



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Andy S. Meyers	Project Number S1514
Project Title Algae: The Living Oil Factory: Year 2	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My hypothesis is: If I expose algae to an electric field, then it will separate from the medium and lyse the cell membrane and release the biomass and lipids which can be used as a biofuel.</p> <p>Methods/Materials Method: 1. Set up algae lab using Tetraselmis chuii in 1.5 liters of medium using photobioreactor and cultured 95 liters of algae in medium over seven months. 2. Harvested 2254 ml of algae and continued to remove water to create 490 ml of concentrated algae for testing. 3. Conducted range tests varying voltage, electrodes and distance to narrow down variables. 4. Exposed concentrated algal medium to electric field. Trial #1 & #2: Placed 80mL of concentrated medium in 30cm trough at 15 volts. Trial #3: Placed 50 mL of concentrated medium in 10cm trough at 15 volts. Allowed electric field to run for 30 minute intervals for three hours. At each interval, took sample and observed and photographed it under microscope at 40x, 100x, 400x and 1000x magnification. After three hours, removed treated algae and placed in graduated cylinder to settle. 5. Analyzed sample in terms of percent flocculated and percent of cell membranes lysed. Materials: Culturing: Photobioreactor, Tetraselmis chuii sample, culturing nutrients, salt. Harvesting: Pans, buckets, custom-made settling tubes. Testing: Power supply, electrodes, leads and wire, 30 cm and 10 cm custom-made troughs, microscope, containers.</p> <p>Results Flocculation begins to occur within the first 30 minutes of exposure and takes up to 2 hours for total flocculation. About 10% of the cells appeared to be ruptured in the first 30 minutes, about 35% -50% after three hours. Oil was captured at an average of 1.5% of the algae concentrate or 15% of the wet biomass.</p> <p>Conclusions/Discussion Hypothesis was correct. Electric field aids harvesting algae from medium and lysing cell for biomass to be released and oil to be extracted. Electric field is more efficient in harvesting than settling. Shorter distance led to higher amps, higher wattage, higher cost but similar results. Opportunity to optimize electric field as higher amps cost more but did not yield better results.</p>	
Summary Statement When algae is exposed to an electric field, the cells flocculate and the membrane can be lysed.	
Help Received Consulted with Dr. Stephen Lyon; mother helped harvest algae; borrowed microscope from a hospital.	