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The Ear

Anatomy & Physiology

By

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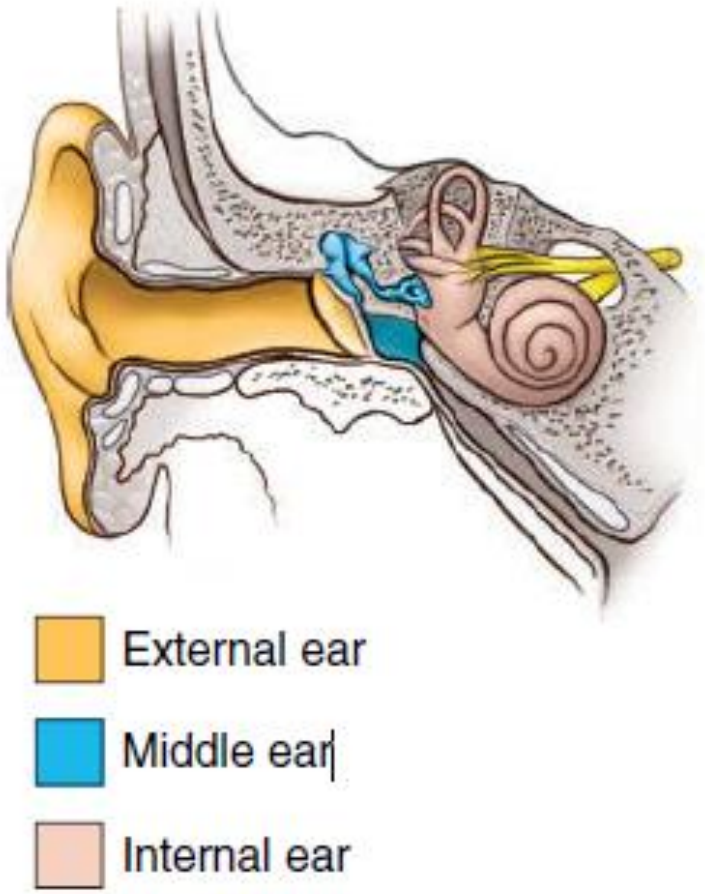
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Hearing is the ability to perceive sounds.

- The ear is the organ of hearing and is also involved in balance.
- It is supplied by the 8th cranial nerve, i.e. the cochlear part of the vestibulocochlear nerve

Anatomy of ear

1. External (collects sound waves and channels them inward)
2. Middle (conveys sound vibrations to the oval window)
3. Internal (houses the receptors for hearing and equilibrium)



01

External Ear

Auricle (pinna):

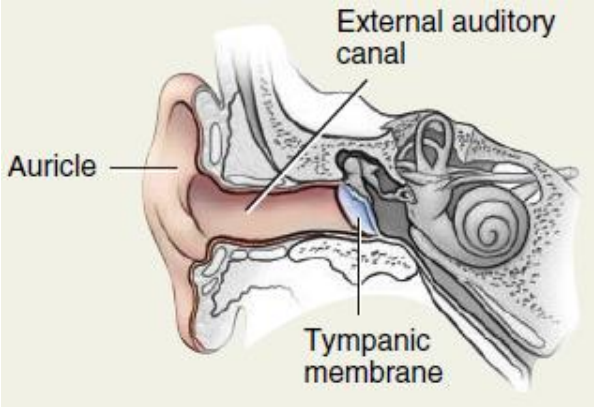
- ✓ visible part of the ear
- ✓ It is composed of fibroelastic cartilage covered with skin.
- ✓ It consists of helix (outer grooved ridge part) and lobule (lower portion of soft pliable part, composed of fibrous and adipose tissue)
- ✓ Collects sound waves.

External auditory canal (external auditory meatus):

- ✓ Slightly 'S'-shaped tube about 2.5 cm long extending from the auricle to the tympanic membrane (eardrum).
- ✓ The meatus (cartilaginous bone) is lined with skin continuous with that of the auricle.
- ✓ In this tube contains ceruminous gland which secrete cerumen (ear wax) and hair follicles. It is helpful for preventing foreign substances like dust, insects and microbes.
- ✓ Directs sound waves to eardrum.

Tympanic membrane (eardrum):

- ✓ completely separates the external acoustic meatus from the middle ear. It is oval-shaped with the slightly broader edge upwards and is formed by three types of tissue:
  1. **Outer (Hairless skin), 2. Middle (fibrous tissue), 3. Inner (mucous membrane)**
- ✓ Sound waves cause it to vibrate, which in turn causes malleus to vibrate



02

Middle Ear

Auditory ossicles:

- ✓ These are three very small bones only a few mm in size that extend across the middle ear from the tympanic membrane to the oval window
- ✓ Transmit and amplify vibrations from tympanic membrane to oval window.

The malleus

- This is the lateral hammer-shaped bone. The handle is in contact with the tympanic membrane and the head forms a movable joint with the incus.

The incus

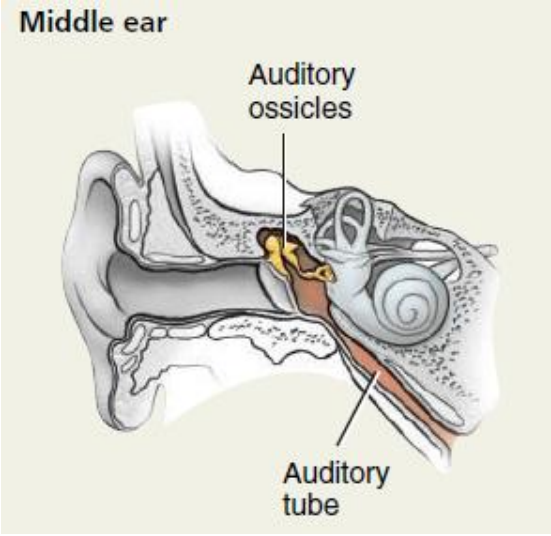
- This is the middle anvil-shaped bone. Its body articulates with the malleus, the long process with the stapes, and it is stabilised by the short process, fixed by fibrous tissue to the posterior wall of the tympanic cavity.

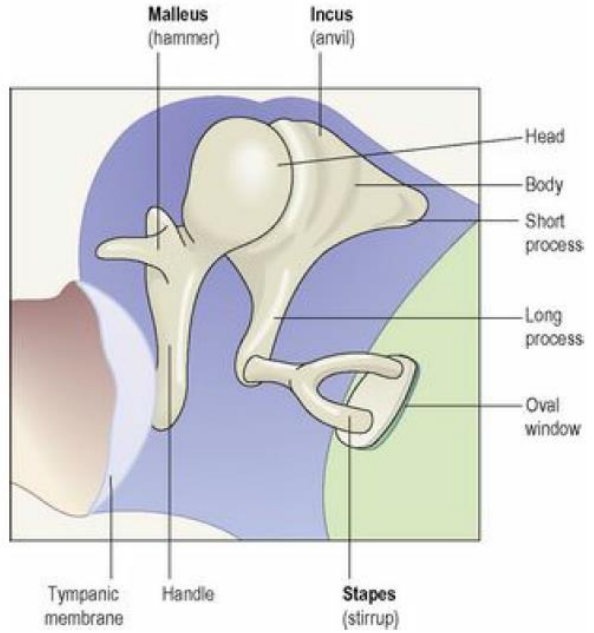
The stapes

- This is the medial stirrup-shaped bone. Its head articulates with the incus and its footplate fits into the oval window.

Auditory tube (eustachian tube):

- ✓ Equalizes air pressure on both sides of tympanic membrane.





The auditory ossicles

03

Internal Ear

Cochlea: Contains a series of fluids, channels, and membranes that transmit vibrations to spiral organ (organ of Corti), the organ of hearing; hair cells in spiral organ produce receptor potentials, which elicit nerve impulses in cochlear branch of vestibulocochlear (VIII) nerve.

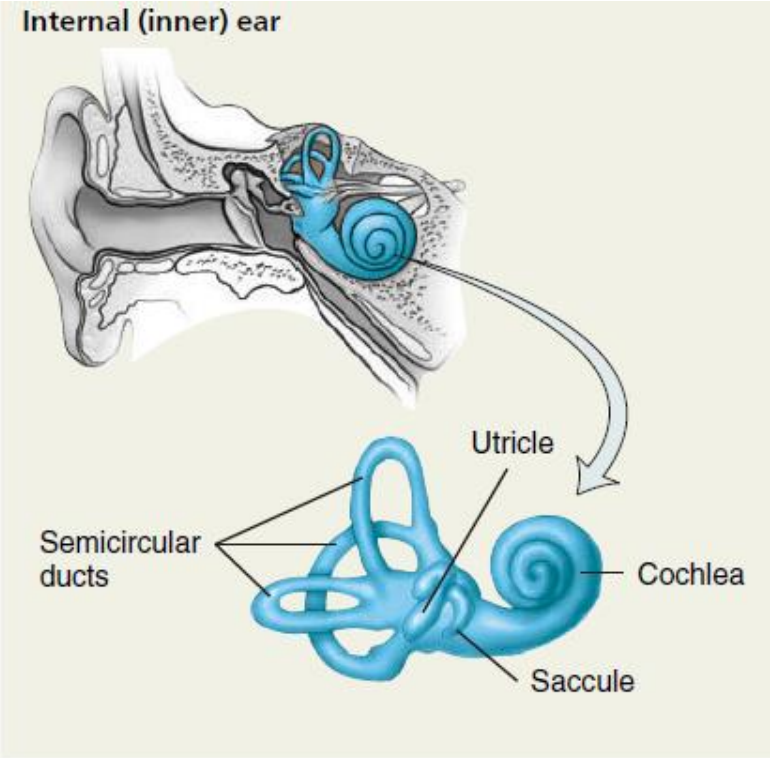
Vestibular apparatus: Includes semicircular ducts, utricle, and saccule, which generate nerve impulses that propagate along vestibular branch of vestibulocochlear (VIII) nerve.

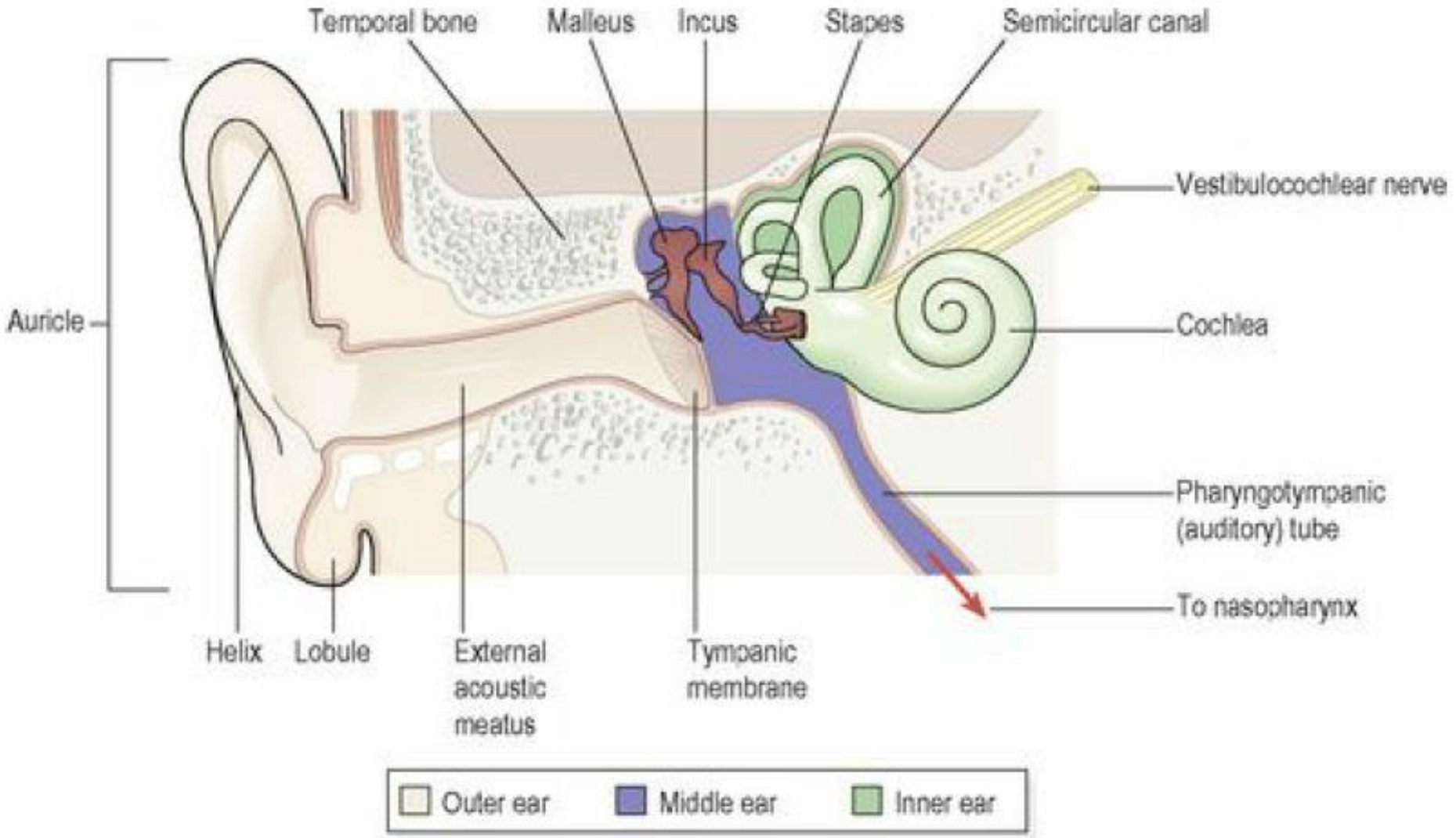
Semicircular ducts: Contain cristae, site of hair cells for *dynamic equilibrium* (maintenance of body position, mainly the head, in response to rotational acceleration and deceleration movements).

Utricle: Contains macula, site of hair cells for *static equilibrium* (maintenance of body position, mainly the head, relative to force of gravity).

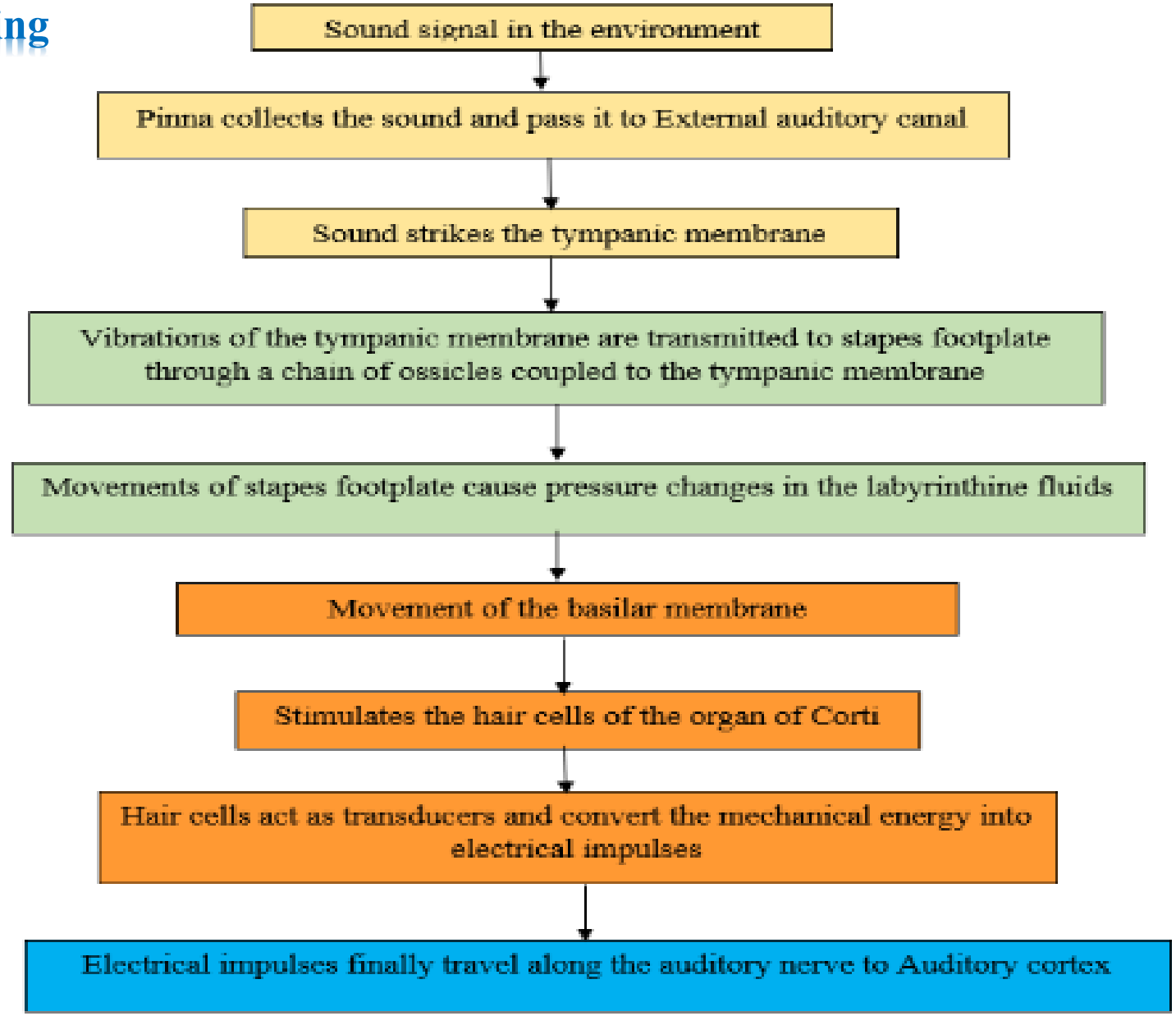
Saccule: Contains macula, site of hair cells for static equilibrium.

Labyrinth
Between the bony and membranous labyrinth there is a layer of watery fluid called ***perilymph*** and within the **Membranous Labyrinth** there is a similarly watery fluid, ***endolymph.***




Temporal bone
Malleus
Incus
Stapes
Semicircular canal
Vestibulocochlear nerve
Auricle
Cochlea
Pharyngotympanic (auditory) tube
To nasopharynx
Helix
Lobule
External acoustic meatus
Tympanic membrane
Outer ear
Middle ear
Inner ear

Physiology of hearing



Thank you