

# Ανατομία Βασικών Γαγγλίων

Δημήτριος Μυτιληναίος

# Στόχοι

1. Ορισμός των βασικών γαγγλίων (Β.Γ.)
2. Περιγραφή της ανατομικής θέσης και των ανατομικών σχέσεων των Β.Γ.
3. Περιγραφή των συνδέσεων και των βασικών λειτουργιών των Β.Γ.

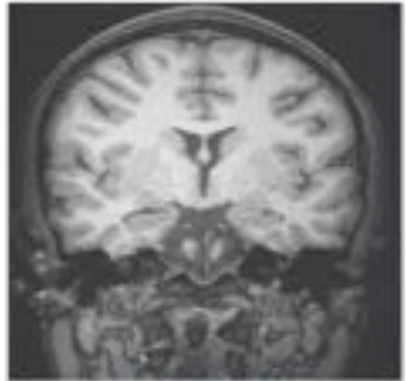
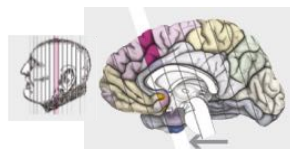
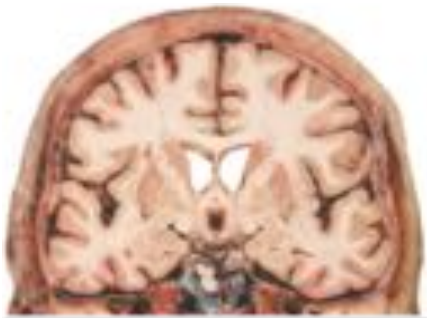
Τα βασικά γάγγλια:

είναι πυρρήνες φαιάς ουσίας μέσα στον  
τελικό εγκέφαλο

περιβάλλονται από λευκή ουσία

παρουσιάζουν πολλαπλές συνδέσεις με  
φλοιώδεις και υποφλοιώδεις περιοχές

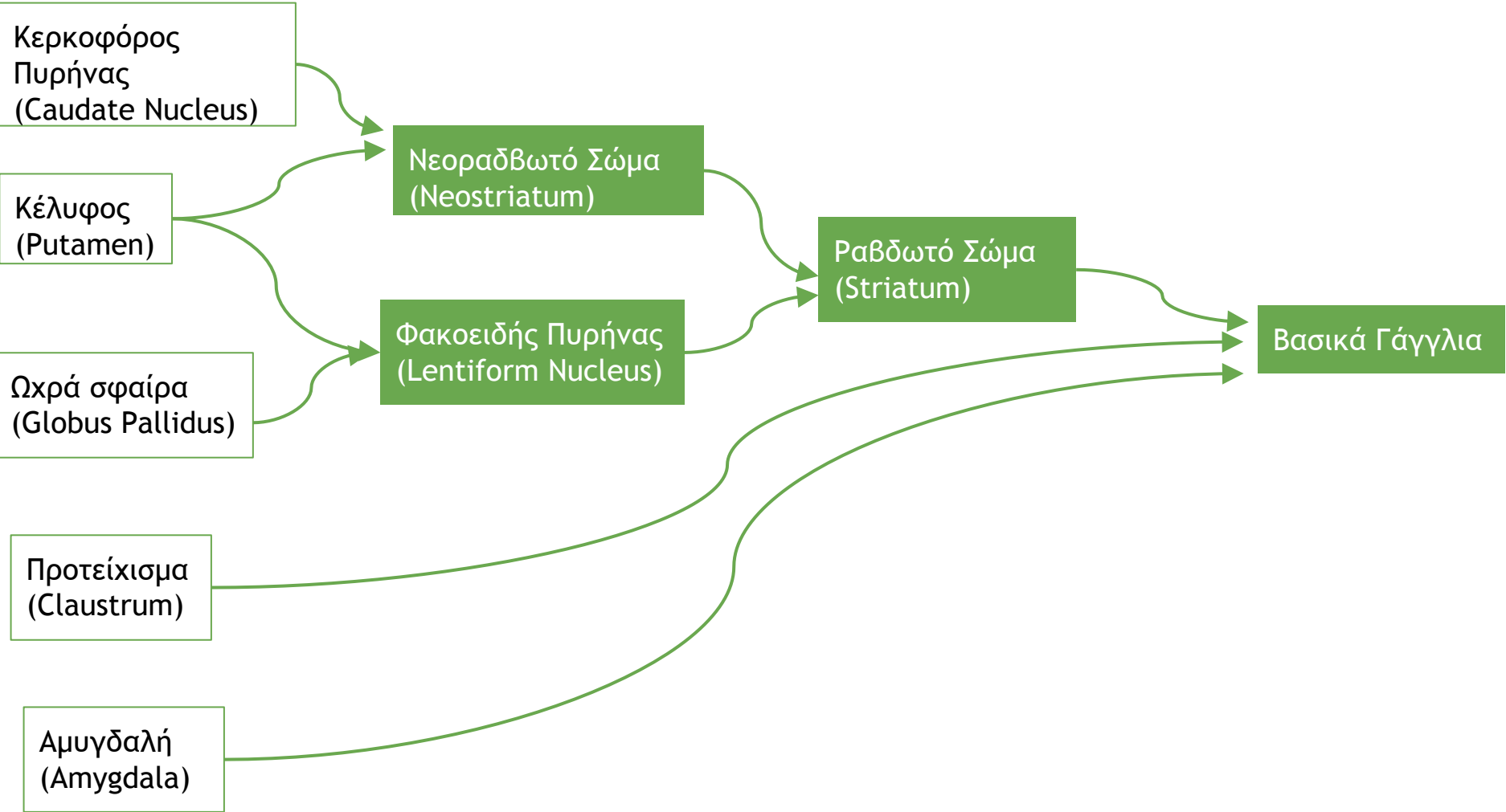




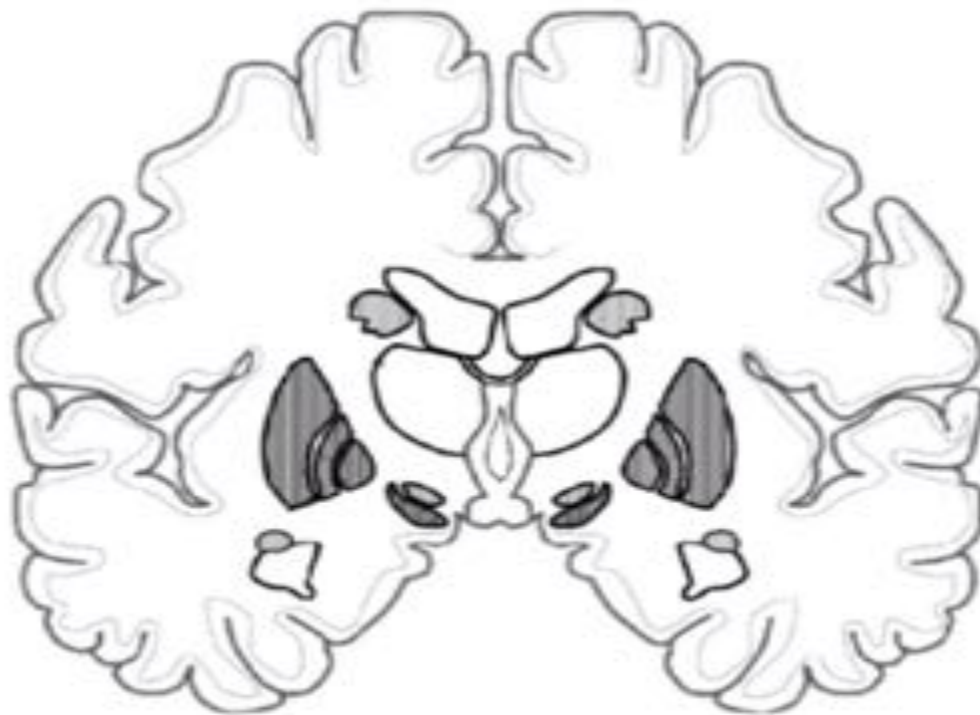
βρίσκονται εξωτερικά των πλαγίων κοιλιών

ανάμεσα στην τρίτη κοιλία και στη νήσο

περιβάλλονται από λευκή ουσία



# Κερκοφόρος Πυρήνας



# Κερκοφόρος Πυρήνας



LATERAL VENTRICLES

# Κερκοφόρος Πυρήνας



LATERAL VENTRICLES  
THIRD VENTRICLE



# Κερκοφόρος Πυρήνας



LATERAL VENTRICLES

THIRD VENTRICLE

THALAMUS

# Κερκοφόρος Πυρήνας



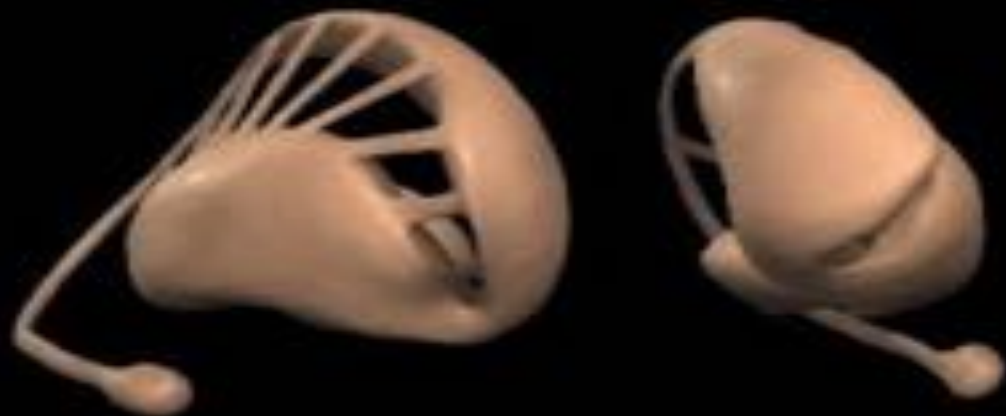
CAUDATE NUCLEUS



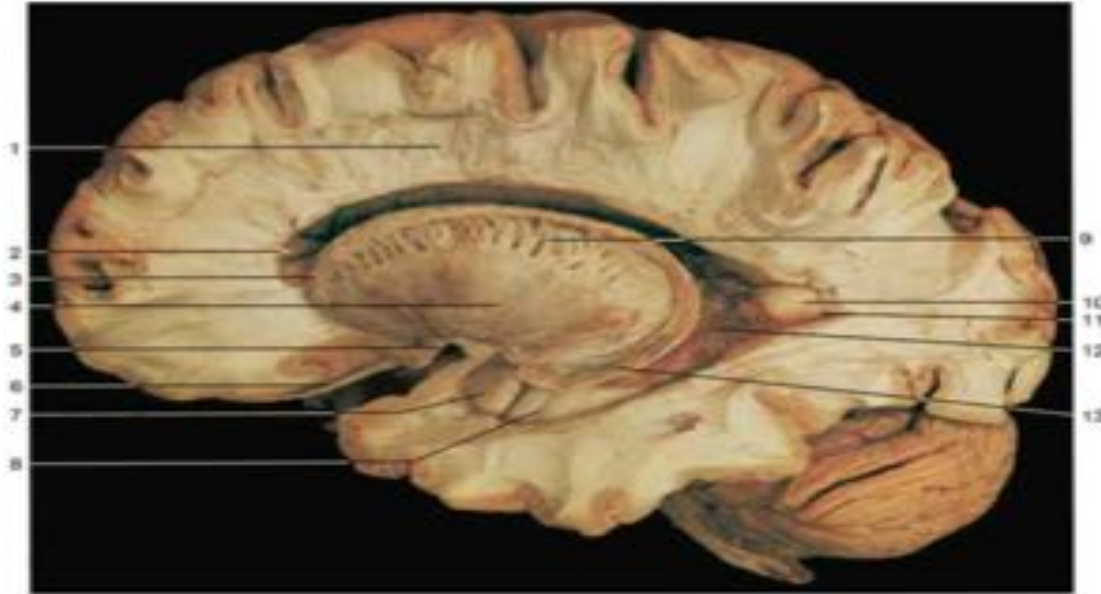
LATERAL VENTRICLES

THIRD VENTRICLE

THALAMUS

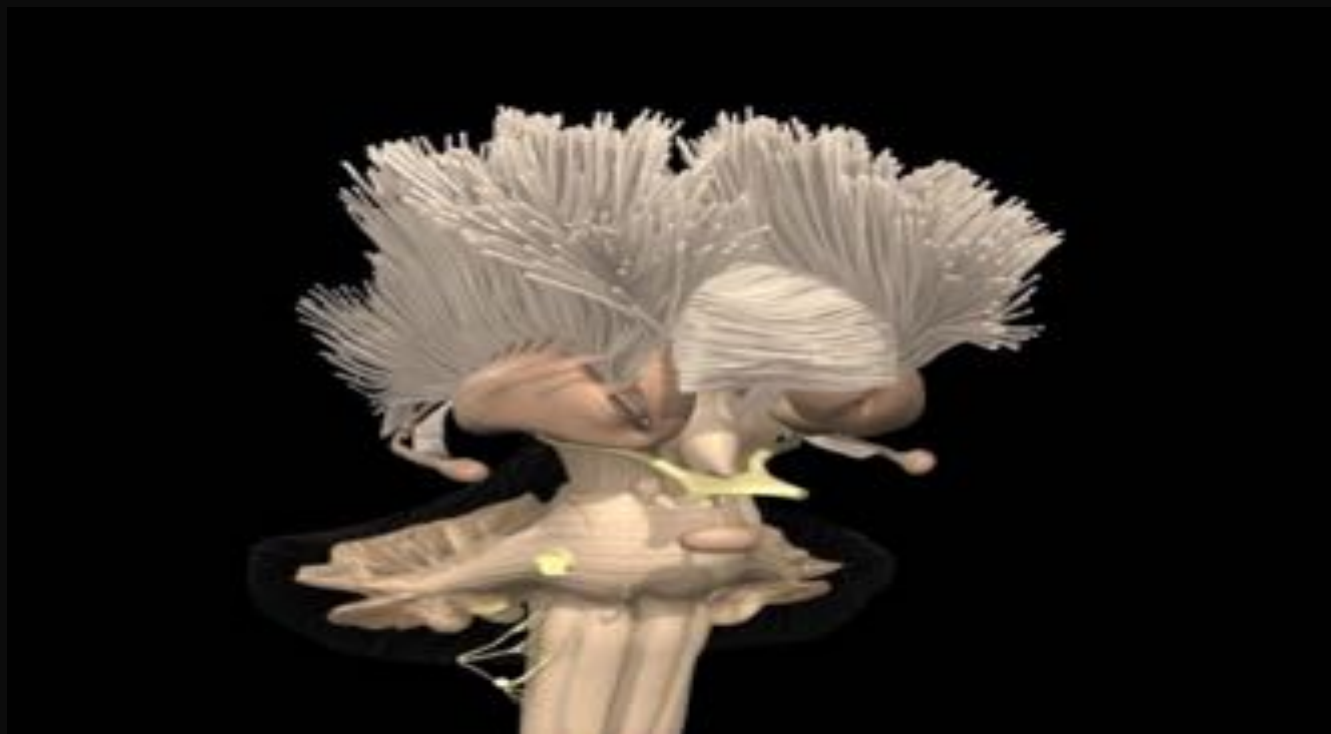


## Κερκοφόρος Πυρήνας



2. Πρόσθιο κέρασ πλάγιας κοιλίας
3. Κεφαλή του κερκοφόρου πυρήνα
4. Κέλυφος
7. Αμυγδαλή
9. Έσω κάψα
13. Ουρά κερκοφόρου πυρήνα

- Ο κερκοφόρος πυρήνας έχει σχήμα "C" και χωρίζεται σε 3 τμήματα
  1. Κεφαλή
  2. Σώμα
  3. Ουρά
- Ο κερκοφόρος πυρήνας σχετίζεται με τις **πλάγιες κοιλίες**. Η κεφαλή με το πρόσθιο κέρασ, το σώμα με το σώμα της πλάγιας κοιλίας και η ουρά με το κροταφικό κέρασ.
- Η κεφαλή στο εμπρός και κολιακό άκρο συνδέεται με το κέλυφος σχηματίζοντας τον **επικληνή πυρήνα**
- Η ουρά καταλήγει ακριβώς ραχιαία της **αμυγδαλής**



## Κερκοφόρος Πυρήνας



- Medium-sized spiny neurons
- 97% του κυτταρικού πληθυσμού
- 5-7 δενδρίτες
- πολλές δενδριτικές άκανθες
- Είναι κυρίως GABA-εργικοί νευρώνες

The same neurons are found in Putamen



That is the reason that  
Caudate Nucleus + Putamen  
form a unique structure  
the Neostriatum

# Putamen



CAUDATE NUCLEUS



LATERAL VENTRICLES

THIRD VENTRICLE

THALAMUS



# Putamen

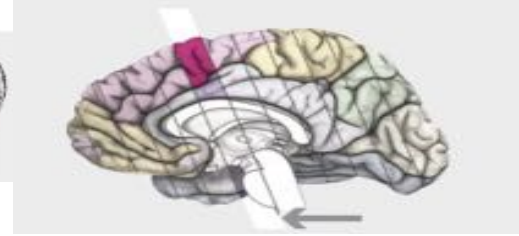


CAUDATE NUCLEUS  
PUTAMEN

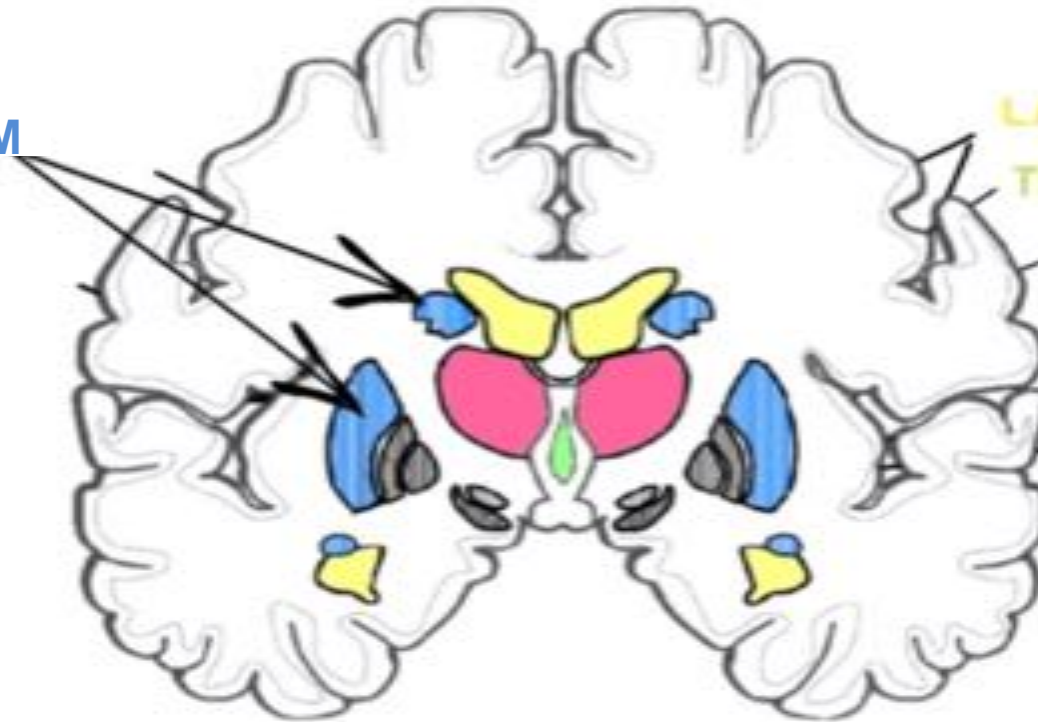


LATERAL VENTRICLES  
THIRD VENTRICLE  
THALAMUS

# Putamen



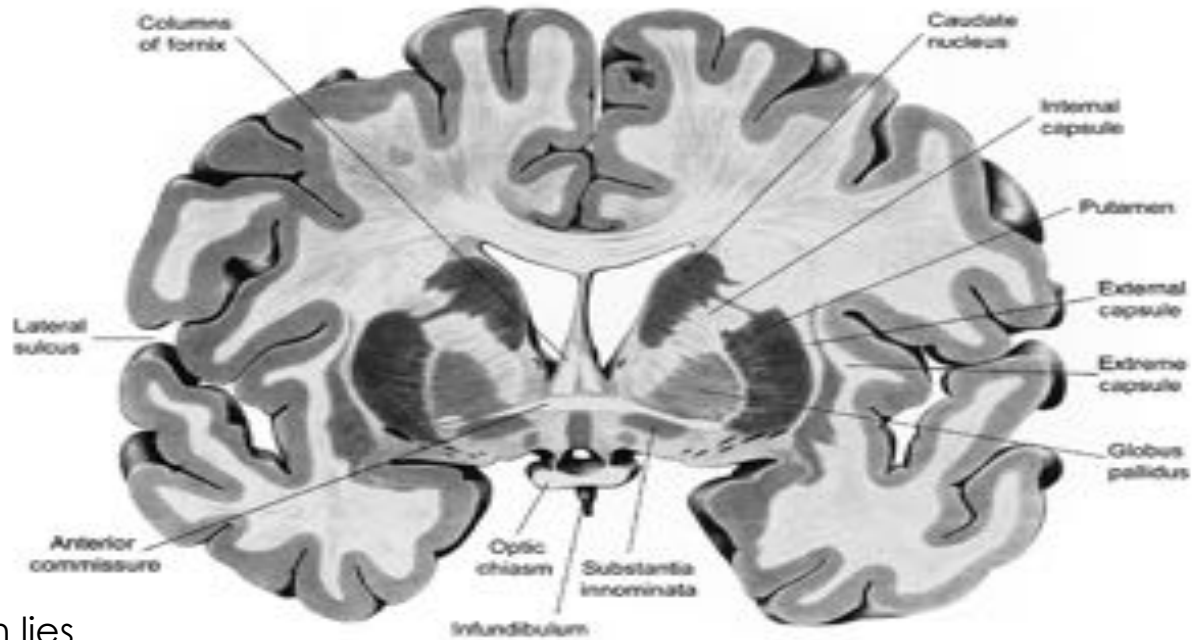
NEOSTRIATUM



LATERAL VENTRICLES  
THIRD VENTRICLE  
THALAMUS

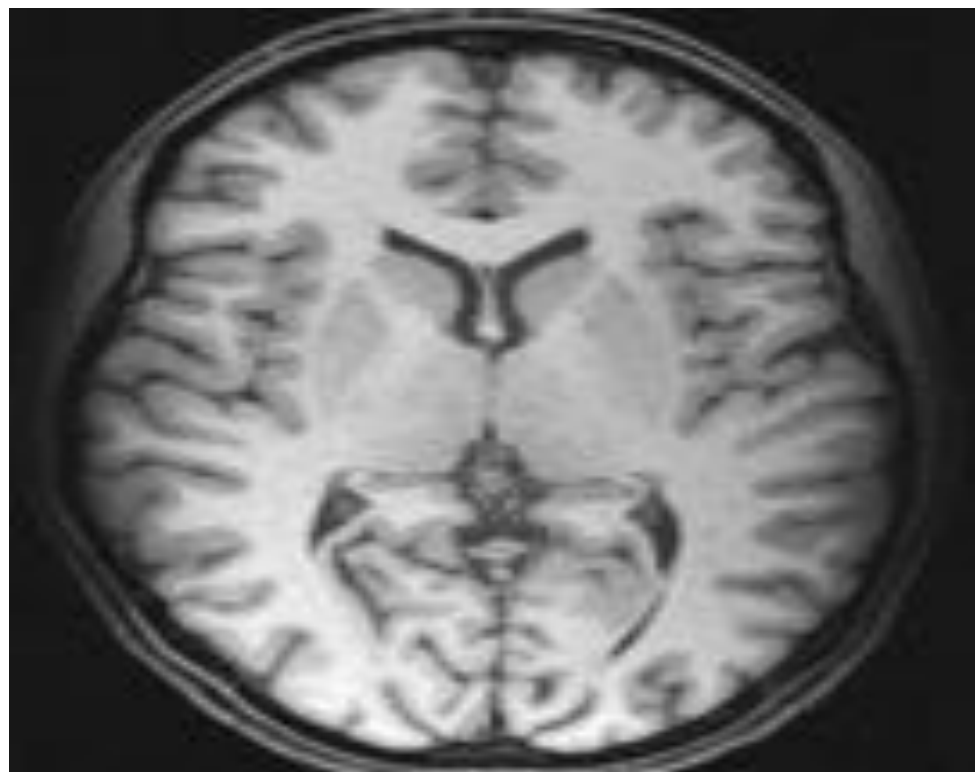
Two Separated Parts of the same Entity: The Neostriatum

# Putamen

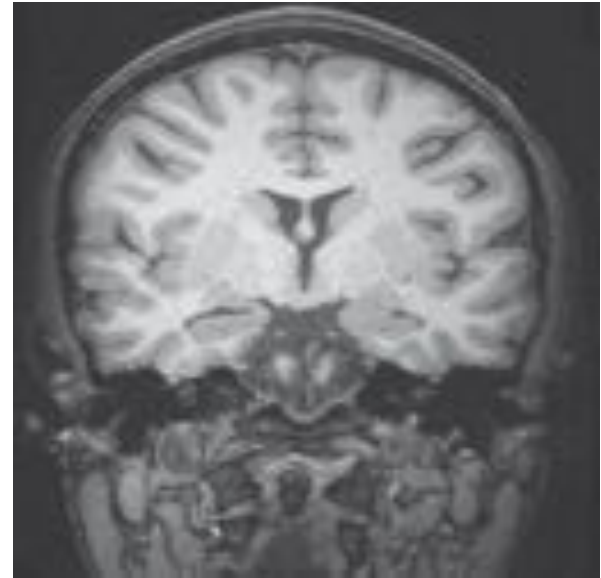
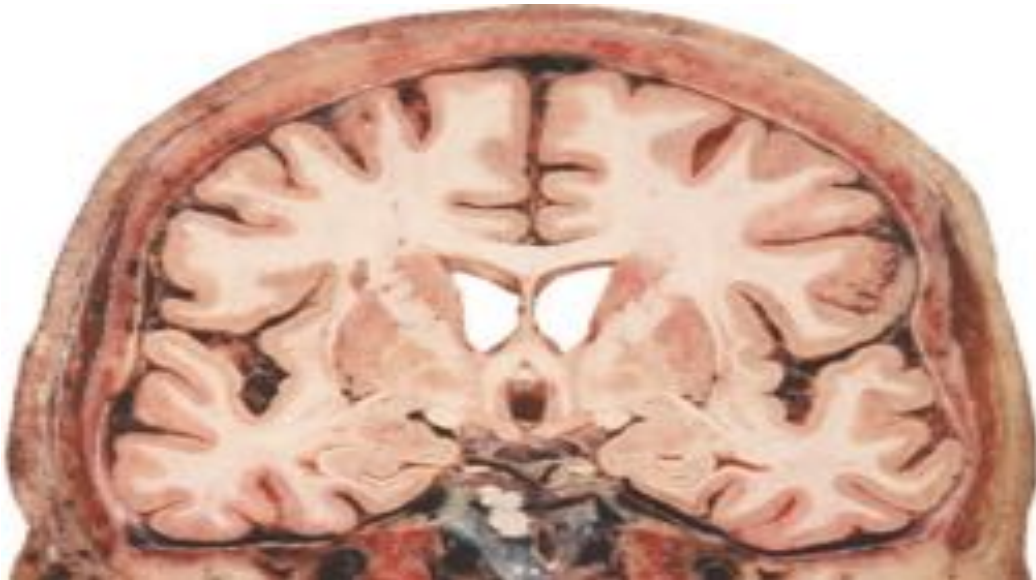


- The putamen lies
  - medial to the insula
  - bounded laterally by the external capsule
  - medially by the globus pallidus.
- The putamen is continuous with the head of the caudate nucleus.
- Putamen and Caudate Nucleus are separated by fibers of the anterior limb of the internal capsule.

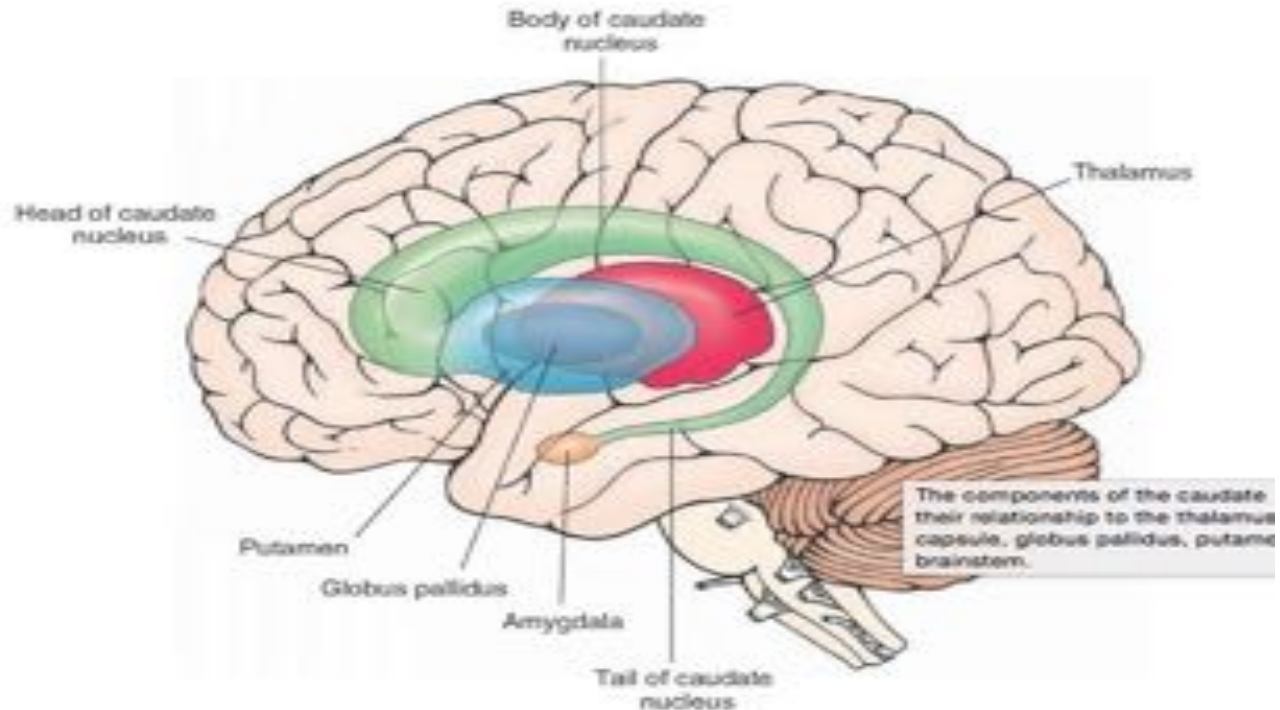
# Putamen



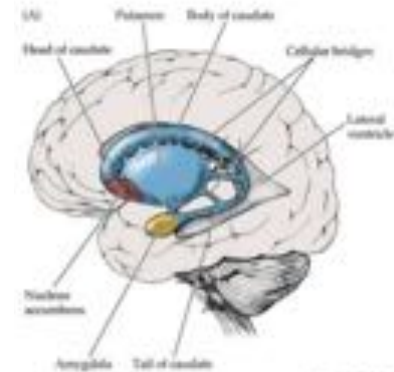
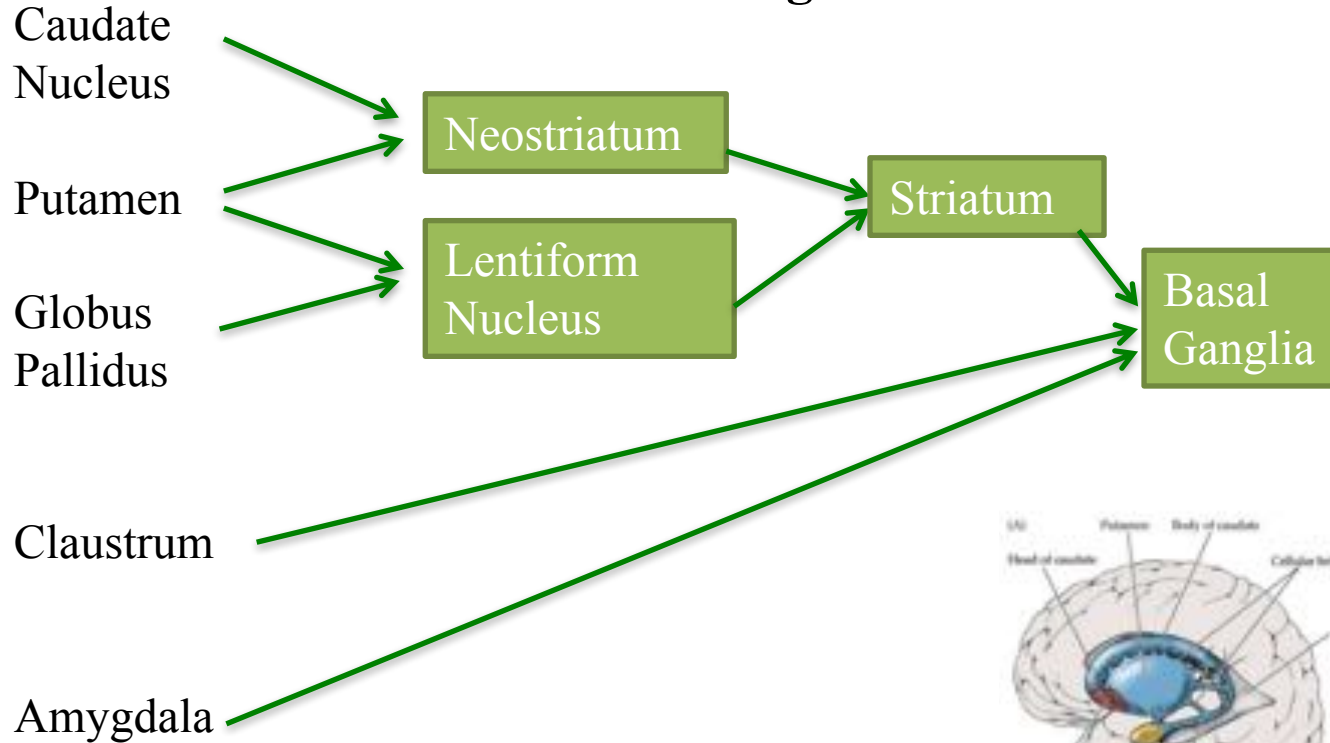
# Putamen



# Putamen + Caudate Nucleus form a unique structure The Neostriatum

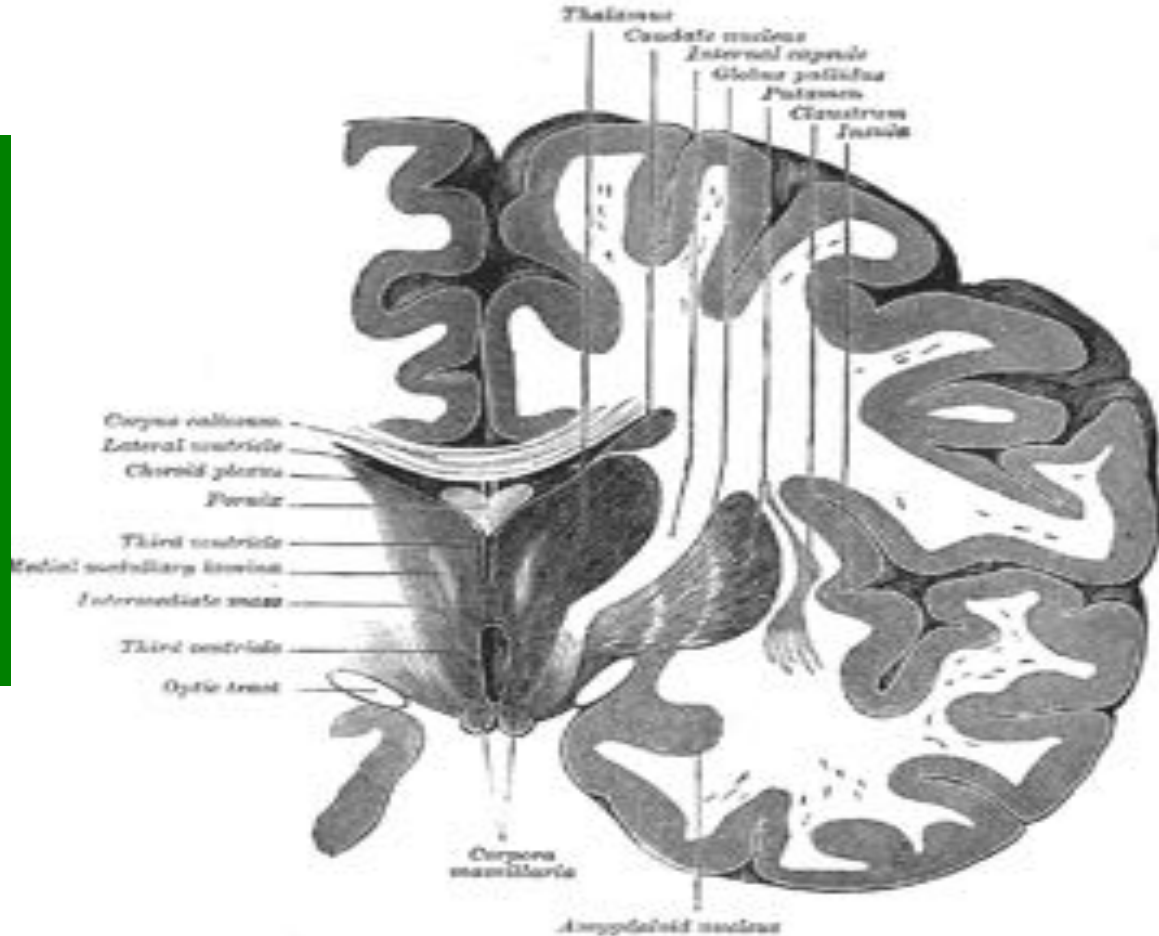


# Basal Ganglia



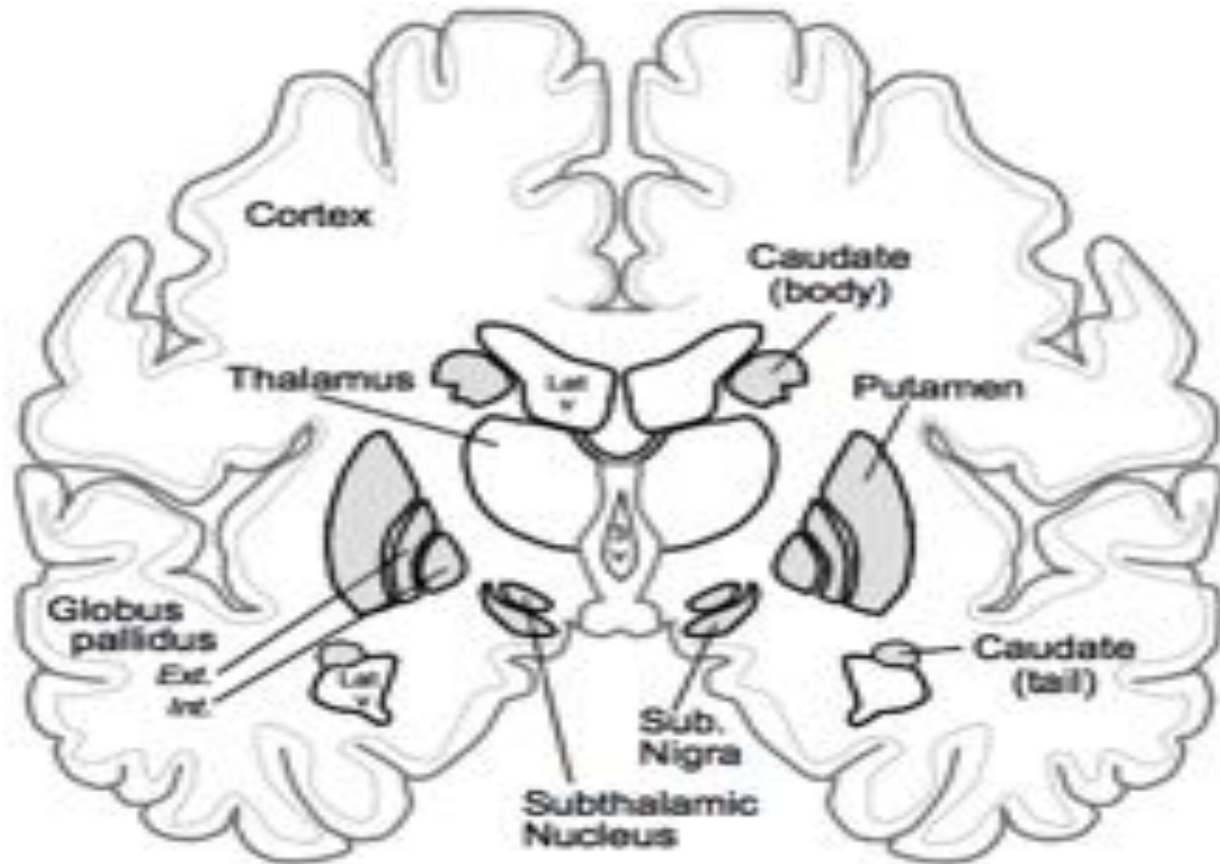
# Globus Pallidus

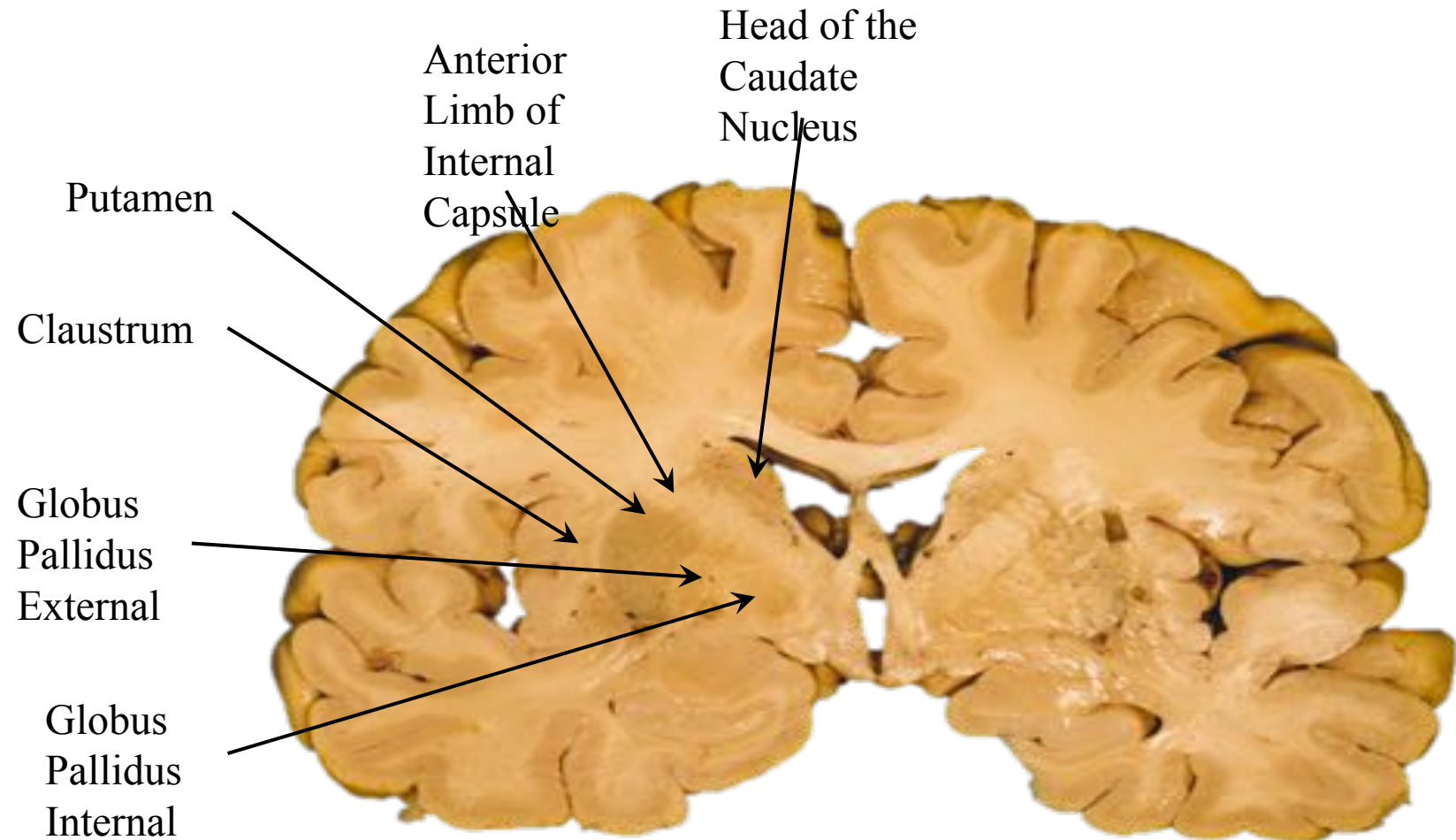
- The globus pallidus, is immediately medial to the putamen and has an external and an internal segment.
- It is divided into two parts by the medial medullary lamina





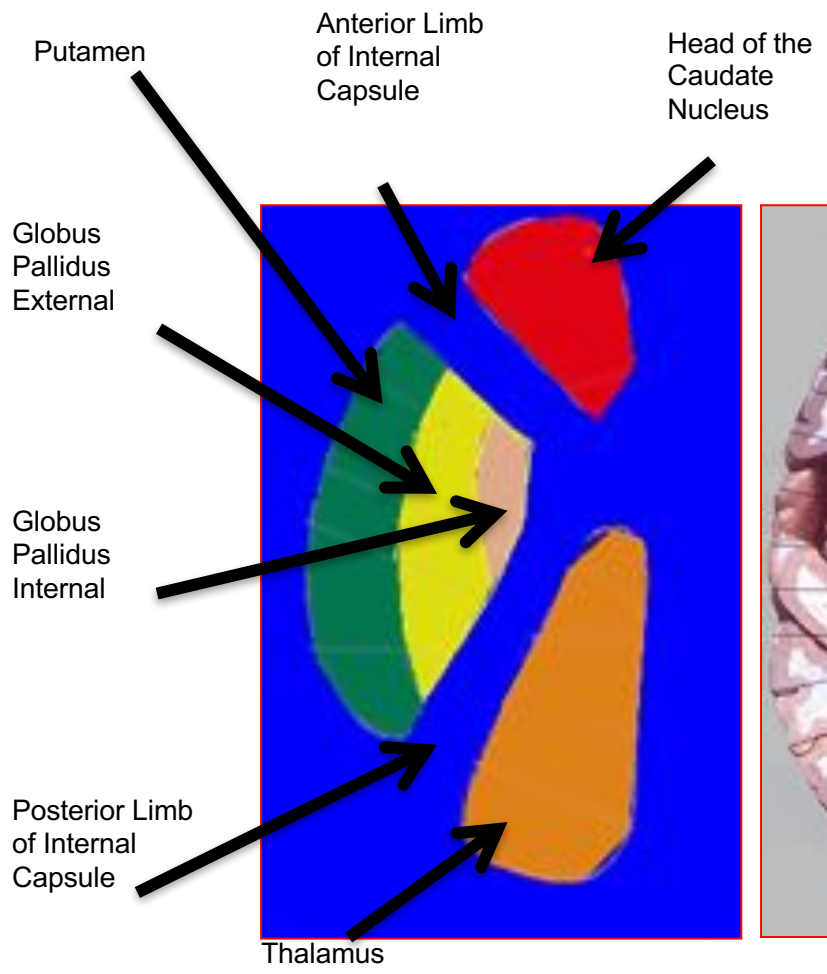
# Globus Pallidus



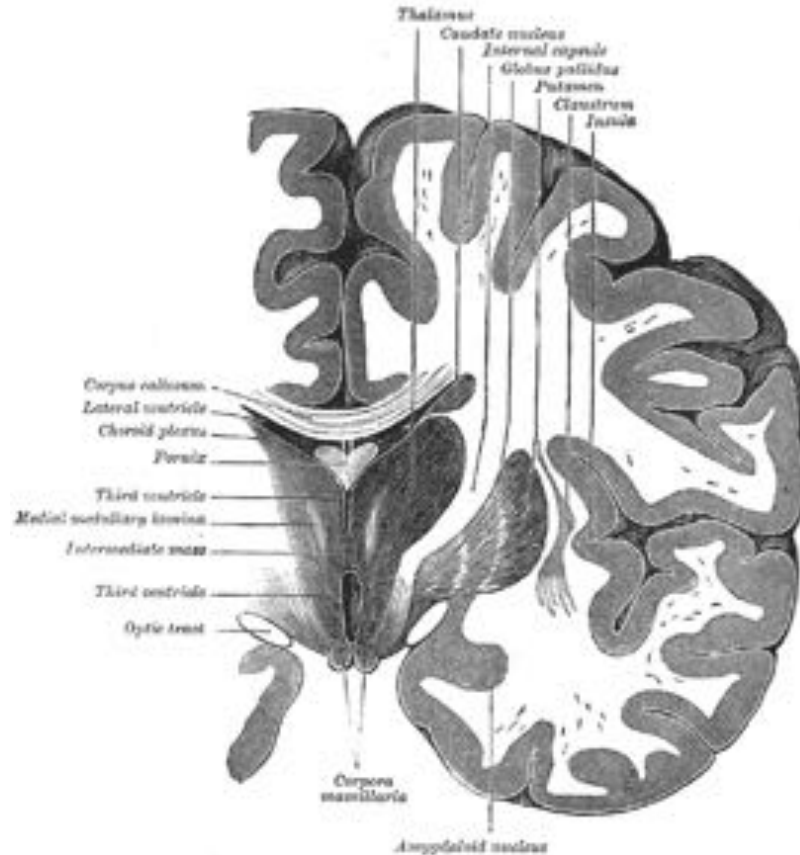


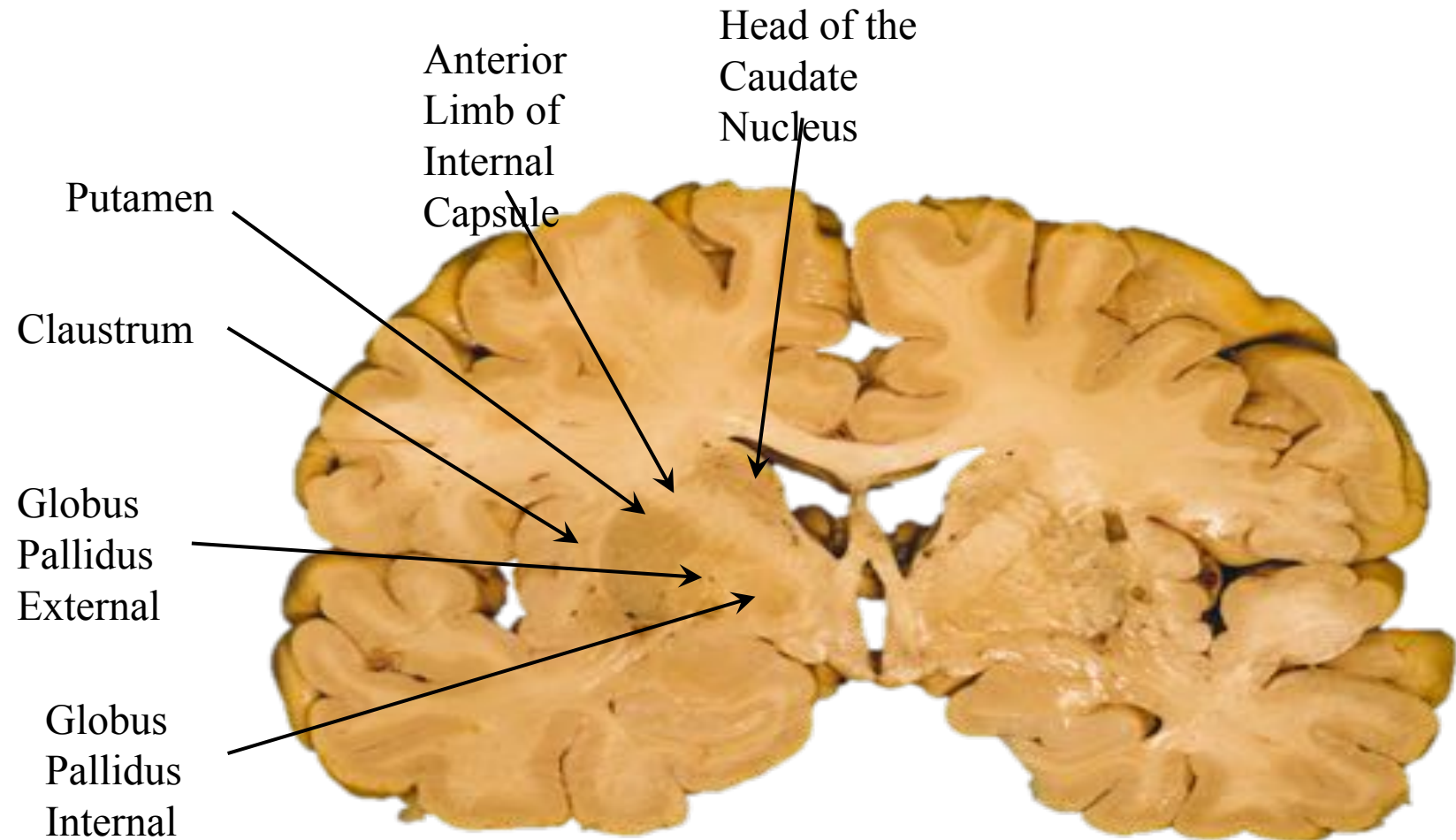
- The anterior limb of the internal capsule separates the caudate nucleus and Globus Pallidus
- The posterior limb separates the thalamus and Globus Pallidus



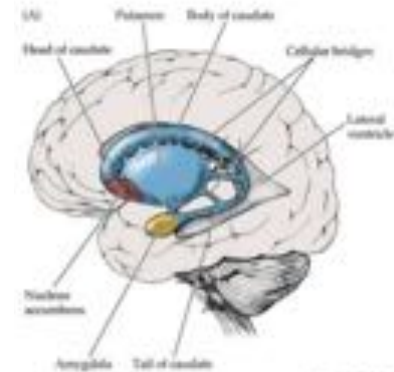
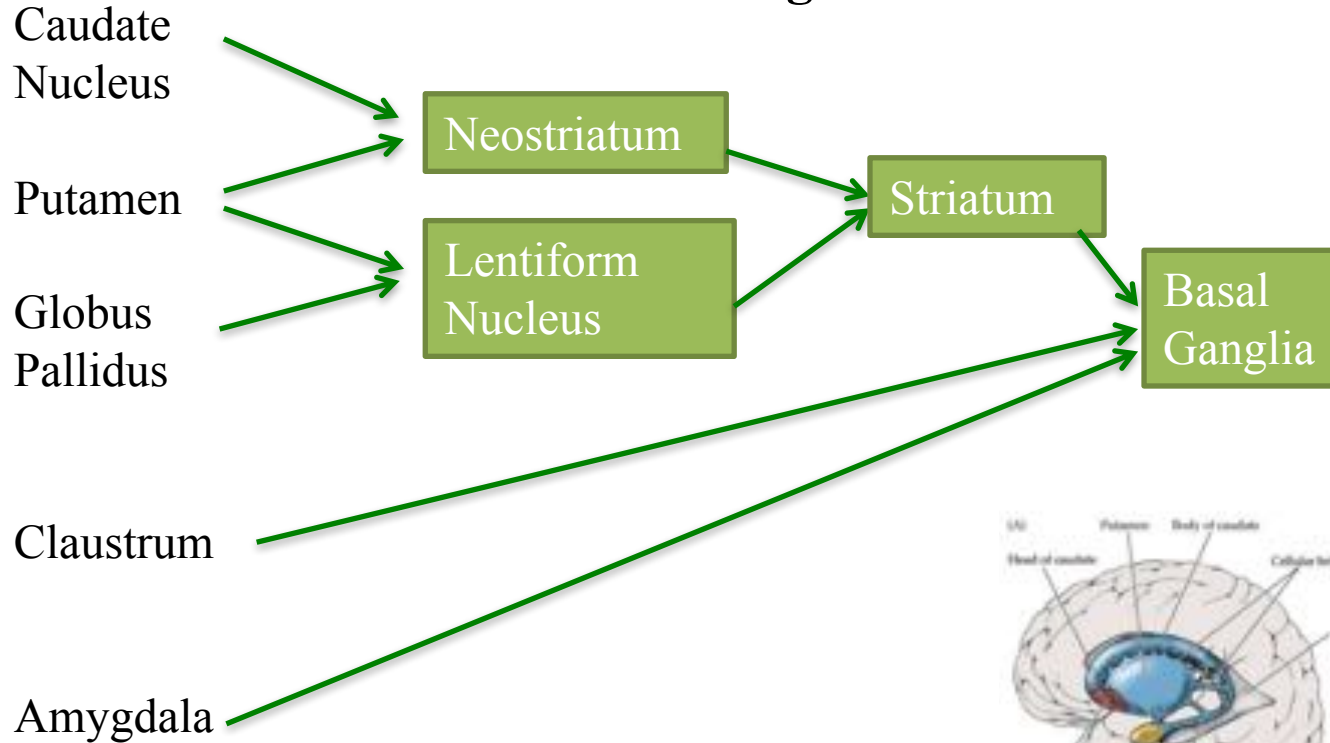


- The lateral medullary lamina separates the external segment of globus pallidus from the putamen
- The Globus Pallidus and the Putamen have a similar shape and they are often called as one entity with the name “Lentiform or Lenticular Nucleus” because they have the shape of a lens.



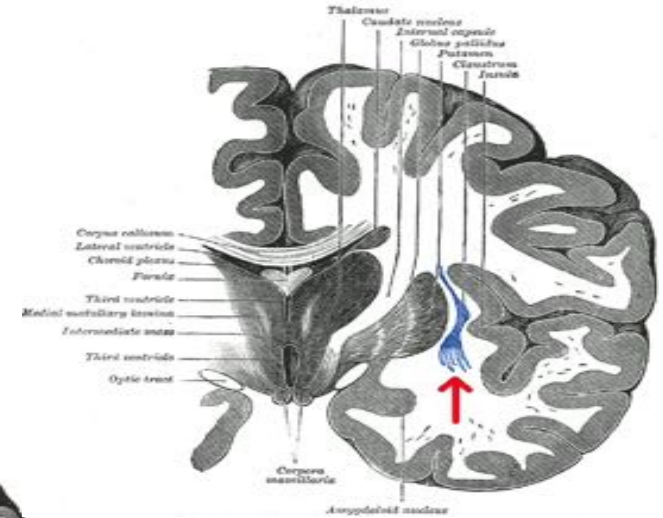
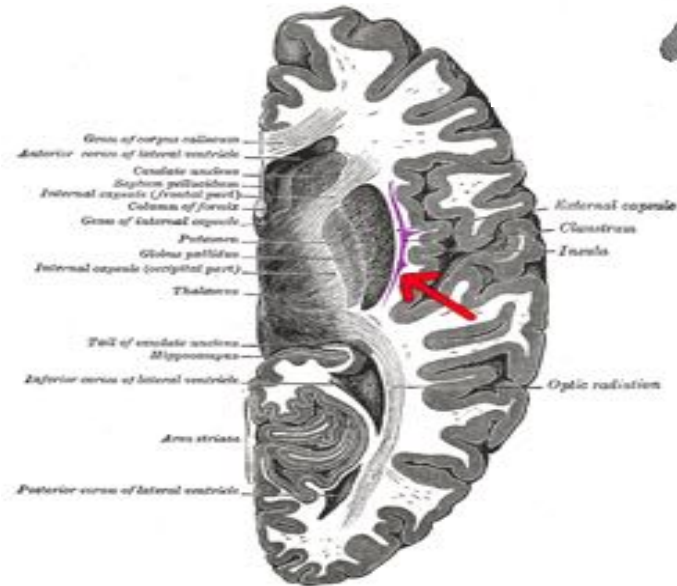


# Basal Ganglia

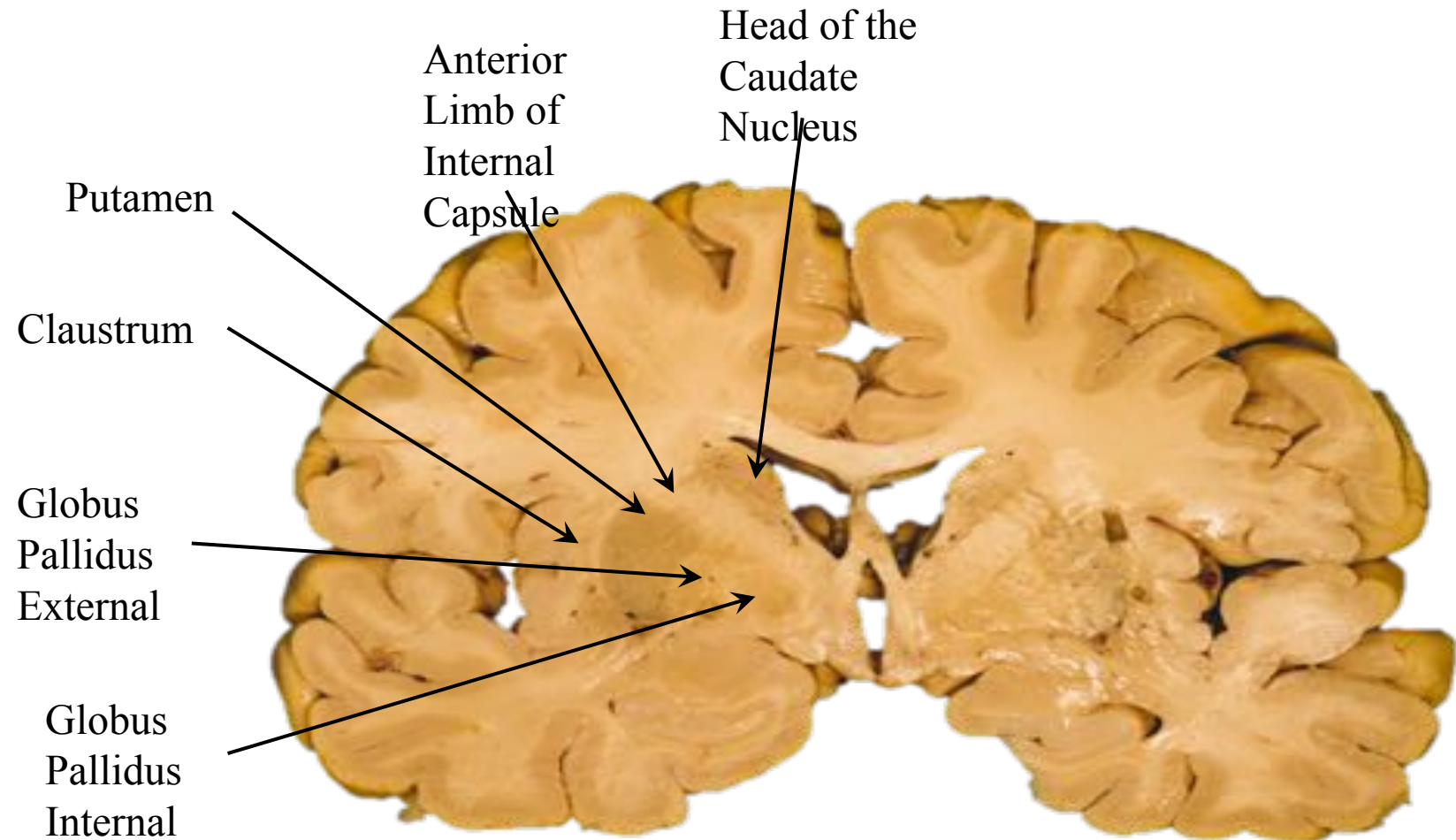


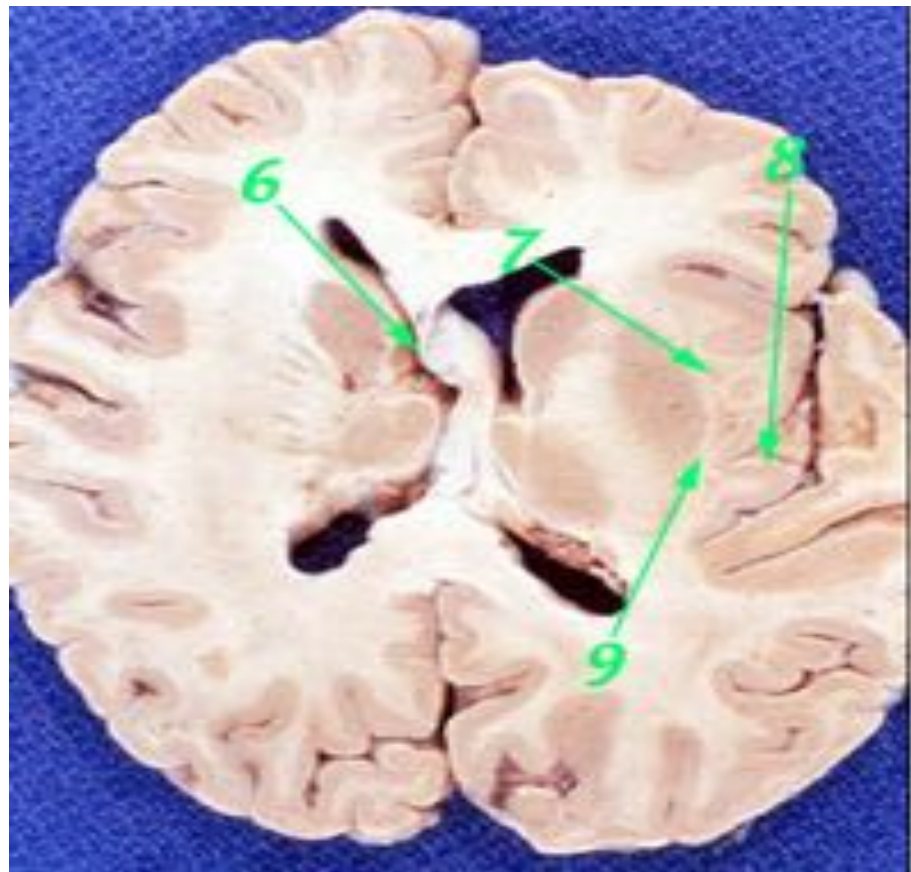
# Claustrum

- A thin, irregular mass of gray matter.
- Medially is covered by the external capsule and the Putamen.
- Laterally is covered by the extreme capsule and the insula.

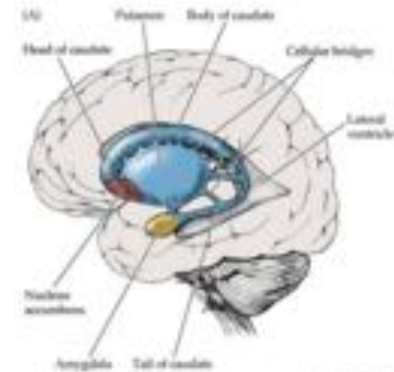
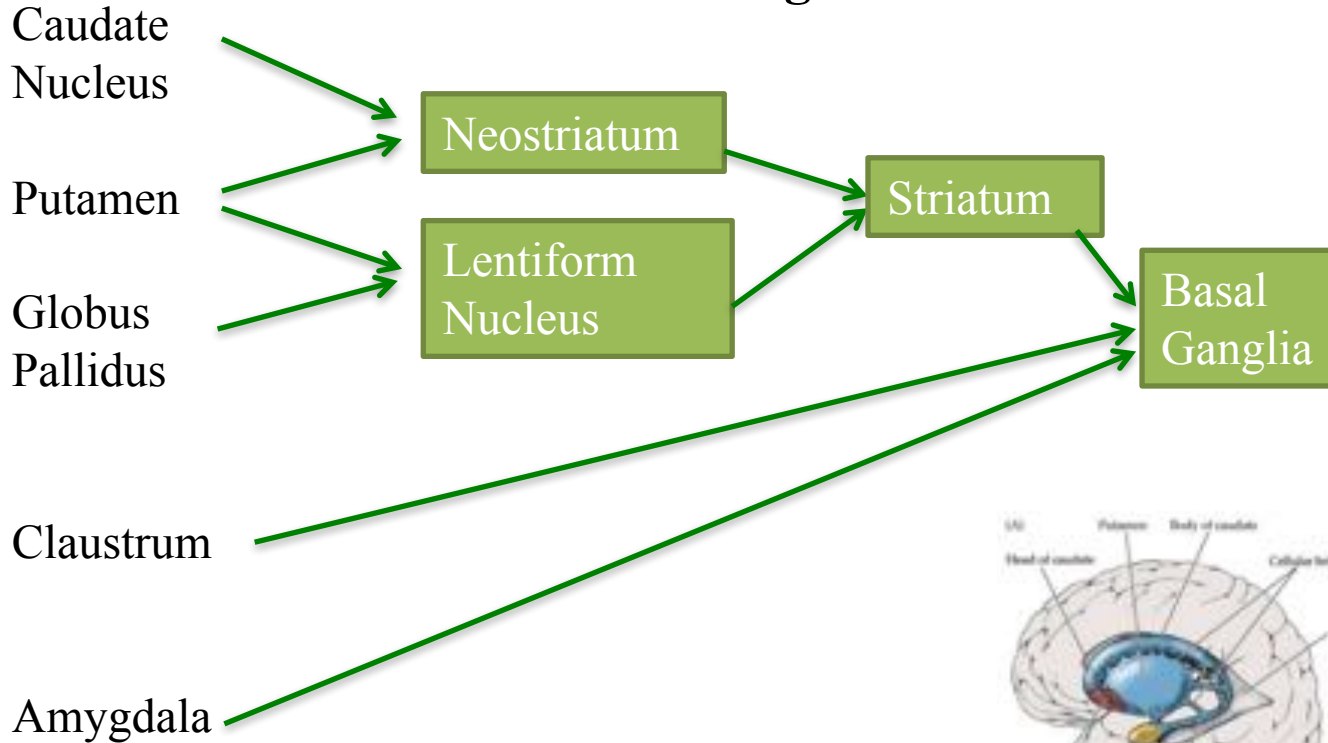






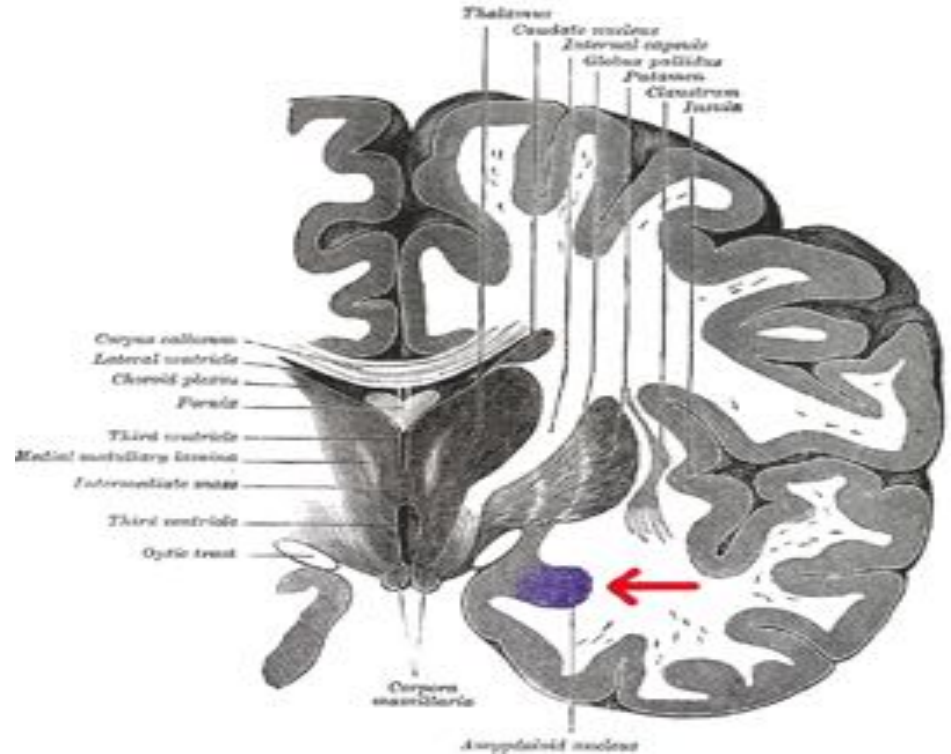


# Basal Ganglia



# Amygdala

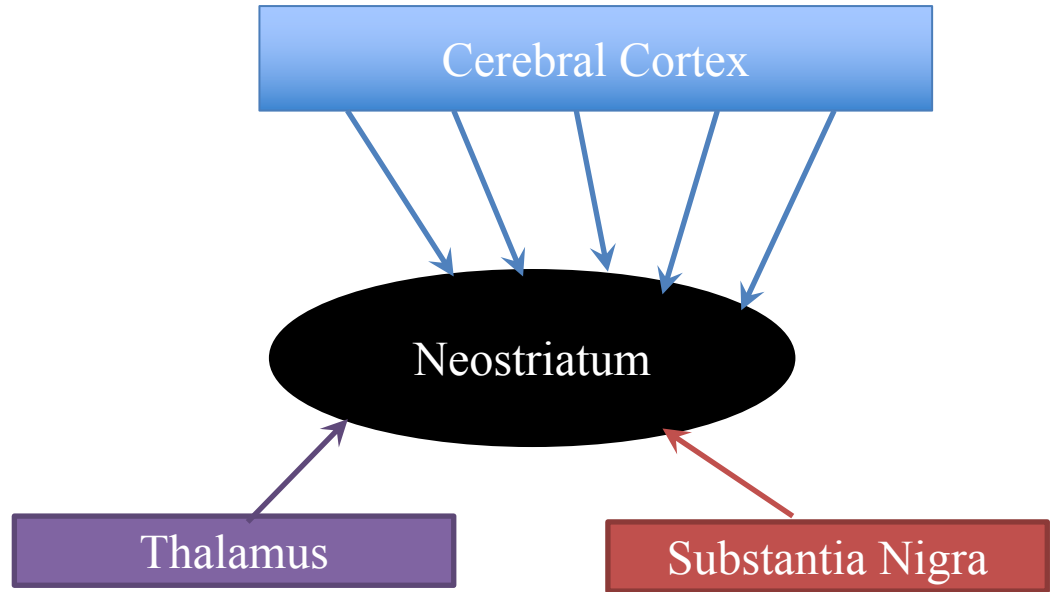
- Amygdala is a group of Nuclei that is located deep in the temporal cortex at the end of the tail of the Caudate Nucleus.
- Functionally belongs to the Limbic System



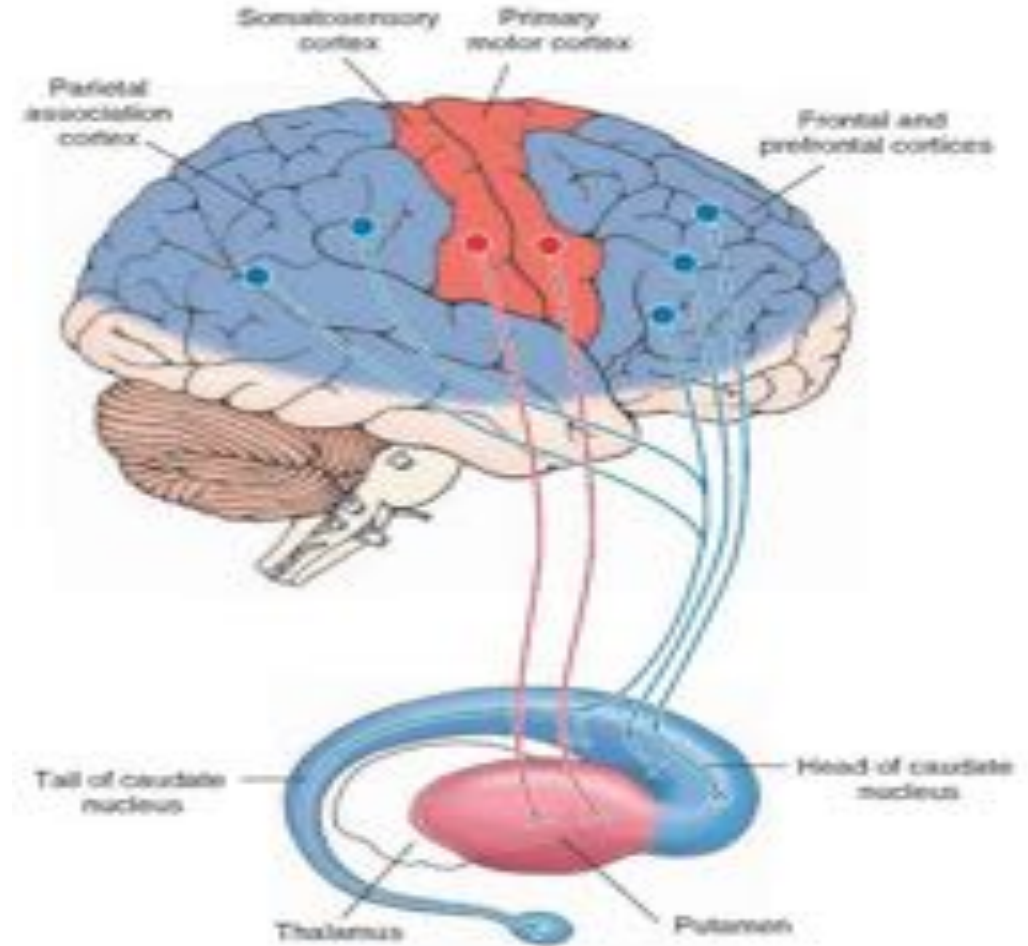
# Basal Ganglia Afferents

The striatum is the main recipient of afferents to the basal ganglia. These excitatory afferents arise from

- the entire cerebral cortex
- The dopamine-containing cell groups of substantia nigra



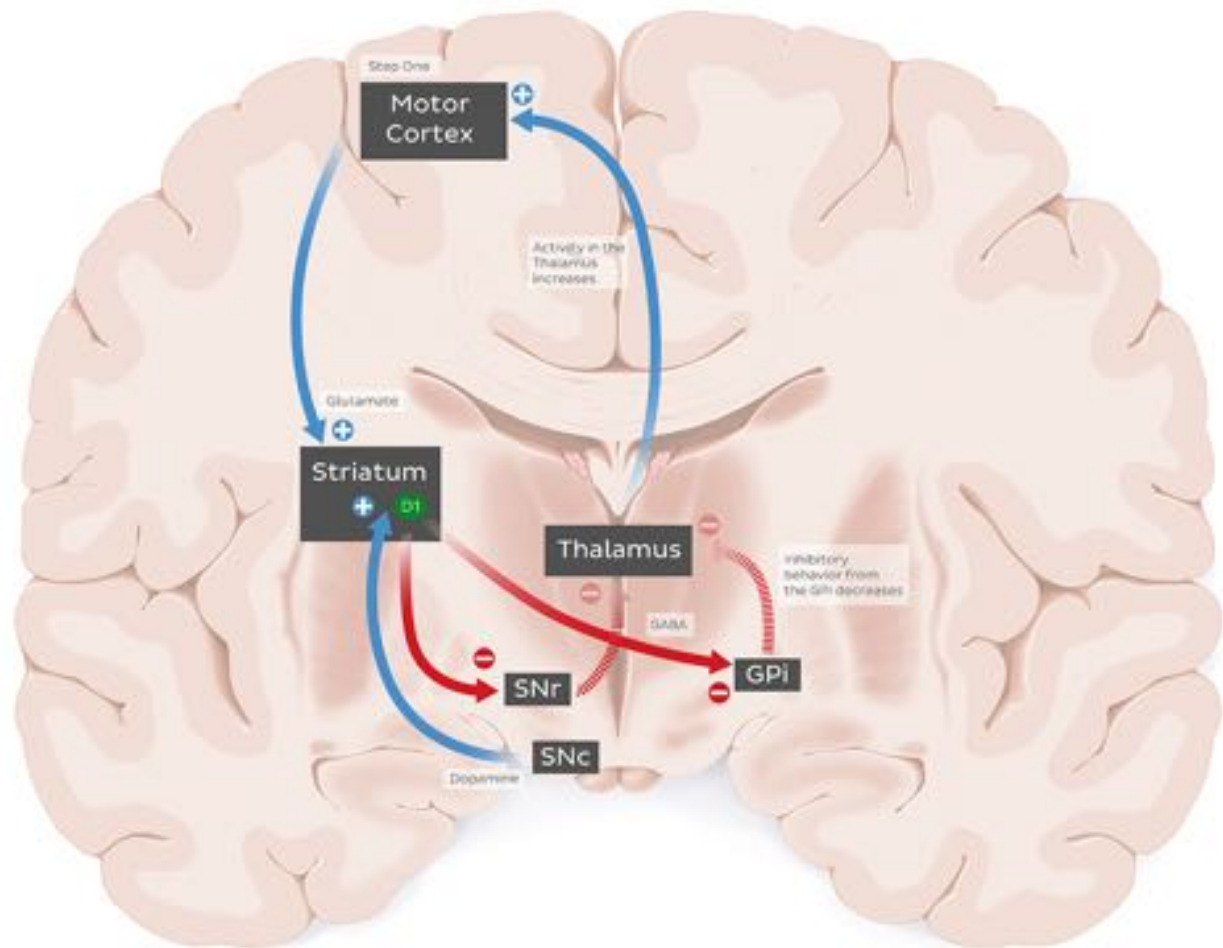
The projections from different cortical areas are segregated, such that the frontal lobe projects predominantly to the caudate head and the putamen; the parietal and occipital lobes project to the caudate body; and the temporal lobe projects to the caudate tail.



# Direct and Indirect Pathways

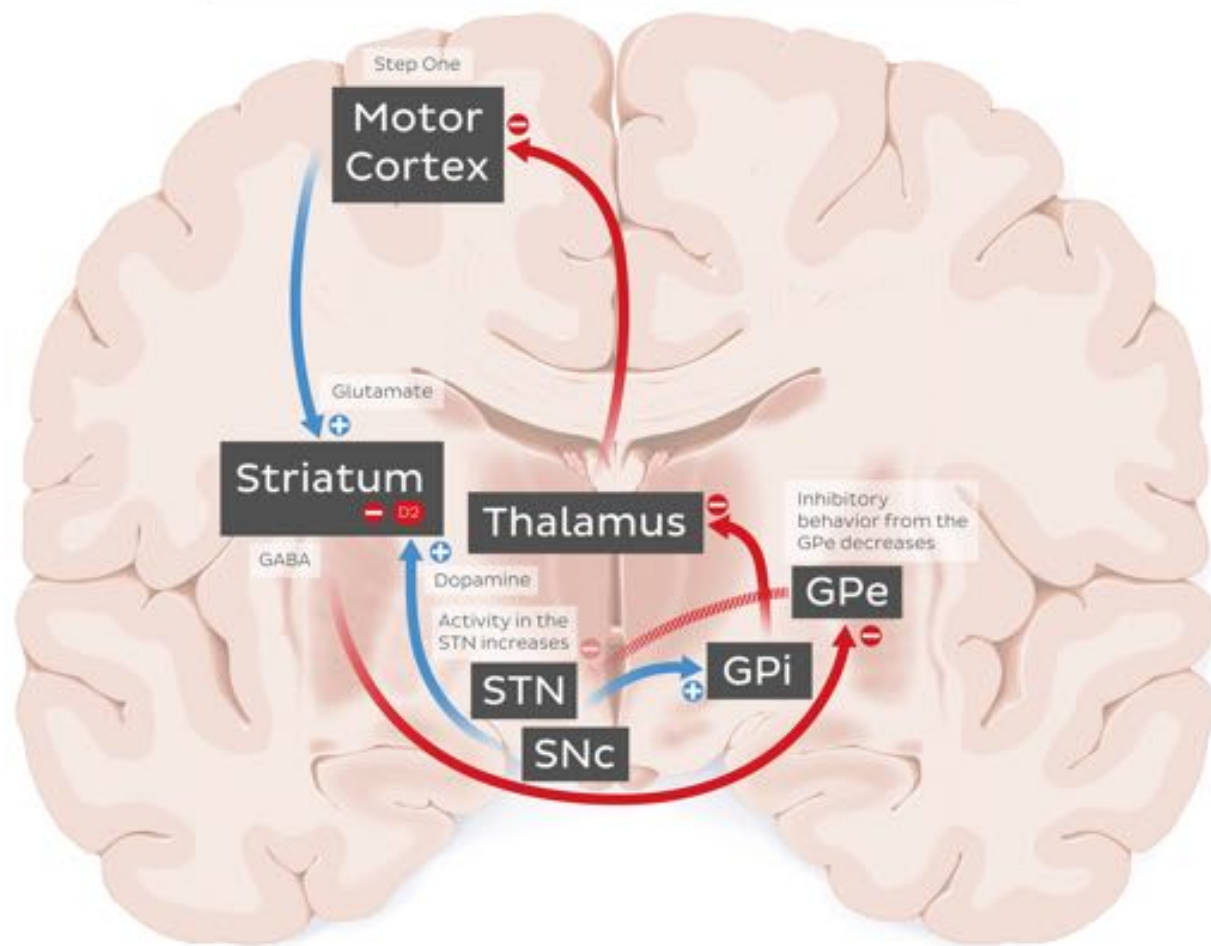
- Outputs from the striatum to the GPi/SNr are divided into two opposing pathways, regulated by dopaminergic efferents from the SNc to the striatum.
- The direct pathway involves activation of monosynaptic GABAergic afferents from the striatum to the GPi/SNr and is important in initiating and maintaining movement through disinhibition of corticothalamic efferents.
- The indirect pathway is important for suppressing extemporaneous movement through inhibition of corticothalamic efferents.
- This involves an internal loop of polysynaptic signals from the striatum to the GPe, disinhibition of the STN, and glutamatergic excitation of the GPi/SNr.

# Direct Pathway of the Basal Ganglia





# Indirect Pathway of the Basal Ganglia



# Basal Ganglia Functions

- Basal Ganglia are involved
- in the initiation of voluntary movements by modulating motor programs stored in the motor cortex and elsewhere in the motor hierarchy
- voluntary movements are not initiated in the basal ganglia (they are initiated in the cortex)
- however, proper functioning of the basal ganglia appears to be necessary in order for the motor cortex to give the appropriate motor commands

## Functions of Striatum

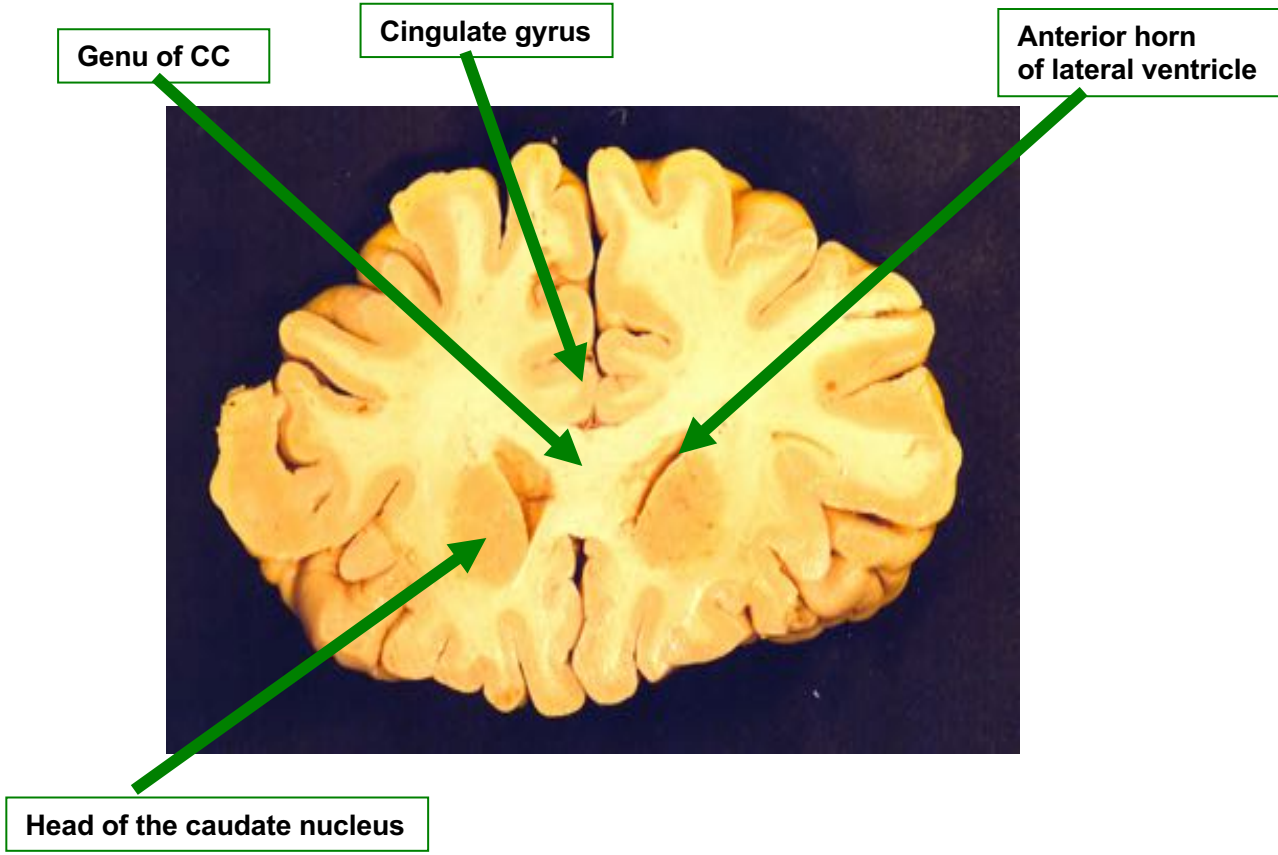
- Traditionally, the function of neostriatum was considered as solely related to the **control of movements**

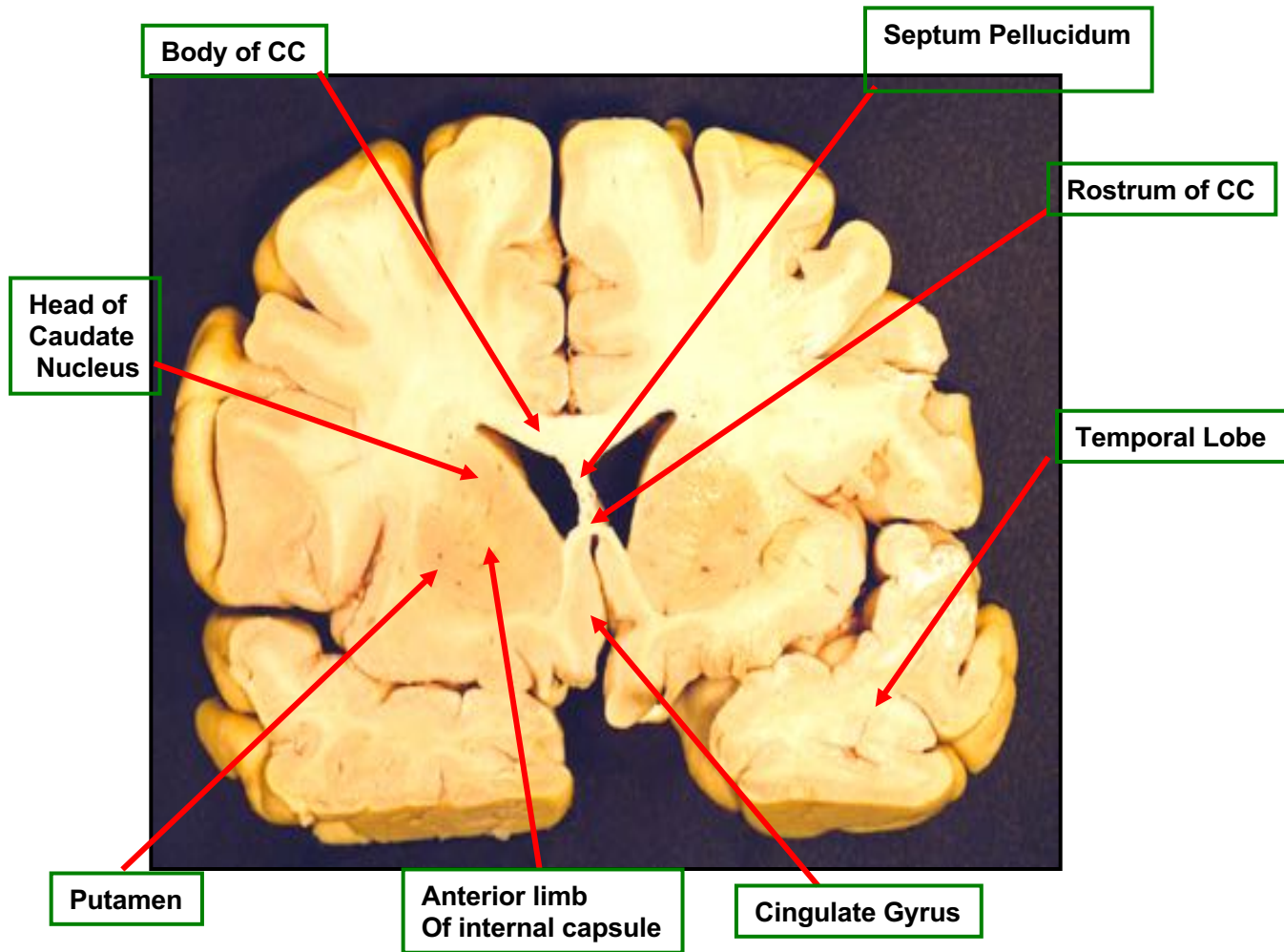
### Parkinson's Disease, Huntington Disease

- Last years it has been proved that the neostriatum plays a central role in the regulation of higher cognitive functions, such as **behavior, memory, learning and emotion** in rodents, monkeys and humans

### Alzheimer's Disease, ADHD, Schizophrenia







**Head of  
Caudate Nucleus**

**Body of CC**

**Septum Pellucidum**

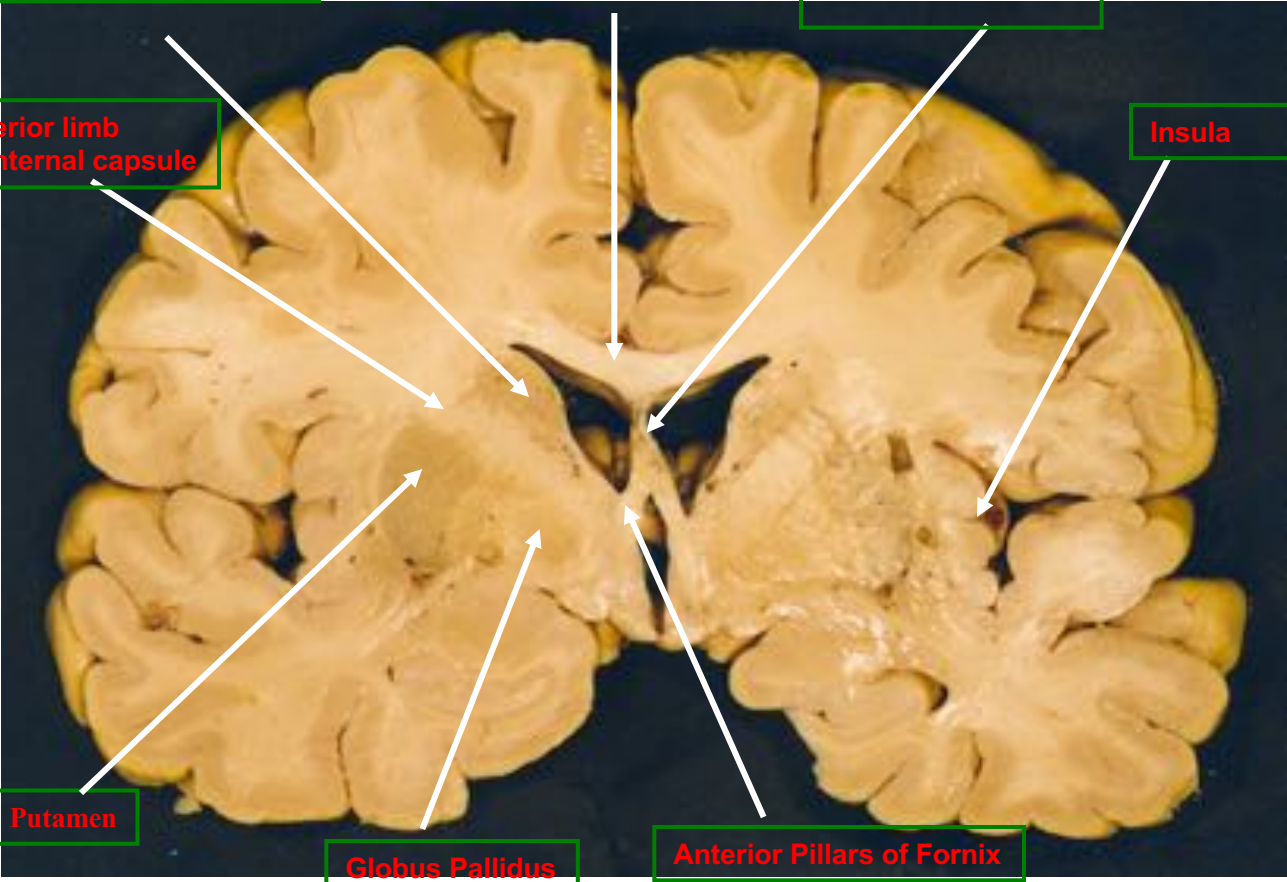
**Anterior limb  
Of internal capsule**

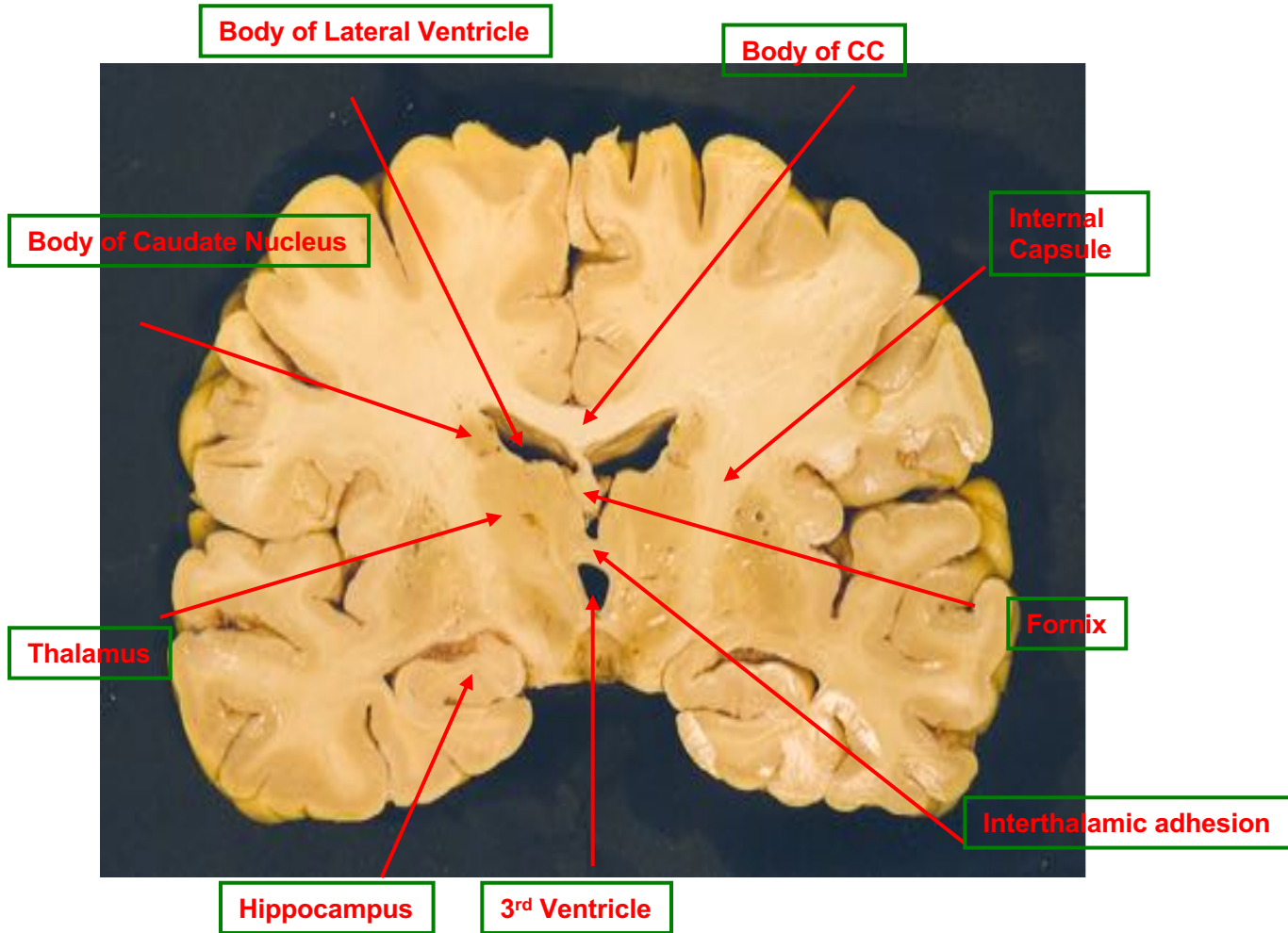
**Insula**

**Putamen**

**Globus Pallidus**

**Anterior Pillars of Fornix**



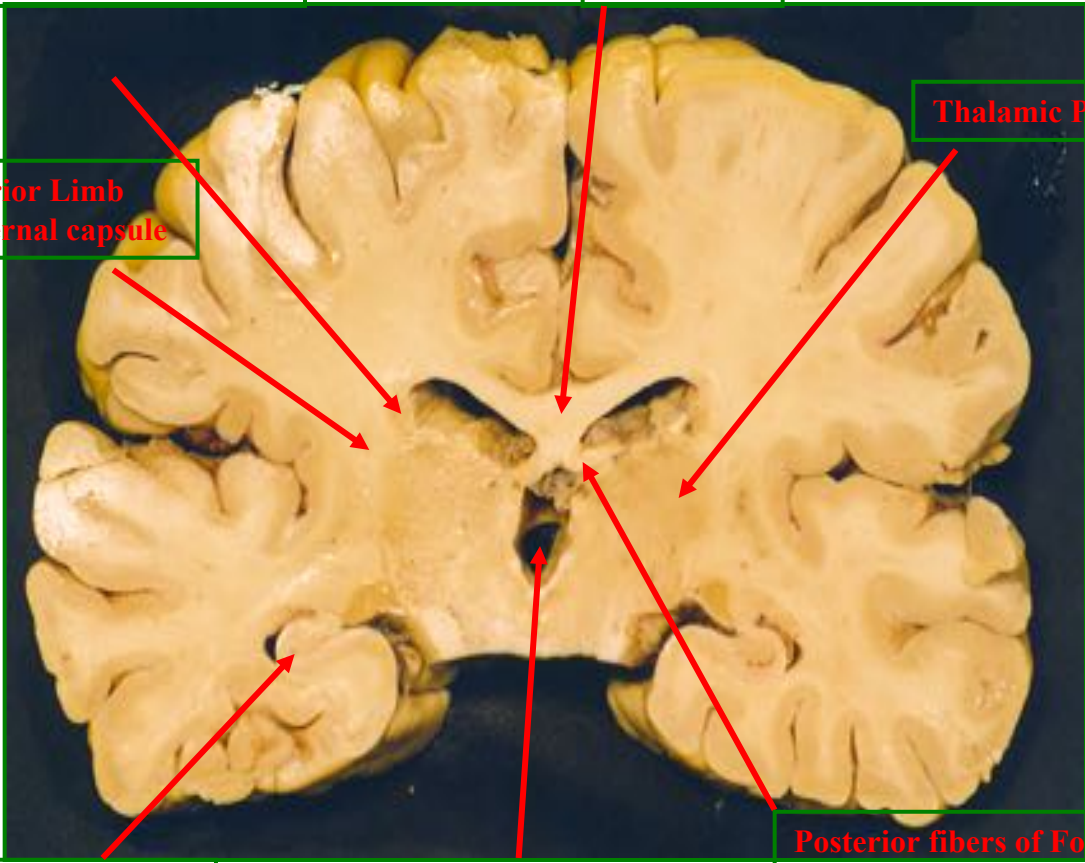


**Body of Caudate Nucleus**

**Body of CC**

**Thalamic Pulvinar**

**Posterior Limb of internal capsule**



**Hippocampus**

**3rd Ventricle**

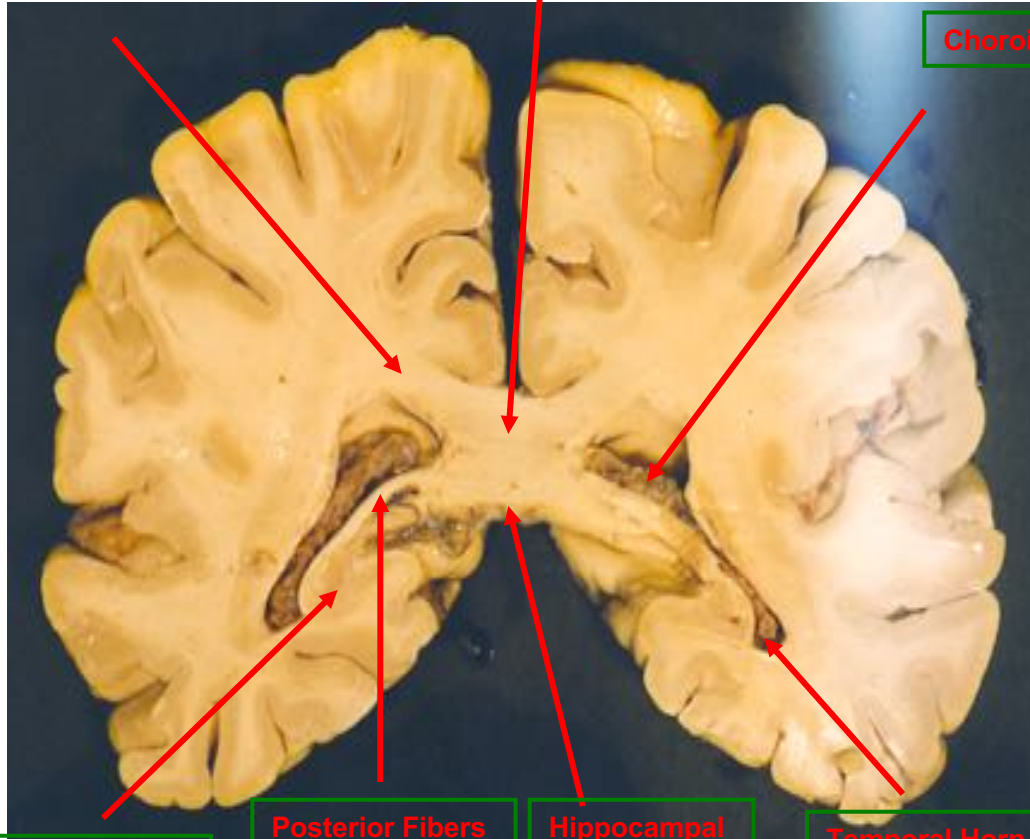
**Posterior fibers of Fornix**



**Body of Caudate Nucleus**

**Splenium of CC**

**Choroid Plexus**



**Hippocampus**

**Posterior Fibers  
Of Fornix**

**Hippocampal  
Commissure**

**Temporal Horn of Lateral Ventricle**

# Quiz Time...

