

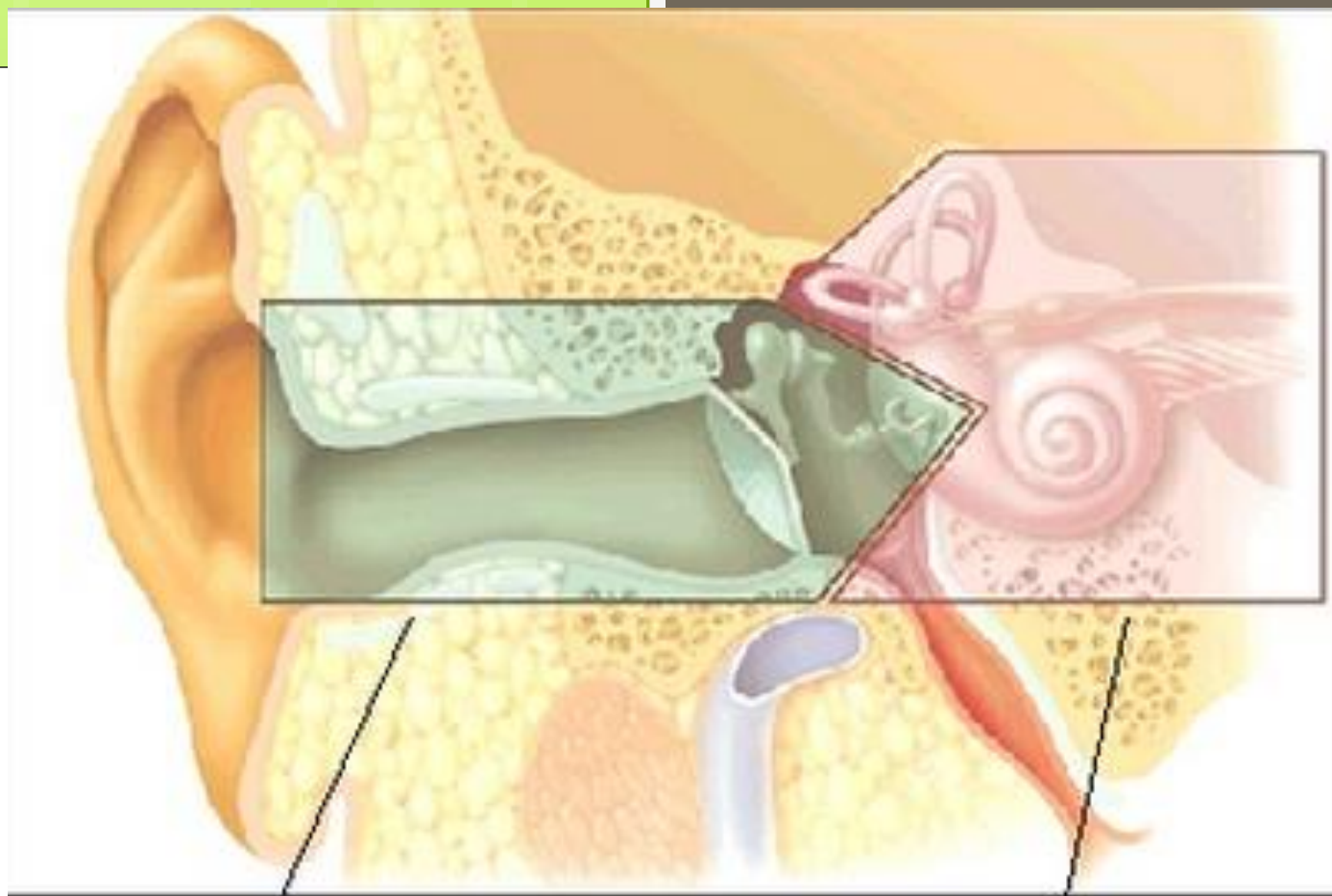


Cochlear Implants

Alyssa Mourey and Melissa
Billings

Hearing Loss

- Defined by type and severity
- Conductive
- Sensorineural
- Mixed
- Degree of Loss



Conductive hearing loss occurs when sound waves do not reach the inner ear.

Sensorineural hearing loss occurs when sound waves are not processed correctly.

LOW

PITCH

HIGH

125

250

500

750

1000

1500

2000

3000

4000

6000

8000

-10

0

10

20

30

40

50

60

70

80

90

100

110

120

SOFT

LOUDNESS

LOUD

NORMAL HEARING

MILD HEARING LOSS

MODERATE HEARING LOSS

MODERATELY SEVERE HEARING LOSS



















SEVERE HEARING LOSS

PROFOUND HEARING LOSS

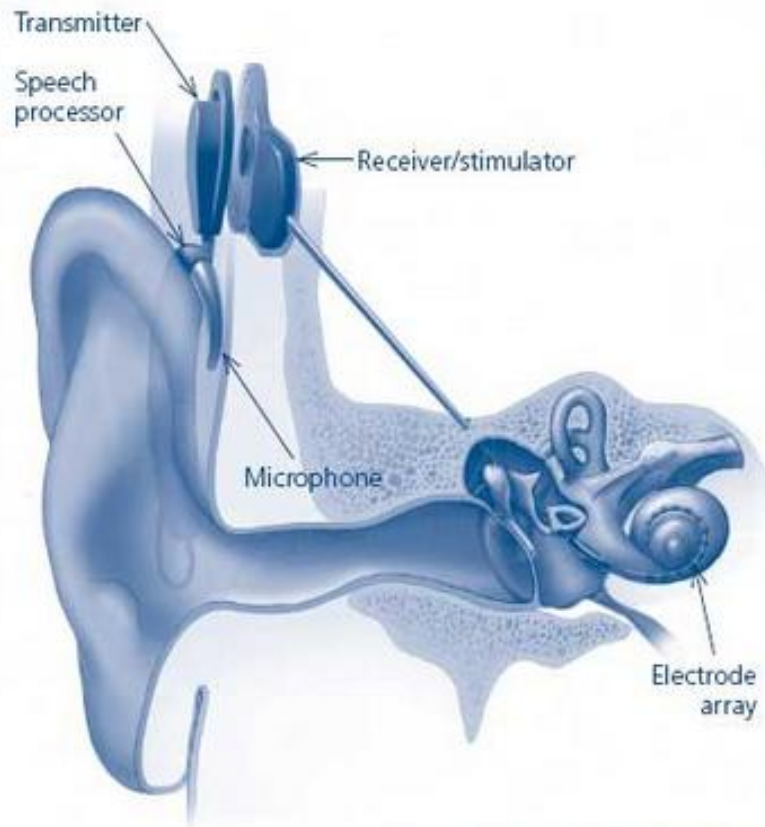
Basic Information

- 36 million have hearing loss
- 7 years is the amount of time hearing loss is denied
- 20% of those who benefit from hearing aids wear them

Rehabilitation Options

Completely-in-Canal (CIC)	Canal	Half-Shell	Full Shell	Behind-The-Ear	Open Ear BTE
					
					
					

Rehabilitation Options



Ear with cochlear implant



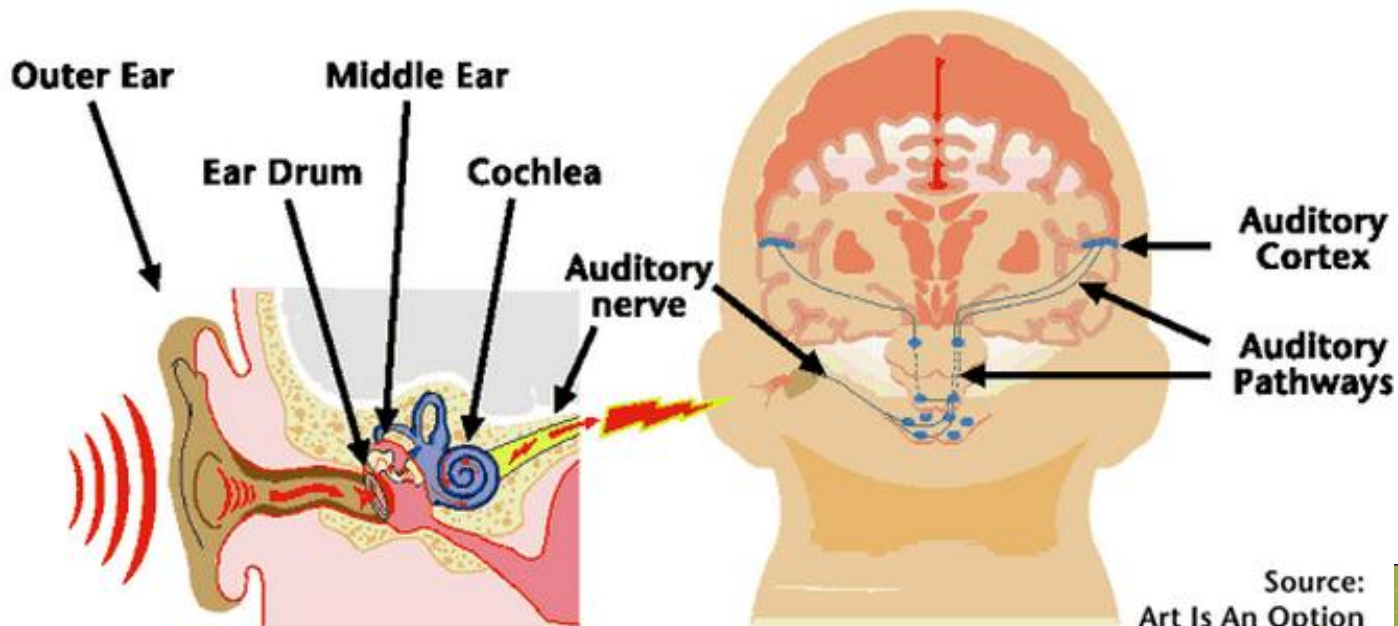
History

- Began in late 1800s with discovery of electrolytic cell by Alessandro Volta
- Stimulation with a direct current could not reproduce a quality sound
- Electrical stimulus with negative polarity worked best and correct electrode placement reduced unpleasant side effects



More Recent History

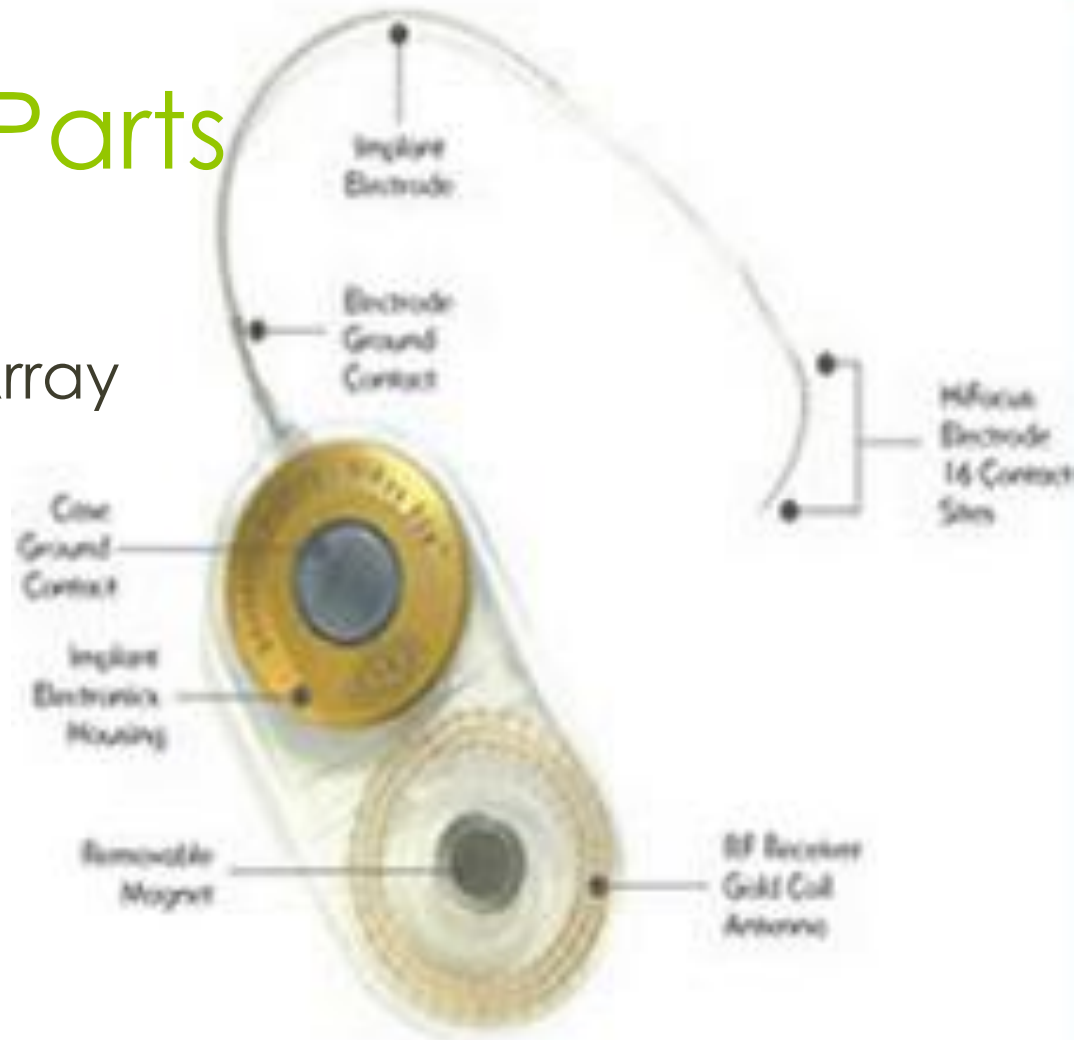
- Determined the cochlea was the site of stimulation
- 3 mechanisms that produced hearing
 - Middle ear
 - Basilar membrane
 - Auditory nerve



Source:
Art Is An Option

Internal Parts

- Receiver
- Electrode Array



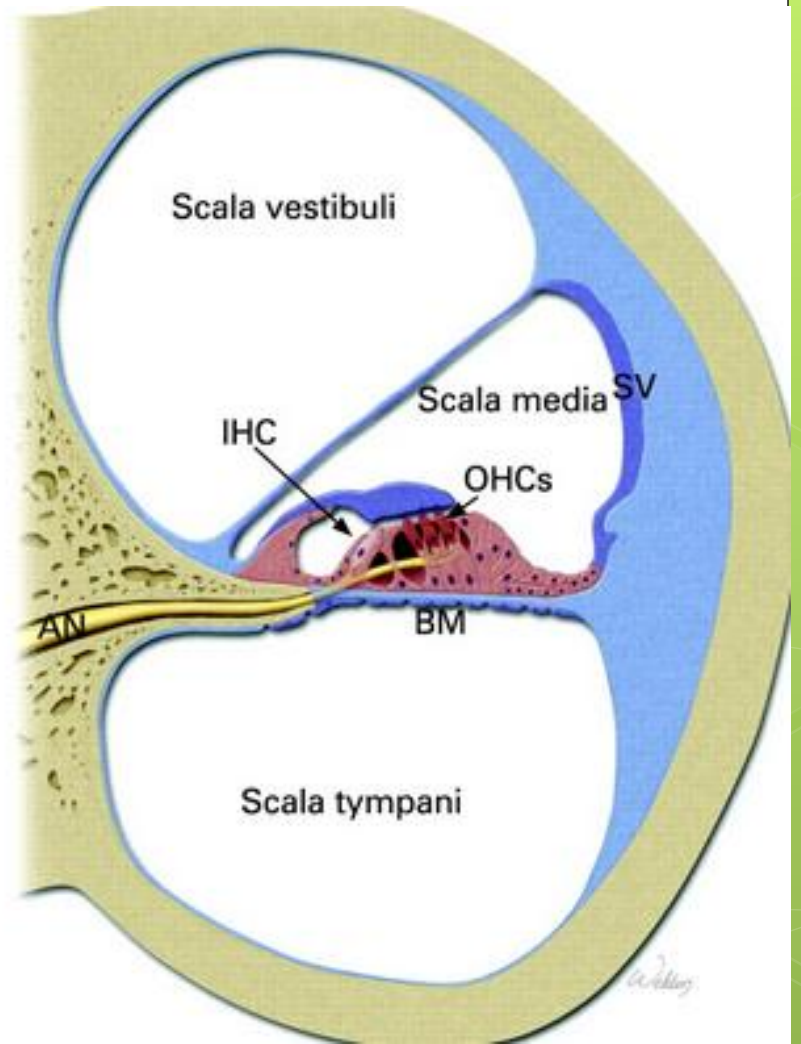
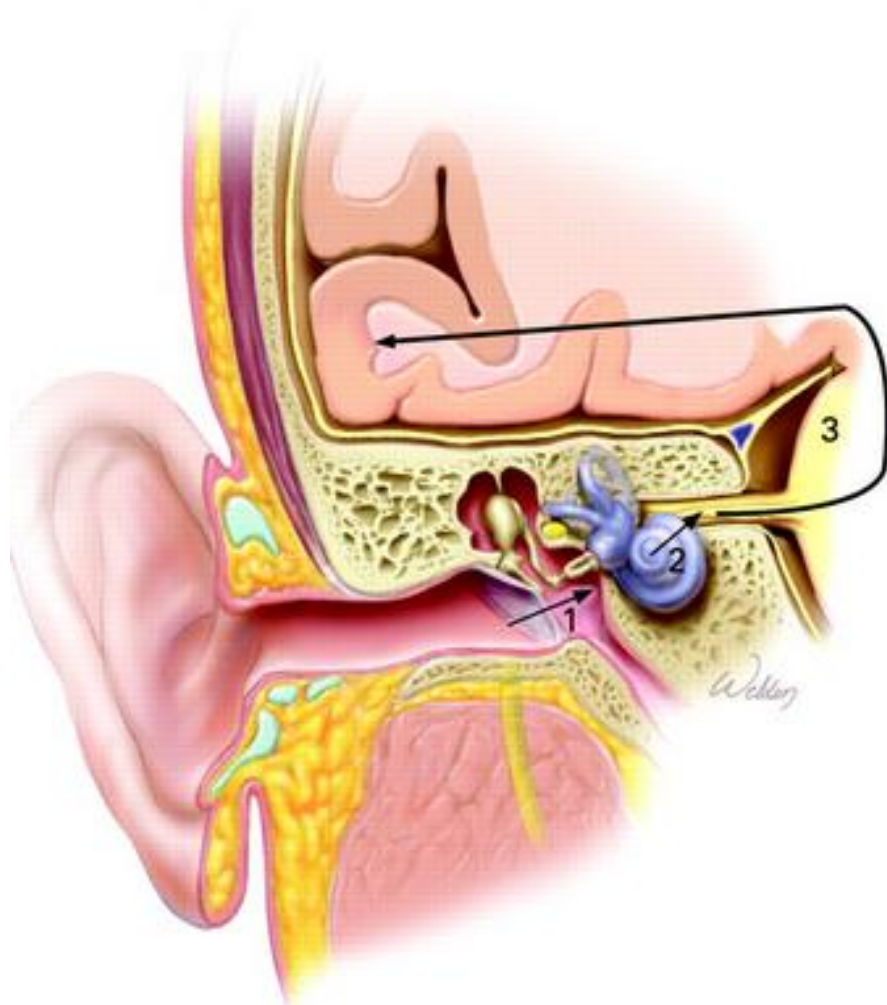
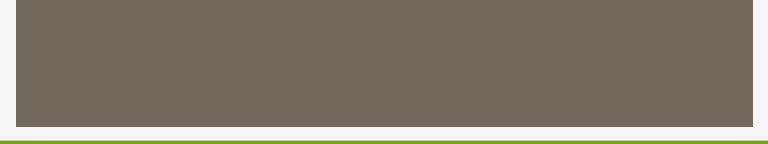
External Parts

- Speech Processor
- Microphone
- Transmitter



How it Works

- Provides direct electrical stimulation to the auditory nerve in inner ear (**4ms**)
- Damage to hair cells in cochlea prevent sounds from reaching auditory nerve
- Damaged hair cells are bypassed
- Does not cure or restore hearing
 - Destroys any hearing one may have
- Allows for perception of the sensation of sound
 - Music



Who Qualifies?

- Anyone who is deaf or severely hard-of-hearing
- 219,000 people worldwide
 - 42,600 adults in the USA
 - 28,400 children in the USA
- Adults
- Children
- Barriers

Controversy

- Age
- Deaf culture
 - Decline of sign language
- Lack of special education
 - Needs not recognized
- Surgery itself
- Development of biological treatment

Simulations

- 24 channel
 - http://ent.uci.edu/sounds/norm%20speech_M0_C500_N24.wav
 - <http://ent.uci.edu/sounds/norm%20speech.wav>
- Music
 - http://www.healthaffairs.uci.edu/hesp/proc_Sim/Music_Original.wav
 - http://www.healthaffairs.uci.edu/hesp/proc_Sim/music_simu.wav