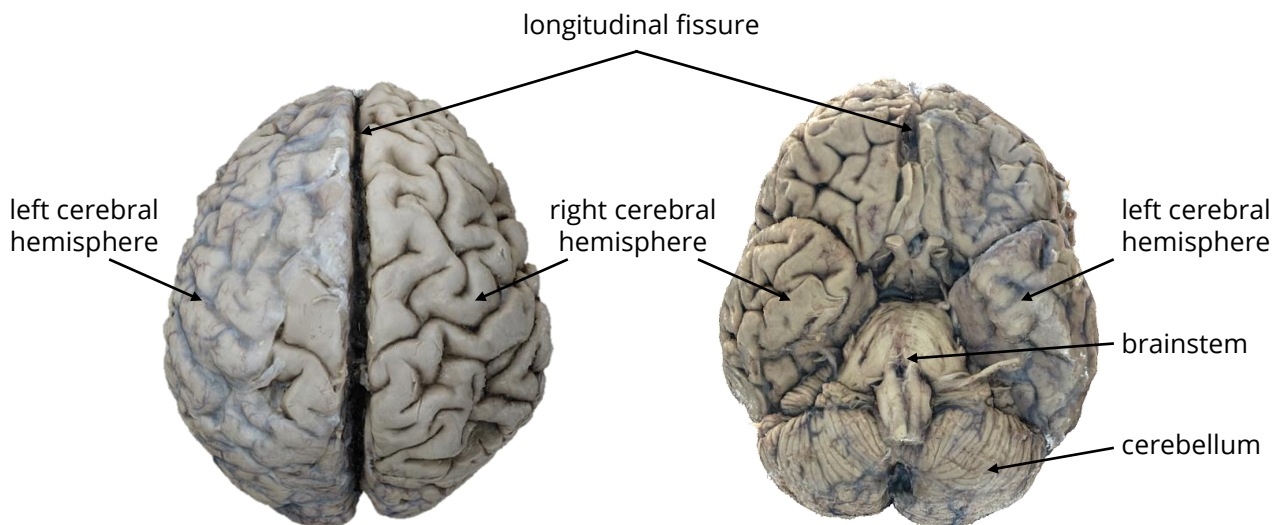


## Surfaces of the cerebrum

In this lab we will study the different structures at the surface of the brain. We will look at a whole brain as well as a single hemisphere (brain cut in a mid-sagittal section).

### Main regions of the central nervous system

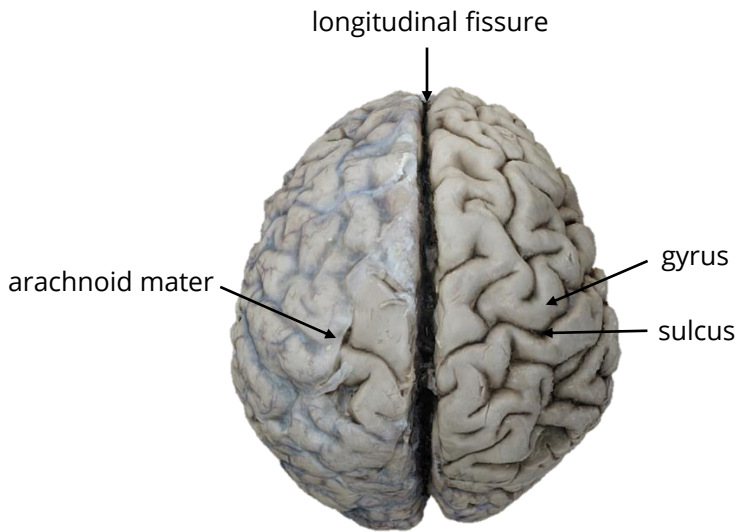
Examine the brain in front of you, it weighs about 1.5 kg and it is continuous with the spinal cord that we studied in the previous lab. Its main regions include the cerebrum which is divided by the longitudinal fissure to the right cerebral hemisphere and the left cerebral hemisphere, the cerebellum and the brainstem.



### Meninges

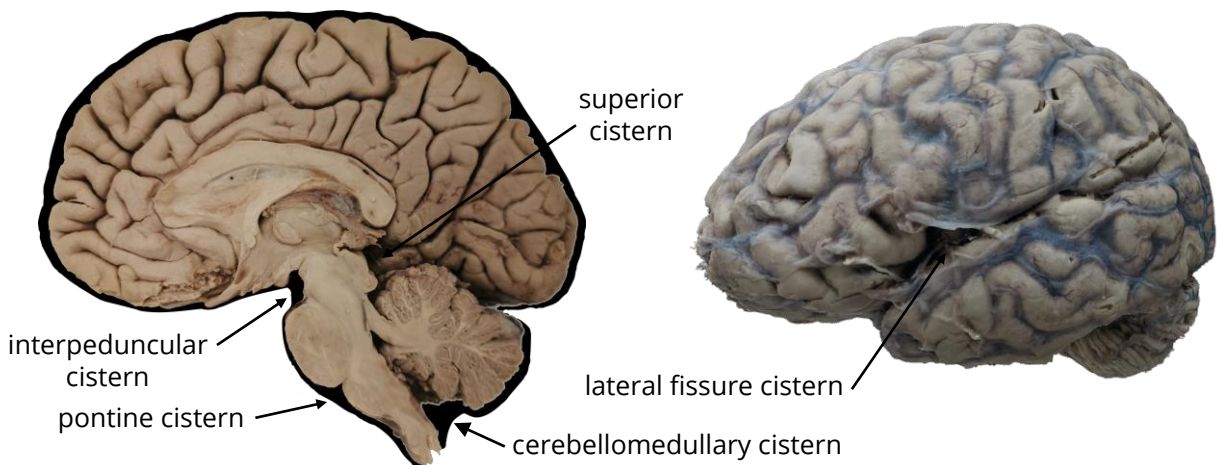
First, we will identify the three meninges that cover the brain: dura, arachnoid and pia. The dura mater (hard) is the most external meninx, it is a thick hard membrane that is located close to the skull. Within the longitudinal fissure, find a fold of dura that leaves the skull and enters it, the falx cerebri (sickle). When the brain is removed, most of the dura remains attached to the skull. The translucent meninx that covers the left hemisphere is the arachnoid mater (spider web). In the right hemisphere, the arachnoid is removed and you can see the gyri (folds) and sulci (grooves) of the cerebral cortex. The innermost meninx is the pia mater, it is a very thin membrane that closely follows the cerebral cortex. Unlike the spinal cord, it cannot be easily seen in the brain.

## Structures in the surface of the cerebrum



## Subarachnoid cisterns

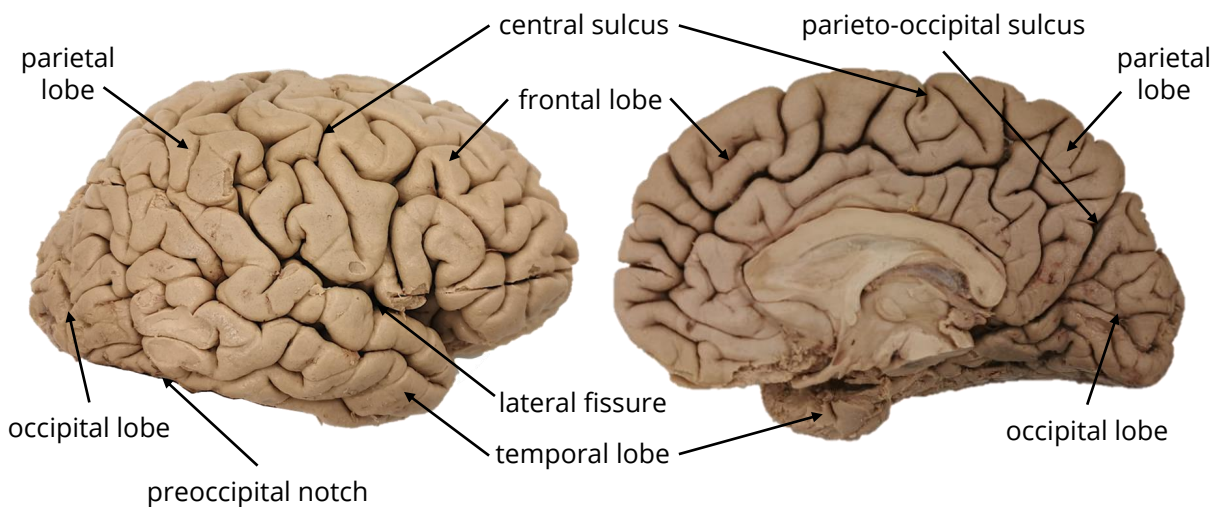
Notice that the arachnoid covers the brain superficially, it passes over the brain surfaces and does not enter into the sulci. In the living human the subarachnoid space is filled with cerebrospinal fluid (CSF). A cistern (reservoir), is an area where the arachnoid passes over a gap between structures and contains more CSF. Identify the cerebellomedullary cistern (cisterna magna), pontine cistern, interpeduncular cistern, superior cistern and lateral fissure cistern.



## Hemispheric lobes (right hemisphere)

Clear the arachnoid from the hemisphere. Three main sulci divide the hemisphere into four lobes. In the lateral surface find the lateral fissure (lateral sulcus) and the central sulcus. In the medial surface find the parieto-occipital sulcus.

Anterior to the central sulcus is the frontal lobe. Inferior to the lateral fissure is the temporal lobe. Between the central sulcus and the parieto-occipital sulcus is the parietal lobe. Posterior to the parieto-occipital sulcus and the preoccipital notch is the occipital lobe.



## Lateral surface of the hemisphere

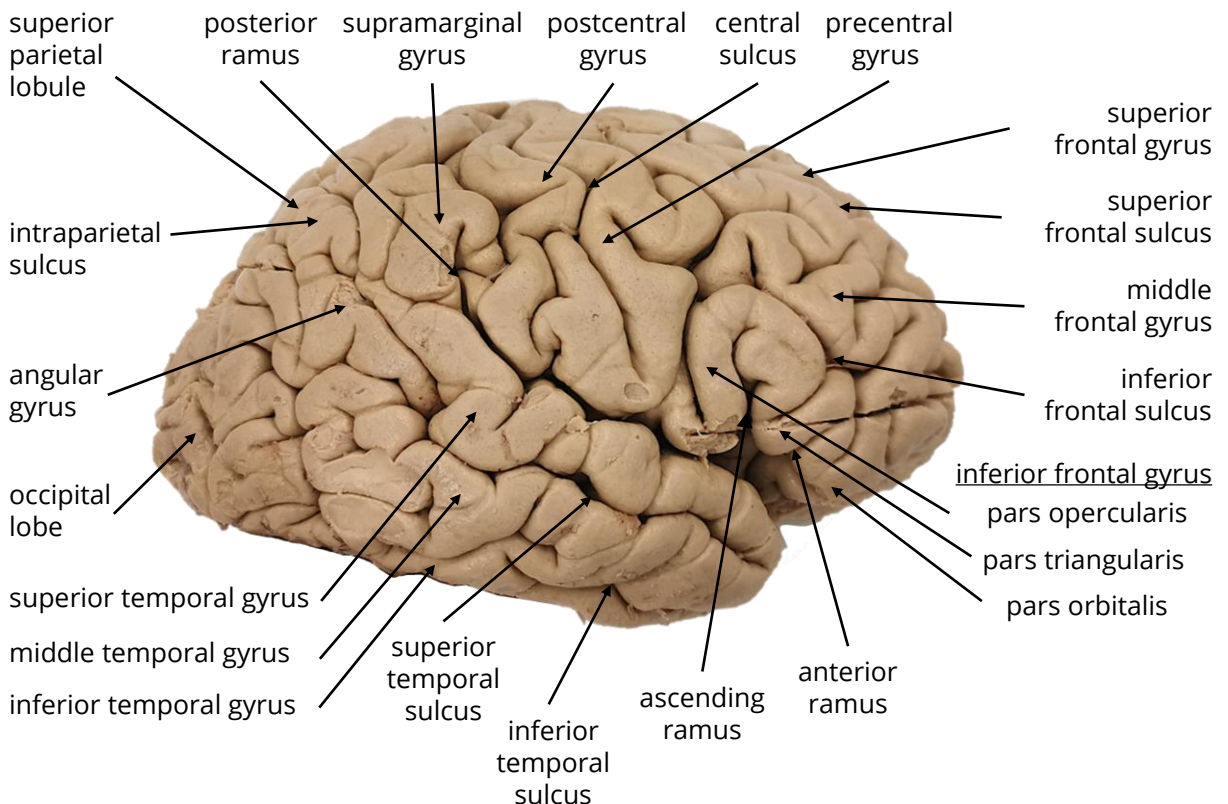
In the lateral surface, the frontal lobe is divided to four gyri. Anterior to the central sulcus is the precentral gyrus that contains the primary motor area. The superior frontal sulcus and the inferior frontal sulcus separate between the superior frontal gyrus, middle frontal gyrus and inferior frontal gyrus. The inferior frontal gyrus is further divided into three parts by two branches of the lateral fissure. The anterior ramus and the ascending ramus separate between the pars orbitalis, pars triangularis and pars opercularis.

## Lateral surface of the hemisphere

The temporal lobe is divided to three gyri. The superior temporal sulcus and the inferior temporal sulcus separate between the superior temporal gyrus, middle temporal gyrus and inferior temporal gyrus.

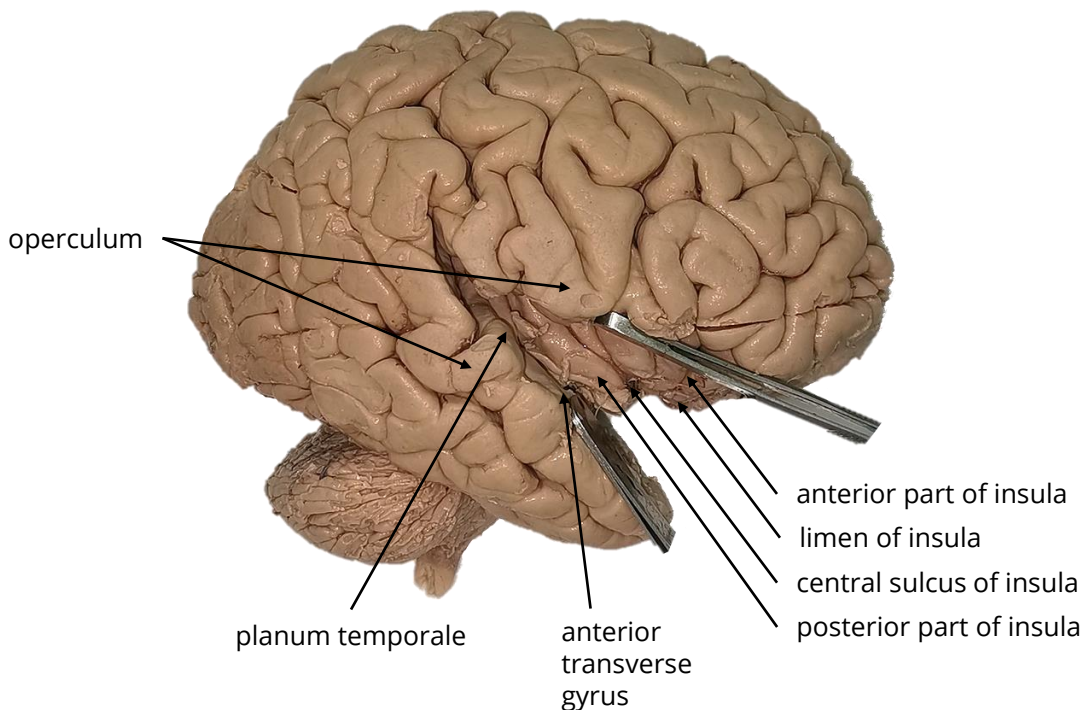
The parietal lobe is divided to four gyri. Posterior to the central sulcus is the postcentral gyrus that contains the primary sensory area. The supramarginal gyrus is located around the posterior ramus of the lateral fissure. The angular gyrus is located around the posterior part of the superior temporal sulcus. The intraparietal sulcus separates between the superior parietal lobule and the inferior parietal lobule (supramarginal gyrus and angular gyrus).

In the lateral surface, the occipital lobe is not further divided.



## Structures in the lateral fissure

Gently spread apart the gyri on each side of the lateral fissure. Within it, find a part of the cortex that is covered by the neighboring gyri, the insula (island). Together, the gyri that cover it (inferior frontal gyrus, lower parts of the precentral and postcentral gyri and superior temporal gyrus) form the operculum (lid). The insula is divided by the central sulcus of insula into an anterior part that is composed of short gyri and a posterior part that is composed of long gyri. The anterior edge of the insula is the limen insulae (threshold). Within the lateral fissure, continuous with the superior temporal gyrus, find the planum temporale and the anterior transverse gyrus (Heschl's convolution) that contains the primary auditory area.

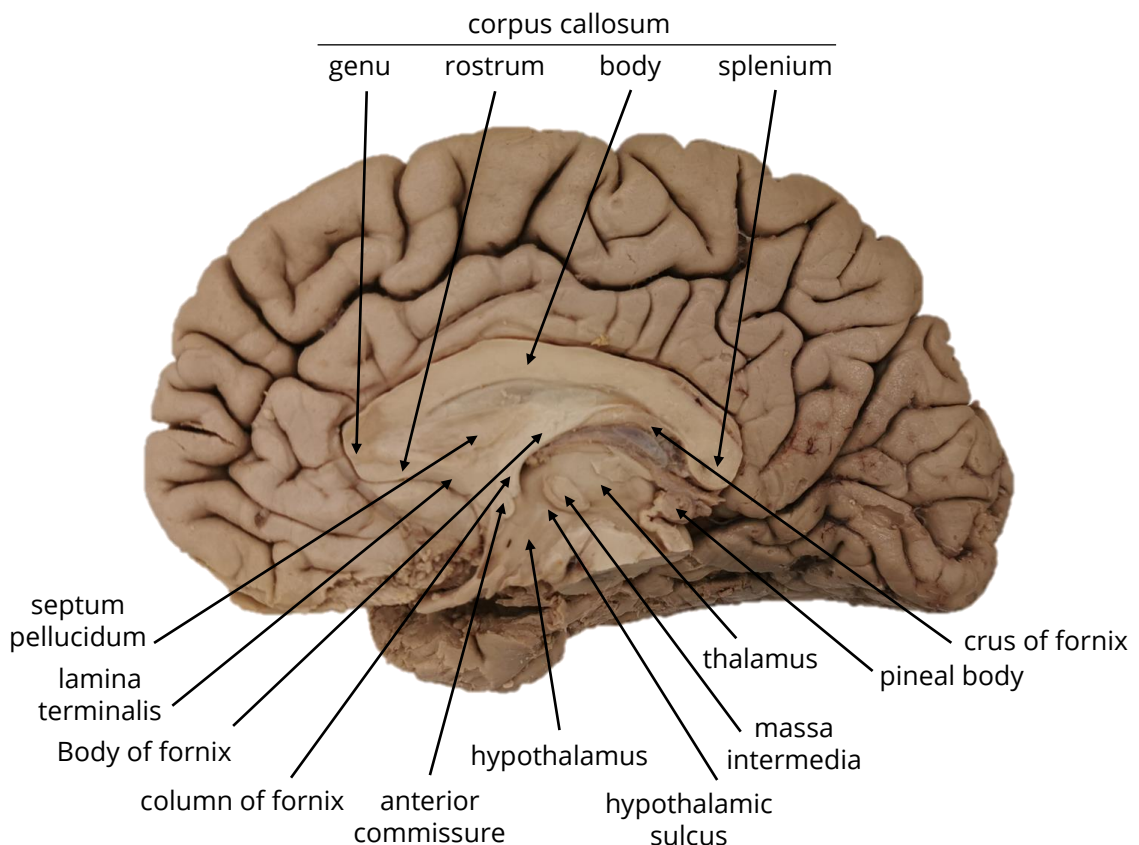




## Medial surface of the hemisphere

### Subcortical structures

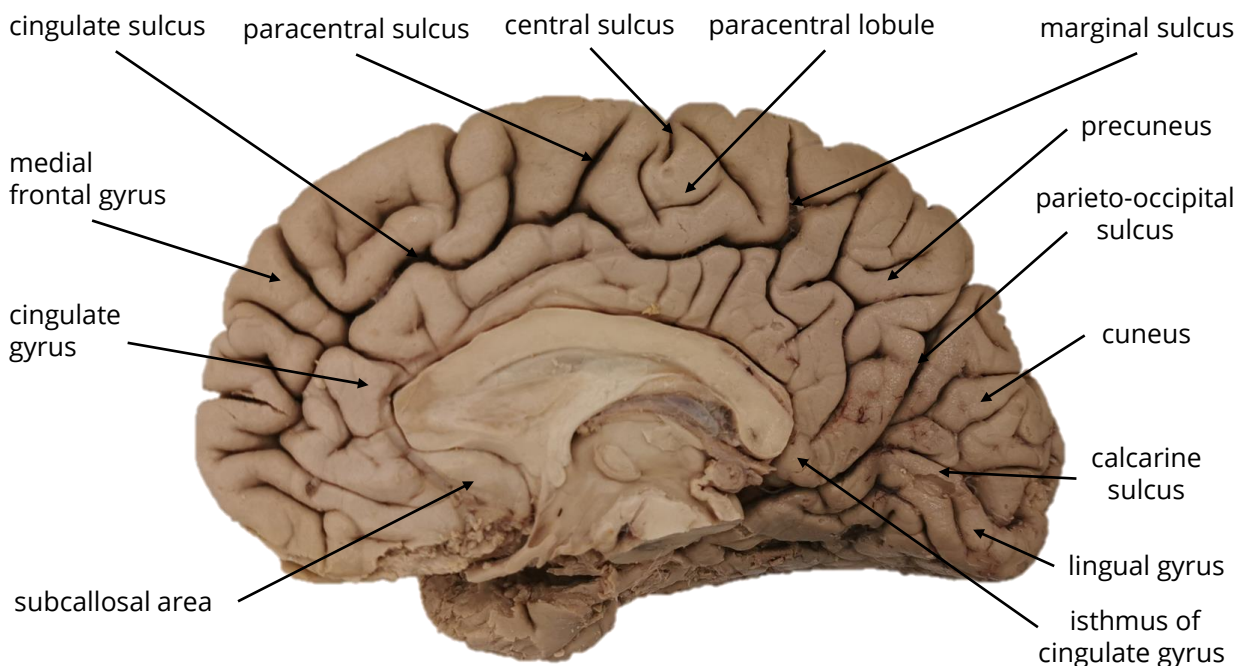
Identify the corpus callosum, it is a large structure of white matter that connects the two hemispheres. In the midsagittal section, it is divided to the rostrum (beak), genu (knee), body and splenium (bandage). Inferior to it, find the fornix (arch), it is a white matter structure of the hippocampus. The fornix is divided to the column, body and crus (leg). Between the corpus callosum and the fornix find the septum pellucidum. It is a thin sheet of neuroglial tissue that separates the frontal horns of the lateral ventricles. Continuing the line of the rostrum, find the lamina terminalis and posterior to it, the anterior commissure. Inferior to the fornix, find an oval structure, the thalamus (inner chamber) and in its center the interthalamic adhesion (massa intermedia). Inferior to the thalamus is the hypothalamus with the hypothalamic sulcus between them. Posterior to the thalamus find the pineal body.



## Medial surface of the hemisphere

### Cortical structures

In the medial surface, the cingulate sulcus divides the frontal lobe into the medial frontal gyrus and the cingulate gyrus (belt). Its two posterior branches, the paracentral sulcus and the marginal sulcus, define the paracentral lobule that surrounds the part of the central sulcus that slightly continues into the medial surface. The area of cortex below the genu of corpus callosum is also called the subcallosal area. Follow the cingulate gyrus posteriorly into the parietal lobe and notice how it becomes narrow posterior to the splenium of corpus callosum, this area is the isthmus of cingulate gyrus (neck). Anterior to the parieto-occipital sulcus is the precuneus and posterior to it, the occipital lobe. It is divided by the calcarine sulcus, that contains the primary visual area, to the cuneus and the lingual gyrus.



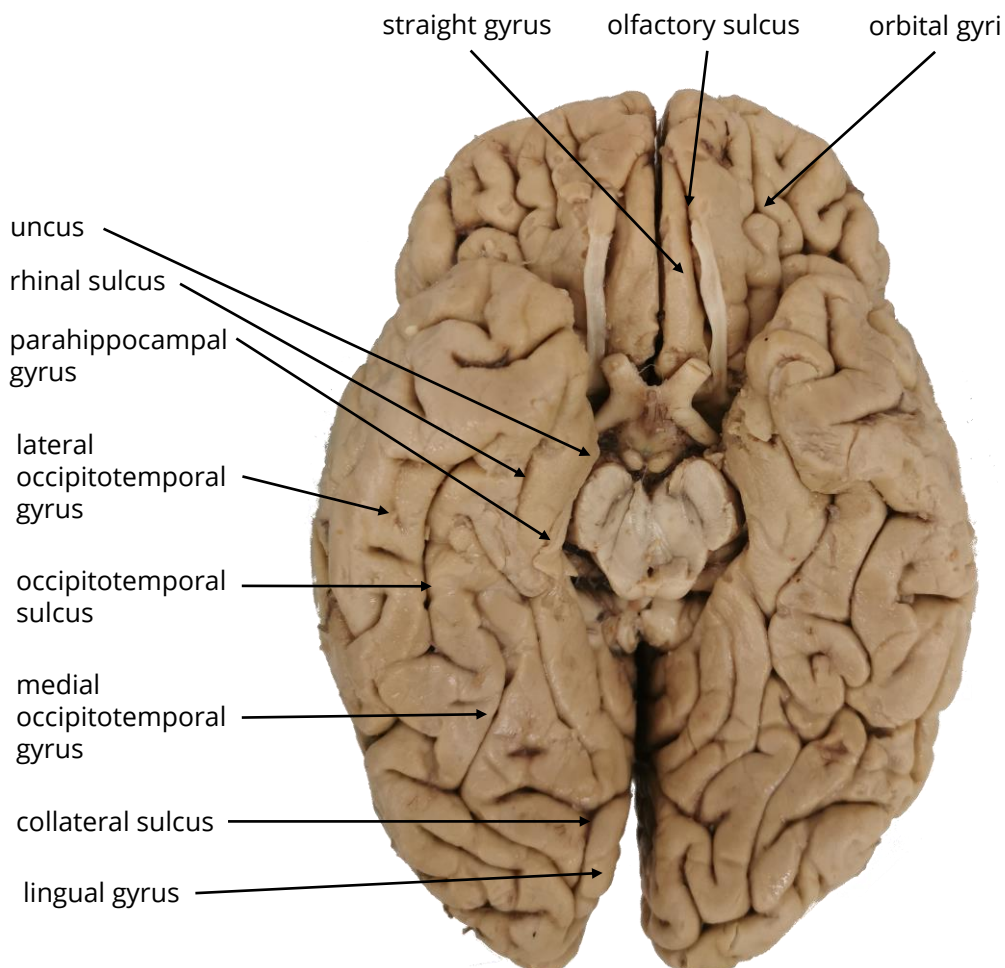
## Inferior surface of the hemisphere

### Cortical structures

In the inferior surface, the frontal lobe is divided by the olfactory sulcus into the straight gyrus (gyrus rectus) and the orbital gyri.

In the occipital lobe, the lingual gyrus is defined laterally by the collateral sulcus.

In the temporal lobe, the parahippocampal gyrus is defined laterally by the rhinal sulcus. Its curved anterior part, the uncus (hook), contains the primary olfactory area. The occipitotemporal sulcus divides between the medial occipitotemporal gyrus (fusiform gyrus) and the lateral occipitotemporal gyrus.





## Inferior surface of the hemisphere

### Subcortical structures

Aligned with the olfactory sulcus, find the olfactory bulb and the white matter coming out of it, the olfactory tract. At its posterior part, it splits into the medial olfactory striae and the lateral olfactory striae. Between them, find the anterior perforated substance.

Next, find the optic nerve, optic chiasm and optic tract. Gently move aside the parahippocampal gyrus and follow the optic tract posteriorly, notice how it reaches the lateral geniculate nucleus of the thalamus. Inferior to the optic chiasm, identify the infundibulum (funnel), it connects the hypophysis (pituitary gland) and the hypothalamus. Notice two protruding round nuclei of the hypothalamus, the mammillary bodies. Between them and the midbrain (that was cut in order to remove the brainstem and cerebellum), find the posterior perforated substance.

