

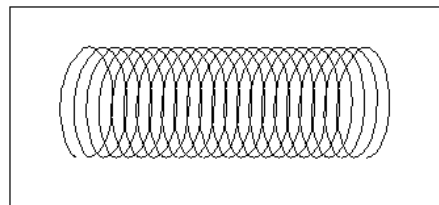
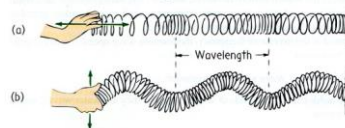
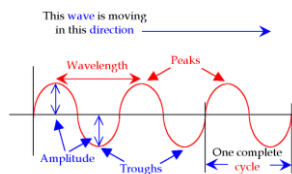
# Physical Science

## Chapter 7

### Characteristics of Waves

#### What are waves?

- **Wave** – a disturbance that transfers energy from place to place.
- **Medium** – the material thru which a wave passes
- Waves travel through the medium without actually moving the medium with it.



## Types of Waves:

- **Transverse Waves:** waves that move the medium at right angles to the direction in which the waves are traveling.
- **Longitudinal Waves:** move particles parallel to the direction the wave is moving, “push-pull” waves.

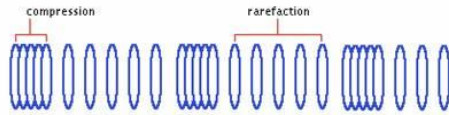


Figure 1: Longitudinal Wave

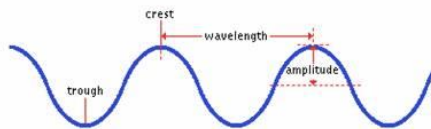
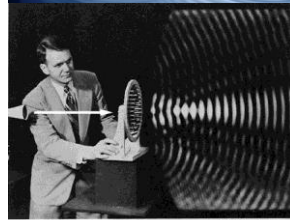


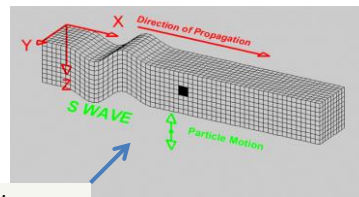
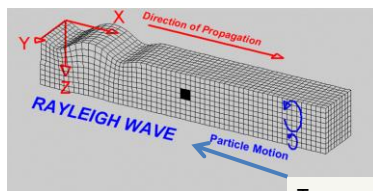
Figure 2: Transverse Wave

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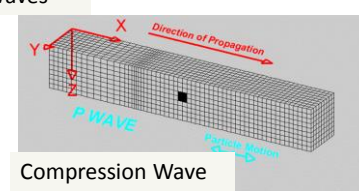
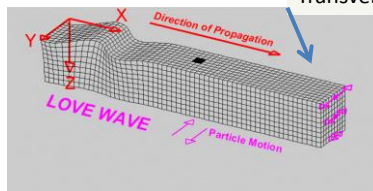


## Wave Particle Movement

- Waves travel through the medium without actually moving the medium with it. Basically the medium stays put while the wave moves some distance



Transverse Waves



Compression Wave

## Properties of Waves

- **Amplitude** – in a transverse wave – the height away from the “rest” position. The amplitude in a longitudinal wave is the measure of how compressed or rarefied the medium becomes.
- **Wavelength** – the distance between two corresponding parts of a wave.
- **Frequency** – the number of complete waves that pass a given point in a certain period of time. Frequency is measured in **HERTZ**, one **Hz** is a wave that occurs once every second.

## Speed Frequency & Wavelength

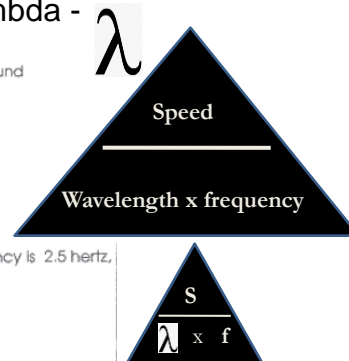
- **Speed** (meters/sec)= wavelength x frequency
- **Frequency** (Hz = 1/sec)= speed / Wavelength
- **Wavelength** (meters) = speed / Frequency  
– Designated by Greek letter lambda -  $\lambda$

A tuning fork has a frequency of 280 hertz, and the wavelength of the sound produced is 1.5 meters. Calculate the velocity of the wave.

$$S = \lambda \times f = 1.5 \text{ m} \times 280 \text{ Hz} = 420 \text{ m/s}$$

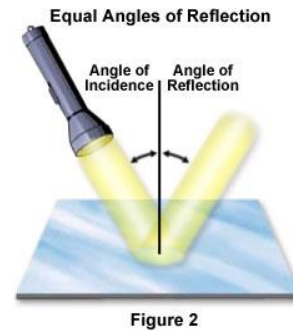
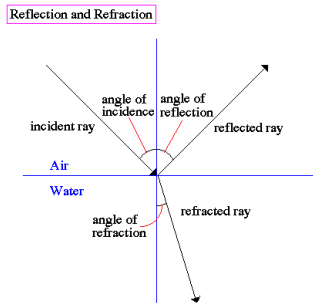
A wave is moving toward shore with a velocity of 5.0 m/s. If its frequency is 2.5 hertz, what is its wavelength?

$$\lambda = S / f \quad \lambda = 5.0 \text{ m/s} / 2.5 \text{ Hz} \quad \lambda = 2 \text{ m}$$



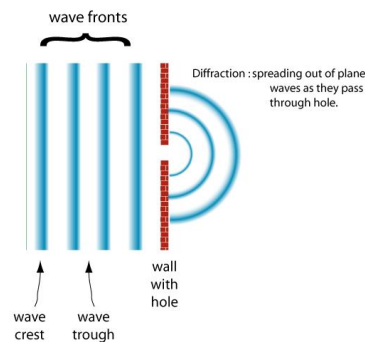
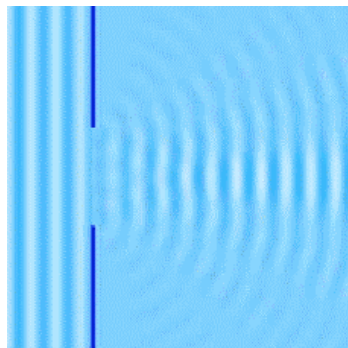
## Interactions of Waves

- **Refraction** – The bending of a wave due to the wave moving from one type of medium into another.
- **Reflection** – Bounce back wave
  - **Angle of Incidence** is the angle of the wave coming into the object reflecting the wave.
  - **Angle of Reflection** is the angle bouncing off and going away from the object.



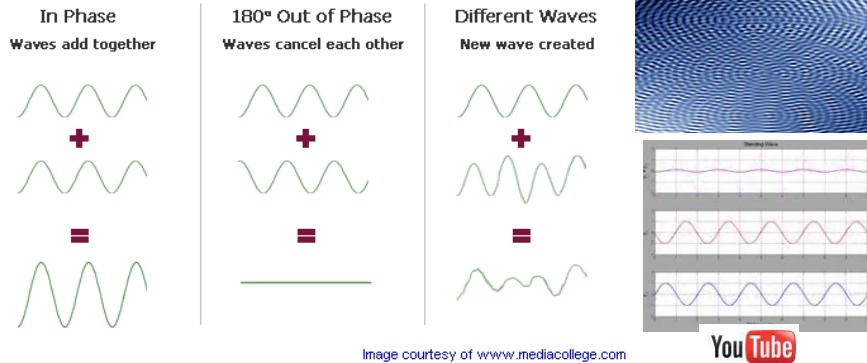
## Interactions of Waves

- **Diffraction** – Wave passing a barrier or going through a hole in a barrier bends and causes the wave to wrap around the barrier



## Interactions of Waves

- **Interference** – when two or more waves meet, they interact. This interaction is called interference.
  - 1. **Constructive Interference** – the combining of waves to cause higher amplitude of any of the original waves.
  - 2. **Destructive Interference** – when the combining of the waves produce a new wave with a smaller amplitude than the beginning waves



## Standing Waves

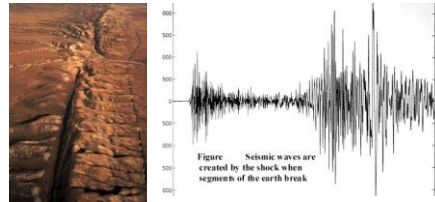
- **Standing Waves** – the combining of the incoming and reflected wave so that the resultant appears to be standing still
- **Node** – the point where Constructive Interference and Destructive Interference cause an amplitude of zero on the standing wave.
- **Antinode** – the point where Constructive Interference and Destructive Interference of a standing wave are represented by the crest and the trough.
- **Resonance** – the point where vibrations traveling thru and object matches the natural vibrations of an object. I.e. an opera singer hitting a note and shattering a crystal glass.



YouTube

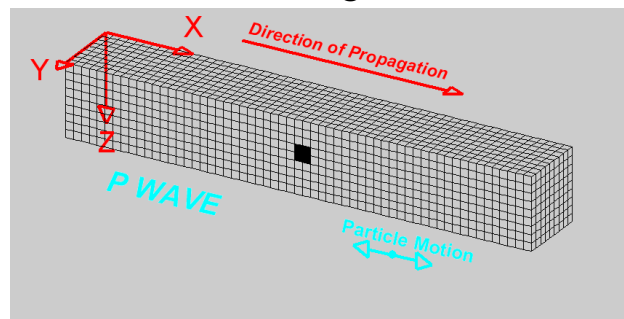
## Seismic Waves

- Seismic Waves – waves caused by the release of energy due to earthquakes composed of
  - P - primary waves
  - S - secondary waves
  - L - surface waves



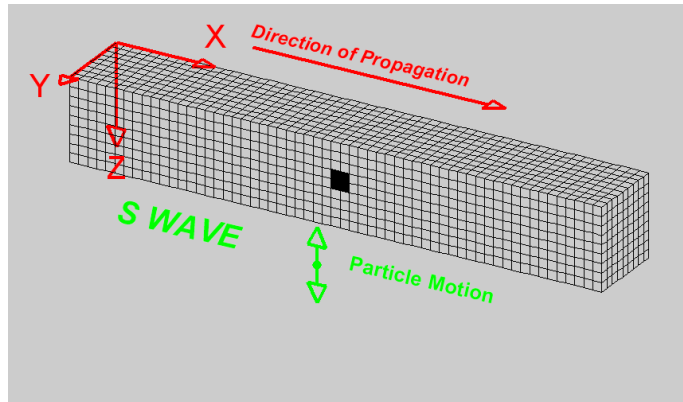
## P Waves

- **P waves** -- Primary waves are pressure waves & are the fastest moving waves, they travel thru solids and liquids, Push-Pull Waves AKA Longitudinal waves



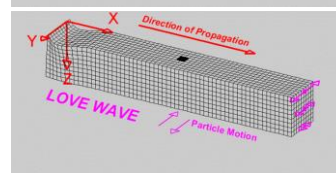
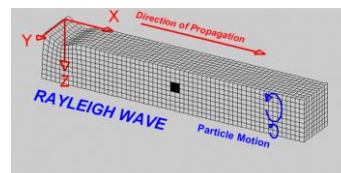
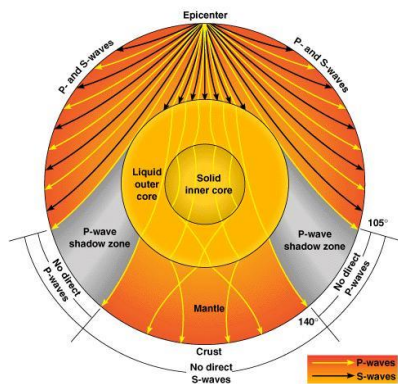
## S Waves

- **S Waves** – Secondary Waves are slower than primary waves, they cannot travel thru liquid and are Transverse Waves.



## L Waves

- L Waves (last waves) Surface wave – the combination on the Earth's surface of Primary and Secondary waves.
  - The rolling chaotic movement of the surface
  - Cause the most damage of the seismic waves



All Done... No mas...  
No more on "waves"  
Keep an eye out for the next  
slide show on  
"Sound"  
Chapter 8  
TTFN