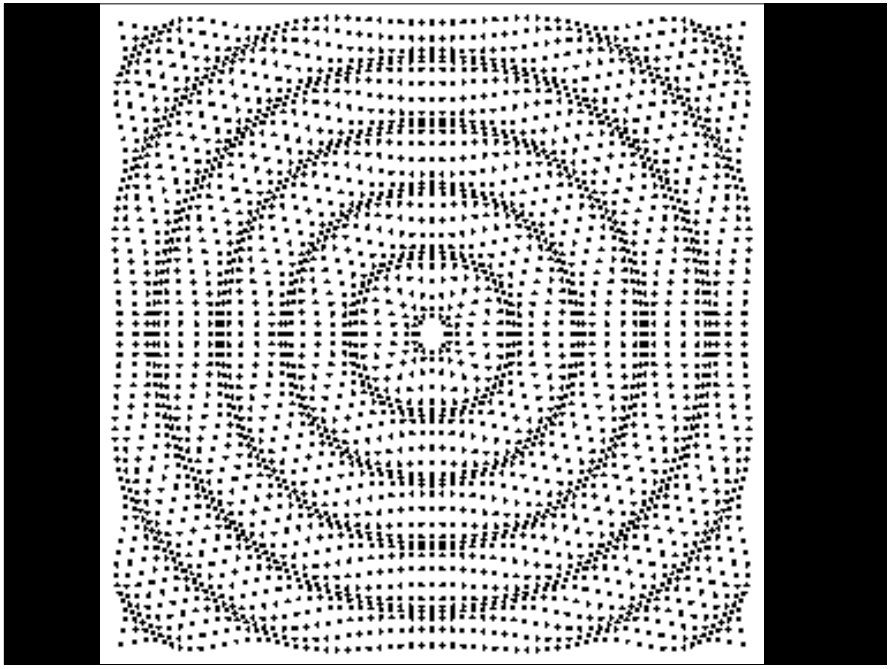
Introduction to Acoustics

1



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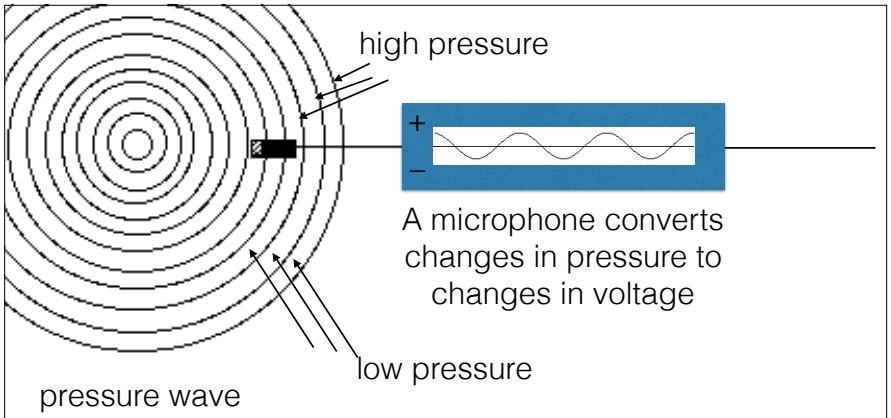

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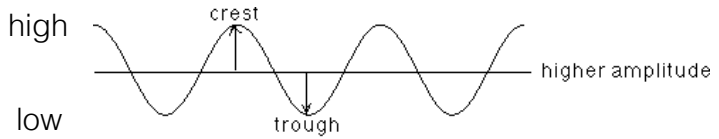
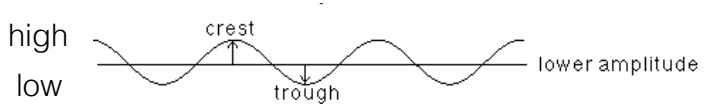
Amplitude

- The *amplitude* of a signal or sound is the maximum absolute value above or below the center line.





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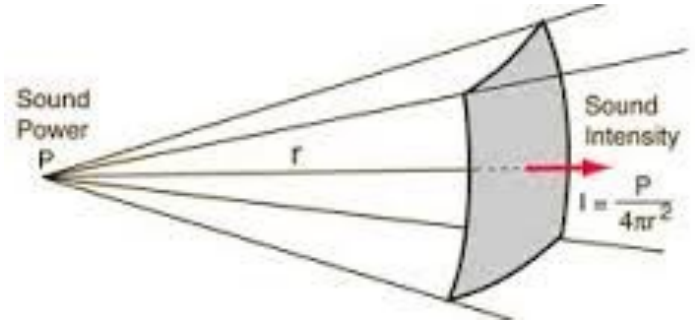
Intensity

- *Intensity* is the energy carried by the sound waves per unit area, measured in watts per square meter.



Decibels

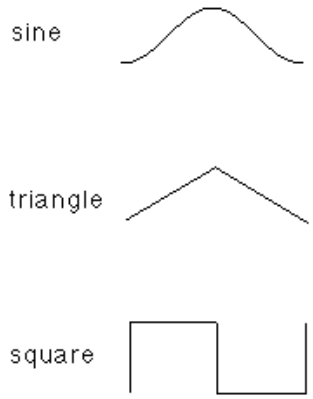
- Named in honor of Alexander Graham Bell
- A decibel = 1/10 of a bel.
- A *decibel* is a measurement used to compare the ratio of intensities of two acoustic signals.

- A decibel is a logarithmic measurement that can measure the tremendous range of sound intensities that the human ear can perceive.

Source	Power (watts/m^2)	dB SPL
Threshold of pain	10	130
Jet takeoff from 500 ft.	1	120
Medium-loud rock concert	.1	110
Circular saw	.01	100
New York subway	.001	90
Jack-hammer from 50 ft.	.0001	80
Vacuum cleaner from 10 ft.	.00001	70
Normal conversation	.000001	60
Light traffic from 100 ft.	.0000001	50
Soft conversation	.00000001	40
Whisper from 5 ft.	.000000001	30
Average household silence	.0000000001	20
Breathing	.00000000001	10
Threshold of hearing in young	.000000000001	0

Physics	Music
amplitude	dynamics

- The *waveform* of an signal is the shape of the alternations between high and low points over time.



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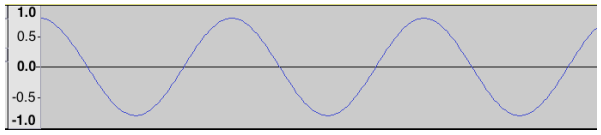
The graph shows changes in the amplitude of the signal over time

Amplitude



time

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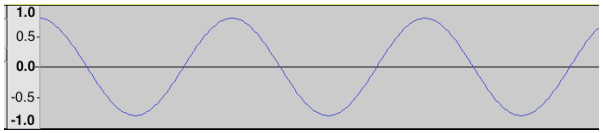
A *sine wave* has the simplest vibration pattern in nature and sounds like a single pure tone.



This signal is created by going through the wine wave vibration cycle 440 times a second

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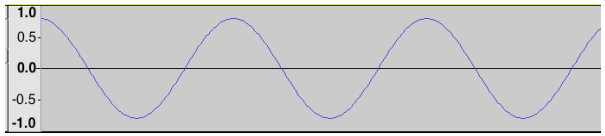

This signal is created by going through the wine wave vibration cycle 440 times a second

The *frequency* of a signal is the number of cycles in one second. We can say that this signal has a frequency of 440 cycles per second.

We use Hertz (Hz) as the unit for cycles per second. We can say that this signal has a frequency of 440 Hz.

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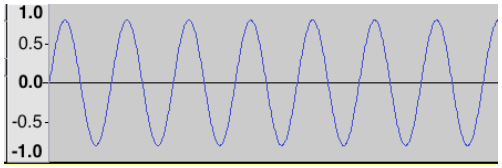
- The frequency of this sine wave has increased to 880 Hz. Doubling the frequency of a wave makes the pitch go up an octave.



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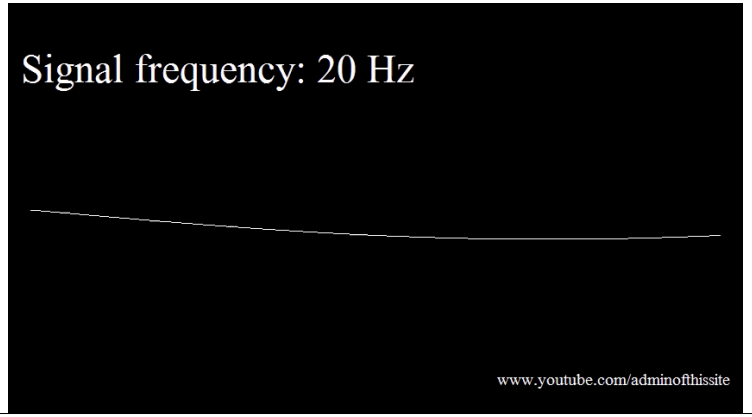
Range of Human Hearing

About 20 Hz to 20 kHz



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Physics	Music
frequency	pitch

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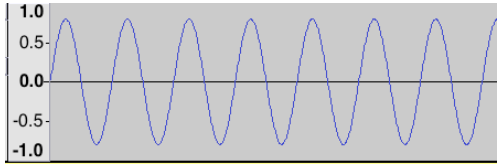
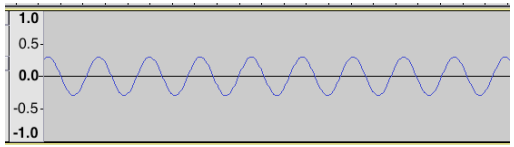
- The amplitude of the sine wave on the bottom has been reduced.





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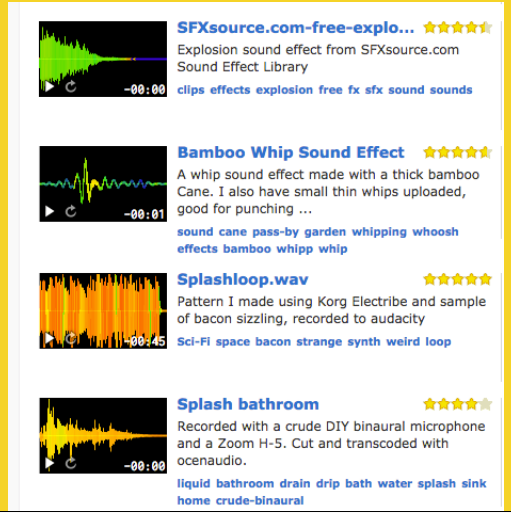
freesound.org



Work left on the lab computers is erased each time the computer is restarted.

Develop a system for how to store and name your files.

Rule of 3-2-1 for Backups

Have 3 copies
in 2 different formats
with at least 1 being offsite

ballstate.box.com

Create a new folder called “MUST121”

Inside that create two new folders:
1) “work”
2) “portfolio”

This is where you save copies of your work between lab session. You may also want to use a USB flash drive.