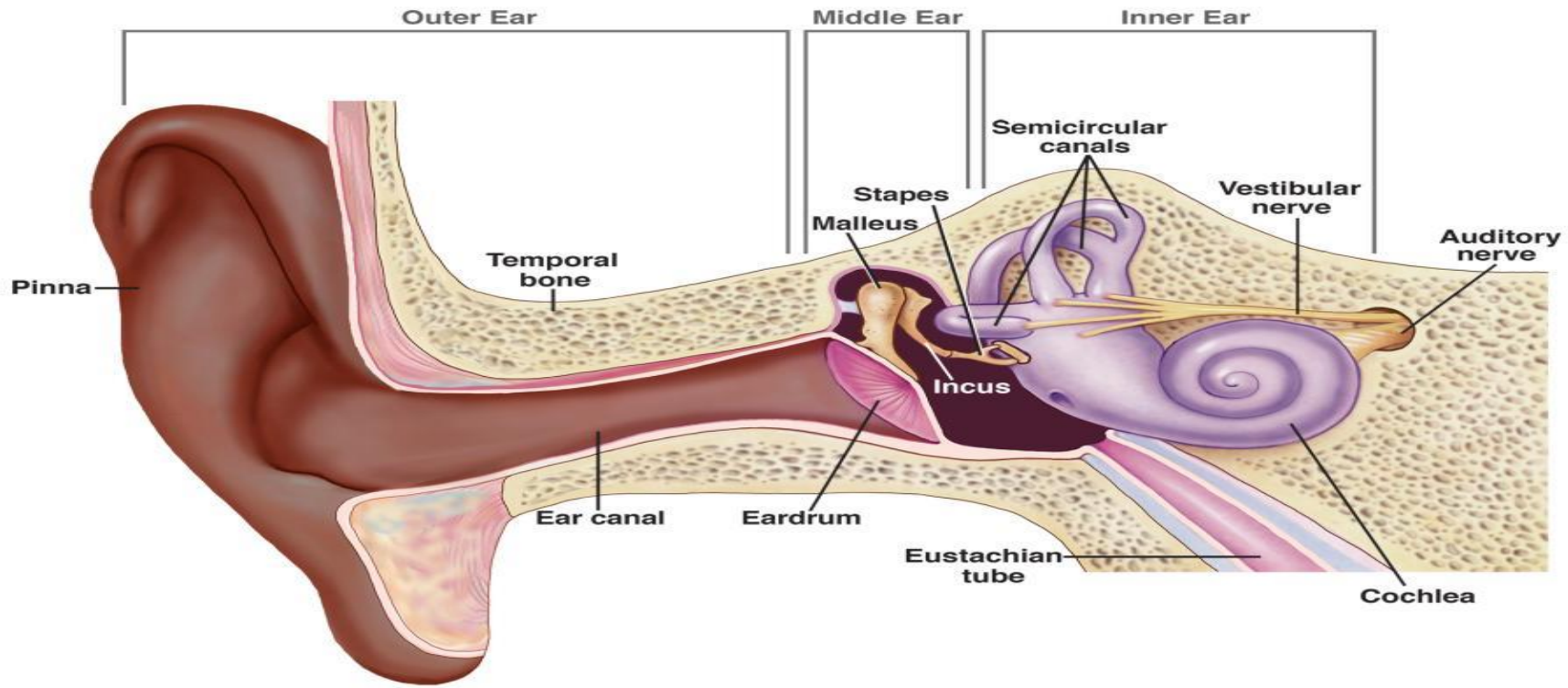
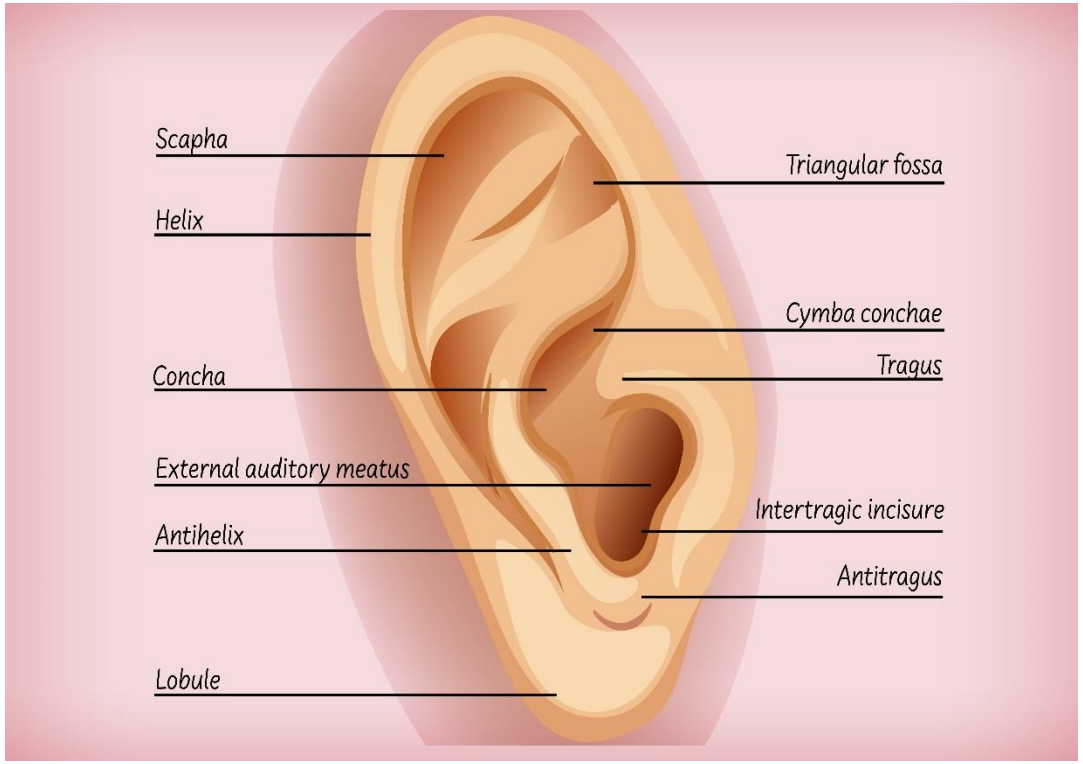
Anatomy of Ear
and Physiology of Hearing

ANATOMY

- The ear is divided into three main regions:
- (1) External(outer) ear - which collects sound waves and channels them inward
- (2) Middle ear - which conveys sound vibrations to the oval window
- (3) Internal ear - which houses the receptors for hearing and equilibrium.



❖ External auditory canal contains a few hairs and specialized sweat glands called **ceruminous glands** that secrete **earwax** or ***cerumen***. The combination of hairs and cerumen helps prevent dust and foreign objects from entering the ear.



INTERNAL(INNER) EAR , LABYRINTH

- Labyrinth means complicated series of canals,
- Structurally, it consists of two main divisions: an outer **bony labyrinth** that encloses an inner **membranous labyrinth**. It is like long balloons put inside a rigid tube.

Outer Bony Labyrinth

Bony labyrinth is a series of cavities in the temporal bone.

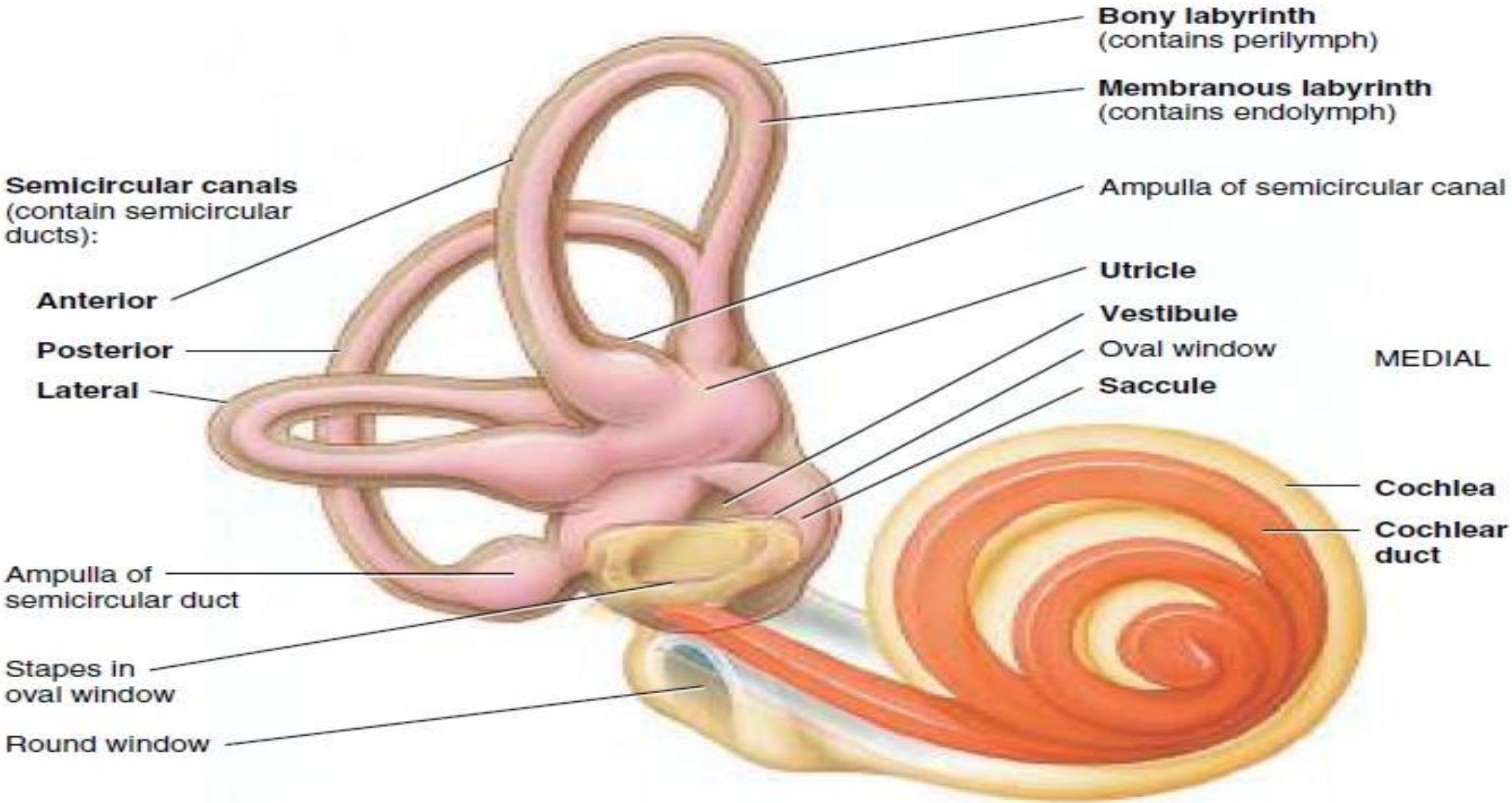
It is divided into three regions-

- Semicircular canals
- Vestibules
- Cochlea

Bony labyrinth is lined with periosteum and contain fluid perilymph which is similar to CSF.

Inner Membranous labyrinth

- It is series of sacs and tubes inside of bony labyrinth is lined with epithelium
- It contains endolymph.
- The level of potassium ions are high in endolymph.
- K+ ions generate the auditory signals.
- It consist of two sacs.
  - Utricle
  - Saccule


Bony labyrinth
(contains perilymph)
Membranous labyrinth
(contains endolymph)
Semicircular canals
(contain semicircular
ducts):
Anterior
Posterior
Lateral
Ampulla of semicircular canal
Utricle
Vestibule
Oval window
Saccule
MEDIAL
Cochlea
Cochlear
duct
Ampulla of
semicircular duct
Stapes in
oval window
Round window

PHYSIOLOGY OF HEARING

- Auricle/Pinna directs sounds waves into external auditory canal.
- When sound waves strikes eardrum that causes eardrum to vibrate.
- The central area of eardrum is connected to malleus which start to vibrate. The vibration is transmitted from malleus to incus then to stapes.
- As stapes moves back and forth it pushes the membrane of oval window in out.
- The movements of the oval window sets up pressure waves in perilymph .
- So the vibrations are transmitted to “organ of Corti” through perilymph and endolymph.
- The pressure waves in the endolymph cause the basilar membrane to vibrate, which moves the hair cells of the spiral organ against the tectorial membrane. This leads to bending of the stereocilia and ultimately to the generation of nerve impulses
- From the organ of corti, the impulse generated are carried to brain through 8^{th} cranial nerve to auditory centers of the brain which is present in the temporal lobe.