

The Workings of the Ear

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By Dr. Derek Conte

One of the most beautiful and interesting parts of the human body, to me, is the ear and its workings. The ear brings us the song of the birds, the voices of loved ones and the magic of music, but also provides us with our sense of balance and spatial orientation. Its function is complex and elegant.

Controlled by the eighth cranial nerve (*vestibulocochlear nerve*), the ear is divided into three regions. The *outer ear* gathers and focuses sound vibrations from the outside world into the ear canal and toward the eardrum (*tympani*) causing it to vibrate. The eardrum is the outer boundary of the *middle ear*, an enclosed chamber connected to the throat by a slender tube (*eustachian tube*) to relieve pressure. Three tiny bones attach to the inside of the eardrum, vibrating sympathetically into a part of the *inner ear*, the water-filled, nautilus-shaped *cochlea*. The vibrating water (*endolymph*) then excites a fine membrane (*tektorial membrane*) suspended inside the cochlea at various points along its curling path depending on the pitch (frequency) of the sound being heard. Nearby nerve cells called *spiral organs of Corti* convert this vibration into electrical impulses to the temporal lobes of the brain for interpretation as speech, noise, music etc.

The other part of the *inner ear* is concerned with balance and has two aspects: the *vestibule* and the *semi-circular canals*. In the *vestibule* are the *utricle* and the *sacculle*, which resemble water-filled beach balls lined on the inside with a multitude of hair-like nerve cells. Inside of this are thousands of very tiny *otoliths* (ear stones) which, since they have weight, respond to gravity and always tumble to toward the center of the earth. So, when we are laying sideways, face down or up---or even upside-down, the otoliths settle on various hair cells signaling the brain as to our static position in space.

Finally, the *semi-circular canals* provide our sense of motion. Imagine three hula-hoops, also water-filled, and oriented on the X, Y and Z axes (horizontally, vertically and side-to-side). When we accelerate or decelerate in a car, the fluid from one of these hoops sweeps past its own set of hair-like nerve cells firing a signal into the brain. The other two “hoops” cover the motions of rotating right-and-left and bending side-to-side. The brain creates our sense of motion from the messages it receives from the eyes, joints, muscles, tendons, ligaments and, of course, the ears, and fires our postural muscles like stabilizer-jets on a space ship to correct and maintain balance in an ongoing and effortless symphony of adaptation.

If this is not beautiful enough for you then we need to talk!

<https://www.bing.com/images/search?q=ear+anatomy+photos&view=detailv2&id=E641023CBAFD13A214DE0BA2A4538C80D3D100E3&selectedindex=23&ccid=oEv2Muga&simid=608032847350464929&thid=OIP.Ma04bf632e81a5a9d2ec64a9cfc8740cbH0&mode=overlay&first=1>

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