

STRUCTURE AND FUNCTION OF EAR

EAR

The human ear serve as an astounding transducer, converting sound energy —→mechanical energy —→nerve impulse which is transmitted to the brain

Ear consists of three basic parts

- Outer ear-collect and channel sound to middle ear
- Middle ear-transform the energy of soundwave into internal vibration to the bones of middle ear and then into compressional wave in the inner ear
- Inner ear-compressional wave into nerve impulse which can be transmitted to brain

OUTER EAR:

The outer ear consist of

- Pinna and
- External auditory meatus

Auricle (pinna) : collects and directs sound waves to move the tympanic membrane

External auditory canal (meatus) : leads sound waves from Auricle to tympanic membrane .

Function : collecting and channeling sound waves into the ear canal .

MIDDLE EAR:

Tympanic membrane: Elastic structure which vibrates with sound waves . connected with Auditory ossicles; 3 small bones – malleus , Incus, and stapes which conduct vibrations to oval window of inner ear.

Tympanic cavity : Air spaces within temporal bone containing middle ear structures .

Eustachian tube : communicates middle ear with pharynx .

Muscle tensor tympani stapedius: protect inner ear from loud sounds .

Function: conduct and amplifies vibrations through the action of 3 bones.

INNER EAR:

It is also called as labyrinth because of its complicated series of canals

It consist of two division

Outer bony labyrinth (serires of channel filled with fluid called perilymph) that encloses inner membranous labyrinth(fluid-endolymph)

Bony labriynth is further divided into

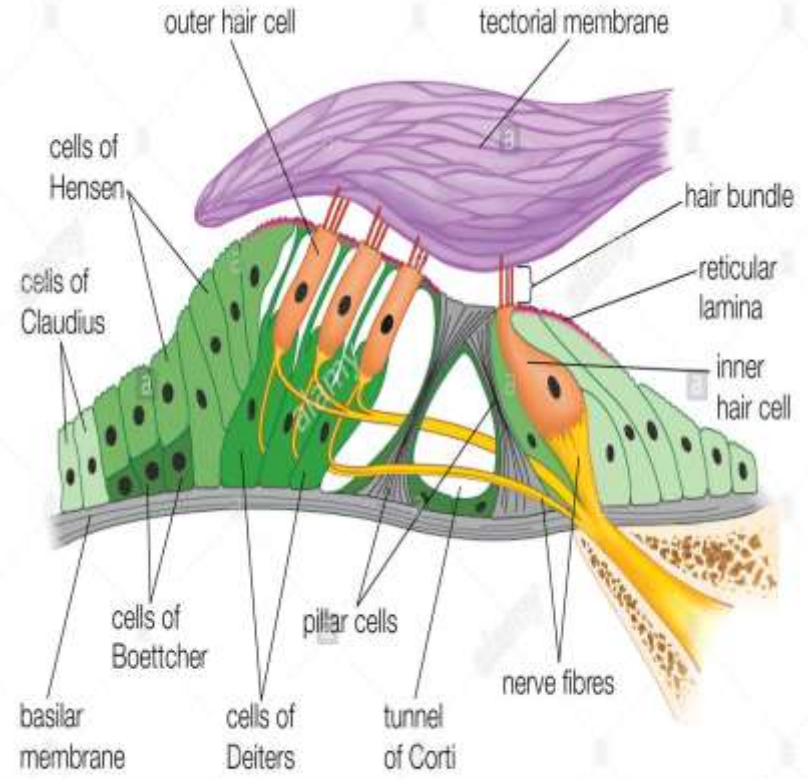
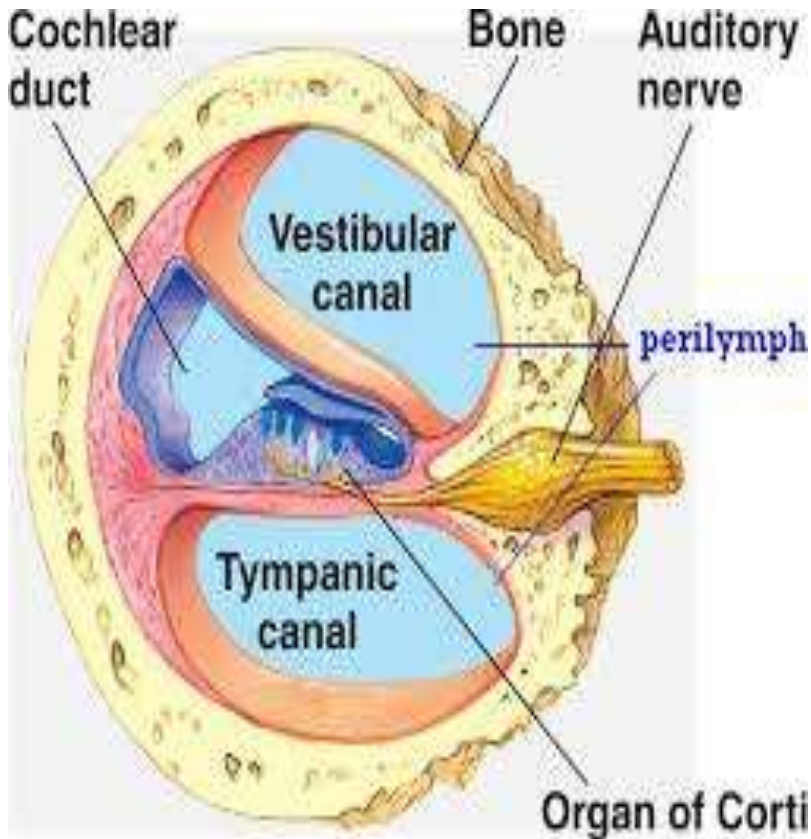
- Cochlea (containing receptors for hearing)
- Vestibular apparatus(containing receptors that responds to sense of equilibrium)

Cochlea:

- It is a coiled tube
- Section of cochlea-cochlea duct, scala vestibuli and scala tympani
- The cochlear duct is an continuation of membranous labyrinth and filled with endolymph
- Channel above cochlear duct is scala vestibuli ends in oval window and channel below the cochlear duct is scala tympani ends in round window. these channels are filled with perilymph and communicate with each other at the apex of cochlea through small opening called helicoterma
- the inner ear consist of 2 membrane
- Vestibular membrane-seperates cochlear duct from vestibular canal
- Basilar membrane-seperates cochlear duct from tympanic canal

- The basilar membrane contains organ of corti which is an highly specialized auditory hair cells.
- The hair cells are arranged in four rows :3 outer and 1 row of inner hair cells.
- protruding from the surface of each hair cell are 100 hairs known as stereocilia.
- these hair cells are mechanoreceptors which generate nerve impulse that is transmitted to the brain

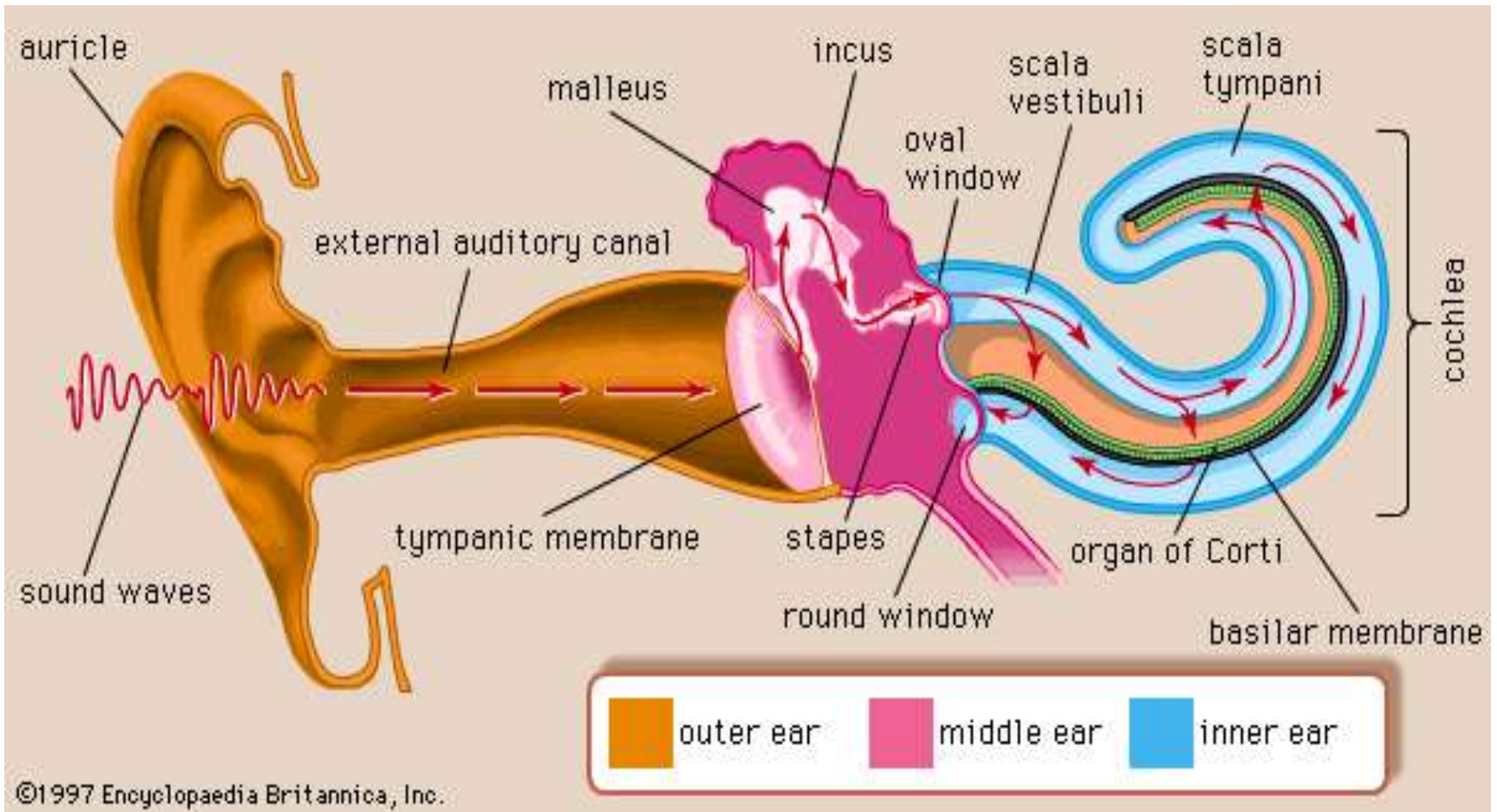
INNER EAR



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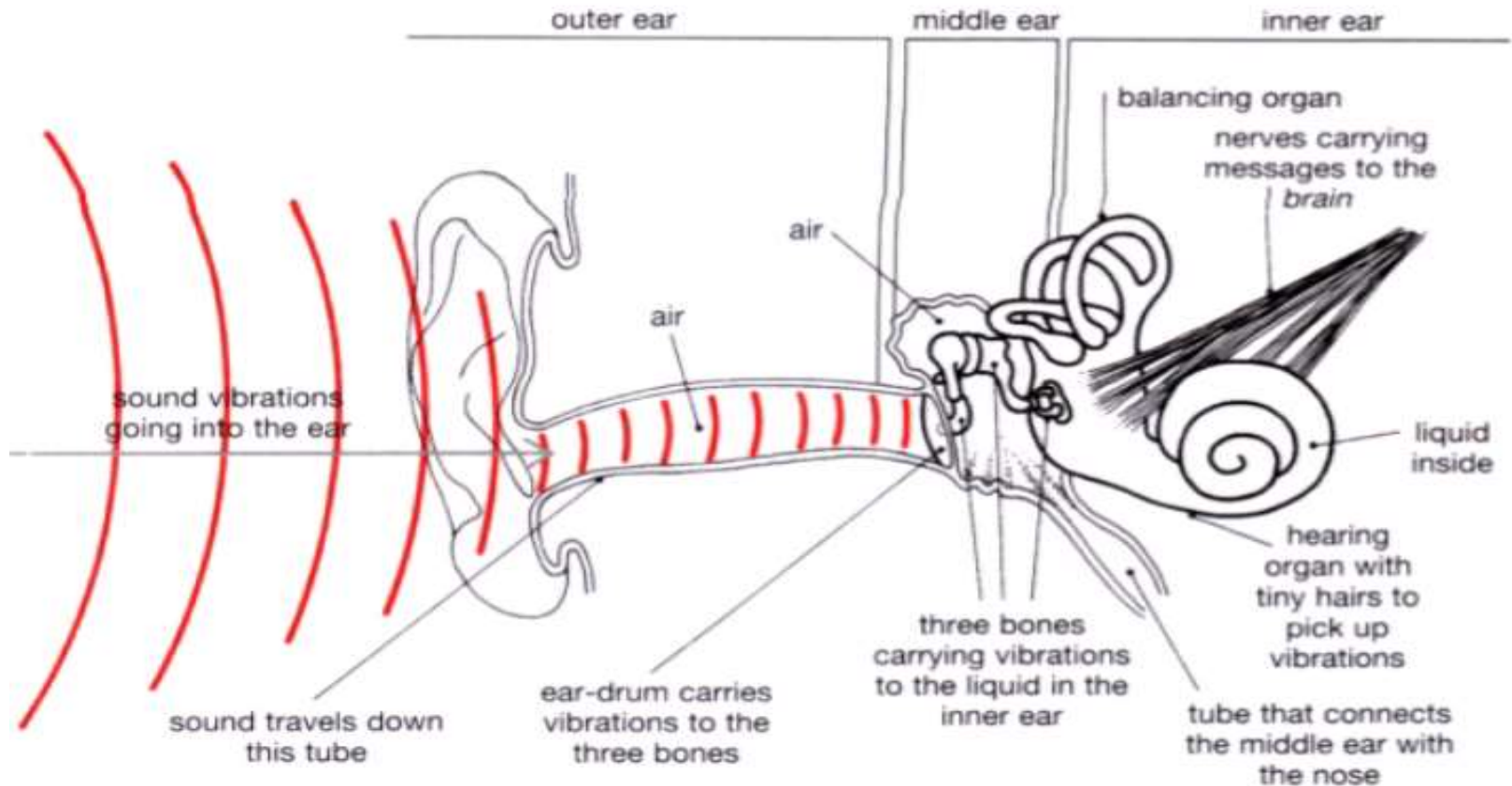
STRUCTURE OF EAR



Physiology of sound processing & reception

Sound collected by pinna → transported through external auditory meatus → sets tympanic membrane in motion
vibration of malleus → incus → stapes → vibration of oval window → fluid wave formed by vibration of oval window travels → vestibular canal → tympanic canal → sets basilar layer in motion → Different portions vibrate according to pitch → hair cells bend against tectorial membrane → Action potential → vestibulocochlear nerve → medulla oblongata midbrain → thalamus temporal lobes of cerebrum .

Physiology of ear



EAR DISORDERS

Otitis externa:

It refers to inflammation of external auditory canal.

Otitis media:

It is the inflammation of mucous membrane of middle ear and eustachian tube.

Deafness(loss of hearing):

It is the result of injury in the inner ear. When the ear drum breaks the person may become partially or totally deaf.

Tinnitus:

It is the perception of noise or ringing in the ears.