DIMENSIONS

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Dimensions is the annual, student-produced journal of architecture at the A. Alfred Taubman College of Architecture and Urban Planning that seeks to contribute to the critical discourse of architectural education by documenting the most compelling work produced by its students, fellows, and visiting lecturers.

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FOREWORD

MCLAIN CLUTTER
ASSOCIATE PROFESSOR + CHAIR OF ARCHITECTURE

As Chair of the Architecture Program, this is the third time I have written a foreword to Dimensions, and it is the third time that I have approached the task feeling as if the year prior were absolutely singular—from the standpoint of society and the discipline. The term "paradigm shift" has often been bandied about in architectural discourse, but rarely so deservedly as since March 2020. The task of curating a student journal in this context isn't easy. So how did our editors proceed?

Systems, precarity, and the precarity of systems. These are preoccupations that might emerge from study of Dimensions 35. No wonder, most of the work gathered herein was conducted online or in hybrid space, during an ongoing pandemic, and against the backdrop of a national racial reckoning. Systemic failure now seems routine, and Taubman students—like so many—undoubtedly feel precarious amidst the wane. These days, it's hard to know what tomorrow will bring, much less next week. The idea of long term strategy can seem quaint. But this is not a volume of hollow laments, nor capitulation to decline. Appropriately, the editors of Dimensions have served us a healthy tome that might help us to think about architecture situationally and tactically. Amidst surging doubt around capitalism's social contract, Dimensions contributors help us to think about how architecture might hack the logic of private property, ride the waves of capitalism, or how to just check out and ride the waves. In a disciplinary context in which many are trying to center historically marginalized populations, Dimensions contributors offer projects about the right to housing and refugee migration. As we grapple with a compounding environmental crisis, find here projects addressing the ecology of material systems, from building material reuse to emerging biomaterials. All of this alongside deep representational experiments that situate architecture amidst the myriad relational forces at its periphery. In sum, one might recognize a deliberate attempt to select contributions that think carefully about architecture's relevance in a tumultuous societal context. Inherently, relevance is about the here-and-now. In a context in which tomorrow is so uncertain, there really isn't any other way.

LETTER FROM THE EDITORS

A NOTE FROM THE DESK OF DIMENSIONS 35

This is an important year for Dimensions, both because of a publication anniversary but also because Dimensions' 35th year coincides with our first year back in person.

While this year marked a transition into hybrid modes of working, with many of our remote methods of collaborating remaining, we reconvened physically in our own little corner of Taubman —the Dimensions workspace. Still, our hybrid modes of being—sometimes in-person and sometimes remote, with some of us at home and others in school—enabled both a level of flexibility and unexpected and shifting challenges. Like our experiences navigating this year, the content of Dimensions 35 is jumbled and shaken up. While previous volumes abide by a central thematic color or designated hierarchies and organization of project types, Dimensions' reemergence from a fully remote, pandemic year called for something completely different inspired by the challenges thrown at us the years prior.

This reemergence of Dimensions 35 is encapsulated in the rainbow. A rainbow—a multicolored arc in the sky caused by the reflection, refraction, and dispersion of light in water droplets—oftentimes materializes when the sun appears after a storm. The rainbow laminate film on the cover and the expansion from one central design color to many colors showcases the reflection and beauty of the work within Dimensions 35 after the storm of the past years.

This volume of Dimensions contains thesis works from graduate students, Wallenberg projects that tackle difficult questions, and experiments conducted via research grants, among others. With an absence of last year's fellows program and visiting lecture series, Dimensions 35 honors its anniversary and this moment in time by looking inward and reflecting on past, current, and ongoing faculty and fellows work within the college. Slipped into the scramble of student work, these conversations add a moment of respite—shifting from where we are now, to where we have been, and where we might be going.

Dimensions 35 brings team members back in person to reflect and shed light on Taubman College's new outlook, reshaped by the challenges students and faculty have faced recently. We also looked at how we, as an editorial staff, have chosen to depict architecture throughout the years. It feels important we give careful consideration to how Dimensions contributes to ongoing design discourse through the works we've chosen to document and showcase herein. Dimensions 35 is a reflection on what has changed, what has stayed the same, and what we hope for the future.

FATIMA AZAHRA ADDOU

SYDNEY CLEVELAND-DATESMAN

JAMES COLLIN GARNETT

MARGARET JANE GIES

KRISTINA MIESEL

PILAR O'HARA

LIBBY OWEN

AREEJ SHAHIN

YICONG SHAN

MADELEINE SMITH

2021 WALLENBERG STUDIO HONORS:

Africatown Park U.S.A. //
Pilar O'Hara + Shujing Chen +
Rachel Lodes + Yanchu Liu

Rouh Al-Sham: Syrian Culture Embassy //
Areej Shahin + Tuleen Alrawashdeh

The Asset Sublimator //
Chandler Caserta + Oscar Eloy Martinez

Gecekondu: Redefining Informal Housing //
Dua Duran

2021 WALLENBERG FEATURED PROJECTS:

The Asset Sublimator //
Chandler Caserta + Oscar Eloy Martinez

Rouh Al-Sham: Syrian Culture Embassy //
Areej Shahin + Tuleen Alrawashdeh

Resistance Through Existence:
An Attitude for Decolonial Space //
Blake Harris + Osama Sukkar

Ruralizing Suburbia: Foregrounding Sustenance Over Consumption in Domestic America // Evan Parness + James Sotiroff + Cooper Schwartz

The Wallenberg studio honors the legacy of Raoul Wallenberg through an overall studio theme focused on a broad humanitarian concern. Wallenberg, a 1935 graduate of the University of Michigan College of Architecture, is credited for his heroic saving of tens of thousands of Jews during World War II. This studio is a critical moment for students to ask themselves and others: what is at stake? Through the lens of "Resistance," students explored how architectural interventions may participate in larger projects of social change, political activism, or cultural reform and how these propositions took up what is at stake in 2021.

Each year, Taubman College exhibits and juries the best work from this final undergraduate design studio. Awards, funded by the Raoul Wallenberg Endowment, are offered in the form of a stipend for international travel to a country of the student's choosing. It is hoped that students who receive these travel awards would engage in the culture of the country they visited, explore architecture and culture, become acquainted with the people, and return with a broadened understanding of the world.

WALLENBERG

2021 MASTER OF SCIENCE FEATURED PROJECTS:

Superorganism: Bio-Scaffolds for New Materiality // Colleen Ludwig

Reverse Auxetics: Architectural Applications of Auxetic Patterns // Mehdi Shirvani

The Master of Science in Architectural Design and Research capitalizes on the University of Michigan's unique position as a premier research university. Formulated as intensive research-based programs, the MS degrees provide cutting edge resources in the concentrations of design health, design technology, and material systems. With this critical framework in place, the programs allow for further exploration on new research methodologies and the production of disciplinary knowledge in order to disrupt and advance the field of architecture.

MASTER OF SCIENCE

2021 THESIS WINNERS:

Equitable Landscapes // Torri Smith //
Burton L. Kampner Memorial Award

Wasted Time: Exploitation + the Life of the Factory //
Alan Escareño // Honorable Mention

2021 THESIS FEATURED PROJECTS:

Village for an Art Forger // Adrian DiCorato

The Right to Housing: Enabling New Economies
for Affordable Housing // Jessica Yelk

[Drawing Not To Scale] // J Cameron Bradberry

Manufacturing Commons // Liyah George

UbiquitoU.S. Conditions: A New Town Hall for
America's Main Street // Jay Schairbaum

The Value of Vacancy: Adaptive Reuse in
the Decline of Detroit // Mingrui Jiang

We Need to Talk: Agents of Conduction //
Waylon Richmond

The product of a year-long investigation, thesis occurs in the final semester of the graduate sequence. A self-directed creative project, students engage in the process of research, critique, and synthesis to create work that engages with architectural discourse. Capping the studio is a review by outside critics and a week-long public exhibition of the work.

THESIS

The Taubman College Architecture Student Research Grant (ASRG) is an annual competitive research grant that is intended as seed money to fund research projects by Taubman College graduate and undergraduate architecture students. Initiated by a class gift from the M.Arch class of 2013, the program funds a select number of projects each year. This largely student-run program is a way to encourage students to develop their own research interests, as well as plan and execute research proposals.

ASRG

2021 ASRG FEATURED PROJECTS:

Sustainable Hollow-body
Marine Forms + Fabrication //
Carson James Brown +
Ellis Wills-Begley

Taubman BioLab //
Prescott Trudeau +
Alexander Vernon

Collaborating with Nature:
Design Explorations
into Biomaterials //
Kara Bowers + Zoë Faylor +
Rosa Manzo

"The history of most things, or at least modern things, could be redesigned through an archeology of proper and improper names, pseudonyms, alibis, forgeries and makers' marks."
—Sylvia Lavin

Village for an Art Forger arises from an interest in reproduction, particularly reproduction facilitated by digital tools. In "Everything is Already An Image," John May posits that the Internet is just a platform for the reproduction and distribution of image. With this reproduction and distribution, corruption and degradation are inevitable, images are compressed, jpeg artifacts appear, things get watermarked, cropped, plagiarized. This proliferation of digital reproductions reflects the 18th century Victorian folly, which imitates classical ruins or artifacts of other cultures. Often, these reproductions were poor facsimiles, contemporary ideas of how ancient temples were supposed to look.

The Internet puts a dark spin on reproduction; it is easier to pirate or steal than ever before. The Internet is ugly—grotesque. It is surreal—unfathomable in the scope of its infrastructure, its binary bits and bobs. The Internet is a haven for outsiders, eccentrics, fringe groups, and even criminals. Lurking in forgotten forum threads or the dark web, strange cultures manifest and mutate.

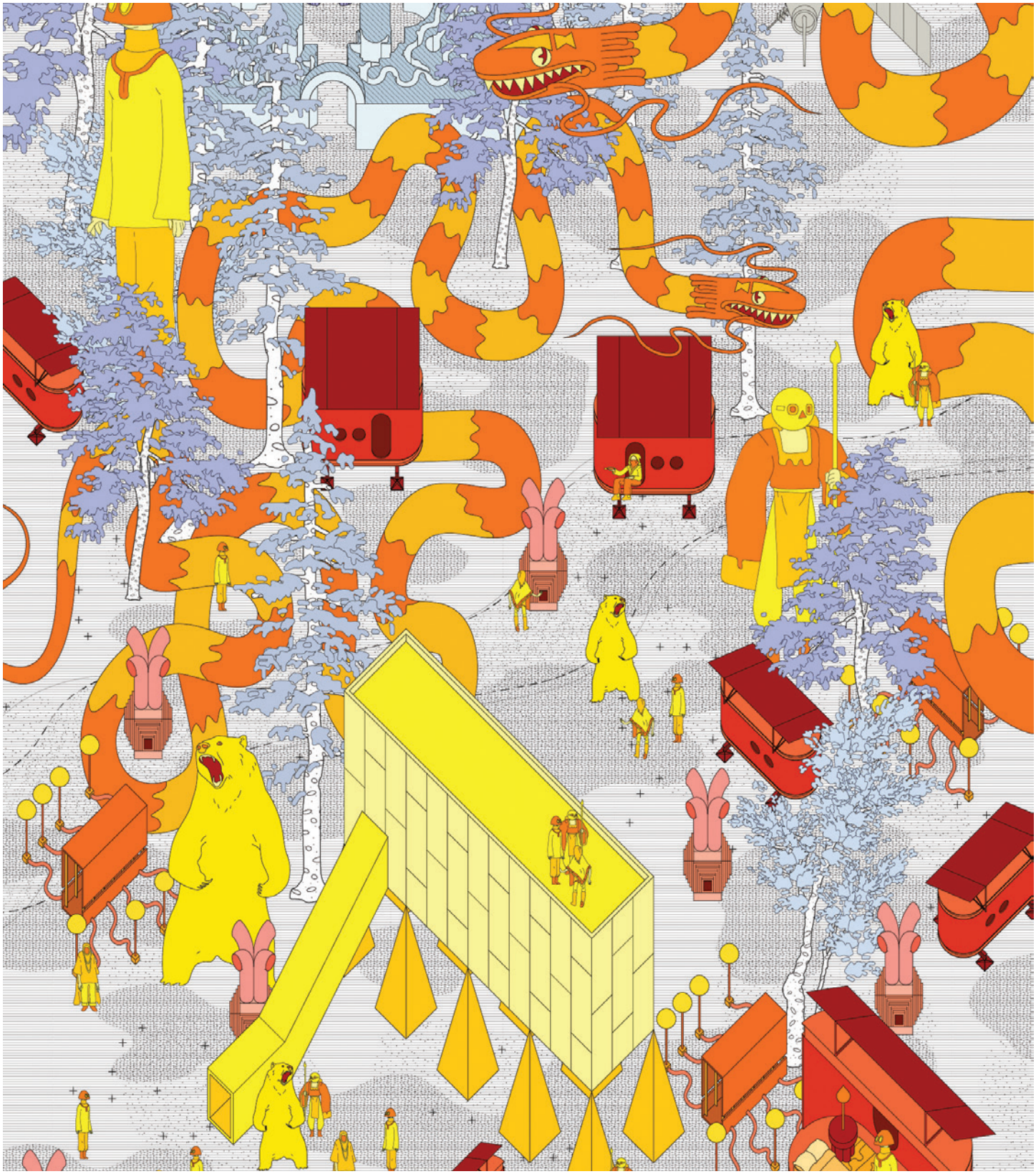
Village for an Art Forger designs histories (and forges mythologies). Our site is the overlap of the dark web and the real world, the proverbial "scene of the crime." This thesis is situated simultaneously in the glitched, corrupted world of digital image reproduction and in the Zone of Death, a 50 square mile section in Idaho of Yellowstone National Park in which, as a result of a purported loophole in the Constitution of the United States, a criminal could theoretically get away with any crime, up to and including murder.

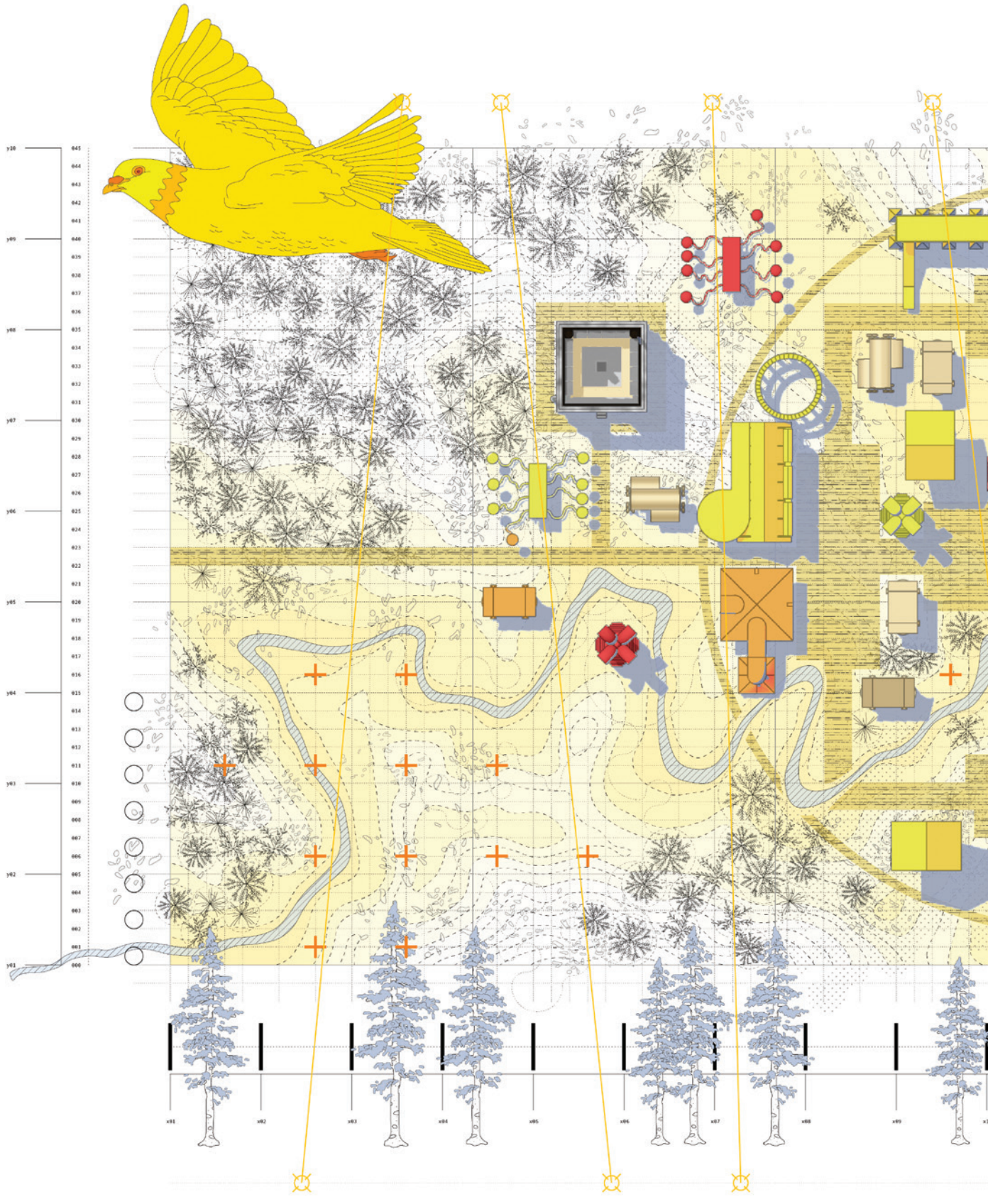
Drawing from Foucault's concept of Heterotopias, the thesis imagines an ontological curiosity cabinet of otherness, architecture at the periphery of "the canon." It exaggerates elements of otherness and their structural expression. In the village, the unique characteristics of the Internet—chatrooms, shady forums, the dark web, social networks, encryption, et cetera—form a structure for subversive activity. Focused on the weird and subversive, the thesis utilizes a codex of "apparatuses" to produce purpose-built social, cultural, economic and environmental intersections—a folly, a house, an archive, a studio—a village for an art forger in the digital age.

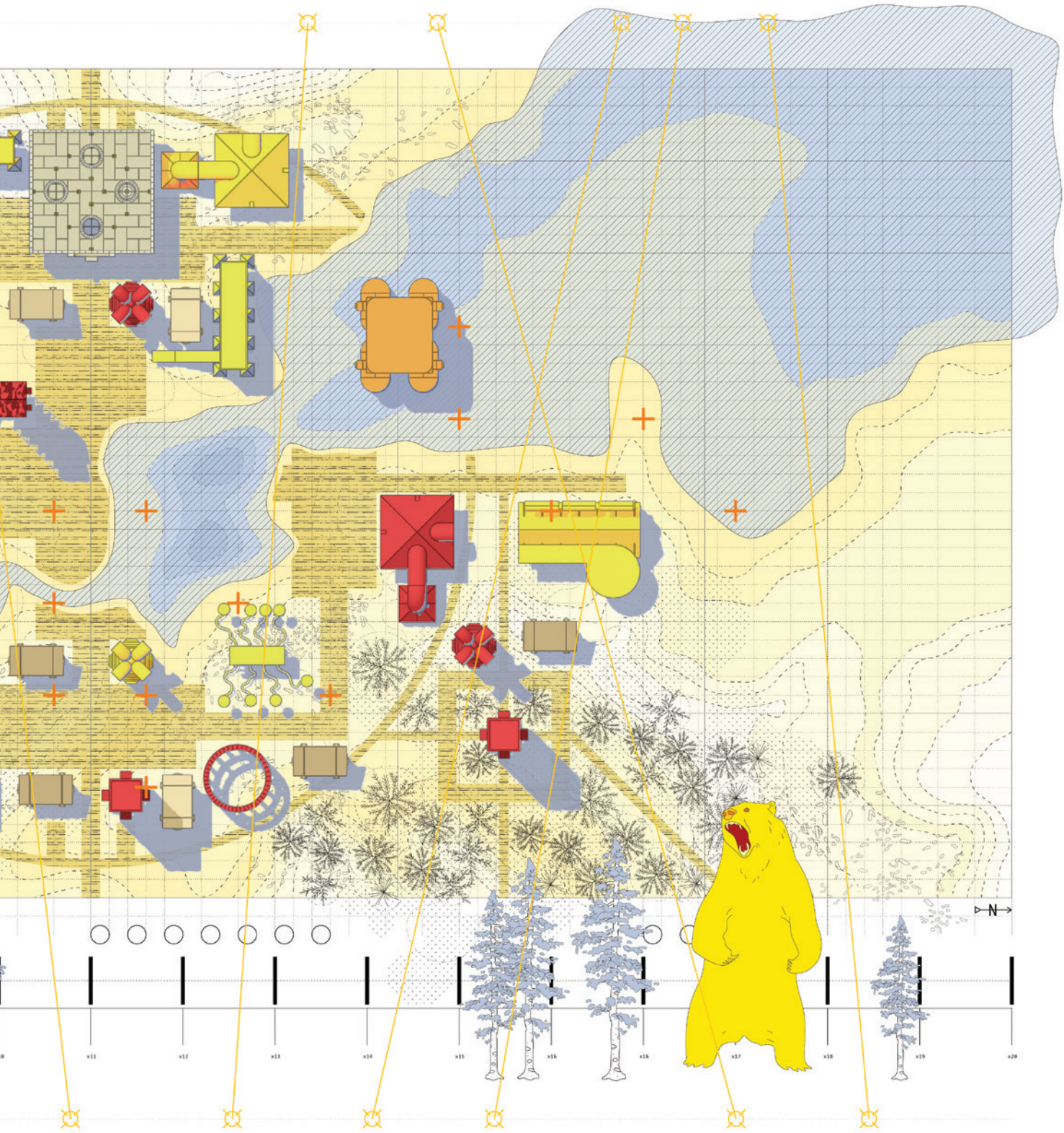
VILLAGE FOR AN ART FORGER

ADRIAN DICORATO

THESIS ADVISOR: PERRY KULPER






N

Two cultural keystones situate the project: Giotto's Scrovegni Chapel (image left) and Ike Taiga's Orchid Pavilion Gathering (image right); one eastern, one western. The Scrovegni Chapel acts as a strategic framework, capitalizing on a grid of frescoes to forge narratives. Embedded within these frescoes are parallel mythologies and analogous structures. The chapel also aligns with the thesis' interest in fakeness—whole chapel is fresco, fake marble panels with no three-dimensional ornament.

The second keystone, the orchid pavilion gathering, embodies the concept of translation. Due to the Edo period policy of isolationism, Japan was cut off from the outside world almost completely. As a result, the Japanese artists who were inspired by Chinese literati were left with an incomplete view of Chinese ideas and art. A new artform, Bunjinga, grew out of what did come to Japan from China, Chinese woodblock-printed painting manuals and paintings widely ranging in quality. Like a game of telephone, this process produced imperfect copies.

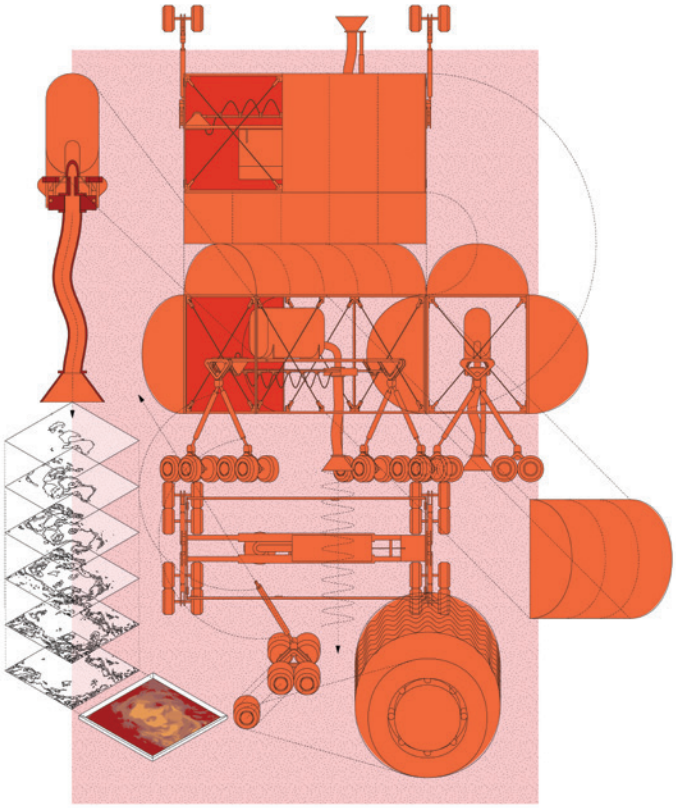


fig. 1 — pigment harvester

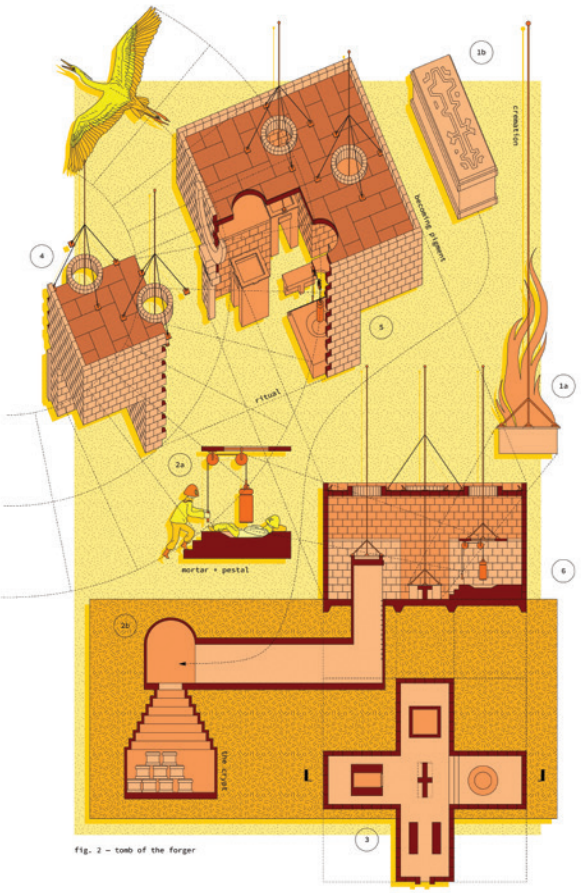


fig. 2 — tomb of the forger

Pages from The Forger's Codex. Here, architectures become characters, drawing from the work of John Hejduk. Apparatuses are crafted with forgery in mind, recorded within an encyclopedic document. Within the codex, language is equally important as the physical expression of its apparatuses. Neologisms offer an opportunity to craft a rich and otherworldly narrative that resonates with the site.

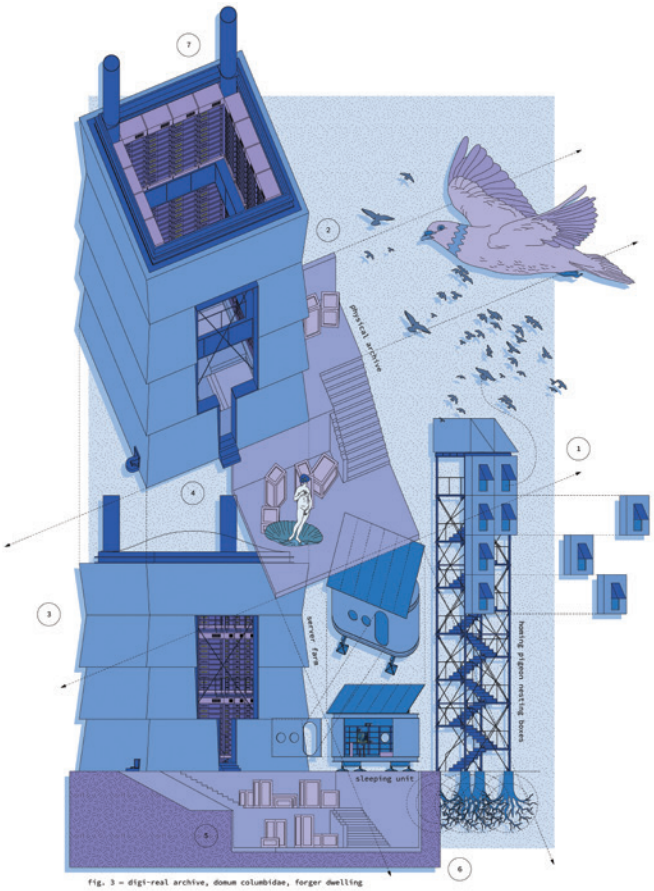
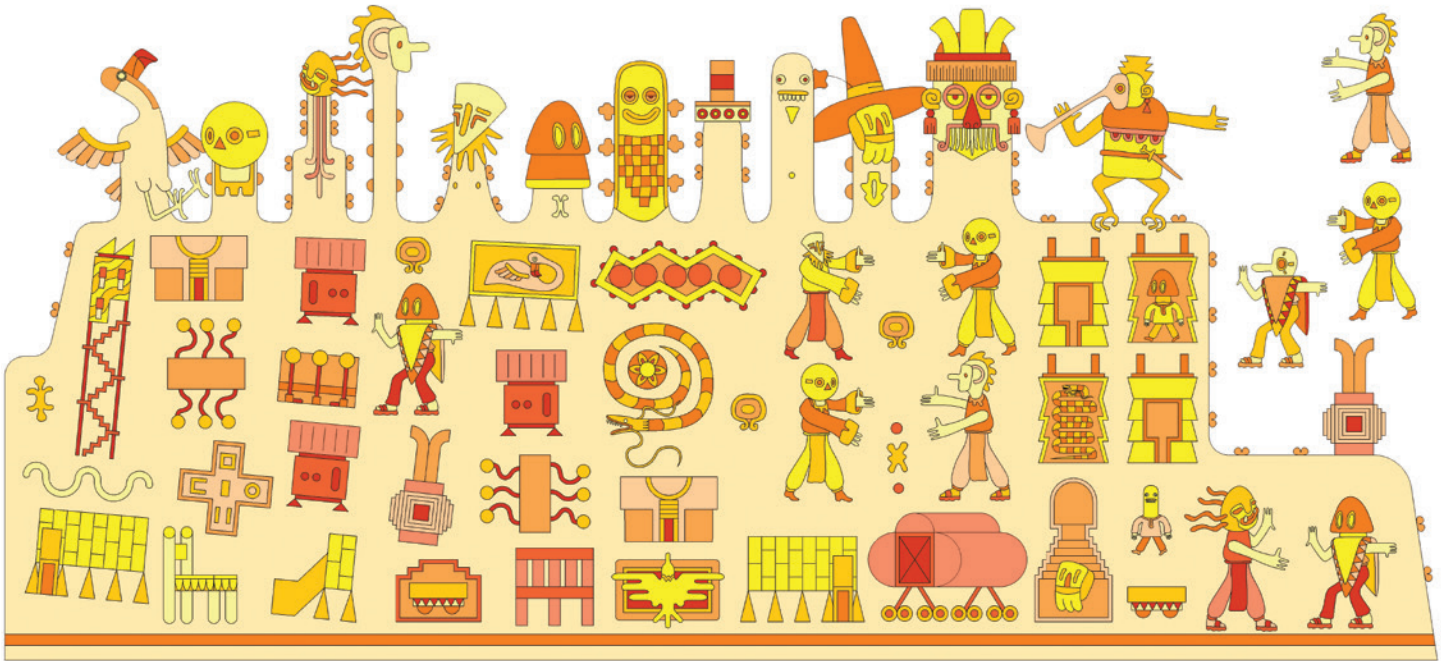


fig. 3 – digi-real archive, domum columbidae, forger dwelling



This final image synthesizes the cultural and formal ambitions of the village into a new object. It relates to the spatial condition of the site but is not spatial. It draws from artistic references but isn't purely referential. It is intended to solely be an artifact of a speculative world.

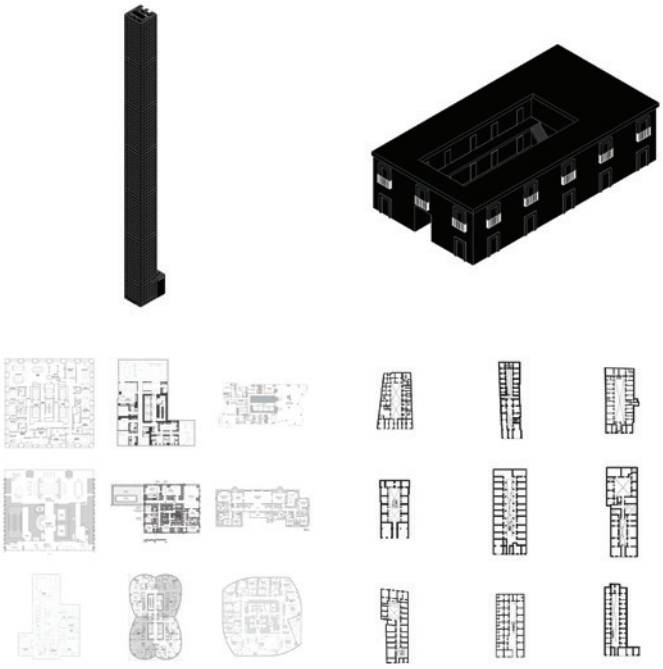
In the United States, your socioeconomic status in urban centers is contingent on where you live and determines how likely you are to afford a stable presence in that city. But as cities grow in population size, so too does the economic disparity in accessibility to stable, affordable housing. Historically, such capital growth equates to precarity in housing for many and profit gains for a select few. Exacerbated by the lack of sustainable affordable housing programs and social safety nets on a national level, the housing crisis that the country finds itself in is one with few paths for recourse. Understanding the precarious housing stability in which working-class communities often find themselves, this thesis proposes a system and financial model for insulating less wealthy populations from potential displacement. This contends with the absurdity of unrestricted capital growth by taking inventory of the physical assets of the ultra-wealthy and sublimating their speculated value into substantive use value through rental subsidies in order to meaningfully address issues of housing stability. Therefore, this project manifests itself as a communal apartment building situated above a “Luxury Asset Storage Facility,” a complex warehouse typology in which wealthy individuals pay premiums to have physical assets stored in government sanctioned foreign trade zones, shielding these assets from taxation and legal scrutiny. Cash flow generated by the facility will fund housing subsidies and be reinvested into liquid securities for personal use of low-income tenants and their assurance for wealth creation.

Economic disparities often manifest themselves in major cities through the proliferation of large-scale private housing developments which choke the market with expensive, unobtainable units. These luxury developments are typically funded through private equity which enable them to be built in cheaply acquired real estate deals usually in areas home to Black and Brown, often working-class, neighborhoods. Through the inevitable pricing out of long-time families and community members, the neighborhood undergoes a collective loss of cultural capital as they are unable to resist these market forces.

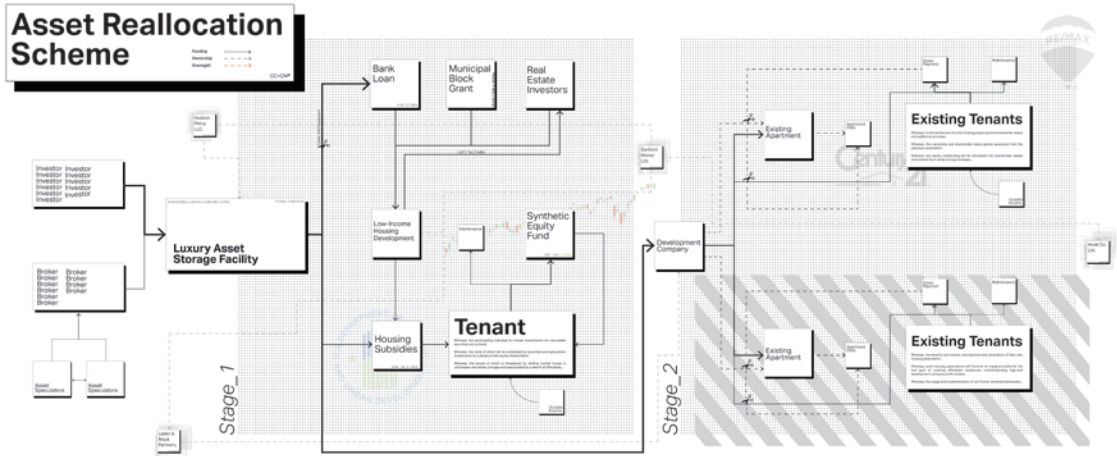
THE ASSET SUBLIMATOR

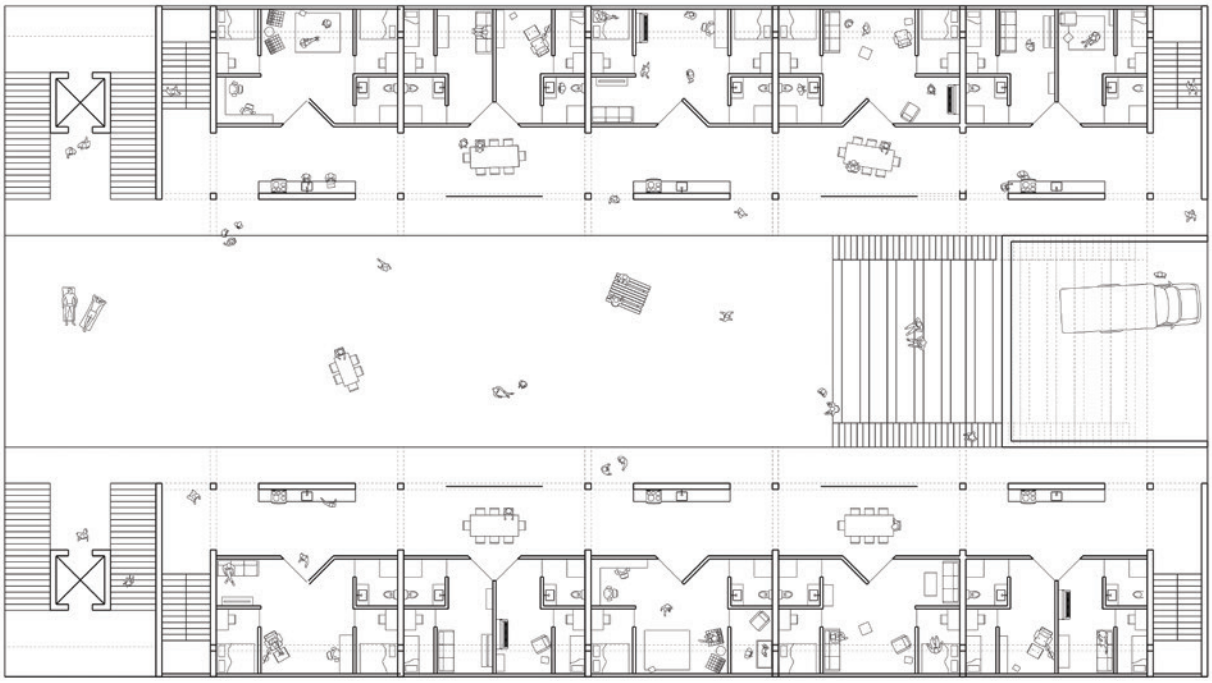
CHANDLER CASERTA + OSCAR ELOY MARTINEZ

WALLENBERG CRITIC: EDUARDO MEDIERO



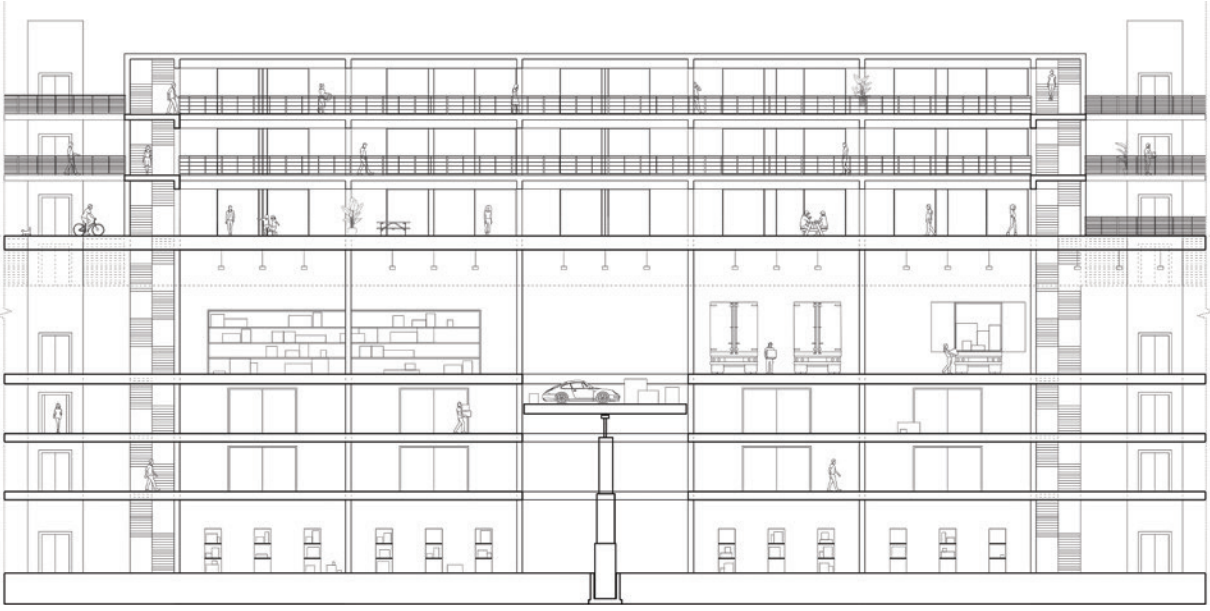
This intervention is underpinned by an affordable housing model funded through the Luxury Asset Storage Facility in which wealthy individuals pay to have their physical assets—such as paintings or cars—stored in a controlled and sterile environment. The incentives provided by the Luxury Asset Storage Facility ensure a constant demand and a considerable cash flow that will effectively subsidize rent for participating tenants. Built in conjunction with a new affordable housing development, the facility will be funded using traditional financial tools such as bank loans, municipal block grants, and real estate investors who are incentivized with existing government tax credits. The profits from the storage facility will then be used to pay off the bank loans as well as subsidize the rent costs for low-income tenants.





The plan of our proposed affordable housing development draws heavily from the vecindad typology commonly found in Mexico City but adapts its scale and form to fit within half of a city block often found in cities such as Los Angeles, New York, or Chicago where this project would most likely be situated.

Each block of housing is bisected into a communal kitchen space oriented to the courtyard. This leaves the private space of the bedroom, bathroom, and living space oriented to the exterior windows. Private living spaces have been created in two sizes to accommodate individuals or couples vs. larger families.



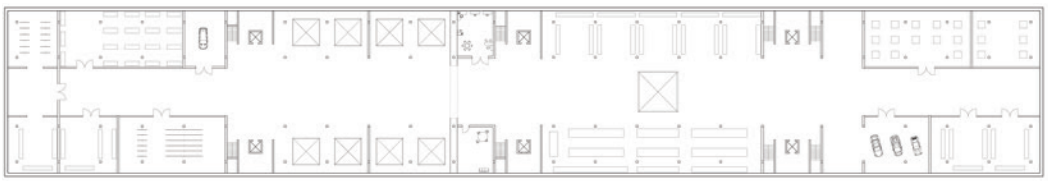
The cross section reveals how the central courtyard and housing units are raised off the floor, and connected to the ground level with a central ramp as well as multiple stair and elevator cores. Light wells between the housing and ground floor allow natural light to gently filter into the storage below.

Because the facility is paying off a majority of the loan to develop the property, no portion of the tenants' rent will go towards profit for developers or owners. Therefore, the portion of the tenants' rent not used for maintenance is instead funneled into a Synthetic Equity Fund. This new financial instrument pools and compounds the tenants' money over the course of renting the apartment unit into a liquid severance payment when the tenant decides to move out.

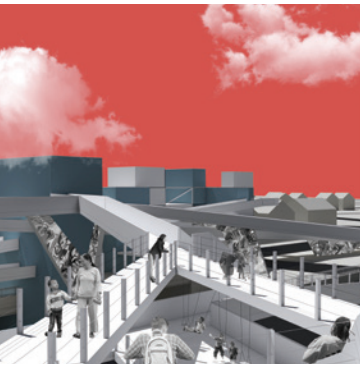
Funded by the excess profits of the Luxury Asset Storage Facility, the second stage of our intervention is able to manifest into a development partnership that has the ability to purchase property at the scale of a city block. Through purchasing this property, the existing tenants will be able to refinance their current rental property into a rent-to-own model by an initial down payment and a newly subsidized price set by the partnership.

Capital always begets more capital in this system, and the ultra wealthy accomplish this by obfuscating their wealth through loopholes consisting of offshore companies and shell corporations. By establishing a series of interconnected partnerships, this intervention is able to operate multiple arms of the same system while accomplishing its objectives of residential stabilization through the fortification of susceptible low-income areas.

Objects are stored in a highly protected environment which works to ensure the longevity and speculated increase in value of investor assets.



The Long Section showcases the ramps that navigate the elevation change necessitated by the storage facility below. Another portion of a housing structure that has been cut to reveal a double height multi-purpose space that can be adapted to meet the programmatic needs of those living in the housing complex.



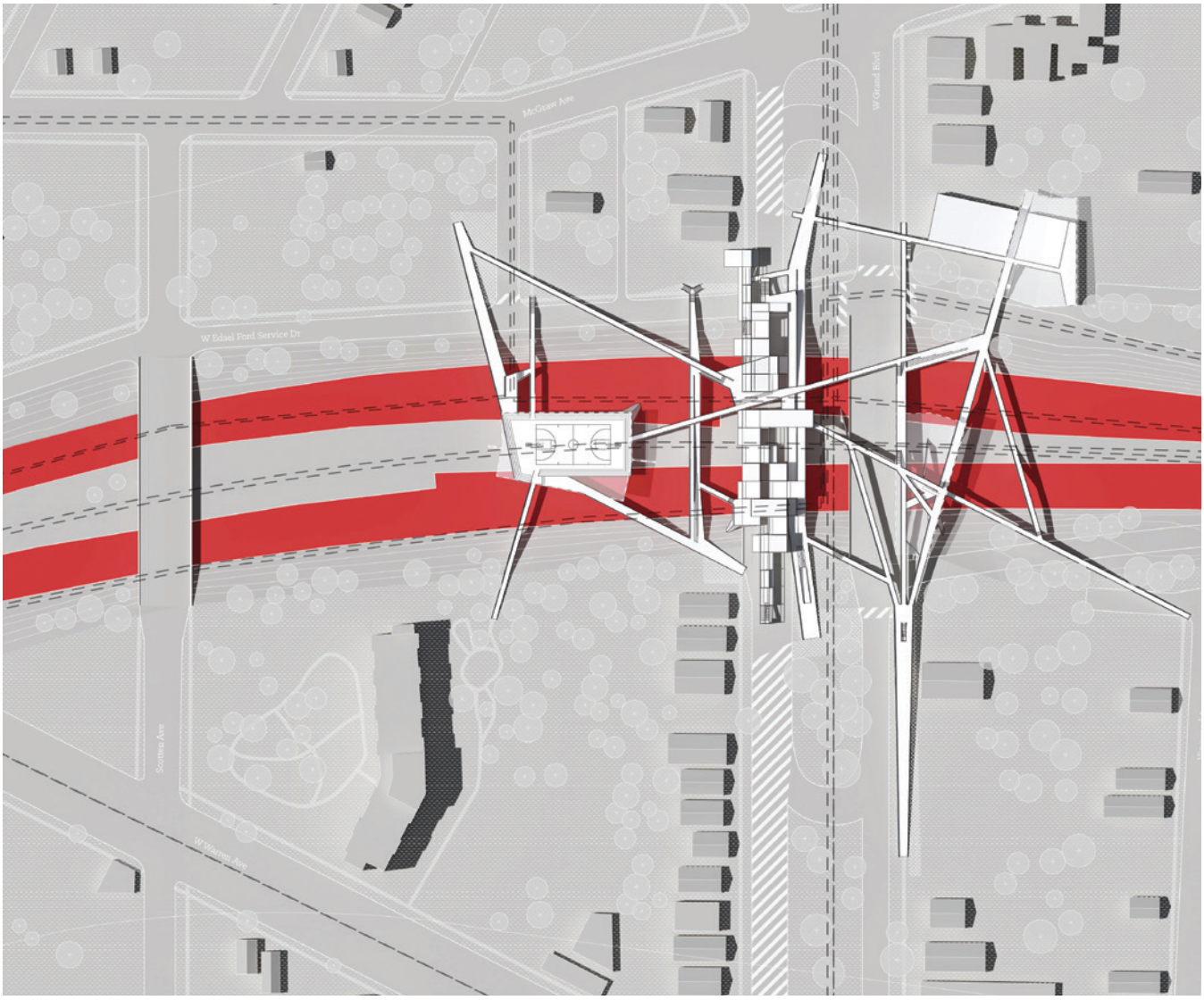
America is facing an affordable housing crisis. This is especially concerning since Americans do not have a right to housing. Unlike other countries around the world, the United States does not recognize the right to housing in its Constitution or in federal laws. In the current model, there is no means of enforcement, nor is there an obligation of the government to provide housing. Without publicly provided housing, housing is left up to the private market. This creates a competitive commodity-based approach to housing tailored not to the people living in the housing, nor to the communities the housing supports, but instead tailored to maximize private and corporate economic gain. Housing in the United States is treated as an economic asset, instead of the human right that it is. “Instead of being guided by communities, development is led by a rapacious market responding to socially-harmful incentives.” Housing is a community resource and without proper access to and distribution of housing, communities suffer.

THE RIGHT TO HOUSING

ENABLING NEW ECONOMIES FOR AFFORDABLE HOUSING

JESSICA YELK

THESIS ADVISOR: JOSE SANCHEZ

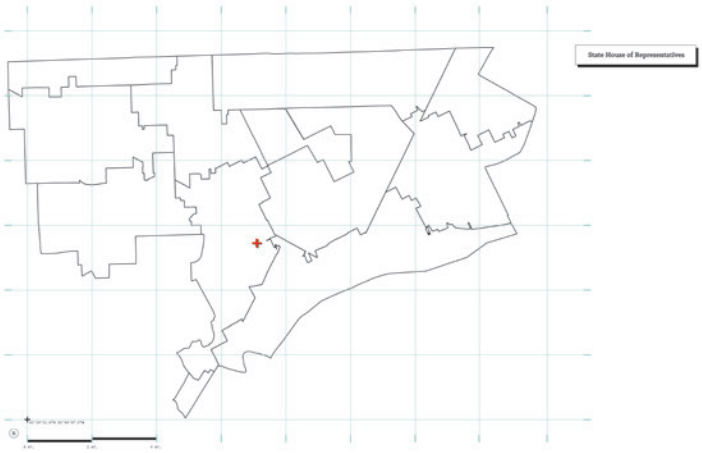


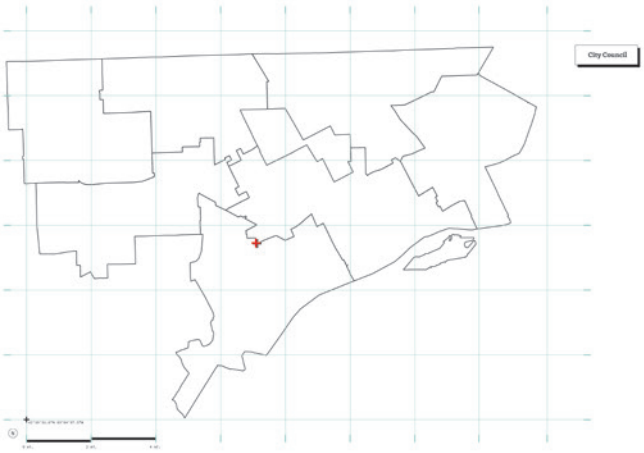
The new capital of knowledge, skill, and sweat equity is not going into one project, but many, creating a system of housing as opposed to a build-and-complete housing typology. By bringing this new circular economy into a people-public partnership, the model is taking advantage of both the capital we typically think of, helping to navigate the current capitalist society we operate in, and taking advantage of a more innovative way to create its own version of capital to accomplish affordable housing.

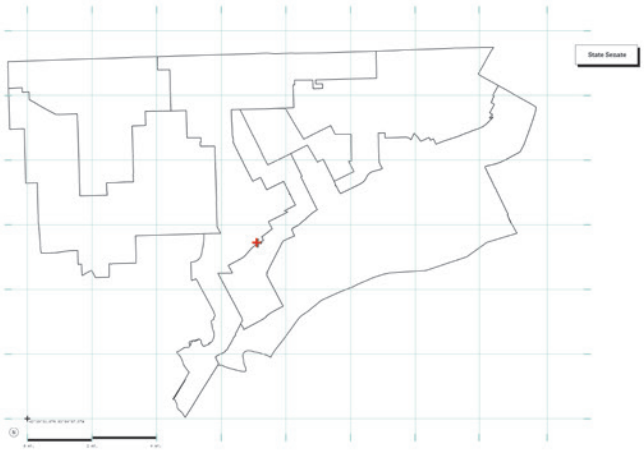
The U.S. government has made attempts to provide adequate housing for low-income populations, but it has faced many challenges, leading the government to assume non-profits and the private market will fill the gap that the country needs. However, when housing is left to the private market, affordable housing is not prioritized because it is not profitable. In more recent years, public-private partnerships have attempted to come up with more creative housing schemes; however, these only work because there is an economic incentive. It is this motivation that makes them less efficient with high transaction costs. Due to the high demand for affordable housing and the extreme lack thereof, none of these methodologies are able to provide the amount of housing needed. David Bollier and Silke Helfrich suggest a new partnership of “public-citizen” projects, as opposed to public, private, or public-private projects that we’ve typically seen. This public-citizen partnership has been implemented with success around the world, and provides precedent for new solutions to housing.


Neighborhoods

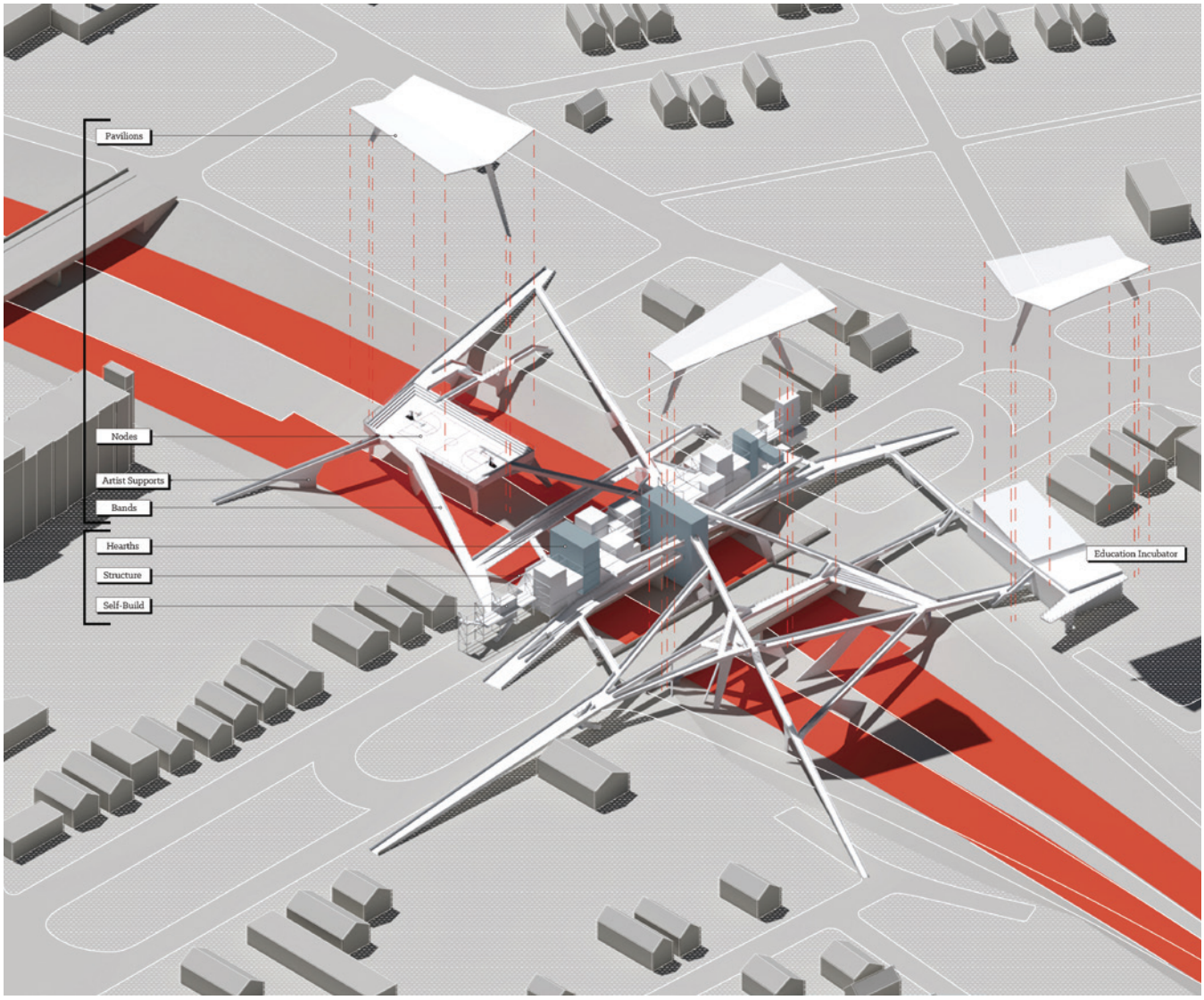

Election Precincts


State House of Representatives

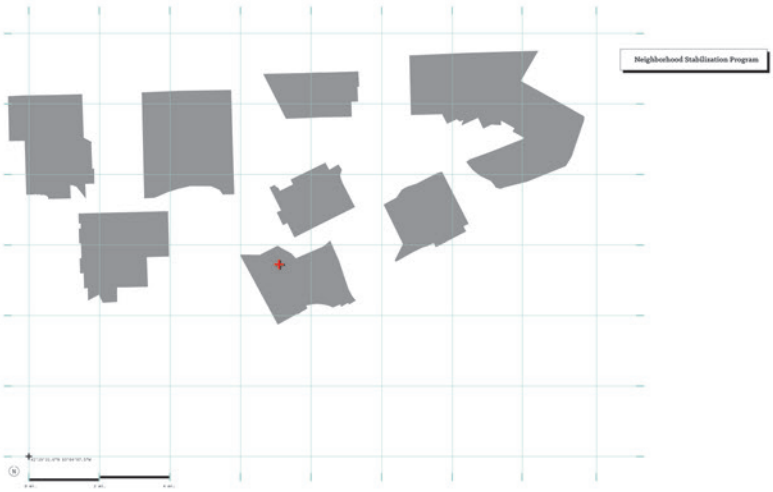

City Council

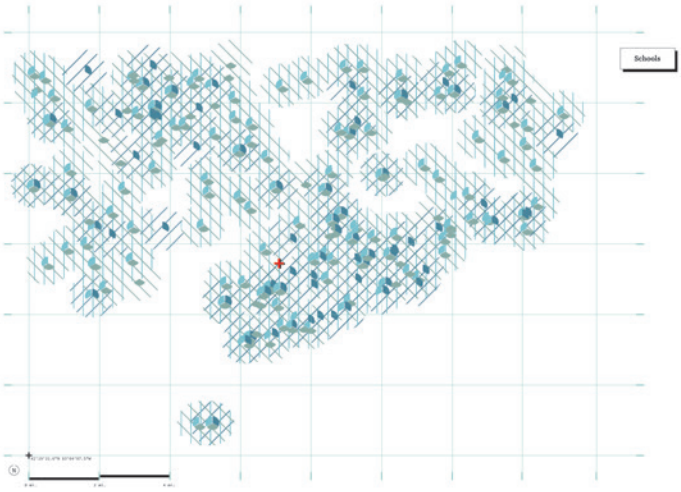

State Senate

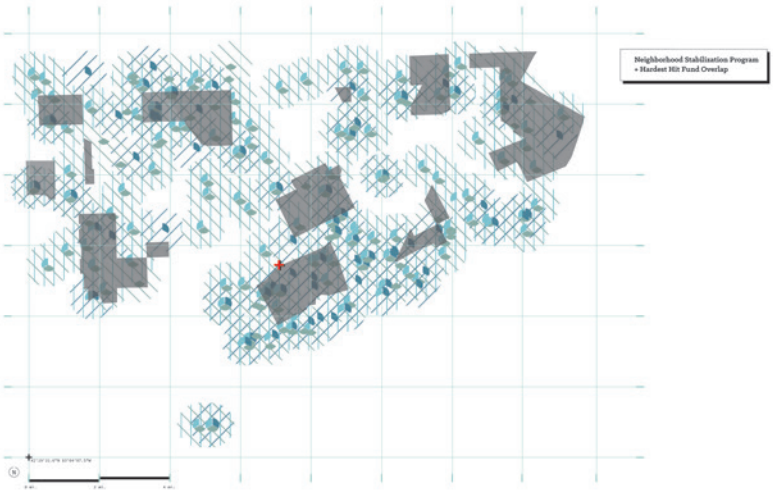

Police Precincts



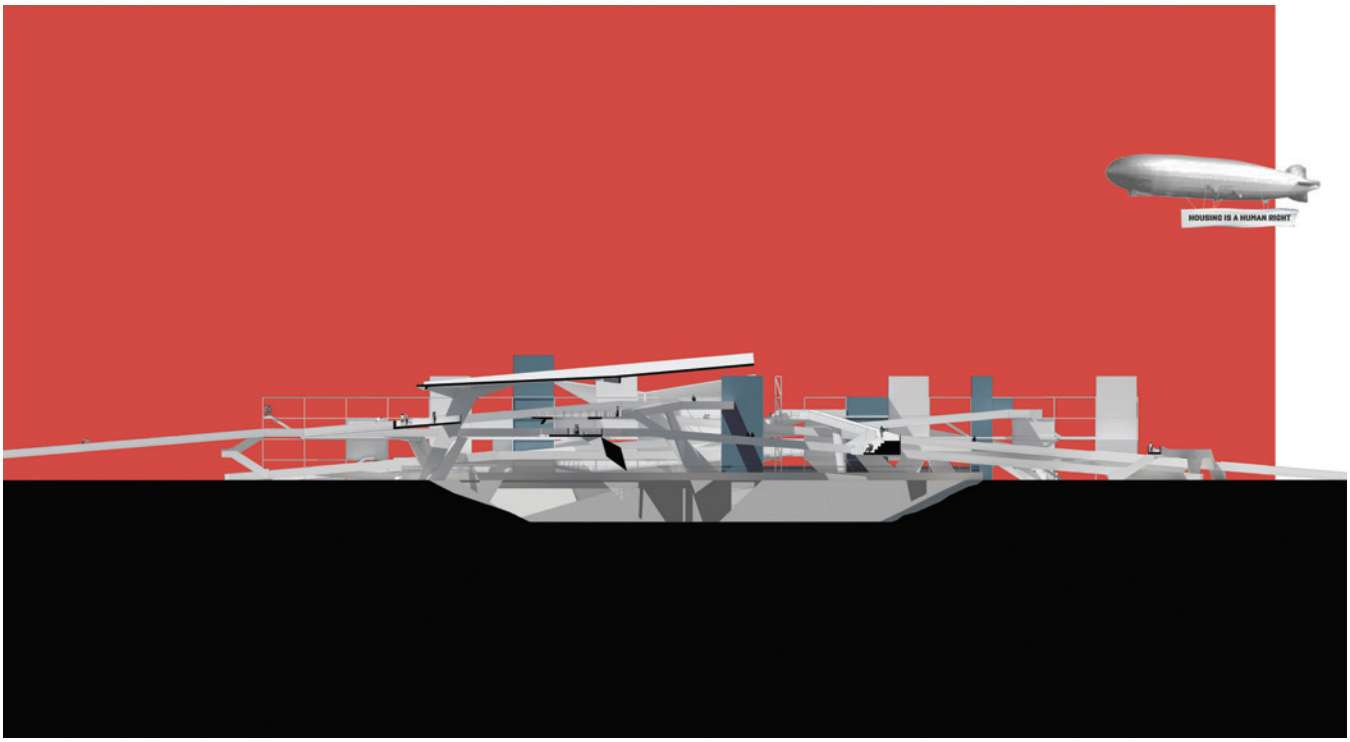
Beyond direct housing policy, another major contributing factor in the production of and access to affordable housing is land use regulations. The *European Journal of Homelessness* assesses, "currently, the spatial consequences of property can be either the cause or the solution for people living in situations of inadequate housing." Further, the United States has a long and complicated relationship with zoning. While zoning creates invisible boundaries that remain unseen, their effects are very visible, powerful, and can be both inclusionary or dangerously exclusionary. Zoning is somewhat unique as policy because it has a level of temporality to it, changing often, and has a direct impact on what is already existing on the land.





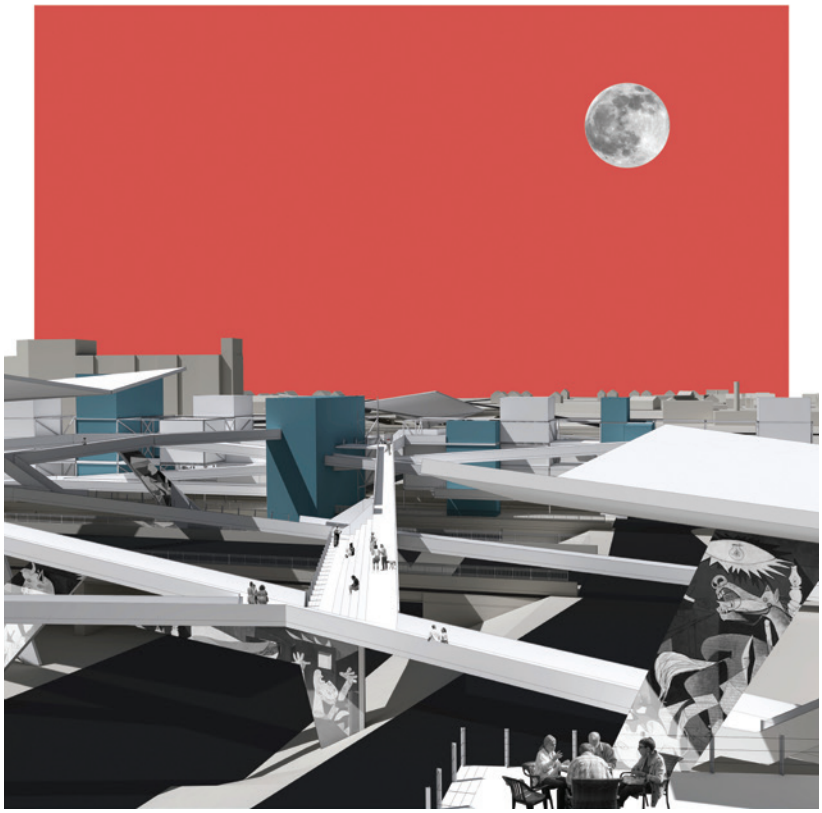


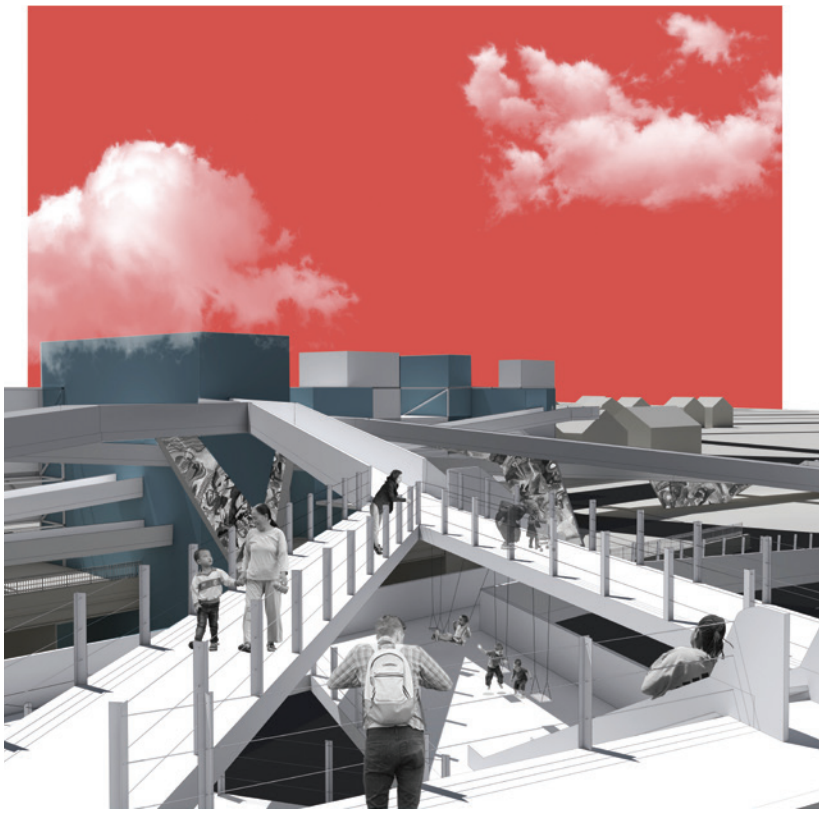
Situated in Detroit, a city with an abundance of both available land and housing stock, the city still suffers by the affordable housing crisis. This project highlights this abundance with an occupation of unexpected public land, an underutilized road, and straddling 23 different land boundaries simultaneously. A building that falls into three different police precincts, two different city councils, two sprawling state senate zones, two different neighborhoods, etc. While other boundaries are often invisible, highways have historically, and devastatingly so, been physical dividers of cities. This project reclaims a small space the highway robbed with an occupation of an overpass, working to stitch the two sides of the highway, while inhabiting multiple boundaries.



This thesis proposes to bring architecture into this equation in tandem with a public-people partnership for a productive and replicable model for affordable housing. In *Architecture for the Commons*, Jose Sanchez states, “the practice of architecture cannot be disentangled from the capital that allows for architecture to be built or practiced.” How can a public-people partnership enabled through architecture introduce a new capital for a cyclical economy into the affordability model? The architecture practice cannot be disentangled from the policy that dictates its form, abundance, and practice. How can policy and architecture work together to create a more productive model?

While the right to housing in the United States is acknowledged but not protected, how can a new model work to de-commodify housing and help secure the human right to housing? This project links three components to explore a new typology that unlocks typically unaccounted for capital, available public land, a public-people partnership, and an open architecture.





Housing projects for people, by people, have the opportunity to create a circular economy, a continuous feedback loop as both the producer and the user. But the user is not the "end user" as often referred to in the design world. Instead they are a participant, and a user that may live in one project, but will still contribute to other projects before, after, and during their tenure. In this spirit, a full sustained economy has the opportunity to develop instead of a constant gathering of capital. Instead, the goal is working towards growing a systematic approach towards the harnessing of this new capital. The public-people partnership will take advantage of a new form of capital that people have to offer that is not accounted for in the typical public or private models: knowledge, skill, and sweat equity as three distinct capital sources.

Mycelium, the vast branching root structure of fungi, has become a fascinating new area of material research. Mycelium grows quickly under controlled conditions and molds easily into forms that are strong, lightweight, and water-resistant. Superorganism tests the limits of architecture's co-existence with the natural environment by creating structures that have a limited lifespan and then biodegrade back into the landscape. The purpose is to highlight and celebrate interspecies communication, interdependence, and agency. The decay process is documented in a small wooded environment and the works' interaction is tested with the surrounding plant life.

Superorganism is a project that tests the limits of architecture's co-existence with the natural environment. Mycelium forms were created for installation in a natural forest setting. Two forms function as bio-scaffolds for organic succession as they decay. The project aims to deploy an architecture where mycelium supports its surrounding environment with a unique structural vocabulary, a self-determined lifespan, and an entwined relationship with other organisms in its territory. The purpose of the project is to highlight and celebrate interspecies communication, interdependence, and agency.

In looking for mold forms for this project, algorithmic expressions yielded growth. My shapes were found through a reaction-diffusion algorithm in Rhino Grasshopper to evoke the meandering lines of individual mushroom hyphae.

SUPERORGANISM

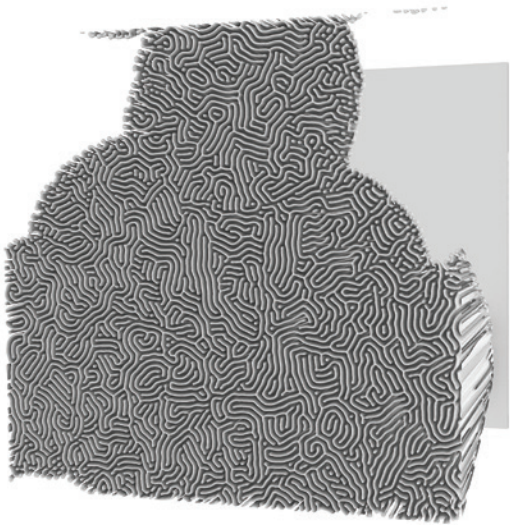
BIO-SCAFFOLDS FOR NEW MATERIALITY

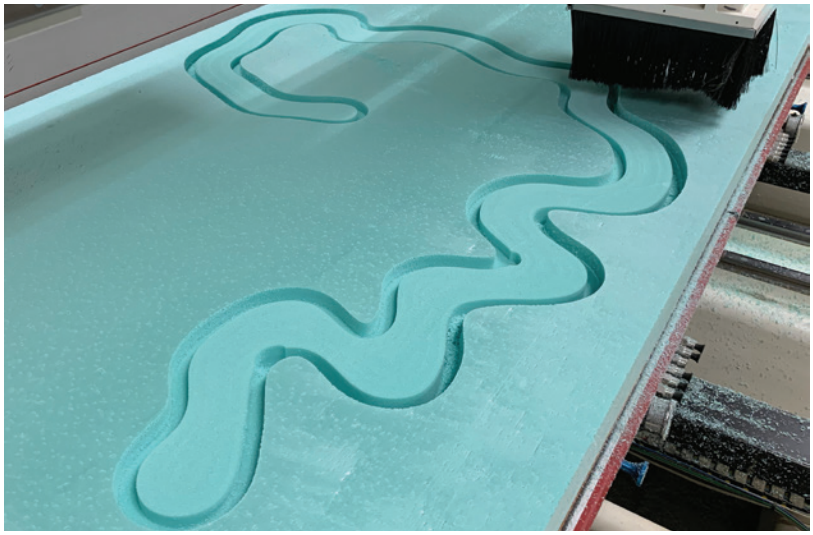
COLLEEN LUDWIG

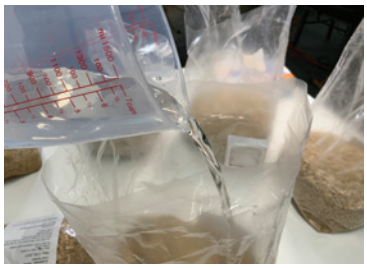
M.S. ADVISORS: ARASH ADEL + TIM JAMES

ABOUT MYCELIUM

Mycelium is the vast, branching root structure of fungi. By sending nutrients and signals through bundles of thread-like hyphae that make up the mycelium body, trees can communicate with each other. In forests, most trees, understory plants, fungi, and microbes are so thoroughly connected, communicative, and codependent that some scientists have described them as superorganisms. These communities form some of the largest and oldest organisms in the world. The superorganism challenges the notion of what it means to be an individual.







USING MYCELIUM IN FABRICATION

Mycelium can be grown quickly under controlled conditions and easily molded into a wide variety of forms and textures. It has varying properties depending on the process. The mycelium can be fixed permanently after growth by desiccation, killing it, or allowed to dry out to a suspended state, in which the mycelium can be reanimated later under specific moisture and temperature conditions. The mycelium product from Ecovative Design grew consistent results over ten days. Instructions are relatively easy to follow; the biggest challenge is keeping the tools and environment sterile. The mushroom roots grow delicate, intricate webs of fibers that are strong, lightweight, and water-resistant.

INSTALLATION

Since September 2021, the work has been installed in small, protected suburban woods. A trail camera mounted nearby captures timelapse footage through motion detection. The decay process will be documented over the project's lifespan, measuring any benefits of the increased mycelium content in nourishing and promoting growth within its direct surroundings.

The forms get soft in the rain, but retain their shape and return to a rigid state upon drying out. The bio-scaffolds are slowly filling up with forest litter. Superorganism asks if over time, it is possible for new life to flourish following the path established? In a final evaluation, the remains will be remediated, if necessary, and leave behind anything that has been fully integrated into the woods to live on and flourish.

Through collaborative research and design, we have synthesized traditional and contemporary fabrication to develop a model for hollow-body surfboard production and inform sustainable futures in design and ecosystem management. We believe that further integrating these fields will promote fabrication processes that produce less waste, create healthier work environments, and promote environmental literacy and workforce development.

These wooden hollow-frame surfboards demonstrate the ability to find solutions to our environmental crisis by learning from our own history, community, and environment. The wood we use is a renewable resource, and serves as an alternative to petroleum-based surfboards that dominate the global surfboard industry.

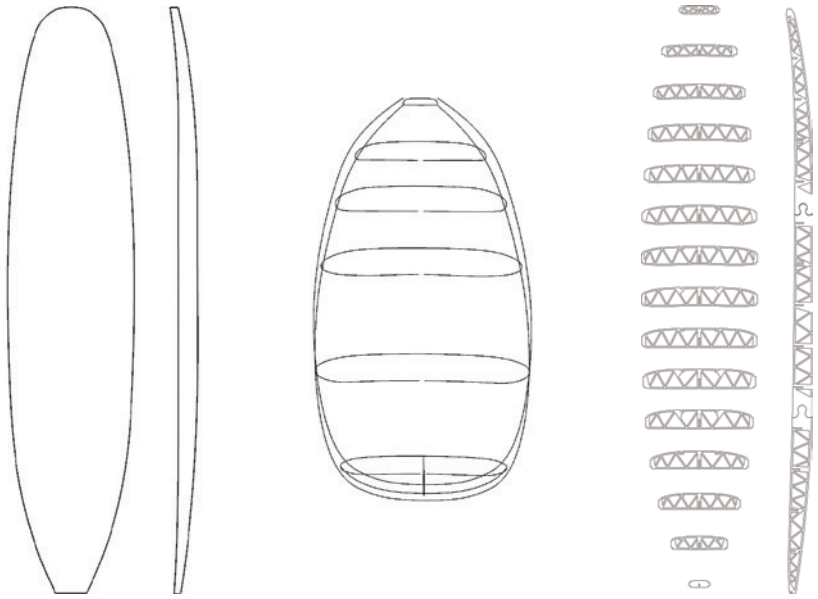
Expanded polystyrene surfboards contribute more than one million metric tons of CO_2 to the atmosphere every year in the production of the foam alone. Wooden hollow-frame surfboards represent a future that can be more equitable and sustainable by fostering circular economies, sustainable ecosystem management, and serving as a means to promote an environmental ethic through communication and engagement with waterways.

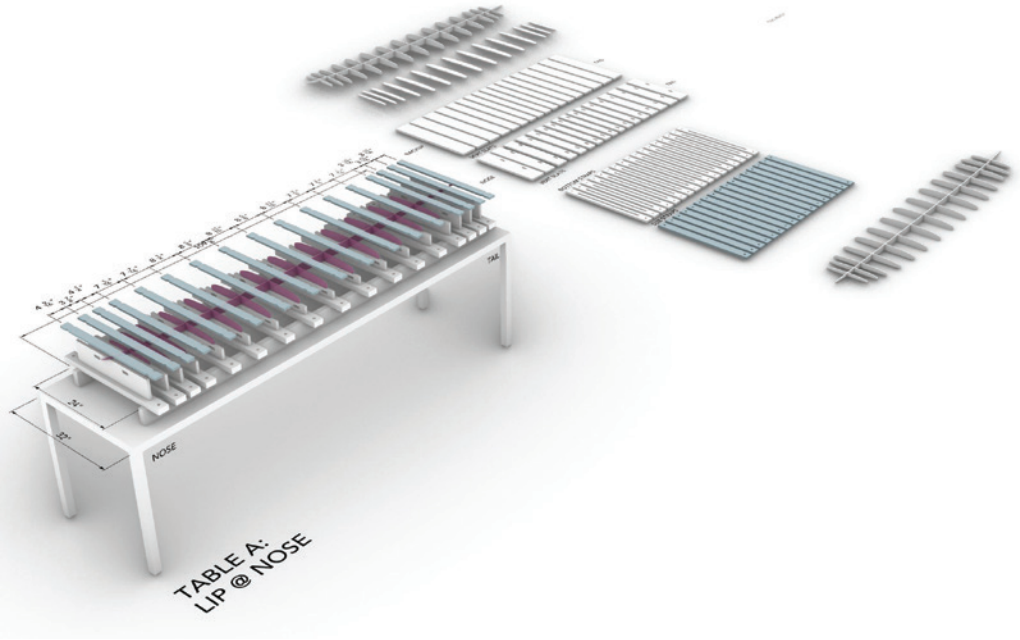
SUSTAINABLE HOLLOW-BODY MARINE FORMS + FABRICATION

CARSON JAMES BROWN + ELLIS WILLS-BEGLEY

ASRG ADVISOR: GLENN WILCOX


Tyvek





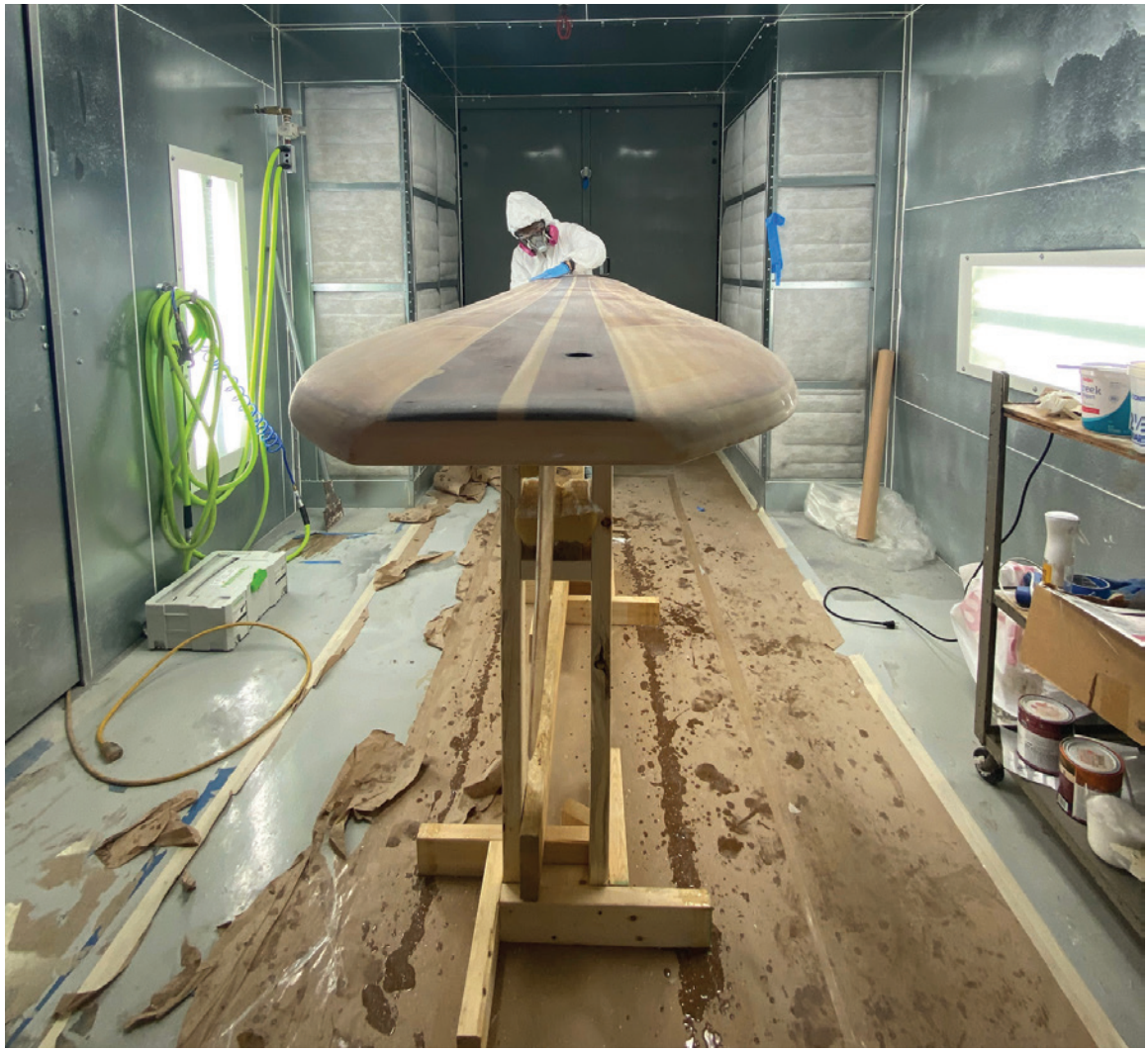
Building these surfcrafts involved a synthesis of historical analysis, in-water experience, ecological knowledge, traditional woodworking, and contemporary fabrication. The model was drafted in a 3D modeling software using original methods to create a lightweight wooden internal skeleton that was cut on either a laser cutter or CNC router. The frame was laminated to sustainably-harvested plywood within a custom-built modular press.

Panel + Rail Layup

Panel Glue Up

Top Panel Lamination

Blocking + Roughing



To create the curvilinear perimeter, white cedar stock was steamed, formed, and fastened to the panels with minimal bio-based epoxy adhesive. Using traditional draw-blades, planes, and rasps, excess wood was carved to reveal a hydrodynamic form of subtle curves and poignant grain parings between the cedar, okoume, and black walnut.

The tools we use carry knowledge and promote a more reciprocal relationship between us and our surroundings. We can learn from the wood—the direction of the grain, the properties of the species, and the way the tree grew in its environment. This craft harkens back to a time when we were more aware of our environment and where our material objects originate. In this way, we can redefine materialism as no longer consumptive and environmentally degrading, but instead promote reciprocity and respect with our materials, environment, and community.

Exhibition At Taubman College Gallery

[Drawing Not To Scale], at its core, is an examination of the deep diagram of architecture. It is an experiment involving multiple aspects of the discipline, all interested in a deeper analysis of fundamental relations that are often taken for granted or hidden within the lines of the architect's plans. The plan itself may be covered in iconography, but ultimately the choice of representation, analysis, generation, and research for architectural drawings are hidden. The thesis offers another view of the Form vs. Function argument, called "Neofunctionalism," to establish its operating terms and boundaries. The inherent driving biases within formalism, and the currently incomplete definition of "function," frame these paradigms like natural enemies, but in reality, they are inevitably intertwined, much more deeply.

Neofunctionalism proposes that functional design is not based upon efficiency, but includes the considerations of rhetoric, emotion, and the unknown. In each of these stages, both reinforce the other. This understanding allows spatiality to be relieved of its dependencies on geometry and scale (traditional "form"), rather focusing on the possibilities of relational structuring.

Form is Function. Function is Form.

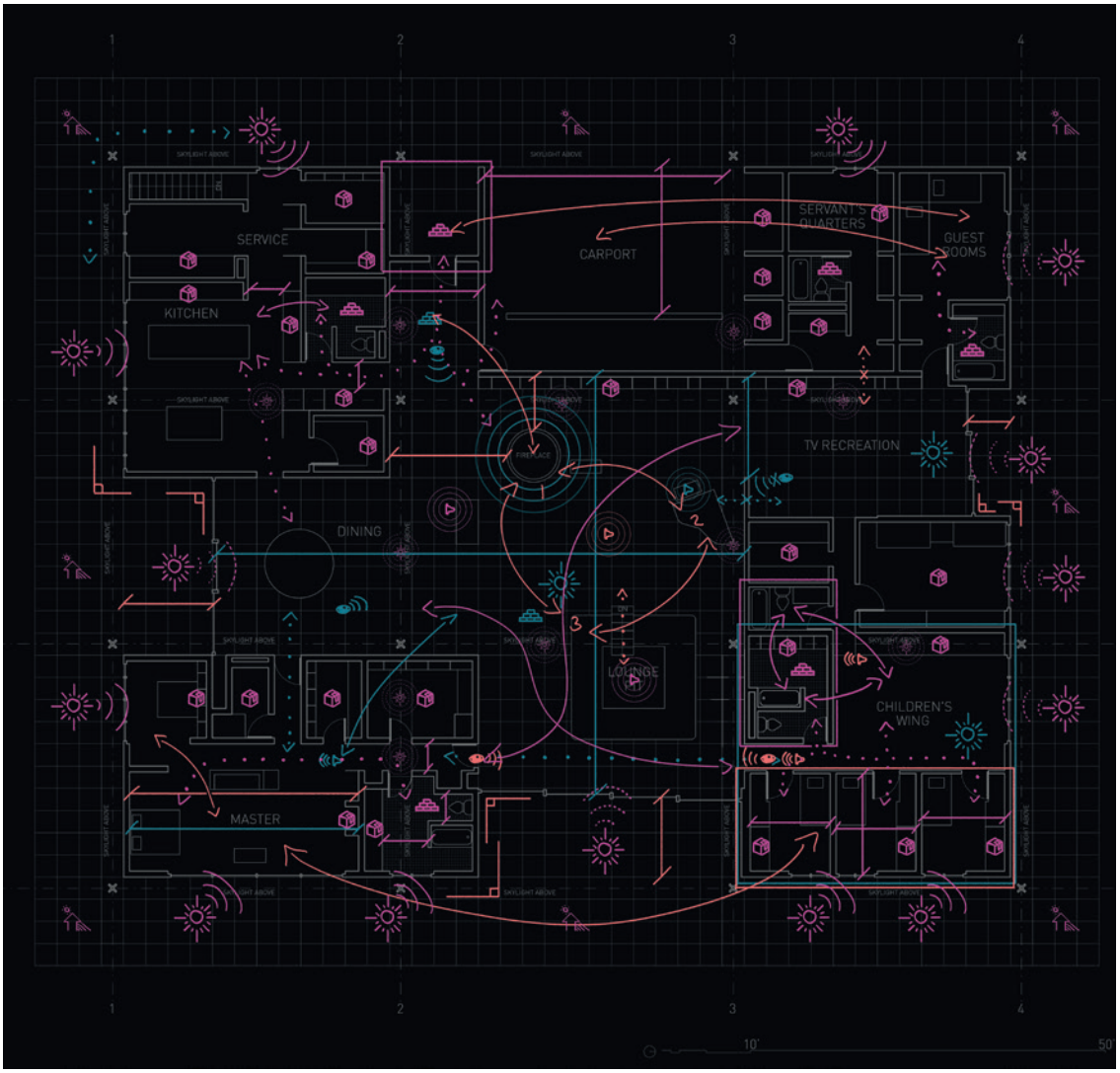
Additionally, the study of Neofunctionalism has resulted in a critical reexamination of traditional architectural techniques of representation, analysis, and generation. Often, the mantra of "Life first, spaces second, then buildings" is used to describe architecture, but not often understood or applied to its true extent. Through Neofunctionalism, the thesis aims to provide an examination of interscalar (or even ex-scalar) relationships and relational thinking in the built environment. It aims to provide composite constructions that may uncover the relationships we take for granted within our living spaces, the American house, and the American city, providing hidden paradigms for how the house and city should work together. It downplays physical scale, because that spatial articulation provides us with what is known, what is safe, what is standard, but not necessarily what is most effective to the breadth of our lived experience. Therefore, the most apt traveling companion or warning may be considered either an architect's nightmare, or dream: [Drawing Not To Scale]

[DRAWING NOT TO SCALE]

J CAMERON BRADBERRY

THESIS ADVISOR: PERRY KULPER

"TEMPO" | An architectural proposal, a disruption of the architectural patron of Change, interconnected with Hierarchy, Density, and Speed.



To begin, one must consider the prompt: Why is function always equated to efficiency? In reality, efficiency is just a component of function, not the whole, used as a justification for a particular type of formal logic. “Functional” simply means something is working towards its intended purpose, but historical, cultural, and emotional purposes contribute to the built environment just as much as efficiency. Ultimately, four major categories of function arise from these investigations:

[1] EFFICIENT
[2] RHETORICAL
[3] EMOTIONAL
[4] THE UNKNOWN

This thesis asks: How can architects and designers expand their methods of working to naturally incorporate these investigations into their plans and designs? What does the “deep diagram” of architecture meticulously examined through this lens reveal? What kind of spaces and life does it help to produce?

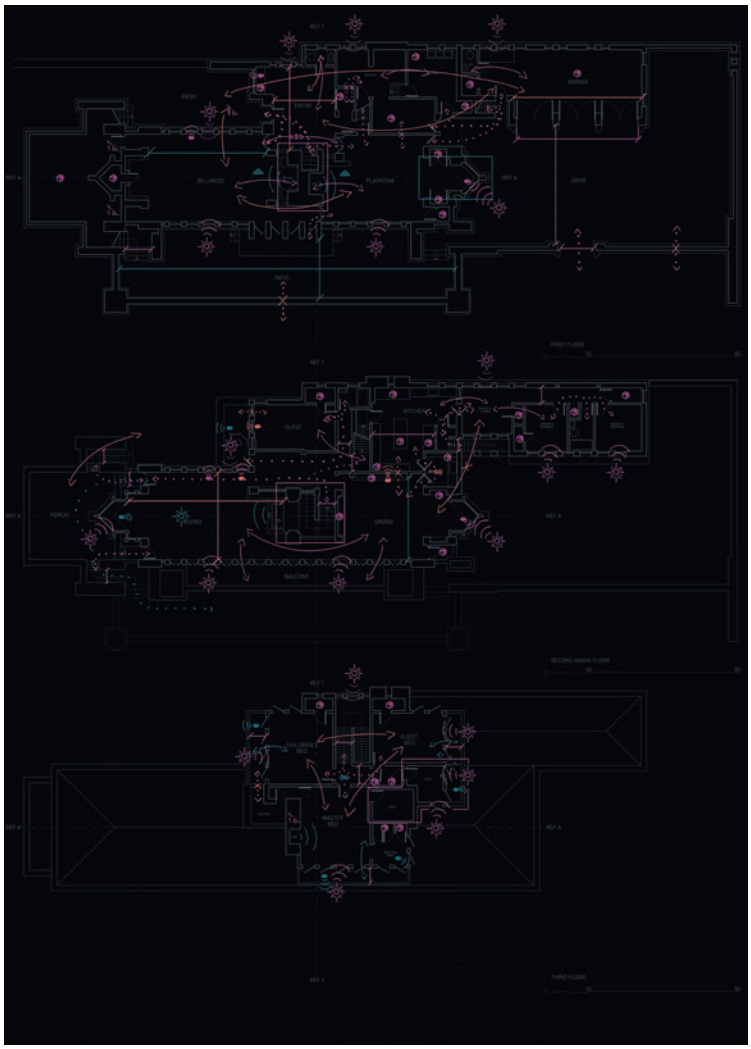
[Drawing Not To Scale] offers a method of working rather than a specific product, as different architects working through similar means will prioritize the various forms of function differently, drawing on their own experiences as fuel for the fire. Ultimately, a navigational chart emerges, inhabited by the Patron Saints of architecture. They guide design via life and experiences rather than form for form’s sake, shaping each piece with care and precedent.

To understand Neofunctionalism when practically applied, a set of test subjects are chosen from famous American houses. Arguably, representing the best of life presented architecturally, they prioritize life over space or building, and everyone is capable of drawing from their own experiences with habitation.

Ultimately, the goal of this thesis is to open up a series of techniques and investigative procedures that are hidden, and occasionally lost, within the current architectural zeitgeist.

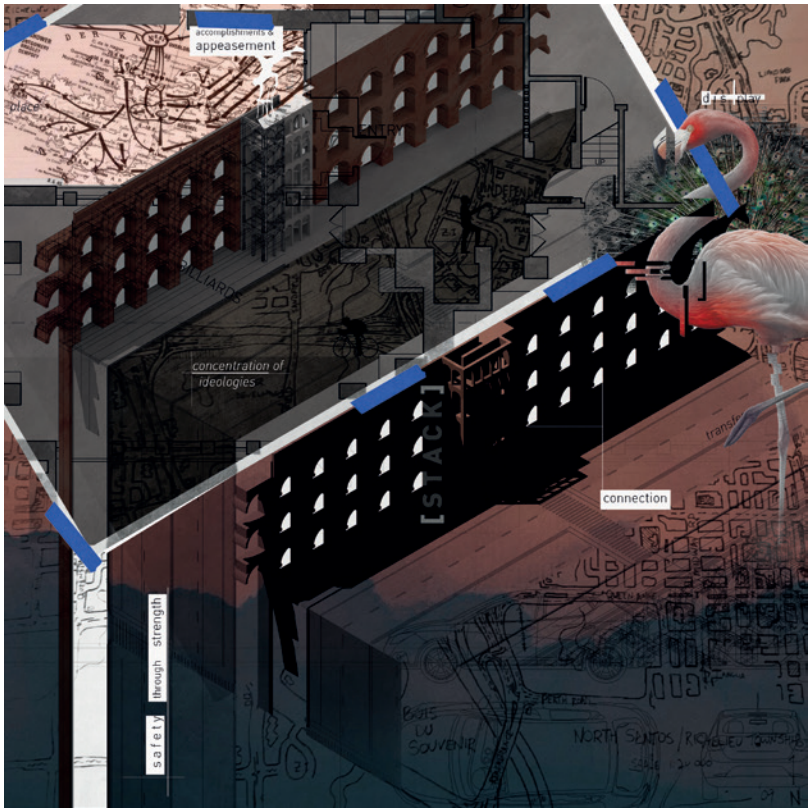
Overlaid on top of the plans, schematic diagrams and sketches are applied to represent the “hidden” lines within an architect’s drawing, signs of Neofunctionalism at work. Truths and opinions are always inherent in the system of an architect’s drawing, but often must be interpreted through simple geometry and occasional annotation.

Ideal programs emerge from the precedent, informing a construction of an architectural composite; a revelation of the deep diagram of architecture, home to certain axioms, Patron Saints, within the designed environment.



This method of generation leads not simply to plans and sections, but a refocused approach for architects towards space making.

Overly reductive traditional programs for a house are eliminated, leaving only the purest form of itself. Foyers, bedrooms, kitchens, etc. are left behind, leaving Change, Ritual, Pause, Distribution, and others in their stead. Each foray reveals new programs hidden in the deep diagram of architecture.


accomplishments &
appeasement
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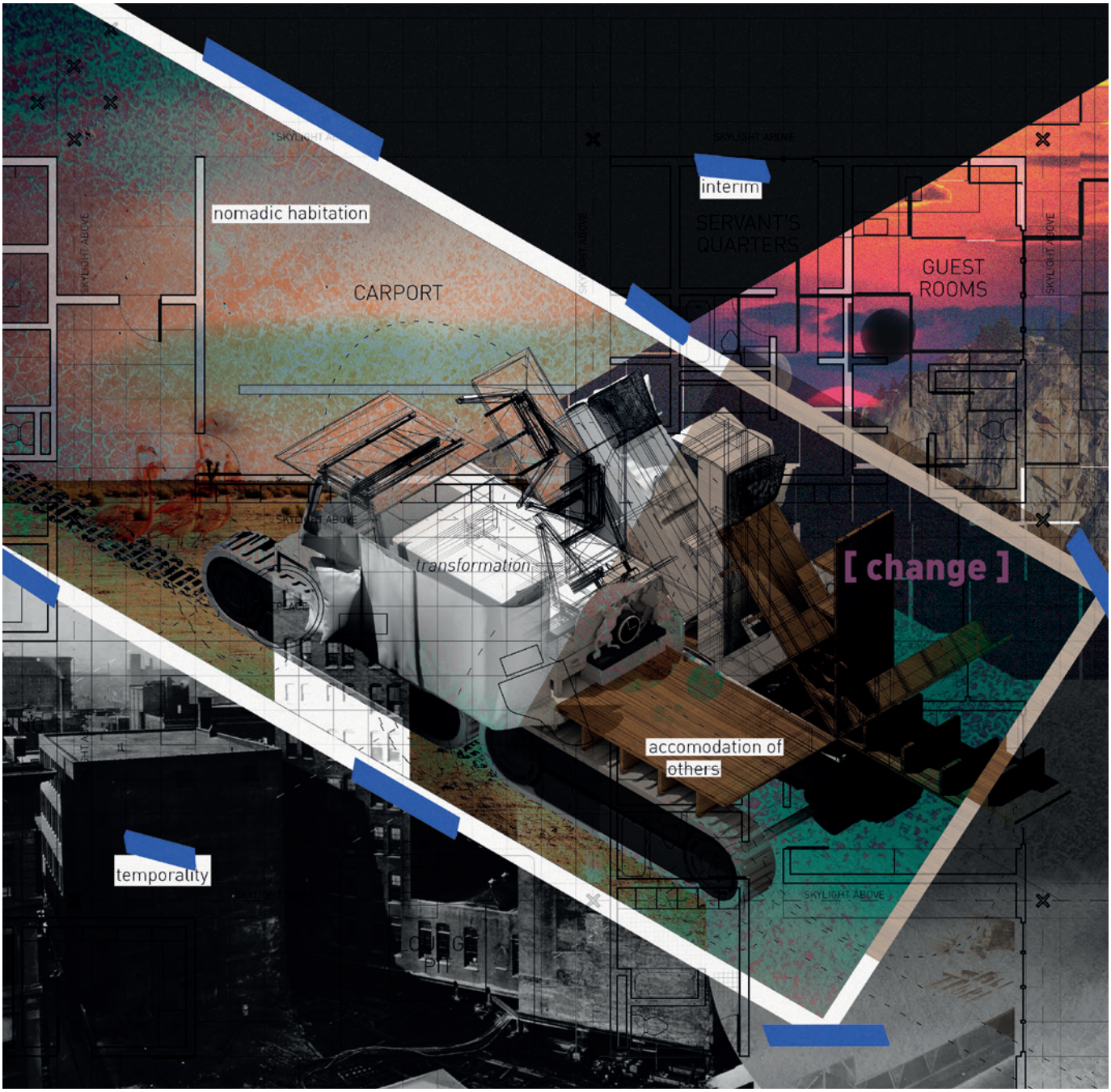
connection
safety through strength



Theoretically, whole projects could be and are designed around a selection of Patrons and their interactions.

Returning to the axiom of “Life, space, then buildings” has been critical to me throughout the explorations of the thesis. The deep diagram, to briefly reiterate, represented Life:

The study of human relational networks that go beyond scale or form. Spatial Composites, like the one shown above, are the evolution of “callouts” from within the deep diagram, and introduced Space. The constructions help the Patrons to their feet, beginning to suggest spatiality and greater relation to an outside world.

The third stage is the Architectural Proposals, renders of the Spatial Composites that provides a possible architecture from the setup of life and space. Here is where building is introduced and literal construction is considered as well as even greater formal suggestions. The proposals are situated within a warehouse. For the time being, siting them within the real world but also allowing for some insulation to avoid overly-rapid introduction into the real world. The Spatial Composites are translated, 1-to-1 as possible, into the real world potentially circumventing any crisis of reduction within typical project programming. Remember: each of these proposals is a single possibility from individual Patrons acting alone...there are far more still that remain undiscovered.

"PAUSE" | An architectural proposal, exploring moments of careful and careless interruptions in movement and thought.
Flow, Separation, and Speed are nearby companions.

"QUIET IMAGE" | An architectural proposal, exploring moments of self reflection, doubt, dark rooms, hygiene, and secrecy, among others. Hidden, Ritual, Exchange, and Service float nearby.

Cities around the world are grappling with an ongoing Syrian migration crisis, the scale of which threatens to fray social contracts and unsettle the ethical grounding of political systems transnationally. Beyond the liability of addressing pressing human needs at the urban scale, including housing, sanitation, and loss, the perceptibility of difference without cultural awareness foments division, exclusion, and xenophobia in host countries. Consequently, Rouh Al-Sham, a nomadic non-profit organization, develops spaces and hospitable practices to build solidarity among diverse groups of people. Founded in 2021, Rouh Al-Sham (or, Spirit of Syria in Arabic), stages week-long public events in an ephemeral, mobile cultural embassy.

ROUH AL-SHAM

SYRIAN CULTURE EMBASSY

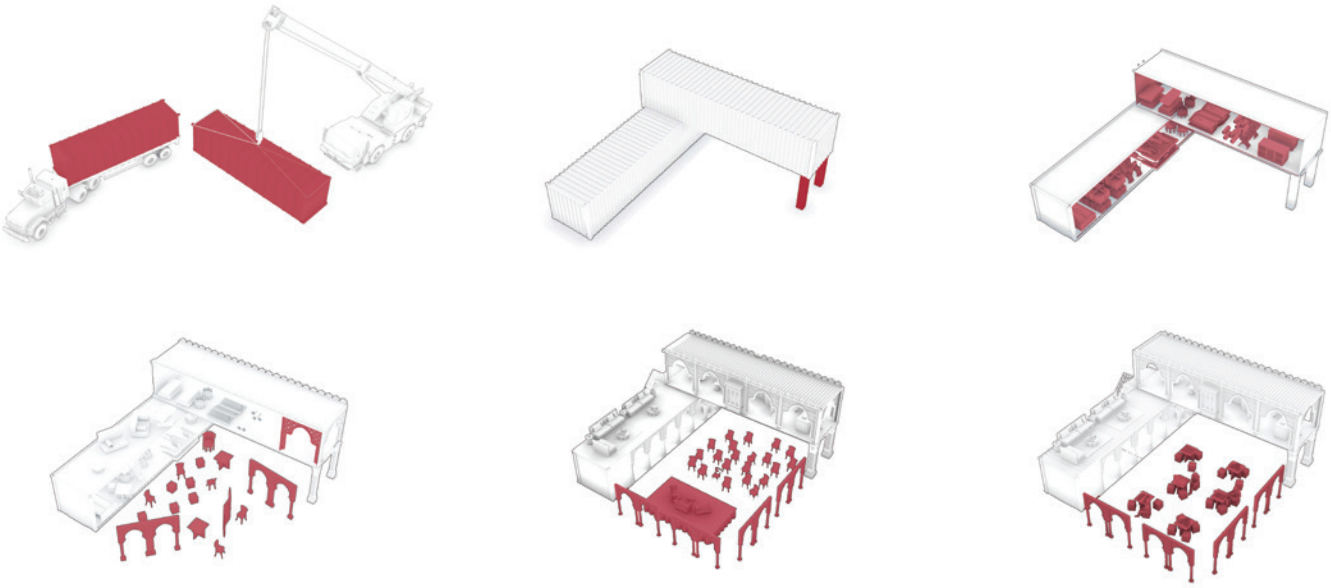
AREEJ SHAHIN + TULEEN ALRAWASHDEH

WALLENBERG CRITICS: ANYA SIROTA + THOM MORAN

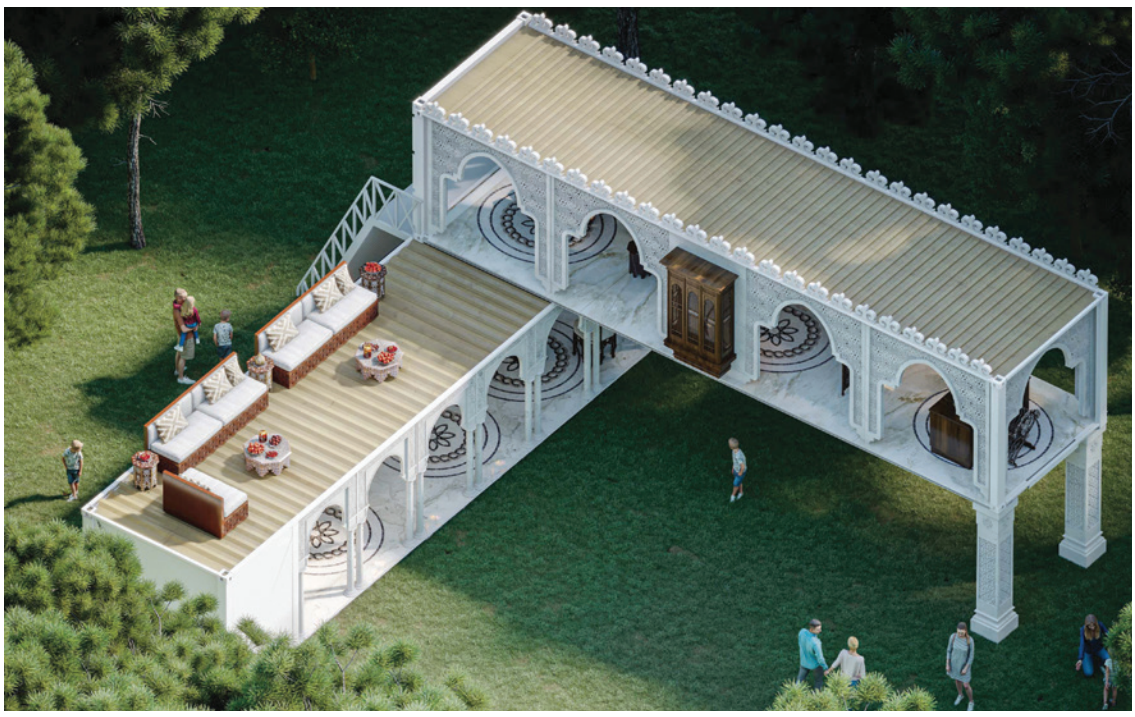
By The Number: Syrian Refugees around the world

Architectural Fragments and Artifacts

The Rouh Al-Sham's embassy module is simple to transport and arrange. Consisting of two shipping containers, the unit unfolds to reveal a series of architectural fragments and artifacts, culled and restored from vernacular architecture in Syria. The elements include artisan furnishings, portable walls, arches, and traditional carved columns. Without fetishism or nostalgia, the construct creates an atmosphere familiar and inviting to cultural arbiters and legible to neophytes of Syrian culture. Its programming offers a glimpse into the music, oral traditions, craft, food, poetry, ornament, and art of Syria—depoliticizing a volatile scenario through aesthetic practices in order to repolicitize important narratives around the human cost of involuntary displacement. Communication is important to ensure Rouh Al-Sham's impact beyond the direct experience of in-person events. To keep in touch with what's happening and to disseminate a vivid image of Syrian identity, we document programming, publish a monthly magazine, engage social media, issue press releases, and participate within a network of mission-driven nonprofits dedicated to expressing the liveliness, beauty, and dignity of otherwise hidden invisibilized people.



Two shipping containers being assembled on site



Full view of the site

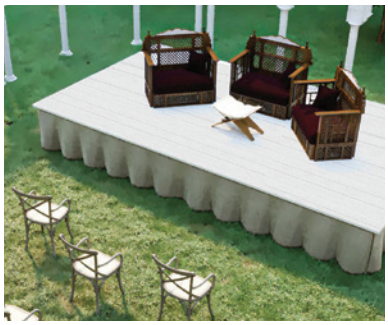
First Module Interior

The site in a park

Second Module Interior

These programs will take place in a modular unit of shipping containers that can easily be transported to different countries. These containers are light, cheap, and made from affordable material that can easily be assembled and easily accessible by all. The unit consists of two containers that store traditional/cultural furniture, portable walls, arches, and columns that make up this event space. The spatial organization and representation is reminiscent of a traditional Syrian home with an open courtyard and includes architectural features from Syrian and Islamic artistic patterns. The goal for using these specific cultural elements and traditional objects is to provide a similar atmosphere found within traditional homes of Syria. This organization is a global, modular event that takes place in major cities that currently have large Syrian populations. This is a seven day event, each day dedicated to a different program and this format will be implemented in every global event location. The first day of our program is named Arabian Nights and is focused on geographic history and traditional storytelling. Day 2, named Media, is focused on production, documentaries, film making, videography, and photography within Syria, before and after the war. Day 3, named Tarab, is focused on traditional music and dance such as Qudud Halabiya, Darwish, Dabke and will also have live performances.

Day 4, named Arts and Crafts, is focused on traditional artisanal works such as ceramics, Arabic calligraphy, Islamic geometric pattern work, ajamy painting, and embroidery. Day 5, named Culinary, is focused on Syrian foods, desserts, and drinks that will be hosted by different chefs. The Last Day, Day 6, named Exhibition, is a celebration where everyone within the community, not just Syrians, come together and celebrate to build relationships and find similarities. The leaders of these daily programs are Syrians who currently live in the country that the event is taking place in and are either successful in the activities that are being presented or have small businesses. To keep in touch with what's happening at these events and the people who attended, we are documenting our daily programs with photographs that we publish in our monthly magazine after the completed event. The magazine displays the diversity of people, countries, and spaces that this event will move through, showcases the interactions within the Syrian people and their communities, and thus highlights the varying featured people who come in to host the programs. As many Syrians go into exile and media representation of Syria continues to focus simply on the refugee crisis, destruction, and violence, this organization aims at recognizing the humanity of Syrian people and the rich culture, traditions, and practices that follow them wherever they may go. The liveliness, beauty, and vividness of Syrian identity, one that is resilient and can never be tarnished regardless of any form of political violence, deserves to be highlighted and shared with the new communities.



Arabian Nights Day

Media Day

Tarab Day

Art + Crafts Day

Culinary Day

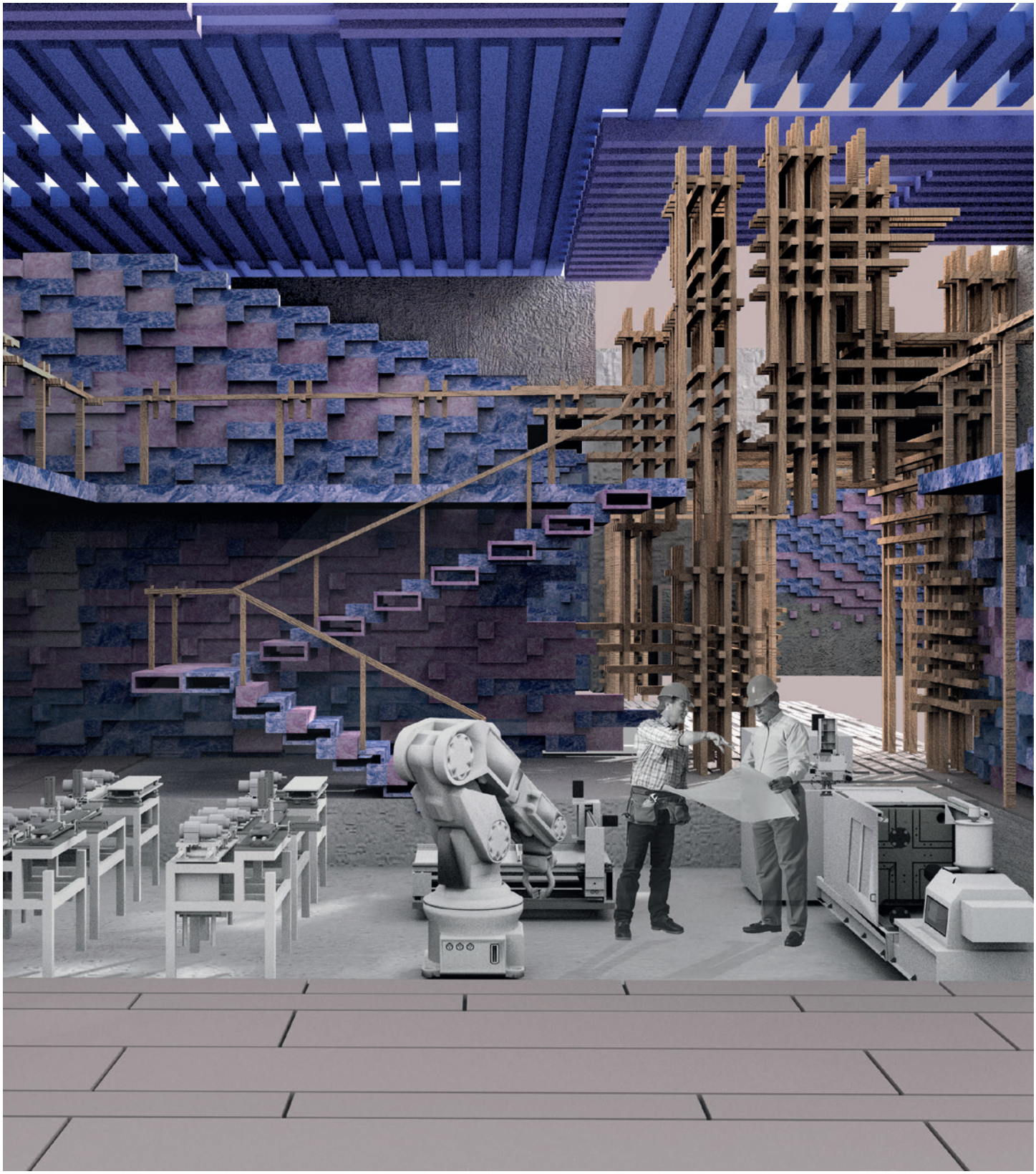
Exhibition Day

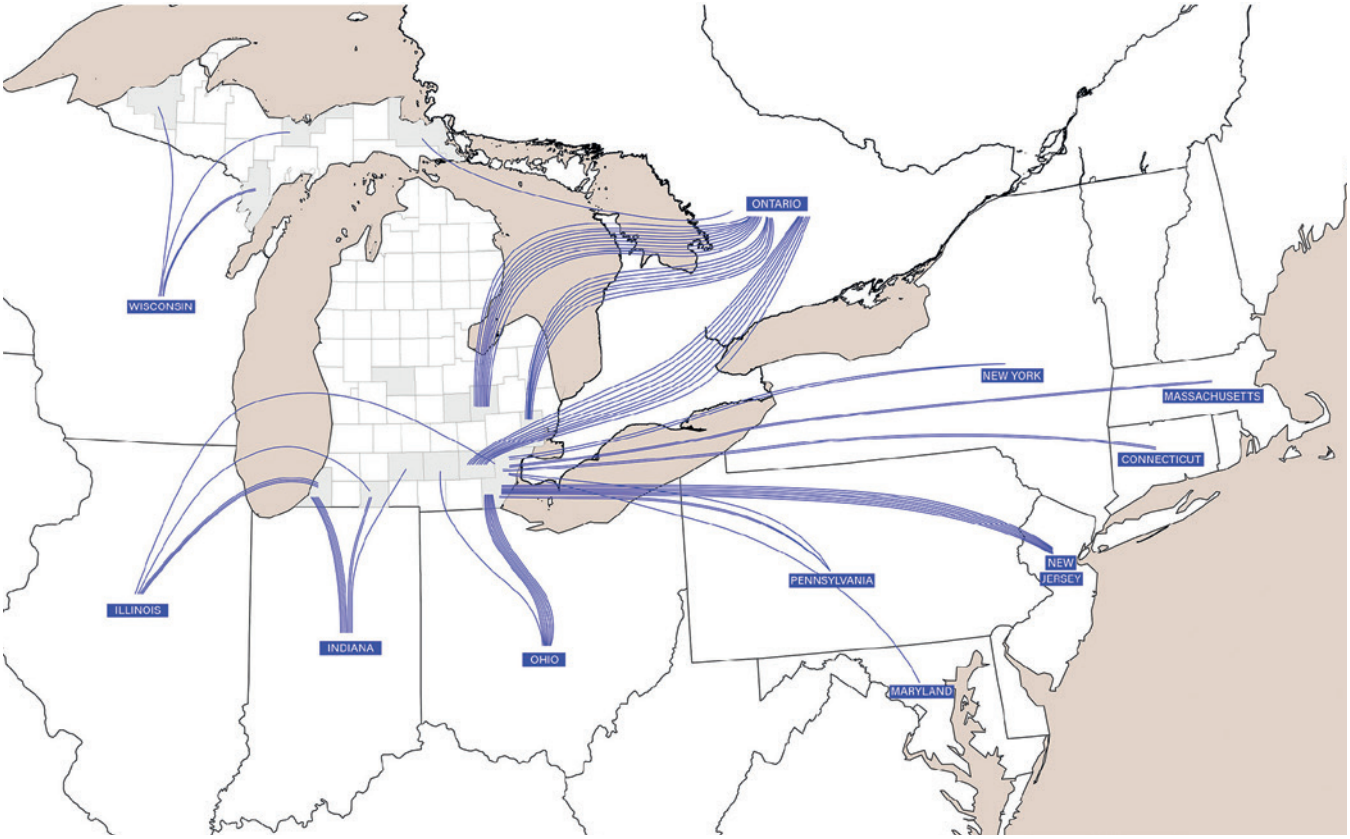
Due to inexpensive land prices and tipping costs, Michigan has become the hotbed for solid waste imports in North America. Manufacturing Commons proposes a model for recycling solid and construction waste, and reclaiming the economic value for the Poletown East neighborhood in Detroit. The project proposes a model of discrete architecture using recycled plastic, salvaged wood, and rubble through assembly and disassembly. Building on the waste ecology of Detroit, the architecture encourages small-scale manufacturing using fab lab/digital commons in neighborhood centers, allowing the community to share knowledge on the methods of construction and experiment with new materials.

MANUFACTURING COMMONS

LIYAH GEORGE

THESIS ADVISOR: JOSE SANCHEZ





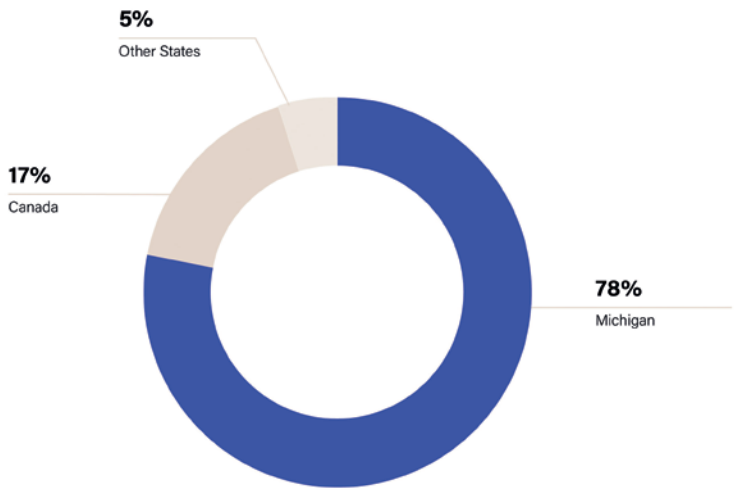
Waste Flow in Michigan

This project looks at the use of three materials—rubble encased in mesh metal casing, recycled plastic, and salvaged wood. Using discrete methods of aggregation these materials can create innovative typologies of architecture and construction and also encourage “self-build.”

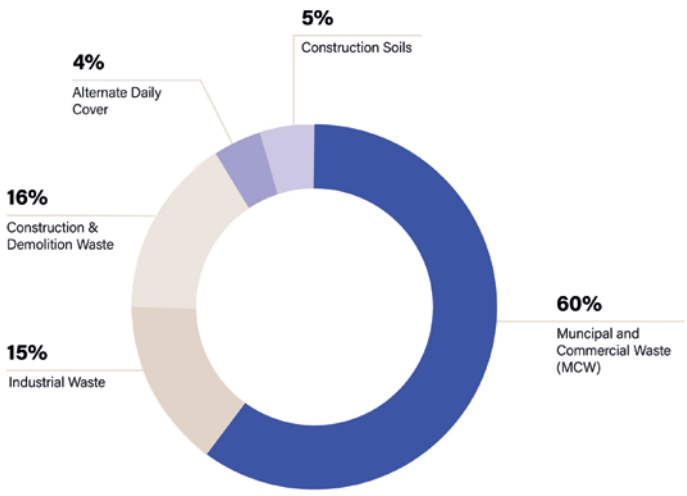
Manufacturing Commons proposes a recycling model of solid and construction waste that reclaims the economic value for the Poletown East neighborhood in Detroit. Located in this neighborhood, is the Detroit Incinerator—the largest waste-to-energy plant in the United States—which was decommissioned due to environmental violations caused in the surrounding neighborhood during the 30 years of its operation.

In this neighborhood network model, deconstructed material from blighted houses such as gypsum, windows, and doors are collected and distributed to the salvage material workshop. Other construction material such as wood and rubble goes to the material recovery center. Municipal plastic waste from Poletown and surrounding neighborhoods are collected, sorted by color and repurposed. Similarly, organic waste is redirected to community farms and urban forests.

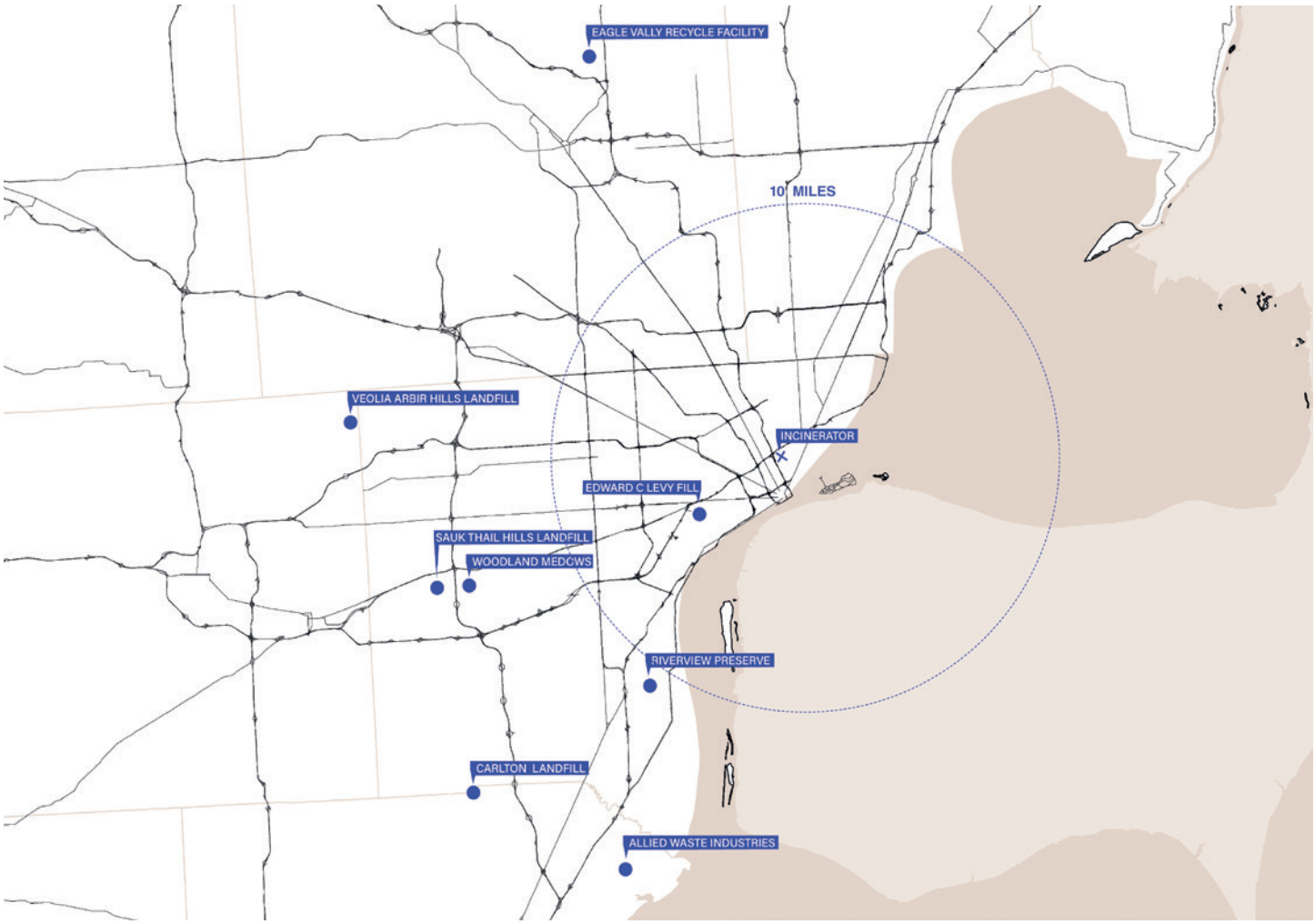
Solid Waste Disposed in Michigan Landfills



Solid Waste Distribution



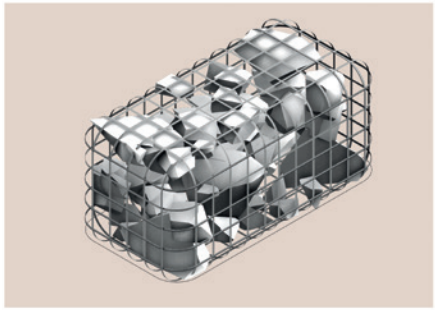
18% of MCW in landfills is **Plastic Waste**



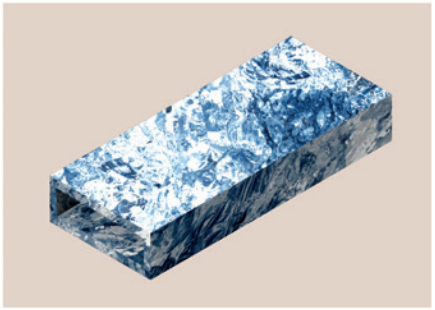
RUBBLE

PLASTIC

WOOD

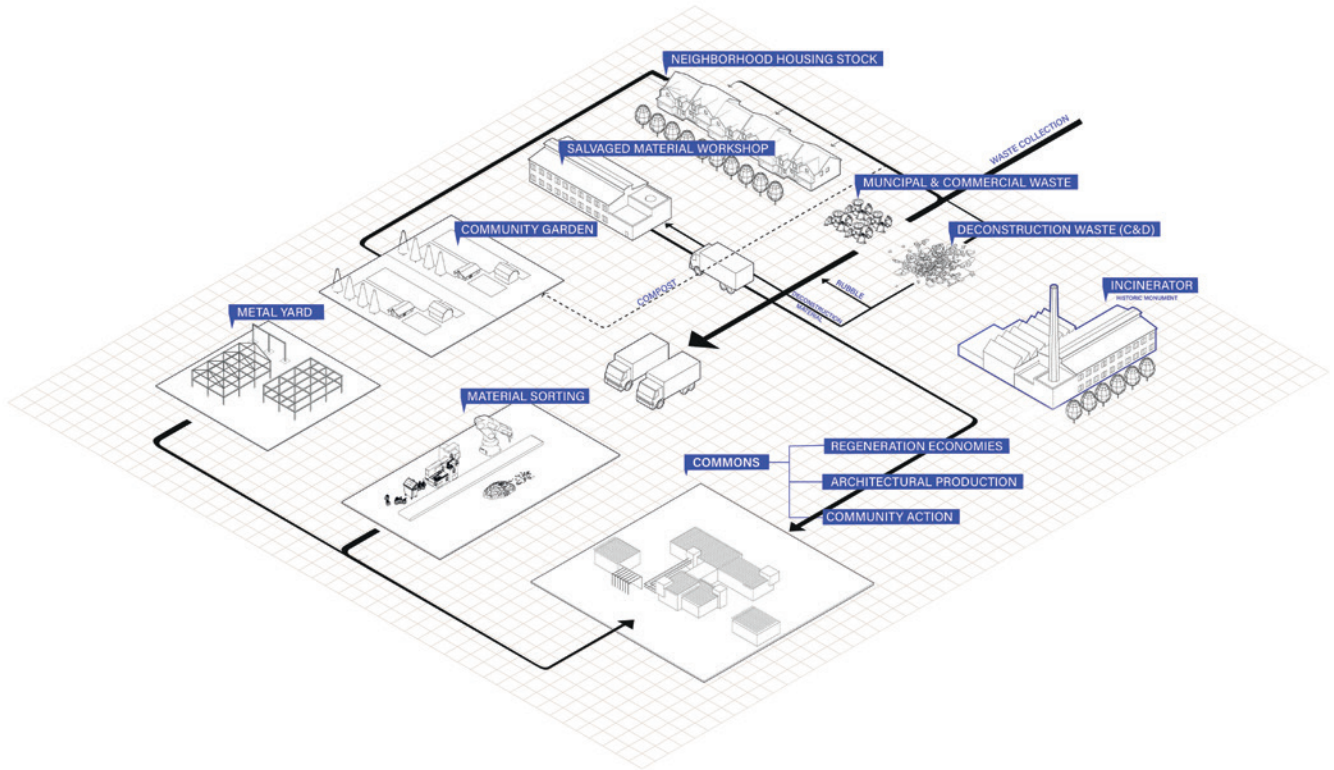


RUBBLE



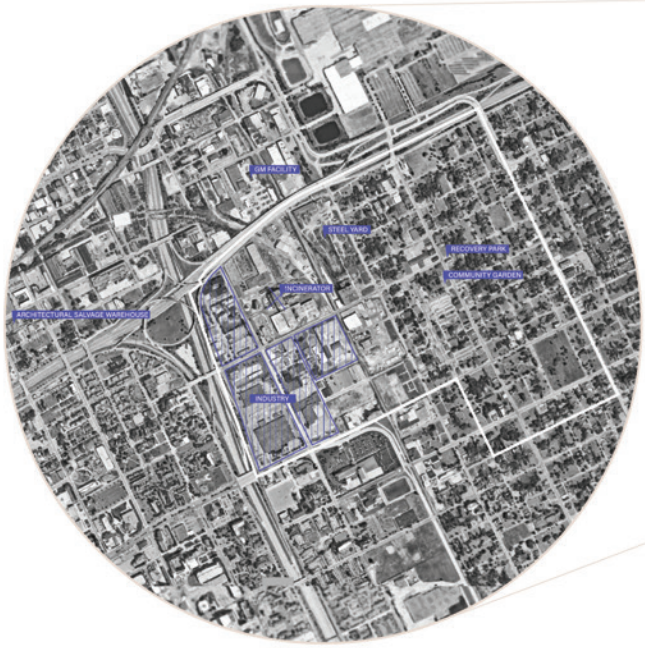
PLASTIC

WOOD

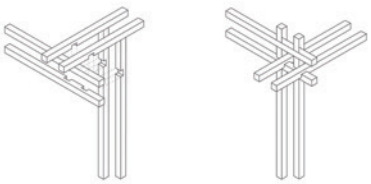


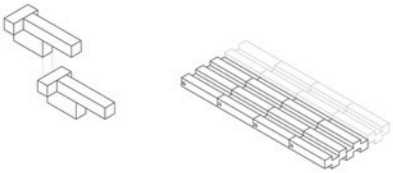
Material Networks Flows

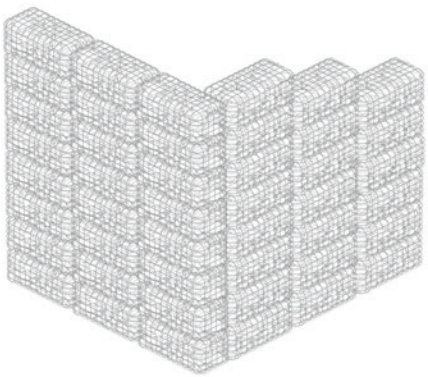
THE SITE

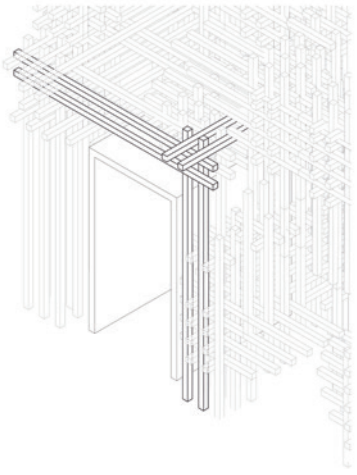

GM FACILITY
STEEL YARD
RECOVERY PARK
COMMUNITY GARDEN
INCINERATOR
ARCHITECTURAL SALVAGE WAREHOUSE
INDUSTRY

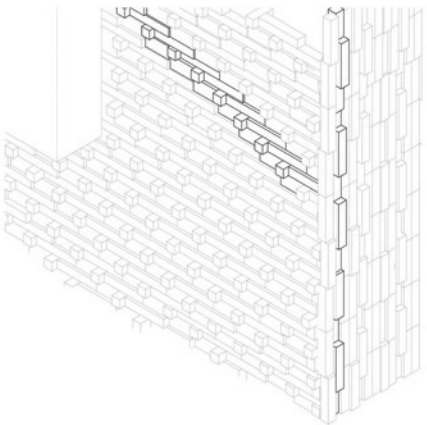

OLD PACKARD PLANT
POLE TOWN
MID TOWN
EASTERN MARKET
DEQUINDRE CUT

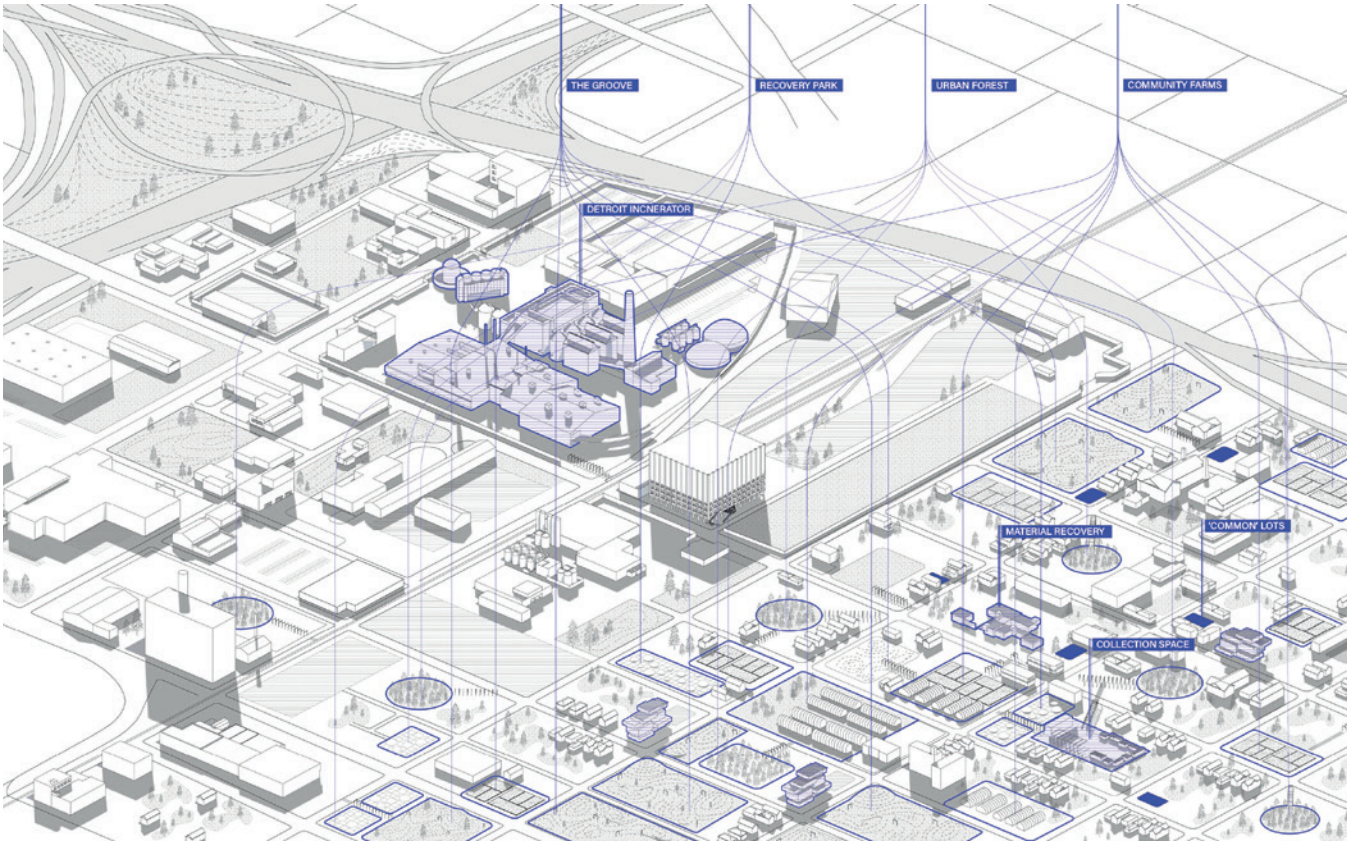












Spaces of production, plugged into the existing urban landscape

These spaces of production are plugged into the existing urban landscape. These include community farms, urban forest, recovery park, the groove/ exhibition spaces and common lots—where the material is used to build amenities for the block. The different spaces are connected by public pathways.

This “commons” gives people ownership over their systems of production, through a public fabrication space, recycling facility, and manufacturing/building spaces, inviting new residents to the Poletown neighborhood.


METAL+RUBBLE
WORKSHOP
PLASTIC CASTING
WORKSHOP
MATERIAL RECOVERY
MATERIAL
COLLECTION SPACE
WOOD
WORKSHOP
MATERIAL
SEPERATOR
FAB - LAB
COMMUNITY
WORKSHOP
MATERIAL
EXIBITION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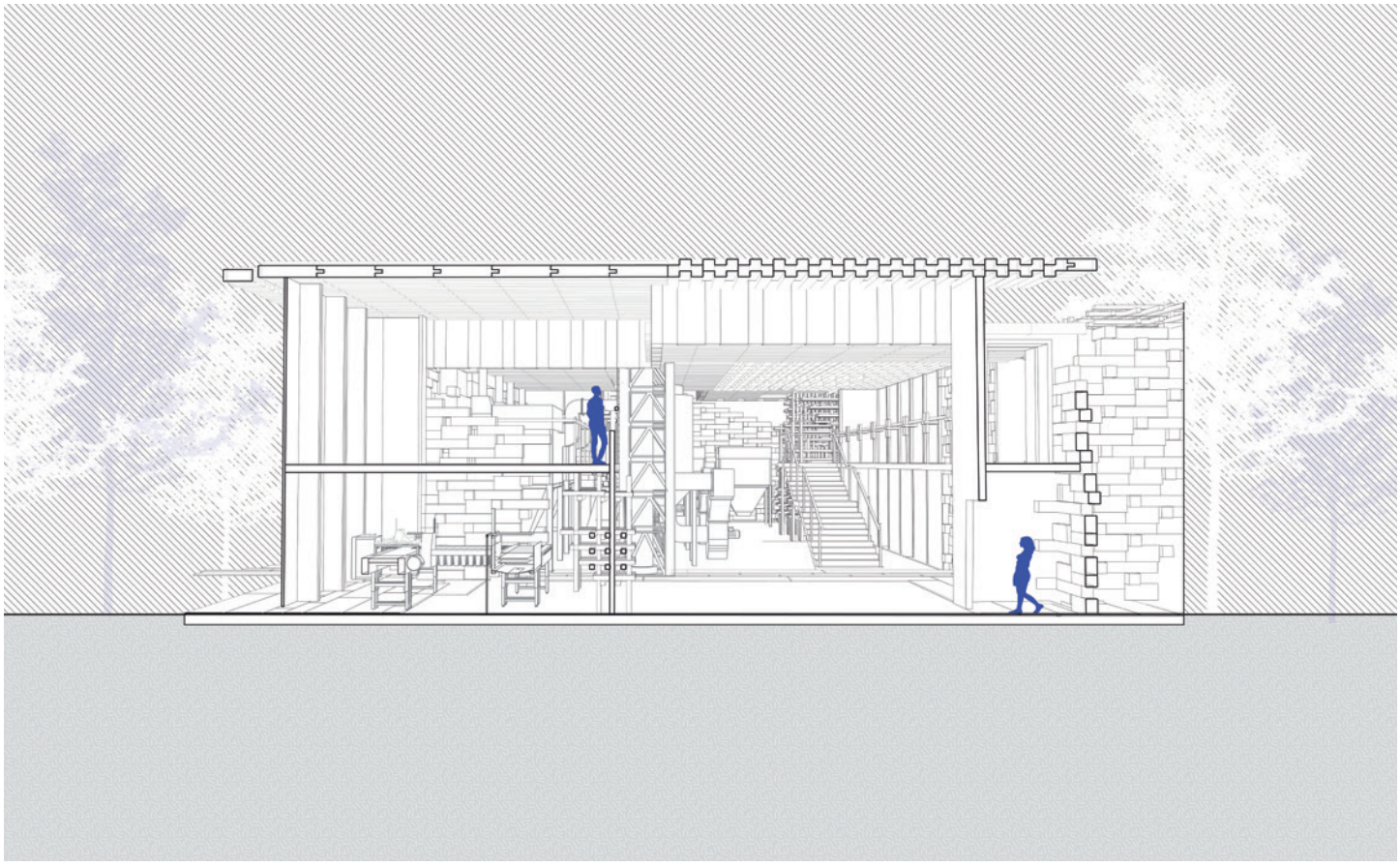
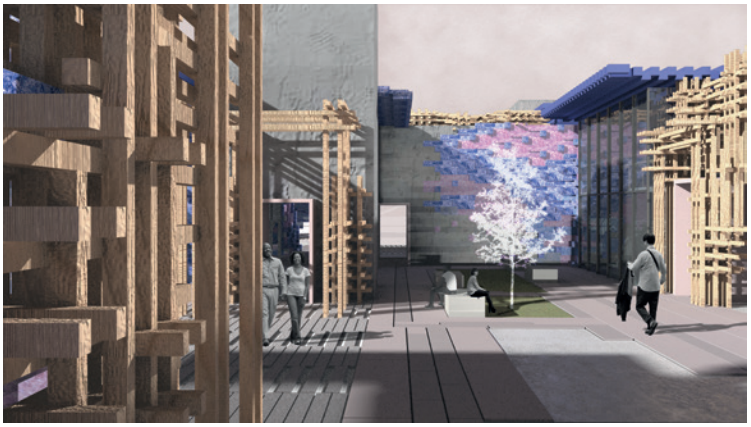
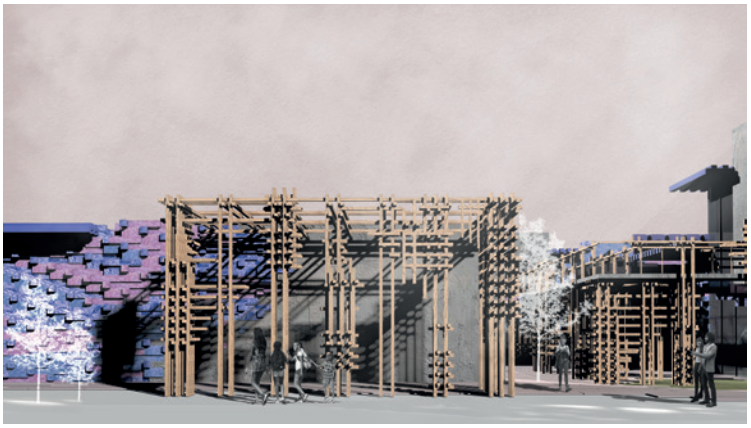
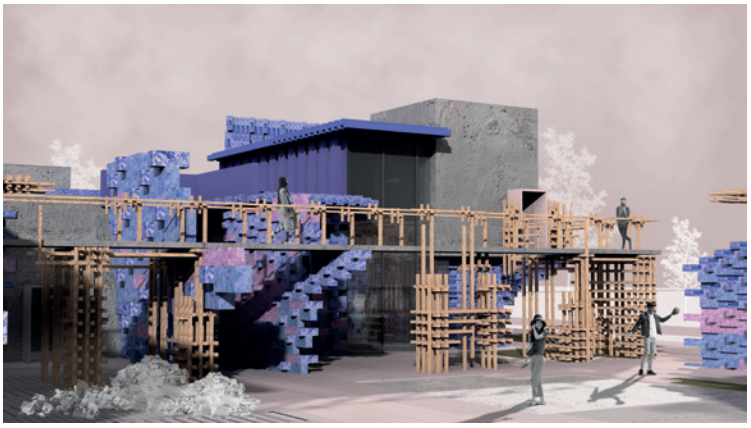
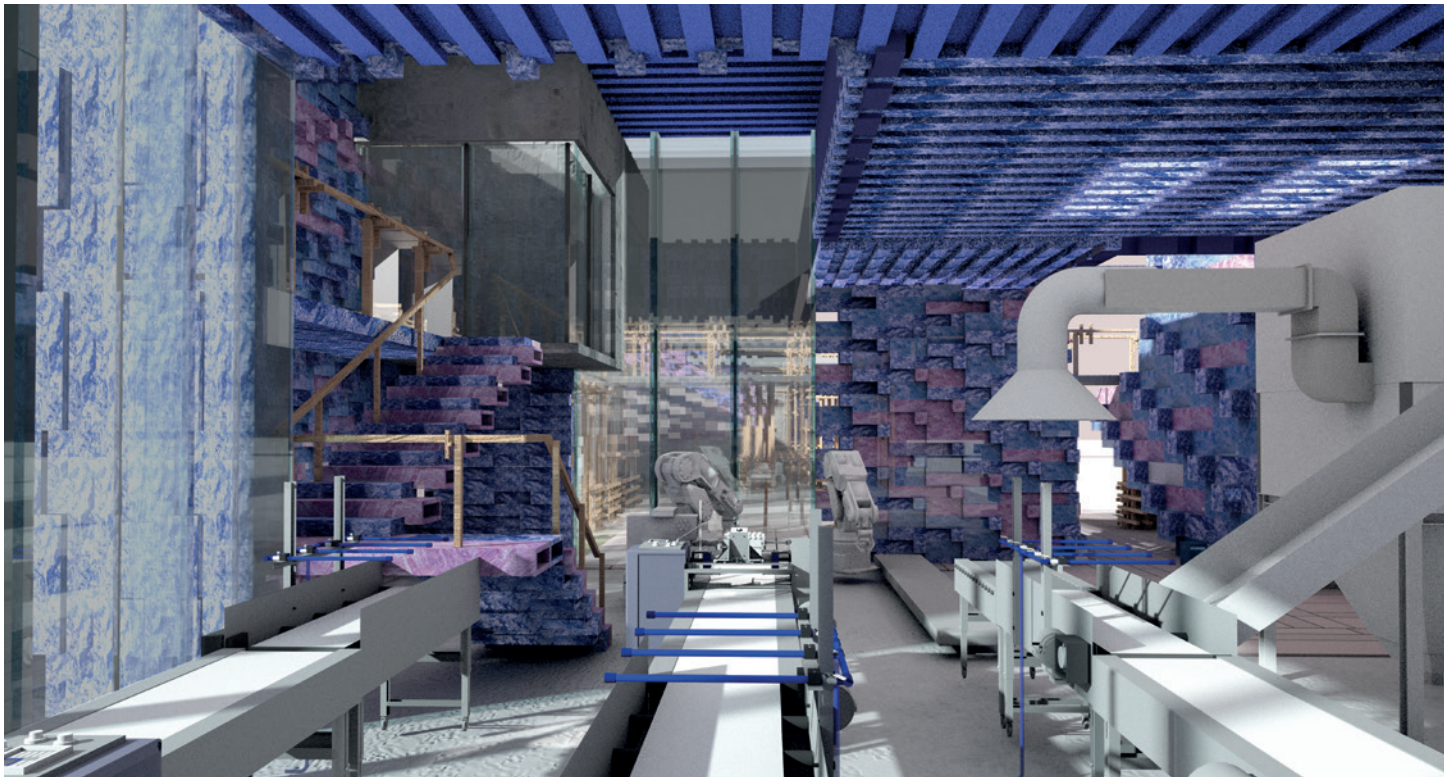


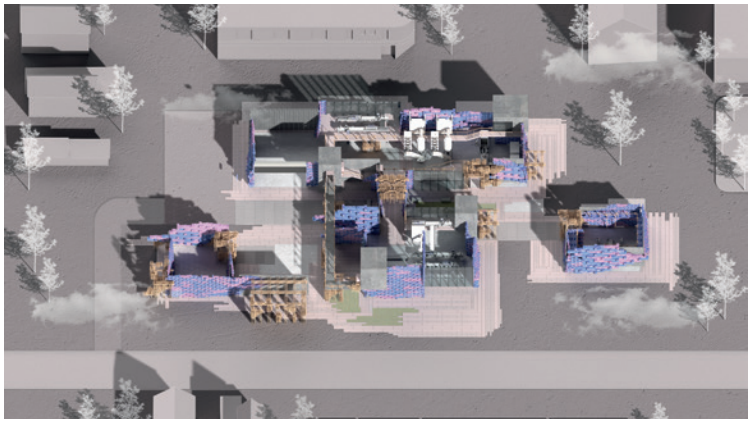






Materials Exhibition Arena





This thesis proposes a model of discrete architecture building on the waste ecology of Detroit that encourages small-scale manufacturing in neighborhood centers, building a more inclusive business community. In addition to diversifying the local economic ecosystem, small-scale manufacturing using fab lab/digital commons has the added benefit of expanding economic opportunity to a diverse range of residents—building a more inclusive community. This proposition renders visible an alternate narrative of inclusive economics and architectural commons in the manufacturing sector.

"Common" Lots

INTERVIEW: MATIAS DEL CAMPO

Dr. Matias del Campo is a registered architect, designer, and associate professor at Taubman College and director of the AR²IL – The Architecture and Artificial Intelligence Laboratory at U-M. He conducts research on advanced design methods in architecture, primarily through the application of artificial intelligence techniques in collaboration with the Computer Science department and Michigan Robotics. He is the co-founder of the architecture practice SPAN, whose award-winning architectural designs are informed by advanced geometry, computational methodologies, and philosophical inquiry.

D35: Let's talk about your academic and professional background briefly before we dive into your work at Taubman College and what you have been exploring at the University. Dimensions 35 was inspired by your experience working closely with professional architects who, at the same time, were also your professors. You've mentioned how Professor Wolf D. Prix (Coop Himmelb(l)au) and Hans Hollein really inspired you, thus, you've worked with him for a decade. How important are those experiences in continuing to inspire you and how do they bleed into your design projects?

MdC: They were both teachers of mine in Vienna and I think I was in a lucky situation because I studied at a time at the Angewandte, the University of Applied Arts, which was very progressive and future-oriented. It's a small school with around 120 architecture students in only three studios. At the time, those studios were headed by Wolf Prix, Hans Hollein, and Zaha Hadid. So there was almost a competition between these three classes as to who could come up with the most innovative architectural ideas, material, designs, methods, and so on. If you expose a student to such an environment, which on the one side is competitive, but on the other side is so heavily pushing forward, in terms of architecture, it will rub off on you. There was no way around it.

I have to admit that I specifically chose to study in this school because this drive was a major interest of mine to start with as a student. A funny story, actually, is that this architecture school was about five minutes walk from my high school. So it was literally on my way to school. Even when I was in high

The Robot Garden

school, I was already looking into the architecture school and seeing things and asking myself, “What are they doing?” and, “Oh, this is interesting.” I was exposed to these very advanced architecture ideas very early on as a teenager and this has continued to this day. It created a baseline of interest in something innovative and future-oriented: how can we apply new tools to design better buildings and what it means for human culture. All of these questions about architecture are, for me at least, some of the basic questions. I don’t say that these are the basic questions for everyone, but for me they were always important. Unfortunately, Hans Hollein passed away a couple of years ago. I am in contact with Wolf Prix and I still have debates with him. The most recent debate took place at the ACADIA Conference this year when Coop Himmelb(l)au received the Lifetime Achievement Award. One of the program points was a discussion between myself and Wolf Prix about the history of his office and how he is still doing exactly what I said before: pushing the architecture boundaries. Debating is a commonality we share. This is certainly something that I am also interested in passing onto the next generation and to you. How can I light the fire in terms of being interested in the future for architecture and pushing the envelope of design?

D35: What were your most cherished moments or biggest challenges while working with Professor Hans Hollein? What was an experience that really pushed you?

MdC: I have to say that I don’t think Hans Hollein was a really good teacher, to be honest with you. I certainly learned more from him working in his office than I learned from him in the studio. When I was in his office, one of the most interesting moments for me was when we were sitting together and building a model together. He explained to me why this very intricate, complex, spatial configuration was a museum. He discussed with me why a room had to be here and why it couldn’t be there. It’s really hard to express now because it was such a spatial experience. He basically tried to explain to me: How do you think through space, in general? How do you compose space? How do you put those things together? Why is it important that I experience that space? I talk to my students about this when I tell them, “Imagine yourself walking through the building, experiencing the

space." Certainly, one of the points that I probably inherited from Hans Hollein is this idea of thinking through spatial conditions. Why is this space high? Why is it low? Why is it wide? Why is it narrow? And how all of those things actually influence you as a user in the terms of experiencing that space? All of those instances are psychological markers. They influence your mindset and how you feel. If the space is compressed and very high, you feel small, you feel insignificant. If the space is wide and open, you feel more free. All those things can be attributed to spatial conditions. Thinking through what spaces can do is certainly something that I learned from Hans Hollein.

The other debate I had with Hans Hollein was when I started using computers—he despised computers. He was constantly saying, "No, a computer cannot do what I envision in my head." I was quite arrogant and insisted, "I can prove you wrong. I can prove you wrong!" This moment of friction between the teacher and the pupil can be frustrating. I come from a Viennese tradition where we argue a lot, it's part of the debate culture. But it's never a hateful arguing. It's a debate between friends, so to speak. This sort of friction is important in the pupil and teacher discussion where the student basically emancipates himself from the person that influences him. I had to emancipate myself from my teachers on several occasions. It's a cathartic experience, but it's also an important experience because it means that you have moved beyond what your teacher can teach you. I think that's when you start becoming your own architect and designer.

D35: That is incredibly interesting, especially in the context that you chose and singled out the University of Applied Arts because of that innovative idea. But given that your teachers didn't have that mindset and didn't embrace the ideas that you now participate in, what was the launching off point for your work in AI? You are obviously heavily involved in work with computers now, so what was the moment where you decided that you would turn your focus towards that in the context of innovation and the future of architecture?

MdC: Back then, when the University of Applied Arts started to buy computers, they had no idea how to use them. Out of the entire university, they selected six or seven students to take basic training in programming and start working with it. You didn't select the training and you didn't apply for it. They just put you in it like, "Okay, you. You, you, you, and you. You're going to be the students doing the computer stuff." I don't know exactly why, but I was one of them. I sat there and for the first time started doing 3D models. I was completely blown away. I was like, "Oh, my God! This is incredible. This is fantastic. This is so much better than any other thing I have seen before in terms of transforming my ideas into something visible." I was sold pretty much immediately, and I think people were a little bit surprised with how much passion and effort I approached designing with software. Other people were like, "Yeah, well, it's a computer. So you can do drawings for your buildings easier." And I was like, "No, no, no, no. No, no. The thing can do more."

That was the starting point. The funny thing is that I think I spent the next two years locked away in the school's little computer lab. We had, I think, four or five computers and it was the same four people sitting day and night in that lab for almost two years. People were asking, "Where did Matias go? He completely disappeared." They were like, "He is in that computer lab doing stuff day and night." They would ask, "What is he doing there?" But no one knew. Then, after I really "mastered" what software we had on our hands, I started teaching the software because no one was teaching it at the time. So students came to me and asked, "Hey, Matias, can you show me how that works?" There were no computer courses. There were no software courses. So that's actually one of the reasons why I went into teaching. There were two significant reasons. One was because people were asking me how to use computers in their work. The other one, which started before I had access to computers was when people asked about my opinion in regards to their designs of using computers.

The Angewandte was strange in that you didn't see your professor very often. The professors were all famous architects like Zaha and Wolf. So they came to school maybe three times a semester or so. The assistants were practically non-existent. Students had to talk to each other about their projects. We were doing project reviews between ourselves. But, I really enjoyed it. I thought, "Okay, talking about other people's projects is something I really like to do, so maybe teaching would be a good option for me."

D35: How captivating. We were also intrigued with how you combine philosophical inquiry with the use of technology. At what point did you think about implementing this background into the use of technology? When did you start thinking that these two could be complementary in creating architecture?

MdC: I always had an interest in philosophy. I was into architecture and also philosophy as a teenager. I found out very quickly that philosophy often influences architecture or architectural thinking. Architecture theory, in general, was always something I was very interested in too. I think it's a marker of cultural significance. If architecture would be just a shelter, it would not have any cultural impact. Because architecture can be infused with theory, philosophy, religion, there are many other influences into architecture's shape and construction. This means that it's part of human culture. That's what is so interesting to me. I would like to point out that in Austria, your education includes philosophy and psychology. It's part of the common education. You don't just read books and think about it, you get the proper education in philosophical terminology and different schools of thinking. Of course, that will make it easier to later implement ideas of philosophy into your own writing. I was trying to understand by asking, "Okay, there are different schools of thinking and philosophy; how do they inform what I do as a designer? And what does it mean for my designs?" AI research has such an enormous potential in terms of theory and philosophy. I'm very curious what's going to come up because I think a lot of people are going to start to write about it.

D35: What is your philosophical approach that you continue to adapt to your architecture and your work?

MdC: That's a good question. I would describe it as speculative realism. There is this idea of the possibility of another universe other than just the anthropocentrism one. We, as humans, don't have only agency in whatever happens around us. So specifically, when it comes to AI research, you're dealing with neural networks and so on. Those networks explore questions about agency and authorship, the origin of sensibility, how sensibility emerges, and if bottom up design exists. And if so, how much are we, as humans, still involved? This whole relationship is between humans and machines. Are machines only tools or can they contribute more to our environment? Do machines question what they are? We often ask ourselves, "Where do we stand in the world? Why are we here? Where are we going?" But in terms of architectural production, for example, we as a discipline are often very self-referential, meaning that we learn from our own history and gain feedback from which "new" knowledge can emerge. There is all of this debate about what is creativity, and what is creativity specifically in the context of machines. The big question is: Can AI be creative? The other question is about extrapolation and interpolation. So, for example, machines are really great at interpolating things and points. But humans are really good at extrapolating, meaning that if puzzle pieces are missing from a puzzle, we still can see the whole picture.

All in all, interrogating AI, architecture and philosophy can open an array of ontological and epistemological questions worth exploring.

Philosophically, there are a lot of things floating around, which I am interested in. I am super interested in New Materialism. People like Manuel DeLanda, the ways he describes the world, and his very encyclopedic approach to knowledge is amazing. Benjamin Bratton is also certainly somebody I am very interested in too. His whole idea of the stack, how we can

think through layers, and how the world is built up in material layers, but also symbolic layers is fascinating. Also, this whole discussion of symbolic and material cultures comes from Manuel DeLanda. So, Manuel is certainly somebody who has been very influential to me. Who else comes to mind? So many. One thing that I explored for a long time was the problem of the sublime: the early 19th century Romantic philosophical tendency. Schopenhauer and so on questioned, "What are we humans in relation to the universe?" Architecture can be sublime in how it impresses or influences you as a user.

So philosophically speaking, I don't think there is one specific methodology in terms of rigor. However, there will always be this discussion between material and symbolic cultures, how machines influence environments, and how we perceive them. These are the main threads, I would say, that are within my philosophical thinking. But, there are always these other planets around that somehow also influence thinking, which I think is okay because you have to keep your mind open. You shouldn't be very narrow in aspects of possibilities in terms of architectural thinking because then it becomes dogmatic. I am certainly not a dogmatic guy.

D35: Considering what you just explained about your philosophy in context of your current work, I am always very curious when AI is brought up in the context of architecture or art. I think most people have the tendency to allow their mind to jump to visions of the future that have eliminated roles of the artist and architect in favor of artificial intelligence and rule out the coexistence of these two things. Do you have an optimistic future or some goal of your work? How do you envision the work that you're doing with artificial intelligence coexisting with the profession that we have? Or maybe it doesn't coexist? How do we evolve as a profession towards a future that utilizes these things more integrally than the current state?

MdC: It's easy to be afraid of AI. But I have to say that the more I know about it, the more I know that AI is not as intelligent as we think. In the future, I am absolutely sure that a lot of jobs will change through AI. But, they will not disappear. They will just be different. And I'm sure it will change how we do architecture. It does not mean it will eradicate architecture as a design profession. We need to differentiate between automation at large and certain aspects of AI and neural networks that you can use for design purposes. Automation will certainly change several aspects of architecture,

Peaches + Plums
High School designed through Machine Learning Algorithms

from the design phase to the construction phase, because whenever something is automated, it will make architects, professionals, and contractors lives easier. If I can create a neural network that can automatically check a plan to determine if it's up to code or not, it's such a benefit instead of sitting around for days trying to figure it out.

D35: Absolutely.

MdC: These applications will come sooner than later. My hope is that if we can dig ourselves out of the mundane parts of designing, we can have more time to think about design and make the design better. Because oftentimes today, architecture is pressed into a timeframe where you don't have the time to really sit down and consider. Remember that example I said before? Sitting together with Hans Hollein, playing around with that model and trying to figure out how the space actually works properly?

D35: Right, it seems like those moments are few and far in between.

MdC: Yeah. This is the time that we need to consider and explore the design options. The mundane tasks of making building plans properly and making sure that the structural engineering is solid will get influenced by AI through automation and possibly more. We need to consider looking at culture through the lens of AI. AI and its neural networks, theoretically speaking, do not invent anything new because they're working with existing data sets. So if I take 1,500 images of a Baroque facade, I can create a neural network that will create a good-looking image of a Baroque facade. I'm sure people will do that, by the way. I'm sure people will create data sets of architects and emulate their style. But this is a simple way of using it. The much more interesting way to use them is when you start to use them against the grain, so to speak. Meaning that you feed the neural network with, let's say, 10,000 images of flowers and you throw in a couple of brutalist buildings into that data set. And then you train that neural network to create an image of a building. This is when things get interesting because suddenly we see architecture that is familiar enough for us to recognize it as a building, but also strange enough that we pay attention. So this aspect of estrangement and defamiliarization is a very strong element in all of these new neural network work that we see. I am borrowing this idea now from the arts because basically they started doing that already two to three years ago with people like Sofia Crespo, Mario Klingemann, Gene Kogan, and several other artists; they're all great. I also think it's an incredibly interesting method for architecture design because it's provocative; it's different. We sort of perceive it as new although the data is not new. But we humans think, "Oh, that's new. That is fascinating. That is different."

We have methods that are so untraditional to how we architects use them. For example, the image that you see in the background of my screen, it's not very sharp now, but this was a design for a high school and we used a method to translate texts to images with a neural network. So you write text and then it generates an image. Instead of the usual thing that architects do, which is sitting down with a pen and trying to sketch a design, we basically typed in super short descriptions of the buildings such as "This building is the gym of the school and is canary yellow and has giraffes." Or something like that. When you write texts that are a little bit surreal and strange, you will get images that are also surreal and strange. Those images were then the bases for the rest of the design. So instead of trying to visualize that school in my head and then make a sketch or a 3D model, we basically created these surreal descriptions of the program. And each of the images that was then output by the neural network was then the base for the rest of the design. Questioning the ways that we as architects are used to designing —that's one of the things I like about AI, in general, is that it's really good at questioning our role, our thinking, our ways of working, and so on.

D35: In one of your conversations with Allison Turpin, you talked about agency, authorship, and the meaning of art in a post-human ecology. Are these issues or concerns that students deal with in your studio here at Taubman College? And where do these

students get the data from when working on their projects?

MdC: This is still an ongoing discussion and I think this will be ongoing for a while because I don't think any one of those things is solved yet. I think it's a good area of interrogation for architecture design. Agency and authorship is an example. Like agency, we humans are pretty much used to the fact that we are at the top of the pyramid, we have agency over our design, we have agency over our art. We always describe it as an expression of the human condition or of human emotion. We also expect that good art grabs you emotionally. It provokes an emotional response in you, if it's good art. This emotional response can be exhilarating, it can be sad, it can be all the nuances of human emotions that can be provoked by art.

Now what happened in the last few years is that there was a question whether neural networks can produce the kind of art that provokes. Although again, it's based on a data set of existing artworks. Mario Klingemann is a good example. His data sets are European paintings from the Renaissance until the end of the 19th century. I'm sure he also created a data set which is only portraits. The neural network basically learns from those data sets, and the funny thing is that you can train a neural network to reproduce or to create a portrait that would look completely convincing, exactly like a late 19th century portrait. And it would be completely convincing and perfect, but this is actually boring.

So what I am trying to do in my architectural work is a form of curve fitting. Curve fitting is when you define what a new network is supposed to do; it basically describes a curve within a data set where the optimal proximity to a realistic image would be. You need to train your neural network for hours or sometimes weeks or months to get closer and so it starts far away from the curve and then it comes closer, closer, closer to that curve. And when it is really close to that curve, it gets a perfect result. That would be a convincing painting. There is this website called "This person does not exist" that does exactly that. If we do this with architecture, you would get a building that looks like it's a 19th century historic building or a building by Mies van der Rohe or by Le Corbusier, however you set it, it does it. But, if you don't come that close to the curve, and you are away from there, that's where things start to get really interesting because that's where you get the weird results, the surreal results, and the provocative results. Things that look familiar to you somehow, but you can't exactly pinpoint it. So this is where things get interesting in the arts as well as in architecture. Mario Klingemann's work that I described before is exactly that. It's a little bit away from that curve. You can still recognize it's a person and it has two eyes, and a nose, and a mouth, and so on. But they are all kind of strange, and surreal, and weird, and beautiful. They are fantastic pieces of art.

Sometimes these works look like they would be from Francis Bacon, but the huge difference is that the work of Francis Bacon is based on his artistic will, so it's totally top-down artistic work. And what Mario Klingemann does, he does not have control over the result. He basically programs a neural network. He feeds it with data, and then he trains it. What kind of image comes out at the end is not so much in the control of Mario or in terms of architecture, it's not so much under my control. What I can control is what data I feed it and how I set up the training. That's what I can influence. And how long I train for it. And that's what I have been debating with my students. This sort of let go from trying to top-down and impose your will onto the process. Don't do that. Just let it emerge. Let it emerge and then start to interpret and look into that, and try to figure out, "How do I use that as an architectural device? How do I walk through it? What's the facade made of? What's the floor made of? How is this structure working?" and so on. This is then the next step.

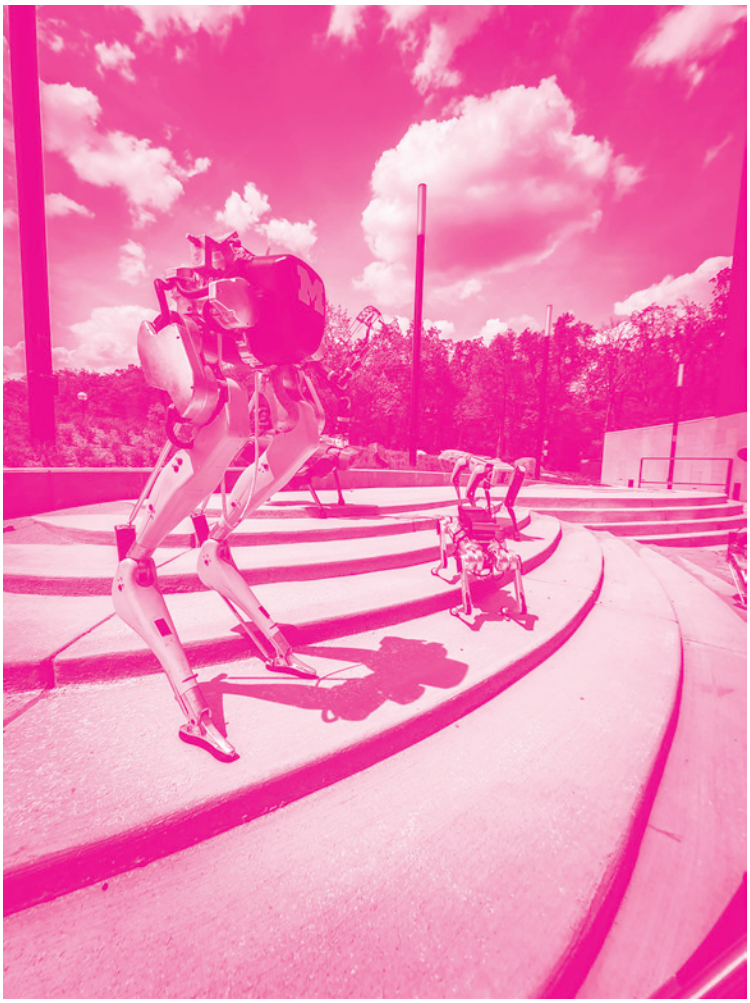
D35: Do you see a next step where the use of AI as a tool is helping this first stage of ideation and iteration? Do you see it stepping further into determining material and the finer tuned aspects of design?

MdC: Yes, absolutely. What I described before are basically the experiments that we have

been doing in the last three to four years. Now we are at the point where we understand the processes well enough to know what the next step is and that's really what we are doing right now. For example at the Architecture and Artificial Intelligence Laboratory we don't just use random images; it's being very deliberate with what we are doing. In order to do this, we need to create data sets for this processes. One of the biggest problems that we have as an architecture discipline is that we don't have the data sets that are designed for architecture. For example, the data sets that are used for automated cars are not architectural. They are designed for the automobile industry or for the robotic industry. If you want to do this sophisticated work in architecture, the first thing we need is the data sets to do that. And The Common House data set that we are building with the AR²IL Laboratory is a large-scale data set of annotated apartment plans. What that means is that a machine or a neural network does not have a concept of what an apartment is. If it sees a plan of an apartment, the only thing it sees are pixels with different color values. But it does not know, "What if this is a wall? What's a door? What's a toilet? What's a living room?" It doesn't know that. For that, we need to manually annotate plans. Meaning somebody has to sit down and mark an area and say, "This is the living room. This is the sleeping room. This is the foyer. This is the entry door." And once we have done that with enough plans, let's say 10,000 plans, we can train a neural network to generically design apartment plans. Because then it has a concept of what is what in a plan, and we can start to use that ability as an advantage in terms of how we can design a better social housing project makes optimal use of the space that is allocated to that project, and creates enough variation and diversity within the planning so that we can cater to a diverse population.

I have to add to this. My background is Vienna, and Vienna has a very strong social housing tradition. The main difference between Vienna and, in my opinion, much of the rest of the world is that no one in Vienna thinks of social housing as housing for the poor. It's housing for everyone, no matter the social strata. This is a mindset that needs to change. Just because it's called "social housing" does not mean it's for the have-nots. You need to mix society in order to make a more fair society because if you expose people to different layers of society, they get to understand them better. Anyways, back to the data set problem. In order to tackle that problem with automation, with large-scale research, we need those data sets. The first one being The Common House data set which is purely 2D, based on pixels. The next step would be how do we use 3D models with neural networks? We are working on a data set called The Model Mine, which is a collection of 3D models of houses from around the world, this data set is also being manually annotated and labeled it will help us generate houses in 3D. Once we have those data sets working with the neural networks that we have, we have a very valuable tool at our hands in terms of planning and design. Also one thing I need to add is that all of those data sets we are creating are public. They are publicly available for everyone to use. We want to make the laboratory completely open source so there is access to all of the neural networks on our repository. As soon as the data sets are finished, they are going to make them publicly available for everyone to use.

The Common House
AI Generated Apartment Plans



The Robot Garden
Ford Robotics Building on U-M North Campus

This is a form of giving back to the community of architects at large. We don't want to be exclusive with the tools we are using. We want to be inclusive so everyone should be able to use them. We are posting tutorials about how to use these sorts of things on our YouTube channel and so on. This is an effort to avoid keeping this sort of information to ourselves, but hopefully disseminate that knowledge through the architecture community and beyond.

D35: That's very interesting. The next question would be: Why U-M now? What caught your attention and made you continue your journey into AI at Taubman College along with the Ford Robotics Building? I know you guys made a really interesting project that I'd love to talk about more.

MdC: The fascinating thing about the University of Michigan is their efforts to create interdisciplinary research. Not every university does that. The University of Michigan's very conscious effort really catered to what I was trying to do. I started to get in touch with U-M's robotics department a couple of years ago and specifically with the director Jessy Grizzle, who recommended Alexandra Carlson for us to work together on those architectural projects we were thinking about. That was incredibly helpful. What really fascinated me was their openness. Their openness towards new ideas, new possibilities to apply what they have been working on in a different field. Michigan's Robotics team are experts in machine vision because they do all of the work for example in terms of automated cars for Ford and so on and that's why Ford is so invested in that school.

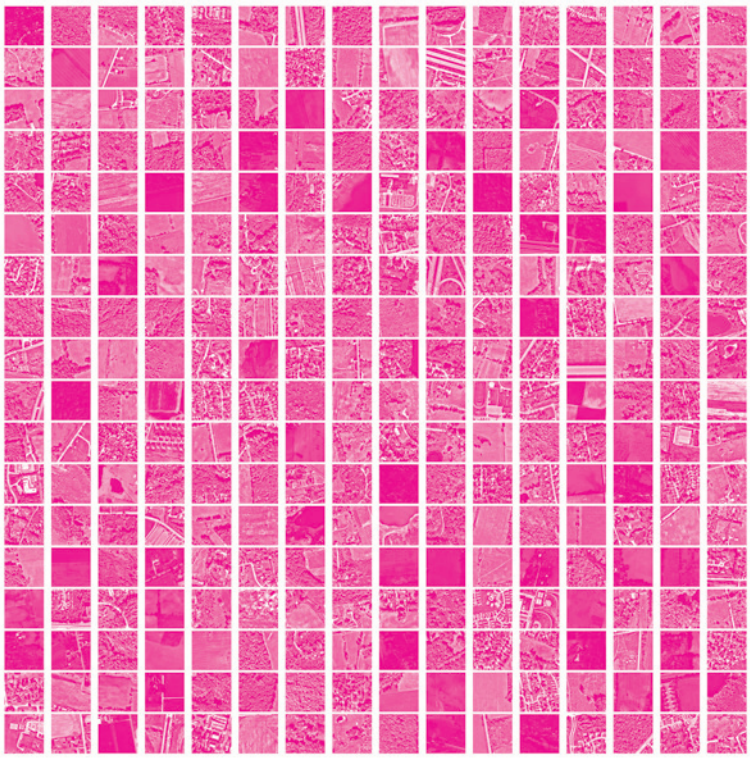
For example, how do you use machine vision techniques that they have been exploring for years now? How do you use that as a design method for architecture? It was new for Robotics that somebody would use their methods as basis for architecture design. They are extremely supportive! I mean they funded students from Robotics to come over to our school, and teach our students how to code neural networks—there is a very close collaboration. That collaboration was expanded to computer science. They have one of the major experts in the world regarding 3D models and neural networks, Justin Johnson. I think that U-M is in a very unique position, at the moment, in terms of research

on architecture and AI. I don't think any other school in the world has such a strong interdisciplinary team working on that problem. We are in the pole position, so to speak, of that sort of research. And now we need to continue to push further, and write more papers, make more publications, make those networks work, and get more data. This is now the usual wheel of running a laboratory, but also, I think this is the first laboratory dedicated exclusively to the research of AI and Architecture. I don't think there is another one at the moment. I am sure there are going to be more labs of this kind in the near future. But right now it's the only one.

D35: Can you tell us more about the conversation to construct the Robot Garden at the Ford Robotics Building? Can you tell us about the technical process and the measures that were involved in the whole design process of that project?

MdC: I am pretty sure it is probably the first built project that used DeepDreaming and style transfers as a design method. Robotics was already building the new building and they wanted to have a testing ground for their robots. The director of Robotics, Jessy Grizzle, came out with the idea and said, "You all have been working with all of these methods derived from our machine vision techniques. It would be super interesting to have that as an example on our site." I jokingly told him after a while when we were working on the project that this is going to be the first project that is designed by robots for robots.

We conducted a series of experiments using first DeepDreaming, meaning that we created data sets of fountains, stairs, arches, and a variety architectural features. We then took a satellite image of the site and DeepDreamed those features onto the site. It was an interesting experiment. Some images are successful and some images are absolutely useless. But the useless ones are actually the more interesting ones, to be honest with you, because they are really showing what machines understand from architecture and how they interpret it on a site. I mean it didn't look like arches, or steps, or anything. It was strange and I like strange. And then in a second approach, we used style transfer where we basically collected a variety of different ground conditions because they needed different ground conditions for the garden. Meaning it had to have sand, gravel, rocks, earth, and so on because they wanted to test their robots on different grounds. Another condition was that it had to have steps. In robotics they have the famous last 100-step problem, which means if, for example, they really wanted to go ahead and have robots deliver goods to your home, then the last 100 steps from the car or from the car to your doorstep is very challenging because there are always different grounds. Sometimes steps are involved, and sometimes not—sometimes the walkway is gravel, or cobblestone, or pavement. So that's like one of



The Robot Garden
Aerial Terrain Data Set

the most challenging aspects for robotics. And the garden was supposed to have a variety of different steps. Longer steps, shorter steps, higher steps, and lower steps. That's why you see so many different steps in that Robot Garden fountain. The idea with the fountain, which was DeepDreamed into that project, came because of one of the demands or ideas from the roboticists. They wanted to test the robots on wet ground. So what we did was we created a pool on top of the steps—when you turn on the water, it can cascade over the steps. The water can go over all of the steps and flow onto the ground. I am super curious whether they're going to do this in winter if it's cold enough! We also talked about the possibility that they could freeze over the entire garden, let the water flow over it, create these icy surfaces, and see if the robots can run over them.

But back to the design method, it was entirely created with these two methods: DeepDreaming and style transferring. And then as mentioned, I think this is the first project that got built that really applied these methods.

D35: And what do you apply to these two main methods? What kind of projects are best for these two methods of design?

MdC: I think every kind of project could use these methods of design. I don't see any restrictions. I mean I had students designing single family housing project with these methods. I have students that designed museums. I had one student design a high-rise office building. One of the cooler things about this whole tendency toward neural networks is that it's not restricting it to any sort of function or program. And it's not even stylistically restricted to because it's so much dependent on your own sensibility, so to speak, and the data set that you select. This is particularly interesting because it means that it is not a recipe. It's not defining a style, it doesn't have those rules sets. What I am working on is more akin to, "Here is a neural network. It can do super exciting things if you feed it accordingly." It's then up to you as a designer, by selecting a particular data set, can steer the design a little bit, even though you're not going to influence the final result entirely. So again, there is this whole idea of bottom-up design methods. It's not me imposing a top-down design idea. It's like a discovery. Really like an expedition. It's like an expedition into these territories of architecture. There are large white spots in this territory and this map. You go in there with your neural network and try to figure out what those white spots on the landscape mean and what they could mean in a large map of contemporary architecture.

I'm super excited about that because these new methods demand pushing the envelope of what architecture can do. Now we have a tool set that really questions a lot of how we design and what to do. Even though I admit that the first years of our research was particularly about morphologies and aesthetics, I think that the next step that is basically how to use those in a more pragmatic role. How do you design structures or structural forces within a building with that method? Or surface conditions, material consumption, energy consumption? All of those things are data—meaning we can definitely work with them.

D35: Well, I have to bring it up because you kind of started touching on this. But I think that there is a lot of apprehension again, like external apprehension from outside the field when you start constructing data sets, like the biases that exist.

What I'm hearing from you is that in addressing that issue, you're saying it's up to the designer to curate those data sets and guide that expedition as you're describing it towards a more desirable outcome, that you don't just leave it up to these neural networks to decide the outcome. Does that sound accurate to you?

MdC: I mean at the end of the day, a lot of people think that AI does everything on its own, but that's not the case. You definitely steer it with certain tools, one being the data sets and the other one being the form of training. But to your point about data bias, which of course is a

very important point: the way data sets get collected today is highly problematic. If you think about, for example, large—really, really, really big Internet companies, social media companies—I'm not going to say names. You know who I'm talking about. They basically collect your data on a daily basis because when you signed up to that social network, you signed a little contract and that contract basically says that everything you upload there is their property. So they can, without asking you, take all your images, take everything, they can track you of course, so they know of course exactly where you're going, at what time, and so on. That's why you get targeted commercials and you're wondering, "Hey. Why is that coming up right now? I was just thinking about it." No, you were not thinking about it. You probably were talking about it at some point. So yeah, it can be used in malicious ways. Let's be honest. It's just the way it is. The only way to get out of that is when you build your own data sets and it is hard work, it takes time, it is not that easy. It would be easier to just scrape the Internet for the information we need. But that's again where you are doing things that are ethically questionable.

It's a big question where to draw the line. For which kind of research is it okay to scrape? For example, if you're doing medical research and you need millions of data points about breast cancer and you found a method on how to scrape them from the Internet. Is this morally okay because it's going to benefit cancer research? I would probably argue yes. If it's a benefit to the larger society, I think that scraping might be a method that is possible. But if it's about creating a new filter for any one of those social network things; if it's about creating a new funny filter and you're scraping millions of images to be able to track the facial features properly, do we need that?

D35: No. I'm inclined to say we don't.

MdC: By the way, every single time you are using one of those filters, that actually is funnily putting things on your face with the help of augmented reality, it's also scanning your face—guess in which data set this is going. Just saying.

D35: We're almost done here. Last, but not least, what do you hope to achieve or gain from your experience at Taubman and the research journey that you have had so far?

MdC: Well, I think I am going to be very egoistic here for a moment. I think that one of the things I tried to achieve is, of course, to push forward my own architecture. How can I continue the trajectory that I have chosen for my career, which is basically informing my art and my architecture through technological means and understanding how they culturally impact me and others. So if it helps me to push that forward, then that is an achievement for me. Furthermore, if I can change the minds of some other people thinking about architecture, even if it's only one or two people, I am happy with that. If I can somehow inform our community of architects or the discipline at large about the technological means that are on our hands right now that we need to work through including not only the technical problems, but also the philosophical and ethical problems, I think this is a very interesting territory. So, if in some way or form, I am able to shape that conversation, then that would be an achievement. I'm not sure if this is going to happen. I am always suspicious about people proclaiming things very quickly because those things need time. But, if I can, at least, somehow imprint the conversation on AI and Architecture in some way, shape, or form, that would be not only a success for me, but that would be a success for Taubman College.

D35: We definitely hope so and it will definitely happen. Thank you very much. This was really insightful. I think every time we have a conversation, there is so much to learn, so much to think about, especially as a student, there's so much there to really process and consider in architecture.

Craig Borum, FAIA, is a professor of architecture at the University of Michigan's Taubman College of Architecture and Urban Planning. He is the 1996–1997 Walter B. Sanders Fellow at the University of Michigan. Professor Borum teaches design and coordinates the required construction courses for both the graduate and undergraduate degree programs.

Borum is also the founding principal of PLY+ architecture, urbanism, design, in partnership with associate professor Jen Maigret. In 2021, PLY+ was one of eight firms awarded the Architectural League of New York's Emerging Voices, as well as an honorable mention in the Architect's Newspaper's Best in Practice Award.

De Peter Yi is an educator, designer, and architect. He is the 2018–2019 Walter B. Sanders Fellow at the University of Michigan. Along with Laura Peterson, Yi is also the co-founder of the research and design practice 1+1+. His work finds design agency at the intersection of formal and social forces, from the scale of the detail to the scale of the urban environment and beyond. Yi has explored these ideas through a long term research framework on housing and its relationship to urban and environmental systems, building technologies, and design representation. Currently, he is cultivating a research project called Moving Rooms, a study of the evolving relationship between the private room and urban space through marginalized housing typologies.

IN CONVERSATION: CRAIG BORUM + DE PETER YI

House P
PLY+

With the absence of Taubman College's fellows program last year, Dimensions saw the pause as an opportunity to invite former fellows to reflect on the evolving pedagogy of the school and the design discipline.

This first conversation with Craig Borum and De Peter Yi focuses on the evolving atmosphere for innovation in architecture and its impact on Taubman College's development. The conversation traces the growth of technology, building materials and methods from the beginnings of the fellowship program to now.

D35: We are going to discuss the evolution of architecture at Taubman, career trajectory, and fellowship experience. We will conclude our conversation hopefully with a discussion about the future of the school's pedagogy in relation to fellows' evolving interest in research.

I will start with the first question to open up the conversation: How would you describe your fellowship experience in relation to the next professional step that followed? And I want to emphasize while we were doing our research, we noticed that Craig started his practice in 1999, two years after the fellowship. So we would be interested to know how the experience assisted you in developing your attitude towards teaching and practicing in the industry.

CB: For me, the fellowship had a great impact on how I had imagined my career unfolding. I came directly from graduate school, but I also had already practiced quite a bit by the time I went to graduate school and already had my architectural license. I was thinking that I was probably, very simply, just going to return to practice at the completion of my Masters. But then in graduate school, the opportunity came to teach as a student instructor and I got excited by it. The fellowship was kind of that next step, the fellowship itself was kind of an extension of my graduate school experience. It really was my first teaching experience beyond what I had done as a student assistant. And it was really transformative in the way that I viewed what I wanted to do and what I wanted to be when I grew up. My thinking was purely in terms of practice up until that point and then really treating the fellowship as an extension of my education. I think in that beginning, I wasn't certain that teaching was going to be something I wanted to do. But it was something I was excited about and wanted to explore. And it just continued from there. The stimulation of my colleagues, Lisa Iwamoto, was the other fellow and there were only two of us that year, and her partner, Craig Scott, was also here, some of the junior faculty that were here: Jason Young, Robert Levit, all of those guys have gone on to other schools, but they were really instrumental in shaping both what I did as a teacher and what I was doing as a designer at the same time. I just couldn't imagine stepping away from this at that point. And so I ended up on the tenure track and that trajectory that has taken me all the way to this point.

DPY: That's great to hear about your experience, Craig, because a lot of my experience parallels yours. I like to see each stage of my career as akin to pursuing a new degree. Studio Gang, where I worked for four years, has a strong ethos of thinking about architecture as a socially and environmentally engaged practice. I interacted with my coworkers very much like how you interact with classmates in school, as much of the learning comes from dialogue with your classmates. I have also been teaching for four years, so it's feeling like I've never left the rhythm of learning and growth established by being in school.

I also try to divide my own work into two spheres of influence that might inform each other. One example could be simultaneously working in academia and practice. Even when I was in practice at Studio Gang, I continued to work on my graduate thesis research and was developing that into a book. It not only allowed me to work in ways that I couldn't while at an office, but it also allowed me to critically evaluate the activities of architectural practice, because whatever you are working on also generates immersion in a world inhabited by the people that you talk to, the clients that you work with. In turn, they create and support a version of what architecture constitutes. Working on research and the book opened up the possibility of collaboration with others that had different conceptions of what architecture could be. These included graphic designers, an art historian, and various editors. This process led nicely to my application for the Michigan Fellowship where I felt I had learned enough in practice and had learned enough through this experience of working on a book where I could contribute a new perspective by coming back to Michigan.

In keeping with this idea of working in two ways at once, at the same time I started my

fellowship in 2018, I began collaborating with my former classmate, Laura Peterson. We started by finding opportunities to work on projects that we both found interesting or aligned with our research interests and goals in some way. Eventually, this became a practice that we call 1+1+, which suggests that our practice is an open-ended equation constantly being reshaped, but in a measured and intentional way.

D35: It is very interesting how you, Peter, talk about your interest and your work today and relating it to the fellowship. When we were looking at both your career trajectories and current work, we selected a distinctive area of interest or a presentation. For example, Peter, your work tends to use a lot of collages, text, and color while Craig focuses on this way of constructive design.

So, how would you reflect on your work as a group both of you, as a group of individuals in the context of the fellowship across time?

CB: That's a good question, and framing it through the digital is a little bit challenging—it's hard to put that in the context of the fellowship for me. When I arrived as a fellow, I had never drawn on the computer. There were no fabrication tools here at Michigan. I think it wasn't even until three or four years after I started teaching that we got our first laser cutter. Then, probably another four or five years before the first CNC machine arrived, not to even mention the incredible resources we have here now. I mean who even knew anything about robots in architecture at that point? That was just something that kind of evolved in my own practice through being here at Taubman. I would say that was definitely an influence that wouldn't have happened had I not been here, the kind of relationship to technology and the relationship to have access to machines that were not accessible through practice at that point. They just were not widely known or accepted. There were practices that were beginning to explore fabrication in the late '90s, but they were pretty rare and either forward-thinking practices or they were kind of ensconced within specific sites within the academy. So for me, the development of the digital was for sure a post-fellowship kind of moment. It's interesting to track that trajectory. I think about fellows across the years in waves of pre-digital, digital, and even post-digital emphasis, with the individuals who came as fellows each year greatly impacting the way, I think, the school—the way those things play out in the school. And that's always been the super exciting thing about the fellowship—that every year there is an influx of new ideas, of almost a kind of new bibliography that comes with the fellows that you begin to—even for someone having been here for a long time—the horizons are continually expanded. You're hearing fresh thoughts, fresh ideas, fresh approaches and that's invigorating as a faculty member. It definitely influences our own work, I think it's just the exposure, proximity, and visibility of the work. We all absorb it in different ways, and I think it all affects us in different ways. But for sure, it's a huge part of the value of that program here.

D35: We were definitely able to pick up on it when we were looking at each one of your works, so it's very interesting.

CB: I think in the beginning for me in my practice, when those tools were starting to become accessible, we really were actually thinking of the projects we had as almost excuses to find reasons to use them, to deploy them, and really the projects were kind of alibis for the skill building that we were doing. I think it took a while for me in my own approach for the work to start to realize that the project wasn't about the tool, but the tool was at the service of the project. And that shift for me is probably over the last ten years, I'd say, where the digital is now just one of our tools. It's not really a driver of how I think about my practice and the way that I work and produce work or produce buildings. I do think very much about how those things affect our processes, but I'd say I don't begin work with a preconceived notion of the tool that I'm going to deploy, where probably in the beginning, that was more the case. Like, "Okay, we've got this CNC machine. What are we going to do with it? What are the steps we can put a project through or what can we do with material in relation to that tool that produces the

aesthetic of the project?" At that point the project itself and the story of use, occupation, and the client's desires were all secondary to that in our early work.

D35: For you, Peter, by 2018 we know there has been a lot of digital that came up at Taubman. How could you relate to what Craig just has said in terms of that?

DPY: I'm intrigued by how you framed your question and Craig's response because it reminds me of how architecture is an ongoing conversation that one tries to find a place within. That's how you begin to define a project. And then there are moments and opportunities where you find or are given the tools to shape that conversation. Being a fellow is one of those moments where you're brought in for a short but intense period of time and produce an exhibition and give a lecture. So if we think about it in those terms, when I came in as a fellow, I brought in my own voice and perspective and experiences. At the same time, one of the main conversations that was happening at Michigan and is still on-going has evolved around the question of post-digital representation and material experimentation. My work has become hybridized through that lens in a way that I find exciting and productive. I love to participate in conversations through my work, but also help shape that conversation. If you look deeper into the images that I make but also other faculty make, on surface level it might seem like we are all working with similar techniques or ideas. But beneath that surface there are differences in what we're trying to achieve with those techniques, the audiences we're speaking to, and the design agendas we have set forth.

My own design interests revolve around questions of housing, of typology, of quotidian

St. Mary Chapel
PLY+

spaces. I am interested in overlooked spaces that we haven't considered as deeply in our toolkits and sites of engagement, particularly in the academy. My work in representation imagines these spaces in surprising and illuminating ways that also empowers them as part of the ongoing conversation of architecture, which is demonstrated in my fellowship project that was published in Dimensions 33.

D35: Can you both highlight a time during your fellowship that was marked as a turning point for your thinking about architecture in what you have discussed?

CB: I think it's fluid in the way that Peter was describing it much earlier. There is a kind of development and a trajectory that we were on that probably, at least for me, there was not a watershed moment. It was more a sum of the entire experience and an opening awareness of the possibilities of what it meant to be an academic and have the opportunities that the university afforded me as a faculty member both in terms of the ability to step outside of the demands of practice and step outside of questions of budget and code and constructability and all of the things that we have to deal with every day in practice. So it was probably a slow awakening about how I could begin to imagine balancing these two worlds and try to straddle between running a practice, between participating in that and the collaborations and discussions that we have at the office, that Jen and I have, and that our crew were having on a daily basis, which are steeped in the minutia of code to the broader questions of like, "Where are we headed?" to making payroll, to be able to step out of that and run a studio that just says, "We're going to look really closely at just one room" or "We're going to take on thesis and how to structure the very questions that can be the foundation of a practice"—trying to step outside of the box of our own comfort zone and figure out how do we build outside of the constraints of the every day in order to inform that every day later on. So, it was probably not so much a single moment, but a kind of an accumulation of experiences, encounters, and conversations, and work.

DPY: I agree with Craig. I don't think I had a turning point because of how everything in architecture builds on what comes before. However there is a seed, starting point of sorts, and for me that actually goes all the way back to my experiences growing up. My family immigrated to the United States when I was six. And we were always in precarious financial situations and moved around a lot. I lived in seven different towns before I entered high school. And we never owned a house. We always lived in low-income apartments and at one point a student cooperative because my father had to go back to school and get another degree. We also coinhabited with relatives. I consider these marginalized environments that don't appear to have the design intent that we typically associate with architecture. For me, these environments actually embody a great deal of impactful space and form-making, whether intentional or unintentional. My subsequent work has allowed me to return to these experiences to understand what impacted me and my family so deeply and how I can direct this knowledge toward the work on housing I am doing now. There is probably a seed or a starting point for everyone. Your question also made me think of the pandemic, which of course was a huge moment of change and reckoning for all of us for many reasons. Reflecting back, the pandemic has also been less of a turning point but rather a moment where I found new purpose for my work on housing and representation. At a more collective scale, the pandemic necessitated a critical rethinking and evolution of the ways we talk about, think about, and work on architecture together.

D35: That's great to hear how the intersections of the pandemic have influenced a lot of how we look at things. So Peter, you mentioned earlier that the fellowship allowed for critical examinations of your work. Could you explain how the fellowship enabled those examinations. And then twofold, could you reflect on your contributions as a fellow to Taubman specifically in terms of your work and your teaching as well?

DPY: Both parts of your question relate to this idea of self-reflection. I believe I

have contributed to Taubman by trying to bring together many threads of knowledge pursued by Taubman faculty and students through my own work on housing. In particular, I've defined projects that blend experimentation with representation alongside engaged design, particularly in Detroit. Along with Laura, I've also contributed to ideas of bridging academia and practice, which has a long history here at Taubman, exemplified not only by Craig and Jen's office but also by many other faculty members who also have practices. At times I see myself adopting the role of a curator, invested in drawing relationships between the disparate forces that shape architecture. Recently I've been asking myself, "What is a coherent architecture, and can it be simultaneously less than and more than a building?" This is related to my work on housing that starts from conventional understandings of typology, but then moves into more nimble methods of inquiry that bring in my particular interest in change over time.

In regards to how the fellowship has allowed for a critical examination of my own work, it's more interesting to look at the fellowship structure as a whole. The fellowship model at Michigan becomes even more impressive when you compare it to other institutions. There's very few schools that have this constant renewal of voices that not only bring in additional perspectives on a topic, but might have actually created counter positions. I have experienced all sides of the fellowship because I was a student at one point admiring the fellowship program, and then I was a fellow, and now I am a former fellow admiring the work of fellows that are coming in now. The critical examination you speak of comes from being confident enough in one's own viewpoint and position to accommodate new ideas fellows are bringing in. The fellowship program sets up an incredibly valuable structure of constant questioning but also strengthening of one's work.

D35: And Craig, from an alternative perspective with a 20/20 vision, if you will, how would you see the fellowship as an examination of, or I guess as a point of reference for, your work and additionally your contributions via that experience to the college?

CB: That's a big question. I think there are many challenges throughout our discipline. In practice, the thing everyone forgets or doesn't recognize is that you don't always get to pick your projects. The phone rings and this week we're doing a chapel. The phone rings next week and we're doing an animal shelter. They are kind of strings of episodes in a way. And I think the biggest challenge of practice is finding the thread between those. How do you step outside of all of the immediate constraints, and requirements, and desires, and different forces that are pulling you in all of these different directions in developing a project. Finding ways of constructing a project, I think, is the biggest challenge of practice. The fellowship and the opportunities afforded through my role on the faculty have provided me the space to work on that. When I interviewed for the fellowship, I realized that my graduate school experience was actually kind of like that. I had a studio with this professor, I had a studio with that professor, one we were really looking closely at furniture detailing and then another we were looking at cubist collages. And you completely enmesh yourself into those moments. You're pulling your seminar work together and trying to think about what you're reading in relation to what you're drawing, and what you're trying to do, and where it's trying to go.

And the funny story is that when they asked me to come and interview for the fellowship, I thought I was going to sit at a table with my portfolio like every other interview that I had had before at every firm that I worked for before where you sit and you flip through your portfolio and explain project after project. And I think it was about a week before I came that the person, who at that time had the job of Laura Brown, called and said, "How many projectors do you need?" And I was like, "What do I need projectors for?"

And I realized that I would be basically doing a lecture. I would need to figure out how to present all of these discrete projects in a cohesive way that made sense. It was the realization that you have to string all of those different

How to Build Our Own Living Structures
Peter Yi

projects together again as well as project that into the future as a way to say, “This is what I am going to do if I come here.” It laid bare the problem of how to structure a design practice through all of the random things that come at you and maintain a set of questions or a set of interests that you’re trying to work on through that? I’d say the same thing over my trajectory as a teacher, which has changed from the courses that I have taught to the kinds of studios that I have run, as the role that I have had within the school has evolved. It’s changed, and it’s changed with my own experiences and my own interests as well as sometimes just feeling the need of working on things that might, in my corner of the world, feel like the school might be lacking. I wanted to build on something that I felt wasn’t quite present or wasn’t quite being addressed explicitly. And so I think it’s hard to say, “This is my contribution to the college over the last 25 years,” but I think that what I have tried to do is always bring some relationship to the practice that I was engaged with at the time into what I was teaching and vice versa. Try to let what we were talking about in the studio or talking about in my seminars influence what we’re doing in the office. I know this conversation is about the fellowship, but I think the questions here are really just about what it means to be a teacher. And particularly a teacher in our discipline where practice and teaching get intertwined, at least from my perspective as a design faculty. I think those are really the questions for me that the fellowship initiated. It’s hard for me to package things like, “This is what the fellowship was” versus like, “This is what I have just been doing.” I don’t know if that’s a way of avoiding your question or not.

D35: How do you see Taubman’s pedagogy evolving with respect to fellows’ research and interests, especially as they relate to technology and constructive innovation that we already talked about in this class? I know Peter had mentioned that during Covid that was reinforced more. Do you see that we students will be able to work more or continue to work on physical models, hand drawing, and really explore things and get

hands on things furthermore or would that be less explored at Taubman, considering all of the technology we have today?

CB: Yeah, a great question. I think it's one that I am grappling with right now. I am on sabbatical. I am not teaching. We're really lucky to have these every now and then. I am taking it right now as a kind of moment to step back and reflect on what I want to do as a teacher next or what I think is the next kind of area of interest and what I want to develop and in relation to where we are at the particular moment in time. Some of it is pandemic related, but I think the pandemic just laid bare a number of things for us in terms of assumptions about how we needed to operate and challenged those. There are broader questions that are at play about social justice and equity, and about the environment, about the way that we build and the impact that it has on the world. I know Jen and I are talking really explicitly about the practice and how we're thinking about trying to shift the practice, and kind of nudge it in a new direction. It's grown quite a bit in the last seven or eight years and we have been really fortunate, but we are also at a kind of moment where I think we can reflect on the practice. We're lucky to have those moments. I don't have a really great answer for you like what's next, what's the big next thing, and how pedagogy is going to change. We've just gone through a remarkable transformation that the pandemic has forced upon us in relation to where we are. We're sitting here on Zoom still even though we probably could have done this in a classroom. There are pre-pandemic modes of working that we're not going to return to.

There are things that we will continue to use like the suite of collaborative tools. We're using Miro and Zoom in the office just as much as I'm doing it in the studio. Some of those logistical things have transformed for the better. I don't think we have enough distance from that to know yet exactly what that's going to mean long-term. For sure it's shortening the distance between things. We can be anywhere in the world and still participate. We can open the conversation up and think even more broadly because of that as well. I am thinking of just very simple reviews, and reviewers, and different ways that we can engage with others in our classrooms, that we're not limited to just what's here in Ann Arbor anymore or what we can afford to fly in. Those are great moments when we have reviewers that are coming in and bringing new opinions, and new voices, and new perspectives. I think we're experiencing a kind of shift in that mode now. But I have a break from all of that with my sabbatical, I am just doing some side projects. I have rented a small shop. I am working with tools, I am making physical things. And I don't know if that's because of the pandemic or just because I am just needing the physicality of it. But I for sure saw some models happening last semester up in school that I was super excited by and super pleased by after a year and a half of nothing but Zoom.

What do you think, Peter?

DPY: For me it's not necessarily about a dichotomy between the digital and the physical. It's more about how you use the tools and technologies that are available to you at any moment in time. Even in today's world of creating buzz around innovation, ideas and methods persist for much longer than we think, reappearing in different forms. The faculty at Taubman are really good at reorienting tools and methods, whether they are digital or physical, through an intellectual lens. The discoveries are then directed towards doing things better, or to more effectively work on issues that are urgent in our societies today.

Taubman is a really big school. It's great for students that there are many different perspectives here. And just as an example, what the faculty in the FABLab and the MS-DMT program are doing with robots, algorithms, and material experimentation is incredible and defies any categorizations of the digital or the physical. And that's just one area of work out of many that collectively makes our college unique but also dynamic and messy in a productive way. As a student, you can curate what skills you pick up and what you take away that applies to your own voice.

D35: I think you already talked about this and touched on this, in terms of the future pedagogy, where would you like to see Taubman headed, or where do you see Taubman headed, and how do you hope to see fellows factoring in to the future of the college and the discipline as a whole?

CB: What do you want to teach next, Peter?

DPY: It's funny that you mention that, Craig, because while the question takes aim at the big picture, long term goals are often carried out through everyday minutiae. For example, my goals are advanced through questions such as: "Well, what course am I going to teach next year? And what is the next grant that I am going to apply for? And what is the next project that will come rolling into the office?" So it does go back to Craig's earlier point and something that has taken me a long time to realize, which is that it's not all within your control. It's also about taking things and circumstances that are given to you and reshaping and curating that into a project that you continuously make better and stronger. Regarding the future of the fellowship, it's a similar answer. Change is happening incrementally but also profoundly with the perspectives the new fellows are bringing in. We could just look at what Leah, Adam, Kevin, Anna, and other fellows are working on, how they are going about it, and the audiences they're engaging to get a clearer picture of the future.

D35: Very interesting.

CB: Very well said. I agree very much with Peter's take on it. I think really too—I think the closest gauge for us to begin to project that next kind of phase of Taubman, I think Peter's incredibly astute in thinking, "Let's look at what the fellows are doing right now. Let's look at this crop that just came in and interviewed. What are the issues that are important there?" Those are the issues that are going to drive the next transformation here at Taubman.

D35: Well, thank you very much for your participation. This was really great and a very insightful conversation. It's really interesting to see the progress and the development of your experience from the fellowship to this day from teaching and the practice. We really appreciate it. Thank you, Craig. Thank you, Peter.

Banner Building Reuse
Peter Yi

Glenn Wilcox is an associate professor of architecture at Taubman College where he was the 1999–2000 Muschenheim Fellow. He teaches courses in architectural design, generative design computing, and digital fabrication. His research agenda focuses on the production of architecture as a technological and cultural artifact, with a specific interest in leveraging the power of computationally based design and numerically controlled machines towards new methodologies, materials, and systems of production.

Cyrus Peñarroyo is a Filipino-American designer and educator whose work examines the urbanity of the Internet—how networked technologies shape urbanization and how media spheres influence built environments. He is an assistant professor at Taubman College where he was the William Muschenheim Fellow in 2015. He is a partner in the Ann Arbor-based design practice EXTENTS.

Jacob Comerci is a designer and educator. He is the 2019–2020 William Muschenheim Fellow at Taubman College. He received a Master of Architecture from Princeton University and a Bachelor of Science in Architecture from the University of Illinois at Chicago. While at Princeton, he was awarded the Howard Crosby Butler Traveling Fellowship where he studied building groups in Berlin as well as the Suzanne Kolarik Underwood Thesis Prize for excellence in design. He has previously worked with Bureau Spectacular in Chicago and Los Angeles and with MOS Architects and LTL Architects in New York.

IN CONVERSATION: GLENN WILCOX + CYRUS PEÑARROYO + JACOB COMERCI

Practice, Product, Protocol
Jacob Comerci

In continuation with the first conversation on innovation in architecture, specifically through Taubman College's Fellowship Program, Dimensions 35 sat down with Jacob Comerci, Cyrus Peñarroyo, and Glenn Wilcox. The conversation reflects on the development of each fellows' research along with their career trajectories. We concluded with reflections on where they believe Taubman's pedagogy is headed, along with some of the fellows' new architectural interests that they continue to bring through their research.

D35: We are going to discuss how the evolution of architectural pedagogy at Taubman relates to your career trajectory and fellowship experience. We are hoping to conduct a conversation where the three of you reflect and compare your benefits from your experience through a set of questions that we will be asking throughout the meeting. We want to hear about your experience as a fellow across the years and we will then conclude our conversation with a discussion about the future of the school's pedagogy in relation to following your interest in research. I will start with the first question for Cyrus and Jacob. When the team was looking across your work and interests, we were interested to know about your current work and your ideologies of examining the urbanity of the Internet in the case of Cyrus.

CP: Yeah, as you mentioned, I work on the urbanity of the Internet: the social, political, and material relations cultivated by pervasive and networked computing. That phrase, "the urbanity of the Internet," is a result of questions that came up before and during my fellowship experience. I've always been interested in issues surrounding urbanism and digital media, and I saw the fellowship as an opportunity for me to further explore these topics and specify how they might expand my understanding of design.

D35: Was there a turning point or a specific studio that helped you raise these questions?

CP: Going all the way back to the period between my undergrad and graduate degrees, I moved to Hong Kong and worked as a research assistant on a project called Cities Without Ground. For seven months, I digitally modeled the city's publicly accessible spaces and expansive pedestrian infrastructure. I was hired by Adam Frampton, Clara Wong, and Jonathan Solomon who were living there at the time and trying to understand how this infrastructure produced a feeling of "groundlessness" that was unique to Hong Kong. When I was working for them and attempting to represent this complex urban network, I developed an interest in the interrelations between infrastructure, urbanism, and identity. My current work on the Internet and the social formations enabled by transnational networks stems from my time abroad trying to make sense of an elaborate system that combines top-down and bottom-up processes of development.

D35: And how do you relate the Internet to the constructive design of architecture?

CP: I think that there are a couple of ways in which the material enterprise of architecture intersects with the Internet. The Internet is sometimes discussed as immaterial or lacking physicality when, in reality, there's a lot of physical stuff required to make it function. A lot of that stuff ends up on top or inside of buildings, or in relation to buildings in some way. Additionally, when we describe online experiences, we often use spatial metaphors. With phrases like "cyberspace" or "chatrooms," for example, we turn to architecture (and how we've been conditioned to inhabit physical environments) to make the Internet more knowable. However, there aren't really "spaces" on the Internet, only representations of spaces that we access by using interfaces that have been designed around communication protocols. I'm interested in how the experiences afforded by these interfaces can expand how we design and engage our material surroundings. I believe that architecture is important to understanding the Internet's functionality and the subjectivities it fosters. I want to get beyond the spatial metaphors and see if the Internet is impacting design in other substantial ways.

D35: And for you, Jacob, when we looked at your career trajectory, we saw that you worked for a different interest in architectural firms. From working with those architectural firms to being a lecturer at Taubman right now. What are you exploring at the moment?

JC: I did work at interesting small architecture firms that were super influential, for better and worse. I think so did Cyrus, actually—he has quite a similar trajectory. My focus has since shifted quite a bit away

from the object and the artifact, towards a more holistic systems thinking. Moving towards systems and also moving toward a different audience that may have less access to design. So a lot of the work that I am doing these days is part of the U-M Public Design Corps, which is very different, and I would say it's a radical departure from the practices I was working at before and even from the fellowship work. The stuff is still there; it's just sort of a tumultuous couple of years that has reframed my trajectory.

D35: I believe so. It's very interesting to see the similarity between your work and Cyrus' work. That's what leads me to my next question for you, Glenn. How distinct is your work of digital design from Cyrus' and Jacob's, and do you see their work as a new interest that recently surfaced in the field of architecture or the pedagogy of Taubman?

GW: Well, I have to say I am not super familiar with their work, although I do understand what Cyrus is talking about in terms of the context of the work; the urbanity of the Internet and its relationship to actual physical space and something that he's thinking about now.

D35: Considering the fact that you had your fellowship from 1999–2000, we felt like there are many new interests and new ideologies brought by researchers and architecture students who want to develop that at Taubman. Do you feel there's a difference between your interest as a fellow in that time and then in comparison to Cyrus' and Jacob's, that to us seemed very different.

GW: Well, I would say on one level, my interest has in some sense always been the same even from when I was a grad student. It was always about the relationship between some form of technology and the production of physical artifacts, and me being directly involved in that production. I tend to always do things at a scale in which I am involved in their making because I enjoy it. That's the first thing. I am always interested in that dialogue between physical and digital production. The making could be something on a computer, but it doesn't necessarily have to be. It could be through other sorts of systems of production, but I would say since my fellowship, it's become much more involved in the physicalities of things, and I think it has to also do with place. We have access to incredible tools here. Not taking advantage of that would be a missed opportunity. I think a place plays some role in steering your interest. Not only the things, but also the people that are there. So I would say the culture of U-M, which includes Cyrus' and Jacob's work and a lot of people's work, influences you and tends to sort of steer you in different ways. One of the biggest things that I would say happened in that period from the fellowship to current day would be in 2005 I made a concerted effort to learn to code. I had done coding when I was a little kid, but I hadn't done it for a long time. I realized that I couldn't do what I wanted to do with the tools in the lab at a level that I wanted to do it. There were a lot of other types of work that I was interested in doing that weren't possible unless I learned code. I realized it was going to take me about five years to be at the level that I needed to be at. And then it became a big part of my teaching. Now I would say currently, I am kind of moving away from code a little bit. I still teach it, but I haven't used coding directly in my own work for a while. I've kind of gotten back into some other things. Then this past year, I started some really new directions that I'm really excited about but they don't involve coding. They could, but in the current stage, they don't.

D35: And what made you move away from coding recently?

GW: It was nothing intentional. It was just that I needed a break from it for a while. I put together a number of online classes, and one of them was an introduction to coding. It required a year of concerted effort to put that together. I think by the time I was done with that, I was kind of burned out on it. I didn't have the desire to sit down and code something new. It was too much a part of my pedagogy—I needed time off to go do something else just as a break from it. It's like any tool. I have a table saw in my garage. I don't use it every day, but I know I could use it. If I have a project in which I need to use it a lot, I'll go and use it. I think coding's

the same way. It's a kind of tool that is actually interesting—it's a tool which I can make tools with. So that makes it an interesting thing to have that I could always produce something in a project through writing or code if it necessitates it. Oftentimes, I think there's always a decision in a project where you move from manual modeling to coding because you can't just start with coding. You have to know the logic of what you're making to do it. So it requires a lot of manual work. So then you make a decision, "Do I put the time in to code this? Is it necessary?" Or do I make it, in a sense, manually in a digital model? So I'm always making those decisions. The stuff I am currently working on doesn't really necessitate it. It's sort of a series of one-offs. It doesn't have variation sort of built within it. It doesn't require a sort of system to produce it yet. It could, but doesn't.

JC: This is really interesting, because the transition from thinking about it as like early thoughts, it's directly related to what you're asking. Which is the transition from understanding the use of code in design as a thing in and of itself. Was there a moment when it was the novelty that made it such that you wanted to play versus maybe now—and this is the way I understand it. It's very much a tool. You use it when you need

An Urbanism of Stuff
Jacob Comerci

it, but it's everywhere. Code is everywhere.

GW: Yeah, and that's why I think it's important to teach it to my pedagogy because we're surrounded by this stuff and we should know a bit of the language. Design students should know at least a bit of the language to be able to do it if they want. To enter that world from where they can. Jacob, I think that there was a time, I could remember it pretty specifically, when I moved out of rewriting codes that I was given and editing them. There was one summer when I was just working every day on a code. I actually started to write my own, just sit down and write it. And that's when it got really interesting because I could write what I wanted, what I was thinking of. It became much easier. Then I could play a lot with it and then it became a much more interesting sort of tool in that respect. Then we did a whole series of projects that involved code, in minor ways and eventually in major ways. Probably the biggest one was the carbon fiber project, which really required a year to code to get it where I wanted it. Then it trailed off after that. I think after that it—well, then it went into focusing on pedagogy. "Okay, I understand the stuff. How can I communicate it clearly to a student? And then how can I communicate it clearly in a form like a MOOC where it has to have a really different type of clarity to it? What is that as a project to do that?" So that became my interest. I wasn't so interested in using it anymore, but I'm still teaching it and I can use it at any time. As you said, like now it's just a tool. Now you can say, "Oh, I could do that. I'll just write it up."

D35: Thank you, Glenn. The next question is kind of framed towards the three of you, although Glenn briefly talked about it in his previous response. That is reflecting on your fellowship experiences, how does your current research practice and teaching benefit from your experience and your time as a fellow? How has your fellowship project informed your teaching and research since you have conducted the fellowship project?

GW: I think that yeah, I kind of touched on it a bit. I mean I think the fellowships are a remarkable pedagogic experiment. I think it's very difficult to come out of a graduate program and go right into a tenure track. To get a tenure track job is difficult without what the fellowship provides you. The fellowship is not only the experience teaching, it allows you to try things out. Then also think about how that is intertwined with your own work because you're doing a project as you're doing it and those things are always sort of related. You're trying out ideas in your own work, but you're also trying them out in teaching. Having that year—and usually two years—to do those things is fantastic. It's such an opportunity to build yourself as a teacher and to build a body of related work that you can then start to look for tenure or other positions with. I think it's a necessary buffer. I think they often give the fellowship position to somebody who's overqualified. I think that it's a big mistake to give it to somebody that is really established in teaching because it's a waste of the position because somebody who could get a tenure track position doesn't really benefit from it as much. I think it's important to maintain that aspect of the fellowship. So for me, it made my career and it made my life to get the fellowship. I had to apply twice; I was shortlisted the first time and I applied again, refined my application, and put it in again. If I hadn't gotten it, I don't know if I would have pursued teaching if that didn't play out. I might have decided to do something else. So it's incredibly essential.

CP: Yeah, prior to doing the fellowship in 2015–2016, I had worked in New York for a couple of years. I found myself working at an office where the principals were all educators. I was asked to co-teach a studio with one of the principals at Columbia University GSAPP, and up until that point I hadn't taught a studio by myself. I think that being around practitioners who value the space of academia—the opportunities to collaborate with other researchers and students on questions about the built environment—made me want to return to an educational setting so soon after receiving my M.Arch degree. I graduated and thought that I was going to work professionally for a longer period. Then, I learned that I really enjoyed the conversations

SRFC_Play
Cyrus Peñarroyo

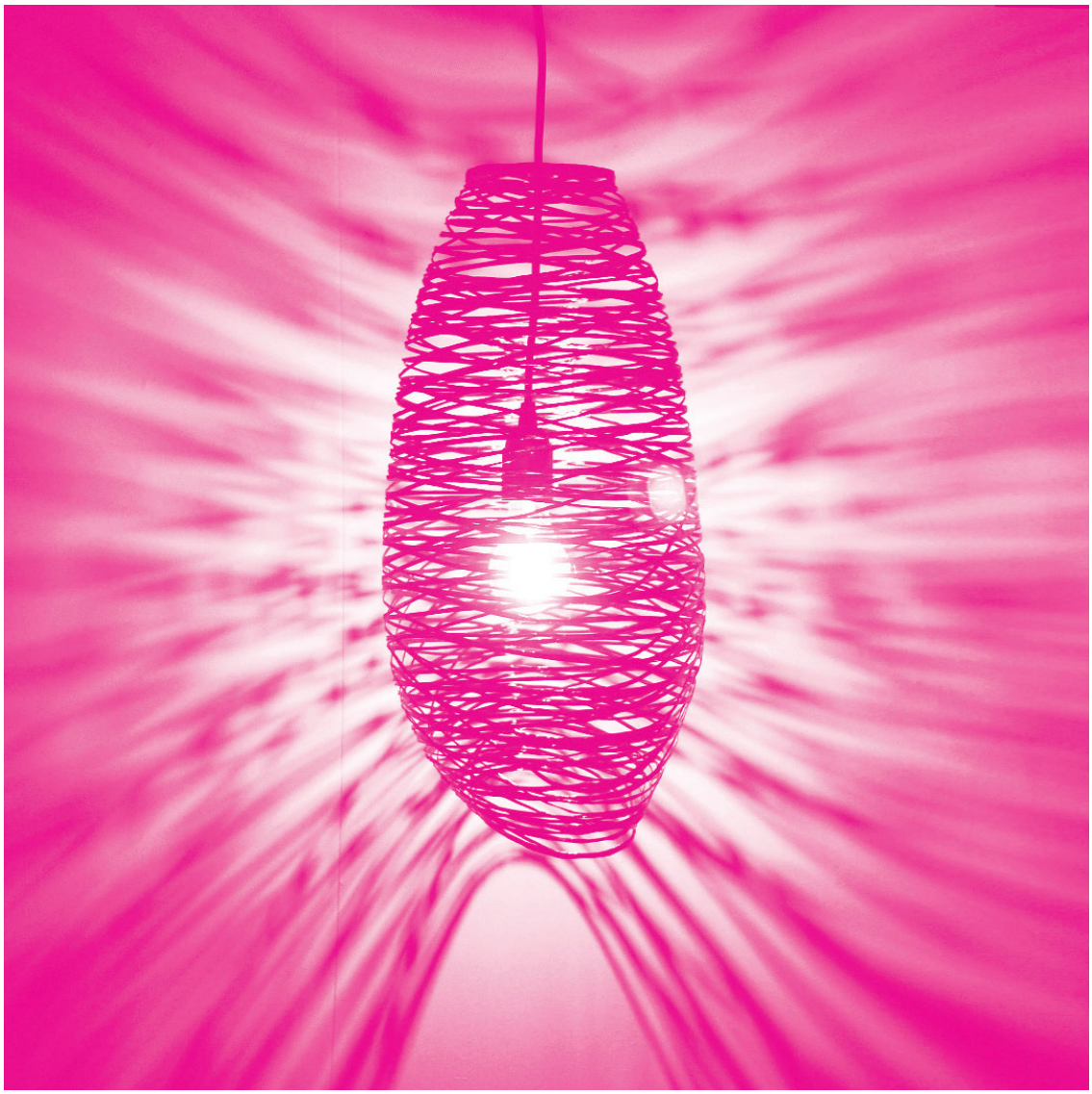
I was having with students at GSAPP and thought that I should maybe apply for a fellowship to see what it would be like to develop my own coursework around topics that I was beginning to work on through writing and design. A fellowship seemed like the perfect way to conduct research and determine if teaching was a potential career path that I wanted to pursue long-term. I had applied for the fellowship with a different project than what I ended with. My initial proposal was focused more on small-scale urban interventions but the project that I developed focused more on drawing, its status within contemporary image culture, and how to materialize qualities that seem inherently digital. Though it was a very different project than what I had proposed, it represented what I was more concerned with during that one year. Ultimately, I was grappling with two sets of interests and trying to figure out what to make of them. Since the fellowship, I continue to think about urbanism and media through different courses that I've been asked to teach as part of my tenure-track appointment. Alongside students, for instance, I'm examining how different sociomaterial relations enabled by the Internet resemble how cities operate. I'm also thinking about the circulation of architectural labor through vast and widely accessible digital networks and how all of our work is interconnected. The fellowship was helpful because it provided me with time to plant some seeds and see which ideas might grow and evolve over the years.

JC: I had the opportunity to teach an option studio during the second semester of my fellowship year. Glenn kind of hit on it already, but it's such a productive space. The content of the course was parallel to exactly what I was doing for my fellowship. Everybody understood that from the get-go. It's like, "We're kind of working on the same thing." The students really liked that. Some of them became my collaborators with the project and so it was a really special space where all of my mind was singularly focused on thinking about alternative models for collective living, and occupying existing real estate with interior architectures. I strongly agree with the idea that the fellowship is an amazing springboard, especially for people who don't have teaching experience. It's a shame for people who already have the leg up. This is an incredible opportunity for any

number of things: tenure track and having access to teach at such an amazing place. This fellowship course I have taken was critical for me and helped me shape my thinking and was a backboard for a lot of the work. I could throw the ball against what I was doing and students have given me ideas for the work I was doing.

D35: My next question is also directed to the three of you, which is: How much of the technological innovation that Glenn already mentioned a lot of interesting points about, offered by Taubman, has contributed to your research as a fellow?

GW: I was back here at a time when we didn't have all of these resources when I was a fellow. There was a lab, which was something very different. We didn't get the first CNC until it was 2003 or 2004 or something. When that happened, I was away for four years after my fellowship. I taught in Oregon and that's when Tom Buresh was here and started to bring in some of that equipment. It didn't really open up until Monica became dean and then there was all of this new stuff. I was working a lot with digital video and so I always had access to that equipment. When we started



Carbon Fiber Lights
Glenn Wilcox

to get laser cutters in the wood shop, that was interesting because I started to be able to play around with those. I believe I had it during the fellowship. I'd have to look back, but I remember when I left to go to Oregon, they had nothing. They had nothing to start with and I pushed to get a laser cutter, which was a big deal there. It was like a revolution because it was a very backwards-looking place. I got it there because of the impact of what was starting to happen at U-M in terms of the equipment. And you could see it. Everything was becoming more prevalent in terms of the digital tools that you had access to. Now it's amazing. Everything you want.

JC: I think the digital influence for me when coming to Taubman had less to do with the hardware available. I have a tremendous amount of respect for faculty like Glenn who have made Taubman College known for its computational design acumen. I also recognize my limitations and my ability to use these things with any degree of competence. I think the digital influence for me had more to do with the post-digital conversation, which was pretty thick when I got in. I think that influenced me in the constant refrain of, "We're already in the digital space immersed in the digital" and it pushed me outside of the boundaries of just the object and made me think more seriously about, for instance, a co-working company. Co-working companies sell space and objects, but they're also selling material services via subscription and in one kind of coherent package that's hardware and software. So thinking about how to integrate, the conversation that was happening at Taubman then still influenced my kind of expansion beyond making things discrete. How does this thing relate to this thing, to this space, to this group of people? How will people use this and how do we start measuring this?

CP: I think I'm maybe somewhere in the middle of what Glenn and Jacob are describing. I arrived at Taubman towards the beginning of a larger conversation about the "post-digital" and its influence on design. Since I had little to no experience using laser cutters, 3D printers, or CNC mills when I was in grad school, I knew that I wanted to learn how to use these machines during my fellowship. I engaged the technology at the school by attempting to make things that test the machine's limitations. For instance, I made drawings on wooden panels, scanned and imported the drawings into Photoshop, manipulated their qualities and turned them into new patterns, and milled those patterns into the original panels. While there's an efficiency to using a CNC machine, I was intrigued by material qualities that emerged from the inefficiencies of working across formats. This is a long way of saying that I was definitely interested in using the different fabrication technologies, and the processes that I developed then continue to inform my understanding of what Jacob is describing now as post-digital.

D35: Thank you. So transitioning from a fellowship or a fellow position to a more permanent faculty position in Glenn's case, a tenured professor, or a tenured track professor, or an academic. In Jacob's case, an academic innovation project manager and also a lecturer here for a couple years now. How do you see yourself differentiating your ways of contributing to the pedagogical and research discourse at Taubman College among both the faculties and the students if there are any differences between your time as a fellow and your position and your time now?

GW: Things change a lot when you go on tenure and then get tenured. I think the school decides to make a commitment to you. They don't like to hire people on tenure that they don't think can be tenured. And so they have confidence in you. But then also it's about you making a commitment to the school because your responsibilities change a lot on tenure track and then also tenure because you become more involved in shepherding people and also reviewing people through the tenure process. On tenure track you become committed in different ways because your responsibilities will be greater for things like coordinating studios or coordinating big required elective classes like fabrication, which I did for the first three or four years. I've done studios and coordinated studios at all different levels, working a lot in the 3G

Online/On-site
Cyrus Peñarroyo

program, and then what now has become a Situations studio that used to be a perimeter. So in my tenure track, I did quite a lot of service to the school as chair of the technology committee for a long time, I think six or seven years. Having that responsibility to coordinate is a really different approach to pedagogy. You have to think, depending on the studio or coordinated class, "How can I give individual faculty freedom to teach to their strengths, but within a coordinated framework?" You can draw on your own experience of being coordinated, what worked and what didn't. It's a bit of trying things out, to see what works and what doesn't. So it is very different from being a fellow. I think being a fellow, you're a bit freer to try things out. You do get opportunities. I think there's opportunities in tenure track to do that if you get an option studio or what's now become Propositions. It's not really coordinated, a thesis, you can sort of try other stuff out. It's also very interesting to do something that's really heavily coordinated. Like when the pandemic hit, our numbers in grad really dropped, but they went up in undergrad. McLain said, "We need people to teach in undergrad." And I hadn't taught UG1 in 15 years or something. I hadn't taught it since I taught at Oregon. I was like, "Sure, I'll try it." That's a very heavily coordinated thing. It was great. It was sort of refreshing to get away from being the director of something to having somebody give me structure. It happened to be my wife, so I agreed with her, luckily. It was a great experience. Then there's a whole other story after tenure. I think things evolve, too, where you actually go back to being able to try things out a bit more. You're free of the structure that you have to go through. That's my long-winded answer.

CP: Maybe to build on that, I have been coordinating M.Arch Thesis for the past three years. Thesis is different from other coordinated studios because the instructors have more freedom to run their sections as they wish. As the coordinator and in lieu of shared content, I organize discussions of student work by internal and external reviewers and try to promote cross-studio collaboration. Getting to advise students for the past six years has been a great way for me to test different research frameworks and to further develop ideas from my fellowship project.

Looking back, I was concerned with digital drawing, image circulation, and materiality. Throughout the years, I've led sections that were about image-making, data, media archeology, and, more recently, temporality. I'm interested in the culture of timekeeping because of the Internet's ability to synchronize us to a range of capitalist times, which is related to recent feelings of burnout due to constant interaction with computers and devices.
To some extent, Thesis can be viewed as a pre-fellowship experience for students aspiring to go into academia or pursue other research trajectories. Students have the chance to work on questions and topics that are important to them for a sustained period of time. In that sense, it's very similar to a fellowship because they are questioning how architecture operates in the world, how design is taught, and what issues are most important for architects to address. These are all things that students tend to grapple with leading up to graduation. I often draw from my own fellowship experience to help students orient themselves in their final year.

D35: Okay. So this last but not least, the final question to conclude the conversation is: How do you see the fellowship evolving in the future? And what contribution do you hope you can bring into Taubman's pedagogy?

GW: Well, I hope it continues in the future. I think for one, it was monopolized for a while by McMorrough.

House B
Glenn Wilcox

I think he was chair on it for some time. I don't agree with that. I think there should be a different group of people on that committee who make the decisions about fellowships. It should be mixed up every year. It should also include people like lecturers, tenured track faculty, and tenured faculty. It's important also for them to find ways that the tenure track faculty or whoever chairs it doesn't monopolize it and make all of the decisions about who they bring in. I served on that committee when Monica was dean and it was a fantastic experience. We brought in a lot of the faculty we have now. We brought in Thom, Ellie, Vivian, Rosalyne, Meredith, and Catie. I think I was on it for two years. It's a wonderful experience from both ends and I think it's important to keep it diverse both in terms of who we choose and then also who we put on that committee. It's important that we maintain a diversity of people to enrich the school. I think that's always the strength of this school is in its plurality. We have a huge faculty. It's a big school. What do we have like 13 thesis studios now or something?

CP: This year there are eight but I think next year there will be 12 and in the past there have been 12.

GW: Oh, because our numbers went down?

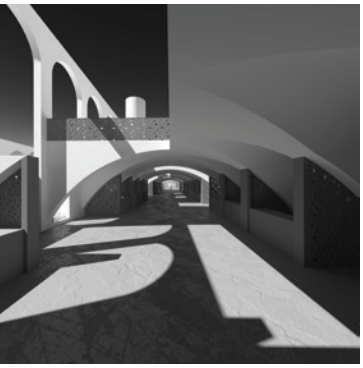
CP: Yeah.

GW: Yeah. And it's important that they're all a little different. Having the diversity within the fellowship, not only in terms of where people are from, and their race, gender, but also ideology and interests is just as important.

CP: Yeah, I completely agree. Looking forward, I hope that more applicants recognize that our fellowship program can accommodate their interests. For example, how the call for applications is written can affect the applicant pool. The call can convey our values as an institution and help potential applicants learn whether or not Taubman could be a place where they want to pursue their research. Last year, I was on a committee that was tasked with looking at our fellowship program and other fellowships across the country to understand the broader impact of these programs. It's interesting to look at how many educators and practitioners have been fellows (here or elsewhere), how important these opportunities have been to their careers, and what we as an institution could do to make our program more inclusive. All this to say that I hope we continue to reflect on the successes and shortcomings of the fellowship.

JC: The best part of the fellowship for me without any close second were my co-fellows. They were incredibly influential in my thinking. With regards to the diversification of the fellowship, one of my co-fellows was a Latvian with a very unique and outwardly Eastern European perspective on all things. White guy, yes, but ideologically, diverse. I think maintaining an international viewpoint by continuing to hire internationals is really important.

D35: That's an interesting point. Well, thank you very much, everyone, for joining. We really appreciate it. It was very interesting and insightful to navigate through all the questions with you guys. Thank you very much.



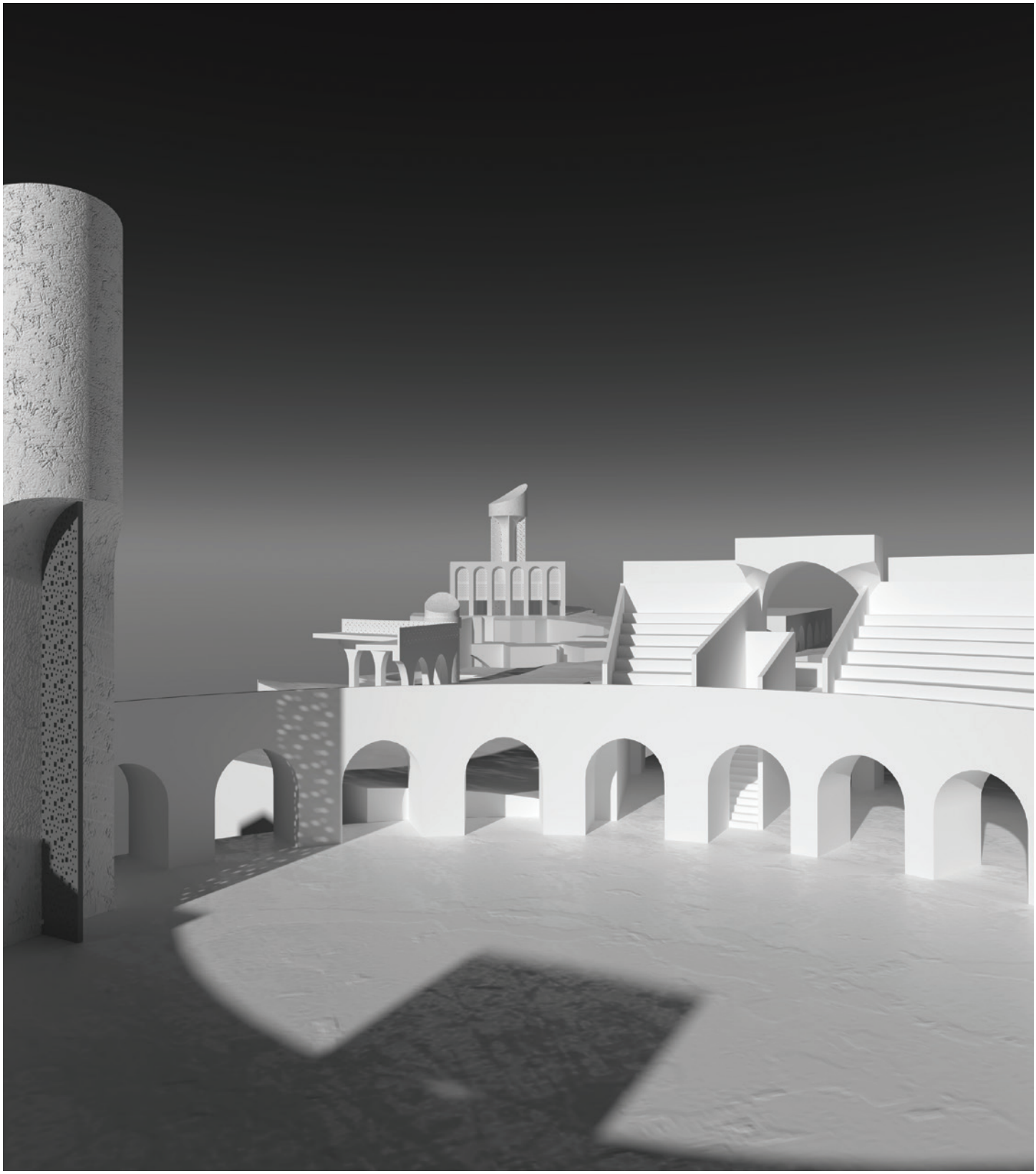
Colonialism is not a historic era, it's a system that continues to confront societies and cultures; one that obeys the logic of dominance and economic exploitation. Through the commodification of space —a process whereby land is subdivided and assigned economic value—colonialism is able to achieve complete control over space under its purview. This is architecturalized by the deployment of the grid, which, in its ability to organize bodies in space, materializes socioeconomic inequality and advances the desires of the few to retain dominion over the spaces they have commodified. Within societies plagued by systemic racism, existing socio-economic conflicts among populations are perpetuated through colonial logics that designate occupation and prescribe the need to be efficient in space. These systems not only enable but promote entitlement of some, creating a definition of who belongs, thus leaving marginalized groups completely unserved. The result is a system of oppression entrenched as law: loitering laws and entitled policing, such as stop and frisk or neighborhood watch, are promoted as methods of maintaining order and safety, but only ensure the suppression and endangerment of disenfranchised populations.

RESISTANCE THROUGH EXISTENCE

AN ATTITUDE FOR DECOLONIAL SPACE

BLAKE HARRIS + OSAMA SUKKAR

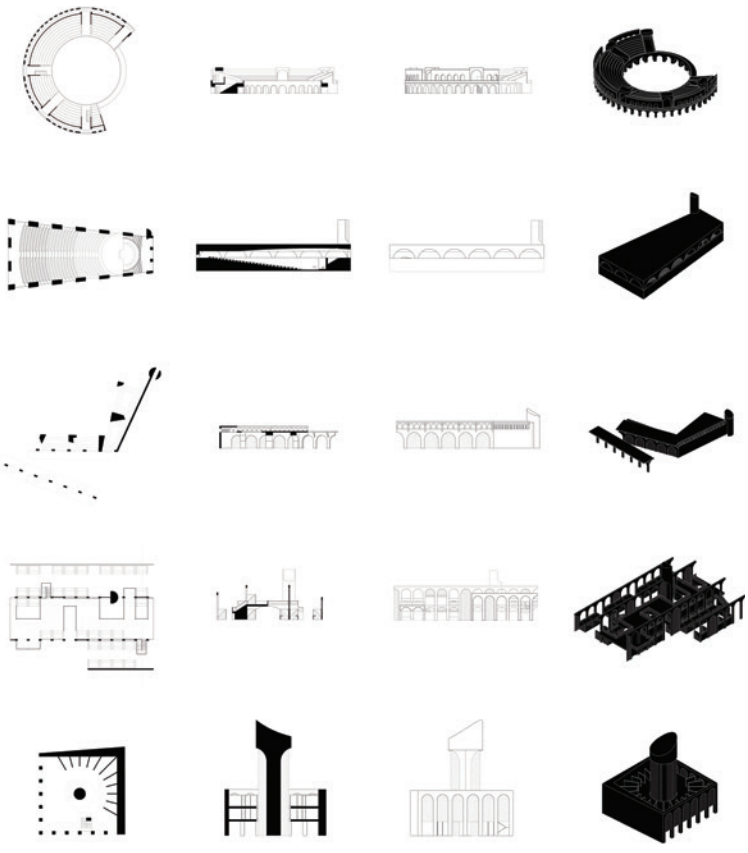
WALLENBERG CRITIC: EDUARDO MEDIERO

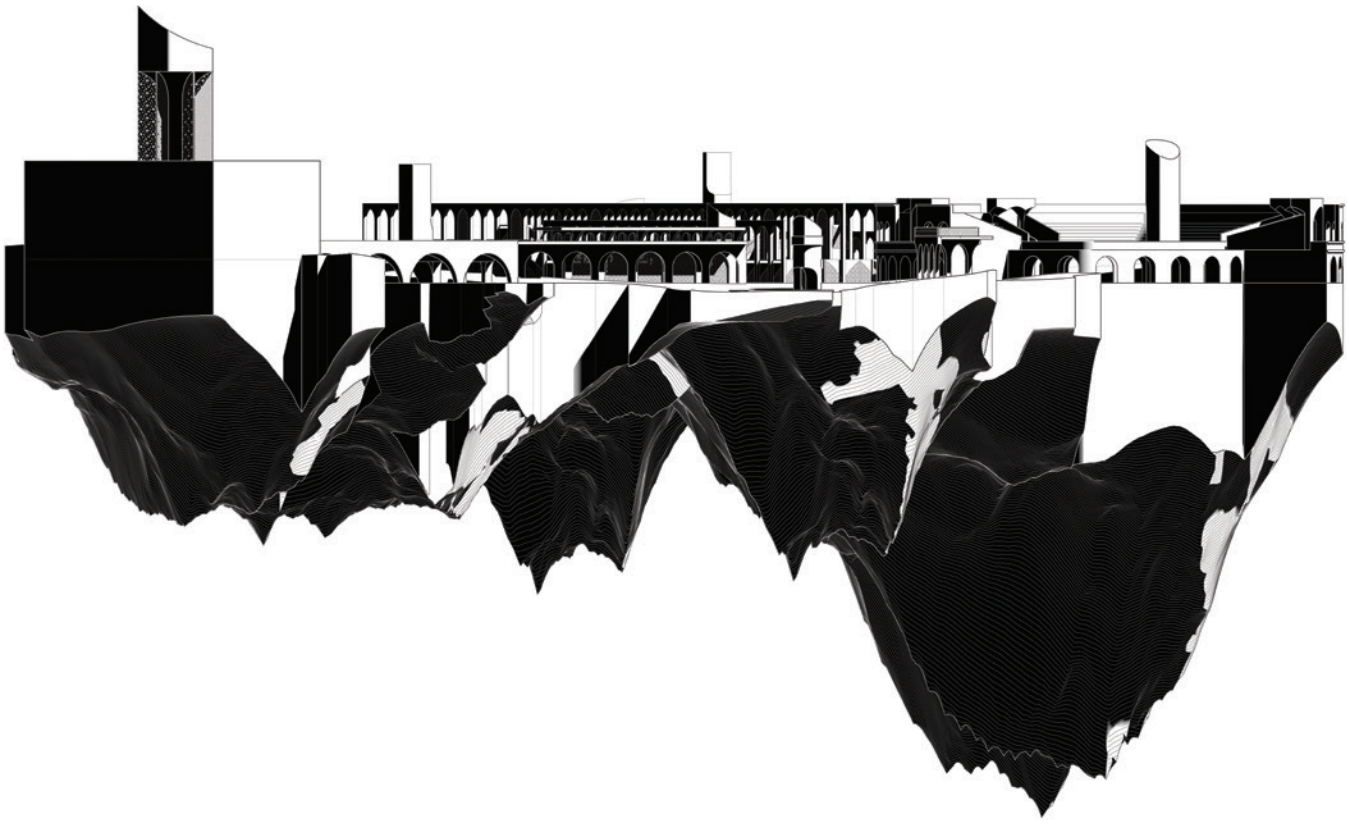


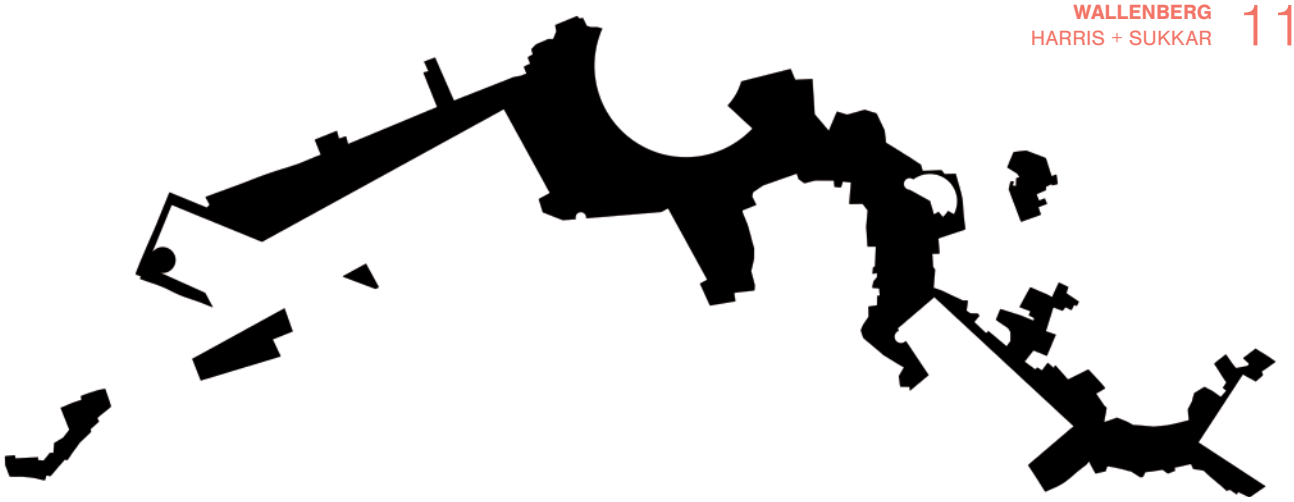
At a broader scale, commodified space governs human existence. Through systemically incentivized privatization and legally backed discrimination, the public-private duality of space becomes exclusionary in its nature of defining belonging, and restricting use. This project seeks to decommodify space through the intentional refusal to deploy the grid, resulting in a spatial condition that dismisses the assignment of a program that prioritizes efficiency and renounces pre-existing definitions of belonging. Realized as a self-contained archipelago of occupiable space with the platforms for communal assembly and exchange, we produce space within which occupants resist colonial systems through unstructured existence.

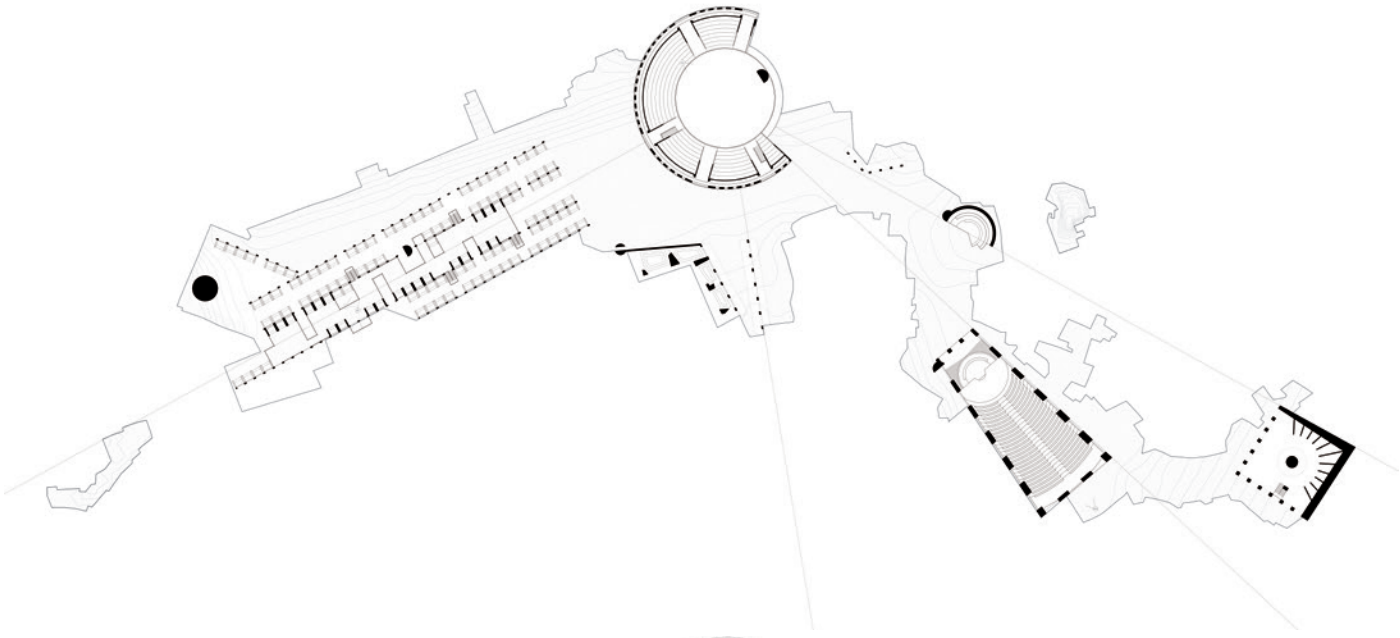
The archipelago utilizes a common typology in order to unify its built spaces, as well as provide an identity that its users can relate to. A series of icons—cylindrical stone towers characterized by detailed wood screens and curved extractions—was first developed as a guide to maintain consistent geometries throughout the project's design process. These icons were then proliferated into the site, integrating into its varied architecture to create unification across spatial conditions. As scalable components, the icons and their geometries adapt to a range of proportions, developing a more engaging complexity for inhabitants.

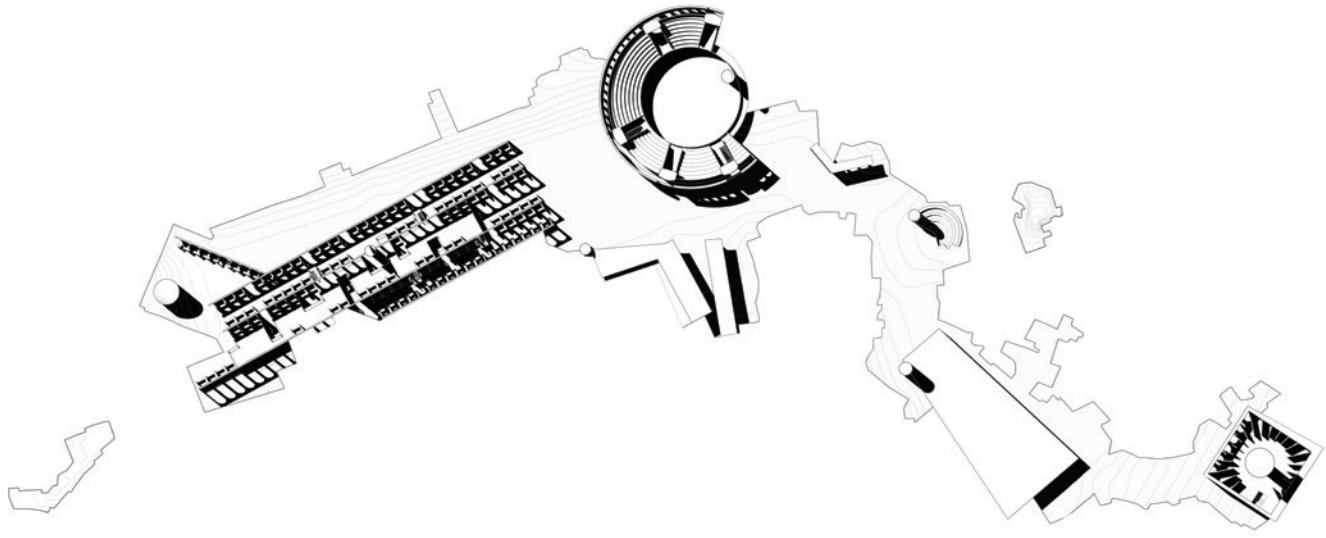
Six primary spaces were designed and placed on the site to form the archipelago, borrowing geometries from the icon set to maintain uniformity. Two volumes support communal exchange of both material or immaterial goods, and the remaining four arrange spaces conducive to assembly at both the intimate and formal scales. While each space was considered as a unique form in its realization, they act in conjunction with remaining spaces to serve the broader ambitions of the site, providing users of the space with the platforms to build wealth and knowledge, and self-organize in ways that traditional public spaces do not support.

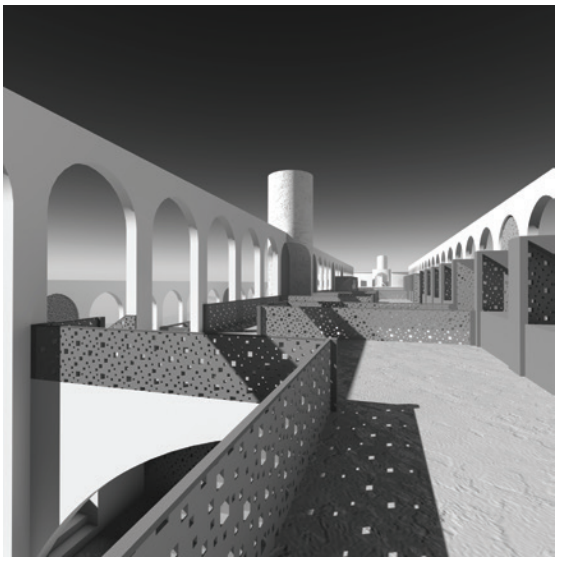


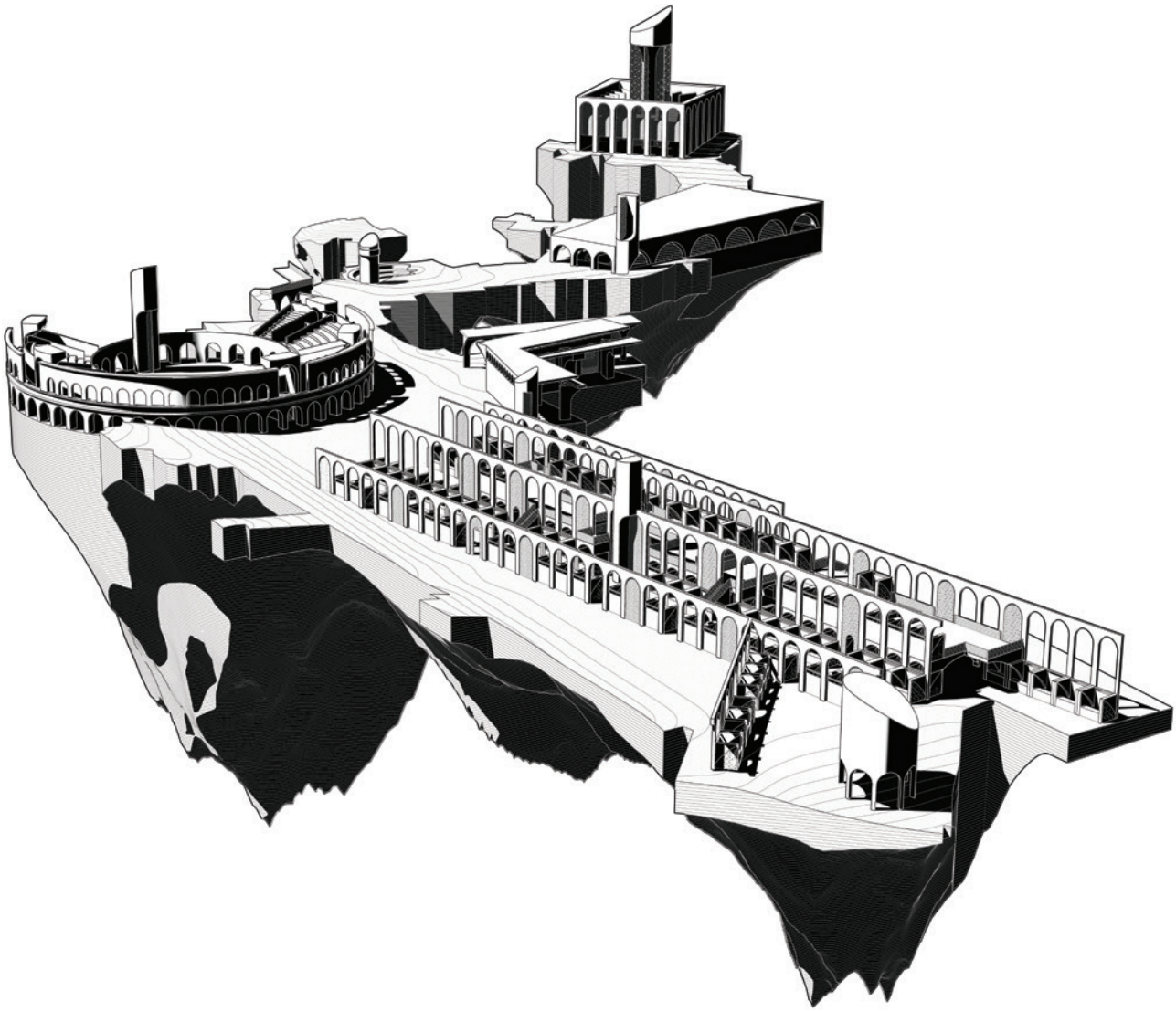








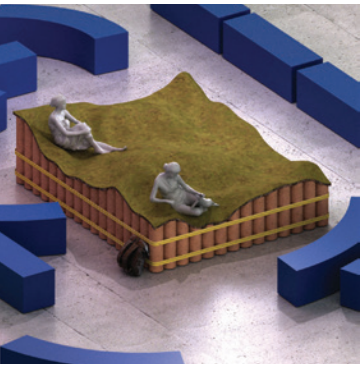




To begin inscribing space, an arbitrarily defined border was designed and employed to unify the six elements of assembly and exchange. Within the meandering profile, space is left unprogrammed for unrestricted occupation of its users, rejecting the grid's geometry and efficiency. This interstitial condition encourages users to be agents, having complete control over the ways in which they occupy the archipelago. These purposeful decisions strengthen the identity of this space as a unique form, and act as a counter expectation to those set by colonial methods of quantified spatial division.

Resistance Through Existence is a response to our critique of how commodified space controls our existence through the strategic organization of bodies in space. This project pursues decolonial possibilities through a justice-oriented study of Assets, Protocols, Forms, and Spaces.

Delving into the realm of speculation, our thesis is represented as a newly imagined spatial condition; a siteless archipelago that is unrestrained by existing conditions of dominance and subdivision. Through the proliferation of stereotomic icons, from which formal attributes of the site were extracted, this project uses this strong visual language to propose an attitude for how a non-exploitative space would exist formally.

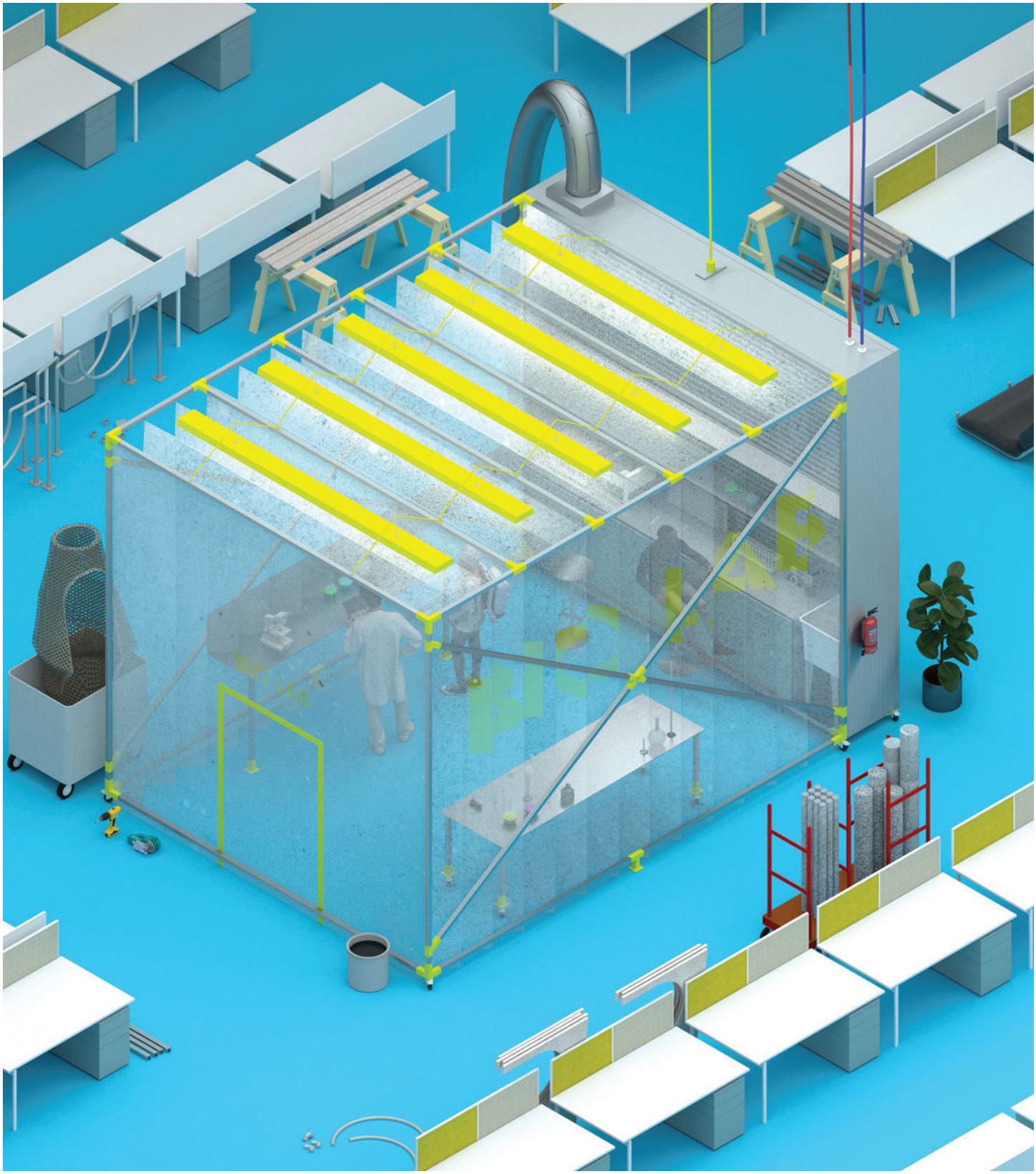


This research project seeks to identify methods to incorporate biological sciences into architectural education, from the materials used to produce models and represent built work, to new pedagogical futures for bio-based design. Blending architecture and biology has yielded not only biomimetic strategies for environmental control and resiliency, but also an array of environment-friendly, plant-based building materials that come from renewable sources. Taubman BioLab proposes a material-driven course of study, through the deployment of a pop-up lab that operates within the traditional studio context. The temperature-controlled environment allows for organic and sustainable explorations of growing biomaterials and investigating design opportunities within the emerging field of Living Architecture.

At its core, Living Architecture seeks to reduce harmful waste generated by material and model studies while also providing students a design process that balances hands-on learning with digital technologies. This lab is woven into the curricula of both graduate and undergraduate programs, particularly within certain studio semesters. The project and exhibition materials suggest the full integration of the BioLab into the curricula by examining a potential studio. This Propositions studio, “NapTime,” explores human form, critiques architectural pressures, and utilizes apparatus within the lab to generate sleeping furniture to be built across the school by a group of nine students.

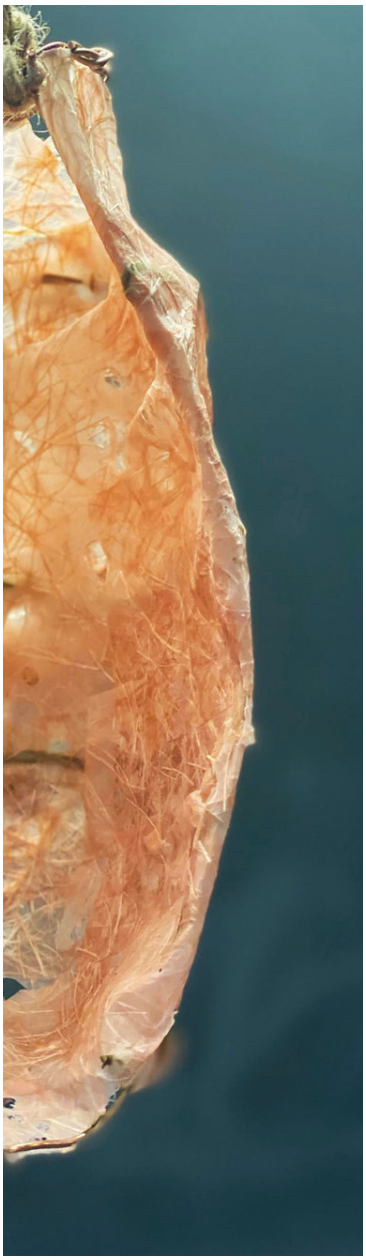
TAUBMAN BIOLAB

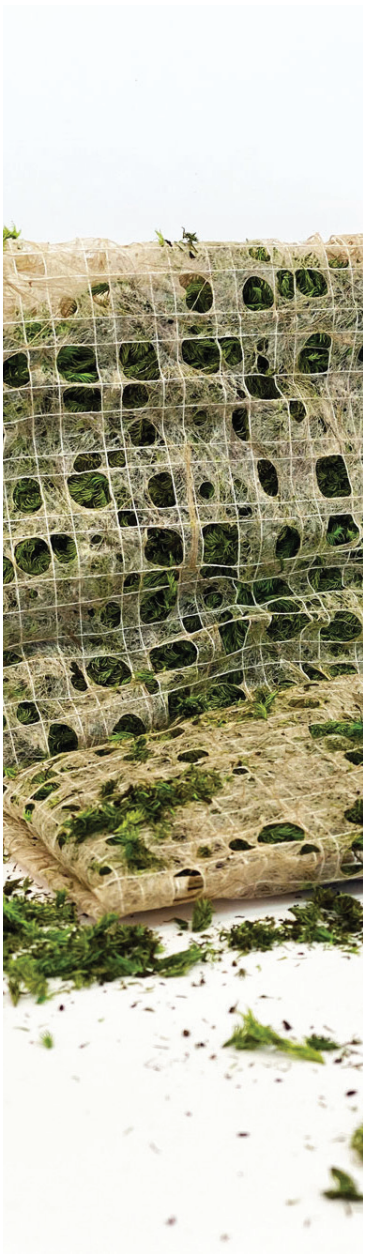
PRESCOTT TRUDEAU + ALEXANDER VERNON

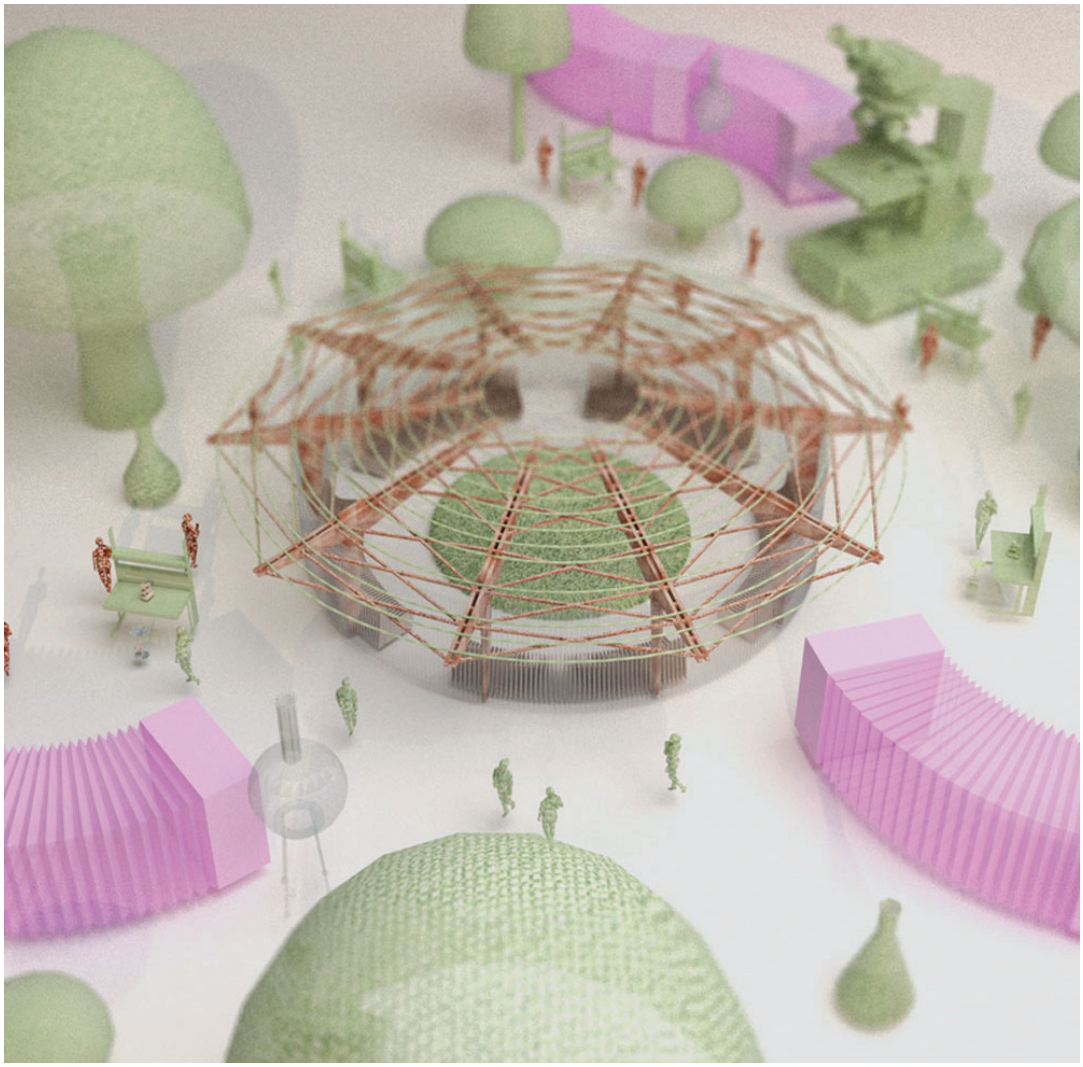


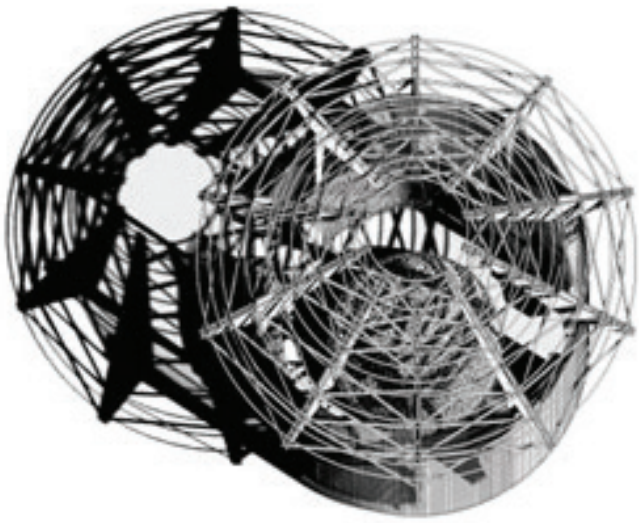
BIOLAB STUDIO V.01 / NAPTIME

Sleep is a human right, a fundamental function of existence. It is an interval of time for the mind and body to recalibrate and unplug from protocols of labor, and as such, it clashes with the 24/7 demands of consumption and productivity. This studio asks students to design an intervention of rest and relaxation into Taubman's own 24/7 environment. Students will employ a wide range of physical modeling techniques, working within the BioLab to grow renewable and biodegradable material assemblies, as well as sourcing commercially available biomaterials. While digital technologies will be utilized, emphasis is placed on tactile experience and knowledge transfer as processes for investigating connections between design and nature.









01 MYCELIUM HARDBOARD

The root structure of mycelium is combined with agricultural waste in molds where it grows, binding the materials into a composite, non-toxic engineered wood. It is cost effective, renewable, naturally fire resistant, and compostable.

Mycelium hardboard has many applications, including furniture, insulation, packaging and non-structural architectural components like cabinetry, wall panels, door cores, and counter surfaces.

This pavilion is inspired by structural components developed by Jean Prouvé, particularly his truss systems for rapidly deployable prefabricated homes. Laminated layers provide extra structural support and 3D printed algae plastic provides a rainscreen.

Mycelium hardboard benches radiate around a central flex space, designed for immersive installations, performances, round tables, and other events.

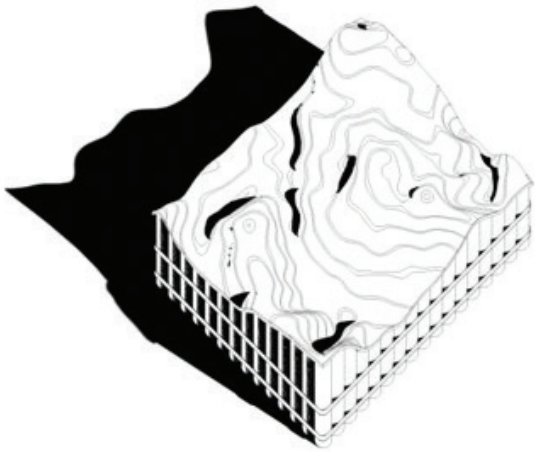
02 REINDEER LICHEN

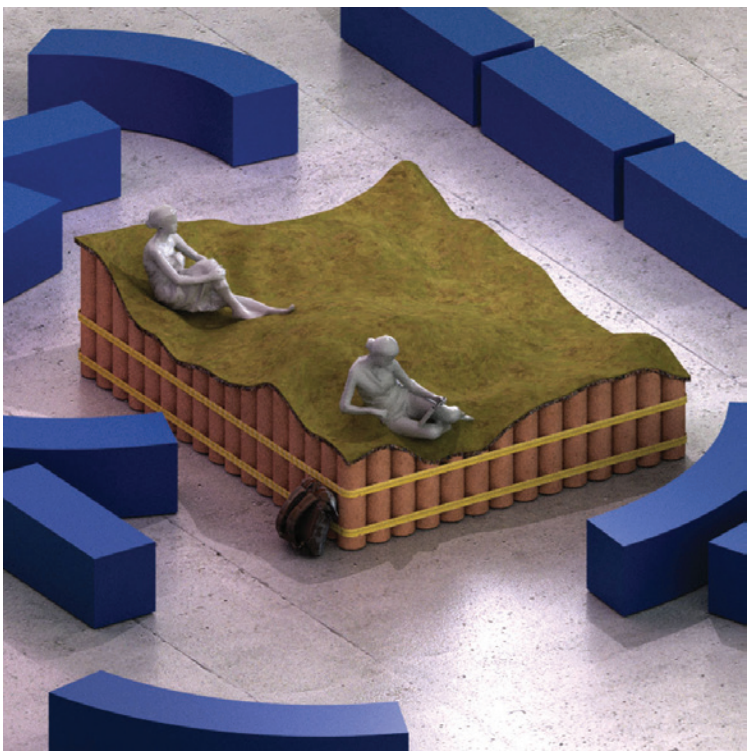
Sourced from Scandinavia, lichen moss is a slow growing, dried, and preserved living organism. It dominates the ground in boreal pine forests and is extremely cold hardy. Ranges from white to grayish to a treated green color.

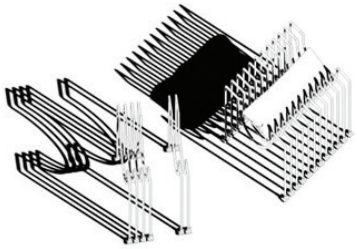
The lichen is used medicinally and in fauna-related activities. Architecturally, the lichen serves as green walls, and ashcrete additive to serve as sponge/cushion material. There are a series of tubes made of ashcrete filled with soil and water sources that feed the living moss field on top.

Lichen has a high tolerance to pressure and temperature changes and requires little maintenance. The topography of pipe structure creates human-shaped impressions.

With clear references to Maya Lin's wave field on North Campus, *To Frolic* suggests a natural, undulating fieldscape that allows for varying forms of relaxation, and directly juxtaposes the rigidity and misleading nature of the blue blocks in the Commons while preserving summer and spring during Michigan's long winters.







03 SANDCRETE

Composed of corn starch, sand, and water, the material is mixed and then microwaved, allowing it to become a quick solid structure.

A variety of molds can be used for forming sandcrete. The mixture is poured into a mold and heated in the oven for ten minutes. This piped form creates a spanning structure for a cushion or hammock and mimics a futon armature.

PVC molded with heated sand creates the initial mold and is then piped into forms and heated to a temperature of 350 for ten minutes. This process is replicated ten times. The cushion is made of a potato starch, gelatin bioplastic, and pulverized, recycled clothes.

To Divide establishes a modular approach to how students might relax. Similar to the block-nature of the foam blocks, the pipes allow for the addition or subtraction of pipes in order to determine function and use.

04 OGURA LACE PAPER

Sourced from Japan, this paper spreads a thin layer of manila hemp over a screen then allows for drops of water to pass through naturally and randomly to create small apertures. This is also considered “falling water” paper.

Paper mache using a honey and cornstarch mixture hardens lace paper into a webbing shell creating a cocoon over a copper armature. Can be applied in furniture applications, paper, and cloth, scrapbooking from acid-free ingredients.

Copper or bamboo armature clad in a tensile manila hemp paper and fitted with cushions or recycled egg crate padding both double as seats or adjustable hammocks. The manila hemp and bamboo curved pieces are made on site in hot water bath and screen pressing machines.

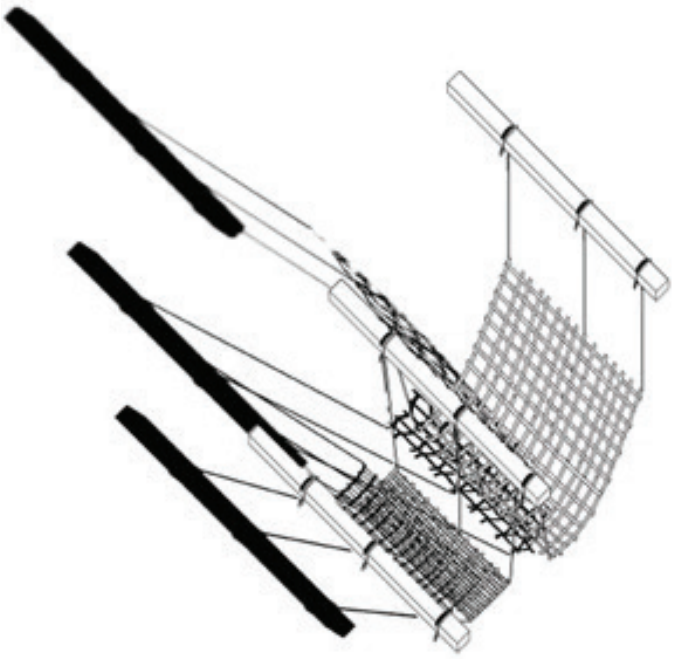
Modeled off of Louise Bourgeois’ *The Quartered One*, the cocoon-like structure envelopes the user, drowning out all focus on studio worries. It is extraordinarily adaptable to spaces and requires only an I-bolt, nylon straps, and the materials mentioned above.

05 ASHCRETE

Composed of agar, glycerol, ash from burned model scraps and alginate, each ingredient is heated in a pot and spread thin in a mold, allowed to cure for six days. Balloons and soft-form molds created rounded objects, and pulverized reindeer lichen is used to texturize/soften form.

Balloon and sculpting forms are used to create beanbags, cured with moss in a concave section to create soft space. Bodily impressions are used to create soft curvatures and self-referential forms.

Here, a composite of sandcrete, reindeer lichen, and ashcrete are sculpted into large scale beanbag forms and pressed with human-forms. These egg shaped pieces are self-referential, interconnect, and are designed to be placed outside.



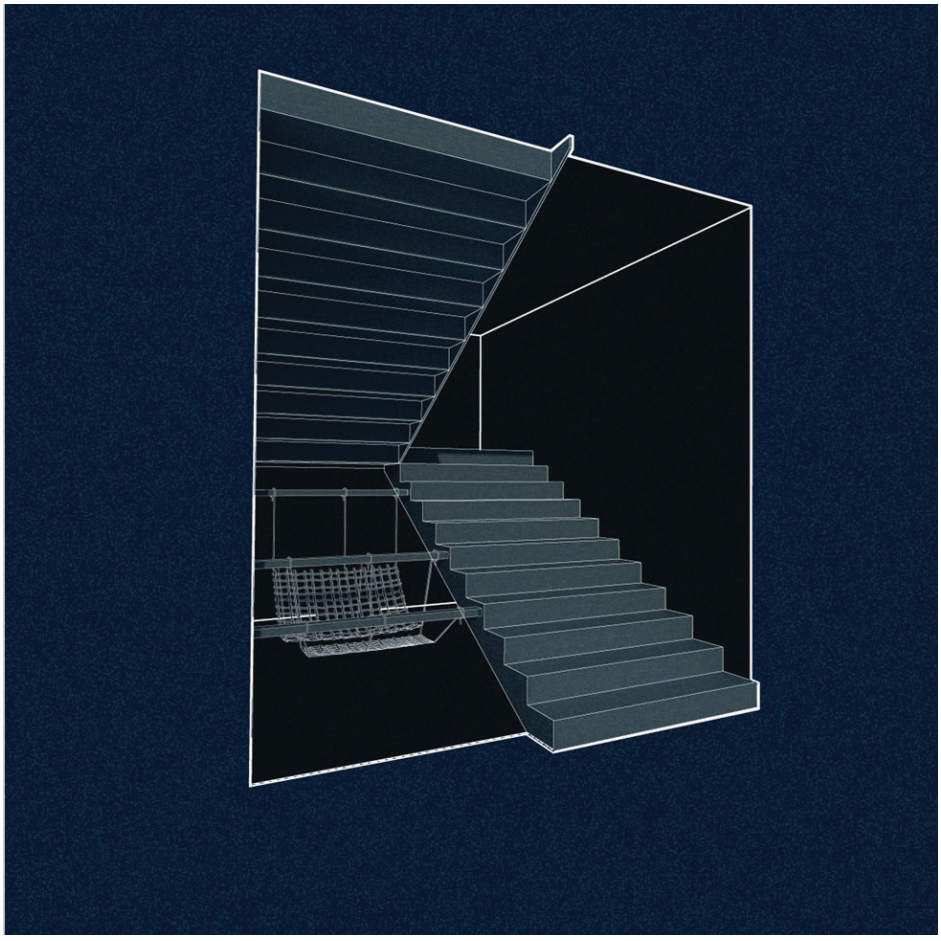
06 ALGINATE YARN

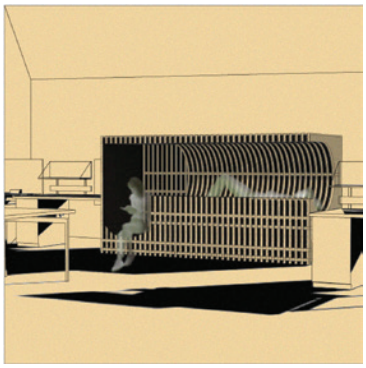
Composed of sodium alginate, honey, turmeric, distilled water, and calcium chloride, this mixture creates a viscous liquid, which after a calcium bath is formed into a yarn that can become globular and dried out to establish a fairly strong string.

Piped to 0.3" diameter threads, each thread is looped around a bar where macrame or knitting can establish a structure serving as a hammock-like pad design. It is looped and sectionalized across hemp wood that spans the gaps between the stairs and the wall.

Woven algae string, hemp wood, and hemp rope comprises the tiered structure. Each string is piped from a caulk gun into a calcium bath. Later, it air dries on the bioplastic/fermentation racks for four days. It is then woven into rope and rests under the heat lamps for three hours until ready for weaving.

Minimal intervention and capitalizing on underused spaces and equipment in the BioLab inspired this project. Each hammock occupies a very small footprint and is receded into the quietest, darkest spots in the building.



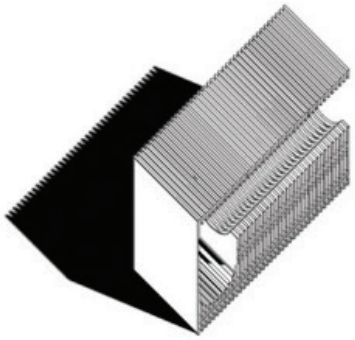


07 HEMP WOOD

Hemp Wood is an engineered wood substitute with the smallest ecological footprint of any lumber alternative. It consists of 85% Hemp, 10% Soy, and 5% Organic Binder. The material has a short, four month growth cycle, but it performs similar to 200-year-old tropical hardwood.

Hemp Wood end products are 20% harder than hickory and are competitively priced with black walnut. The material can be drilled, hammered, cut, sanded, or stained the same way as traditional wood. Waffle slab and interconnecting repetitive pieces were the inspiration for this project. Quick assembly and flat pack systems make these an easy build.

Cross pieces are made the same way. Slabs are tied back to walls in studio spaces to establish furniture structures and resting spaces.



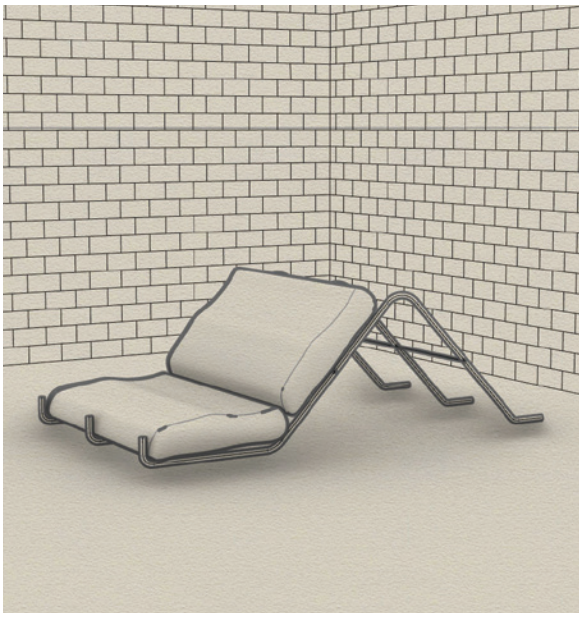
08 THAI KOZO PAPER

Sourced from Thailand, this paper uses kozo pulp webbed between random checkered hemp threads. Funneling kozo pulp across threads allows for raised pulp textures to rest above the threads, making it an almost cloth-like material.

The paper serves as a netted structure to hold and maintain lichen padding. Theoretically if scaled up, it could be cross laminated to act as a hammock or hanging cloth.

Piped into a suspended silicone mold, this mycelium based pipe is stored in a humid room while it cures, then under the heat lamps for two days. The form is free standing with flattened bases and can be placed anywhere. The pads are translucent layers of glycerine bioplastics.

Lucy McRae's body architecture inspired by the longing and lack of touch in the future inspired this project, one of constant pressure from a soft form emulating the familiar shape of the ubiquitous futon.



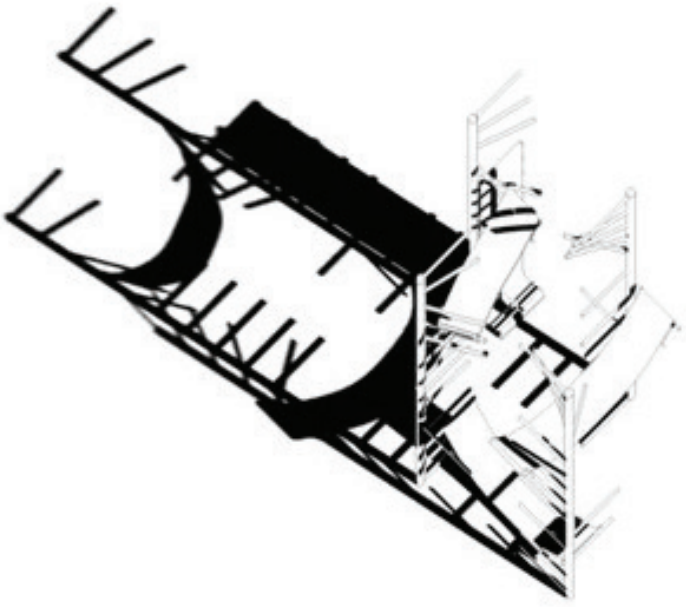
09 VERMITE REINFORCED BAMBOO

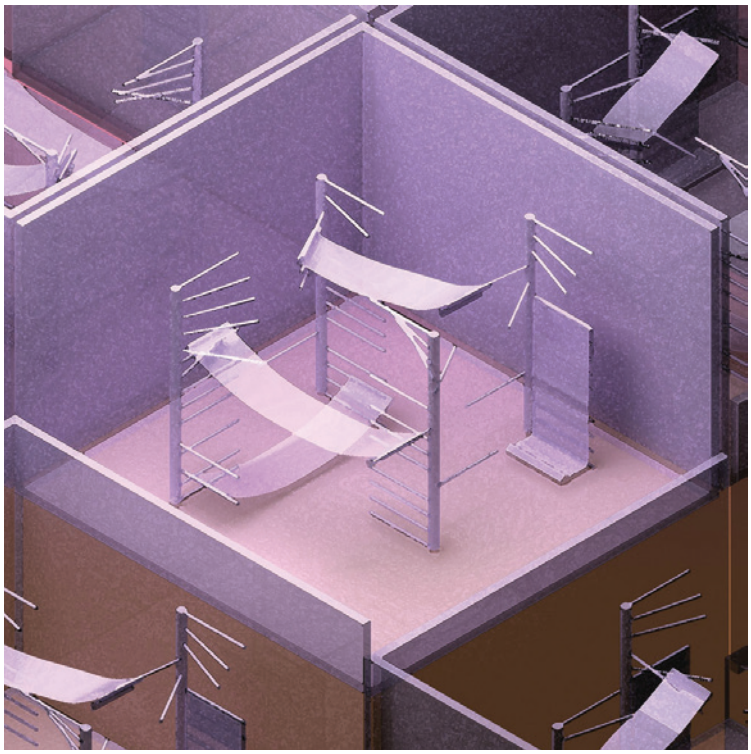
Grown in South America, Phyllostachys bamboo is one of the few varieties that allows for structural elements. Further reinforced with vermite, a geopolymer based concrete (or even ashcrete using recycled ash and portland cement), allows for tall narrow free standing structures.

The bamboo is bored into ground and filled with a quick curing concrete as well as concrete filled around it at ground level. Hemp cloth and burlap are cross laminated and looped around the pegs that have been grafted onto bamboo as a means of adding hooks to snag the support straps of the cloth.

Hemp cloth and burlap is laminated 15 times in perpendicular directions into lengths of 28 inches by 6 feet and built with loops on each side. Posts of bamboo reinforced with rebar and bearings are cemented into the ground.

Each cantilever post swings 360 degrees to align with the adjacent post and the cloth material is looped onto each peg. This approach uses simple drying racks found in laundry rooms as a precedent. Its modularity allows for multiple users and quick storage.





In many ways, America is a landscape of localities, both connected and distinguished by unique systems of infrastructure and manufacturing. These conduits behave as filters of how global factors might be perceived at the scale of cities and towns. While American towns each have a unique flavor, they are unified by a set of underlying parameters like zoning codes, land ordinances, construction methods, and architectural styles that have been adopted as standards throughout the country. They behave as prototypical models resulting in a ubiquitous condition exemplified through nostalgic downtowns, catalog homes, franchised establishments, and suburban subdivisions. It is because of this phenomenon that globalization can be seen through the scale of Main Street. Energy usage is perceived through gas prices, food consumption through chain restaurants, and commodities through big box stores. Yet, Main Street offers more than such a caricature implies.

The challenge of these ubiquitous conditions are their double edged nature. On one hand they promote a certain level of individual agency through ownership and DIY culture, but on another hand, they decentralize communities through policies of exclusivity and suburban expansion. This type of development introduces the opportunity for a civic space to exist between the nostalgia of Main Street and the expansiveness of globalization.

UBIQUITOU.S. CONDITIONS

A NEW TOWN HALL FOR AMERICA'S MAIN STREET

JAY SCHAIRBAUM

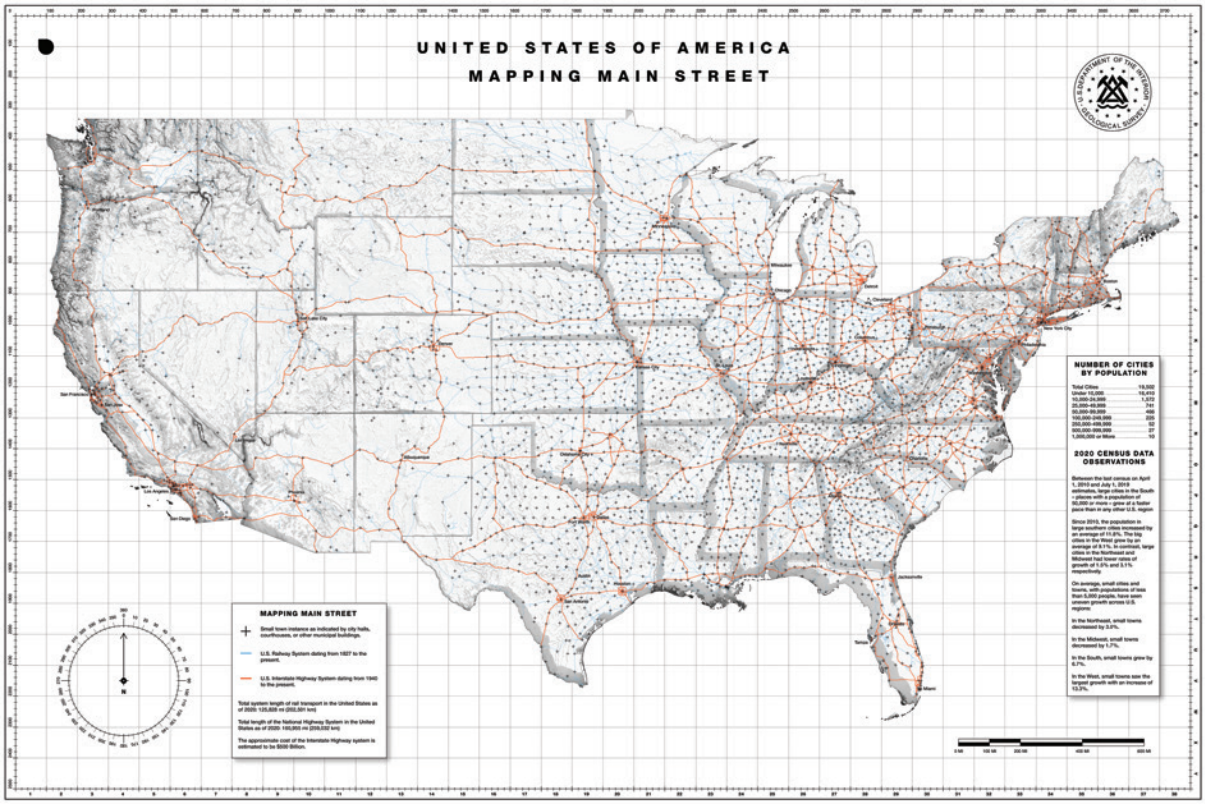
THESIS ADVISOR: JULIA MCMORROUGH

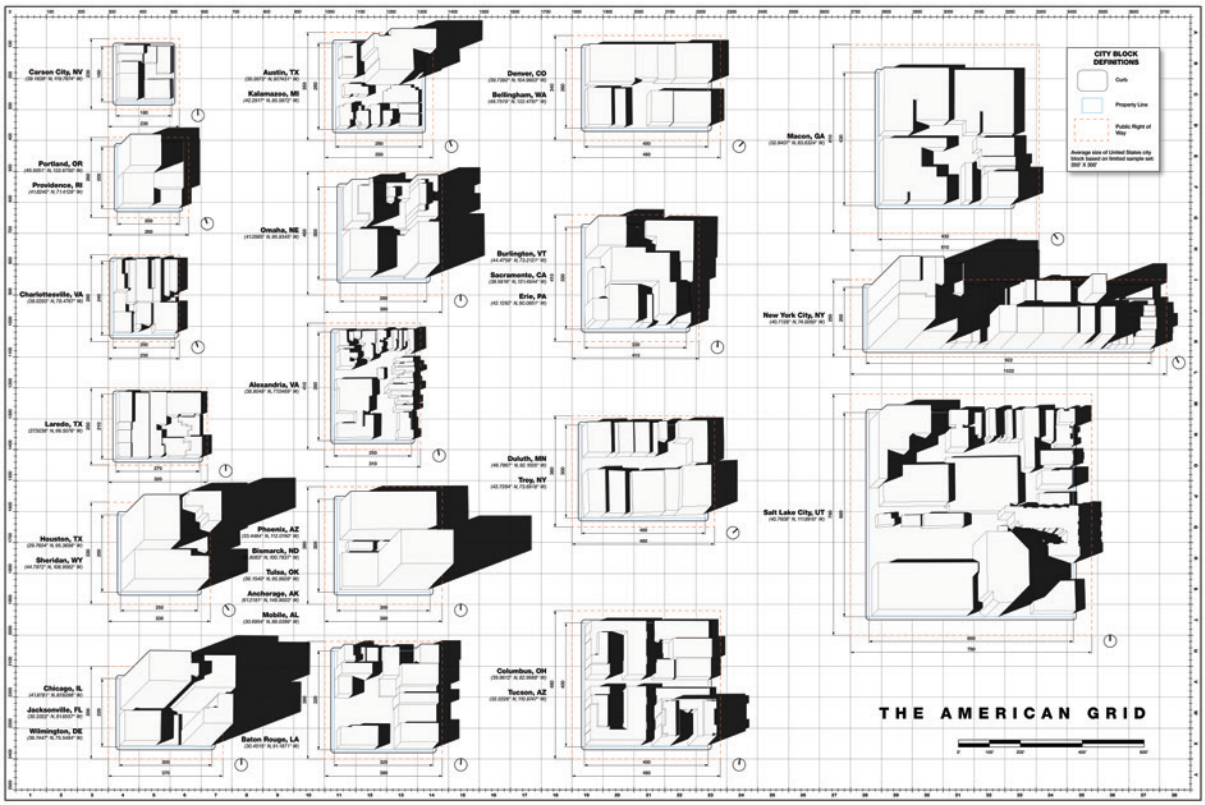
View of the World From Main Street

This project introduces the proposal of *A New Town Hall for America's Main Street* that addresses this reliance on familiarity by evoking an affinity for locality and an awareness of a town's position amongst global factors. This project occupies a typical grid plan block measuring 300 feet by 350 feet and is composed of four main structures arranged around a central plaza. The Depot includes a bus station, an occupied roof connected to the plaza, and an observation deck that doubles as a clock tower. The Parking Court contains classrooms overlooking a basketball court, parking on lower levels that can be converted to occupied floors over time, and a greenhouse on the top level. The Meeting House includes both ground level public amenities servicing the plaza and offices for the city government. The Gathering Hall houses the council chamber, an auditorium, the town archive, and public event rooms.

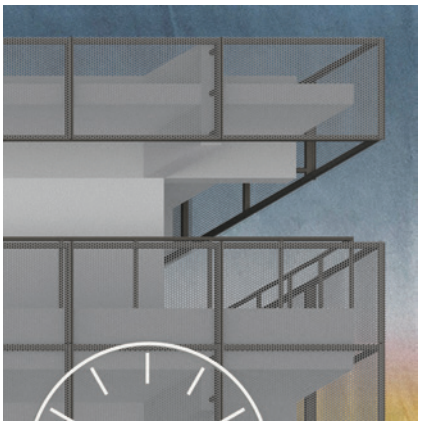
Each of the four buildings suggest possibilities of public space that will help aggregate new modes of community interaction. They independently express discrete modes of construction and facade articulation borrowed from traditional methods and materials, but still culminate in a unified urban space. The project responds to the conditions of ubiquity in the American Townscape by instilling an ethos that celebrates place and identity through community engagement and representation.

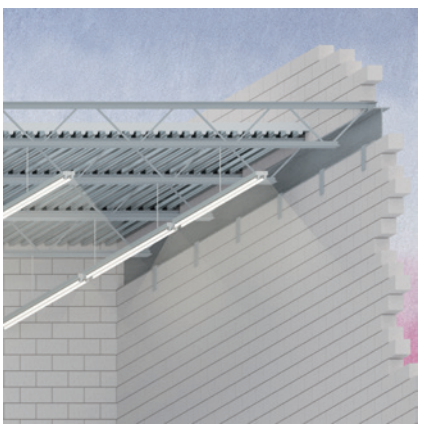
The project began by taking stock of common conditions found along the American Main Street such as diners, movie theaters, corner stores, and Sears and Roebuck catalog homes. These elements help define the nostalgia of cities and towns.

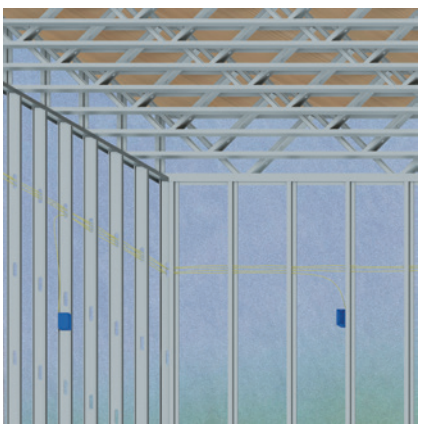


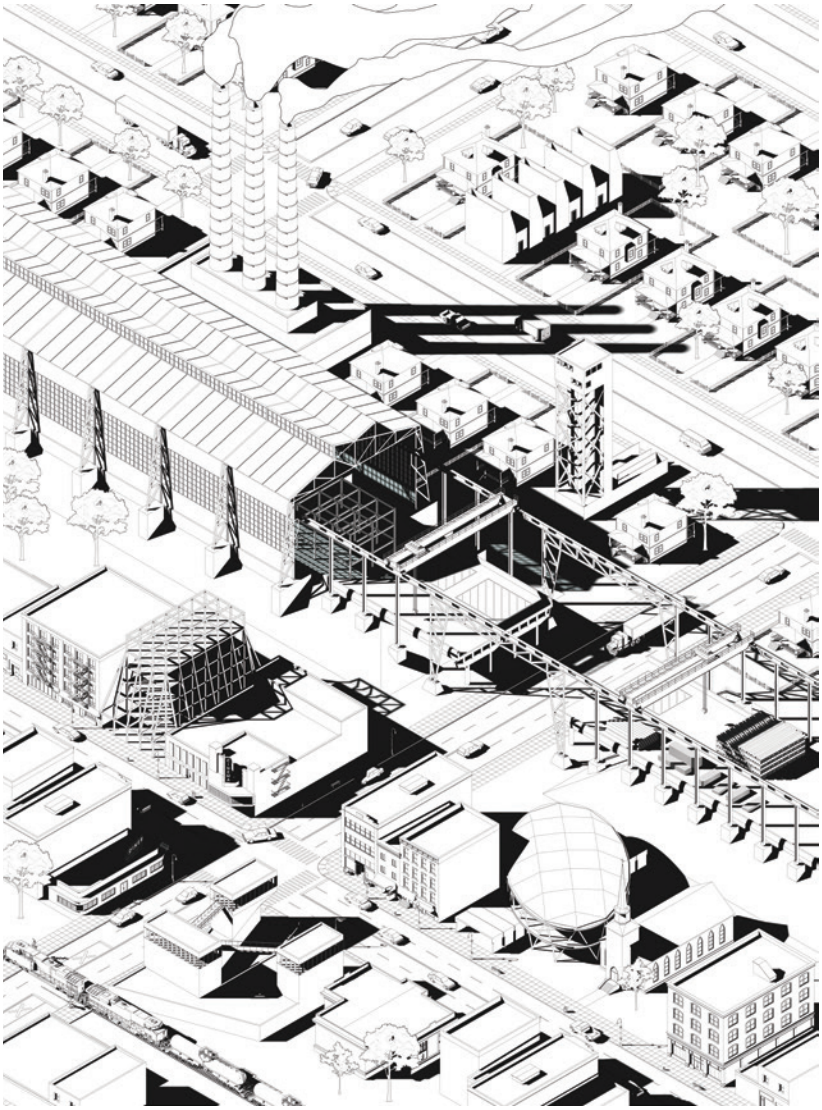


The map shows an overlay of every city hall in the United States (shown with black dots), the National Rail System (shown in blue) and the Interstate Highway System (shown in red). Below is a scale comparison between block sizes of grid plan cities in the US. Their average size measures 300 feet by 350 feet.







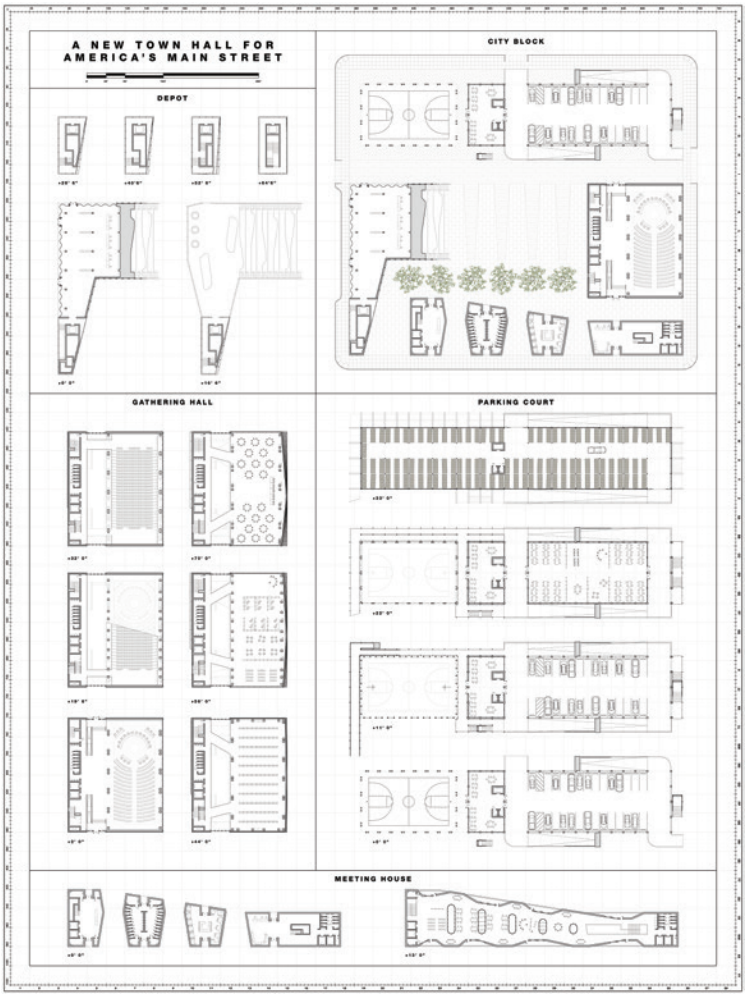


As a rhetorical exercise, this image reimagines the city as being cut off from the Interstate Highway System and other global influences, instead having to locally produce all of its goods and architecture from a central factory.

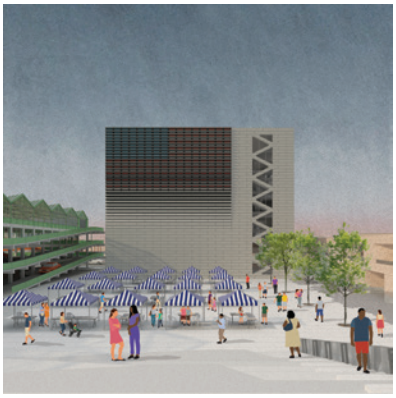
These details show four of the most commonly used construction materials in the U.S. and their qualities of efficiency. They include steel framing with precast hollow-core slab elements, CMU block with open web joists, dimensional lumber framing, and metal stud framing. Each of these methods have been optimized through the commoditization of construction parts.

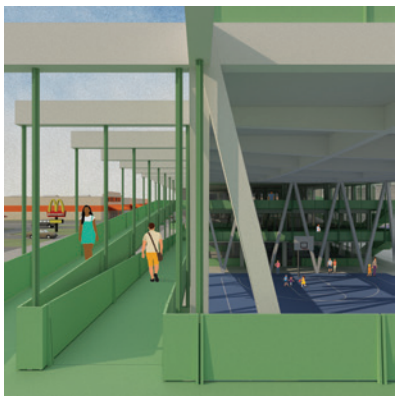
The Depot clock tower and observation deck offer a new perspective over the town. Alleyways between the Meeting House and Gathering Hall connect the street with the plaza. The Gathering Hall assembly spaces are transparent to the street front while a series of stairs and ramps on the parking court allow for easy circulation. The occupied roof of The Depot acts as a canopy over the bus station.

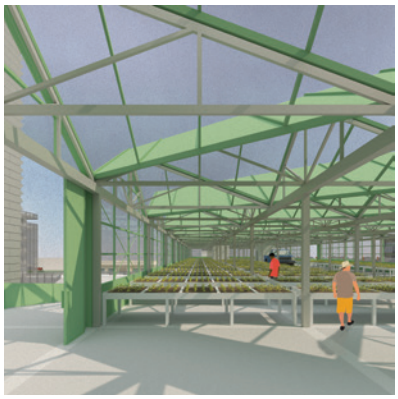
The town hall exists between a traditional main street and franchised establishments such as gas stations and fast food chains. Its elements are a response at both a pedestrian and vehicular scale.



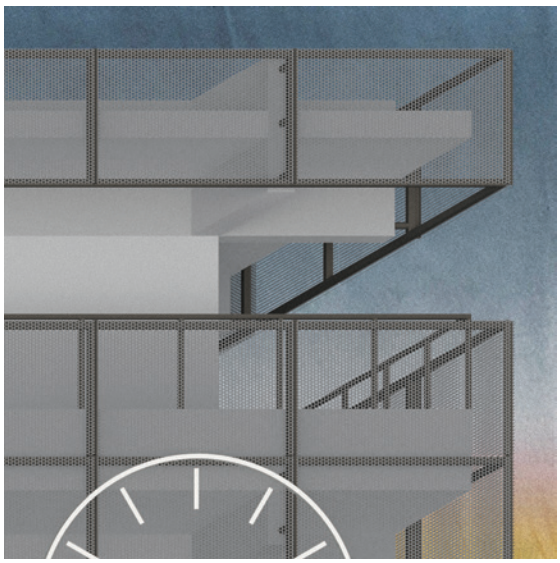
Each of the four building massings are determined by their diverse programming and adjacencies. They are arranged around a central plaza with pedestrian portals that connect to the street.

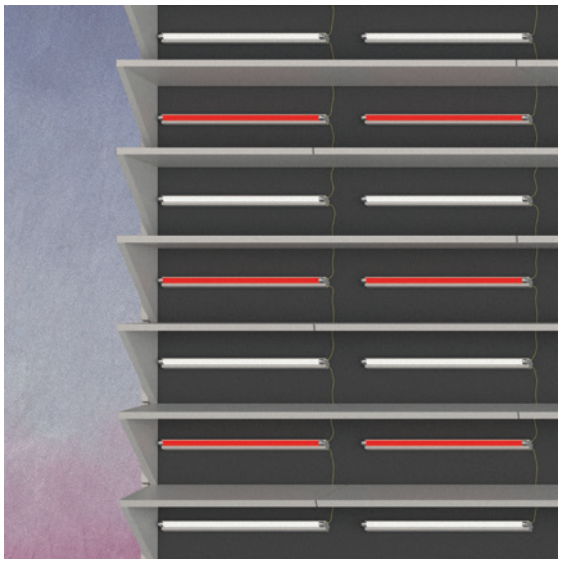


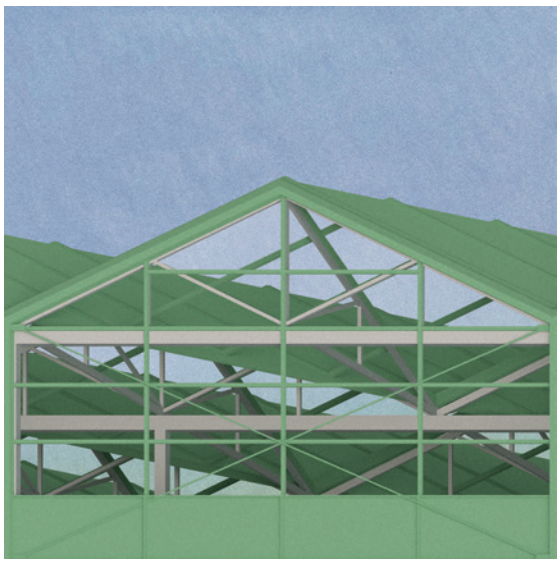


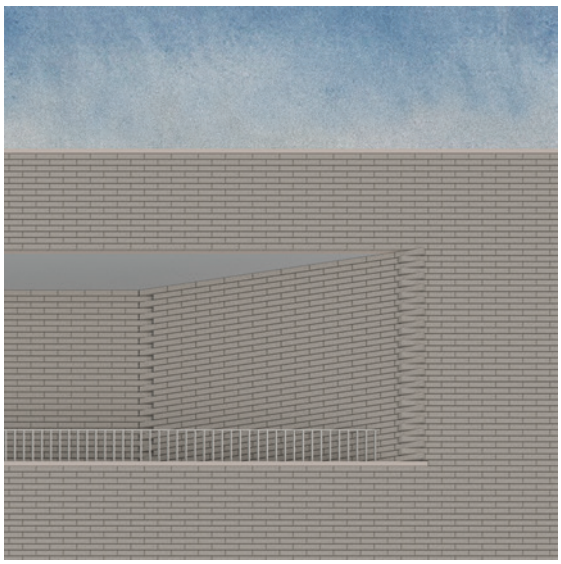


The facade of the Gathering Hall facing the plaza includes a light installation that can be changed to match certain events. Walkways in the Parking Court connect classrooms and also overlook the sports court. A greenhouse on the roof of the Parking Court influences community based food production. The atrium of the Gathering Hall shows the adjacencies of different programs like the council chamber and auditorium.

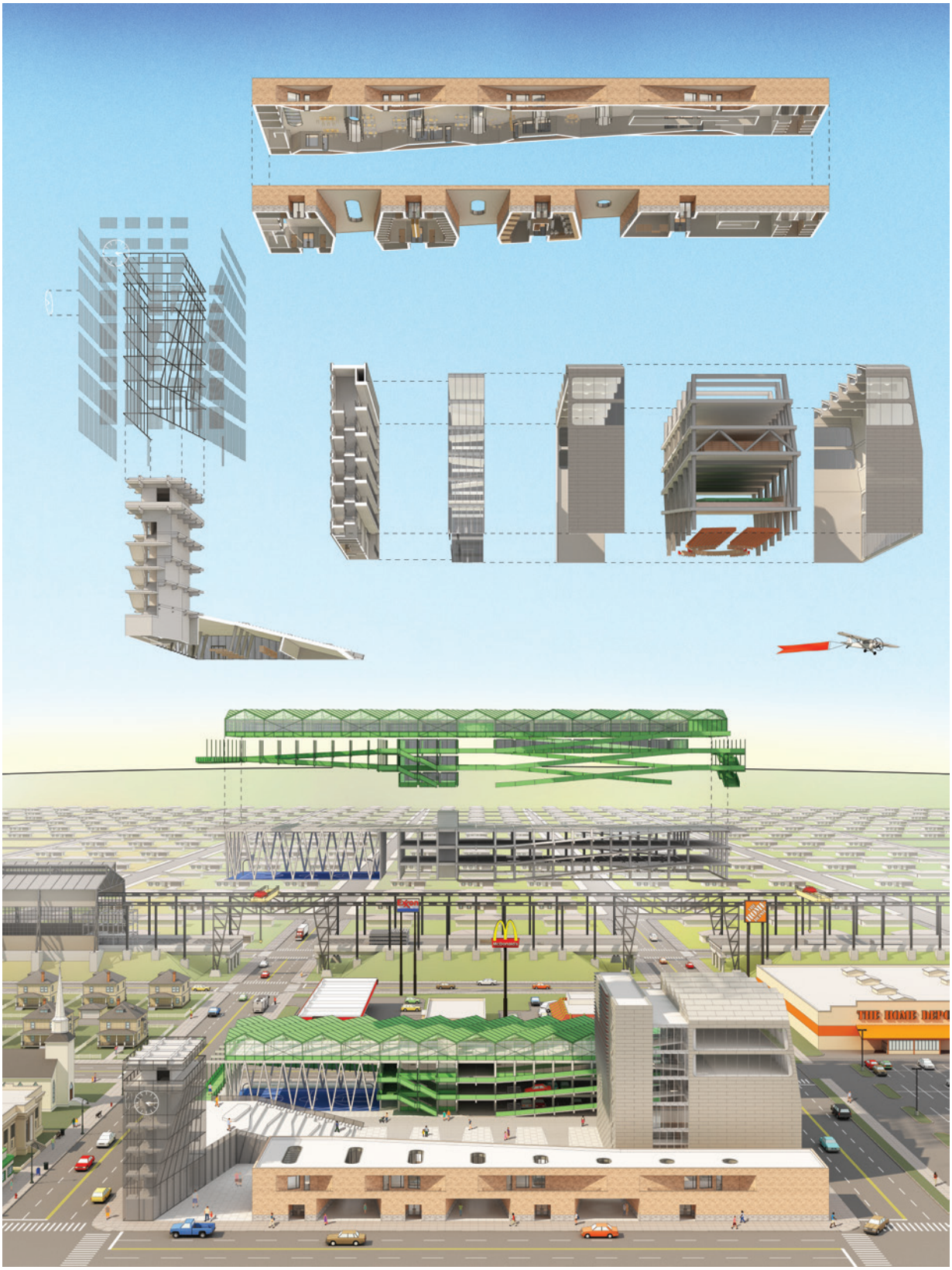




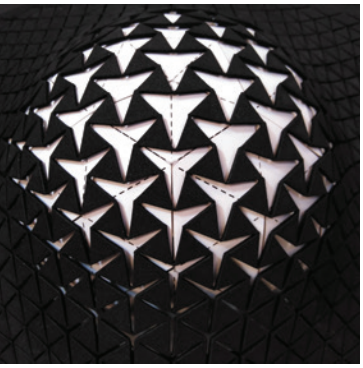




Facade materials range from brick and metal expanded mesh to precast concrete and painted steel that counters the vibrant colors of the surrounding signage. The lighting installation of the Gathering Hall consists of LED bars that are able to change colors.



Each of the four main elements have their own character, yet combine to form a cohesive urban block, not unlike the combination of styles and materials found in a typical American Town.



Auxetics are defined as structures or materials with a negative Poisson's ratio, which means that when the material is pulled in one direction it also expands in all other directions. Auxetic patterns have been used across various industries including fashion, medical, sports, etc. There is a great potential to increase the use of auxetics in the field of architecture.

Reverse Auxetics studies behaviors of auxetic patterns and uses the reversed, in other words collapsing, behavior as potential behavior.

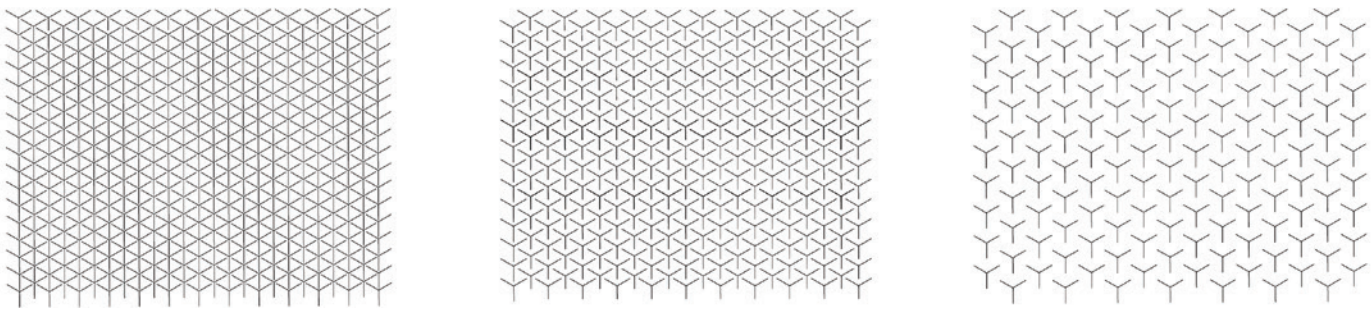
REVERSE AUXETICS

ARCHITECTURAL APPLICATIONS OF AUXETIC PATTERNS

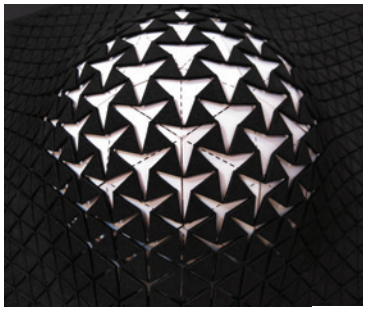
MEHDI SHIRVANI

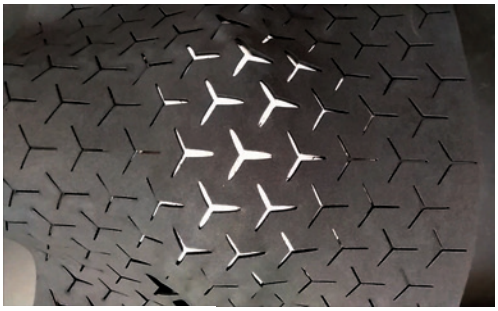
M.S. ADVISORS: ARASH ADEL + CATIE NEWELL

Fascinated by auxetic patterns and their behaviors, this Master of Science Digital and Material Technologies project started by exploring different auxetic patterns and experimenting with different constraints. These explorations included: blocking movement in different spots, changing the spacing between patterns and testing them in different scenarios, changing the scale of the patterns while keeping the surface area they are applied on consistent, and examining the impact of surface thicknesses on the behavior of the patterns, in order to have a thorough understanding of the auxetics and their behavior. After rigorous testing, the observations and results on the thickness tests showed an interesting reverse behavior. This reversal behavior became the focus of the research.

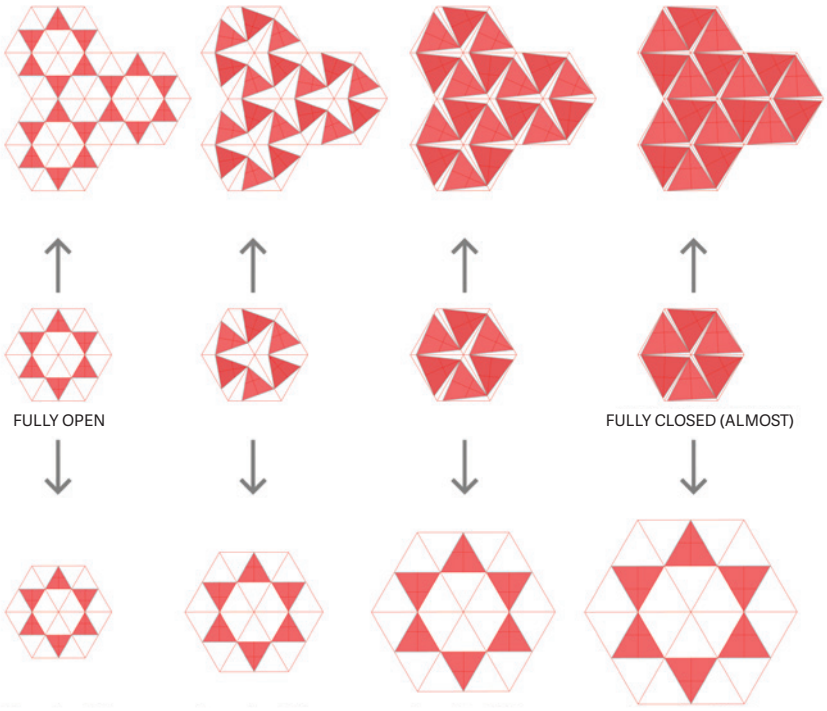


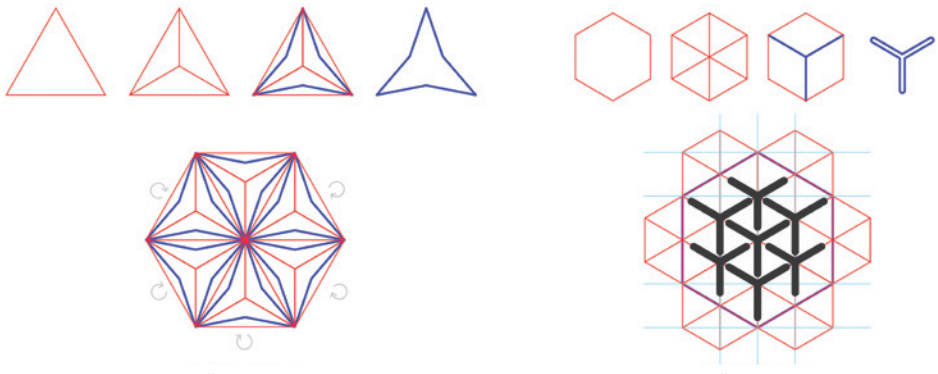
Primary Spacing Tests





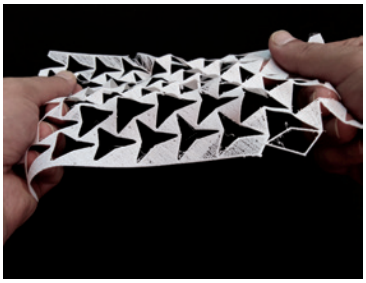
2 mm + 4 mm + 12 mm Spacing Tests

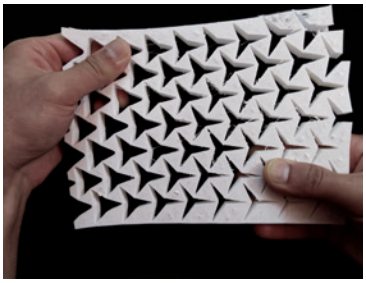


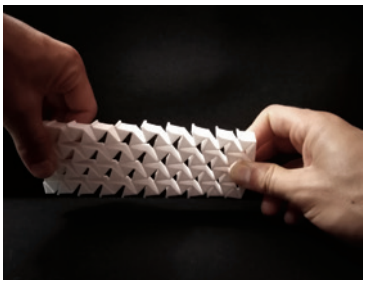


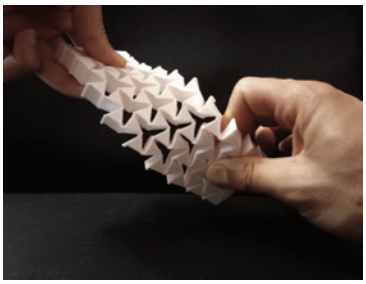
Opening + Tessellation Variations

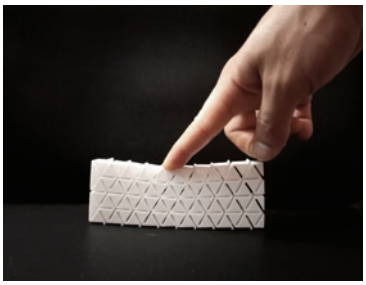
Auxetics are known to be great performers; when stretching from the sides they will expand. In this case, they are already expanded and collapse based on the load applied to them. In order to give the project a functional goal and to prove the concept, a designed chair was used as a case study, through parametric design by using reverse auxetics as the main structure in order to respond to the loads within the chair.

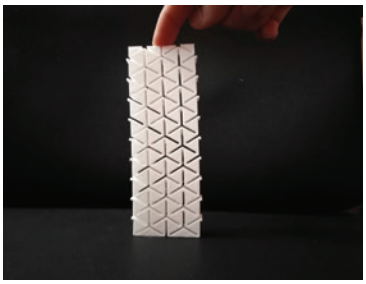


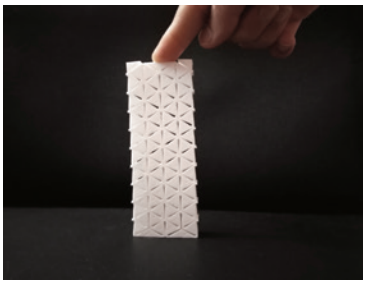




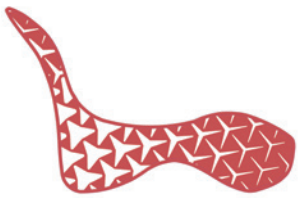








Thickness Tests



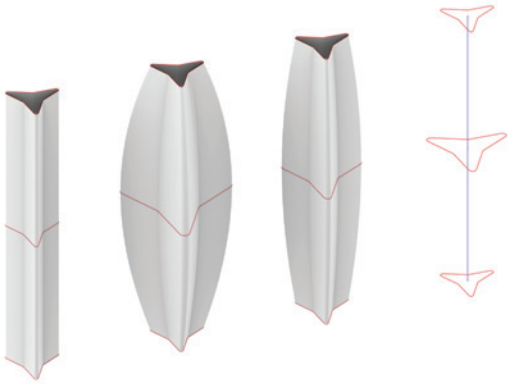
An important part of the research was also the extrusion of the auxetic patterns that were used to achieve the most efficient behavior in the chair. Different extrusion scenarios were explored which showed a difference in the behavior of the chair patterns. When the patterns were extruded in a straight line, the reverse auxetic pattern would collapse in the same way across the entire chair with the same amount of load applied to that section or point. Whereas, with a tight extrusion on the edges and a wider one in the middle part (extrusion following a curve/arc rather than a straight line), the edges would collapse less than the middle part with the same amount of load applied on the same section or point. The chair is an apt case study on auxetic patterns' application in architecture.

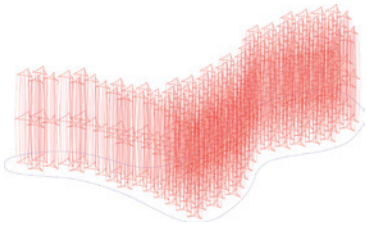
Auxetic Applications on Chair

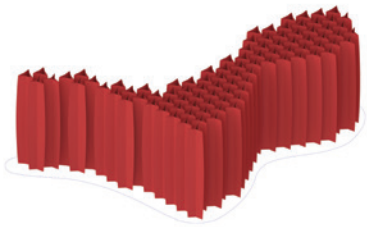
In the parametric design process, part of the project included pattern and extrusion studies using Rhinoceros and Grasshopper to explore and visualize the patterns on the chair.

In the fabrication process, exported files were 3D printed, in one-sixth of actual scale, by using Thermoplastic Polyurethane (TPU) filament. The next steps for this research will explore the auxetic patterns in voxel space, an interdisciplinary research endeavor.

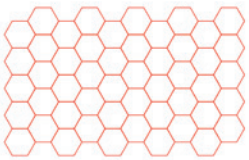
We can learn from the auxetic behavior in relation to space, form, and performance and apply them in architectural applications.



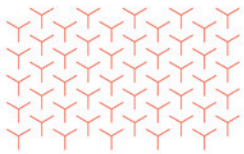




Steps in Grasshopper to Create Auxetic Patterns + Attractor Point Changing the Openness



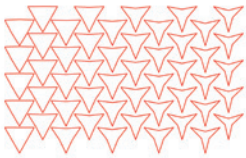
Hexagonal Grid Generation



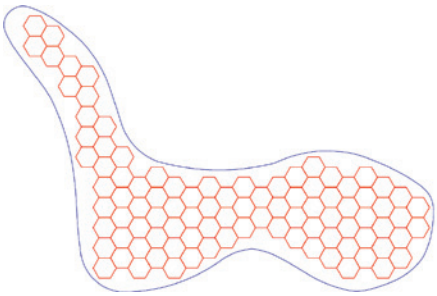
Auxetic Pattern Generation

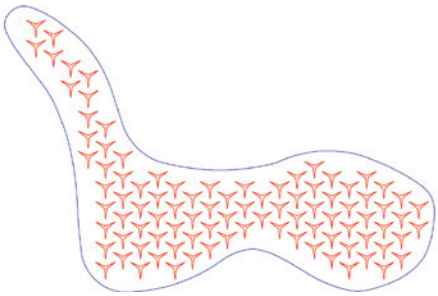
Auxetic Pattern Generation
Similar Opening

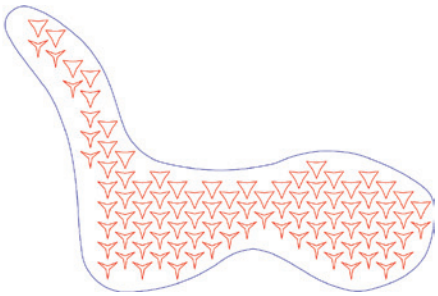
Auxetic Pattern Generation
Opening Variation +
Attractor Point



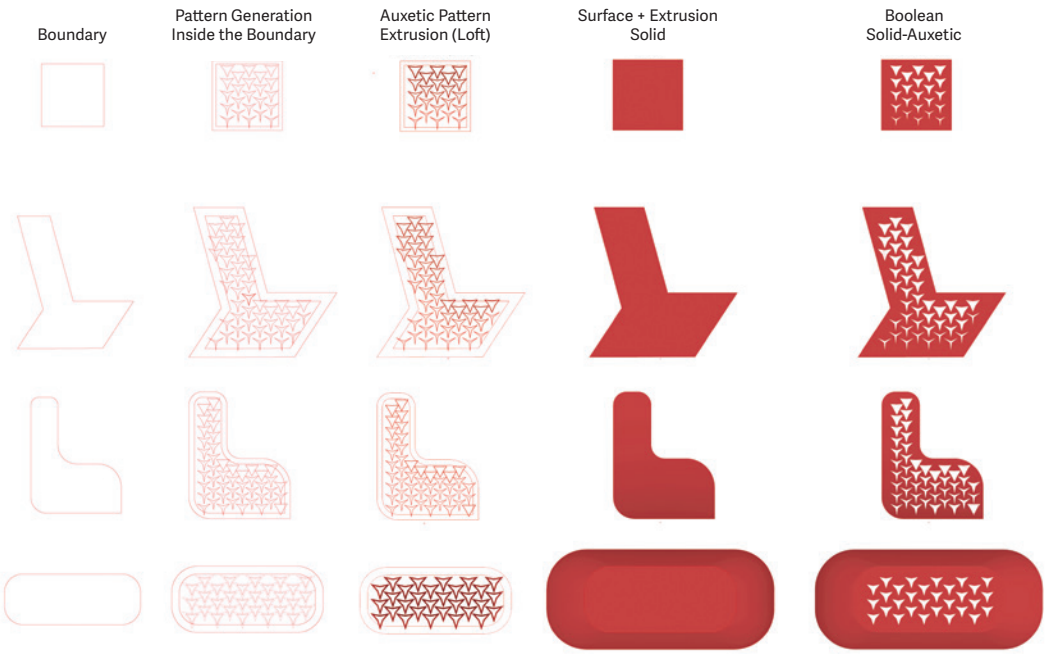
Auxetic Pattern Generation
Opening Variation + Attractor
Point + Scaling

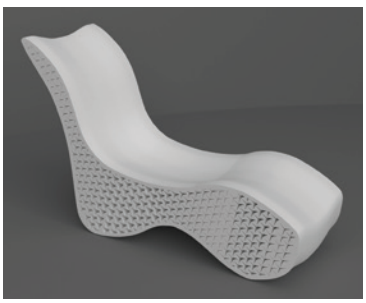


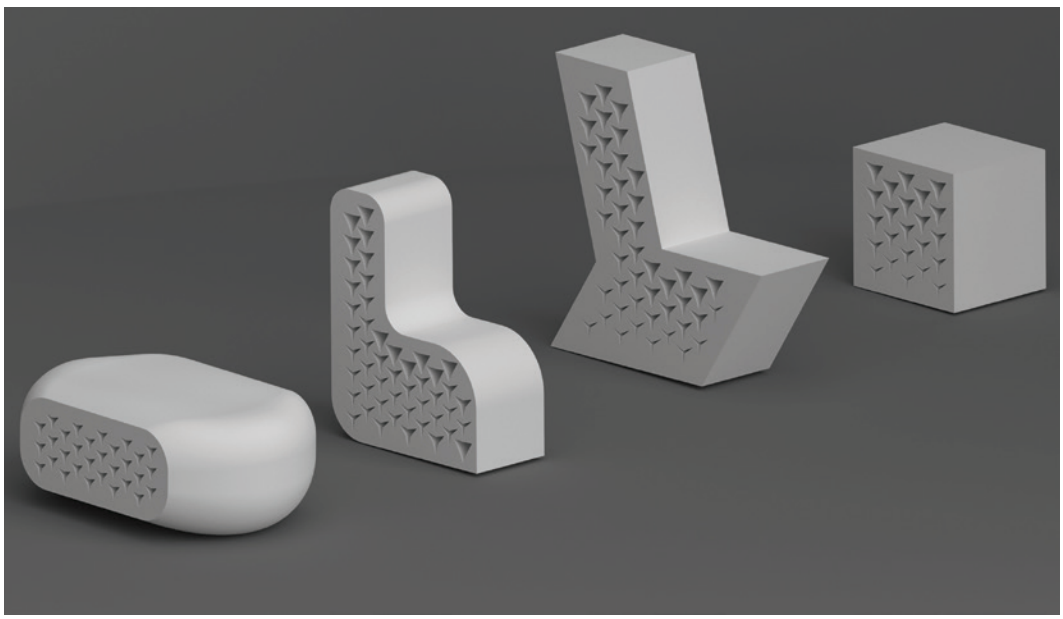


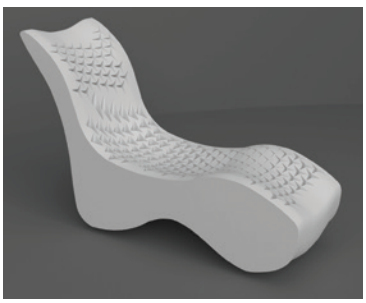


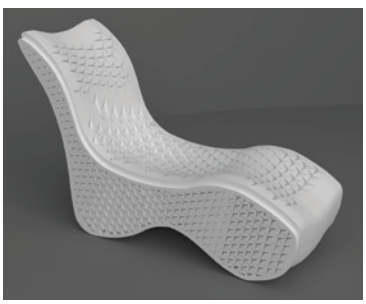
Parametric Pattern Generation


Boundary
Pattern Generation
Inside the Boundary
Auxetic Pattern
Extrusion (Loft)
Surface + Extrusion
Solid
Boolean
Solid-Auxetic









In Rust Belt cities like Detroit, abandoned buildings are either carved up, traded and sold as a commodity, or face the fate of demolition driven by real estate. Architects are responsible for reclaiming space that has been abandoned due to neglect or lack of vision.

From 1916 to 1994, the urban pattern of Detroit has constantly been shrinking, which results in less high-paying jobs and higher poverty rates. The decay of land and abandoned buildings has made Detroit gradually turn into a ghost town. Moreover, the city of Detroit pushes for numerous deconstruction permissions, with few construction permissions per year. Most deserted buildings are just waiting for their universal ending—to be knocked down. However, these vacant land and buildings are new opportunities for Rust Belt cities.

The Value of Vacancy project proposes adaptive reuse in the Packard Automotive Plant with components using various geometries and colors, which emphasize the value of Detroit's history and envisions a future of revival. The aggregation of new pieces would completely alter the appearance of the old structure and rebuild the lost vitality. Additionally, the new architectural design transposed on the ruins discusses the relationship between the old and the new.

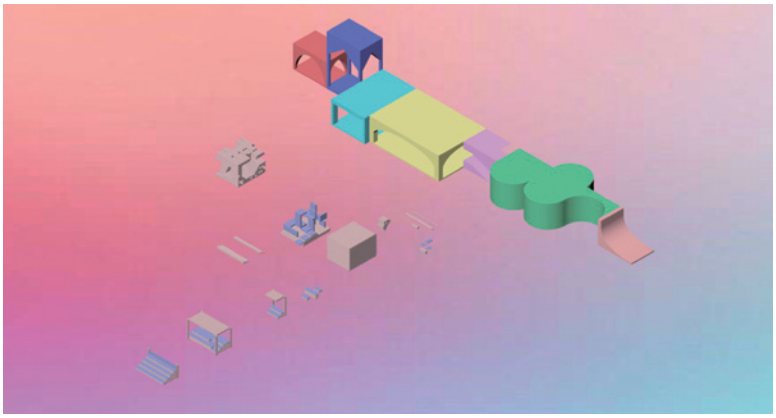
To respect the industrial history of Packard Automotive Plant, the old Packard structure will be retained. New architecture has the power to maintain the historical heritage of the building as an icon while adaptively reusing and developing the existing structure. Enriched dialogues brought by the co-existence of new and old would trigger more possibilities that could be applied to similar situations.

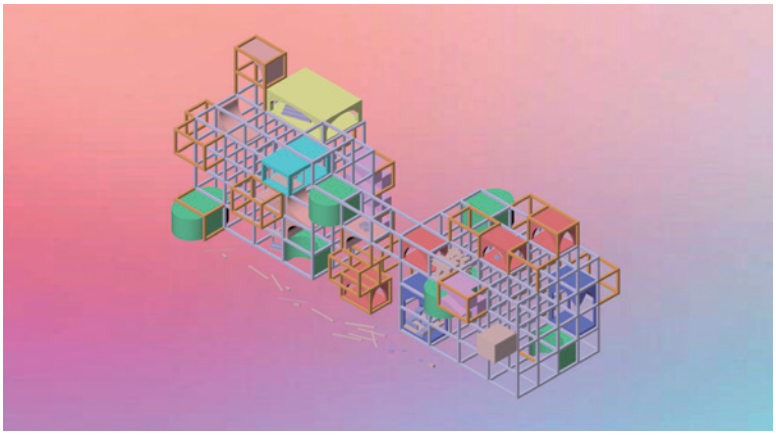
THE VALUE OF VACANCY

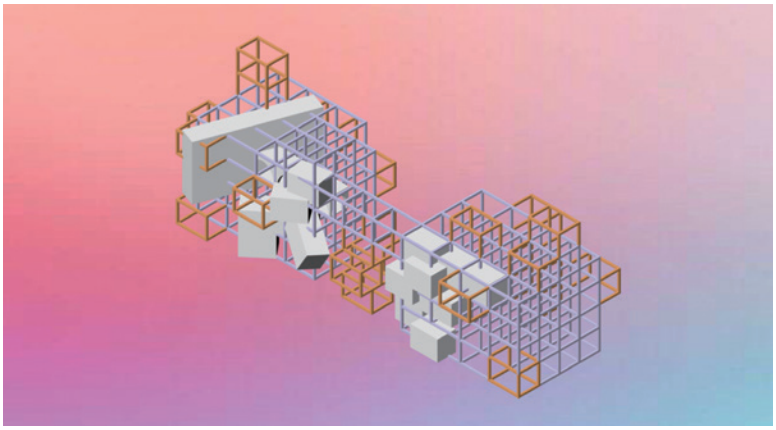
ADAPTIVE REUSE IN THE DECLINE OF DETROIT

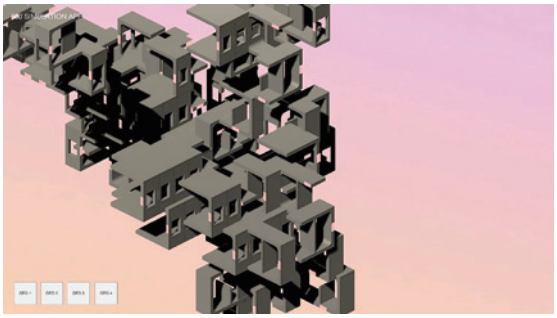
MINGRUI JIANG

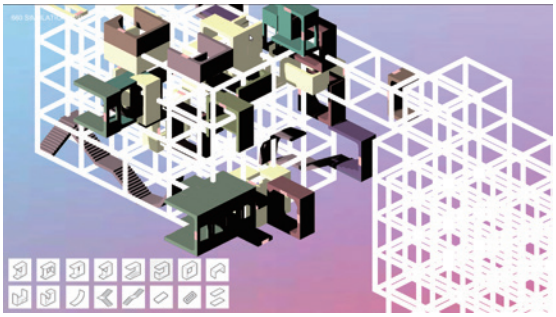
THESIS ADVISOR: JOSE SANCHEZ

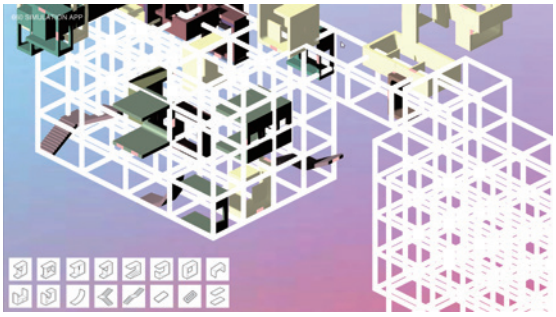


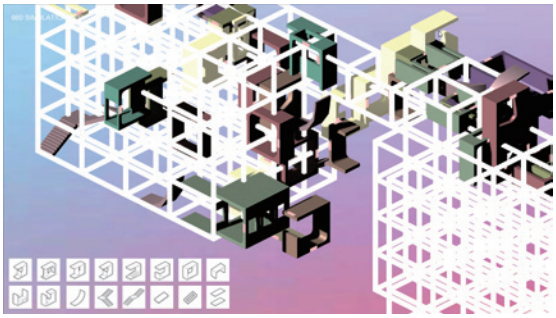






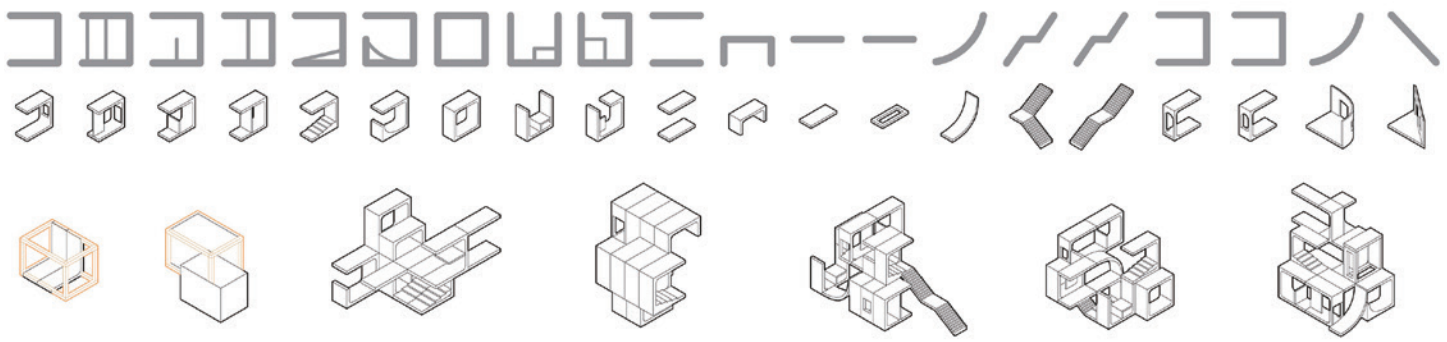




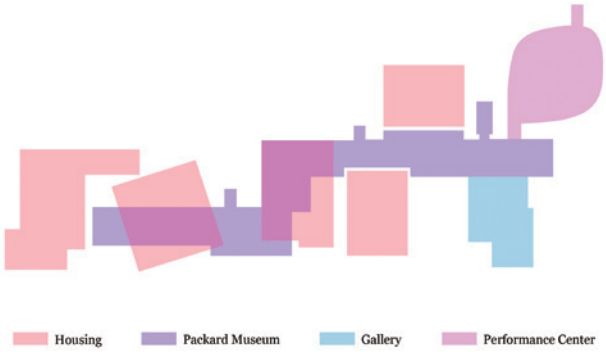


Component System

To adaptively reuse the existing abandoned public structure of the Packard Automotive Plant in Detroit, various geometries with different colors are introduced to change the appearance of the ruins and create a vibrant new atmosphere. With the application of Unity, component pieces are assembled to form a new complex. The users can click the sixteen geometric components in Unity to visualize their imagination about the Packard ruins. The introduction of technology would encourage public participation in the adaptive reuse proposals.



Generative Drawing: The generative drawing discusses the possibilities of aggregation forms on the old structure of the Packard Plant, portraying a dynamic reconstruction moment of the ruin.



Owned by Different Stakeholders

Studio Apartment

for single people

Mixed-use Housing A

for all

Mixed-use Housing B

for all

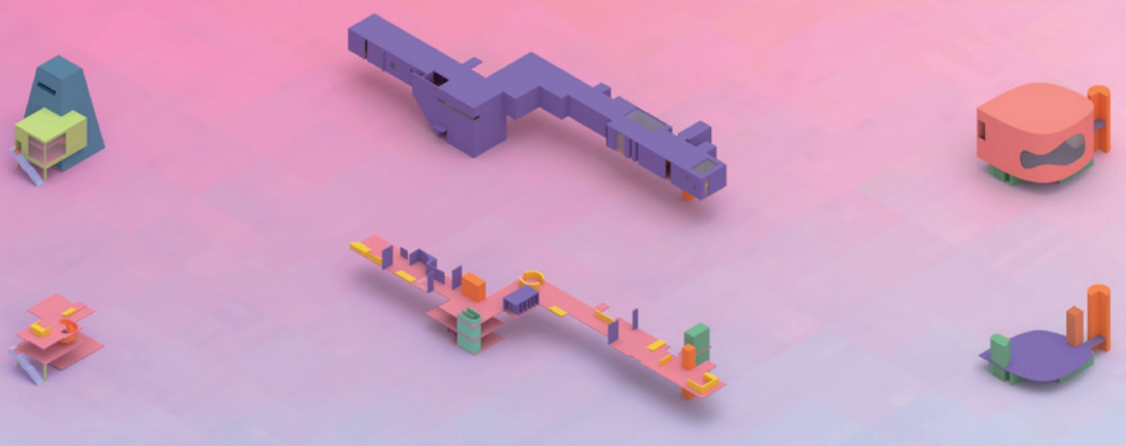
Multi-generation Housing

for families

Co-op House

for all

Owned by the City of Detroit



Gallery

Packard Museum

Performance Center

Mixed Ownership

There are five types of housing to fit the resident types in Detroit. The accommodation is owned by private stakeholders and attracts people to reinvest in Detroit. The Packard Gallery, Museum, and Performance Center owned by the City of Detroit is open to the public while the private stakeholders own the housing. The collective complex respects the value of the Packard culture. It provides public indoor and outdoor space for residents living in privately-owned housing to organize the community building activities and enrich the civic life of Detroit.

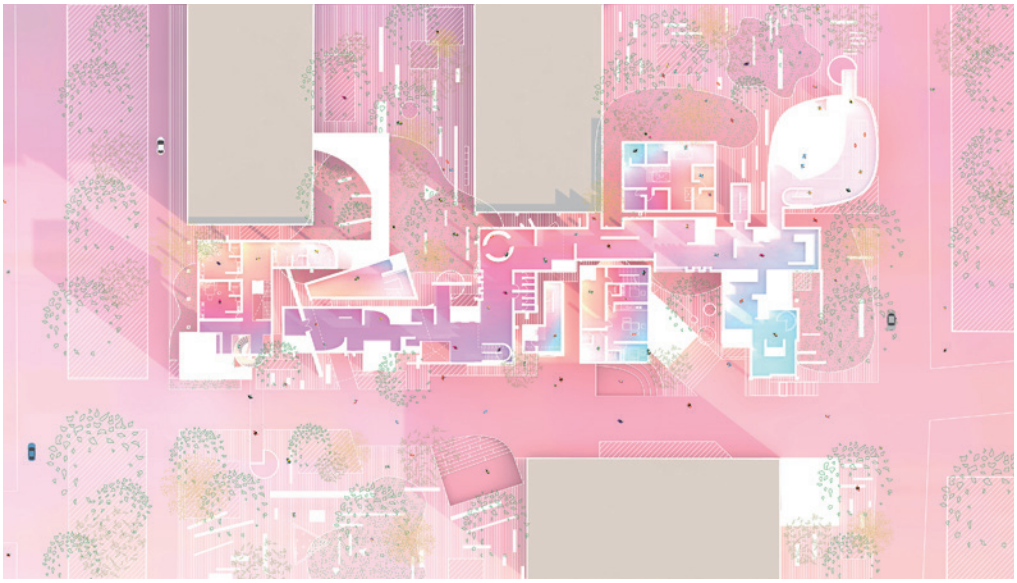
Based on the component system, the massing of the new complex integrates the formal language and color of geometric pieces to break the left rigid concrete structure and past impression of the Packard Automotive Plant. The new collective contains different housing and public buildings to preserve and showcase Packard history. Furthermore, the diverse landscape serves as the public resting space and outdoor gallery of Packard cars. The retained old structure supports the new design to reuse the abandoned site adaptively.

Axonometric Massing Diagram

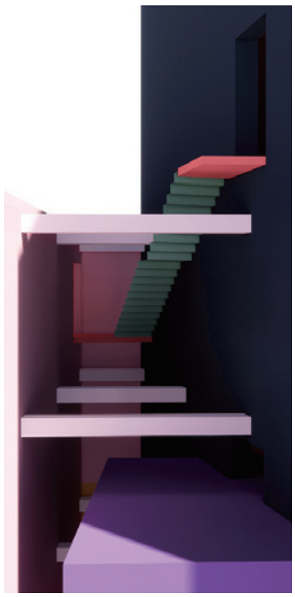
The housing scatters around the Packard Museum, separated from the Museum, and protects the residents' privacy in the community. The Gallery and Performance Center is connected with the Museum to promote the circulation of the public. The publicity of the program will attract more people to visit the complex and learn more about the history of Detroit.

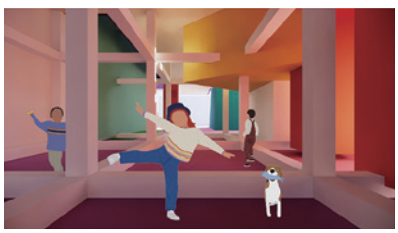
People from different buildings would meet and interact at different spaces and moments within the complex, generating numerous new vital dialogues between the old and the new—the new structure rebirths the old system by granting it new functions and appearance. The retained frame turns into a lively place for children in the outdoor playground and becomes a cultural symbol in the interior space of Packard Museum.

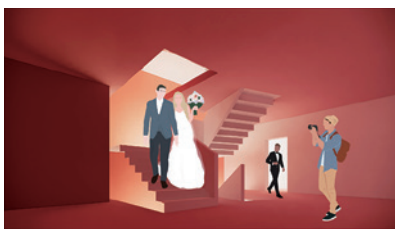
The old structure co-exists with the new structure. Part of it becomes the decorative frame for the complex, while the other part becomes the new structure to support it. These moments generate new stories for the existing abandoned Packard structure. Considering the potential of adaptive reuse of old structures, other abandoned structures in Rust Belt cities can apply it further.

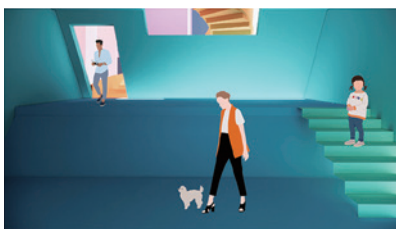


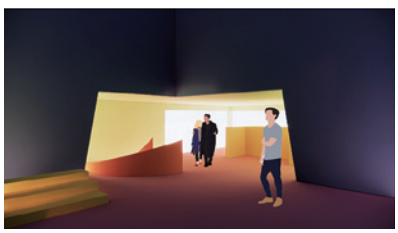
First Floor Plan + Ground Floor Plan

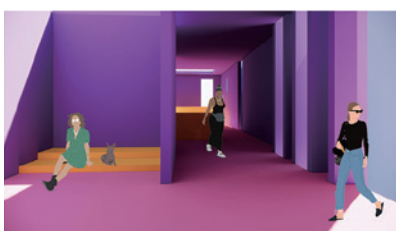


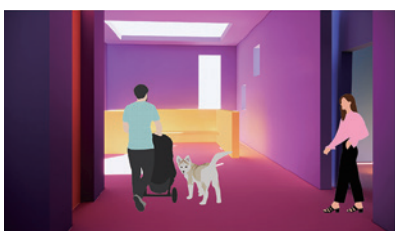












Interior + exterior scenes

The interior of the building applies color to vitalize the civic life in the buildings. Visitors would see the old structure of the Packard both internally and externally. People can enter the complex from East Palmer Street and East Grand Boulevard. The landscape surrounding the site contains pavement, planting area, playground, interior and exterior courtyards for visitors and residents to meet, chat, and relax.


E PALMER STREET

Ruralizing Suburbia reimagines the American suburb to be oriented around mutual community sustenance, resisting overconsumption and unsustainable domestic lifestyles. Overconsumption is embedded within the architecturalized built environment. The United States' economic model rationalizes environmental degradation for profitable gain. This creates a culture where the individual is dependent on overconsumption, removed from the industrialized contexts which produce each manufactured component of domestic life. American suburbia is constructed to reinforce consumption, privatization, and individualism under the illusion of living in a natural context, which is actively destroying the ecosystems in which suburbs are developed.

Our proposal seeks to design the suburban community as integrated within the production of food, energy, and resources necessary for its operation. Hoping to catalyze a new domestic lifestyle that embraces common wellbeing as opposed to individual overconsumption and accumulation, we propose three new suburban typologies.

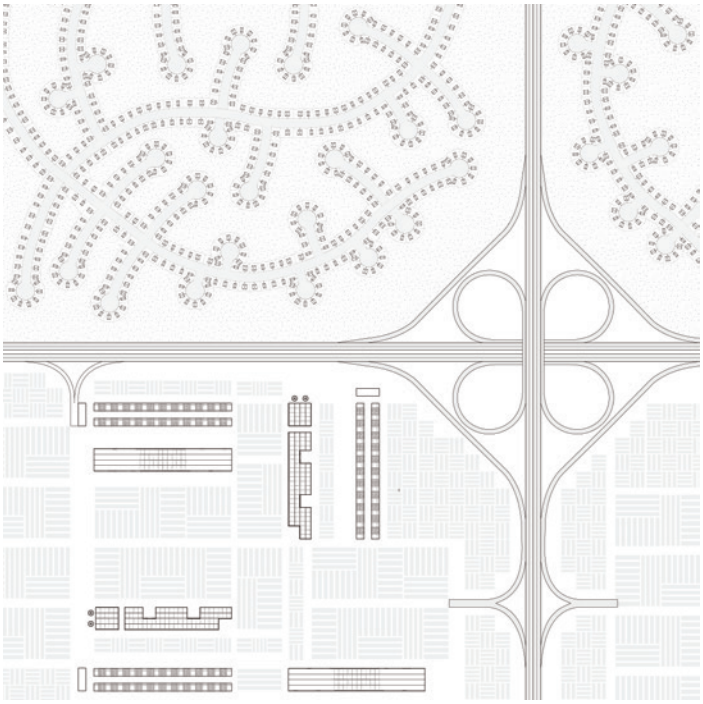
RURALIZING SUBURBIA

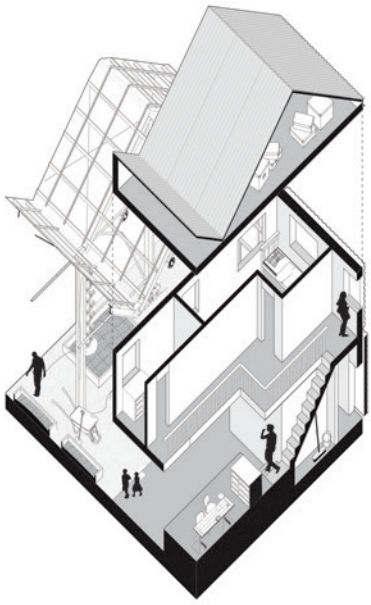
FOREGROUNDING SUSTENANCE OVER CONSUMPTION IN DOMESTIC AMERICA

EVAN PARNESS + JAMES SOTIROFF + COOPER SCHWARTZ

WALLENBERG CRITIC: EDUARDO MEDIERO

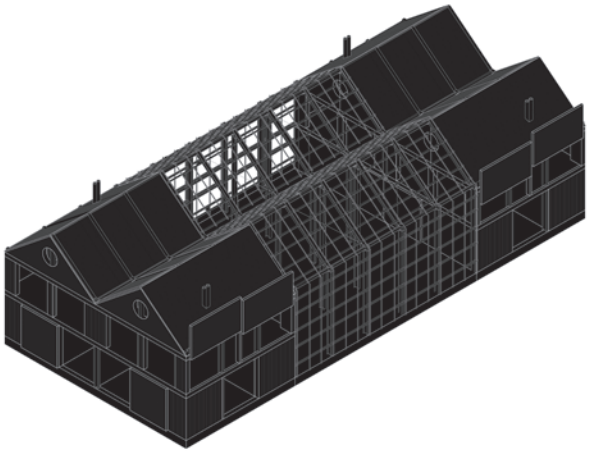
Grazing Field





ROW HOUSING UNITS

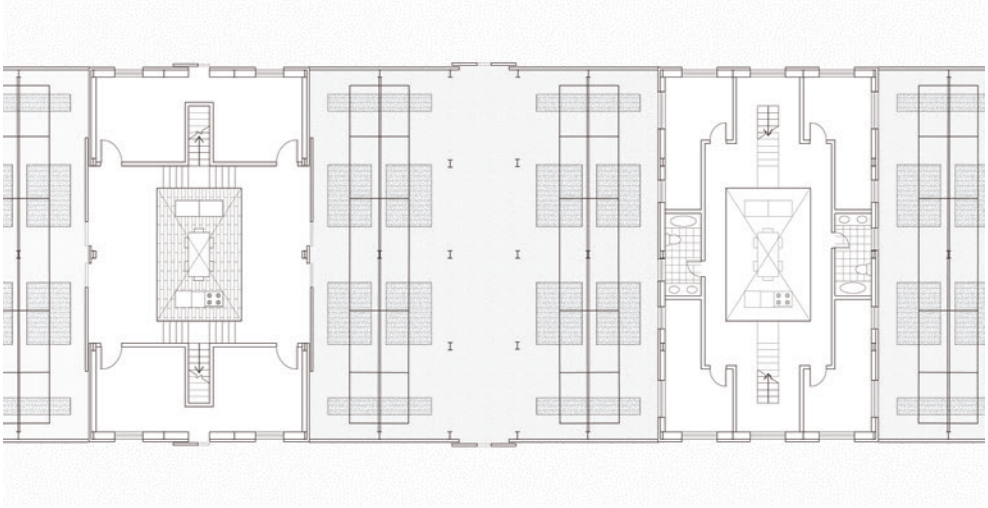
A Row Housing Unit with greenhouses between single family residences. This new housing typology, where qualities of suburban and communal-agrarian life merge, create semi-private and semi-public units designed for mutual care and localized food production between neighboring families. This design redefines backyard space, fostering a culture of cooperation and sustenance rather than individual overconsumption.

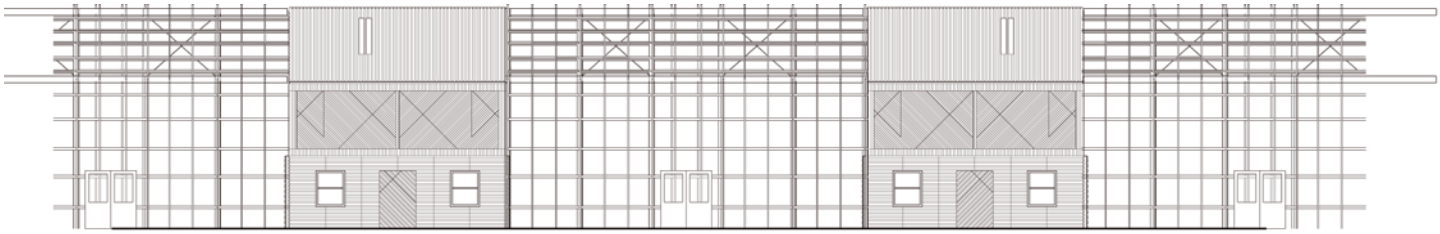


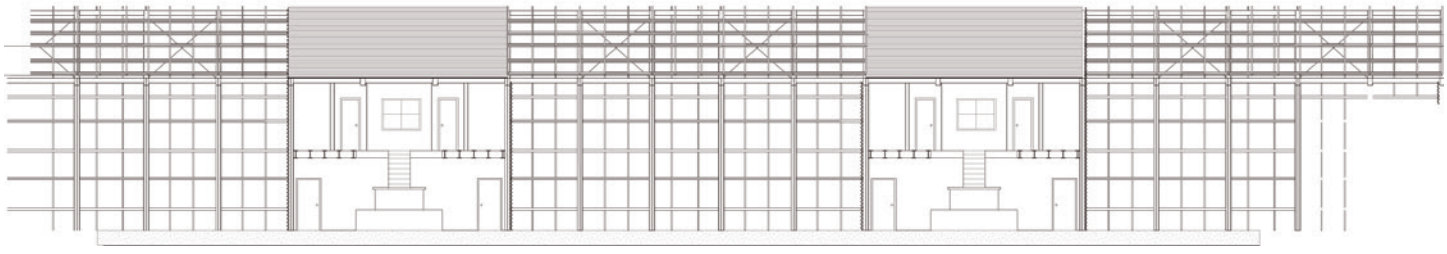
Approach to Row Housing

Row Housing Threshold

Row Housing Interior Greenhouse



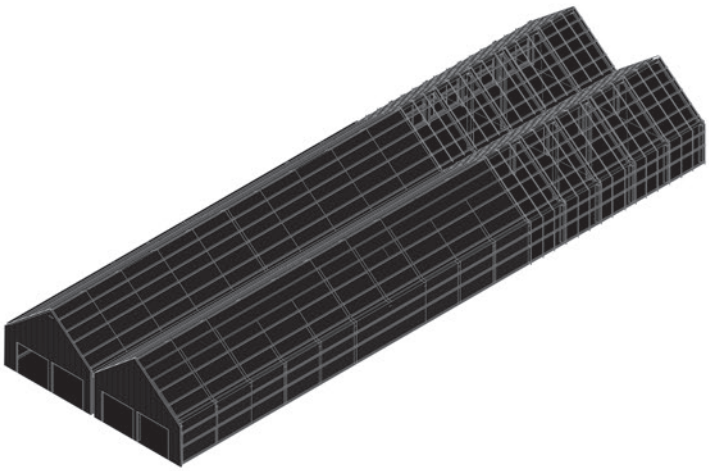


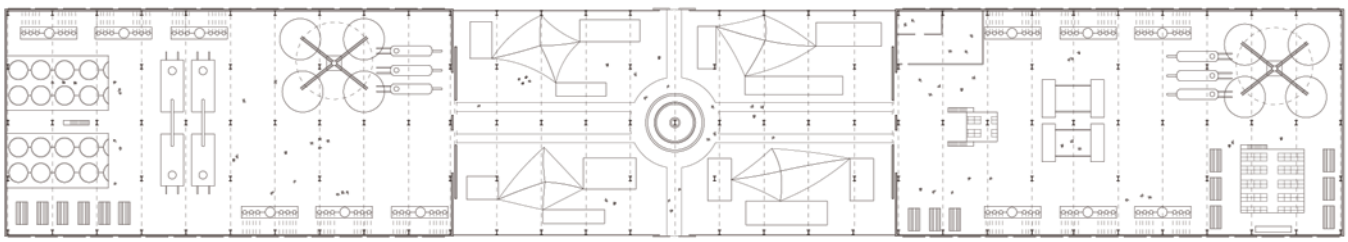


Row Housing Plan + Elevation + Section

RESOURCE GENERATION + INDUSTRIAL PRODUCTION CENTERS

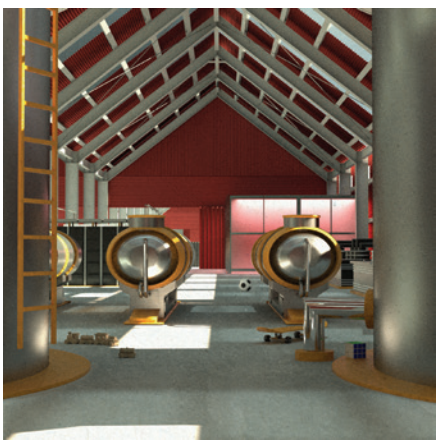
Centers for resource generation and industrial production serve as a unifying space for the community, while also producing energy. The resource center creates a flexible template for non-fossil fuel sources such as solar, wind, and waste-to-energy generation as per each community's energy generating capability, in addition to data storage, water treatment, and sanitation. With the same formal industrial language as our housing unit, the resource center is organized with gathering space in the middle that are used for commerce and to sell produce within the community and surrounding suburbs.



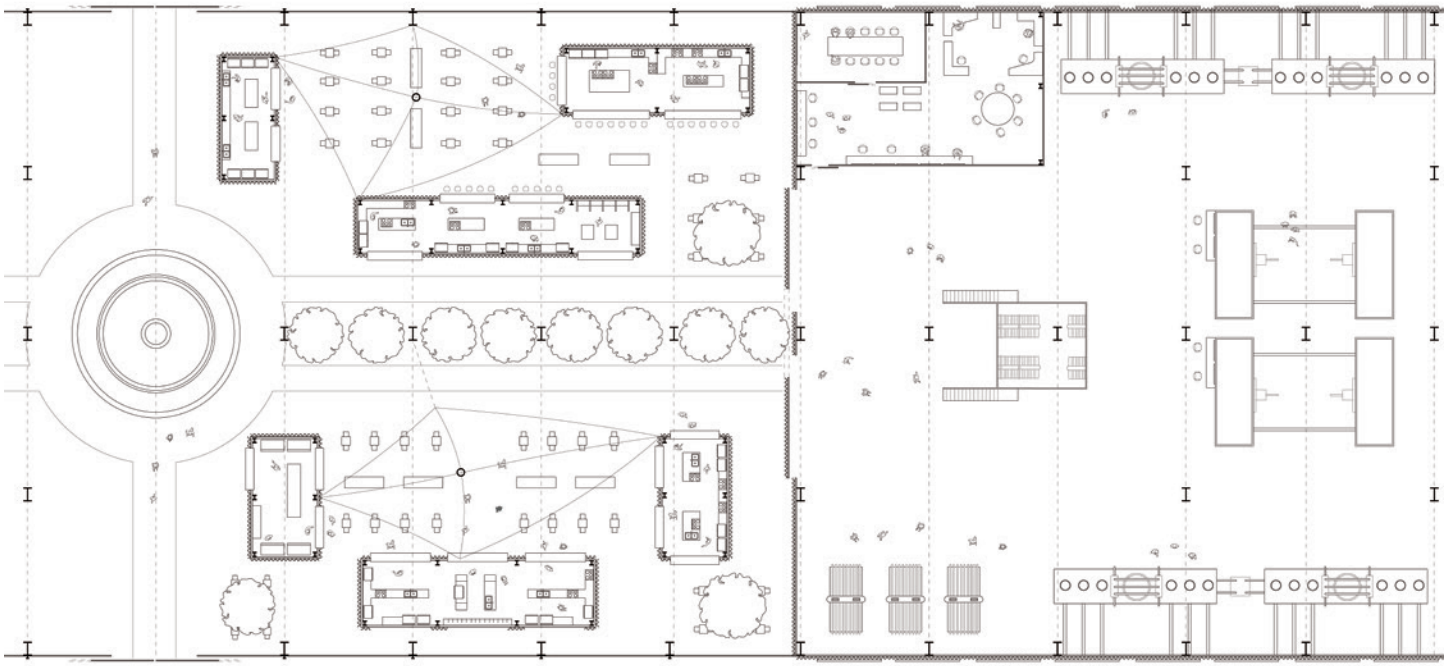


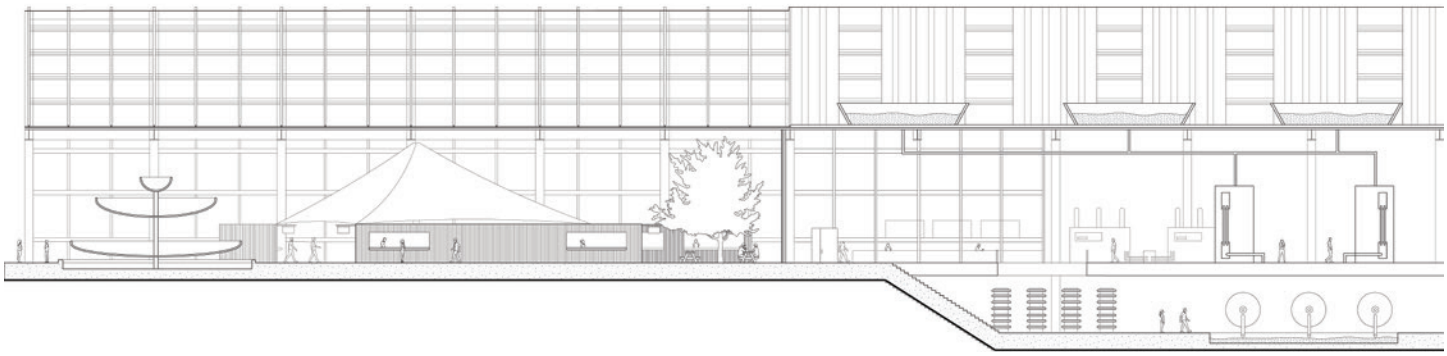
Approach to Resource Generation + Industrial Production Centers

Resource Generation + Industrial Production Center Threshold



Resource Generation + Industrial Production Center Interior



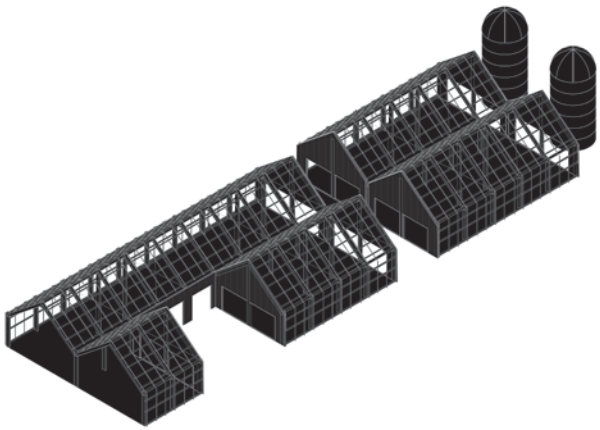


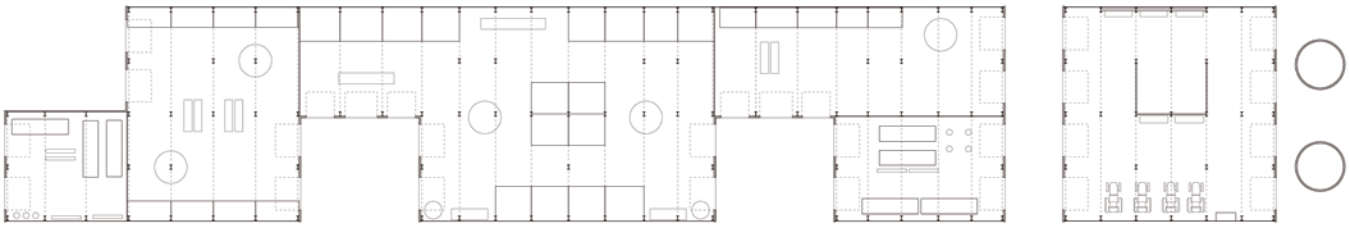
Resource Generation + Industrial
Production Center Detail Plan + Section

SUSTAINABLE FARMING

Animal housing and free range farming with fields between built components for rotational grazing, environmental regeneration, and native wildlife planting/ protection. In opposition to the inhumane and unsustainable practices of factory farming that supplies the majority of meat for Americans, we propose smaller scale meat production and consumption. Life in these communities would embrace a shift towards plant based diets grown in row house gardens, while developing a closer relationship with the community and the animals families depend on for sustenance. Our housing for animals was designed to provide 20m² of individual space per animal, serving as a sheltered playscape for animals with many openings, encouraging rotational grazing among each community's fields, pastures, and habitats.

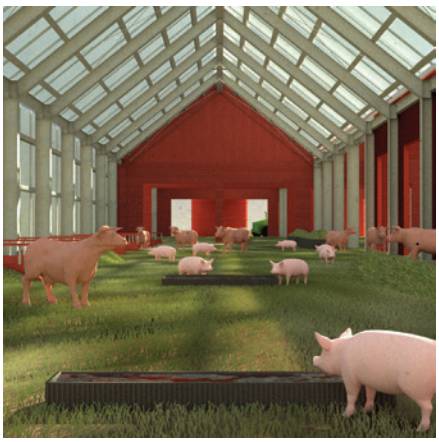
Our project asserts that if suburban development will continue, we must embrace the rural within the sprawl, becoming more closely integrated with the land. We believe in creating equitable ecological conditions for both human and nonhuman actors, and see tremendous value in communal empowerment through self-sustaining initiatives. Architectural initiatives must work to rectify the dissonances created by overconsumption of resources between the built and natural environment.



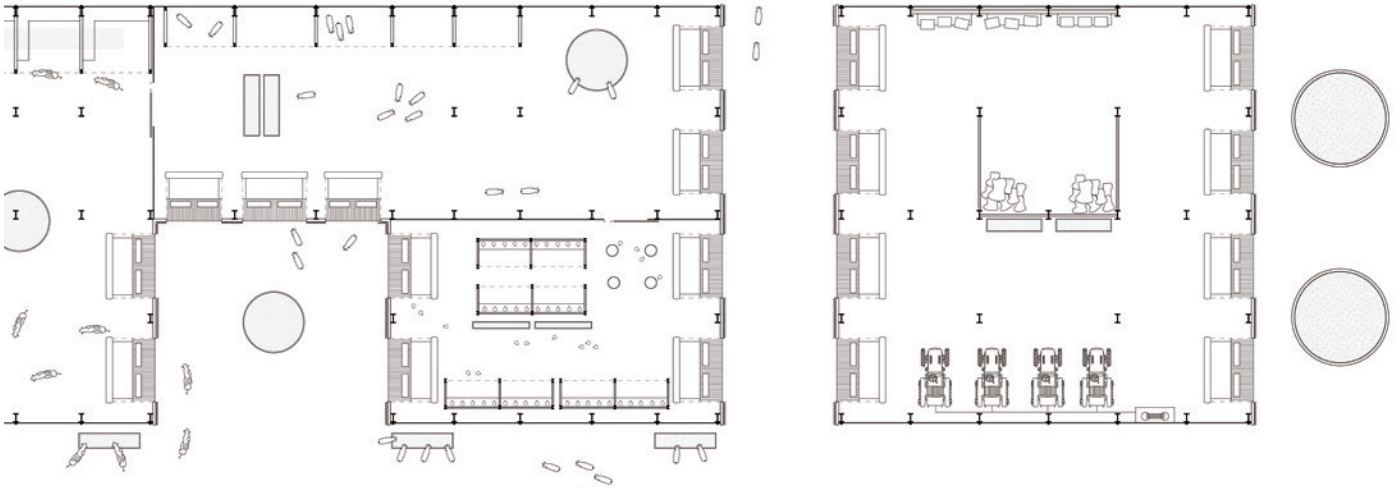


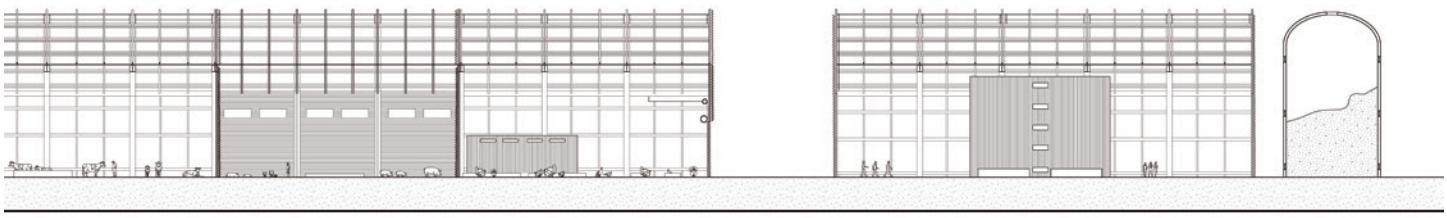
Approach to Farm

Farm Threshold



Farm Interior





Farm Detail Plan + Section

Plastics are one of the most widely produced man-made materials globally. Since their large-scale adoption in the 1950s, plastics have become an integral part of our daily lives. Every year approximately 380 million tons of plastics are produced, roughly half of which is designated as “single use.” Single use plastics are particularly problematic given their high embodied energy, general inability to be recycled, and long periods of degradation. As a result, there is urgency to rethink our relationship with single use materials.

Collaborating With Nature is a project that explores the production and scalability of biodegradable materials through the use of algae and mycelium bio-composites.

Taking inspiration from firms and practitioners spearheading research in the applications and manufacturing of bio-based materials, such as Ecovative and Biology Studio by Edith Medina, set up frameworks for the production of algae based bioplastics and mycelium prototypes. Over the past few months, our team has performed a series of material studies to increase our knowledge on how algae and mycelium bio-composites can be used within the design process. The goal was to create a series of prototypes that would increase understanding of bio-composite processes and the applications of bio-based materials within design. There is an interest in material properties such as texture, flexibility, and strength, as well as scalability of these bio-based processes.

COLLABORATING WITH NATURE

DESIGN EXPLORATIONS INTO BIOMATERIALS

KARA BOWERS + ZOË FAYLOR + ROSA MANZO

Image of bioplastic sheet in glass frame.

ALGAE BIOPLASTIC

Biopolymer: Agar (red algae)
Solvent: Water
Plasticizer: Glycerine
Additive: pigment, texture

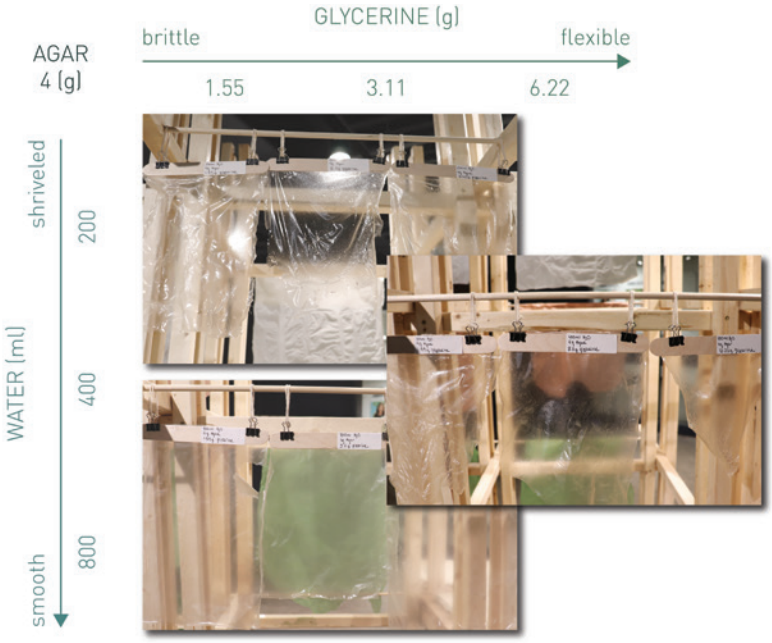


Figure 01

COMPOSITION AND INITIAL TESTS

A bioplastic is a type of plastic derived from renewable plant material rather than fossil-fuel. The main advantage of bioplastics is its ability to biodegrade. Bioplastics are composed of a biopolymer, solvent, and plasticizer. In these bioplastic material explorations, agar was chosen to work with. It is a biopolymer extracted from red algae, known for its gel-like quality.

The initial experiments started at a small scale using 4 x 6" frames, and followed the recipes of others online to find a composition. Figure 01 illustrates the initial experiments before scaling up. Using 4 grams of agar as our constant variable, while varying the amount of glycerine and water. The material experiments showed the more glycerine that was added, the more flexible the bioplastics became, while the more water that was added, the smoother the texture became. Thus, we settled on the middle composition of 4g agar, 400ml of water, 3.11 grams (1⁄2 tsp) of glycerine as a viable solution to scale-up.

PROCESS

Figure 02 illustrates the procedure followed when scaling up the bioplastics: first was the heating of the pigment and water, adding in the glycerine just before adding the agar at 60 degrees Celsius (the temperature at which the agar dissolves). Continuing to heat the mixture until it reached 80 degrees, where it simmered for 5 minutes before adding texture (optional) and pouring into the molds. Then, demolding the smaller experiments after 24 hours; however, when scaling up by a factor of 6, there is a need to wait 72 hours before the bioplastics completely dried in their frames.

The images on the next page show the bioplastic-making process:

1. Heating the mixture
2. Pouring into larger glass frames
3. Utilizing a heat gun to get rid of air bubbles prior to its gelification
4. The sheets drying in their frames
5. Removing the bioplastics from their frames

Removing the bioplastics from the larger frames was tricky. It took time and patience as the large sheets would rip and/or not release from the frame. The sheets were then hung to continue drying because we had rehydrated them. For texture, seaweed was selectively added which actually made the bioplastic more difficult to get out of the frames.

ALGAE BIOPLASTIC

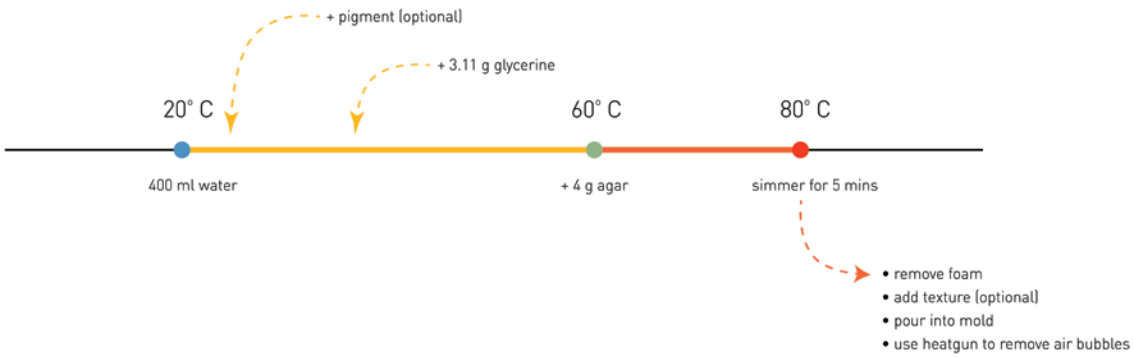
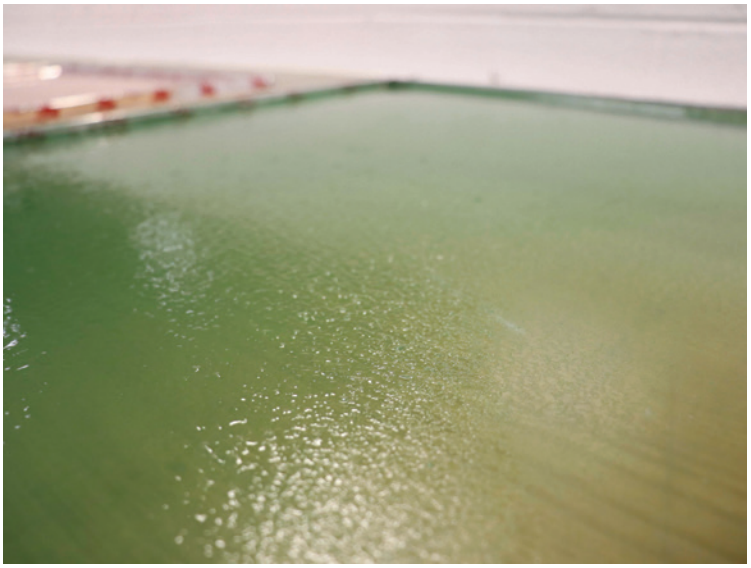
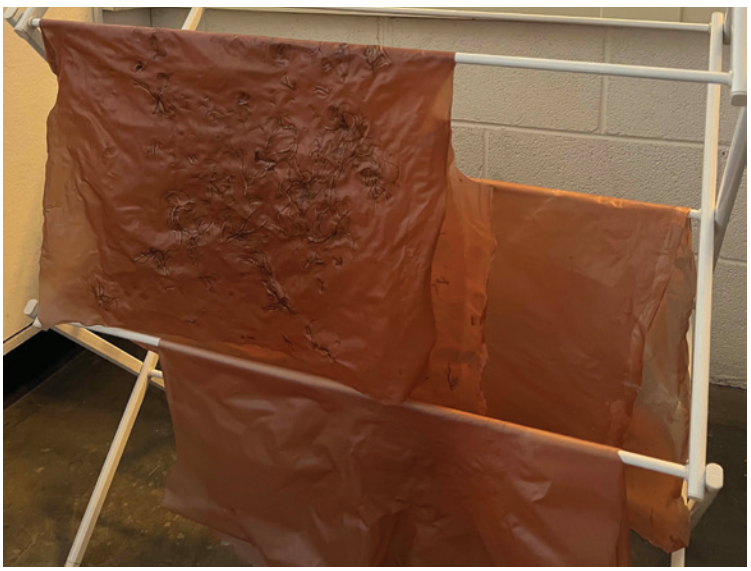


Figure 02





Additional images of the bioplastic process.

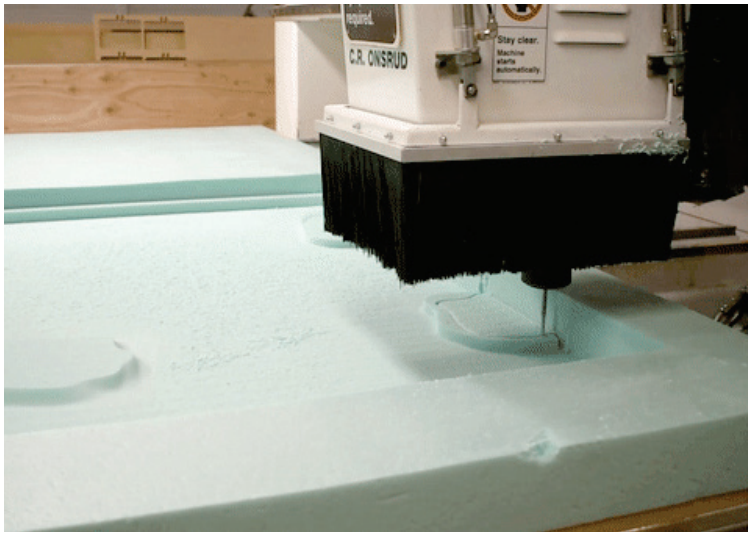
MYCELIUM FORMATIONS

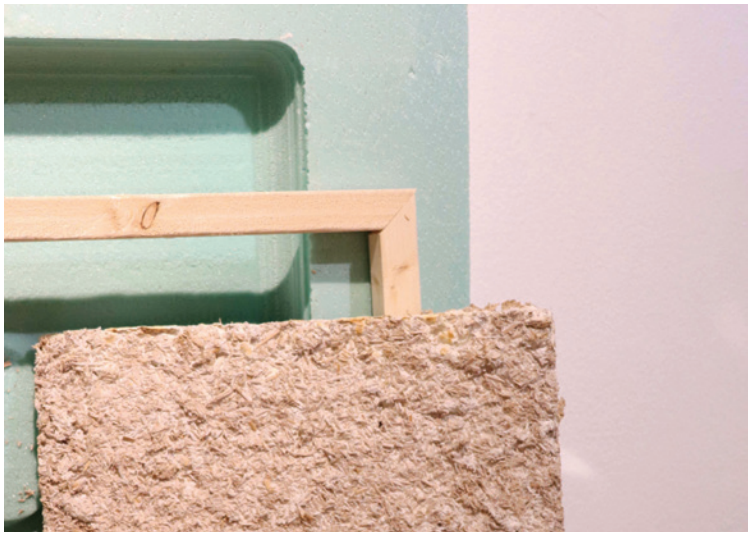
In addition to our studies with bioplastics, our group worked with mycelium composites. Mycelium is the vegetative structure (i.e. root structure) of fungus, often referred to as a fungal colony that grows within substrates such as soil or wood. Key ingredients to the growing process are the fungal spores and an organic substrate, such as wood shavings or agricultural byproducts. Different substrates produce different material properties and impact everything from aesthetics to structural capacity of the final product. As a result, mycelium's ability to grow in a range of substrates gives it the potential to be a diverse building material.

PROCESS

To produce the mycelium composite, Collaborating with Nature used Ecovative Grow-It-Yourself kits, which came prepackaged with dehydrated mycelium spores and a pasteurized agricultural substrate. Using packaged kits because it streamlined the growing process and eliminated the need for us to source our own spores and pasteurize the substrate material.

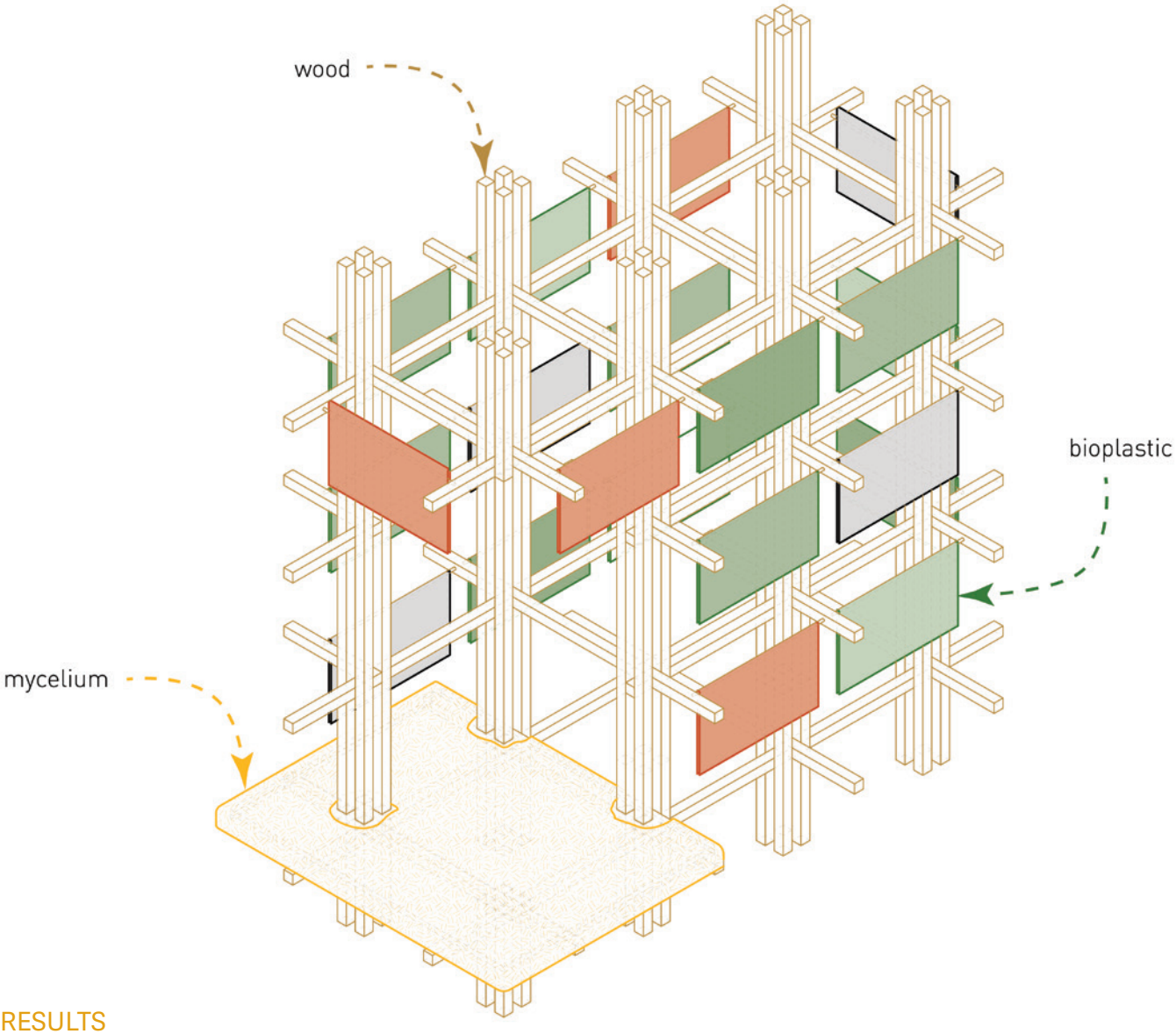
Growing mycelium is a ten day, three-step process: activation, formation, desiccation. Since it is a living organism, it's crucial to monitor growth during this ten day period because it can be susceptible to mold and bacterial growth, which can kill the mycelium.





The mycelium composite is activated by adding water and flour to the kits. The water rehydrates the spores and the flour provides a food source. The activated bags are left to grow for a five day period in a room temperature environment, out of direct sunlight. While the mycelium is in the first stage of growth, molds for the formation process can be prepared. Molds can be made out of many different materials. Collaborating with Nature used everything from silicon and PETG molds to metal bowls, cling film, foam, and wood. Porosity is the most important material characteristic to consider when selecting a mold material. Mycelium will demold quite easily from less porous materials like plastic. However, it will grow into porous materials, such as wood, which makes it difficult to release without damaging the structural integrity of the composite.

After five days, the activated mycelium is ready to transition into the formation stage. To form the composite into its final shape, the mycelium must be manually broken down into a loose substrate and tightly packed into a prepared mold. Once everything is in place, the form must be covered with perforated cling wrap to prevent contamination and left to grow undisturbed for another five day period, after which it will be snowy white in color and soft to the touch. To dessicate, the mycelium composite is baked in the oven or left to air dry for several days, which was the preferred method of desiccation in Collaborating with Nature.



RESULTS

Overall, the material experiments supported empirical findings reported online which postulate that using agar (vegetable) instead of gelatine (animal) as a biopolymer has less predictable results. The amount of water lost and shrinkage experienced during the drying process and found this was also difficult to predict and also surprising.

Utilizing different materials for the frames had more of an impact on the success of the bioplastics. Initially the use of non-stick baking sheets allowed for a quick release and demolding. However, the final texture was not smooth, so the bioplastics had a cloudy appearance.

Frame materials that provide a smooth finish and easy demolding were then used to experiment. Using wood frames taped over acrylic sheets, it was found that the heat of the mixture warped the wood and acrylics. Additionally, the tape wasn't enough to hold the mixture in. This led to a significant amount of leakage and the final bioplastic was very thin, unevenly spread and significantly hard to demold. Using much thicker wood sticks taped around a large glass backing with 3M aluminum foil tape that could withstand temperatures up to 300 degrees Fahrenheit. While this helped with the warping, two of the glass backing sheets cracked from the heat. Lastly, the demolding process seemed to be more difficult than simply peeling back the sheets from their frames when scaling up.

The sheet was impossible to remove from the frame, as we discovered we were unable to properly peel the sheets off in one complete piece. After trial and error, applying a small amount of water with a foam brush to the bioplastic allowed the sheets to gently release from their frames while keeping their sheet shape. Thus, rehydrating the sheets allowed us to pull it up in a single large piece. This rehydration process wrinkled the sheets, however, we were able to smooth out and soften some wrinkles with a steamer.

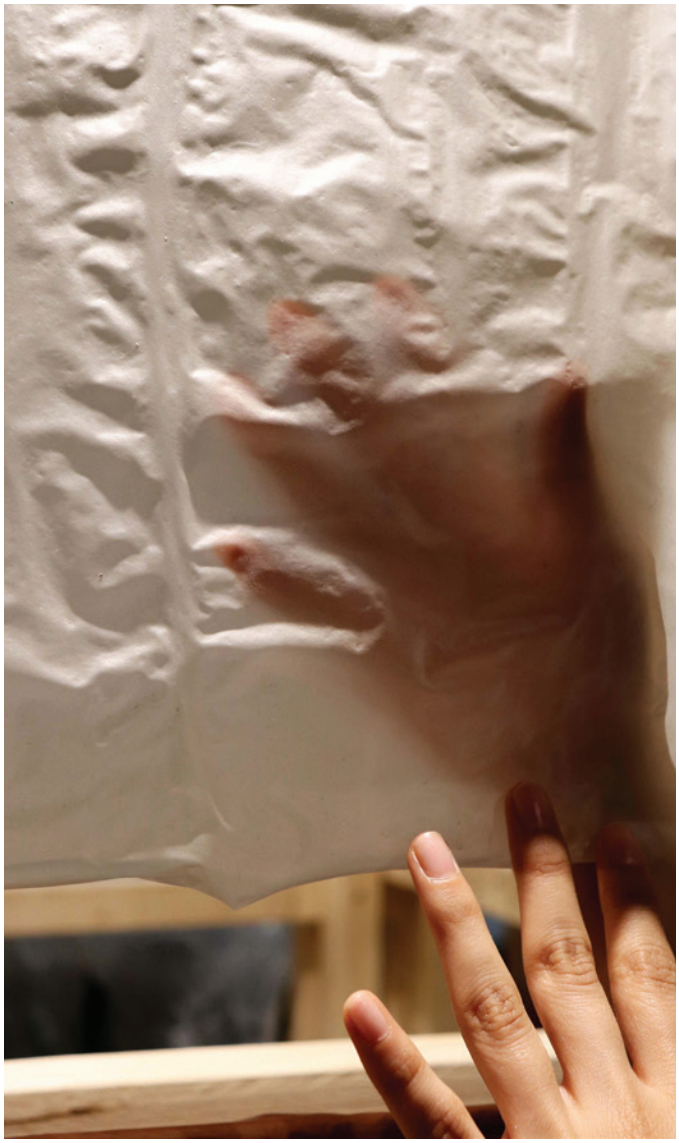
REFLECTIONS AND FURTHER RESEARCH

Bioplastics:
As it stands, this body of research has applicability for short-term, temporary installations given the water solubility and delicate nature of the material. Bioplastics is difficult, especially when scaling up. As such, there is still further work to be done with regards to bioplastics. This team encourages anyone interested in bioplastics to partake in this cultivation of knowledge. Further research can be conducted into making the products waterproof for long-term installation and increased usability. One such example would be the incorporation of organic waxes, such as soy, coconut, and beeswax, that would render the bioplastics waterproof, yet allow them to be compostable. Continued research into the potential of 3D printing with bioplastics and re-formulating for injection molding would help increase its applicability and scalability.

Mycelium:
Similarly, further research with mycelium can be conducted into making the material more structurally sound. In this project, the mycelium cultures were a bit temperamental, regarding their shelf life and viability. As such, further research can be done into the longevity and viability of different mushroom cultures. Lastly, the team found the growing process as outlined by the Ecovative kits used to be rather dependent on plastic, from activating the cultures in bags, to the molds themselves, and the plastic covers to maintain proper moisture and sterilization. Further research could be done into how to make the process more plastic-free either by incorporating waterproofed bioplastics or sculpting mycelium blocks via CNC routers to eliminate the need for molds.

EXHIBITION

For the exhibition, there was a desire to create a display structure that thought about the applicability of the biomaterials. The exhibition was interactive but also helped display the various experimentation samples. As such, this multiple-orientation gridded design allowed various people to view and interact with the materials simultaneously. The construction process, in total, took around 12 hours, not counting the time it took to cut and pre-drill some of the wood strips. This process might have gone quicker if not for the fact that some of the wood strips were significantly warped and twisted, a challenge that was expected and accommodated to during construction. While this was not a wood research project, there was a desire to work with wood, given it is an organic biomaterial the team was all familiar with, contrasting it with the less familiar biomaterials that the team was developing. Wood would also allow for experimenting with the mycelium's ability to grow into the wood and incorporate an integral mycelium-based element into the exhibition design. This was designed as a bench and complemented with two pendant mycelium lamps.



Objects that occupy physical weight in space invite a tactile experience beyond the two-dimensional picture plane. We Need to Talk: Agents of Conduction is modeled as an interactive furniture set embedded with commoning catalysts and social cues.

During the pandemic in 2020, societies evolved a new level of dependence on the Internet. It has enabled waves of attention harvesting through addictive software, polarization through filter bubbles, and powerful etiquette transformations. This thesis examined the effects of social media as a platform of attention harvesting and behavior manipulation enforcing divisiveness and misinformation in the present day United States. We Need to Talk prototyped architectural responses that counter polarizing digital forces.

Rather than tapping into our vulnerable reactive intelligence, the designs seek to promote our reflective and deep intelligence, encouraging curiosity through interaction, and elevating wisdom over efficiency. The designs prioritize participation, space, and the questioning of reductions. The interventions have the ability to grow into the fabric of the neighborhood, influencing social routines and fostering a neighborhood commons. In reference to ancient human comforts, a campfire invites all to gather and share the attention of one another.

WE NEED TO TALK

AGENTS OF CONDUCTION

WAYLON RICHMOND

THESIS ADVISORS: MALCOLM MCCULLOUGH + CATIE NEWELL

The Orb is currently active in Pittsburgh, PA with a radiant bench system under construction.

The Orb is designed and fabricated as a public infrastructure that provides a social gathering space or modern hearth, providing heat distribution within thermally active outdoor furniture and a neighborhood bread oven. The warm thermal mass and anamorphic optical lenses draw public curiosity. The 400 lb object cultivates an atmosphere that cannot be reproduced digitally. Darkness activates the viewports, while cooler nights draw hands in for communal warmth. The firelight magnifies and projects outward, while the mass slowly warms. Food and baked goods can be prepared on a threaded steel grill top, gathering the neighborhood through dining.


STOP
ALL WAY
WHEELER PARK

Thermosiphon Heat Distribution System

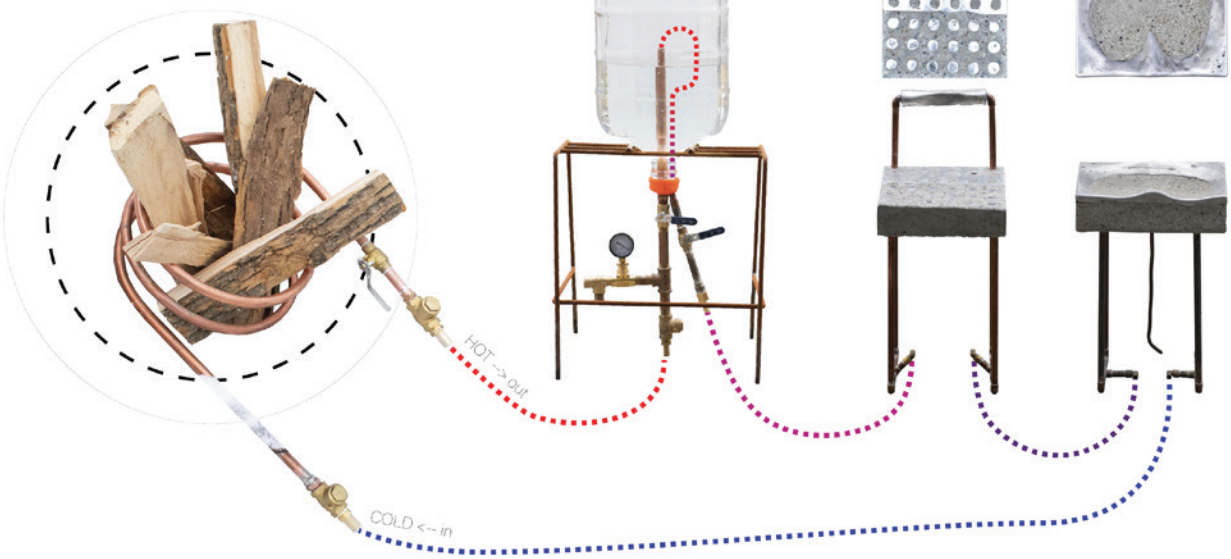
Orb thermal mass
Heat source- wood combustion
Radiant heating element
One-way and shut-off valves

Glass regulation water tank
1:25 Propylene Glycol
Pressure gauge
Pressure release valve (75 psi)

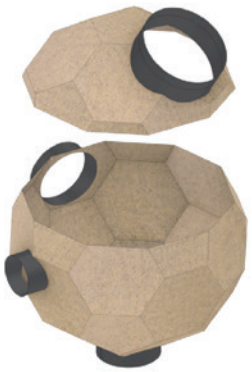
Radiant Furniture Prototypes

Carton Stool II

Fudi Chair I



Assembly Process



Interior Fire Barrier
Truncated Icosahedron
Firebrick
Stovepipe shafts

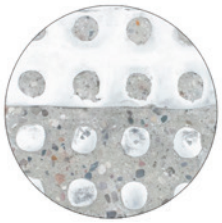
Viewport Hardware
Water-jet cut steel brackets
Polyceram glass
Magnification lenses
Radiant heating element coil

Exterior Thermal Mass
Refractory concrete shell:
Fireclay, hydrated lime, lava rock, gravel, portland cement, fine sand, sodium silicate

Stovepipe- 6'
Filled copper stand

custom refractory concrete
volcanic rock aggregate

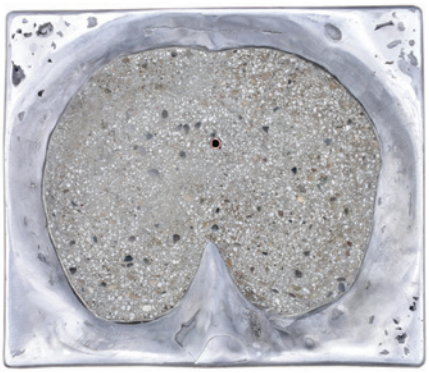
1000 grit masonry wet polish
sodium silicate seal



cast aluminum forms *conduct*
insulative concrete masses *store*

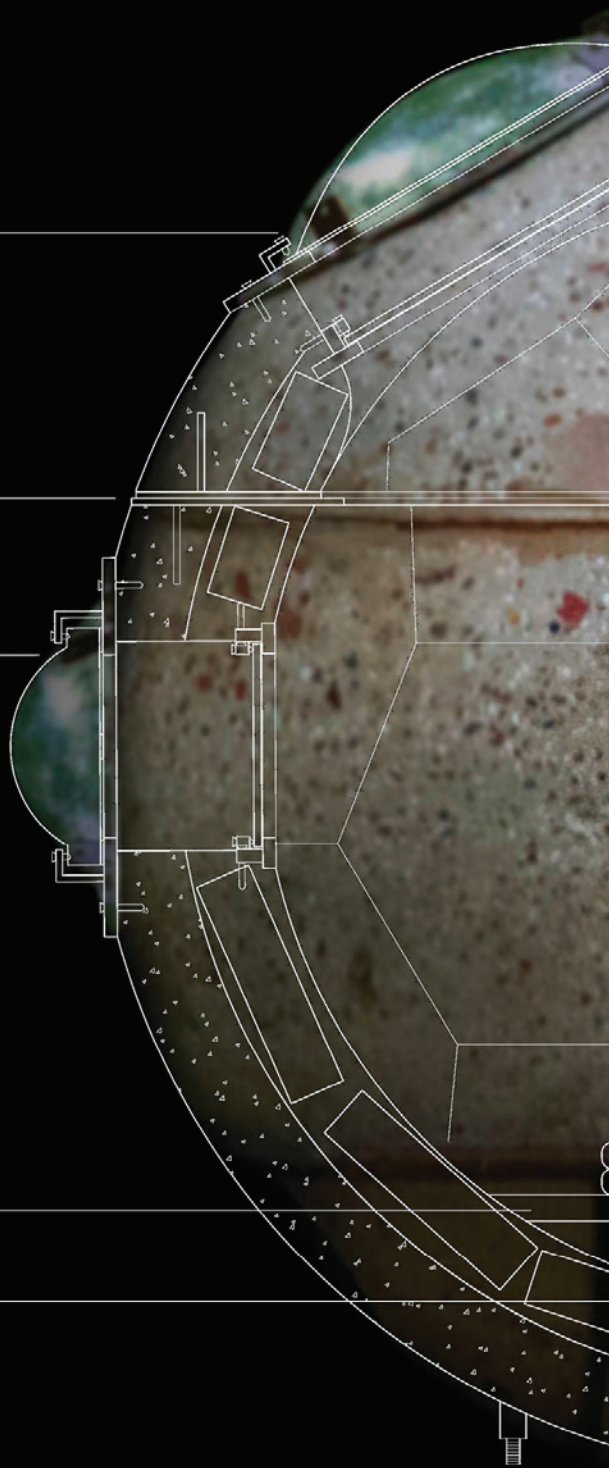
polystyrene pipe

copper pipe



Radiant Furniture Prototypes

Orb Structural Section



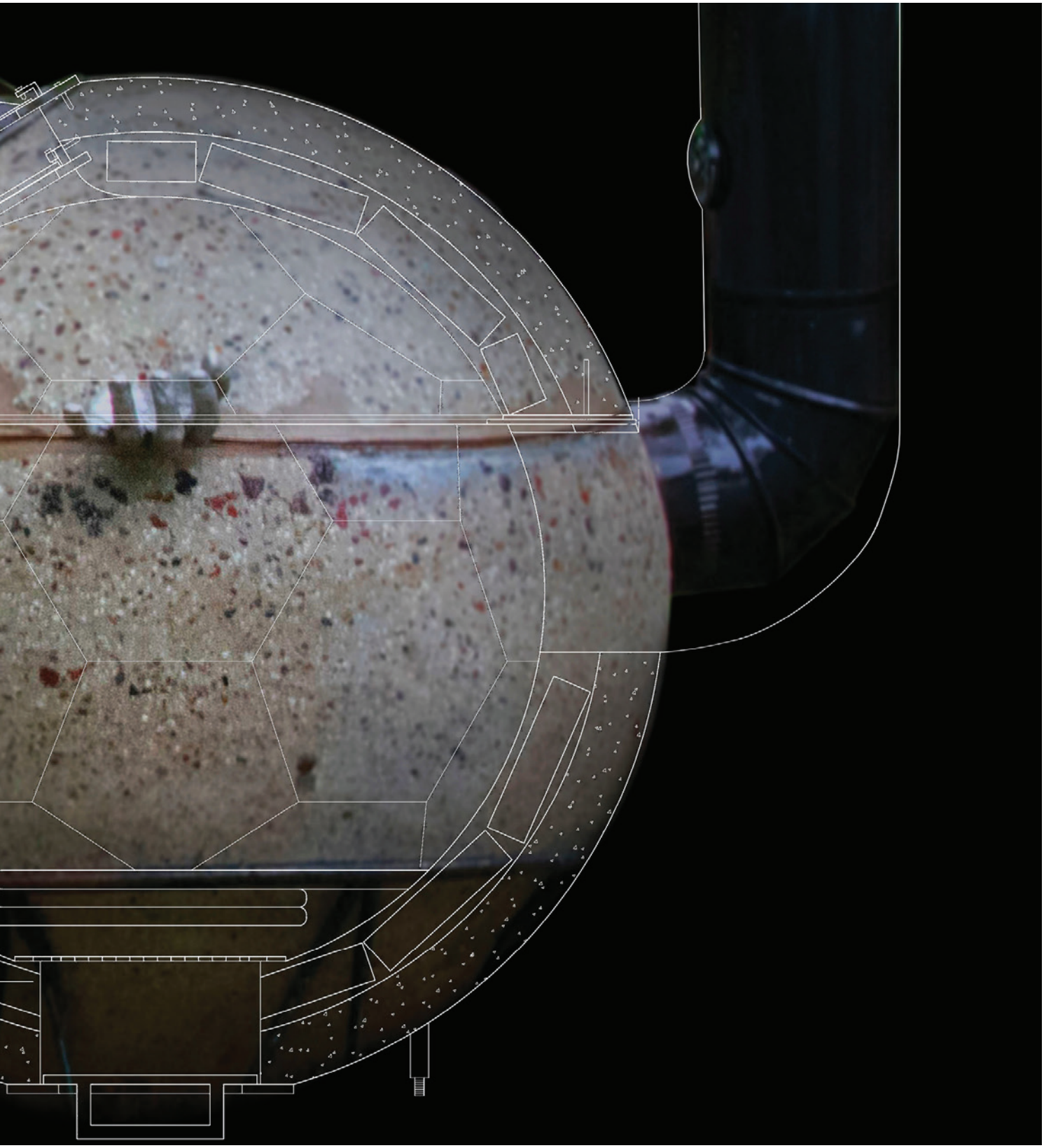
1.5″ refractory concrete shell
1.25″ firebrick interior shell
16 ga. steel reinforcement wire

0.25″ steel ring plates 28″ Ø (2)

5″ glass viewport
folded steel mounting brackets
0.25″ threaded fasteners
4″ Ø steel shaft
interior pyroceram fireproof glass
fiberglass cloth gasket

0.5″ x 10′ coiled steel pipe, threaded

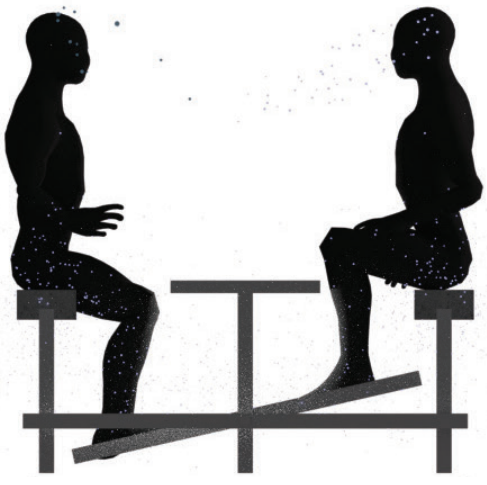
0.5″ x 8″ Ø coal tray
6″ Ø steel air intake shaft
rotary steel air damper
8″ Ø external steel bracket

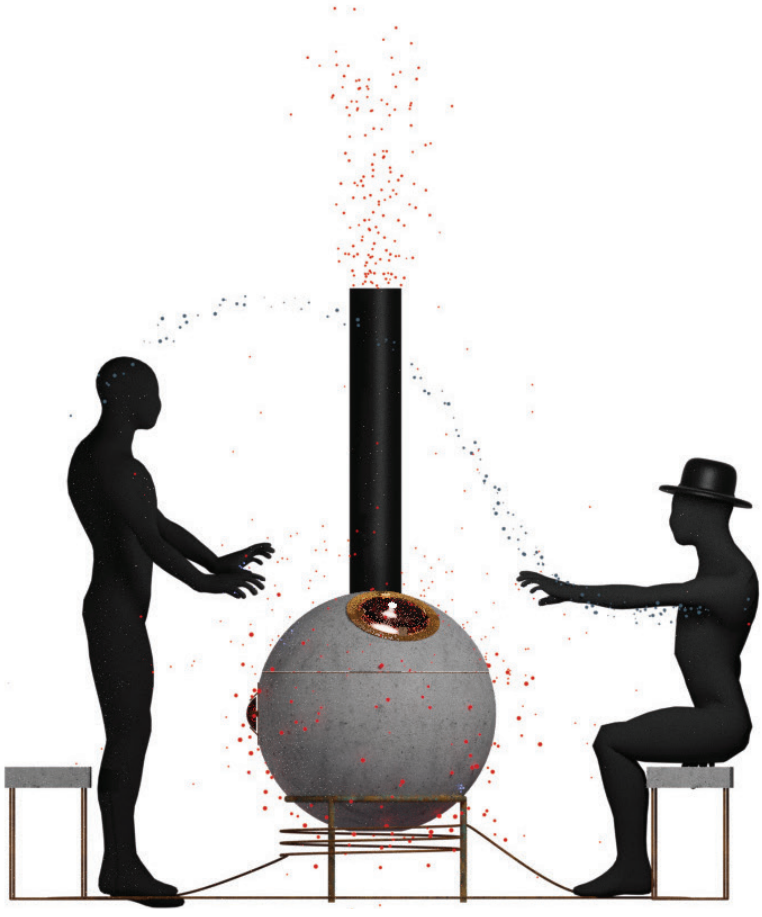


The prototype was stationed on an Ann Arbor sidewalk for six months. It was lit once a week, and a communal woodpile supplied passersby the opportunity to stoke the furnace. It steadily rose to beacon status in the neighborhood, prompting glimpses, small talk, and heavy conversations. The curious anamorphic body engaged children and artists alike, uniting groups through shared wonder.

The heating system operates by thermosiphon, the steel coil embedded within the fire heats and draws pressure from the closed loop system, circulating hot water throughout the thermally active furniture. The prototypes reference technologies used prior to the information age that offer intimate energy-transfer processes through water, steam, heat, and electricity. The materials chosen were driven by thermal conductivity attributes, physical body cues, and their curiosity value for sparking conversation. Thermally conductive materials of aluminum and copper are fused with insulative concrete with high thermal mass, enabling the participant to feel the kinesthetic energy change through interactions. Cast aluminum is lagged into insulative concrete to create conductive warm spots on the furniture. Two aluminum hands are used as handles for the removable lid. Shaped bodily cues invite a platonic relationship between body and object.

The brick is cut in an icosahedron structure of hexagons and pentagons. Two magnified lenses extend into the fire through steel shafts with accompanying custom brackets, protected from the interior by high heat ceramic glass. The exterior shell is composed of a refractory concrete mixture of volcanic rock aggregate, fireclay, and fine silica sand.





POSTSCRIPT

CHRISTIAN UNVERZAGT
ASSOCIATE PROFESSOR OF PRACTICE IN ARCHITECTURE + FACULTY ADVISOR

Producing a journal of architecture for the first time is hard. The second time is even harder. Yet, students at Michigan have managed to publish Dimensions for thirty-five consecutive years.

Spanning across five decades, seven U.S. Presidents, and at least four college deans, the journal began in 1987 with four editors who adopted the square pamphlet format of Dimension, a visually expressive and diverse publishing initiative that ran for more than a decade from 1955–1967.

Those first editors of Dimensions asked for suggestions on how to keep the journal going, as efforts of this kind are difficult to maintain and often wane over time. They knew that despite their best efforts, there was no guarantee anyone would pick up the baton they had just put down.

Dean Robert Beckley, who recognized both the inherent value and challenging nature of publishing, pledged the support of the College to help Dimensions renew this tradition, and the journal is forever indebted to him for initial and sustained support, which has been reinforced by subsequent leadership. It is also indebted to the nearly four hundred students who have taken up the baton and worked to answer the question of how to keep Dimensions going. This year, a team of ten editors strove to extend the non-traditional traditions of Dimensions. Like past years, their contributions to its design and production are a gift to us all. Now that they've put it down, the baton awaits.

Keep it going.

ACKNOWLEDGEMENTS

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