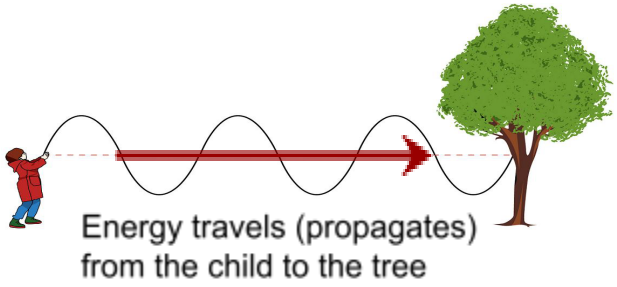
Inquiry Activity: Making Waves

A. Background

We have just finished our unit of energy and explored some of the types of energy we encounter the word. We looked at kinetic, gravitation, elastic, and thermal energies, and talked about when they transformed from one type to another.

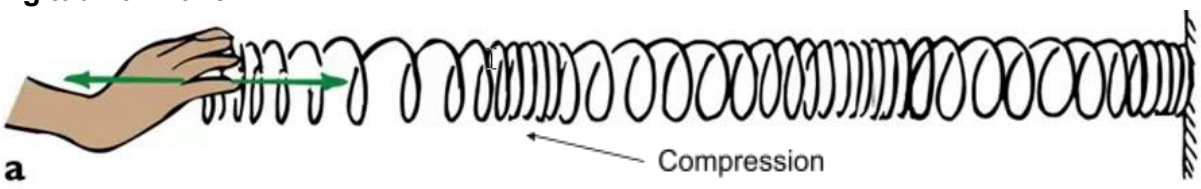
In this unit, we are going to look a bit deeper into the details of *how* energy gets transferred by looking at one specific way energy can move: through waves. A **wave** is created when energy travels through matter or space without that matter being displaced overall. We say that a wave *propagates* through a medium when we describe how it moves. For example, think about a crowd doing the wave in a big stadium.The energy of the wave is propagating through the people, but each person stays in the same seat the whole time; their displacement at the end is zero.



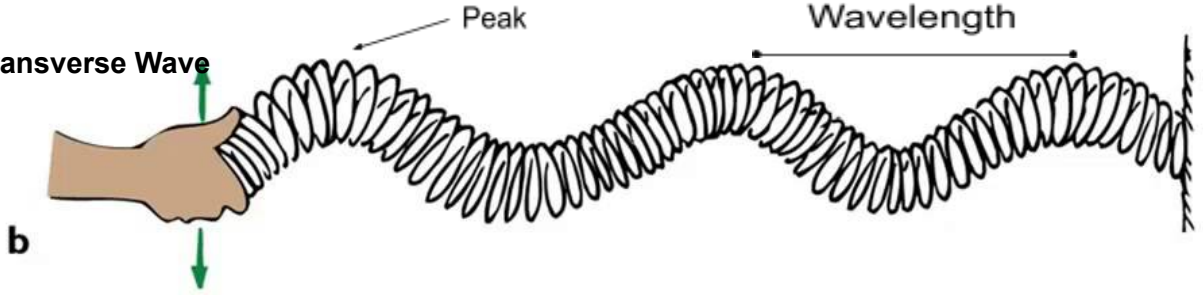
B. Need to Know: Types of Waves

In this inquiry we will be using slinkies to make two different types of waves: **longitudinal** waves and **transverse** waves. A longitudinal wave occurs when we move the slinky back and forth, while a transverse wave occurs when we move the slinky up and down. In both cases energy is still moving in the same direction (away from your hand). You can see examples of both in the diagram below.

Longitudinal Wave



Transverse Wave



Each bunched-up part of a longitudinal wave is called a **compression**, while in a transverse wave the top of each curve is called a **peak**. The distance between two compressions or two peaks is called the **wavelength**.

Inquiry - Making Waves:

Our goal today is to investigate how waves are made and measure some of their properties. With your group grab a slinky and do the following:

1. Have one groupmate hold one end of the slinky steady.
2. Have a second person pluck the other end to make single transverse wave on the slinky
3. Make a few more waves, plucking harder or softer. Then make an observation:

   What happens to the wave as you put more or less energy into it?

   _____

4. Next, you are going to take some measurements of both types of waves. Use the same set up (one person holding one end still) and experiment with how fast you have to move your hand to make just one longitudinal wave, then try to make two waves at a time, then three.
5. Measure the wavelengths (the length from one compression to the next) and record how they change with the number of waves you make. When you only have one compression, the wavelength will be twice the length of spring you are using.
6. Measure also how long it takes each compression to travel from your hand to the opposite end (the travel time).
7. Do the same with a transverse wave; the only change is we are looking at peaks instead of compressions.
8. Measure the length of your slinky and record it.
9. Finally, answer the two questions below to help reflect on your observations of how waves behave on our slinkies.

Longitudinal Wave

# of Compressions	Wavelength	Travel Time
1		
2		
3		

Transverse Wave

# of Peaks	Wavelength	Travel Time
1		
2		
3		

Length of Slinky: ____ meters

What did you have to do with your hand to make more waves at a time?

_____

What happens to the wavelength as we add more waves?
What happens to the time it takes each wave to travel?

_____