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**Jacob Kritzinger\_** Portfolio

**Masters of Design\_**

MDes - University of Berkeley, California

**Masters of Architecture\_**

MArch(Prof) - University of Pretoria, South Africa

I'm a multidisciplinary human-centered designer with my roots in both food and architecture. I've always had a passion for exciting people with my designs, whether a carefully executed detail in a building, or a delectable morsel of food on a plate. I pride myself in being capable of tackling new tasks with vigor and ingenuity. Nothing excites me more than that eureka moment when an invention finally comes to life, but to be honest, I can even appreciate little moments like when you find the exact right bolt in that: "I should keep these for something later box".

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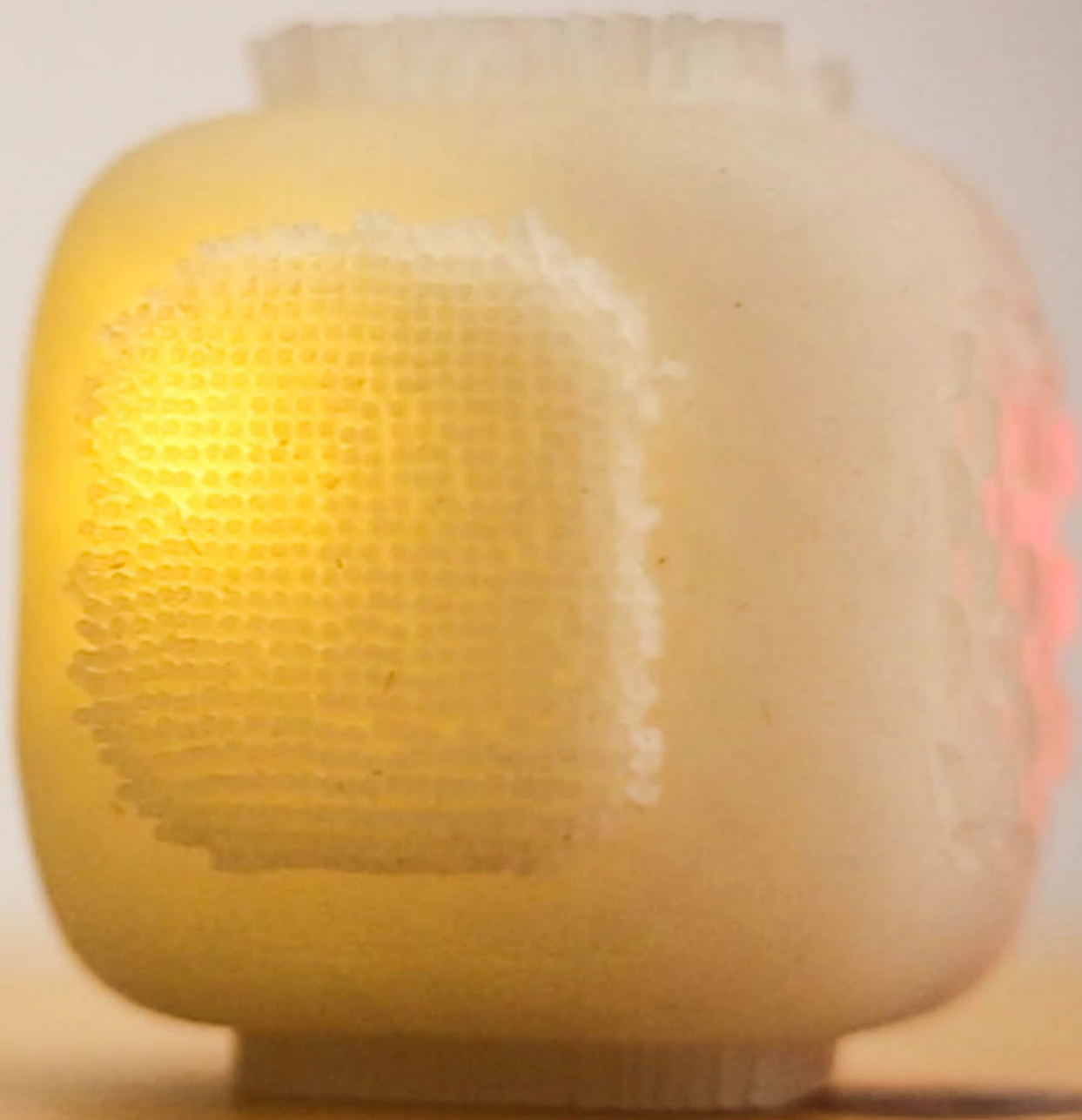
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# Kube

A sensory toy created for autistic children to overcome anxiety during collaborative play and learning.

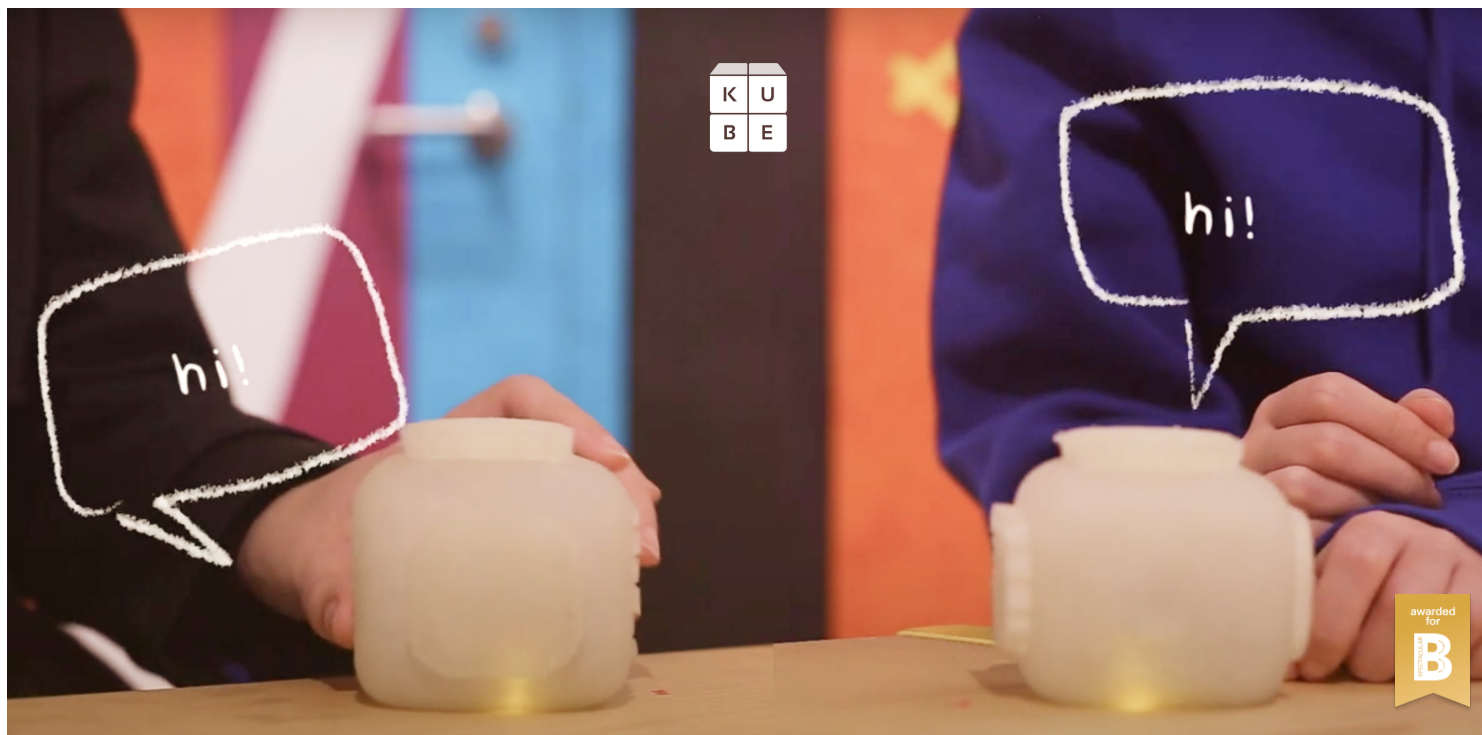


**Problem\_**

Autistic children often play solitarily, whereas cooperative play can be more difficult to engage in organically. Cooperative play may cause anxiety in many instances.

**Problem Statement\_**

How might we create an opportunity for autistic children to overcome anxiety through play?



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## User Research\_



**Christina, Parent**

" My son's anger is difficult to control, but the methods his therapist suggest make it easier to help him feel better. "



**Sebastian, Autistic Child**

" When I'm angry, I like to be by myself. I sit on the big blue couch alone. I need to be somewhere on my own. "



**Dr. Wold, Director of Positive Pathways**

" Autism affects the development of important skills needed for play like sharing objects and attention with others. "



**Julia, Health Journalist**

" I didn't have any stimming techniques. I doodle flowers when I felt stressed, talked with my friend, and played with my pet. These helped me to take a break. "

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## Individual Play\_

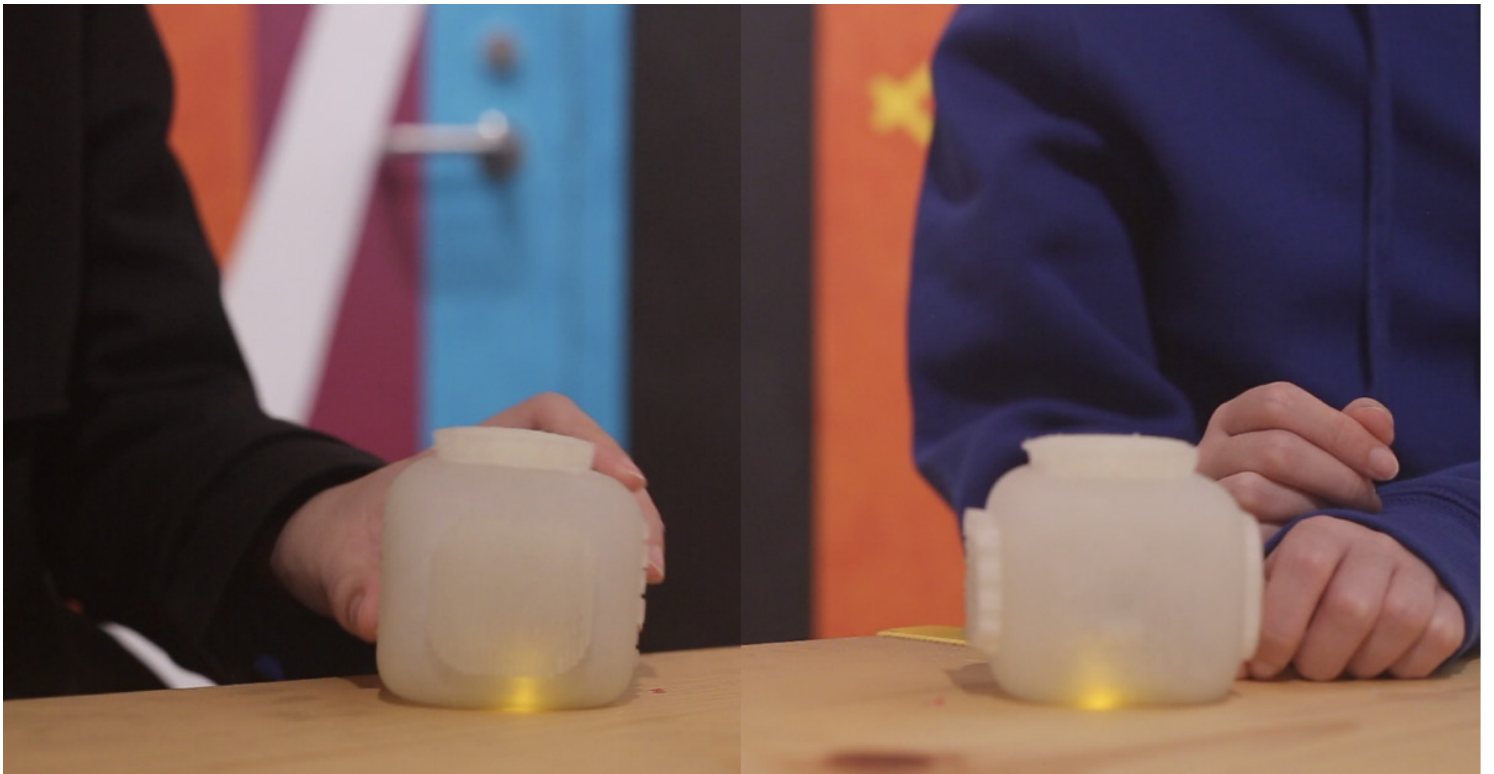
When the child is in a moment of duress, they can feel the textures and mimic the rhythm of the light with their breathing.





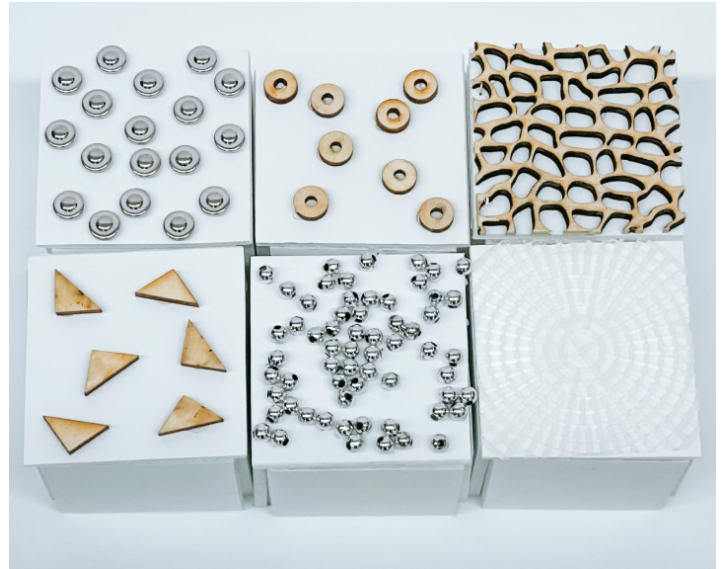
## Cooperative Play\_

When each child holds the cube, tilting or shaking one cube will make another one vibrate; squeezing one will make the other light up accordingly.



## Prototyping\_

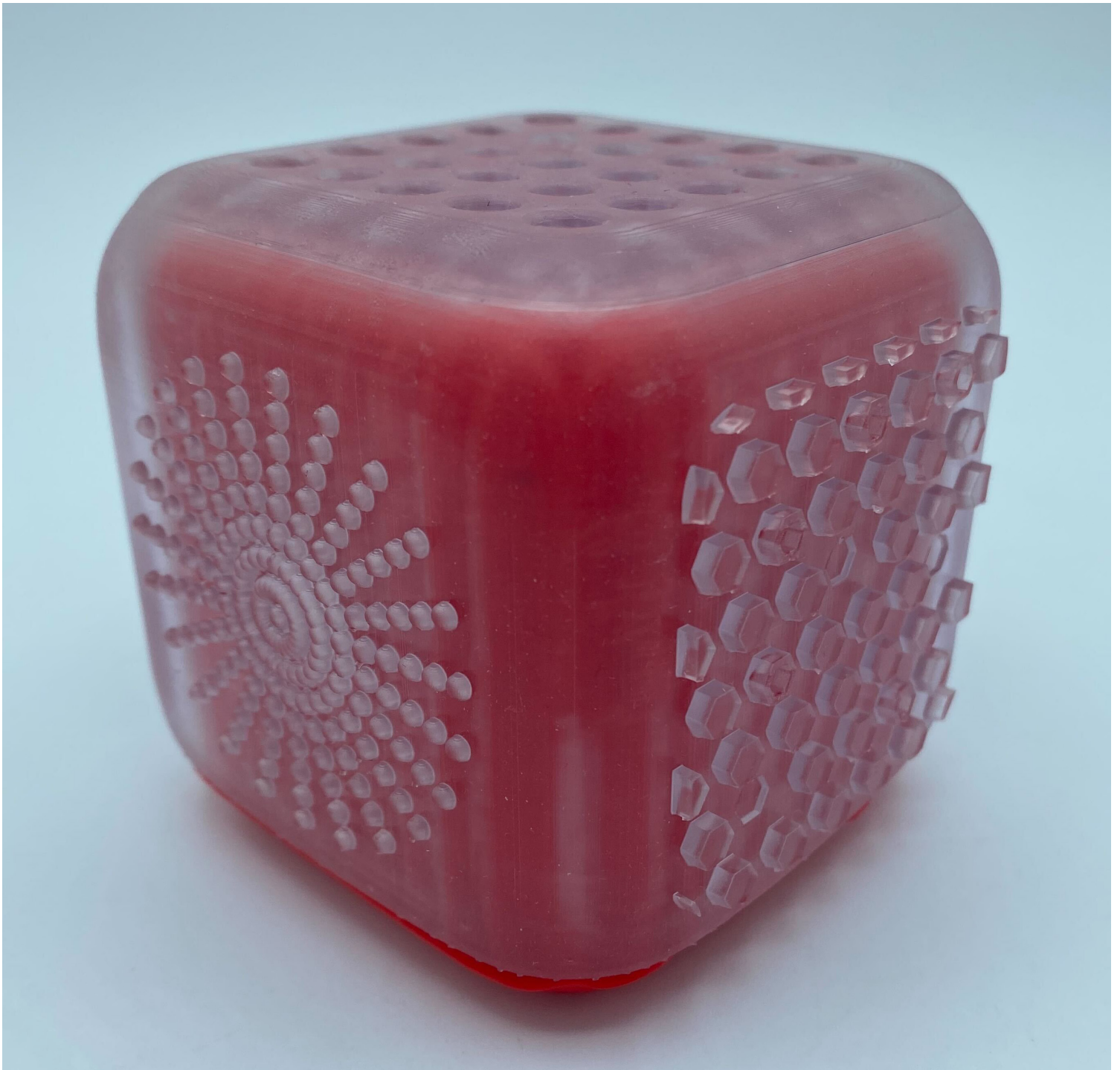
From the prototype, we want to create varying tactile experiences using different textures on the top of the cubes.



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## Textures\_

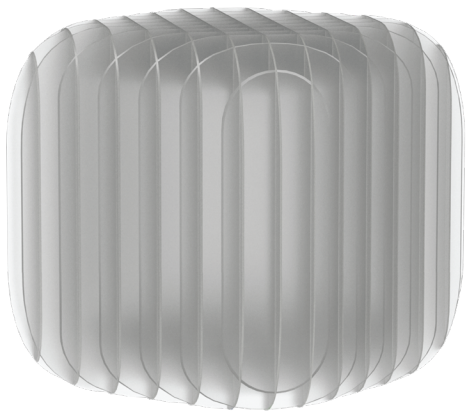
Our group considered how creating pronounced textures could encourage repetitive action as an outlet for self stimulatory behavior.



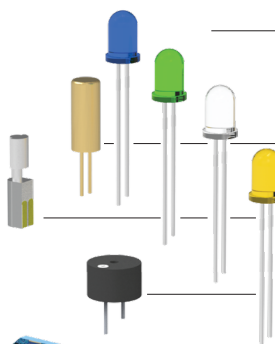
**Technical Review\_**



**Agilus30 - PolyJet Elastic Photopolymer  
Cube with textured sides**



**Translucent FDM 3D Printed TPU soft  
elastic core - Shore hardness 95A**

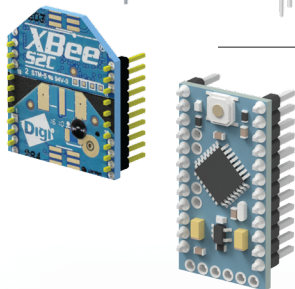


**2 PIN - 5mm LED**

**Tilt Ball Switch Sensor**

**Minature 3V Vibrating Motor**

**Piezoelectric speaker**

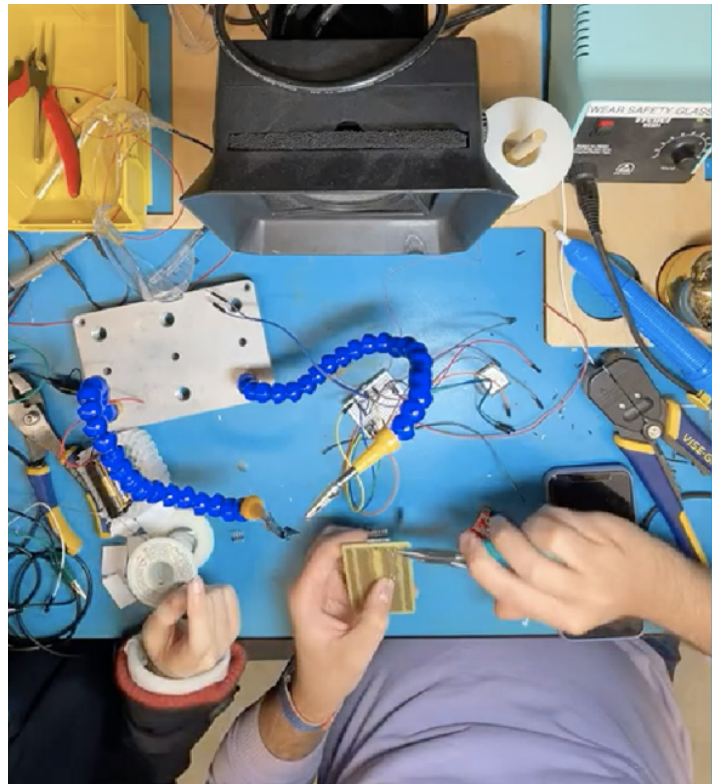
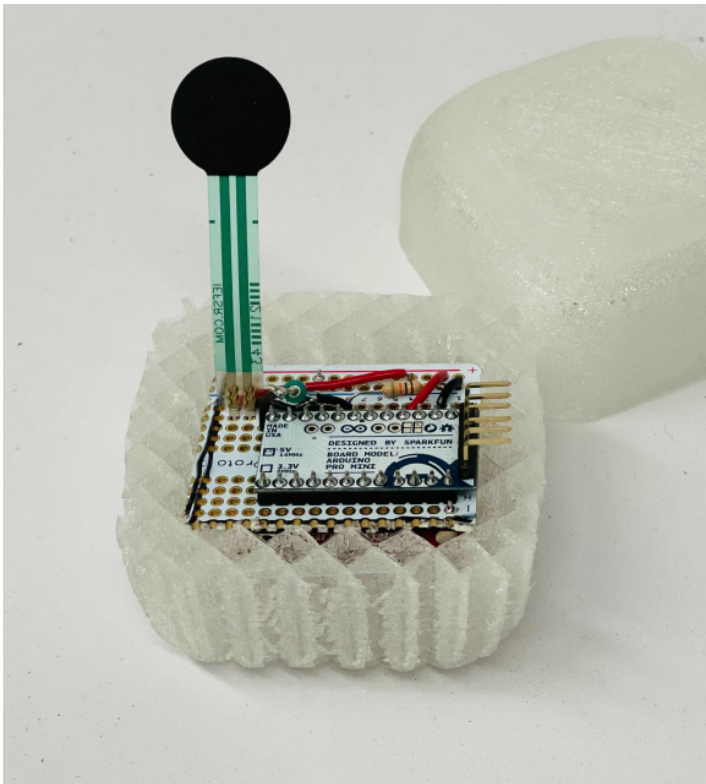
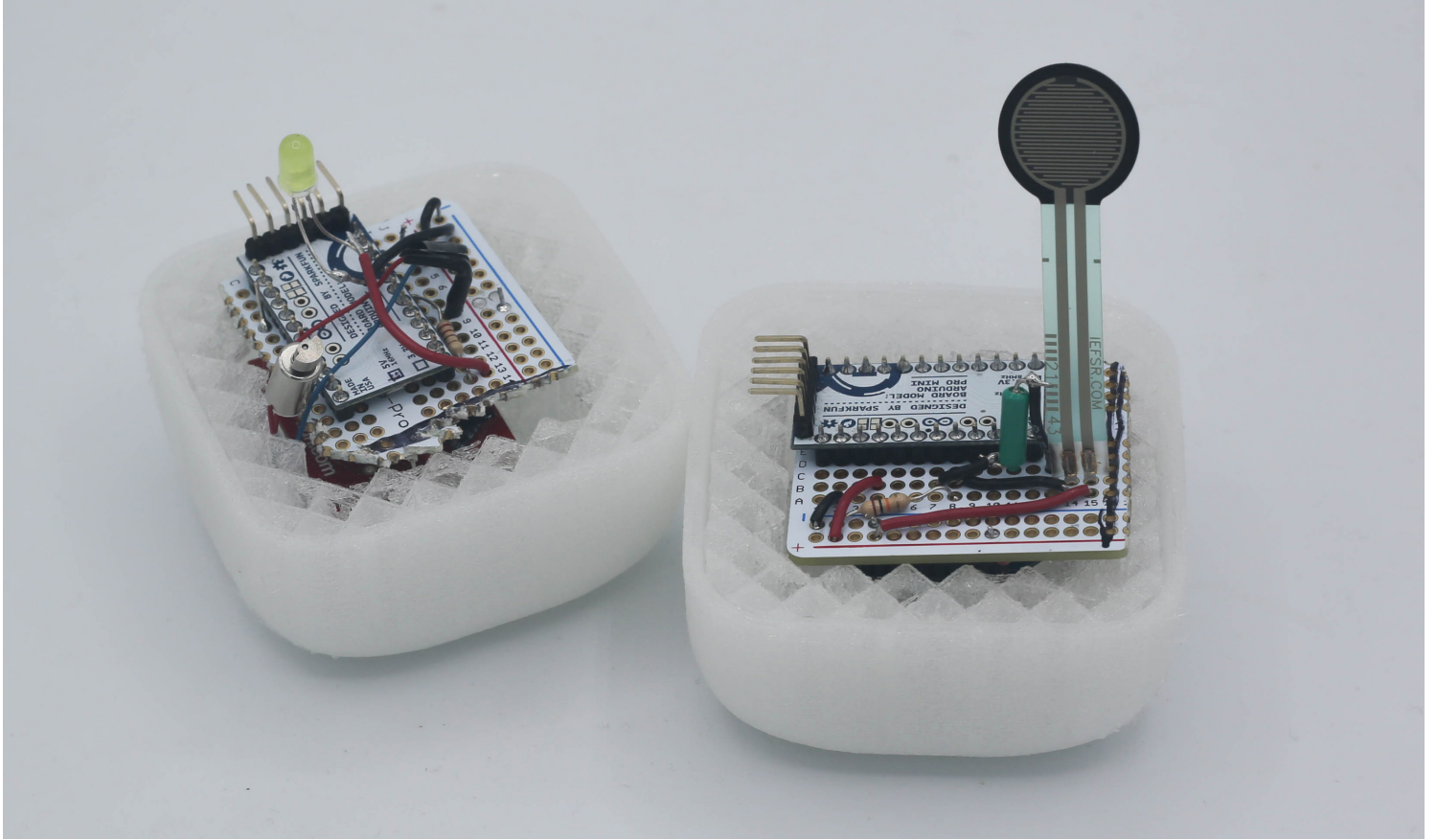


**XBee SC RF Communication Module**

**Arduino Pro**



**Agilus30 - PolyJet Elastic Photopolymer Cap**



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# Visualising The Future

ai safety glasses for the visually  
impaired



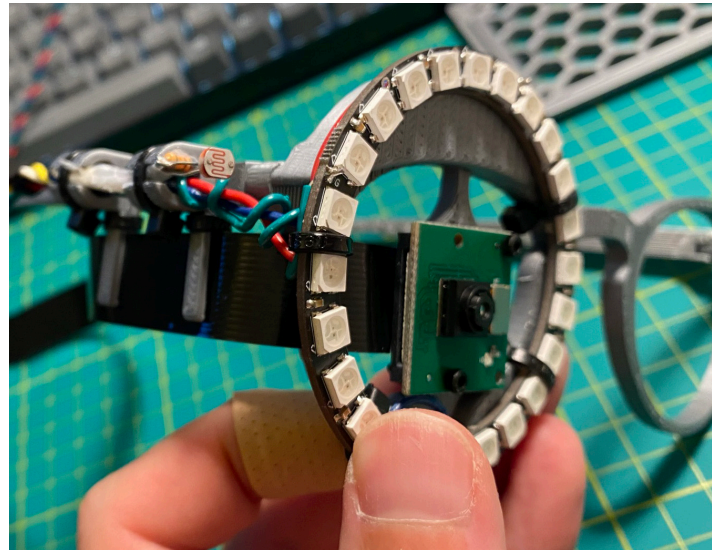
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## Vision\_

A pair of glasses designed to make the world safer and more accessible for the visually impaired. The glasses utilized deep learning image recognition to convert detected objects and signage text to voice warnings.



An important consideration for this project was to make the image recognition localized by utilising Edge Architecture. In my case this was done with the use of TensorFlow and a localised dataset from COCO to ensure no connectivity problems could endanger the user.



```
pi@tdf22: ~/Projects/Python/flite/obje
File Edit Tabs Help
Object 6: traffic light at (820, 571)
Object 7: car at (431, 627)
Object 8: traffic light at (748, 550)
Object 0: traffic light at (236, 388)
Object 1: traffic light at (23, 368)
Object 2: traffic light at (757, 580)
Object 3: traffic light at (734, 505)
Object 4: car at (299, 660)
Object 5: car at (230, 665)
Object 6: car at (163, 666)
Object 7: car at (357, 660)
Object 0: bench at (645, 378)
Object 0: bench at (645, 384)
```



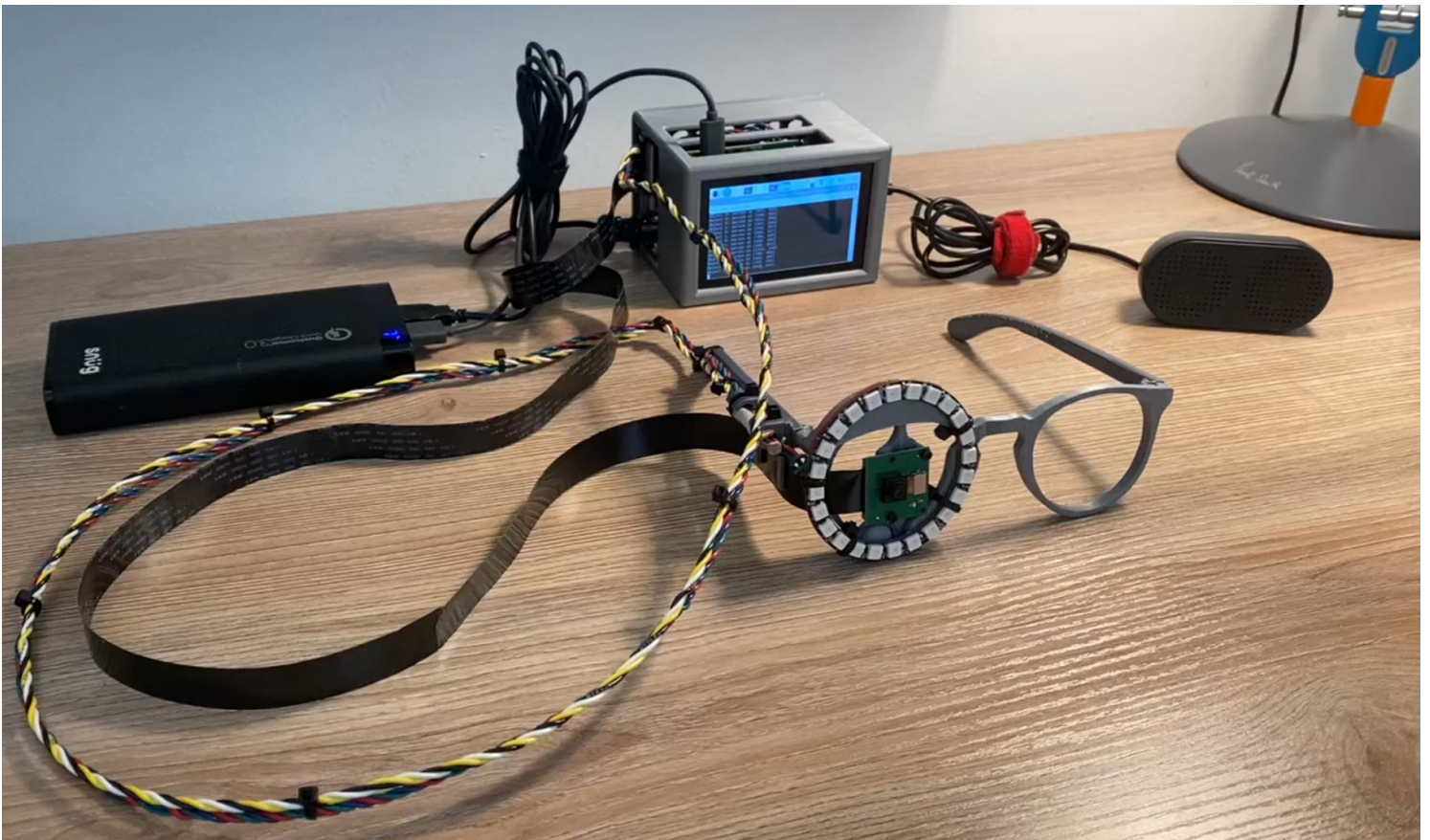


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## Technical Review\_

The design of my project intended to adopt an item of daily use which the visually impaired, in this case the blind, already use. This would mean that the user does not need to get used to a new wearable. In my case this would be modifying the blacked-out glasses that the blind wear to protect their eyes from sunburn, which causes severe pain even if it can't further their blindness.

Visualising the Future also made use of a photocell to determine when the camera would need additional lighting to be able to continue with image recognition. Lighting was accomplished through the use of a NeoPixel mounted around the camera.



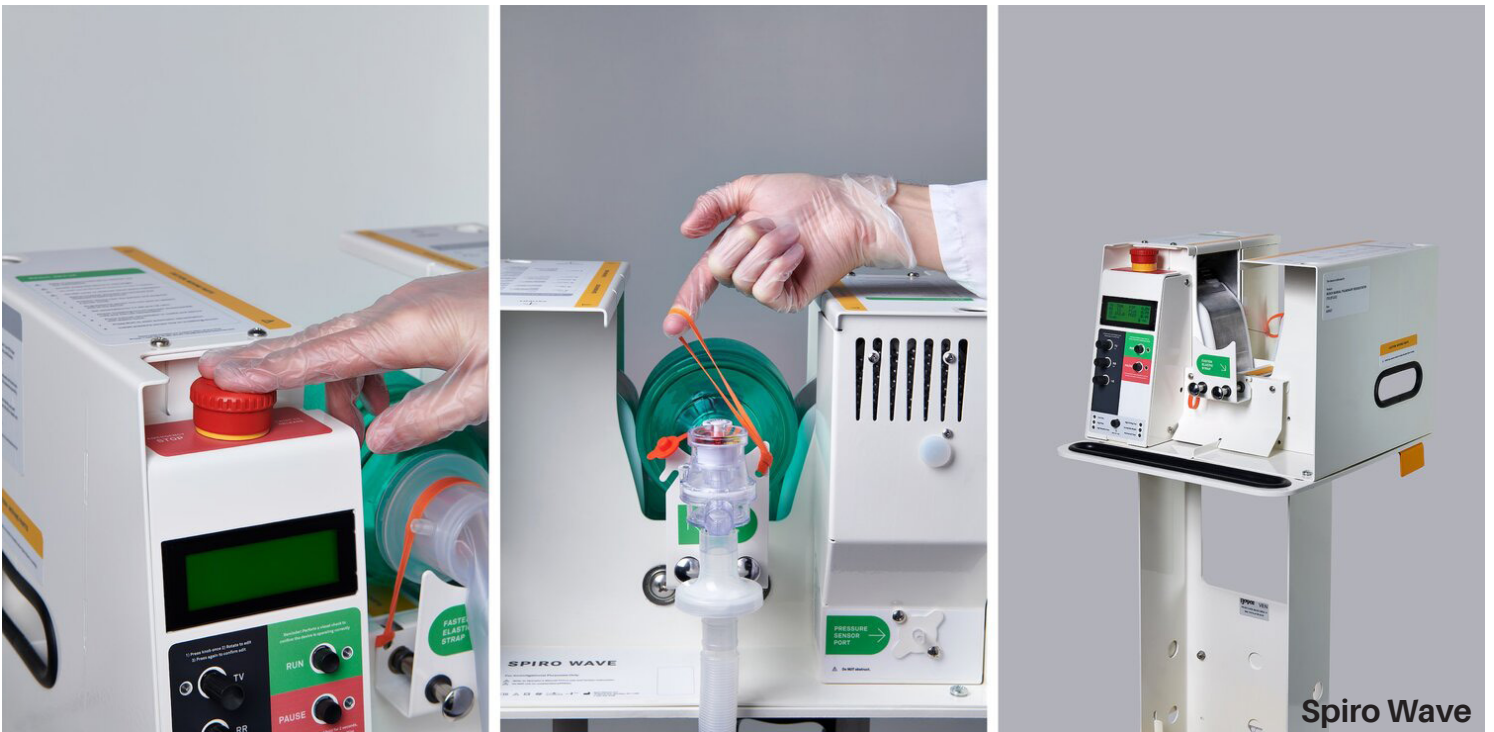
# Spiro Mini 10XBeta

medical device miniaturisation  
rapid response to a ventilator crisis



## Response\_

As COVID-19 cases in NYC continued to quickly amass, the 10XBeta was invited to join the Emergency Ventilator Response team, a consortium formed to provide solutions in response to the COVID-19 pandemic. Their first mission, to rapidly create a low-cost, easy-to-manufacture, automated resuscitator to help meet the growing demands amid the coronavirus pandemic ventilator shortage.



**With manufacturability, scalability, and timeline in mind, 10XBeta worked quickly to design, test, and iterate on Spiro Wave.**

In March, as the number of COVID-19 related cases and deaths rapidly grew in size, hospitals in affected areas continually became overwhelmed with patients and a great need for supplies and ventilators. While a number of initiatives were underway to increase the production of conventional ventilators, 10XBeta's mission was to design a device to bypass some of the time, cost, and supply chain hurdles facing those efforts. Inspired by the MIT's E-vent, the device was designed to work with standard medical components readily available in most hospital settings.

What resulted was Spiro Wave - a low-cost, automatic resuscitator that helps hospitals expand their capacity to care for patients with critical ventilation. The device is able to be manufactured quickly, at scale, and at a fraction of the cost of traditional ventilators.





Spiro Mini

## Streamlining the Supply Chain\_



**Spiro Wave**



Faced with weakened global supply chains and medical equipment shortages, 10XBeta aimed to develop a device that utilizes fewer parts than the traditional ventilator which allows for supply chains to be easily streamlined to keep production costs low. Additionally, Spiro Wave's simple interface design is compatible with standard medical components, contributing to its accessibility, and allowing healthcare professionals to be quickly trained to operate the device.

In just 5 weeks, 10XBeta took Spiro Wave from concept to realization, receiving FDA Emergency Use Authorization for use during the COVID-19 pandemic. Working in close proximity to Boyce Technologies, meant 10XBeta could quickly prototype, test, and iterate the design within an accelerated time frame. Spiro Wave's smart design and consideration of supply chain pressures, means it can be quickly produced to address immediate shortages and bolster emergency stockpiles for the future.

Transport Ready for Porcine Study



# FungalForm

Product design for a mycoremediated future.

Reservoir Lid



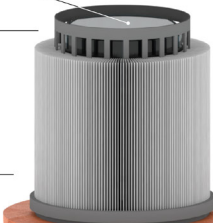
FungalForm Water Reservoir



MycoCore

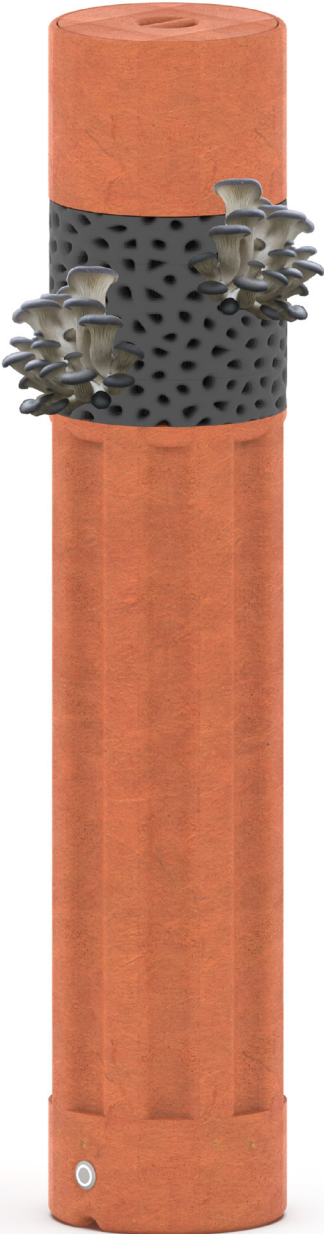
Oscillating Fan

Filter Retainer



Evaporative Cooler Filter

FungalForm Main Body



FungalForm Mains Power Switch





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FungalForm is an evaporative tower cooler incorporating a replaceable mycelium core, or MycoCore, designed to grow the user mushrooms. FungalForm has the ability to both actively and passively cool the environment around it. Furthermore, through intelligent control software, FungalForm can self-modulate its active evaporative cooling stage to provide the MycoCore with the optimal environmental conditions for mycelial and mushroom growth.



## MycoCore

Mycelium has been proven to be highly efficient at biodegrading petroleum hydrocarbons and a number of plastics. It also acts as a hyper-effective bioabsorption agent, absorbing a considerable variety of toxins, such as heavy metals and toxic inorganic and organic chemical compounds. These attributes make mycelium an excellent candidate for aiding in the bioremediation of the world's freshwater sources.

*Filling a MycoCore with Italian Oyster Mushrooms (*Pleurotus pulmonarius*) inoculated bulk substrate and progression of growth over two weeks.*



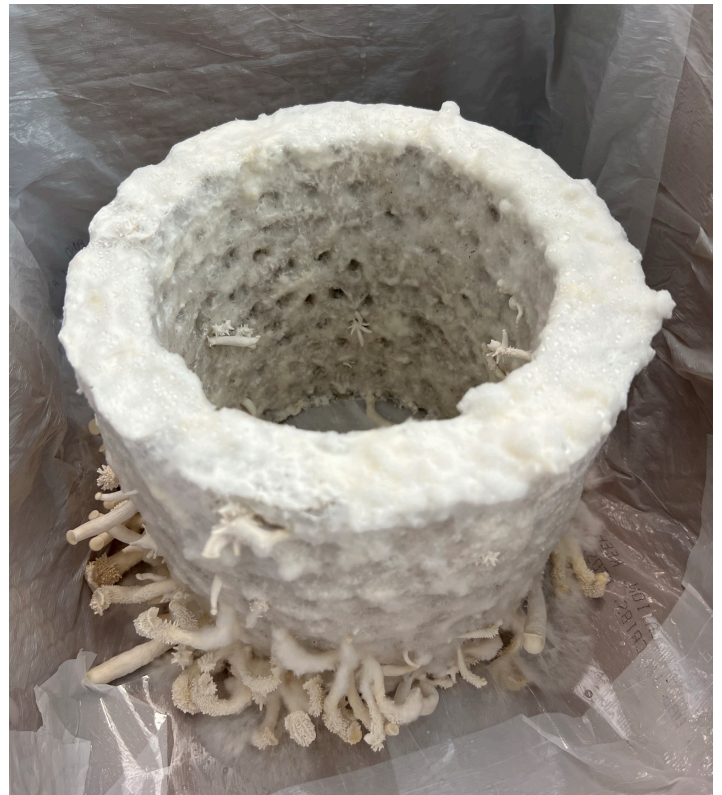
## MycoCore

The lack of mycoremediation adoption is due to the short time frame the United States federal regulations allow for the total removal of targeted contaminants during environmental remediation activities. (Alexander, 2019) Current mycoremediation solutions do not work quickly enough to be deemed effective by regulatory bodies. An obvious answer to this seems to be the use of an increased quantity of mycelium in the mycoremediation process. However, there is a permanent shortage of mycelium, especially when it is most needed. "...there is more oil spilled than there is currently mycelium available.". (Stamets, 2010) Re-



## MycoCore

Numerous mycoremediation products have been developed over the last three decades, but none have found a successful product-market fit. Products such as MycoMat or MycoRemedy were touted as ready-to-implement bioremediation units but were never adopted in any formal remediation strategies. One type of product which has shown more potential is mycoremediation media, such as that sold by RAPID, a South African hydrocarbon and chemical spill response company. Mycoremediation media is essentially standard bulk inoculated substrates. The major limitation with products of this nature is the stock available, as these companies are not set up for mass mycelial cultivation.



## MycoCore

A solution to the mycelium shortage lies in the introduction of mycelium into everyday households. Instead of trying to convince regulatory bodies to invest in the development of mycoremediation products, we create consumer market demand for a product which incorporates mycelium. A product for households including a replaceable mycelium component that, when discarded, could act as a mycoremediation agent.

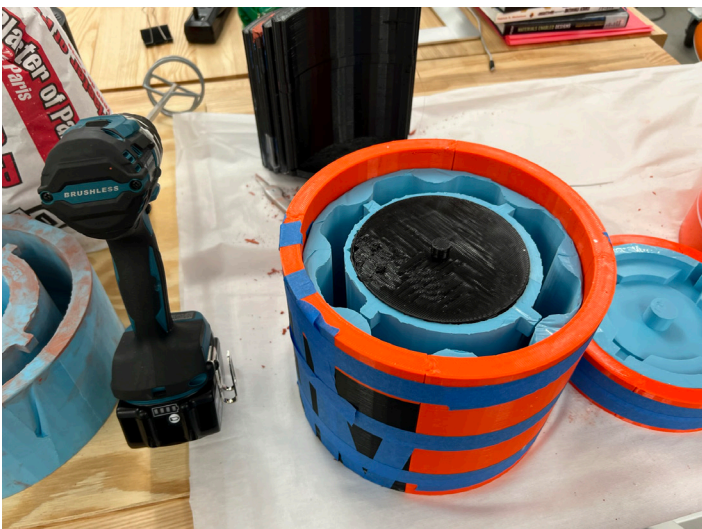


Product packaging for the replaceable MycoCores, including installation instructions.

## Silicone Casting



This thesis aims to design an evaporative cooler which houses a mycelium-inoculated grow core, with the intention of making mushroom cultivation as commonplace as the growth of indoor plants. The grow core will consist of a replaceable 3D printed form, optimised for mycelial and mushroom growth, filled with specifically formulated substrates pre-inoculated with mycelium. In addition, the thesis will include the development of a circular product ecosystem which includes biomaterial harvesting for the fabrication of manufacturing materials, mycelium cultivation processes and a mycelium product subscription network where expended mycelial cores are exchanged bimonthly. Although the ecosystem in which this product will exist will be extensively investigated and delineated, this thesis will be limited to producing a proof-of-concept product. Therefore, the greater scope and effectiveness of FungalForm's mycoremediation potential will not be tested in situ. Instead, the project will be set in a speculative narrative where the potential impact of FungalForm will be defined. Through this integration of mycology into everyday life, we can start to heal our polluted water sources while being prepared for future contamination events.

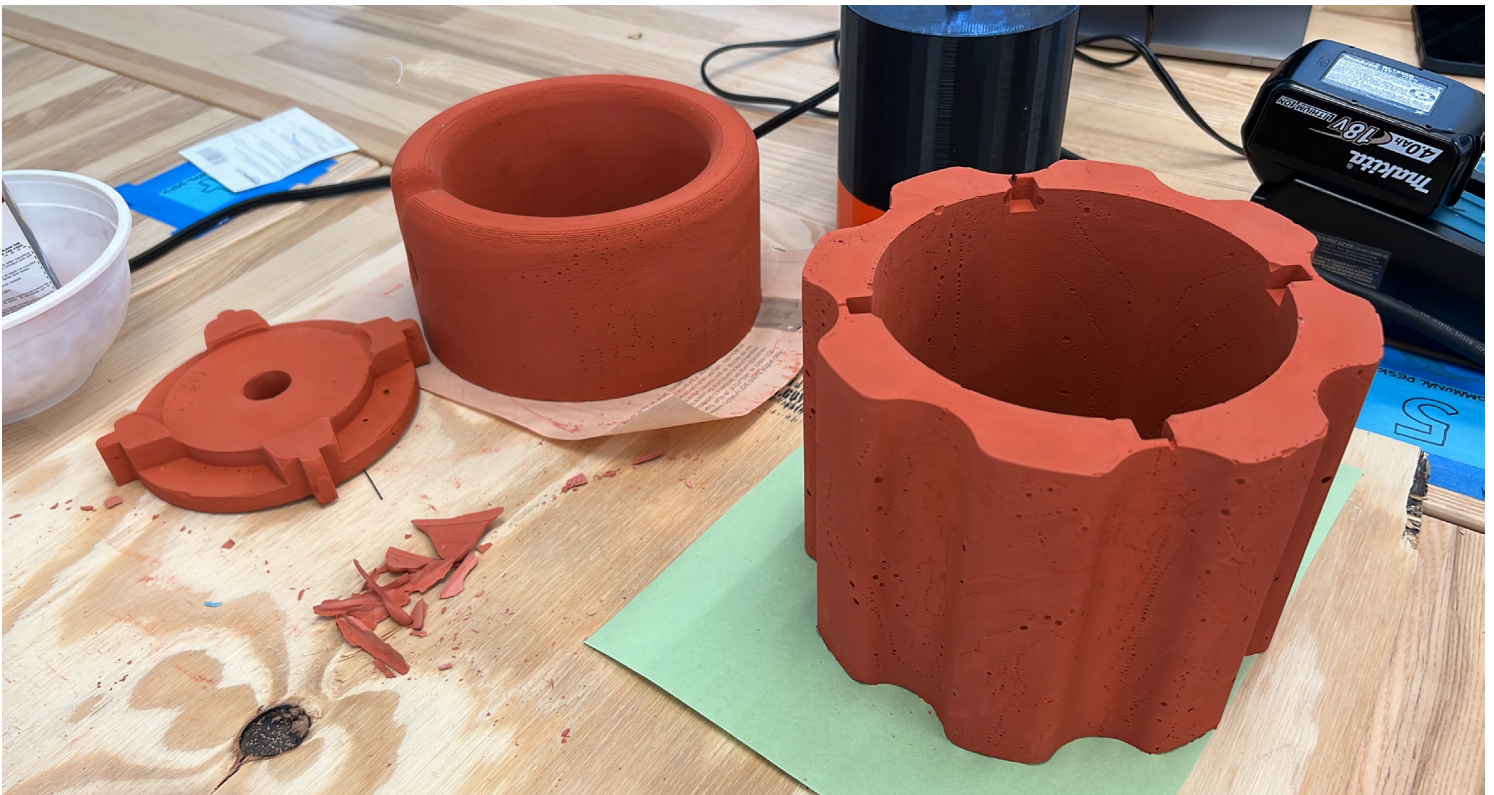


## Terracotta Casting



formulated substrates pre-inoculated with mycelium. In addition, the thesis will include the development of a circular product ecosystem which includes biomaterial harvesting for the fabrication of manufacturing materials, mycelium cultivation processes and a mycelium product subscription network where expended mycelial cores are exchanged bimonthly.

Although the ecosystem in which this product will exist will be extensively investigated and delineated, this thesis will be limited to producing a proof-of-concept product. Therefore, the greater scope and effectiveness of FungalForm's mycoremediation potential will not be tested in situ. Instead, the project will be set in a speculative narrative where the potential impact of FungalForm will be defined.



## Prototyping\_



*Home page of the FungalForm mobile app. The FungalForm app controls the device, orders new MycoCores, displays mycoremediation data and shares daily mushroom recipe recommendations.*

Through this integration of mycology into everyday life, we can start to heal our polluted water sources while being prepared for future contamination events.

Future work would include active integration of the mycelial cores into polluted environments, predominantly those which are a potential source of potable water, such as rivers located within urban communities.

Decades of continued scientific research has demonstrated the extensive ability of mycelium to act as an agent in bioremediation. Mycelium's ability to degrade pollutants lies in the enzymes it naturally produces to process materials into a food source. Over 120 novel mycelial enzymes have been discovered, each offering specialised degradation abilities. (Stamets, 2010) The number of studies and experiments dealing with mycelium and mushrooms has rapidly accelerated in the last decade. However, even with all the new research that has been performed, we still only know an infinitesimal portion of the possible benefits and opportunities the kingdom of fungi holds. (Briggs, 2018) There is a great need for mycelium to play a more significant role in our lives. However, currently, it is of the utmost importance to discover an effective and federally adoptable method to utilise the remediative powers that mycelium has to offer.



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# JACOB KRITZINGER

Design Engineer. Architect. Débrouillardé.

RESUME

## PLACES I'VE WORKED

**10XBeta** - Summer internship.

06/2022↓ -Mechanical system development and prototyping for the miniaturization of a  
09/2022 covid ventilator product called Spiro Wave. [10xbeta.com/spiro-wave](http://10xbeta.com/spiro-wave)

**University of Pretoria** - Honours year external design lecturer.

09/2020↓ -Design studio lecturer focusing on educating students to design and implement  
12/2020 highly technical details into their architectural structures.

**Ludwig Hansen Architects & Urban Designers** - Architect .

-Technical detailing of a new Student Residence building at the University of Mpumalanga - South Africa.

-Lead Architect of a private residence on an ecologically diverse conservation.

08/2018↓ -Architectural representative for the renovations of Orlando state dentistry clinic  
06/2020 in Soweto, South Africa, a severely impoverished area.

**University of Pretoria** - First year design lecturer.

06/2018↓ -Design studio lecturer focusing on educating students to design architecture  
12/2019 with both theoretical and technical resolution.

**Marianne de Klerk Architects and Urban Designers** - 3D Modeler.

-Model design & construction for International ArchitectureZA Conference (AZA18).

02/2018↓ -3D Printed 1:500 site model of CBD Pretoria - South Africa  
05/2018 ( Printing 24/7 for 3 months on five 3D printers ).

## COMPANIES I'VE STARTED

**Minerva Machinery Production**

01/2018↓ -Laser cutter and 3D printer systems: Design + Construction + Integration.  
08/2020

**Electronic Burn Computer Solutions**

03/2007↓ -Design of desktop computers for integration into medical practices.  
11/2010

## AWARDS I'VE RECEIVED

2021 -Winning Project University of Berkeley Technology Design Foundations - Kube

2021 -Winning Project University of Berkeley Human Centered Design award - stAble

2017 -Golden Key International Honour Society Award - University of Pretoria

## QUALIFICATIONS I HOLD

2022 -Masters of Design - MDes University of Berkeley, California

2017 -MArch(Prof) University of Pretoria, South Africa

2016 -BArch(Hons) University of Pretoria, South Africa

2014 -BSc. Architecture University of Pretoria, South Africa

2011 -City & Guilds Diploma South African Chefs Academy

## SKILL SET

### DESIGN

Additive & Subtractive CNC  
+Design

+Construction  
+Implementation  
Rapid Prototyping

Kludging

Furniture Design  
Product Manufacturing

Visual Design  
Product Concept Drawing

Culinary Arts  
Industrial Kitchen Design  
Indoor Agriculture System Design

### ANALYSIS

Strategic Foresight  
Contextual Analysis  
Client Needs Analysis  
Urban Design Strategies

### SOFTWARE

Rhinoceros 3D - Proficient  
SolidWorks - Proficient  
Adobe Suite - Proficient  
SketchUp - Advanced  
ArchiCad - Proficient  
AutoDesk Revit - Proficient  
Microsoft Suite - Proficient

### ARCHITECTURE

Construction Detailing  
Passive Systems Design  
Technology Design  
Project Management  
Mapping

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