



# CALIFORNIA STATE SCIENCE FAIR 2009 PROJECT SUMMARY

<b>Name(s)</b> <b>Jonathan T. Ota</b>	<b>Project Number</b> <b>S0217</b>
<b>Project Title</b> <b>Helio Tracker</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Photovoltaic panels are commonly plagued with a single problem: inefficiency due to immobility. However, when photovoltaic panels track the movement of the sun, their efficiency increases significantly. A solution exists in nature: the sunflower. The purpose of this project is to design a device that can track the movement of the sun without consuming electricity by mimicking the phototropic qualities of the sunflower. The three basic actions of a sunflower reacting to light are imitated through three components on the device. A parabolic mirror channels light to a central bottle, thus acting like the photoreceptor in plants. Within the bottle, alcohol absorbs heat and undergoes a phase change to create pressure. The pressure, similar to the hormone in plants, acts as the signal and moves through lengths of tubing to a piston on the opposite side of the device. The pressure triggers the elongation of the pistons emulating the elongation of the cells in plants, thus moving the mounted panel towards the light.</p> <p><b>Methods/Materials</b> mylar (space blanket), 91% isopropyl rubbing alcohol, 20mL plastic syringes (pistons), 1/4 vinyl tubing, 1/4 polyethylene tubing, 22 gauge copper wire, paper towel rolls (cardboard), Black cloth tape masking tape, "engine enamel" black paint, 1/4 inch aluminum tubing, plastic panel, for mounting photovoltaic panel</p> <p><b>Results</b> Individually, the separate systems responded to sunlight by creating pressure to move the pistons. The elongation of the pistons did not translate into the movement of the head of the device.</p> <p><b>Conclusions/Discussion</b> There are various reasons why the head of the device did not move. Although the pistons respond to pressure and expand, they are not mounted securely to the panel and the main trunk of the device to make the head of the device move. Another example is that the rubber plungers of the pistons exert too much friction against the walls of the syringe which hinders the pistons from reacting to small changes in pressure. Also, the bottles containing the alcohol are not completely clear, thus reducing the amount of sunlight heating the alcohol and the pressure created. All or some of these factors may be a reason the device does not fully function as hypothesized. Further study of these individual factors needs to be undertaken.</p>	
<b>Summary Statement</b> My project aims to Emulate phototropic qualities in plants to increase the efficiency of photovoltaic panels.	
<b>Help Received</b> My father helped me with writing the report. Donal Ferris helped me with different aspects of the structure of the device. Debra Mauzy-Melitz assisted me with my abstract and board.	