



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Dorae D. Hankin	Project Number J1511
Project Title Singing Goblets: Measuring Sound Frequencies from Glass Goblets	
Abstract Objectives/Goals The objective is to test the hypothesis that greater liquid volumes and thicker liquids make a glass goblet resonate at a lower frequency. Also, to determine what effect size and/or shape of goblet has on frequency. Methods/Materials I used a KORGE Chromatic Tuner CA-30 to measure and record pitches of a small and big glass goblet filled at different volumes with either water, vegetable oil, or molasses. I repeated all trials. I used the formula: $f(2) = f(1) * 2^{(x/1200)}$, where $f(2)$ represents the sound frequency in Hertz, $f(1)$ the frequency of the closest semitone, and x the number of cents (a unit of pitch based on the equal tempered scale) away from the closest semitone, to convert the recorded pitches to frequencies. Results Greater liquid volumes produce lower frequencies than goblets filled with less liquid. Oil produced higher frequencies than water, molasses lower than water, and the smaller goblet produced frequencies lower than the larger goblet. Results were very consistent and repeatable. Conclusions/Discussion My hypothesis that as more liquid is added the frequency gets lower was correct. The size and/or shape of the glass also influenced the pitch along with the liquid's density. Liquid volume had a greater effect on frequency than liquid density, however.	
Summary Statement Sound frequencies from glass goblets vary depending on the volume and type of liquid, and size and/or shape of the glass.	
Help Received My dad helped me make graphs and convert pitches to frequencies.	