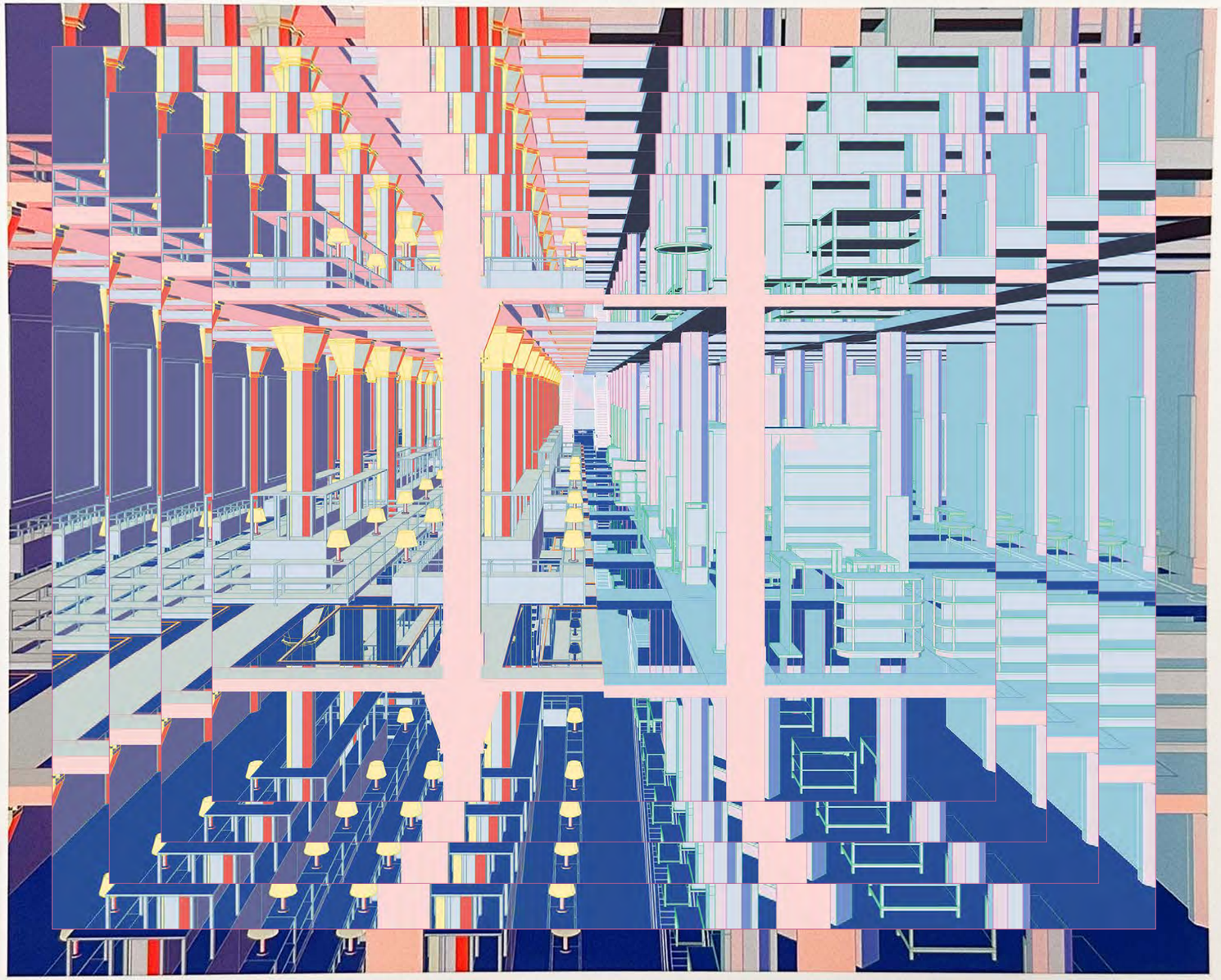

Transcendence

Windows into Anna's 4 Years at Avery Hall

Anna Nanju Kim Academic Portfolio 2020-2024
Columbia GSAPP Master of Architecture 2024'

Transcendence

Windows into Anna's 4 Years at Avery Hall
Written in May, 2024

2020 : Admitted during the Zoom Era
2021 : Gap Year; Recharge
2022 - 2024 : Growth

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Preface

Three years of GSAPP were a journey of constant struggle and agony as I sought to discover my identity both as a person and as a designer. The most valuable lesson I gleaned from Columbia is learning how to live with myself. I learned about my specific color preferences, the types of projects that resonate with me, what design principles and values I think is important, the geometries that captivate me, the types of drawings I aspire to create, the kind of design practice I envision post-graduation, how to collaborate with studio partners, how do I learn from my peers and collegues, and much more. Most importantly, I learned how to stay in love with what I do.

The title, “Transcendene”, encapsulates my focus during my time at GSAPP; attempting to translate my envisioned concepts into tangible forms for sharing with others. And through visualization of what I am dreaming for the drawing, I am taken to a different world. Precise visualization achieved through thoughtful color selection and carefully constructed narrative for each project, was the most important aspect of my work. This pursuit echoes the struggles of many artists throughout history, from impressionists endeavoring to capture light and shadow in myriad hues to Van Gogh’s quest to portray the brilliance of the sun, and the broader challenge faced by painters striving to imbue two-dimensional surfaces with the depth of the real world prior to the advent of photography.

Creating drawings were an integral part of my design process; through it, I learned how to design. It was always very fascinating and exciting to experience the myriad unexpected variables, challenges, and drastic changes in the process of depicting the images I had in my mind. The most memorable moments were when the project took me to its final form and completed itself, not the other way around.

Table of Contents

01

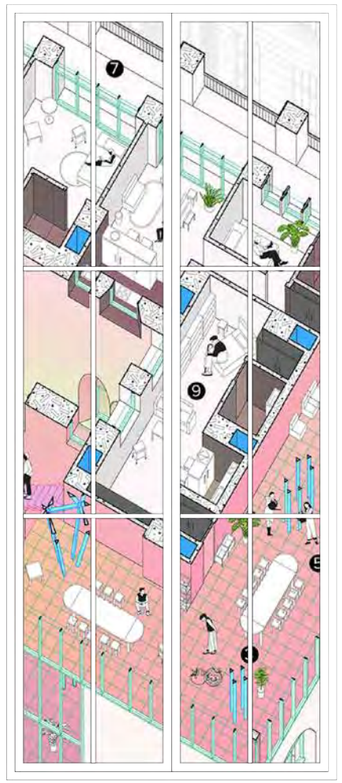
Courtyard House

Horizontal City
GSAPP Core III
Housing Studio
Instructed by Benjamin Cadena
Collaborative Work with Burcu Turkay

02

Ravena Quarry Monument

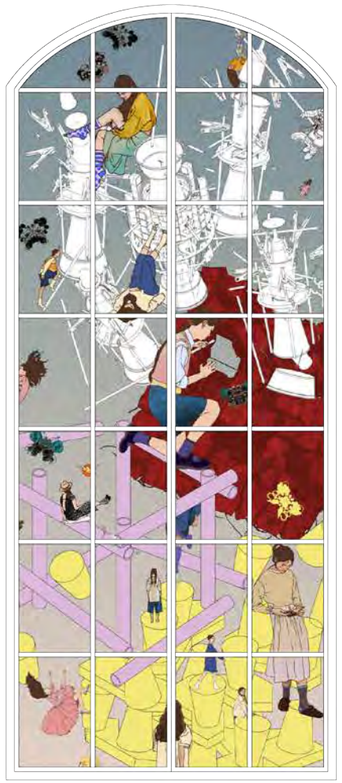
Exploring Anthropocenic New Geology
GSAPP Advanced IV
Sanctuaries Studio
Instructed by Nahyun Hwang
Individual Work



03

Decarbon Air-Rights

Climate Change, Material Ecosystems, and AI
GSAPP Advanced V
Research Thesis Studio
Instructed by David Benjamin
Collaborative Work with Phoebe Lee



04

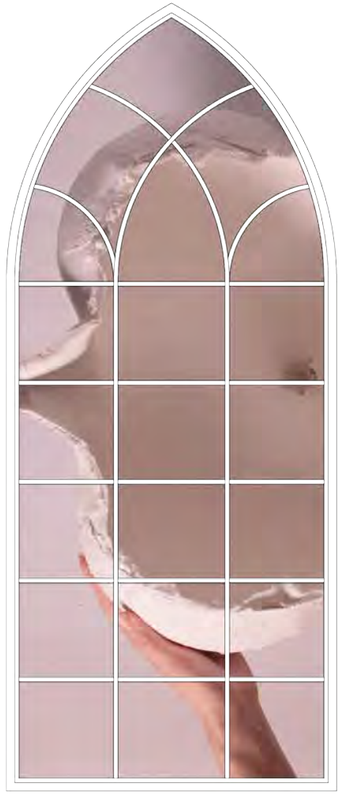
Minute Pieces

Imaginative Depiction of Material Exploration
GSAPP Advanced VI
Makergraph Studio: Book Publishment
Instructed by Ada Tolla and Giuseppe Lignano
Individual Work

05

Aperture School

Building as an Instrument
GSAPP Core II
School Project
Instructed by Lindy Roy
Individual Work



06

Balloon Dome

Tensile/Compression Surfaces
in Architecture: Tactile Methods for Architects
GSAPP Building Science & Technology Elective
Instructed by Robert Marino
Collaborative Work with Minjeong and Joy

01

Courtyard House

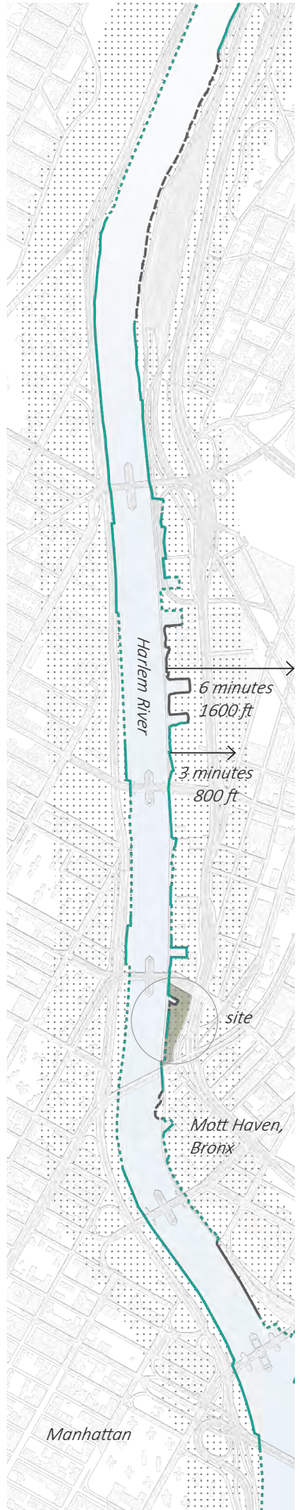
Fall of 2022

A Horizontal City

Columbia GSAPP_Core Studio III
Type: Housing Studio
Location: Bronx, New York City
Instructor: Benjamin Cadena
Collaborative work with Burcu Turkay

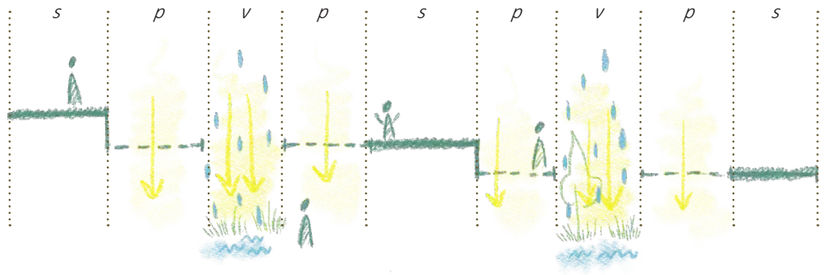
...on the ground floor, architecture almost becomes elusive and nature dominates.

This project proposes an urban life that is integrated with nature. The low-rise building brings the residents closer to the ground and enables them to be in sync with nature and the community. Housing units cluster around green courtyards without sacrificing density, creating a porous, permeable, and continuous landscape to circulate. In this landscape, the omnipresence of pedestrian activity strengthens the sense of belonging which helps expats to take root in this community. Reimagining the low-rise housing across South Bronx, this project provides a neighborhood infrastructure with publicly accessible open space, greenery, and a waterfront. This housing as an antidote to the auto-centric surroundings. The housing complex becomes a park that offers a pleasant pedestrian experience by activating the currently underutilized waterfront severed by highways and railways. The ground level is an open, continuous landscape. The porosity on the ground level is enabled by the clustering of units around courtyards and cantilevering units on the second and third floors. The channel glass facade and white steel structure give the building its light form while the units hover above the park. To minimize the building's footprint and open up the waterfront as a park, the second floor is more densified than the first. On the ground floor, architecture almost becomes elusive and nature dominates.

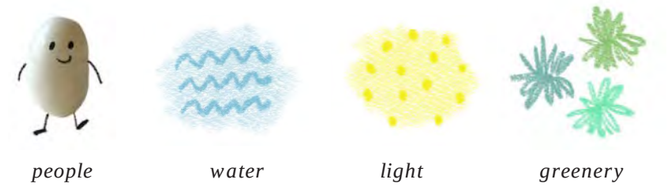


Design Strategy : Permeability and Porosity

continued rhythm of porous light+water pockets, permeanble walkways, and solid slabs



Canopy System



people *water* *light* *greenery*

p: permeable
v: void
s: solid

Harlem River Edge Accessiblity

road & street inaccessibility to the waterfront

completely accessible

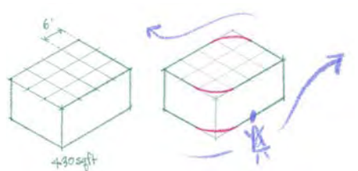
accessible with the fence

accessible without the fence

completely inaccessible

The drawing here categorizes the edge accessibility of the Harlem River into 4 conditions. These conditions distinguish between visual and physical connection to the waterfront. The pink represents complete inaccessibility. After analyzing the edge, we started to imagine this underutilized stretch of the waterfront as neighborhood infrastructure with public walkways, parks, and recreational amenities.

Massing Studies

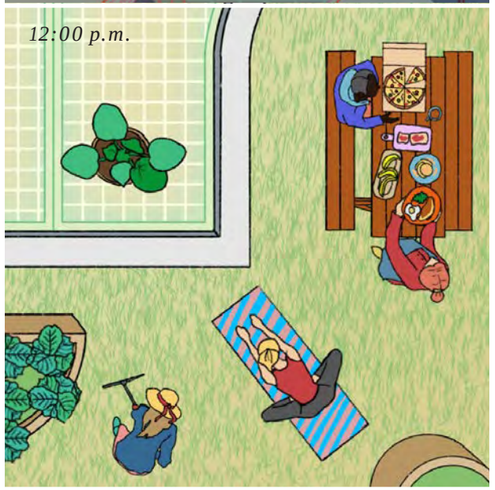


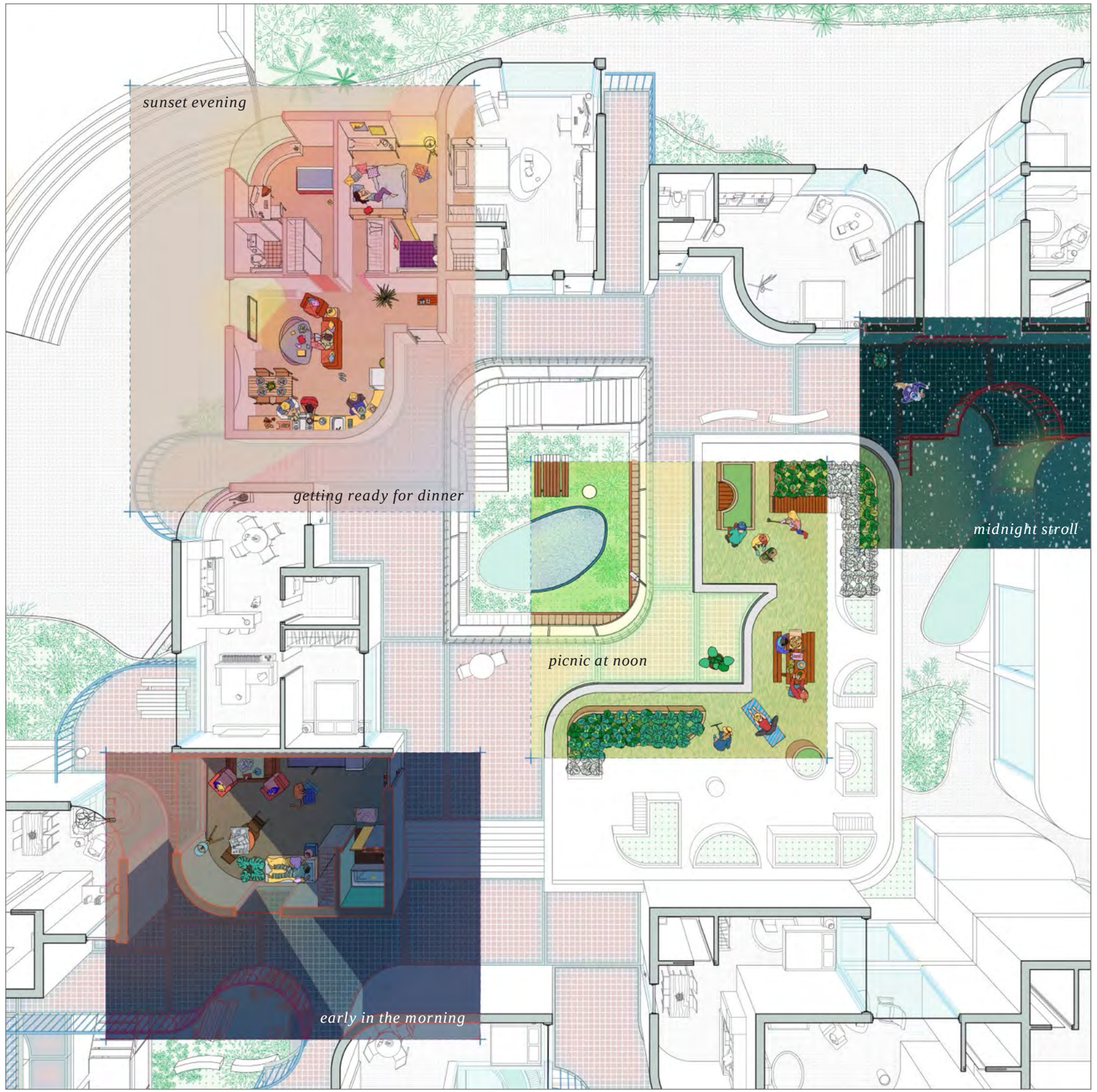
units' round corners enable smoother pathways for the residents to navigate the canopy house

One Unit Mass

Key Cluster Design

A Day at the Canopy House





A Cluster's Elements :

- *a Vegetation Barriers*
- *b Rooftop Gardens*
- *c Community Spaces*
- *d Glassblock Passageways*

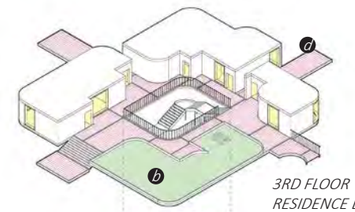
permeable

- *e Units*

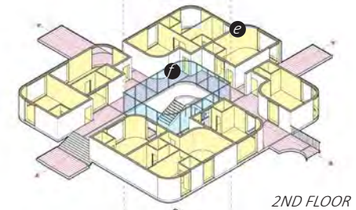
solid

- *f A Courtyard*
- *g A Pond*

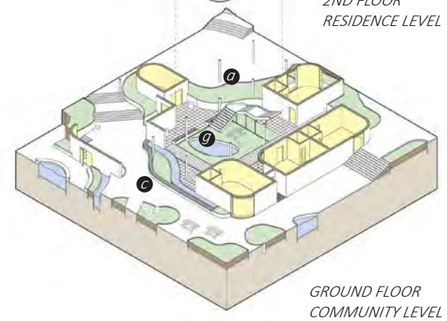
void



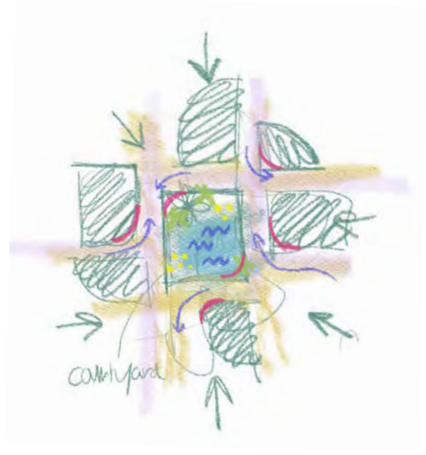
3RD FLOOR RESIDENCE LEVEL



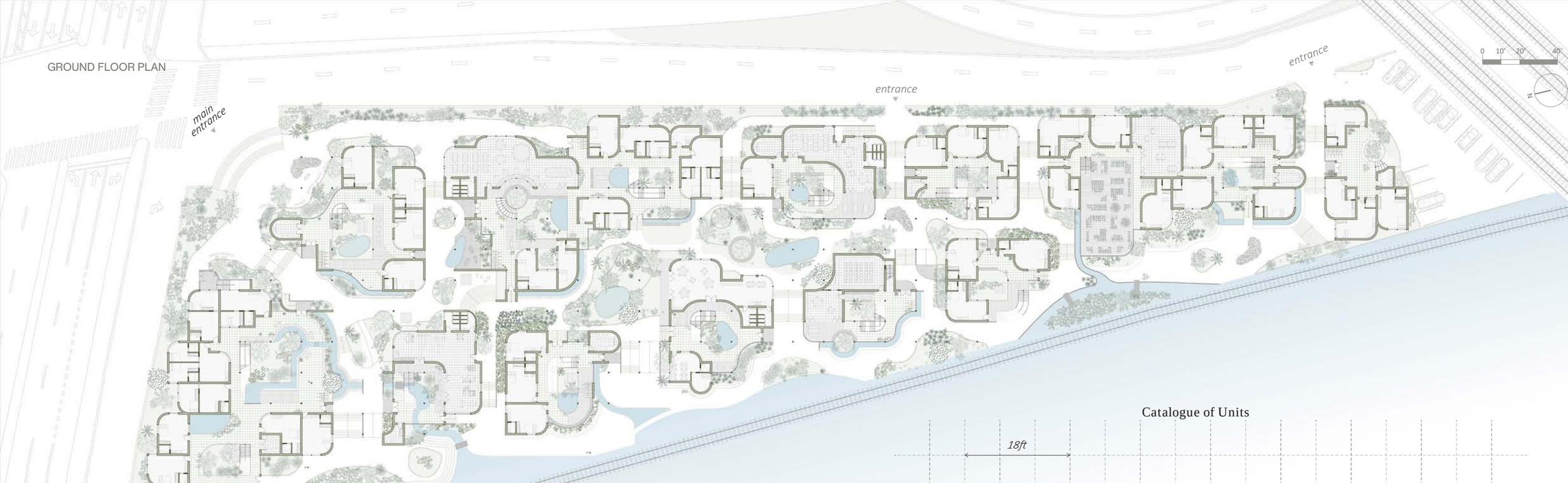
2ND FLOOR RESIDENCE LEVEL



GROUND FLOOR COMMUNITY LEVEL



GROUND FLOOR PLAN



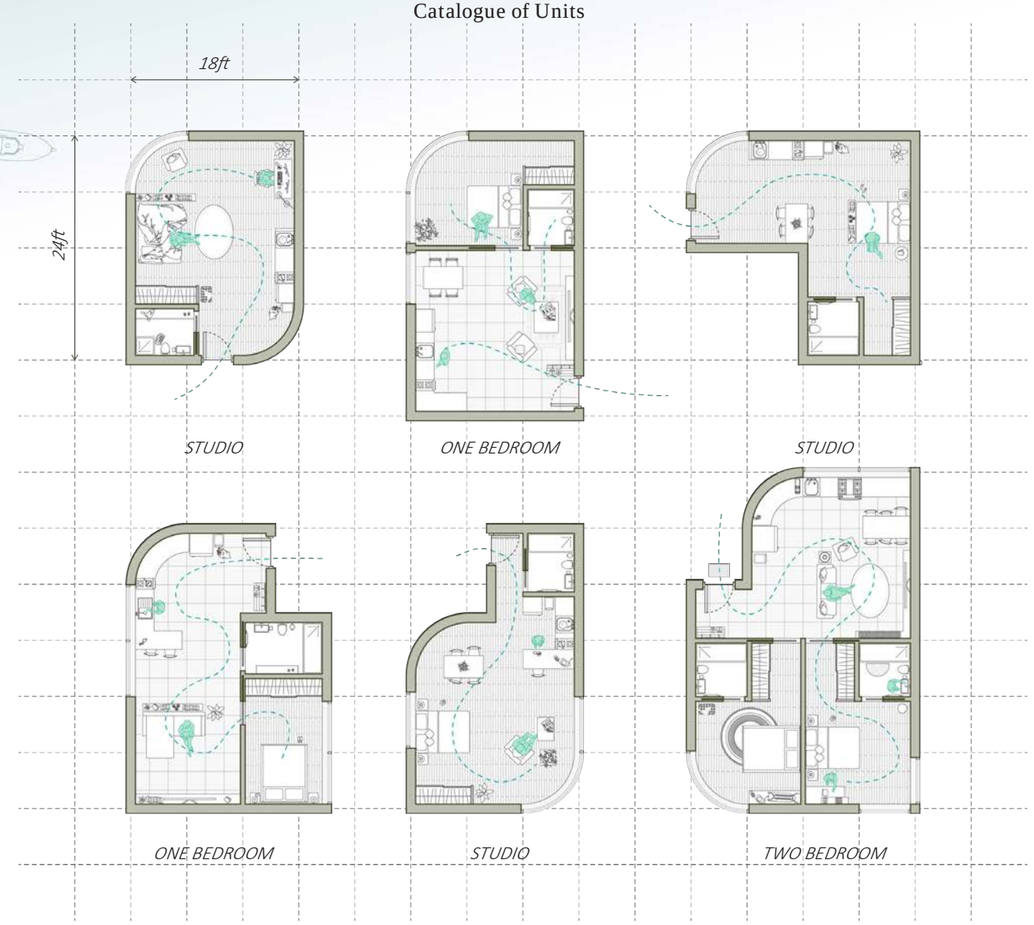
Accessible Waterfront

Weaving past under the canopy of houses towards the waterfront

The ground floor is woven from clusters of green courtyards, indoor community spaces, and publicly accessible pathways, ramps, and stairs. As the ground level descends smoothly towards the river, people walking down the pathways experience being pulled toward the waterfront. This elevation change provides undisrupted views of the river even for the units farther away from the waterfront. In between the clusters, nature takes over and provides the public with open green space. Here, landscaping serves multiple functions. While it has a recreational role, it also has a performative role. The planters, benches, ponds, and streams navigate the individuals through the public pathways toward the waterfront without blocking off visual connection into the courtyards.

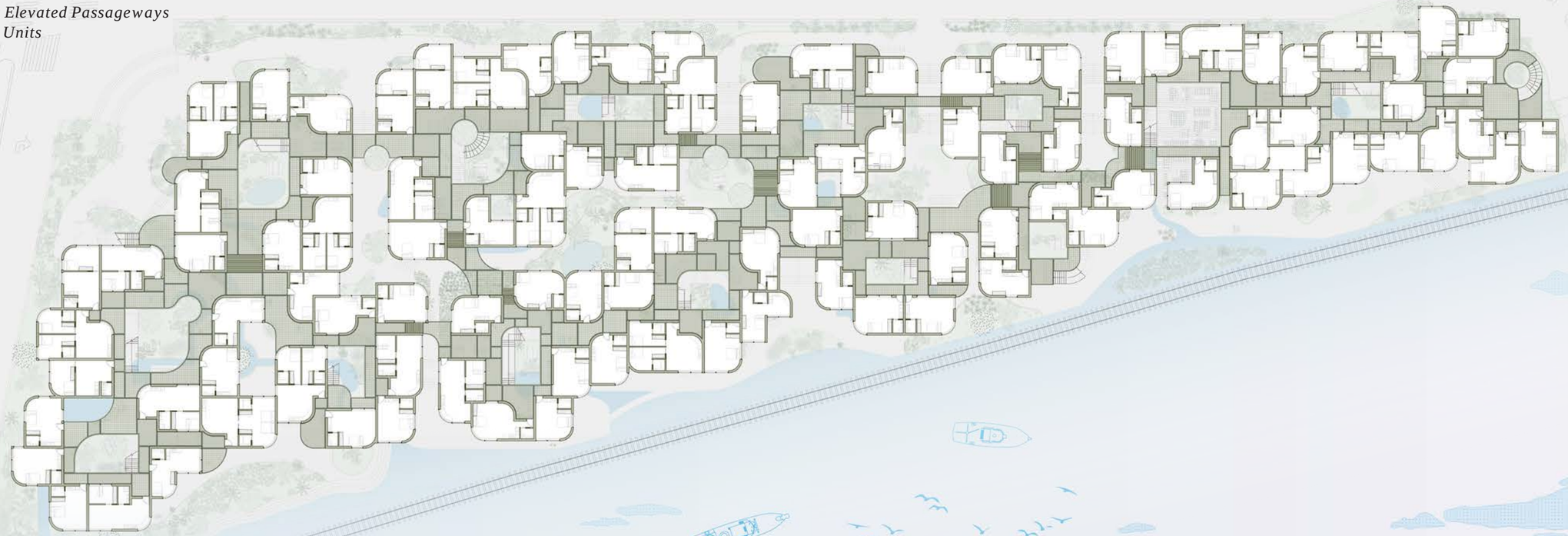
Section_from the street level to the waterfront

Catalogue of Units



2ND FLOOR PLAN

- *Glass Block Elevated Passageways*
- *Residential Units*



Horizontal City

Solving Density Problem while keeping the Horizontality

Rather than going vertical, the project aims to keep everything horizontal to preserve the visual and physical connections throughout the site. The 3-story low-rise building brings the expat residents closer to the ground and this proximity enables them to be in sync with nature and the community. The units clustering around a courtyard have 3 different types: studio, one-bedroom and two-bedroom. While the layouts are standardized for each type, the way units come together and are oriented toward each other is not standardized. This creates a variety of spaces to occupy and circulate, which gives residents the experience of living in their own unique houses, not standardized apartments. Above the park, there is a canopy of units clustered around courtyards. On this second floor, the circulation takes place on an elevated passageway made of translucent glass blocks, enabling daylight to reach the ground floor.

Light Pockets in the courtyards and in between clusters

Accessibility distinction by Vegetation

permiability and porosity

Ground Floor

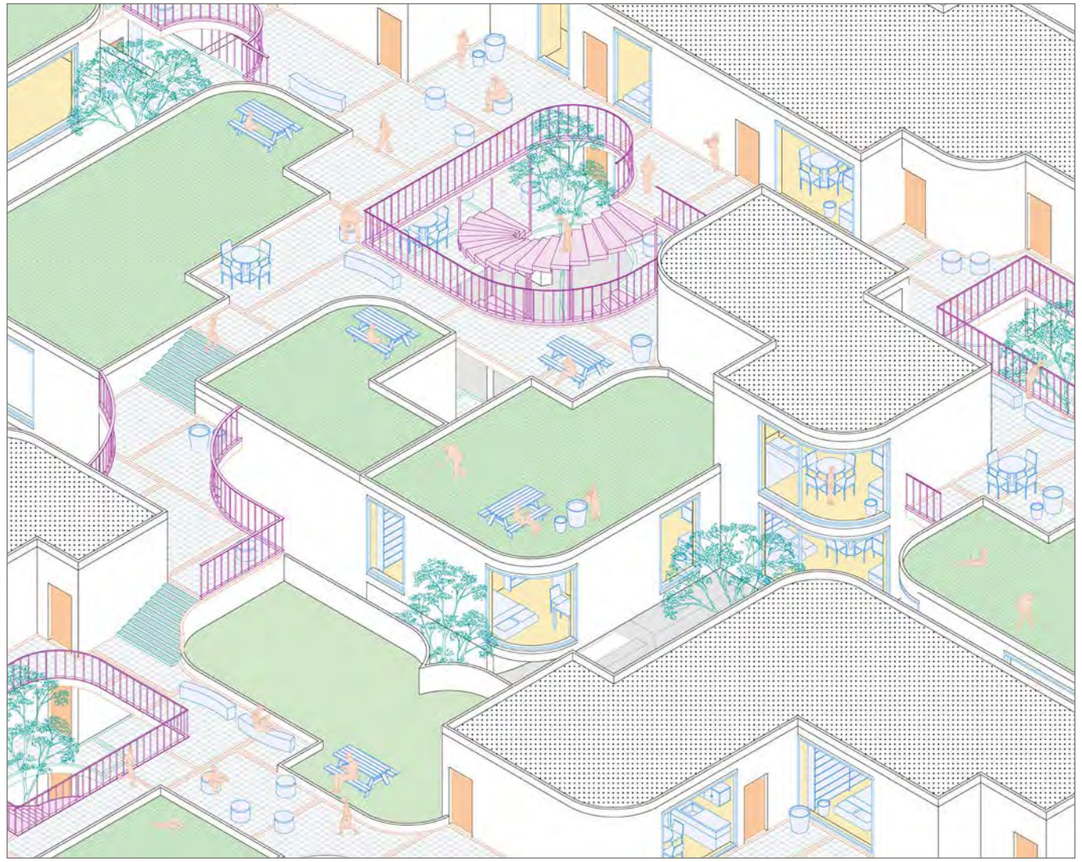
The visual and physical connections enabled by the porosity of the building brings the neighbors closer rtogether

Valleys inbetween the Clusters

The ground floor is woven from clusters of green courtyards, indoor community spaces, and publicly accessible pathways, ramps, and stairs. As the ground level descends smoothly towards the river, people walking down the pathways experience being pulled toward the waterfront. This elevation change provides undisrupted views of the river even for the units farther away from the waterfront. In between the clusters, nature takes over and provides the public with open green space.

Shared Neighborhood

familiar strangers

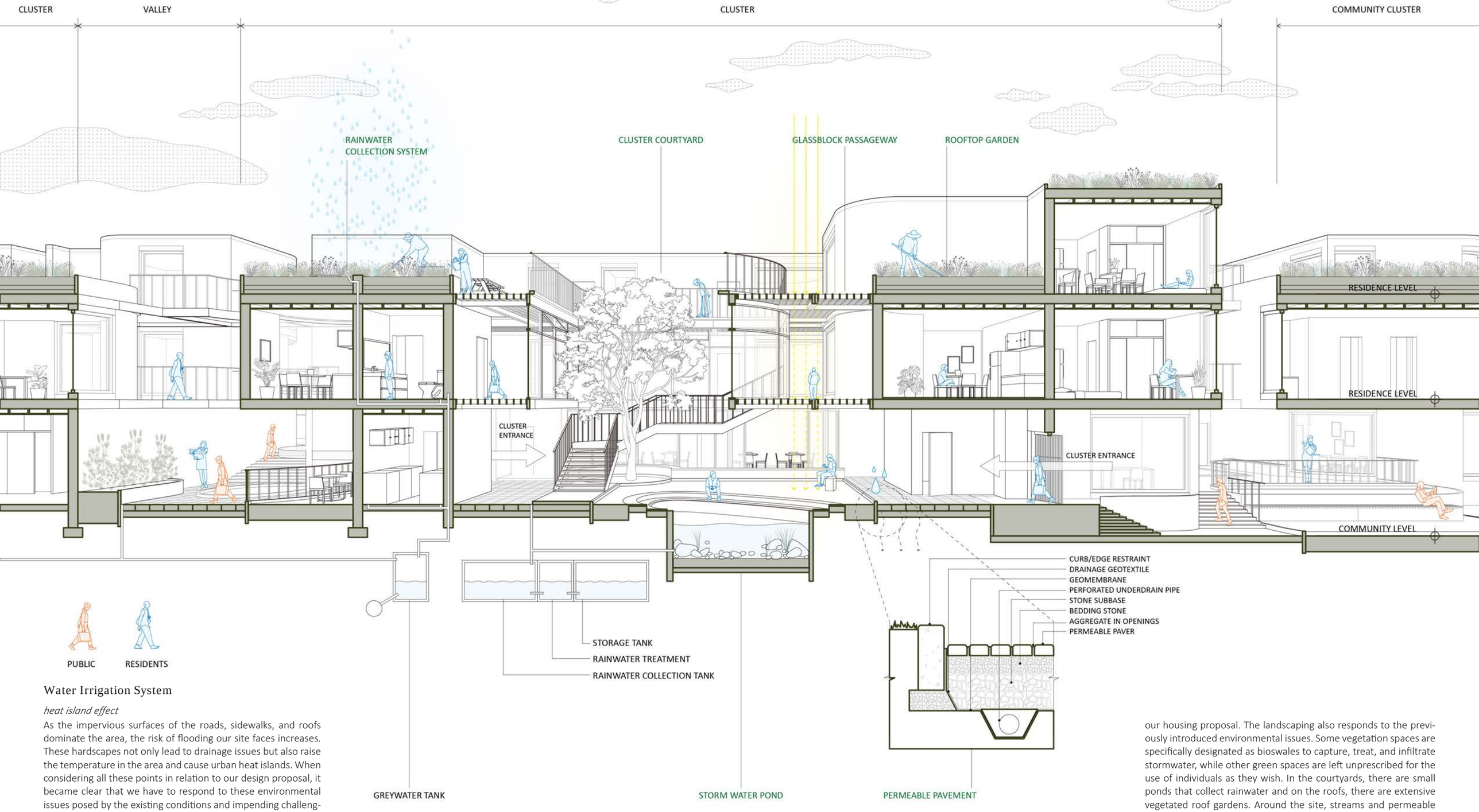


Rooftop Floor

Sense of belonging is rooted in residents community

Elevated Passageways Connecting the Clusters

Reaching the top floor is the third story. This floor is not an extrusion of the second floor but a careful distribution of units in fewer numbers without restricting the light from reaching lower floors. Walking on the elevated passageway of the third floor, one might walk onto the roof of the second-floor unit and relax by the green roof and enjoy the river view. Due to elevation changes on the ground floor, the residents living on the second and third floors can also enjoy nature by having a window right next to a green roof. As highlighted by the design, the relationship to nature is sustained throughout the building not only by the physical closeness to the ground but also by visual connection.

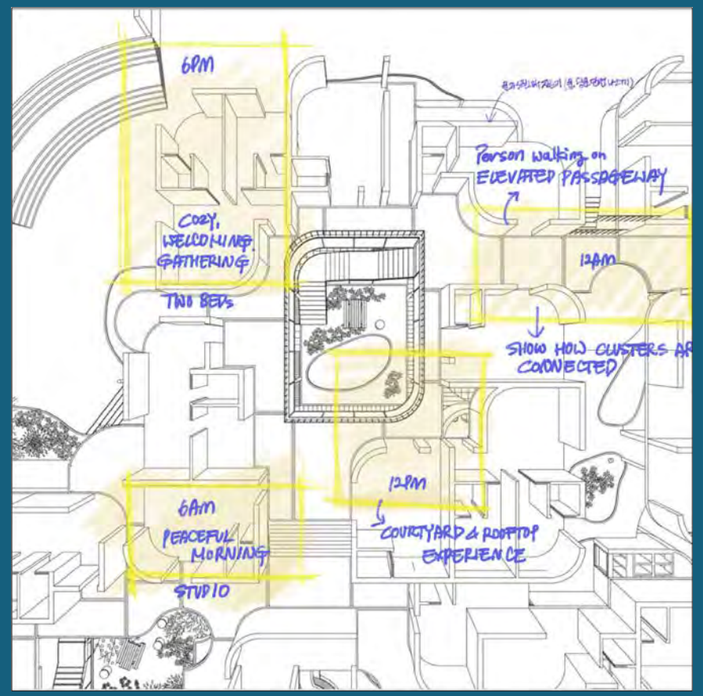


Water Irrigation System

heat island effect

As the impervious surfaces of the roads, sidewalks, and roofs dominate the area, the risk of flooding our site faces increases. These hardscapes not only lead to drainage issues but also raise the temperature in the area and cause urban heat islands. When considering all these points in relation to our design proposal, it became clear that we have to respond to these environmental issues posed by the existing conditions and impending challenges. The need for open public space, better drainage infrastructure, and more vegetation cover in the area become integral to our housing proposal. The landscaping also responds to the previously introduced environmental issues. Some vegetation spaces are specifically designated as bioswales to capture, treat, and infiltrate stormwater, while other green spaces are left unprescribed for the use of individuals as they wish. In the courtyards, there are small ponds that collect rainwater and on the roofs, there are extensive vegetated roof gardens. Around the site, streams and permeable pavers help reduce stormwater. Together all these elements create a resilient park open to the public.

behind the scenes



Plan Perspective Draft

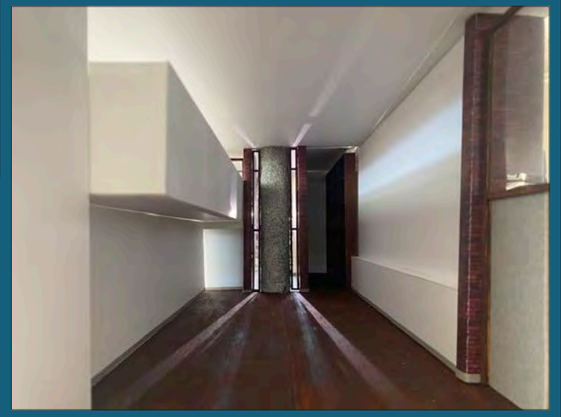
River Edge Studies

Massing Studies

Study Model

Final Review, December 7th, 2022

Class Photo



Precedent Model Studies

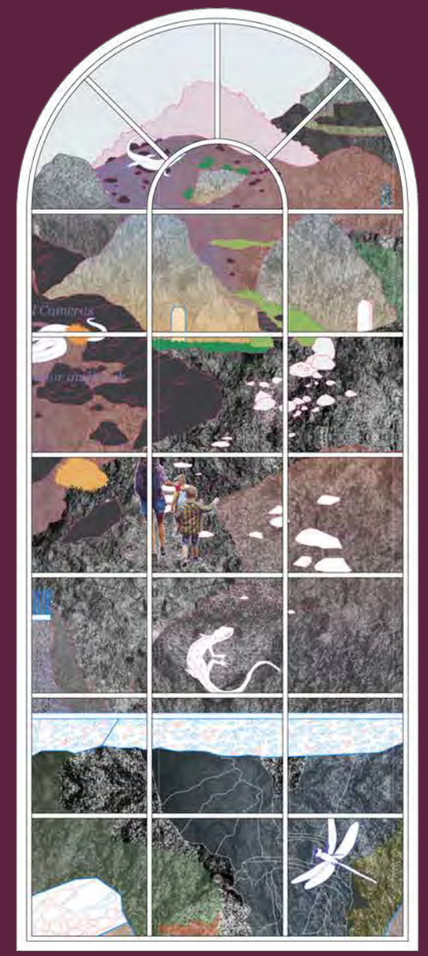
02

Ravena Quarry Monument

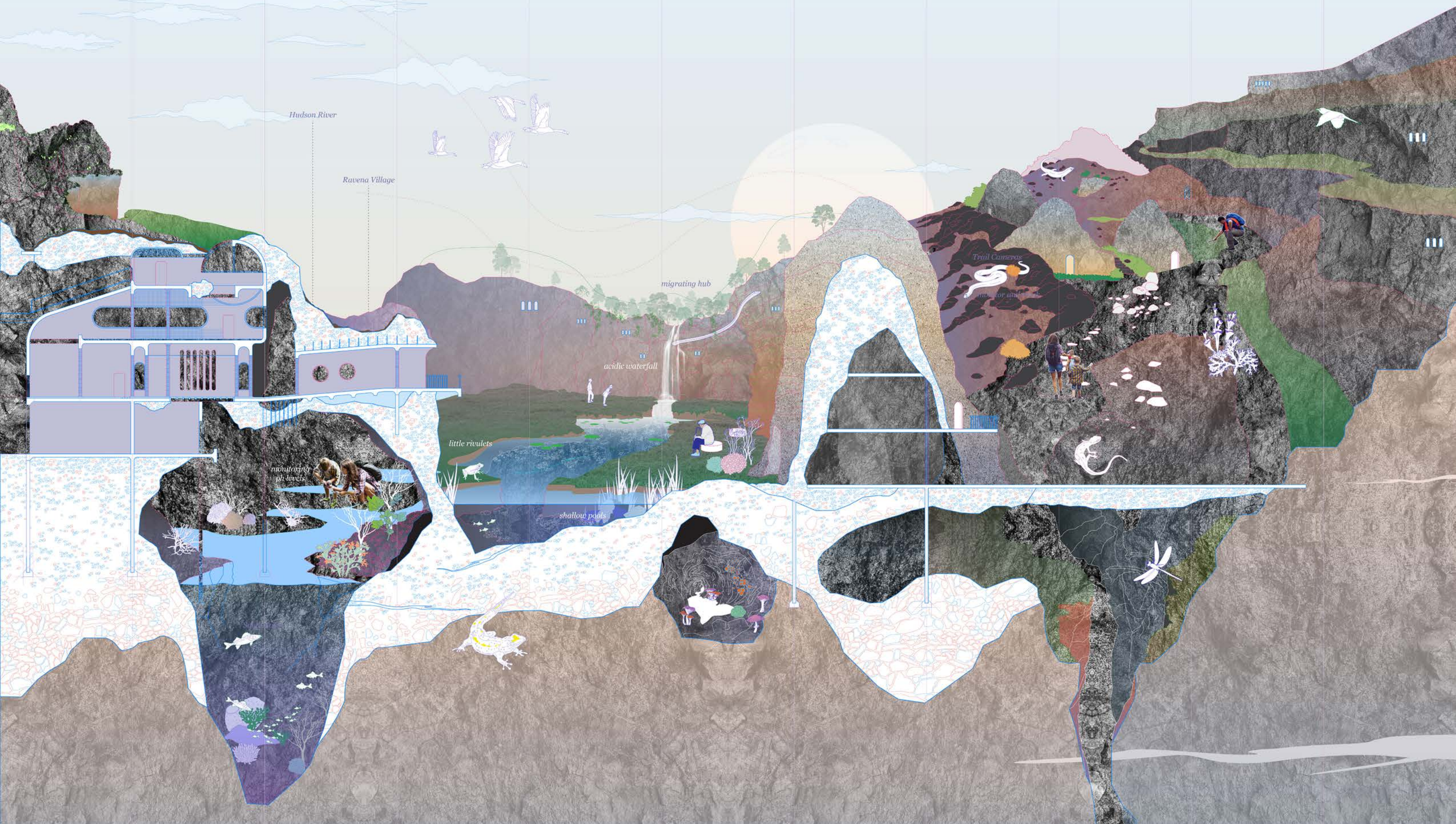
Spring of 2023

Exploring Anthropocenic New Geology

Columbia GSAPP_Advanced Studio IV
Type: Sanctuaries Studio
Location: Ravena Village, Albany County
Instructor: Nahyun Hwang
Individual Work



...and to challenge what really is the notion of traditional glorification of American Wilderness.



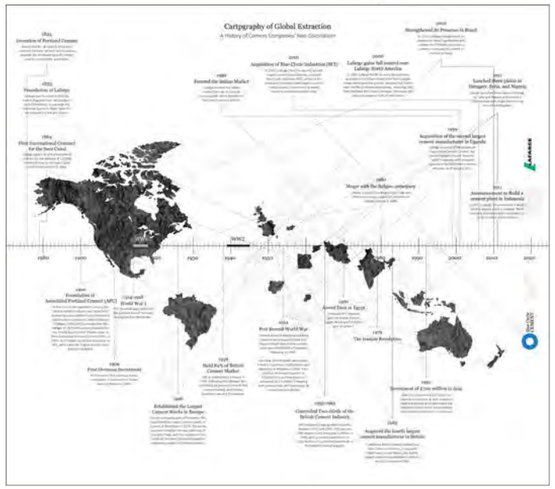
This project started with a desire to contest the notion of Hudson Valley as perfect nature, a getaway retreat, and question the idea of what wilderness really is. What does it really mean when we say “natural” landscape after the extensive history of human intervention? Instead of thinking of quarries as destroyed land, quarries represent production of new sublime and new unique ecologies. The investigation started in Ravena Village. The Ravena quarry, the chosen site, is one of many quarries in hudson valley, is in fact the last active cement quarry site in New York State. Ravena is a small village of 3,240 people in Albany County. There were two major cement companies that owned Ravena Quarry. The first dig was in 1962 by Blue Circle Industries, a British Company. Blue Circle Industries was the sixth largest company in the world when Lafarge, a French Company acquired it in 2001. As a result, Lafarge became the biggest concrete manufacturer in the world. These two companies were both founded during the 19th century and increased in size over the two world wars and also by purchasing cement companies internationally aggressively, in order to monopolize the global industry. The project’s goal is to propose this particular quarry site as a new typology of national monuments, such as Yellowstone and Yosemite. However, unlike them, Ravena quarry is an artificial landscape, a result of human exploitation of earth, that has never been talked about before. By illustrating the quarry site in the format of national monument maps, the project aims to depict this new landscape / new nature legible to the public and to challenge what really is the notion of traditional glorification of American Wilderness.

What does “natural landscape” truly mean, after the extensive history of human intervention?

Exploitation History of Hudson River Valley

Human Intervention History of Hudson River Valley

The research aimed to understand how the Hudson River Valley came to be and the commodification of the land. In this drawing, the logging industry, ice harvesting, brick making, reservoirs, cement industry, resort industries are highlighted and illustrates the extraction and transportation process for the benefit of New York City. There are at least 15 quarry sites along the Hudson River and they are all in different conditions. More than half of the 35 million tons of natural cement produced in the United States at the height of the industry originated with cement rock mined in Hudson Valley. Material excavated in these mines went straight to NYC to build some of the most famous landmarks, including the Brooklyn Bridge, the pedestal of the Statue of Liberty, Federal Hall National memorial, and the west wing of the United States Capitol building. Quarries are notable in a way that it is a sharp contrast to the types of landscape and geologies that we usually associate with the Hudson Valley, the ones that Hudson River School Painted, such as Catskills Mountains. Quarries are new Anthropocenic geology that emerged through human intervention with the land. The perspective I took is that the extraction is a production process of a new anthropocenic geology.

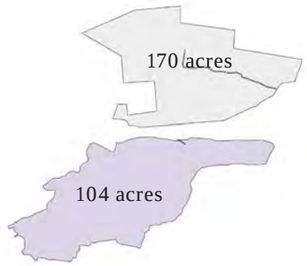


Global Extraction of Quarries : A History of Cement Companies’ Neo-Colonism

The anthropocenic / extractive geology has been formed through these giant cement companies globally. There were two major cement companies that owned Ravena Quarry. The first dig was in 1962 by Blue Circle Industries, a British Company. Blue Circle Industries was the sixth largest company in the world when Lafarge, a French Company acquired it in 2001. As a result, Lafarge became the biggest concrete manufacturer in the world. These two companies were both founded during the 19th century and increased in size over the two world wars and also by purchasing cement companies from their former colonial sites aggressively, in order to monopolize the global industry. This multi-national network of extraction is a new form of colonization that has a very local impact.

Constructive Wilderness and the Artificial Landscape

Right above the quarry, there is Deer Mountain Nature Preserve. It was originally a part of a large farm owned by the Hotaling family and was acquired by the Blue Circle Industries when they bought the quarry land. What was interesting about this preserve is that it's a mirrored condition of the quarry, conceptually and quite literally with its size and the location. It's more of a promotional preserve. Blue Circle Industries turned what was originally a farm into a nature preserve and advertised it with its certifications from the Wildlife Habitat Council. Wildlife Habitat Council is a non-profit organization, founded by five companies, Anheuser Busch, a brewing company, BP, DuPont, multinational chemical company, Exxon, oil and gas company and US Steel. So these private industrial corporations created an environmentally friendly institution to credit themselves. There have been and there are these just handful of huge cement companies that are creating quarry landscapes across continents, something that doesn't exist naturally because it's entirely man-made. And they are also purchasing lands like Deer Mountain Nature Preserve as a shadow of their actions, in order to make their actions look less harmful. In result, creating constructed wilderness.



Mirrored Condition of Constructive Wilderness (Deer Mountain Park) and the Artificial Landscape (Ravena Quarry)

Artificial Landscape: Ravena Quarry

Originally part of a Larger Farm

Mid-20th Century — Purchased by DEC

1962 — Atlantic Cement Company

mid 1970s — Blue Circle Cement Factory

1995 — Founded

1996 — Deer Mountain Nature Trail Guide Book Published

2001 — Lafarge acquired Blue Circle Industries

2003 — Transferred to MHLC

2004-2006 — Lafarge's mercury emissions

2006 — Open to Public

2008 — Working with Wildlife Habitat Council (WHC)

2014 — Lafarge cement used in One World Trade Center

2014 — Certified by Wildlife Habitat Council (WHC)

2015 — Lafarge merged with Holcim

2015 — Lafarge organized Maintenance Day

2019 — Albany Clean Air Act

2021 — Burning Tires and waste for fuel

2021 — Noise Pollution

2021 — Unkempt and Mismanaged

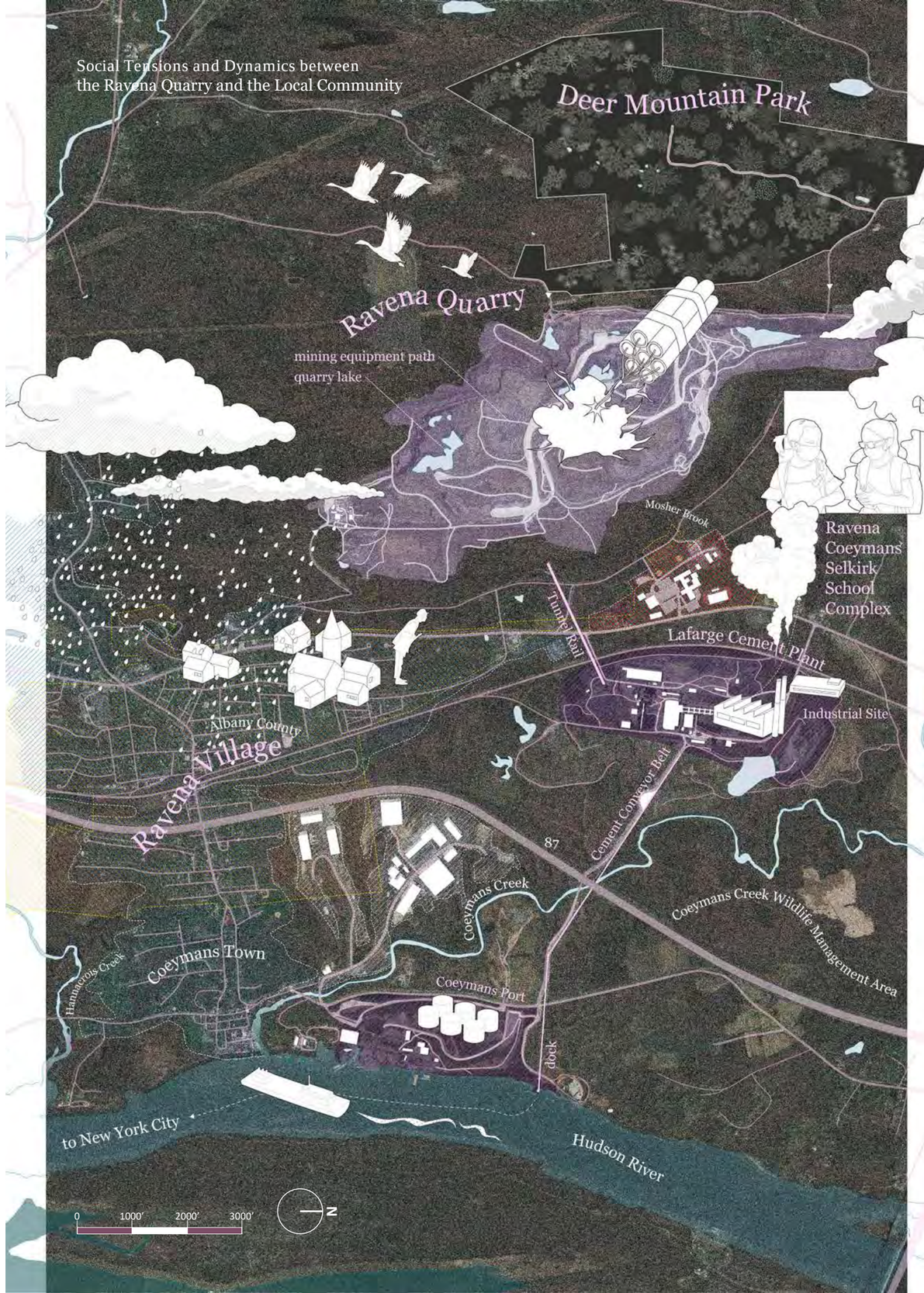
2021 — Water Quality pollution

2022 — Air Pollution

2022 — School Trip

2022 — Terrorist financing

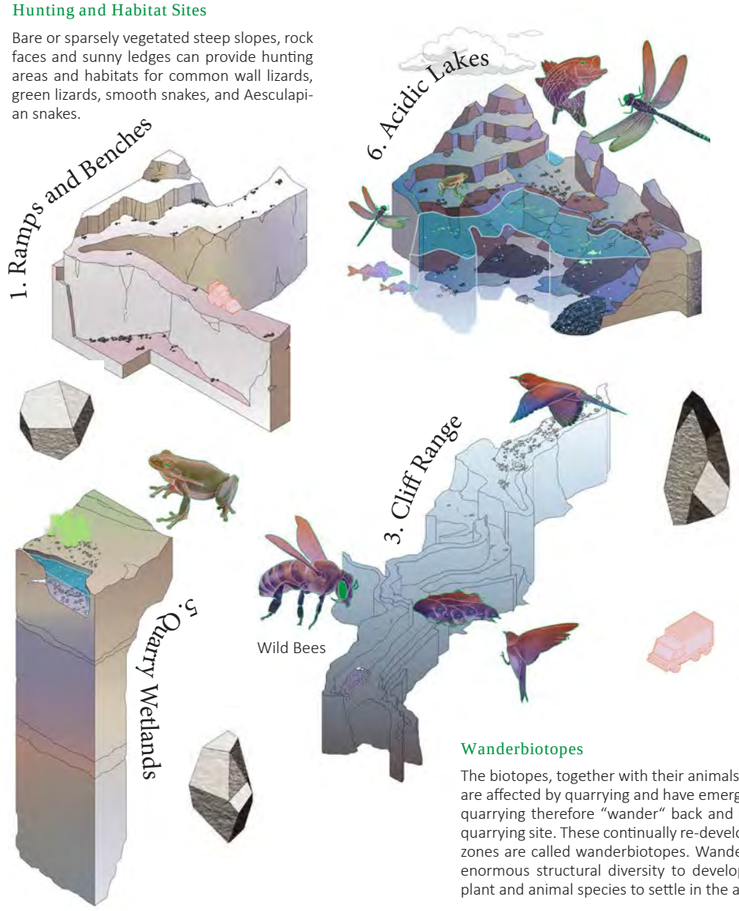
Constructive Wilderness : Deer Mountain Park



Quarries are notable in a way that it is a sharp contrast to the types of landscape and geologies that we usually associate with the Hudson Valley, the ones that Hudson River School Painted, such as Catskills Mountains. Quarries are new Anthropocenic geology that emerged through human intervention with the land. The perspective I took is that the extraction is a production process of a new anthropocenic geology.

Hunting and Habitat Sites

Bare or sparsely vegetated steep slopes, rock faces and sunny ledges can provide hunting areas and habitats for common wall lizards, green lizards, smooth snakes, and Aesculapian snakes.

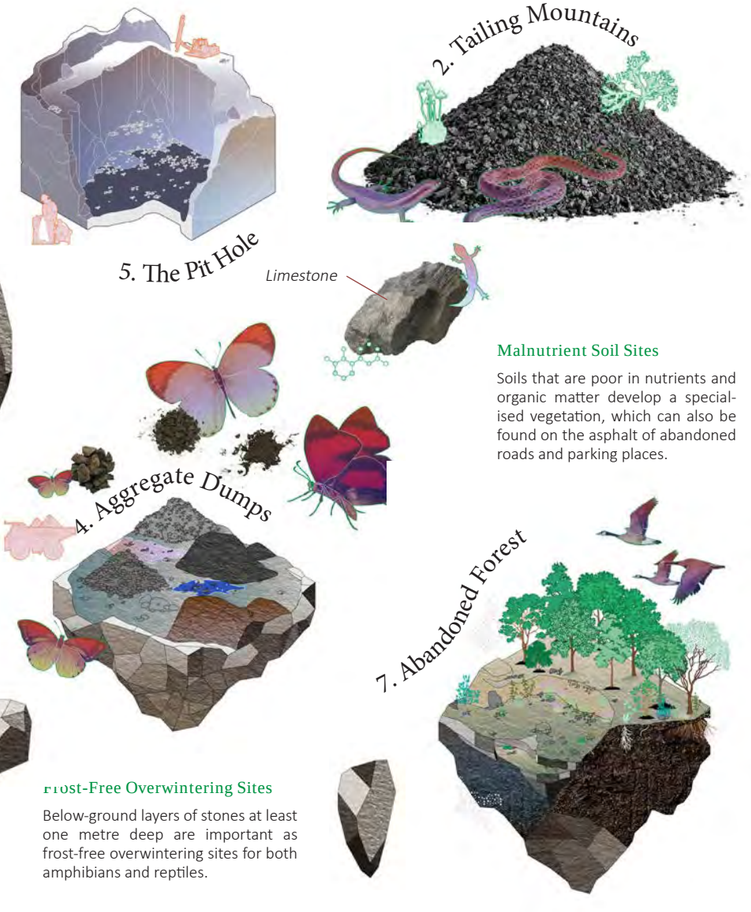


Typologies of the Ravena Quarry Landscape

Dynamic Mosaic of Habitats of Different Stages of Successions

Quarries can provide a dynamic mosaic of habitats at different stages of succession, and landforms that provide an interesting microtopography with unique climatic conditions. The juxtaposition of wet and dry, vegetated and exposed soils creates transition zones, which are of extra high value for plants and animals. Through the active process of the quarry, these features are often transient in nature, occurring in different parts of the site at different times.

1:1 Scale Model of the Tailing Dumps created with waste rocks collected from the site



Malnutrient Soil Sites

Soils that are poor in nutrients and organic matter develop a specialised vegetation, which can also be found on the asphalt of abandoned roads and parking places.

Wanderbiotopes

The biotopes, together with their animals and plants, that are affected by quarrying and have emerged as a result of quarrying therefore "wander" back and forth across the quarrying site. These continually re-developing succession zones are called wanderbiotopes. Wanderbiotopes allow enormous structural diversity to develop, enabling rare plant and animal species to settle in the area.

Breeding Sites

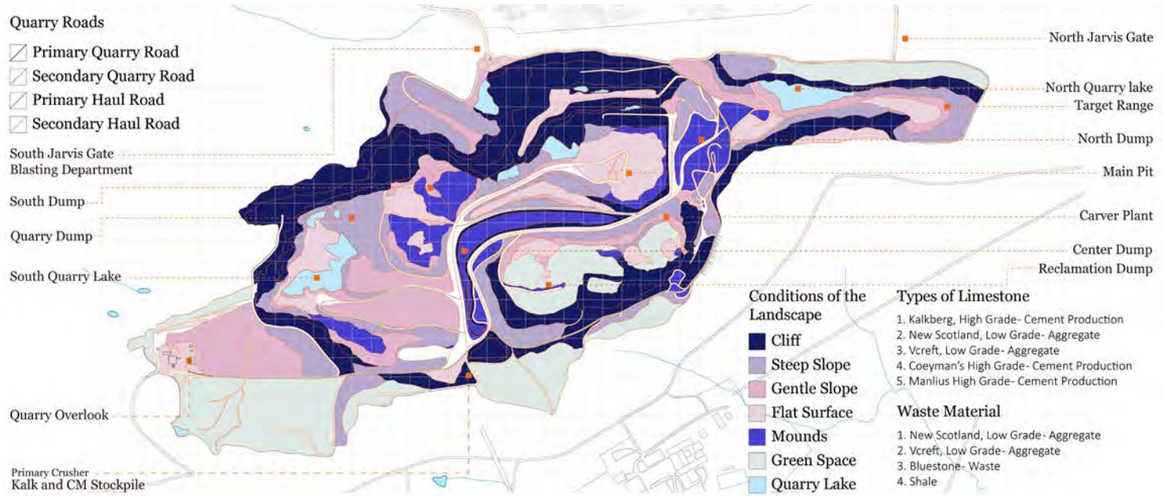
Sand MartinSteep faces produced during the process of mineral extraction can be suitable for breeding colonies

Frost-Free Overwintering Sites

Below-ground layers of stones at least one metre deep are important as frost-free overwintering sites for both amphibians and reptiles.

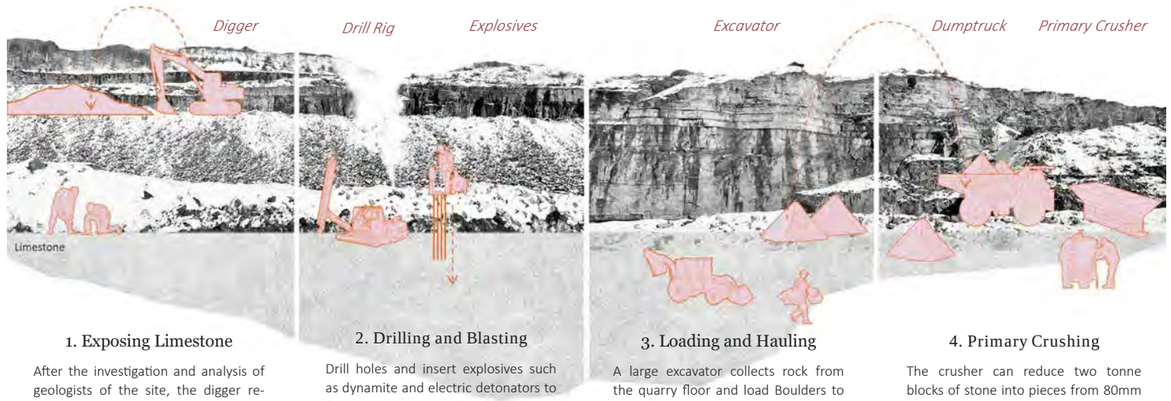
Analysis of the Quarry's Current Condition

Morphology Study of "Quarry Design"



Process of Extraction

Creation of Quarry Landscape



1. Exposing Limestone

After the investigation and analysis of geologists of the site, the digger removes the topsoil of the quarry and exposes the bedrock.

2. Drilling and Blasting

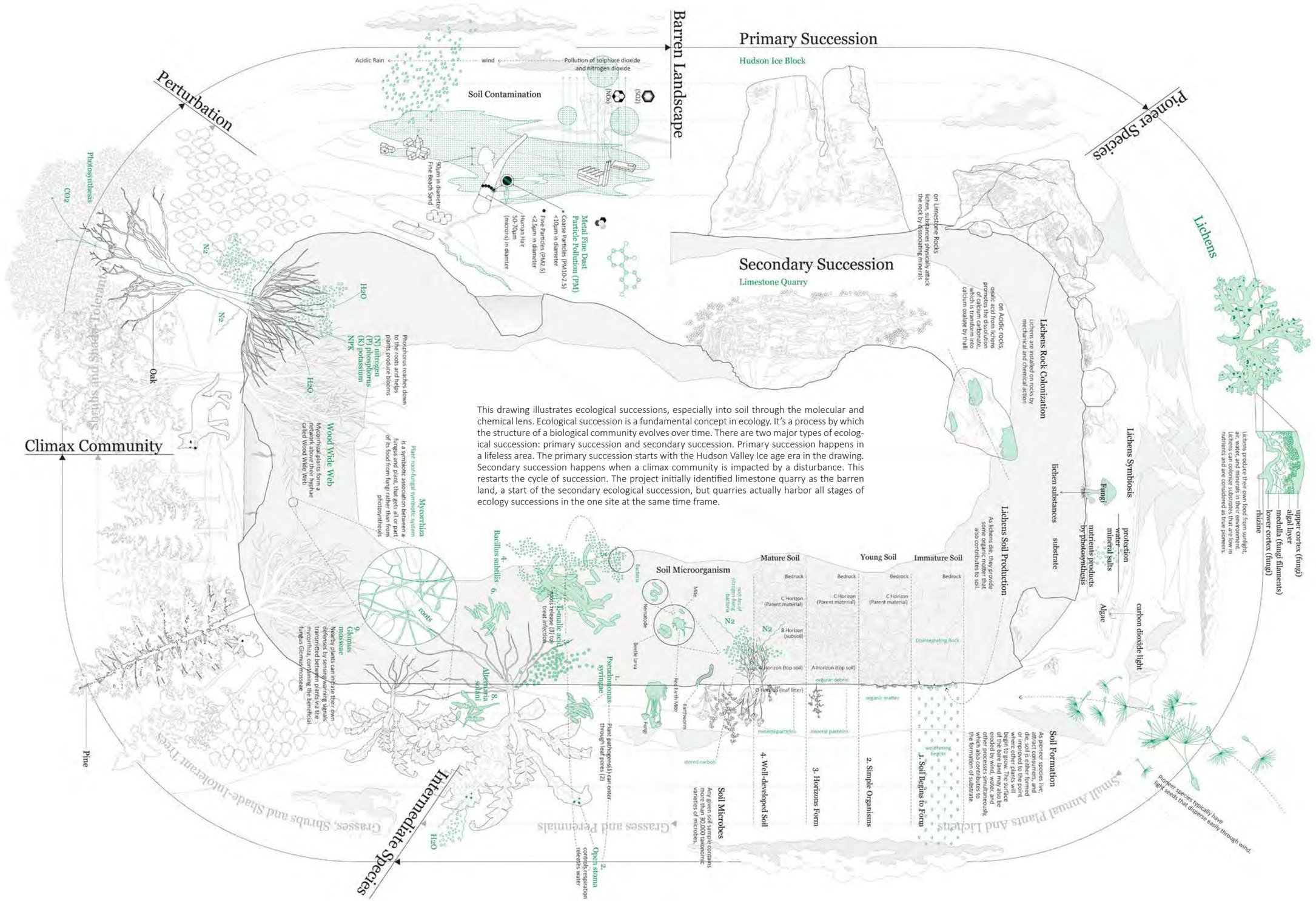
Drill holes and insert explosives such as dynamite and electric detonators to fracture bedrock and loosen material. Each blast provides 40,000 tonnes of minerals to crush.

3. Loading and Hauling

A large excavator collects rock from the quarry floor and load Boulders to Dumptruck. Transport mateirals for processing

4. Primary Crushing

The crusher can reduce two tonne blocks of stone into pieces from 80mm diameter down to dust in one pass. Primary Crusher relies on either impact or compression to break the rock by dump them 10 stories down.



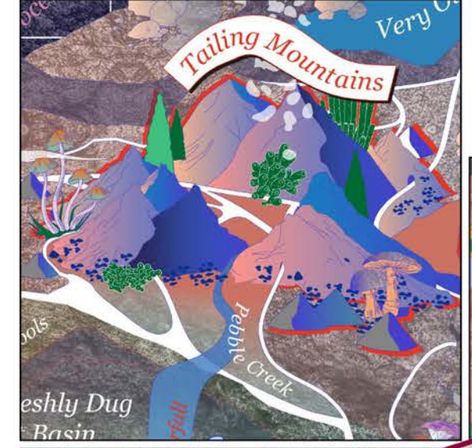
This drawing illustrates ecological successions, especially into soil through the molecular and chemical lens. Ecological succession is a fundamental concept in ecology. It's a process by which the structure of a biological community evolves over time. There are two major types of ecological succession: primary succession and secondary succession. Primary succession happens in a lifeless area. The primary succession starts with the Hudson Valley Ice age era in the drawing. Secondary succession happens when a climax community is impacted by a disturbance. This restarts the cycle of succession. The project initially identified limestone quarry as the barren land, a start of the secondary ecological succession, but quarries actually harbor all stages of ecology successions in the one site at the same time frame.

Proposal: Ravena Quarry as the National Monument

Exploring the Anthropocenic New Geology

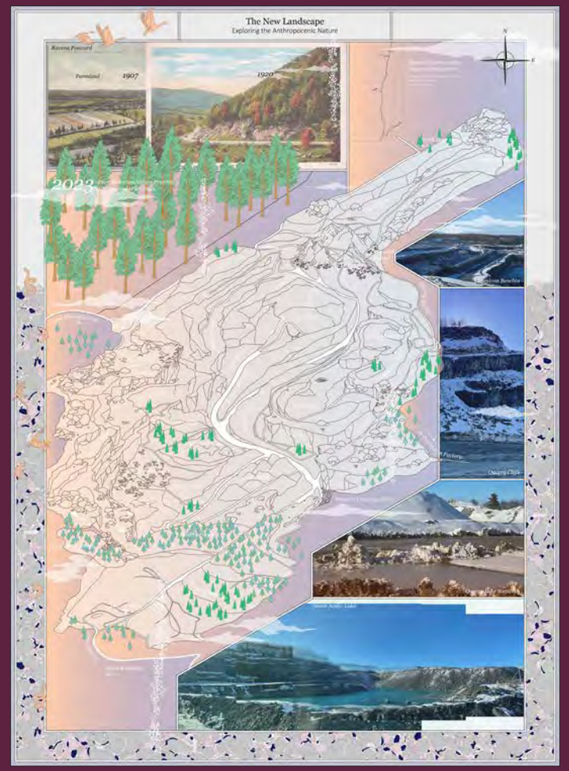
The project's goal is to propose this particular quarry site as a new typology of national monuments, such as Yellowstone and Yosemite. However, unlike them, Ravena quarry is an artificial landscape, a result of human exploitation of earth, that has never been talked about before. By illustrating the quarry site in the format of national monument maps, the project aims to depict this new landscape, new nature legible to the public and challenge what really is the notion of traditional glorification of American Wilderness. The frame of the map shows the life cycle and history of the Ravena Quarry.

This project will be open to the public and the architecture and mineral interventions are designed to accentuate the quarry micro-geologies and make it reachable to human scale. By visiting the Ravena Quarry Monument, people will experience the surreal subliminal quality of the quarry landscape, as if they are on a different planet and notice the vast gradient of ecological successions that happen in a very condensed site.



Ravena Quarry National Monument Guide Map

Ravena National Monument Park Map Drafts



Dividng Regions by Altitudes

Final Review, April 26th, 2023

behind the scenes

Anna, collecting waste rocks on site

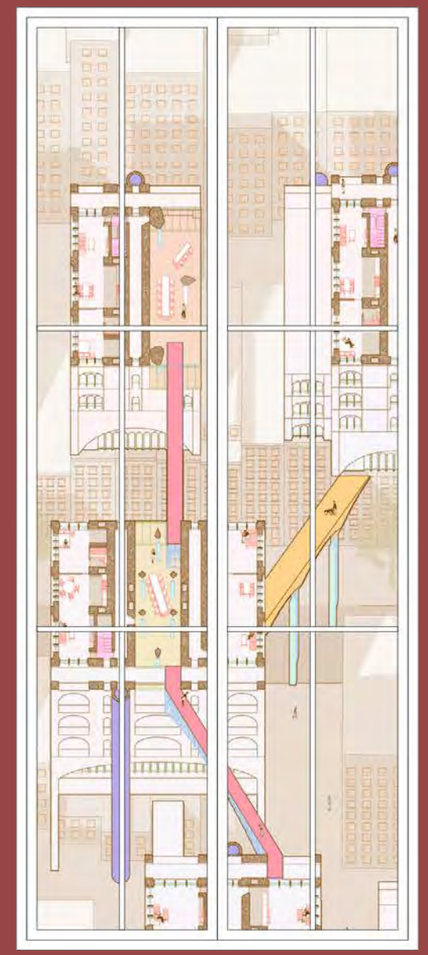
03

Decarbon Air Rights: New New York Rising

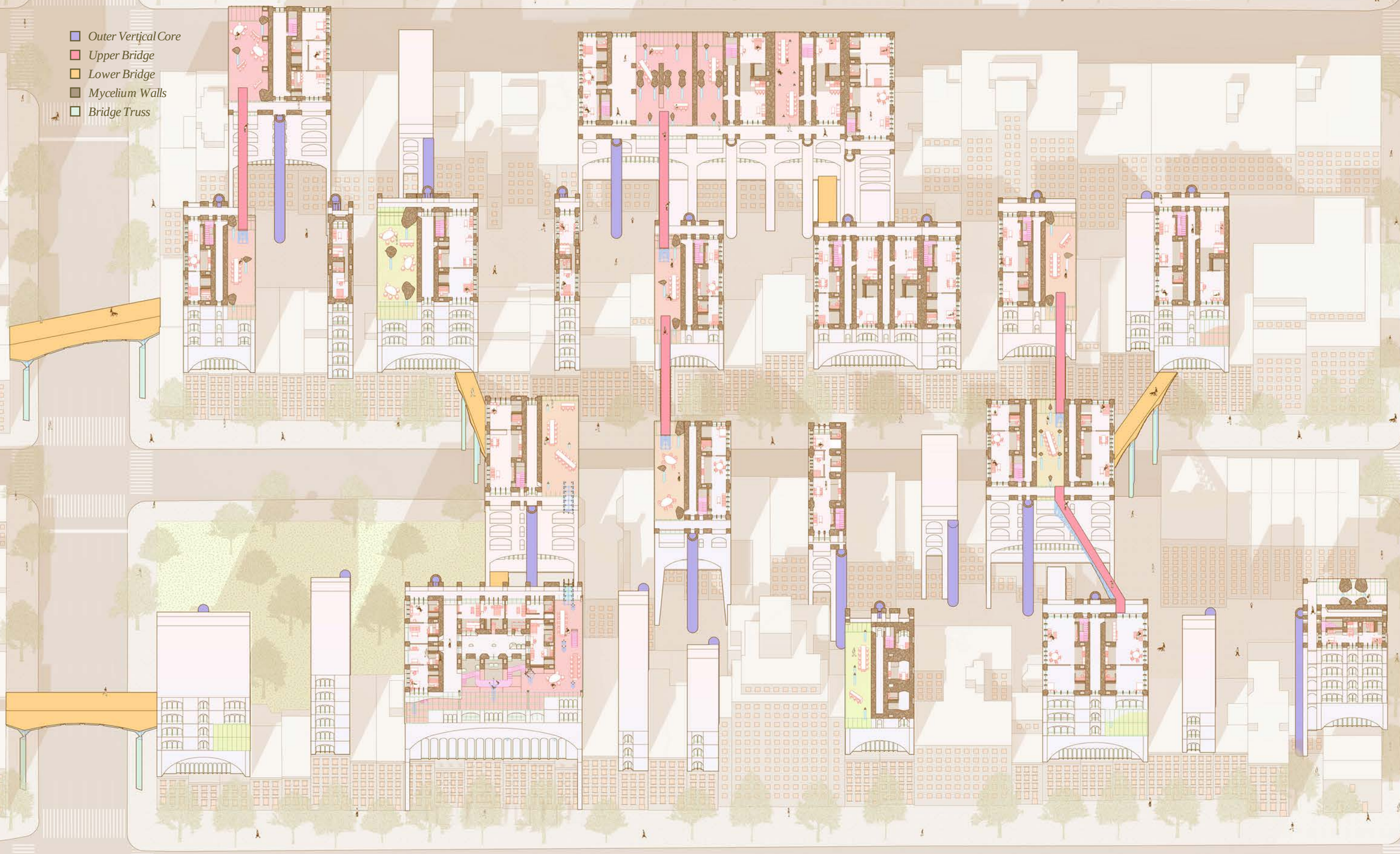
Fall of 2023

Climate Change, Material Ecosystems, and Artificial Intelligence

Columbia GSAPP_ Advanced Studio V
Type: Research Thesis Studio
Location: Chelsea, Manhattan
Instructor: David Benjamin
Collaborative work with Phoebe Lee



...imagines a future where neighborhoods are interconnected and interdependent.

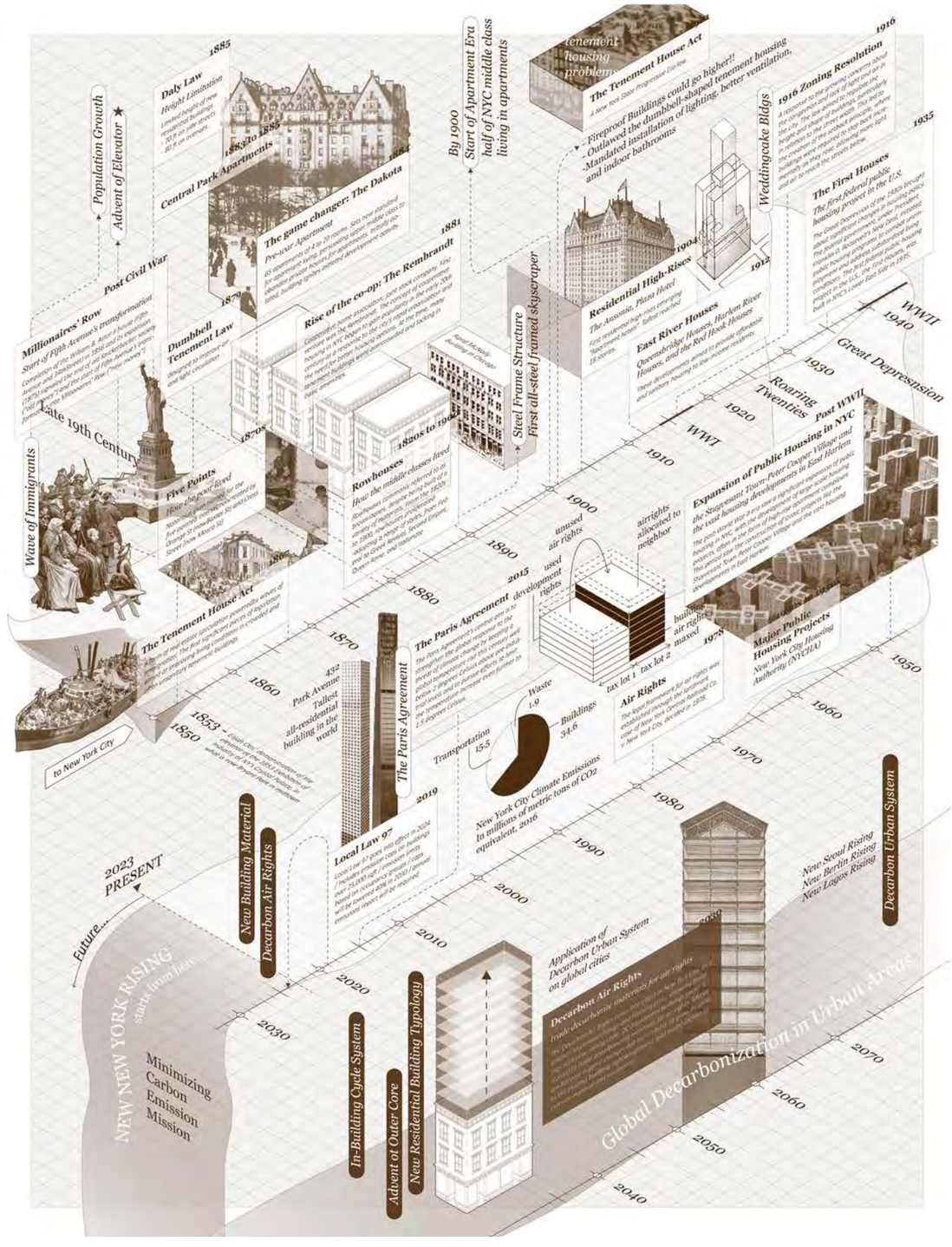


This project proposes the Decarbon Air Rights as a solution to the climate and housing crisis, allowing buildings with the new zoning code, DC (residential buildings under 5 stories) to trade decarbonizing materials for air rights. By creating a new policy and investigating the building, carbon, material cycle and related decision-makers, we are looking for a possibility to minimize the carbon emissions by locating the entire material cycle at the city. To make this new future possible, designing a holistic system is important. We saw the importance of proposing a regulation, as the NYC government has been the main driver of transforming of the NYC cityscape, with the ability to set the regulations and give incentives to developers. The decarbon air rights regulation not only provides alternatives to the climate and housing crisis, but also imagines a future where neighborhoods are interconnected and interdependent for each other.

Carbon-Negative Material
Substitute material to concrete and insulations by using Mycelium as binding agent, mixed with substrates collected from the local site.

Approach to Generative AI:
Using generative AI as an assistant tool, such as delivering conceptual ideas via abstract images, and as an engine to produce source image materials.

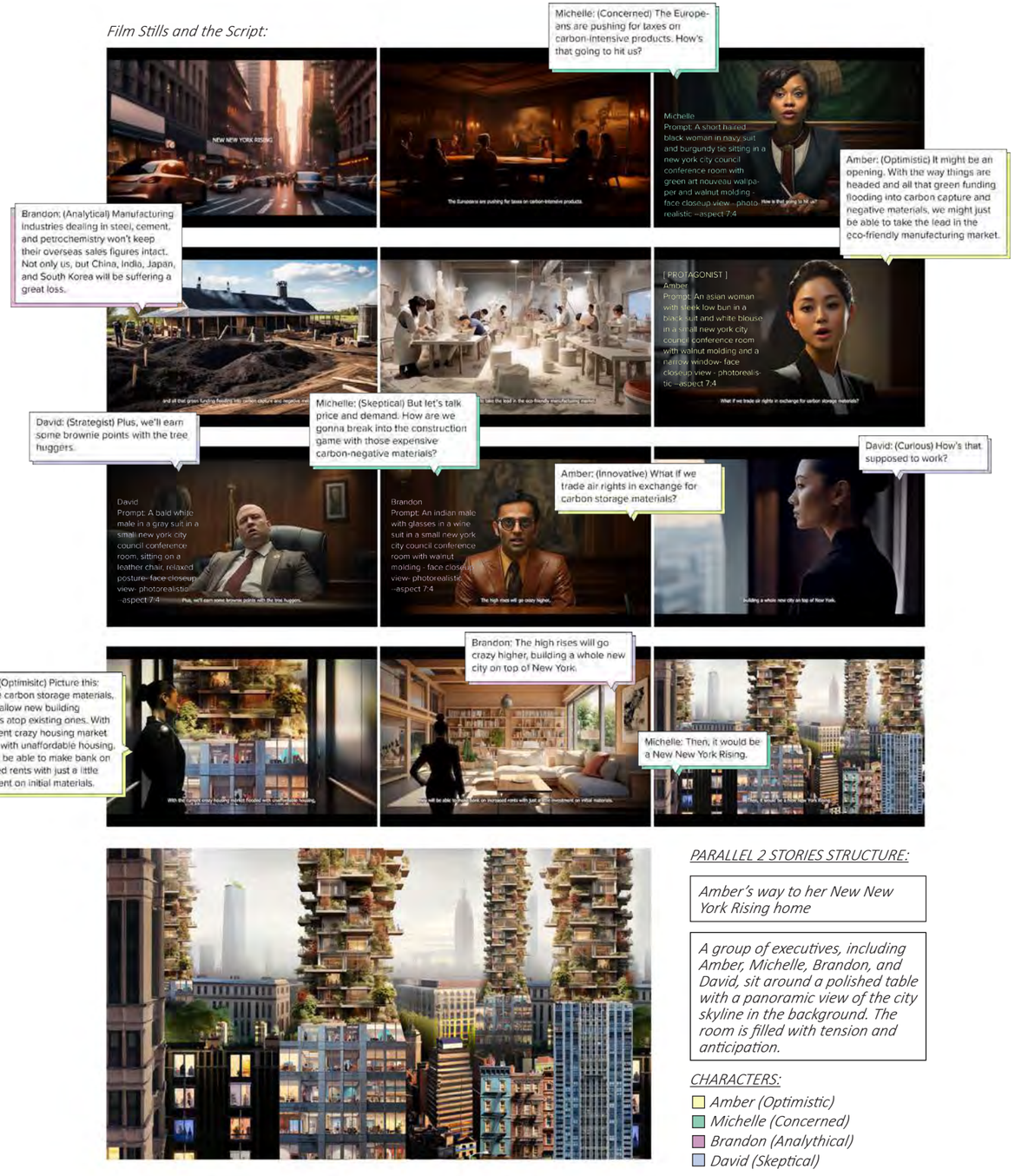
The History and the Future of
Residential Building Typologies, Technologies, and Regulations in Manhattan
and their relations with Climate Change



Film Title : <Decision Makers' Table: New New York Rising>

Video produced by Generative Ai:
Runway, Midjourney, DALL-E, D-ID, Elevenlabs

Film Stills and the Script:



PARALLEL 2 STORIES STRUCTURE:

Amber's way to her New New York Rising home

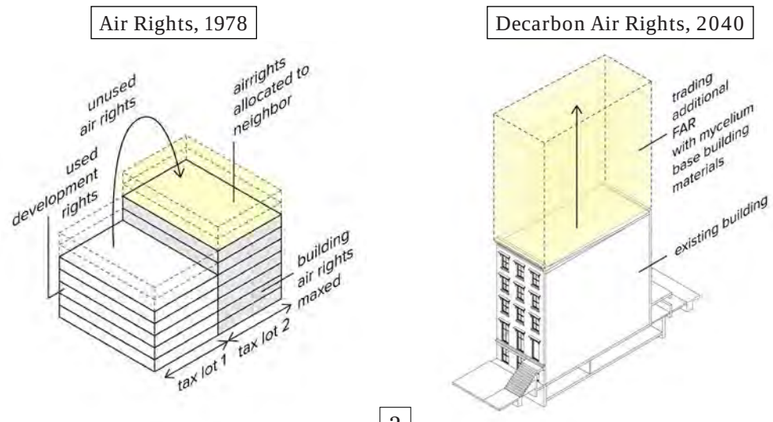
A group of executives, including Amber, Michelle, Brandon, and David, sit around a polished table with a panoramic view of the city skyline in the background. The room is filled with tension and anticipation.

CHARACTERS:

- *Amber (Optimistic)*
- *Michelle (Concerned)*
- *Brandon (Analythical)*
- *David (Skeptical)*

Project Approach : New Regulation Proposal

Reaction to the Housing Crisis and Increasing Carbon Emission



1

New Building Material : Mycelium

Living Material

- Light weight
- Strong in Compression
- Binding Agent
- Multi-purpose material

2

New Regulation : Decarbon Air Rights

Add Residential Floors Above Existing Buildings

- Respond to the Housing Crisis
- Limited Empty Land in Manhattan
- Lower-Carbon Emission Method than demolishing existing buildings
- The Need to go Vertical

3

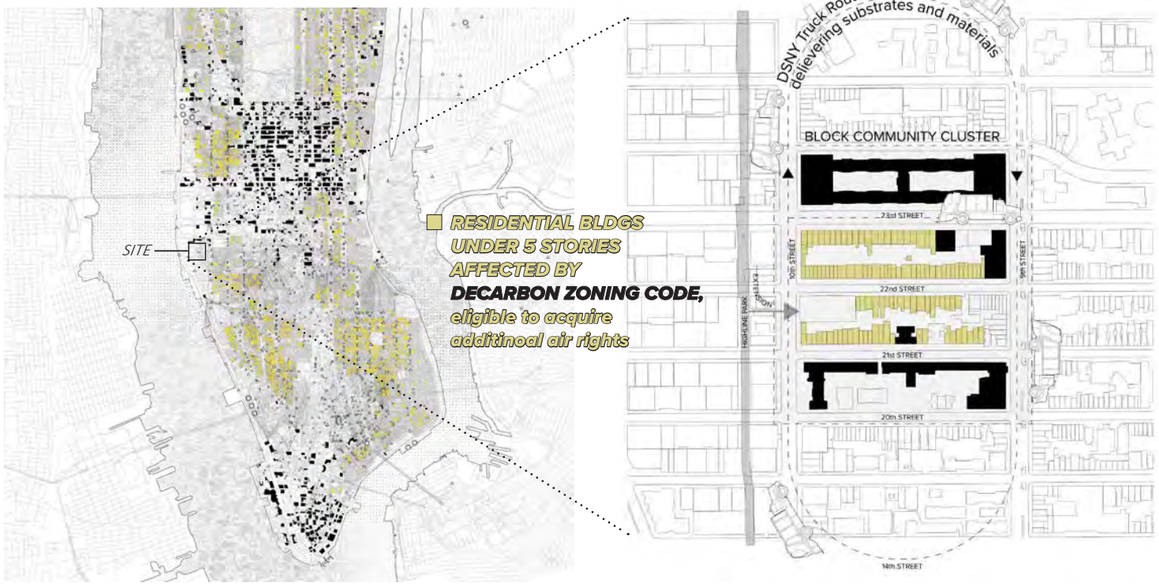
New System : On-Site Cycle System

Mnimize Carbon Emission

- Reduce Transportation Costs
- Lessen Carbon Emission
- Shorten Material Supply / Manufacture / Construction Cycle

Site Selection : Block Community Cluster

Analysis of the Impact of the Local Law 97



◎ *DSNY Truck Garage, Substrate Transportation Base*

○ *Grocery Store, where food waste will be collected*

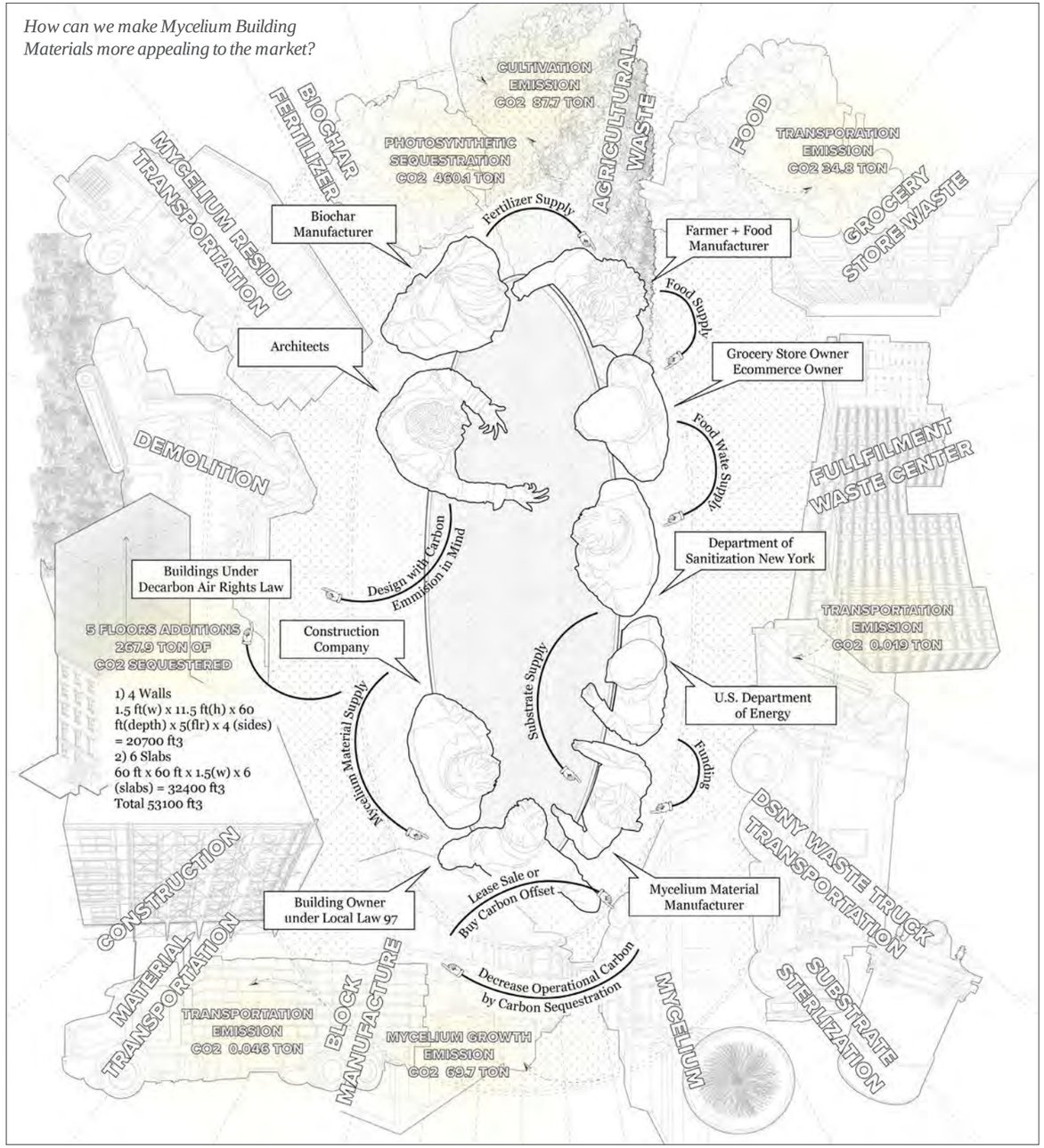
△ *DSNY Food Scrap Collect Location, collect cleaner food waste that can be used as substrates*

▢ *Residential Zone*

■ ***BIG BUILDINGS AFFECTED BY LOCAL LAW 97,** buying carbon offset or free leasing boiler room to Mycelium Manufactuers*

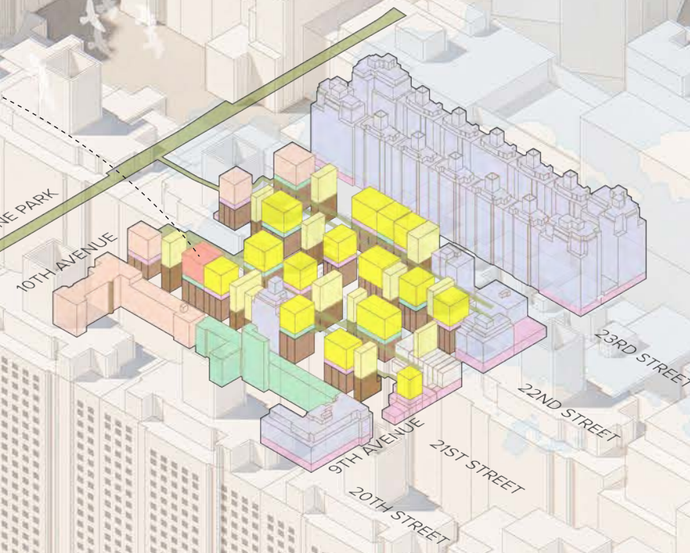
In-Manhattan Material Manufacture Cycle

Place the Entire Material Sourcing & Manufacture + Construction in the City



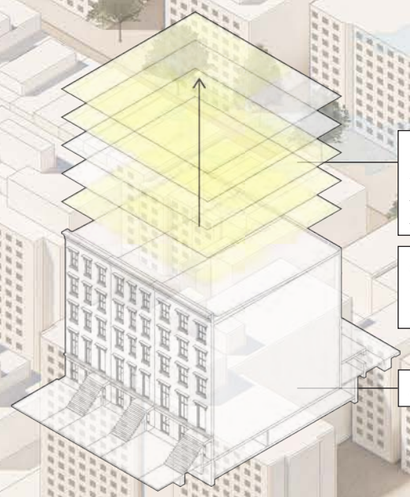
This project imagines **the entire material and construction cycle** to happen within the building to **minimize the carbon emissions**. Within a central table of decision makers, a new system is proposed; the full cycle of mycelium building materials within the scope of New York City where the cycle utilizes the supply chain. As mycelium needs cellulose substrates to grow on, we will utilize food waste from supply chains that will be **transported by DSNY waste trucks**. The manufacturing location will be in **the big buildings that are affected by Local Law 97**, which will reduce its carbon numbers by either buying carbon offsets from mycelium manufacturers or free leasing their **boiler rooms for manufacturing**. After calculation, expectations are to have **267 tons of CO2 sequestered as one building constructs 5 floor additions.**

Mycelium Block Community Cluster
Encourage Buildings to
Exchange & Cooperate together
to achieve Common Benefits



Target Building

Row House Cluster



Trading additional FAR with mycelium based building materials

Bigger Floor Plate = More Diverse Plan + Program Possibilities

Existing Buildings

Interdependent Blocks

→ Less Transportation Costs
→ Buildings supporting eachother with different specialties for each block
→ Blocks exchanging benefits

- *Target Building*
- *Additional Residential Floors*
- *Additional Temp-Residential Floors*
- *Community Floors*
- *Commercial Floors*
- *Manufacture Buildings*
- *Highlign Park*
- *Existing Rowhouse*
- *Parking Floors*

Common Benefits

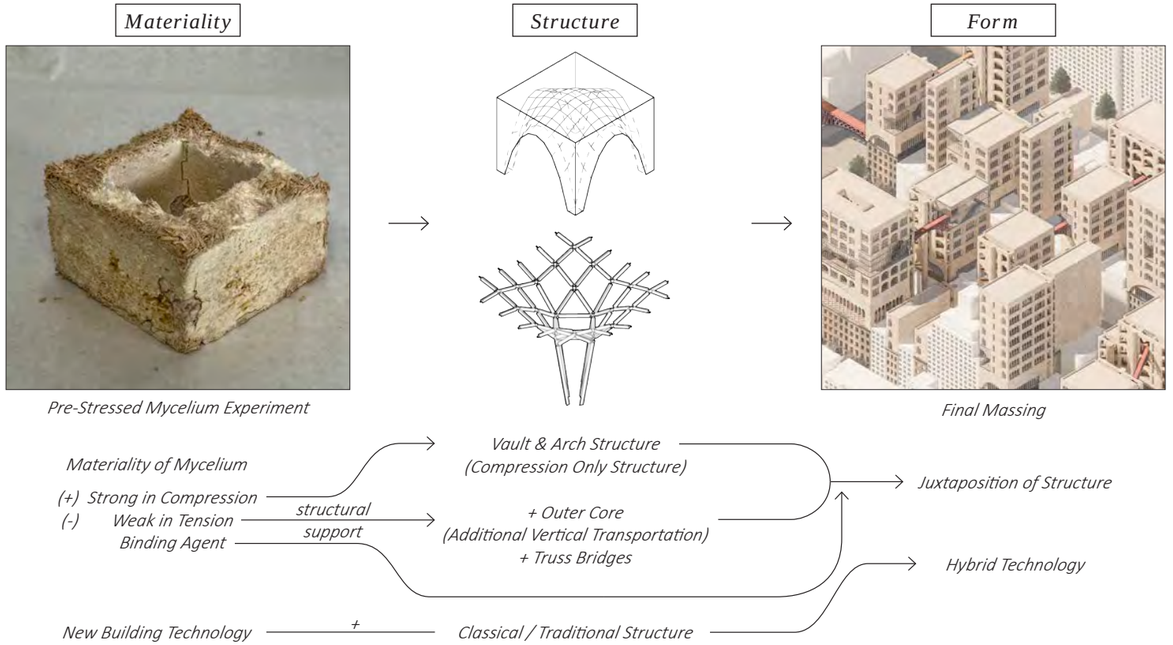
Decarbon Materials
Diverse Floor plans
Community Areas
Open Public Spaces
Extension of the Highline

Mycelium Building Material

Hybrid Material Structure

Design Strategy

Form Driven by Materiality Qualities and Structure



Since mycelium is strong in compression and weak in tension, compression only structure was selected with pre-tension form finding methods, and interpreted it in monolith vault, arch and truss systems. With computational tests, we draw optimal dimensions for slab, span, ceiling heights, and saw the possibility to support the upper structure with a long span ground floor. Next, the construction method was tested in a fraction model. First, we filled a box with dirt to use as the mold. And then we poured mycelium in, layer by layer, prestressing each layer. During the actual construction, we plan on constructing the scaffoldings on site, first to support the weight of dirt volumes, then, construct the boundary mold and pour the dirt in. Then conduct a 3d scanning on site to make the dirt mounds and pour the mycelium in, give stress, and complete floor by floor.

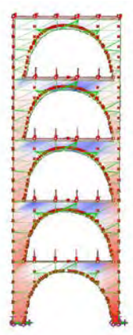
Structural Analysis: Computational Tests on Karamba

Identifying the Structural limitations and Possibilities

Using RV2 :
Multi Floor Vault Study

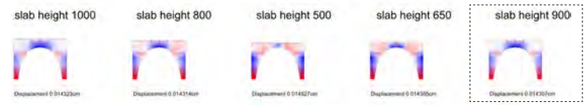
Section Structure Study

Multi Floor Study

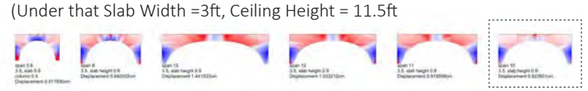


Using RV2 - Multi Dimensions Study (Manual Optimization)

Slab Width Study : Optimized Slab width = **2.95ft**
Selection Criteria: NYC Zoning Code Displacement Limit = Storey Height x 0.004
→since we only measure live & dead load, we halved the limit(Storey Height x 0.002)

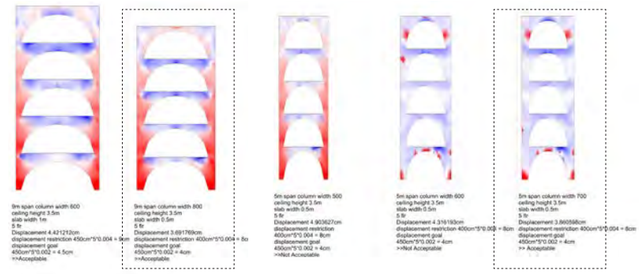


Span Length Study : Limit = **32.8ft**
(Under that Slab Width =3ft, Ceiling Height = 11.5ft



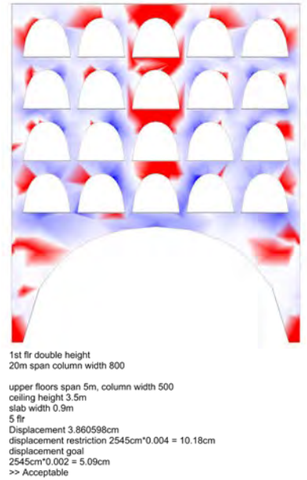
Using RV2 - Multi Floor Vault Dimensions Study (Manual Optimization)

30ft Span Slab & Column Width Study (Ceiling Height=11.5ft):
Slab width can be reduced to **1.64ft**
Column width can be reduced to **2.62ft**
16ft Span Column Width Study (Ceiling Height=11.5ft):
Column width can be reduced to **2.30ft**



→Conclusion
If the span length is under 30 ft, it is better to keep the span longer, since column widths do not have a big difference although span changes:
Beneficial to have CLUSTERS!

Using RV2 - Possibilities for Support from Outside the Existing Building and a Longer Span for the 1st Floor



It's possible to have on **65ft long span**, if it's double heighted.
It's also possible to not have the upper columns stretched towards the bottom, if the first floor is strong enough

→Possibilities
If there are **two bridges and an outer core supporting the building** from the street & rear yard direction,
→ the long span can be supported from the bridges & provide larger community & commercial space

Formal and Material Experiment with Mycelium

Construction Method Study

Physical Model, 1/4" scale

THE NEW NEW YORK RISING

Construction Phase

How are the additional floors built on-site?

1. Scaffolding Construction

Construction of scaffoldings that will support the weight of dirt volumes

2. Set Boundary Mold

After constructing the boundary mold, pour the dirt inside.

3. Construct Dirt Mounds

Conduct 3D scanning on site to shape the dirt mounds

4. Mixing Mycelium and Substrates

Mixing mycelium and substrates on site by using mixer truck

5. Pour and Give Stress

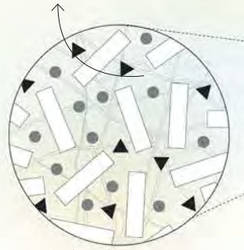
Pour Mycelium
Give Stress
Complete One Floor

6. Recycle Dirt and Repeat

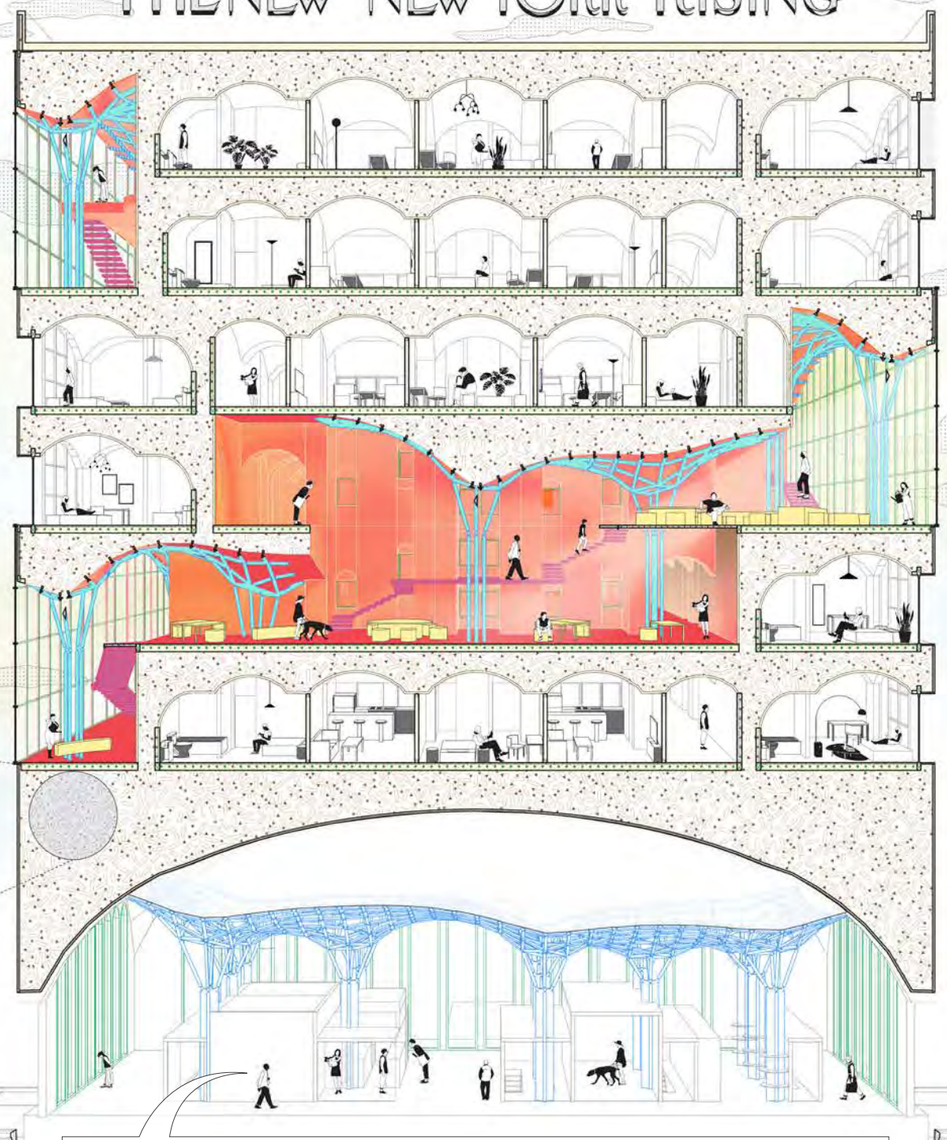
Recycle the dirt for the next floor
Repeat the whole process
Complete floor by floor

Building Materials as the Storage for Locked Carbon

Mycelium as the Binding Agent

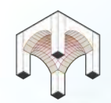


Agricultural Waste ●
Food Waste ▲

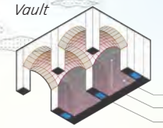


Unit Configuration

Program Designated by Sturctural Distinction

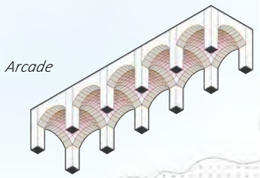


Vault

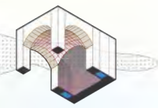


Vault+Service Area

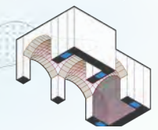
Arcade



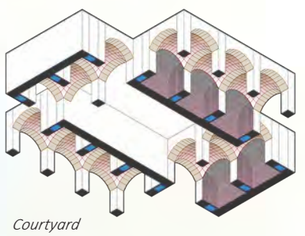
Service Space
Possible Openings
HVAC



2 Vault L-Shaped [Residential Unit]

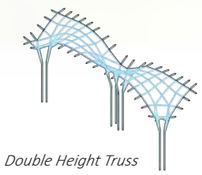


2 Vault Linear [Residential Unit]



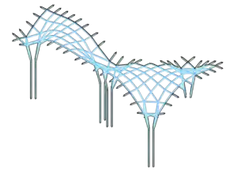
Courtyard

Single Height Truss



Double Height Truss

Double Height Truss [Community Space]



Double Height+Single Height Truss [Connected Community Space]

Expected Carbon Sequester

Locked Carbon that does not biodegradae

As there are 1 million buildings in NYC that are affected by decarbon air rights, if it is allowed to do 3 floor additions, it will be able to sequester huge amounts of carbon by mycelium additions. While these scales of concrete and steel buildings are created, demolishing the existing, 500 tons of carbon will be embodied by each building, in total 530 million tons in Manhattan. When these are not demolished but added, 180 tons of carbon will be embodied by each building, 190 million tons in Manhattan. However, these mycelium neighborhoods would sequester 35 tons of carbon by each addition, 37 million tons as a whole in Manhattan.

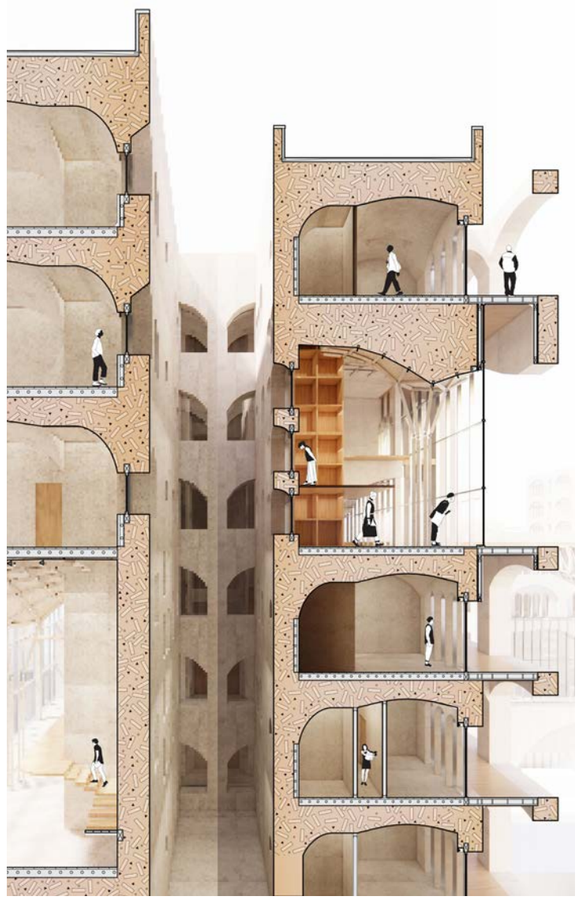
Demolish 8 floors = 500 ton
→ 530 milllion ton (Entire NYC)
3 floors addtion = 180 ton
→ 190 million ton (Entire NYC)
1,055,514 Buildings
Mycelium 3 floors addition = 35ton
→ Sequester 37 million ton (Entire NYC)

Replacing Carbon Emissive Building Materials with Locked Carbon that does not biodegrade

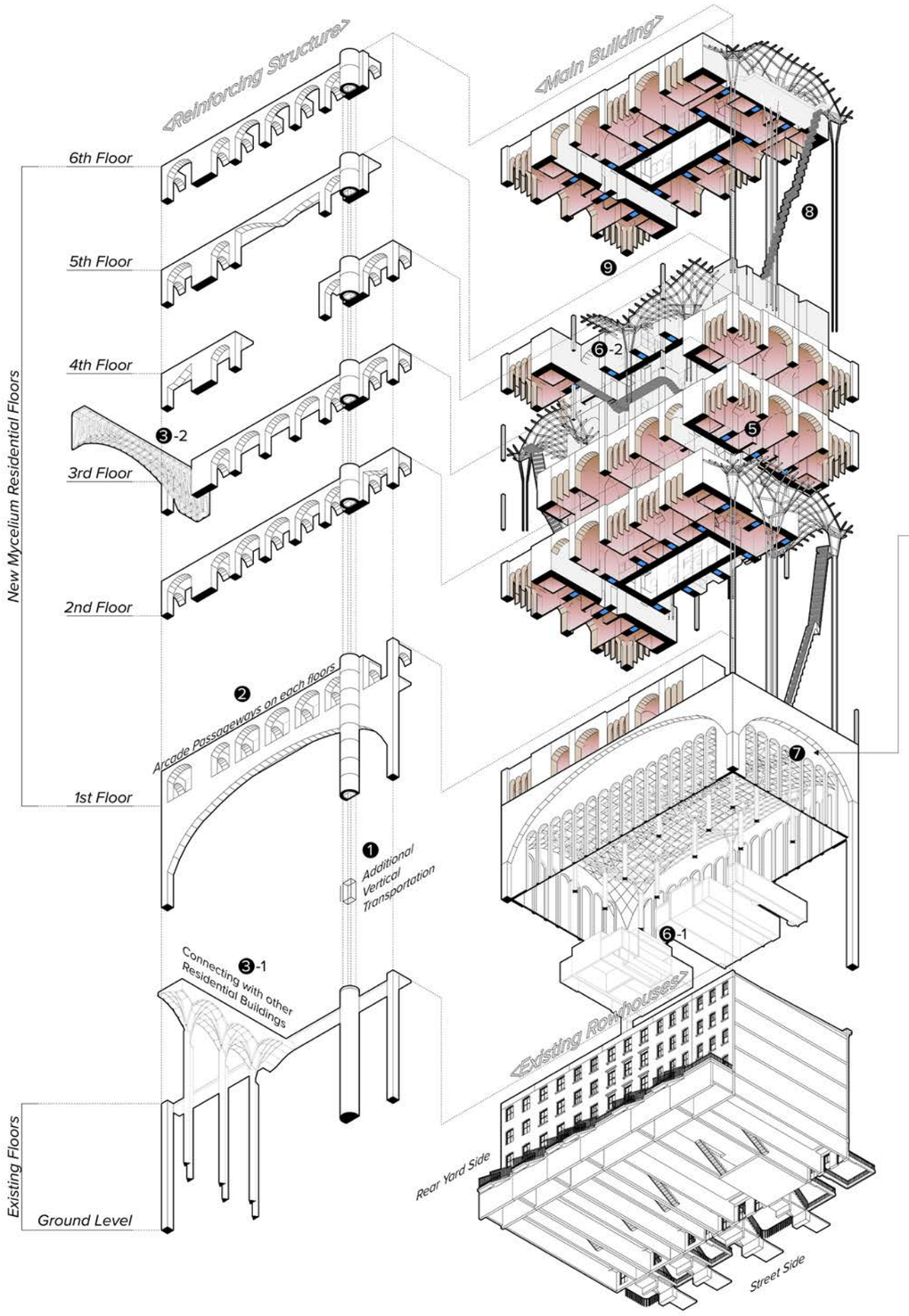
Structural Organization and In-Building Cycle System

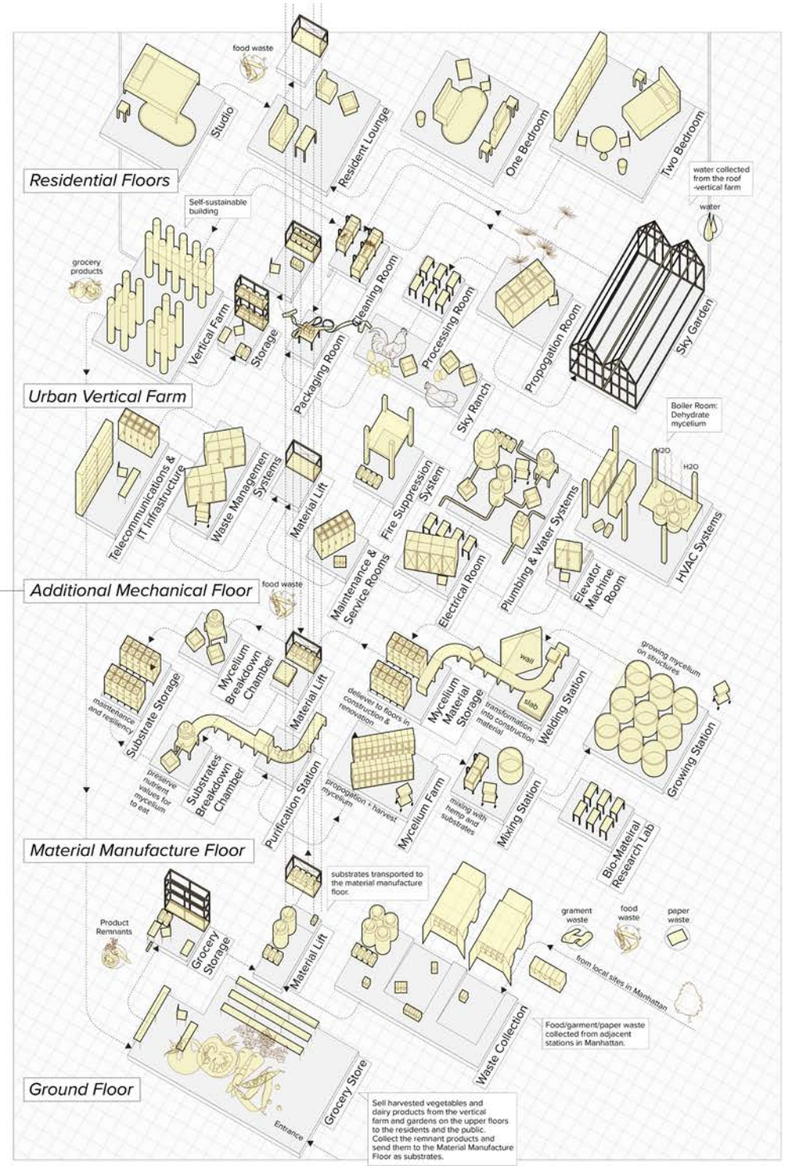
Interconnected Neighborhood by New Elevated City Network

Vaults and arches are used in resdiential spaces for their enclosed quality. Trusses are used in public spaces and bridges as they create more open spaces. Vaults are supported by supporting arches, where wet walls and HVACs are placed. These vaults connect and create l-shaped linear units, arcades and courtyards.



Residential Unit Interior Render



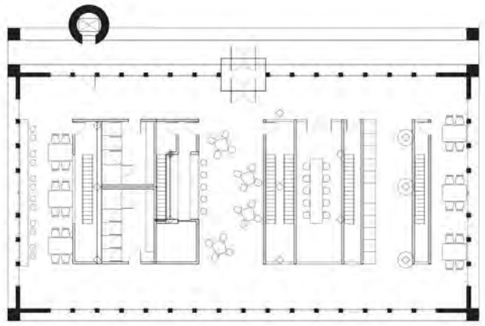


Reinforcing Structure

- ❶ Outer Core — *Mycelium Masonry Structure*
- ❷ Arcade Passageway — *Extended Mycelium Slab*
- ❸ Bridge — *Truss Structure*

Main Building

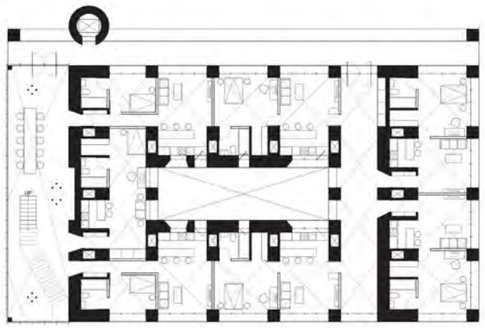
- ❺ Residential Vault Units — *Stressed Mycelium Slabs & Walls*
- ❻ Community Space — *Single & Double Height Truss Structure*
- ❼ Additional Mechanical Floor
- ❽ Staircase
- ❾ HVAC System



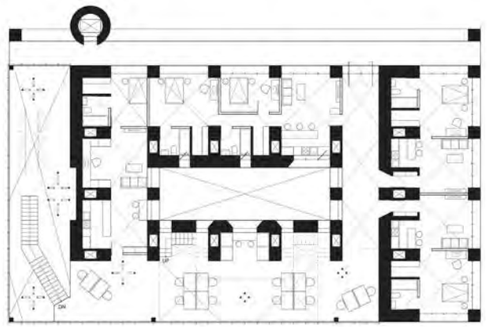
Transitional Public Floor

Floors Additions to the Target Building

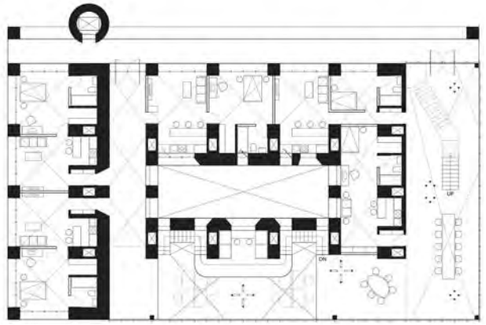
The units are connected by arcade hall and the staired public space, accessed from Balconies and the elevator. Service spaces are connected next to the vaults creating restrooms, kitchens and storage. Residential units access outdoor air also from the courtyard. Thick walls of the service arches are carved out to create windows for ventilation and daylight. Pipes and facilities are located under the wooden floor finishing and inside the walls of service arches. Trusses are joined with the mycelium ceiling from the ball joints.



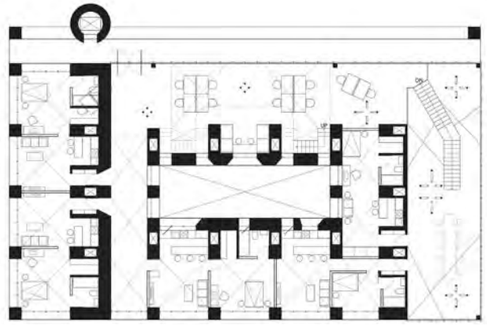
Residential 1st Floor



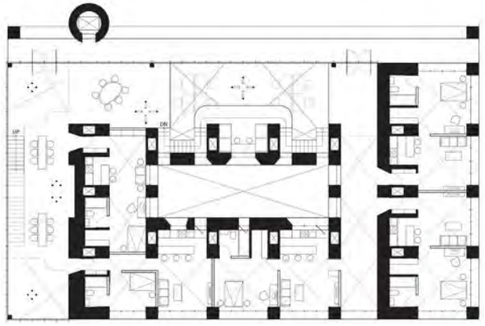
Residential 2nd Floor



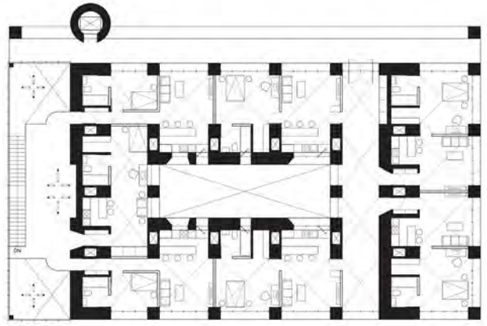
Residential 3rd Floor



Residential 4th Floor



Residential 5th Floor



Residential 6th Floor

1. *Transitional Public Space*
2. *Upper Public Space*
3. *Vertical Farm*
4. *Mycelium Furniture Workshop*
5. *Common Room*
6. *Outer Core*
7. *Balcony*
8. *One Bedroom*
9. *Studio*

Plan Strategy

1. Carve into the walls

Place Service Area into the Negative Space

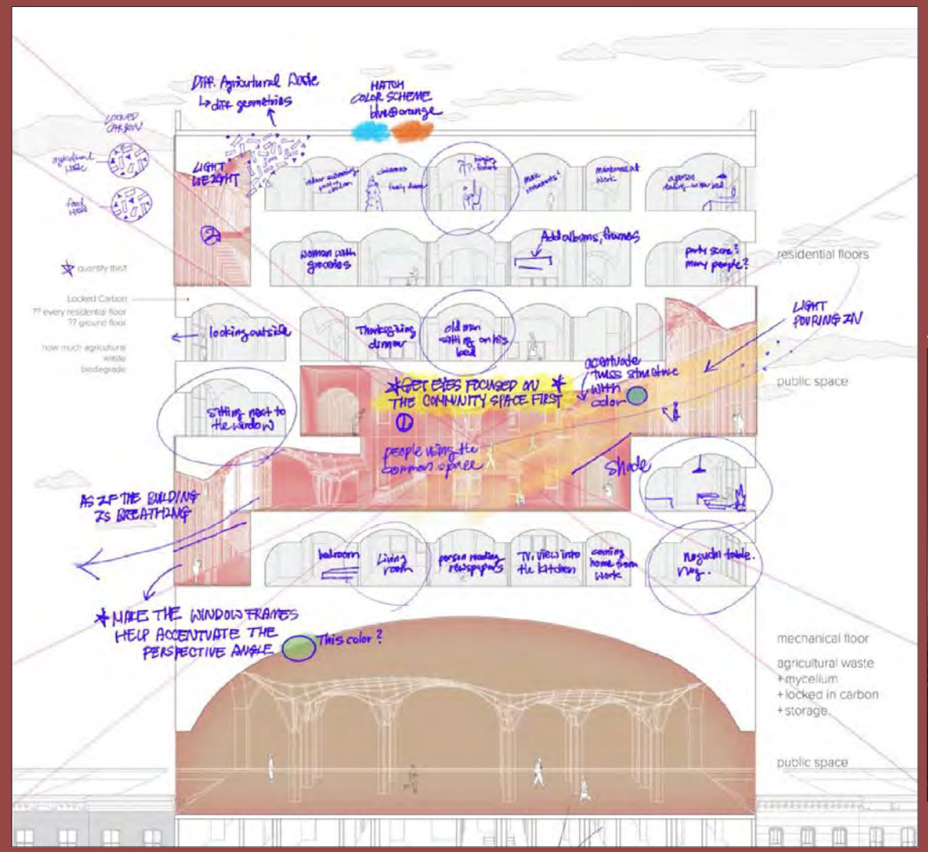
2. Rotating Staircase

-Provides continuous double-height public space that interpenetrates the building vertically

-Spirals around the courtyard with Truss Structure System

3. Outer Core

-Provides additional vertical transportation from the Rear garden and difectly lands on the bridges that support the building's structure

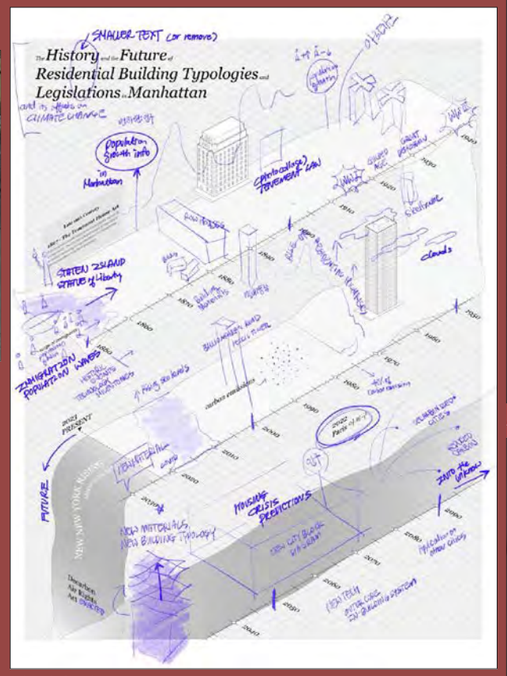


Sketch for Perspective Section

Decarbon Air Rights Poster - Mid Review

Final Review, December 13th, 2023

Material Kitchen



Sketch for the History Research Drawing

Mycelium Experiment

Class Photo

behind the scenes

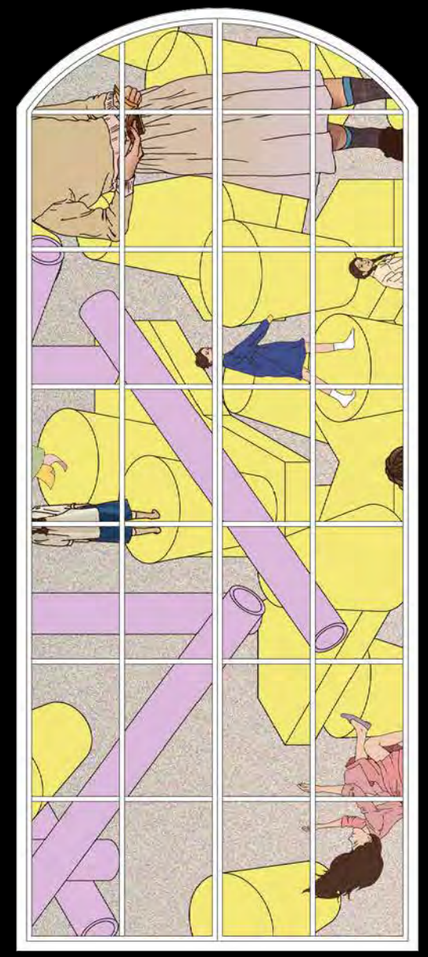
04

Minute Pieces: Depiction of the World through Anna's Lenses

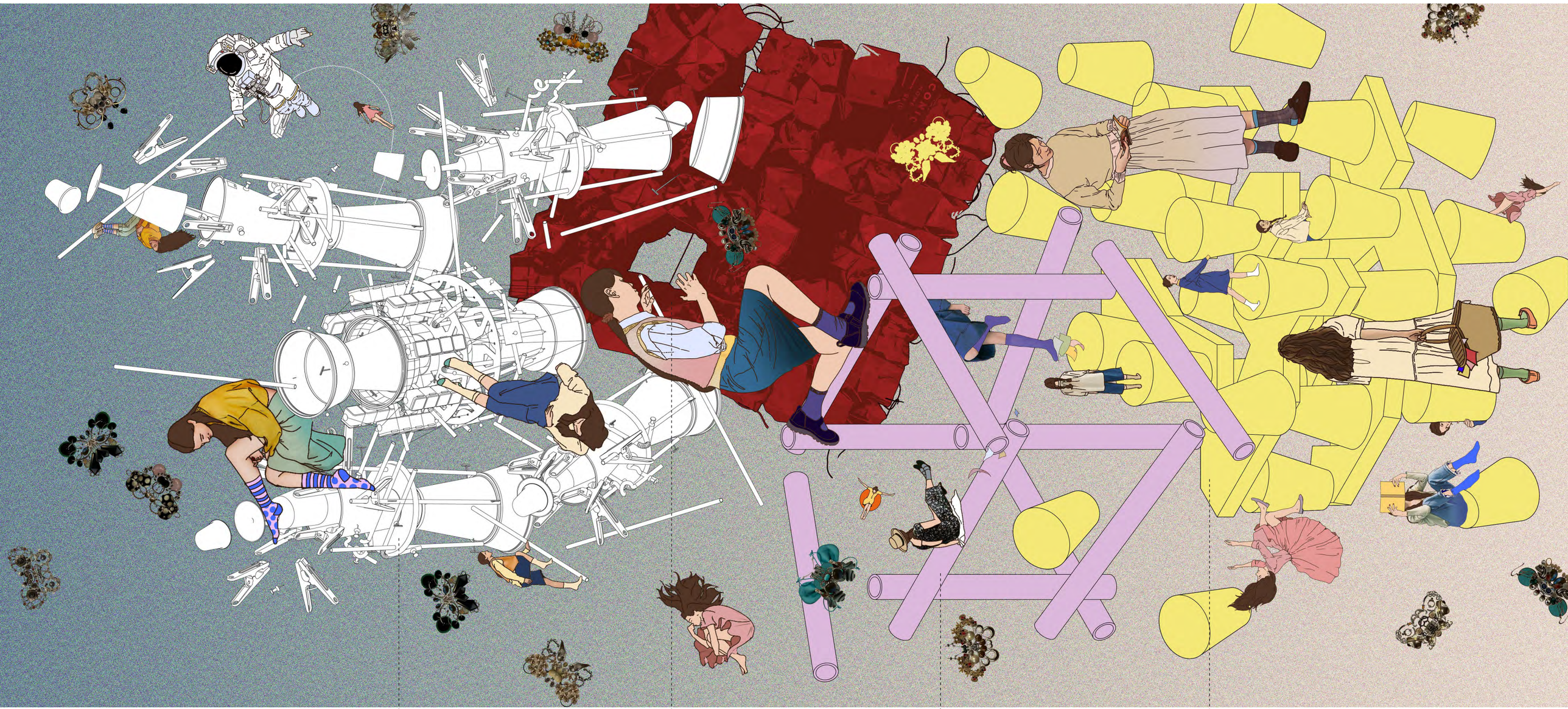
Spring of 2024

Imaginative Depiction of Material Exploration through Book Making

Columbia GSAPP_Advanced Studio VI
Type: Makergraph Studio_Book Publication
Instructor: Ada Tolla and Giuseppe Lignano
Individual Work



I focused on capturing all these imaginations, scenes, fantasies, that only I could see and realize them on papers. Through this book, I am showing you how I dream and live this world.



A girl and a thread guide the readers throughout the book's narrative

I approached this book as a final chapter to all of my 12 years of education journey. Through making this book I had an amazing experience of falling in love with design and art over and over again. I was discovering and reminding myself of why I came into this field and why I chose to become a designer. And why it's so important to me to not forget those reasons.

It's called Minute Pieces because I work with little pieces in a meditative incremental practice that accumulates over time, eventually creating the whole object. That's how I design, weaving narrative through accumulating little details and with the harmonious working of those design components, I tell a story.

It's a meditative practice because I don't think about anything and at the same time, I think about everything. Through this practice I keep myself together. When I see the accumulation of my fract, I realize that I got healed through the process. It's almost as if I am witnessing the evidence of my time spent. Or finding a way to quantify effort. You can almost trace the shadows of my working hands and the history of making each piece through each stitch and joinery. This is the project I worked on most intuitively. By letting myself be very intuitive, I was fully immersed in the process of making. The making process was almost as if I was chasing a butterfly in a meadow.

Throughout the project, I made a point to avoid using glue and tape, which is why I started to use threads and pins to connect everything together. I am an embroiderer

when I am not designing, so I know how sturdy and reliable threads can be. Designing the joints became the essence of the whole process of this totem.

Throughout the book, there is this girl and a thread guiding you. She is me. Through her, I wanted to illustrate how I was experiencing the making process. I imagine almost out of habit. When I was making the joineries in the plastic pieces, I saw her perching on one of the straws. I saw her sleeping inside the cocoon when I was making plaster cups. I saw her cooking in her kitchen in her paper popcorn residential unit when I was weaving the structure. She has been roaming inside my head this whole semester.

The obsessions chapters resonate how I find beauty and joy in taking a closer look into what's already around us, discover unseen values, and give new identities. Like how I created butterflies out of my jewelry collection. I've always thought that earring posts look like insect's legs. How I took zoomed in view in my hands, discovering vast landscapes. I've always been fascinated by the soft curves that little muscles on my hands create.

During the editing process of this book, I focused on capturing all these imaginations, scenes, fantasies, that only I could see and realize them on papers. Through this book, I am showing you how I dream and live this world.

Outer Cover

Interior Cover

Final Review Setup

The book is called [Minute Pieces] because I work with little pieces in a meditative incremental practice that accumulates over time, eventually creating the whole object. That's how I design, weaving narrative through accumulating little details and with the harmonious working of those design components, I tell a story.

The Whole Book

Making Method:

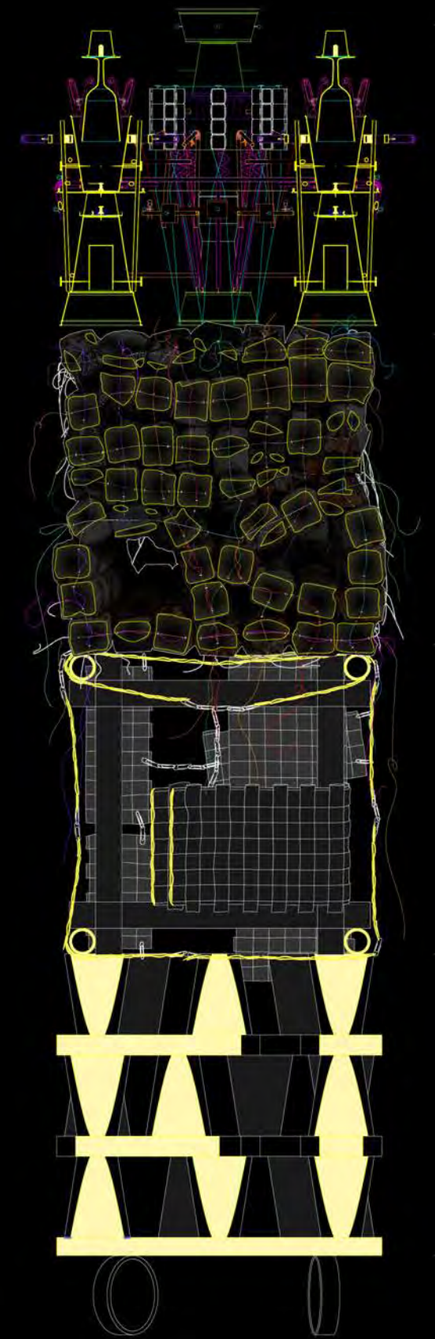
minute
pieces
repetitive
practices
incremental
accumulation
symmetrical
stories

The Narrator and the Material Totem
18"(w) x 18"(l) x 72"(h)

Section through Everyday Objects

This totem is built with everyday objects that I can find. Seeing alternative purpose and identity for the objects I touch daily and depicting the new perpsona through book making.

Total Totem Section



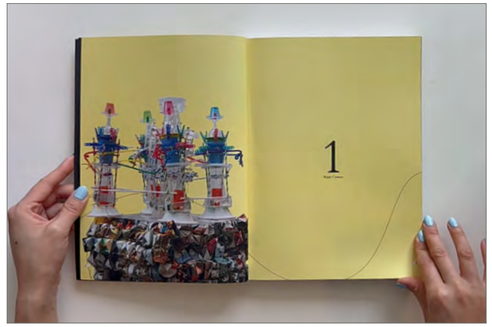
Structure of the Book

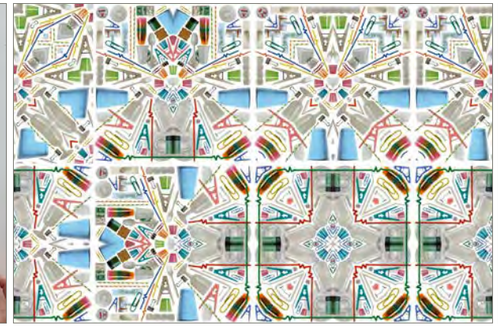
Part 01 - the Materials

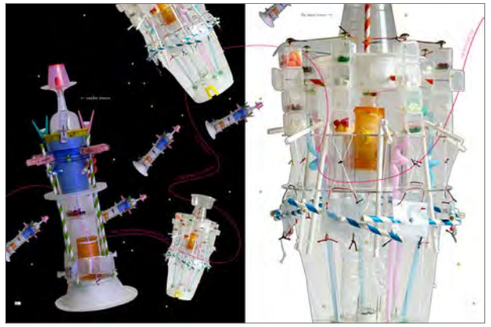
Each chapter starts with part 1, introducing one of the 4 objects. Each object is created by different materials; earth, metal, paper, and plastic

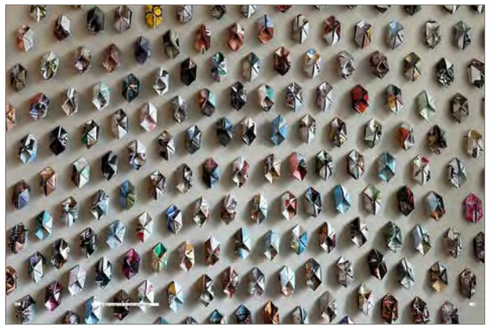
Part 02 - the Obsessions

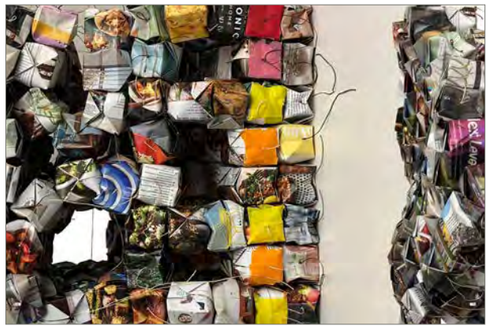
Part 2 resonates how I find beauty and joy in taking a closer look into what's already around us, discover unseen values, and give new identities.

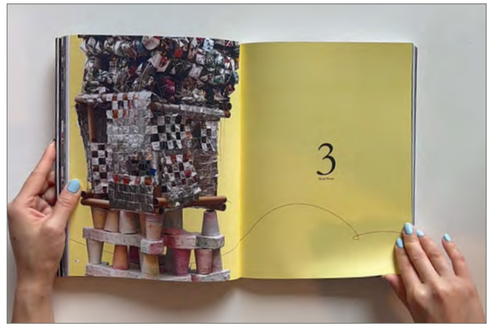


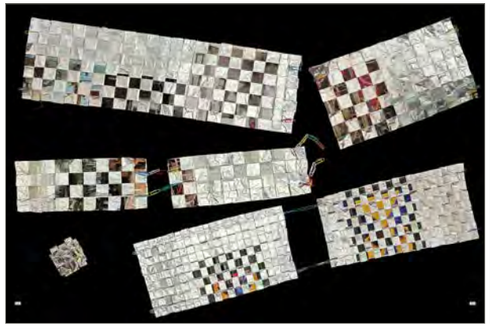


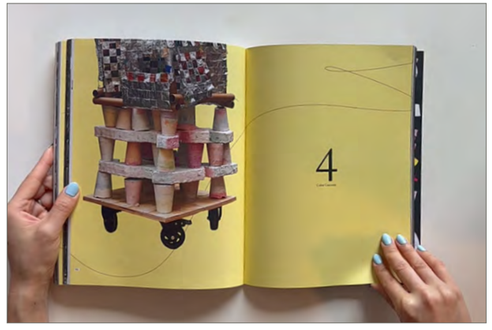












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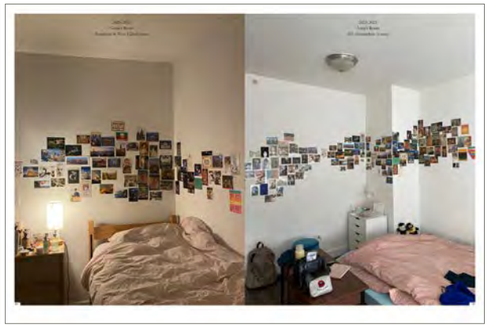
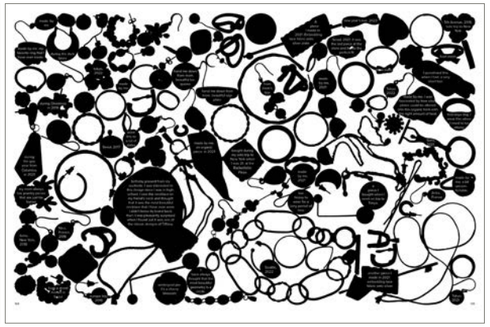
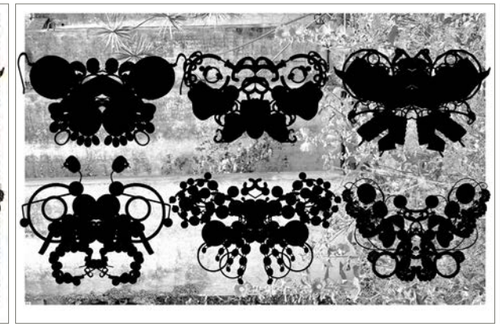
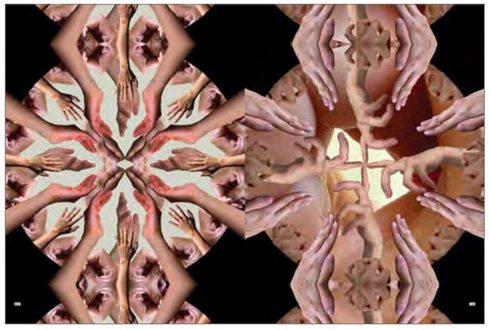
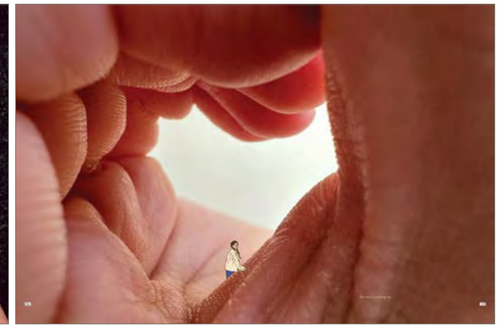
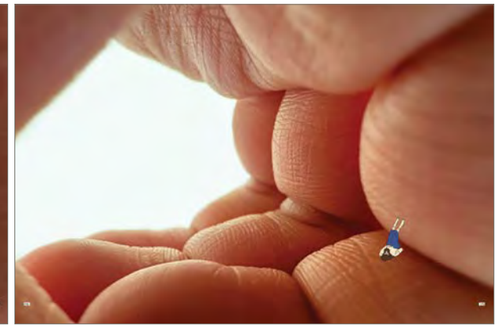




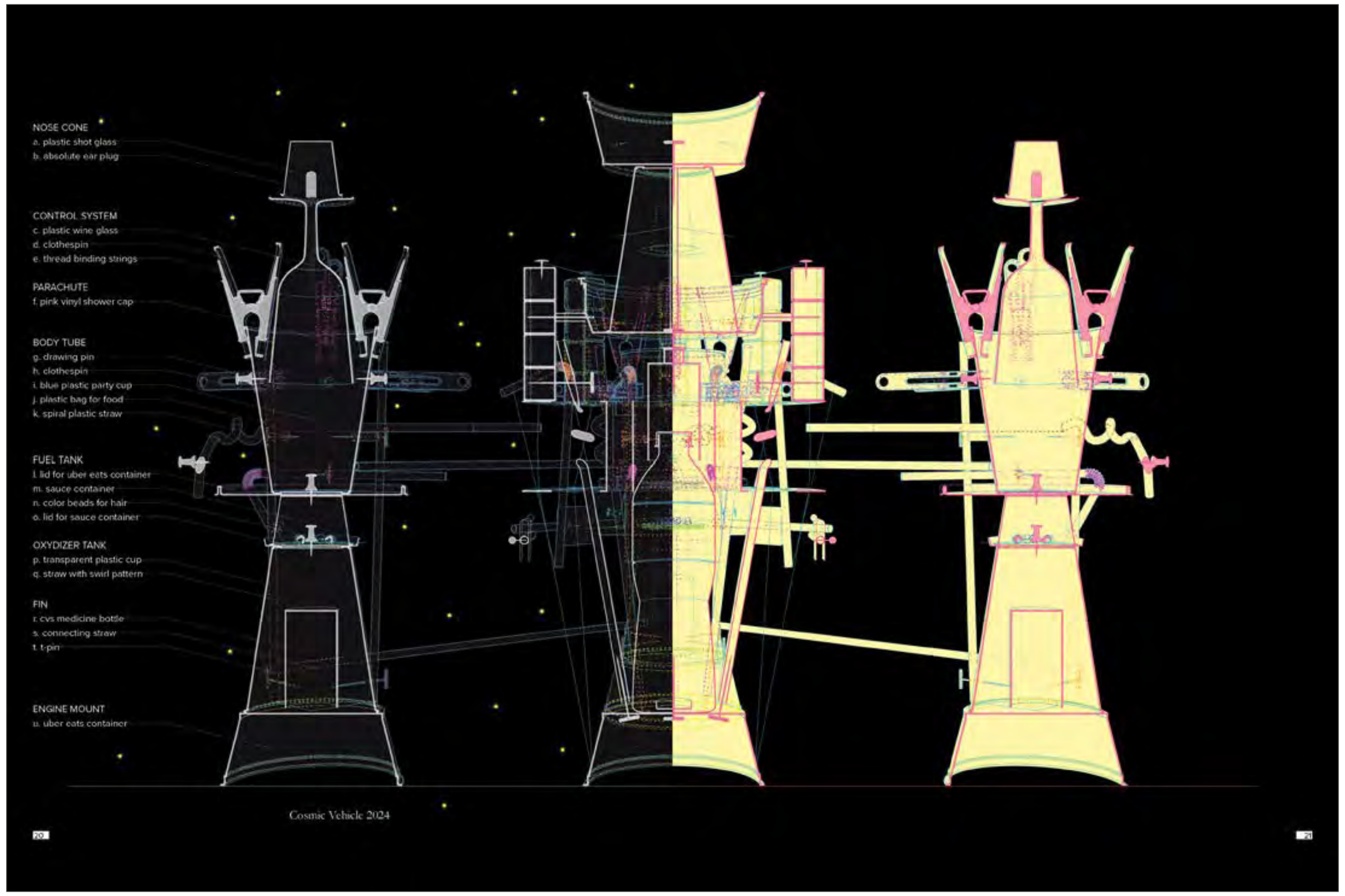




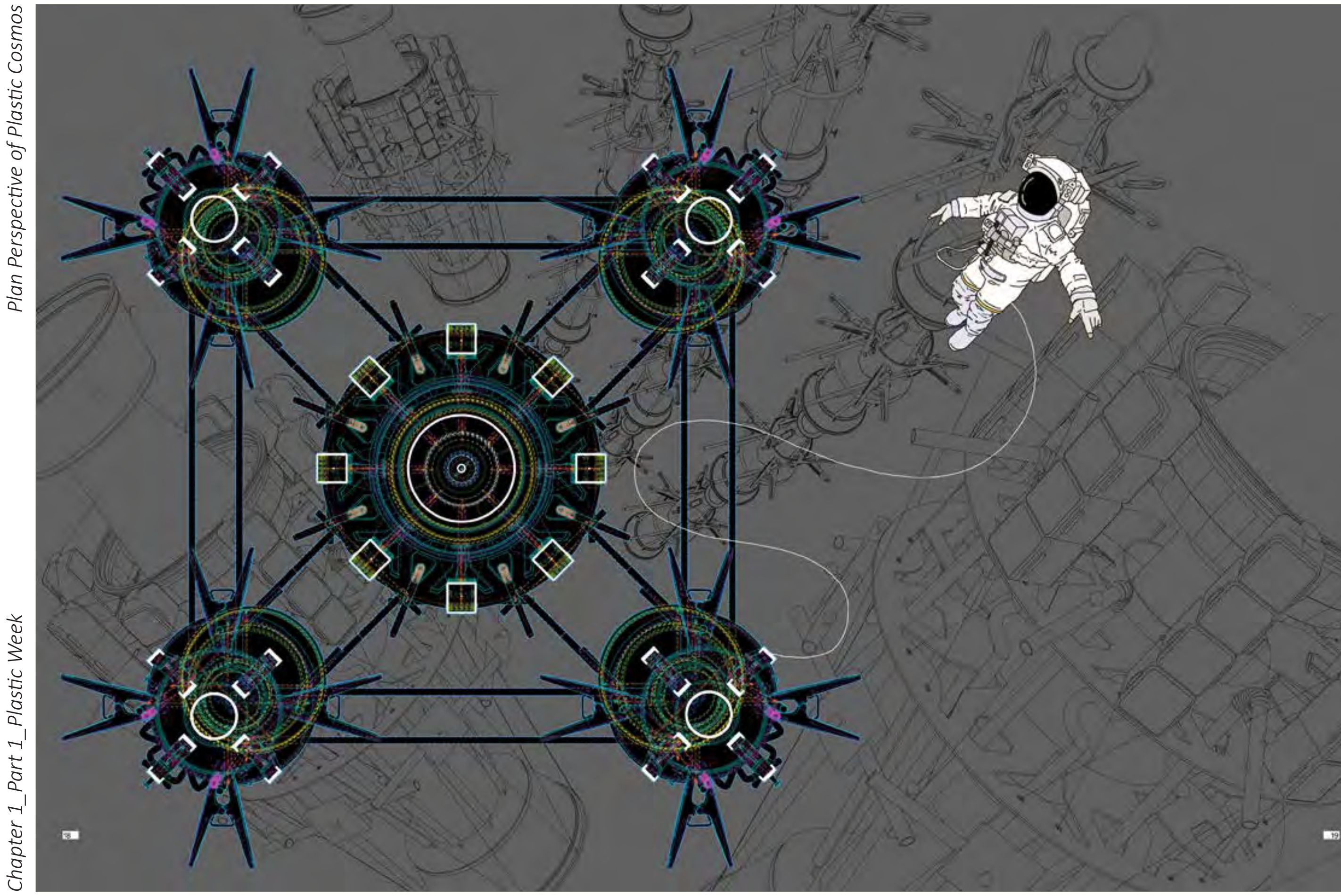




Chapter 1_Part 1_Plastic Week
Section of Plastic Cosmos

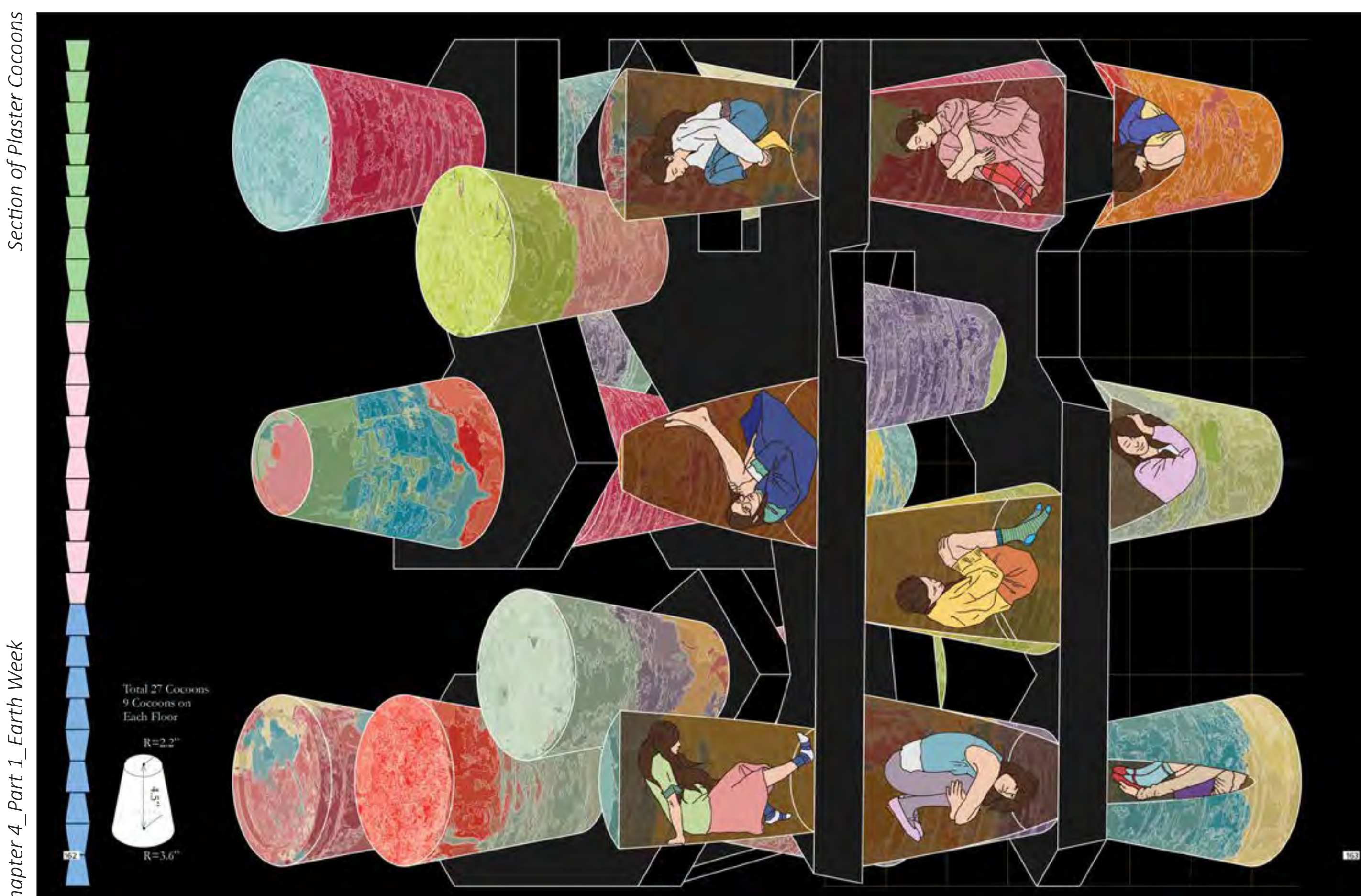


Chapter 1_Part 1_Plastic Week
Plan Perspective of Plastic Cosmos



Chapter 2_Part 1_Paper Week
Section of Paper Popcorn

Chapter 4_Part 1_Earth Week
Section of Plaster Cocoons



Chapter 4_Part 1_Earth Week

Finding landscape on the surface of plater cocoon

cocoon #7
hatching

Page 156 & 157

Chapter 1_Part 1_Plastic Week

Plastic Cosmos First Iteration

the house

travel starts early in the morning as the sun rises

Page 16 & 17

Chapter 2_Part 1_Paper Week

Process of Making Paper Popcorn

Page 66 & 67

Chapter 2_Part 1_Paper Week

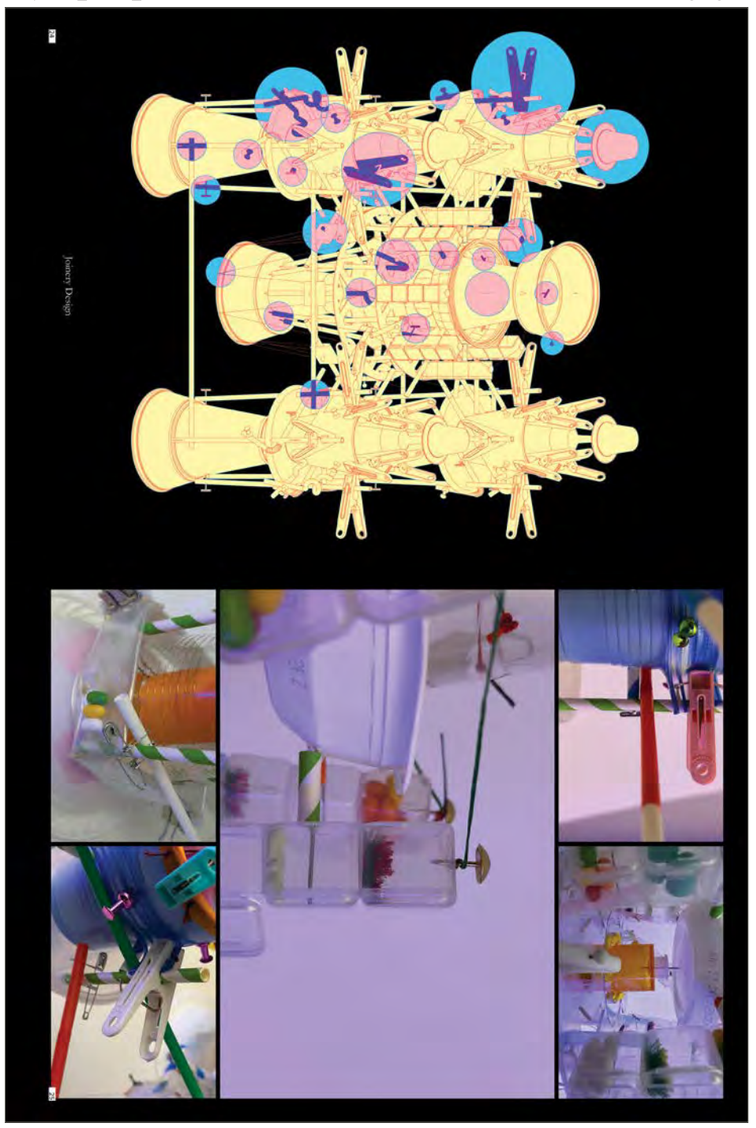
Process of Accumulating Paper Popcorn

a single floor of paper popcorn

a portal to a different world

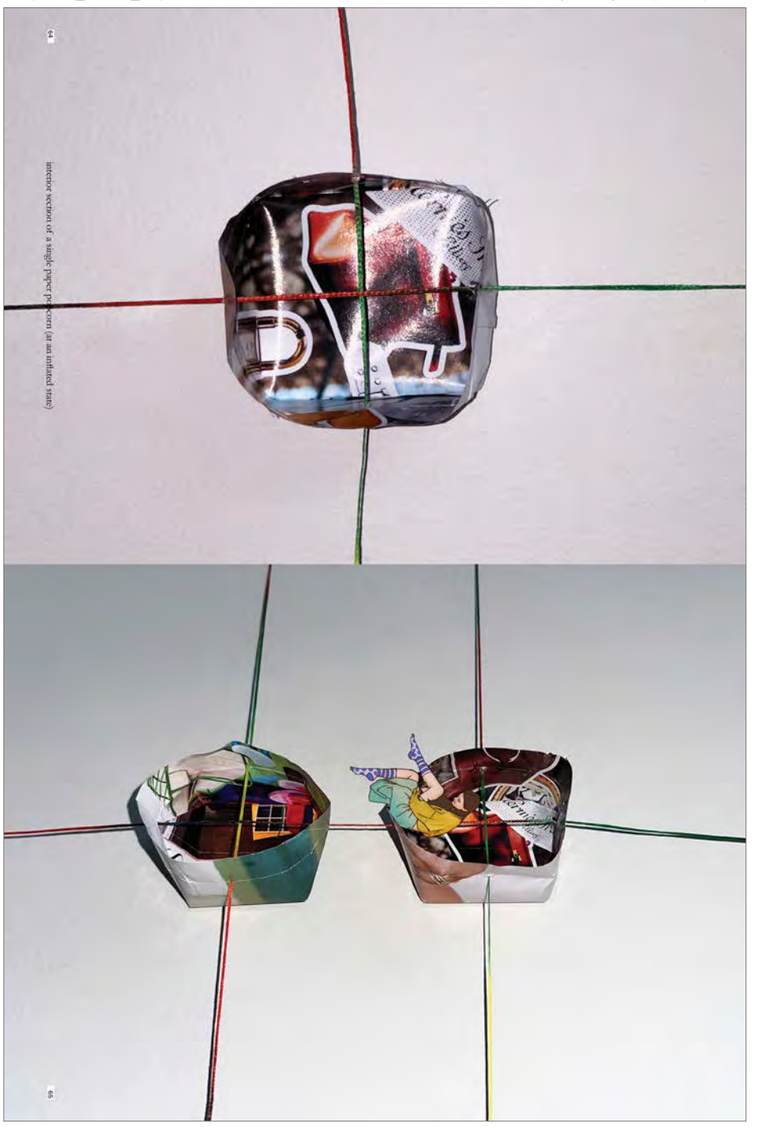
Page 68 & 69

Chapter 1_Part 1_Plastic Week *Joineries Highlights*



Page 24 & 25

Chapter 2_Part 1_Paper Week *Interior Section of a Single Paper Popcorn*

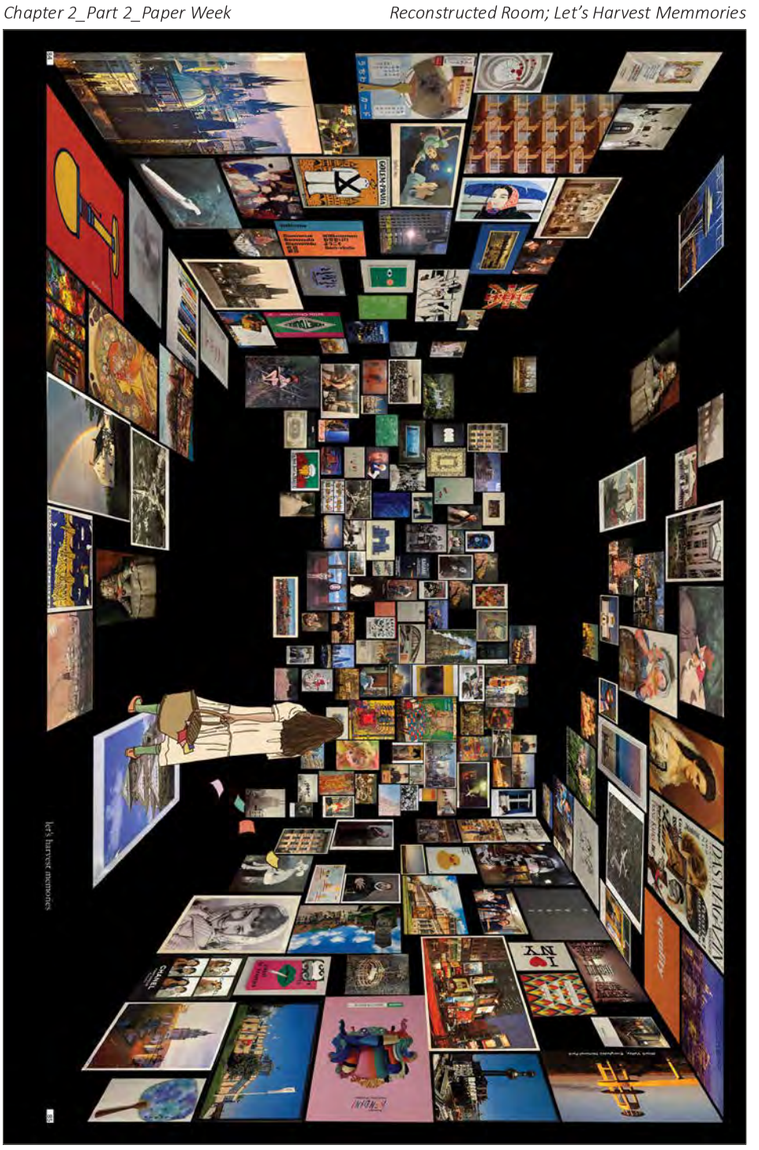


Page 64 & 65

Chapter 4_Part 1_Earth Week *Girl falling into the Plaster Ponds*

Page 148 & 149

Chapter 2_Part 2_Paper Week *Reconstructed Room; Let's Harvest Memmories*



Page 84 & 85

Chapter 4_Part 2_Earth Week

A Girl Stands on the Palm Boulder under the Starry Sky

Page 174 & 175

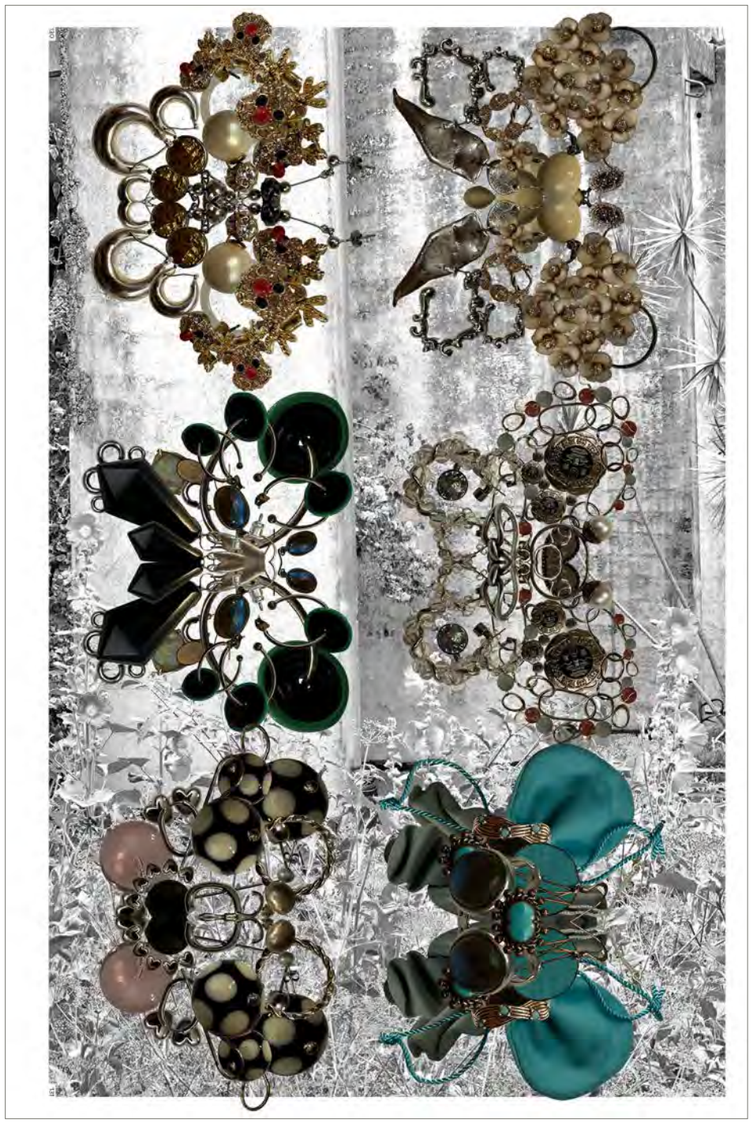
Chapter 1_Part 2_Plastic Week

Objects Found on Anna's Working Desk

Page 36 & 37

Chapter 3_Part 2_Metal Week

Butterfly Created with Anna's Personal Jewelry



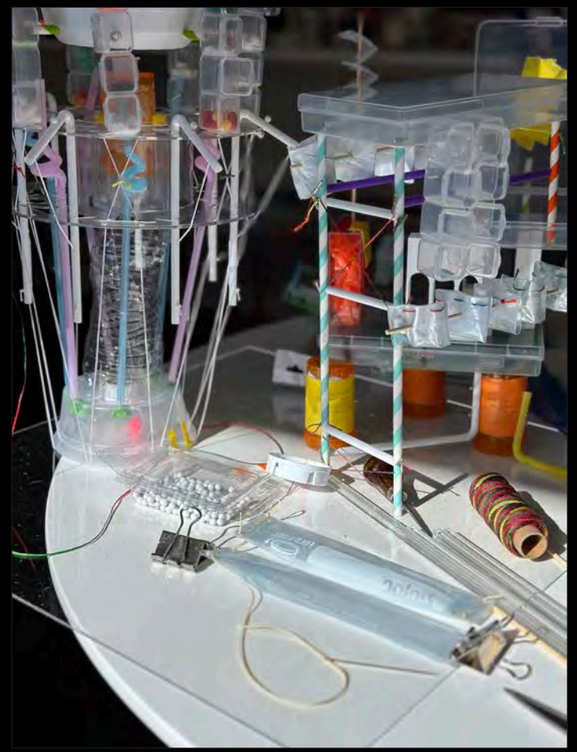
Page 130 & 131

Chapter 1_Part 2_Plastic Week

Chandelier

Page 44 & 45

behind the scenes



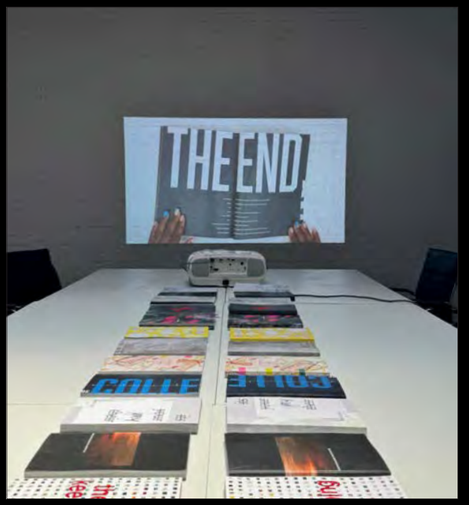
Plastic Week Process

Final Review, April 30th, 2024

Earth Week Process

Metal Week Process

Mid Review, February 26th, 2024



05

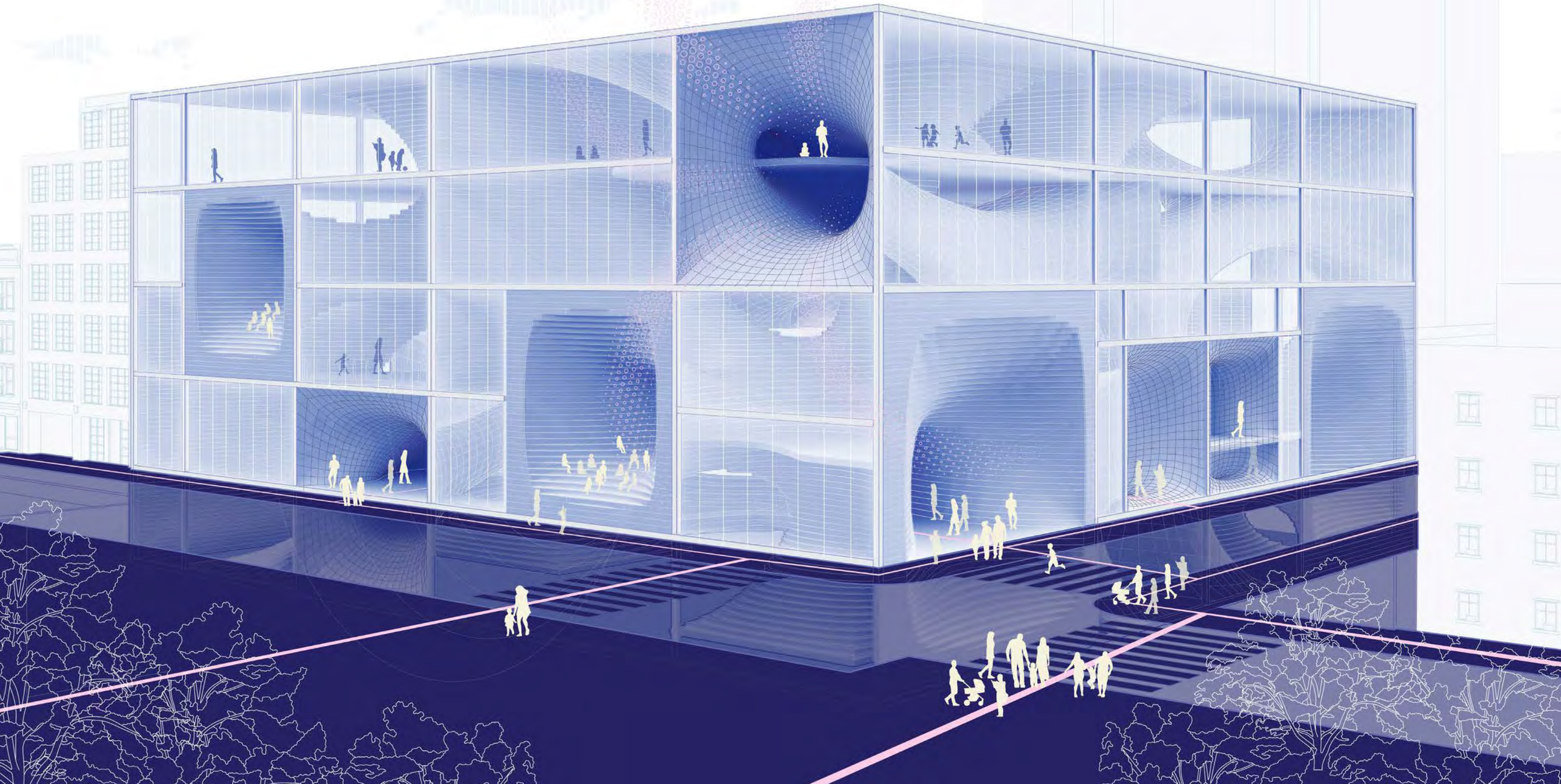
Aperture School

Spring of 2022

Absorbin the City, Listening to the City

Columbia GSAPP_ Core Studio II
Type: School
Location: East Village, Manhattan, NY
Instructor: Lindy Roy
Individual Work

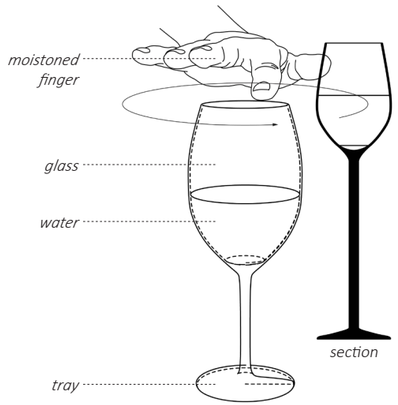
The form studies center around the same idea, about network of spaces, connections, and continuity. It's about tuning the the spaces to create infinite scale of possibilities.



This project experiments the notion of thinking of building as an instrument, producing melodies and gradients of spaces, as instruments create complex music by tuning the notes. Is it possible to start to create spaces that could be tuned in a similar way? Space that could be tuned to different kinds of kids, to different kinds of activities, and to different nervous systems.

The Aperture school is focused on developing a full range of interests among students, with a focus on encountering unexpected spaces as they travel throughout the school. The different experiences that horizontal and vertical circulation programs provide can heighten the creativity in children's development.

At this school, students are encouraged to have an extended period of intimate relationship with nature, outdoor activities, and interactions with the city. The Building is composed of three masses, rotated and mirrored by one unit. Each mass has relationships with other chunks and the surrounding environment. Each of them have different characters that lead to diverse space programs. Main two circulation programs weave throughout the building, creating space and apertures. Apertures appear on all sides of the buildings, each one interacting with the city and urban surroundings and connecting the students and the public. Just traveling from one space to another, will be an experience that will foster children's natural curiosity, and the need for physical movement.



The Source of All Sound is Vibration

glass harp tuning,
tuning spaces

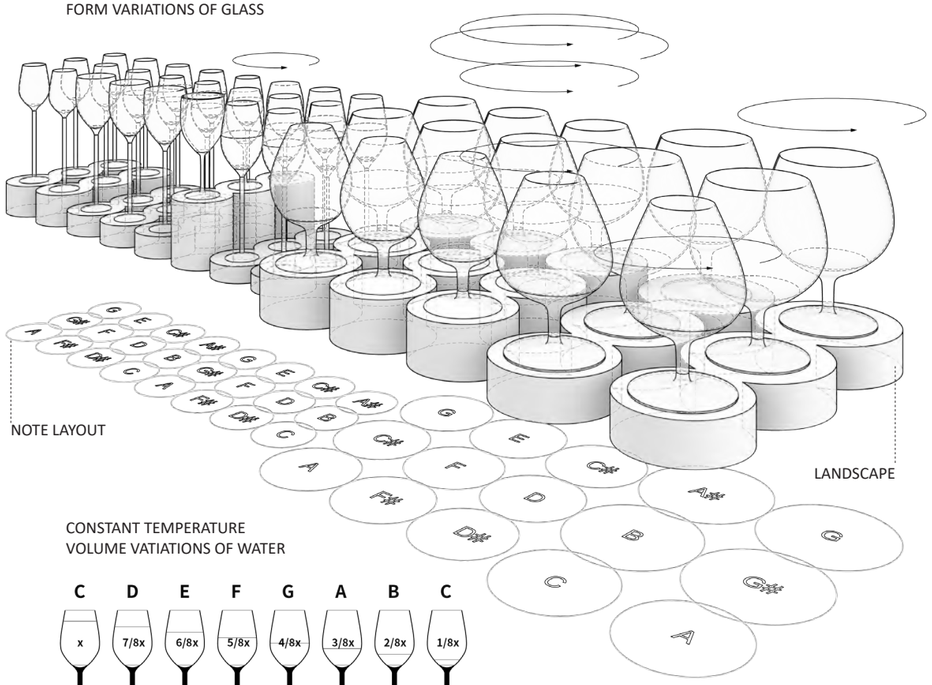
Glass harp is a very simple assemblage of glasses of different sizes, different water levels. The vibrations created by your fingers moving over the rim of the glass, casuing the glass to resonate. This means that you are casuing the crystals in the glass to vibrate togeteher at a similar frequency to create one clear tone. They hit a same datum at the top for the convenience of the player and guestures of hands over the glass openings create tones that resonate.

Glass harp create infinite variety of tones and melodies from this very simple instrument.

Glassharp Family

This instrument is based on the principle of generating musical tones by means of friction.

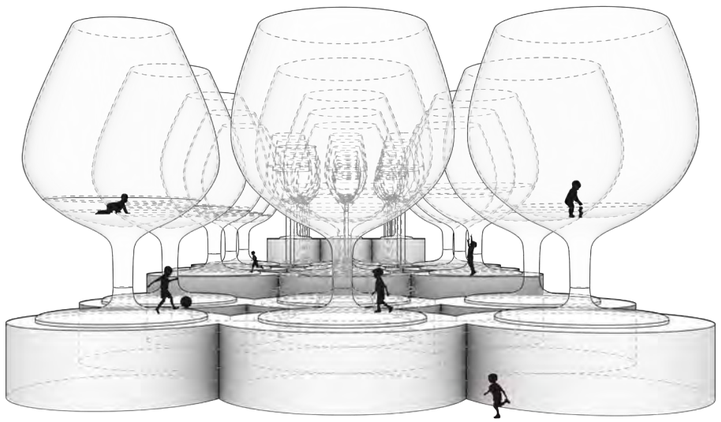
FORM VARIATIONS OF GLASS

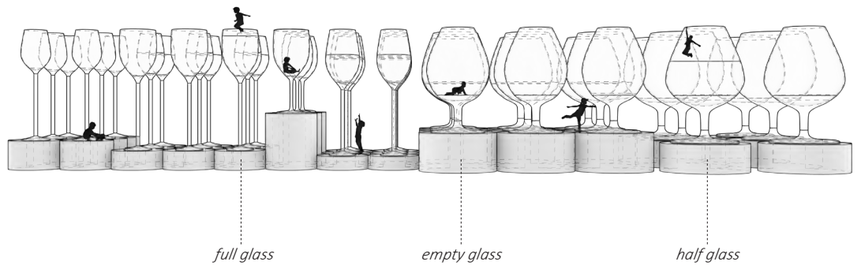


MUSIC
pitch
volulme
tone

PHYSICS
frequency
vibrations
resonance

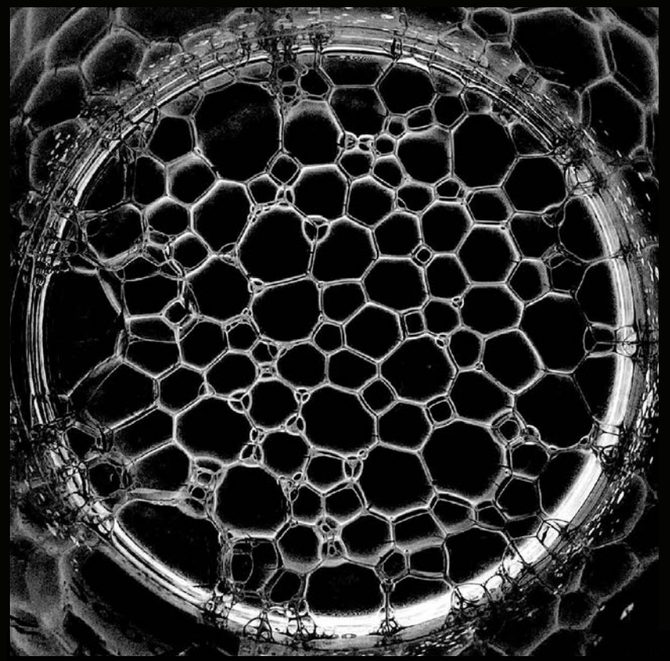
glass forest





Building as an Instrument

Thinking of building as an instrument, producing melodies and harmonies of spaces, as instruments create complex music by tuning the notes.



Apollonian gasket

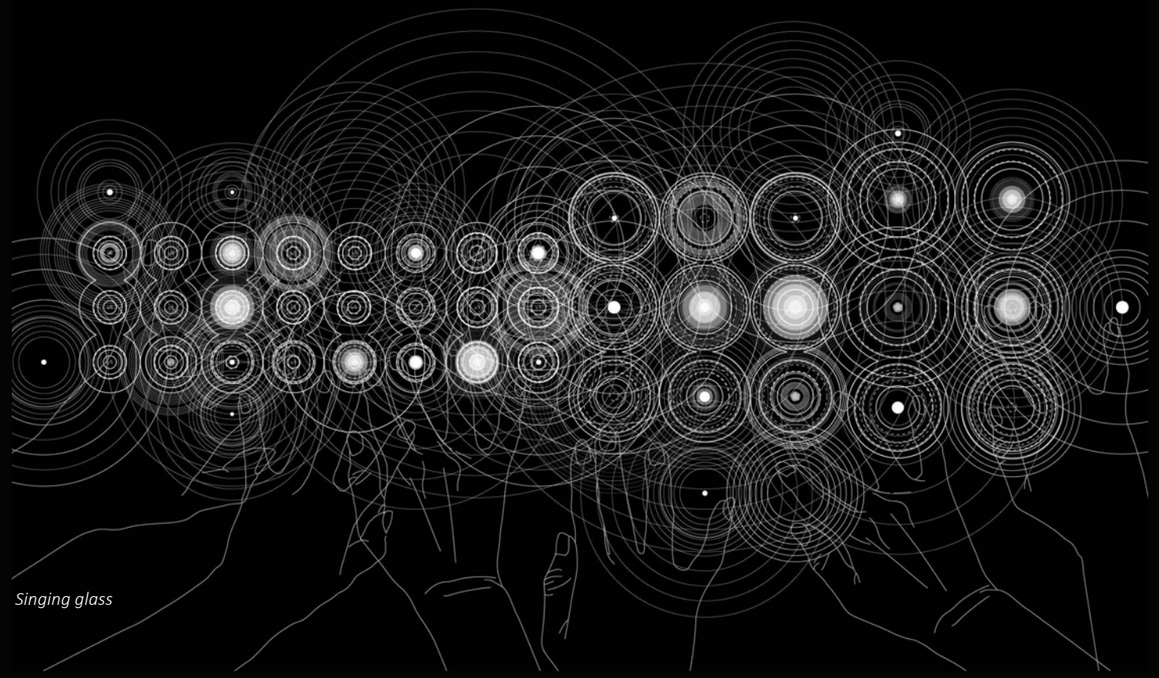
Importance of Surface Tension: Minimal Surface

From a mathematical point of view, soap films are minimal surfaces. Surface tension is the energy that is required to produce the surface, per unit area. A film—like any body or structure—prefers to exist in a state of minimum potential energy. In order to minimize its energy, a droplet of liquid in free space naturally assumes a spherical shape, which has the minimum surface area for a given volume. The red dots indicate the angles meeting at 120 degrees

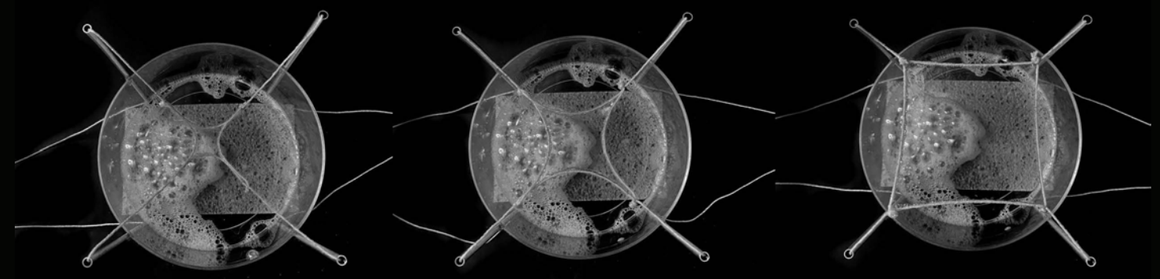
soap films augmentation

Echoes of Resonation

Is it possible to start to create spaces that could be tuned in a similar way? Space that could be tuned to different kinds of kids, to different kinds of activities, and to differenet nervous systems.

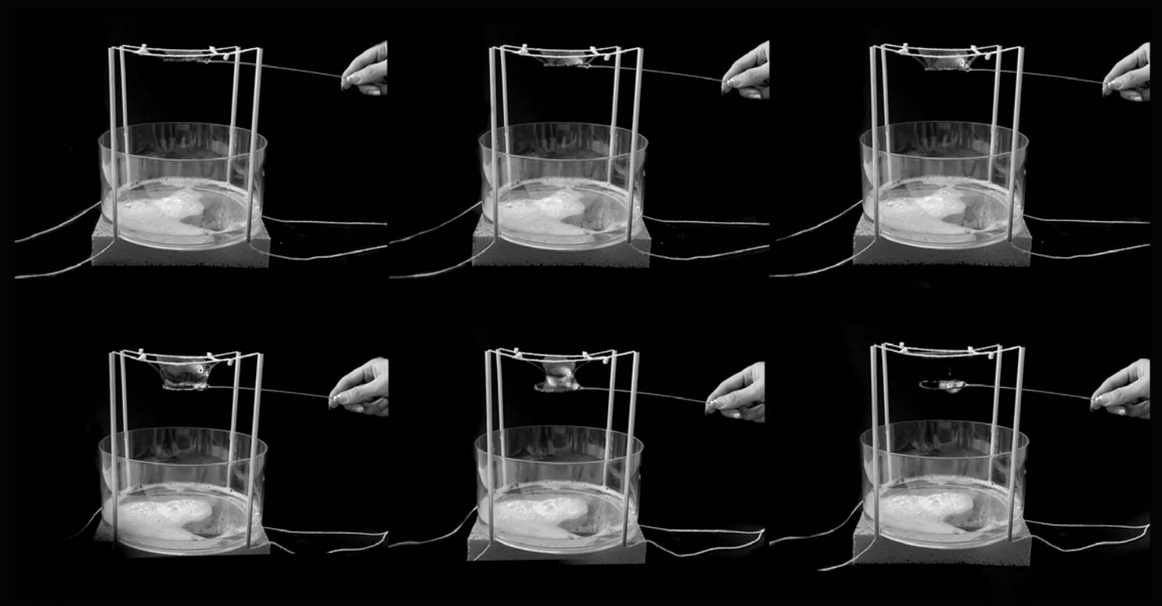


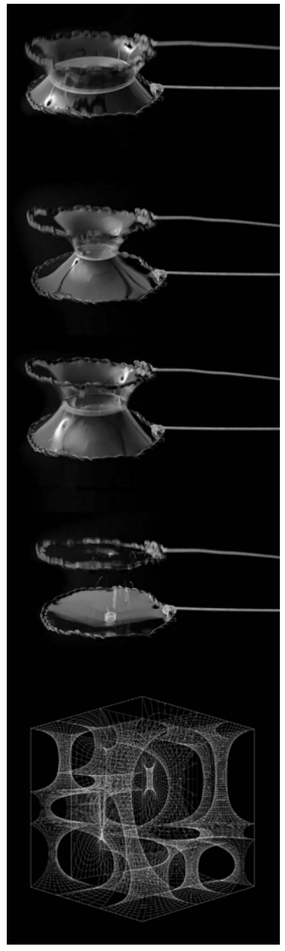
Singing glass

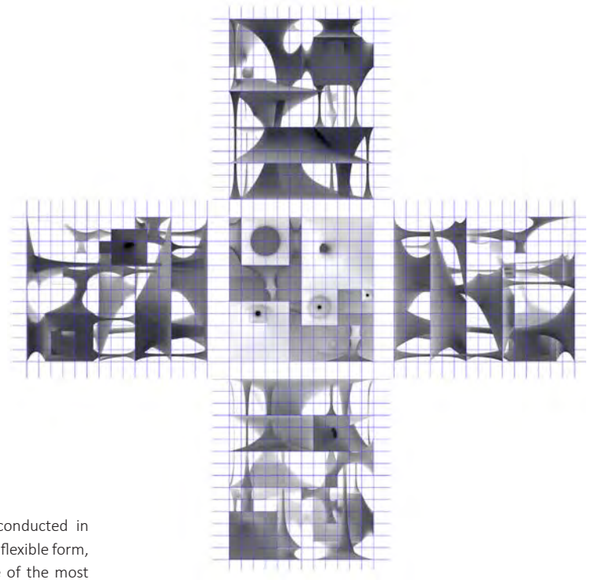


Spatial Experiments to find a Permeable and Flexible form

Spheres do not pack together very nicely. There's always gaps between the adjacent spheres. So when a foam forms, there may be some number of large bubbles, interspersed with smaller bubbles in the gaps, which in turn have even smaller bubbles in their gaps and so on. The foam is approximately self-similar on smaller and smaller scales; in other words, foam is fractal.





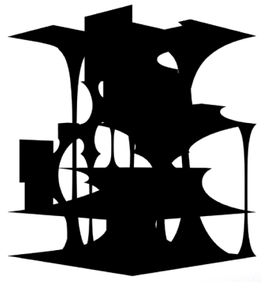


Spatial Prototype

Soap Catenoid

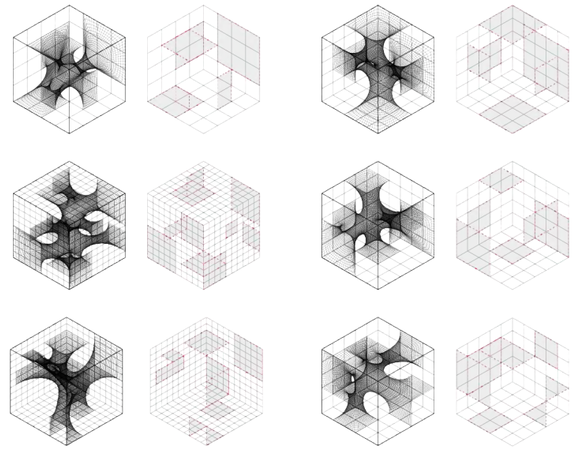
Multiple experiments were conducted in order to find a permeable and flexible form, looking at soap bubbles. One of the most important features of soap bubble was the minimal surface soap bubbles create. Like thsese catenoids on the left.

The prototype studies on the right and below are the result of the soap experiments. They are all different forms but they all center around a same idea, about network of spaces, connections, and continuity. It's about tuning the the spaces to create infinite scale of possibilities.



Experimenting Possibilities of Catenoid Spaces

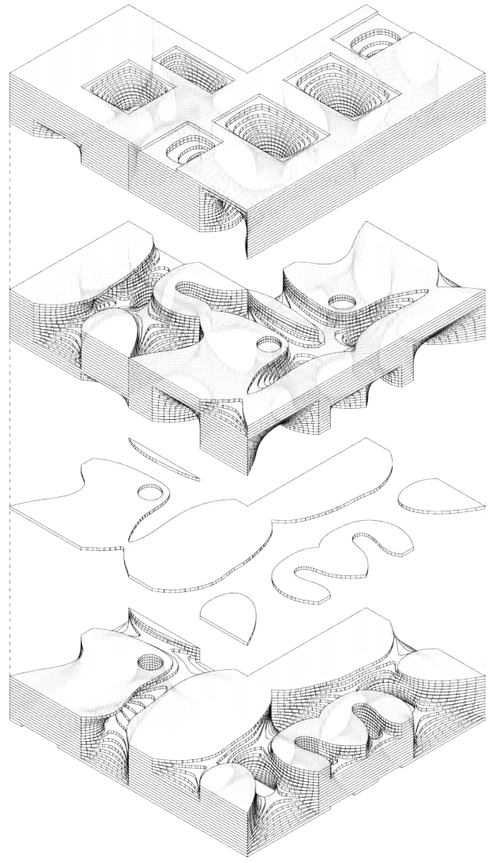
Form Finding Scheme

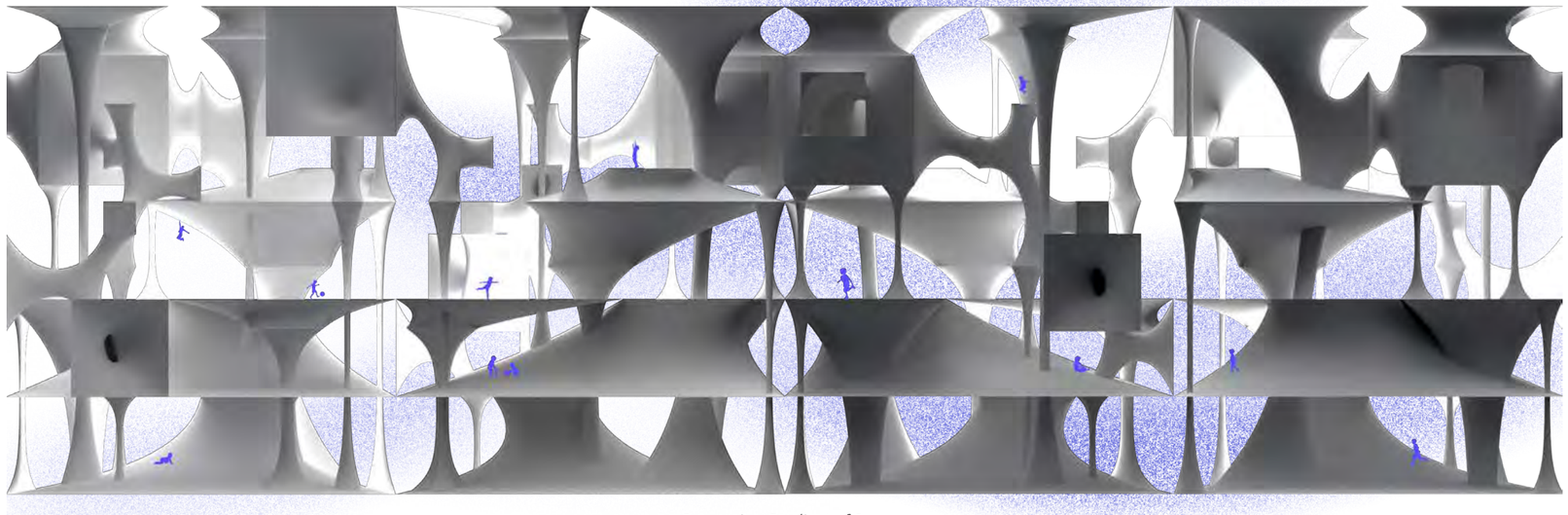


Gradient of Spaces

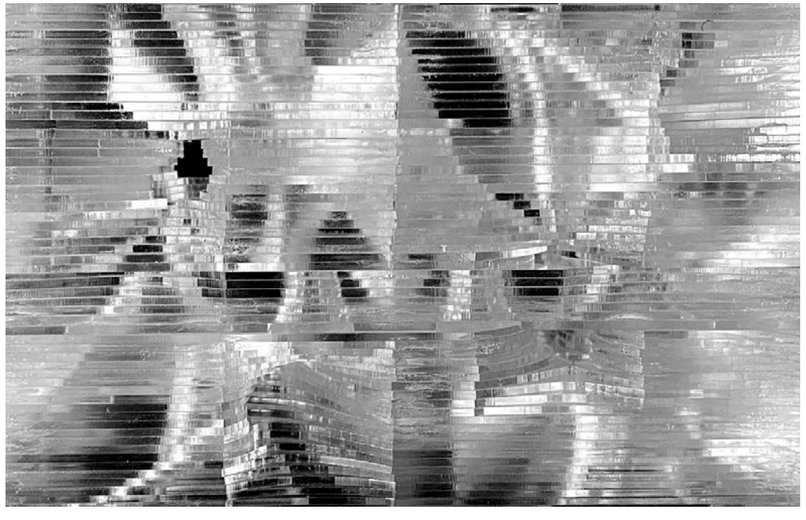
Resonating Spaces

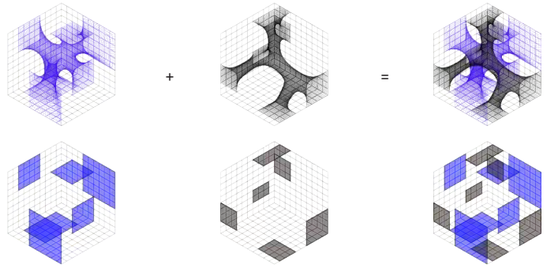
Testing forms all center around same idea, about network of spaces, connections, and continuity. It's about tuning the the spaces to create infinite scale of possibilities. The project explores the relationship between the voids by interlacing minimal spaces. These voids in the mass create a wide spectrum of spaces that serves for diverse children with different sensitivities.





Generating Gradient of Spaces



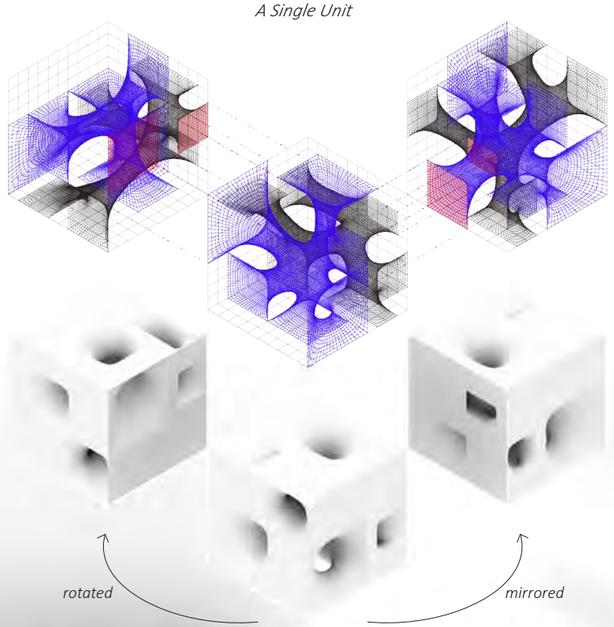


A Single Unit

Final Formation

Interlacing Apertures

The final formation of a single unit is formed by interlacing two different circulation spaces. This black and blue forms don't intersect each other, they weave above and below eachother to create one unit. The different experiences that horizontal and vertical circulation programs provide can heighten the creativity in children's development.



Augmentation of Units

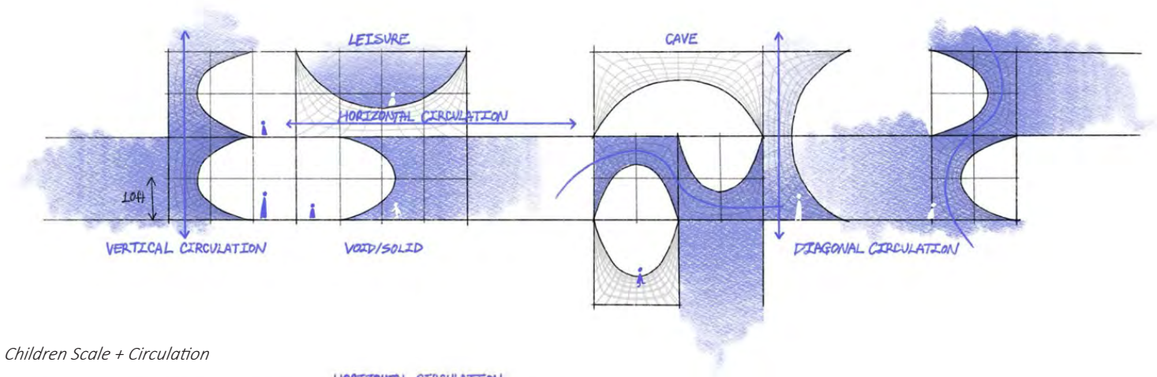
By inserting the unit on to the site's corner chunk, gradient of spaces is fromed by rotating and mirroring the single unit.

Apertures are connected to the outside by all sides of the building, and connecting units in the interior.

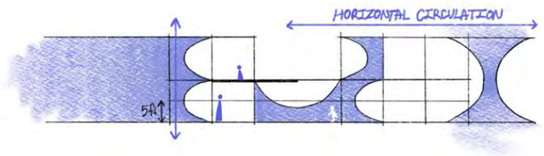
masing model on site
1:50

Chamber Types / Scale Variation

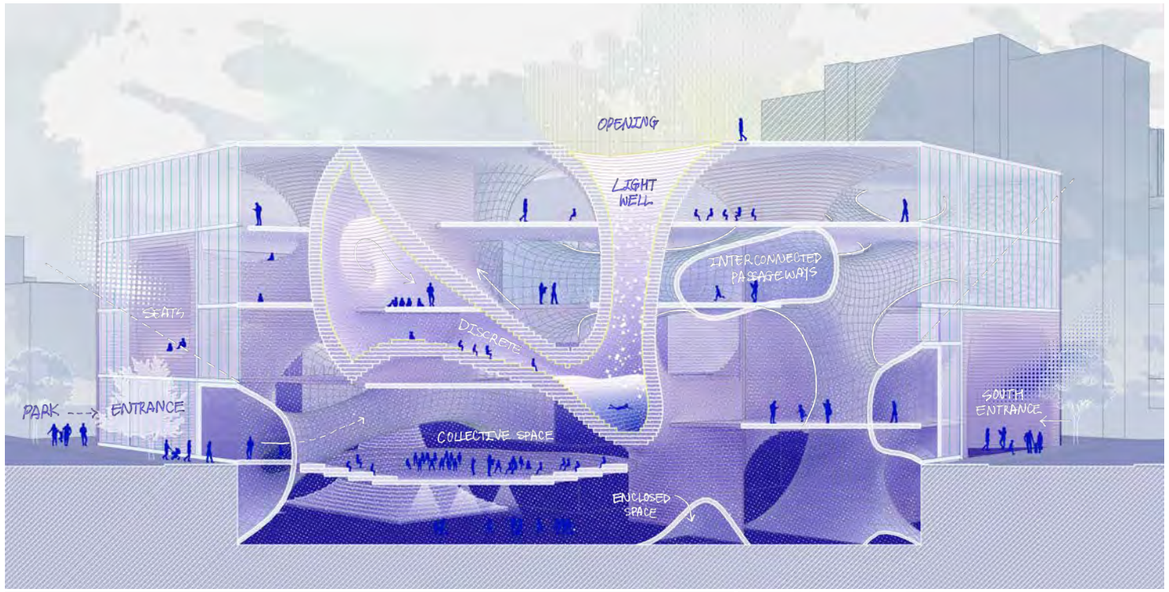
Adult Scale + Circulation

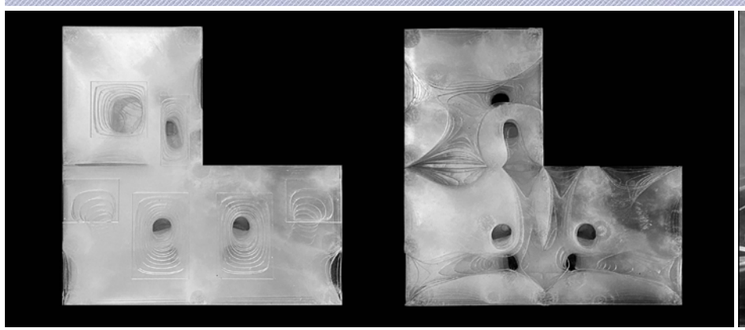


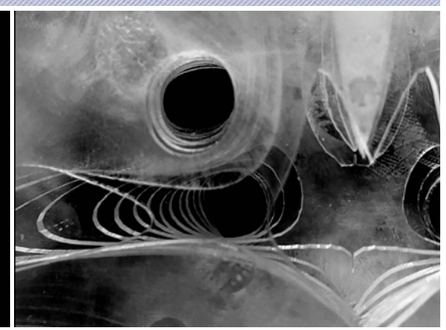
Children Scale + Circulation



The school's original form leads children to perform physical movements in variety of scales







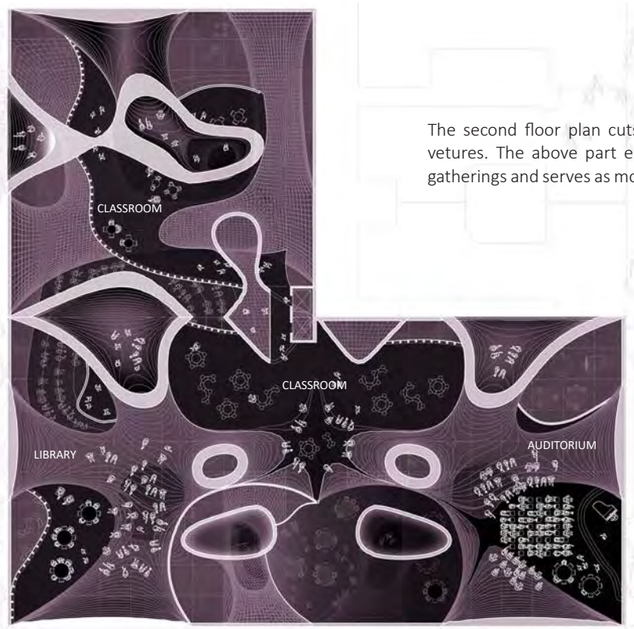
Ground Floor Plan

Cut Inbetween the Curvetures:
Enclosed and Intimate Spaces

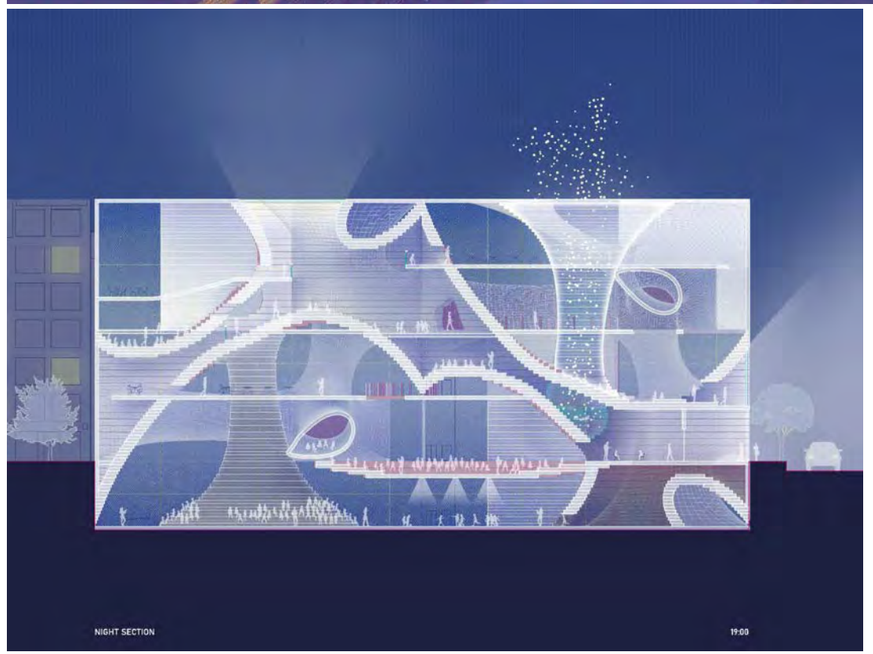
People are entering and exiting from multiple aperatures connected to the sidewalk. The ground floor plan cuts through the curvetures to show the interior of the cuvetures which is more private and intimate.

Key Floor Plan

Cut Below and Above the Curvetures:
Open and Gathering Spaces

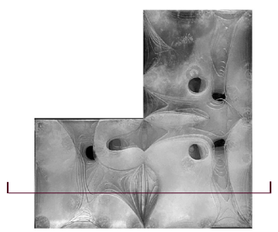


The second floor plan cuts above the curvetures. The above part encourages larger gatherings and serves as more public spaces.

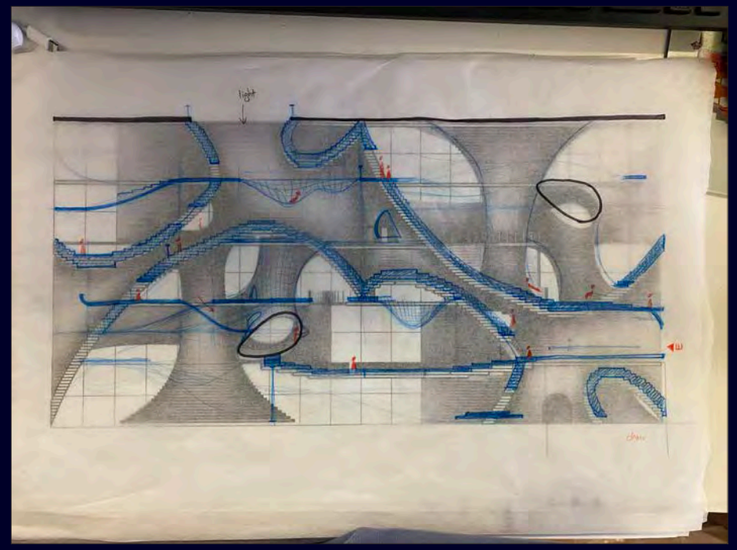


Through the apertures,
the building is..

Absorbing the city,
Absorbing rainwater,
Listening to the city,
Letting light in,
Emitting light into the city,
Projecting and absorbing sound



behind the scenes



Sketch for Section

Study Model in Progress

Final Review, April 21st, 2022

Soap Bubble Experiment

One of the Desk Crits

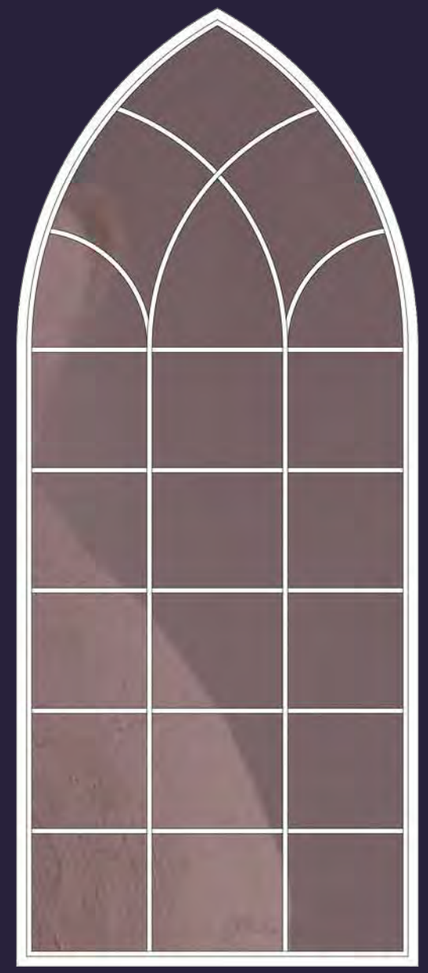
06

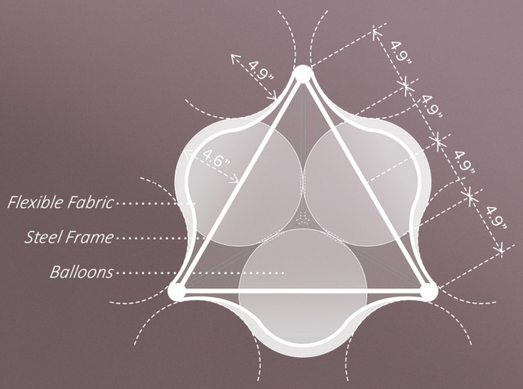
Balloon Dome

Fall of 2023

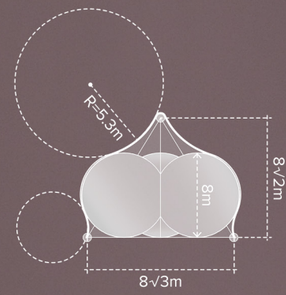
Tensile & Compression Surfaces in Architecure: Tectile Methods for Architects

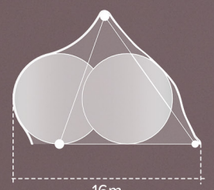
Columbia GSAPP
Building Science & Technology Elective
Instructor: Robert Marino
Collaborative work with
Minjeong Song and Joy Liu



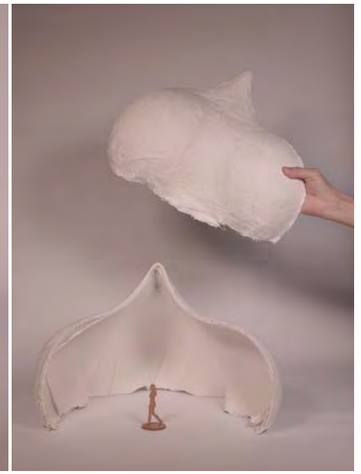


Worm-Eye View Plan_real life scale





Section_building scale



Study Models

Top View

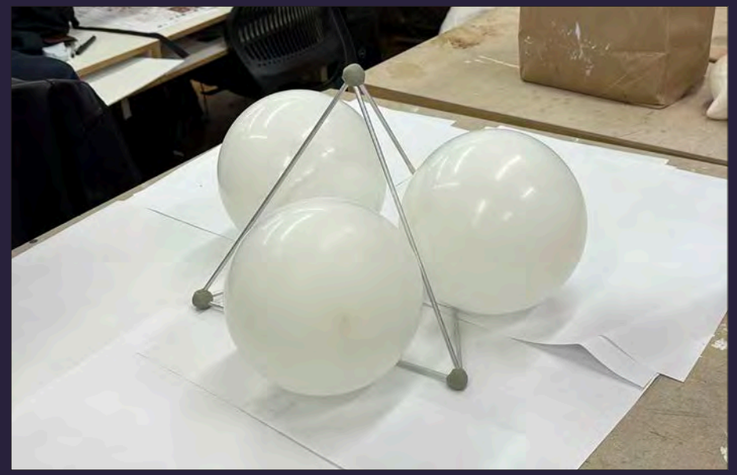
Work Process

Set up boundary condition
Insert 3 inflatable balloons

Wrap with flexible fabric
Pin down the fabric

Add plaster on top of the fabric
Dry the plaster shell

Remove the balloons
Remove the fabric

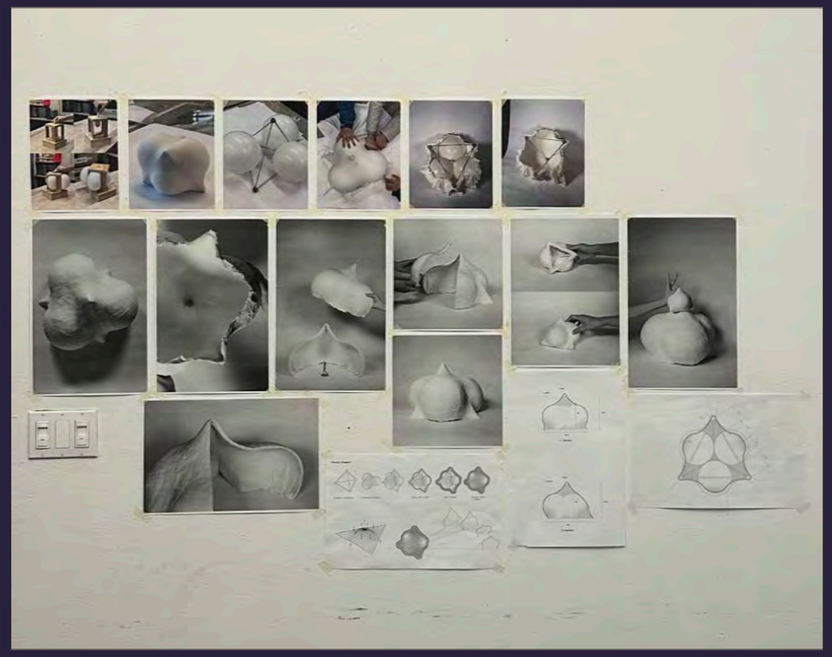


Setting the Skeleton Structure

Setting up the Shell

behind the scenes

Final Review Wall



Final Review, November 28th, 2023

Removing the Balloons

Thanks to:

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