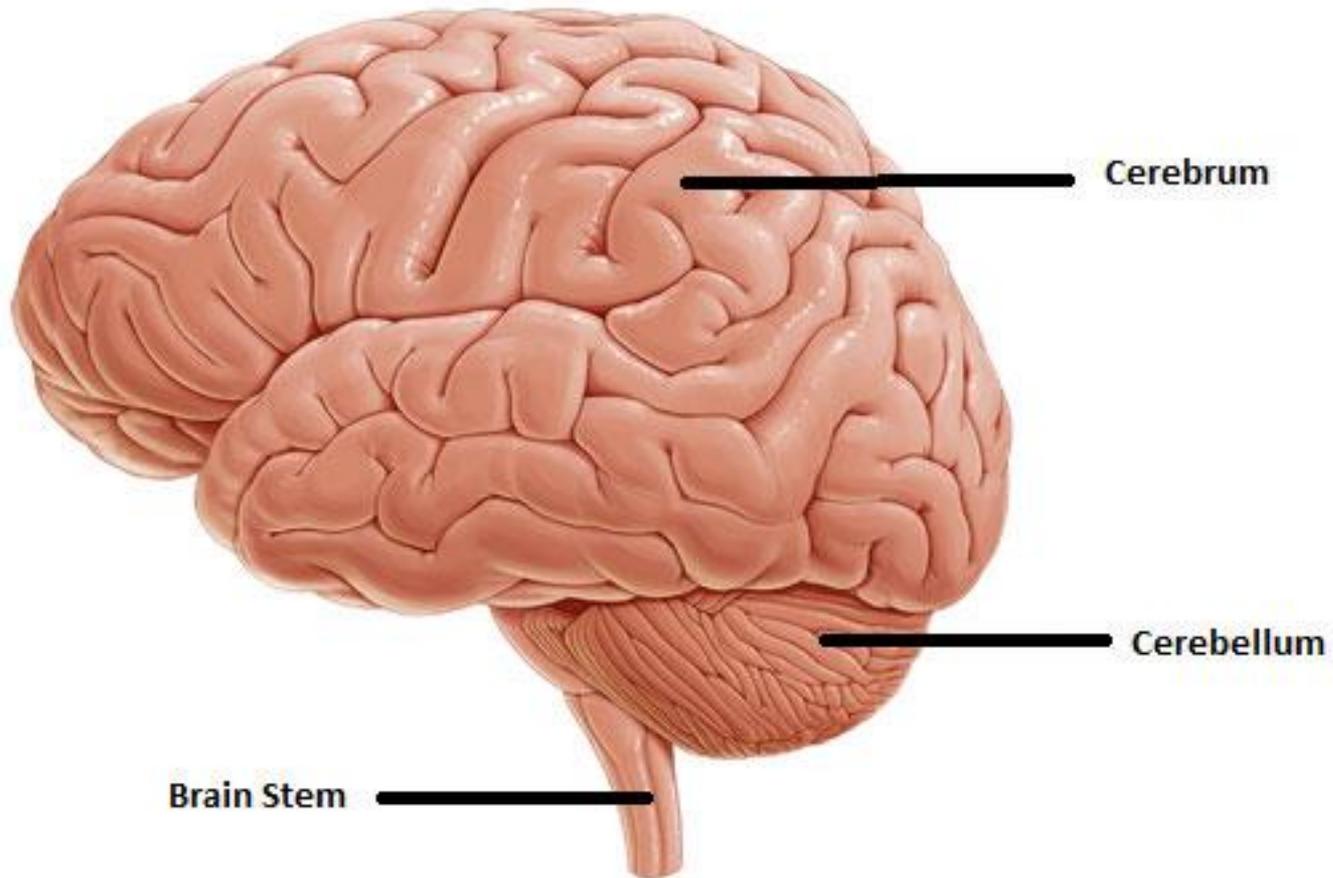
A microscopic image of brain tissue, likely stained with hematoxylin and eosin (H&E). The image shows a dense network of neurons with prominent nuclei and branching processes. A large, dark, elongated structure, possibly a blood vessel or a large axon, is visible in the upper right quadrant. The overall appearance is that of a highly organized neural network.

Cerebrum & cerebellum Histology

Dr Amal AlBtoosh

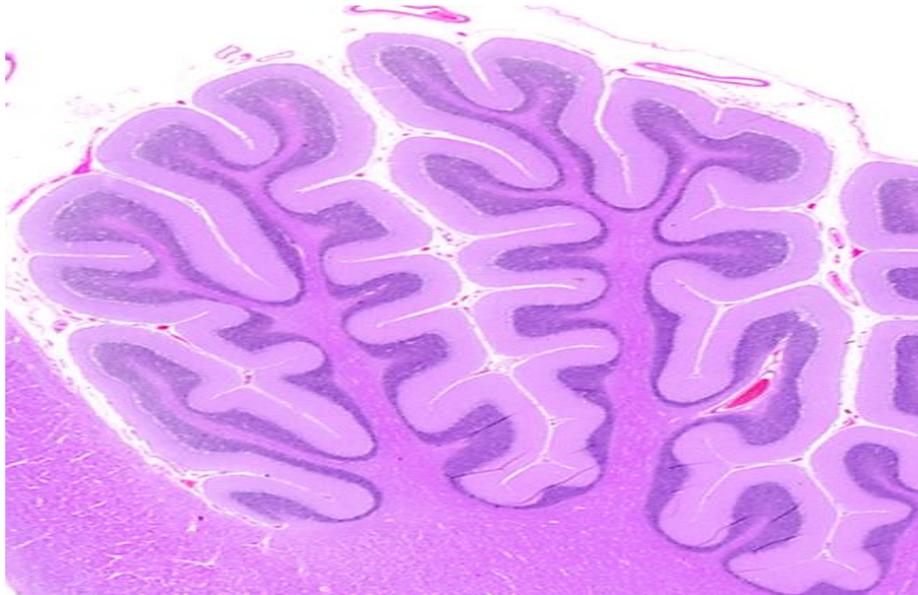
Histology of the cerebellum



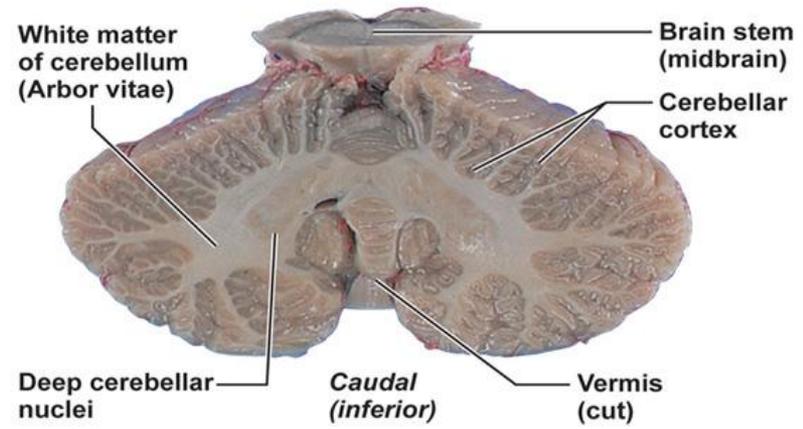
The Cerebellar cortex

❖ Consists of:

- ✓ external grey matter
 - ✓ core of white matter contain deep cerebellar nuclei
- ❖ form **Folia**, a branching array that in a sectional view resembles a tree



The Cerebellum – White and Gray Matter

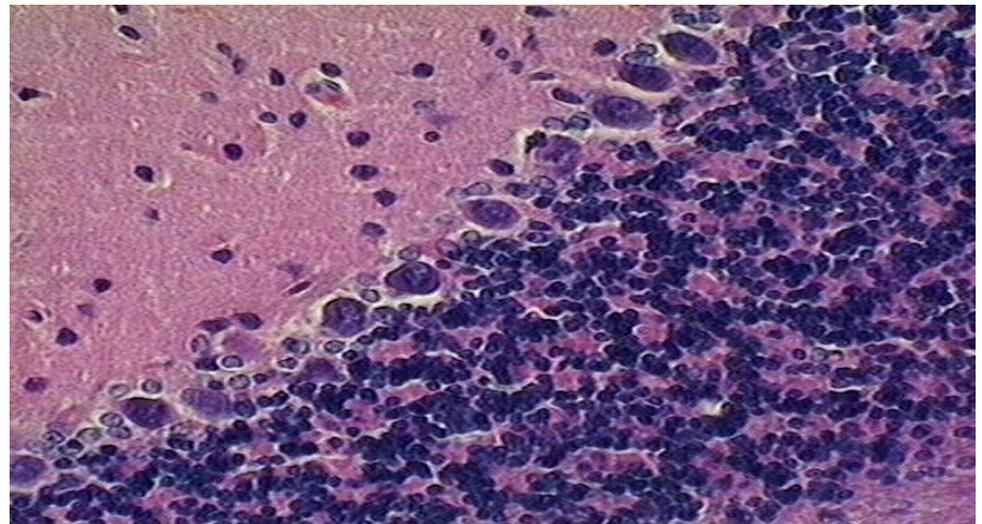
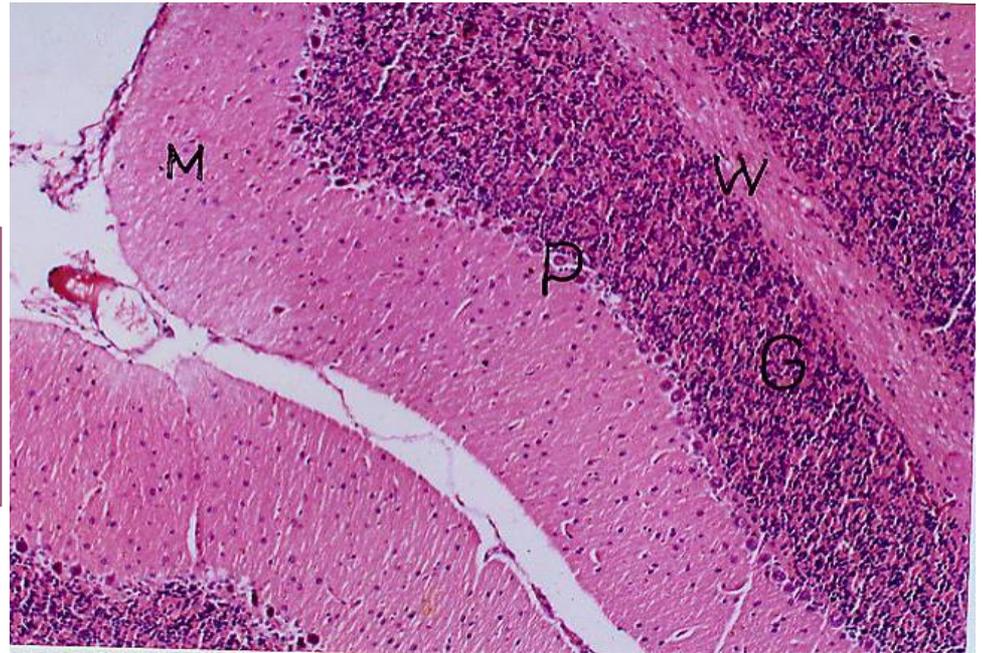


(d) Coronal section, posterior view

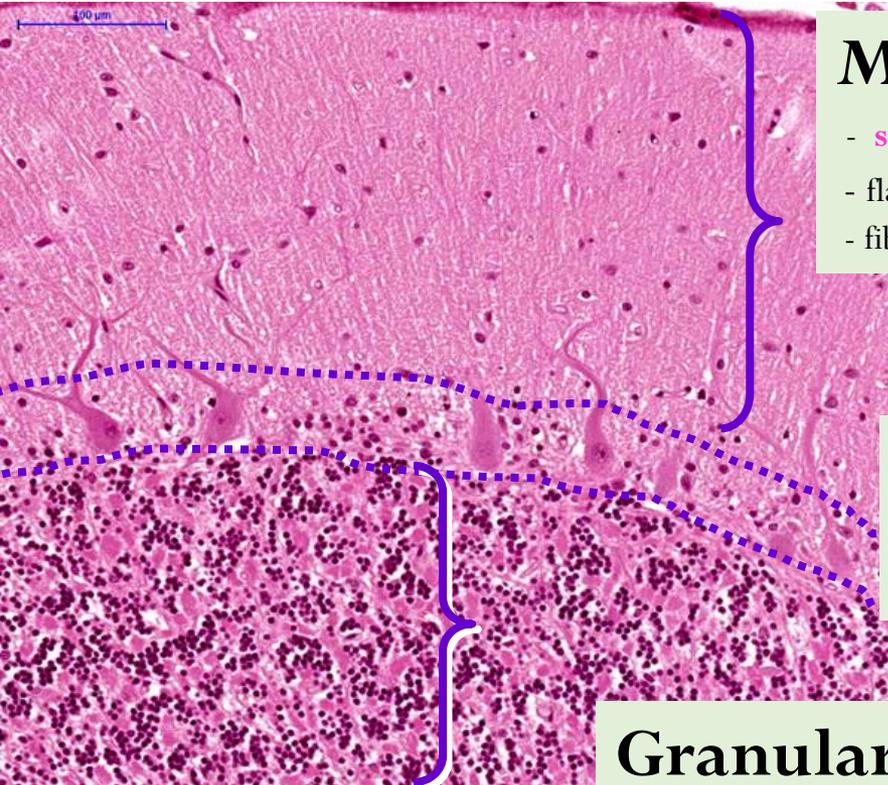


Layers of the cerebellar cortex

- 1-Molecular layer:
- 2- Purkinje cell layer.
- 3- Granular layer.



Layers of cerebellar cortex



Molecular layer

- **stellate cells, basket cells**
- flattened **dendritic trees** of Purkinje cells
- fibers: **parallel fibers** originating from granule cells

Purkinje cell layer

- cell bodies of **Purkinje cells** and **glial cells**

Granular layer

- densely packed with **granule cells**
- interneurons: mainly **Golgi cells**
- fibers:
 - terminating mossy fibers
 - traversing climbing fibers

1. Molecular layer

1-Molecular layer:

Fibers:

1- dendrites of Purkinje cells

2- dendrites of Golgi cells.

3- climbing fibers

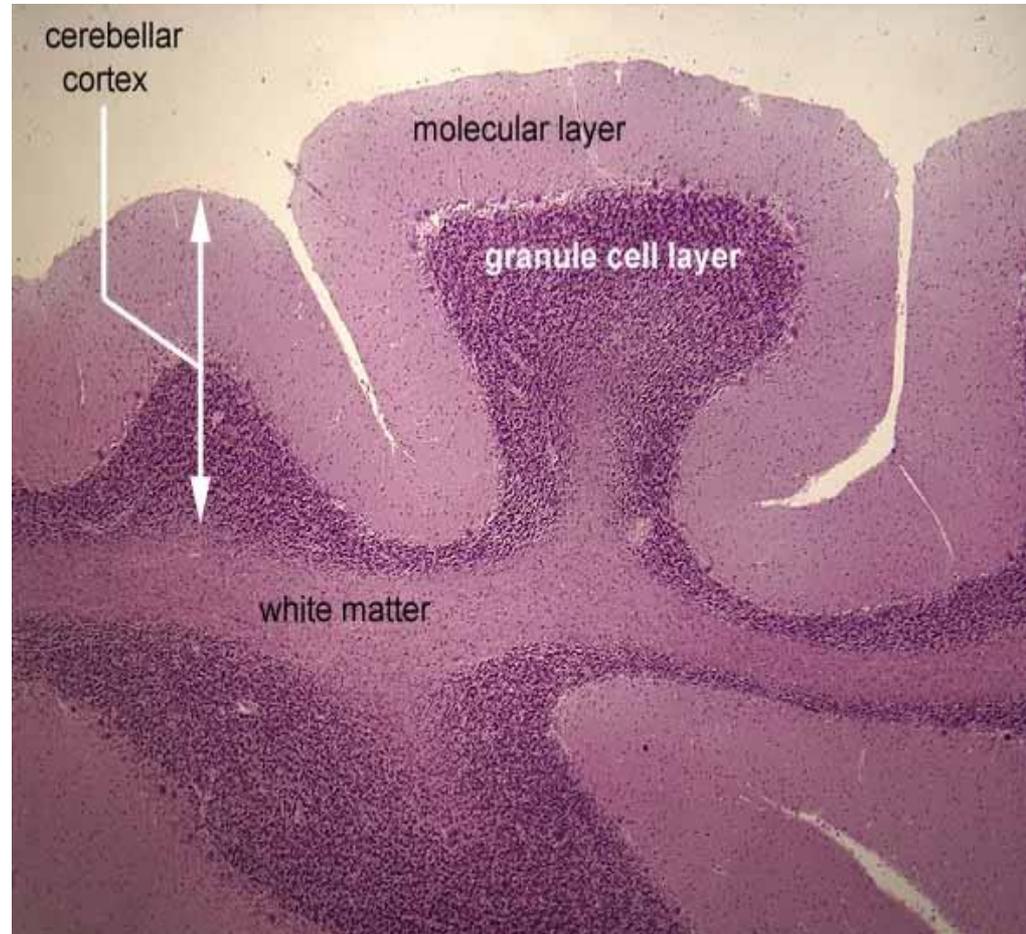
(from **inferior olive** to Purkinje cells)

4- **axons** of granular cells.

Cells

1- basket cells

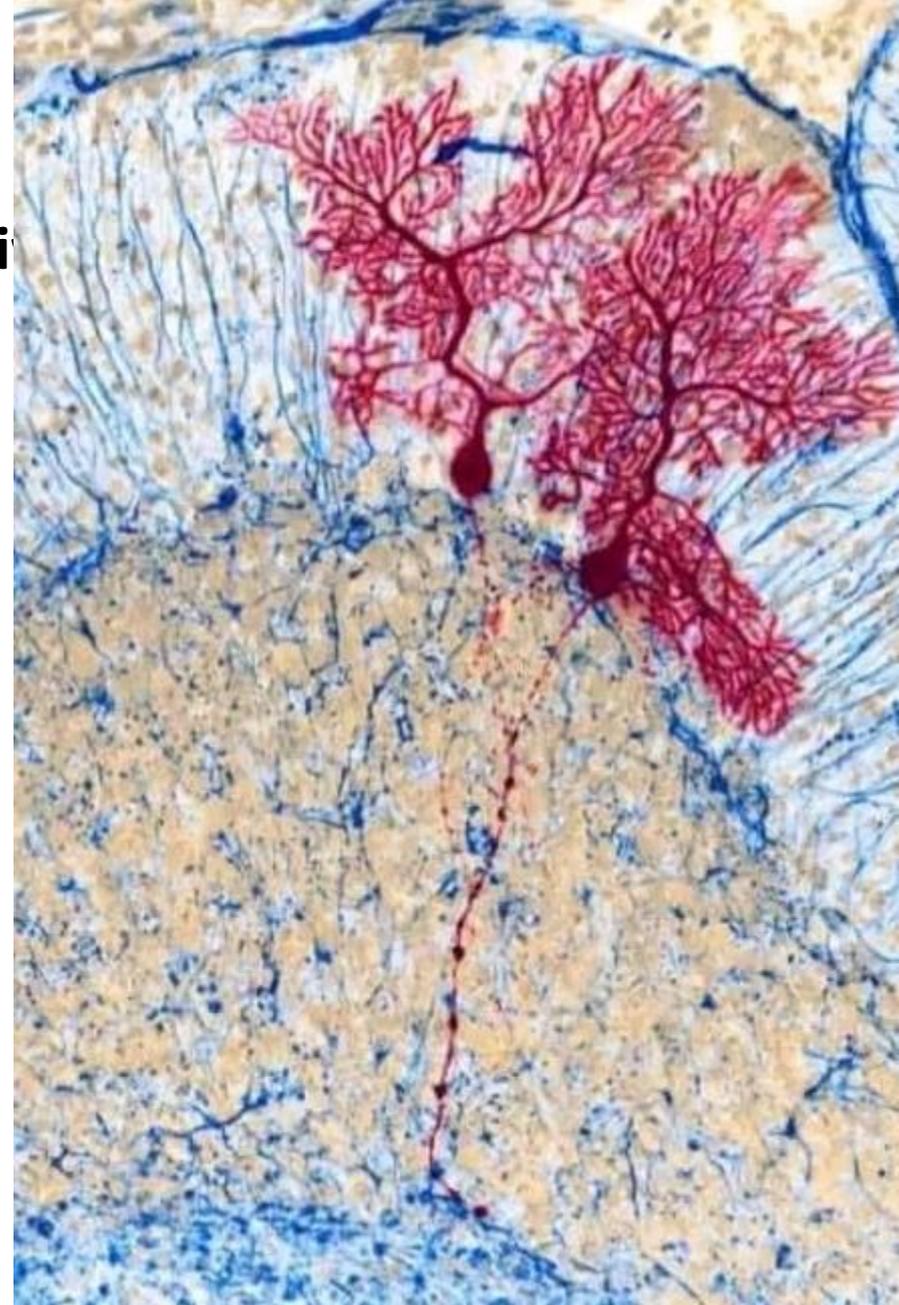
2- neuroglia. [stellate

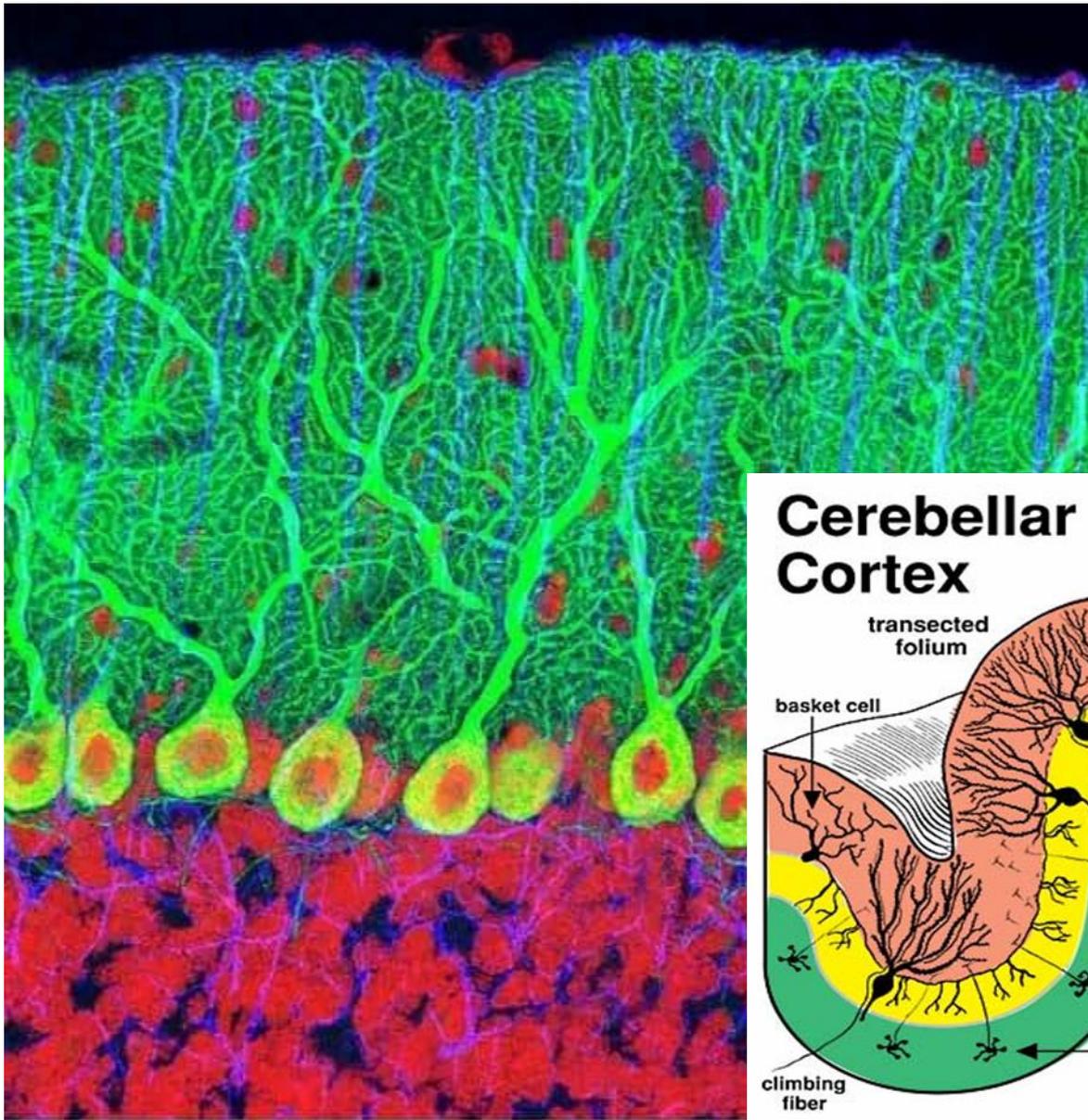


2- Purkinje cell layer:

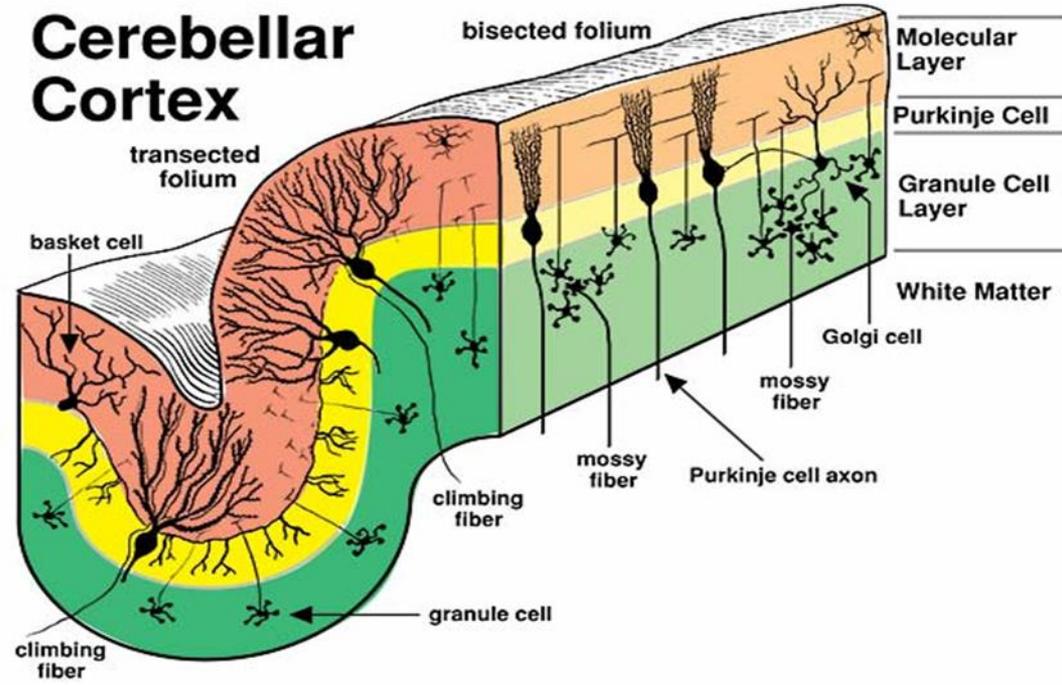
Consists of Purkinje cells: huge pyriform, in single layer: it has **extensive dendritic arborization**.

& Axons to deep cerebellar nuclei.



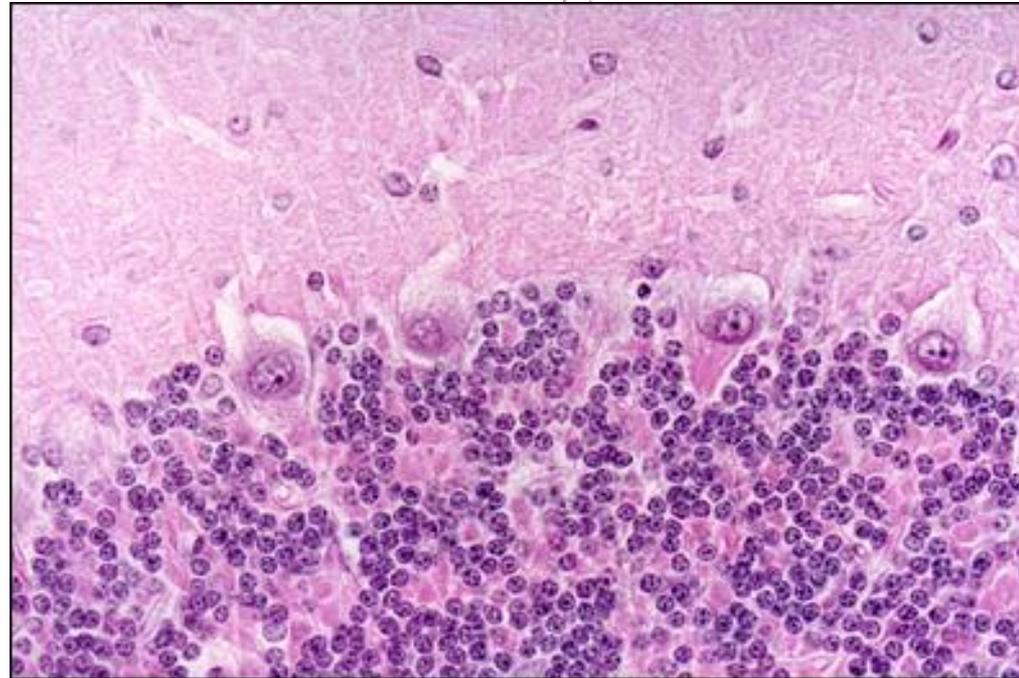
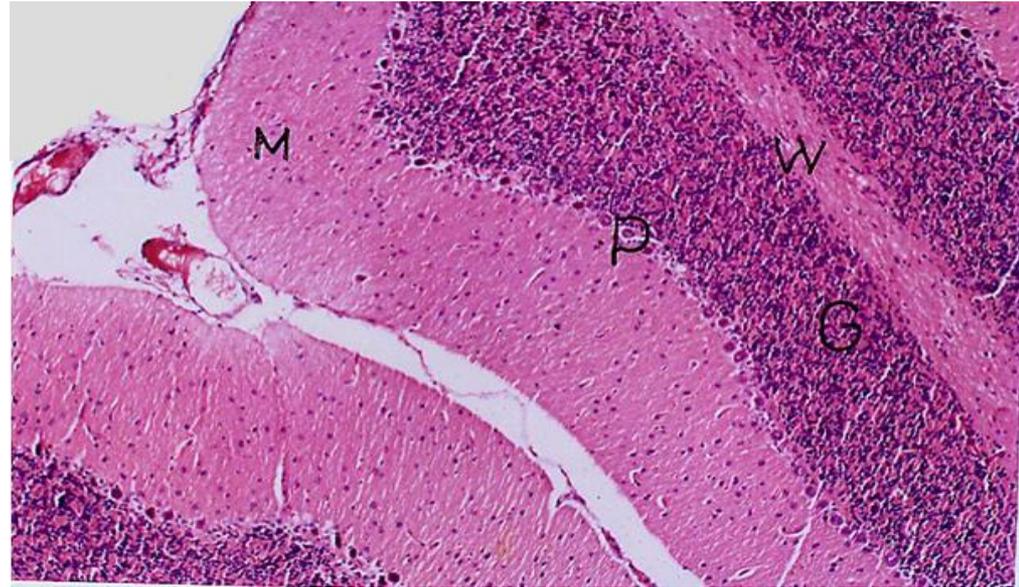


Cerebellar Cortex



3- granular layer:

- Densely packed small stellate **granule cells:**
- receive **mossy fibers.**
- Axons to molecular layer.
- Golgi cells:**
- extensive branching dendrites in different planes
- receive **recurrent collateral fibers.**



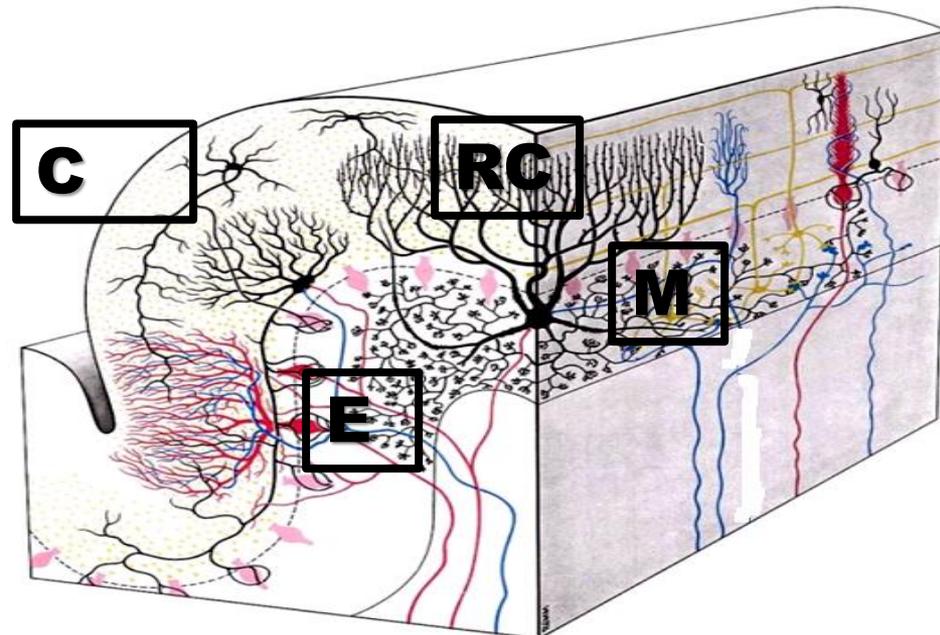
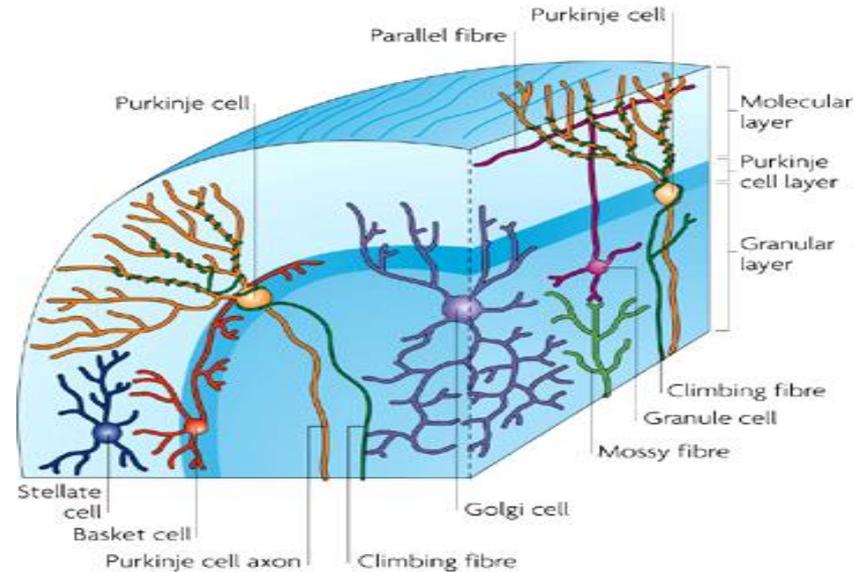
The fiber architecture of the cerebellar cortex:

It includes:

❑ **Afferent fibers** are the fiber inputs to the cerebellar cortex, these are:

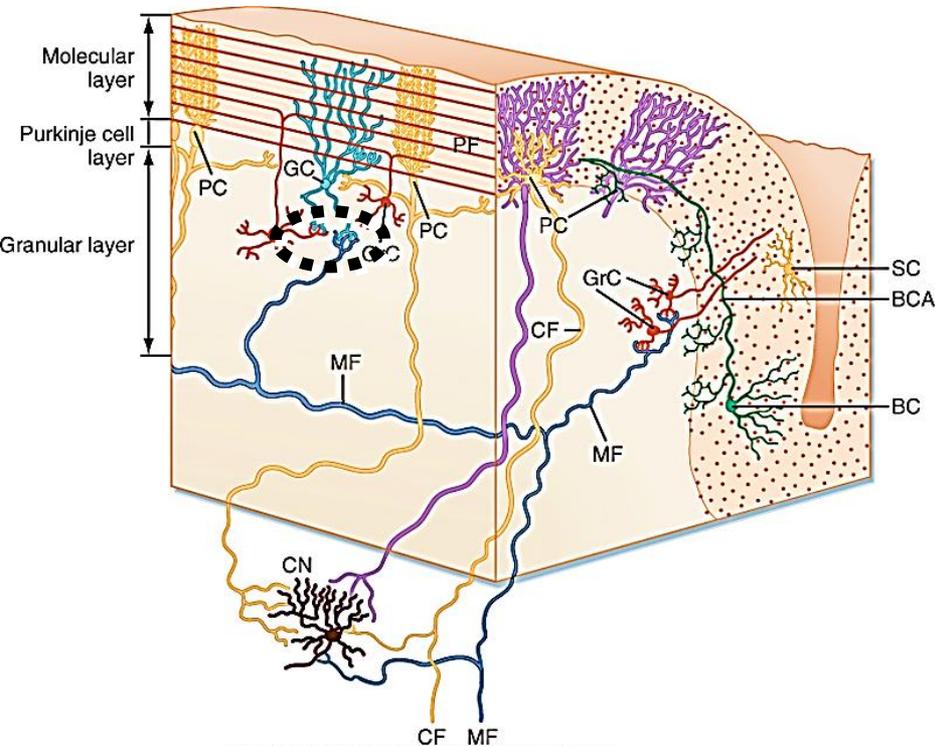
- **Mossy fibers** which constitute the majority of afferent fibers to the cerebellar cortex. They end on the granule cells.
- **Climbing fibers** which are the olivo- cerebellar fibers that end on the dendrites of Purkinje cells.
- **Recurrent collaterals** arise from axons of Purkinje cells and end on dendrites of Golgi cells.

❑ **Efferent fibers** are the axons of Purkinje cells that **end on the deep cerebellar nuclei.**

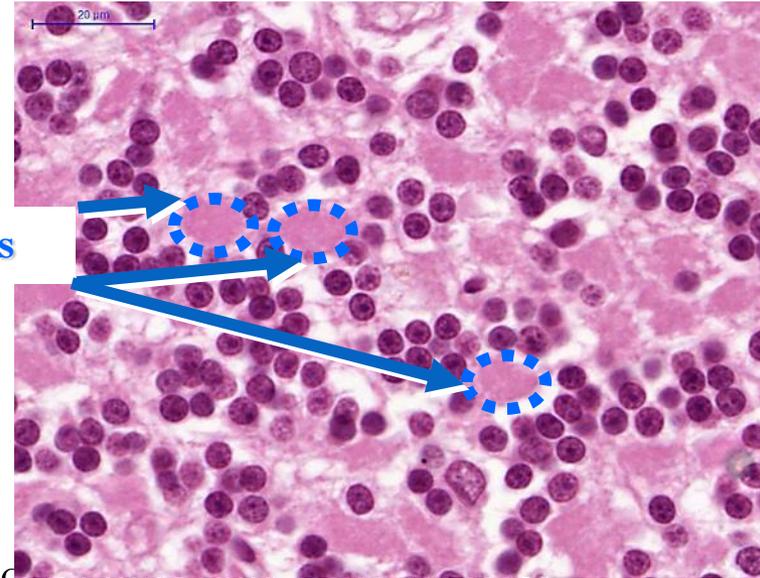


Granule cells

About 75 % of the brain's neurons:
cerebellar **granule cells**



dendritic glomerulus



- Granule cells have only **four to five dendrites**

- End in an enlargement called:
Dendritic glomerulus

-Enlargements:

Sites of excitatory input from **mossy fiber**
Inhibitory input from **Golgi cells**

cerebrum histology

□ grey matter (cortex)

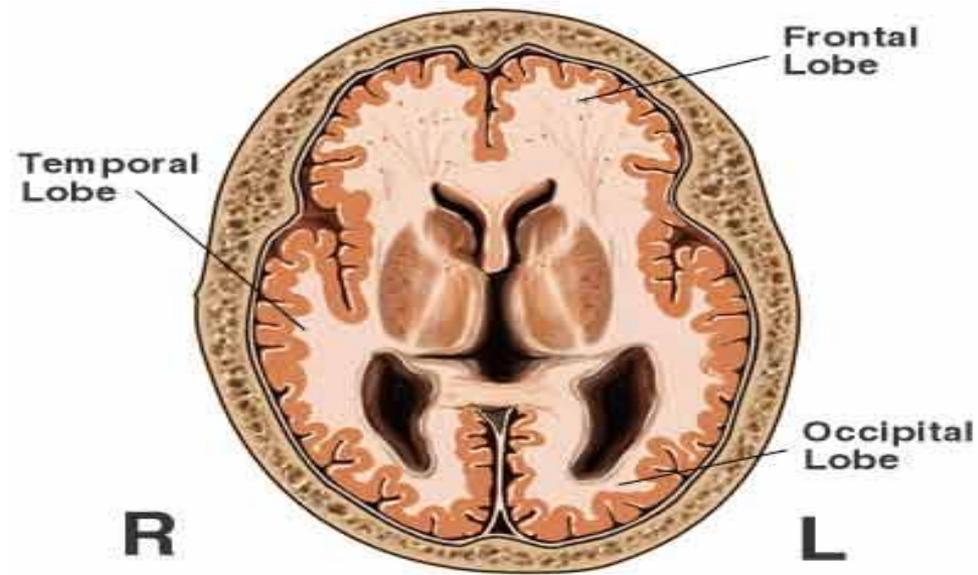
It is composed of:

- **nerve cell bodies.**
- **Unmyelinated** Nerve fiber
- **neuroglia**
- **A rich capillary bed.**

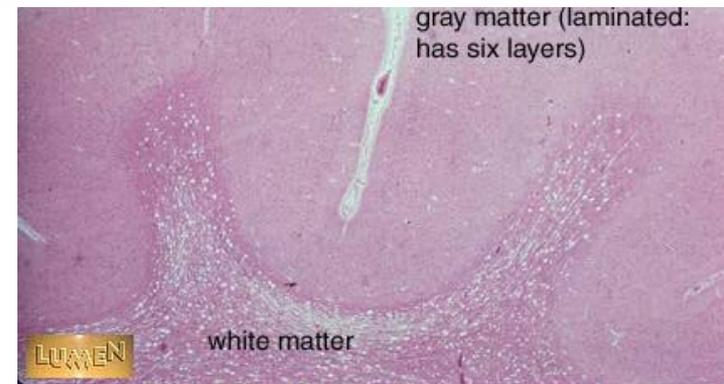
□ white matter (medulla)

It is composed of:

- **Myelinated nerve fiber**
- **neuroglia**
- **Few blood capillaries.**



Horizontal section
of the brain



Types of neurons in the cerebral cortex

2 main types arranged in layers called (**laminae**)

1. **Pyramidal cells:**

2. **Stellate cells:**

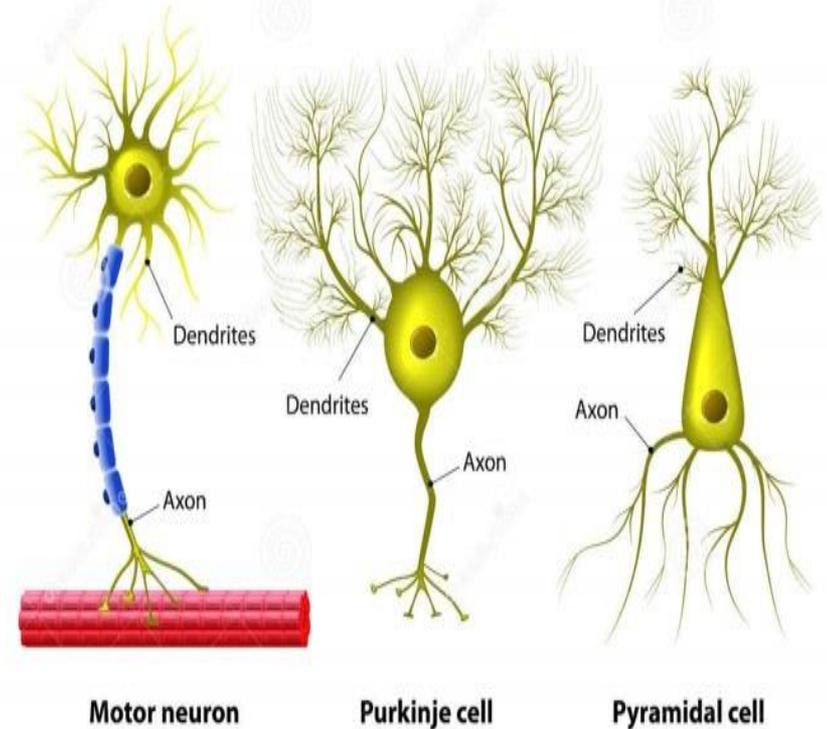
➤ **Horizontal cells of Cajal**

➤ **Fusiform cells**

➤ **Granule cells**

➤ **Cells of Martinotti**

Multipolar neuron



6 Layers of the cerebral cortex in the motor area

From outside -----inside

1- Molecular layer (plexiform)

Fibers: parallel to surface.

= dendrites of **pyramidal**

+ axons of **granule & Martinotti** cells.

Cell bodies:

horizontal cells of Cajal

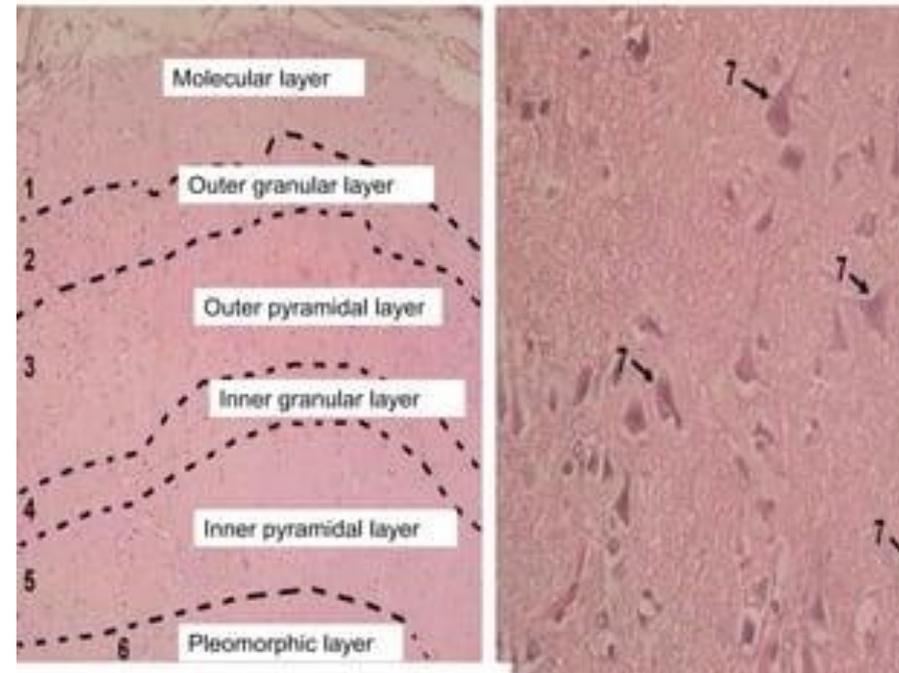
+ **Neuroglia**

2- External granular layer

Cell bodies: **granule** cells

3- External pyramidal cell

layer Cell bodies: small & med-sized **pyramidal**



4- Internal granular layer

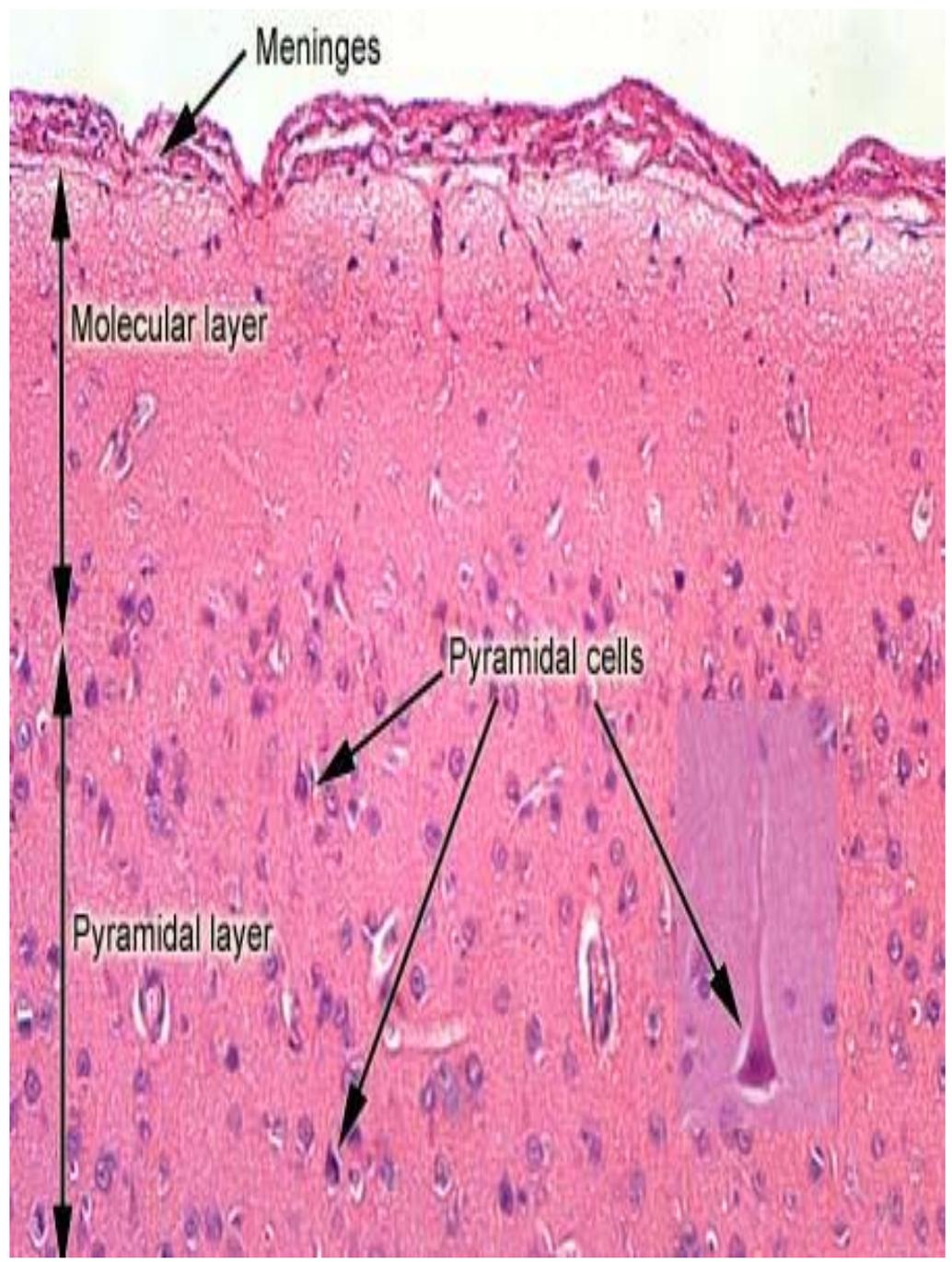
Cell bodies: **granule** cells

5- Internal pyramidal cell layer

med.- sized & Large **pyramidal** cells
= Betz cells

6- The polymorphic layer multiform

The deepest & broadest
Contain cells of **Martinotti**



Cyto-architecture of some cerebral areas

- The cerebral cortex shows the same general structure (laminar pattern) with certain modifications in some cortical areas to perform different functions.
- A **Brodmann area** is a region of the cerebral cortex , defined by its cytoarchitecture , or histological structure and organization of cells

1. The motor area . It is of the *agranular cytological type*. It has few scattered granule cells, while the pyramidal cell layers are well developed. **Betz cells** are found in the inner pyramidal layer.

2. The sensory area It is of *granular type*. The granular layers are well developed, whereas, the pyramidal layers are ill-defined due to the small size and few number of their pyramidal cells.

