



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Stephen T. Ai	Project Number J0202
Project Title Quantifying the Effects of Temperature and Relative Humidity on Violin Pitch	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals I play violin. I noticed my violin sounded somewhat different and became out of tune more easily when the weather was warm and dry. I decided to try to verify this effect. My project attempted to study the effects of temperature and relative humidity on the pitch of a violin.</p> <p>Methods/Materials A built-in microphone on a laptop and a spectrum analysis program OscilloMeter were used to record spectra of violin sound and measure peak positions of the fundamental and harmonic frequencies of the violin. A heater and a humidifier were used to change the temperature and humidity under which the violin was tested. I measured the fundamental frequencies of all four strings in both control and manipulated environments. I recorded results. To reduce error, I repeated the same measurements several times and calculated the mean values. I performed 160 tests in four test environments. I changed the experimental environments by turning on a heater or a humidifier in both a large and a small room for 60 minutes. Each time, I moved the violin into the experimental environment and left it there for 30 minutes before testing. I then repeated the measurement procedures. I compared the results of each string's fundamental frequency in the control room to the results recorded in the various experimental environments. I repeated my entire procedures using another violin to see if it exhibited similar changes in pitch.</p> <p>Results My results suggested that the pitch of a violin does change according to the temperature and humidity and that violins exhibit greater sensitivity to the temperature than humidity.</p> <p>Conclusions/Discussion When the temperature increased, the violin pitch shifted to lower frequencies. As the humidity decreased, the frequency of most strings also decreased. A thin string was more sensitive to the environment than a thicker string. In addition, strings played under conditions of high relative humidity produced less undesirable noise than strings played under the condition of low relative humidity.</p>	
Summary Statement This project studied the effects of temperature and relative humidity on violin pitch.	
Help Received Thanks to my parents for their help and support. Thanks to my science teacher for her guidance.	