Western

UNIVERSITY · CANADA

Tutorial 5
Sections 009/010

TA: Greydon Gilmore

Physiology 2130

Oct 8th, 2019

Western

Your TA reminding you…

- **1st Peerwise assignment** (1.5%)
  - Post 2 MC questions: due Oct 16th @ midnight (next Wednesday!)
  - Answer 5 MC questions: due Oct 18th @ midnight
    - 22 students completed
    - 27 students have answered at least 5
- **1st Quiz** (1%)
  - Opens: Oct 21st @ 4pm
  - Closes: Oct 22nd @ 4pm
- **1st Midterm** - Oct 25th @ 6pm-7pm (15%)
- **Midterm Review session**
  - When: Tuesday, Oct 22nd from 6:00-8:00pm
  - Where: Auditorium B, University Hospital, 3rd floor

Today

- Group work
- Learning Catalytics Question
- Nervous system overview
- Touch

Group Work

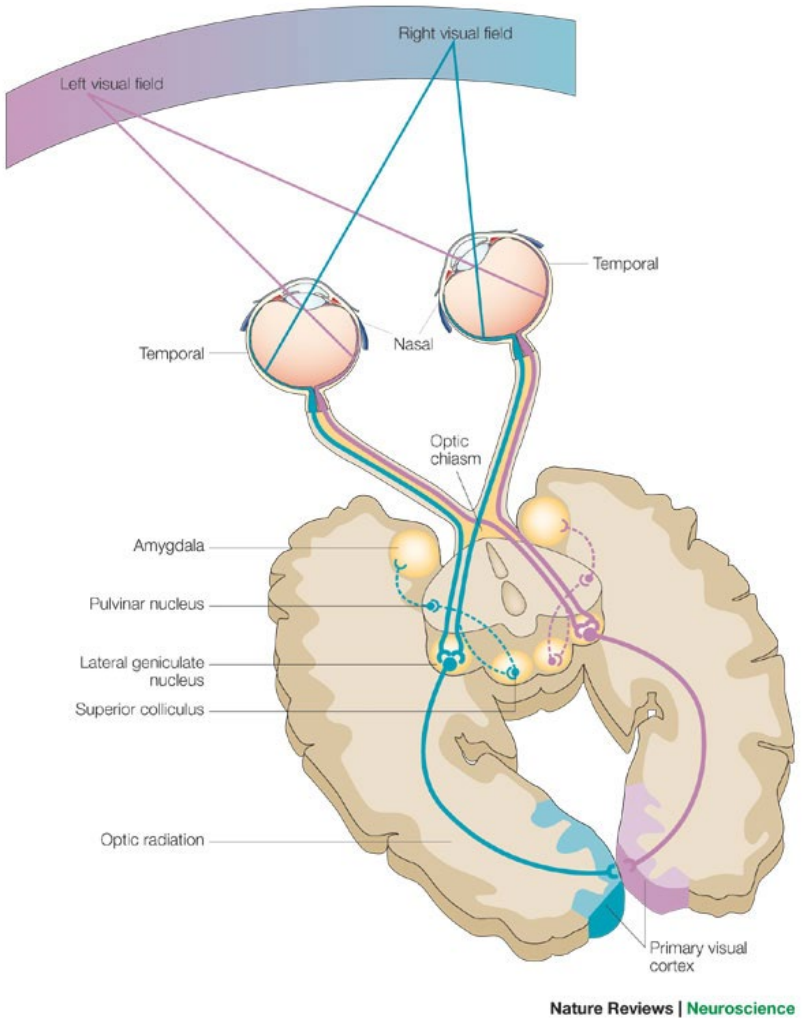
Western

Sensory Case Study

Steven is a 21-year-old male that has just been involved in a car accident where his car was hit broadside as he drove through a busy 4-way stop intersection in the evening on his way home from school. Although relatively unharmed, since Steven lost consciousness for a short period of time at the scene of the accident, the emergency room staff admitted him to evaluate if any head trauma occurred. Steven does not wear prescription glasses although he is red/green colour blind; he has no history of seizures and does not take any medication.

Sensory Case Study

- After a physical assessment and an MRI of his head, Steven was diagnosed with an intracranial tumor that affected his peripheral vision in both eyes



Sensory Case Study

1. Where is the likely location of the tumor that causes the loss of peripheral vision in both eyes of the patient? Explain why.
2. What if Steven could not see the right half of his visual world. What lesion(s) could cause that problem?
3. What kind of damage would have to occur to make someone completely blind?

Sensory Case Study

1. Where is the likely location of the tumor that causes the loss of peripheral vision in both eyes of the patient? Explain why.
   - Vertical across optic chiasm
2. What if Steven could not see the right half of his visual world. What lesion(s) could cause that problem?
   - left optic tract, left LGN, left optic radiation, left primary visual cortex
3. What kind of damage would have to occur to make someone completely blind?
   - Horizontal across optic chiasm
   - Damage both right and left thalamus
   - Damage both right and left visual cortex
   - Damage to both retinas
   - Severing both optic nerves

Learning Catalytic Question

Western

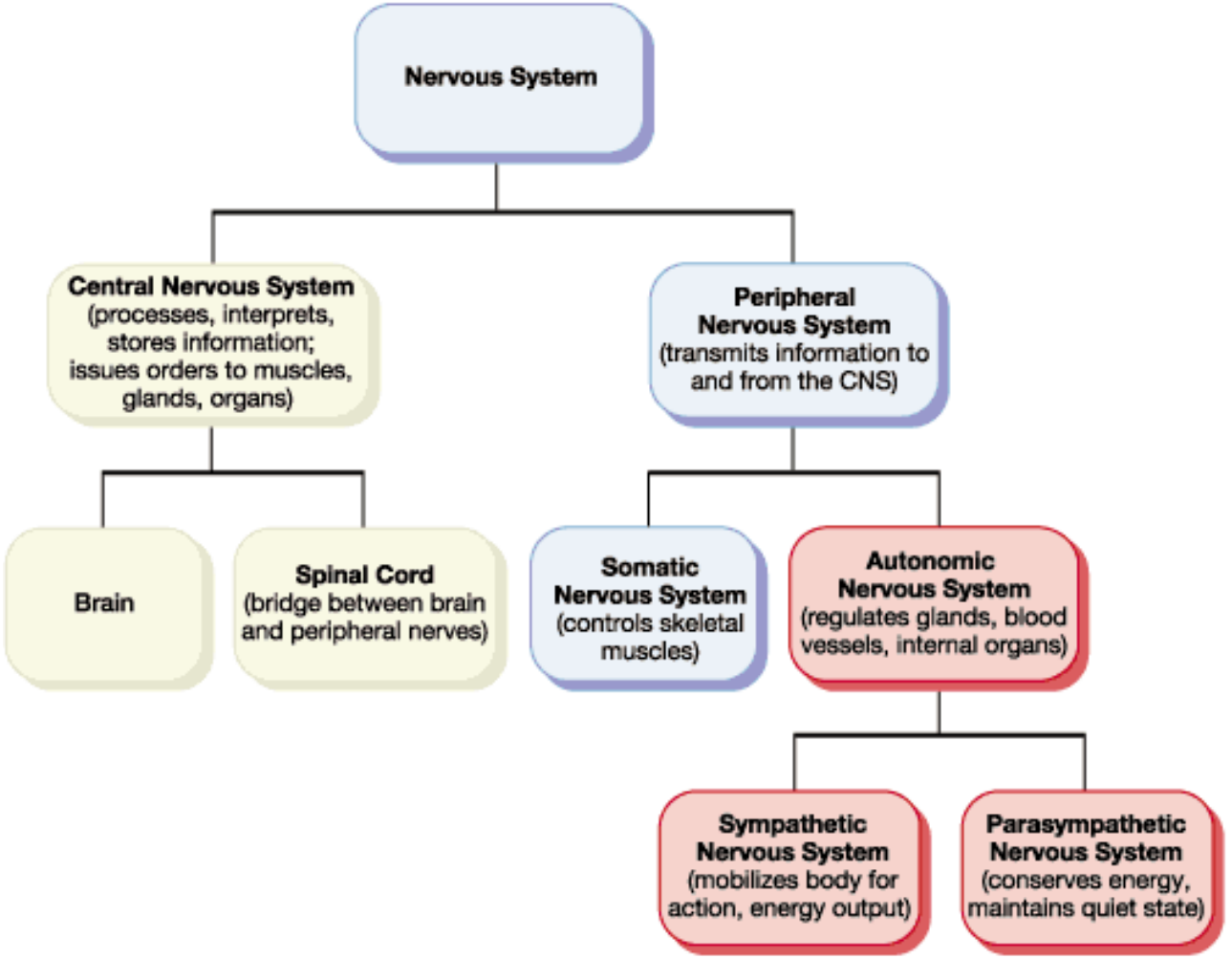
Nervous System Overview

Chapter 2: Dr. Everling

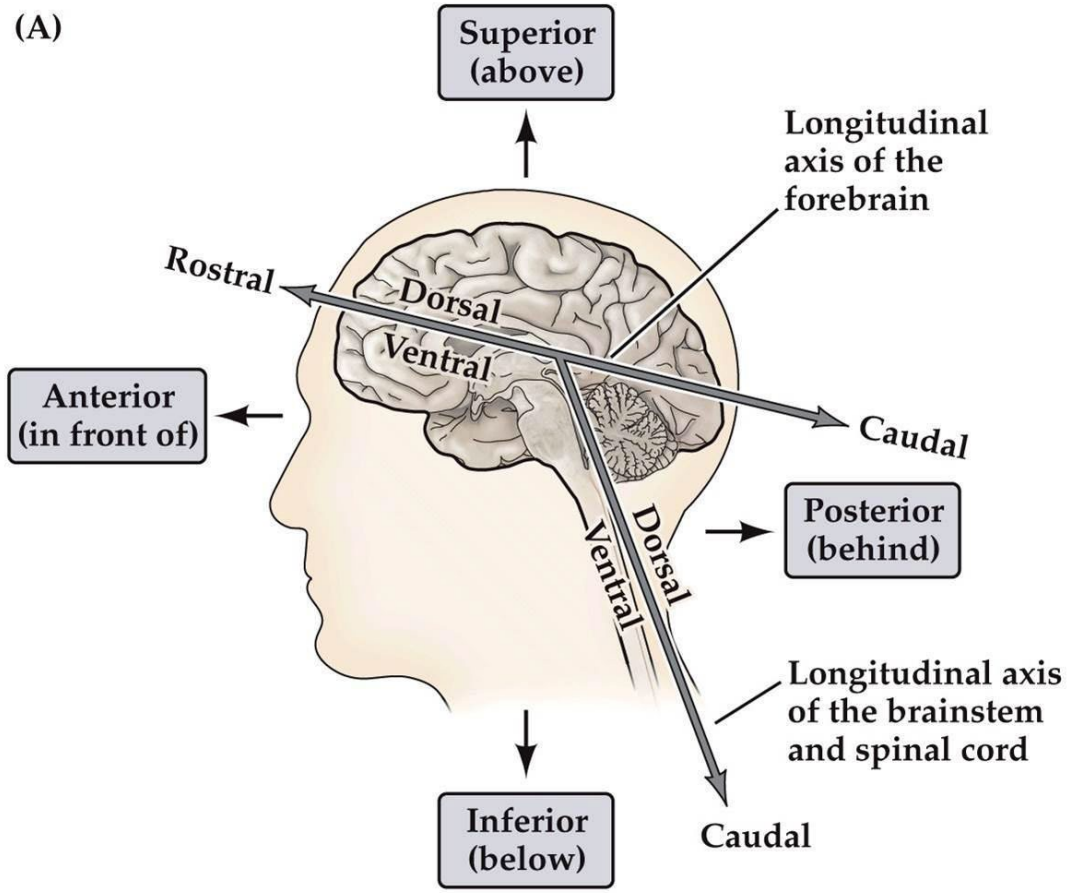
pp.

Western

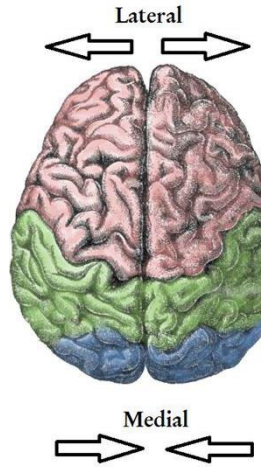
Divisions of the Nervous System

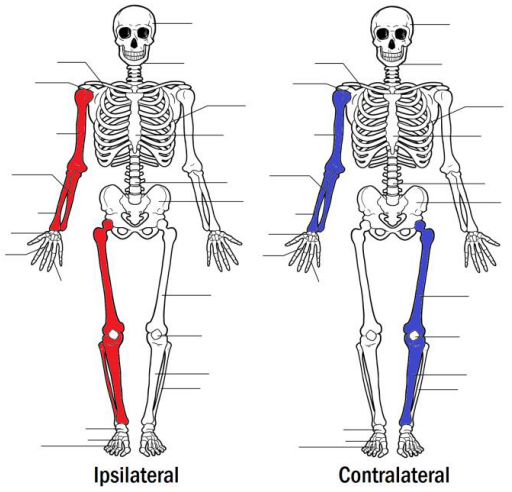


Anatomical Terms of Location

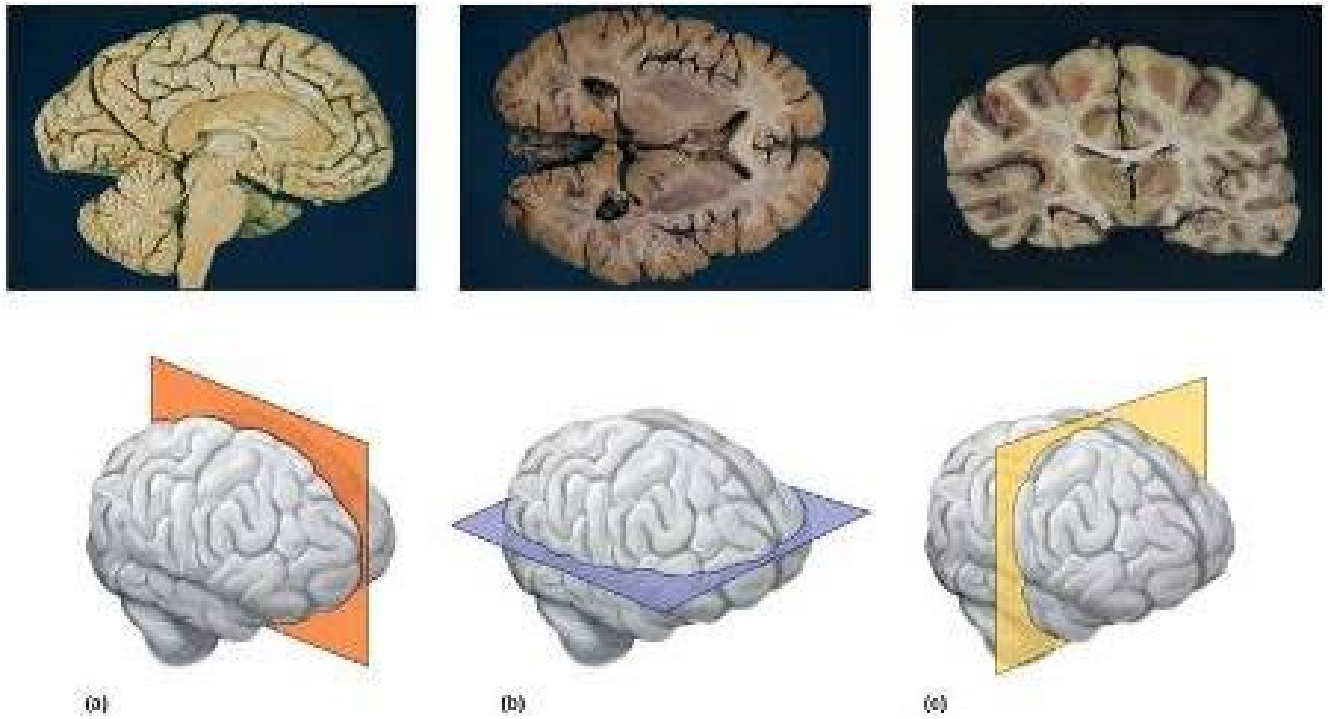


NEUROSCIENCE 5e, Figure A1 (Part 1)





Anatomical Planes of Section



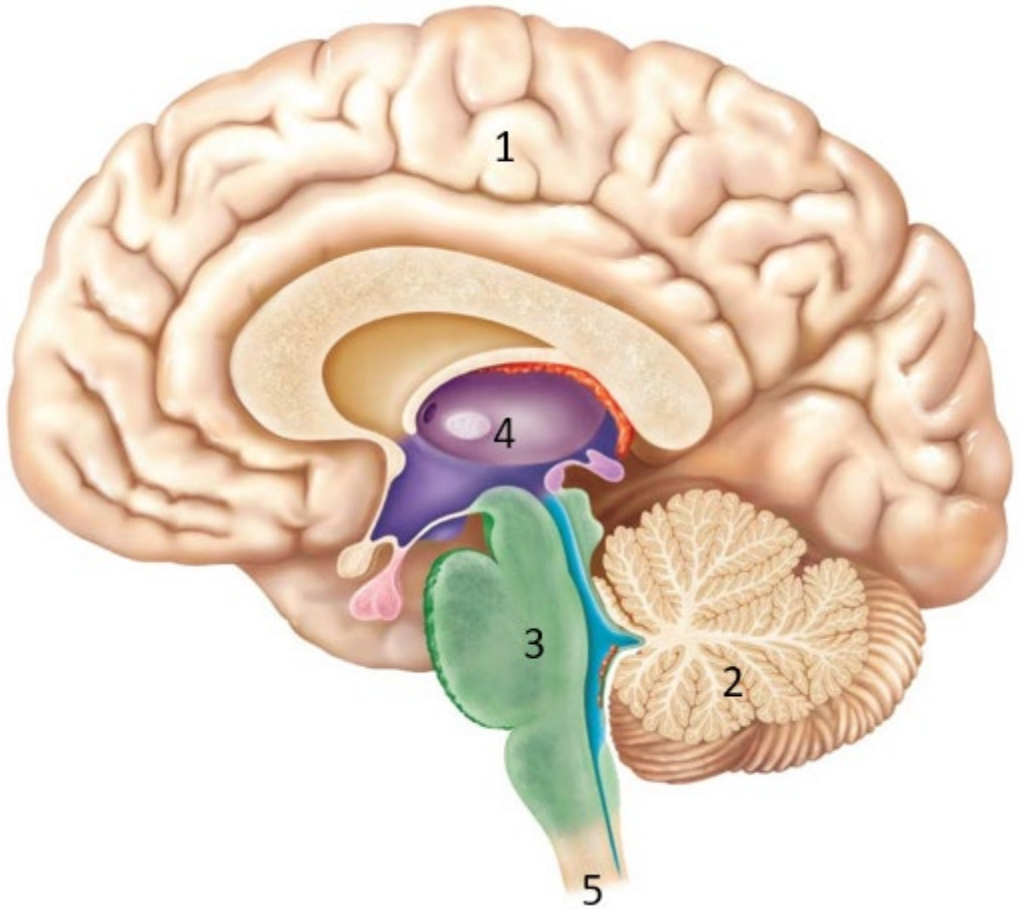
Sagittal: Divides left and right

Horizontal: Divides superior and inferior

Coronal: Divides anterior and posterior

CNS Major Parts and Functions

1. Cerebrum
   - Cortex, basal ganglia, limbic system
   - Contralateral sensation and movement
2. Cerebellum
   - Ipsilateral motor function
3. Brain Stem
   - Medulla oblongata, pons, midbrain
   - Life functions (ex: respiration)



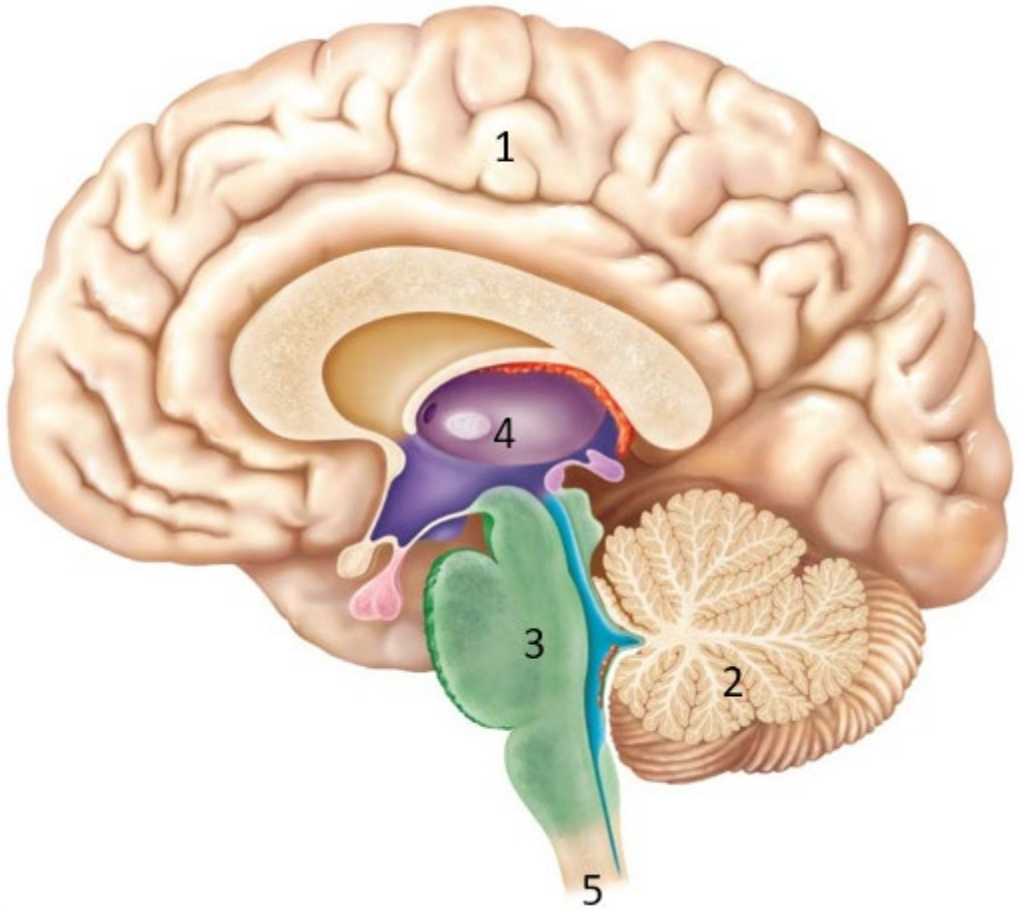
CNS Major Parts and Functions

4. Spinal Cord

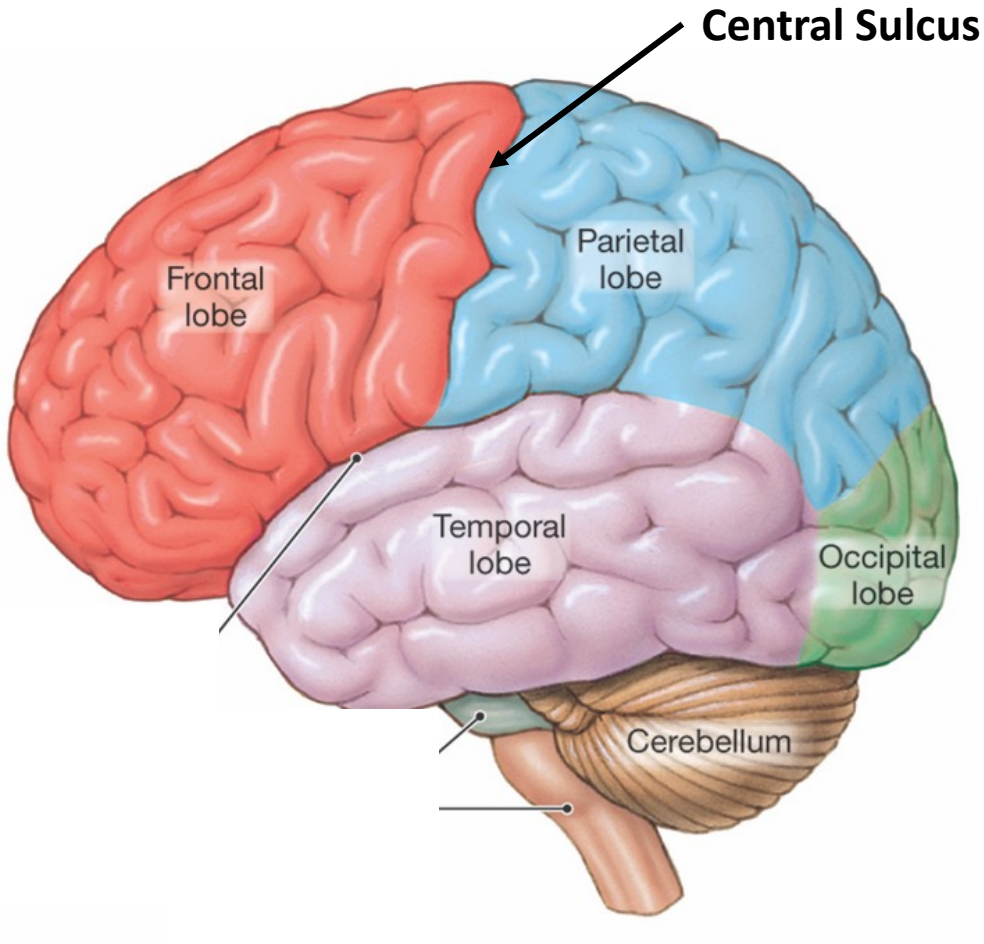
- Conduit for information

5. Diencephalon

- Thalamus, Hypothalamus, pineal gland, pituitary gland



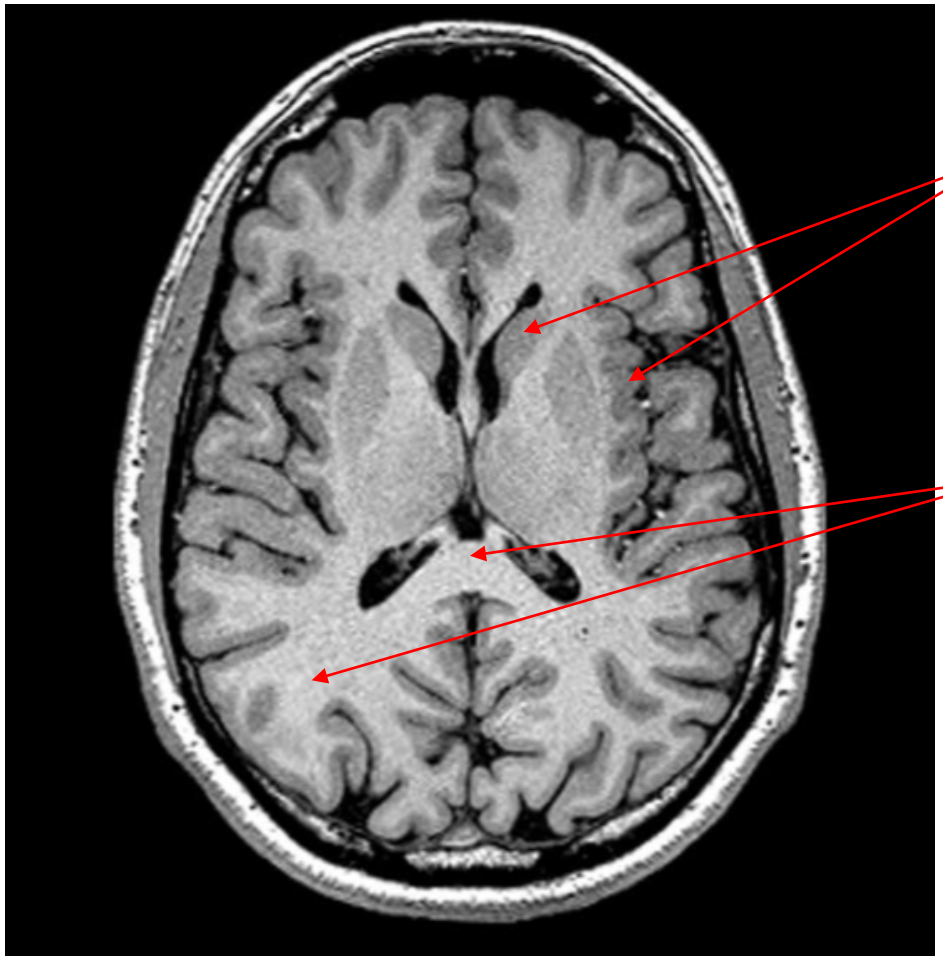
CNS: Lobes of the Cerebral Cortex



White vs. Grey Matter

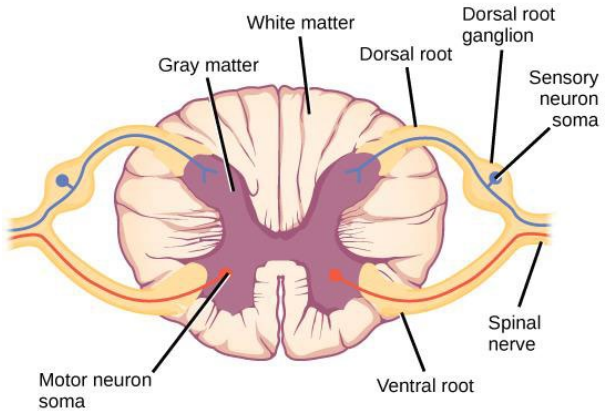
	White Matter	Grey Matter
Colour	White	Grey
Components	Axons	Cell bodies, dendrites and axon terminals
Myelin present	Yes, gives white appearance	No
Function	For communication between grey matter sites	Processing of information

White vs. Grey Matter

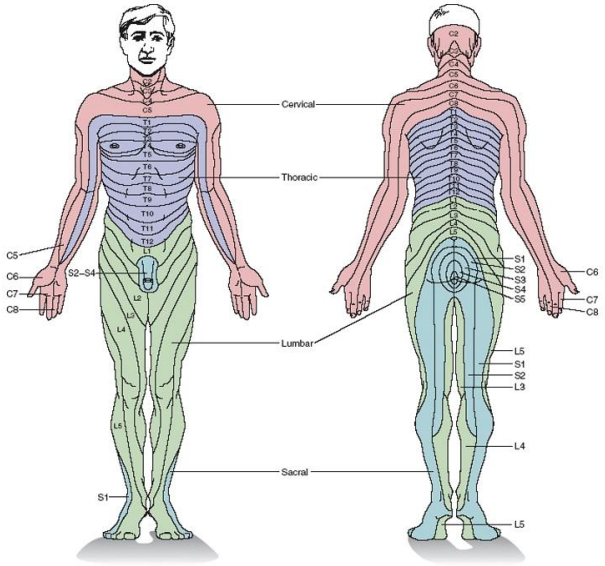


CNS: The Spinal Cord

- White and gray matter are opposite to the brain (spinal cord: white external and grey internal)
- 31 segments
- Each segment has a pair of spinal nerves (PNS) – 31 pairs of spinal nerves
- Each segment receives sensory info and sends motor info to a similar region
- On the skin, the sensory region is called a dermatome

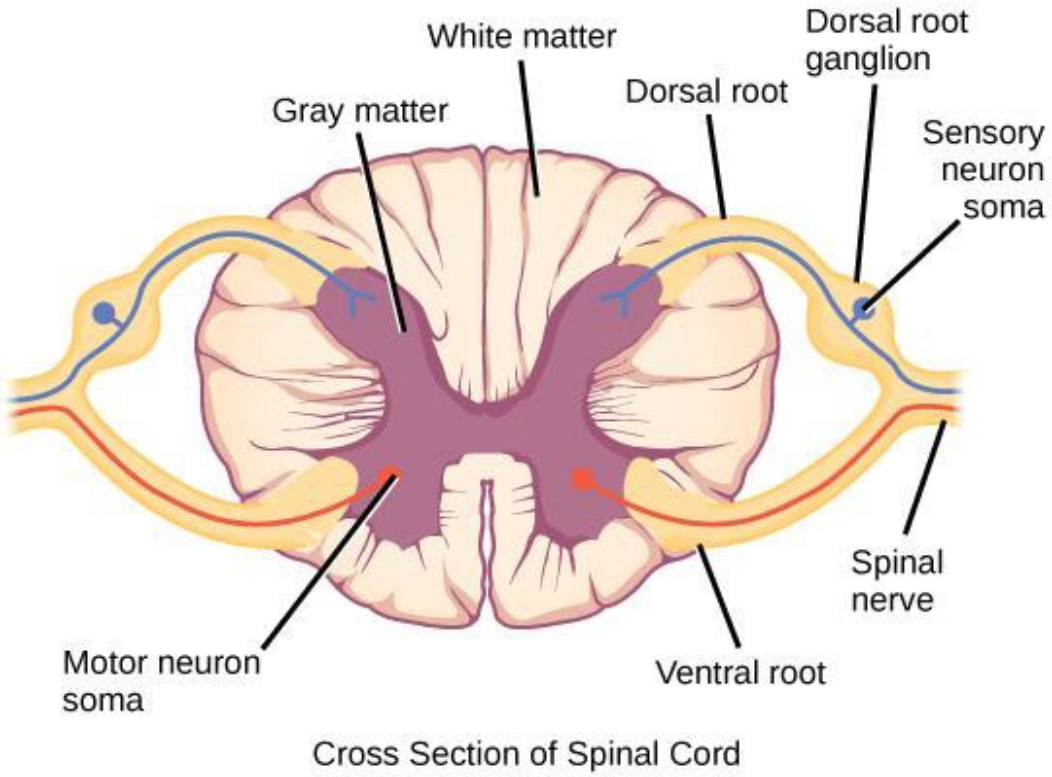


Cross Section of Spinal Cord



PNS: Spinal Nerves

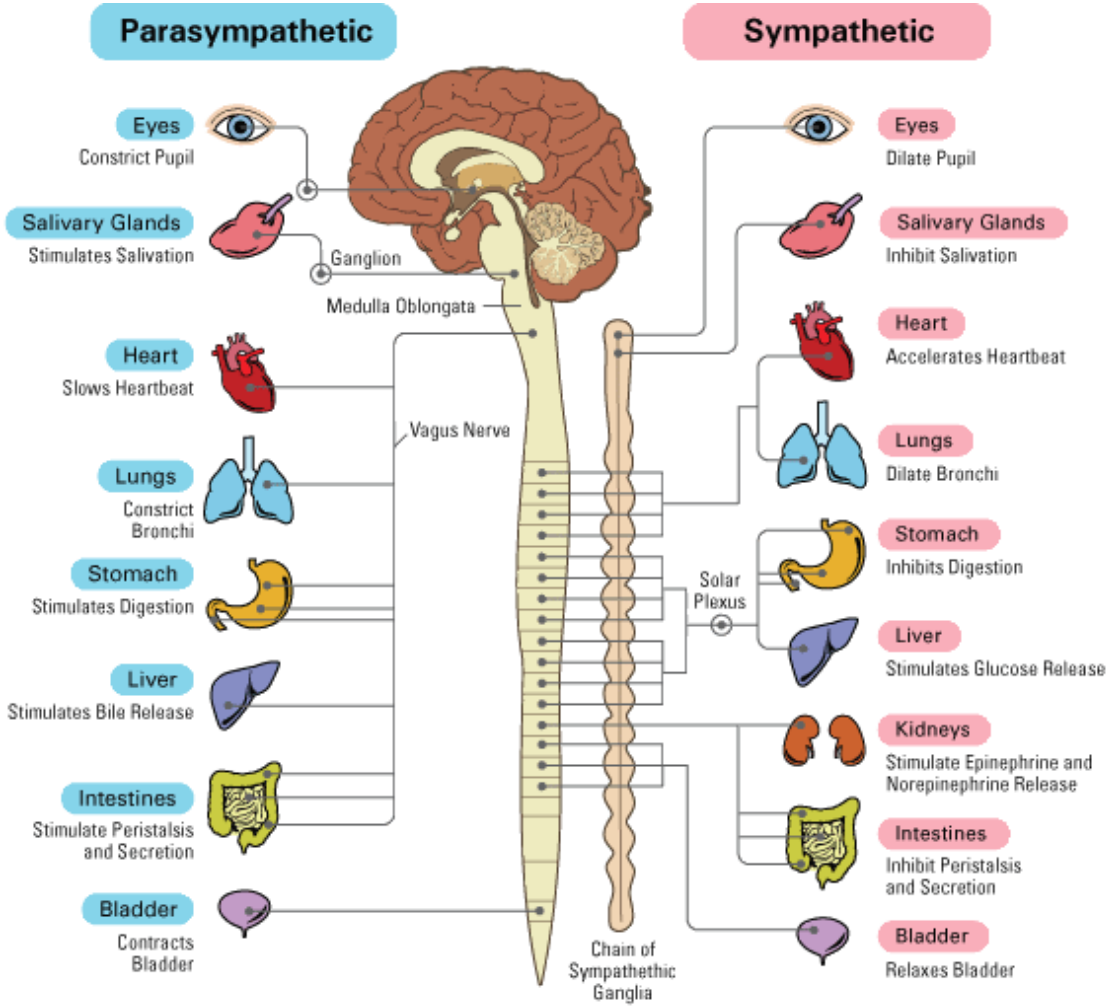
- Sensory information is carried TOWARDS (afferent neuron) the spinal cord through the dorsal root
- Motor information is carried OUT (efferent) the spinal cord through the ventral root
- “SAME DAVE” sensory afferent motor efferent dorsal afferent ventral efferent



Cross Section of Spinal Cord

PNS: Divisions: Somatic vs. Autonomic

- Somatic
  - Conscious Sensation
  - Voluntary Movement
  - Spinal Nerves
- Autonomic (Visceral)
  - Involuntary Actions
  - Sympathetic vs Parasympathetic Response



Somatosensation (Touch)

Chapter 2: Dr. Everling

pp.

Western

Definitions

- Threshold: minimum stimulus required to activate a receptor
- Adaptation rate: the time it takes for a receptor to get used to the stimulus (i.e. when a mechanoreceptor receives a stimulus, it begins to fire APs at an elevated frequency. Eventually, the receptor adapts to that stimulus and the firing of the AP stops (or decreases))
- Receptive field: the region of sensory space in which a stimulus will activate the receptor
- Tactile acuity: measured by two-point discrimination (i.e. the smallest separation between 2 points on the skin that is perceived as 2 points rather than 1)
  - Regions with high tactile acuity have small receptive fields

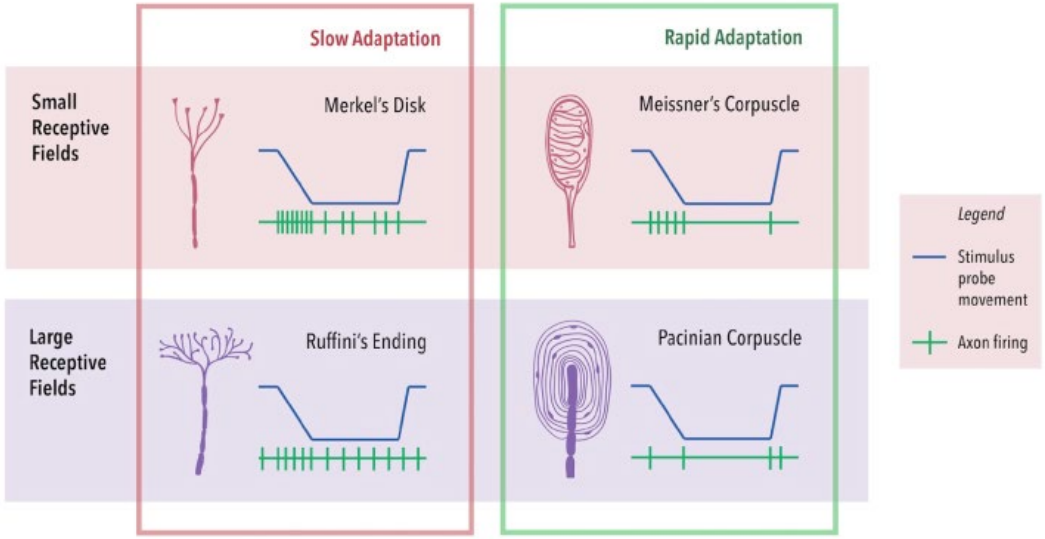
Skin Mechanoreceptors

- **Respond to physical distortion of the skin**

Receptor	Location	Adaption Rate	Receptive Field Size	Type of Stimulus
Merkel's Disks	Epidermis-Dermis Border	Slow	Small	Pressure, texture
Meissner's corpuscles	Dermis (Surface)	Rapid	Small	Flutter, stroking
Ruffini's endings	Dermis (Deep)	Slow	Large	Stretch
Pacinian corpuscles	Dermis (Deep)	Rapid	Large	Vibration

Difference in Mechanoreceptors

- Adaptation rate: sensory receptors respond to stimulus, they will eventually become used to the stimulus (adapt to it).
  - Rapid adaptation (Pacinian, Meissner's), Slow adaptation (Merkel's, Ruffini)
- Receptive field size: sensory receptors have a specific surface area they cover.
  - Small field (Merkel's, Meissner's), large field(Pacinian, Ruffini)

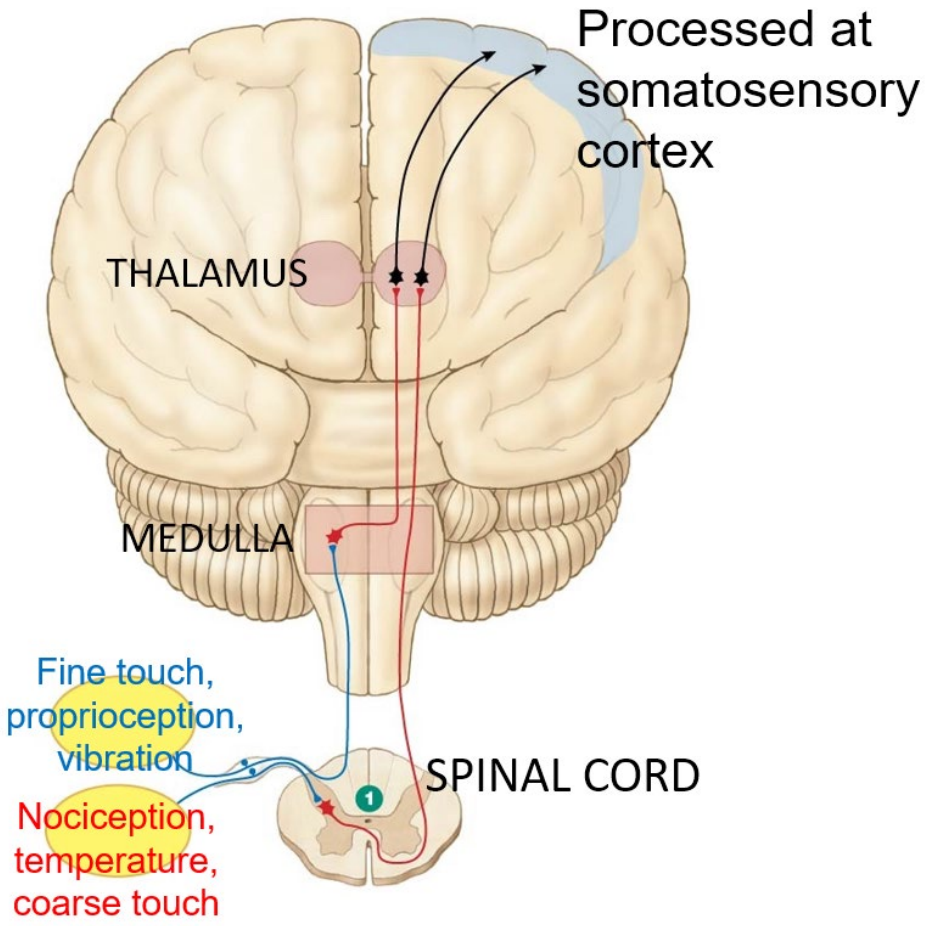


Other Receptors

- Chemoreceptors
  - Respond to specific chemicals
- Osmoreceptors
  - Respond to changes in solute concentration and osmotic activity
- Skin Thermoreceptors
  - Respond to specific temperatures and changes in temperatures
- Nociceptors
  - Respond to somatic sensation of pain
  - Hyperalgesia: increased sensitivity to painful stimuli
  - Analgesia: an inability to sense pain
  - Brain has no nociceptors

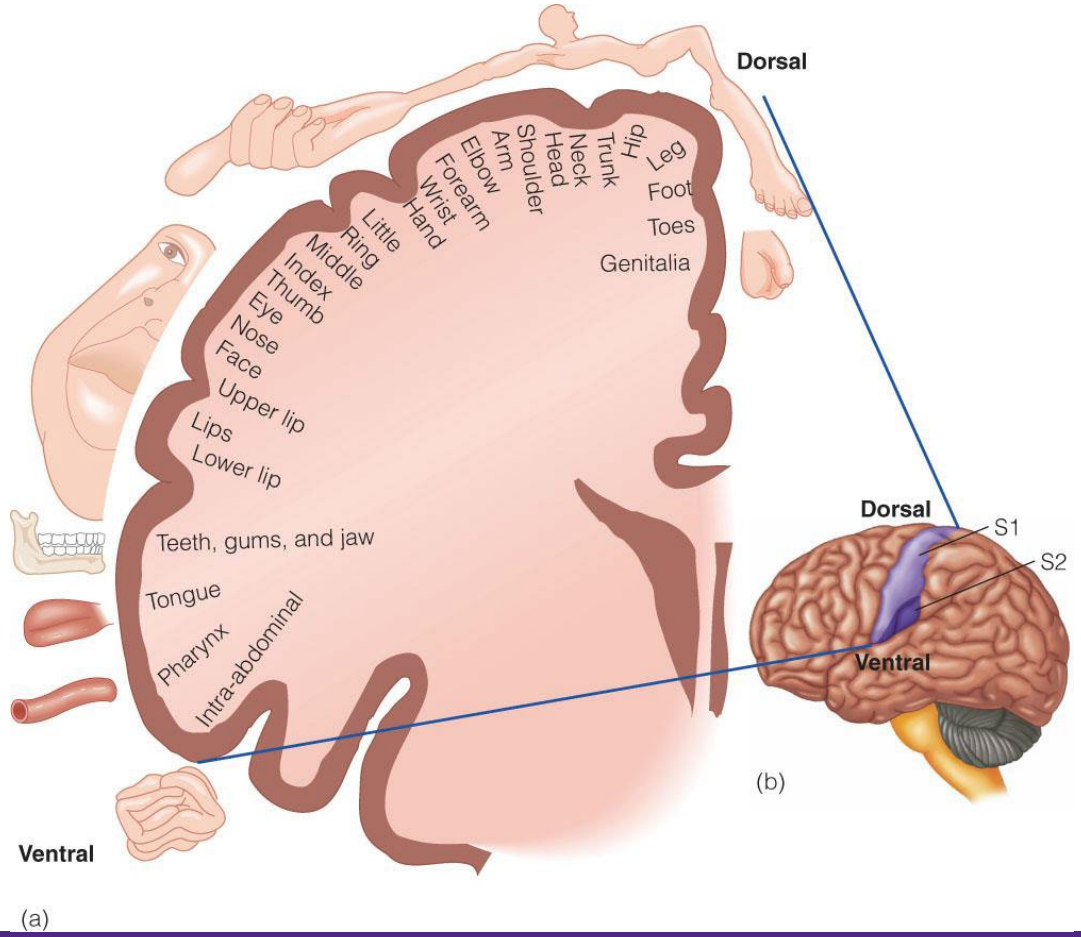
Somatosensory Pathway

- Primary sensory neuron carries sensory info (PNS) to the spinal cord (CNS) through the dorsal root
- Fine touch, proprioception and vibration stimuli ascend and cross midline at the medulla (secondary sensory neurons)
- Nociception, temperature and coarse touch cross midline at spinal cord (secondary sensory neurons)

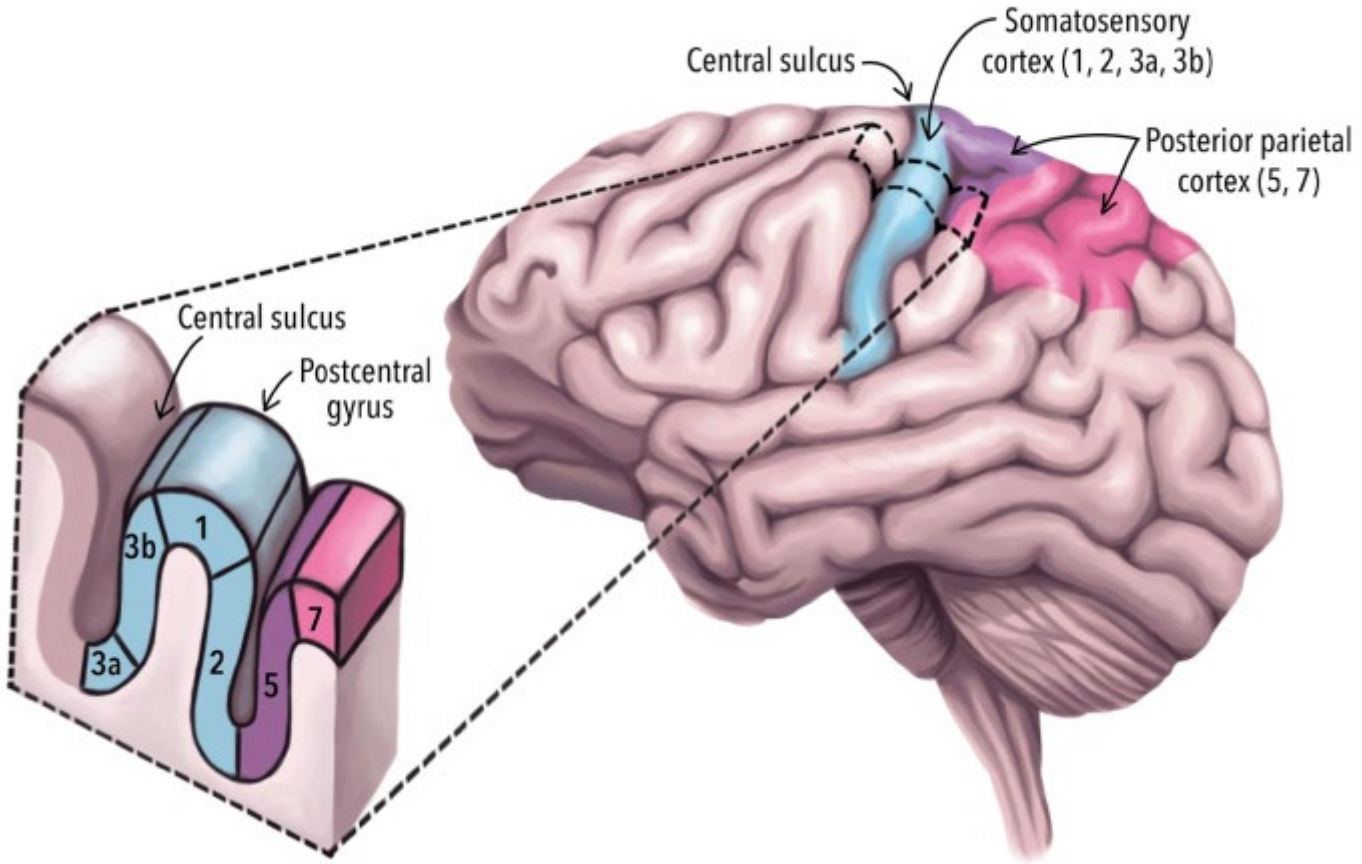


Which lobe receives incoming somatosensory information?

- Located on postcentral gyrus (posterior to central sulcus; parietal lobe)
- Somatotopy: body regions correspond to specific points on the brain
- Magnification factor: particular body regions are overrepresented
- There is plasticity in the somatosensory system (i.e. cortical maps can change)



Somatosensory Cortex



Next Tutorial (Oct 15th)

- Vision
- Audition

What Questions Do You Have?

You can ask in the **Owl forums** as well!

Also anonymously ask questions in the **online dropbox**!!

Western