# CALIFORNIA STATE SCIENCE FAIR
## 2010 PROJECT SUMMARY

**Name(s)**
Kriti Lall

**Project Number**
**J1721**

**Project Title**
## Environmentally-Friendly Algal Hydrogen

**Abstract**

**Objectives/Goals**

The purpose of my project is to test two different methods of producing environmentally friendly hydrogen using the green algae Chlamydomonas reinhardtii. Under certain conditions, the photosynthesis process occurring within this algae is known to produce hydrogen.

Although the use of hydrogen as a fuel is environmentally friendly, its production is not. Today, most of the hydrogen is produced from fossil fuels, emitting greenhouse gases. Hence, hydrogen as a fuel does not solve the greenhouse gas problem. On the other hand, producing hydrogen through algae promises reduction in air pollution and global warming.

**Methods/Materials**

I used five water bottles (with spouts), and labeled them as Control, Copper 1 ppm, Copper 1.6 ppm, Copper .8 ppm, and Sulfur Free. I added control, sulfur free and copper (0.8 ppm, 1ppm and 1.6 ppm) solutions to each bottle, along with equal amount of algae in each bottle. I assembled an airtight apparatus for each to make sure the algae environment would eventually become anaerobic. I left the apparatus assembled for four days.

On the fourth day, I took off the apparatus, and fitted balloons onto the spouts of the water bottles. These would be used to collect the gas that the algae produced. After 12 days, I observed the bottles again. The balloons were filling up with gas. Carefully pinching the balloons, I took them off of the water bottle spout. Then, I measured the amount and type of gas produced (oxygen/hydrogen) using a graduated cylinder and a burning splinter. I repeated this experiment two times to make sure my results were valid.

**Results**

The sulfur free environment for the Chlamydomonas reinhardtii was the most effective in producing hydrogen, followed by copper 0.8 ppm, copper 1 ppm, copper 1.6 ppm, and control. Control produced no hydrogen, but made 17.5 ml of oxygen.

**Conclusions/Discussion**

Both methods, sulfur deprivation and copper addition, produced hydrogen with Chlamydomonas reinhardtii. Control didn#t produce any hydrogen because it was not under any specific conditions. Sulfur free produced the most hydrogen, but it eventually killed the algae. This was due to the absence of proteins that were in the deprived sulfur. Due to the fact that copper is an algaecide, copper 1.6 ppm produced less hydrogen than copper 1 ppm and copper 0.8 ppm. In other words, as the copper amount increased, the hydrogen amount produced decreased.

**Summary Statement**

This project involves testing and comparing two methods of producing environmentally friendly hydrogen, copper enrichment and sulfur deprivation, using the green algae Chlamydomonas reinhardtii.

**Help Received**

Dad helped in procuring project materials and handling algae and chemicals.