



Senses: General concepts

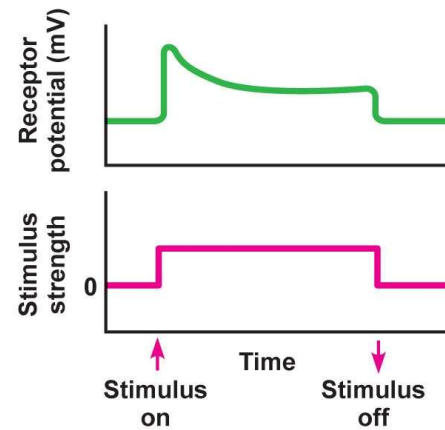
12.3.2024

Learning outcomes

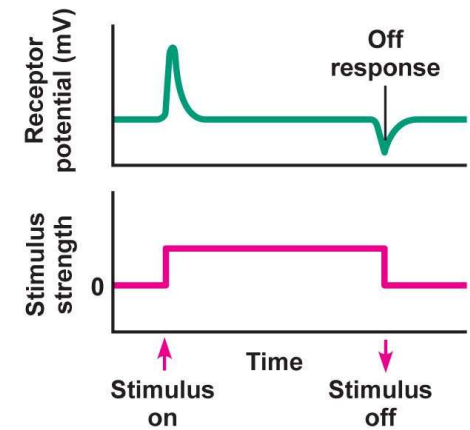
- Recognize the anatomical structures and general physiological principles related to senses
- Understand the essential physiological features related to touch, equilibrium, hearing, vision, smell, and taste
- Comprehend dizziness as an example of the interaction and supporting functions provided by different senses

General concepts related to senses

- Information of the environment, own body, and of their relationship
- Receptors transform the information to electrical nerve signals
- Receptors are either specialized cells or free nerve endings
- Change more important than the amount of stimuli → continuous stimulation results in *adaptation*



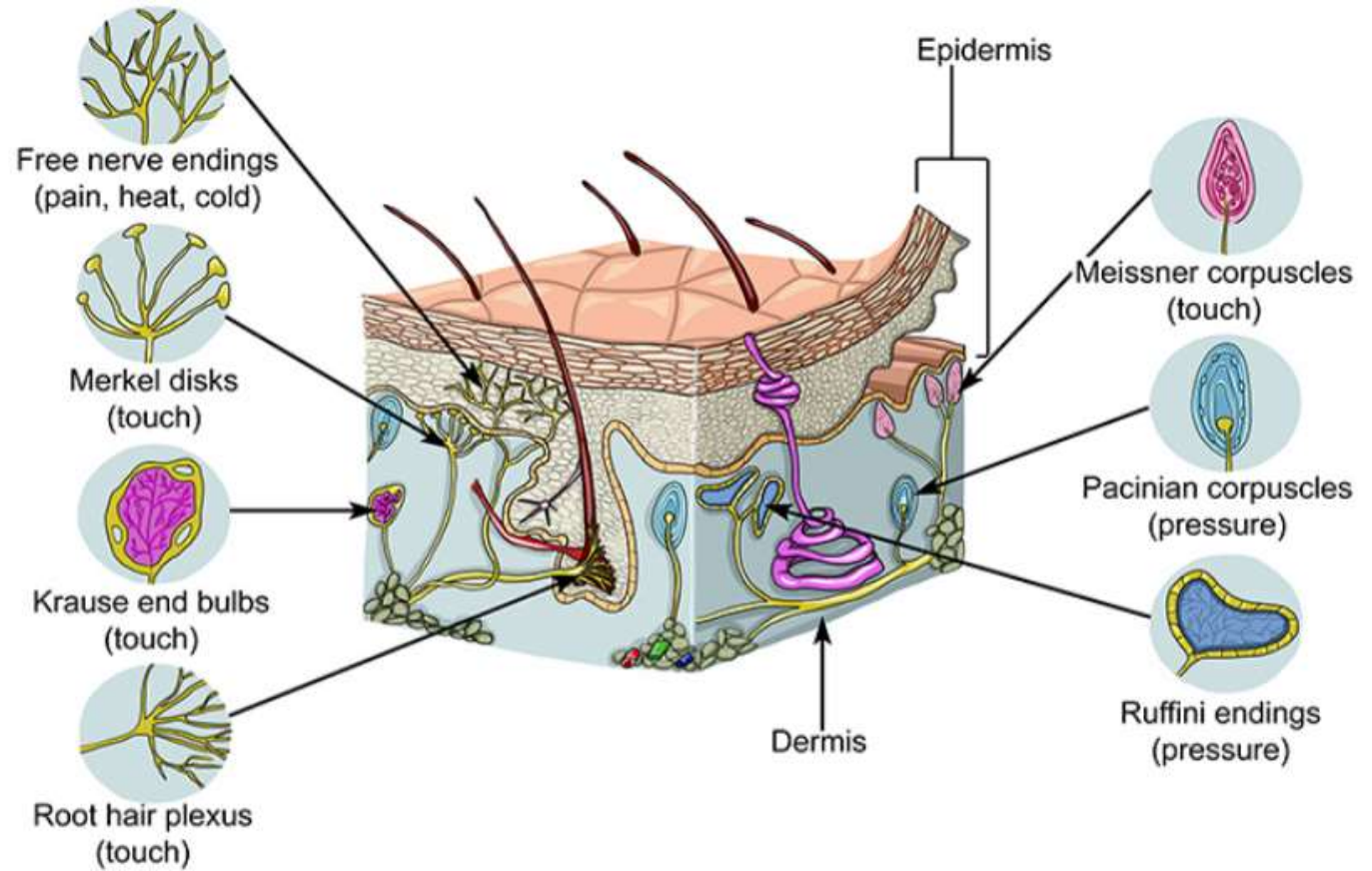
(a) Slowly adapting receptors



(b) Rapidly adapting receptors

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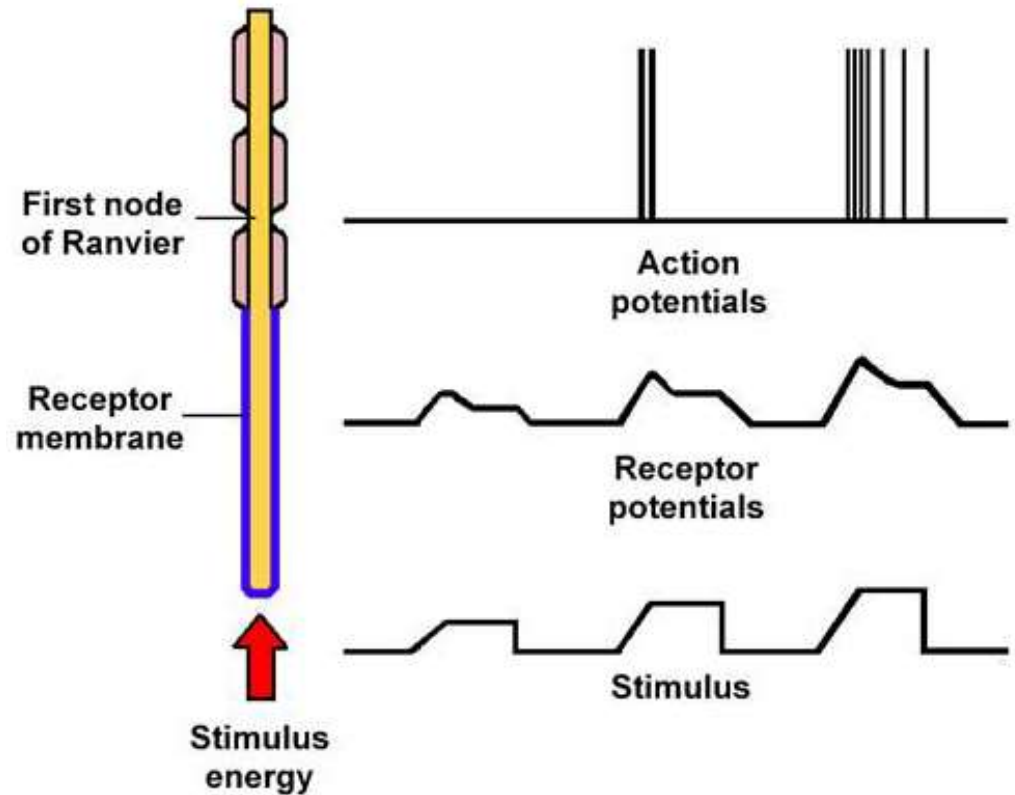
Free nerve endings vs. special receptors



Reddit.com

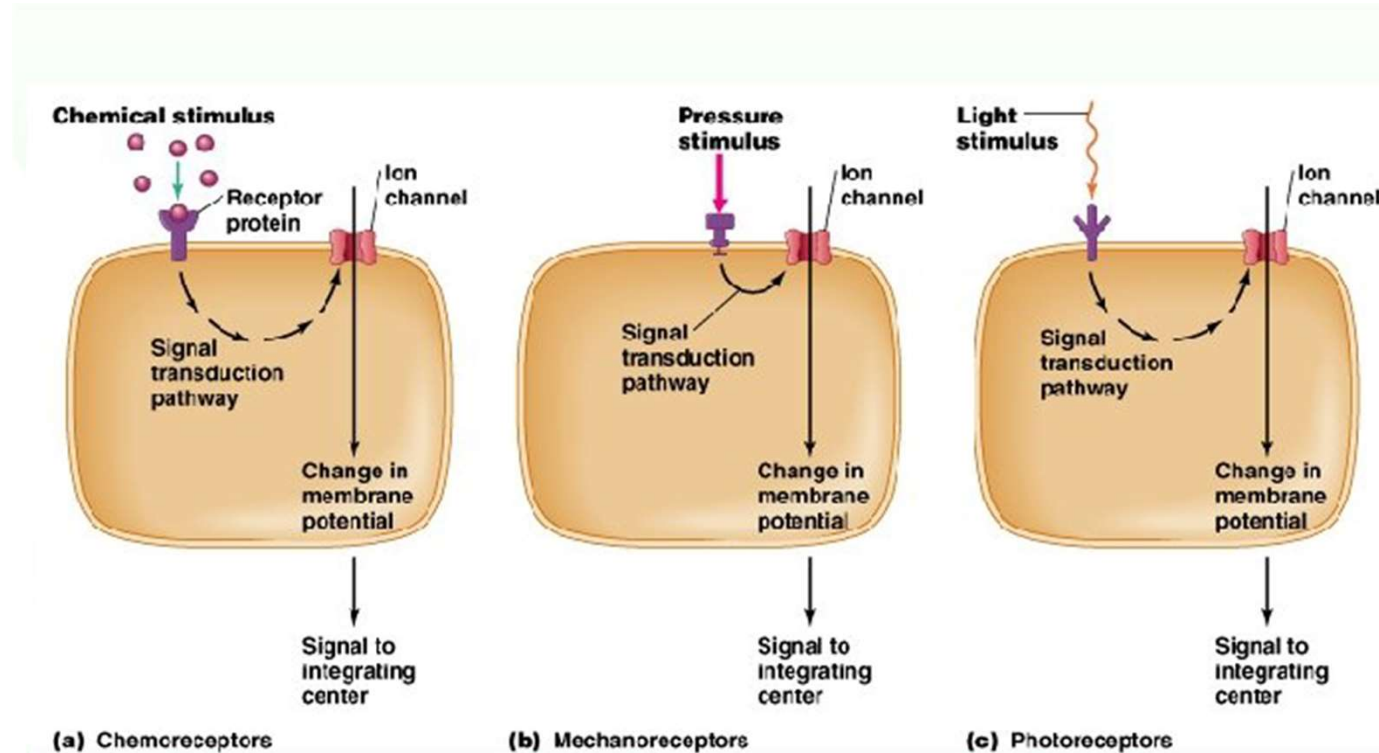
Receptor potential

- Stimulus suitable for the receptor → cell membrane's ion permeability changes → depolarisation
- Local change vs. travelling action potential
- “More or less” vs. “everything or nothing”

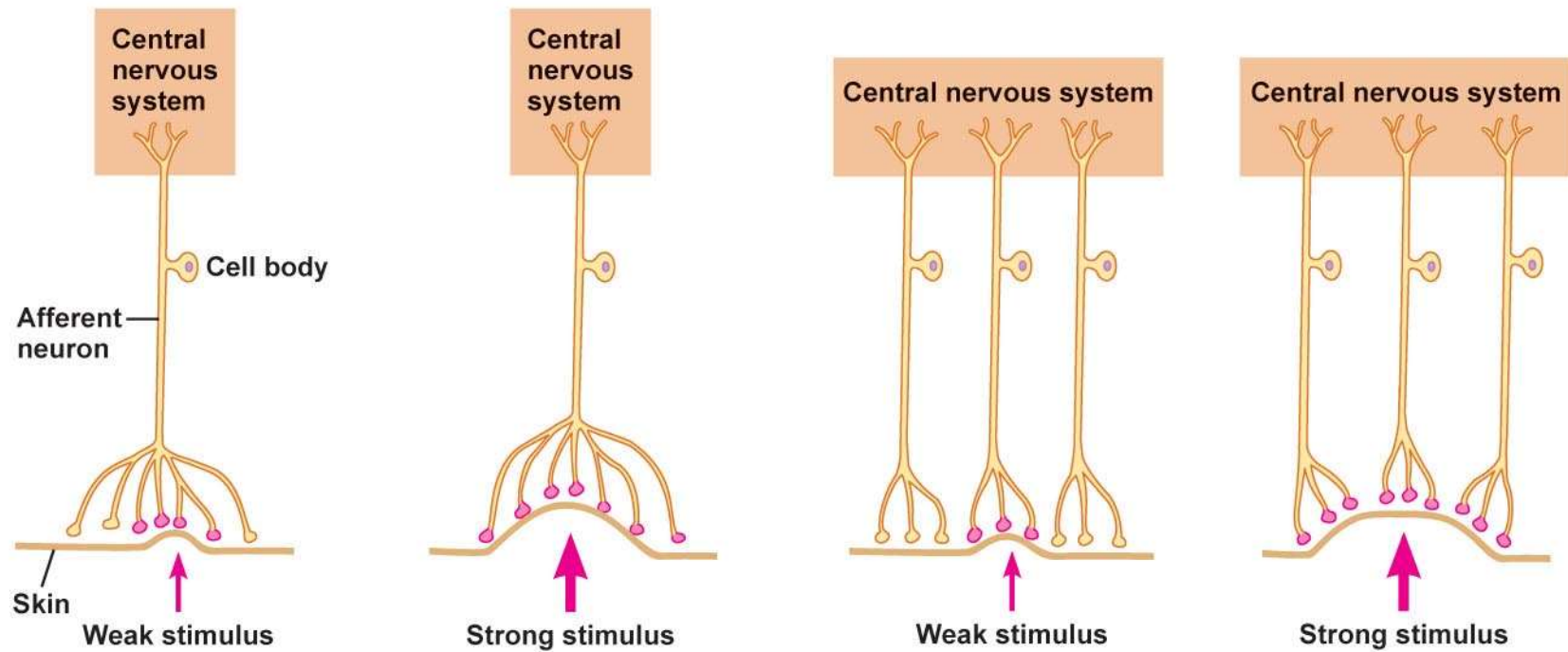


Receptors are sensitive to certain type of stimuli

- E.g., electromagnetic radiation for vision, sound waves for hearing
- Mechanical (touch, pressure, hearing), chemical (sense, taste), thermal (heat, cold), electromagnetic (vision) senses
- Non-adequate stimulus can also sometimes produce a sensation: e.g., blow in the eye → visual sensation



Interpretation of stimulus intensity

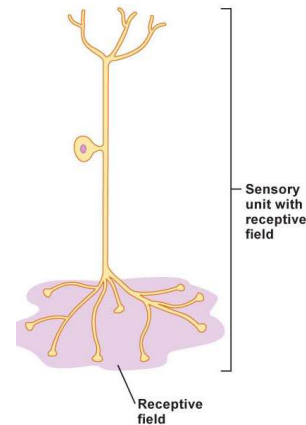


(a) Single sensory unit stimulated

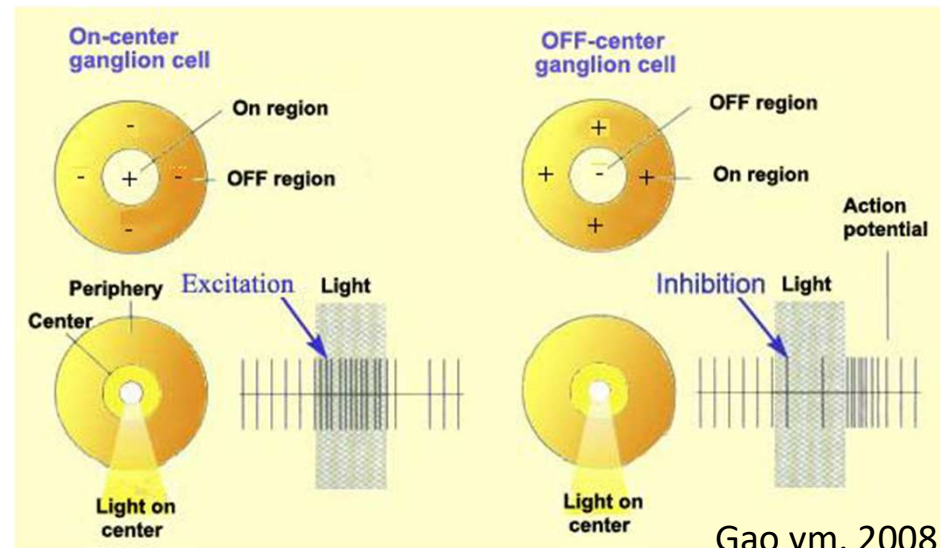
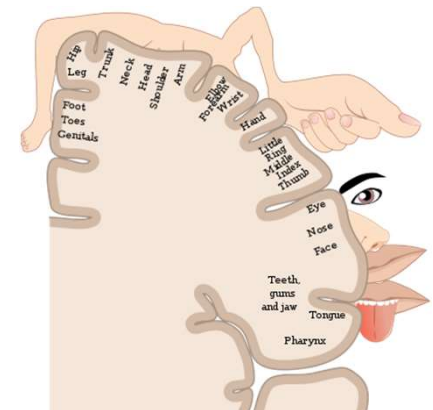
(b) Multiple sensory units stimulated

Receptive field

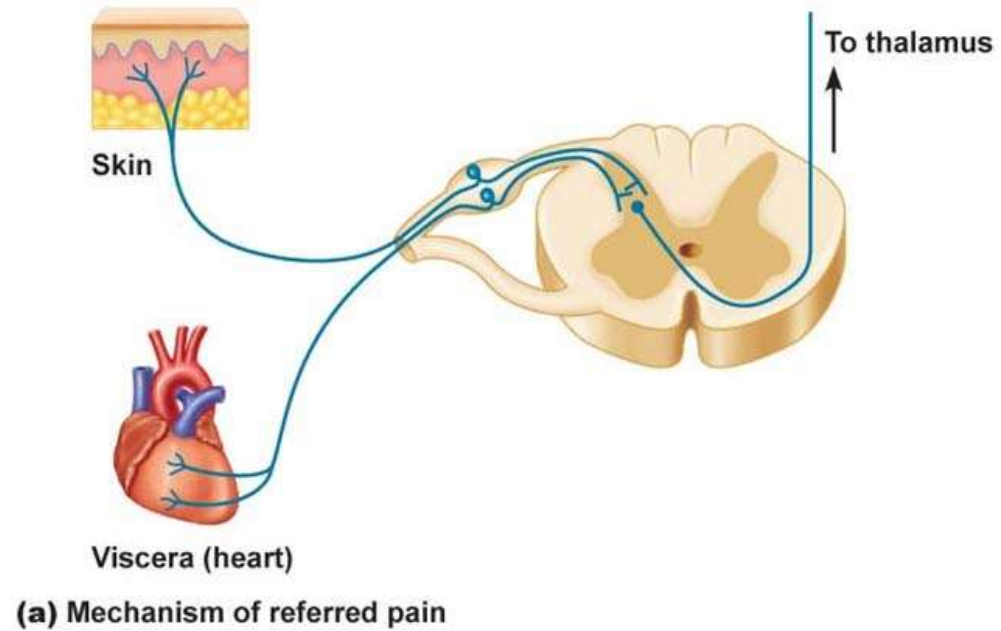
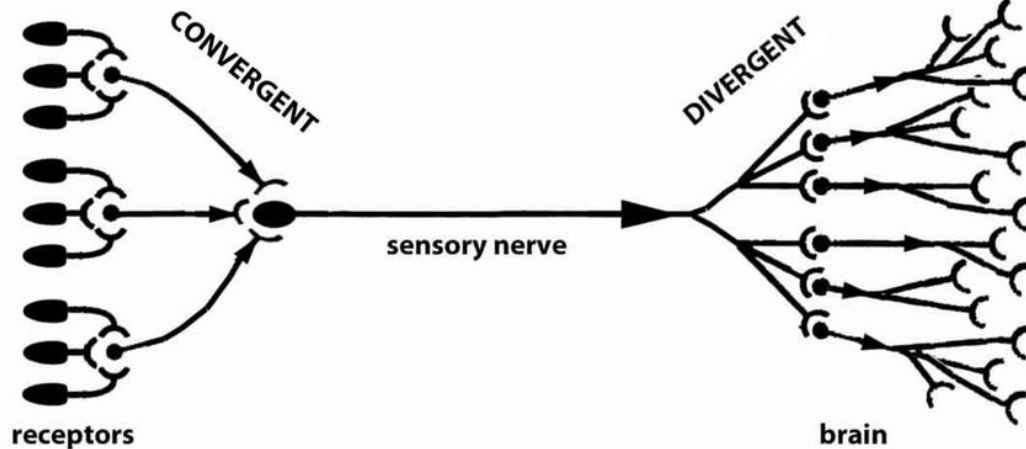
- Region from which a nerve cell can be influenced
- Small in fingertip, large in the back
- Vision: on-off –fields of the cells mediate contrast sensitivity
- Hearing: cell's receptive field is the set of frequencies to which the cell responds to



droualb.faculty.mjc.edu/



Sensory pathways show both convergence and divergence



Nilsson, 2014

<https://www.d.umn.edu/>

Information is modified along the sensory pathways

- Usually 3 successive nerve cells: receptor → spinal cord/brain stem → thalamus → cerebral cortex
- Most of the tracts cross (only small part of smell tracts, ~50% visual tracts)
- Impulses along the tract can produce phantom sensations

