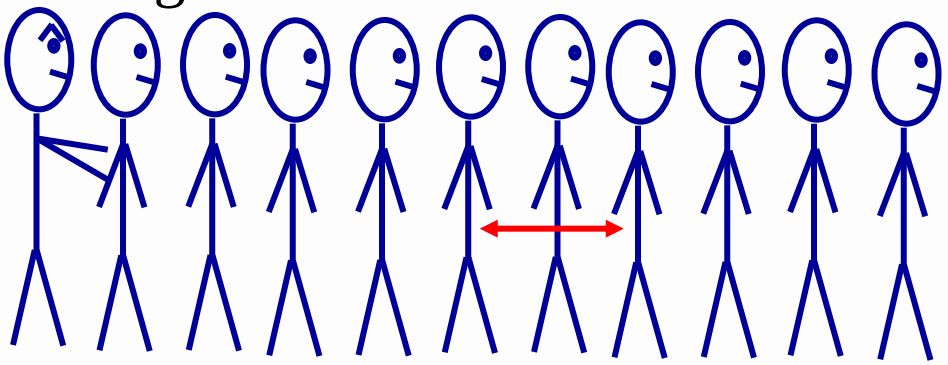
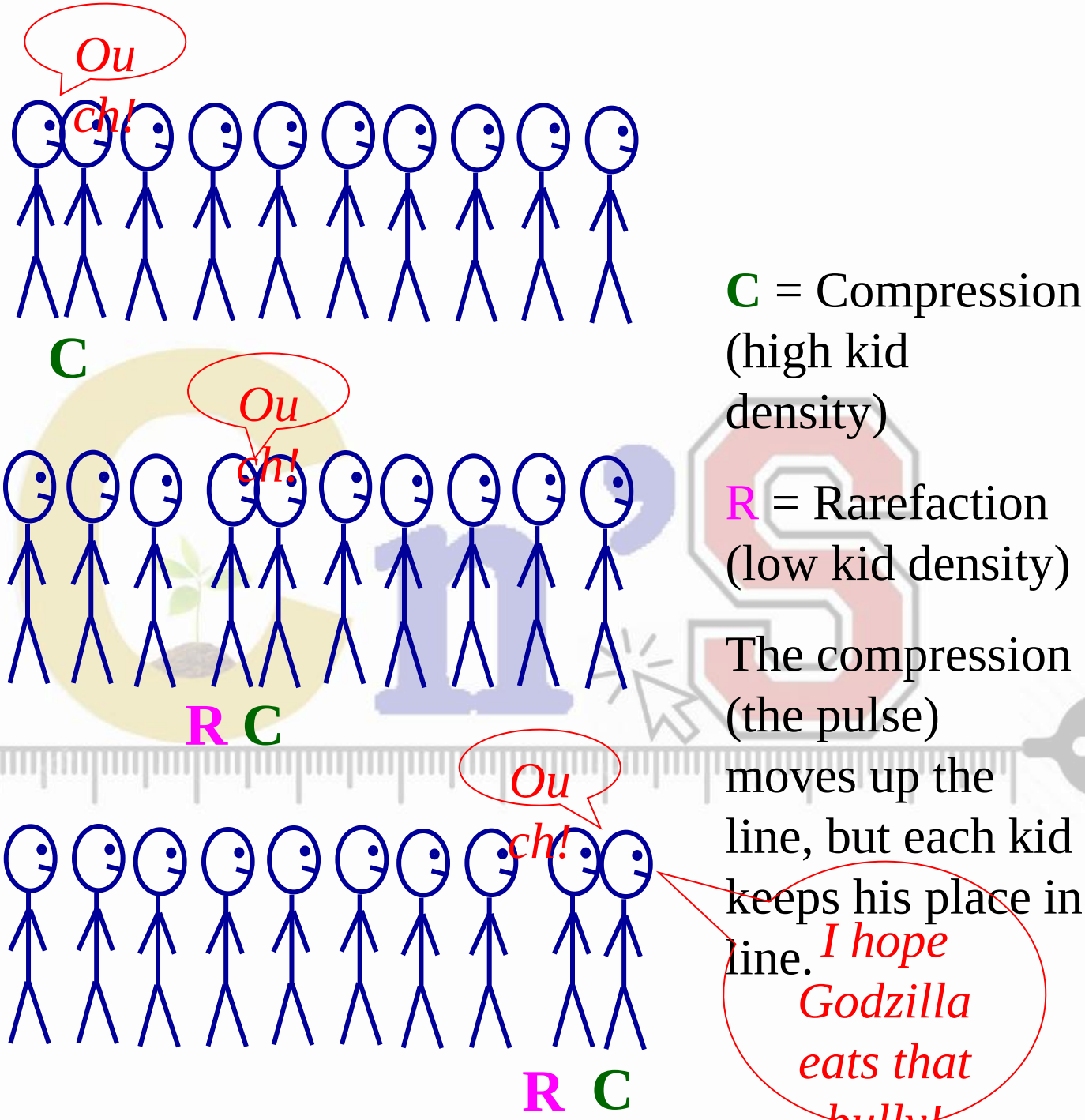
The domino fall is like a longitudinal wave

Longitudinal Waves

Longitudinal Waves

A whole bunch of kids are waiting in line to get their picture taken with Godzilla. The bully (tormentor) in back pushes the kid in front of him, who bumps into the next kid, and so on down the line. A longitudinal pulse is sent through the line of kids. It's longitudinal because as each kid gets bumped, he moves forwards, then backwards (red arrow), parallel to the direction of the p
location of the pulse is the point where
being compressed together. The next s
how the pulse progresses
through the line.





C = Compression (high kid density)

R = Rarefaction (low kid density)

The compression (the pulse) moves up the line, but each kid keeps his place in line.

Sound is a Longitudinal Wave

As sound travels through air, water, a solid, etc., the molecules of the medium move back and forth in the direction of the wave, just like the kids in the last example, except the molecules continually move back and forth for as long as the sound persists. If the bully kept shoving (pushing) the kid at

last, he kept shoving (pushing) the kid at. If he shoved with equal force each time and did this at a regular rate, we would call these pulses a wave. Similarly, when a speaker or a tuning fork vibrates, it repeatedly shoves the air in front of it, and a longitudinal wave propagates through to the air. The speaker shoves air molecules; the bully shoves people. In either case, the components of the medium

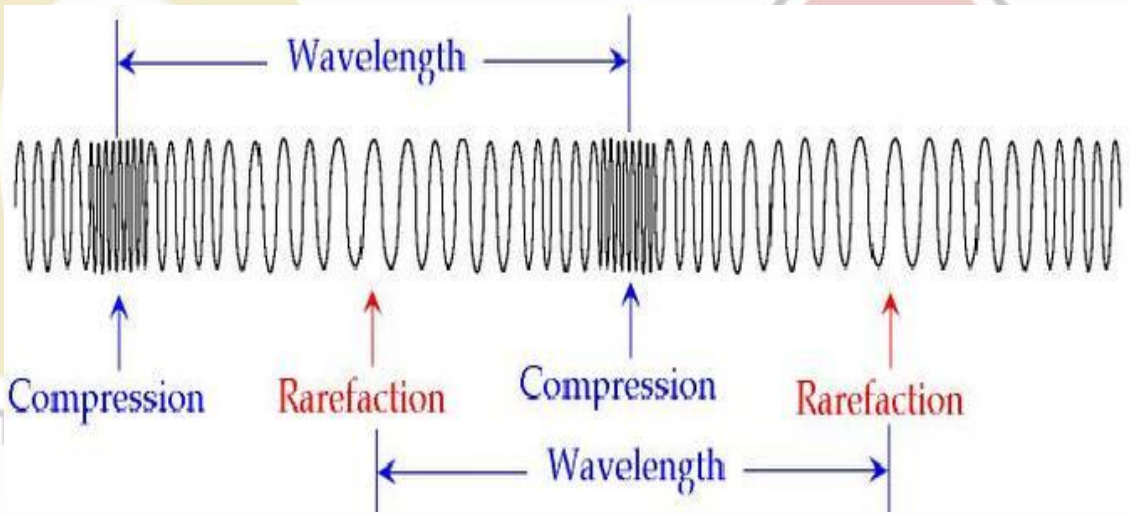
Pulses vs. Periodic Waves

- **Pulse -** one single propagating oscillation.

- **Periodic Wave –** successive os

Longitudinal Waves

- **Longitudinal waves –** particle motion is parallel to the direction of wave propagation.



- **Compression –** Area of high density/pressure.
- **Rarefaction –** Area of low density/pressure

Longitudinal wave

Source moves left and right

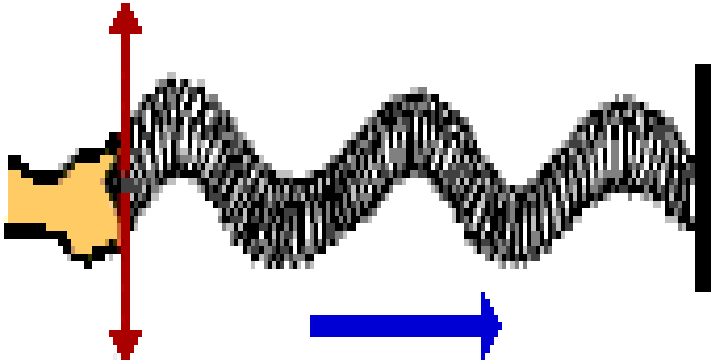
Coils move left and right

Energy Transport

Transverse Wave

Source moves up and down

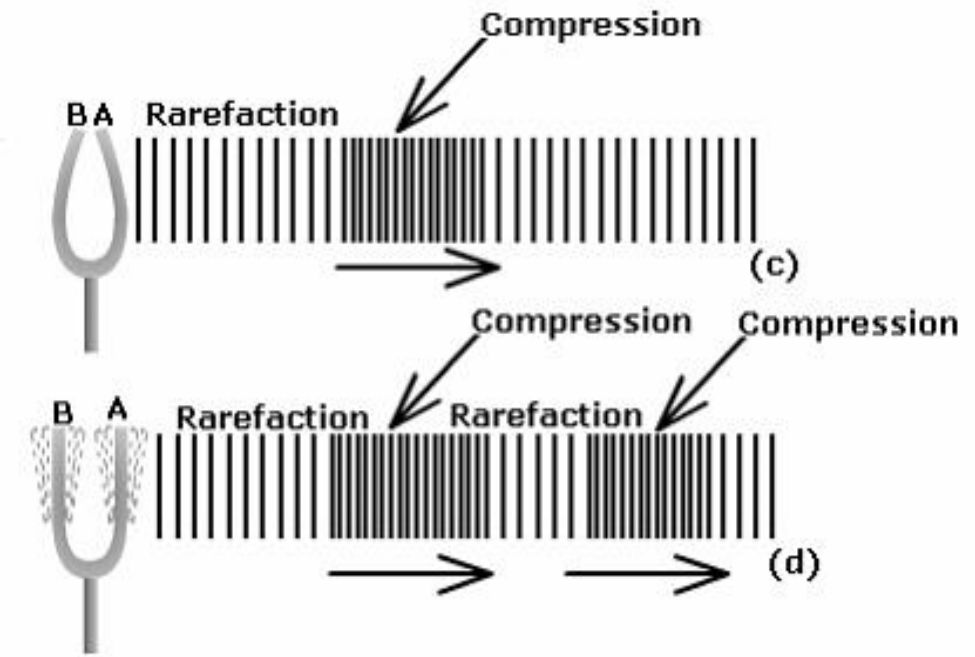
Coils move up and down



Energy Transport

The subsequent direction of motion of individual particles of a medium is the same as the direction of vibration of the source of the disturbance.

Longitudinal wave



Examples

- Sound waves in a solid, liquid or gas.
- Compression waves on a spring.
- Seismic waves.

Compression and Rarefaction

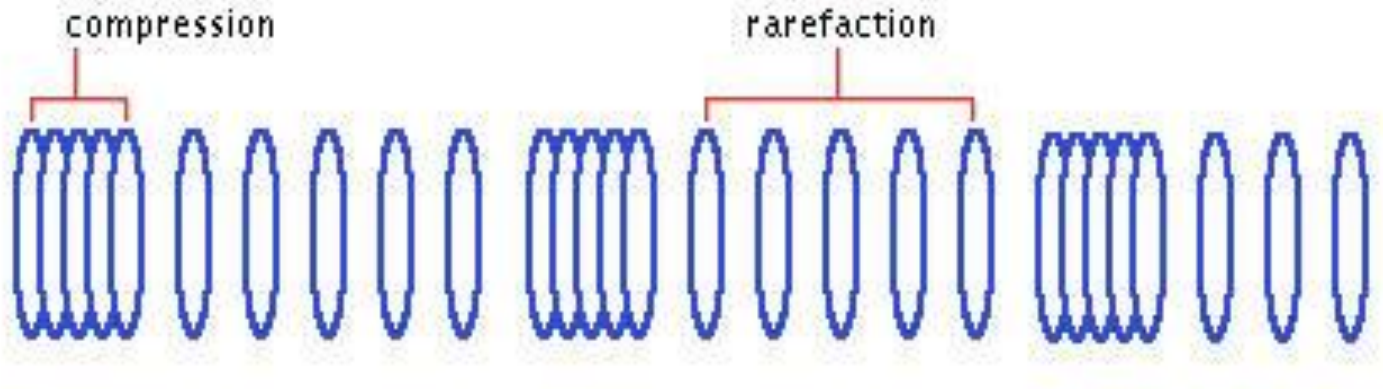


Figure 1: Longitudinal Wave

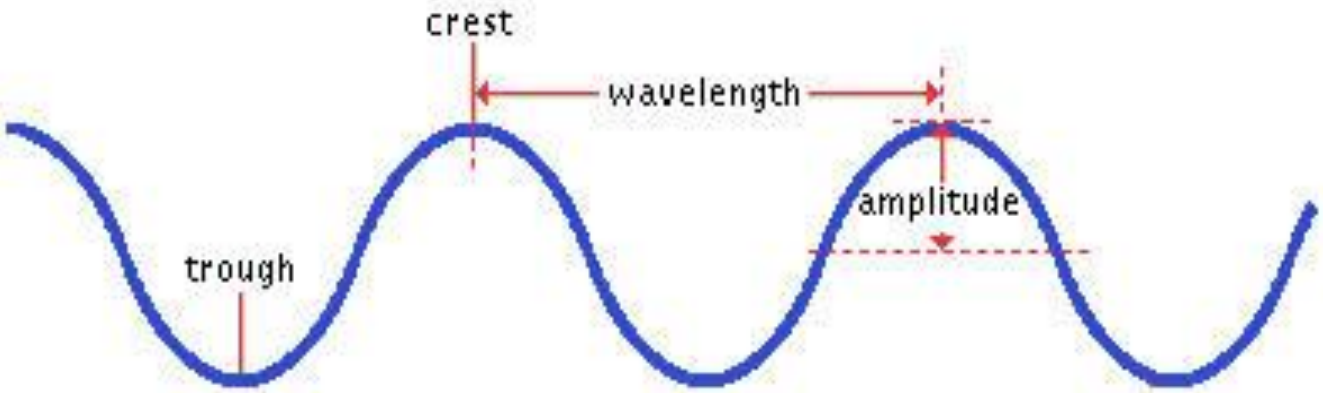
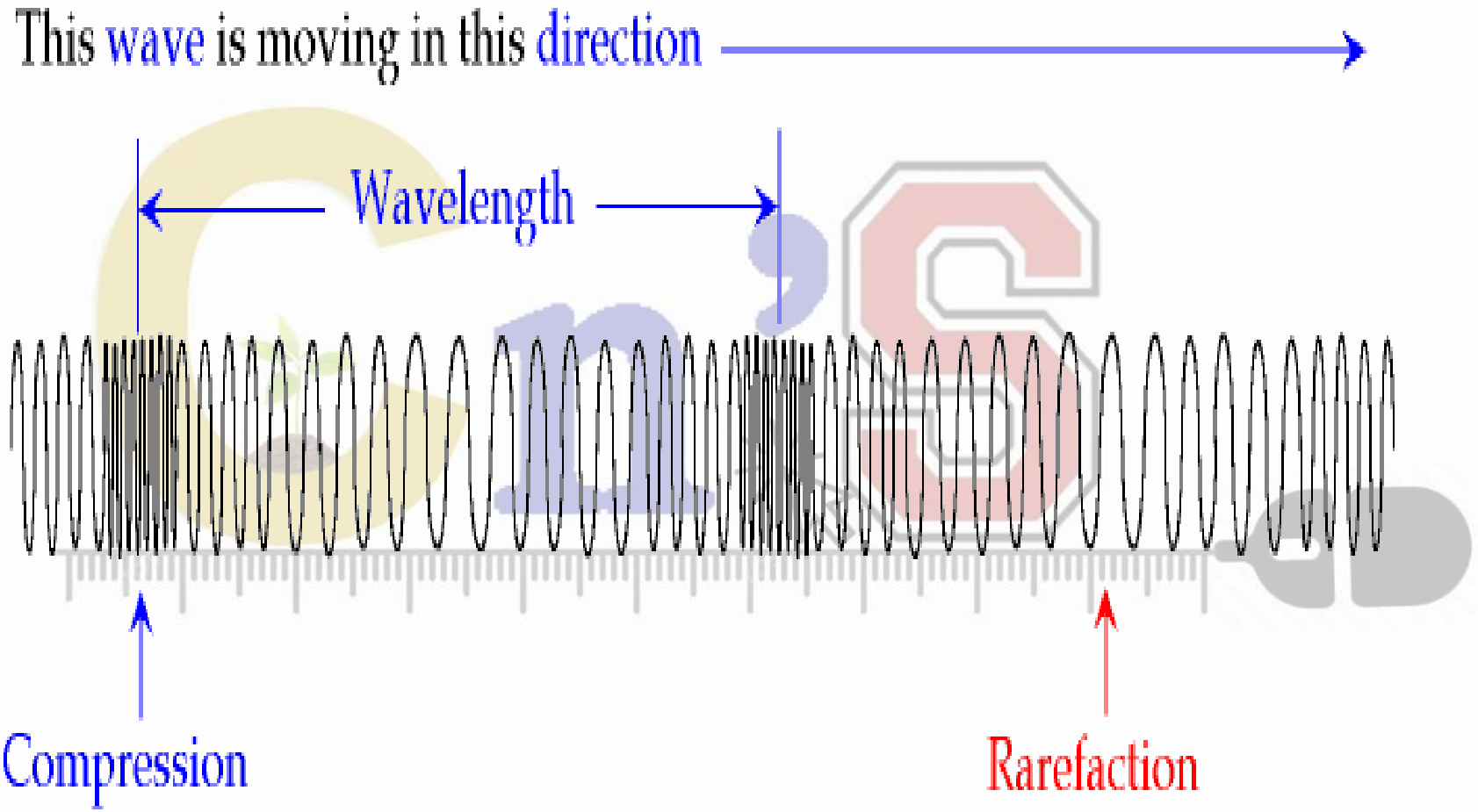


Figure 2: Transverse Wave


This wave is moving in this direction
Wavelength
Compression
Rarefaction

Q . What features do longitudinal waves have in common with transverse waves

- Both are mechanical waves.
- Particles oscillate about their mean position in both types of waves.
- Both transport energy from one place to another.
- Both satisfy the equation:

Q . Is it possible for two identical waves travelling in the same direction along a string to give rise to stationary waves?

- No, it is not possible for two identical waves travelling in the same direction along a string to give rise to stationary waves. For stationary waves, two identical waves must travel in opposite direction.

Q; When both transverse and longitudinal waves are present (such as s and p seismic waves in the Earth), the longitudinal wave usually travels faster.

If the longitudinal wave travels about twice as fast as the transverse wave of the same frequency, how are their wavelengths related?

A. Longitudinal wavelength twice as long
B. Longitudinal wavelength half as long
C. Both same.

Q. What features do longitudinal waves have in common with transverse waves?

Ans. Following features are common in transverse and longitudinal waves:

- Both are mechanical waves.
- Particles oscillate about their mean position in both types of waves.
- Both transport energy from one place to another.
- Both satisfy the equation: $v = f\lambda$

Water waves are

- Upper particles move in circles = Surface waves are circular waves
- Lower particles move in ellipses
- Deep particles move back and forth