



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) <p align="center">Kriti Lall</p>	Project Number <p align="right">31485</p>
Project Title <p align="center">A Study of Mutant Algae for Hydrogen Production</p>	
<p align="center">Abstract</p> <p>Objectives/Goals Last year, I tested 2 methods of producing H₂ from the algae <i>Chlamydomonas reinhardtii</i> by sulfur(S)-deprivation and addition of different copper (Cu) concentrations to the algae media.</p> <p>This year, I am continuing from last year and focusing on improving photosynthetic efficiency of this process. I am testing whether mutants with special properties improve the algae's light utilization efficiency, resulting in better H₂ production. I chose 0.8 ppm Cu because it was the best medium from last year. This can help improve commercial H₂ photobioreactors, making algal H₂ economically viable.</p> <p>I questioned: Are <i>C. reinhardtii</i> mutants better at producing H₂ than the wild type in Cu-enriched or S-deprived media? I hypothesized that mutants with less chlorophyll will utilize light better, producing more H₂. From last year, I hypothesized that on a continuous basis, the Cu-enriched media will produce H₂ more effectively.</p> <p>Methods/Materials I labeled 6 water bottles as CC-125 Cu, CC-125 S, CC-1101 Cu, CC-1101 S, CC-4170 Cu, and CC-4170 S. I added S-free and Cu 0.8 ppm solutions, and equal amounts of respective algae strains. I assembled an airtight apparatus for the algae environment to become anaerobic. I left it assembled for 5 days, after which I took it off, and fitted balloons onto the bottle spouts to collect the gas produced. After 12 days, I removed the gas-filled balloons and measured H₂ using a graduated cylinder. At the beginning and end of the experiment, I measured the light intensity through each bottle with a light meter. Repeated experiment.</p> <p>Results CC-4170 S produced the most H₂, followed by CC-4170 Cu, CC-125 S, CC-125 Cu, CC-1101 S, and CC-1101 Cu. Light intensity decreased as it passed through the bottles. The decrease was most for CC-125 Cu (78%) and least for CC-1101 S (58%). The H₂ produced by CC-1101 was lower than expected.</p> <p>Conclusions/Discussion My hypothesis was supported. CC-4170, with less chlorophyll than CC-125 let more light pass through it and produced more H₂ than CC-125. CC-1101 performed poorly. I think this is because it lacks an eyespot, which is needed for the algae to function properly. As expected, mutants in the S-deprived medium produced more H₂; but by the end of the experiment, they began to die. The algae in the Cu-enriched medium produced less H₂, but remained healthy at the end of the experiment.</p>	
<p>Summary Statement</p> <p>My project investigates whether <i>Chlamydomonas reinhardtii</i> mutants can improve the photosynthetic efficiency of hydrogen-producing process by better light utilization.</p>	
<p>Help Received</p> <p>Dad helped procure algae mutant strains</p>	