

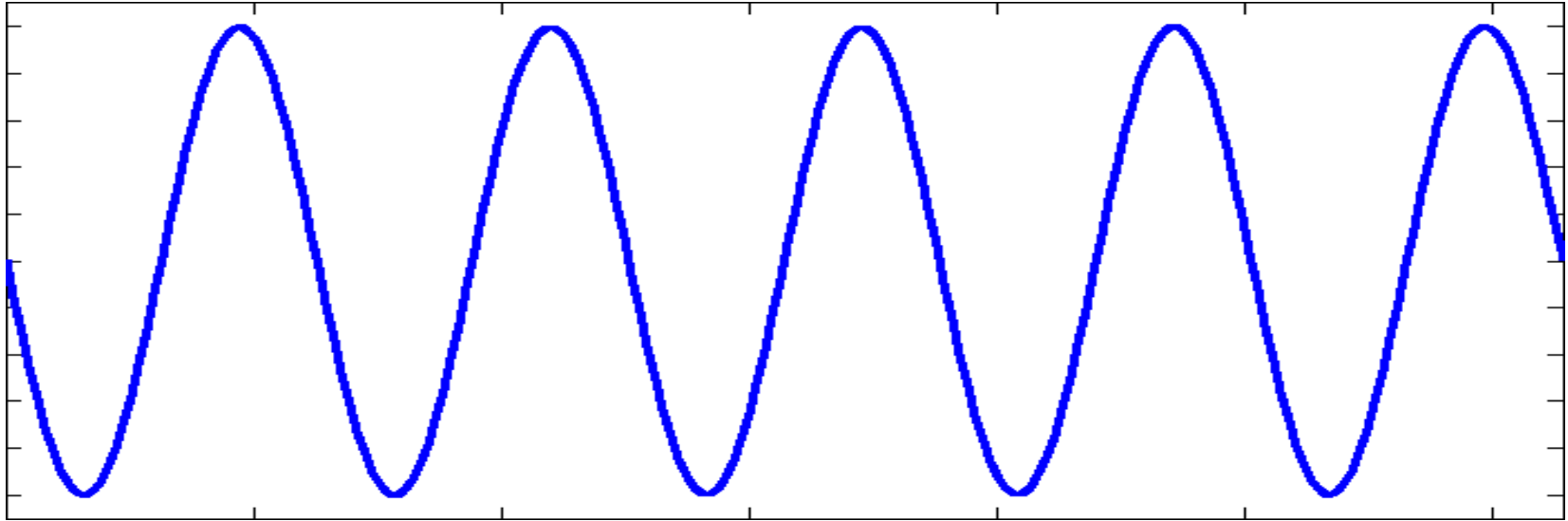
Can you identify **two**  
different kinds of  
mechanical **waves**  
that are created when  
someone plays a  
musical instrument?



***What vibrates  
and where?***

# A traveling wave

is a wave that **moves** through space and matter.

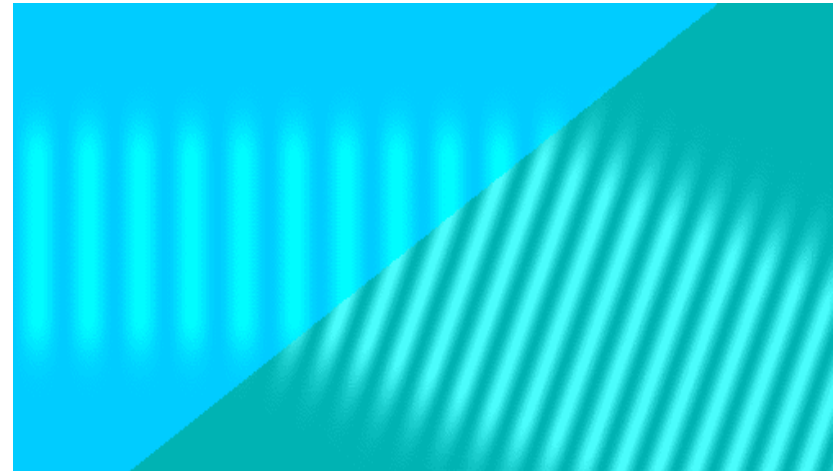
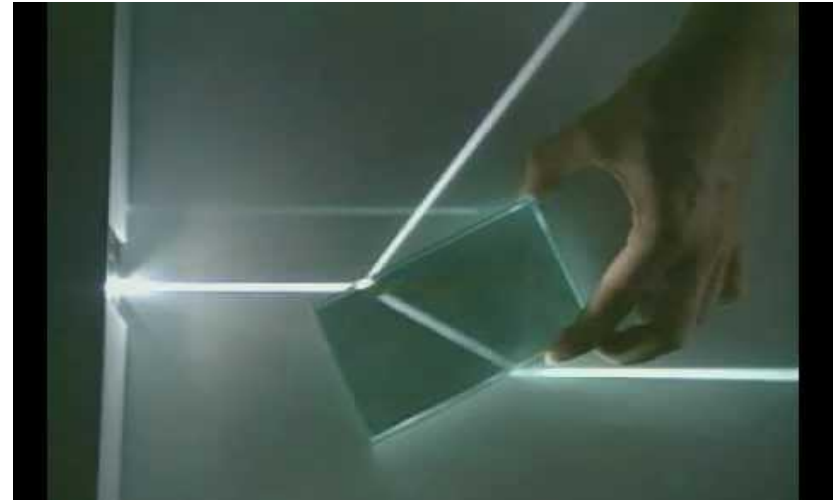
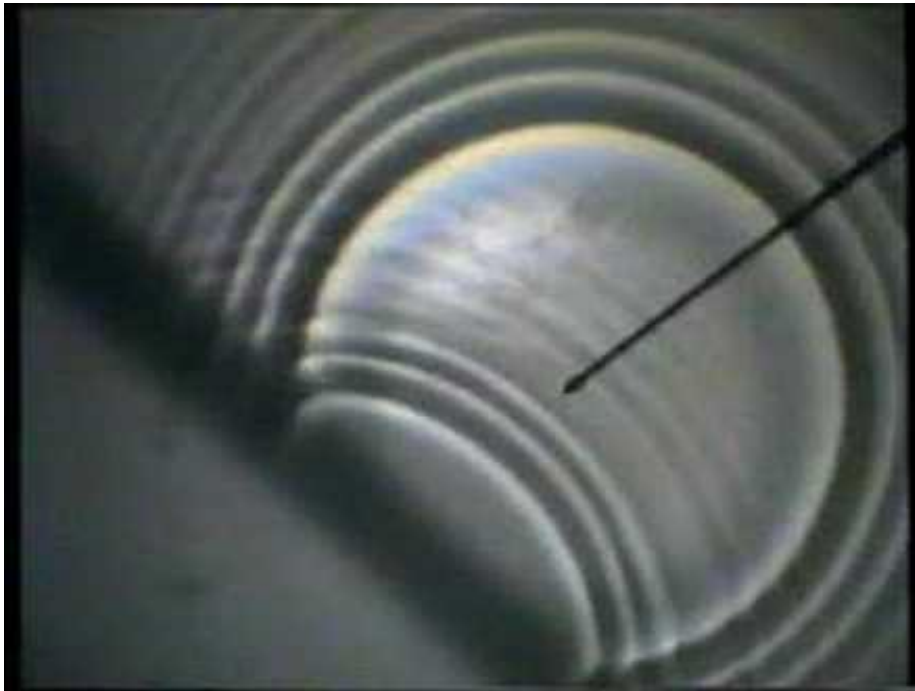


$$\text{FREQUENCY} = \frac{\text{VELOCITY (speed)}}{\text{WAVELENGTH}}$$

$$f = \frac{v}{\lambda}$$

Light and sound are both examples of traveling waves.

Traveling waves can  
**reflect** off objects  
and surfaces...

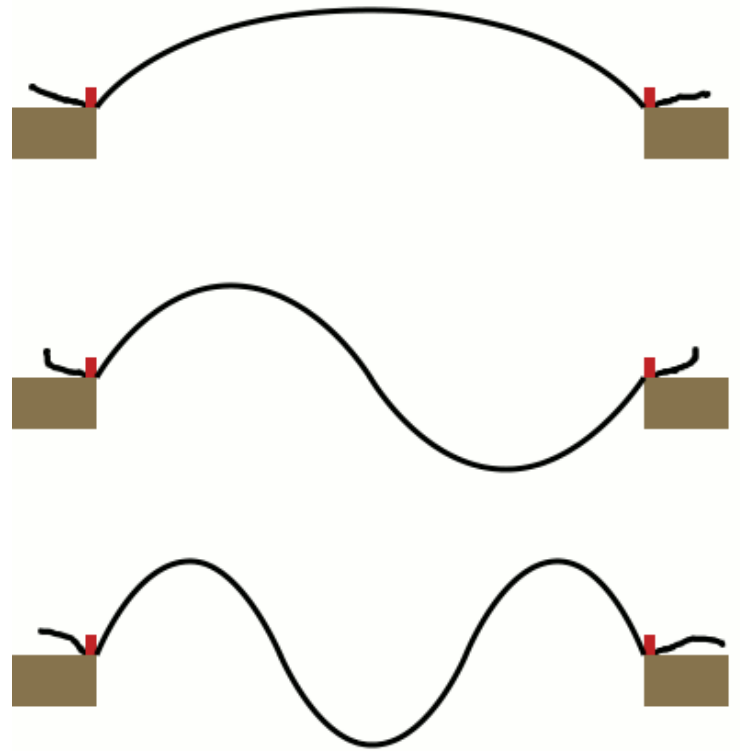


...and **refract** - change their direction when  
entering a different medium at an angle.

# A standing wave

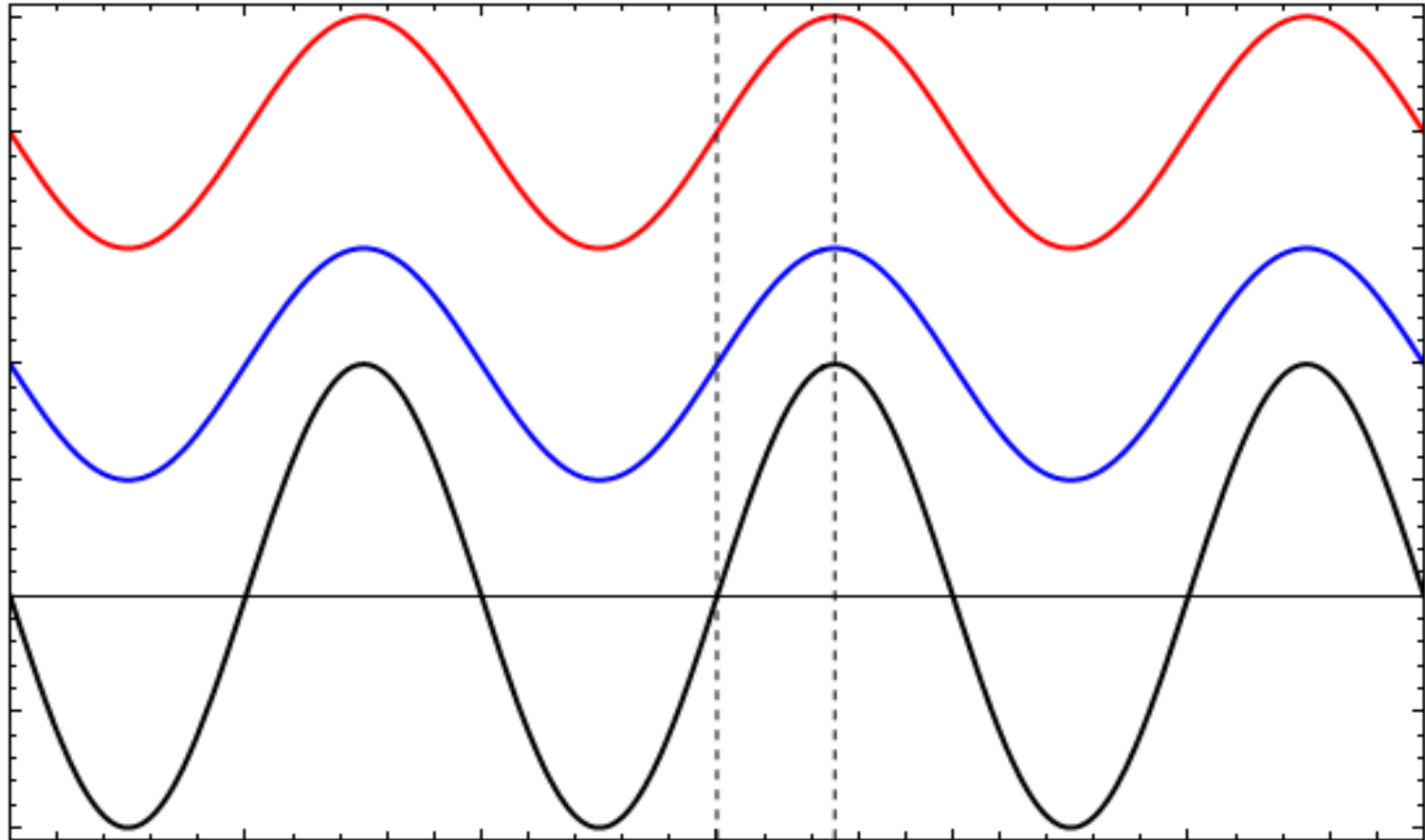
(also called a stationary wave)

is a wave that oscillates in one **constant position**.



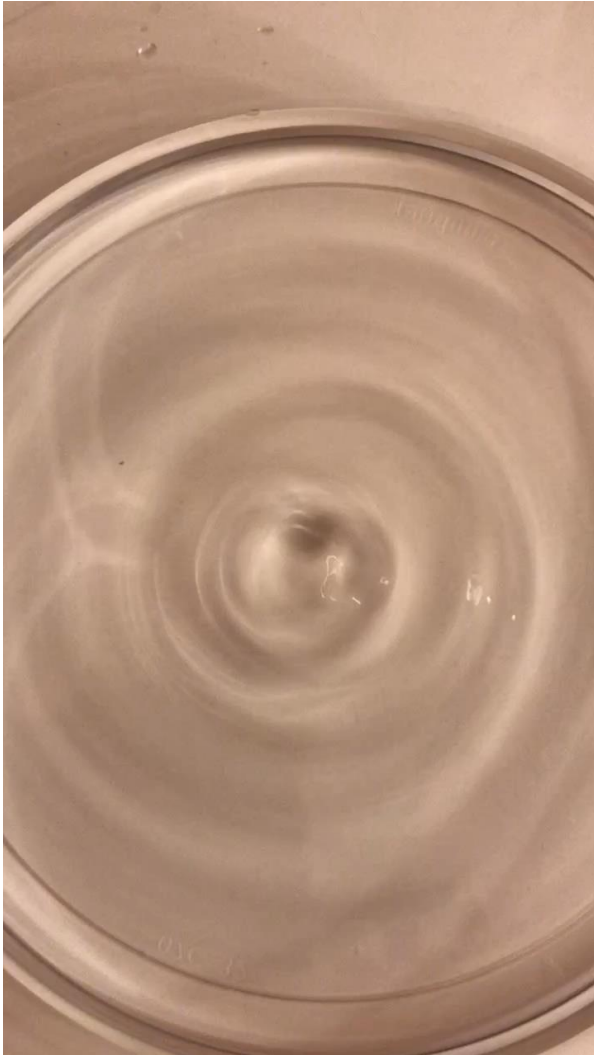
A vibrating guitar string is an example of a standing wave.

**To make a standing wave...**



**...combine two travelling waves  
that go in opposite directions!**

**A standing wave pattern forms  
when vibrations are confined.**





# Watch out for hot spots!

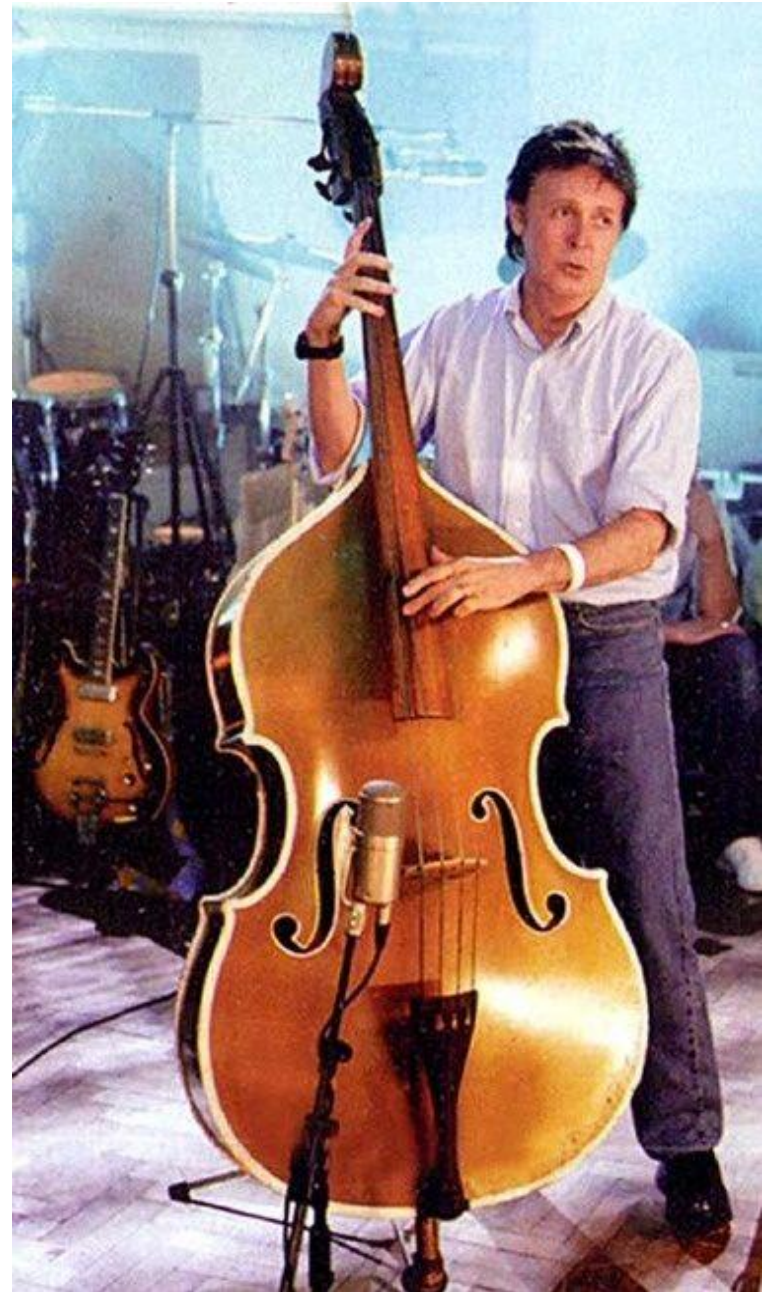
In microwave oven, standing waves are created in the chamber due to reflection from metal surfaces.



This is exactly what causes hot spots and cold spots in the food. The rotating turntable moves the food around to mitigate this effect.

Can you identify **two** different kinds of **vibrations** that are created when someone plays a **string** instrument?

*Now think about **not only what and where vibrates but how exactly it vibrates!***

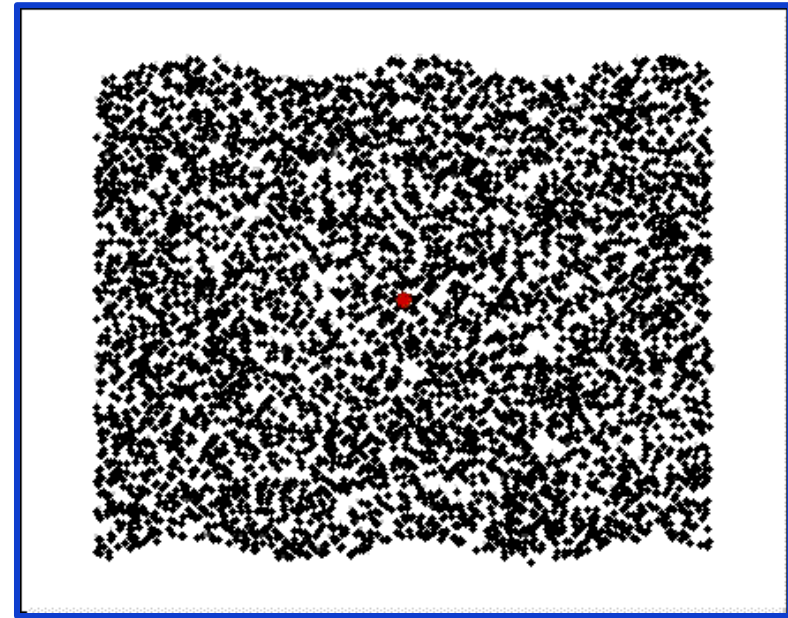




# Watch the particles!

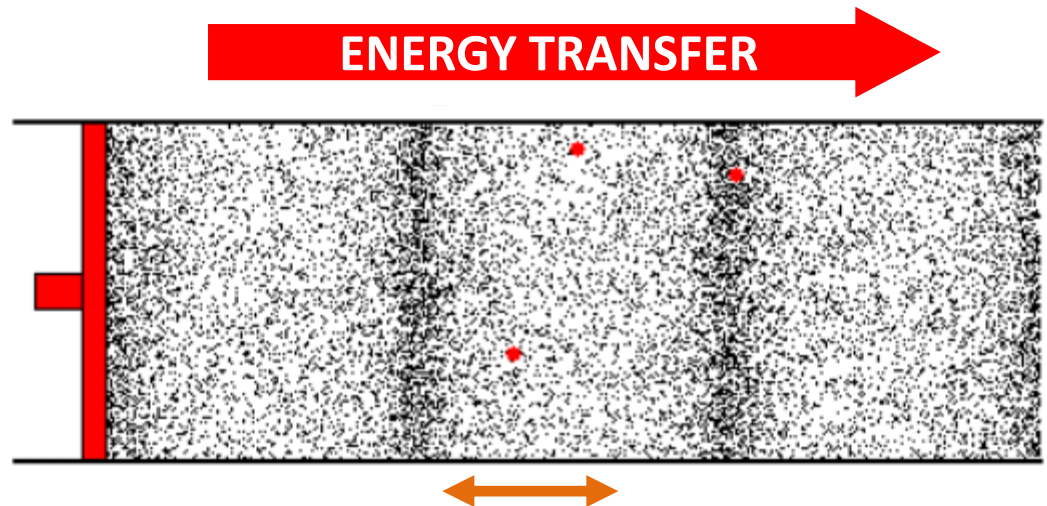
## 1. STRING vibration

oscillations are **perpendicular** to the direction of the energy transfer (or wave propagation)



## 2. AIR vibration

oscillations are **parallel (same direction)** to the propagation of the wave.



# Types of mechanical waves

**“compression-expansion”**  
(or “forward-and-back”)

**LONGITUDINAL WAVE**  
can travel through solids, liquids and gases



← - - - - - →  
Vibration of particles

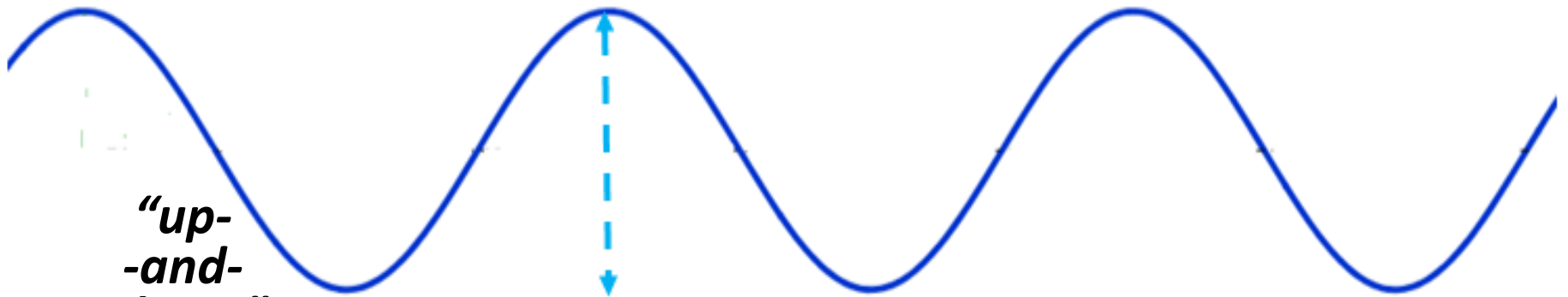
→  
Direction of Energy Transfer

**“up-  
-and-  
-down”**

(or “side-to-side”)

Vibration of particles

**TRANSVERSE WAVE**  
cannot travel through gases

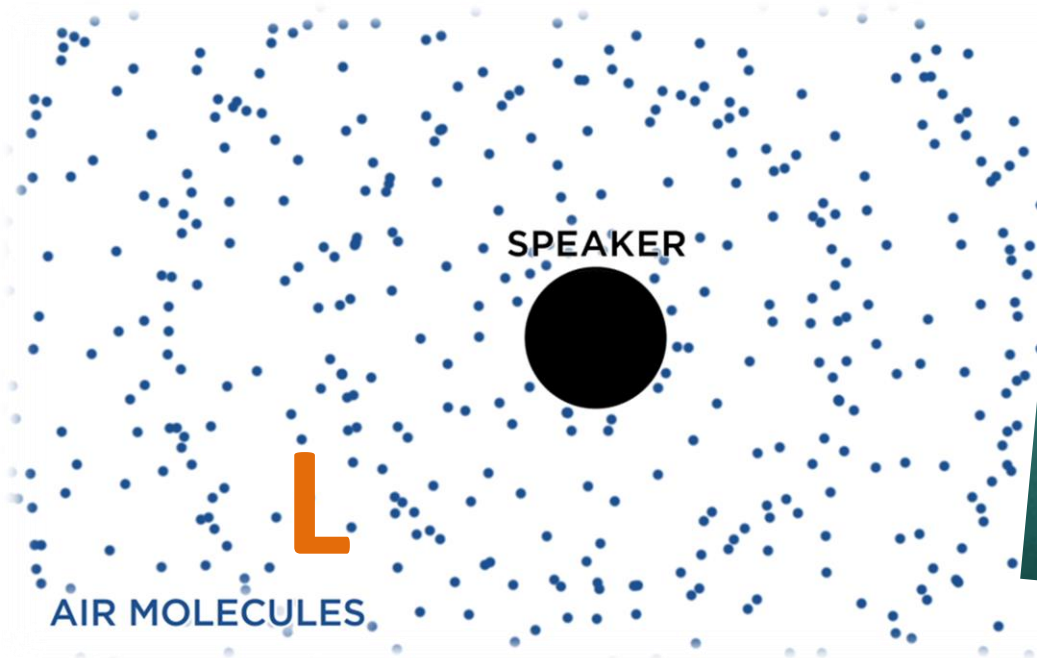


# Let's classify!

T



T+L



And  
some  
more!

