

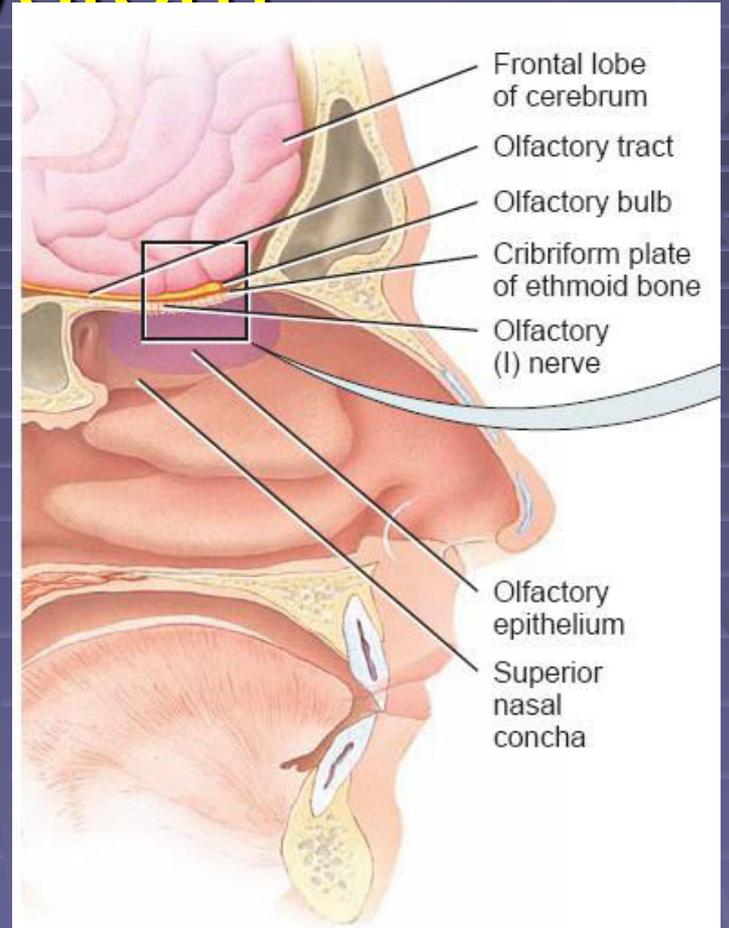
# The Special Senses

**The chemical sensations  
i.e Olfaction & gustation**

# Definitions

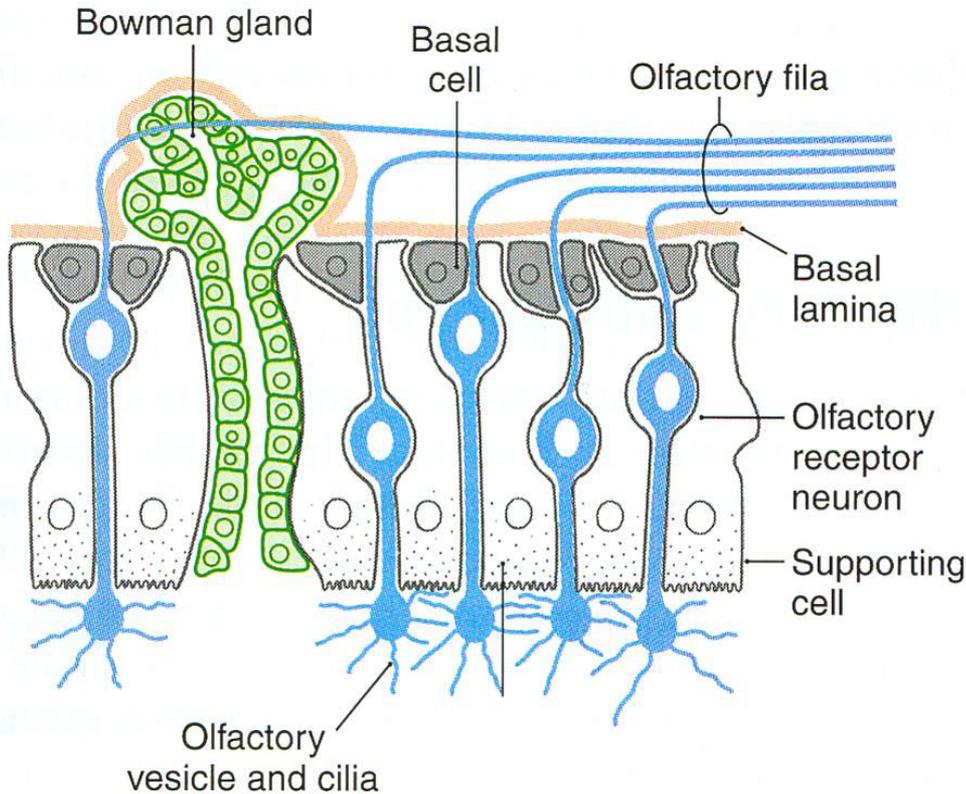
- Olfaction: The ability to sense odors through the detection of substances which have been aerosolized into the environment.
- Gustation: The sensation which is produced by the interaction of taste receptors with solubilized chemical stimuli in the oropharyngeal cavity.

# Olfactory System



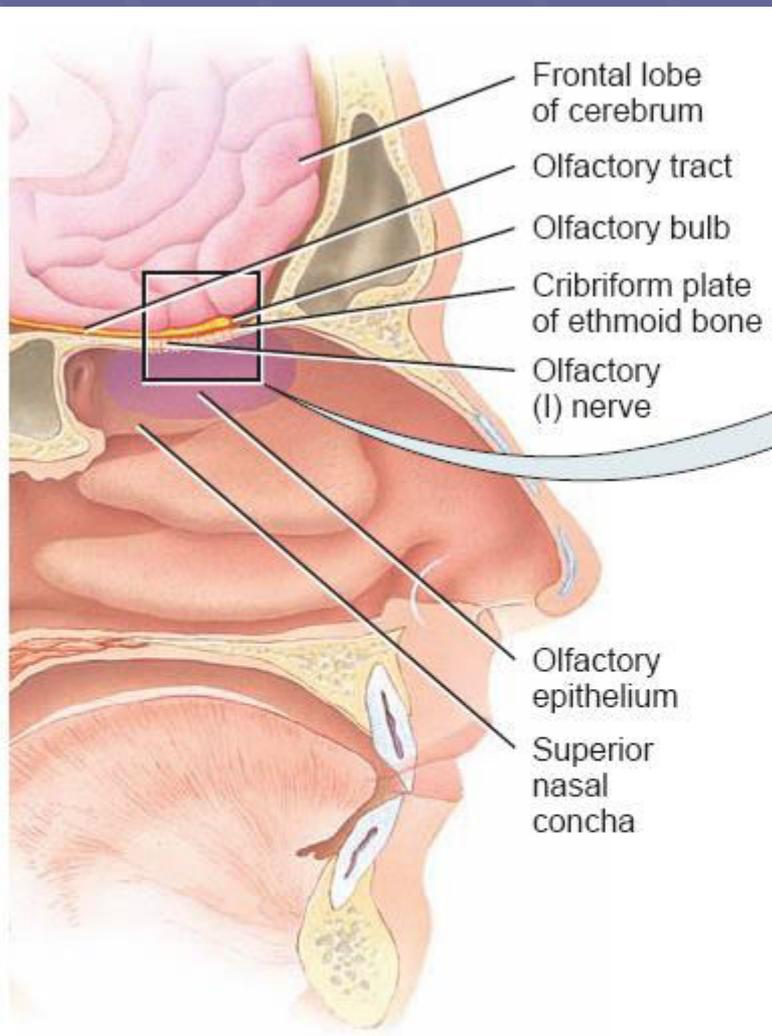
(a) Sagittal view

# Olfactory Epithelium

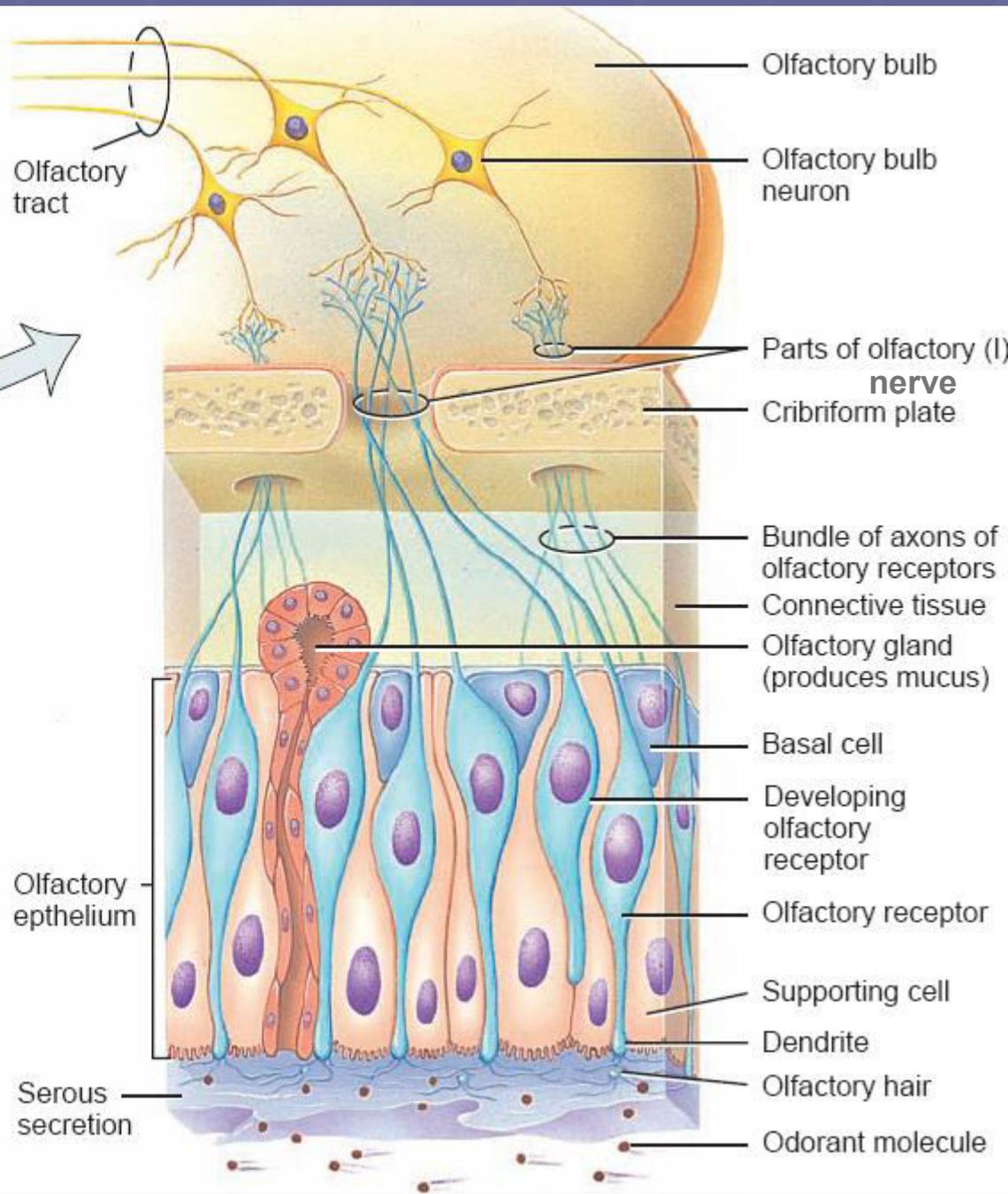


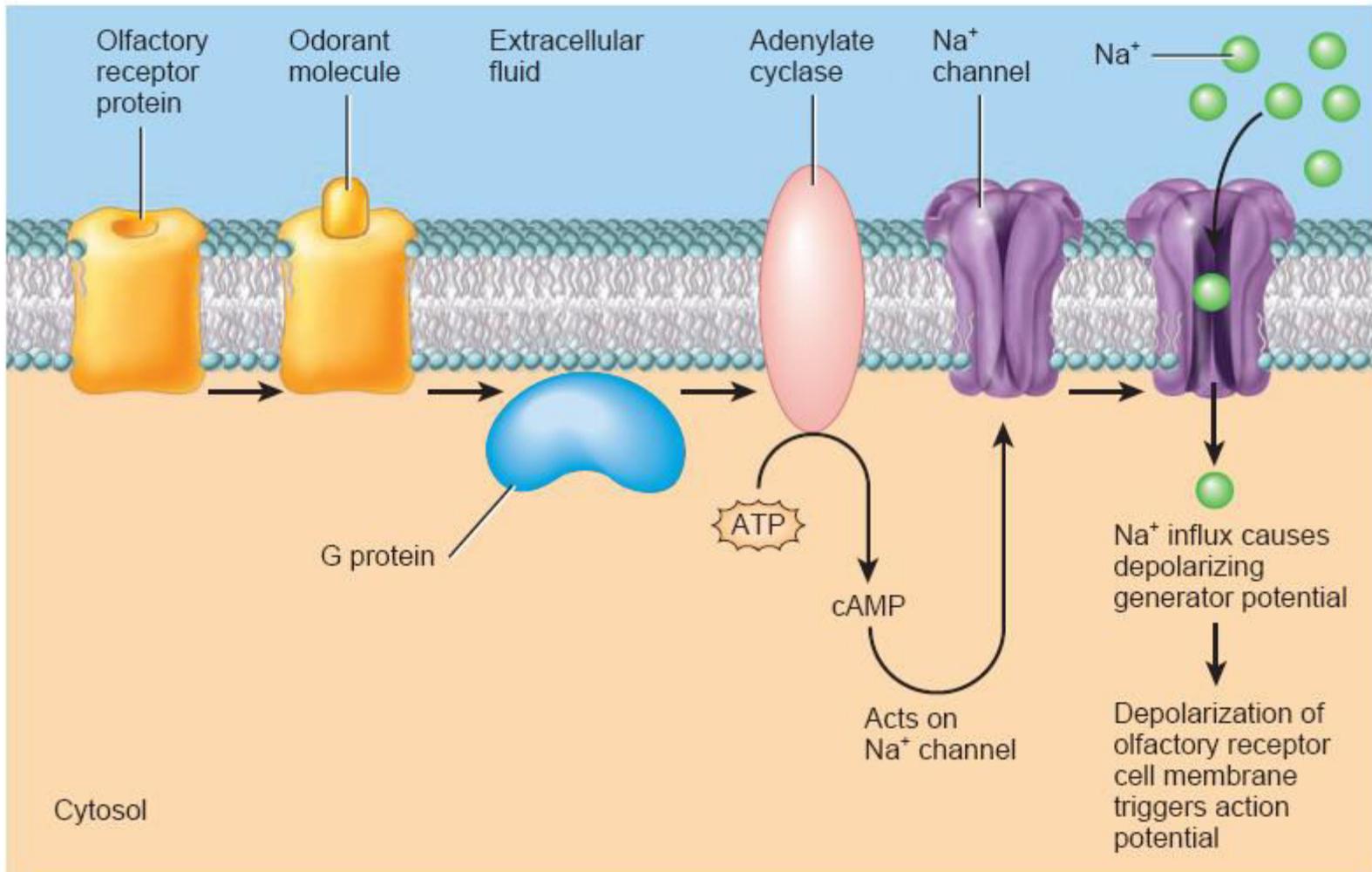
**containing 3 main cell types:**

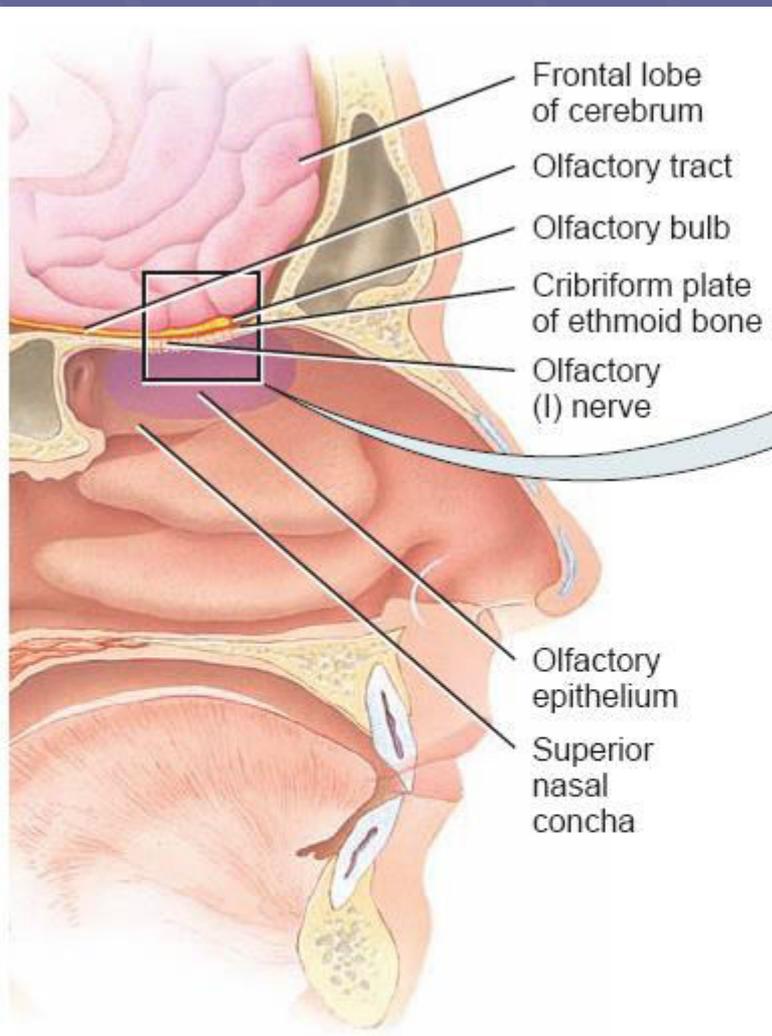
- **Olfactory receptor neurons**
- **Supporting cells**
- **Basal cells**



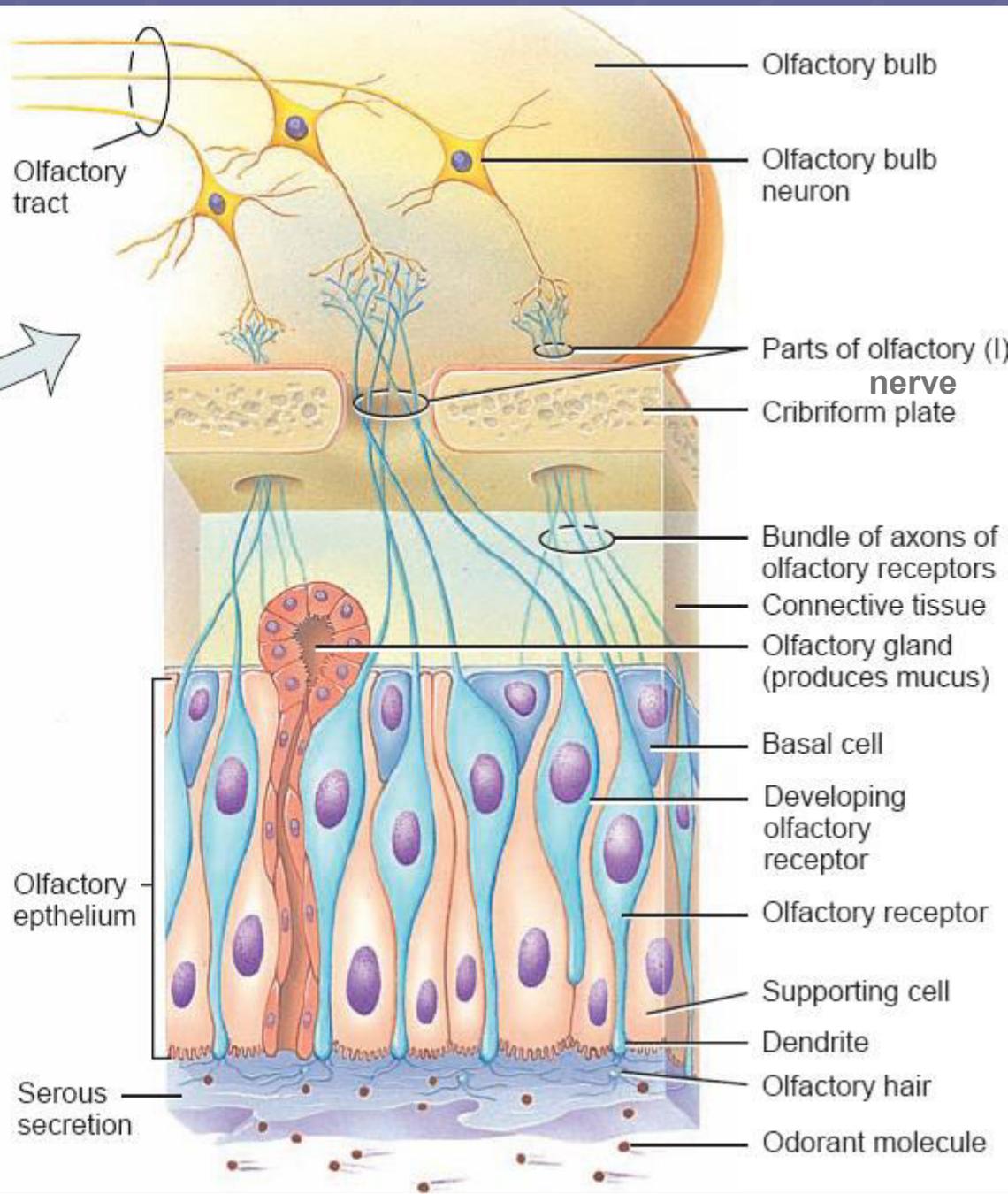
(a) Sagittal view



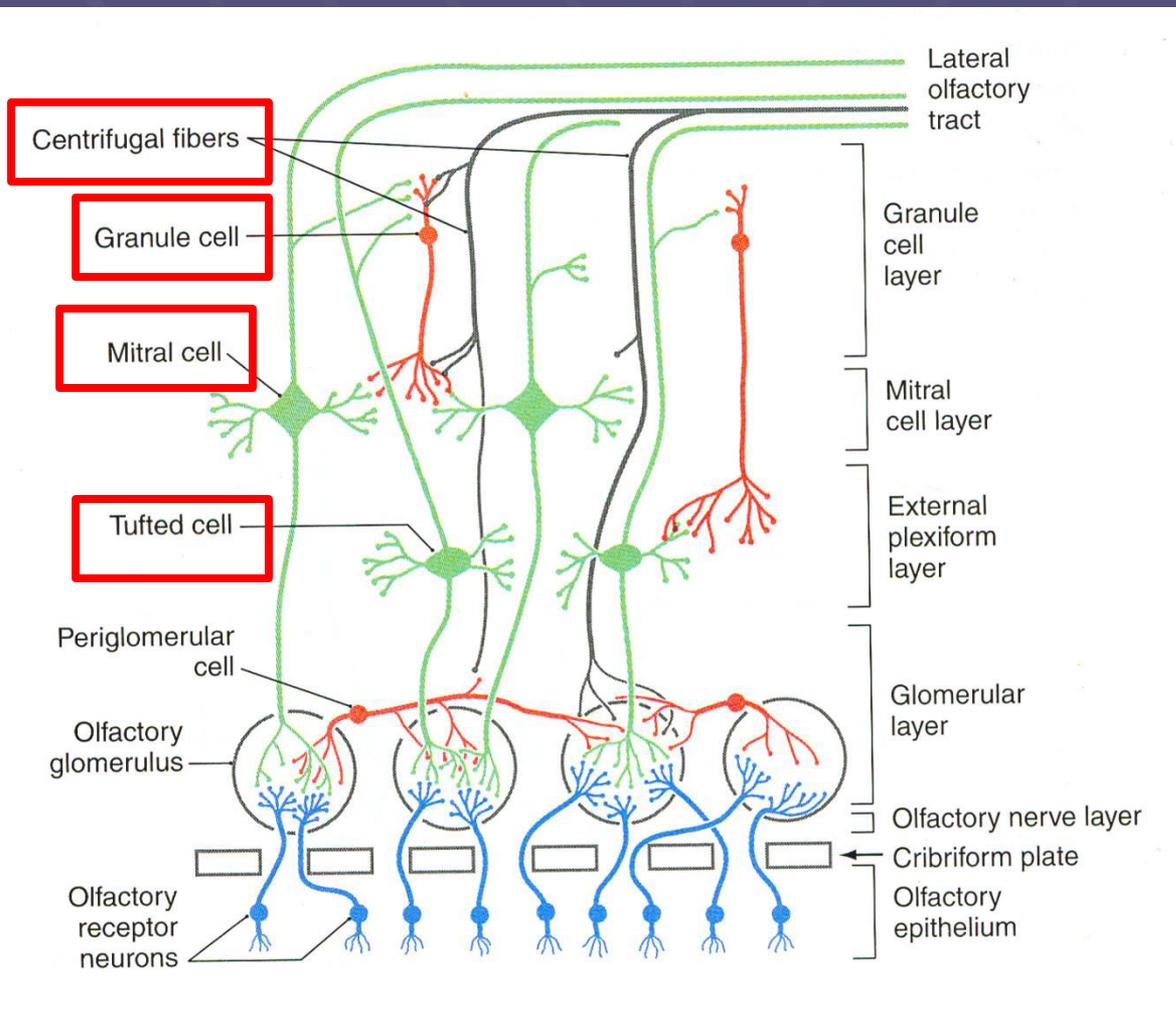




(a) Sagittal view



# Olfactory Bulb (feedback and adaptation)



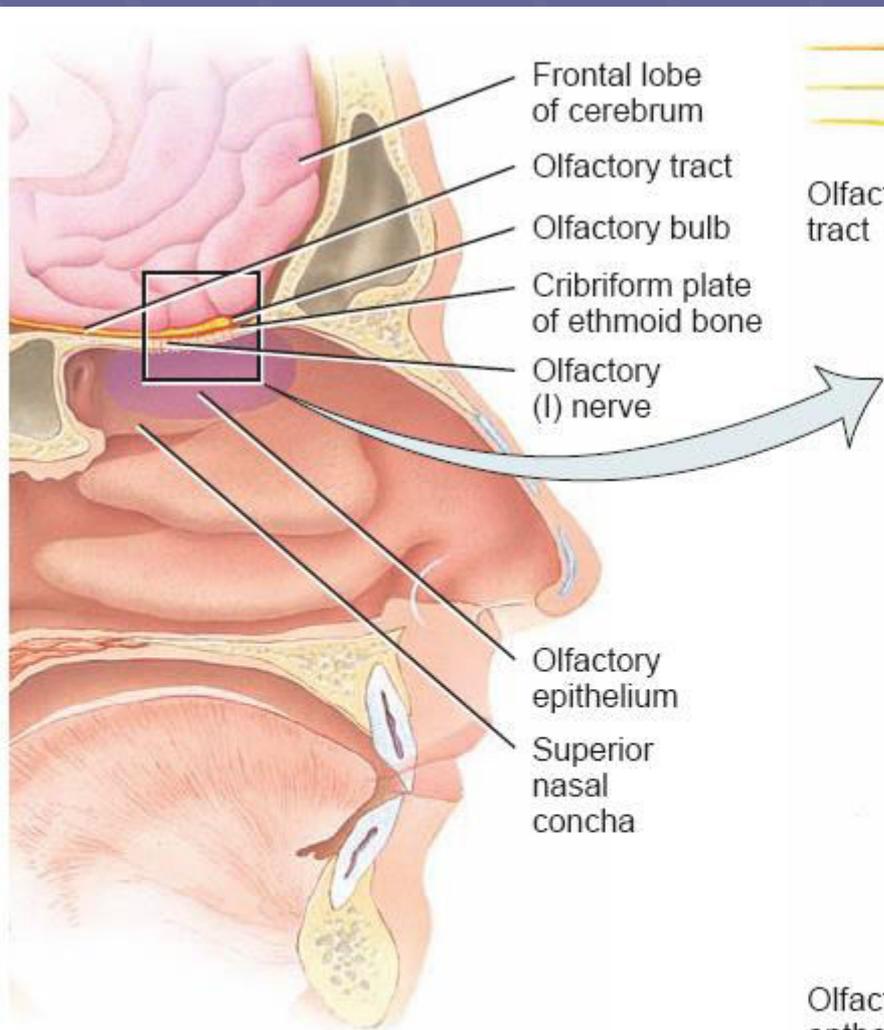
- Five well-defined layers of cells & fibers, which give a laminated appearance

- Olfactory nerve layer
- Glomerular layer
- External plexiform layer
- Mitral cell layer
- Granule cell layer

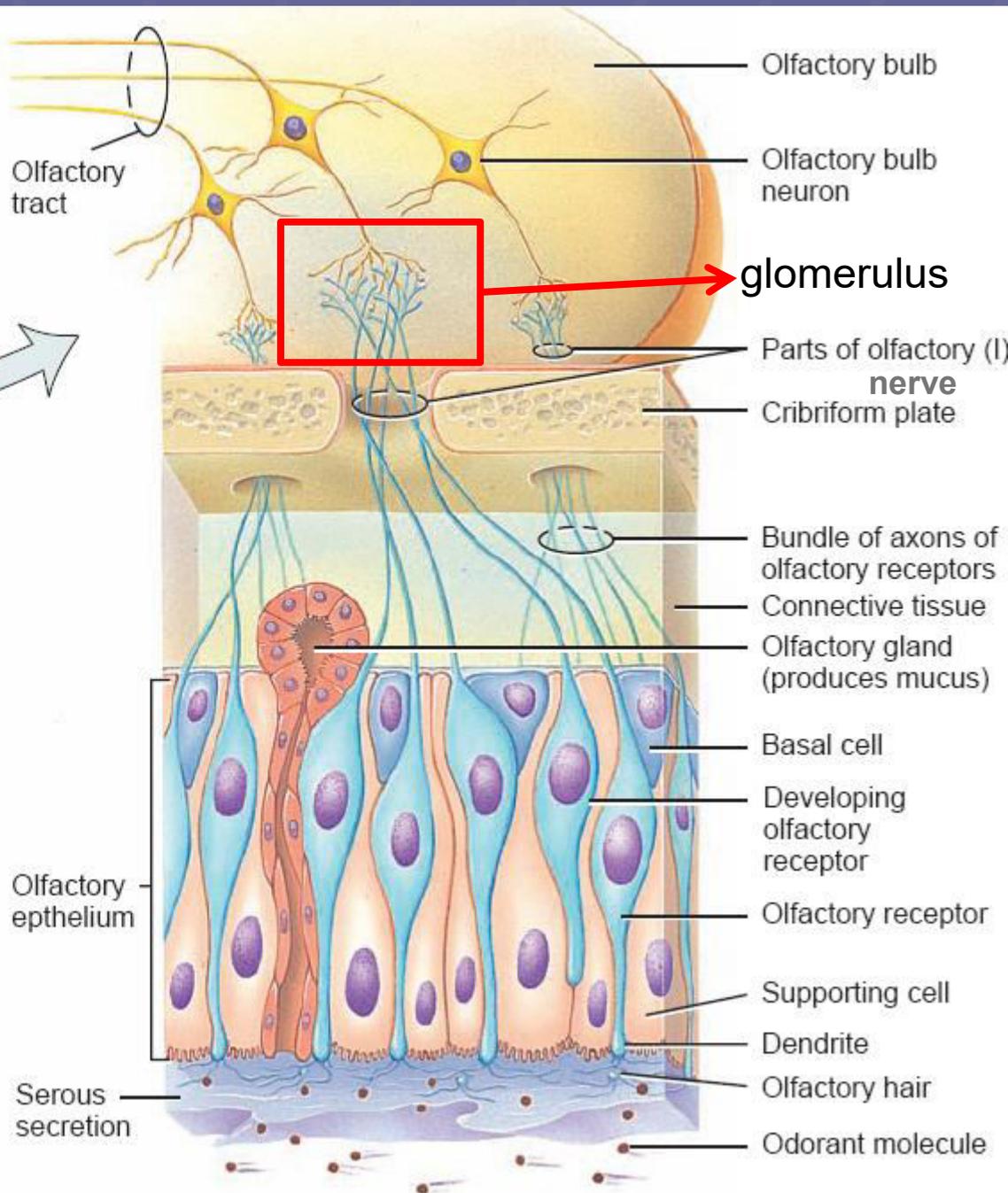
## Important Points

- Olfactory receptor neuron axons converge to synapse on the apical dendrites of **mitral**, **tufted**, and **periglomerular cells** in core regions of the glomerular layer known as **glomeruli**

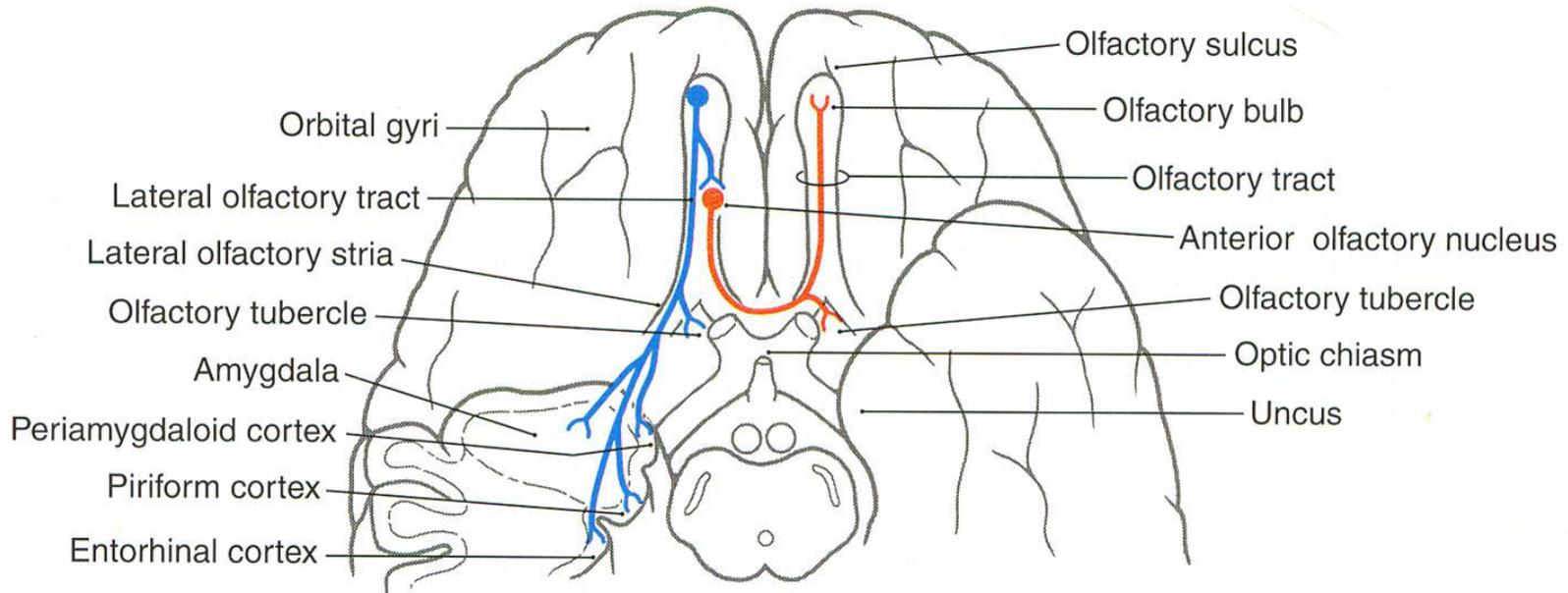
- Mitral and tufted cells form the efferent projection from the olfactory bulb



(a) Sagittal view



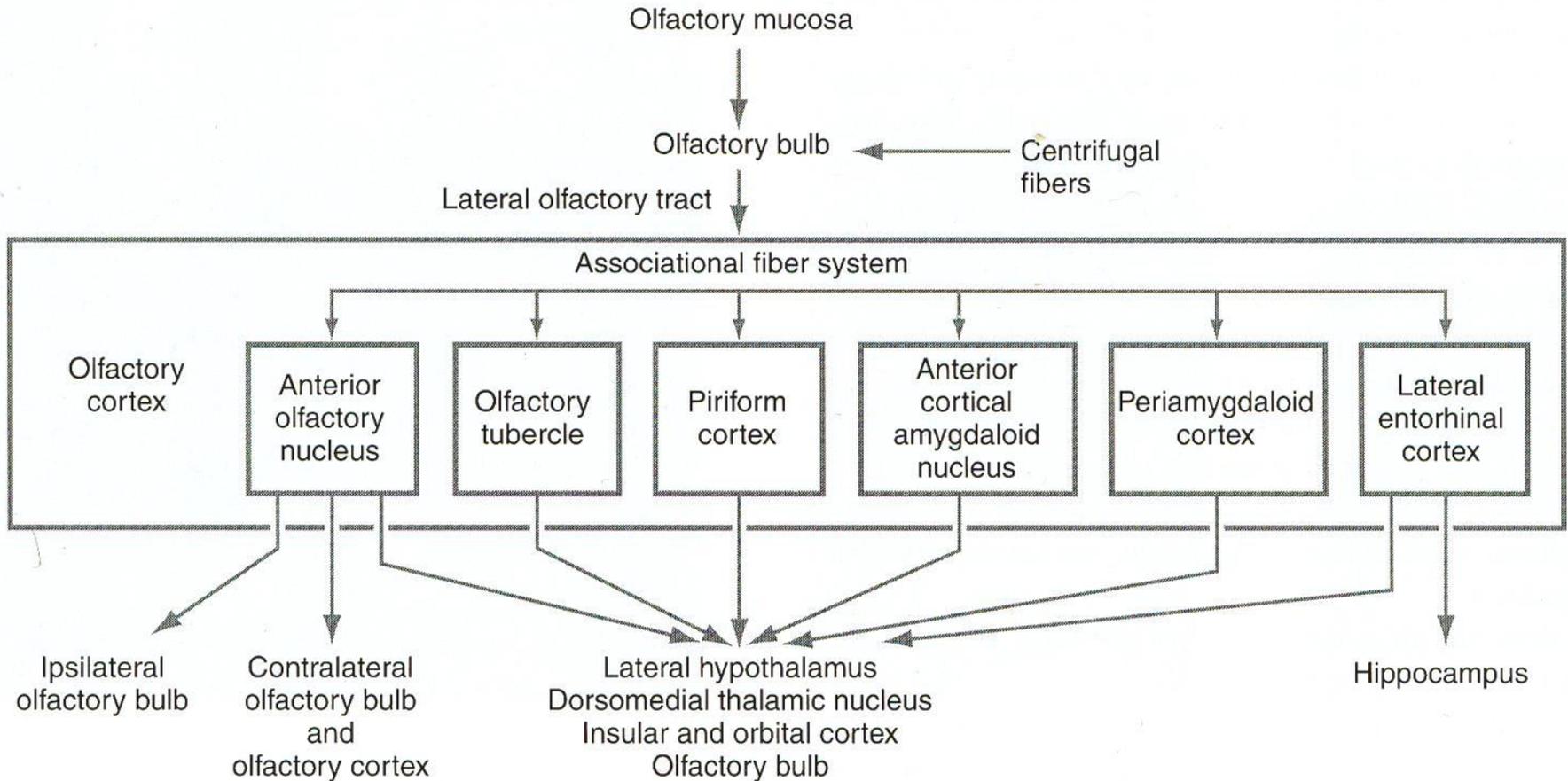
# Projections of Olfactory Bulb



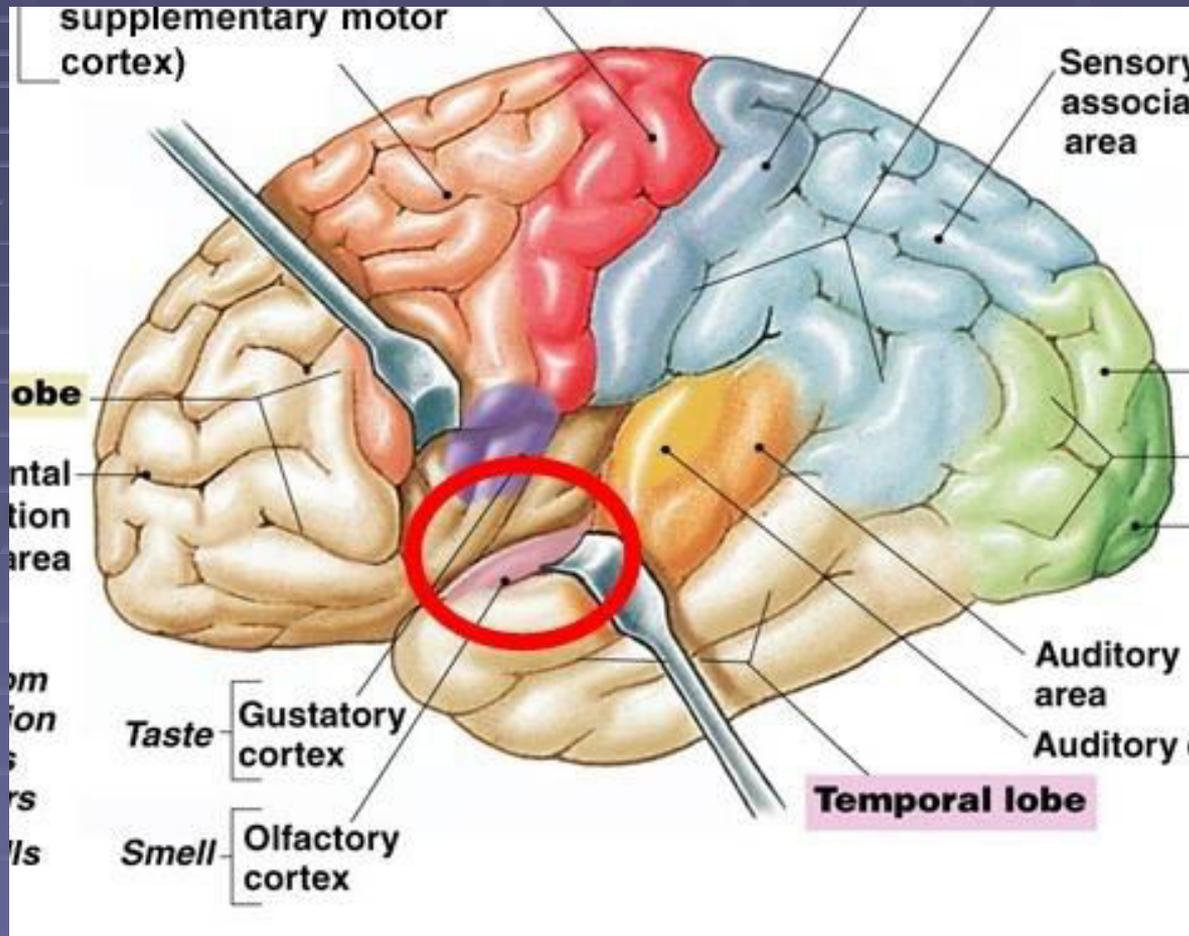
Axons leaving the olfactory bulb project to the **anterior olfactory nucleus**  
Or  
Travel via the **lateral olfactory stria** to the olfactory cortex on the ventral surface of the telencephalon

Olfactory cortex lies adjacent to the **olfactory trigone**: the triangle-shaped area at the intersection of the olfactory tract, lateral and medial olfactory stria and **olfactory tubercle**.

# Associational Connections



# Primary Olfactory cortex



- Inferior and medial surface of temporal lobe

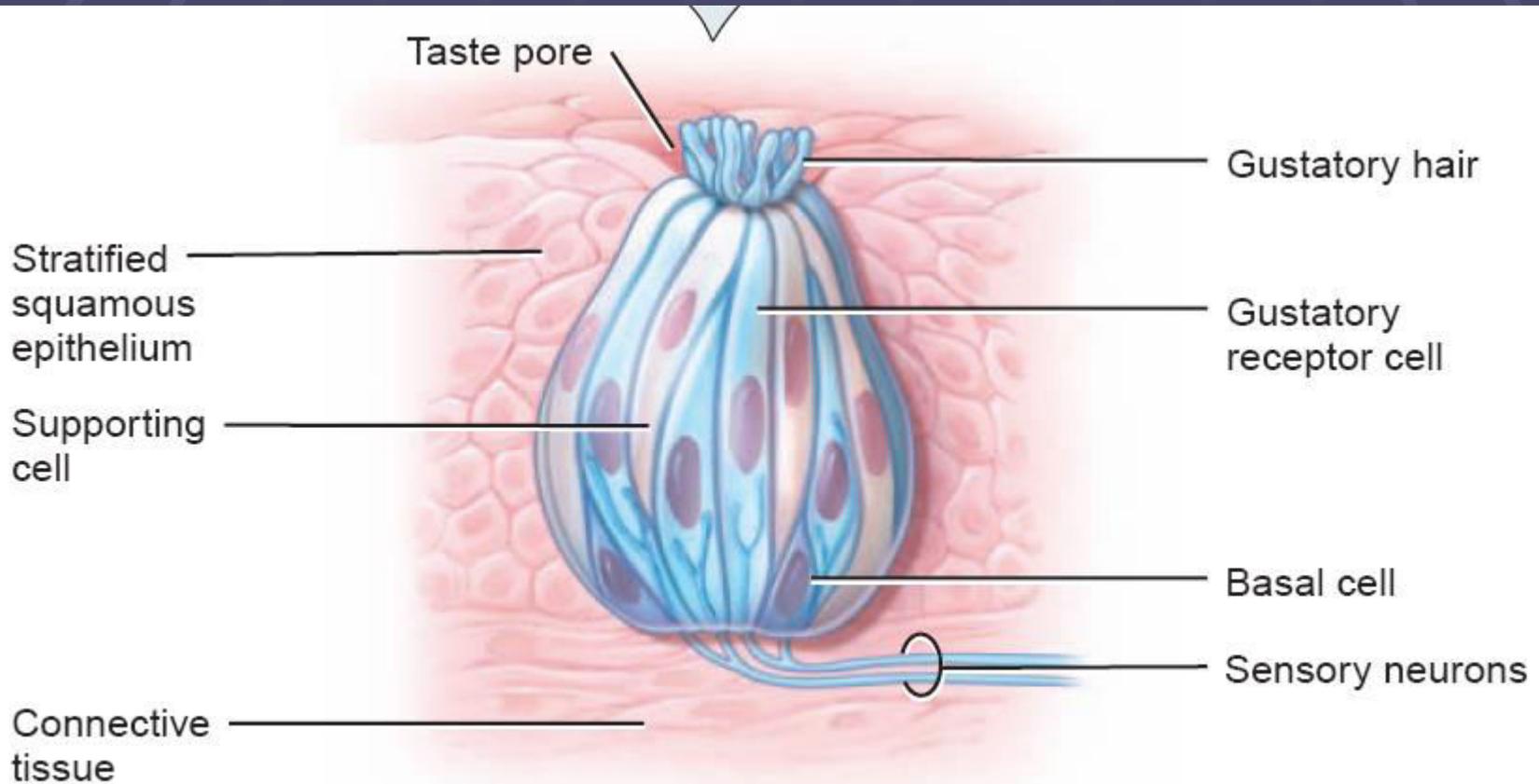
# Disorders of the Olfactory System

- Anosmia/Hyposmia: Loss/decreased sensitivity to odorants.
  - Access of odorants to olfactory epithelium is blocked.
    - Edema of olfactory epithelium.
    - Ex. Upper respiratory infections, sinus disease.
  - Head Trauma
    - Ex. Shearing movement of olfactory bulb relative to cribriform plate.
    - Boxers- transection of olfactory receptor axons in passage.
  - Nasal polyps

# The Gustatory System



# Taste receptors ( taste buds)

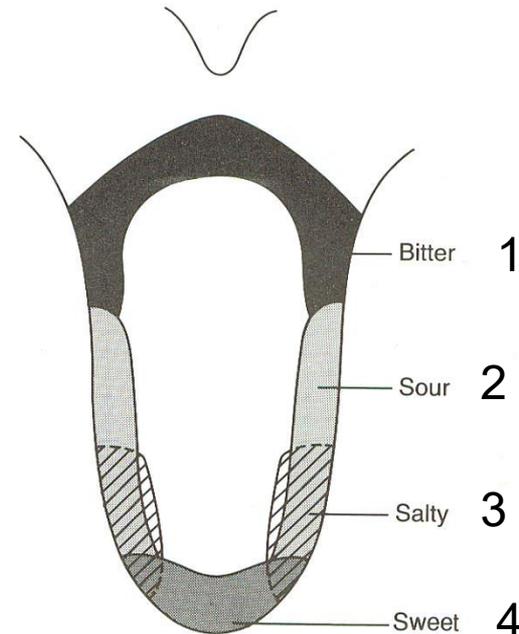


(c) Structure of a taste bud

# Regional Specialization for the Detection of Different Taste Qualities ?

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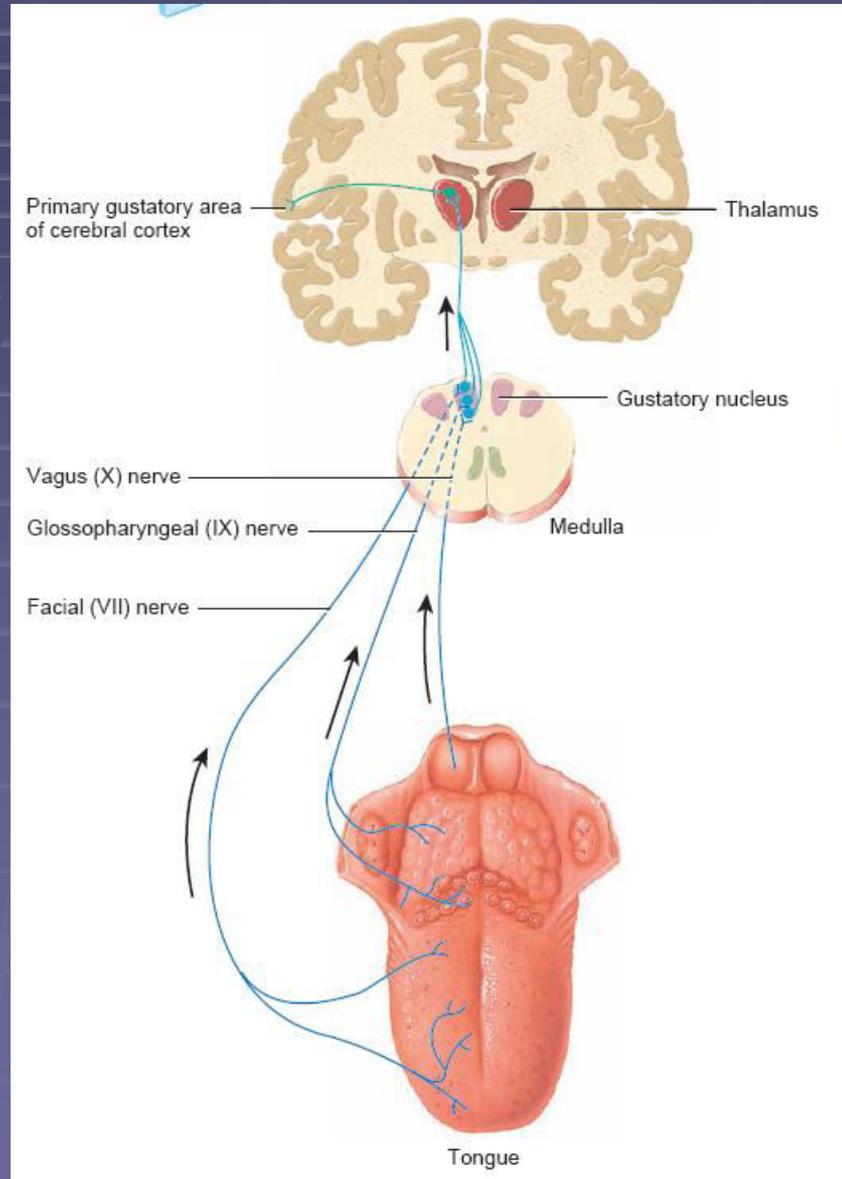
- **Umami: a recently described taste sensation for meaty sensation, that exemplifies the taste of monosodium glutamate & is important in the identification of amino acids.**



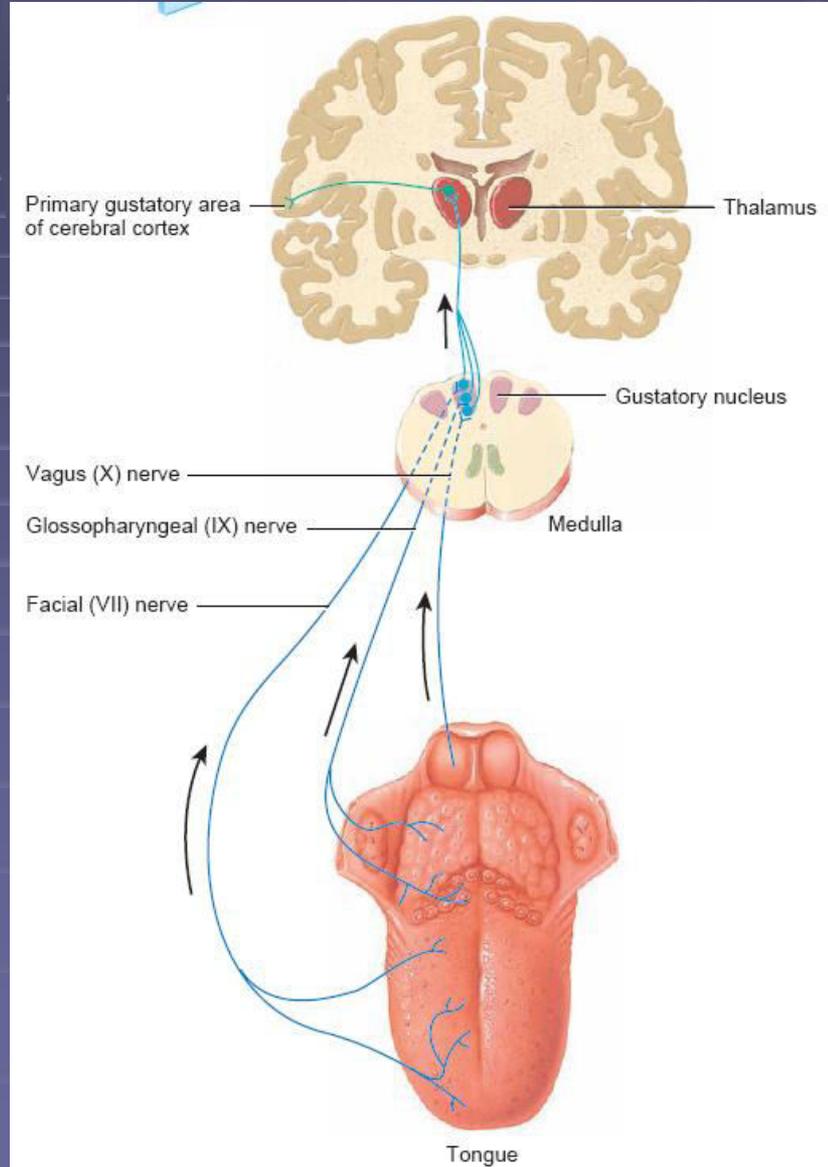
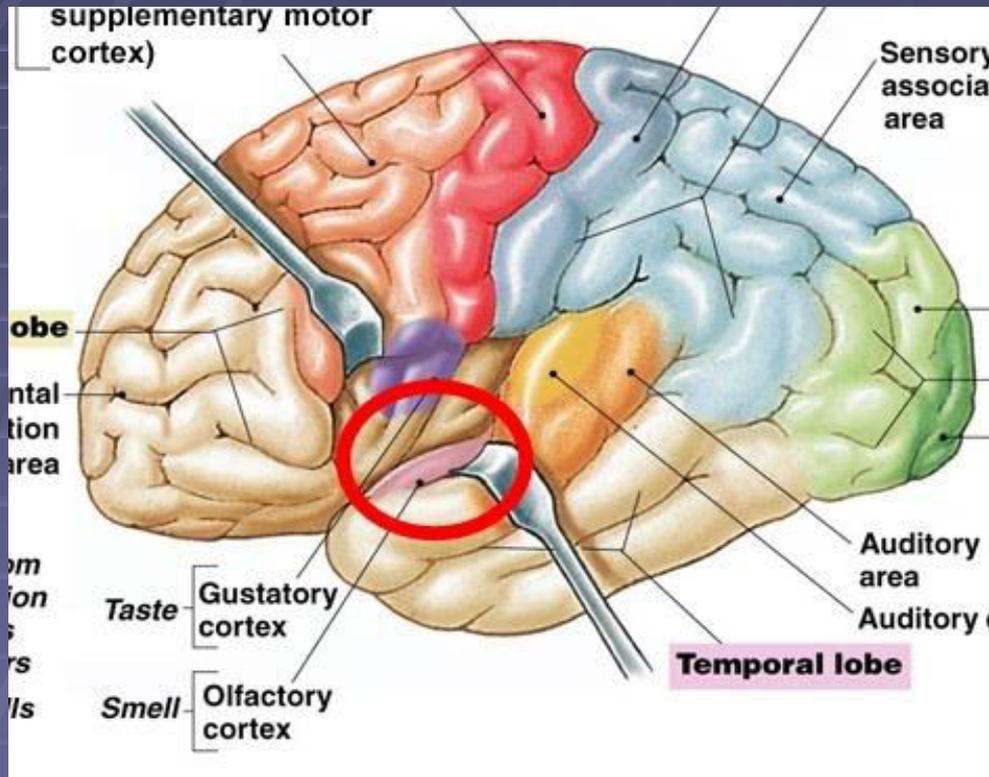
(Kandel, Schwartz & Jessup: Principles of Neural Science 3<sup>rd</sup> ed. Fig. 34-8)

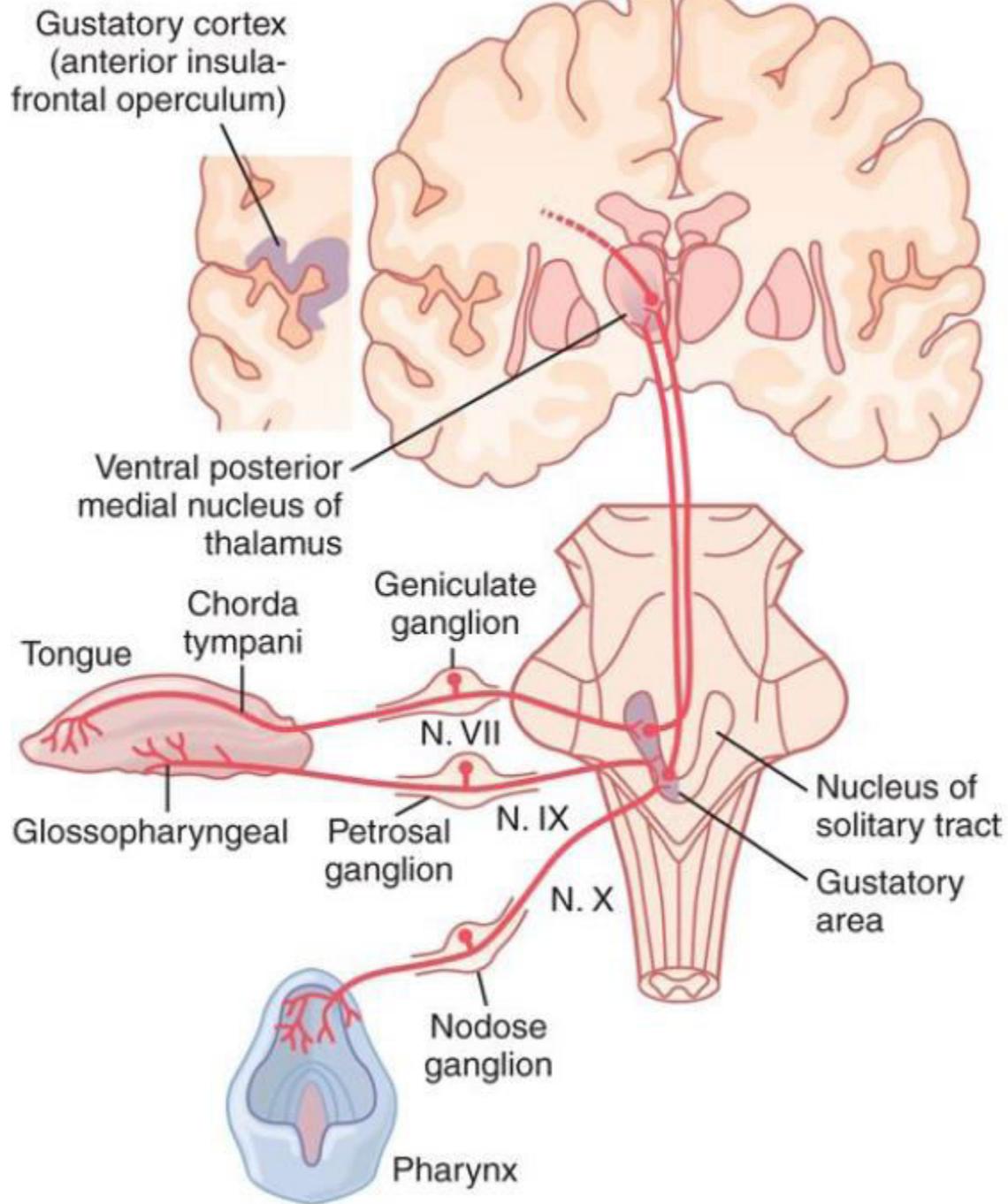
All taste qualities are detected in all regions of the tongue, although sensitivity to the different taste qualities may vary by region

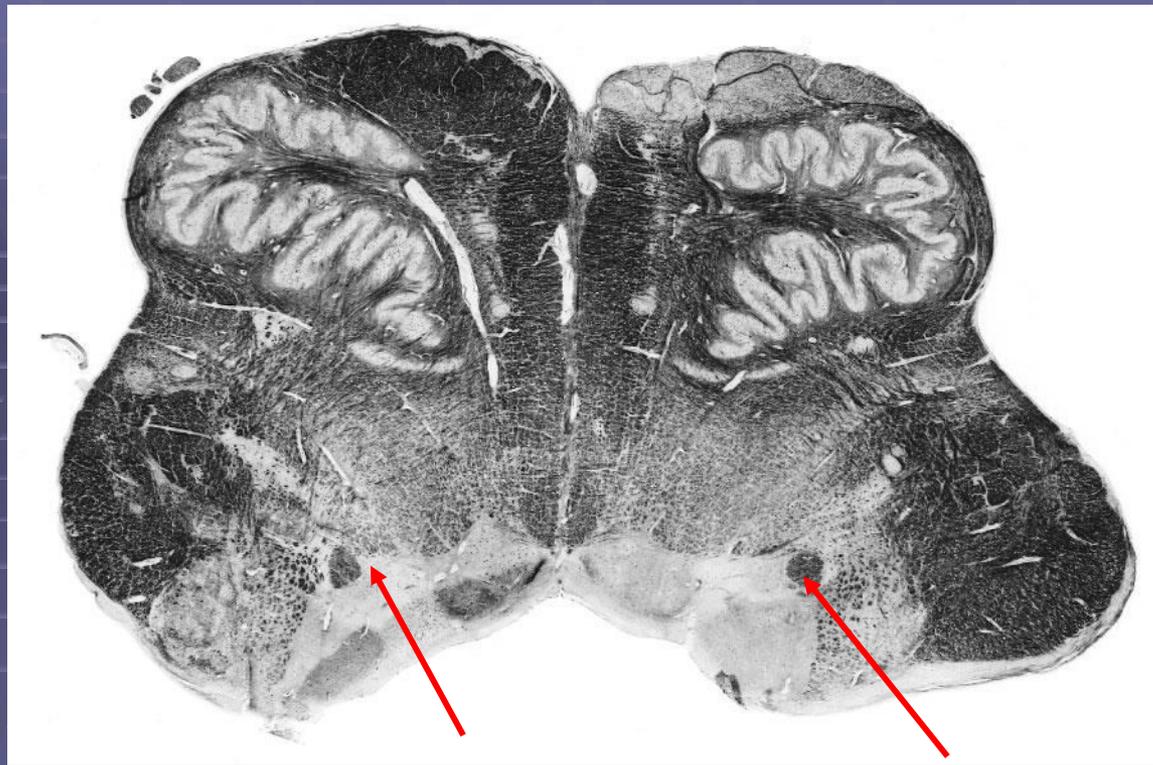
# Taste pathway



# Taste pathway

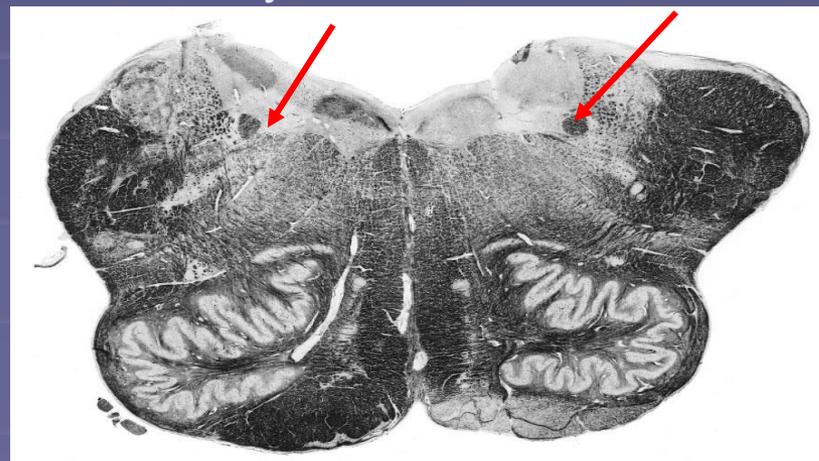


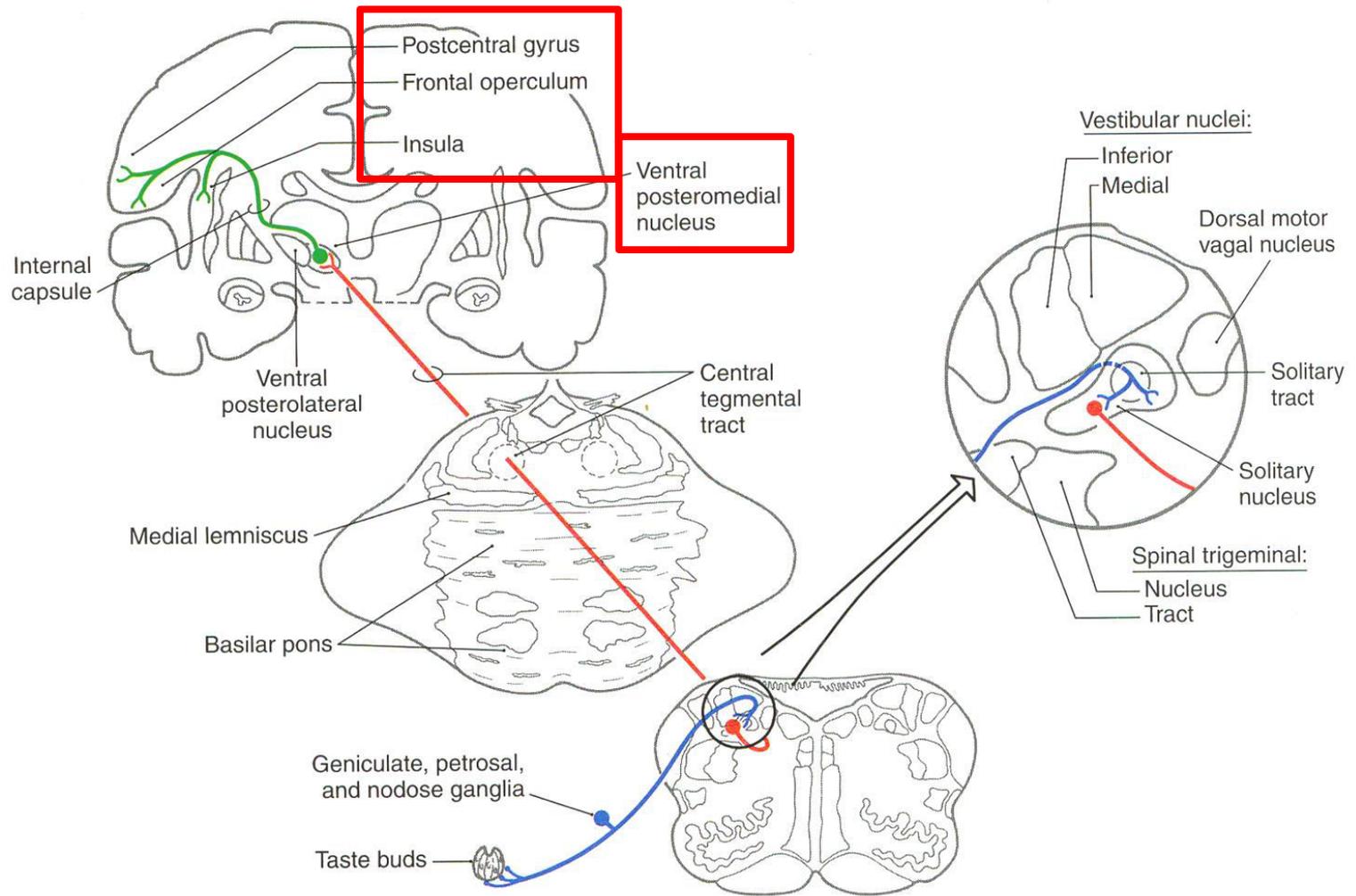




Nucleus of the Solitary tract

Solitary Tract





# Disorders of Taste

- Ageusia: Complete loss of taste.
- Hypoageusia: Decreased taste sensitivity.
- Examples:
  - Cancer patients undergoing radiation or chemotherapy.
  - Medications.
  - Progressive loss of taste in diabetic patients.

# Flavor

# Taste smell interaction

- Although anatomically distinct systems, the modalities of taste and smell work well together
- Flavor:
  - Incorrectly mistaken as taste
  - A sensory experience which results from the combination of olfactory and taste, somatosensory, and visual cues.

Olfaction >>>> taste  
potent

# insular cortex and orbitofrontal cortex

- The **medial orbitofrontal cortex** & **lateral posterior orbitofrontal cortex** play an important role in integrating olfactory, taste, and other food-related cues that produce the experience of flavor

