



Faculty of Biological Science and Technology
Zoology and Botanical Department
Practical Histology

Nervous Tissue

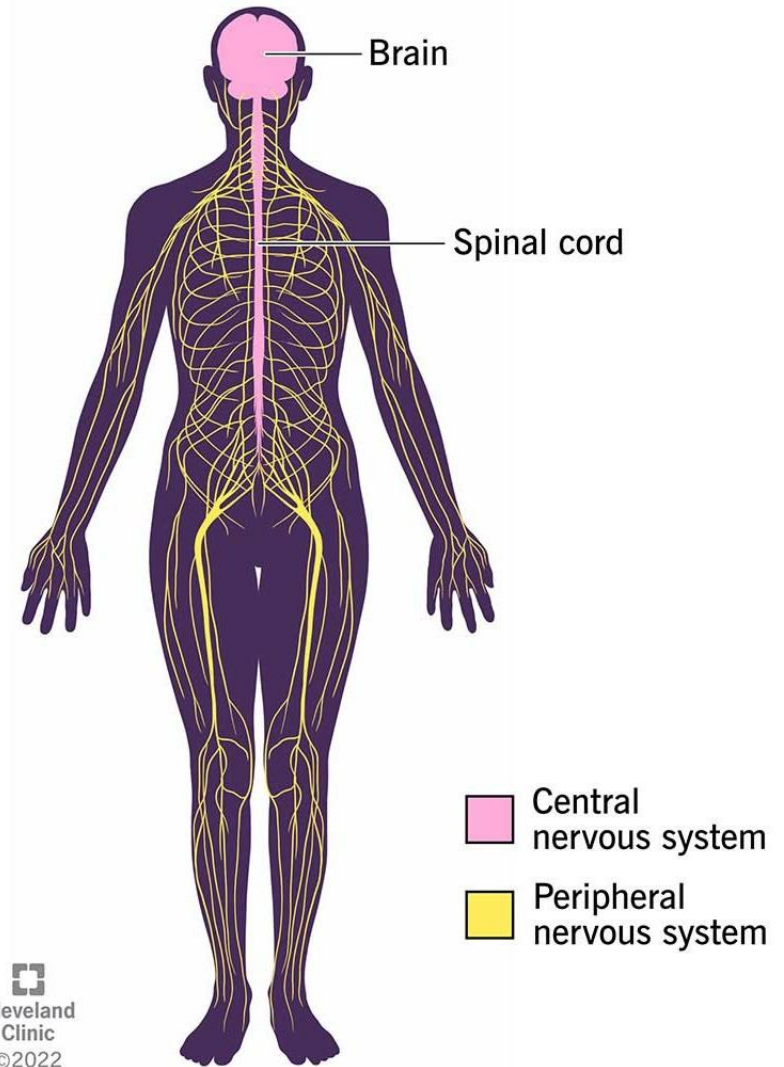
Part 2-Central Nervous System

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Nervous system

- ▶ Nervous system is divided in two components:
 - ▶ Central nervous system (CNS), which includes brain and spinal cord
 - ▶ Peripheral nervous system (PNS), which includes nerves, ganglion and nerve endings



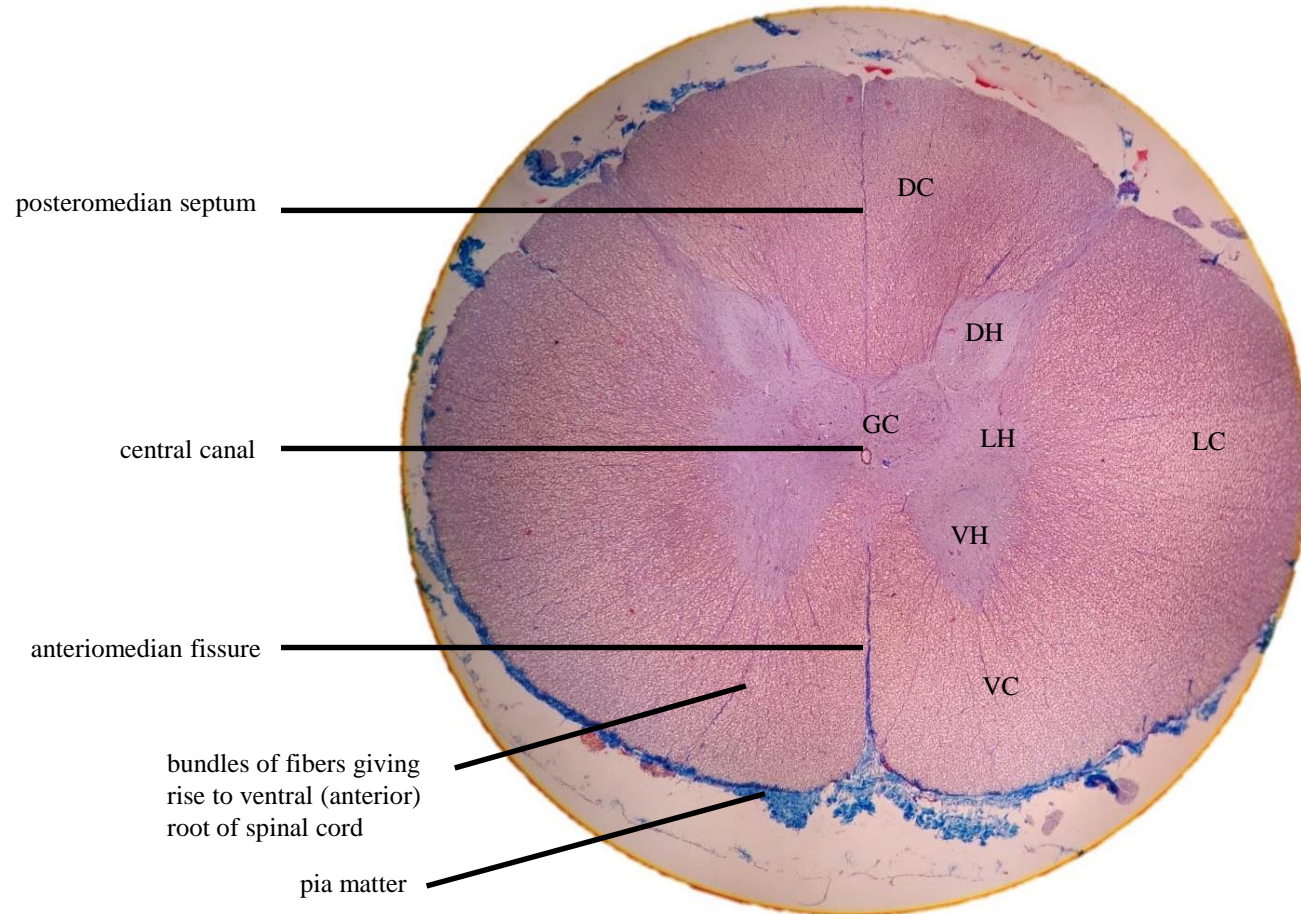


Spinal cord

- ▶ Spinal cord is a tubular structure that occupies the upper two-third of vertebral canal
- ▶ Small, round canal exists in the center of spinal cord that contains cerebrospinal fluid (CSF)
- ▶ Spinal cord composed of grey matter and white matter. Grey matter is an H-shaped or butterfly shaped structure surrounded by white matter. Grey matter contains nerve cell bodies and glial cells, while the peripheral white matter contains sensory and motor fibers which form nerve tracts. Glial cells also can be found in white matter
- ▶ Grey matter is divided into posterior (dorsal) and anterior (ventral) horns. Some segments of spinal cord display lateral horn
- ▶ A bundle of fibers known as grey commissure connects the right and left side of grey matter. Grey commissure can be seen around central canal in cross section of spinal cord
- ▶ Two grooves that are called posteromedian septum and anteriomedian fissure divide white matter into right and left side. White matter in each side is subdivided into three regions known as posterior (dorsal), anterior (ventral) and lateral columns



Spinal cord

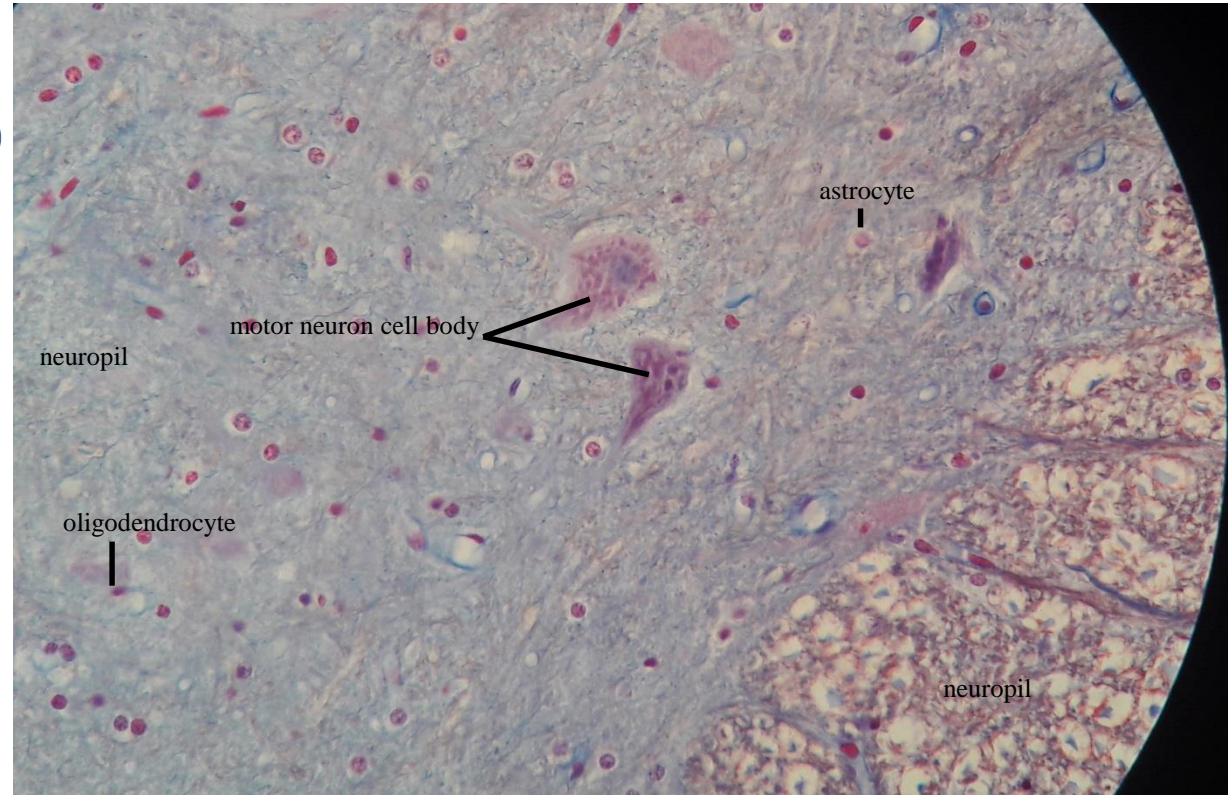


Cross section of cat spinal cord. DC: dorsal column, VC: ventral column, LC: lateral column, DH: dorsal horn, VH: ventral horn, LH: lateral horn, GC: grey commissure. Note that pia matter covers nervous tissue. H&E, 4X. This picture is taken from histological slide in histology laboratory of Isfahan University



Spinal cord

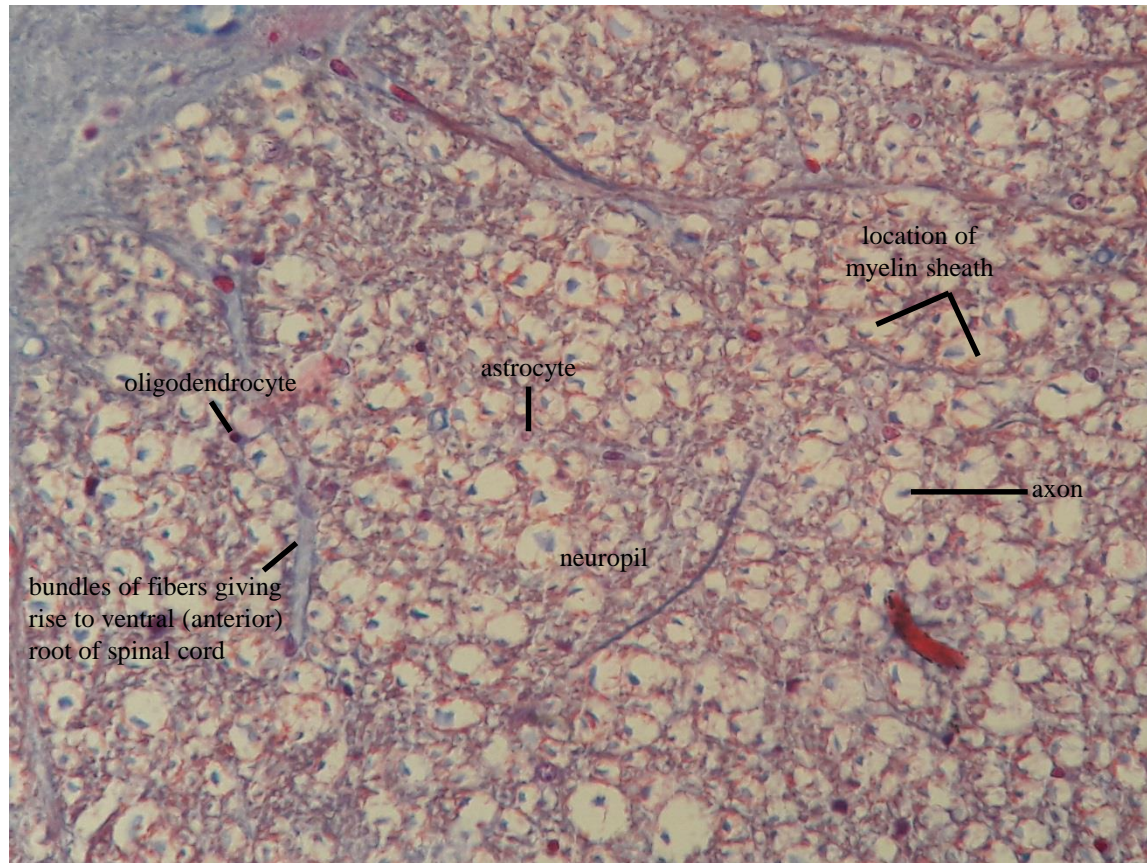
Neuropil (or neuropile) is any area in nervous tissue between neuron and glial cell bodies. It is composed of dendrites, axons, and glial cell process



Cross section of spinal cord. Grey matter is seen in the left side and white matter in the right side; H&E, 60X. This picture is taken from histological slide in histology laboratory of Isfahan University



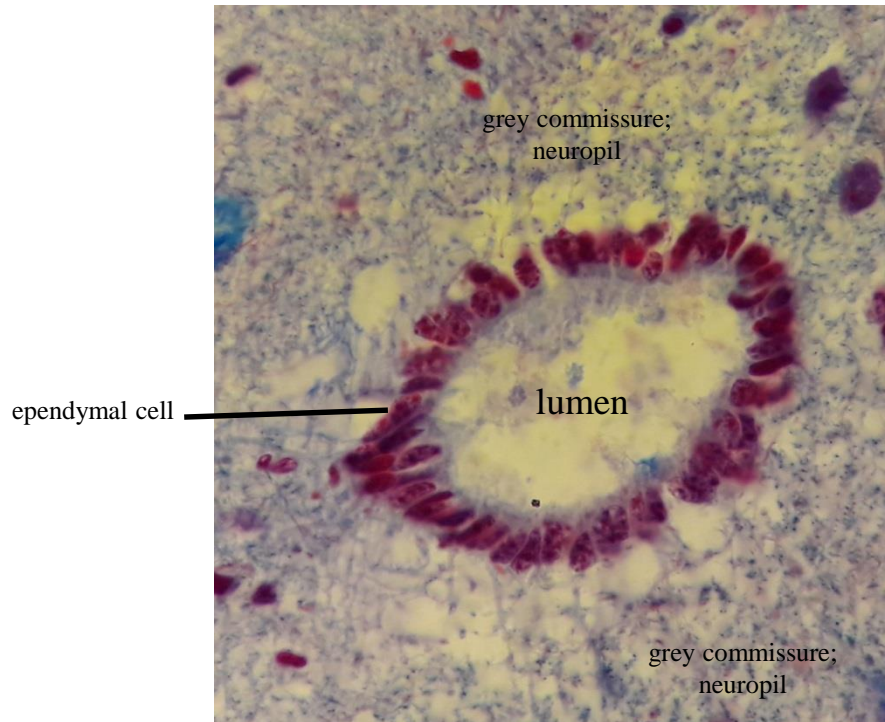
Spinal cord



Cross section of spinal cord. Grey matter is seen in the left-upper side and white matter in the right-bottom side; H&E, 60X. This picture is taken from histological slide in histology laboratory of Isfahan University



Spinal cord



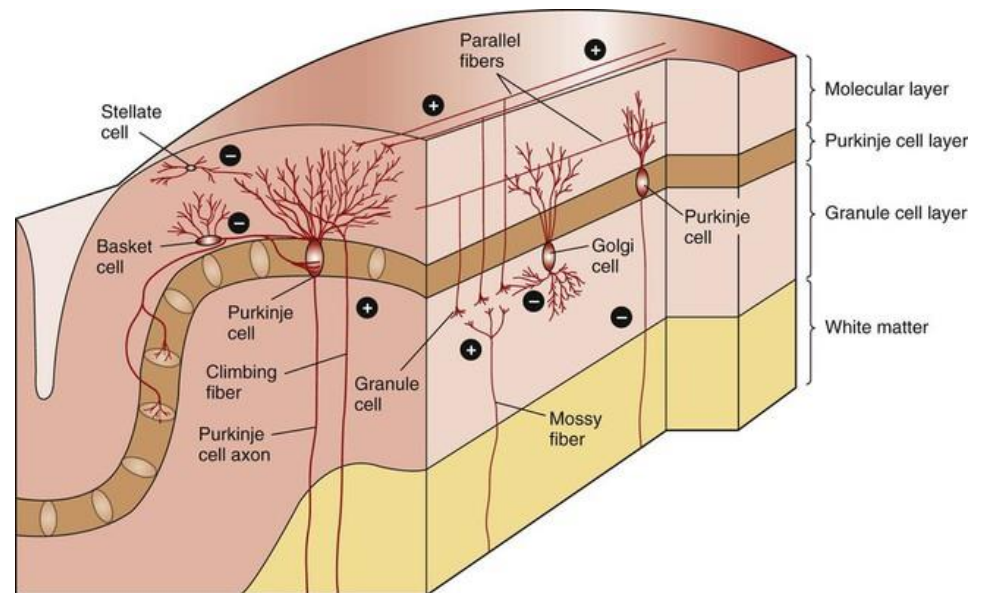
Cross section of spinal cord. Ependymal cells line central (ependymal) canal. H&E, 100X. This picture is taken from histological slide in histology laboratory of Isfahan University



Cerebellum

- ▶ The cerebellum is the largest part of hind brain. It is situated in the posterior of medulla oblongata and pons, separated from them by fourth ventricle
- ▶ The grey matter of cerebellum is distributed at the surface of the cerebellum hemispheres, which is known as cortex, as well as in the depth of cerebellum white matter as the cerebellum nucleus
- ▶ The cerebellum cortex is composed of three layers, that from superficial to deep including: molecular layer, Purkinje cell layer and granular layer

- ▶ Molecular layer is composed mainly of parallel fiber, dendrites of Purkinje cells, satellite cell and basket cell
- ▶ The middle layer of cerebellum cortex made up only from Purkinje cells
- ▶ Golgi cells and granular cells are two neurons located in granular layer

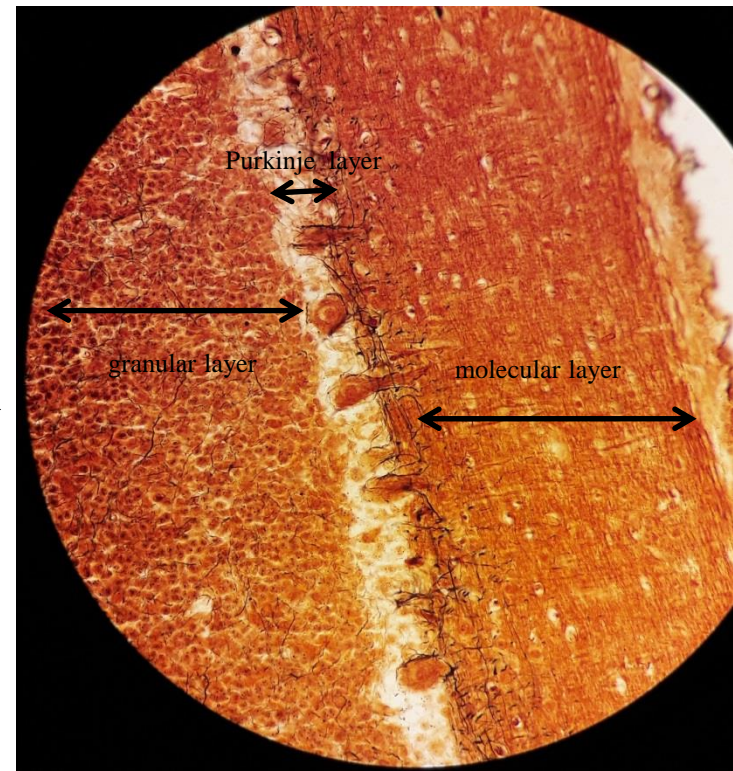
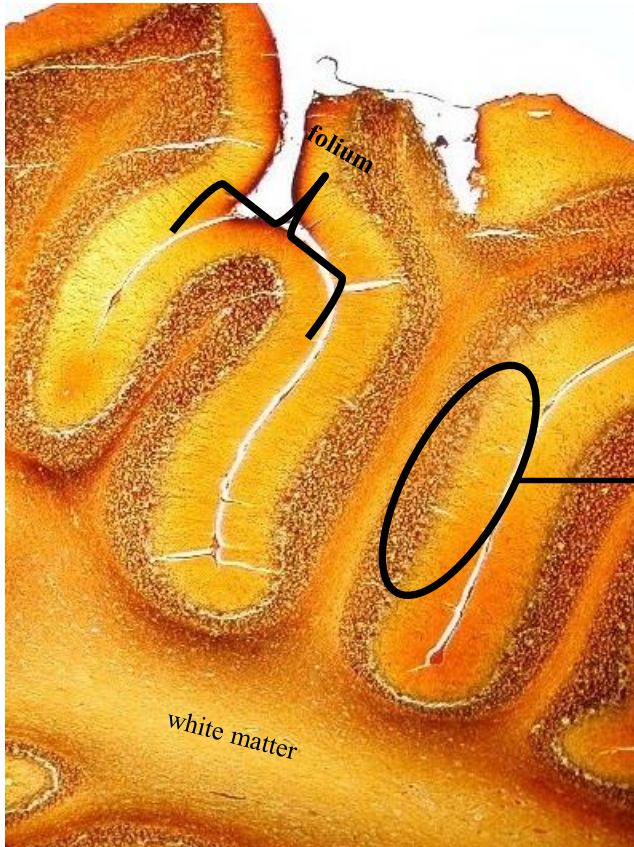


From <https://veteriankey.com/the-cerebellum/>



Cerebellum

- ▶ The surface layer of cerebellum has fine folds called folium
- ▶ Each folium consists of a core of white matter surrounded by cerebellar cortex

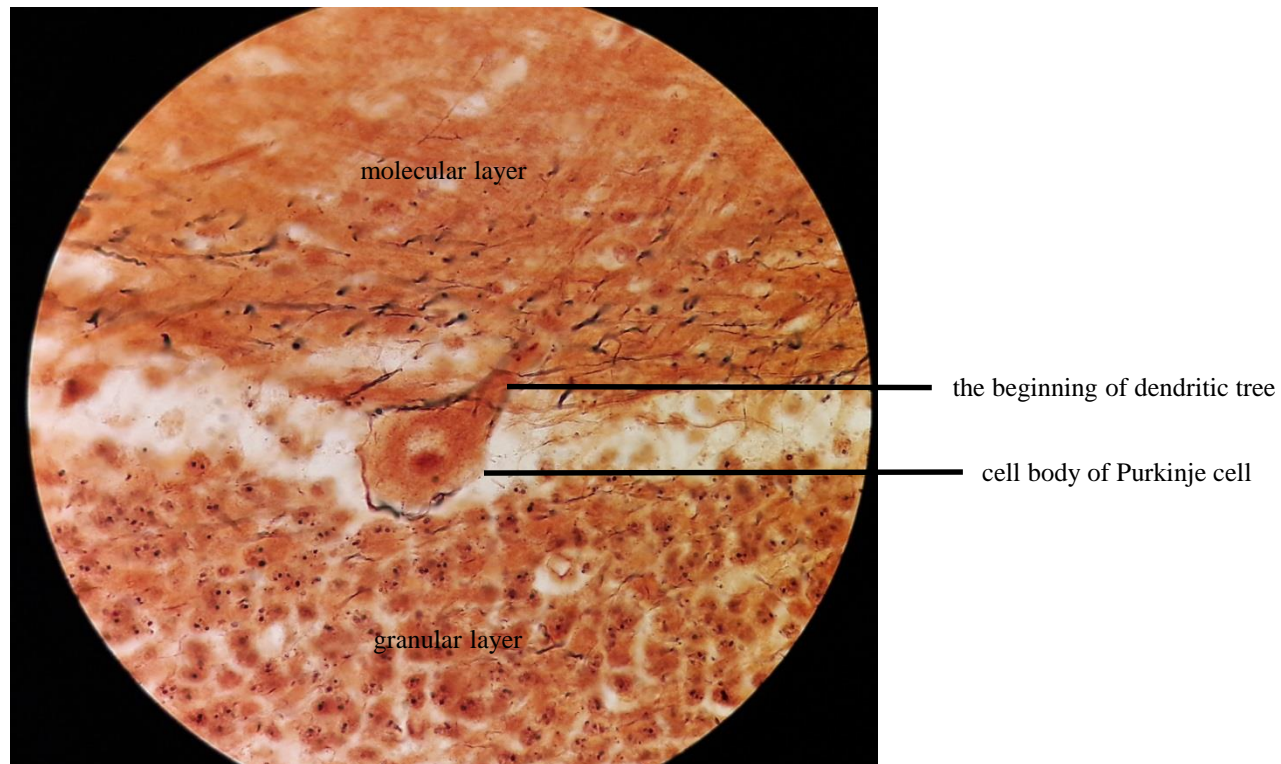


Silver staining of cerebellum. Left: folium. 10X; right: part of cerebellar; 10X. These pictures are taken from histological slide in histology laboratory of Isfahan University



Cerebellum

- ▶ Purkinje cells are large neurons with pear-shaped cell bodies formed the middle layer of cerebellum cortex.
- ▶ Their massive, highly branched dendritic tree extend to molecular layer, while their single, long axon projects to cerebellar nucleus

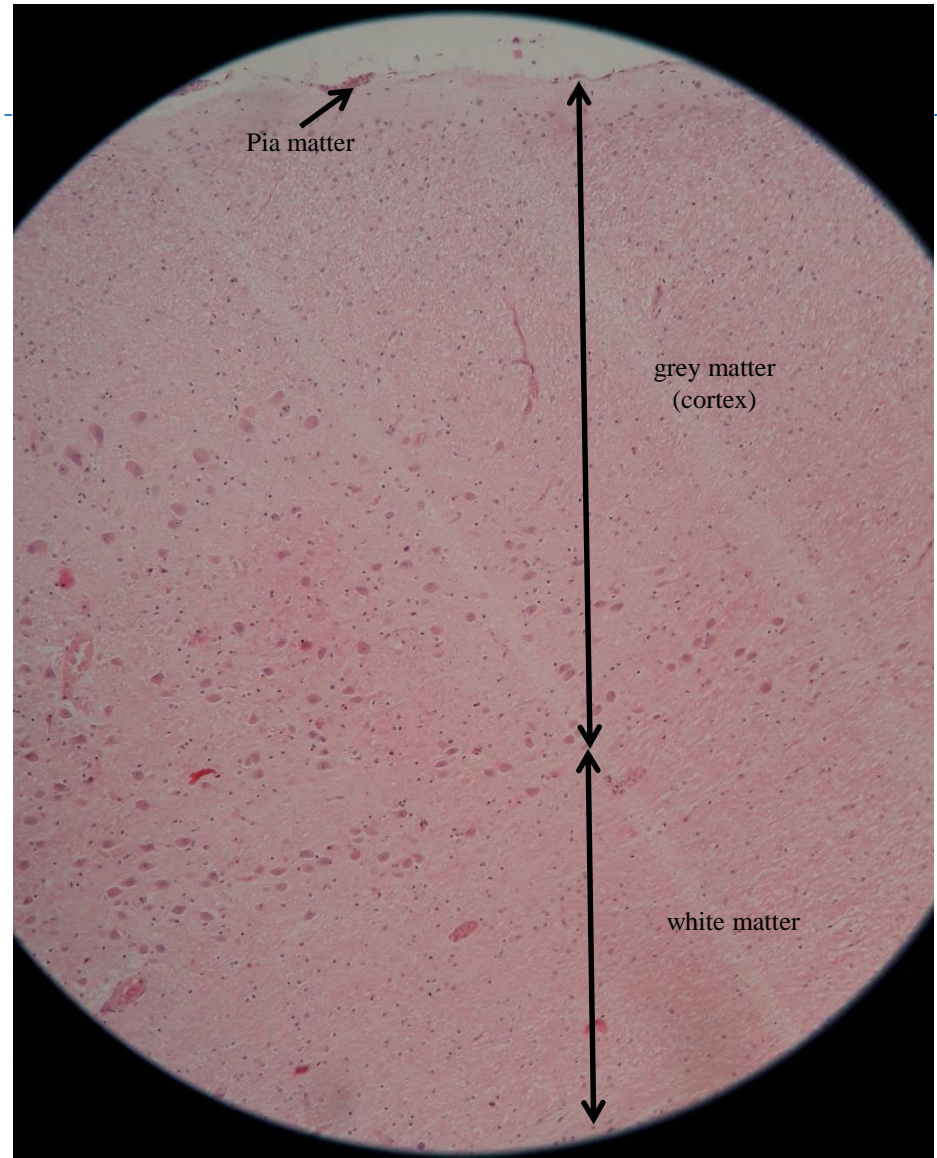


Silver staining of cerebellum cortex. 100X. This picture is taken from histological slide in histology laboratory of Isfahan University



Cerebrum

- ▶ The grey matter of cerebrum is mainly located surrounding white matter and is known as cortex. Regions of grey matters are also found in deeper regions of the brain which is known as cerebrum nuclei
- ▶ The cerebrum cortex is composed of six major layers in most regions, beginning from surface, including:
 - ▶ Layer I- molecular layer
 - ▶ Layer II - outer granular layer
 - ▶ Layer III - outer pyramidal layer
 - ▶ Layer IV- inner granular layer
 - ▶ Layer V- inner pyramidal layer
 - ▶ Layer VI- polymorphic layer



Cross section of cerebrum. H&E, 4X. This picture is taken from histological slide in histology laboratory of Isfahan University



Cerebrum



Pyramidal neuron in cross section of cerebellum. H&E, 40X. This picture is taken from histological slide in histology laboratory of Isfahan University