Audition
- The sense or act of hearing

Wavelengths
- The height of the wave gives us the **amplitude** of the sound.
- The **frequency** of the wave gives us the pitch of the sound.

Transduction in the Ear
- Sound waves hit the **eardrum** then **anvil** then **hammer** then **stirrup** then **oval window**.
- Everything is just vibrating.
- Then the **cochlea** vibrates.
- The **cochlea** is lined with mucus called **basilar membrane**.
- In **basilar membrane** there are **hair cells**.
- When **hair cells** vibrate they turn vibrations into neural impulses in adjacent nerve fibers which converge to form the **auditory nerve**.
• Auditory nerve then sends to the thalamus.
• Signal goes from thalamus to the auditory cortex of the temporal lobe.

How do we perceive pitch?

• Hemholtz’s place theory
  o We hear different pitches because different sound waves trigger activity at different places along
    the cochlea’s basilar membrane.
  o The brain can determine a sound’s pitch by recognizing the place on the membrane for which it
    receives neural signals.

• Frequency theory
  o We sense pitch by the basilar membrane vibrating at the same rate as the sound which trigger
    neural impulses to the brain at the same rate as the sound wave.
  o But this theory has trouble explaining high pitch sounds because our hairs cannot vibrate at
    certain speeds (1000 times per second).
  o This problem can be explained using the volley principle.
    ▪ Neural cells can alternate firing. By firing in rapid succession, they can achieve a
     combined frequency above 1000 times per second.

How do we locate sounds?

• Sound waves strike one ear sooner and more intensely than the other.
• Using parallel processing, the brain analyzes the minute differences in the sounds received by the two
  ears and computes the source of the sound.

Hearing Loss

• Conduction hearing loss
  o Caused by damage to the mechanical system that conducts sound waves to the cochlea.
  o You can replace the bones or get a hearing aid to help.

• Sensorineural hearing loss
  o Caused by damage to the cochlea’s hair cell receptors or to the auditory nerves (also called nerve
    deafness).
  o Sometimes caused by disease, more often from heredity, aging and prolonged exposure to ear-
    splitting noise or music.

• Cochlear implant
  o A device for converting sounds into electrical signals and stimulating the auditory nerve through
    electrodes threaded through the cochlea.