CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
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Project Number
J1811

Project Title
Super Sound Science

Abstract

Objectives/Goals
My objective was to find the speed of sound in different materials and how that speed changes with temperature. In my experiment, I measured the speed of sound in 12 materials at room temperature (21.7°C) and at 76.7°C. My hypothesis was that sound would travel the fastest in steel. I also hypothesized that sound would travel faster through steel at a higher temperature.

Methods/Materials
I measured the speed of sound in the materials using an oscilloscope, a function generator, and two ultrasound transducers. With this setup I measured the time it took for sound to travel from one end of the material to the other. Next, I calculated the rate using the formula d = r # t. I repeated all of the tests at three lengths and averaged the results. The lengths were 40, 30, and 20 centimeters. I compared all the results at two different temperatures.

Results
I found that the speed of sound through glass was the fastest at 5270 meters per second (m/s) and air was the slowest at 334 m/s. My results for the influence of temperature were unexpected. The speed of sound in water increased 20% with temperature. Though, the speed of sound in teflon decreased 37%. Since I took into account my measurement errors, my results on the effect of temperature were inconclusive for a few materials.

Conclusions/Discussion
My hypothesis that sound would travel fastest through steel was incorrect. The speed of sound in steel was second fastest behind glass. I also hypothesized that sound would travel faster through steel when heated. However, my experimental results for the effect of temperature on steel were inconclusive. I found conclusively that heat increased the speed of sound in air and water but surprisingly had the opposite effect on acrylic, PVC, and teflon.

Summary Statement
In my project I measured the speed of sound in different materials and how that speed changes with temperature.

Help Received
My father loaned me electronic test equipment and taught me how to use it. He also helped me with the layout of the display.