



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

Name(s) Leah C. Grams-Johnson	Project Number J1510
Project Title Looking at Sound	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine which musical instrument has the purest tone through visual image analysis of the digitized sound waves.</p> <p>Methods/Materials I recorded ten different instrument's singular "A" note in an isolated environment using a Sony mini-disc sound recorder and dynamic microphone. Each instrument that I was able to tune was precisely tuned using a Korg Chromatic Tuner. To ensure the tonal value of each instrument's note, I played and recorded the "A" note at least three times. After this step I connected the recorder and computer through a stereo mini plug cable, and used the software Sound Forge to capture and digitize each instrument's sound wave. Selecting a waveform for each instrument based on quality, accuracy, and consistency, I was able to determine and classify the purity of each instruments tone through my extensive research on sound.</p> <p>Results Through visual representations of digital sound waves, I discovered variation in tonal purity and harmonics. Of the musical instruments I tested, only the piano and song flute/recorder had periodic (pure) wave forms. The other eight remaining instruments, including a violin, mandolin, saxophone, banjo, guitar, harmonica, organ, and human voice, all had complex periodic tones. Due to a slight variation in the visual wave train of the song flute/recorder, the piano proved to have the most consistent, simple, and continuous waveform. Thus, the purest tone was from a piano.</p> <p>Conclusions/Discussion In conclusion, my hypothesis that the piano has the purest tone, was correct. I initially thought the piano would have the purest tone because a piano doesn't have variations in playing a simple note. Other instruments have bow contact, mouth shape, and finger control which can all affect the note being played.</p>	
Summary Statement My project is an intricate comparison of digitized soundwaves to determine the purity of tones from different musical instruments.	
Help Received My Dad helped set up the recorder and capture the sounds into the computer as well as teaching me about the Sound Forge software.	