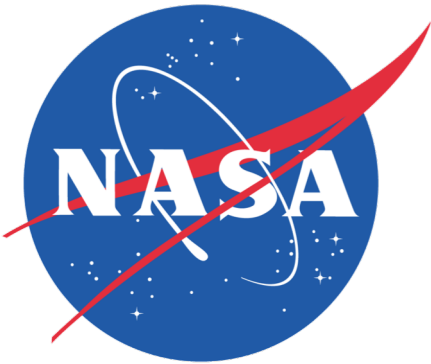
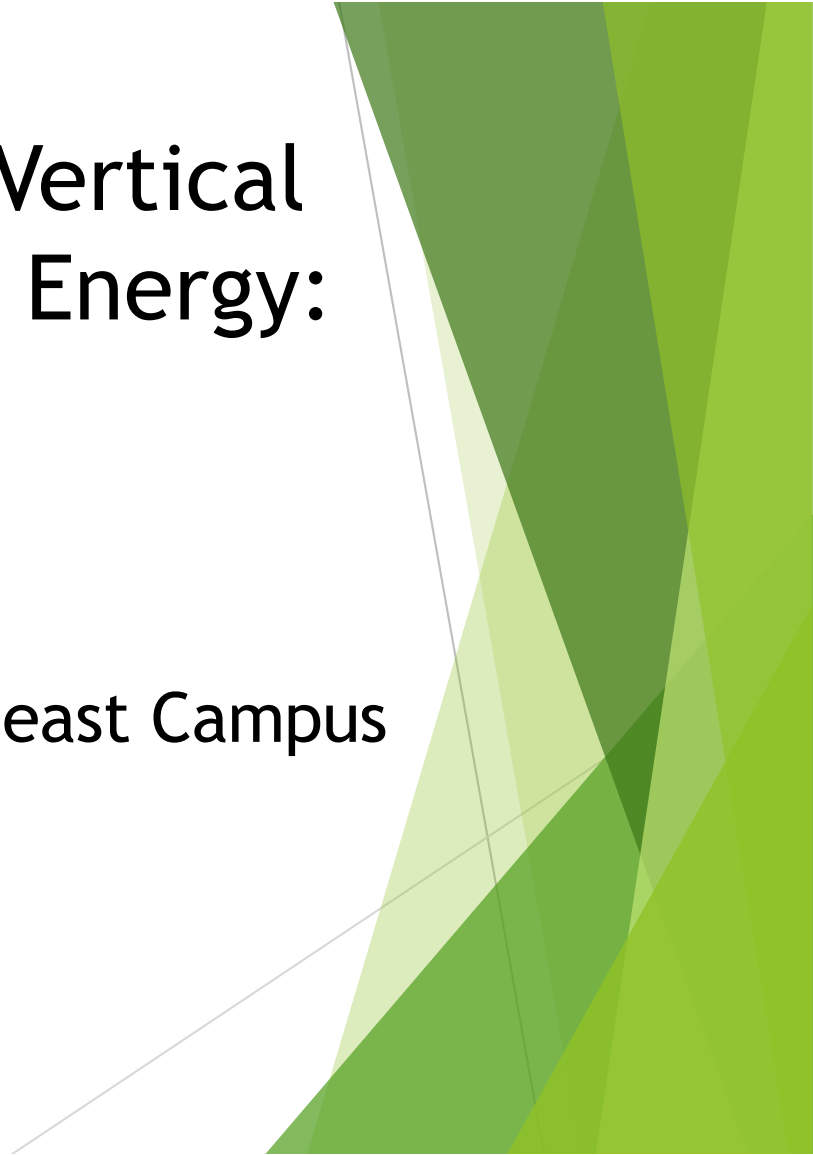


Oregon NASA Space Grant SCORE Symposium May 17, 2019



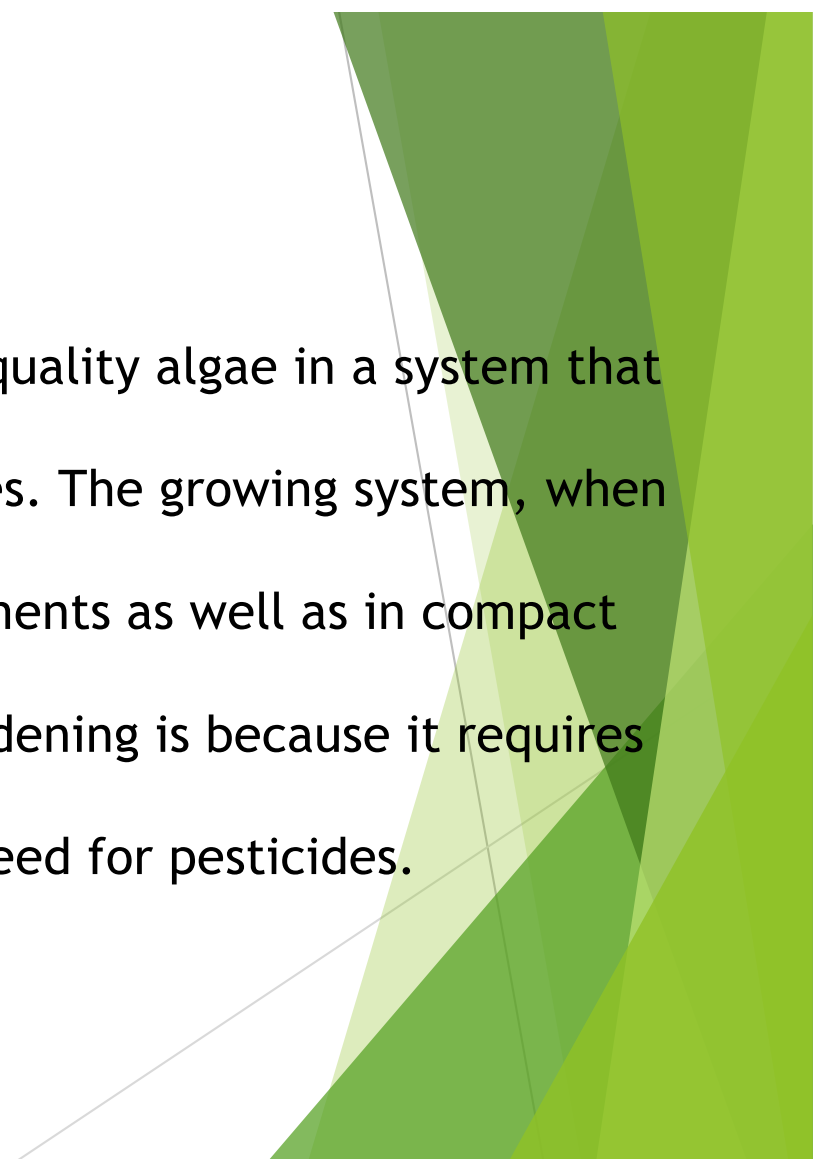
Growing Edible Algae Using Vertical Hydroponics And Renewable Energy: Part 1

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Vertical Hydroponics

The focus of this project is to pilot growing food quality algae in a system that uses renewable energy and minimal land resources. The growing system, when perfected, could be used in dense urban environments as well as in compact spacecraft. The choice of vertical hydroponic gardening is because it requires less acreage, less water overall, and avoids the need for pesticides.



Spirulina

Filamentous Cyanobacteria, or spirulina, is a strong protein supplement that is produced in alkaline lakes, and was originally grown in Africa and South America .

Spirulina offers all the benefits of a plant-based protein, without requiring soil to grow.



Overview

Project work, Part 1:

Start: December 15, 2018

End: May 9, 2019

Part 1 Focus:

Creating apparatus to test algae growth in controlled conditions



Goal:

To create and test an apparatus and process for using vertical hydroponics to grow edible algae in artificial lighting conditions, as a means of food production on long-term space missions.

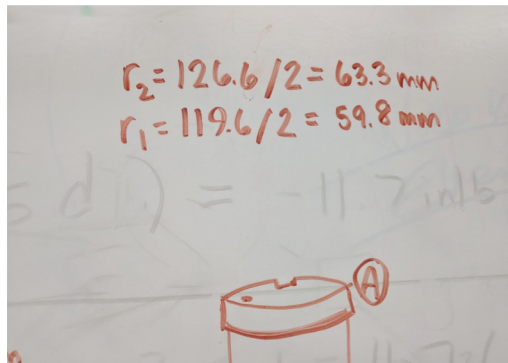


Process and Materials

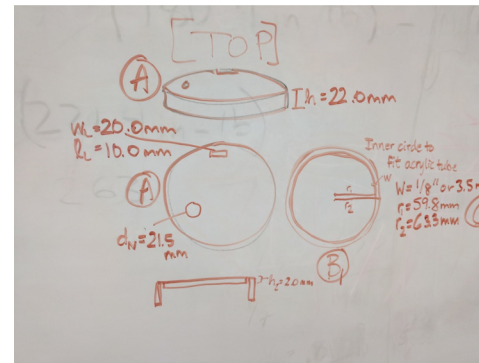
Process:

- Research on vertical hydroponics, algae options, renewable energy sources
- Designed apparatus to use combination of purchased and created items, including
 - acrylic cylinder
 - 8 Alkaline 1.5 volt batteries
 - spigot
 - 120 volt pump for air circulation
 - rock filter to balance turbulence
- Built apparatus, including 3-D printing caps for vessel ends
- Tested apparatus for lighting and water tightness

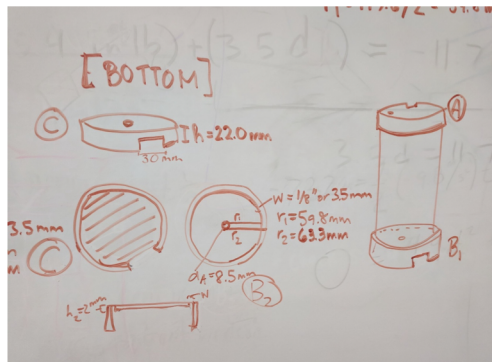
Blue Prints



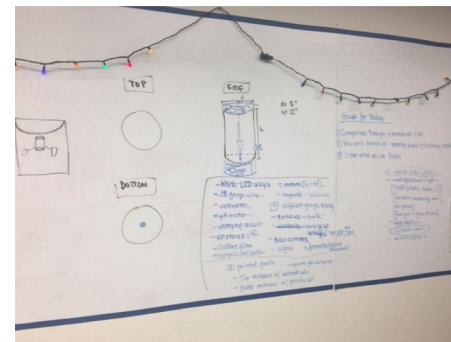
Dimensions for end caps



Design of top end cap for 3-D printer



Design of bottom end caps for 3-D printer



Overall design of apparatus

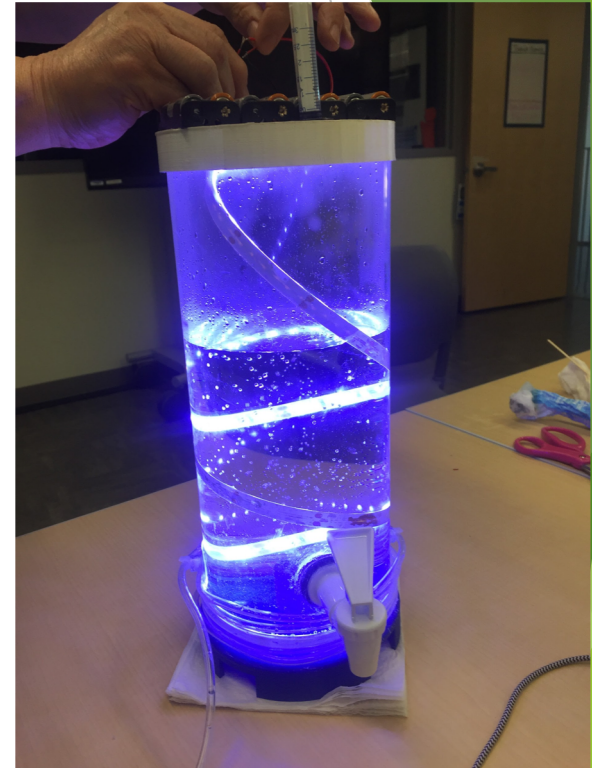
Outcomes

- Printed 4x to get the right cap size for each end
- Wired the Alkaline batteries together as initial power source for lights
- Cut LED strip lights to fit the vessel and attached
- Cut through the plastic and insert spigot in side
- Cut through caps to install air circulation system
- Apply JB Weld Concealer to all connections and test for leaks
- Measure amount of tubing for filtration to circulate oxygen through the water

Apparatus Without Water



With Water and Lights



Reflection:

What I personally gained from this experience is that your first experiment isn't always going to go accordingly to the plan. That changes the outcomes of the experiment because of the time that it took to complete this phase of the project.

“Education is our passport to the future, for tomorrow belongs to the people who prepare today.”

Malcolm X

Trials and Tribulations

- ❖ Time! (Snow, traffic, . . .)
- ❖ Water Leaking
- ❖ 3-D Printing and Grid Producing

“Around here, however, we don't look backwards for very long. We **keep moving forward**, opening up new doors and doing new things, because we're curious...and curiosity keeps leading us down new paths.” Walt Disney

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