



**CALIFORNIA STATE SCIENCE FAIR  
2014 PROJECT SUMMARY**

<b>Name(s)</b> <b>Colin S. Takeda</b>	<b>Project Number</b> <b>J0230</b>
<b>Project Title</b> <b>Sushi Power: Making Solar Cells from Seaweed and Squid Ink</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Different types of solar cells, like nano crystalline dye-sensitized solar cells (DSSC), have become the subject of intense interest and research. The use of anthocyanin derived from various fruit has been the standard dye used in DSSCs. The purpose of my experiment is to compare anthocyanin-sensitized solar cells with solar cells constructed using novel sources of photosensitive dyes including phycoerythrin from red algae and melanin from squid ink. I hypothesized that if a natural dye pigment is photosensitive, then it will generate electricity when used in a DSSC.</p> <p><b>Methods/Materials</b> In my experiment, I assemble 15 solar cells in the Grätzel style of DSSC - 5 for each dye tested. The conductive side of a tin oxide coated piece of glass is coated with titanium dioxide. Raspberries, nori (dried red algae), and squid ink are liquefied and treated with ethanol. The liquid derived after straining is used to soak the titanium dioxide. The conductive side of another piece of glass is covered with carbon by exposing it to a flame. Then the two pieces of glass are stacked in an off set fashion with the conductive sides facing each other. An electrolyte solution of potassium iodide is added between the slides. The solar cell is exposed to a controlled amount of light from a lamp that produces natural sunlight. Using a multimeter, the voltage generated is measured and the results are averaged.</p> <p><b>Results</b> All three types of solar cells produced instantaneous current when exposed to light. For all three types, there was a rapid drop in voltage followed by a slower increase. In my tests, the phycoerythrin-sensitized solar cell (red algae) outperformed the anthocyanin-sensitized solar cell (raspberries) in both maximum voltage and average voltage over the test period. The maximum and average voltage for the melanin-sensitized solar cell (squid ink) was less but the slope of its voltage increase was greater than both the other groups.</p> <p><b>Conclusions/Discussion</b> Based on my experiments, if a natural dye pigment is photosensitive, then it will produce electricity when used in a DSSC. In fact, a novel source of photosensitive pigment, red algae, proved to be as effective as the standard fruit-derived anthocyanin-sensitized solar cell. In addition, my experiments show that an animal-derived photosensitive pigment, melanin, can also be used in a DSSC.</p>	
<b>Summary Statement</b> This project compares the phycoerythrin and melanin to anthocyanin as photosensitive dyes in nano crystalline dye-sensitized solar cell.	
<b>Help Received</b> My Mother help me with some of the cutting for my display board and my father taught me how to use Adobe Photoshop. My teacher, Ms. Cohen answered my questions and proof-read my work.	