  Investigation 28

Speed of Sound

Waves travel at a variety of speeds. Ocean waves travel at “human” speeds; waves on a string may travel much faster or slower. How much of the universe we can see is determined in a large part by the speed of light waves.

Preliminary Observations

When you talk with a classmate at the desk next to you, the transit time of the sound waves is imperceptible. But sound waves must travel at some finite speed. At what point do you begin to notice a delay between when the words are spoken and when they are heard? Over what distances do those delays become important?

Procedure

1. Discuss and decide on a method for measuring the speed of sound.
2. Develop a step-by-step procedure for your investigation.
   * Your procedure should result in an estimate for the speed of sound and a measure of the uncertainty.
   * Include the measurement equipment you will use.
   * Decide how much data or observation to take in order to have enough information to satisfy your purpose and stand up to questioning by your peers.
3. Carry out the investigation and record your data and observations. Make sure all group members have access to the data.

Analysis

Compare your speed estimate to that of others in your class. How close are your estimates? How close are they to the accepted value for the speed of sound in air? You may wish to look back at your previous work in class, or do some research.

Extensions

1. Does the speed of sound vary with the air temperature? Compose an argument why it should or should not. Then, test your hypothesis.
2. Build a sonic ranger that uses sound waves to determine the distance to an object in front of it. The Vernier Motion Detector is an example of a commercial sonic ranger, if you would like to learn more about how sonic rangers work.