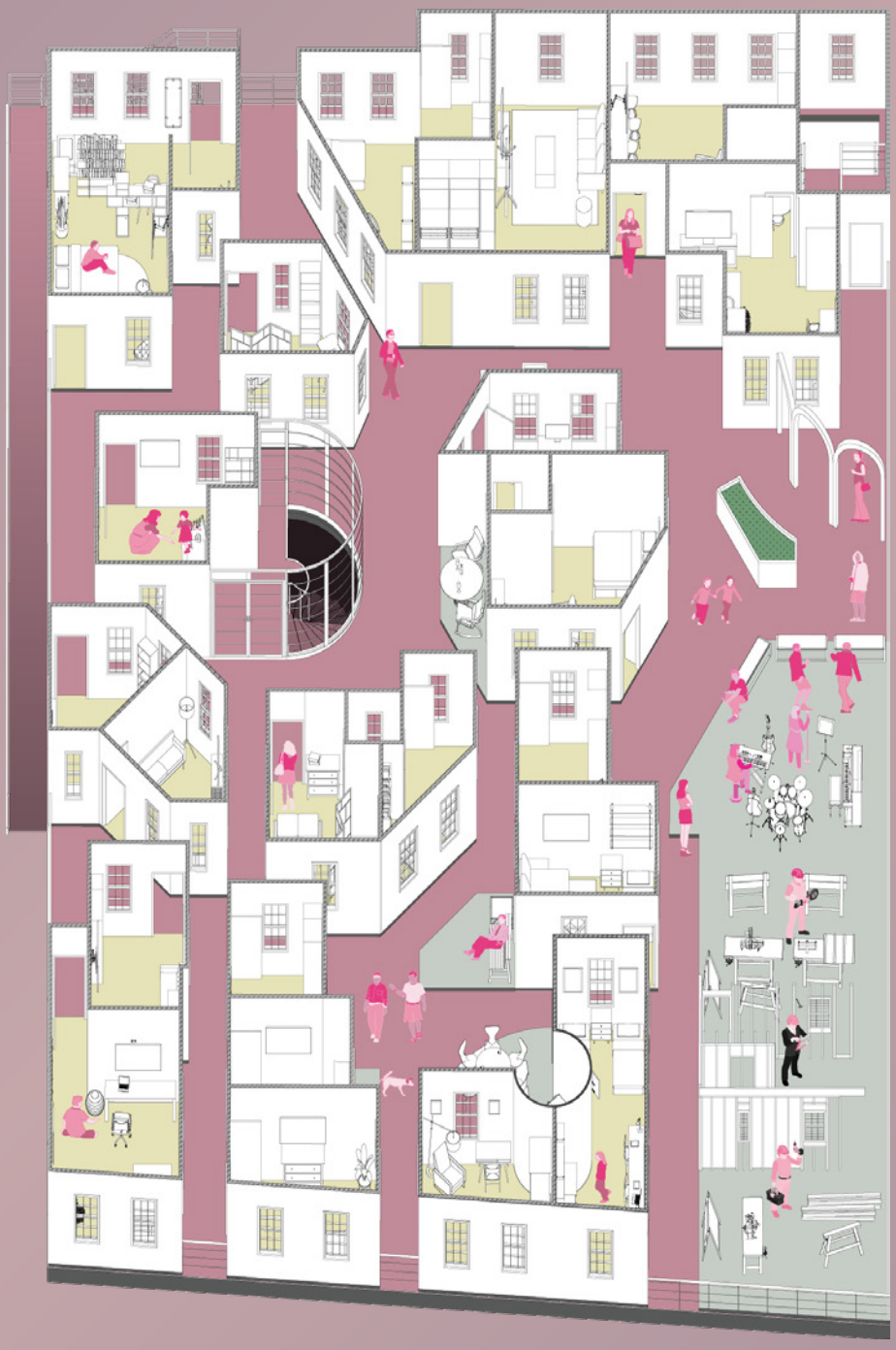
Interstitial Lives



James E. Churchill

GSAPP · COLUMBIA · MARCH 2025

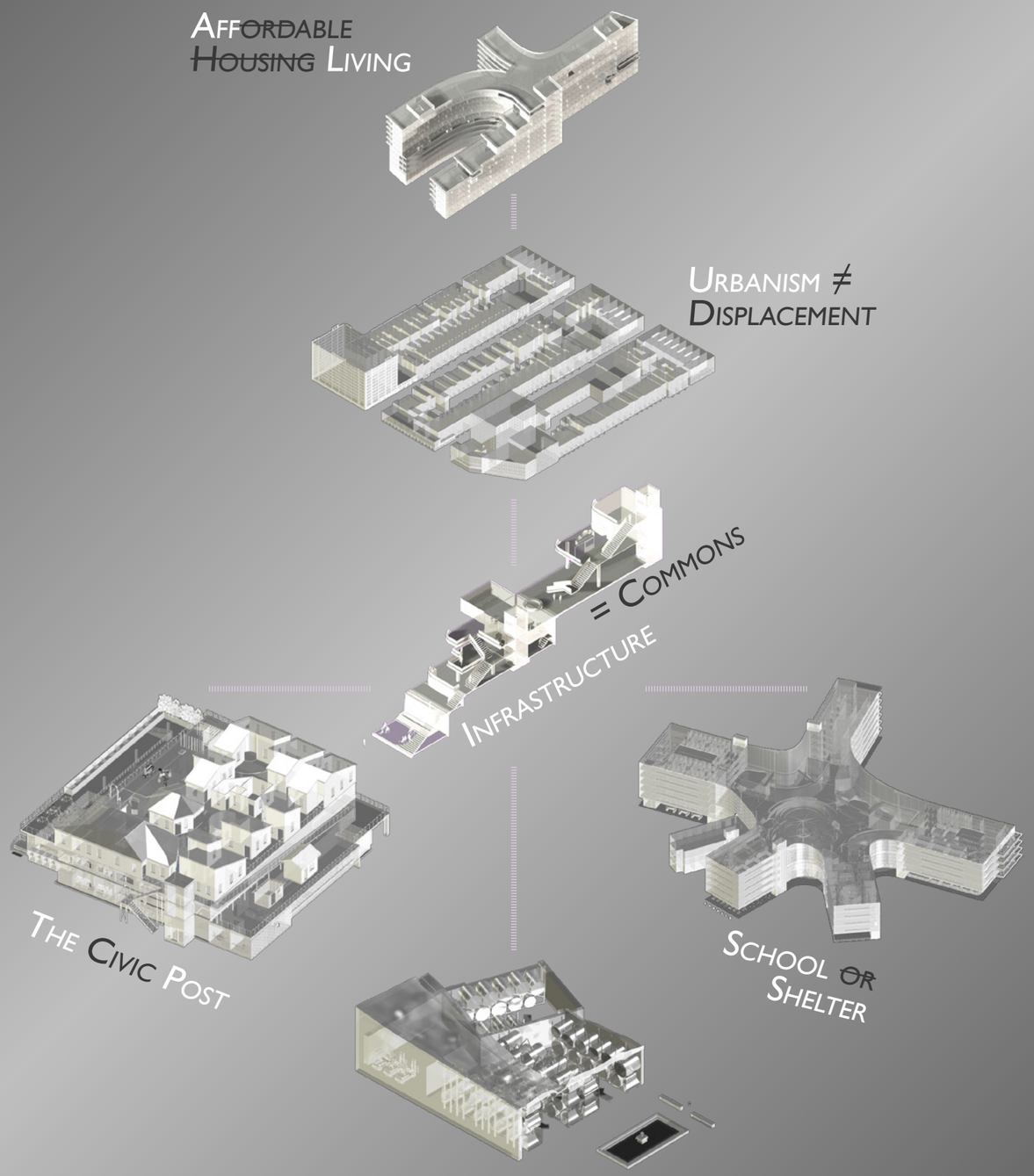
I have always believed in social responsibility. I have served as a Special Constable with the Metropolitan Police, a pilot with the Royal Air Force, and engaged in volunteer work for nature conservation. My passion for culture led me to earn degrees in Japanese and Chinese, and to live in both Tokyo and Hong Kong. These experiences shaped a 16-year career in finance. By 2015, however, I was in search of greater personal fulfillment and began part-time architectural studies at SCAD Hong Kong.

In 2017, I wrote a preservation analysis "The Architectural Harmony of Union Church." The paper was cited by the Hong Kong Free Press and used by Docomomo to urge Chief Executive Carrie Lam to protect a Grade III listed building facing redevelopment. Despite passionate public demonstrations and community opposition, the building was lost to demolition. The experience and outcry were pivotal, prompting me to step away from a long-standing career in finance and pursue a new path dedicated to heritage architecture and cultural preservation.

At GSAPP, my work builds on a foundation shaped by these experiences. Developing fluency with different cultures has allowed me to approach urbanism with a cross-cultural lens. My research has explored how urban planning, adaptive reuse, and programmatic strategy can empower communities while leveraging the interstitial spaces of the city. This portfolio reflects a commitment to rethinking overlooked urban zones. By experimenting with typology and scale, I aim to restore relevance to New York City's forgotten corners, fostering sustainable growth rooted in local engagement.

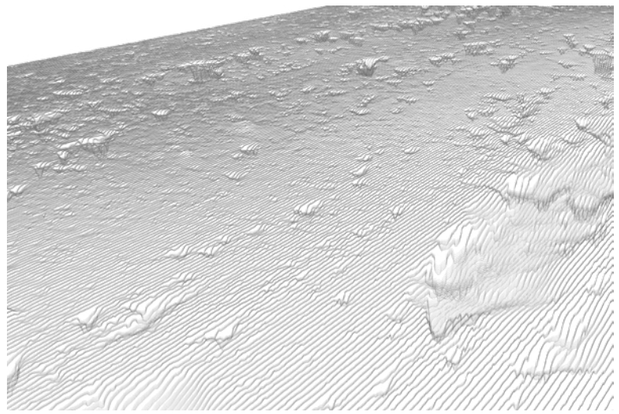
James E. Churchill

01.	*Unearthing San Juan Hill*	Urbanism ≠ Demolition
02.	*The Bronx In-Between*	Infrastructure = Commons
03.	*For Us Apartments*	Affordable ~~Housing~~ Living
04.	*Phoenix Academy*	School ~~or~~ Shelter
05.	*Address the Future*	The Civic Post
06.	*The Reflecting Tomb*	Architecture of Holding
07.	*A Study of Muqarnas*	Critical Research



01

UNEARTHING SAN JUAN HILL



REEVALUATING MATERIAL TENSIONS AT LINCOLN CENTER

Studio: *Core I*
Professor: *Christoph Kumpusch*
Site: *Upper West Side, NYC*
Duration: *13 weeks*

NatureWorks navigates the urban condition of Manhattan, shaped by density, displacement, and the ethics of development. Like molecular systems, the city reveals interactions and voids that demand careful study across scales.

Through material investigation, this project re-examines Lincoln Center and the erased neighborhood of San Juan Hill. Travertine, extracted from Tivoli, and used to clad Lincoln Center, becomes both symbol and surface, whitewashing history while asserting permanence. The site is unpacked through studies at multiple scales:

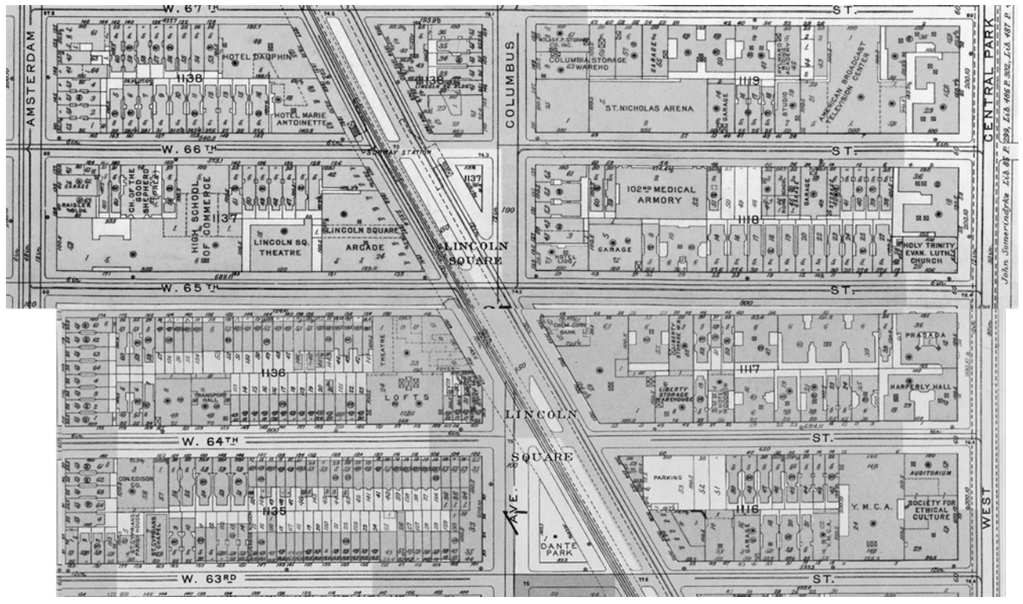
1:∞
1:400
2:1
3:1

"The Case Against Lincoln Center", 1968

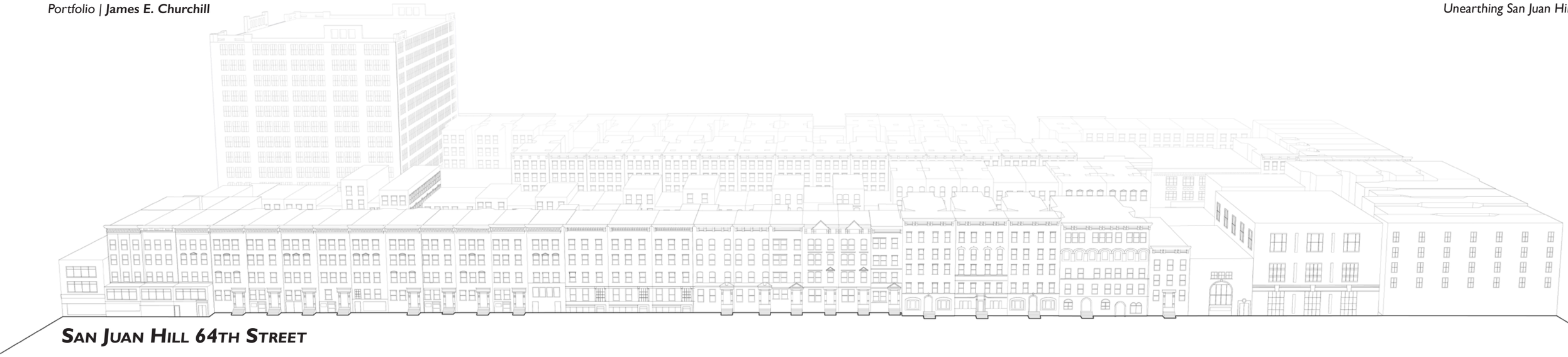
The Lincoln Square Urban Renewal Area Project announced by Robert Moses in 1955.

Aim: *To merge the Metropolitan Opera and Philharmonic Orchestra with other cultural institutions to create a pre-eminent center to rival European capitals.*

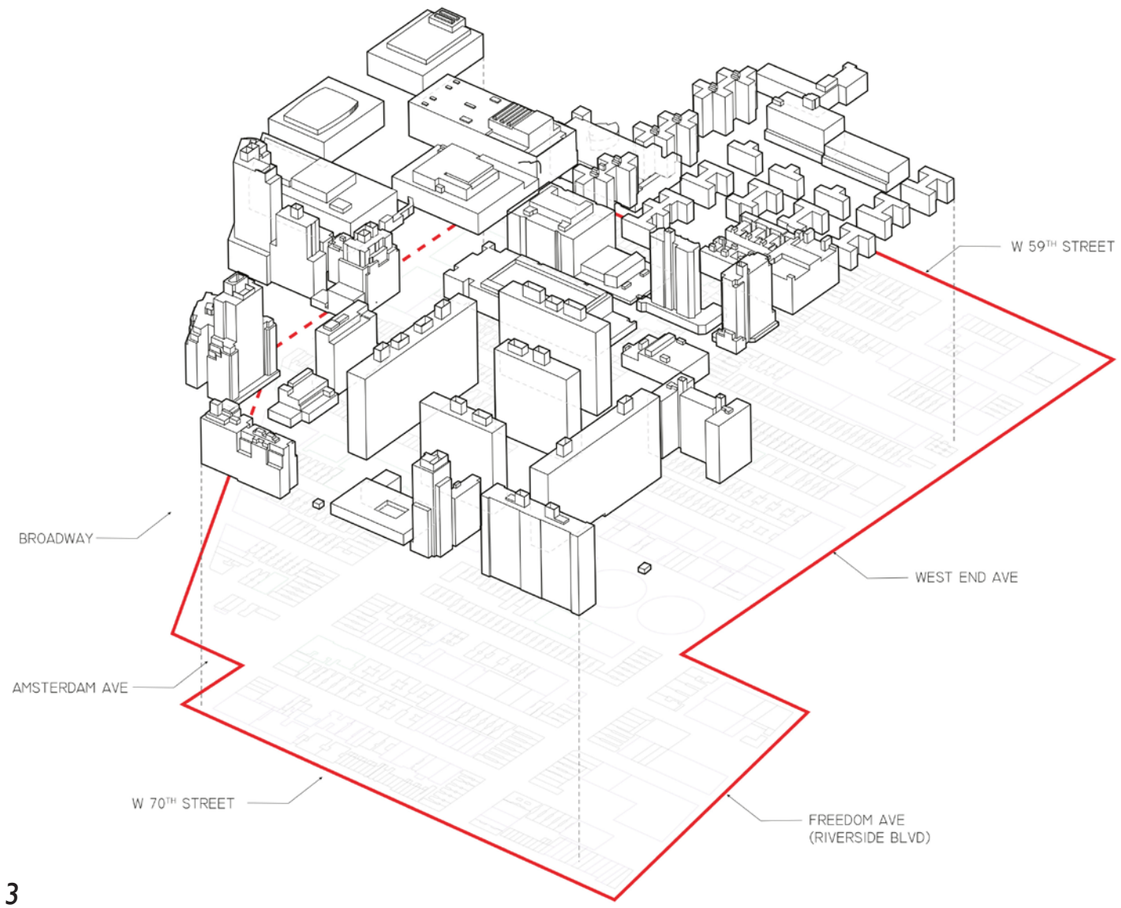
Method: *Demolition and Redesign of 8 city blocks*



MAP PRE-DEMOLITION



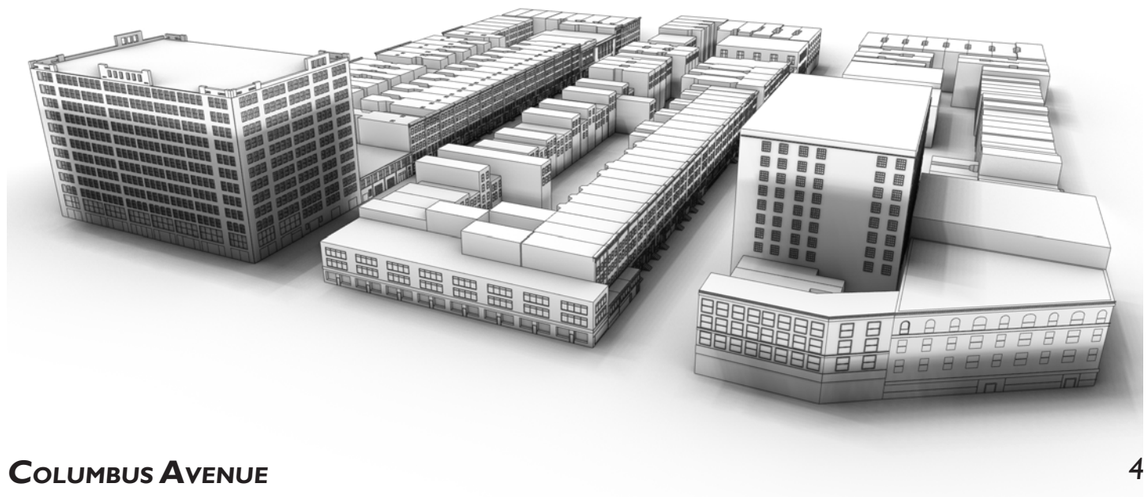
San Juan Hill 64th Street



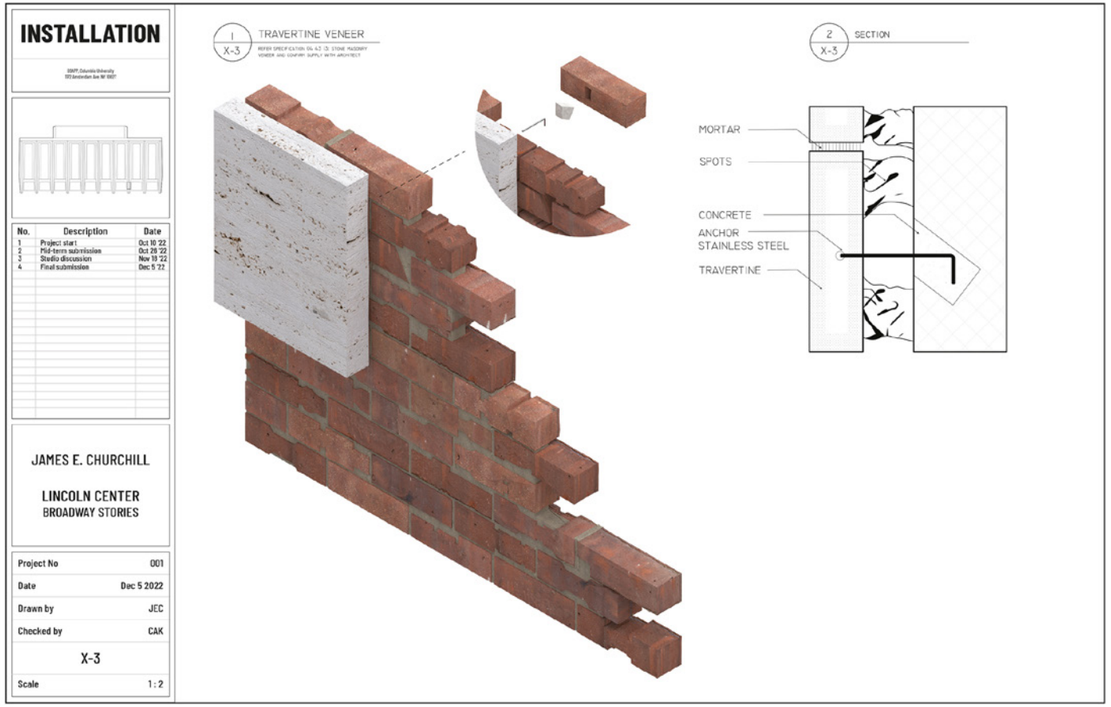
Neighborhood Analysis

Statistics

***16,723** People Displaced*
***188** Residential Buildings Demolished*
***383** Commercial Buildings Demolished*
***1** Neighborhood Destroyed*



Columbus Avenue

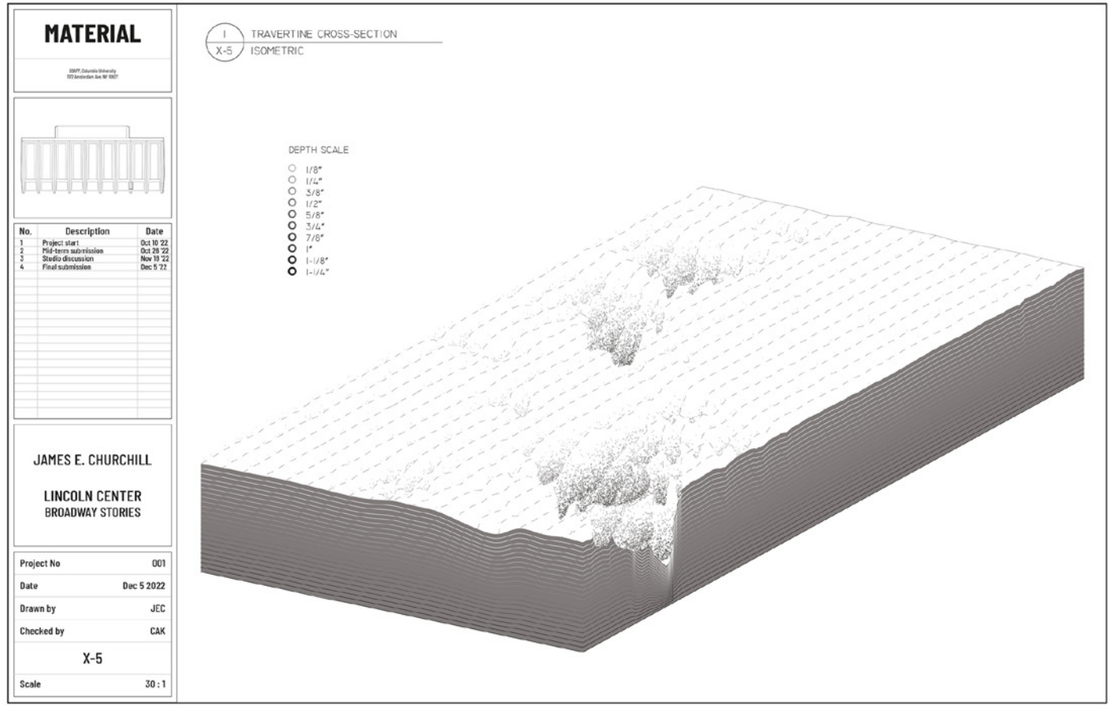


Critical Analysis

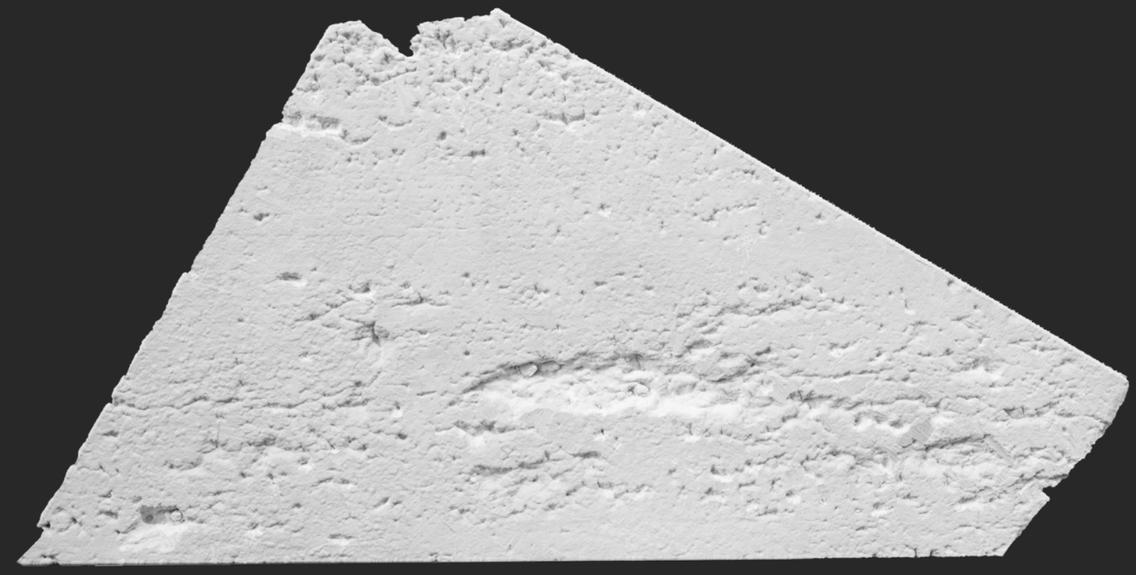
Travertine

The six architects, Belluschi, Saarinen, Bunshaft, Harrison, Abramovitz and Johnson agreed on one thing. The choice of travertine from Tivoli, Italy as the primary cladding. Sourced from the same quarry as the Colosseum, the material lent a veneer of grandeur to the destructiond of hundreds of homes and the displacement of thousands of families.

Photogrammetry was carried out on a single wall of travertine at Geffen Hall to recreate the material for analysis and exhibition. The intent was to capture time, history and space through a construction set that viewed the material's color, porosity, depth of pitting and other material qualities through an alternative stakeholder's lens.



Group Model - Broadway Stories
Scale 1:750 (metric)
#3 rebar (3/8") for frame and thin gauge wire for detail



Model of Lincoln Center Travertine
Scale 3:1
Rockite pour using a high-density polyurethane CNC'd mold

Traverine was extracted from the same mine as the Colosseum.
Travertine is a material of conflict.
Travertine symbolizes the white-washing and razing of San Juan Hill.
Travertine is highly porous and not suited to the climate of New York City.
Travertine has been replaced around the courtyard and continues to fail to this day.

02

The Bronx "In-Between"

Reimagining the 238th "Step Street" in the Bronx

Studio: *Core II*
Professor: *Benjamin Cadena*
Site: *238th Street and Irwin Avenue*
Duration: *12 weeks*

The "In-between." Phases that exist at both the atomic and the urban scale, offering unique and exciting spatial conditions in the fabric of delirious New York. Through administrative or topographical chance, space collides with normative grid and lot patterns, existing as carved-off remnants of industrial or residential land. The fractal landscape of the West Bronx is an exemplar of this boundary condition in New York where the city bisected geography with paved stairs to connect neighborhoods and improve pedestrian circulation.

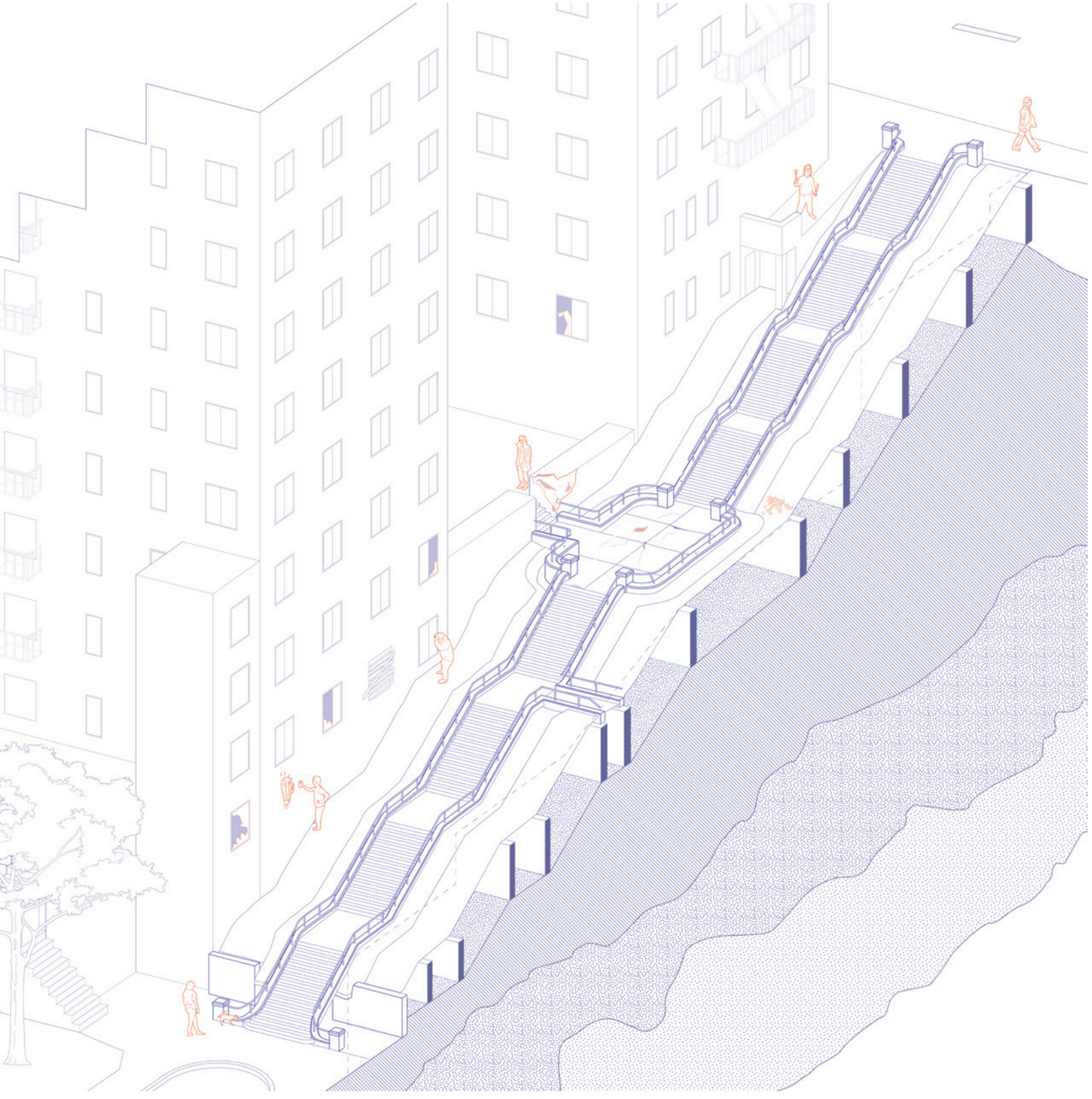
As the poorest of the five boroughs, many of these transit corridors exist in a state of disrepair and damaged from years of neglect and increasing social disharmony. How do we rethink urban damage and utilitarian thoroughfares? How do we reconfigure the space for visual spectacle and meditation, while also improving the street wall relationship to create a vibrant bedrock for the community?

Interviewees

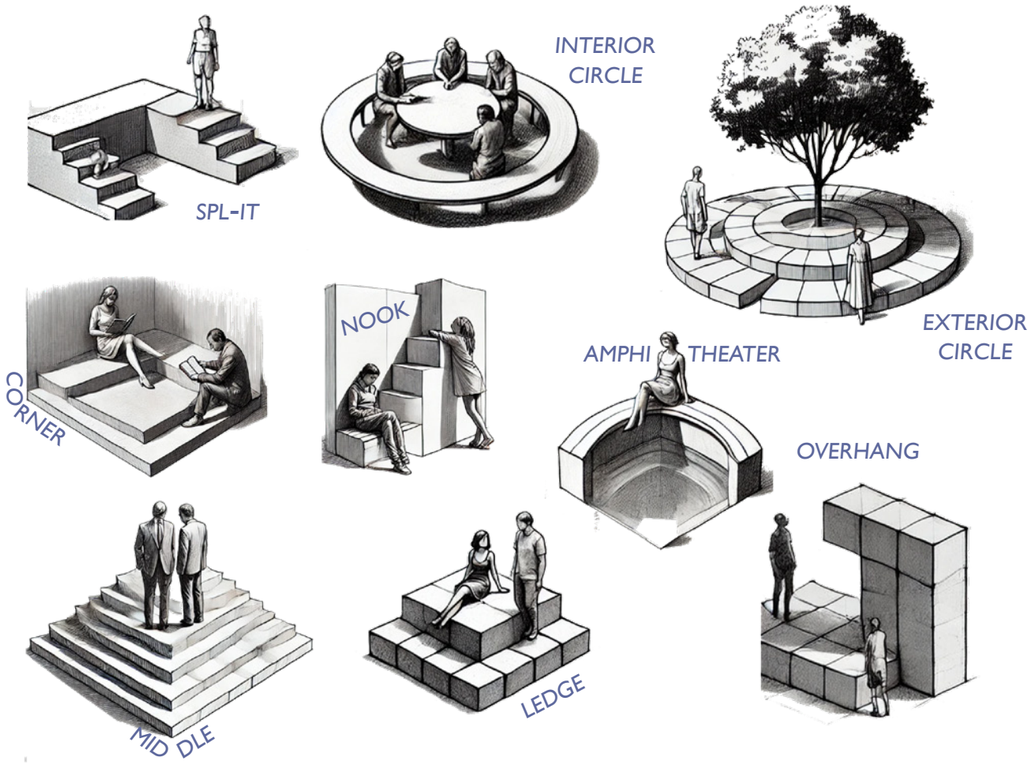
"Dirty"
"Broken"
"Trip Hazard"
"Inaccessible"

Lidar Scan of Site

Conditions Assessment

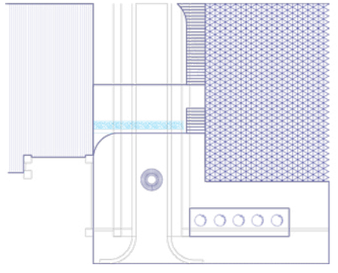


Exploration in Levels

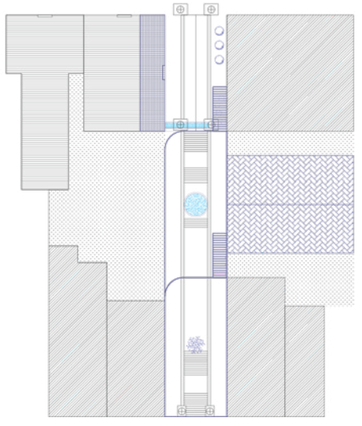


Neighborhood Form and Program

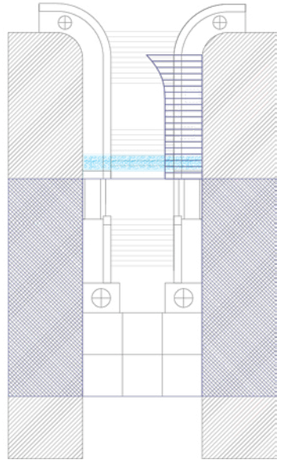
- Residential
- Commercial
- Multi-Purpose
- Landscape
- Community Garden
- Water Feature
- Entertainment



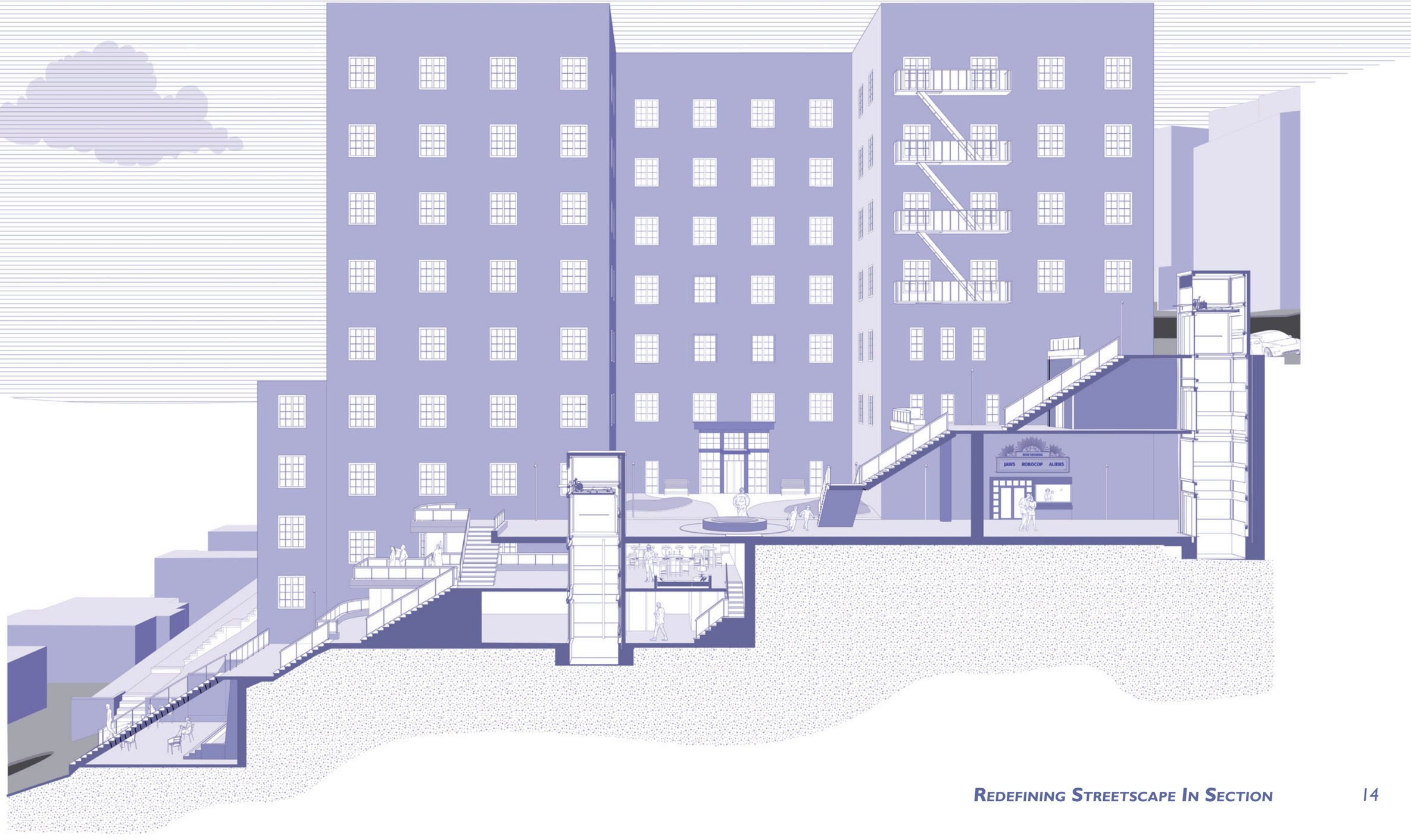
Broadway - Naples Terrace



Bailey Ave - Heath Ave



231st St - Godwin Terrace


JAWS ROBOCOP ALIENS

The Overlook
A vista to reestablish the beauty of the West Bronx

The Street
A relationship between building, business and street through reconstruction and programming.

The Landscape
Nooks, ledges, corners, blocks and other moments, as well as water and plantings to create new engagement.

AXONOMETRIC WITH PLAN INSET

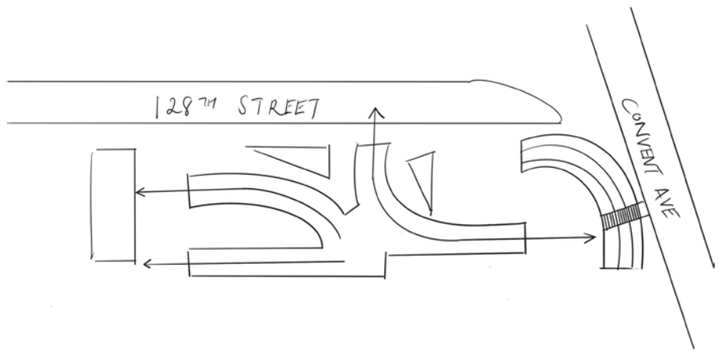
Foam model

Scale 1/8" = 1'-0", Size: 3' l x 3' w x 1' h

Corafoam 4lb, card stock, semi-transparent acrylic, dowels ¼" Di

03

For Us Apartments



Renewing Affordable Living in West Harlem

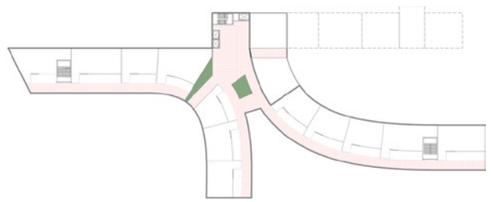
Studio: *Core III "Housing"*
Professor: *Gary Bates*
Site: *128th Street between Amsterdam Ave and Convent Ave*
Team: *In collaboration with Kwamina Akwa*
Duration: *12 weeks*

Can we alter the trajectory of current New York City Housing Authority policy and offer an alternative to underfunded property and the doom loop of a rent-based public handcuffed by the low income threshold?

128th Street Apartments confronts the conundrum of budgetary constraint to offer an alternative. High density "living" with financial and familial support in the up-zoned Special 125th Street District. This new community is anchored in 3 tenets: light, intergenerational living and property. Offering a "mutual plan" of financing it will enable a path to ownership, encourages maintenance through a customizable porch to façade zone, offers programming for seniors and youth, and utilizes a variable single-loaded corridor and terracing to bring in light throughout the season. Multi-level "tsuboniwa" dot throughout the levels providing alternating vistas and a calm oasis on every floor.

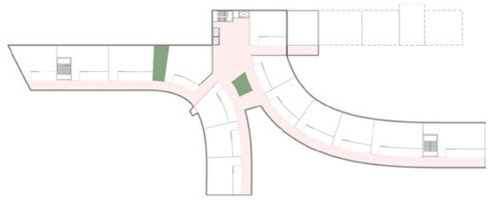
East Elevation

5th Floor



10th Floor

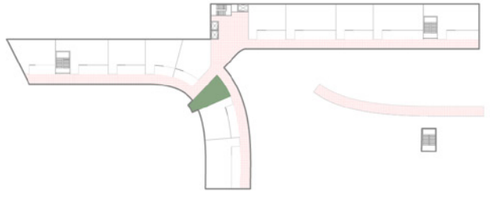
4th Floor



9th Floor

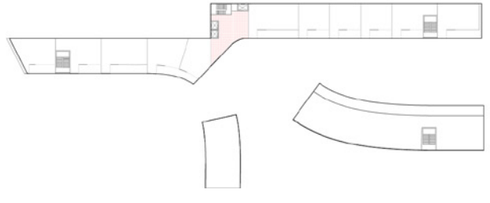
3rd Floor

8th Floor

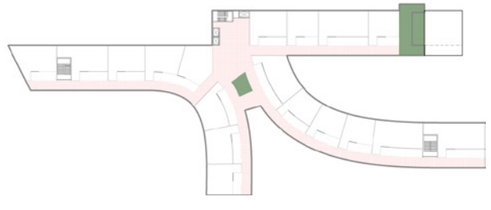


2nd Floor

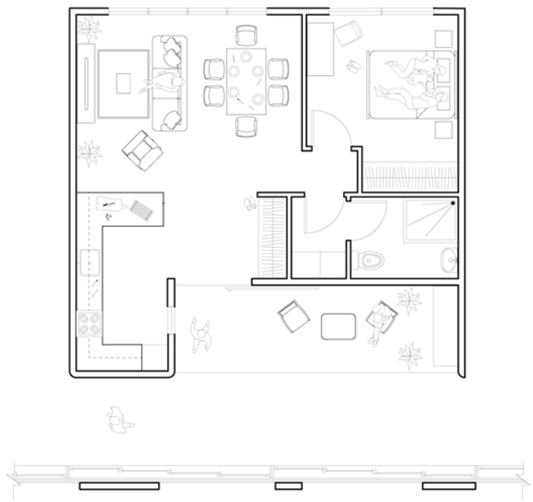
7th Floor



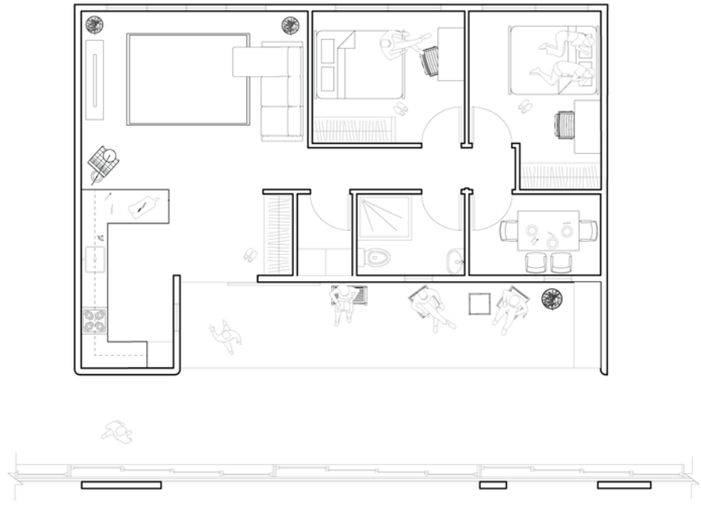
Grd Floor



6th Floor



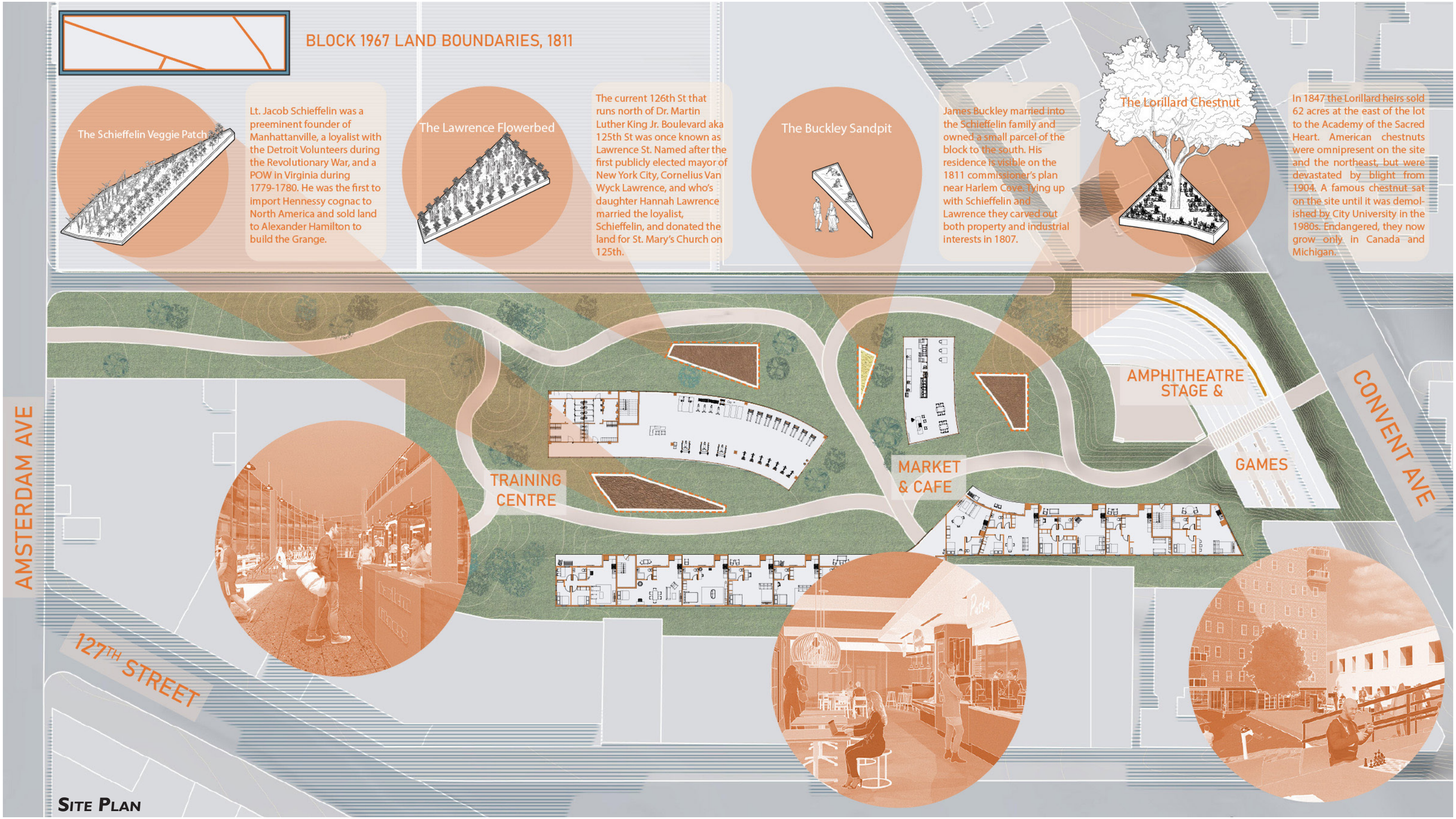
650 SF Unit with 160 SF Porch



900 SF Unit with 230 SF Porch

8TH FLOOR

Demonstration of the versatility and customization possibilities of the plan



Site Plan

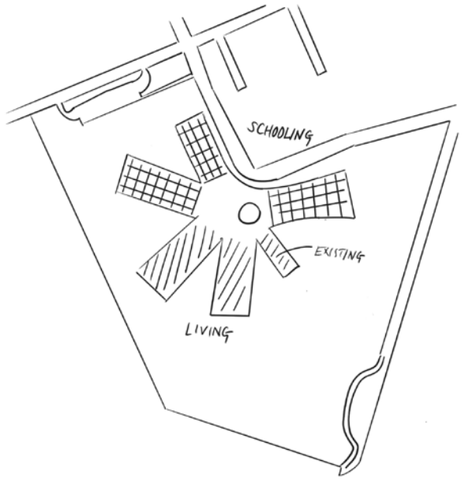
Manipulating the topography of the site, the building traverses a contoured plot that provides community facilities throughout the landscape.

Model of Facade
Scale ¼” = 20” l x 10” w x 16” h
Balsa wood, 3D printed figurines, painted thread, dried flowers, sand dust

Facade Close-up

04

Phoenix Academy



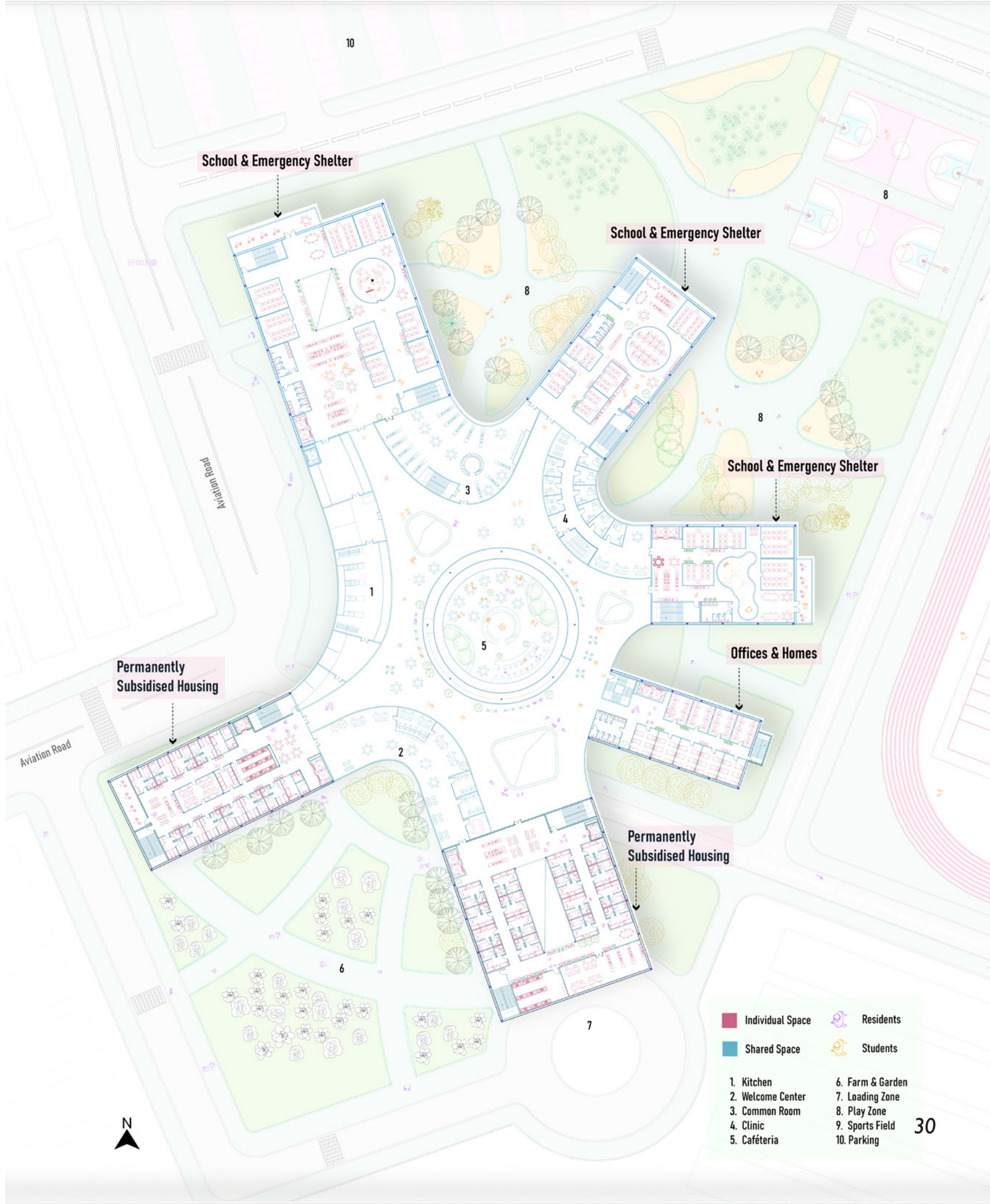
Reframing Schools: Temporal Commons for Care and Learning

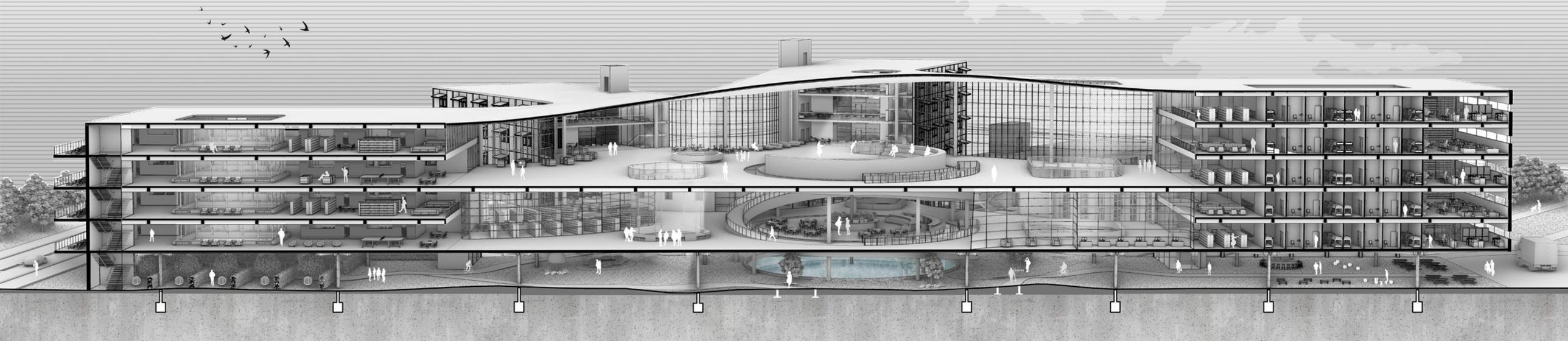
Studio: *Advanced IV*
Professor: *Håvard Breivik-Khan*
Site: *Floyd Bennett Field, Brooklyn*
Team: *In collaboration with Yiheng Zhao (Marc)*
Duration: *11 weeks*

Historically, schools are used as places of emergency shelter and refuge but are rarely designed to accommodate an influx of visitors without the potential for disruption and political conflict.

Our proposal is to revolutionize the concept of a public school and its service to the community and offer a place of education for the young, but also for the old, infirm, and displaced. The ethos of Phoenix Academy is to rebirth the school as a public space and a font of knowledge, to offer a welcome to all who require temporary or long-term support, and to be a naturally expansive and contractive place to match the ebb and flow of need.

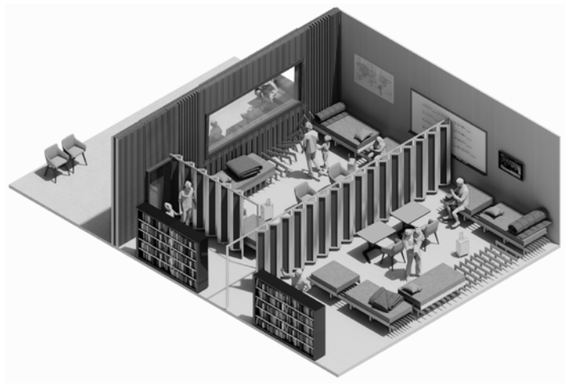
Our research identified potential crossovers between residential and educational programs and offers a new typology that temporally considers the mix between residential, common, and educational spaces throughout a 24-hour period.





Temporal Modularity

Classroom 9am



Emergency shelter 9pm

Section Render

The academy offers permanent supportive housing alongside emergency shelter through modular classrooms, where walls fold into beds and desks hinge from the floor. Shared spaces like a third-floor amphitheater host school events and resident gatherings, while planted areas foster connection between students and residents.

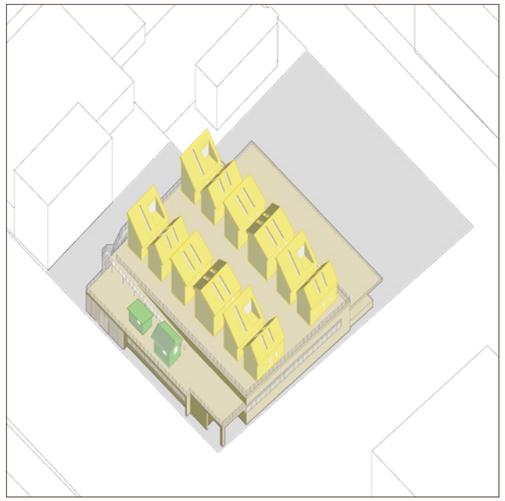
The ground floor supports the broader community with programs including storage, a food and clothing bank, showers, mental health therapy, and trauma support. These functions are enveloped by a shaded moss garden that softens the site and offers a space of quiet restoration. A track and field supports recreation for both students and residents.

MULTI-PURPOSE CIVIC SPACE

The building responds to both site and program. Located at flood-prone Floyd Bennett Field, mitigation was a priority. The first story is elevated 15 feet, with access through a soaring atrium sealed at the second level. Mixing a teaching institution with a civic shelter required careful access choreography. Zones shift throughout the day: mornings provide a safe space with dynamic classrooms and mobile libraries, transforming to extended education in the evening. Large double- and triple-height commons connect to a separate residence with kitchens, offices, and balconies.

05

Address the Future



Reconfiguring the Post Office for 21st-century service

Studio: *Advanced V*
Professor: *Cyrus Peñarroyo*
Site: *Broadway Junction, Brooklyn*
Duration: *12 weeks*

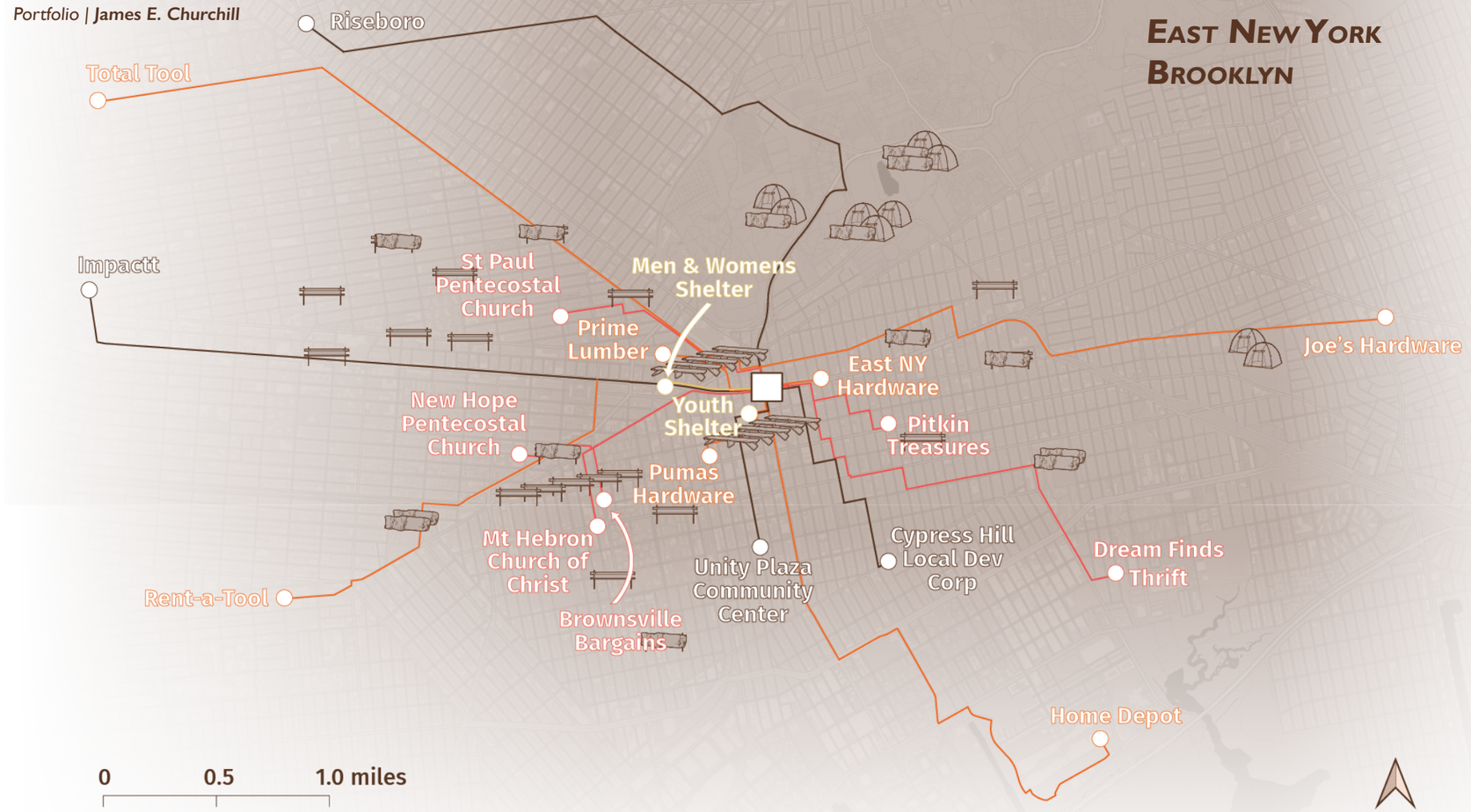
Address the Future faces the ongoing crisis at the United States Postal Service and aims to benefit from the intrinsic property value held by the federal government. Returning the service to its roots, the project offers an address for all.

Capitalizing on the nineteenth-century system of General Delivery, every post office will offer mail pick-up with no fixed address. Currently limited to one post office in the five boroughs, the new service will aid the unhoused to reenter society on their terms. With over 150,000 sheltered and thousands of unsheltered people in NYC, general delivery will reverse the demonization of the homeless.

The post office will retain its service with 80% of its footprint, but be reconfigured with an additional mezzanine and rooftop that offers additional facilities to the community to reestablish itself as a key institution of the people.

USPS Historical Collage

Late 1700s to the modern day



Data courtesy of NYC Open Data, Coalition for the Homeless. Photographs courtesy of Google.

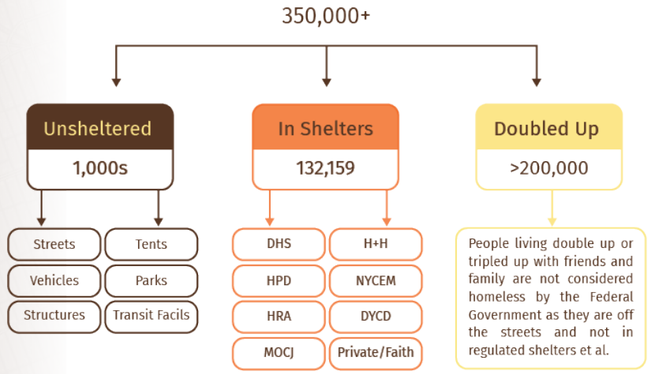
Bench
Area: 15 sq ft
Capacity: 1
Fully Exposed

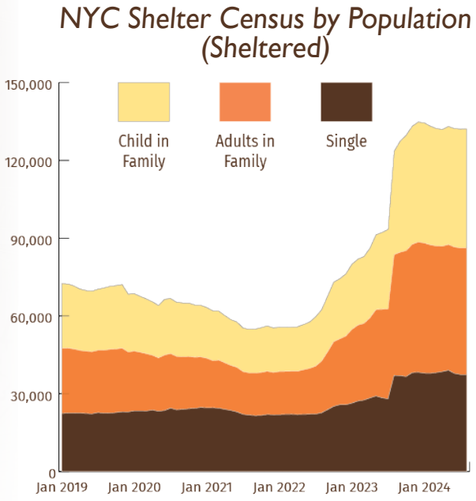
Sleeping Bag
Area: 12 sq ft
Capacity: 1
Fully Exposed

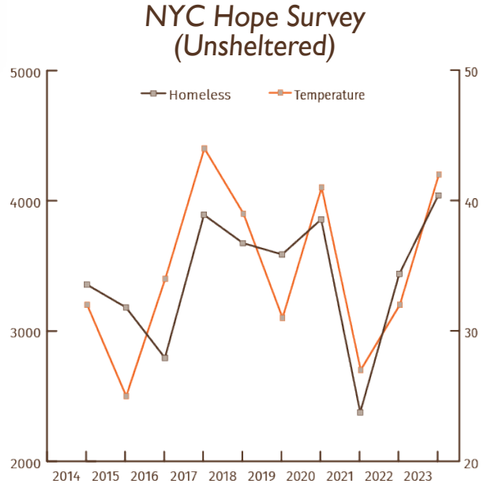
Small Tent
Area: 30-40 sq ft
Capacity: 1-3
Partially Exposed

Shelter Cot
Area: 18 sq ft
Capacity: 1
Unexposed

- *Address the Future Post Office 2645 Atlantic Ave, Brooklyn, NY*
- *Community Centers*
- *Jardware Partners*
- *Clothing Partners*
- *Shelters*







SITE MAP

Data on homelessness shelter statistics, courtesy HOPE count and NYC.GOV

Design

How do we redesign the Post Office to invite businesses to contribute to local growth?

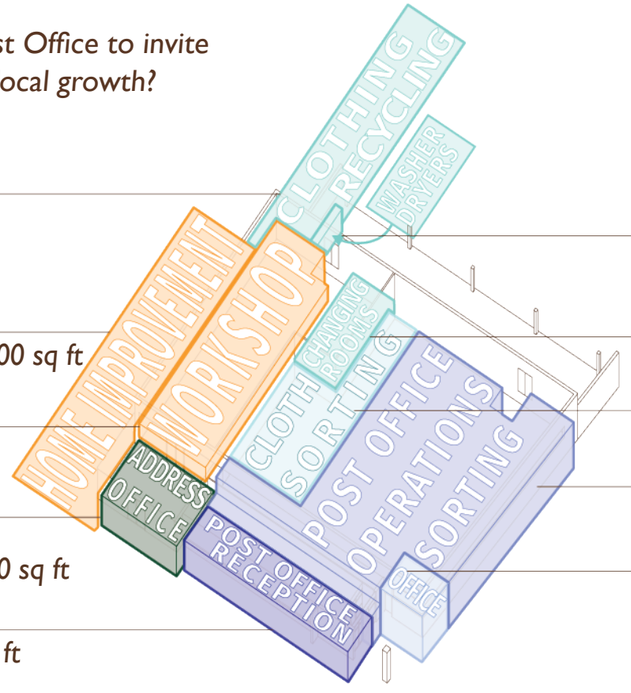
Recycling Area: 2,350 sq ft

Home Improvement Area: 3,600 sq ft

Work shop: 2,350 sq ft

Address the Future Office: 740 sq ft

Post Office Reception: 950 sq ft



1st Floor

Laundry Area: 250 sq ft

Changing Room: 700 sq ft

Cloth Sorting: 1,650 sq ft

Mail Sorting: 5,200 sq ft

New Postmaster office: 275 sq ft

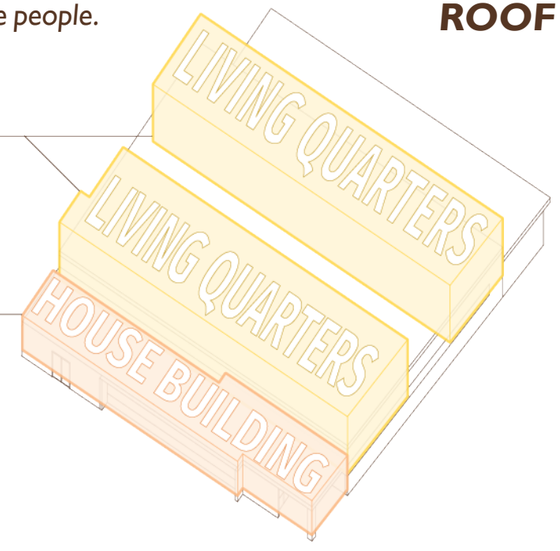
Program

While preserving essential postal operations, the project introduces shared spaces that blur the boundary between public and private, encouraging interaction and restoring the USPS as an engaged institution in service to the people.

ROOF

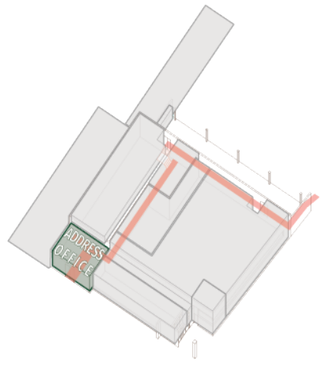
Living Area: 8,500 sq ft

Restricted Construction Area: 2,400 sq ft



Case 1

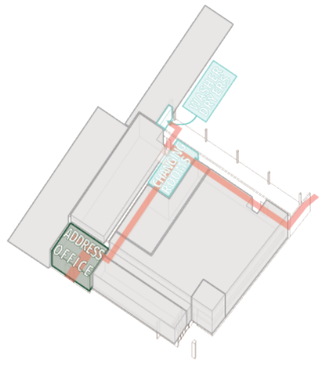
Initial registration



- *Initial registration for* ***Address the Future*** *general delivery*
- *Minimal identity requirements such as municipal ID, shelter referral letter or verbal ID (cross-verified with service providers)*

Case 2

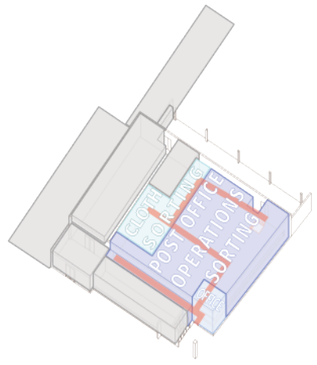
Mail collection and cleaning



- *Check in at address office and collect mail*
- *Check in at changing rooms and register for clothes fitting*
- *Clean clothes with free washer dryers*

Case 3

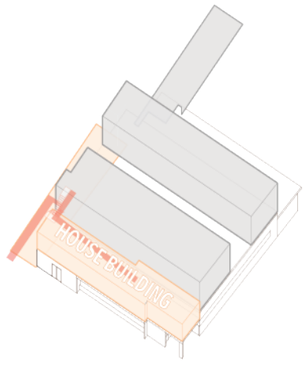
Postal interview and walkthrough



- *Interview with Postmaster for federal intership in the post office*
- *Walkthrough of clothes and postal sorting operations and connectivity between public and private space*

Case 4

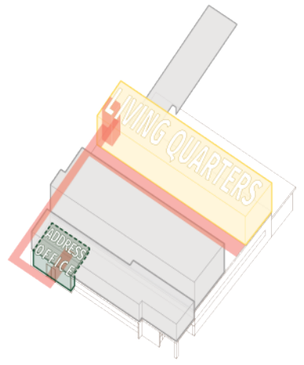
Home improvement class with construction case study



- *Meet up with home improvement specialist onsite in laydown area*
- *Training on PPE and OSHA protocols*
- *Study mock-ups on roof and learn basic training on residential framing*

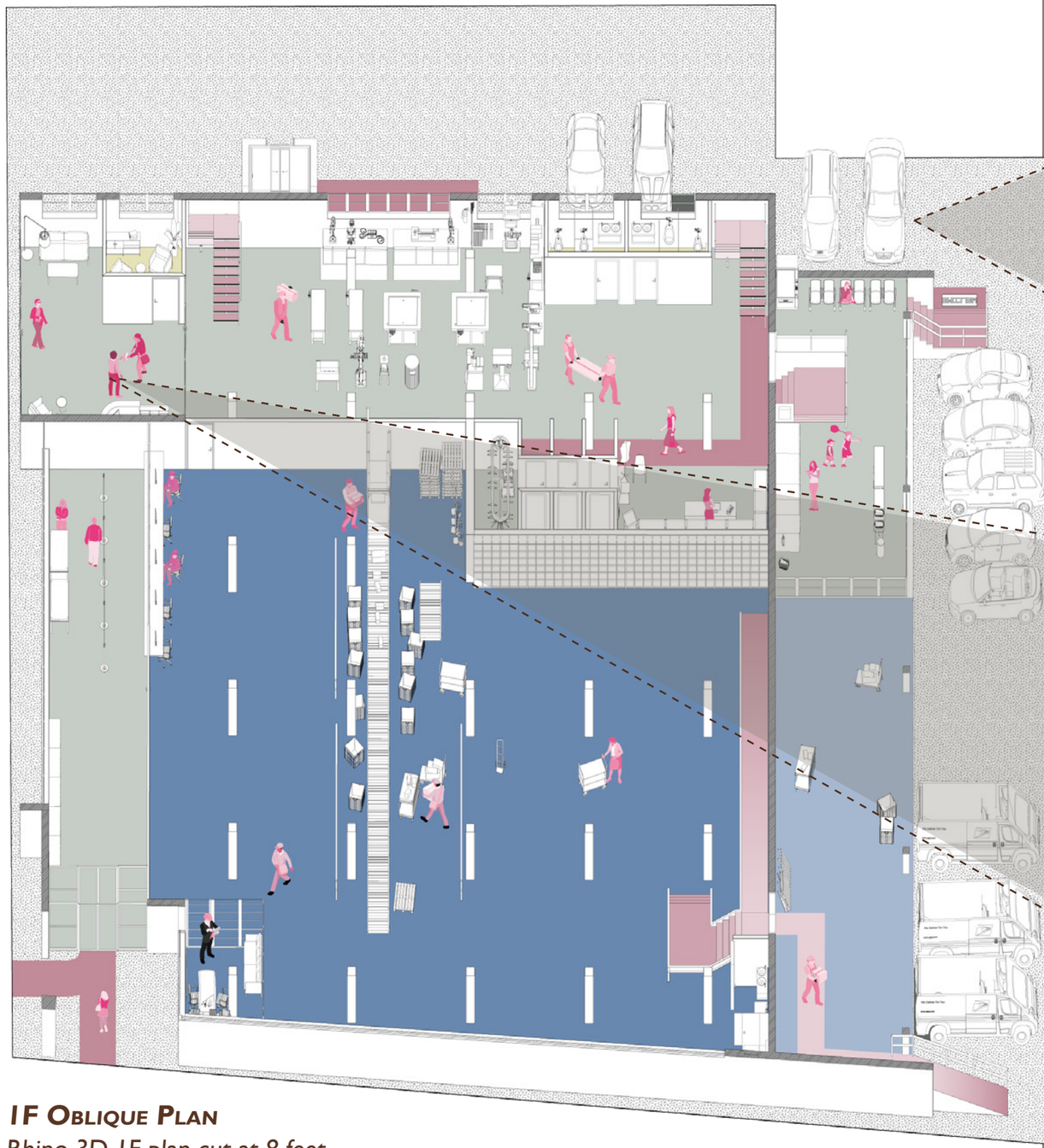
Case 5

Mail collection and home



- *Check in at address office and collect mail*
- *Take elevator up to temporary tiny home on the roof*

Block colors in Adobe Illustrator
Render in Vray for Rhino



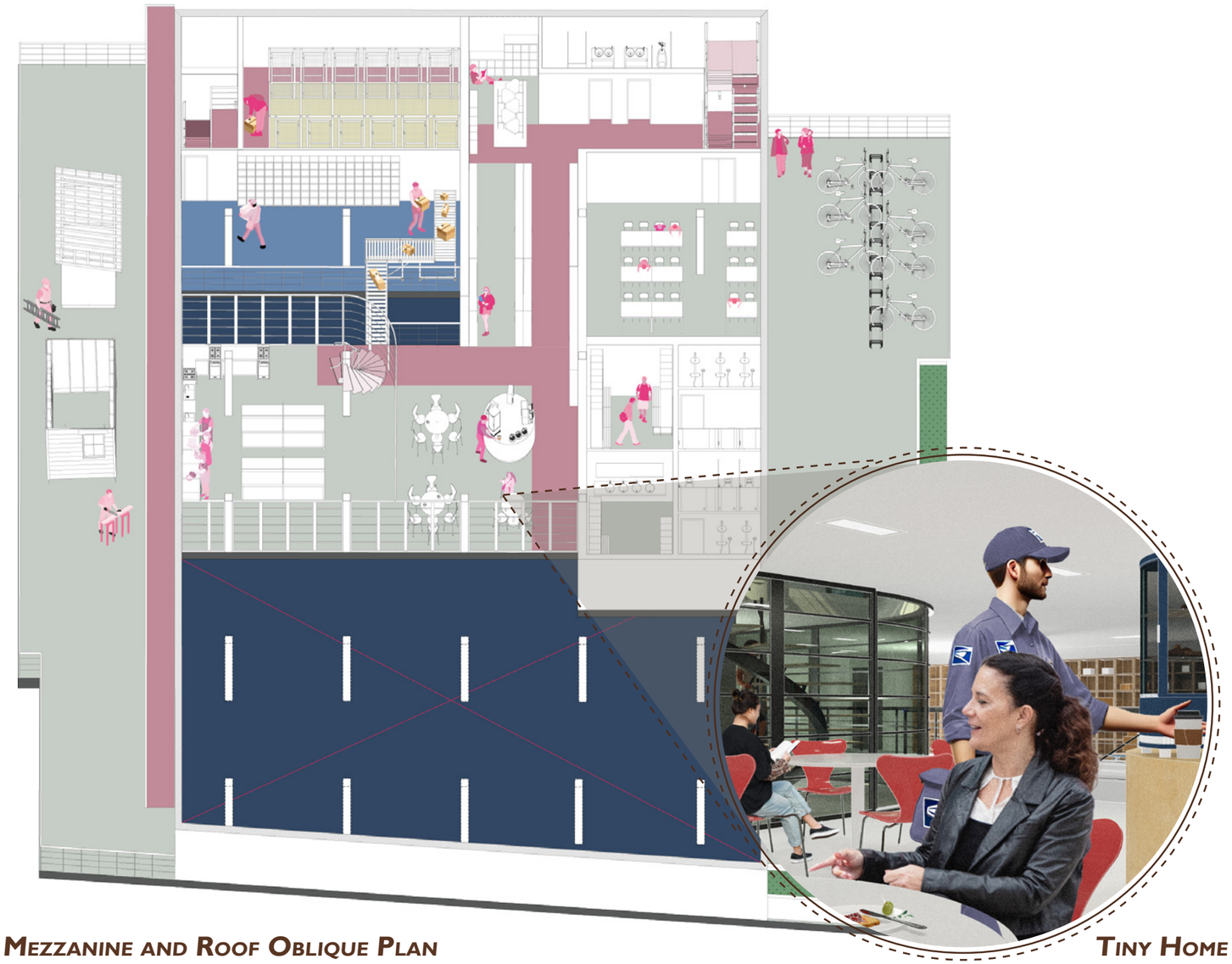
1F Oblique Plan
Rhino 3D 1F plan cut at 8 feet
Editing and linework in Illustrator

The Loading Dock
USPS operations are separated at the GF from the public where a laundry, changing rooms and workshop are run by local business.

The Office
General delivery by first name and a private office offers dignified mail collection for the unlisted.

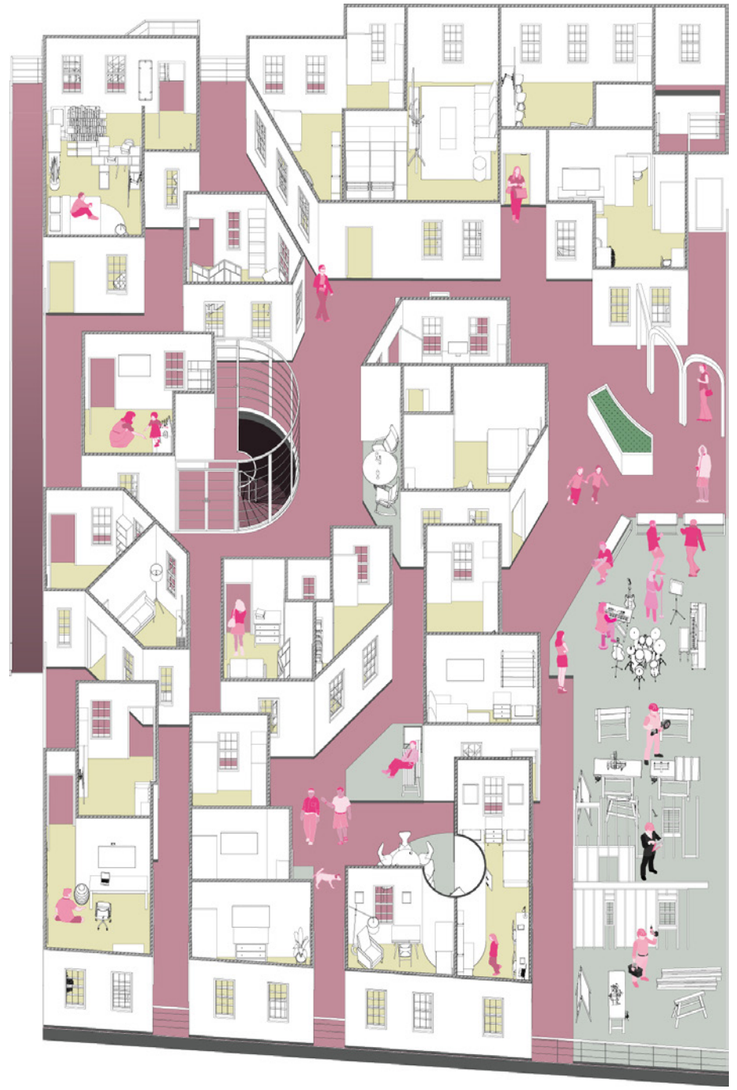
Public and Private space

The mezzanine level merges public and private space offering a café, classroom, storage, and both a children's and adult trade library. The new layout and viewing platform enables interpersonal connectivity between the post office and the general public.



Mezzanine and Roof Oblique Plan

Rhino 3D plans cut at 4 feet
Editing and linework in Adobe Illustrator



Tiny Home Project

The roof offers a tiny home apprenticeship program and temporary accomodation for the unhoused. Built with surplus materials, local businesses will teach an eclectic range of construction to participants.

06

The Reflecting Tomb

Restoring a Relic for the Future of Natural Organic Reduction (NOR)

Studio: *Advanced VI*
Professor: *Karla Rothstein*
Site: *Green-Wood Cemetery Brooklyn*
Duration: *13 weeks*

Impermanence is part of us. Life and death are not singular but in continuous flux at the cellular level as our DNA orchestrate a symphony of activation and deactivation processes that enable our existence. We should not deny this fact, but reckon with it, understand it, and design with it in mind.

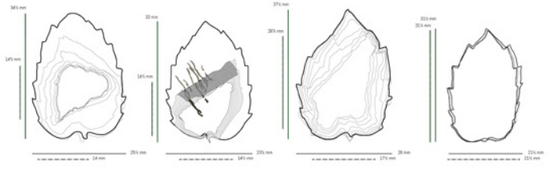
The receiving tomb at Green-Wood, now in total disrepair, was built as a temporary interment structure. Housing the deceased during winter when the ground was too frozen to permit burial, it was one of the earliest columbariums in New York City and symbolizes the climatic constraints of 19th-century mortuary practices.

The new facility integrates a filtration and water system that frames decomposition as part of a broader cycle of renewal. A quiet memorial chamber centers on a reflecting pool, while communal interior and garden spaces invite shared participation in the process, echoing the cemetery's role as a site of collective care and remembrance.

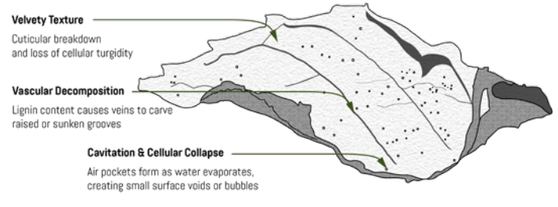
Material Studies

Spearmint was studied for its cellular and rhizomatic qualities, revealing thresholds of decay as environmental factors triggered cell collapse. Textures shifted, structures curled, thinned, and fragmented in stages. Controlled environments delayed or hastened death, establishing themes of threshold, tending and watering in my design.

Spearmint leaf in resin

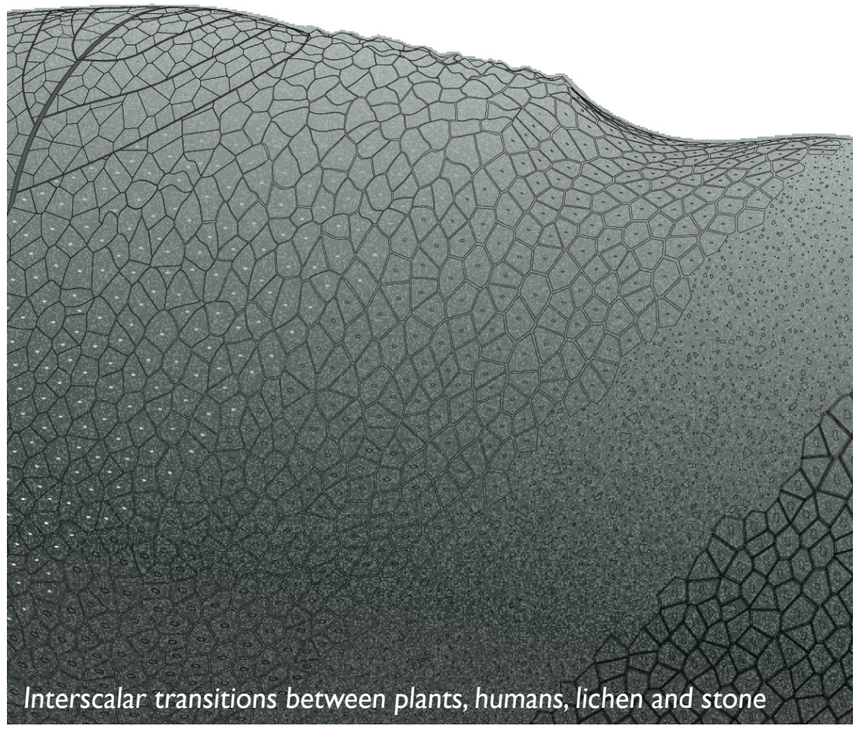


Curl analysis



Transformation analysis

Operational Drawing



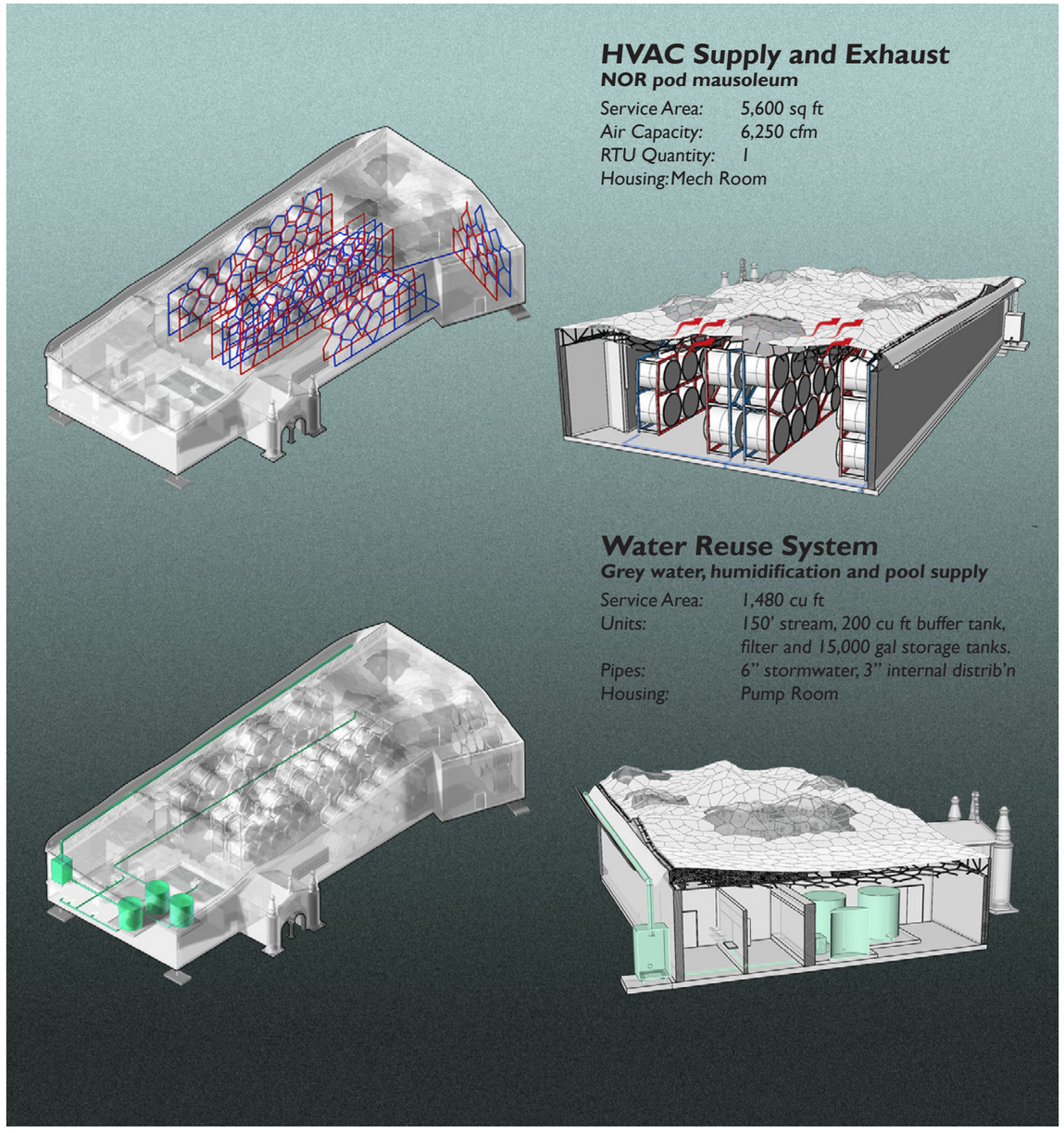
Interscalar transitions between plants, humans, lichen and stone

Timelapse

Start

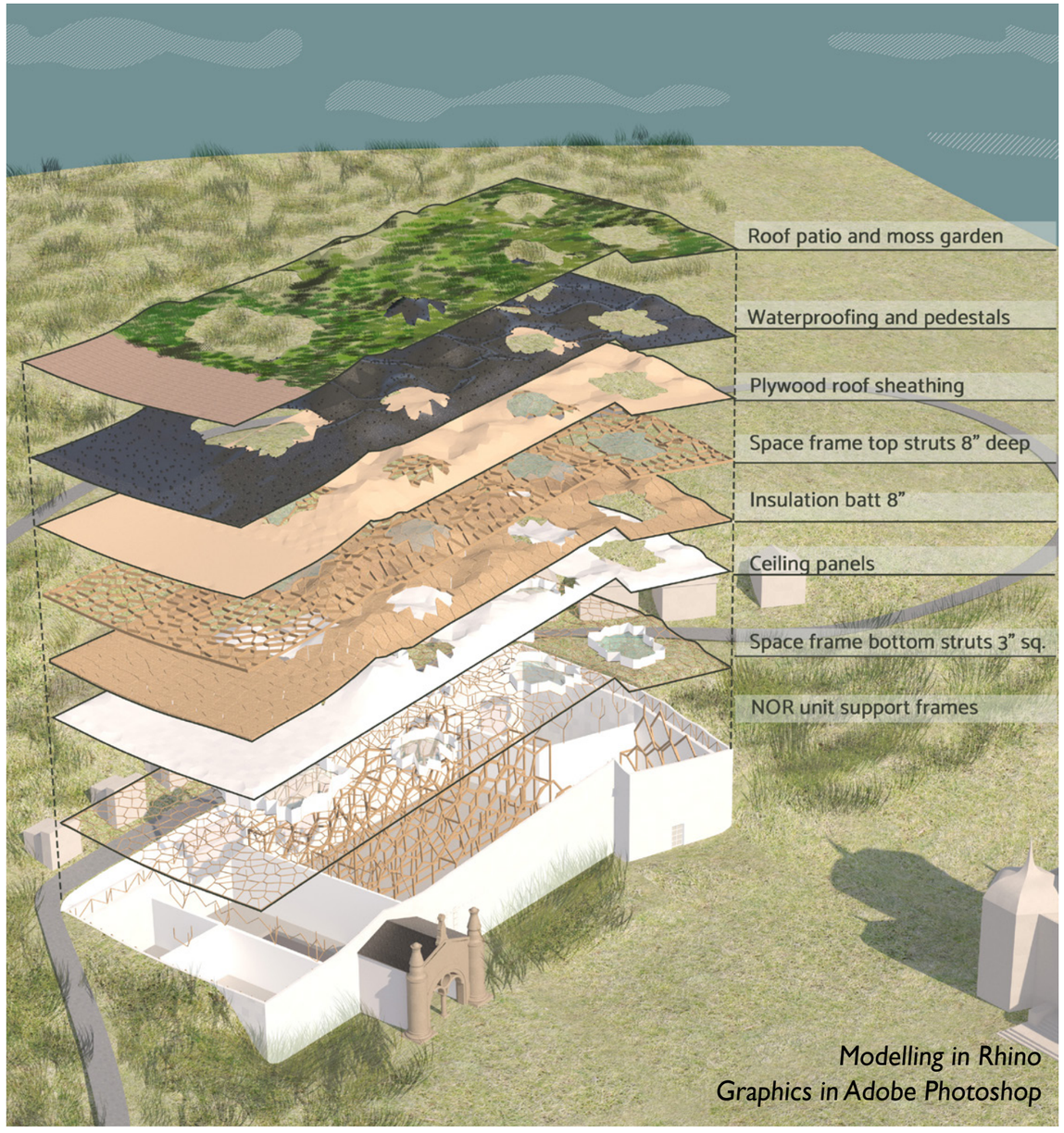
12 Hrs

24 Hrs



NOR and Mechanical

Natural Organic Reduction is a 3-month process. The deceased are lifted into cylindrical pods in the mausoleum chamber. An integrated rainwater collection system collects greywater for the reflecting pond and restrooms while integrating with the voronoi frame that receives air supply from the mechanical room and exhausts to the roof.



Exploded Axonometric

The roof is supported by a new timber space frame with members that expand and contract like a living organism. The pods not only support transformation but the space frame above, while their exhaust penetrates to a 10,000 sq ft deck of moss. The biofilm traps gases and purifies ammonia, methane and CO_2 while photosynthesis returns O_2 to the environment.

A shallow stepped pool anchors the space in silence, while reflections engage with the fractalized skylights above. A perforated jali screen modulates seasonal light, shielding guests from harsh summer glare while admitting the warmth of the oblique winter sun.

Rhino 3D, Editing and layering in Adobe Photoshop

A Critical Study of Muqarnas مقرنص

Building Islam
Professor Ziad Jamaleddine
Spring 2024

Key Words:
Islam, Muqarnas, Geometric architecture

فَجَعَلَهُمْ جُذَاذًا إِلَّا كَبِيرًا لَّهُمْ لَعَلَّهُمْ إِلَيْهِ يَرْجِعُونَ

Then he reduced them to fragments, all save the chief of them, that haply they might have recourse to it. Quran 21:58 (Surah Al-Anbiya Ayat 58)[1]

The Metropolitan Museum of Art has, within its Nishapur archaeological collection of 1937, four of the oldest known elements from a stalactite squinch (muqarnas). Excavated at Sabz Pushan in Nishapur, Iran, these artifacts are hand-painted on stucco, date to the tenth century, and are housed in the new galleries for the Art of the Arab Lands, Turkey, Iran, Central Asia, and Later South Asia. Hanging in the top left corner of a sand-colored partition wall that delineates Gallery 452, the four cells are interspersed with other elements from the dig that include ornamental details from an arch, frieze, and wall (Fig. 1). The fragmented and categorized curation of these archaeological items is nothing out of the ordinary in Western museums, but on careful inspection, the wall is a carefully choreographed selection of architectural "details" that bears striking similarity to eighteenth-century manuscripts. Western academics began cataloging many of these so-called "stalactites" along with other architectural elements through surveys. Engineers and Orientalists alike recognized the fervor for Middle Eastern design. Flattening the forms onto a two-dimensional plane, they published reproductions for ornament and geometric patterning. Subsequent growth of Empire and gunboat diplomacy hastened excavations that imported objects, such as those from the Nishapur dig, to the Metropolitan Museum of today. These curated items are not far removed from their two-dimensional Victorian patterns: simulacrums, divorced from location and context. While the authenticity of the Nishapur objects is not in question, extant muqarnas are three-dimensional cells forming part of an architectural whole - a dome, apse, or portal that likely carried a "high symbolic charge" at their time of inception.[2]

Tracing routes back to North Africa and Iran, Muqarnas slipped into ornamental secularism as early as the Mamluk period.[3] The Metropolitan Museum's exhibition is, therefore, part of a long history of discovery, study, and representation. Taking muqarnas as the focal point, this paper intends to map this Islamic architectural "detail," how it declined from religious significance and entered the vernacular architectural canon in the Middle East and its transition from pattern to ethnographic and then geometric classification in the West.

Muqarnas appear to have started life as an angular squinch with researchers dating it to as early as the fifth century in the Sasanid palace of Sarvestan (Fig. 2). More complicated geometry appeared around the tenth century but dates remain contested. Michel Échochard points to the Samanid Mausoleum in Bukhara, Uzbekistan ca. 907 CE and subsequent development in Iran with the Shrine of the Twelve Imans ca. 1037 CE at Yazd.[4] Yazd is in the center of the country and more than 500 miles from the Nishapur dig site in northeastern Iran. Jonathan Bloom dated the form to 1085 CE in Egypt and the minaret of Badr al-Jamali.[5] Another academic, Yasser Tabbaa, argues convincingly that miniatures prove Baghdad was a haven for the architectural form by the end of the ninth century (Fig. 3). It is challenging to date or place the origin of this architectural detail due to wide-ranging demolition and little connection between similar forms appearing in both North Africa and the Mesopotamian-Persian region around the same time. Immersion was complete throughout the Islamic world though by the twelfth century.

1. Marmaduke Pickthall, The meaning of the glorious Koran, New American Library, (New York, NY: Penguin Books, 1988), 238.

2. Yasser Tabbaa, "The Muqaranas Dome: Its Origin and Meaning," Muqarnas 3, no. 1 (1985): 201, https://doi.org/https://doi.org/10.2307/1523084.

3. R. Stephen Humphreys, "The Expressive Intent of the Mamluk Architecture of Cairo: A Preliminary Essay," Studia Islamica, no. 35 (1972): 80, https://doi.org/10.2307/1595476.

4. Michel Écochard, Filiation de monuments grecs, byzantins et islamiques: une question de géométrie (Paris, France: P. Geuthner, 1977), 66.

5. Jonathan M. Bloom, "The Introduction of the Muqarnas into Egypt," Muqarnas 5 (1988): 21, https://doi.org/10.2307/1523107.

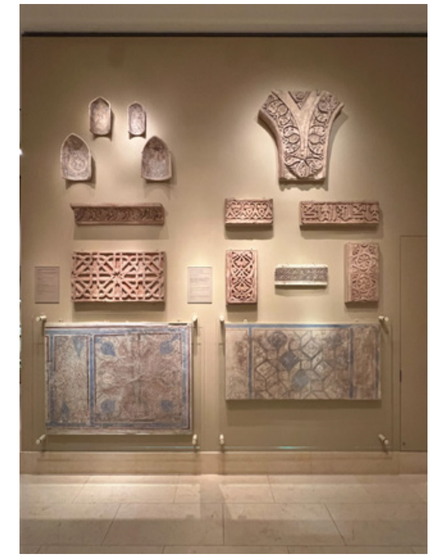


Fig. 1

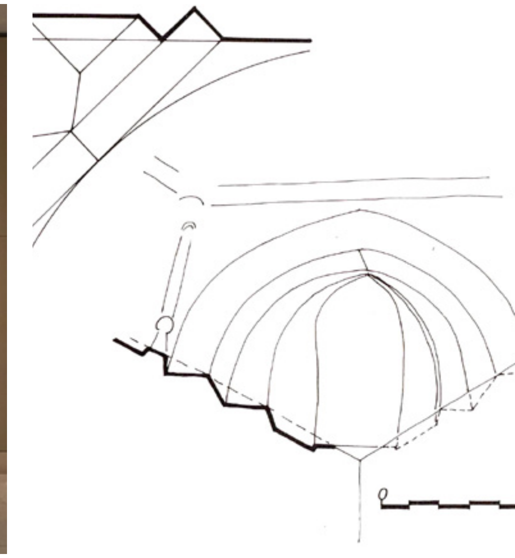


Fig. 2

Fig. 3

6. Humphreys, "The Expressive Intent of the Mamluk Architecture of Cairo: A Preliminary Essay," 94.

Muqarnas are a modular architecture of threshold. Made up of multiple interconnected cells generally formed in a pentagonal or octagonal symmetry, they are found in a host of transitions. Muqarnas demarcate two or more planes and are created using a subtractive sculptural process and then decorated with a range of paints or materials such as tiles, mosaics, mirrors, or gilding. In early examples, muqarnas were often applied to vaults but later became part of the support structure as materials evolved. In two dimensions the shift is usually from straight to curved form as found in a cornice and in three dimensions the shift is often between square or rectangular to rounded form, sometimes with intermediate zones such as octagonal forms. Examples of the former can be seen in the Toqrol Tower of Rey or the Tomb of Haydar Amuli in Amol, Iran (Fig. 4), while the cover photo is an example of the latter. In three dimensions, concurrent cells increasingly cantilever to an apex. Muqarnas ornament tends to hide another structural member such as a supporting column or squinch. The cells can have varied geometry with concave or convex geometry the most common, while multi-sided regular geometric shapes are also found pivoting out from a central point such as stars, hexagons, octagons et al.

Geometries became more complex with the arrival of the Mamluk period 1250-1517 CE. While the Ayyubid sultanate 1171-1260 CE saw notable political transitions take place in favor of the Sunni branch of Islam, architecture largely remained static until the succeeding sultanate gained relevance in the late thirteenth century. The pluralistic make-up of the Mamluk rulers with Turkish, Circassian, and Caucasian origins and background in military affairs as manumitted slaves bore little resemblance to the Kurdish aristocrats of the Ayubbids. The Mongol invasion of the Levant and the sacking of Baghdad in 1258 destroyed the Ayubbid sultanate and further incursions were only stopped due to the Mamluk victory at Ain Jalut in 1260. This action not only defined the new era but drove the capital and bulk of craftspeople southwest to Cairo. Humphreys notes that the new amirs quickly shifted to smaller mosques as the idea of central government receded while the rulers introduced new monumental types of building that included the mashhad, turba, khanaqah, ribat, zawiya, and specifically, the madrasa.[6] Many of these new forms leaned into Sufism and monastic life and the muqarnas were instrumental in this push. As the architectural scale elongated vertically, the muqarnas bridged tighter and larger angles at the transition between niche and dome, earth and heaven. The shift led to substantially more complex geometries aided by talented migrants. Humphreys asserts the shift was likely due to political expediency rather than religious purposes The Mamluks built impracticably tall minarets for display, while ornament began to appear across secular and religious sites, cementing power but diluting sacred symbolism. Imposing portals elaborated on Syrian and Egyptian versions as muqarnas were carved into ever deeper niches and decorated in explosions of color.

Muqarnas cells were made from various materials and could be less than two centimeters to several meters long. While those displayed at the Metropolitan Museum were crafted in stucco and painted, less plastic materials such as wood, brick, and stone were also used, depending on time, location, and available craftspeople. The ninth-century Qarawiyyin mosque in Fez, Morocco, saw significant renovations between 1134-1143 CE and subsequently received a beautiful geometric muqarnas in plaster (Fig. 5). It is considered one of the oldest extant examples of the form transitioning from structural squinch to decorative element hung by a wooden support structure. Similar ornamentation was spreading rapidly and was not reserved for a specific material language or country in the Islamic world. North Africa had a penchant for plaster or wood, brick was common

Fig. 4

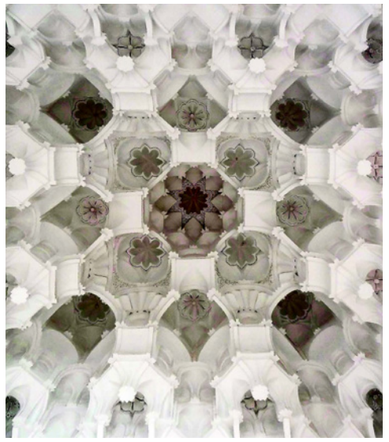


Fig. 5

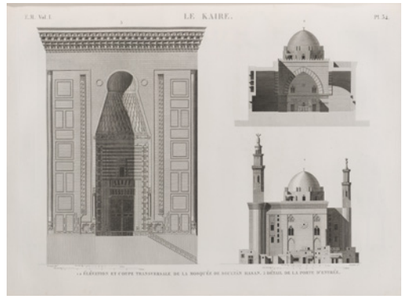


Fig. 6

7. Tabbaa, "The Muqaranas Dome: Its Origin and Meaning," 65.

8. For more on the seventeen Euclidean symmetry groups found in Islamic art, see Bonner Jay, Islamic Geometric Patterns : Their Historical Development and Traditional Methods of Construction. New York: Springer, 2017.

9. Écochard, Filiation de monuments grecs, byzantins et islamiques: une question de géométrie, 76.

10. Humphreys, "The Expressive Intent of the Mamluk Architecture of Cairo: A Preliminary Essay," 103.

11. Oleg. Grabar, The Alhambra (Cambridge, MA: Harvard University Press, 1978), 147.

12. Under the title Play of Light in Ernst J. Grube and George Michell, Architecture of the Islamic world : its history and social meaning, with a complete survey of key monuments (London: Thames and Hudson, 1978), 152.

13. Ibid., 162; Grabar, The Alhambra, 181.

14. Tabbaa, "The Muqaranas Dome: Its Origin and Meaning," 68.

15. Ibid., 69.

in Iraq and Iran and consisted of a single shell, expressed on both the exterior and interior of the building, while stone was popular in Syria and Egypt. These guidelines are by no means firm and changed temporally as well as geographically. Even on the periphery of the sultanates in Palermo, Sicily, we find two examples of muqarnas. The Palatine Chapel 1132-40 CE received beautiful wooden muqarnas on the ceiling, claimed but not confirmed to be by Fatimid artisans, while not far away, a stone Muqarnas was reserved for a niche in the Zisa palace.[7] Both of these designs are geometrically similar to Qarawiyyin and are made up of rhomboidal, rectangular, star, and tear-drop forms.[8] Échocard's discovery that the niche in Zisa is reproduced twelve years later at the entry to the maristan of Nur al-din in Damascus, Syria, while the dome is found at the Zumurrud Khatun Mosque and Mausoleum in Baghdad, Iraq demonstrates the broad dissemination of form throughout the Muslim world.[9] Despite the early variety, however, common trends emerged with different sultanates. Where the Fatimid and Ayyubid sultanates had largely embraced stucco and wood with an appetite for Iranian and Rum Seljukid polychrome faience, the Mamluks advanced with monumental displays of stone and ablaq construction of colored marble paneling, gilded or painted wood, and stained glass. Stucco was largely abandoned by the 1330s, and the Ottoman Empire embraced faience and mosaic tiling, with an appetite for blue and turquoise coloring from the mid-fourteenth century.[10]

Muqarnas have already been identified as an architecture of transition, but questions remain about whether there was an underlying purpose outside of structural support or simple ornament. Oleg Grabar works backward from the Alhambra and posits, based on readings of Ibn Zamrak's poetry and other scripts at The Hall of the Two Sisters and The Hall of the Abencerrajes, that the domes were symbolic of the cosmic and rotating nature of heaven, namely the daily cycle of light and darkness. The windows light the space and reflect the multi-faceted design, presumably enhanced by the architecture of the muqarnas.[11] Grabar is not explicit here, but interestingly this is picked up by Dalu Jones, in a book co-written by Grabar, "muqarnas cells beneath the domes can be understood by their function in reflecting and refacting light. To accentuate their play of light, shining ceramic tiles and even mirrors are utilized, as in the Shah-Hamza 'Ali mausoleum at Shiraz."[12] Both Jones and Grabar go on to define the meaning behind muqarnas as "ambivalent," one that blurred the line between structure and ornament.[13] Tabbaa argues against this meaning. For him, the meaning of muqarnas cannot be derived from the great dome of the Hall of the Two Sisters. Given muqarnas multi-valence, he believes the answer is in the form itself; generally used as a subdivision of space, Tabbaa claims the answer lies in the medieval Islamic belief of non-divisible atomic matter or al-juz alladhi la yatajazza.[14] This belief was based on "the atomist-occasionalist view of the universe formulated by al-Baqillani and supported by Caliph al-Qadir (991-1031)."[15] It is, however, impossible to speculate. The form itself is volumetric and was used as a catch-all infill device both on the interior and exterior of buildings during the medieval period. The original meaning is likely lost forever and Humphreys was undoubtedly correct when he asserted that the Mamluk amirs were far enough removed from the initial symbolism to amplify the cellular form into an architecture of power and prestige.

As time progressed, Western influence ebbed and flowed in the Islamic world but it was Napoleon's invasion of Syria and Egypt in 1798 that catapulted the region back into the Western spotlight. While ultimately unsuccessful, the subsequent survey and findings led to Egyptomania, an explosion of interest in North Africa, and the arts of the Middle East under the guise of Orientalism: a multifaceted nineteenth-century

16. For further discussion on the picturesque see Abigail Harrison Moore, "Voyage: Dominique–Vivant Denon and the Transference of Images of Egypt," Art History 25, no. 4 (2002): 535.

17. "The Thousand and One Nights" were a collection of tales compiled and written down during the Islamic Golden Age spanning from the 8th to the 14th centuries. Antoine Galland's seminal French translation, "Les Mille et Une Nuits," was first published in twelve volumes between 1704-1717, some 135 years prior to the English translation.

discourse that veered between imperial justification and academic interest. Unsurprisingly, the discussion was dominated by British and French scholars, citizens of the increasingly bellicose nation-states. Napoleon's survey was vast with 151 "savants" leaving no stone unturned. Muqarnas were represented in several images with plates 32-34 of the État moderne (modern state) section displaying both the exterior cornice of the Mosque-Madrasa of Sultan Hasan and the portal in elevation. The elevation, drawn by Jean Constantin Protain, was a simplification using a basic lattice shape with minimal effort at recreating the three-dimensionality of the form (Fig 6-7). Given the immensity of the survey, such oversight is not surprising. In many ways, these drawings may appear to be an afterthought to the wider selection found in the Antiquités section. Art historians claim that Description d'Egypte was meant to connect France to the heroic age and to be a beacon of culture. Ancient Egypt was removed from the reality of modern Egyptian life and appealed more to the romantic mindset. In Dominique Vivant-Denon's Voyage dans la Basse et la Haute d'Egypte pendant les campagnes du General Bonaparte, the Sphinx and other monuments were set in picturesque landscape while contemporary people were denigrated as beggars (Fig. 8).[16] Despite this, the modern works in the survey remain some of the earliest catalogs of local monuments.

By the mid-1850s, the Industrial Revolution and capitalism had propelled London and Paris to double their population. Appetite for the Middle East was heightened by geopolitical affairs as the Greek War of Independence against the Ottoman Empire from 1821-32 saw the West push for more expansionism with France invading a weakened Ottoman Algeria in 1830. A horde of artists increasingly eroticized the Middle East and North Africa. The translation of The Thousand and One Nights into English in 1839 and paintings such as Eugène Delacroix's Femmes d'Alger (women of Algiers) all heightened this dynamic.[17] Owen Jones entered the literary fray with various publications from the 1830s, but his The Grammar of Ornament in 1856, was the book that set the tone for color and design. Cataloged by ethnographic titles, visual representations of patterns were systematically shown for the first time. Muqarnas were captured in the arches at the Alhambra in Moresque No.2 (Fig. 9). Three dimensionality was not the focal point and the book's popularity was due to the flat nature of the design swatches and the ability to reproduce them mechanically ad infinitum. Jones's study of polychromy some fifteen years prior led him to a much more relevant study, back at the Hall of the Two Sisters at the Alhambra with the Frenchman, Jules Goury (Fig. 10). Focusing on the muqarnas themselves, the duo's drawings are more detailed than the Napoleonic plates. Not only were the cells depicted accurately in elevation but the pattern itself was rolled out in two dimensions and given three levels of resolution to elucidate the varied orthogonal geometries. Jones and Goury concluded that five thousand muqarnas were used, that these invariably consisted of seven types of prisms made up of three faces that combine isosceles, equilateral triangles, or rectangles, and that they can be used in any number of variations dependent on angle and curvature.

An exhaustive analysis of which Jones' and Goury's designs included muqarnas is beyond the scope of this paper, but we know that their work was extremely popular with manufacturers seeking new and refreshing material. Jones partnered with ceramicists Maw & Co. and Minton, wallpaper firms Townsend and Parker, Trumble & Sons, and textile producers Warner, Sillett & Ramm et al. The capitalist machine led to profitability through mass production and brought Jones recognition and financial rewards in the name of royalties and consulting fees. His color theory gained the attention of Prince Albert and an invitation to design the interiors for the Great Exhibition of the

Fig. 7

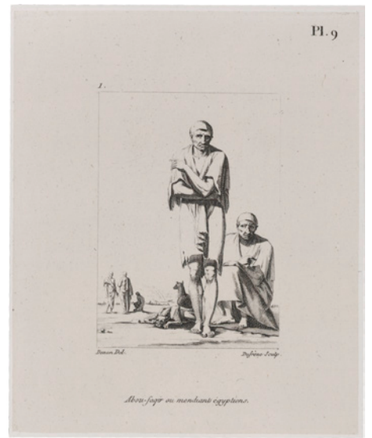


Fig. 8

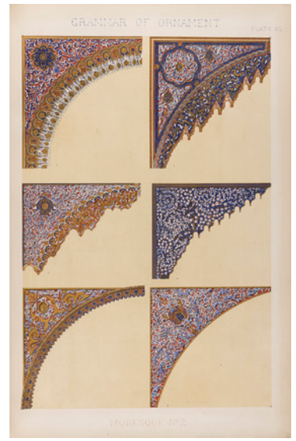


Fig. 9

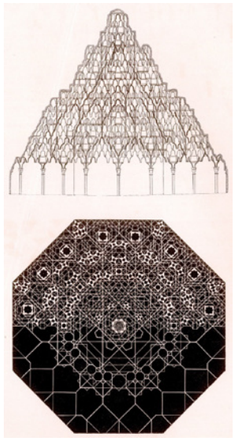


Fig. 10

Fig. 11

Fig. 12

18. K.A. C. Creswell, The Muslim architecture of Egypt, vol. 1 (Oxford, England: Clarendon Press, 1952), 231-2.

19. Bloom, "The Introduction of the Muqarnas into Egypt," 22.

Works of Industry of All Nations in 1851. Jones's choice of red, blue, and yellow against the ironwork bore striking similarity to the Alhambra color scheme of his Designs for tiles in Islamic style (Figs. 11 and 12).

As an architect, Jones highlighted many of his designs at the scale and in the style of an architectural "detail." The detail was a new phenomenon that gained traction in the mid to late eighteenth century and was used to full effect in the Napoleonic survey (Fig. 13). The word's origins lay in the French de tailler, meaning to cut up. Eric Bellin has claimed that the word specifically means "to cut into pieces," but this translation is more implied than specific, and contemporary French uses the term "en morceaux" to enumerate piecemeal separation.[18] Nevertheless, Bellin is astute in noting the detail was inherently an architectural fragment that started life as an explanation of ornament and transmogrified into a tool for the construction industry. The increasing complexity of the Crystal Palace and other engineered structures required details for installation by the 1850s but architect Jacques-François Blondel used the word détail extensively in his Cours d'Architecture of 1750 to fragment the building into pieces of ornament to be studied (Fig. 14). The conflation of these two concepts is covered in some detail by Bellin but the answer lies in the enlarged title, Traité de la décoration, distribution & construction des bâtiments, or in English, Treatise on the "decoration, design and construction" of buildings. Curiously, this conflation resembles the blurred boundary between structure and ornamentation in muqarnas.

The history of Western academia on the Islamic world and muqarnas would not be complete without the mention of K.A. C. Creswell. Arguably, the man most responsible for raising the resolution of Islamic architectural survey to contemporary standards, he remained dogmatically faithful to his belief that Iranian and Egyptian muqarnas were entirely separate developments. Born in 1879, his early work on Persian domes was interrupted by the outbreak of World War I in 1914. Creswell enjoyed successive promotions to Captain and his appointment to Inspector of Monuments in Palestine and Syria led him to his life's vocation. His tendency for perfection is amply demonstrated by his three-year endowment from the King of Egypt in 1920 to write The Muslim Architecture of Egypt; the book eventually went to six volumes and multiple editions that were still incomplete by his death some 54 years later. Photography was used heavily in his books and enabled accurate representation that predated the use of photogrammetry (Fig. 15). Despite his credentials though, Creswell maintained muqarnas in Egypt as a pendentive form that was different from the Iranian stalactite squinch. Bloom writes that Creswell was likely reacting against widely-held theories at the time of Persian influence on Fatimid architecture, but his insistence may have been as much politically influenced as academically.[19] His entire career was based in Cairo and while no formal connection has been found to exist between the two forms, the visual similarities are undeniable.

Muqarnas survive in museums and institutions of learning today mostly as fragments. Despite their omnipresence across the Middle East, it is surprising to find that many great collections fail to have a single cell. The world's largest, the Smithsonian only has photographs and written media, while in Michigan, home to the first Arab-American majority population in Dearborn, the Detroit Institute of Arts comes up empty. LACMA has two colored ceramic muqarnas tiles from the 14th and 15th century and a Spanish ceiling panel but none of these are currently on view. In England, the Victoria and Albert Museum has the fortune of the Creswell collection of photographs as well as an entire plaster cast from the Alhambra and a 15th-century muqarnas section, but again, both are

20. Jean-Marc Castera, "The Muqarnas Dome of the Hall of the Two Sisters in the Alhambra in Granada," in Mathematics and Culture V, ed. Michele Emmer (Berlin, Heidelberg: Springer Berlin Heidelberg, 2007); Ignacio Ferrer-Pérez-Blanco, Antonio Gámiz-Gordo, and Juan Francisco Reinoso-Gordo, "New Drawings of the Alhambra: Deformations of Muqarnas in the Pendentives of the Sala de la Barca," Sustainability 11, no. 2 (2019) et al.

21. See various exhibits such as One and One and All Borrow Their Light at https://timo-nasseri.squarespace.com

not on view. In Germany, the Pergamon Museum has in its possession the mihrab of Beyhekim Mosque from Konya, however, the institution is currently closed undergoing an up to 20-year renovation. Similar in size to the famous Madrasa Imami mihrab at the Metropolitan Museum of Art, it remains a contentious piece and is under restitution negotiation by the Turkish government, said to have been smuggled out under the pretext of repairs in 1907 by Consul General Dr. Hardeg Loeytve (Fig. 16). The Pergamon mihrab is the only object within a collection that the author has thus far found that is a complete muqarnas formation.

As with all institutions of learning, the curation and exhibition of works are essential to fulfill a mission of education and learning. The Metropolitan Museum of Art has some of the earliest known muqarnas cells in their possession. Unfortunately, their identity is muddled due to curation alongside a diverse array of other fragments from the Nishapur dig while representation remains an anachronistic version of a two-dimensional Napoleonic detail. The question remains, is this the best way to display this unique Middle Eastern artifact? While the ultimate use and religious meaning of the muqarnas may be buried in history, the object itself is a celebration of craftsmanship, geometry, and mathematical genius. Significant work by Jean-Marc Castera in 2006 on the modeling of the muqarnas at the Alhambra has since been added to with more advanced scanning techniques by a range of preservation experts.[20] Many of the techniques used for the construction of muqarnas and their idiosyncrasies are detailed in these texts. Furthermore, artists such as Timo Nasseri, have been working with muqarnas to create both drawings and three-dimensional artworks to explain their symmetry, geometry, surface, patterning, refraction, and reflectivity.[21] Muqarnas and their variegated history may better be served by these institutions through artistic dialog and display, academic and preservation-based study and modeling, and interactive exhibitions detailing the multi-faceted nature of these incredible and unique Middle Eastern artifacts.

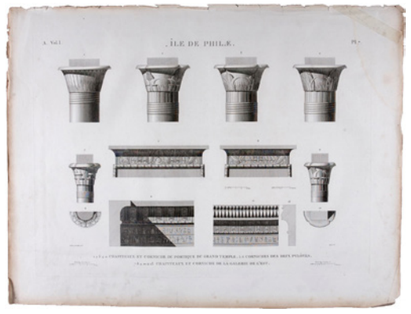


Fig. 13

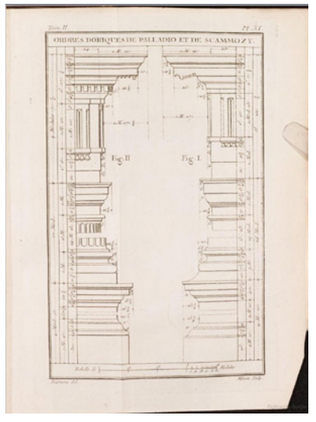


Fig. 14

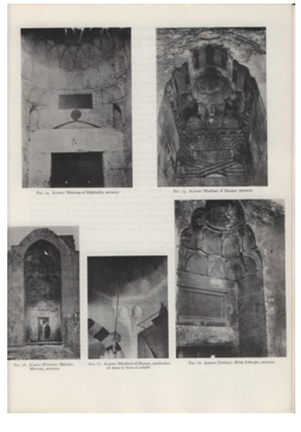


Fig. 15

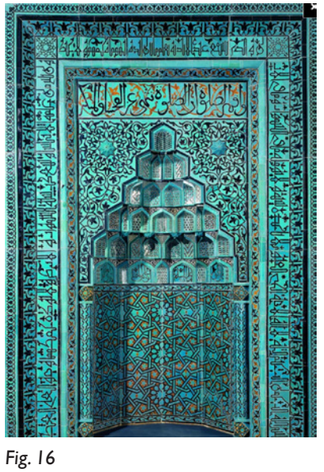


Fig. 16