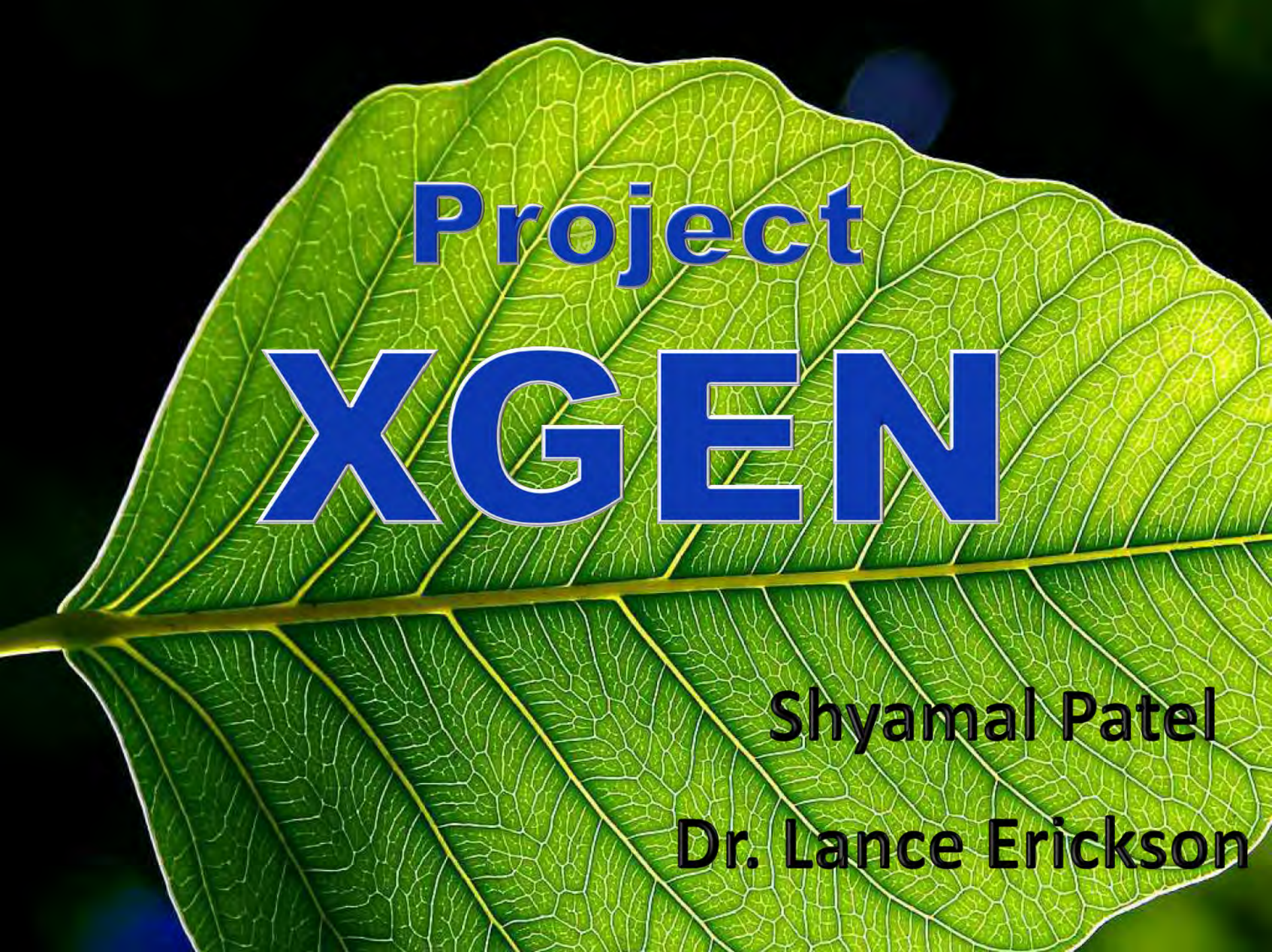

Project
XGEN
Shyamal Patel
Dr. Lance Erickson

Background

Major:

Aerospace Engineering (Astronautics) Senior

Minors:

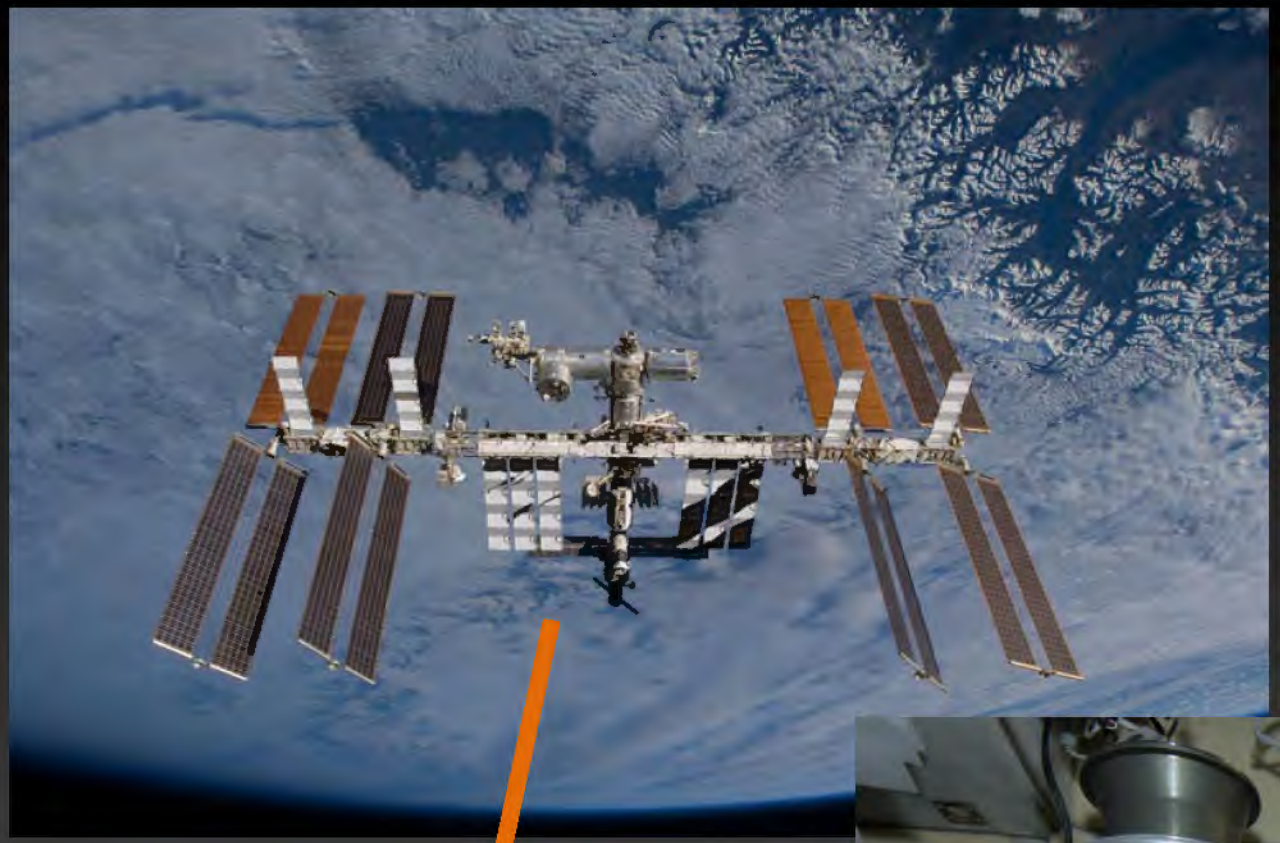
Aerospace Life Sciences, Mathematics, Homeland Security, and Space Studies

Internships:

Northrup Grumman, NASA, Boeing, Masten Space Systems, SpaceX

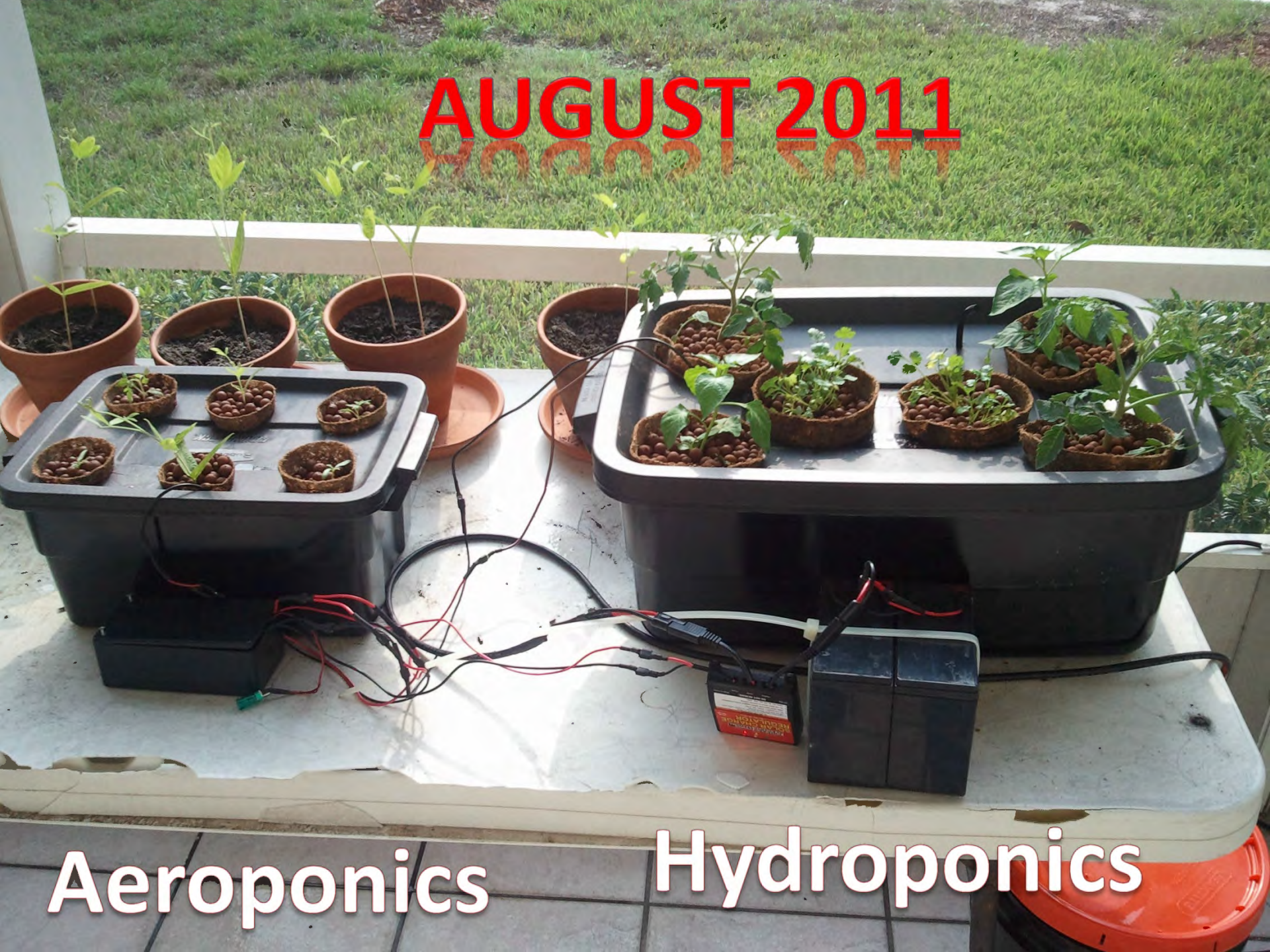
Other:

Private Pilot, EMT, Novice Gardener



O2?

Water &
Pressurized Tanks!


AUGUST 2011
Aeroponics
Hydroponics

BIOREGENERATION IN SPACE

Research, Design, Fabricate an Aeroponic Grow Chamber with sensor and automation capability

Where to Start?

Initially – Dwarf Citrus - Large Aeroponics Chamber!

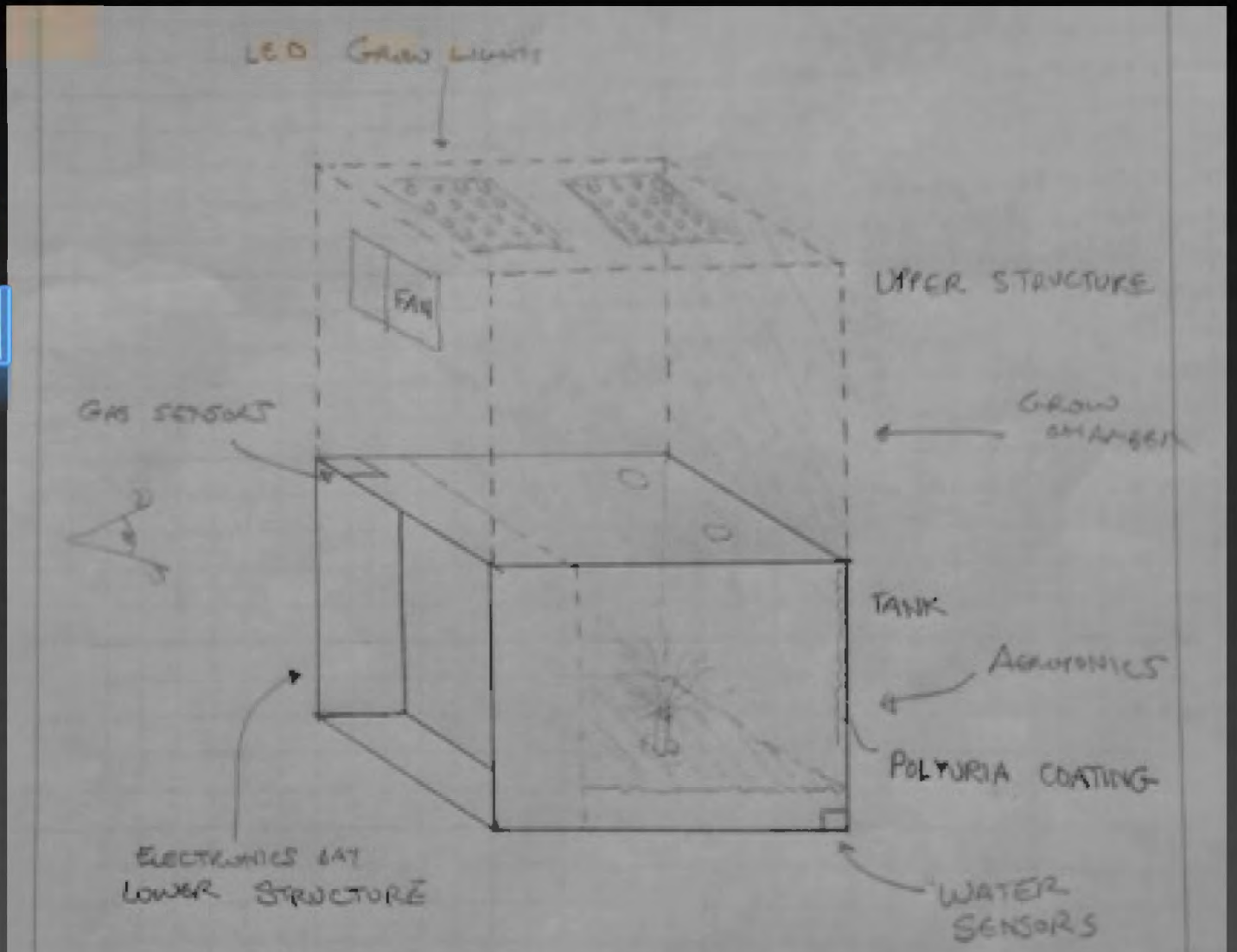
Start with small plant:

The average spread and height of Strawberries are 9” and 8”
The average spread and height of Spinach are 12” and 12”.

Progress

- Initial Research
- Design
- Fabrication
- Integration*
- Testing*
- Research

INITIAL DESIGN



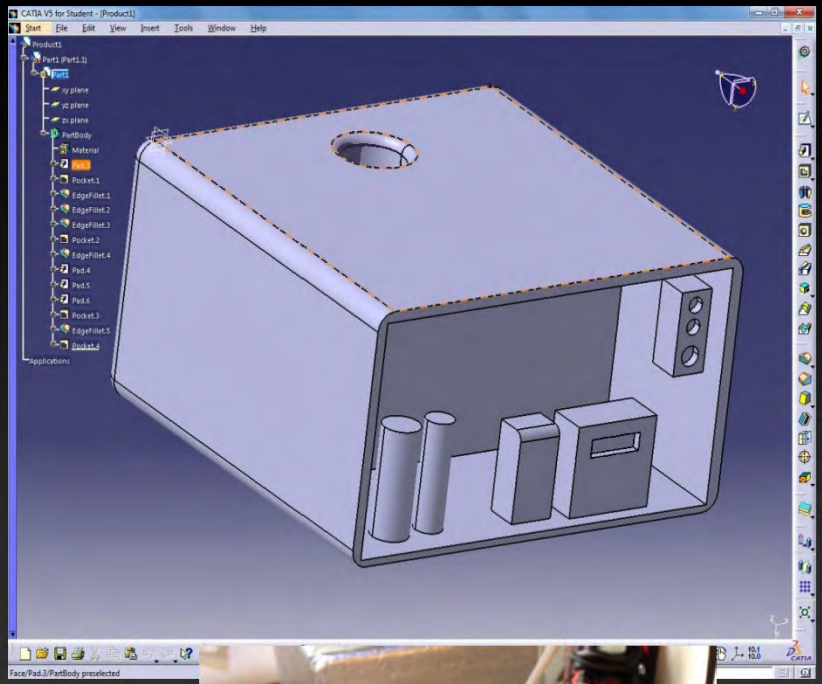
GAS SENSORS

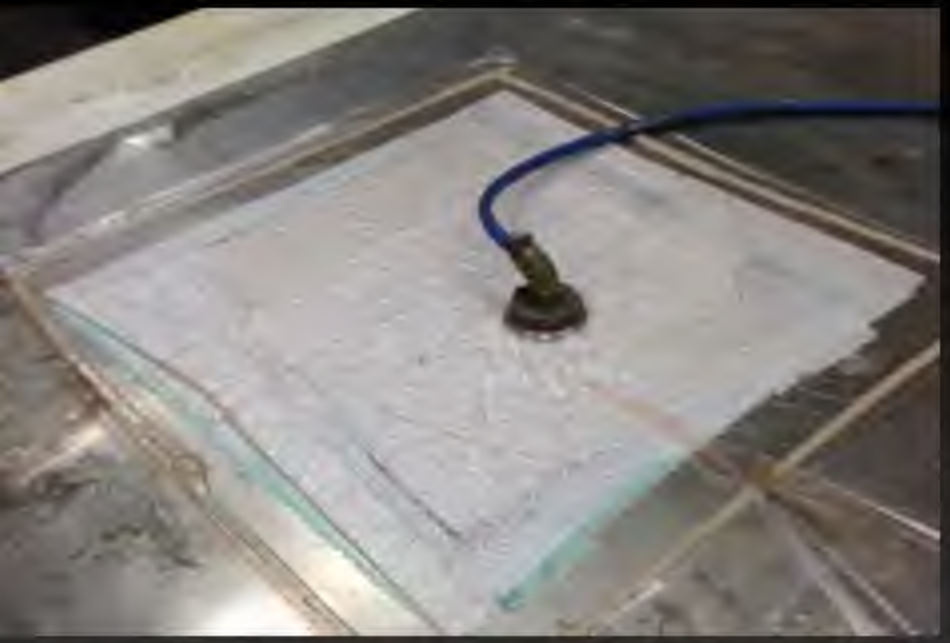
O_2, CO_2

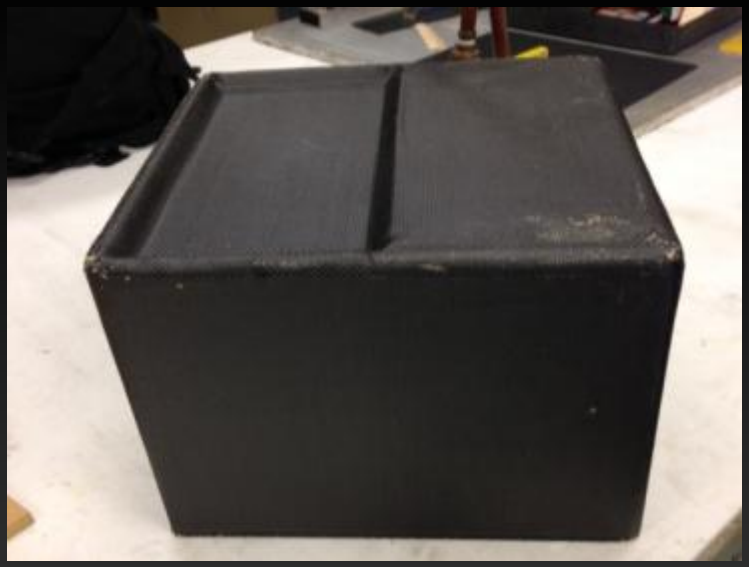
WATER SENSORS

pH, DISSOLVED O_2

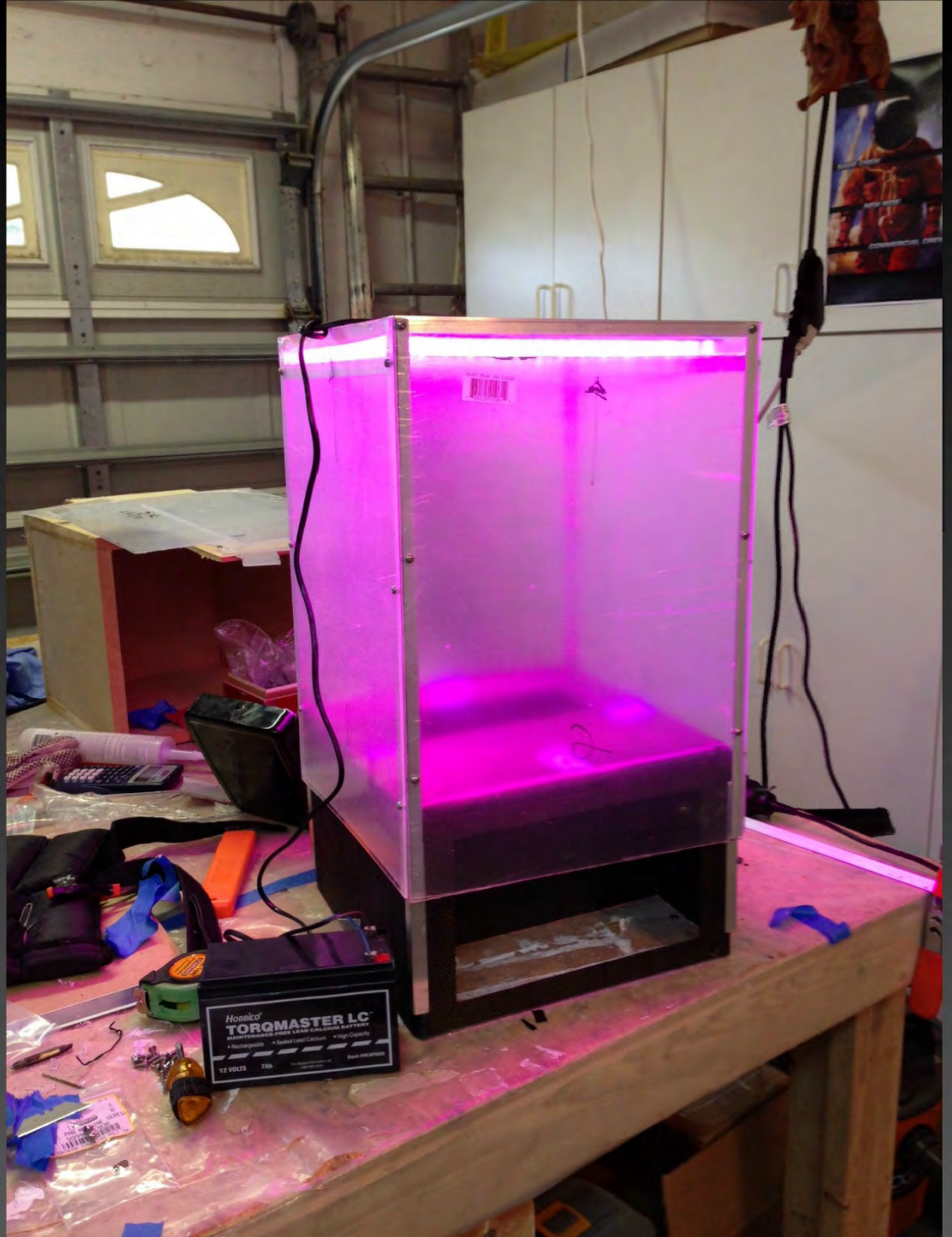
FABRICATION


CATIA V5 for Student - [Product1]
Start File Edit View Insert Tools Window Help
Product1
Part1 (Part1.1)
Part1
xy plane
yz plane
zx plane
PartBody
Material
Pad.1
Pocket.1
EdgeFillet.1
EdgeFillet.2
EdgeFillet.3
Pocket.2
EdgeFillet.4
Pad.4
Pad.5
Pad.6
Pocket.3
EdgeFillet.5
Pocket.4
Applications
Face/Pad.3/PartBody preselected

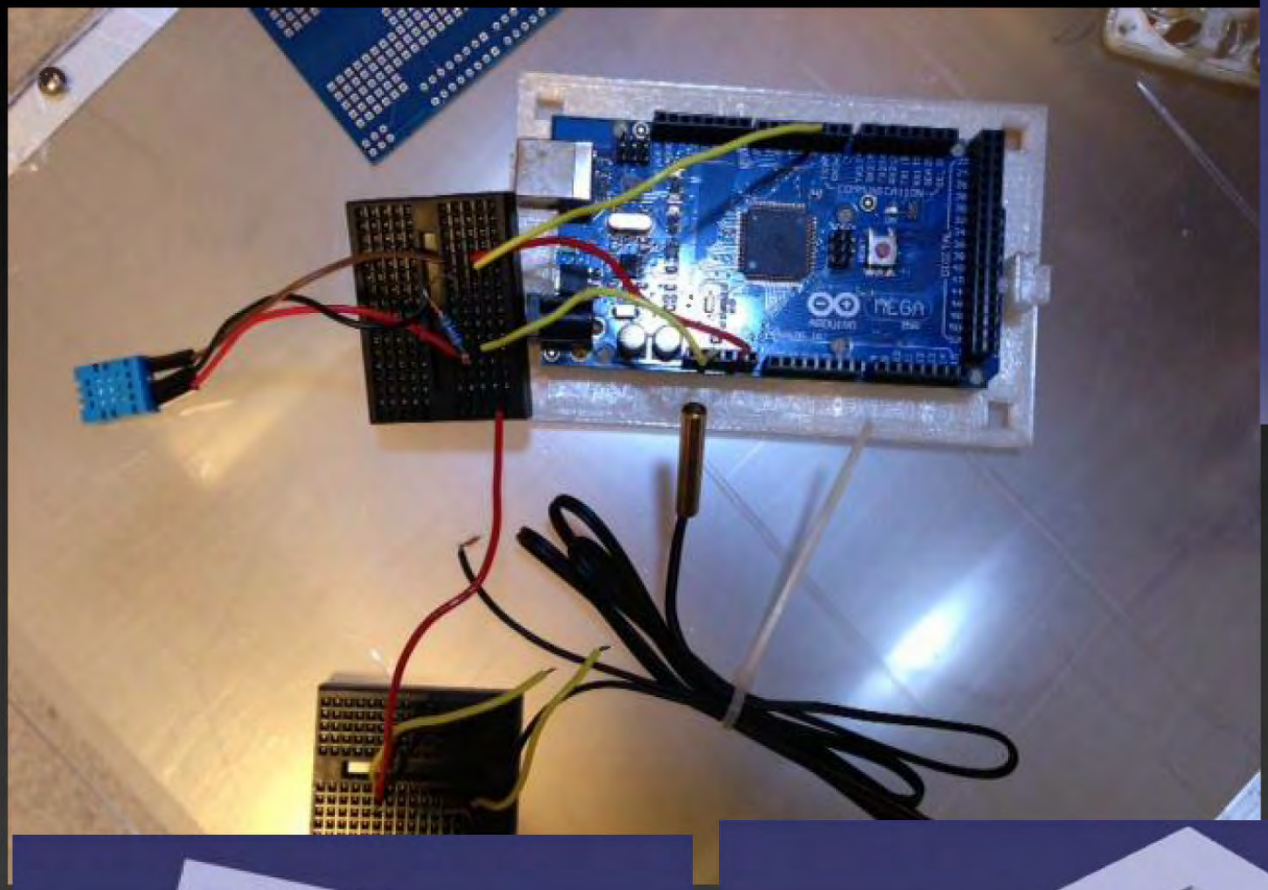


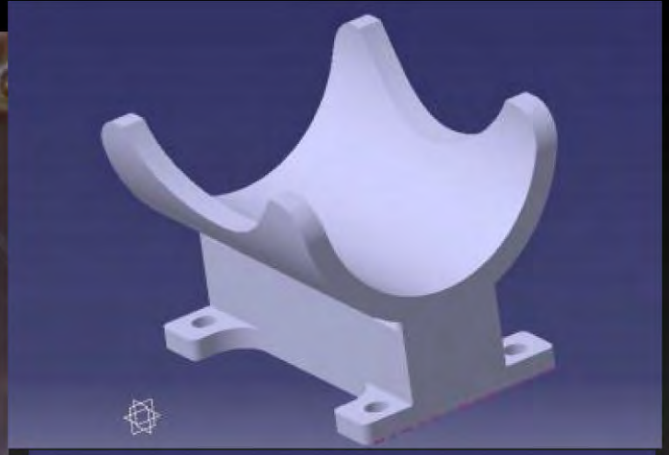


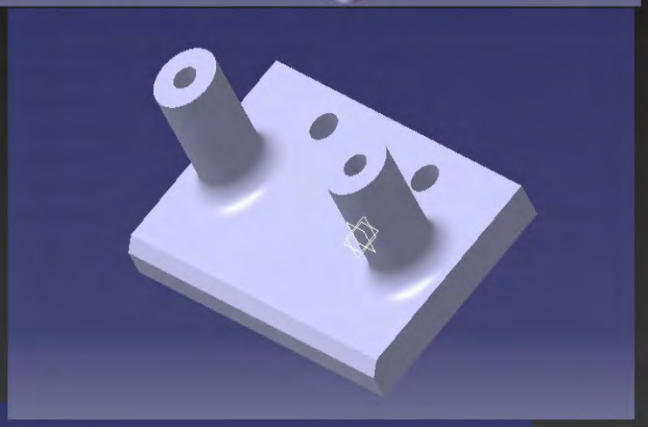

Try #2

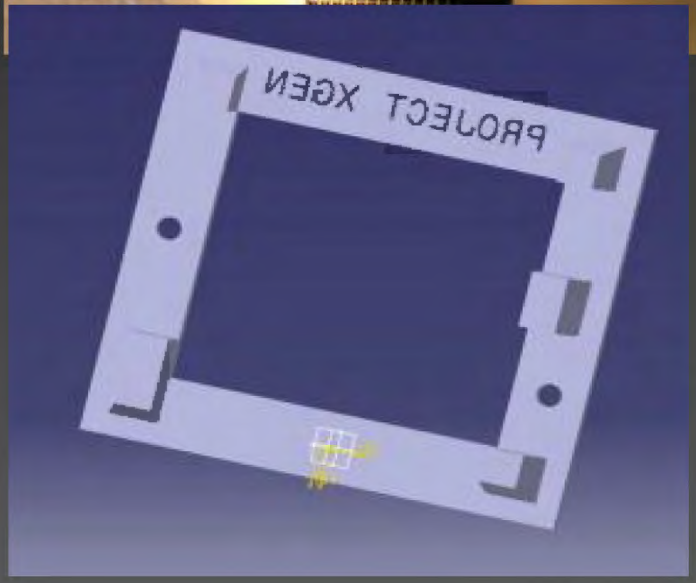

Hobbico
TORQMASTER LC
12 VOLTS
7Ah

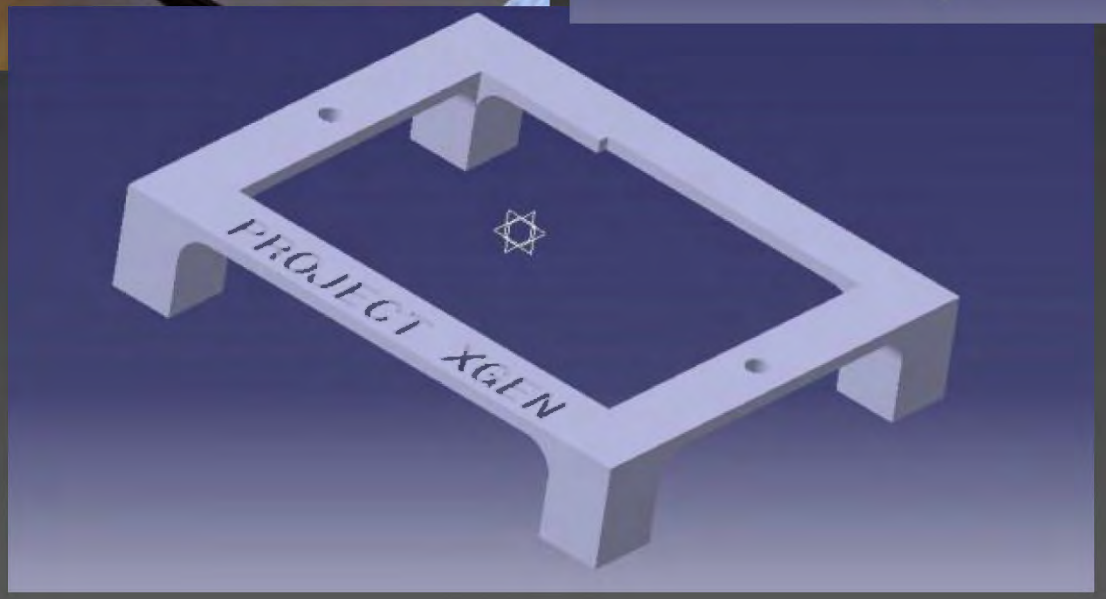
SENSORS PROGRAMMING & MOUNTS

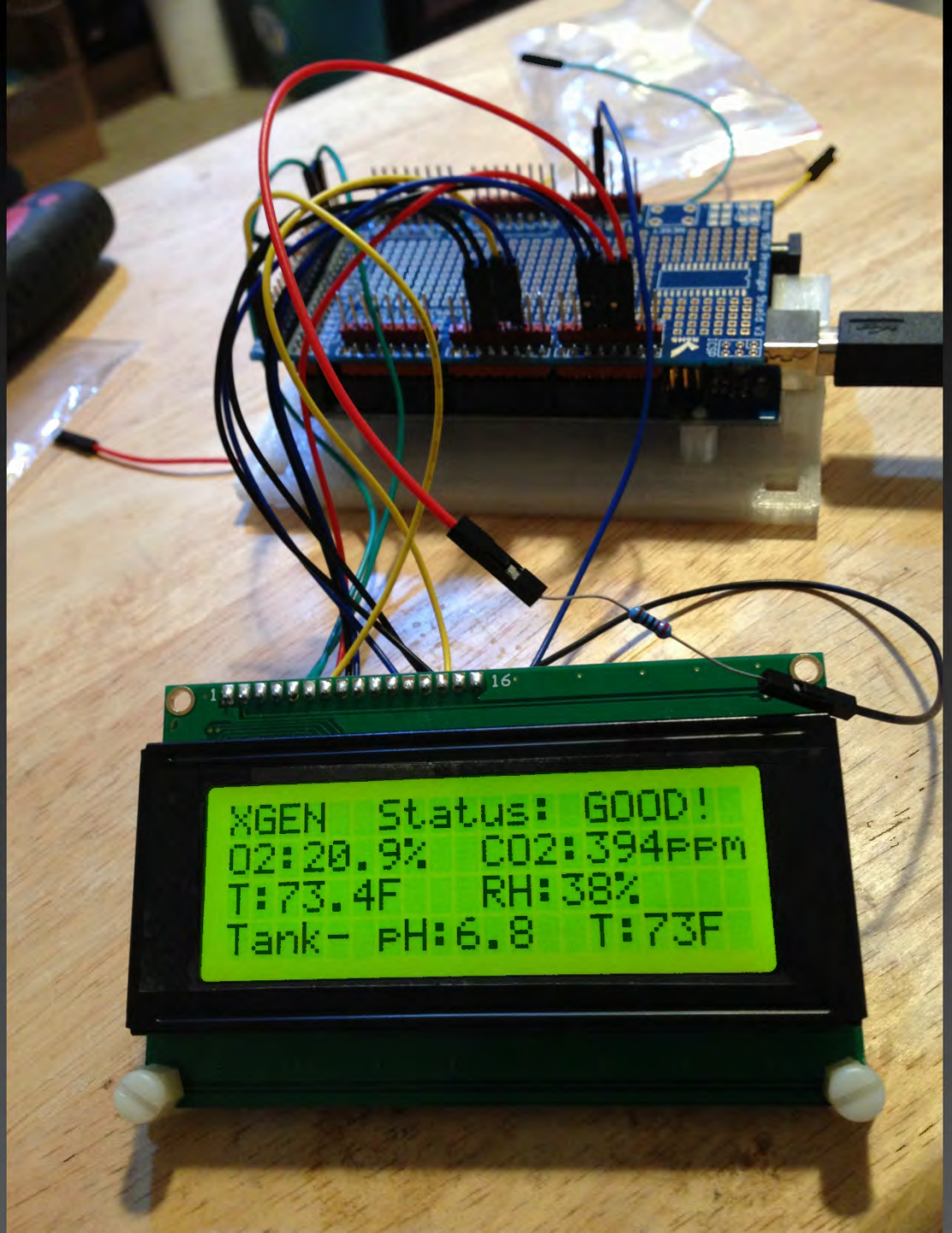

MEGA



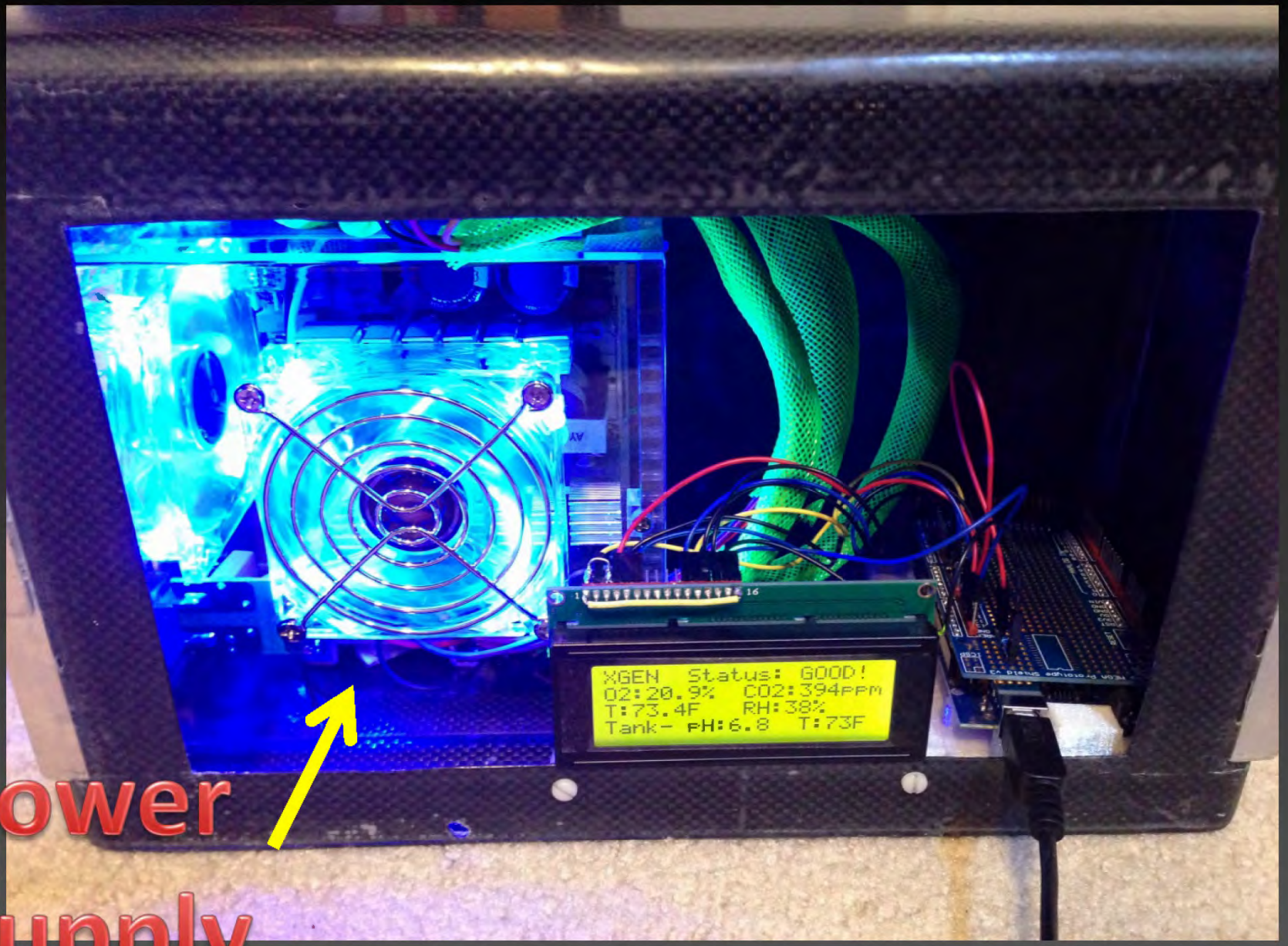


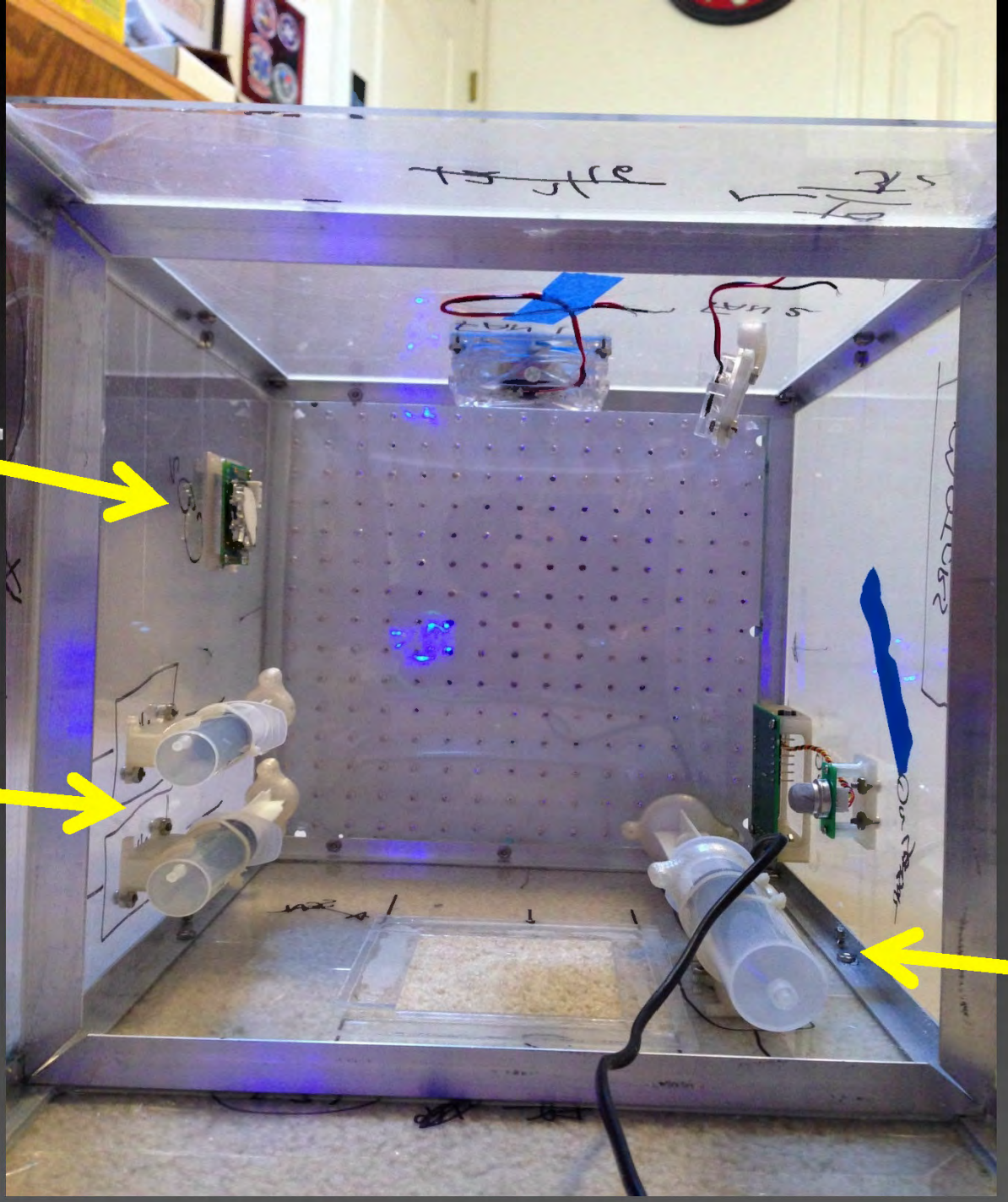

PROJECT XGEN


PROJECT XGEN


XGEN Status: GOOD!
O2:20.9% CO2:394ppm
T:73.4F RH:38%
Tank- pH:6.8 T:73F

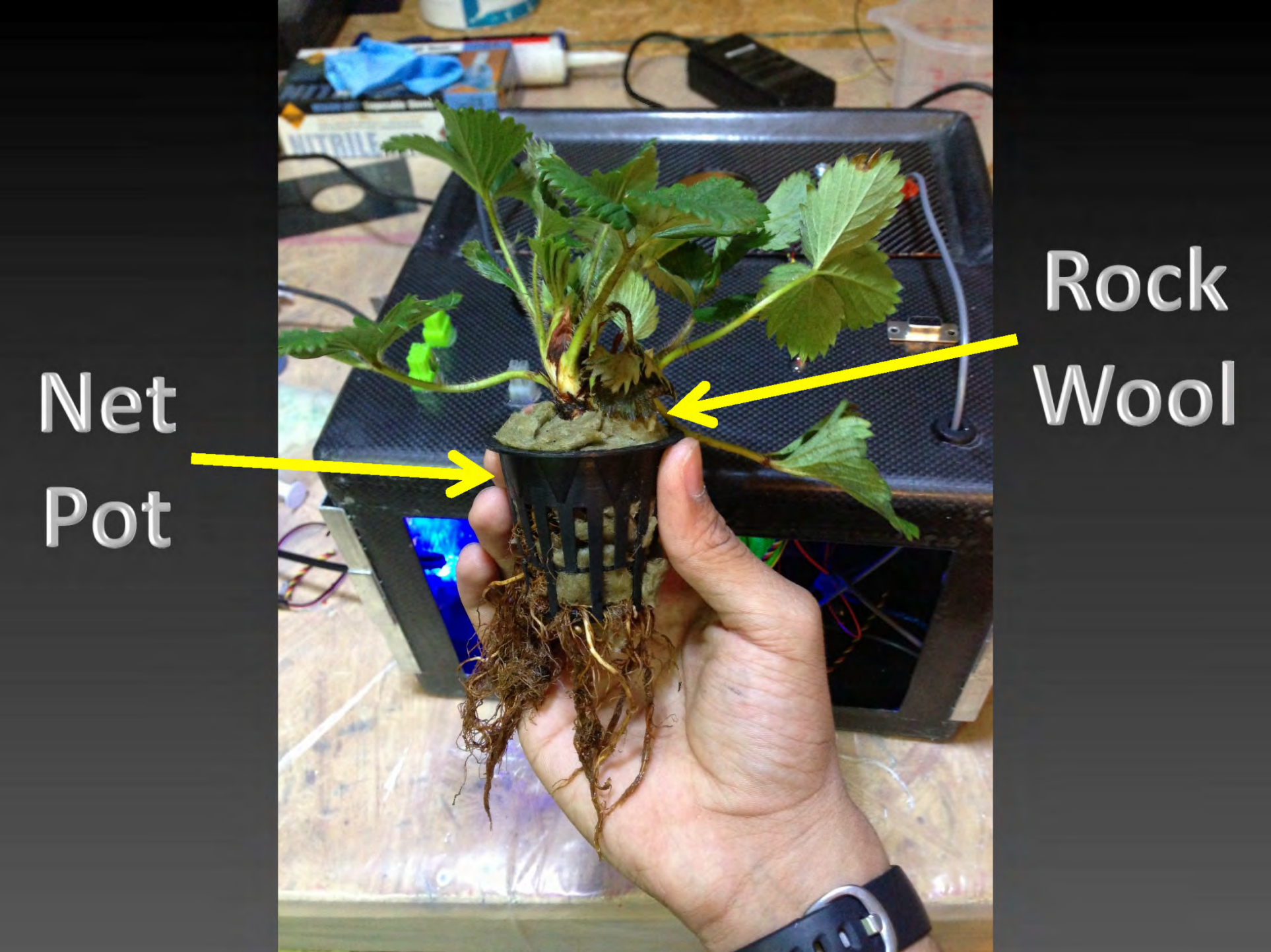
INTEGRATION


XGEN Status: GOOD!
O2:20.9% CO2:394ppm
T:73.4F RH:38%
Tank- pH:6.8 T:73F
Power
Supply


Sealed
CO2
pH
H20


O2 Sensor
O2
MOTORS

Next Step:
Sustain Life!


Net
Pot
Rock
Wool


208
PROJECT
XGEN
Patriot
420
BEST

NEXT

Finish Verification and Validation of sensors

Test and set pH control with Empirical data

3D Print Motor Mounts & Design pulley

Integrate and Test Automated Syringes

Design Manifold Mount and Integrate to syringes

Write SD card data logging program

RESEARCH

O2 Production CO2 Reduction

Abnormal Grow Solution Conditions

Abnormal Lighting Conditions

Light Fluctuations and Growth

Future Chamber

Sensors: DO, Electrical Conductivity, Pressure, Photocell, etc

Reduced Pressure (Stronger Chamber)

Adding CO2 to the Chamber

Future Chamber

Large scale research with thousands of chambers

Vast amount of research for space exploration

Find new and efficient growing techniques