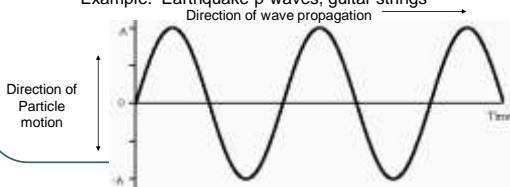


Mechanical Waves

- **What is a wave?**
 - A rhythmic disturbance that allows energy to be transferred through matter because of the motion of and interactions between the particles in the matter
 - The **Medium** is the general term for the actual matter through which the wave is traveling.
 - **Wave Propagation** – the term given when describing the transfer of energy through a medium

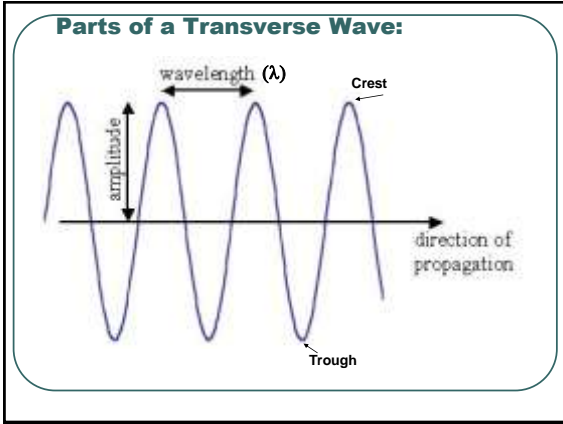
Mechanical Waves

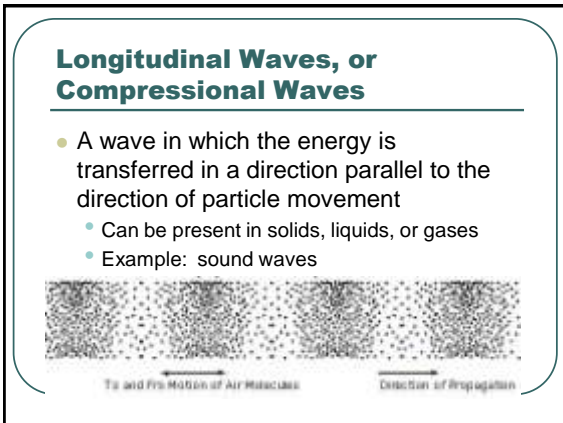
- **Transverse Waves:**
 - A wave in which the energy is transferred in a direction perpendicular to the direction of particle movement
 - Can be found typically only in solids
 - Example: Earthquake p-waves, guitar strings

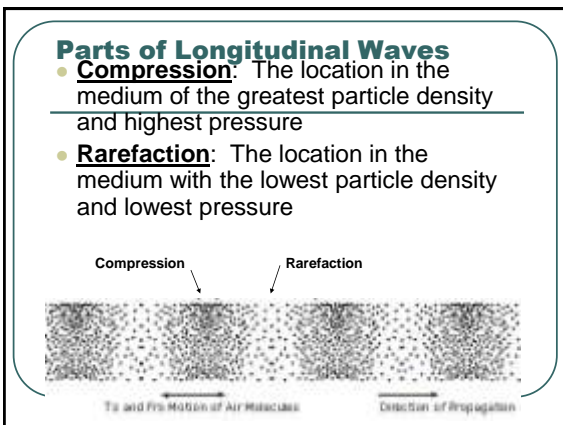


Parts of a Transverse Wave:

- **Amplitude:** the maximum displacement of a particle in the medium from its rest position
- **Trough:** The point in a wave cycle where the medium has reached the maximum displacement **BELOW** the rest position (max. displacement in the negative direction)
- **Crest:** The point in a wave cycle where the medium has reached the maximum displacement **ABOVE** the rest position (max. displacement in the positive direction)
- **Wavelength:**
 - The distance that energy moves forward in the time it takes a particle in the medium to oscillate one complete cycle.
 - The distance from one point on a wave to the same point on the next wave (i.e. the distance from crest to crest...)

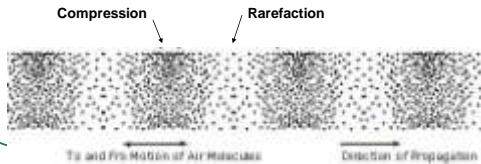






Parts of Longitudinal Waves

- The wavelength of a longitudinal wave is typically measured from the beginning of one compression to the beginning of the next (or center to center)



Surface Waves

- Waves that have characteristics of both transverse and longitudinal waves
- Medium particles move both parallel to and perpendicular to wave propagation
 - Resulting path of particles' motion is circular



Quantitative Wave Characteristics

- **Wave Frequency:** (f)
 - The number of complete wave cycles that pass by a point every second
 - Units = **Hertz (Hz)** = 1 (1/sec) = 1 sec⁻¹
- **Period:** (T)
 - The amount of time that it takes for one complete wave cycle to pass by a point
 - Units = **Seconds (s)**
- By definition, the frequency and the period of a wave are the inverse of each other:

$$f = 1/T$$

Wave Speed

- Speed of a wave will be constant in a given medium, so...

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

- For waves:

- Distance = wavelength

- Time = period

$$\text{Speed} = \frac{\text{wavelength}}{\text{period}}$$

$$\mathbf{V = \lambda / T}$$

or

$$\mathbf{V = f\lambda}$$
