



# CALIFORNIA STATE SCIENCE FAIR 2017 PROJECT SUMMARY

<b>Name(s)</b> <b>Rohan Bhushan</b>	<b>Project Number</b> <b>S1603</b>
<b>Project Title</b> <b>Phototactic Analysis of the Effects of the Chemorepellent Nitrate on Taxis-Based Vertical Column Orientation in Protists</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Nitrate pollution is a major issue around the world, and has contributed to much environmental damage. Many experiments have been conducted to explore the effects of nitrate on ecology, but none have fully explored the effects of nitrate on algae's abilities. This experiment aimed to investigate the effects nitrate pollution has on algae's motility to the surface of water, and the influence gravitaxis, phototaxis and chemotaxis has.</p> <p><b>Methods/Materials</b> During my testing I analyzed three different variables: light, nitrate, and algal species, to properly isolate exactly which function of the algae the nitrate was impacting. Varying light helped isolate phototaxis, nitrate helped isolate chemotaxis, and the two different species of algae helped further display similar trends across species. I had a total of 12 tests, with three repetitions each. During my testing I isolated samples from the surface and depth of each vial and took two pictures at both 160x and 400x magnifications. These photos were later analyzed using an image analyzer called ImageJ, and these values were then substituted into two equations for cell concentration and size, which were developed by this project. I also measured glucose concentrations to analyze the algae's dependence on glucose, therefore gaining insight into their dependence on photosynthesis as well.</p> <p><b>Results</b> Following the testing period, I analyzed my results. The main finding of this experiment was that due to nitrate concentrations, the algae tended to migrate deeper in the water. This was seen by comparing cell concentration values between tests with nitrate and without nitrate, and looking at surface and depth values. This migration to deeper levels also saw an increase in glucose metabolism, and concurrently, a decrease in photosynthesis. Tests without light also saw erratic behavior from cells, which led to the explanation that the nitrate was affecting gravitaxis as well, due to the fact that the cells were not able to migrate to the surface of the water in the absence of light.</p> <p><b>Conclusions/Discussion</b> Nitrate is a major issue, and could be indirectly lowering carbon fixation rates by phytoplanktonic flagellates, which contribute to over 85% of the world's carbon fixation. My results show what a huge issue excessive use of nitrate in agriculture is, and with recent rain causing severe runoff, this nitrate is leeching into our water sources and environment.</p>	
<b>Summary Statement</b> This experiment isolated the effects of nitrate pollution on the ability of phytoplanktonic flagellates to maintain vertical column orientation for optimal photosynthetic output.	
<b>Help Received</b> Dr. Shannon Johnson and Dr. Josh Plant provided answers prior to experimentation for questions about methodology.	