Ear

- Organ of hearing & Balance
- Vestibulo-cochlear apparatus

Three Parts

❖ External Ear

Tympanic Membrane

❖ Middle Ear ⟶ Nasopharynx (Auditory Tube)

❖ Internal Ear

Ear

Three parts & three functions

External ear

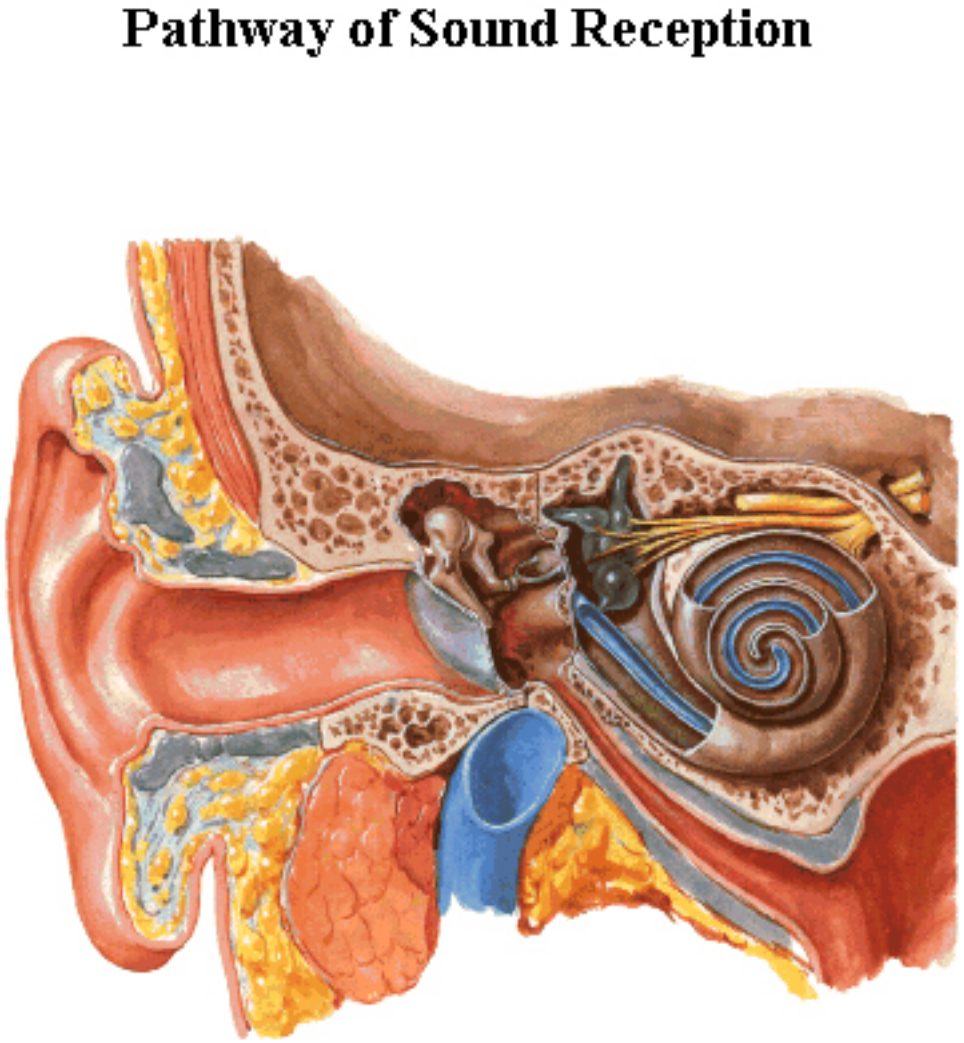
- Collection & Conduction of sound waves

Middle ear

- Intensify force of sound vibrations

Internal ear

- Conversion of sound energy into nerve energy
- Convey sense of hearing & equilibrium by cochlear & vestibular division of 8th nerve



External Ear

Components

- Auricle (Pinna)
- External Acoustic Meatus

Auricle (pinna)

- Superficial , Ireregular (elevations & depressions) , concave projection facing forward & laterally from side of head

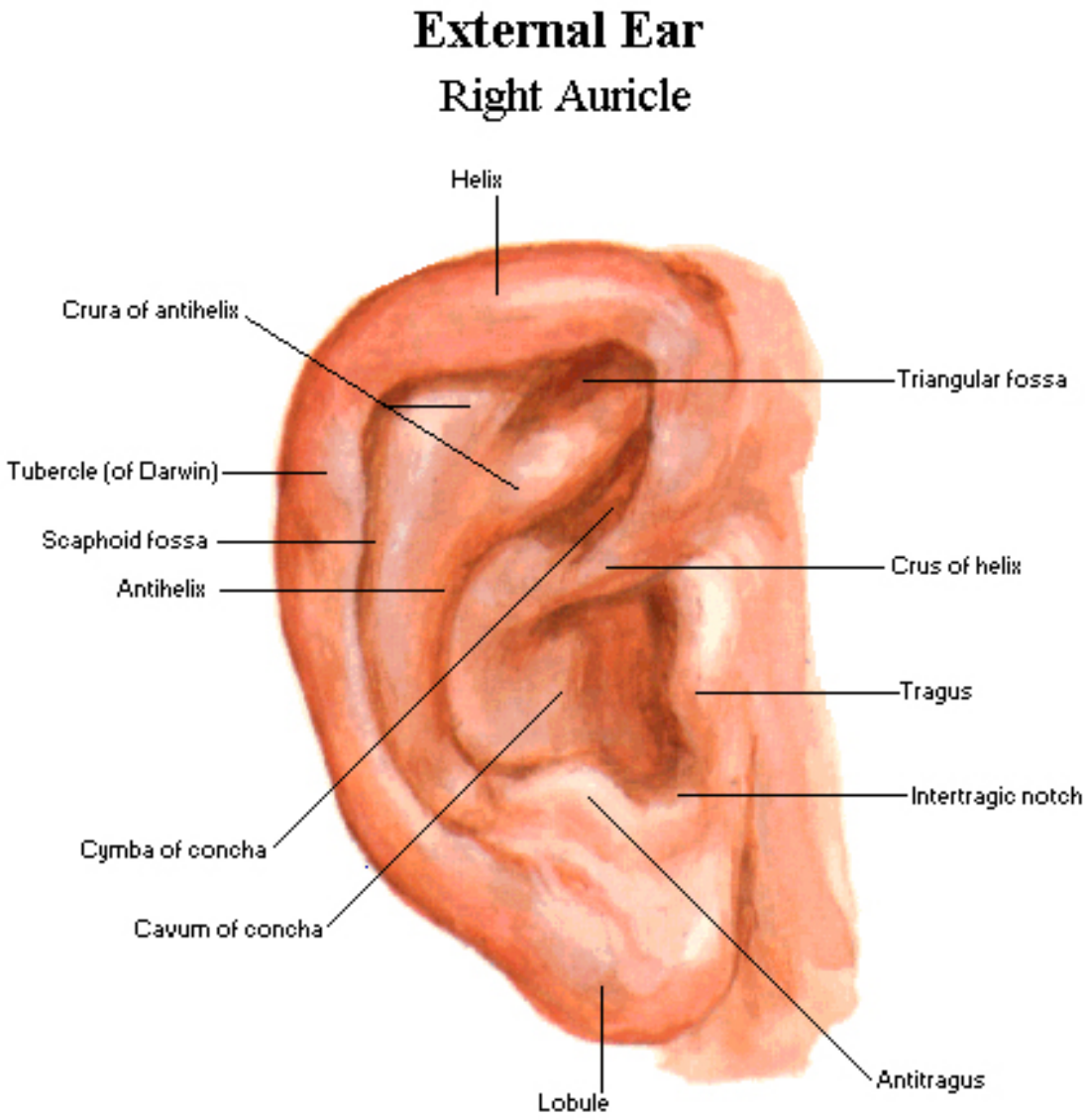
- skin covered , single piece of yellow elastic cartilage (auricular cartilage) ,continuous with cartilaginous part of external acoustic meatus

- Cartilage absent in lobule

Auricle

Features

- Helix , Crus of helix
- Antihelix , Triangular fossa , Scaphoid fossa
- Concha , Tragus , Antitragus , Intertragic notch, Symba Chonchae
- Lobule



Auricle - musculature

Extrinsic

Auricularis anterior, superior & posterior

Intrinsic

Helicis major & minor , Tragicus , Antitragicus

Transverse & Oblique Auriculae

External Acoustic Meatus

- 24 mm long (approx 1 inches) canal from bottom of concha to tympanic membrane
- Lie in line with internal acoustic meatus
- Lateral 1/3rd cartilaginous part (8 mm)
- Bony medial 2/3rd (16 mm) – Tympanic Plate
- Floor & ant. Wall are longer than roof & post wall

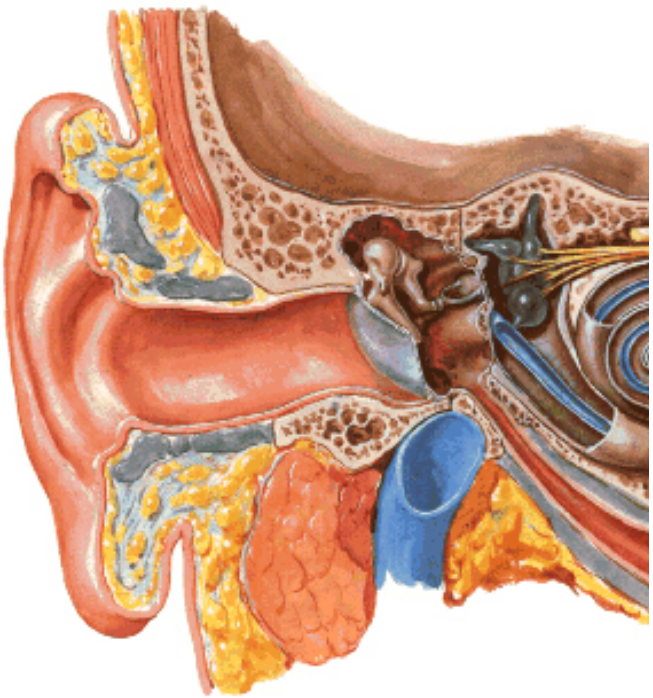
External Acoustic Meatus

Course – S - shaped curve – 3 parts

Parts

- Pars externa- Medially, forward & upwards
- Pars intermedia – Medially ,backward & upwards
- Pars interna – Medially, forward & downwards

Otoscopy -Ear to be pulled upward backward & laterally



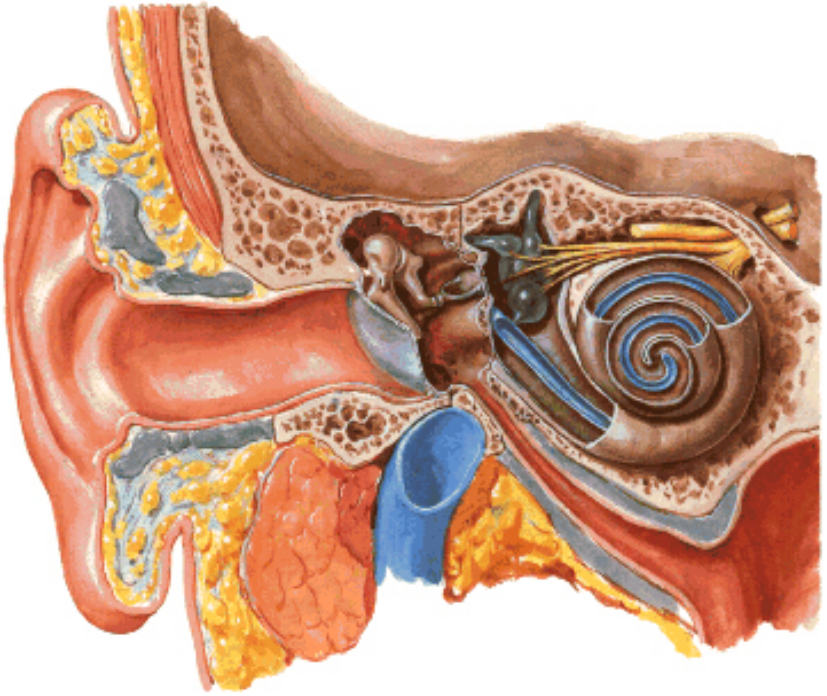
Schematic frontal section

External Acoustic Meatus

Constrictions

- At junction of bony & cartilaginous part
- At isthmus in bony part approx 2 cm deep to concha (narrower)

Pathway of Sound Reception



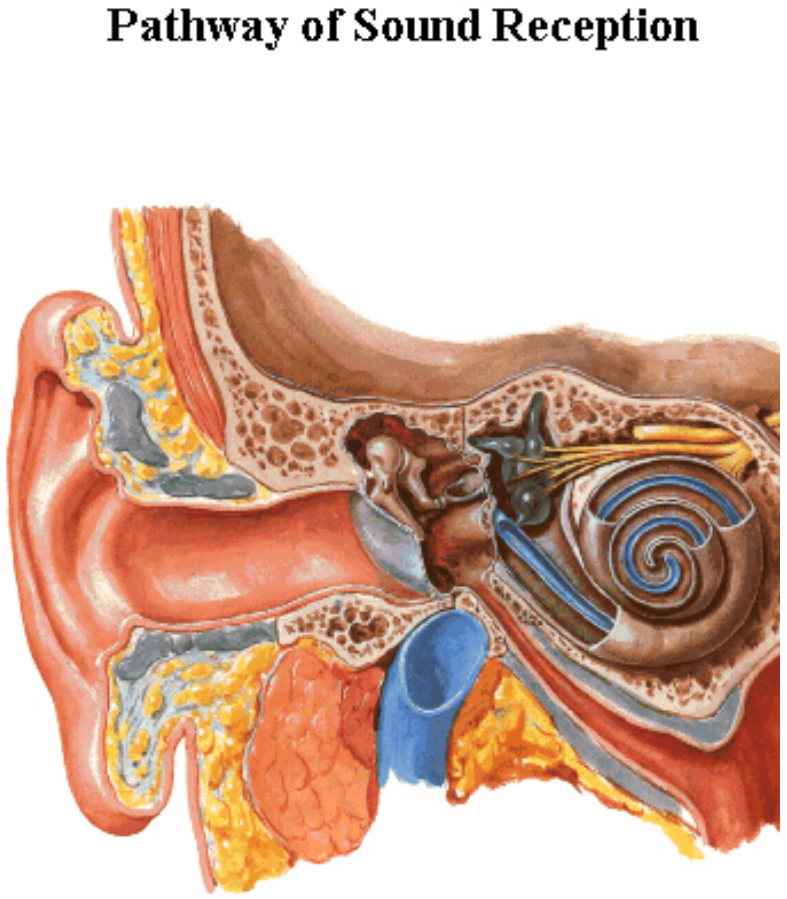
Schematic frontal section

Applied - External Acoustic Meatus

- Wax – produced by modified coiled sweat glands (ceruminous) of cartilaginous part – blocks & impedes transmission of sound vibration
- Boils , septic infections
- Foreign body removal – obtuse angle antero-inferiorly at junction of two parts
- Biopsy of lobule – Leprosy
- Stimulation of Vagus Nerve
- Referred pain

Tympanic membrane (Ear Drum)

- Thin Oval ,semi transparent partition b/w external acoustic meatus & middle ear
- Pearly gray , trilaminar memb.
- 9x10 mm ,Placed obliquly at 55 degree with floor of meatus
- Faces downward , forward & laterally



Schematic frontal section

Tympanic membrane

Attachment

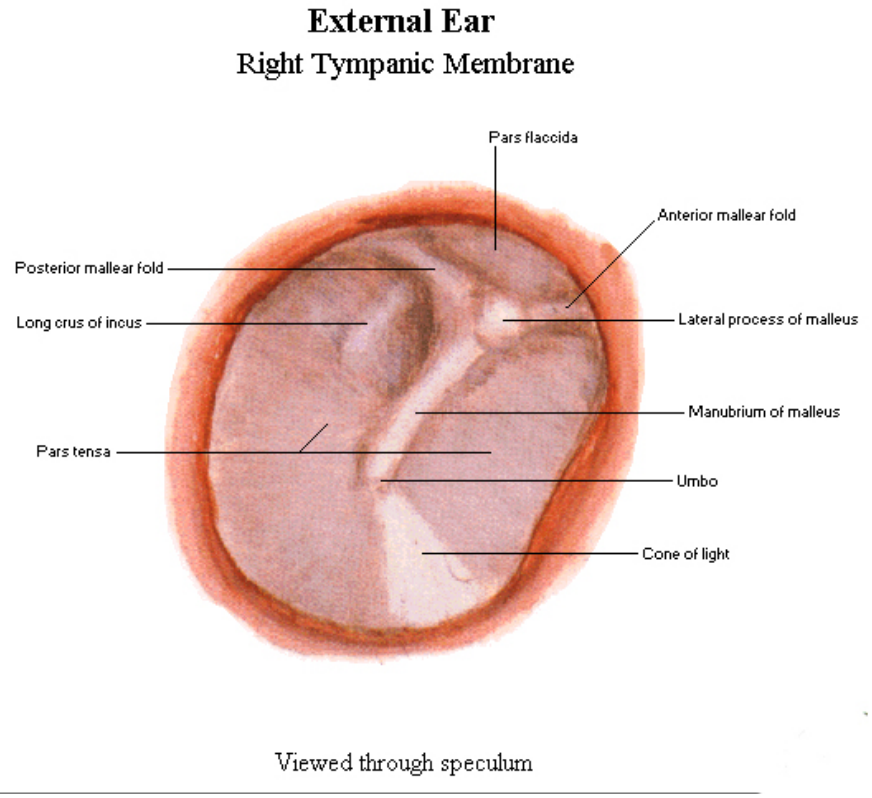
Thickened at periphery

Attached to tympanic sulcus (tympanic plate) by fibrocartilaginous ring

Deficient superiorly – attached to notch

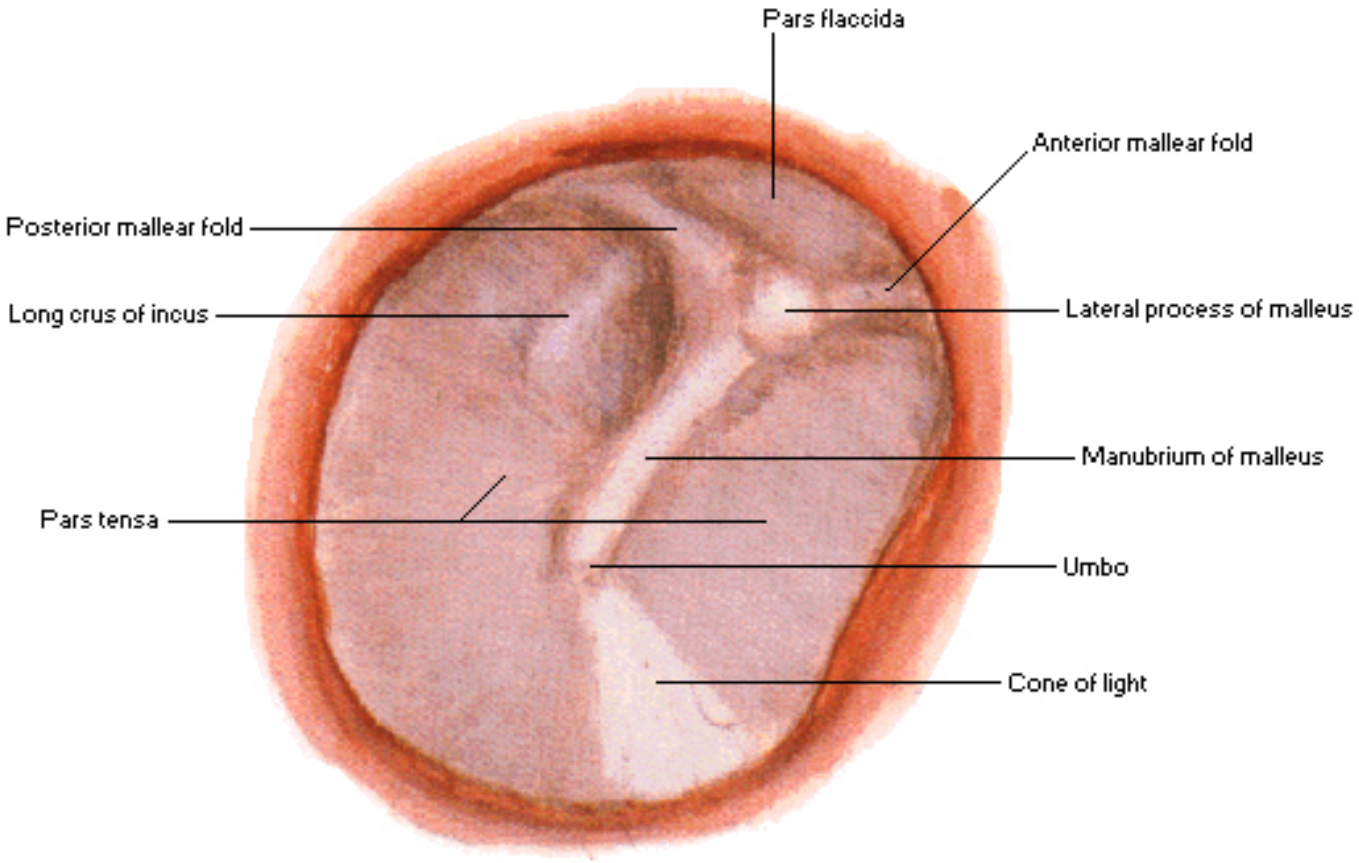
Ant. & post. Malleolar folds

Membrane remain tensed by inward pull of tensor tympani muscle



External Ear

Right Tympanic Membrane



Viewed through speculum

Tympanic membrane

Parts

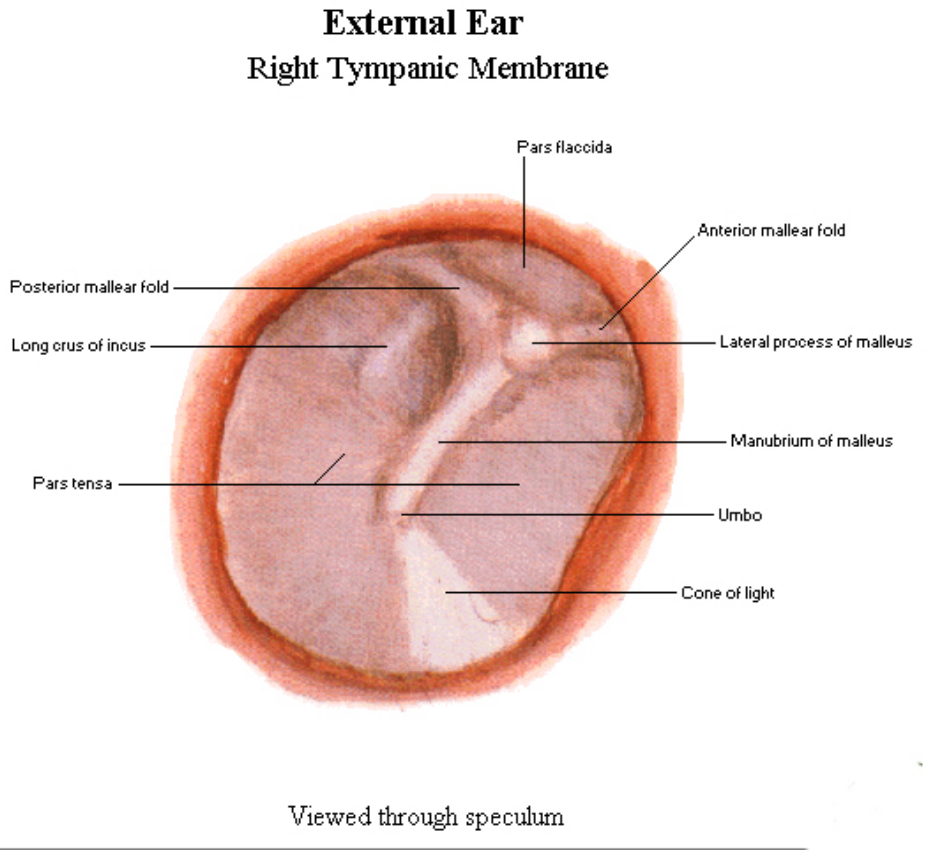
Pars flaccida (Sharpnells membrane)

Small triangular area above malleolar folds

Crossed internally by chorda tympani

Pars tensa

Greater part of membrane below malleolar folds



Tympanic membrane

Surfaces

Outer -Free , concave – lined by thin skin

Inner –Convex , bulges towards tympanic cavity

Attachment of handle of malleus

Umbo- point of max. convexity

Tympanic membrane

Structure - Three layers

Outer cuticular layer(skin) –hairless , st. sq ker. Epi , no dermal papilla & continue with skin of meatus

Middle fibrous layer with superficial radiating fibres & depp circular fibres

Middle layer replaced by loose connective tissue in pars flaccida

Inner mucous layer lined by simple columnar ciliated or squamous epithelium

Tympanic membrane

Applied

- External examination – by ear speculum Cone of light – antero – inf . quardant
- Myringotomy - Psteroinferior quardant of membrane – to avoid injury to chorda tympani nerve & ossicles

Middle Ear(Tympanic Cavity)

- Narrow sandwitched space, b/w ext. & int. ear
- Within petrous part of temporal bone
- Filled with air , lined by mucous membrane (invest all contents of cavity and form folds projecting into cavity – honey comb appearance
- Assumes full adult size at birth
- Resemble biconcave disc in coronal sections (compressed at centre & broader at periphery)

Tympanic cavity

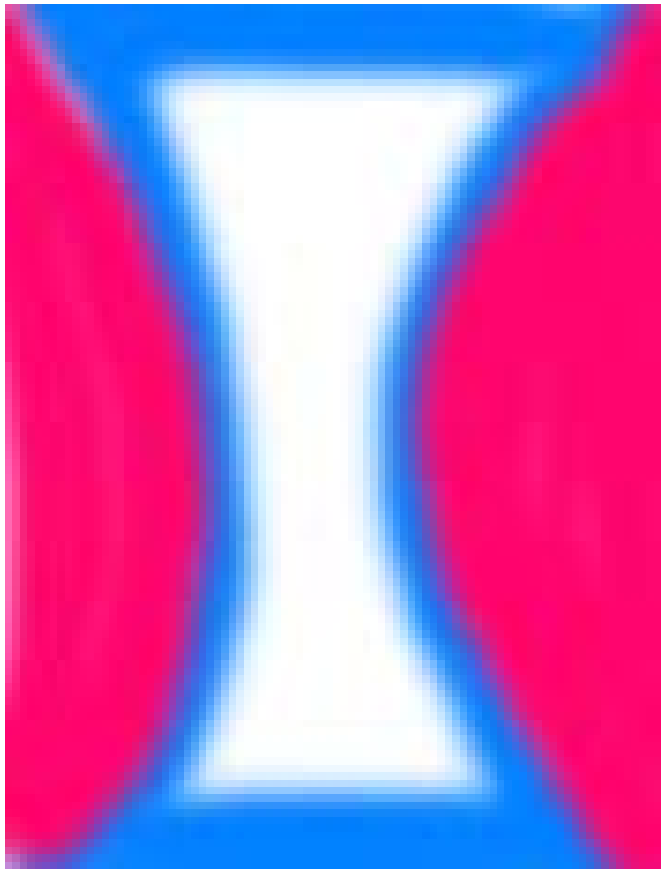
Measurements

Vertical dianmeter – 15 mm

Antero- post. diameter – 15 mm

Transverse diameter

- 6 mm (above)
- 2mm (centre)
- 4mm (below)



Tympanic cavity

Contents

Three ossicles – Malleus , Incus, Stapes & their Ligaments

Two muscles – Tensor tympani , Stapedius

Nerves – Chorda tympani & tympanic plexus

Blood vessels

Air

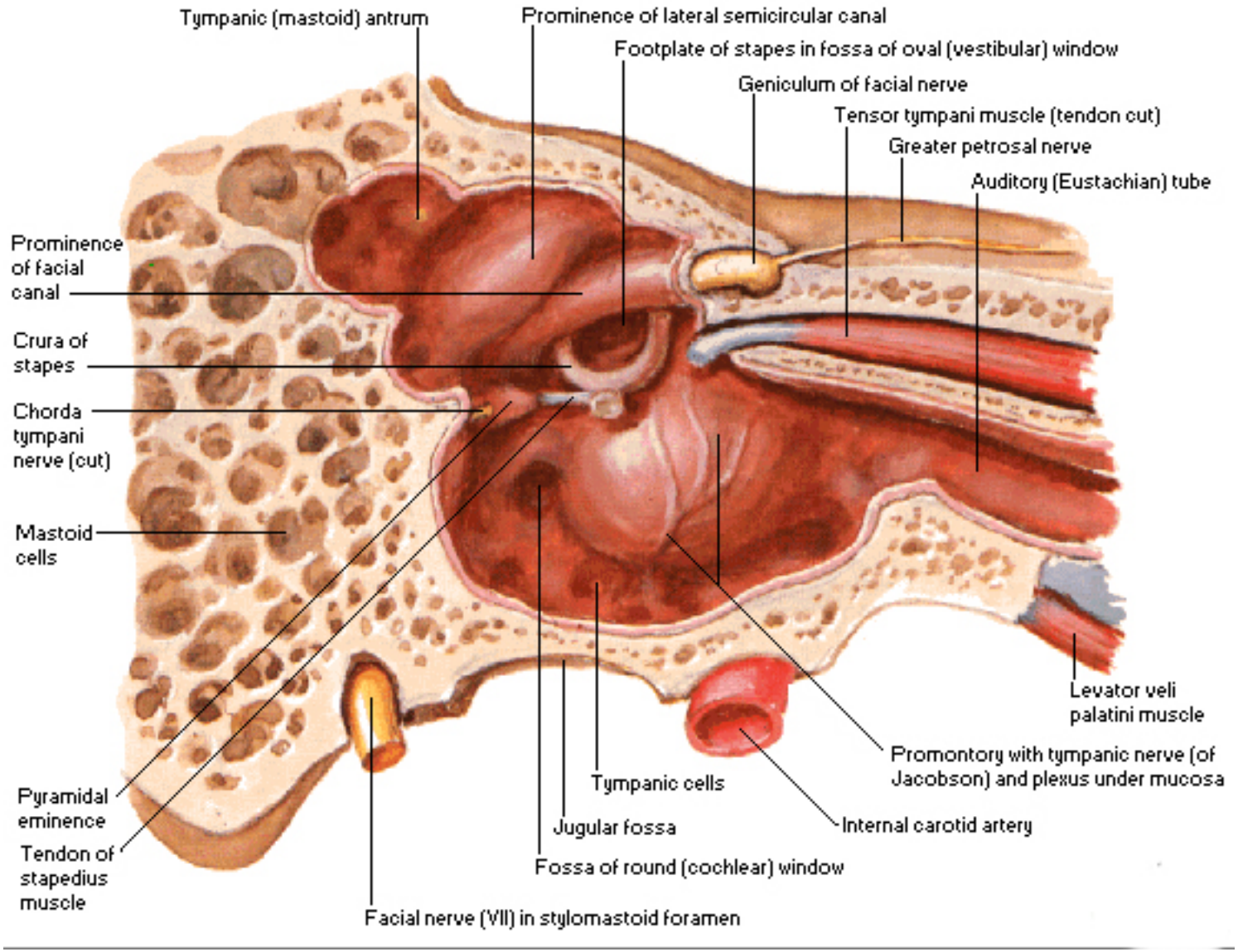
Two communications

Anteriorly – nasopharynx – auditory tube

Posteriorly – mastoid antrum – aditus to antrum

Tympanic Cavity - Medial Wall

Lateral View



Tympanic cavity

Boundaries

Roughly cuboidal , six walled

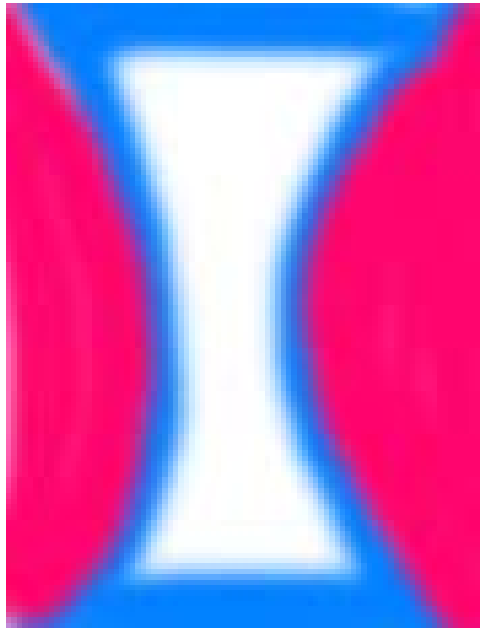
- Roof (Tegmental wall) - tegmen tympani
- Floor(jugular wall) – jugular fossa
- Anterior (Carotid) wall
- Posterior (Mastoid) wall
- Medial(Labyrinthine) wall
- Lateral (membranous) wall

Anterior wall is mostly arterial,post wall occupied by nerves , floor is venous

Roof wider than floor

Ant. wall narrower than post wall

Medial & lateral wall projects in with their convexities



Tympanic cavity

Parts

- Tympanic cavity proper

Lie opposite tympanic membrane

- Epitympanic recess (attic)
- Lie above the level of TM
- Contain upper half of malleus & greater part of incus

Tympanic cavity

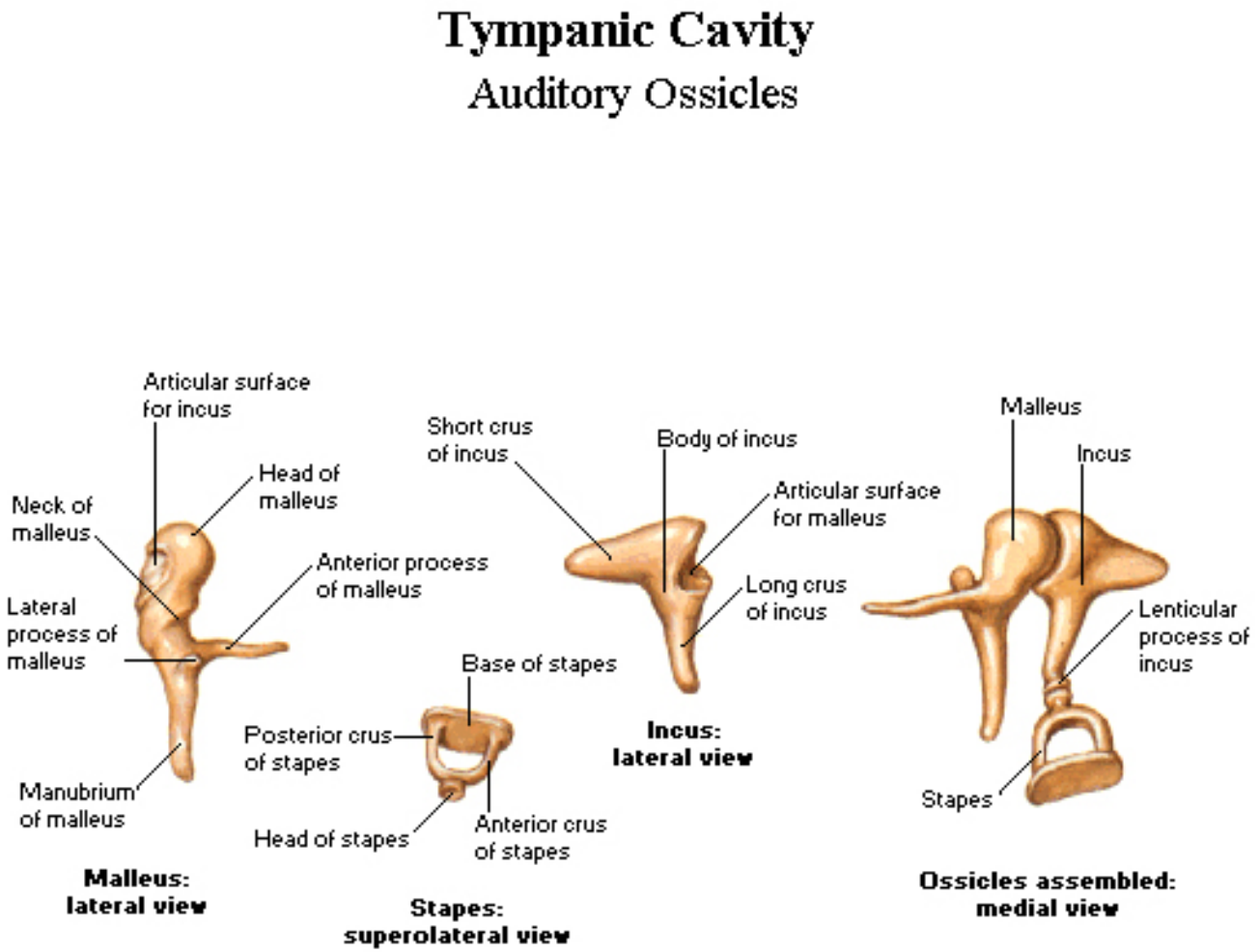
Applied

- Chronic otitis media
- Throat infections
- Fracture of middle cranial fossa

Ossicles – middle ear

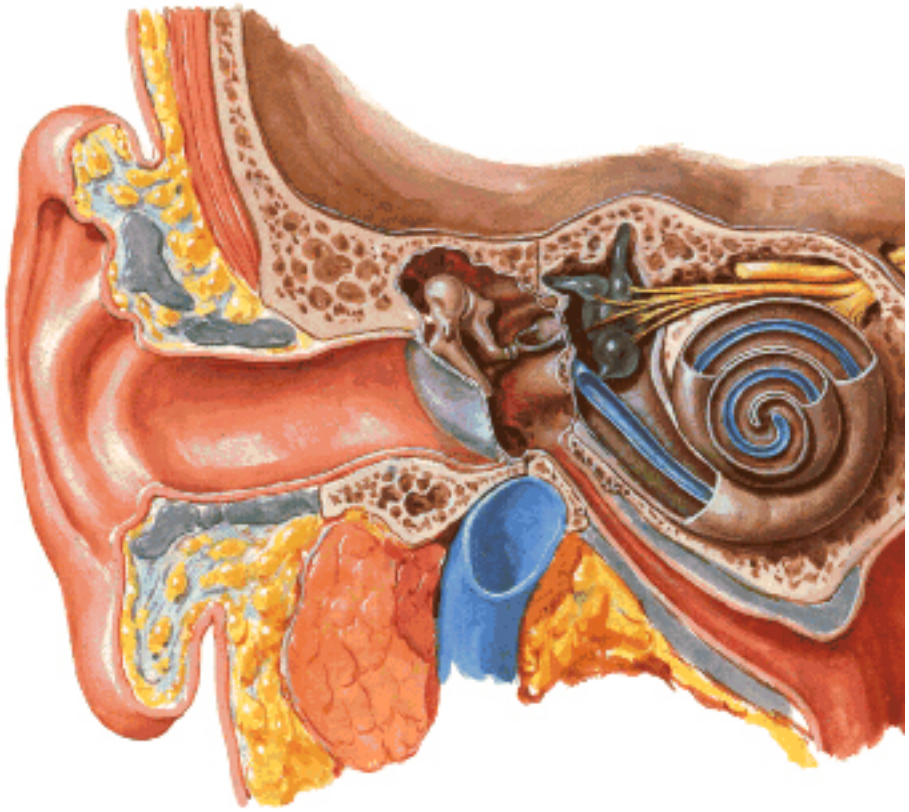
Malleus

- Largest
- Lateral
- 8-9mm
- Head
- Neck &
- 3 process



Internal ear (Labyrinth)

- Lie in petrous part of temporal bone
- Consist of bony labyrinth enclosing a membranous labyrinth – filled with endolymph seperated by perilymph suspending it



Schematic frontal section

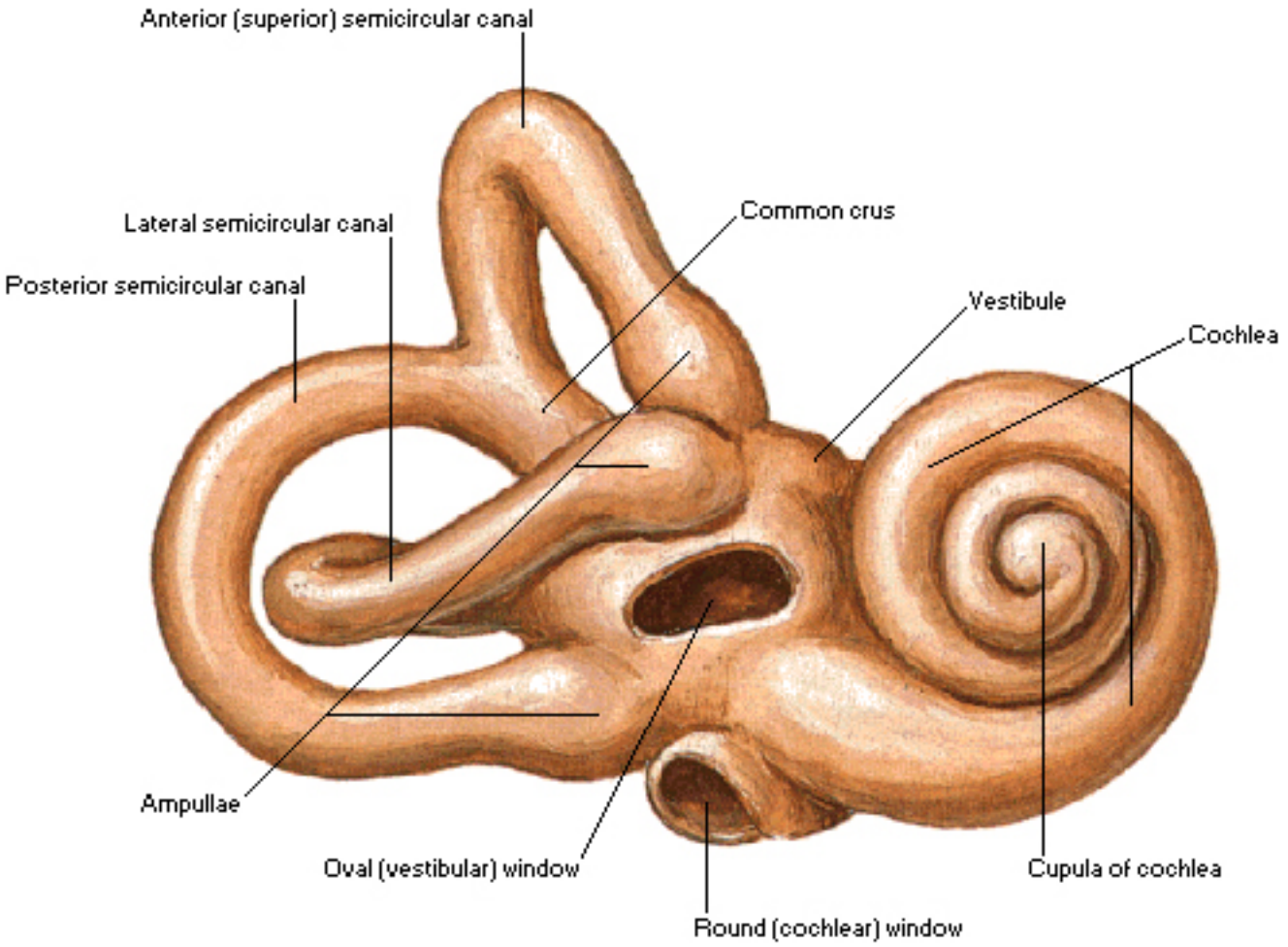
Bony Labyrinth

Three parts

- Cochlea
- Vestibule
- Semicircular canals

Right Osseous Labyrinth

Anterolateral View



Surrounding cancellous bone removed

Membranous Labyrinth

Three parts

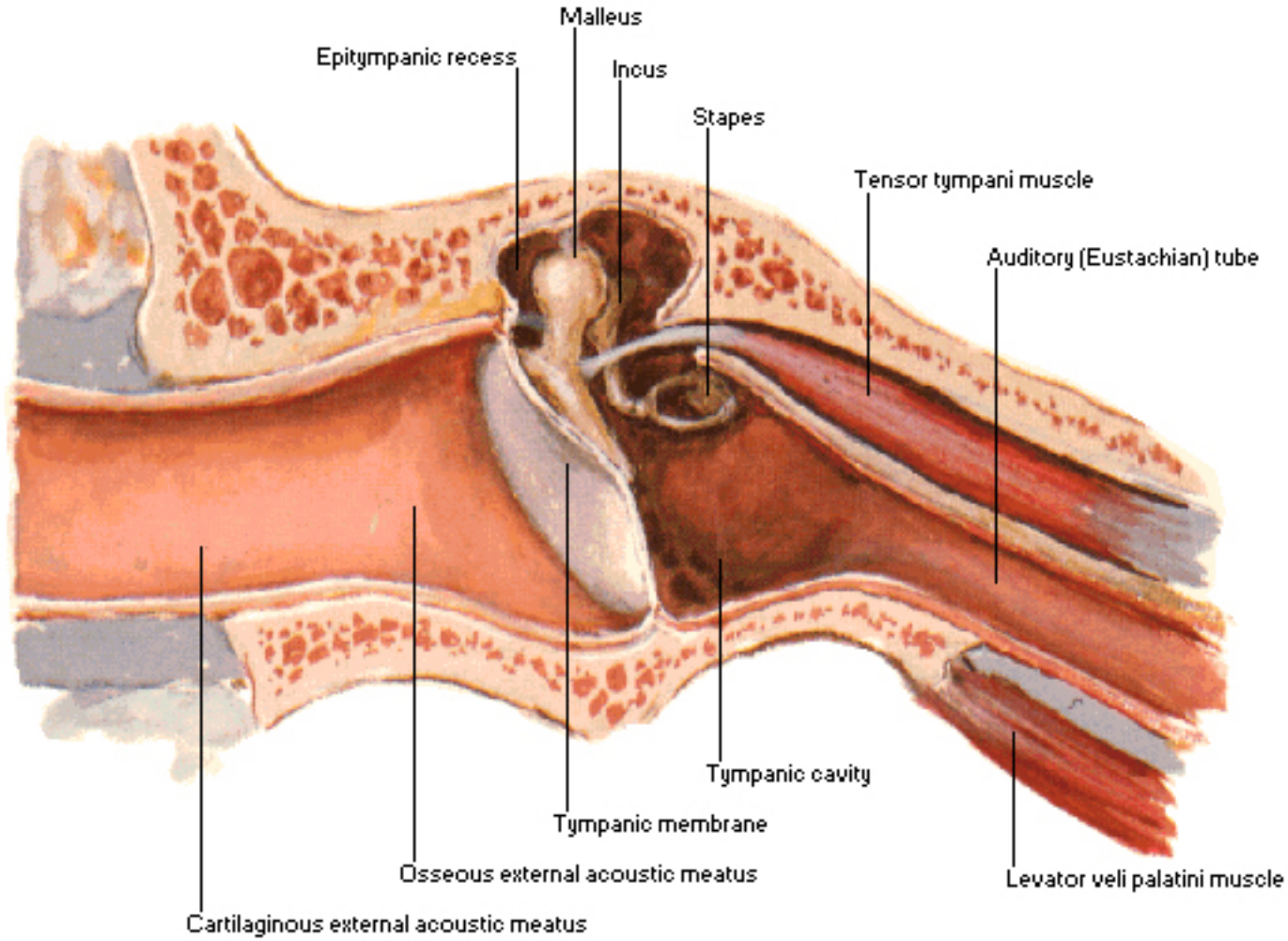
Anteriorly - Spiral duct of cochlea – organ of hearing

Utricle & saccule (organ of static balance) in middle

Semicircular canals (organ of kinetic balance) posteriorly

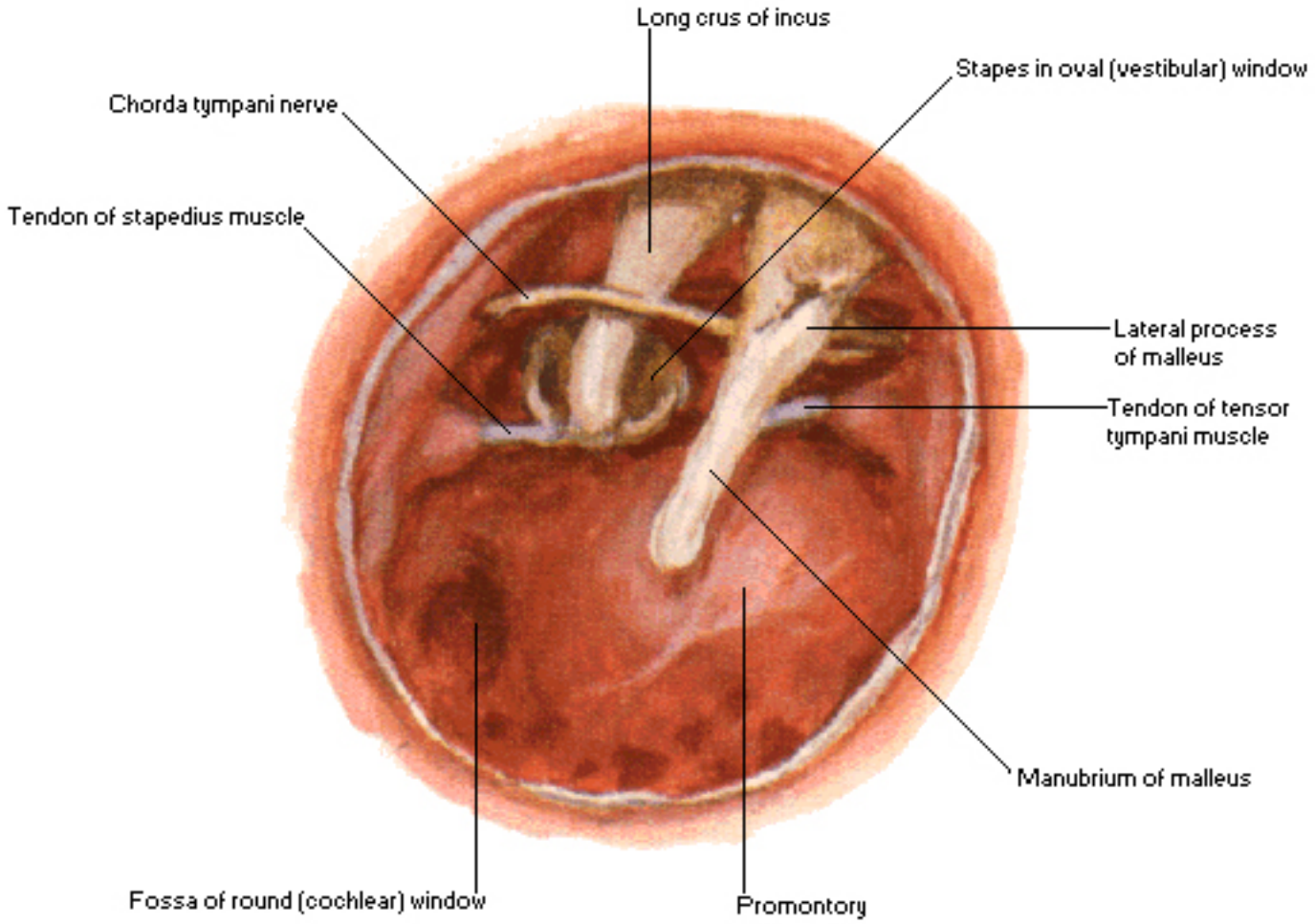
External Ear and Tympanic Cavity

Coronal Oblique Section



Tympanic Cavity

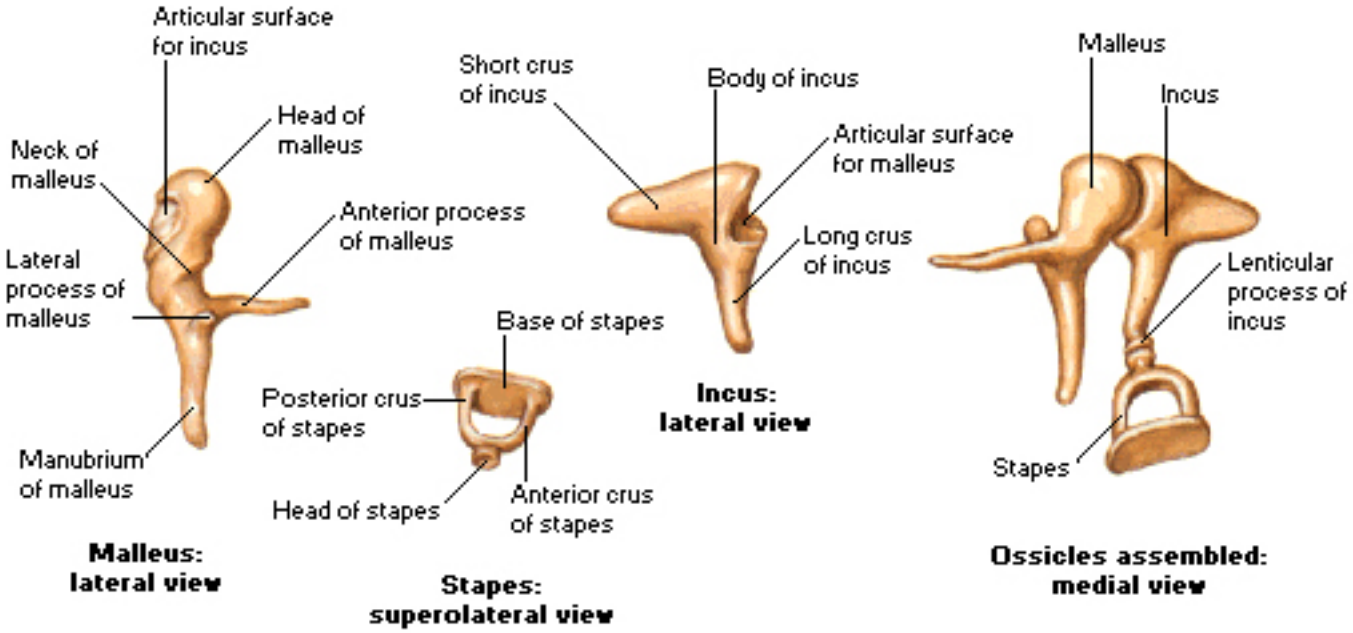
Viewed from External Acoustic Meatus



Tympanic Membrane Removed

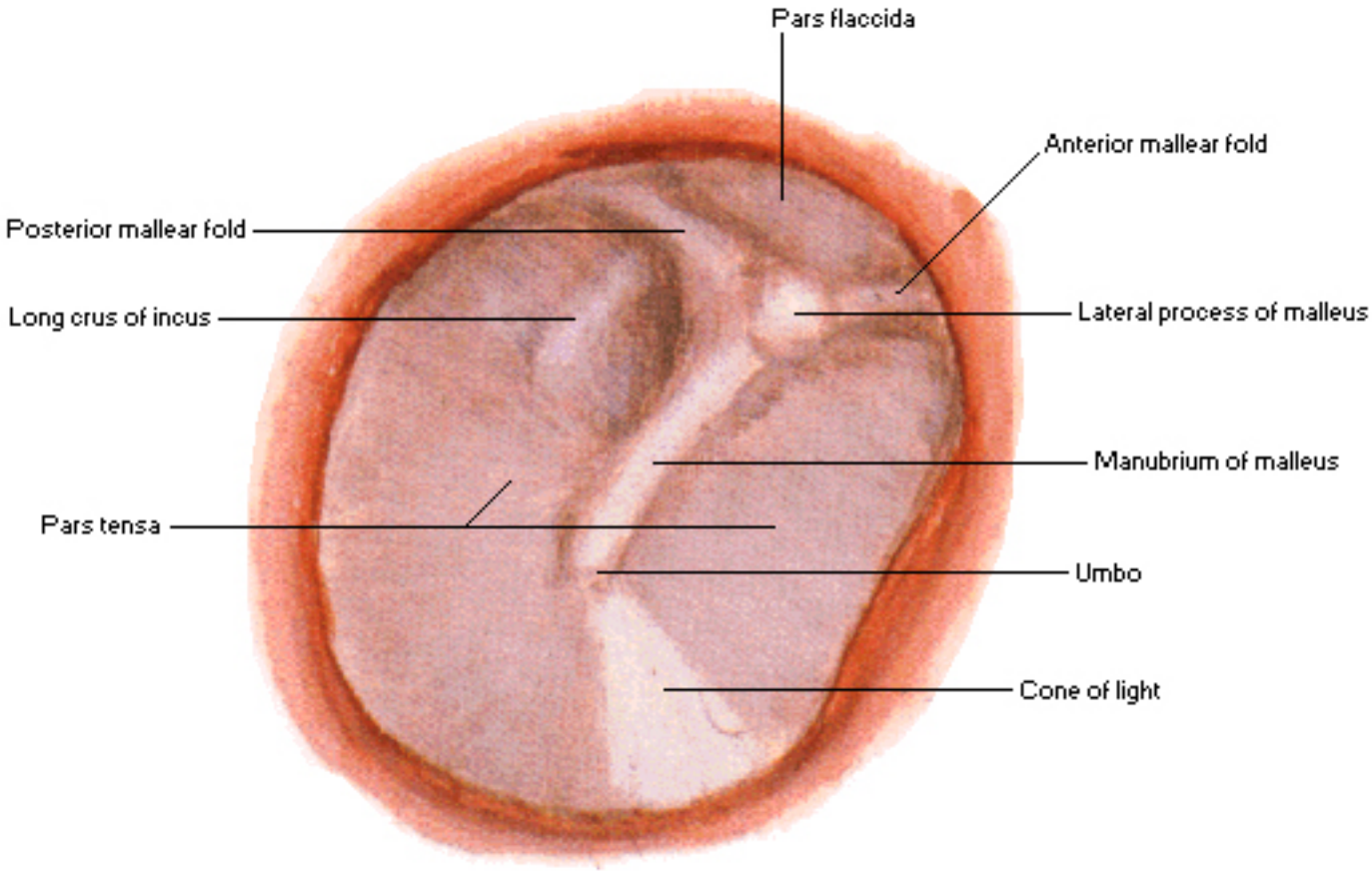
Tympanic Cavity

Auditory Ossicles



External Ear

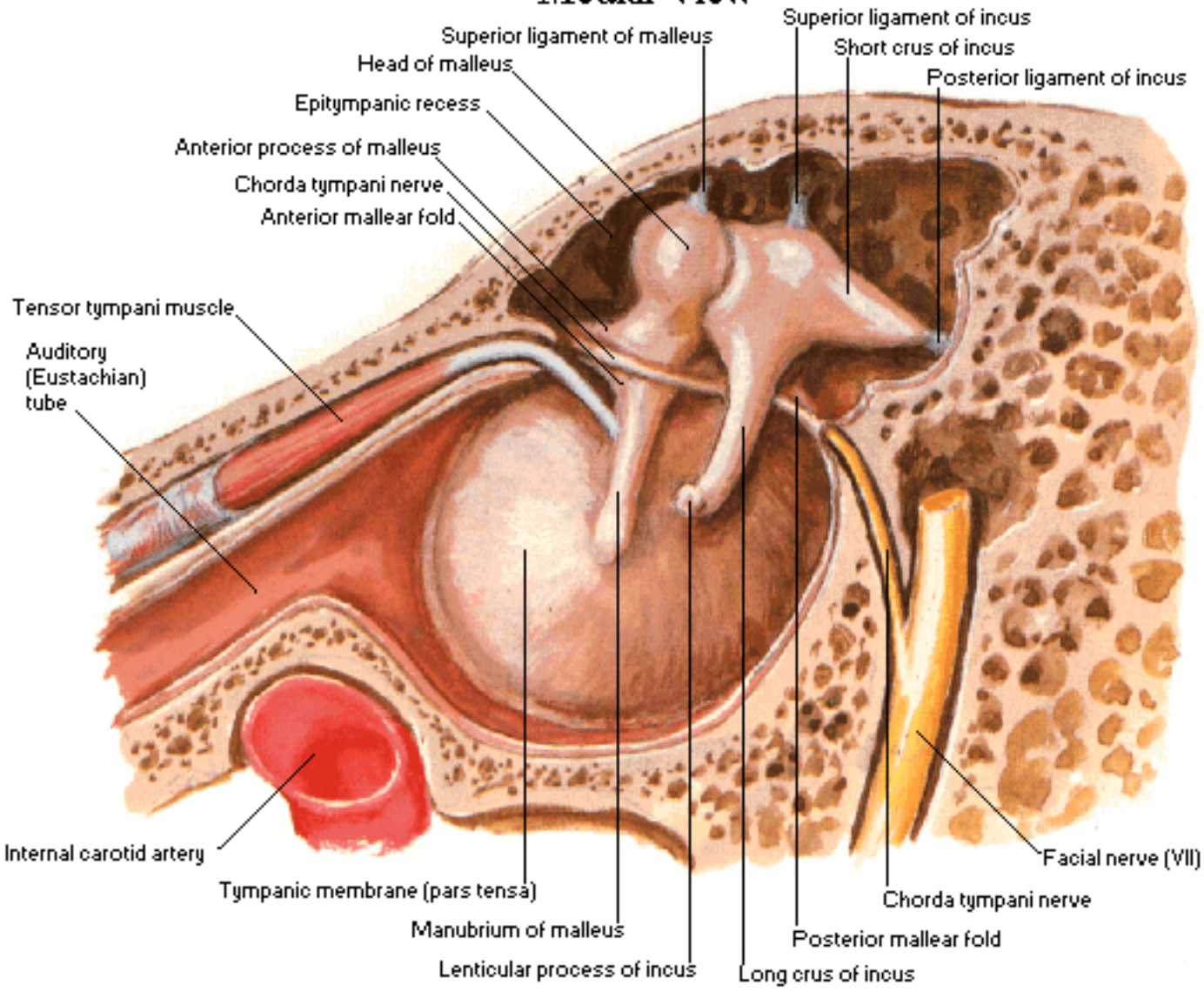
Right Tympanic Membrane



Viewed through speculum

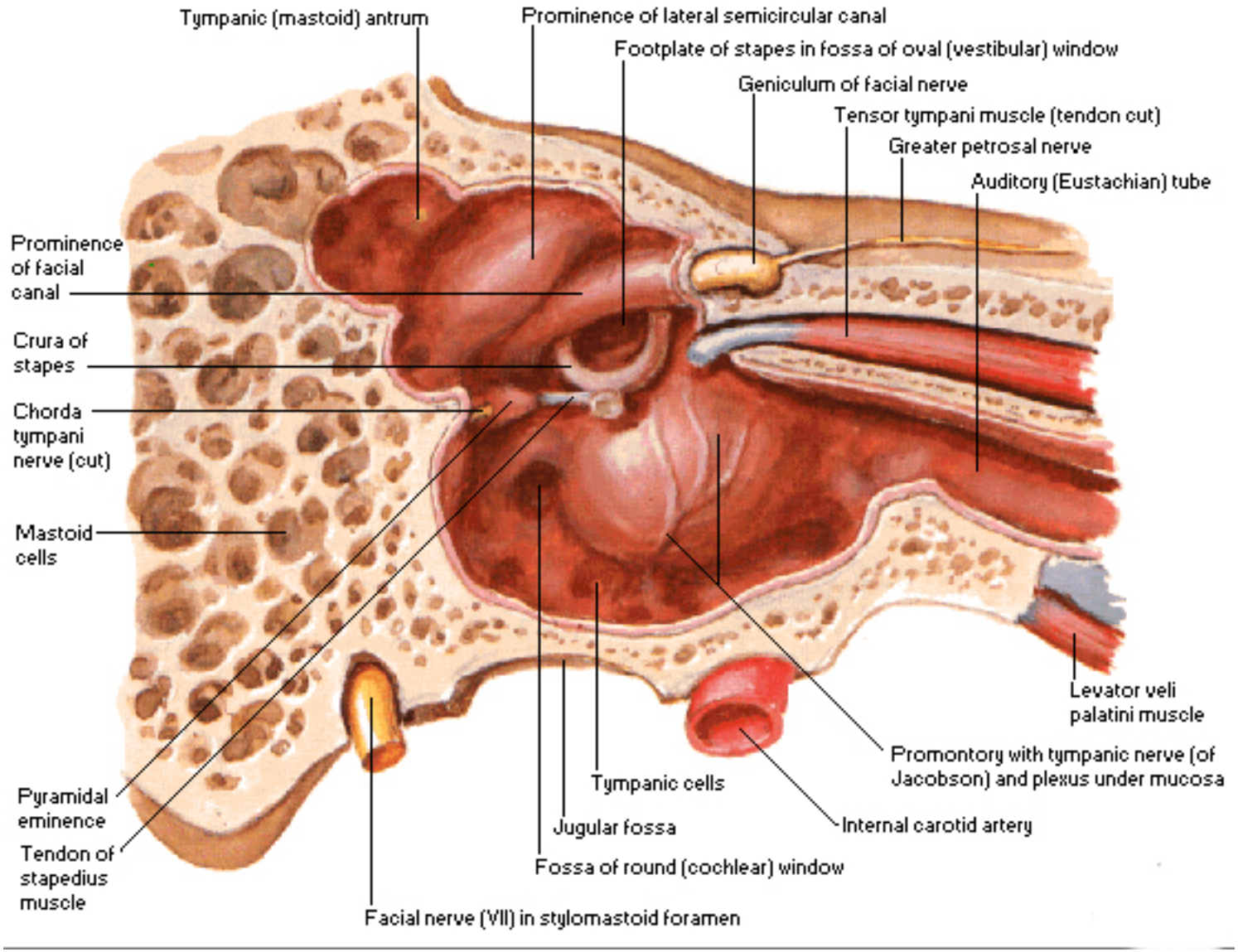
Tympanic Cavity - Lateral Wall

Medial View



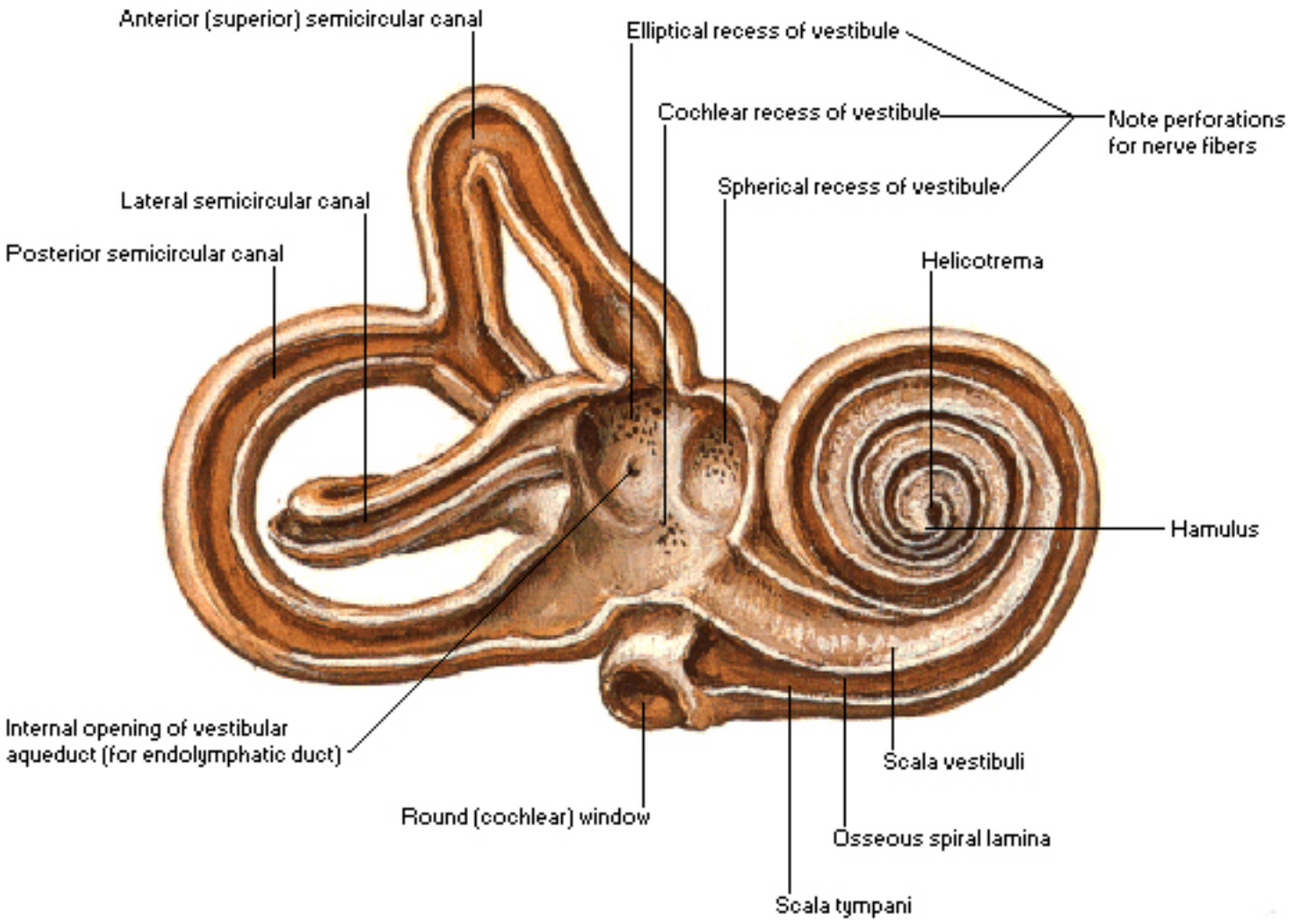
Tympanic Cavity - Medial Wall

Lateral View



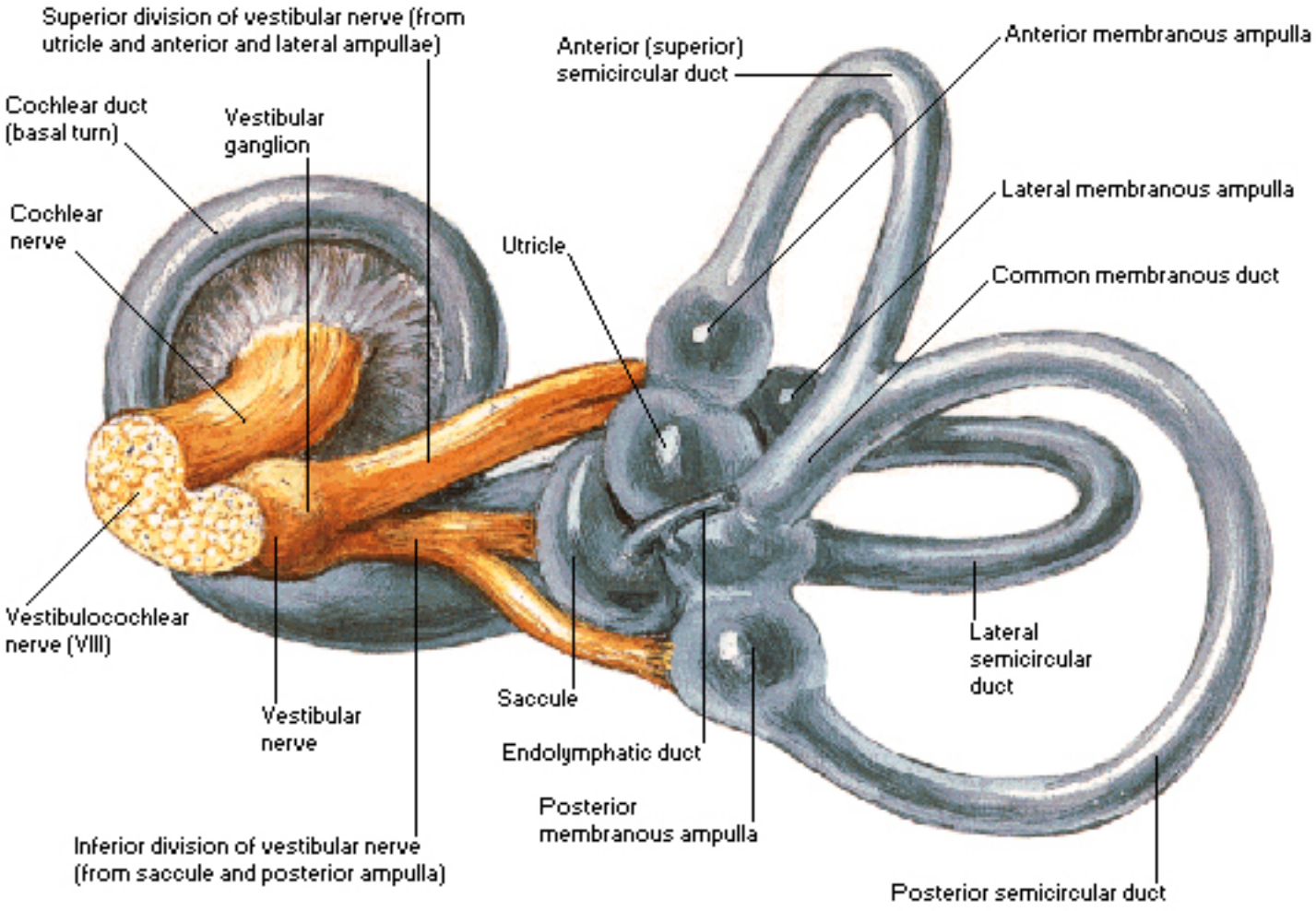
Right Osseous Labyrinth - Dissected

Membranous Labyrinth Removed



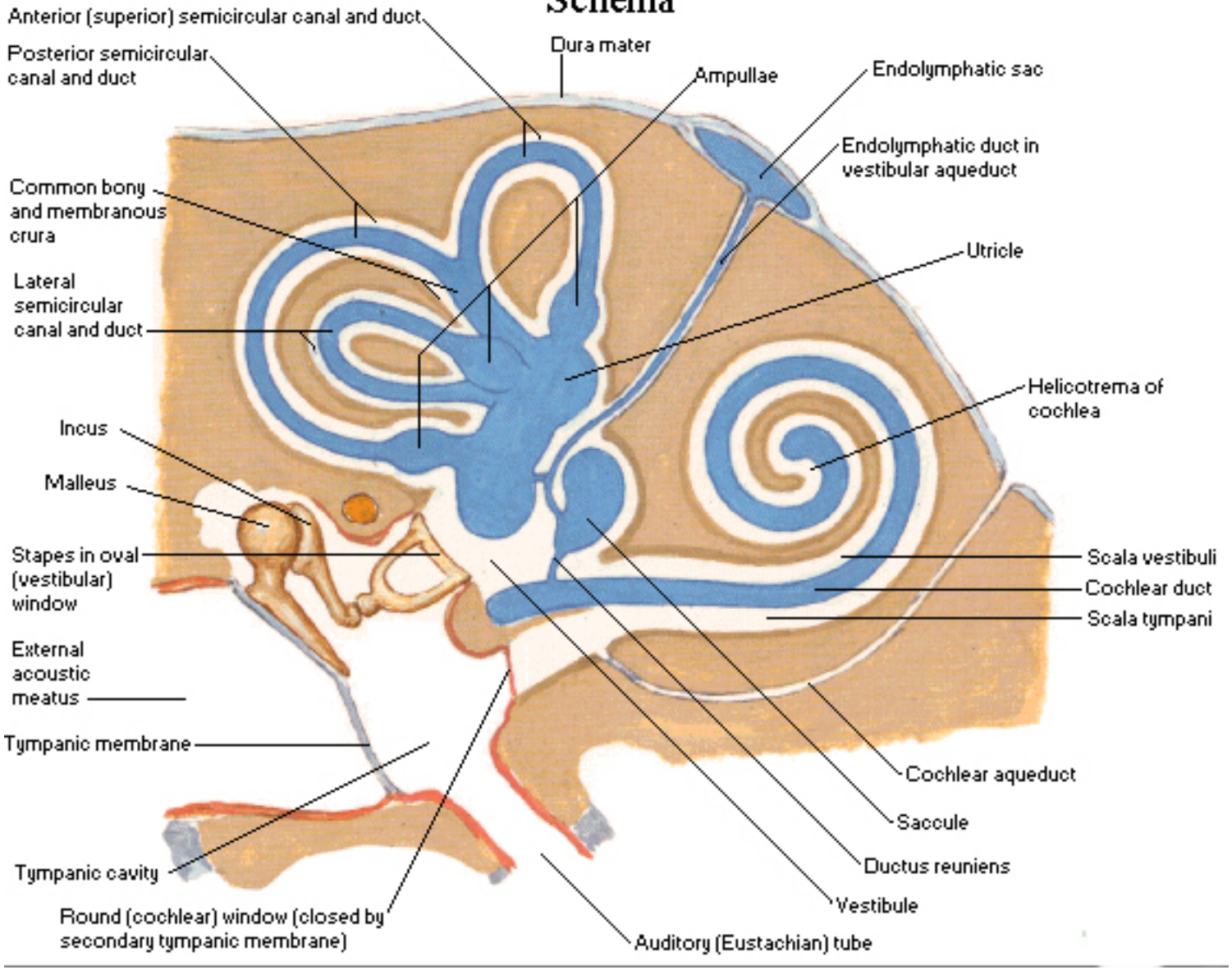
Right Membranous Labyrinth with Nerves

Posteromedial View



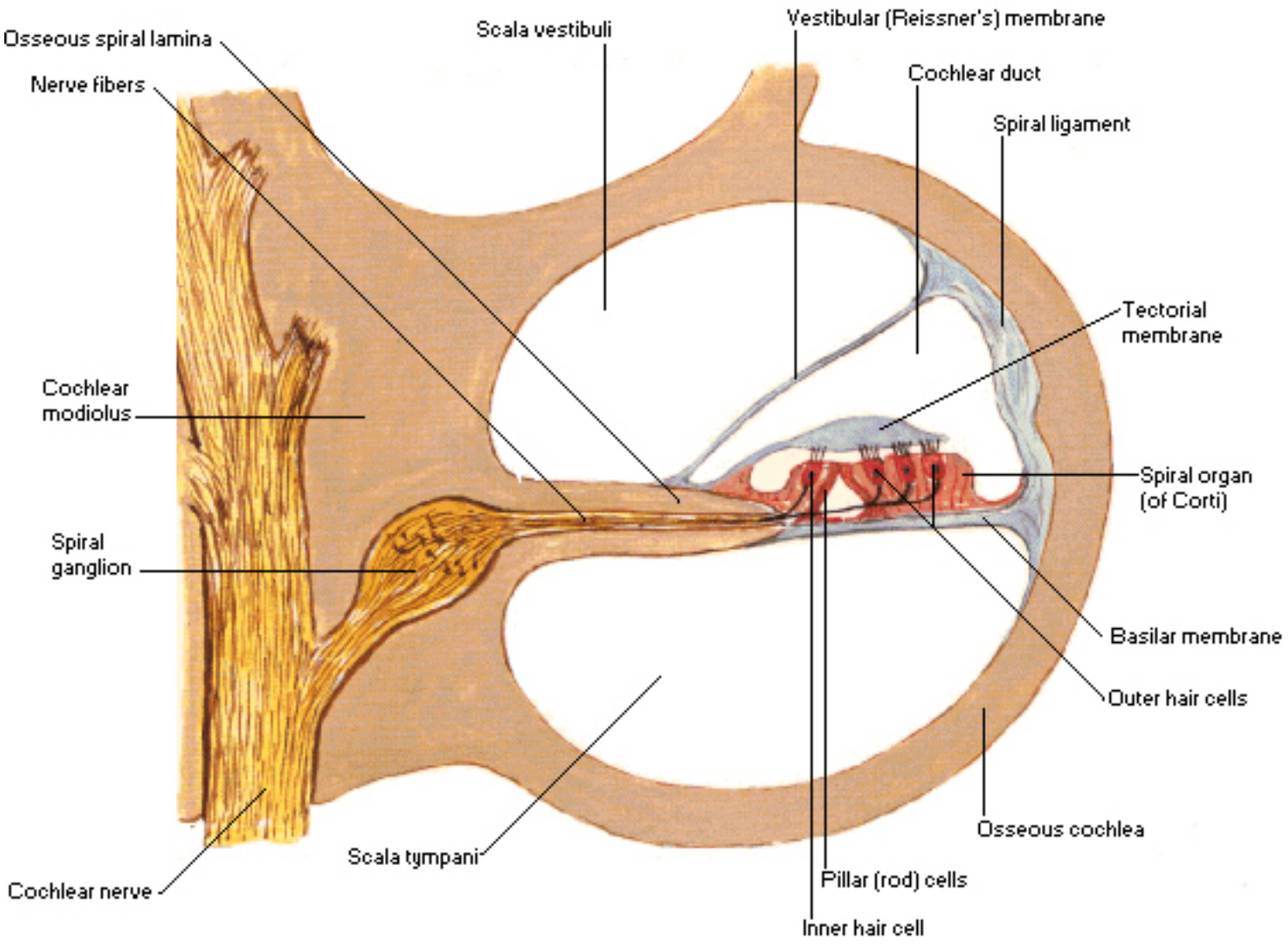
Osseous and Membranous Labyrinths

Schema



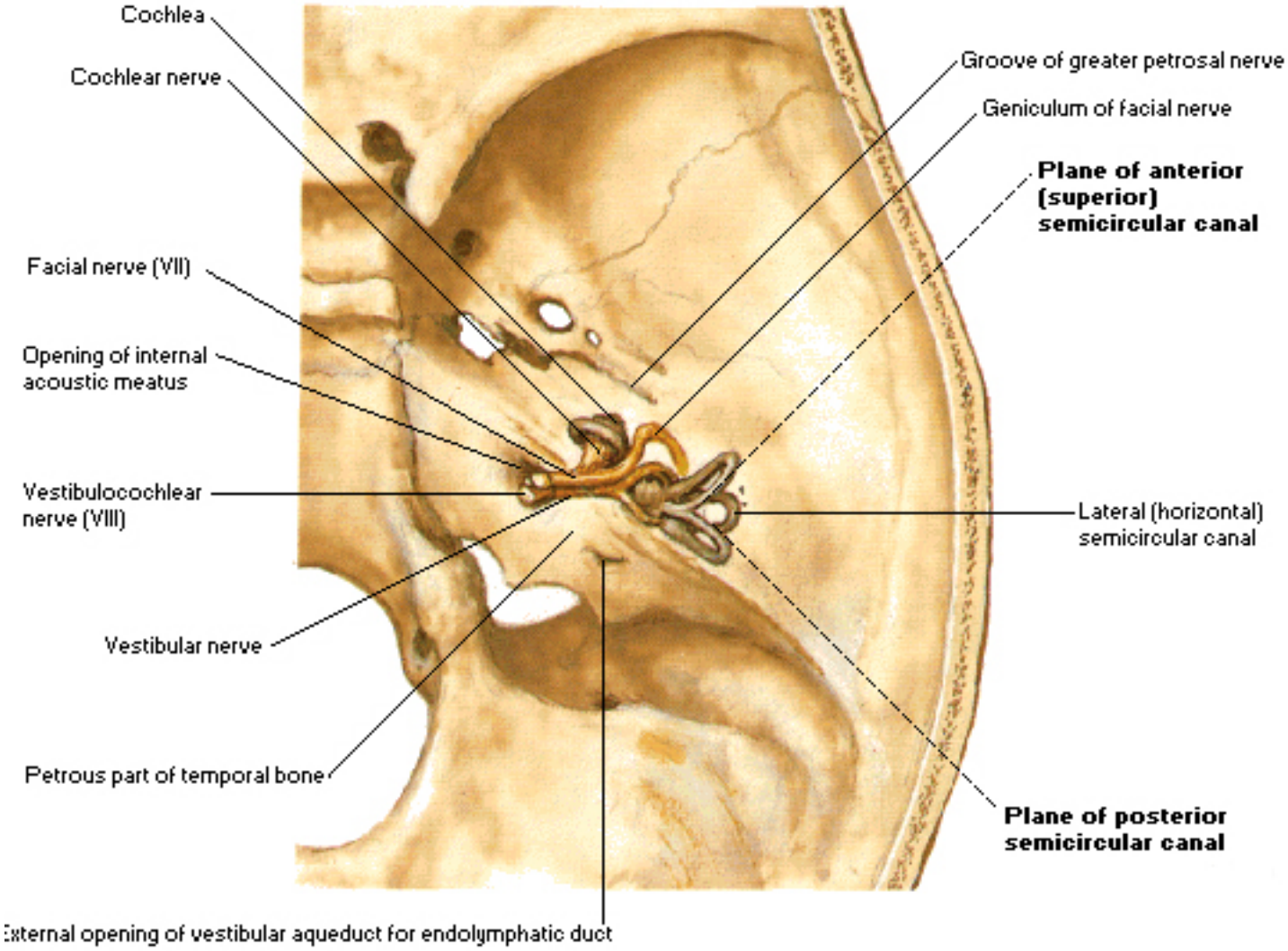
Osseous and Membranous Labyrinths

Section Through Turn of Cochlea



Orientation of Labyrinth in Skull

Superior Projection



Orientation of Labyrinth in Skull

Lateral Projection