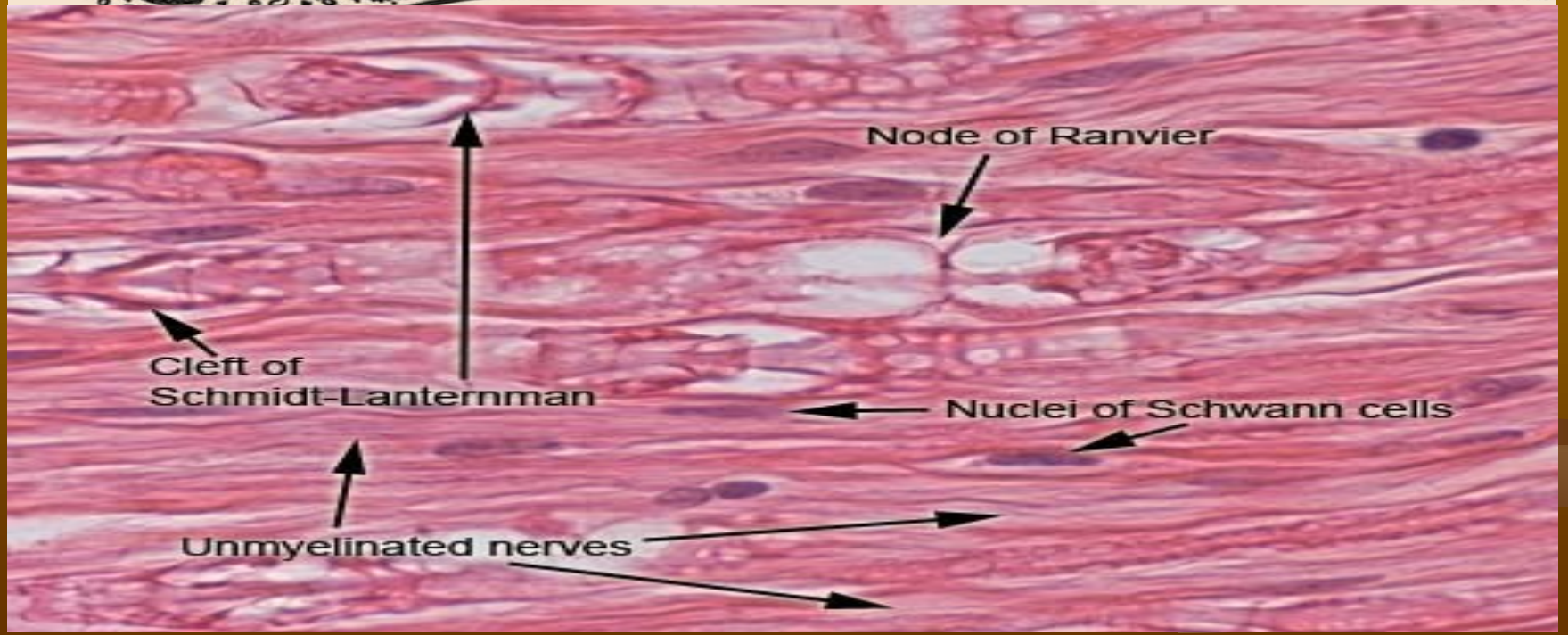
Ranvierovy zářezy
Internodium
- saltatorní vedení (skokem)





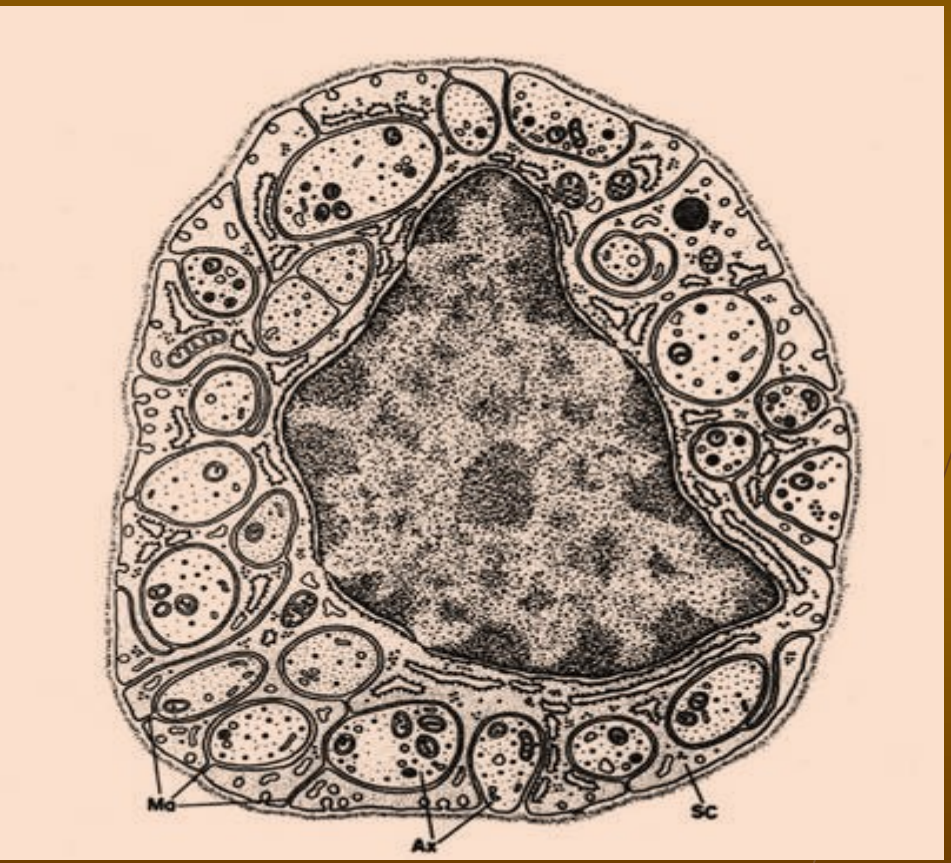
20 µm

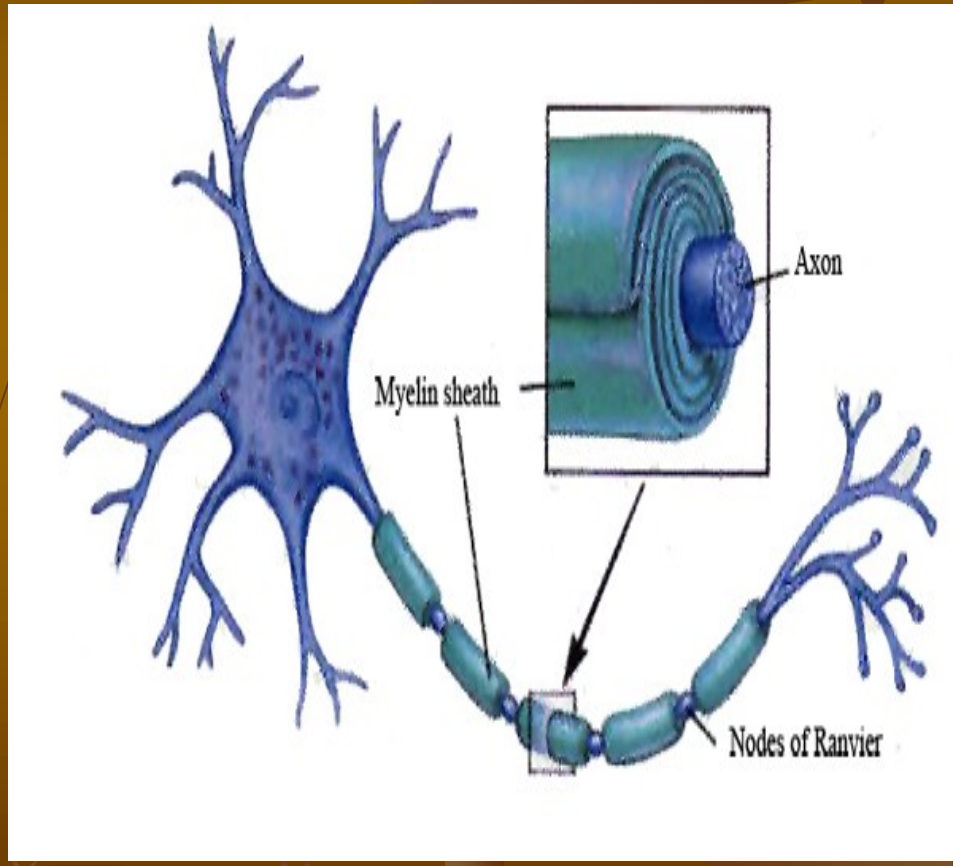

MS
Mt
Nf
SER
Ma
PM
SC


Node of Ranvier
Cleft of
Schmidt-Lanternman
Nuclei of Schwann cells
Unmyelinated nerves

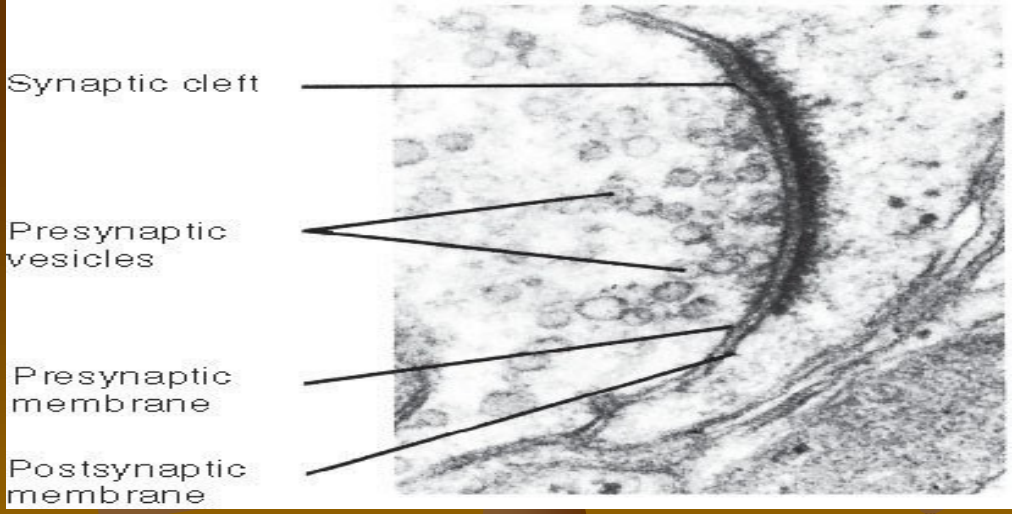
Neurilema = Schwannovy bb.

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

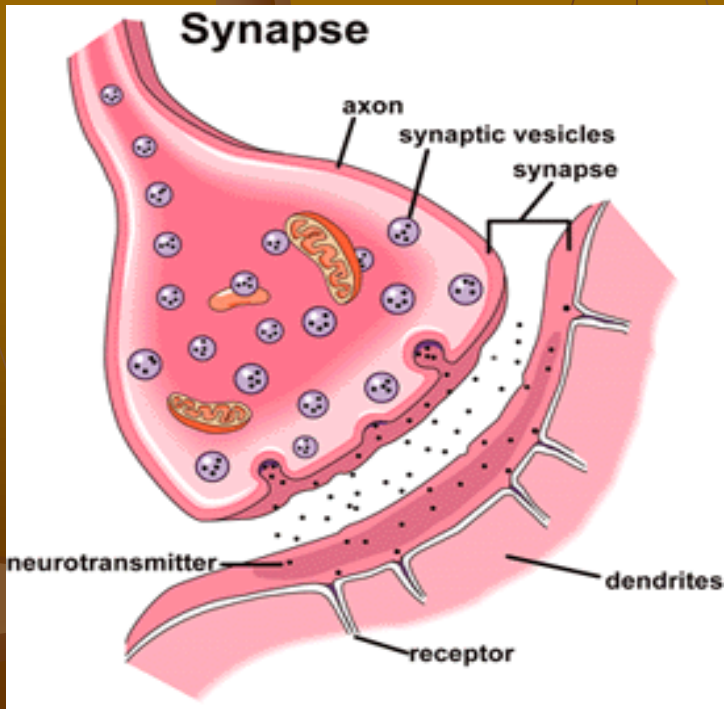




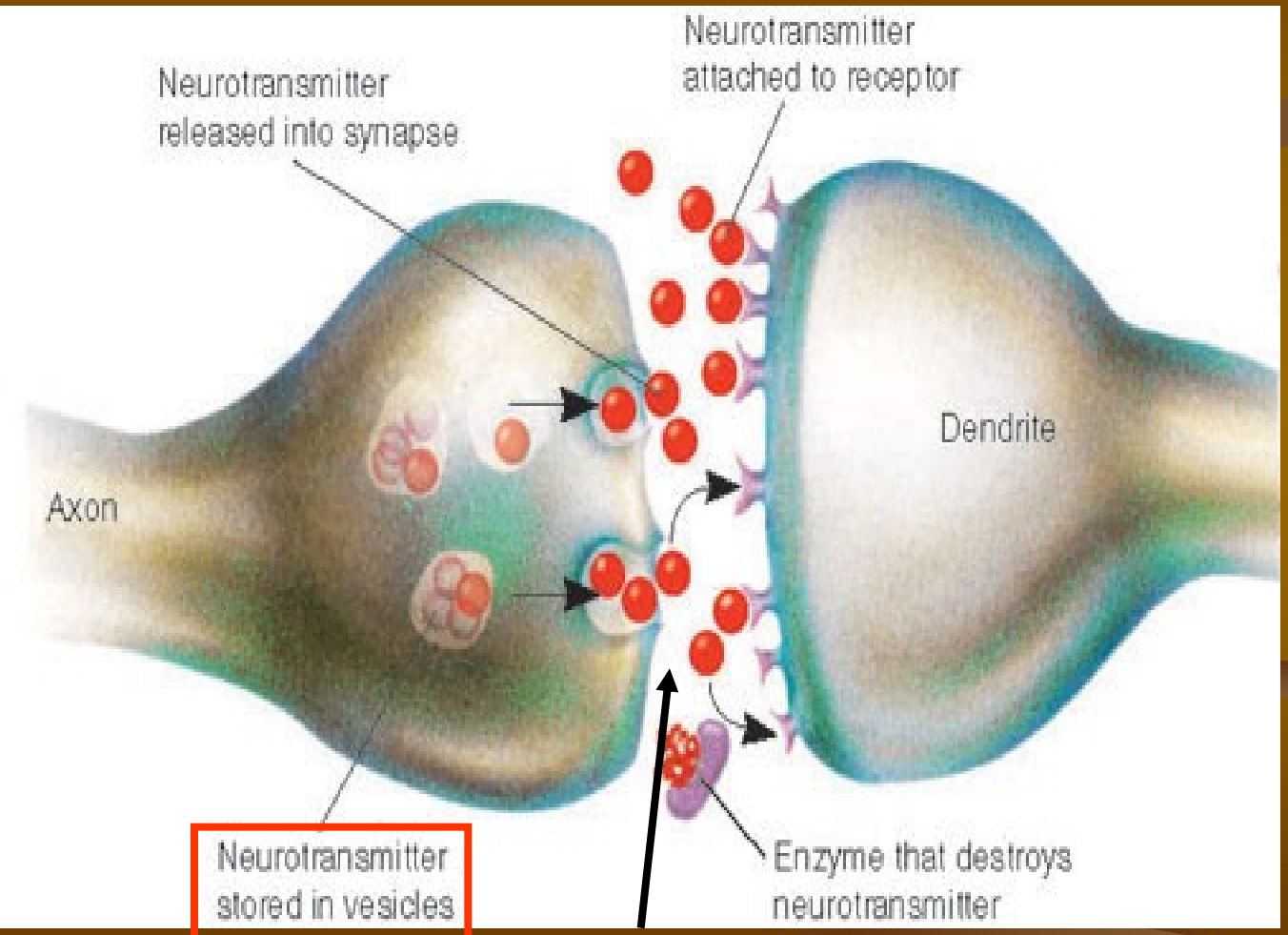
Synapse

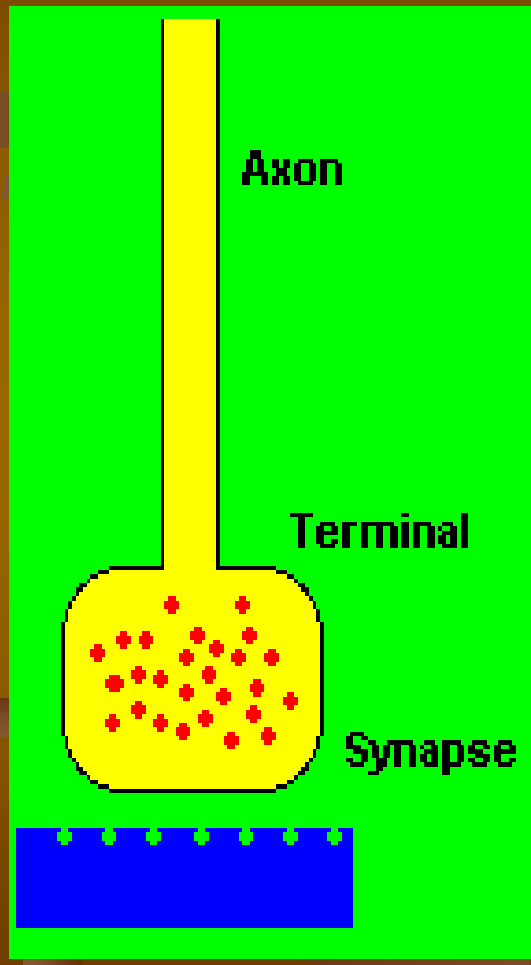


- pro převod vzruchu mezi 2 neurony nebo neuronem a efektorovou b.,
- chemická nebo elektrická synapse,
- úseky synapse:
  1) presynaptické zakončení
  2) synaptická štěrbina
  3) postsynaptická membrána

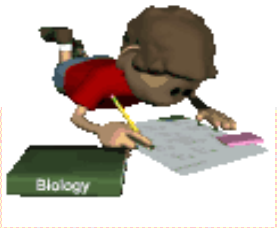


Funkce synapse



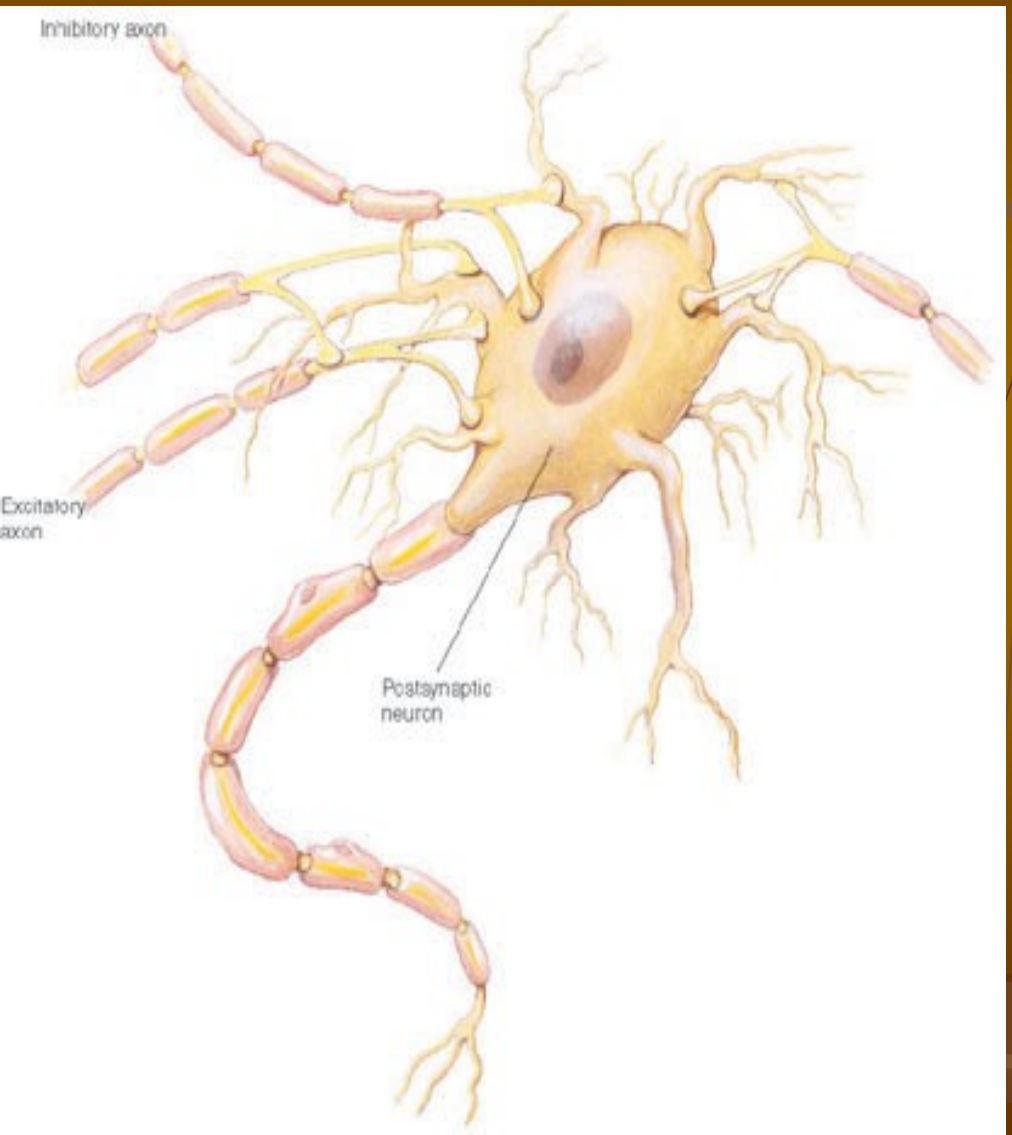


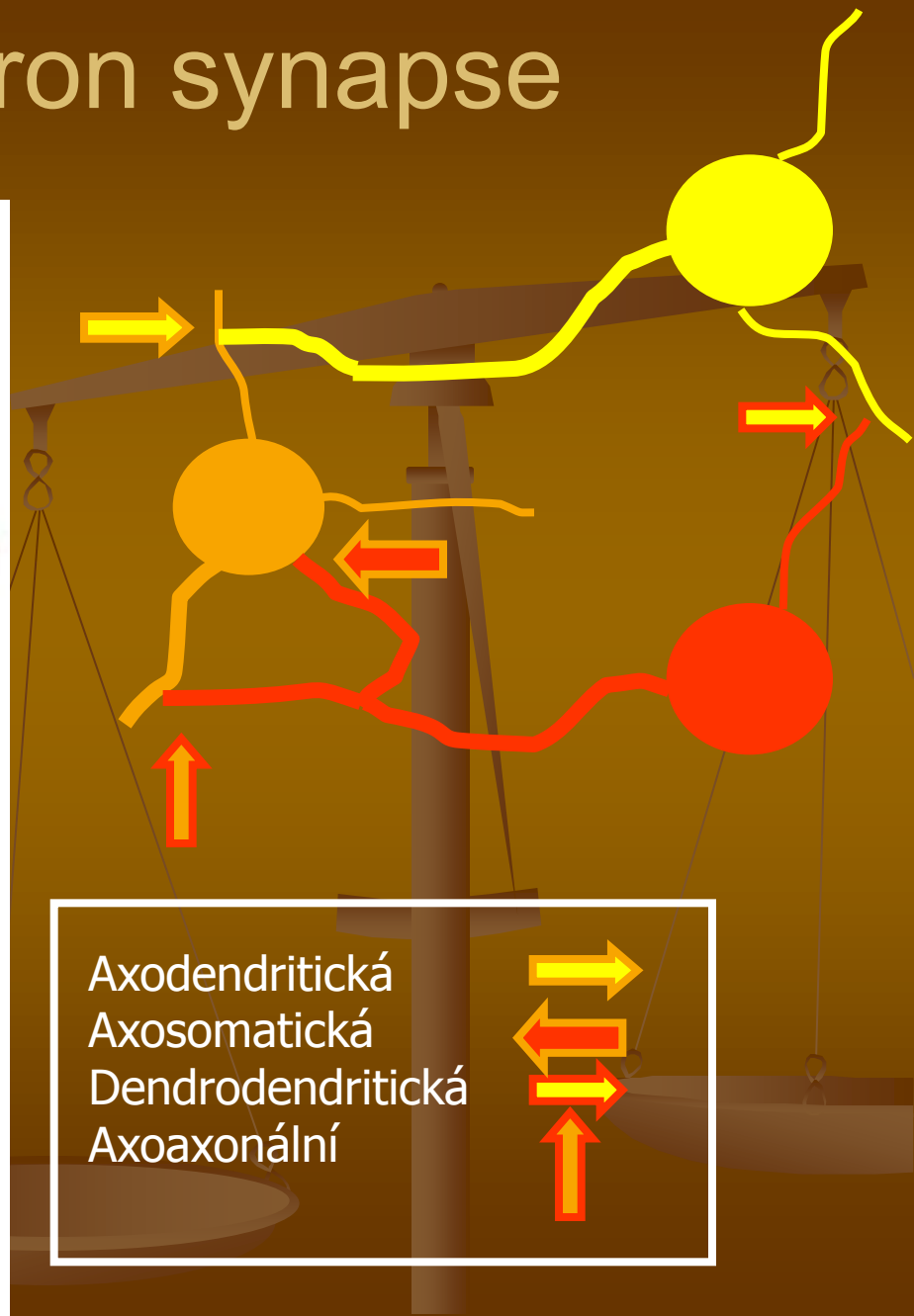
▶ Classes of Neurotransmitters



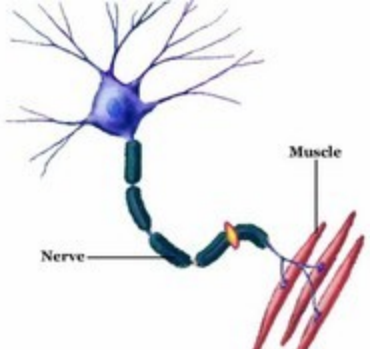
- **Amino acids** — Glutamate, Aspartate, Glycine, GABA
- **Monoamines**
  - **Catecholamines** — Dopamine, Epinephrine - adrenalin, Norepinephrine - noradrenalin
  - **Indolamines** — Serotonin
- **Soluble gases** — Nitric oxide, Carbon monoxide
- **Acetylcholine** — Acetylcholine
- **Neuropeptide**
  - **Endorphins**
  - Short chains of peptides

neuron – neuron synapse





Axodendritická
Axosomatická
Dendrodendritická
Axoaxonální

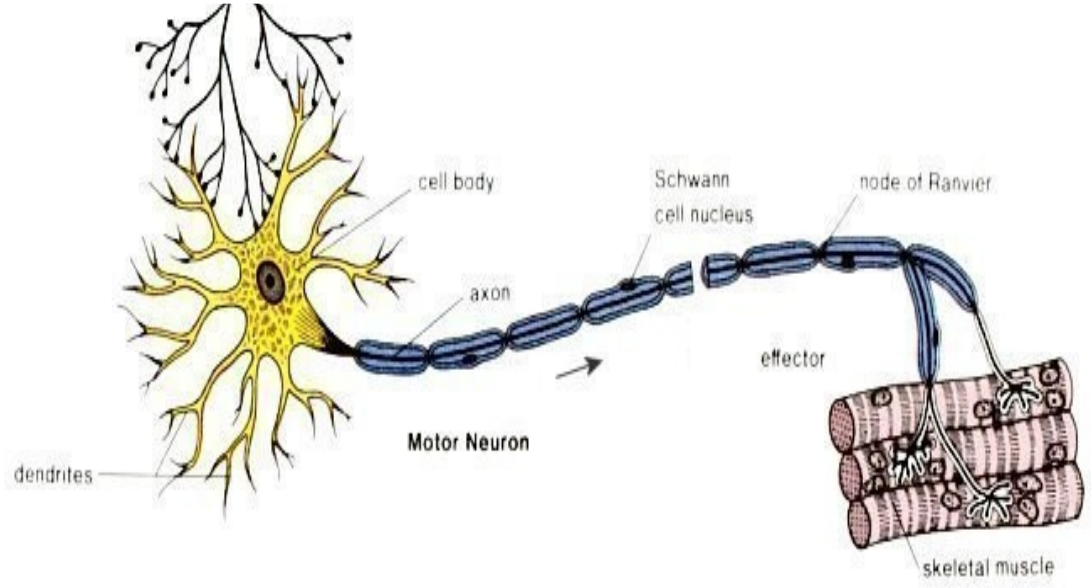


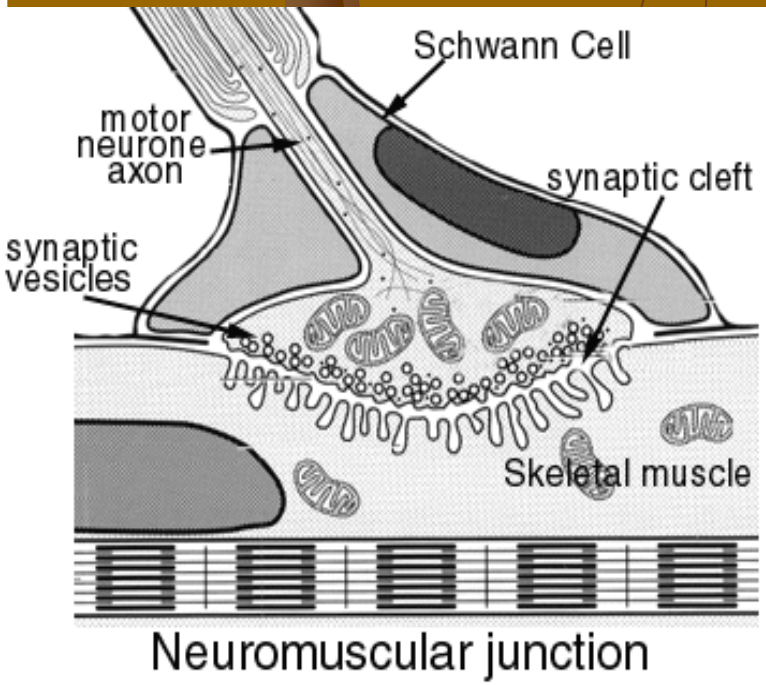
Periferní synapse neuron – efektor

Efektorové buňky:

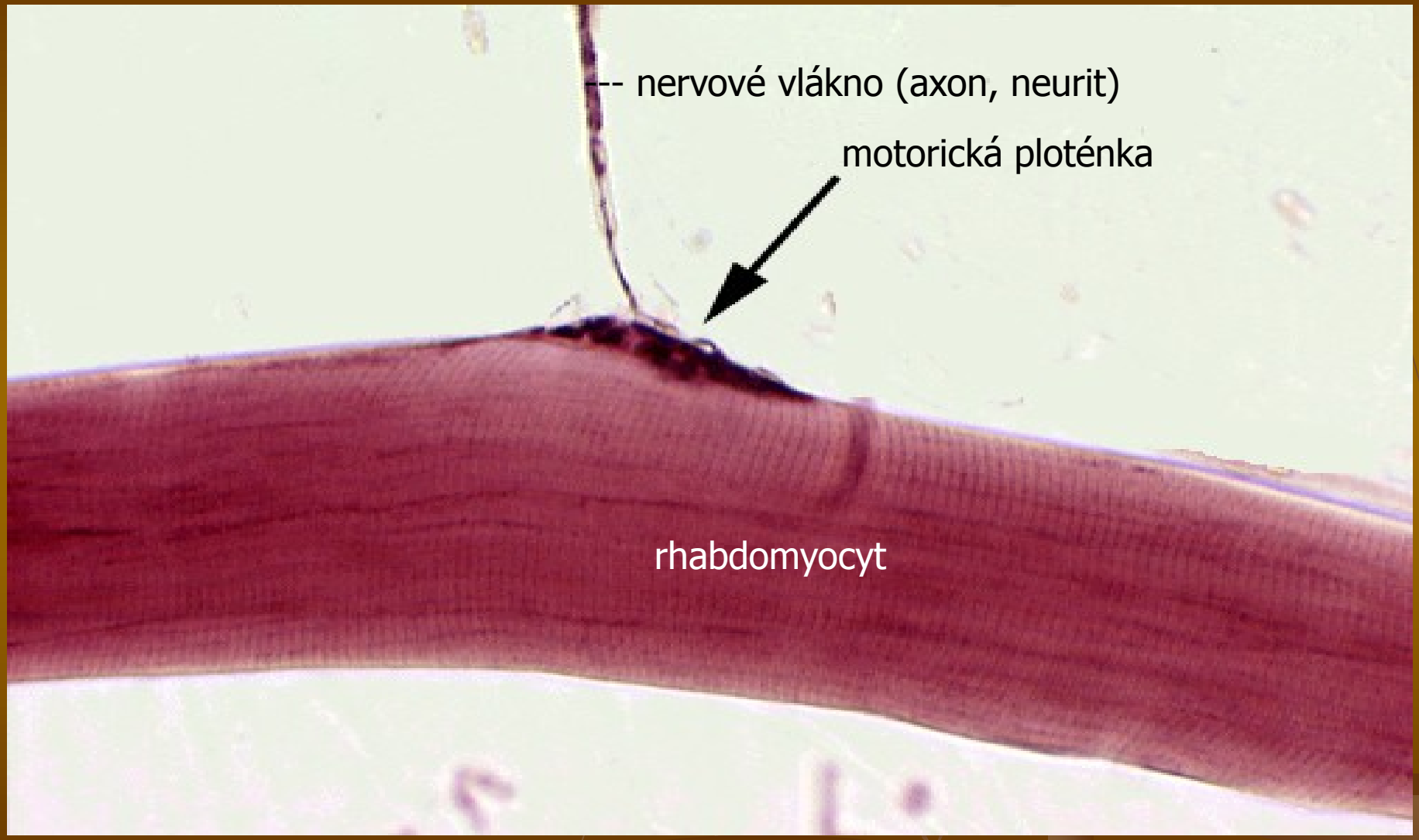
žlázové, svalové (hladká, kosterní, srdeční)
jejich plazmalema představuje postsynaptickou membránu

Motorická ploténka



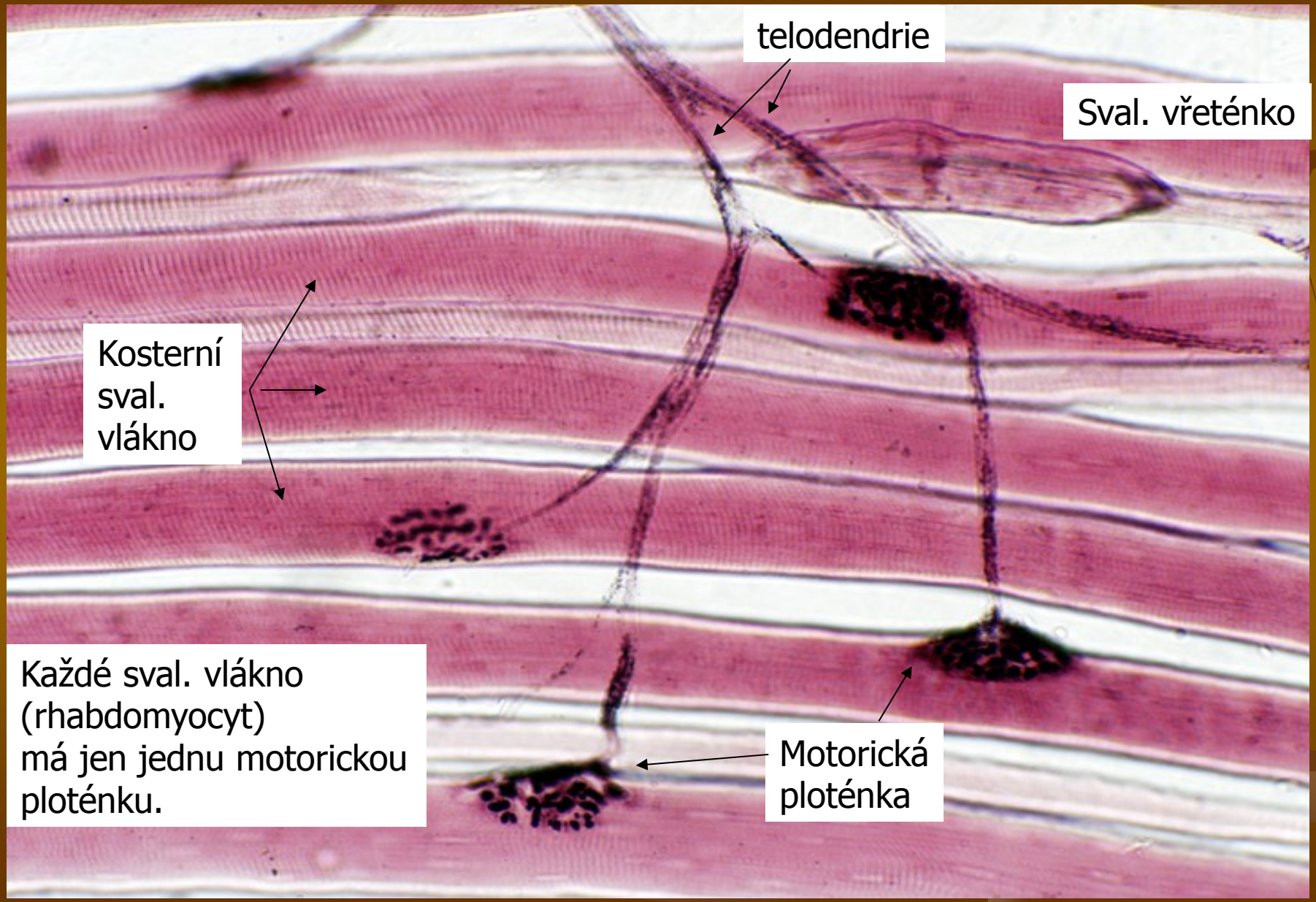


Neuromuscular junction


--- nervové vlákno (axon, neurit)
motorická ploténka
rhabdomyocyt

Motorické ploténky z 1 axonu tvoří motorickou jednotku

Tato svalová vlákna s kontrahují současně



Neuroglie

Centrální glie

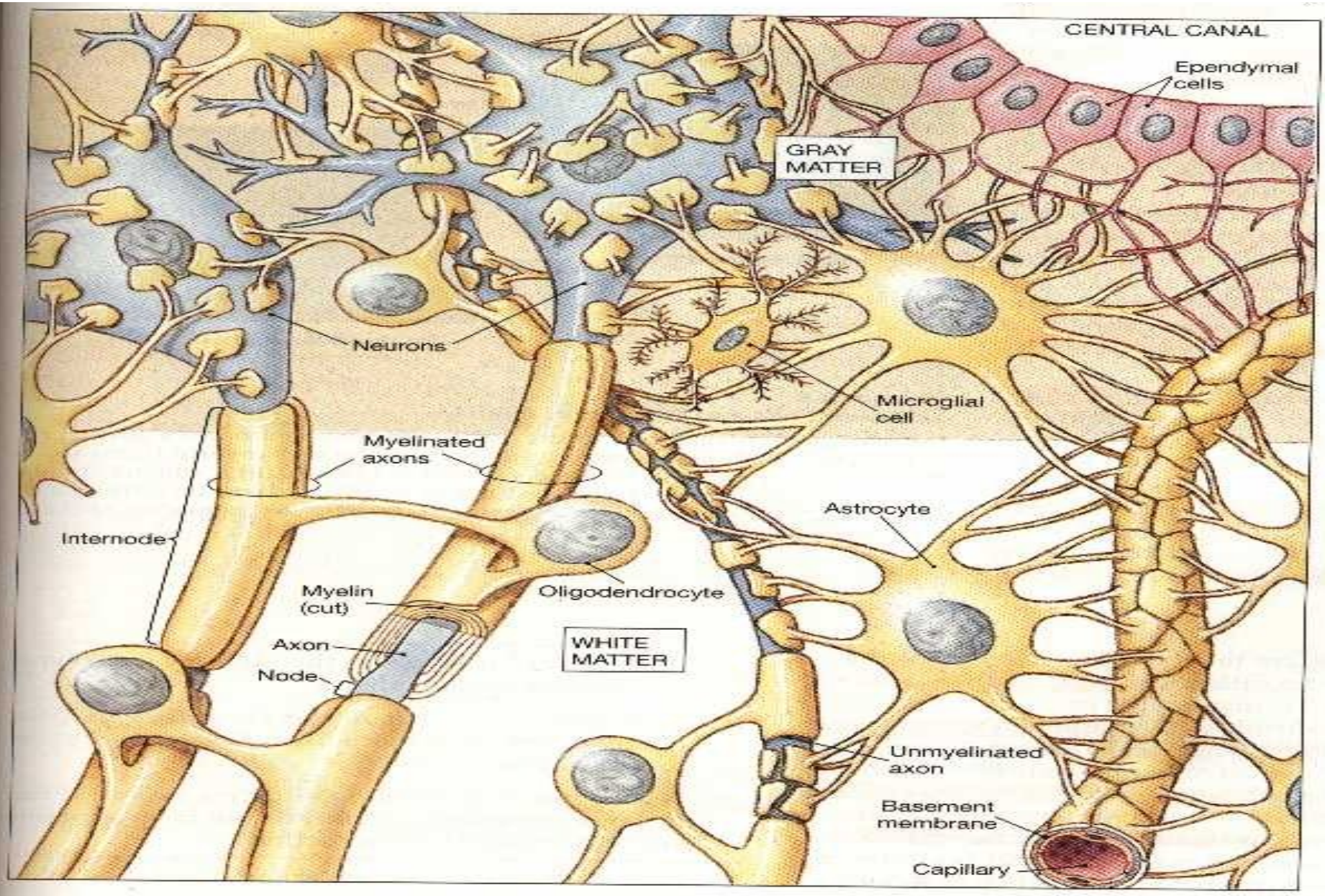
- astrocyty fibrilární/astrocyty plazmatické
  hematoencefalická bariéra
- oligodendrocyty – myelin
- mikroglie – fagocytóza (neuronofagie)
- ependymocyty – výstelka komor + produkce likvoru

Periferní glie

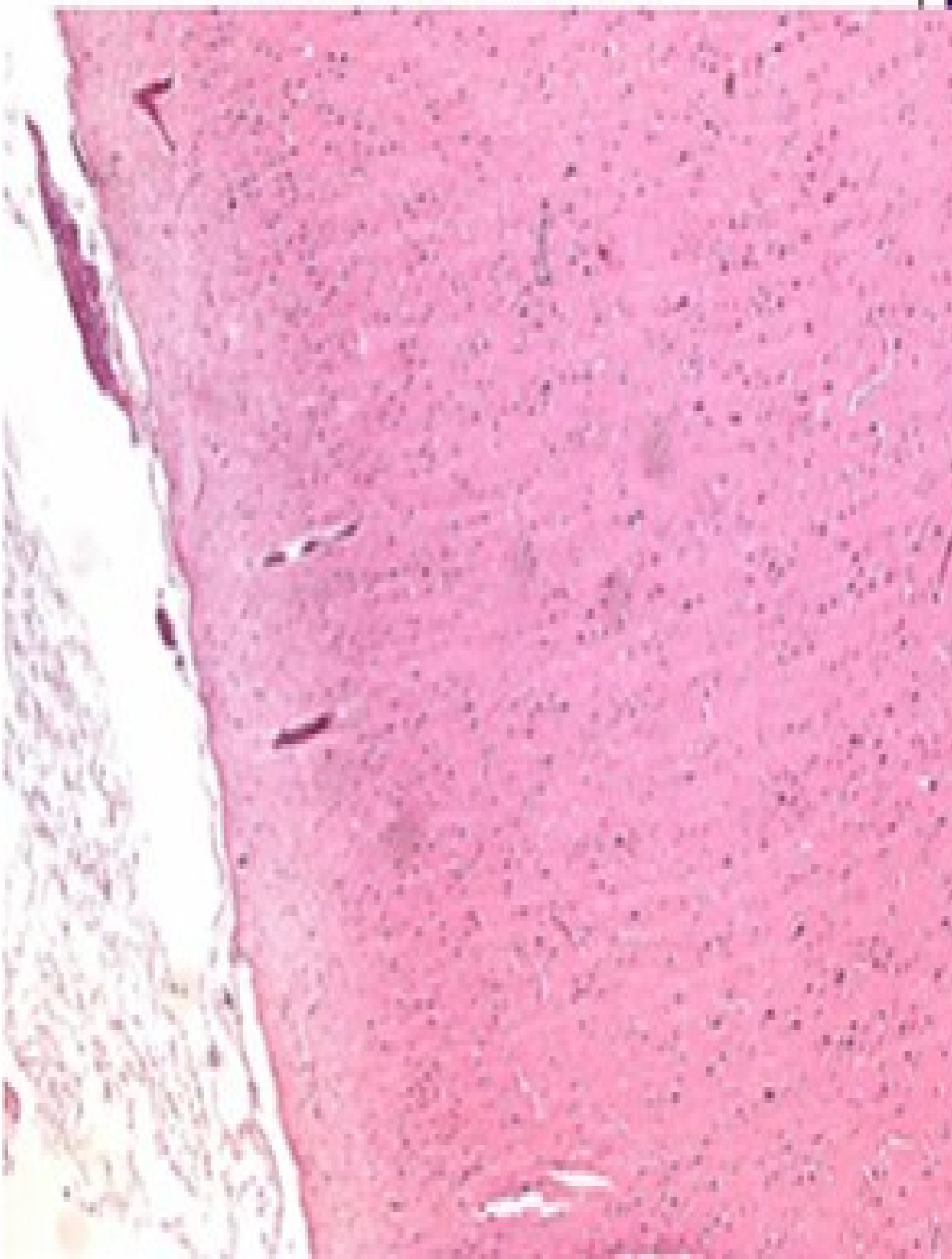
- Schwannovy buňky (lemnocyty) – myelin,
  neurilemma izoluje neurit
- satelitové (plášťové) buňky – izolace perikaryí v gangliích

NS – struktura:

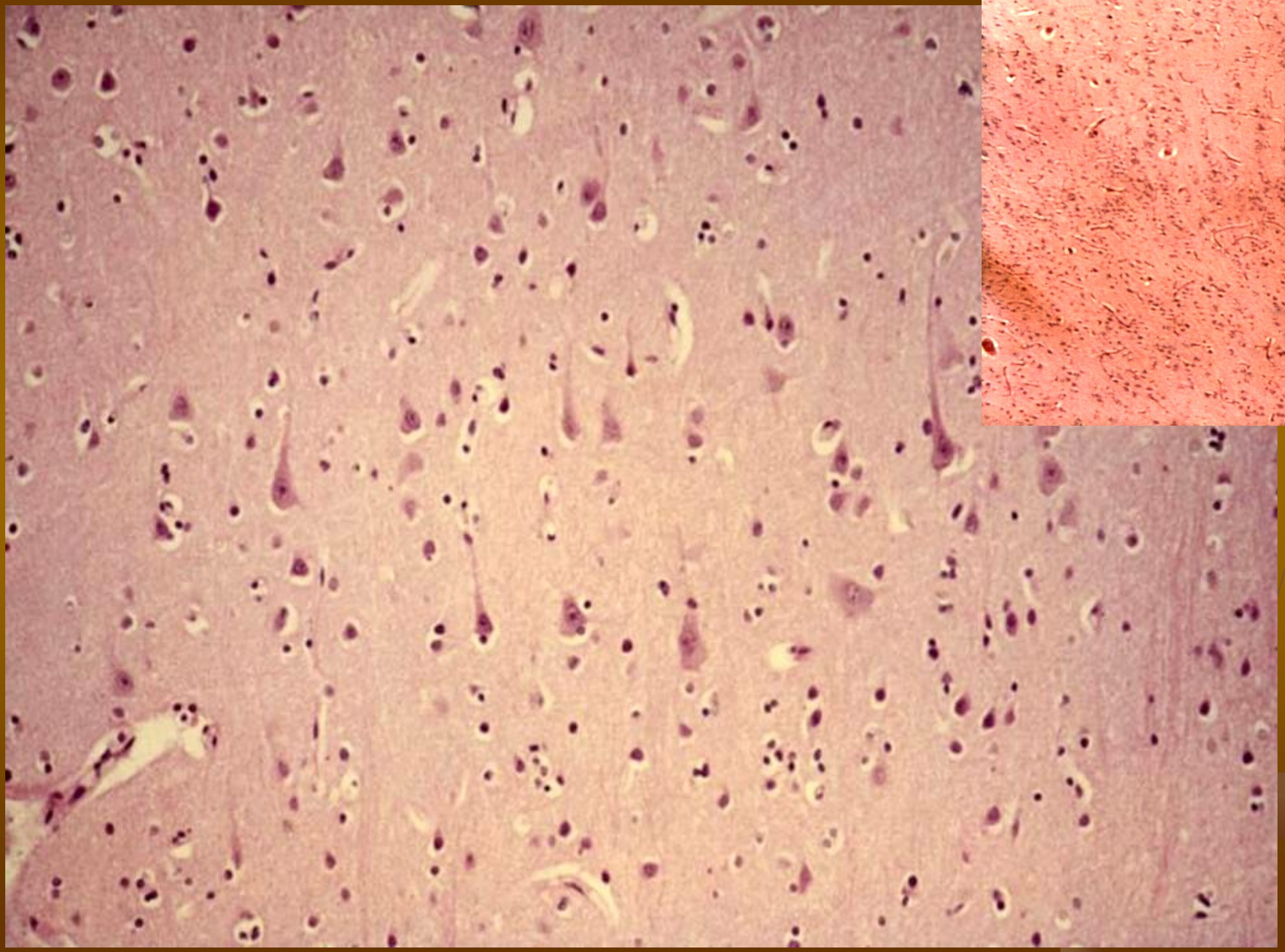
Neurony + gliové buňky



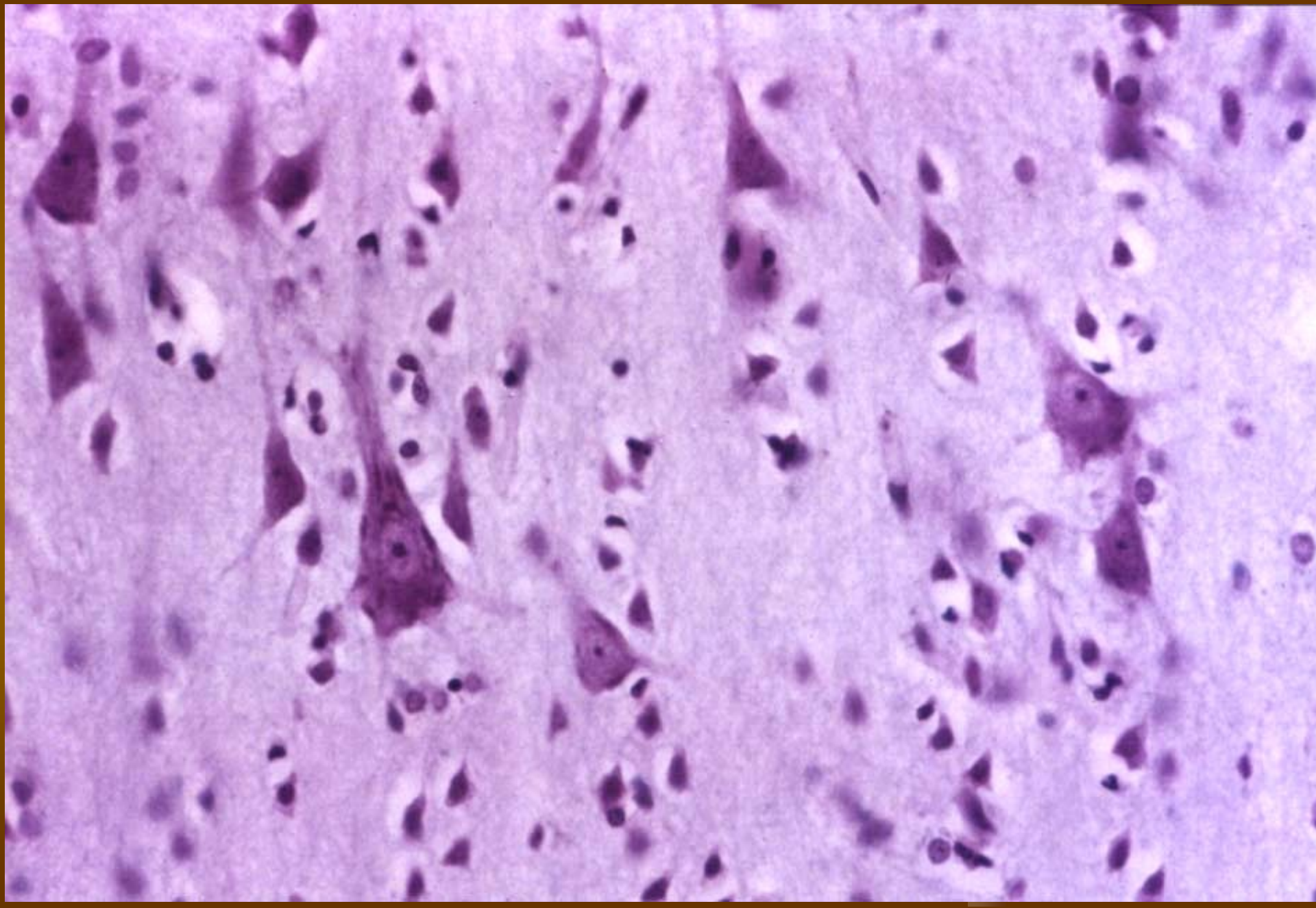
Cortex cerebri



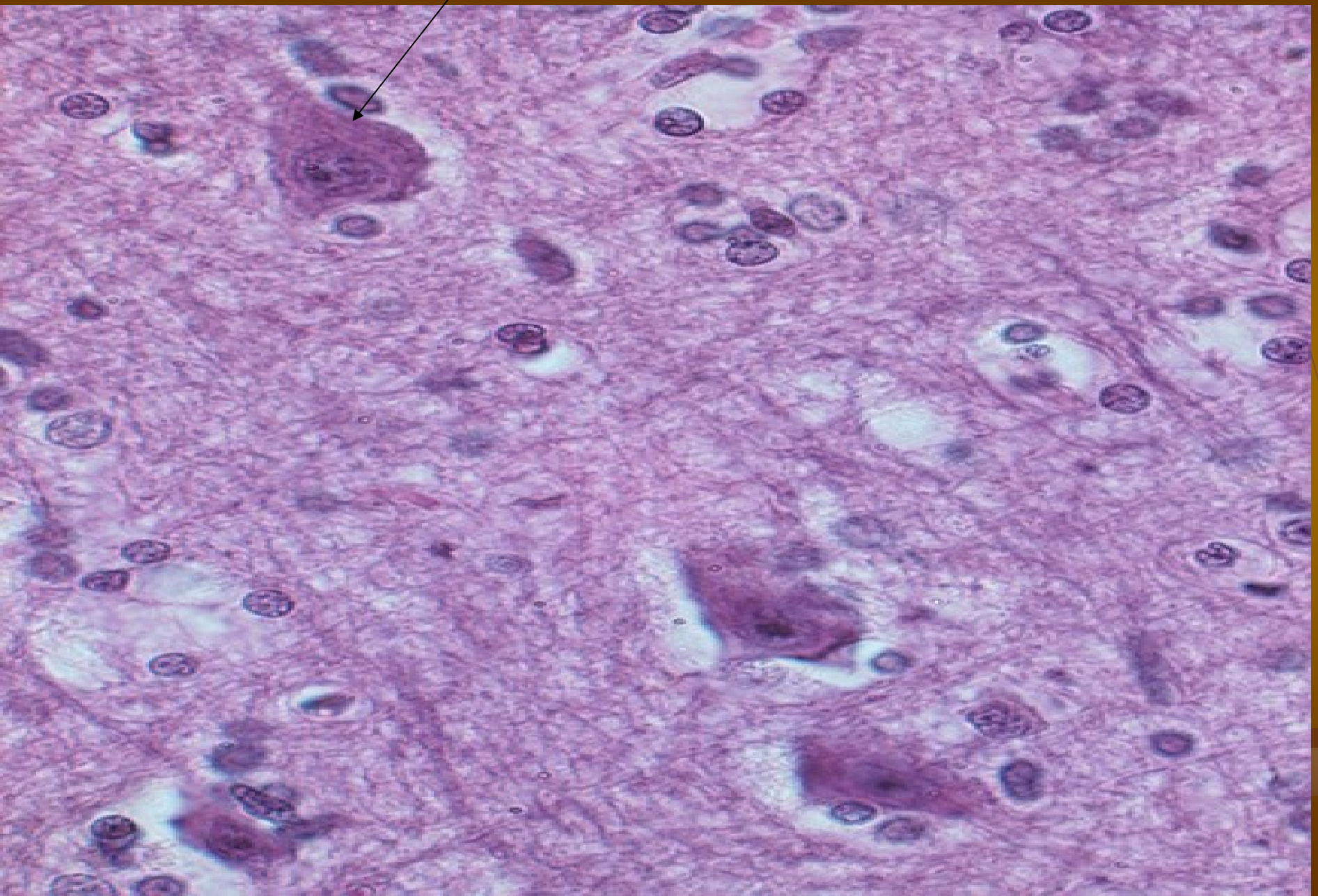
Cortex cerebri (HE) – lamina pyramidalis



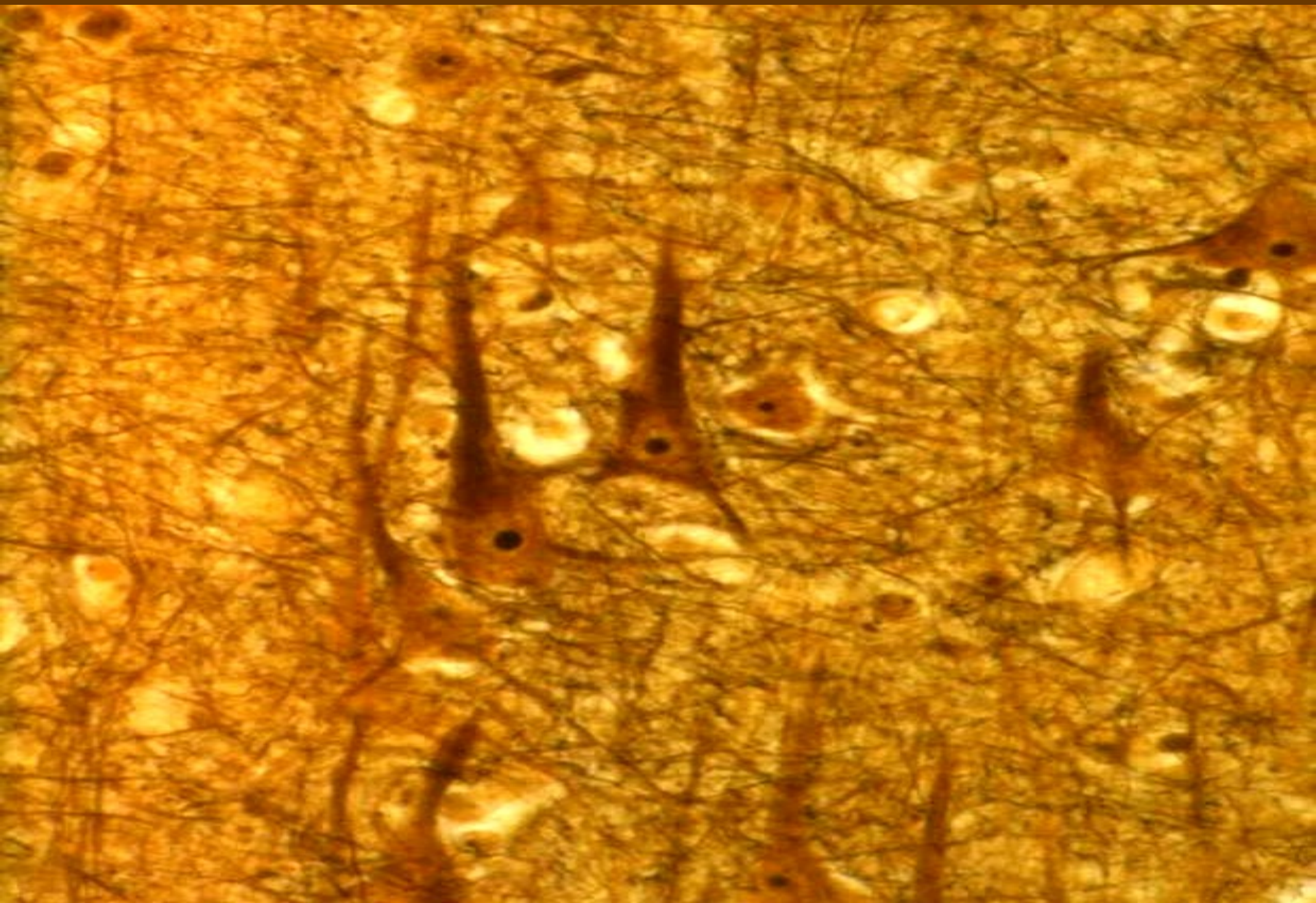
Cortex cerebri (HE) – velké pyramidové buňky = multipolární neurony



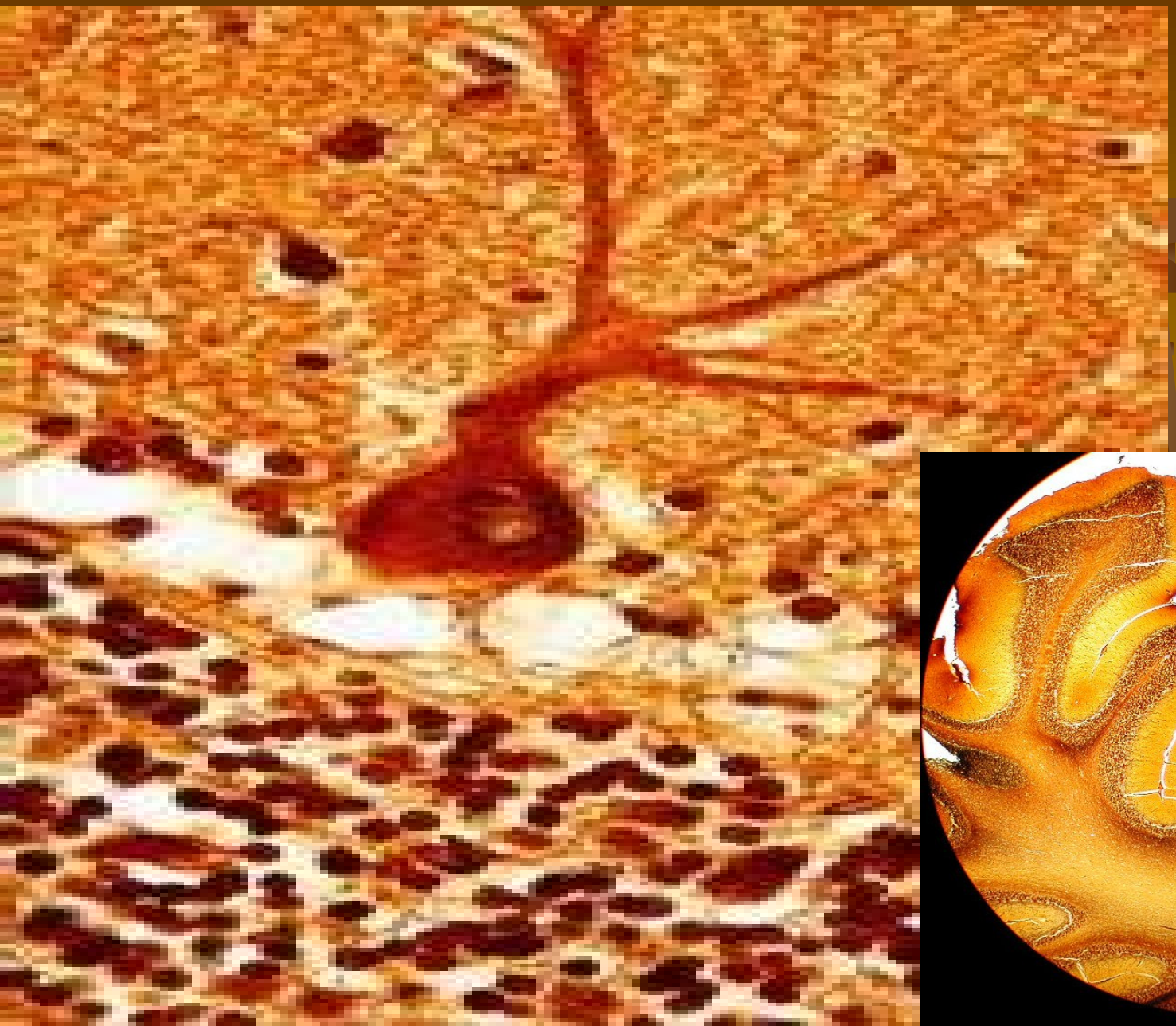
Cortex cerebri (HE) – pyramidové buňky



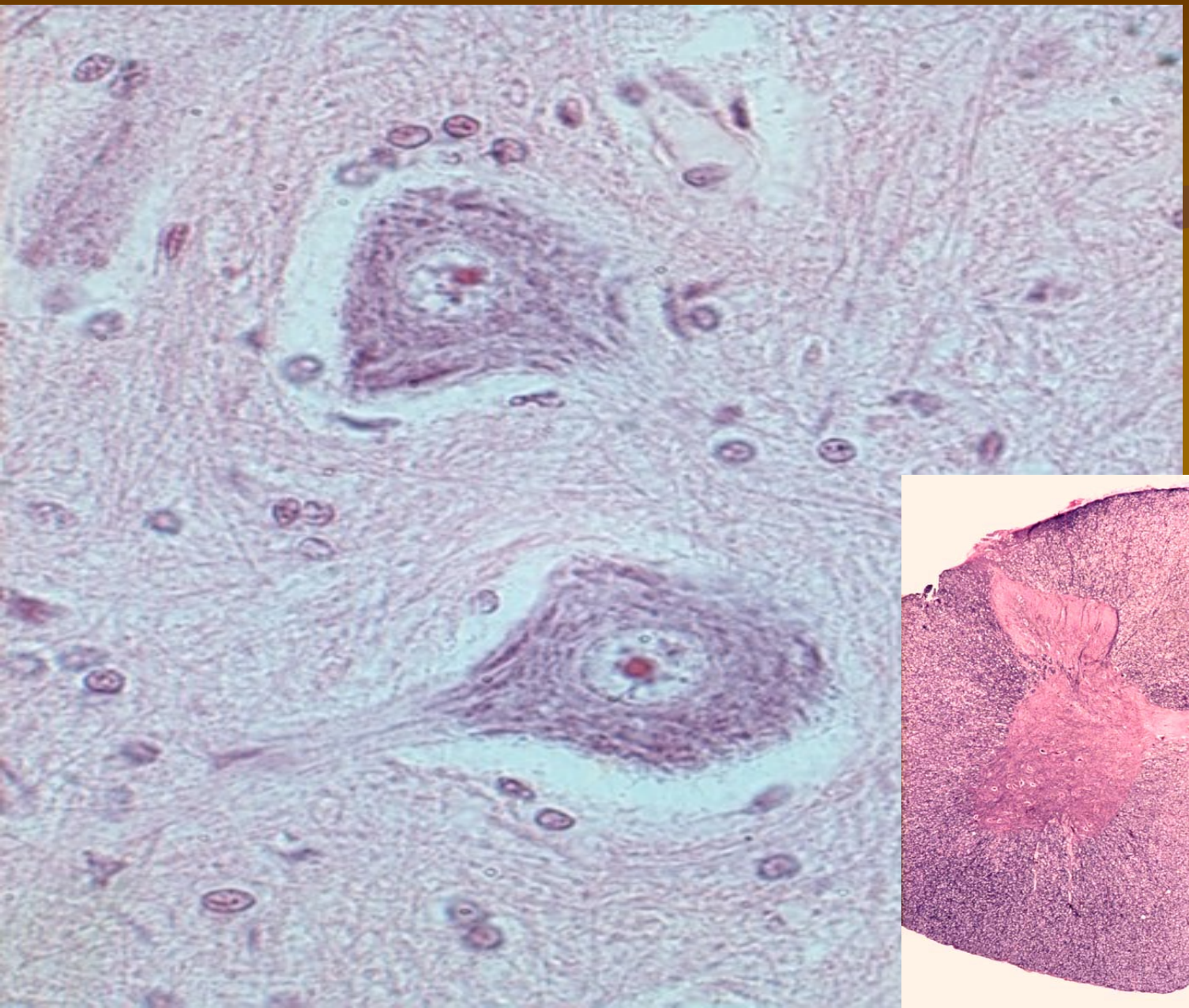
Cortex cerebri (impregnace) – pyramidové buňky



Cerebellum (impregnace) – Purkyňovy buňky = bipolární neurony

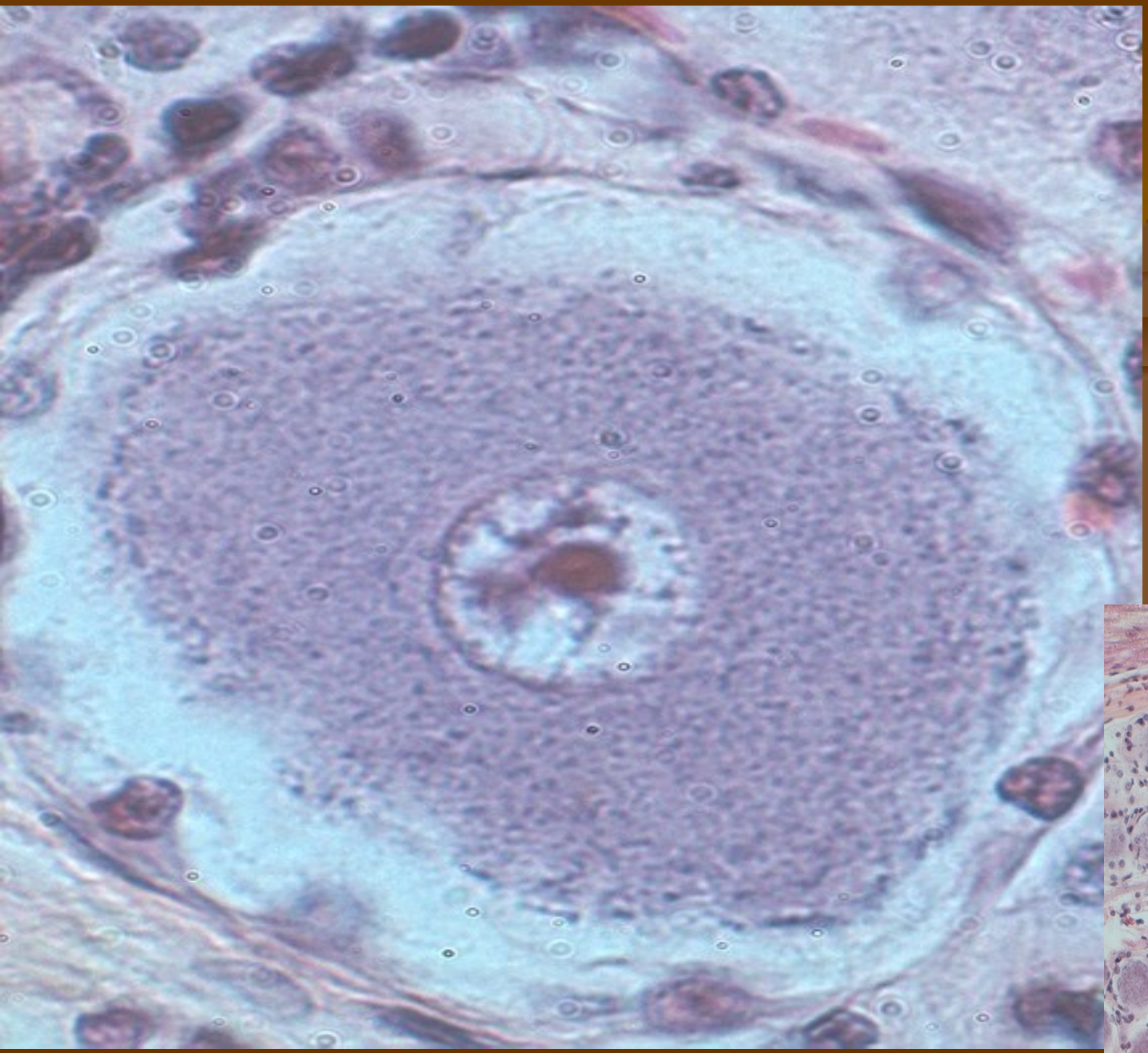


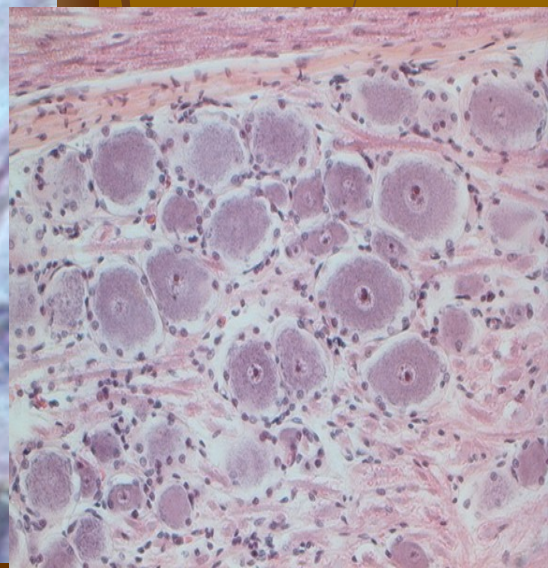
Medulla spinalis (HE) – somatomotorické neuron = multipolární



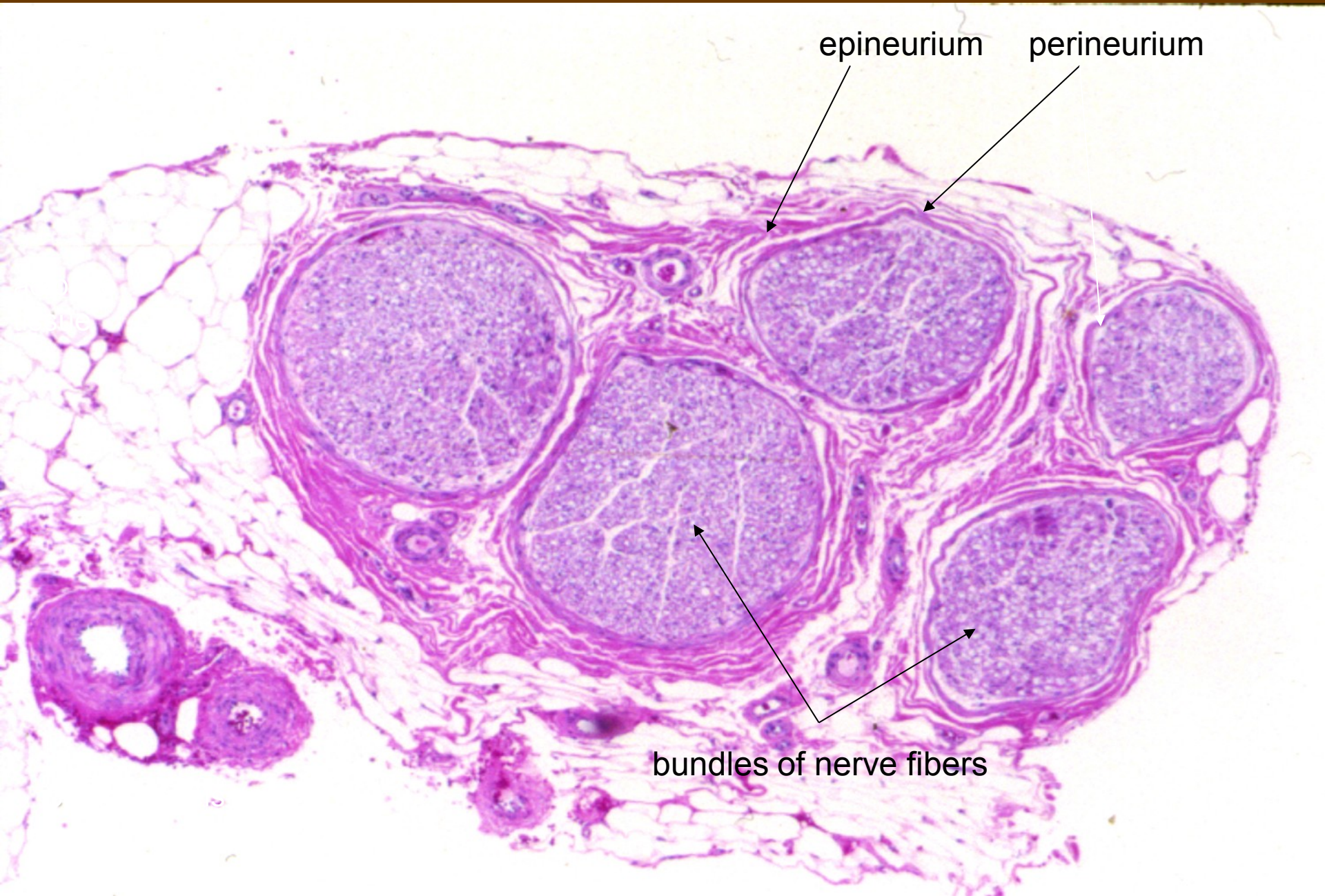
Spinalní ganglion (HE)

Gangliové buňky = pseudounipolární neurony + satelitní bb

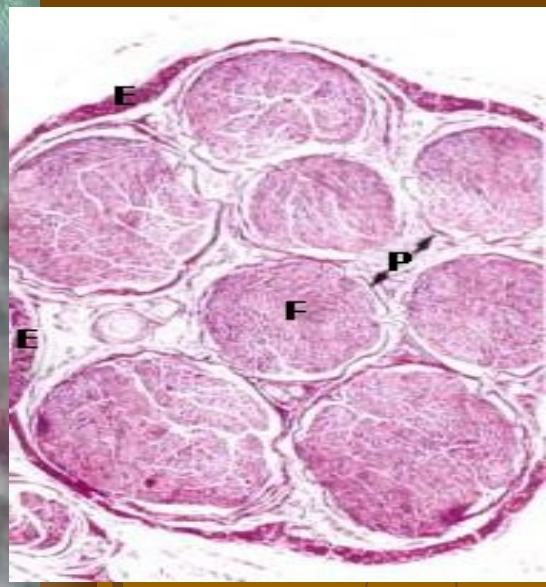


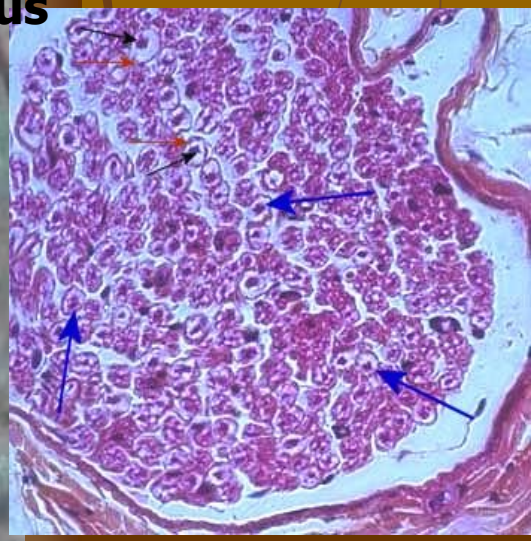


Periferní nerv (HE) – příčně

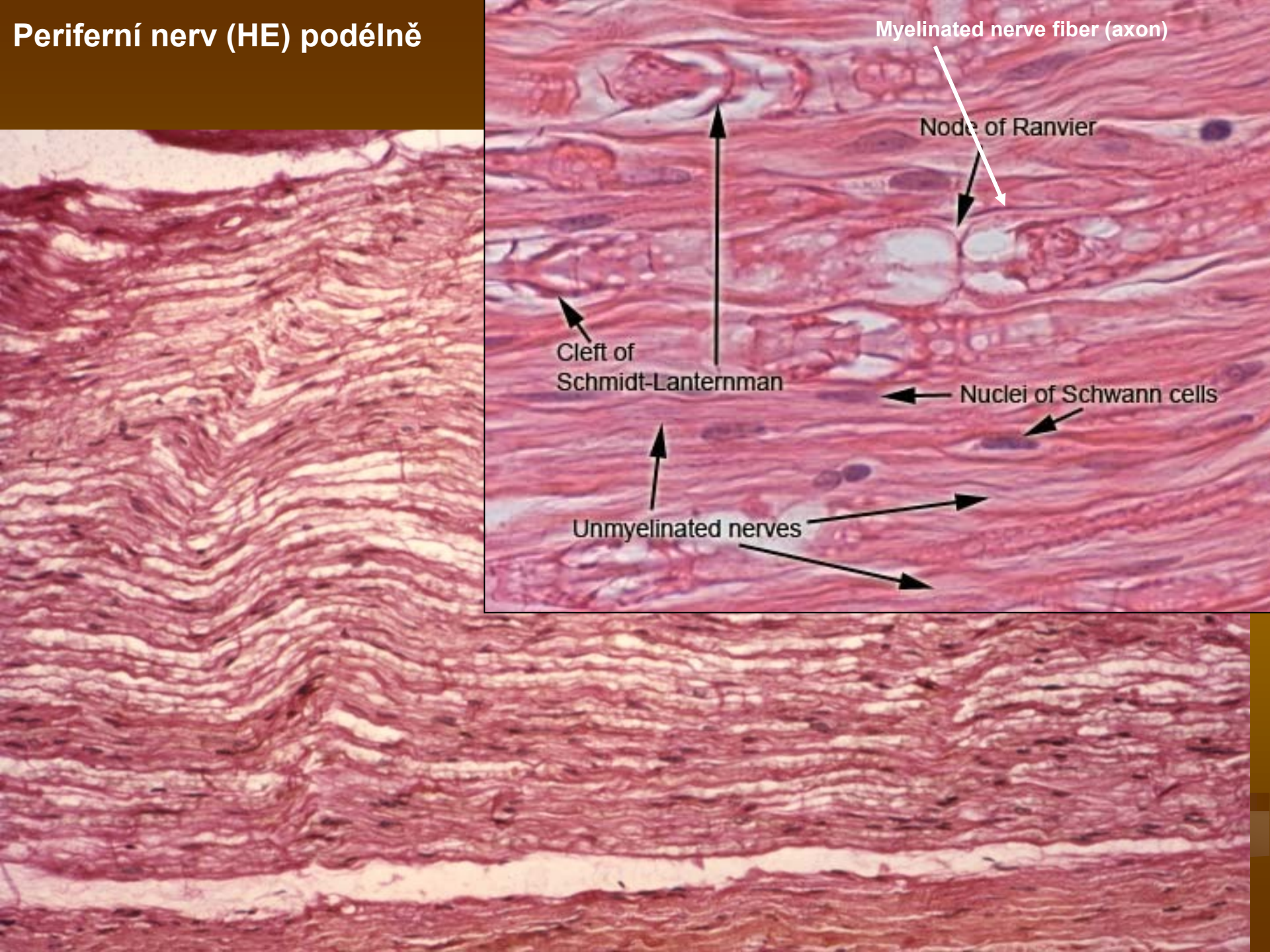


Periferní nerv (HE)





Periferní nerv (HE) podélně



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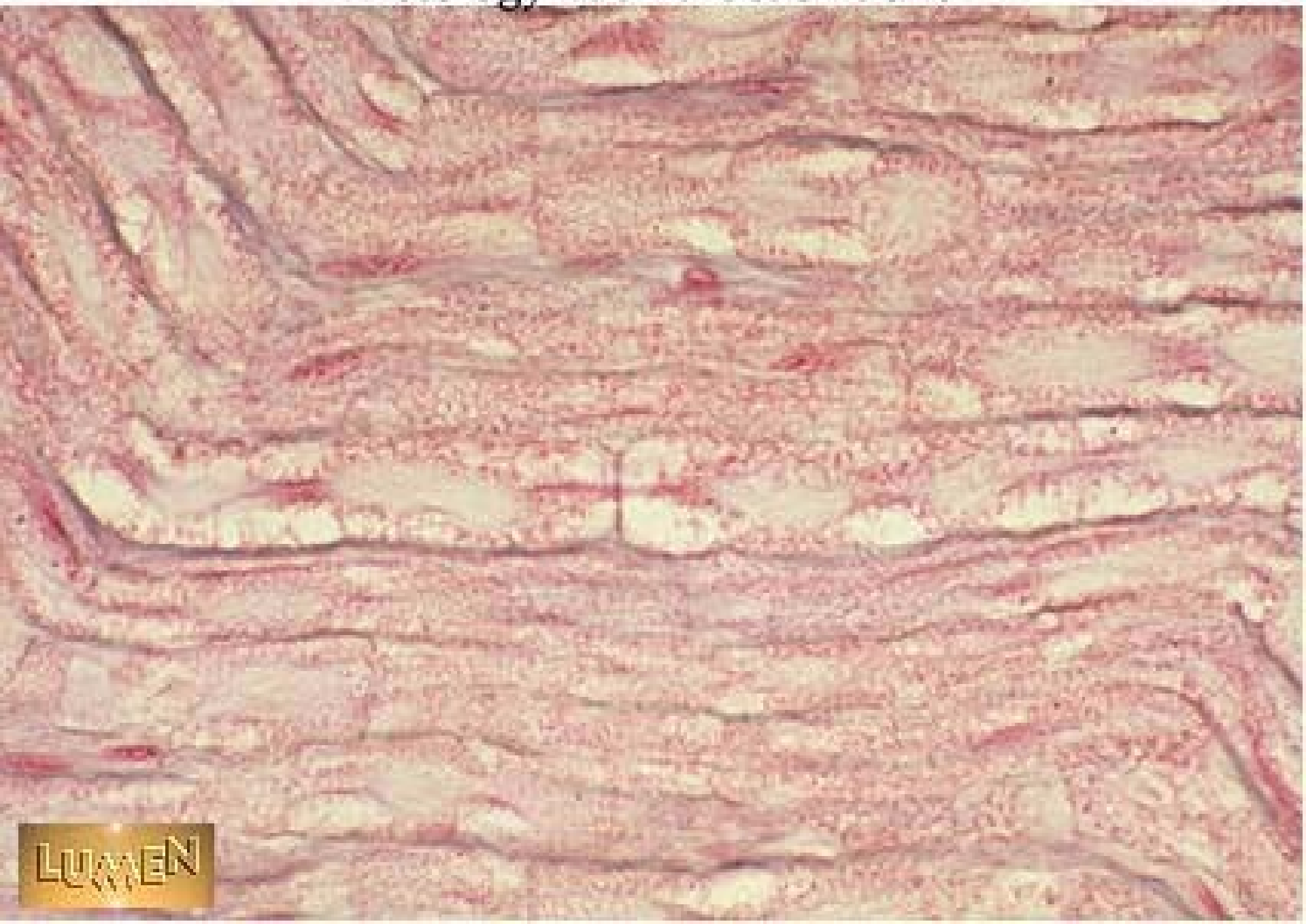
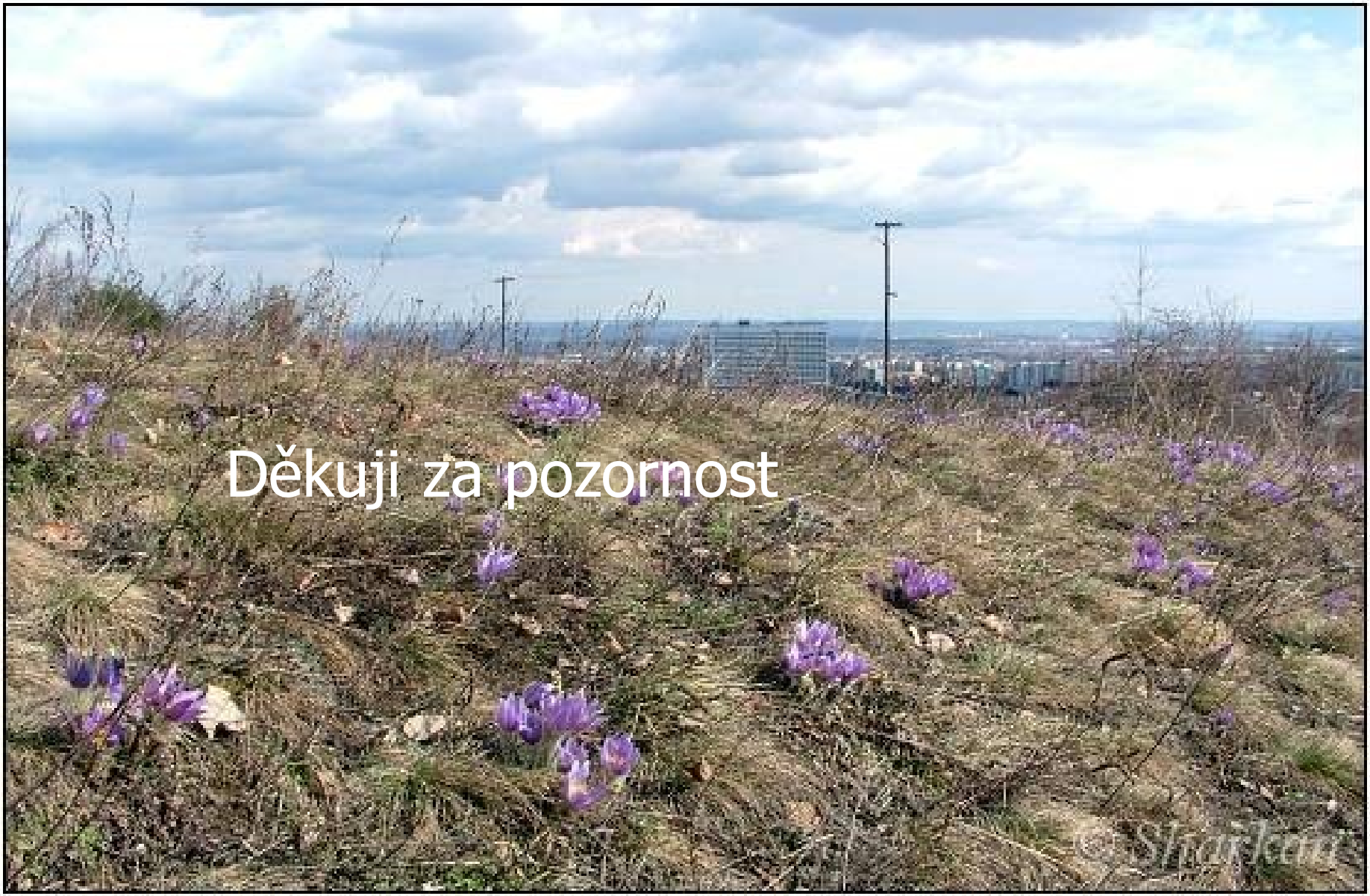
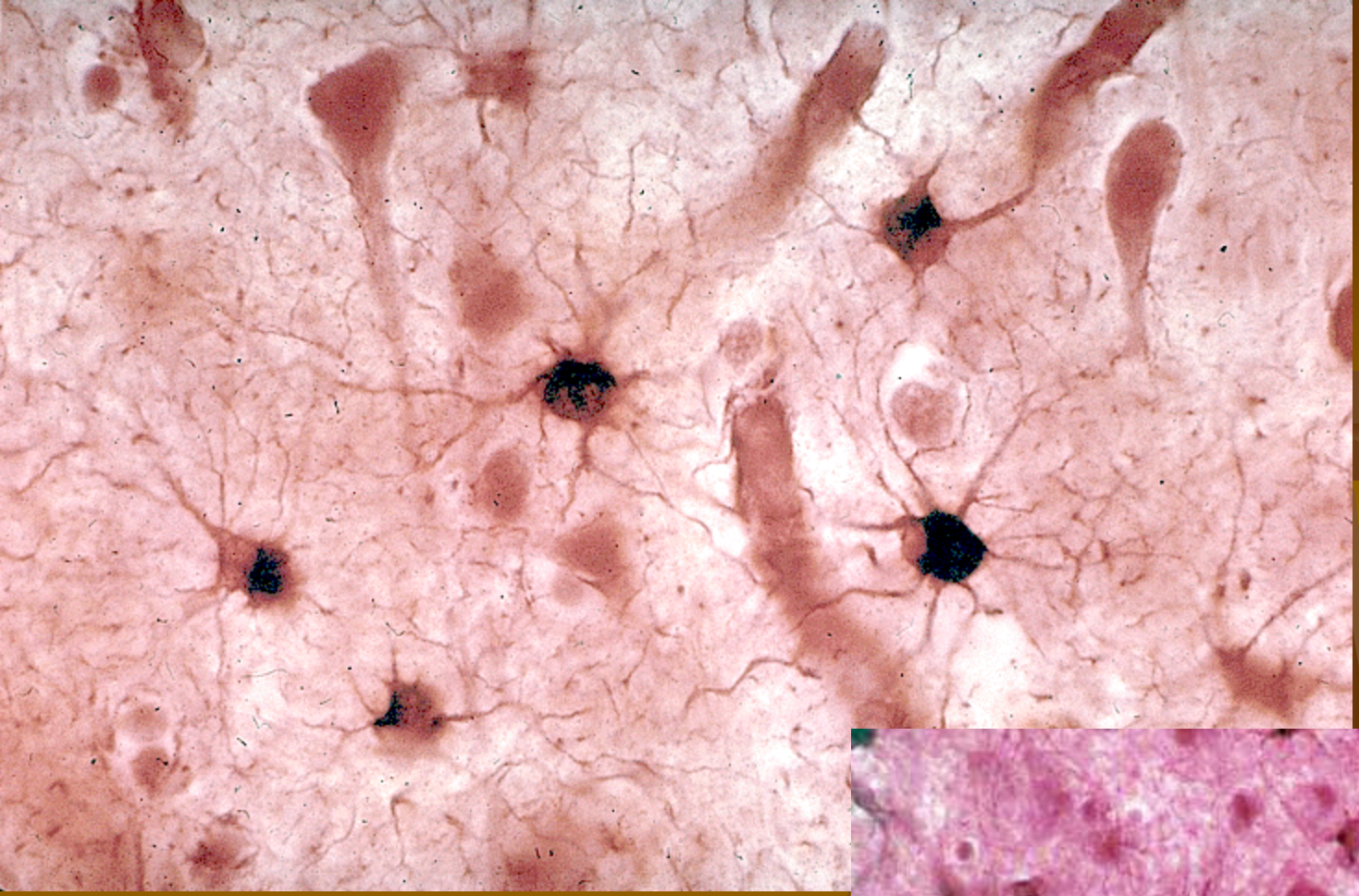



Děkuji za pozornost



Astrocytes