



**CALIFORNIA STATE SCIENCE FAIR  
2002 PROJECT SUMMARY**

<b>Name(s)</b> <b>Alexandra J. Berger</b>	<b>Project Number</b> <b>J1303</b>
<b>Project Title</b> <b>Biophotolysis in Various Bacterial and Algal Cultures</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> I determined which microorganisms most efficiently produce hydrogen through biophotolysis (the microbial production of hydrogen): photosynthetic bacteria from the soil or natural water, <i>Anabaena</i> sp. of cyanobacteria, or <i>Chlamydomonas reinhardtii</i> sp. of Eukaryotic Algae. I believe the photosynthetic bacteria from the soil are the most effective hydrogen producers.</p> <p><b>Methods/Materials</b> I made a medium for growing the photosynthetic bacteria from the soil and natural water by combining water, fruit, monosodium glutamate, and bicarbonate. To measure hydrogen, I used the gas-collection method with a pneumatic trough with water and a metal tray inside with an inverted graduated cylinder filled with water. I put microorganisms in vials and inserted rubber stoppers so that there was no air. A piece of glass tubing attached to a piece of rubber tubing was placed in a hole in the stopper. This tubing went into one of the graduated cylinders. I observed the amount of water displaced for a 120-hour period. I tested for hydrogen by lighting a wooden splint and I holding the splint near the end of the glass tubing. If the fire flared up, hydrogen was present.</p> <p><b>Results</b> The <i>Anabaena</i> sp. and <i>Chlamydomonas reinhardtii</i> sp. produced an average of 0 ml. of hydrogen after 120 hours. After 120 hours, the photosynthetic bacteria from the soil had produced an average of 19.75 ml. of hydrogen with a standard deviation of 1.8 ml. After 120 hours, the photosynthetic bacteria from the natural water produced an average of 9.25 ml. of hydrogen with a standard deviation of 0.886 ml.</p> <p><b>Conclusions/Discussion</b> My hypothesis was correct, photosynthetic bacteria in the soil are the most effective hydrogen producers. Hydrogen fuel cells are beneficial to our environment because the only byproduct of them is water. The problem with fuel cells is that hydrogen is not found pure naturally. Because of this, it has to be created. The popular way to create hydrogen is to split water molecules into 2 hydrogen atoms and an oxygen atom, but it takes a lot of energy and the energy is usually created from fossil fuels. This defeats the purpose of using hydrogen fuel cells. The only other method of creating pure hydrogen for fuel cells is through biophotolysis. This method is safe and inexpensive. My project was created to help with the process of determining which type of microorganisms should be used in order for this method to become reality.</p>	
<b>Summary Statement</b> My project is about the efficiency of biophotolysis in microorganisms.	
<b>Help Received</b> none	