PSYCH 260

Neuroanatomy III

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Prelude (2:54)

(Abdikareem, 2017)

Prelude (1:22)

Today's topics

- Quiz 1 on Canvas, opens at 4:30 PM
- Warm-up
- More neuroanatomy

Warm-up

What hindbrain area's name means 'little brain'?

- A. Pons
- B. 4th ventricle
- C. Cerebellum
- D. Tegmentum

What hindbrain area's name means 'little brain'?

- A. ~~Pons~~
- B. ~~4th ventricle~~
- C. Cerebellum
- D. ~~Tegmentum~~

What part of the midbrain is especially activated when a cat chases a laser pointer?

- A. Hypothalamus
- B. Hippocampus
- C. Tectum
- D. Medulla oblongata

What part of the midbrain is especially activated when a cat chases a laser pointer?

- A. ~~Hypothalamus~~
- B. ~~Hippocampus~~
- C. Tectum
- D. ~~Medulla oblongata~~

More neuroanatomy

Organization of the brain

Major division	Ventricular Landmark	Embryonic Division	Structure
Forebrain	Lateral	Telencephalon	*Cerebral cortex*
			Basal ganglia
			Hippocampus, *Amygdala*
	Third	Diencephalon	*Thalamus*
			Hypothalamus
Midbrain	Cerebral Aqueduct	Mesencephalon	*Tectum*, *Tegmentum*

Organization of the brain

Major division	Ventricular Landmark	Embryonic Division	Structure
Hindbrain	4th	Rhombencephalon	*Cerebellum*, *pons*
	–		*Medulla oblongata*

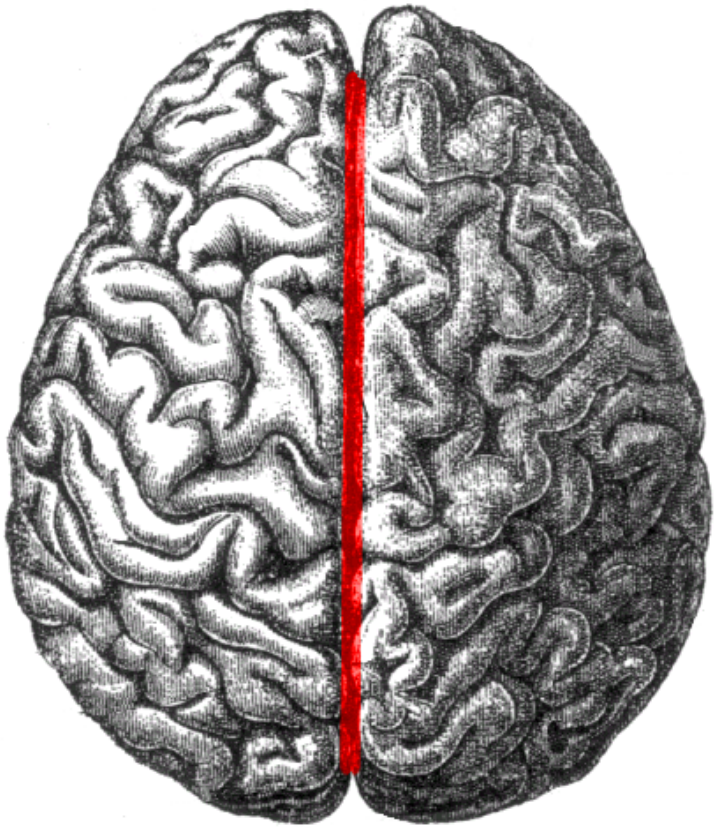
Cerebral hemispheres

- Right cerebral hemisphere
- Left cerebral hemisphere
- Gyrus/gyri (bumps)
- Sulcus/sulci, fissures (grooves)

Landmarks of the cerebral cortex

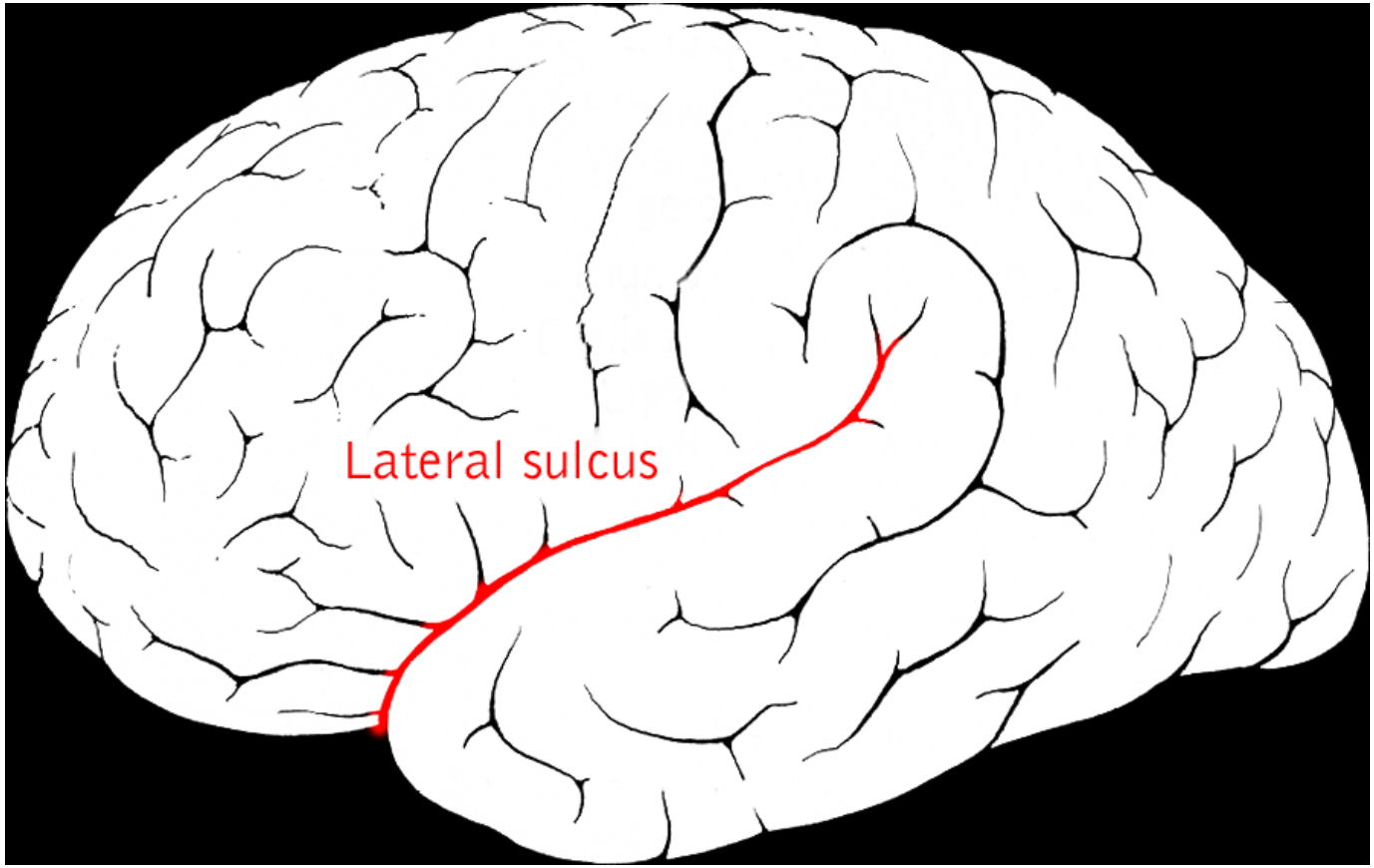
Landmark	Identifies/separates
Medial longitudinal fissure (longitudinal fissure)	Divides hemispheres
Lateral sulcus/fissure	Divides temporal lobe from frontal & parietal
Central sulcus	Divides frontal from parietal lobe

Medial longitudinal fissure (longitudinal fissure)



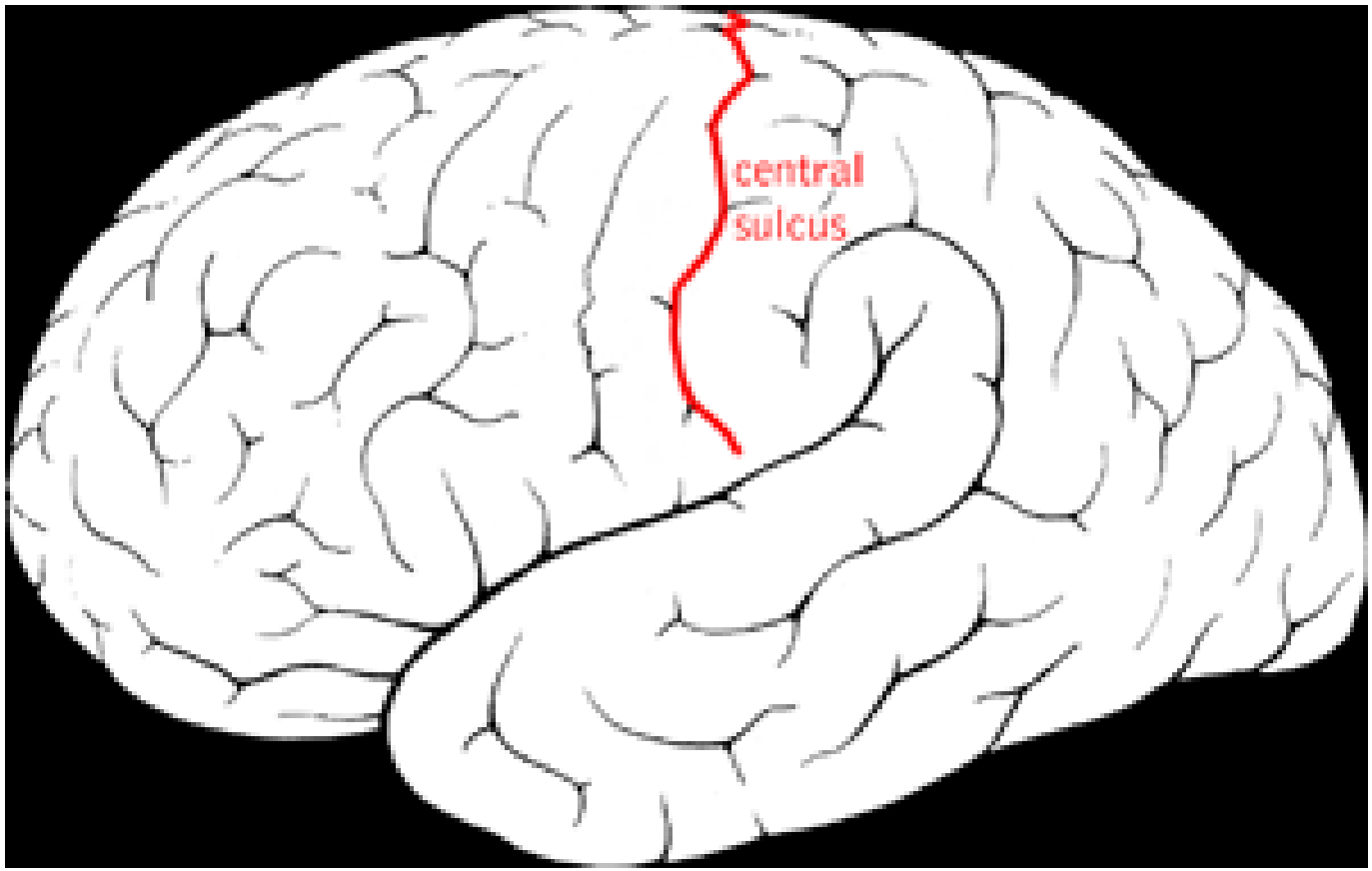
https://upload.wikimedia.org/wikipedia/commons/0/04/Human_brain_longitudinal_fissure.png

Lateral sulcus/fissure



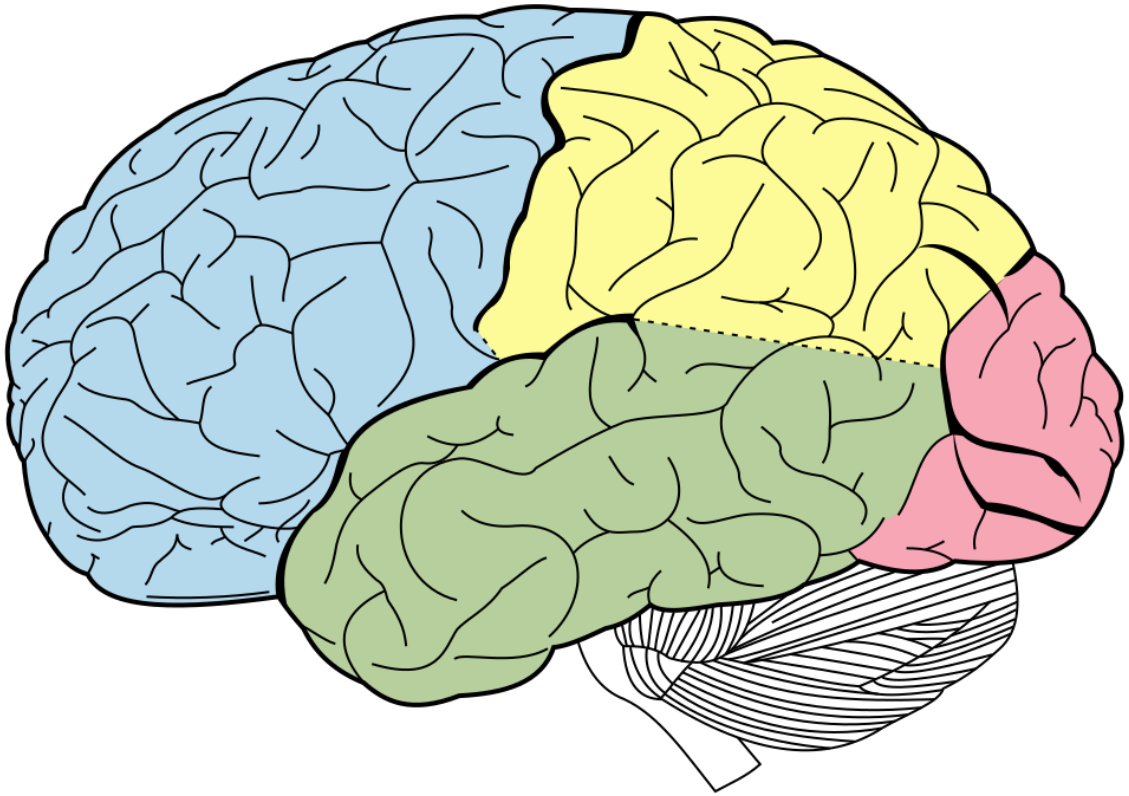
https://upload.wikimedia.org/wikipedia/commons/4/41/Lateral_sulcus2.png

Central sulcus



https://upload.wikimedia.org/wikipedia/commons/8/88/Central_sulcus_diagram.png

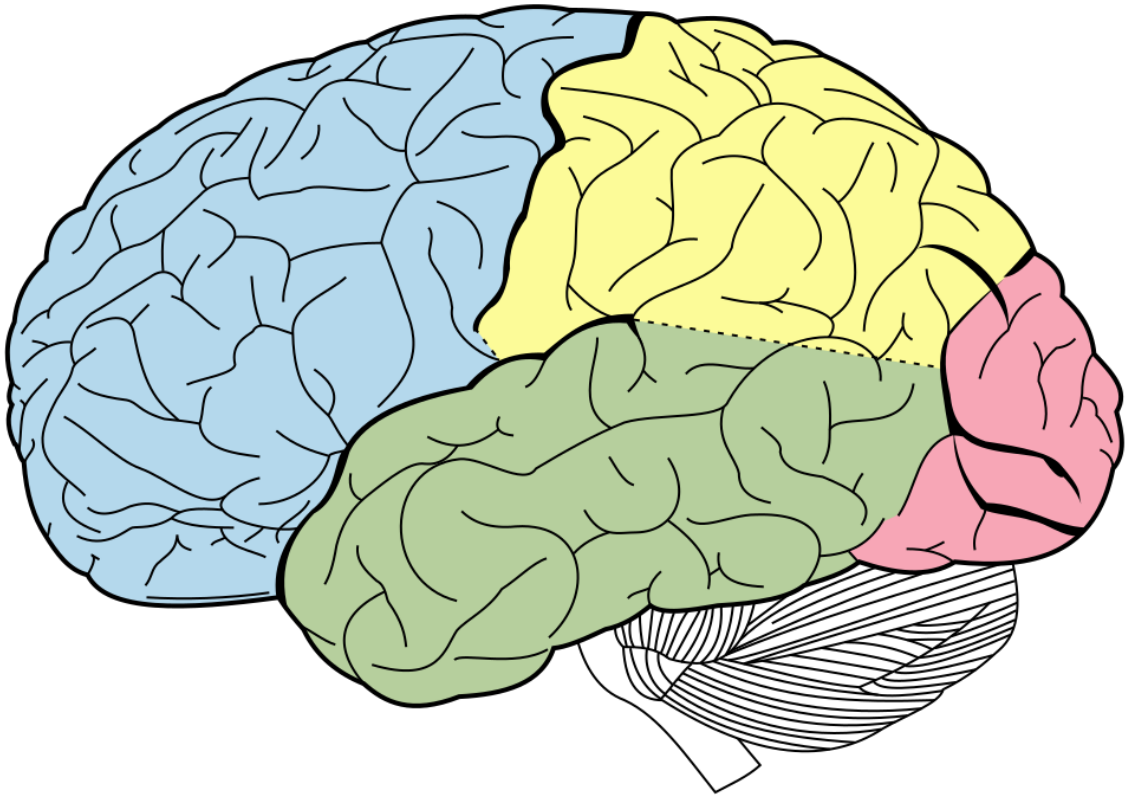
Lobes of the Cerebral Cortex



https://upload.wikimedia.org/wikipedia/commons/thumb/0/0e/Lobes_of_the_brain_NL.svg/1024px-Lobes_of_the_brain_NL.svg.png

Frontal lobe

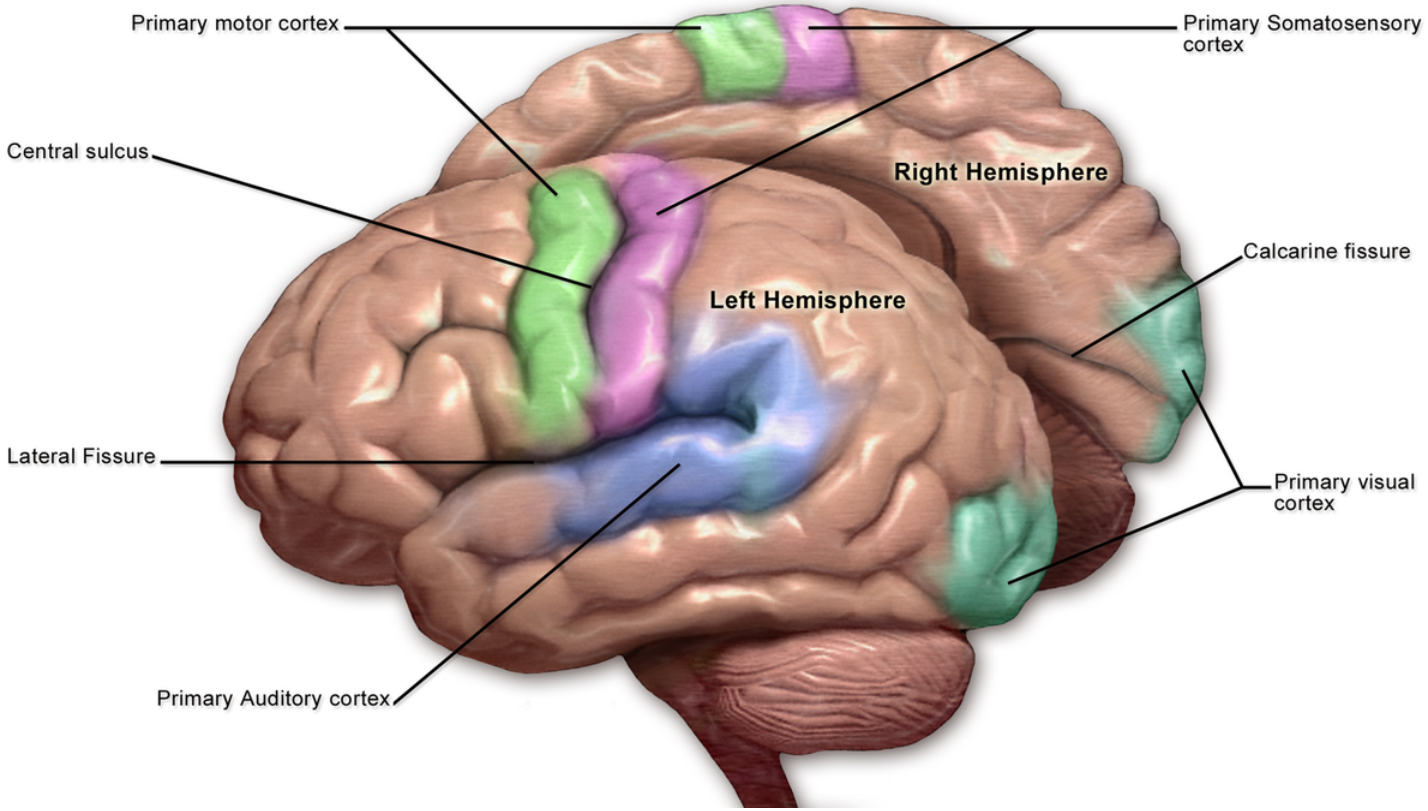
- Where is it?
  - Anterior to central sulcus
  - Superior to lateral fissure
  - Dorsal to temporal lobe



https://upload.wikimedia.org/wikipedia/commons/thumb/0
Lobes_of_the_brain_NL.svg.png

Frontal lobe

- What does it do/contain?
  - Pre-central gyrus (pre/anterior to central sulcus)
    - Primary motor cortex (M1)



https://upload.wikimedia.org/wikipedia/commons/thumb/c
Blausen_0103_Brain_Sensory%26Motor.png

Frontal lobe

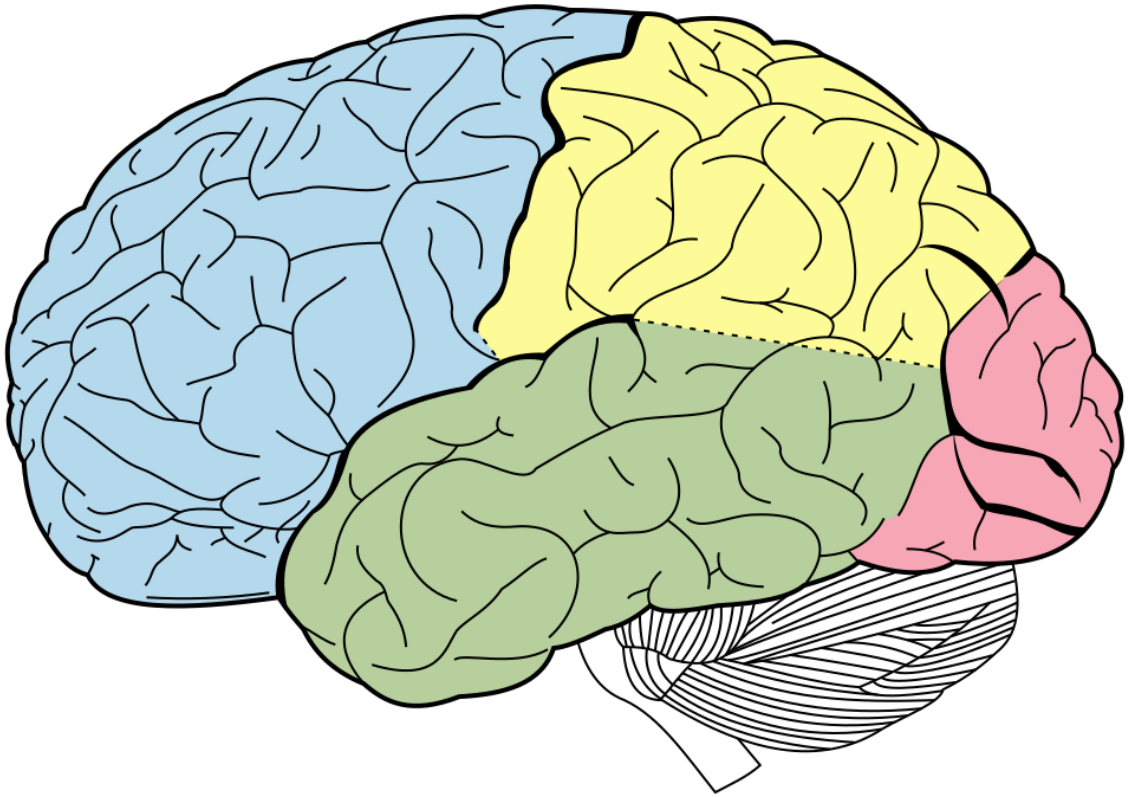
- What does it do/contain?
  - Prefrontal cortex
    - Planning, problem solving, working memory…?
  - Anterior cingulate cortex (ACC)
  - Primary olfactory cortex
  - Gustatory cortex

Cingulate Gyrus

http://cis.jhu.edu/data.sets/cortical_segmentation_validation/photos/cinggyrus75.jpg

Temporal lobe

- Where is it?
  - Ventral to frontal, parietal lobes
  - Inferior to lateral fissure



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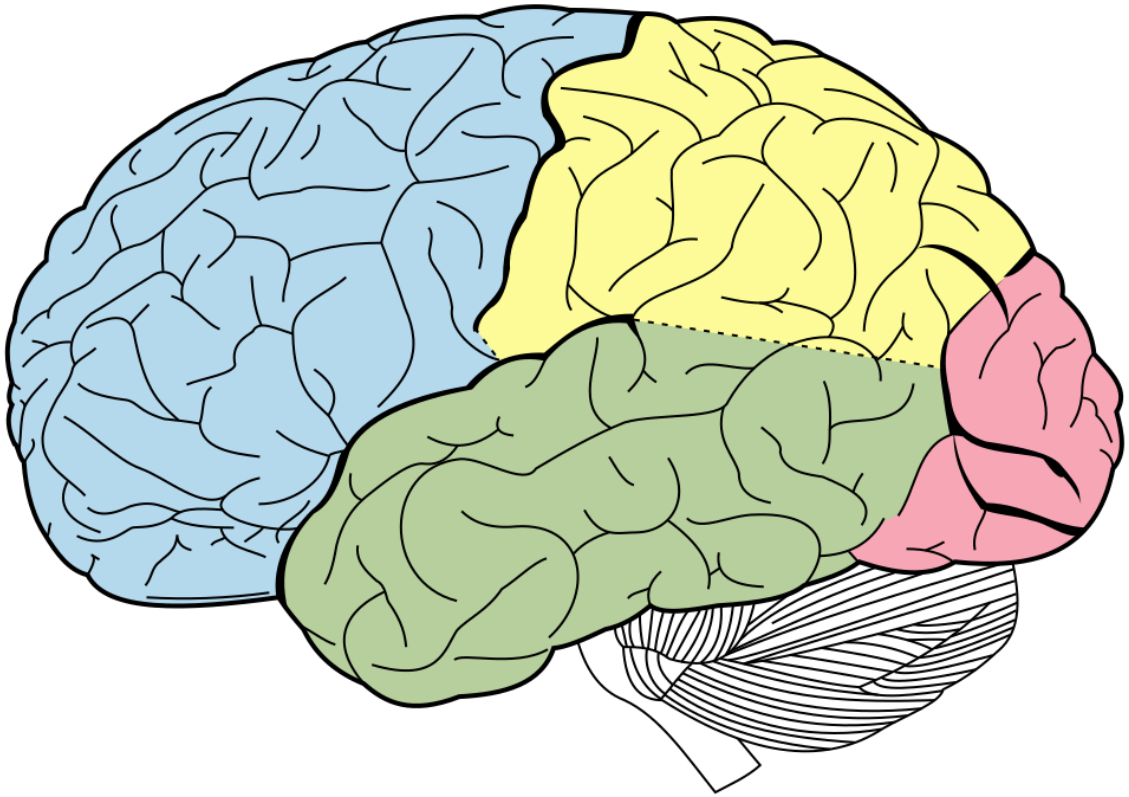
Lobes_of_the_brain_NL.svg.png

Temporal lobe

- What does it do/contain?
  - Primary auditory cortex (A-I)
  - Object, face recognition
  - Amygdala, hippocampus
  - Storage/recall of memories about events, objects

Parietal lobe

- Where is it?
  - Caudal to frontal lobe
  - Dorsal to temporal lobe
  - Posterior to central sulcus



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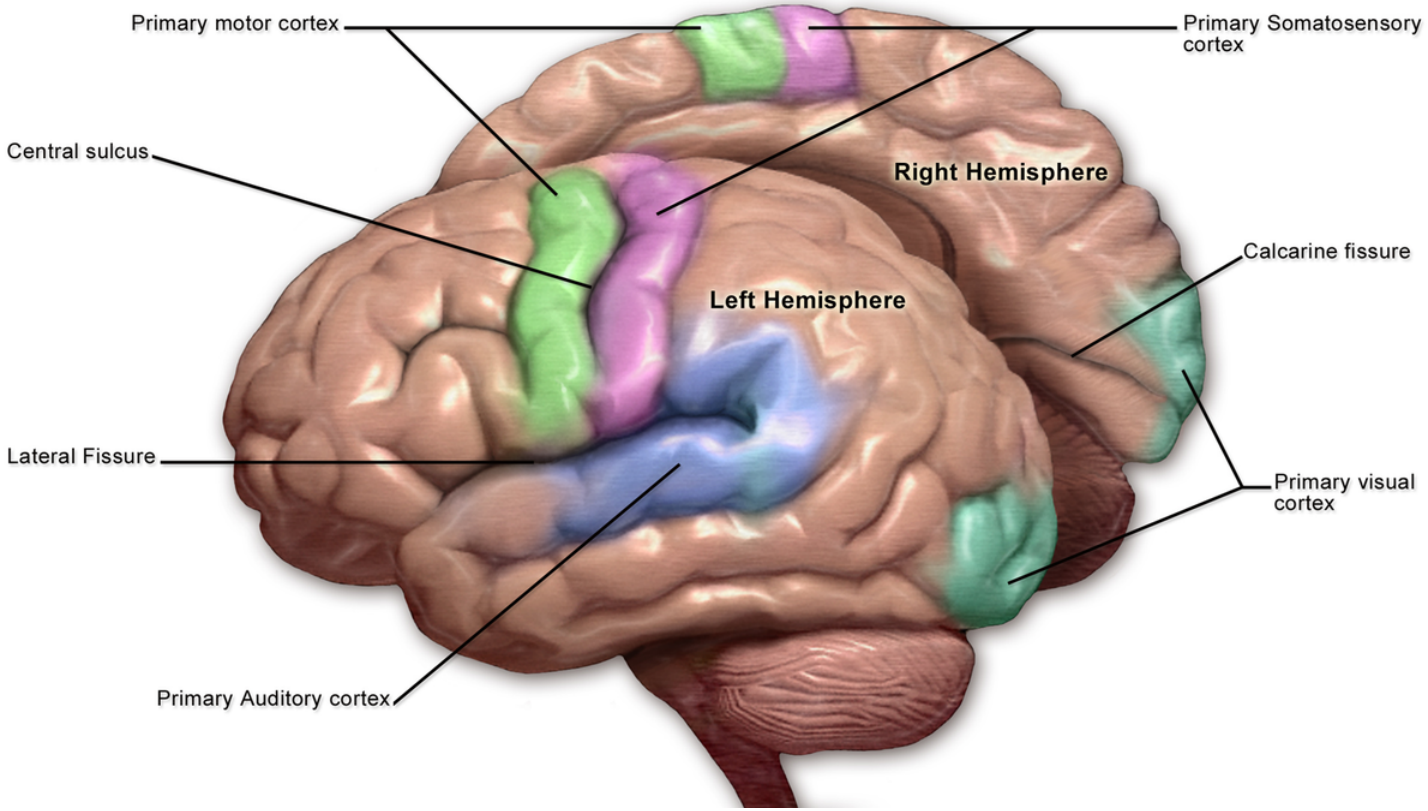
Lobes_of_the_brain_NL.svg.png

Parietal lobe

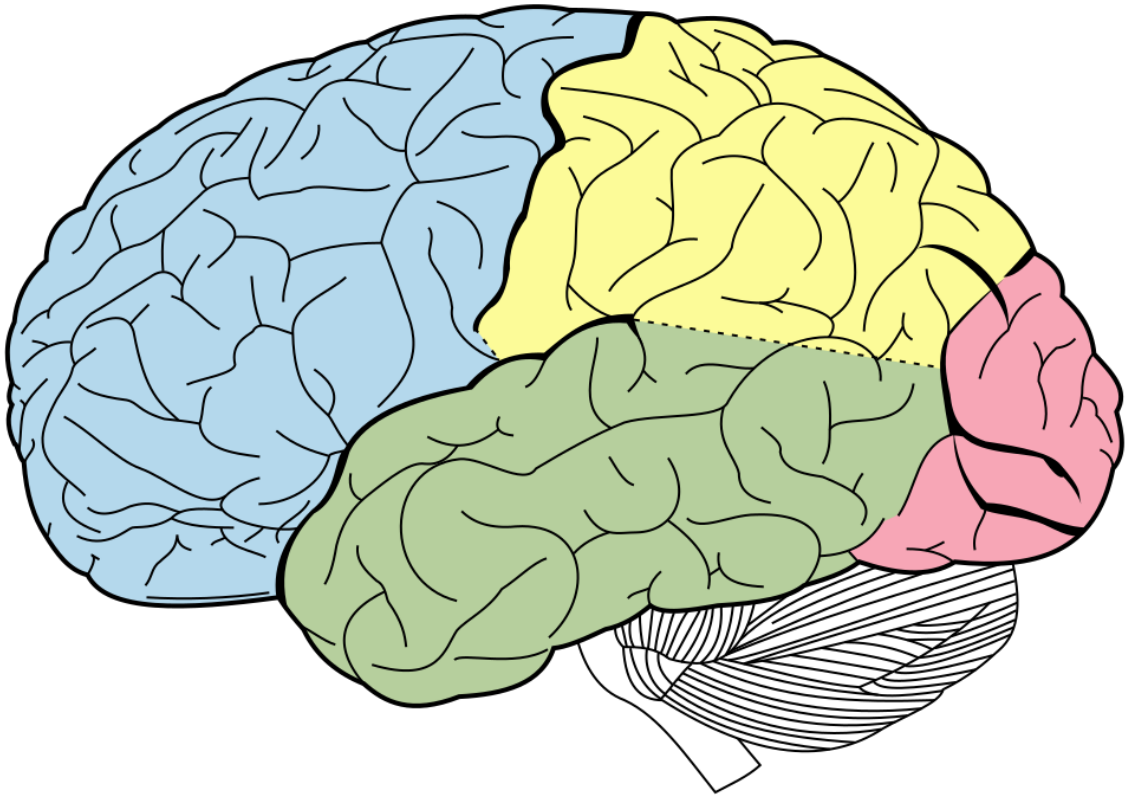
- What does it do/contain?
  - Perception of spatial relations, action planning
  - Post-central gyrus
    - Post-central -> “posterior to” central sulcus
    - Primary somatosensory cortex (S-I)



https://upload.wikimedia.org/wikipedia/commons/thumb/c
Blausen_0103_Brain_Sensory%26Motor.png

Occipital lobe

- Where is it?
  - Caudal to parietal & temporal lobes
- What does it do/contain?
  - Primary visual cortex (V1)



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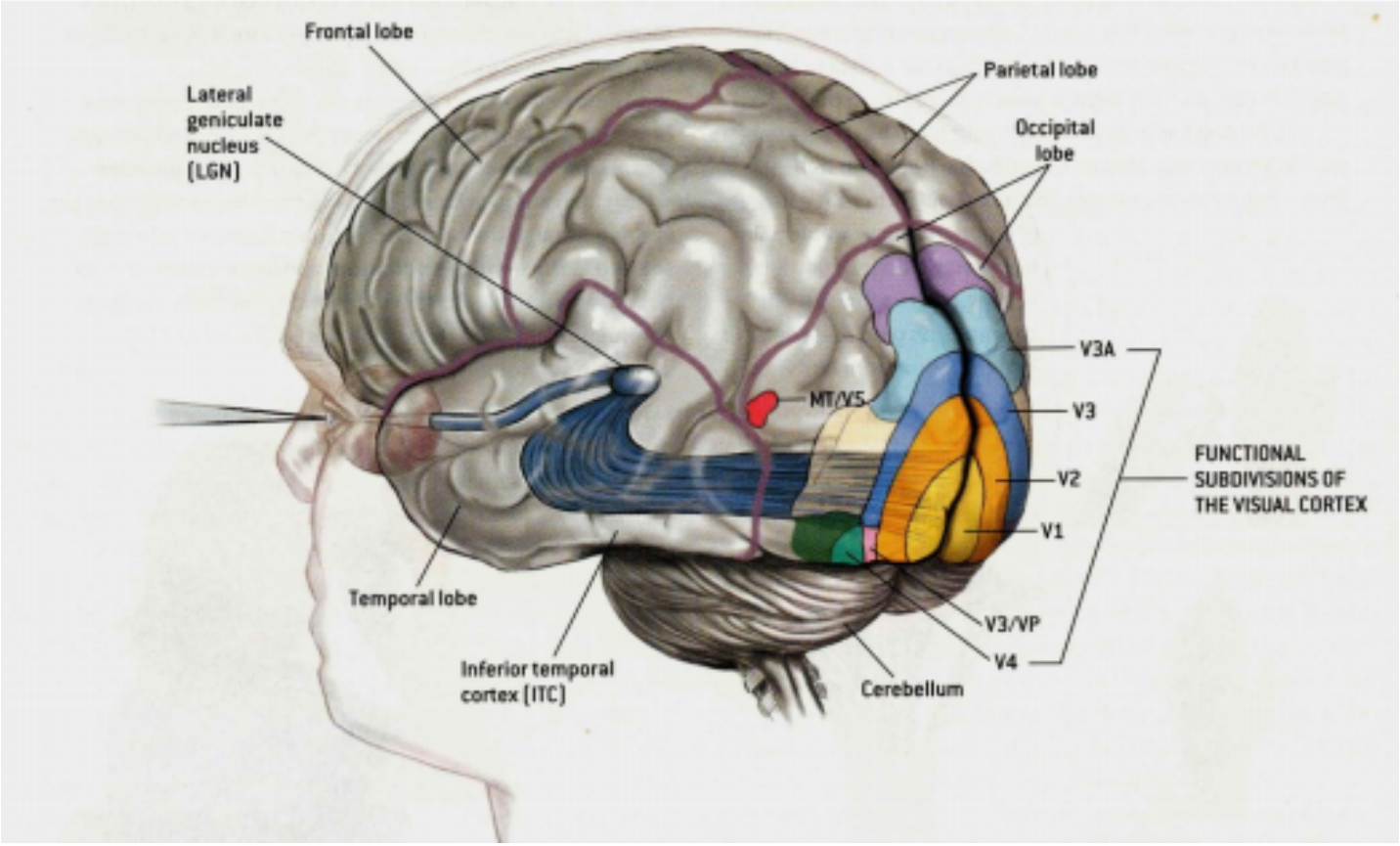
Lobes_of_the_brain_NL.svg.png

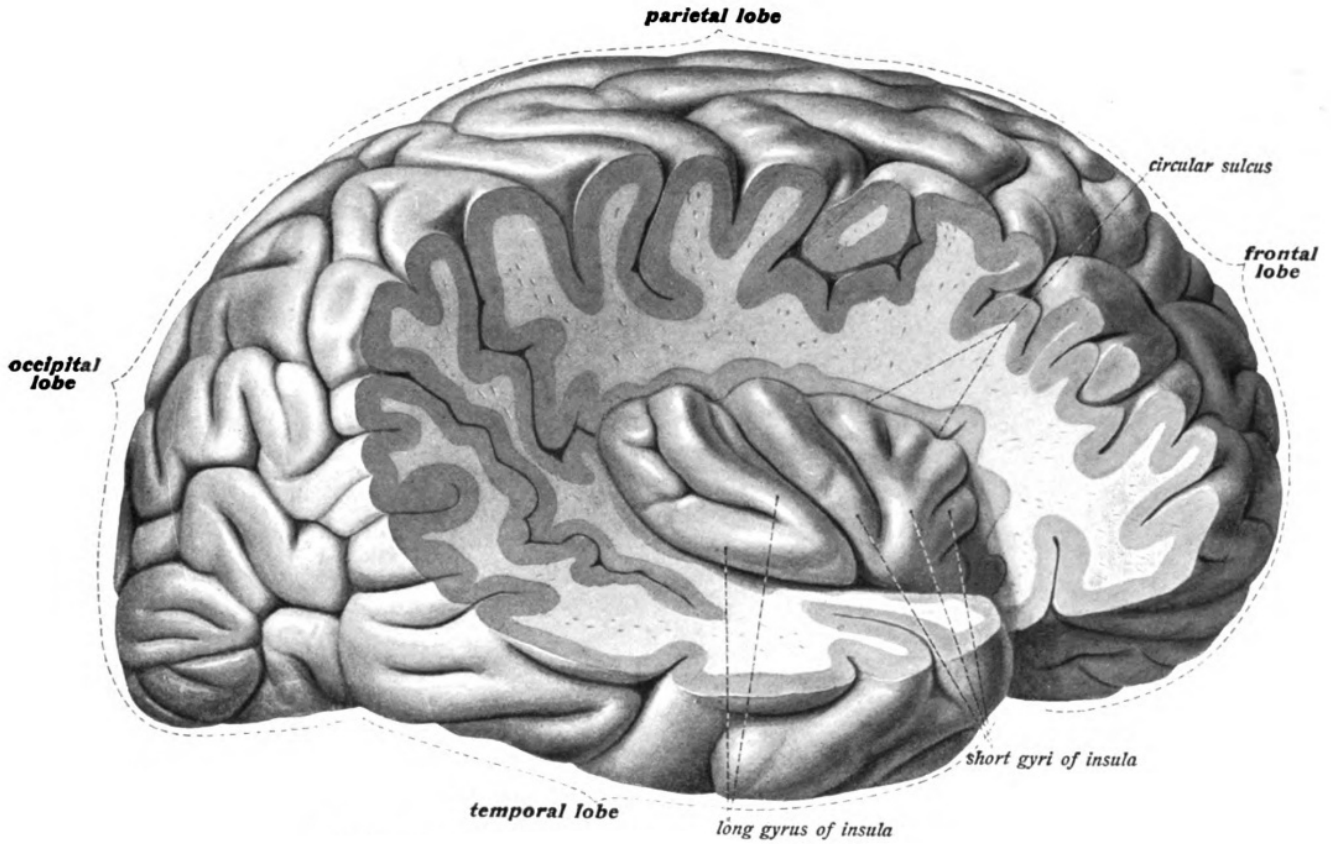
Visual Cortex



Insular cortex (insula)

- Where is it?
  - medial to temporal lobe
  - deep inside lateral fissure

Insula



https://upload.wikimedia.org/wikipedia/commons/b/b4/So

Insula

- What does it do/contain?
  - Primary gustatory cortex
  - self-awareness, interpersonal experiences, motor control

Lobes, landmarks, areas

Lobe	Sulci	Gyri	Areas
Frontal	Central sulcus	Precentral gyrus	motor cortex
	Corpus callosum	Cingulate gyrus	anterior cingulate cortex
			olfactory cortex
			gustatory cortex

Lobes, landmarks, areas

Lobe	Sulci	Gyri	Areas
Temporal	Lateral fissure		auditory cortex
			olfactory cortex
			hipppocampus
			amygdala

Lobes, landmarks, areas

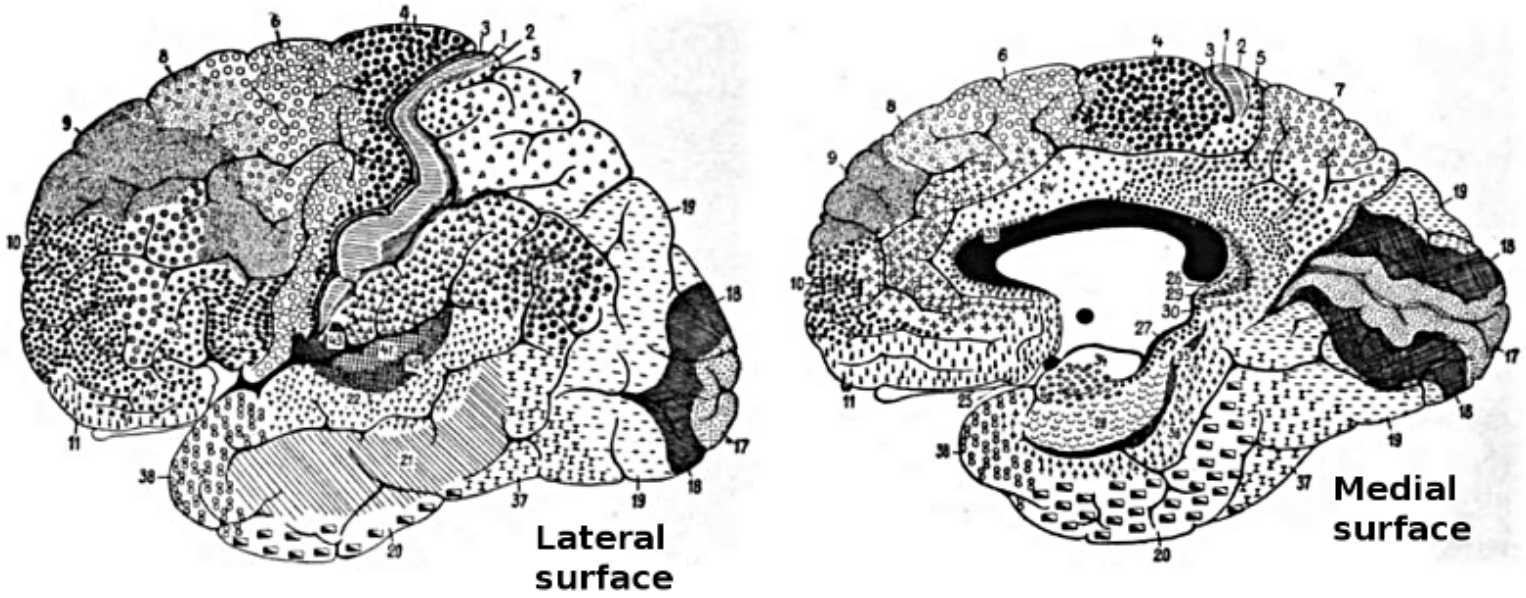
Lobe	Sulci	Gyri	Areas
Parietal	Central sulcus	Postcentral gyrus	somatosensory ctx
Occipital			visual ctx
Insula	Lateral fissure		gustatory ctx

Brodmann Areas

- Regions of cerebral cortex that differ in cellular architecture

http://www.spektrum.de/lexika/images/bio/fff1209_w.jpg

Brodmann Areas



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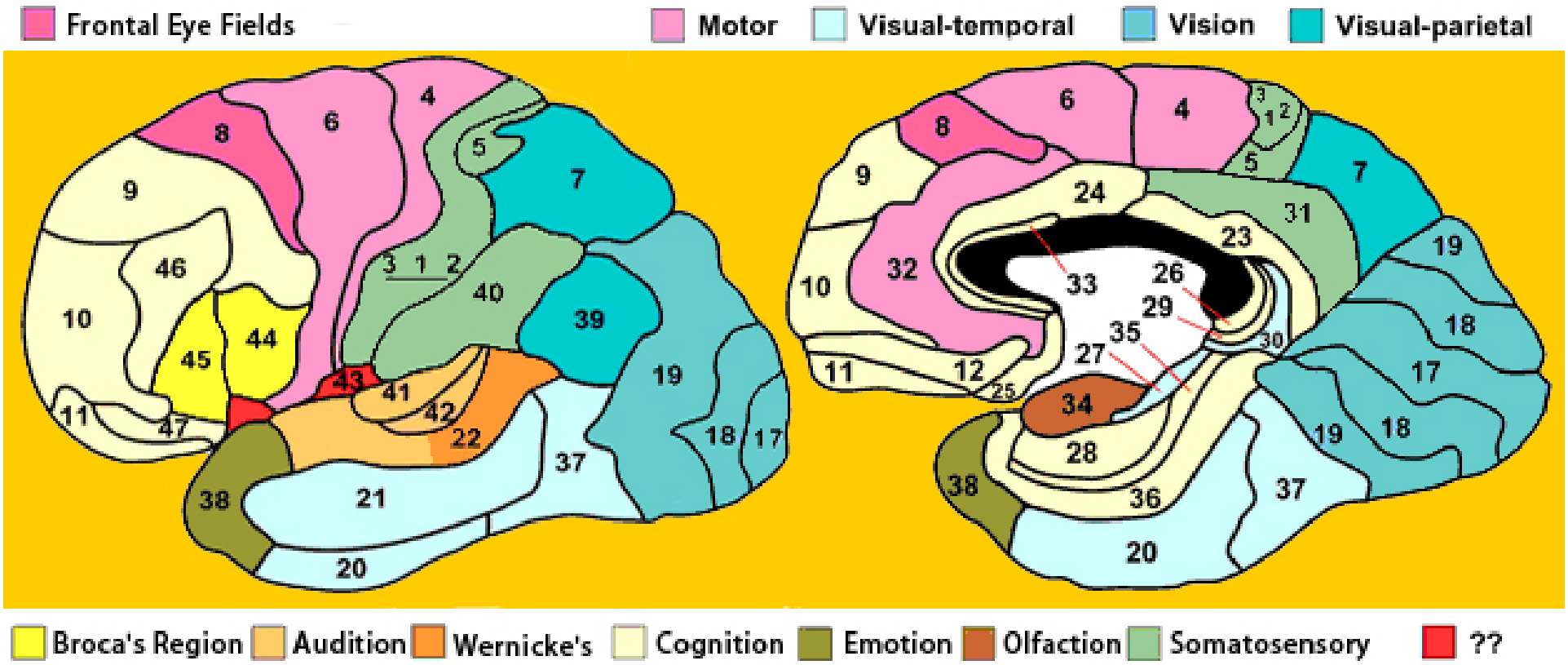
Brodmann Areas

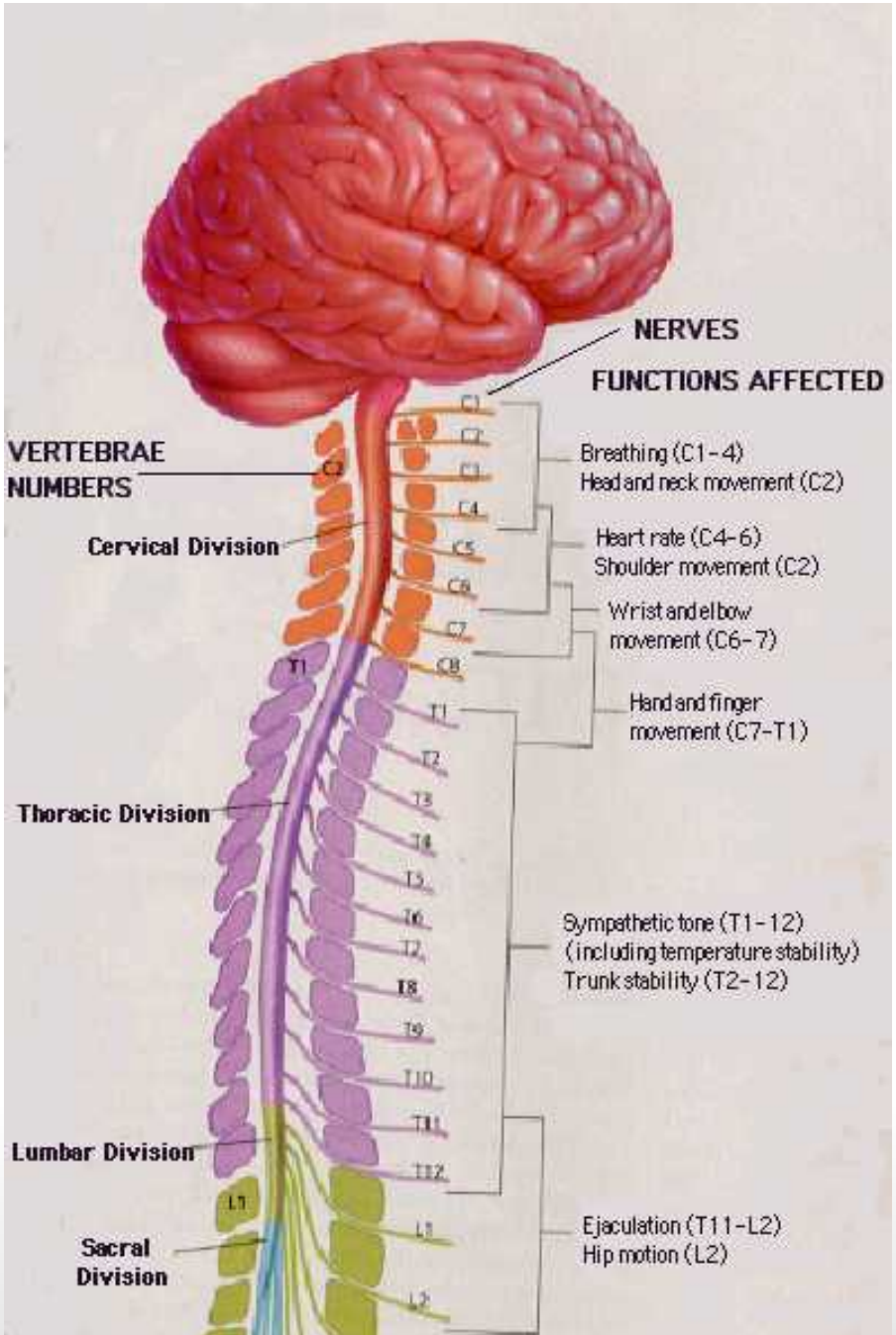


http://www.brain-maps.com/gehirn/brodmann_areale.jpg

Spinal cord

- Rostral/Caudal axis
  - Spinal column w/ vertebrae
  - Cervical (8), thoracic (12), lumbar (5), sacral (5), coccygeal (1)
  - Spinal segments & 31 nerve pairs
  - Cauda equina

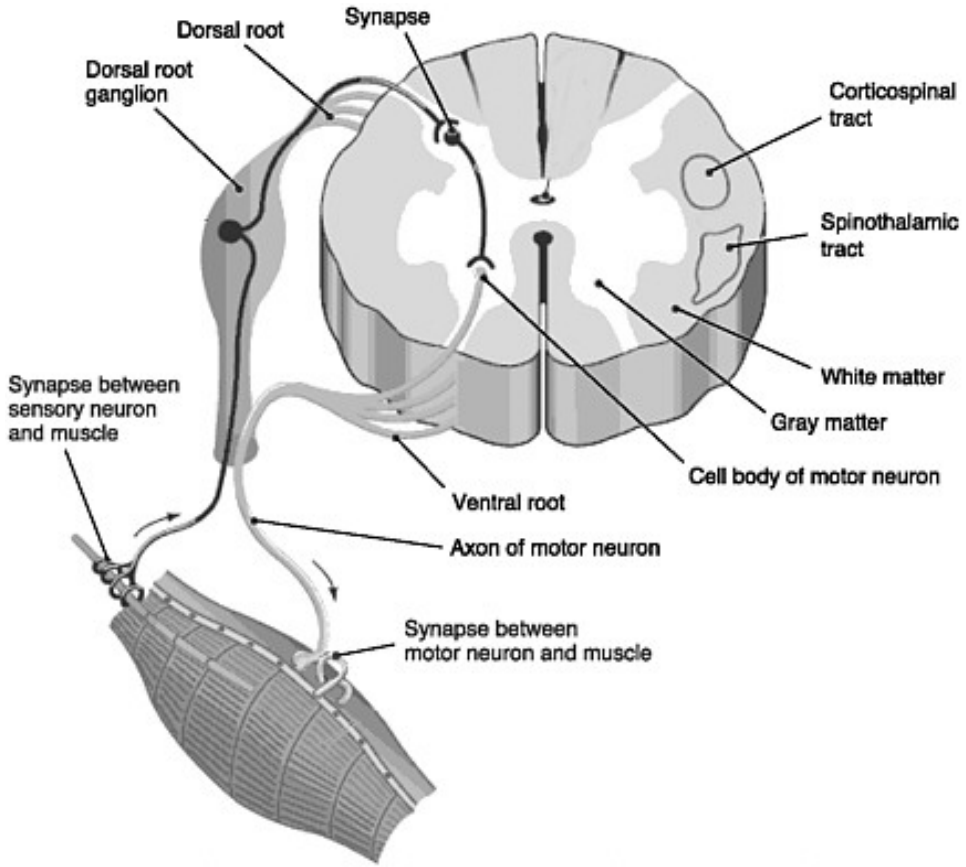
Spinal cord


NERVES
FUNCTIONS AFFECTED
VERTEBRAE NUMBERS
Cervical Division
Thoracic Division
Lumbar Division
Sacral Division
Breathing (C1-4)
Head and neck movement (C2)
Heart rate (C4-6)
Shoulder movement (C2)
Wrist and elbow movement (C6-7)
Hand and finger movement (C7-T1)
Sympathetic tone (T1-12)
(including temperature stability)
Trunk stability (T2-12)
Ejaculation (T11-L2)
Hip motion (L2)

Spinal cord

- Organization of the spinal cord
  - Dorsal/Ventral
    - Dorsal root (sensory)
    - Ventral root (mostly motor)
  - Grey (interior) vs. white matter (exterior)

Spinal cord



https://www.nap.edu/openbook/0309095859/xhtml/images/p2000d3bdg31001.jpg

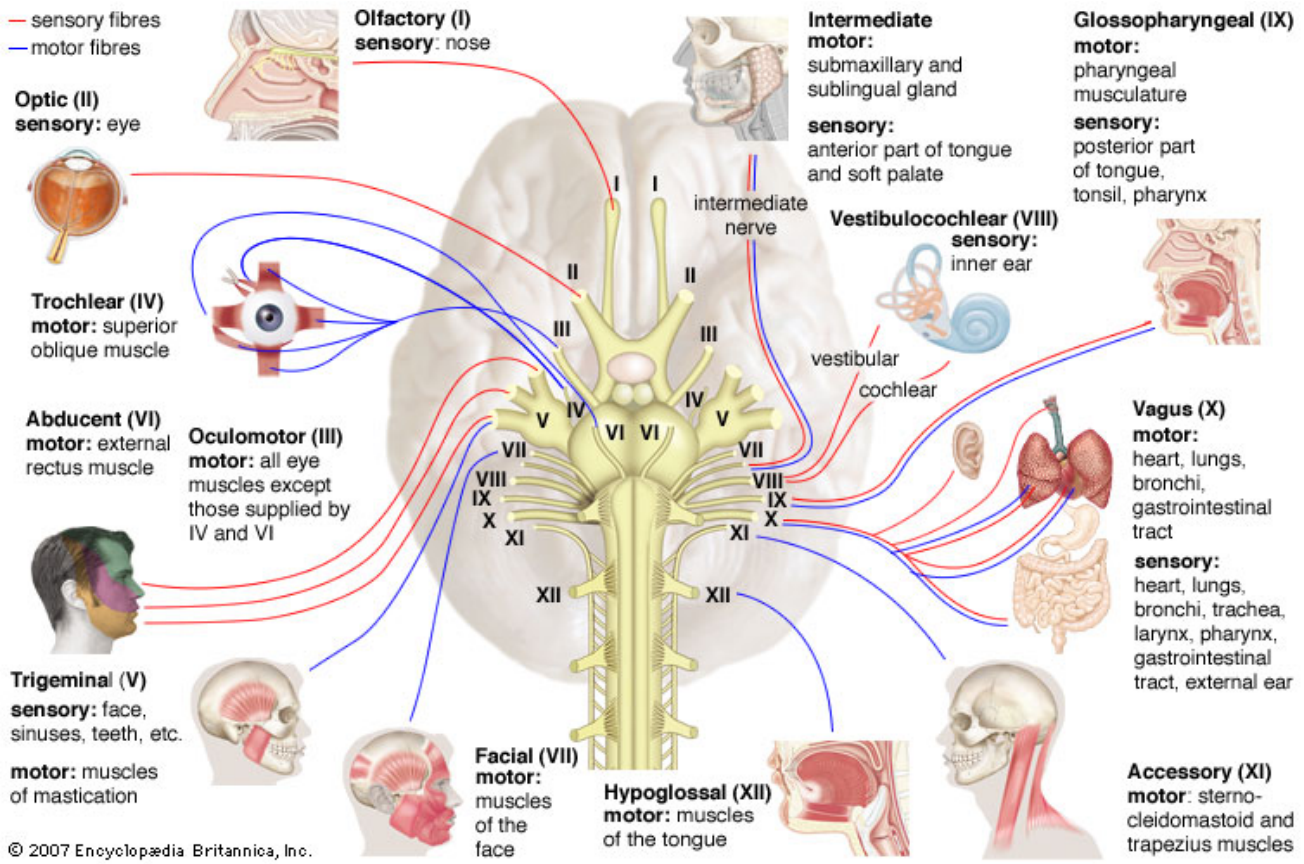
Organization of the PNS

- Somatic division
  - Voluntary sensory & motor function
- Autonomic division
  - Involuntary sensory & motor function
- Cranial nerves
- Spinal nerves

Cranial nerves

- Afferents (input/sensory), efferents (output/motor), or mixed/both
    - On Old Olympus' Towering Top…
    - Some Say Marry Money…
- Innervate head and neck
- Olfactory (I), optic (II), (VIII) auditory, vagus (X), etc.
- Spinal nerves

Cranial nerves



http://media-1.web.britannica.com/eb-media/44/54244-004-892C5169.jpg

Autonomic nervous system (ANS)

- CNS & PNS components
- Controls “vegetative functions””
  - Limited voluntary control
- Two divisions
  - Sympathetic
  - Parasympathetic

ANS

Sympathetic division

- Prepares body for action
- “Fight or flight””
- Spinal cord
    - ganglion chain along spinal column to End organs
- NTs
    - Preganglionic: ACh
    - Post: NE

Parasympathetic division

- Para -> “around”
- Restorative function
- “Rest & digest”
- Spinal cord -> ganglia near end organs -> end organ
    - NT: ACh

Next time…

- Cells of the nervous system

References

Abdikareem, A. (2017, December). Best cranial nerves song. Youtube. Retrieved from https://www.youtube.com/watch?v=uLGz15DXwjc