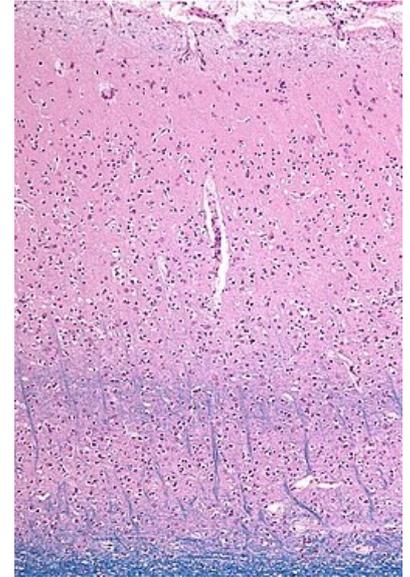


# Cytoarchitectonics of the brain cortex

**Cytoarchitectonics** is a method by which we study the structure of cortical regions of the brain. This method mainly studies the arrangement of neurons in the cerebral cortex.

The cytoarchitectonics of the cerebral cortex is best imaged by Nissl staining (contains toluidine blue - stains the granular endoplasmic reticulum), impregnation (shows the cytoskeleton, neurofibrils - neurofilaments, neurotubules) or staining for myelin (luxol blue). Neurons in the cerebral cortex are arranged linearly in six layers. There are two basic types of neurons - **pyramidal neurons** (predominant in the third and fifth layers), **star-shaped (granular) neurons** (predominant in the second and fourth layers). Other cells found in the cerebral cortex include spindle cells, Martinotti cells, horizontal Cajal cells (interneurons). Due to cytoarchitectonics, we divide the cerebral cortex into **homotypic** and **heterotypic**. The homotypic cortex contains six layers, while the heterotypic cortex is divided into the granular cortex (sensory areas, sensory centres - visual, auditory) and the agranular cortex (motor areas, most prominent in the gyrus precentralis). The basic six layers of the cortex include the lamina molecularis, lamina granularis externa, lamina pyramidalis externa, lamina granularis interna, lamina pyramidalis interna, and lamina multiformis.



Cerebral cortex - microscopic view

## Lamina molecularis (zonalis)

This layer is also referred to as the **molecular layer**. Here we find small **multipolar neurons** (mostly laid horizontally, their dendrites and axons are in this layer - associative function), **nerve cell processes**, **membrana limitans gliae superficialis** (formed by plasma astrocyte processes), horizontal **Cajal cells** and glial cells (predominant).

## Lamina granularis externa

This layer is also referred to as the **outer nuclear layer**. In this layer, we find mainly the bodies of **star-shaped cells** and **small pyramidal cells**. These small pyramidal cells are usually polarized opposite to other cells in the cortex - the apex faces the base, the axon faces the molecular layer. The main function of the cells in this layer is associative; we also find dendrites of cells from deeper layers.

## Lamina pyramidalis externa

This layer is referred to as the **outer pyramidal layer**. We find here mainly the bodies of **smaller pyramidal cells** (the main dendrite facing the lamina molecularis, the axon facing the white matter), **star-shaped** and **Martinotti cells** (multipolar neurons of star or spindle shape, which have dendrites close to the cell and the axon facing the lamina molecularis). The main function of most neurons in this layer is associative.

## Lamina granularis interna

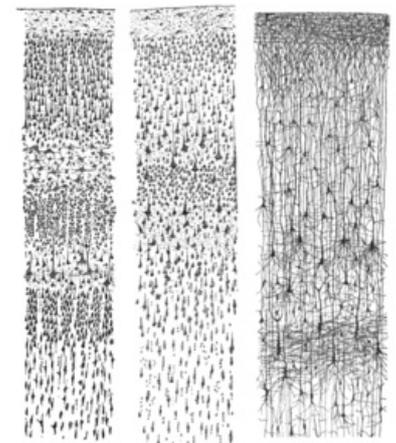
This layer is also referred to as the **inner nuclear layer**. This layer is strong in the sensory cortical areas (visual cortex), and almost absent in the motor cortical areas. **Small star-shaped (granular) cells** and **interneurons** are the main constituents.

## Lamina pyramidalis interna

This layer is referred to as the **inner pyramidal layer** or **lamina ganglionalis**. Here we find large cells of - pyramidal **cells of Betz** (up to 120µm), which dendrite faces the lamina molecularis and axons are part of the pyramidal pathway

## Lamina multiformis

It is also referred to as the **multiform layer** or **polymorphic cell layer**. There are mainly **spindle, granular** and **Martinotti's cells** (large polymorphic neurons).



Comparison of visual cortex (left), motor cortex (middle) and cerebral cortex of a young child (right). For the first two schematics, Nissl's staining method is used, which highlights the perikarya; for the latter, Golgi's method highlights the neuronal processes.

# Links

## Related articles

- Brain
- Neuroglia
- Axon
- Neuron
- Myeloarchitectonics of the brain cortex
- Functional cortical areas

## External links

- Mozek (česká wikipedie)
- Brain (wikipedia)

## Literature

- KONRÁDOVÁ, Václava – UHLÍK, Jiří – VAJNER, Luděk. *Funkční histologie*. 2. edition. H&H, 2000. ISBN 978-80-86022-80-2.
- JUNQUEIRA, L. Carlos – CARNEIRO, José – KELLEY, Robert O. *Základy histologie*. 1. v ČR edition. H & H, 1997. 502 pp. ISBN 80-85787-37-7.