
Beyond Hearing Aids and Cochlear Implants:

Helping Families Make the Most of Assistive Technology

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Disclosure Statement

- Nothing to disclose.
- No financial arrangement with any product discussed in this presentation.



Since I grew up with hearing loss too, some things about me...

- Diagnosed at 3 ½ years
- Hearing aids for 31 years
- Cochlear implant for 9 years
- Mainstream education, but 14 different schools before HS graduation
- Active in both hearing and Deaf worlds
- Former President of the Association of Medical Professionals with Hearing Losses



What's the Best Way to Teach Families about Assistive Technology?



Best Way?

- Handouts
- Websites
- Presentation
- Demonstration
- Hands-On

- Problems?
 - A lot of different technology to consider
 - A lot of different scenarios to consider
 - A lot of compatibility issues to consider
 - What's a personal device vs. what's publicly available



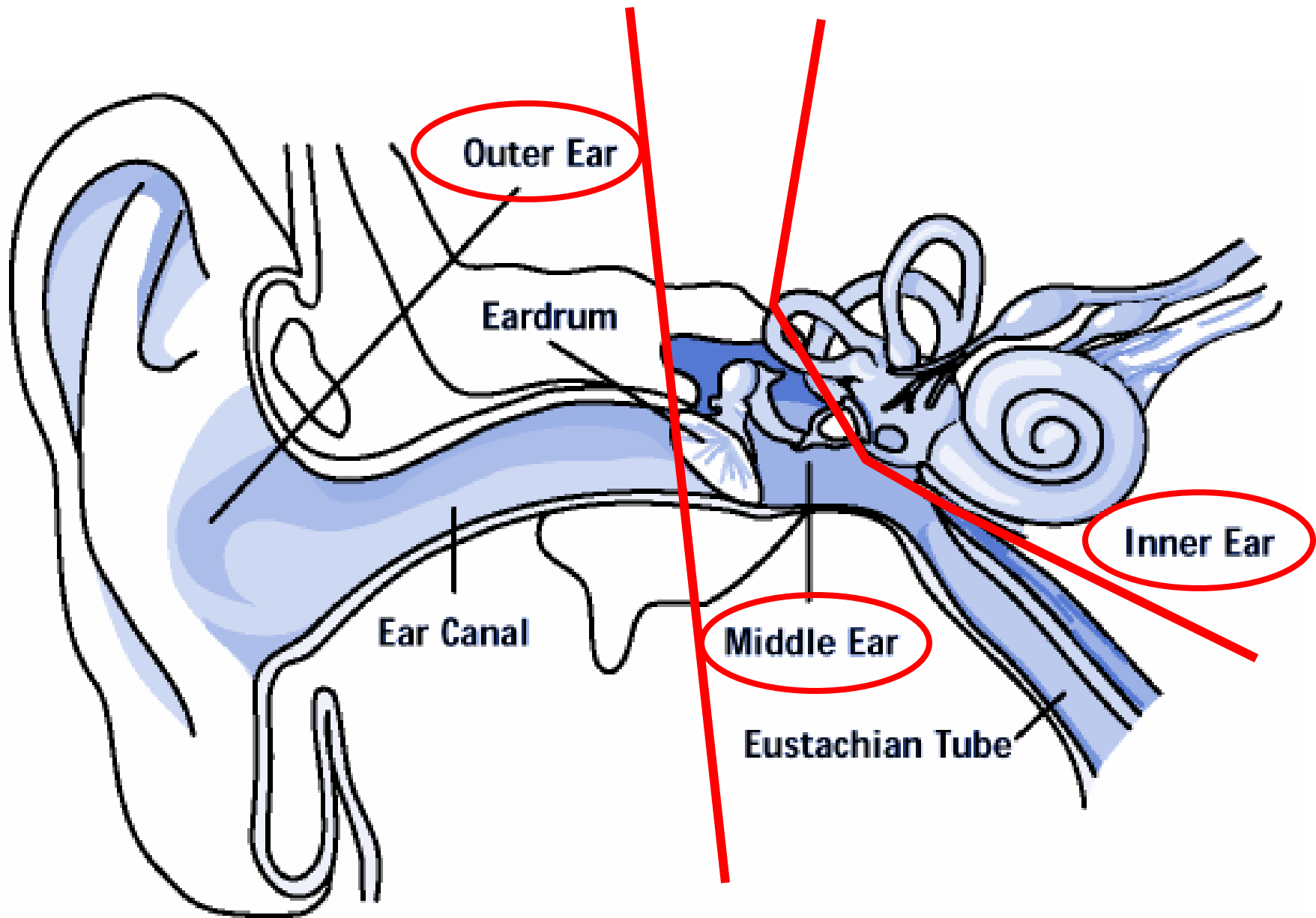
Today's Topics

- How Ear Works
- What Hearing Aids and Cochlear Implants Do
- Hearing Assistive Technology and Assistive Technology



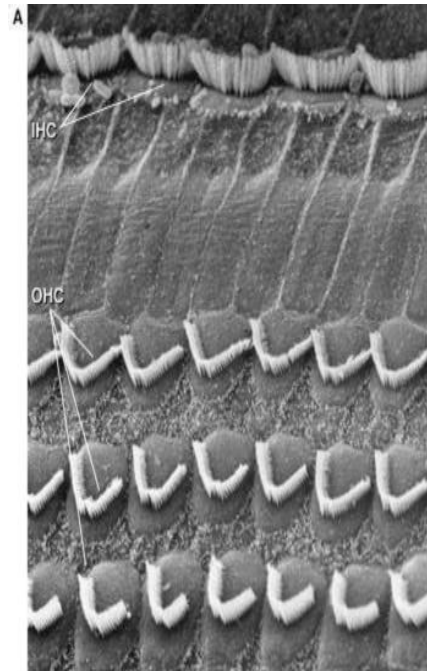
How the Ear Works

- Outer ear – traps sound
- Middle ear – changes sound from air to fluid
- Inner ear – changes sound from fluid to electric



Inner and Outer Hair Cells

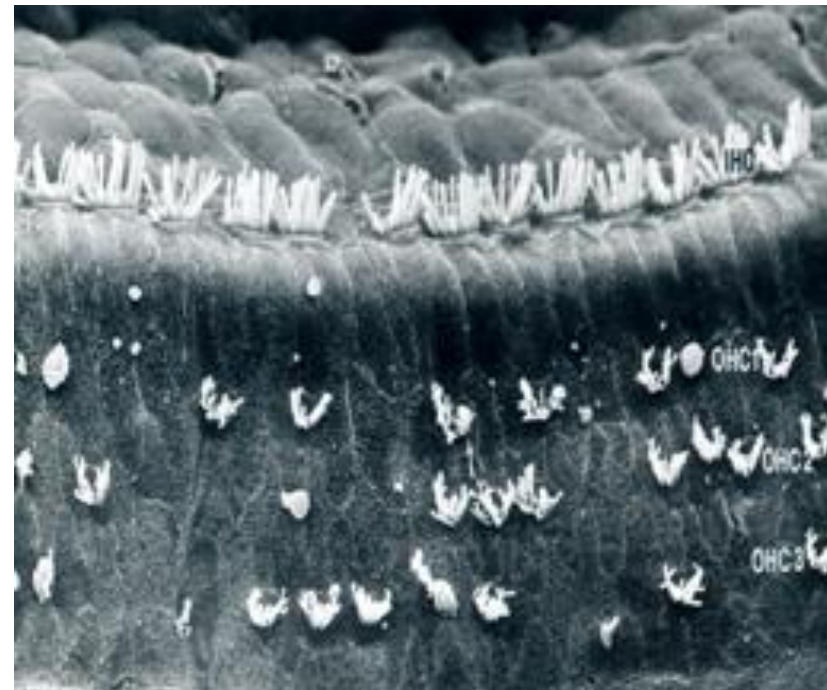
Healthy



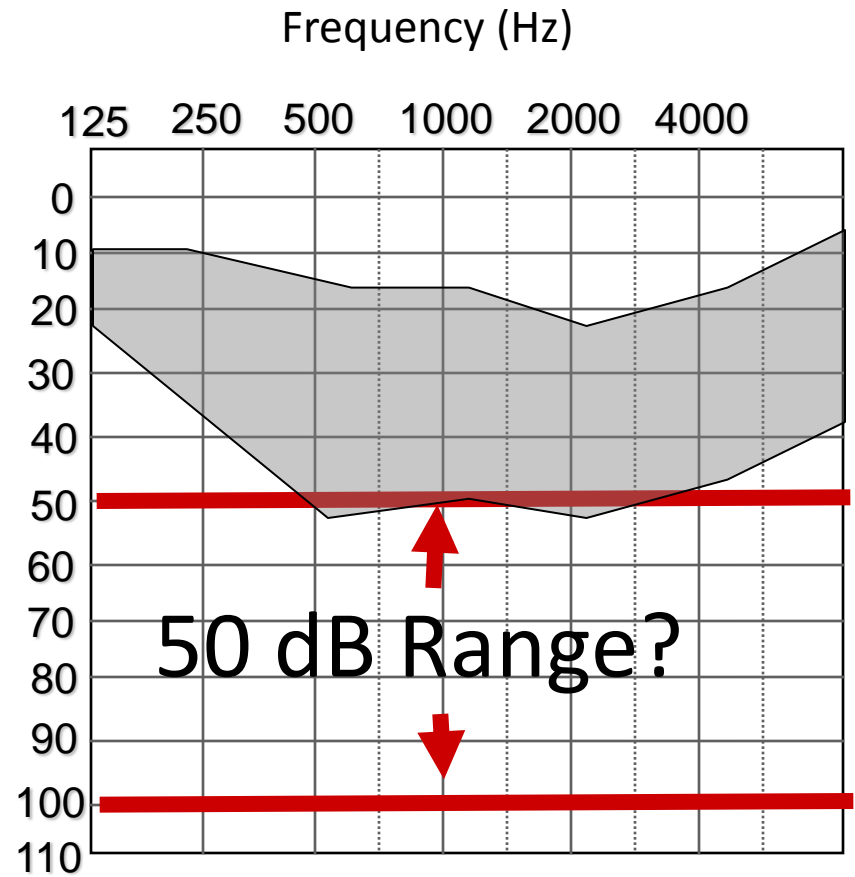
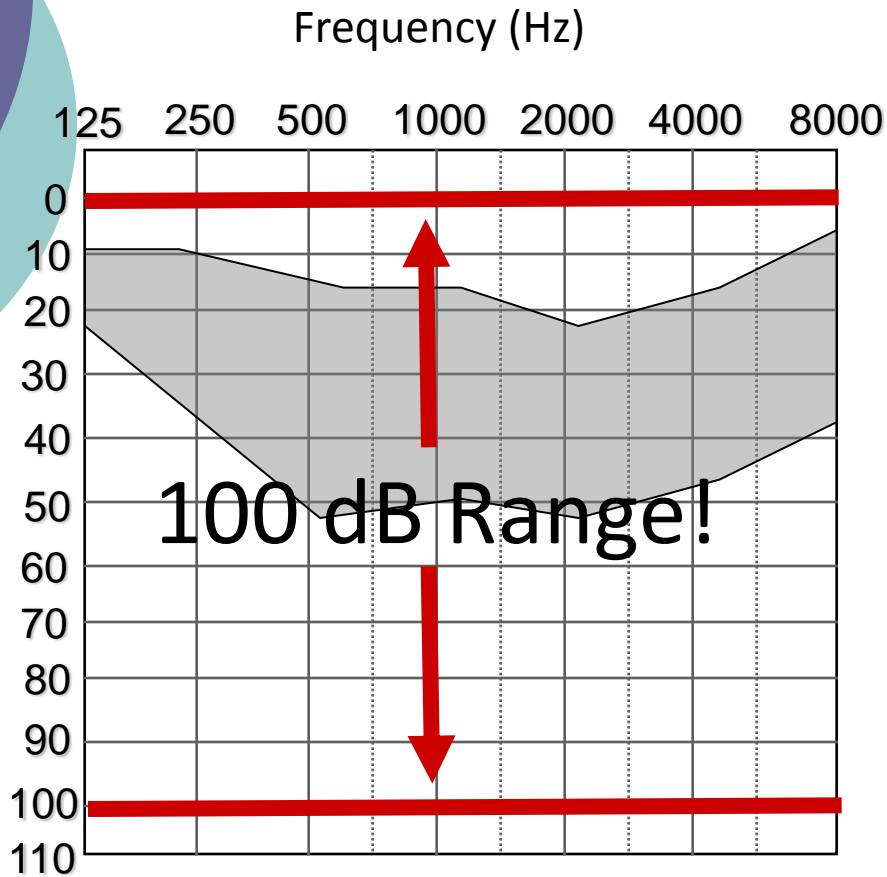
Inner Hair Cells
(to the
Hearing nerve)

Outer Hair Cells
(makes sound
LOUDER)

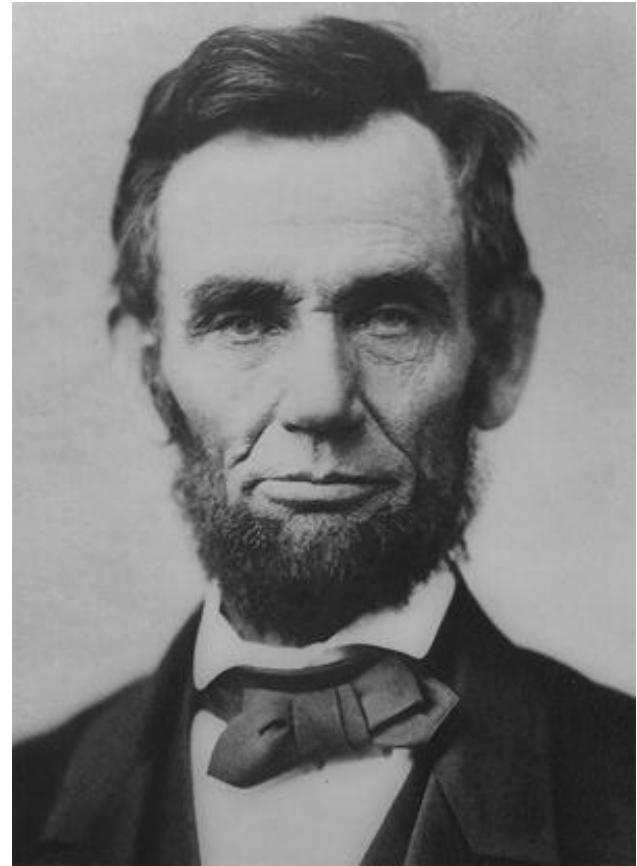
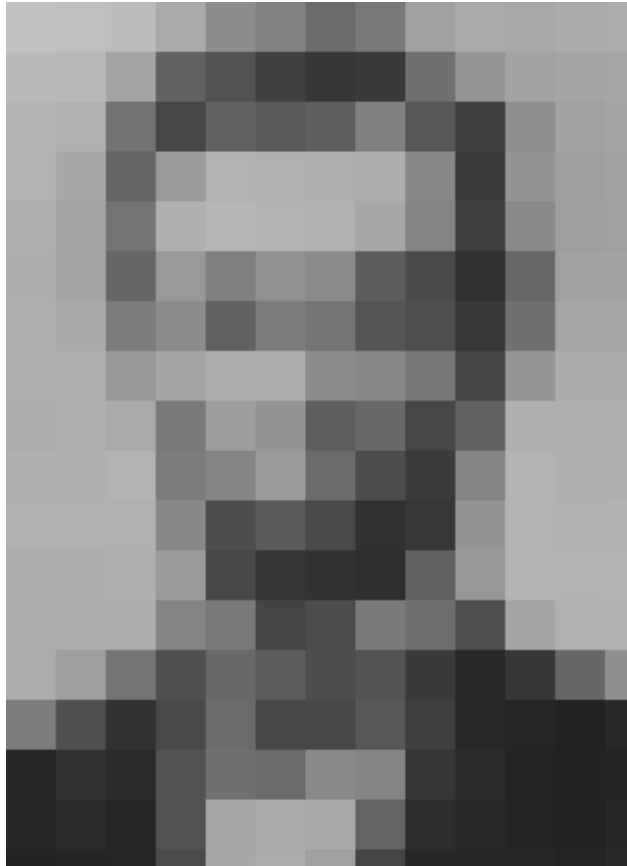
Damaged



Problem 1 - Audibility

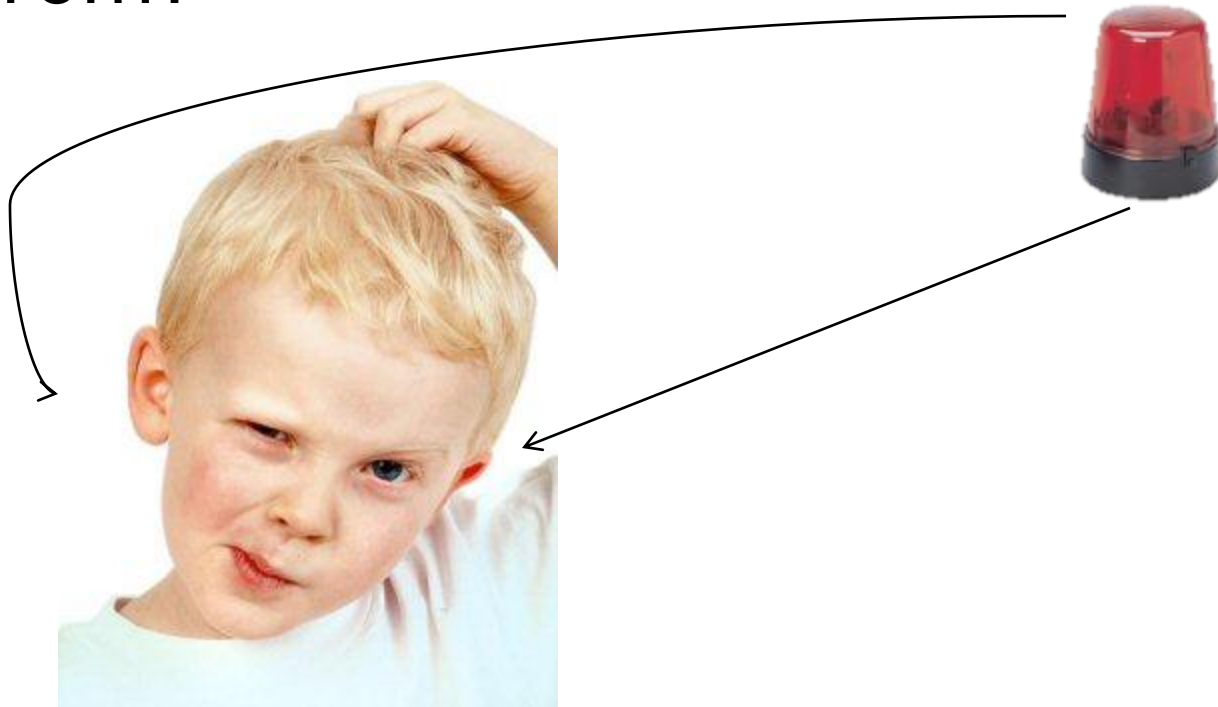


Problem 2 - Discrimination



Problem 3 - Localization

- Can't tell where sound is coming from?



Problem 4 – Attention/ Fatigue

- Passive Listening

Versus

- Active Listening





Hearing Aids

Hearing Aids



- Purpose: to **amplify** sounds
- Requires a **good** outer, middle, and inner ear
- The more severe the hearing loss, is more **"muffled"** speech will become
- If speech is "muffled", **strong** hearing aids only make the "muffle" **louder**



Hearing Aids NOT Perfect

- **Cannot** amplify all high pitches well
- **Cannot** remove all background noise
- Directional microphones **don't work well** in gymnasium or cafeteria
- Hearing aids still **depend on good** outer, middle, and inner ear

Hearing Aid Features Related to Assistive Technology

- Telecoils
- FM
- Direct Audio Input
- Wireless/Bluetooth



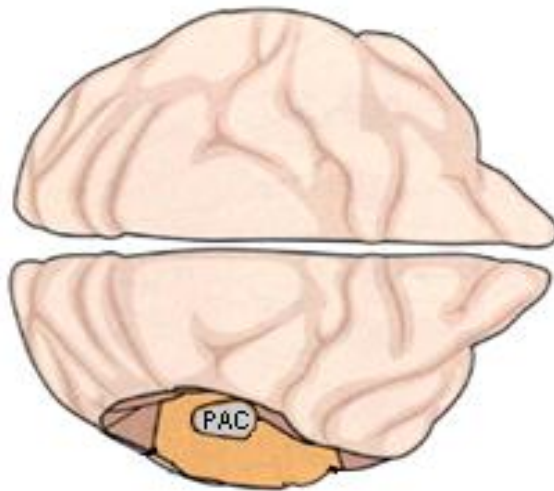


Cochlear Implants

Cochlear Implants

- 100,000+ people worldwide
- Purpose: **electrically stimulate** hearing nerve
- Requires good **hearing nerve**
- **NOT** brain surgery
- May help develop **hearing skills**



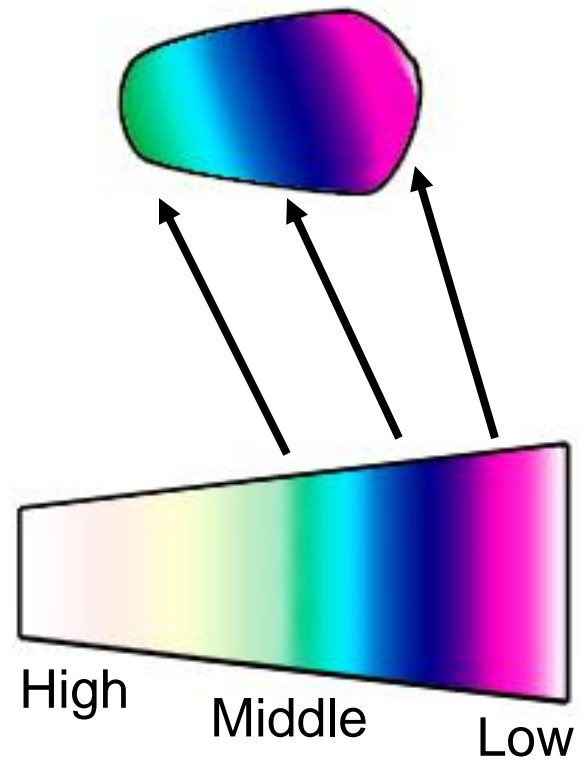
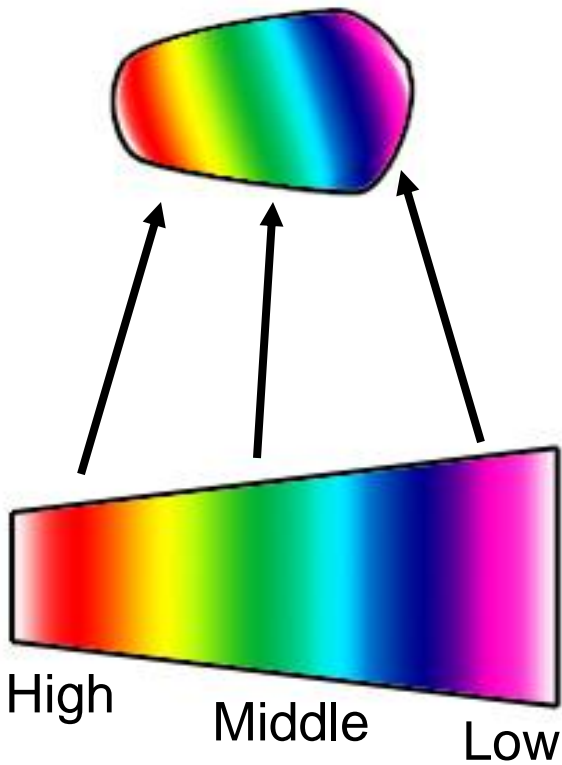


Typical Hearing

Hearing Loss

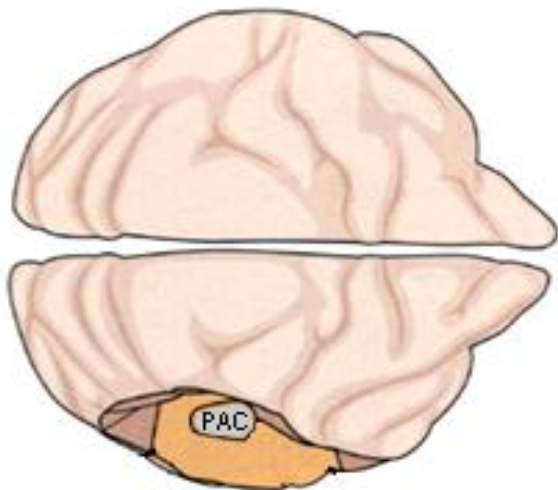
Brain

Cochlea



Frequencies (Hz)

Frequencies (Hz)



Typical Hearing

Implant User

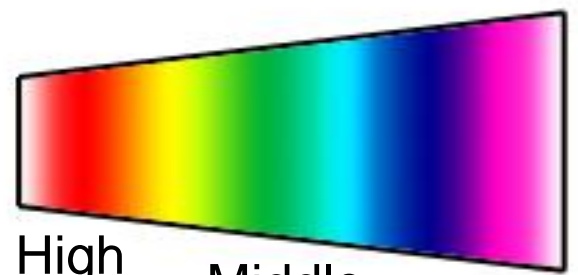
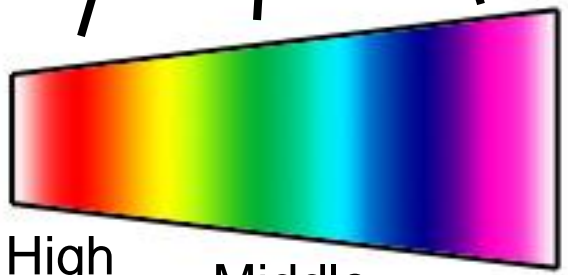
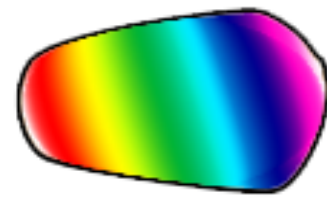
Brain

? . ?

Confusion?

? ?

Cochlea



Frequencies (Hz)

Frequencies (Hz)

What Cochlear Implants **Might** Help With

- Soft sounds
- High pitch sounds
- Music appreciation
- Recognize or understand speech
- Know “where” sounds are



Paul and Sally Taylor,
Deaf Couple with Cochlear
Implants



Cochlear Implants NOT Perfect

- **Cannot** make hearing normal
- **Cannot** help understand music
- **Cannot** remove background noise

Cochlear Implant Features Related to Assistive Technology

- Telecoils
- FM
- Direct Audio Input
- Wireless/Bluetooth





Hearing Assistive Technology and Assistive Technology

*Why Hearing Aids and Cochlear
Implants May Not Be Enough!*



Choosing Assistive Technology

- Consider a formal or informal needs assessment for the child/patient involving parents and teachers
- Formal Examples:
 - ALDS Checklist for Listening and Talking Problems¹
 - The Compton Assistive Technology Questionnaire²

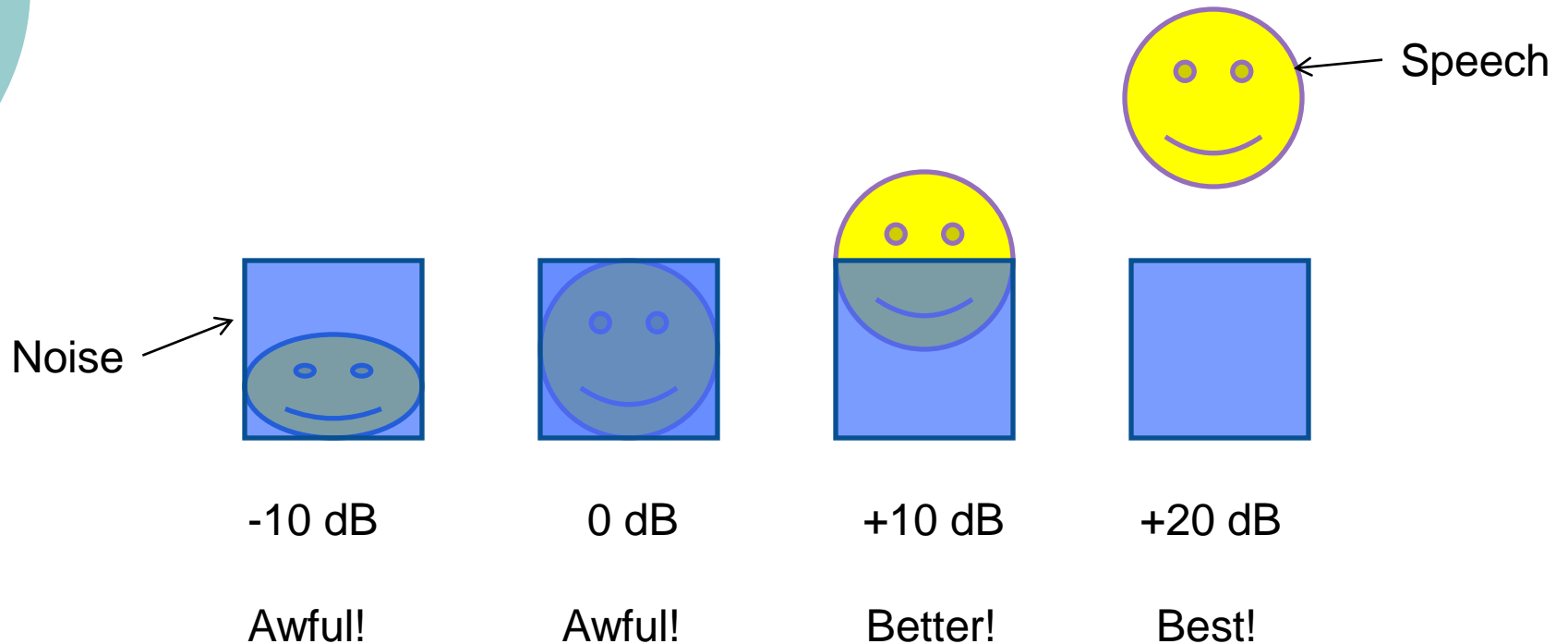
¹ Lightfoot & Vaughn (1989) chapter; Introduction to Aural Rehabilitation (2nd ed.)

² Compton (2000) chapter; Rehabilitative Audiology: Children and Adults (3rd ed.)

Important Concept

Signal-to-Noise Ratio

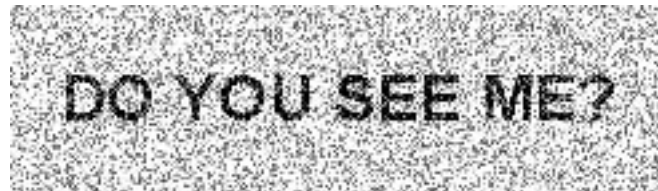
Signal-to-Noise Ratio (SNR)



Noise: A Visual Example

DO YOU SEE ME?

+Infinity dB



+25 dB



+5 dB



0 dB

Reverberation: A Visual Example

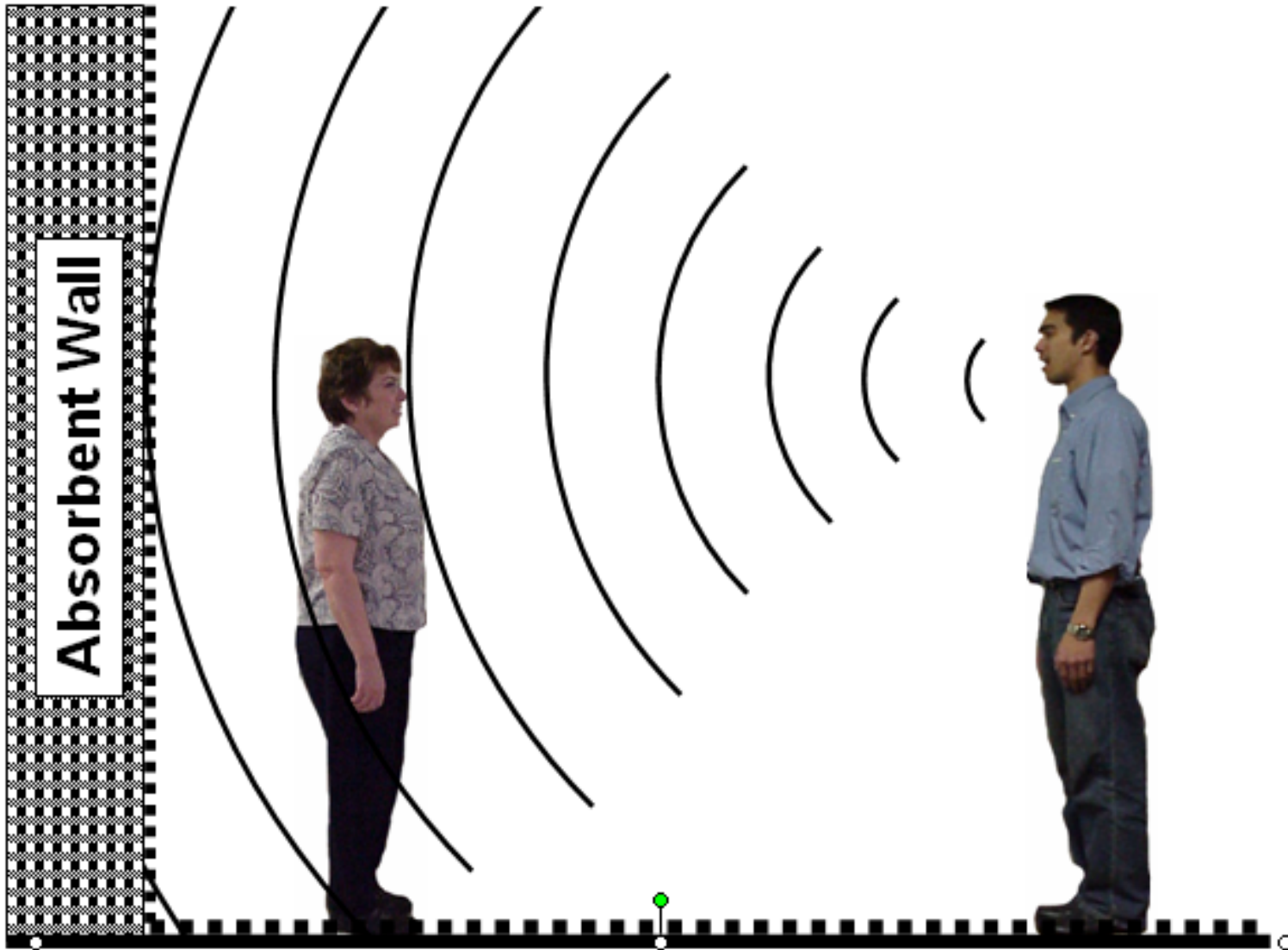
DO YOU SEE ME?

DO YOU SEE ME?

DO YOU SEE ME?

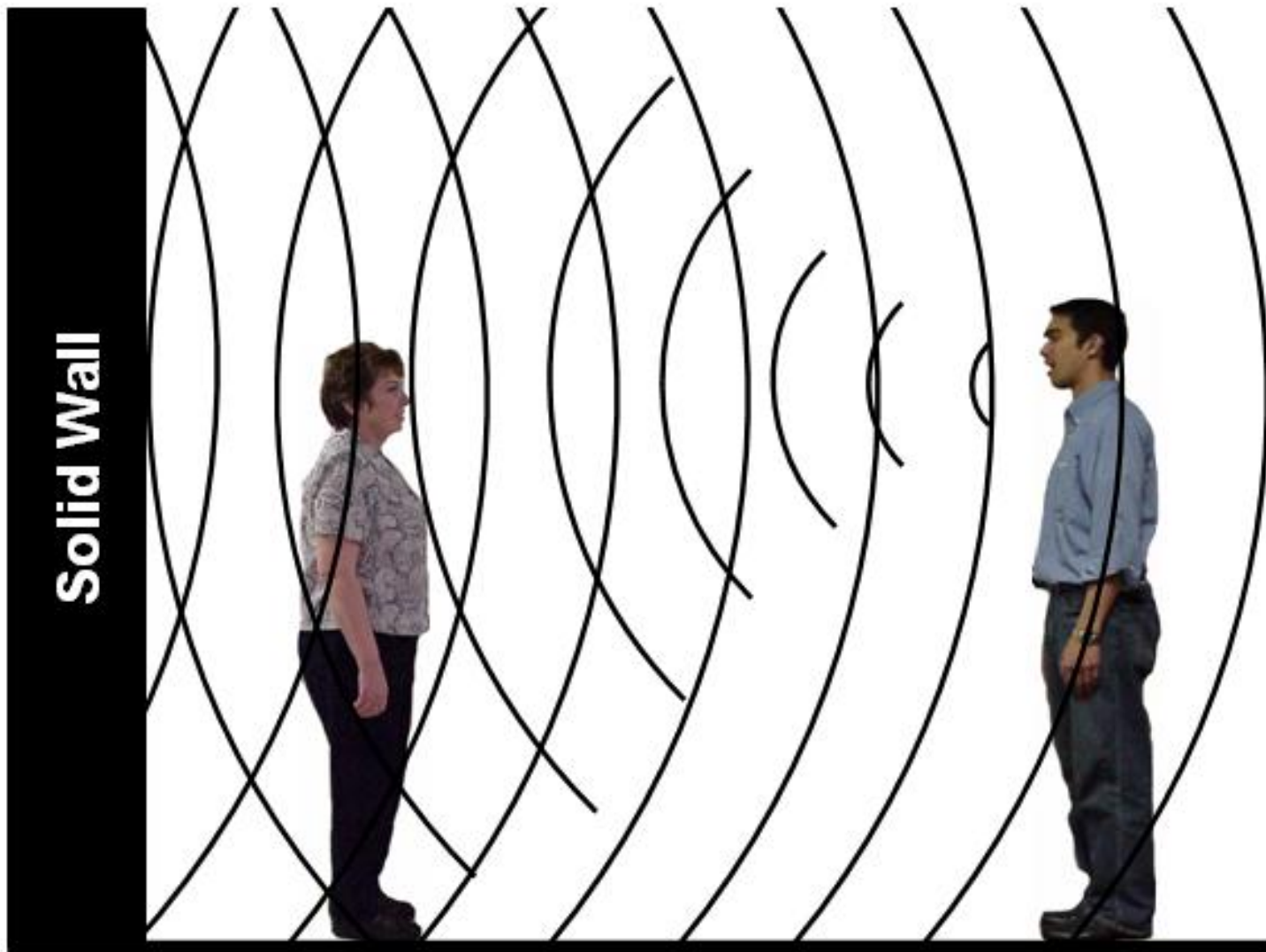
DO YOU SEE ME?

No Reverberation



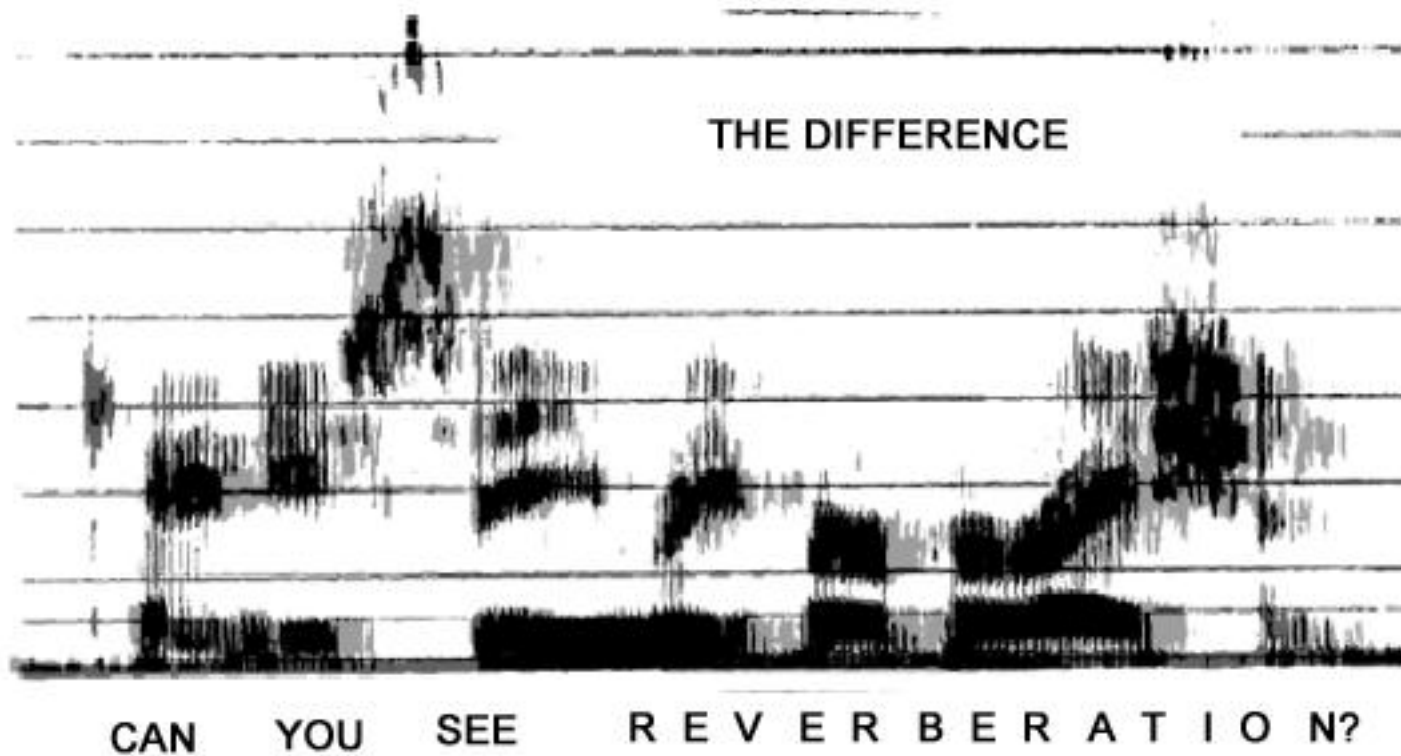
Atcherson & Davis (2007)

Reverberation



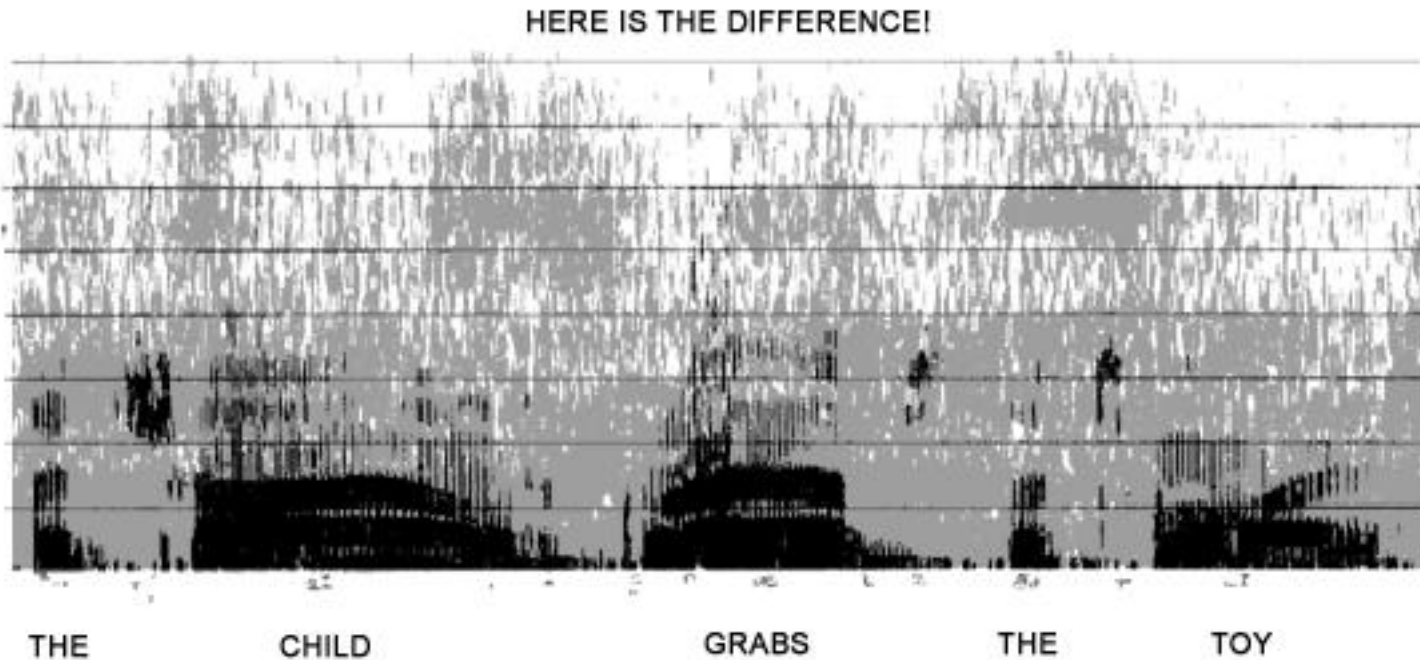
Atcherson & Davis (2007)

Speech in Reverberation



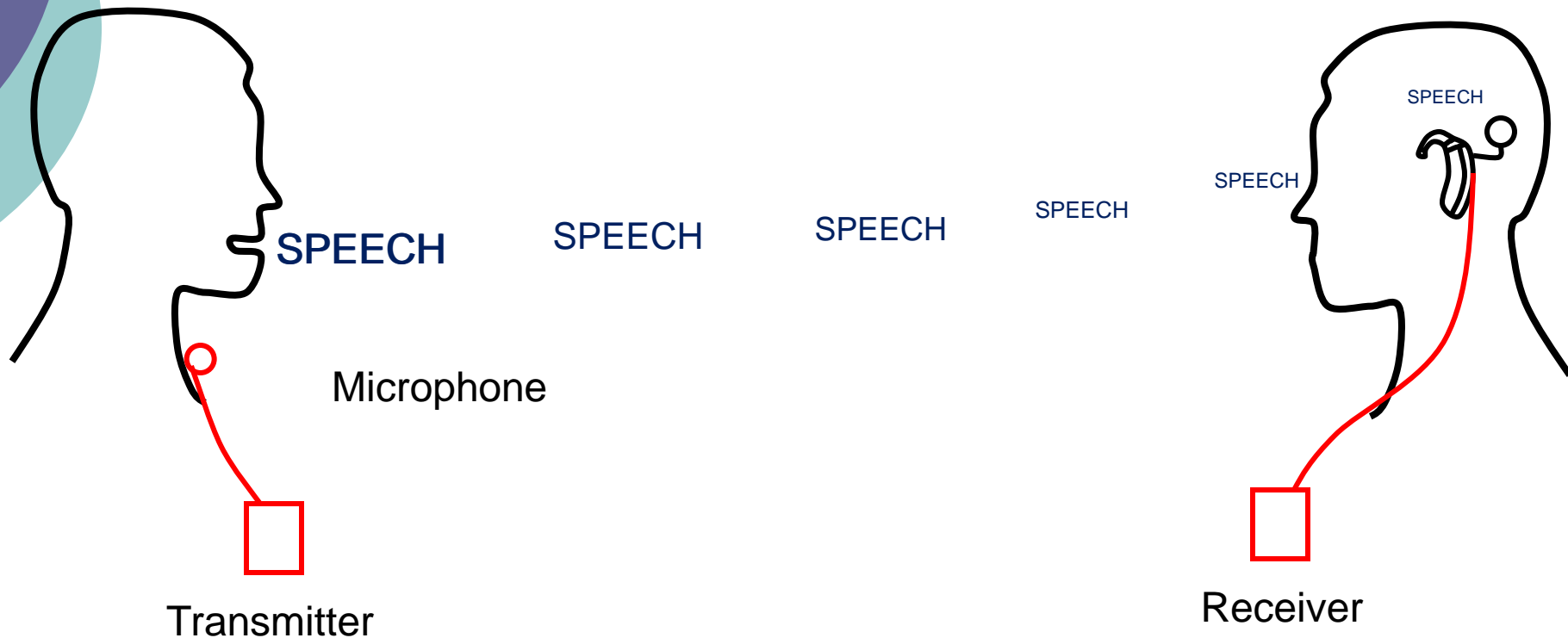
Adapted from Hawkins (1988), In *Hearing Impairment in Children*

Speech in Reverberation and Noise

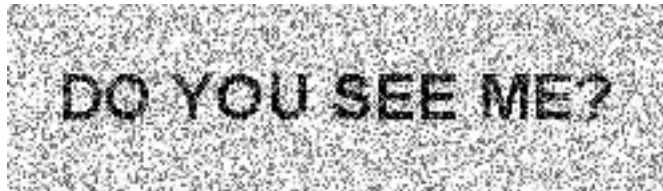


Adapted from Bess and Tharpe (1986) *Ear Hear* 7(1)

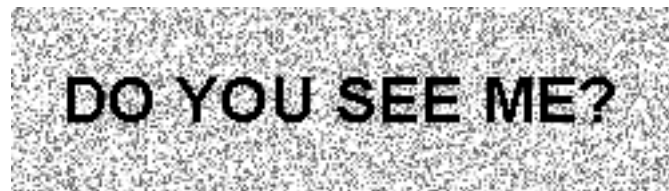
How Assistive Listening Devices Work



DO YOU SEE ME?



DO YOU SEE ME?



ME



FM System (circa 1980s)

FM Systems

Phonak Inspiro



Oticon Amigo



Small FM Receivers!

ML10i for Naída



MLxi Baha



MLxi





Assistive Technology

More choices and
decisions...



Pros and Cons of Hearing Assistive Technology

- Not all work for everyone
- Everyone has different hearing aids, cochlear implants, and needs
- Motivation is the key to success



Television/ Movie Theater

- Closed Captioning (CC)
 - VHS with CC
- DVD subtitles
- Opened Captioning
 - Seen in selected movies at theaters
- Rear-Window Captioning
 - Seen in selected movies or shows

Rear-Window Captioning



Alerting/ Signaling Devices

- Vibrating alarm clocks (nighttime)
- Vibrating alarm watches
- Vibrating pagers
- Signalers (acoustic, smoke, carbon monoxide, motion, phone, etc.)
- Wasabi alarms?

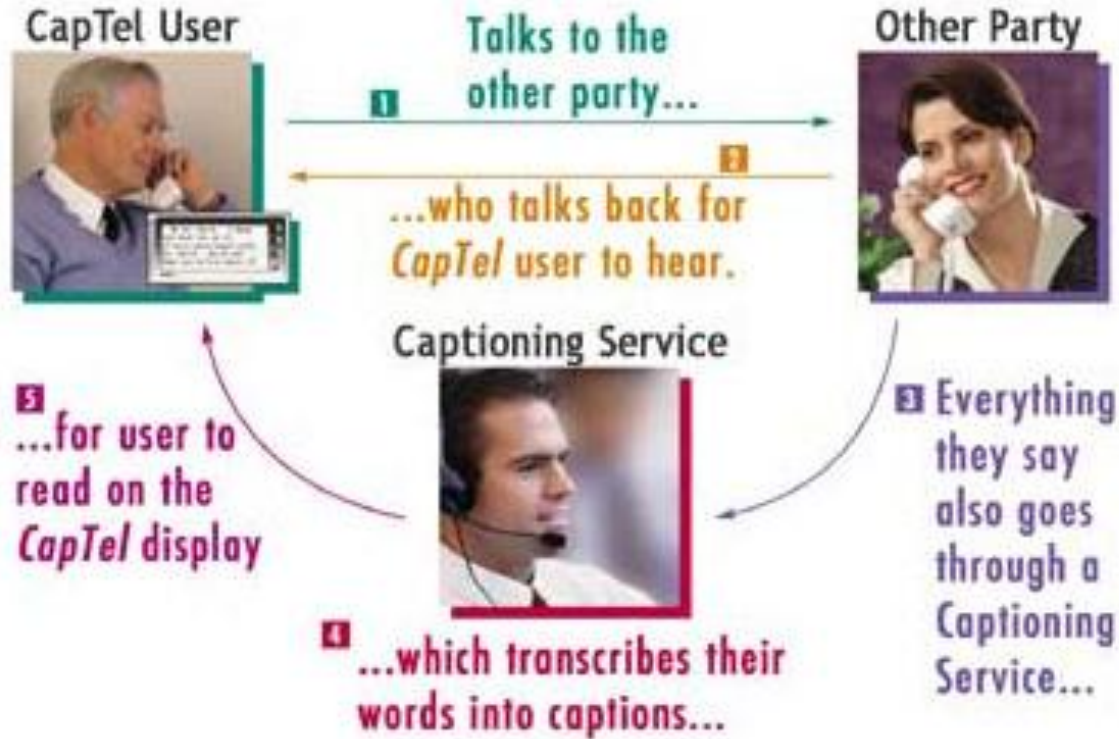


Telephone Options

- Amplified Phones
- TTY/ TDD
 - User-to-user
 - User-to-relay-to-non-user
- VCO and Captel phones
- Videophone, Skype, etc.
- Cells Phones



VCO and CapTel Phones



www.sprintcapter.com – requires caption telephone

www.sprintcapter.com – required internet connection and any phone

www.capter.com – requires caption telephone

Videophone Options



FROM: SORENSONVRS.COM



Sorenson VRS – <http://www.sorensonvrs.com>

Skype – requires webcam, microphone, speakers, and internet



Cell Phones

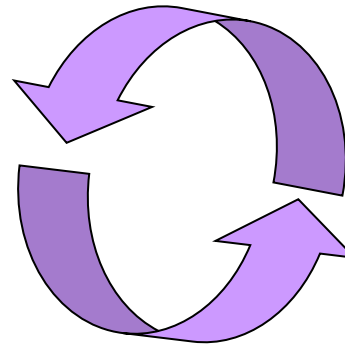
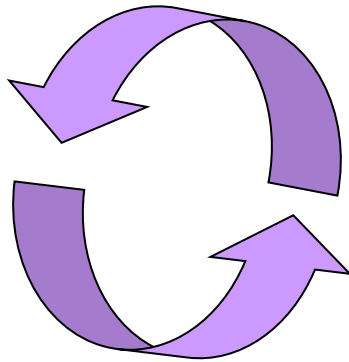
- Major push to make all phones hearing aid compatible
- What are some issues with cell phones?
- What are other uses of cell phones?

Bluetooth Cell Phone Connectors

- Bluetooth wireless system for use with cell phones
- Requires direct audio input
- Ask your audiologist



Bluetooth Cellphone and iPod Setup: Oticon Streamer Example



Bluetooth/DAI/Telecoil Products

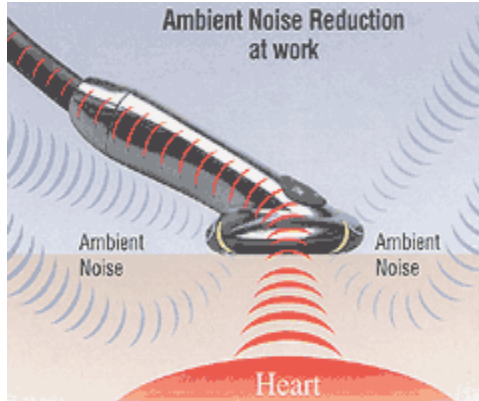
- Geemarc i-Loop and t-LOOP



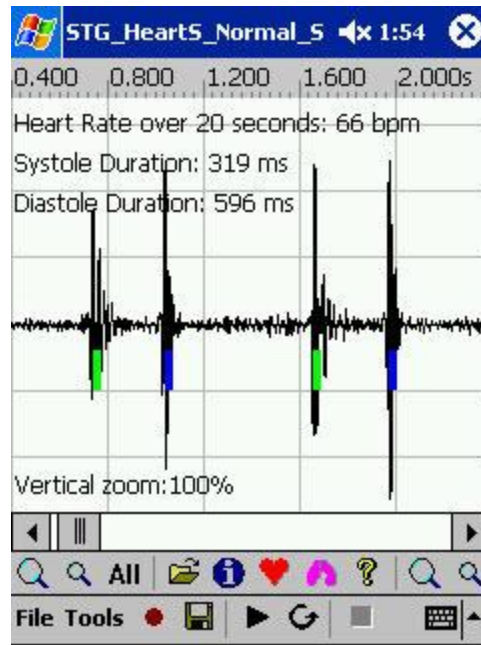
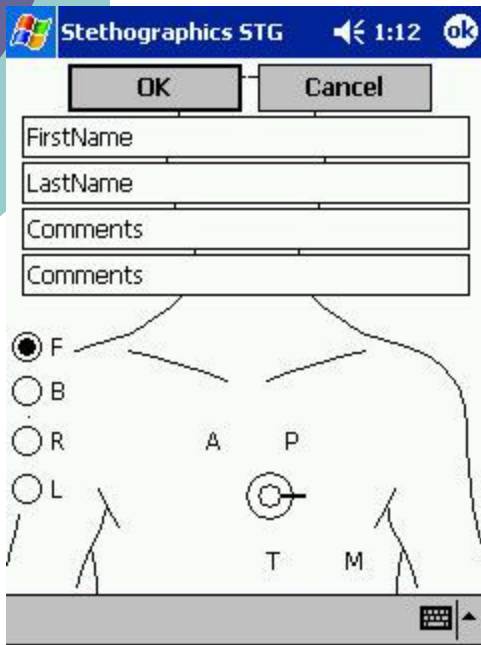
<http://www.geemarc.com/eng/>

AblePlanet – clarity or noise cancellation phones

Amplified Stethoscopes



Visual Stethoscope



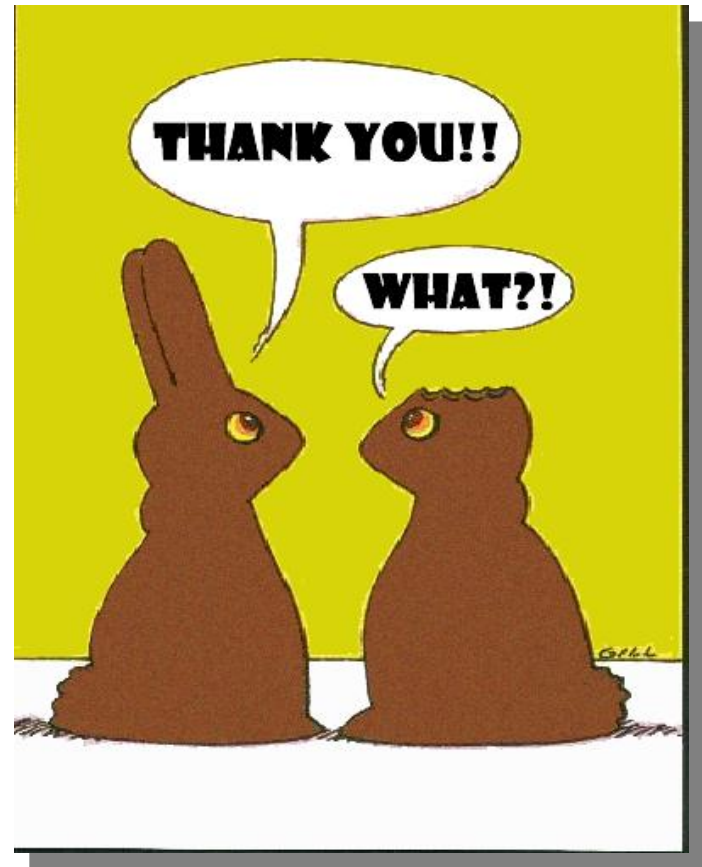
Stethographics Handheld STG



More Resources

- Demystifying Hearing Assistance Technology: A Guide for Consumers
 - Davis, Atcherson, and Johnson (2007)
 - <http://www.wou.edu/~davisc/Demystifying.pdf>
- www.aldtraining.com
 - Becky Morris

THANK YOU!



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