2022 Design and Prototype Semi-Finalists

Fungus NanoLab

Students: Greg McDonald, Ben Hogan, Kelly Lee, Koh McGinn, Saphala John, Melanie Loza, TroyDuffy, Aidan Mangin
Teacher: 7Fred Bauer
School: Council Rock South, Pennsylvania

Students: Dylan Schioppo, Mark Kamel, Cole Weiss, Zach Greenberg
Teacher: Chris Regini
School: Half Hollow Hills, New York

Students: Dayna Rohmann, Justin Okorie, Connor Healey
Teacher: Ray Gerstner
School: Glenelg, Maryland

Students: Owen Murtha
Teacher: Mitch Daigle
School: Minetonka, Minnesota

Students: Brandt Dousay, Bella Woodard
Teacher: Robin Merritt
School: Clear Creek, Texas

Students: Couper Bowers-S, Bergen Thorne
Teacher: Matt Brown
School: Warren Tech, Colorado

Students: Bryce Roethel, Wyatt Mortimer, Spencer Ellingham, Zachary Evans
Teacher: Vince Stornello, Donna Himmelberg
School: Fairport, New York

Hand powered Zero-g Bulk Transfer System

Students: Alexia Velasquez, Joshua Fernandez, Ci Lee, Ulises Guerrero
Teacher: Shaun Cuaron
School: Sanger, California

Students: Brandon Brazil, Dridger Stiles, Walter Duquette
Teacher: Gary Duquette
School: Jackson Hole, Wyoming

Students: Sierra Rohmann, Eric Dorsey
Teacher: Ray Gerstner
School: Glenelg,

Students: Nick Burhard, Noah Deis, David Li, Ashton Thompson
Teacher: Matt Heer
School: Platteville, Wisconsin

Students: xxxx
Teacher: David Laughlin
School: Bridgeland, Texas

Students: Moises Fuentes, Garret Gretz, Cole Osborn
Teacher: David Laughlin
School: Bridgeland, Texas

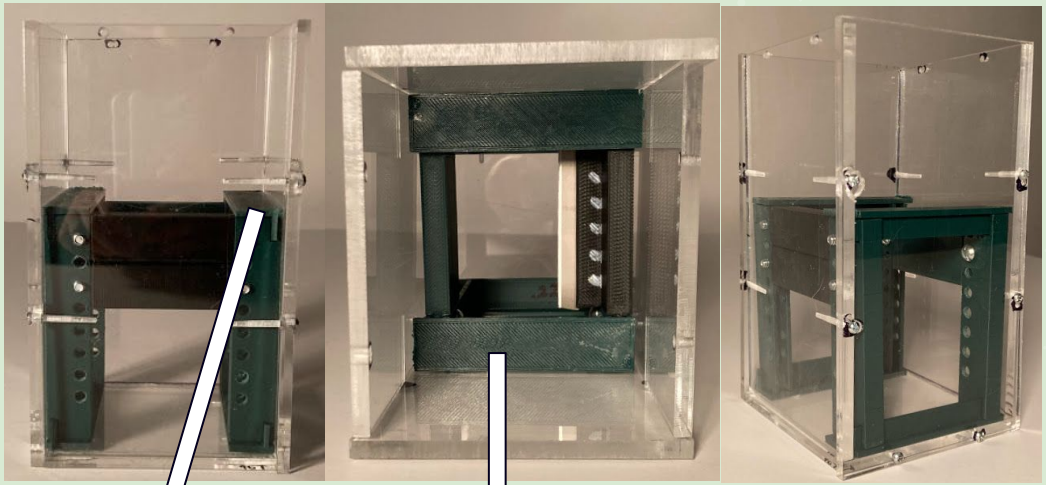
Students: Russ Ogbor, Cartier Pahl, Vic Williams, Magic Medeles
Teacher: Jacob Smith
School: Manvel, Texas

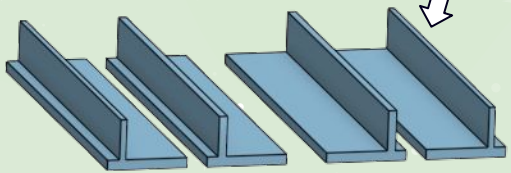
Students: Abria Sims, Karina Perez, Omar Caldera
Teacher: Steven Marcus
School: Cypress Springs, Texas

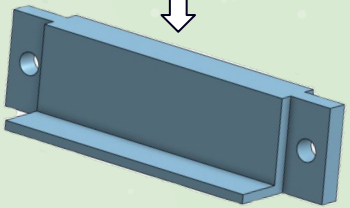
Students: Bella Woodard, Briana Zamora
Teacher: Robin Merritt

10x10 rail build meant to move a knife and a “chopping block” towards each other to meet in the middle and cut the mushroom tops before spore release.

Fungus Nanolab







New blade holder design used to clamp the blade into place.

Our Team:

Greg McDonald- Team Lead, Researcher, Mushroom Nanolab Designer
Ben Hogan- Interior Nanolab Designer
Kelly Lee- Rails and Mounts Designer
Koh McGinn- Mushroom growth Researcher
Saphala John- Sterilization Researcher
Melanie Loza- Lighting Researcher
Troy Duffy and Aidan Mangin- Powerpoint Designer

Our Backgrounds:

School: Council Rock South
Teacher: Mr Bauer

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Pros and Cons:

Pros:

- ❏ Good at cutting taller mushrooms
- ❏ Simplicity of the build allows little complications

Cons:

- ❏ Caps of mushrooms cannot be removed
- ❏ Shorter mushrooms may not be cut

Future Improvements:

We want to grow multiple batches of fungus at the same time. Also, we would like to work further into the motorization of our build to make it operate remotely

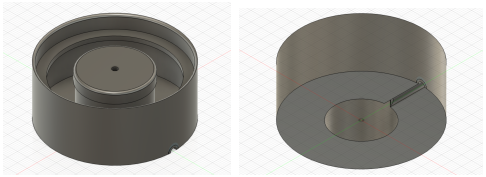
Fungus NanoLab

HHH High School East
Dylan Schioppo, Mark Kamel,
Cole Weiss, Zach Greenberg

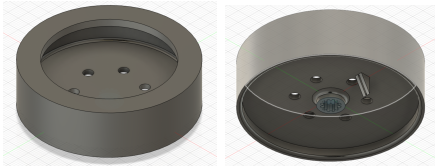
For our designs there are no commercial products that we are basing our design off of. Together Mr Regini and our team developed the designs that we are using currently today for our Fungus NanoLab.

Water Injection System

- This is the mechanism that will hold the water inside of it and will also hold the motor inside with a tunnel for wires to be routed out of this design



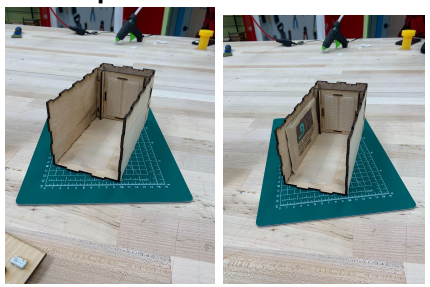
- This mechanism will spin from a DC motor and the teeth that are on the bottom will be holding a knife that will cut a layer of filament protecting the water from coming out. After this is cut sponges and wicks will extend down and soak up water that will transfer through the device with capillary action and into the hemp pad that will be holding the mushroom being grown and the mushrooms will be watered as a result of this.



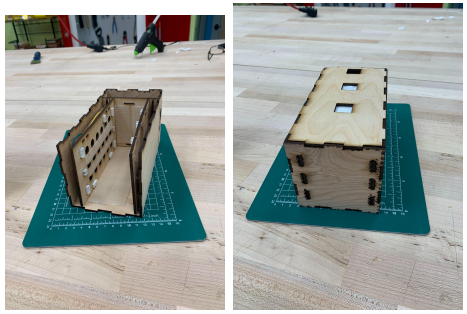
DC motor Housing for spore

Inner and Outer Modular Walls to account for the Modularity of the WIS and Spore Cutting Mechanism

- **This is the outer box which holds the components and mechanics and moisture pads.The picture on the right is where the moisture pads sit inside the box**



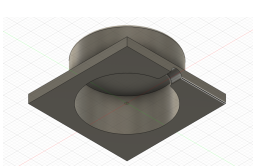
- **The holes on the picture on the left let the moisture pad seep into the box causing a great environment for mushrooms to grow. The white ports of the box are for quick connection of the different electronics in the box.**

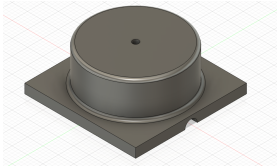


- **The picture on the left shows the**

Cutting System

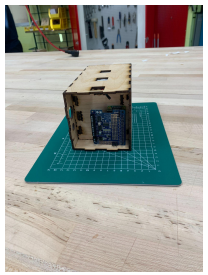
- This device will be holding a dc motor inside of with a tunnel to route wires out of it. The purpose of this device is to hold a drill bit with a connector that was designed on CAD. This drill bit will cut the spores off of the mushrooms before they have a chance to sprout

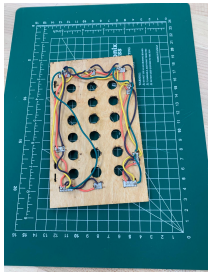




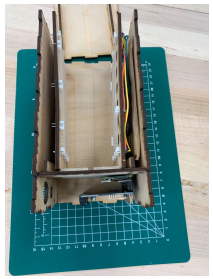
area where the raspberry pie mini will go to be kept in safe storage. THe slots on the sides of the pie give the pie the opinion to pass wires to the electronics connecting the pie to the sensors.

- **The picture on the right shows the wiring behind the retractable wall of the box. The wiring gives the opinion for mobility. The holes in the wall let the moisture pack leak into the box creating a good environment for the mushrooms to grow.**





- **The picture on the right shows where the fans would be covered by a mask. The fans are to let air flow in with carbon dioxide from the astronauts and not let the spores of the mushroom go through. Mushrooms need carbon dioxide so this is perfect. The picture on the left shows the replaceable walls that can be taken off.**

Why Mycelium?

- **Semi-Structural Applications**
  - Insulation and flooring
  - Acoustic absorption
  - Furnishing
- **Material Properties**
  - Fireproof
  - Non-toxic
  - Dense yet lightweight
- **Self-Replicating**
  - Fast, easy, and cost and energy efficient to grow
  - Can be produced locally instead of imported from Earth
- **Over 60% water**
  - Radiation protection for lunar habitats
- **Bioluminescent Lighting**

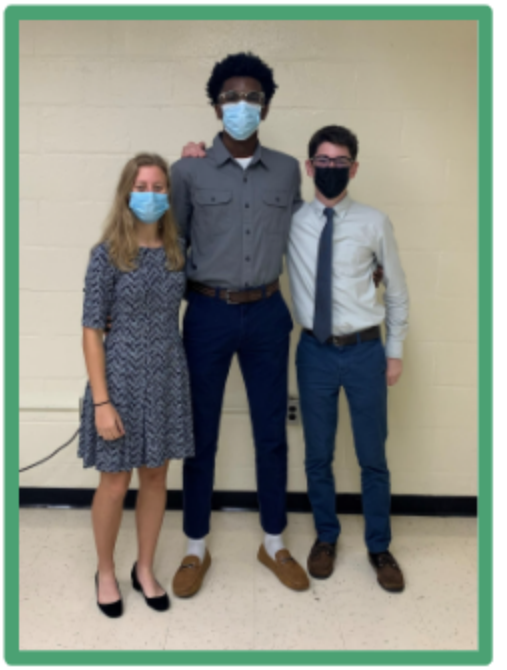
Mycelium can be built into any shape needed using agricultural waste, a mold, and the proper conditions for the fungus species being grown.

Contact us at:
glenelgfungusnanolab@gmail.com

Check out our website!

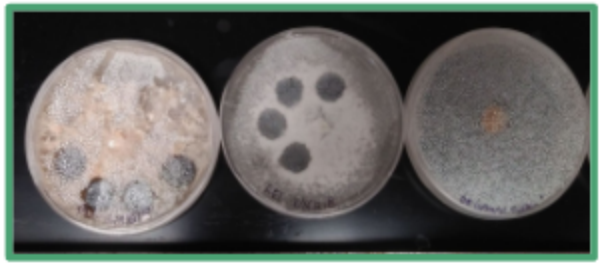
Glenelg Fungus Nanolab

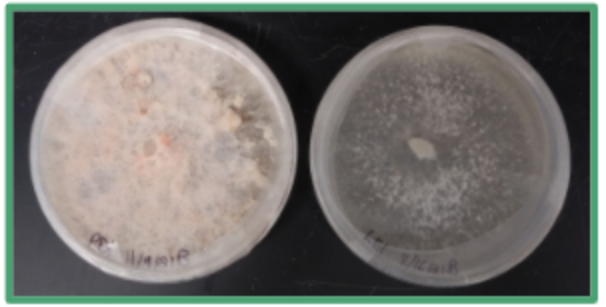
Dayna Rohmann, Justin Okorie, and Connor Healey
Monitored by Mr. Gerstner



Mycelium Experiment

With the help of Mr. Regis, a biology teacher at our school, we were able to conduct an experiment to grow Shiitake and Pink Oyster mycelium. Over the course of two months, both cultures grew in agar petri dishes. At the end of the experiment, half of them had been contaminated with mold due to lack of materials and equipment for complete sterilization when the cultures were cloned.

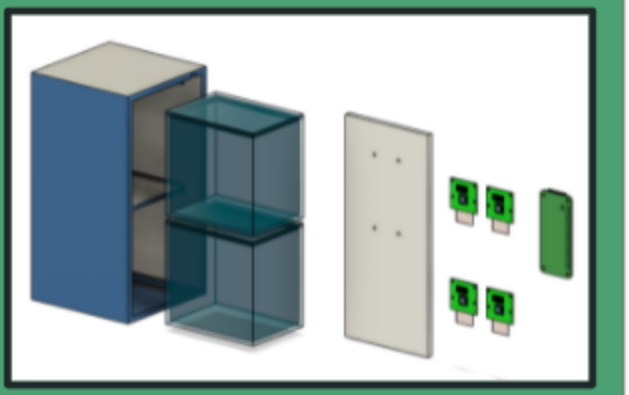




Pink Oyster mycelium is pictured left and Shiitake mycelium is on the right.

CAD Model

Our CAD design is a shell that will fit inside of a 10cm x 10cm x 20cm aluminum box. Two square petri dishes will fit inside, and an insertable wall will hold a camera and raspberry pi to take and store pictures.

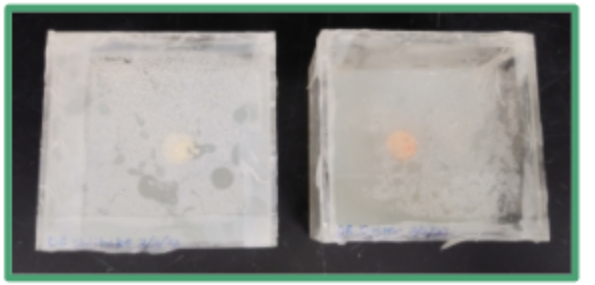


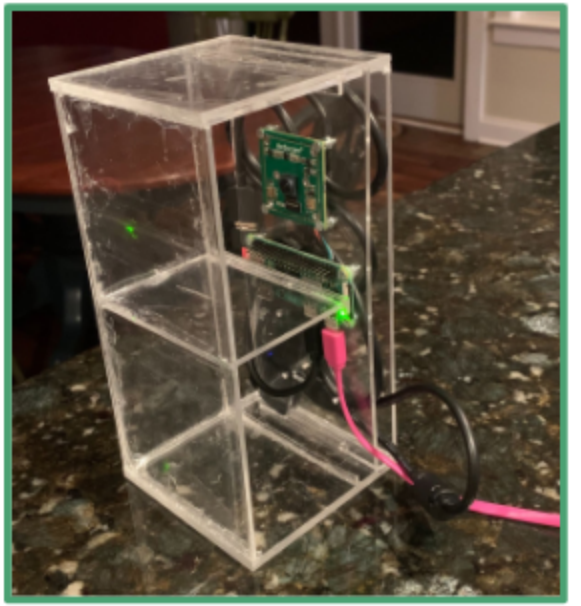
Parts List

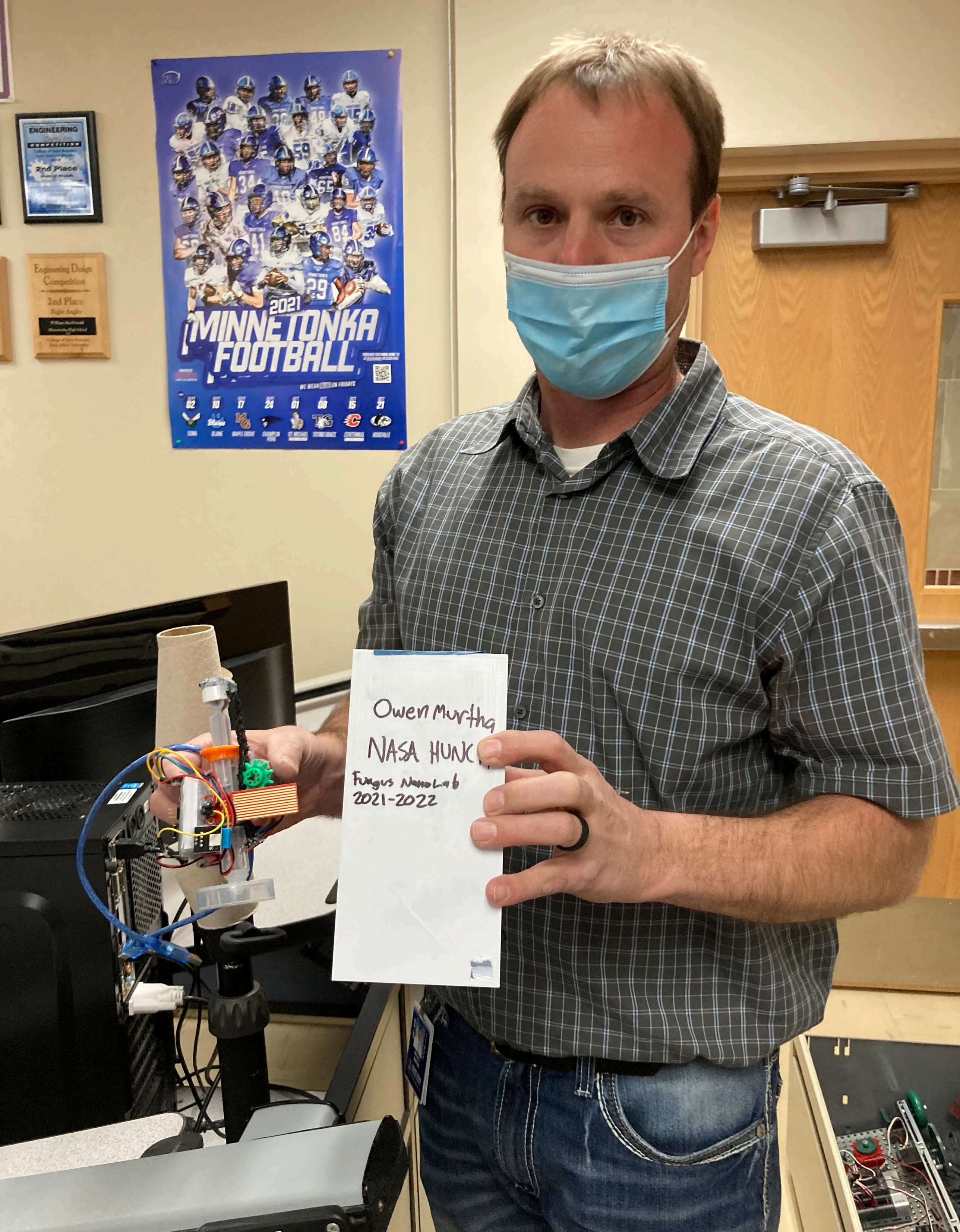
- Parafilm
- E6000 Adhesive
- USB Camera
- M2.5 Screws
- USB Hub
- Acrylic Sheets
- Electronics Frame
- Nanorack DLR Box
- Mycelium
- Nutrient Agar
- Raspberry Pi Zero W 2
- Micro USB to USB Female End
- Sparkfun LED Lights
- Nanolab Sleeve Cap

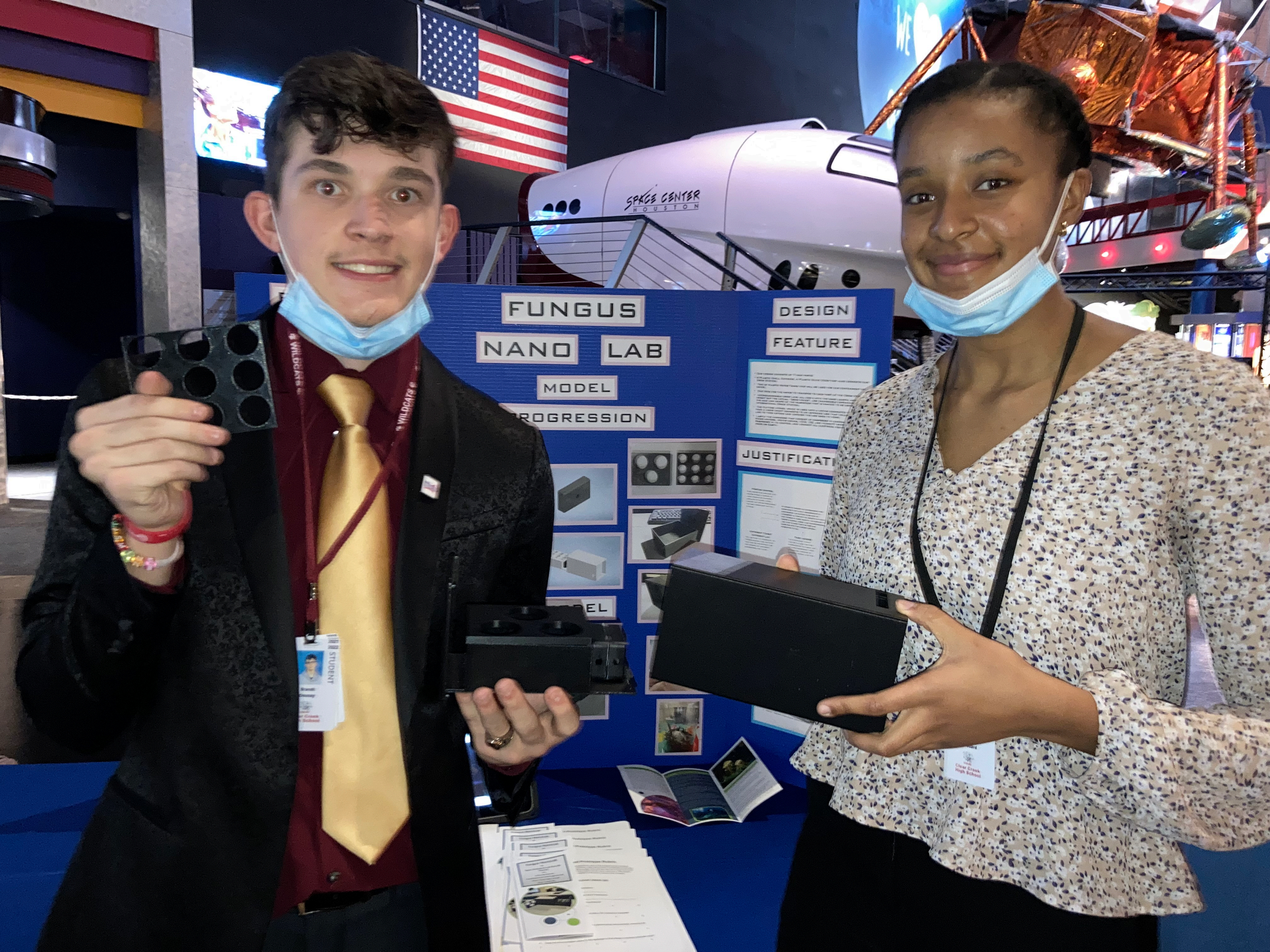
Prototype

We laser cut our prototype out of acrylic and cemented it together using E6000 adhesive. We currently have a working camera and Raspberry Pi Zero W 2 inside. We were also able to transfer the mycelium into acrylic rectangular petri dishes that we made to fit inside.






ENGINEERING
COMPETITION
2nd Place
2021
MINNETONKA
FOOTBALL
WE WEAR ON FRIDAYS
Engineering Design
Competition
2nd Place
Owen Murtha
NASA HUNCH
Fungus NanoLab
2021-2022


SPACE CENTER
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MODEL
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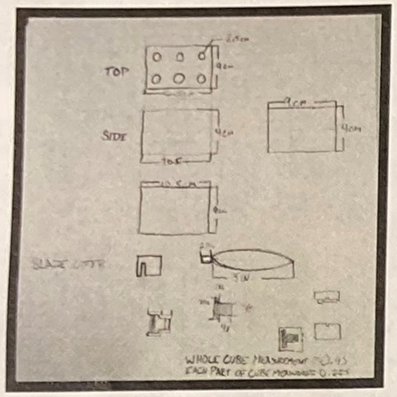
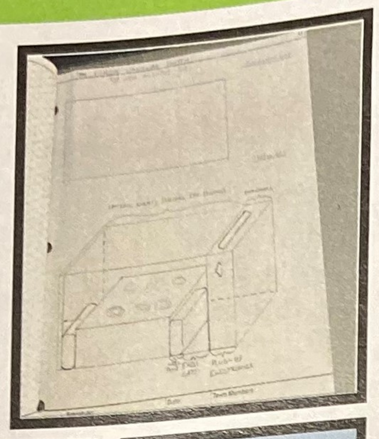
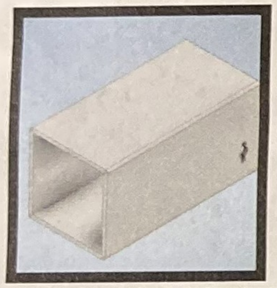
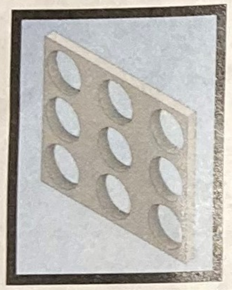
Clear Brook
High School

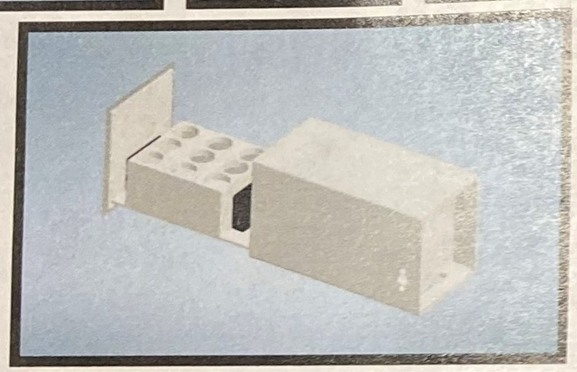
PHOTO PROGRESSION

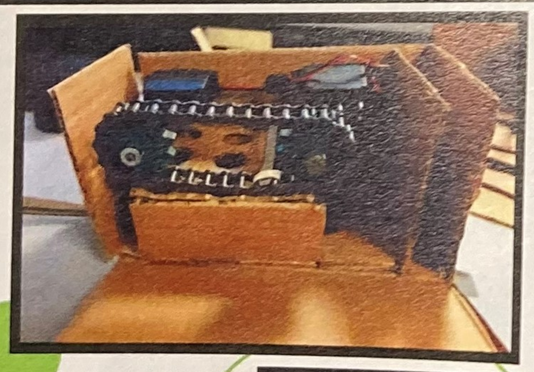


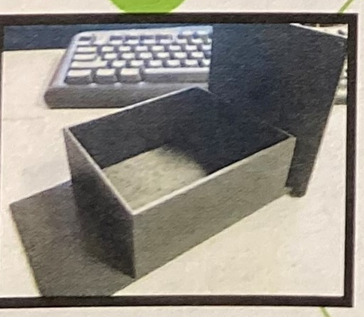












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