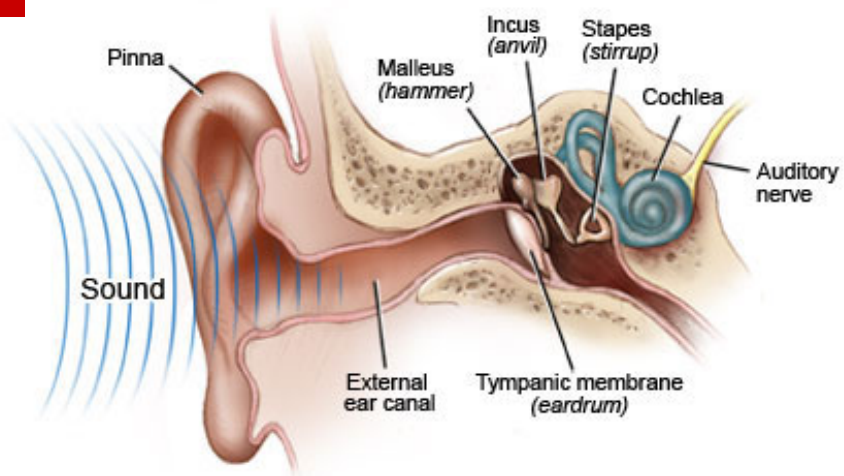
The Basics of Hearing



The external ear, or outer ear, is the part of the ear that we can see or feel. It is made of cartilage and soft tissue, and is also known as the pinna or auricle.

The pinna plays a minor role in hearing. Its twists and folds help amplify certain sound frequencies and help you determine where a sound is coming from. In addition, the pinna "collects" sound, which is why you sometimes see people put a hand over their ear to hear better. Cupping the ear with a hand helps reduce background noise by blocking, at least in part, sound that is not to the front or side of a person.

The external auditory meatus, better known as the ear canal, measures an inch long and goes all the way from the pinna to the tympanic membrane, or eardrum. The ear canal is a natural resonator, meaning it makes sounds louder, deeper, and clearer.

Middle Ear

The middle ear is a gap between the eardrum and the deep inner ear. This gap contains three bones called ossicles -- the malleus (hammer), incus (anvil), and stapes (stirrup) -- which make up what is known as the ossicular chain. They link the eardrum to the inner ear and are very important to our ability to hear.

Vibrations come through the ear canal and ultimately cause the tympanic membrane to vibrate. It's these vibrations that are passed on to the ossicles.

The eustachian tube sits between the middle ear and the back of the throat. When the eustachian tube opens, it equalizes the air pressure. This is important for sound going through the middle ear. In children, the eustachian tube is flat, which contributes to ear infections.

Inner Ear

The inner ear has two parts. The vestibular part has to do with balance. The other, the cochlea, plays an important role in hearing.

The cochlea is coiled and shaped like a seashell. It is also filled with fluid. When the aforementioned ossicles vibrate, they push a membrane-covered hole between the middle ear and the inner ear, called the oval window, which makes the cochlear fluid move.

Movement of the cochlear fluid affects hair cells in the cochlea's Organ of Corti area. The hair cells respond according to what sounds come in to the ear, creating signals that become nerve impulses. These nerve impulses are carried to the brainstem by the acoustic nerve (eighth cranial nerve) to auditory processing centers within the brain. (Each half of the brain has its own auditory cortex for processing sound information.)

A central auditory system handles the processing of the sound, so that we can understand the differences between sounds, for example.

From this point on, further auditory processing takes place in the brain. This processing helps people interpret sounds, such as speech, correctly.