

Neurophysiology

Somatic Sensory Pathways

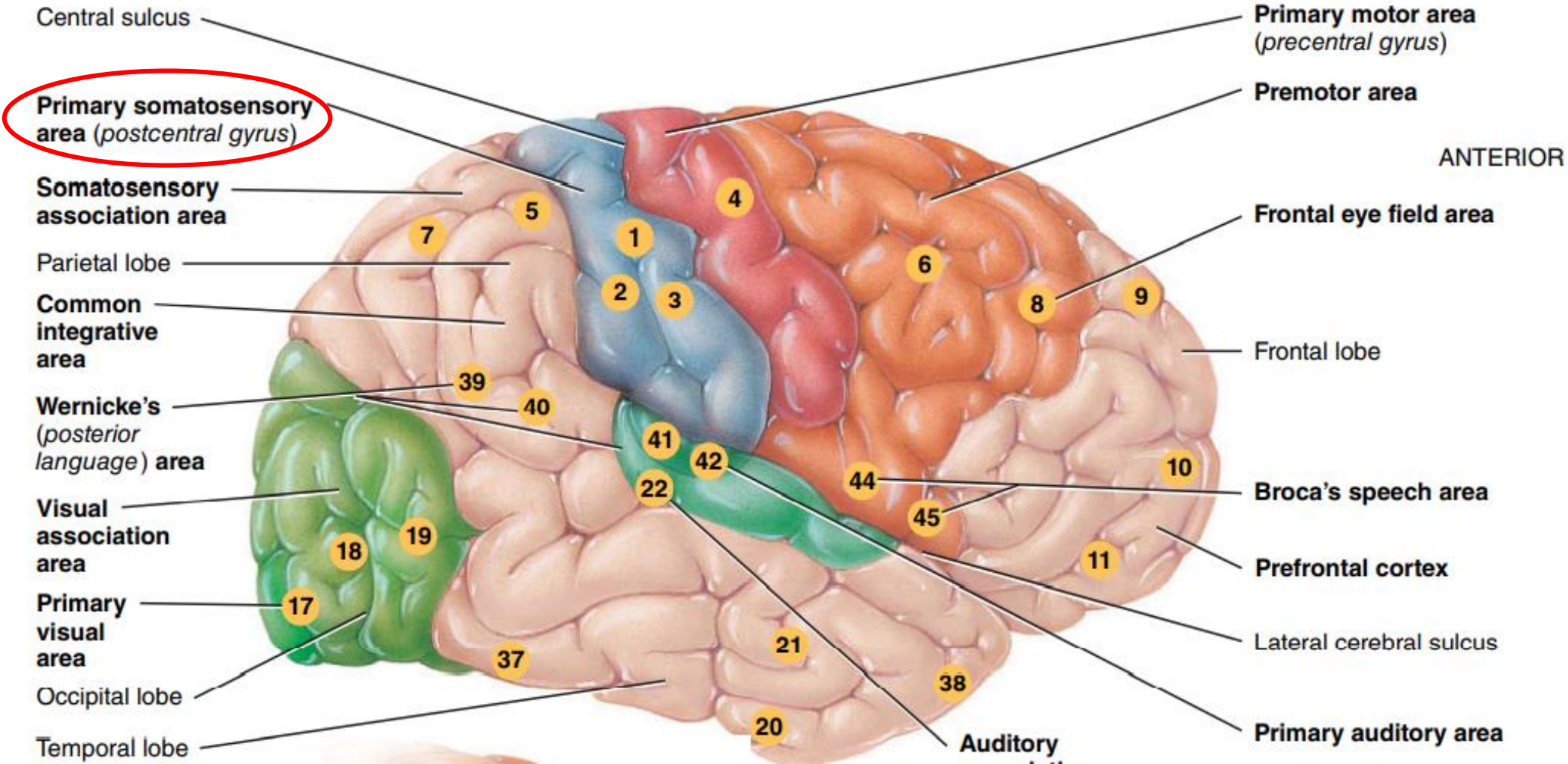
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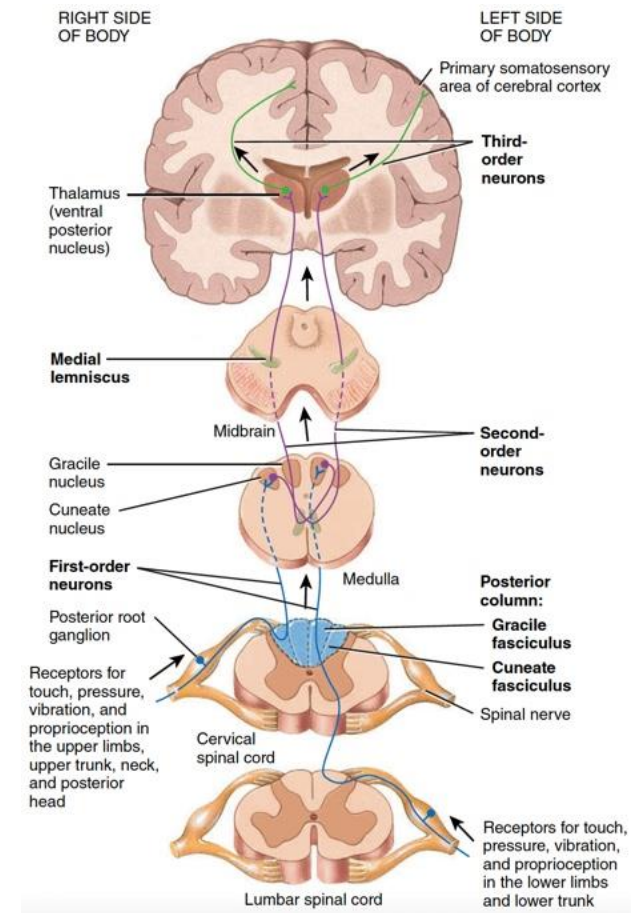
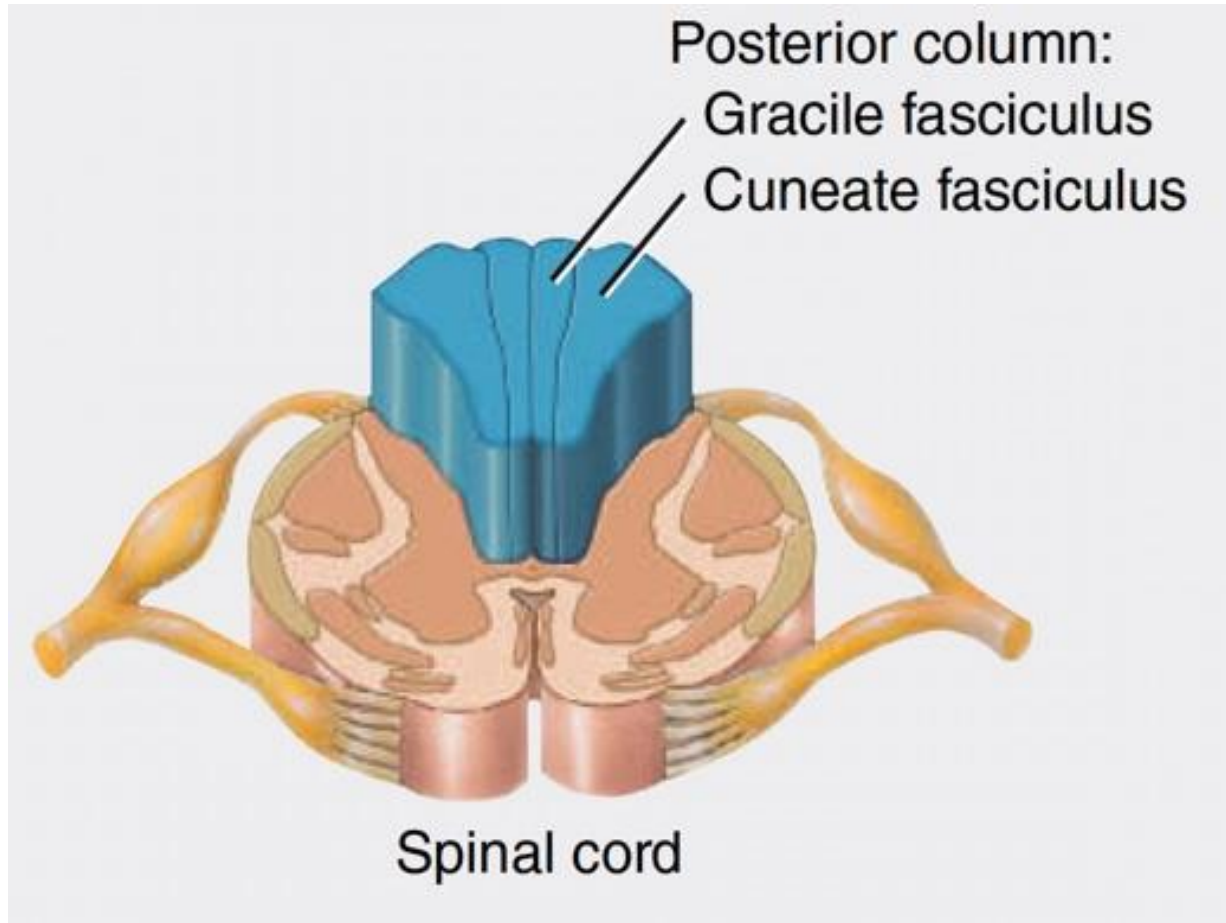
School of Medicine, University of Jordan



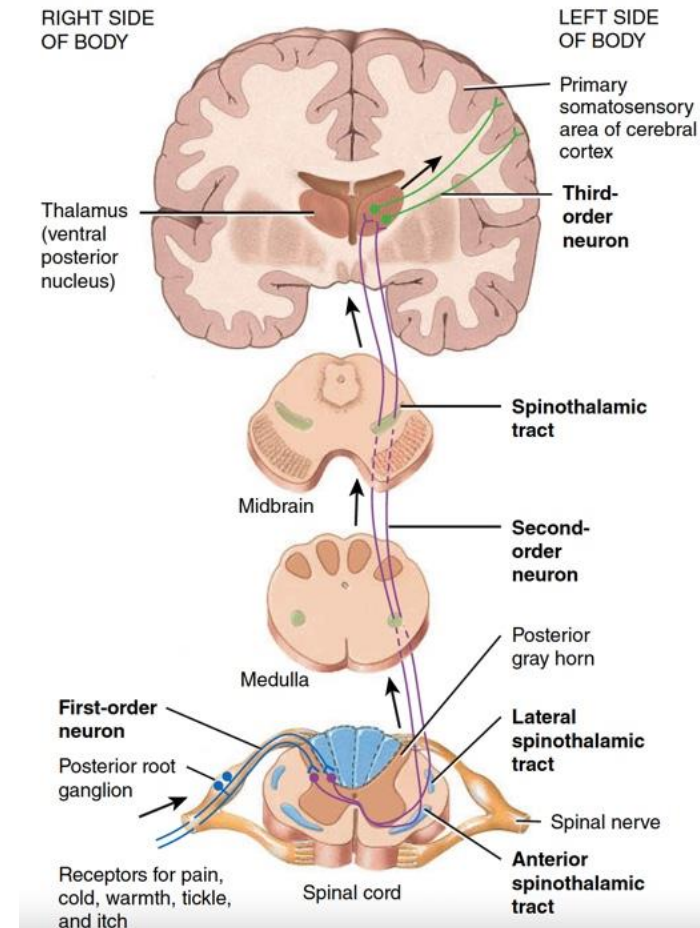
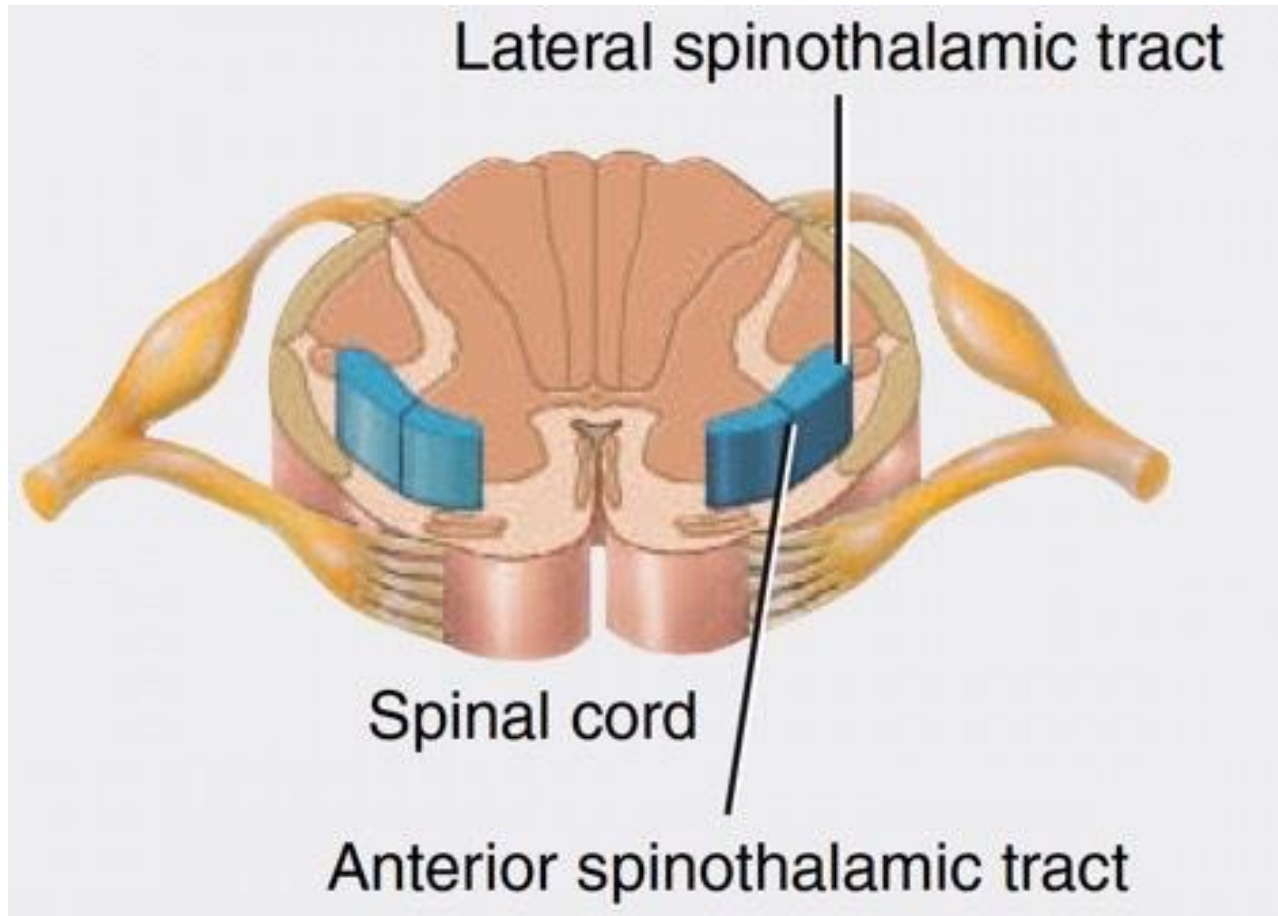
Cerebral cortex



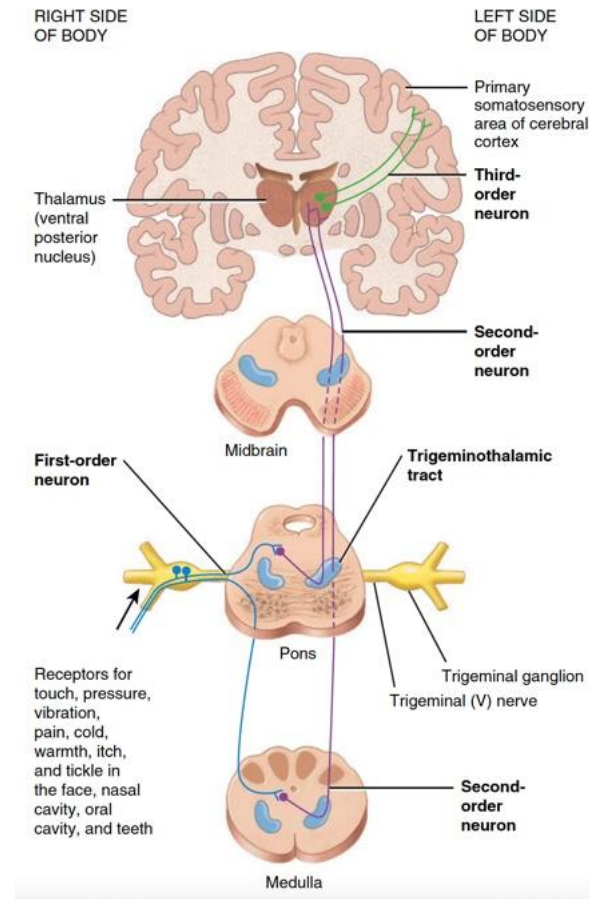
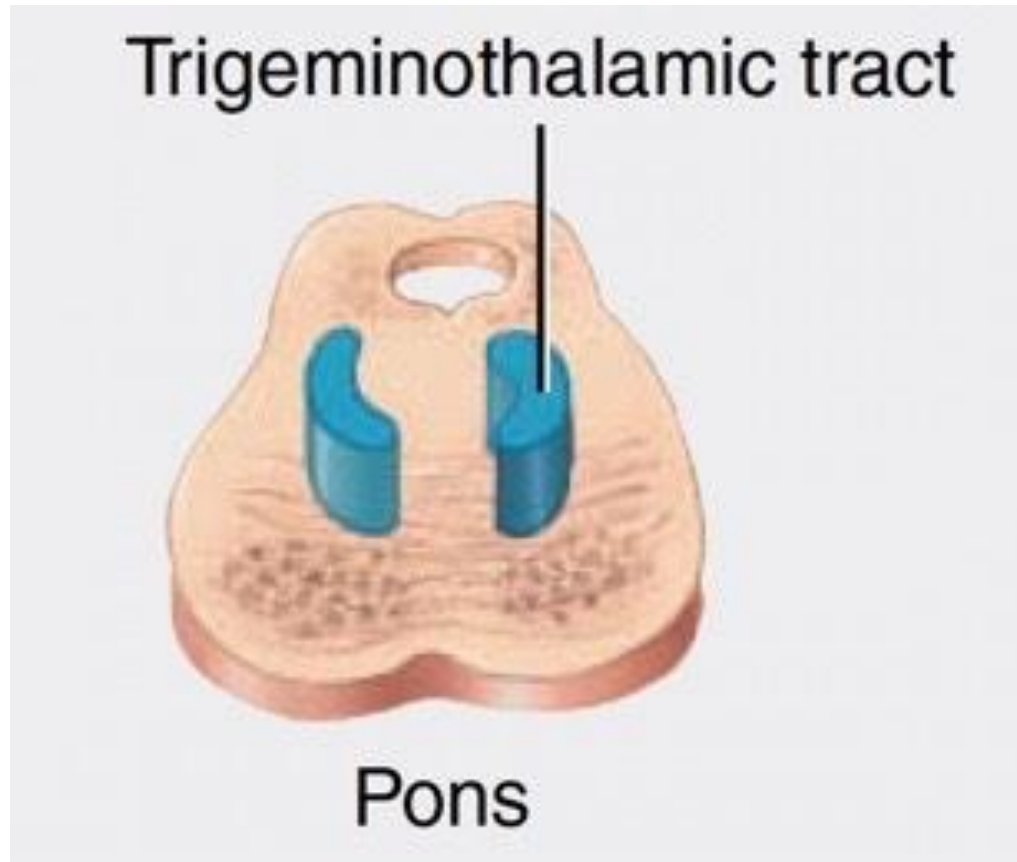
Posterior (Dorsal) Column- Medial Lemniscus Pathway



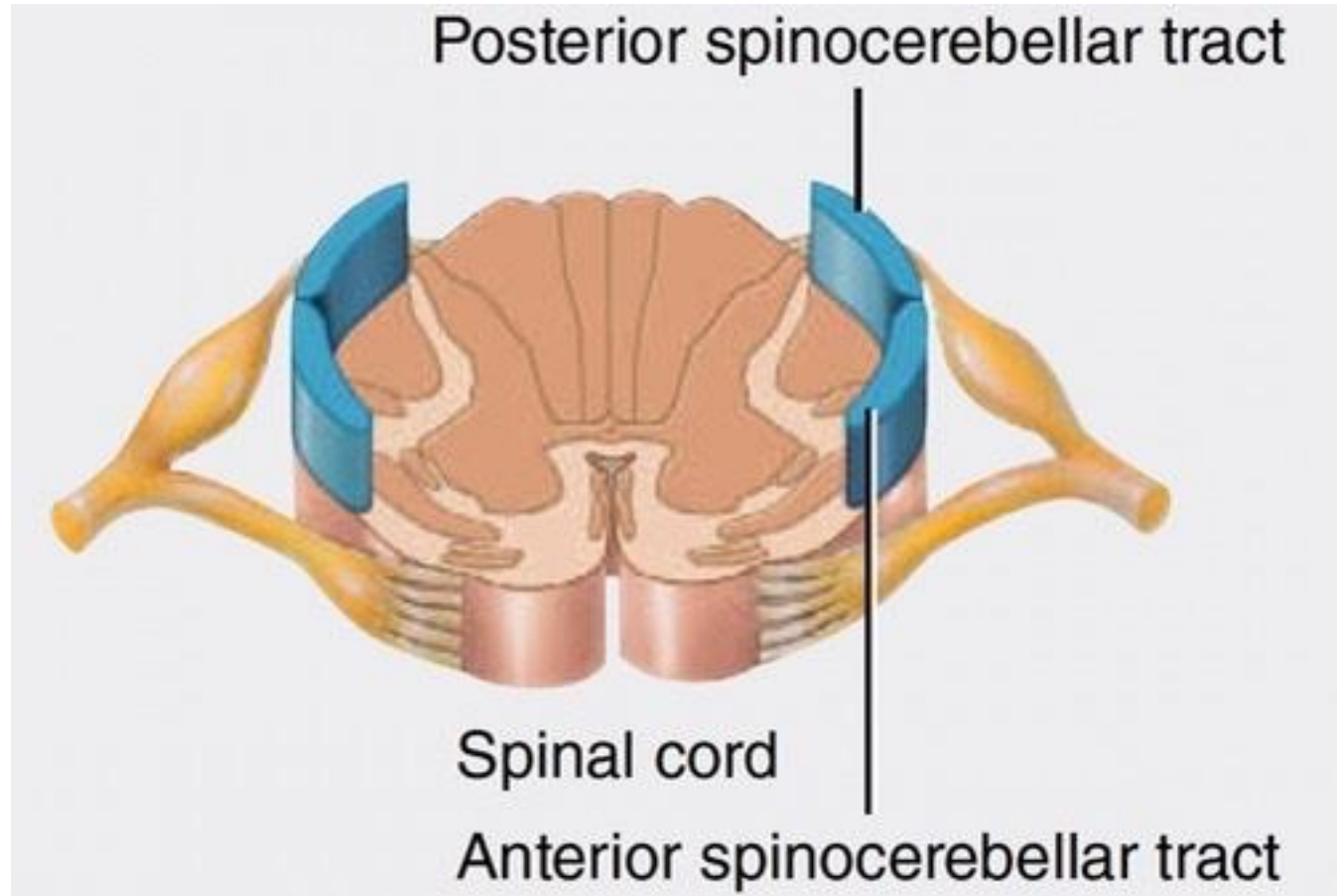
Antero-Lateral Spinothalamic Pathways



Trigeminothalamic Pathway



Anterior and Posterior Spinocerebellar Pathways



Somatic sensory pathways

- A somatic sensory pathway to the cerebral cortex consist of thousands of **sets of three neurons**:
- a first-order neuron, a second-order neuron, and a third-order neuron.
- Integration (processing) of information occurs at each synapse along the pathway.



First-order (primary) neurons

- Sensory neurons that conduct impulses from somatic sensory receptors into the brainstem or spinal cord.
- Somatic sensory impulses propagate along spinal or cranial nerves.
- All other neurons in a somatic sensory pathway are located completely within the CNS.



Second-order (secondary) neurons

- Conduct impulses from the brainstem or spinal cord to the **thalamus**.
- Axons of second-order neurons **decussate** (cross over to the opposite side) as they course through the brainstem or spinal cord before ascending to the thalamus.

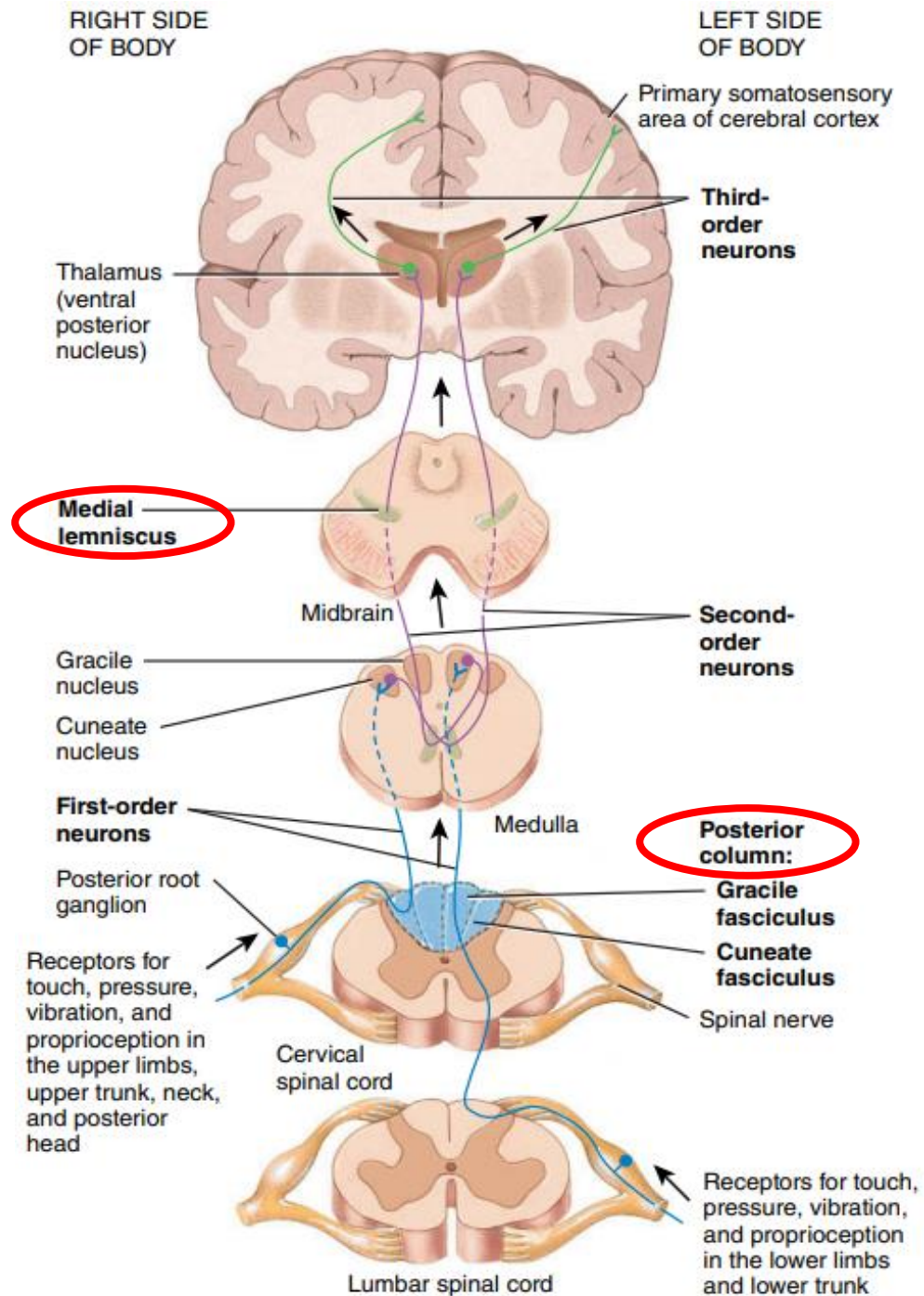


Third-order (tertiary) neurons

- Conduct impulses from the thalamus to the primary somatosensory area on the same side.
- Somatic sensory information on one side of the body is perceived by the primary somatosensory area on the opposite side of the brain.

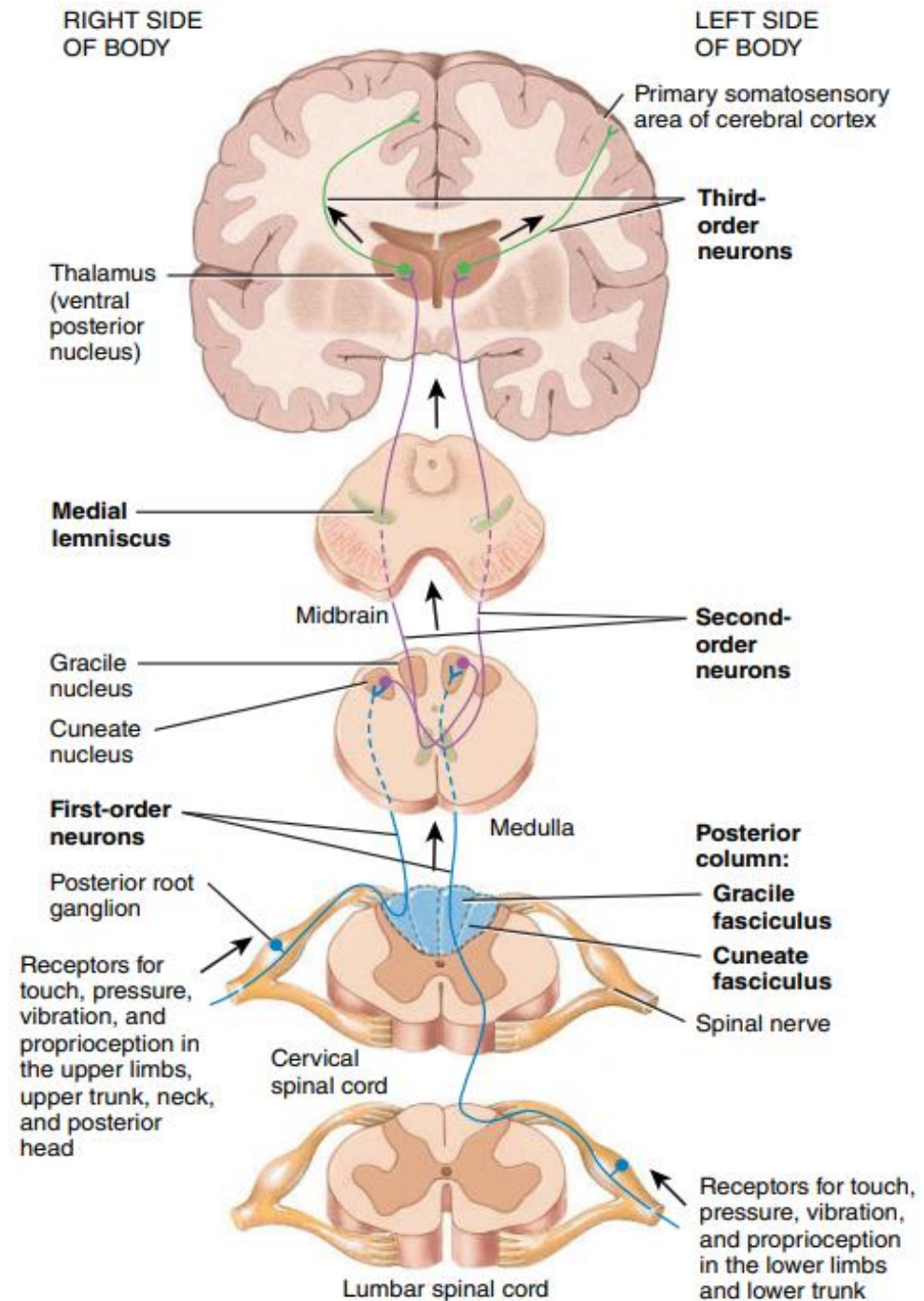


Posterior column - medial lemniscus pathway



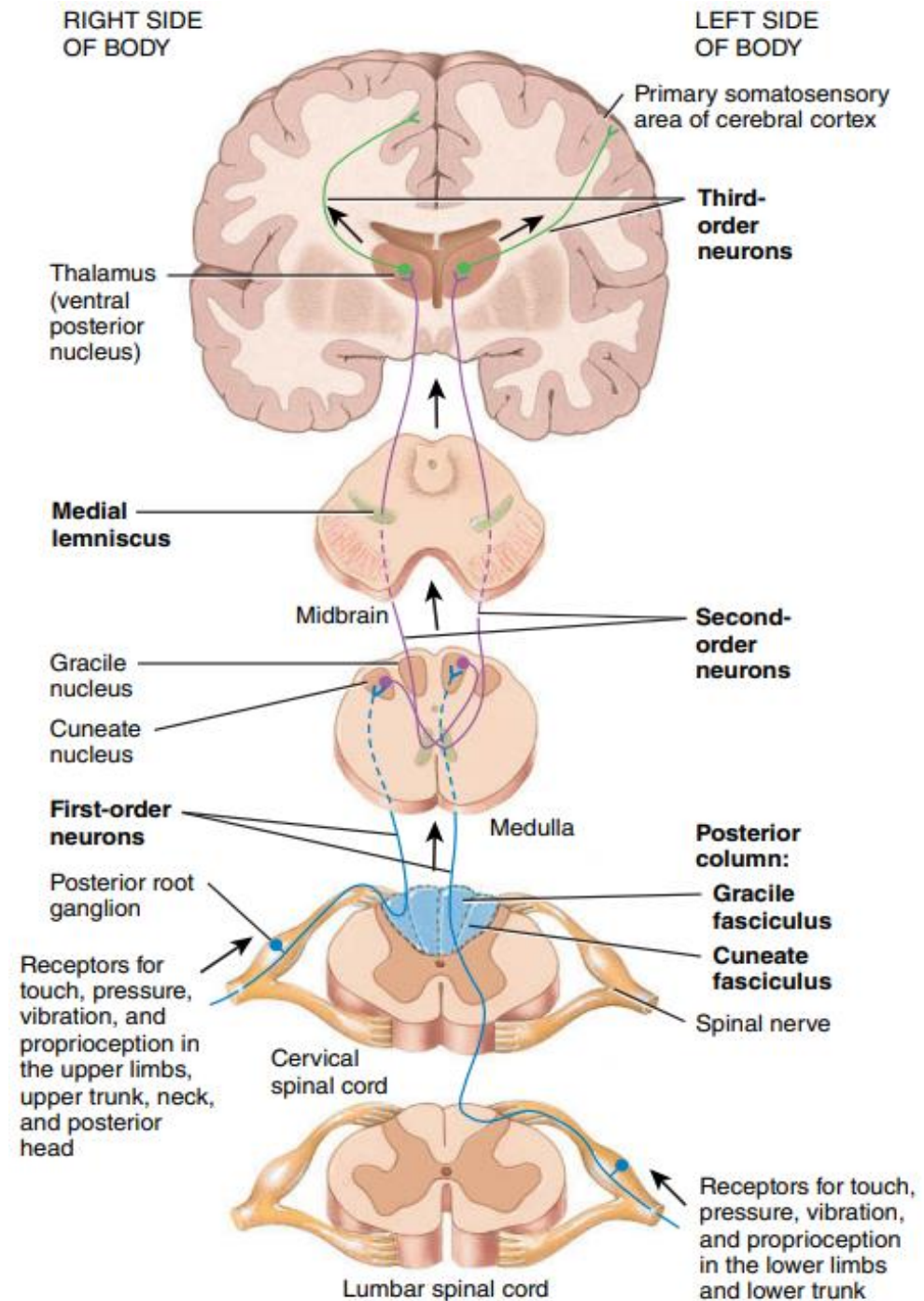
Posterior column - medial lemniscus pathway

Limbs
Trunk
Neck
Posterior head

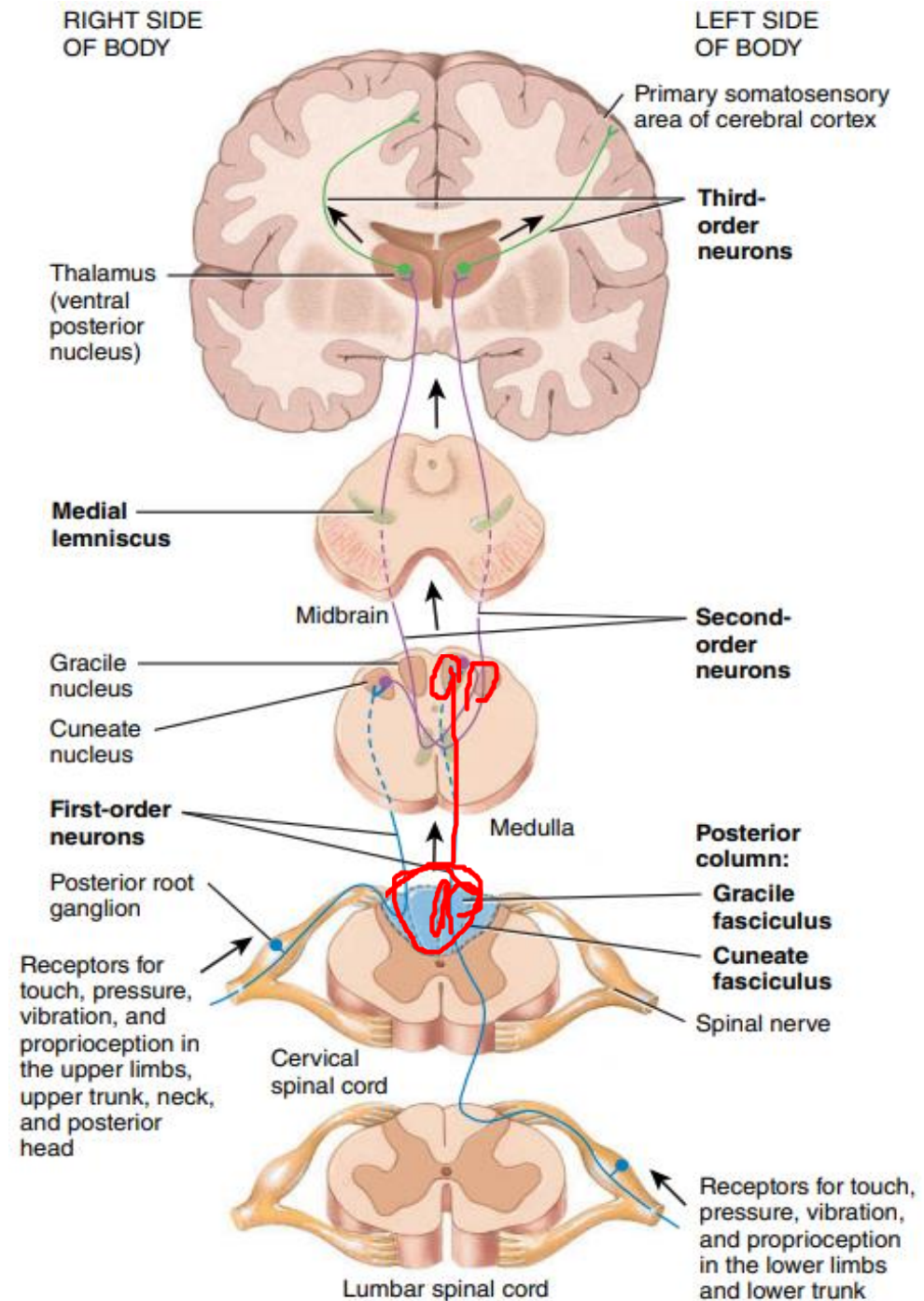


Posterior column - medial lemniscus pathway

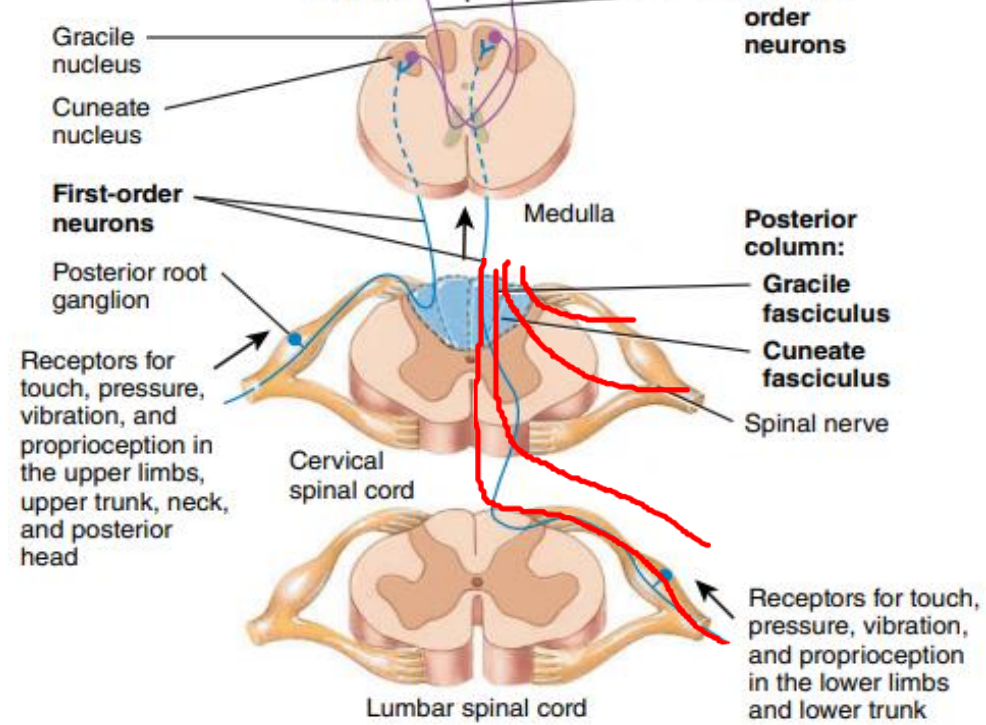
Touch
Vibration
Pressure
Proprioception



Posterior column - medial lemniscus pathway

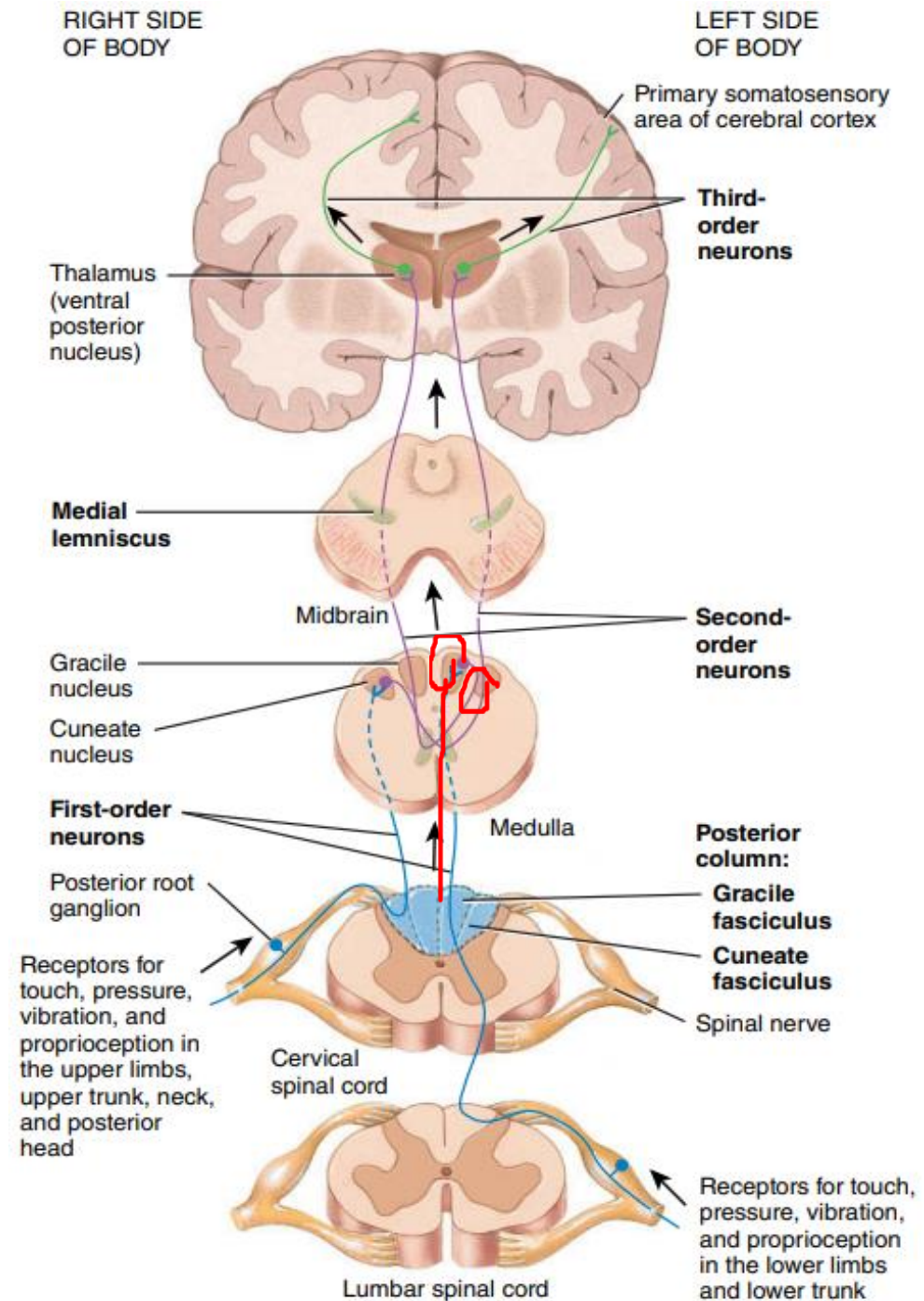


Posterior column - medial lemniscus pathway



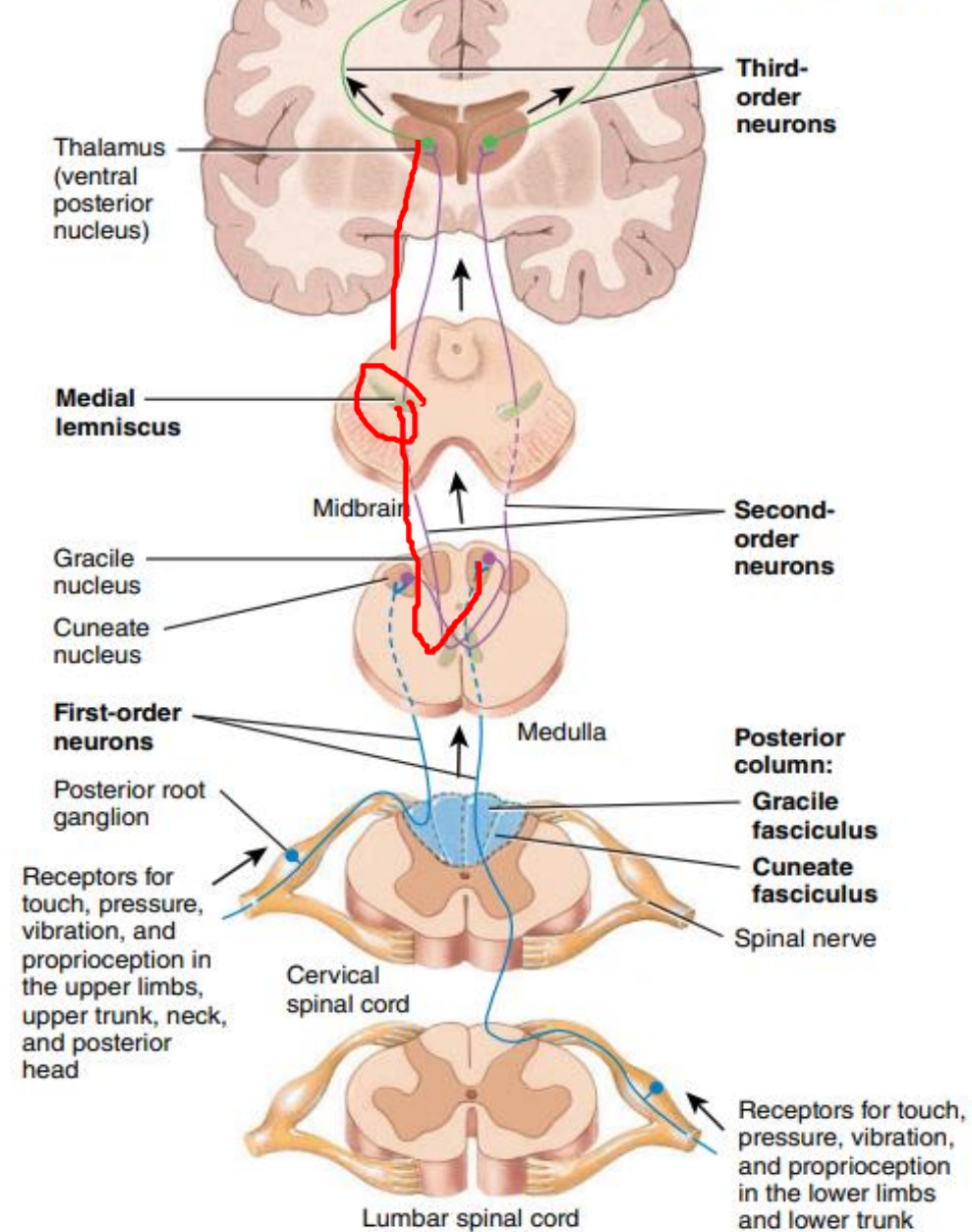
Posterior column - medial lemniscus pathway

Decussation in
the medulla

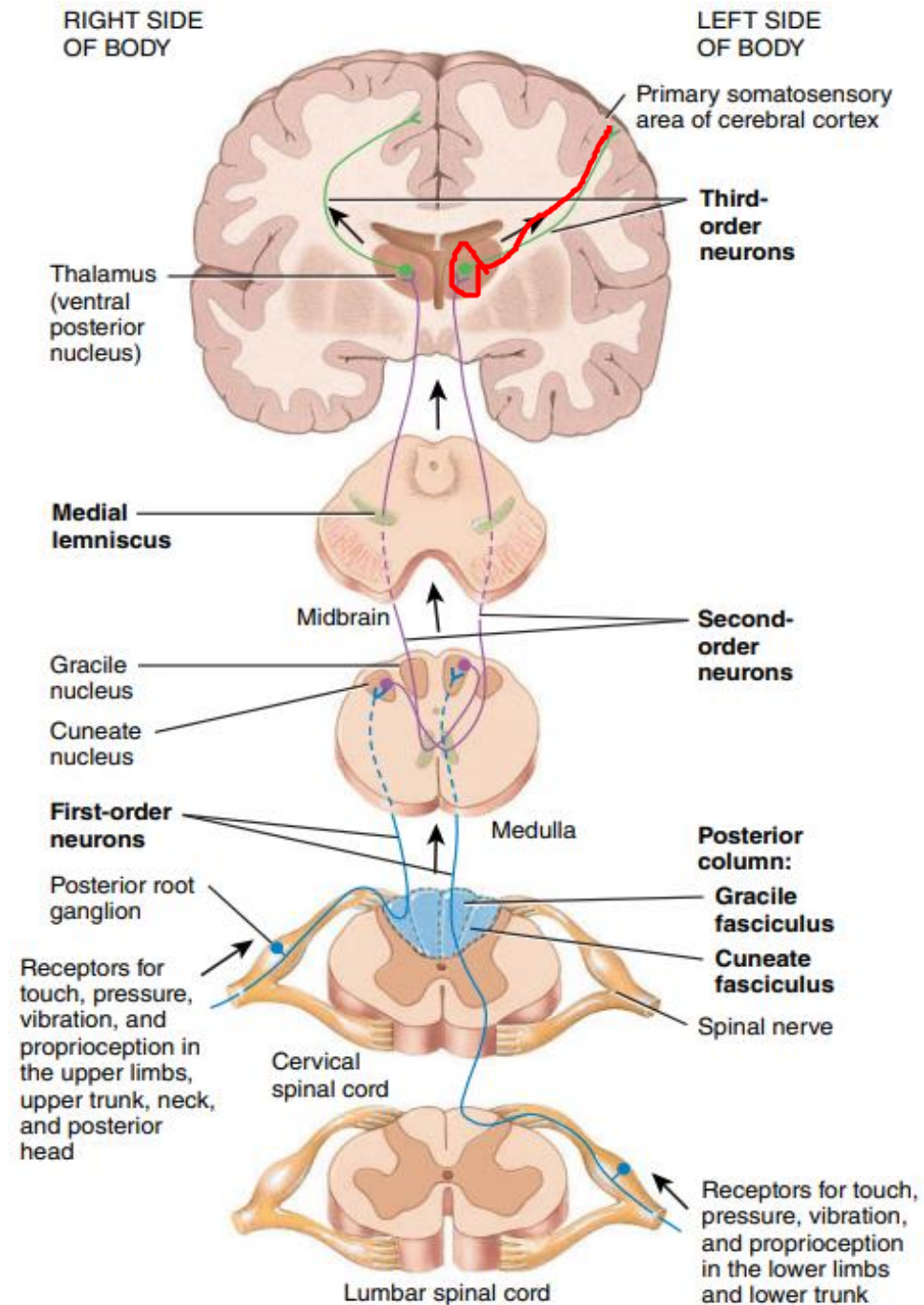


Posterior column - medial lemniscus pathway

Decussation in
the medulla

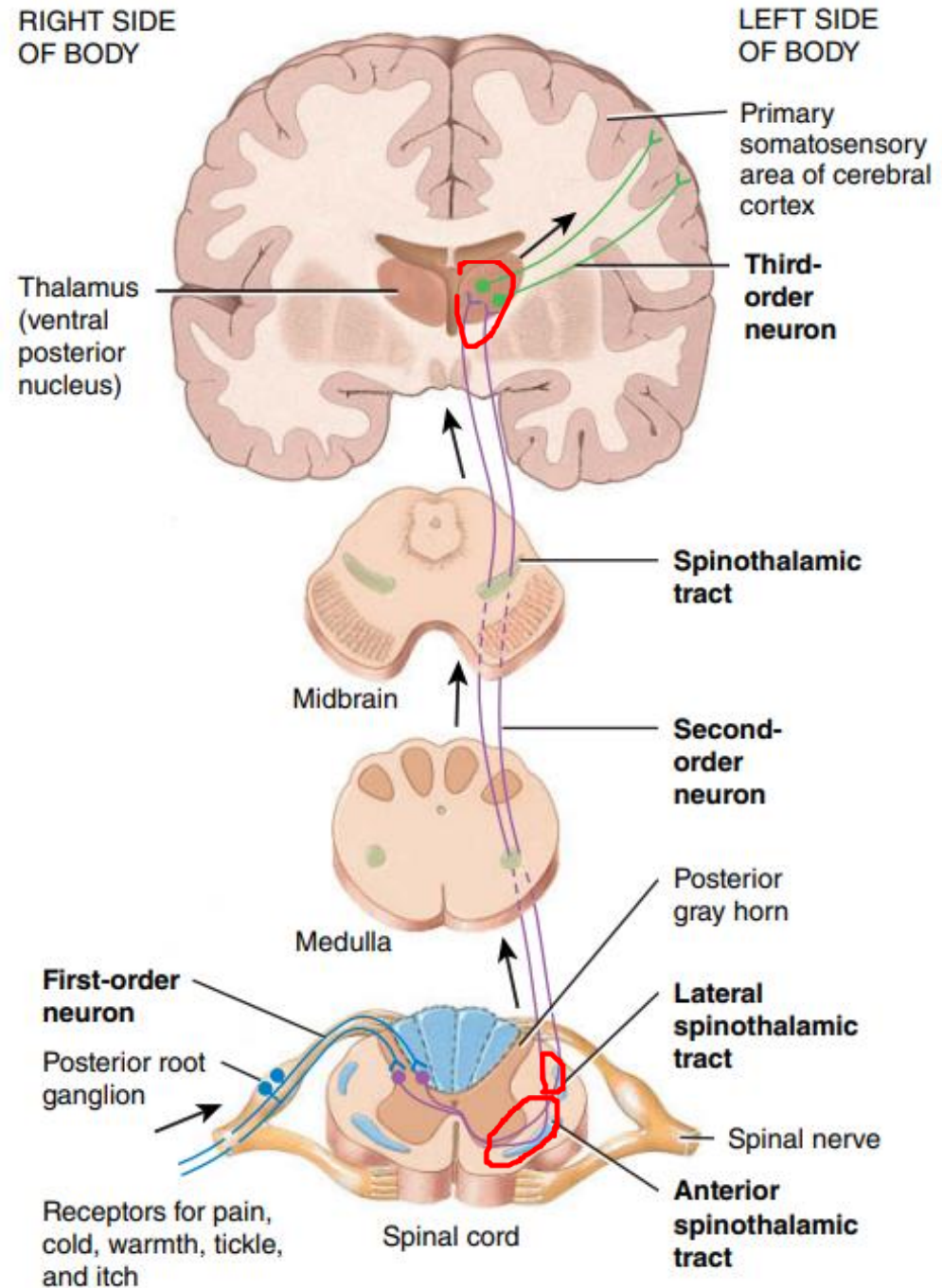


Posterior column - medial lemniscus pathway



Anterolateral spinothalamic pathway

Pain
Temperature
Itch
Tickle



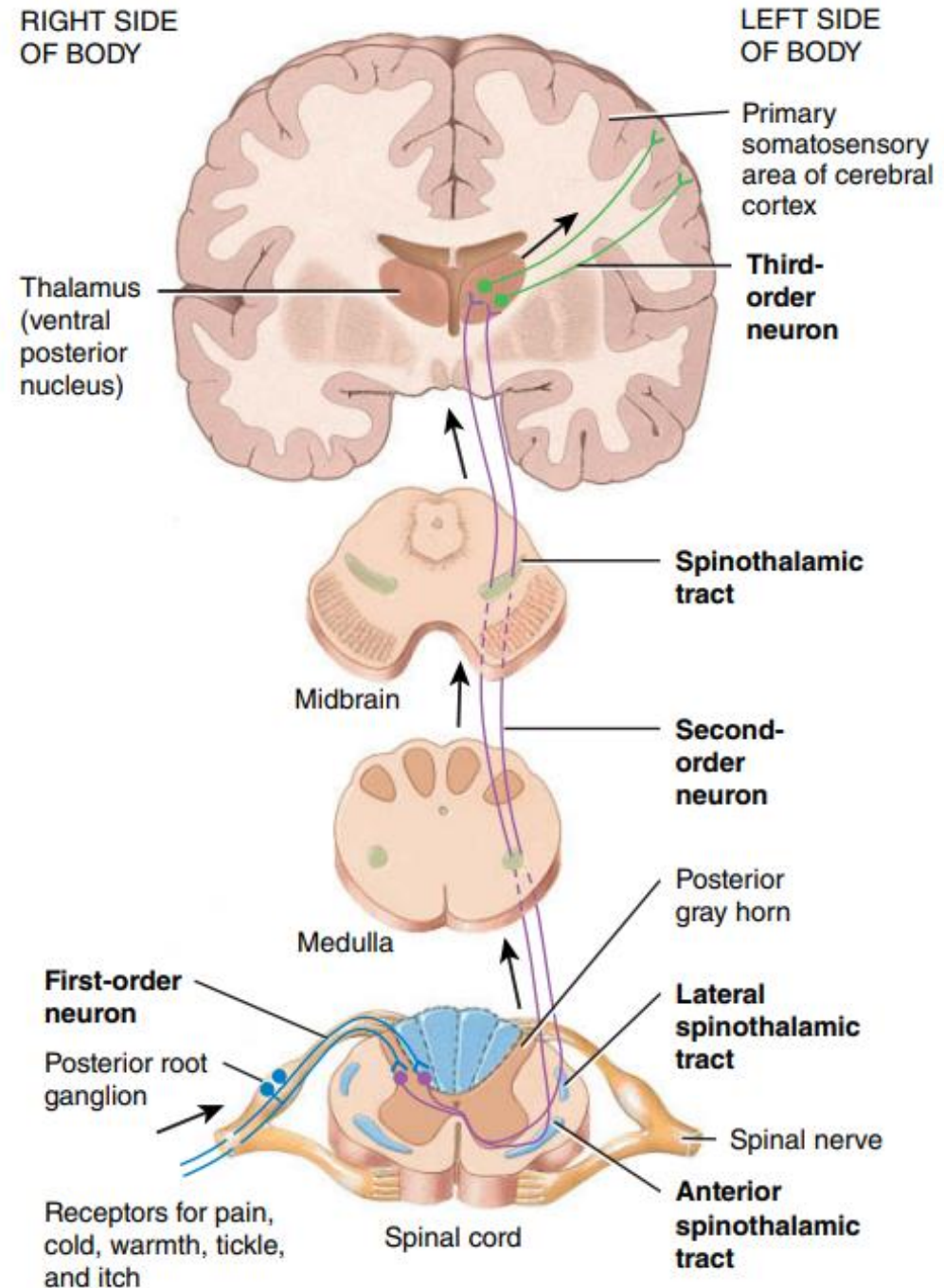
Anterolateral spinothalamic pathway

The limbs

The trunk

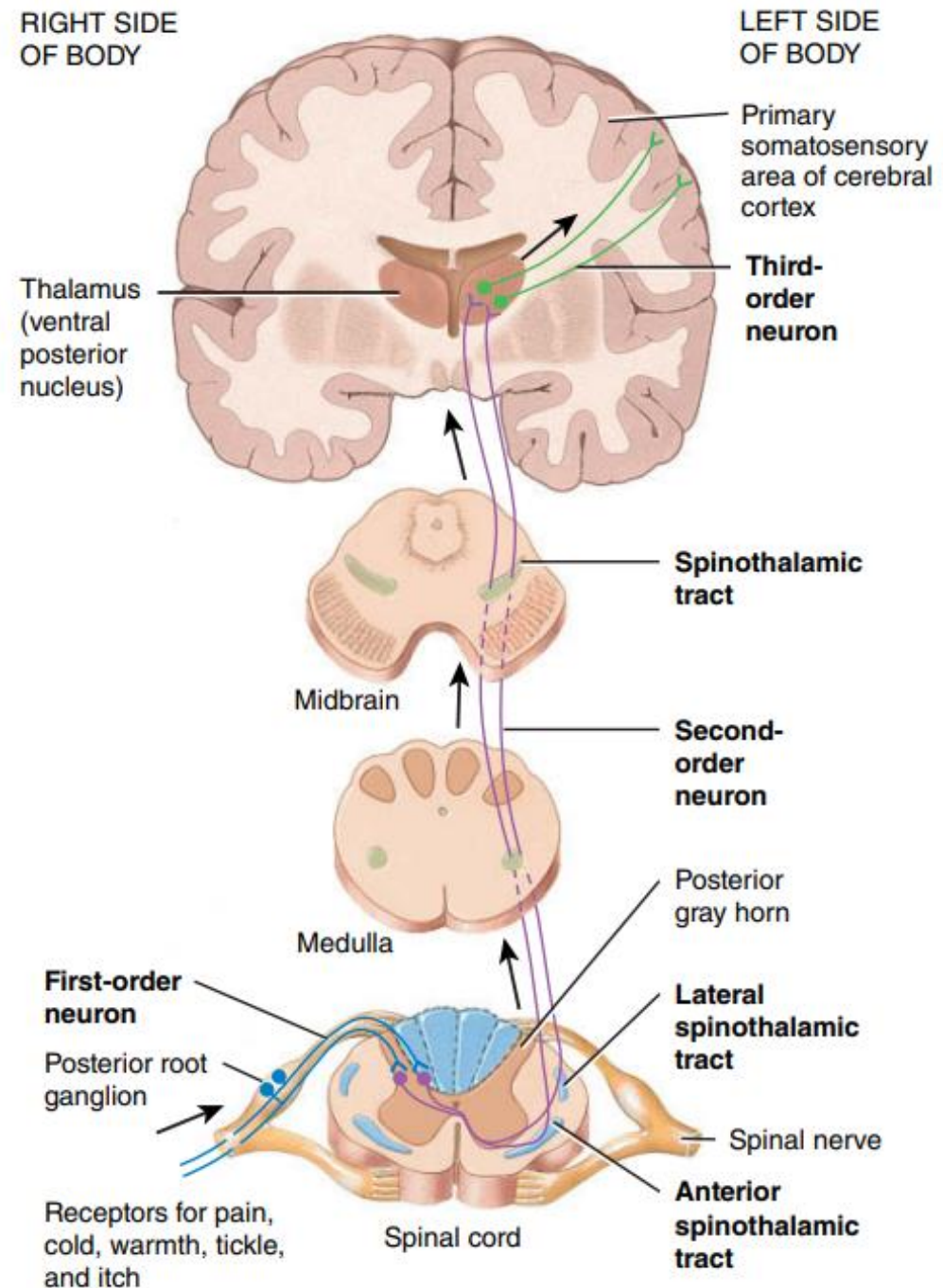
The neck

Posterior head

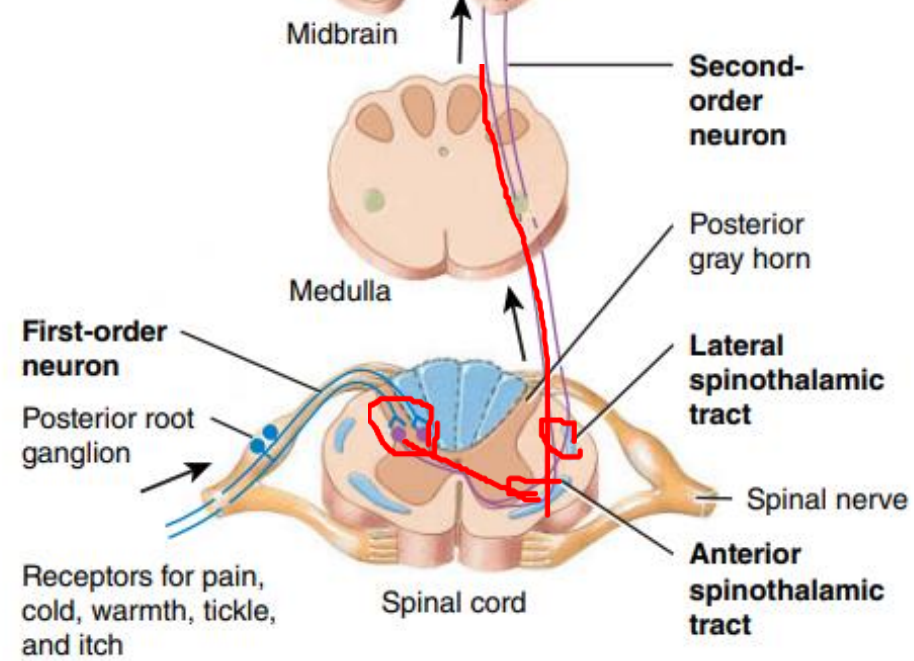


Anterolateral spinothalamic pathway

Synapse at dorsal horn of spinal gray matter

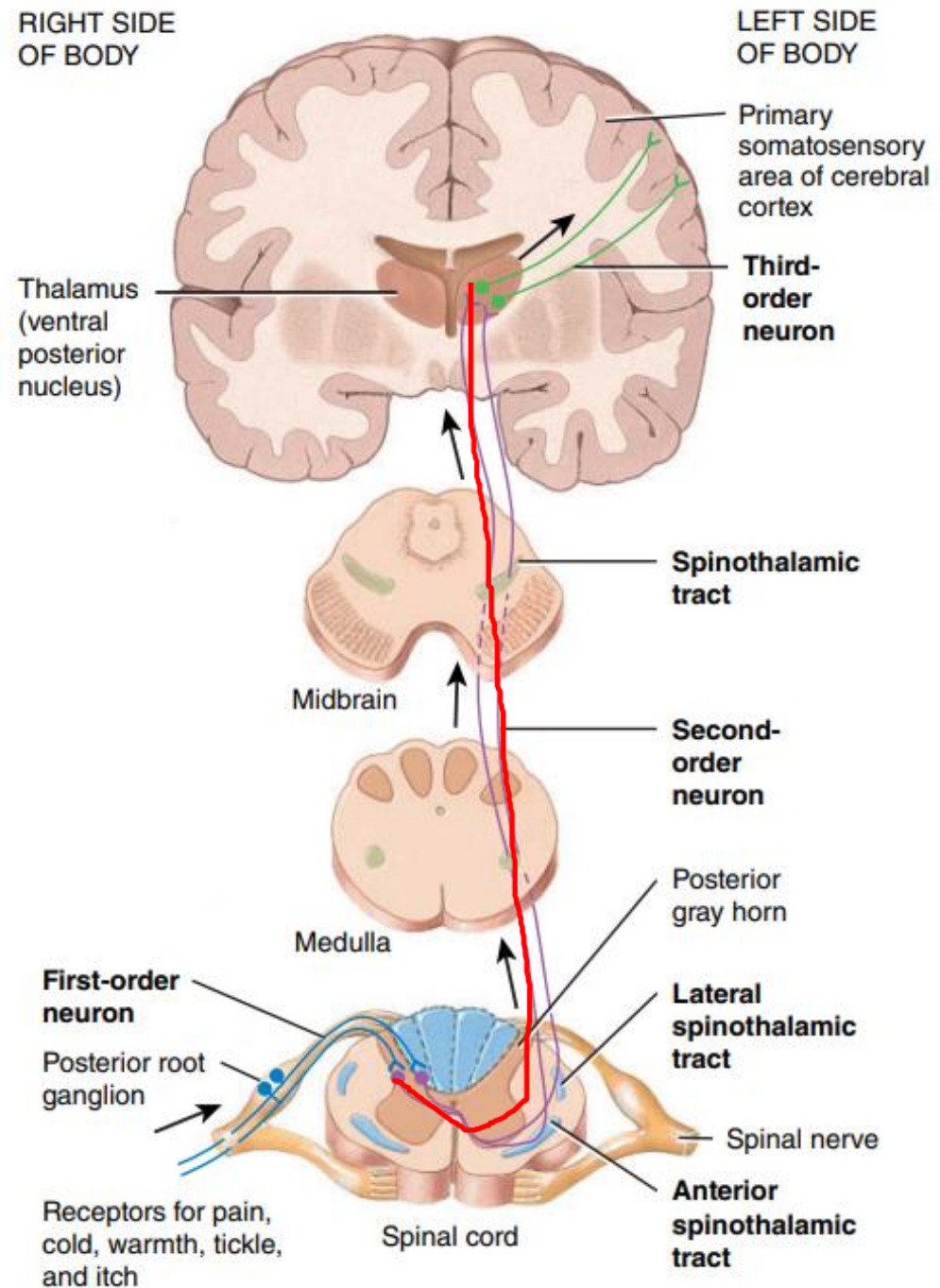


Anterolateral spinothalamic pathway



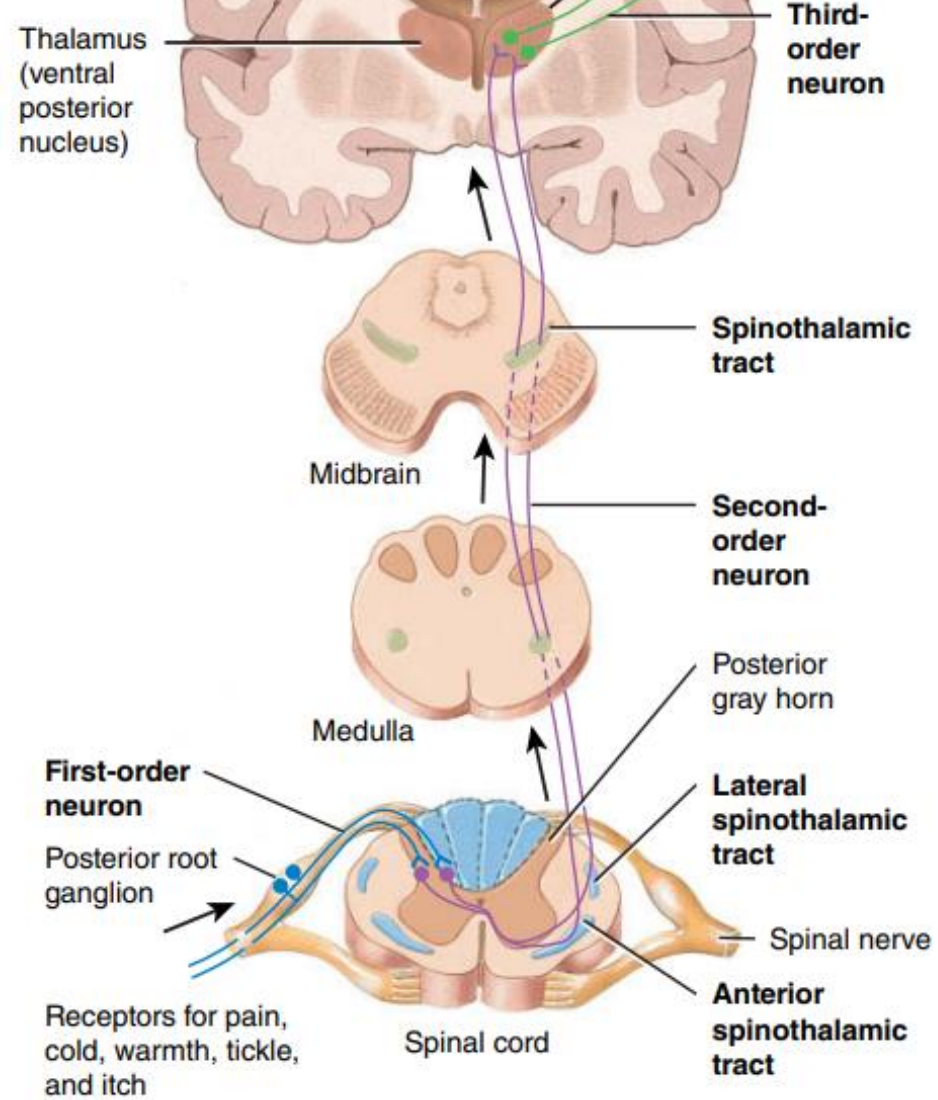
Anterolateral spinothalamic pathway

Decussation in spinal cord

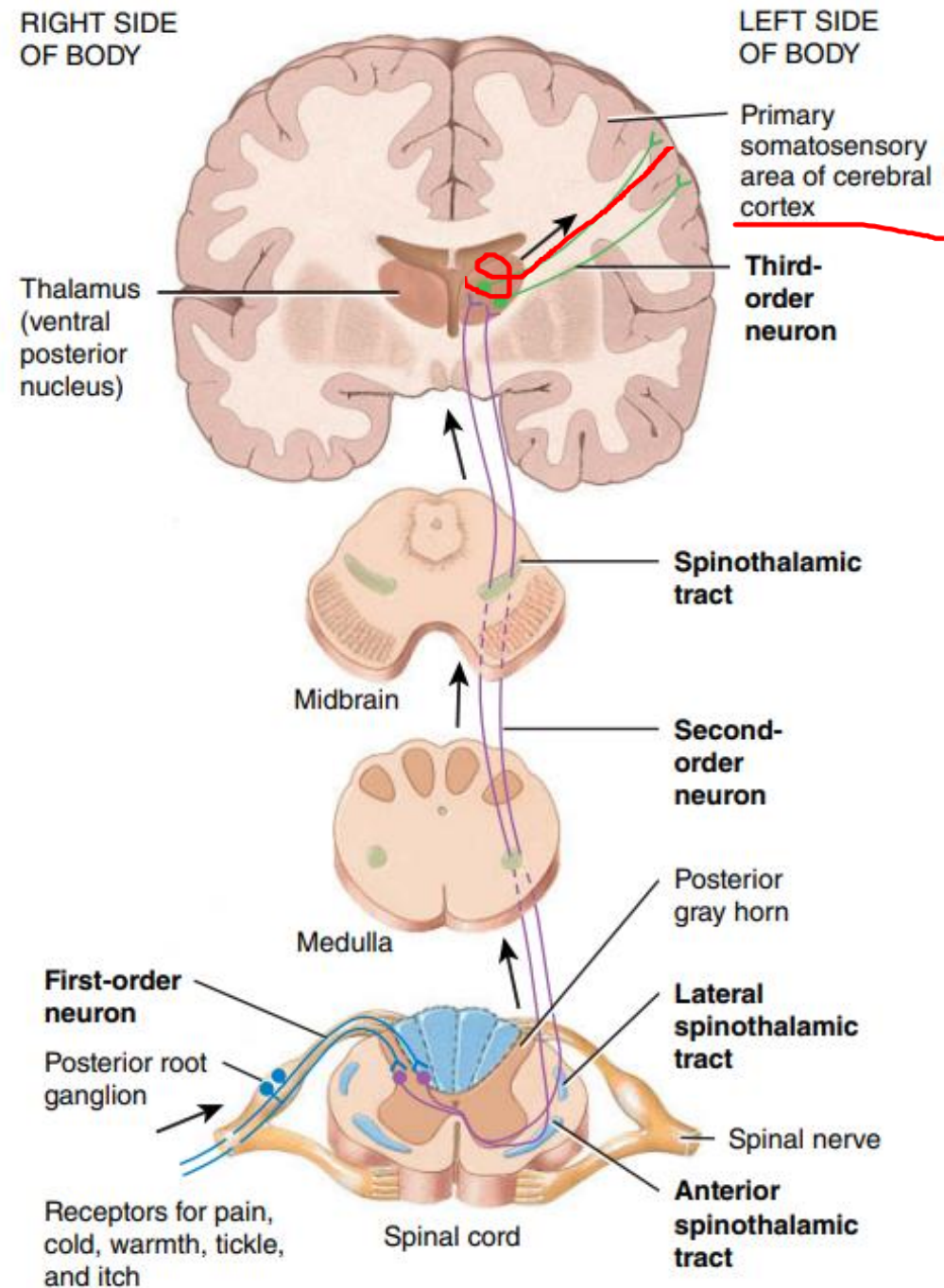


Anterolateral spinothalamic pathway

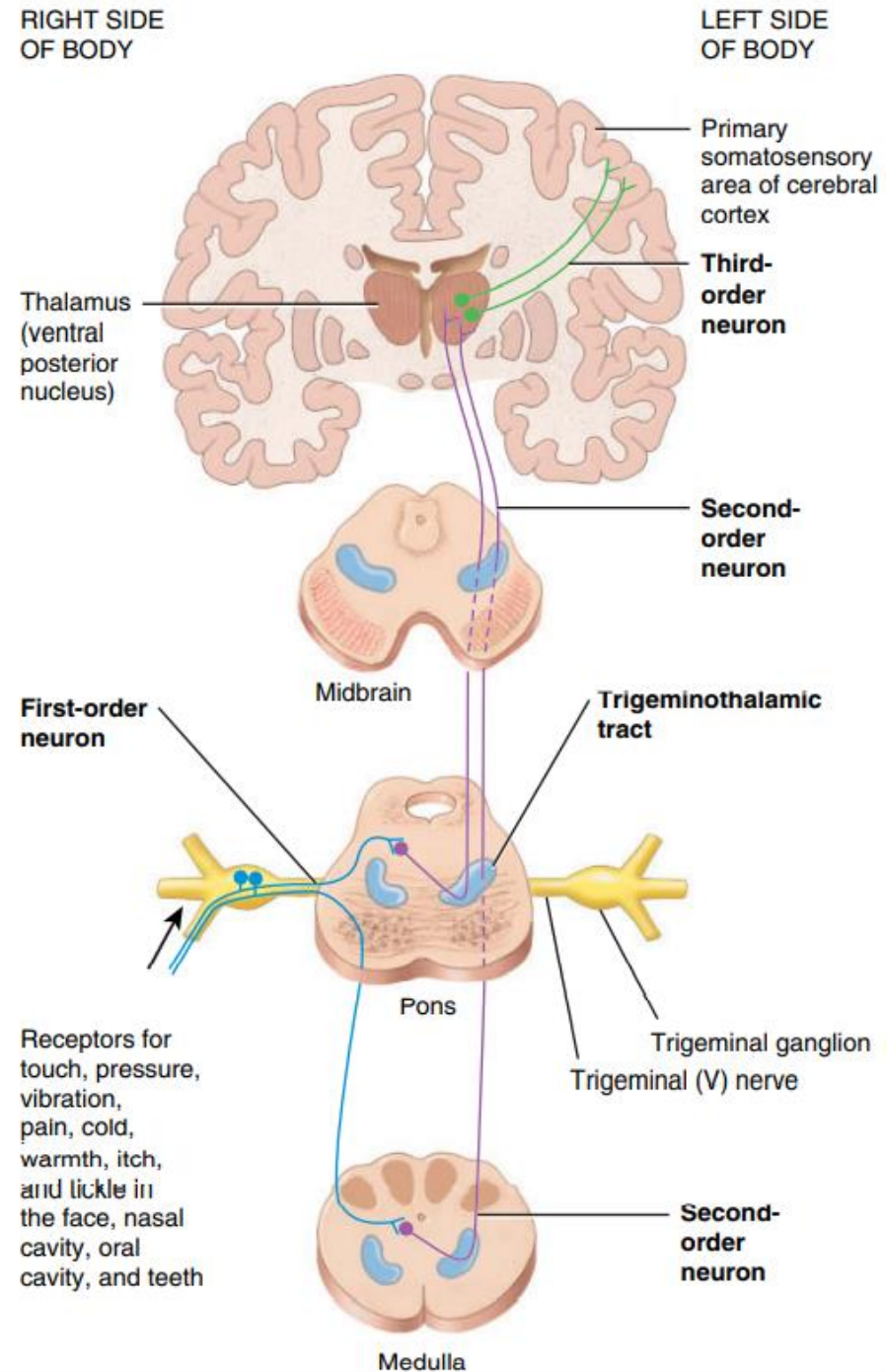
Decussation in spinal cord



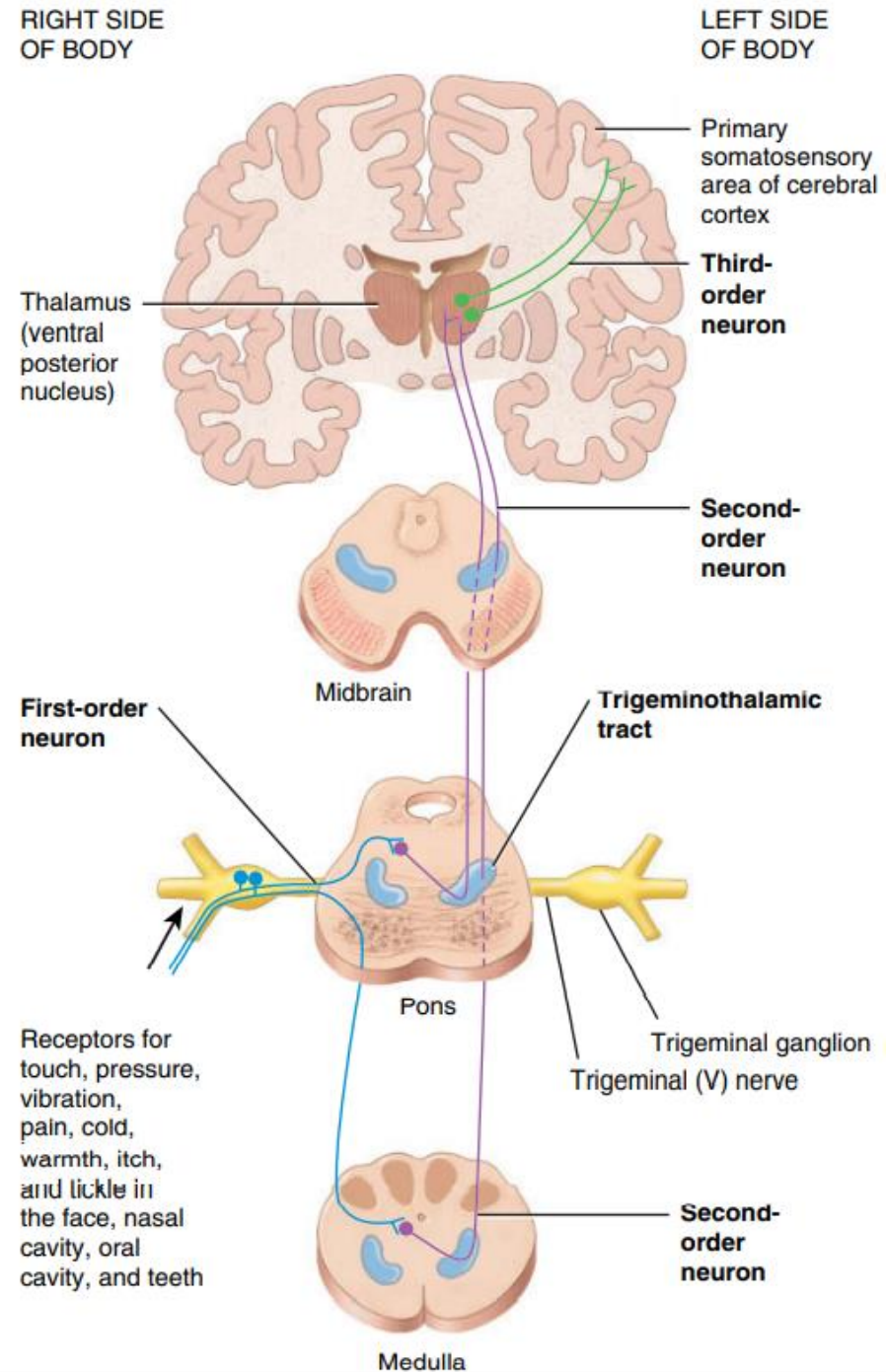
Anterolateral spinothalamic pathway



Trigeminothalamic pathway

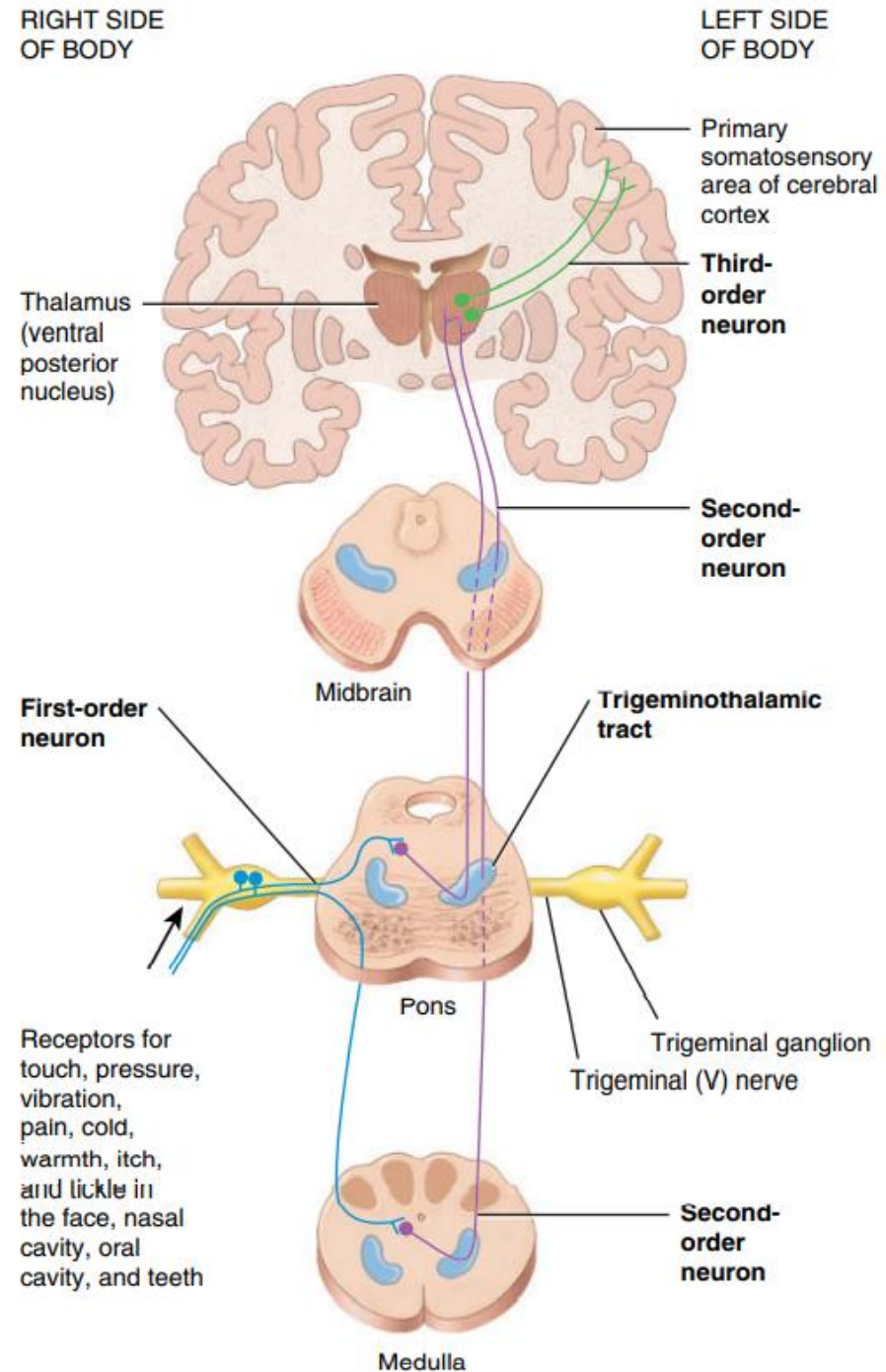


Trigeminothalamic pathway

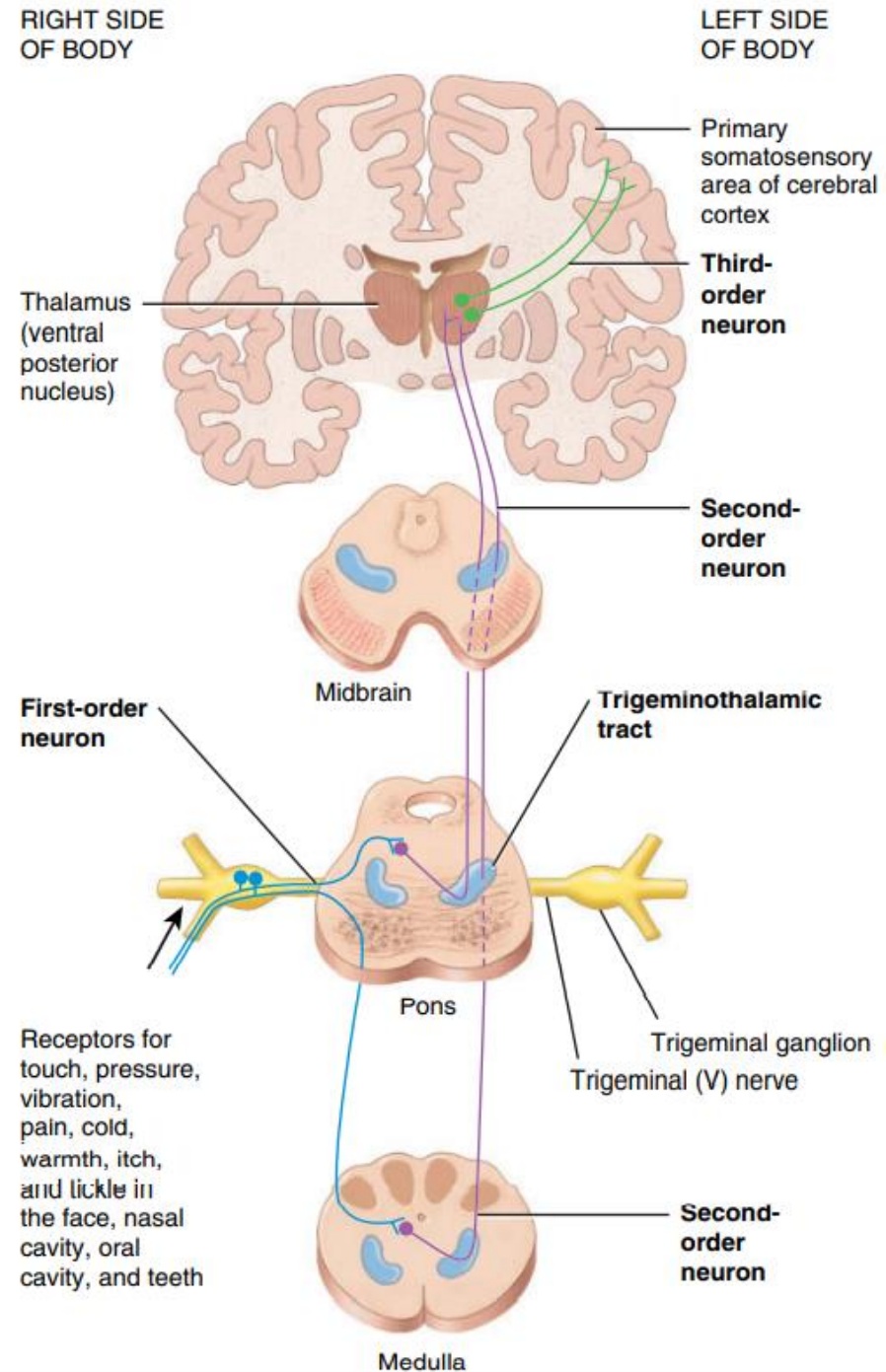


Trigeminothalamic pathway

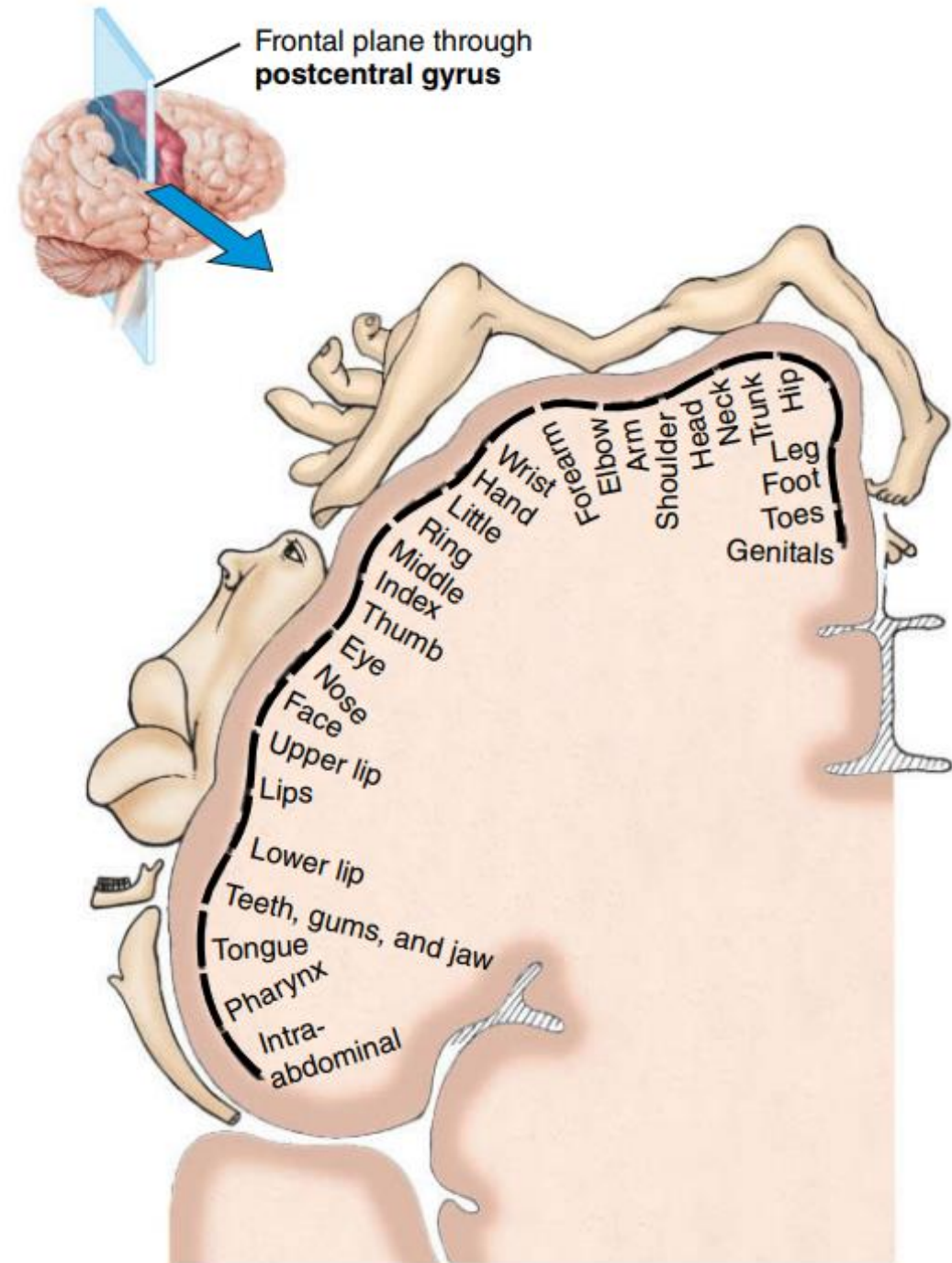
Decussation



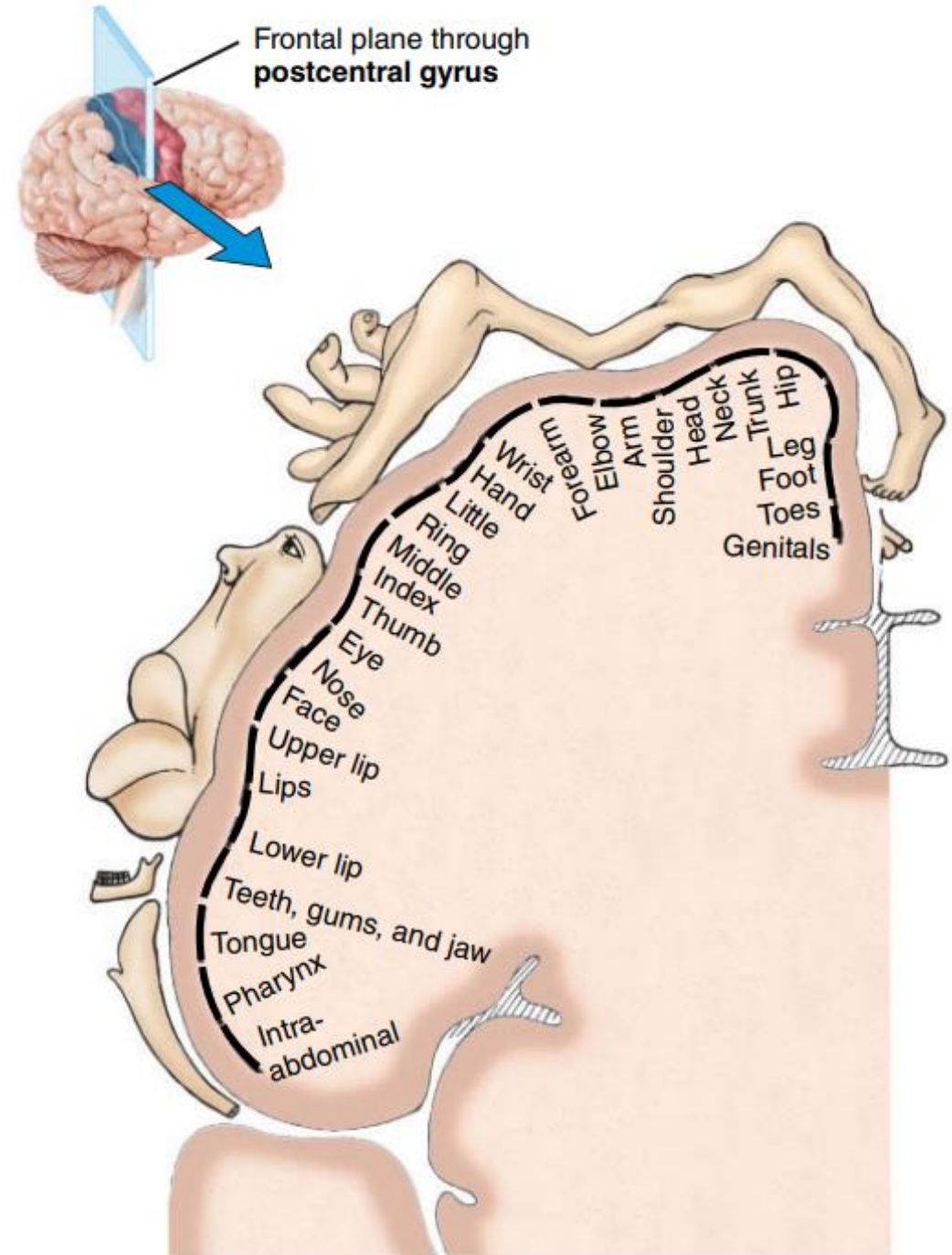
Trigeminothalamic pathway



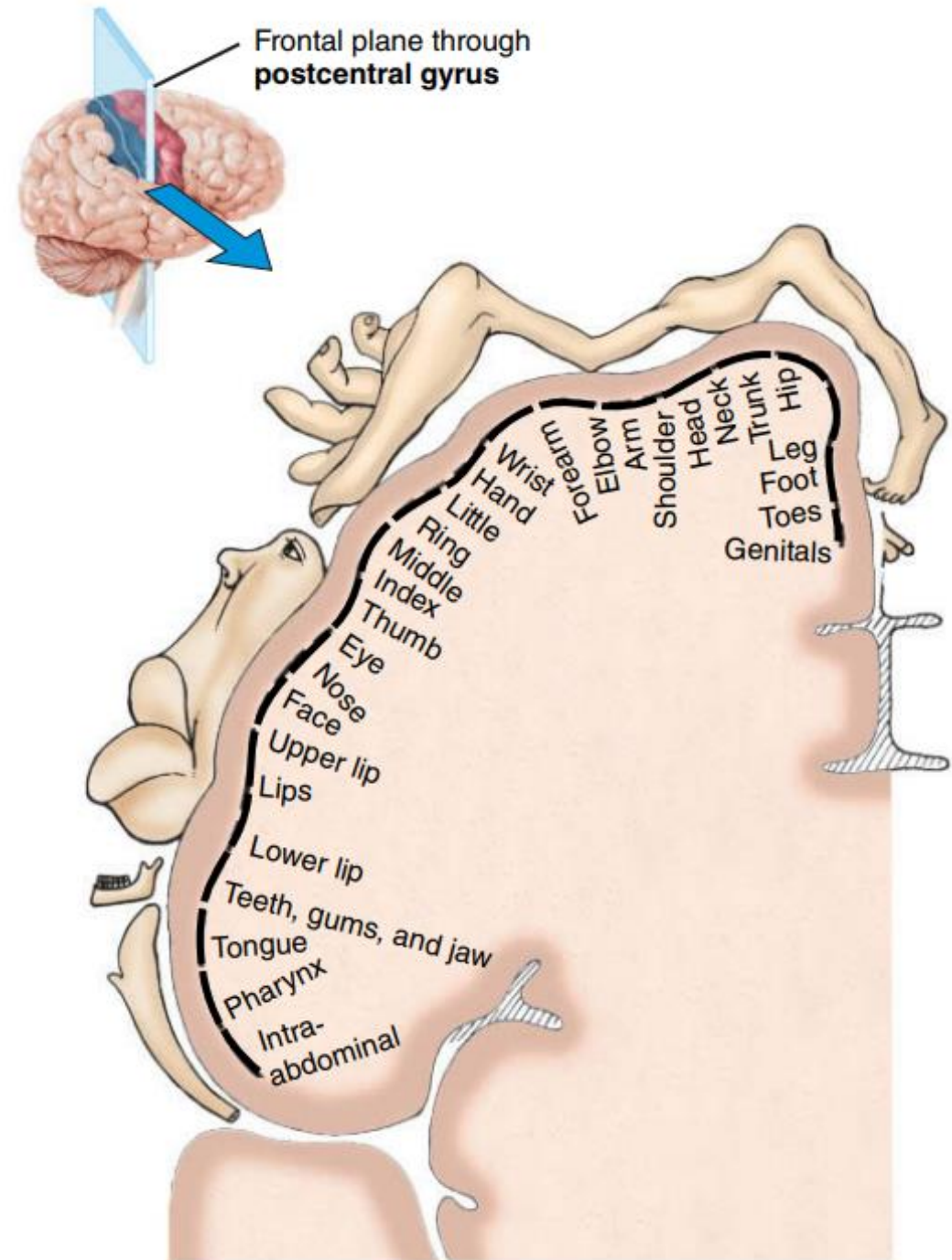
Mapping of the primary somatosensory area in the cerebral cortex



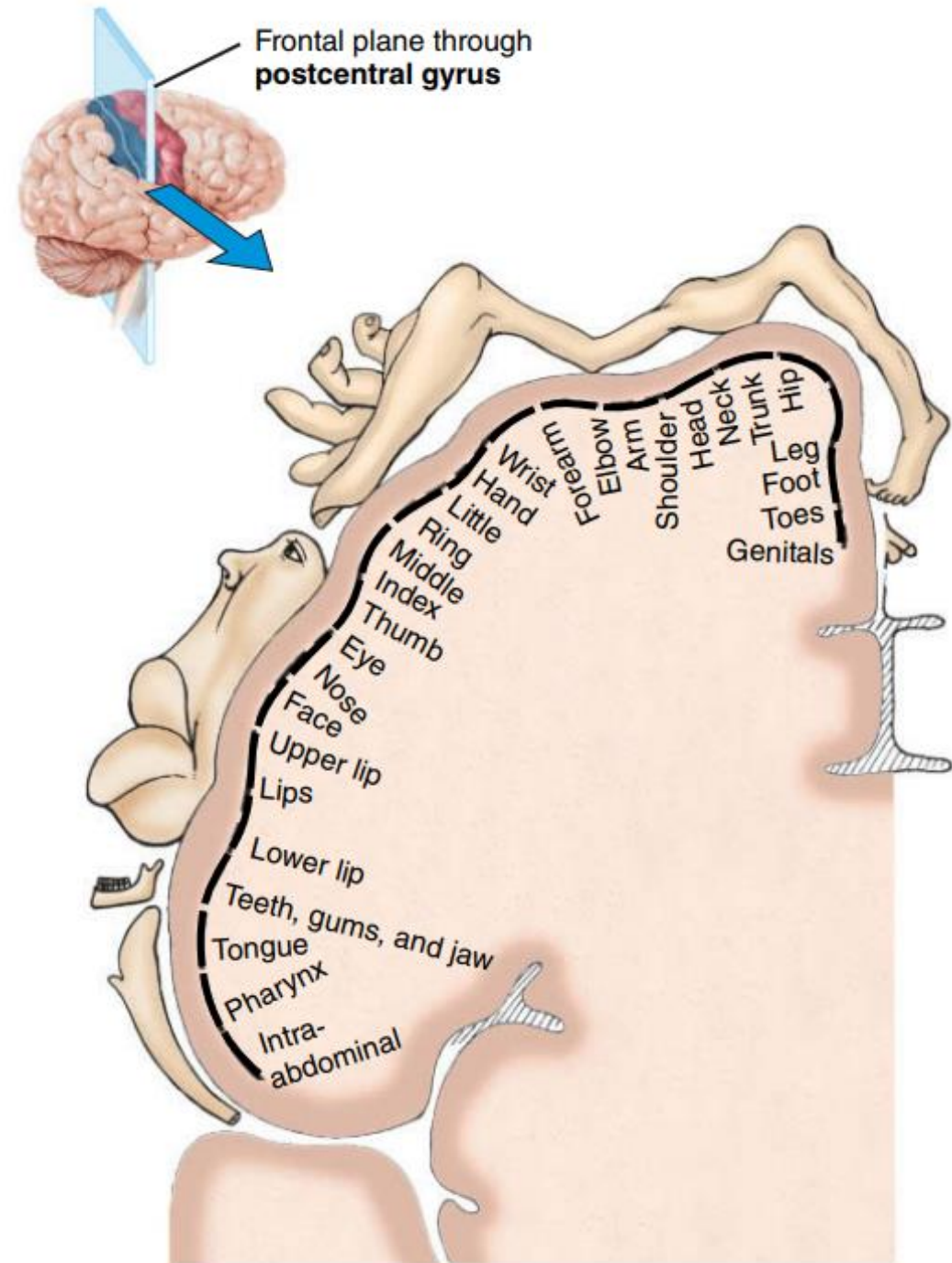
Located in postcentral gyri of the parietal lobes of the cerebral cortex.



The left cerebral hemisphere receives sensory input from the right side of the body

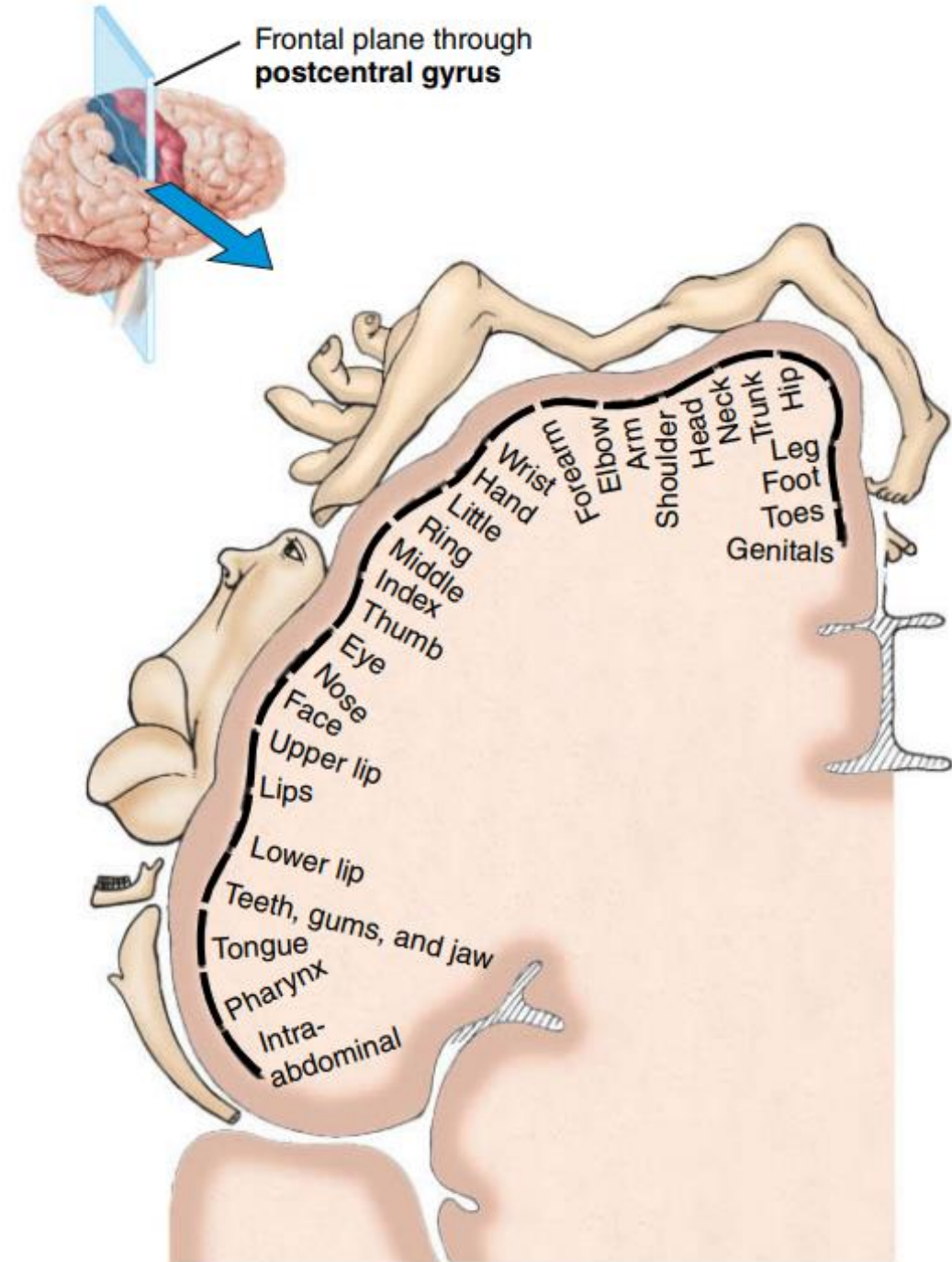


Distorted somatic sensory map
of the body:
Sensory homunculus.

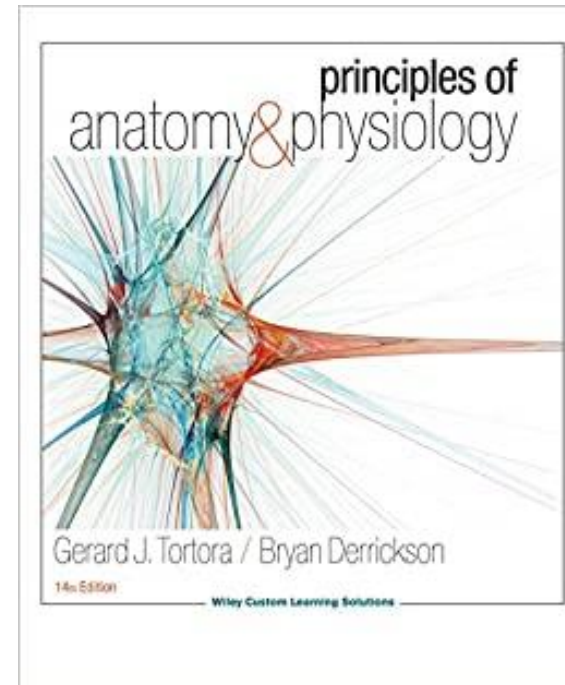
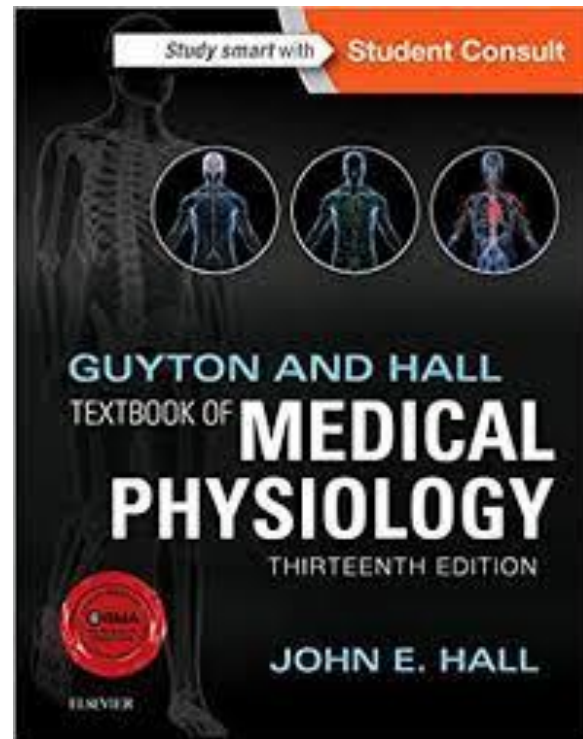
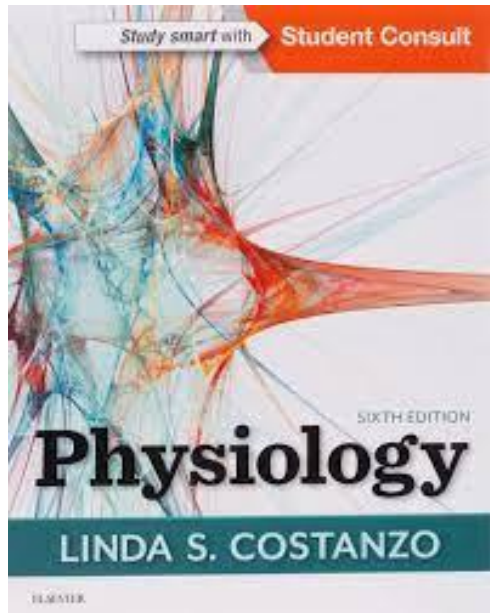


Think about this:

What will happen to this map if the quantity of sensory impulses received from certain body part changed significantly?



References



9TH
Edition

Human Physiology From Cells to Systems

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CENGAGE
Learning

Australia • Brazil • Mexico • Singapore • United Kingdom • United States



Thank you

