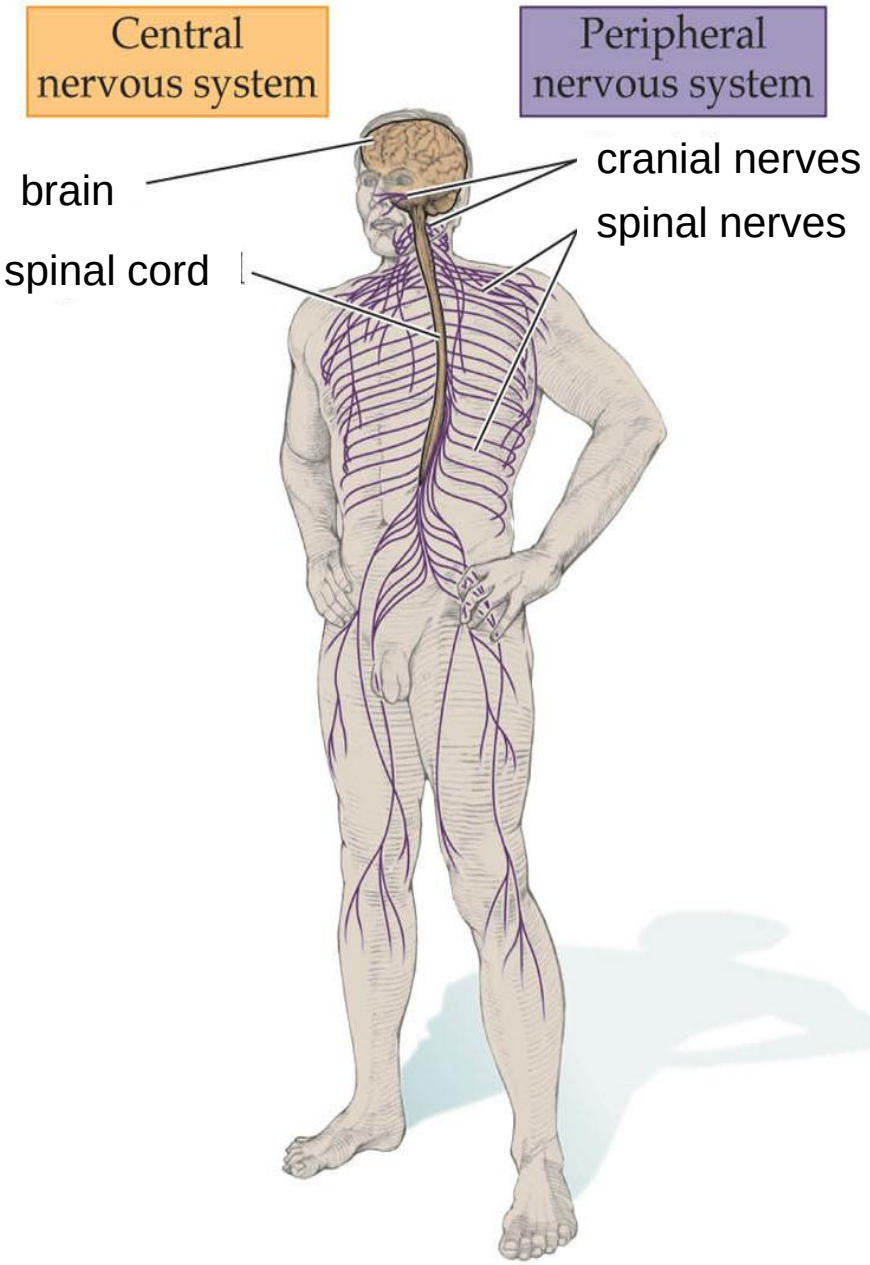
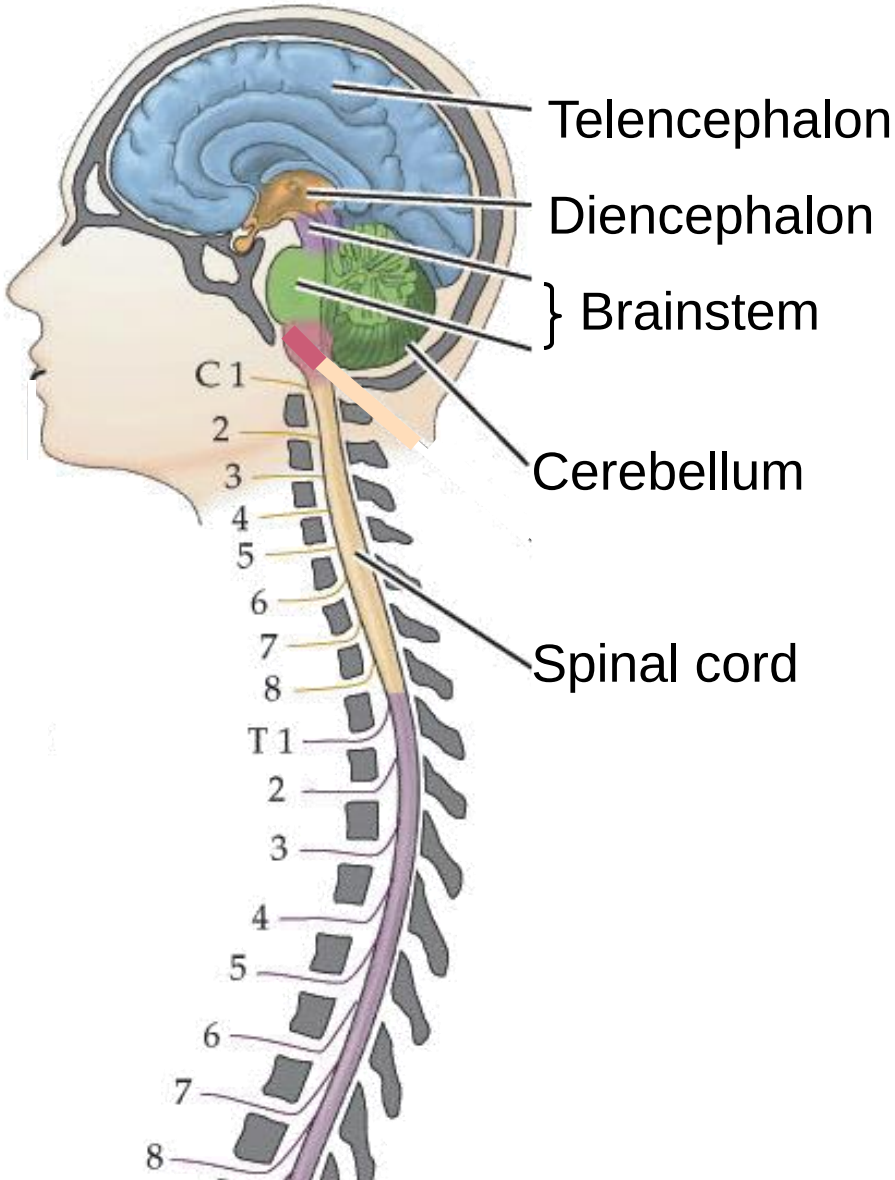
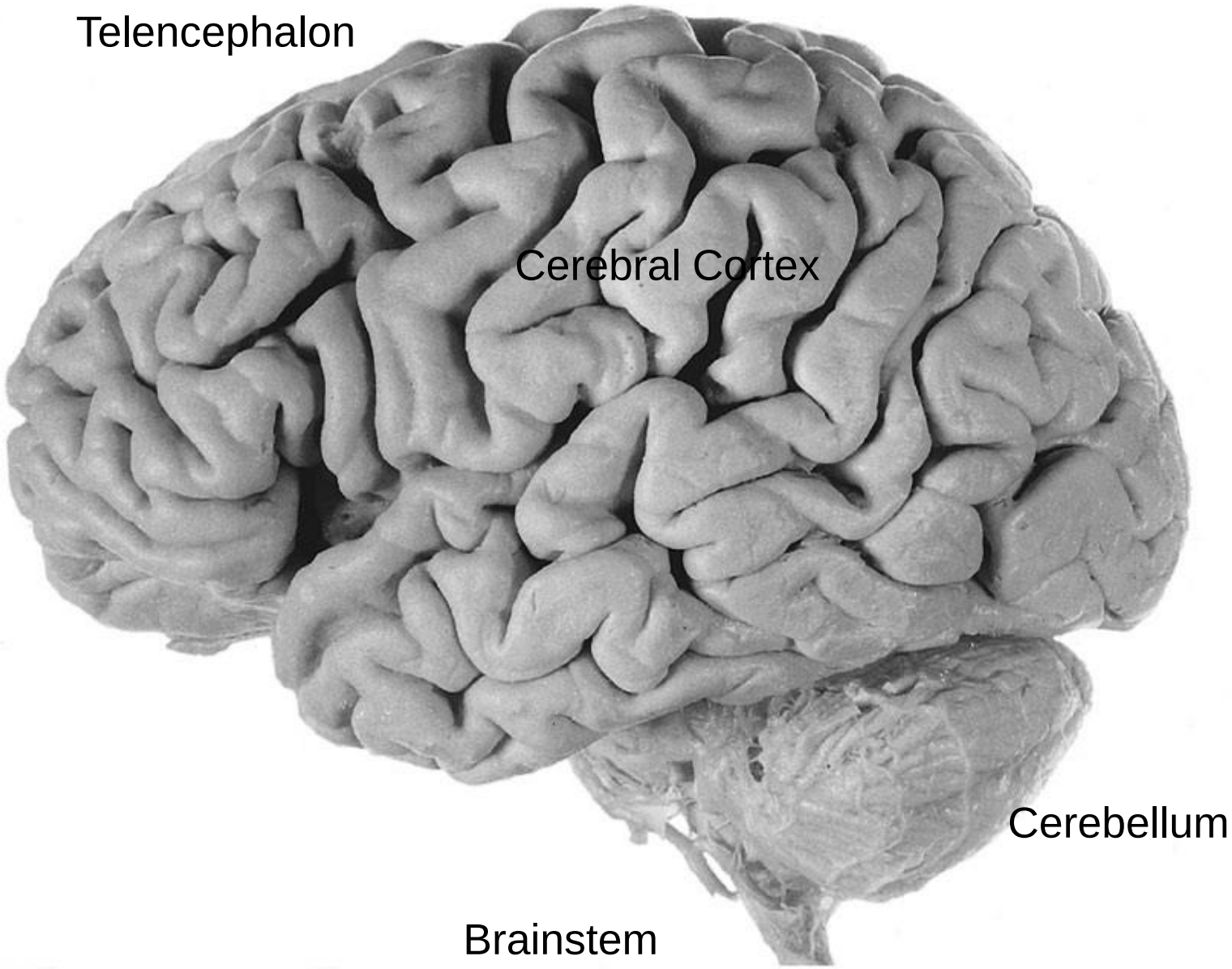
Neuroanatomy - overview

Lennart Brodin


Central nervous system
Peripheral nervous system
brain
spinal cord
cranial nerves
spinal nerves

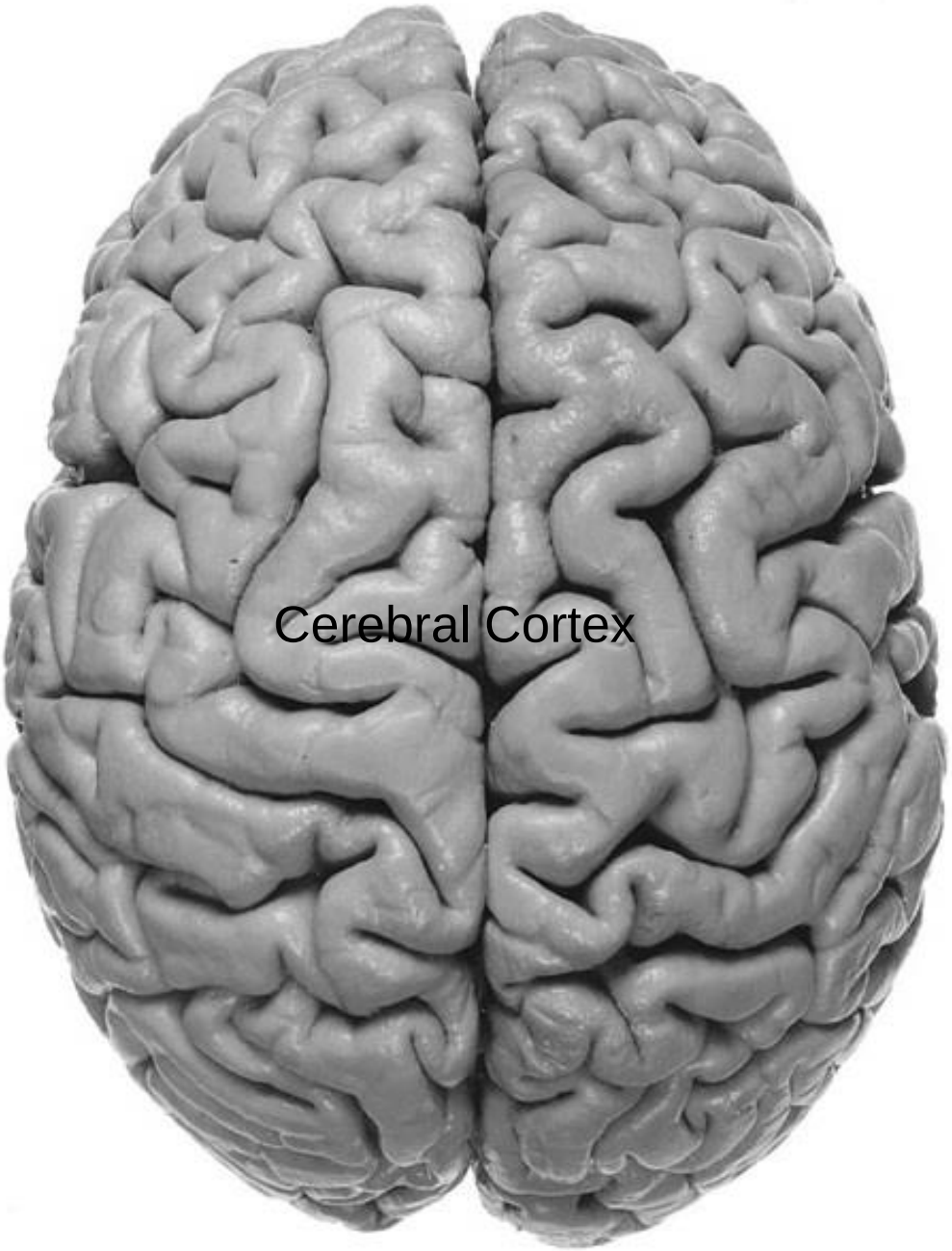
The components of the CNS

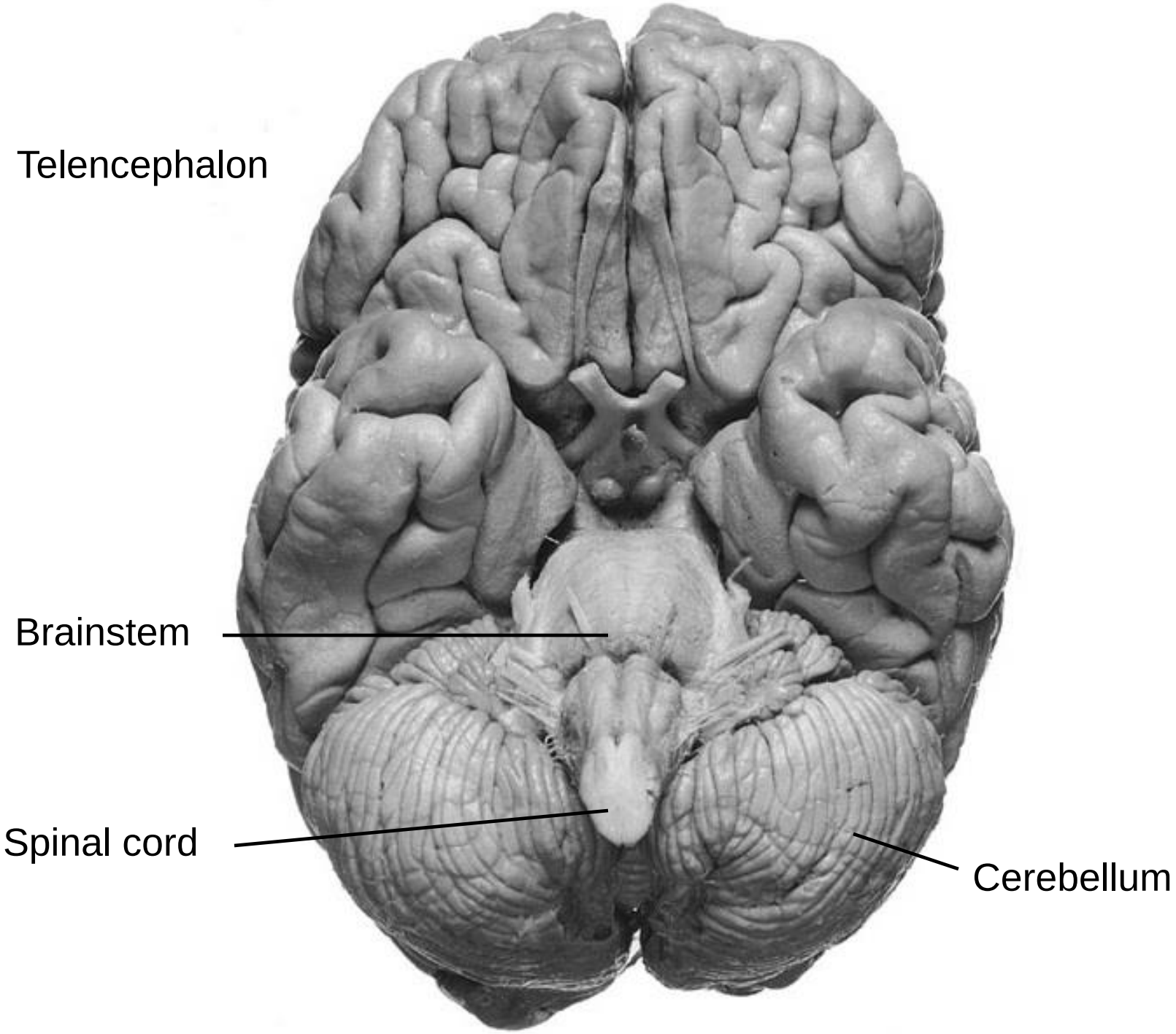



Telencephalon
Cerebral Cortex
Cerebellum
Brainstem

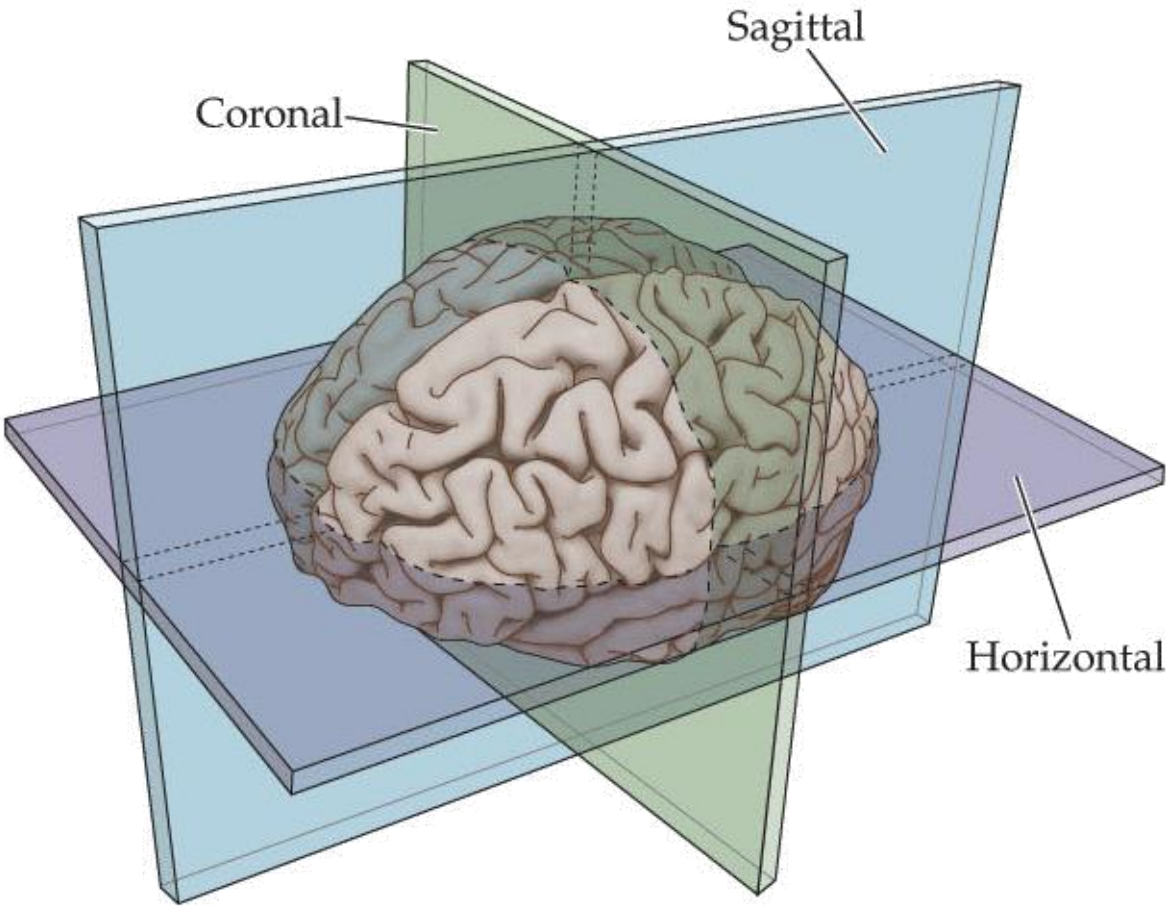
Telencephalon:

Hemispheres




Telencephalon
Brainstem
Spinal cord
Cerebellum

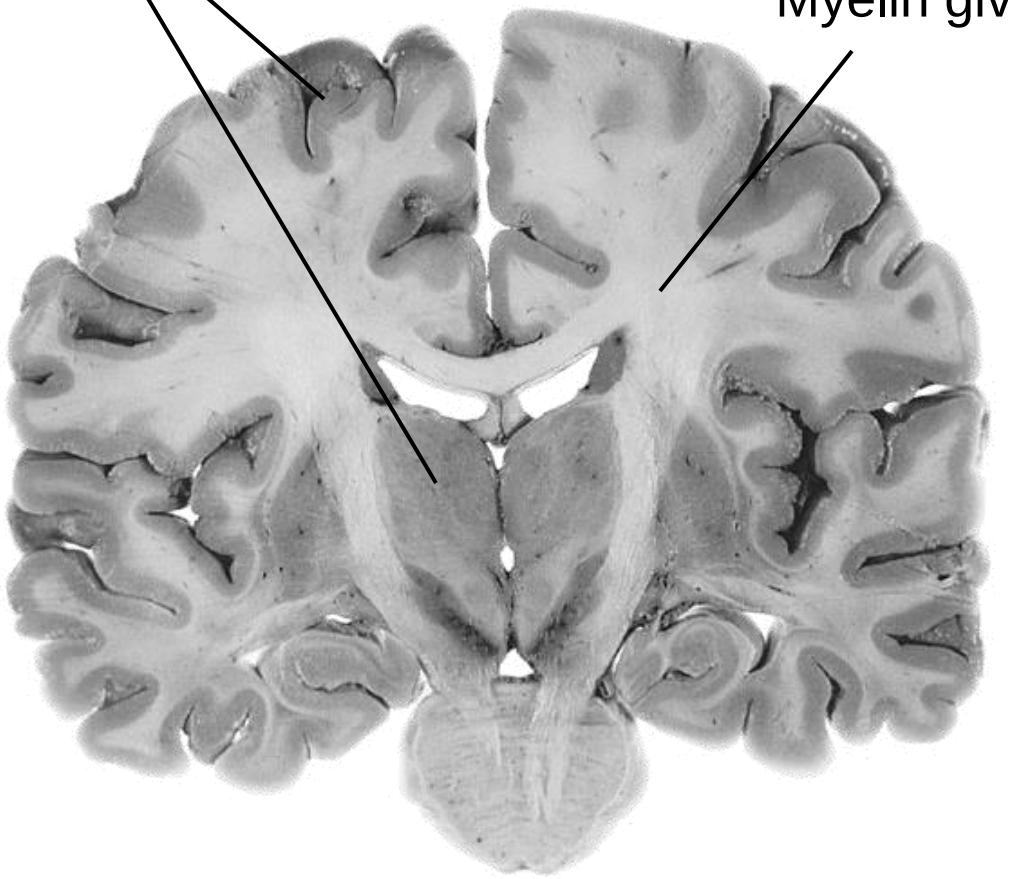
Sectioning the brain - nomenclature



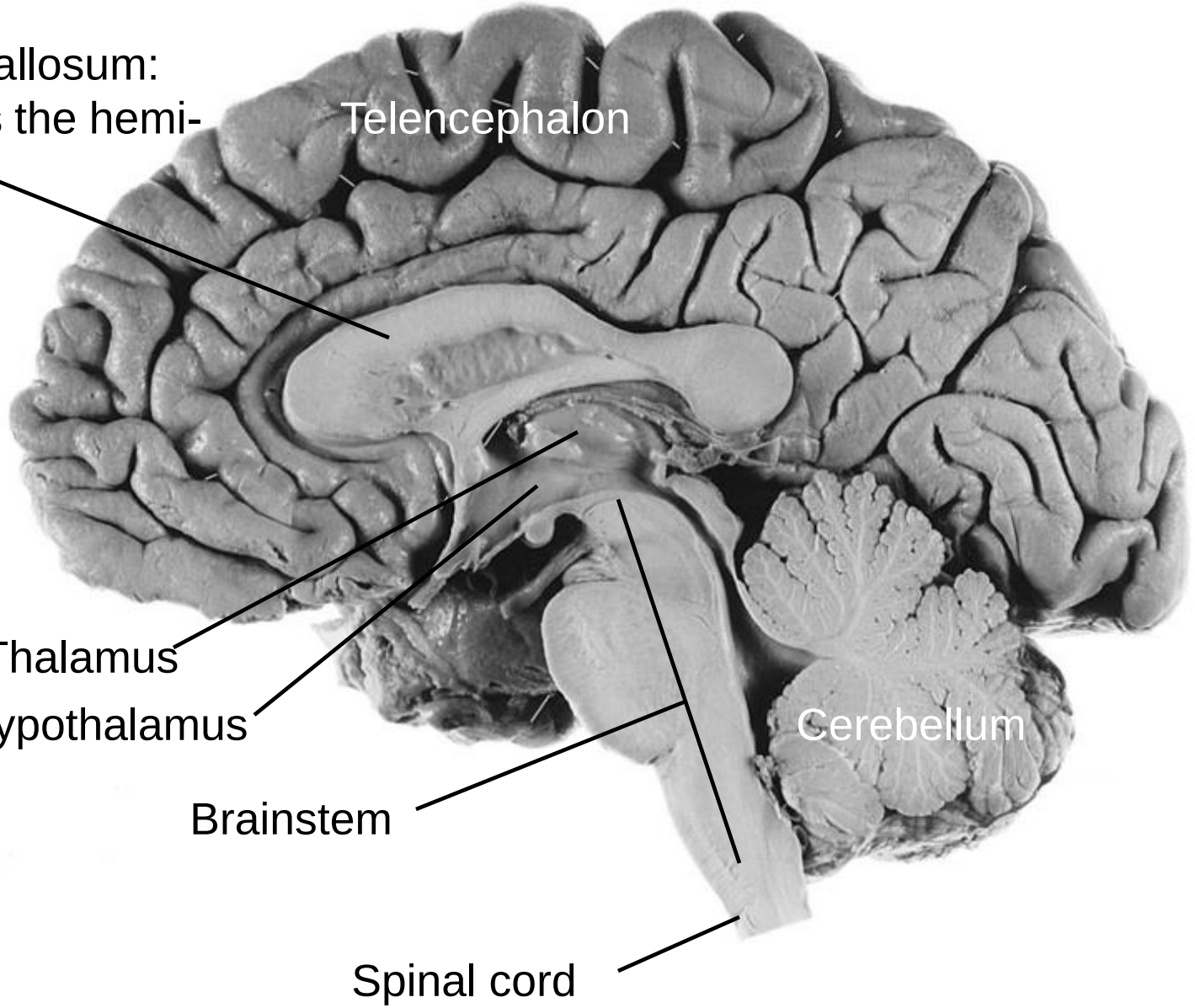
Coronal section

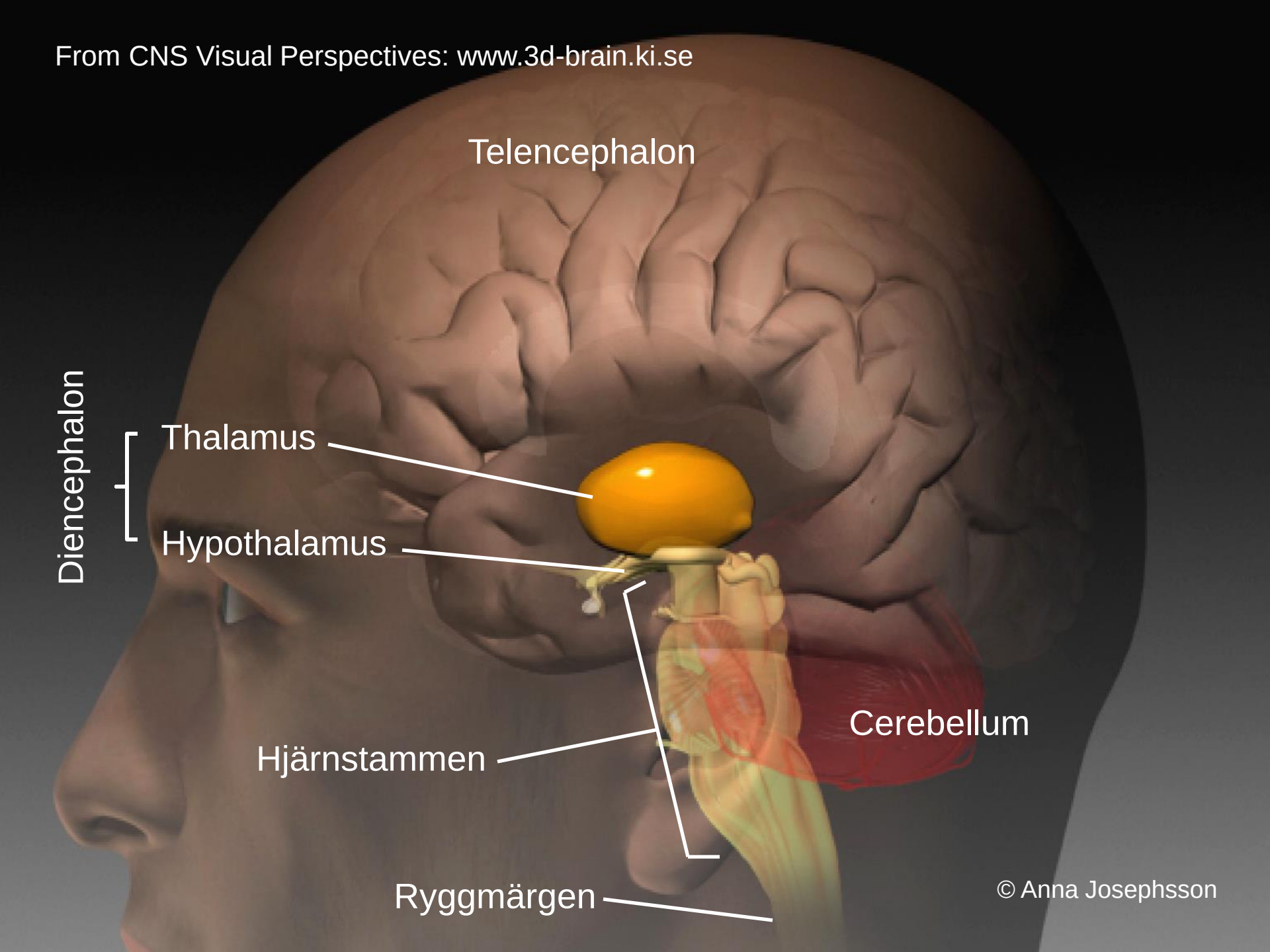
Grey matter: cell bodies
of neurons

White matter: nerve tracts,
Myelin gives the white color

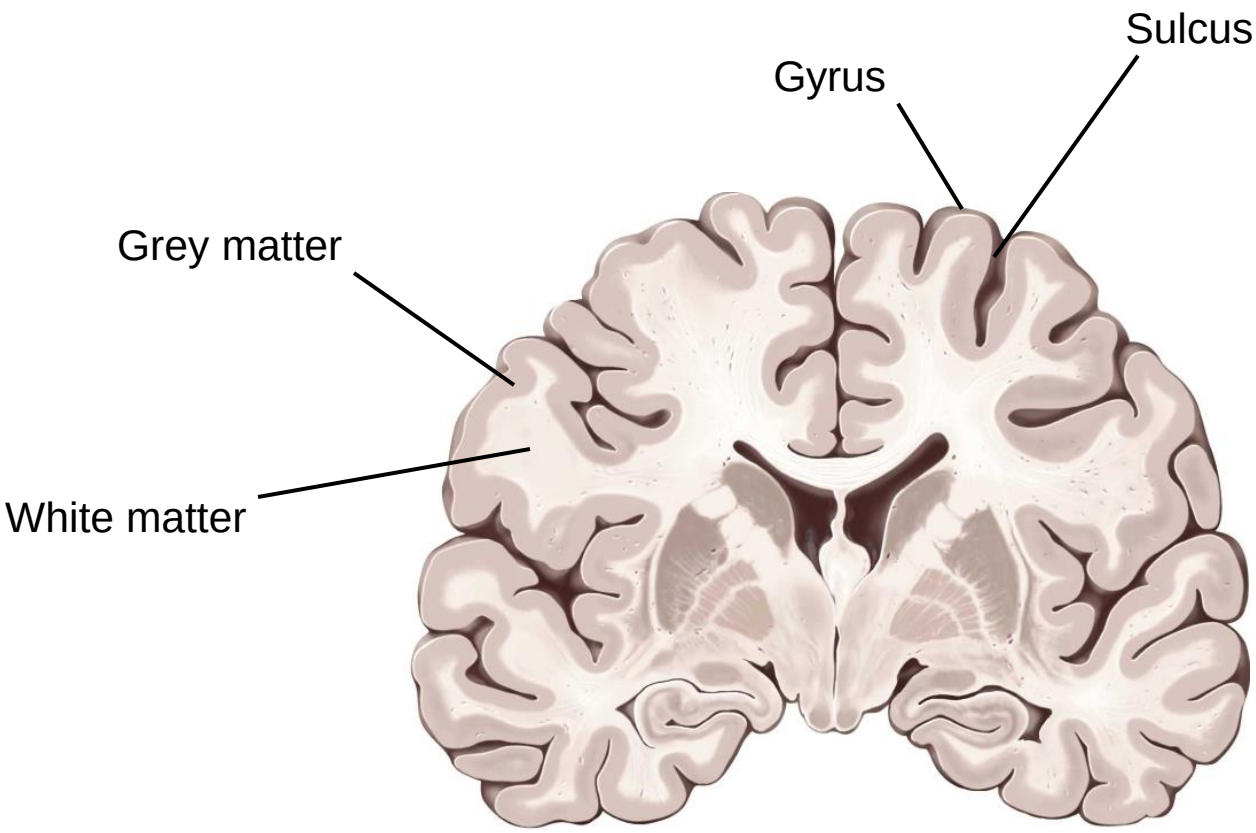


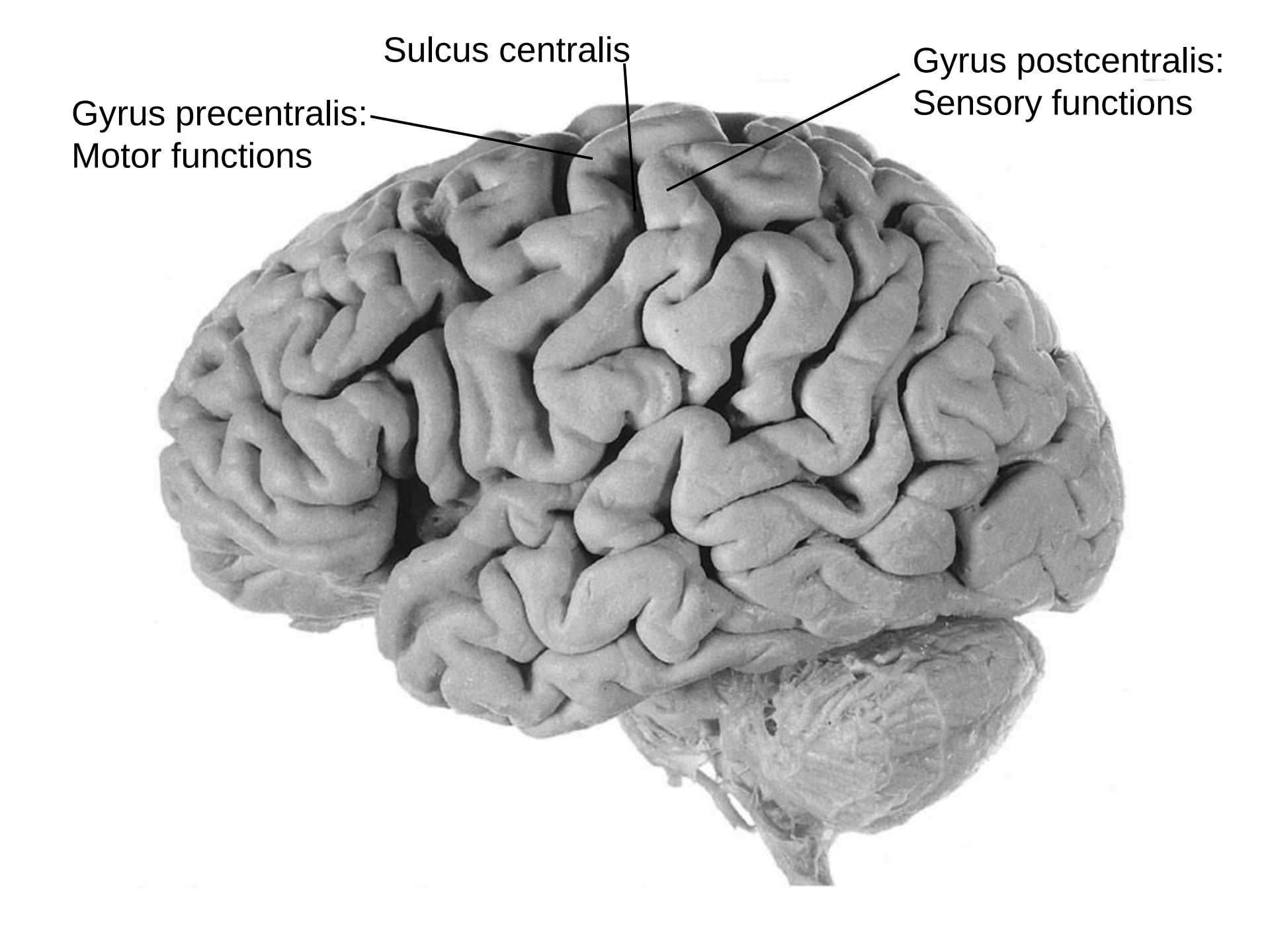
Sagittal section



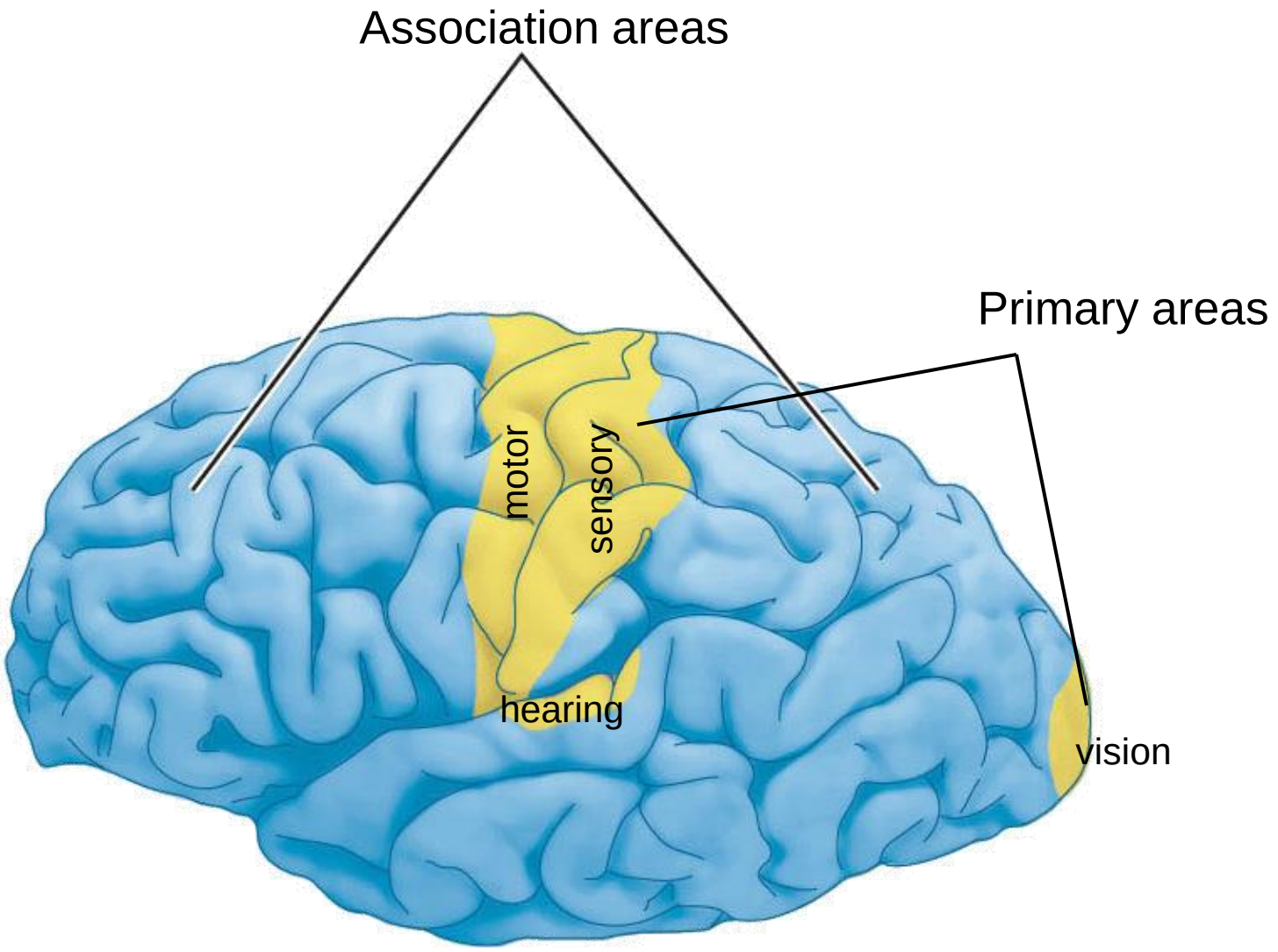

From CNS Visual Perspectives: www.3d-brain.ki.se
Telencephalon
Diencephalon
Thalamus
Hypothalamus
Cerebellum
Hjärnstammen
Ryggmärgen
© Anna Josephsson

The Cerebral Cortex

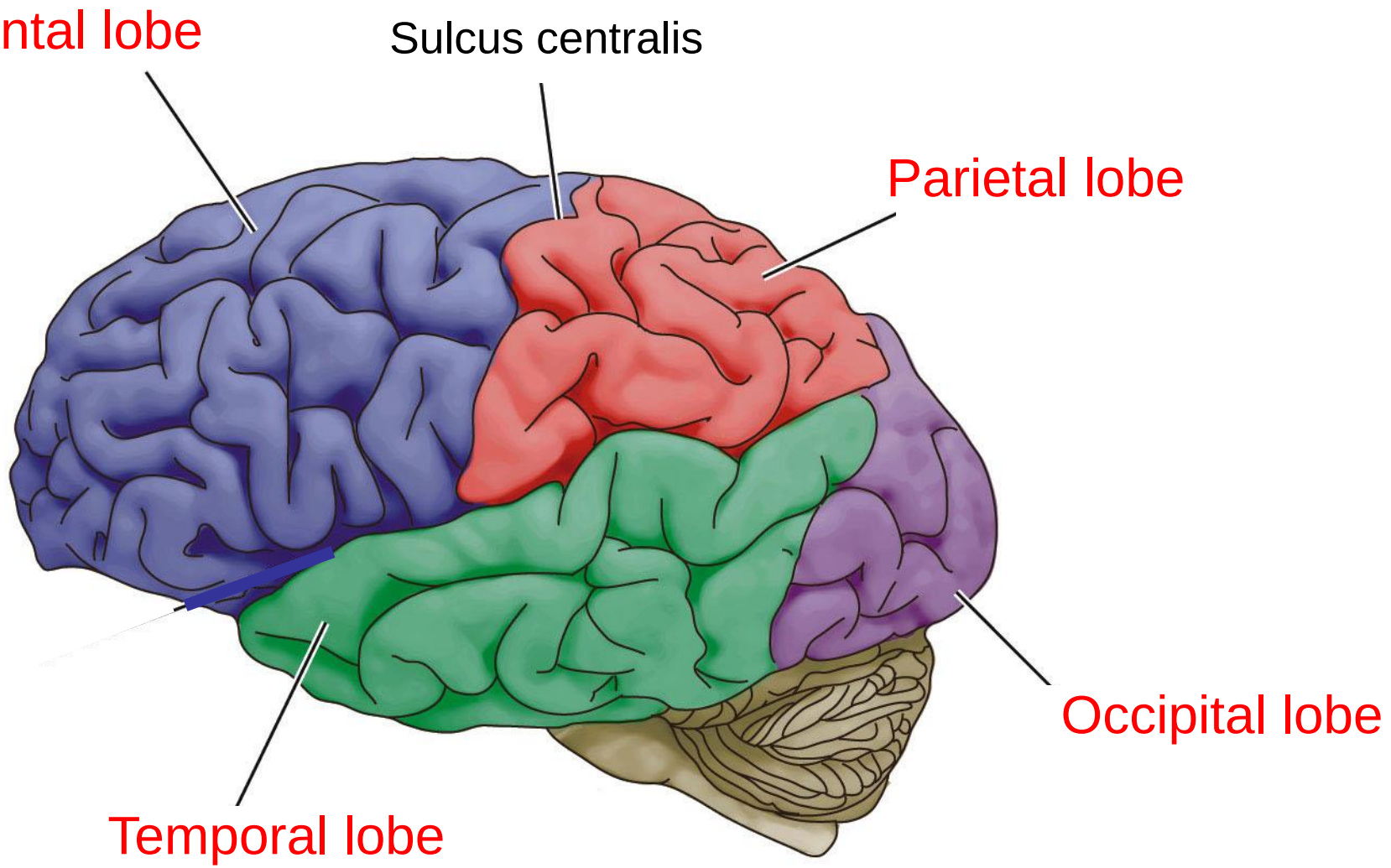



Sulcus centralis
Gyrus postcentralis:
Sensory functions
Gyrus precentralis:
Motor functions

The Cerebral Cortex – Division into Functional Areas

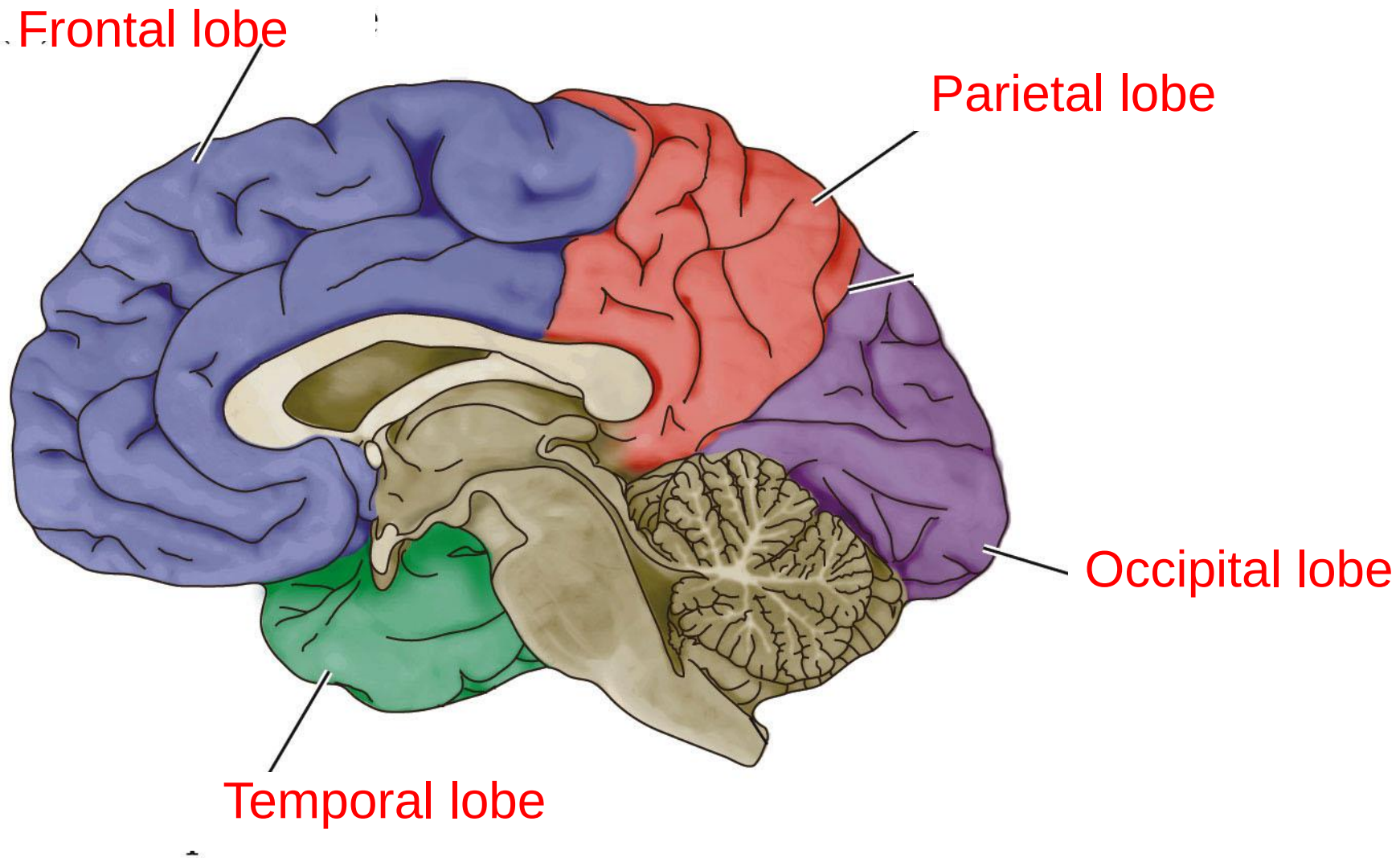


The Cerebral Cortex – Division into Lobes



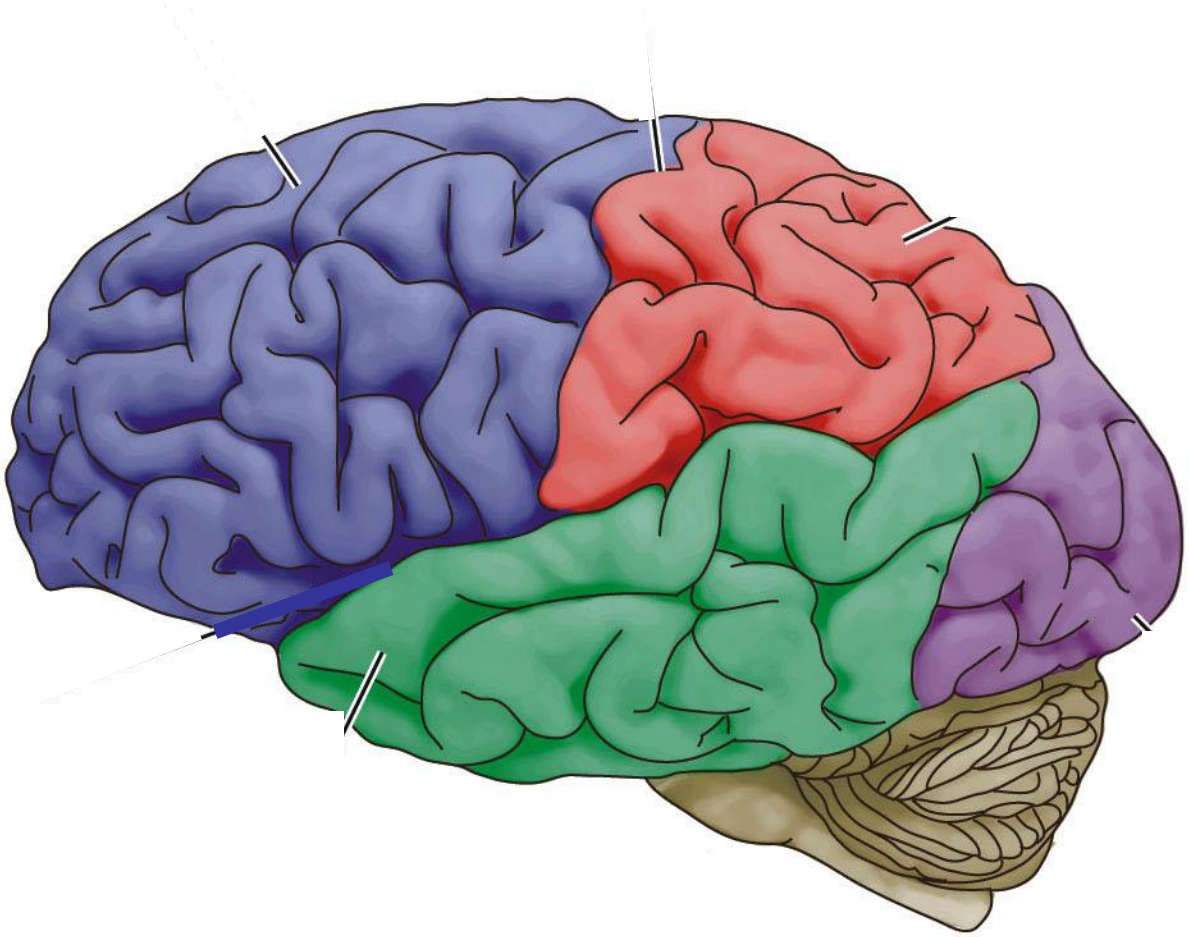
***NEUROSCIENCE, Fourth Edition,* Appendix, Figure A3 (Part 1)**

The Cerebral Cortex – Division into Lobes



NEUROSCIENCE, Fourth Edition, Appendix, Figure A3 (Part 2)

Localization of functions to lobes

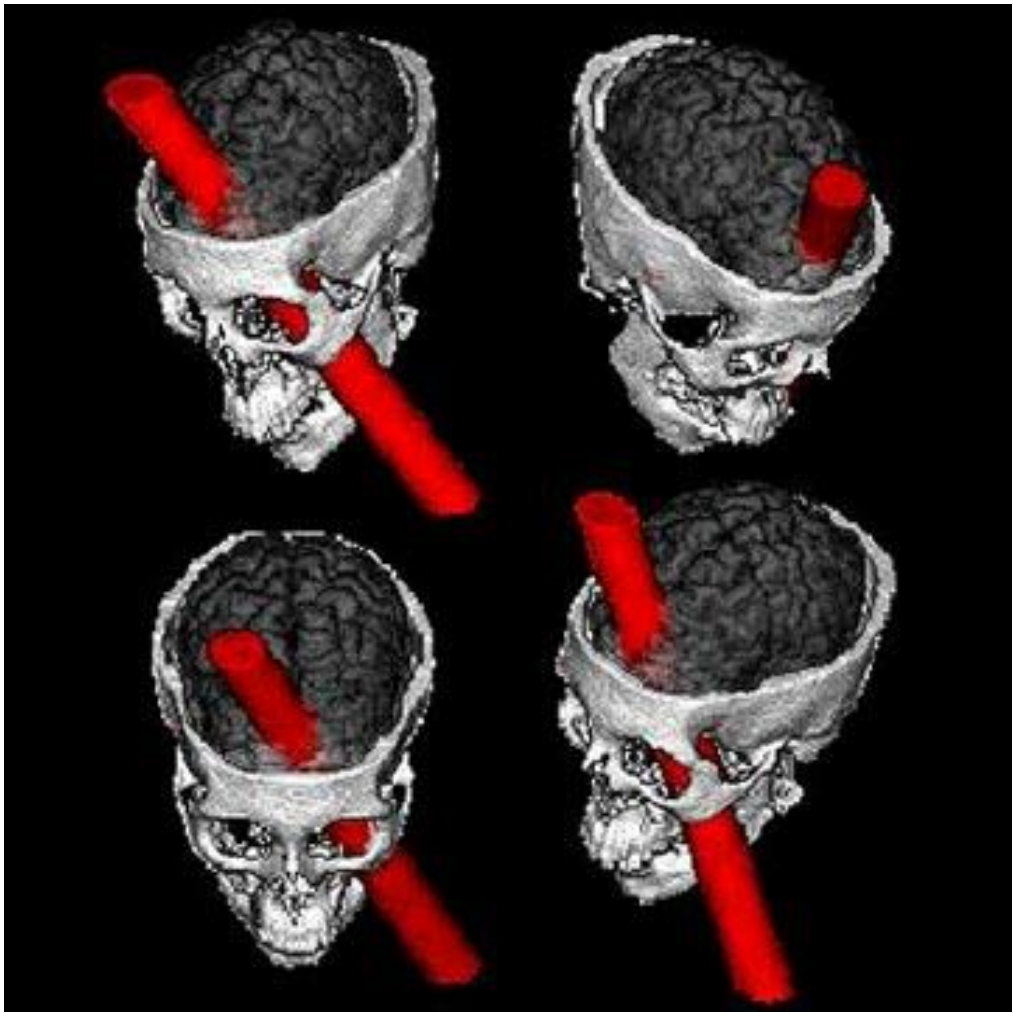


***NEUROSCIENCE, Fourth Edition,* Appendix, Figure A3 (Part 1)**

The Frontal lobe

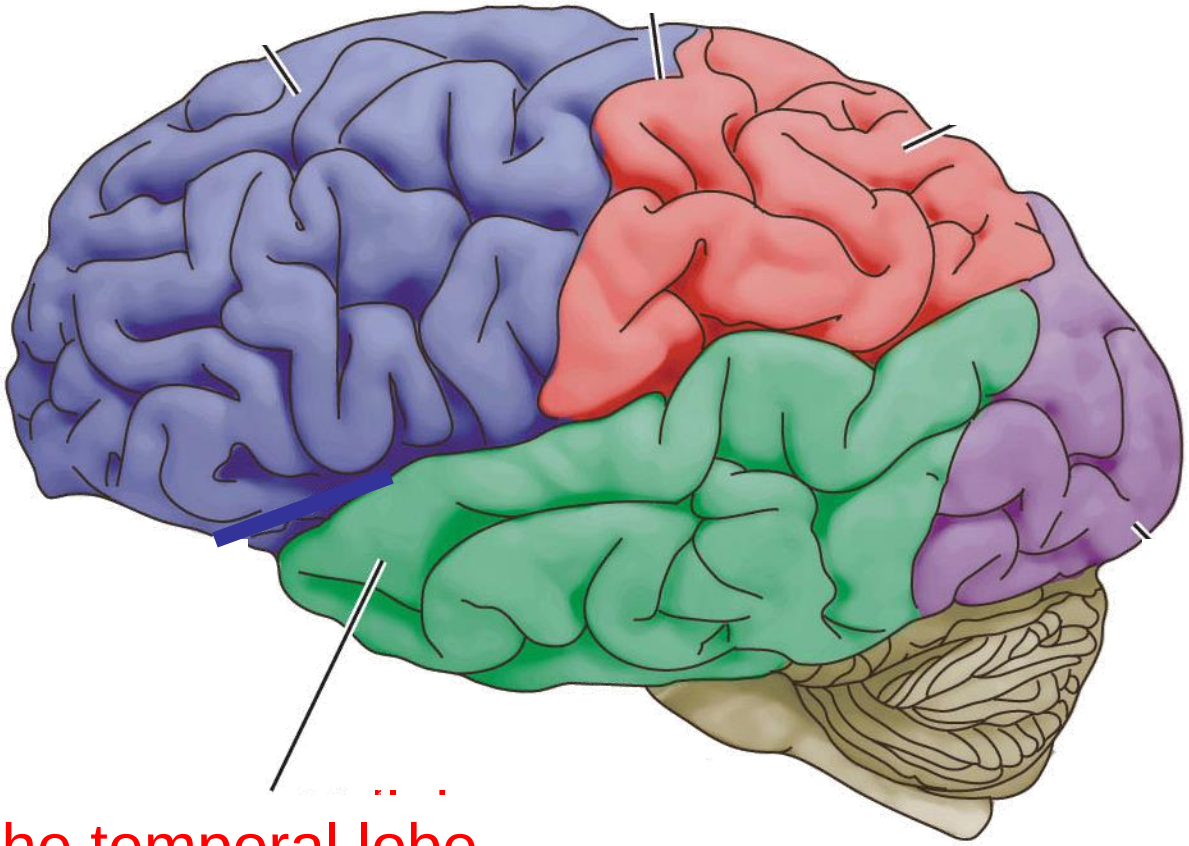
1848: The famous case of the railway worker Phineas Gage gave the first insigths into the functions of the frontal lobe

The Frontal lobe



The Frontal lobe

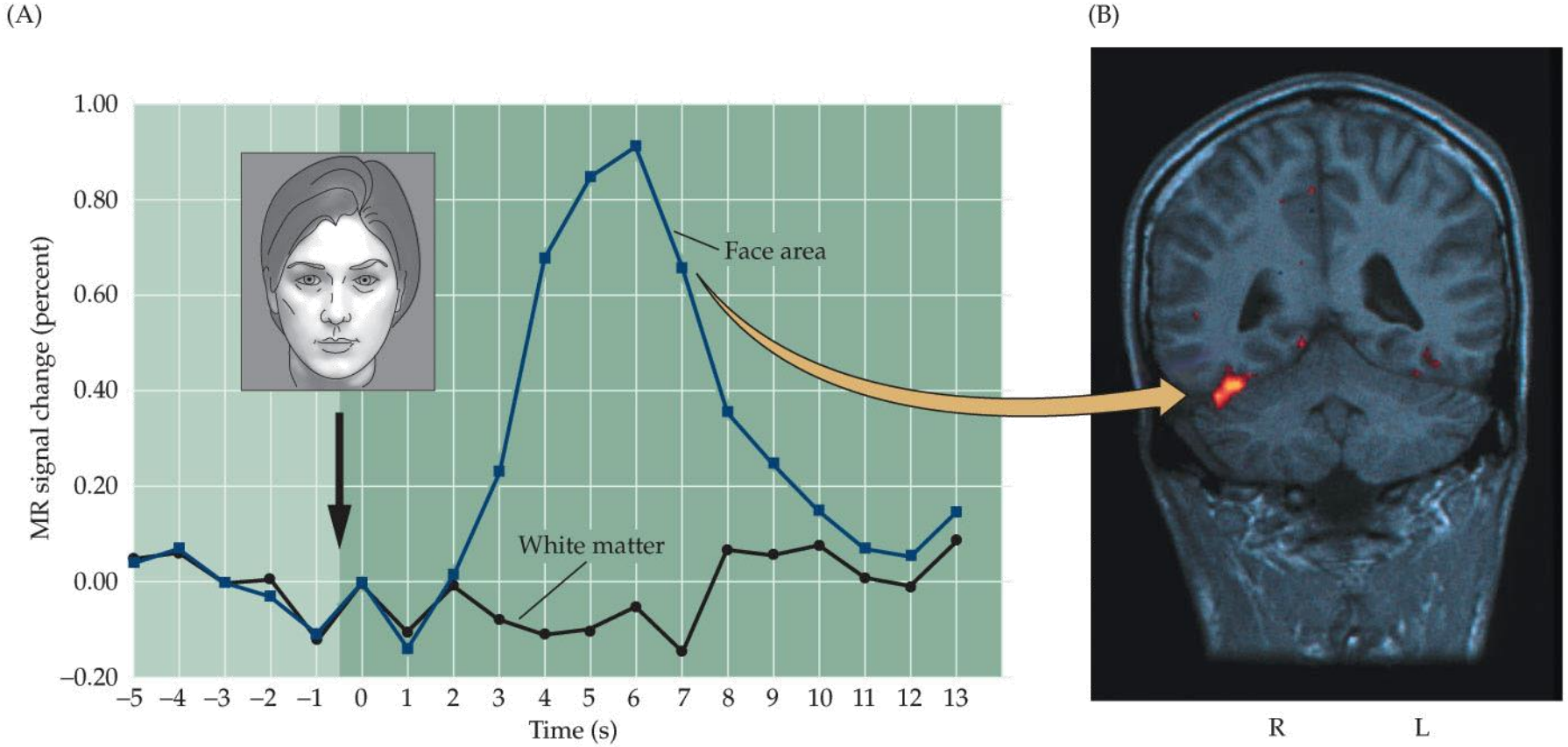
Personality
Motivation
Planning
Decision-making
Social skills



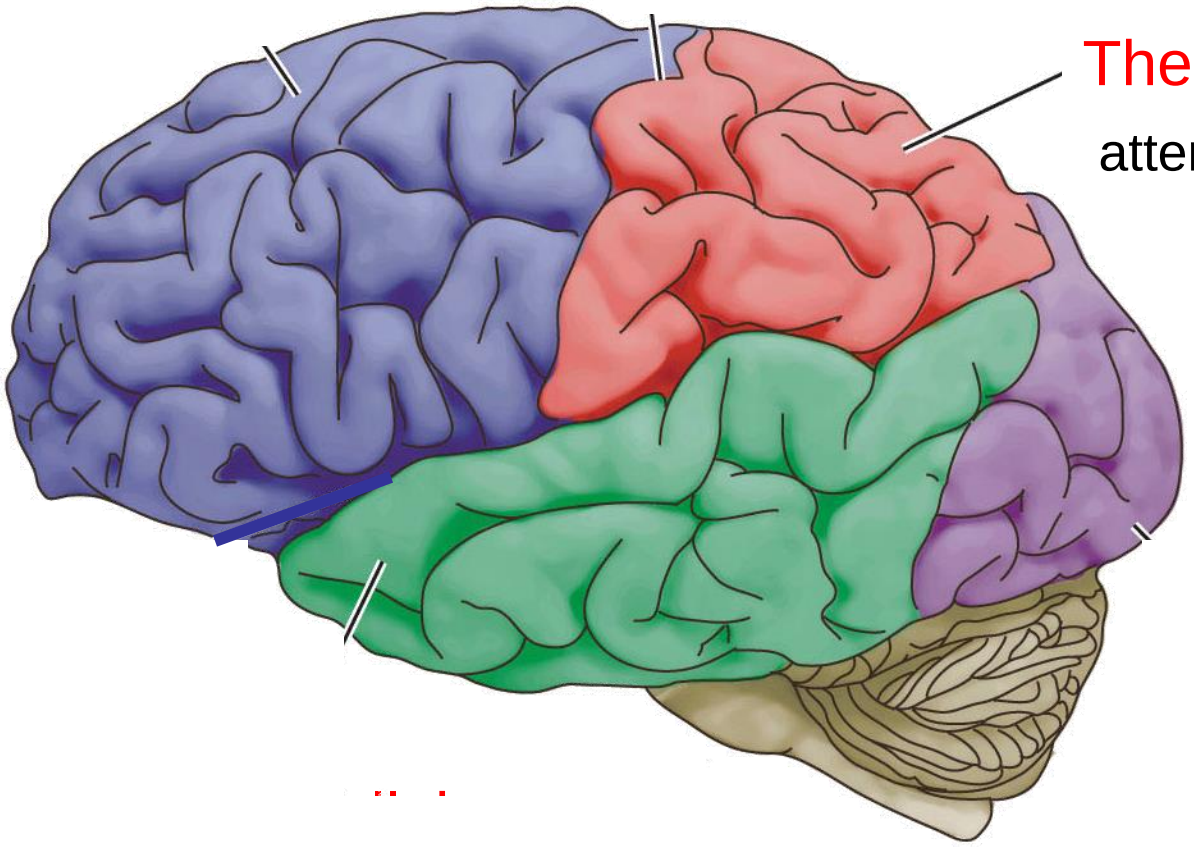
The temporal lobe

recognition

Activation of the temporal lobe during recognition of a known face



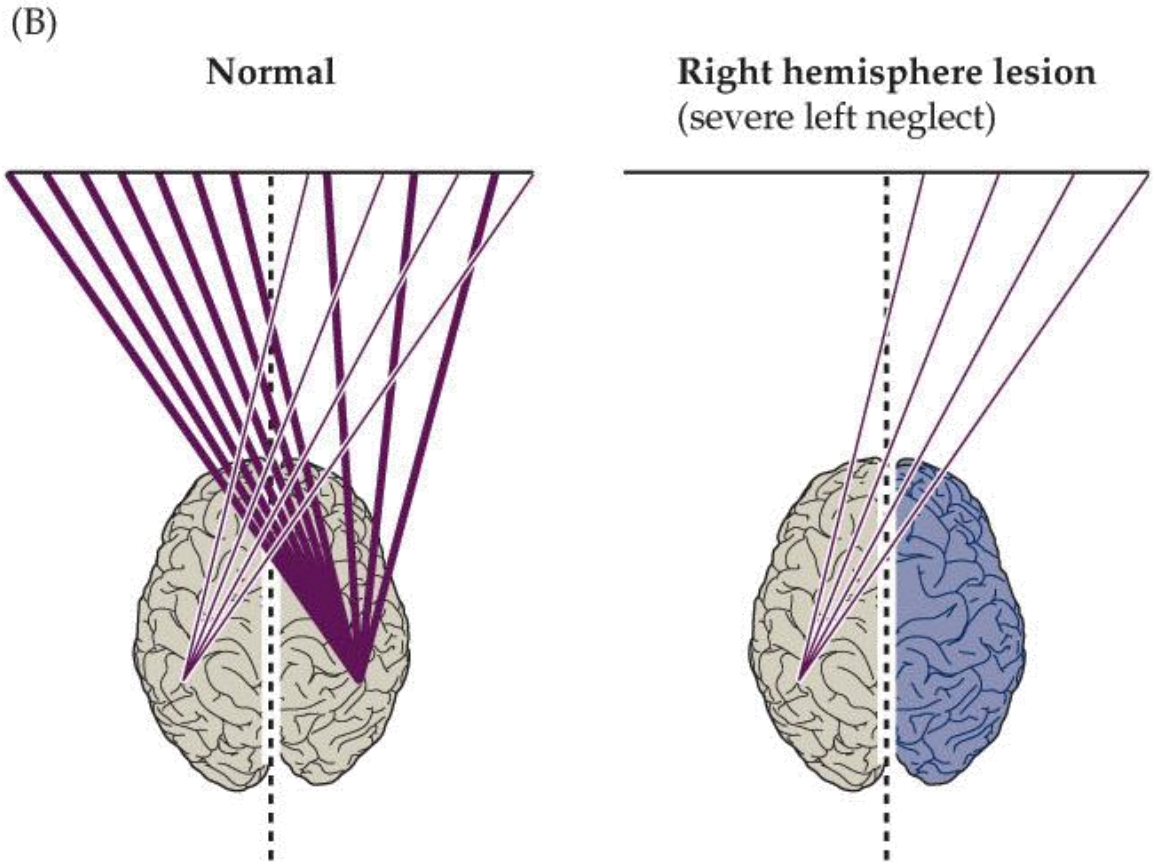
fMRI signal indicates increased activity



The parietal lobe

attention

Damage of the right parietal lobe



Damage of the right parietal lobe

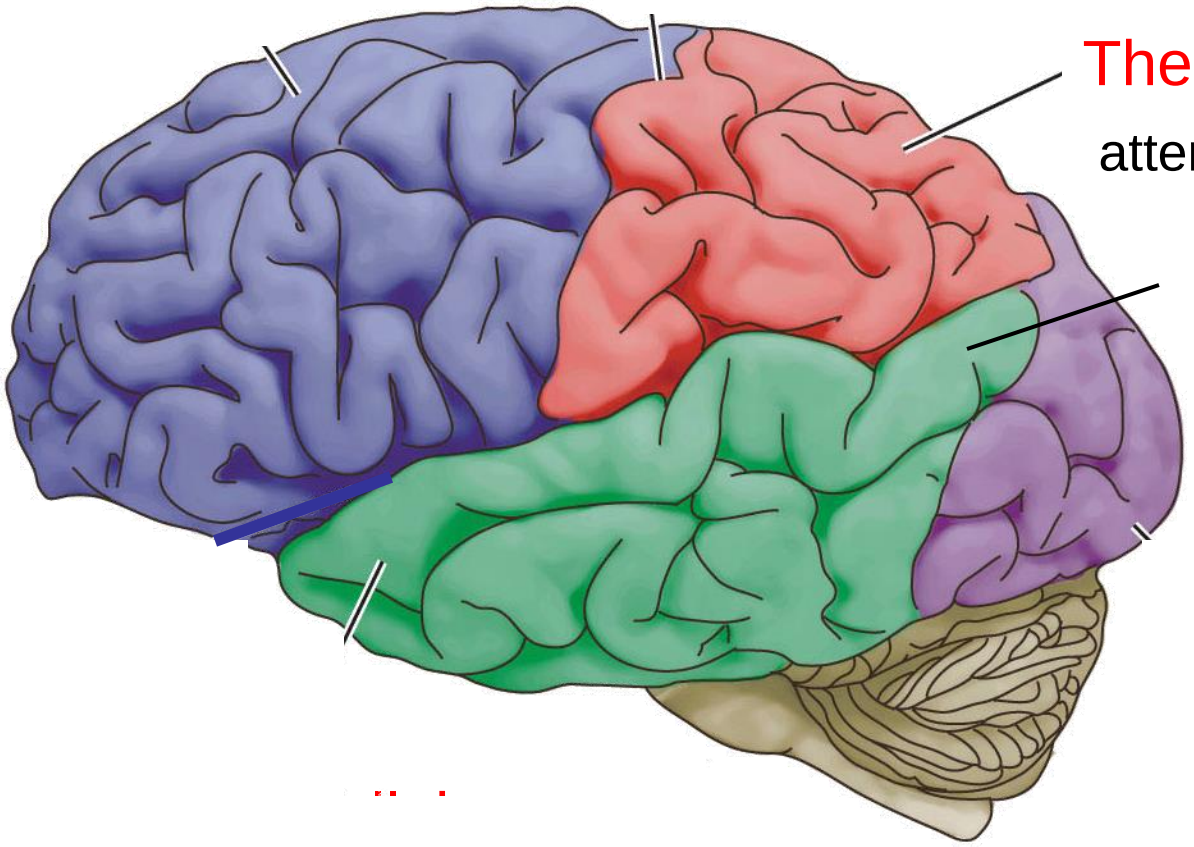
(A) "Draw a house"

Model

Patient's copy

(B) "Bisect the line"

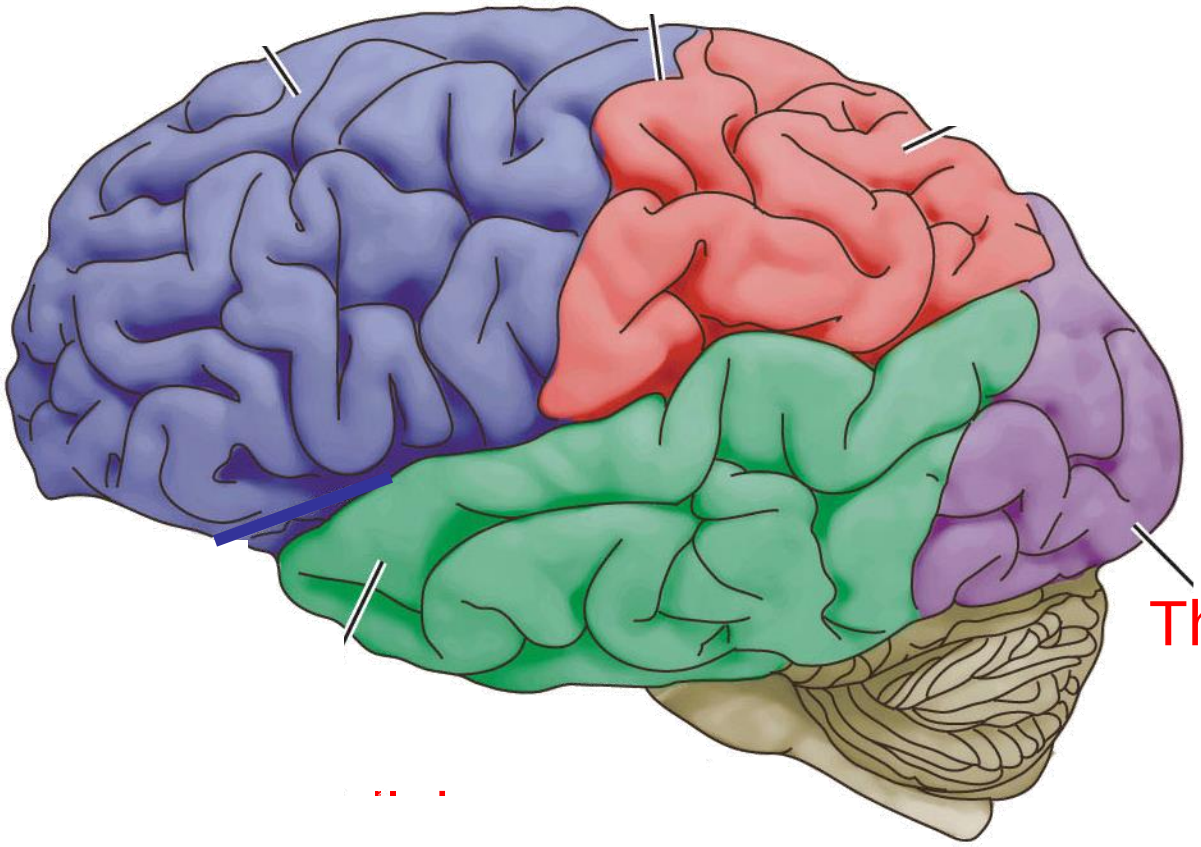
Recent data: The temporal lobe is also involved



The parietal lobe

attention

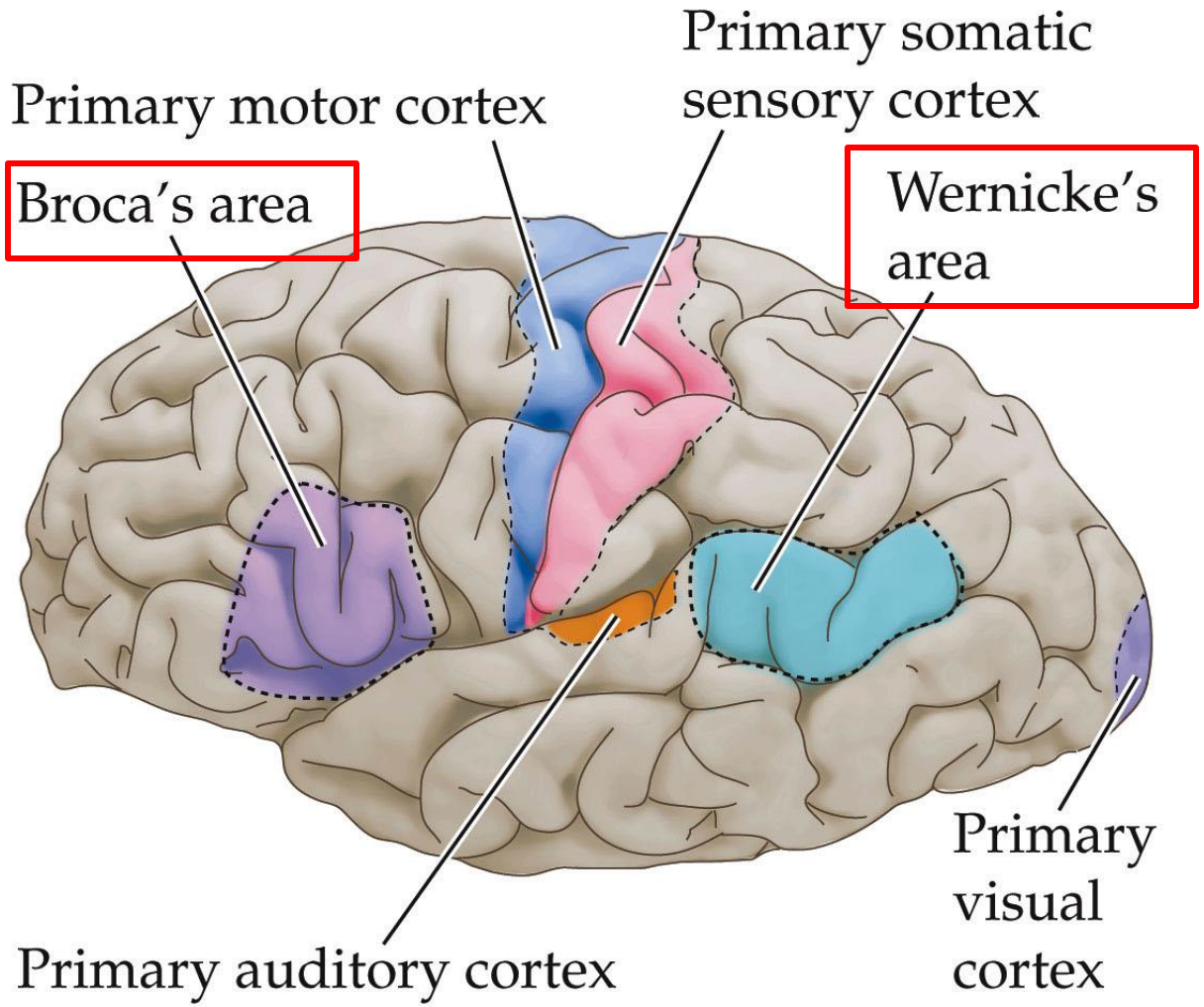
The posterior temporal lobe



The occipital lobe

Receives and processes visual information

Language: specific regions in the frontal and temporal lobes



NEUROSCIENCE, Fourth Edition, Figure 27.1

Language: specific regions in the frontal and temporal lobes

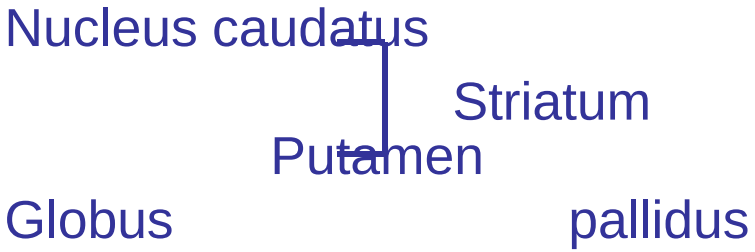
Wernickes area: language perception
Damage results in sensory aphasia

Broca´s area: language expression
Damage results in motor aphasia

Subcortikal nuclei

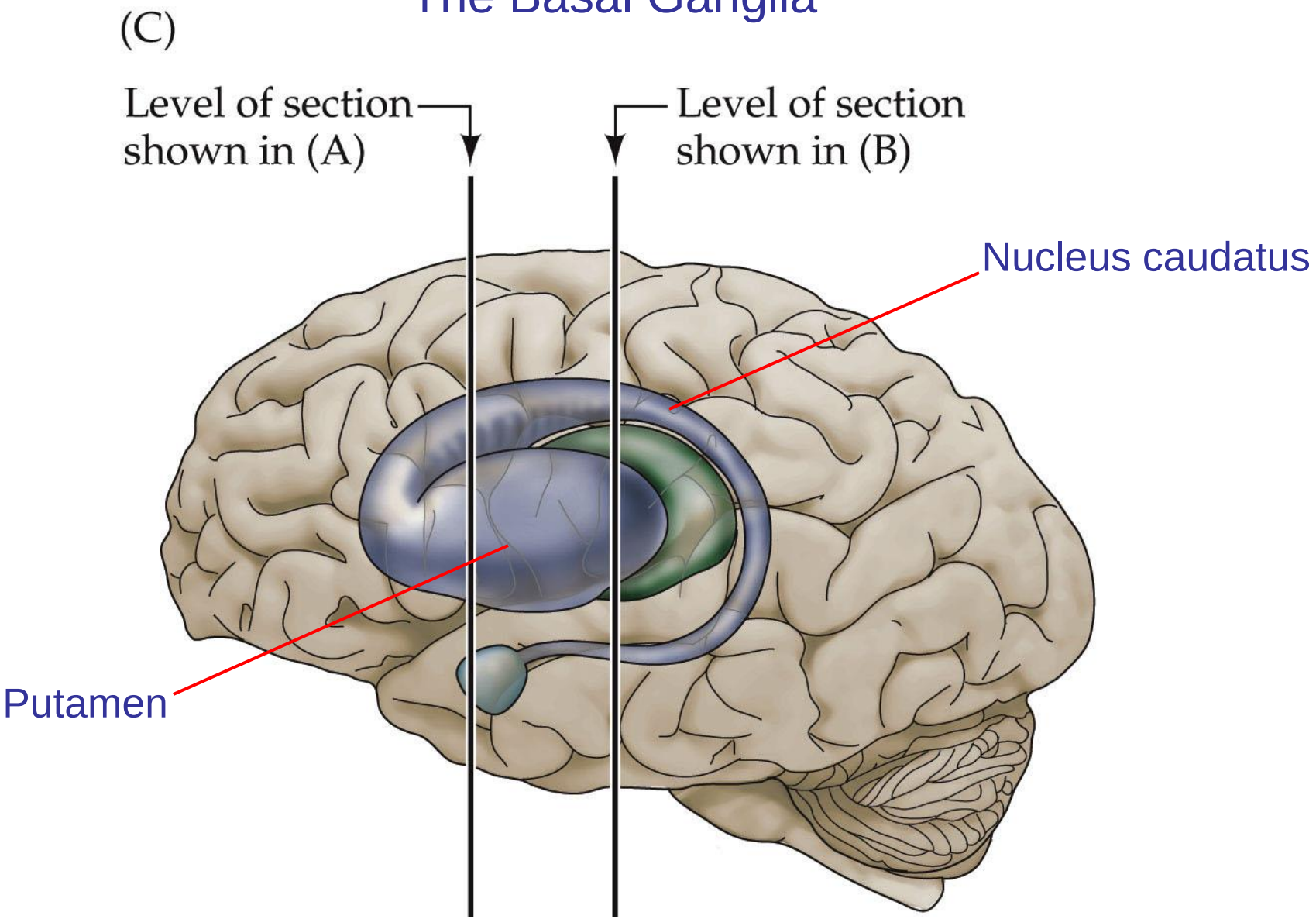
Telencephalon:

The basal ganglia



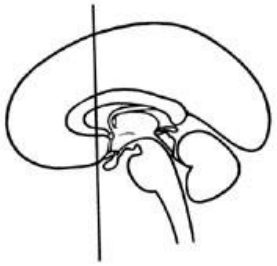
Motor control
Cognition
Emotions

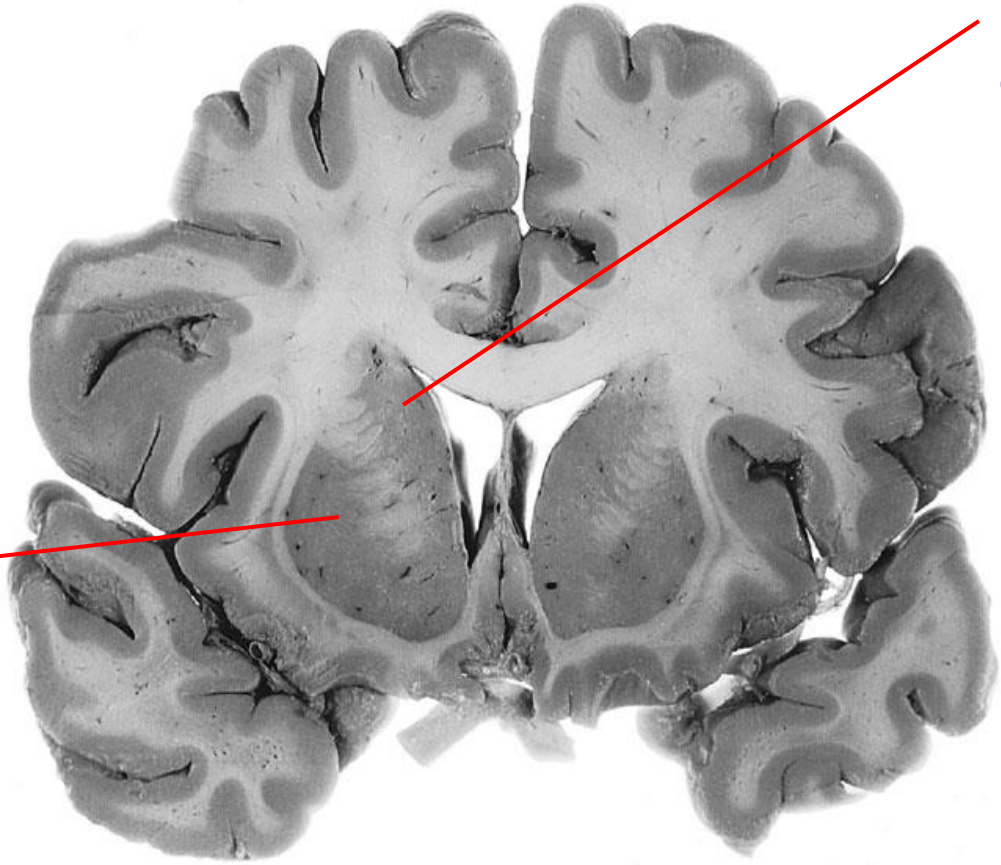
The Basal Ganglia



The Basal Ganglia

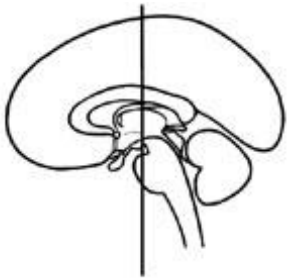
coronal section





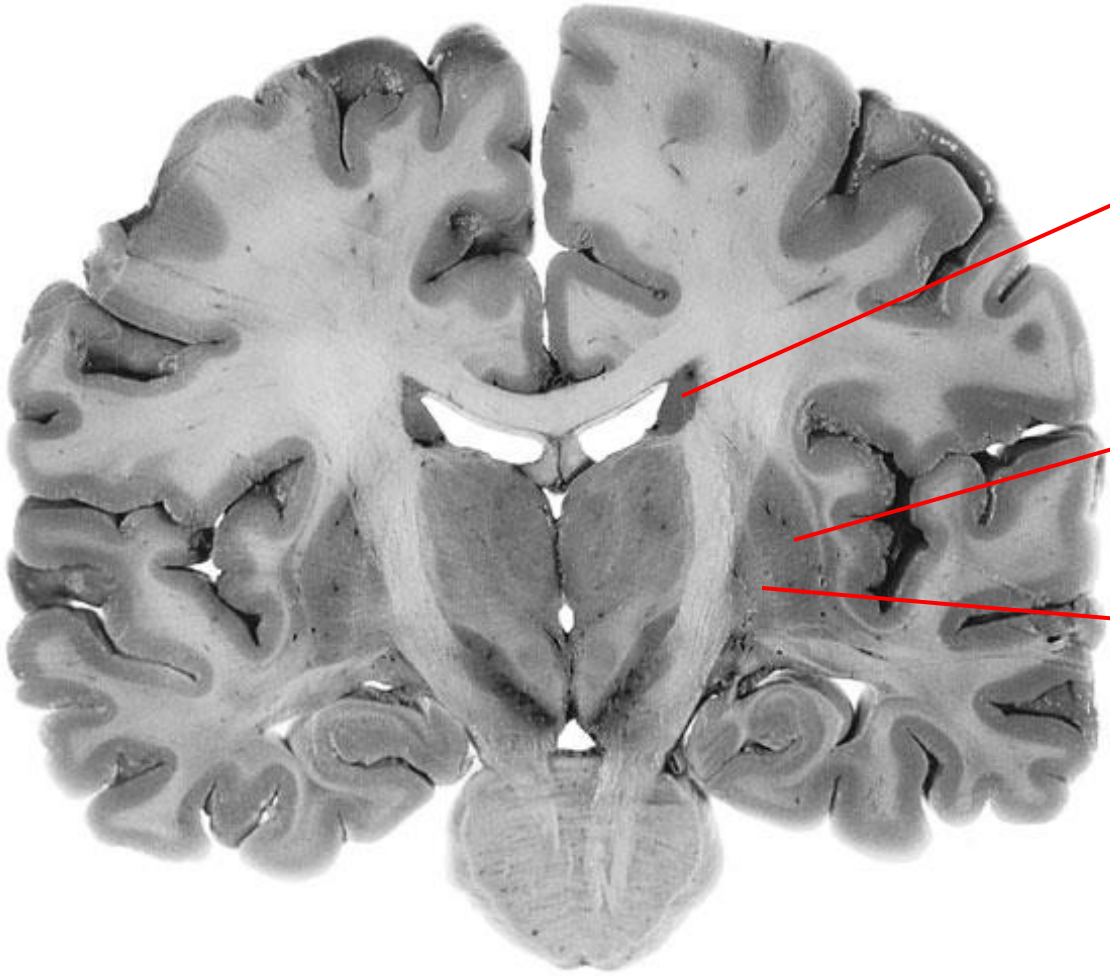
Nucleus caudatus

Putamen



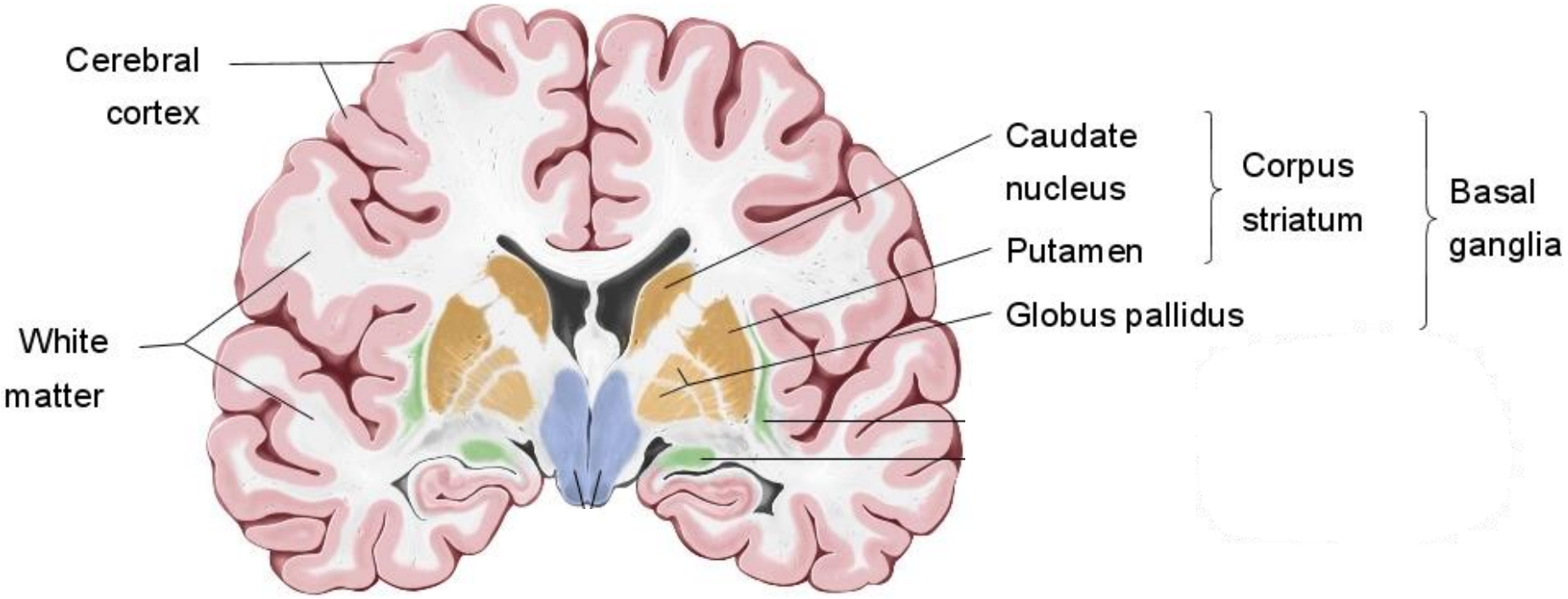
The Basal Ganglia

coronal section



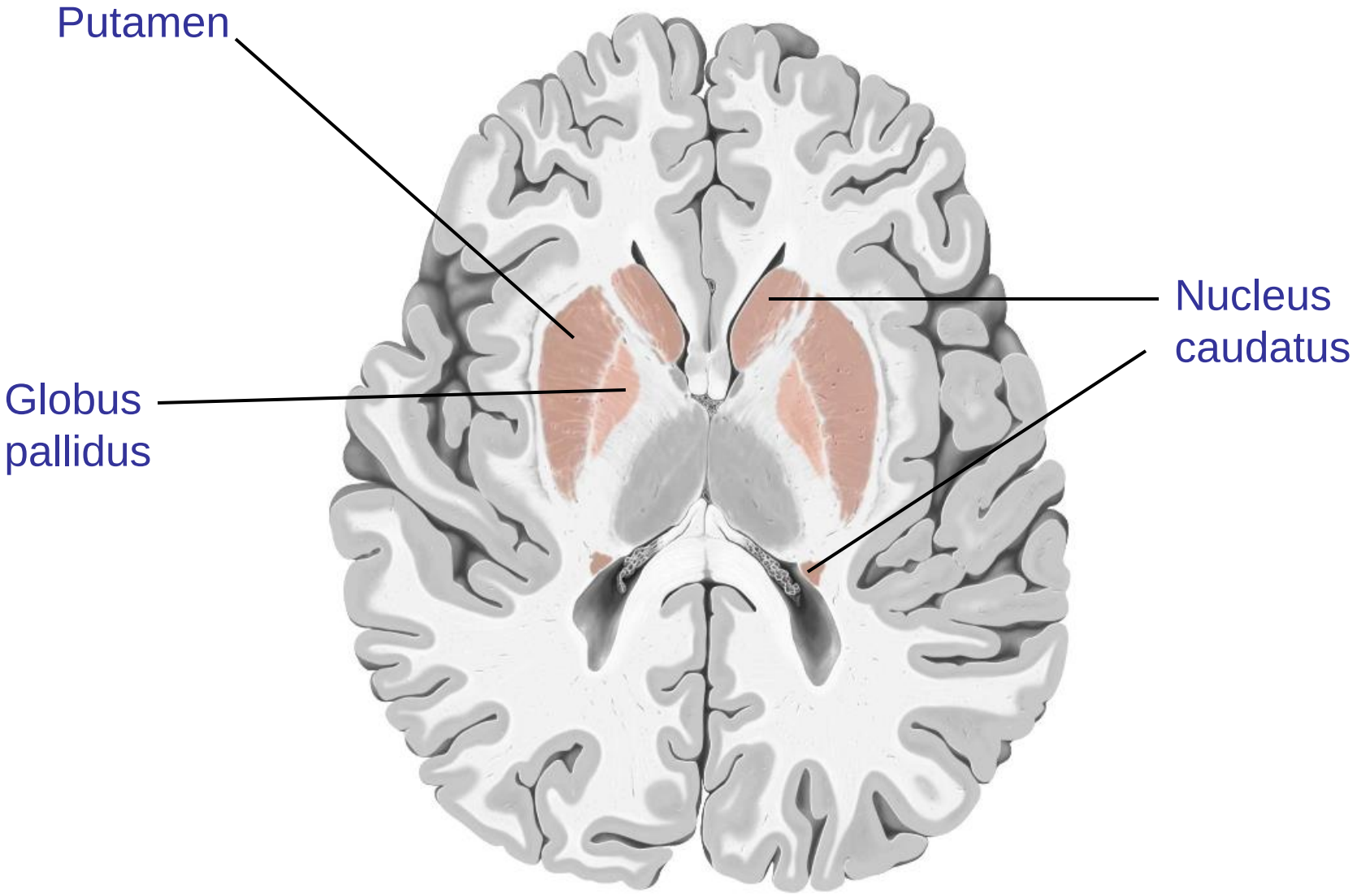
The Basal Ganglia

coronal section



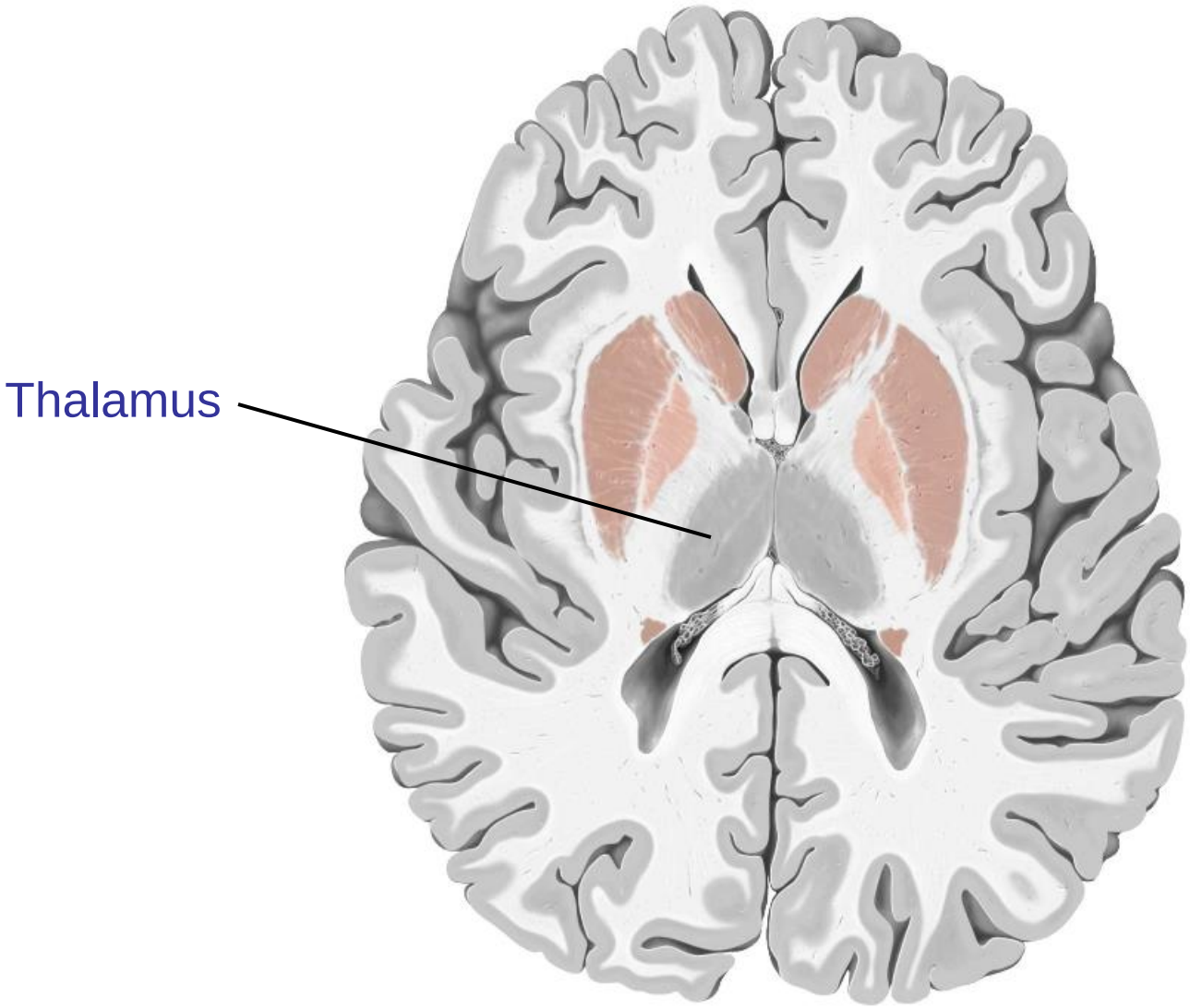
The Basal Ganglia

horisontal section

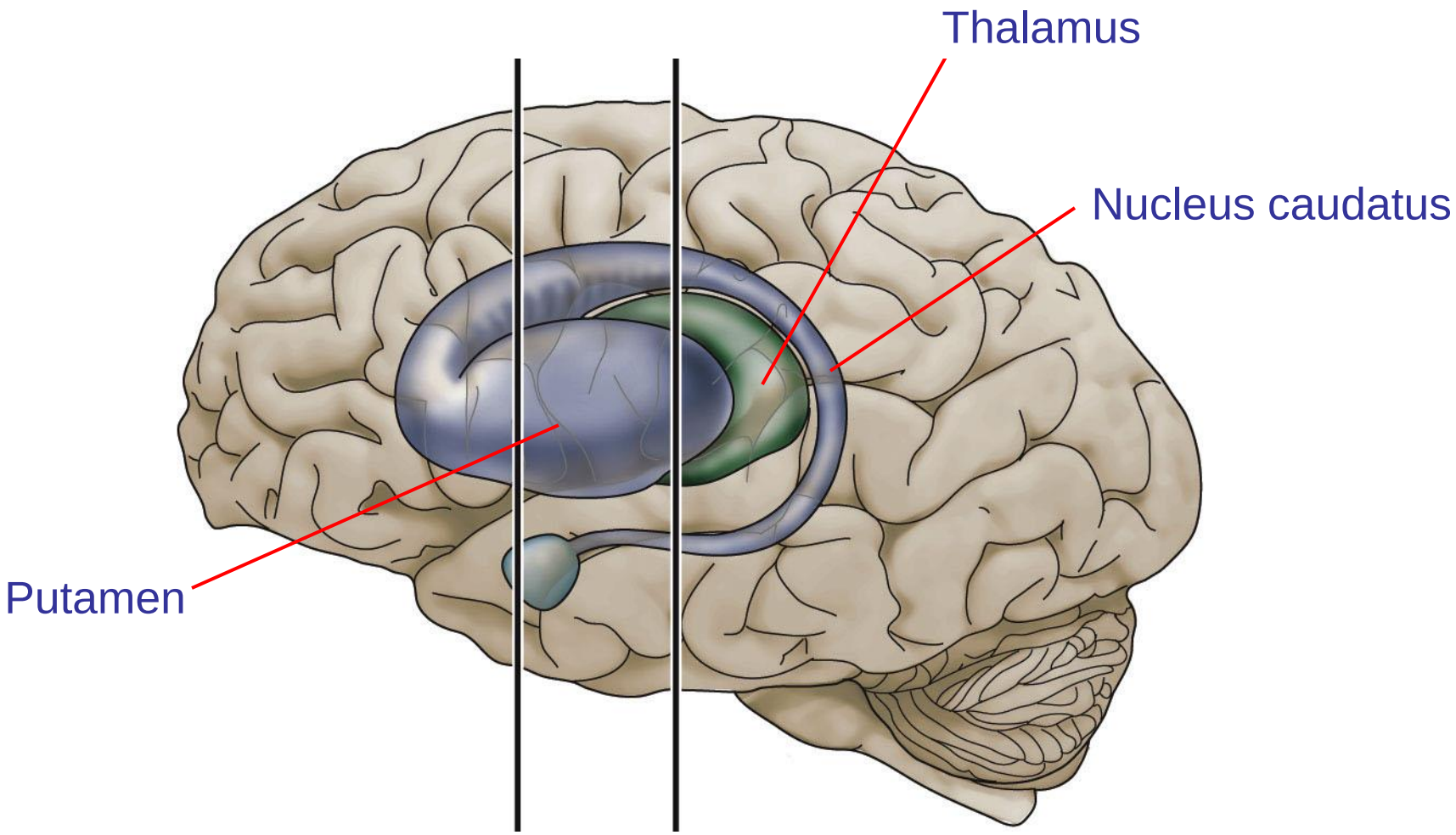


Diencephalon

horisontal section

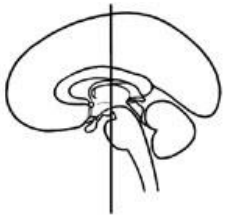


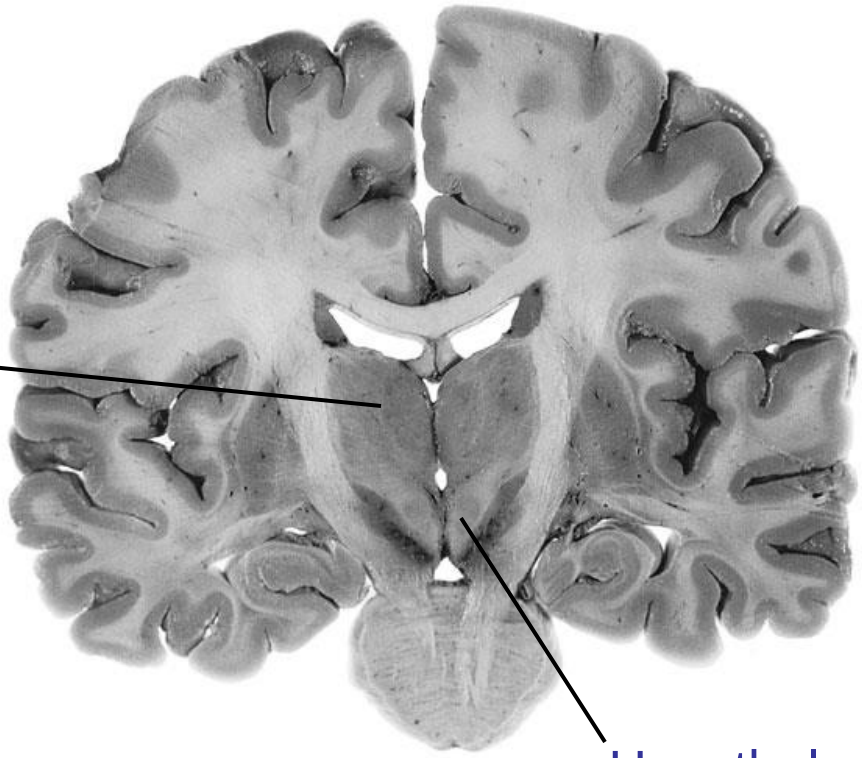
Diencephalon



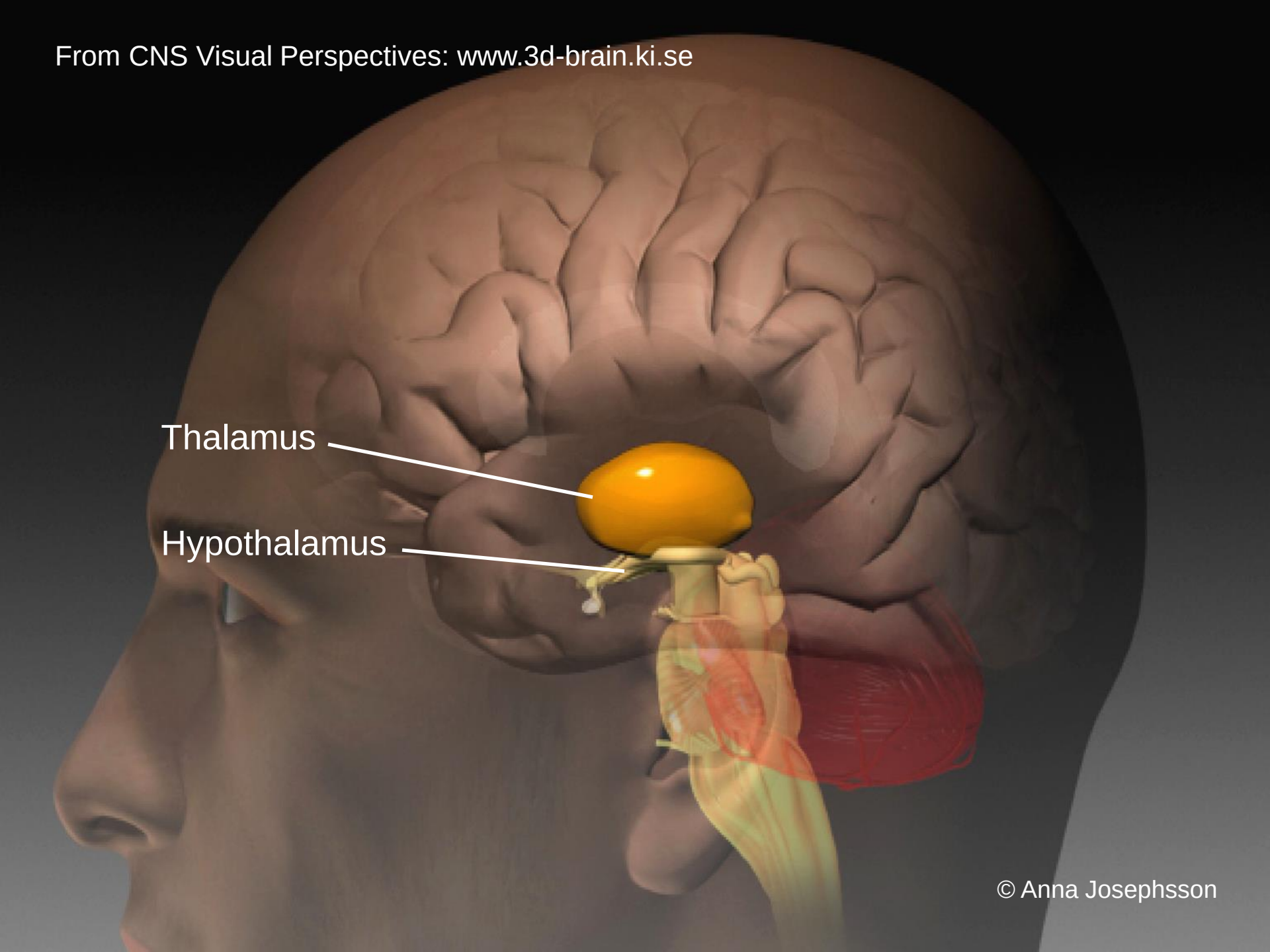
Diencephalon

coronalsnitt





From CNS Visual Perspectives: www.3d-brain.ki.se

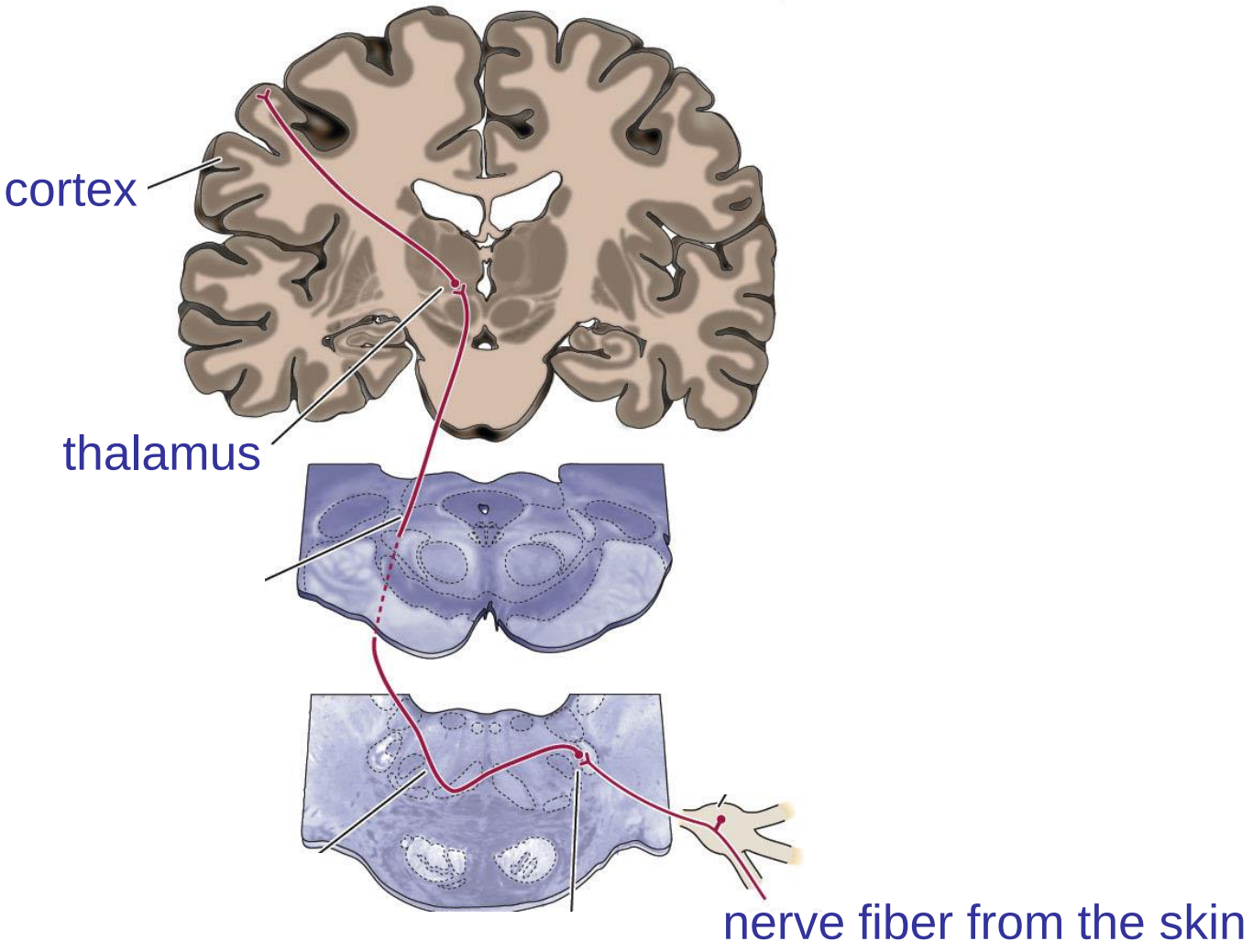


Diencephalon

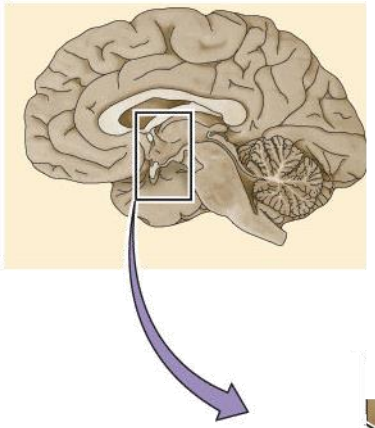
Thalamus:

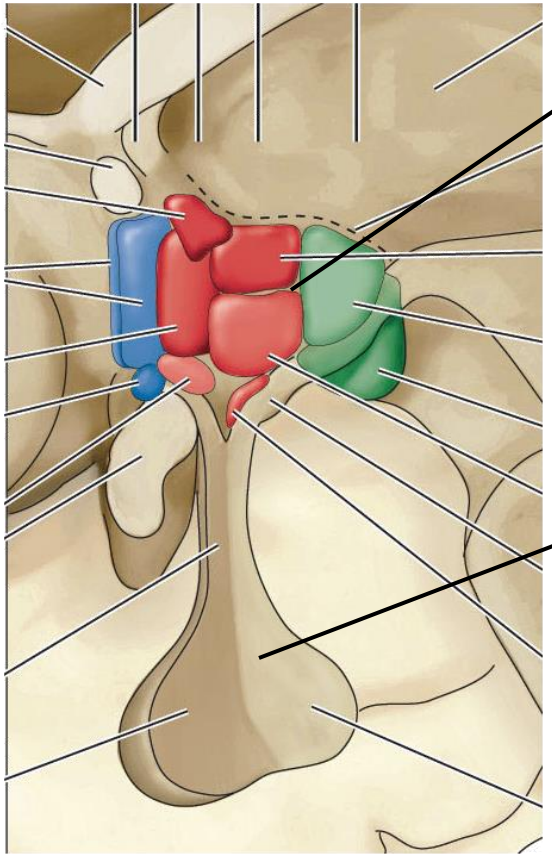
the brains “switch board”: relays sensory input to the cerebral cortex

Thalamus relays sensory input to the cerebral cortex



Diencephalon





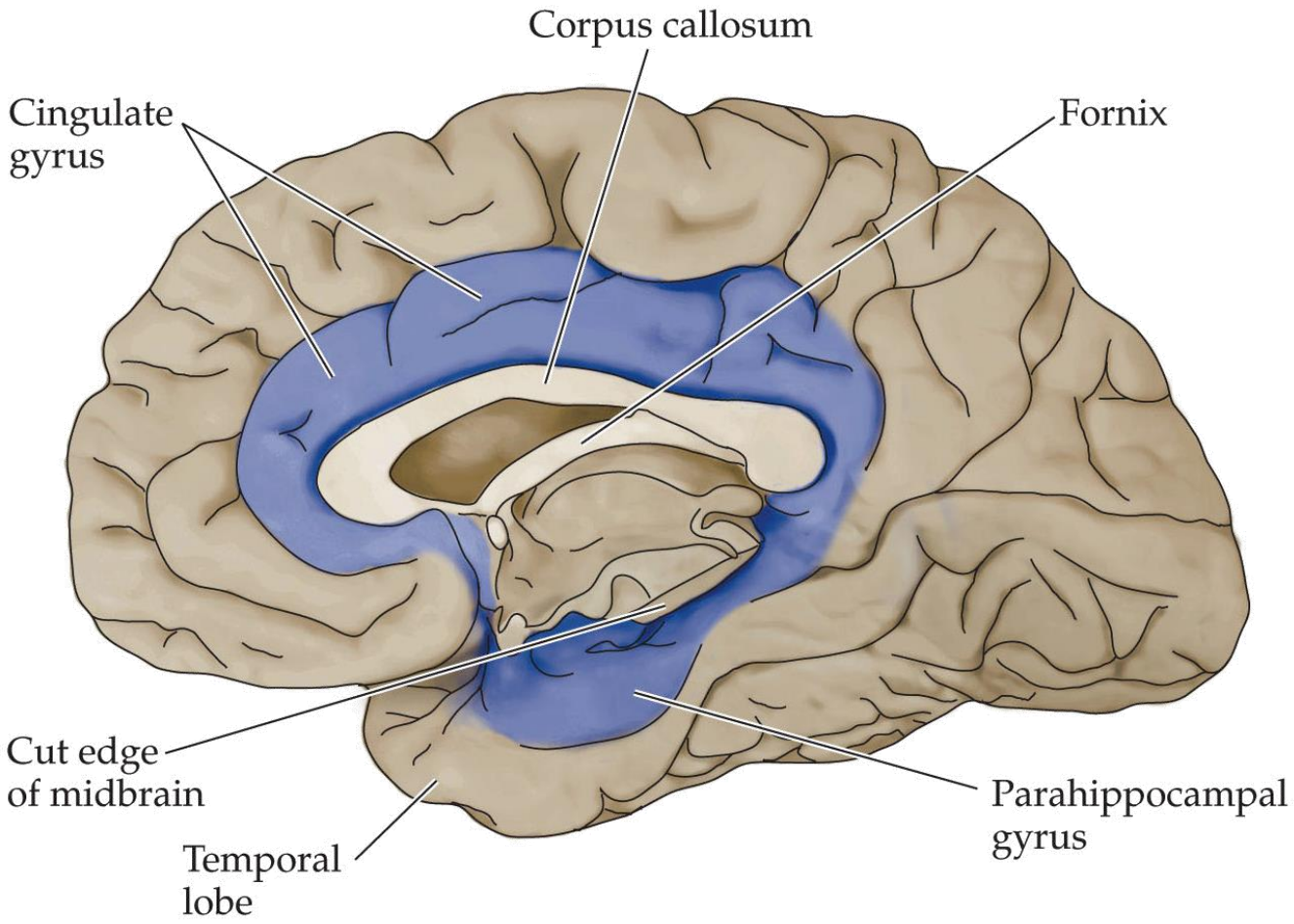
Hypothalamus

Homeostasis
Emotions

The pituitary gland

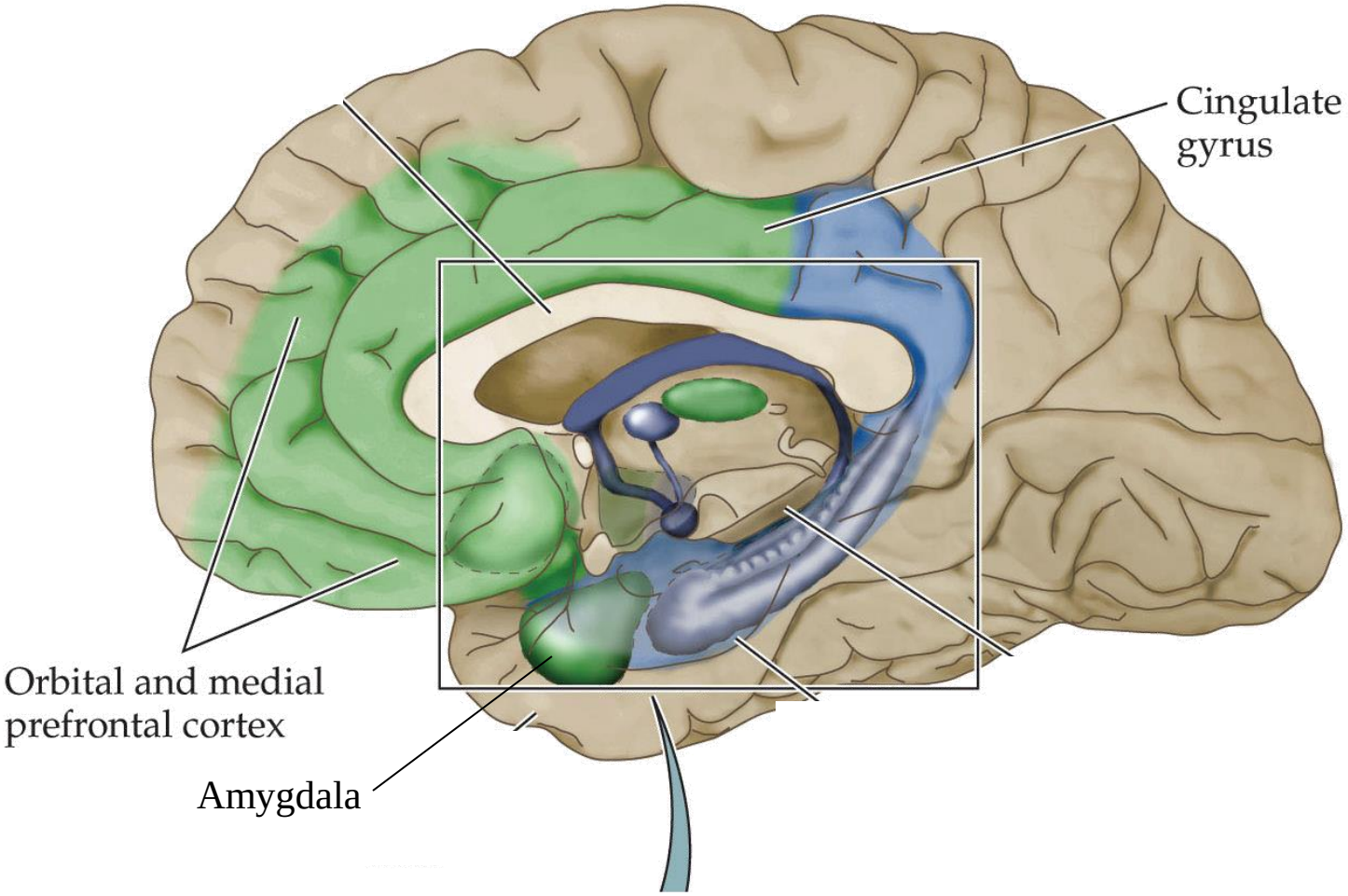
The anatomy of emotions

The “old” view of the limbic system



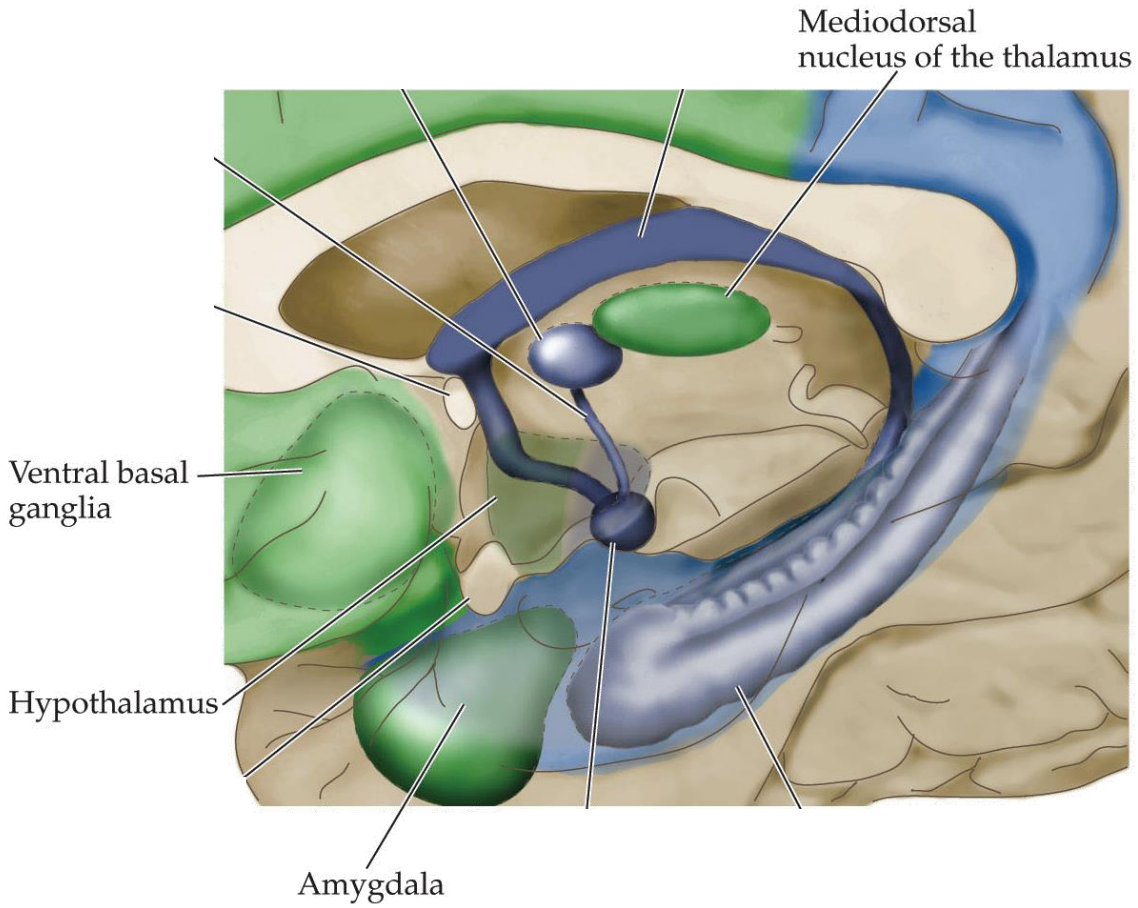
The anatomy of emotions

The “modern” view of the limbic system:
Anterior part: emotions; Posterior part: memory



The anatomy of emotions

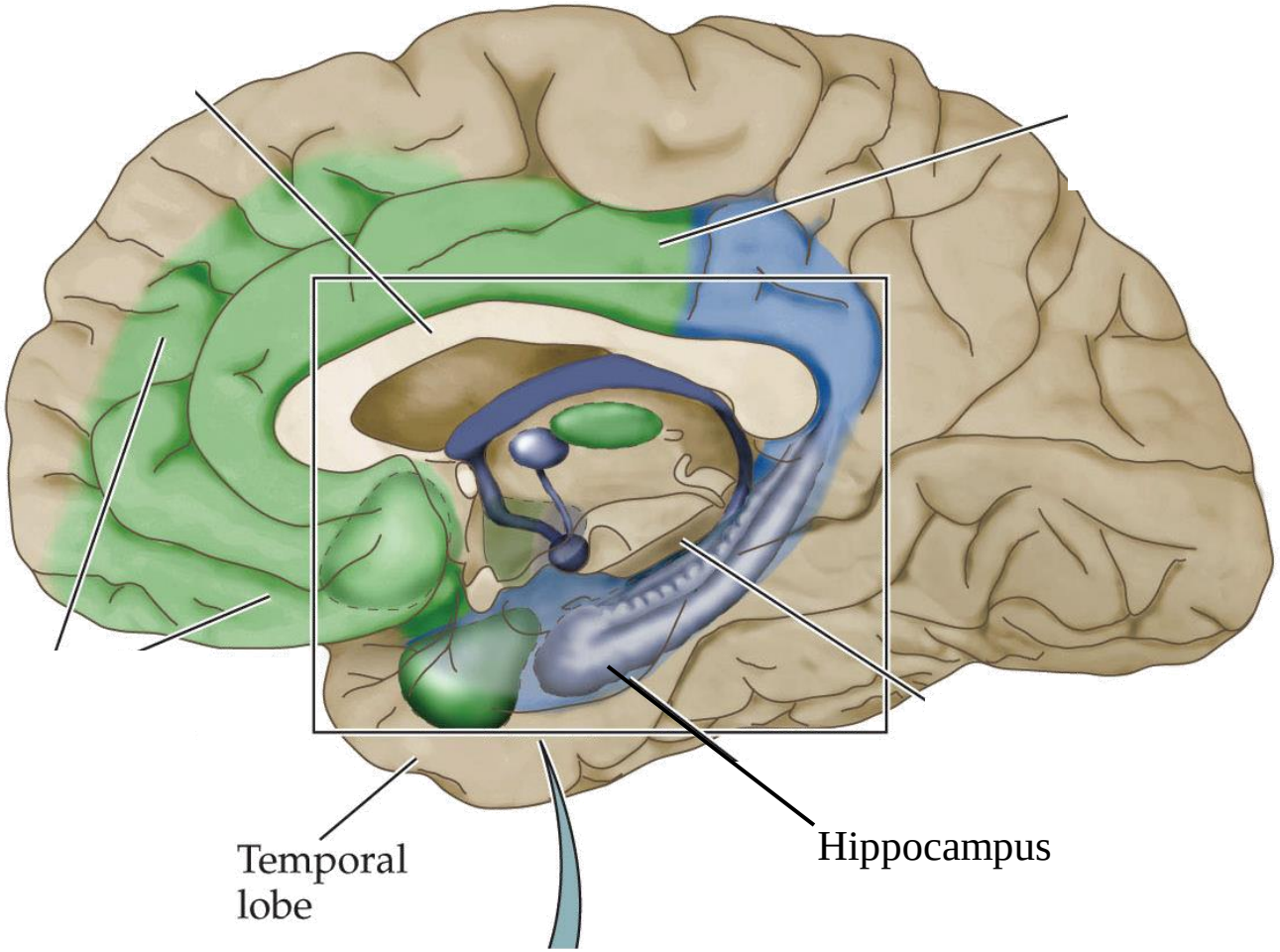
The “modern” view of the limbic system:
Anterior part: emotions; Posterior part: memory



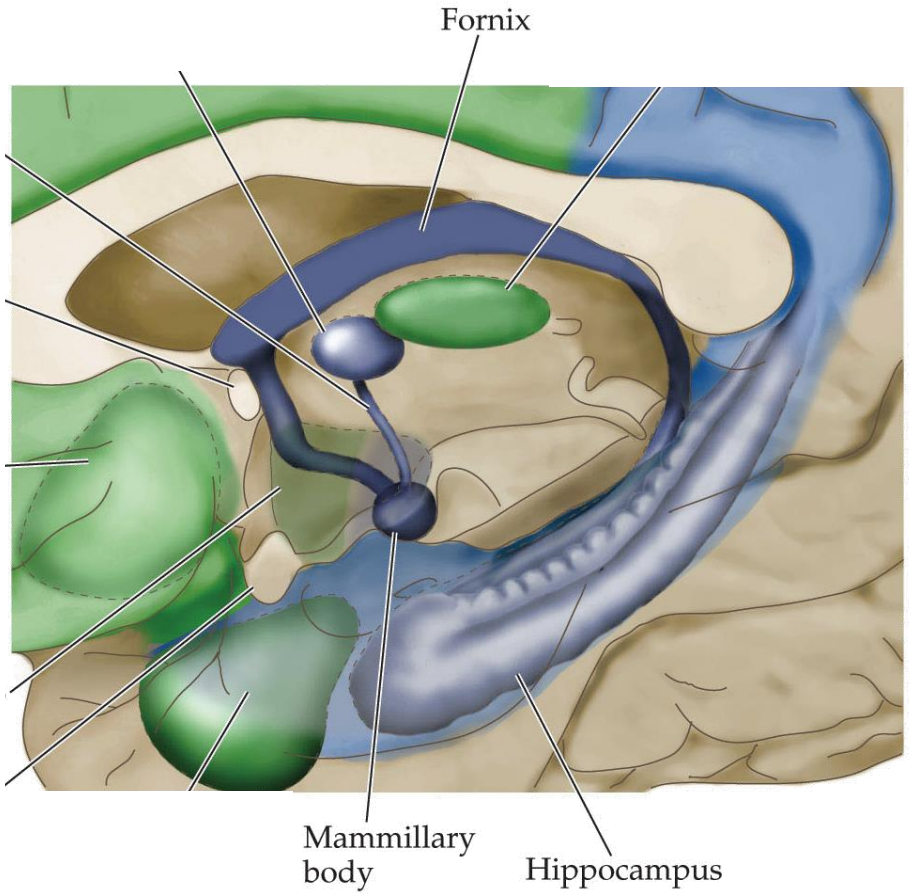
Different Forms of Memory

Declarative memory	Non-declarative memory
Memories that can be described in words	Can not be described (e.g how to ride a bicycle)

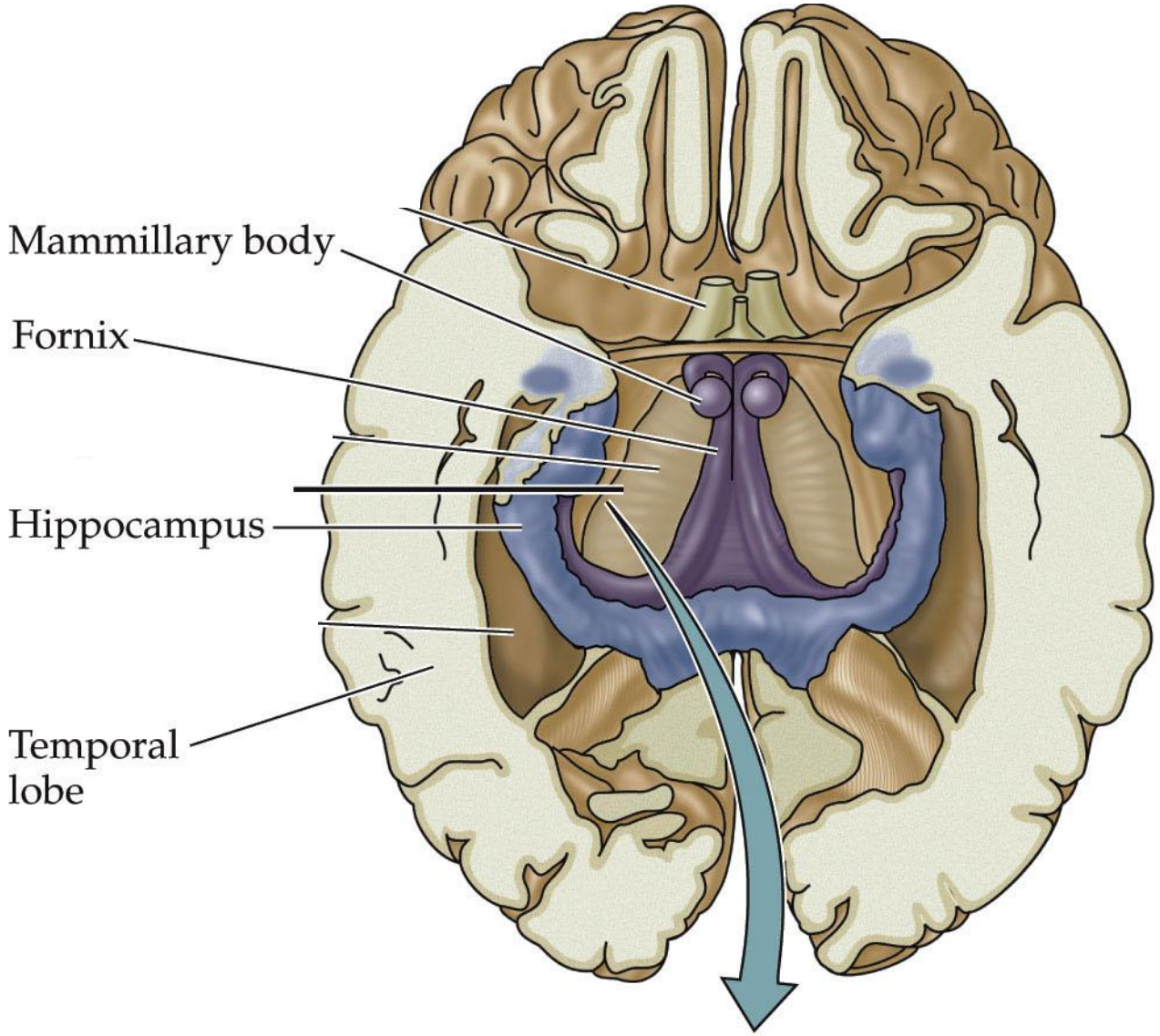
Brain structures participating in declarative memory: The posterior part of the limbic system



Brain structures participating in declarative memory: The posterior part of the limbic system

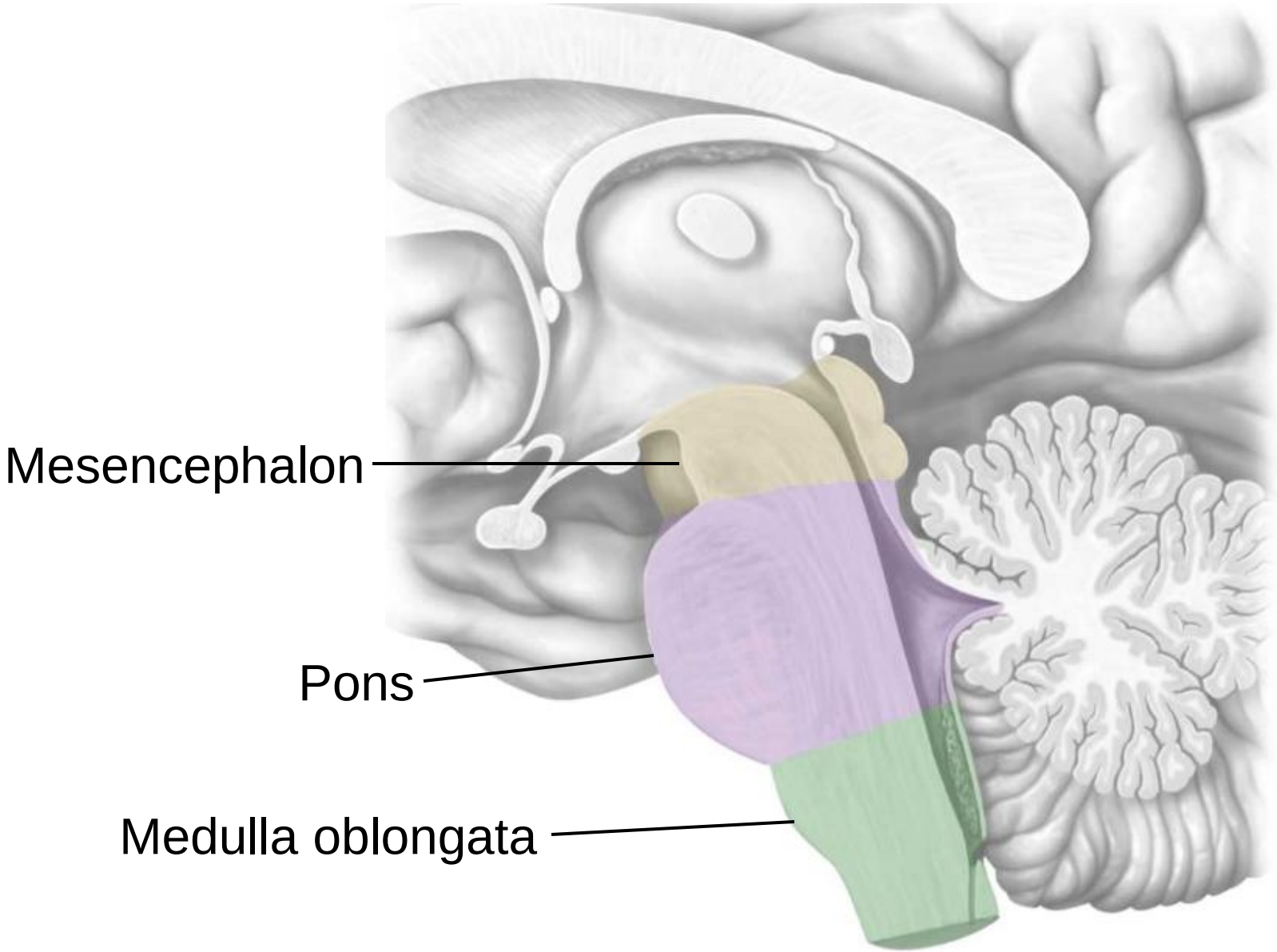


Hippocampus seen from below (parts of the temporal lobes removed)

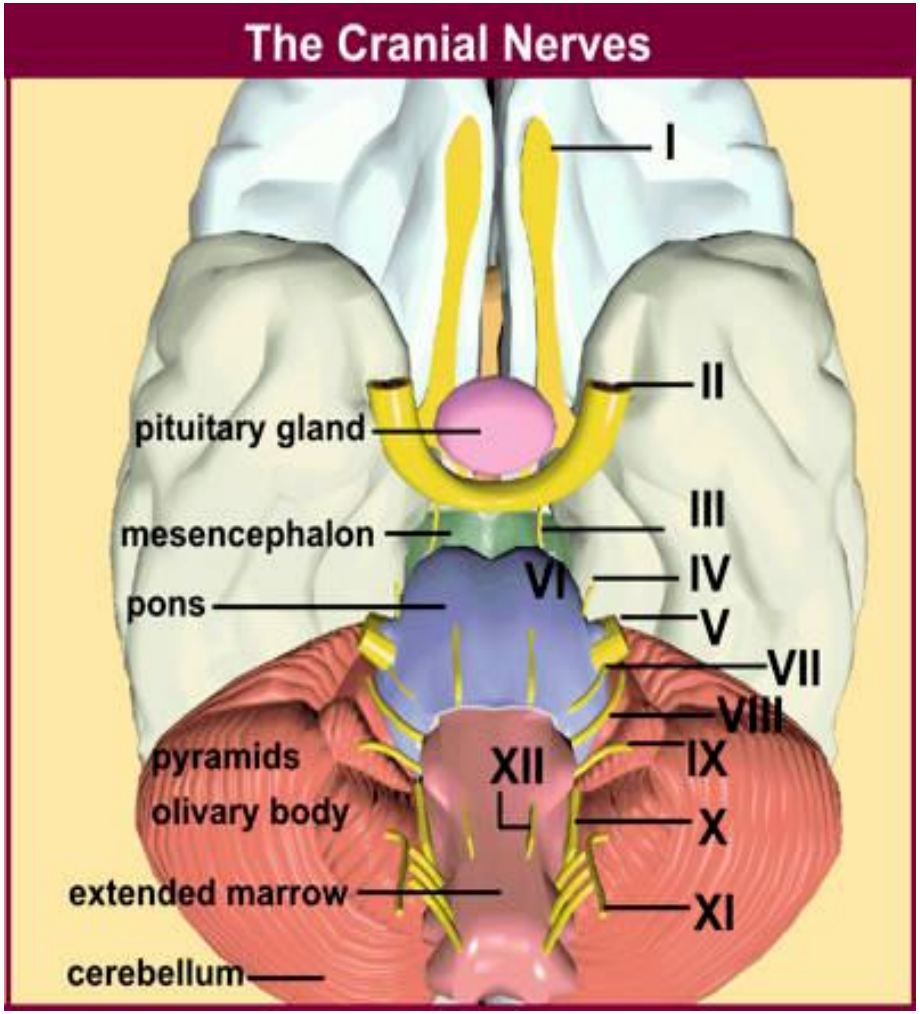


NEUROSCIENCE, Fourth Edition, Figure 31.7 (Part 2)

The Brainstem



Cranial nerves emerging from the brainstem mediate sensory and motor functions in the head



(I. N. Olfactorii)

(II. N. Opticus)

III. N.Oculomotorius

IV. N.Trochlearis

V. N.Trigeminus

VI. N. Abducens

VII. N. Facialis

VIII. N.Vestibulo-cochlearis

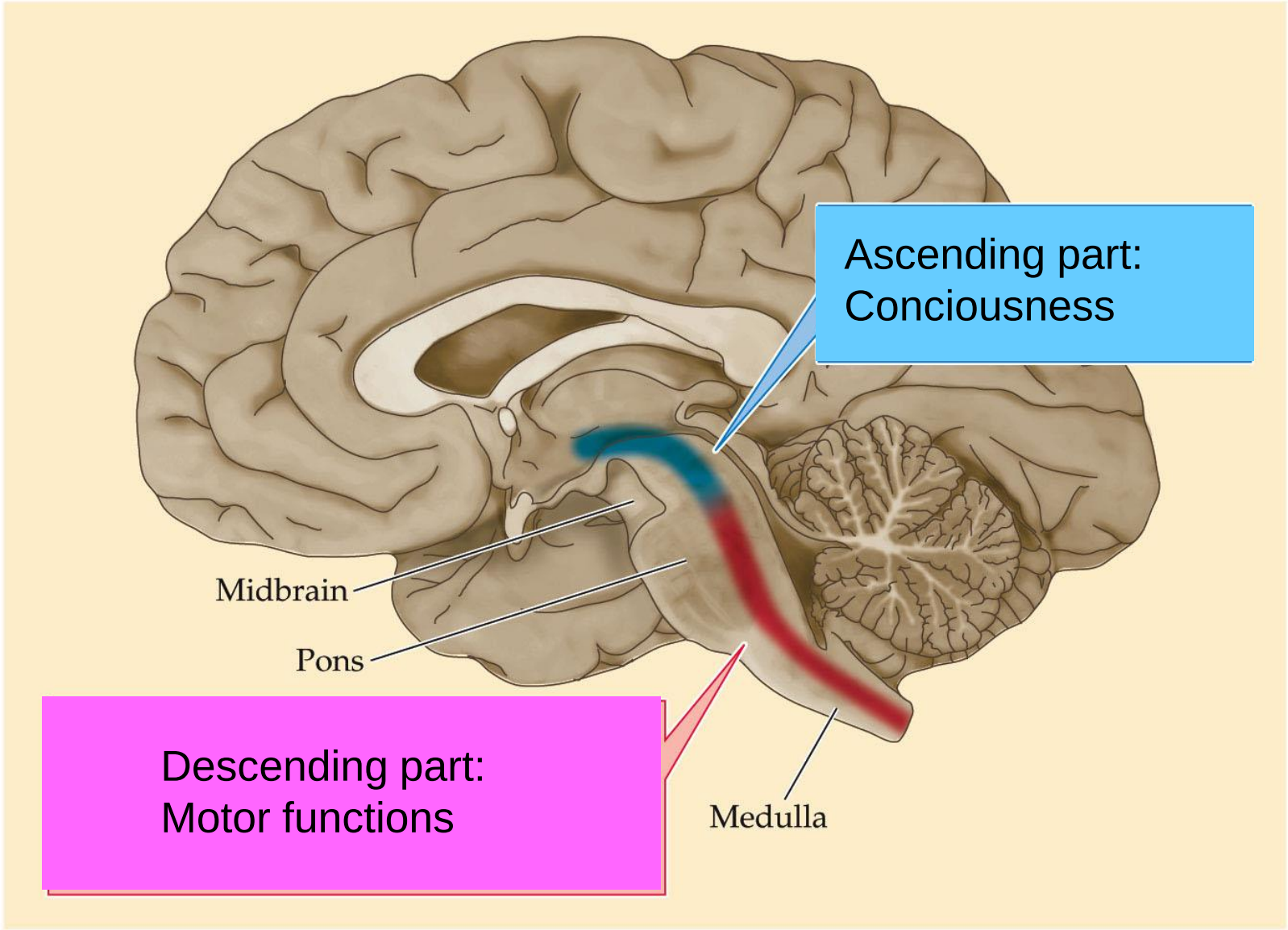
IX. N. Glosso-pharyngeus

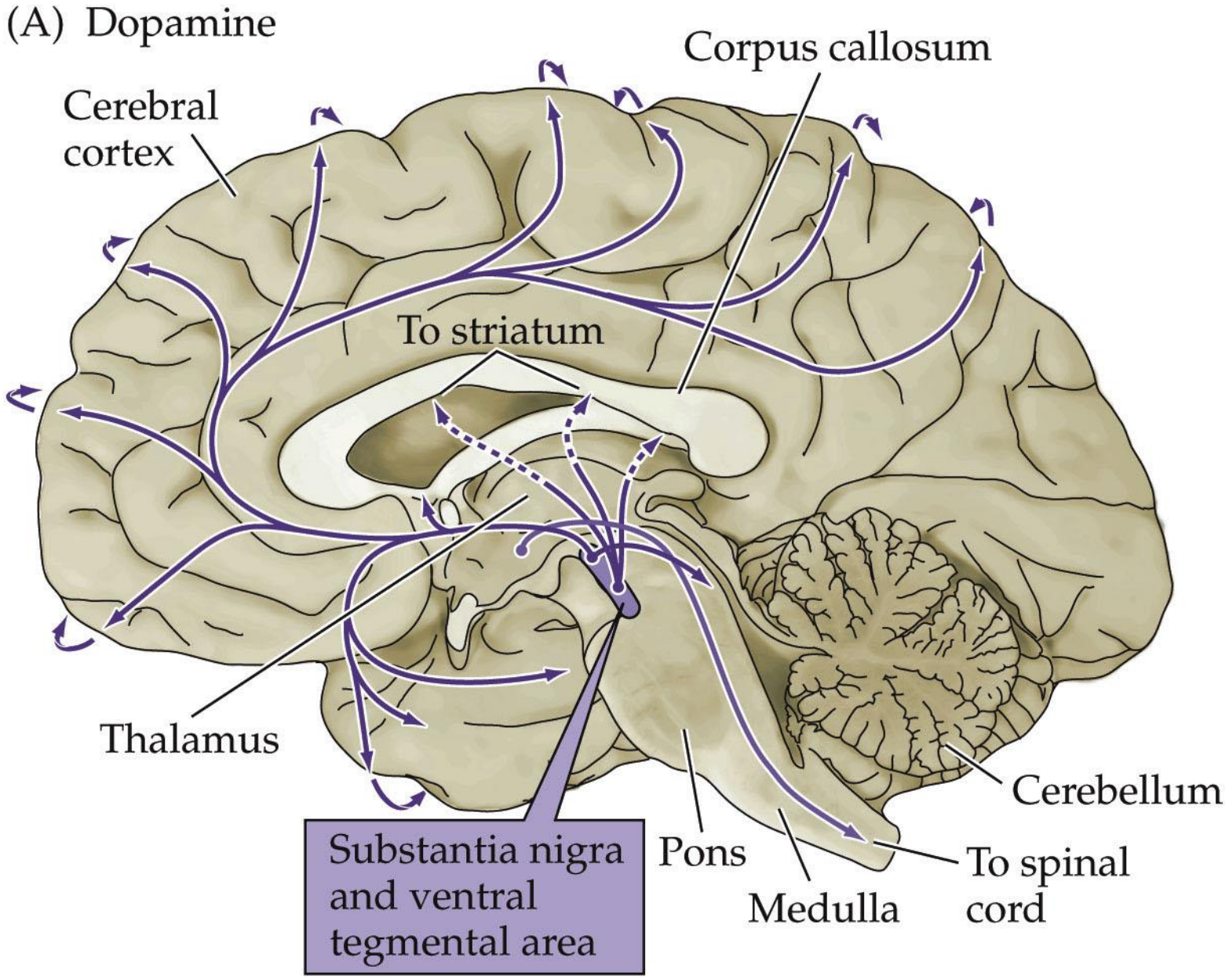
X. N. Vagus

XI. N. Accesorius

XII. N. Hypoglossus

The Reticular Formation

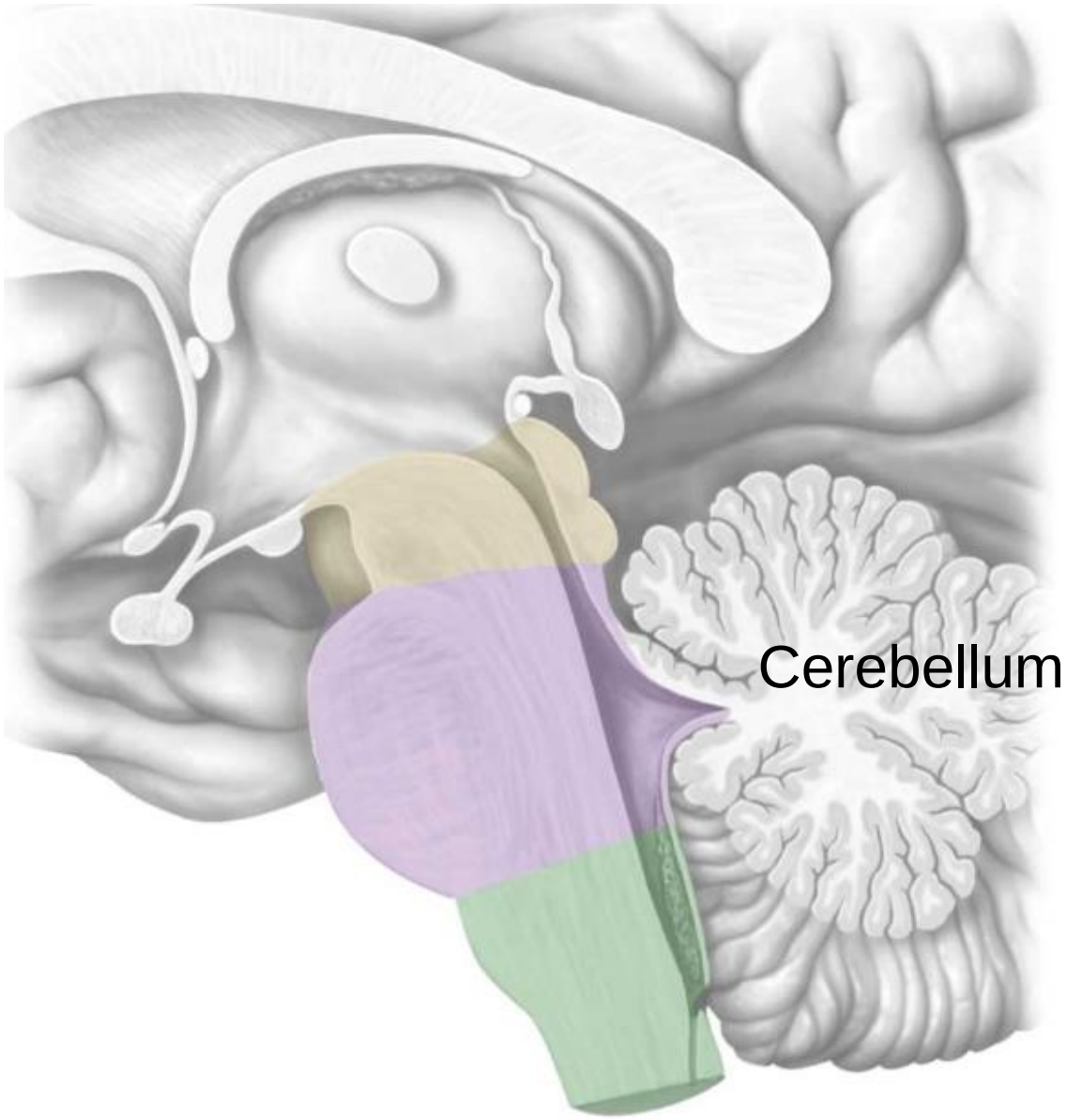




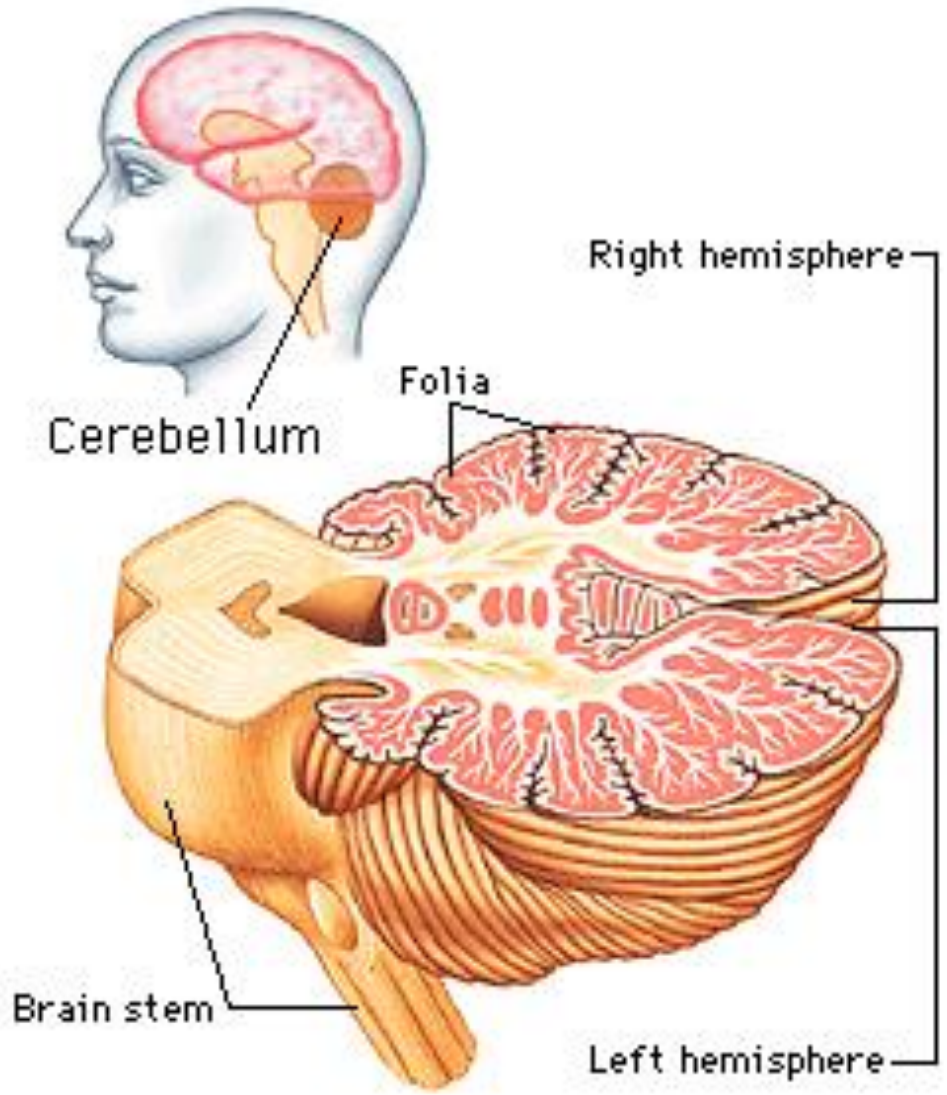
***NEUROSCIENCE, Fourth Edition,* Figure 6.11 (Part 1)**

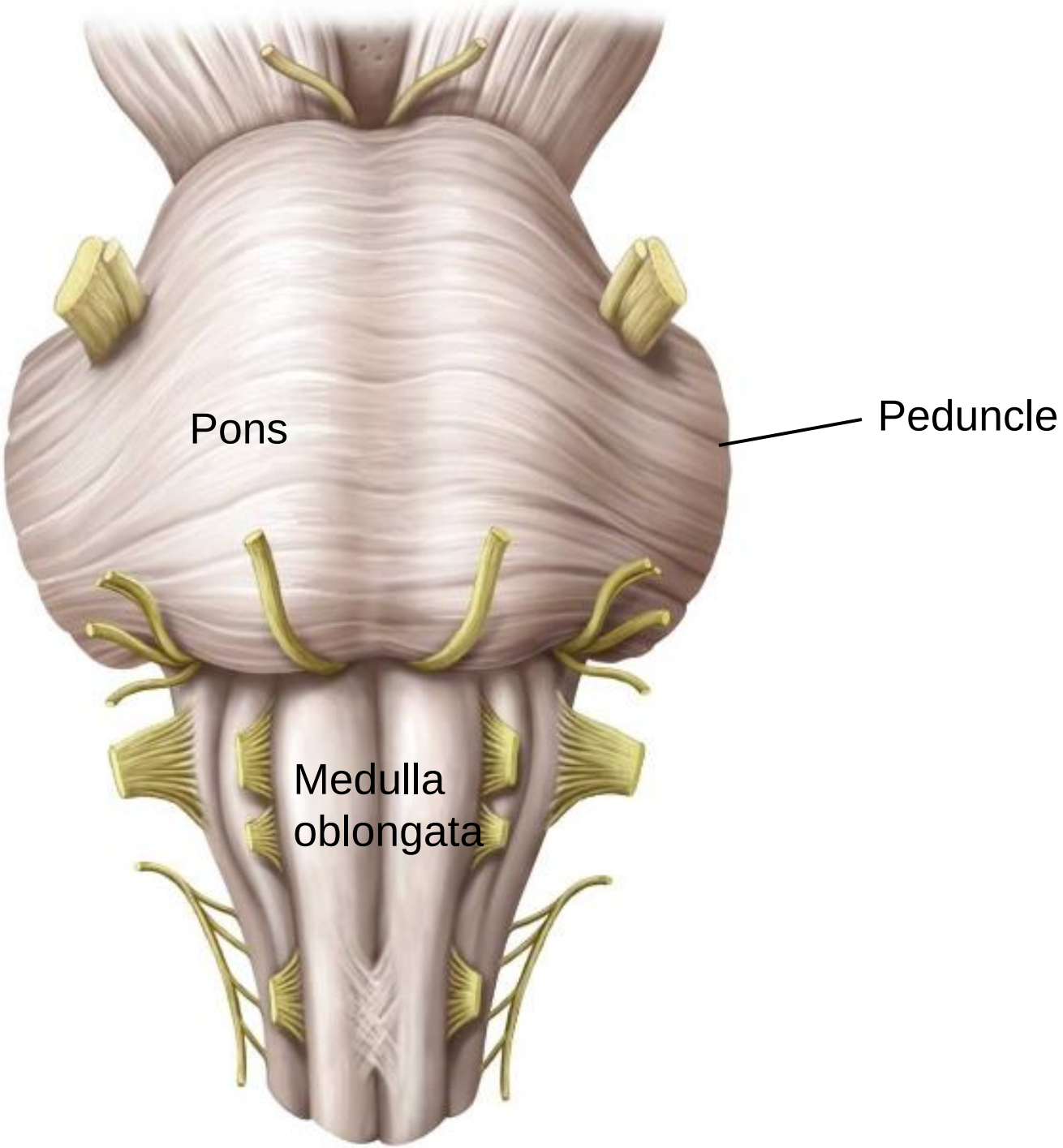
The Brainstem - Summary

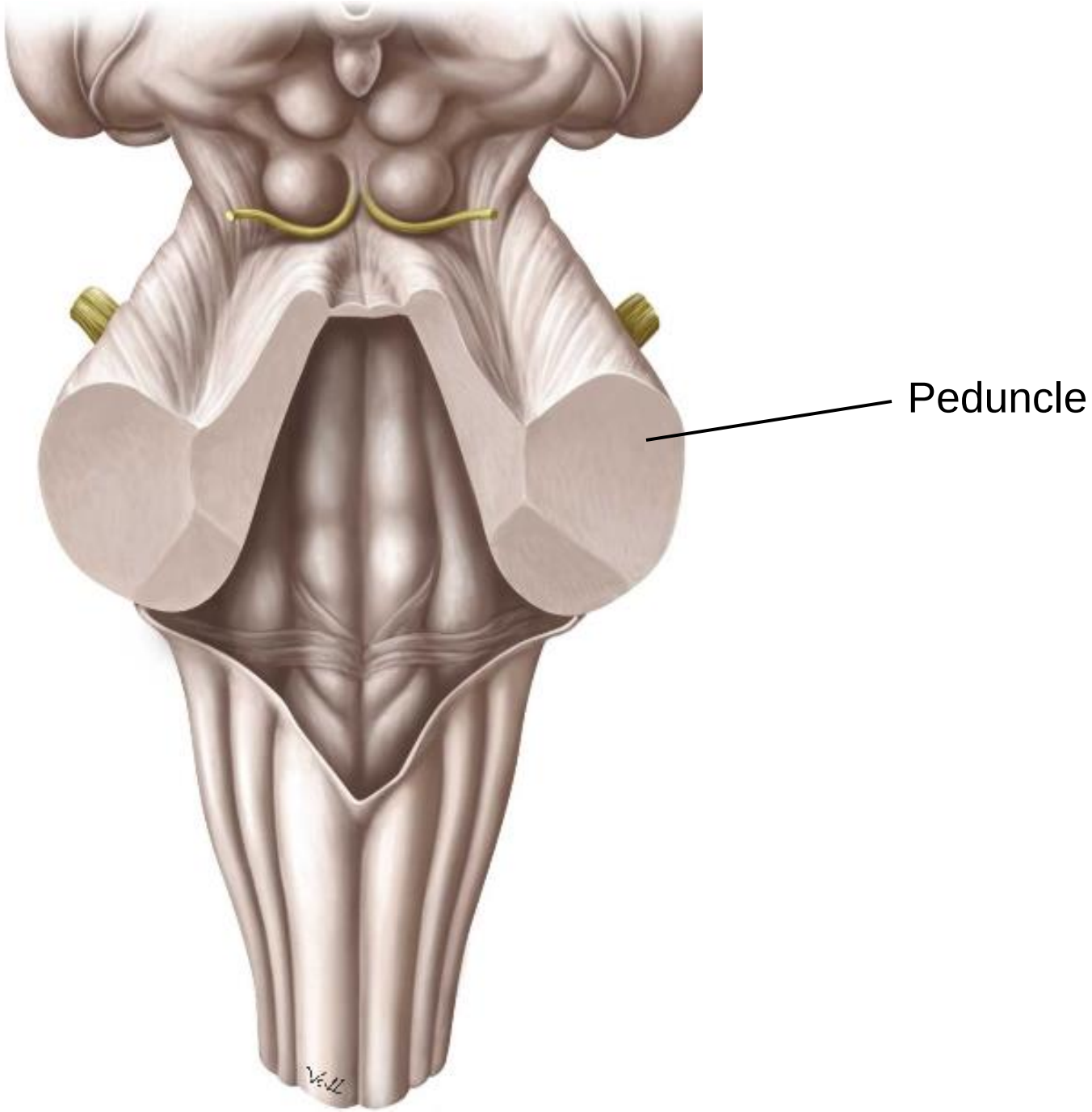
Cranial nerves:	sensory and motor functions in the head incl eye movements, hearing, balance, inner organs
Reticular Formation:	consciousness, motor functions
Dopamine systems:	motivation, reward, motor functions
Serotonin systems:	mood, emotions, hunger-satiety, motor functions
Other functions:	breathing, swalloving


Cerebellum

Cerebellum: connected to pons via the peduncles



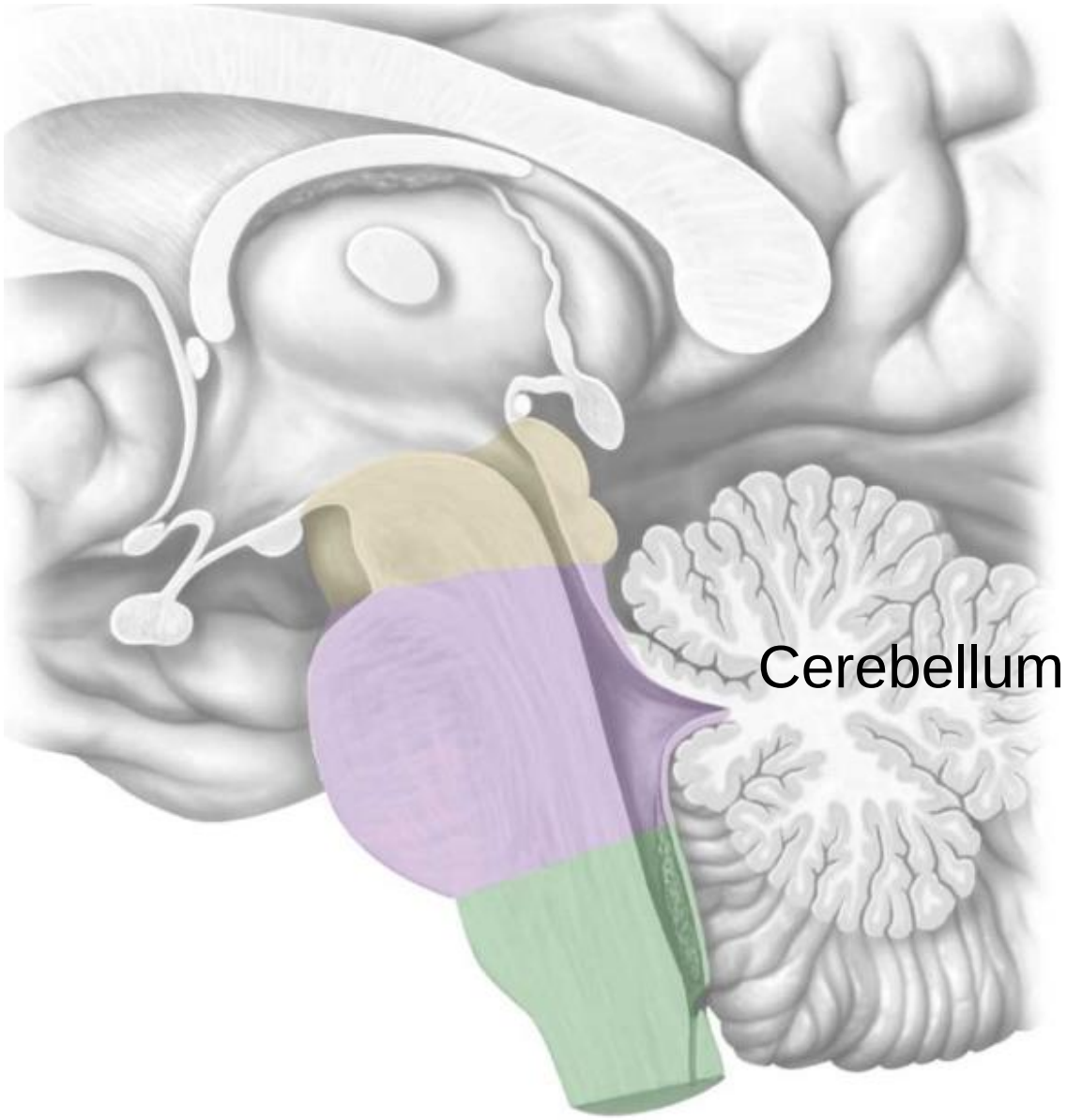

Pons
Peduncle
Medulla
oblongata


Peduncle

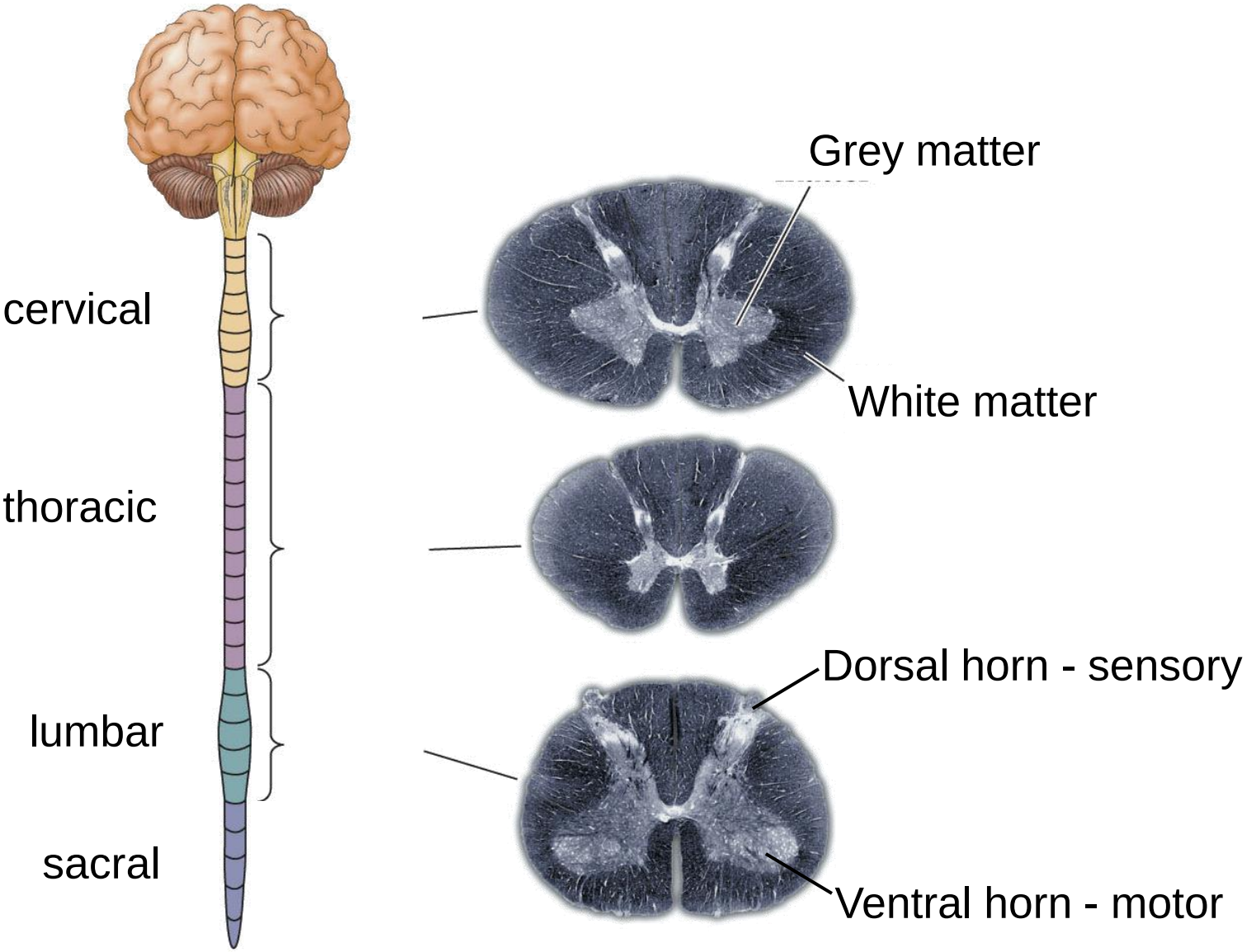
Fine-tuning of motor functions

Motor learning

Cognition



The Spinal Cord



The Spinal Cord