IMPERMANENT MYCOTECTURES

BIO-WELDING AS METHODOLOGY

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ARCHITECTURE THESIS

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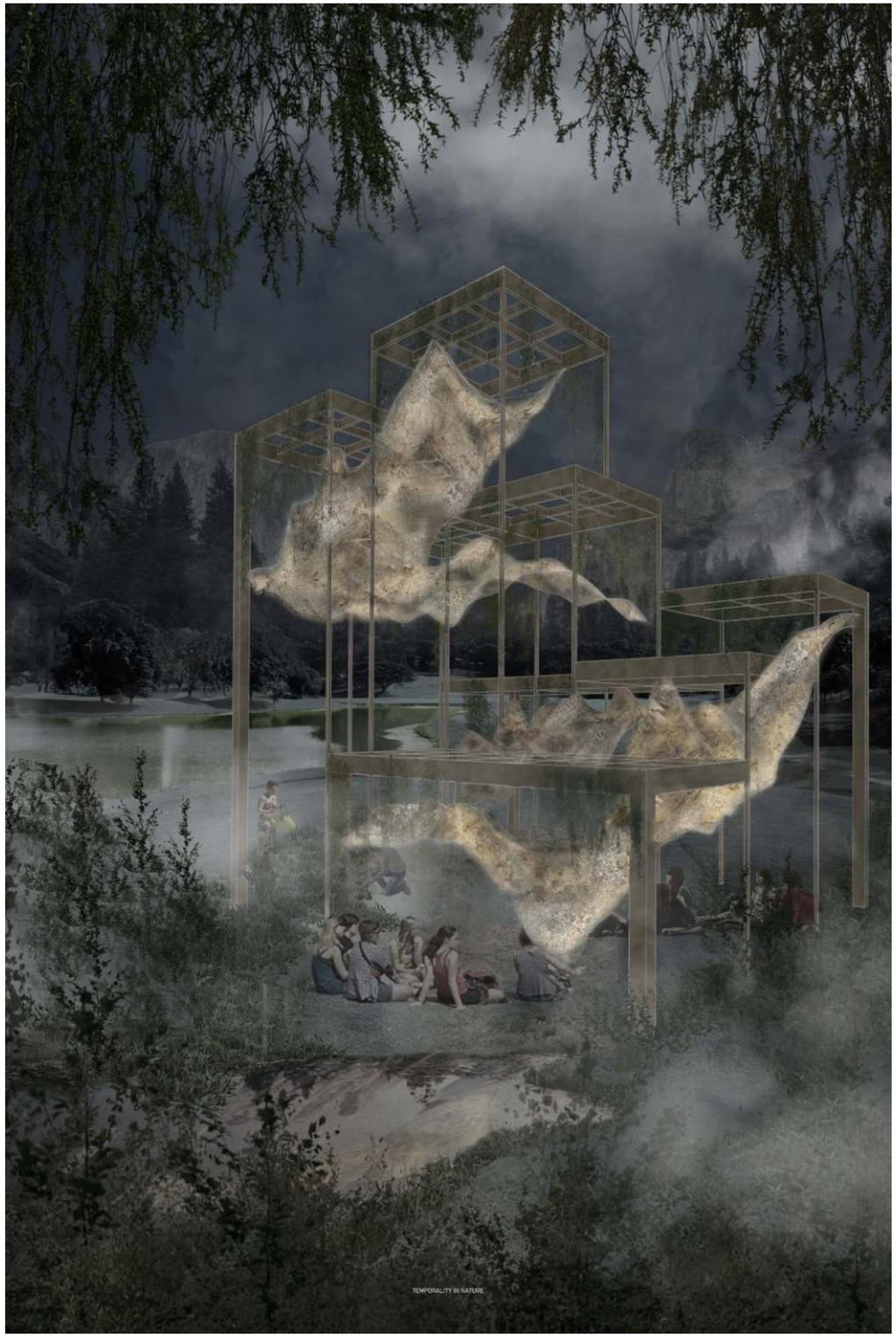
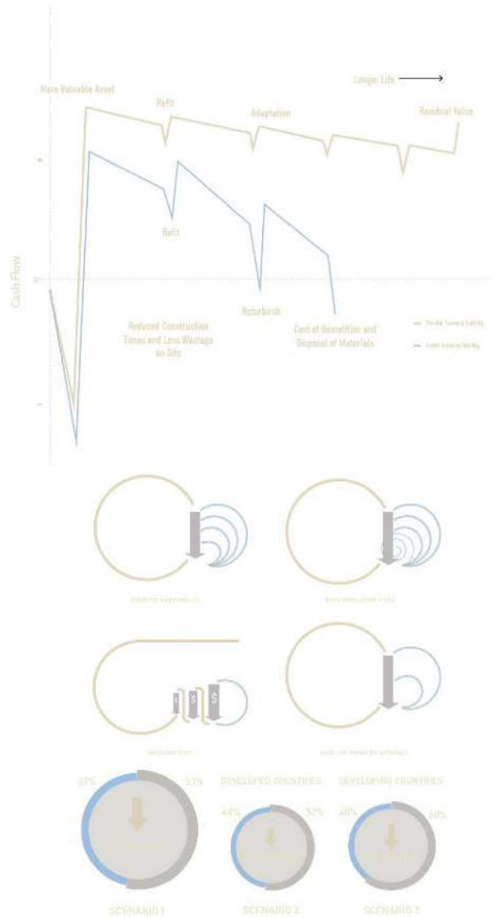


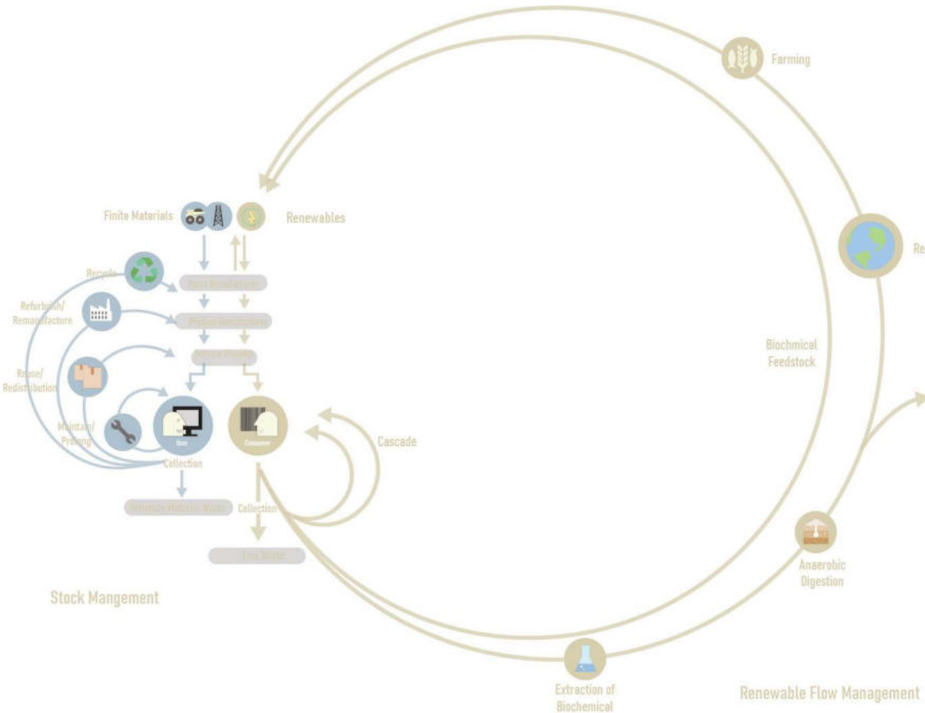
EMBRACING IMPERMANENCE

Everything is temporary. From the emotions we feel, the thoughts we conceive, people we see, down to the scenery that lies before us. This ephemerality produces an ominous perception of reality that cautions us about getting too attached to anything and everything around us. In the end, the only thing that is definite is change. Which is why we posit the need to shift our perception of the environments and spaces we construct to one that mimics the natural forces of nature. We need to think of life in terms of impermanence, which starts by investigating the very materials we use to construct the spaces we inhabit. Materials can produce a certain agency for buildings that completely obliterates the compulsion to produce timeless pieces.

CIRCULAR ECONOMIES

In an age where consumer culture has been driven by the linear economy or a make-take-use-waste mentality, climate change and detrimental effects to the building industry and our built environment have become the norm. The depletion of natural elements and resources has reached a point where we can no longer afford the luxury of remaining complacent in the severity of our massive carbon footprint. We need to reintroduce and revitalize bio-based materials, specifically Mycelium and biodegradable substrates into circular economies where zero waste is produced. Mycelium's potential bio-welding abilities to fuse with natural materials to create new building blocks, presents a new way of thinking in a zero-waste economy and longevity for non-recyclable building materials.





CIRCULAR ECONOMIES

Embracing the beauty in what is fleeting can allow us to recognize a shift in the way we think about circular economies. A similar trend is seen within consumer culture and rather than trying to fight against this force, we can galvanize an age of perpetual change whether that implies an alteration of scenery, material, spaces, etc. Constant change witnessed in today's consumer culture should not be scrutinized as a negative social construct, but rather embraced as an innate form of nature; a perfect example is evolution. Change exists everywhere and it is in our nature to adapt.

BUILDING WITH LIVING ORGANISMS

We are currently witnessing the fourth industrial revolution in which we turn towards investigating the construc-tional potential of living organisms. The scope of our research on harnessing mycelum's bio-welding properties aims to explore natural solutions towards surecting temporal environments. In our latest research, we have been focusing on the binding properties of fungal mycelium and developing differ-ent methods of fabrication for bringing about a flexibility within the material.

WHAT IS MYCELIUM?

Fungi in nature performs as a decomposer. It grows on dead organic matter, disassembles and recycles back to the environment. Mycelium, in particular, is the vegetative tissue of the fungus, the apparatus through which fungi absorbs nutrients. It can be found in large quantities around the world as it easily colonizes soil and various substrates, performing as a glue that binds natural particles together.

Mycelium technology has a lot to offer in the world of construction and form making. The advantages of using mycelium include that it is 100% biodegradable, insulative ; trapping more heat than fiberglass insulation, fireproof, nontoxic, partly mold and water resistant, and stronger pound for pound than concrete. Additionally, when the material is dried, we found that it can become extremely lightweight. It also grows quite rapidly, approximately 2 weeks to grow from pre-inoculation state.



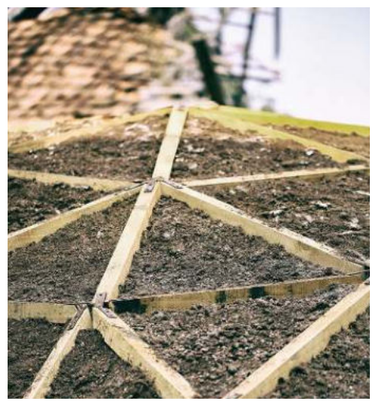





CASE STUDY : PACKAGING

CASE STUDY : THE GROWING PAVILION

CASE STUDY : MYCOTREE



CASE STUDY : PAVILION

CASE STUDY : MYCOTEX

DESIGN: ANGELA HOITINK

MODEL: MYCELIUM ON CHEESECLOTH

MODEL : SUSPENDED MYCOFABRIC

MODEL: MYCELIUM ON CHEESECLOTH

HOW IS MYCELIUM GROWN?

ESSENTIALS

1. Flour
2. Water
3. Clips or Tape
4. Disposable Gloves
5. Mixing Bowl
6. Isopropyl [Rubbing Alcohol]

STEP 1: ACTIVATE THE MYCELIUM

Thoroughly clean hands, tools, and work environment before opening the bag of dry mycelium material just below the seal. Mix x tablespoons of flour with x cups of distilled water, and pour into the bag of dry material. Shake the closed bag for at least one minute to get everything covered in flour and water. Once done, it is crucial to leave the filter pathc uncovered to allow air exchange, and seal the bag with tape or clips.

STEP 1 : ACTIVATE THE MYCELIUM

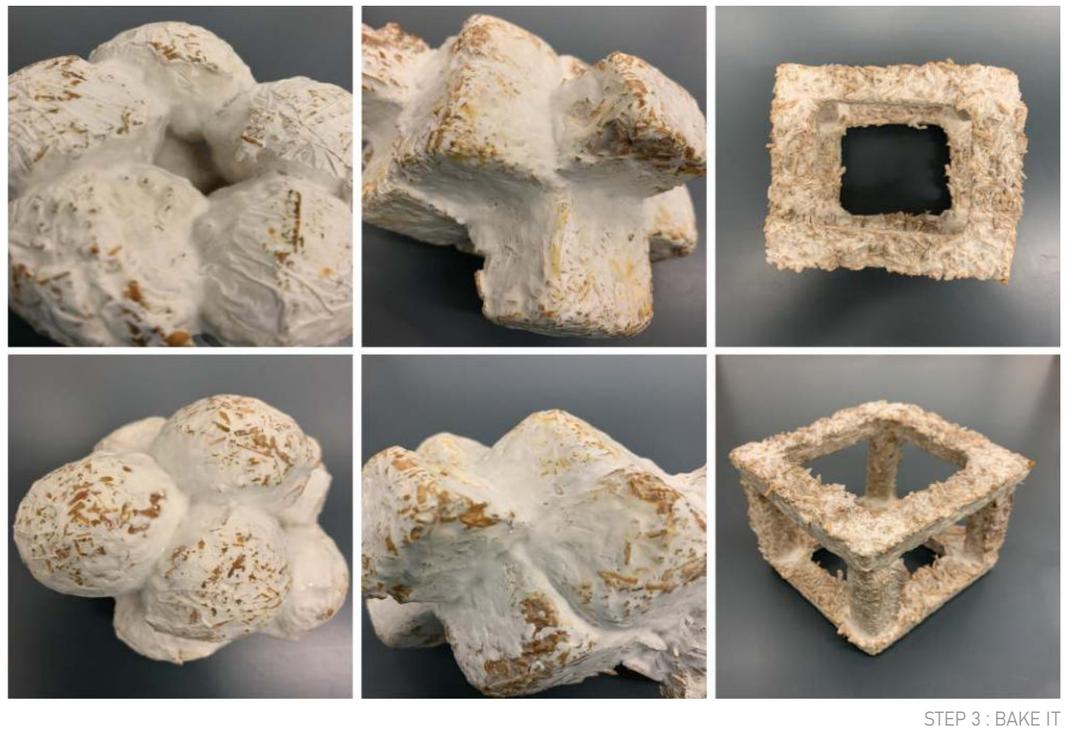
STEP 2: MAKE IT

Sterilize gloves and mixing bowl with rubbing alcohol. After both have dried, open the bag of completely white mycelium material and crumble particles until all the white spores disappear. Add x tablespoons of flour and mix for one minute. sanitize growing container with rubbing alcohol and pack it with material. Cover with lid or plastic wrap with holes.

STEP 3: BAKE IT

Remove growing material from container. Place it in a well ventilated area. Let dry in open air for 1-2 days. Once dried, preheat oven to 200°F. Place in oven for 30 minutes then let cool. Creation will weigh 35% of its original weight when dried.

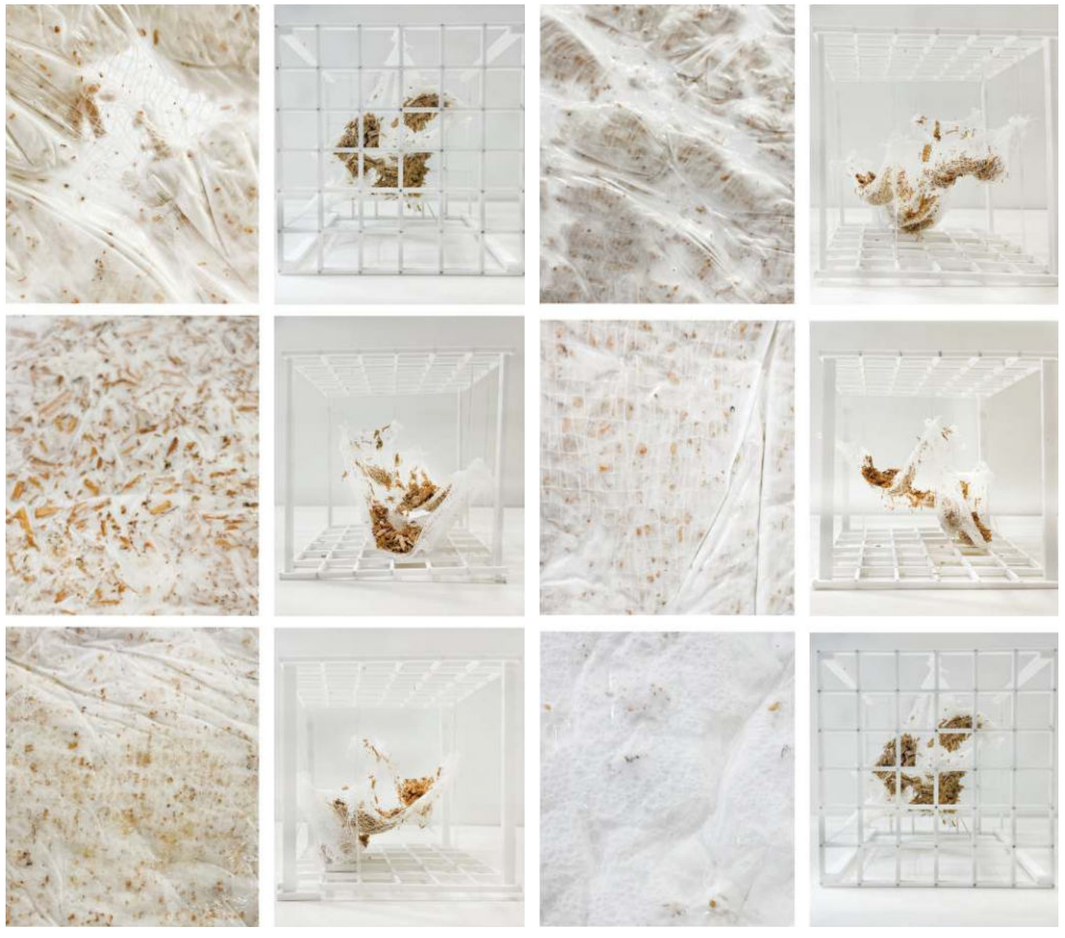
STEP 2 : MAKE IT



STEP 3 : BAKE IT

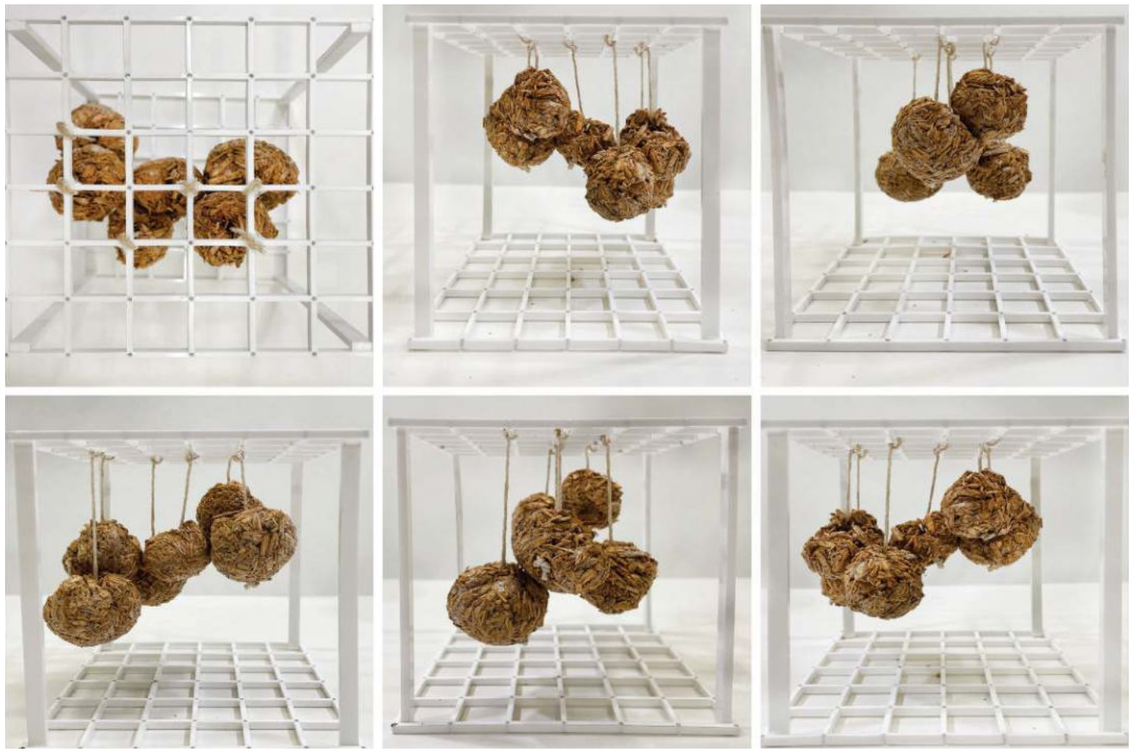
1ST METHODOLOGY
BIO-WELDING ON FABRIC

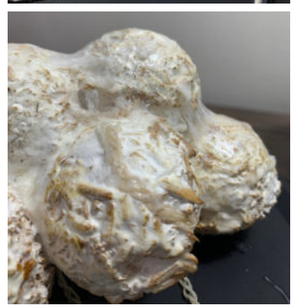
Our first fabrication process takes inspiration from Anoni Gaudi's chain model to produce catenary curves with the aid of cables to orchestrate points for the curves to perform in tension. We found that in order to grow mycelium on fabric, we had to use a substrate such as cheesecloth that the mycelium could use as feed. In this scenario, mycelium bio-welds to the cloth and after blooming, we bio-welded swatches of these sheets with the help of hemp string to stitch the pieces together. Once we had the whole sheet, we suspended the mycelium fabric at various points to construct the form, which has been dried out and hardened into a shell.

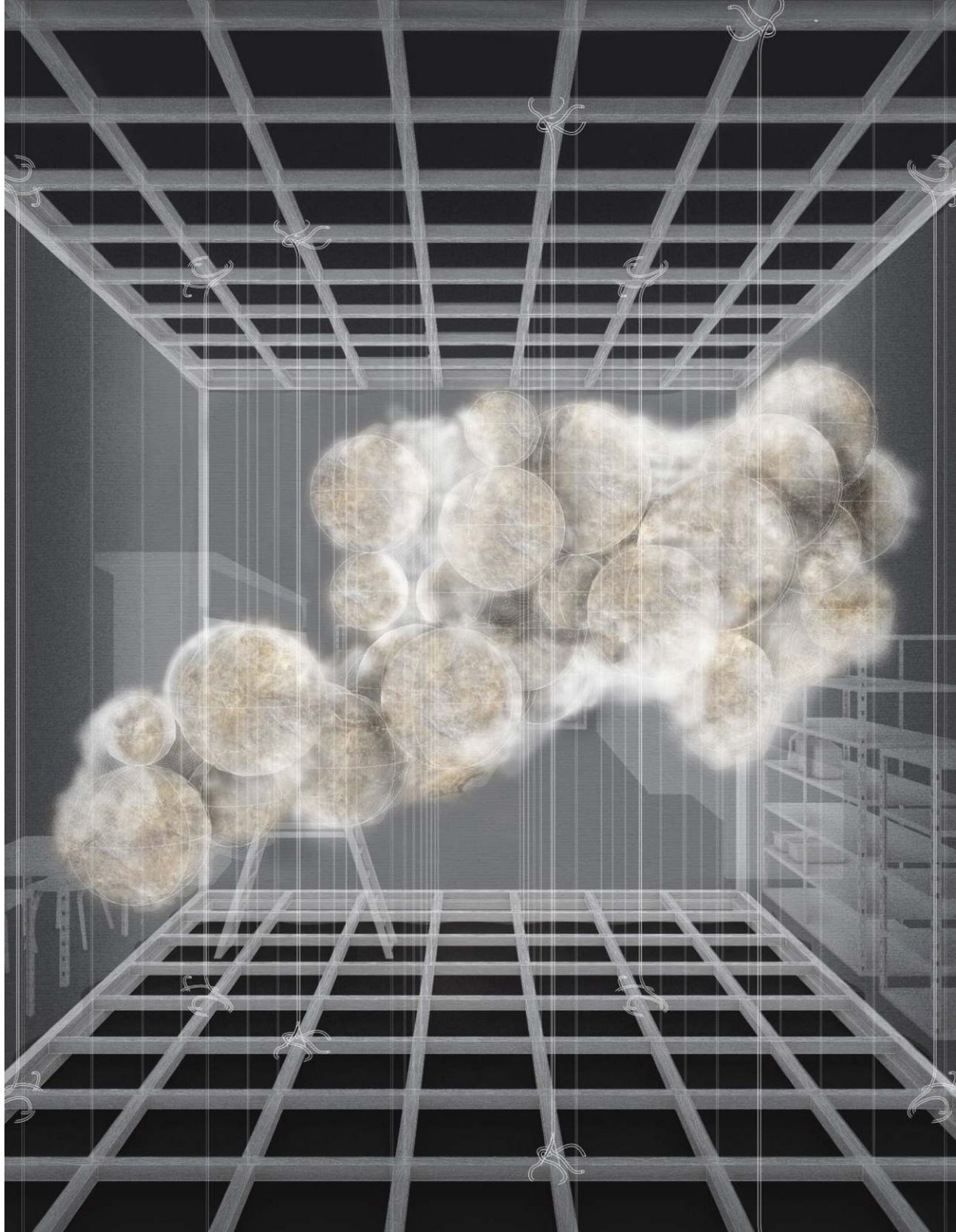


2ND METHODOLOGY
BIO-WELDING THROUGH PROXMITY

Our second fabrication process explores bio-welding through proximity. In this case, we had mycelium masses bio-welding with itself. We placed two pieces in contact with one another and after three days, we started witnessing the masses binding with one another when the mycelium's hair-like structure called hyphae, began to grow.

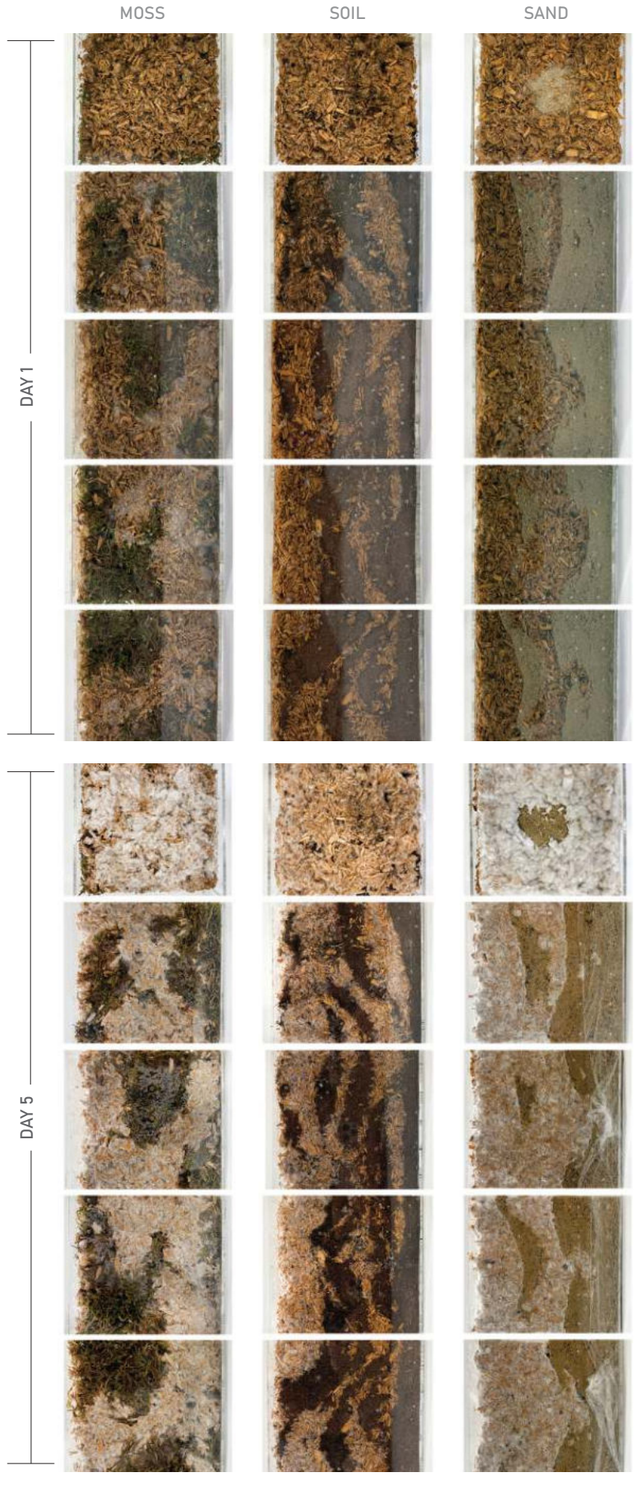






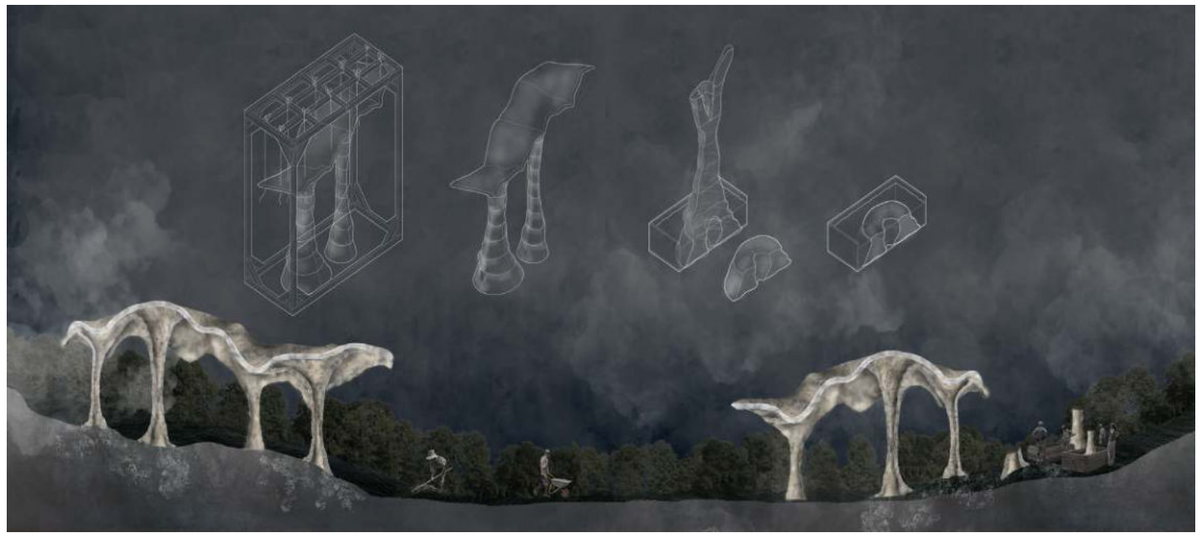
3RD METHODOLOGY
GROWN IN SUBNATURES

Our third fabrication process challenges the limitations of the materials. We had mycelium growing in organic subnatures, as organic molds. This produced promising forms, however, it also compromises the lifespan of the mycelium since when in contact with the ground or subnature, mycelium may start to decompose at a much faster rate [approximately 6 weeks] than if it were maintained in favorable and stable conditions [having a lifespan of approximately 20 years]. In essence, mycelium will behave like untreated softwood, meaning it will stay strong whilst inside but start decaying when overly exposed to changing weather conditions.


MOSS
SOIL
SAND
DAY 1
DAY 5

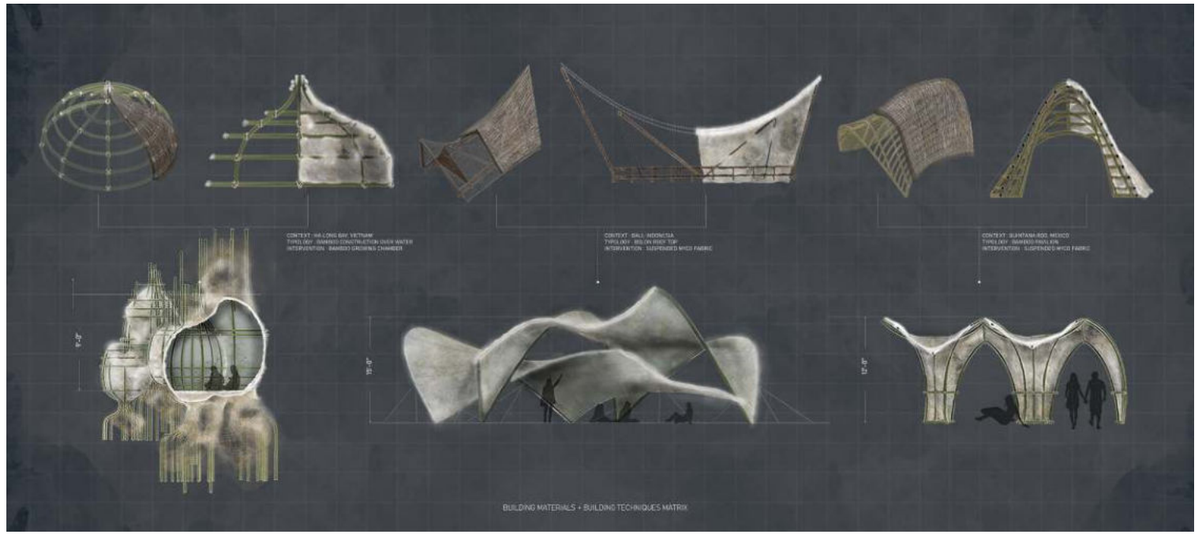
IMPERMANENT MYCOTECTURES FOSTER ECOTOURISM

World Heritage sites are known to be landmarks with legal protection administered by the United Nations Educational, Scientific and Cultural Organization. Each UNESCO declared World Heritage Site is designated for having cultural, historical and scientific significance and containing high value to humanity. Selected World Heritage UNESCO sites include sites along the equator in what we designate as mycelium zones, paving way for temporary and decomposable architecture. Each site has optimal conditions for mycelium to thrive in. These locations range from rice terracing, coastal areas, cenotes and national parks including rainforests which establish a symbiotic relationship with the mycelium as it grows in the landscape.

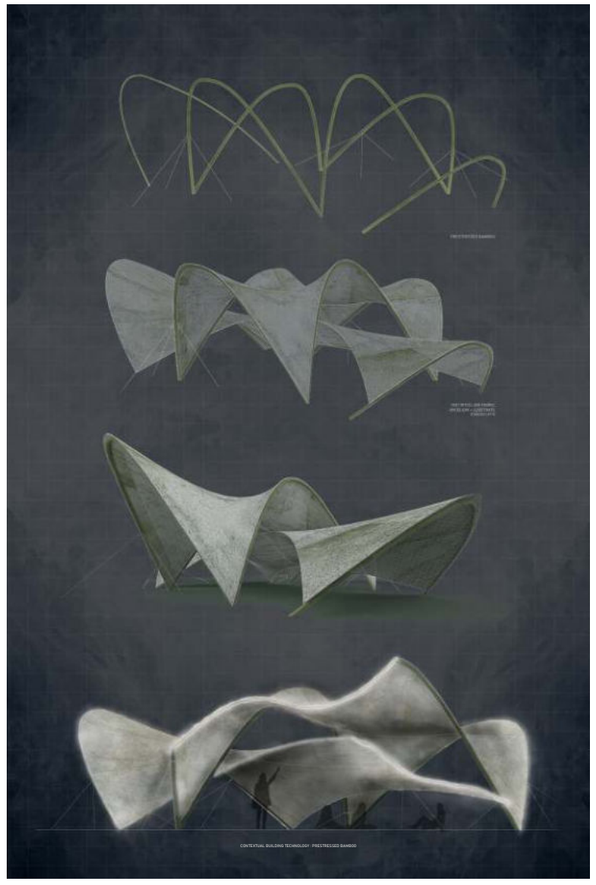


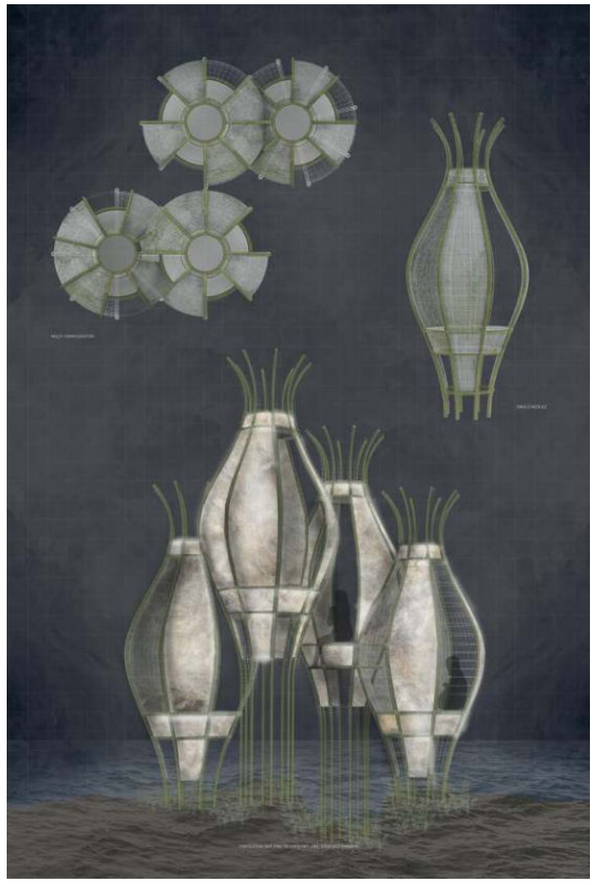
IMPERMANENT MYCOTECTURES FOSTER ECOTOURISM

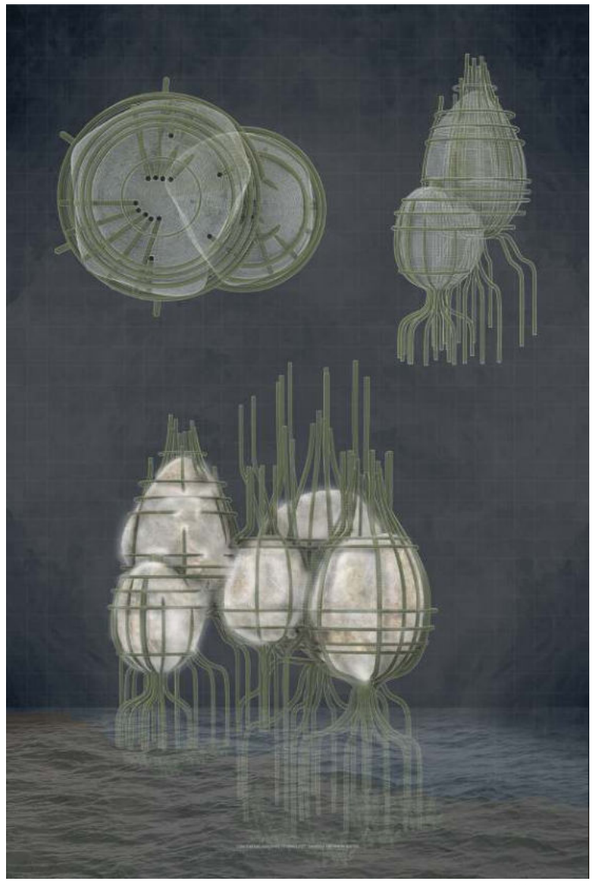
What yearns for mycelium's properties as a biodegradable material is its potential for performing as temporal structures within World Heritage UNESCO sites to restore $2 trillion loss as a result of COVID19 this past year. Cities whose economies heavily depend on tourism are looking to restore travel and build a case for building temporary structures to reduce the massive carbon footprint. Building mycelium structures as a proposal gives new sustainable opportunities to lessen carbon footprints on World Heritage UNESCO sites. In addition, these impermanent mycotectures would be grown using local building materials and local building techniques, which construct a participatory experience as well as a much more sustainable way of thinking about tourism in protected regions.



LOCAL BUILDING TECHNIQUES







TYPOLOGIES

BIO-WELDING BIO-COMPOSITES TO GROWN STRUCTURES [BAMBOO]

BIOFABRICATION

Ultimately, this revolution in biofabrication stands to alter the way we manufacture, consume, and live. Our world is an ecosystem maintained by self-assembling organisms that are constantly evolving. Now we must learn from them to pilot, rehabilitate, and reconstruct our conventional fabrication processes and material palette. Biological technology is the strongest technology we currently have and with an orchestrated method of harnessing this knowledge, we can utilize it to live in symbiosis with our environment.

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