



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Akshay P. Madhani	Project Number J1028
Project Title Solar Mirrors: An Economical Design to Increase the Power Output of Silicon Photovoltaic Solar Cells	
Abstract Objectives/Goals Current solar concentrator systems are either too expensive or too complicated to build and therefore are not used by the common man. My objective was to design an economical solar concentrator using ordinary mirrors to enhance power output of silicon photovoltaic solar cells. Methods/Materials I experimented with different sizes of mirrors and angles with respect to the solar cell to figure out the combination which will give the maximum power output. I first attached two modified hinges to a Styrofoam board, followed by a solar cell on top of the hinges. The hinges helped control the angle of the mirror. I put the Styrofoam board on an easel so the hinges were to the top and bottom of the solar cell. I experimented with three mirror sizes: 1 times the width and 1 times the length of the solar cell, 2 width x 1 length, and 1 width x 2 length. I measured the solar cell power output with the 1 width x 1 length mirrors when they were at 100, 110, 120, and 140 degree angle with respect to the solar cell. I did this with not only with both the top and the bottom mirrors but also with only the bottom mirror. I repeated the experiment with the other mirror sizes. The readings were taken every 2 hours from 9 a.m. to 3 p.m. Materials: 1. Solar cell, 2. 2 mirrors of size 1 Length x 1 Width of solar cell, 3. 2 mirrors of size 2 Length x 1 Width, 4. 2 mirrors or size 1 Length x 2 Width, 5. 2 hinges, 6. Digital multimeter, 7. Styrofoam board Results Mirrors at a 140 degree angle did not really help increase the power output as the angle was too wide. The top mirror at a 100 degree angle blocked light coming to the solar cell and sometimes created a loss in efficiency. Mirrors at a 110 degree angle performed the best, followed by a 120 degree angle. 2 length x 1 width mirrors performed the best, followed by 2 width x 1 length mirrors, followed by 1 width x 1 length mirrors. Conclusions/Discussion By using only one 2 length x 1 width mirror at a 110 degree angle with respect to the bottom of the solar cell, you can increase the maximum efficiency of the solar cell by 27.9% and average efficiency by 17.25% for less than 3% increase in the cost. This is a very economical way of boosting the output from the solar cells using an innovative design with ordinary mirrors. You can increase efficiency even more using both the top and the bottom mirrors; however, efficiency increase created by adding the top mirror is marginal.	
Summary Statement The purpose of my project was to create an economical solar concentrator system using simple, inexpensive mirrors which would increase the power output of solar cells.	
Help Received Mother helped me with the board. Father helped me with obtaining the materials. Mrs. Nguyen guided me in the project.	