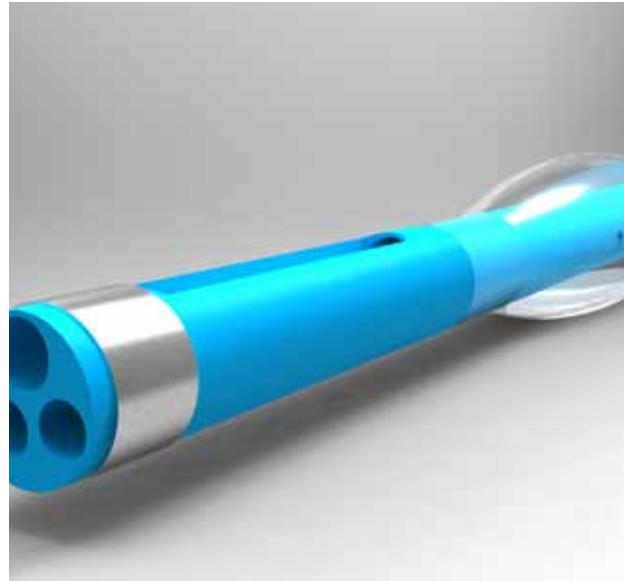


**DESIGN**  
**PORTFOLIO** **JASON KETCHAM**

# **PROJECTS**

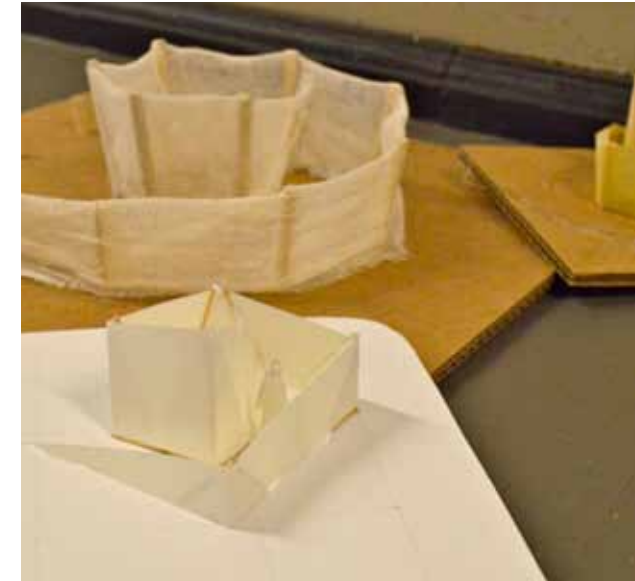
---



**ISOFLOW**



**MEDIPEBBLE**



**MEDHAB**

Isoflow

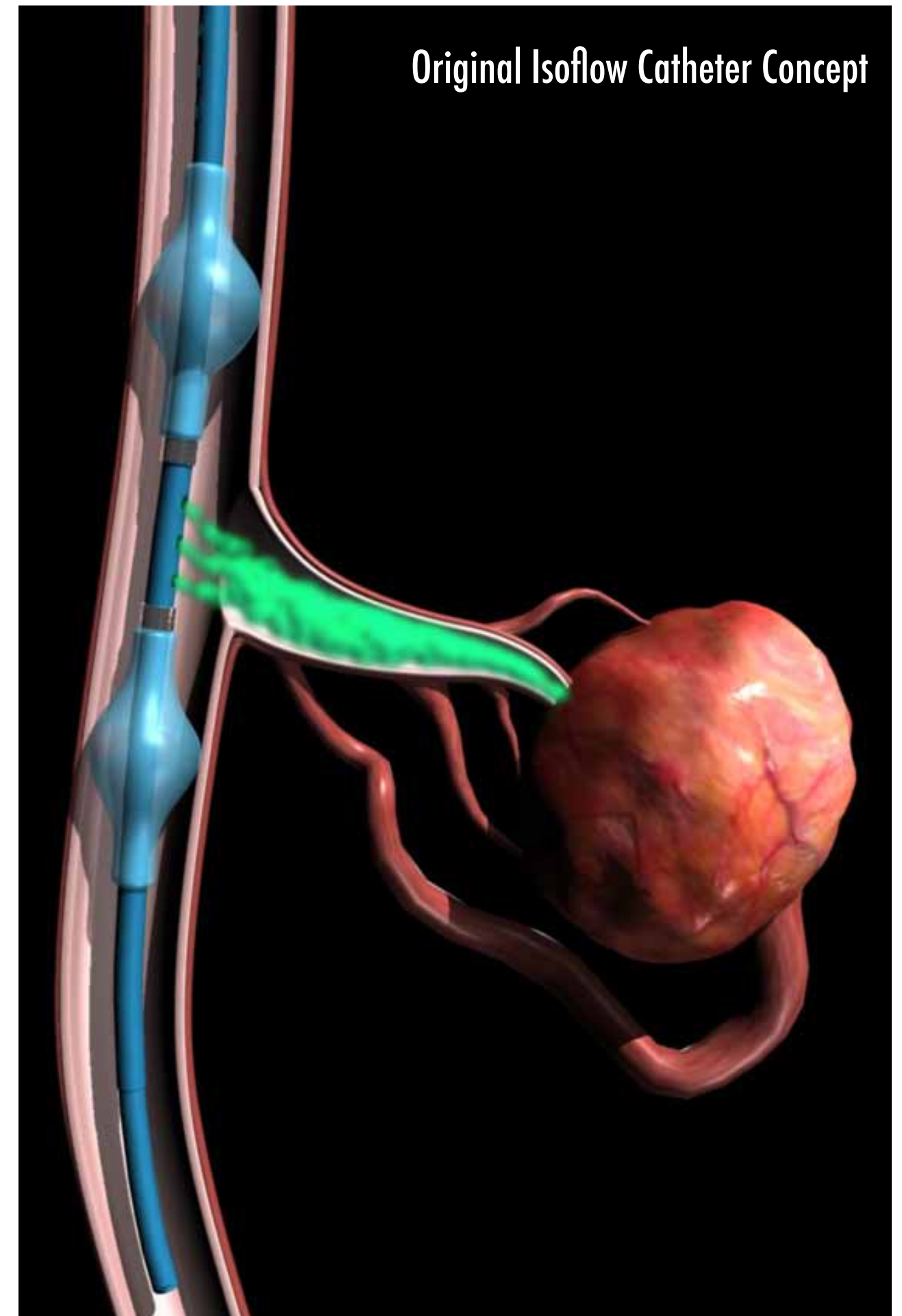
A catheter based Cancer treatment



## THE PROJECT

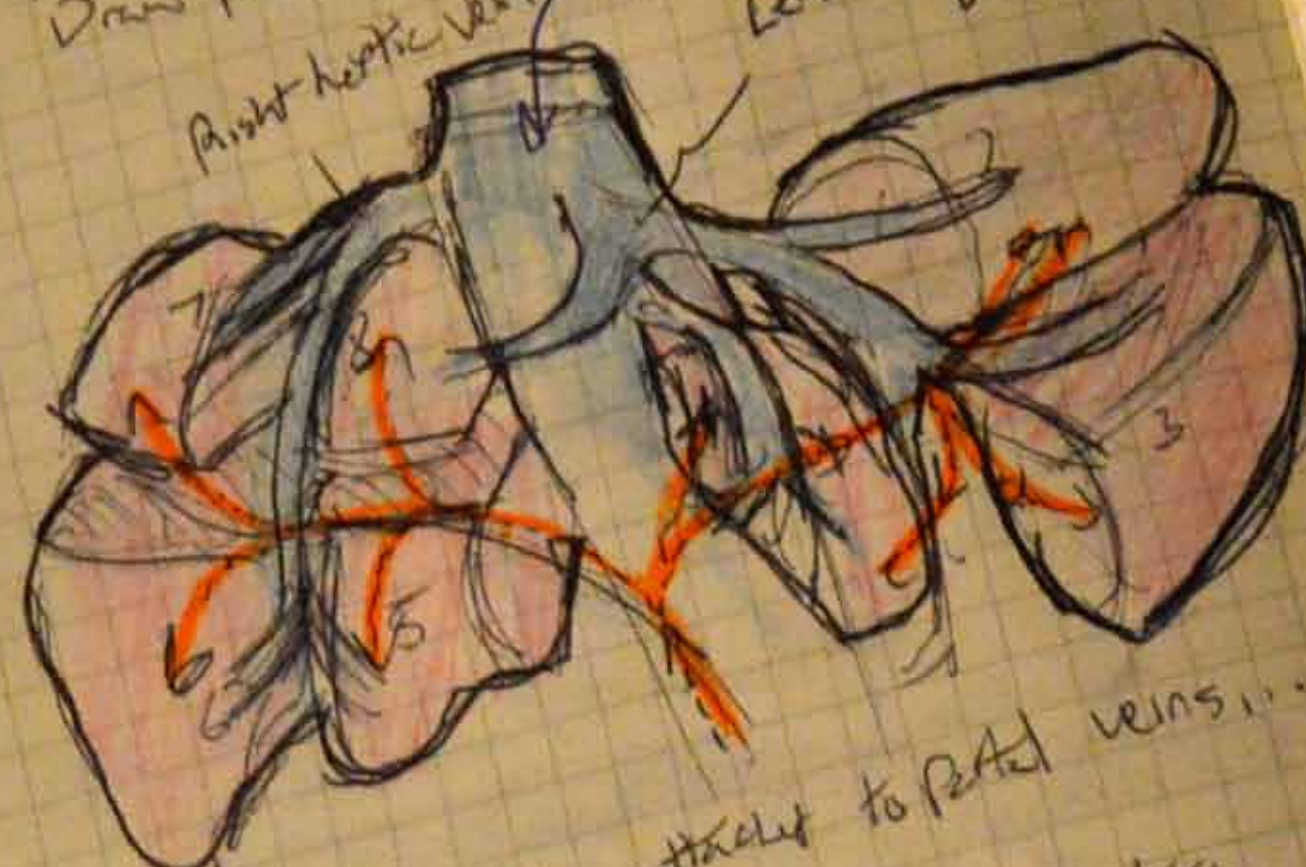
I was lucky to have the experience of joining the class of 2012 Bioengineers in their senior capstone project.

With Robert Goldman as our client, myself and 5 engineers were given the task to redesign a catheter system for the localized drug delivery of Yttrium-90 ( $^{90}\text{Y}$ ) to tumors within the liver.



10

Liver anatomy - how to  
y90  
5cc space  
pharmacokinetics  
microspheres  
Draw possible interactions.



● = Hepatic arteries, attached to Portal veins...

- Right hepatic artery
- also common hepatic duct



Limit - inability to deliver regional perfusing gastrointestinal to

### TheraSphere

also called malignant common form of liver

consists of millions of microspheres (20-30 microns)

The microspheres embolize liver capillaries & bathing of yttrium 90 radiation

Insoluble glass Part of the glass

Each milligram microspheres

y90 decays in 2.67 days

decays to stable zirconium



X 2.67 days

## Secondary Research

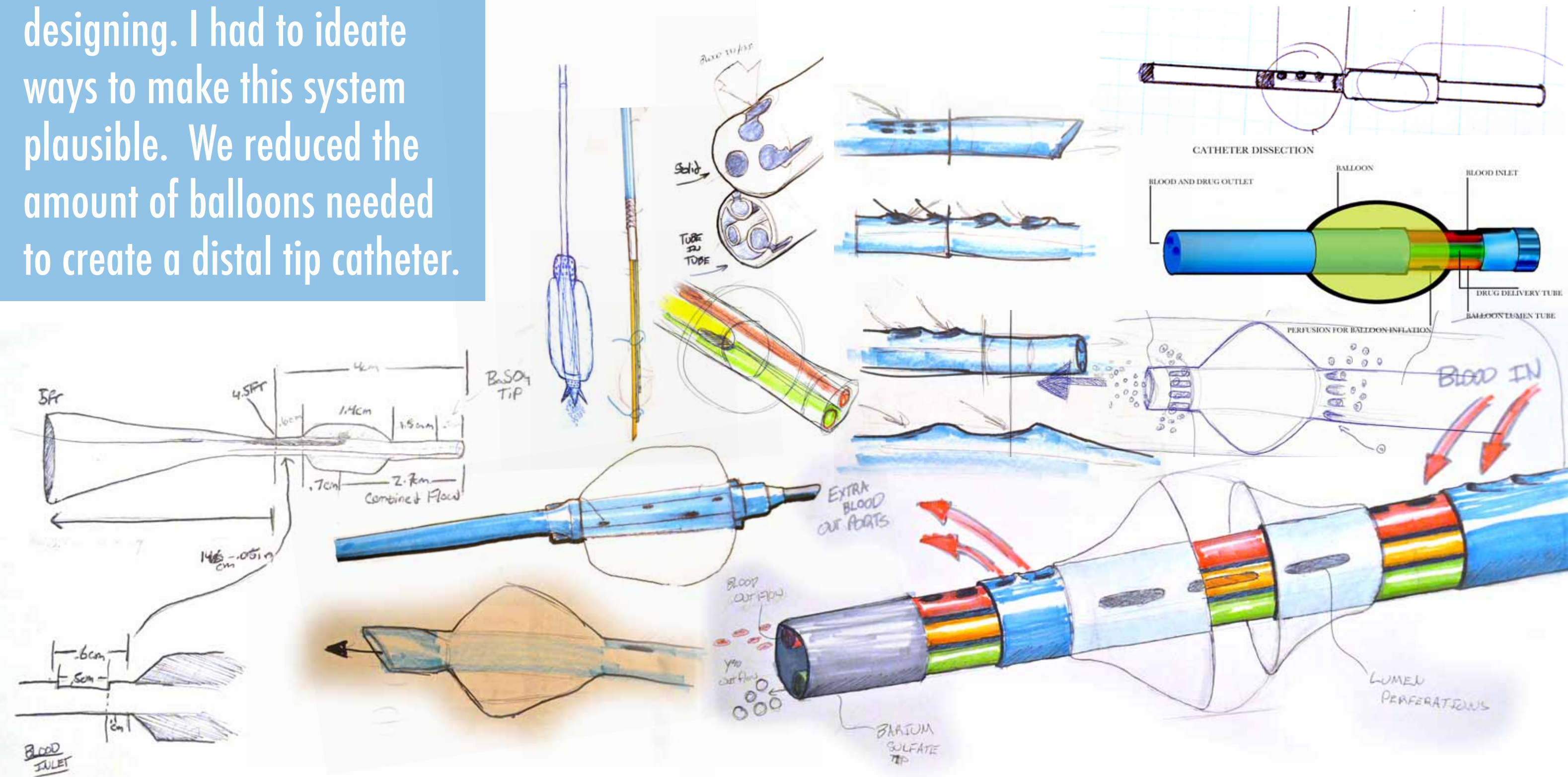
With a system that is designed to travel within the human vascular system there were a lot of constraints that needed to be found and met.

Our team researched the following topics:

- Liver Cancer
- Liver anatomy
- Vasculature anatomy
- Yttrium 90
- Catheter systems

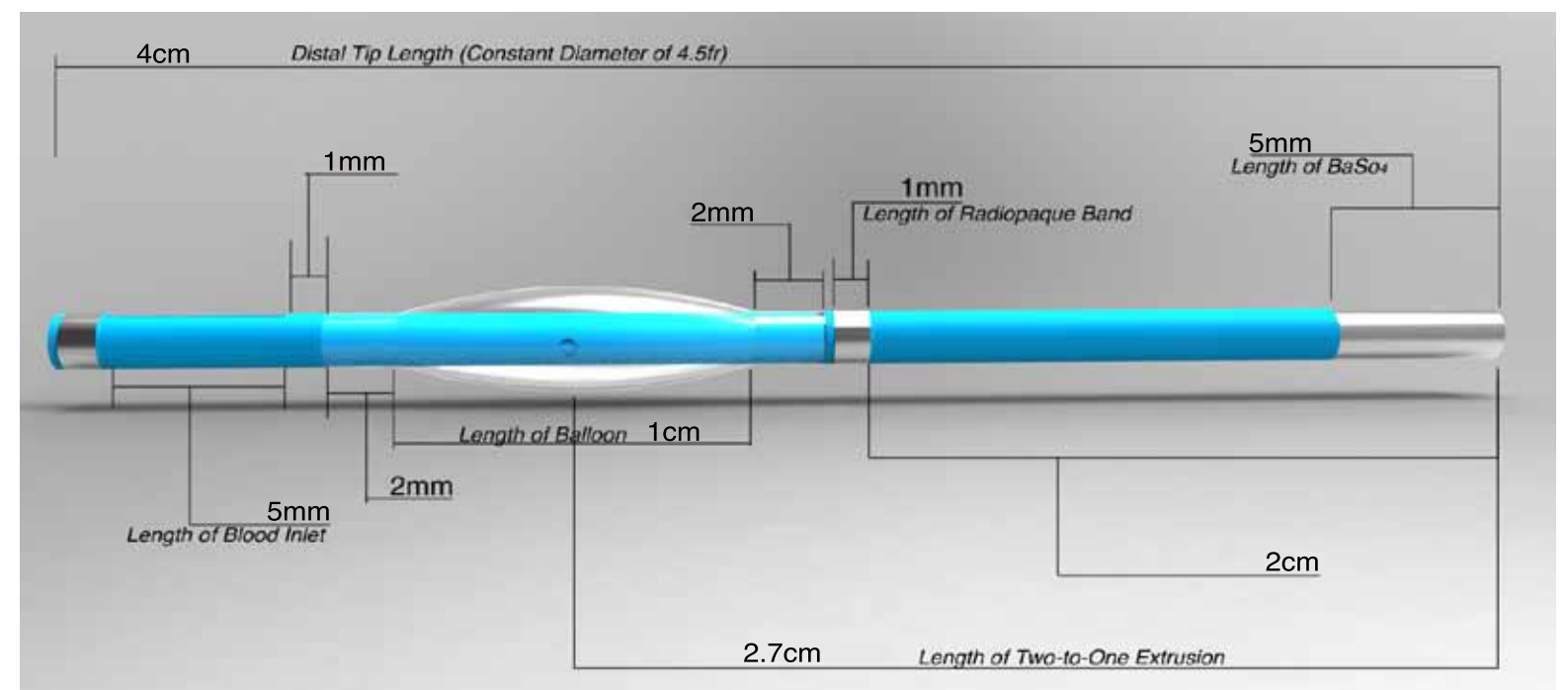
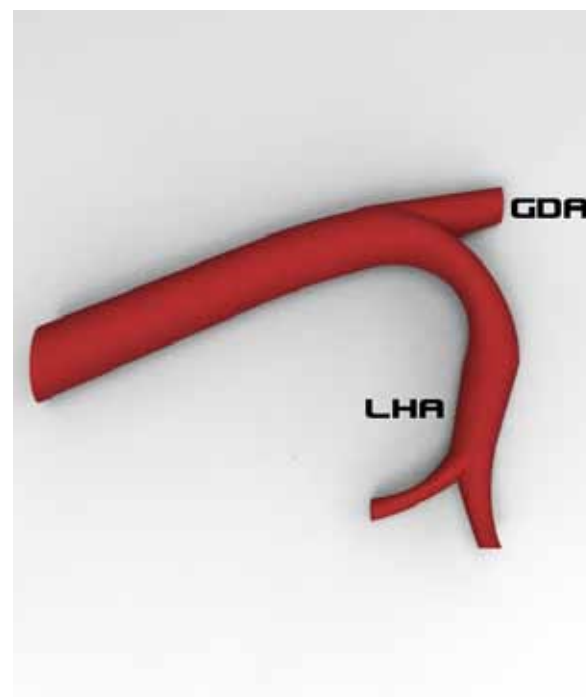
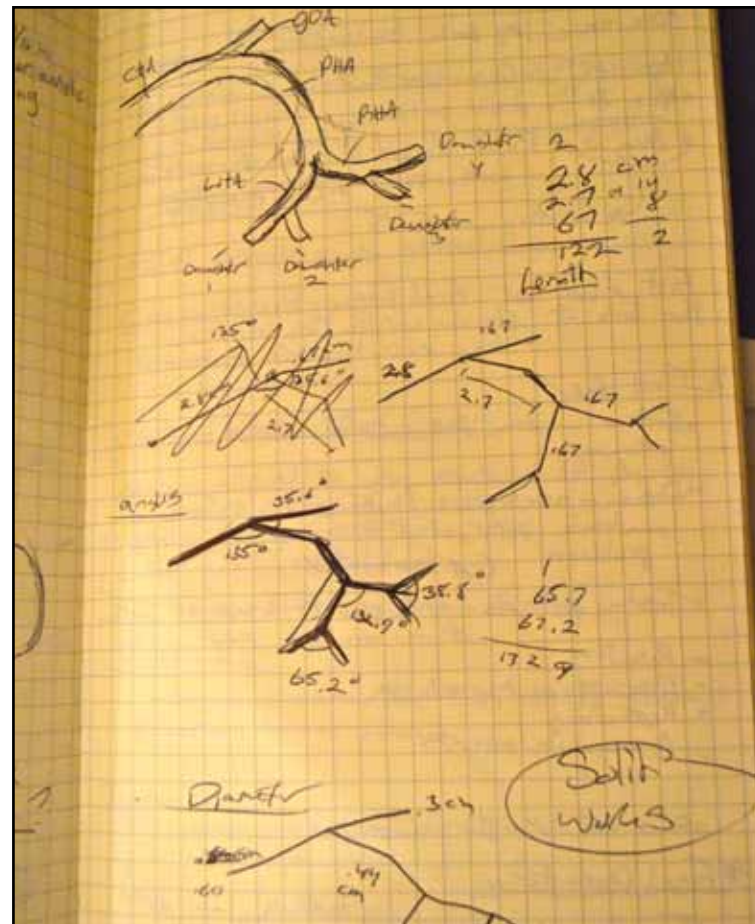
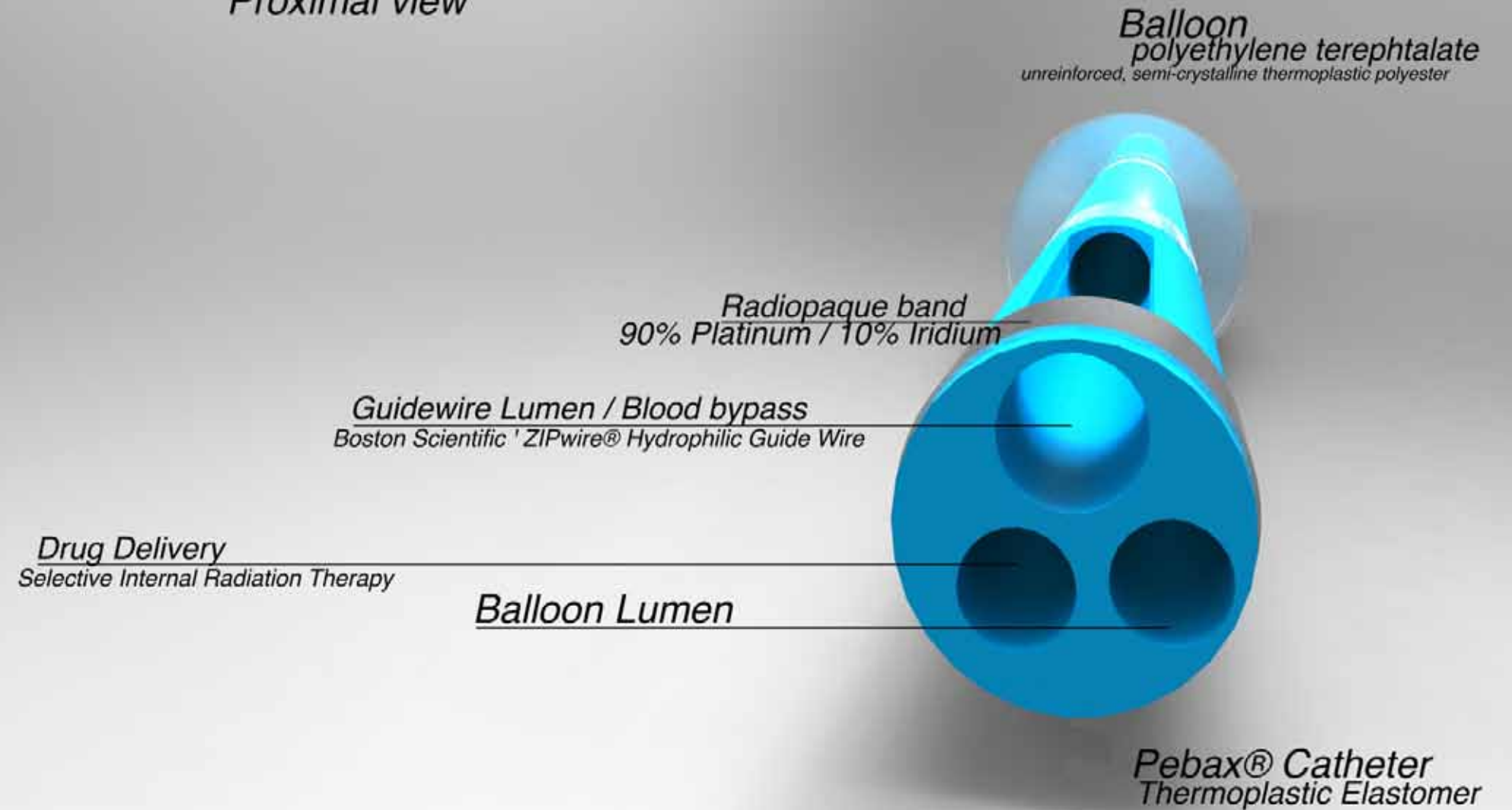
Our main purpose was to reduce the reflux of the Y(90) into other arteries which could kill patients.

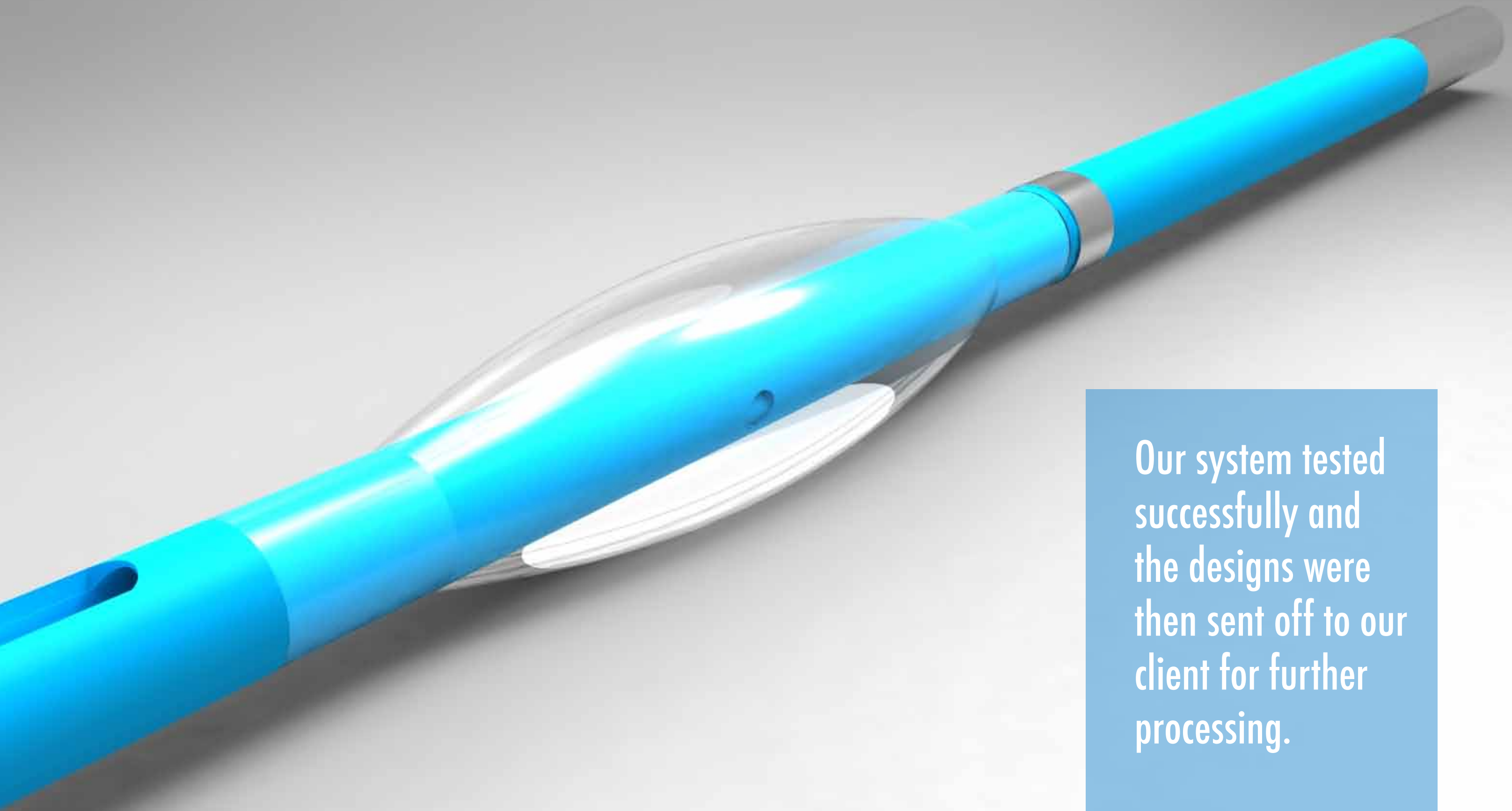
My specific role was designing. I had to ideate ways to make this system plausible. We reduced the amount of balloons needed to create a distal tip catheter.



I modeled the catheter to exact scale and then also modeled the vasculature so our engineers could test for reflux.

### Isoflow Infusion Catheter Proximal view



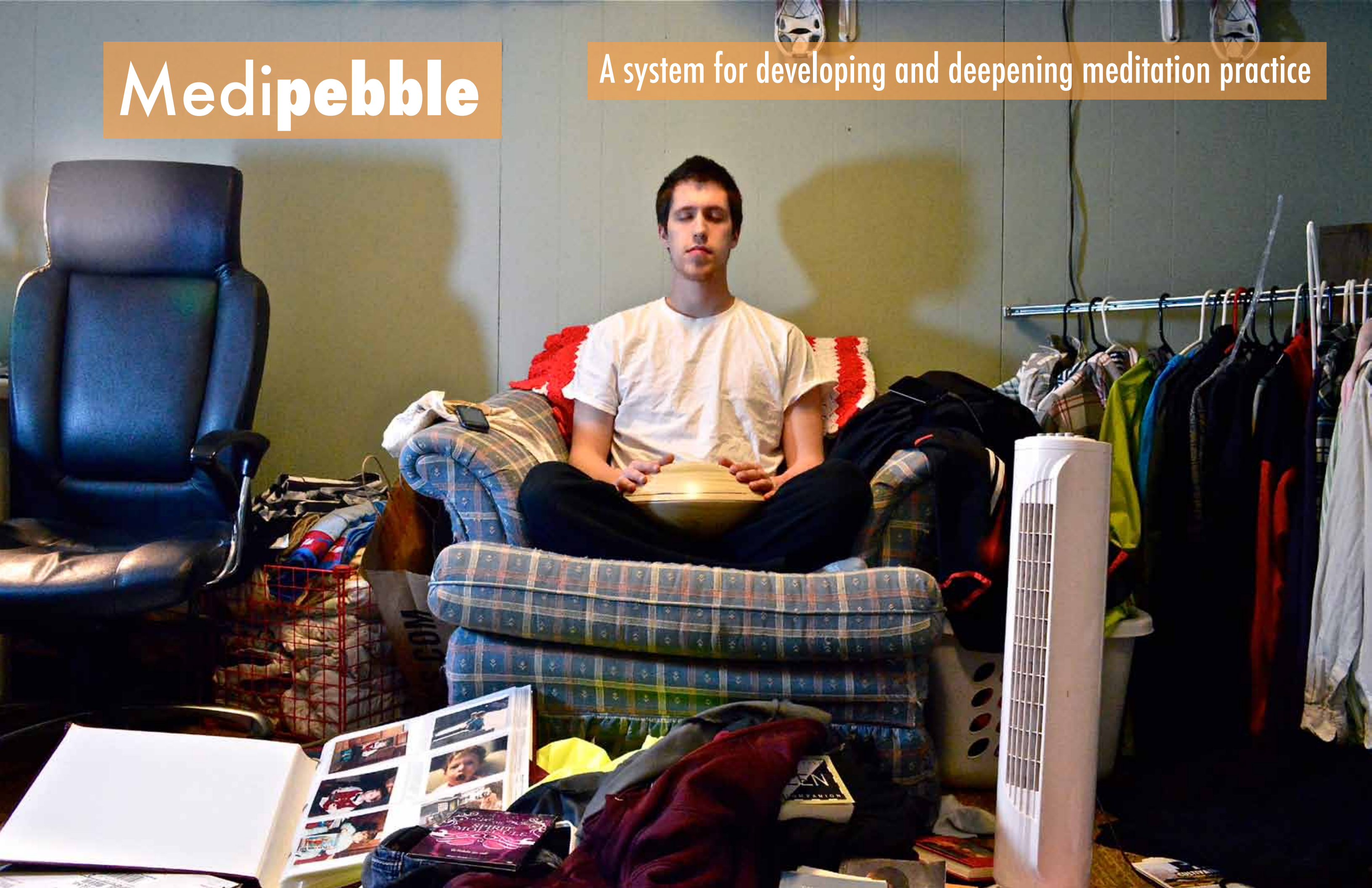


Our system tested successfully and the designs were then sent off to our client for further processing.



# Medipebble

A system for developing and deepening meditation practice



## THE OPPORTUNITY

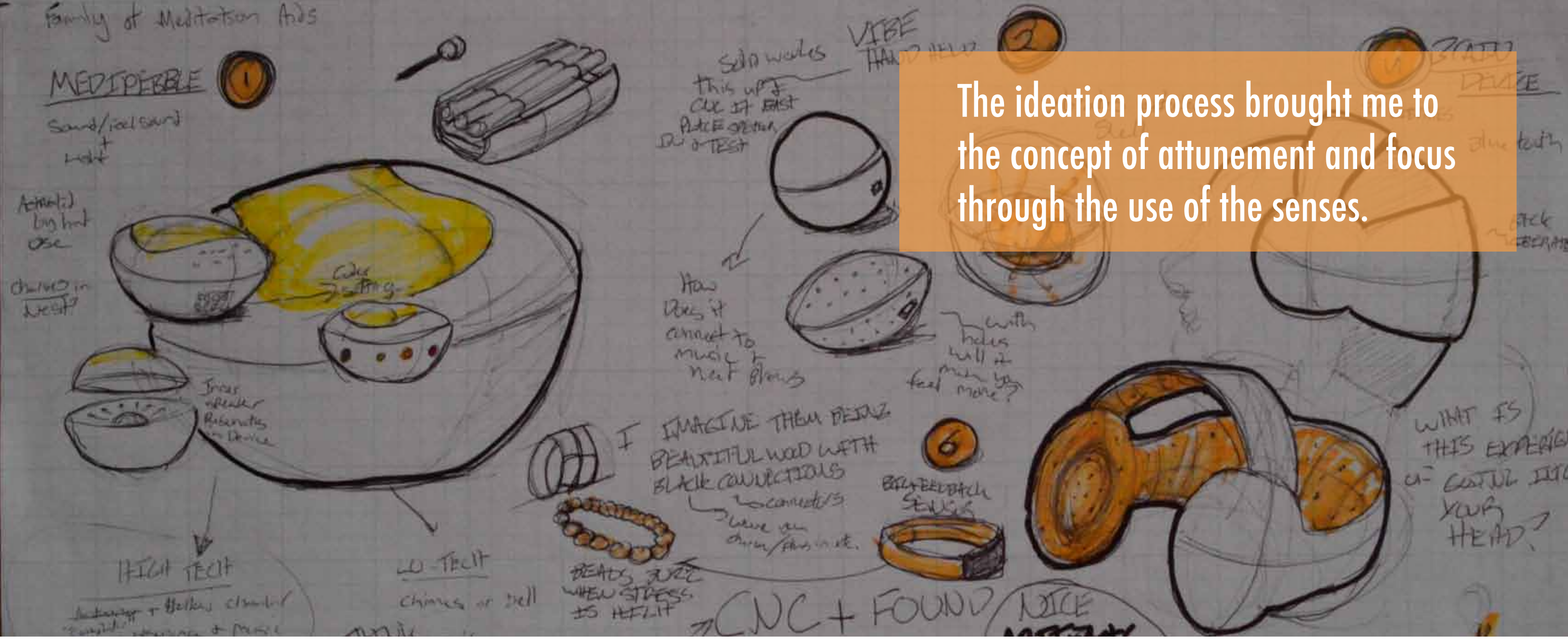
“We spend half of our lives *lost in the thoughts racing around our minds.*”

Stress and anxiety are the core causes of disharmony in our life. We must look at health *holistically* by taking care of ***mind, body and soul.***

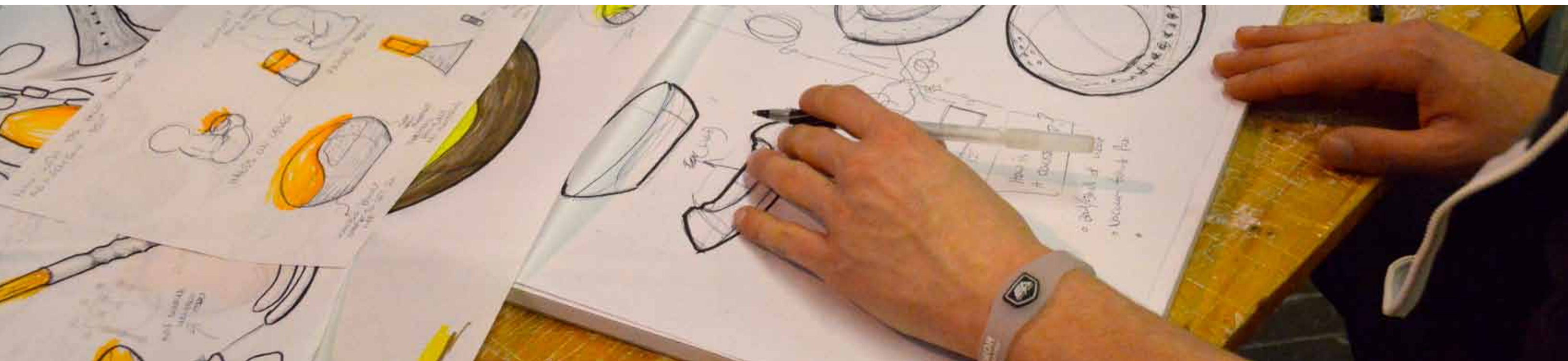


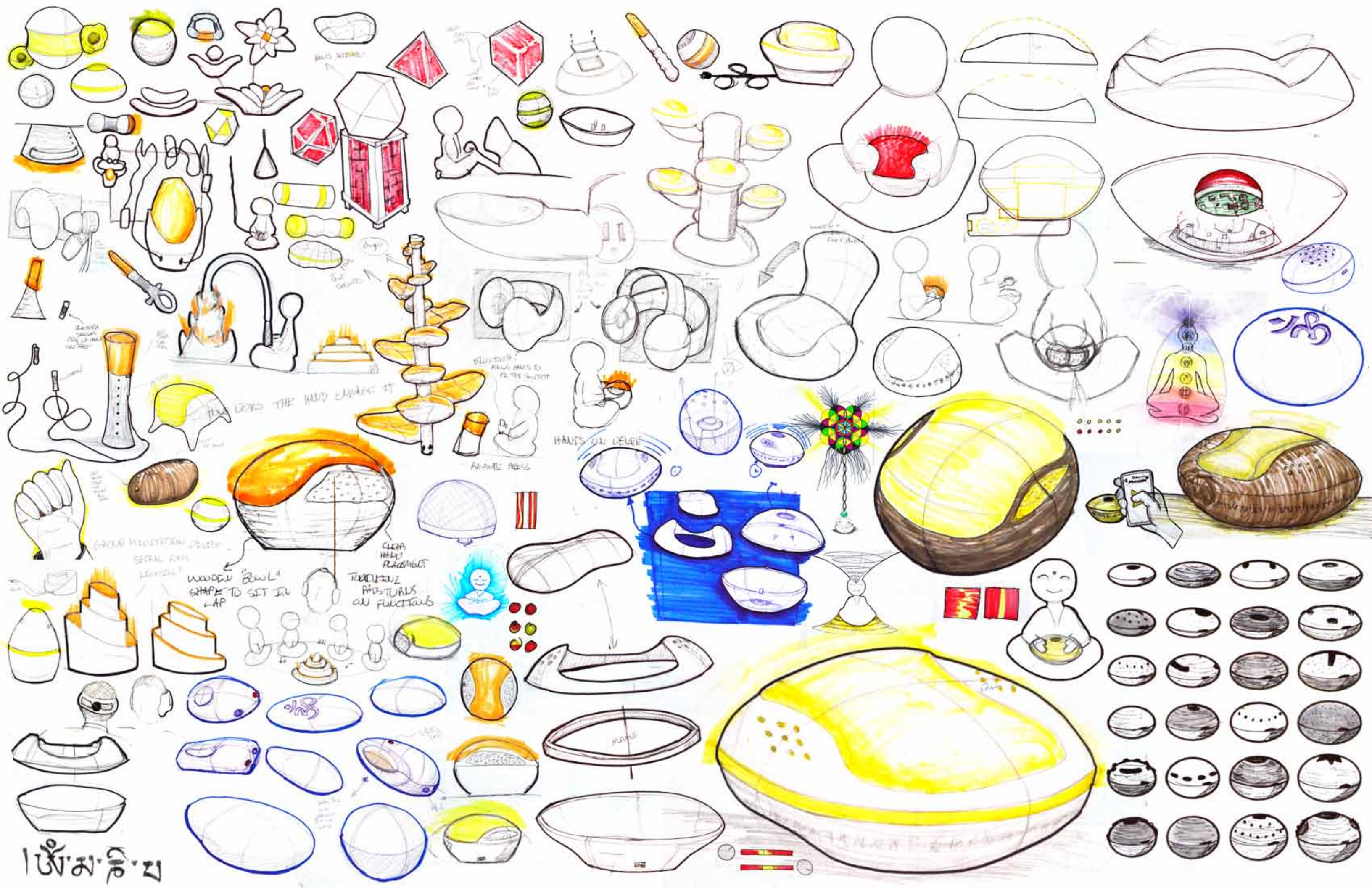
The second step of the project was researching the current systems of meditation. Using ethnographic research I began to formulate an idea of how meditation was perceived in western culture.





The ideation process brought me to the concept of attunement and focus through the use of the senses.





ॐ म न म

HAS LED THE HAND EXERCISE IT

WOODEN 'BOWL' SHAPE TO SET IN LAP

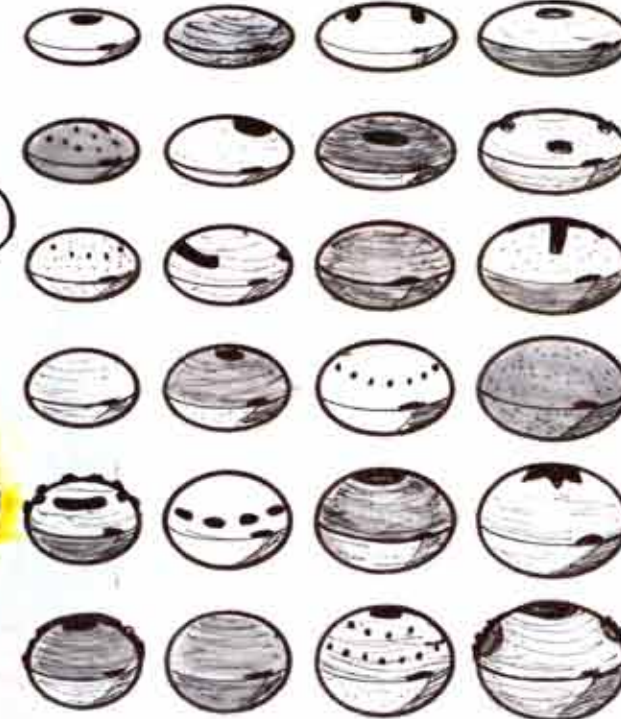
TECHNICAL PROTOTYPES AND FUNCTIONS

HAUTS ON DEURE

ARANTE 10-15

CLEAR HOLE PLACEMENT

MOUSE

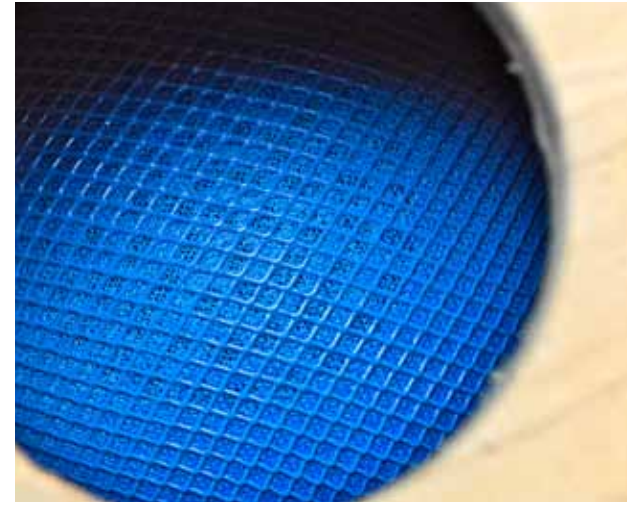
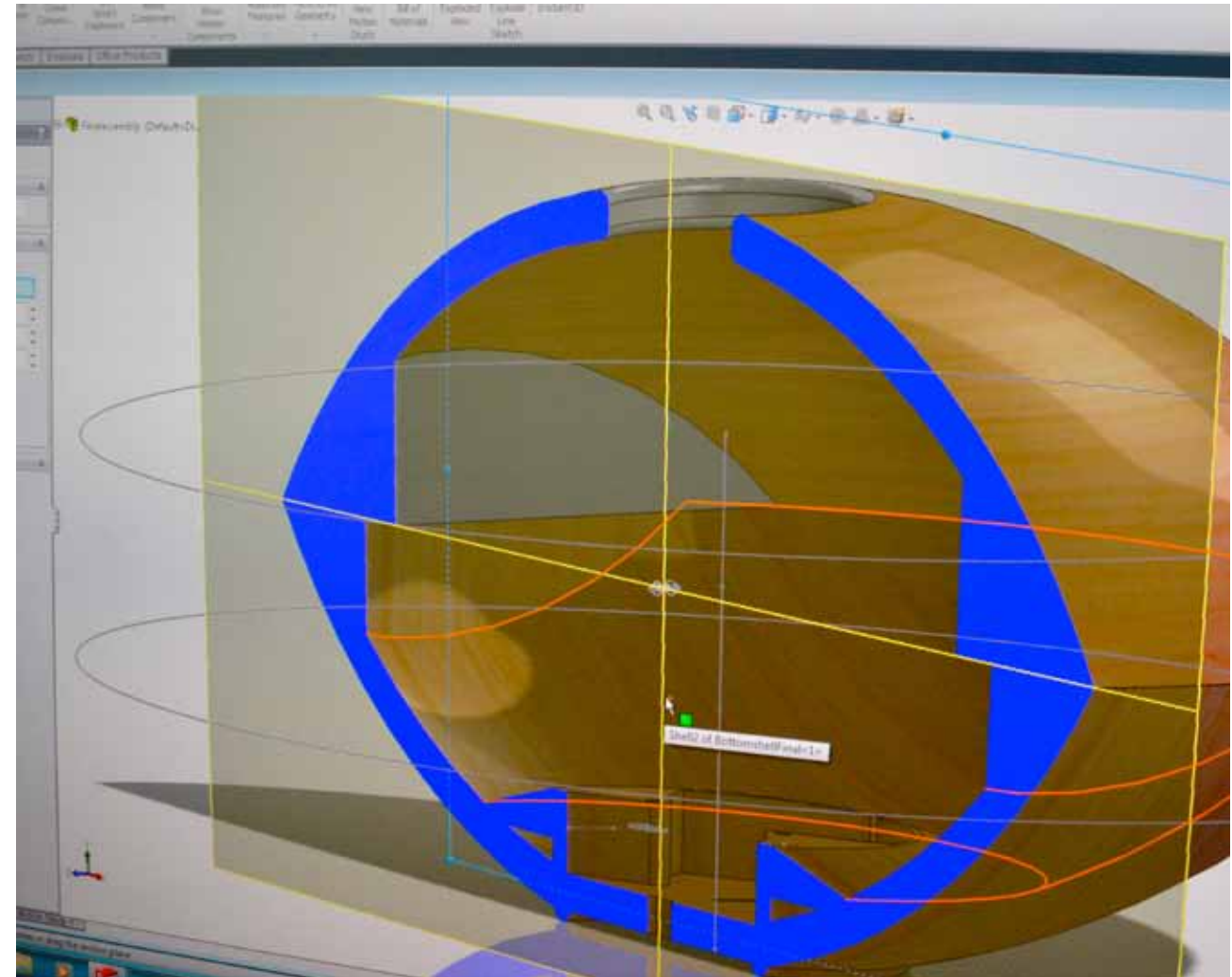




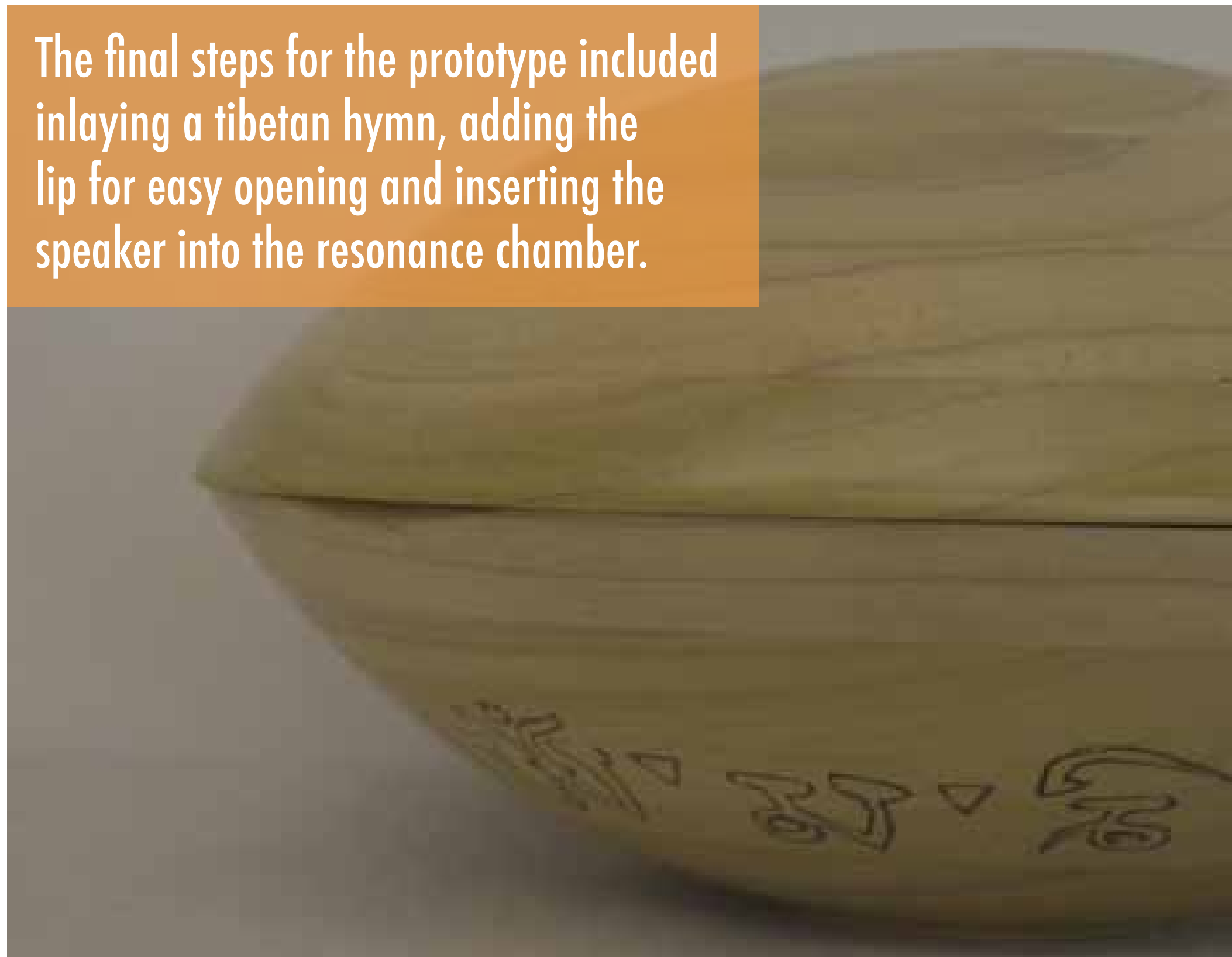
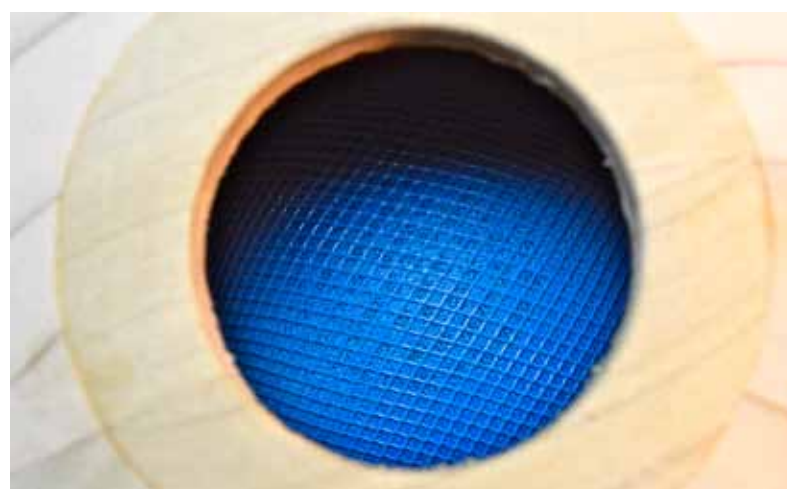
A key insight was that western culture was obsessed with gadgets. I took this concept and used it as a basis for the project. I wanted to use a physical device to bring people inward.



The prototype was constructed in Solidworks and then was cnc milled in two shells. The resulting product created an oscillation chamber which when paired with a speaker created a device that would sync your sense of touch and hearing to enhance focus while in meditation.

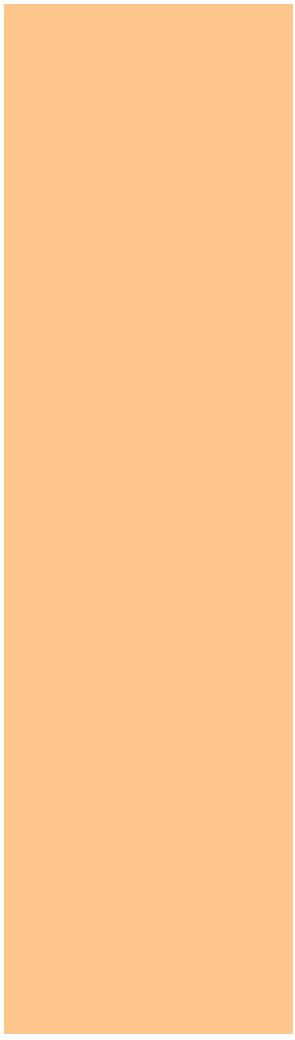


The final steps for the prototype included inlaying a tibetan hymn, adding the lip for easy opening and inserting the speaker into the resonance chamber.



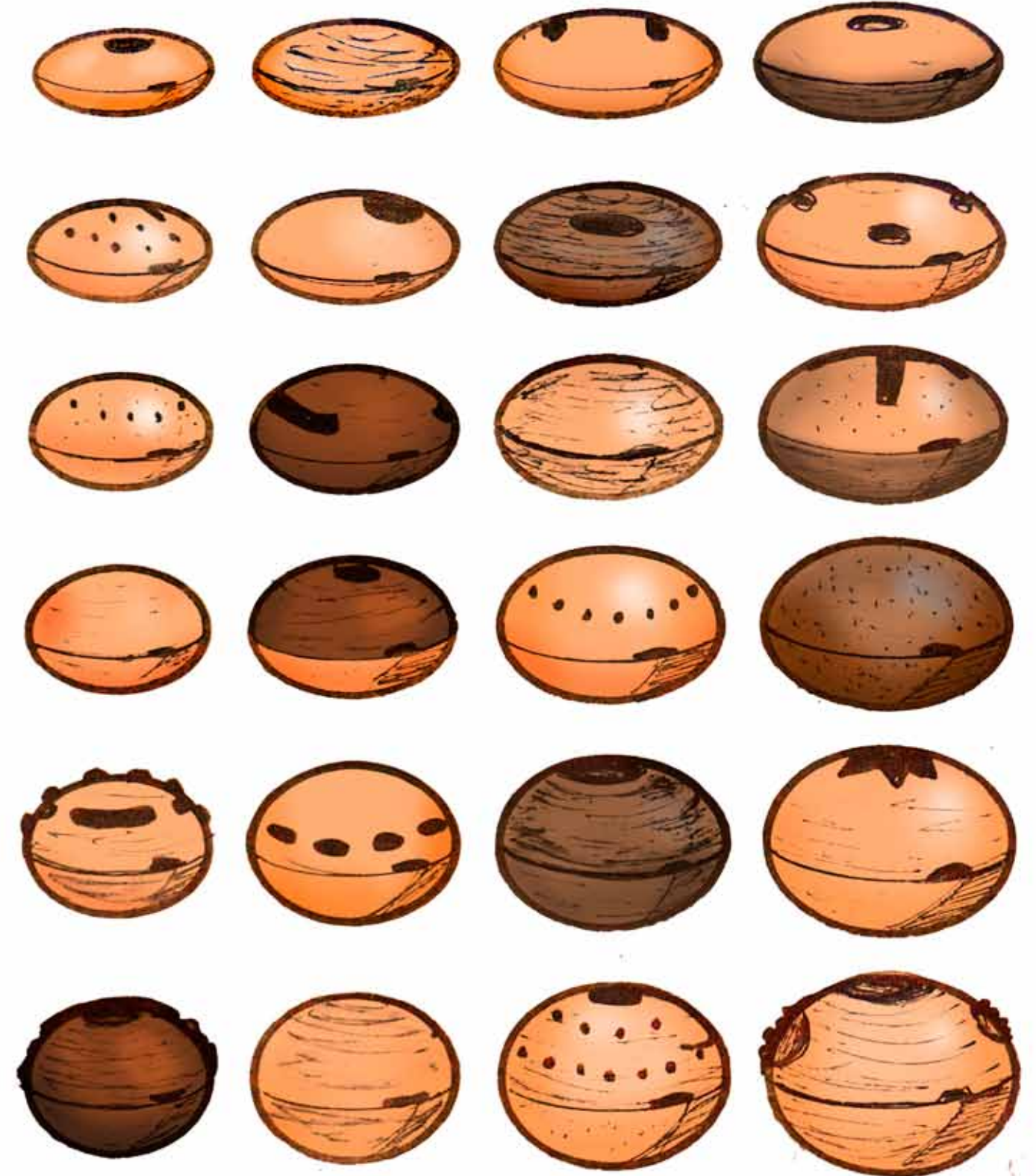


During the thesis show I obtained a great amount of interest in the tool.



I am currently in the phase of finalizing the design and creating a business for medipebble.

Customizing your own medipebble is one of the goals I want to make a reality. Users will be able to choose from different woods and glass for their own unique look.





# Meditation Habitat

Redesigning a space for students to practice mindfulness



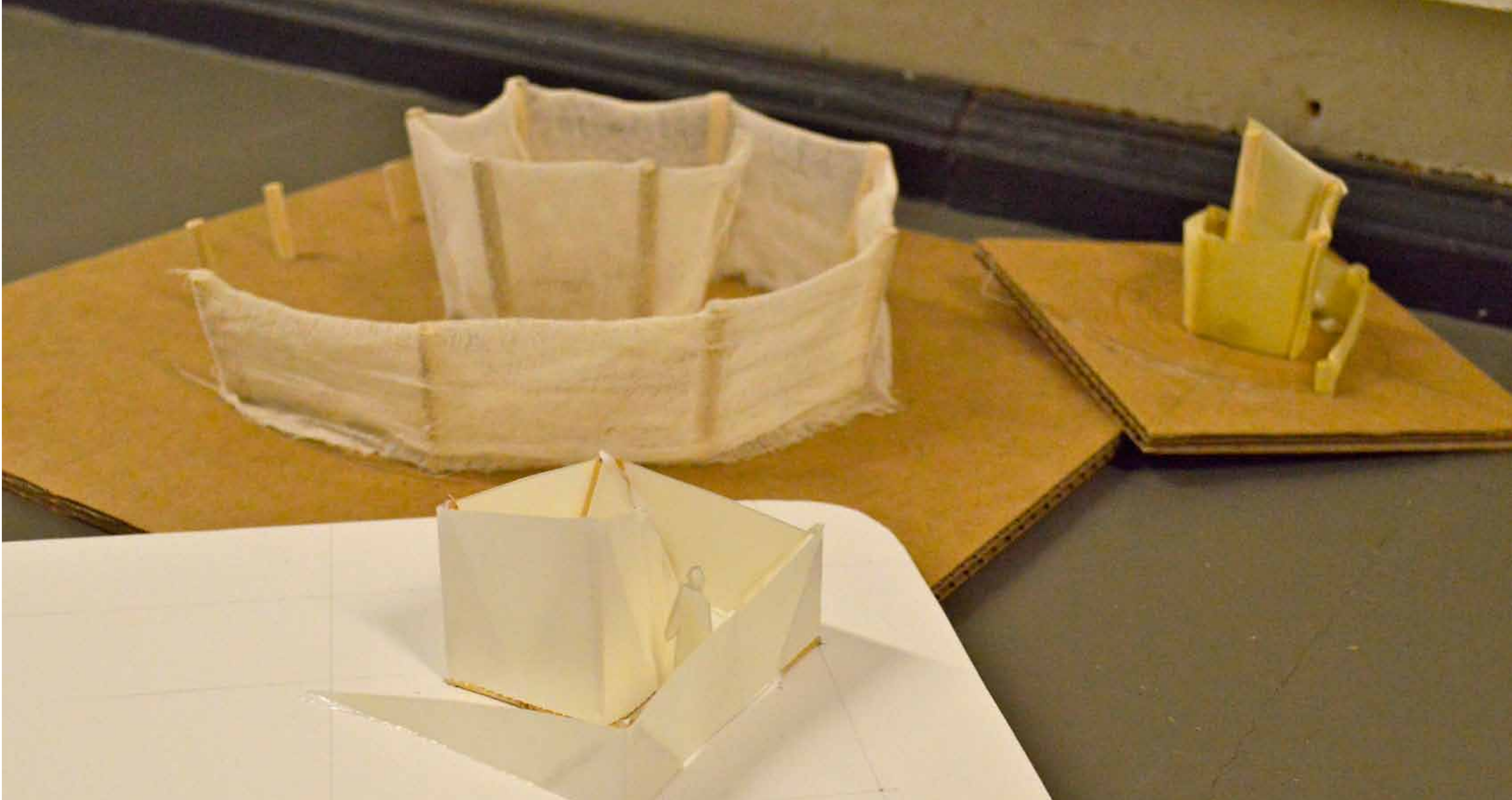
Meghan Adams, Hal Woodin and I were a group of three amongst a class of under 20. The purpose of this class was to redesign a meditation habitat from the previous year, Framing The Sky.

#### THE ISSUE

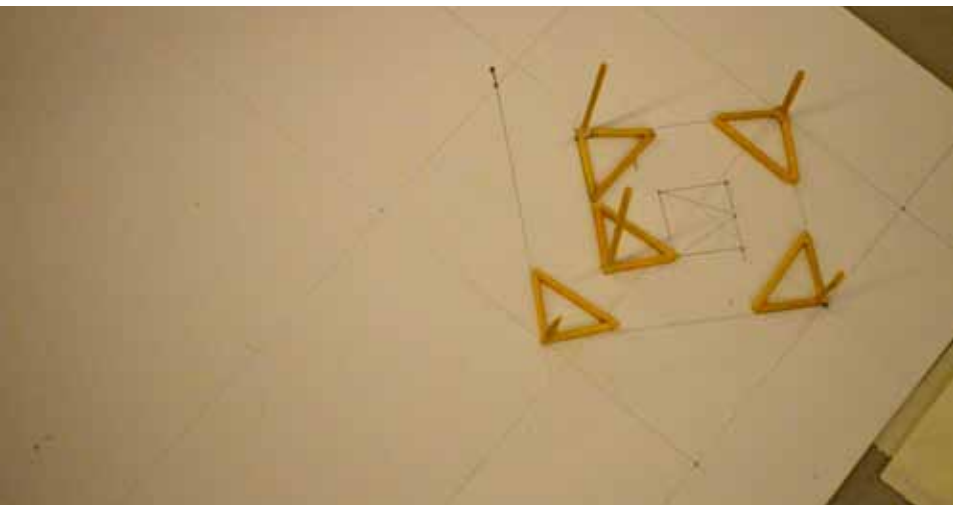
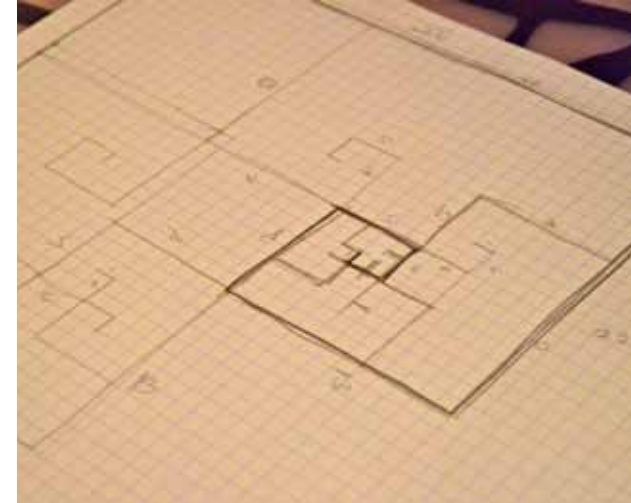
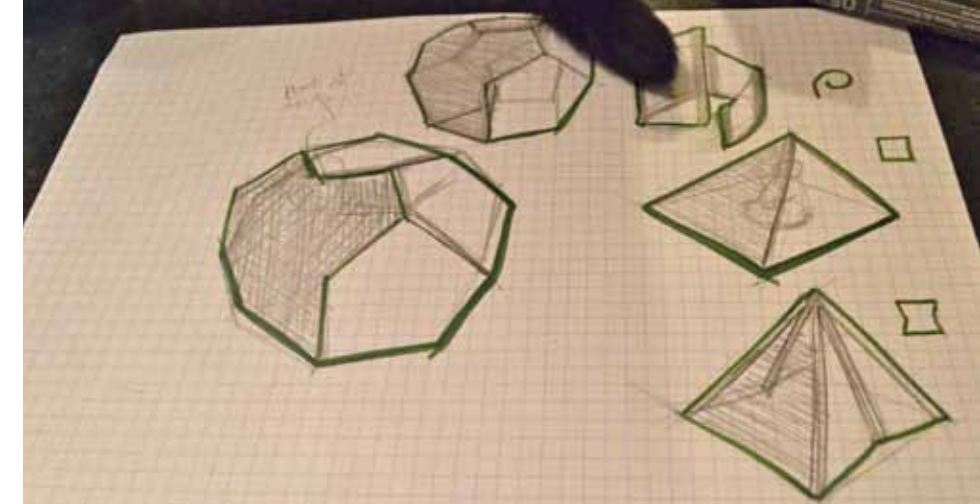
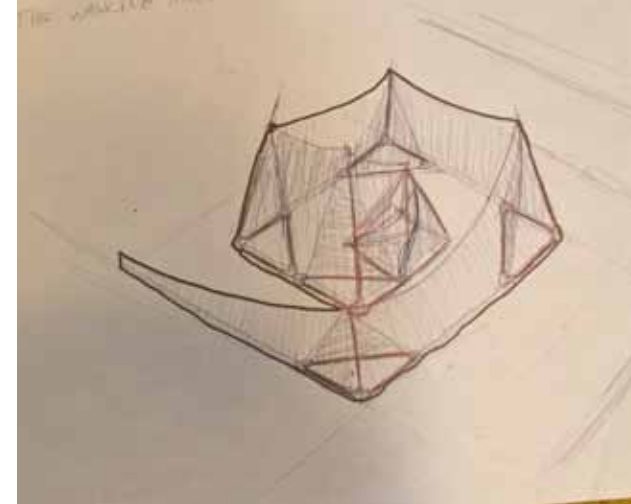
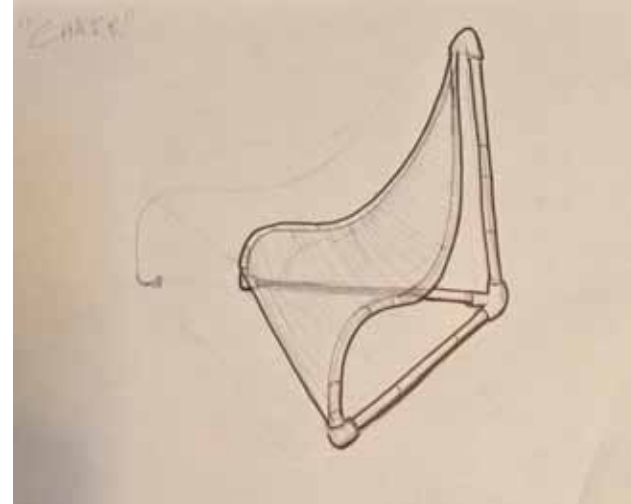
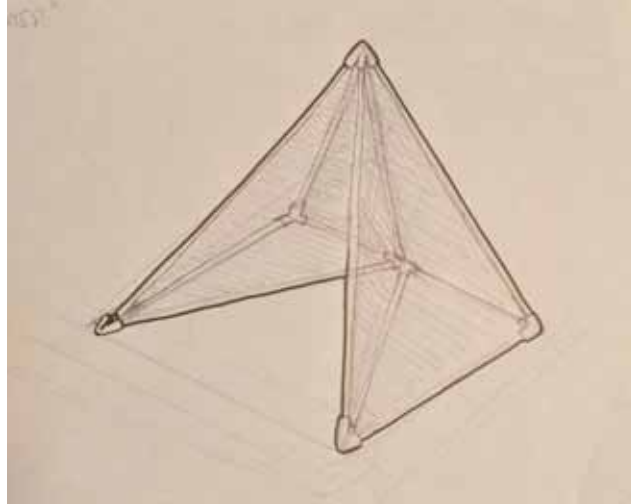
College is a stressful environment. You have to make the grade, make friends, juggle responsibilities and *“the rest of your life is just around the corner”*.

*We need spaces for meditation so students can practice mindfulness and get away from stress.*

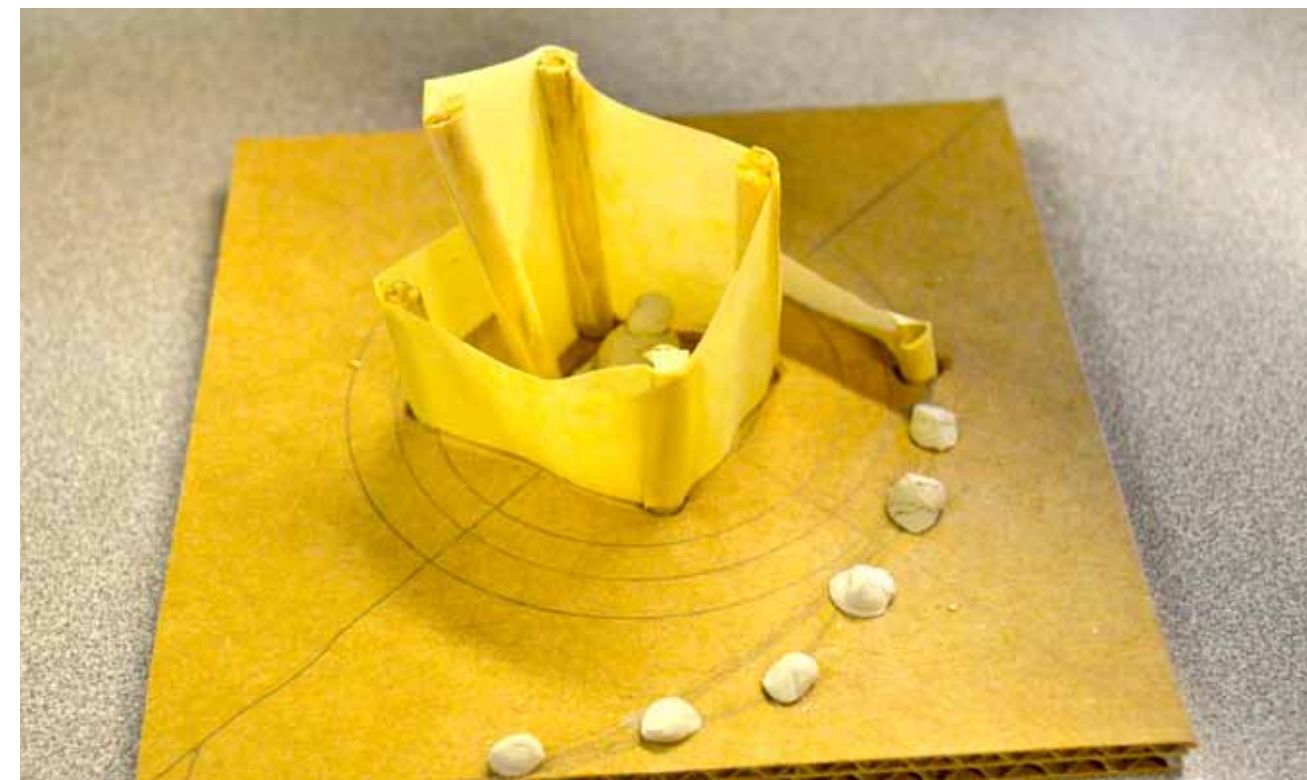




*The initial idea was to use a mixture of screen and wood to create a space that was intimate yet public.*



*The ideation process involved drawings and scale models to get the idea across to our peers for critique.*

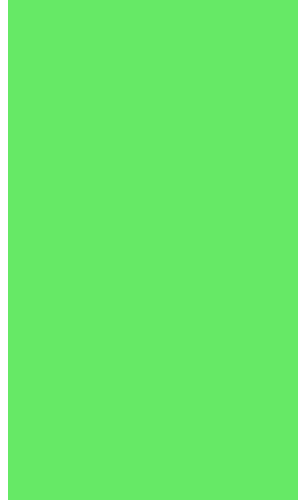




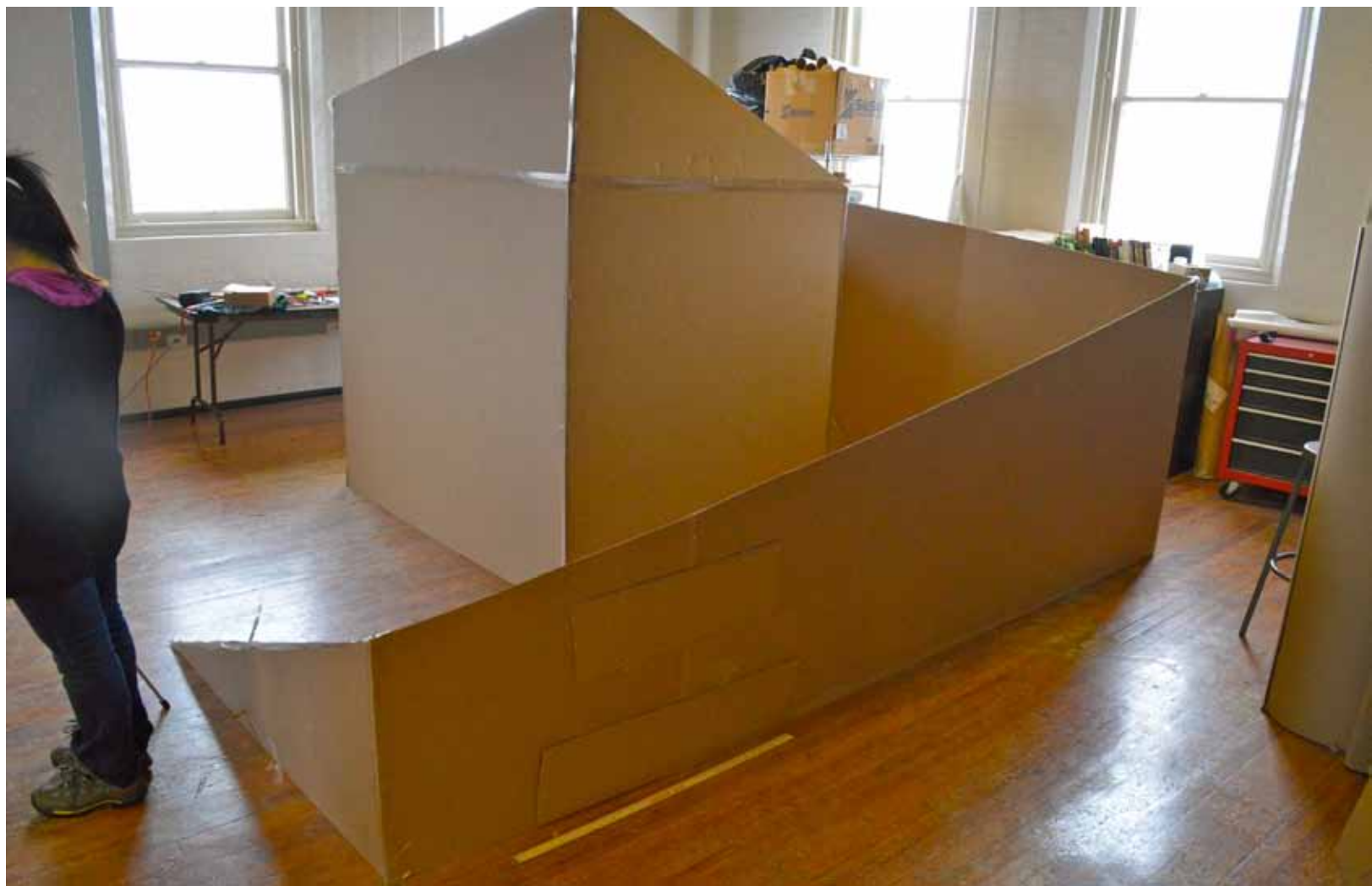
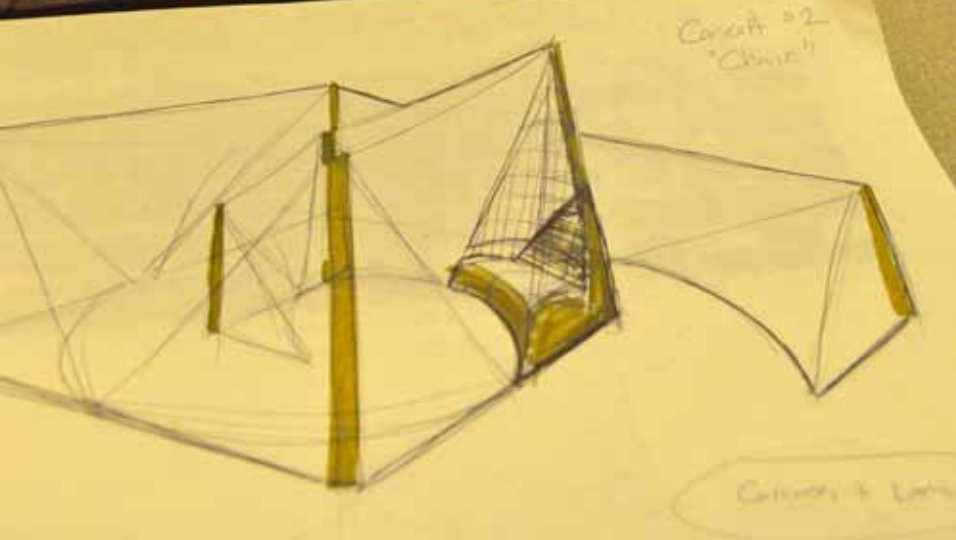
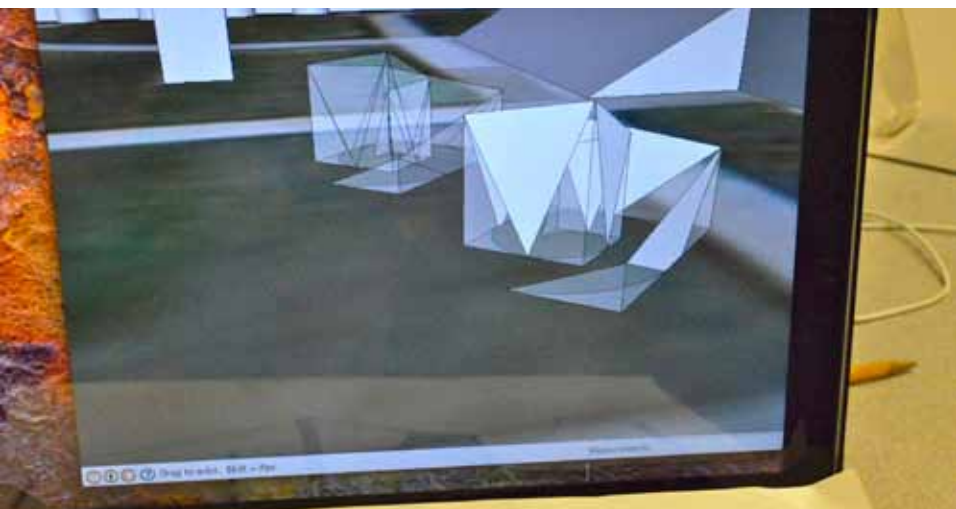
*Going full scale gave us a sense of what the real experience inside this habitat would be.*



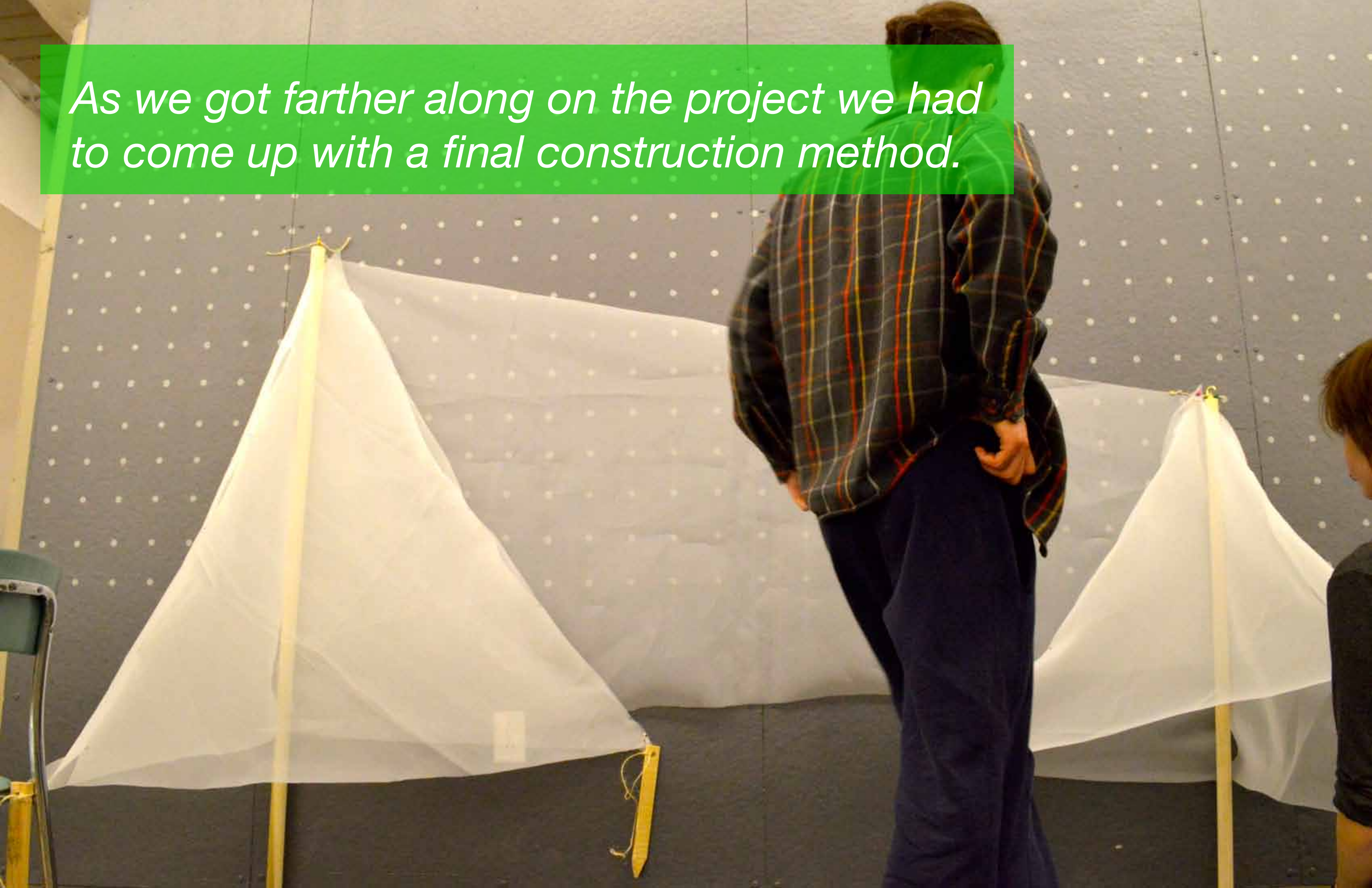


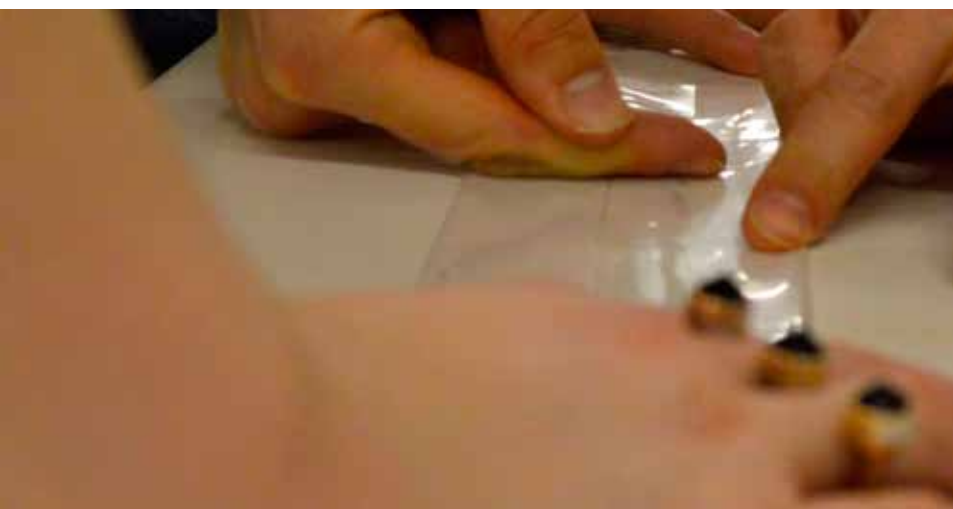


*We had to figure out our size, our components and where the user would meditate.*



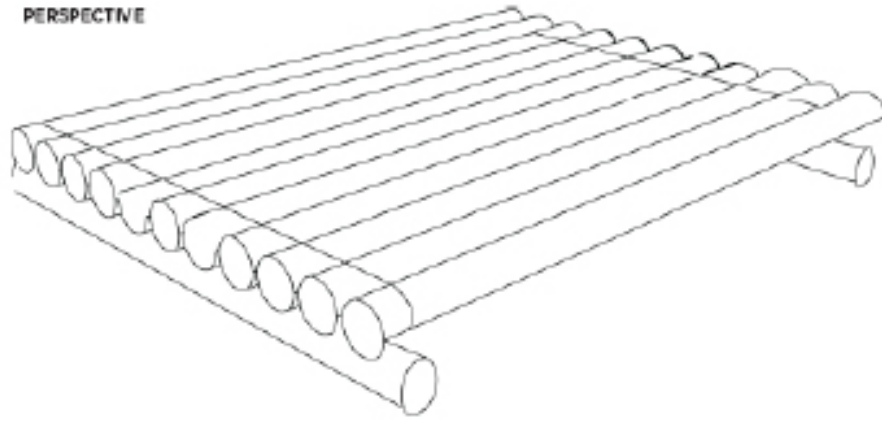
*As we got farther along on the project we had to come up with a final construction method.*



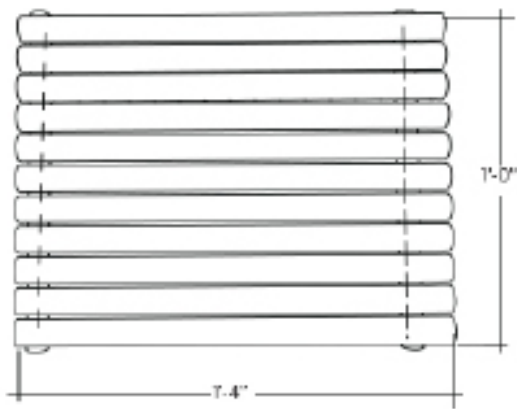


We found that using natural bamboo and keeping it simple would be the best design

PERSPECTIVE



VIEW FROM ABOVE

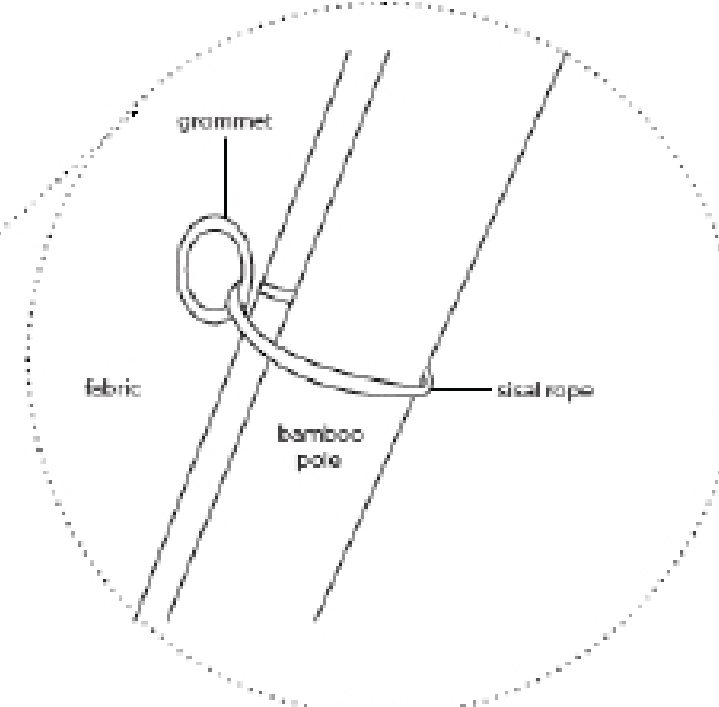
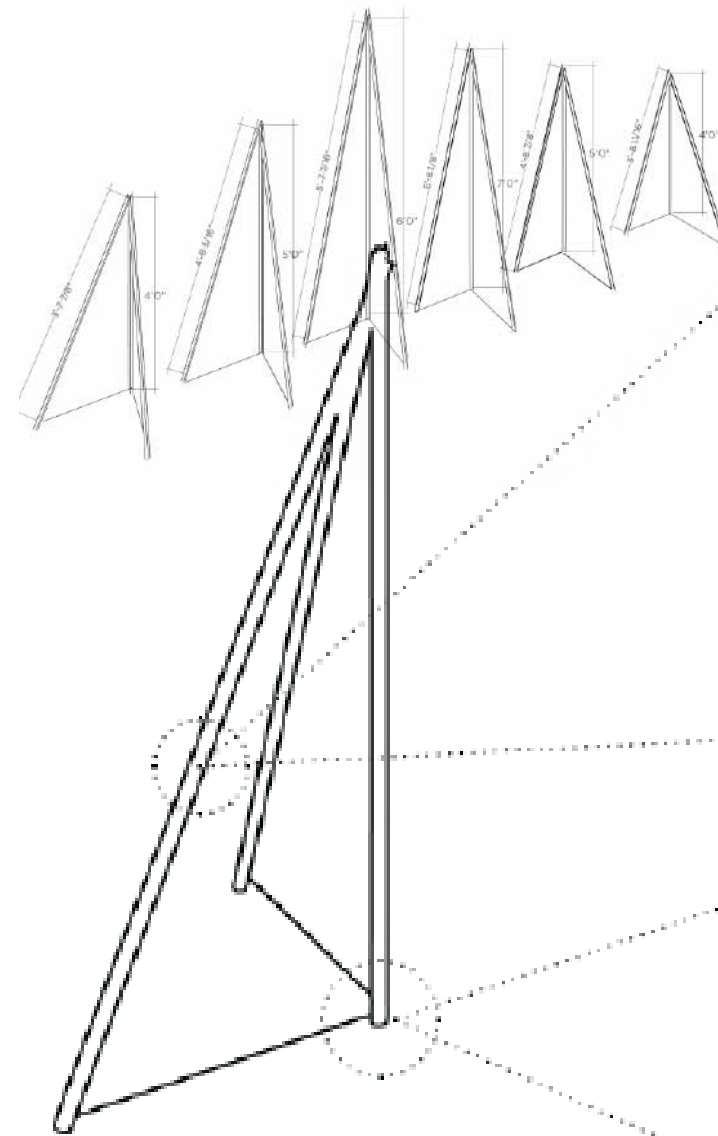


VIEW FROM BELOW

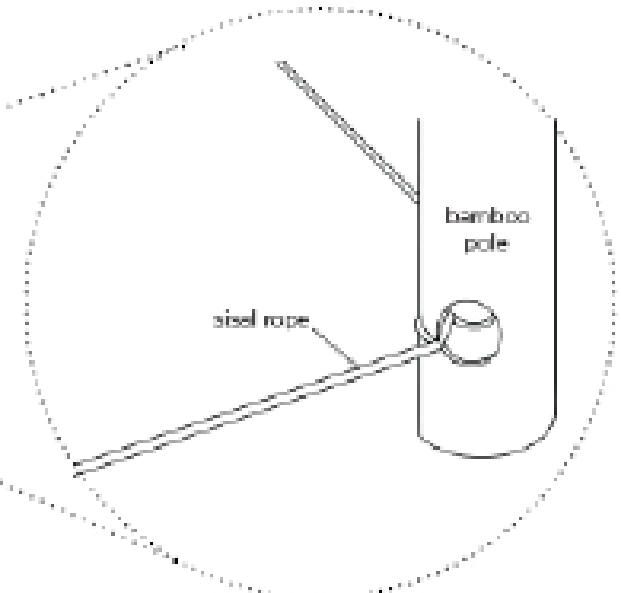


**CHAIR SPECS**

The platform seat, located in the center of our structure, is designed to be held off the ground by 2 inches. This will preserve the grass located underneath. The seat will be made out of bamboo poles lashed together with sisal rope, similar to the floor structure from last year's Framing the Sky method of installation.



**FABRIC ATTACHMENTS**  
Reinforced metal grommets will be applied to material, and sisal rope will be used to wrap through and around bamboo poles. A secure knot will hold this in place.



**ROPE ATTACHMENTS**  
A hole will be drilled into the base of each bamboo pole. Sisal rope will then wrap through and be knotted securely. This will prevent the rope from slipping off, and will also provide a more seamless finish.

ATTACHMENT DETAILS

LOCATION | Clearing in front of Smith Hall



#### MATERIALS LIST

##### Armature

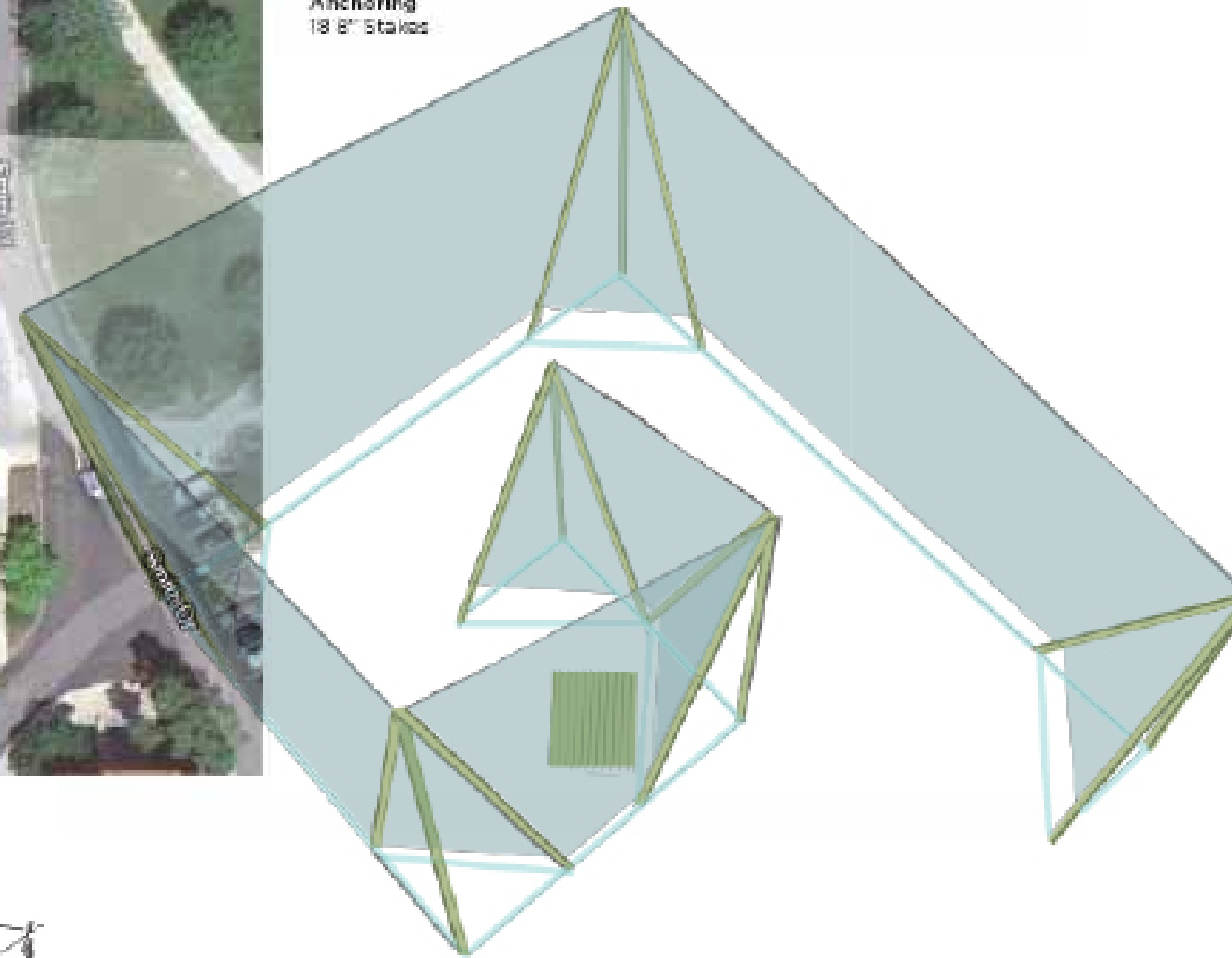
16 Bamboo Poles, cut to various lengths  
300' 3/8" Natural Sisal Rope  
2 cans White Montana Spray Paint

##### Fabric

200 sq Chameleon Scrim Material  
40 1/4" Metal Grommets  
3 spools polyester thread

##### Anchoring

18 8" Stakes



#### ASSEMBLY PROCEDURE:

##### 1. Armature

The six bamboo tripods are connected with sisal rope in order to space out the plan accordingly. The tripods pieces are crucial to the overall structure of the piece, and are driven into the ground with stakes at each corner. The top intersection of each tripod is lashed securely with sisal rope.

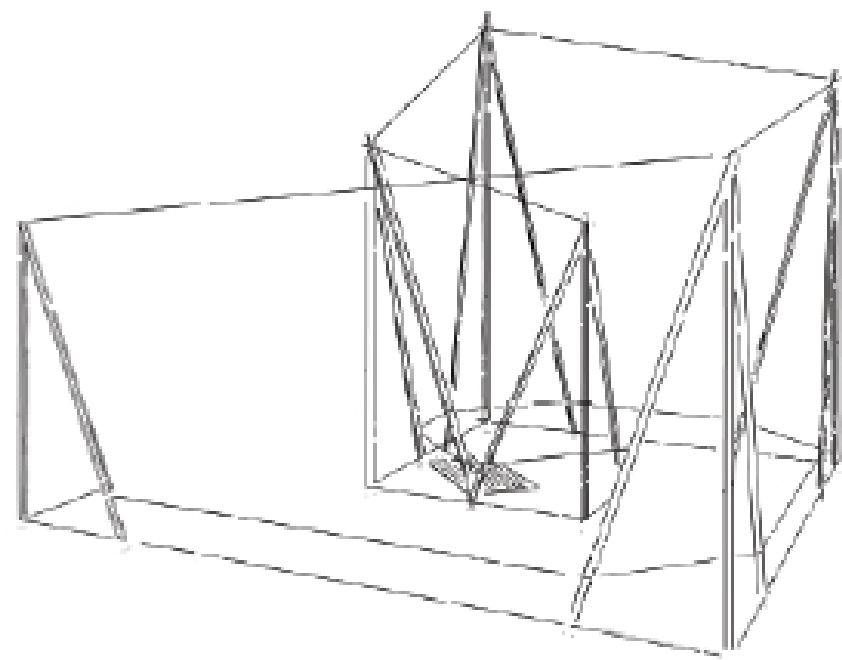
Set up the middle tripod first, taking care to extend the front side of the frame and making sure the rope holding the pieces at the bottom is taught. This will ensure that the tripod is forming a 90 degree angle. Next, move on to the next tripod, following the same instructions. More specific instructions on setup angles can be found on the next page.

##### 2. Fabric\*

The fabric will be pre-cut in one piece with grommets already in place. Using these grommets and 5" pieces of natural sisal rope, secure the fabric to the bamboo poles by tying the rope through the grommets and knotting securely. Each piece of fabric is elevated 6" from the ground in an attempt to keep it relatively clean.

\*Fabric material is not finalized yet.

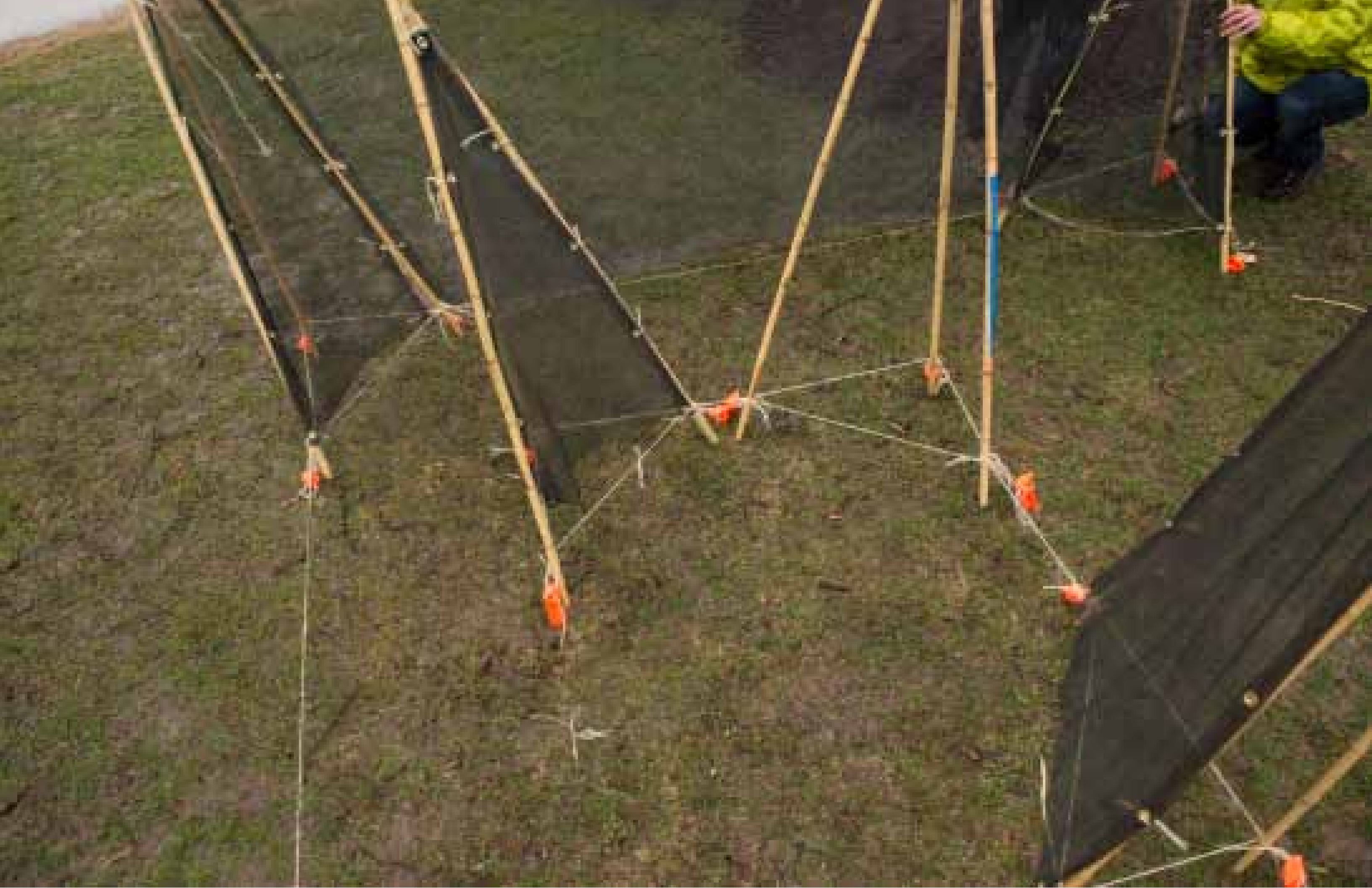
#### MATERIAL KEY



The final design was approved and we then built our habitat.



Our installation was a great test. We experienced what it would be like installing during rainy and windy conditions which helped us understand the reality of our system in mud.



The final product was built as a team and set up during the week before spring finals.  
Students became engaged and used the habitat in both night and day time.







Thank you for your time.