# CALIFORNIA STATE SCIENCE FAIR
# 2013 PROJECT SUMMARY

**Name(s)**
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**Project Number**
**J0210**

**Project Title**
## Getting Solar Energy into Focus

**Abstract**

**Objectives/Goals**
My project was to find out what happens when the solar cell in a parabolic solar concentrator is at a variety of points in relation to the focal point of the parabolic mirror, in order to learn more about making solar concentrators more efficient. I believe that the concentrator with the solar cell closest to the focal point of the parabola will have the highest efficiency and generate the highest output voltage.

**Methods/Materials**
I built a parabolic mirror from wood, posterboard and Mylar, mounted a solar cell on a PVC tube and set up a notch to enable me to put the solar cell at different heights above the vertex of the parabola. I then wired the solar cell to a voltmeter so I could measure the output. Using the sun as a light source, I performed my experiment by recording the output voltage of the solar cell when mounted different heights from the focal point, with 3 trials for each height.

**Results**
The average output voltages when the solar cell was 1cm above and 1cm below the focal point were as expected - lower than the average output voltage for the focal point. However, the average output voltage for higher points (2, 3, and 4cm above the focal point) were increasingly larger than that of the focal point.

**Conclusions/Discussion**
My hypothesis of the concentrator with the solar cell closest to the parabola's focal point having the highest efficiency was not supported because even though 3 data points supported my hypothesis, the 3 others did not. I discovered from research afterwards that solar cell output was not meaningful below 10v and could be inaccurate by up to 1v - so the range of values I got could be misleading. However, I also discovered afterwards that the solar cell at points much higher than the focal point could be picking up light that had been reflected twice - first hitting one wall of the mirror and passing through the focal point and bouncing against the other wall to finally hit the solar cell at a higher position. That opens up new possibilities for experimenting with improvements to solar cell efficiency by using solar cells at multiple heights and generating more electricity.

**Summary Statement**
My project explores one way to get the highest output voltage from a parabolic solar concentrator.

**Help Received**
Teacher helped clarify project idea; mom helped with soldering, some typing/printing; dad helped buy materials, saw wood, trouble-shoot connections.