



CALIFORNIA STATE SCIENCE FAIR 2002 PROJECT SUMMARY

Name(s) Matthew J. Bauer	Project Number 22176
Project Title Critical Variables of an Effective Solar Box Cooker	
Objectives/Goals These experiments were conducted to find the most critical parts of a solar box cooker. The variables of insulation, conduction/conversion, transparency and reflection were tested to determine their effects on heating a liter of water. Using the best combination of these variables it is possible to build an efficient solar box cooker. Methods/Materials Two identical solar box cookers were built out of plywood. This allowed one to be used as a control and the other to be tested with a new variable. In each experiment the #winner# was the solar cooker that reached the highest plateau temperature. The #winner# was used as the control in the next experiment. Each experiment also contained a #clear jar# control that contained one liter of water. This control allowed for a comparison between each experiment. Results These experiments demonstrate that insulation is important in maintaining the heat inside of the solar cooker. The use of a black jar to adsorb sunlight and to convert it into heat (conduction) was also important. Increasing the total amount of light to enter the inner box through the use of reflectors or transparent surfaces were extremely critical variables. Conclusions/Discussion In these experiments the critical variables of a solar box cooker were determined. These included insulation, the ability to keep heat from escaping; conduction/conversion, the ability to convert light into heat; transparency the ability to pass light through a solid surface; and reflection the ability to cast light at an angle. Using the #winner# from each experiment allowed the best selection of variables. The highest plateau temperature reached was 197°F. Although this is a high enough temperature to cook food, it took all day to reach this temperature. To be practical, a solar cooker should heat up to cooking temperature in less than 3 hours. Future experiments will include building better reflectors and testing solar cookers in different locations (the desert, for instance). Also, the solar cookers will be tested in the summer when the sun is closer, to see if the current solar cooker will obtain even higher temperatures.	
Summary Statement Determining the critical variables of an effective solar box cooker.	
Help Received My father helped with cutting the wood and glass for the solar box cookers and with making the graphs. My mother proof read my paper made suggestions for improvement.	