



CALIFORNIA STATE SCIENCE FAIR 2012 PROJECT SUMMARY

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Project Title The Mechanics of Life	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This project is a cluster of experiments aimed at creating an apparatus to successfully and efficiently grow energy-producing algae. In order to do this, tests were done to discover what would be the best form factor and amenities for the algae. We chose to perform our experiments on a strain called <i>Dunaliella tertiolecta</i>, which is known for its high lipid yield. This lipid can then be turned into fuel.</p> <p>Methods/Materials For the medium solution, we chose to test the necessity of a medium called F/2. F/2 medium is a cocktail of nutrients specifically designed for <i>Dunaliella tertiolecta</i>. The test consisted of two sets of beakers with two beakers in each set. The control held a 1:10 ratio of algae to seawater, while the variable had the same ratio, with 2mL of F/2 medium added. These beakers were set under grow lights and daily spectrophotometer readings were taken at the 760 nm spectrum. These readings were then inputted into a hemocytometer/spectrophotometer linear regression to get cell counts. Alongside the medium test, it was tested to see whether or not bubbling would be valuable to include in the apparatus. A beaker with identical contents to the variable of the medium test, as well as a micro-bubbler, was placed under grow lights, with spectrophotometer readings taken regularly. The final component of the apparatus ended up being more of a research project than an experiment. We tried to find out what spectrum of light algae grows best in, and found lights to accommodate that.</p> <p>Results The medium test showed that the algae with the medium grew to have three times the cell count of the control for only 2mL of the cocktail. This made it necessary for the medium to be included due to its sheer boost in speed. The bubbling experiment revealed interesting results, for it had ended up killing the algae within through excess turbulence. We discovered that our type of algae prefers the natural light spectrum the sun emits. Prototype one incorporated all of the knowledge we gathered through the project, but gave us unexpected results: it was creating such turbulent conditions for the algae, that they were getting killed. This, coupled with the fact that the prototype was not as energy efficient as possible, lead us to create our second prototype.</p> <p>Conclusions/Discussion The second prototype is in its final phases of testing, and solved the turbulence issue by instituting an Archimedes screw that promotes a current.</p>	
Summary Statement Trying to create a energy-producing algae culturing apparatus using the least amount of energy and resources.	
Help Received Dr. Jay Vavra provided facilities, materials, and guidance; Rick Bizzoco and Elliott Weiss provided algae strains and advice	