



# CALIFORNIA STATE SCIENCE FAIR 2008 PROJECT SUMMARY

<b>Name(s)</b> <b>Jacob M. Kohlhepp</b>	<b>Project Number</b> <b>J1220</b>
<b>Project Title</b> <b>Crystal Energy: Harnessing the Power of Piezoelectricity</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My objective was to see which mineral type displayed the greatest piezoelectric effect. This can be discovered by measuring the amount of electrical displacement (voltage) across the rock due to mechanical stress. The property of piezoelectricity can mostly be said to be a characteristic of certain crystalline minerals/rocks that allows them to convert applied mechanical energy into electrical energy.</p> <p><b>Methods/Materials</b> To begin creation of my experimental setup, I acquired 8 mineral samples, including three different types of the mineral quartz. I created a clamping setup that allowed me to have a good connection between the rock sample and the test leads. I purchased a multimeter with a computer interface that takes samples every second. I attached the leads on the meter to the clamps, and started the program. For each mineral, I applied 50 taps of mechanical stress using a wooden tool. Each rock had three sets of 50 taps. The computer logged the acquired voltage measurements.</p> <p><b>Results</b> Once I finished my experimenting, I received many interesting results. The data showed that my control, which was a piezoelectric igniter, displayed the greatest voltage and amperage. (max. spike of 4 volts) But, I was not testing the igniter, it was mainly just for reference or comparison. The mineral that displayed the greatest maximum and overall voltage when tapped was the amethyst variation of quartz. (max. voltage of 0.128 volts and 0.036 amps)</p> <p><b>Conclusions/Discussion</b> From my results, I found that my hypothesis could be said to be true, since it predicted that the most piezoelectric mineral would be the amethyst variation of quartz. From the fact that the amethyst variation of quartz displayed the greatest effect, it would seem that the larger the crystal, the greater the effect. But this is not so, because my control, the igniter, showed many times greater voltage than the amethyst, and it used a miniscule crystal. I can gather that the amethyst crystal either had the best crystal structure for the piezoelectric effect to take place, or amethyst quartz is simply the most piezoelectric of all the minerals I tested. This information can be used to develop alternative sources of energy, such as seismic generators that convert seismic energy into electrical energy using piezoelectric minerals.</p>	
<b>Summary Statement</b> My project was conducted to test which of the eight minerals I used most effectively converts mechanical stress applied into electrical energy through the property of piezoelectricity.	
<b>Help Received</b> Mrs. Vodraska gave me advice and helped me register; Ms. White lent me her large amethyst sample; My mother helped me with my Excel data sheets; My father allowed me to use his tools to construct my experimental setup.	