

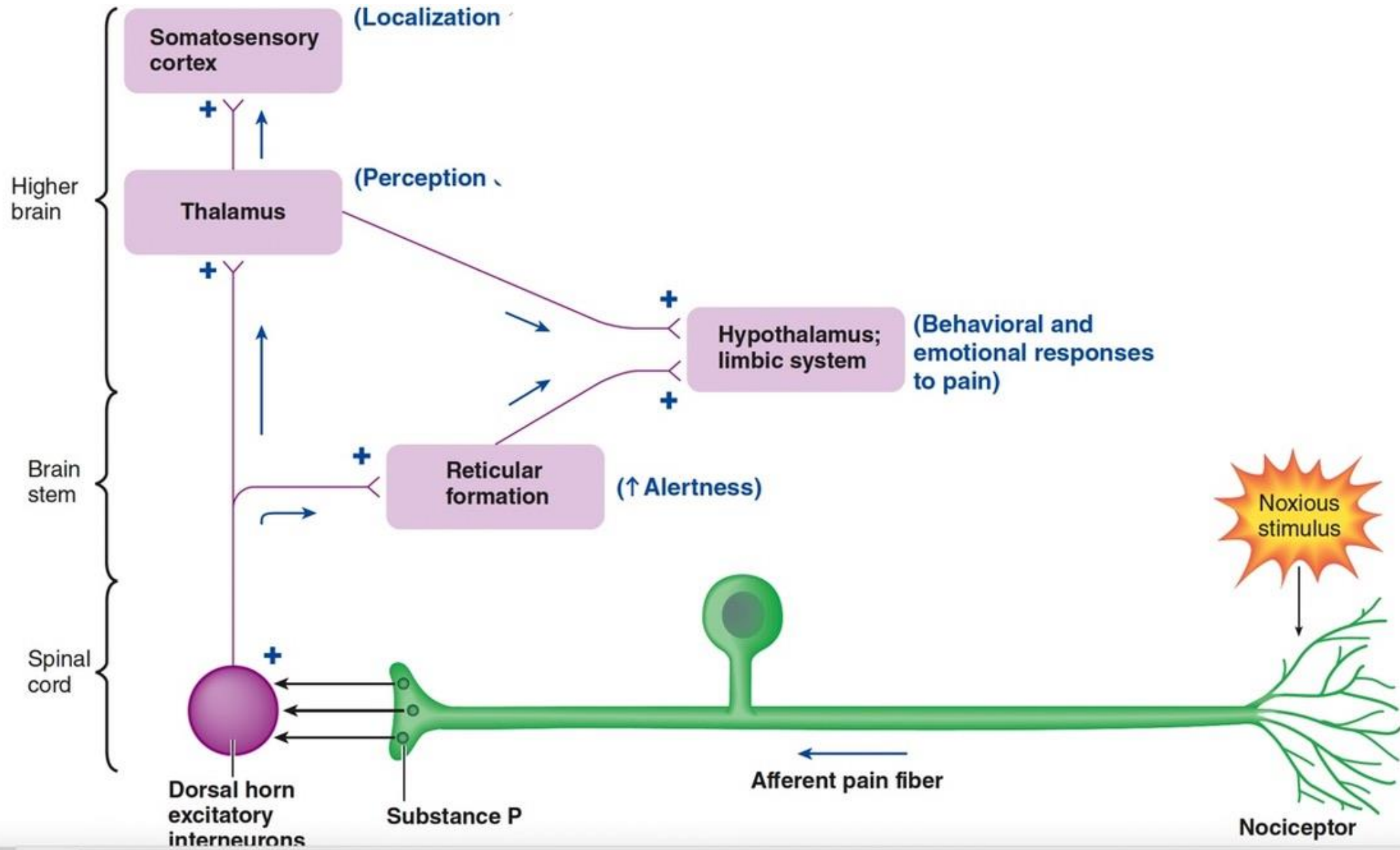
Neurophysiology

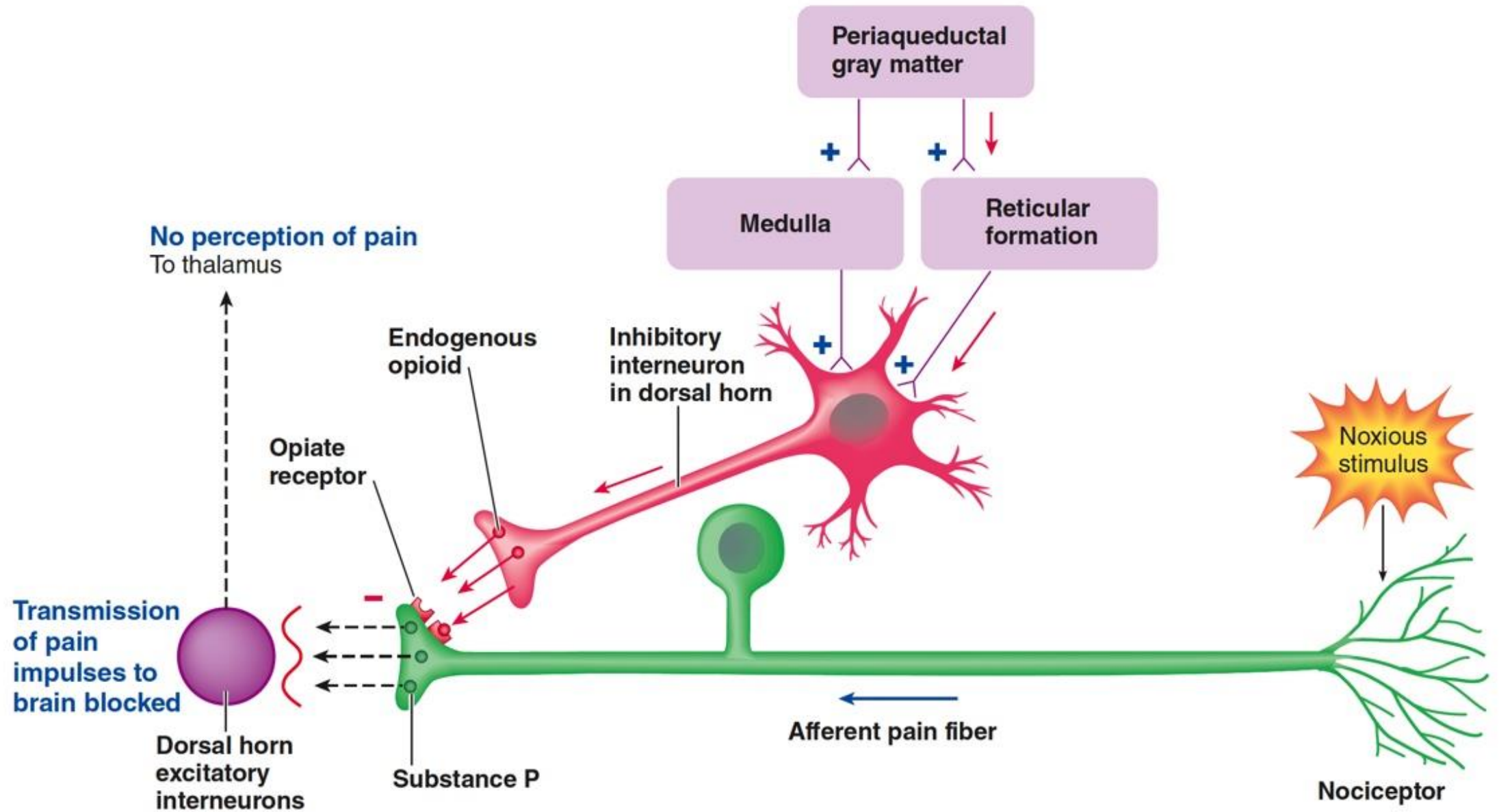
Somatosensory cortex

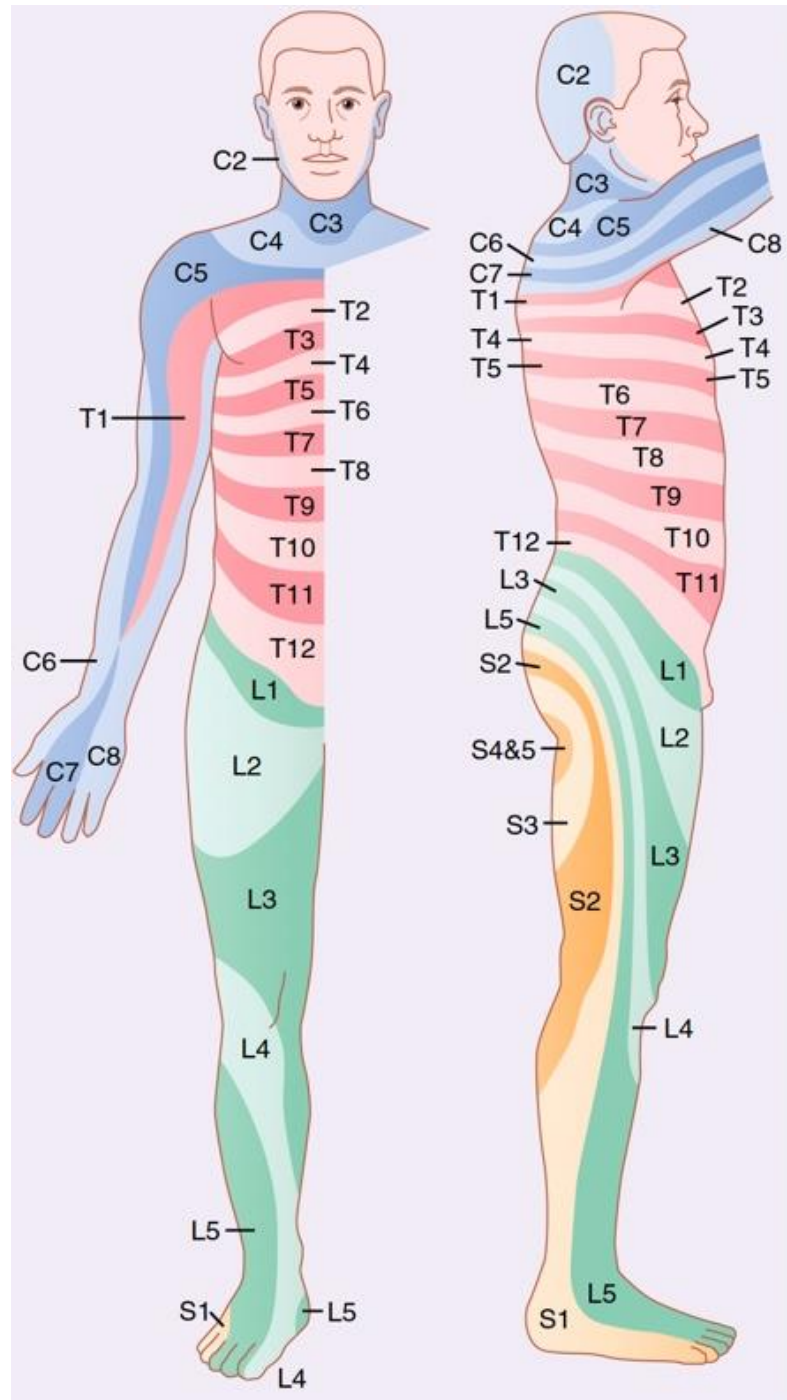
Fatima Ryalat, MD, PhD

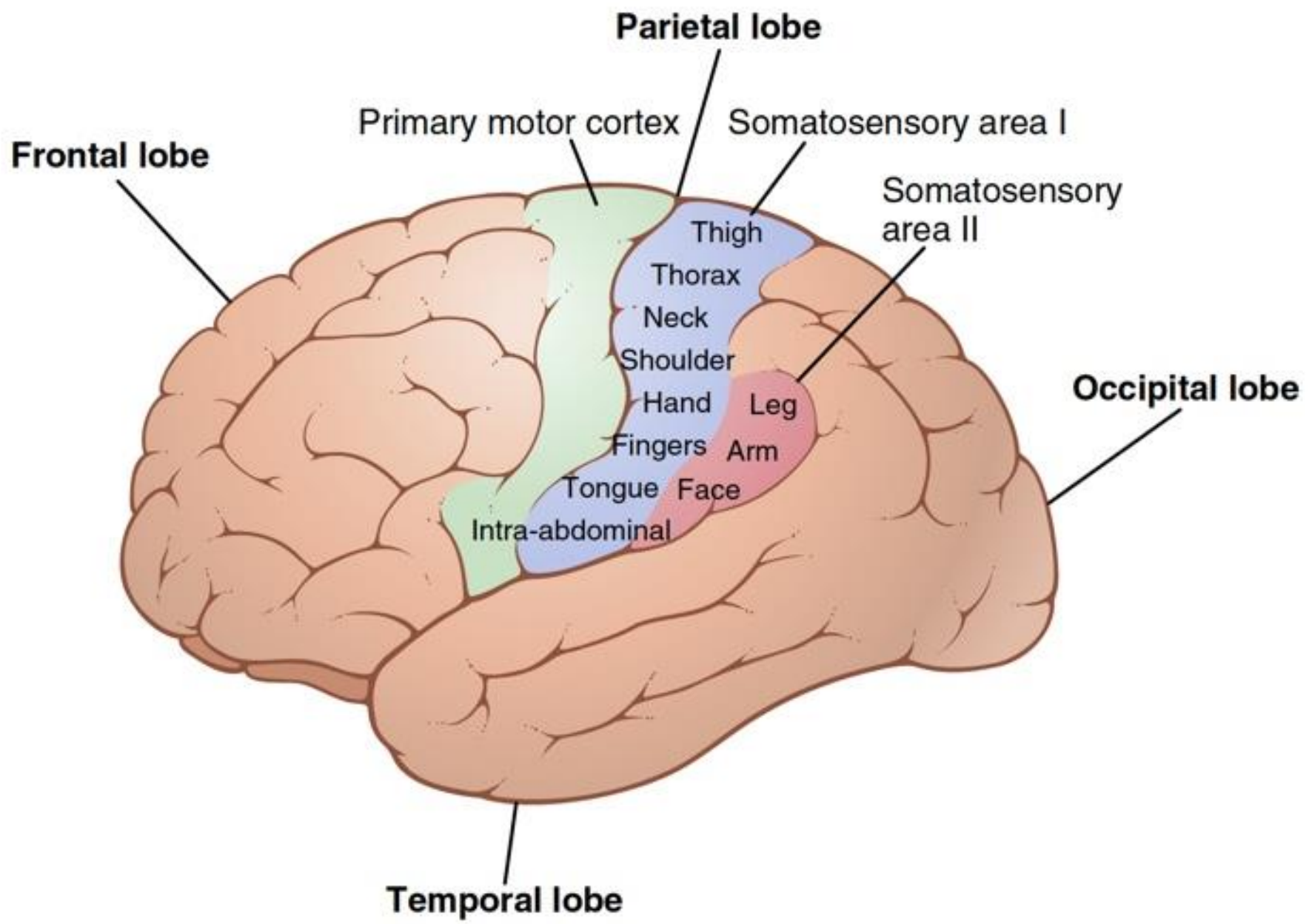
Assistant Professor, Department of Physiology and Biochemistry

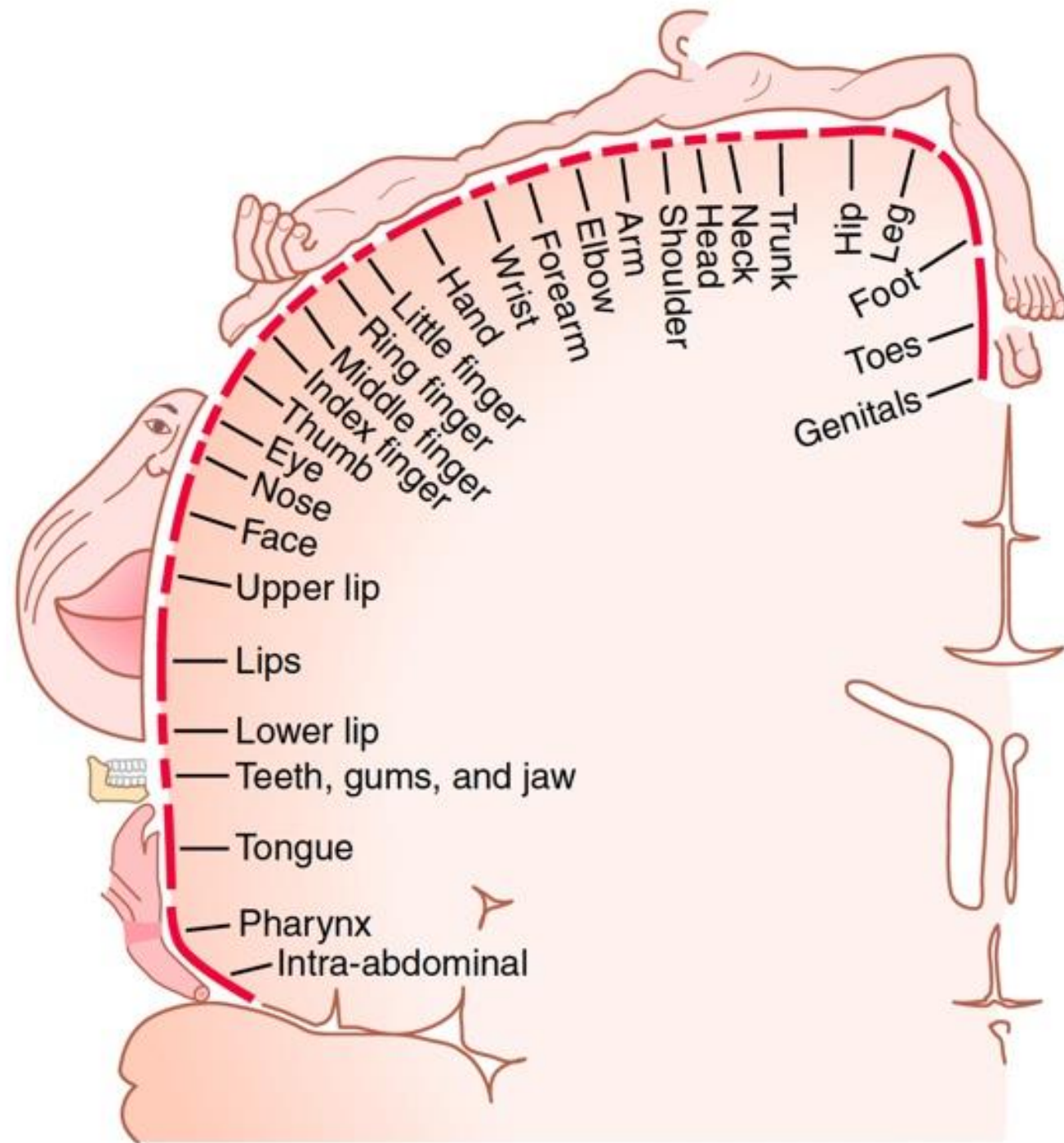
School of Medicine, University of Jordan





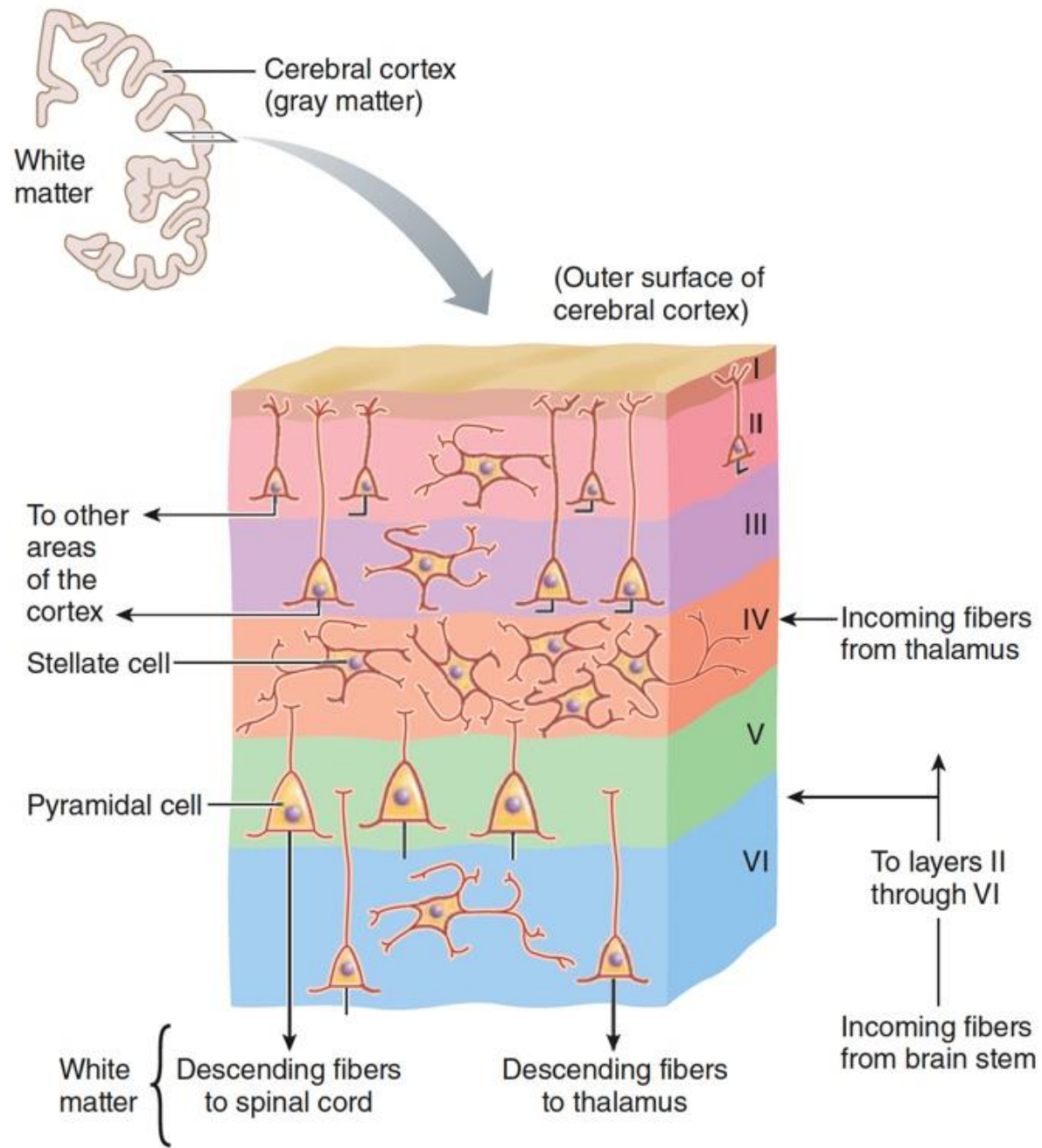






Somatosensory cortex

- The cerebral cortex is organized into six well-defined layers based on varying distributions of several distinctive cell types.
- These layers are organized into functional vertical columns that extend perpendicularly about 2 mm from the cortical surface down through the thickness of the cortex to the underlying white matter.



Somatosensory cortex

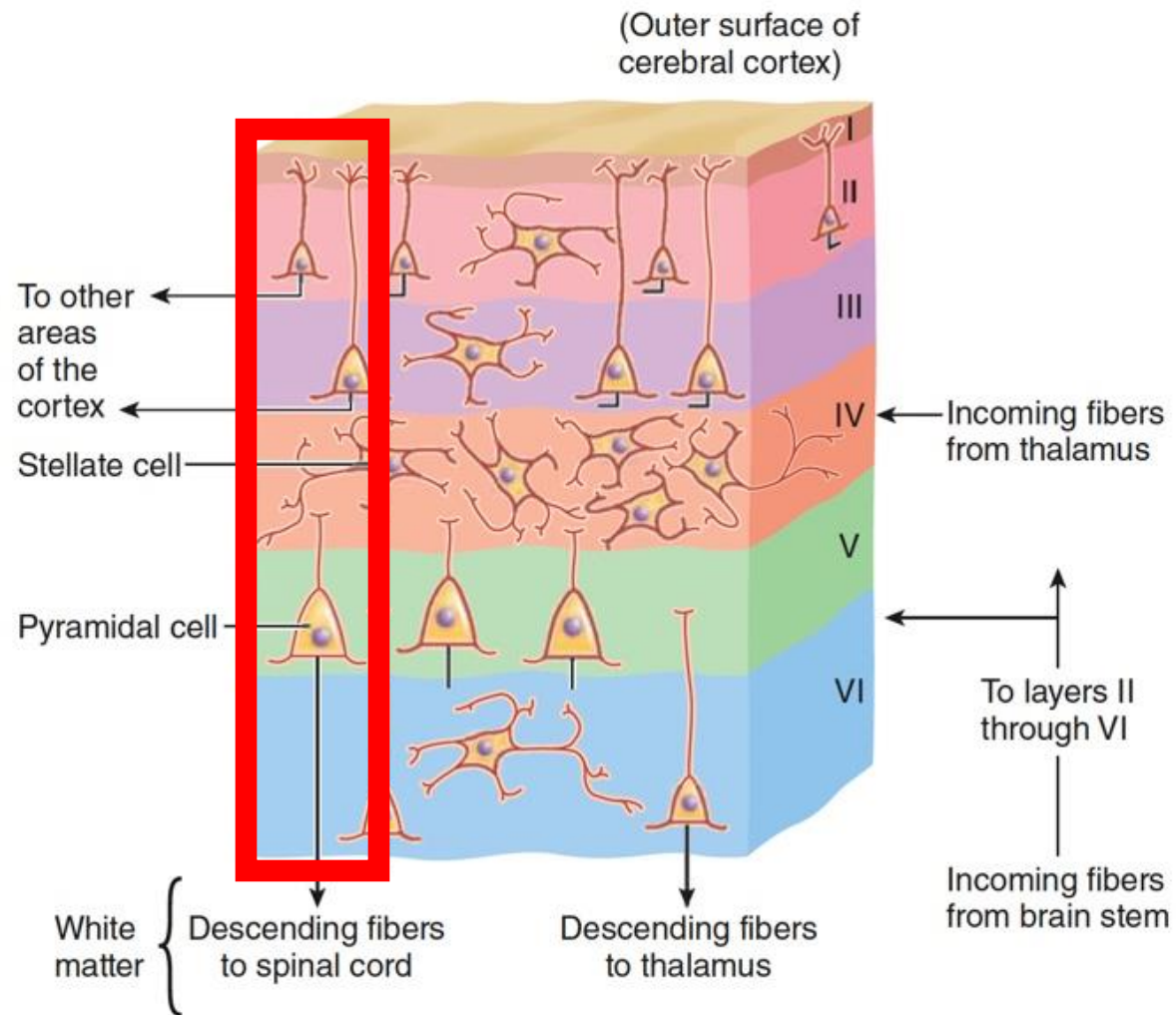
- The functional differences between various areas of the cortex result from different layering patterns within the columns and from different input–output connections
- In somatosensory cortex, each of these columns serves a single specific sensory modality.

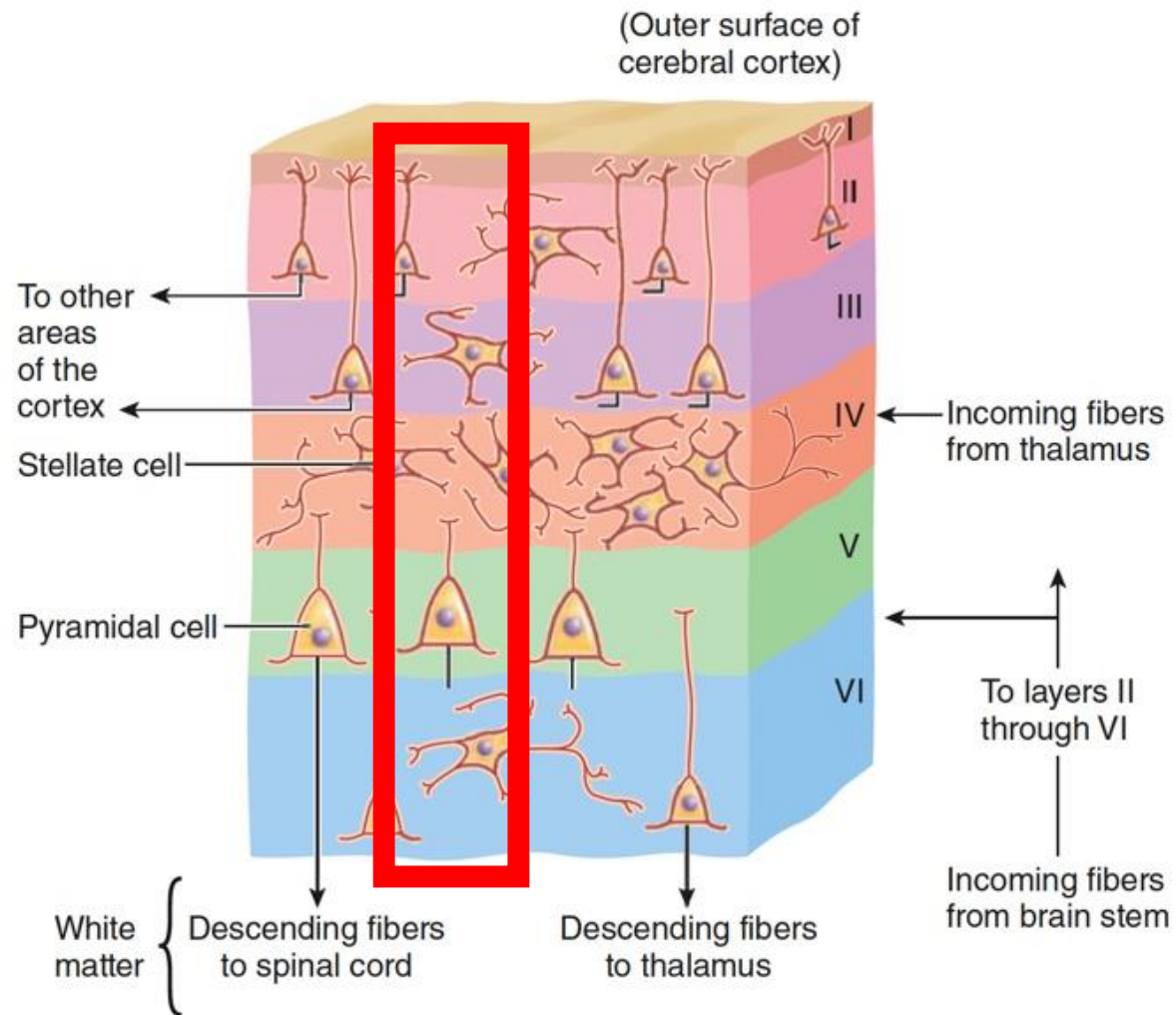
Somatosensory cortex

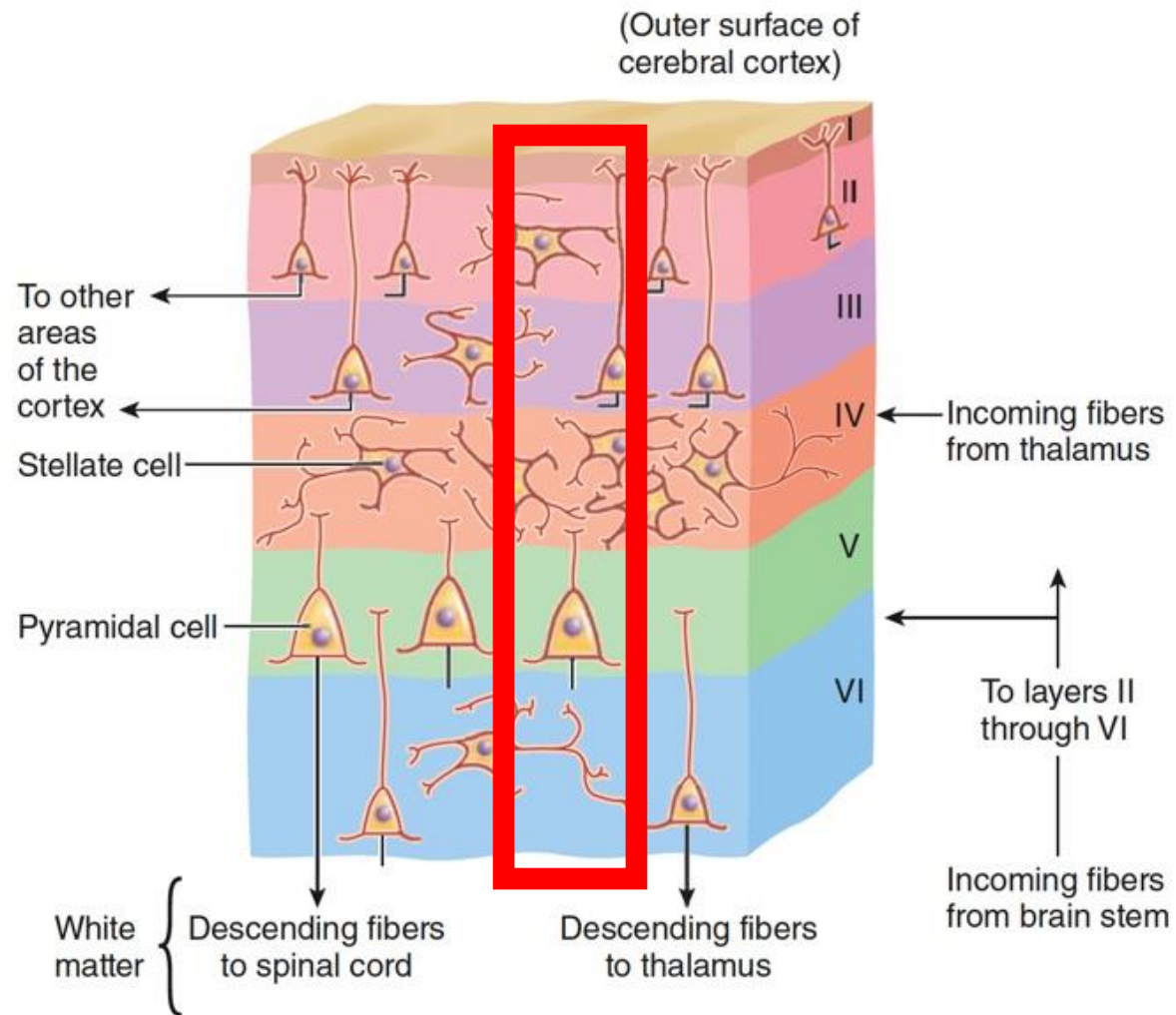
- The incoming sensory signal excites neuronal layer IV first; the signal then spreads toward the surface of the cortex and also toward deeper layers.
- Layers I and II receive diffuse, nonspecific input signals from lower brain centers that facilitate specific regions of the cortex.
- The neurons in layers II and III send axons to related portions of the cerebral cortex on the opposite side of the brain through the corpus callosum.
- The neurons in layers V and VI send axons to the deeper parts of the nervous system. Those in layer V are generally larger and project to more distant areas, such as to the basal ganglia, brain stem, and spinal cord, where they control signal transmission.
- From layer VI, especially large numbers of axons extend to the thalamus, providing signals from the cerebral cortex that interact with and help to control the excitatory levels of incoming sensory signals entering the thalamus.

Somatosensory cortex

- In the most anterior part of the postcentral gyrus, located deep in the central fissure in Brodmann's area 3A, an especially large share of the vertical columns responds to muscle, tendon, and joint stretch receptors.
- Many of the signals from these sensory columns then spread anteriorly, directly to the motor cortex located immediately forward of the central fissure.
- These signals play a major role in controlling the effluent motor signals that activate sequences of muscle contraction.







Somatosensory cortex function

- Widespread bilateral excision of somatosensory area I causes loss of the following types of sensory judgment:
 - 1. The person is unable to localize discretely the different sensations in the different parts of the body. However, he or she can localize these sensations crudely.
 - 2. The person is unable to judge critical degrees of pressure against the body.
 - 3. The person is unable to judge the weights of objects.
 - 4. The person is unable to judge shapes or forms of objects. This condition is called astereognosis.
 - 5. The person is unable to judge texture of materials.

Somatosensory cortex function

- In the specific absence of only somatosensory area I, appreciation of pain and temperature sensory modalities is still preserved both in quality and intensity.
- However, the sensations are poorly localized, indicating that pain and temperature localization depend greatly on the topographic map of the body in somatosensory area I to localize the source.

Thalamus

- When the somatosensory cortex of a human being is destroyed, that person loses most critical tactile sensibilities, but a slight degree of crude tactile sensibility does return.
- Therefore, it must be assumed that the thalamus (and other lower centers) has a slight ability to discriminate tactile sensation, even though the thalamus normally functions mainly to relay this type of information to the cortex.

Somatosensory association area

- When the somatosensory association area is removed on one side of the brain, the person loses the ability to recognize complex objects and complex forms felt on the opposite side of the body.
- In addition, the person loses most of the sense of form of his or her own body or body parts on the opposite side.
- When feeling objects, the person tends to recognize only one side of the object and forgets that the other side even exists. This complex sensory deficit is called amorphosynthesis.

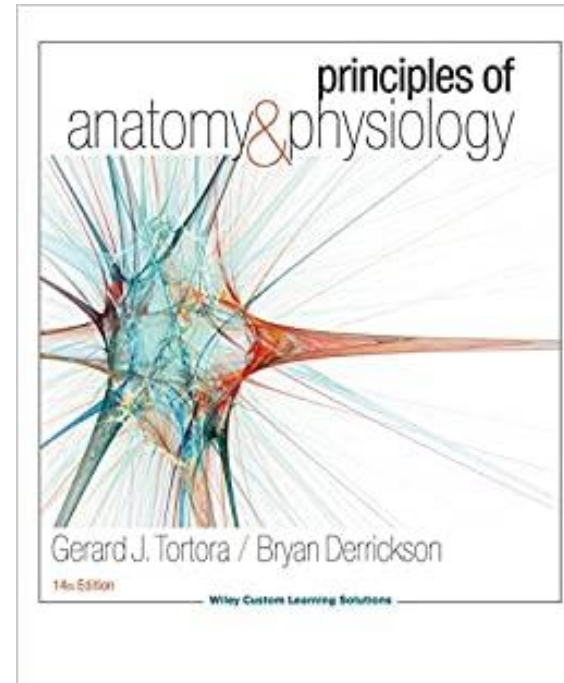
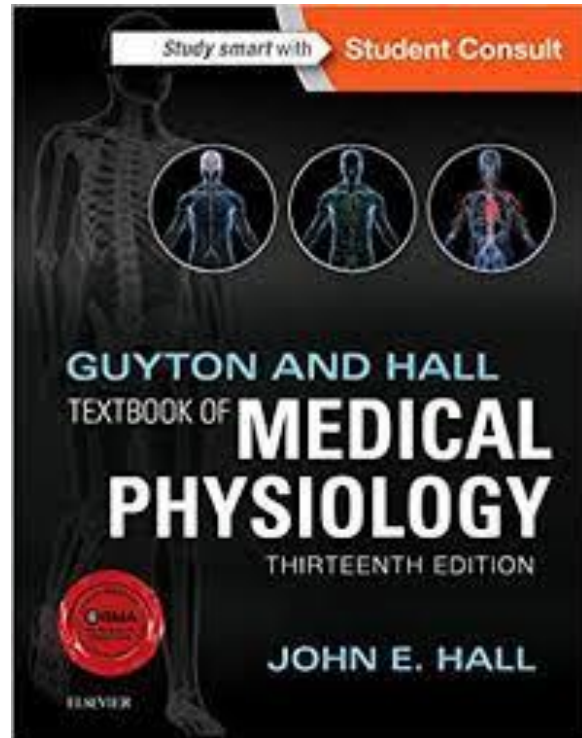
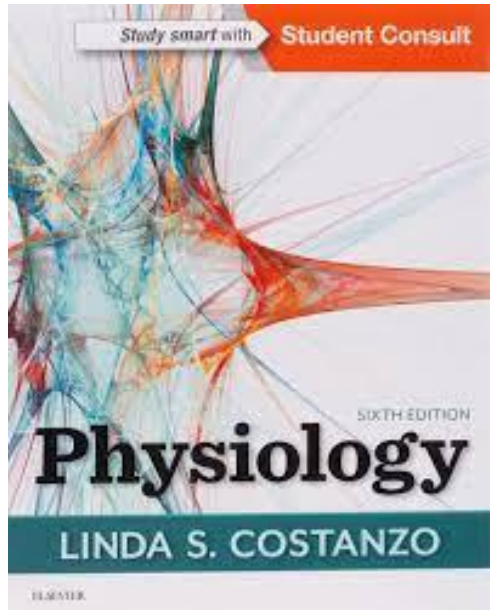
Physical examination of sensory function

- Introduce yourself.
- Take permission.
- Privacy and chaperon.
- Wash your hands before and after.
- Explain the procedure.
- Sternum as a reference.
- Close eyes.
- Distal to proximal.
- Compare both sides.

Physical examination of sensory function

- Light touch.
- Pain.
- Vibration (on bony prominences).
- Position sense.
- Two point discrimination.
- Stereognosis and graphaesthesia.
- Sensory inattention.

References



9TH
Edition

Human Physiology From Cells to Systems

Lauralee Sherwood
Department of Physiology and Pharmacology
School of Medicine
West Virginia University

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