



**CALIFORNIA STATE SCIENCE FAIR  
2017 PROJECT SUMMARY**

<b>Name(s)</b> <b>Corina Dunn</b>	<b>Project Number</b> <b>J1805</b>
<b>Project Title</b> <b>The Effects of Temperature and Material on the Speed of Sound in a Gas</b>	
<b>Objectives/Goals</b> This project was designed to test how temperature and material affect the speed of sound in a gas. I tested the hypothesis that if the temperature is changed, then the speed of sound is proportional to temperature. I also tested the hypothesis that if the material is changed, then the speed of sound is inversely related to the molecular weight of the gas.	
<b>Abstract</b> <b>Methods/Materials</b> To perform the measurements, an ultrasonic range finder was attached to one side of a 1 m long, 4-in. diameter PVC pipe. The ultrasonic range finder was used to determine the speed of sound at various temperatures through air, and near room temperature for carbon dioxide and helium. To heat the air, the PVC pipe was wrapped in an electric blanket, and a towel for insulation. To cool the air, the PVC pipe was covered in ice, and a towel for insulation. A kitchen thermometer was used to measure the temperature.	
<b>Results</b> As the temperature increased, so did the speed of sound at a rate of 0.6739 (m/s)/degree K. This agrees well with the accepted rate of 0.6(m/s)/degree K. The speed of sound in helium was measured to be much higher than that of air, but the equipment was unable to measure the exact speed. The speed of sound in carbon dioxide at 292.04° Kelvin was measured as 277.70 m/s. This is similar to the accepted speed of sound for 292.04° Kelvin in carbon dioxide, which is 266.67 m/s.	
<b>Conclusions/Discussion</b> The results concurred with the hypothesis; in a gas, the speed of sound is proportional to temperature and inversely related to the molecular weight of the material. Sources of error are discussed.	
<b>Summary Statement</b> I measured that, in a gas, the speed of sound is proportional to temperature and inversely related to the molecular weight of the material.	
<b>Help Received</b> I received general advice from my parents, as well as some help with power tools during construction of the apparatus. I discussed my results with my parents.	