



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) HyunJeong Lee	Project Number S0211
Project Title The Effect of Temperature Change on the Tune of Musical Instruments: String, Woodwind, and Brass Instruments	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Many musicians have to be conscious of the changes in tune their instruments go through while playing their instruments. This experiment tests how the instruments change caused by the temperature change and whether every instrument changes in different ways and they are categorized into string, woodwind, and brass instruments. The scientific question that is #How does the temperature affect the pitch and the tuning of musical instruments # string, wood wind, brass instruments, and why?' My hypothesis is that when an instrument undergoes temperature changes, the tuning of the instrument will change; the string isnruments will go flat and woodwinds and brass instruments will be sharp at hotter temperatures.</p> <p>Methods/Materials brass instruments (French horn,trombone),string instruments (violin,guitar),woodwind instrument (flute),thermometer or temeprature controller(heater/cooler),electric tuner - experiment performed one instrument at a time.- rooms into normal room temperature room, heated room, and cooled room- while one of the room is either heated the cooled, the instrument is taken out in the room at normal room temperature and set to the correct tune.- when one of the room has been heated for 30 minutes and the instrument has been sitting in the room at normal room temperature for 15 minutes, take the instrument to the heated or the cooled room and let it sit for an hour.- after an hour, tune the instrument and record data.</p> <p>Results When the instruments were heated to the temperature of 30°C, the stringed instrumns showed that their pitch went low. However, the woodwind and brass instruments showed that their pitch went highat high temperature. When the instruments were cooled to the temperature of 13°C, the stringed instruments turned out to have a higher pitch, making the tune to be sharp. However, the woodwind and brass isnruments turned out to have a lower pitch, making the tune to be flat.</p> <p>Conclusions/Discussion For stringed instruments,in hotter temperature they have to press harder on the strings to make it sharper and in colder temperature, they have to press lighter for less stress to make it flat. As for woodwind and brass players, they can pull their tuning slides when their instruments are sharp at hotter temperatures and the other way at colder temperatures to contract the space inside the instruments. Brass players can also change the tune through trying different embouchure.</p>	
Summary Statement When string, woodwind, and brass instruments undergo a change in temperature, their instruments will be affected in its tuning and its pitch due to the materials they are made out of.	
Help Received Friends who are in music classes and music teachers helped with background information.	