

BOWIE SENIORS COMPUTER CLUB

MEETING MINUTES FOR MARCH 19, 2015

Carl Bulger called the meeting to order. He raised the question of how much interest there might be in a user group for Apple products.

Treasurer's report: \$152.60

Dr. Stacey Samuels Cole, Director of Audiology, Hearing Professionals, Inc. gave a presentation on the technology used in conducting hearing evaluations and prescribing hearing aids. BSCC member Dave Hackenberg (photo) is one of Dr Cole's patients. The presentation was well attended and well received. The meeting included an extensive question and answer session on information that is of particular interest to seniors. See enclosed copies of Dr. Cole's powerpoint presentation slides.



Meeting Minutes prepared by Bill Long, Secretary

Photo by Dennis Edgington

THE TECHNOLOGY BEHIND THE HEARING AID

Dr. Stacey Samuels Cole
Executive Director of Audiology
Hearing Professionals

Hearing Aid Styles

- Behind The Ear (BTE)



- Custom (ITE/ITC/CIC)



- Receiver-in-Canal(RIC)

All Hearing Aids Are Alike

1. Sound goes in the Microphone.
2. Sound gets amplified.
3. Sound comes out the Speaker into your Ear



Technology

Analog:

Settings and Sound are both processed via analog technology.

Digital Programmable:

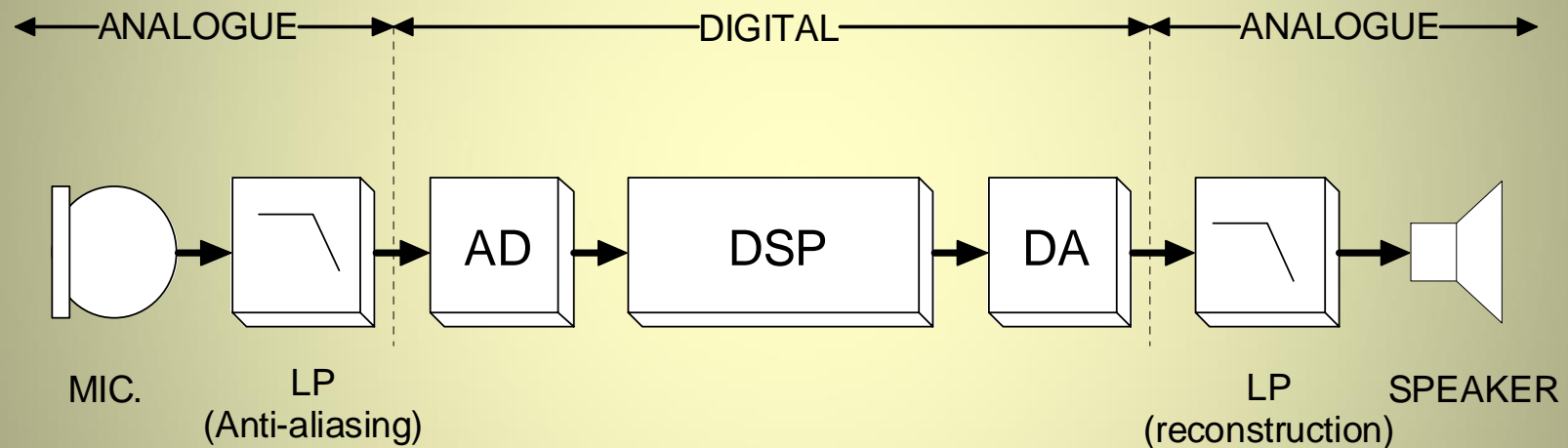
Settings are processed digitally, Sound is processed via analog technology.

Full Digital:

Both Settings and Sound are processed digitally.

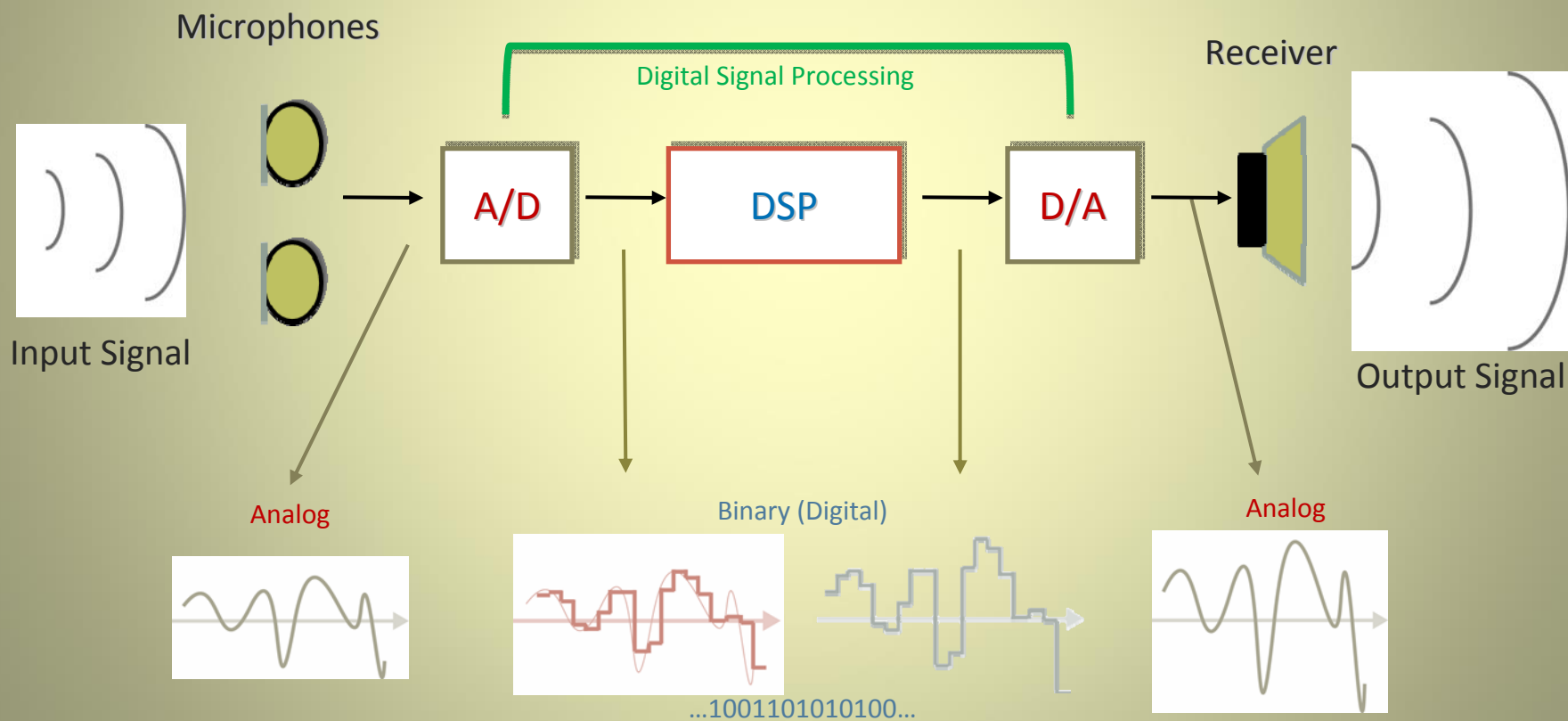
What is a digital hearing aid?

A digital hearing aid simply converts the signal to a numerical form before processing it

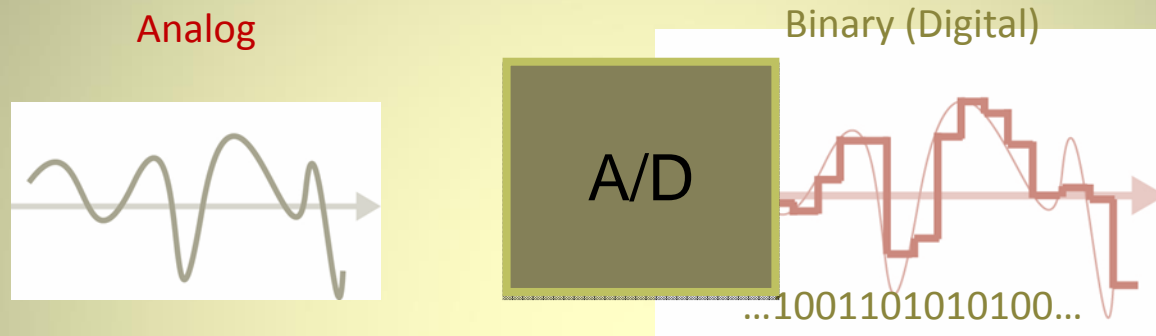


It's the signal processing algorithm that is important

PARTS OF A DIGITAL HEARING AID



ANALOG TO DIGITAL CONVERTER



- Accuracy of the A/D conversion will impact the following:

Input
Range

Sampling
Frequency

Bit Depth
& Dynamic
Range

Intern
al
Noise

Battery
Consumption

Features

- Multiple Microphone Directionality
- Compression
- Bluetooth
- Programmability
- Speech Enhancement/Noise Reduction
- Frequency Shifting
- Telecoil

Multiple Microphone Directionality

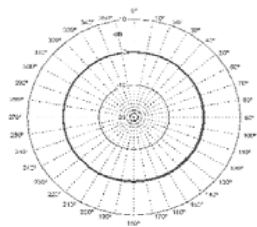


Figure 7-1. Polar plot sensitivity plot for an omnidirectional microphone. (Reproduced with permission from ReSound Corporation.)

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OMNIDIRECTIONAL

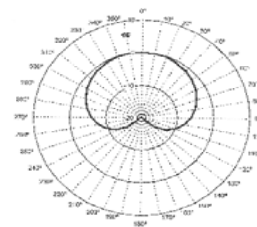


Figure 7-2. Polar plot sensitivity plot for a cardioid directional microphone. (Reproduced with permission from ReSound Corporation.)

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FULL DIRECTIONAL

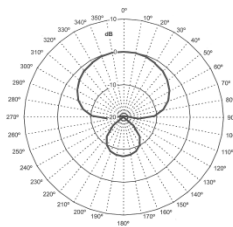


Figure 7-3. Polar plot sensitivity plot for a hypercardioid directional microphone. (Reproduced with permission from ReSound Corporation.)

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SPLIT DIRECTIONAL

How HD locator preserves audibility and enhances SNR?

Multichannel, fully adaptive, matched dual mic system with moderate dir activation thresholds and sound classifier (with digital pinna)

To achieve SNR improvement with spatially separated speech and noise

Multichannel

Low frequency in omni mode to minimize circuit noise (and maintain loudness)

Preserve intelligibility with frequency-specific noise

Fully adaptive

Dual mic

To achieve flexibility in polar patterns (omni to various dir modes)

Moderate activation thresholds (> 55 dB)

To preserve audibility

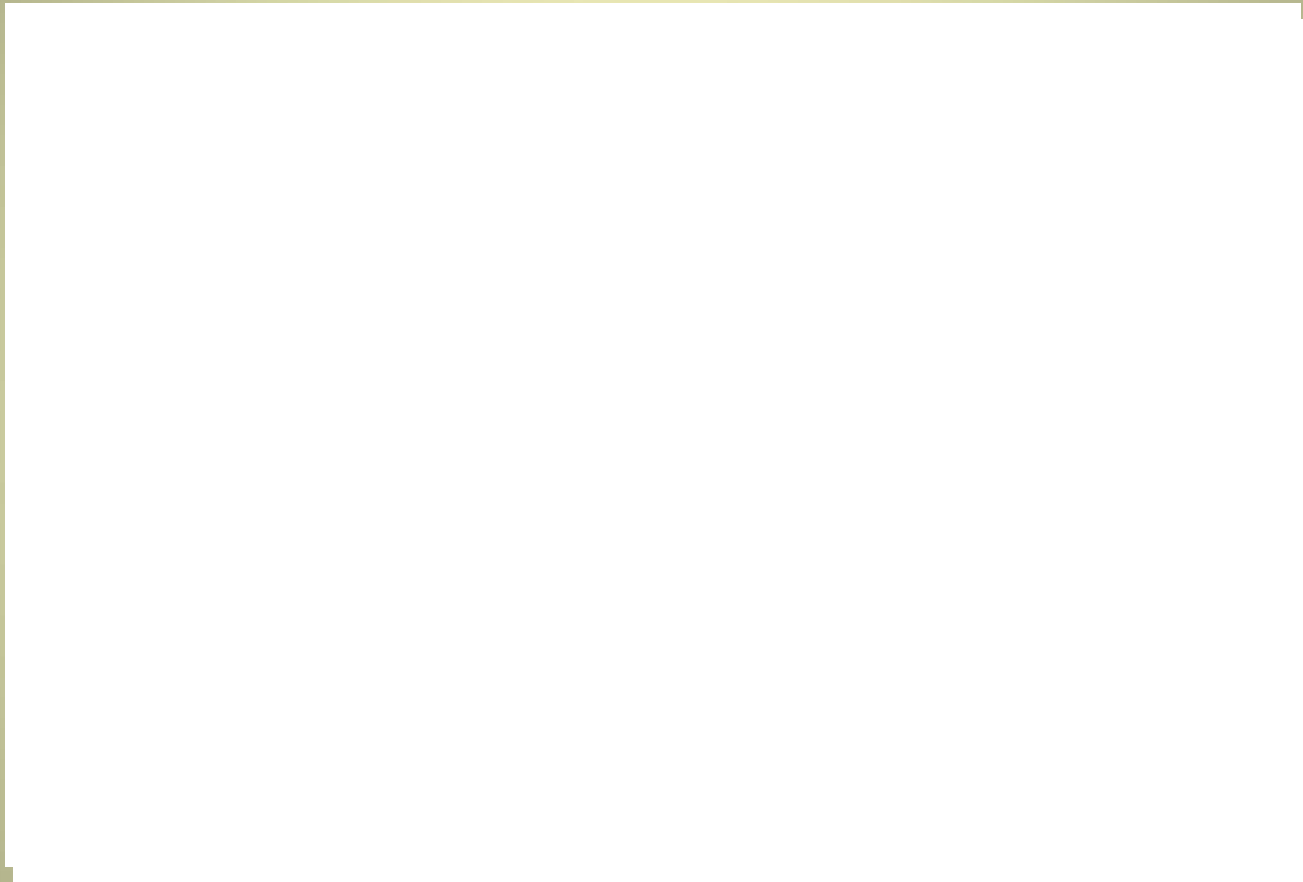
Sound classifier

Treat different sounds differently, including speech and wind

Reverse polarity mic and free-focus mic as needs warrant



HEARING IN NOISE



What is compression?

- Compression:
 - the range of input sound intensities is "*squashed*" into a smaller range of output intensities
 - e.g. a range of input intensities from 0 to 100 dB SPL may be compressed into an output range of 50 to 100 dB SPL
 - The output "dynamic range" is reduced compared to that of the input

Why do we need compression?

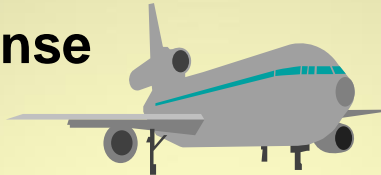
- Sensorineural hearing loss most often results from damage to outer hair cells in the cochlear
- This results in:
 - Loss of sensitivity at low sound intensities
 - Abnormally rapid growth of loudness (recruitment)
 - Loss of frequency selectivity

Compression

Normal

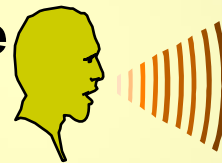
Impaired

Intense

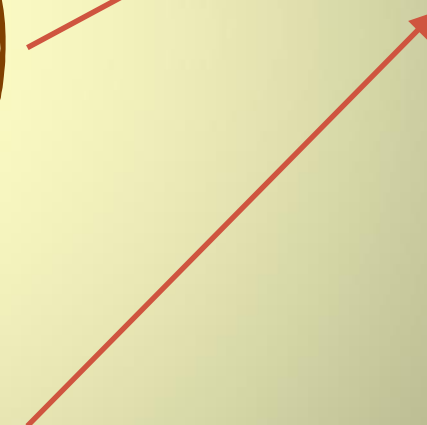
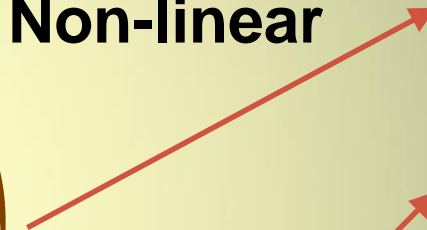


Non-linear

Moderate

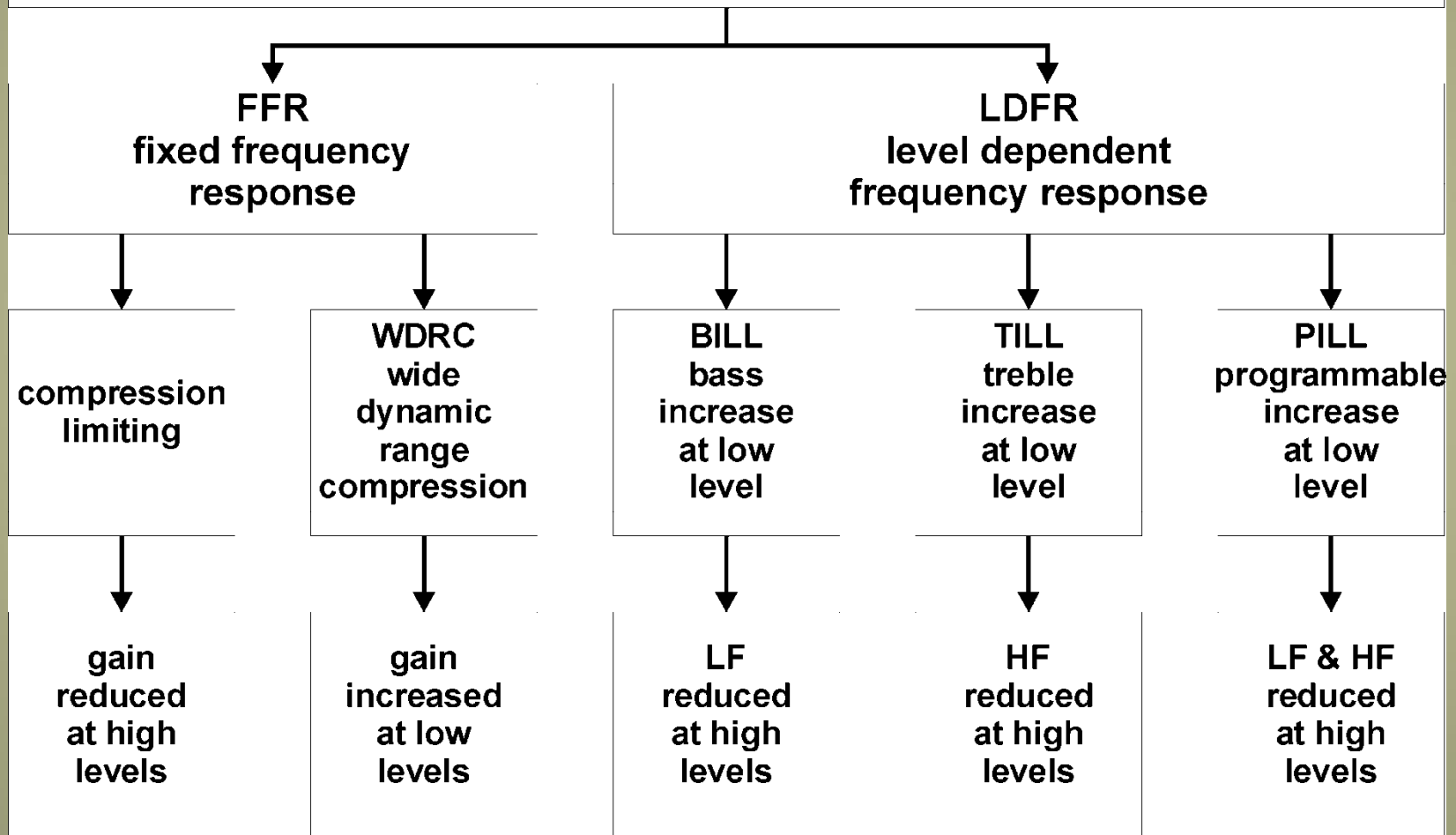


Weak

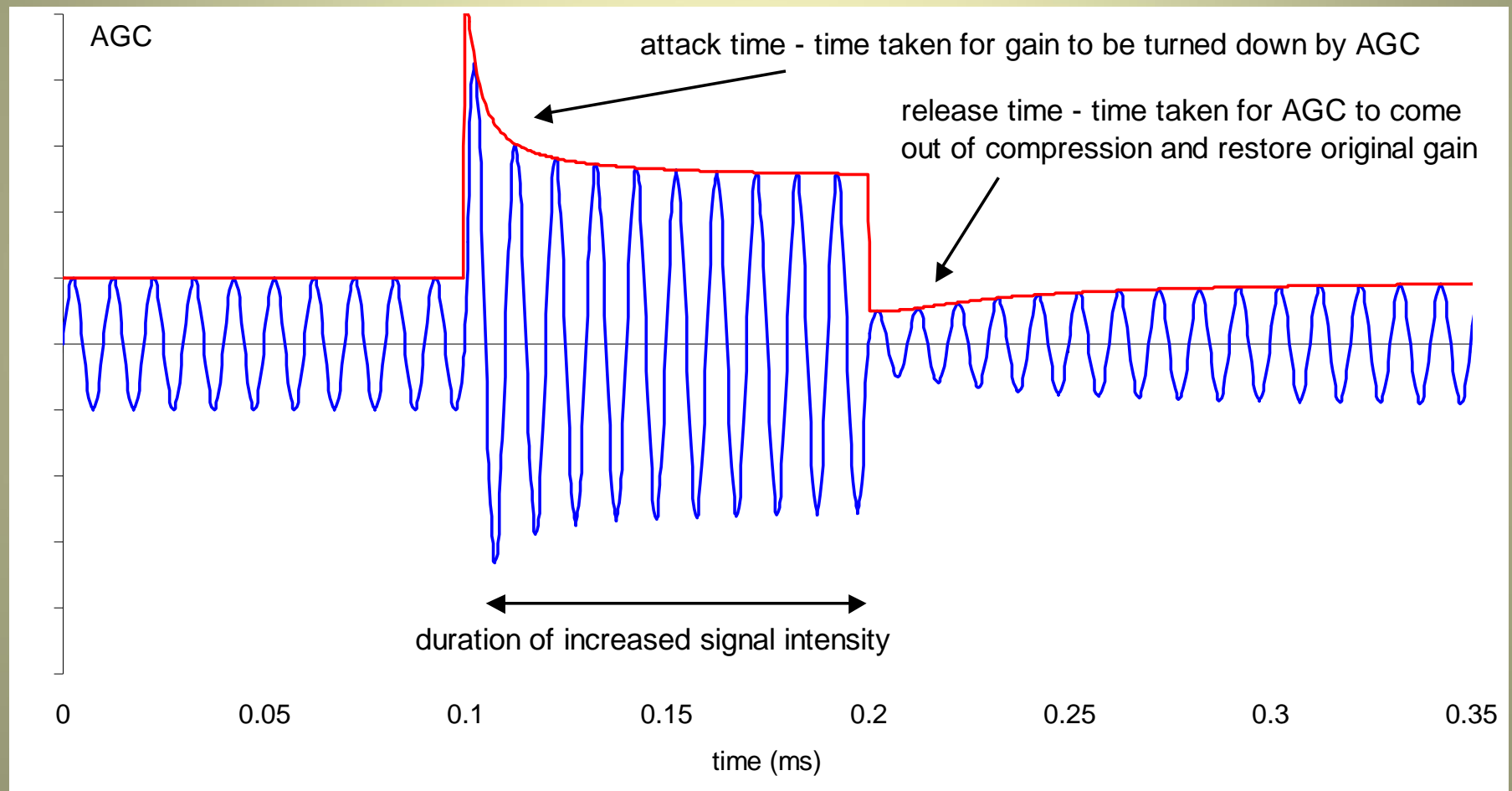


ASP

Automatic Signal Processing



Automatic gain control



**LET'S TAKE A LOOK AT HOW
THIS ALL WORKS**