Reducing Noise

What do we call noise?

- *Anything* in a sound that we don't want.
- Hiss from electronics.
- Hum from AC power. Buzz from an instrument amplifier.
- A fan in the background of a film dialog.
- A door slam in an interview.

"Signal-to-noise ratio"

- The difference between the signal level and the *noise floor*, specified in dB.
  - 70 dB is ok. 50 dB is poor.
- Noise in mixed tracks adds up! Equal levels in a mix add 3 dB for each track.
- Hardware systems have additive noise. Individual hardware has s/n specified.

Best to avoid it altogether

- Minimizing noise on a remote recording/film/video session
  - First of all notice them, and realize they will seem "louder" when recorded.
  - Get the mics away from the noise source.
  - Physically muffle the noise sources with pads.
  - Get a little bit of just the background noise ahead of time.
    - To use as a sample in noise reduction software.

Best to avoid it altogether

- Minimizing noise on a remote recording/film/ video session
  - Or often record a lot of it, without any dialog.
    - That way you can put it behind any ADR you do later.
  - Or get a mic with it's own track recording only the noise, and no dialog.
    - While the dialog is on another track.
    - Later, align and invert it, in the mix.
    - It helps if you have a clapperboard.

Cables are a common noise source

- **Unbalanced** cables pick up noise easily. They use 2 internal connectors.
- **Balanced cables reject electromagnetic noise (like AChum) using 3 conductors.**
  - Two wires, each carry the same signal. However one copy is flipped out of phase.
  - Receiving hardware will flip that out-of-phase copy back and combine the two copies.
  - Noise that overwhelms the cable shielding will get into both copies equally as much.
  - The receiving hardware flips one copy phase 180 degrees so that the signals now add.
  - But the noise, which <u>was</u> in phase, has one copy now flipped out of phase.
- The noise cancels itself out. The wanted signal is strengthened.

Reducing noise in postproduction

- Perception of noise is relative. People may not notice it if it is simply reduced a bit.
  - How loud does the noise have to be for us to notice it... compared to the desired sound? Depends on psychoacoustics.
- Almost all noise reduction techniques require a compromise. Some bad comes with the good.

Reducing noise in postproduction

- Masking is a very useful phenomenon. When two sounds are in the same frequency range, we tend to notice only the louder one.
  - So if a splice in one track will be audible, we put that splice "behind" a snare hit in another track.
- We don't notice a little guitar amplifier buzz during the guitar notes.
  - In between the guitar notes is another story. We deal with that.

Common tools

- Try filters? (EQ) They can work for a simple tone noise.
  - But there are too many harmonics in our Buzzing Bass amp example
- Best to use learned/sampled noise reduction.
  - There is Just enough sample noise in Buzz Bass.
- For pops? There are dedicated tools – Audacity pop/click removal
  - Set the thresholds and listen, retry until you get it.

- For occasional sound behind the desired sound, as a car honk, Audition/Soundboard have unique tools such as the Healing tool

Steady-state noises: fan, hiss

- Manually cut to silence or negatively amplify (Audacity's tool to lower levels)
  - But this often leaves noticeable dropouts.
  - Ironically people might not notice the noise, but do notice the dropouts.
- Use a Gate – good for small problems,
  - See the bass guitar and snare tracks that are gated.
  - Also used live for not getting the noise in the first place when recording live
- Use EQ
  - Audacity > Spectrum will sometimes reveals the offending frequency.
  - Note that AC 60 hz harmonics are most often multiples, 60-120-240 Hz
  - Narrow filters are best, as they affect the wanted sound the least.

Remember…

- *Most noise reduction tools are not perfect. Many require learned skill.*
- *Try to get things right when recording in the first place.*
- *Noise is only a problem if you notice it. Don't work over every track.*
- *Some noises require multiple passes of the same tool, taking a little more noise with each pass.*
- *Some noises, like guitar amp noise, require a combination of treatments.*