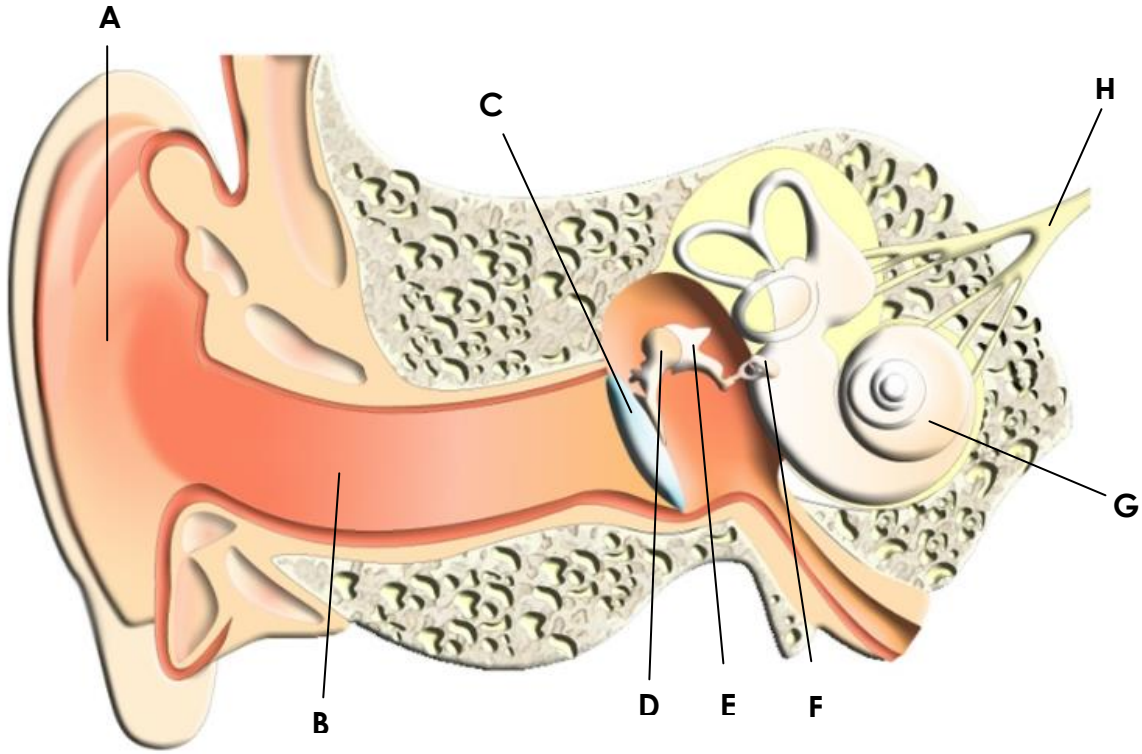
Structure and function of the ear

Two different senses are located in our ears: the **sense of hearing** and the **sense of balance**. Our sense of hearing gives us the ability to hear music, speech, sounds, etc. Our sense of balance enables us to stand and walk without falling over. It helps us perceive our posture and orient ourselves in space.

The **entire ear** consists of three sections: the outer ear, the middle ear, and the inner ear.

How do we hear? – The sound path

A dog barks and we hear it. But how?
Noises and sounds are collected as sound waves by the outer ear (**A**). The sound waves move through the ear canal (**B**) to the eardrum (**C**). The eardrum is a very thin membrane. It is set in vibration by the sound waves.
The wave movements are passed along through the ossicles: the malleus (**D**), incus (**E**), and stapes (**F**).
The ossicles transmit the sound to the cochlea (**G**). The cochlea transmits the signal to the brain via the auditory nerve (**H**). The brain processes the signals and then knows that a dog is barking.



Description of the individual parts of the sense of hearing

Outer ear

The outer ear consists of the pinna and the ear canal.

The pinna

Elephants have large ears, and rabbits long ears. By contrast, our ears are small and shaped like a shell.
The pinna's purpose is to collect sound waves. Depending on the direction from which the sound waves hit the ear, they have a different sound. This is how we know whether a sound is coming from above or below, from in front or behind us.
The earlobe is typical of human beings and otherwise is found only in apes. It is composed of fatty tissue.
Many animals can move their pinnas by using muscles; for example, a cat pricks its ears up. We also have these muscles, but we cannot control them well because we have forgotten how to do so over many thousands of years. That is why not everybody can wiggle their ears.

The ear canal

The ear canal is up to 3 cm in length and is shaped like an S. In order to see the eardrum at the end of the ear canal, it is necessary to pull the pinna slightly back and up.
In the wall of the ear canal, there are ceruminous glands and tiny ear hairs. The ear hairs prevent water or foreign bodies from entering the ear canal.

Middle ear

The adjoining middle ear consists of the eardrum and the air-filled tympanic cavity containing the ossicles.

The eardrum

The eardrum is a thin membrane and works like a skin stretched on a drum: It vibrates in the rhythm of the sound waves. These vibrations are passed along to the ossicles.

The Eustachian tube
The Eustachian tube is also found in the lower part of the middle ear. The Eustachian tube makes it possible to equalize pressure in the ear.

Tympanic cavity with ossicles
The middle ear is a cavity (tympanic cavity) containing the three smallest bones in the human body, the ossicles: malleus, incus, and stapes. They connect the outer ear with the inner ear.

The middle ear is crucial for the hearing process. It can amplify the sound, but also dampen sound, such as when it is filled with fluid due to an infection of the middle ear.

Inner ear

The inner ear contains the **sense of balance** and the **cochlea**.

The sense of balance
The sense-of-balance organ registers the head's every movement and change in position.

The cochlea
The cochlea is about 32 mm long when it is uncoiled. It has two-and-a-half coils.

The organ of Corti with the cochlear hair cells
A very important hearing organ, called the organ of Corti, is found inside the cochlea.
It contains approximately 35,000 hair cells with fine hairs. The signal is converted to an electrical stimulus in the organ of Corti. The stimuli are transmitted to the brain via the auditory nerve.
Our brain takes on the task of evaluating these stimuli and translating them into familiar harmonics, sounds, and speech. We hear.