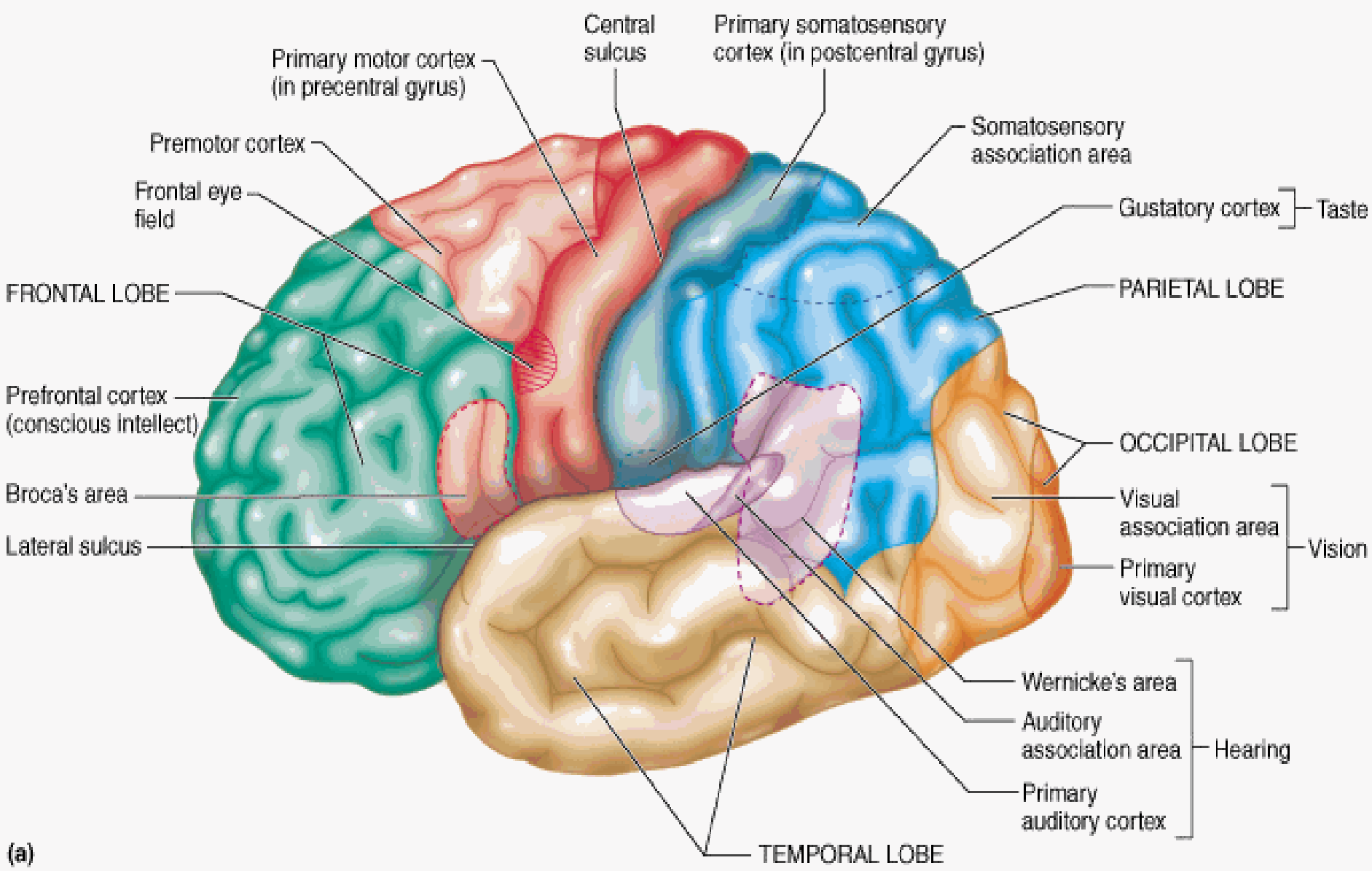


HISTOLOGY OF CEREBRAL CORTEX

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(a)

LAYERS OF NEOCORTEX

Differing in neuron morphology, size and population density, there are 6 layers in the neocortex.

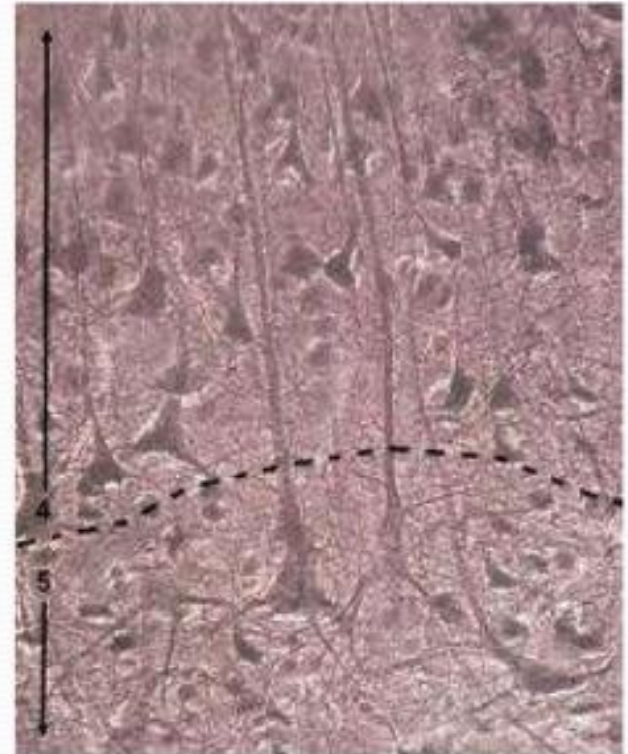
1. plexiform or molecular layer
 2. outer granular layer
 3. outer pyramidal cell layer
 4. inner granular layer
 5. inner pyramidal cell layer/ganglion cell layer
 6. multiform cell layer
- The six neocortical layers are not equally prominent everywhere. They form granular & agranular layers.

Neuron Cell types

- Two principal cell types are present in neo cortex.
 - 1.The pyramidal cell
 - 2.The Stellate cell
- Other cells are
 - 3. The cells of Martinotti
 - 4.Fusiform cells
 - 5.Horizontal cells of cajal

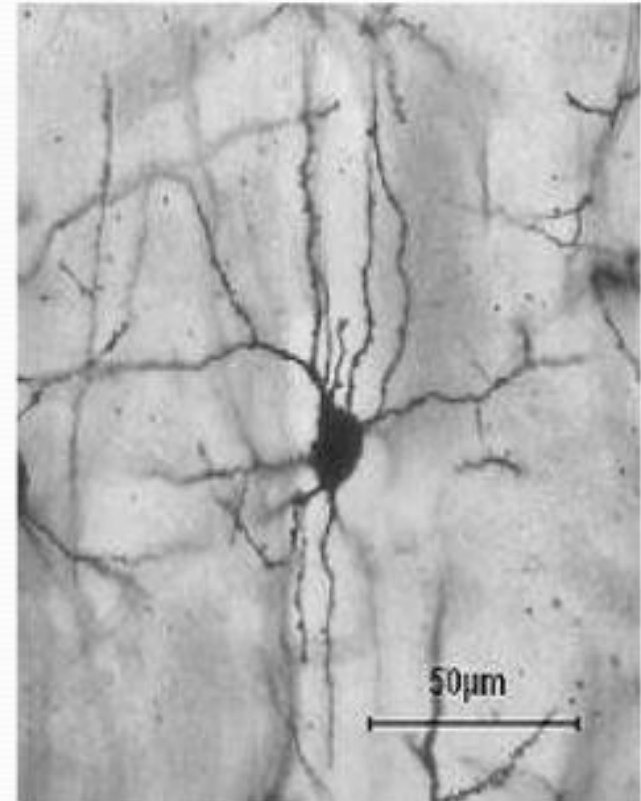
PYRAMIDAL CELLS

- Pyramid shaped cell bodies.
- About 10 microns to 70 microns in diameter.
- Axon arises from the base and the dendrite from the apex.
- The largest of the pyramidal cells are called the **BETZ cells**.



STELLATE CELLS

- Also known as granular cells.
- They are the principal interneurons of cortex .
- These come in a **wide assortment of shapes**.
- They are typically **small** (< 10 micrometres) **multipolar neurons**.



CELLS OF MARTINOTTI

- Small polygonal cells.
- Have very few short dendrites.
- The axon extends towards the surface and bifurcate to run horizontally in most superficial layers.
- Forms synapses with the pyramidal cells.

FUSIFORM CELLS

- Spindle shaped cells.
- They are oriented at right angles to the cortex.
- Axon arises from the side of the cell body and passes superficially.
- Dendrites extend from each end of the cell body branching into deeper and more superficial layers.
- Functions are similar to that of pyramidal cells.

HORIZONTAL CELLS OF CAJAL (OR) RETZIUS CAJAL CELLS

- Small ,spindle shaped.
- Oriented parallel to the surface.
- Least common cell type.
- Found only in most superficial layer.
- Axons pass laterally to synapse with dendrites of pyramidal cells.
- They are prominent during development, but disappear after birth.

LAYERS OF NEOCORTEX

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 2. outer granular layer
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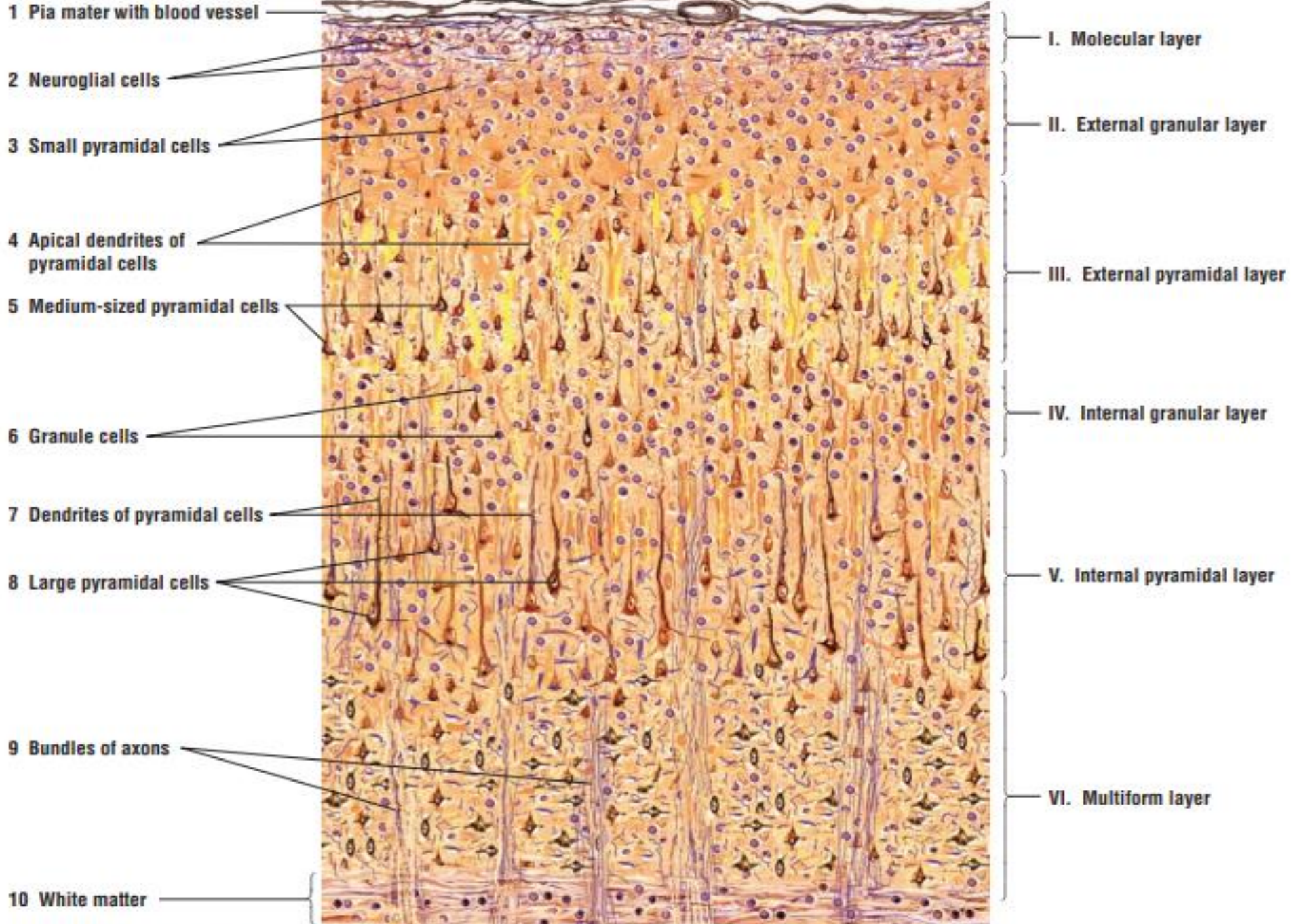
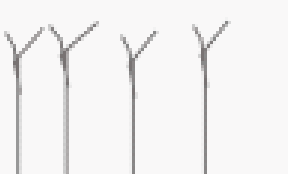

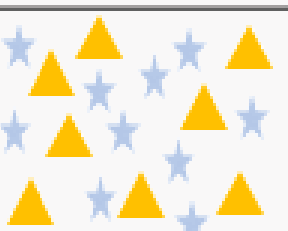
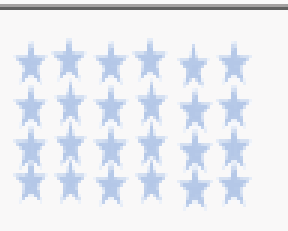
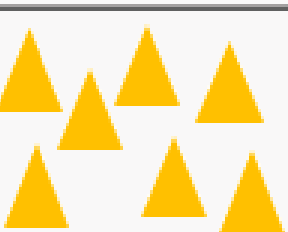



FIGURE 7.8 ■ Cerebral cortex: gray matter: Stain: silver impregnation (Cajal's method). Low magnification.

Layers	Components	Schematic	Afferents	Efferents
Cortical	Axons and Dendrites (Cell processes)		From other regions of Cortex and Brainstem	To other regions of cortex (Intra-cortical Association functions)
Granular	Densely packed Stellate cells + Small pyramidal cells			
Agranular	Loosely packed Stellate cells + Medium pyramidal cells			
Archicortical	Densely packed Stellate cells only			
Granular	Large pyramidal cells only (few stellate cells) – Giant Pyramidal cells of Betz		+ From Brain stem	To Brain & Spinal Cord (Projection)
Aggranular	Multiple sized pyramidal cells + Loosely packed stellate cells			To Thalamus

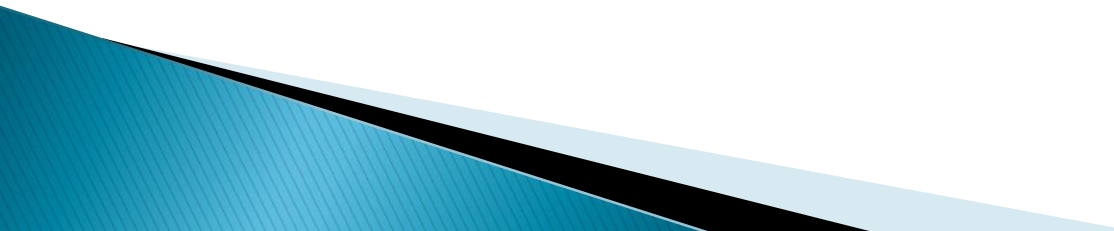
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1. PLEXIFORM LAYER

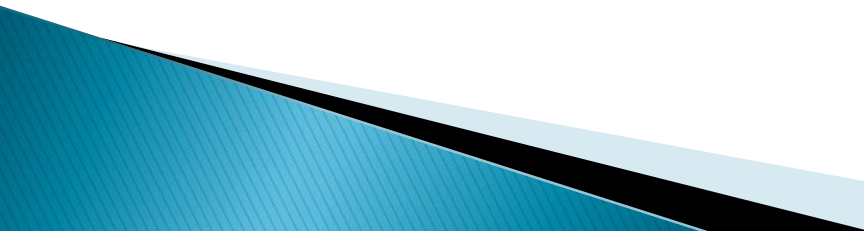
- Most superficial layer.
- Contains many dendritic and axonal synapses with one another.
- Sparse nuclei are seen that belongs to neuroglia.
- Occasional horizontal cells of cajal are seen.



MOLECULAR LAYER

- ▶ Overlying and covering the molecular cell layer is the delicate connective tissue of the brain, the pia mater.
 - ▶ The peripheral portion of molecular layer is composed predominantly of neuroglial cells and horizontal cells of Cajal.
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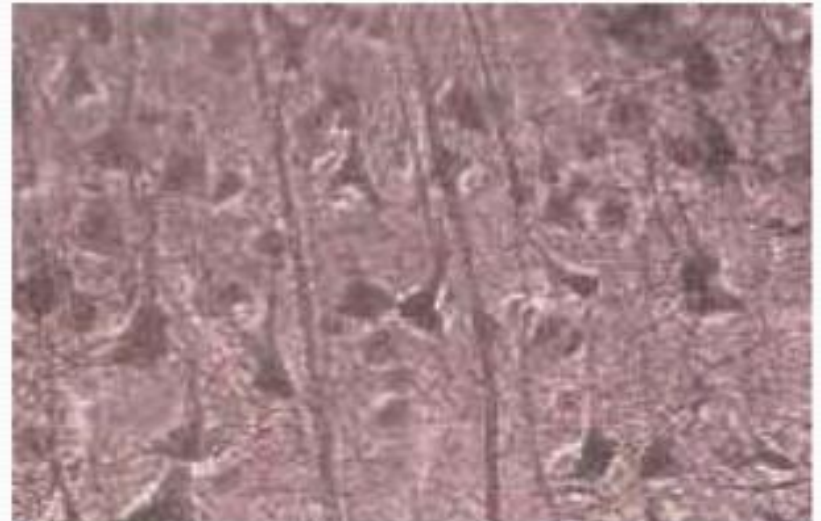
EXTERNAL GRANULAR LAYER

- ▶ The external granular layer contains mainly different types of neuroglial cells and small pyramidal cells.
 - ▶ Note that the pyramidal cells get progressively larger in successively deeper layers of the cortex.
 - ▶ The apical dendrites of the pyramidal cells are directed toward the periphery of the cortex, whereas their axons extend from the cell bases
- 

EXTERNAL PYRAMIDAL CELL LAYER

3. PYRAMIDAL CELL LAYER

- Moderate sized pyramidal cells predominate.
- Large pyramidal cells are present in further deeper layers.
- Martinotti cells are also present.



4. INNER GRANULAR LAYER

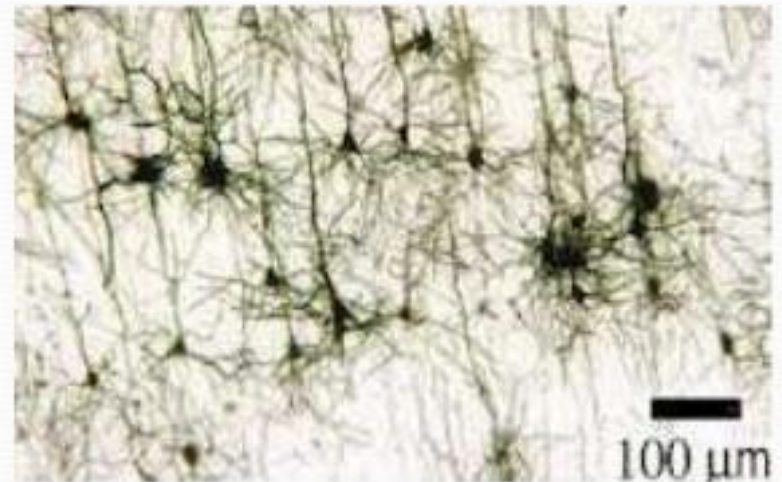
- Consists of densely packed stellate cells.



INTERNAL/INNER PYRAMIDAL CELLS LAYERS

5. GANGLIONIC LAYER

- Large pyramidal cells
- Stellate cells (few)
- Cells of martinotti
- Huge pyramidal Betz cells of motor cortex are present. Hence the name ganglion cell layer.



6. MULTIFORM CELL LAYER

- All morphological forms are found in this layer.
- Fusiform cells in deeper and other cells are present superficially in this layer.

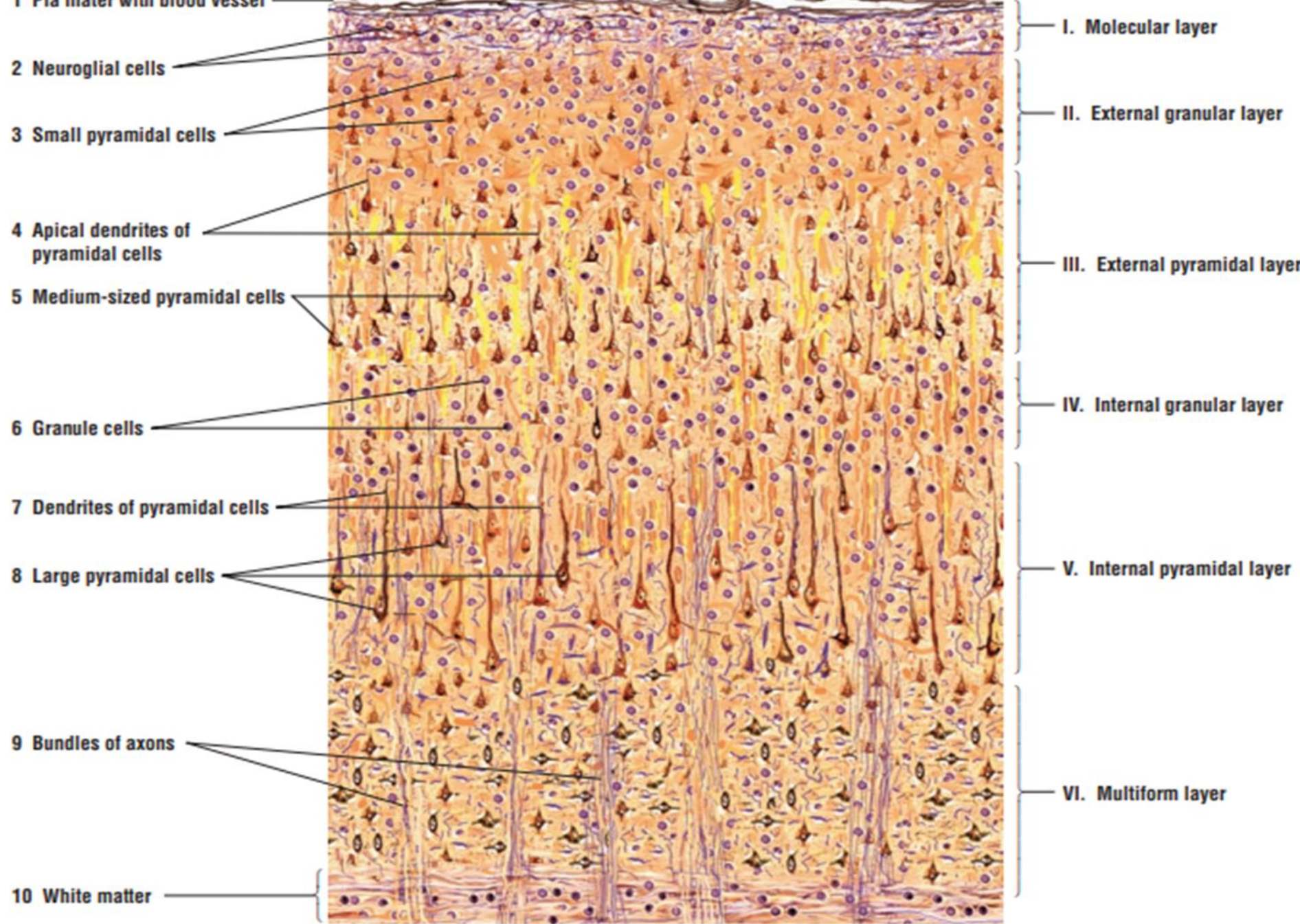


FIGURE 7.8 ■ Cerebral cortex: gray matter: Stain: silver impregnation (Cajal's method). Low magnification.

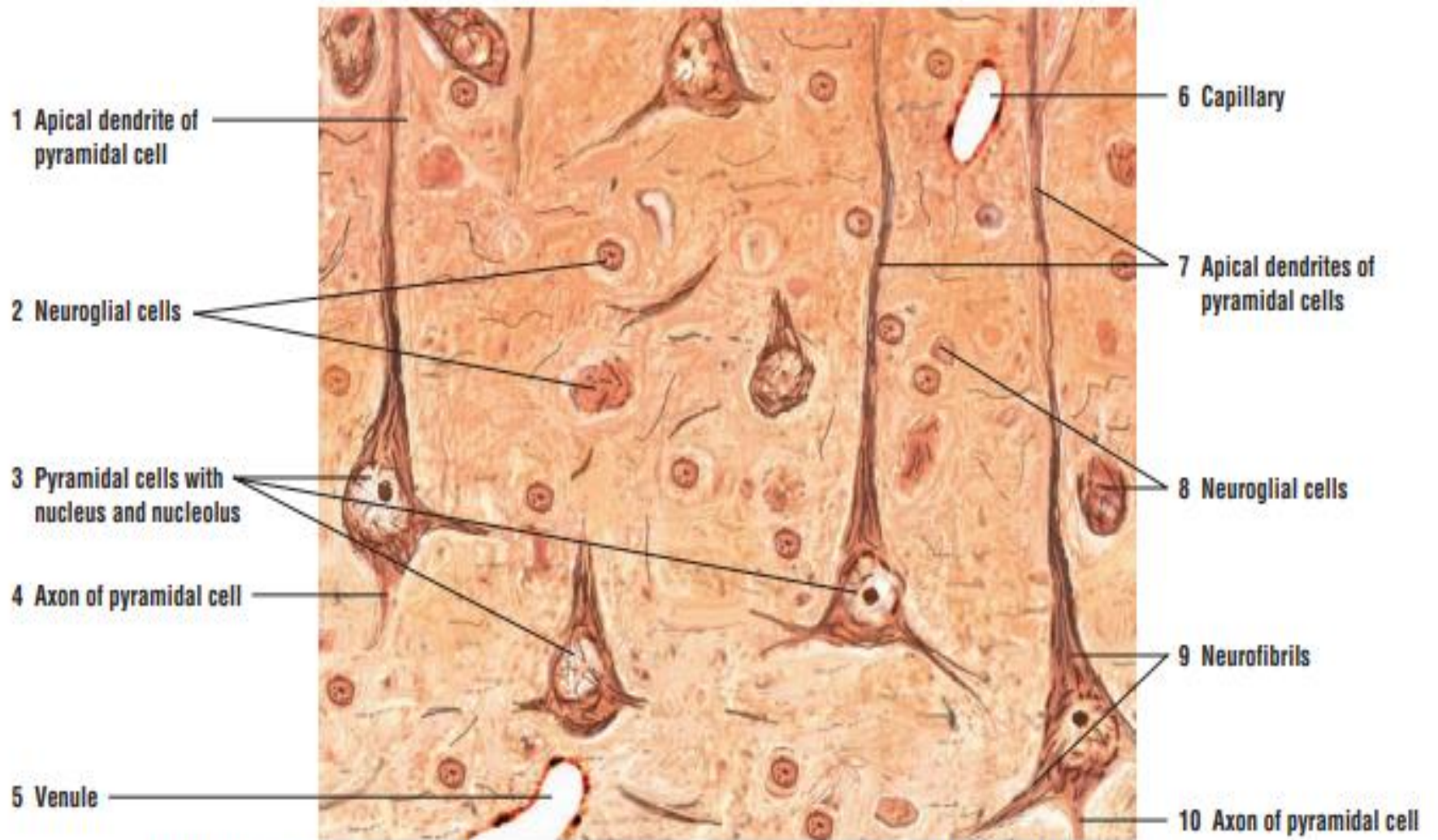
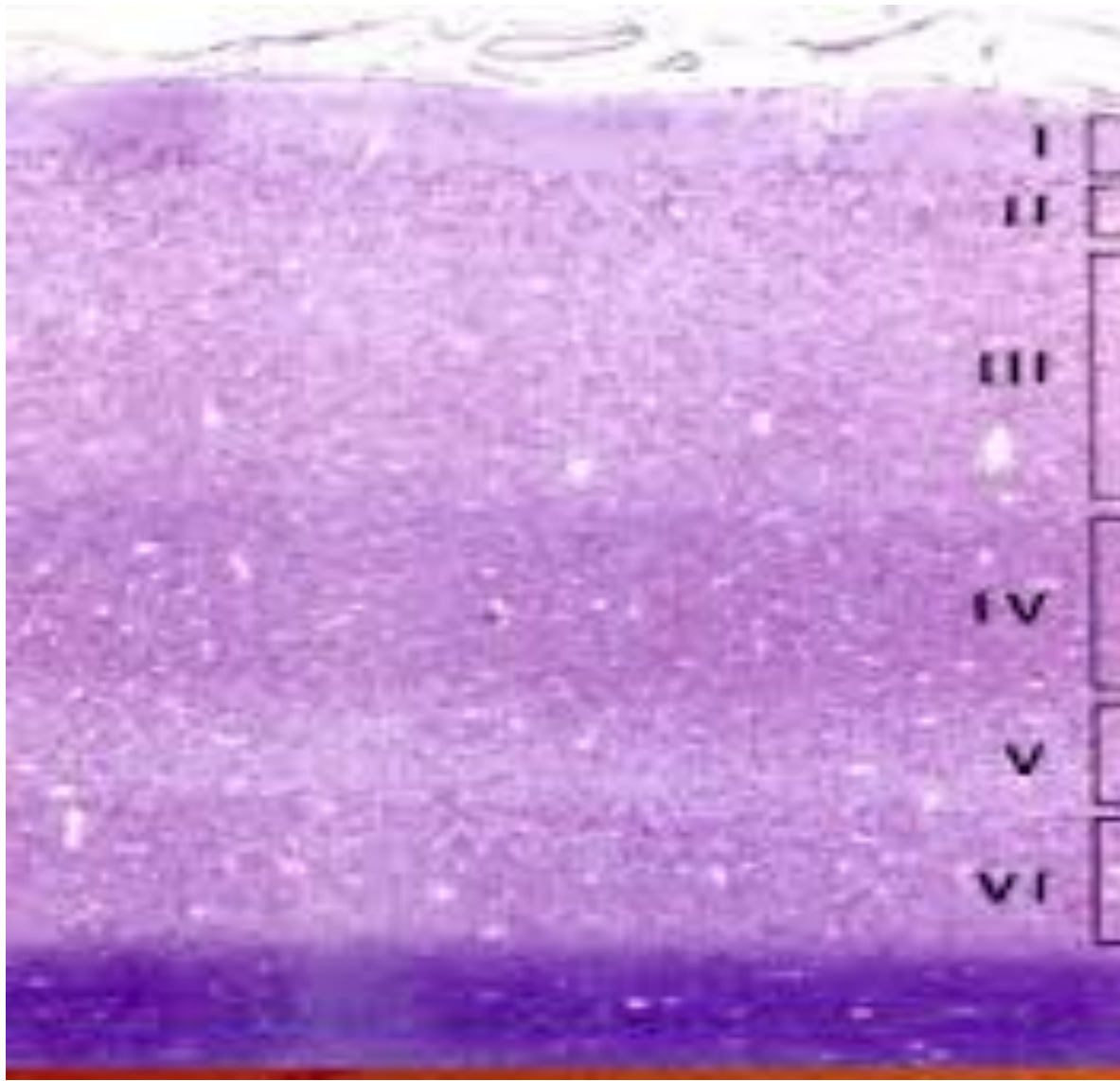


FIGURE 7.9 ■ Layer V of the cerebral cortex. Stain: silver impregnation (Cajal's method). High magnification.



neocortex

pia mater

Molecular layer

External granular layer

External pyramidal layer

Internal granular layer

Internal pyramidal layer

Multiform layer

white matter

