ELENA YU
PORTFOLIO
SELECTED WORKS . 2021-2023
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   FALL 2022  
   - Adaptive Reuse 70% Affordable Housing  
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   SPRING 2022  
   - Museum of Nature

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   SPRING 2022

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## Education

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<tr>
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<th>Details</th>
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| Sep. 2023  | Columbia University                              | Master of Architecture with Advanced placement  
Annual scholarship of $24,000 |
| May. 2023  | The Ohio State University - Columbus             | Bachelor of Science in Architecture  
Latin Honors  
Research Distinction  
GPA 3.64.6 |
| Summer 2019| GSD, Harvard University                          | Design Discovery                              |

**Dean’s List**  
Spring 2020, Fall 2019, Spring 2019, Spring 2018
Covered by continuous granite panels cut in the same dimensions, the ATT long line building is totally opaque, geometric, and easily perceived as a finished solid object. Designed to protect precious communication devices deemed vital to a democracy under nuclear threat, the building’s exterior is composed of extremely thick layers of granite cladding, precast concrete panels, terracotta and CMU bricks, in order to withstand the nuclear blast. As the longline technology became obsolete and the USSR collapsed, the windowless skyscraper lost its purpose it was initially designed for. What is left are a series of strangely layout floors concealed within opaque walls filled with an unnecessarily excessive amount of materials.
MATERIAL REUSE INSTRUCTION

CONCRETE PANEL
Reuse instruction:
Step 1. attach concrete panel anchor points to crane eye hooks
Step 2. transport concrete panels with crane
Step 3. repurpose panels as floating balconies

CMU BLOCK
Reuse instruction
Step 1. knock out top course CMU blocks with sledgehammer
Step 2. use electric hammer to remove the mortar surrounding the lower course
Step 3. crush damaged CMU blocks into gravels as aggregates for concrete and gabion rainscreen wall

GRANITE PANEL
Reuse instruction
Step 1. remove granite cladding
Step 2. trim panels into differential sizes
Step 3. reuse new panels as floor and wall finishes

TERRACOTTA BLOCK
Reuse instruction
Step 1. use electric jack to drill holes on the mortar surrounding the terracotta bricks. Chisel out the remaining mortar
Step 2. 70% of the bricks are kept intact and are stored for future construction
Step 3. crush damaged bricks into gravels as aggregates

Our approach to adaptive reuse of the longline building is to keep as much of the original building as possible. This not only means that we are keeping most structures, but also leads us to redistribute the existing substances. The building’s opaque thick walls, void of purpose, is seen as a quarry where most materials for the adaptive reuse are sourced. A careful deconstruction that disassembles the building into basic material units will happen to the building while dense layers of scaffolding provide space for interactions between labor and materials.

Materials that compose the facade, then, are collapsed into the interior of the building or expanded outward and held in place by scaffolding that were initially used for deconstruction. For instance, the granite cladings are cut and used to clad the public swimming pool, floors of the public space, and cap the kitchen counters within social housings. The large precast concrete panels are hung outward, rotated 90 degrees and made into balconies for housing units, moved inside, elevated and transformed into loft sleeping platforms, or cut and reconfigured into art walls inside the gallery. Terracotta bricks are cut out one by one. The complete ones are reused in dry walls and built-in furniture while the damaged ones are crushed together with CMU brick into gravels. Then these construction wastes are put into a thin layer of gabion that is used to clad the building’s new exterior walls.
Public programs like laundry and open terrace happen every level. Reading area and extended open terrace happen every four levels, acting as ties among residents, creating a supporting network within the building. This located in the southeast area with sufficient sun light, connecting to the vertical circulation hanging outside of the envelope.

Considering different floor heights and NYC building codes, there are 6 housing unit types in total being embedded. Type A and D are artist studios with relatively larger open space, which provides flexibility of differential layouts.

Facade materials are repurposed inside. Concrete panels are rotated 90 degrees, elevated and transformed into loft sleeping platforms. The intact terracotta bricks are reused in dry walls and built-in furniture.

Loft units are served for levels with 17.5’ floor height. Southern units provide larger outdoor terrace of two concrete panels. Northern ones provide smaller terrace.

Granite claddings are resized to cap kitchen counters.

The leftover terracotta bricks are kept from deconstruction.
Concrete panels on the facade are repurposed as space divider in the art gallery.

Visitors can enjoy the exterior terrace for sunbathing.

Granite cladding on the facade are trimmed in differential sizes and repurposed as floor and wall finishes.

Housing and social infrastructure are gapped by mechanical trans-floor. Redirect plumbing from housing to lower space.
02. New Means of The Acropolis of Athens in Nature

This project studies from the Acropolis of Athens and gets situated in the south bay tidal wetland in the upstate. Acropolis is primarily dedicated to the goddess Athena in Greek mythology. The means is to keep what is sacred inside. Original acropolis was not designed for pure aesthetics, but for good defense and to manipulate perspectives by precise proportion alignment and part to whole relationship. In this project of the museum of nature, natural phenomena provide the higher importance. Museums are oriented according to the landscape to demonstrate respect to nature.

The experience starts with a ramp and is derived into three axes, air, water, and earth. The floating island celebrates the tension between human and nature. Visitors are forced to look at it at the end of all three axes, but only able to take a boat there at certain seasons. Architecture itself is like a petri dish. It is artificial, but neutral. It says nothing, but carefully curates fauna and flora in different scales, even water. With rising water levels, different exhibits become active. Bulkhead is the construction method used in structural elements, learning from piers in the Hudson river.
This project is orientated according to the landscape because nature is what is celebrated here. The experience starts with a ramp and derived to 3 directions (air, water, earth). The island in the end is to celebrate the tension between human and nature. Visitors are only able to get there at certain seasons. The animal analysis showcases what animals are curated in the museum. They all live in this area, including endangered ones, and some disappeared but returned ones. They are listed on the order of scale, from small to large. The grid is a guideline measuring time you walk from place to place. Wood is the main material with two shapes that can apply to different building forms. The circular one is used for curvy form, and the rectangular one for the others. This idea comes from piers in the Hudson river. Some special treatment can be applied to the pier. Use a bulkhead to pin it into the retaining wall and it can last for decades. All buildings in this project are structured by these wall types based on different environment conditions. A is to insert vertical piles into soil and strengthen them by horizontal elements. B is to pin the bulkhead into the retaining wall. C is a half-underwater structure, having a metal bar connect the underwater structure to the one in soil. Floor Plates can be placed on top of the metal bar. D allows water to go through the space between vertical piles and it's used mainly in the bridge and floating island in this project.

In the earth museum, stairs reinforce the axis. Visitors are forced to look at the floating island at their last stop. These four structures scale up depends on the size of fauna and flora. It starts with animals like frog, turtle, marbled salamander and etc. Then the structure gets lifted up, keeping visitors a safe distance away from larger size animals like deer and coyote. The third one is at a very steep slope. It curates plants. Visitors can reach to the branches and leaves on the north-west side, and easily touch bushes and rocks on the southeast side. Plants that required very low sunlight are curated under the platform. The last one curates one oak tree. White oak is the main source of wood structures for this project. Visitors are brought here to appreciate this natural material.

Air museum is oriented north-south, responding to wind direction. It’s built along existing path to save construction cost. It has two scales for different bird sizes. Bird cage acts like a tent with wiremesh sitting on top of the four columns and anchored to the roof structure. It uses wall type B retaining wall, which is to have the metal bar inserted into the soil behind.
A turtle coming up for air, its reptile’s head in almost blind swaying. No matter. Take off your sandals, lie on your back, breathe deeply, but with no purpose in mind.

Beside the still waters, you will be restored.

---Dick Allen "Still Waters"

Water museum is the main building. In the upper level, the program includes reception, cafe, kitchen, bathroom, lab, permanent exhibit, and library. In the lower levels, exhibits are seasonal. Two wings are pulled apart, and sit on two sides of the stream, allowing water to go under the bridge. Visitors can take a boat to reach the furthest point, the floating island. To create the semi-floating island result, airbags are tied on the bottom of the floorplate, allowing it to go up and down as water flows. This view is taken from island looking back at the museum.
"Upward or downward, motion, dry out. Full of a nature, nothing can tame. Changed every moment, ever the same."
—James Russell Lowell "The Fountain"

The water museum is located in a tidal zone. Water level changes in the range of four feet. When water rises, it will hit the upper exhibit space and leave water in it. Different faunas are curated based on their living levels. Each level becomes active in different seasons. Metal deck with special treatment is used for levels that would interact with water. The hole allows water to flow in and out. After years, a thin layer of dirt would leave on the metal deck, symbolizing nature taking over man made structure. The stairs in front of the entrance go directly into the water, providing easy access for visitors. Special community events can happen in the mudflat area. Natural light gets introduced into the room. Room divider also serve as sun shading mullions.
Dear Environmental Citizens,

Here begins the journey, where players become defenders of the environment and allies to those impacted by sacrifice zones. Let's roll the dice, draw the cards, and uncover the hidden forces that shape our world, the intricate ecological web of causes and effects that surrounds us. Together, we can discover new insights, spark meaningful conversations, and lay the groundwork for a more just, equitable and sustainable world.

Lots of love,

From the Game Creator
This project seeks to explore methods for transitioning sacrifice zones into territories of repair, known as Equitopia. Initially, “sacrifice zone” referred to areas that suffered extensive environmental damage or economic disinvestment, causing chemical pollution and health hazards for adjacent residents. Today, the term encompasses a range of case studies from across the globe, describing situations where particular groups are deemed expendable and thus subjected to harm or sacrifice without their consent. The victims can include humans, animals, nature, or even cultural and religious beliefs. The project aims to identify and implement strategies to address these harms and shift towards more just and sustainable outcomes.

A key tool in this endeavor is a board game designed to foster critical thinking and discussion among citizens, empowering them to advocate for their rights and claim the services they need. By playing the game, individuals can become more engaged in civic events and better equipped to navigate complex power dynamics within the system. In the future, the potential applications for this tool are diverse. As a pedagogical tool, it could prove invaluable for teachers seeking to enhance their lessons with interactive and engaging content. Its interactive nature provided the potential to be a conversation starter at international conferences. As I continue to develop and refine its capabilities, we may discover even more innovative and exciting ways to leverage its power.

Each player takes on the role of one of five stakeholders. Government use an 8 faced dice, Corporation use 6 faced dice, other player use 4 faced dice, hinting the power structure. And everyone picks a case card. Then each player should determine their own mission, stating how they want to win the game - whether through cooperation with other players, going solo and completing the mission alone, or doing whatever it takes to win the game. The relationships between different stakeholders is fluid which may change and evolve over time. Everytime they change their side, they need to write it down. When the game ends, players can use the mission card as a tool for further reflection.

Relationship Station is where players can switch their side. Event Station is where multiple stakeholders may be affected. In Question Station, players need to share their answers or thoughts to other people. If they can’t come up with anything, they will be sent back to where they started. Lexicon Station is to assist players fill in the missing ending from different aspects, Inherent right, cultural preservation, environmental justice, racial equity, nature rights. They can look up the definition of each word on the card.

<table>
<thead>
<tr>
<th>Lexicon Card</th>
<th>Case Card</th>
<th>Actor Card</th>
<th>Game Stand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedagogizing</td>
<td>Corporation</td>
<td>Nature</td>
<td>Government</td>
</tr>
<tr>
<td>Cultural preservation</td>
<td>RGO</td>
<td></td>
<td>Citizen</td>
</tr>
<tr>
<td>Nature rights</td>
<td></td>
<td></td>
<td>Nature</td>
</tr>
</tbody>
</table>
As you look back on your journey through the intricate relationships among its stakeholders, what visions do you hold for a just ending of your own story?

In the wake of sacrifice zones and their impacts, what role can you play in shaping an "OEUtopian" future?
Avery Hall was built in 1912 as part of the original campus plan. As the architecture department has expanded, the available space for conducting studio reviews has become increasingly cramped. This lack of space has forced students and faculty members to share classrooms and other inadequate spaces, which can negatively impact the quality of reviews and limit the department’s ability to foster collaboration and innovation. This is a pressing issue that needs to be addressed to ensure that the department can continue to provide a high-quality education for its students and maintain its reputation for excellence in the field of architecture. This project aims to highlight the underutilization of the Avery basement and propose potential solutions to optimize its use for studio review or exhibition. Therefore, the project uses generative design as a method to generate optimal layouts for reviews.
Methodology
Based on the idea, we propose a four-step process:
1. Collect input information and calculating maximum wall space for each student
2. Determine class boundary based on proximity to the walls.
3. Apply view angle and visibility as metrics to measure the performance.
4. Generate the optimal options and provide users with options.

Input Parameters
To determine the maximum wall space available per student, we first calculated the total number of students by multiplying the Number of Classes and Student Number per Class inputs. Then we divide this value by the total length of the wall. With the maximum wall width per student determined, we divided the wall into segments.

Poster Clustering and Class Boundary
To create a comfortable distance between the jury and the wall during reviews, we created a boundary by offsetting the wall by 7 feet. Within this narrowed down boundary, seeds were randomly populated, from which a given number of seeds were selected as the center point of a cluster of chairs for the juries and students. The number of points is determined by the Number of Class input. This approach ensures a fair and equal distribution of seating for each class during reviews.

With walls divided and cluster points selected, we measured the distance between the middle point of each wall segment and each of the cluster points, and connected the middle points to their closest cluster points.

Minimum number, View angle and visibility
First, we calculated the angle between the visual line and normal line as θ. A smaller value of θ indicates better visibility for the jury. We added all the θ values. The optimal option was then identified as the configuration with the smallest sum of θ, ensuring that all juries have the best possible visibility during review/exhibition. For each iteration, the sum of θ is calculated towards the score for optimization.

Second, the total number of lines in each cluster is compared to the desired number of students in each class. When a cluster with lines fewer than that number, a penalty number will be calculated towards the score for optimization in this iteration.

Third, when the lines in a cluster intersect with columns, the intersections are documented and counted. The counts of intersections are weighted and calculated towards the score for optimization.

Optimization
As mentioned earlier, view angles, minimum number, and visibility are factored in when calculating a final score for each iteration. In this project, the minimum number of lines has the heaviest weight as meeting the number of students per class takes priority. In the end, a higher score indicated higher penalty, which means a less optimal layout for reviews.
Following the same concept from our MRI-inspired drawings, we want to showcase in our model as many elements as possible at a first glance. We use 3D printing for the extrusions, and more intricate elements of the model. After having all of them properly printed, we construct the base and the slab with cotton and acrylic. Finally, we assemble the model with the IGU part.
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SELECTED WORKS. 2019-2023

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