

SMART SPIRULINA SYSTEM

by Jimmy Tang and Regina Flores Mir



THE PLUG-IN ECOLOGY

Urban Farm Pod is a “living” room for individuals and urban nuclear families to grow and provide for their daily vegetable needs.

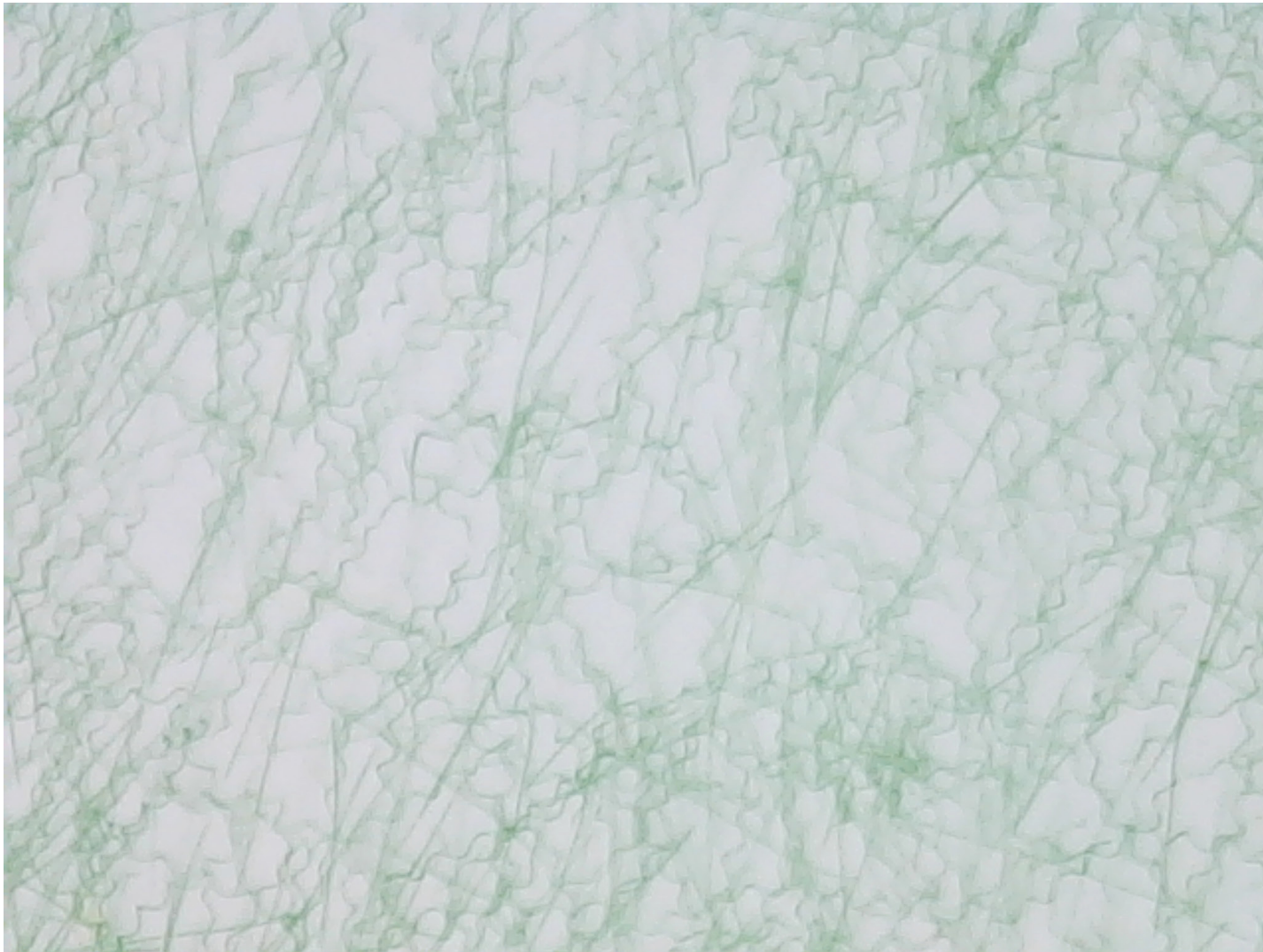
The **Smart Spirulina System** is a bio-informatic message system incorporated into the Urban Farm Pod part of the Plug-In Ecology framework being developed at Terreform One. The objective of this project is a system design that will show how to grow Spirulina in an urban farm setting.

The system design is broken out into two areas:

(1) A **grow system** for the cultivation of large amounts of Spirulina and a distribution system to allocate to Spirulina bottles on the surface of the sphere.

(2) A **digital monitoring platform** that can relay specific information about the health and growing conditions of the Spirulina directly to a user's smart-phone or desktop and integrate into the Internet of Plants by providing a public and free API.

SPIRULINA



SPIRULINA

Spirulina is a cyanobacterium that can be consumed by humans and other animals. Spirulina contains a high amount of protein; over 60% of the dry body weight and **all 9 essential amino acids** that a human body needs.

DENSELY PACKED NUTRITION

- 1) Complete protein - 60% dry body weight.
- 2) 10 times more calcium more than milk.
- 3) Vitamins B group - B1, B2, B3, B5, B6, and B9.
- 4) Antioxidants - beta-carotene, zeaxanthin, lutein, xanthophylls.

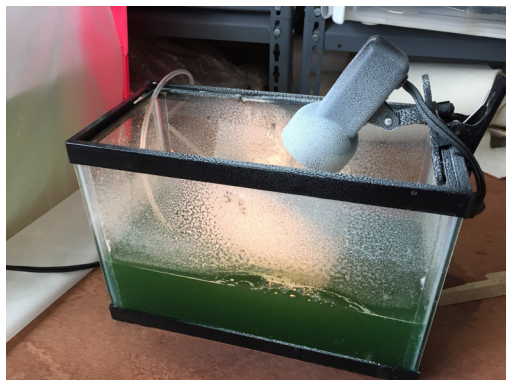
With optimal conditions Spirulina can double every 24-48 hours. It has a photosynthetic conversion rate of 8 to 10%, compared to only 3% in crop plants such as soybeans. * It is considered as one of the **fastest reproduced protein sources in the world.**

*Naveen K. Sharma, Ashawani K. Rai, Lucas J. Stal, Cyanobacteria: An Economic Perspective

EXPERIMENT

1

~1 gallon
Air Diffusion
Artificial Light
Open



EXPERIMENT

2

~64 oz
Air Diffusion
Sunlight
Closed

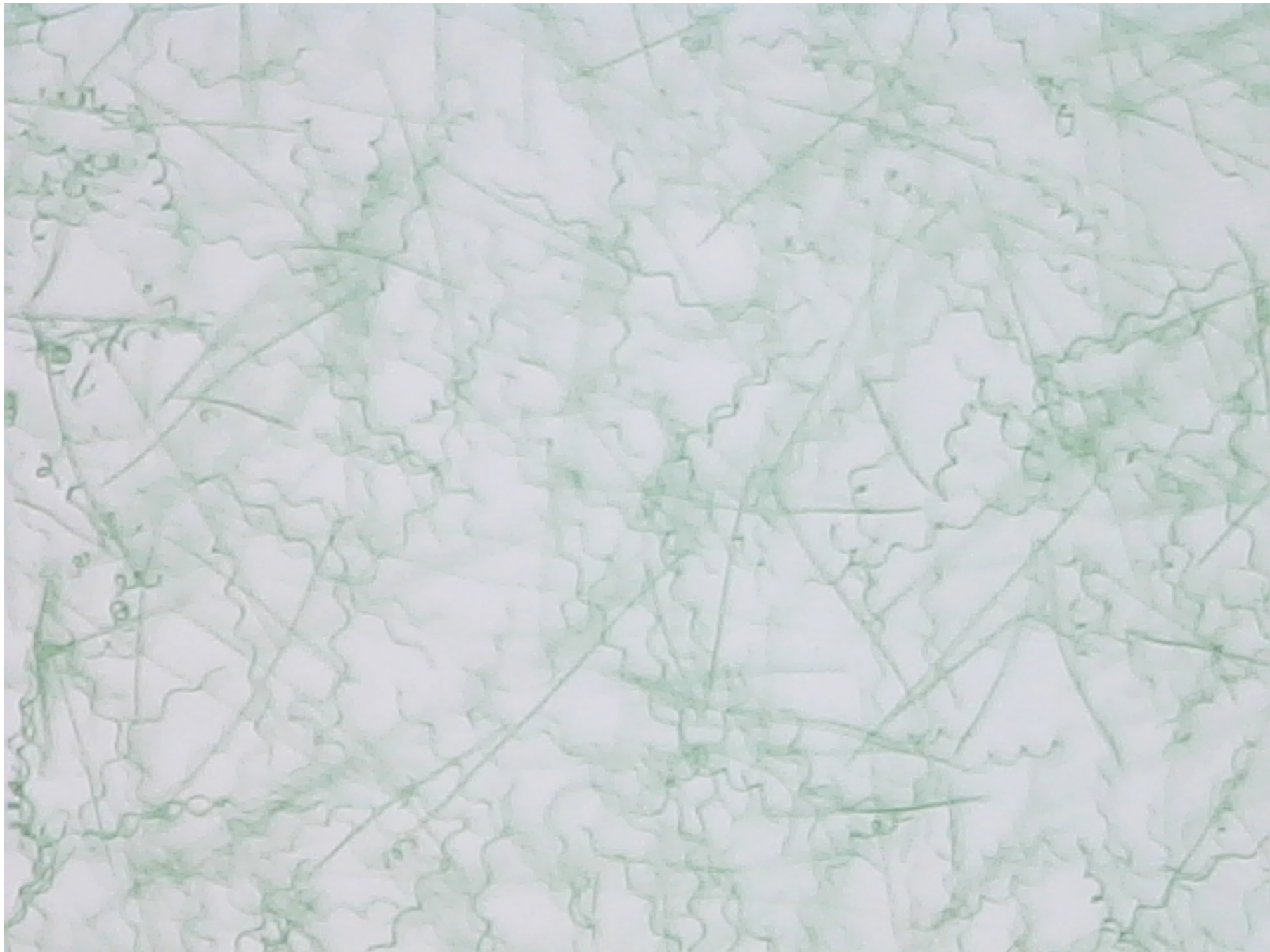


EXPERIMENT

3

~5 gallon
Air Diffusion
Sunlight
Closed





Experiment 1, after 14 days

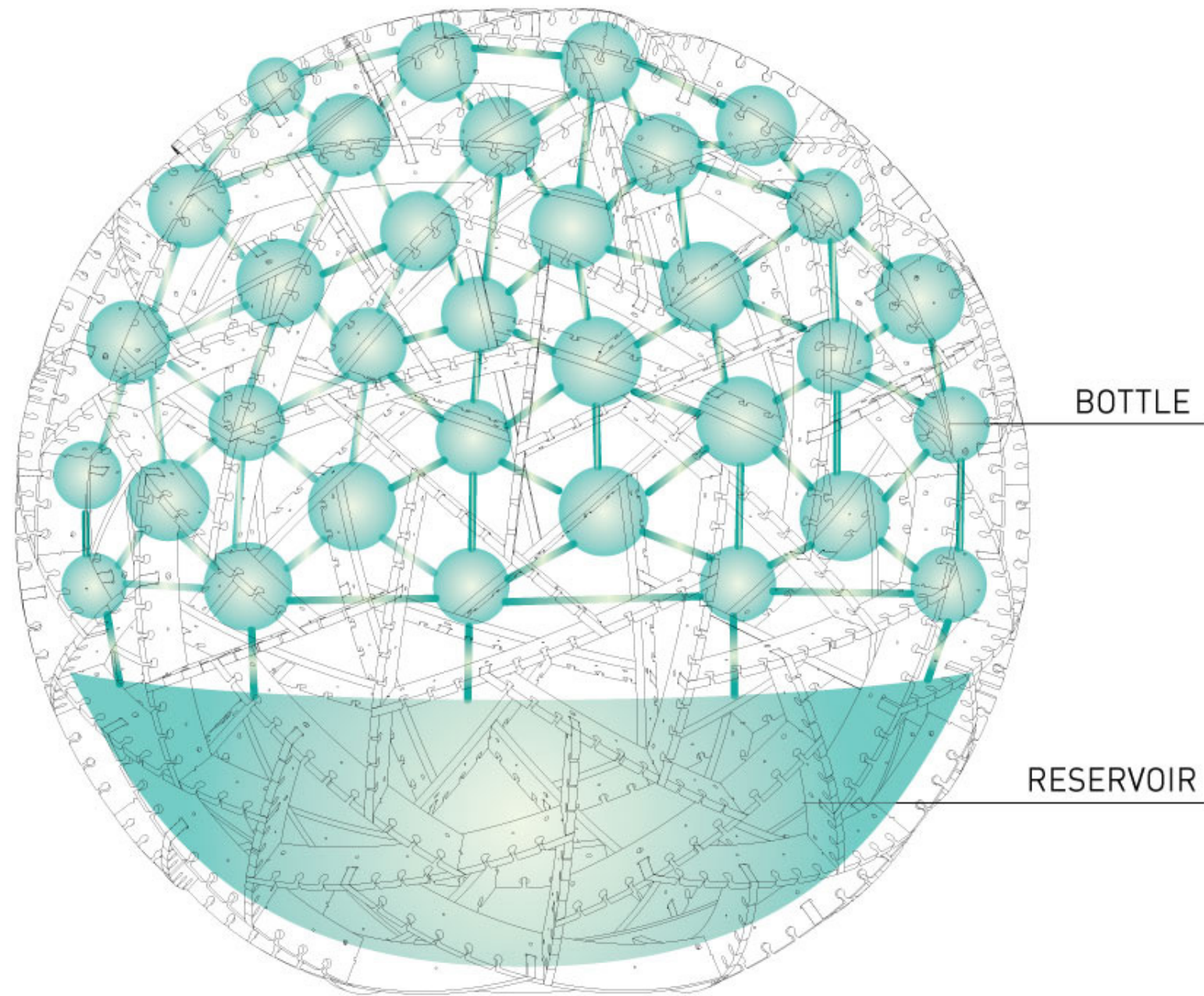


Experiment 2, after 14 days

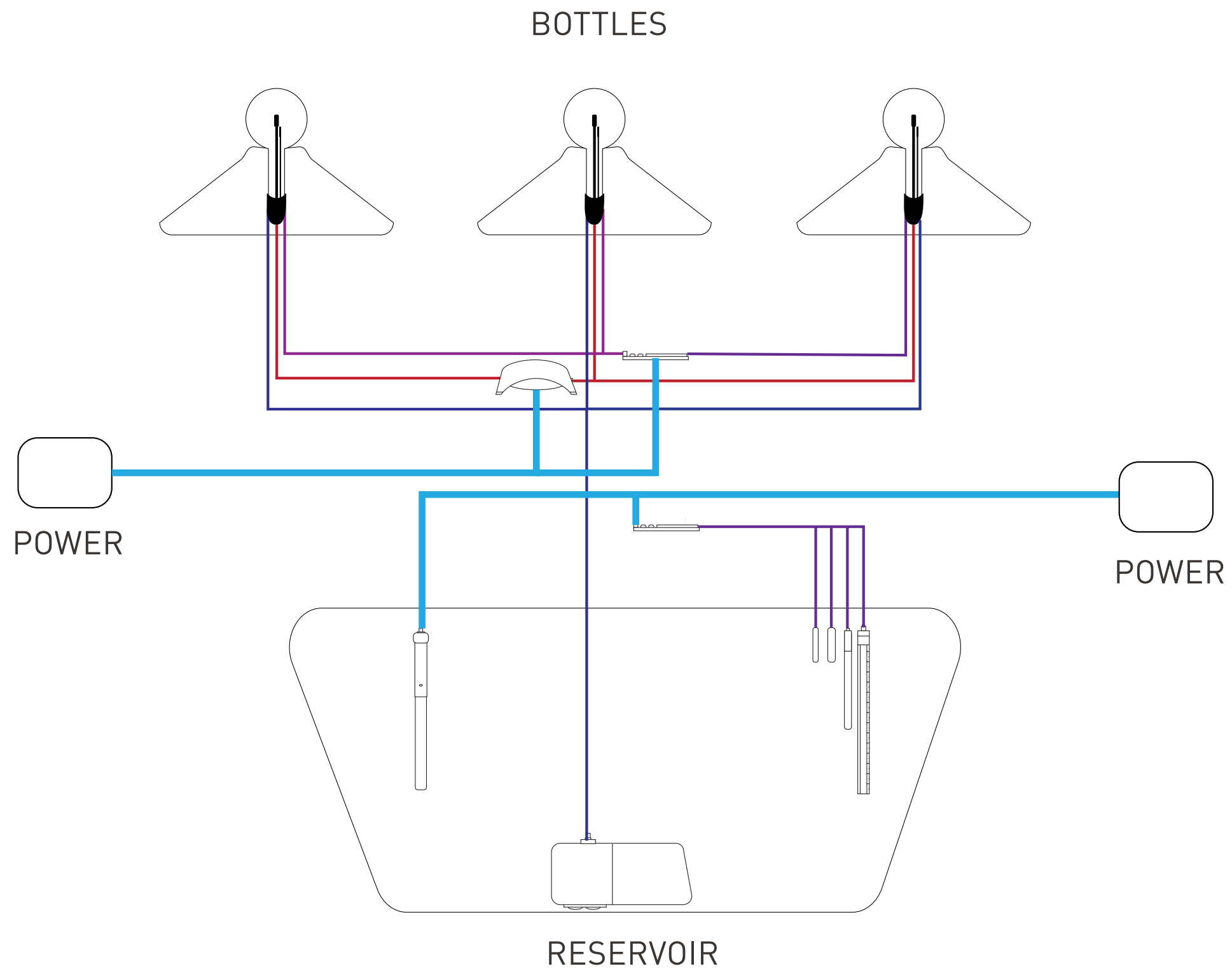


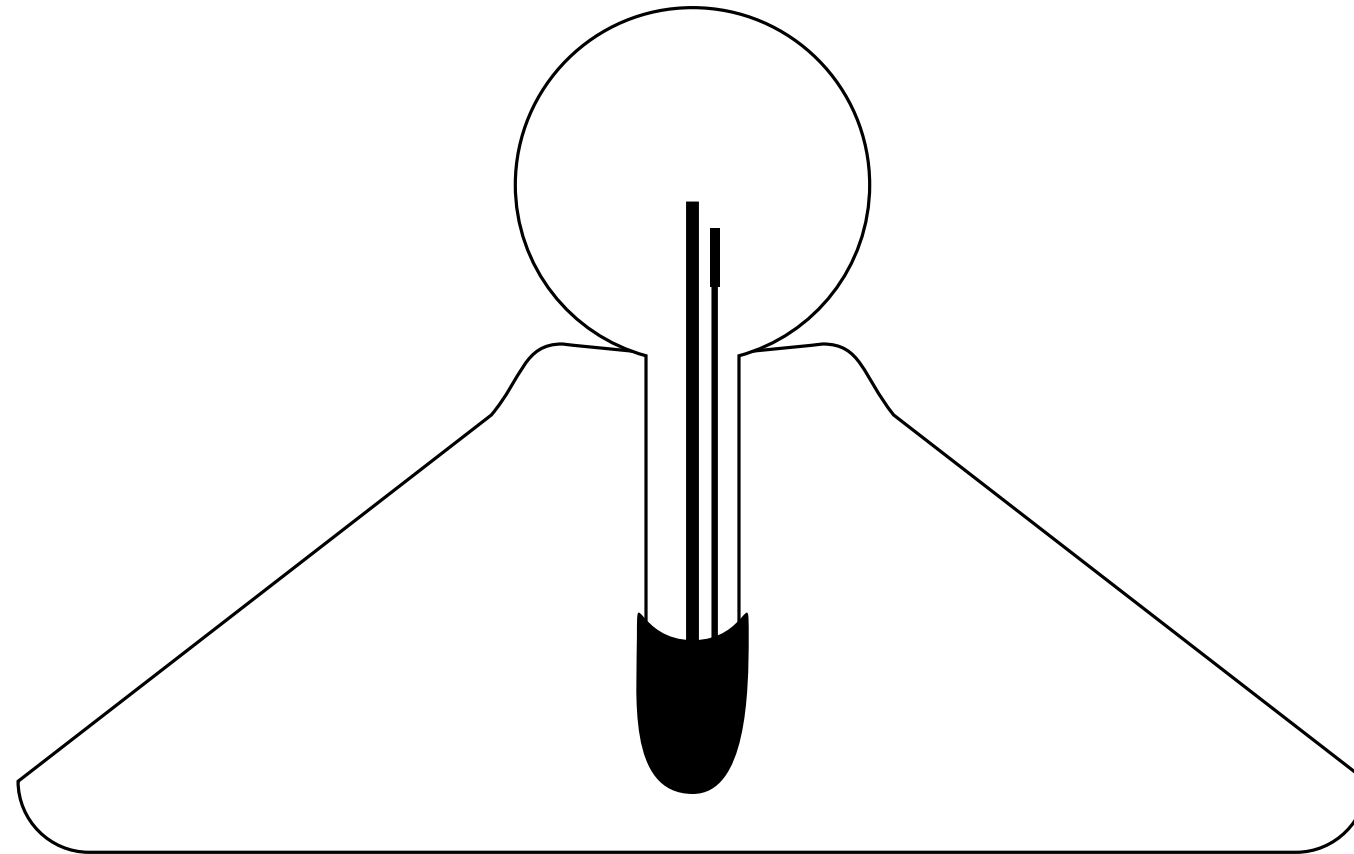
Experiment 3, after 14 days

SYSTEM

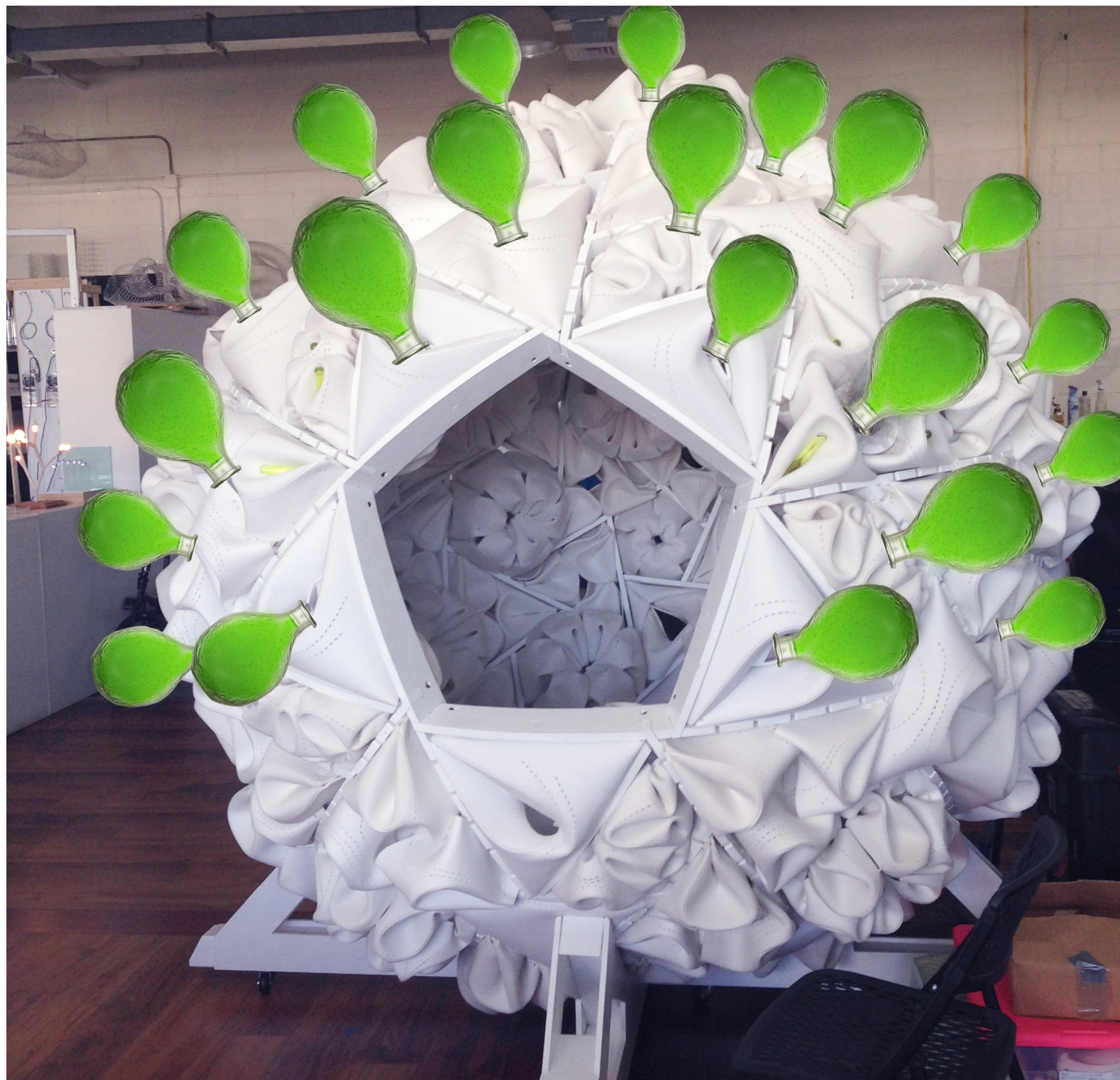


System Diagram





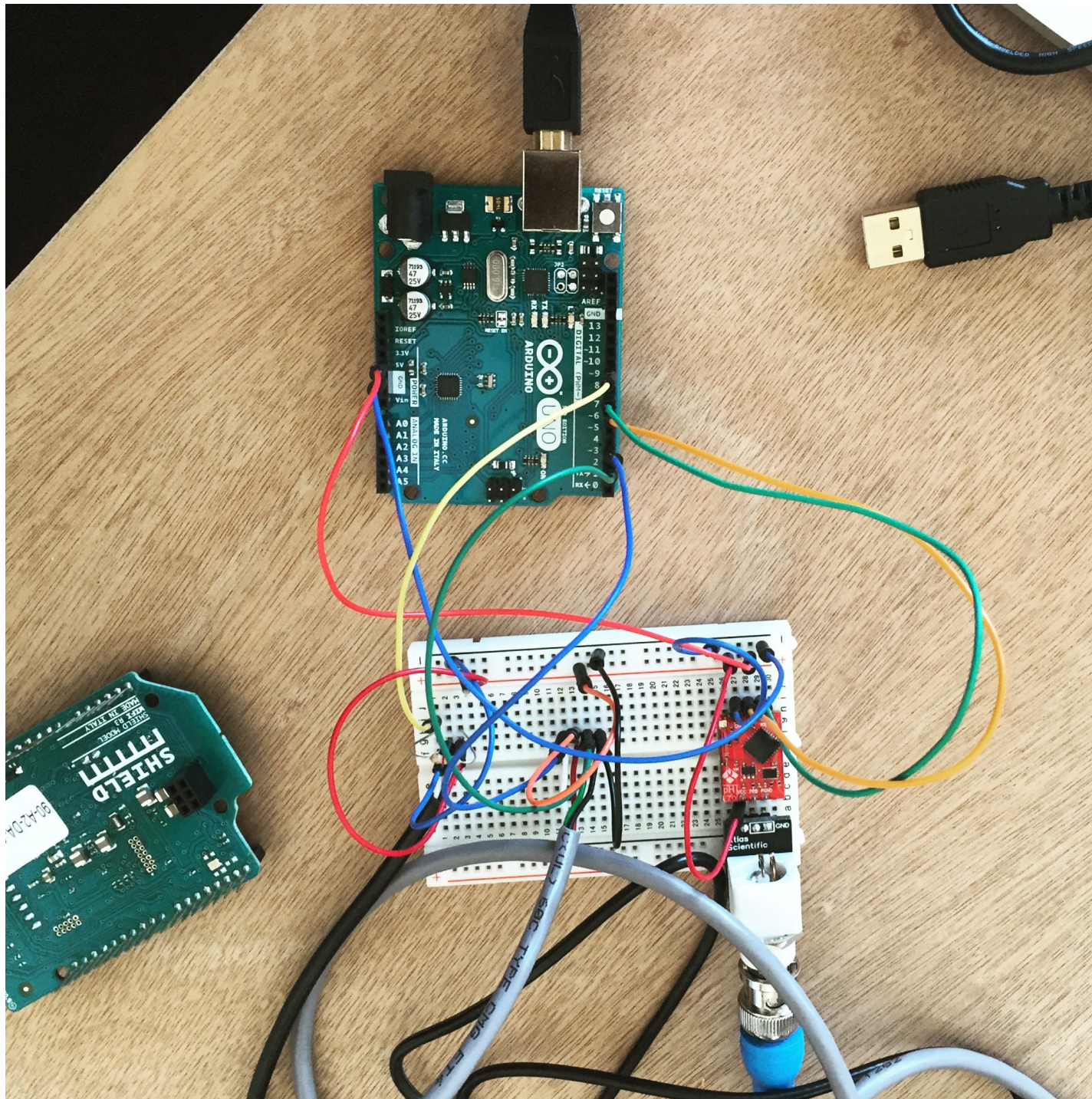
Spirulina Bottle Diagram



Visual Mockup



HARDWARE + SOFTWARE



ARDUINO

Arduino Uno
Wifi Shield
pH Sensor
RGB Sensor
Temperature Sensor
Humidity Sensor

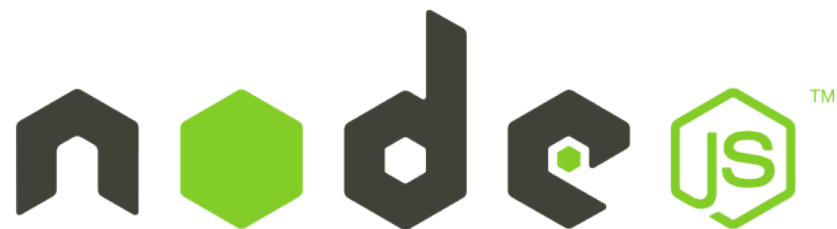


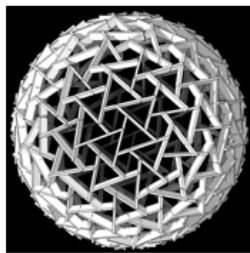
SOFTWARE

Front-end
Javascript, three.js

Back-end
node.js

three.js ^{r71}





*Networked Farm
Pod Sphere*



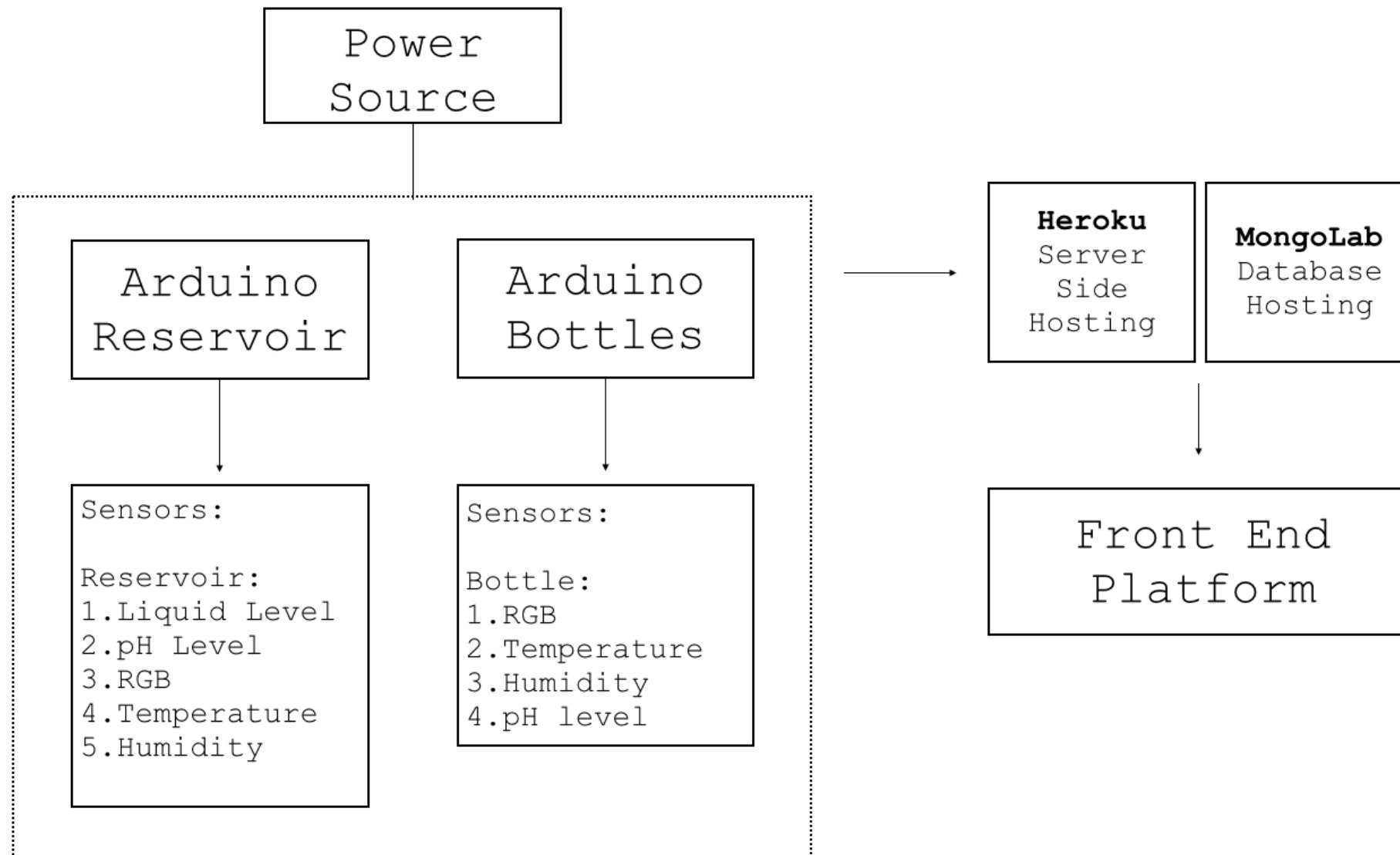
*Sensors tracking
and recording data*



*Database storing
data*



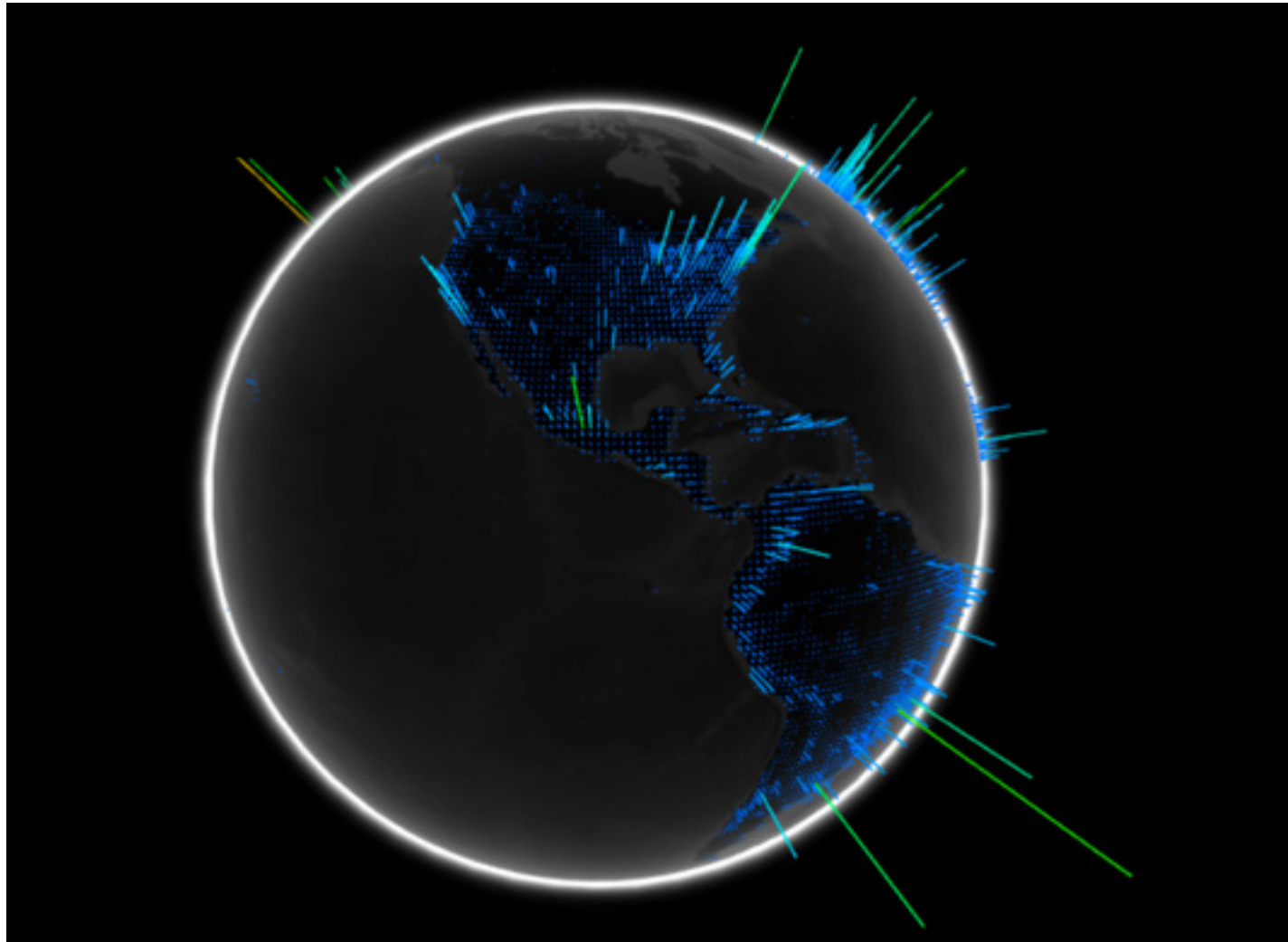
*Live monitoring
on the web*





LIVE DEMO

NEXT STEPS



GLOBAL NETWORK

A system can link up all the Urban Farm Pods around the world.

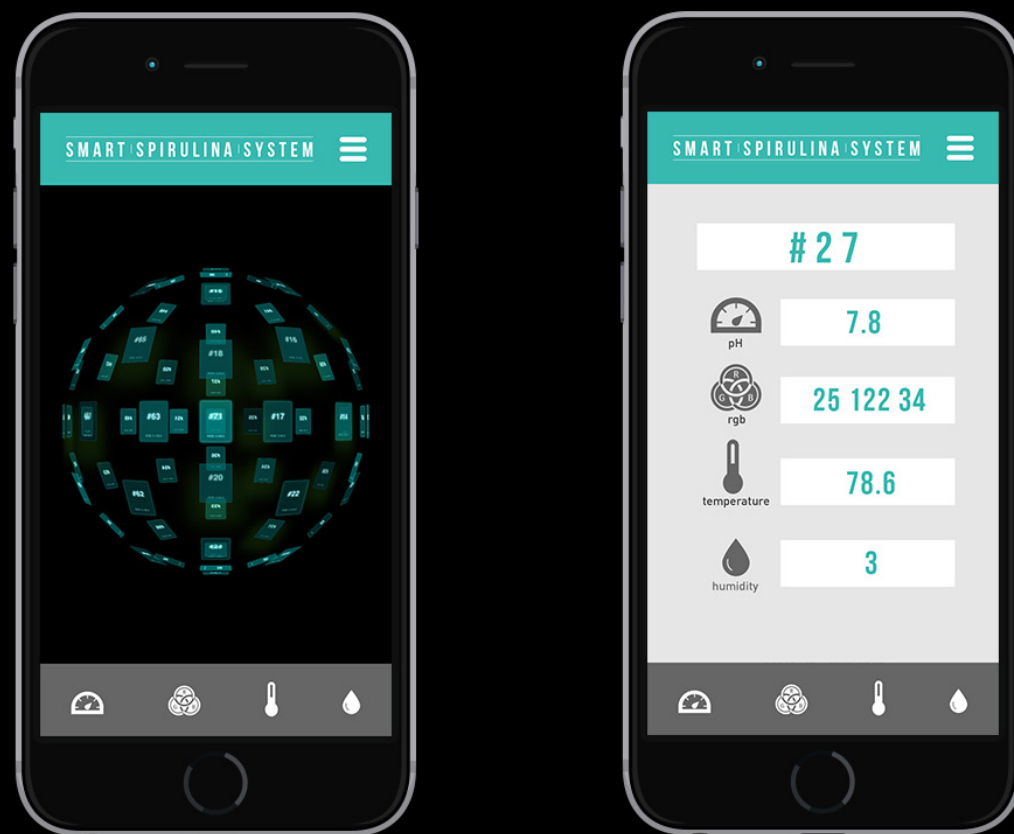
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14       "pH": 4.09,
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43     },
44   ]
45 }

```

API

When farm pods exist all over the world, providing open and free access to databases via a REST API will allow users to monitor and track plant data from all regions of the world.



MOBILE APP

Further front end design could include an iOS roll-out to allow users to receive alerts via their mobile devices.

THANKS