



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Adam W. Goldman	Project Number J0615
Project Title The Effect of Materials on the Amplitude and Experience of Sound	
Abstract Objectives/Goals Experiments were conducted to determine the differences between the sounds made by instruments constructed from different materials. Attempts were made to discover what effect changing the soundboard of an instrument has on its sound by graphing the amplitude on a computer software program and by how those differences are perceived by the human mind. Methods/Materials Experiments were conducted by recording one instrument with interchangeable tops, referred to as soundboards, on a high fidelity recording with Pro Tools software program. This included a visual frequency graph enabling comparison of graphed characteristics to acoustic attributes determined by a questionnaire. Applicant made experimental string instrument resembling a Banjo (zinc washbucket, axe handle, tamborine, shelf bracket, common and musical hardware) with interchangeable soundboards. Materials List: (Experiment) Shure KSM44 microphone, microphone cable, microphone stand, Shure M367 Six Input Portable Mixing audio processor, Macintosh computer with ProTools and iPhoto software, Bose Triport OE headphones, instrument with interchangeable tops (wooden top, metal top, acrylic top, Remo top, skin top,) tape, digital camera, tripod, paper, printer, socket wrench. (Questionnaire) Pen, Paper, computer with Microsoft Word, CD recordings of same music played on the instrument with each different soundboard, head phones and portable CD player. Results Amplitude Peak Statistics were recorded, graphed and analyzed. The acrylic top had the fastest attack and was the loudest of all the different soundboards. The acrylic top stayed mainly in the high/mid range and had the highest amplitude. The metal soundboard had a quiet and slow attack that was the quietest of all of the tops. The metal stayed in the high range and low amplitude. Questionnaire responses were recorded and graphed. Wood was voted most appealing because it had the strongest midrange tones and amplitude. Conclusions/Discussion The wood soundboard's amplitude was in the midrange and had the most appealing sound of the five. The results suggested that the middle range of tone and sound are what people think of as musical. The material of the top, or soundboard, of the instrument had a major effect on its sound. The effect of materials on sound, and what the human ear identifies as these differences are discussed.	
Summary Statement This project compares the objective and subjective qualities of sound.	
Help Received Mother helped shop for materials, assist with power tools . Professional music editor recorded instrument at home recording studio.	