

## INNER EAR SPECIAL SENSES:

### HEARING

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

Hearing and balance sensed here.

Three divisions of ear: external, middle and inner.

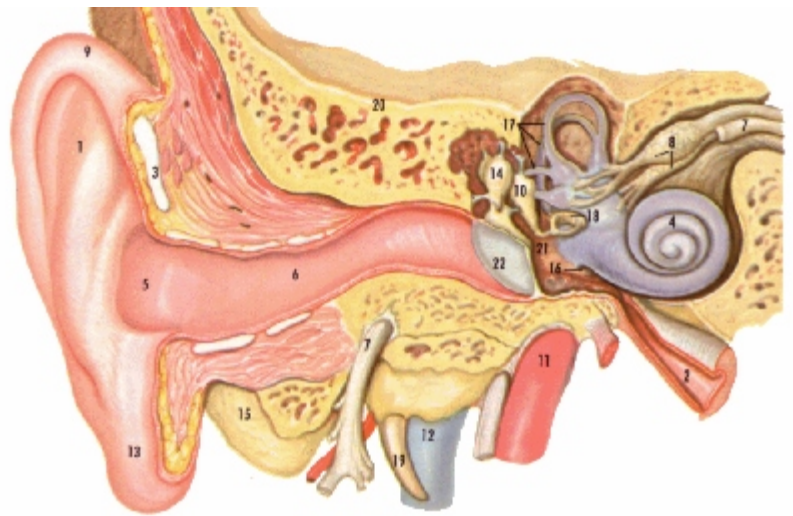
- 586: External pinna** (auricle and lobule) and external auditory meatus  
**Middle** chamber containing three **ossicles**  
**Inner** transduction occurs in fluid-filled chambers

**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                     | 17. Semicircular canals | 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 |                                     |                         |                                 |

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

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Ceruminous glands make **cerumen**, antibacterial

**MIDDLE EAR:**

**tympanic membrane** partitions external from middle ear

(p 587)

**oval and round windows** lead to and from cochlea

**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 586)

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

**INNER EAR** (within petrous portion of temporal bone): (p 588)

**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 593)

spiral laminae extend to spirals of cochlea from 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 594)

**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 598)

**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)

