DESIGN PORTFOLIO

AMELIA WONG | 2022

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I am both an artist and engineer. I am currently in my first year at the Royal College of Art in the MA Design Products programme. Prior to that, I worked in strategy consulting and graduated from MIT with a degree in Mechanical Engineering.

I have always had an appreciation for art and design enjoying a variety of mediums such as drawing, silversmithing, and flameworking. I also appreciate the technical rigour of mechanical design. My portfolio highlights both disciplines incorporating a variety of projects from rigorous engineering to interdisciplinary design.

Enjoy and thank you for your time and consideration!

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RESUME

EDUCATION

ROYAL COLLEGE OF ARTS
Sept 2021 - Jun 2023, London, UK
Candidate for Masters of Arts in Product Design

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
September 2015 - June 2019, Cambridge, MA
Bachelor of Science in Engineering, Mechanical Engineering
GPA: 4.7/5.0

SKILLS

MANUFACTURING
- 3D printing — Advanced (with work experience)
- CNC — Intermediate
- Mill & lathe — Intermediate
- Woodwork — Intermediate

3D MODELLING
- Creo — Advanced (with work experience)
- SolidWorks — Intermediate
- KeyShot — Intermediate

CODING
- SQL — Advanced (with work experience)
- MATLAB — Intermediate
- Arduino — Intermediate
- Python — Intermediate

ADOBE DESIGN
- Illustrator — Advanced
- InDesign — Advanced
- Photoshop — Intermediate

MICROSOFT OFFICE
- Excel — Advanced (with work experience)
- Powerpoint — Advanced (with work experience)
- Word — Advanced

LANGUAGES
- English — Fluent
- Mandarin — Functional

WORK EXPERIENCE

SMART DESIGN WORLDWIDE
April - July 2021 | Boston, MA
DESIGN ENGINEERING INTERN
- Developed engineering CAD using surface modelling for a variety of OXO products collaborating with an industrial design team and clients to align on features
- Developed strategic product vision for a high tech cosmetic wearable through product testing, prototyping, and leading user interviews

BOSTON CONSULTING GROUP
June 2018 - April 2021 | Atlanta, GA
ASSOCIATE | September 2019 - Present, Atlanta GA
- Worked in team environments daily, presenting to senior colleagues and clients
- Problem solving in real-world contexts for digital marketing, pricing, org design, and transformation

ASSOCIATE INTERN | June - August 2018, Atlanta GA
- Worked in digital pricing running competitor analytics, user interviews and survey data analytics

MIT MEDIA LAB: MEDIATED MATTER GROUP
January - June 2019, Cambridge, MA
UNDERGRADUATE RESEARCHER UNDER THE SUPERVISION OF PROFESSOR NERI OXMAN
- Collaborated on building a 3D programmable water-based biocomposites printer for the digital design and manufacturing of complex multi-scale structures
- Designed and prototyped hardware and software to dynamically calibrate the printer nozzle

MIT SELF-ASSEMBLY LAB
September 2018 - June 2019, Cambridge, MA
UNDERGRADUATE RESEARCHER UNDER THE SUPERVISION OF PROFESSOR SKYLAR TIBBITS
- Designed, prototyped and tested objects that facilitate sandbar formation in the Maldives to address rising sea levels - further details in TED Talks presentation
- Designed and programmed wave environments to simulate testing environments

SOUNDBRENNER
June - August 2017, Hong Kong
MECHANICAL ENGINEERING INTERN
- Designed and prototyped models to optimize vibration of a wearable metronome
- Collaborated with electrical engineers, computer scientists, and UI/UX designers
- Worked autonomously in a start-up environment conducting self-guided research
- Visited Shenzhen to test and purchase parts

MIT DESIGN FABRICATION GROUP
June - July 2016, Cambridge, MA
ARCHITECTURE INTERN UNDER THE SUPERVISION OF PROFESSOR LAWRENCE SASS
- Designed and fabricated models using Rhinoceros to 3D print molds for casting modular concrete homes that can be flat packed for easier transportation

ELEVATE

Seatlift retrofit for manual wheelchairs providing up to 20 cm of assisted elevation to address physical and social challenges associated with living at a seated height

Alpha prototype showcased in the final presentation linked here

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WORKING ENVIRONMENT

Team of 20 mechanical engineering students; I headed task forces of four students during several phases of the project

HARD SKILLS

Prototyping

Product teardowns, woodwork, metal work, vacuum forming

Design for Manufacturing

Design for injection molding

CAD

Designed CAD model for injection mold assembly

SOFT SKILLS

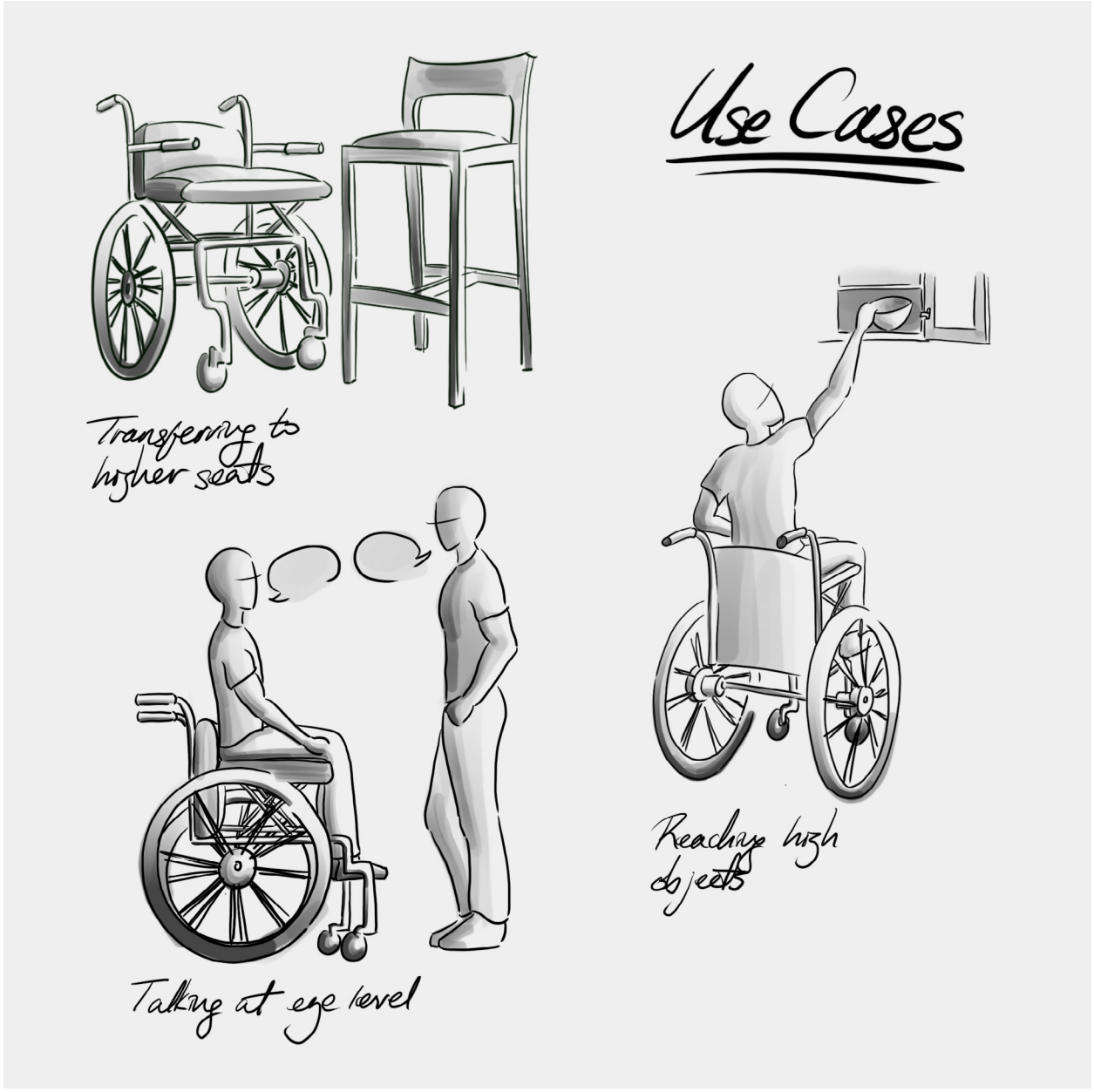
User research

Interviewed manual wheelchair users at Spaulding Rehabilitation Center

Leadership

Led task forces of four members during ideation, research, prototyping and testing phases

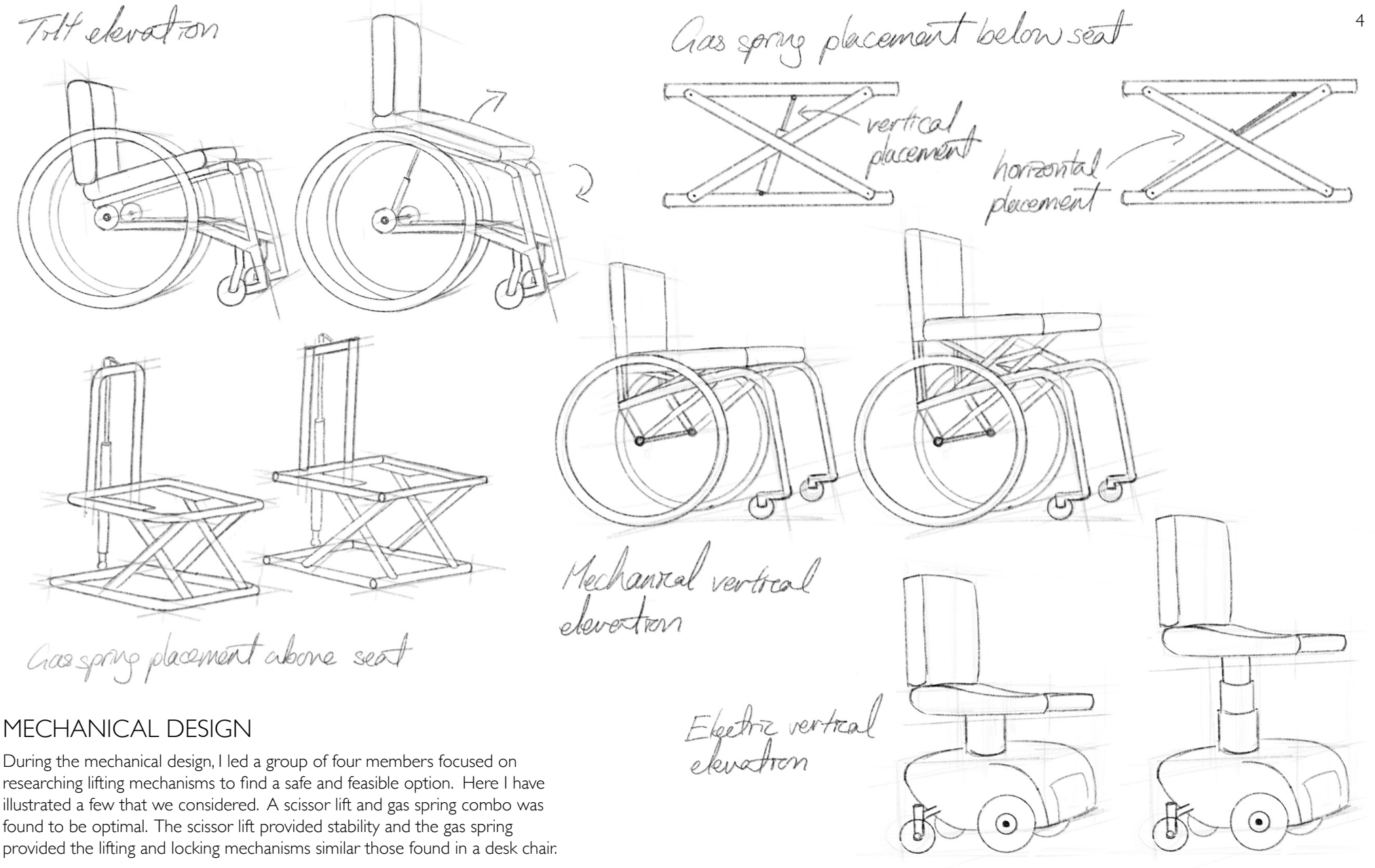
MIT Fall 2018
Cambridge, MA
3 months



USER RESEARCH

Many wheelchair users face not only physical challenges in seeing and reaching high up objects, but also social challenges in speaking and connecting with others eye to eye.

A few team members and I conducted extensive interviews with manual wheelchair users at the Spaulding Rehabilitation Hospital to better understand the challenges they face and inform key use cases.



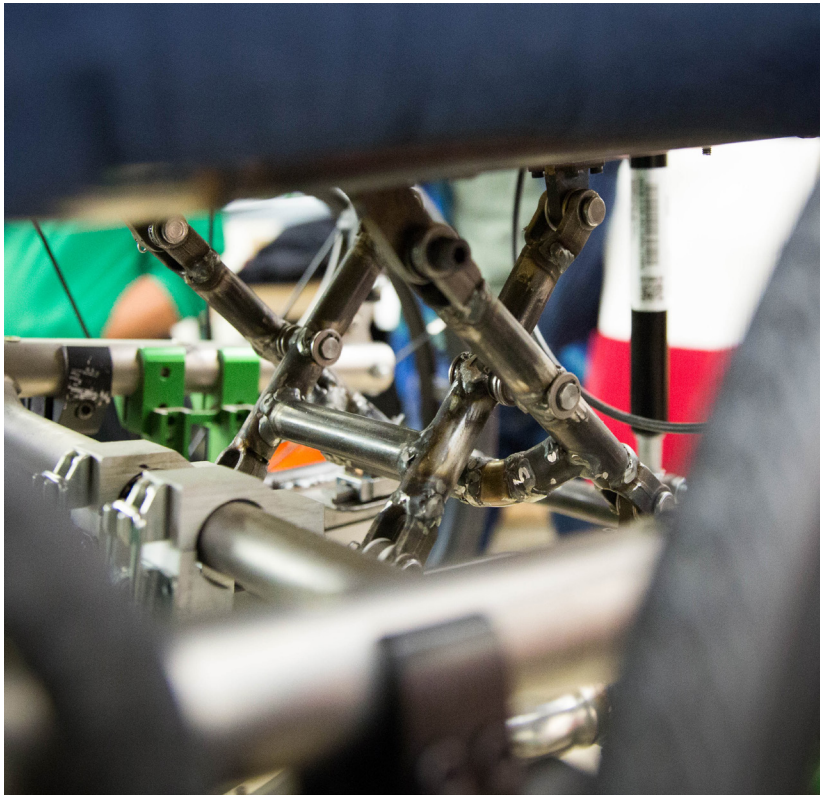
MECHANICAL DESIGN

During the mechanical design, I led a group of four members focused on researching lifting mechanisms to find a safe and feasible option. Here I have illustrated a few that we considered. A scissor lift and gas spring combo was found to be optimal. The scissor lift provided stability and the gas spring provided the lifting and locking mechanisms similar those found in a desk chair.

CONCEPTUAL PROTOTYPE

Several models were built to prototype various parts of the design . My unit of five team members were tasked with building a conceptual prototype for the lifting mechanism.

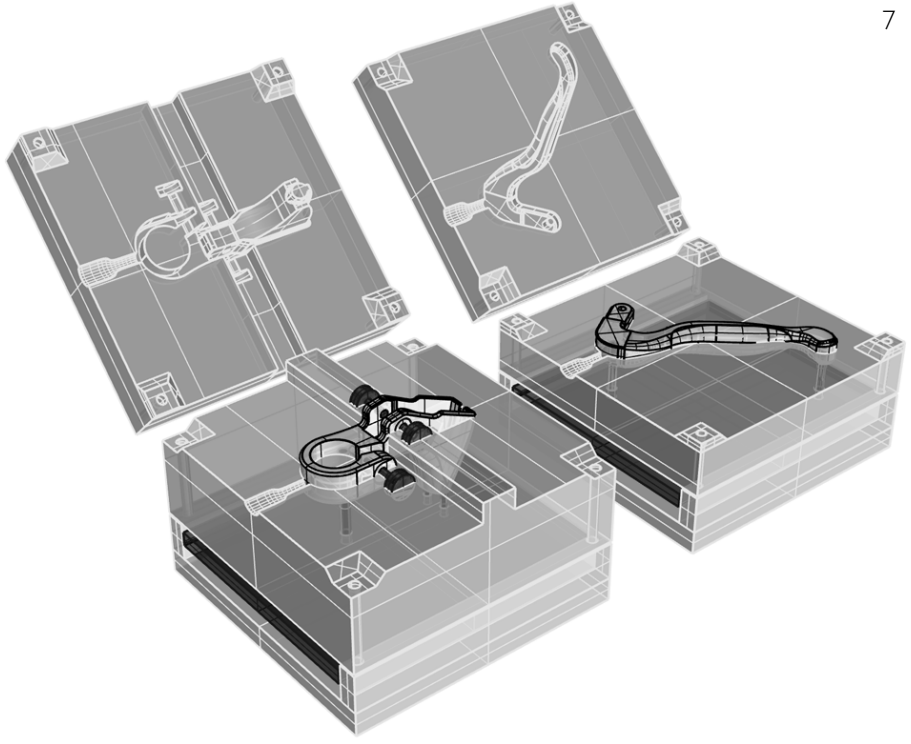
We disassembled a desk chair and integrated the gas spring lifting mechanism into the frame of a manual wheelchair with a bike handle attached to trigger the lifting mechanism. We tested this model ourselves to check the feasibility of this lifting mechanism.

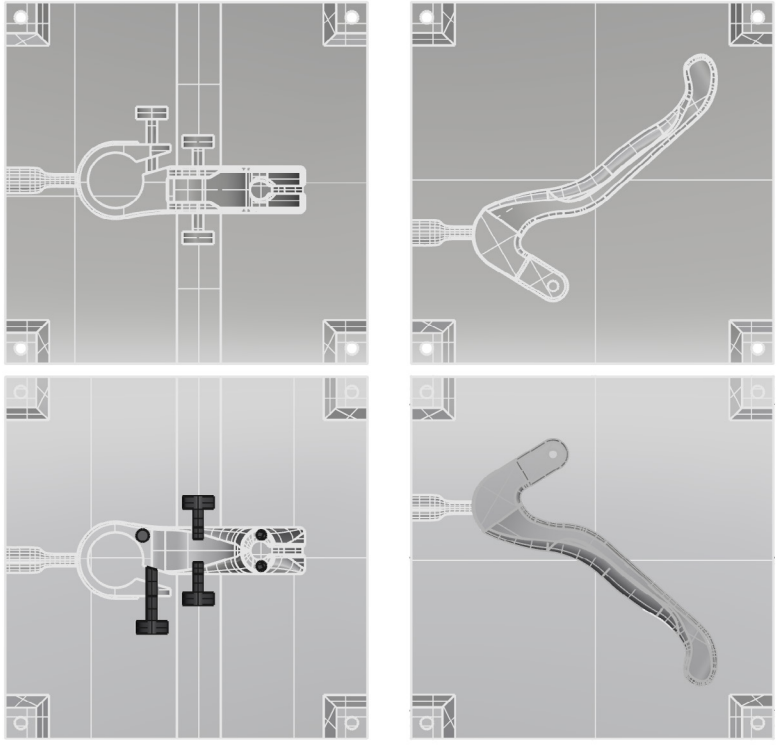


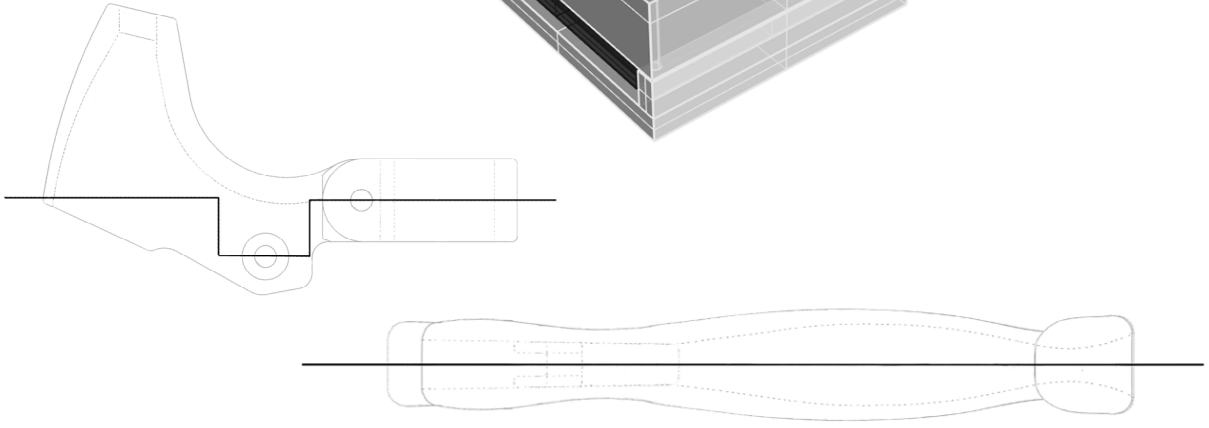
WORKING PROTOTYPE

Next, a working prototype was built by the whole team to test the feasibility of attaching a scissor lift and handle bars to a wheelchair frame and the feasibility of lifting a person via this mechanism. I helped to design and manufacture the four clamps that attach the seat lift to the wheelchair.

I led several rounds of testing with manual wheelchair users to better understand the pros and cons of our design.

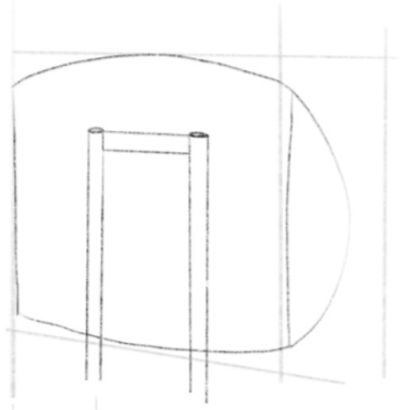


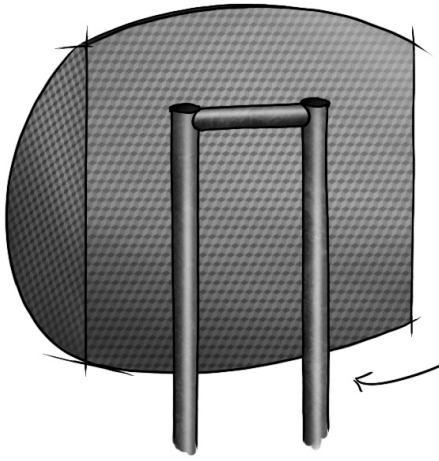




DESIGN FOR MANUFACTURING

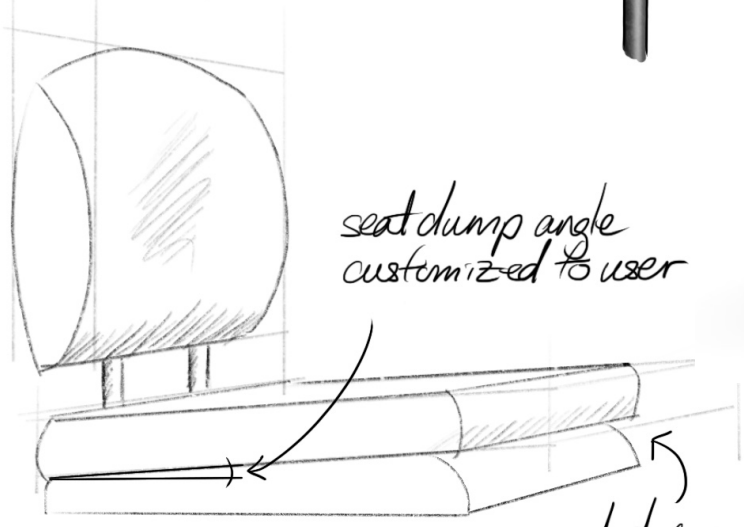
I designed and 3D modelled the arm lever used to trigger the gas spring elevation so that it can be mass manufactured through injection moulding with a hard, wear resistant thermoplastic. The base of the lever required a complex parting line to keep the through holes at varying heights parallel to the parting plane. I designed the mould plates with two removable core pins and a 1.5° draft to accommodate a textured material finish.





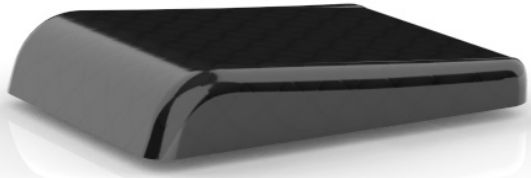
steel extrusions for prototyping
- titanium extrusions at scale
- powder coated finish and plastic end caps

carbon fibre layup, lightweight, rigid, customizable form to user



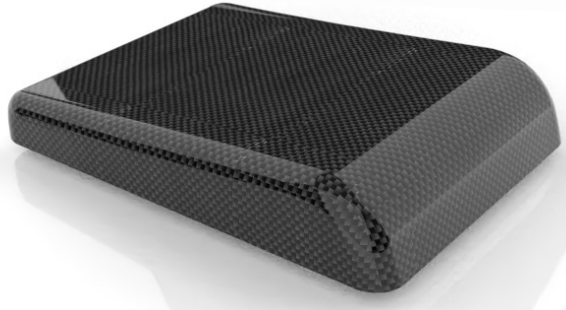
seat dump angle customized to user

rounded for comfort



vacuum formed plastic composite
- easily manufactured

carbon fiber layup
- customizable
- complex manufacturing process



DESIGN FOR MANUFACTURING

Here I created some CAD renderings and illustrations to show options for the seat assembly. At scale, the seat back and and seat frame can be manufactured through vacuum forming or carbon fibre layups to provide a strong and lightweight structure. Customisable forms are critical to keep in mind as these structures need to be optimized to the user's body for daily comfort and to prevent pressure sores.

User squeezes the lever and pushes off the armrests to raise the seat

A gas spring provides a lifting of 30 - 50% of the target user's weight aiding them as they push their body up and locks at any height up to 20 cm

User can attach their choice of cushion to the rigid seat and back rest

Four clamps secure the retrofit in place attaching to bars common to rigid lightweight wheelchair models most popular among target users

USER EXPERIENCE

Elevate transforms the user's experience by elongating their reach, extending their line of sight, and bridging the gap when speaking eye to eye with others.

ALPHA PROTOTYPE

The final prototype our team created was manufactured from steel, aluminium, high density foam, and thermoformed plastic. The device is designed to be compact, stable, and easy to use. I mainly worked on manufacturing the scissor lift. At scale, titanium, carbon fibre composites, and hard plastic composites would be used to bring the weight down to < 2 kg.

CHANGING PAD

Baby changing pad developed for a client focused on household and kitchen products

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WORKING ENVIRONMENT

Smart Design

Worked in a design consultancy as a design engineering intern

HARD SKILLS

CAD | Creo

Developed product engineering CAD for shareout with client

Design for Cost

Adjusted CAD to meet client's budget for cost of materials

Design for Manufacturing

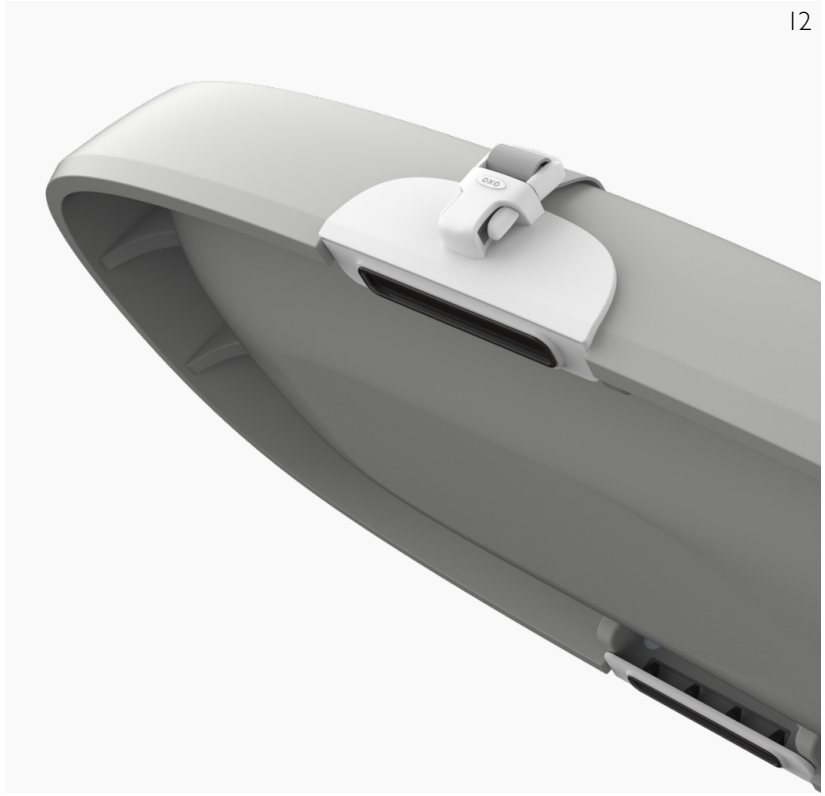
Designed product CAD to be compliant with injection molding

SOFT SKILLS

Interdisciplinary Teamwork

Worked with industrial designer to develop engineering CAD

April - July 2021
Boston, MA
4 months



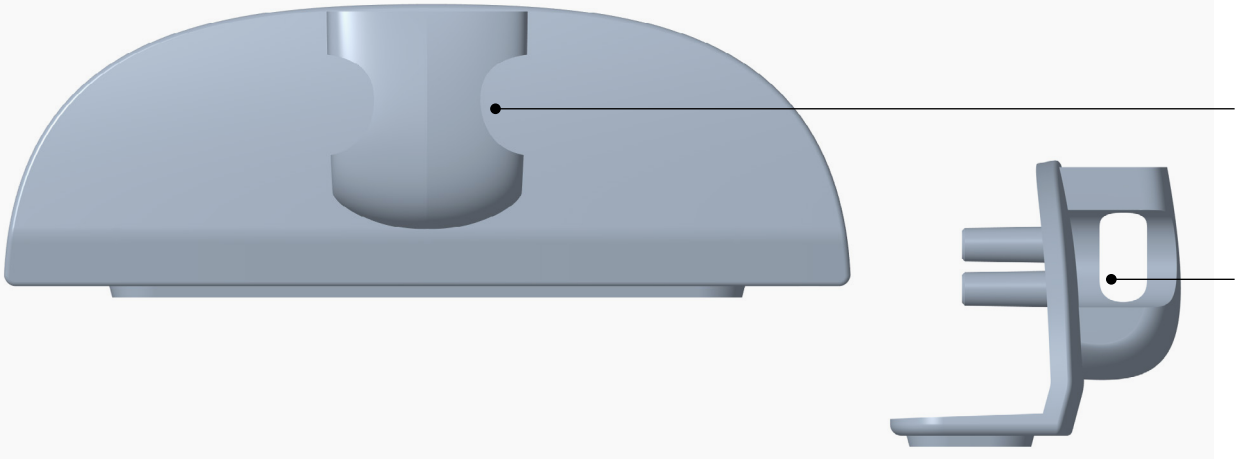
USER EXPERIENCE

The tot changing pad allows parents to safely and easily change their baby's diaper. The mat is made from EVA foam and the strap is lined with a polyester fabric to maximise the baby's comfort. The strap and buckle feature keeps the baby safely in place and is easy to the parent to secure and remove. At the base is also a set of non slip feet to keep the mat in place

BUCKLE DESIGN DEVELOPMENT

The team decided to use an existing buckle to minimise design work and liability around creating a new design. Several buckles were tested for usability.

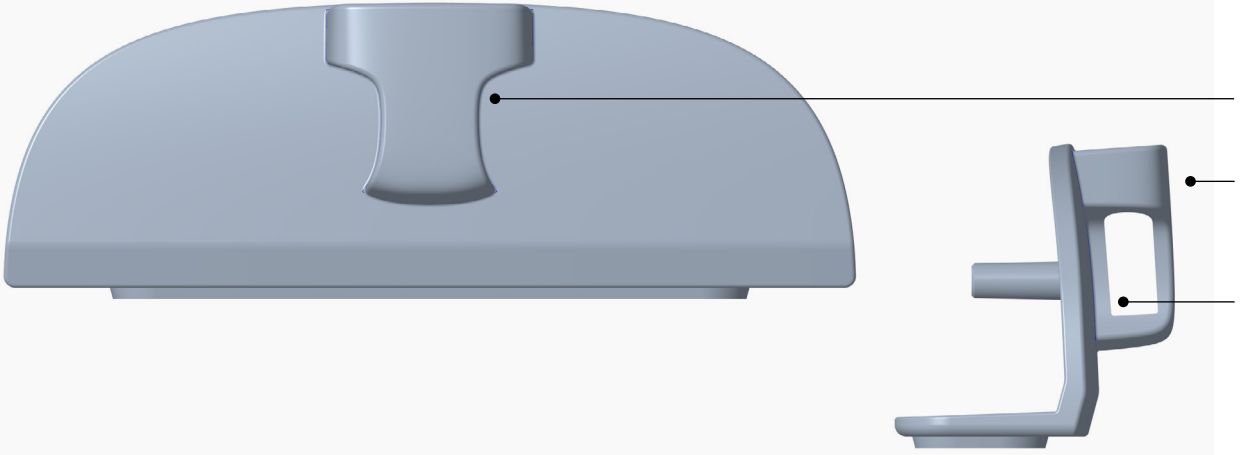
Version 1



Shape of finger grip cavity was changed in version 2 to allow for more space

Larger offset between the buckle and attachment plate to test how much finger space was needed to grip the buckle

Version 2



Larger finger grip cavity also reduces material cost

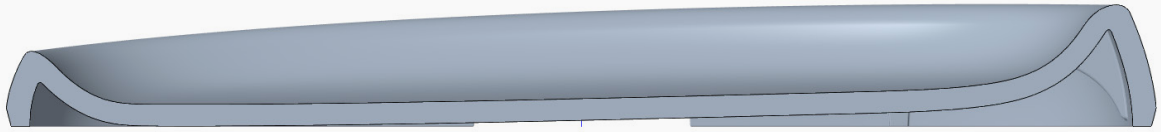
Buckle was aligned with attachment plate to minimise overall footprint

Offset between buckle and attachment plate was minimised while maintaining enough room to easily grip the buckle

BUCKLE DESIGN DEVELOPMENT

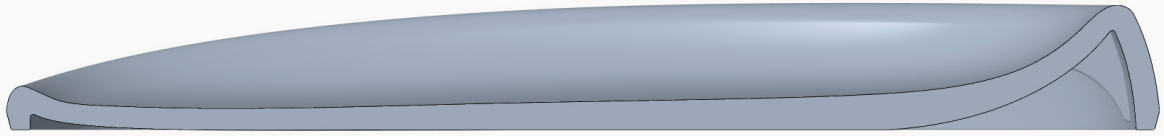
I created the buckle engineering CAD based on models from the Industrial Design team. I iterated on the design with an Industrial Designer to reduce the footprint and material cost while maintaining usability.

The first iteration of the changing mat measured at 7,400 cm^3



It features a taller and straighter front profile

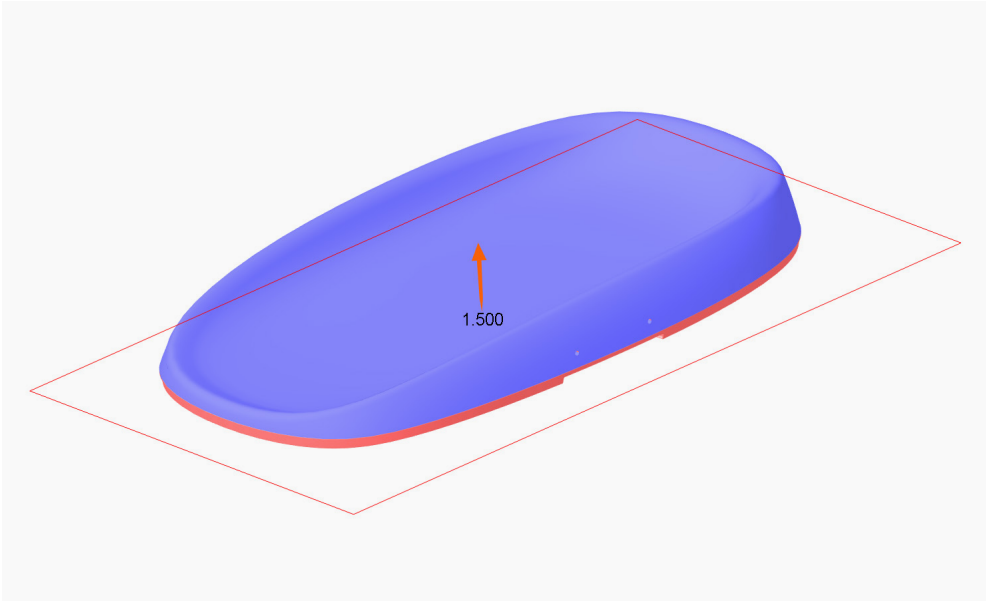
The second iteration lowers the front edge of the mat surfacing to reduce the volume to 7,100 cm^3

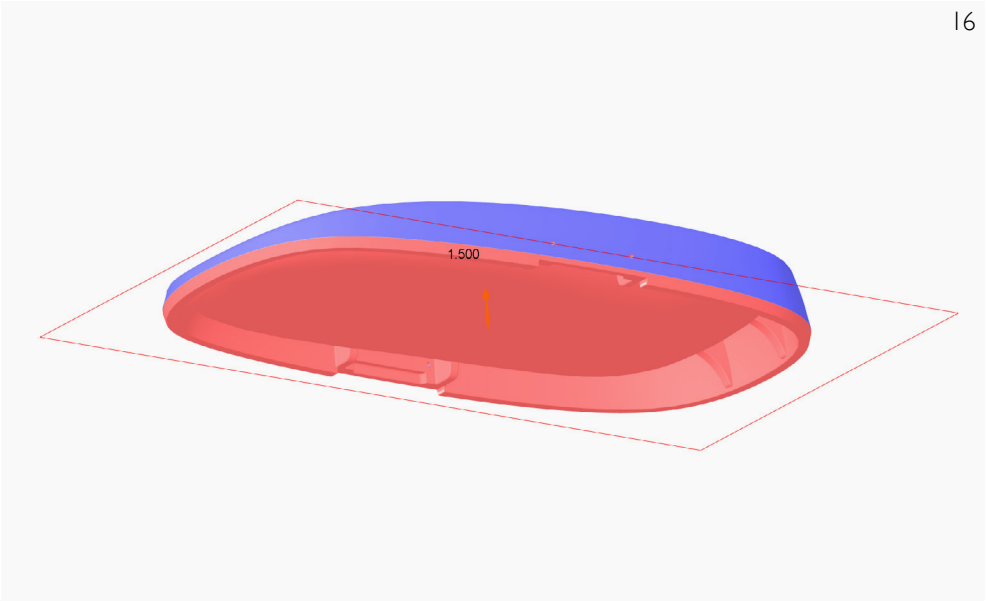


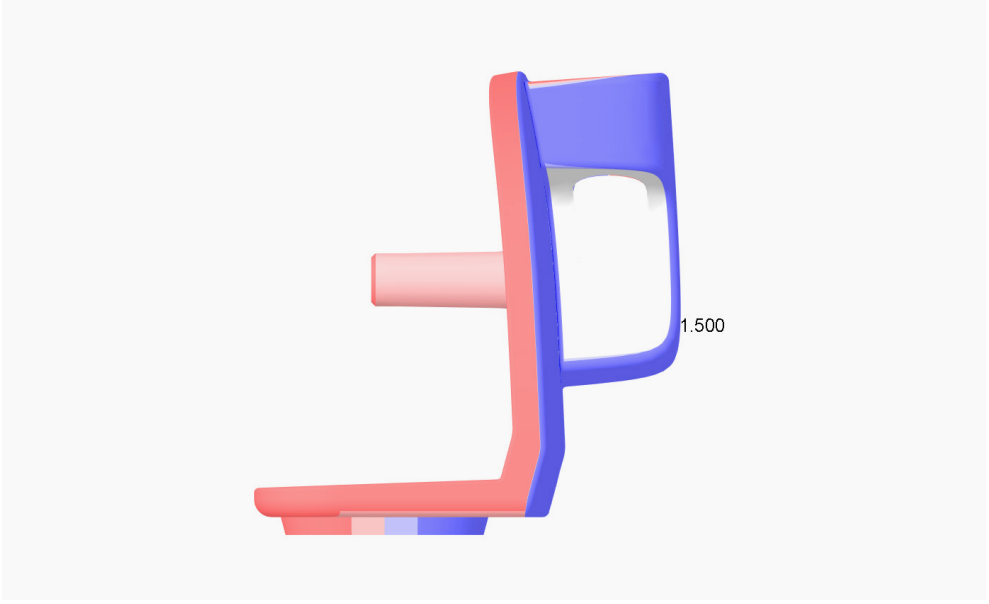
The second iteration features a lower front profile

DESIGN FOR COST

I developed engineering CAD for the changing mat based on models from the Industrial Design team. I adjusted the surfacing to reduce volume to < 7,200 cm^3 to meet the client's set material cost.







DESIGN FOR MANUFACTURING

I created the changing mat CAD with a horizontal parting line and a 1.5° draft built into the surfacing to accommodate a matte material. For the buckle, I built in a vertical parting line and a 1.5° draft for textured PP.

PLASTER PLANES

Bowl designed for decorative houseware inspired by paper folded geometries

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WORKING ENVIRONMENT

Independent design project under the supervision of Professor Skylar Tibbits

HARD SKILLS

Prototyping

Paper folding, plaster work

Rendering | Keyshot

Explored material finishes in the context of home decor

Illustration | Adobe Illustrator

Portrayed creative design and conceptual use through process illustrations

SOFT SKILLS

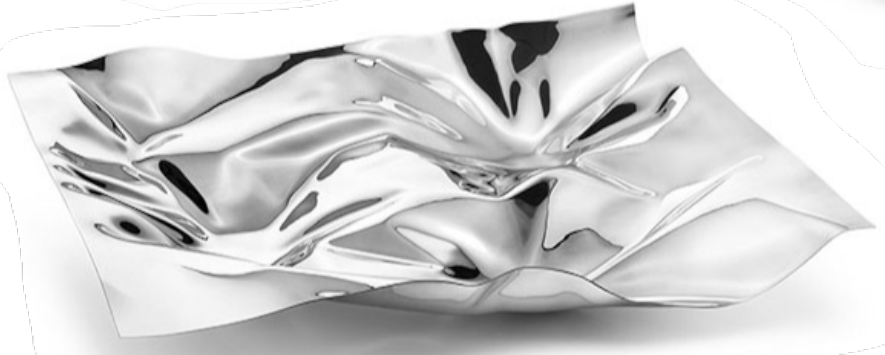
Research

Conducted research for design inspiration

Visual Design

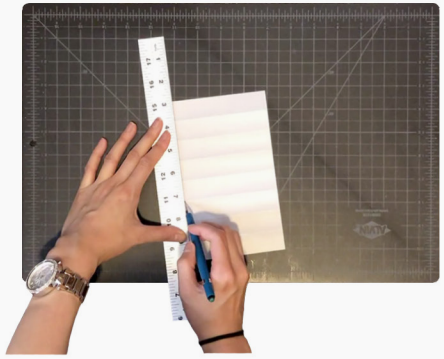
Experimented with prototypes and renderings to develop an aesthetically beautiful and unique design

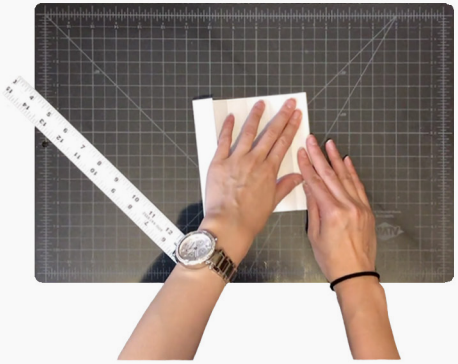
MIT Spring 2019
Cambridge, MA
1 month

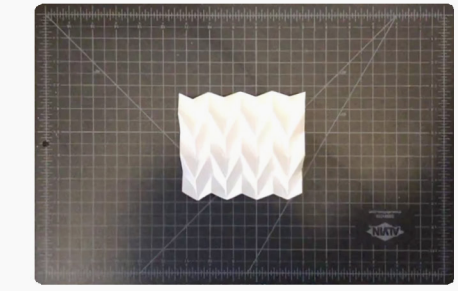


PRODUCT RESEARCH

The aim of this project was to develop a unique process to design and create a bowl. My product inspiration was focused on iconic pieces from brands such as Alessi and Georg Jensen. I wanted to achieve the same level of elegance and creativity exhibited in their pieces.





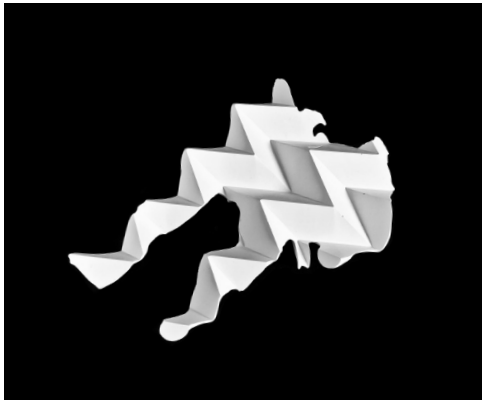
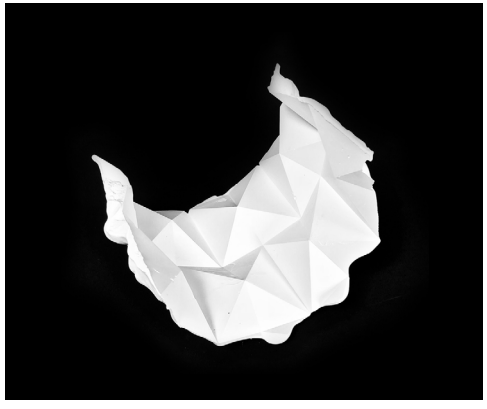


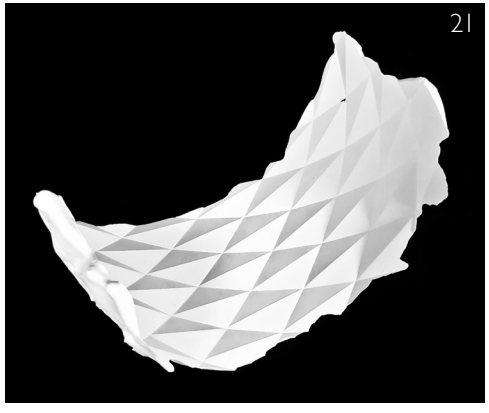
CONCEPT RESEARCH

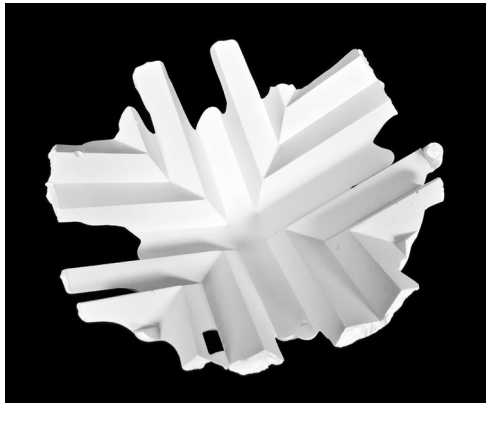
For the design of my vessel, I was inspired by paper folding forms from artists such as Richard Sweeney and Anna Kruhelska. I wanted to recreate the geometric, repeating, contours and patterns for my vessel design. I started by folding my own pieces to understand how to make and manipulate different contours and geometries.

PROTOTYPING

I chose plaster as my prototyping medium. I wanted to capture the folded geometries in vessel form by pouring plaster over the folded patterns.



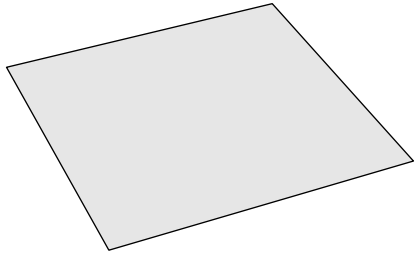




CONCEPTUAL PROTOTYPE

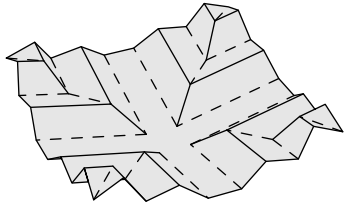
I repeatedly experimented with pouring plaster over folded paper. I tried different patterns of folds and plaster consistencies to better understand the medium and process. Due to the fluid nature of the plaster, each creation had a striking contrast between the organic shape of the poured outline and the crispness of the folded lines.

The last two rows of prototypes shown aimed to create a vessel form. I had to experiment significantly to achieve the right pouring technique and plaster consistency to achieve the form factor of a bowl.

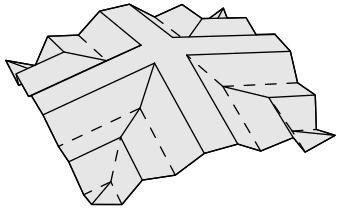
1. Flat paper



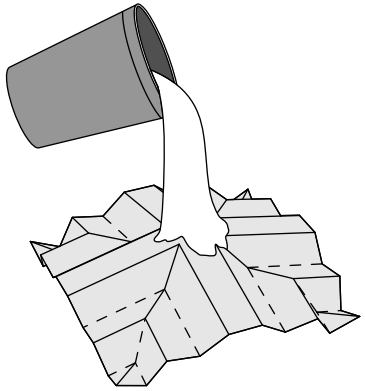
2. Folded paper



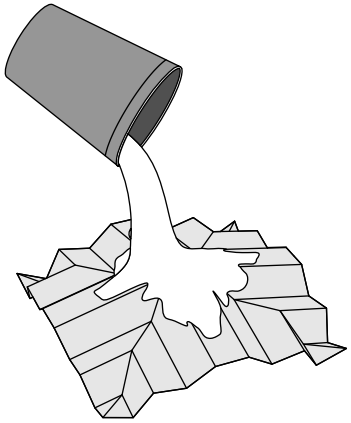
3. Orientate folded paper



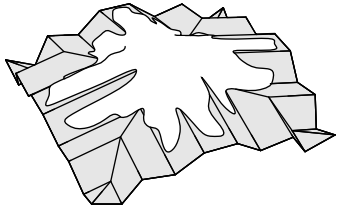
4. Pour plaster over paper



5. Cover paper in plaster

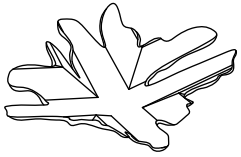


6. Let plaster dry

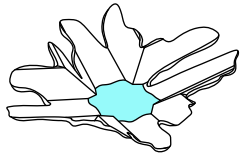


7. Peel paper off

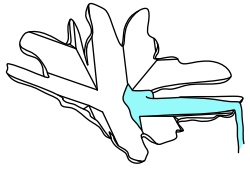
8. Final plaster bowl



9. Bowl containing liquid

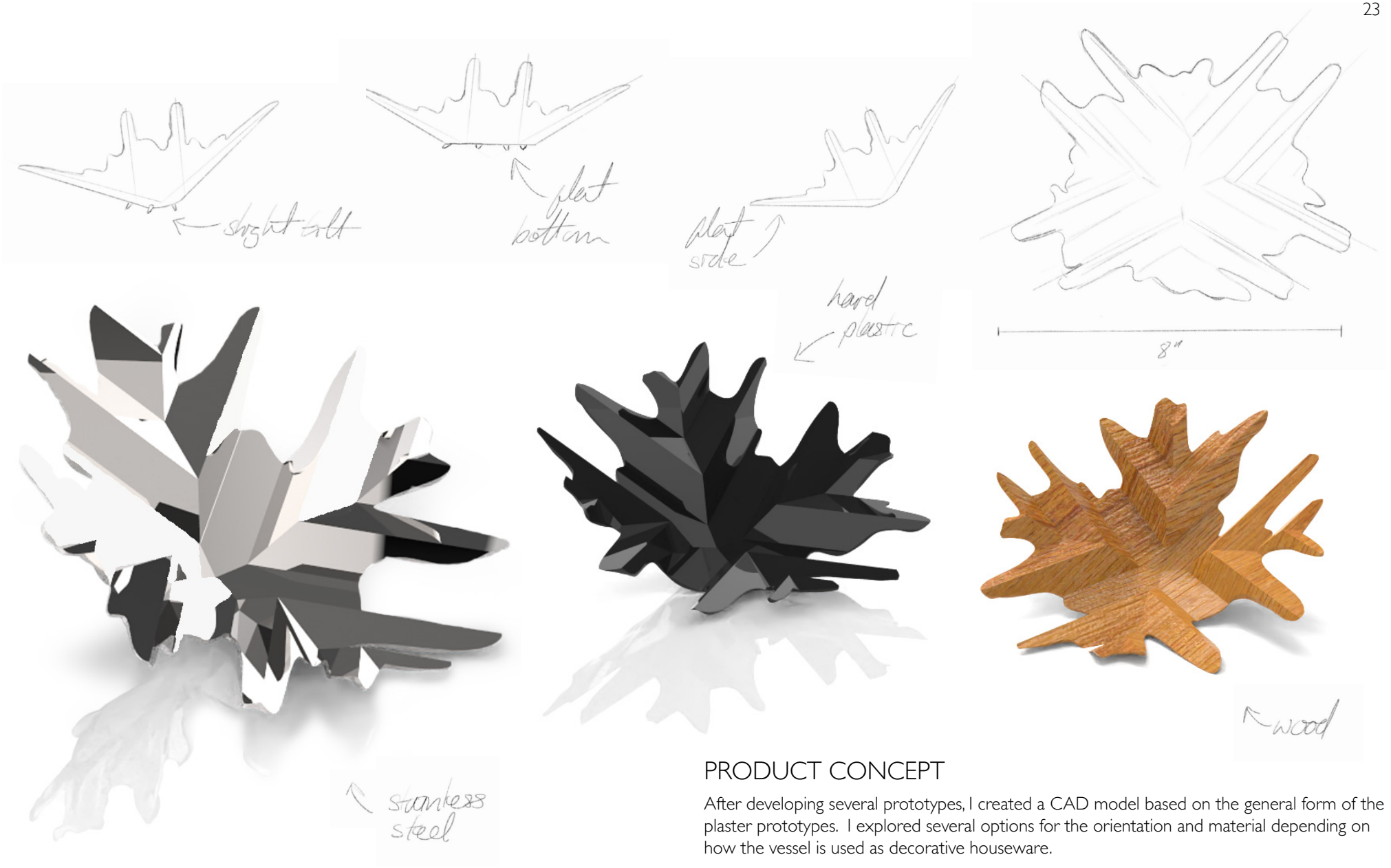


10. Bowl pouring liquid



PROCESS DIAGRAM

I developed illustrations to show the creation process and the intended use. Here, the conceptual material portrayed is plaster, however in practice the material would need to be a stronger material to withstand holding dry objects and everyday handling, and a potentially a non-porous material for use with liquid substances.



PRODUCT CONCEPT

After developing several prototypes, I created a CAD model based on the general form of the plaster prototypes. I explored several options for the orientation and material depending on how the vessel is used as decorative houseware.

FINAL RENDERING

I created a conceptual rendering of the 3D model as a polished stainless steel fruit bowl as inspired by the metallic abstract designs from Alessi and Georg Jensen

DESIGNED ECOLOGIES

3D printing biopolymers to create programmable, biodegradable materials as alternatives to environmentally harmful, methane rich, waste producing construction methods

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WORKING ENVIRONMENT

mit media lab | mediated matter

Worked in a research group as a mechanical engineering intern

HARD SKILLS

Prototyping

Rapid prototyping and assembly of gantry system

Mechanical Design

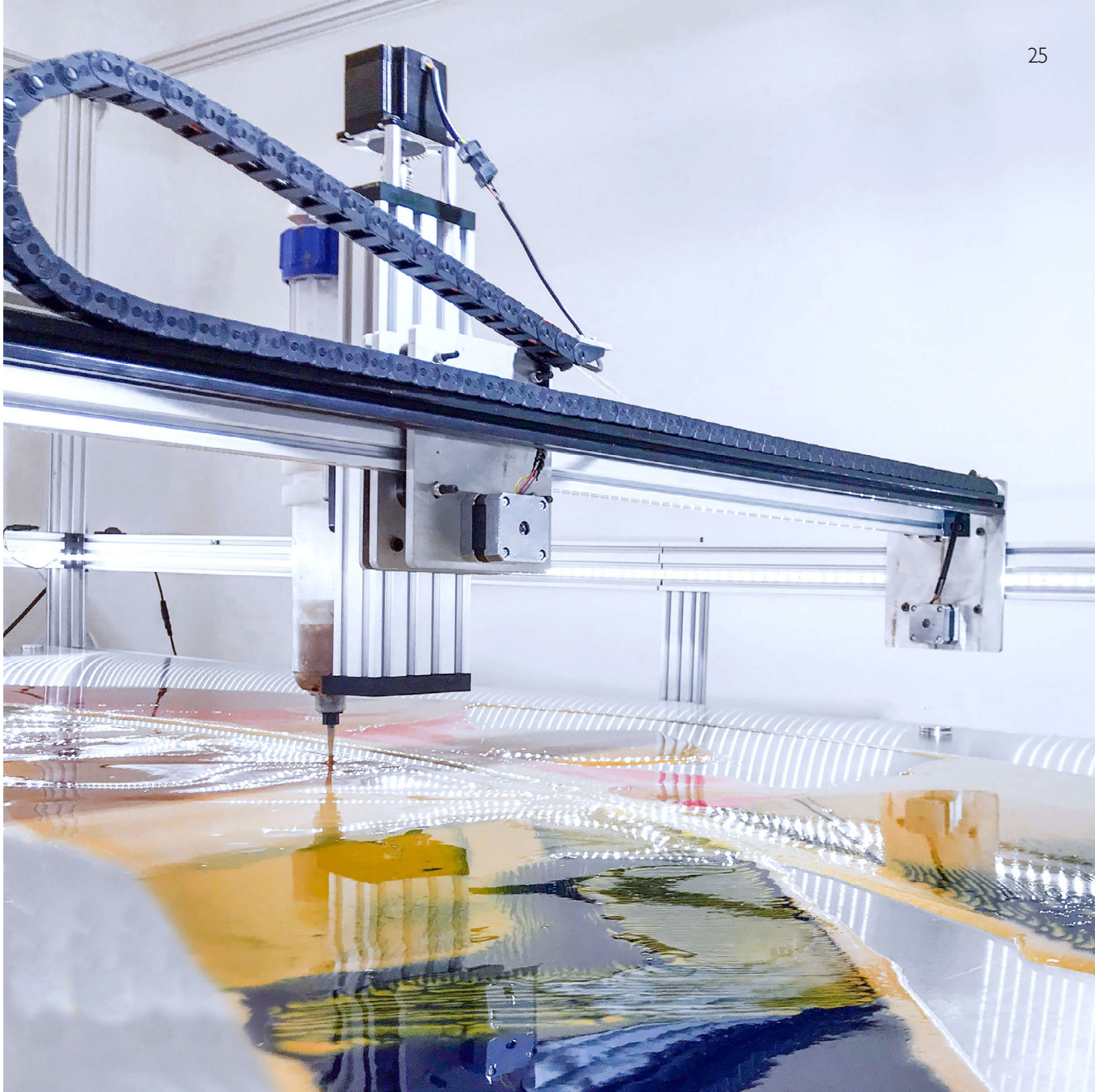
Developed gantry and adjusted design as needed to calibrate for biopolymer printing

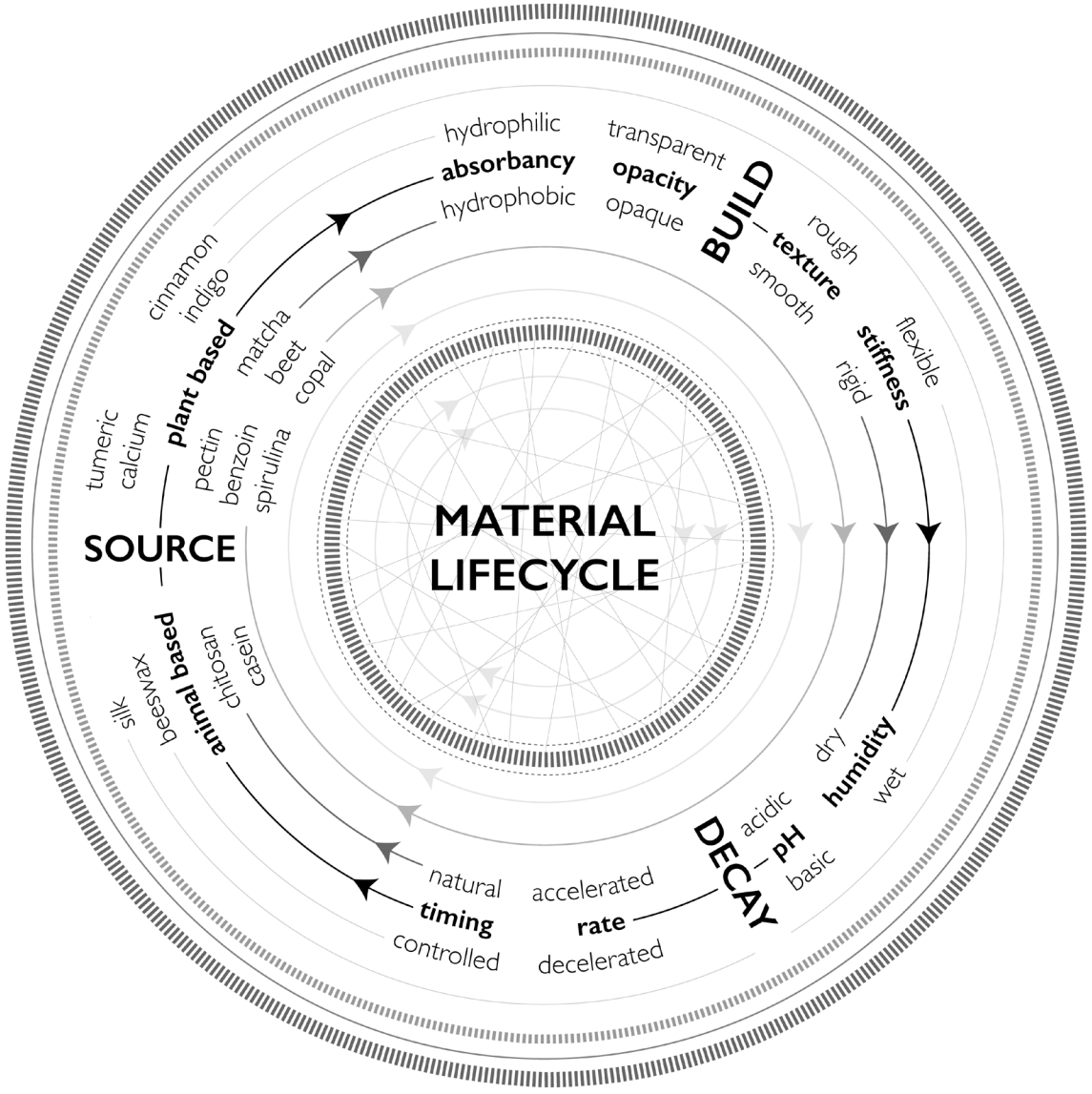
SOFT SKILLS

Interdisciplinary Teamwork

Worked with an architect and bioengineer to develop biopolymer 3D printer

MIT Spring 2019
Cambridge, MA
6 months





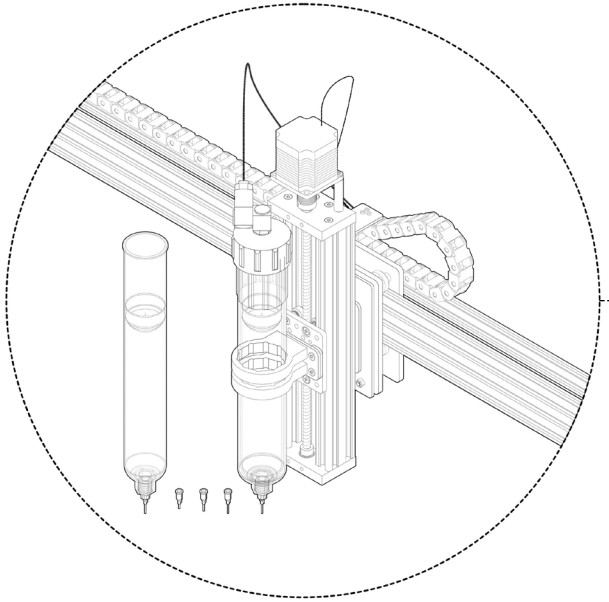
1. Source - leverage natural resources for renewable and biocompatible polymers

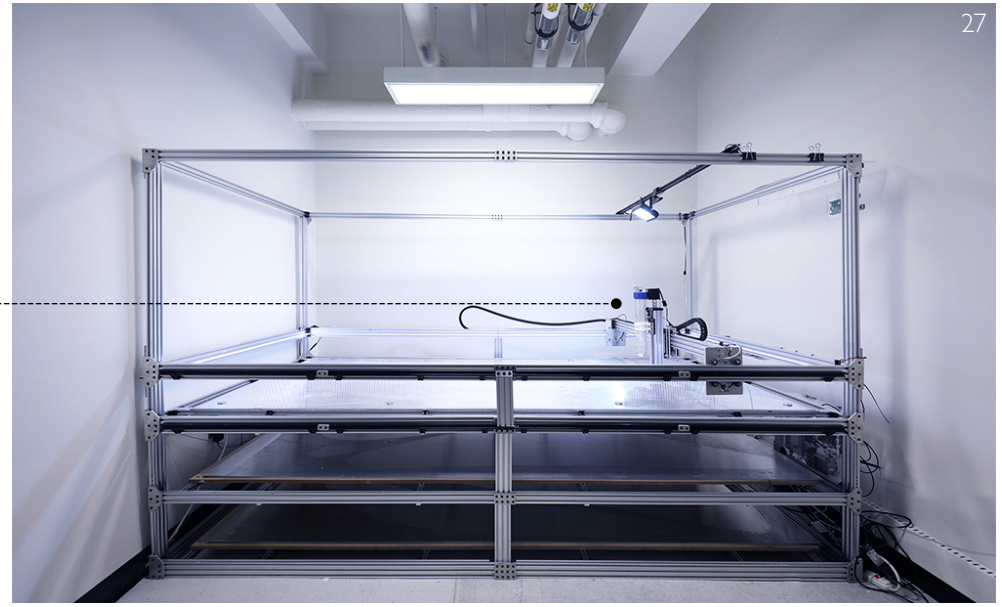
2. Build - convert natural resources into human builds by programming materials to have variable mechanical, optical, and olfactory properties

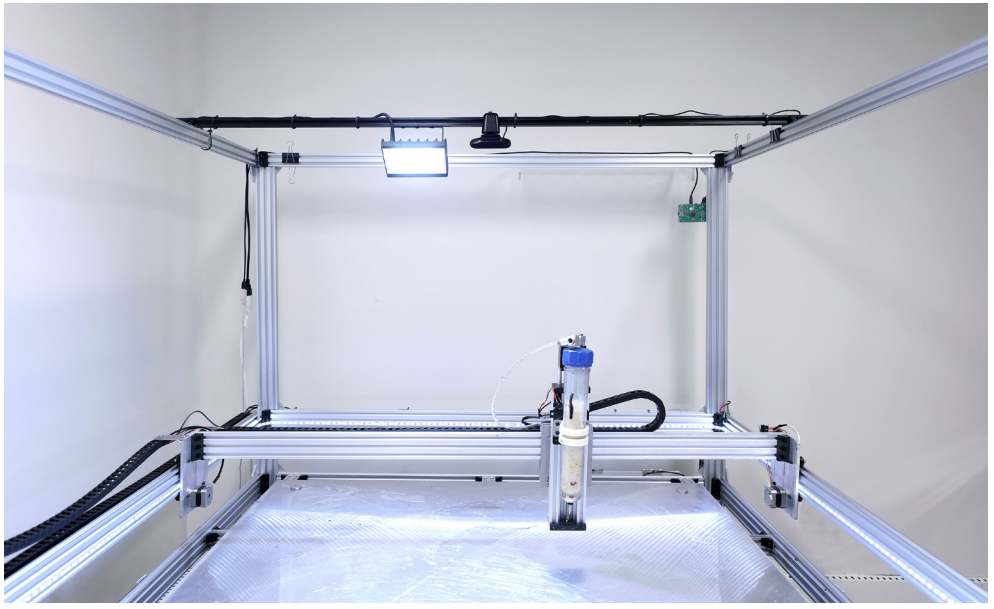
3. Decay - program materials to decay in a controlled manner on a set schedule to return resources back to the earth

CONTEXT

Designed Ecologies aims to interrupt the industrial cycle of waste production through developing organic material alternatives. Materials from healthy ecosystems can be temporarily diverted to human builds, and at the end of their materially programmed lifecycle, naturally decay back into the environment.

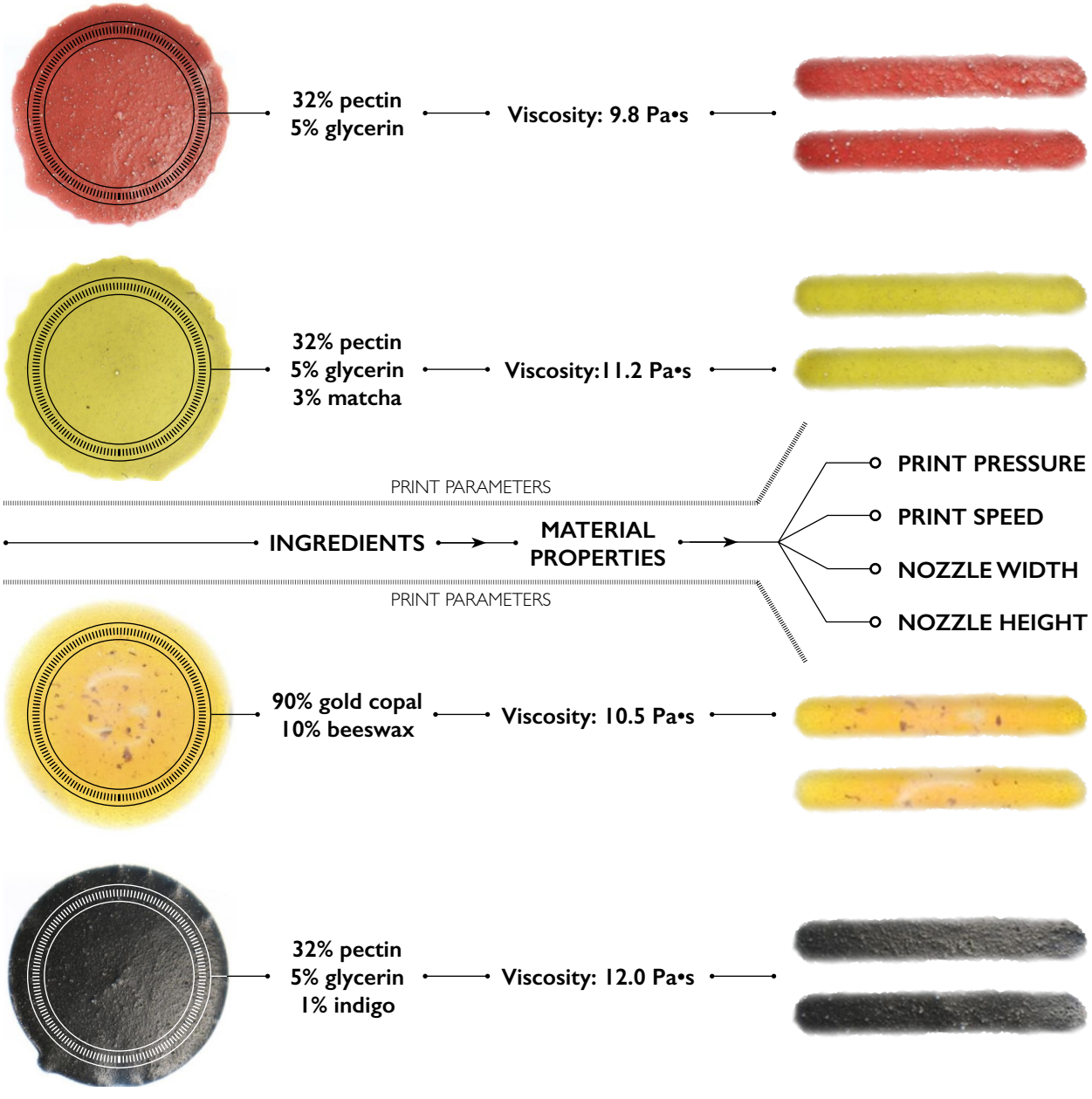






FABRICATION

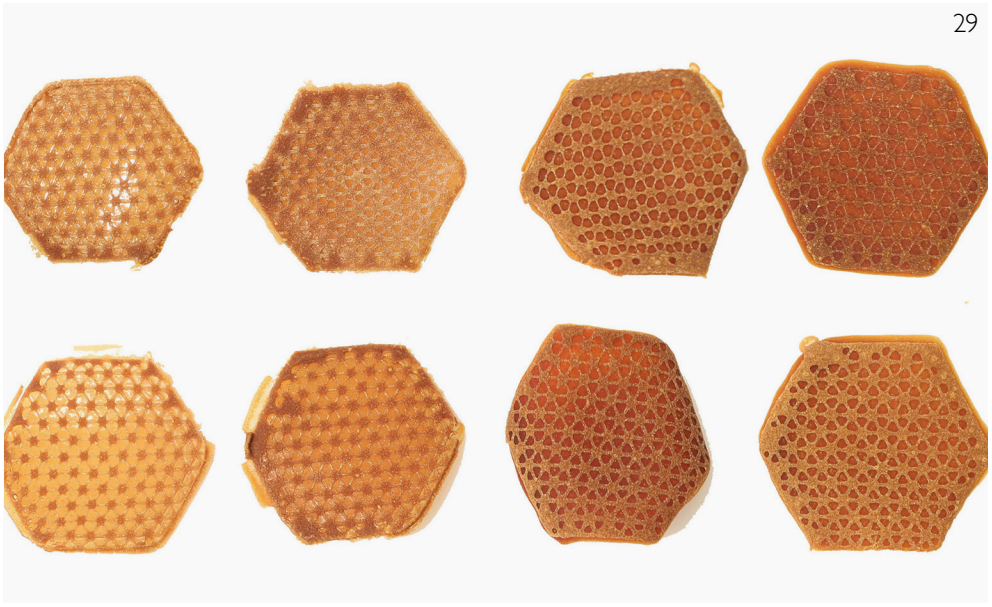
My role was primarily to design, assemble, and run a platform to 3D print biomaterial structures of varying scales. I worked with a fellow architect to design a custom 1.2 x 1.8m CNC gantry with a pneumatic hydrogel extruder with drying racks layered below the printing surface.



PRINTER CALIBRATION

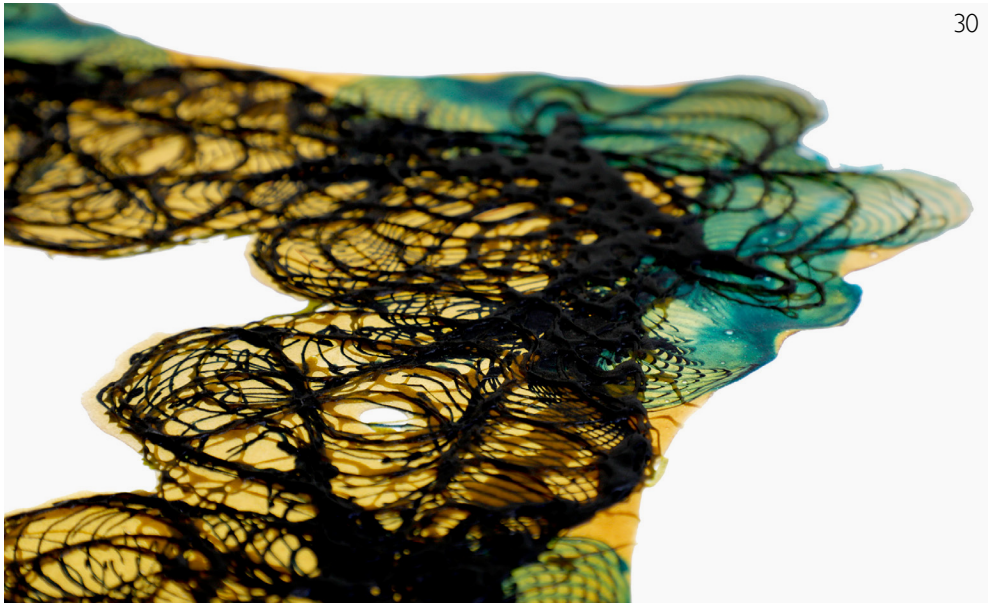
A fellow bioengineer developed biopolymer materials for 3D printing adjusting them to achieve specific material properties.

For each biopolymer material, I helped calibrate the 3D printer hardware and software to achieve predictable printing results. Hardware adjustments were made to the extruder nozzle shape and position. Software adjustments were made to the printing pressure and speed.



PRINTING

Initially, smaller structures were printed and assembled to test the material composition and printing techniques. Adjustments were made as necessary to enable variable flexibility, decay, stiffness, and other mechanical properties.



PRINTING

Larger designs were eventually printed to test the material limitations in terms of colour, design, scalability, and complexity. The results showed that biomaterials can be programmed to adopt varied physical properties useful in the production of scalable complex structures.