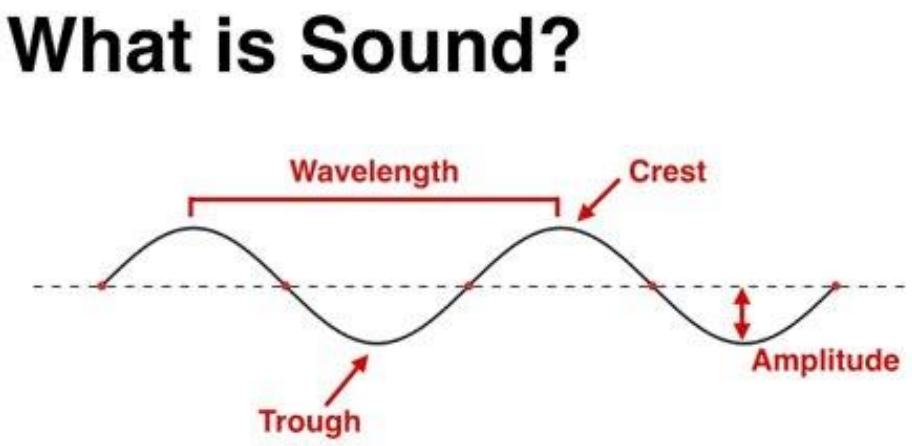
Intro to Sound

So, what is sound?



Molecules exciting air (or other medium, like water)

The more irregular the wave, the more "noisy"

Hertz is how we measure sound frequency = cycles per second which translates into the pitch we hear

Amplitude translates into is how loud a wave sounds

Perception of Frequency

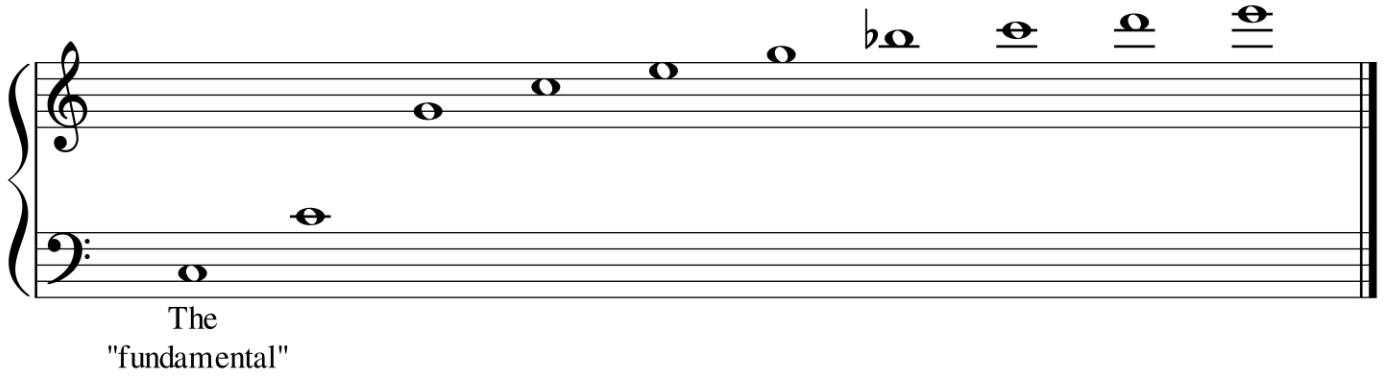
Our perception of frequency and amplitude requires a bit more math because we hear things exponentially (as opposed to linearly)

Pitch is a ratio of frequencies found in the harmonic series

So, for every octave higher (8 notes on a keyboard), the frequency doubles

We can hear from 20-20k hertz, the higher the hz, the higher pitch the sound

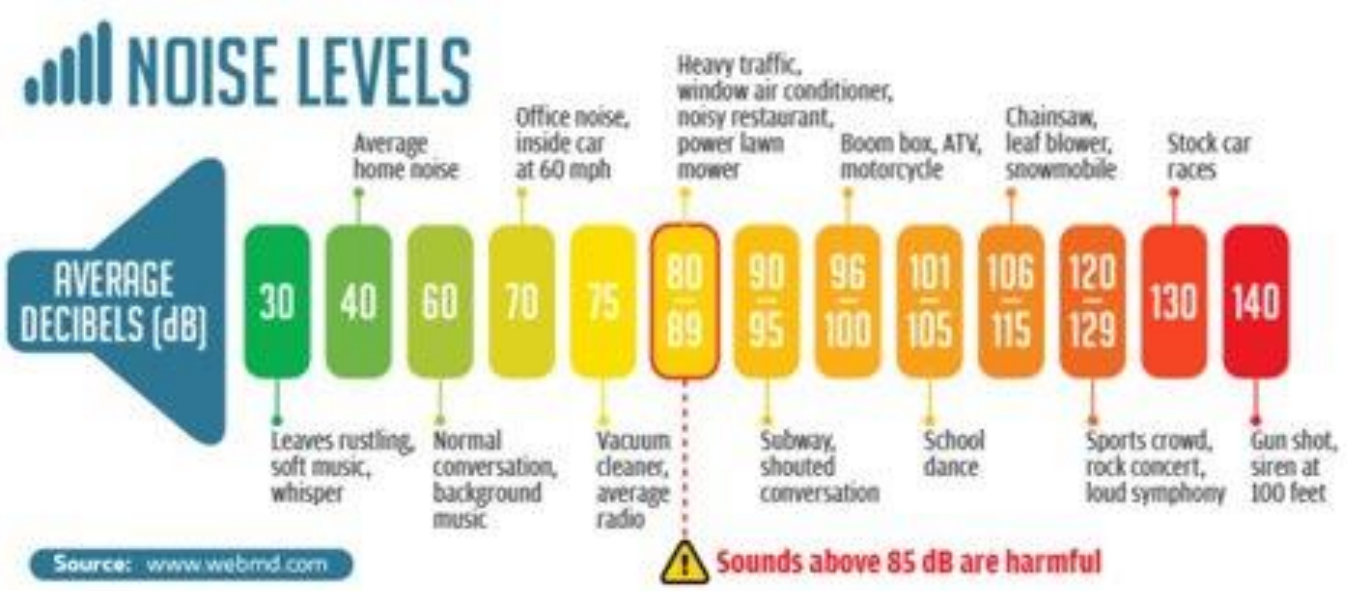
Timber or quality of a sound is also affected by the harmonic series



Perception of Amplitude

We hear amplitude in deciBels (perceived loudness)

We hear dB from 0-120



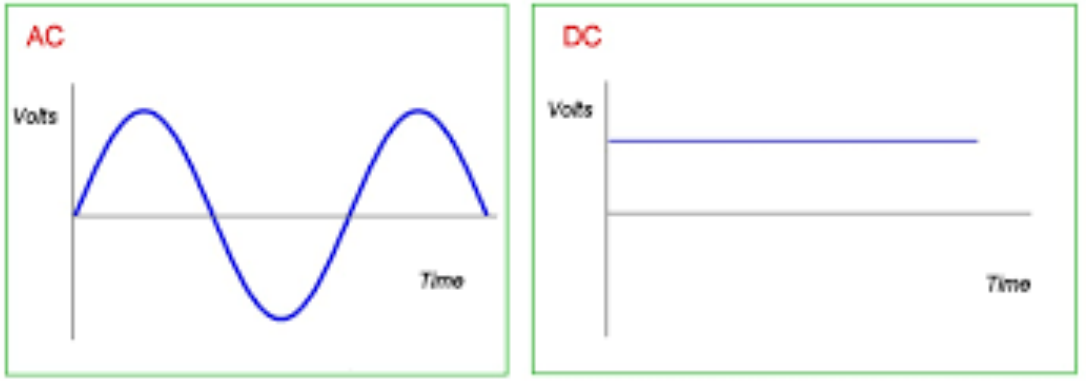
Analog Recording

Sound and electricity follow the same wave structure

Hz = current, amplitude = voltage

It's why sometimes you can hear your appliances humming

Because of this, we can change sound to electricity and back with a concept called transduction



Analog Continued

We can put sound into a microphone, change it to electricity, and back to sound through a speaker with transduction

We also can add some circuitry into the speaker to create an amplifier

Back in the day we used vacuum tubes to do this, today we use "solid state" electronics

Tape Machines to Computers

We used to record by writing these analogous waveforms onto magnetic tape

To edit this tape, we would cut it with a razor blade and literally paste it together

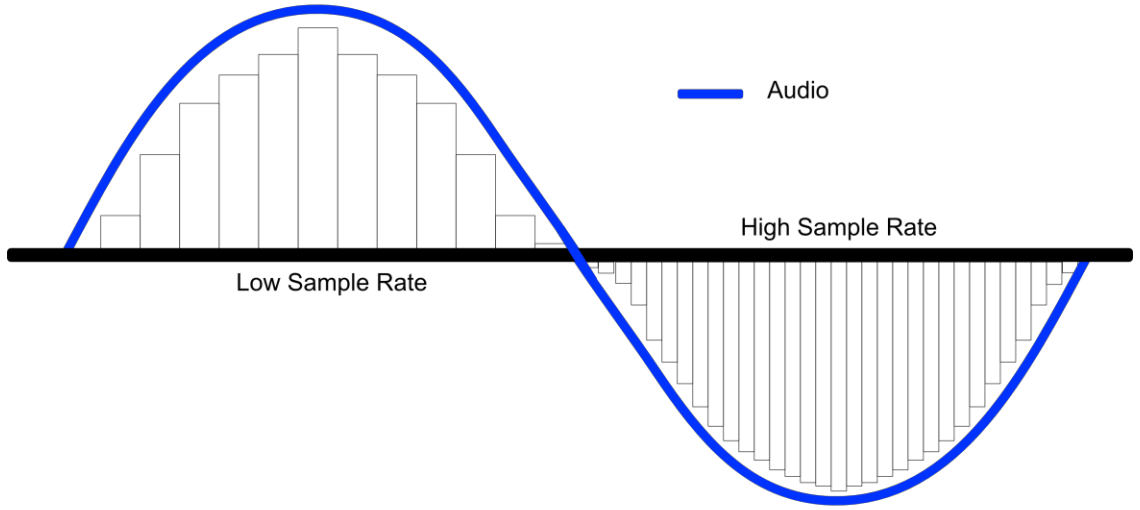
Today we do this with computers which requires some more math (sorry)

ADC and DAC

Computers unfortunately cannot process continuous analogous data

So, we have to chop up the waveforms into discrete units to process

This is what an ADC or analog to digital converter does



Sample Rate and Bit Depth

The sample rate is how many pieces of the wave the computer takes per second

Standard sample rate is 44.1k for audio (double the highest we can hear at 22k)

Bit depth determines the number of possible amplitude values we can record for each audio sample

The higher the bit depth, the more amplitude values per sample are captured to recreate the original audio signal.

The most common audio bit depths are 16-bit, 24-bit, and 32-bit

What is a DAW?

Digital Audio Workstation

Ableton, Logic, Pro Tools, Reaper, Studio One, Audacity

Used to record and edit recordings today

Ableton- creating digital tracks and playing live electronic music

Pro Tools, Logic, Studio One- good for mixing and mastering

Reaper and Audacity- free and flexible. Can do multichannel audio easily

Digital Music and MIDI

Digital audio gear began appearing in the 1980s mostly

Solid state electronics appeared earlier in the 1950s

MIDI appeared in 1983 (musical instrument digital interface)

MIDI is not audio but information that can be passed to a DAW

[MIDI Wiki for more information here.]