



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Kriti Lall	Project Number J0218
Project Title A Study of Mutant Algae for Hydrogen Production	
Objectives/Goals Last year, I tested 2 methods of producing H ₂ from the algae <i>Chlamydomonas reinhardtii</i> by sulfur(S)-deprivation and addition of different copper (Cu) concentrations to the algae media. 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 H ₂ production. I chose 0.8 ppm Cu because it was the best medium from last year. This can help improve commercial H ₂ photobioreactors, making algal H ₂ economically viable. I questioned: Are <i>C. reinhardtii</i> mutants better at producing H ₂ than the wild type in Cu-enriched or S-deprived media? I hypothesized that mutants with less chlorophyll will utilize light better, producing more H ₂ . From last year, I hypothesized that on a continuous basis, the Cu-enriched media will produce H ₂ more effectively.	
Abstract	
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 H ₂ 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.	
Results CC-4170 S produced the most H ₂ , 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 H ₂ produced by CC-1101 was lower than expected.	
Conclusions/Discussion My hypothesis was supported. CC-4170, with less chlorophyll than CC-125 let more light pass through it and produced more H ₂ 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 H ₂ ; but by the end of the experiment, they began to die. The algae in the Cu-enriched medium produced less H ₂ , but remained healthy at the end of the experiment.	
Summary Statement My projects investigates whether <i>Chlamydomonas reinhardtii</i> mutants can improve the photosynthetic efficiency of hydrogen-producing process by better light utilization.	
Help Received Dad helped procure algae mutant strains	