

# EAR - IV



Presented by:-  
Dr. Sushma Tomar  
Associate Professor  
Department of Anatomy

# Lesson Plan

## Internal Ear

### ❖ Introduction

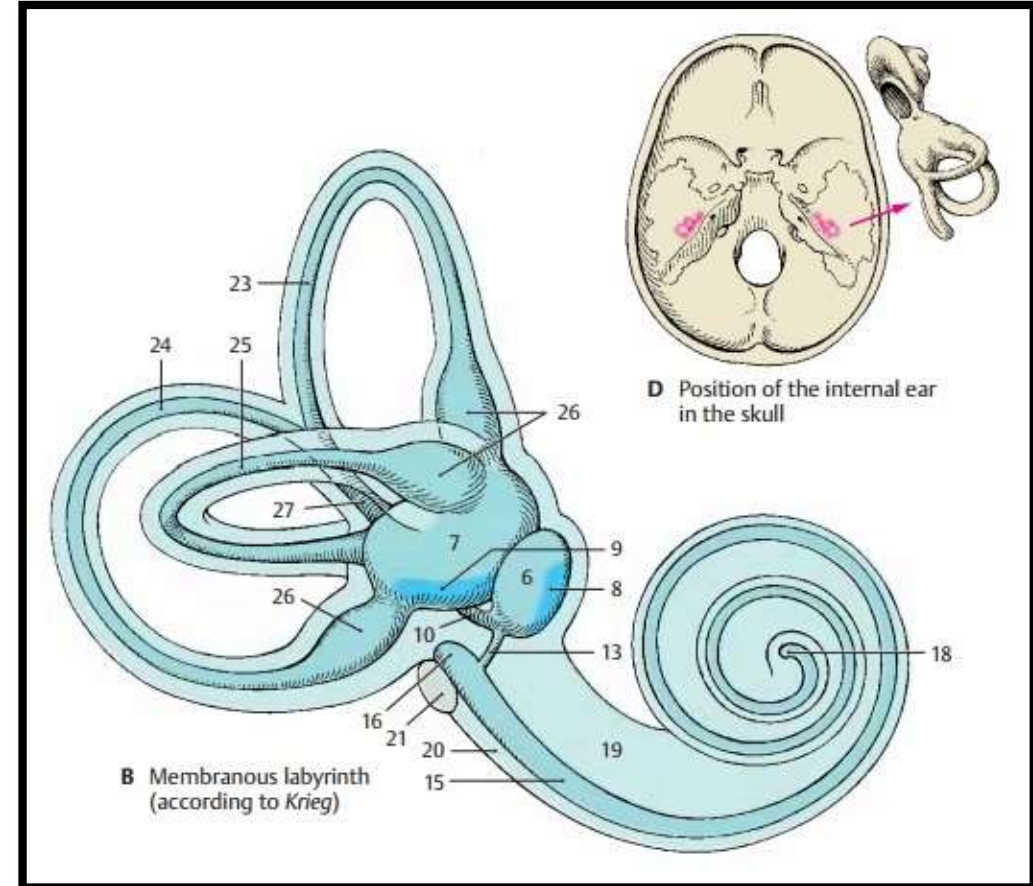
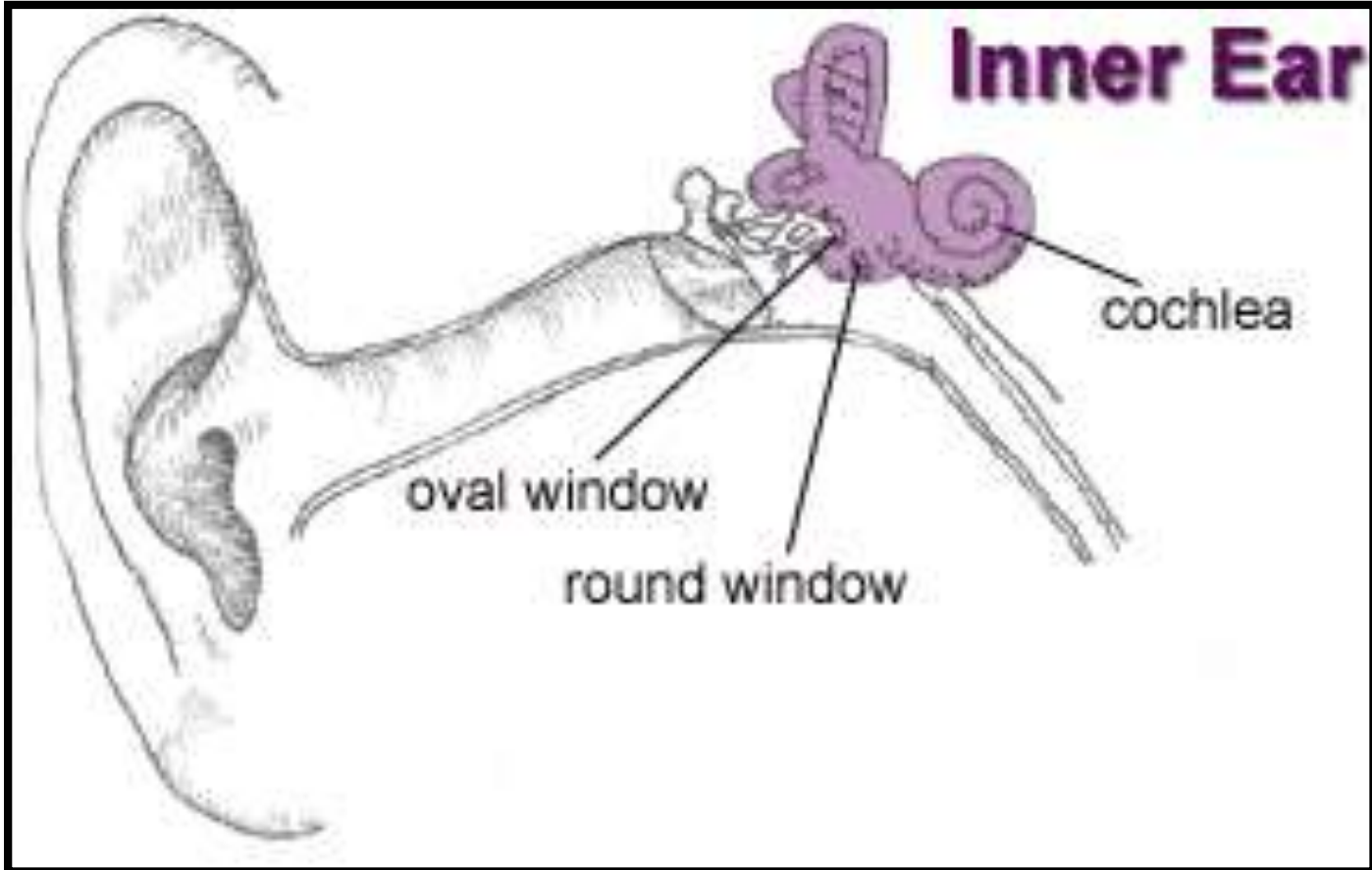
### ❖ Bony labyrinth:

- Cochlea
- Vestibule
- Semicircular canals

### ❖ Membranous labyrinth

- Cochlear duct
- Saccule & Utricle
- Utriculo-saccular duct
- Receptors in Utricle & Saccule
- Semicircular ducts
- Innervation of receptors of vestibular system

# Internal [Inner Ear]



# Introduction

## Components of Internal Ear-

- Bony labyrinth.
- Membranous labyrinth.

## Bony Labyrinth-

**Location-** Petrous part of temporal bone.

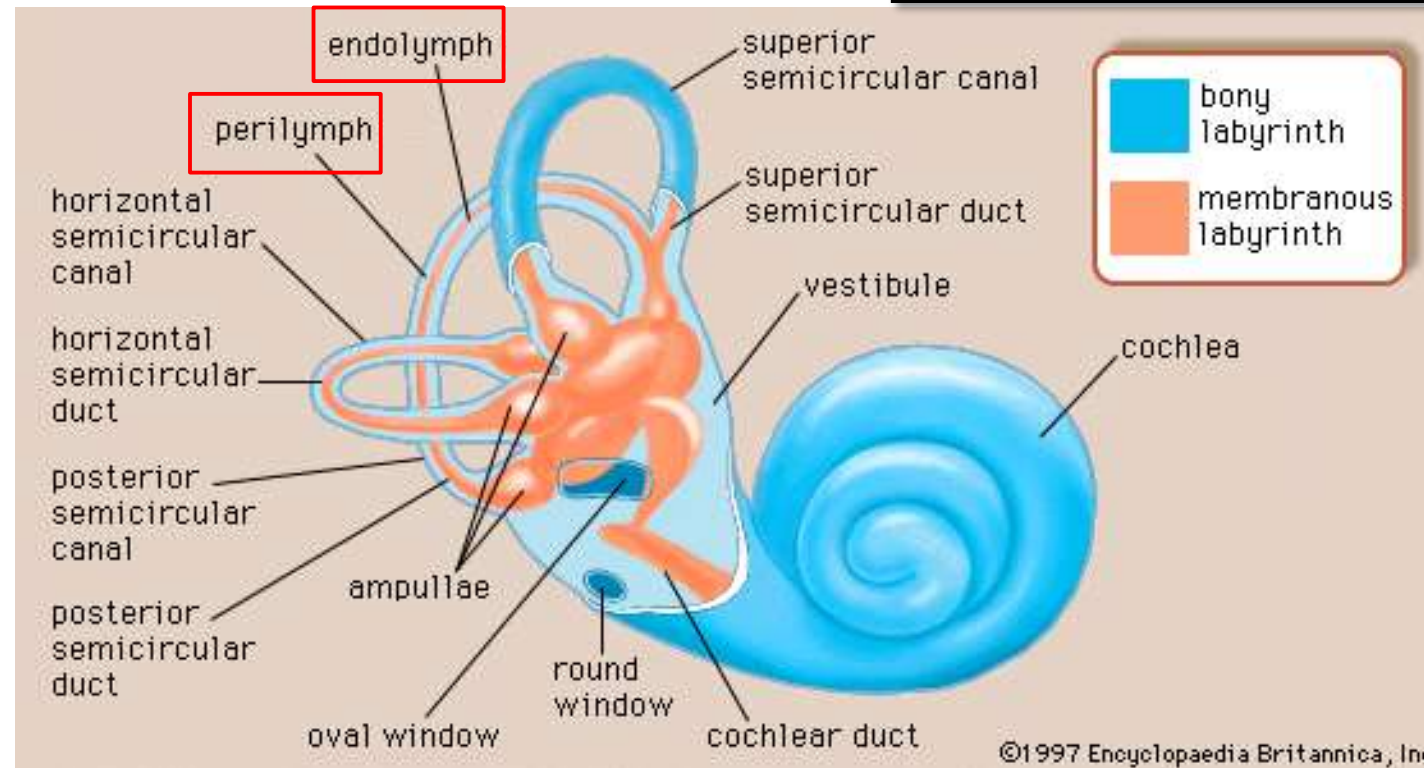
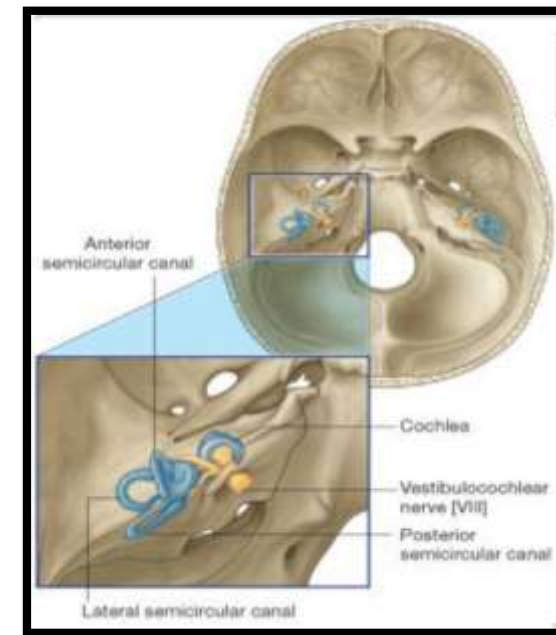
- The space between membranous and bony labyrinth is filled with **perilymph**.

## Membranous Labyrinth-

**Location-** Within bony labyrinth.

- It is a closed system of fluid filled intercommunicating membranous sacs and ducts.

- Fluid in it is called **endolymph**.



# Bony Labyrinth

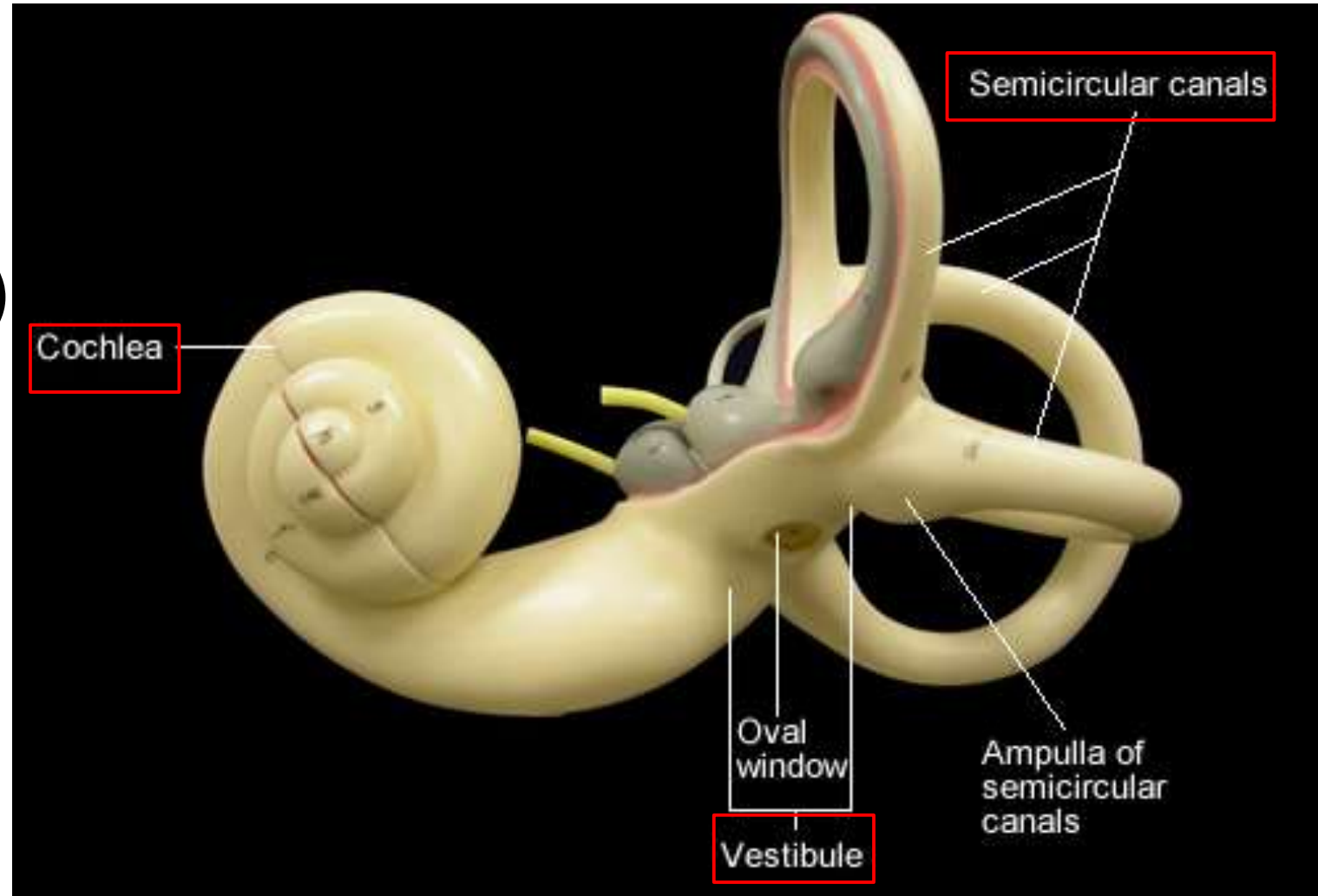
- It consists of intercommunicating bony cavities and canals.

## Location-

- Petrous part of temporal bone.

## Parts- 3 (from before backwards)

- Cochlea (anterior part)
- Vestibule (middle part)
- Semicircular canals (posterior part).





# Cochlea

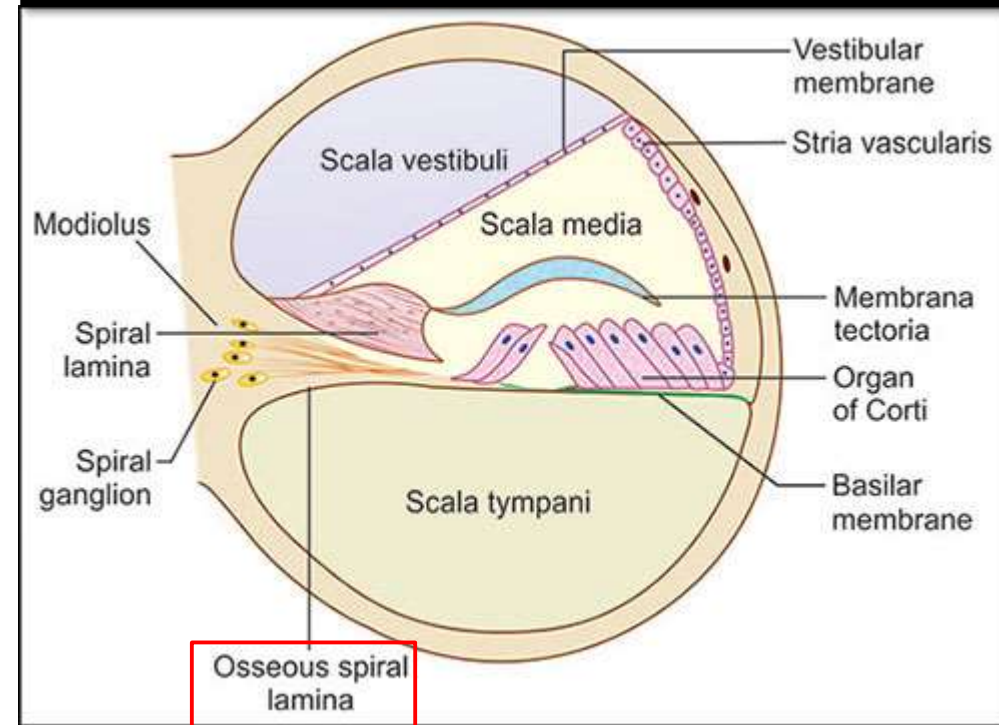
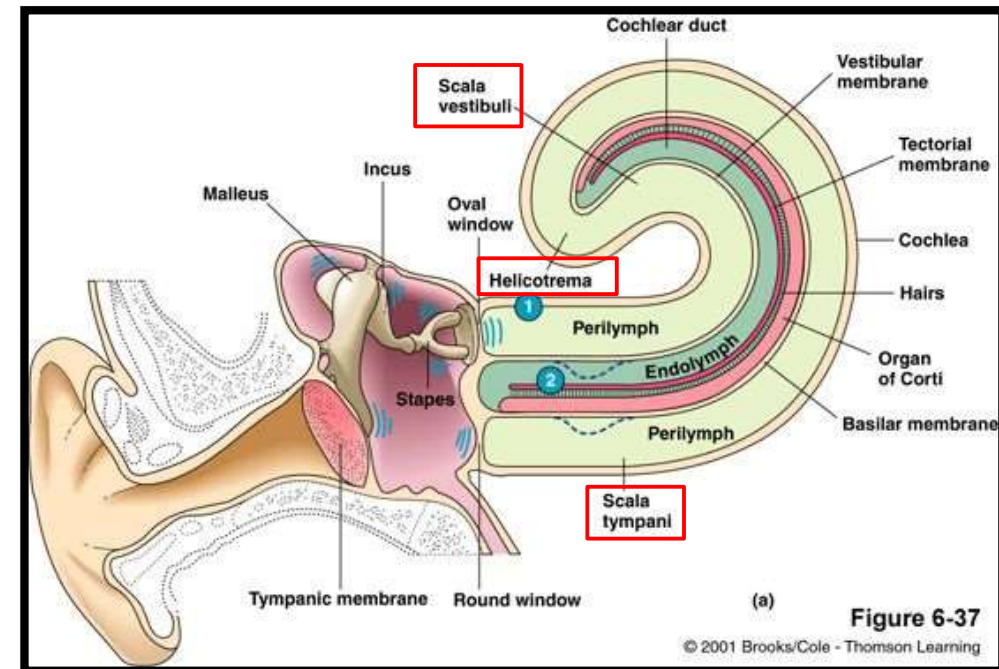
❖ It consists of:

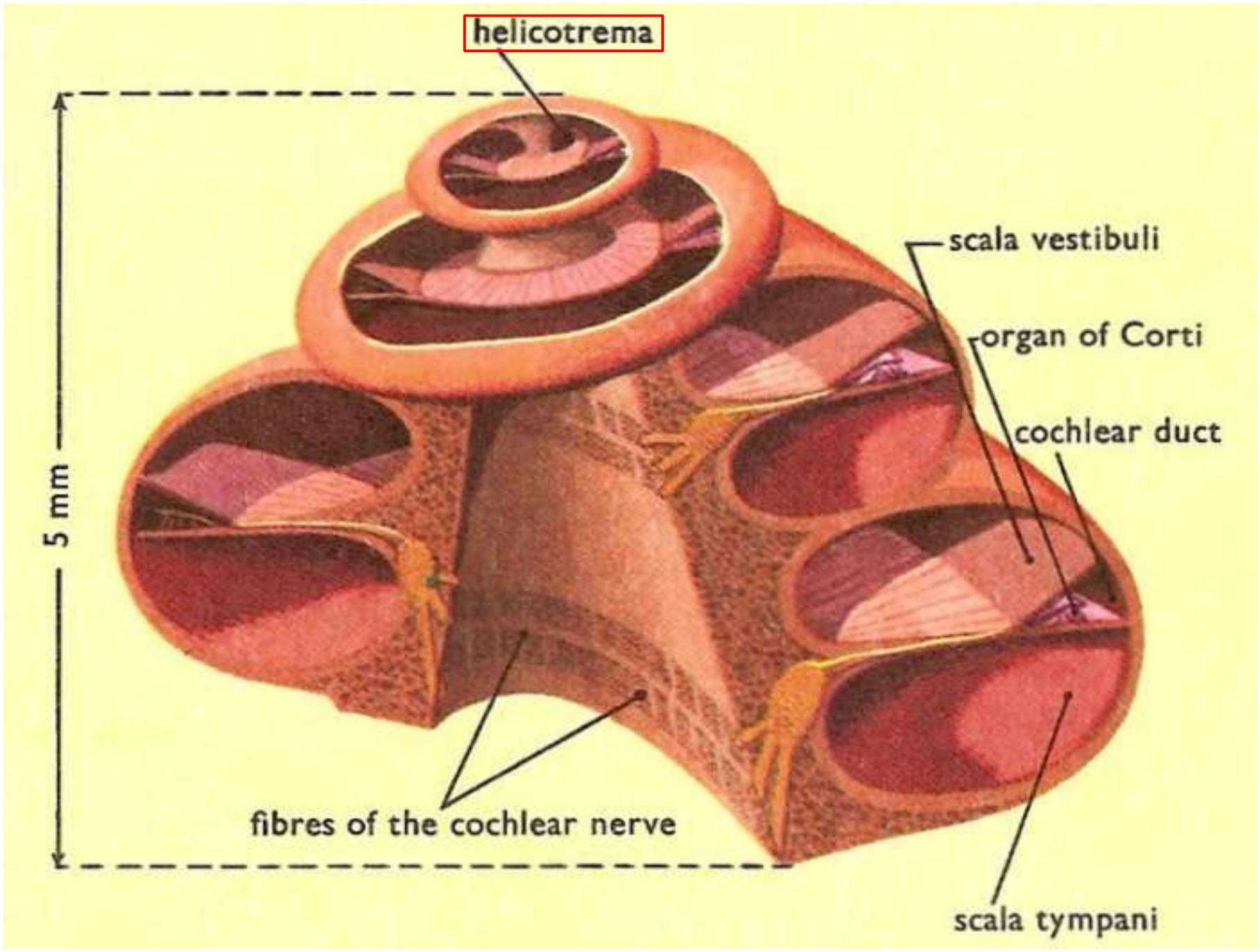
- Modiolus
- Cochlear canal

❖ A spiral ridge of bone called **spiral lamina**, divides the cochlear canal into:

- Scala Vestibuli above &
- Scala Tympani below

❖ Scala Vestibuli and Scala Tympani communicate with each other at the apex of cochlea by a small opening called **helicotrema**.

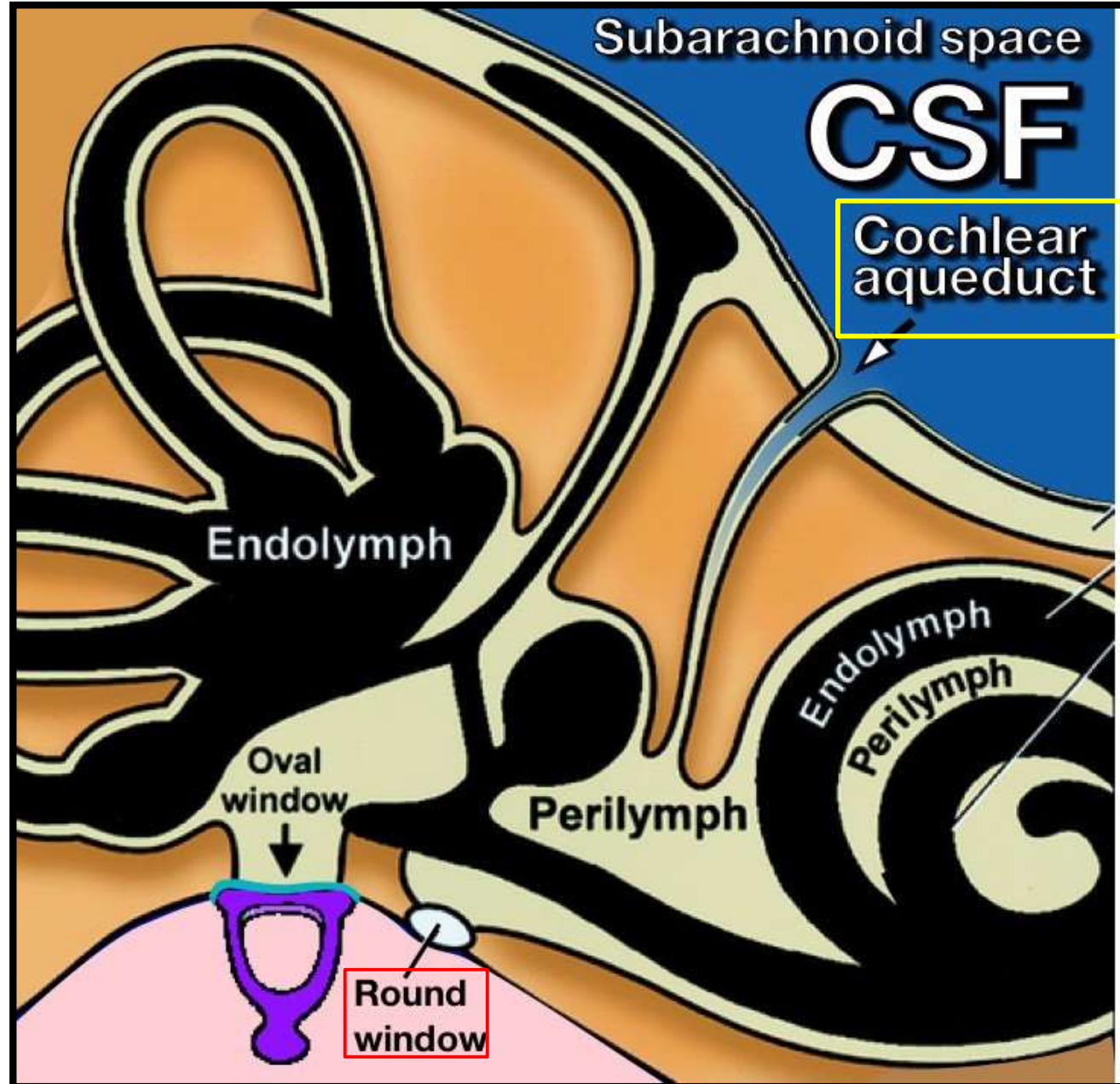






## Cochlea contd...

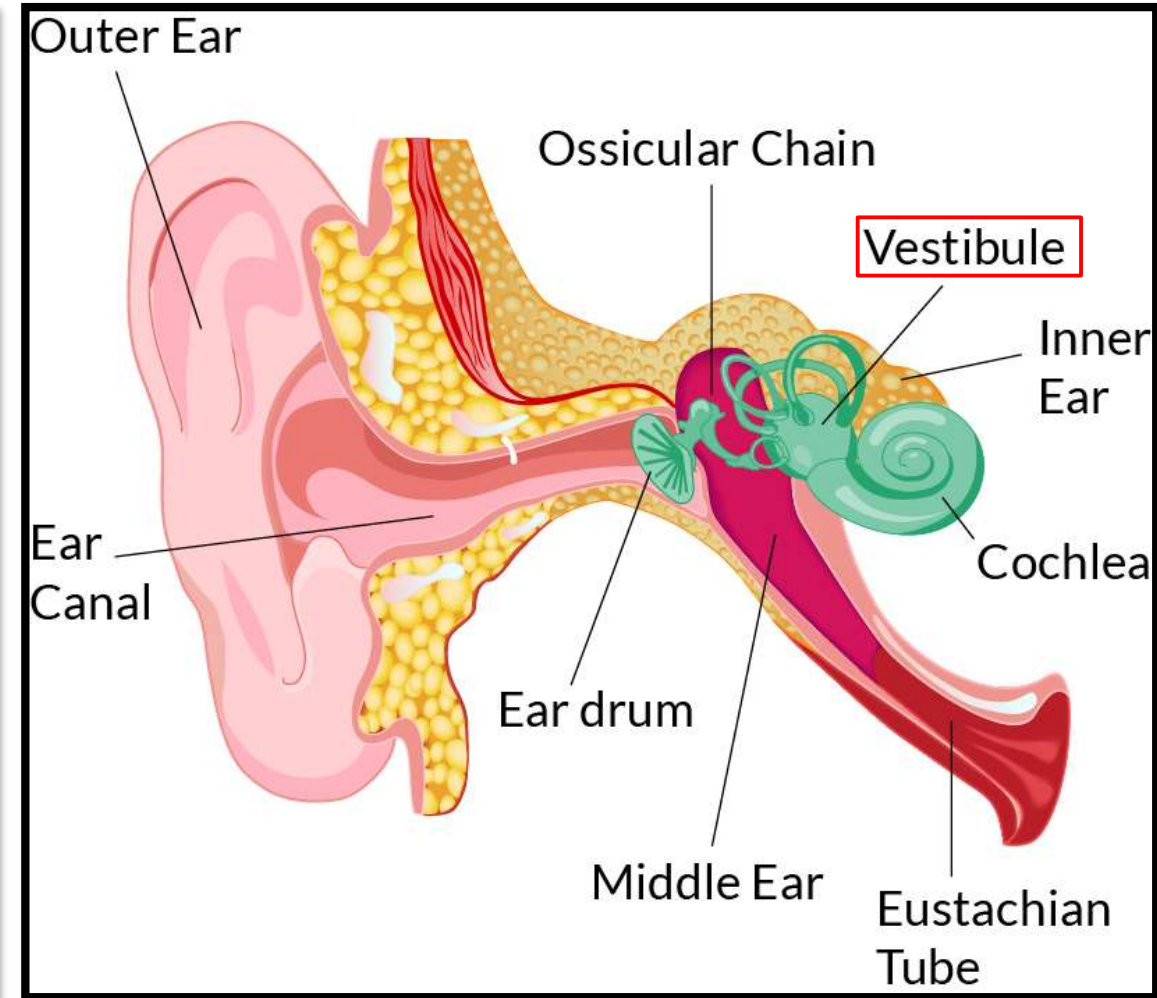
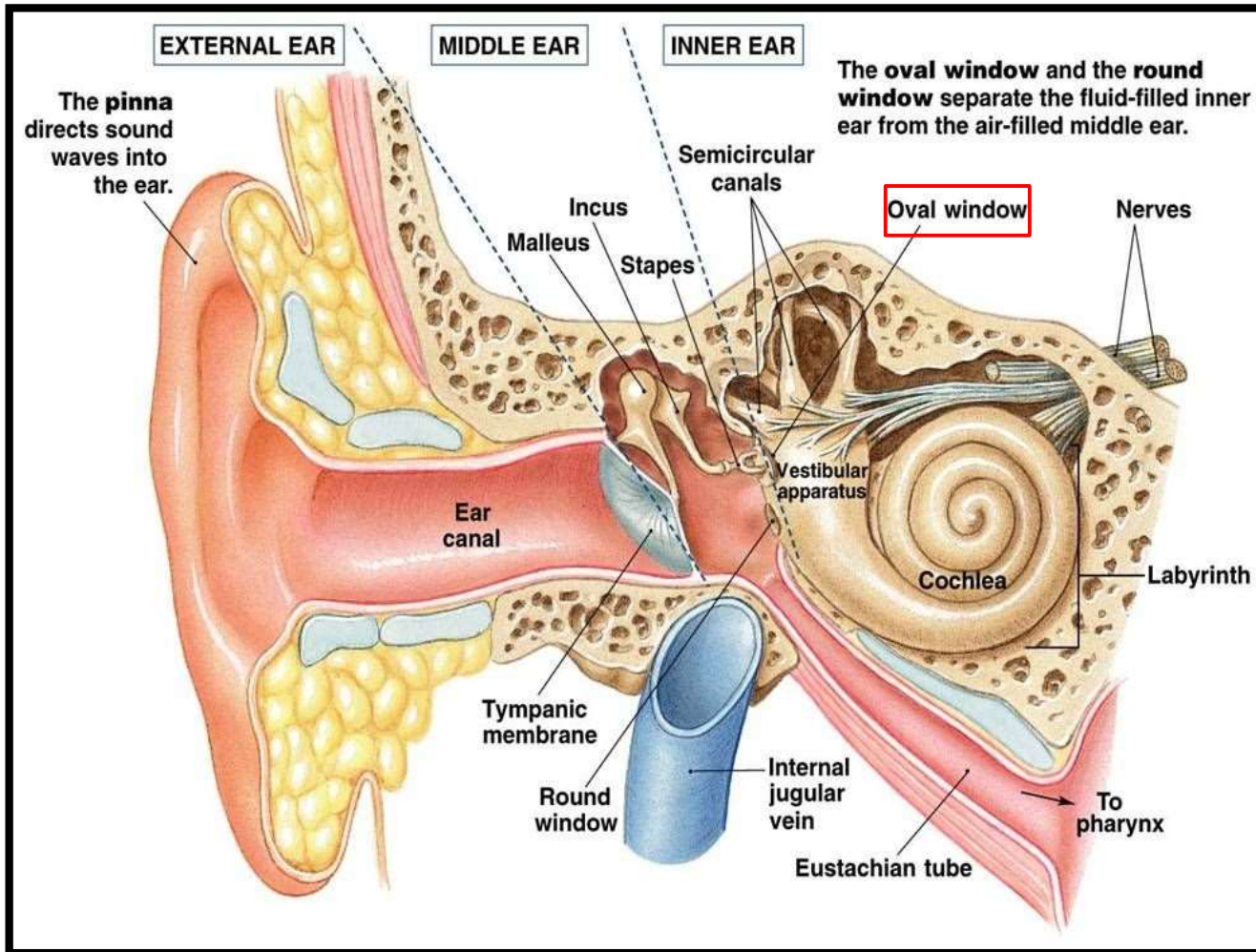
- ❖ Close to the basal turn of cochlea, scala tympani presents 2 features:
  - Fenestra cochleae (Round Window).
  - Aqueduct of cochlea.
- ❖ Through **Aqueduct of cochlea**, cochlea communicates with subarachnoid space.
- **Aqueduct of cochlea** passes through cochlear canaliculus.





# Vestibule

- It lies medial to middle ear cavity.
- Its lateral wall communicates with middle ear through fenestra vestibuli (Oval Window).



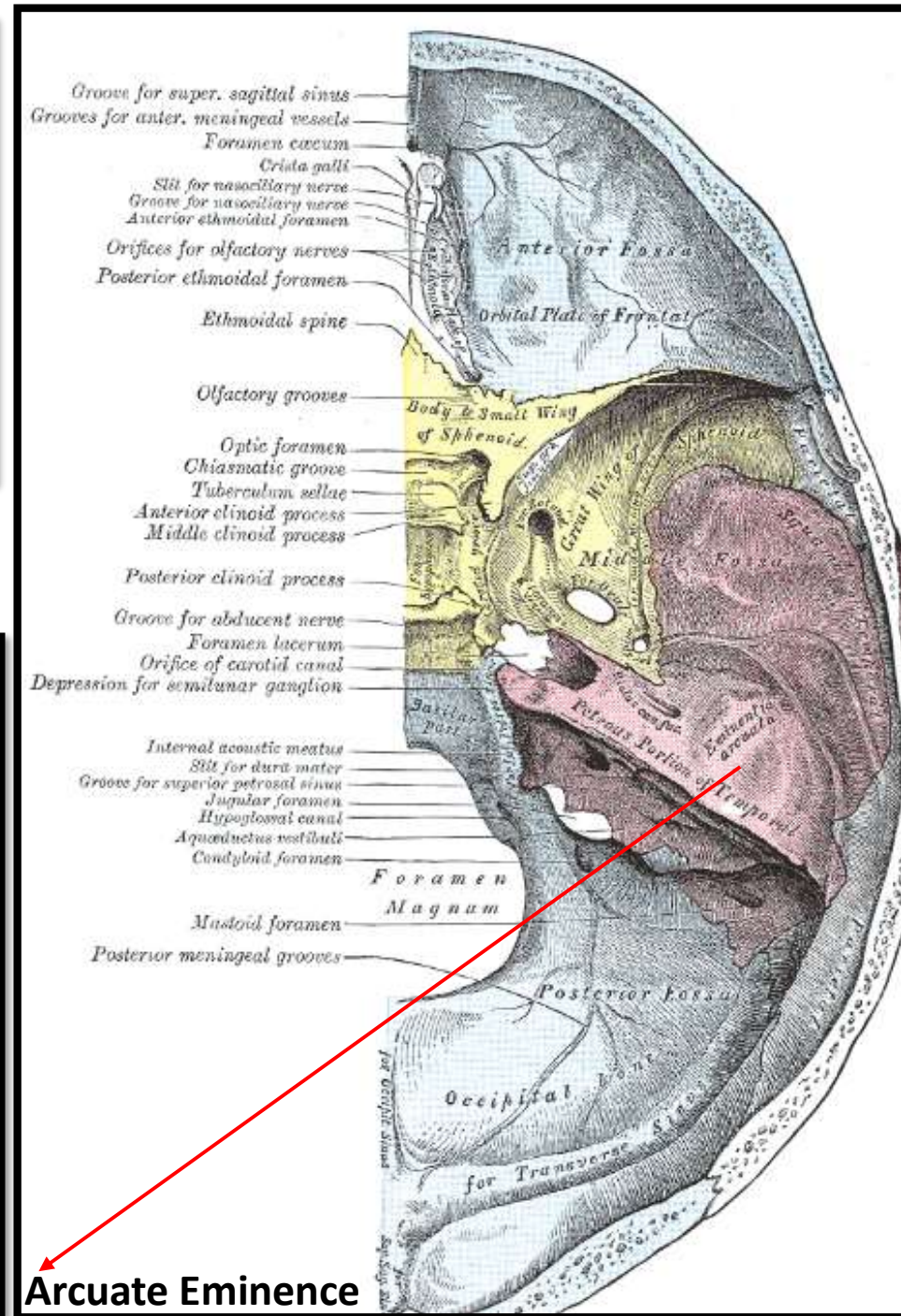
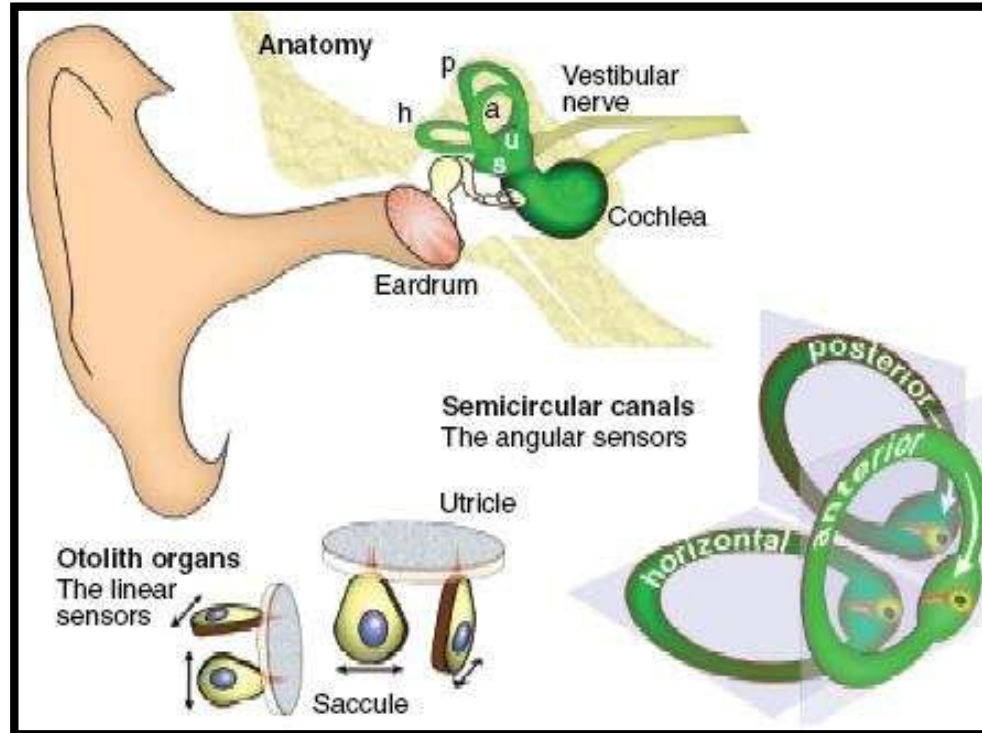
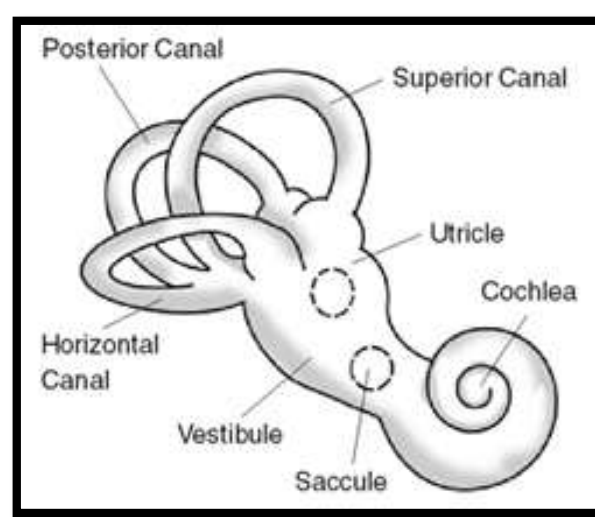


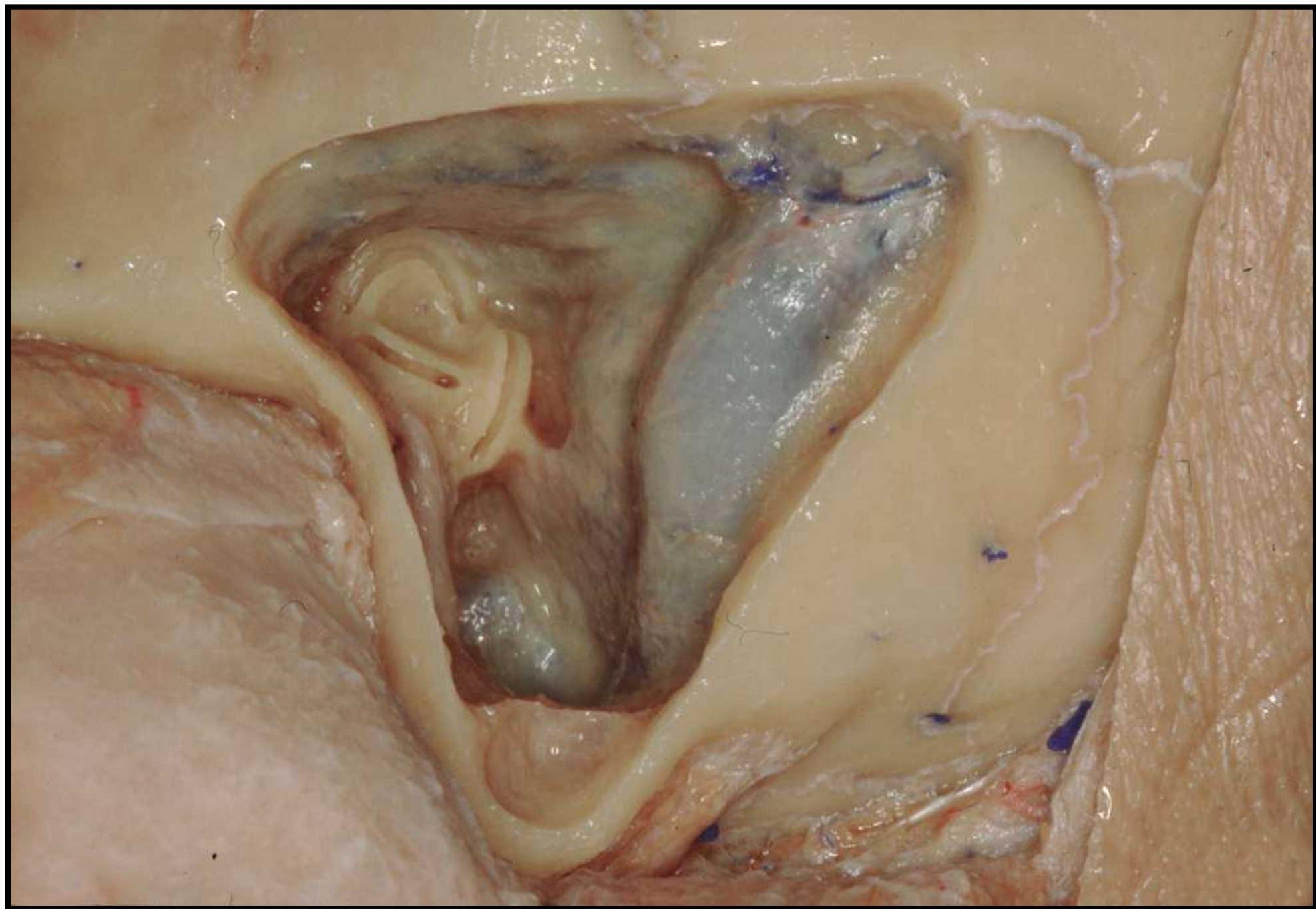
# Semicircular Canals

Number- 3

- Anterior (Superior)
- Posterior
- Lateral (Horizontal)

- ❖ Anterior semicircular canal is convex upwards.
- ❖ Its position is indicated on the anterior surface of petrous part as **arcuate eminence**.



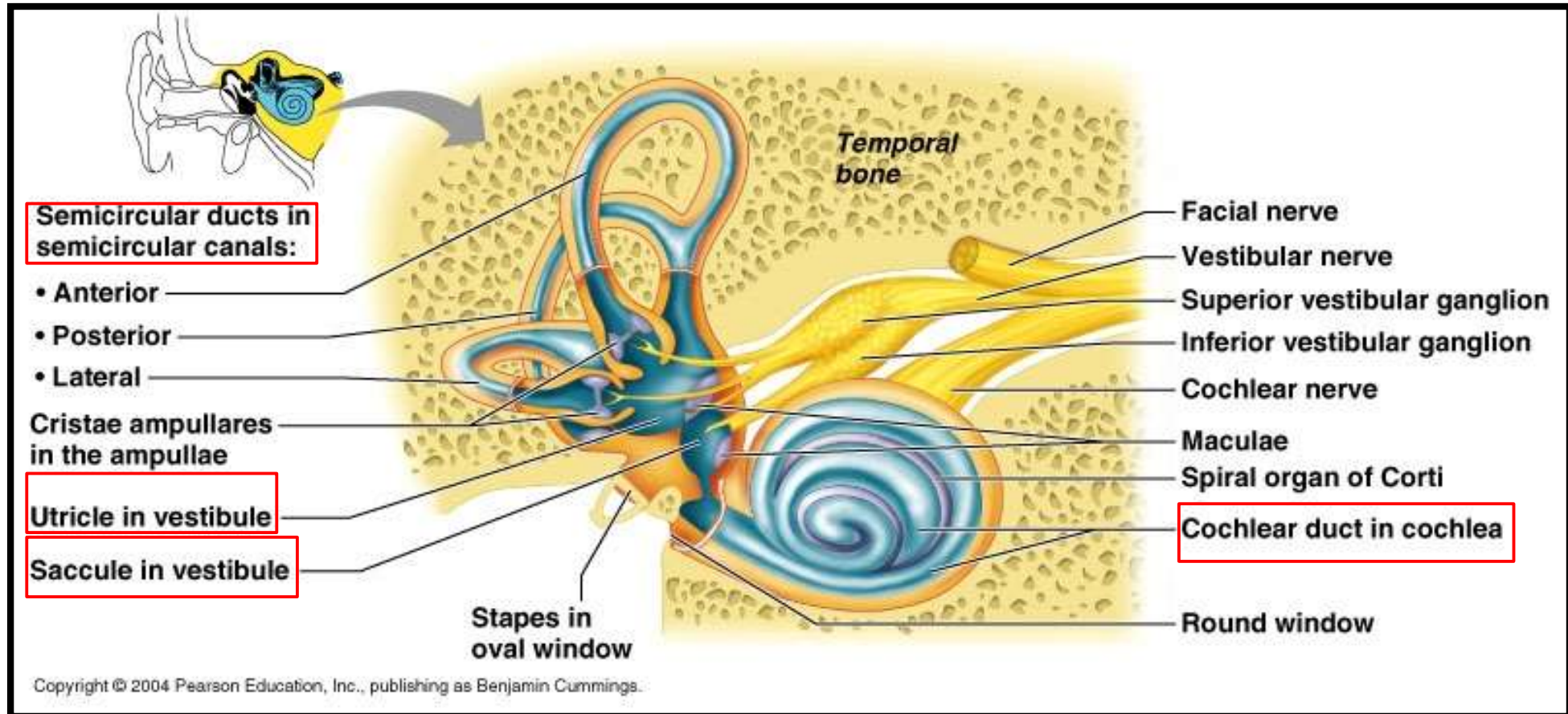




# Membranous Labyrinth

❖ It consists of: (from before backwards)

- Cochlear duct.
- Sacculle.
- Utricle.
- Semicircular ducts.



# Cochlear Duct [Scala Media]

## Location-

- It lies in the middle part of bony cochlear canal.
- It is the **anterior** part of membranous labyrinth.
- It has 2 & 3/4<sup>th</sup> turns.
- It contains sensory receptor for hearing which is **Spiral Organ of Corti**.

## Spiral Organ of Corti-

It has:

- **Tunnel of Corti**.
- **Hair Cells**- Outer and Inner
- **Supporting Cells**- **Deiter's** and **Hansen's Cells**.
- **Membrana Tectoria**.

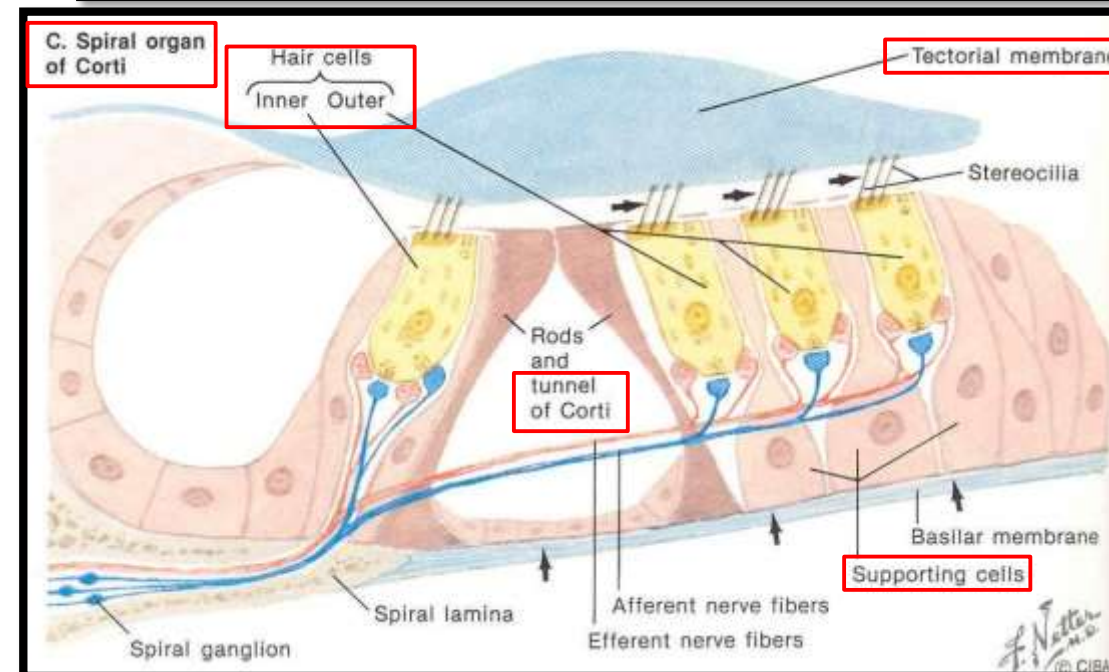
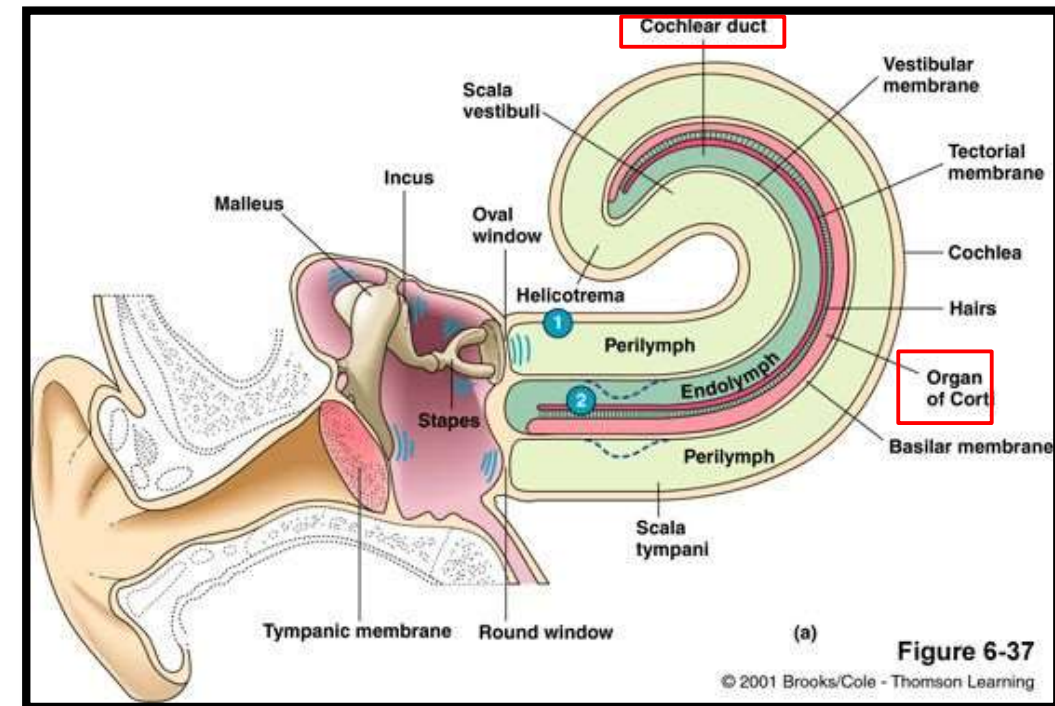
## Tunnel of Corti-

❖ It contains:

- **Outer and Inner rod cells**.
- **Corticolymp**.

## Hair Cells-

- These are receptor cells of hearing.
- Inner hair cells are richly supplied by Cochlear nerve fibers.





# Saccule & Utricle

## Location-

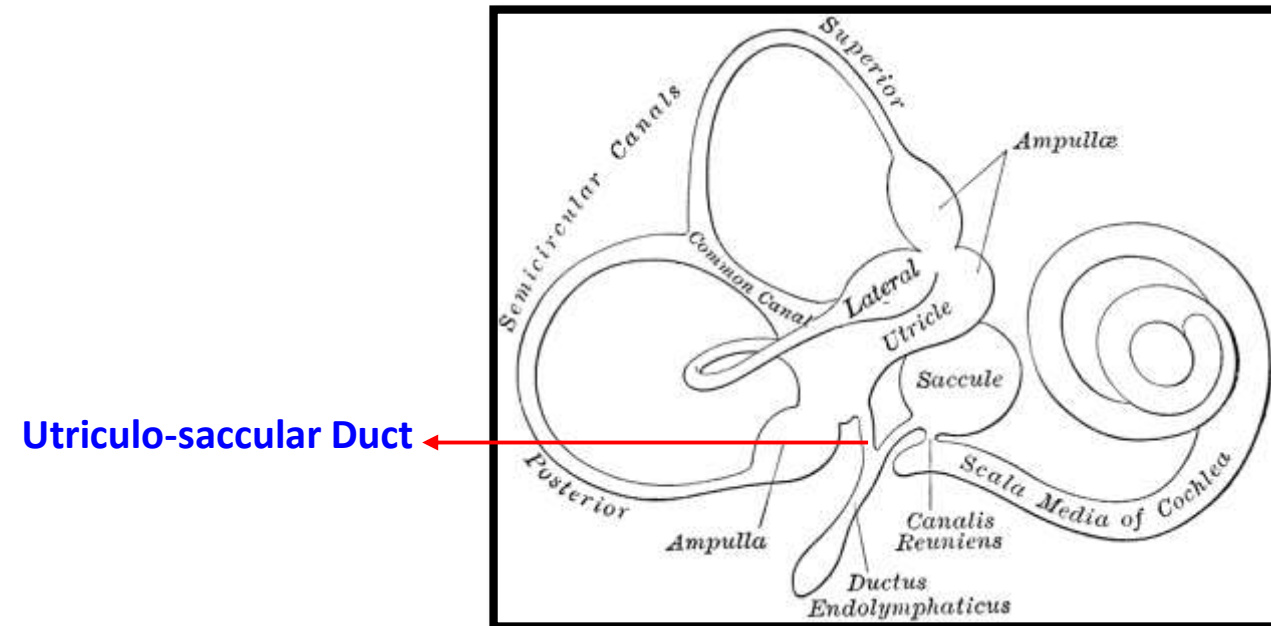
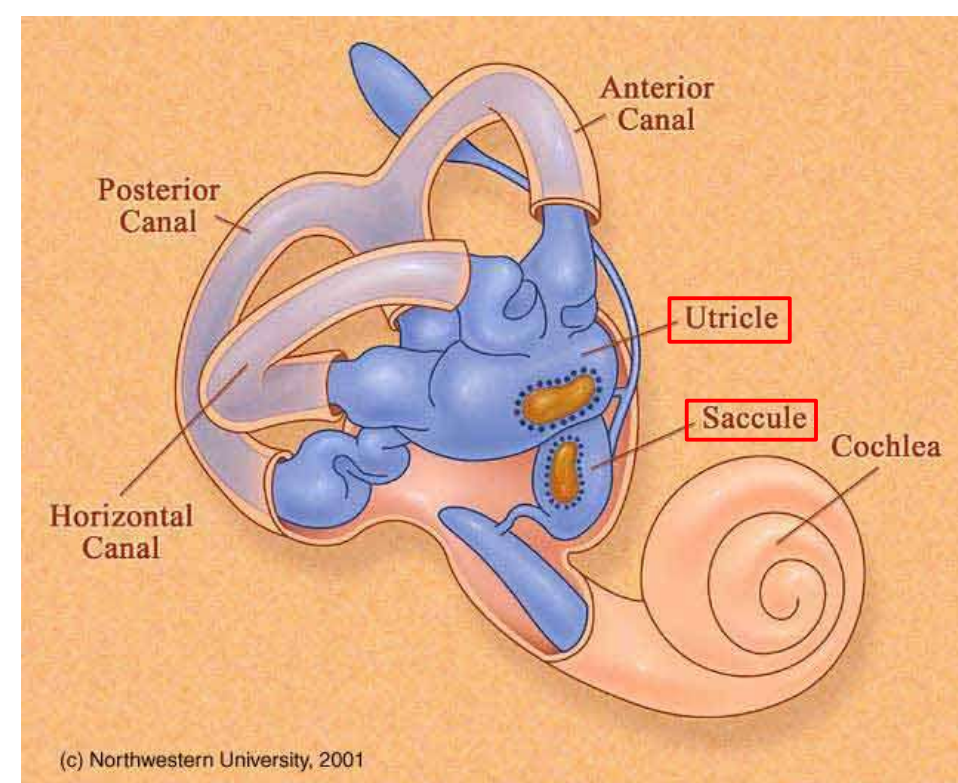
- Within bony vestibule

## Saccule-

- It is a small **globular** membranous sac.
- It lies in the **anteroinferior** part of vestibule.
- It is connected to the basal turn of cochlear duct by **ductus reuniens**.
- It is connected to the utricle by utriculo-saccular duct.

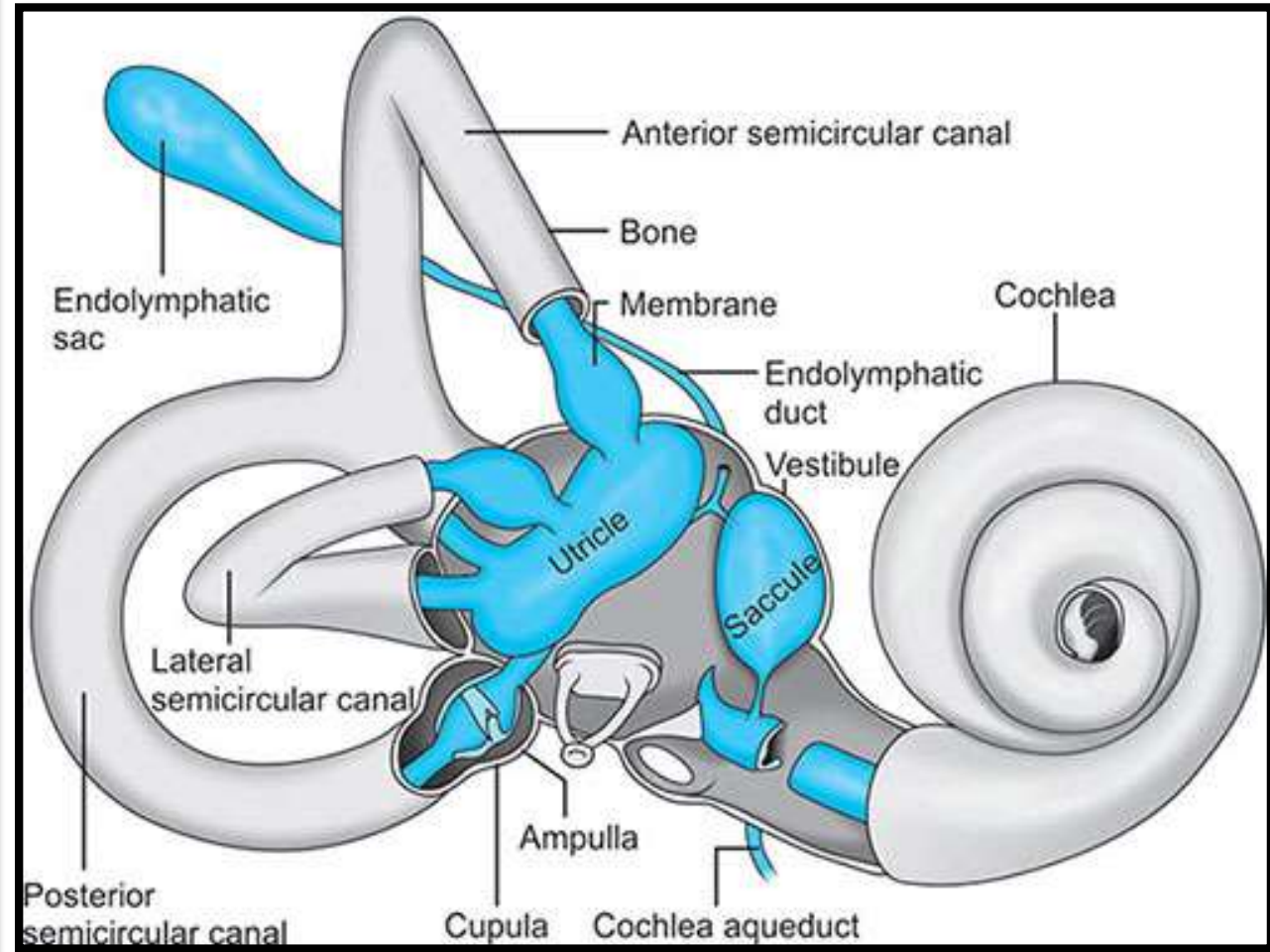
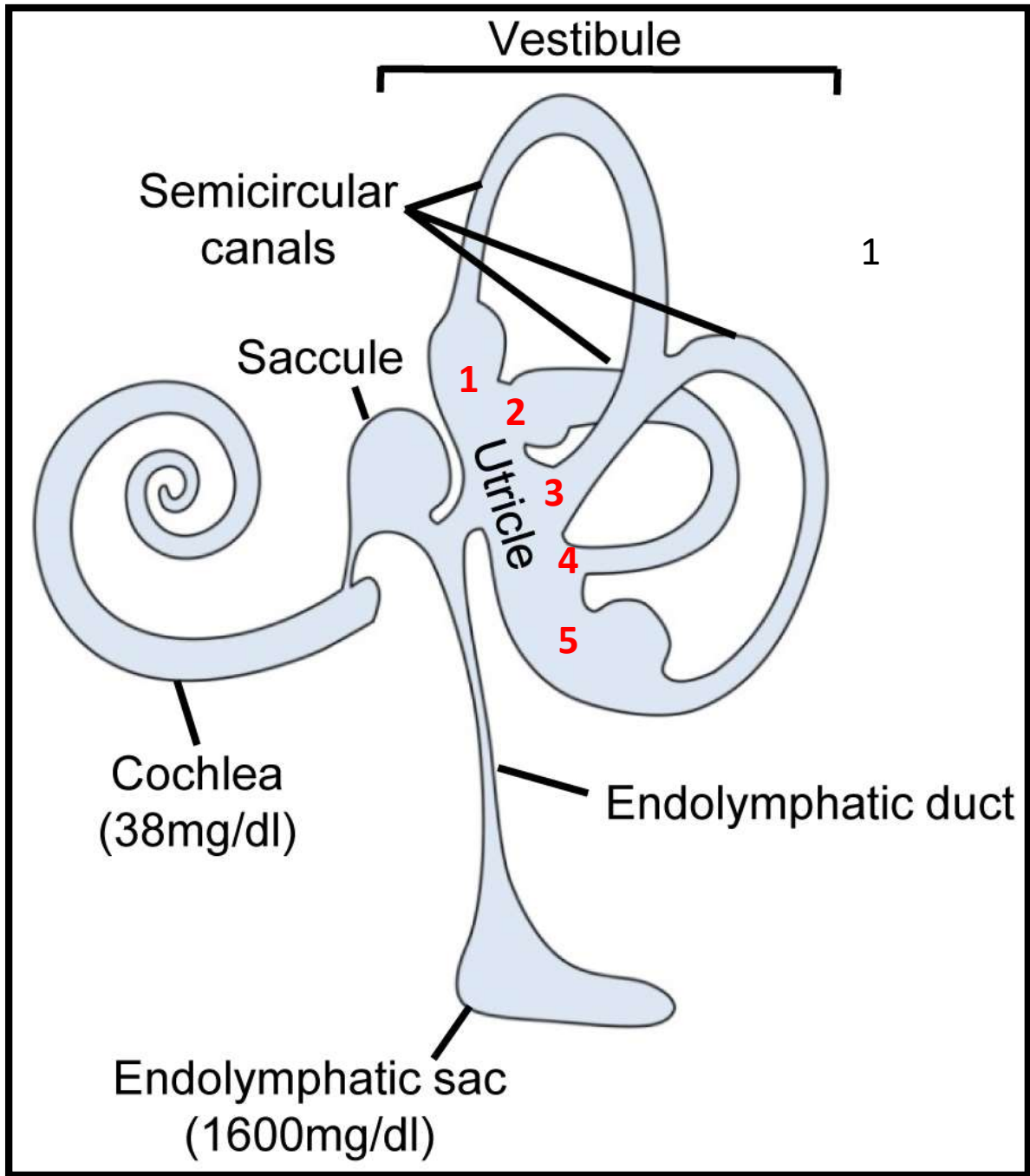
## Utricle-

- It is an **oblong** membranous sac, larger than saccule.
- It lies in the **posterosuperior** part of vestibule.
- It receives **3 semicircular ducts** through **5 openings**.



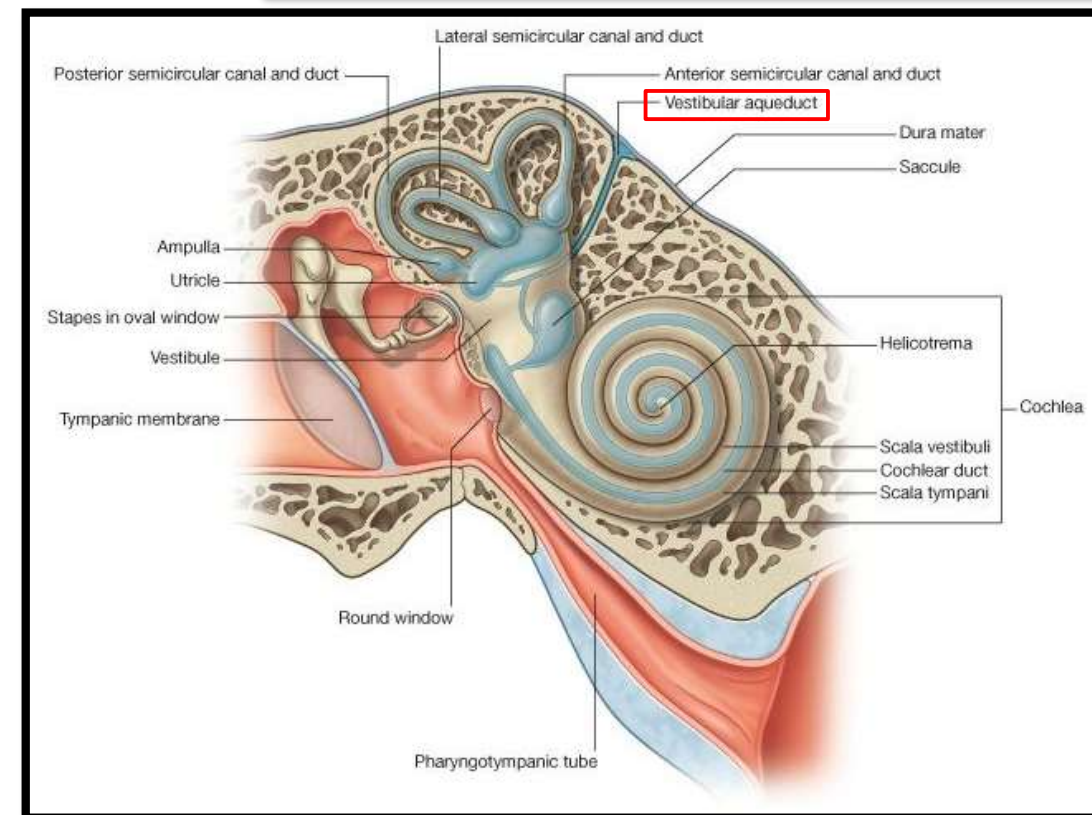
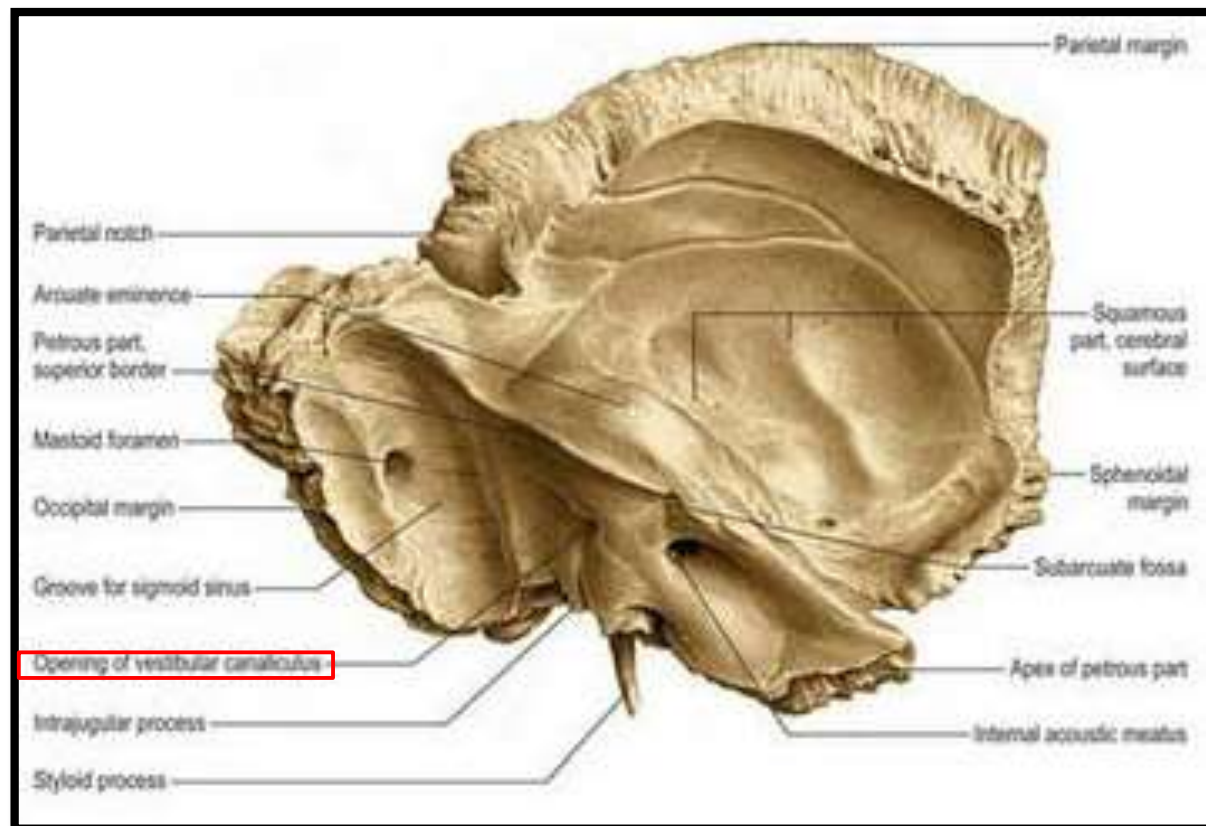
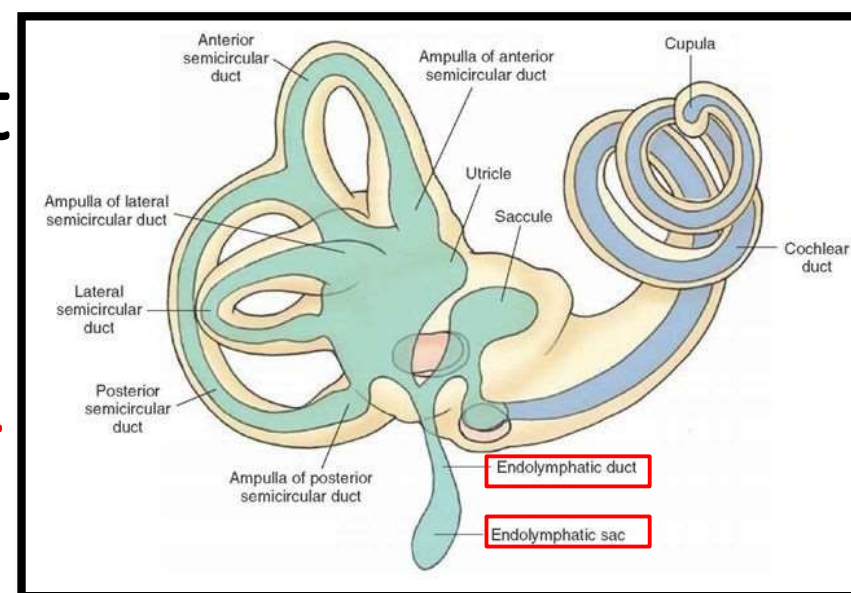
Utriculo-saccular Duct





# Utriculo-Saccular Duct

- It is 'Y' shaped.
- Utriculo-saccular duct continues as **endolymphatic duct** and its dilated end is called **endolymphatic sac**.
- Endolymphatic duct passes through a bony canal ( **Aqueduct of Vestibule** ).
- Aqueduct of Vestibule is present in the posterior part of petrous part of temporal bone.



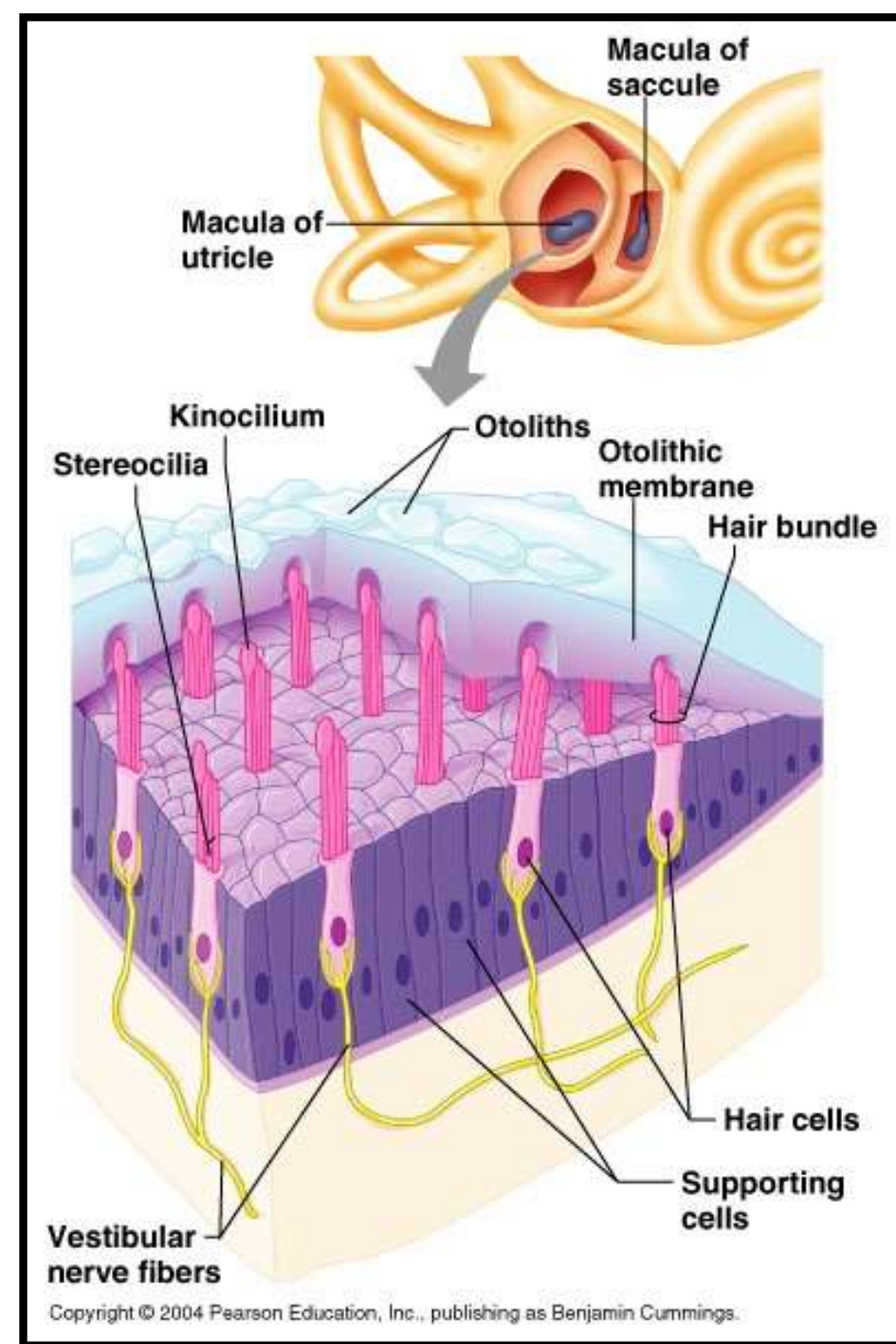
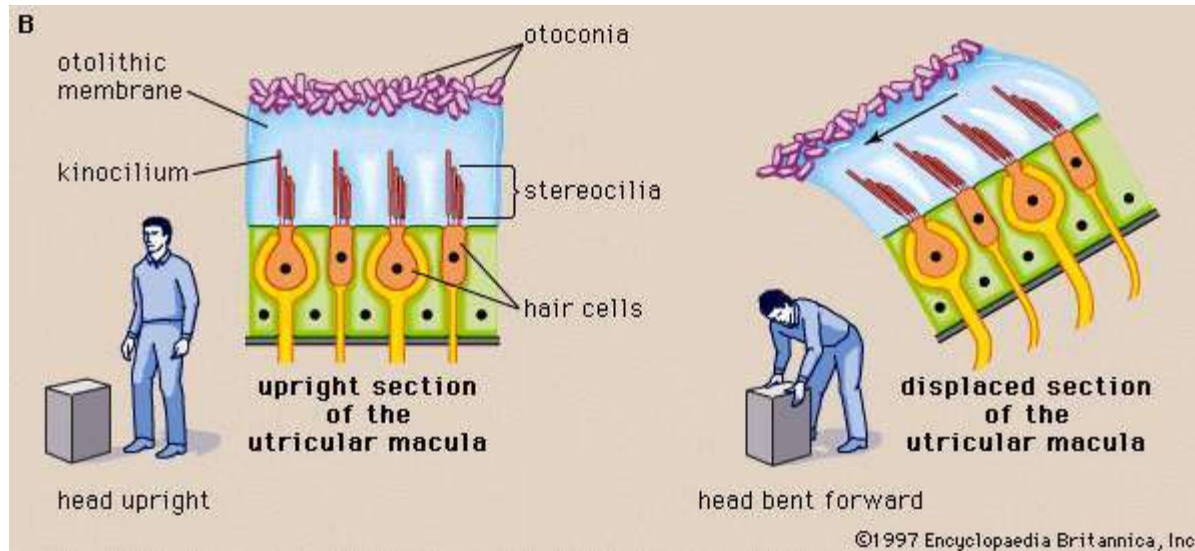


# Receptors in Saccule & Utricle

## Maculae-

## Location-

- In medial wall of Saccule and Utricle.
- Maculae maintain the 'static balance'.
- These receptors sense the position of head in response to gravity and linear acceleration.



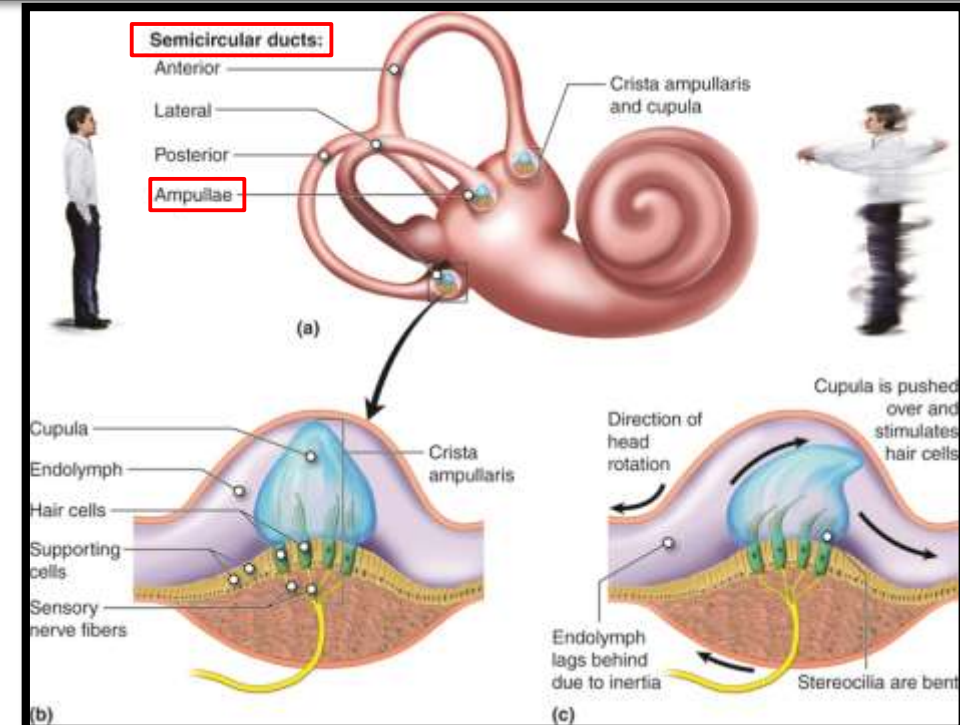
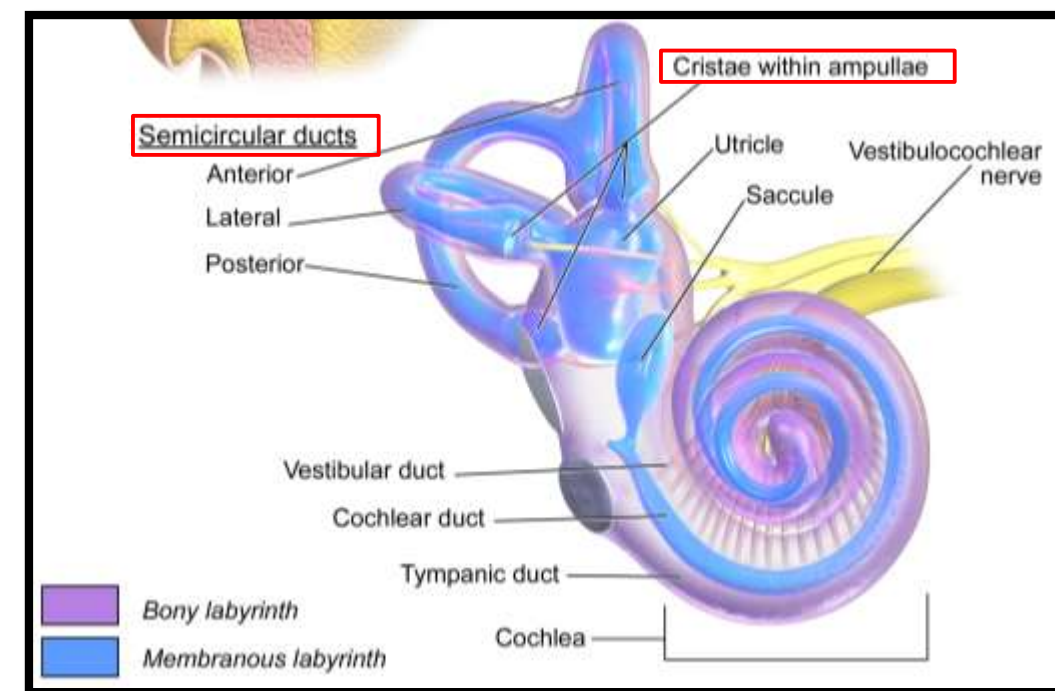


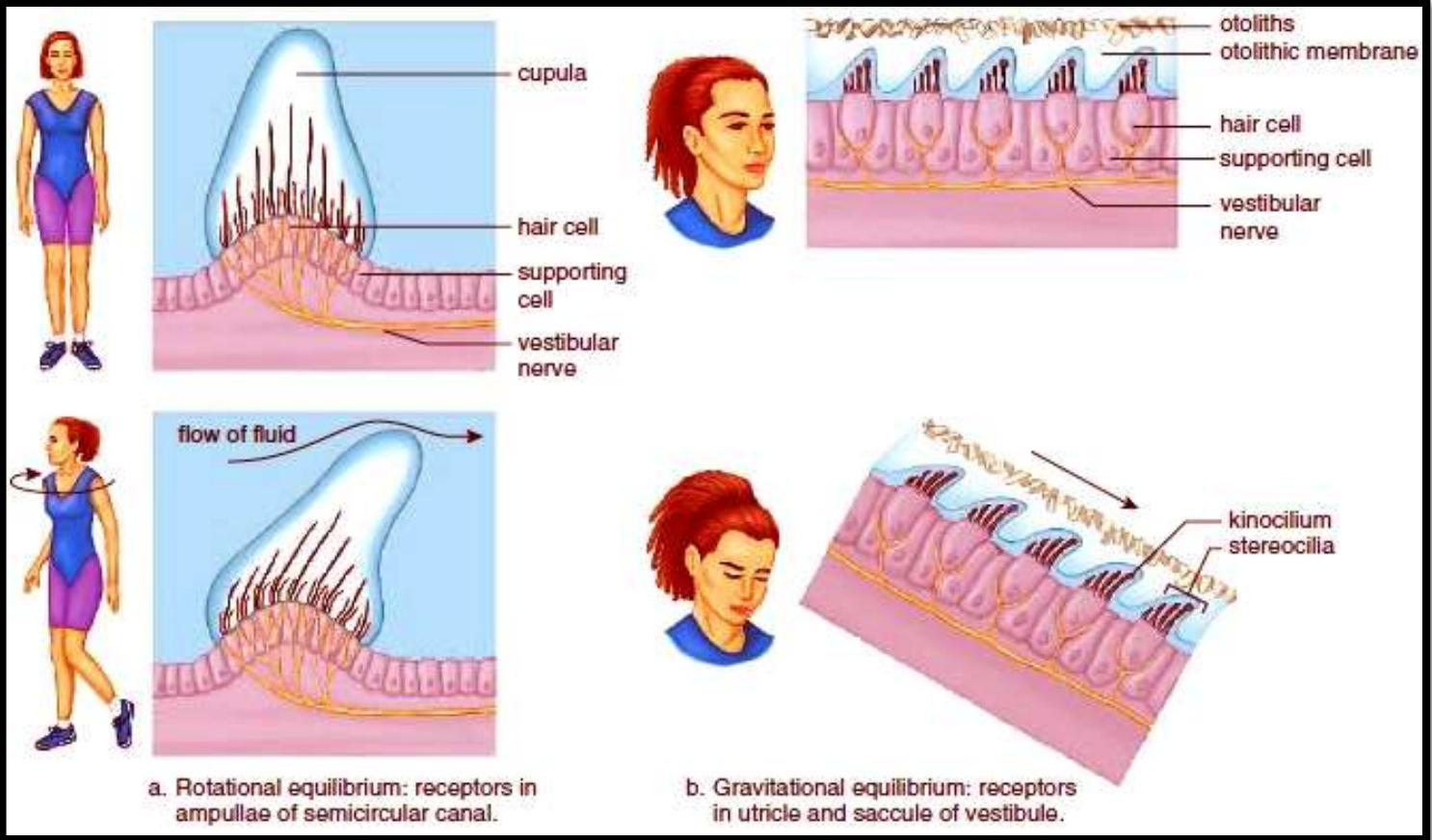
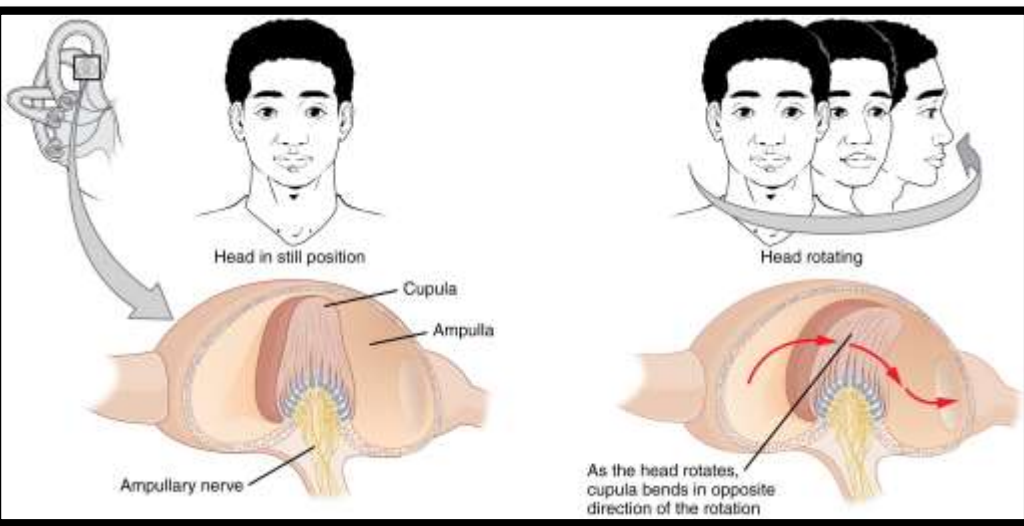
# Semicircular Ducts

## Number- 3

- Anterior
- Posterior
- Lateral

- ❖ These 3 ducts lie within 3 corresponding semicircular canals.
- ❖ Each duct has one dilated end called **ampulla**.
- ❖ Ampullae have sensory receptors called '**cris**tae'.
- ❖ **Cristae** maintain the '**kinetic balance**'.
- ❖ These receptors respond to '**angular acceleration**'.



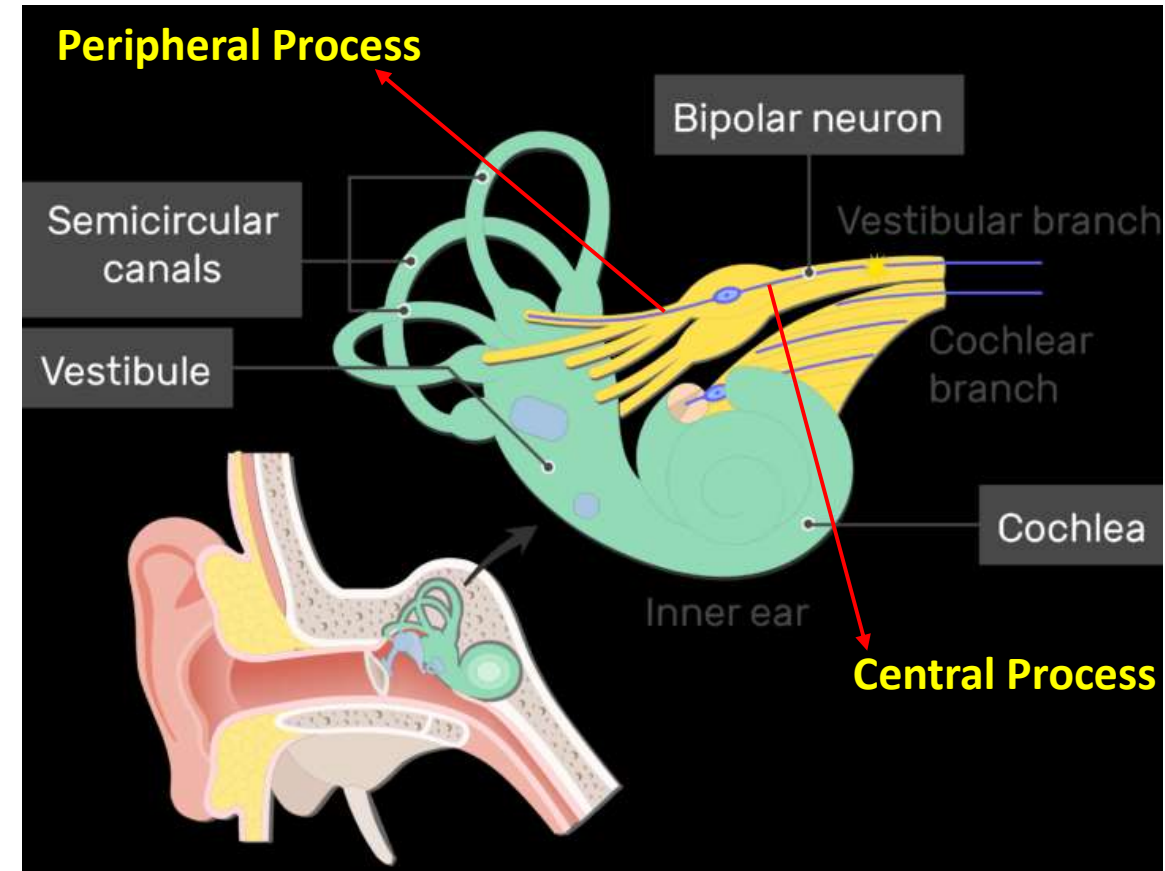
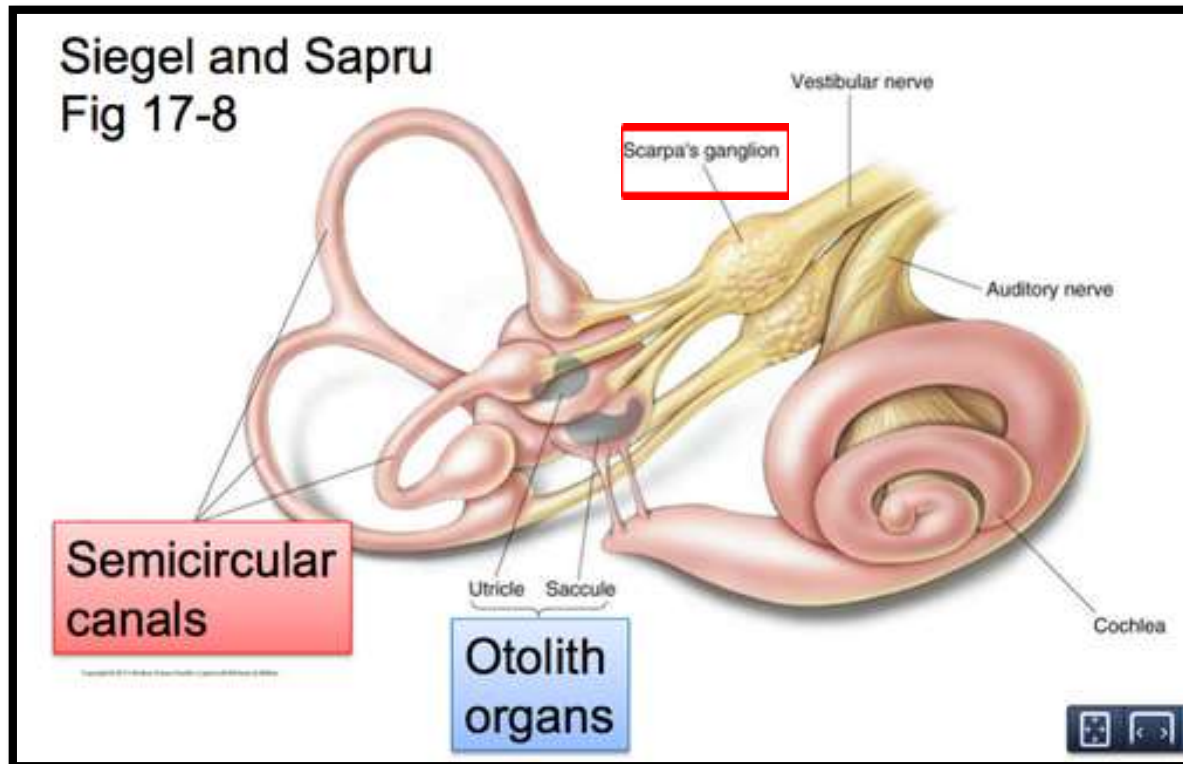


# Innervation of Receptors of Vestibular System

## Vestibular/Scarpa's Ganglion-

### Location-

- Lateral part of internal acoustic meatus.
- ❖ This ganglion has bipolar neurons.
- ❖ **Peripheral processes** of these neurons innervate hair cells of cristae and maculae.
- ❖ **Central processes** aggregate to form vestibular nerve.





*Thank You*

