2022 Design and Prototype Semi-Finalists

Crystal Growth NanoLab

Students:	Caroline Fouras, Diana Moser
Teacher:	Gary Duquette
School:	Jackson Hole, Wyoming

Students:	Rodrick West, Miguel Armenta
Teacher:	Steven Marcus
School:	Cypress Springs, Texas

Students:	Joshua Santa Croce, Joshua Szymanski, Jacob Berry
Teacher:	Rebecca Allen
School:	Palm Bay Magnet, Florida

Students:	xxx Hauserman
Teacher:	Nate Olsen
School:	Warren Tech Central

Students:	Leighanne Bennett
Teacher:	Ashley Pederson
School:	Lakewood, Colorado

Students:	XXXXXX
Teacher:	Kristin Magas
School:	Tri-County Regional Vocational Tech, Massachusetts

Students:	Jacob Zimmerman, Hudson Staub
Teacher:	Nate Olsen
School:	Warren Tech Central, Colorado

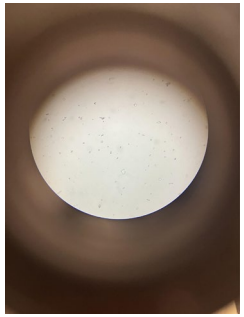
Crystal Growth NanoLab

Jackson Hole High School
Teacher: Gary Duquette
Team members: Caroline Fouras, Diana Moser

Protein Options

The protein crystallography kit from Molecular Dimensions allowed us to grow Thaumatin, Proteinase K, and Lysozyme protein crystals. Our module is compatible with any protein used in sitting drop experiments.

Lysozyme



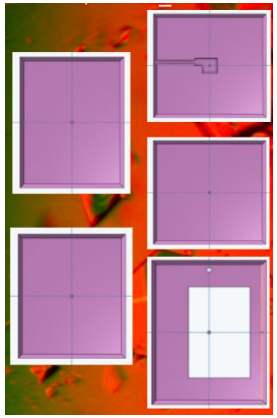
Thaumatin

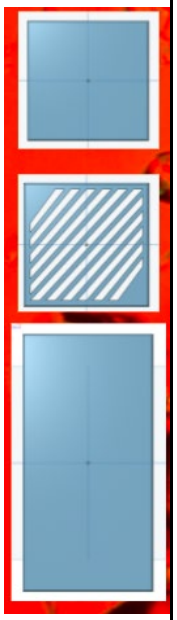
Proteinase K

CREPE Module

Jackson Hole High School CREPE tear
Mr. Duquette
Caroline Fouras, Diana Moser

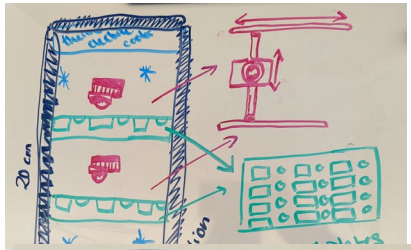
Our team designed a box compatible to hold crystal growth experiments in space.

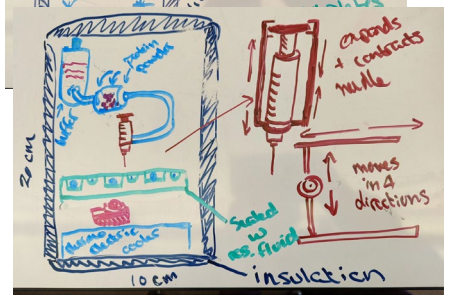




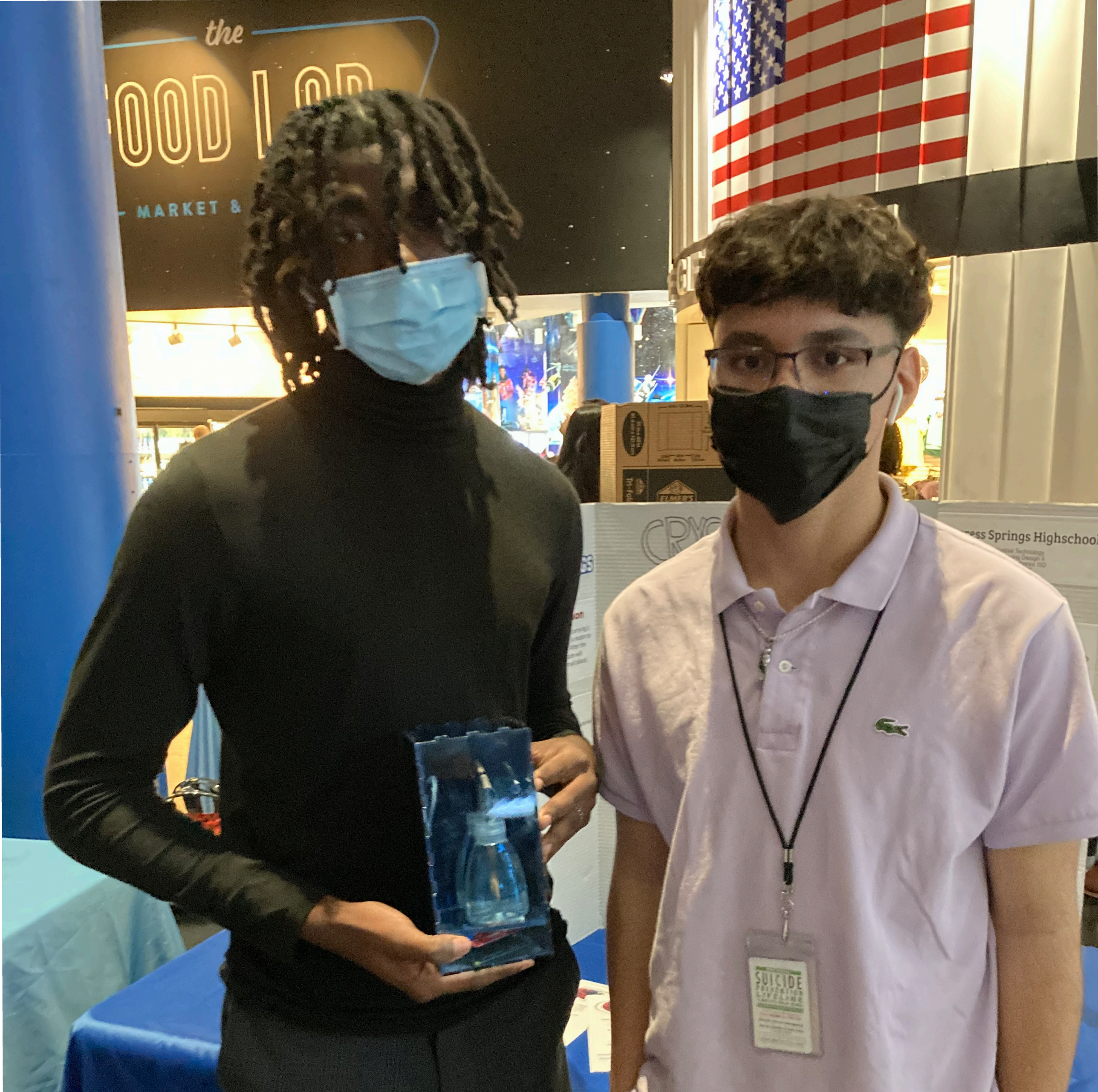
Design Plans

The CREPE team worked to design a box by first sketching and drafting out ideas.





Due to its simplicity and the presence MERLIN module as an existing proof of concept, we chose to move forward with freezing our samples until they reached orbit. Next we used OnShape to CAD our box.


the
MARKET &
SUICIDE

Cypress Springs High School
Industrial Technology
Engineering Design II
Cypress-Fairbanks ISD
Cypress, TX

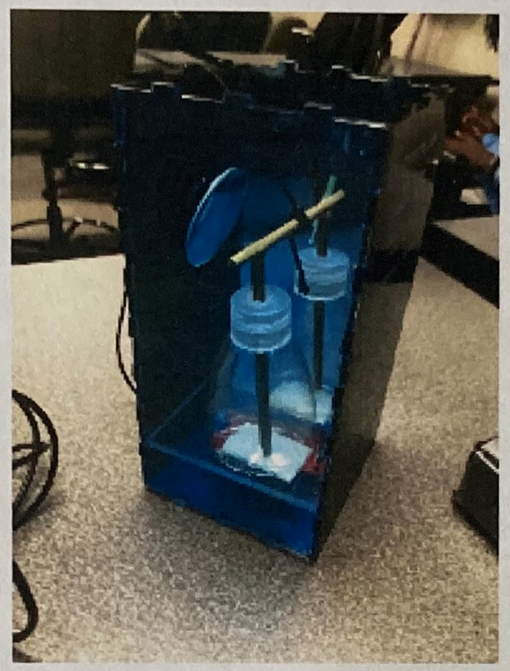
NASA Hunch Program
Team members:
Rodrick West
Miguel Armenta

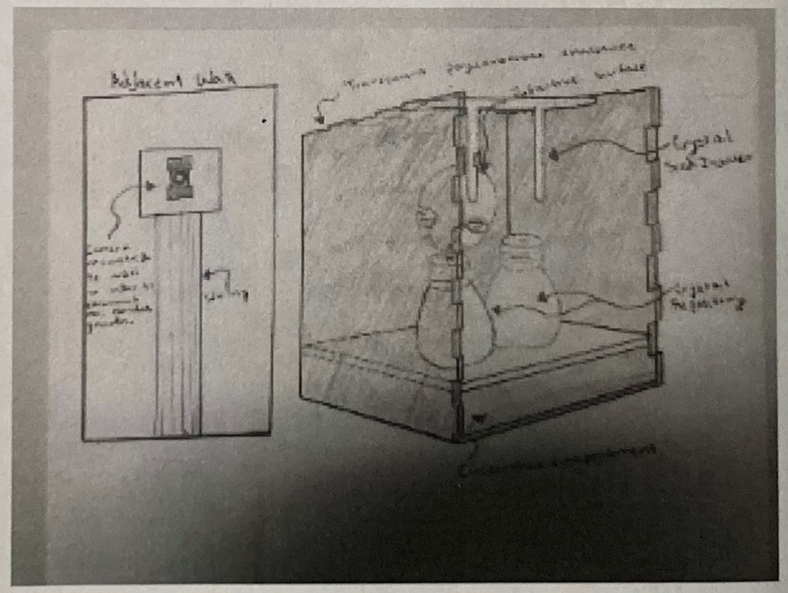
Instructor
Steven Marcus

HUNCH Advisor/ Mentor
Glen Johnson

Emails/ Info.
Miguel Armenta :
thatonekidthat@icloud.com / 346-773-9491
Rodrick West :
rodricktwest@gmail.com / 346-276-9567

CRYSTAL LAB





Crystal Nano Lab Demo

GENERAL INFO.

- The NanoLab will inject a needle carrying a seed crystal into a solution using a servo motor. After the injection, the solution will react with the seed crystal and begin the crystallization

Objectives

- Create an efficient and affordable NanoLab for creation of crystals in space
- Document growth of crystals in Zero-Gravity
- Create multiple crystals in a confined space

Materials

- Camera
- Mirror
- Polycarbonate sheet
- Servo motor
- Raspberry Pi

Problems

- Solution may stick to surface due to Zero-Gravity
- Ways to position motor w/o interfering with lab
- How to program the camera

Solutions

- Use hydrophobic spray to deter solution from sticking to the container
- Place motor above lab
- Use Raspberry Pi to program camera

Crystal Growth
NanoLab

Important Information

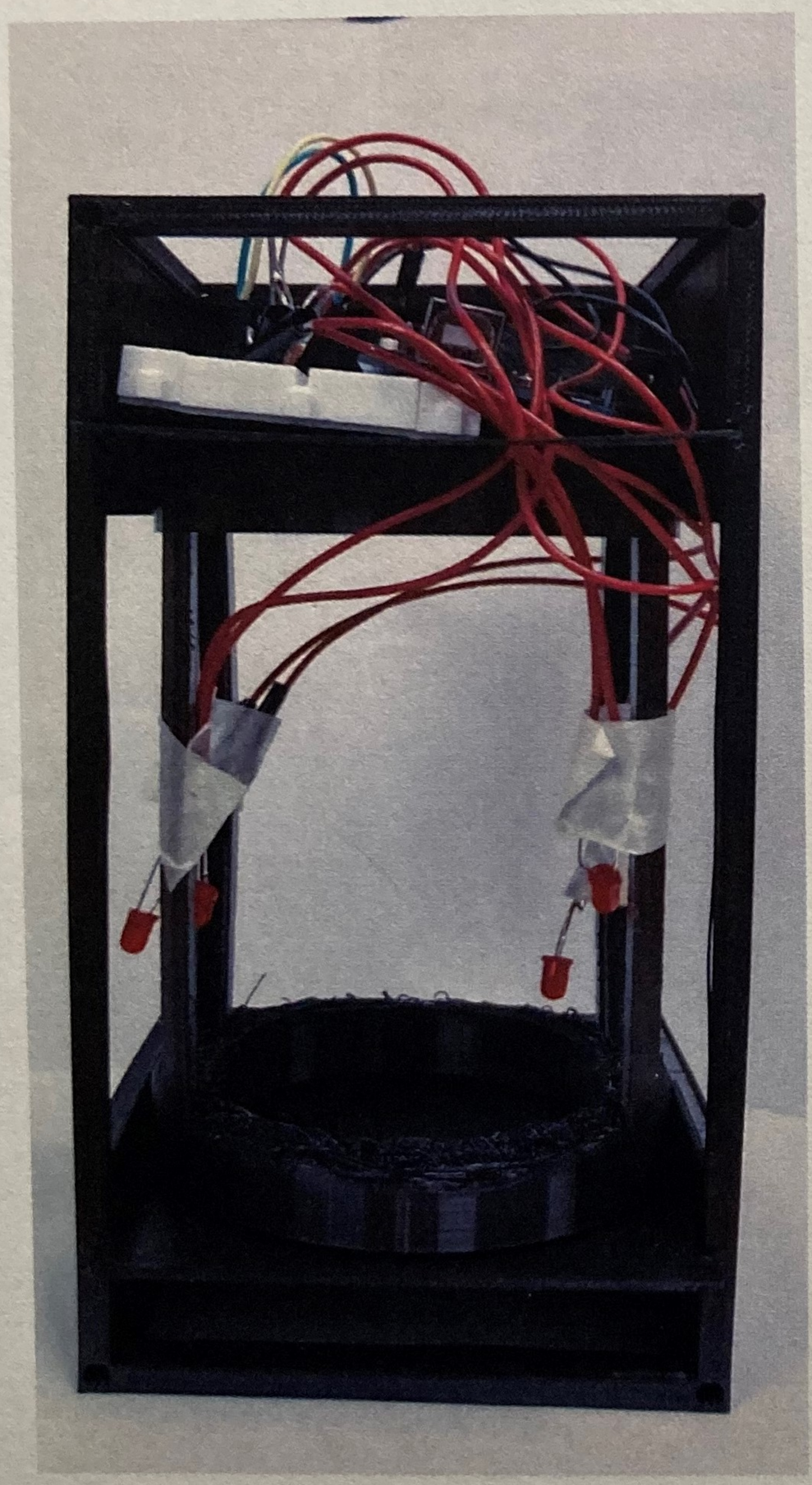
Solution

HOLLISTER
CALIFORNIA

SANTA CRUZ

CRAFTSMAN

Crystal Growth Nanolab



Palm Bay Magnet High School

Mrs. Allen

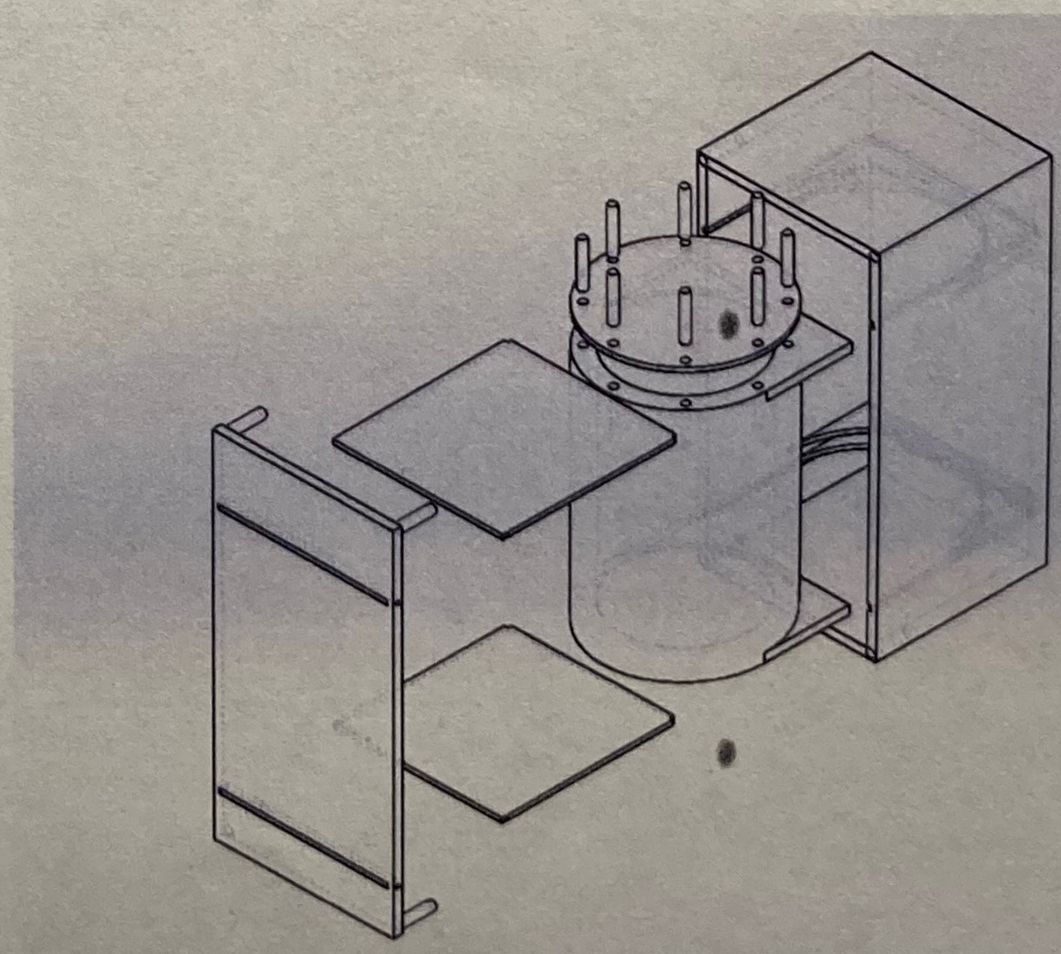
Joshua Santa Croce, Joshua Szymanski, & Jacob Berry

Means of Completion

1. **Electrolysis -** Electricity is sent into the solution via metal rods inserted into the solution and provided with a current through the primary electronic system, the arduino and breadboard in this case.
2. **Photography -** A camera is to be attached to the opposite wall from the testing unit to record the results of the experiments with the most all encompassing view possible.

Design Basis

The original idea as depicted in CAD was to design a unit that consisted of the primary testing unit and a small array of electronics to control and observe the performance of the tests. The primary parts lacking in the current prototype is the heating plate. This unit is now in such a form factor as to assemble very easily and hold well.



Capabilities

- Electrolysis
- Photography

Results we

ing/ Fixes

After testing

ystal Growth

ano Lab

n Tech Central

r. Olsen

Hauserman

Material

Arduino

peristaltic pump

3-D printed boxs

components have

Foam for hea

Elegoo Nano

Crystal Nanolab

Mason Hauserman

Nathan Olsen

Warren tech central

NASA HUNCH

WARREN TECH

EXIT

F-111

Crystal Growth NanoLab

Team members: Leighanne Bennett

Lakewood High School

Teacher: Ashley Pederson

Previous designs

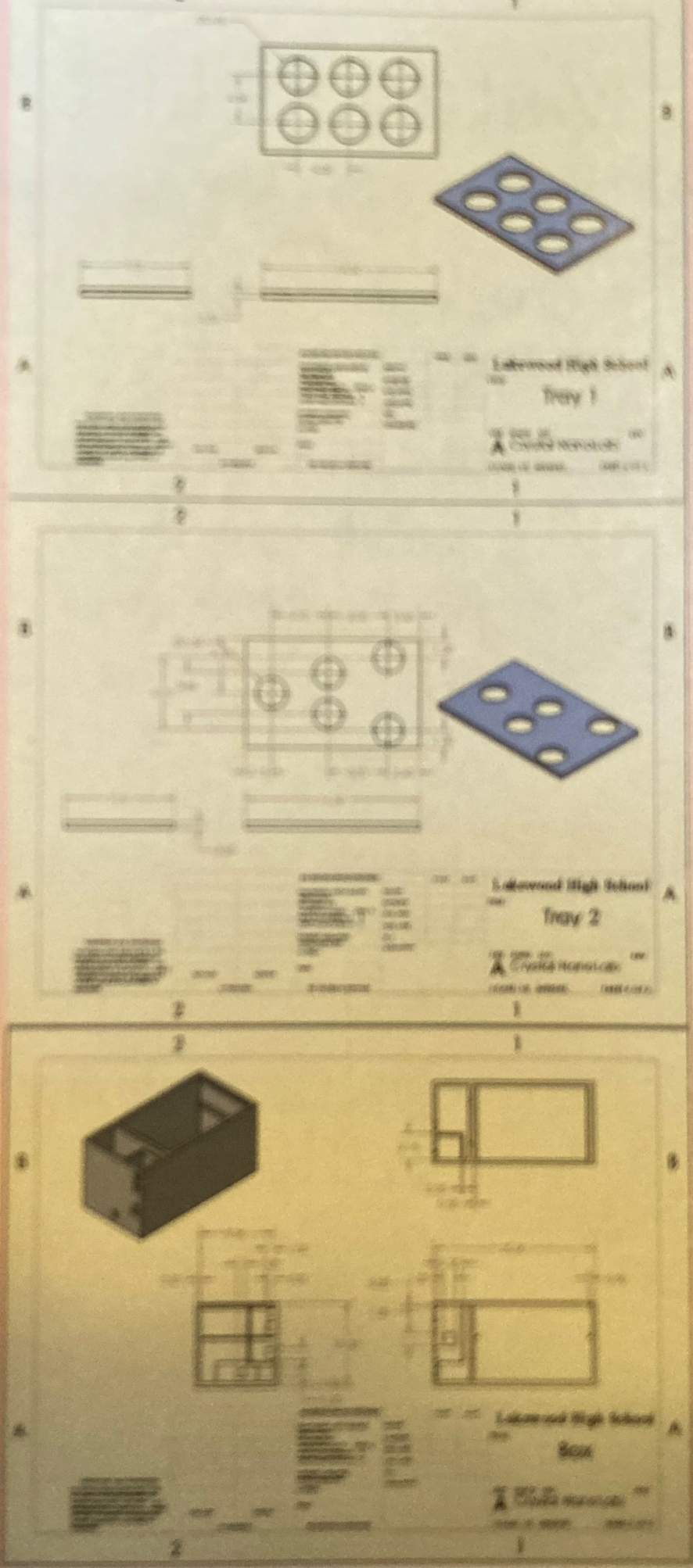
Picture of working prototype

QR Code

Crystal Growth NanoLab

Lakewood High School
NASA HUNCH
Team members: Leighanne Bennett

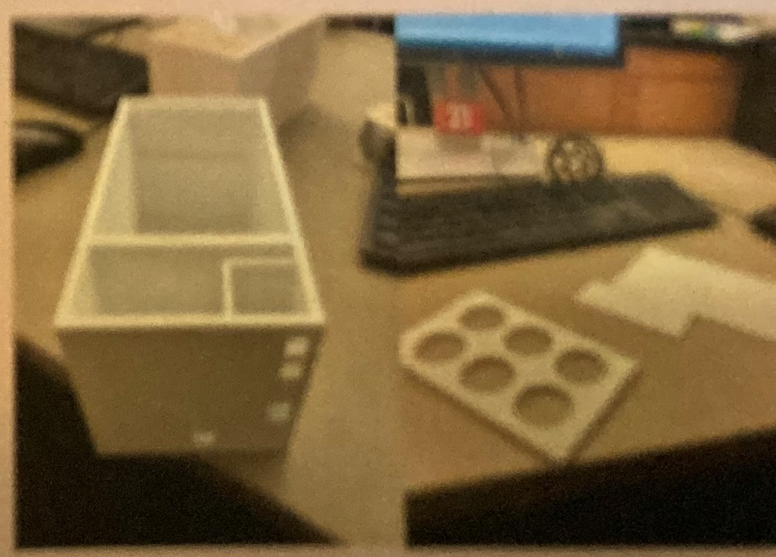
Teacher: Ashley Pederson



Prototypes

Iteration 1

Iteration 2



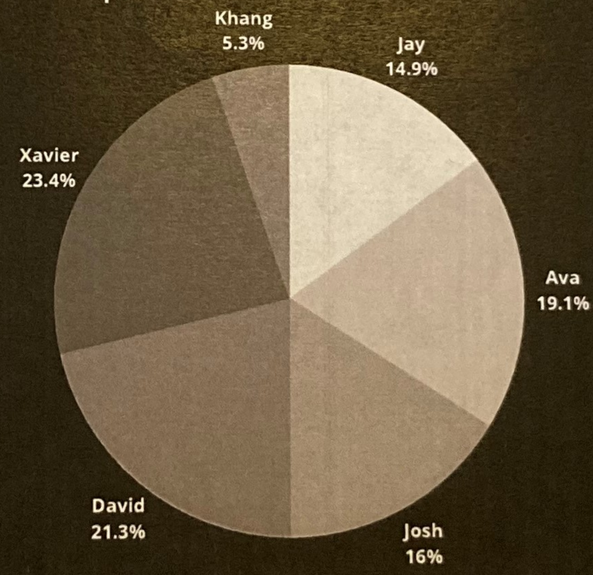
Brainstorming

Now that our group has figured out exactly what our final main idea will be we can begin to make it a reality and contribute together to construct it. We have our 3D Printed model ready in Solid works, we can begin sorts of tests and see whether or not our box would produce a better quality of crystals.

An important question we tried to figure out while constructing is what materials and blueprints can we use to make a Crystallization Nano Lab successfully in zero gravity that will travel up to the ISS without breaking or compromising any of the other projects, that produces higher quality crystals than we can create on Earth and also insulate all of the technology within the project from the water or any possible errors?

TEAM DECISION MATRIX/FINAL TESTING

Our team all contributed for our final product but in specifics, Xavier completed a gran majority of the solid works, Ava completed our arts and notes, David assisted in correcting research and helped in solid works, Jay analyzed our research and assisted in the trifold, Josh completed the brochure and a portion of research.



OR CODE FOR VIDEO

Materials

- Aluminum
- Raspberry Pie $14.00
- Wall Adapter $7.95
- Camera Module V2 $25.00
- Camera Cable $5.95
- Test Tubes $12.00-13.00
- Plastic (3D Printed Prototype) $-70.00
- Sparkfun Qwiic Kit $41.21
- Heating Wire
- Waterproof sealant

(Exact Items On Amazon)

3M Marine Adhesive Sealant Fast Cure 5200 (06535) Permanent Bonding and Sealing for Boats and RVs Above and Below the Waterline Waterproof Repair, White, 1 fl oz Tube for $11.47

uxcell A16030100ux0520 7.5M 24.6Ft 0.2x4mm Nichrome Flat Heater Wire for Heating Elements for $16.90

Total Price of Project $204.48 in dollars.

Crystal Growth Nanolab

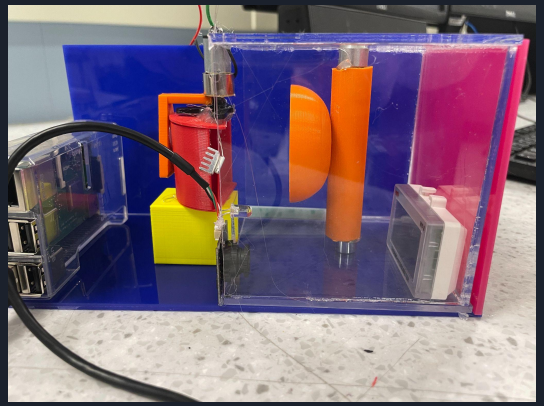
School: Tri-County

Teacher: Ms Magas

We have a design that allows for a multitude of crystal growth including cooling, evaporation, introducing an already formed crystal into the lab after launch and introducing 2 liquids that combine before being introduced into the lab.

Features

- Many options for how to grow crystals.
- Designs for growing crystals easily removed if not needed.



Nano lab team (left to right)

Wyatt Cibulka

Andrew Vicario

Ryan Blanchette

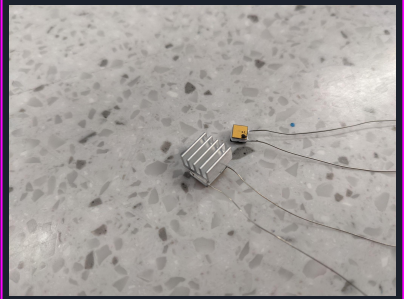
Solutions

Future designs

- May want to change the net to hold the desiccant packets into.
- Will apply an insulator to the metal side of the growth chamber.

Slow cooling

This is the circuit that will cool the crystal growth chamber.

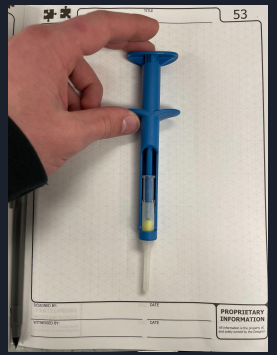


Evaporation

The desiccant packets removes moisture from the air and the net keeps them from interfering with the lab.

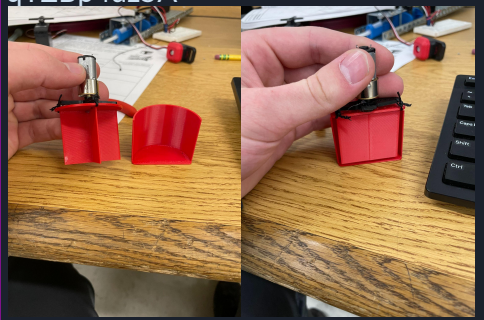
Precipitate reaction

We use a static mixer to have 2 chemicals separate before launch and when the power is turned on they will mix together and enter the lab.
https://www.youtube.com/watch?v=UwBjWxe8tgo



Seeding a supersaturated solution with a crystal

This system will hold a crystal in a secure location until it gets into space where it will be released into the lab.
https://www.youtube.com/watch?v=PqTZBp4uz5A



Crystal Nanolab

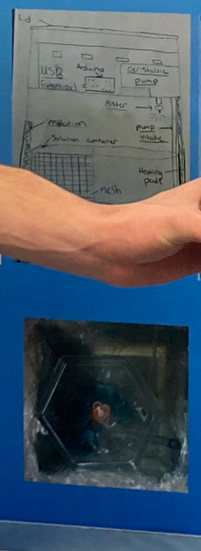
Jacob Zimmerman and Hudson Staub
Warren Tech Central
Mr. Olsen

Mid-Fi

Experimenting/ Fixes

After testing

Before Test



Results we have so far

Our final result after 7 days of testing are crystals.

Next Steps

Our nex
would
redesig
our or
box des
inco

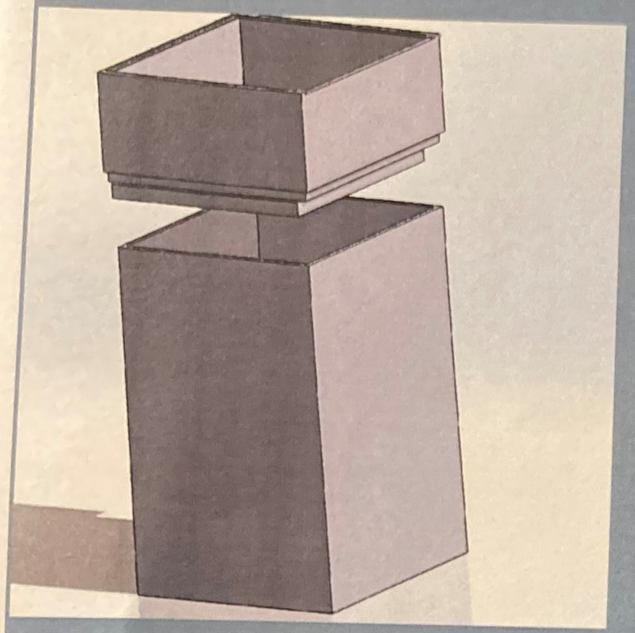
-Camera
-Light
-Locking mechanis
- More insulation

What I need fo flight:

.Water tight Locking

ing circuts

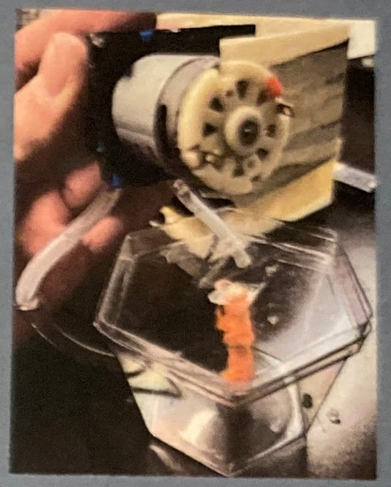
wire
one
sign
etter
em.

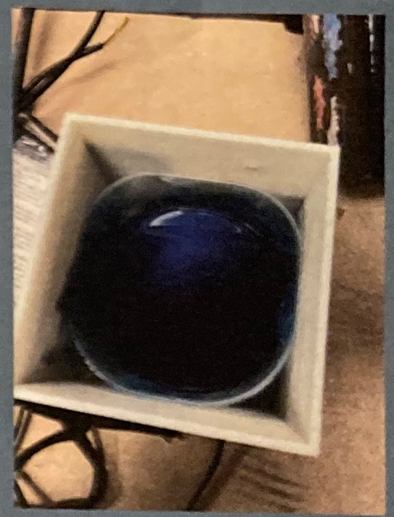


Crystal nanolab

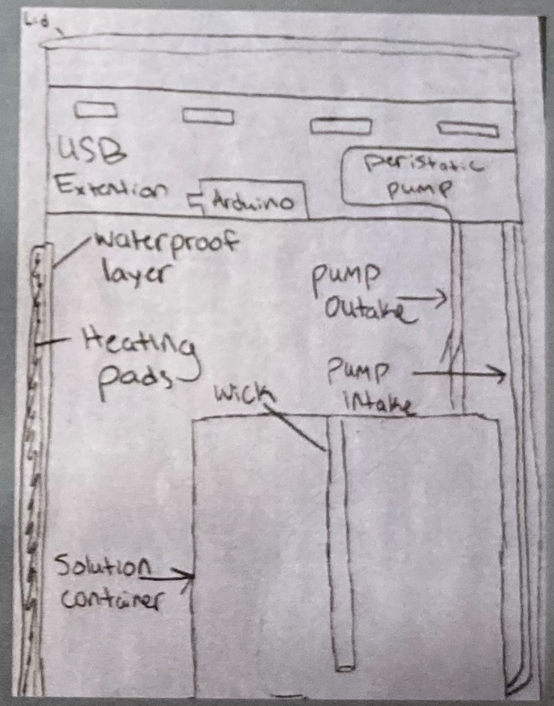
Jacob Zimmerman and Hudson Staub
Warren Tech central Mr.Olsen

Our Crystal Nanolab maximizes growth because we added as much space and heat as possible for them to grow over a 30 day period.





The water pump is constantly running, and the solution drips down the wick and forms crystals as the water is constantly flowing. The solution should ball up around the wick because of zero gravity.



The way to make the highest quality crystals is to make them avoid hitting anything in the container, this could caus imperfections in the crystals.