



**CALIFORNIA STATE SCIENCE FAIR  
2005 PROJECT SUMMARY**

<b>Name(s)</b> <b>Brennan C. Plassmeyer</b>	<b>Project Number</b> <b>J0729</b>
<b>Project Title</b> <b>Creating an Accoustic Guitar Pickup Using Optical Components</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> This project attempted to show that an optical guitar pickup could be built using inexpensive, and would produce clean sounding music. The problem with existing magnetic pickups is that they pull on guitar strings to detect vibrations. In doing this, they decrease the guitar's sustain, and this is not desirable. If an optical pickup could be constructed, then it could eliminate the dampening effect of ordinary magnetic pickups. This would increase sustain, so the sound quality would improve. If the components of the pickup could be built inexpensively, then the pickup would have a great chance of being marketed.</p> <p><b>Methods/Materials</b> Initially, a Michelson interferometer was used to detect the vibrations of teh guitar strings. The interference pattern from the interferometer was shown onto a photodiode, which sensed changes in the interference pattern. The diode converted the changes into an electrical signal which was played over an audio amplifier. This approach produced poor quality sound. A new approach using onlu a laser, a mirror, a lens, and a photodiode was attempted. The laser bounced off the guitar-mounted mirror at a 45-degree angle, and went through a lens, and was shown onto a photodiode.</p> <p><b>Results</b> The Michelson interferometer based optical pickup was very sensitive. However, the sound quality was poor, and the guitar notes had a scratchy, "techno" sound. the author speculated that the mirror moving more than one wavelength of laser light caused this. The second approach, produced good quality sound, and was simpler and less expensive.</p> <p><b>Conclusions/Discussion</b> The Michelson interferometer based pickup produced poor quality sound possibly because the pattern was too sensitive. The new idea, using a laser, a mirror, a lens, and a photodiode produced good quality sound. To further improve the quality of the sound, higher quality optics could have been used.</p>	
<b>Summary Statement</b> I began this project by constructing a Michelson interferometer for use as an optica guitar pickup, which was unsuccessful, wo i constructed a successful optical guitar pickup using a laser, a mirror, a lens, and a photodiode.	
<b>Help Received</b> Dad supervised and bought optical components; Mother helped edit report; Mrs. Hunker got the project started	