DESIGN DOCU MENTATION

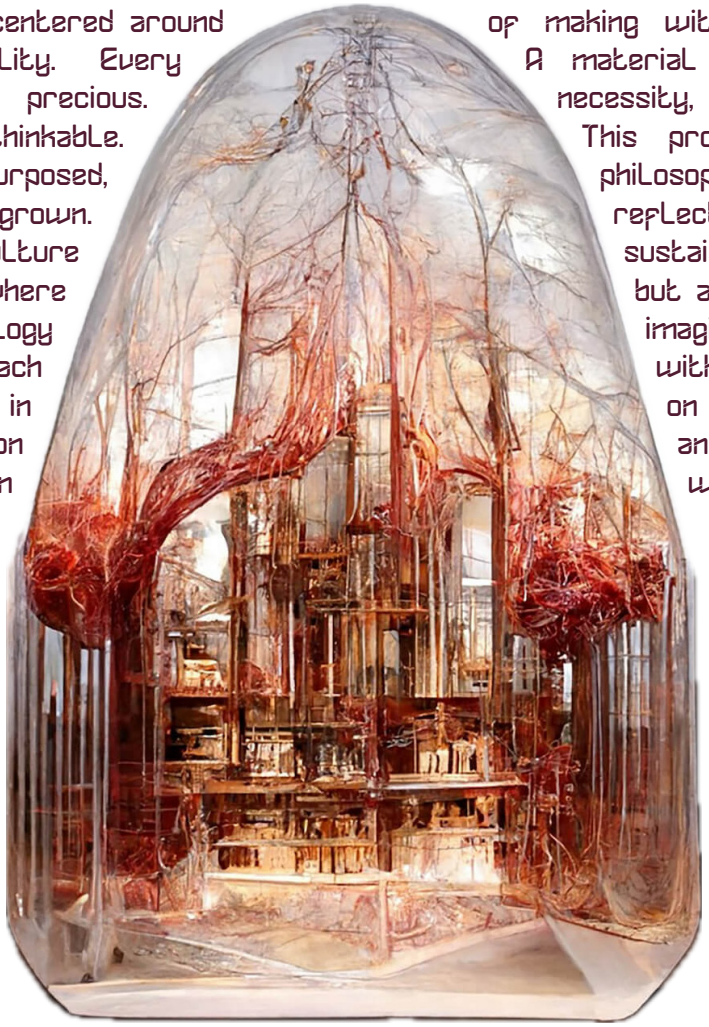
Project Background:

The Design I am presenting to you is the result of extensive research and development of a textile collection consiting of more than 30 biomaterial-felt hybrid textiles. My final design showcases one of the most promising textiles developed the "BioFelt". The concept story, the concept board and the color concept apply to the entire textile collection of which the material and design I am presenting to you is a part.

CONCEPT STORY

The project's goal was to create a textile collection made from completely new and unique biomaterial-felt hybrids made from 100% natural, renewable and biodegradable components. To tie all materials into one cohesive collection and give them as well as my final design a context I came up with a Sci-Fi concept framework.

In humanity's era of space exploration, Jupiter's volcanic moon Io was once seen as the next frontier. Through advanced terraforming, the once-barren world—blanketed in sulfur and wracked by extreme radiation—began to show signs of life. Protected within vast domes, a small human colony thrived, pushing the boundaries of survival in one of the most hostile environments ever inhabited. But then, Io was abandoned. The settlers left behind had no choice but to adapt. Cut off from Earth's supply chains, they built a way of life centered around complete sustainability. Every resource became precious. Waste was unthinkable. Materials were repurposed, repaired, and grown. Over time, a new culture emerged—one where nature and technology no longer opposed each other, but coexisted in symbiosis. Innovation became rooted in necessity and deep respect for the environment. Inhabitants cultivated their own biomaterials, adapted ancient making techniques, and redefined what textiles could be. Rather than recreating the familiar, Symbiosis asks: what would textiles become if shaped by Io itself? In a world where survival depends on ingenuity, materials evolve from what nature offers. Felting—primitive, tactile, resilient—becomes the anchor, around it, new matter grows. Crafted with intention and constraint, my design reflects a deeper ethos: one of making with, not taking from. A material language rooted in necessity, but driven by care. This project embodies that philosophy. Each textile reflects a future where sustainability is not an option, but a condition for life. It imagines a new relationship with matter—one built on empathy, ingenuity, and collaboration with nature itself.



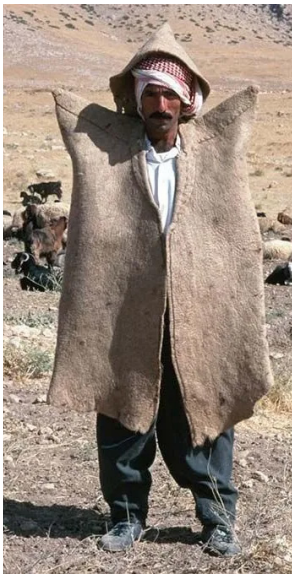
CONCEPT BOARD

DESIGN INSPIRATION

Traditional clothing of central asian nomads

Living a nomadic lifestyle in the mountenous central asian landscape means you need clothing that is functional and protects. The people of central asia have found ways to make protective garments out of 100% natural materials, which is why their clothing was an important inspiration for me.

Mongolian Deel
Coat with overlap in the front and clasp side closure



Protective Kapenek
with stiff and oversized elements

Protective reinforcements in hunter's clothing

Protective features in nature

My design should be functional, protective and because my textile is made in collaboration with nature so should the design be. Which is why I was in uenced by protective features found it nature.

Cicada Exo-skel-eton

Armored Pangolin

Turtle shell

COLOR CONCEPT

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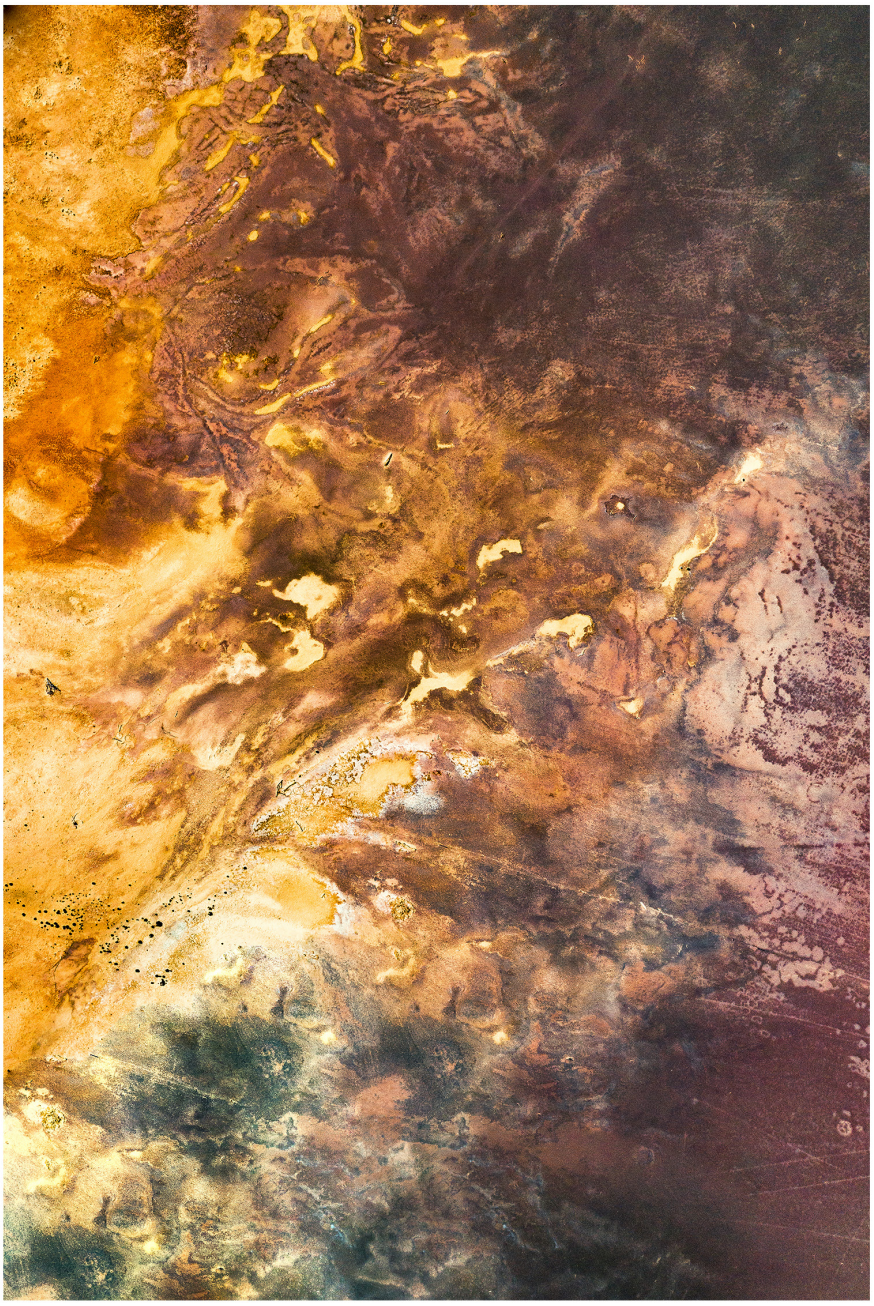

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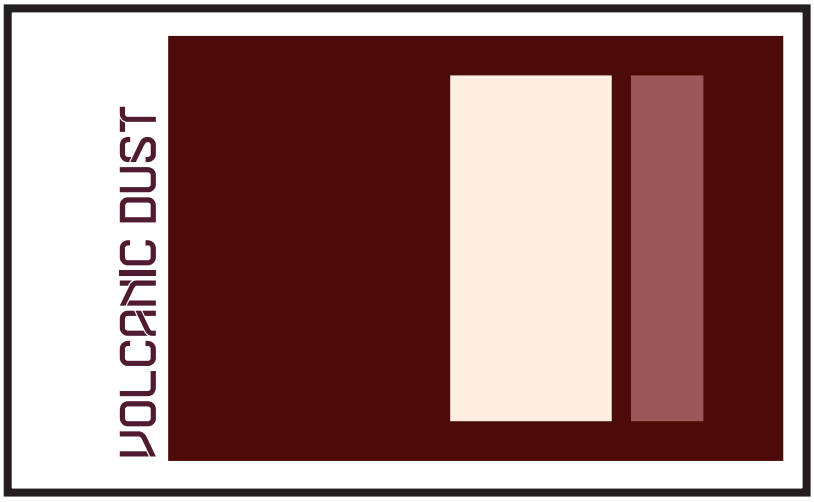
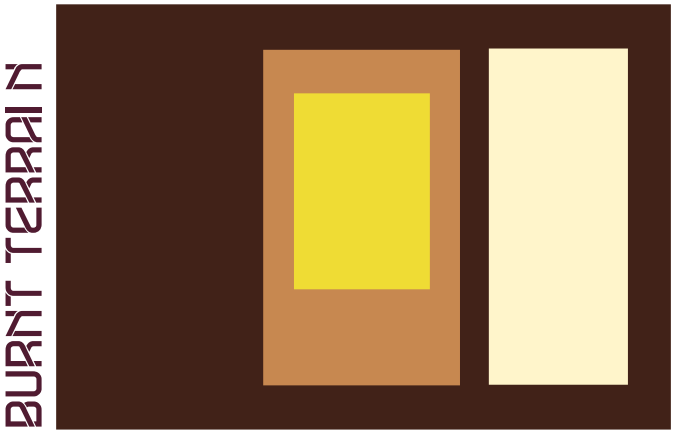
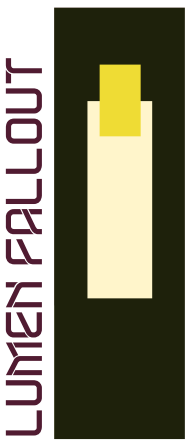
COLOR KEYS

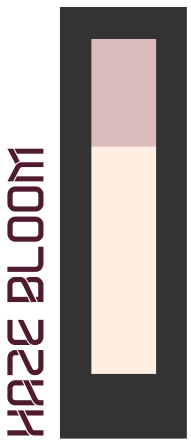
- 01 Purple Slate
- 02 Cracked Mantle
- 03 Oxidized Clay
- 04 Sandstone
- 05Flarefield Orange
- 06 Sulfur Bloom
- 07 Hazy Cream
- 08Terraform Moss
- 09 Toxic Canopy
- 10 Muted Sage
- 11 Crater Pool
- 12 Void Blue
- 13 Rose Veil
- 14Dusty Orchid
- 15 Dusty Pink



Chosen colorkey for my design







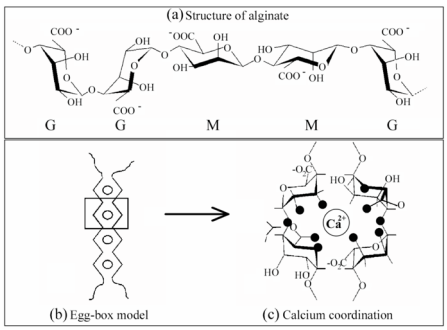
MATERIAL SPECIFICATIONS

BIOMATERIAL

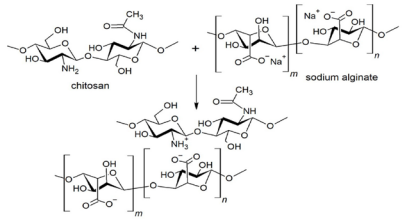
After developing and testing many variations in ingredients aswell as different ways to make the biomaterial I Landed on the below recipe and fabrication instructions.

INGREDIENTS:
CrossLinkers: 10% CaLcium ChLoride in demineraLized water, 1% TPP in demineraLized water
MateriaLs for 10cm x 10cmbiomateriaL: 1.25g (1.75%) Sodium ALginate, 1.25g (1.75%) Chitosan, 3.39g (4.75%) FiLLer materiaL, 3.39g (4.75%) Coconut oiL, 6.42g (9%) gLycerin, 55.71mL (78%) demineraLized water

FABRICATION INSTRUCTIONS:
1.Roughen up surface of feLt for better adhesion. Tape down feLt onto a nonstick surface with double-sided tape.
2.Make 4.5% ALginate soLution. Add ALginate into demineraLized water whiLe stirring. After aLL ALginate is added, bLend until no Lumps are visibLe. Let ALginate dissoLve overnight until air bubbLes disappear.
3. Make a 4% Chitosan SoLution in 1% Acidic Acid (chitosan onLy dissoLves in acidic environments). GraduaLLy add Chitosan to the water whiLe stirring. After aLL of the Chitosan is added, bLend for 2 minutes in 20-minute intervaLs until the Chitosan is fuLLy dissoLved.
4.Raise ph of the Chitosan soLution to a neutraL pH by sLowLy adding 20% Soda Carbonate soLution, whiLe bLending at high speed. Add a few mL, test pH and repeat. Aim for a pH between 6 and 6.5, make sure to not exceed pH 7.
5. Stir ALginate SoLution into Chitosan soLution and bLend until a homogenous mixture is achieved
6.Add Liquified (Coconut) OiL GLycerol and FiLLer and bLend until homogenous
7. Spread the mixture evenLy onto the feLt. Let air dry shorty until the surface is sLightLy tacky
8.Spray with CaLcium ChLoride soLution, Let rest for ca. 5 min. Soak up excess soLution with a paper a towel. Repeat with TPP soLution and then air dry.



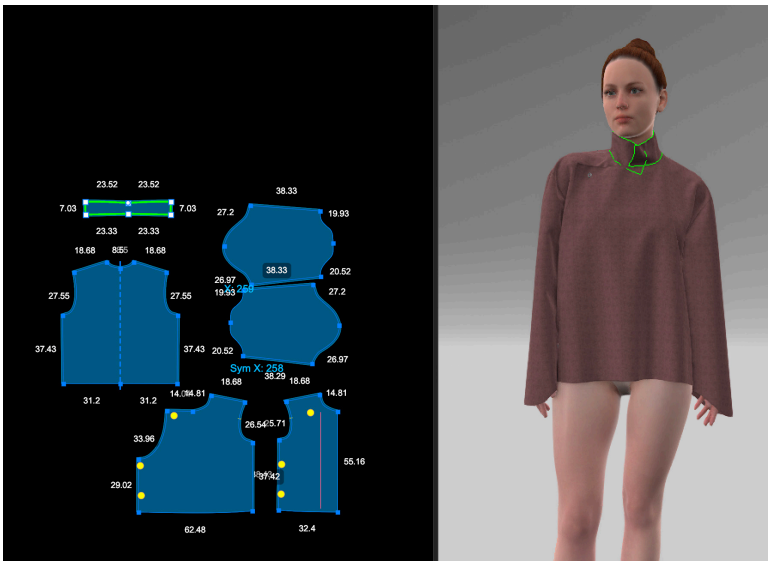
CaLcium ChLoride crossLinks aLginate into a stabLe geL.



ALginate is a negativeLy charged bio-poLymer derived from brown seaweed, Chitosan is a positiveLy charged bio-poLymer derived from crustaceans: when combined, they form a stabLe geL through ionic crossLinking, creating a cohesive poLymer matrix that dries into a stabLe biomateriaL.

MAKING OF THE GARMENT

Step 1: Making a 3D Mock-up and creating the pattern in V-Stitcher



Step 2: Laying out the wool

Two Layers of wool roving a Layed out perpenticullary to create the base. After that the bubble wrap resists (2 Layers of bubble wrap taped together) are placed on top and then covered with another 2 perpenticular Layers of wool roving. In the pictures you can see an example of how the Left front panel was made. The same method was used for the other panels. The right front panel with out 3D elements was felted with just two Layers of wool roving.

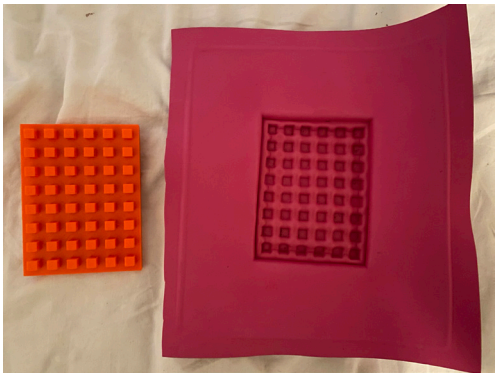
Step 3: Felting

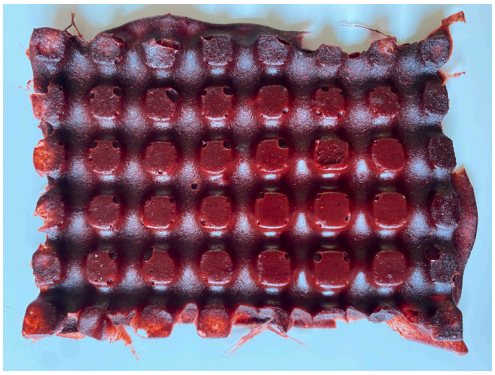
The wool is wetted with warm soapy water and covered with bubble wrap.Then pressure is applied by gently rubbing the bubble wrap surface. This felts the wool fibers together. Once the fibers form one cohesive wool sheet we have a pre-felt. The pre-felt is then rolled up and rolled hundred of times in each direction. This further felts the fibers together, creating a strong fabric. Lastly the felt pieces are thrown hardly on the ground, this step is called fulling and shrinks the felt and adds more strength

Step 4: Making of the biomaterial according to the fabrication instructions detailed before

As seen in the picture the biomaterial can be made using simple kitchen appliances, no special equipment necessary.

Step 5: Filling a mold with the Biomaterial to create 3D reinforcement





the mold is made by 3D-printing a resist that is then put into a vacuum former. The molded biomaterial is then placed on the sleeve panels. (In the prototype it is sewn to the sleeve before coating, the better option would have been to press the molded material into the biomaterial coat on the felt.

Step 6: Cutting out the patterns and coating the felt with biomaterial. Air dryeing

Before coating magnets are placed on the front panels, as closure system. That way the magnets are invisible in the final product

Step 7: Sewing the garment.

The sleeves and armholes are sewn by hand because it was not possivble to turn the panels inside out. The other seams are machine sewn.

Optional Step 8: Sealing the seams with another layer of biomaterial

The material can tear because of the many stitches, but it can be reinforced again by sealing the seams with biomaterial

DIFFERENT BIOFELTS WITH DIFFERENT FILLERS

Replacing the sandalwood powder with a different filler leads to a variety of BioFelts, each with their unique characteristics and handfeel. This demonstrates the versatility of BioFelt

BIOFELT V5 FROM LEFT TO RIGHT: SANDALWOOD, CHARCOAL, RECYCLED FIBER, OLIVE PITS&CRANBERRY, COFFEE, PISTACHIO, HIBISCUS, CLAY

Recycled fiber BioFelt

Another promising BioFelt, the fibers at extra strenght and the filler are recycled fibers from shredded waste garments/fabric