



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

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Project Title Does Environmental pH Affect the Growth of Nannochloropsis? Or Vice Versa?	
Objectives/Goals Scientists predict that much of the carbon dioxide in Earth's atmosphere will be absorbed by the world's oceans. As this carbon dioxide interacts with seawater, it forms carbonic acid, driving down the pH of the seawater. The two questions addressed in this project are: 1. How does an aquatic environment's pH affect the growth of the Nannochloropsis? 2. How does Nannochloropsis growth affect an aquatic environment's pH?	
Abstract Methods/Materials Nannochloropsis (a type of marine alga) was cultured in duplicate for two experiments. In one experiment the algae were grown under identical conditions (light, temperature, nutrients), but were exposed to different pH levels. Growth and pH were monitored. In the other experiment the algae were grown under identical conditions, except that specific volumes of dilute hydrochloric acid were added several times during the incubation period to help maintain the different pH levels. The growth was monitored using spectrophotometry, and pH was monitored using a pH meter and pH test strips. Nannochloropsis was cultured in filtered seawater enriched with f/2 nutrient solution, and exposed to a cool white fluorescent lamp.	
Results Fig. 1 shows that the drop in pH due to the addition of dilute hydrochloric acid was reversed after less than three days. After six days the culture's pH increased by at least 2 pH units. Fig. 2 shows that the pH of the other set of cultures decreased with the addition of dilute hydrochloric acid. These pH levels also increased over time. Fig. 3 shows that if the acid is only added once, the growth of the algae over 7 days was highest for the culture that was exposed to the most acid. Fig. 4 shows that if acid is added throughout the culture period, the growth of the algae exposed to the highest levels of acid was reduced.	
Conclusions/Discussion A continuous low pH level appears to decrease the growth of Nannochloropsis, while a brief exposure to a low pH level appears to increase the growth. The Nannochloropsis increased the environmental pH over time. Since Nannochloropsis is capable of raising the pH of seawater, growth of this algae in the world's oceans may allow for a correction of the acidification of these oceans due to anthropogenic carbon.	
Summary Statement Nannochloropsis can raise the pH of seawater that has been acidified, but this acidification can affect the growth of the algae.	
Help Received Suggestions for culturing Nannochloropsis were provided by aquarists at Cabrillo Marine Aquarium, San Pedro, CA. Use of a pH meter was provided by Glendale College. Use of a spectrophotometer and glassware were provided by Pasadena City College.	