Soundwaves and Acoustic Levitation

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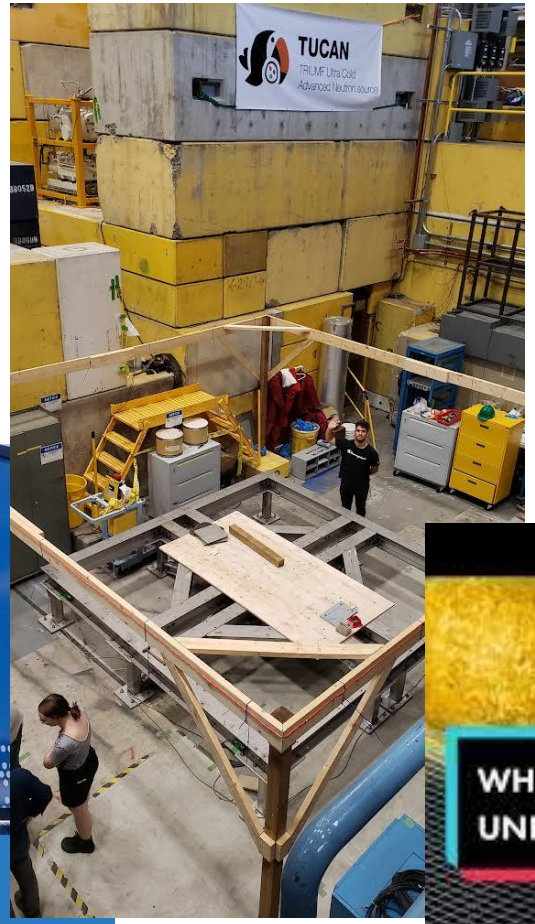
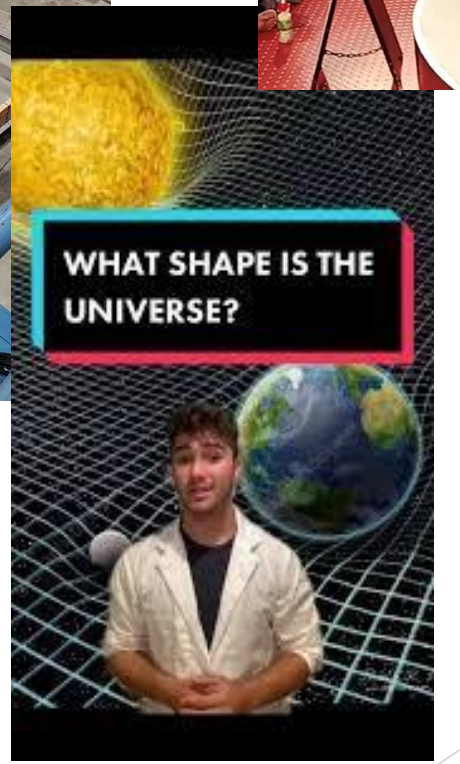
HONOURS PHYSICS

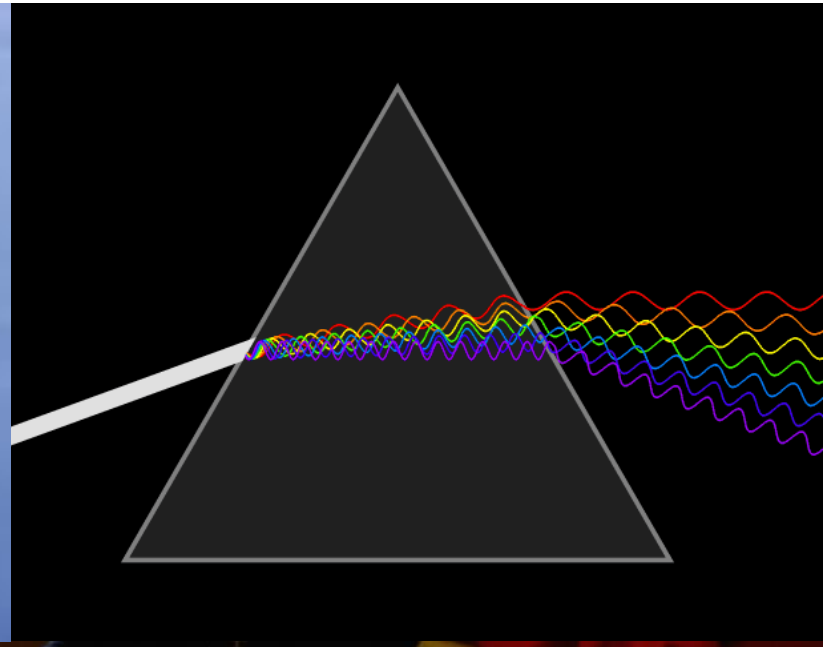

TUCAN

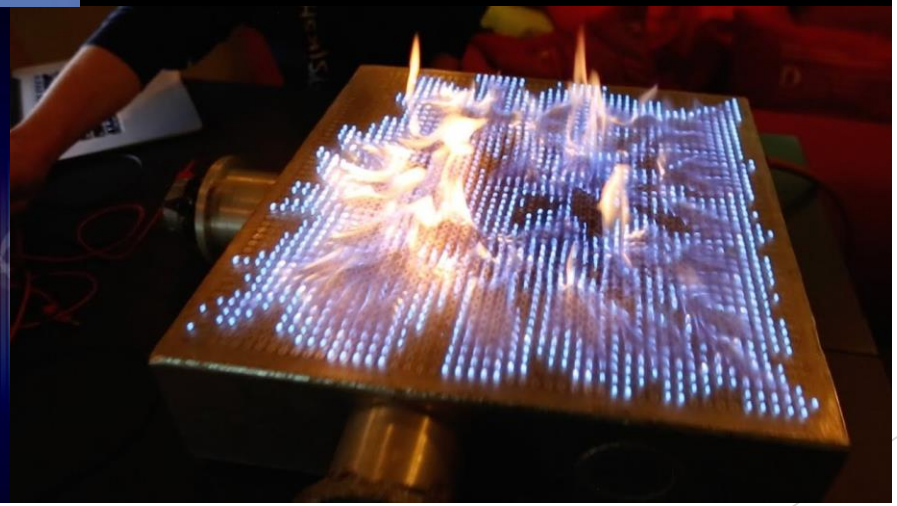

WHAT SHAPE IS THE UNIVERSE?

Outline:

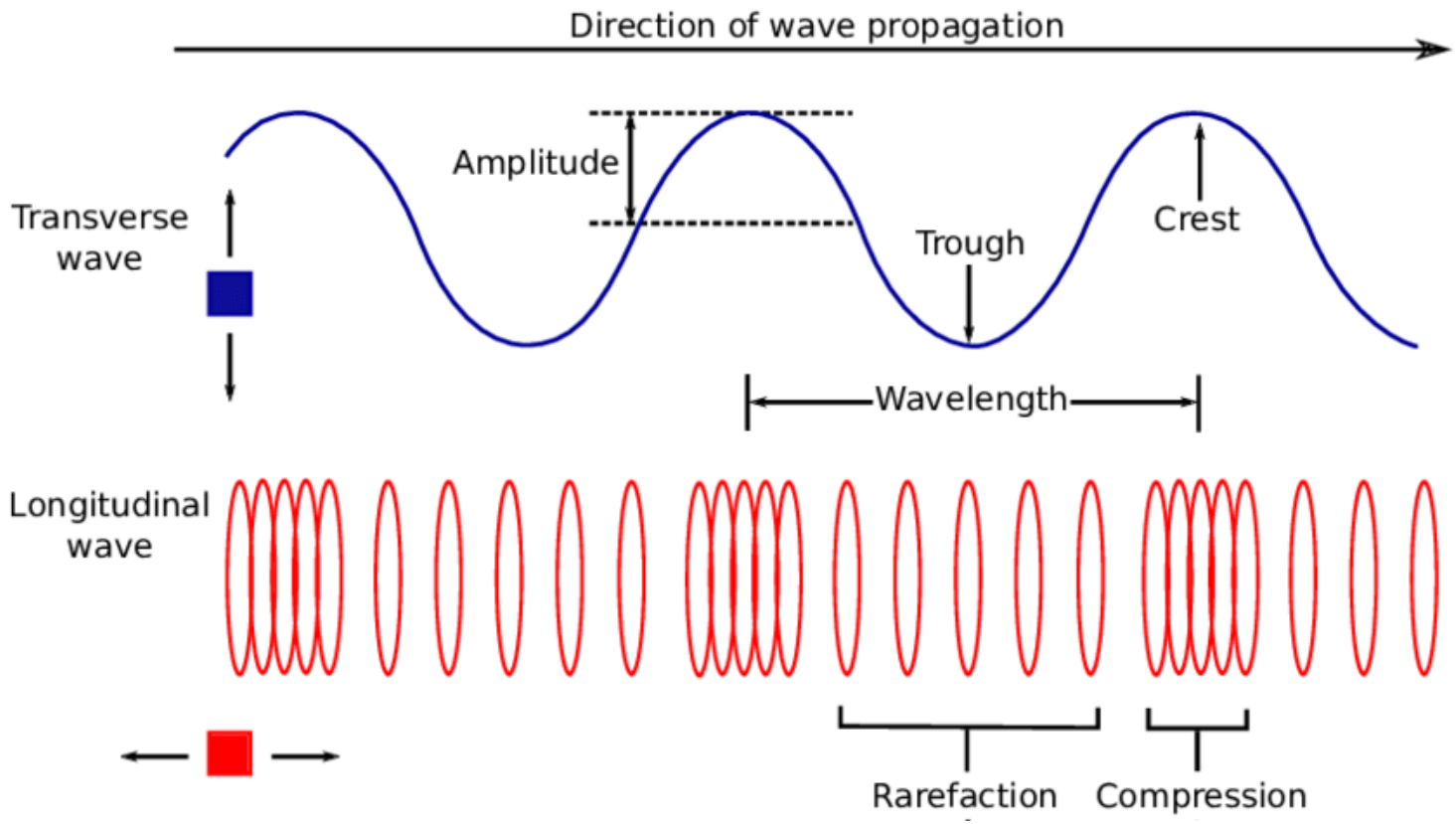
- Wave Interference
- Standing Waves
- Acoustic Levitation
- TinyLev

Waves:

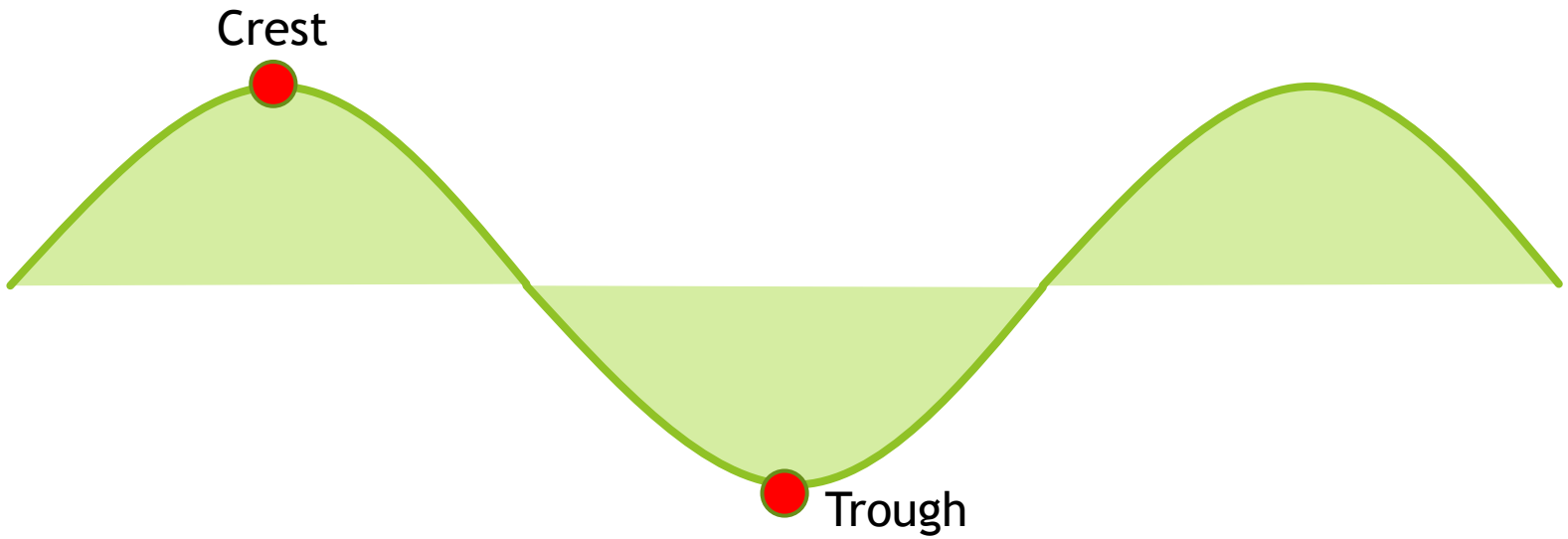




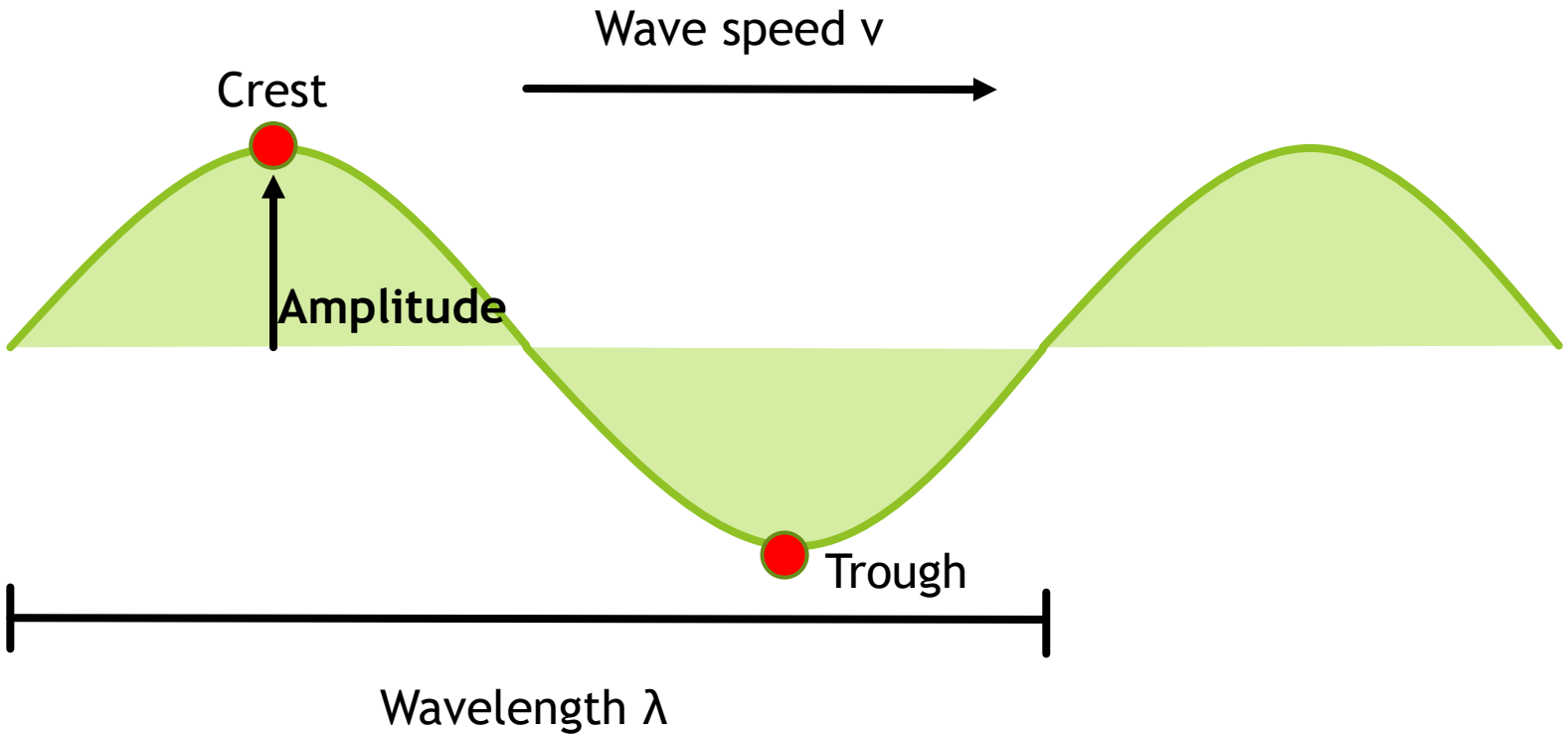
There are two types of waves in physics:



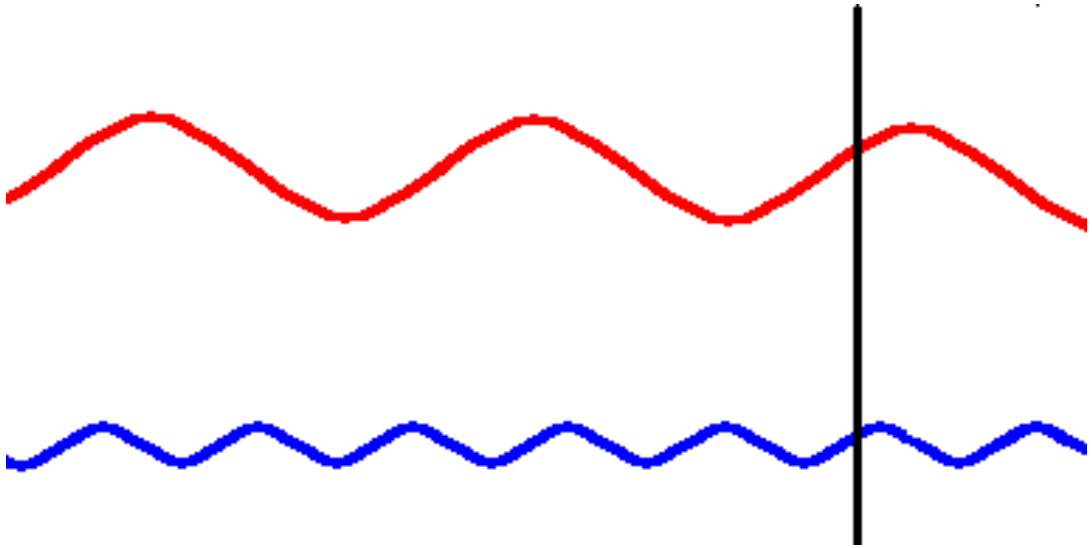
Transverse Waves Characteristics:



Transverse Waves Characteristics:



Frequency



Definition: The number of wavelengths that pass by a certain point in a sec [1/s].

1 /s = 1 Hz

So How Do We Calculate Frequency?

Well we have…

- Wavelength
- Wave speed
- Amplitude

And we want to get Frequency

So How Do We Calculate Frequency?

Well we have…

- Wavelength [m]
- Wave speed [m/s]
- Amplitude [Depends on the type of wave, but tends to be ‘m’]

And we want to get Frequency [1/s]

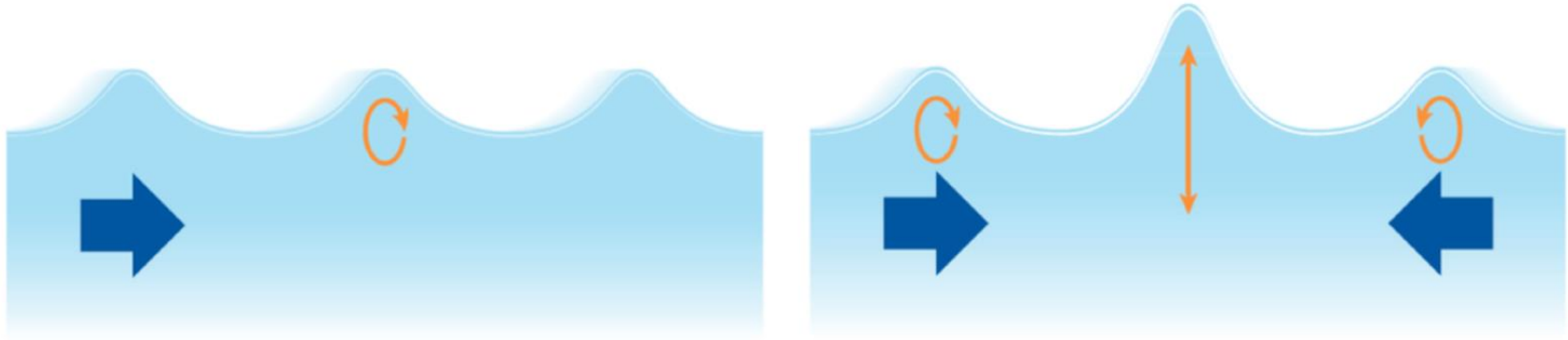
Dimensional Analysis

$f = \frac{v}{\lambda}$, $[1/s] = \frac{[\frac{m}{s}]}{m}$

So…

How do we get a waves period which is the time in seconds it takes for one full wavelength to pass?

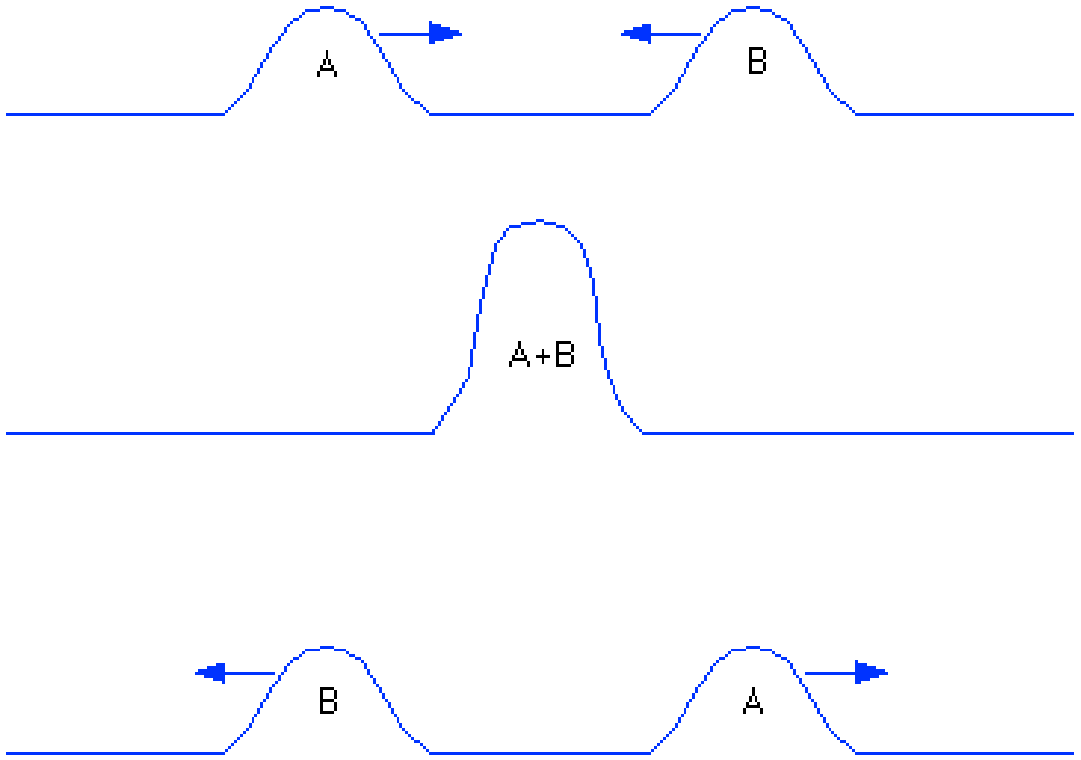
Wave Interference:



Wavelength, Frequency, and Amplitude can all be considered conserved quantities. If energy must be conserved in a system when two waves come in contact with each other, then so must these quantities.

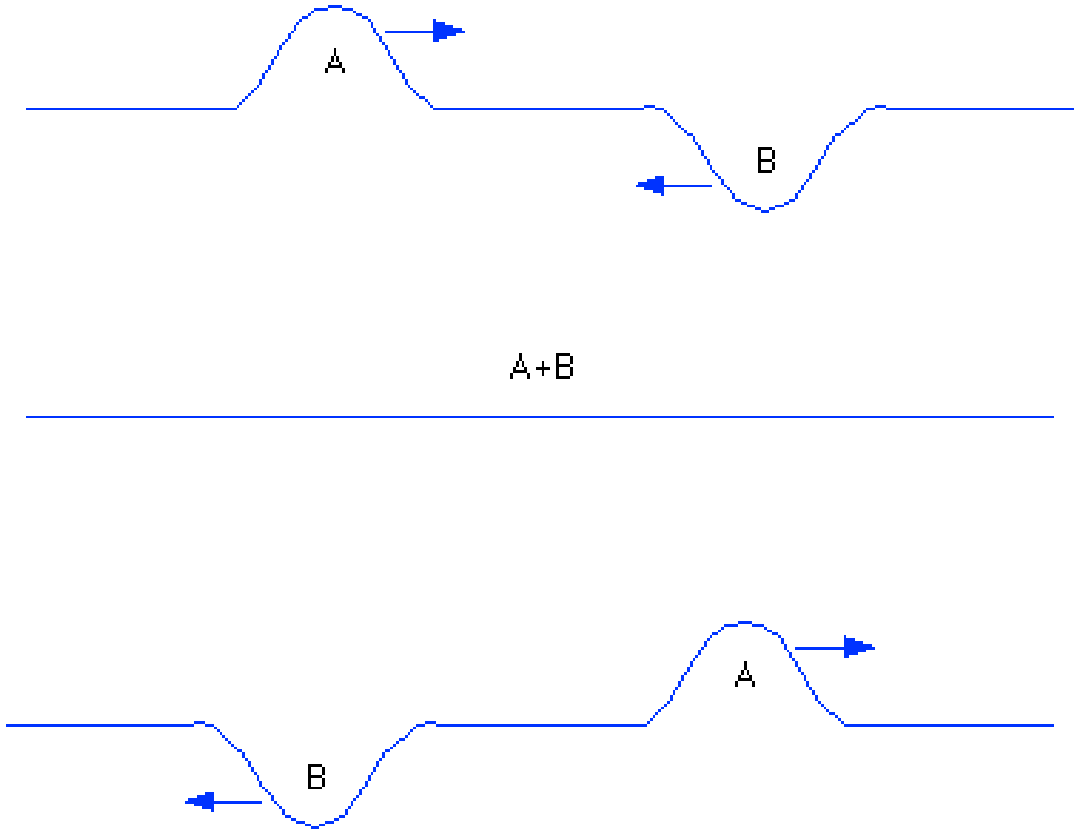
Constructive Interference

When two or more waves interfere to create a wave with a greater amplitude.



Destructive Interference

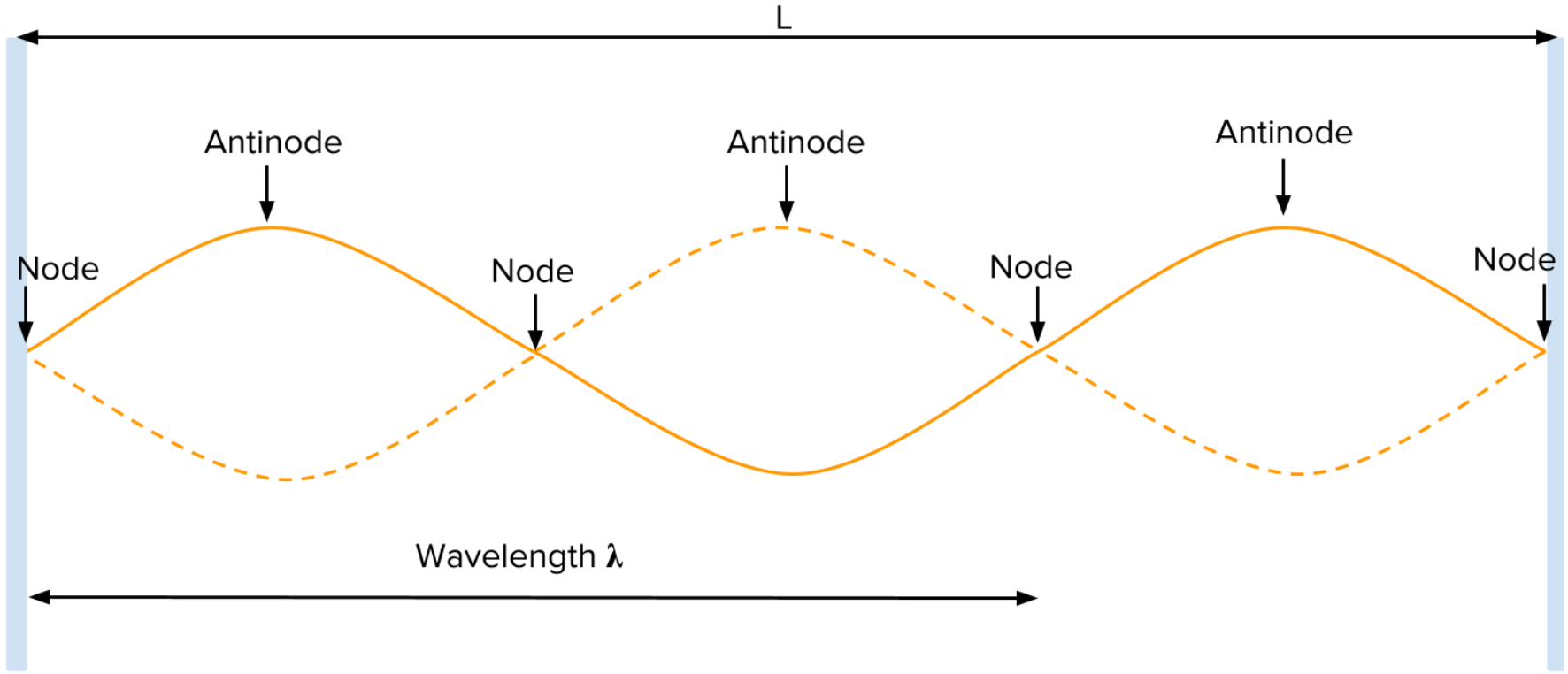
When two or more waves interfere to create a wave with a smaller amplitude.



Wave Interference Simulation

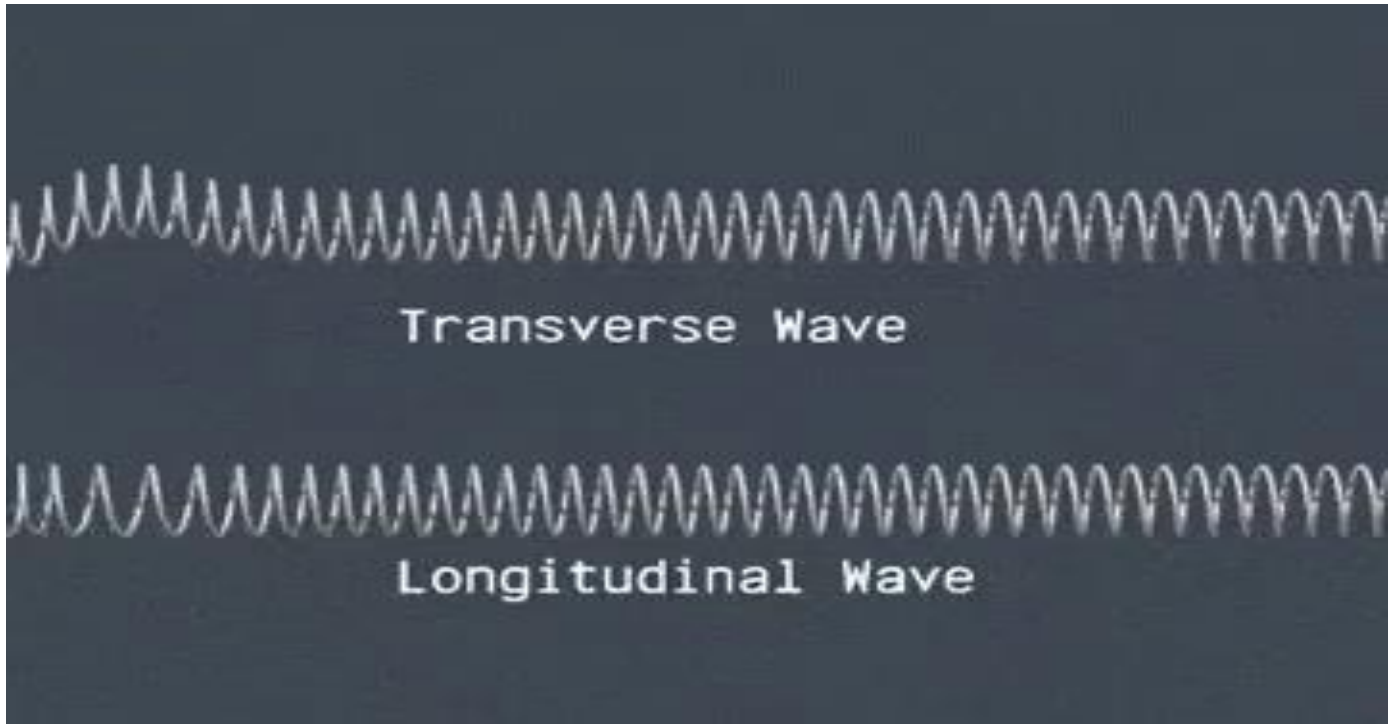
https://www.physicsclassroom.com/Physics-Interactives/Waves-and-Sound/Wave-Addition/Wave-Addition-Interactive

Standing Wave Interference

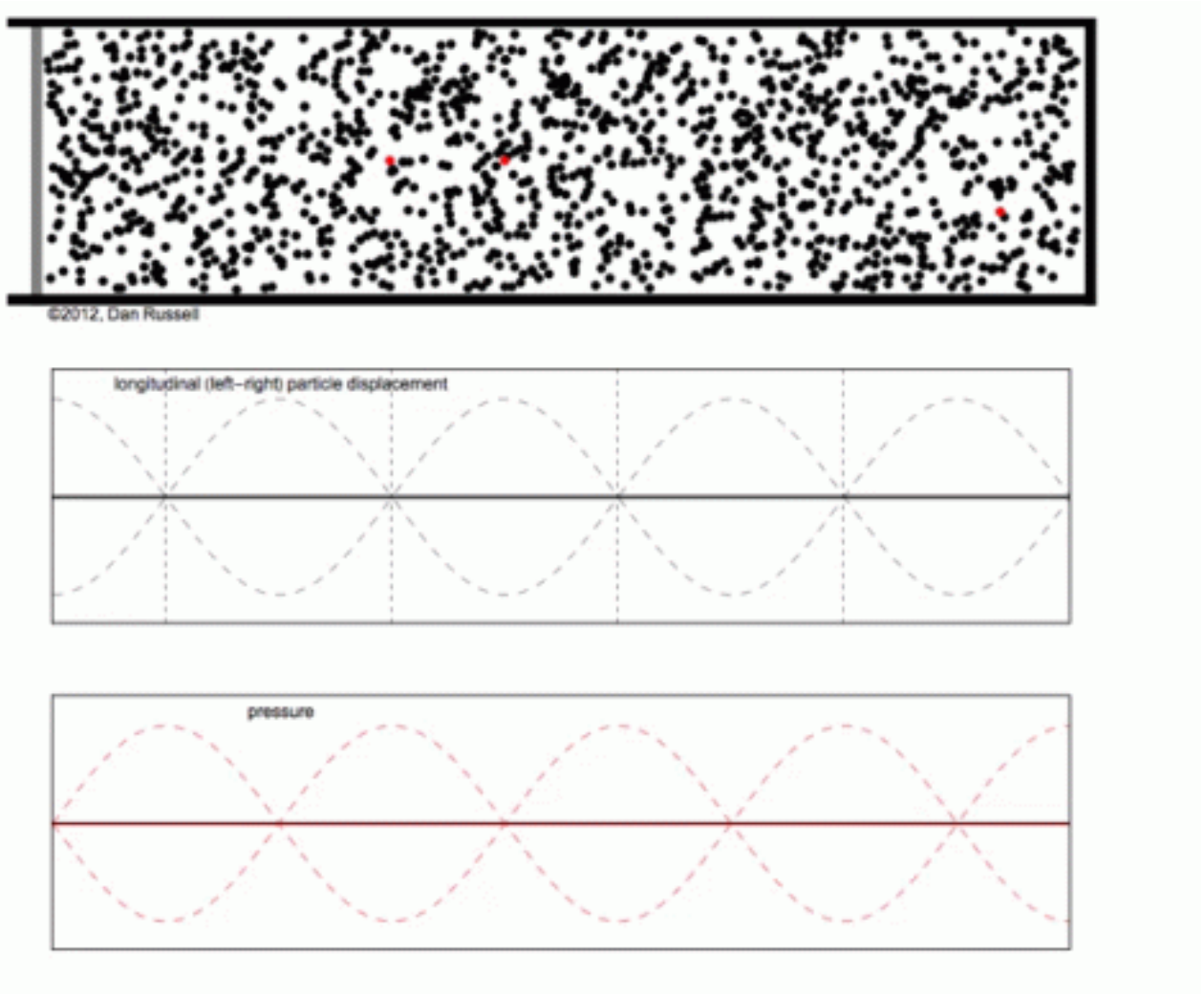


Rope Demo

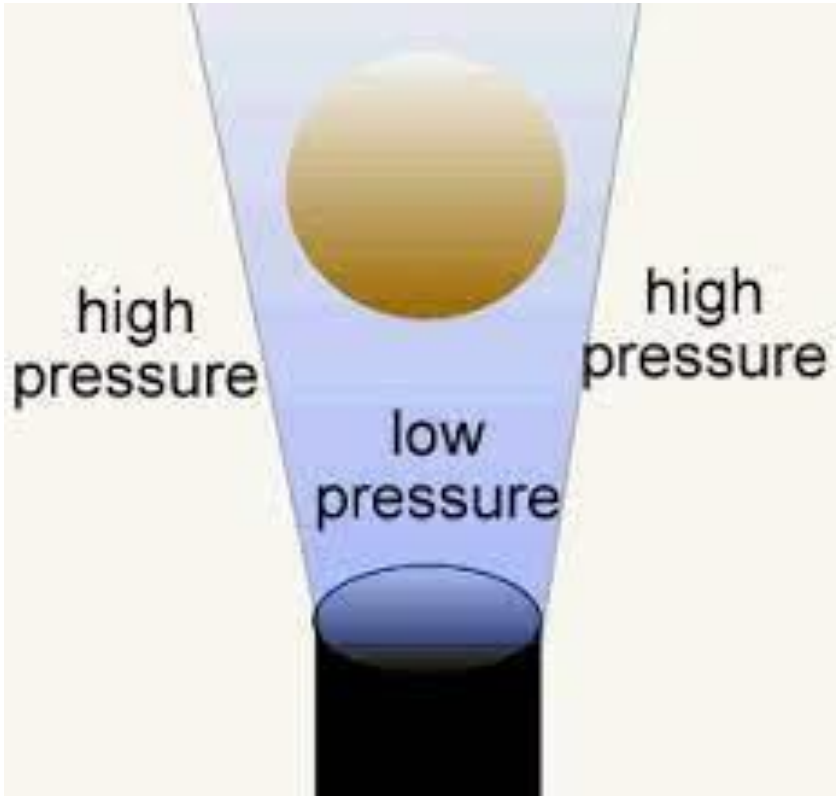
Standing Wave in Longitudinal



Standing Wave in Air



Objects tend to volumes of Low Pressure



Acoustic Levitation