



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

<b>Name(s)</b> Kelly L. Moore	<b>Project Number</b> <b>S1823</b>
<b>Project Title</b> <b>Harvesting Light: An Investigation on the Effect of Refraction through a Glass Panel</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective is to test if a photovoltaic cell can still absorb light through a glass panel from different angles.</p> <p><b>Methods/Materials</b> A box was constructed to hold a photovoltaic cell during all tests and trials. The box was made of flat glass, white pine, masonite, wood screws, and flat black paint. A 100 watt spotlight was set in a table saw stand. Four feet were measured between the glass panel and spotlight. There were three readings taken without the glass panel in place and the spotlight placed at 90° compared to the photovoltaic cell: ambient (surrounding) light, "raw" (spotlight and ambient) light, and corrected (ambient subtracted from "raw"). Ten trials were conducted at the angles of 90°, 75°, 60°, 45°, 30°, and 15°. Each test had the ambient reading taken, and then the "raw" reading with both the garage light and spotlight on. The ambient reading was subtracted from the raw reading to generate the corrected reading. An overall average was taken for each of the six angles. The averages were calculated for all three light readings: ambient, raw, and corrected.</p> <p><b>Results</b> The values for the 90° readings were the highest for all three of the categories. It was higher than the unrestricted value, which was .555 volts. The raw values for 90° were all within .005 volts of the unrestricted level. Otherwise the voltage decreased throughout the experiment. The lowest reading was a raw voltage of .145 volts at 15 degrees. The averaged raw data indicated a decrease of .407 volts. As the angle decreased the averaged correct data shows the cell's output decreased a total of 0.404 volts.</p> <p><b>Conclusions/Discussion</b> The experiment supports the hypothesis that the angle of light through a glass panel definitely affects the output. The farther from perpendicular the light source was in relation to the glass panel, the output from the photovoltaic cell decreased. This could be because since there was nothing for the light to reflect off of inside the black box once it had been refracted. Only a limited amount of light hitting the glass at a certain angle bent enough to the cell without being reflected a different way. Any light that had its direction changed lost strength and therefore caused a reduction in the light absorbed by the cell. However, photovoltaic cell can still absorb light from a source if there is glass over it, despite the effect of refraction.</p>	
<b>Summary Statement</b> Light was shone from six different angles in comparison to a photovoltaic cell, with a piece of flat glass placed in between the light and solar cell to see if the solar cell could still absorb light despite the effect of refraction.	
<b>Help Received</b> Father helped construct the box holding the solar cell.	