9.2 Basilar Membrane Movement for Sounds of Different Frequencies. In this illustration the basilar membrane is represented as uncoiled. (a) Displacement of the basilar membrane peaks at the cochlear base for high frequencies and at the apex for low frequencies. (b) As the frequency (measured in hertz [Hz], or cycles per second) of stimulation decreases, the position of the peak of membrane movement is displaced progressively toward the apex of the cochlea.

The region nearest the oval-window membrane is the base of the spiral; the other end is referred to as the apex. The cochlea is a coil of three parallel canals: (1) the scala vestibuli (vestibular canal), (2) the scala media (middle canal), and (3) the scala tympani (tympanic canal) (see Figure 9.1c). Because the entire structure is filled with noncompressible fluid, movement within the cochlea in response to a push on the oval window requires the presence of a movable outlet membrane. This membrane is the round window, which separates the scala tympani from the middle ear (see Figure 9.1b).

The principal components that do the work of converting sounds into neural activity, collectively known as the organ of Corti (see Figure 9.1d), consist of three main structures: (1) the sensory cells (hair cells), (2) an elaborate framework of supporting cells, and (3) the terminations of the auditory fibers. The base of the organ of Corti is the basilar membrane. This flexible membrane separates the scala tympani from the scala media, and importantly, it vibrates in response to sound. The basilar membrane is about five times wider at the apex of the cochlea than at the base, even though the cochlea itself narrows toward its apex.

When the stapes moves in and out as a result of acoustic vibrations, it exerts varying pressure on the fluid of the scala vestibuli, which in turn causes oscillating movements of the basilar membrane. Georg von Békésy (1890–1972) demonstrated that different parts of the basilar membrane are affected by different frequencies of sound. The site of the largest amplitude of displacement of the basilar membrane depends on the frequency of the stimulus (Figure 9.2). High frequencies cause maximal displacement of the basilar membrane near the base, where the membrane is narrow. For low-frequency stimuli, displacement of the basilar membrane is greatest in regions where the membrane is wider—toward the apex (Ashmore, 1994).

**scala vestibuli** Also called vestibular canal. One of three principal canals running along the length of the cochlea.

**scala media** Also called middle canal. The central of the three spiraling canals inside the cochlea, situated between the scala vestibuli and the scala tympani.

**scala tympani** Also called tympanic canal. One of three principal canals running along the length of the cochlea.

**round window** A membrane separating the cochlear duct from the middle-ear cavity.

**organ of Corti** A structure in the inner ear that lies on the basilar membrane of the cochlea and contains the hair cells and terminations of the auditory nerve.

**hair cell** One of the receptor cells for hearing in the cochlea.

**basilar membrane** A membrane in the cochlea that contains the principal structures involved in auditory transduction.