

INNER EAR SPECIAL SENSES:

HEARING

2/9/82, RVSD 2/13/97, 8 Feb 00, 11 Feb 04, 18 Feb 08,
11Mar09, 22Feb10, 16Feb11, 20Feb12
S&M p 414, Martini 5th: 557-561, 564-571, 6th: 588-590, 7th:
573-586, 8th: 585-599, 9th: 574-588

Hearing and balance sensed here.

THREE DIVISIONS OF EAR: (p 575)

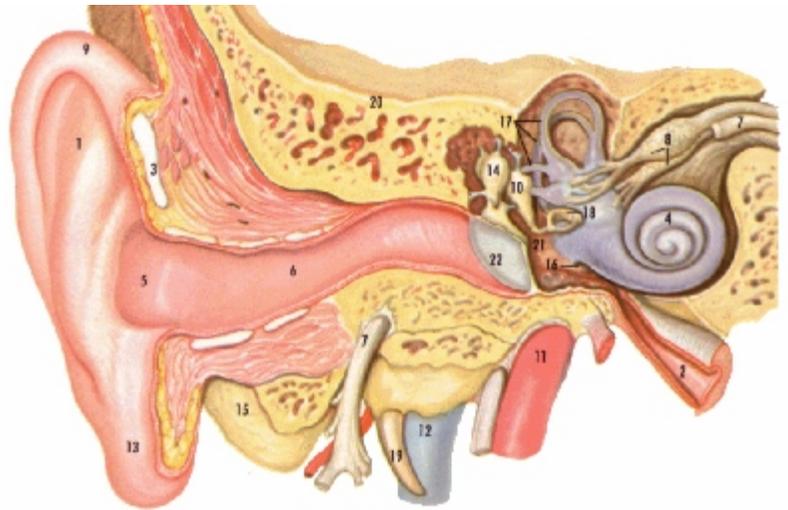
- External** pinna (auricle and lobule) and external auditory meatus
- Middle** chamber containing three **ossicles**
- Inner** transduction occurs in fluid-filled chambers

Embryology: otic placode forms, invaginates into otic pit, then vesicle.

- lateral pouch forms from pharynx,
- pharyngeal pouch** forms **eustachian tube**

Otic vesicle forms membranous labyrinth, enervated by C.N VIII, vestibulocochlear nerve

External auditory meatus, 2.5 cm long, **down and forward**, resonator for 2500 to 5000 cps



- | | | | |
|-----------------------------|-------------------------------------|---------------------------|---------------------------------|
| 1. Anthelix | 7. Facial nerve | 12. Internal jugular vein | 18. Stapes (stirrup) |
| 2. Auditory tube | 8. Ganglion of the vestibular nerve | 13. Lobe | 19. Styloid process |
| 3. Cartilage | 9. Helix | 14. Malleus (hammer) | 20. Temporal bone |
| 4. Cochlea | 10. Incus (anvil) | 15. Mastoid process | 21. Tympanic cavity |
| 5. Concha | 11. Internal carotid artery | 16. Round window | 22. Tympanic membrane (eardrum) |
| 6. External acoustic meatus | | 17. Semicircular canals | |

EXTERNAL EAR: Auricle, lobule, helix, antihelix, tragus.

(Page 575) Ceruminous glands make **cerumen**, antibacterial

MIDDLE EAR: **tympanic membrane** partitions external from middle ear
oval and round windows oval leads to scala vestibuli of cochlea and round exit via scala tympani
two other openings: to **mastoid sinuses** and **eustachian tube** (to **nasopharynx**)

lined with mucous membrane, continuous with throat, infections can spread **esp in young** where eustachian tubes open all the time: mastoiditis is especially dangerous, proximity to brain

- otitis media:** infections of mucous membrane of middle ear, can impair hearing.
- otitis externa:** told by tugging on pinna in various directions. if painful, otitis externa.

OSSICLES: malleus, incus to stapes. (page 576)

possess sm muscles (tensor tympani stapedius), react to loud noises, protect inner ear

INNER EAR (within petrous portion of temporal bone): (p 577)

- osseus labyrinth** three areas: **vestibule**
- (In temporal bone) **semicircular canals**
- cochlea**

membranous labyrinth lines, filled with **endolymph**.
Perilymph fills outer space

Oval window "opens" (membrane separates) into vestibule, vibrations carried by perilymph which fills the scala vestibuli

COCHLEA: 2 turns around modiolus, bony central core. (P 582)

spiral laminae extend to spirals of cochlea fr modiolus.

- two membranes** extend across, basilar and vestibular membranes
- three tunnels** **scala vestibuli** connects with oval window
- cochlear duct** central chamber, filled with endolymph
- scala tympani** duct terminates at round window

organ of Corti: rests on **basilar membrane**,
hair cells rest on basilar membrane.(p 583)
Tectorial membrane, hairs touch, trigger impulse

BASILAR MEMBRANE:

- near **oval window** base of cochlea, rigid, small, responds to high pitch vibrations.
- near **helicotrema**, wide, flexible, detects low frequency sound vibrations

Sounds which can be heard by human: 20 to 20,000 hertz, most sensitive to 1000 to 4000

Auditory pathways: (p 587)

- organ of Corti**
- spiral ganglion**
- cochlear nerve** in medulla
- to **inferior colliculus**
- to **medial geniculate body** of thalamus
- to **temporal lobe near insula** (lines lower lateral fissure of cortex)

