SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai

DEPARTMENT OF PHYSICIAN ASSISTANT

COURSE NAME : NEUROLOGY

UNIT : SENSORY SYSTEM AND MOTOR SYSTEM

TOPIC : SENSORY SYSTEM

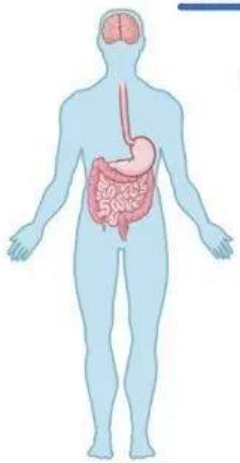
FACULTY NAME : Ms. SINEKA M

INTRODUCTION (Define)

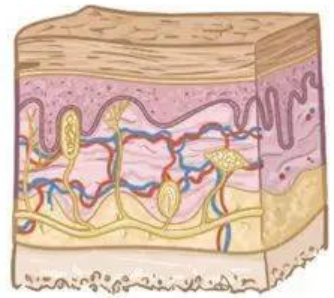
- The sensory system is functionally organized to **detect, encode, and interpret stimuli** from the environment to produce perception.
- Sensory stimuli are first detected by specialized receptors that **convert physical energy into neural signals,** which are then encoded and transmitted to the brain for processing.

SENSORY SYSTEM

GENERAL SENSES



- RECEPTORS ALL OVER BODY
  - ~ TOUCH
  - ~ PRESSURE
  - ~ POSITION
  - ~ PAIN



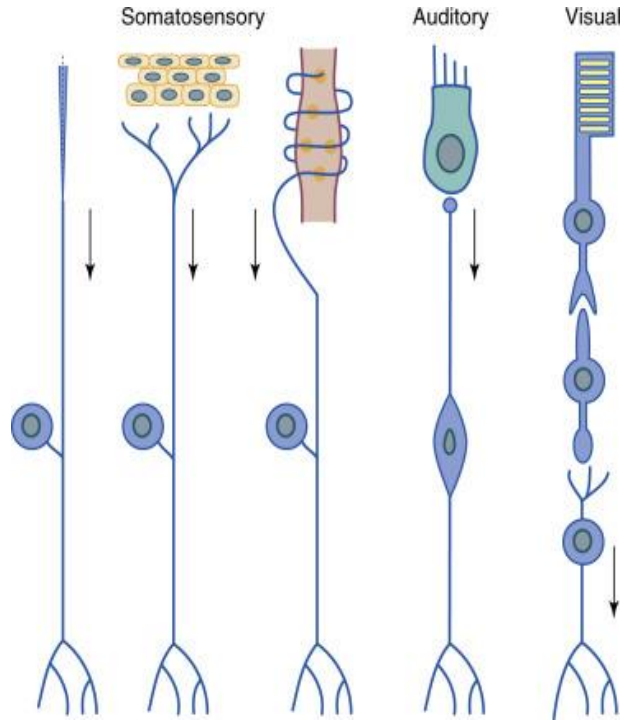
SPECIAL SENSES

- SPECIALIZED ORGANS
  - ~ TASTE
  - ~ SMELL
  - ~ SIGHT
  - ~ HEARING
  - ~ BALANCE

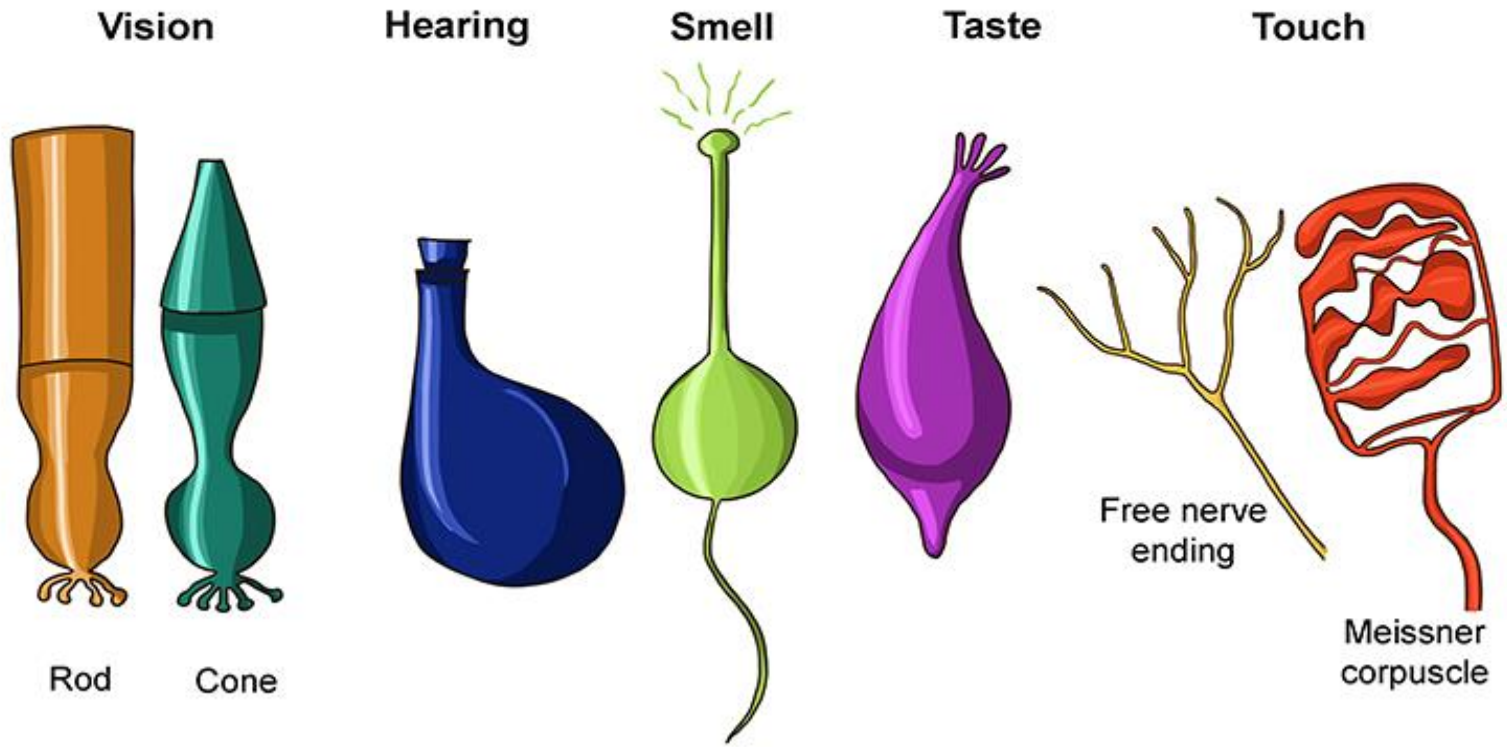
* AGING → CHANGES in SPECIAL SENSES
  - └ DECREASE CLIENTS' APPETITE

FUNCTIONAL ORGANIZATION

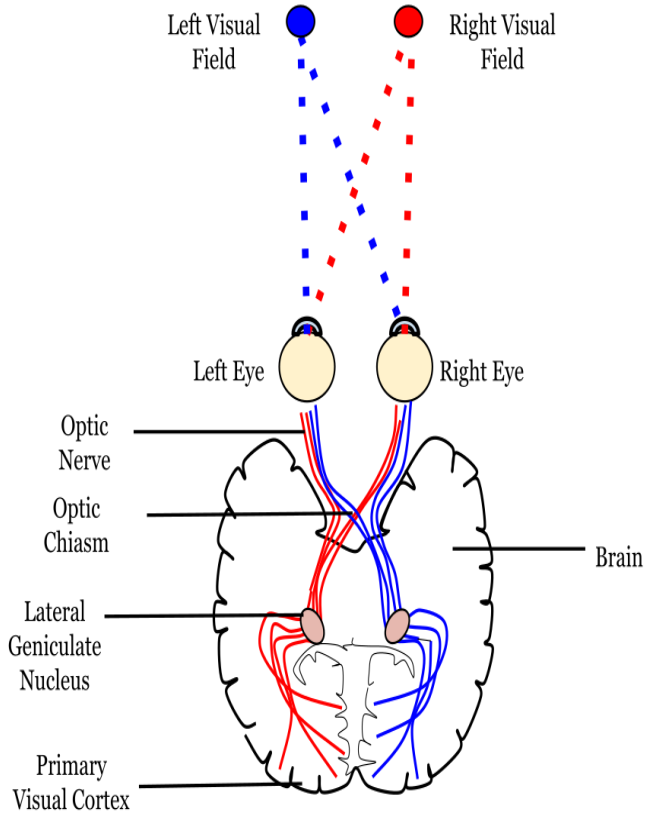
- **Sensory Receptors:** Specialized cells or free nerve endings that detect specific internal or external stimuli (e.g., light, pressure, chemicals, temperature).
- Receptors are classified by the stimulus they detect (mechanoreceptors, chemoreceptors, photoreceptors, thermoreceptors, nociceptors) and exhibit specificity, responding best to a single type of stimulus.



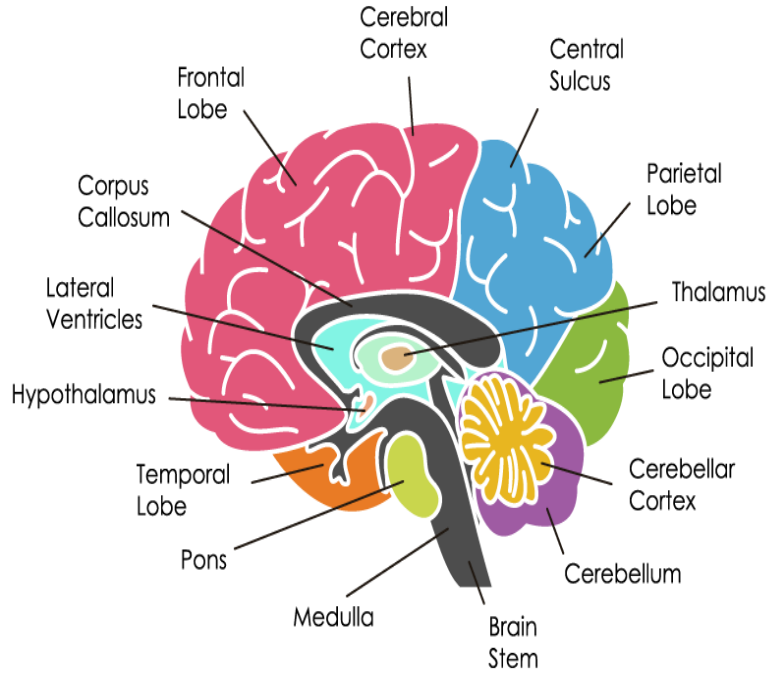
Sense Organ Receptors



- **Neural Pathways:** Afferent neurons transmit the electrical signals from the receptors to the central nervous system (CNS).
- These pathways are generally "labeled lines," meaning activity in a specific nerve fiber type consistently signals a particular sensory modality to a designated brain area.
- Most pathways (except olfaction) relay through the **thalamus** before reaching the cerebral cortex.

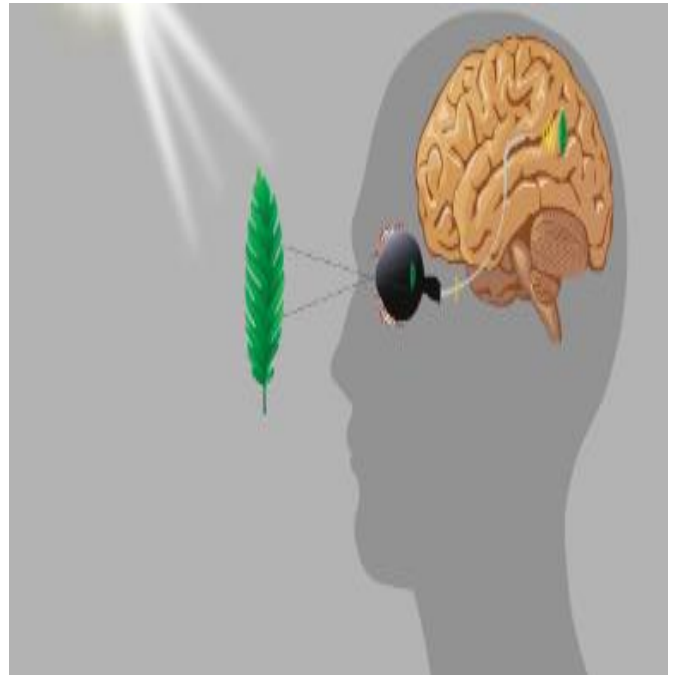


- **Brain Processing Centers:** Specific regions of the cerebral cortex (e.g., somatosensory cortex, visual cortex, auditory cortex) receive and process the relayed information.
- Integration of information from different senses occurs in association areas to form a complete, meaningful perception.



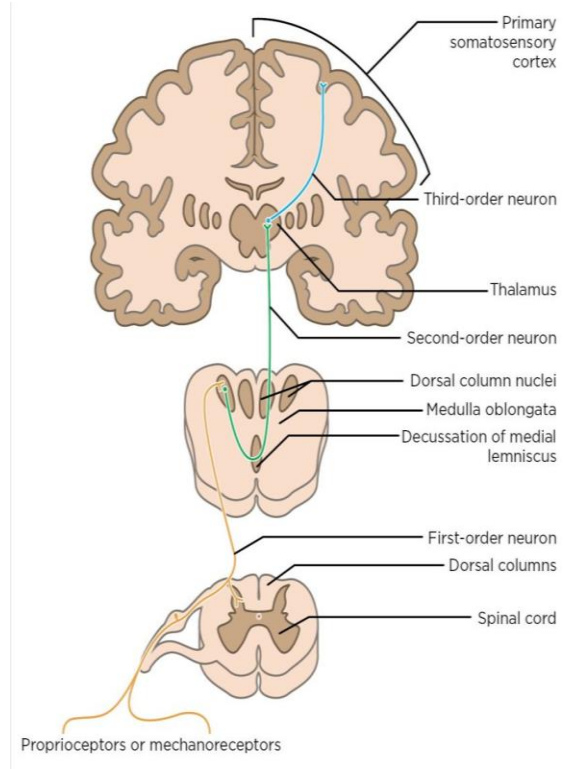
PERCEPTION OF SENSORY STIMULI & CODING

- **Sensation** is the initial activation of sensory receptors, while **perception** is the complex process of the brain organizing and interpreting these sensory inputs into a meaningful conscious experience.

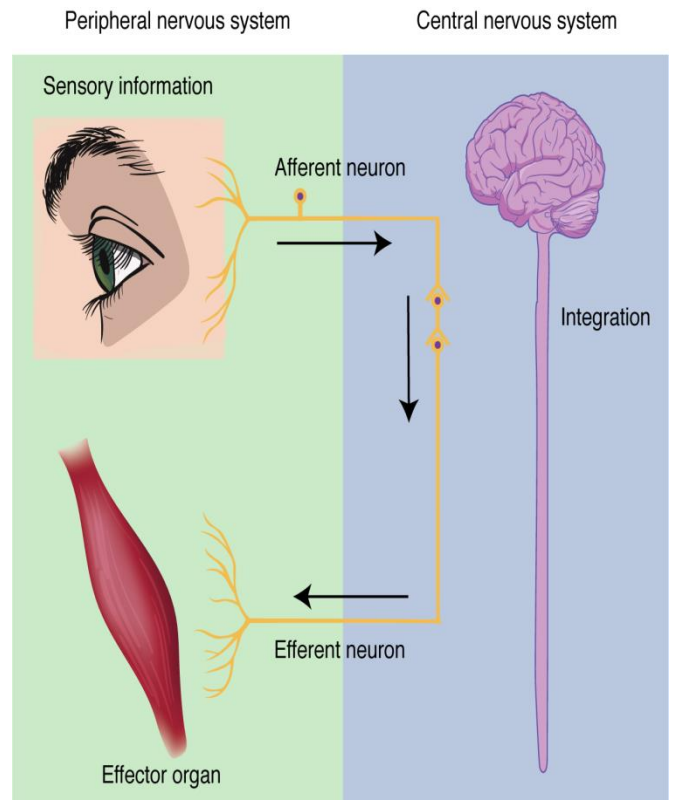


- Sensory systems encode four key aspects of a stimulus:

- **Modality (Type):** The brain distinguishes stimulus type based on which labeled line (specific pathway) the signal travels along.
- **Intensity:** A stronger stimulus produces a higher frequency of action potentials in the afferent neuron and activates a larger number of receptors.



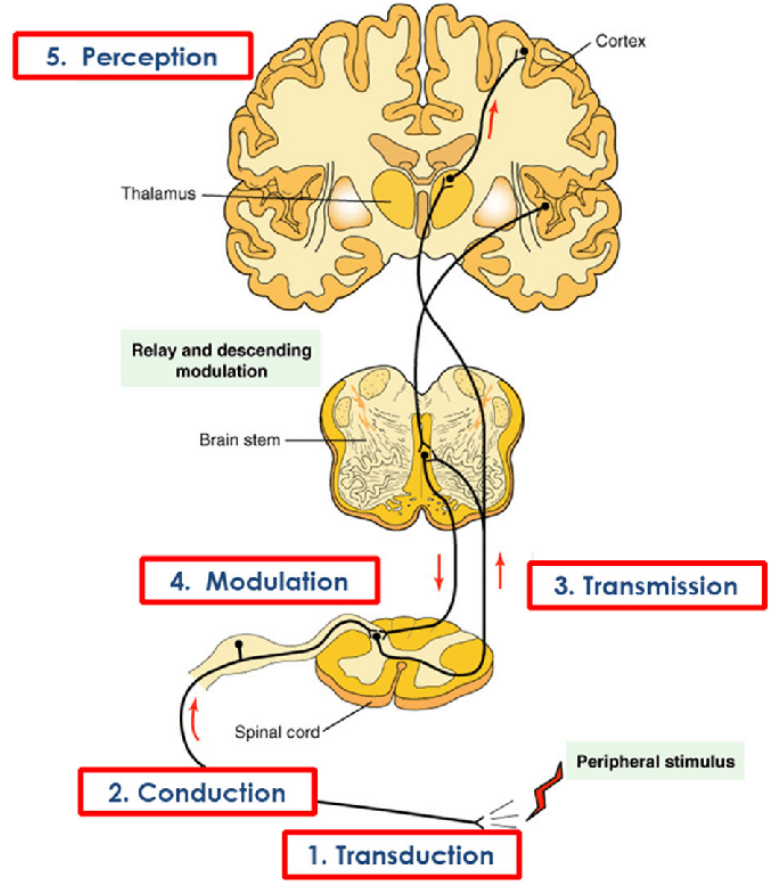
- **Location:** The brain identifies the location based on the receptive field of the activated neuron and the topographical organization of the sensory cortex.
- **Duration:** The adaptation properties of receptors (rapidly vs. slowly adapting) signal how long a stimulus lasts or its changes over time.

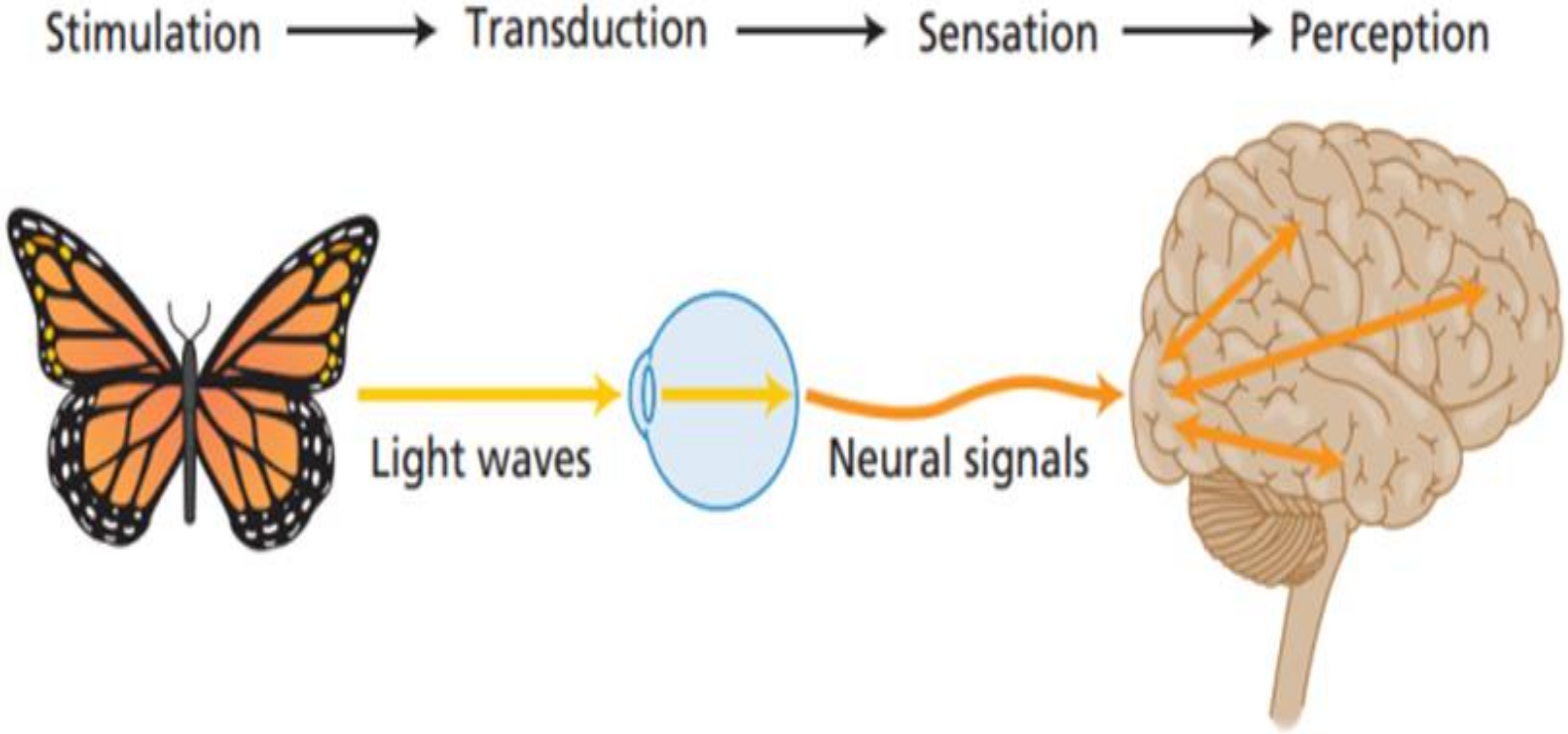


PHYSIOLOGY OF PAIN (NOCICEPTION)

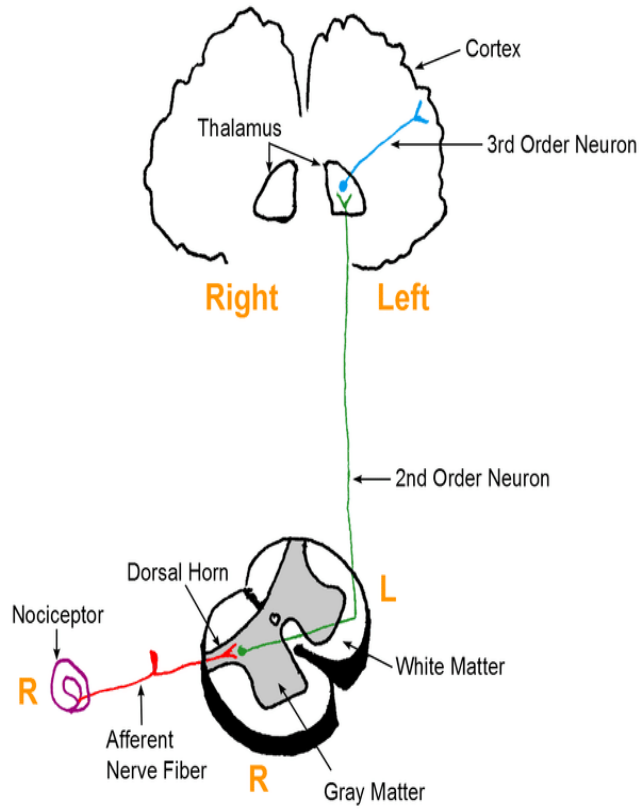
Pain is the perception of potentially damaging (noxious) stimuli and involves four major physiological processes:

- **Transduction**
- **Transmission**
- **Modulation**
- **Perception**

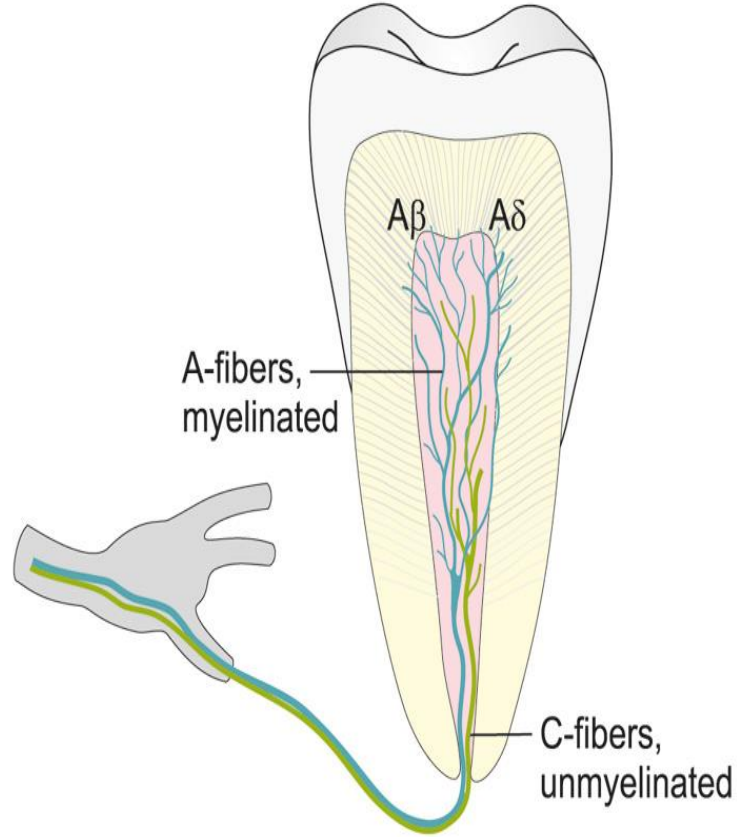



Stimulation
Transduction
Sensation
Perception
Light waves
Neural signals

- **Transduction:** Specialized free nerve endings called **nociceptors** convert intense mechanical pressure, extreme temperatures, or noxious chemicals released from damaged tissues into electrical signals.
- **Transmission:** These signals are carried to the spinal cord via two types of afferent nerve fibers:

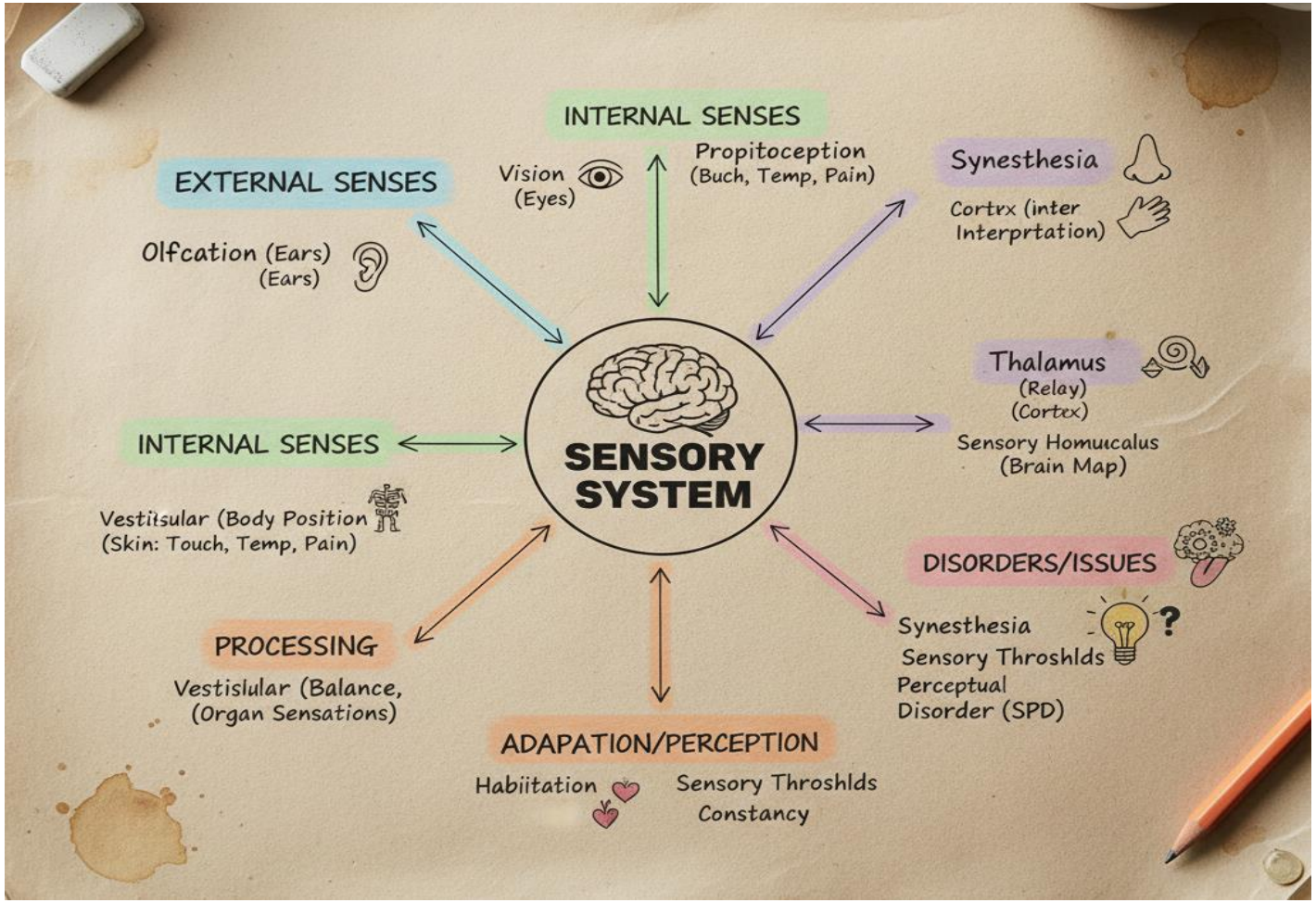


- **A-delta fibers:** Myelinated, faster-conducting fibers that transmit sharp, "first" pain.
- **C-fibers:** Unmyelinated, slower fibers responsible for dull, aching, "second" pain.
- The signals then ascend the spinal cord via pathways like the spinothalamic tract.



- **Modulation:** The pain signal can be amplified or suppressed at various levels of the nervous system, including the spinal cord and descending pathways from the brainstem.
- **Perception:** The signal reaches the brain, where it is processed in the somatosensory cortex and other areas like the limbic system, resulting in the subjective experience of pain.

SUMMARY


INTERNAL SENSES
Propitoception
(Buch, Temp, Pain)
EXTERNAL SENSES
Vision
(Eyes)
Synesthesia
Cortrx (inter
Interprtation)
Olfcation (Ears)
(Ears)
Thalamus
(Relay)
(Cortex)
Sensory Homuicalus
(Brain Map)
SENSORY
SYSTEM
INTERNAL SENSES
Vestitsular (Body Position
(Skin: Touch, Temp, Pain)
DISORDERS/ISSUES
Synesthesia
Sensory Throshlds
Perceptual
Disorder (SPD)
PROCESSING
Vestislular (Balance,
(Organ Sensations)
ADAPATION/PERCEPTION
Habiitation
Sensory Throshlds
Constancy

References

- https://www.geeksforgeeks.org/biology/sensory-perception/
- https://www.ncbi.nlm.nih.gov/books/NBK219252/
- https://www.frontiersin.org/journals/computational-neuroscience/articles/10.3389/fncom.2025.1771109/full