Shannon -
Biopsychology (PSY302)
Class #10 - Audition

AUDITION

Stimulus: Air

Sounds: Can be from simple (ex. Tones) to complicated (ex. Voices)

- Air pressure waves travel 700mph to make sounds.

A sound is composed of 3 functions

1) Pitch: positioning of the hair cells along the Basilar membrane creates the frequency measured by Hertz

2) Amplitude: stretching of the Tip Links, opening of the Ion Channel creates the loudness; measured by Decibel

3) Timbre: Complexity

SENSING

For just audible sounds, tympanic membrane traveling distance is comparable to the diameter of a hydrogen atom!

Cochlea: Sound Transduction

- Dieter Cells provide support, Basilar membrane moves relative to Tectorial membrane, hair cells transduce sounds into electrical impulses and their axons form the auditory nerve.

- Cochlear nerve contains axons from: Inner cells & Outer cells

Inner cells are responsible for auditory information

Outer cells act as preamplifiers aka "motor cells"

If Inner or Outer cells are defective, this could cause someone's perception of background sounds to be defective, as well.
ANATOMY

Sound > Air > Middle Ear > Inner Ear > Action Potentials

Middle Ear contains the functions of: Tympanic membrane, Malleus, Incus, Stapes

Inner Ear contains the functions of: Oval & Round window

Organ Corti contains the functions of: Basilar membrane, hair cells, Tectorial membrane

Hair Cells as Transducers

Hair cells contain: Cilia, Tip Links, Ion Channels

AUDITORY PATHWAY

Auditory Nerve > Superior Olivary Complex Cochlear Nuclei > Interior Colliculus > Medial Geniculate Nucleus > Auditory Cortex

AUDITORY CORTEX

- Two streams of auditory information processing: Anterior/Posterior

  MGN (Thalamus) > Core > Belt > Parabelt - after this step, the information is either sent down the Anterior or Posterior Stream depending on the pitch, loudness, and timbre of the sound.

AUDITORY CORTEXES: Sound Processing

- Pattern recognition: Learning to associate a complex sound with something else
- Amusia: deficit in perceiving/remembering music
- The cocktail party problem: one voice at a time, making limited attention
- The Mozart Effect: Music & IQ

VESTIBULAR SYSTEM
Stimulus: Gravity

- Vestibular sacs: head orientation
- Semicircular Canals: head acceleration
- Functions of the vestibular system: Balance, Eye movement (or correction for head movement)