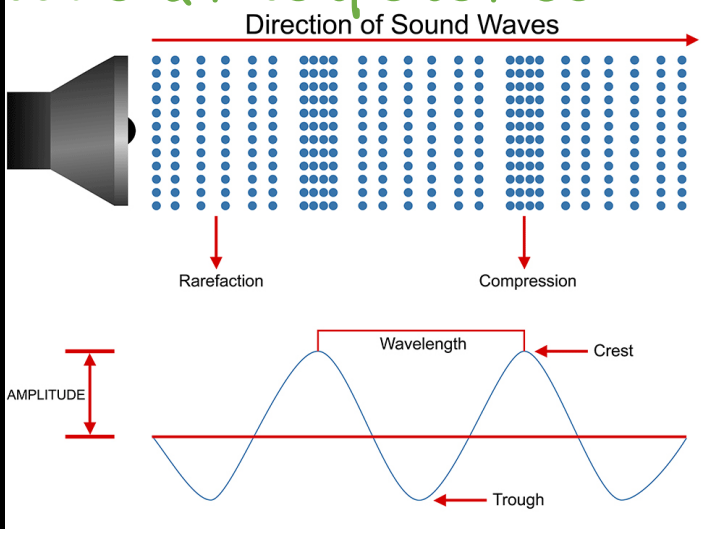
Issue 64
February 2023

Constructive Interference



Your amazing brain calculates that it is 440 compressions per second and tells you that it is a pitch.

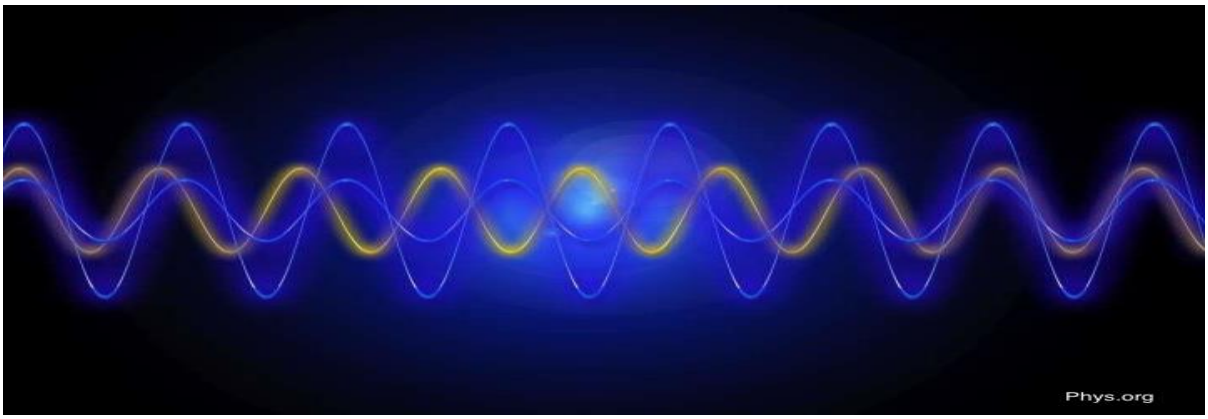
I have written in a more abstract way what sound and vibration are and how they relate, but I think it is important to also look at the actual measurable functionality of sound so maybe the abstract will make more sense. At its core, sound is vibration, but vibration that requires a medium (such as air or water) to move through so we can experience it. It is pressure changes in the medium, which is why you can feel it. It has a measurable power in Watts, which is a physical force. Some people claim to be able to see sound and relate it to colors (vibrations of light). Even those with hearing loss can enjoy sound because they can feel it in their body without being able to process the frequencies in their brain. Sound is an amazing thing!

A sound wave has some basic parts: amplitude (loudness), frequency (number of compressions per second), and wavelength. Wavelength is determined by the distance between the compressions in the medium of a sound wave. If it has a long wavelength, it is a low bass note; a short wavelength is a high treble note. A Hertz(Hz) is a measurement of sound known as frequency. Your piano is tuned to a frequency of 440 cycles per second (Hz). That means the wavelength occurs 440 times in one second! Your amazing brain calculates that it is 440 compressions per second and tells you that it is a pitch. You hear a note. We humans can hear 20Hz-20,000Hz and understand it. Other animals have different hearing ranges and are most definitely listening to other things than we are.

Written By Kestrel Curro BM

CURRO
PIANO SERVICE, LLC

Issue 64
February 2023



The loudness of the sound is determined by the amplitude of the wave. A larger amplitude is a louder sound; the sound wave covers a wider area. This is why bigger speakers are louder. The larger the speaker, the wider the wave can be, the louder the sound. A louder sound puts out more force, travels farther, and is easier to hear. Rock bands use large, powerful speakers so the sound will travel to the back of the room. A nine foot concert grand piano will be louder than a 42" upright piano because the larger soundboard, or amplifier, is able to create larger sound waves. The joke about a large speaker blowing Marty McFly across the room is somewhat true, because a speaker that large will create a strong force and a lot of air movement when the power is turned to maximum.

Two or more sound waves with the exact same frequency from different sources that are in phase, meaning the waves are occurring simultaneously and the compressions match up, combine their amplitudes and make the sound louder.

The most interesting thing happens when sound waves are combined and overlapped. Two or more sound waves with the exact same frequency from different sources that are in phase, meaning the waves are occurring simultaneously and the compressions match up, combine their amplitudes and make the sound louder. This is called constructive interference. If the sounds occur at different times and are out of phase or have a different frequency, they fight against each other and make the sound quieter. This is destructive interference. Many of the notes on a piano use sound coming from three individual strings per note. If one of those strings is out of tune (different frequency or timing) with the other two, the sound is quieter and you may even be able to hear the conflicting waves make a "wawa" sound. This is why a tuned piano sounds louder than an out of tune piano. The sound waves of the notes are able to combine constructively to increase loudness and clarity. Pianos that are extremely out of tune may contain so many different frequencies that it just sounds like white noise (a conglomerate of random frequencies).

An in tune piano generates sounds that are louder, clearer, and put out more energy than an out of tune piano. Pianos that sound well and effectively are more fun to play than those that do not. Remove the distortion from your piano by having it tuned and maintained regularly.

Written By Kestrel Curro BM

CURRO
PIANO SERVICE, LLC