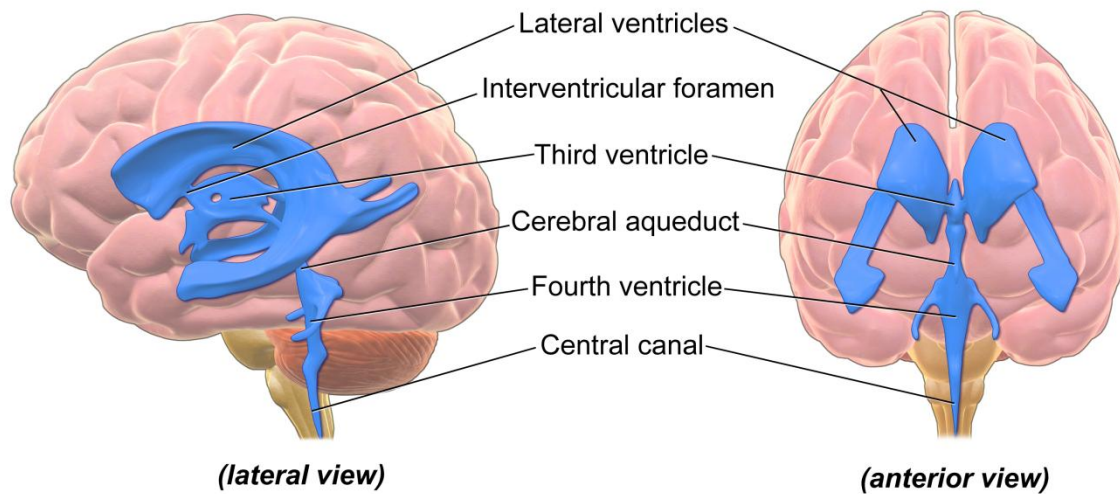


*In this lab you should be able to identify the different parts of the internal capsule and the basal ganglia in coronal and horizontal sections*

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## INTRODUCTION



In the picture above, notice the locations of the following structures within the cerebral hemisphere:

- Lateral ventricle
  - Third ventricle
  - Cerebral aqueduct
  - Fourth ventricle
- The lateral ventricles are C-shaped, and constitute of the following parts, along with their locations:

Anterior horn	Frontal lobe
Body	Parietal lobe
Inferior horn	Temporal lobe
Posterior horn	Occipital lobe

- The third ventricle is present between the two thalami, and is connected to the lateral ventricles through *the interventricular foramina*.
- The fourth ventricle is connected to the third ventricle through *the cerebral aqueduct*.

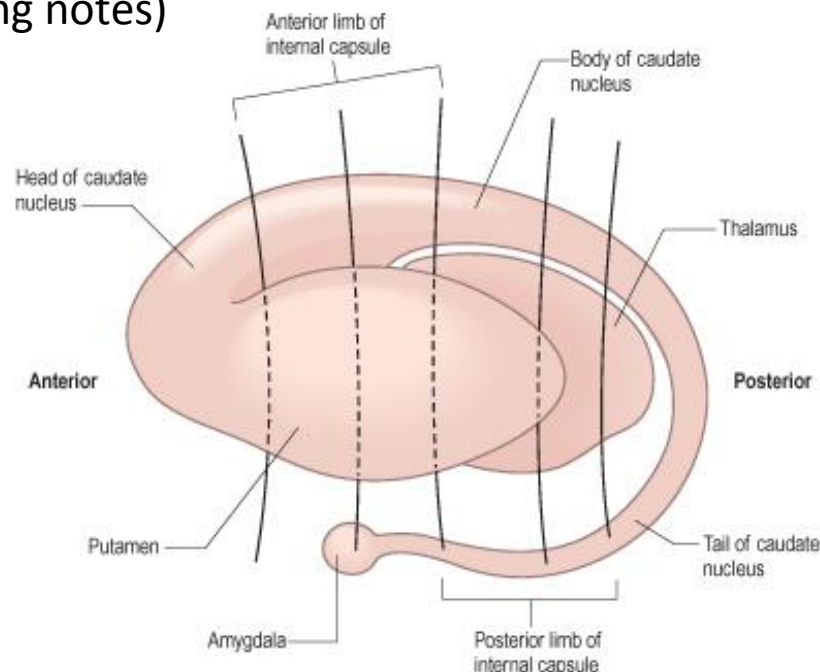
❖ Important note

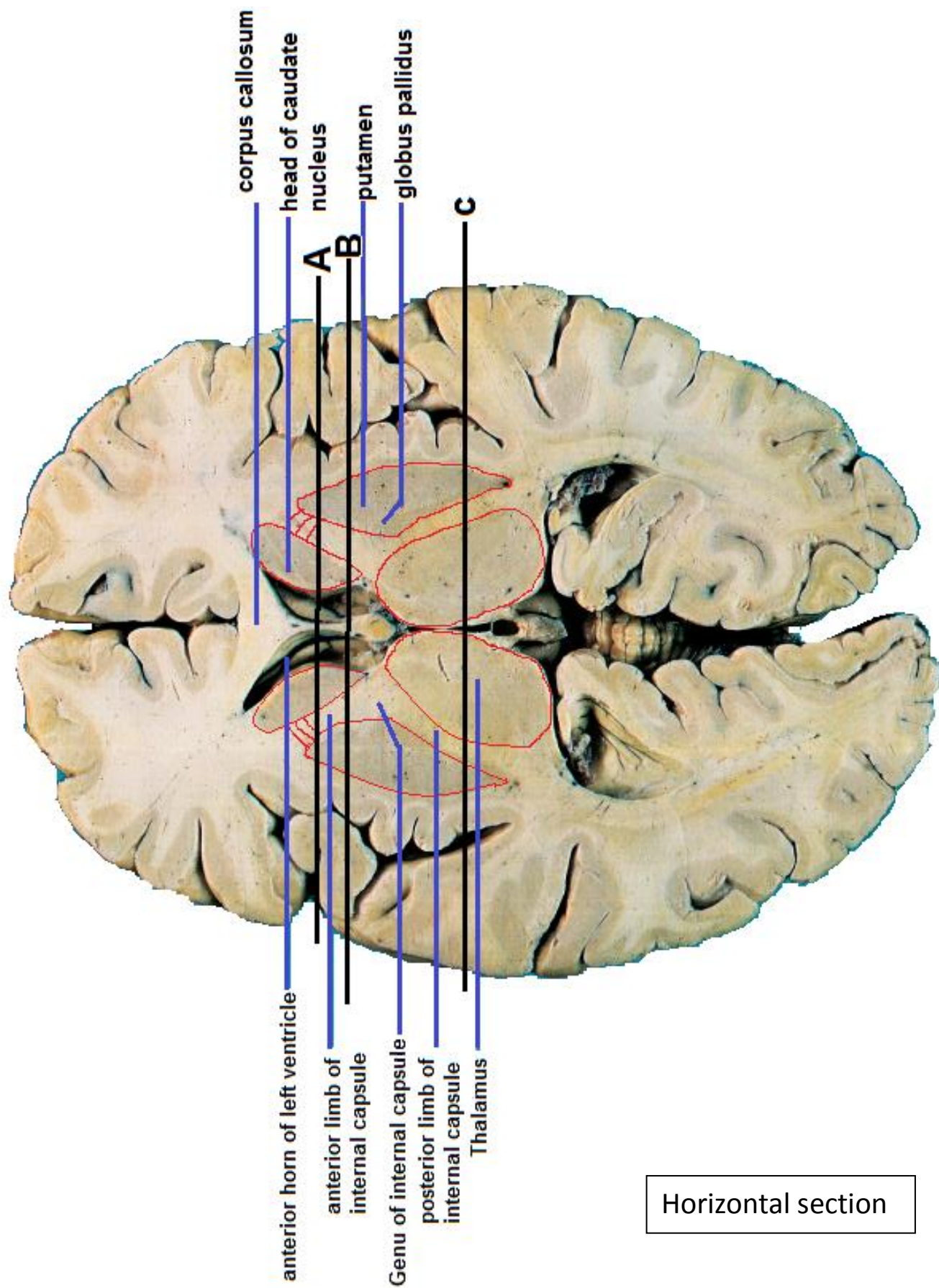
The lateral fissure has the frontal and parietal lobes above it, and the temporal lobe below it.

Deep in the lateral fissure, part of the **parietal** cortex is submerged and folded inside to form the **insula**.

Deep to the insula and just beneath it is the largest part of the basal ganglia, which is the **lentiform nucleus**.

(Please refer to the pictures below while studying the following notes)





Horizontal section

- ⇒ If we take a horizontal section in the lentiform nucleus, we find that it's made up of three parts, which are the putamen, the Globus pallidus externus and the Globus pallidus internus. Medial to the lentiform nucleus is the internal capsule, and medial to the internal capsule is the caudate and thalamus.
- ⇒ The caudate has a head, a body and a tail that terminates in the amygdaloid nucleus (amygdala).

**The internal capsule has the following parts:**

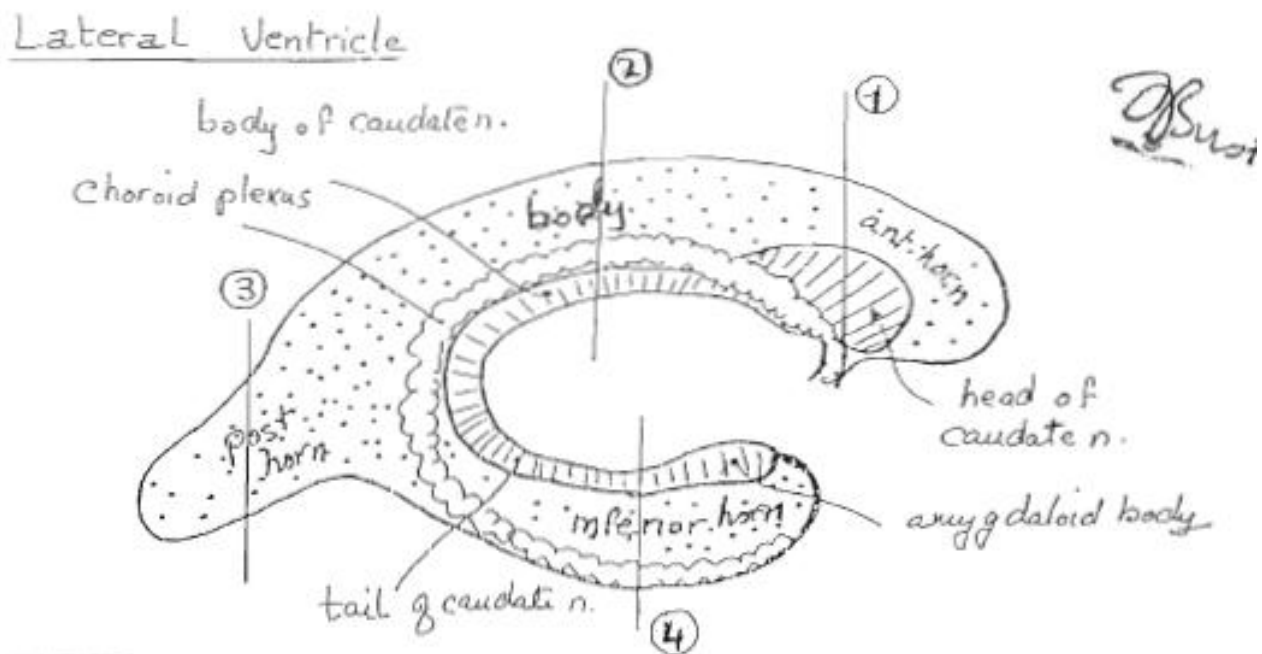
- ⇒ Between the caudate and lentiform nucleus is the anterior limb of the internal capsule.
- ⇒ Between the lentiform and the thalamus is the posterior limb of the internal capsule.
- ⇒ At the angle between the anterior and posterior limbs is the genu.
- ⇒ Behind the lentiform nucleus is the retrolentiform part of internal capsule.
- ⇒ Beneath the lentiform nucleus is the sublentiform part of internal capsule.

(All of these parts appear in a horizontal section except the sublentiform part)

(Refer to the previous horizontal section in studying the following levels of coronal sections)

Coronal section	Location	Crossed areas
<b>A</b>	Frontal lobe (more to the front)	<ul style="list-style-type: none"> <li>• Head of caudate</li> <li>• putamen</li> </ul>
<b>B</b>	Frontal lobe (more to the posterior)	<ul style="list-style-type: none"> <li>• Head of caudate</li> <li>• Putamen</li> <li>• Globus pallidus</li> </ul>
<b>C</b>	Parietal lobe	<ul style="list-style-type: none"> <li>• Thalamus and brain stem (on the same level)</li> <li>• Putamen with or without the Globus pallidus depending on the level of the section)</li> </ul>

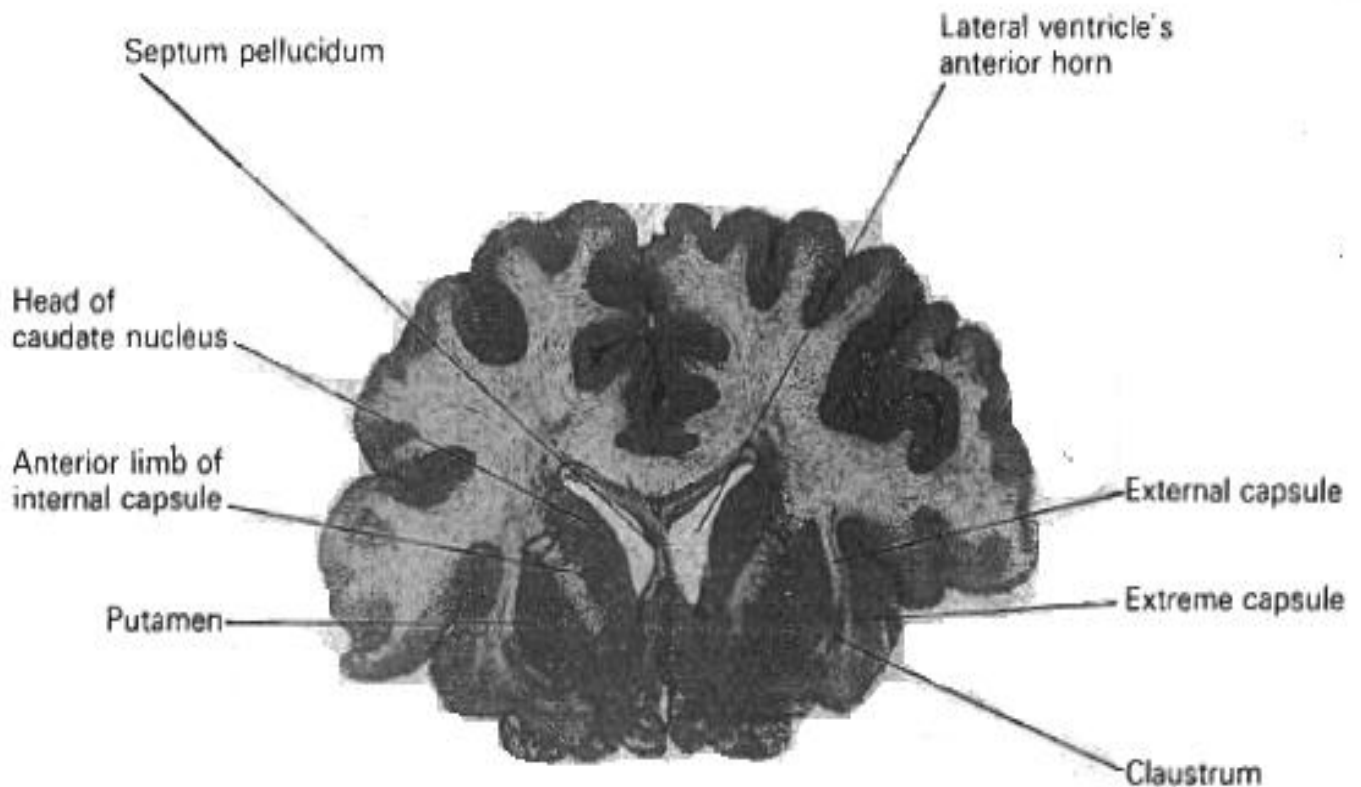
⇒ Now take a look at the following diagram



- Section at number (1): at the frontal lobe  
anterior horn of lateral ventricle – head of caudate
- Section at number (2): at the parietal lobe  
Body of the lateral ventricle – body of the caudate
- Section at number (4): at the temporal lobe  
inferior horn of the lateral ventricle- tail of the caudate  
and amygdaloid body (superiorly)

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***Coronal section through the anterior horns of the lateral ventricles (within the frontal lobe)***

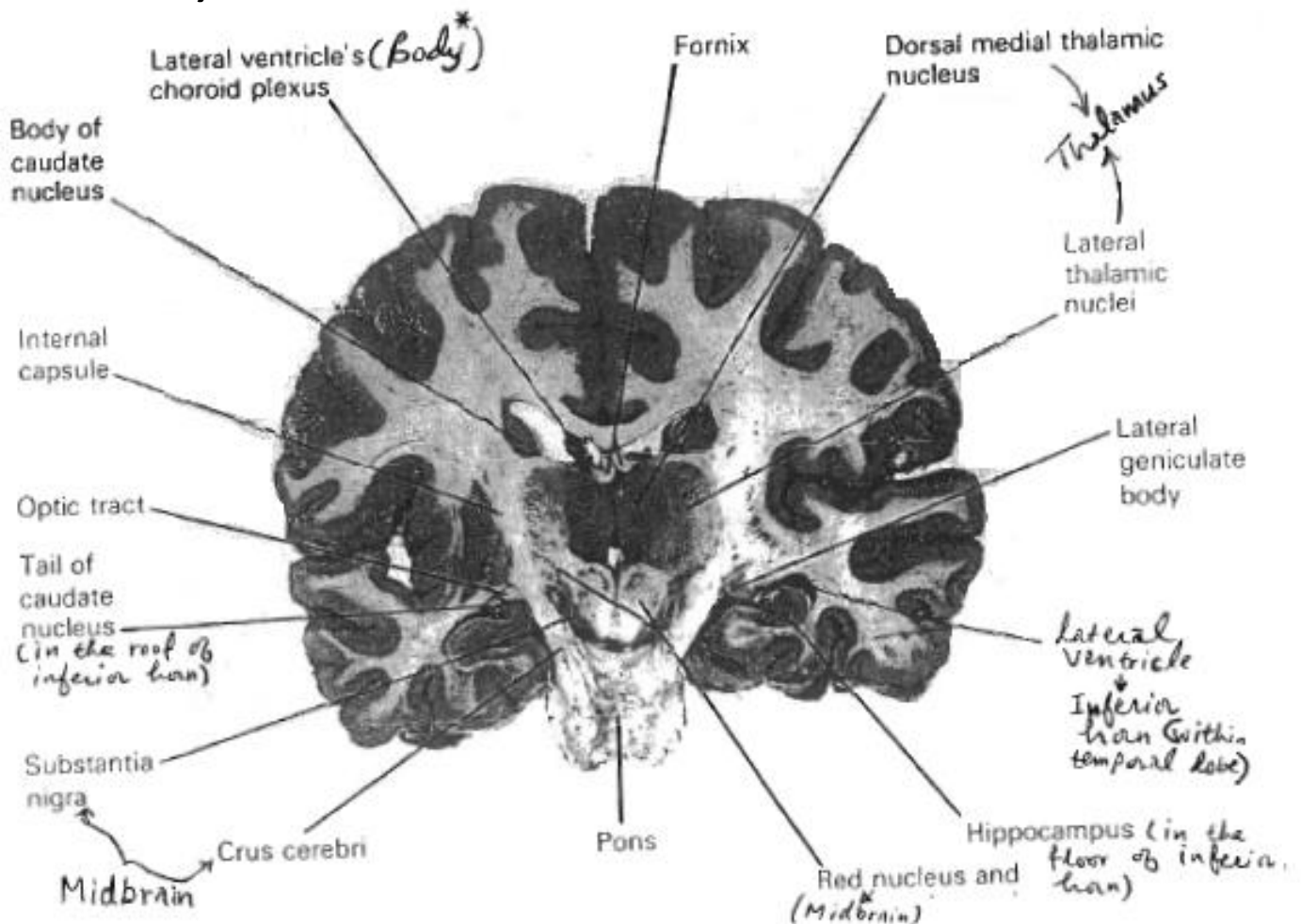


**Roof of anterior horn of lateral ventricle:** genu of corpus callosum

**laterally:** head of caudate (bulging to the inside)

**medially:** septum pellucidum and fornix

***Coronal section through the bodies and inferior horns of the lateral ventricles (within the parietal and temporal lobes)***





⇒ Section through the body of the lateral ventricle (within the parietal lobe)

**Roof of body of lateral ventricle:** body of corpus callosum

**Medially:** fornix

**Laterally:** body of caudate

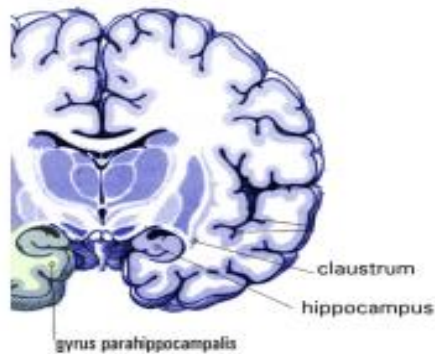
⇒ Section through the inferior horn of the lateral ventricle (within the temporal lobe)

**Roof:** tail of caudate and amygdale

**Floor:** hippocampus (hippocampal gyrus)

**Laterally:** tapetum of corpus callosum

Note: the hippocampus is an inward fold of the cortex, while the parahippocampus is bulging outwards.



*Description for the previous section*

[Coronal section passing through parietal and temporal lobes, separated by the lateral fissure, which has the insula in its depth. We notice the two thalami, so the section must be passing through the brain stem, because they're at the same level. So we see the midbrain, pons and medulla.

Above the thalamus is the body of the lateral ventricle, and above



the body of the lateral ventricle is the body of the corpus callosum. The body of caudate is present laterally. And between the two thalami is the third ventricle.

between the caudate and lentiform is the anterior limb of internal capsule, while between the thalamus and lentiform is the posterior limb of internal capsule, and at the angle is the genu of internal capsule.

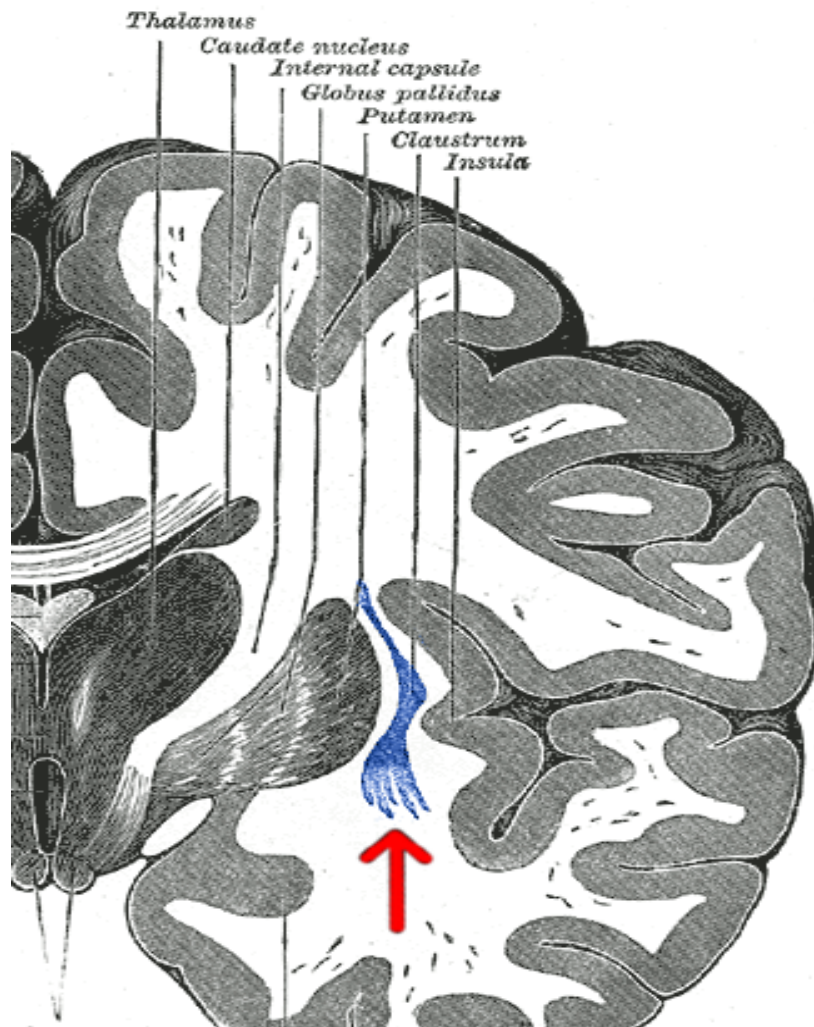
Inferior to the thalami we see the red nucleus of the midbrain, and under the red nucleus we see substantia nigra which is anatomically part of the midbrain but physiologically part of the basal ganglia. lateral to substantia nigra is a white matter that is an extension of the internal capsule and part of the midbrain called crus.

note: substantia nigra produces dopamine, lack of dopamine is responsible for Parkinson's disease, where patients have increased muscle tone.

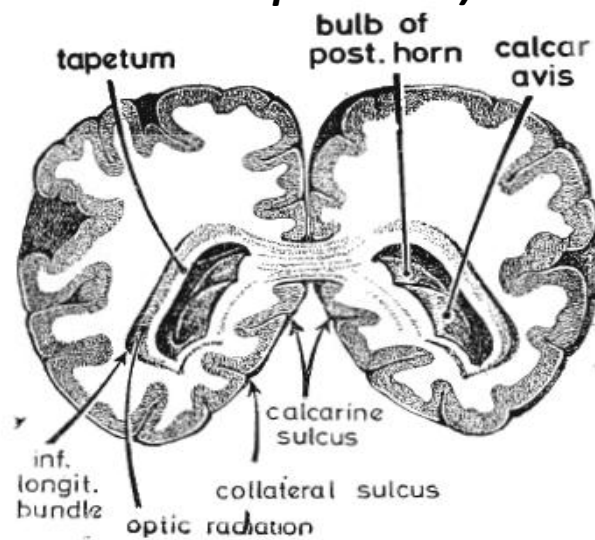
The inferior horn appears as a small cavity, at its floor is an inward fold of the cortex which is the hippocampus, and the parahippocampus remains outside. ]

**\*\*in stereotactic surgery for Parkinson's disease the doctor inserts an electrode to burn the Globus pallidus internus, to relief the tremor. The electrode must pass in the following layers:**  
lateral fissure → insula → white matter (extreme capsule) → claustrum → external capsule → putamen → GP(e) → GP(i) → posterior limb of internal capsule → thalamus → Third ventricle.

If the electrode reaches the posterior limb of internal capsule, we lose the whole movement.



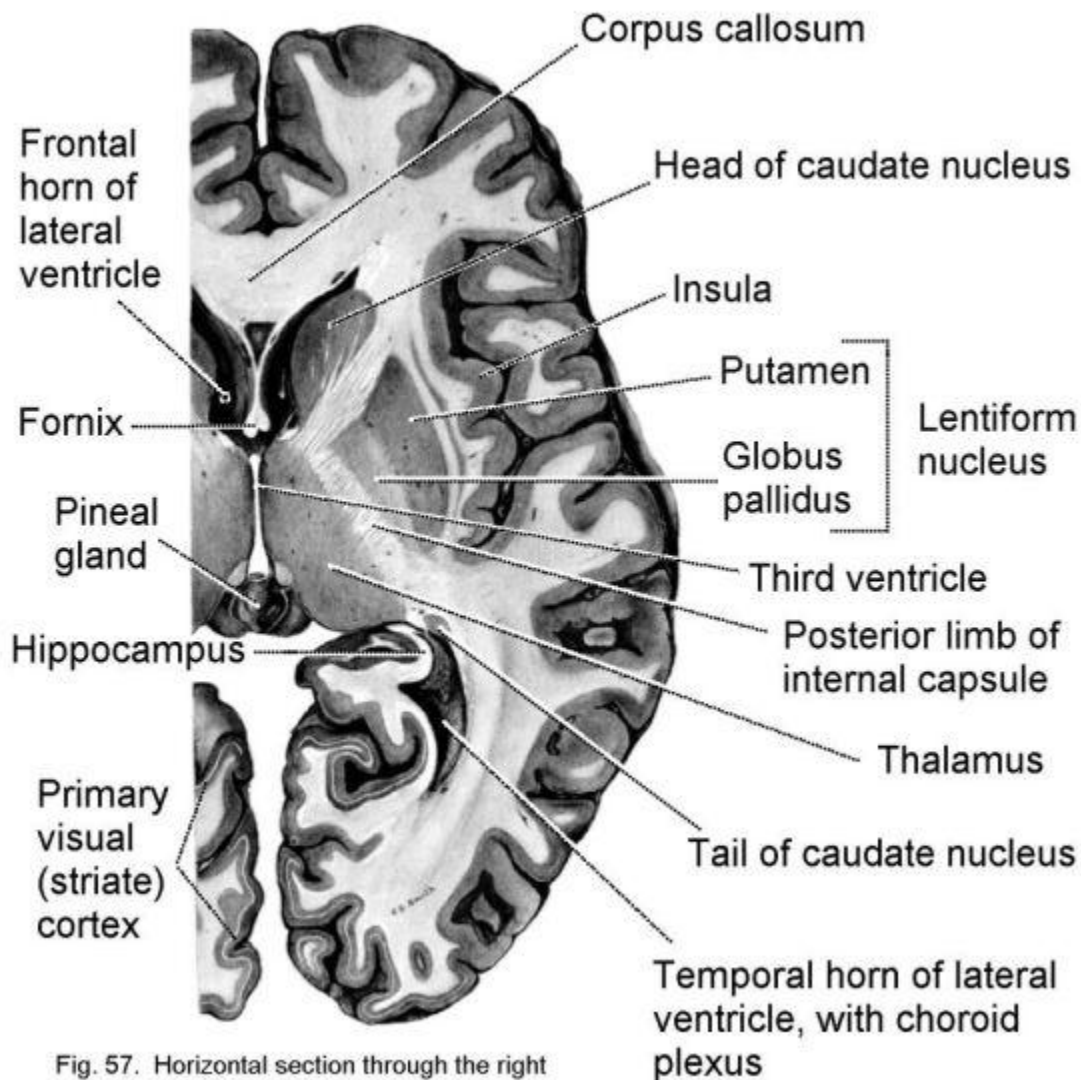
***Coronal section through the posterior horns of the lateral ventricles (within the occipital lobe)***



**Roof:** tapetum

**medially:** bulb of posterior horn (from splenium) and calcar avis  
(result from projection of calcarine fissures to the inside)

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This picture is a horizontal section through the brain, because it passed through two parts of the corpus callosum, the genu and

splenium, it also passes through the two thalami and the anterior and posterior horns of the lateral ventricles.

This section is important for the identification of four out of five parts of the internal capsule. We notice the anterior limb of the internal capsule between the caudate and lentiform, the posterior limb lies between the thalamus and lentiform, the genu is present at the angle, the retrolentiform part is found behind the lentiform nucleus, and finally the sublentiform part is present underneath the lentiform (doesn't show).

If this section passed through the genu of corpus callosum but not through the splenium, the cerebellum will start to appear gradually, because the cerebellum is found under the splenium.

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Q: in a section passing through the frontal and temporal lobe, which parts of the limbic system appear in this section?

Amygdala, hippocampus, parahippocampus, nucleus accumbens, cingulate gyrus (above the corpus callosum).