BHARATHIDASAN UNIVERSITY

Program: M.Sc., Biomedical Science

Course Title : Neurobiology

The Somatosensory Neurotransmission

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Neural Integration
The Somatosensory
Neurotransmission (pathways)

Touch,
Pain, and
Temperature

Somato = Body

Sensory = a physical feeling or perception

Sensations

Define sensation:

A state of awareness of a stimulus.

Awareness

When a stimulus is detected by the body; below the level of consciousness.

Such as a change in blood pressure or blood pH.

Perception

When a stimulus reaches consciousness; pain, hunger, thirst, sight, sound, etc.

Sensation vs Perception

Sensation: The detection of physical energy by our body sense organs, which relay this information to the brain; turning the signal to an electrical, neuronal signal.

Perception: The brain's interpretation of the sensation information; turning the electrical signal, into meaningful experience

➢Stimulus

• Anything capable of exciting a sensory receptor cell can be defined as a “stimulus”

Examples include: sound, light, heat, cold, odor, color, touch, and pressure

➢Which can generate Stimulus

• Any change in the environment, either internal or external, can generate a stimulus.

➢Neuro Receptor

A structure which detects a stimulus and converts it into an action potential

Sense organs operate through sensory receptor cells that receive external forms of energy (Environmental sensation) and translate these external forms into neural impulses that can be transmitted to the brain.

• Sensory receptors may convey information to the CNS with awareness or perception

• Sensory receptors also serve as afferent pathways for reflex action with or without conscious sensation.

Afferent Division of the Nervous System & location in CNS

- Sensory Receptors
- Sensory neurons
- Sensory pathways
  - There are many **sensory receptors that relay information** about the internal and external environment to the CNS but do not reach consciousness

Afferent Division – location in CNS

1. Somatic Sensory info
   - Sensory cortex of cerebrum
   - Cerebellum
2. Visceral Sensory info
   - Reflex centers in brainstem
   - Reflex centers in diencephalon

The somatic sensory system

- Sensory stimuli that reach the conscious level of perception
- Specialized cells that monitor specific conditions in the body or external environment
- General Senses:
  - Temp, pain, touch, pressure, vibration, proprioception
  - Simple receptors located anywhere on body
- Special Senses:
  - Are located in sense organs such as the eye or ear
  - Olfaction, vision, gustation, hearing, equilibrium
  - Complex receptors located in specialized sense organs

General Properties: Sensory Division

TABLE 10-1 Information Processing by the Sensory Division

STIMULUS PROCESSING IS USUALLY CONSCIOUS	
SPECIAL SENSES	SOMATIC SENSES
Vision	Touch
Hearing	Temperature
Taste	Pain
Smell	Itch
Equilibrium	Proprioception

Table 10-1 (1 of 2)

Cortical Sensory Areas

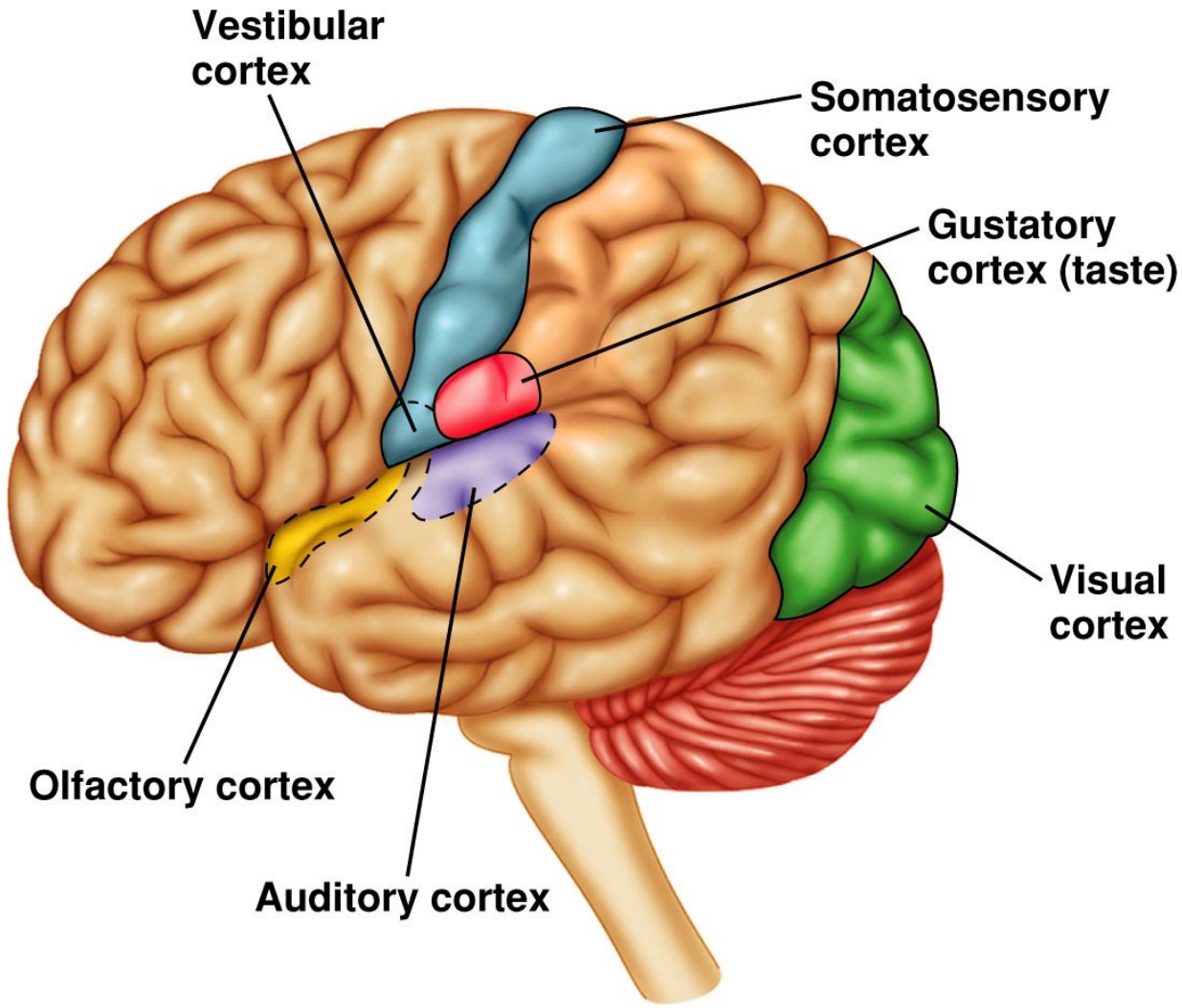
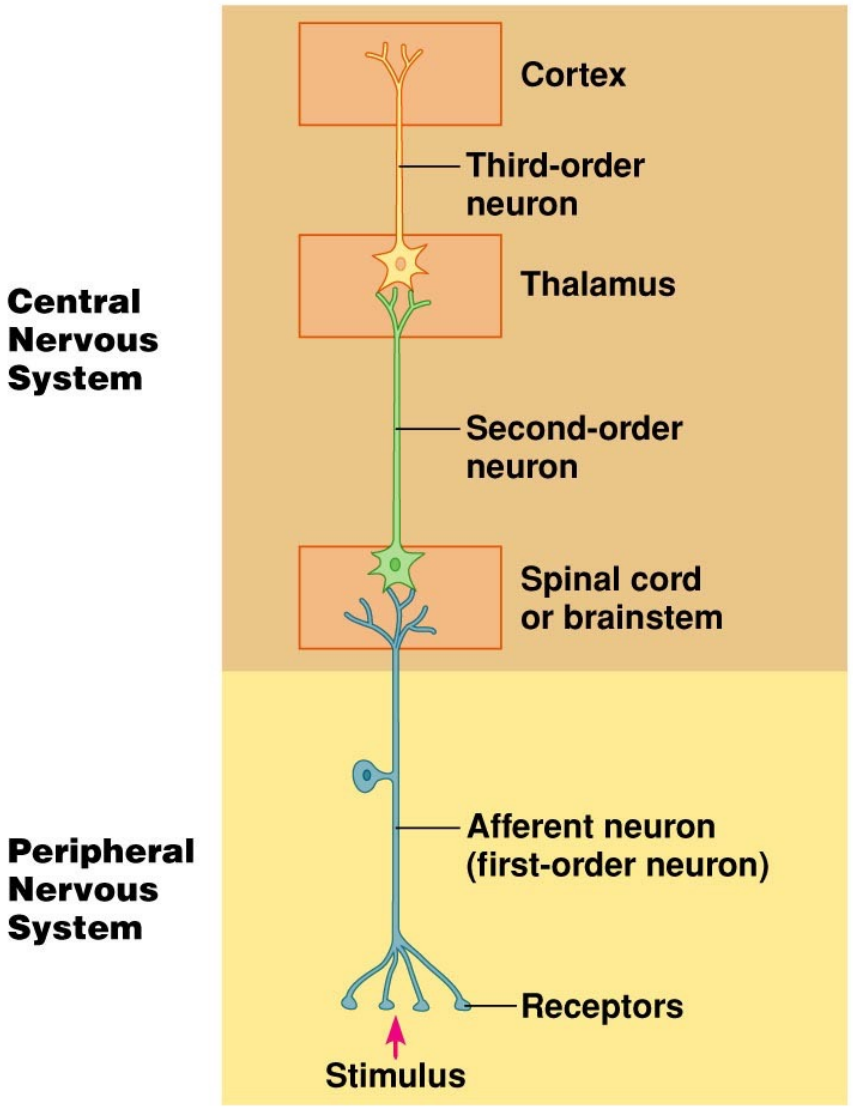
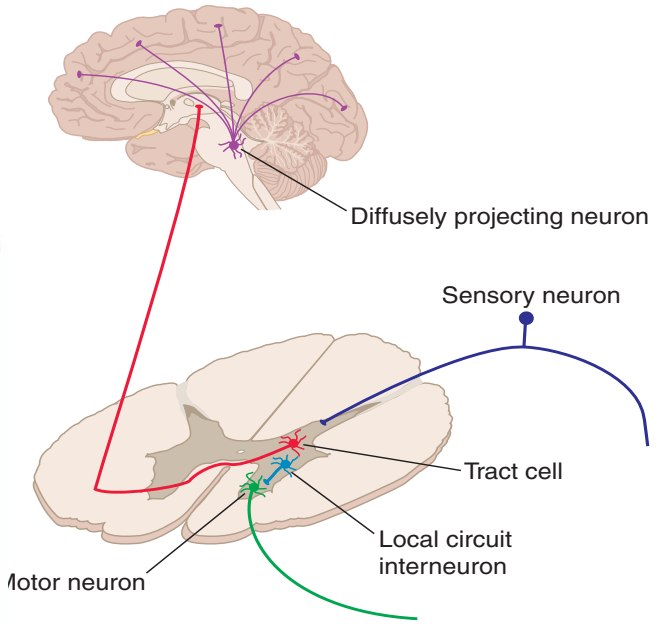
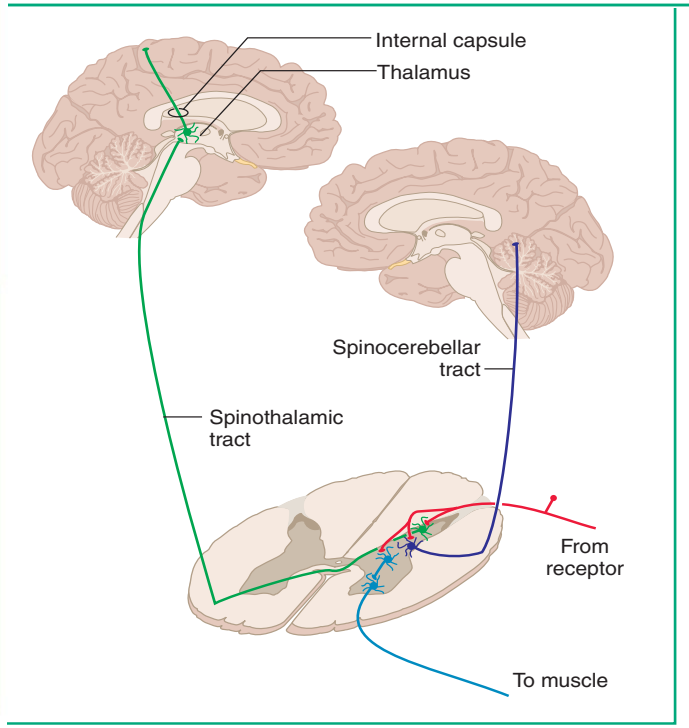


Figure 10.4

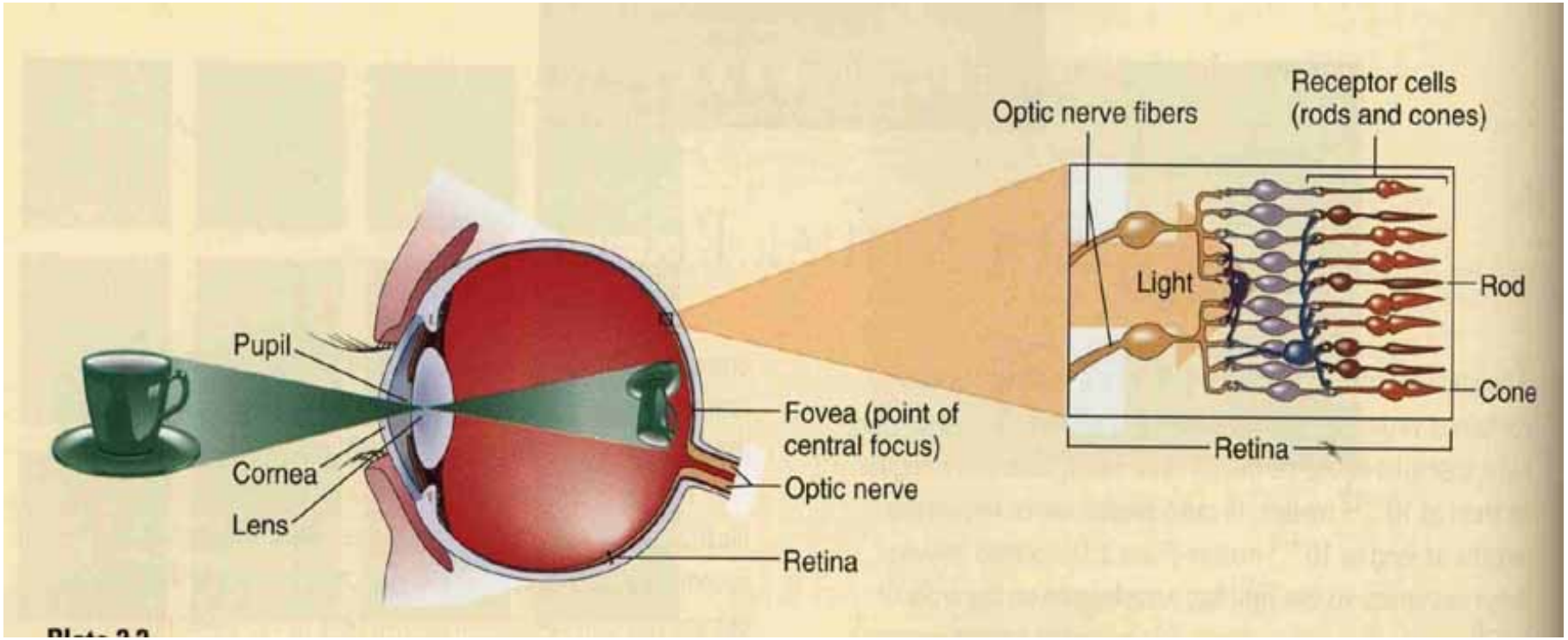
General Sensory Pathway







From Sensation to Perception



Sensory Pathways – from sensation to perception

- Stimulus as physical energy → sensory **receptor**
  - Receptor acts as a *transducer*
  - Transduction – conversion of environmental stimulus into action potential by sensory receptor
  - Receptors specific for particular type of stimulus
  - Specificity is due to structure of receptor

- Intracellular signal → usually change in membrane potential
- Stimulus → threshold → action potential to CNS
- Integration in **CNS** → cerebral cortex or acted on subconsciously

From Sensation to Perception

- A stimulus is a change in the environment that is detected by a receptor
- Sensation: the awareness of changes in the internal and external environment
- Perception: the conscious interpretation of those stimuli