Psychoacoustics

The study of subjective human perception of sounds.

Both the ear and the brain are involved in a person's listening experience.

We hear what our brains want us to hear.

Why are we interested in Psychoacoustics?

Listeners tend to notice things that seem "louder" to their brains. That's why commercials seem louder on TV.

As communicators, we want to control what listeners pay attention to: the message, the "beats" in the story line, or details that enrich the story.

At least, we want to avoid obscuring the important sonic details with less important sounds.

How Much Louder Does That Seem?

- *Relative loudness <u>perception:</u>*
- *Is not a linear perception due to how the inner ear works.*
- *It is however more like a log scale. Therefore we use decibels (dB)*

Facts

- *A common form of sound masking in offices, is pink noise. It also works for sleepers in noisy motels.*
  - *Other sounds are hidden or masked.*
- *People standing watch in the dark can perceive sounds that are not really there.*
- *If you hear two notes, at least 50Hz apart, you will perceive two additional notes, A+B and A-B.*

Tuning Out Noises

- *We can tune out details. A person listens to scratchy records eventually stops noticing the background noise, and simply perceives the music. S/he might not even remember hearing scratches.*
- *You probably don't notice the background noises much in this room until we record a narration in here.*

Loudness vs. Amplitude

Amplitude and loudness are related but not the same…

*Something **sounds louder,** even if the amplitude is the same, **if**:*

- *its frequency is around 1000-2000Hz*
- *Or - other sounds are now quieter*
  - *(or muted completely – common in film)*
- *Or - the amplitude never drops*
  - *(as in commercials)*

- Something ***sounds louder*** even if the amplitude is the same, ***if***…
  - *more frequency overtone elements, or an EQ boost in the 800-2000 Hz range, are added to it.*
  - *If it is moved away from other sounds in a sound field (like stereo or 5.1 surround)*
    - *"Making room in the pan" (panorama)*

- Something sounds louder even if the amplitude is the same, if:.. no other sounds in the mix occupy the *same frequency range*.
  - *So you can EQ some "frequency space" in the EQ of the other tracks.*
  - ***Example:***
    Dialog is masked by the storm sound.
  - *A male voice might occupy the frequency range from 200 hz to 1000 hz.*
    - *(yes there will be overtones in higher frequencies, but…)*
  - *Edit the storm. Use EQ to pull down the energy in the the frequency range of 250 hz to 3000 hz.*
  - *Listen again and re-adjust.*

The Haas Effect

- Any first reflections occurring in the first 40 ms or so after a sound, *are perceived as part of the original sound*.
  - This can help a sound seem bigger or stronger. Especially useful in vocal and drum tracks.
  - If we are adding reverb later, it is often better to delay the onset of the reverb until 50 or 100 ms, to let the first reflections sound clearly before the reverb starts.

Loud Lows?

True low frequencies are hard to reproduce over most compact speakers and many home audio systems, even with subwoofers. Some theaters can do it.

"Loud" Lows

*Editors or sound designers usually **cheat** by putting in a little of the very low fundamental we **want** (say 25 Hz) and add a **lot of the next octave** (50 Hz in this case).*

*If we get the balance between the frequencies right, people **perceive** they are hearing more of the 25 Hz note and we save money on heavy duty speakers and amplifier power.*

- (Naturally WAVES sells a plugin for this!)

So…

- If key dialog is panned to the middle, don't put any other sounds in the exact middle, except perhaps low frequency sounds that are below the vocal frequency range.
- If other sounds are in the same frequency range, pan them a little right or left.
- Keep all the words in a dialog track at even amplitude. Don't let quiet words get "lost."
- Keep masking sounds at lower amplitude, at least over the contested frequency range.