My journey begins here...

[Contents]

01 SEISMIC FIELD
  A Museum of Earthquake

02 EXTRACTIVE TASKSCAPE
  Lithium & Slow Violence in Sonora, Mexico

03 THE VAULT OF AVERY HALL
  Avery Hall Renovation and Extension

04 MISCELLANEOUS COLLECTION
  4-1 GENERATIVE DESIGN
      Solar Mushroom in Central Park

  4-2 TECHNIQUES OF THE ULTRAREAL
      The Underworld

  4-3 SEMINAR OF SECTION
      The Arc at Green School

  4-4 RETHINK BIM
      Reimagine Seagram Building
A Museum of Earthquakes

Inspired by ‘Little Island’, studio island confronted architecture with natural and human-driven disasters. A new island is proposed on the Hudson River, incorporating a ‘museum’ of catastrophes and experimental program/spaces. Throughout preliminary research on earthquakes, we define the phenomenon as the motion of earth or ground, with duality between creation and destruction. Then accordingly the island is divided into two parts, the water surface as the boundary. Above-water part serves as a recreational center, and below-water part as an educational museum. Kinetic floors are placed in both parts to harvest energy, which is stored in the battery tower. The island takes the form of an archipelago, providing a strong contrast to the ‘concrete jungle’ of Manhattan.

Keywords: Earth & Earthquakes, Energy, Motion
There are mainly 4 types of earthquakes: tectonic, volcanic, collapse, and explosion. The first two are natural events, caused by the movement of tectonic plate, and eruption of volcano, while the last two are human-driven.

Magnitude and Damage

Earthquakes have different intensities, varying from magnitude 2 to 9, and the destructive impact an earthquake can bring about is related to its magnitude. There are earthquakes happening every day, most of which are too weak for people to sense.

Duality of Earthquakes

Although earthquakes are perceived as devastating, destructive events. We propose that it is the motion of earth or ground, characterized by the energy that causes it and the destruction as a result of it.
Seismic Field

Similar to the term magnetic field, we define a new term seismic field as the area that affected by the motion of nature or human. Then the field can be used for energy harvesting and motion experience.

Each program is arranged according to the motion it include. Battery tower lies in the center of the island, and the more motion it involves, the closer it is to the center.

According to the duality of earthquakes, all programs are divided into two parts. The above-water part serves as a recreational center, including a main gathering space, rehearsal studios and backstage area. The below-water part educates the destruction of earthquake through galleries, motion experience spaces.

Motion Intensity and Epicenter

Each program is arranged according to the motion it include. Battery tower lies in the center of the island, and the more motion it involves, the closer it is to the center.
The site locates at the extension of 42nd St, between rows of high-rise buildings, where people have least perception of earth and ground.

The island takes the form of an archipelago with curved roof, hoping to provide a different perception of earth in contrast to the concrete jungle in Manhattan.

Archipelago

The island takes the form of an archipelago with curved roof, hoping to provide a different perception of earth in contrast to the concrete jungle in Manhattan.
Sunken alley extends downward from the circulation of ground floor, run through motion experience space and exhibition hall, and allows visual connection between two parts.
Energy Harvest & Storage

- People's Motion
  - Walking
  - Jumping
  - Dancing

- Kinetic Floor Activation

- Energy Storage in Battery Tower
Motion Experience

Section A-A

Horizontal Walls
Vertical Ground & Ceiling

P Wave & S Wave Motion Transmission
Motion Experience Ways

Seismic Wave & Motion Visualization

Gathering Space

Walls
Ground & Ceiling

Motion Experience Hall
Lithium, the main component of fast charging, electricity storing lithium-ion batteries, has become the most forthcoming mineral globally. The demand for lithium ore is growing triple folds, responding to our desire to be constantly connected on electronic devices and the worldwide transition to ‘green’ electric cars. In the hope to lead to a social consciousness of the invisible violence and shorten the distance between us and this industry’s productional, environmental and societal impact, we are investigating the processes and relationships from the birthplace of lithium- the mining site. By drawing the taskscape of a new lithium mine in Sonora, Mexico, we examined the violence brought on by the production of this mineral, which lies hidden behind a facade that the developed world comfortably ignores. A mineral that supposedly helps construct a greener future for us while the burdens are imposed upon the invisible many.

Keywords: Lithium, Slow Violence, Sonora, Environmental & Social Impact

Lithium, the main component of fast charging, electricity storing lithium-ion batteries, has become the most forthcoming mineral globally. The demand for lithium ore is growing triple folds, responding to our desire to be constantly connected on electronic devices and the worldwide transition to ‘green’ electric cars. In the hope to lead to a social consciousness of the invisible violence and shorten the distance between us and this industry’s productional, environmental and societal impact, we are investigating the processes and relationships from the birthplace of lithium- the mining site. By drawing the taskscape of a new lithium mine in Sonora, Mexico, we examined the violence brought on by the production of this mineral, which lies hidden behind a facade that the developed world comfortably ignores. A mineral that supposedly helps construct a greener future for us while the burdens are imposed upon the invisible many.
Underbelly of What Powers Our Devices

The demand of lithium are mainly in the form of batteries for smartphones, electrical vehicles, laptops, and grid-level electricity storage. We investigated the different extraction methods and the potential environmental impact it has around the immediate taskscape. We found that Lithium prices has doubled between 2016 and 2018 due to exponentially increasing demand.

Sonora Lithium will soon become the most productive mining site in the world. This global hunger for Lithium is creating a violence around the extraction site.
Lying in this complex landscape that involves politics, economics, and societies, Sonora Lithium Project is entangled with many companies, communities, and organizations, not only between Mexico, US, but also by overseas investments. Therefore, it will act as a catalyst eventually; intensifying the existing violence around the site, and bringing on more violence slow to the point of invisibility. Impacting the local community and environment, we realize that legal and illegal economies cannot be analyzed separately as they are dependent on each other.
Our investigation starts by looking at the immediate environmental and societal impact surrounding the proposed mine site. Sonora Lithium Project is planned to be developed within the boundaries of 4 towns, in an area of 8,000 hectares equivalent to 15,000 soccer fields.

Access to the project area from the town of Bacadéhuachi is through an 11km-long secondary, dry-weather road. The first phase of the mining activity is located in the center of the concession, 9km away from the Bavispe river.

Early site work began in February 2020, the production of battery-grade lithium products is projected to start in 2023. In 2023, this 19-year plan will transform the landscape, excavating soil and transporting them, leaving an open pit the size of 800 soccer fields - a hole in the landscape, while flattening other parts of the earth with tailing and rock storage from the excavation, literally moving mountains. It is an eventual taskscape that we fear will impact the ecosystem and could potentially disrupt the environmental balance surrounding it.
According to the Bacanora mineral deposit study, they have determined along with the bands of rich lithium deposits, the town of Huasabas will be intersecting with the concession area. Therefore, we decided to zoom into Huasabas to look at the slow violence that could potentially appear.

Before soil stripping, the drilling rigs will come in for 3 to 5 years, silently impacting the geological layers from 100 to 200 meters deep to determine the exact location of the open pit in areas of wild animal habitat. Then the mining infrastructure and equipment will start occupying in close proximity to the tranquil farming town of Huasabas, stripping soil and opening landscapes. From what we have collected, the ecosystem, water system, employment, economics and most importantly, the societal balance of Huasabas would be significantly impacted for an extended period in the future.

Here we have visually interpreted the violence brought on by the taskscapes to bring attention to these almost invisible slow acts of violence. Unfortunately, the Lithium production lies hidden behind a facade that the developed world comfortably ignores. As designers, we hope by breaking this facade to reveal this violence that all of us are participating in the open and reveal the uncomfortable truth that our technologies are burdens to invisible many.

Future Transformation of Huásabas

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This studio investigates wood and plants as an alternative building material of concrete and steel with an attempt to define more integral architectural solution to a sustainable future. Bamboo grows extremely fast, has high compressive strength and low weight, which provides it with huge potential. Different from timber, Bamboo cannot carry the load along its length direction, but when it is bent, it could carry lateral load, which is similar to the idea of prestressing. The Vault of Avery Hall tries to explore the possibility of hybrid structure and engages bamboo, steel, and timber in the extension part.
**Bamboo Structure Typology**

**Bamboo Feature**

Bamboo as a building material has high compressive strength and low weight has been one of the most used building material as support for concrete. Unlike wood, brick or other natural material, Bamboo cannot carry the load along the length direction and will bend. However, if pre-bended, it can carry a lateral load. This is the same idea of prestressed beams or other components.

**Initial Proposal: Vault**

The Initial Proposal is about a continuous-vaulting bamboo structure. The space beneath it is for people’s activities, whereas the space above is for plant cultivation. The greenery plant will purify the environment and bring a different natural touch to the spaces.

**Distribution of GSAPP in Campus**

Currently, GSAPP are separated in four buildings, making it inconvenient to travel between some classrooms and make studio. The physical distances between studios of different program also go against transdisciplinary communication. So the idea of this project is ‘All in One’: to put every program in one building to form the extended Avery.
The two-storey high bamboo columns grow from the existing concrete column of current Avery Hall. Each bunch of bamboo vault towards different direction to connect with other bunch and layers overlap with higher layers to form a robust structure.
Existing Part:
- Concrete & Steel Column
- Concrete Beam
- Concrete Floor
- Masonary Wall

Extended Part:
- Bamboo Column
- Steel Ring
- Cross Laminated Timber Floor
- Glass Curtain Wall
04
MISCELLANEOUS COLLECTION

4-1 GENERATIVE DESIGN
Solar Mushroom in Central Park

4-2 TECHNIQUES OF THE ULTRAREAL
The Underworld

4-3 SEMINAR OF SECTION
The Arc at Green School

4-4 RETHINK BIM
Reimagine Seagram Building
4.1 GENERATIVE DESIGN | Solar Mushroom in Central Park

Fall 2021
GSAPP Building Science & Technology Elective
Instructor: Dani Nagy
Partner: Risa Mimura, Gloria Zhu, Bingyu Xia, Yining Lai
Participation: Concept Development, Grasshopper & Python Script, Diagram Drawing

Environmental Factors
- Sunlight data of New York City
- The height, size and location of trees

Manual Inputs
- Height of solar panels
- Radius of 3 types of solar panels

GH Parameters
- Coordinates of center of solar panels
- Rotation angle of each solar panel

1. Sunlight analysis of site

4. Set Objective & Constraints
- No intersection with trees
- No overlapping with other panels
- Maximum of Sunlight Hours

5. Sunlight Analysis of Solar Panels

6. Iteration
- One Generation of Design (Parents)
- Cull designs that violate constraints
- Collect favorable parental parameters
- Next Generation of Design (Children)

7. Optimal Design Generation
- All Generations of Designs
- Objective Evaluation
- Optimal Design(s)
Selected Examples of Iteration

Visualization of Iteration & Evaluation

Optimal Design #2260
4-2 TECHNIQUES OF THE ULTRAREAL | The Underworld

Fall 2021
GSAPP Visual Studies
Instructor: Joseph Brennan, Phillip Crupi
Partner: Risa Mimura
Participation: Concept Development, 3D Modeling, Rendering

The Present World

The Underworld
Lying in Indonesia, the arc at Green School is a bamboo architecture with unprecedented lightweight structure, designed by IBUKU. The unique structure features bamboo arches that support an organically shaped canopy. The 14-meter-tall bamboo arches, spanning 19 meters, are interconnected by antisidastic grid-shells which derive their strength from curving in two opposite directions to form a robust tensioned structure.
1. 3D Modeling

2.1 Benchmarking Facade Solar Analysis
- Envelope Solar Radiation
  Calculate Average Direct Sunlight Hours on Selected Hours on 21st of Every Month

2.2 Benchmarking Interior Daylighting Level
- 11th & 38th Floor plans

3. Examine Renovation Design Possibilities of West Facade
   Type A
   Type B
   Type C
   Type D
   Type E

4. Batch Testing for Each Strategies Select the Best One
   - Solar Radiation Simulation
   - Interior Daylighting Simulation

5. Hybrid Selected Strategies Produce Design Iterations
   - Combine the feature of Type A and C rectangular panel with different rotating angles

6. Evaluate & Improve Overall Performance

7. Loop Optimization

8. Optimal Design Generated
   - Solar Radiation Analysis
   - 11th & 38th Floor Shades
   - Optimal Shades Metrics (unit: mm)
     - Panel Spacing: 602
     - Panel Height: 1,109
     - Panel Width: 600
Seagram building is a 515 feet (157m) tall skyscraper at 375 Park Ave., designed by Mies van der Rohe and Philipe Johnson. Mies used non-structural bronze-toned I-beams to suggest structure instead. These are visible from the outside of the building, and run vertically, like mullions, surrounding the large glass windows. This method of construction using an interior reinforced concrete shell to support a larger non-structural edifice has since become commonplace.

As designed, the building used 1,500 tons of bronze in its construction. On completion, the construction costs of Seagram made it the world’s most expensive skyscraper at the time, due to the use of expensive, high-quality materials and lavish interior decoration including bronze, travertine, and marble. The interior was designed to assure cohesion with the external features, repeated in the glass and bronze furnishings and decorative scheme.

Another interesting feature of the Seagram Building is the window blinds. One aspect of a façade which Mies disliked, was the disordered irregularity when window blinds are drawn. To reduce this disproportionate appearance, Mies specified window blinds which only operated in three positions – fully open, halfway open/closed, or fully closed.

The term ‘technofossil’ was coined by Professor Jan Zalasiewicz and colleagues at the University of Leicester, to describe the material footprints that humans will leave behind through their material goods.

The ratio of energy content to mass was identified as the most telling indicator of the construction ecology in this case. The technomass and technofossils are understood as the index of natural and social processes, and moreover how such processes mix to yield uneven and asymmetric world-system. The world’s technomass — the sum of all the world’s non-living technology and technologically-created production (and non-organic waste).