

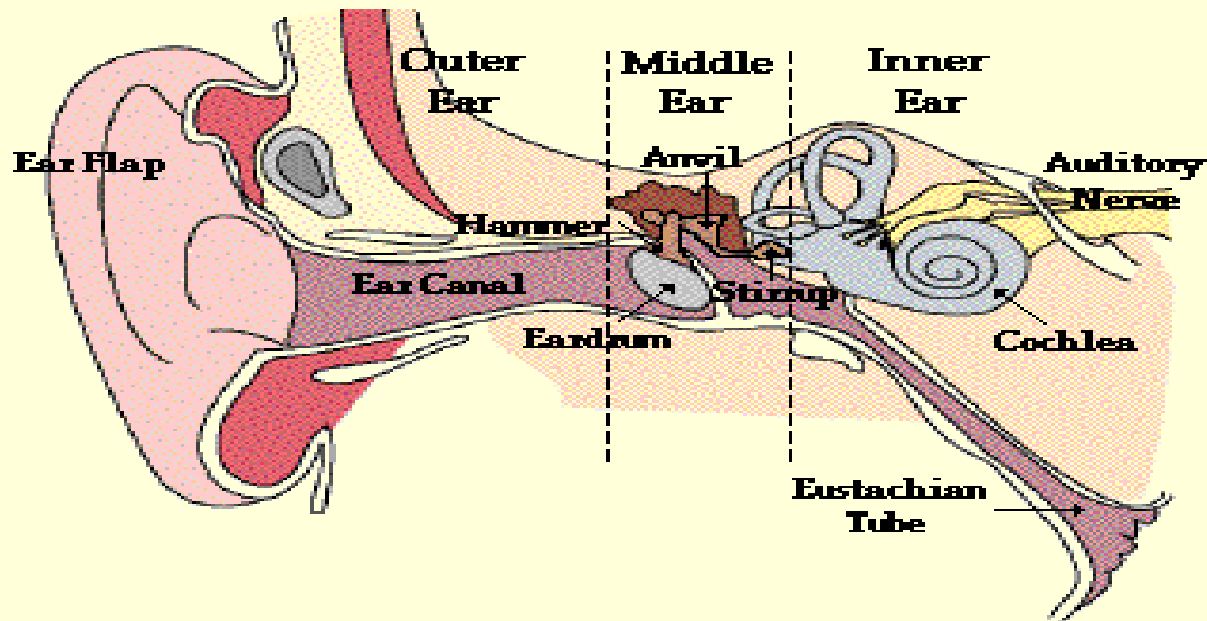
Ear...

...And Hearing

# How Does the Ear Work?



- 1. In general, the ear consists of three major sections:**
- 2. the outer, middle and inner ear.**
- 3. Sound is collected by the outer ear and funneled down the ear canal (outer ear).**
- 4. The sound vibrations cause movement of the eardrum and the chain of three tiny bones connected to it (middle ear).**
- 5. The middle ear system serves to intensify the energy of the sound vibrations and delivers them to the cochlea (inner ear).**
- 6. Inside the cochlea are thousands of tiny hair-like cells that connect to fibers of the hearing (acoustic) nerve. Sound vibrations entering the cochlea cause a wave to travel through the fluid-filled organ of hearing.**
- 7. This wave causes movement of the hair cells which then generate electro-chemical signals which travel through the acoustic nerve to the brain where they are recognized as sounds.**



## Outer ear

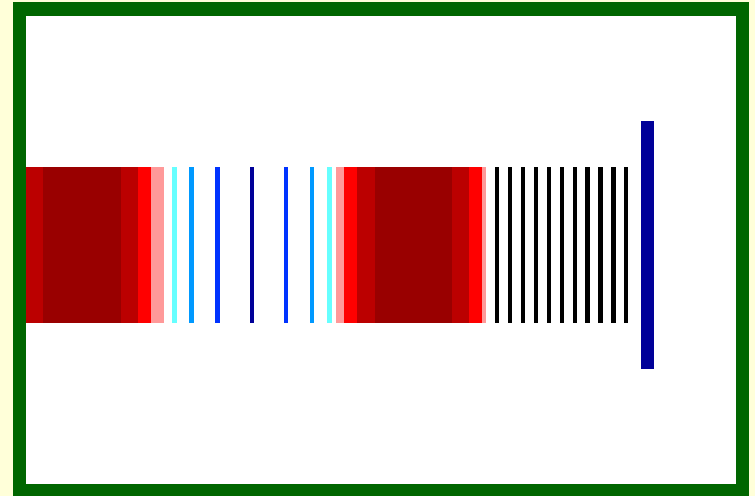
- .The three parts of the outer ear are the auricle (also called the pinna), the external auditory meatus (or ear canal), and the tympanic membrane (or eardrum).
- .Here sound waves are collected and directed towards middle ear.
- .Ear canal is compared to an organ pipe with dimensions (3cm x 0.7cm).
- .Eardrum (tympanic membrane). The ear drum is so-named because it functions much like the head of a drum, vibrating when sound waves strike it.

.Ear canal. Ear wax (cerumen) is produced in the ear canal. The wax serves as a protective mechanism and helps to keep the ear canal clean.

## **Middle ear**

.The mechanical movement of the tympanic membrane are transmitted through three small bones know as ossicles comprising the malleus, incus and stapes.

.malleus, incus and stapes more  
Commonly know as hammer anvil  
and stirrup



.When sound waves strike the outer surface of the eardrum, it vibrates. These vibrations are mechanically transmitted through the middle ear by the ossicles.

.The malleus, or hammer, is the first ossicle to receive vibrations from the eardrum. It passes them to the second ossicle--the incus, or anvil. The third ossicle--the stapes or stirrup--relays the vibrations to a membrane that covers the opening into the inner ear. This opening is the round or oval window called cochlea.

### **Eustachian tube.**

This tube leads from the middle ear space to the back of the throat and serves to equalize the air pressure on both sides of the eardrum. Unequal pressure is responsible for the "plugged" feeling you sometimes get when driving into the mountains or riding in an airplane. When the eustachian tube opens you feel a "pop" as the pressure is equalized and your ear feels "normal" again.

## **The functions of middle ear:-**

.To transmit the movement of the tympanic membrane to the fluid which fills the cochlea without significant loss in energy.

. To protect the hearing system to some extent from the effects of loud sounds.

## **The Inner ear**

.The inner ear contains cochlea –the organ of hearing.

.It is coiled like seashell, filled with fluid.



- .Balance (vestibular) canals. The vestibular system in your ear is part of the balance system for your body. The system contains sensory cells that provide information about the position and motion of your head.
- .The cochlea is coiled into approximately 2.5 turns and contains 3 fluid-filled compartments separated by Reisner's membrane and the basilar membrane.
- .The waves act on hair like nerve terminals bunched under basilar membrane.
- .Each fiber in the cochlea nerve responds most sensitively to its own characteristic frequency.
- .These information pass through the auditory nerves and reaches the Brain.
- .The ear interprets this information a ratio of amplitude and give a picture of sound.