



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Asmita Kumar	Project Number 22731
Project Title Comparison of Photovoltaic Effect in Silicon and Natural Dye Based Cells using Different Light Sources	
Abstract Objectives/Goals The objective is to compare the performance of home made natural dye based organic photovoltaic devices with commercial inorganic silicon based photovoltaic devices in sunlight and colored artificial light. Methods/Materials Chlorophyll and anthocyanin organic dyes extracted from citrus leaves, raspberries and blackberries were absorbed onto nano-crystalline titanium dioxide coated on conducting glass slides. Photovoltaic devices were made with an iodide/triodode electrolyte separating a graphite coated conducting glass slide from the dye coated slides. The voltage and current characteristics were measured in sunlight and colored artificial lights and compared to those observed for commercial silicon based photovoltaic devices. Results The open circuit voltage (OCV) for anthocyanin based cells in sunlight averaged 371 mV and the short circuit current (SCC) averaged 0.43 mA/cm ² and the maximum power in sunlight was 0.03 mW/cm ² . The average sunlight OCV for chlorophyll dye cells was 451 mV. The average SCC was 0.21 mA/cm ² in sunlight providing maximum power of about 0.016 mW/cm ² . The silicon photovoltaic devices provided an average 380 mV open circuit voltage (OCV) and 6.6 mA/cm ² short circuit current (SCC) and average maximum power was 1.37 mW/cm ² in the sun. Conclusions/Discussion Organic dye based photovoltaic cells can be made at home using chlorophyll and anthocyanin dyes. These cells capture energy from sunlight and indoor light of sufficient intensity. Commercial silicon cells are considerably more efficient than the home-made photovoltaic devices.	
Summary Statement Natural organic dyes can be used to make home made cells for the capture of solar energy.	
Help Received Dr. Greg Smestad, creator of the dye-sensitized solar cell kit, provided tips by e-mail. Mr. M. P. Reidy gave conductive glass plates. Applied Films sent heat shield glass and Drs. Kaustav and Sonali Das gave Triton X 100. Mother took notes during outdoor measurements. Father helped wire the circuit board and	