

## *Genes To Fuels*

Sophomore Gemstone Team  
March 26, 2009

## *Overview*

- Mission Statement
- Purpose
- Literature Review
- Methodology
- Current Research
- Future Goals/Timeline
- Budget
- Team Organization
- Acknowledgements

## *Mission Statement*

Genes to Fuels is dedicated to the advancement of the field of algal biofuel, in an effort to contribute to the global movement towards a future powered by renewable, carbon-neutral energy. Within the team's research endeavors is a focus on individual growth, as well as the unity of its members, in an environment that fosters an appreciation for science and a passion for the betterment of society.

## *Purpose*

- Problems with fossil fuels
- Alternative energy sources
  - Wind
  - Solar
  - Nuclear
- Biofuels

## *Biofuels*

- Potential sources
  - Corn ethanol
  - Cellulosic ethanol
  - Algal biodiesel
- Benefits of algal biodiesel

## *Literature Review*

- Extensive research on algae, phytohormones
  - determination of algal species
  - current and past research
  - potential of phytohormone supplementation

## Research Questions

- Which phytohormones have an effect on *Chlamydomonas reinhardtii*?
- How do these phytohormones affect the metabolism of *C. reinhardtii* to bring about changes in growth rate or lipid production?

## Comparative Genomics

- Potential for future research in the field of genetic engineering

## Comparative Genomics

- Choice of *Arabidopsis thaliana* as model plant
- Known *Arabidopsis thaliana* phytohormone receptors
- Search for homologous *C. reinhardtii* receptor sequences using Basic Local Alignment Search Tool (BLAST)

## Comparative Genomics

- Phytohormone classes
  - Auxins
  - Gibberellins
  - Cytokinins
  - Abscisic Acid (ABA)
  - Ethylene

## Hypothesis

- The uptake of certain phytohormones by *C. reinhardtii* will increase growth rates and lipid production in the organism.

## Methodology

- Preliminary experimentation
  - Optimize growth conditions
  - Determine typical cell growth rate
- Develop algae cultures
  - Algae obtained from University of Texas, Culture Collection of Algae

## Methodology

- Begin variable testing
  - Introduce phytohormones
  - Determine effectiveness of phytohormones
- Monitoring growth
  - Hemocytometer
  - UV/Vis spectrophotometry
- Soxhlet extraction of lipids
- HPLC to determine lipid composition
- Statistical analysis of data

## Current Research

- Progress
- Initial Problems
  - Photosynthesis, Shaking, Algae Supply, Storage



## Future Goals

- Finalize choice of phytohormones
- Introduce phytohormones to algae
- Cell growth and lipid analysis

## Timeline

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|---|---|
| <p>Spring 2009</p> <ul style="list-style-type: none"> <li>-Find and apply to grants</li> <li>-Establish optimal growth conditions</li> </ul> <p>Summer 2009</p> <ul style="list-style-type: none"> <li>-Preliminary experimentation with phytohormones</li> </ul> <p>Fall 2009</p> <ul style="list-style-type: none"> <li>-Continuation of experimentation</li> <li>-Junior colloquium</li> </ul> | <p>Spring 2010</p> <ul style="list-style-type: none"> <li>-Continuation of labwork</li> <li>-Begin compiling results</li> </ul> <p>Summer 2010</p> <ul style="list-style-type: none"> <li>-Complete labwork</li> <li>-Begin analysis of results</li> </ul> <p>Fall 2010</p> <ul style="list-style-type: none"> <li>-Work on thesis</li> </ul> <p>Spring 2011</p> <ul style="list-style-type: none"> <li>-Defend thesis</li> </ul> |
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## Budget

### Genes to Fuels Proposed Budget 2009

\$100.00	Chemicals
\$400.00	Phytohormones
\$100.00	Algae
\$100.00	Glassware/Plasticware
\$150.00	General Lab Supplies
\$150.00	Pipettes
\$200.00	Microscope
\$300.00	Hemocytometer Slides
\$1500.00	Total Cost

## Team Organization

Executive Summary: Christine Perry  
 HHMI: Andrew Chang, Kelsey Nadig, Pragun Vohra  
 Proposal: Justin Wong, Patrick Feng  
 Bioinformatics: Sharad Thaper  
 Budgeting, ordering: Cory Mekelburg  
 Website: Pragun Vohra  
 Phytohormones: Christian Weber  
 Lab protocols/techniques: Maria Chang  
 Secretary: Tana Luo  
 Lab director: Jasjeet Khural  
 Scheduling: James McCarthy  
 Liaison: Rick Urbanski

## *Acknowledgments*



### Mentor

- Dr. Jason Kahn

### Experts

- Dr. Ganesh Sriram
- Dr. Elisabeth Gantt
- Dr. Paul Behrens

### Librarians

- Maureen Cech
- Bob Kackley

### Gemstone Staff