

SUSUNAN SARAF PUSAT



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Laboratorium histologi
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Pendahuluan

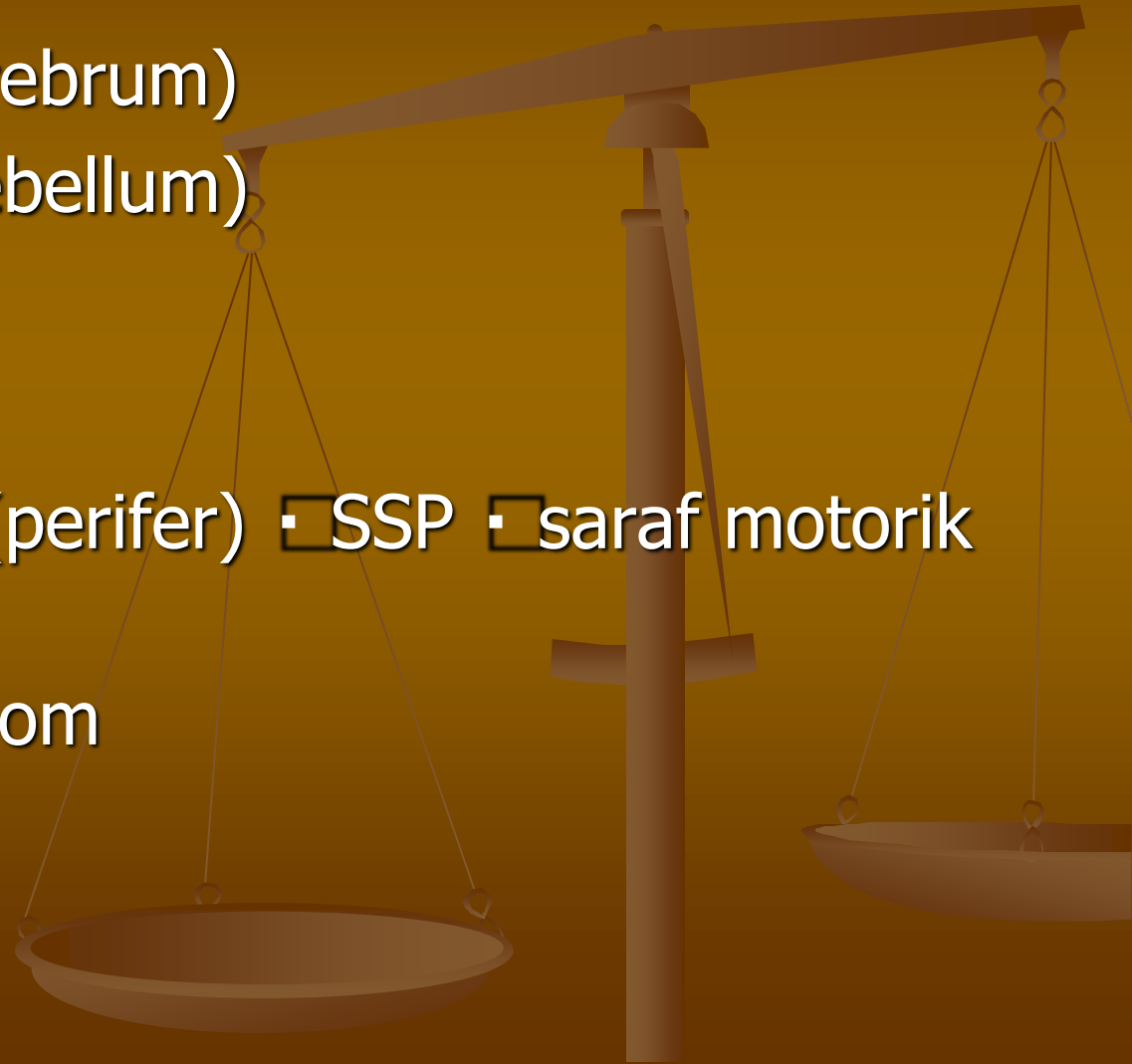
■ Anatomi

- Otak besar (cerebrum)
- Otak kecil (cerebellum)
- Medula spinalis

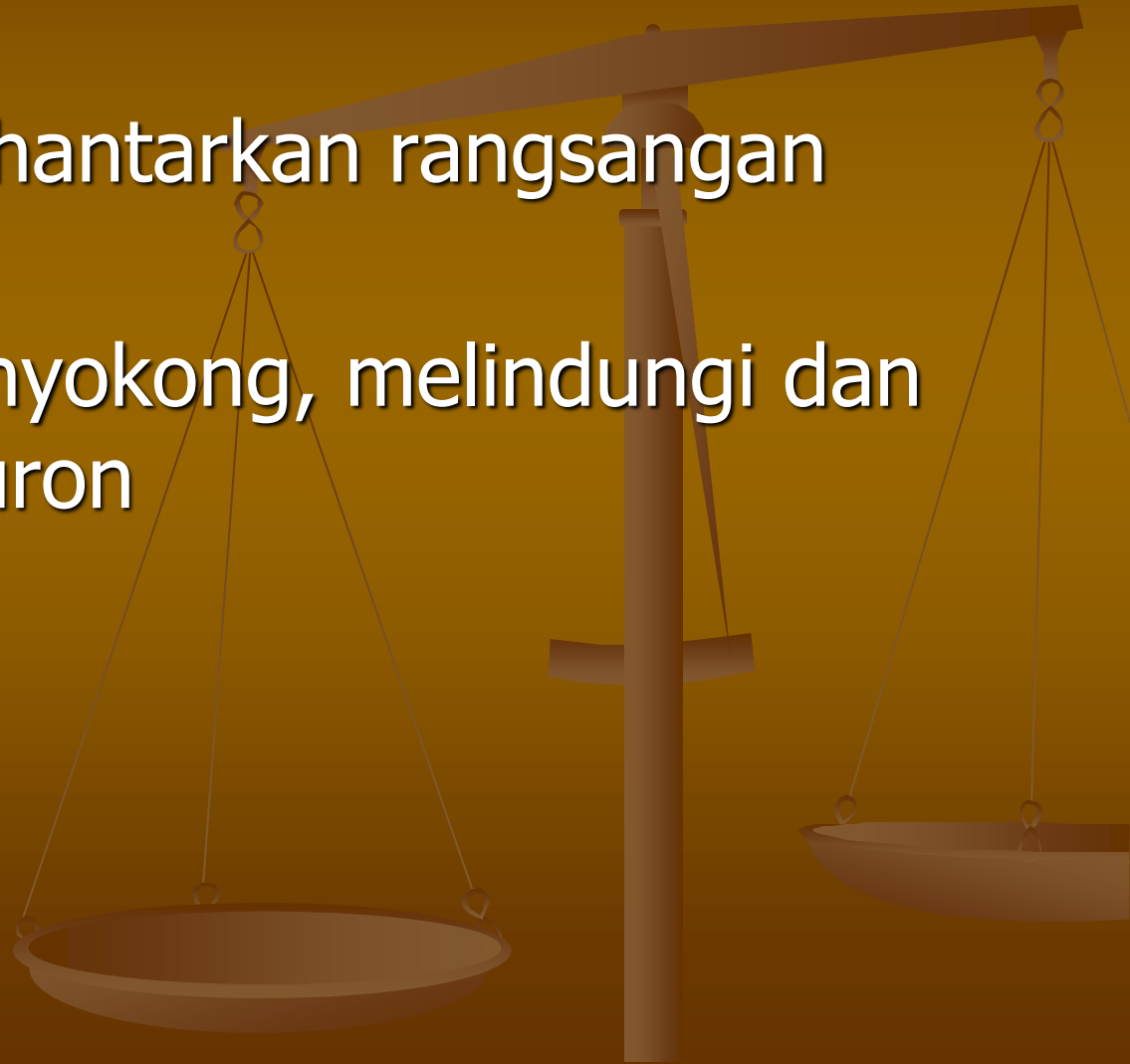
■ Fungsi:

- Saraf sensorik (perifer) □ SSP □ saraf motorik
: somatis

autonom

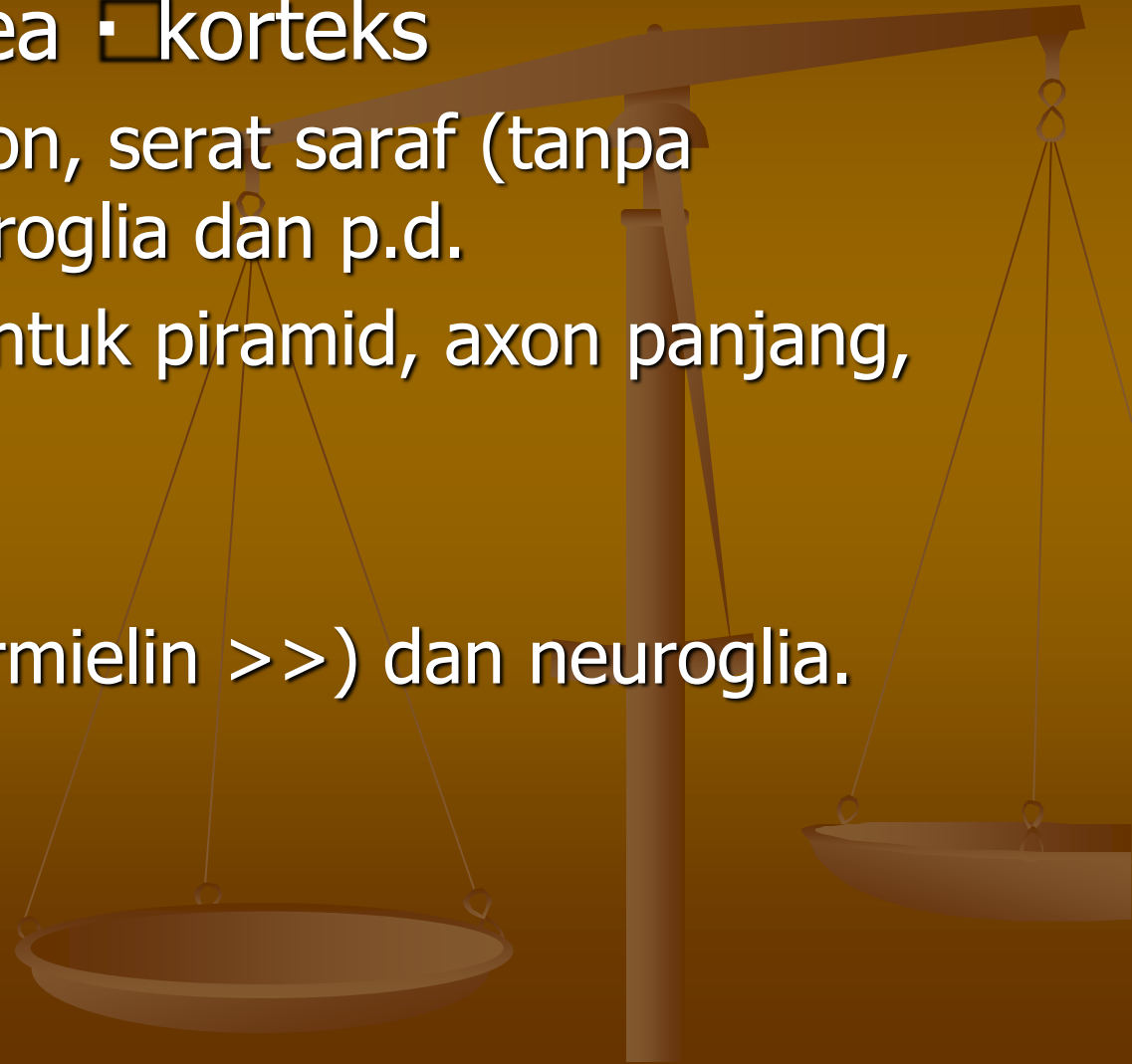


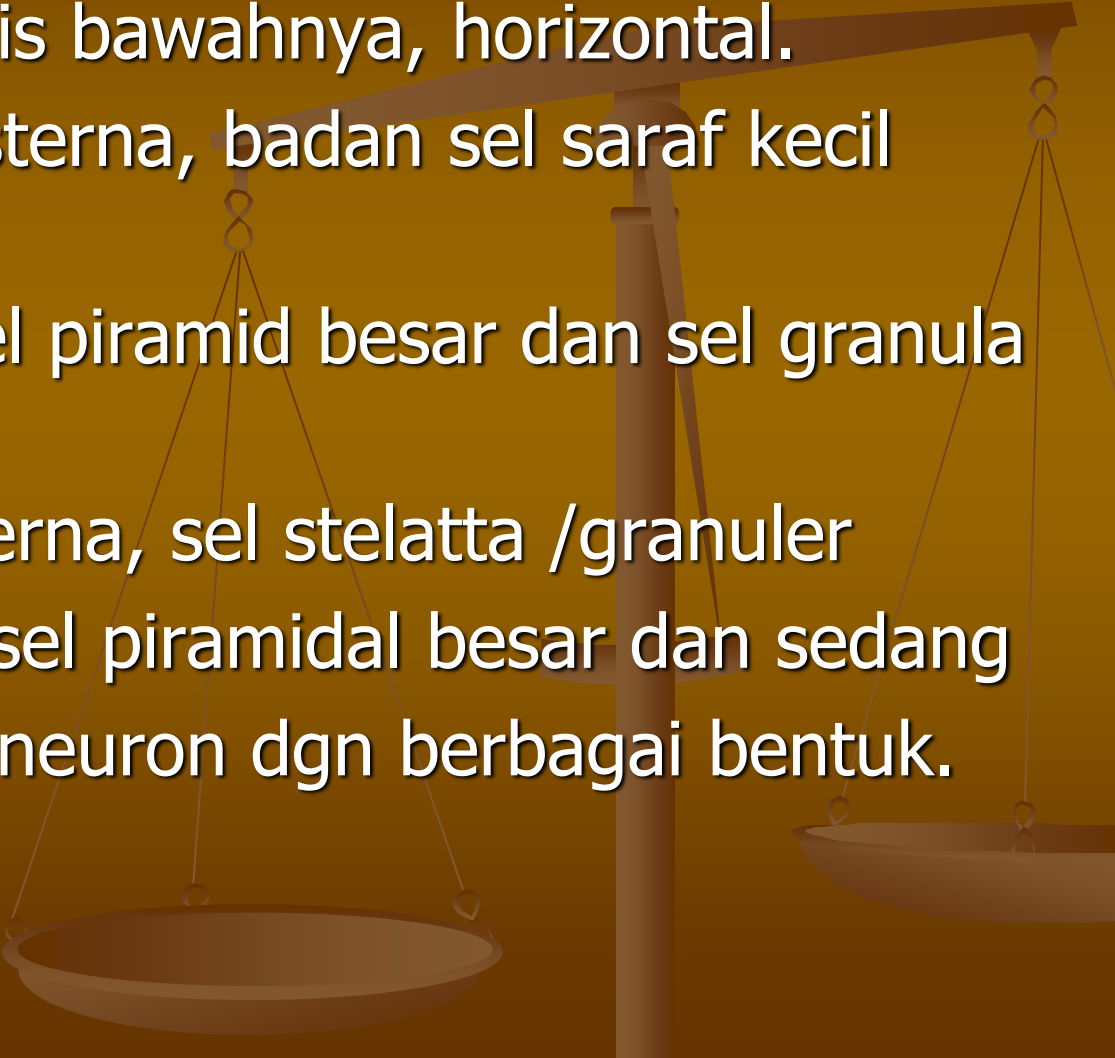
- Jaringan saraf:
- Neuron □ menghantarkan rangsangan listrik
- Neuroglia □ menyokong, melindungi dan memelihara neuron



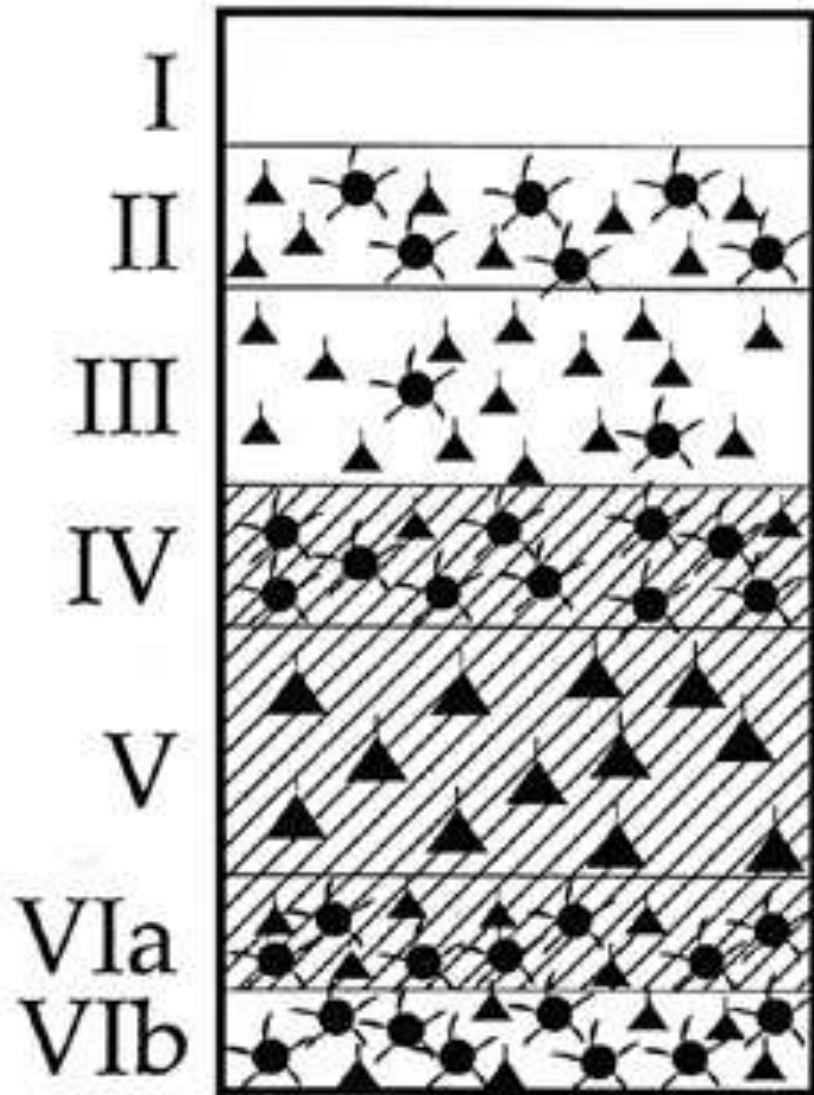
Cerebrum

- Substansia grisea □ korteks
 - Badan sel neuron, serat saraf (tanpa mielin >>), neuroglia dan p.d.
 - Sel piramid: bentuk piramid, axon panjang, dendrit >>>
- Substansia alba
 - Serat saraf (bermielin >>) dan neuroglia.

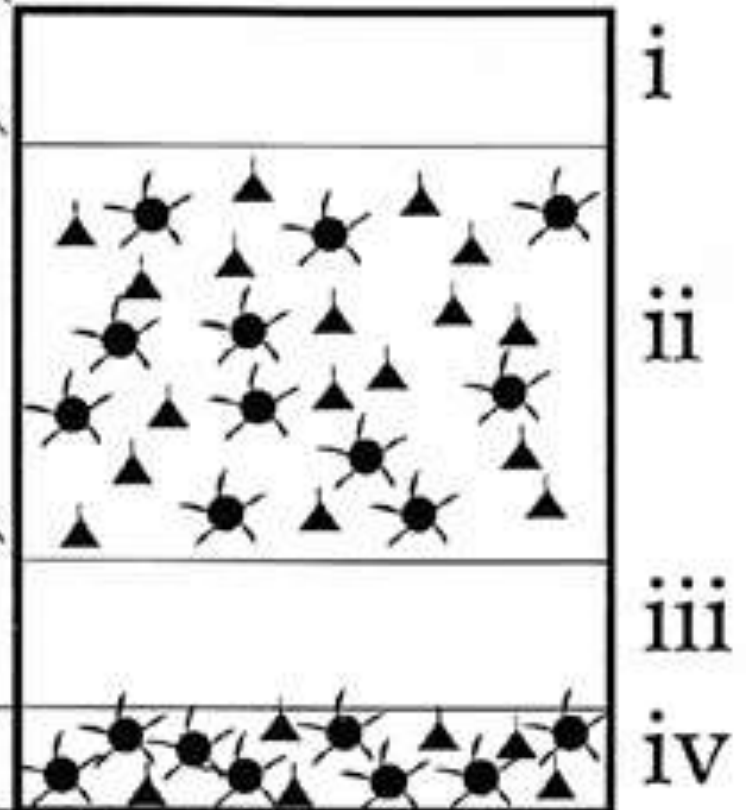


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- Lapisan cortex dari luar ke dalam:
 - Lap. Molekuler, terutama tdd prosesus (serat saraf) dari sel lapis bawahnya, horizontal.
 - Lap. Granuler eksterna, badan sel saraf kecil bentuk segitiga
 - Lap. Piramidal, sel piramid besar dan sel granula kecil
 - Lap. Granuler interna, sel stelatta /granuler
 - Lap. Ganglioner, sel piramidal besar dan sedang
 - Lap. Multiformis, neuron dgn berbagai bentuk.

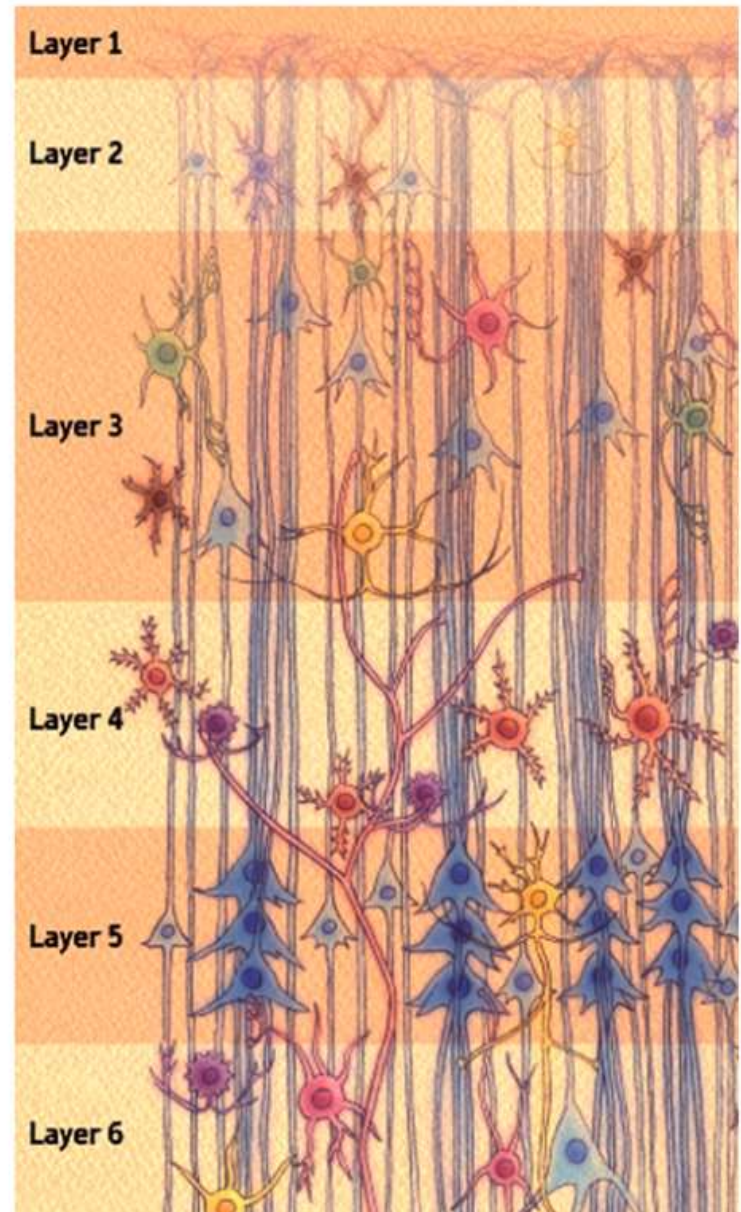
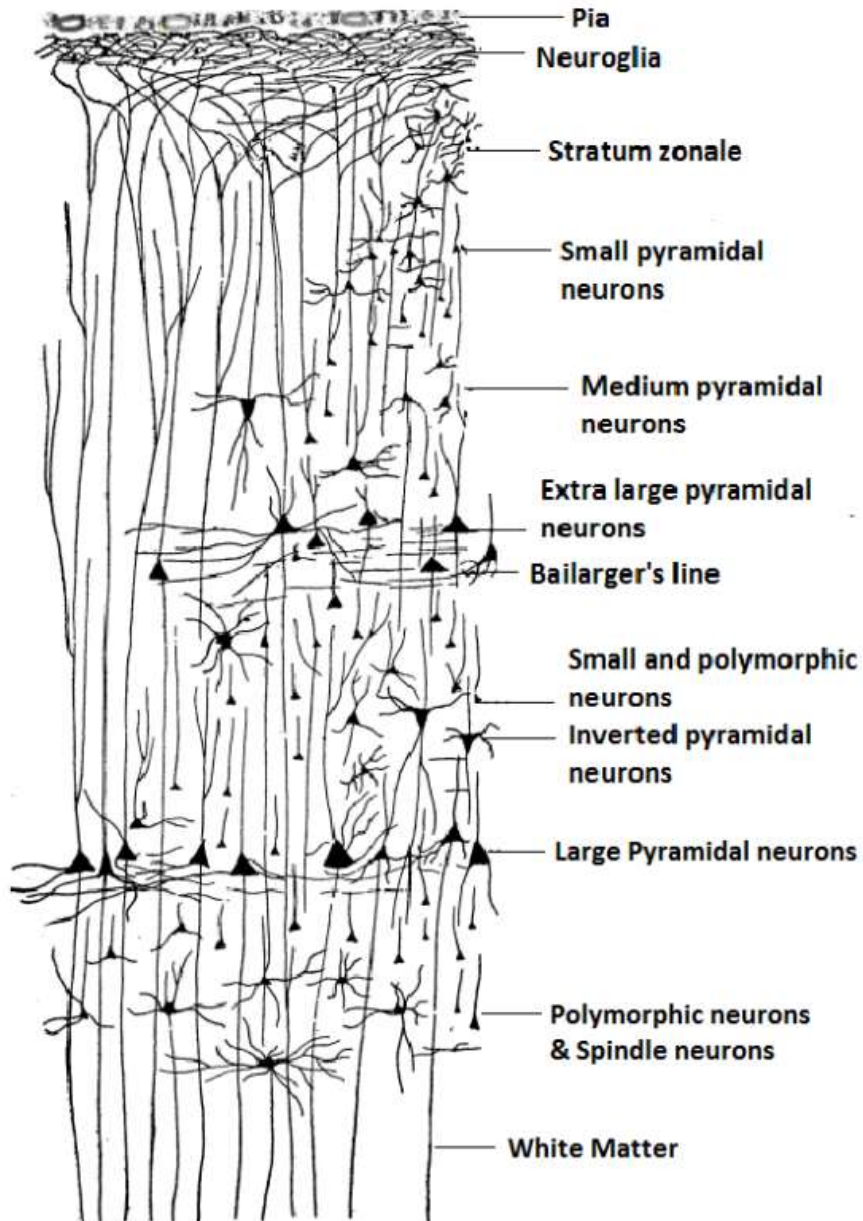
Intact Cortex



Microgyric Cortex



Histological Structure of the Cerebral Cortex



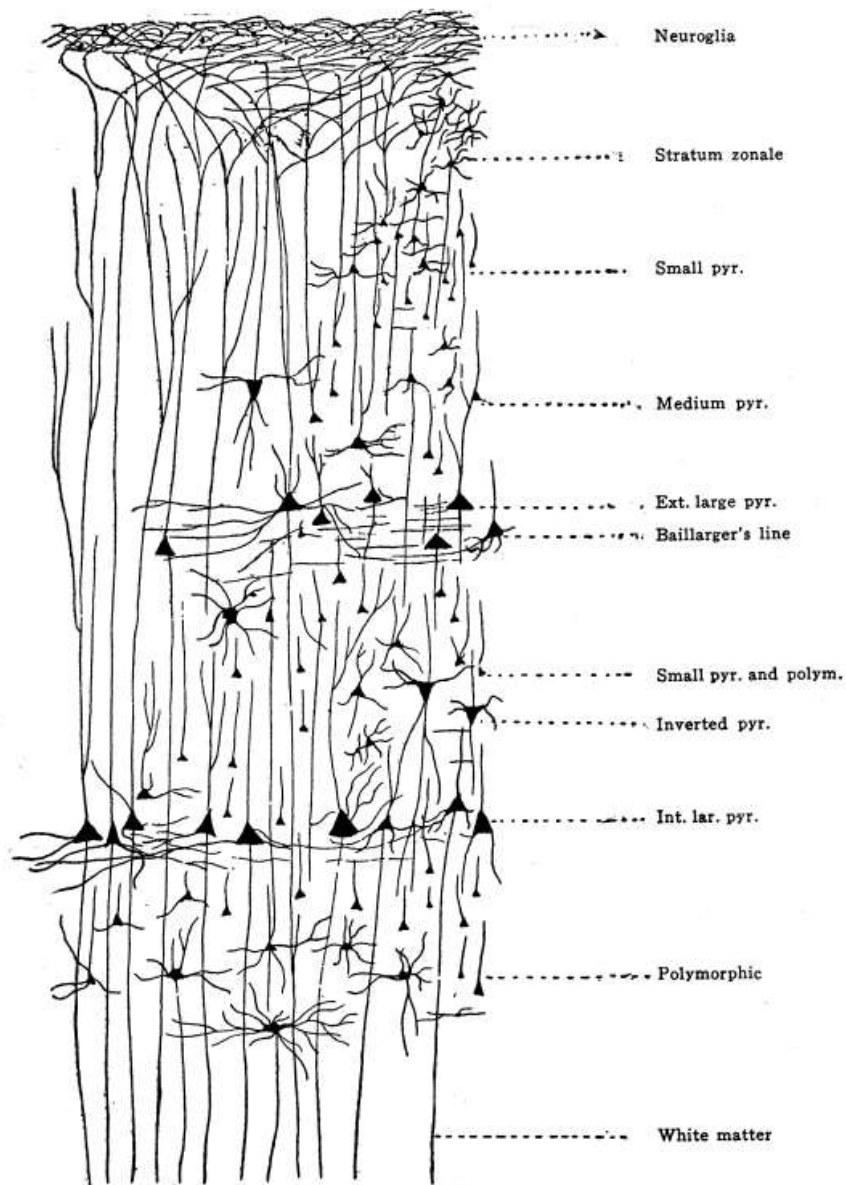
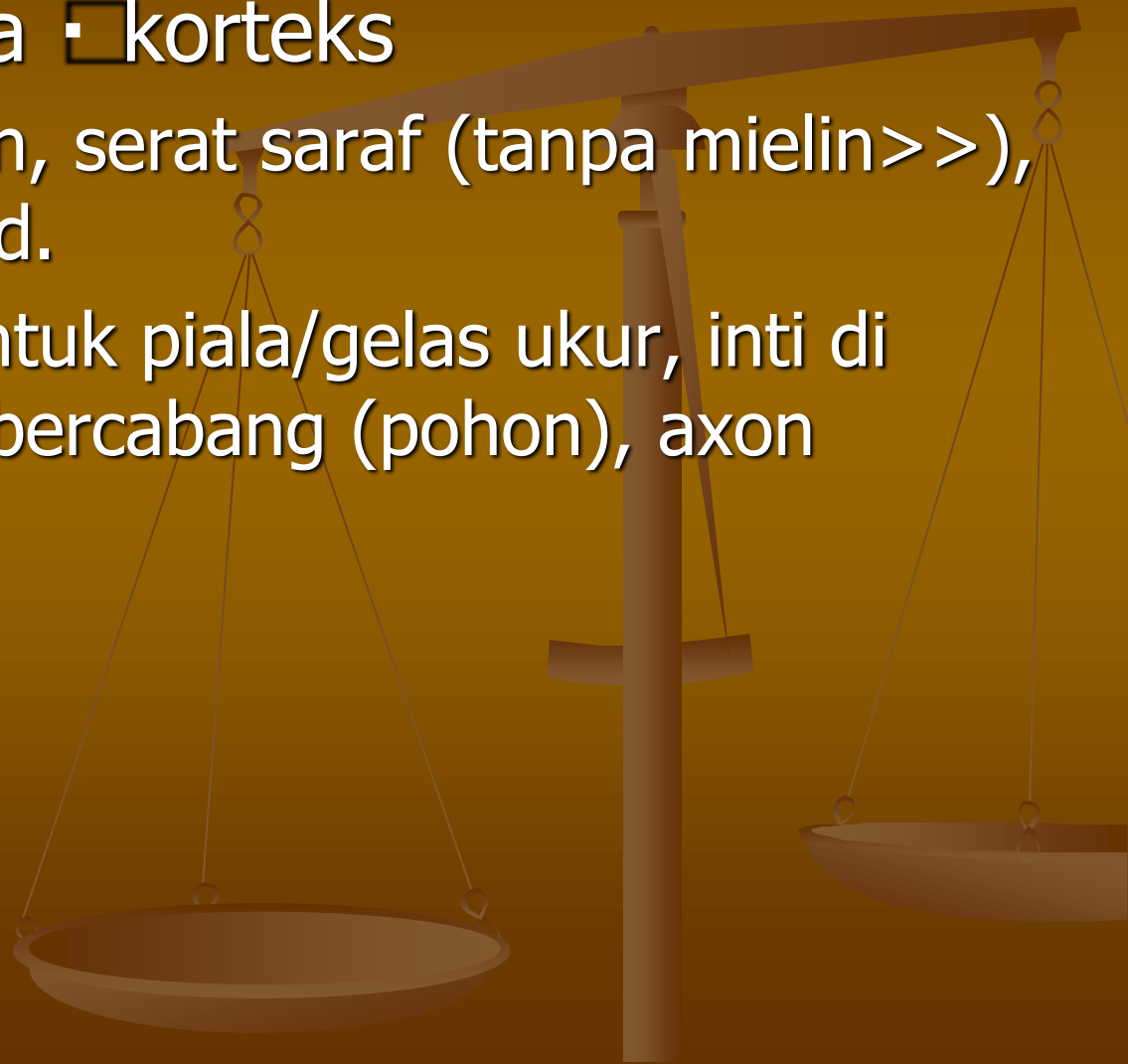


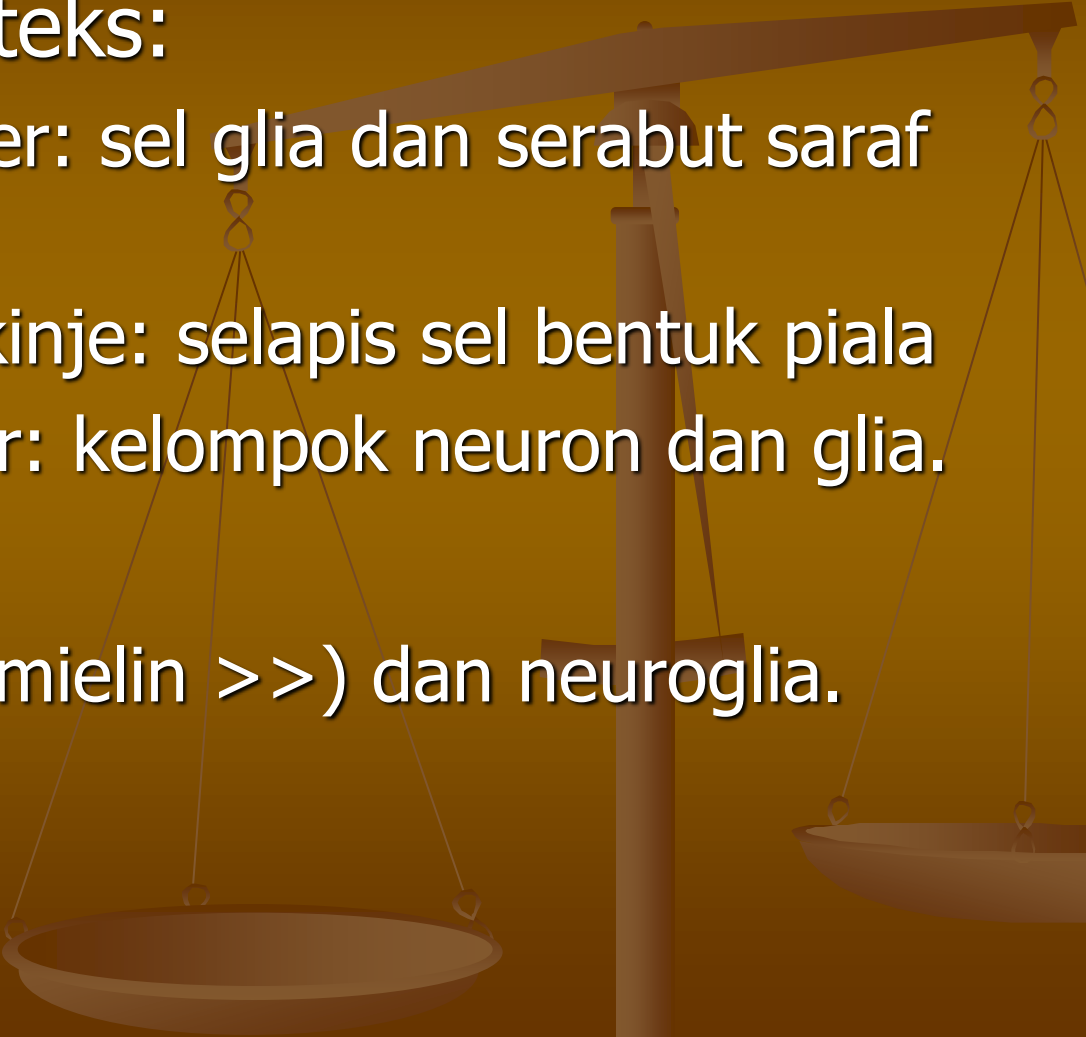
Fig. 5. Diagram of the layers of the typical cerebral cortex. The neuroglia appears at the external surface. The first layer of the cortex contains the spindle and polymorphic cells. (See Fig. 3.) Among these cells the dendrites of other cells, and the axons and collaterals of the inverted pyramids of Martinotti branch freely. The layer of small pyramids lies next. The dendrites of these reach the first layer; the axons exhaust themselves branching among the deeper layers. The third layer is characterized by the medium pyramids. The relations of these are as the small pyramids. The fourth layer is characterized by the large pyramids. The axons of these may enter the white matter and pass to other parts of the nervous system. The fifth layer includes small pyramids and polymorphic cells. The sixth layer contains large pyramidal cells, and the axons of these may enter the white matter. The seventh layer contains spindle and polymorphic cells, whose axons also may reach the white matter and pass to other parts of the nervous system. Small pyramidal cells, multipolar cells, Golgi Type II cells, and inverted pyramids may be found through all except the first layer. The line of Baillarger coincides with the external layer of large pyramids.

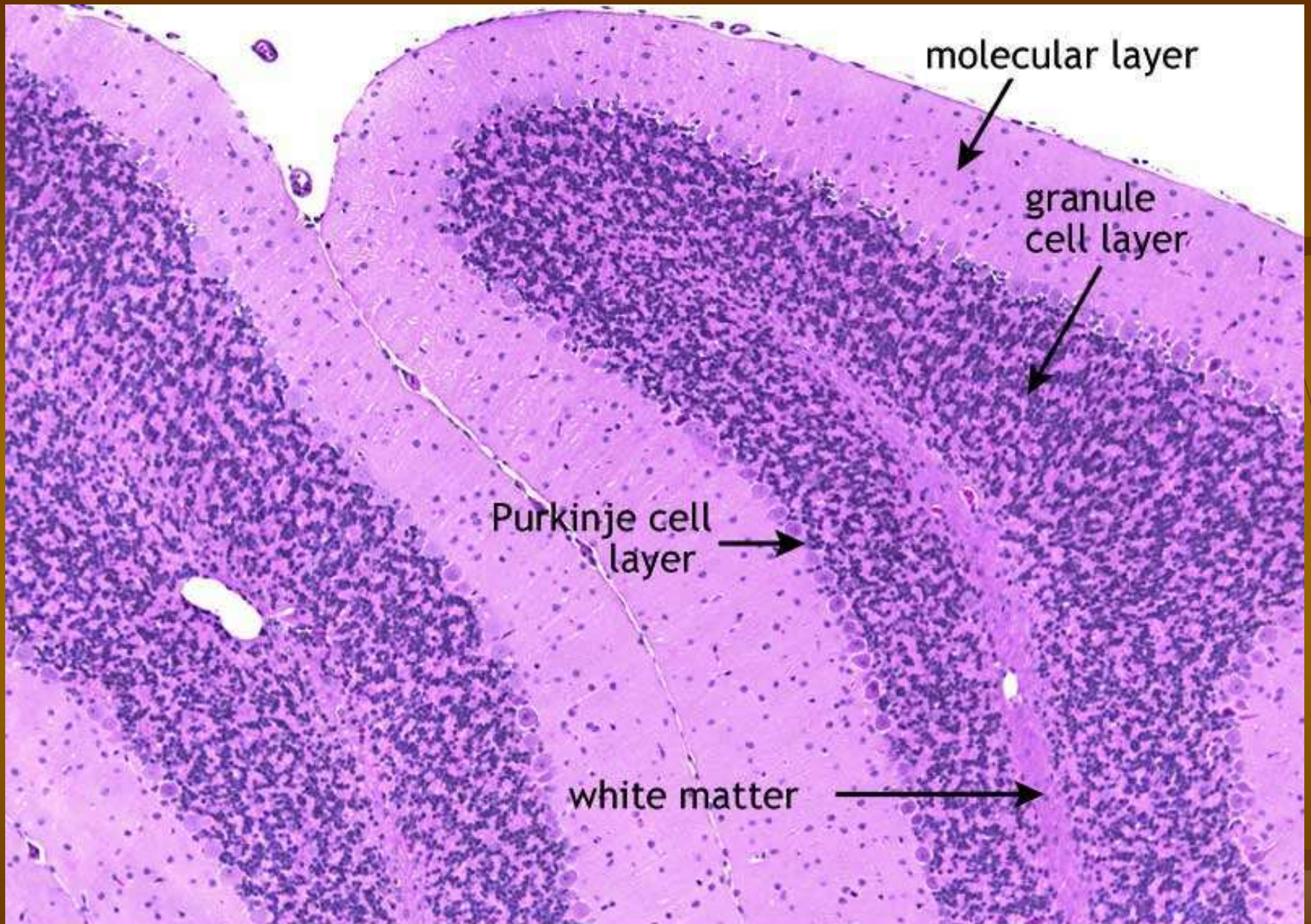


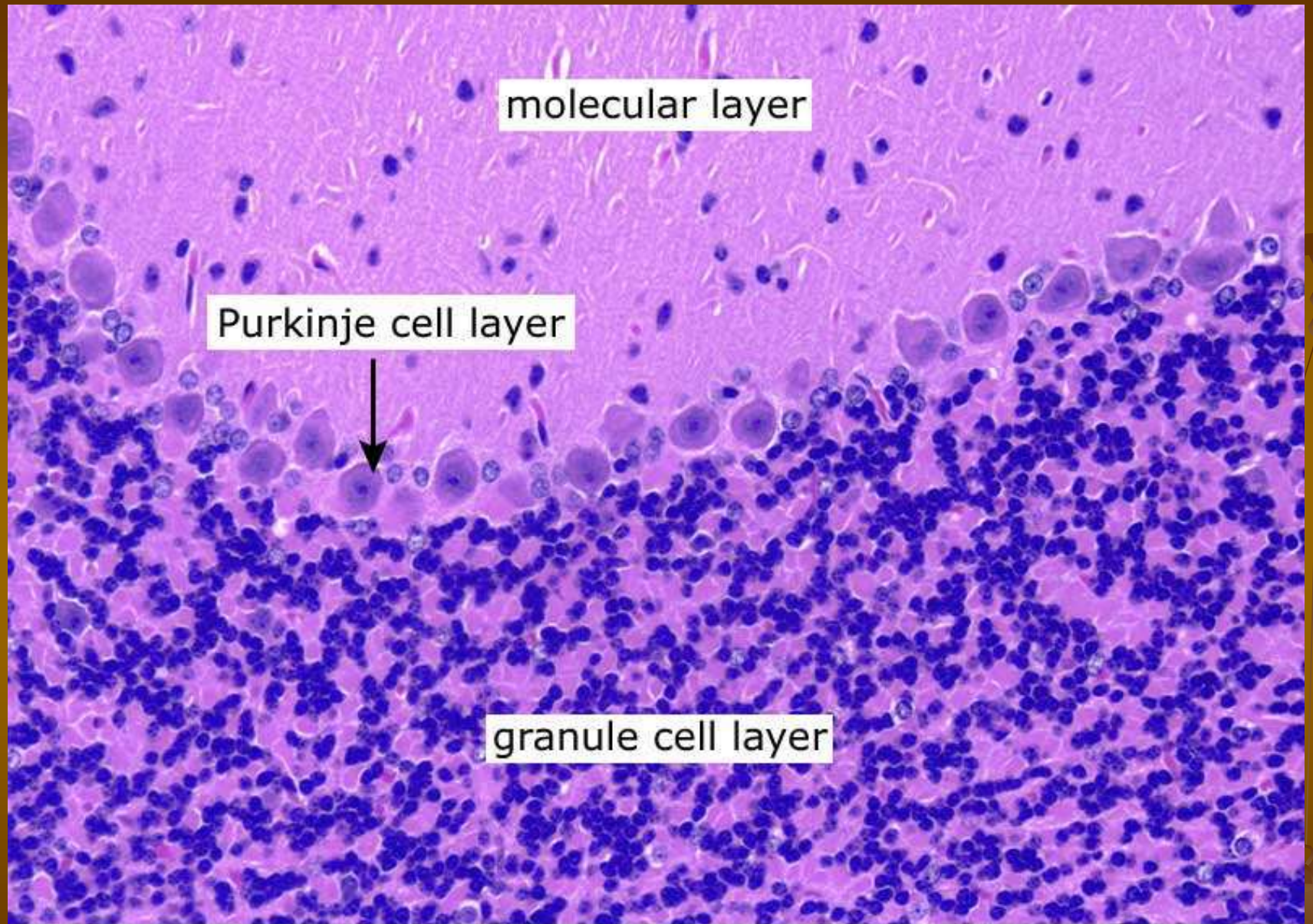
Cerebellum

- Substansia grisea □ korteks
 - Badan sel neuron, serat saraf (tanpa mielin >>), neuroglia dan p.d.
 - Sel Purkinje: bentuk piala/gelas ukur, inti di tengah, dendrit bercabang (pohon), axon bermielin



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- Tiga lapisan korteks:
 - lapisan molekuler: sel glia dan serabut saraf myelin (-)
 - Lapisan sel Purkinje: selapis sel bentuk piala
 - Lapisan granuler: kelompok neuron dan glia.
 - Substansia alba
 - Serat saraf (bermielin >>) dan neuroglia.

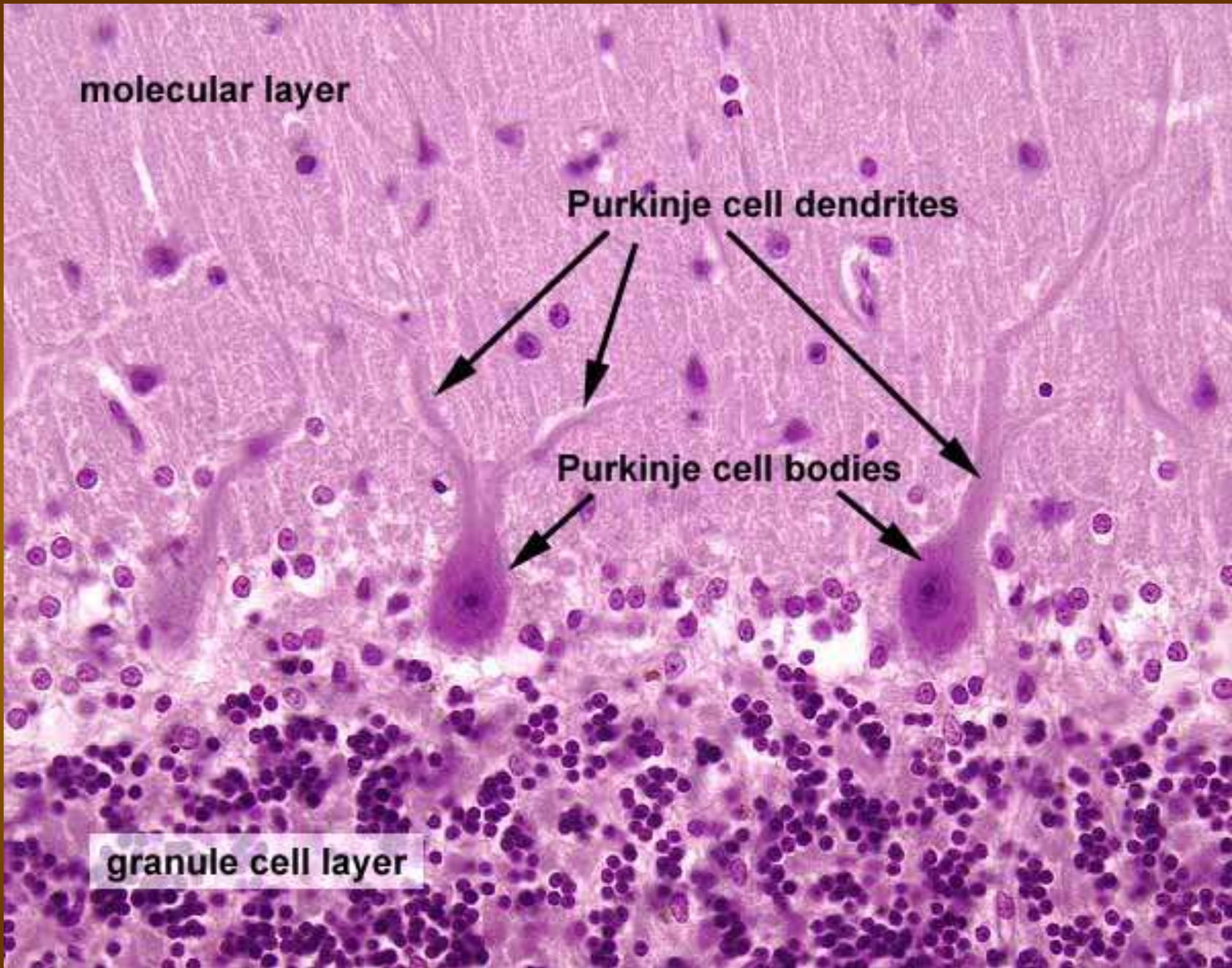




molecular layer

Purkinje cell layer

granule cell layer



molecular layer

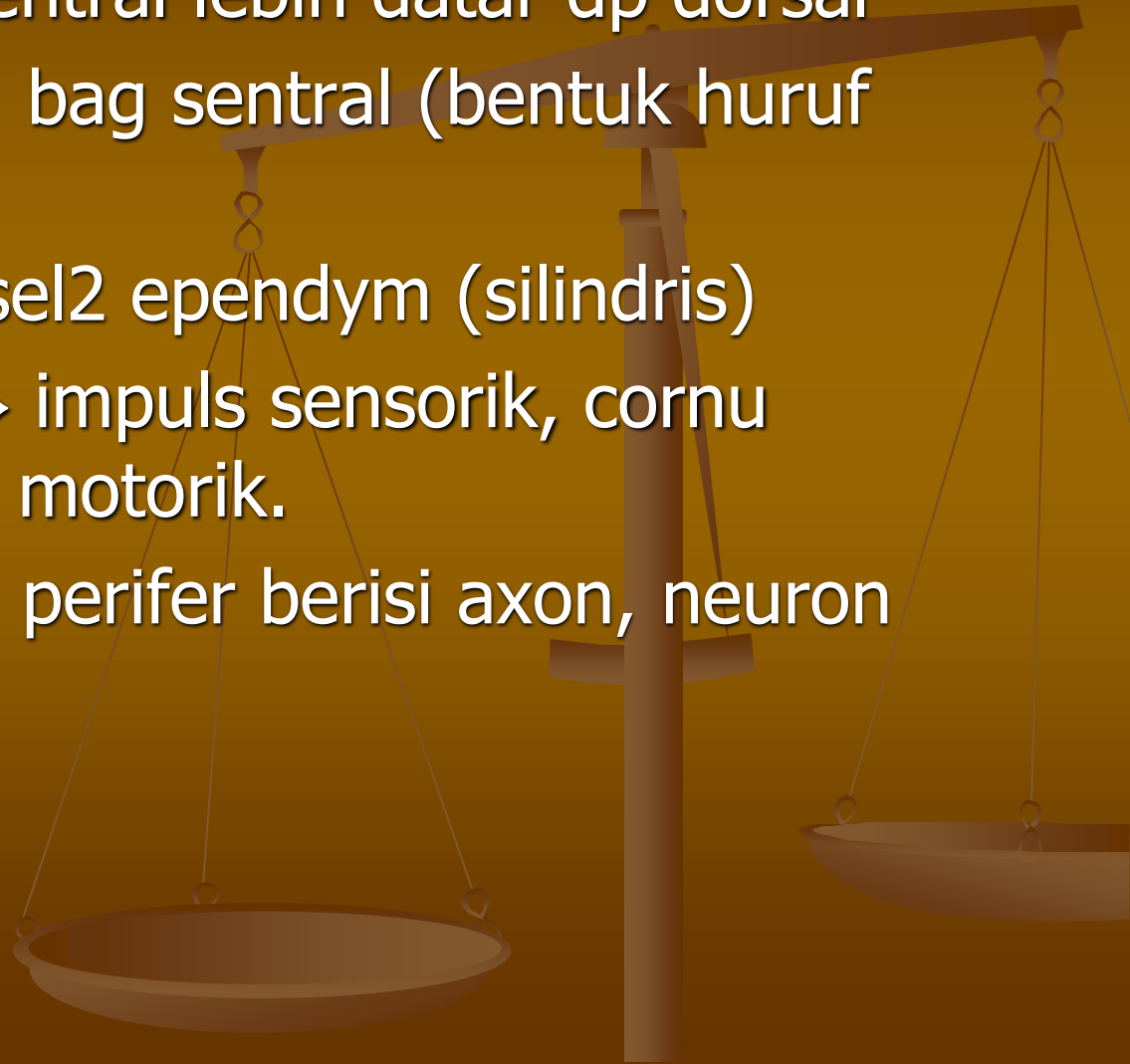
Purkinje cell dendrites

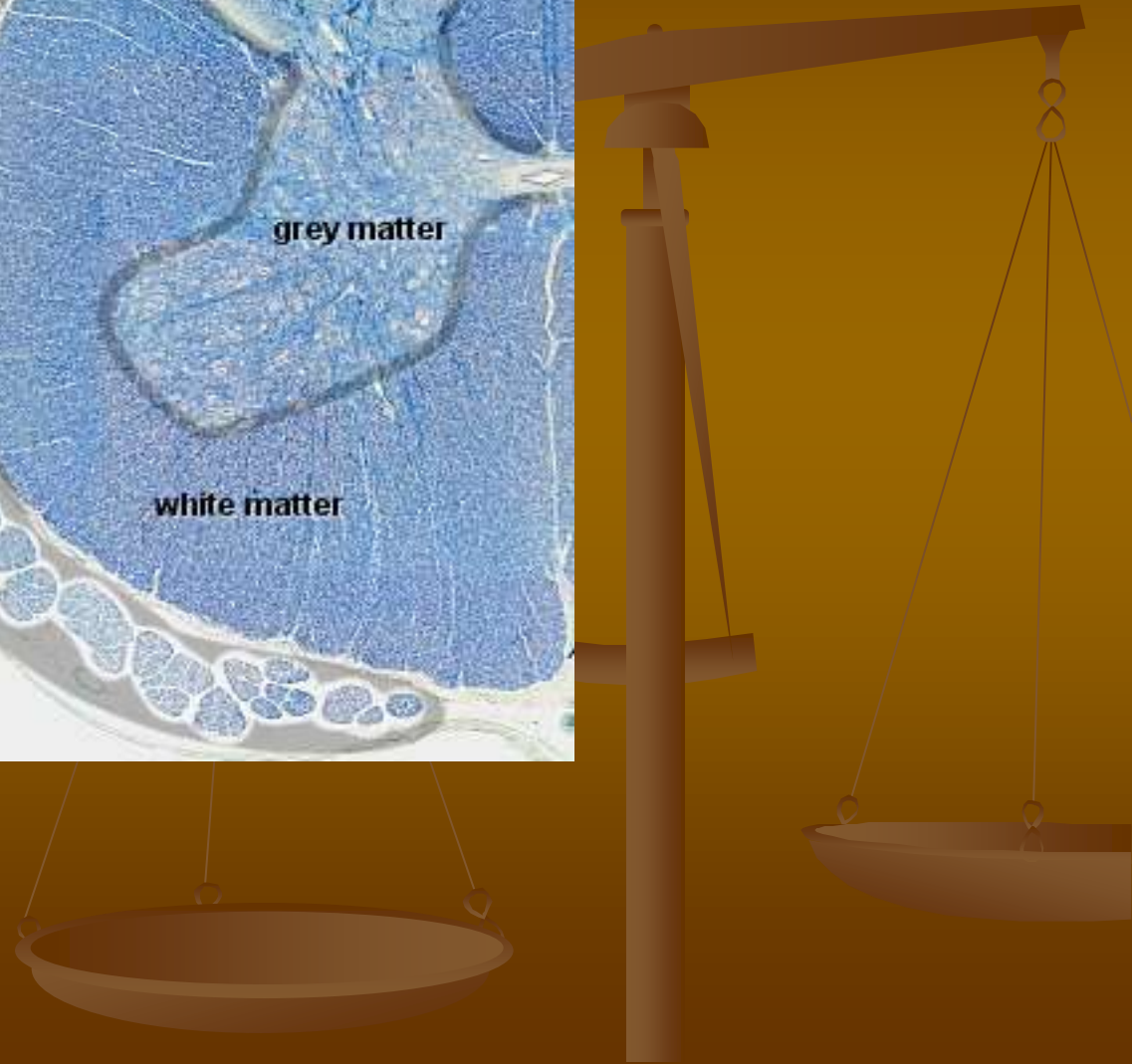
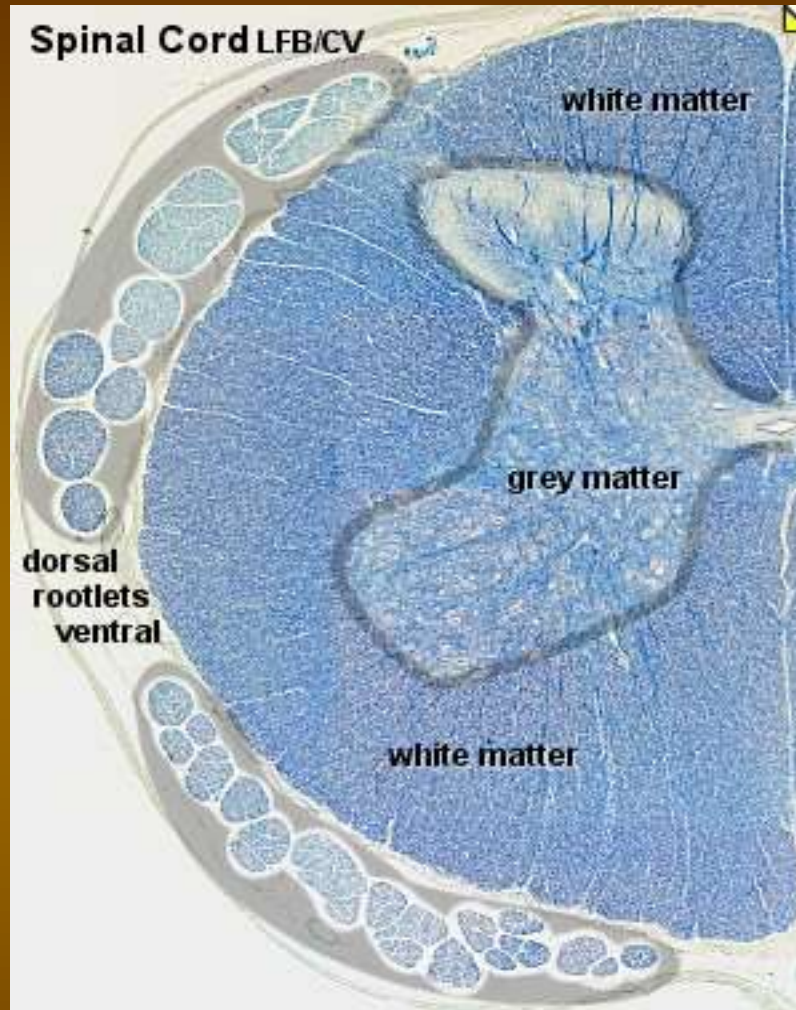
Purkinje cell bodies

granule cell layer

Medula spinalis

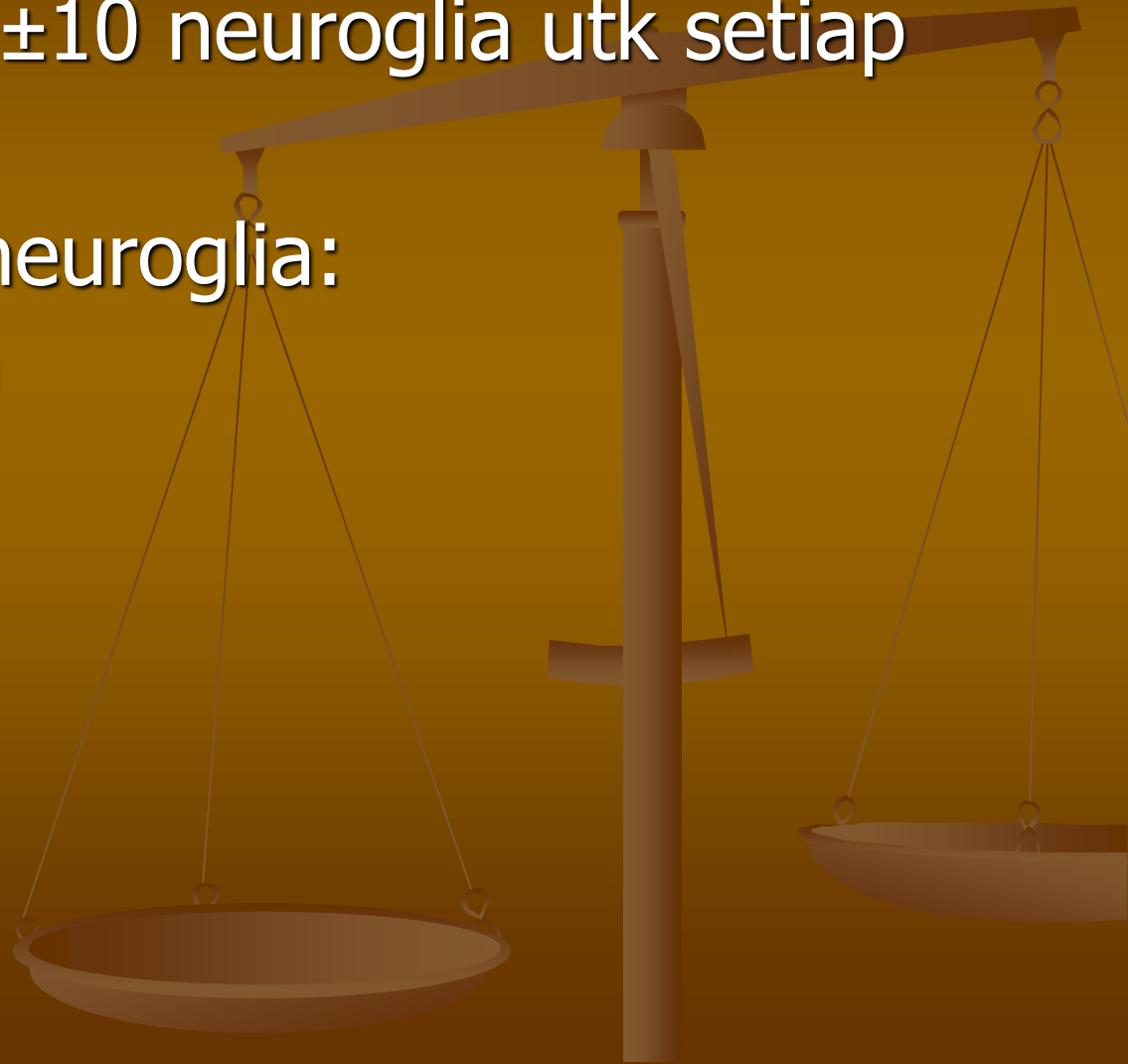
- Berbentuk oval, ventral lebih datar dp dorsal
- Substansia grisea: bag sentral (bentuk huruf "H").
- Kanalis sentralis, sel2 ependym (silindris)
- Cornu posterior → impuls sensorik, cornu anterior → impuls motorik.
- Substansia alba di perifer berisi axon, neuron dan dendrit (-)



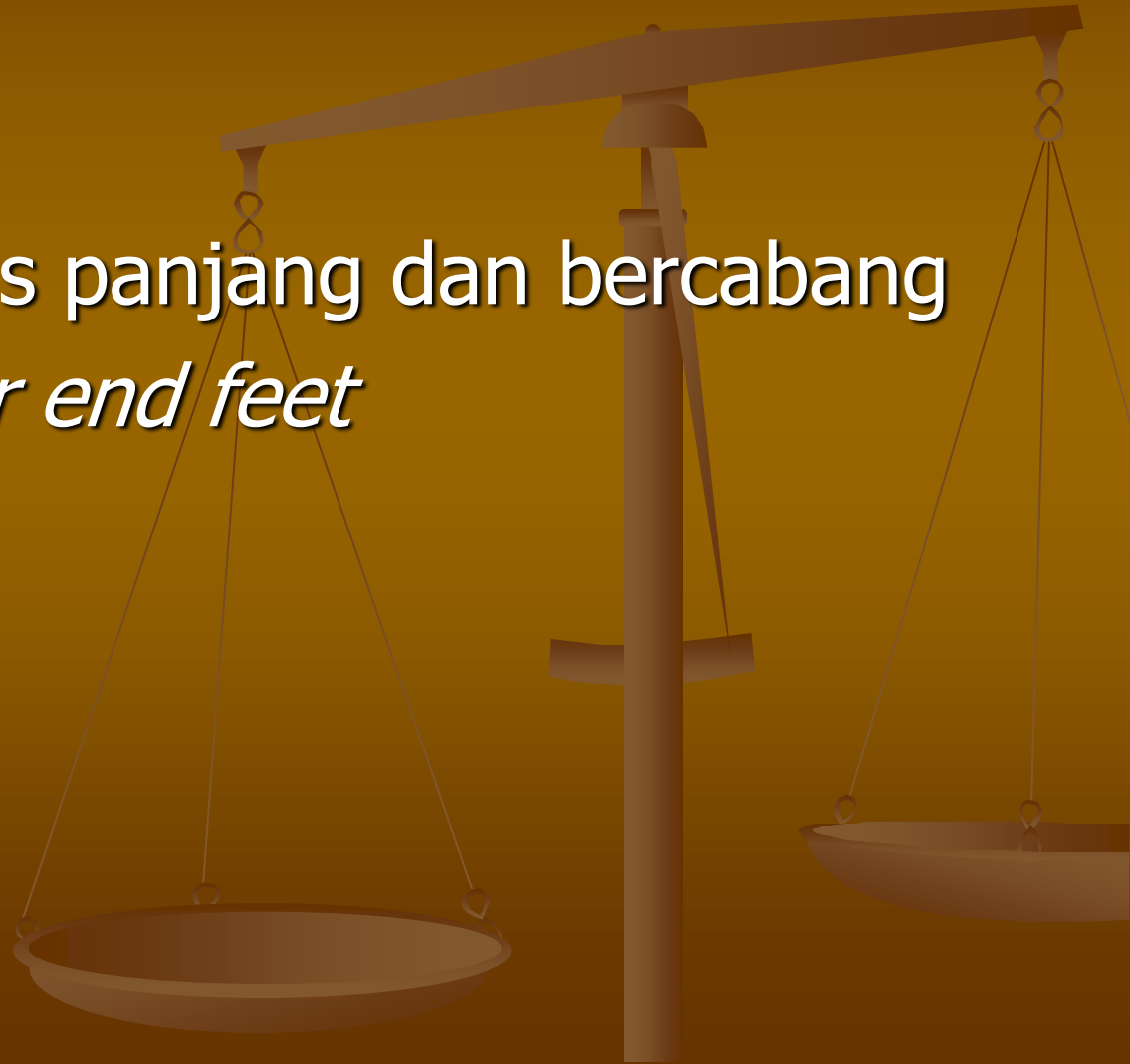


SEL PENUNJANG CNS

- Dalam CNS tdp ± 10 neuroglia utk setiap neuron
- Tdp 4 type sel neuroglia:
 - Oligodendroglia
 - Astrocyt
 - Microglia
 - Sel ependym

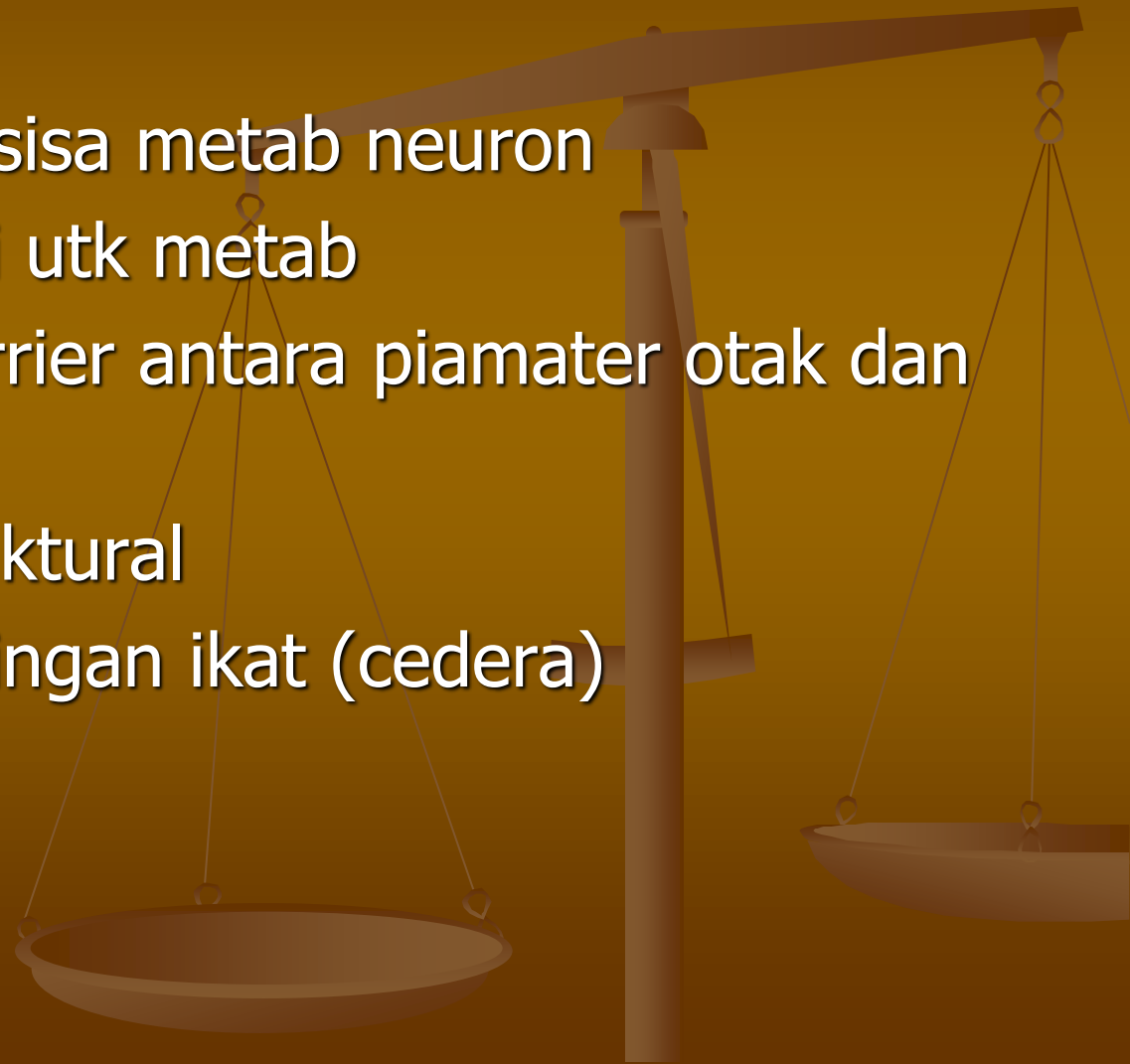


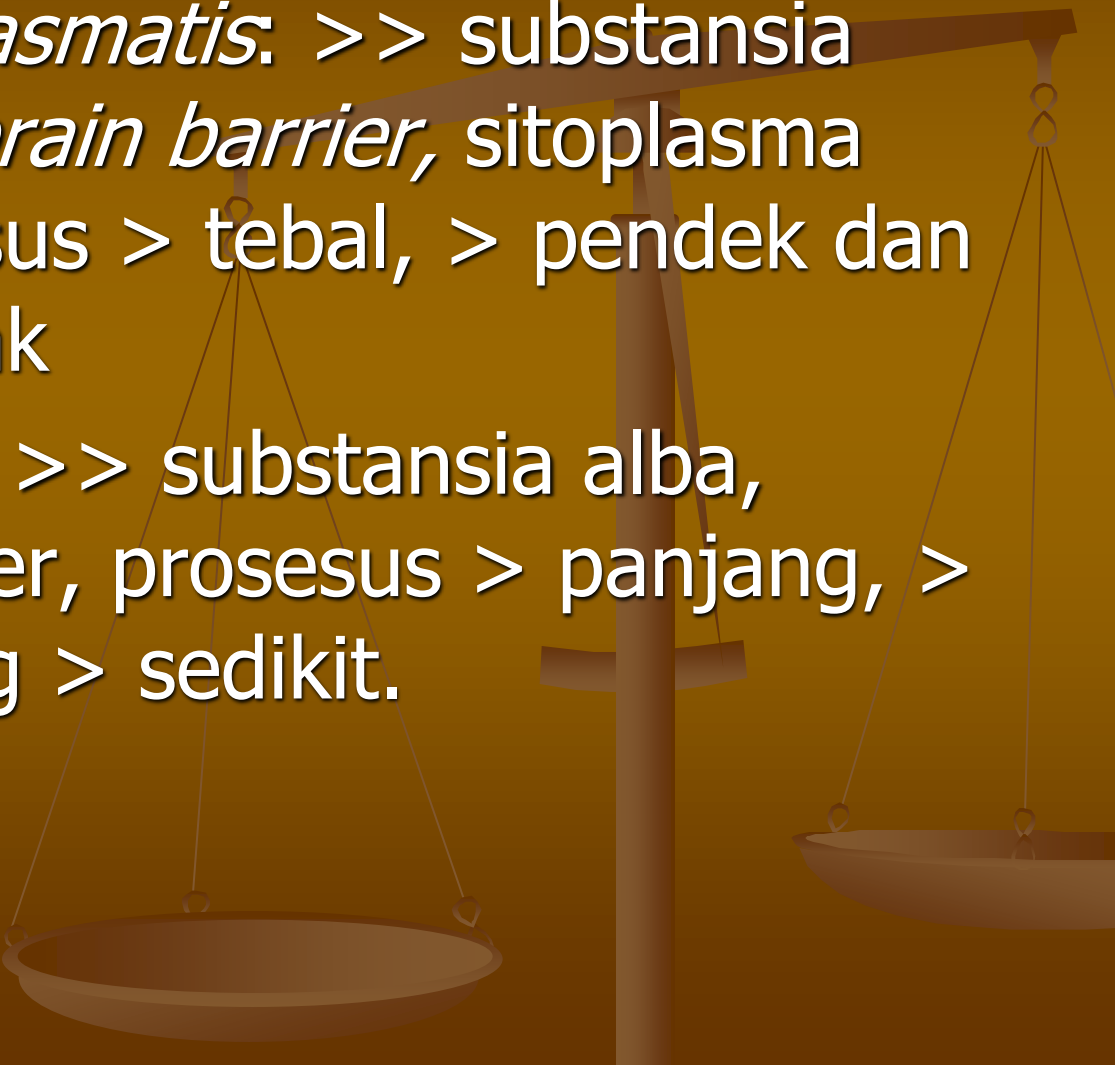
- Astrosit
- Paling besar
- Ireguler, prosesus panjang dan bercabang
- ⑩ Pedicle / *vascular end feet*



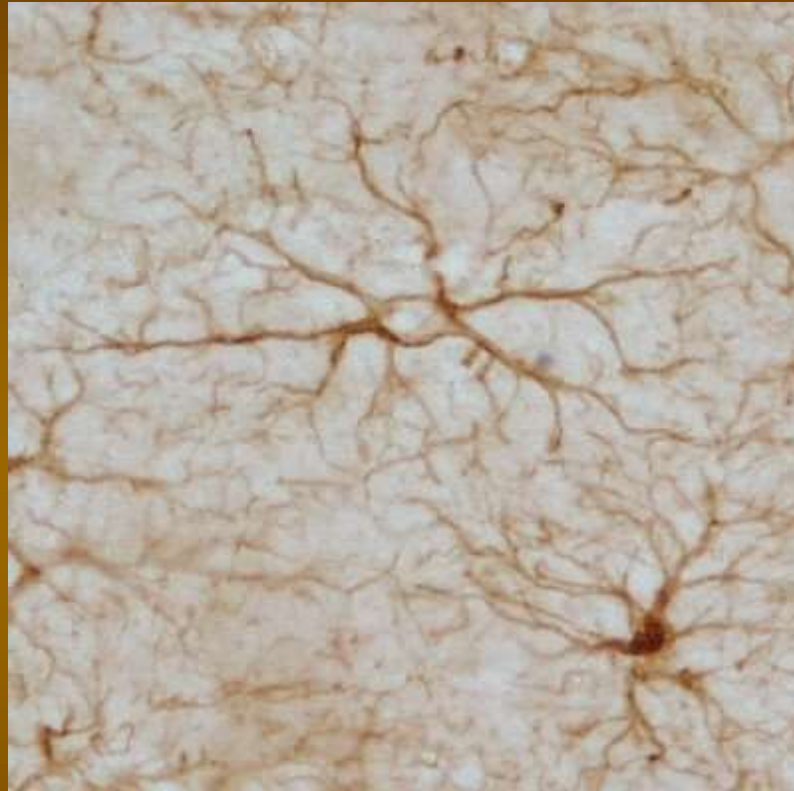
■ Fungsi:

- Membersihkan sisa metab neuron
- Memberi energi utk metab
- Membentuk barrier antara piamater otak dan med. spinalis
- Penyokong struktural
- Membentuk jaringan ikat (cedera)

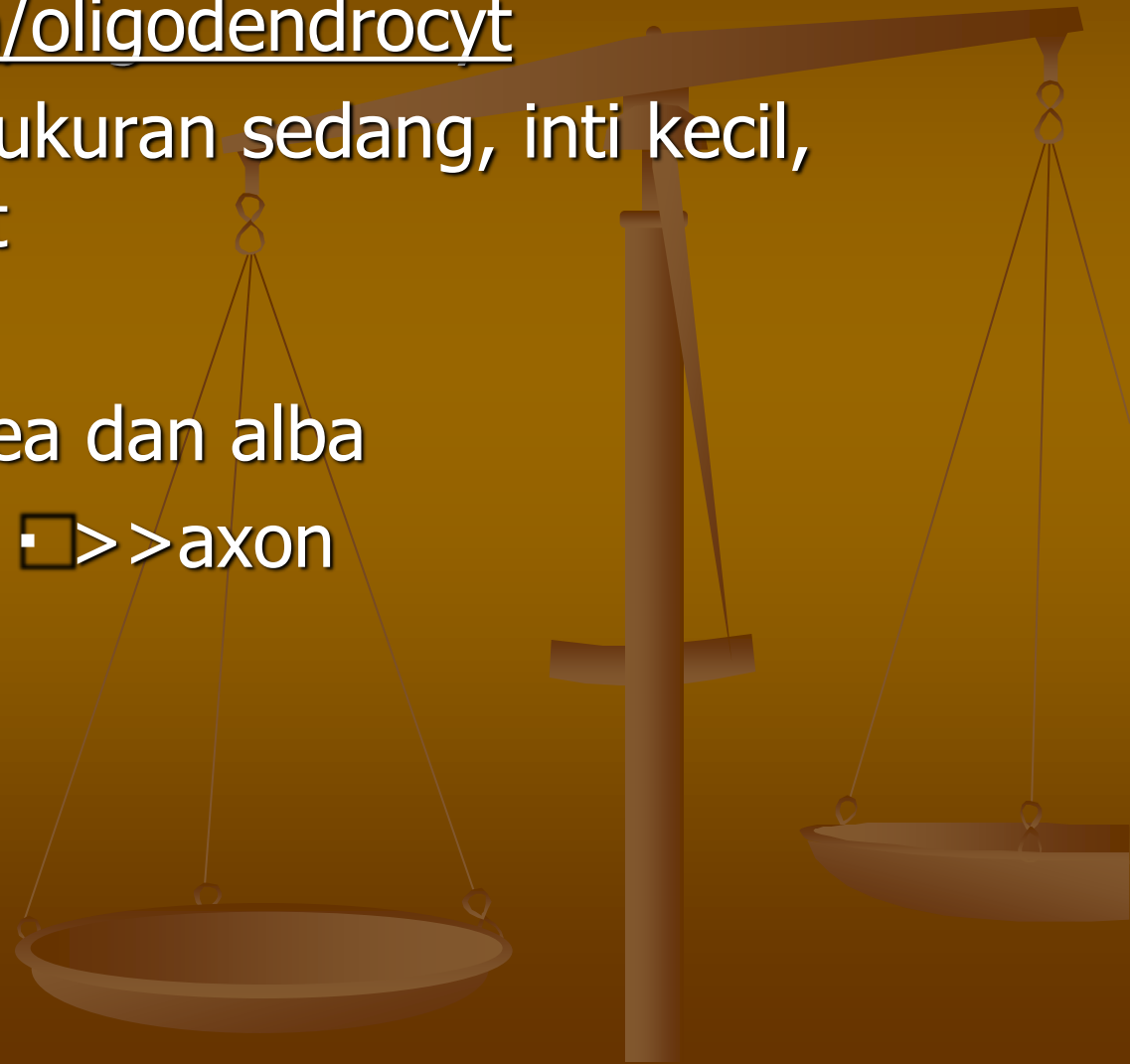


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- ⑩ *Astrosit protoplasmatis*: >> substansia grisea □ *blood brain barrier*, sitoplasma granular, prosesus > tebal, > pendek dan cabang > banyak
 - ⑩ *Astrosit fibrosa*: >> substansia alba, sitoplasma fibriler, prosesus > panjang, > kecil dan cabang > sedikit.





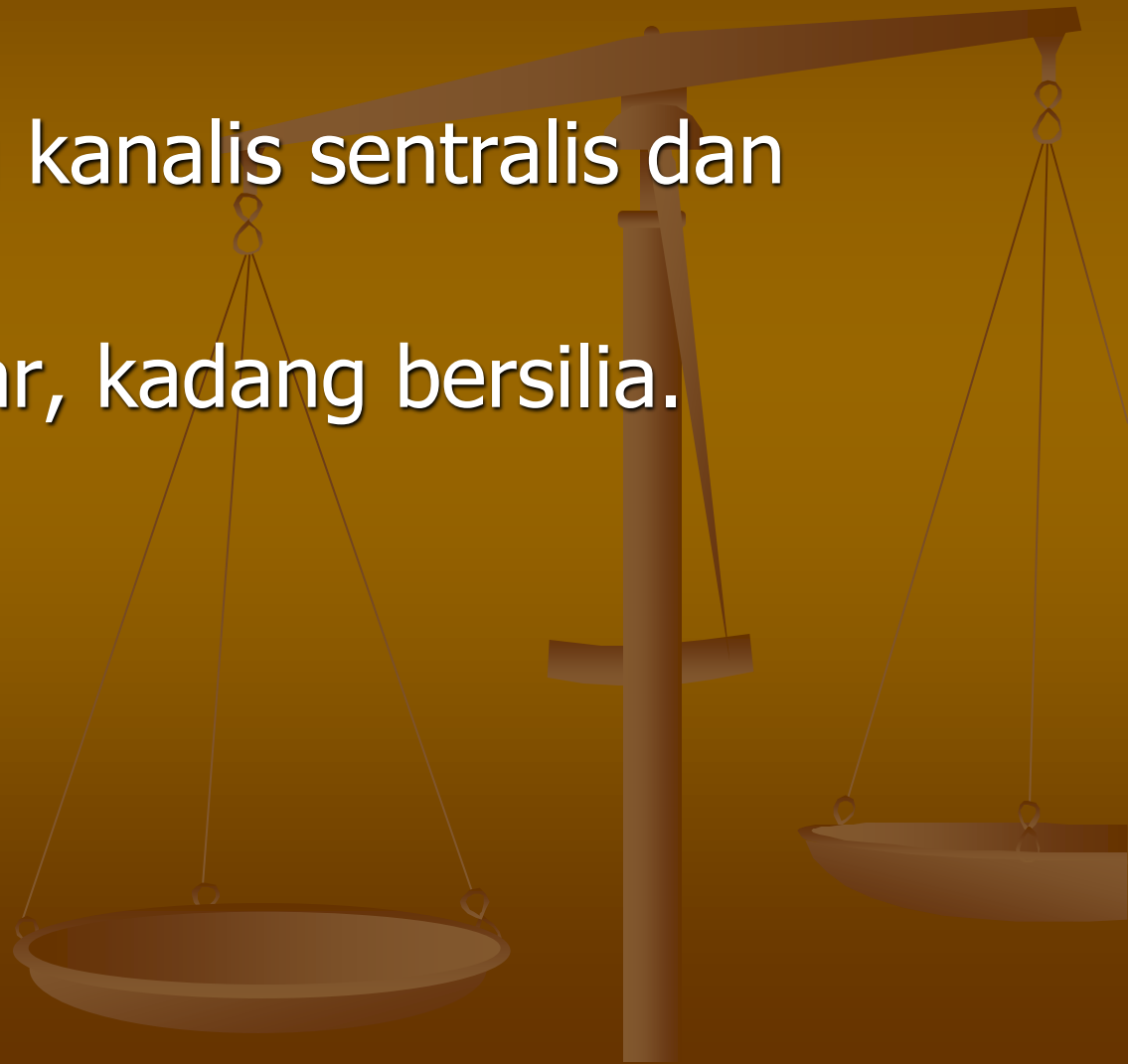
- Oligodendroglia/oligodendrocyt
- Paling banyak, ukuran sedang, inti kecil, padat dan bulat
- \approx sel *Schwann*
- Substansia grisea dan alba
- Produksi mielin $\square \gg \gg$ axon

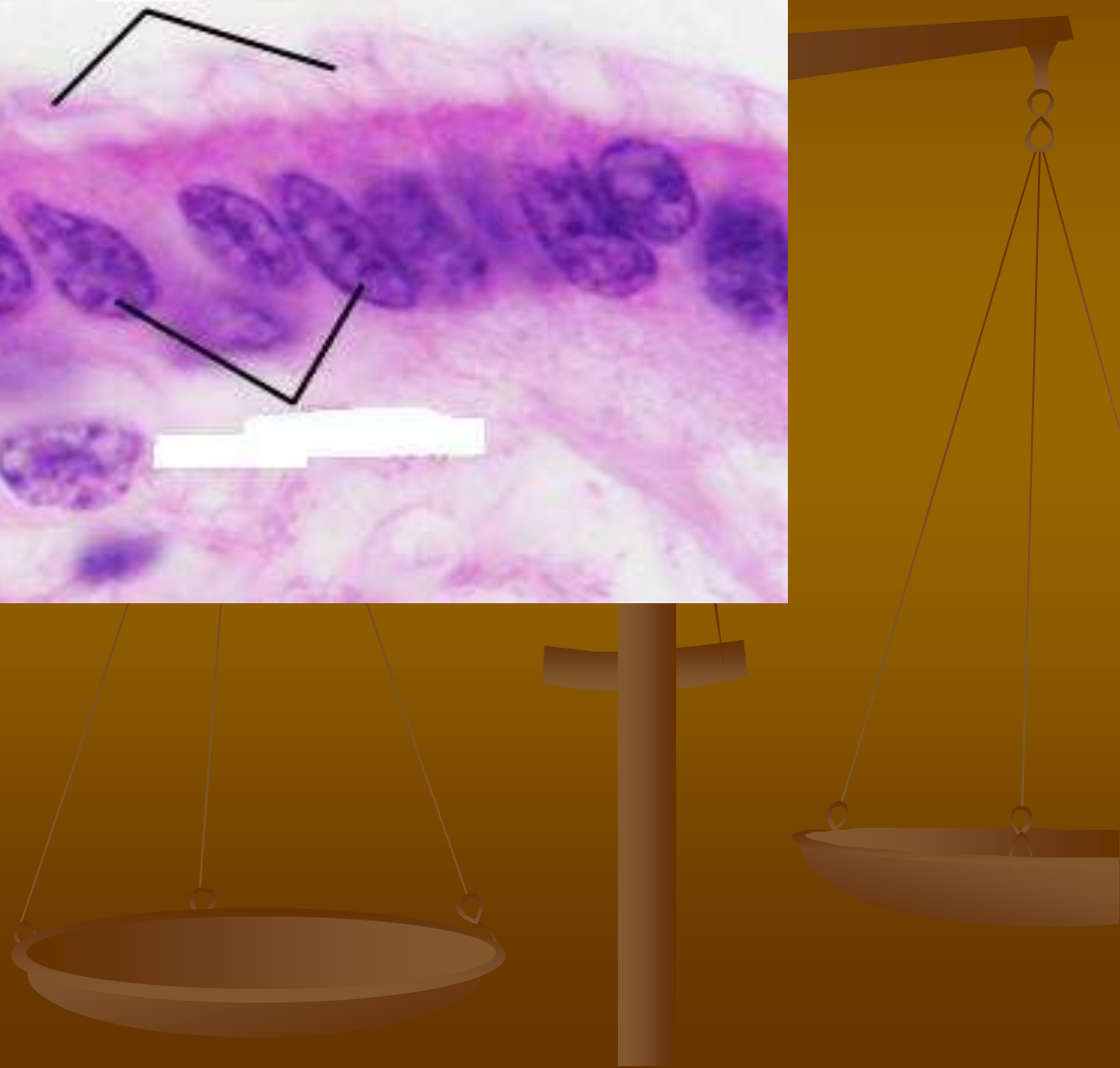
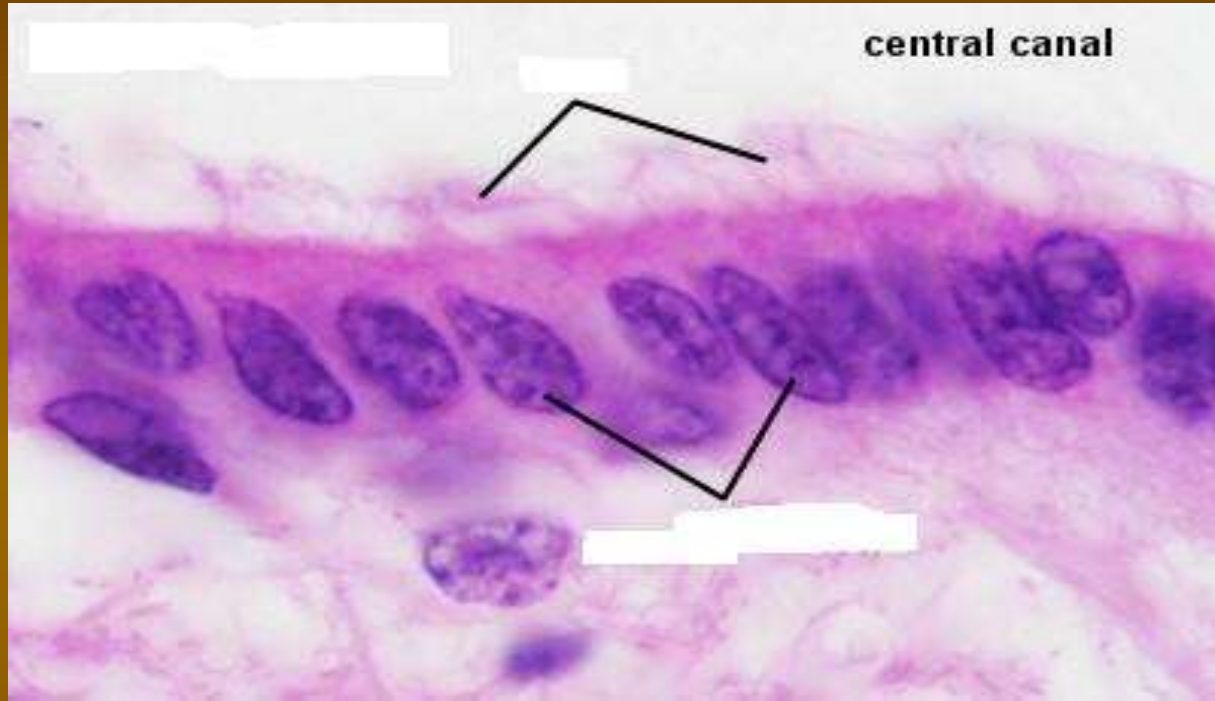


- Microglia
- Paling kecil, sedikit,
- Subs grisea dan alba,
- Inti kecil dan panjang, prosesus > pendek dan bercabang2 spt duri
- Sekresi sitokin
- Fagositik



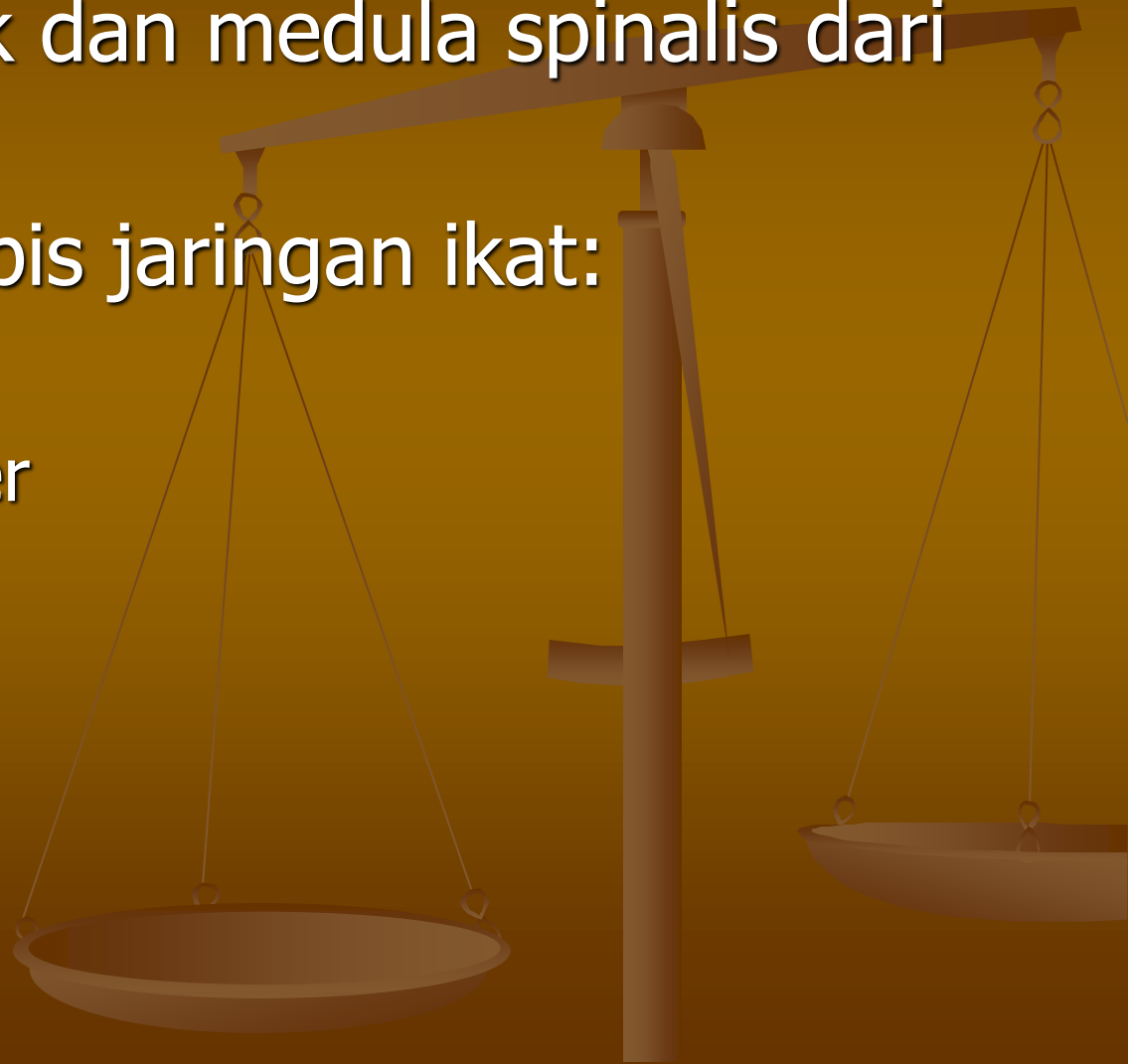
- Sel ependym
- Menjadi dinding kanalis sentralis dan ventrikel otak
- Bentuk kolumnar, kadang bersilia.



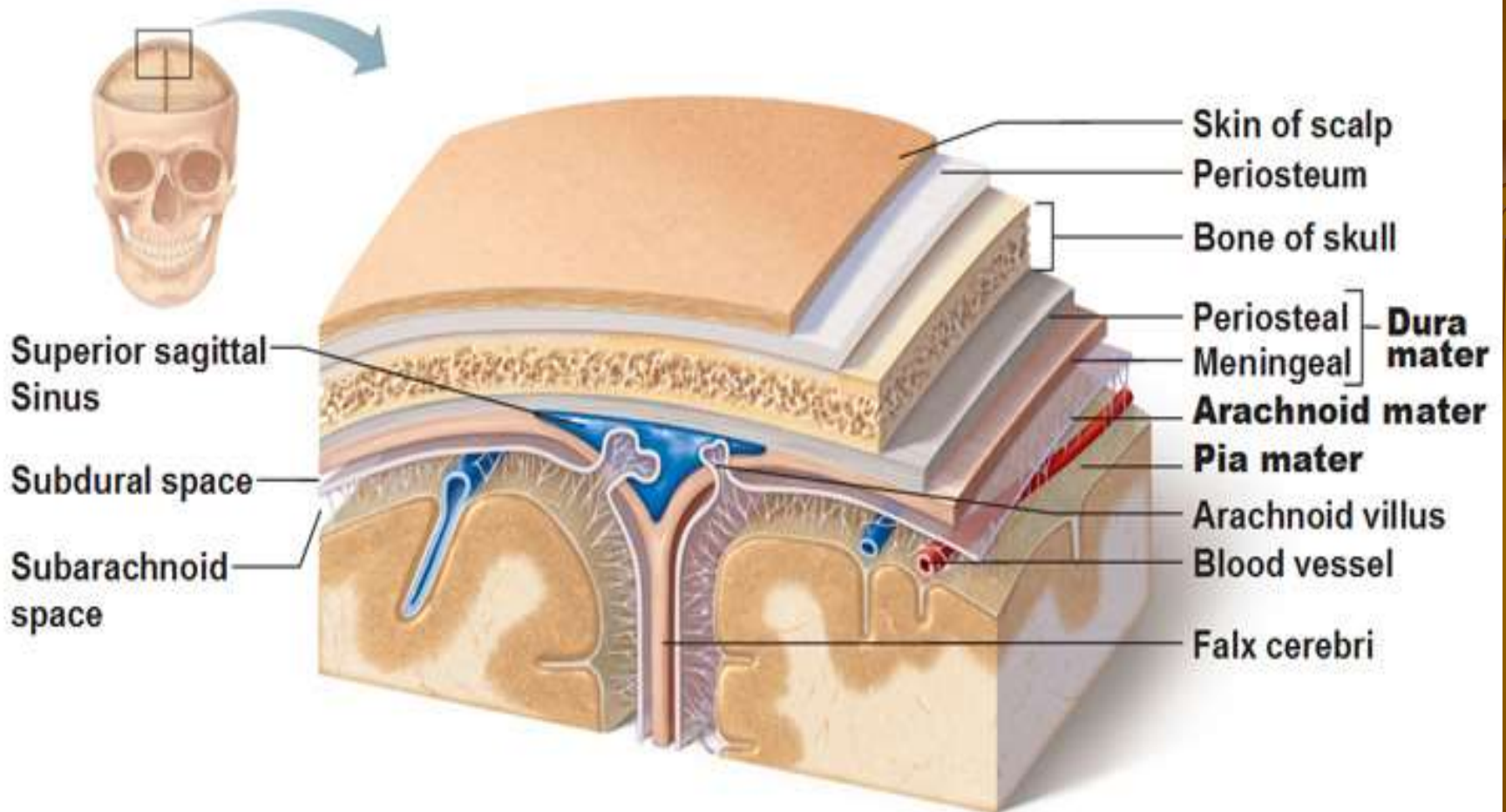


MENINGEN

- Membran □ otak dan medula spinalis dari tulang.
- Terdiri dari 3 lapis jaringan ikat:
 - Duramater
 - Arachnoid mater
 - Piamater



The Dura Mater



The Meninges

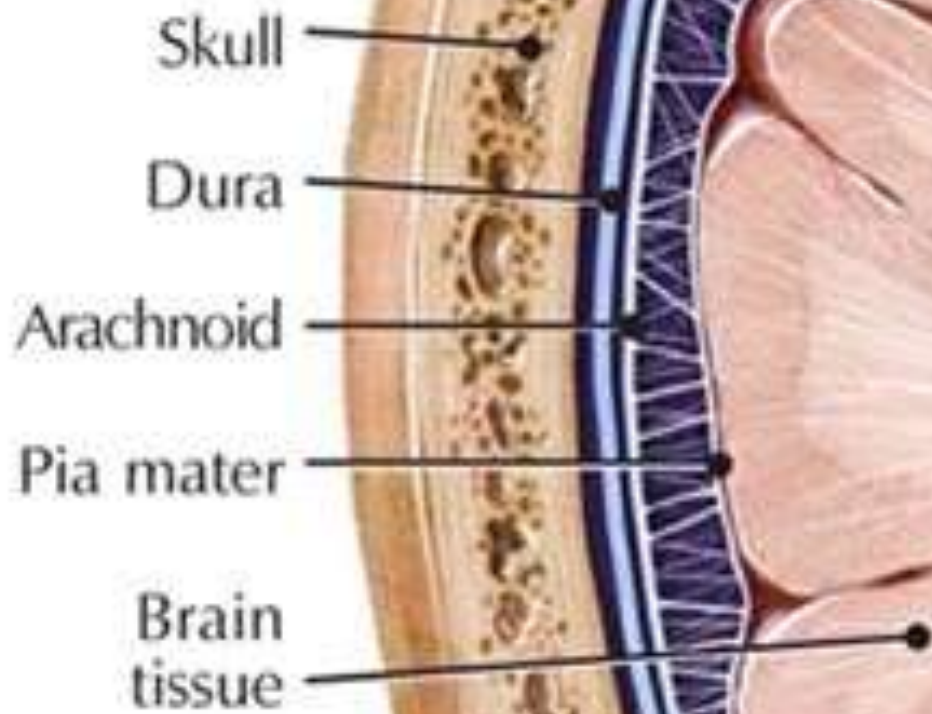
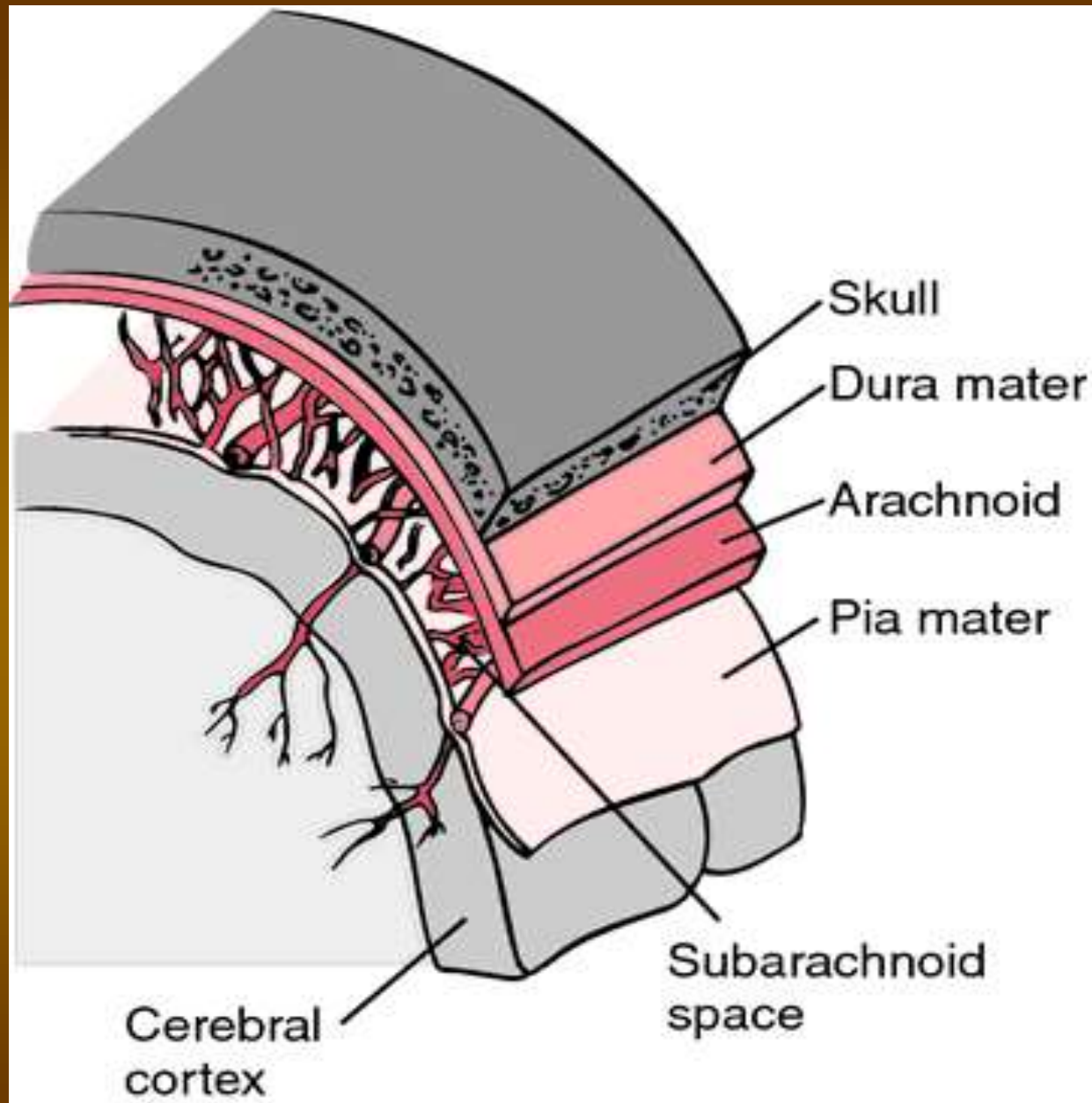
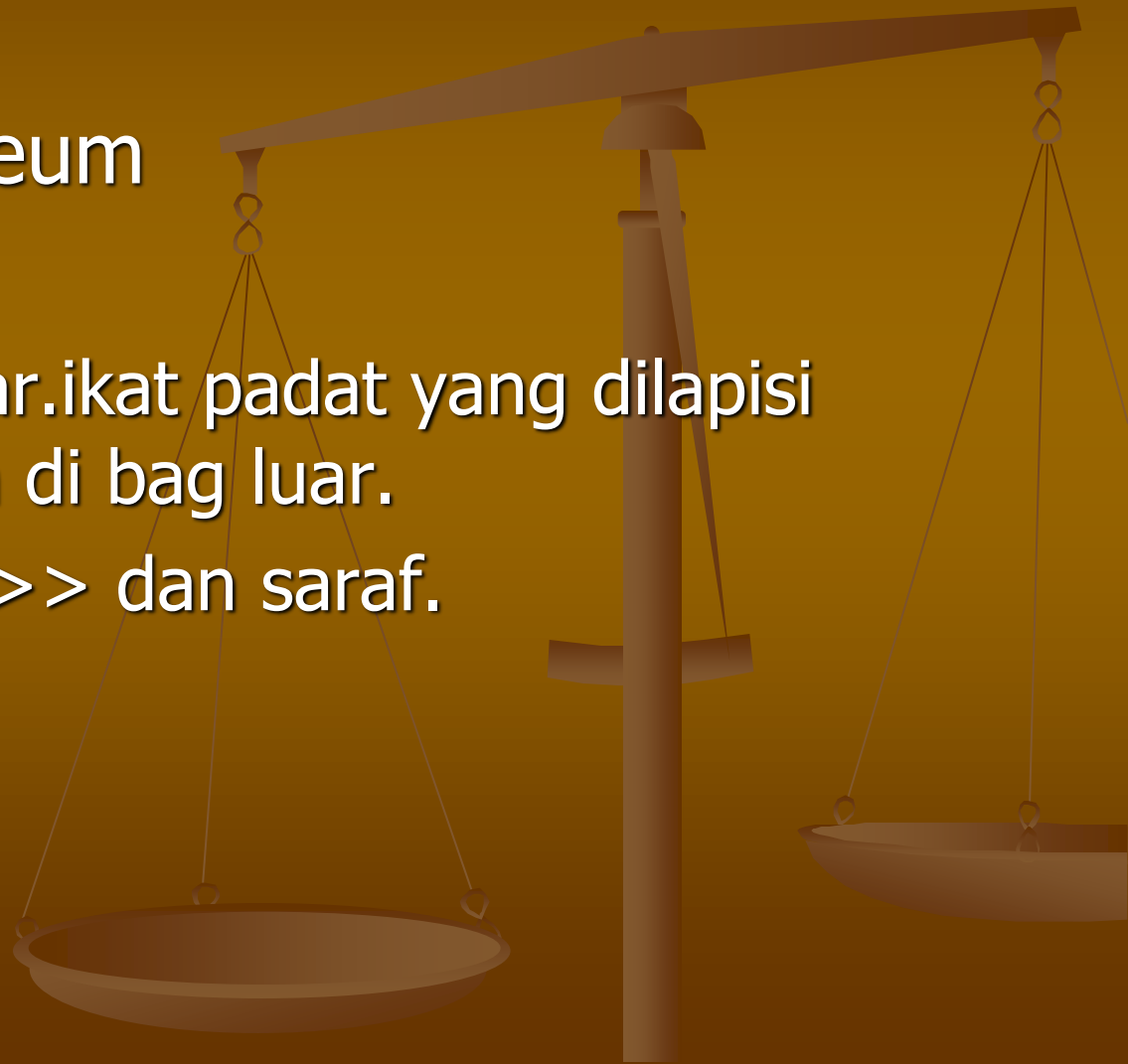
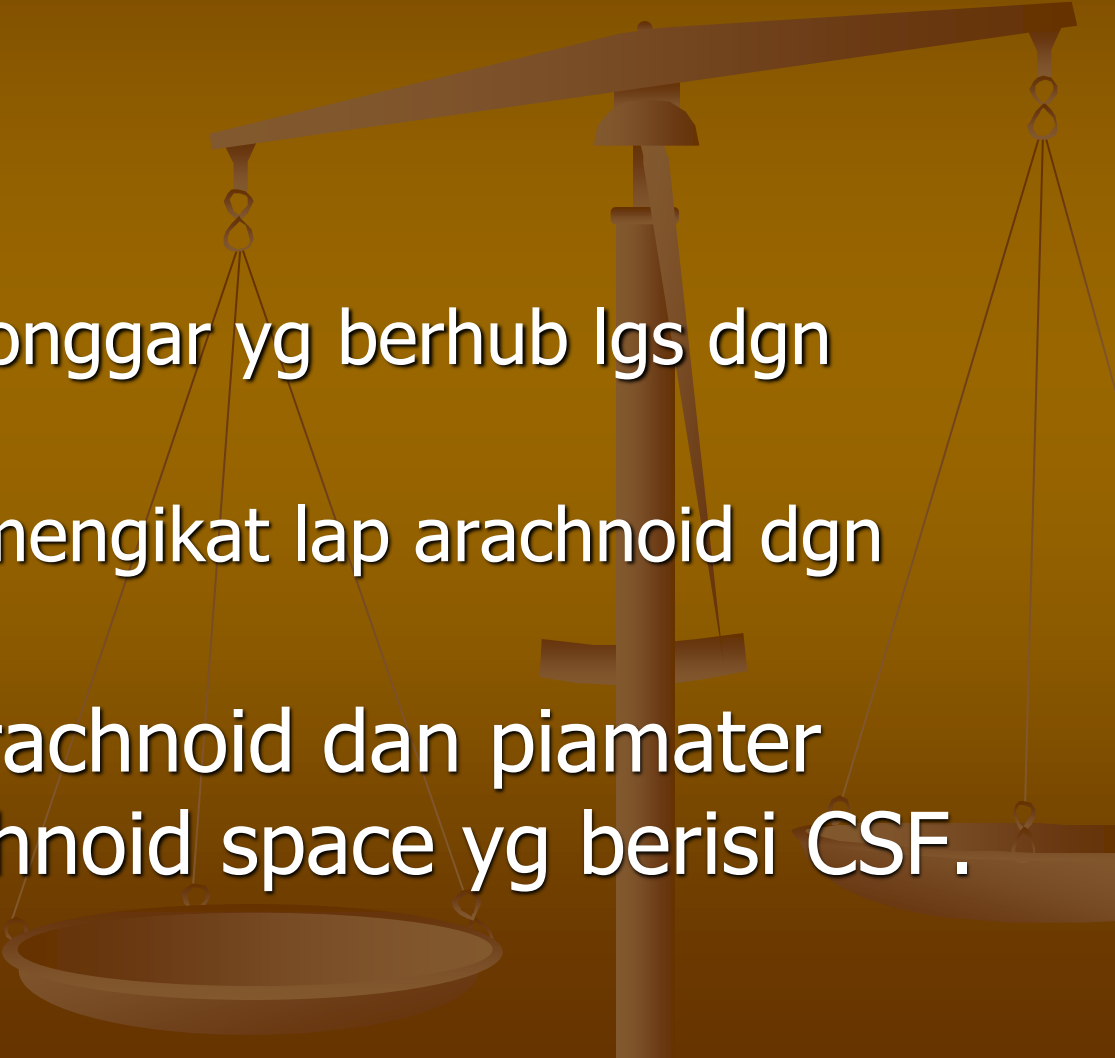


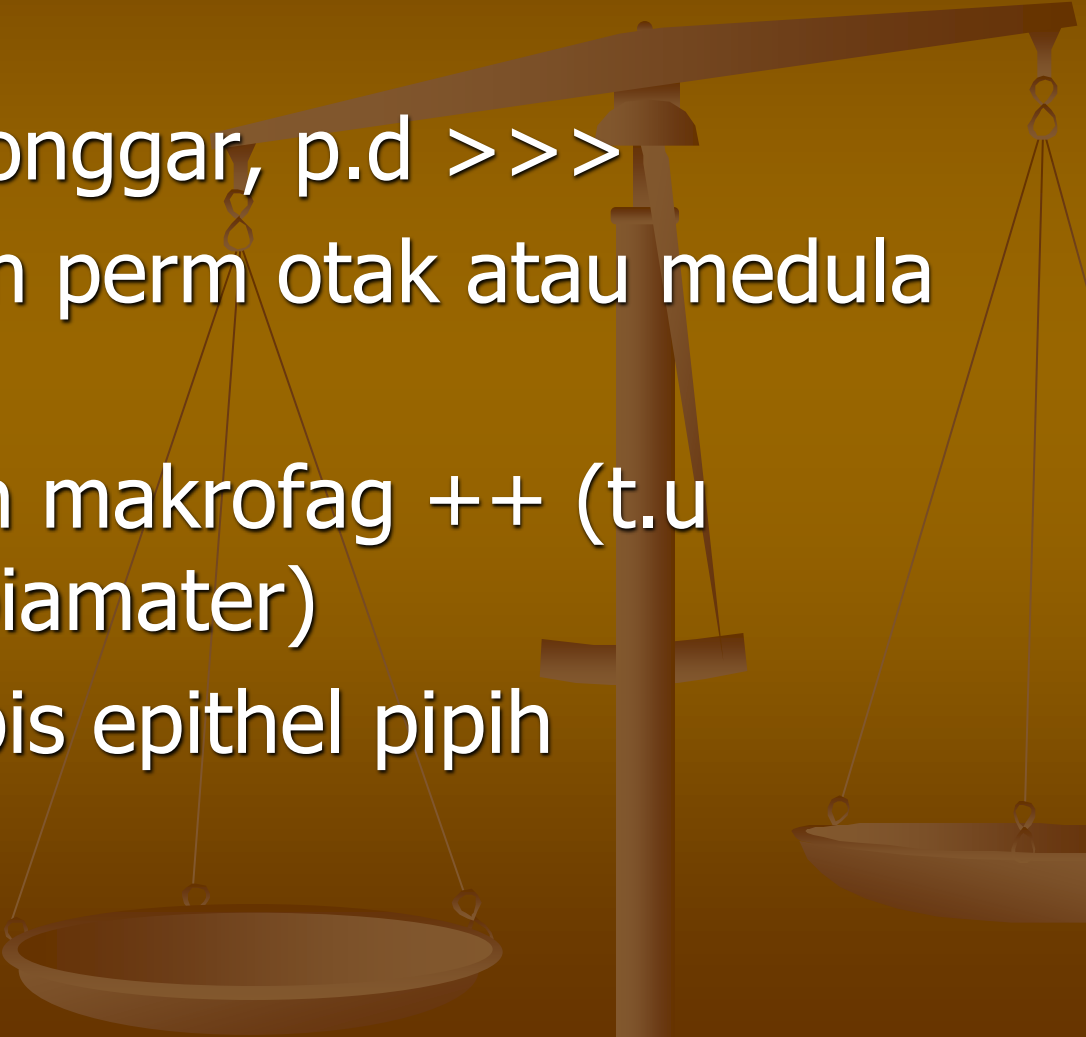
Fig. 2



- *Duramater*
- Sebagai periosteum
- Tdd 2 lapis:
 - lap dalam adl jar.ikat padat yang dilapisi selapis sel pipih di bag luar.
 - Lap luar: p.d >>> dan saraf.

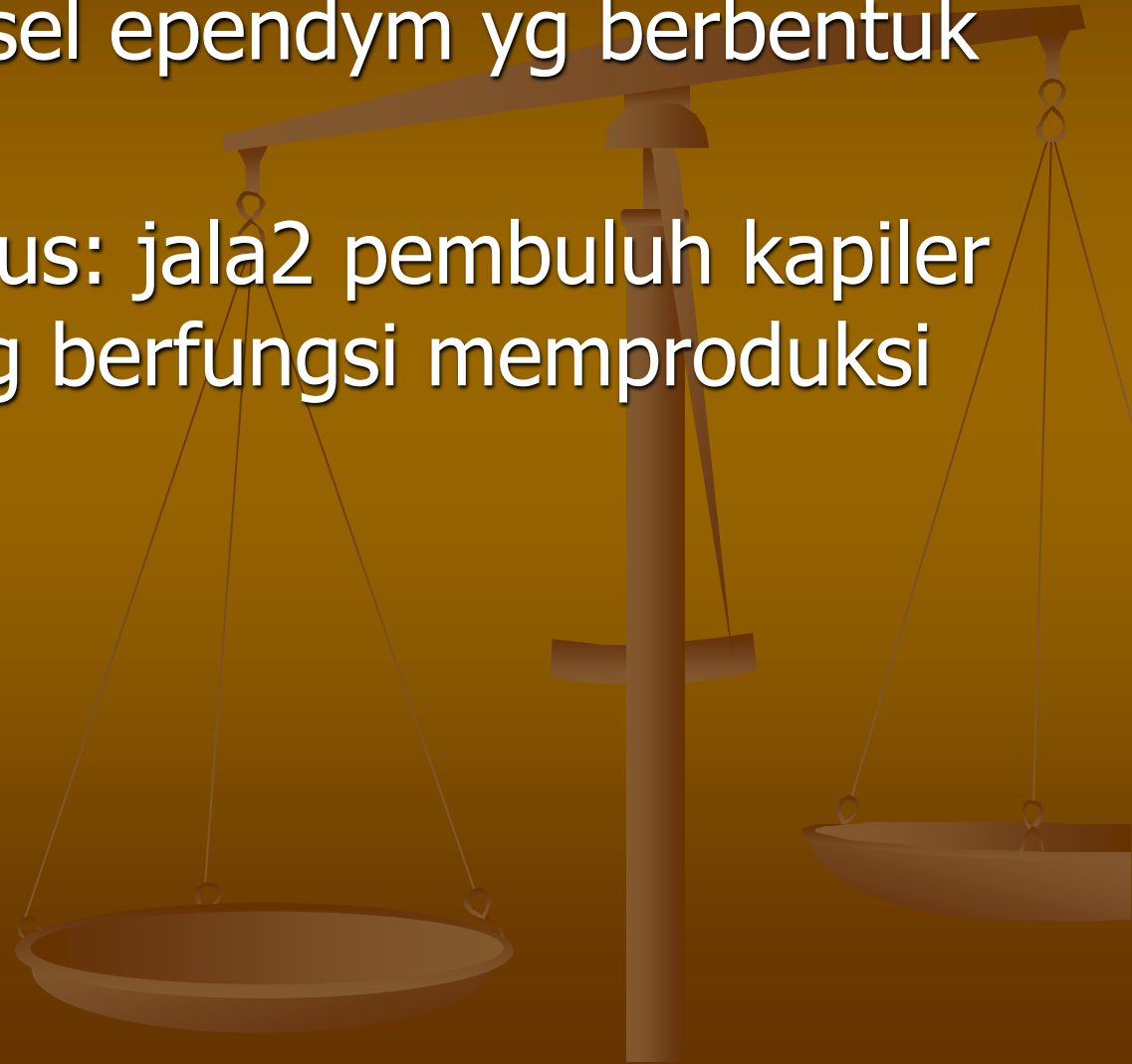


- *Arachnoid*
 - Avaskular
 - Tdd 2 bagian:
 - 1 lapis jar ikat longgar yg berhub lgs dgn duramater.
 - Trabekulae yg mengikat lap arachnoid dgn piamater.
 - Ruang antara arachnoid dan piamater disebut subarachnoid space yg berisi CSF.
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- *Piamater*
 - Tdd dr jar ikat longgar, p.d >>>
 - Melekat erat dgn perm otak atau medula spinalis.
 - Fibroblast + dan makrofag ++ (t.u sepanjang p.d piamater)
 - Perm luar: selapis epitel pipih

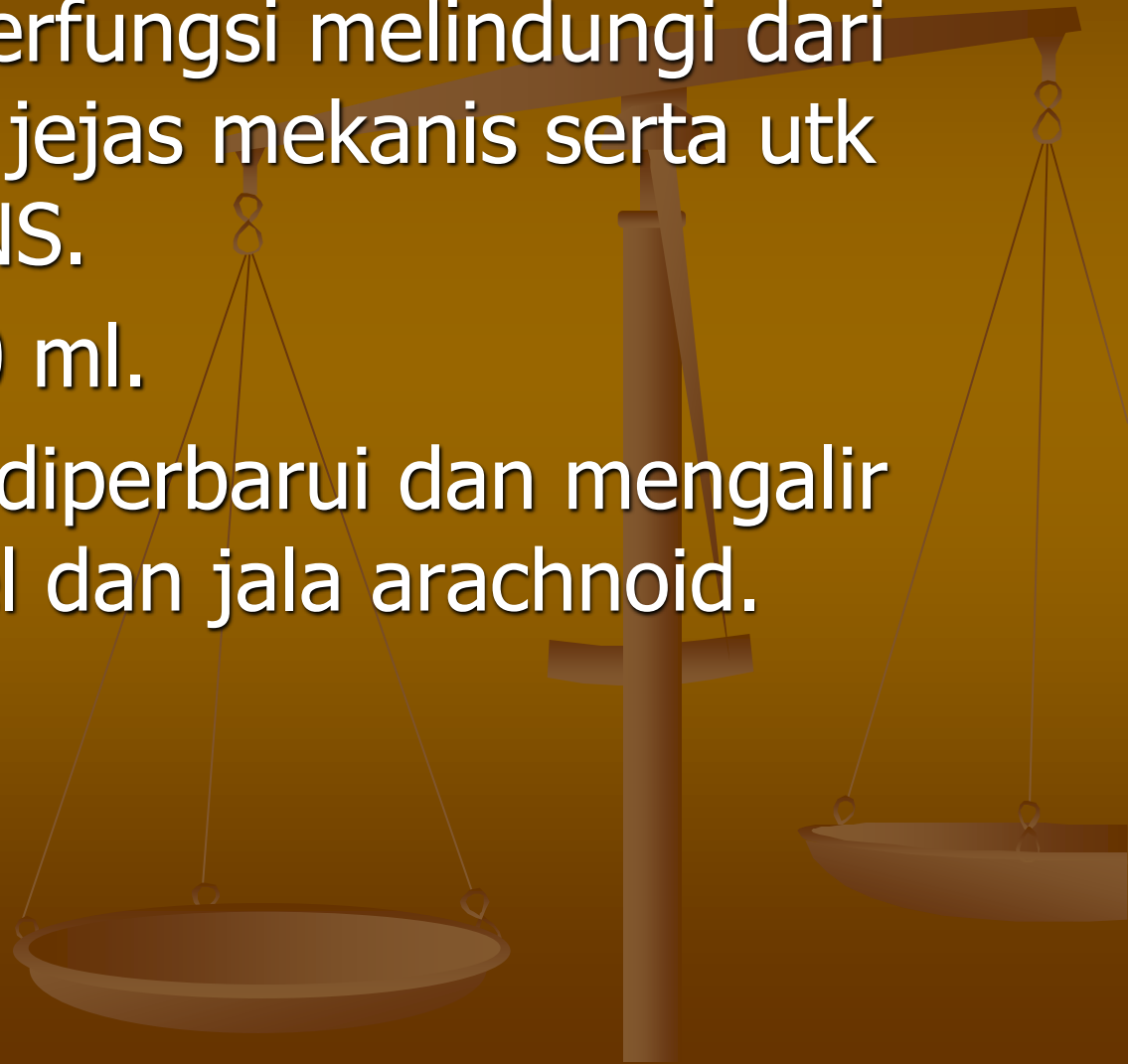
Ventrikel otak

- Tdp modifikasi sel ependym yg berbentuk kubis.
- Plexus choroideus: jala2 pembuluh kapiler dari piamater yg berfungsi memproduksi CSF

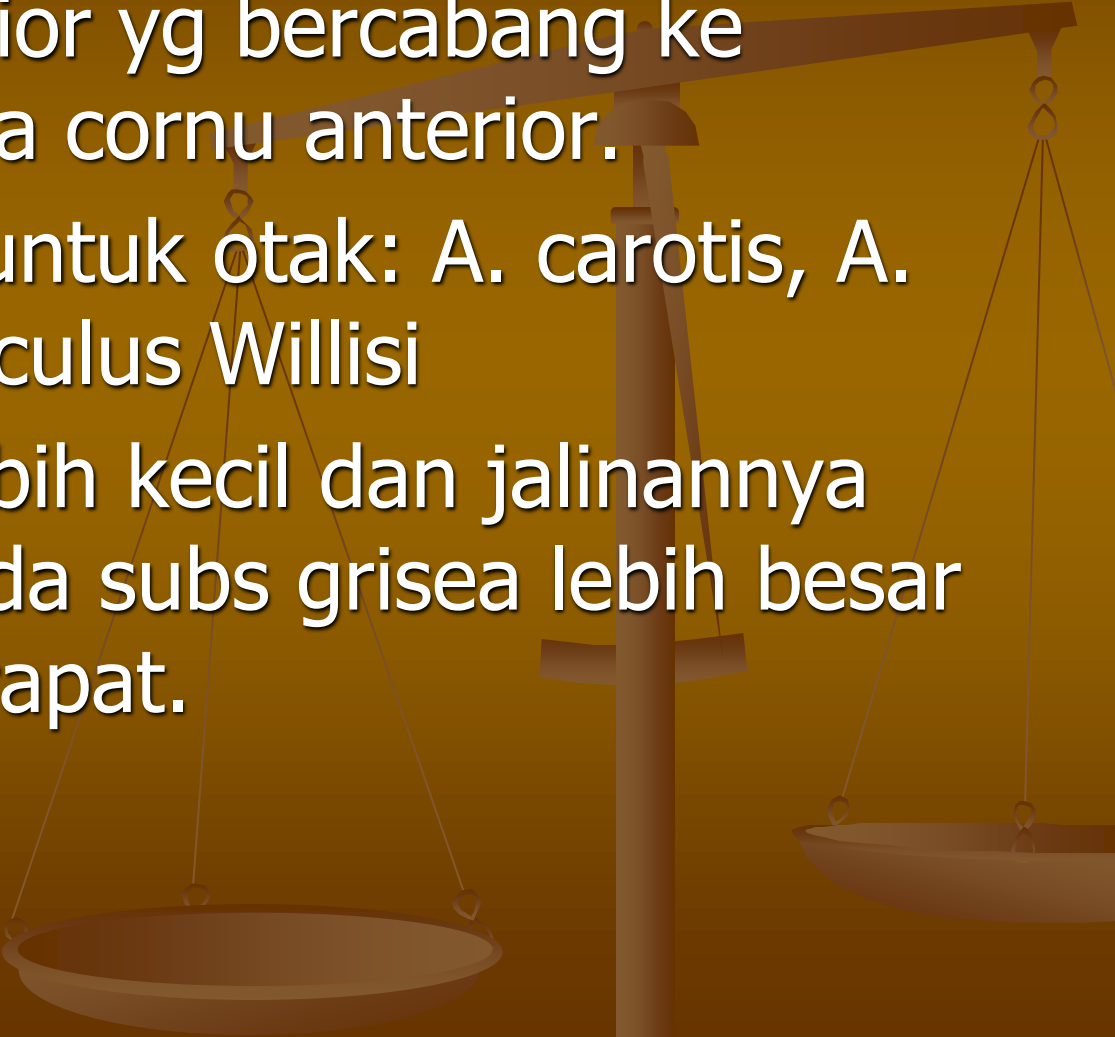


Cerebro Spinal Fluid

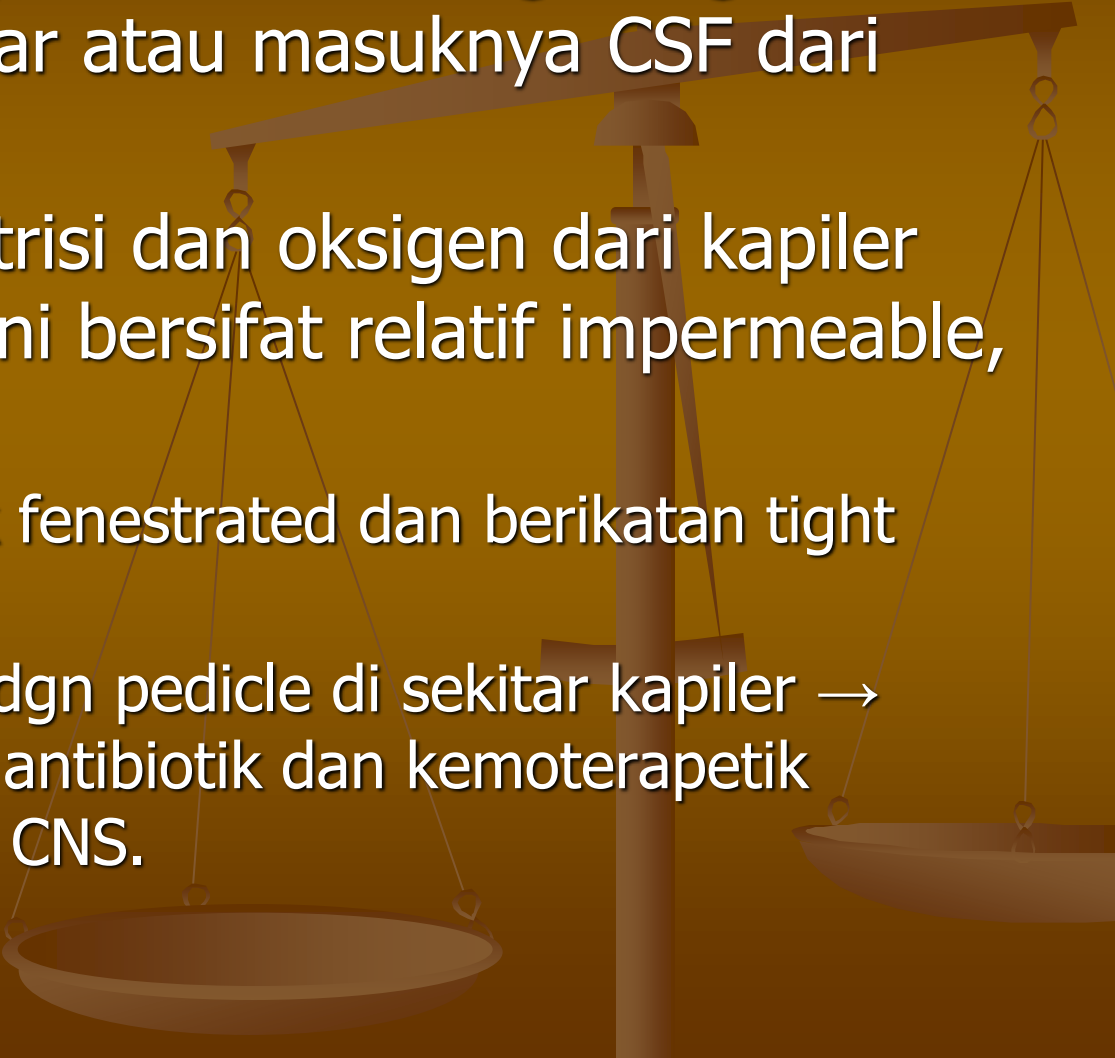
- Meliputi CNS, berfungsi melindungi dari goncangan dan jejas mekanis serta utk metabolisme CNS.
- Volume: 80-100 ml.
- Terus menerus diperbarui dan mengalir melalui ventrikel dan jala arachnoid.



P.D pada CNS

- A. spinalis anterior yg bercabang ke substansia grisea cornu anterior.
 - Pasokan darah untuk otak: A. carotis, A. basilaris dan Circulus Willisi
 - P.d subs alba lebih kecil dan jalinannya longgar, sdg pada subs grisea lebih besar dan jalinannya rapat.
- 

BLOOD BRAIN BARRIER

- Sel ependym dan piamater berfungsi sbg barrier yg mencegah keluar atau masuknya CSF dari otak.
 - CNS mendapat nutrisi dan oksigen dari kapiler piamater. Kapiler ini bersifat relatif impermeable, karena:
 - Sel endotelnya tdk fenestrated dan berikatan tight junction.
 - Prosesus astrocyt dgn pedicle di sekitar kapiler → BBB → mencegah antibiotik dan kemoterapetik tertentu mencapai CNS.
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Wassalam

