Intro to Waves

Early Effects Animation

Walt Disney had a staff of animators who specialized in effects animation for *Snow White* (1937).

Disney's effects department expanded quickly and created many memorable scenes in *Fantasia* (1940).

Waves

Waves are a common natural phenomena.

Waves in Effects Animation

Kung Fu Panda 2

Waves on the water surface

Kubo and the Two Strings

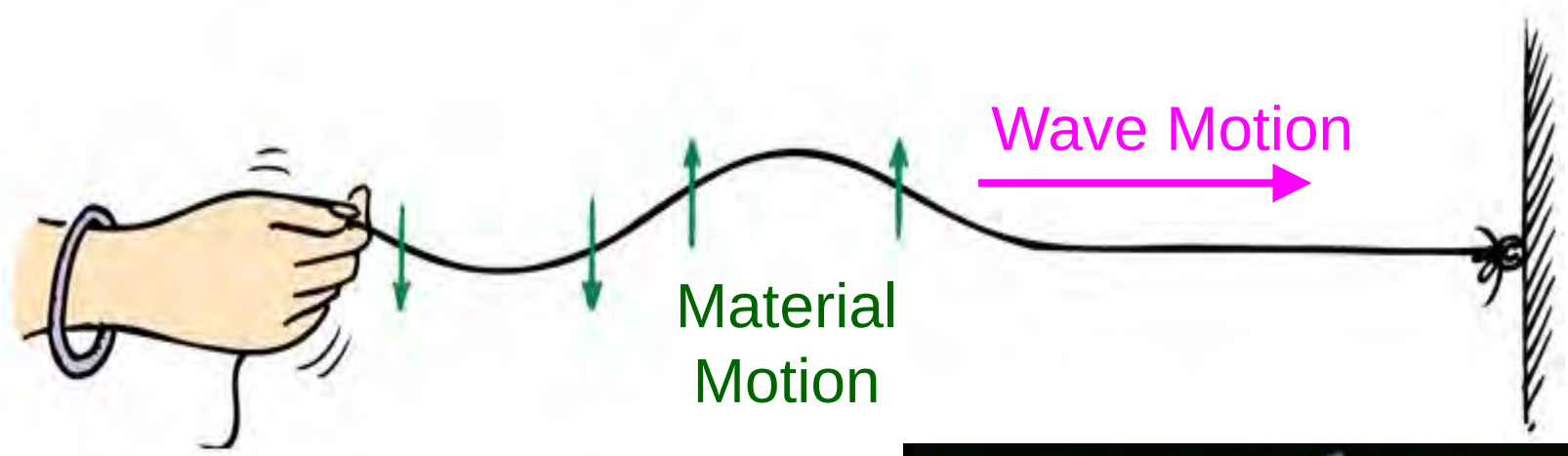
Waves in CFX Animation

Shrek Forever After

Waves in hair, fabric, flesh, etc.

How to Train Your Dragon 2

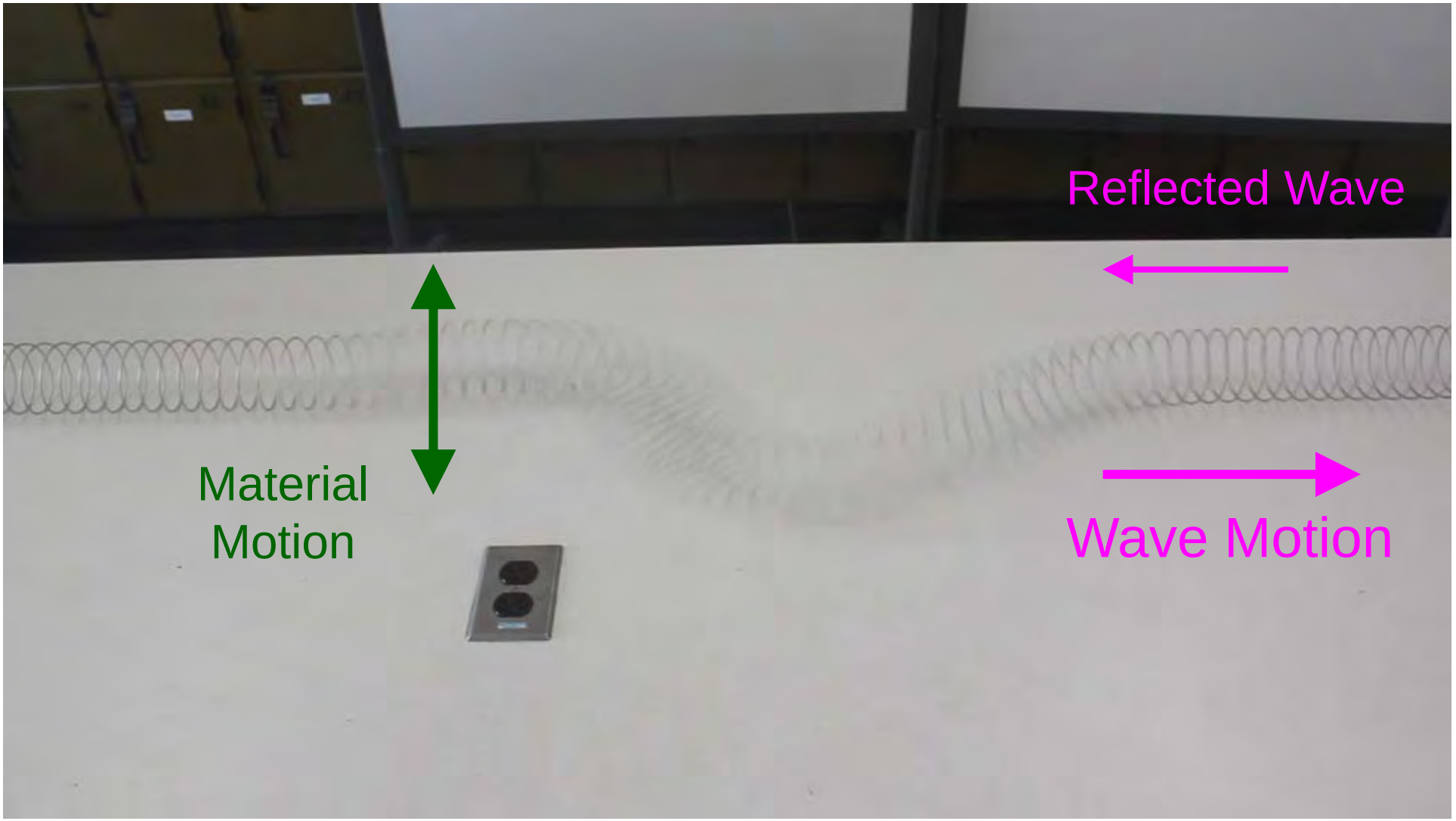
Transverse Waves



For transverse waves the material motion is *perpendicular* to the wave's motion.

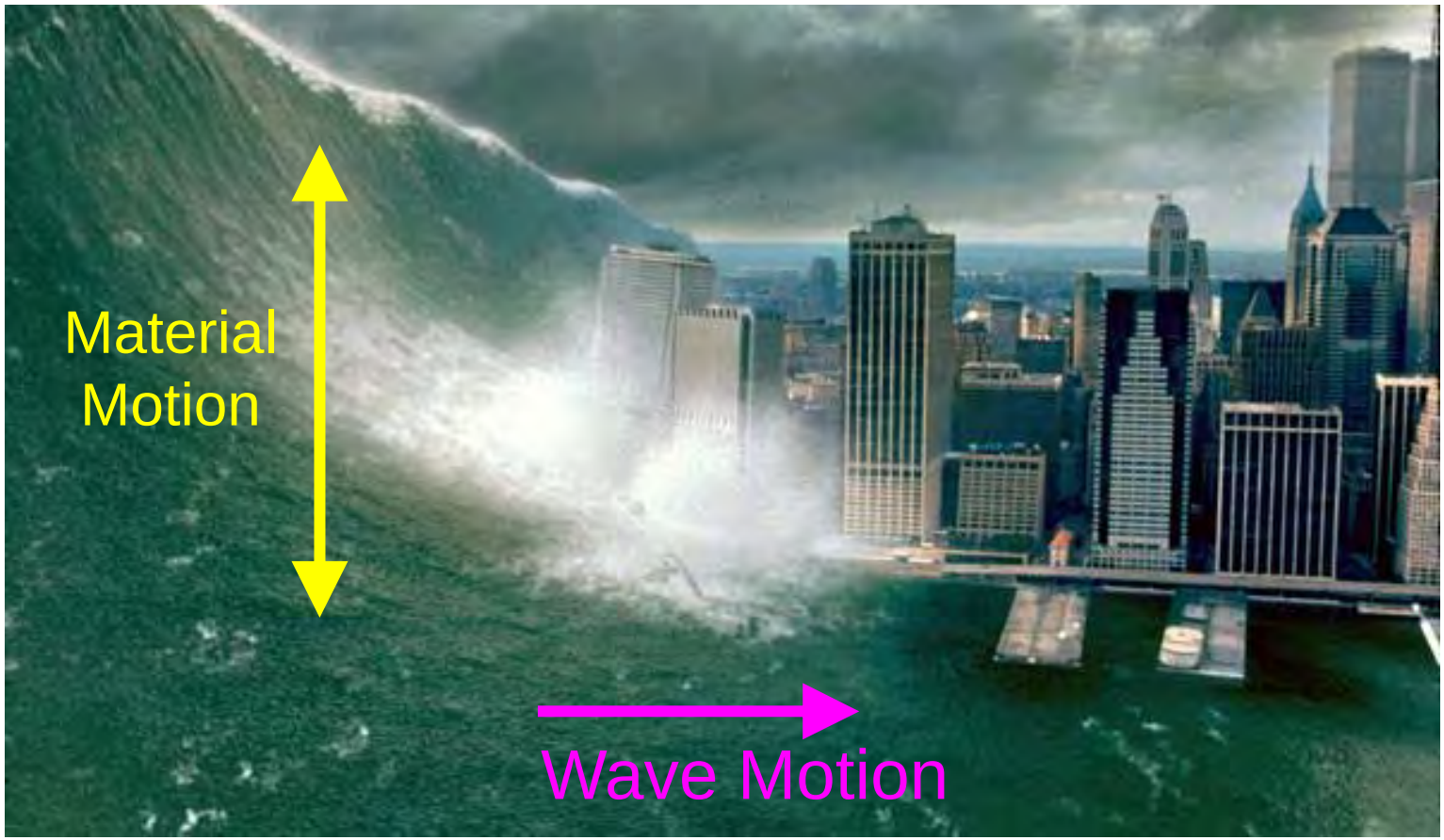
Luxo Jr.'s cord shows some nice transverse waves.

Transverse Wave Pulse



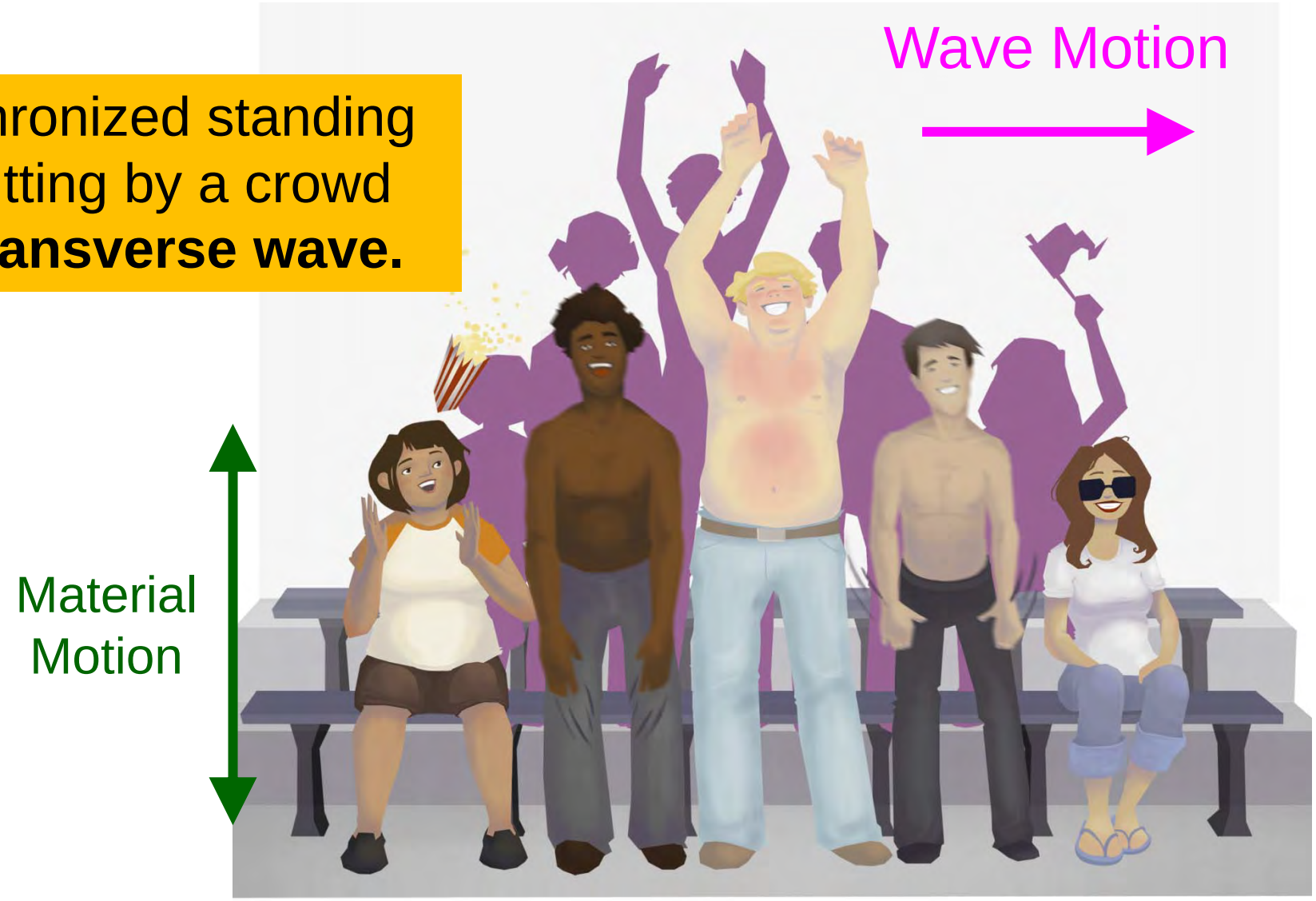
Surface Water Waves

Surface water waves are transverse waves.



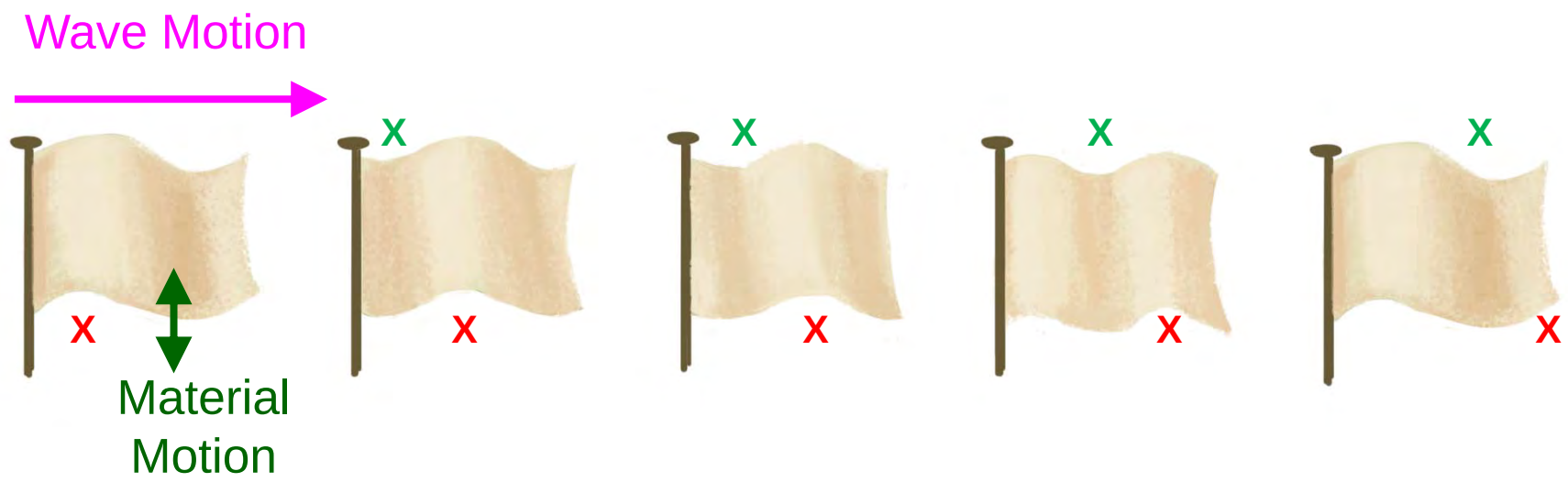
Doing “The Wave”

Synchronized standing and sitting by a crowd is a **transverse wave.**



Flag Cycle

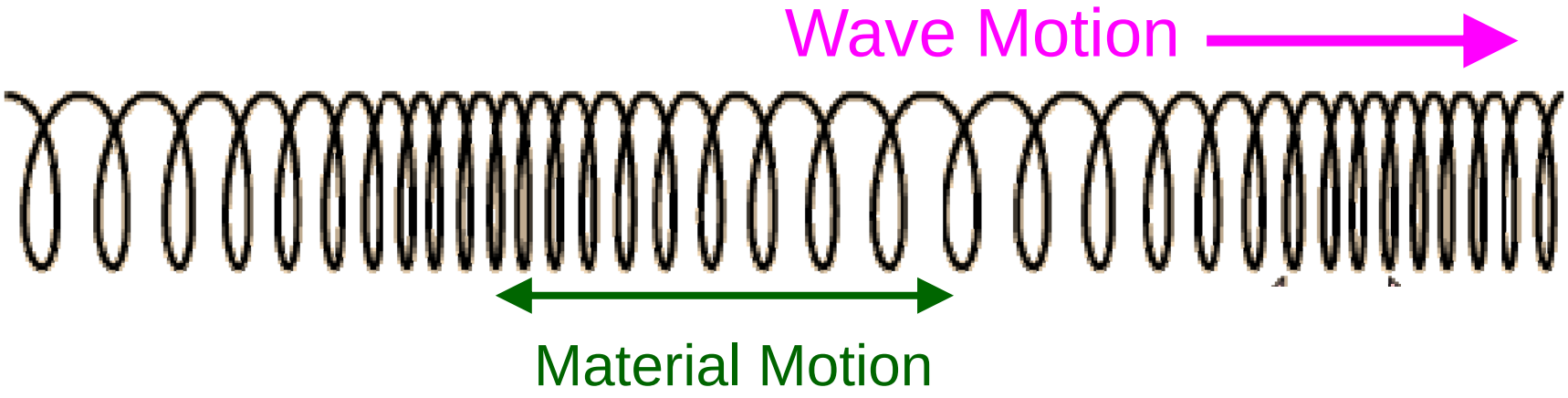
Flag cycle is a common effects animation exercise for waves.



Ripples in cloth are transverse waves.

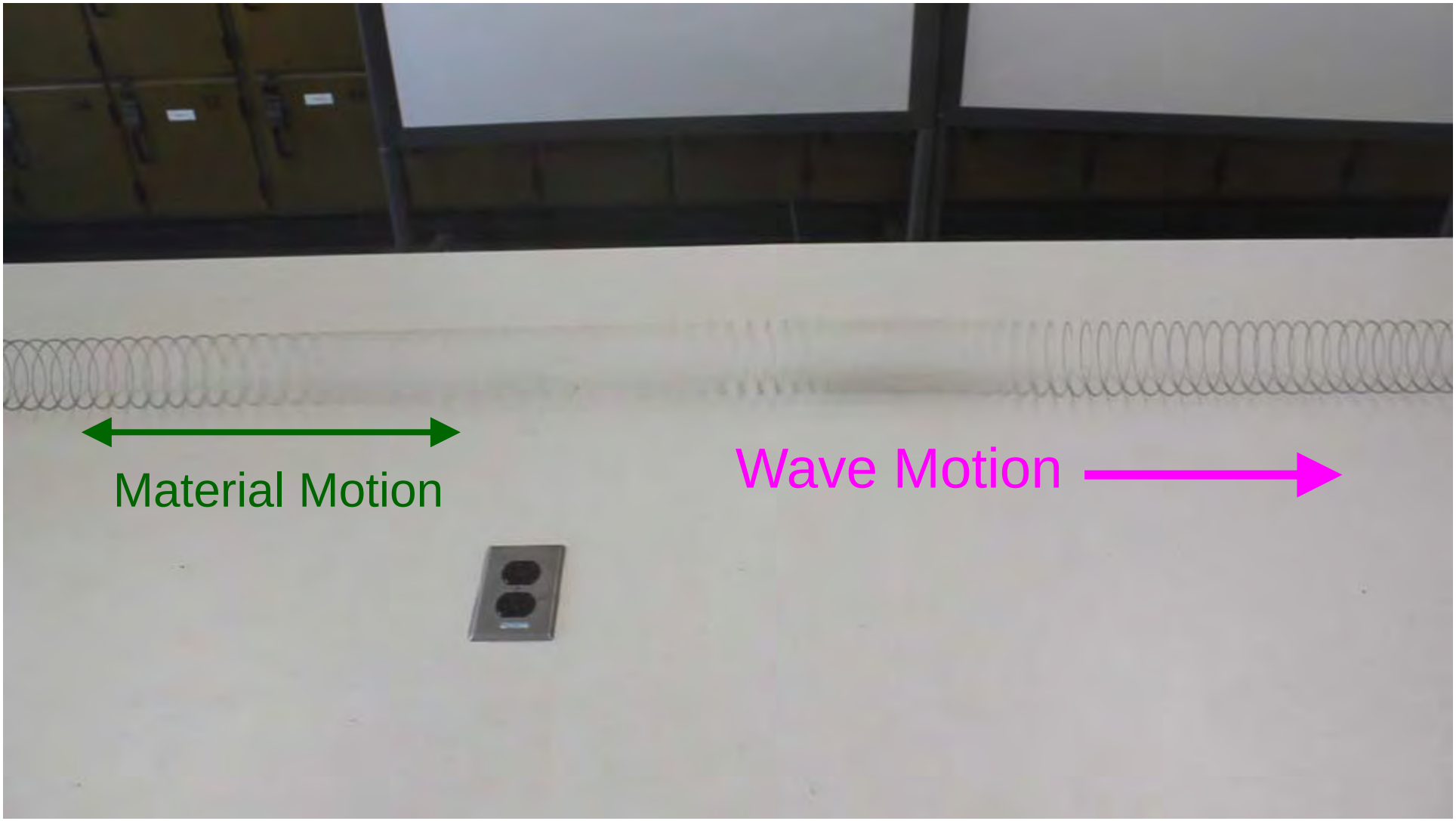
Longitudinal Waves

For longitudinal waves, the amplitude and wave motion are parallel.



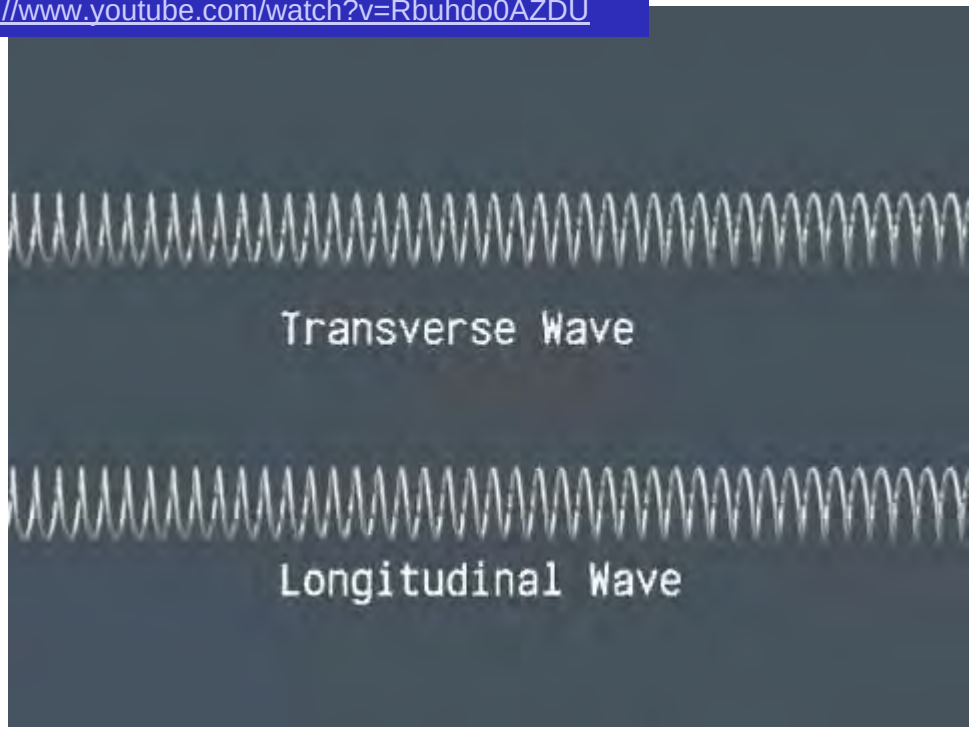
A crowd can do a longitudinal wave by moving side-to-side instead of up-and-down

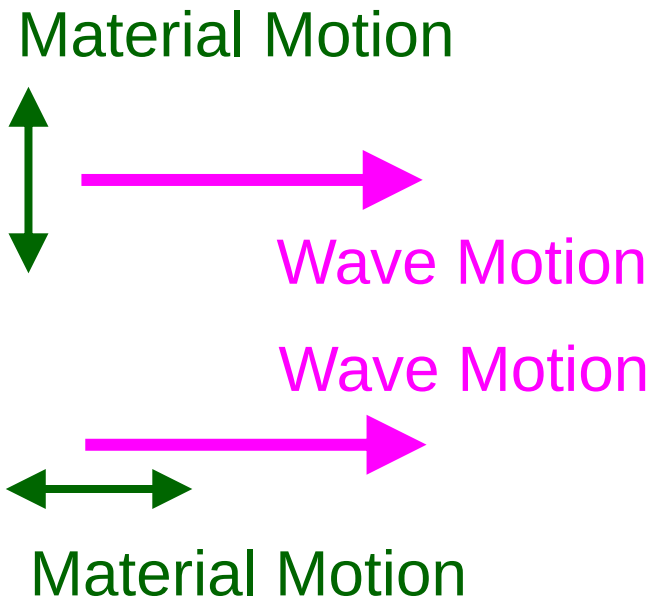
Slinky Longitudinal Waves



Transverse vs. Longitudinal Waves

http://www.youtube.com/watch?v=Rbuhdo0AZDU

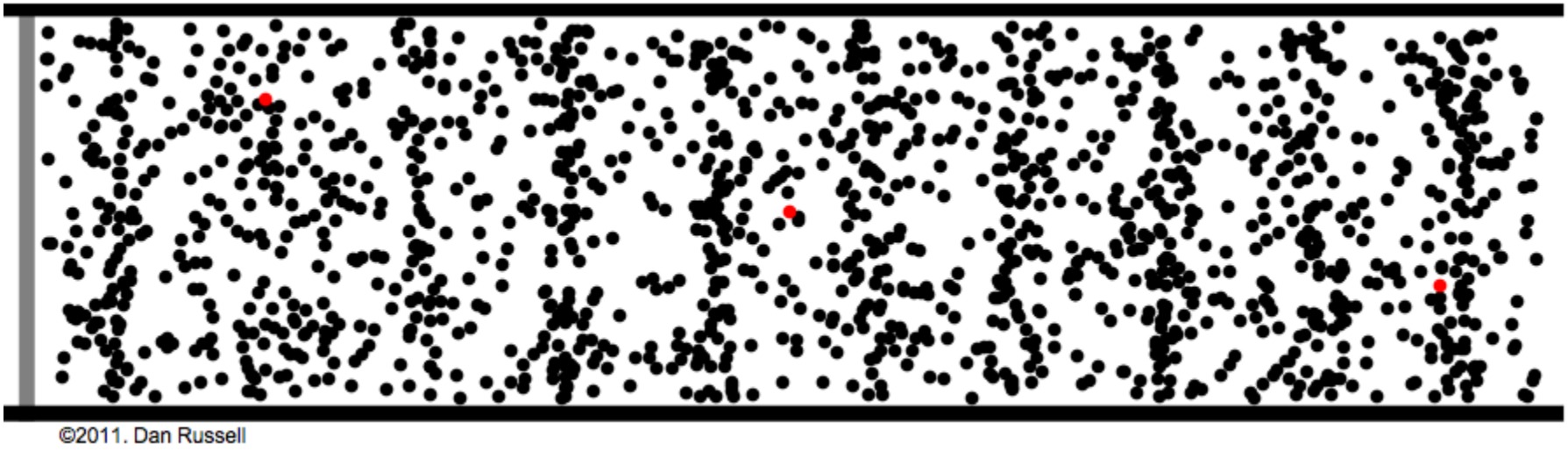




Both types of waves can travel down a Slinky

Nature of Sound in Air

Sound in air is a longitudinal wave created by compressions and rarefactions.



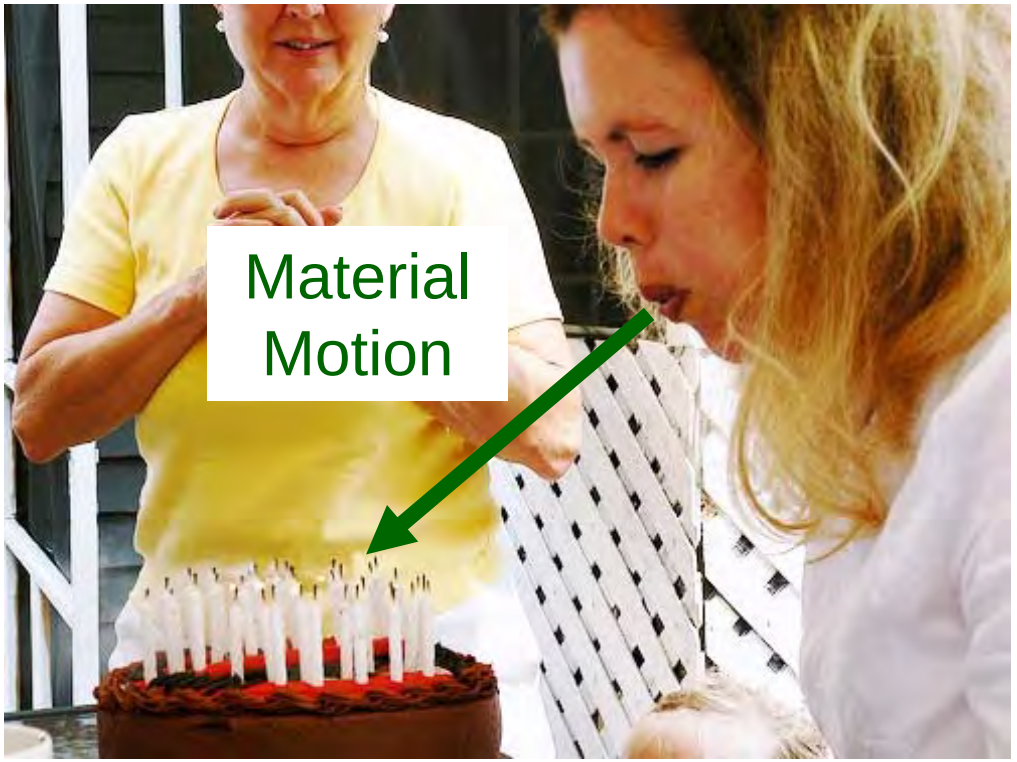
Waves vs. Flow

With *waves*, the material oscillates in place.

With *flow*, the material moves with the flow.

When you speak, you are making sound *waves* in the air.

When you blow out a candle, you make a *flow* of the air.



www.flickr.com/photos/tgaw/

Wind is Flow

Wind is an example of flow.

Wind speeds in a hurricane average 80 to 150 m.p.h.

Speed of sound waves is over 750 m.p.h.

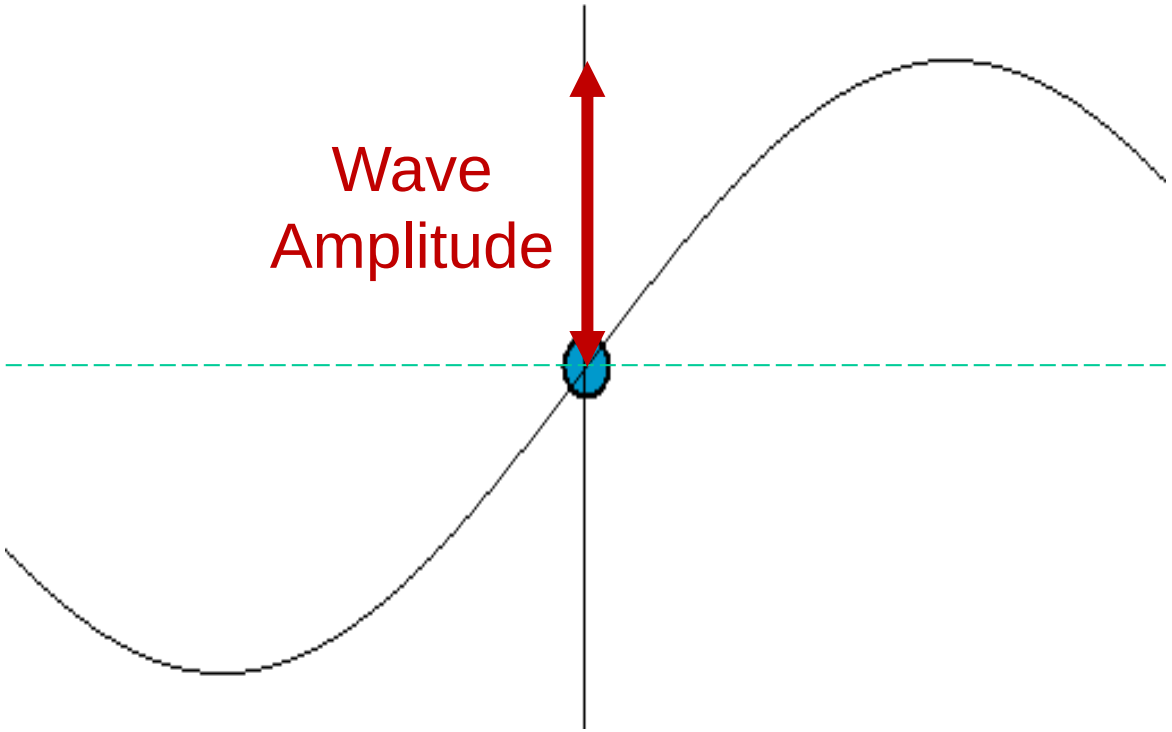
news.nationalgeographic.com

Smoke Ring Cannon

Smoke rings are flow and *not* waves since the material (smoke) moves with the ring rather than oscillating.

Wave Amplitude

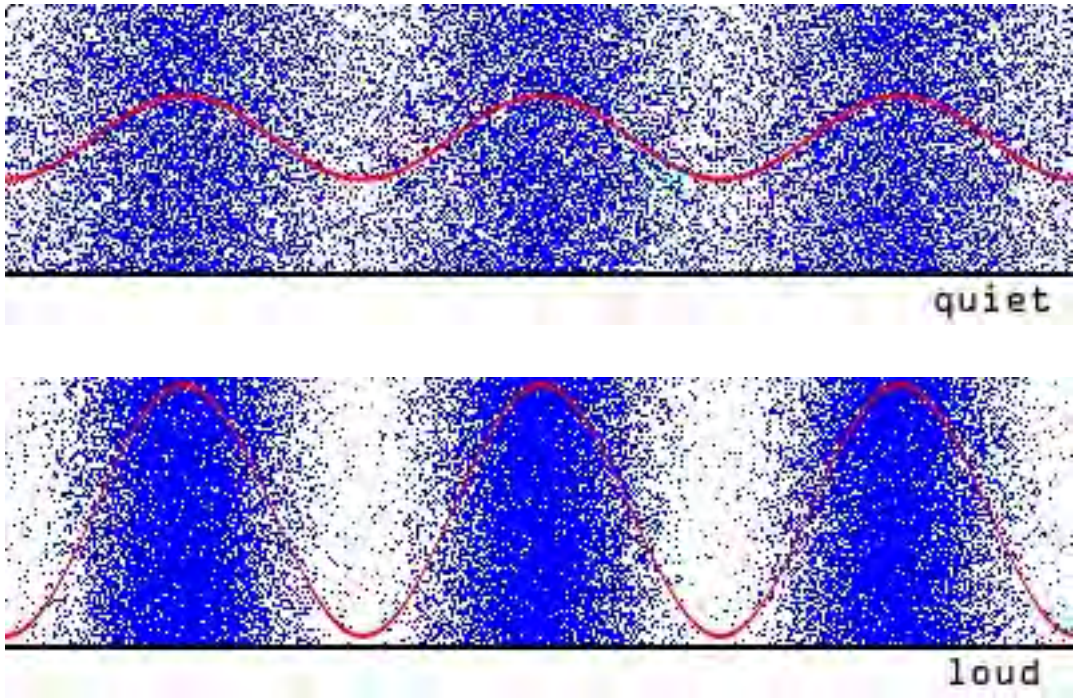
Cyclic wave motion has an amplitude, similar to that of vibrations and oscillations.



From Wikipedia

Sound Amplitude

Loudness depends on amplitude of pressure variations in sound waves.



Beaufort Scale for Sea Waves

BEAUFORT FORCE 0
WIND SPEED: LESS THAN 1 KNOT

SEA: SEA LIKE A MIRROR

BEAUFORT FORCE 4
WIND SPEED: 11-16 KNOTS

SEA: WAVE HEIGHT 1-1.5M (3.5-5FT), SMALL WAVES BECOMING LONGER, FAIRLY FREQUENT WHITE HORSES

BEAUFORT FORCE 8
WIND SPEED: 34-40 KNOTS

SEA: WAVE HEIGHT 5.5-7.5M (18-25FT), MODERATELY HIGH WAVES OF GREATER LENGTH, EDGES OF CREST BEGIN TO BREAK INTO THE SPINDRIFT, FOAM BLOWN IN WELL MARKED STREAKS ALONG WIND DIRECTION.

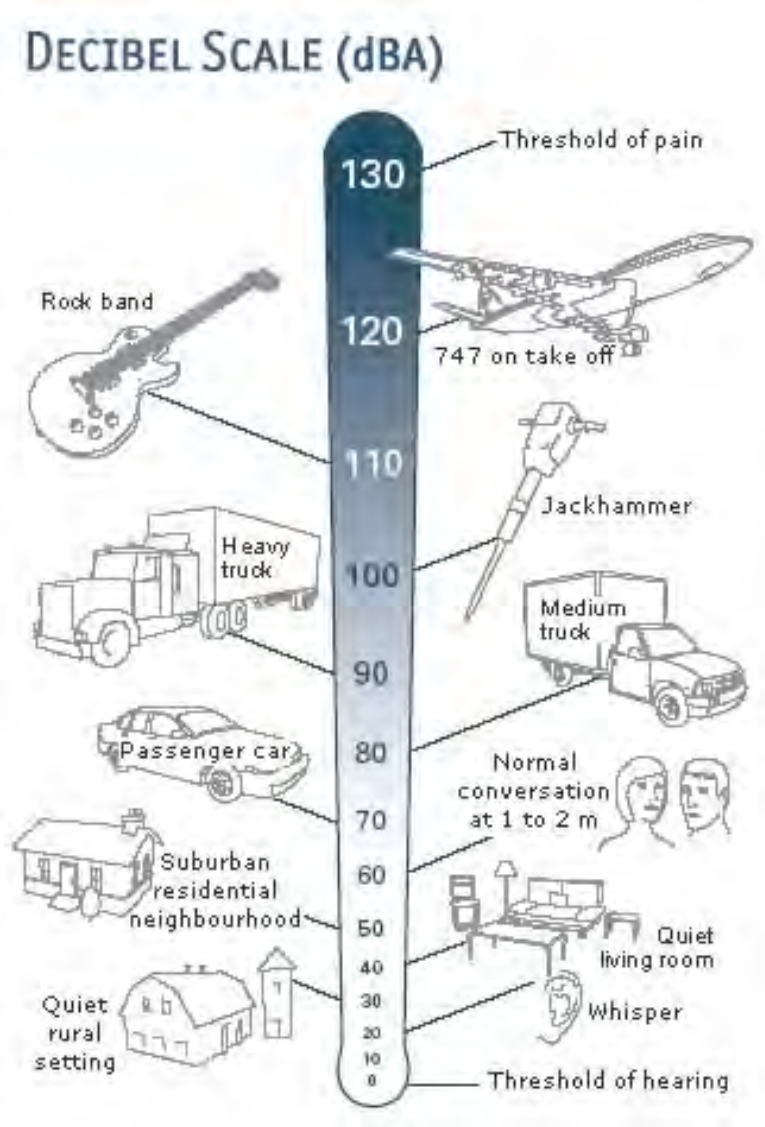
BEAUFORT FORCE 12
WIND SPEED: 64 KNOTS

SEA: SEA COMPLETELY WHITE WITH DRIVING SPRAY, VISIBILITY VERY SERIOUSLY AFFECTED. THE AIR IS FILLED WITH FOAM AND SPRAY

Decibel Scale

Loudness is measured in decibels (dB), which is a logarithmic scale (since our perception of loudness varies logarithmically).

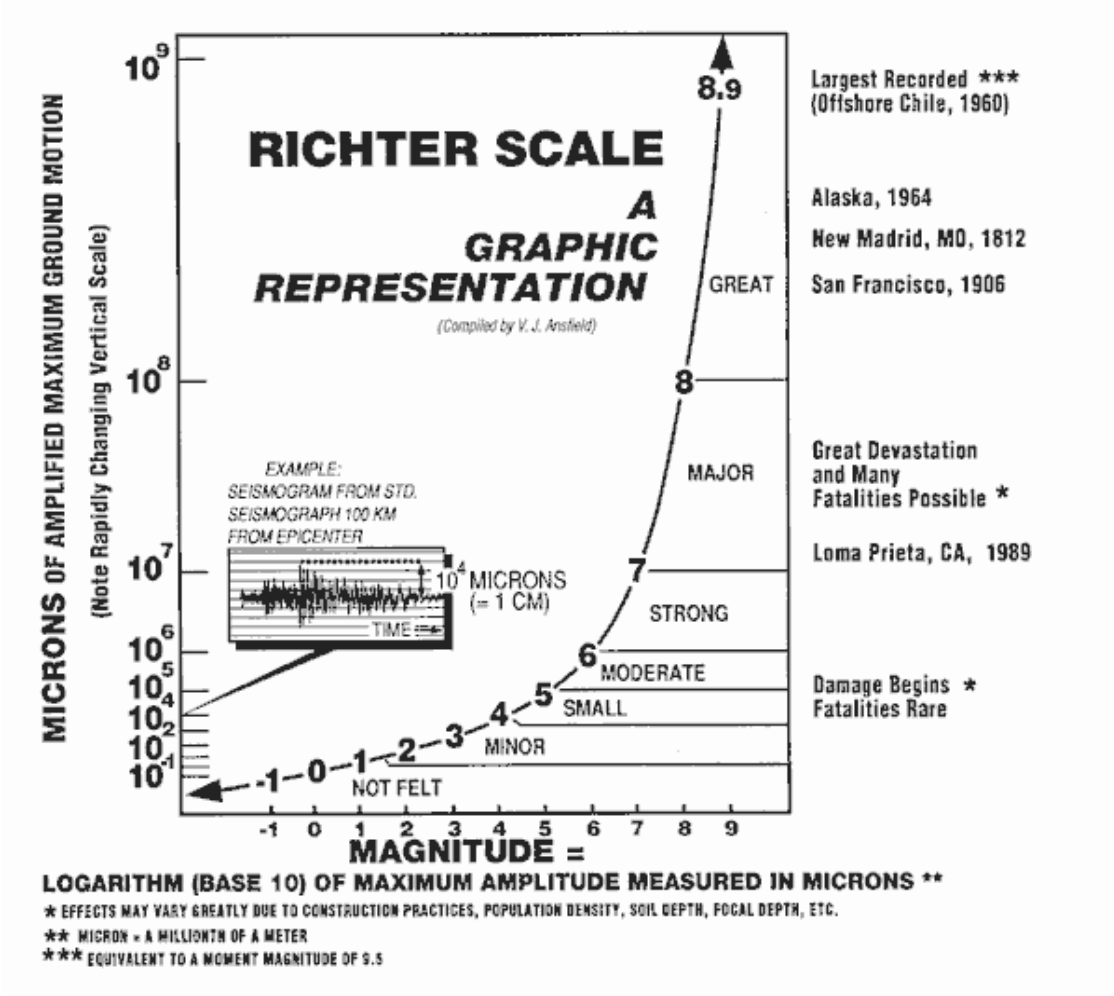
Zero decibels is approximately the threshold of hearing for a normal young adult.



Richter Scale

Richter scale for earthquakes is based on the amplitude of the seismic waves.

As with the decibel scale, it's logarithmic (wave amplitude x10 for each level up on the Richter scale).



Summary

- For transverse waves the material motion is *perpendicular* to the wave's motion.
- For longitudinal waves the material motion is *parallel* to the wave's motion.
- For waves, the material oscillates in place but for flow (wind, for example) the material moves along with the flow.
- The amplitude of a wave is determined by the displacement of the material as it oscillates.
- There are various scales for wave amplitude, such as the decibel scale for sound.