Lab W1: ***Investigating Pulses on a Slinky*** ***may 9 2003***

Goals:

- To investigate how pulses are transmitted along a long spring.
- To measure the speed of wave propagation down the spring.
- To investigate how pulses interact with one another.

Equipment: Slinky ; Meter Stick ; Stopwatch

Note: The long springs can easily be stretched beyond their elastic limit. They can also hurt someone if they fly loose while you're shaking them rapidly or while they're stretched. Be careful! Also TAKE CARE not to get them tangled, or else you will personally have to come back after school for detangling.

PART A: Transverse pulses: One end is held steady, the student at the other end "plucks" or whips the spring perpendicular to the spring length to send a transverse pulse down the spring.

Make all pulses using the "hand whip" method unless instructed otherwise. Also, be sure to keep the Slinky the same length throughout the experiment.

1) Watch the pulse size as it travels along the spring. Why does the pulse change size?

2) What happens to a pulse as it reflects from the stationary end of the spring?
(In this and the remaining parts, make the amplitude of the pulses fairly large, so that the pulses travel all the way down the spring (and back) without being destroyed by friction with the floor.) Does the pulse flip over or remain on the same side ?

3) Does the speed depend on the size of the pulse? How would you decide? Do so.
Record all results below.

4) We will now determine if the speed of a pulse depends on the spring tension. Vary the tension by letting more or fewer coils into the spring, again WITHOUT changing the length of the spring between partners. (Note: by keeping the length of the spring constant, the linear density of the spring stays nearly constant as long as we do greatly change the number of coils of the spring). Try at least 3 different spring tensions. Record all results below – be sure to indicate the number of Slinky coils you held stationary at each end.

5) A person at one end should now make *periodic* transverse pulses. Make the number of stationary Slinky coils the same as you did for one of the experiments in #4. The amplitude of the pulses should not be too great; you don't want the reflected pulses to interfere significantly with the original ones. Adjust the *frequency* of the pulses until ONE complete wavelength appears on the spring. When you have done this, measure the frequency of the pulses generated. Using your observed frequency and wavelength, calculate the speed of the periodic pulses. How does your calculated speed compare with the speed you measured in step 4 ?

6) a) If two pulses of equal size meet while traveling in opposite directions but starting on the same side of the spring, what happens? Do they reflect off of each other or do they pass through each other? What do they look like when they interact?

b) same question as (a) but pulses start on opposite sides of the spring?

PART B: revisit question 1 - 7 again with longitudinal pulses created by pulling the spring toward you and letting go.