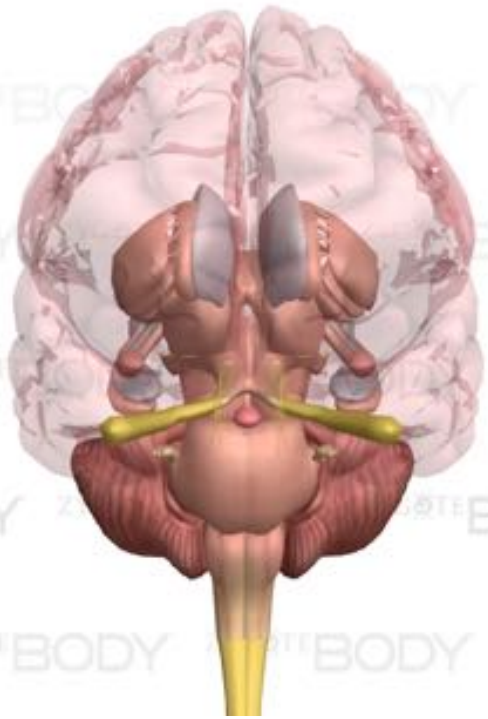
Diencephalon

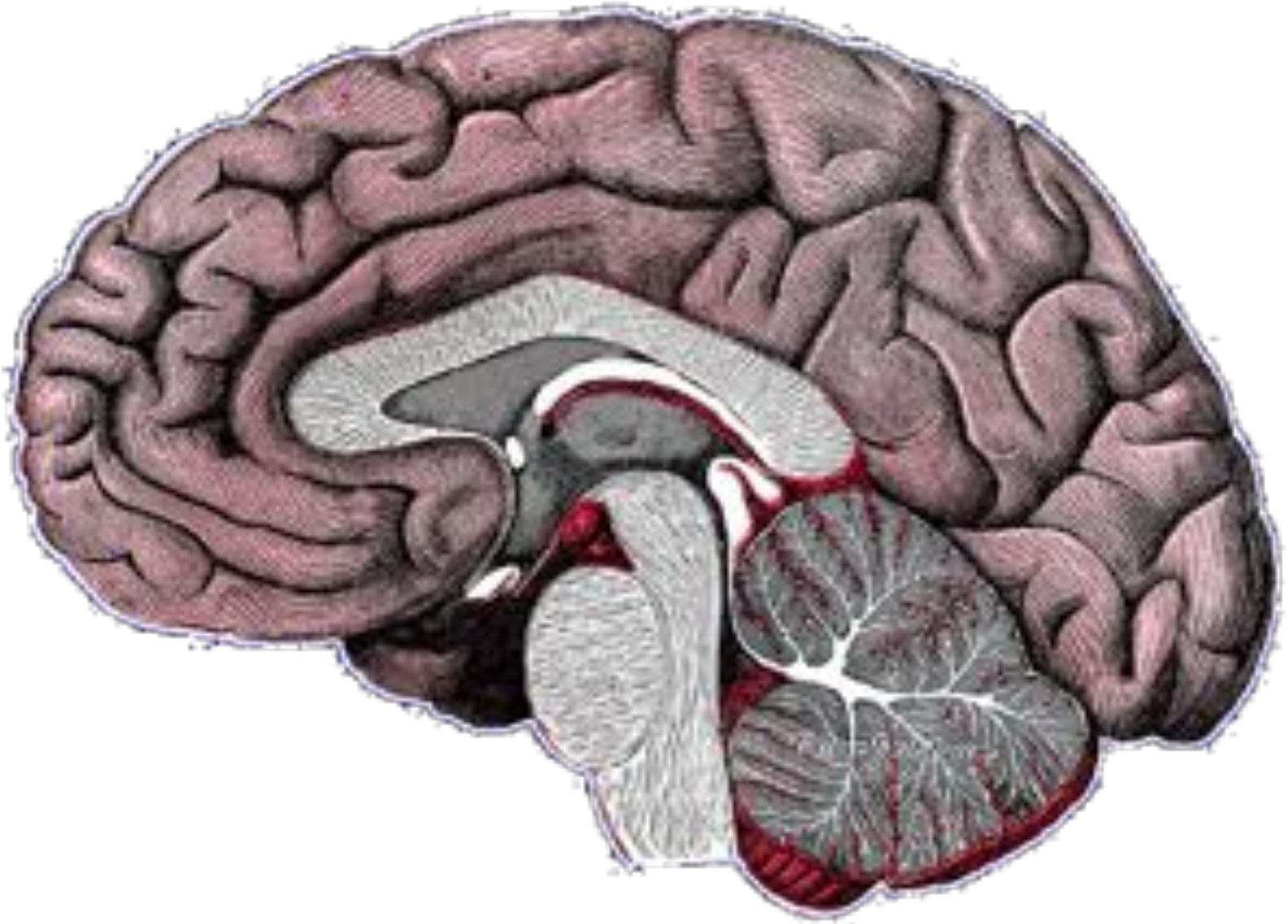
Dimitrios Mytilinaios



The inner part of Cerebral Hemispheres comprises of:

- Lateral Ventricles
- White matter
- Subcortical Nuclei (Basal Ganglia)
- Limbic System
- Diencephalon

Diencephalon is composed of the structures that surround the 3rd ventricle



Diencephalon

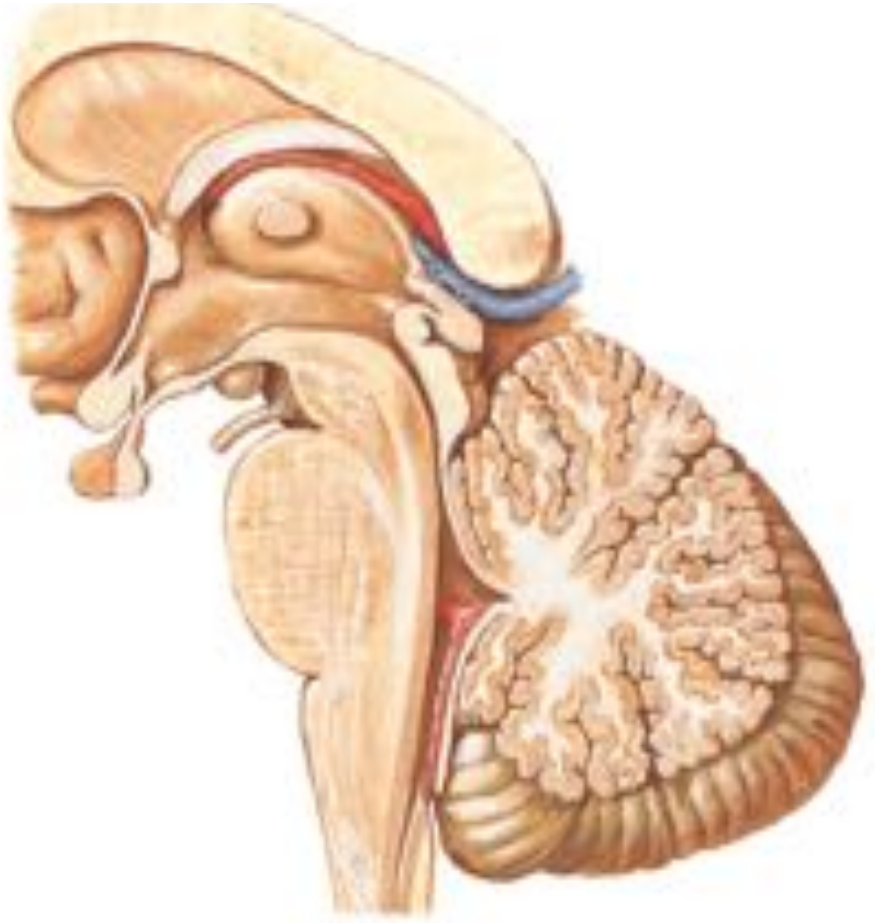
Epithalamus

Thalamus

Metathalamus

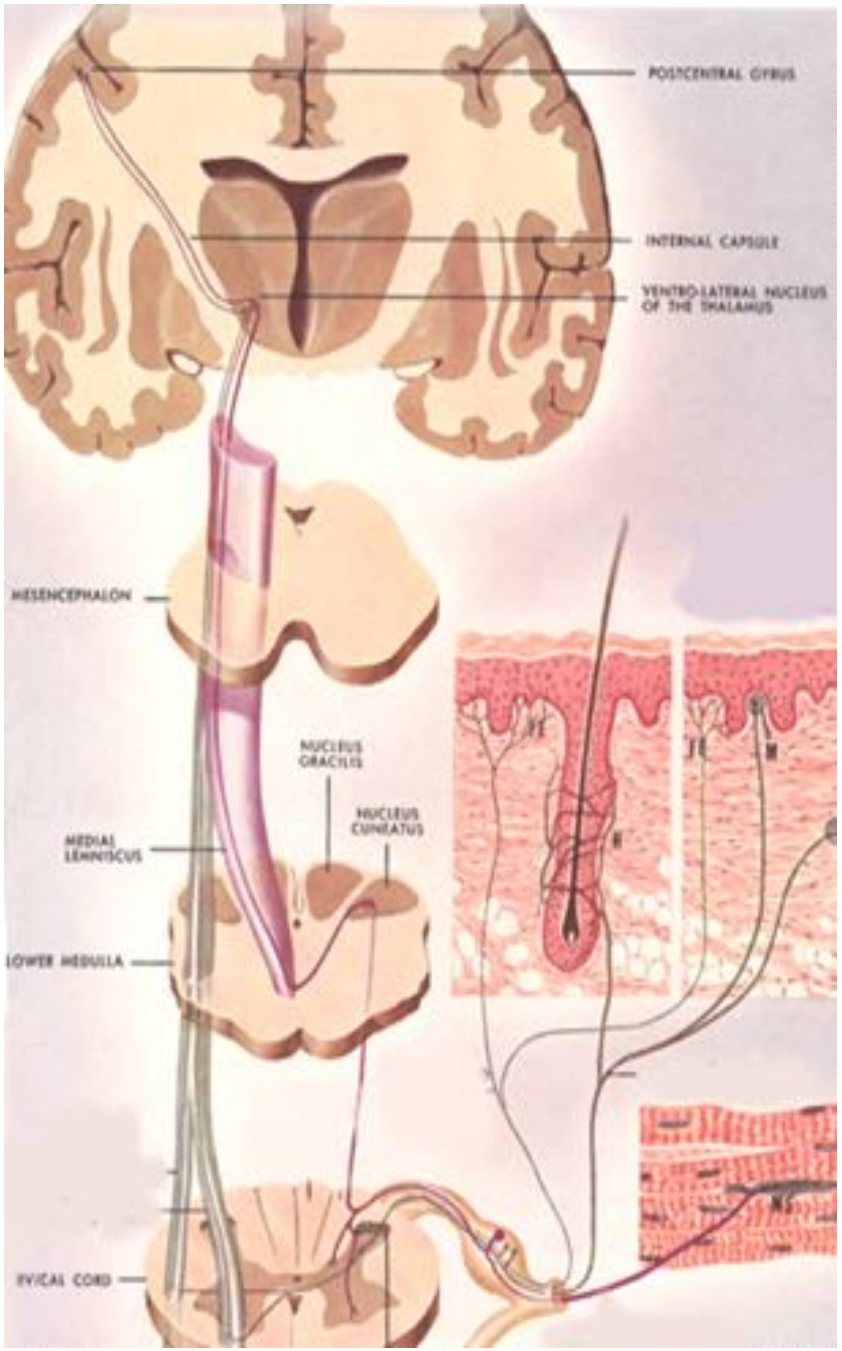
Hypothalamus

3rd Ventricle



Thalamus:

THE GATEWAY TO THE CERBRAL CORTEX



Thalamus

Large, paired, structure of grey matter
Dimensions 3 x 1.5 x 1.5 cm

Lies immediately lateral to third ventricle

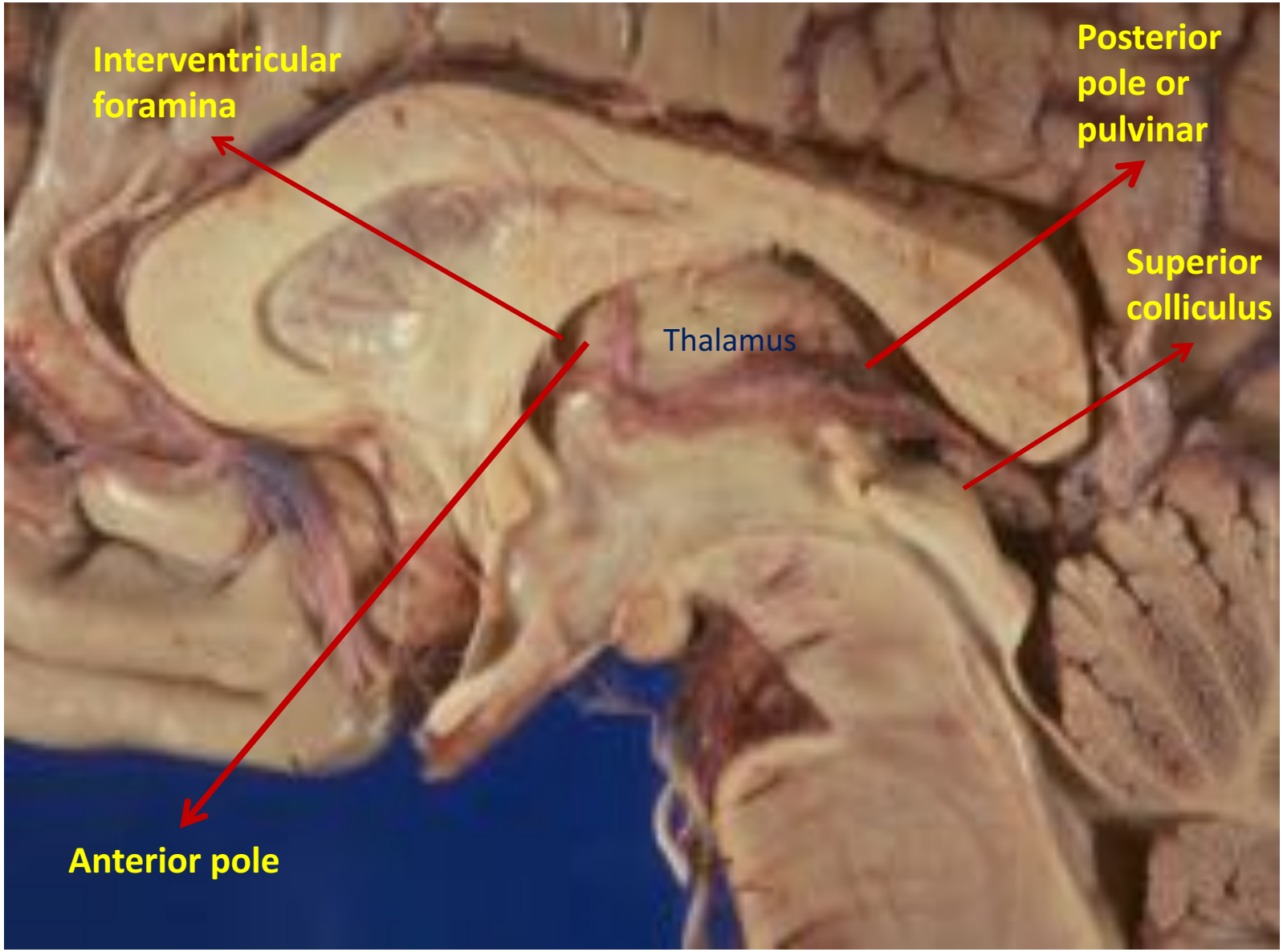
Between cerebral cortex and brain stem
(Both anatomically and functionally)

Sends fibres out to cerebral cortex in all directions

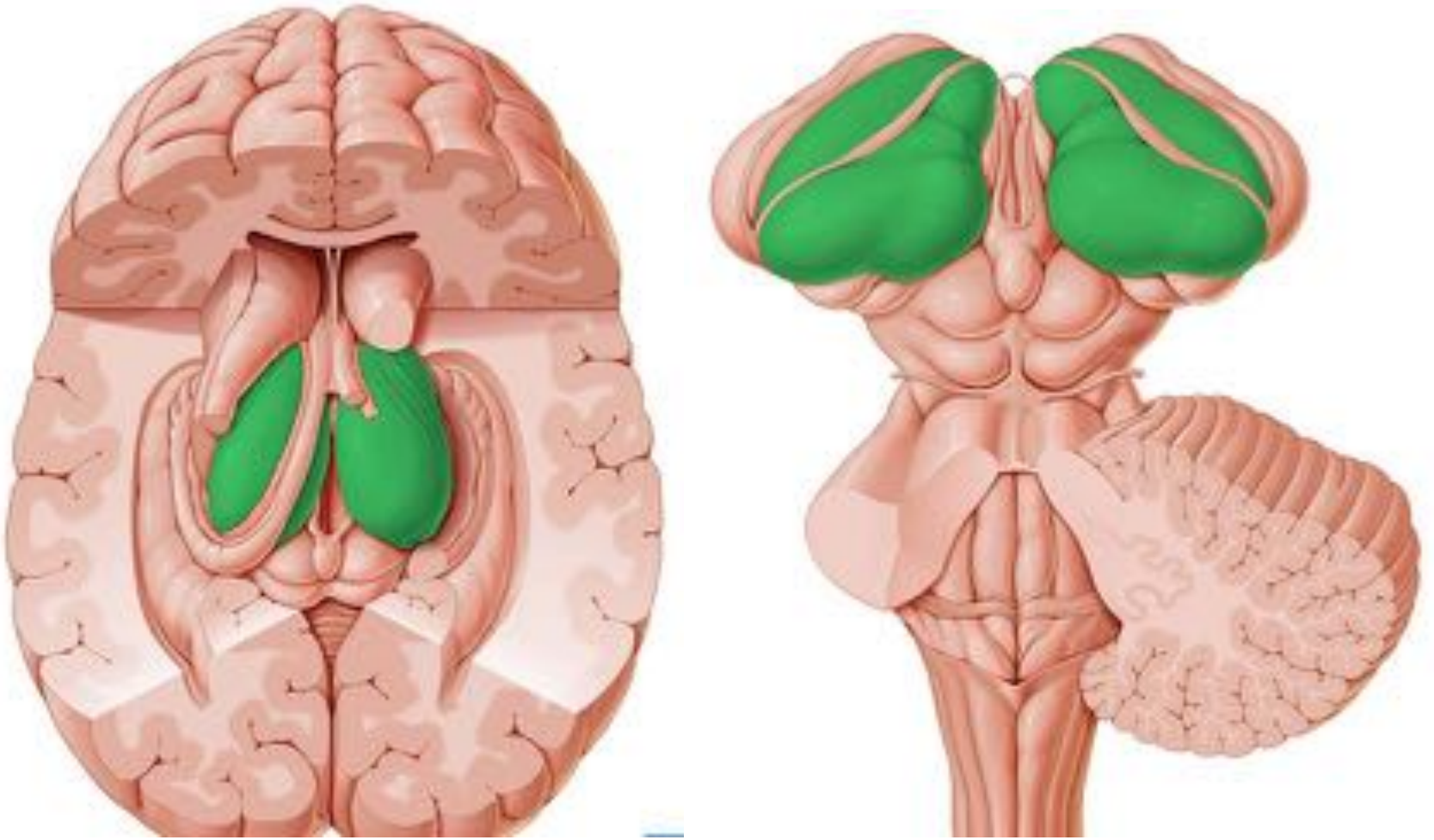
Thalamus

FUNCTIONS
Integration of sensory information
Regulation of motor activity
Regulation of consciousness

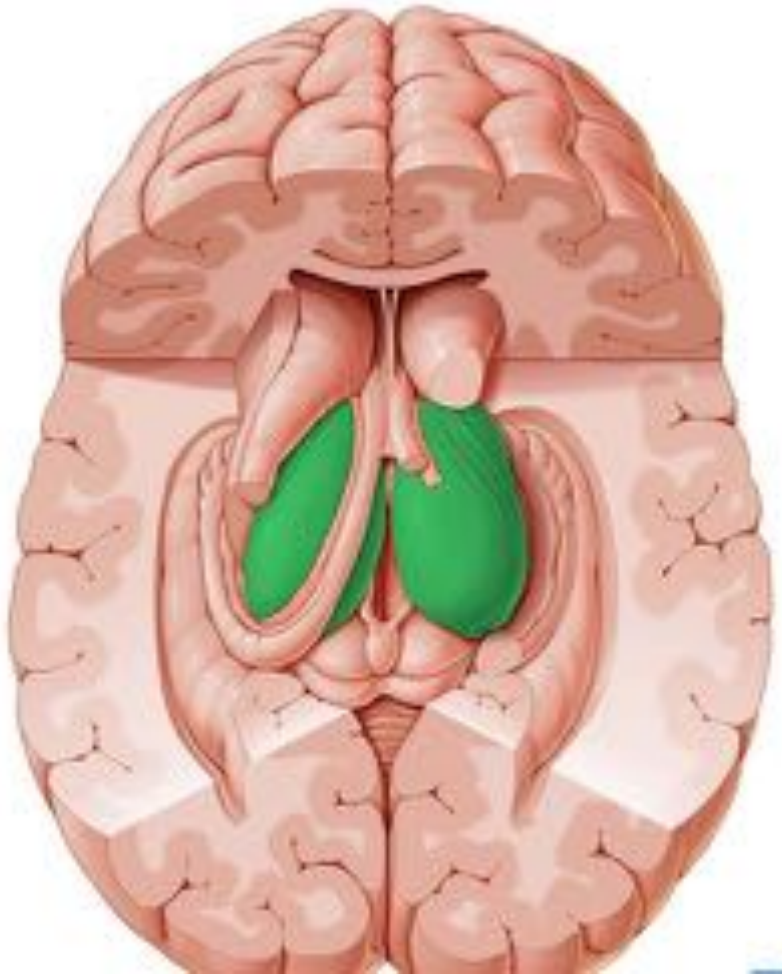
Thalamus


Interventricular foramina
Posterior pole or pulvinar
Superior colliculus
Thalamus
Anterior pole

Thalamus



Thalamus

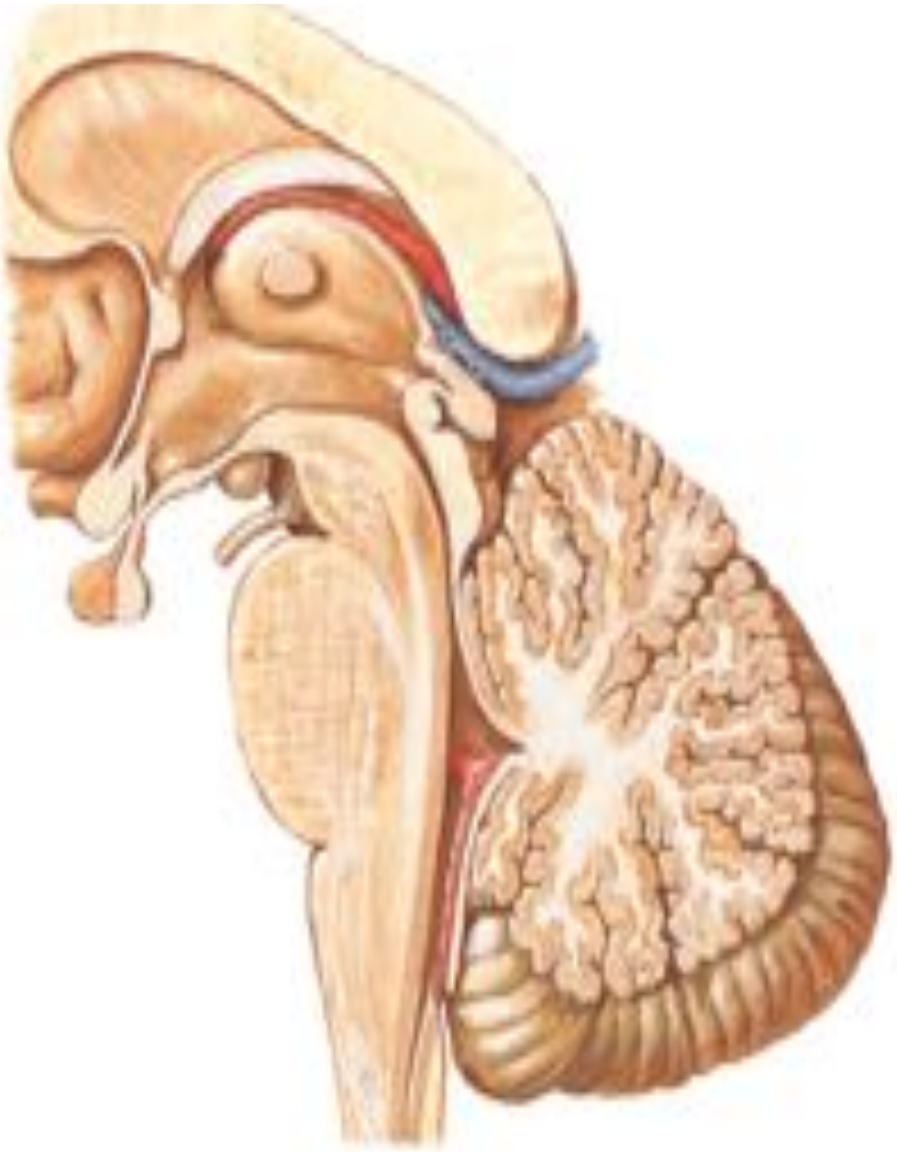


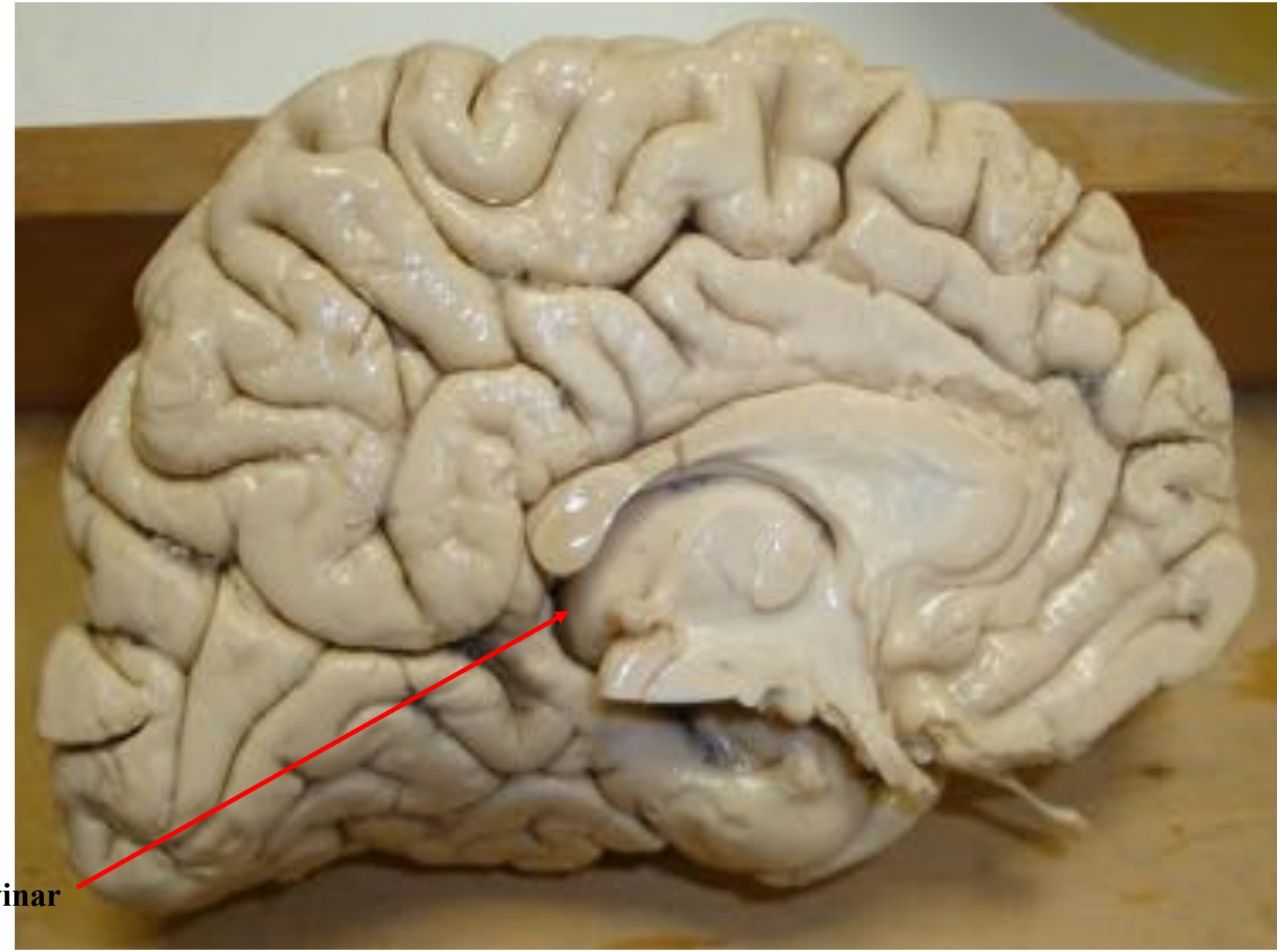
Thalamus

External features

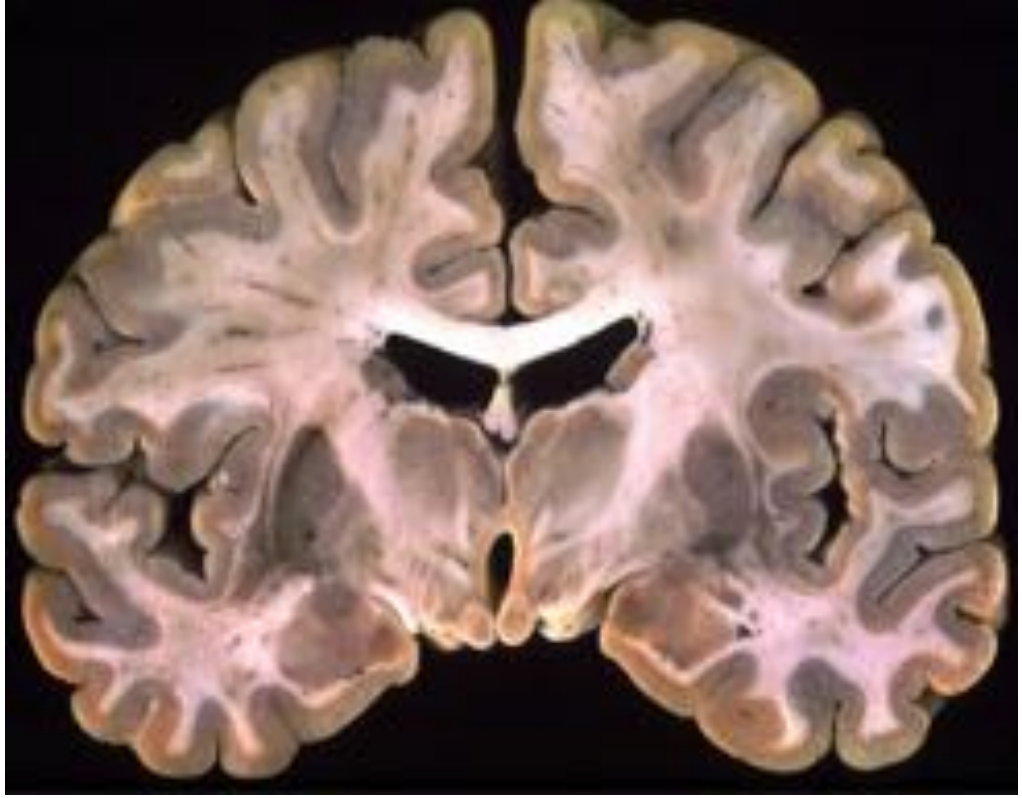
Two ends
Anterior end: Forms the posterior boundary of the intraventricular foramen

Posterior end – Pulvinar: Overhangs the Geniculate Bodies and the Superior Colliculus




Pulvinar

Thalamus



Surfaces

Superior Surface: Lateral ventricle and fornix

Inferior Surface: Continuous with the hypothalamus and the midbrain

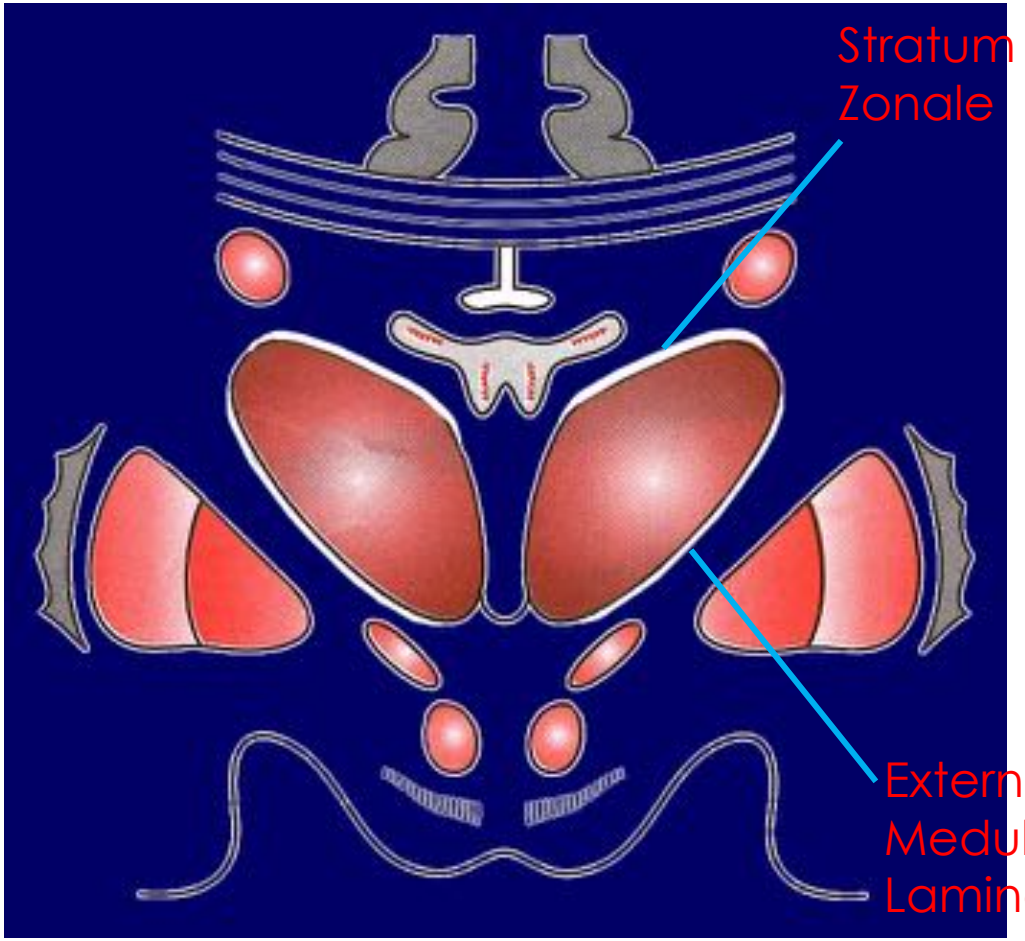
Medial Surface: Forms the lateral wall of the 3rd Ventricle and it is connected with the opposite thalamus with the interthalamic connection

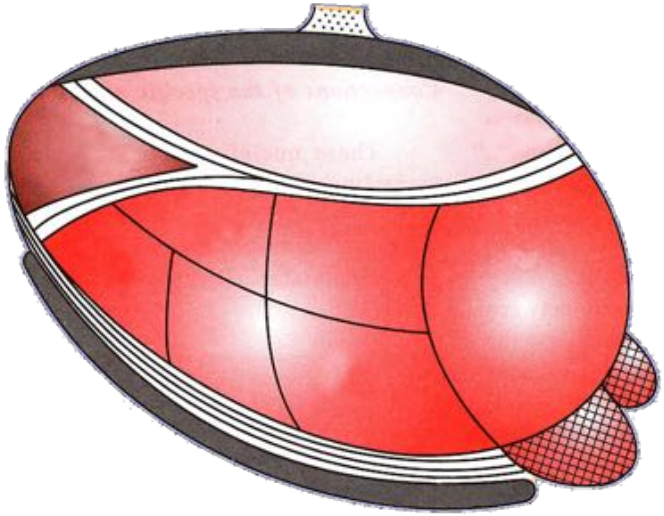
Lateral surface: Internal capsule

Lateral surface of Thalamus – Medial boundary of Post. Limb of Int.Capsule

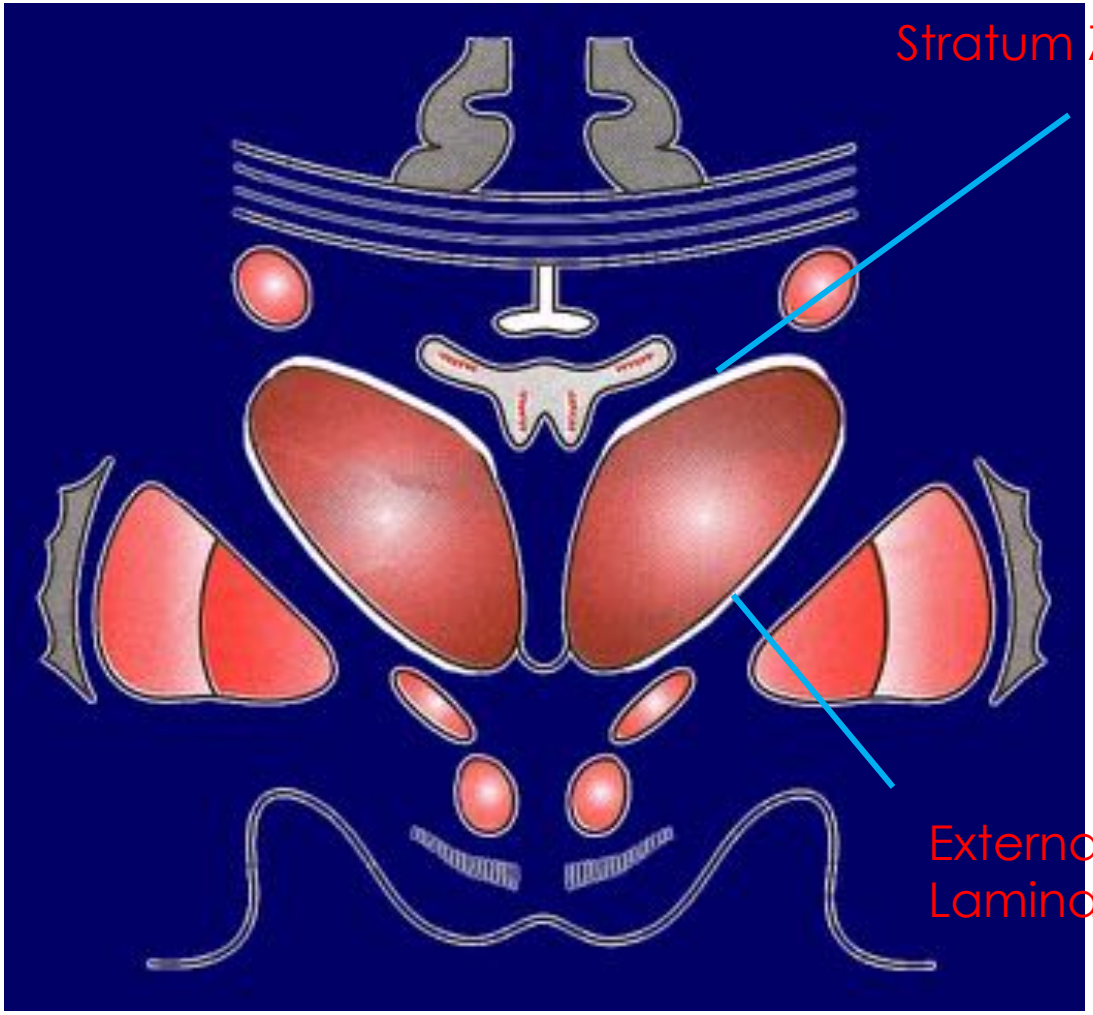
Internal structure of the thalamus

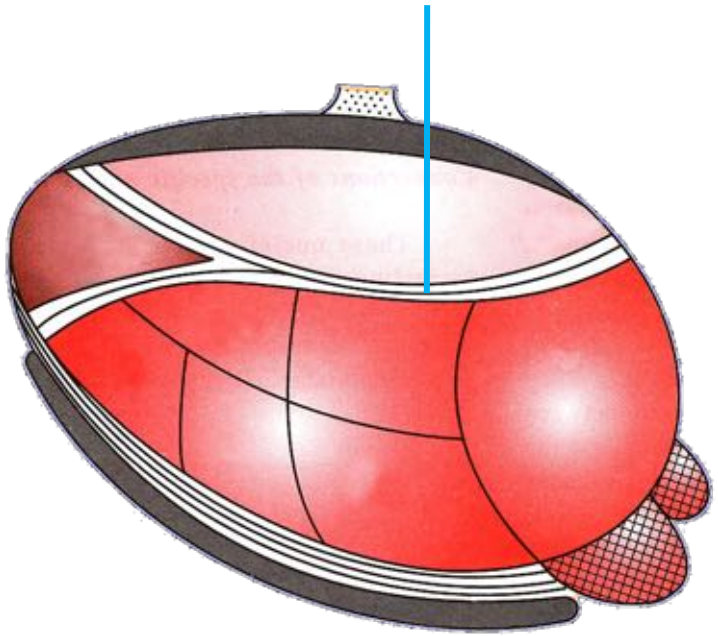
- Thalamus consists mainly of grey matter
- Superior surface is covered by a thin layer of white matter called stratum zonale (ζωνιαία στοιβάδα)
- Lateral surface is covered by a similar layer called external medullary layer (έξω μυελώδες πέταλο).





WHITE MATTER - THALAMUS

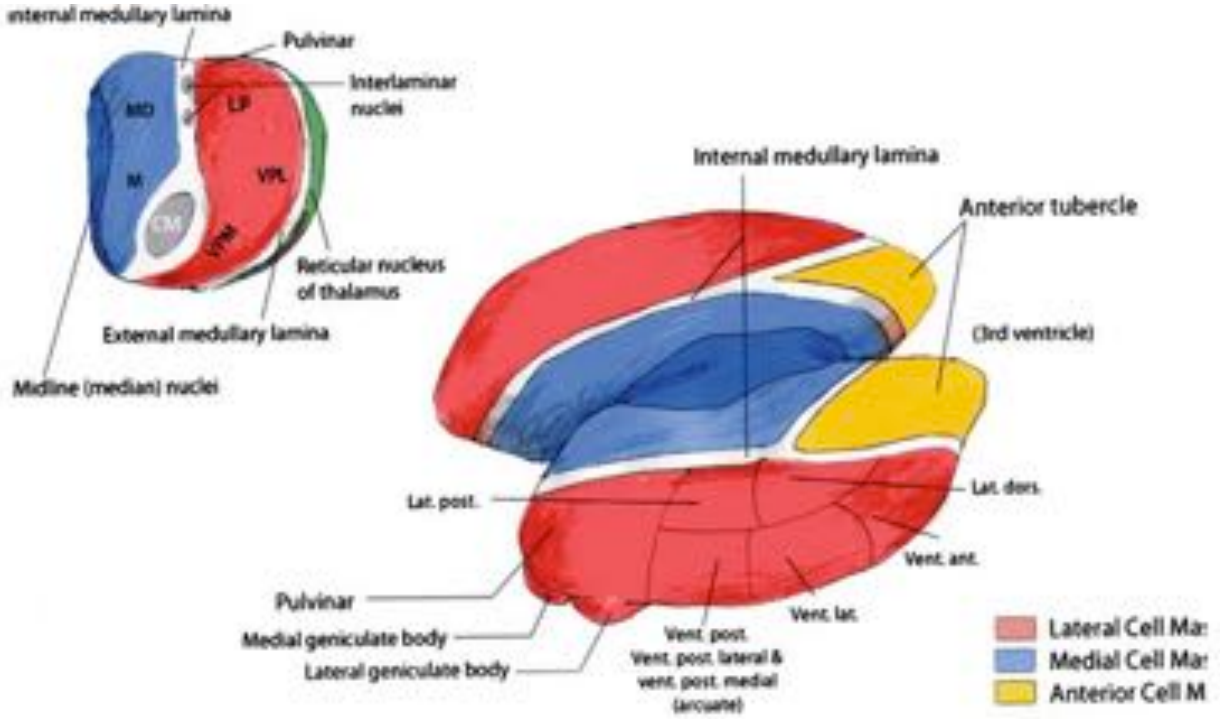




Subdivision of the thalamus

thalamus is divided by a vertical Y-shaped sheet of white matter, the internal medullary lamina into

- **anterior,**
- **medial and**
- **lateral nuclear groups**



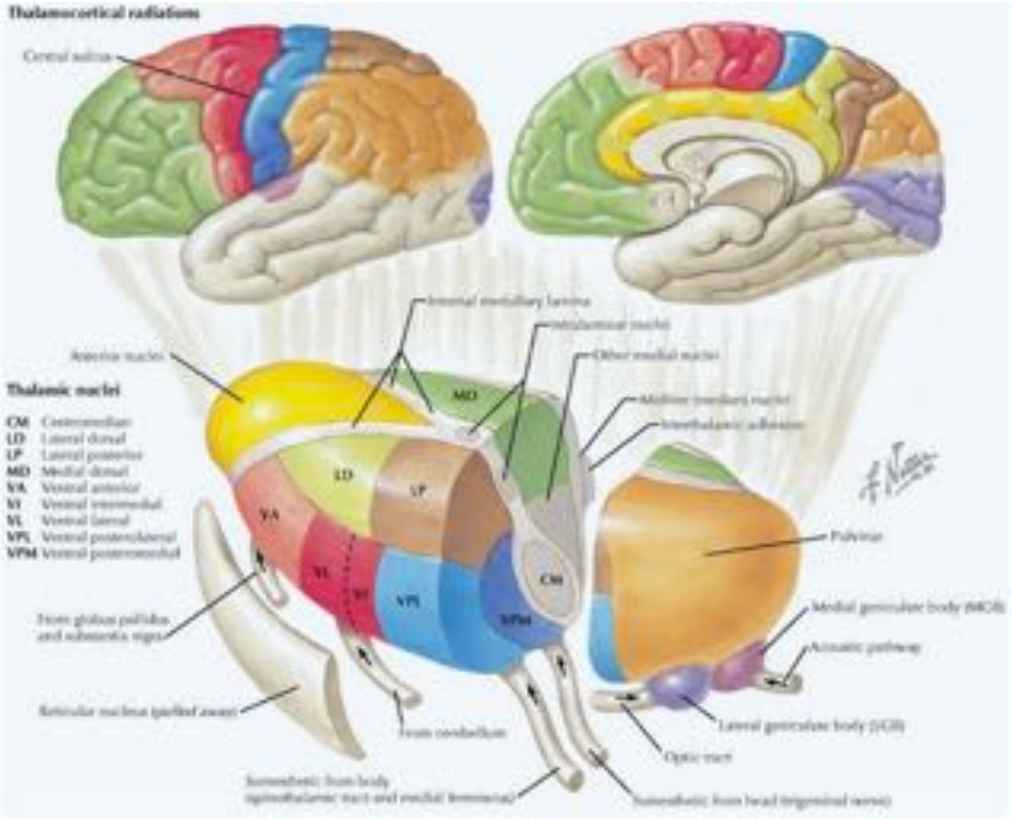
Subdivision of the thalamus: Anterior Part

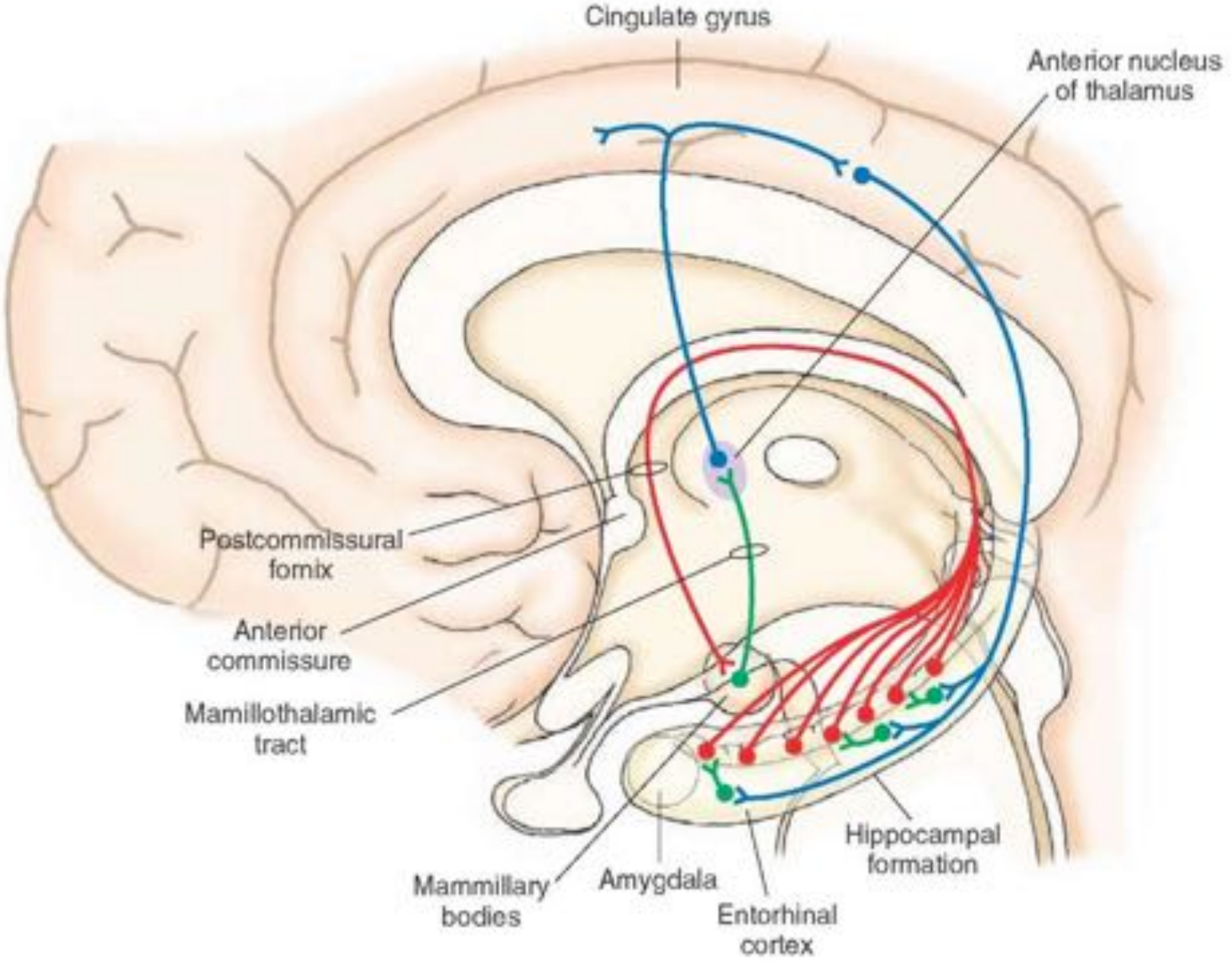
Anterior Thalamic Nucleus

Afferents: Mammillary bodies, hippocampus

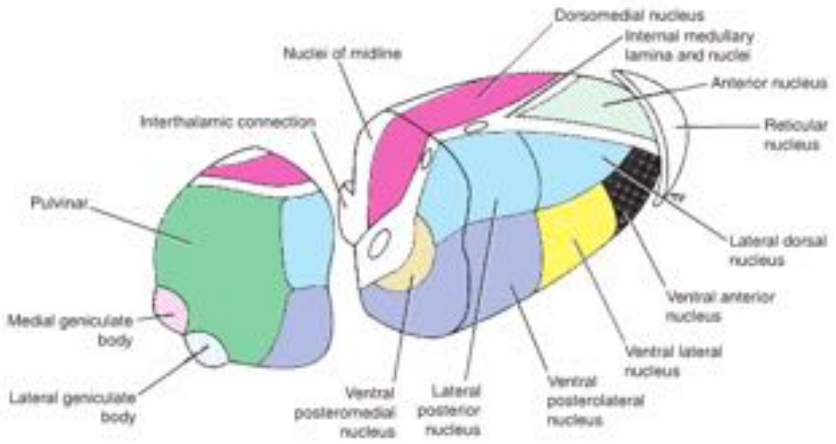
Efferents: Hypothalamus, cingulate gyrus

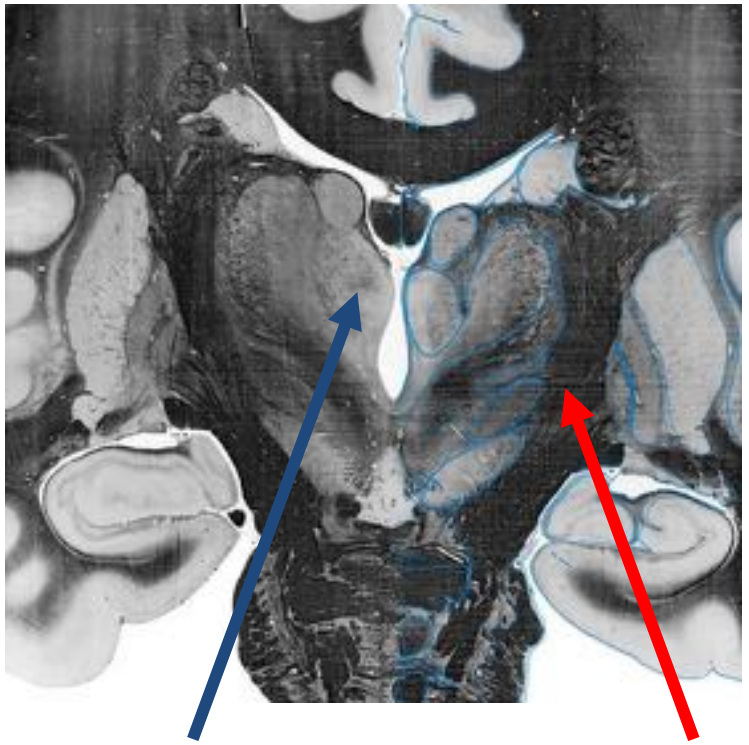
Function: Part of limbic system




Cingulate gyrus
Anterior nucleus of thalamus
Postcommissural fornix
Anterior commissure
Mamillothalamic tract
Mammillary bodies
Amygdala
Entorhinal cortex
Hippocampal formation

Subdivision of the thalamus: Medial Part





Dorsomedial nucleus Internal capsule

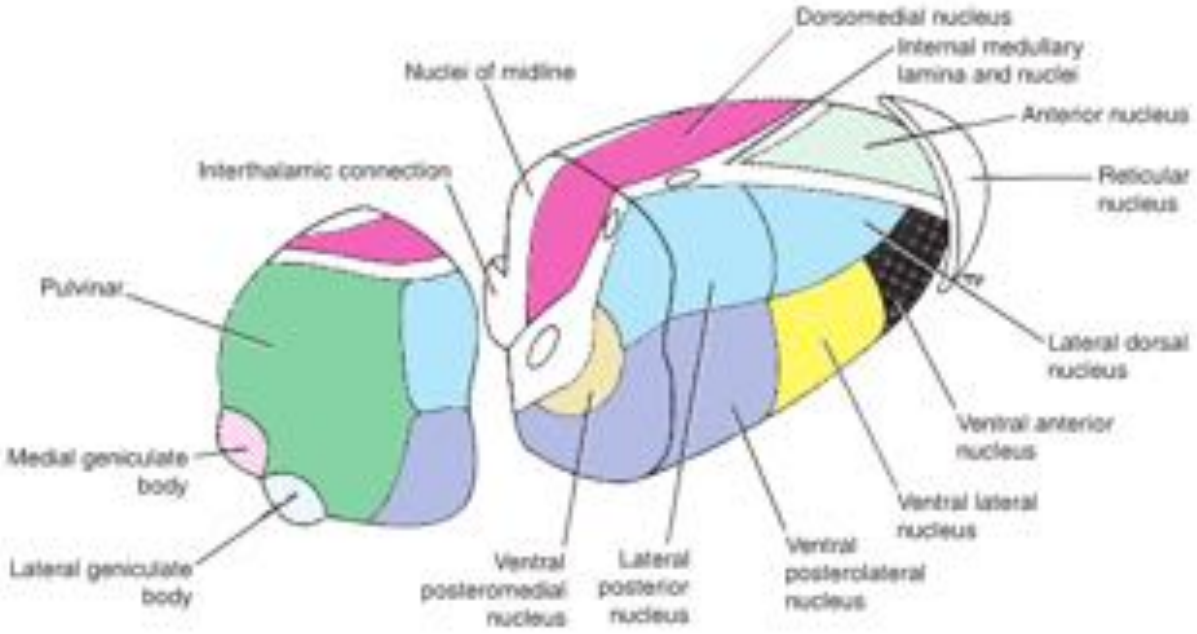
Dorsomedial Nucleus (ραχιαίος έσω πυρήνας)

Afferents: Prefrontal cortex, frontal cortex, hypothalamus, thalamic nuclei

Efferents: Entire cerebral cortex, hypothalamus

Function: Integration of sensory information, concerned with judgment, decision making, memory and behavior.

Subdivision of the thalamus: Lateral Part

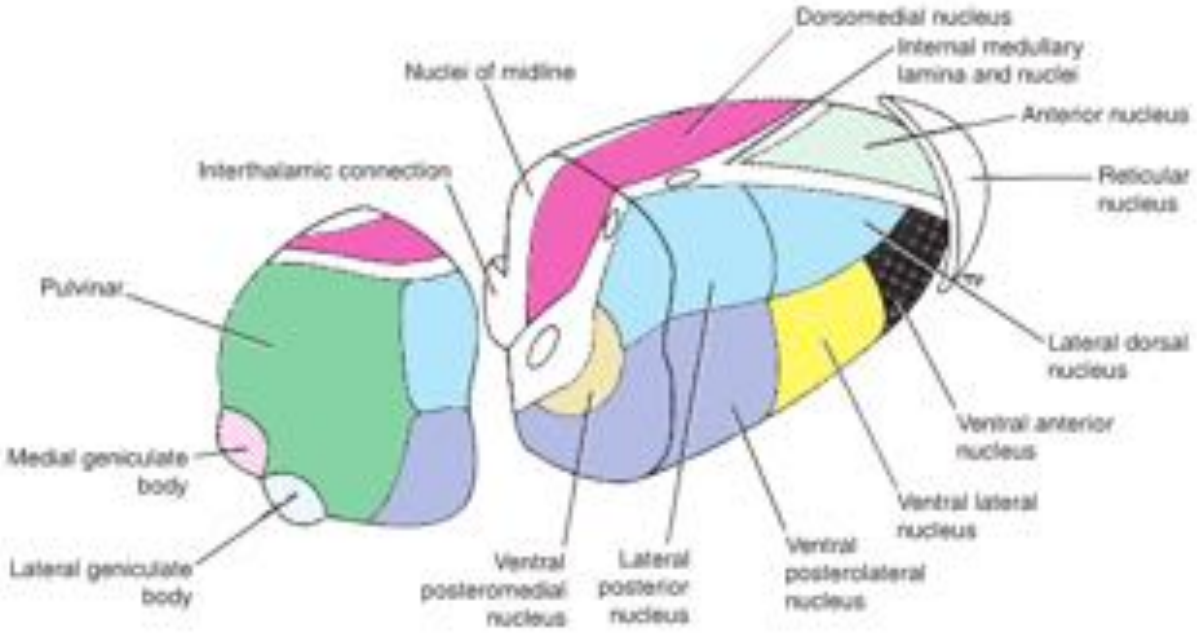


2 Levels: Dorsal and Ventral nuclei

Dorsal Nuclei (lateral dorsal n., lateral posterior n., pulvinar)

The dorsal group of nuclei communicate with several regions of the brain via afferent fibers. It is also connected with several other areas but the exact nature of these communications is unknown.

Subdivision of the thalamus: Lateral Part



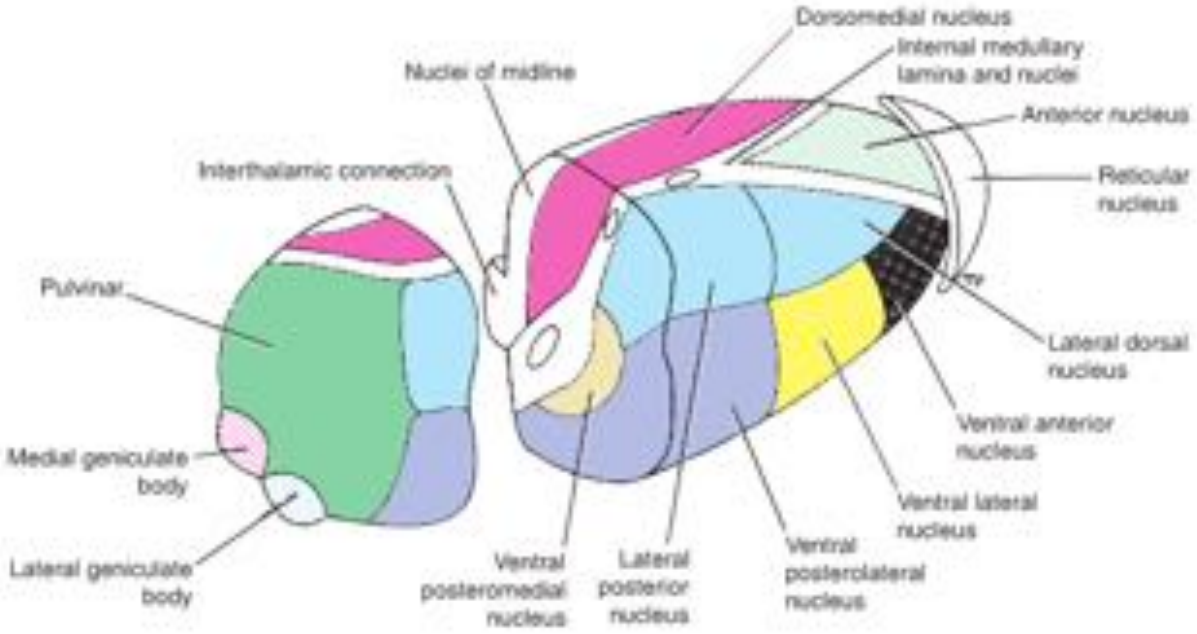
Ventral Nuclei (ventral anterior n., ventral lateral n., ventral posterior n.)

These nuclei are located on the path between the basal ganglia and the motor areas of the premotor cortex, relaying information with both.

Function: they influence the activity of the motor cortex

ESPECIALLY the ventral posterior lateral: receives info from the ascending pathways and it is the primary relay nucleus of the thalamus

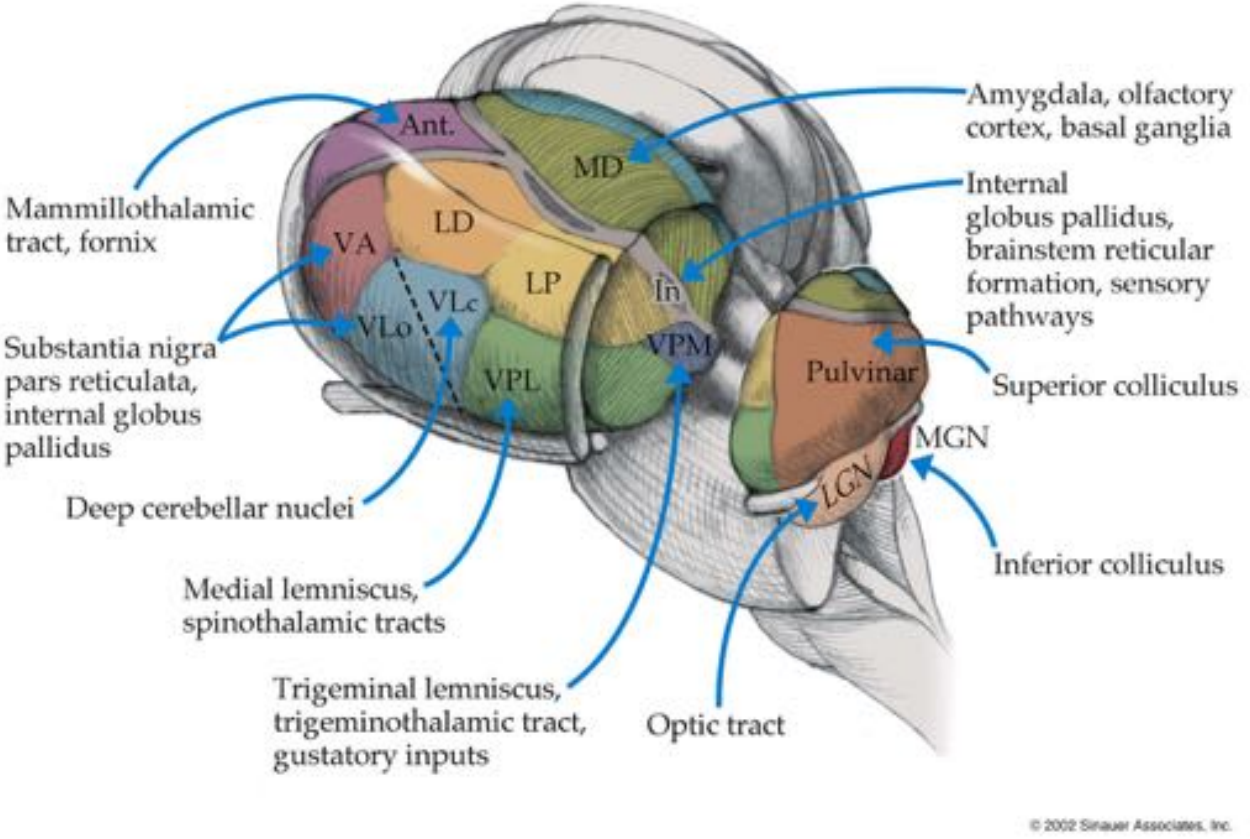
Other Nuclei of the Thalamus



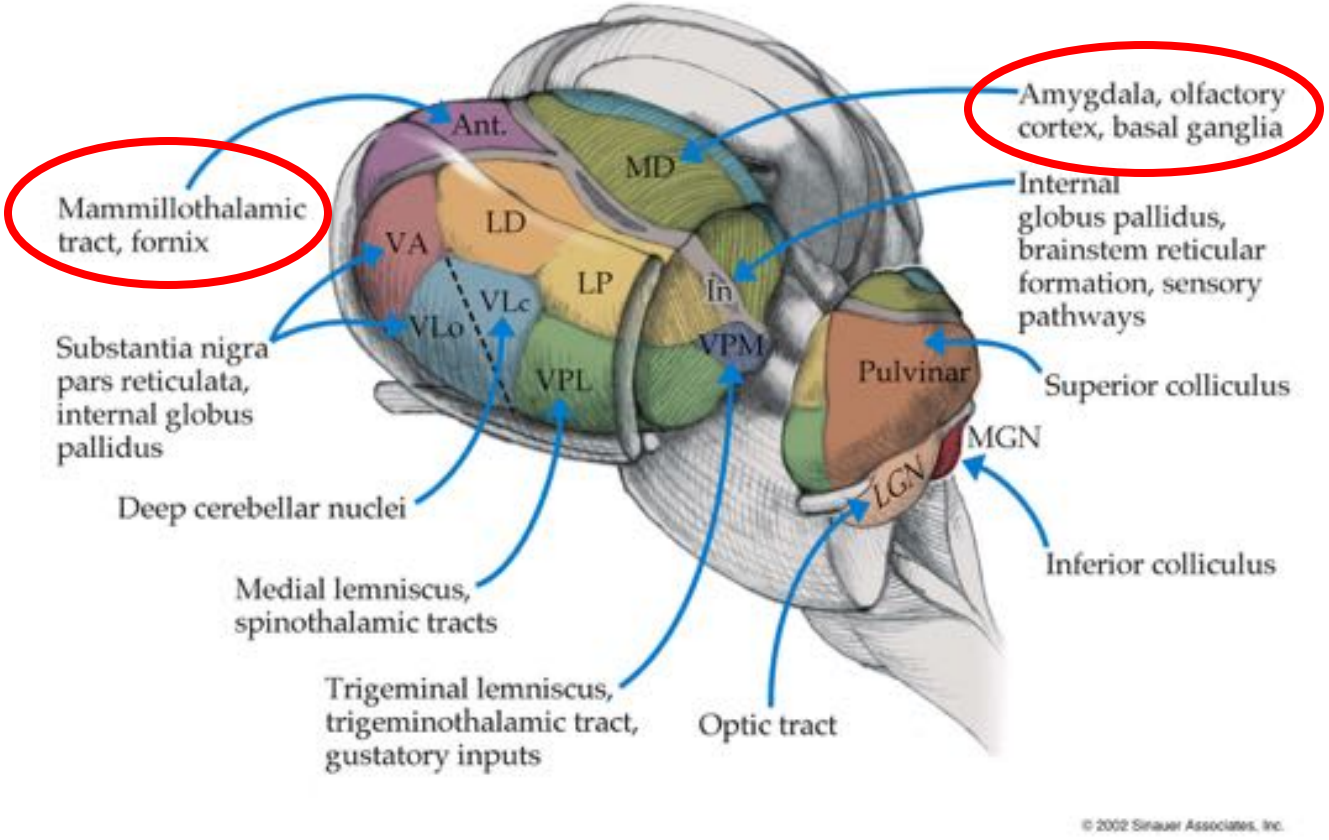
a. Intralaminar nuclei
b. midline nuclei
c. reticular nucleus

Function: they influence the levels of consciousness and alertness

Input to the Thalamus



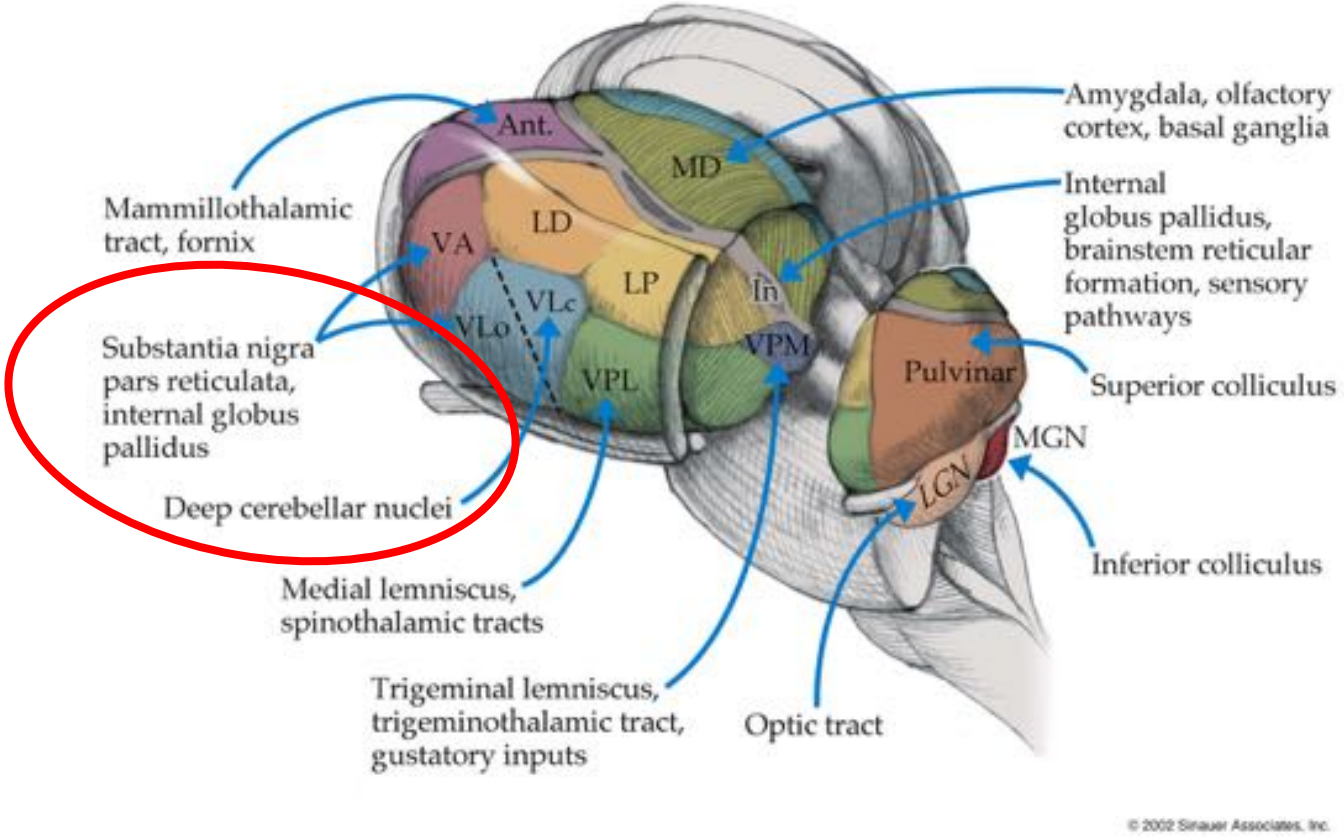
Input to the Thalamus



Behavior and emotion

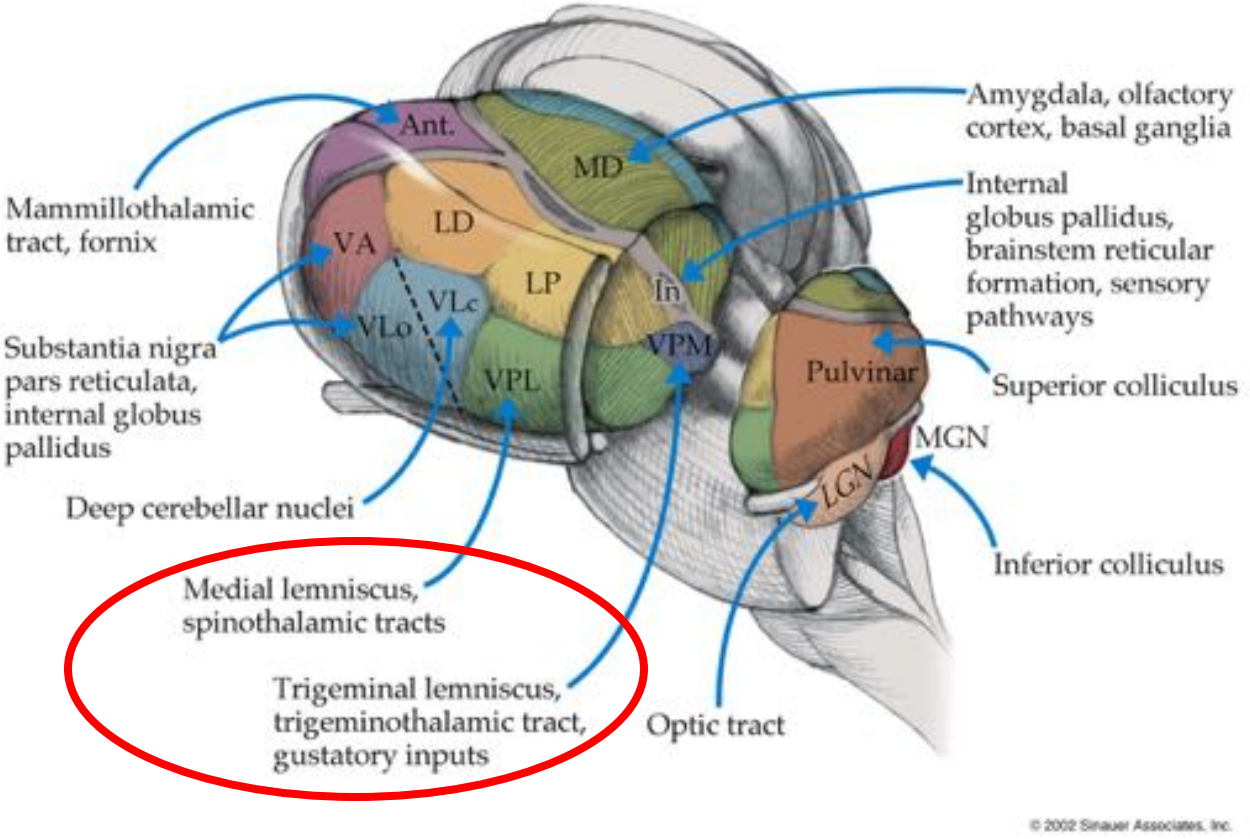
connection with hypothalamus

Input to the Thalamus



Motor control and integration

Input to the Thalamus



Sensory relay - Ventral posterior group

all sensation from body and head, including pain

Functions of the thalamus

1. Sensory integration/relay station for all sensory pathways (Except olfaction)
2. Capable of recognition of pain, thermal & tactile sensations
3. Influences voluntary movements through basal ganglia & cerebellum – cerebral cortex – cortico-nuclear / cortico-spinal pathways
4. Maintains state of wakefulness and alertness
5. Impulses received from hypothalamus projected o prefrontal & cingulate gyrus – Determination of mood
6. Recent memory and emotions

Lesions of the thalamus:

a. Sensory loss (light touch, discrimination, muscle joint sense)
b. Thalamic Pain (thalamic overreaction)
c. Motor Dysfunctions
d. Changes in consciousness and alertness

SOS: The lesions of the thalamus usually affect the neighboring structures producing symptoms from these structures……

Diencephalon

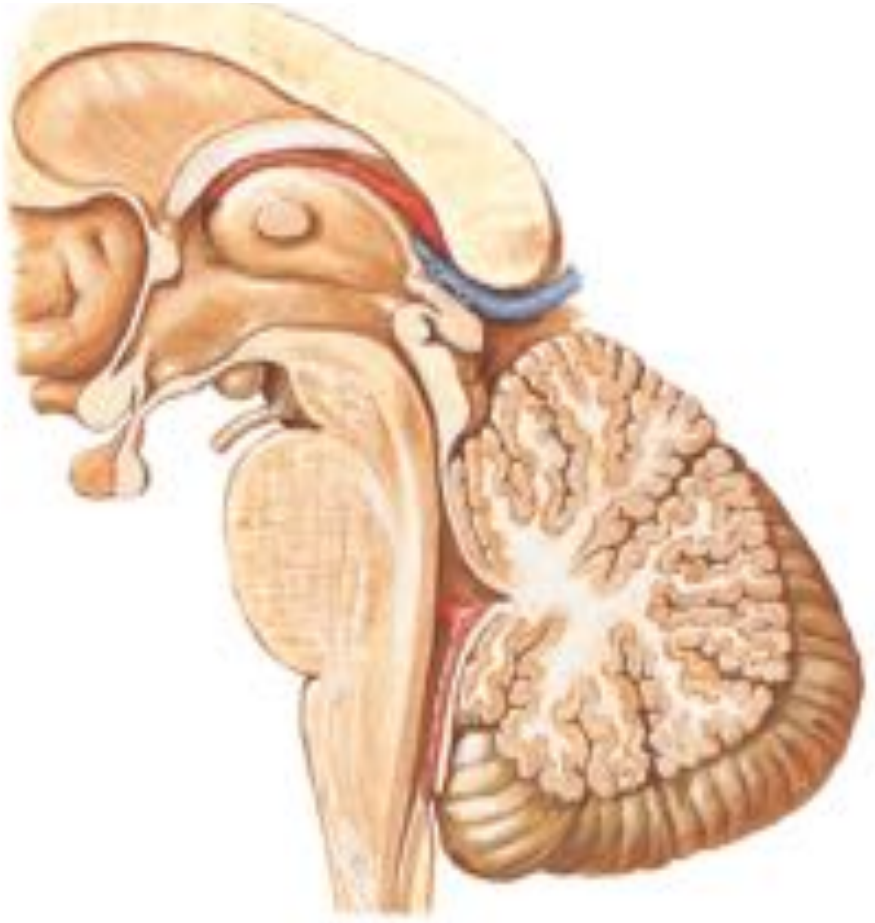
Thalamus

Metathalamus

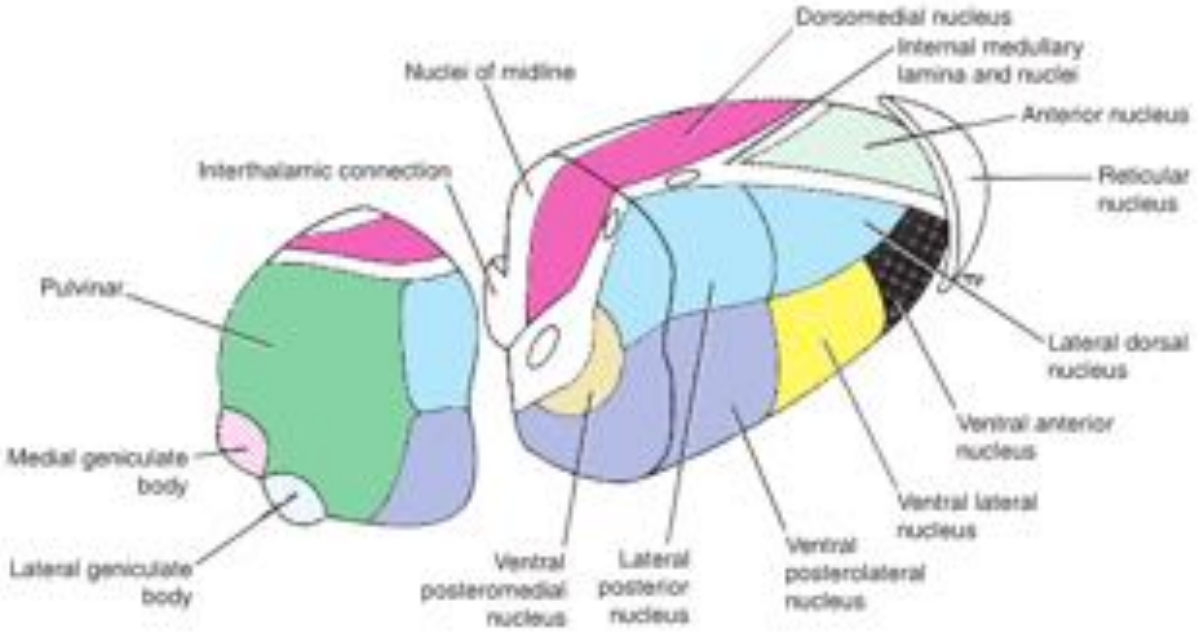
Hypothalamus

Epithalamus

3rd Ventricle

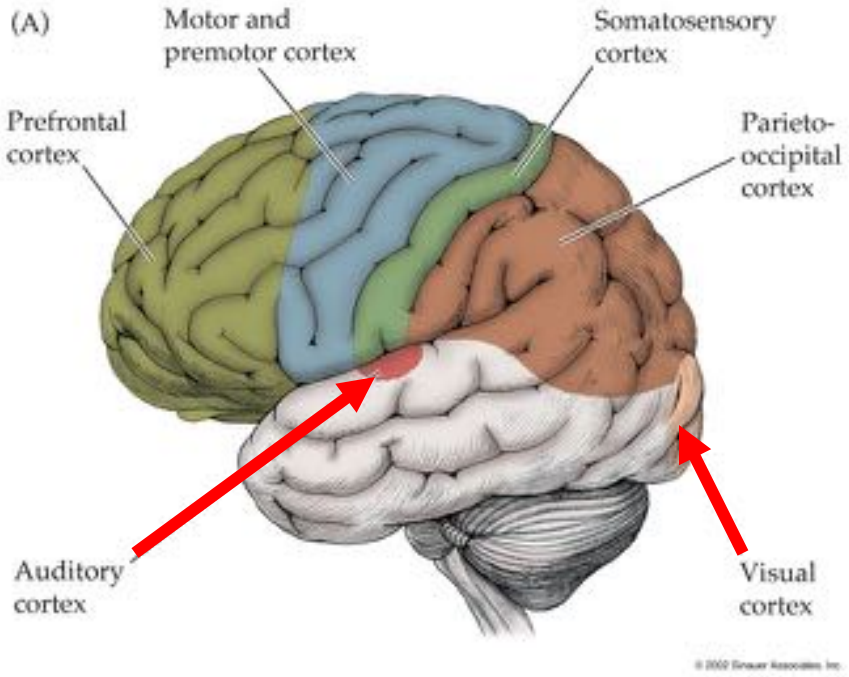


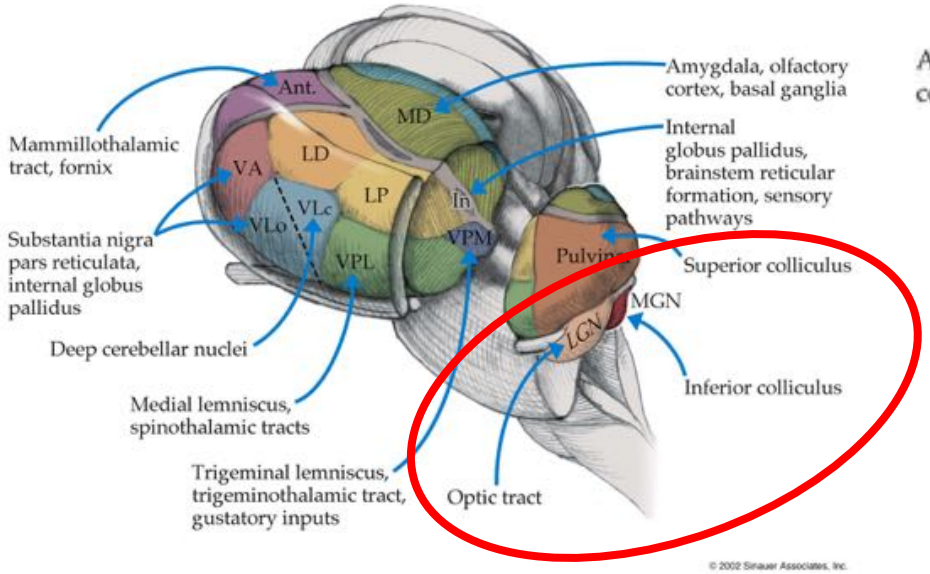
Metathalamus



a. Medial Geniculate Body (part of auditory pathway, it is connected via the inferior branchium with the inferior colliculus)
b. Lateral Geniculate Body (part of visual pathway, it is connected via the superior branchium with the superior colliculus)

Connections of the Metahalamus

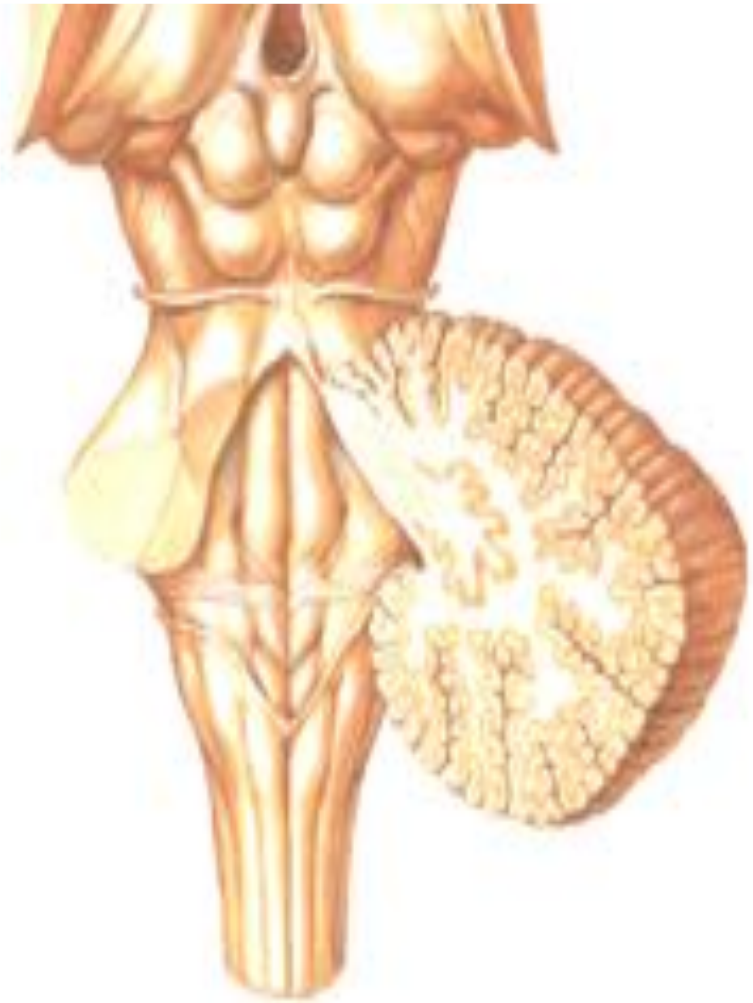


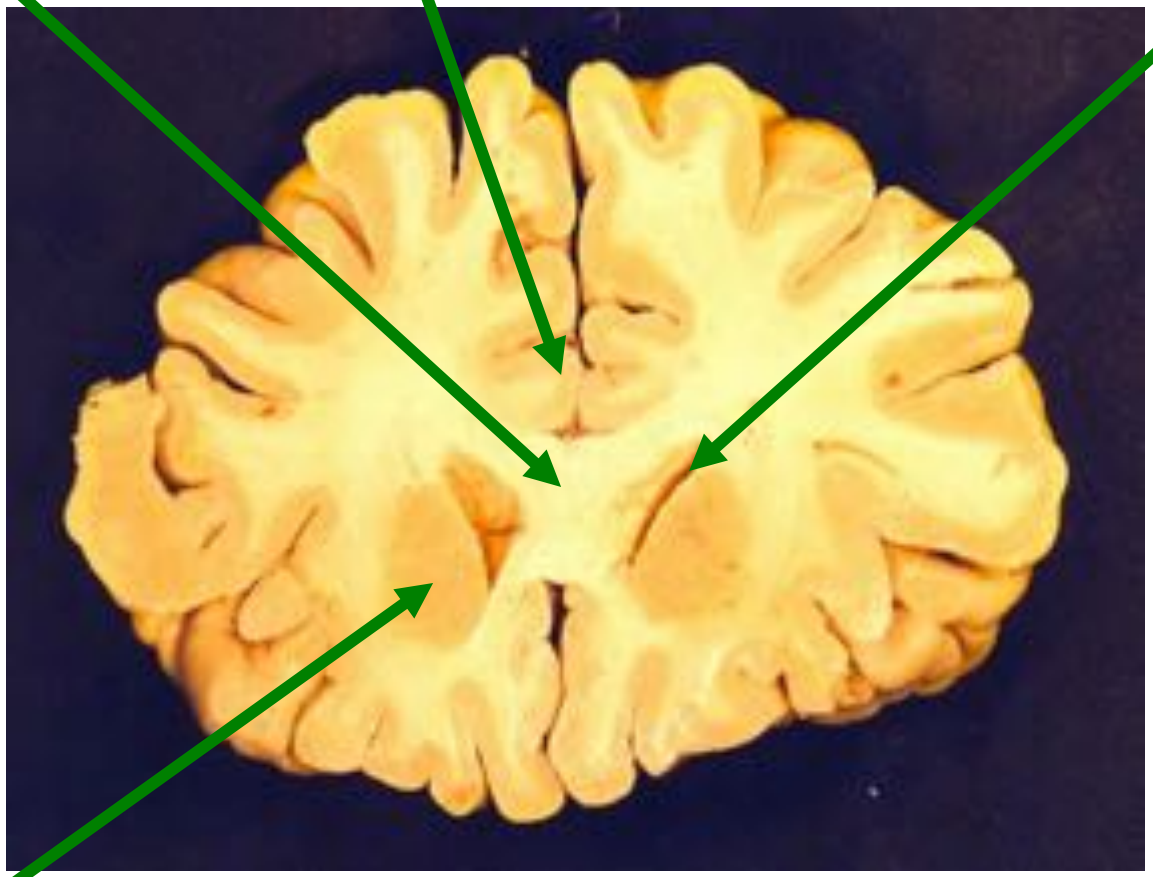


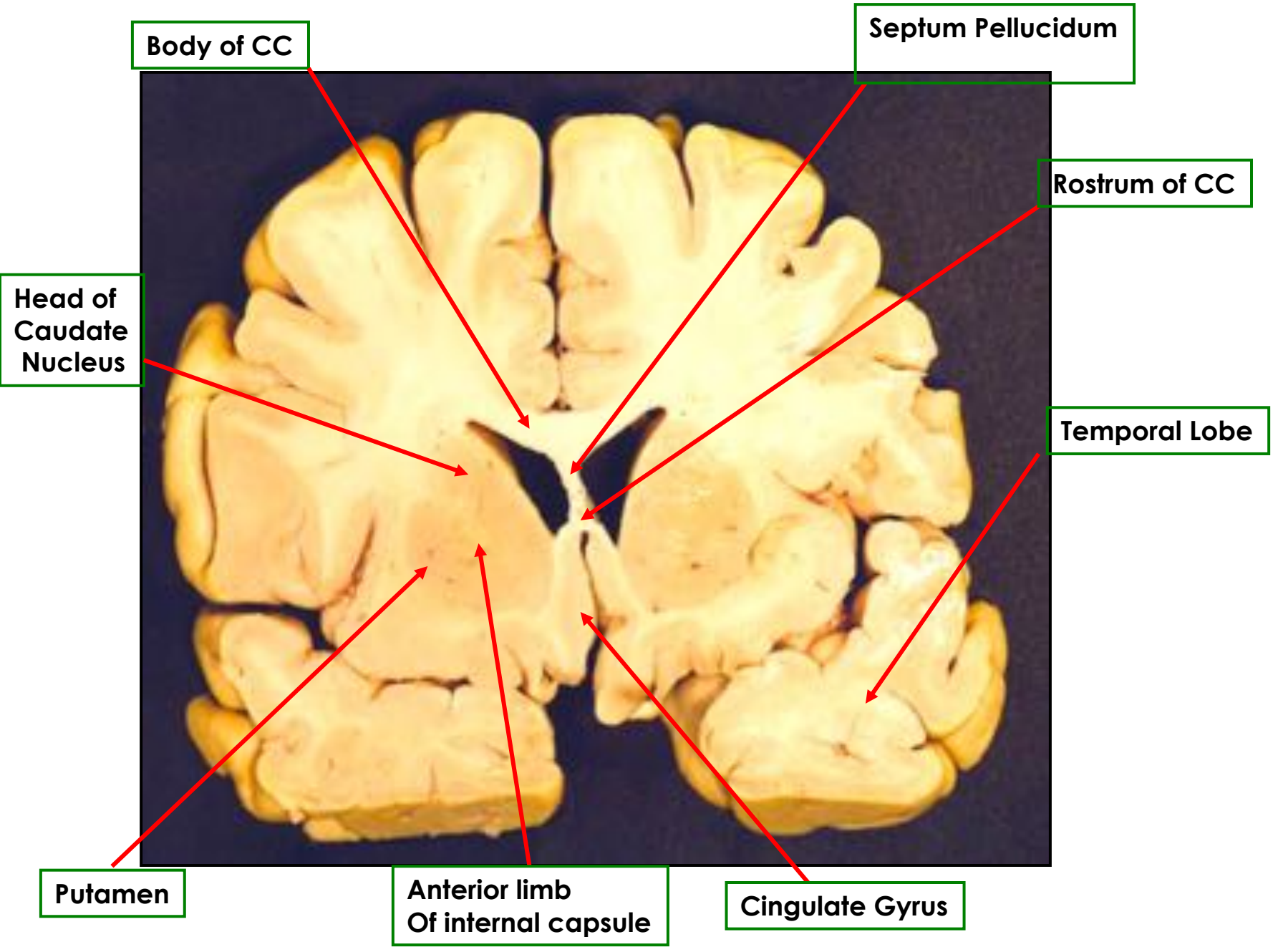
Metathalamus

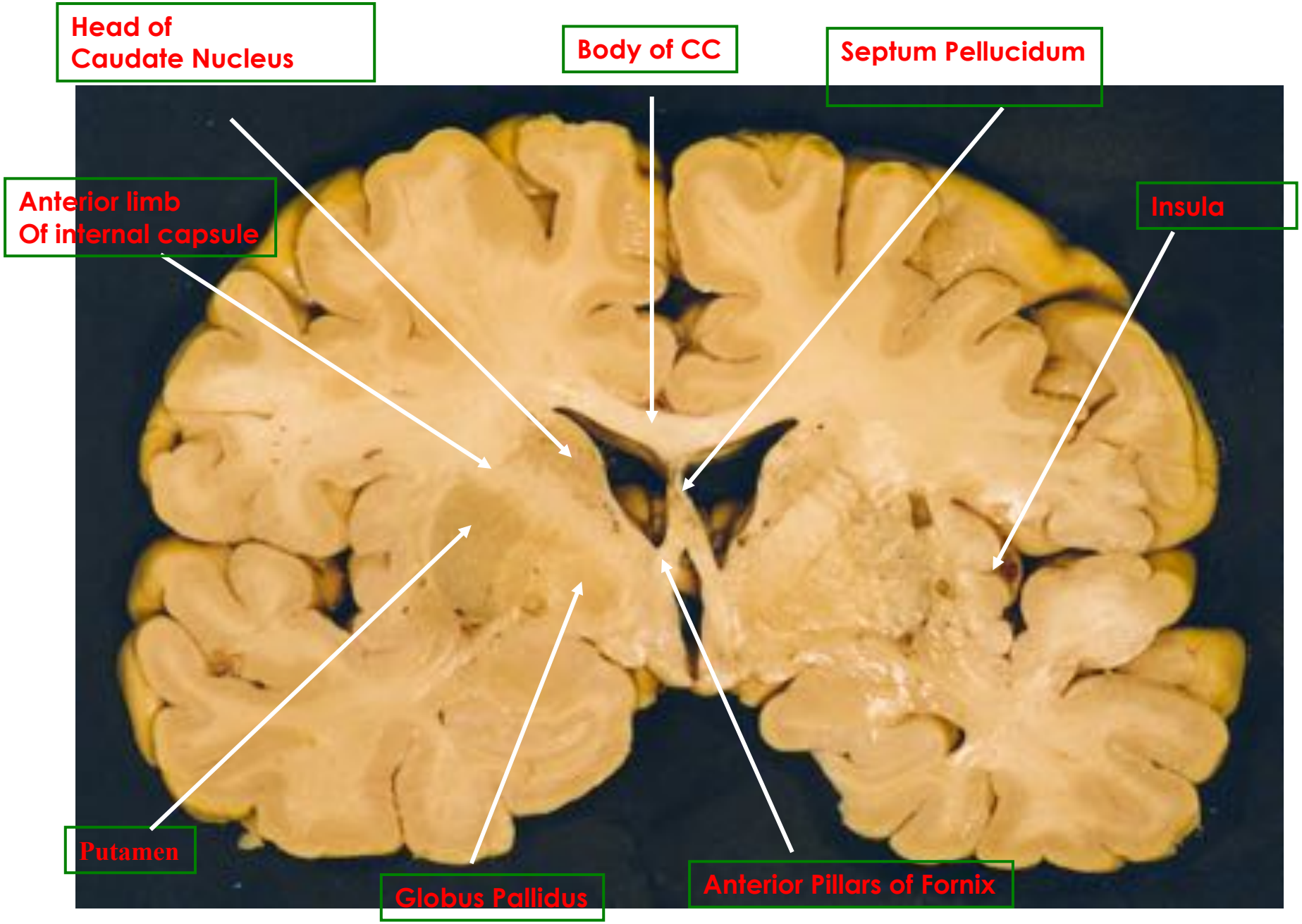
Vision and Hearing

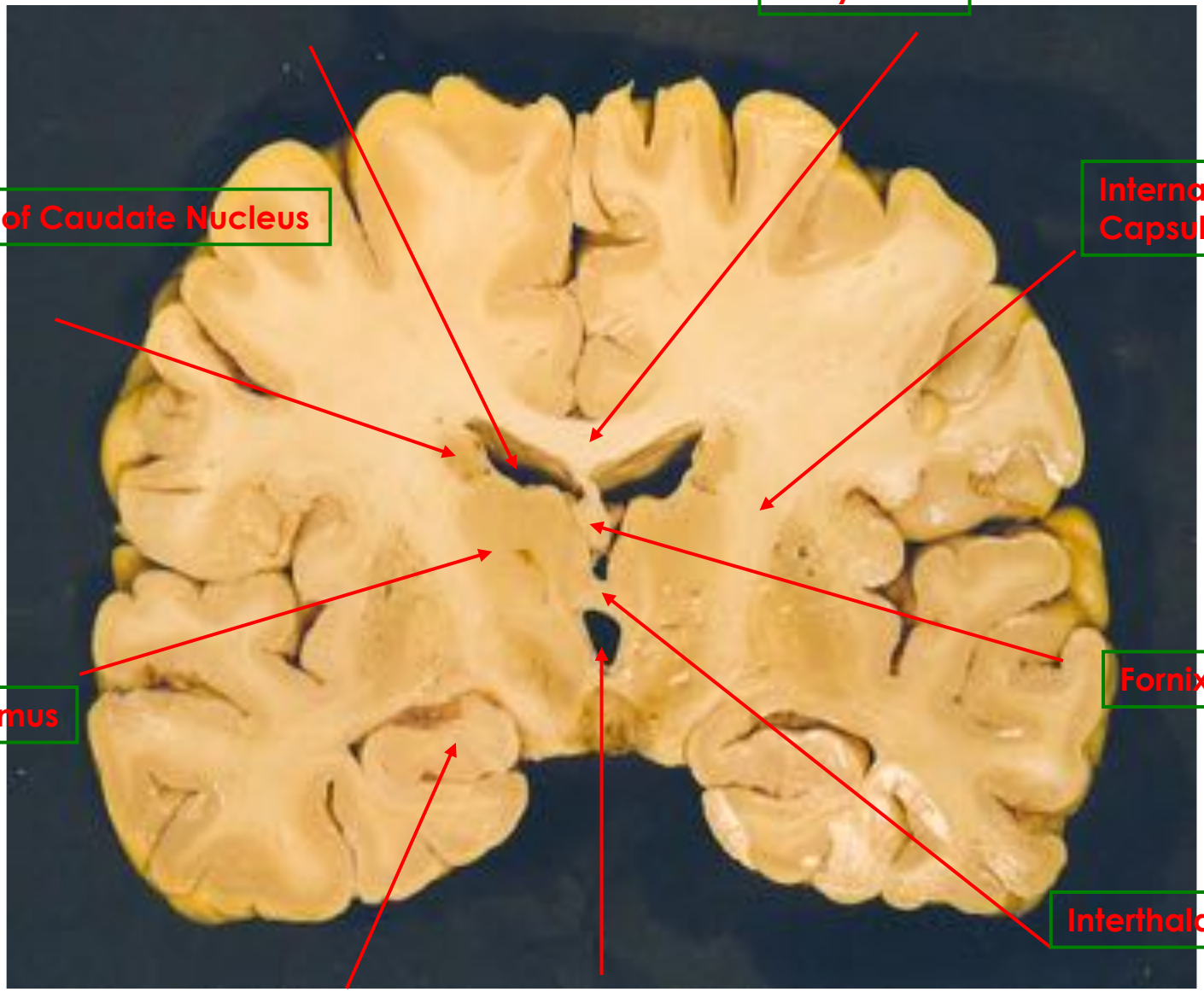
Metathalamus

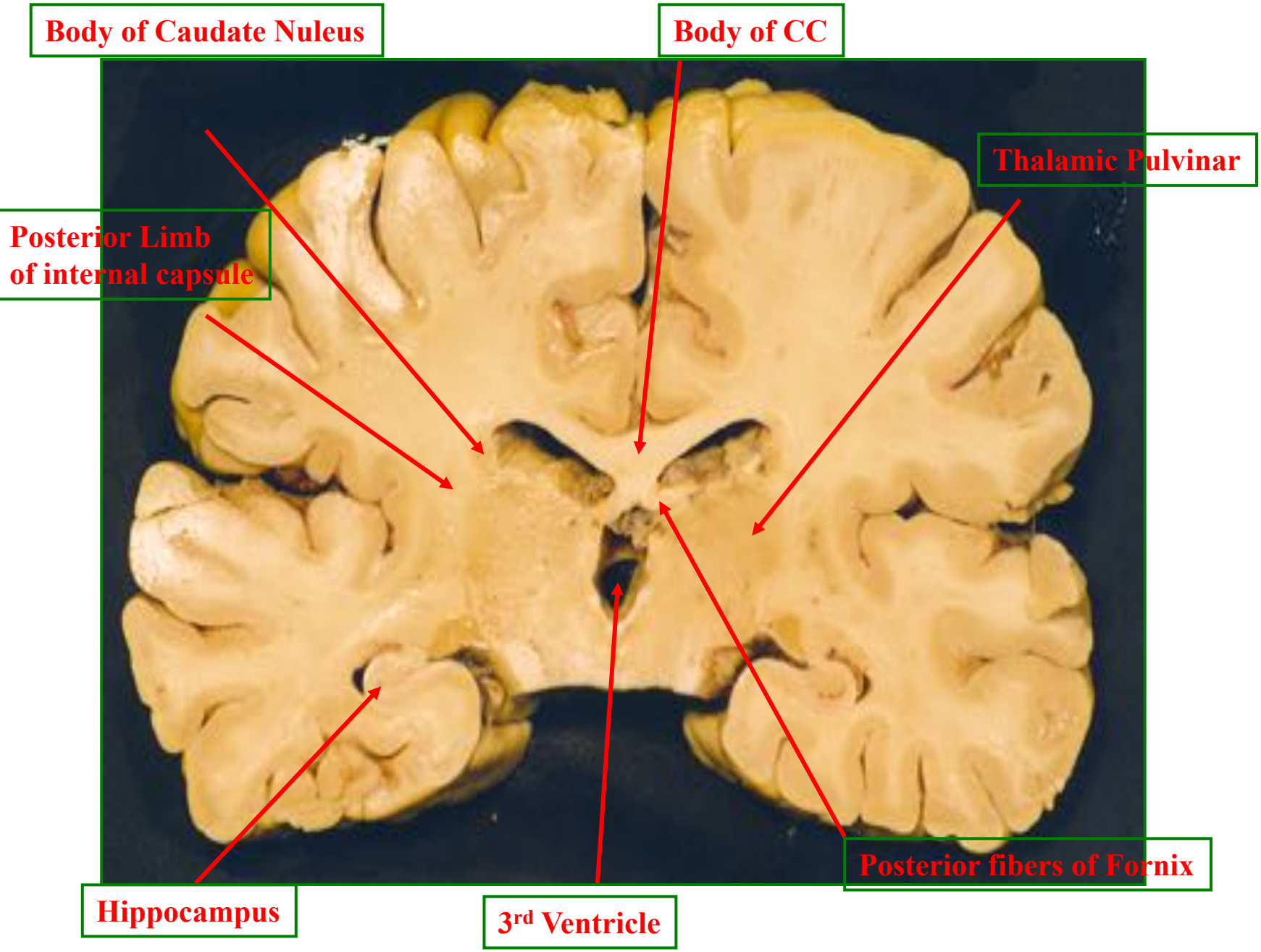


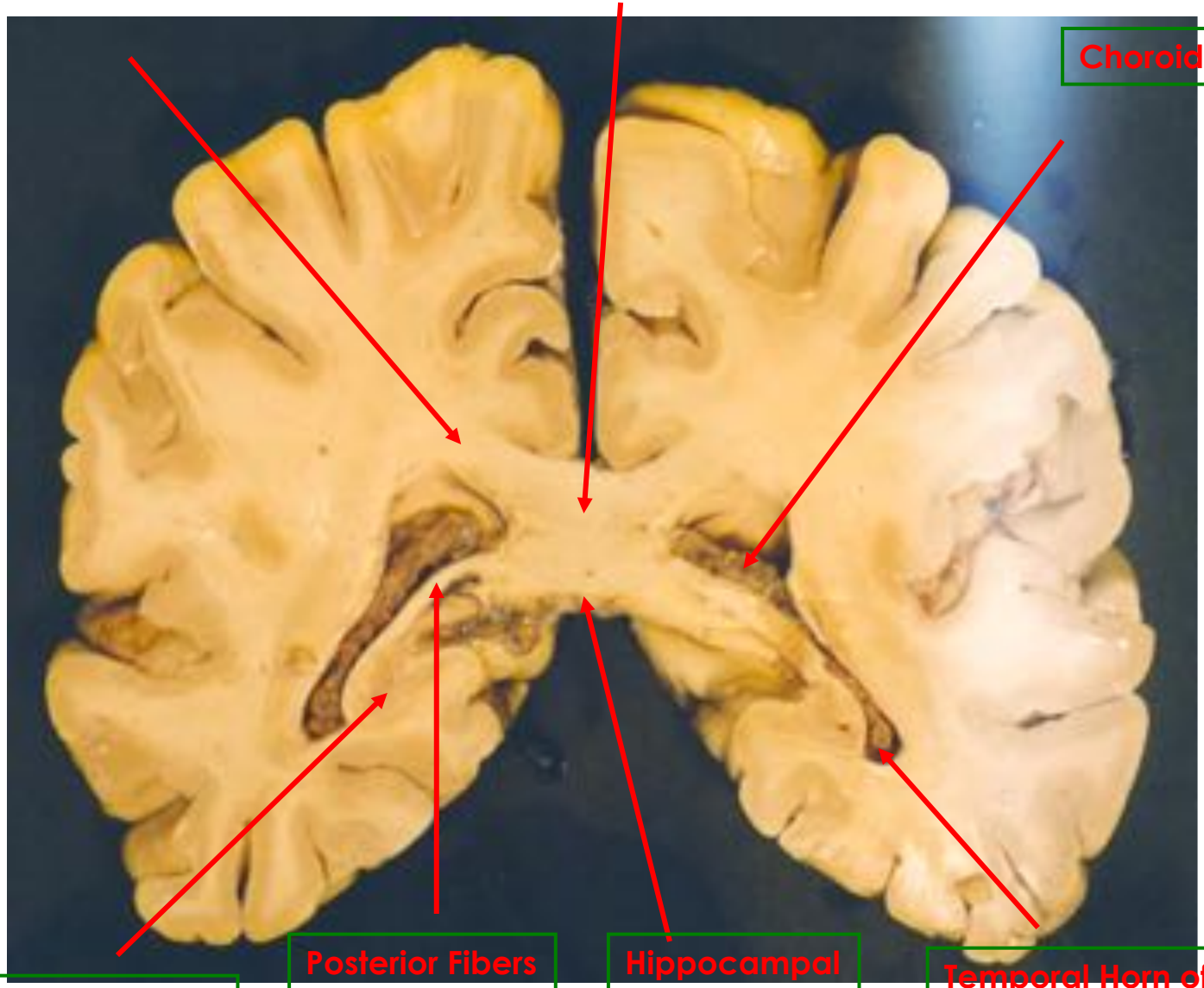

Genu of CC
Cingulate gyrus
Anterior horn
of lateral ventricle
Head of the caudate nucleus


Body of CC
Septum Pellucidum
Rostrum of CC
Head of Caudate Nucleus
Temporal Lobe
Putamen
Anterior limb Of internal capsule
Cingulate Gyrus


Head of
Caudate Nucleus
Body of CC
Septum Pellucidum
Anterior limb
Of internal capsule
Insula
Putamen
Globus Pallidus
Anterior Pillars of Fornix


Body of Lateral Ventricle
Body of CC
Body of Caudate Nucleus
Internal Capsule
Thalamus
Fornix
Interthalamic adhesion
Hippocampus
3rd Ventricle


Body of Caudate Nuleus
Body of CC
Thalamic Pulvinar
Posterior Limb
of internal capsule
Posterior fibers of Fornix
Hippocampus
3rd Ventricle


Body of Caudate Nucleus
Splenium of CC
Choroid Plexus
Hippocampus
Posterior Fibers
Of Fornix
Hippocampal
Commissure
Temporal Horn of Lateral Ventricle