

An·thro·po·gen·ic

Emissions And Architecture

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Master of Science December 2022

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Abstract

Scientists have long held the suspicion that human activities can alter our planet's climate. It is indisputable that without the use of coal and fossil fuels, humanity would not have been able to have the same level or type of progress that it has now. Yet, along with that development, came the climate emergency and the question of whether human activity's consequences are still reversible. The twentieth century marked the birth of Modernism in architecture, which encouraged architects and engineers to explore new materials, including those that use fossil fuels, coal, or natural gas as a main ingredient in production. Kuwait experienced an unprecedented speed of urbanization between, 1950 and 1980. This period known as "Al-Nahdah". It marked the beginning of Kuwait's significant reliance on nonrenewable energy sources. As of 2021, Kuwait recorded the highest temperature on Earth, reaching a high of 58C. The Al-Nahdah period was recognized for modernization and affluence, but it also served as a prelude to climate change and the rise of temperatures. Additionally, the impacts of the Gulf War had long-lasting consequences. Today, Kuwait faces a great challenge in overcoming the consequences of these major decisions and events of its recent past. This thesis book includes projects that confront urban and architectural problems connected to climate change around the world, such as sinking cities, reuse of buildings materials, and experiments with environmentally conscious construction materials. It also includes seminar papers on the topic of climate change, materials and oil crisis.

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Critical Text

Scientists have long held the suspicion that human activities can alter our planet's climate, dating back to ancient Greece. Early civilizations like the Roman, Persian, and Egyptian empires used labor, agriculture, and animals as the main sources of energy to build magnificent structures and wage wars. The local environment of those regions has unquestionably been affected and penetrated by these behaviors. But since that time, as science has advanced, so has the human population, along with energy consumption. The notion that humans are changing the earth's climate was addressed early in history by scientists and philosophers¹. It is indisputable that without the use of coal and fossil fuels, humanity would not have been able to advance at this rate. These fuels helped us speed up the development of numerous technologies across numerous industries. Yet, along with that progress came climate emergency and the question of whether human activity's consequences are still reversible. Humans may have cut down more trees if coal had not been employed as a heating source throughout the 19th century². However, the question of whether or not that problem could have been resolved remains. It is possible that people might have been able to develop tools or techniques to help protect forests. And, since we no longer rely primarily on wood as a source of energy, people have stopped searching for new methods and technology relating to it.

During the industrial revolution scientist such as physicist Joseph Fourier suggested the idea of greenhouse effect. That Solar energy must be mitigated by energy returning to space because, warmed surfaces release heat. But part of that energy must be stored in the atmosphere and not released back into space, keeping Earth's temperature warm. He also argued that the atmosphere of our planet acts as a glass greenhouse. Where energy penetrates it and becomes trapped within it. The knowledge regarding global warming was analyzed and processed based on his theory³. Scientists like Eunice Foote and John Tyndall further built on to Fourier's theory. Through her investigations with glass cylinders, Foote discovered that CO₂-filled cylinders trapped a significant amount of solar energy from other glass cylinders. She wasn't mentioned or given credit in Tyndall's work, even though her work followed that of his discovery⁴. Tyndall studied and analyzed different kinds of gases that absorbed heat. Based on those scientists' experimentation and discoveries, modern experts were able to comprehend and expand upon their research and understand the impact of global warming on earth. What makes this phenomenon intriguing is that the notion of global warming was unheard of and often denied during the late 20th century⁵. Since then, industrial construction techniques have prevailed, resulting in structures that are built fast and with low-cost solutions. As new technology and construction techniques were developed,

this event gradually exacerbated global warming. Due to the fact that, at the time, the primary component of modern technology used fuels that release greenhouse emissions into the environment, such as natural gas, coal, and fossil fuels. The twentieth century marked the birth of the Modernism movement in architecture. It was a time when vernacular methods of building were being rejected and viewed as archaic. The movement encouraged architects and engineers to explore new materials. One that uses fossil fuels, coal, or natural gas as a main ingredient in its production. This energy source allowed for the testing of many materials that had not before been possible. such as mass-produced glass, cast iron, and concrete. The advancement of engineering gave architects more creative freedom. The use of steel made load-bearing walls obsolete, allowing for spacious interior floor plans. Floor-to-ceiling windows and freedom with façade manipulation have become possible. This movement gave ample opportunity for experimentation with materials and building techniques. At the time, architects and designers were still uncertain of how the materials would age over time and, more significantly, whether they were made to last or would eventually disintegrate into waste. This architectural style reached all the way to the middle east and far eastern countries until the 1980's.

In 1938, an oil well was discovered in the Burgan field, located in the desserts of Kuwait. During the second half of the twentieth century,

Kuwait experienced an unprecedented speed of urbanization; that lasted from 1950-1980. This period was marked as “Al-Nahdah” in the historical timeline of the country. Within two decades, Kuwait City transformed from courtyard mud houses into a concrete metropolis⁶. This era erected one of the first modernist buildings in the Gulf region. It also dismantled the architectural identity of the old city. Furthermore, it destroyed city dweller’s perception and connection to its space. After the demolition of the old city, suburbia immersed. It is where all Kuwaitis immigrated to and still live to this day. Very few buildings were spared from demolition, such as Mosques, Amiri Hospital, The American Missionary Hospital, and a few governmental headquarters. These buildings are the only traces of Kuwait’s pre-oil urban fabric. This occurrence left a deep mark not on the generation that witnessed it. But, on the generations that came after. Today, the old city known as “Al Deerah” exists in the memory of The Silent Generation, only a few of whom are still alive today. Additionally, it marked the beginning of Kuwait’s significant reliance on nonrenewable energy sources. The country is currently going through a new wave of urbanization and demolition. Several modernist structures were recently bulldozed to the ground. The environmental impact was not taken into account when making these decisions due to economic and sociopolitical factors.

During the summer of 1990, Iraqi forces invaded Kuwait. This event became known as the Gulf War. It resulted in one of the most severe environmental disasters, which had both local and worldwide implications. Over 240 million gallons of crude oil was dumped into the Arabian Gulf and over 1 billion barrels were burned by the Iraqi forces which resulted in fires that lasted 7 months. These occurrences led to a huge increase in carbon emissions and created large-scale environmental catastrophe that the country is still recovering from. The events that unfolded during the war caused new diseases to emerge in the Arabian Gulf⁷. Climate change is one of the most challenging issues that Kuwait is facing today. Due to its climatic characteristics and a severe rise in temperature. As of 2021, Kuwait recorded the highest temperature on Earth, reaching a high of 58C. The Al-Nahdah period was recognized for modernization and affluence, but it also served as a prelude to climate change and a rise in temperature. The impacts of the Gulf War had long-lasting consequences due to the emissions that were caused by fires and spills in the oil infrastructure⁸. Today Kuwait faces a great challenge in overcoming the consequences of these occurrences. The choices made by the previous generations have had a significant effect on shaping the environment in which we currently live. Climate change and its existence has often been rejected by some dominant forces locally and globally.

The power of environmental issues is that they evoke inferiority, vulnerability, and helplessness while also encouraging us to investigate alternative possibilities for gaining agency through adaptation and survival. This program was an opportunity to investigate sustainable building material options such as bamboo in rural China. In this studio, an extensive study and exploration have been conducted to understand bamboo as a material and research its joinery methods. Unbuild Design Studio investigates deconstruction methods through analyzing and locating components from a previous residential structure in Ithaca that has been dismantled rather than demolished. A number of investigations responding to rising sea levels and sinking cities were produced by the Sink or Swim Studio. The studio ultimately issued a book with all the data and design proposals. This thesis book addresses issues through projects and research papers that confront urban and architectural problems connected to climate change around the world, such as the oil crisis, data centers, and colocation carrier hotels that contribute greatly to the yearly consumption of energy globally.

Projects

Studio: That Sinking Feeling

Fall 2021

Instructor
Gregg Keefe

Team:
Noor Abdulkhaleq
Lulin He
Chiehsheng Huang
Fanghong Xu

Studio Description

This studio explores design proposals responding to the threat of rising sea levels. Using information collected from reliable federal, state, city, academic, and private sources, studio teams have assembled a vast network of information in order to create data visualizations that communicate the urgency and importance of addressing sea level rise.

The following designs are less solutions than they are responses. In aiming to address the immediate issues surrounding sea level rise, they do not take into account the full complexity of global climate change. Instead, they are vignettes of possible futures- experiments in investigating one aspect of climate change. However, these proposals are valuable beyond their surface level imagery- they are meant to be utilized as conversation starters, idea generators, and reminders of the potentiality of both an apocalyptic future if we change nothing, and a hopeful future if appropriate and timely action is taken.

Submarine City

Portland, Maine

As the earth's climate system becomes warmer, the sea level is rising. Coastline cities are most vulnerable to coastal floods and storm surges. The City of Portland experiences 0.7 inches of sea level rise per year. At this rate, by the year 2100 the city's sea level will rise to 10 ft. This rise in water levels will result in population displacement and hazardous living conditions for remaining structures. Submarine City is a solution to climate change that will affect Portland. In theory, the proposed city will aid Portland in its population displacement and economic crisis. Submarine City is a mobile underwater settlement that provides permanent habitat for displaced humans.

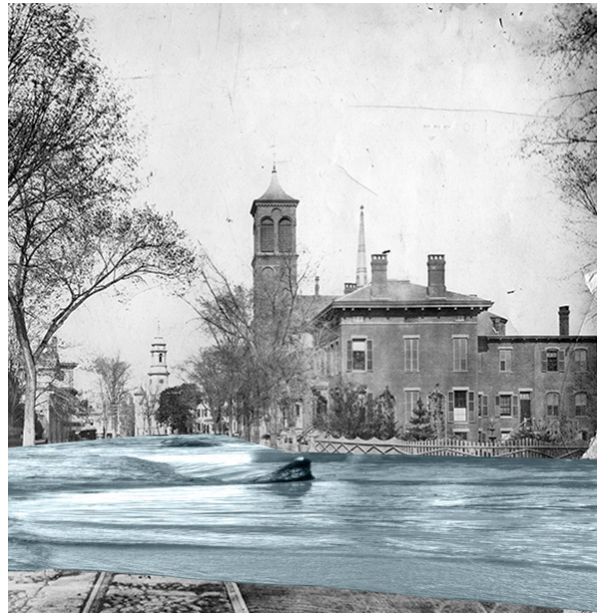


Figure 01. MS AAD'22 candidate, 2021



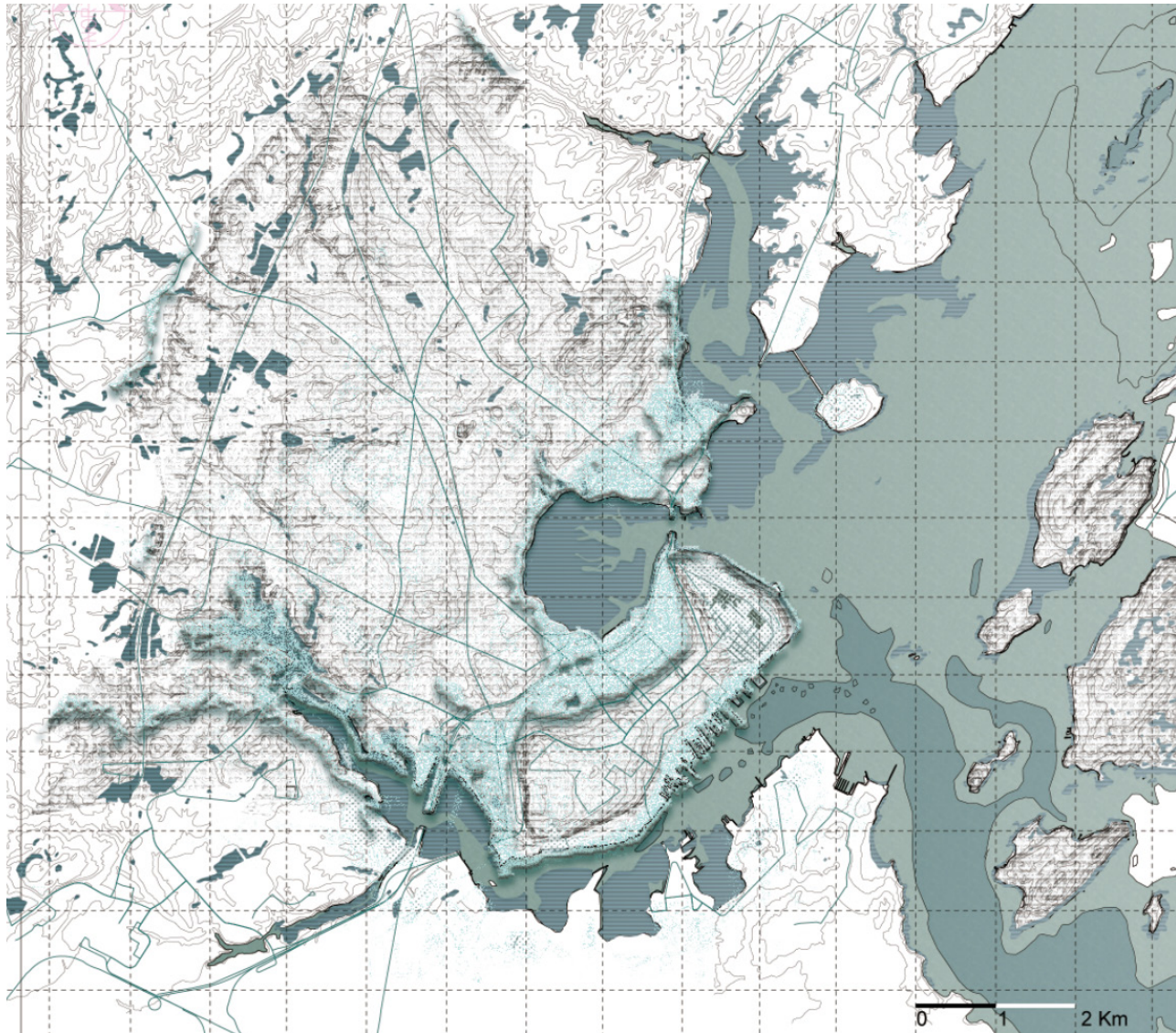
Portland sea level rise increase

Sea level rise poses great threat to coastal cities like Portland.



> Portland sea level rise increase

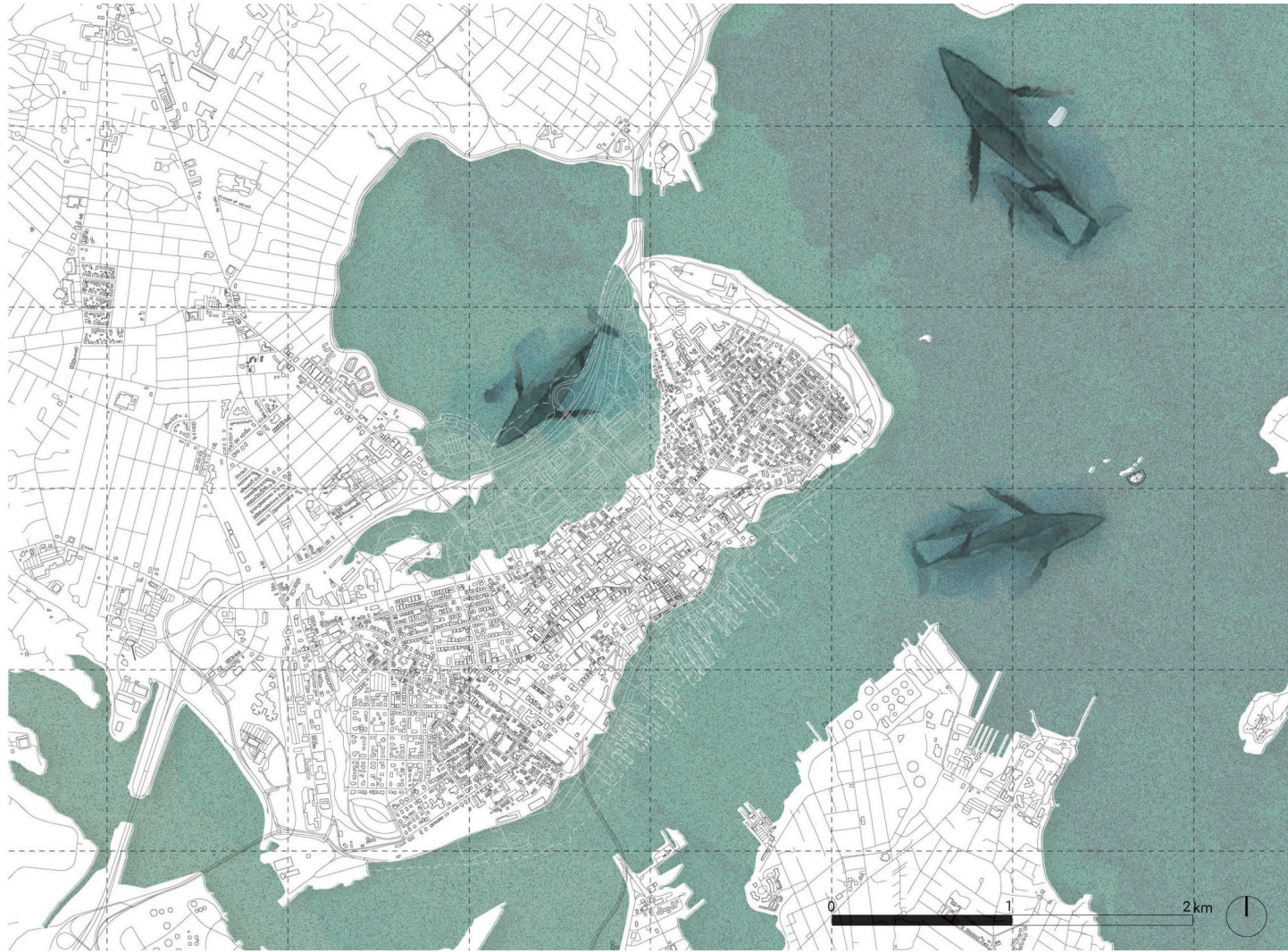
12 Ft sea level rise is expected by the year 2300 in Maine.



Sea Level Rise & Storm Surge

The next fifty years sea level rise will dramatically reconstruct Maine state shoreline.

Figure 05. MS AAD'22 Candidate, 2021



Whales as Submarine Cities

Through a series of wall building, the flooded areas eventually turn into submarine cities that carrying villages/towns that travel freely around the world.



Submarine City

An oceanic habitat that provides a solution to the climate change effecting the city of Portland.

Figure 07. MS AAD'22 Candidate, 2021

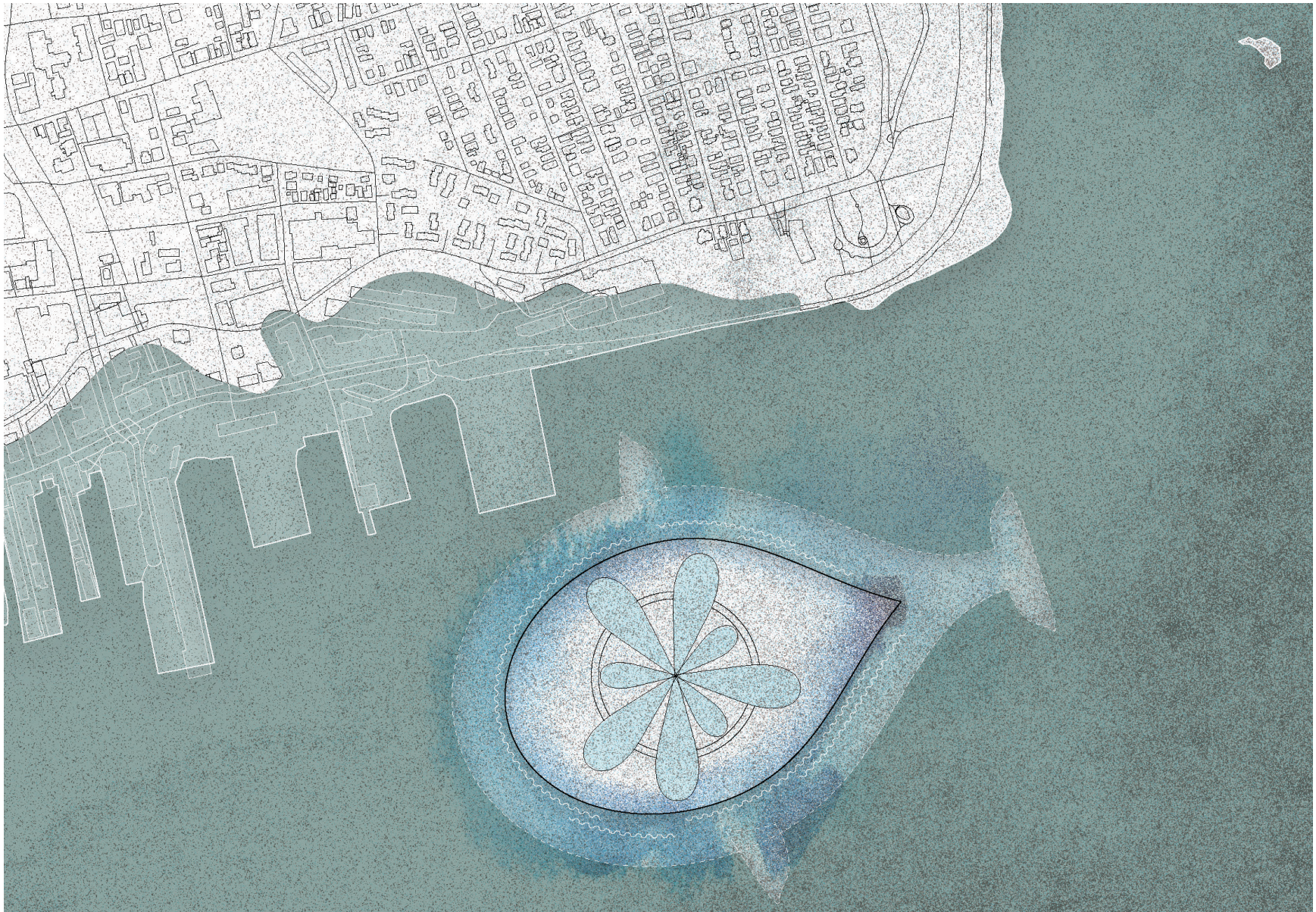


Figure 08. MS AAD'22 Candidate, 2021



Sink or Swim Book
Cover

Master of Science, Advanced Architectural Design 2021-2022
Cornell University

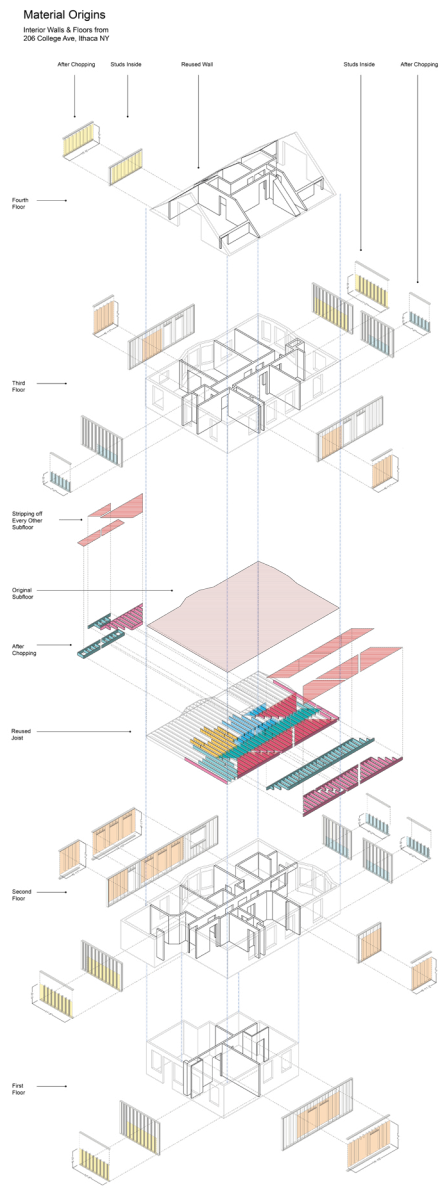
Studio: Unbuild Design

Instructor
Felix Heisel

Team:
Noor Abdulkhaleq
Jun cho
Sijja Chi
Yunqin Wang

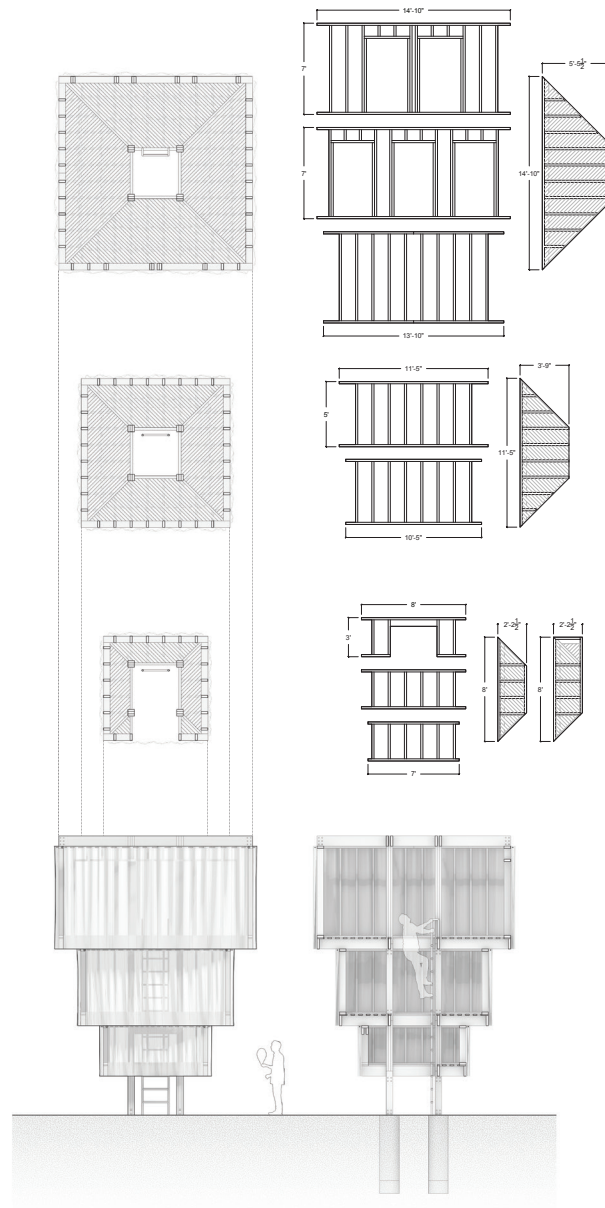
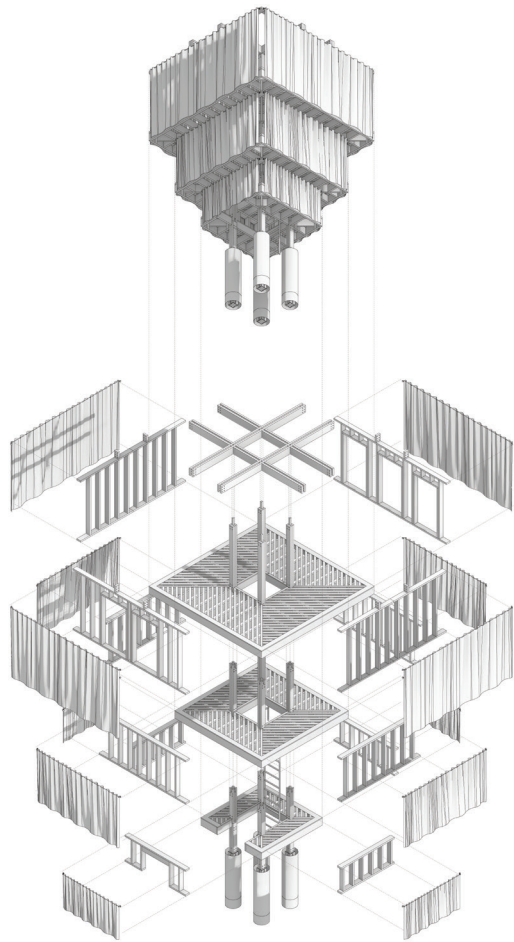
Project Description

The Unbuild.Design studio asks the question how systemic concepts or methods for the direct reuse of building elements and components at scale can be developed and implemented – utilizing Ithaca, New York as both urban mine and site for its investigation. Beginning with selected building typologies as a material source, students will be tasked to design a series of spatial follies that address the global aspiration of the circular economy through the development of both systemic design for disassembly proposals and local resource specific architectural applications. Through this investigation, the studio aims to promote a new design paradigm that begins from material availability and specificity, and foresees future material and component reuse within industrialized re-construction.



Tangram proposes a strategic opportunity to salvage and re-use wood floor and interior wall framings as they currently exist in an old building planned for demolition. The goal of the design is to achieve a new structure with a novel form only through selectively disassembling floor and interior wall panels as whole panels and finding a new assembly that requires a minimal fabrication of the panels.

The form and the assembly of this folly express a metaphor that delineates the distinction of interior walls compared to the parts of a building: interior walls are light and hollow barriers that create and define rooms and spaces inside while hiding more complex components such as structures, framing studs, or mechanical joints behind the immaculate surfaces..









Option Studio: Bamboo City

Spring 2022

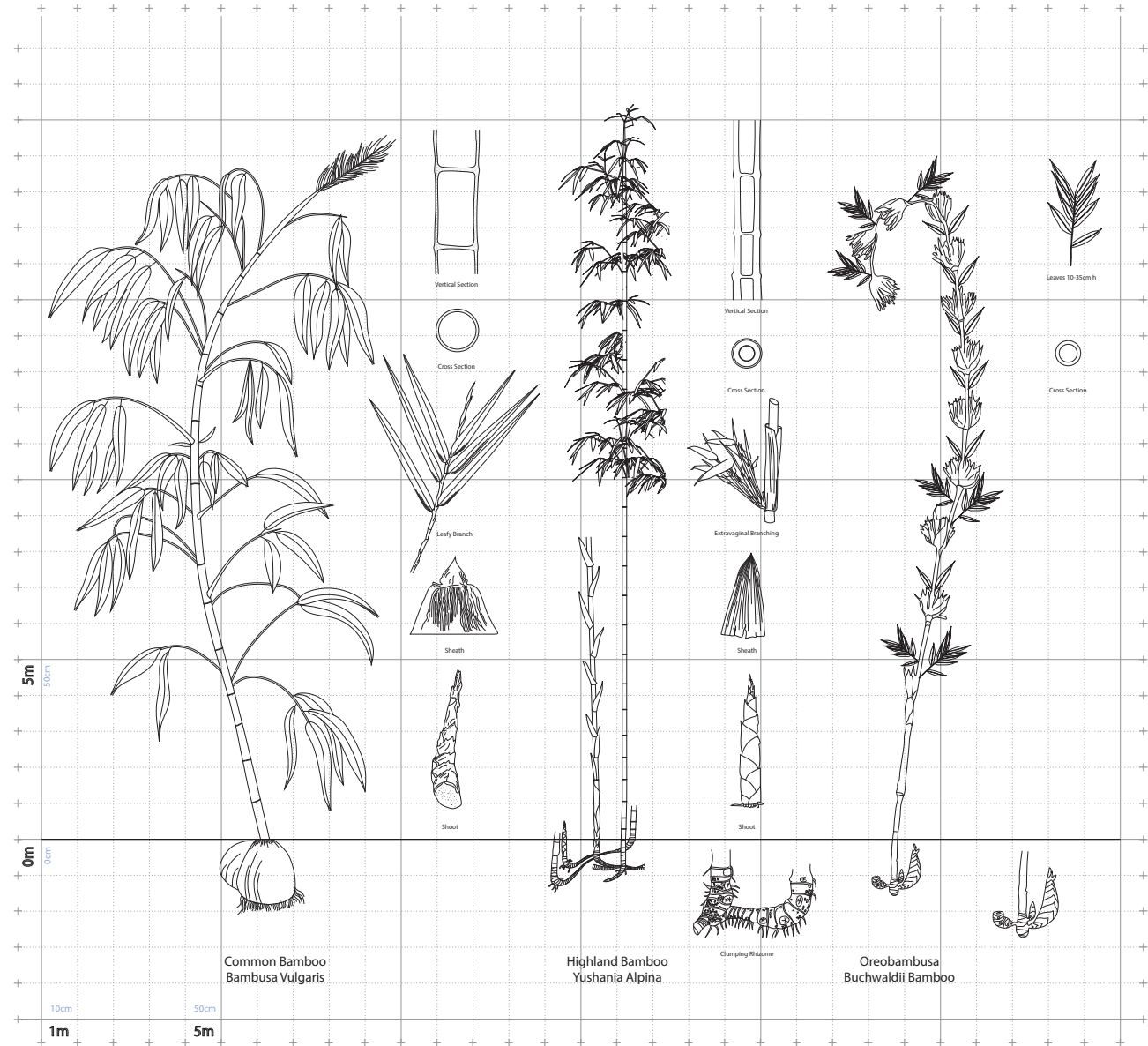
Instructor
Leslie Lok

Studio Description

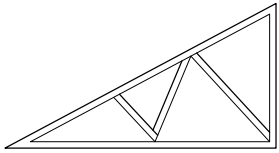
The fringe territory between urban centers and rural landscapes – a collage of urban fabric, productive landscapes for manufacturing, agricultural areas, and vernacular village fabric – has emerged as the predominant framework for urbanization in China. This “in-between” fringe is characterized by the uncompromising juxtaposition of urban systems, architectural typologies, material practices, spatial practices, economies, technologies, and ecologies. While the multivalent urban fringe constitutes an exciting and powerful incubator for new urban typologies and architectural innovation, it frequently generates a multiplicity of challenging environmental, social, and ecological problems.

In recent years, cultivated bamboo plantations in fringe territories have been increasingly abandoned due to the diminishing usage of the material in construction and other industries. Invasive bamboo forests around rural-urban villages have become a critical environmental issue, causing severe losses in biodiversity, soil retention, and water quality. In collaboration with the Nature Conservancy (TNC), a global environmental NGO, the studio will explore novel trajectories to re-integrate bamboo into today’s complex building ecosystem through the design of a housing project sited in Qingshan Village in southeast China. The studio will explore alternate housing models for the urban fringe by utilizing local bamboo resources in combination with emerging construction technologies such as augmented reality (AR) and mixed reality (MR) tools. Such tools allow for an intuitive interaction with bamboo as a complex and high-tech building material, while enabling new forms of sustainable and material-efficient construction.

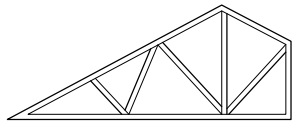
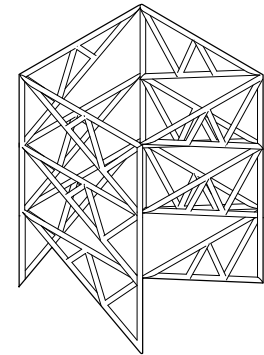
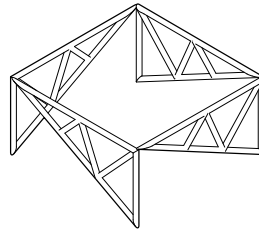
Bamboo Material Analysis



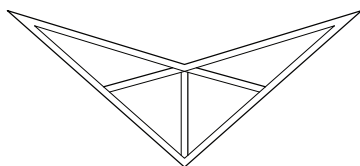
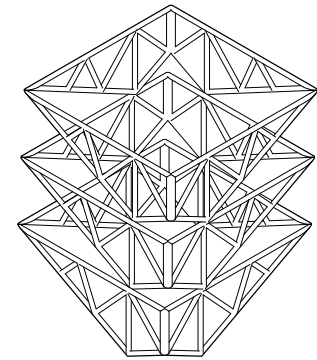
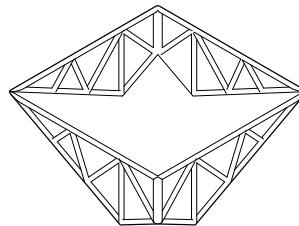
Typology Analysis



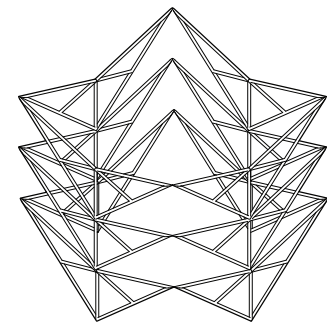
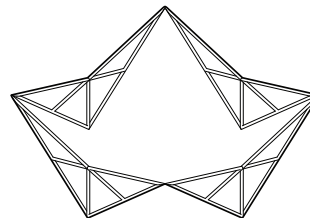
Monopitch



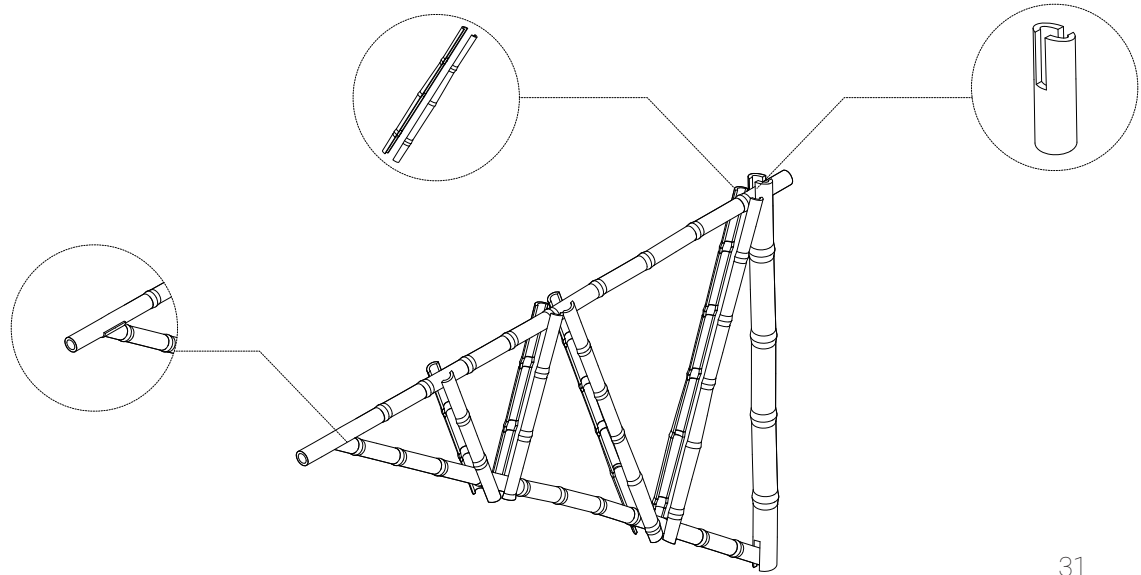
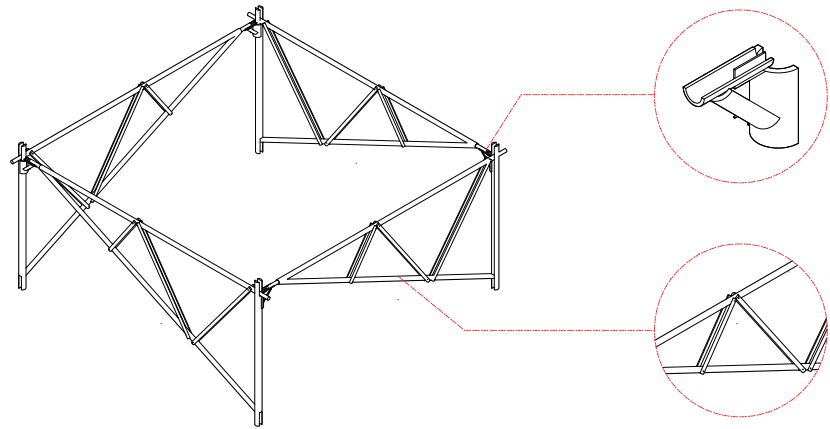
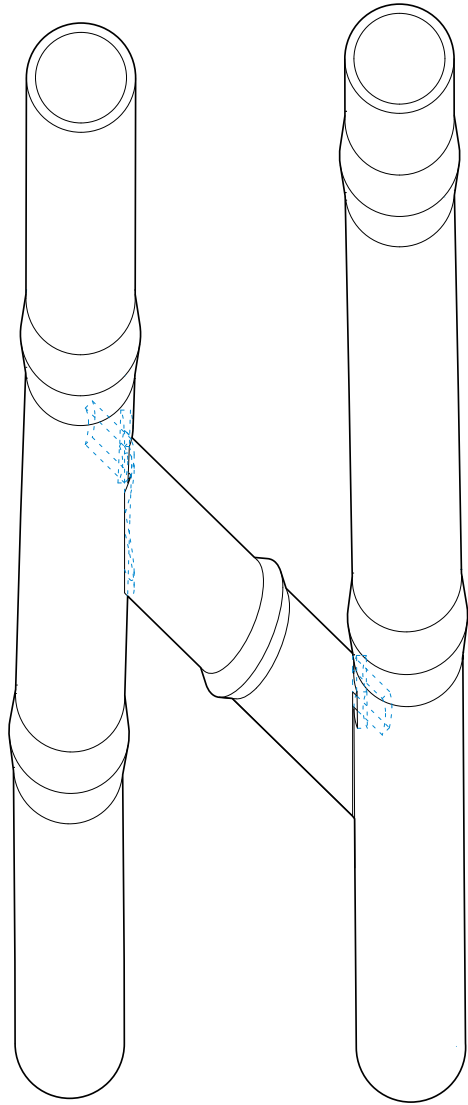
Stub

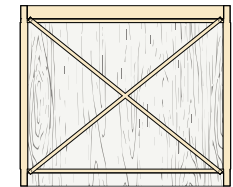
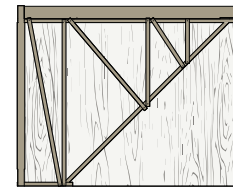
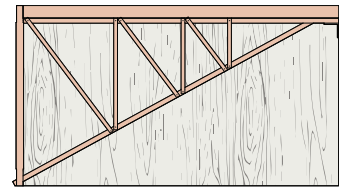
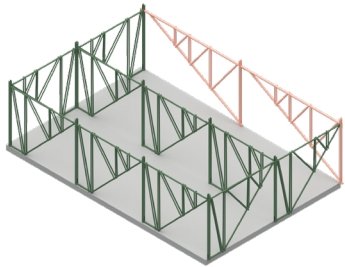
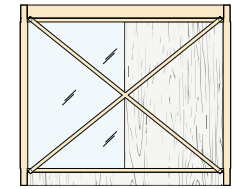
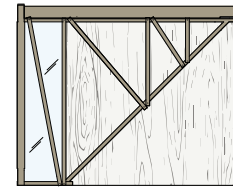
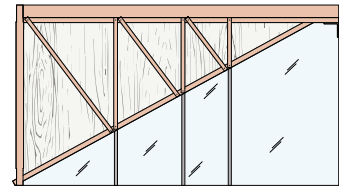
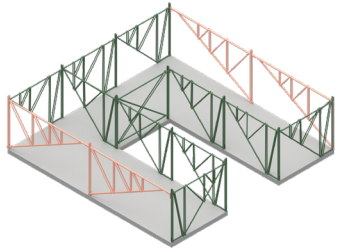
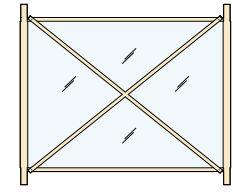
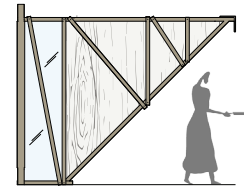
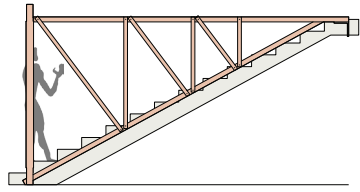
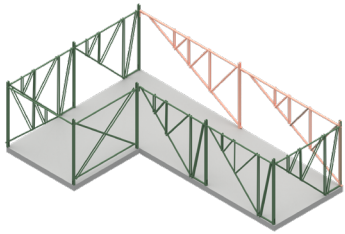
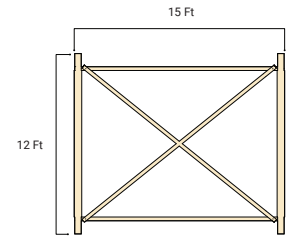
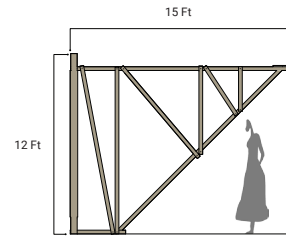
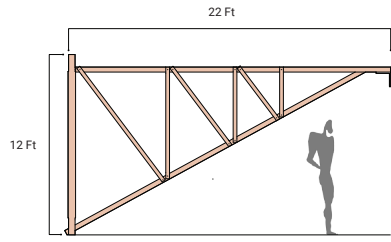
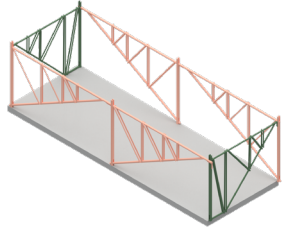


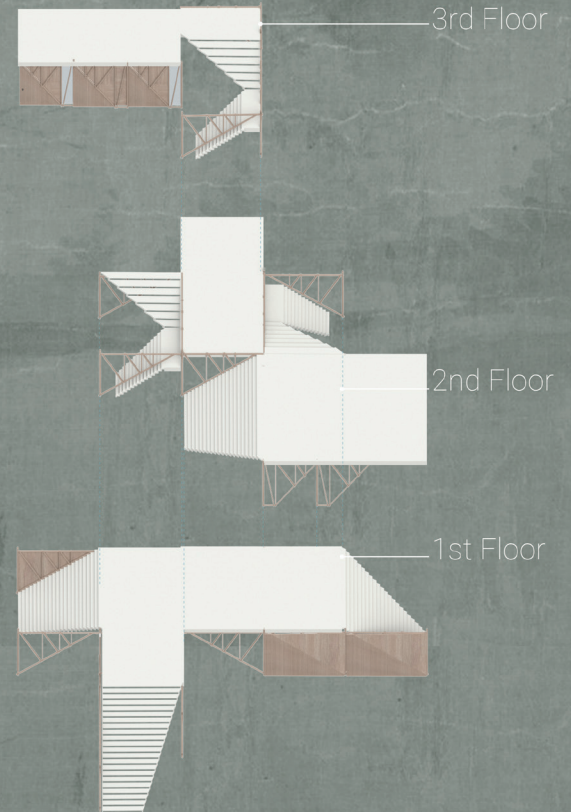
Scissors

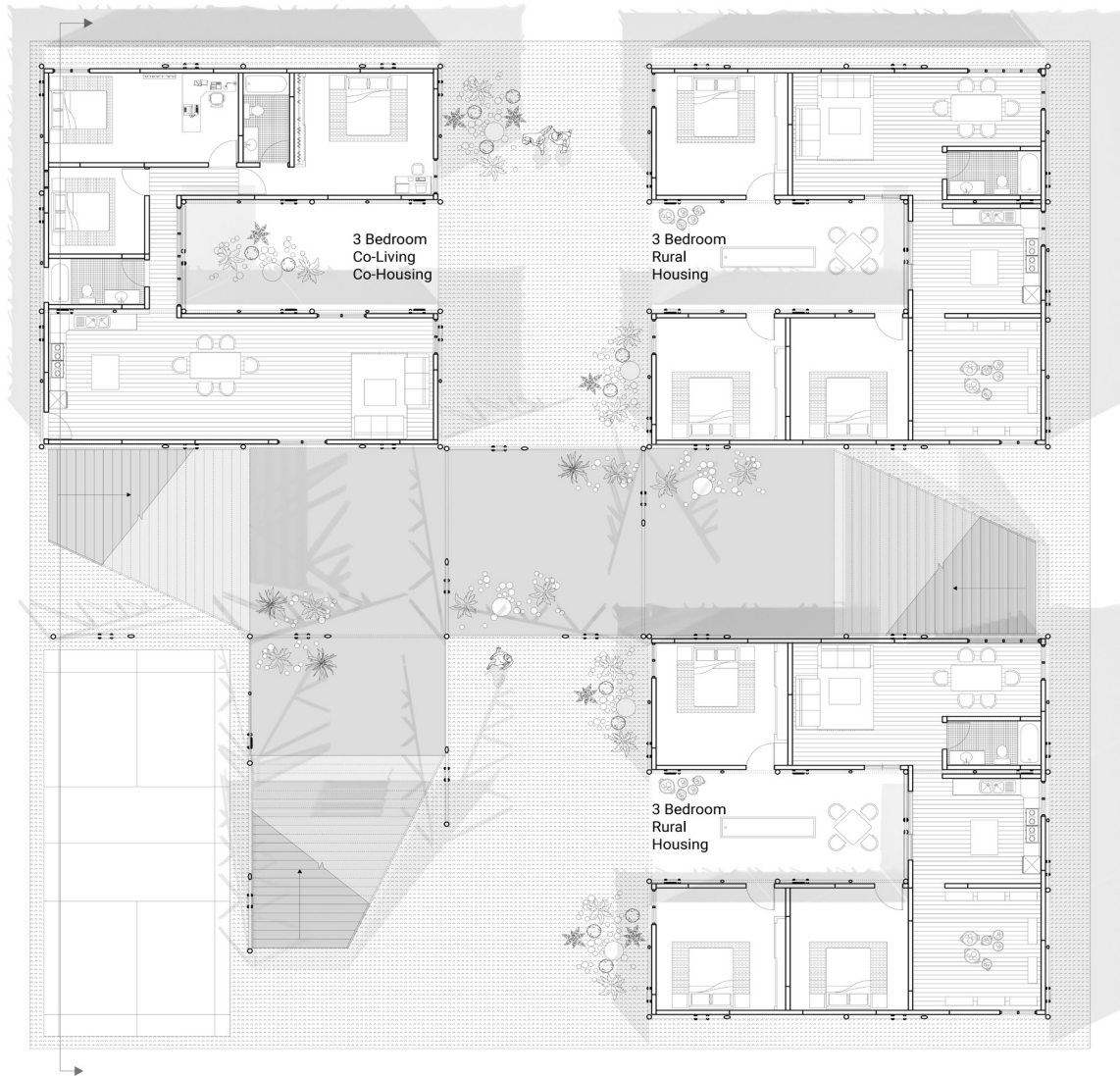


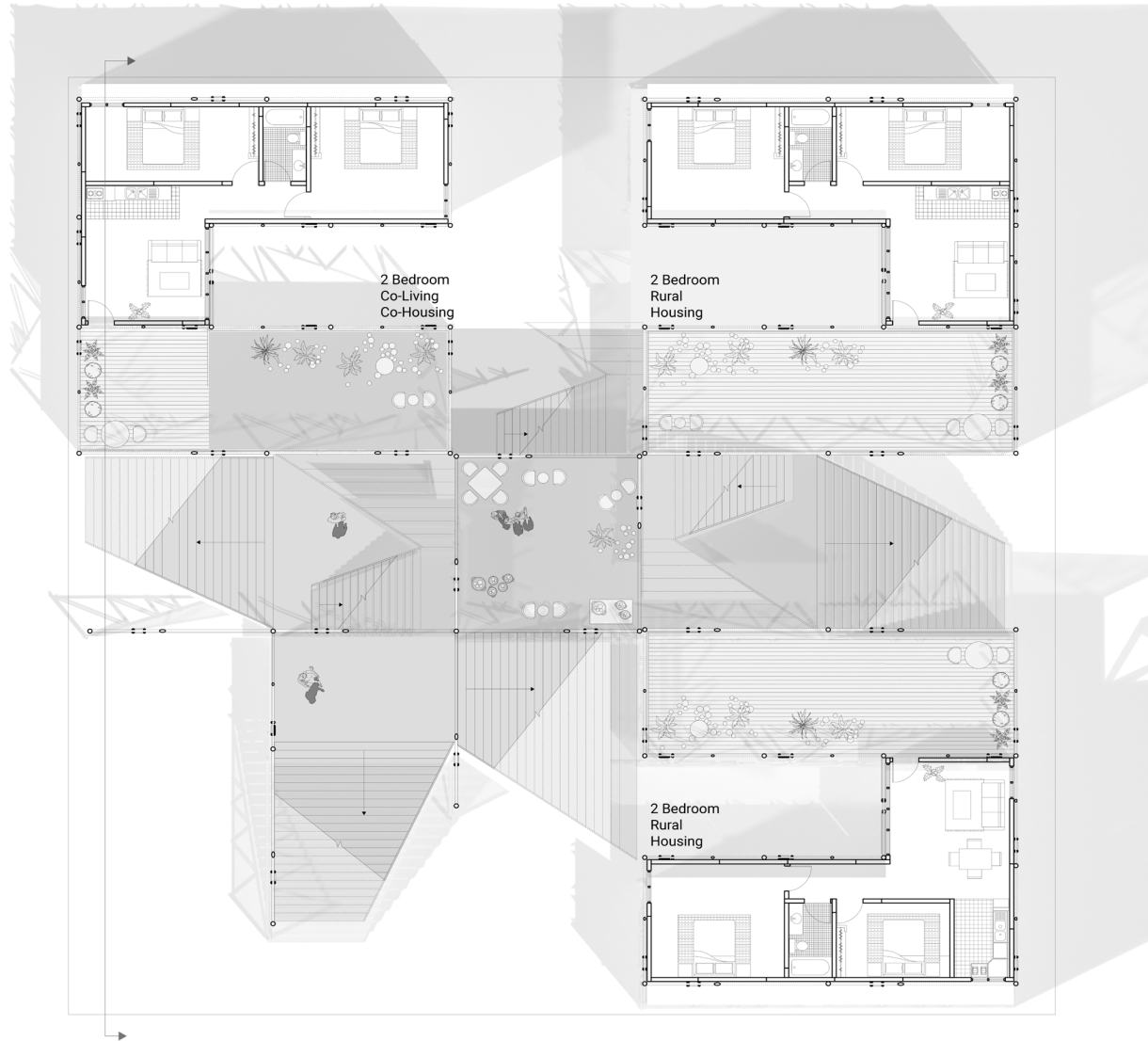
Construction/ Connection

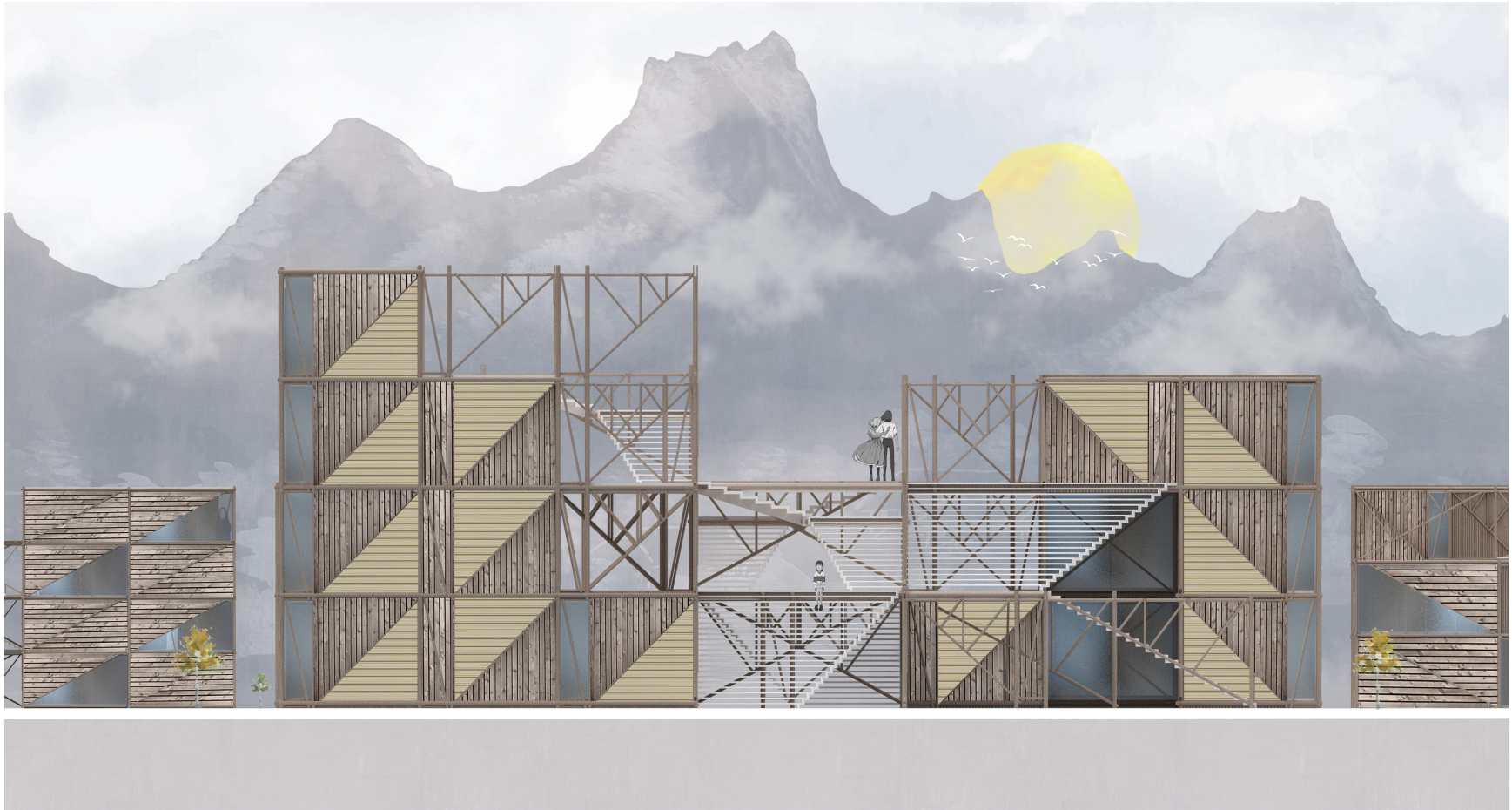


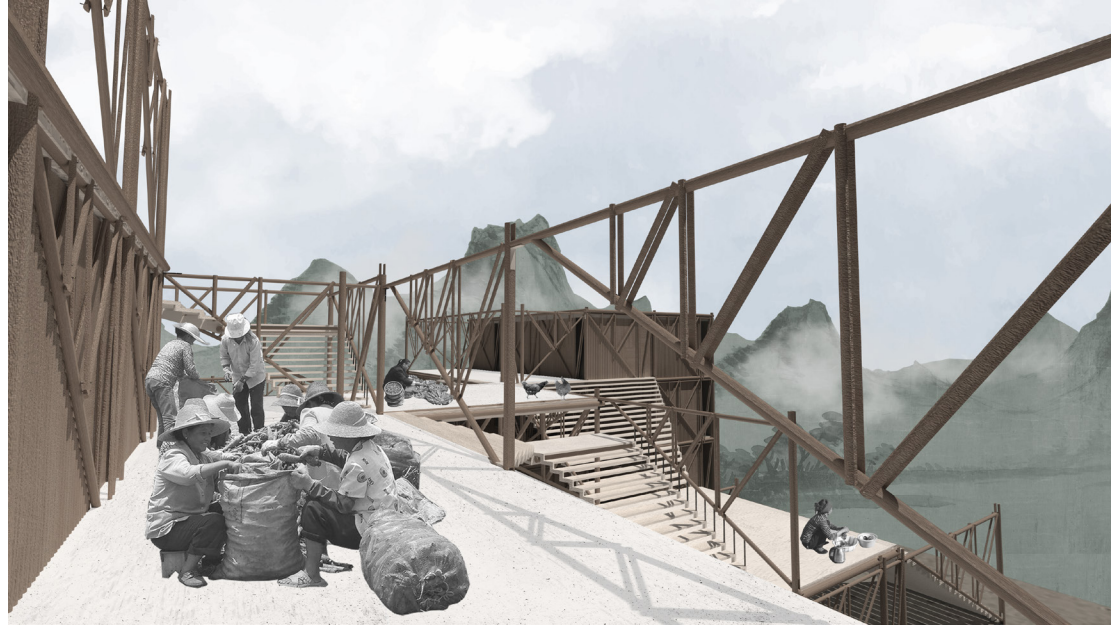












Elective: Bamboo Tactics

Spring 2022

Instructor
Leslie Lok

Team 1
Noor Abdulkhaleq
Nancy Niu
Yunqin Wang

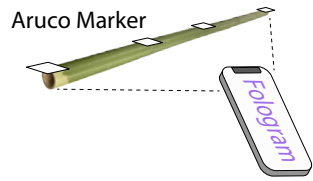
Seminar Description

Bamboo is widely accessible as a sustainable natural resource and has long been used in traditional architecture across various global contexts. It is also a natural resource with unique material and structural characteristics. With its non-uniform dimension, there remain challenges to processing and using bamboo beyond the standardized methods. Through hands-on making, the seminar explored mixed-reality (MR) enhanced design workflow to discover a catalog of new material tactics for the application, customization, and fabrication of bamboo architectural assemblies.

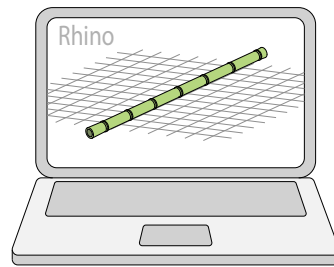
The seminar began by researching regional means of bamboo applications that embody vernacular construction and ecological knowledge, then follow by introduction to augmented reality (AR) and mixed reality (MR) tools. We experimented with AR/MR technologies in the following capacities: Design tool to negotiate bamboo's non-uniform dimensional nature; experiment with visualization to enhance user agency; fabrication tool with "how-to" holographic instruction. Pairing manual making with virtual augmentation can enable material tactics for bamboo that are both high-tech and low-tech, customizable and translatable to rural/rural-urban areas where the material is often abundantly available.

AR Process

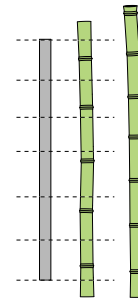
Physical Bamboo



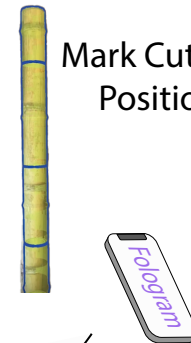
Digital Bamboo



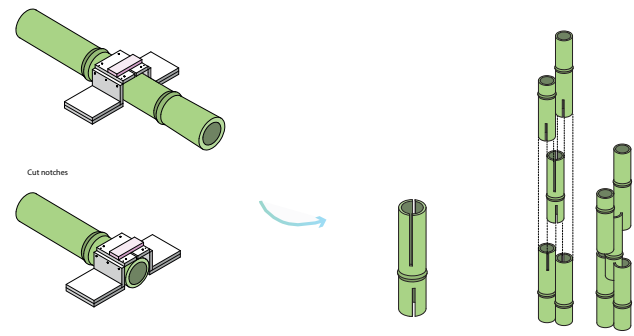
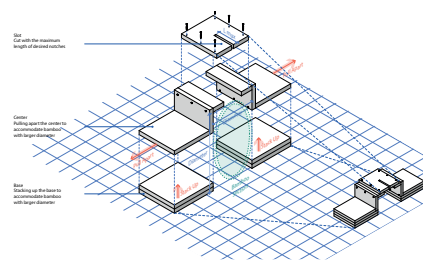
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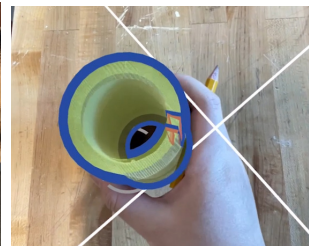
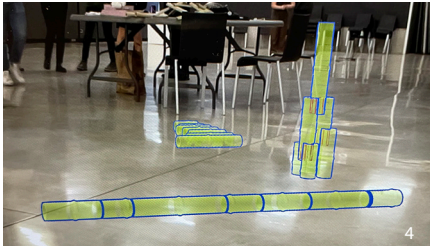


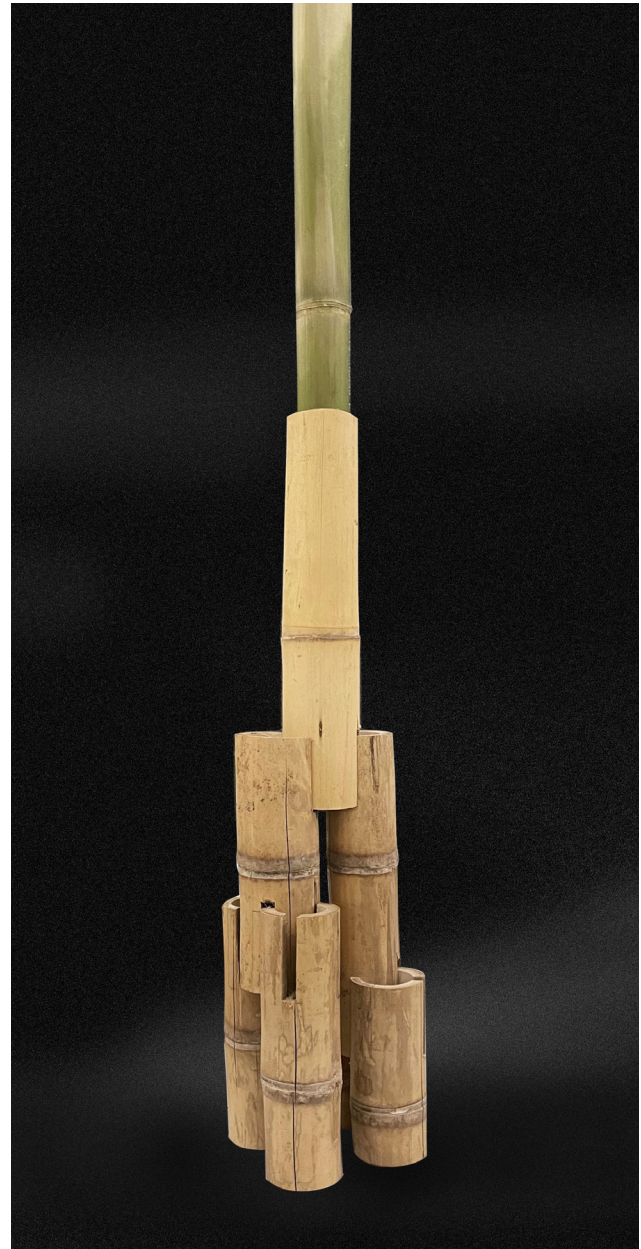
Mark Cutting Position



Cut with a tailored jig







Elective: Climate : History : Architecture

Spring 2022

Instructor
Esra Akcan, PhD

Sorry, out of gas exhibition and book

Sorry, Out of Gas is an exhibition and book that was published in 2007 by Giovanna Borasi, Mirko Zardini, Adam Bobbette, Daria Kaloustian, and Pierre-Edouard Latouche. It documents the architectural innovation that occurred during the 1973 oil crisis. a time when the increase in oil prices caused tremendous stress economically, politically, and socially across the world. The book highlights the global response to that issue and how it is correlated to architecture in the present day. The exhibition that occurred in 2007 showed over 350 objects that included architectural drawings, maps, photographs, books, and television footage from that time. It also showed books and pamphlets that are related to the issues of the oil crises of the 1970s.

Fossil fuel is everywhere. The phenomenon goes beyond filling our cars with gas. It's a key ingredient used in almost all manufacturing industries. It is tremendously used in the "fast fashion" industry as they use synthetic fabrics such as polyester, nylon, and spandex. It is also used to make the chair you're sitting on right now, as well as your smart phone. Even electricity is generated through fossil fuels. which makes it ironic that electric cars are being promoted as environmentally friendly. It is true that it's less harmful. But it is still harmful, nonetheless. It can only be considered environmentally friendly when electricity is generated through renewable sources such as wind, hydropower, and solar power. Unfortunately, more than 60% of the world generates its electricity through fossil fuels.



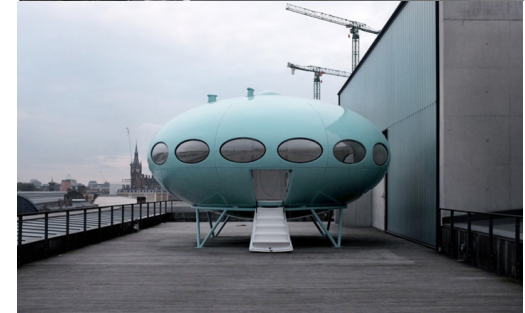
And only 26% through renewable energy in 2019. From the 1940's until 1970 was marked as "thirty glorious years" filled with growth and prosperity due to fossil fuel. The industrial revolution was powered by it, and it pulled many people out of poverty. Its discovery marked the birth of the modern economy. This notion ended in 1973, when the fourth Arab-Israeli War erupted. Arab countries, who were the main oil distributors during that time, cut oil exports by 5% a month. and then imposed an embargo on oil exports to the United States and other countries that support Israel. The embargo altered the global price of oil. It almost quadrupled the price of oil from \$2.90 to \$11.65 a barrel. It was very clear that oil was being used as a political weapon by the OAPEC nations. This occurrence affected the world similarly to today's recession combined with inflation. Development became globally difficult during that time. The change in regime in Iran by the end of 70's made the oil price inflate more than it already was. During that time, fuel was almost always sold out due to shortages, which resulted in people waiting in very long lines at gas stations. Some countries imposed car-free Sundays in response to the shortage. People in the Netherlands were riding horses to supermarkets. Some were having picnics on the highway. In Germany, people were hiking on a deserted highway. In some states in the US, such as the state of Oregon, curfews were placed on energy use. Not only was the use of fossil fuels expensive, but it was also severely limited, which is why some states in the US were trying to



minimize energy consumption as much as possible. These social/ political issues of the 70's had a great influence on architecture. The 70's were a decade of intense exploration for architecture and urban development. Renewable energy and new forms of energy conservation and new production methods were extensively explored during that time. Unfortunately, those studies were gradually forgotten after the oil crisis ended. The world went back to the same way of life they're used to before the crisis occurred.

Futuro House by Matti Suuronen is a good example of how some innovative architectural projects were affected by the crisis. It was the first plastic housing design. Made of fiberglass- reinforced polyester exterior and polyurethane insulation. The project failed due to the oil crises and the tripling costs of plastic. which uses fossil fuel as a key ingredient in its manufacturing.

The 1973 crisis was a wake-up call for public institutions to begin to pay attention to the energy question. Many leading architects started exploring or built their first buildings that rely on renewable energy before 1973. Most renewable energy methods research was already in progress, but the crisis accelerated the research and experimentation in alternative energy. 'Solar House" Prototypes a study conducted by MIT already existed before the crisis. Some were using new modules of solar panels, and some were exploiting building orientation and direct solar energy gain.



Until 1973, passive and active solar houses were scientific projects only. They were mostly constructed by universities. A solar house is considered “passive” when its architecture, orientation, and architectonic components such as size and arrangement of openings, materials and thickness of the walls and floors, and insulation quality meet certain criteria. All acted as both heat collectors and thermal storage, eliminating the need to use any mechanical system that depends on gas or fossil fuel products. Prior to 1973, the best-known case study of a solar house was conducted by MIT in 1938, directed by Hoyt C. Hottel, an expert in liquid fuel.

Test modules were constructed on the MIT campus. The first full-scale houses were built between 1939 and 1947. The houses contained labs, where researchers monitored the performance of the collectors and storage tanks and validated their methods of measurement. By 1949, the focus shifted to solar heating in conditions like everyday life. Hottel had one of his graduate students move into one of the houses with his family. This experiment went on until 1995, when a fire destroyed the house. By the 1950s, the project pivoted to issues like the economic viability of active solar heating systems. The aim was to study whether the system was cost-effective compared to conventional heating methods. They also explored aesthetic considerations and the question of whether these houses could compete with standard housing in the real estate market. To address this notion, MIT built a fourth solar house

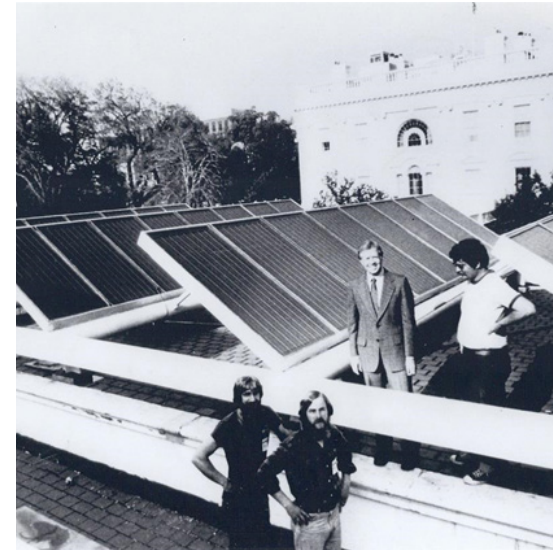


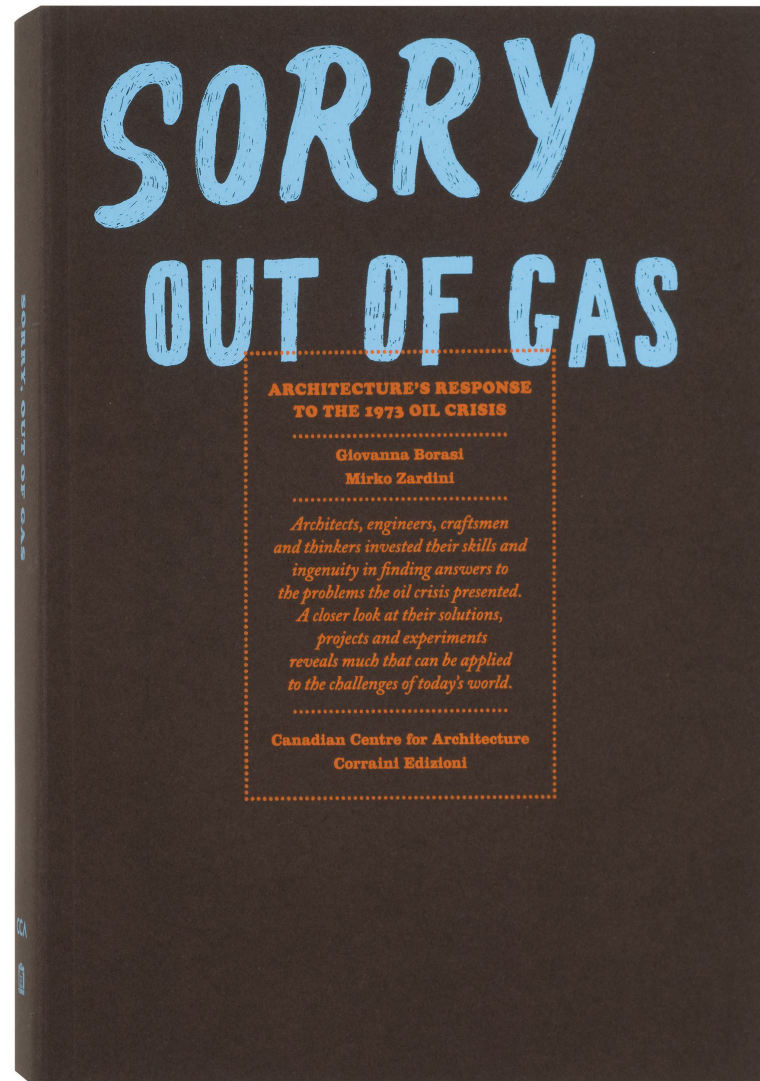
in 1959 in a residential neighborhood in Lexington, MA, so that it could be put up for sale after an initial trial period. Special emphasis was placed on the design of the house, for which the MIT School of Architecture held a competition. The publicity for this project stressed not only its elegant design but also the simplicity of its heating and cooling systems, which the occupant can reverse simply by turning some valves twice a year. The Peabody House, or Dover House, was the final Solar House series project by MIT in the book. It was built for Amelia Peabody in Dover, MA. The project team was led by architect Eleanor Raymond, who drew up the plans and supervised all stages of its construction. The engineer who oversaw the project was Maria Telkes, a colleague of Hottel at MIT. It was the first solar home that was lived in that was entirely heated by solar energy. It was deliberately designed without a backup heating system. This project was distinctive because it was the result of the collaboration of three women. An unprecedented, gender-specific accomplishment in the very masculine field of architecture and engineering of that time.

The Baer House in New Mexico was commissioned in 1971 by inventor and designer Steve Baer. This project is an important case study in the solar movement. Baer built an 11-room house. The rooms were in the form of polygons, which he called zones. They're joined on one or two sides, giving the floor plan the look of a cluster. It was built with adobe brick walls and aluminum cladding on the outside. Four of the zones or



clusters had their south façade entirely made of single glazed windows. Inside, metal drums were filled with water and piled up, nearly blocking the windows. During summer, a shutter that is manually operated covers these windows by day. At night, they were opened to allow fresh air to cool the water in the drums. In winter, the process was reversed. In the daytime, the water drums collected heat through maximum exposure to solar radiation. At night, the shutters were closed to prevent any heat loss. An essential aspect of this design is the simplicity of its heating and cooling system and its installation. which was something that Baer was known for. As a designer, he valued this aspect of his designs. President Jimmy Carter was the first American president to take steps to promote solar energy. He advocated for clean energy during his presidency and set the example by introducing a solar water heating system for the White House in 1979. 32 solar panels were installed on the west wing roof. The system was used for seven years until Ronald Reagan came into office. . He convinced the nation that the energy crisis was not caused by a lack of oil or gas resources. and that these sources of energy are still abundantly available. He was able to persuade the world that the crisis occurred due to bureaucratic interference in supply and demand in the energy sector. He had the solar panels in the White House removed in 1986. They were stored in a government warehouse until 1991.





Elective: Museum Histories

Spring 2022

Instructor
Kelly Presutti

Noor Abdulkhaleq
Klytaimnistra Avgetidou

Course Description

Museum Histories considers current and ongoing crises in arts institutions (COVID, labor issues, underrepresentation of minorities, calls for restitution of wrongfully-acquired objects) in relation to both the history of museums and collections and the kinds of histories they are able to tell. Readings will focus particularly on the 18th and 19th centuries and the ways in which museums developed alongside and in support of nationalist and imperialist agendas, asking to what extent present problems are informed by choices and alignments made in the past.

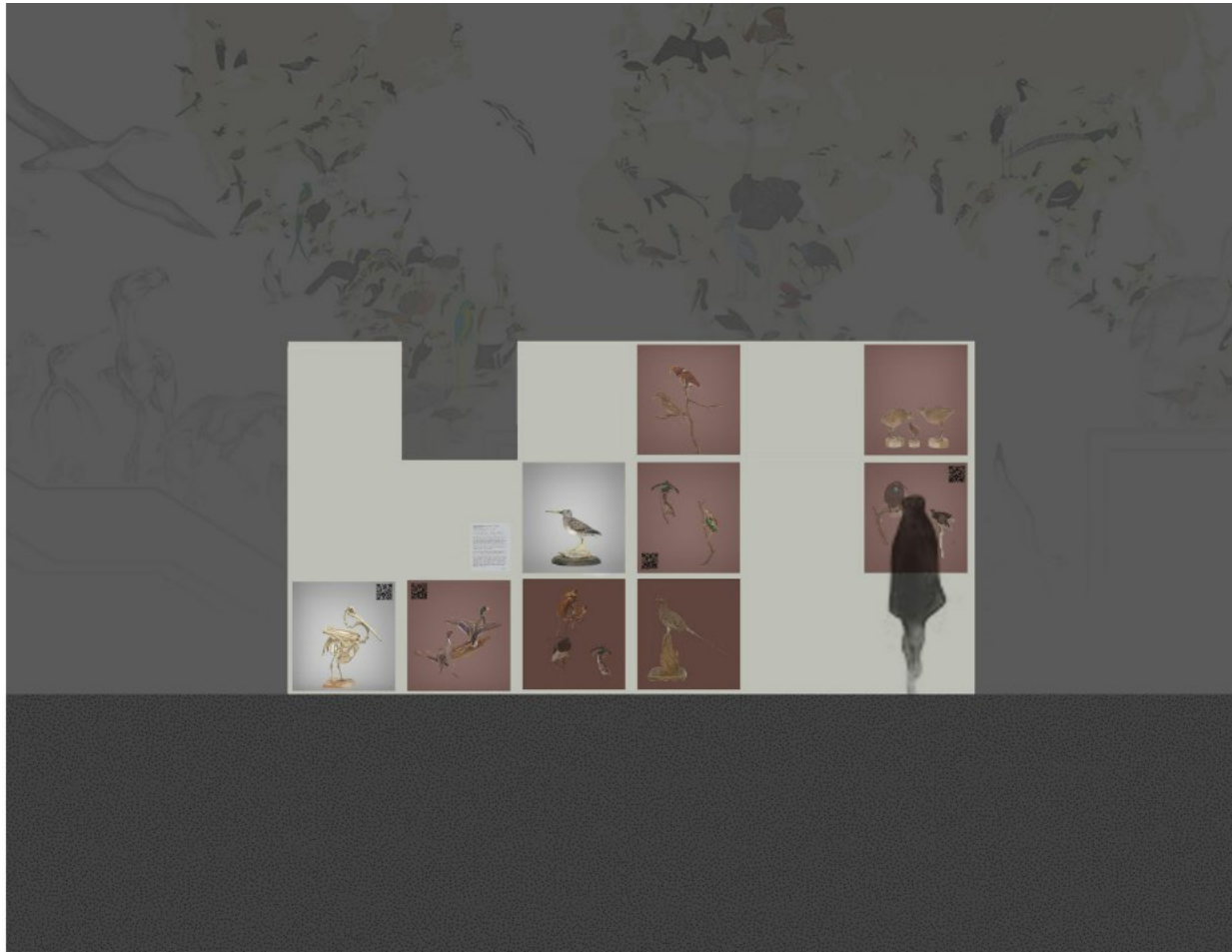
Display for the Cornell Ornithology Lab:

Prior to our visit to the Cornell Lab of Ornithology, we had this notion of how natural history museums constituted paradigms of unethical practices within their collections. We had this belief that animals were often sacrificed for the sake of display rather than science. As if they're displayed as means of entertainment. Most museums only provide the name of the specimen and some traits and leave behind crucial information such as how the object or specimen was collected or how it contributed to the advancement of science. Because of this, the narrative of natural history museums negatively affected the way we perceive those institutions. However, when we visited the Lab of Ornithology, we got exposed to another narrative that is normally hidden from visitors. While discussing with people within the field, we came to really acknowledge their importance and better understand that without their contribution to science, our knowledge in biology wouldn't have been as advanced as it is today. One could argue that providing this much information could overshadow the object itself and in a way overwhelms the visitor. But it's human nature to be curious and question how, when, where, and why those specimens are on display.

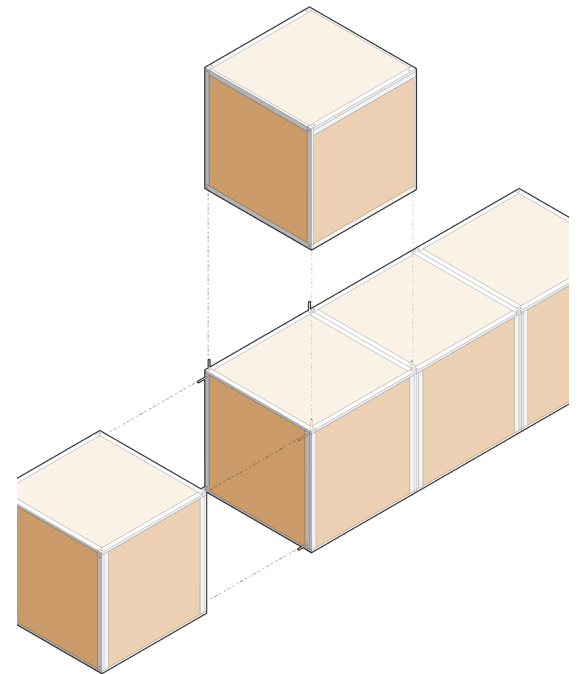
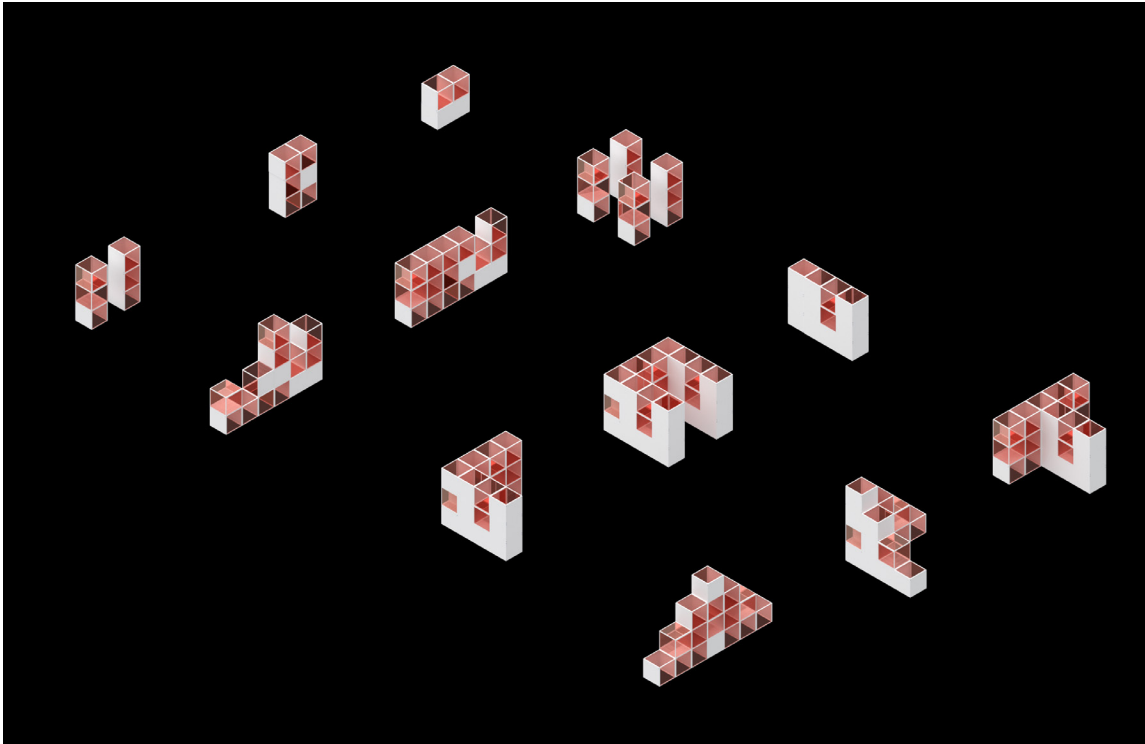
Therefore, we asked ourselves...how can the design of the display highlight the often-neglected aspect of the institution's role in the advancement of natural science? And at the same time,...by bringing back the old cabinet design, could that better help us understand the museum collections? In an age where our attention span and capacity to be impressed and engaged are shrinking, can the cabinet concept be the first step into addressing some of the issues of modern museum institutions? These questions constituted the agents that drove our design proposal for the display of the Cornell Lab of Ornithology. Before we started our design exploration, we had the opportunity to sit down with Casey and discuss some of the issues that the Lab is facing in terms of displaying their specimens. Since most of them are extremely sensitive to light and temperature, they are very fragile and need to be handled with utmost care. He showed us the display of the snake skeleton they have at the Lab. He kept stressing how that display lacks flexibility in terms of mobility and assembly. He also mentioned how difficult, time consuming and expensive it was to put everything together and actually, in the end, they had to hire a professional to handle the display. Unfortunately, the skeleton can not be removed from the case for further studies.

He often stressed the importance of considering ways and means to protect the specimens on display from the surrounding environment such as light, air, and temperature to help elongate their legibility because nowadays it's very hard to get new specimens specially from rare species. A good example is the orangutan that we saw in our visit with our classmates. The specimen was very deteriorated and it can not handle further experimentation. Because of that, it stays hidden inside a box and they are just trying to preserve it for as long as they can because of how rare it is to obtain such a specimen. Moving forward, we started exploring different ideas of how to combine permanent and ephemeral concepts of display that would help the museum exhibit their diverse collection that consists of an enormous number of specimens. We started investigating the possibility of a display that is mobile and easy to assemble, and a design that emphasizes its fluidity. Inspired by the "cabinet of curiosities", we explored simple forms that highlight the displayed objects rather than obscuring them. We designed a simple box module 12x12 in. that could expand to 24x12 in. if needed to accommodate the larger specimens. In order to minimize the cost we are proposing the use of recycled materials such as acrylic and wood frames. The module was designed in a way that allowed different iterations of assembly according to space and type of exhibition. We also further investigated the type of glass that would protect the specimens from light exposure. We actually found out that red light carries low energy and is usually used as "safelight" in dark rooms. Orange filters are more protective of objects as they filter out the blue part of the spectrum. In addition, the element of color, especially hot tones such as red, orange and yellow, can symbolize the violence of how those specimens were killed in the name of science. This is our way of acknowledging the history of the displayed object through design. Studies have shown that the use of color within space can greatly affect humans emotions and perception of space. By using the mentioned colors the display will be able to achieve that effect on the visitors. Although the use of color could alter the way the specimens are displayed, in some cases maybe that effect is crucial to the narrative of the exhibition. Another design element that we were very eager to explore is how we were able to see "behind the scene" of the lab of ornithology. And the work that scientists put in for the advancement of the field. The process itself was very interesting to witness. The fact that it was a hidden aspect for the visitors but, we had the opportunity to witness added value to our experience.

We emphasized that through our design by proposing an additional module that looks like a solid box but actually contains hidden drawers that could include tools and other information related to the process of studying and examining the specimens. With this design effect we are trying to address how this process and also the information related to it are often hidden from the visitors. This relates back to the notion of how, as cabinets of curiosities evolved into museums, much information got lost or overshadowed by the ever growing collection of these institutions. Furthermore, to tackle this issue to a greater extent we started inspecting ways to label the specimens and objects. Due to the possibility of overwhelming the visitors with long texts we are proposing the idea of visible and hidden information. The visible information represents the common way of labeling artifacts. The hidden information is displayed through a QR code that could be scanned by visitors' smart phones for further facts and data. Also, the QR code could be linked with information from other institutions creating a network that could connect similar specimens from different museums to each other. A crucial aspect of our design is the flexibility and mobility of the module. It could be used both for permanent and temporary exhibitions. It could be placed in hallways and lobbies, or even outdoor areas if the weather conditions allow. Furthermore, its assembly doesn't require hiring professionals as it can be assembled and disassembled by anyone due to the simplicity of the construction. Because of that, unlike the snake display, specimens can actually be removed for further studies and experimentation without any cost of time and money. Through this experience, we realized that as architects, we often neglect the importance of designing to enhance the experience, whether it be for humans or objects, even though we were taught in school to consider these elements. In reality, we don't practice what we learned. On the contrary, we often contribute to the acidification of the issue of space and display in museums. We design "sculptures" rather than space. As architects we are as much responsible for issues that modern museums face today as the curators and collectors are.



Visual Representation of the display



Different iterations of the module

Elective: MACHINE CONSEQUENCES

Fall 2022

Instructor
Alicia Imperiale, PhD

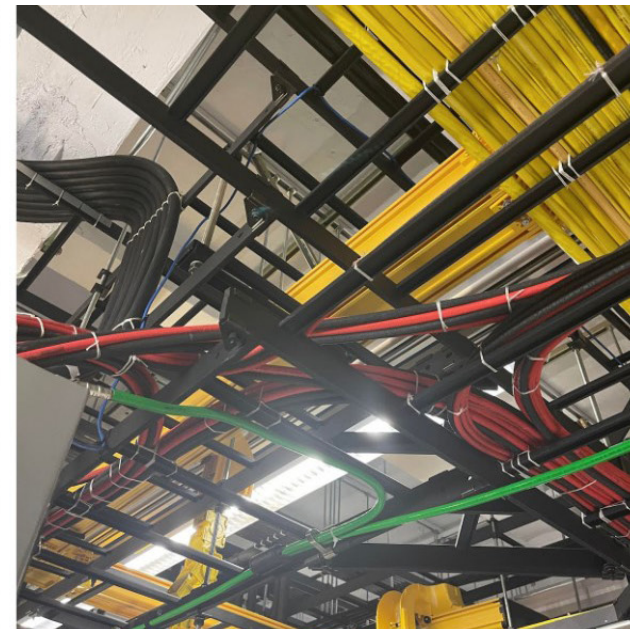
Noor Abdulkhaleq
Klytaimnistra Avgetidou

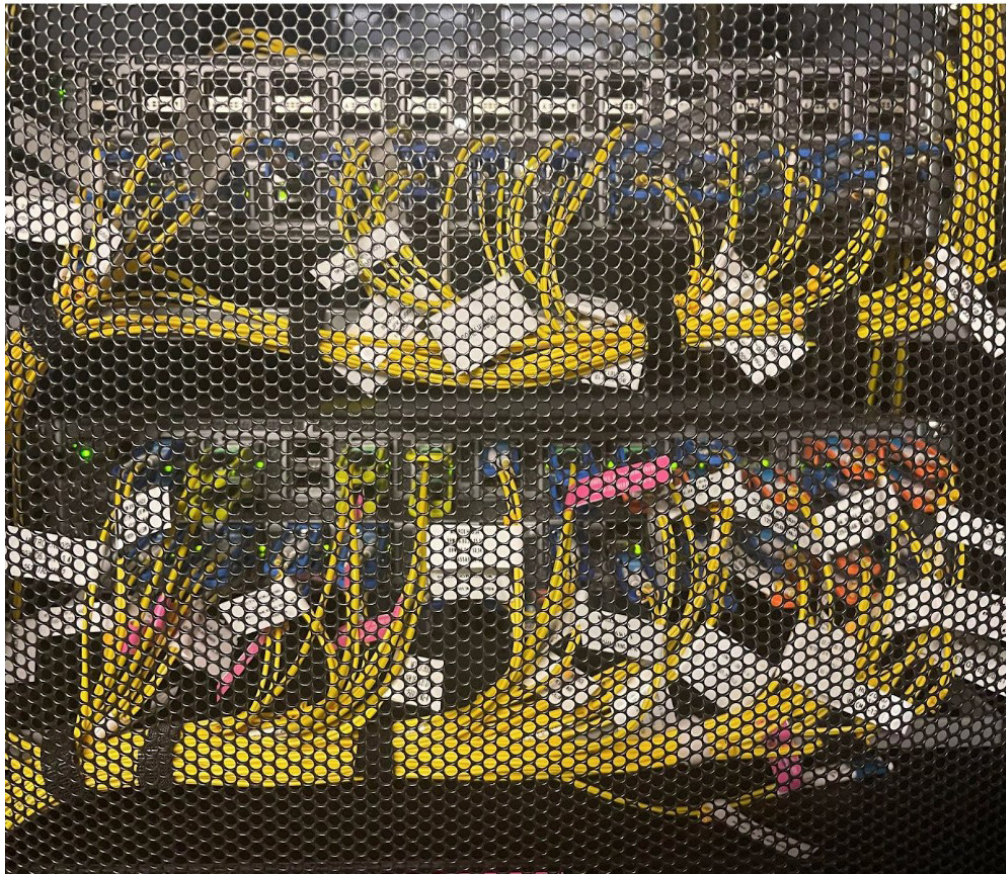
Data Centers Research

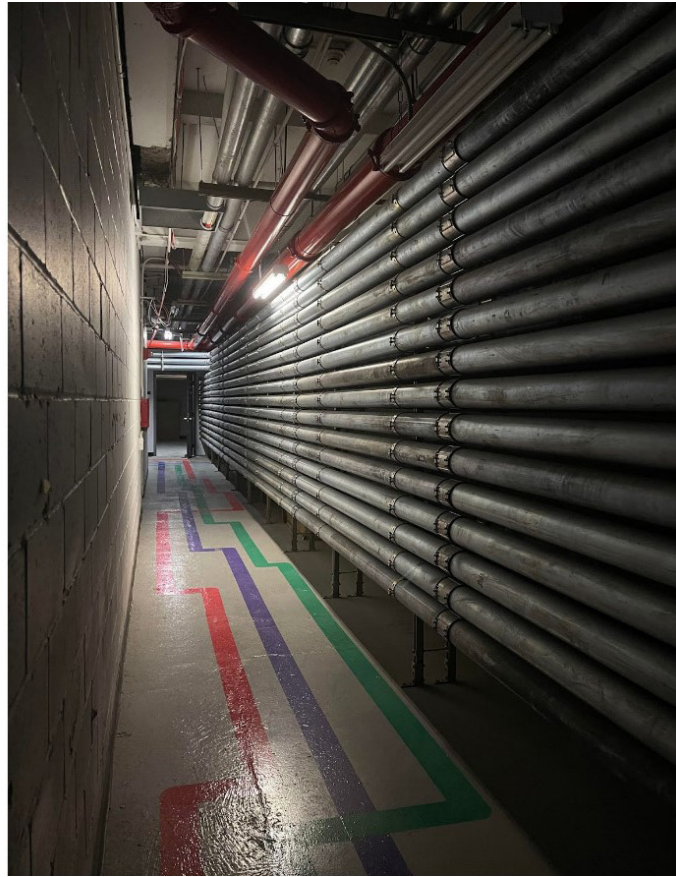
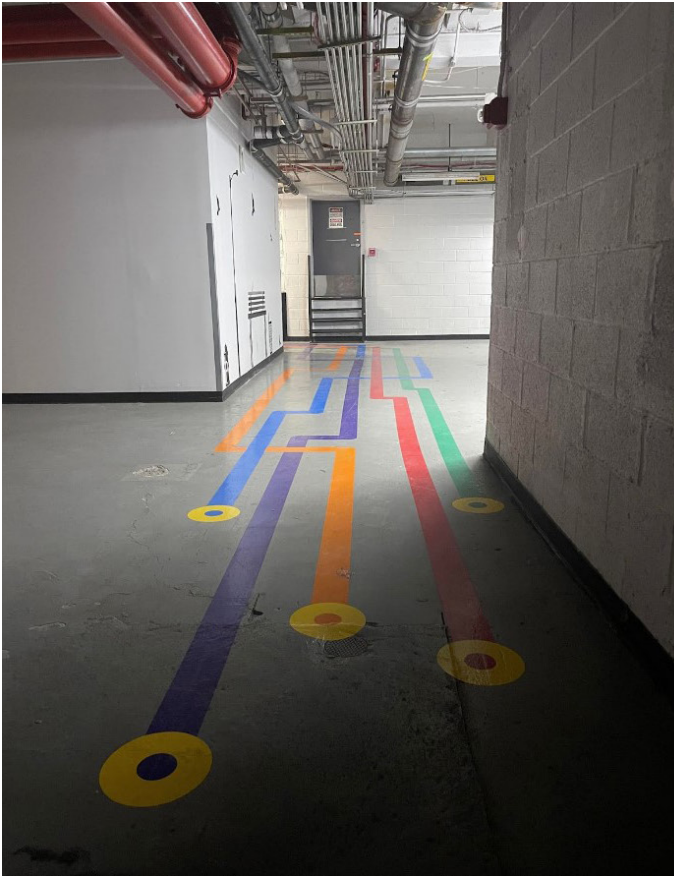
By definition, Data Centers constitute facilities composed of networked computers, storage systems and computing infrastructure that companies and organizations use to assemble, process, store and disseminate large amounts of data. Businesses rely heavily on the services data centers offer, constituting a critical asset for their daily operations. In this sense, there is no doubt that Data Centers compose the foundation of the world we live in today. There are reportedly more than 7 million Data Centers worldwide which means that practically every business or company maintains its own center or at least has access to one of them as they deliver resilient environments that withstand service disruptions and ensure business continuity. Data centers address network downtime by building redundancy into their infrastructure. They actually have a backup for their backup plans. For instance, a Data Center could have up to four different layers of redundancy to ensure information flow and minimize network disruption. It is always a security strategy in case of human and/or environmental threats such as hurricanes and earthquakes. The Data Center is a customizable typology that can accommodate the programs' expansion and the constant emergence of new technologies. It is purposely constructed to blend into its surrounding environment. This design strategy is for safety from aerial threats caused by humans. The military also utilizes camouflage by having soldiers wear clothes that enable them to blend in with their surroundings. The typology of the data center prioritizes adaptability and invisibility over sophistication. The facility is home to many different networks and thousands of pieces of information¹. Information travels and flows through fiber-optic cables that act as valves. When the cables bend it disrupts information flow. These cables flow through a system that is similar to the sewage system, hidden and cannot be seen. They are also laid in the bed of the ocean which aids in powering the global internet. There were instances of sharks biting the cables and causing worldwide internet disruption. Sharks can sense electric fields developed by living animals. The Fiber-optic cables generate huge amounts of electric fields that naturally attract them². Communication companies like Google use Kevlar, a bullet proof metal sheet wrapped around their cables for further protection³. The idea of invisibility, concealing, and inaccessibility are keywords that convey the design strategies of these institutions. Data Centers have always been perceived as being in the middle of nowhere and isolated from the human eyes. Blending into its surrounding environment with its architecture and design⁴.

But, if mega Data Centers exist far away from cities then how can information travel and get distributed to our devices and networks? This investigation started with us researching and learning more about Data Centers in terms of function, Design, and Architecture. We had the opportunity to visit H5 Data Centers. The H5 Data Center is located in the 325 Hudson Street building along the Hudson Fiber Corridor in lower Manhattan. Upon our arrival it was confusing as to where the entrance to the building was. There were no signs that indicated as to whether the building had a data center. In the end we entered through the emergency exit as the building was going through renovations. We were greeted by a security guard, who took our ID and our Cell Phone numbers. We were skeptical and worried that we were being scammed until our tour guide showed up and erased all of our doubts and concerns. Mr Adrian Bailey the Vice President of H5 gave us a tour of the space.. Up until that moment we only communicated with him via emails to confirm the reason for our visit and the institutions we are affiliated with. It was very nice to see him and talk to him in person. He shared his knowledge and experiences in the industry. Before the visit our knowledge about the phenomenon was very limited and there were not enough sources about it. However, Mr Bailey welcomed us and gave a thorough presentation and access to information that we couldn't have otherwise obtained. What resonated with us is how Data centers function through redundancy. It was a very rare opportunity to see it first hand. Mr Adrian kept pointing out the importance of a system that ensures redundancy like the one that they have in H5. It features N+1 emergency generators and access to more than 40 networks and multiple Internet exchanges. The N+1 redundancy provides a level of resilience by adding a single component - for instance a generator- to the N architecture in order to support a failure or allow any machine to be serviced. When one system is offline, the extra component takes over its load. According to him, redundancy is connected to reliability and in the case of H5 they have a 100% success rate of uptime since 2012 thanks to their N+1 system. We ended the tour at his office. He was kind enough to offer us giveaways that included a hat, Portable charger, camera sealing sticker and a sanitizer. They all had the H5 Logo on them. Even though these institutions are not open to the public yet, they still have marketing strategies such as advertising and giving gifts to visitors. At the beginning of the tour we noticed some graphics on the ground. At first we thought they were meant to guide us into the meet-me interconnection room where all the cabinets were. However,

Adrian confirmed that they were actually there for advertising purposes. This was interesting due to the fact that carrier hotels are not accessible to the public. Most of their clients are companies that prefer to conceal the fact that they are storing their data base there. It is undeniable that these graphics and their bright colors changed the ambiance of the space. It was playful and welcoming, it also concealed the fact that they are trying to be invisible. By attempting to share information that vaguely explains colocation services through symbols and color. This investigation helped us understand how our daily lives functionality highly depends on this technology. Without it running smoothly we risk obliterating our contemporary way of existing. Not just in the physical world but also the virtual world. For instance, a grocery store contains products that serve our physical environment and wellbeing. However, it also contains hidden information and messages that are stored within Data centers. The invisibility of millions of information through this infrastructure flows all around us constantly and endlessly. Yet, the knowledge is not accessible to everyone. For the 21st century human this technology is a necessity yet it is still concealed.







References:

Critical Text

- 1- Elizabeth Alter, S., Mark P. Simmonds, and John R. Brandon. "Forecasting the Consequences of Climate-Driven Shifts in Human Behavior on Cetaceans." *Marine Policy* 34, no. 5 (2010): 943–54. <https://doi.org/10.1016/j.marpol.2010.01.026>.
- 2- York, Richard, Eugene A. Rosa, and Thomas Dietz. "A Rift in Modernity? Assessing the Anthropogenic Sources of Global Climate Change with the STIRPAT Model." *International Journal of Sociology and Social Policy* 23, no. 10 (2003): 31–51. <https://doi.org/10.1108/01443330310790291>.
- 3- Fleming, James R. "Joseph Fourier, the 'Greenhouse Effect', and the Quest for a Universal Theory of Terrestrial Temperatures." *Endeavour* 23, no. 2 (1999): 72–75. [https://doi.org/10.1016/s0160-9327\(99\)01210-7](https://doi.org/10.1016/s0160-9327(99)01210-7).
- 4- Jackson, Roland. "Eunice Foote, John Tyndall and a Question of Priority." *Notes and Records: the Royal Society Journal of the History of Science* 74, no. 1 (2019): 105–18. <https://doi.org/10.1098/rsnr.2018.0066>.
- 5- Jackson, Roland. "Eunice Foote, John Tyndall and a Question of Priority." *Notes and Records: the Royal Society Journal of the History of Science* 74, no. 1 (2019): 105–18. <https://doi.org/10.1098/rsnr.2018.0066>.
- 6- Al-Nakib, Farah. *Kuwait Transformed: A History of Oil and Urban Life*. Stanford, CA, California : Stanford University Press, 2016.
- 7- El-Baz, Farouk. *The Gulf War and the Environment*. London , UK: Routledge, 1994.
- 8- El-Baz, Farouk. *The Gulf War and the Environment*. London , UK: Routledge, 1994.

Projects: That Sinking feeling

Notes:

Figure 1. M.S AAD Candidate. 2021. Photo Montage

- Victoria Mansion. .Staib.2007. https://commons.wikimedia.org/wiki/File:Victoria_Mansion,_Portland,_Maine_USA.jpg
- Portland Observatory.Allen L. Hubbard. 1936. https://en.wikipedia.org/wiki/Portland_Observatory#/media/File:Portland_Observatory_1936.jpg
- City Hall. Archive project: Old City Hall. 1904. <https://archiveproject.com/old-city-hall-photos-ancestry-familyhistory?ref=recent-stories>.
- Peter Cook. Museum of modern art, Graz. <https://www.designboom.com/interviews/peter-cook/>

Figure 2. M.S AAD Candidate. 2021. Timeline Diagram.

- S.S. Kresge Co. "Congress Street, Portland, ca. 1914." (circa 1914). <https://www.mainememory.net/artifact/26159>
- Soule, J. P., "Canal Bank Building, Middle Street, viewed from Exchange Street." (1866). Stereograph Cards : The Great Fire - 1866. 7. https://digitalcommons.portlandlibrary.com/greatfire1866_images/7
- Penobscot Marine Museum. "Pulp pile, St. Croix Paper Co., Woodland, ca. 1910." (circa 1910). <https://www.mainememory.net/artifact/98636?popup=1>
- Maine Historical Society. "Shipbuilding, South Portland, 1943." (circa 1943). <https://www.mainememory.net/artifact/19012>
- Author unknown. Vintage image of Dawn Wells with fireworks. <http://myloveofoldhollywood.blogspot.com/2012/07/heres-your-4th-of-july-firecrackers.html>
- Maine Historical Society. "Immigrant students at Chapman School in Portland." (1920). Portland Press Herald. 2017. <https://www.pressherald.com/2017/10/08/paths-of-immigrants-to-maine-differ-but-their-hopes-have-echoed-through-the-centuries/>
- Seng Kim. "Portland Maine Cityscape Skyline at Sunset Panorama." (2011). <https://captainkimo.com/portland-maine-cityscape-skyline-at-sunset-panorama/>
- Portland public Library. Portland, Maine 1800's.<https://www.portlandlibrary.com/topics/portland-history/>

MACHINE CONSEQUENCES: Data Centers Research

- 1- LeCavalier, Jesse. *The Rule of Logistics: Walmart and the Architecture of Fulfillment*. Minneapolis, Minnesota: University of Minnesota Press, 2016.
- 2- Saunavaara, Juha, and Mirva Salminen. "Geography of the Global Submarine Fiber-Optic Cable Network: The Case for Arctic Ocean Solutions." *Geographical Review*, 2020, 1–19. <https://doi.org/10.1080/00167428.2020.1773266>.
- 3- Wong, Stephanie. "Google's Subsea Fiber Optics, Explained." *Cloud.google.com (blog)*. Google, April 7, 2022. <https://cloud.google.com/blog/topics/developers-practitioners/googles-subsea-fiber-optics-explained>.
- 4- LeCavalier, Jesse. *The Rule of Logistics: Walmart and the Architecture of Fulfillment*. Minneapolis, Minnesota: University of Minnesota Press, 2016.

