CONTAMINATED MYCOSCAPES

designing with living organisms

CONTAMINATED MYCOSCAPES

Maria Gutierrez & Elise Zilius

Syracuse University School of Architecture

Advisory Group:
Dissimulating and Disheveling Matter

Advisors:
Jean-Francois Bedard
Britt Eversole
Roger Hubeli
Julie Larsen

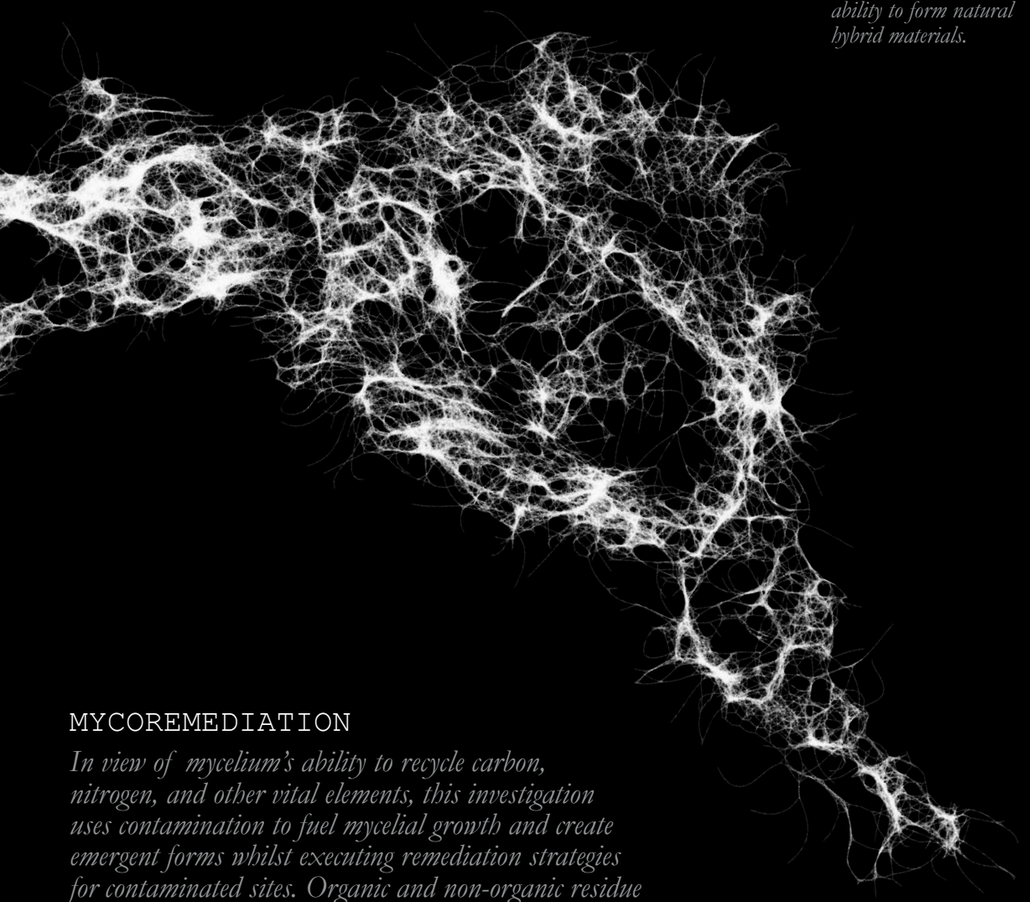
The Anthropocene has stripped the planet of its resources, leaving behind an abundance of contamination. The built environment no longer meets the standards set by our turbulent planet. Humankind has lost the privilege of agency in design and construction. Construction methods have failed to evolve concurrently to the intense accumulation of waste; remaining firmly rooted in the materiality of the past, they have upheld architectural notions of stagnancy, cleanliness, and hygiene and ignore the rapidly changing conditions of the environment. This investigation uses contamination to fuel mycelial growth and construct emergent forms whilst executing remediation strategies for polluted sites of wildfires, oil spills, and landfills.

Environmental contamination and destruction will now serve a material purpose in architecture, redefining the concept of 'waste' as 'resource'. Harnessing mycelium's digestive power to decompose toxic waste and pollutants, this design investigation presents a new method of construction that accounts for an evolution of growth and decay, allowing natural processes to determine the form, material, and aesthetic of the built environment. Spreading across a landscape from inoculated nodes, mycelial growth forms a network over the contaminated areas dictating its form in response to the substrate of each polluted area and the site's environmental conditions. The cyclical processes of growth and decay adapt to the changing site conditions of the polluted areas becoming substantially more resilient over time.

Employing nature's cyclical processes of growth and decay, this constantly evolving architecture will unseat humankind's stagnant ideas of space. Designing with living organisms restructures the deeply rooted hierarchy in architectural processes relegating man from sole decision-maker to indirect contributor. This ideological shift accepts its visual manifestation of mycelium as an aesthetic repugnance and defies the firmly established notions of hygiene and cleanliness so deeply rooted in the visual language of our society.

As environmental contamination continues to infiltrate every corner of the earth, the resultant anthropogenic architecture will morph in accordance. Incorporating living material in the form of mycelial hybrids into design practice, by taking a more material, spatial, and aesthetic approach to sites of decay, has the potential to create a more adaptable and evolving architectural response to reshape our relationship to the environment. Anthropocentric destruction has transfigured our world into a planet of contamination, humankind must relinquish control over the built environment and give agency to living organisms to allow for a new architectural era of evolution, adaptability, and resiliency.

Mycelium is the vegetative part of a fungus, consisting of a network of fine white filaments (hyphae). Mycelium consumes carbon-based substrates, giving it the ability to form natural hybrid materials.



MYCOREMEDIATION

In view of mycelium's ability to recycle carbon, nitrogen, and other vital elements, this investigation uses contamination to fuel mycelial growth and create emergent forms whilst executing remediation strategies for contaminated sites. Organic and non-organic residue from landfills, crude oil, and toxic ash will be utilized to fuel the growth of mycelium and manipulate its development during the construction process. Organic and non-organic residue from wildfires, landfills, and oil spills will be utilized to fuel the growth of mycelium and manipulate its development during the construction process.

LANDFILL

Substrate: organic + inorganic trash
Topography: steep slopes
Temperature: moderate

OIL SPILL

Substrate: petroleum-soaked straw + hair
Topography: flat, loose sand
Temperature: moderate to cold

WILDFIRE

Substrate: toxic ash + debris
Topography: moderate to low slope
Temperature: warm to hot

REPUGNANT AESTHETIC

This investigation utilizes the combination of contamination and mycelial growth as a method for creating repugnant aesthetic effects and evolving architectural conditions. Mycelial growth can take many forms; having a wide range of unpredictable aesthetic effects, the resultant growth experiments take on various conditions of thickness, holes, bumps, transparencies, colors, and textures. Mycelial growth varies depending on the type of substrate as well as its growing conditions such as temperature, lighting, and humidity.

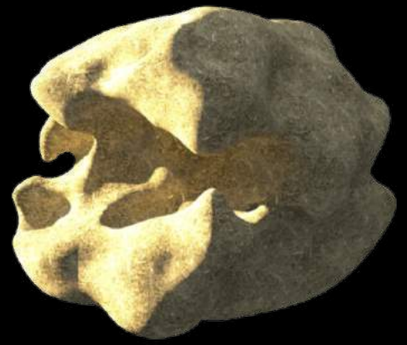
SAWDUST, FLOUR, + WATER

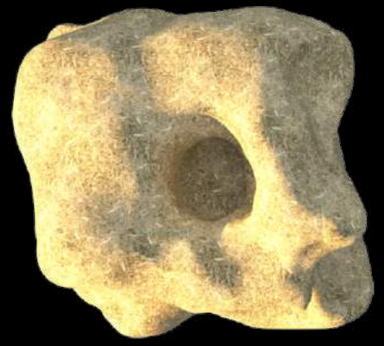
SOIL + WATER

STRAW, FLOUR, + WATER

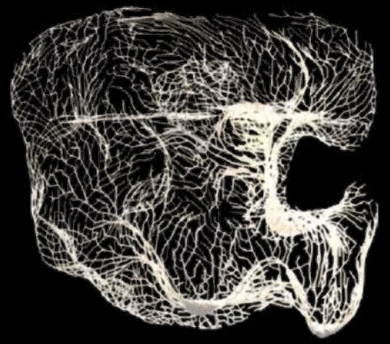
SAWDUST, SOIL, + WATER

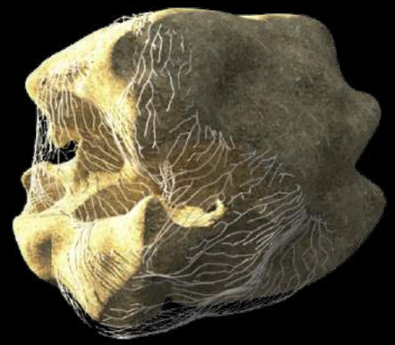
THICKNESS, HOLES, & BUMPS



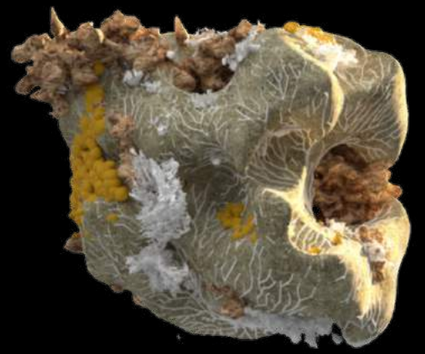


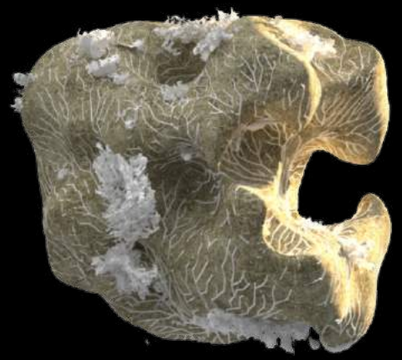
TRANSPARENCIES & SCREENS

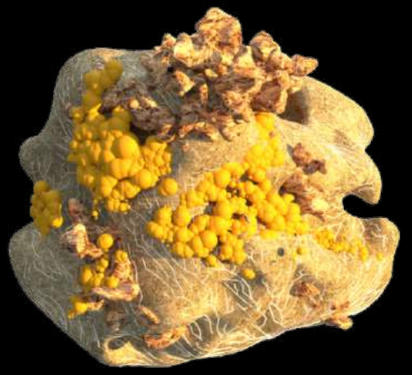




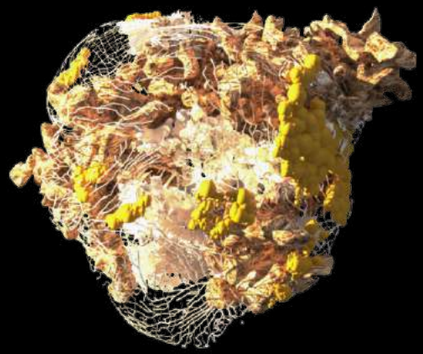
COLORS & GROWTHS

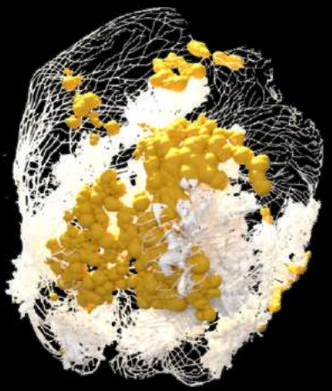


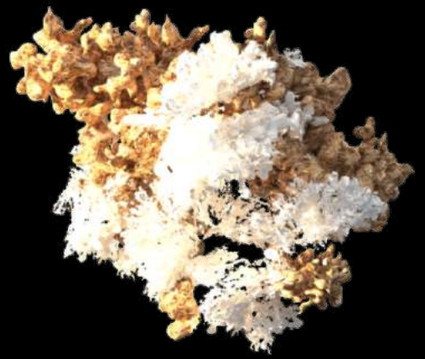


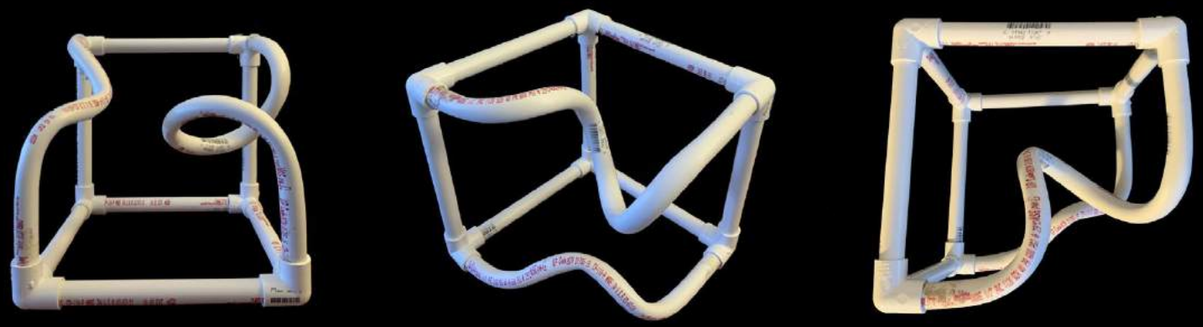


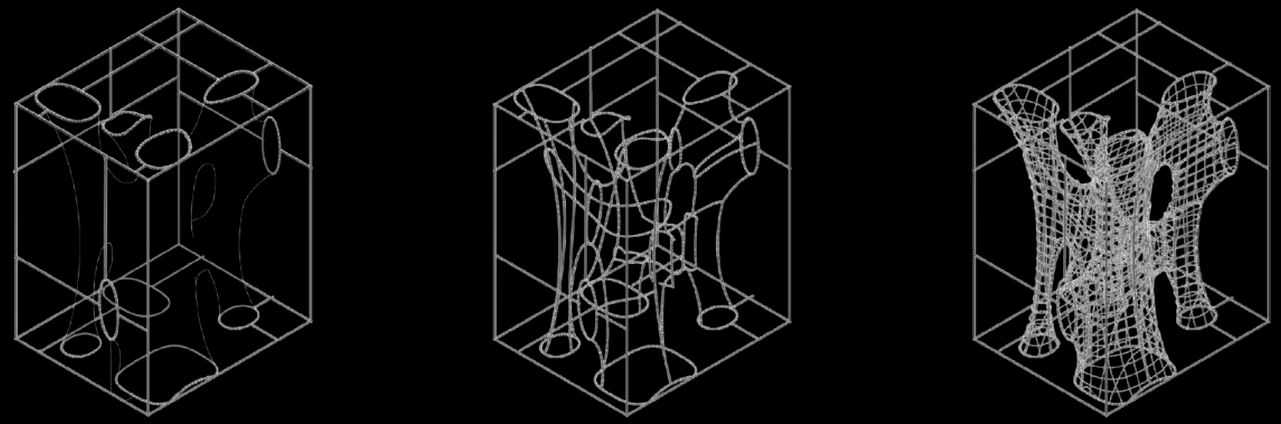
TEXTURES







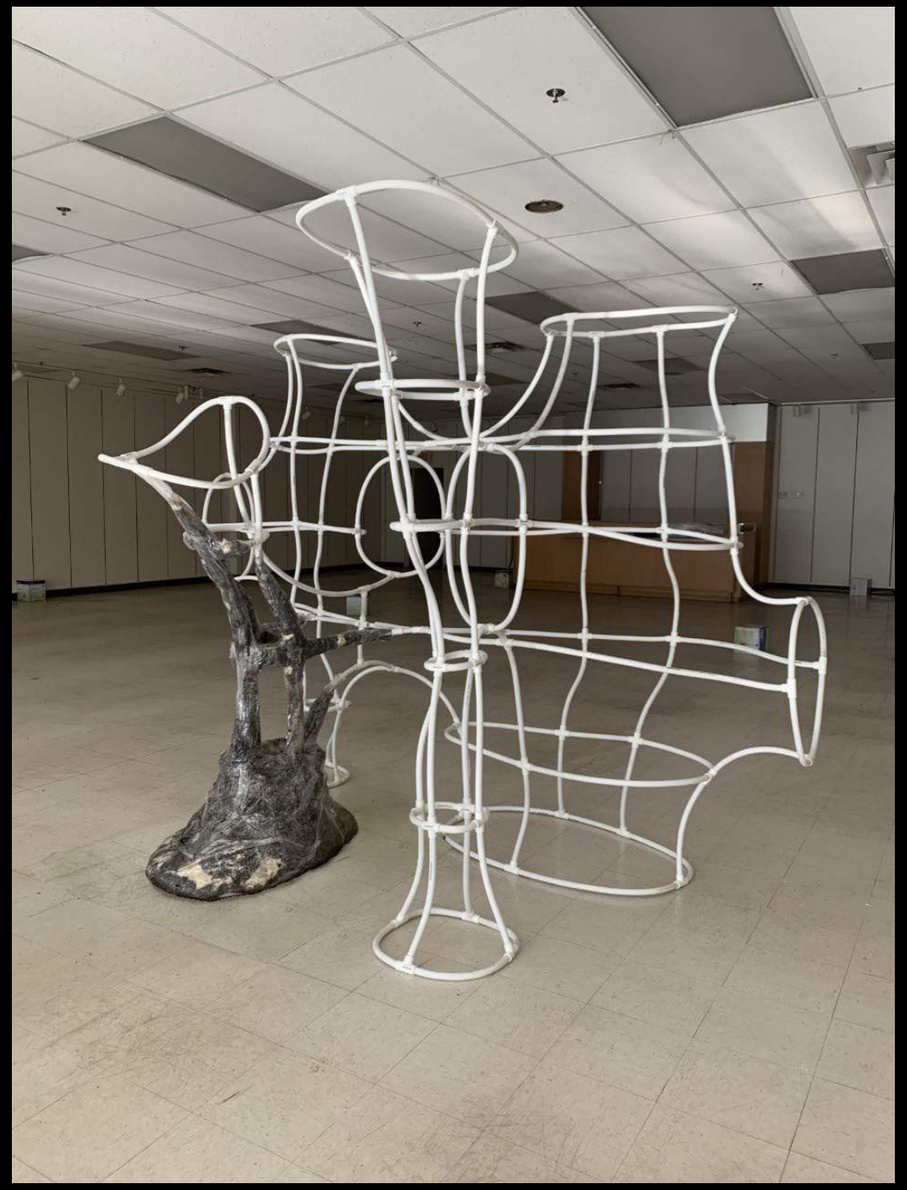




INSTALLATION STRATEGY

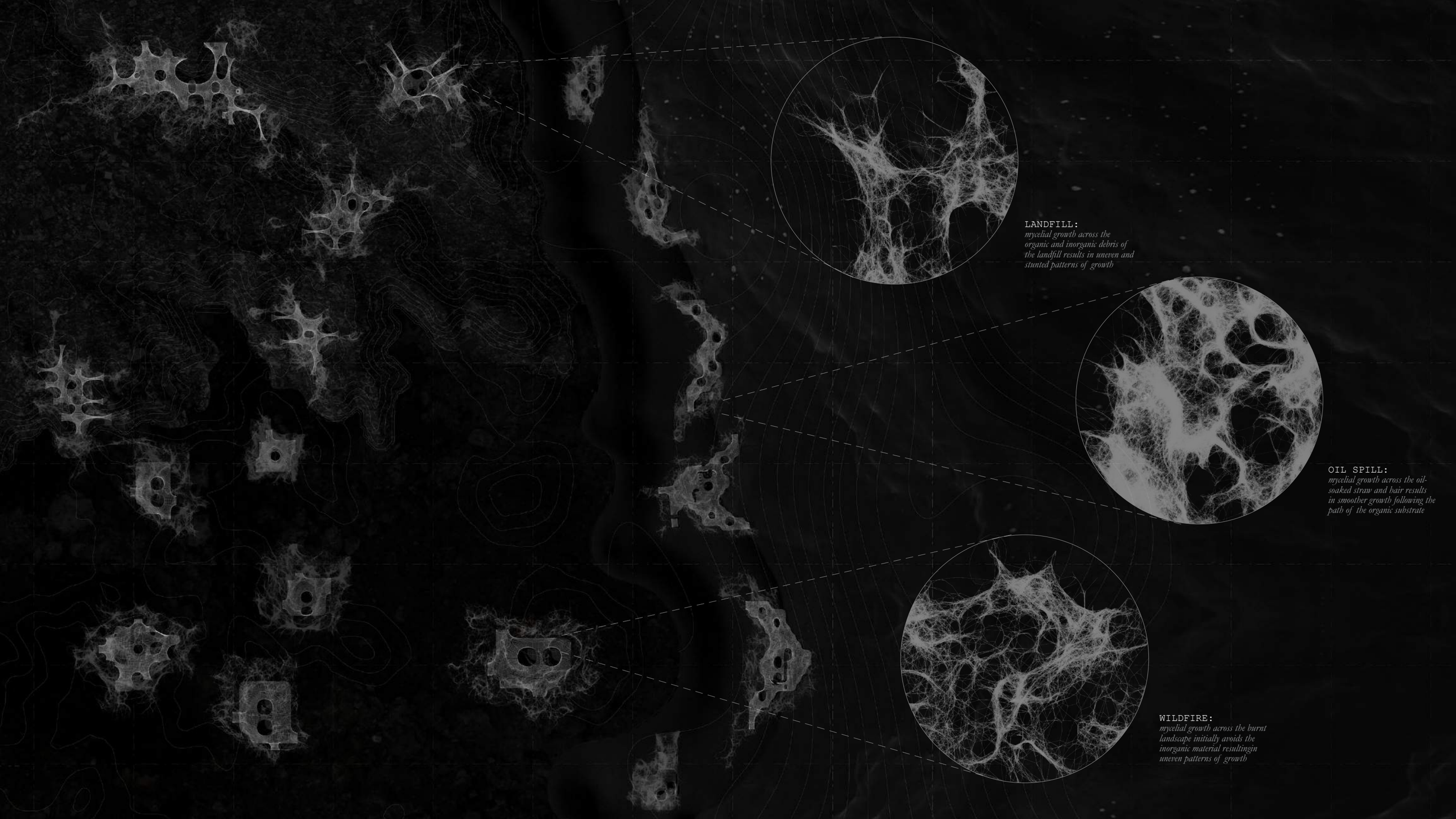
Bent PVC pipe or 3D printed plastic serves as an internal scaffold for substrate to be accumalted around and mycelium to grow on.

3D Printed Growth Experiment



INSTALLATION

This large-scale installation explores the possibilities of controlled emergence, guiding mycelial growth using a system of an internal PVC pipe scaffold and a temporary envelope of plastic sheeting.



LANDFILL:
mycelial growth across the organic and inorganic debris of the landfill results in uneven and stunted patterns of growth

OIL SPILL:
mycelial growth across the oil-soaked straw and hair results in smoother growth following the path of the organic substrate

WILDFIRE:
mycelial growth across the burnt landscape initially avoids the inorganic material resultingin uneven patterns of growth

WILDFIRE (YEAR 1):

In its first phase, toxic ash and organic debris from the wildfire are consolidated around the node, serving as substrate for mycelial growth to begin.

0' 5' 10' 20' 30'

OIL SPILL (YEAR 5):

In its initial phases of growth, the node will experience multiple types of growth including infection, fruiting growth, and initial stages of decay.

0' 3' 6' 12' 24'

LANDFILL (YEAR 50):

Once the mycelium has broken down the organic substrate of the landfill, the structures themselves will go into a process of decay.

0' 6' 12' 24' 36'