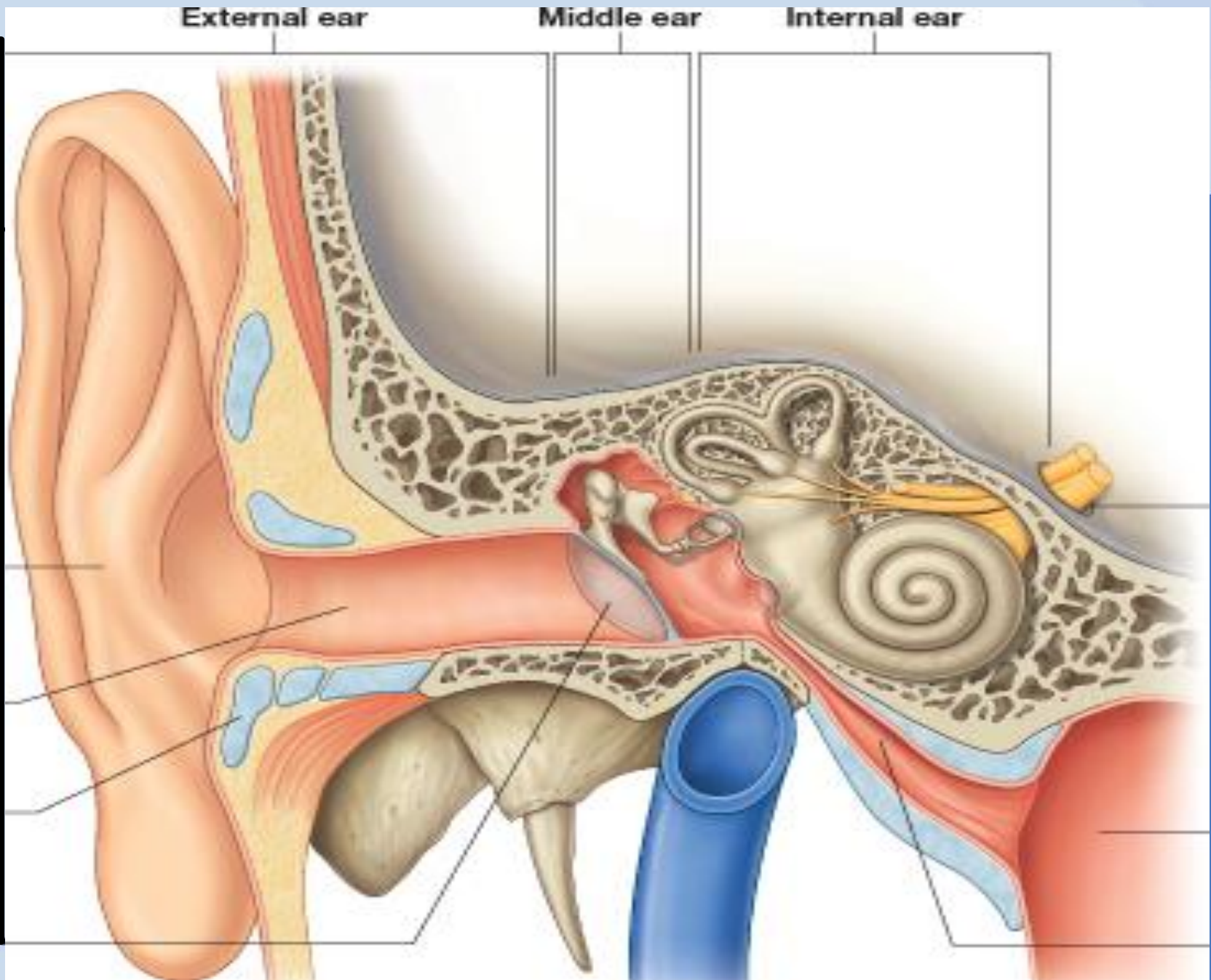


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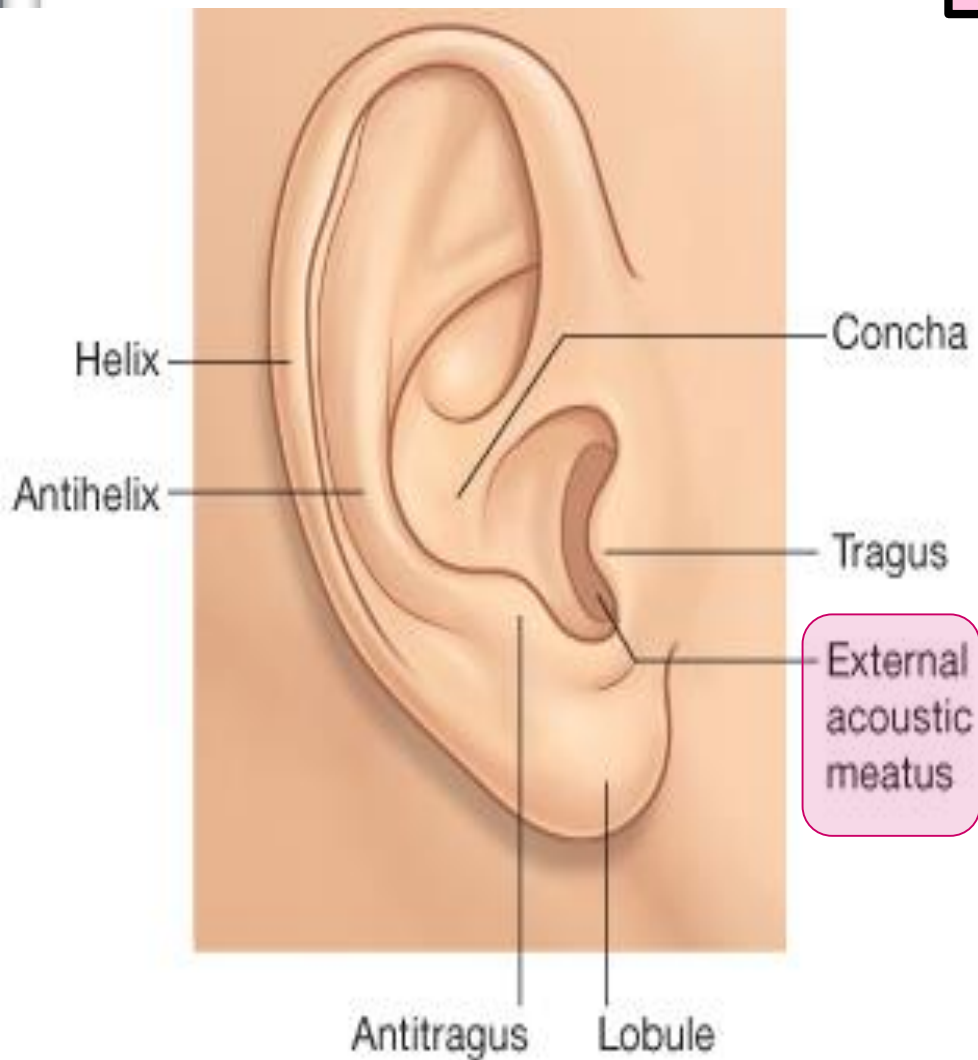
# Objectives

- By the end of the lecture the student should be able to:
- List the parts of the ear: **External**, Middle (tympanic cavity) and **Internal (labyrinth)**.
- Describe the parts of the external ear: auricle **and external auditory meatus**.
- Identify the boundaries of the middle ear : roof, floor and four walls (anterior, posterior, medial and lateral).

# Objectives

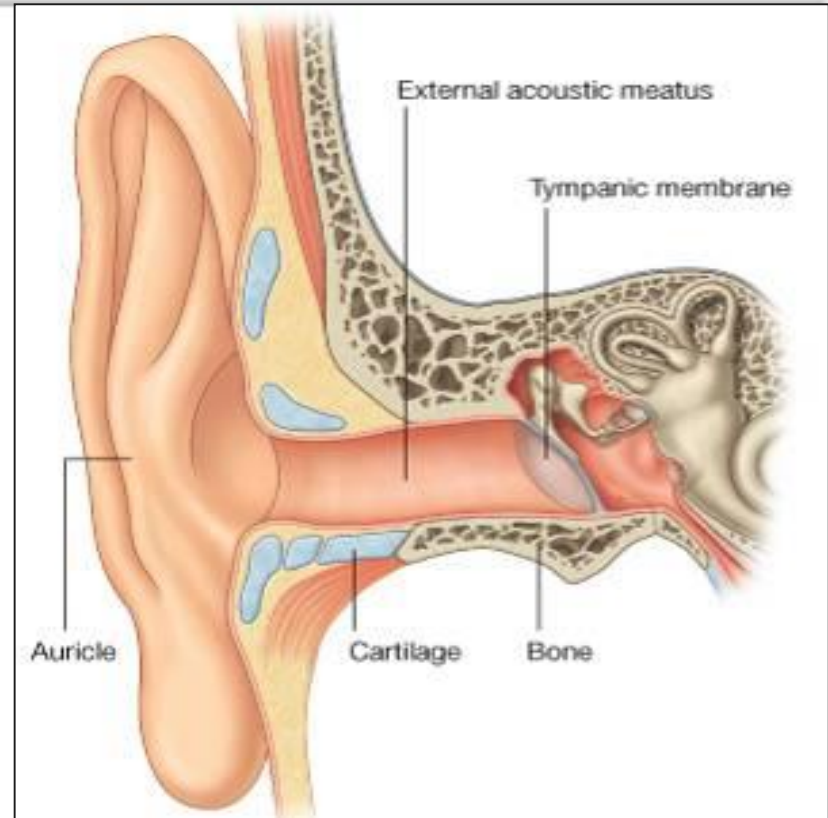
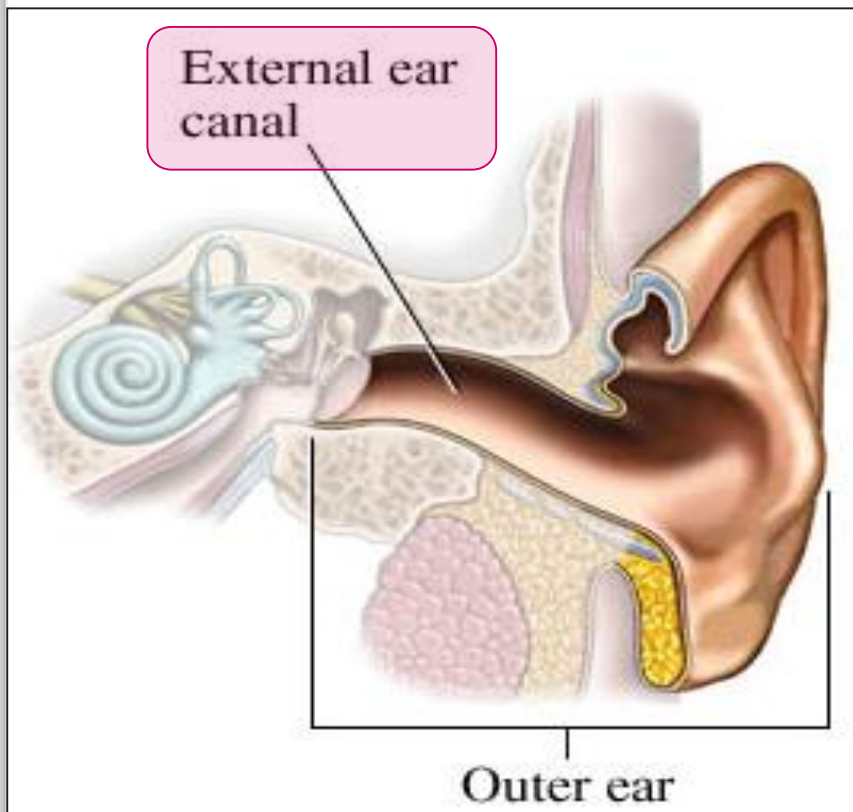
- Define the contents of the tympanic cavity:
- I. Ear ossicles, : (*malleus, incus and stapes*)
- II. Muscles, (tensor tympani and stapedius).
- III. Nerves (branches of facial and glossopharyngeal).
- List the parts of the inner ear, ***bony part filled*** with perilymph (Cochlea, vestibule and semicircular canals), in which is suspended the membranous part that filled with endolymph).
- List the organs of hearing and equilibrium.

# EXTERNAL EAR



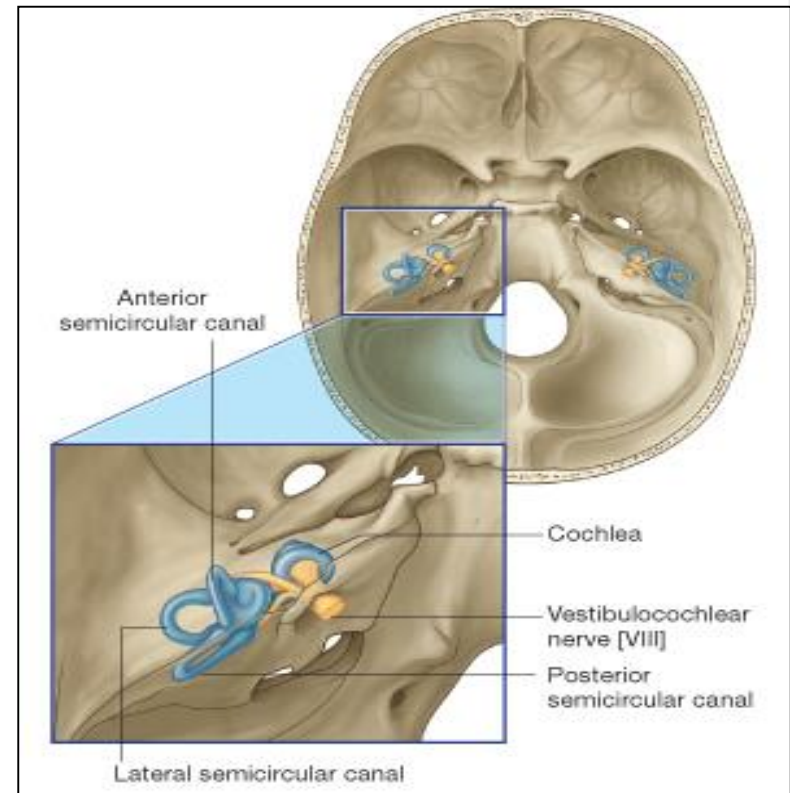
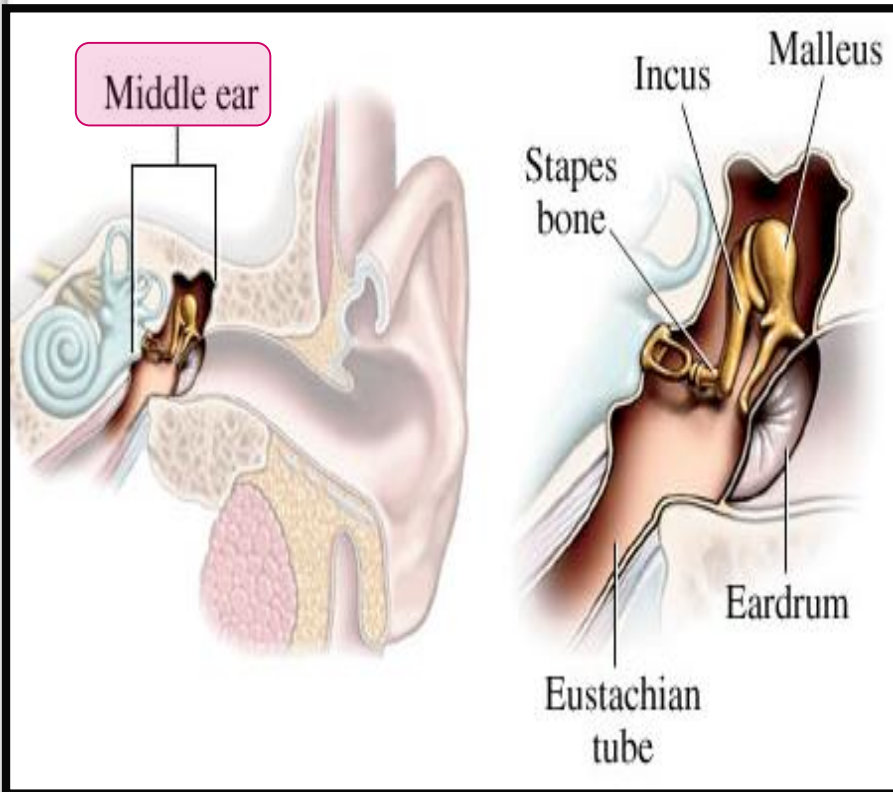
It is formed of the **auricle**, & the **external auditory meatus**.

- The **Auricle** has a characteristic shape and collects air vibrations.
- It consists of a thin plate of ***elastic cartilage*** covered by a double layer of skin.
- It receives the insertion of extrinsic muscles, which are supplied by the **facial nerve**. **Sensation** is carried by **great auricular & auriculotemporal nerves**.



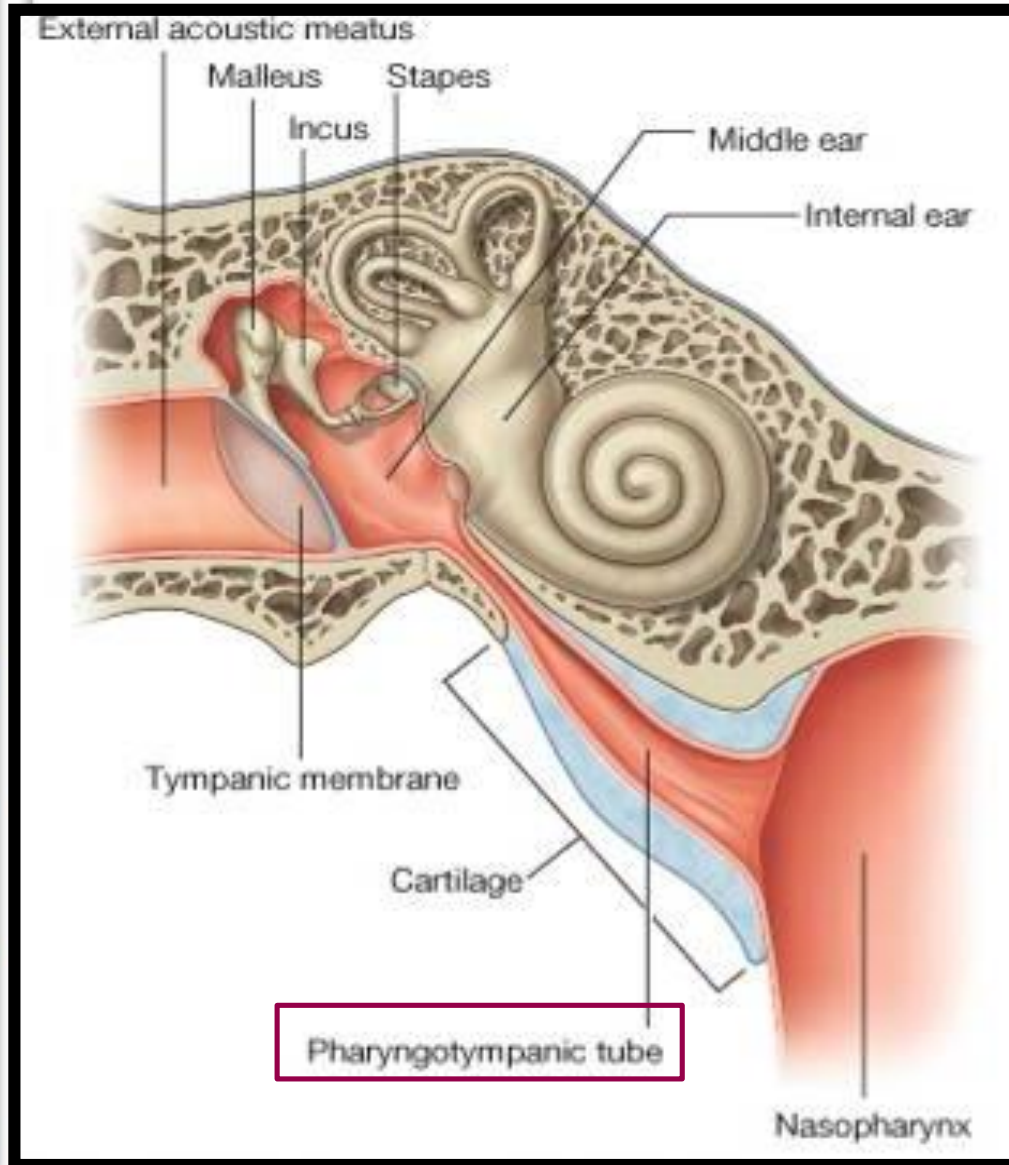
- **The external auditory canal** is a curved S-shaped tube about 2.5 cm, that conducts & collects sound waves from the auricle to the tympanic membrane. Its outer 1/3<sup>rd</sup> is **elastic cartilage**, while its inner 2/3<sup>rd</sup>s are **boney**.
- It is lined by skin, and its outer 1/3rd is provided with **hairs, sebaceous and Ceruminous Glands**: (modified sweat glands that secrete a yellowish brownish substance called the **ear wax**).

# MIDDLE EAR (TYMPANIC CAVITY)



- **Middle ear** is a narrow, oblique, slit-like cavity (air-filled) in the petrous temporal bone & lined with mucous membrane.
- It contains the **auditory ossicles**, which transmit the vibrations of the tympanic membrane (eardrum) to the internal ear.

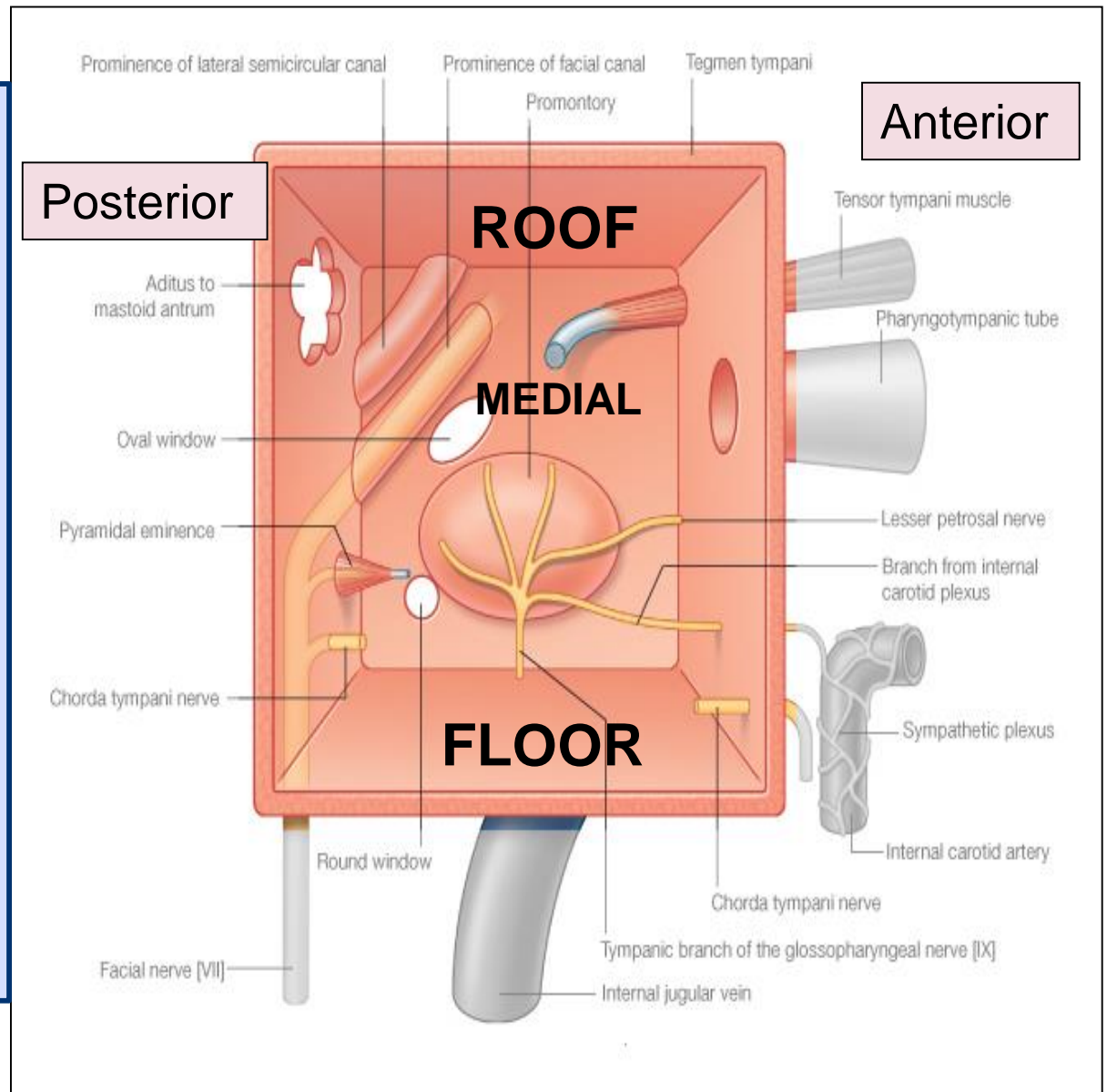
## MIDDLE EAR (TYMPANIC CAVITY)



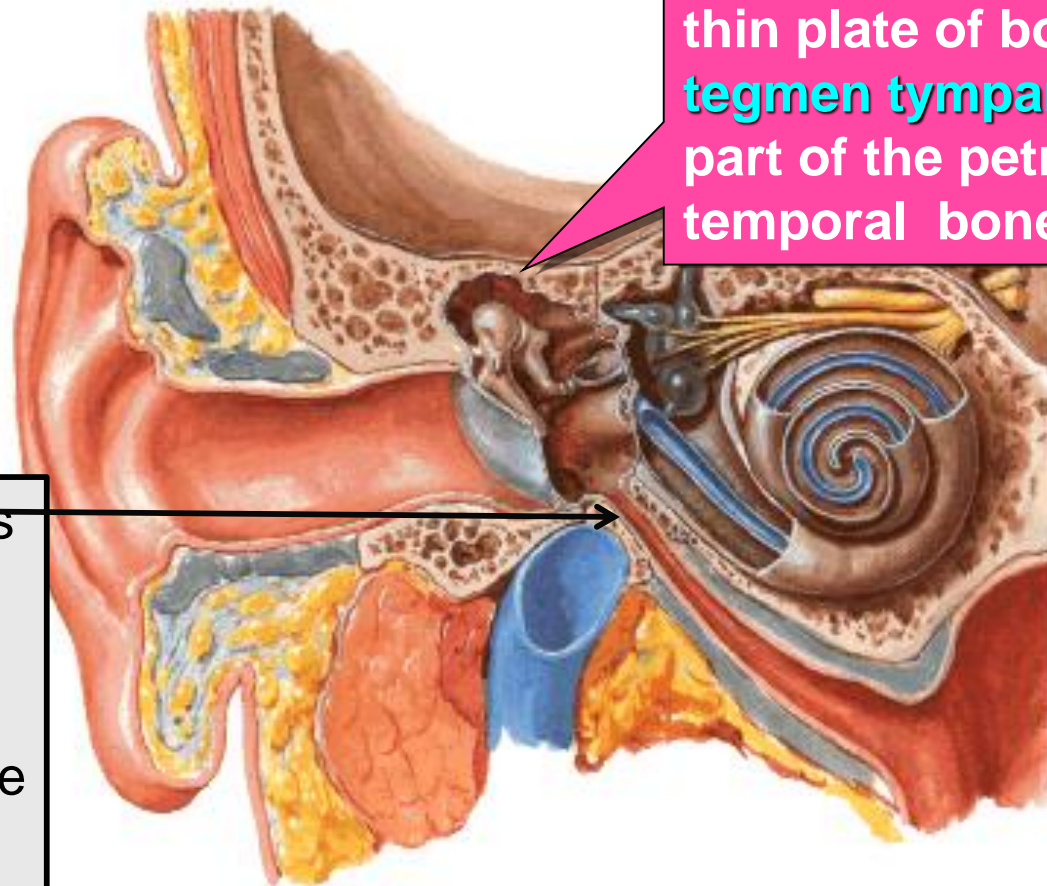
- **Communicates**  
*Anteriorly*
- with the **Nasopharynx** through the **Auditory Tube, which** extends from the anterior wall downward, forward, and medially to the nasopharynx).
- The posterior 1/3<sup>rd</sup> of the canal is bony, and its anterior 2/3rds are cartilaginous.
- Its function is to equalize the pressure on both sides of the ear drum.

The middle ear **has:**

- **Roof,**
- **Floor,**
- **and 4**
- **walls:**
- **Anterior,**
- **Posterior,**
- **Lateral,**
- **and**
- **Medial.**







**The Roof** is formed by a thin plate of bone, called **tegmen tympani**, which is part of the petrous temporal bone.

It separates the tympanic cavity from the temporal lobe of the brain.

**The Floor** is formed by a thin plate of bone, which separates the **middle ear** from **the bulb of the internal jugular vein**.

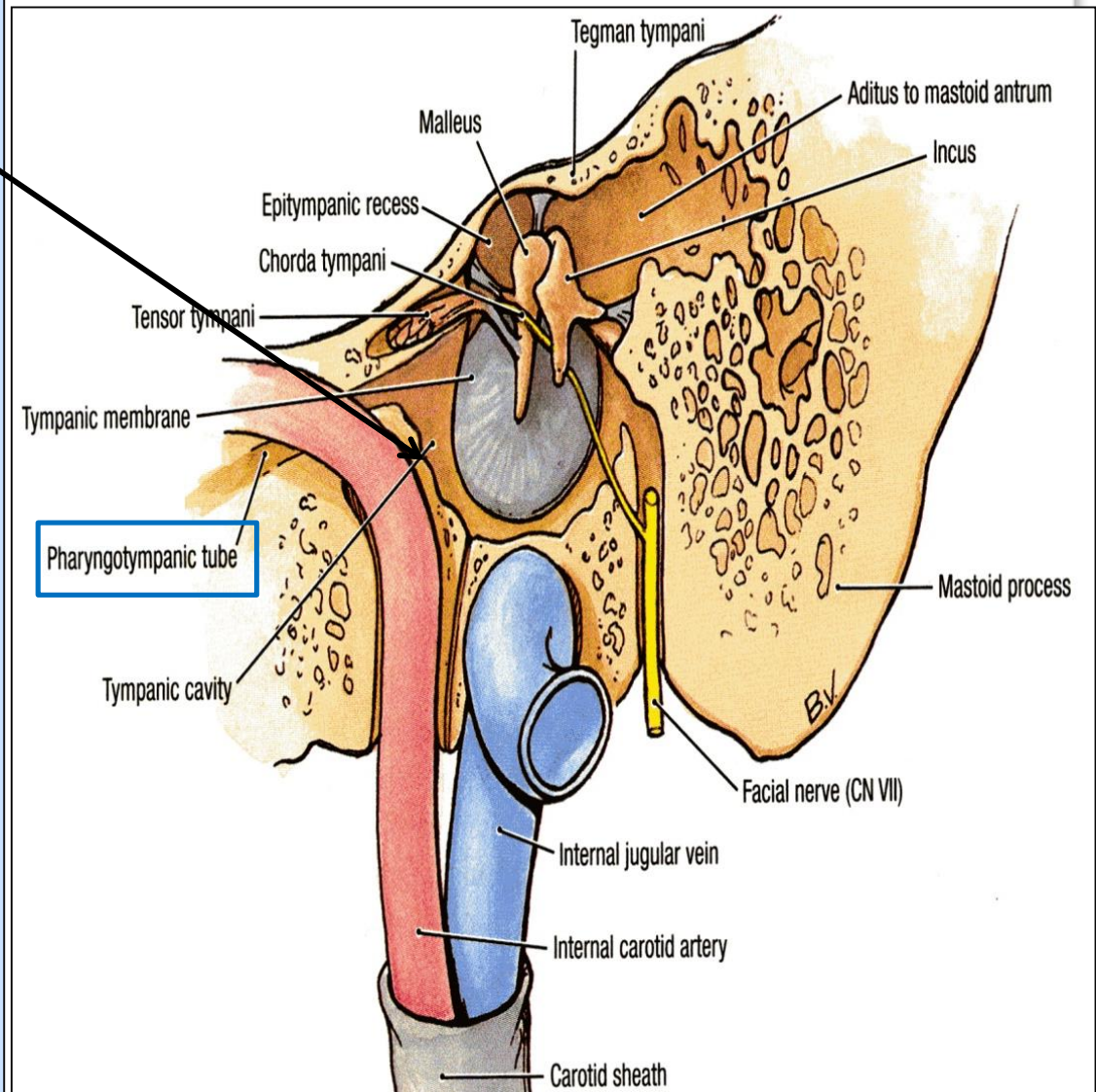
# Anterior wall

The *anterior wall* is formed below by a thin plate of bone that separates tympanic cavity from the **internal carotid artery**.

**There** are 2 canals at the upper part of the anterior wall.

**The** upper smaller is the **canal for the tensor tympani muscle**.

**The** lower larger is for the **auditory tube**.

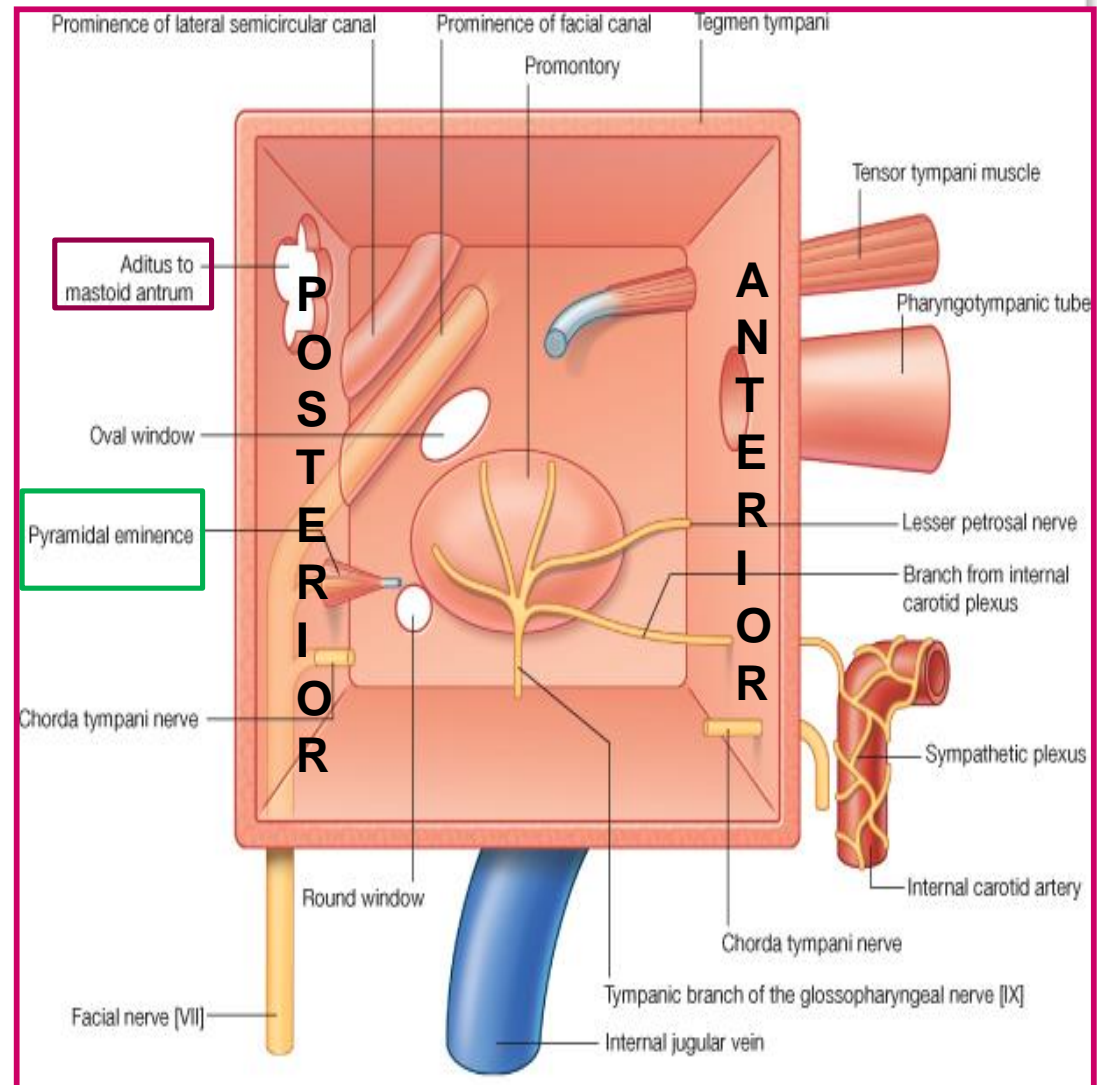


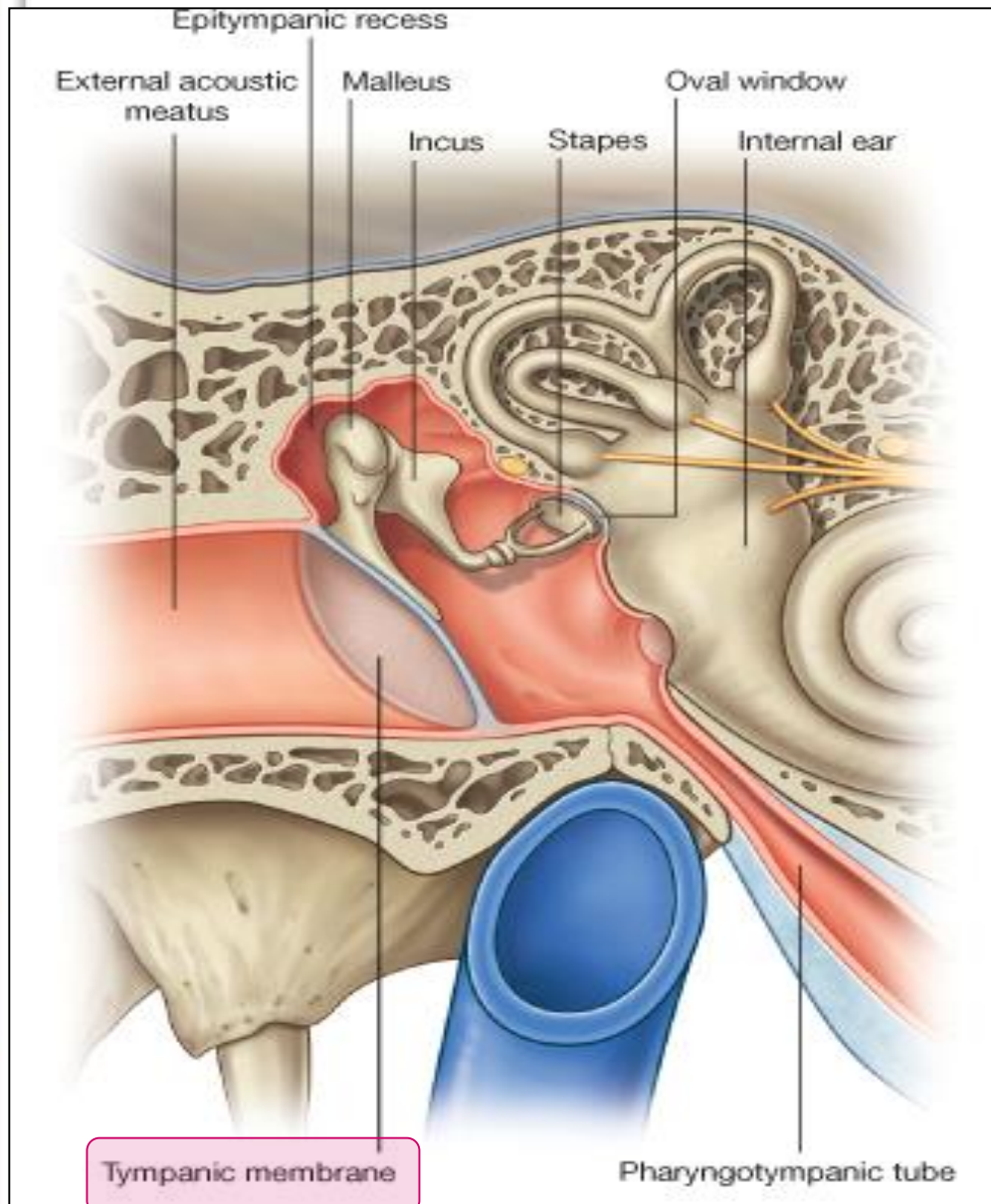
# Posterior wall

*The posterior wall* has in its **Upper** part a large, irregular opening, the **aditus to the mastoid antrum**.

**Below** : a small, hollow, conical projection, the **pyramid**, which houses the **stapedius muscle and its tendon**.

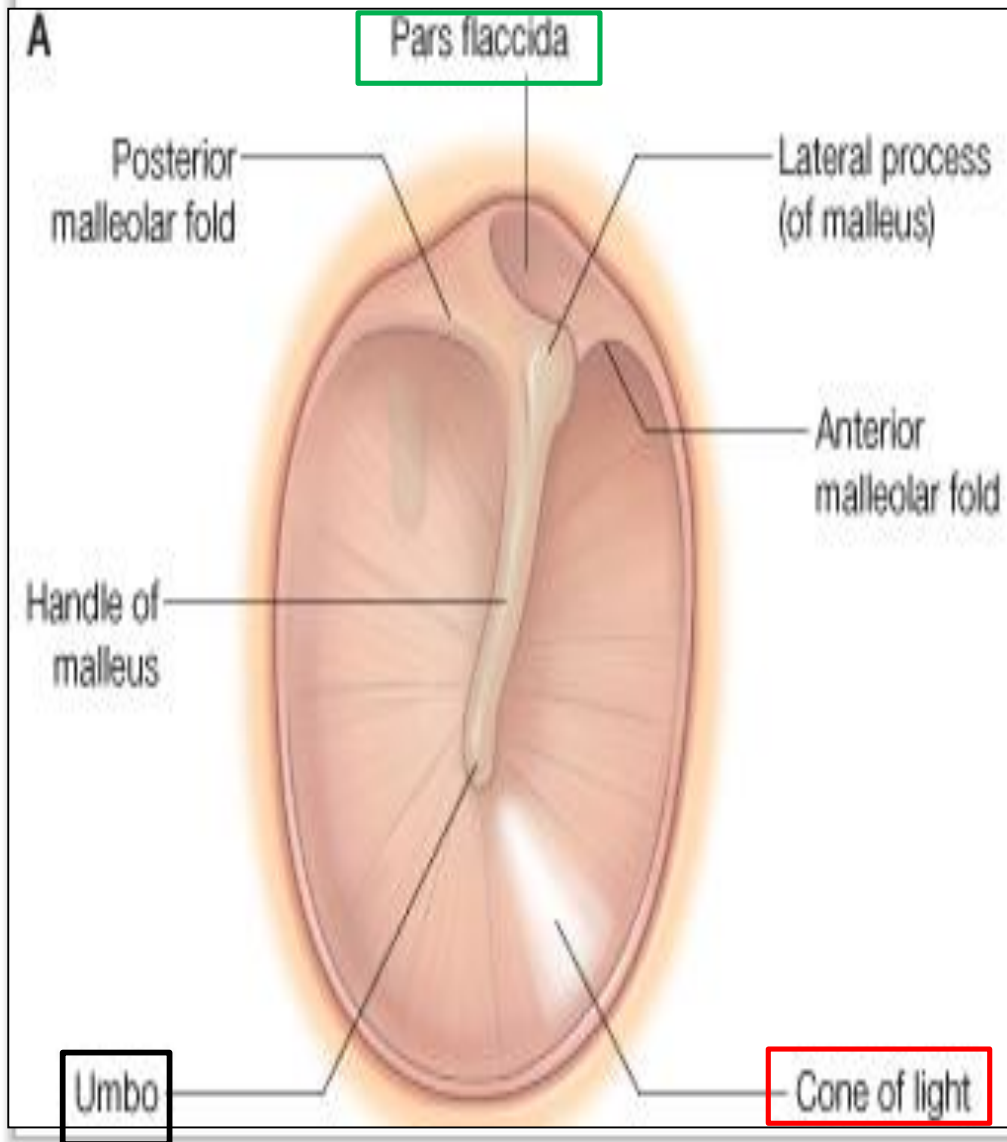
**The tendon emerges** from the apex of the pyramid.





- *The lateral wall* :
- Is largely formed by the **tympanic membrane**.
- The membrane is obliquely placed, facing downward, forward, & laterally.
- It is **extremely sensitive to pain**.
- *Nerve supply of ear drum*:
- Outer surface:
- 1- **Auriculotemporal nerve**.
- 2- **Auricular branch of vagus**.
- Inner surface:
- ***Tympanic branch of the glossopharyngeal nerve***.

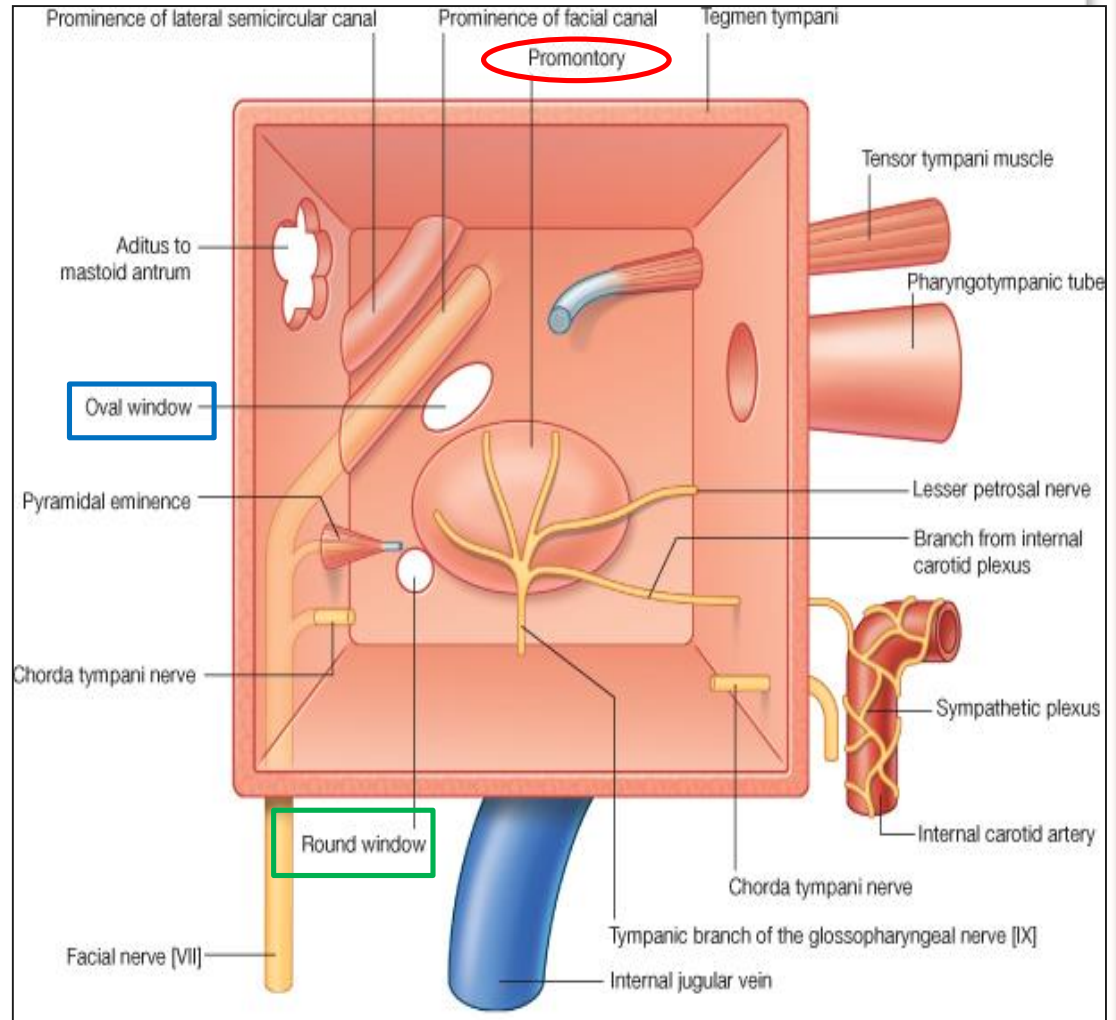
# TYMPANIC MEBRANE



- It is **concave** laterally, and at the depth of its concavity there is a small depression, “ the **Umbo**” produced by the tip of the handle of the malleus.
- When the membrane is illuminated through an otoscope, the concavity produces a “**Cone of Light,**” which radiates anteriorly and inferiorly from the umbo.
- Most of the of the membrane is tense and is called the **Pars Tensa.**
- A small triangular area on its upper part is slack and called the **Pars Flaccida**

- Greater part of the **medial** wall shows a rounded projection, called **promontory**, that results from the underlying 1<sup>st</sup> turn of the cochlea.
- Above and behind the promontory lies the oval window (**Fenestra Vestibuli**), which is closed by the **base of the stapes**. Below and behind the promontory lies the round window (**Fenestra Cochleae**), which is closed by the **secondary tympanic membrane**.

## Medial wall



**It is formed by the lateral wall of the inner ear.**

# Auditory Ossicles



Malleus  
(hammer)



Incus  
(anvil)



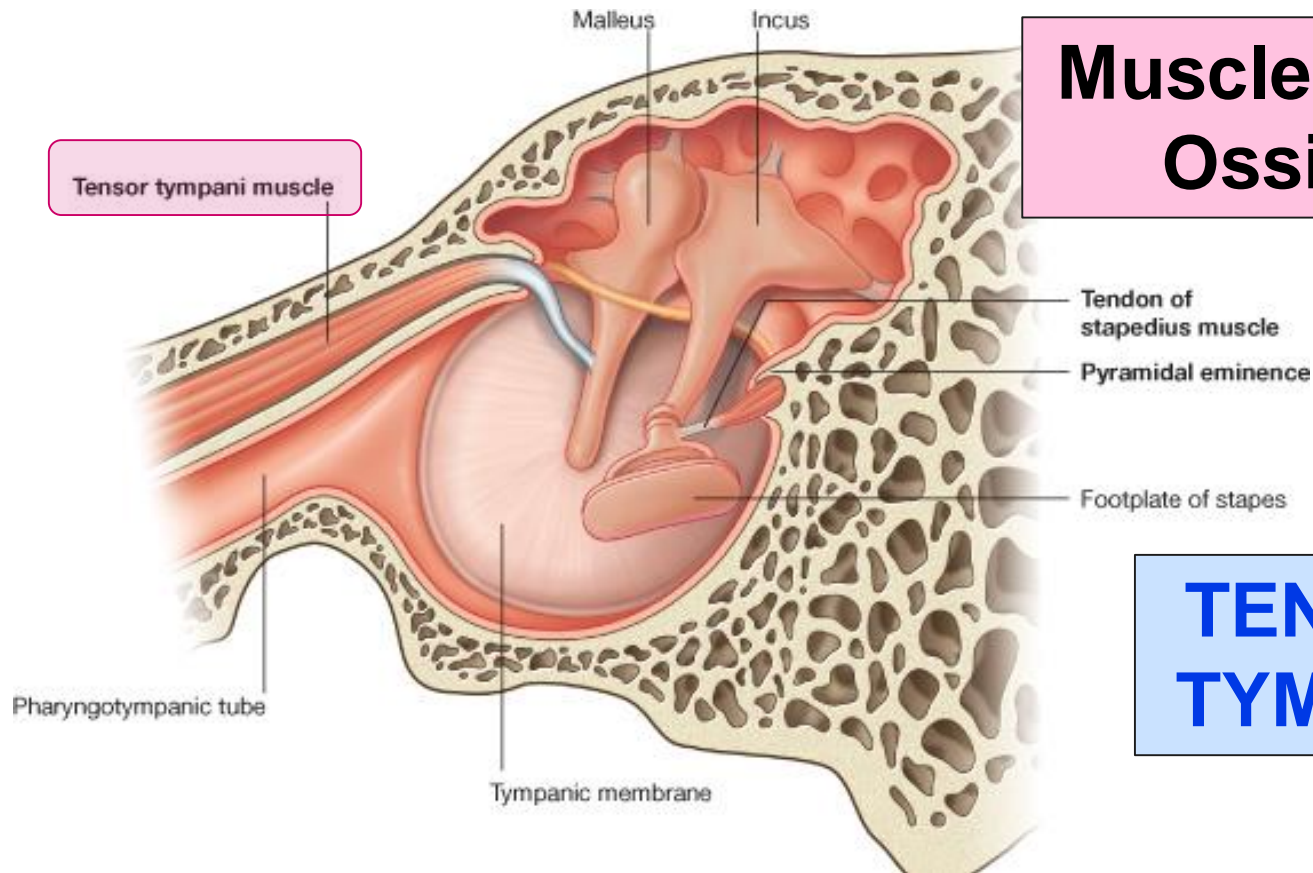
Stapes  
(stirrup)

The auditory ossicles are **(3)** malleus, incus, and stapes.

They transmit sound waves from tympanic membrane to the perilymph of the internal ear.

They are covered by mucous membrane & articulated by synovial joints.

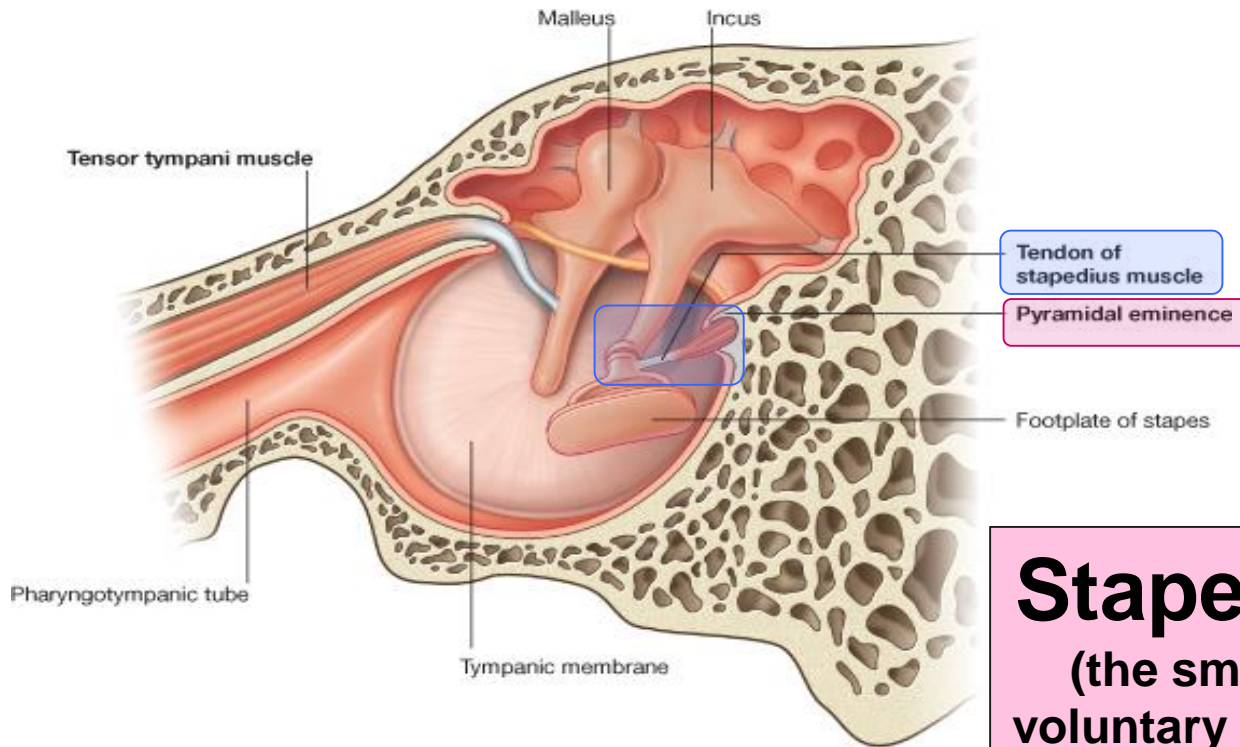
# Muscles of the Ossicles



## TENSOR TYMPANI

- **Origin:** Cartilage of the auditory tube and the bony walls of its own canal.
- **Insertion:** *into the handle of the malleus.*
- **Nerve supply:** Mandibular nerve.
- **Action:** Contracts reflexly in response to loud sounds to limit the excursion of the tympanic membrane.

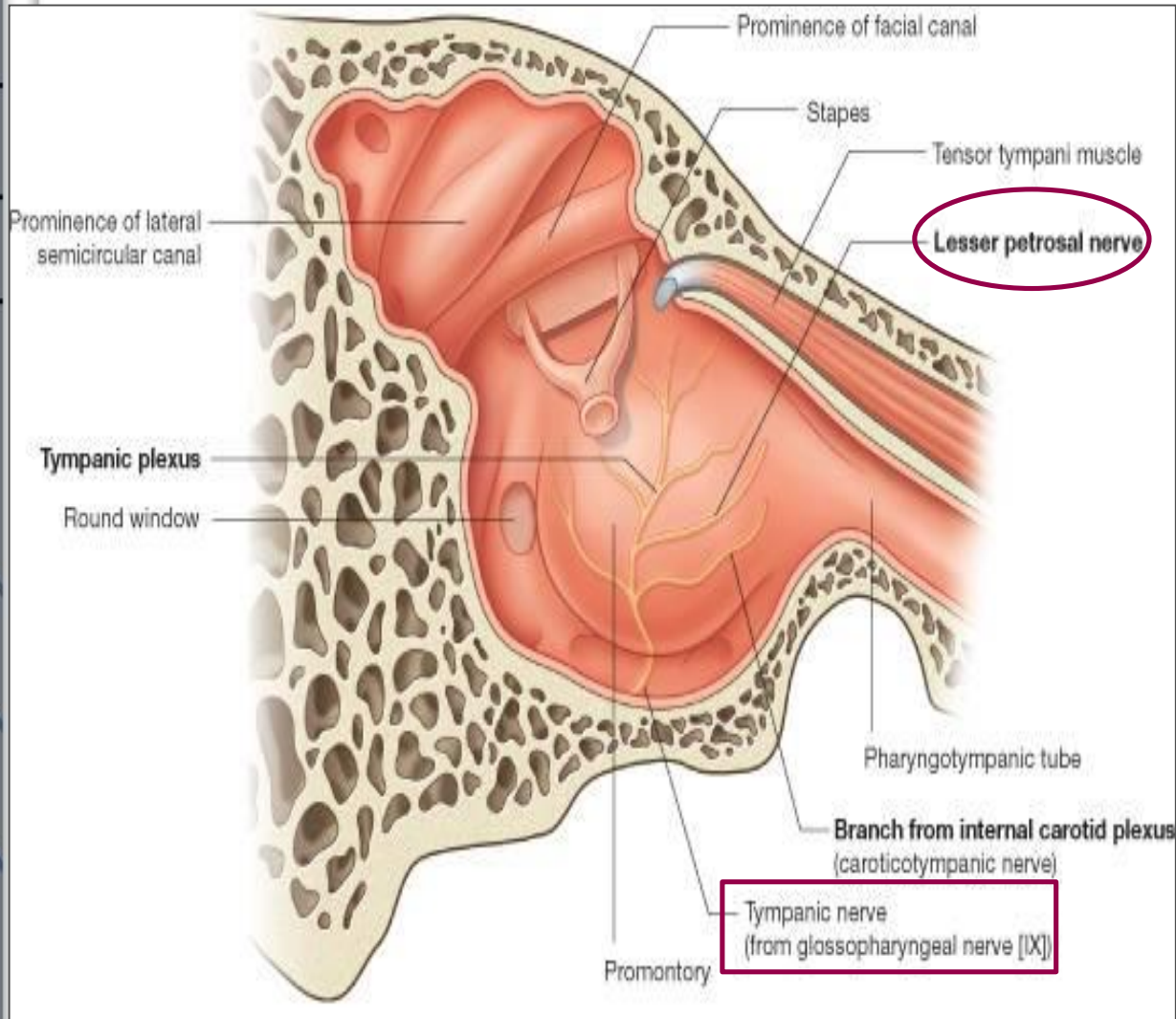




## Stapedius (the smallest voluntary muscle)

- **Origin:** Internal walls of the hollow pyramid.
- **Insertion:** The tendon emerges from the apex of the pyramid and is *inserted into the neck of the stapes.*
- **Nerve supply:** Facial nerve.
- **Action:** Reflexly damps down the vibrations of the stapes by pulling on the neck of that bone.

# NERVES IN MIDDLE EAR



- **Tympanic nerve**
- It is a branch of the glossopharyngeal nerve.
- **It gives:**
- Tympanic plexus on the promontory
- The tympanic plexus gives the,
- **Lesser petrosal** nerve which relays in the otic ganglion.
- It gives secretomotor supply to the **parotid gland**

# FACIAL NERVE

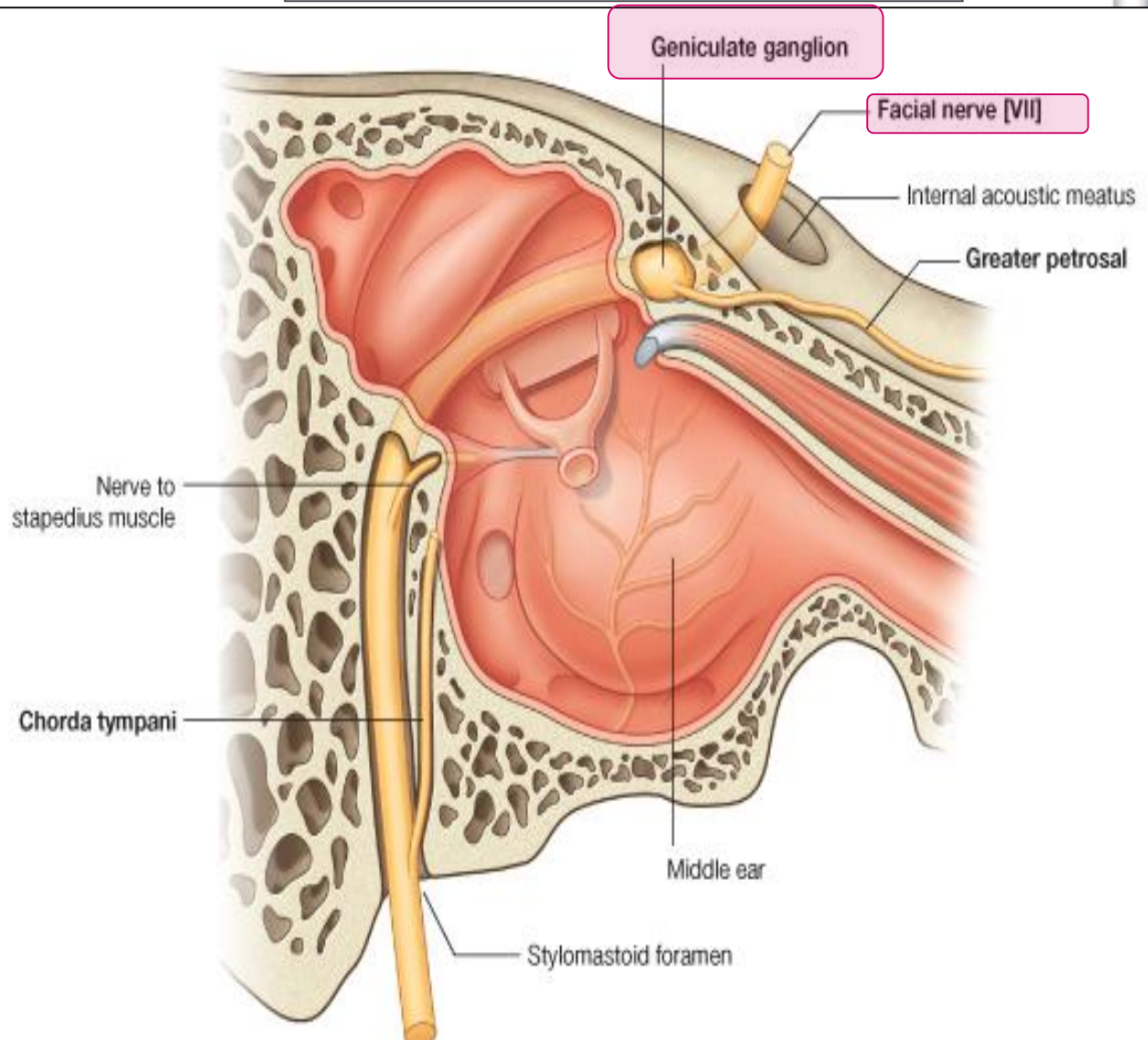
Enters through the

Internal acoustic meatus with the 8<sup>th</sup> nerve.

It expands to form **Geniculate ganglion**.

It passes vertical behind the pyramid.

**It leaves the middle ear through the stylomastoid foramen.**



# BRANCHES OF FACIAL NERVE

## 1. Greater Petrosal nerve.

Arises from **Geniculate Ganglion.**

Carries preganglionic parasympathetic to supply:

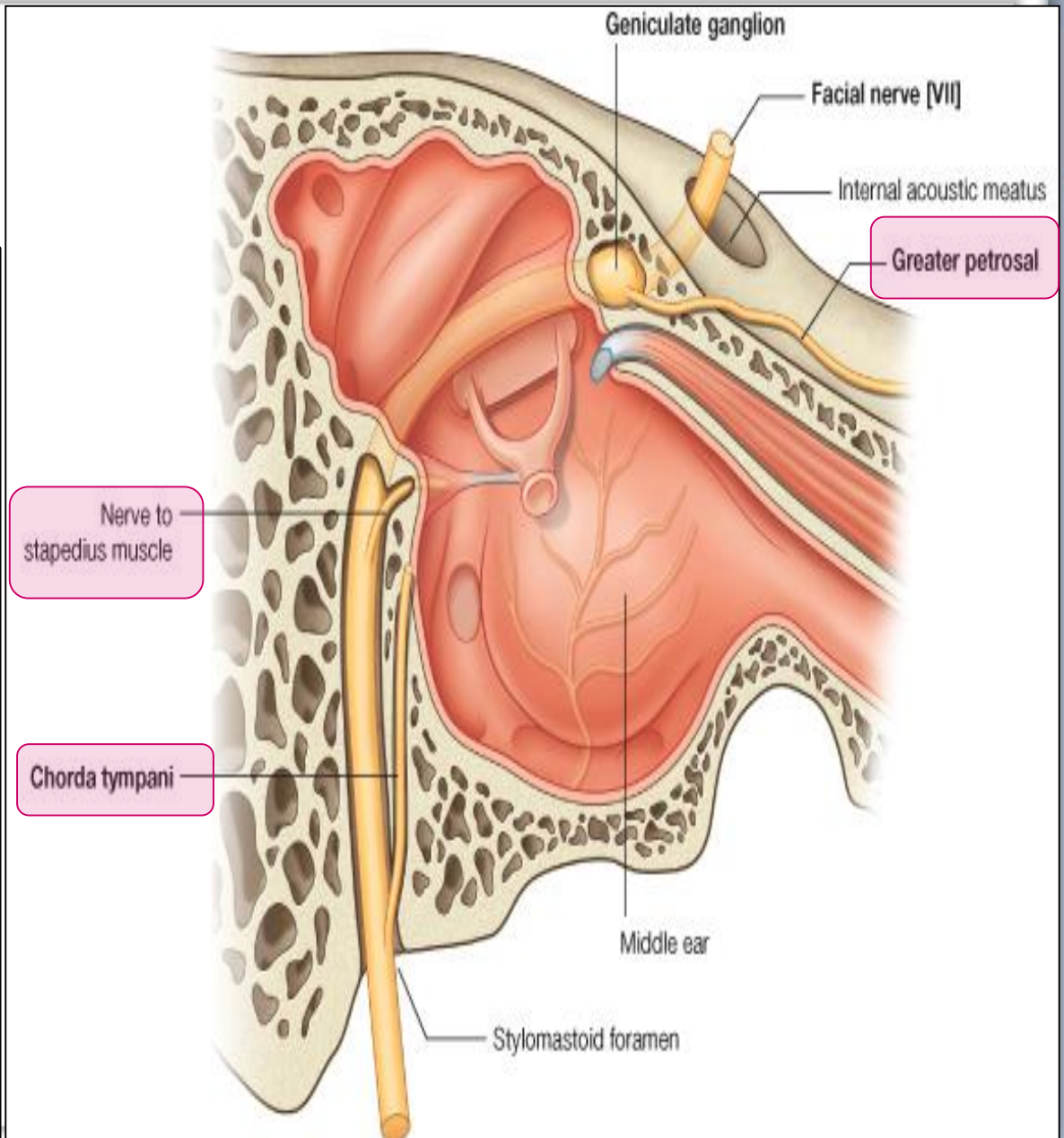
Lacrimal,  
Nasal

Palatine glands.

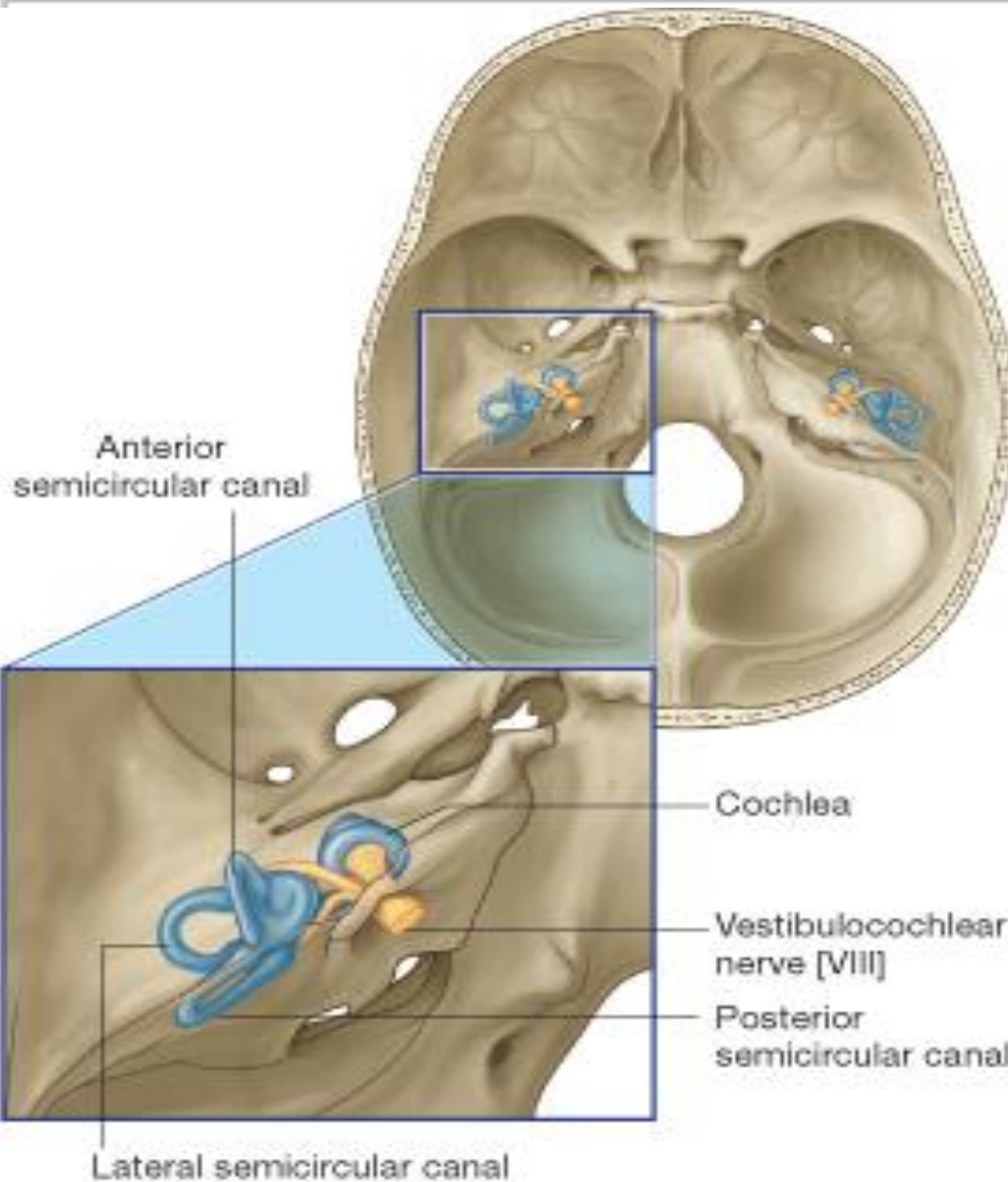
## 2. Nerve to Stapedius.

## 3. Chorda Tympani.

Arises just before the facial nerve exits.

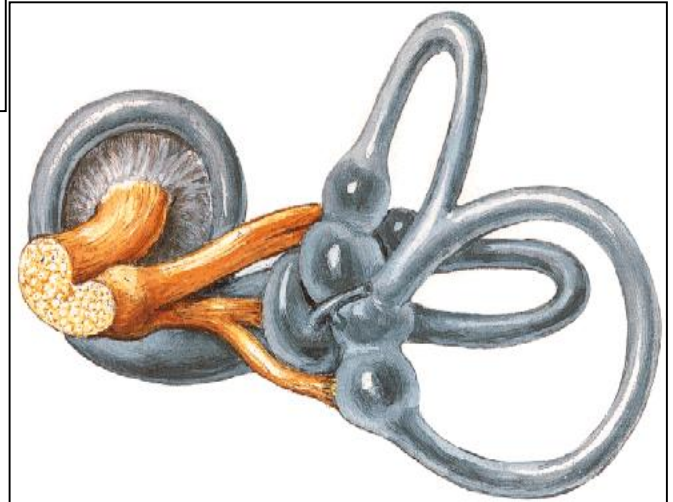
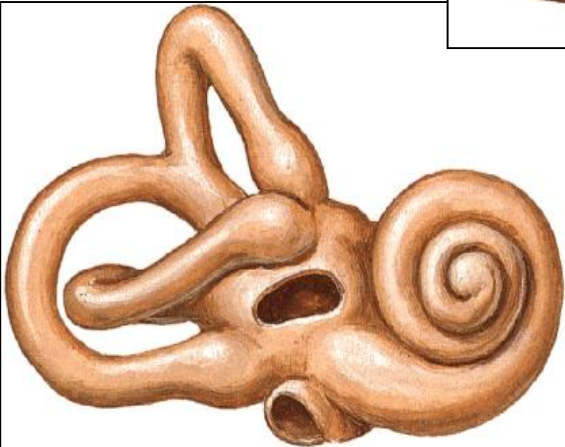


## INTERNAL EAR, OR LABYRINTH



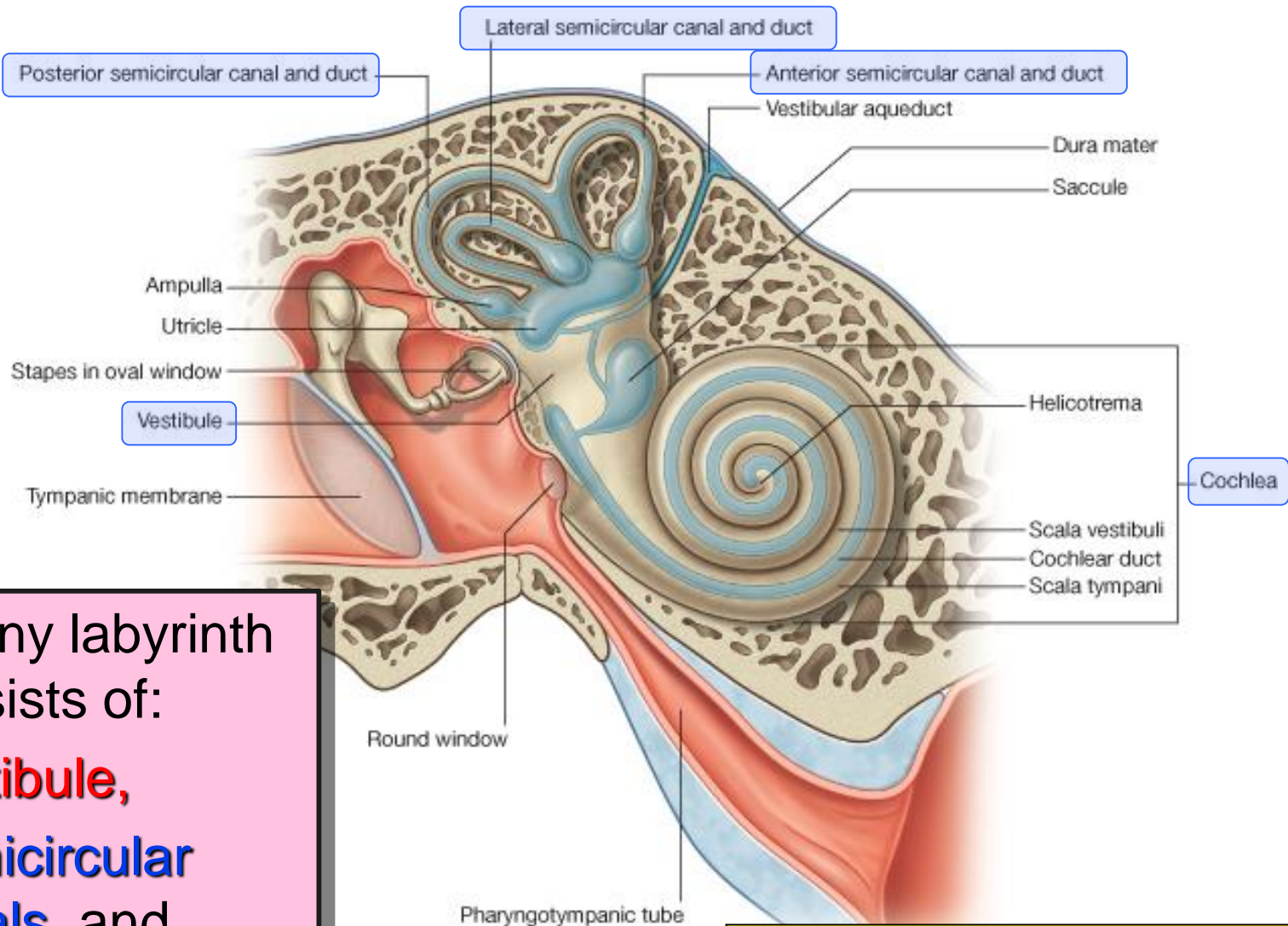
**Labyrinth** is situated in the petrous part of the temporal bone, medial to the middle ear.

# Labyrinth



**It** consists of:

- **Bony labyrinth**: a series of bony chambers lined by endosteum.
- They contain a clear fluid, the **perilymph**, in which is suspended the membranous labyrinth.
- **Membranous labyrinth**: consists of a series of membranous sacs and ducts within the bony labyrinth, It is filled with **endolymph**.



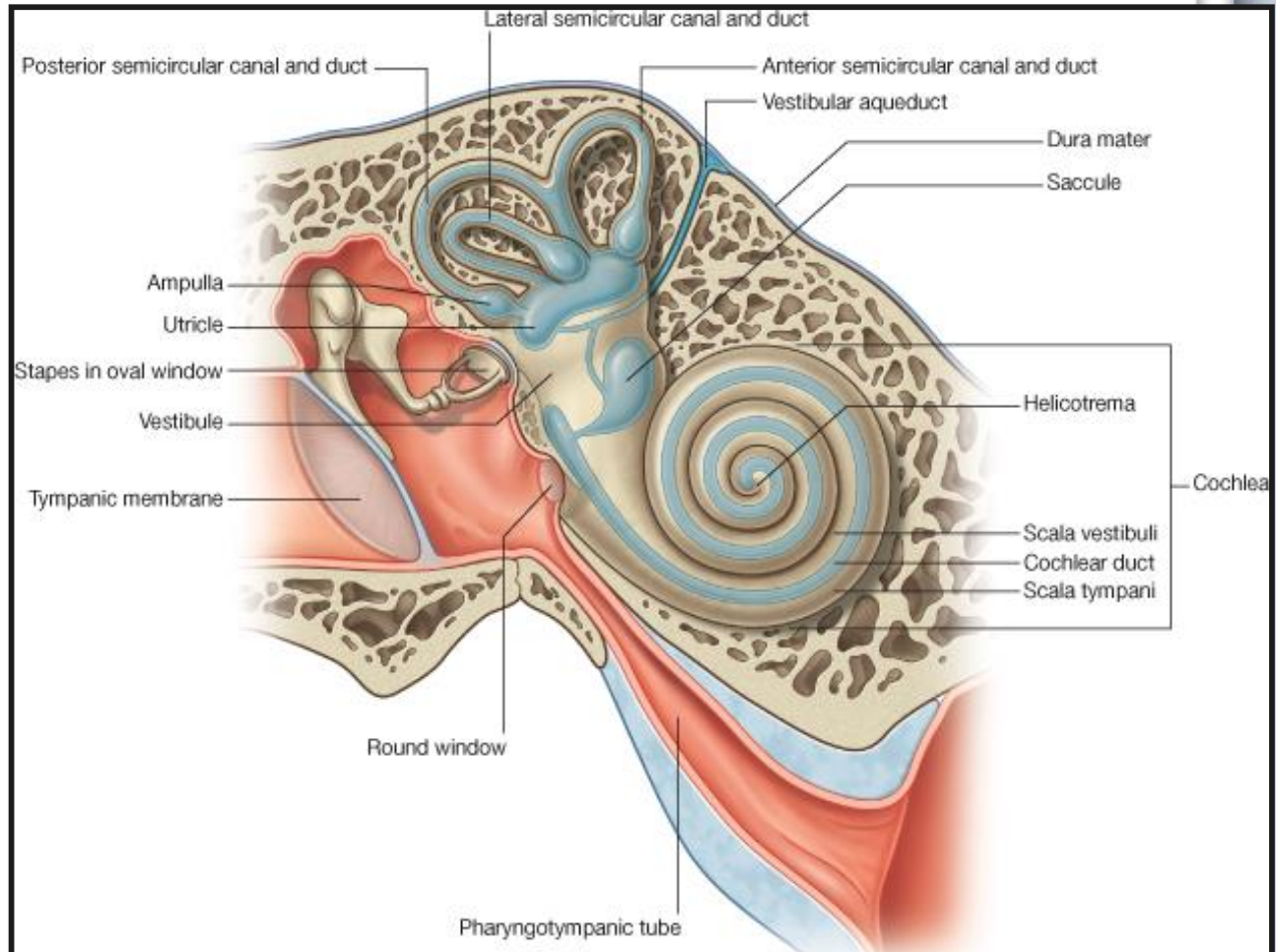
The bony labyrinth consists of:

- **Vestibule,**
- **Semicircular canals,** and
- **Cochlea.**

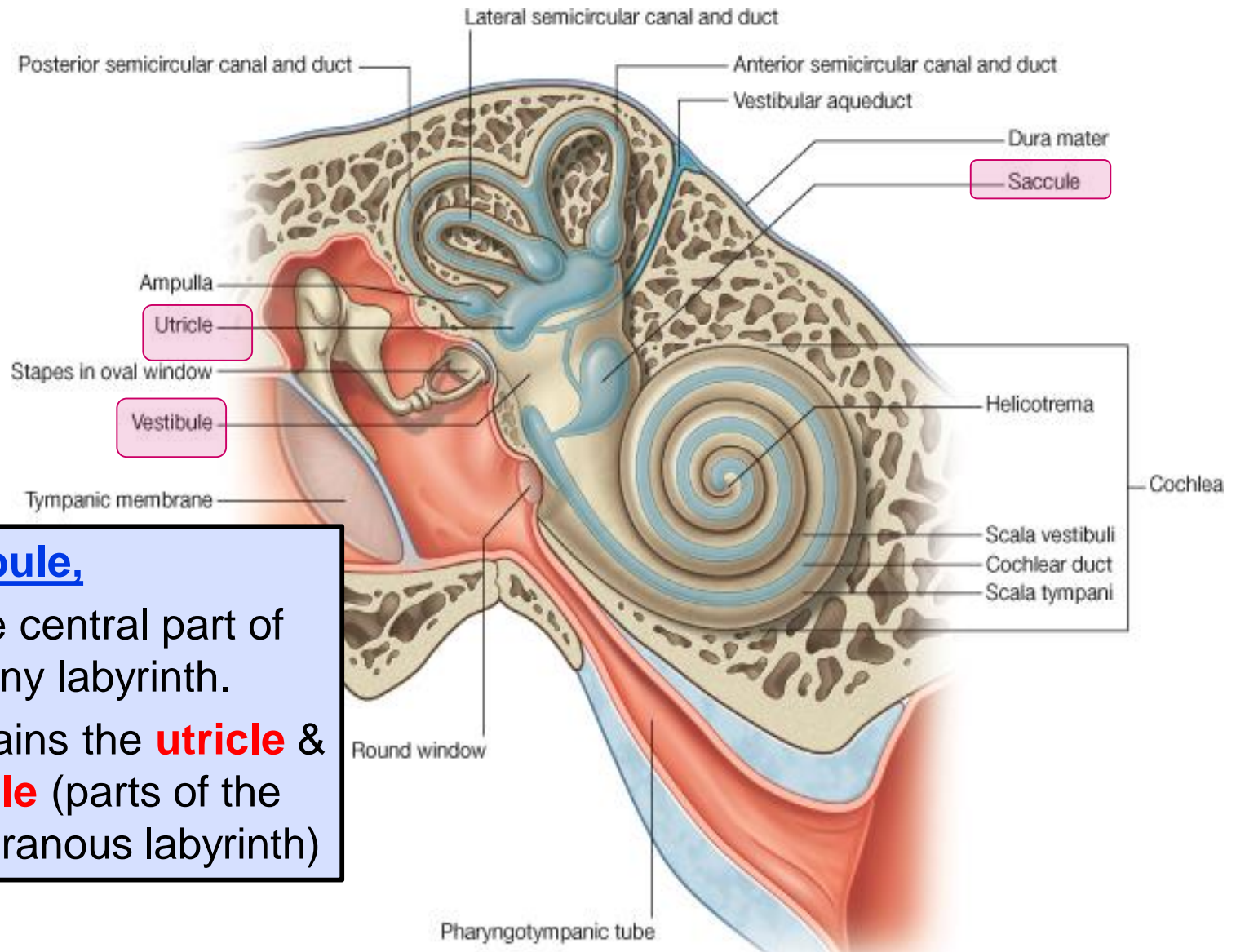
## Bony Labyrinth

# Cochlea

- Its first turn produces the **promontory** on the medial wall of the tympanic cavity.
- It contains the **cochlear duct** (part of the membranous labyrinth).

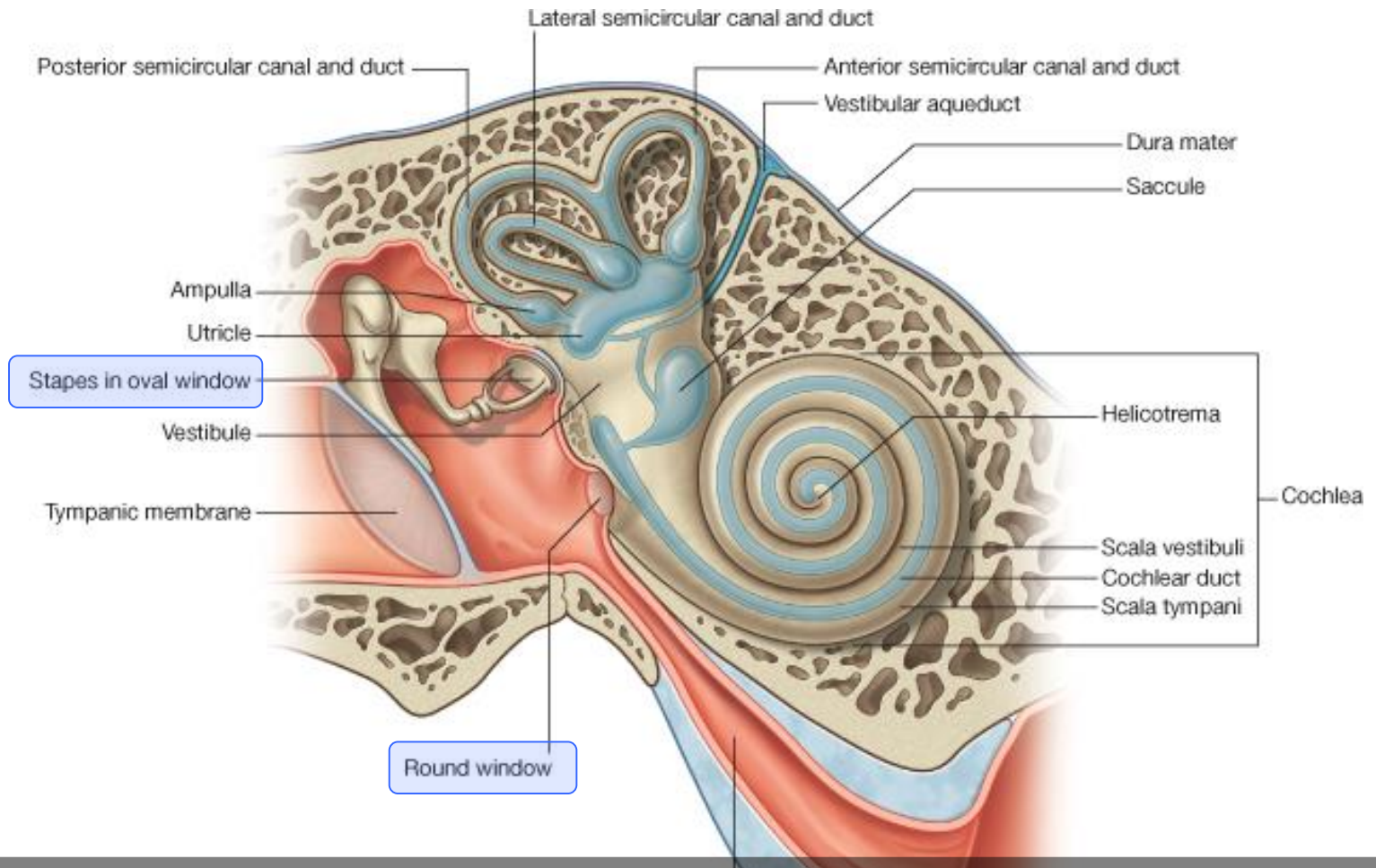






## Vestibule,

- Is the central part of the bony labyrinth.
- Contains the **utricle** & **saccule** (parts of the membranous labyrinth)



In the lateral wall of the vestibule are the **fenestra vestibuli**, which is **closed by the base of the stapes**, and the **fenestra cochleae**, which is closed by the **secondary tympanic membrane**.

# Semicircular Canals

Posterior semicircular canal and duct

Lateral semicircular canal and duct

Anterior semicircular canal and duct

Vestibular aqueduct

Semicircular canals: **superior (anterior), posterior & lateral.**

Each canal has a swelling at one end called the **ampulla.**

The canals open into the vestibule by five orifices, one of which is common to two of the canals.

Lodged within the canals are the **semicircular ducts.**

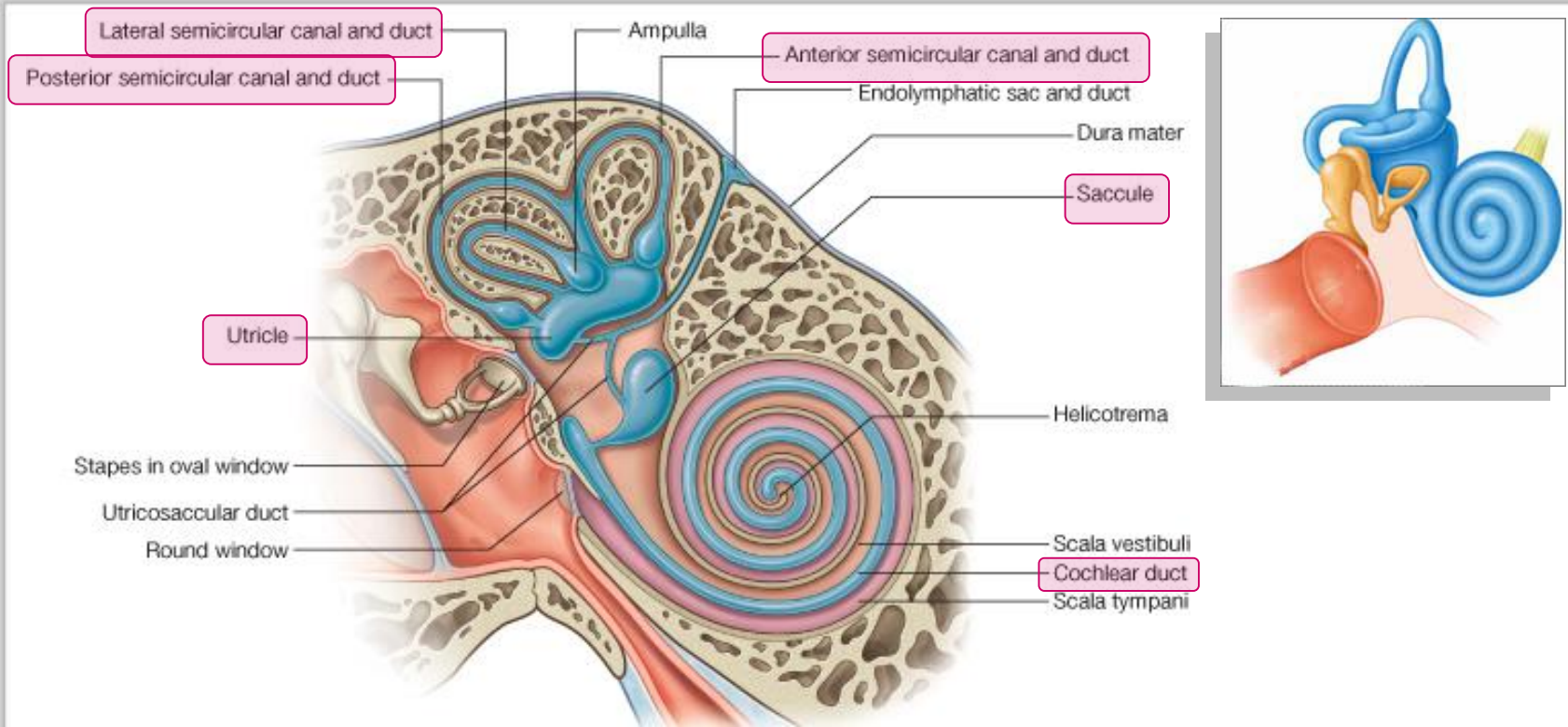
Ampulla  
Utricle  
Stapes in oval window  
Vestibule  
Tympanic membrane

Scala vestibuli  
Cochlear duct

Cochlea

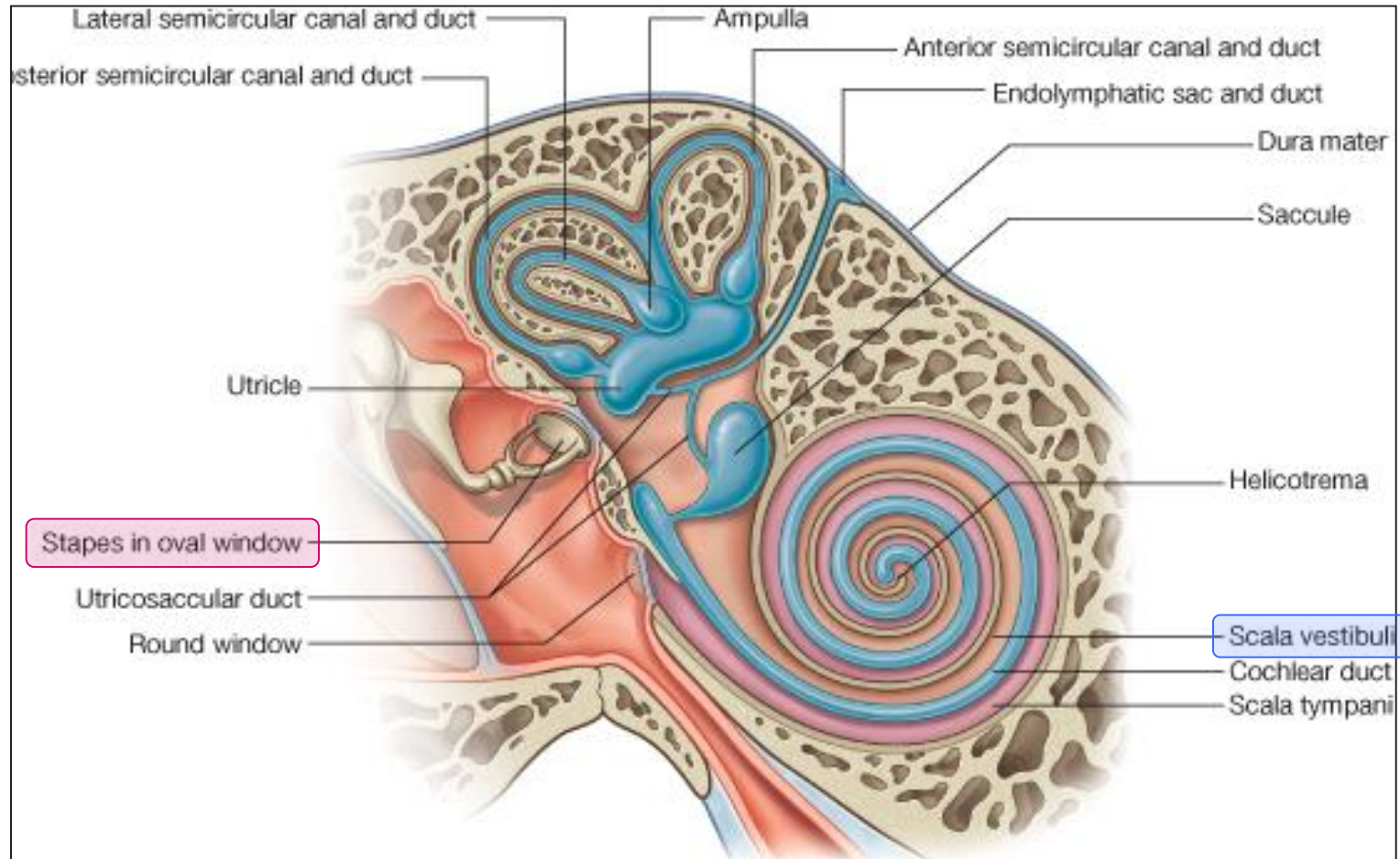
nd window

aryngotympanic tube

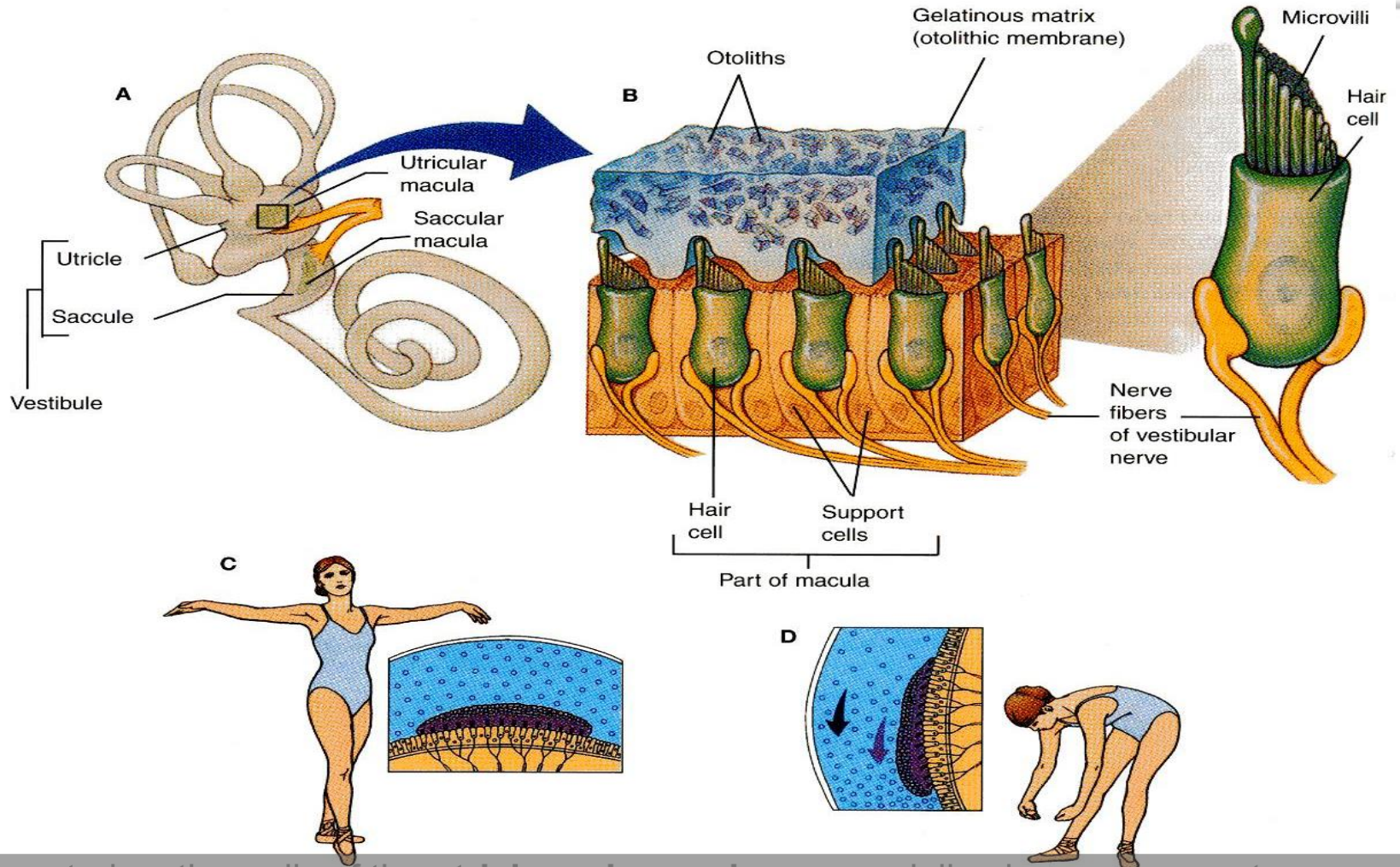


**The Membranous Labyrinth** consists of (**Four ducts & Two sacs**) Which are freely communicate with one another :

- **Sacs: Utricle & Sacculle** (lodged in the bony vestibule).
- **Ducts: Three semicircular Ducts** ,(lie within the bony semicircular canals),
- **Cochlear Duct:** (lies within the bony cochlea). The cochlear duct divides the bony cavity into **Scala Vestibuli and Scala tympani.**

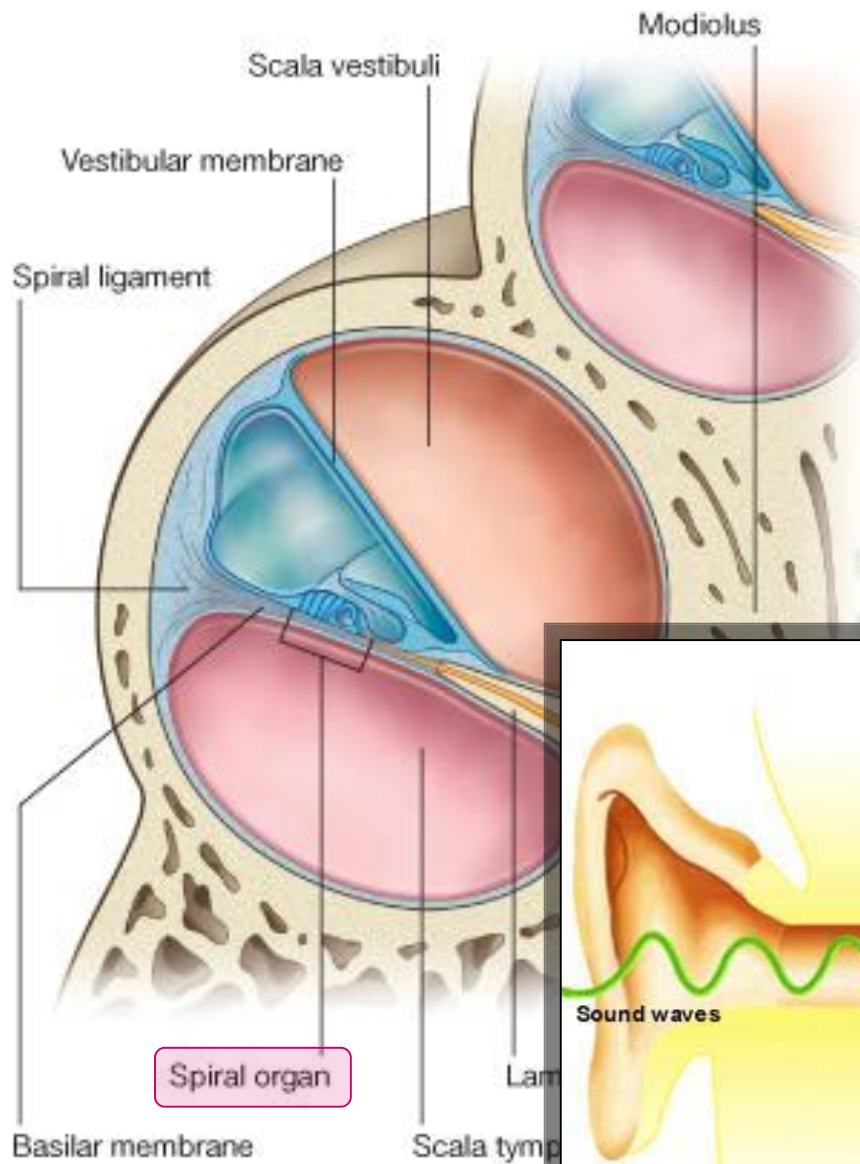


The perilymph ***within the scala vestibuli*** is separated from the middle ear by the **base of the stapes** at the fenestra vestibuli. The perilymph ***in the scala tympani*** is separated from the middle ear by the secondary tympanic membrane at the **fenestra cochleae**.

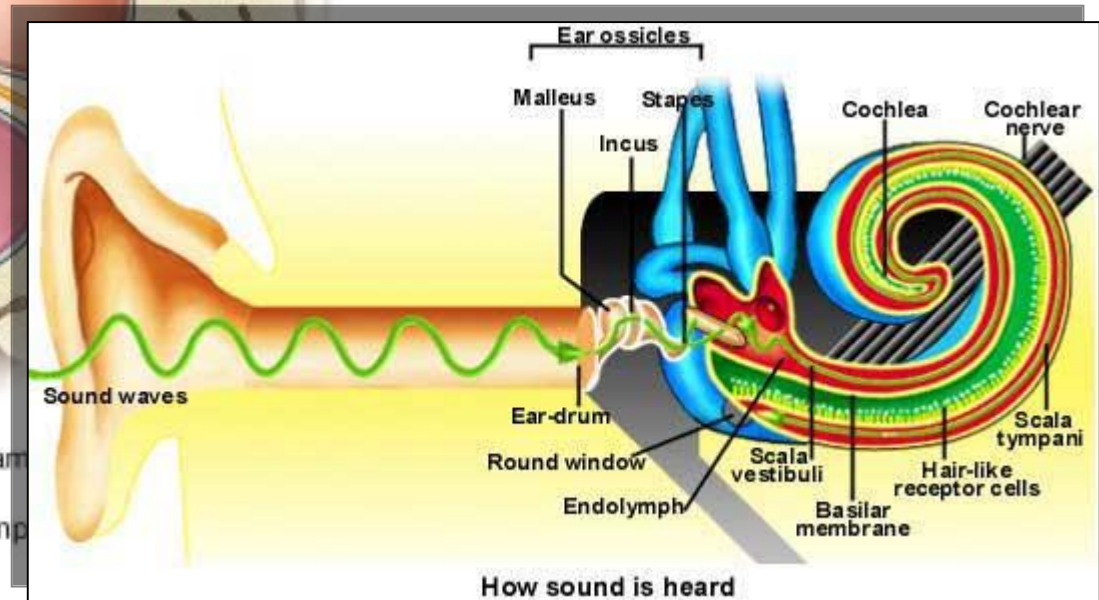


Located on the walls of the **utricle** and **saccule** are specialized sensory receptors, which are sensitive to the orientation of the head to gravity or other acceleration forces.

The **utricle, saccule and semicircular ducts** are concerned with maintenance of **Equilibrium**



- The highly specialized epithelium on the floor of cochlear duct forms **the Spiral organ of Corti** that
- contains the sensory receptors for **Hearing.**



**THANK YOU**