

# Sensory System

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# THE SENSORY SYSTEM

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- Sensory receptors
- Neural pathway
- Parts of the brain

# Receptors

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- Transducers (energy → action potentials)
- Differential sensitivity of receptors
  - i. Rods and cones
  - ii. Osmoreceptors
- The Labeled Line Principle (Modality of sensation)
  - Type of sensation
  - Specific nerve fibers
  - Excitation of specific receptors
  - Specific point in the CNS.

# Modality of Sensation

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- **Q.** : How that different nerve fiber transmits different modalities of sensation??
- **Answer:** Each nerve tract terminates at a specific point in the CNS.
- i.e., stimulating pain fiber → person perceives pain regardless of what type of stimulus excites the fiber.

# Neural Pathway in the Sensory System

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- A **sensory pathway** is made up of a group of neuron chains.
- Each chain consists of three or more neurons connected end to end by synapse.
- 1<sup>st</sup>: enters spinal cord from periphery
- 2<sup>nd</sup>: crosses over (decussates), ascends in spinal cord to thalamus
- 3<sup>rd</sup>: projects to somatosensory cortex

# Sensory Units

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- Afferent neuron divides into many fine branches, each terminating at a receptor.
- Single neuron with all its receptors endings → sensory unit.
- Single receptor (few cases).

# The Receptive Field

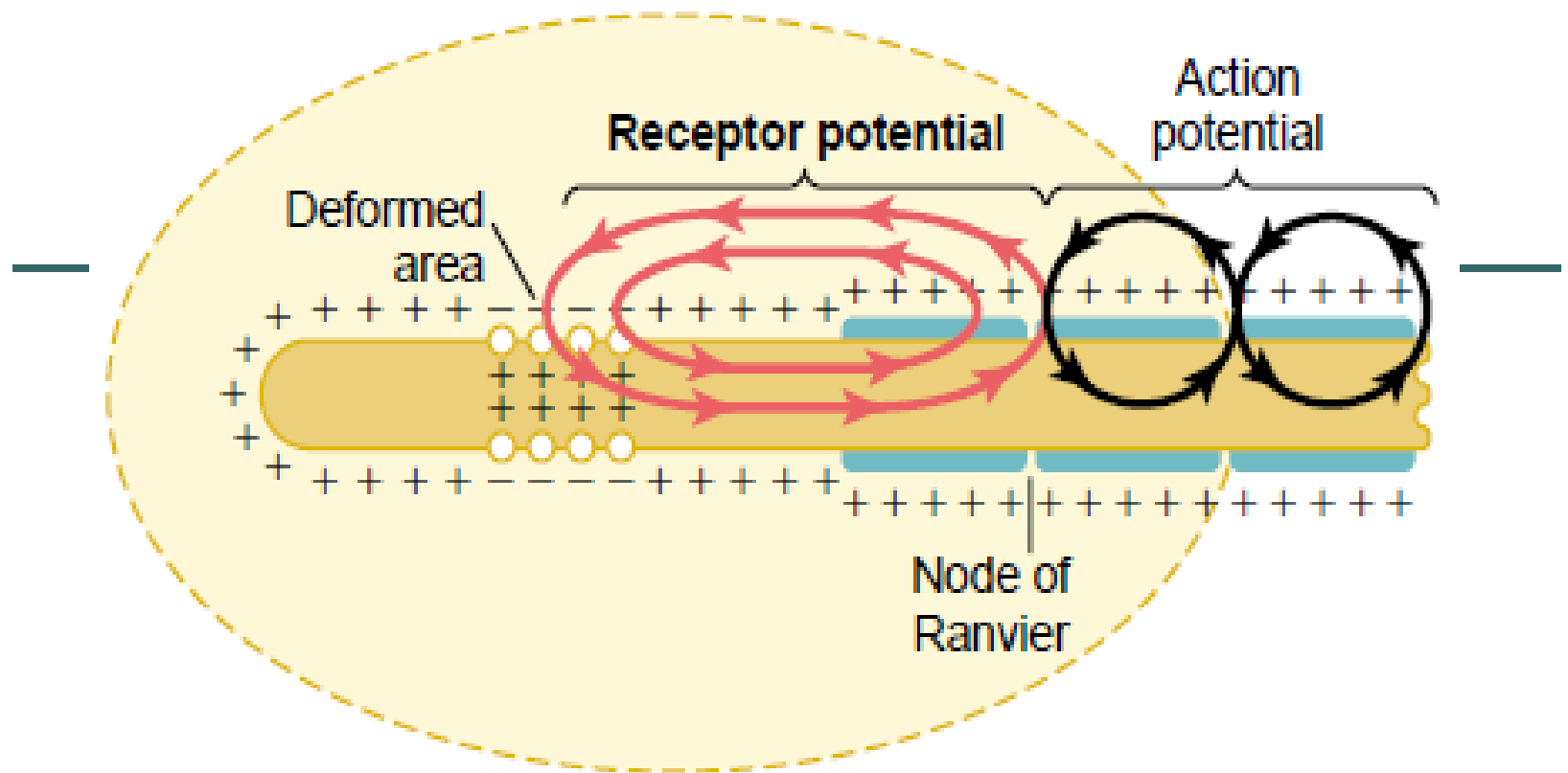
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- Portion of the body → stimulated → activity in a particular afferent neuron.
- Overlapping of receptor fields of neighboring afferent neurons.
- Activation of a single sensory unit (almost never occurs).

# Receptor potential

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- Stimulus → receptors excited → change membrane potential → immediate effect.
- Ways of excitation:
  - A. Mechanical deformation.
  - B. Chemical application.
  - C. Changing temperature.
  - D. Electromagnetic radiation.



**Figure 46-3**

Excitation of a sensory nerve fiber by a receptor potential produced in a pacinian corpuscle. (Modified from Loëwenstein WR: Excitation and inactivation in a receptor membrane. *Ann N Y Acad Sci* 94:510, 1961.)

# Somatic Sensation

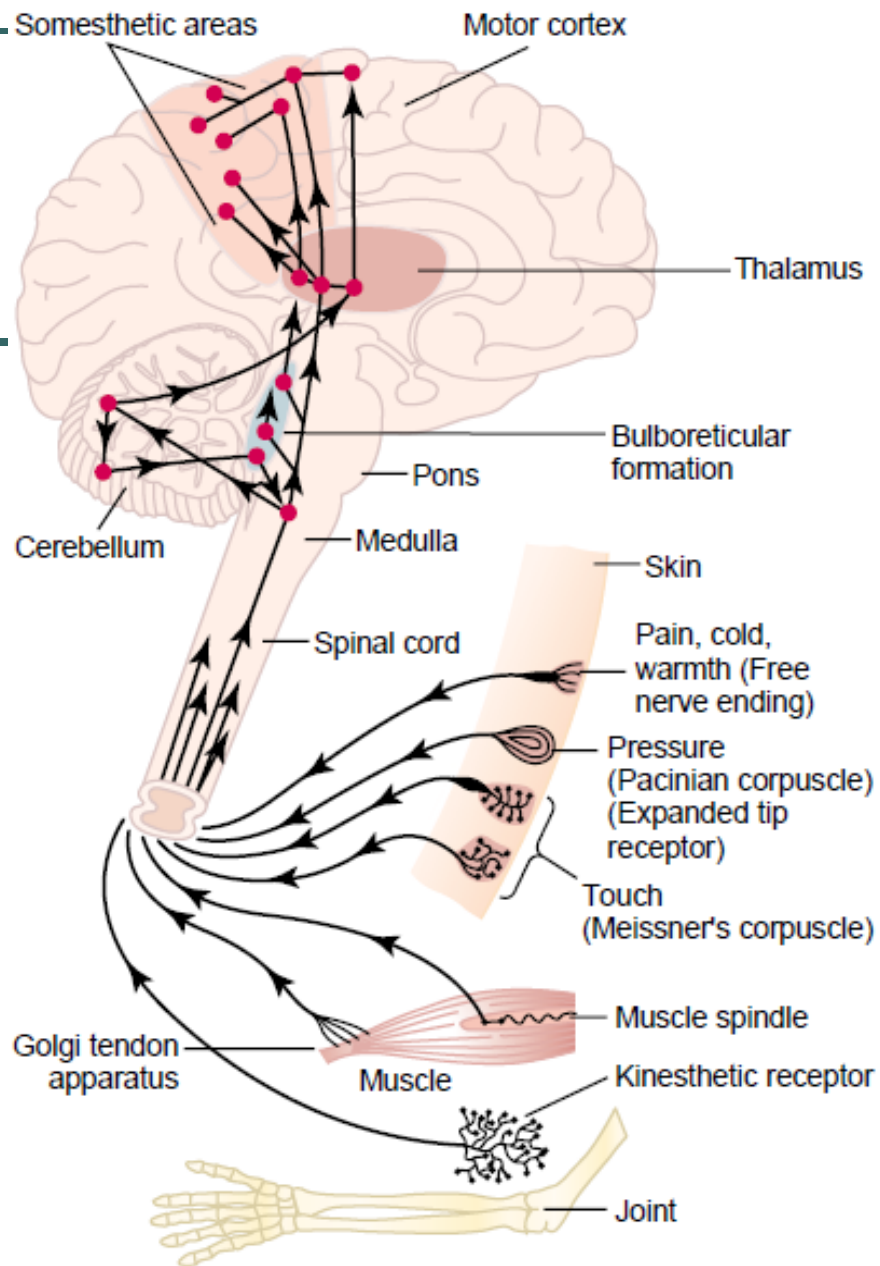
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- 3 physiological classes:
  - I. Mechanoreceptive Senses (Tactile and Position sensation)
  - II. Thermoreceptive Senses (heat and cold).
  - III. Pain Senses

# Somatic Sensation

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- Exteroceptive Sensation (body surface).
- Proprioceptive Sensation
  - i. Position, Tendon and muscle , Pressure sensations from bottom of the feet, Sensation of the equilibrium.
- Visceral Sensation (viscera).
- Deep sensation (deep tissues)
  - i. Deep pressure, Pain, Vibration sensation.



**Figure 45-2**

Somatosensory axis of the nervous system.