

# SHAPING NEW KNOWLEDGES

104<sup>TH</sup>

ACSA  
ANNUAL  
MEETING  
2016



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Published by ACSA Press and distributed by the  
Association of Collegiate Schools of Architecture  
1735 New York Avenue, NW  
Washington, DC 20006  
Tel: 202.785.2324  
Fax: 202.628.0448  
[www.acsa-arch.org](http://www.acsa-arch.org)

ACSA Press 978-1-944214-02-9



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# **Architecture in an Expanded Field, from Interiors to Landscapes**

# Arrivals Public Art + Infrastructure Project

**CARYN BRAUSE**

University of Massachusetts, Amherst

**JOSEPH KRUPCZYNSKI**

University of Massachusetts, Amherst

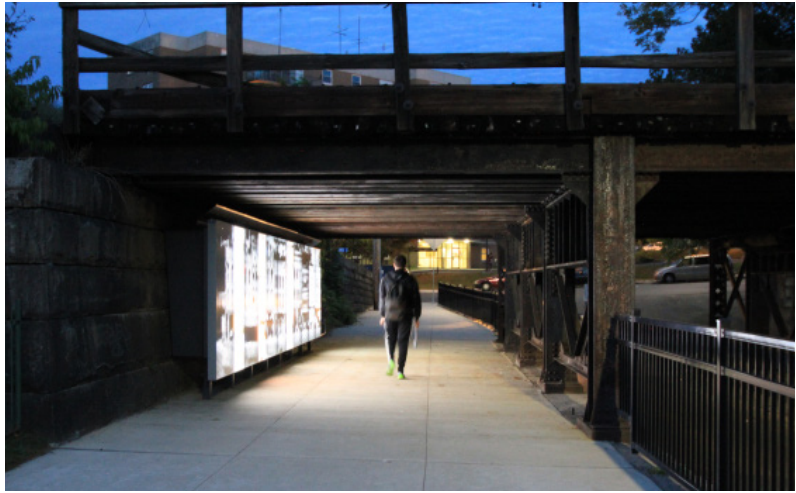
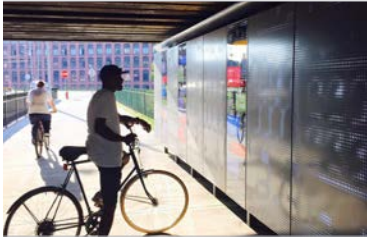
Winner of an open public competition, “Arrivals” is a public art + infrastructure project at the Mosher St. Underpass in Holyoke, Massachusetts. The project transforms a key gateway between downtown Holyoke and an adjacent residential neighborhood into a safe, inviting, and creative attraction. The intention of the project is to contrast the singular image of the city with the multiple voices of residents’ arrival stories, and in doing so, capture Holyoke’s rich immigrant and migrant experience. The \$35,000, CDBG-funded creative placemaking project is a direct response to the immediate context of its site, which is adjacent to the historic gateway to the city—H.H. Richardson’s former train station.

Completed in August 2015, the project consists of a thirty-foot long LED-lit wall of digitally fabricated perforated panels that depict a historic Main Street scene which represents Holyoke’s past as an industrial city producing textiles and paper. Set within the wall are three “story boxes” comprising excerpts of Holyoke resident’s arrival stories. The stories, gathered through a series of public engagement sessions at different venues throughout the city, capture a diverse cross section of residents—from those who were born here in the

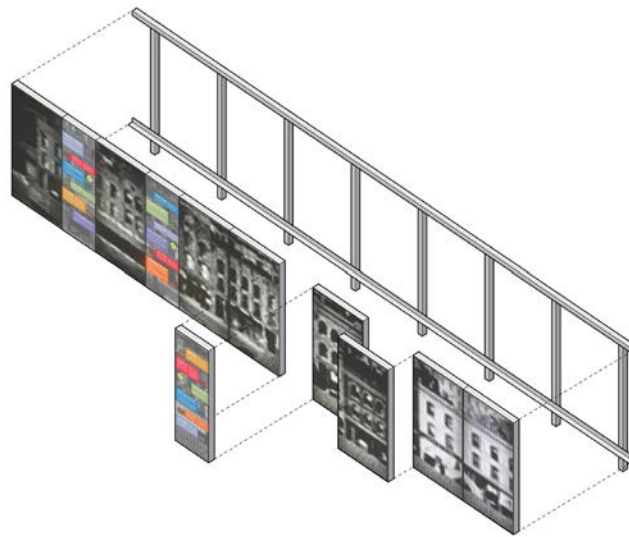
early part of the twentieth century to those who have recently arrived. Importantly, the story panels’ are in Spanish and English, which speaks to the current Latino/a demographics of adjacent neighborhoods, inviting participation in the public domain of a city that has not always been accessible.

“Arrivals” operates in many ways. As public infrastructure, it lights a formerly desolate underpass, providing a safe physical connection between a lower income neighborhood and the city’s central business district. As public art, it reflects the many voices and the many cultures that have shaped, and continue to shape, Holyoke’s past, present and future. As a public engagement process, it provides a model for creating community receptivity for creative placemaking—and the collected stories included on the project website create the capacity to be an ever-evolving archive as a community resource. As a local production, its perforated panels and LED lighting highlight the advanced capabilities of regional fabricators. Finally, the project also signals municipal commitment to reinvestment in the neighborhood and aims to galvanize support for the future development of the historic, but now unused, H. H. Richardson train station.

Since its founding in 1848, Holyoke has long been home to successive waves of immigrants and migrants. For over 150 years, people from Ireland, Canada, Italy, Germany, Poland and Puerto Rico have flocked to the “Paper City” to create a better life for themselves and their families, and with each successive wave of immigrants and migrants, its new inhabitants have redefined Holyoke. This project acknowledges that those diverse voices influence both the historic and the contemporary understanding of public space in the city. The work seeks not to simply beautify the underpass site, but to use art as a means to connect the aesthetic, historic, social and everyday perceptions of public art and public life.



VIEW OF "ARRIVALS" INSTALLED IN THE MOSHER STREET UNDERPASS



# ARRIVALS

PUBLIC ART + INFRASTRUCTURE PROJECT

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This work seeks not to simply beautify the underpass site, but to use art as a means to connect the aesthetic, historic, social and everyday perceptions of public art and public life.

## "Arrivals" operates in a number of ways:

**As public infrastructure**, it lights a formerly desolate underpass, providing a safe physical connection between a lower income neighborhood and the city's central business district.

**As public art**, it reflects the many voices and the many cultures that have shaped, and continue to shape, Holyoke's past, present and future.

**As a public engagement process**, it provides a model for creating community receptivity for creative placemaking—and the collected stories included on the project website create the capacity to be an ever-evolving archive as a community resource.

**As a local production**, its perforated panels and LED lighting highlight the advanced capabilities of regional fabricators.

**As an economic catalyst**, the project signals municipal commitment to reinvestment in the neighborhood and aims to galvanize support for the future development of the historic, but now unused, H. H. Richardson train station.

# Breaking Ground

MARK A. ROEHRLE

University of Wisconsin–Milwaukee

Innovation, experimentation and temporality – terms that resonate with projects designated as installations. Not quite architecture but also not art, these structures serve to provoke questions about material, construction and temporality. Once at the periphery of disciplinary discussions, installations now form a core component of current practice and scholarship. For installations, experience is the currency – with no assigned programming – the power of human agency changes the unprogrammed to one that has a purpose and function. Through these individual experiences public space is controlled and curated by the user.

Breaking Ground is a re-emergent type of site-specific, temporary architecture that elevates the experience of the users to see and reconsider an existing context while testing the phenomenal qualities of building materials and tectonics. Capitalizing on the 30th anniversary celebration at the Haggerty Art Museum that brought out of storage the original Keith Haring construction fence mural, Breaking Ground seeks to transform readily assembled materials like 2x wood lumber, plywood and polycarbonate panels into a new type of aperture: one for being viewed, viewing the sky, viewing others and for occupying a new ground—the tree canopy.

In 1983, Keith Haring was invited to paint a mural on the construction fence built in preparation for the ground breaking of Marquette

University's Haggerty Museum. This collaborative endeavor (students were allowed to prep the wall and infill Haring's linework) consisted of 24 4x8 plywood panels laid out to create an 8' high by 96' long canvas.

The overlapping of the two polycarbonate systems, one 8mm the other 20mm, becomes evident when the outer layer is relatively more transparent. The inner polycarbonate panels tower over the user when entering the space, establishing a datum at 9', then become railings at the other end. This expanding, horizontal datum accentuates the incline of the ramp and frames the sky. The transparency of the polycarbonate panels changes throughout the day depending on the sun and relative position/angle to the piece. The polycarbonate is simultaneously reflective, opaque and transparent.

Breaking Ground served as a backdrop for an programming that included an improvisational dance piece inspired by the installation. The dancers, musicians, and audience interacted with one another and with Breaking Ground by engaging the pathways and landscape of the sculpture garden through changing elevations and layers of intimacy enhanced by the changing transparency of the polycarbonate.

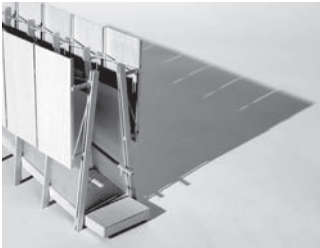
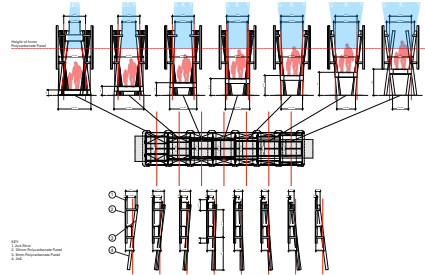
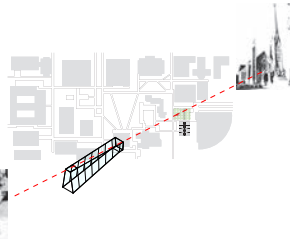


# Breaking Ground

Marc Roehle + Mo Zell: bauenstudio

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# Bridging Between Interior and Environmental Stewardship

DANIEL BUTKO

University of Oklahoma

A four-week elective course to design and build a children's playhouse benefiting Court Appointed Special Advocates (CASA) offered a pedagogical bridge between introductory ideas of design-build and research-based components of inhabitable space. This pedagogically adaptive project provided a learning environment where 1st – 5th year University of Oklahoma Architecture students vertically interacted with each other and faculty outside the constraints of the typical design studio, allowing diversity of theoretical approaches, material sensitivities, and organizational methodologies. The college-established budget of \$500 and short timeframe necessitated financial and environmental stewardship. Design initiatives were immediately focused on salvaged, donated, repurposed, and recycled materials with additional donations through personal and corporate allocations, resulting in an abundance of cedar, cypress, oak, and acrylic. The playhouse project explored the constant integration of critical development, craft, and fabrication, favoring fabrication as a real-time method of informing design and pedagogical decisions. This build-design hybrid provides opportunities for students to appreciate time and materiality as integral to design, developing connections between learning and doing. In addition, the project contained community-based collaboration to foster both contributions to society and initiate public involvement.

The team was bound by CASA's mandates for exterior use, a maximum 7'-6" x 7'-6" footprint and 8'-0" height, able to be transported in pieces for display, assembled by hand within a couple hours inside a shopping mall, on display during the 10-day raffle, disassembled and transported to the winner's home, and permanently reassembled on site. While working around OU's Creating\_Making Lab Monday – Friday hours, the physical testing, mockups, and construction were completed in a mere 19 business days. The atypical learning environment induced students and faculty to not only think outside the proverbial box for design creativity, but budget, schedule, safety, and modularity quickly became integral issues to the overall process. The ambitious team allowed creativity to offer an experiential alternative to preconceived ideas of specific form or style.

Labels and descriptive words conjure critical thought of how the intended function of a project influences the nature in which the project is developed and eventually occupied. Based upon the behaviors of children, the design team focused more on "play" (in the active recreational sense) than on "house", developing conceptual ideas into a multilayered interactive sensory experience - visual, physical, aromatic, and auditory - all facilitated through a place for children to climb, slide, and hang out. The project allowed

students to study the historical aspects of playhouses, compare sketches of rough ideas to accurate models and drawings, and validate concepts with truth in materials.

Materials, history, culture, theory, sustainability, budget limits, and technology were unified as cohesive elements of designing a particular inhabitable structure with a defined interior acoustical character. The team also had to think about adaptability for unknown site conditions and children heights. With this project as their single focus, the team was able to immerse themselves in the entire process without digression. The pedagogical objective was not merely a successful project, but to introduce students to various phases and stages of an inhabitable construct.



# CASA PLAYHOUSE PARADE ENTRY

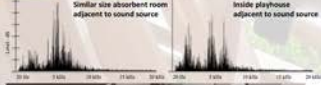
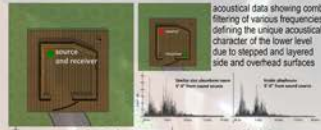
## COURT APPOINTED SPECIAL ADVOCATES CHARITY EVENT

### bridging between interior experience and environmental stewardship

Open, inviting, playful, interactive, breathable, and dynamic: driving forces behind development and manifestation of concepts into reality



"Design concepts focused on qualities we believed children would enjoy in a playhouse."



**Daniel J. Butko - AIA, NCARB, LEED AP, ASA**  
The University of Oklahoma - College of Architecture

Images depict students and faculty designing and fabricating the CASA Playhouse in class, at OU's Creating\_Making Lab, at start of 10 day raffle in shopping mall, and final assembled construct on site.



Images show students and faculty working in a hybrid design-build / build-design environment. Approached as material stewardship with course pedagogy focused on hands-on kinesthetic learning. 4 enrolled students, 4 volunteer students, 1 assigned professor, 1 volunteer professor, and the shop manager consulted a separate Design Review Committee and elementary school children to design, construct, and install the playhouse in 3 1/2 weeks.



**SALVAGED CEDAR, CYPRESS, OAK, AND ACRYLIC + \$500 + PASSION FOR DESIGN**

**Salvaged Materials:** 1200 lb of cedar salvaged from OU campus trees claimed during 2007 ice storm, milled and planed in COA model shop.  
200 lb cypress and oak salvaged from a local jobsite  
300 1/2" acrylic scraps donated by a local company

**Purchased Materials:** 36 lb of cypress to complete banding of each lift  
184 lb pressure treated lumber for base platform  
Coated fasteners, galvanized carriage bolts, stain, wood glue, galvanized steel pipe, and hinges and latches

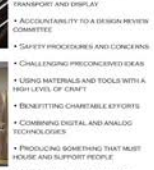
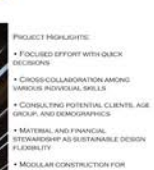
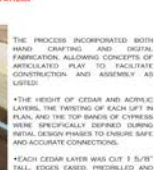
**Material Budget:** \$500  
**Funds spent on supplies/materials:** \$498

"PLAY" AND "HOUSE" CAN BE DEFINED IN VARIOUS WAYS AND THEREFORE, CONAIRE CRITICAL THOUGHT OF HOW THE INTENDED FUNCTION OF A PROJECT INFLUENCES THE NATURE IN WHICH THE PROJECT IS DEVELOPED AND EVENTUALLY OCCUPIED. BASED UPON THE BEHAVIOR OF CHILDREN, THE DESIGN TEAM FOCUSED MORE ON "PLAY" ON THE ACTIVE RECREATIONAL BEHAVIOR THAN ON "HOUSE". DEVELOPING CONCEPTUAL IDEAS INTO A MULTILAYERED INTERACTIVE SENSORY EXPERIENCE: VISUAL, PHYSICAL, AROMATIC, AND AUDITORY. THE TEAM DETERMINED THE PLAYHOUSE WILL LITERALLY HOUSE YEARS OF MEMORIES INSTEAD OF LINKED TO THE DEFINED SPACE, MATERIALS, AND SENSORY STIMULI OF THE SPACES. STUDENTS WERE IMMEDIATELY THRILLED INTO A WHOLEMIND DESIGN PROCESS THAT ULTIMATELY BECAME AN INEVITABLE STRUCTURE FOSTERING / CULTIVATING / PROMOTING THE NEED FOR HUMANITY MATERIAL CRAFTING AS AN INTEGRAL PART OF DEVELOPING IDEAS AND MOVING FORWARD INTO PRODUCTION. THE THRIVING MOTION OF THE STRUCTURE STEMS FROM THE IDEA OF MODULARITY AND "MATERIALITY" THAT PROVIDED A DYNAMIC EXPERIENCE FOR CHILDREN AND ALLOWED US TO CONSTRUCT IN A WAY THAT COULD BE EASILY ASSEMBLED AND DISASSEMBLED. THE TWIST ALSO FUNCTIONS AS A CLIMBING FEATURE, ALLOWING CHILDREN TO ASCEND THE STRUCTURE.



#### THE CEDAR TWIST

STUDIES BEHAVIORS OF CHILDREN AND CONVERSATION WITH ELEMENTARY SCHOOL AGES IDENTIFIED THE TEAM TO FOCUS MORE ON "PLAY" ON THE ACTIVE RECREATIONAL BEHAVIOR THAN ON "HOUSE". DEVELOPING CONCEPTUAL IDEAS INTO A MULTILAYERED INTERACTIVE SENSORY EXPERIENCE: VISUAL, PHYSICAL, AROMATIC, AND AUDITORY. DESIGN STUDENTS ARE NOT "PLAYING" WITH DESIGN IDEAS. THEY ARE DEVELOPING CONCEPTS TO REALITY IN A FORM OF "ARTICULATED" PLAY. CONCLUSIVELY INFLUENCING MATERIAL AND SURFACE ARTICULATION.



THE PROCESS INCORPORATED BOTH HAND CRAFTING AND DIGITAL FABRICATION, ALLOWING CONCEPTS OF ARTICULATED PLAY TO FACILITATE CONSTRUCTION AND ASSEMBLY AS LAYERS.

- THE HEIGHT OF CEDAR AND ACRYLIC LAYERS, THE TWISTING OF EACH LIFT IN PLAN, AND THE TOP BANDS OF CYPRESS WERE SPECIFICALLY DEFINED DURING INITIAL DESIGN PHASES TO ENSURE SAFE AND ACCURATE CONNECTIONS.
- EACH CEDAR LAYER WAS CUT 3/8" TALL, EDGES SAVED, PREDRILLED, AND THEN HAND SIZED AND SCAWED INTO THE LAYER BELOW.
- THE ACRYLIC WAS PREDRILLED WITH LARGER ANNUAL SPACE SO FASTENERS PASS EASILY THROUGH TO THE CEDAR BELOW WITHOUT DISTURBING THE ACRYLIC.
- GALVANIZED CARRIAGE BOLTS THROUGH PREDRILLED HOLES IN THE CYPRESS BANDS CONNECT EACH LIFT.
- A CNC MACHINE WAS USED TO ROUTE GROOVES IN THE LIFT FLOOR FOR ALIGNMENT ON THE STAINED CYPRESS AT THE TOP OF THE ETLIFT.

**PROJECT HIGHLIGHTS:**

- FOCUSED EFFORT WITH QUICK DECISIONS
- CROSS-COLLABORATION AMONG VARIOUS POTENTIAL SKILLS
- CONSULTING POTENTIAL CLIENTS, AGE GROUP, AND DEMOGRAPHICS
- MATERIAL AND FINANCIAL STEWARDSHIP AS SUSTAINABLE DESIGN FLEXIBILITY
- MODULAR CONSTRUCTION FOR TRANSPORT AND DISPLAY
- ACCOUNTABILITY TO A DESIGN REVIEW COMMITTEE
- SAFETY PROCEDURES AND CONCERNS
- CHALLENGING PRECONCEIVED IDEAS
- USING MATERIALS AND TOOLS WITH A HIGH LEVEL OF CRAFT
- BENEFITTING CHARITABLE EFFORTS
- COMBINING DIGITAL AND ANALOG TECHNOLOGIES
- PRODUCING SOMETHING THAT MUST HOUSE AND SUPPORT PEOPLE
- VERTICAL LEARNING EXPERIENCE

# Civil War Veterans Memoria

A. KATHERINE BAMBRICK AMBROZIAK

University of Tennessee—Knoxville

The Civil War Veterans Memoria are small scale interventions that demonstrate architecture's capacity to serve as an agent promoting community activism. The commemorative pieces work in the realm of social justice enacted in open public space.

The project is part of a larger initiative by the community, the city, and the university to reclaim and rehabilitate Odd Fellows Cemetery, an abandoned African-American burial ground in a predominantly minority neighborhood. The rehabilitation's primary goal is to address the negative physical and social influences affecting the area and to offer the community a safe, engaging, and respectful environment to rediscover its heritage.

The specific purpose of the memoria was to highlight and bring attention to the standing headstones of Civil War veterans in the cemetery. The original stones are visible reminders of the pride and hope of brave men, but many are worn and the information they bear is often illegible. The memoria restate and clarify the text. They also provide a permanent sleeve to hold the American flag, used to celebrate the Sesquicentennial of the war and for future Veterans Day remembrances.

The work is the product of twelve architecture students and was conducted as an introductory study in a studio course that focused on architectural ritual and engagement. Design proposals were reviewed by faculty, peers, and community members. The favored design

was refined and fabricated for each of the fourteen veterans whose headstones currently stand in the cemetery.

The Memoria: Four concrete bars march at the foot of each veteran's headstone. Inscribed text gives identity to the men, especially important where the stones are faded or damaged.

Bar 1 gives the veteran's Christian name.

Bar 2 provides place for birth and death dates. Most of these bars are intentionally left blank reflecting the lack of records for former slaves.

Bar 3 identifies each veteran's rank, company, and unit. Most were from the 1st United States Colored Heavy Artillery, founded in the city.

Bar 4 proudly states the status of the men as Civil War Veterans and provides the sleeve for the placement of the flag.

The tops of the bars are coated with powdered glass to reinforce one of the goals of the reclamation- to take something that is worn and neglected and reveal its true beauty. The glass references the discarded bottles found littering the cemetery. The transformed nature of the powdered glass reflects sunlight and brings strong attention to the markers.

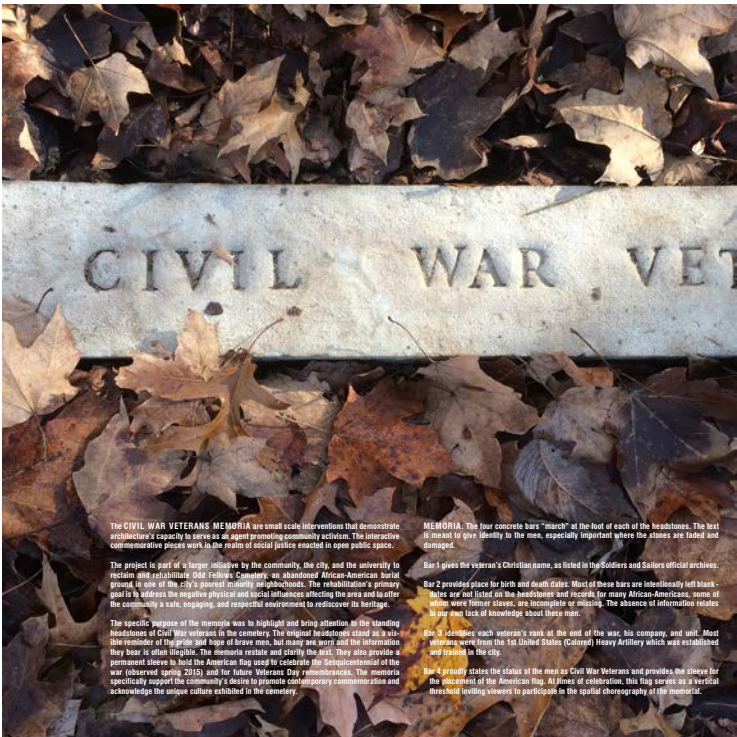
The bars are placed to measure a human step and are meant to encourage visitors to walk

toward the historic headstones. Some visitors stand at the foot of the memorial and view all the pieces in composition. Others feel invited to step between the bars, to approach the headstone and kneel down at the final bar to pay their respects. Note that the memoria do not mark the position of the veterans' bodies underground, which here is usually on the opposite side of the headstone. The memoria are for the visitor, symbolizing his or her current participation in contemporary commemoration.



# CIVIL WAR VETERANS MEMORIA

Contemporary markers designed and fabricated to honor African American Civil War Veterans during the City's Sesquicentennial Celebration - Odd Fellows Cemetery



The CIVIL WAR VETERANS MEMORIA are small scale interventions that demonstrate architecture's capacity to serve as a quiet prompting community activities. The interactive commemorative pieces work in the realm of social justice enacted in open public space.

The project is part of a larger initiative by the community, the city, and the university to reclaim and establish Odd Fellows Cemetery, an abandoned African-American burial ground, as one of the city's diverse multi-use neighborhoods. The rehabilitation's primary goal is to address the negative physical and social influences affecting the area and to offer the community a safe, engaging, and respectful environment to rediscover its heritage.

The specific purpose of the memoria was to highlight and bring attention to the untold headstones of Civil War veterans in the cemetery. The original headstones stand in white, the remainder of the graves and those of brown men, but many are worn and the information they bear is often illegible. The memoria restore and clarify the text. They also provide a permanent tribute to hold the American flag used by the Sesquicentennial of the war (observed spring 2015) and for future Veterans Day remembrances. The memoria specifically support the community's desire to promote contemporary commemoration and acknowledge the unique culture exhibited in the cemetery.

MEMORIA. The four concrete bars "match" at the foot of each of the headstones. The text is meant to give identity to the men, especially important where the stones are faded and damaged.

Bar 1 gives the veteran's Christian name, as listed in the Soldiers and Sailors official archive. Bar 2 provides place for birth and death dates. Most of these bars are intentionally left blank - white were former slaves, the interpretation is missing. The absence of information relates to our own lack of knowledge about these men.

Bar 3 denotes each veteran's rank at the end of the war, his company, and unit. Most veterans were from the 1st United States (Colored) Heavy Artillery which was established and trained in the city.

Bar 4 proudly states the status of the men as Civil War Veterans and provides the avenue for the placement of the American flag. At times of celebration, this flag serves as a vertical, marching banding viewers to participate in the spatial choreography of the memoria.



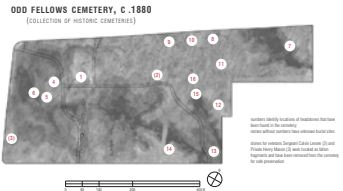
SEQUICENTENNIAL EVENT. The Civil War headstones, with the memoria, were installed during the Sesquicentennial Event in early spring 2015. Dozens dressed as 1st United States Colored Heavy Artillery soldiers dignified the role of the unit in the war. American flags were placed at each veteran's headstone, held by Bar 4 of the memoria, which installed the person as a veteran of the war.

DESIGN: The work was the product of twelve architecture students and was conducted as an introductory study in a studio course that focused on architectural ritual and engagement. Teams of students proposed designs which were reviewed by faculty, peers, and community members. The favored design was refined and fabricated for each of the fourteen veterans whose headstones currently stand in the cemetery.

The design is composed of four concrete bars with inscribed text that gives identity. The tops of the bars were coated with powdered glass to reinforce one of the goals of the reclamation - to take something that is worn and neglected and reveal its true beauty. The glass references the discarded bottles found littering the cemetery. The transformed nature of the powdered glass reflects sunlight and brings strong attention to the markers.

The bars are placed to measure a human step and are meant to encourage visitors to walk toward the historic headstones. Some visitors stand at the foot of the memorial and view all the pieces in composition. Others feel invited to march between the bars, to approach the headstone and kneel down at the foot bar to pay their respects. Note that the memoria does not mark the position of the veteran's body underground, which here is usually on the opposite side of the headstone. The memoria, located on the front side of the headstone, is for the visitor and symbolizes his or her current participation in contemporary commemoration.

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- DAUGHTERS OF JOHN CEMETERY**
- 7. ADAM BROWN, Private, Co. A, 1st US Colored Heavy Artillery, 1862-1865
  - 8. ADAM BROWN, Private, Co. A, 1st US Colored Heavy Artillery, 1862-1865
  - 9. ADAM BROWN, Private, Co. A, 1st US Colored Heavy Artillery, 1862-1865
  - 10. ADAM BROWN, Private, Co. A, 1st US Colored Heavy Artillery, 1862-1865
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- 13. ADAM BROWN, Private, Co. A, 1st US Colored Heavy Artillery, 1862-1865
  - 14. ADAM BROWN, Private, Co. A, 1st US Colored Heavy Artillery, 1862-1865



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The dedication was conducted as a scripted, closed ceremony in which each attendee played a part. Community members served as primary narrators for specified dialog; students acted as "practitioner" each with roles by marking the bars with a pastel chalk line, tacitly acknowledging their own dedication.

# The Continental Compact

**IAN CAINE**

University of Texas at San Antonio

**EMILY CHEN**

**TIFFIN THOMPSON**

**DEREK HOEFERLIN**

Washington University in St. Louis

**PABLO CHAVEZ**

The drought crisis in California is first and foremost a political crisis. Decades of public policy have created a system of massive water conveyance, fostering and maintaining a fundamental misalignment between the supply and demand of water. The untenable status quo in California is maintained through an elaborate slew of public policies, designed to support a system of water-trading between western states in areas like the Colorado River Basin.

The Continental Compact proposes to fundamentally alter the culture of water-trading: re-legislating water distribution, first in California and ultimately throughout the United States, Canada and Mexico. The new laws will be based on four principles: Don't transfer water. Do guide population growth to water. Do allow regions to shrink by attrition. Do return the river to its natural course.

California has maintained itself through an elaborate mechanism of water conveyance via aqueducts for decades. Unfortunately, the financial and environmental costs of this strategy are high. Currently the financial costs are being borne by the State and Federal governments, while the environmental costs are simply externalized, thereby delaying and intensifying their impact. This is an infrastructural shell game that California cannot win.

The Continental Compact provides a long-term solution to the contradiction that is California, incentivizing urbanism in water-rich basins near dams, rivers and deltas. The

3 types of hydro-urbanisms leverage existing water resources to create a conurbation at the scale of the river basin. Locally, each responds to the specific characteristics of its riverine, geographic and landscape environment. The hydro-urbanisms are capable of accommodating diverse programs including agriculture, residential, ecology, industry, recreation and tourism.

The Continental Compact replaces hydraulic urbanism with hydrological urbanism. Simply put, the Continental Compact stops moving water to the people and starts moving people to the water. The Continental Compact incentivizes a series of Hydro-regions, each leveraging a piece of new infrastructure in an existing water basin. The resulting megalopolis allows new water-rich urbanism to grow over a period of one hundred years. Conversely, it allows existing water-poor urbanism in Los Angeles, San Diego, San Francisco, Phoenix, and Denver to slowly shrink via attrition. The positive environmental and financial benefits of the revised policy will be significant, saving energy, reducing carbon emissions, slowing subsidence, lowering infrastructure costs, and regenerating California's deltas.

The history of Westward Expansion in the United States was an epic success, leveraging cheap land and abundant natural resources to grow the country. Things are very different today: land is expensive, resources are scarce, and state and federal governments are increasingly unable to afford the spiraling

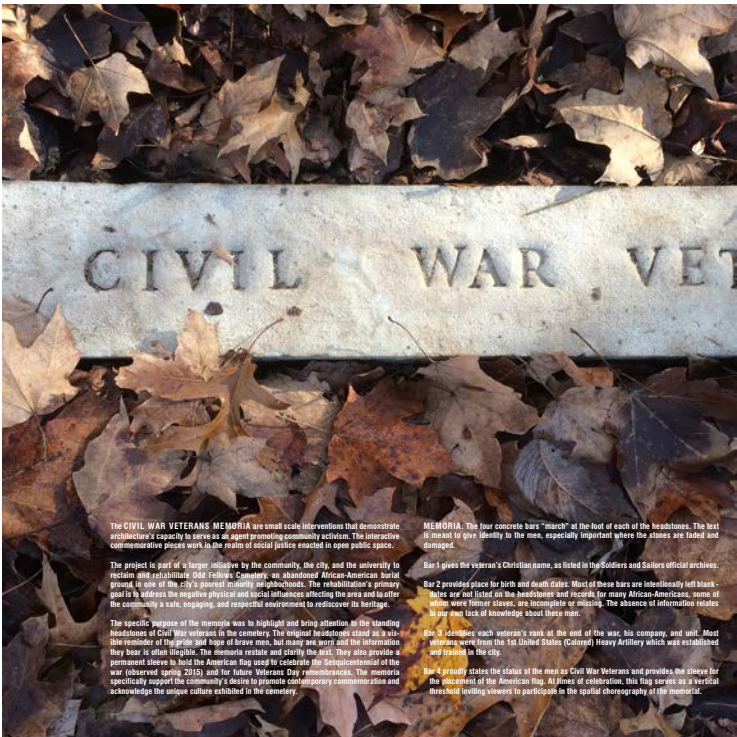
price tag associated with infrastructural obligations.

Current 2050 growth projections in the U.S. don't factor what will likely become the most critical determinant of successful urbanism: water supply. The Continental Compact re-directs growth from Mega-regions to Hydro-regions, investing in water-rich urban conurbations built around dams, rivers and deltas. The Compact re-invests the massive resources that currently support the construction and operation of aqueducts into the construction of new infrastructure to support water-rich sustainable urbanism.



CIVIL WAR VETERANS MEMORIA

Contemporary markers designed and fabricated to honor African American Civil War Veterans during the City's Sesquicentennial Celebration - Odd Fellows Cemetery



The CIVIL WAR VETERANS MEMORIA are small scale interventions that demonstrate architecture's capacity to serve as a space promoting community activities. The interactive commemorative pieces work in the realm of social justice enacted in open public space.

The project is part of a larger initiative by the community, the city, and the university to reclaim and establish Odd Fellows Cemetery, an abandoned African-American burial ground, as one of the city's diverse multi-use neighborhoods. The rehabilitation's primary goal is to address the negative physical and social influences affecting the area and to offer the community a safe, engaging, and respectful environment to rediscover its heritage.

The specific purpose of the memoria was to highlight and bring attention to the untold headstones of Civil War veterans in the cemetery. The original headstones stand in white, the remainder of the grave and base of brass markers, but many are worn and the information they bear is often illegible. The memoria restore and clarify the text. They also provide a permanent tribute to hold the American flag used by the Sesquicentennial of the war (observed spring 2015) and for future Veterans Day remembrances. The memoria specifically support the community's desire to promote contemporary commemorative and acknowledge the unique culture exhibited in the cemetery.

MEMORIA. The four concrete bars "match" at the foot of each of the headstones. The text is meant to give identity to the men, especially important where the stones are faded and damaged.

Bar 1 gives the veteran's Christian name, as listed in the Soldiers and Sailors official archive. Bar 2 provides place for birth and death dates. Most of these bars are intentionally left blank - names are not listed on the headstones and records, for many African-Americans, some of which were former slaves, are incomplete or missing. The absence of information relates to our own lack of knowledge about these men.

Bar 3 identifies each veteran's rank at the end of the war, his company, and unit. Most veterans were from the 1st United States (Colored) Heavy Artillery which was established and trained in the city.

Bar 4 proudly states the status of the man as Civil War Veterans and provides the avenue for the placement of the American flag. At times of celebration, this flag serves as a vertical, marching banding viewers to participate in the spatial choreography of the memoria.



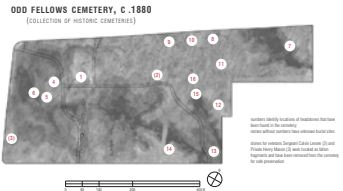
SEQUICENTENNIAL EVENT. The Civil War headstones, with the memoria, were installed during the Sesquicentennial Event in early spring 2015. Dozens dressed as 1st United States Colored Heavy Artillery soldiers dignified the role of the unit in the war. American flags were placed at each veteran's headstone, held by Bar 4 of the memoria, which installed the person as a veteran of the war.

DESIGN: The work was the product of twelve architecture students and was conducted as an introductory study in a studio course that focused on architectural ritual and engagement. Teams of students proposed designs which were reviewed by faculty, peers, and community members. The favored design was refined and fabricated for each of the fourteen veterans whose headstones currently stand in the cemetery.

The design is composed of four concrete bars with inscribed text that gives identity. The tops of the bars were coated with powdered glass to reinforce one of the goals of the reclamation - to take something that is worn and neglected and reveal its true beauty. The glass references the discarded bottles found littering the cemetery. The transformed nature of the powdered glass reflects sunlight and brings strong attention to the markers.

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# Flying Carpet

**GLENN WILCOX**

University of Michigan

**ANCA TRANDAFIRESCU**

University of Michigan

The FLYING CARPET is a piece of microarchitecture that converts a long, narrow volume of space in an elementary school into a reading, writing, lounging, and play space for the children occupants of the building. We created FLYING CARPET to provide resistance to the disciplinary trappings of traditional school furnishings. With this design we set out to give the young users a series of physical provocations about how the body could be configured while learning. Our site was a long, narrow band of space, 3' x 65', in a wide corridor. The most significant attribute of the site, apart from its high ceiling and excellent natural light, was the fact that this space existed outside of direct visual supervision by teachers in the adjacent classrooms. This meant the children would be free to actively create new modes of inhabitation and misuses of the designed forms. Toward this end we provided unconventional spaces for play and invention. We made a piece that consists of hybrids of slides and chairs, caves and tables, podiums and loungers all in the guise of conventional reading, writing, and tutoring places, in an effort to encourage our young clients to see these types of learning as overlapping, rather than segregated, by the educational institution. Folk stories in many cultures tell of a mythical flying carpet that transport their riders to distant places faster than the wind. Recalling these stories from our own childhood, the flying carpet became the apt poetic metaphor for the space's primary activities: reading, writing, and imagining... the fastest ways we know to travel elsewhere.

The design was generated using a computer script we wrote which enabled us to experiment with a wide range of sectional shapes. Once written, we then could input conditional statements to control the table, bench, lounge, and variable "bump" heights. Our early variations explored the use of double curved surfaces and alternative leg supports.

The final design responds to particular site conditions and utilizes the curvature and "landing" of the surface for self-support in addition to steel legs which follow the same geometry of the surface.

Since we were also going to be the fabricators on the project we made a series of scale models to study and refine the geometry in greater detail, and also to understand the process of fabrication and assembly of the final full scale piece.

For ease of fabrication, transport, and assembly, the final design is divided into seven sections. The steel support legs also serve a secondary role of joining the sections to each other. Each section is broken down into smaller elements which overlap to create a stronger bonding surface. We developed cut sheets for CNC and Water-Jet cutting of both the wood and steel elements. It's important to note that these were output directly from a 3D model to cutting files – no construction documents were made for the project. After CNC machining, elements are laid out in order prior to assembly. Sections are glued and clamped in stages.



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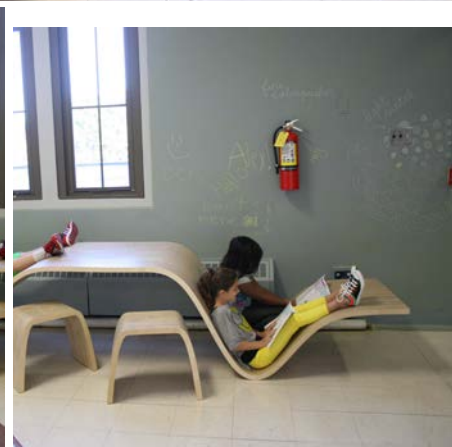
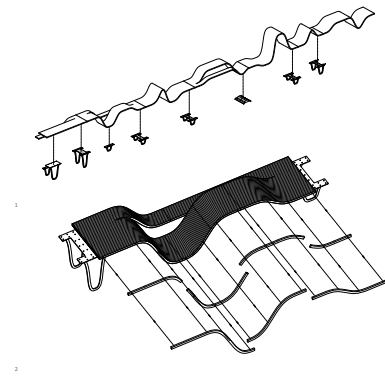
The computer script we wrote to generate the final form for the piece had to be able to produce widely varying sectional shapes, but also had to conform precisely to children's body dimensions. Once written, we then could input conditional statements to control the table, bench, lounge, and variable "bump" heights. Our early variations explored the use of double curved surfaces and alternative leg supports.

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# Latent (e)Scapes

**GREGORY SPAW**

American University of Sharjah

**CHRISTINA GEROS**

Harvard University

**LEE SU HUANG**

University of Florida

**JAKE MARSICO**

Carnegie Mellon University

Latent (e)Scapes is a landscape installation in the Susan S. and Kenneth L. Wallach Garden at the Radcliffe Institute for Advanced Study at Harvard University. Installations in the garden rotate on a two-year competition cycle and are selected by an esteemed jury of Harvard faculty, including the Dean of the Radcliffe Institute.

An interactive and kinetic media installation, Latent (e)Scapes explores the natural-synthetic landscape through systematizing the implicit and explicit impacts of human and non-human forces within the garden. Finding inspiration in the swaying grasses of the prairies and coasts, the work calls in to question our roles within everyday environments and creates an immersive experience contrasting the typical urban landscape.

Designed to be seamlessly embedded within the natural landscape and therefore integrated within the natural ecology, the installation is comprised of 1600 RGB LEDs embedded within a series of berms each planted with Pennsylvania Sedge and a No-mow Fescue mix. Each RGB pixel is connected to a 3 foot long, 0.125" diameter extruded acrylic rod that transmits and projects the light upwards. Every RGB pixel is mapped spatially within a custom-written environmental simulation interface that controls the lighting behaviour of each individually addressable pixel.

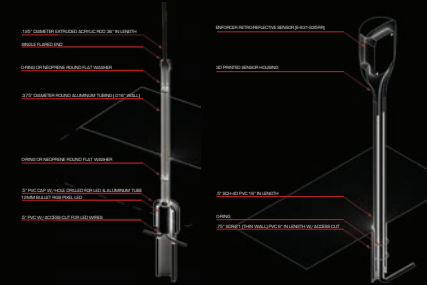
A network of motion sensors tracks the movement of occupants as they traverse the space, as each sensor is activated a series of reactive animations propagate throughout the installation in real-time. While the interactive animations convey the spatial location of human occupancy, the color of the LEDs can be used to imply specific environmental factors such as temperature or humidity, each tied to a RGB value. In contrast to the digital interpretation of physical stimuli, the acrylic stalks and their inherent flexible physical properties react naturally to self-weight, air movement, and human touch, embodying and tracing the kinetic energies and latent forces present within the environment.

The installation can be seen as a physical metaphor of an attitude towards symbiotic relationships between natural and synthetic, the implicit and the explicit, the static and kinetic manifestations of energy. As human impact is registered through the synthetic elements, the interactivity makes explicit the synthetic nature of the ecology, while the effect of natural environmental forces are simultaneously implied in the structure and material of the installation. This interweaving of natural/synthetic ecologies serves as a critique and method in which artificial systems could possibly be designed to mimic, co-exist, and co-create within the natural-synthetic landscape of the anthropocene.



# Latent (e)Scapes

Christina Genos, Gregory Thomas Spaw, Lee Su Huang & Jake Marsico



# Mobile Craft Module

**ADAM MARCUS**

California College of the Arts

The Mobile Craft Module proposes an architecture of deployable structures that can be reconfigured to serve a variety of functions. The twin modules can be arranged in multiple ways to facilitate exhibition space, event space, and work space, and they nest together to become secure at night.

The modules were designed and built by a team of thirteen students in eight weeks. The project served as the anchor pavilion for California College of the Arts (CCA) during the Market Street Prototyping Festival, a three-day event in San Francisco that explored new ideas for designing public space. Throughout the festival, the modules hosted a series of exhibitions and events showcasing work by students and faculty. Following the festival, the project returned to the school to serve as mobile workstations on the school's outdoor maker space. The intent is for the modules to provide an infrastructure for the construction of future design-build projects undertaken by students and faculty.

Each module is open on one side, providing access to the modular shelving and work surfaces on the interior. The reconfigurable plug-in shelving system includes removable caps, which double as stools once they are removed from the module. The structural frame is fabricated from welded steel tube, with angle iron members welded to the corners to serve as protective edges for the cladding. The cladding is fabricated from western

red cedar boards, each of which is cut to size. A robotically-cut pattern carved into the cedar boards consists of abstract shapes that merge together to spell CCA's name as one moves around the module.





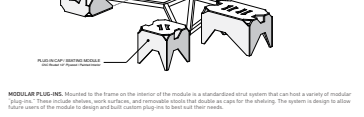
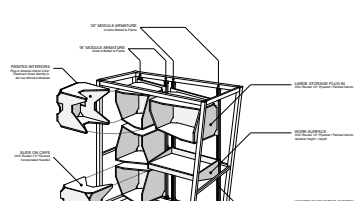
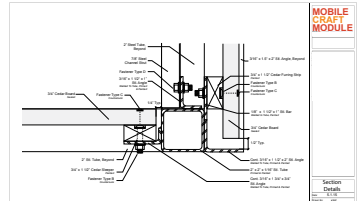
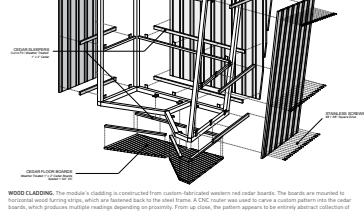
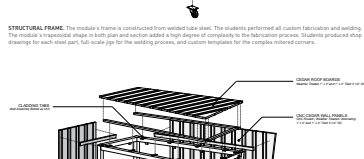
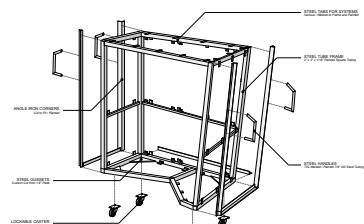
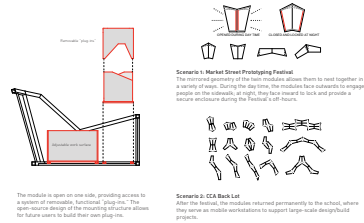
# MOBILE CRAFT MODULE

Adam Marcus, California College of the Arts

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# Production Process: Developing Logics of Surface, Object, Space, and Effects

CLAY ODOM

University of Texas at Austin

The work outlined here focuses on PRODUCTION PROCESS generating logics for form, surface, and effects which are explored and generated through design processes, material manipulations, and interventions. In particular through a current iteration of an ongoing research project moving from ephemeral effects such as caustic lighting to material manipulation.

Rem Koolhaas has stated that, 'PERFORMANCE is not function...what does it (design) create?... what does it stimulate?' Here we embrace this contemporary engagement with performance as production. Fundamentally, the work explores simple questions regarding Depth and Surface as related to light and atmospheric effects. Building on this trajectory of investigation which moves from issues of objects to issues of surface ultimately generating emergent spatio-atmospheric effects. These outcomes are then re-engaged via surface and form as means of expanding the temporal, subjective potentials for future iterations.

## DESCRIPTION

Using a system comprised of geometries and projections, the project expanded on concepts surrounding the generation of effects and spatial experience\_ expanding on concepts of caustic, interference and the production of patterns as ephemeral, transforming and contemporary approach to the production of glamour as both material, surface affect and magical phantasm.

## CONTEXT

The existing interior and the typology of installation is engaged as both a generator and armature for installation. The work expands on the use of rigging as both a physical infrastructural link- tying literally to the existing conditions- and as a extension and material exploration of caustic patterns of productive interference.

## MATERIAL / SURFACE

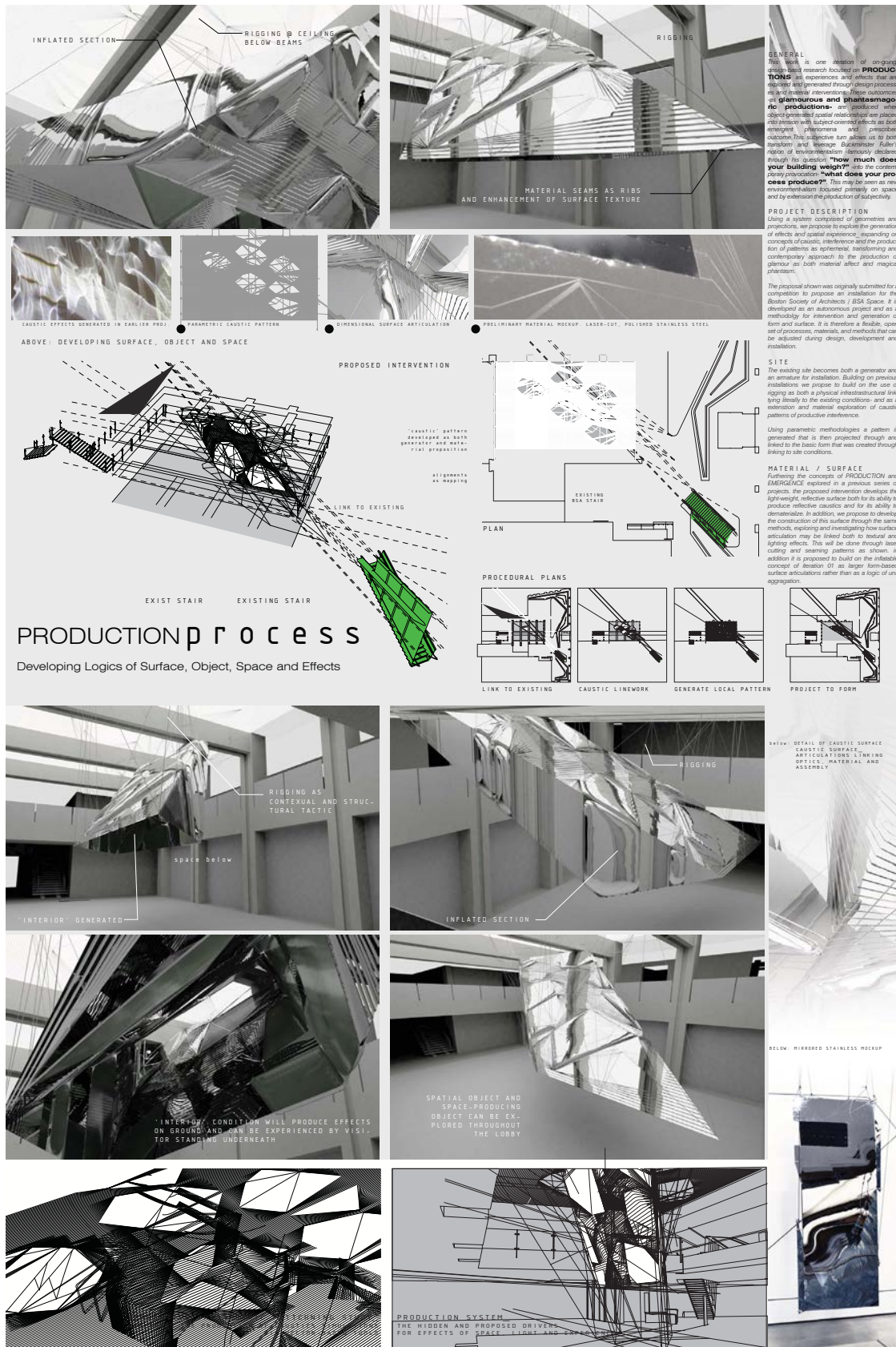
Extending concepts and tests generated previously we propose to further develop the light-weight, reflective surface both for its ability to produce reflective caustics and for its ability to dematerialize. In addition, develop the construction of this surface through the same methods, exploring and investigating how surface articulation may be linked both to textural and lighting effects. This was developed done through laser cutting and seaming patterns. Finally, inflatable of iteration 01 as larger form-based surface articulations rather than as a logic of unit aggregation.

## CONCLUSION

The goal within this work is not focused on how form is generated as an end-goal, but instead turns toward how material-form is both responsive and generative, formed by and forming spatial, atmospheric and experiential conditions. The interior productions often have the effect of dematerializing both the existing formal-spatial contexts and our formal intervention, subsuming them into ephemeral atmospheric effects

and experience. Operational methods of deployment and material limitations led from conceptual strategies to local tactics that incorporated light-weight, reflective materials and methods of rigging, and folding para-textile systems which further both engagement with and generation of context(s). Ultimately, this line of inquiry -situated primarily within the interior- can be seen as critical exploration of speculative design practices situated between contemporary theoretical positions of Gernot Bohme (Atmospheres) and Graham Harman (Object Oriented Ontology). Finally, the proposal is understood as both (process) design methodology and (product) material procedure. The negotiation of process and method generates conditions that supersede constituencies of the system to produce effects ranging from form and surface to wonder.





# Ver Sacrum

**DANIEL M. BAERLECKEN**

Georgia Institute of Technology

**JUDITH REITZ**

DESIGNDEVELOPBUILD

**SABRI GOKMEN**

Georgia Institute of Technology

Within the category Architecture in an Expanded Field, from Interiors to Landscapes, this project operates at the micro-scale of an intervention at the interface of public space and infrastructural space.

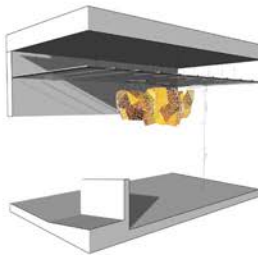
The public art project, Ver Sacrum, studies a new form of digital pattern making on architectural surfaces by combining organic figures with structural scaffolds. Ver Sacrum refers to an engraving at the Viennese Secession Building with its golden, highly ornamented dome structure. Taking inspiration from the Viennese Arts and Crafts movement, this suspended installation is attempting to achieve a technologically driven version of ornamented surfaces, generating a radiant array of spatial effects. Located at the entrance of the Decatur Marta station, the three structures undulate, creating a contrast to the Decatur Square's architecture. Light meets solid, as ornament engages with industrial structure, overhead the vibrant pattern radiates and projects onto the surrounding surfaces.

The installation is fabricated from thin mirrored, golden aluminum sheet metal. The color is referencing the Viennese Secession Building by Joseph Maria Olbrich, but instead of formulating an iconic, exterior gesture it creates a hidden experience. It starts a dialogue with the infrastructural architecture of the train station by creating a contrast to the metallic and grey surfaces of the infrastructural architecture. The golden color animates the spaces through reflections. The surface

is ornamented with leaves, which are bent towards the center of each structure. The bent leaves cause additional reflections and implant an organic motif. The algorithm used to grow veins and leaves tries to treat the object as one: it creates continuity by growing veins from three starting points along each edge of the facet, until the veins and leaves meet in the center of each facet negotiating their space for growth with each other.

Through its fragility and lightness, the structure reacts to the force of the site and makes hidden movements underground visible. Approaching and departing trains create a strong airflow through the lower levels of the station, which exit through the main entrance areas. The wind animates the structure and the now shaking surfaces communicate the hidden underground activity.





#### VER SACRUM

Within the category Architecture in an Expanded Field, from *Boundaries to Landscapes*, this project operates at the micro-scale of an intervention at the interface of public space and infrastructural space.

The public art project, Ver Sacrum, unfolds a new form of digital patterns making on architectural surfaces by combining organic figures with structural scaffolds. Ver Sacrum refers to an engraving at the Vietnamese Secession Building with its golden, highly ornamented dome structure. Taking inspiration from the Vietnamese Arts and Crafts movement, this suspended installation is an attempt to achieve a technologically layered version of ornamented surfaces, generating a radiant array of spatial effects. Located at the entrance of the Decatur Metro station, the three structures unfold, creating a contrast to the Decatur Square's infrastructure. Light meets solid, as ornament engages with industrial structure, overhead the vibrant patterns radiates and projects onto the surrounding surfaces.

The installation is fabricated from thin mirrored, golden aluminum sheet metal. The color is referencing the Vietnamese Secession Building by Joseph Maria Olinda, but instead of formulating an iconic, exterior gesture it creates a hidden experience. It starts a dialogue with the infrastructural architecture of the main station by creating a contrast to the sterile and grey surfaces of the infrastructural architecture. The golden color animates the spaces through reflections. The surface is ornamented with leaves, which are bent towards the center of each structure. The bent leaves cause additional reflections and capture an organic world. The algorithm used to grow veins and leaves tries to treat the object as one: it creates continuity by growing veins from three starting points along each edge of the facet, until the veins and leaves meet in the center of each facet negotiating their space for growth with each other.

Through its fragility and lightness, the structure reacts to the force of the site and makes hidden movements underground visible. Approaching and departing trains create a strong airflow through the lower levels of the station, which exit through the main entrance areas. The wind animates the structure and the new shining surfaces rearticulate the hidden underground activity.







# **Design Research & Building Behaviors**

# Cooling Oculus: A Passive Prototype

DORIT AVIV

The Cooper Union

Deserts cover a third of the earth's land surface and are growing at unprecedented rates. If envisioned strategically, deserts can be rethought as an immense resource. However, inhabiting the deserts requires architectural strategies that reimagine shelter in this extreme environment without reliance on fossil fuels.

Cooling Oculus is a project that emerged out of the question, how should one build for the desert climate? The Oculus is a prototype of a lightweight roof structure for passive cooling in hot-dry weather. It integrates two cooling strategies that compliment each other over a diurnal (day-night) cycle. These work in two ways as follows:

## 1. DAY

During the day the roof takes the shape of a downdraft solar chimney. To make use of evaporative cooling a light water mist sprays inside the chimney's crown, cooling dry desert air and causing it to sink down. Cool air is pulled into the interior, across a geometry informed by fluid dynamics that maximizes air distribution through the underlying space. Using this system at an outdoor temperature of 40°C, internal air can be cooled to 25°C.

## 2. NIGHT

During the night the roof's chimney is dilated to open up a maximum surface of the project's concrete slab to the night sky above. With the chimney structurally deployed in the open

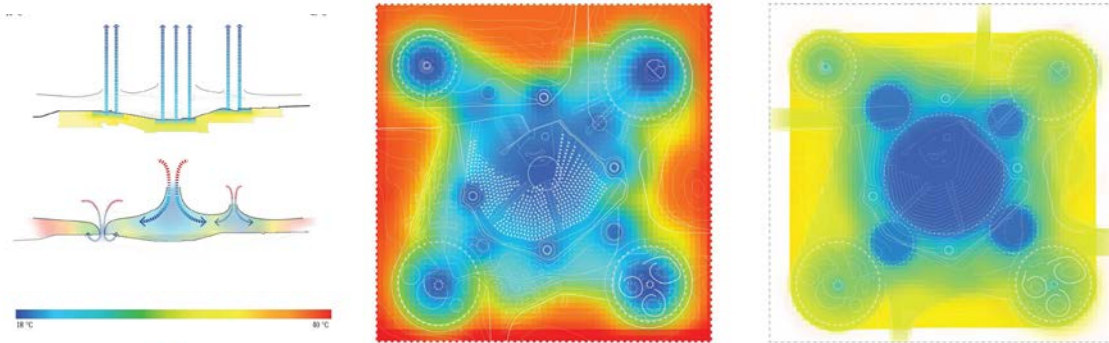
position, on a cloudless night the cold sky absorbs heat from the concrete thermal mass depressing its temperature by 5°C and thus turning it into a huge battery of coolness for the following day.

While building on contemporary energy-system possibilities, these cooling strategies also draw from the longer tradition of vernacular desert architecture in the Middle East. For example the Bedouin tent, which relies on an adjustable lightweight roof for sun shading and the malqaf (wind catcher), which directs atmospheric airflow into a building. The Cooling Oculus makes use of a double-membrane envelope, which shades and insulates from direct sun radiation. Like the malqaf it draws air into the interior volume, but regulates airflow precisely through a hyperbolic geometry. The dilation of the chimney at night is made possible by a triangulated geometry of lightweight tubes and a hinged mechanical joint system.

The development of the project began with a parametric model developed based on airflow calculations. In the past months, a large-scale prototype has been constructed in order to resolve the material and mechanical requirements of the system and it is now being tested for its airflow and cooling capacities in lab conditions.

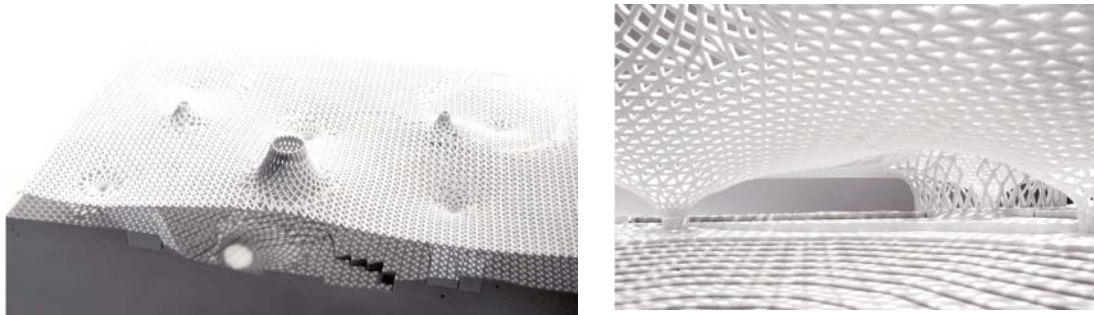
## 1 NIGHT AND DAY TEMPERATURE GRADIENT

Diagrams demonstrate the air cooling during the day and the slab cooling during the night



## 2 STRUCTURE AND ENVELOPE

A lightweight grid-shell structure is coupled a double-membrane envelope to shade and insulates from direct sun radiation



## 4 PROTOTYPE DEVELOPMENT

Using hyperbolic geometry and mechanical joints, an operable prototype was developed. Below see its construction process



# COOLING OCULUS

A PROTOTYPE FOR PASSIVE COOLING IN THE DESERT  
Integrating evaporative and radiative cooling along a diurnal cycle

# EcoTechnoHub: UpCycling of an Obsolete Water Treatment Plant

DIEGO GARCIA-SETIEN

Arizona State University

SILVIA SANCHEZ

EcoTechnoHub is our proposal of a 3rd life for the Obsolete Water Treatment Plant in Miraflores de la Sierra (Madrid, Spain). Situated on an existing sheep route, it served as an infrastructure for the village of Miraflores, until a new plant was built downstream, when the site started its 2nd life as a nursery, and diverse private and public associations and communities have been using it since then for ecological education purposes (NGOs as ADEA, private Corporations, schools, neighbors). For its 3rd life, the site enhances its biodiversity and relates to the new Natural Park to which it belongs. As its new effective landmark, the Hub would benefit from the Park's visitor flow.

**Tank Full of Light:** By emptying the bacterial filter bed tank, unveiling and enabling the new usable spaces for local and global communities, the intervention would enhance and expand its activity. The underground tank would still be used as a cistern to store rain water for nursery's irrigation. Since 2/3 of its volume is subterranean, a new underground level and access is provided, enhancing its flexibility of usage and allowing a dual management of the spaces: ground level could relate to the nursery's daylight activities, and the lower level could be scheduled for other night activities such as exhibits and other events environmentally focused.

**Shelter:** Covered, although sunlit as an open-air space, the tank's new bright interior

features only an umbrella-like roof, a tensile structure with a ventilated double fabric membrane (featuring an image of a protected flower (Silene family)). It is an open-air Hall, where visitors can receive information about the New Natural Park and organize routes or promote collective events. The umbrella light-structure seizes an existing concrete infrastructure as its foundation and ballast, integrating within itself also organic matter (climbers) and non-organic composite materials, in order to condition this open-air, sunlit-covered public space for ecological education. The self-sufficient structure integrates Infrastructure, Landscape & Architecture, and performs sustainably, consuming as much energy as it generates, being the social and environmental surpluses its most important benefits.

**Ecosystem:** Ecological rehabilitation of this unused space not only saves energy and resources, but also reduces carbon footprint by extending its lifecycle and using efficient renewable energies, with a minimum maintenance (wind, solar and geothermal).

Avoiding demolition is an exemplary act of economy of means. In spite of being a public protected domain, financial support for the intervention might come out of a private-public initiative, seizing a new type of legal ecological compensation related to the laying of aerial power lines, over the sheep tracks. Public maintenance and management of the

Hub is guaranteed, even if activities are held by private or local entities.

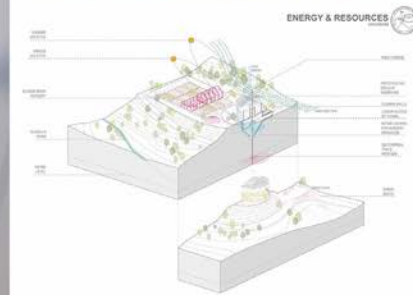
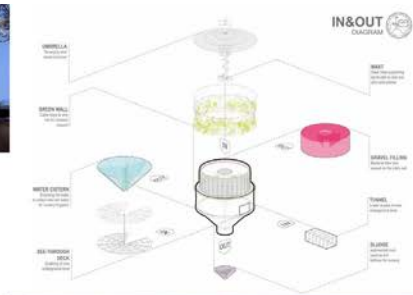
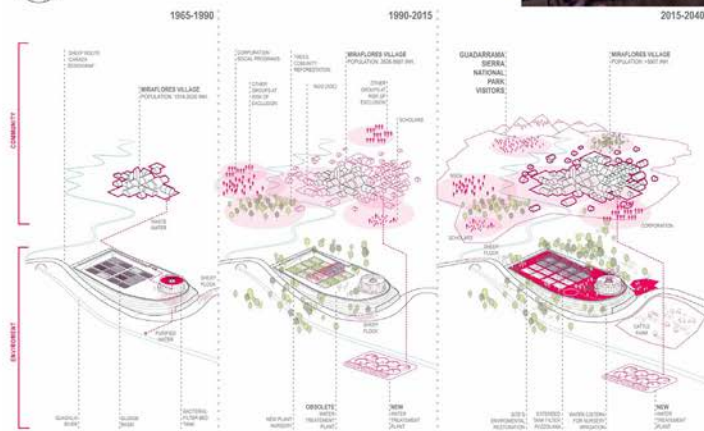
Conceiving Architecture as the support for living organic matter (climbers and the nursery) promotes biodiversity and enhances the site's ecosystem –just as it happened when transhumance was more popular- integrating human and non-human communities: neighbors and visitors, the sheep-track, the nursery or the Natural Park, promoting an ecological culture.

# ECO-TECHNO HUB

MIRAFLORES DE LA SIERRA MADRID SPAIN



**SITE TIME-LINE EVOLUTION**  
INCREASING SOCIAL EXCHANGE



EcoTechnoHub is a 3rd life for the Obsolete Water Treatment Plant in Miraflores, Madrid. Currently functioning as a supplying nursery for regional restoration programs, and used by private and public associations for ecological education, the intervention will enhance its activity after emptying the building after last year, unroofing and creating new usable spaces for the local and global community.

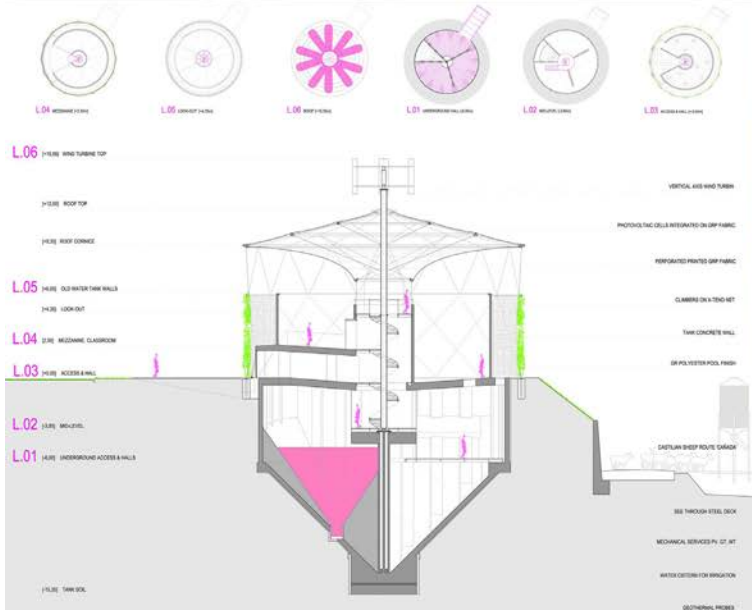
**Landscaping/Commitment.** First the Water Treatment Plant just served as an infrastructure for the Village. When a new Plant was built downstream, the site started a 2nd life as a Nursery, integrating Regional Restoration Programs with autonomous species. Chinese communities have been using it since then (MOG as ACESA, private Corporations, schools, neighbours). In its 3rd life the site enhances its biodiversity relating also to the Natural Park. As its new effective landscape, it will also benefit from intensive use. Since 2013 all its volume is water-treatment, a new underground level and access is provided, enhancing facility of use & allowing a dual management of the spaces: ground level can relate to Nursery design activities, lower level can be scheduled for evening uses such as individual events or environmental.

**Shelter.** Covered, although sunlit and open-air, the land's new bright interior features only an umbrella-like roof, a temporary structure with a ventilated double fabric membrane (printed geometric shapes, Stone fabric). It is an open-air hall, where visitors can receive information about the New Natural Park, organize routes or create a collective event.

**Lightness.** A new light umbrella tent-like structure serves as existing concrete infrastructure as its foundation and support, integrating within itself organic matter (plants) and composite materials, in order to consider an open-air, with covered public space for site education. The tent structure integrates Infrastructure, Landscape & Architecture, and performs sustainably, consuming as much energy as it generates, being social suitable to most important benefits.

**Sustainability/Ecology.** The existing infrastructure is situated on an existing sheep route. Ecological rehabilitation of its unused spaces not only saves energy and resources, but also reduces carbon footprint by extending its lifecycle and using efficient renewable energies (Wind, Solar & Geothermal) with a minimum maintenance. Consuming Architecture as the support for living organic matter (plants) & water storage for nursery irrigation, promotes biodiversity and enhances the site occupation as it transcends time, integrating former & non-human communities: neighbours, visitors, Sheep-ranch, Nursery and Natural Park, providing sustainable & ecological culture.

**Arriving destination** is an exemplary act of recovery of memory, in spite of being a public presence: domain, financial support for the intervention will come out of a private-public initiative, involving a new type of legal ecological compensation related to the loss of aerial power lines, over the sheep tracks. Public maintenance and management of the Hub is guaranteed, even if activities are held by private or local entities.





# faBRICK: temporary pavillion

MO ZELL

University of Wisconsin—Milwaukee

The traditional assumption is that masonry is permanent. Students in the UWM-SARUP Marcus Prize Studio, co-taught with Sou Fujimoto and Associate Professor Mo Zell, innovate new masonry construction assemblies that rethink brick as a lightweight and short-term material by exploring new options for the joint.

The faBRICK pavilion, a temporary installation, transforms an undeveloped lot into a public destination. An architectural installation, one form of temporary construction, is intended to be in place over a short period of time. As Sarah Bonnemaïson and Ronit Eisenbach state in *Installations by Architects*: “(a)n installation ... is temporary, that is, its demise is planned from the outset; its function turns away from utility in favor of criticism and reflection; and it foregrounds the content.” [Installations] also offer precious freedom to experiment.” (PAP, 2009, p 14.) Implicit in this observation is an acknowledgment that installations require a different set of construction parameters; that they require a critical stance, one that provides opportunities to not only solve problems, but also to create questions.

For obvious reasons, masonry is rarely deployed in these types of structures. Bricks weigh between 4 and 5 pounds (1.8 kg - 2.27 kg) depending on the core pattern, number of cores, and the aggregate material. The weight of brick assembly increases rapidly within a small area. For instance, a 4” masonry wall

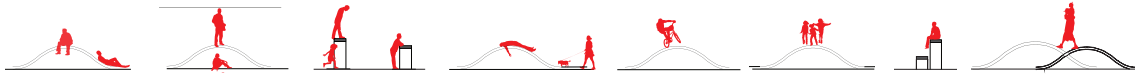
runs about 42 pounds per square foot while 2x4 Douglas Fir lumber runs about 1.28 pounds per foot. Due to this weight, formwork or other assemblies of construction are often needed to help hold brick structures in place during construction. A lot of material is also needed to create a substantial visual impact. However, the oversight of not experimenting with brick installations limits the nature and type of construction innovation needed for this material.

In conceiving a temporary public pavilion, the project pays homage to Milwaukee’s tradition of masonry construction. Through material explorations, this studio developed a novel method of linking bricks into billowing arches (no mortar), giving the traditionally heavy material a feeling of lightness and playfulness. These arches combine to form a rippling brick carpet that invites human interaction and exploration while critiquing the definition of pavilion. As a result, a hard material was transformed into something that appeared soft. The installation challenges the notion of a pavilion by changing the ways in which bodies exist in relationship to building - how we sit, stand, lean, move, interact and observe. Though the parts of the architecture are familiar - the brick and wood, it is the assembly of those parts that changes our expectations of the world around us.

The linking system provides a constantly changing texture—grass flows in, light

flows through, nature envelops. This transformed brick wall, harkening back to Thomas Jefferson’s garden walls at UVA, rotated 90 degrees horizontally, transforms heavy material into an open web of a rippling brick texture. The arches flow into and above the ground hovering in some areas, nested in others - the bricks seem to float.

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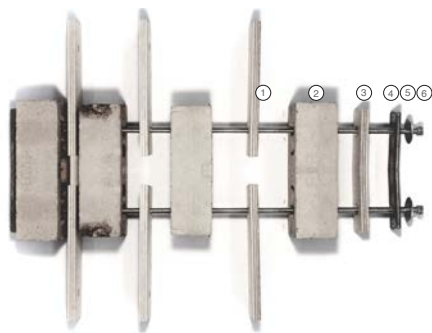
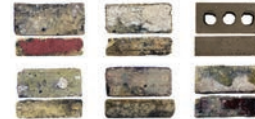
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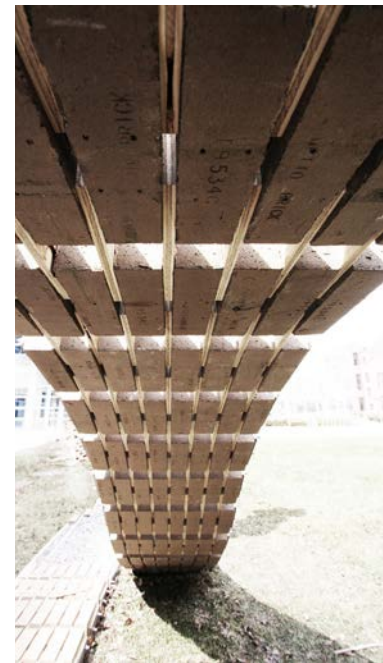
to stretch over distances. However, the oversight of not experimenting with brick installations limits the nature and type of construction innovation needed for this material.

In conceiving a temporary public pavilion, the project pays homage to BLANK's rich tradition of masonry construction. Through creative material explorations, this studio developed a novel method of linking bricks into billowing arches (no mortar), giving the traditionally heavy material a feeling of lightness and playfulness. These arches combine to form a rippling brick carpet that invites human interaction and exploration while critiquing the definition of pavilion. As a result, a hard material was transformed into something that appeared soft. The installation challenges the notion of a pavilion by changing the ways in which our bodies exist in relationship to building - how we sit, stand, lean, how we move, how we interact and observe. Though the parts of the architecture are familiar - the brick and wood, it is the assembly of those parts that changes our expectations of the world around us.

This pavilion connects nature and architecture. It puts the city towards nature at the back of the site and out to the lake. It anticipates over the summer a regeneration of nature. The porosity of the brick carpet allows nature to erupt through the gaps (in this case grass) and also allows light to dapple through to the ground. The linking system provides a constantly changing texture - grass flows in, light flows through, nature envelops. This transformed brick wall, harkening back to Thomas Jefferson's garden walls at UVA, rotated 90 degrees horizontally, transforms heavy material into an open web of a rippling brick texture. The arches flow into and above the ground hovering in some areas, nestled in others - the bricks seem to float.



- 1 - plywood gasket
- 2 - five-hole brick
- 3 - plywood cap
- 4 - steel cap
- 5 - neoprene washer
- 6 - steel nut



## uwm marcus prize studio with sou fujimoto

# Keswa

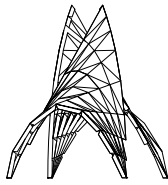
EMILY BAKER

Tulane University

The public installation *Keswa* toured the United Arab Emirates in the spring of 2015 as the winner of the Christo and Jeanne-Claude Award for public art. The student team was given a \$10,000 prize and \$5,000 to produce their winning design with the support of the Abu Dhabi Music and Arts Foundation and NYU Abu Dhabi. The resulting piece falls between the typology of the pavilion—favored vehicle for architectural experimentation—and a piece of public art, intended to elicit changed viewpoints and altered awareness. Developed by two Saudi architecture students at the American University of Sharjah (Salwa al Khudairi and Nada al Mulla, mentored by Emily Baker and Daniel Chavez), the piece recasts the abaya, or traditional black robe worn by Arab Gulf women in public space, as a self-structuring habitable space fashioned in laser-cut steel. The stretch and flow of fabric are captured in the bisected form. An iterative process of development through direct access to the means of fabrication allowed the team to develop a detailing language that is not only performative, but allusive, evoking the embellished stitching of the abaya, and creating patterns of light in the shaded interior of the piece. Two distinct perforation patterns were used—one along the folded structural ribs, and the other at mid-panel folds. The fold pattern along the ribs pushes out from the surface creating shadows on the steel face and voids that allow light into the interior, each recalling raised embroidery found both on abayas and on the keswa (or

kiswah), black fabric covering over the Ka’aba, or Muslim holy site at Mecca. The fold pattern at mid-panel recalls a simpler stitch pattern of offset parallel lines, functioning to ease stress on the steel during assembly, when pieces may be folded multiple times before set in final position. The piece was made to break down into twelve self-structuring panels, giving it rhythm and allowing easy break down and transport. *Keswa*’s structural capacity and detailing grow from an iterative design process with direct access to digital fabrication tools, enriching the capacity of advanced fabrication to engage both cultural content and performance simultaneously.





# KESWA

BY SALWA AL KHUDAIRI & NADA AL MULLA  
EMILY BAKER & DANIEL CHAVEZ - FACULTY MENTORS

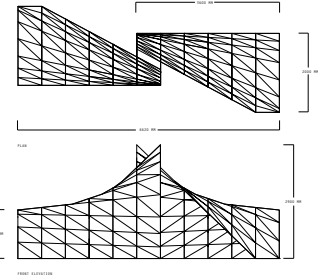
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2015 CHRISTO & JEANNE-CLAUDE AWARD  
FOR PUBLIC ART / ABU DHABI MUSIC & ARTS  
FOUNDATION / NYU ABU DHABI

*keswa* – Arabic: clothing or vesture, covering



The designers on site for installation.



Diagrammatic plan and elevation of *Keswa*.



*Keswa* installed on the campus of NYU Abu Dhabi.



Interior lit through pierced seams.



Fold marks on a steel prototype document adjustments for constructibility.



Students assemble the piece on campus at the American University of Sharjah.



The central arch spans a path through the center of the piece, and each end provides space to sit.



Two distinct perforation patterns along specific types of folds as well as call to mind the embellished stitching of the *abaya*.



*Keswa* installed in the desert at Qasr al Sarab in United Arab Emirates' empty quarter.

# Object Fields

## NEREA FELIZ

University of Texas at Austin

"A bedroom is a room in which there is a bed; a dining-room is a room in which there are a table and chairs, and often a side board; a sitting-room is a room in which there are arm-chairs and a couch..."(The apartment, Georges Perec)

"Despite its apparent innocence, furniture arrangement is an act of conquest in which space surrenders its playful adolescence..."

(After Space, Louis Weinthal)

Object Fields was a third year Undergraduate Design Studio with a focus on spatial organizations defined by the active role of objects. Rather than looking at objects as a the last layer to populate space, the studio embraced the agency latent in objects as generators of spatial configurations. With a particular emphasis on the documentation, production, and placement of objects in space, participants in the studio explored a series of proposals where content became container of space and traditional content-container relationships were blurred.

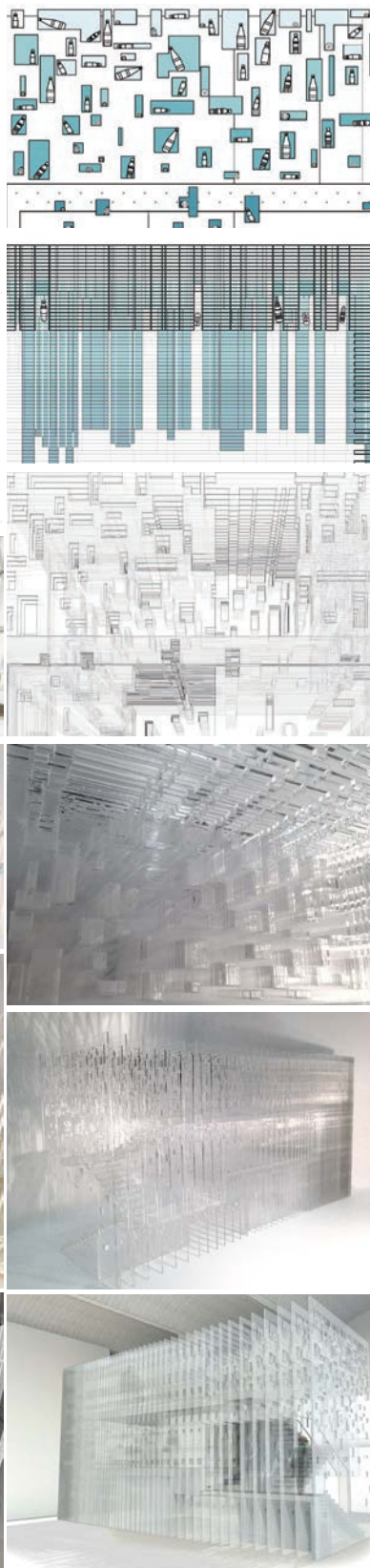
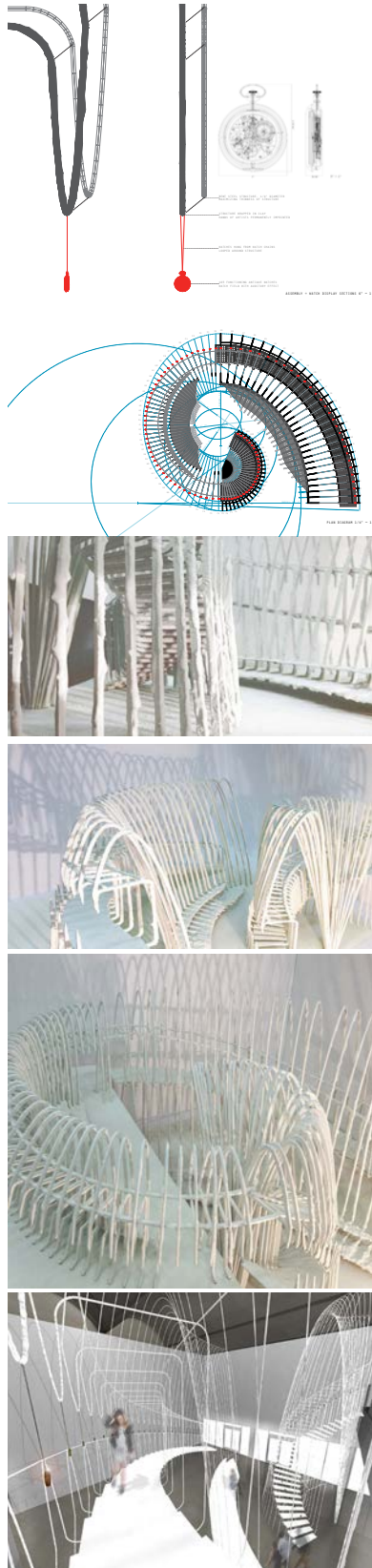
The final project was the design of an exhibition space for a collection of objects of the students choosing. Students negotiated the different scales of the object (closely associated with the body) the user and the room. The design of a display system turned into the design of a virtual scaffold of the room. The direct relationships between the objects, the

body, the display, and their impact on space, guided the design proposals in this studio.

Featured Student's work by Sheridan Treadwell, Erin D Hamilton and Ronnie William Marquez.



# Object Fields



**Nerea Feliz, Assistant Professor**  
School of Architecture, University of Texas at Austin

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Featured student's work:  
(From column left to right)  
Sheridan Treadwell  
Erin D Hamilton  
Ronnie William Marquez



# Rapturous South: A Retroactive Manifesto

BRIAN M. AMBROZIAK

University of Tennessee-Knoxville

GHOSTWRITER: Movie stars who have led adventure packed lives are often too ego-centric to discover patterns, too inarticulate to express intentions, too restless to record or remember events. Ghostwriters do it for them. In the same way I was Manhattan's ghostwriter.

From DELIRIOUS NEW YORK: A Retroactive Manifesto for Manhattan

Rem Koolhaas, 1978

RAPTUROUS SOUTH: A RETROACTIVE MANIFESTO (or how eating pork rinds can be a complex social experience) embraces the region of the South as a vibrant cultural and historical artifact, one that possesses a valuable FUTURE TENSE. The design studio scoured the South looking for dead bodies and searching for any evidence that could yield a new cultural theory.

The stories told in the nine unique investigations began with the bone pine porches of James Agee, the rabbit traps of Cormac McCarthy, and Mark Twain's midnight trips along the Mississippi. These propositions evolved into a series of spatial constructs that portrayed the South and its many unique faces from a new vantage point. With each stance a presupposed history was challenged that either reinforced or distanced the design student from their inherent biases of place as defined by personal experience. The new stories told became forgeries in the purest

sense of the word. Engaging Dali's Paranoid Critical Method (PCM) as described by Rem Koolhaas in his seminal work *Delirious New York: A Retroactive Manifesto for Manhattan* (1978), students engaged a process of conceptual recycling, one that promised to recharge the worn consumed contents of the world. Working within Ernst's plane of non-agreement, the studio's process of design embraced methods that privileged inversion and accident.

The unique proposals generated by students over the course of the semester covered a wide range of topics that positioned themselves outside mere quantitative forms of traditional site analysis. They embraced the sounds of locusts, the smell of chicken, whispers, the personalities of place, as well as its various characters. This search for a kind of hyper-reality, one that looks so closely that it seems as if one is on the verge of insanity exposed the true potential of designer as ghostwriter.

In the introduction to *Concerning Architecture* by David Greene (1999), he writes, "If we consider for a moment Christo's seminal work – the 'wrapped cliff' – we might see it in one of two ways: as a wrapped cliff or; preferably, as the point at which all other cliffs are unwrapped." The true success of this research studio lays in its ability to wrap the cliffs and scrape, stretch, consume, and subvert the stereotypical image of the South in search of its alter ego. In so doing, a series of themes ripe

for discussion and speculation with regard to the future of architecture and its multivalent soul are exposed.



# rapturous south: a retroactive manifesto ... or how eating pork rinds can be a complex social experience

university of tennessee | arc 496, advanced architectural design | professor brian ambrozk

GHOSTWRITER: More stories than have had adventure poked into are often lost questions to discover patterns, but inordinate to repeat intentions, but not to record or remember create. Ghostwriters do it for them. In the same way I was Manhattan's ghostwriter.

from DELEUZE'S NEW YORK: A Retroactive Manifesto for Manhattan  
Ren Kofman, 1978

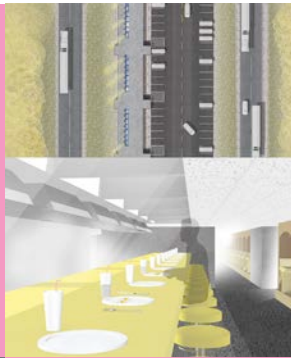
RAPTUROUS SOUTH: A RETROACTIVE MANIFESTO for how eating pork rinds can be a complex social experience. The region of the South as a vibrant cultural and historical artifact, one that possesses a valuable FUTURE TENSE. The design studio around the South looking for dead bodies and searching for any evidence that could yield a new cultural theory.

The stories told in the nine unique investigations began with the bone pine porches of James Agee, the rabbit traps of Cormac McCarthy, and Mark Twain's midnight trips along the Mississippi. These propositions evolved into a series of spatial constructs that portrayed the South and its many unique faces from a new vantage point. With each stance a prepositional history was challenged that either reinforced or distanced the design incident from their inherent biases of place as defined by personal experience. The new stories told became legacies in the purest sense of the word. Enig-

ing Daily Personal Critical Method (PCM) as described by Ren Kofman in his seminal work *Johnson, New York: A Retroactive Manifesto for Manhattan* (1978), students engaged a process of conceptual recycling, one that promised to recharge the worn animal context of the world. Working within Erwin's place of non-agreement, the studio process of design embodied methods that privileged invention and accident.

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## pitstop confessional [cayce davis]

The Pitstop Confessional (WAFFLE HOUSE reVINTED) is a continuum surface where year-long highway pilgrimages come to a temporary end. Under a dusky sky, exit ramps capture the weary, fatigued into communion and supple rubber leads scraps of praise. Soft asphalt, the adjust-able, vent belt, and a truck wheel turntable preface the wisdom of the mirror. Purification is achieved through crossing the hallowed abyss of the trap. Neon signs, moving headlights and the luminance of eternity gaze upon the confessional. Over easy conversation and easy food, conversations, group traversals partake together and reconcile themselves to each other. Race, beliefs and laughing faces under the stars of epic center. This is a social experiment. They enter as individuals and leave as more.

(01) play and play pitstop provides a highly repetitive and colorful landscape  
(02) 17', 10.3' to the other



## BAZAAR [kelsey julian]

Before the invention of the cotton gin, these things were done by hand. Cotton fibers were stretched and spun using a distaff and spindle, transforming staples to workable yarn. You can't have the word spindle without the sound of cranking, the image of a slender neck resting on a screen porch, and round axles struggling to fight the humidity.

These bolts of cloth belong to the South. Cotton requires the sandy loam and full sun of business zones 9a through 11. They need cicadas at dusk and the purr of diesel tractors, heads bowed. They need a congregation of pickers, bales, and gin.

Swaths of cotton stretch together space under a permeable canopy. This fabric, infected the interstitial zones left by necessary infrastructure, creating space that wants to be occupied. That you want to rest within. Spreading into the landscape, these mechanical bolts diffuse light onto the stalls below. Vendors advertise cargo with loud voices and intricate patterns. Smells of drying herbs and ground spices orbit concrete retaining basins, tracing the path of the buyer. Sifting through fabric displays is the sound of metal bearings, sliding against aluminum tracks. The bazaar marks views of the fields, the chatter of transactions, smells of cooking sausage, sticky-sweet jelly, dappled yellow stained glass reflections, midges, crickets, and secure stitched flower bouquets.

(01) distaff station marks the point of exchange, stitched into existing infrastructure  
(02) cotton through market for pattern modules



## hotel persona [clifton sullivan]

A resounding ring of a brass bell echoes through the hotel lobby as faintly dressed gentlemen in black tailored suits carrying leather briefcases rush in and out. A plush red carpet runs from the hotel entrance to the front desk and continues up the grandiose staircase allowing the traveler to arrive but not her destination. Whorling, conical pither pillars become a host as guests make their way up the stairs to their rooms. The light of an ornate, elaborate crystal chandelier hanging in the center of the lobby creates a dancing array of colors that catches the weary traveler's eye and provides a sense of the elegant comfort offered within the confines of the hotel. The hotel patron occasionally sense shifts of smells from the kitchen of food being prepared for the premium workers who enter and exit through the back to eat in a remote dining hall. Ornate room keys, placed on the back wall, are functional but look as if they are on display. Travelers, when leaving this place, feel an unsettling emotion as if they were not merely visiting but leaving a place of rest and tranquility. As they drive away the car seems to move and the place appears to become a part of the mountains that surround it. Reality begins to set in as the traveler ends his journey and returns home.

(01) George J. Borjas offers a study in choreographed space



## crophouse [dillon canfield]

This project is about our relationship with the land. As our media and technology advances, a gulf between the productive landscape and us deepens. Crophouse questions what re-educating the public about agriculture and landscapes could look like in the face of our modern world.

A Crophouse holds the line between home and equipment, it's a house that has been multiplied and shrunk down along tracks to maintain the land. Traditional boundaries of interior and exterior are augmented by machinery that moves, deploys, and shifts depending on the house's relationship with its surroundings. The physical rig of cultivation has been supplemented with technology, but the awareness necessary to operate the equipment, house is still present. As occupants navigate the terraces, house density oscillates from urban to rural, while surroundings also shift between dense orchards and open plains. Through this slow movement and exposure to the environment, it is hoped that we will remember what it means to be in the land.

(01) integration, interior view of crophouse  
(02) central back configuration of crophouse prior to deployment



## natron [ryan ballek]

Since the time of creation, man has harvested the earth for his needs to sustain life. The relationship between man and the environment is one of dependence. The ways in which people have harvested the earth have varied over time and place. It is solely up to the harvester to keep a watchful mind over his use of the land. Thoughtful harvesting of the earth must provide a subsidiary amount of resources to promote life without earth's destruction. The loss of this concept can lead to a path of destruction. The Southern United States have been identified as the primary region for harvesting resources since the nineteenth century. What started as a way to provide a subsidiary amount of resources to sustain life ultimately transformed Southern plantations into profitable for harvesting on a mass scale. These slowly evolved over time into Southern resource harvesting companies. The power drives motives of these harvesters has got too worse over time which has led a detrimental effect on the Southern environment. Through the implementation of controlled environments and phytoremediation the South can return as a region known for its balanced harvesting of resources.

(01) stage of remediation, interior of the first remediation dome  
(02) stage of remediation and regeneration



## BLUE 42 [nate ryman]

Once existed a small town spread thin by parking lots and manicured lawns, isolated from one another, the town's social dynamic was broken apart by walls of pristine white picket fences. The town's people relied upon Friday nights to engage in acts of consumption. Pride, aggression, love, and inequality were all negative aspects of the tradition to be used with good intentions as ingredients towards the creation of a new culture.

The following study catalogs the steps necessary to create an oasis of pride and desires contained within a matrix of socially isolated communities. The stadium stands, as an icon for the release of human nature, amidst a society restrained by suffocating political correctness. Renovations occur around a small town's old sports complex. Driven by pride, the renovations grow at an alarming rate. Desires to live by the field, to smell the grass, to wake up beside the site of fond memories facilitates a large tower adjacent to the center. Soon a wall of shops and infrastructure the sacred center. The wall grows exponentially, cutting off the school from the town. The youth become separate from the new congregation, the producers separate from the consumers.

This architecture is a silent machine of light and shadow, the life inside is a frenzied cycle of production and consumption of memory facilitated by controlled instances of love and aggression beneath burning halogen lights.

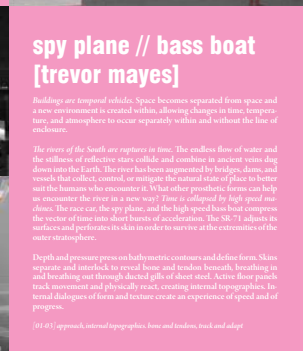
(01) final alterations



## forced inadequacy [jes-sica porter]

Johnny Cash credits his style of country music to the inadequacy of his musicians' skills. The singularity of the Johnny Cash style is literally because the guitarist couldn't play certain chords accurately so he just did the best he could playing. This consistency of inadequacy made these famous. There are two primary inadequacies on this site. The first is the nature of the site and the second is the nature of the design. No design would ever be good enough. The second is the open landscape. The green space needs an authentic design to overcome the inadequacy of emptiness. The combination of the two inadequacies needs to be designed. The degree of permanence becomes important to both locations. The attachment of a design to both locations at alternating times of the year is one solution to both inadequacies.

(01) under house elevation as viewed from the amphitheater



## the hike [jake heaton]

The majority of people visiting the mountains hardly leave their vehicles. The Great Smoky Mountain National Park provides a comfortable option of being able to experience nature through the warm embrace of a car seat as the windows become their television. As said but understandable phenomenon occurs here rather frequently as tourists with various desires, drawn by the natural park, but for a peek of the local fauna. The terrain road becomes an assembly line for the justification of leaving the hotel room. Each spectator salivates to snap a picture, if not for the thoughts of warm foot long corngods.

Gnatomy takes refuge in the slow moving crowd paced by the struggling anticipation of animals reaching a power source. The car is a part of the car's large screen about the for mountain and the Drive Stampede in every direction. A lot of shops and events becomes a short story as at various times collapse and only the brightest colored info are read.

The hike becomes an inclusive Gnatomy experience. It contains the full truck of candy, liquor, and corned attractions while simultaneously bringing nature to downtown.

(01) a road in the vertical landscape



## spy plane // bass boat [trevor mayes]

Buildings are temporal objects. Space becomes separated from space and a new environment is created within, allowing changes in time, temperature, and atmosphere to occur separately within and without the time of nature.

The rivers of the South are rapturous in time. The endless flow of water and the surface of reflective stars collide and combine in ancient veins dug down into the Earth. The river has been augmented by bridges, dams, and weirs that collect, control, or mitigate the natural state of place to better suit the humans who encounter it. What other prosaic forms can help us encounter the river in a new way? Time is collapsed by high speed movement. The race on the spy plane, and the high speed bass boat compress the vector of time into short bursts of acceleration. The SR-71 adjusts its surface and perforates its skin in order to survive at the extremes of the outer stratosphere.

Depth and pressure press on bathymetric contours and define form. Skins separate and interlock to reveal bone and tendon beneath, breathing in and breathing out through direct glow of their steel. Active down track movement and physically race, creating internal topographies. Internal dialogues of form and texture create an experience of speed and of progress.

(01) Approach, internal topographies, bone and tendon, track and depth

# Responsive Facades\_ Solar Petal Field

**DALE CLIFFORD**

California Polytechnic State University

Solar Petals is a project that bridges photovoltaic energy harvesting, sensing technologies, programming and shape memory alloy actuation.

## **INTENT**

Develop an energy neutral façade component that is responsive to light.

Beginning with study of the thermally triggered motion of the tulip petal, Solar Petals became a study in emerging material technologies that has been realized through collaboration between an interdisciplinary team of architects, artists, computer scientists and electrical engineers. As the tulip, opens and closes in response to heat, the petals are activated by shape memory alloys - a temperature activated actuator - that contract 6% of their length when charged by energy collected by photovoltaic cells.

## **ENVIRONMENTAL DATA**

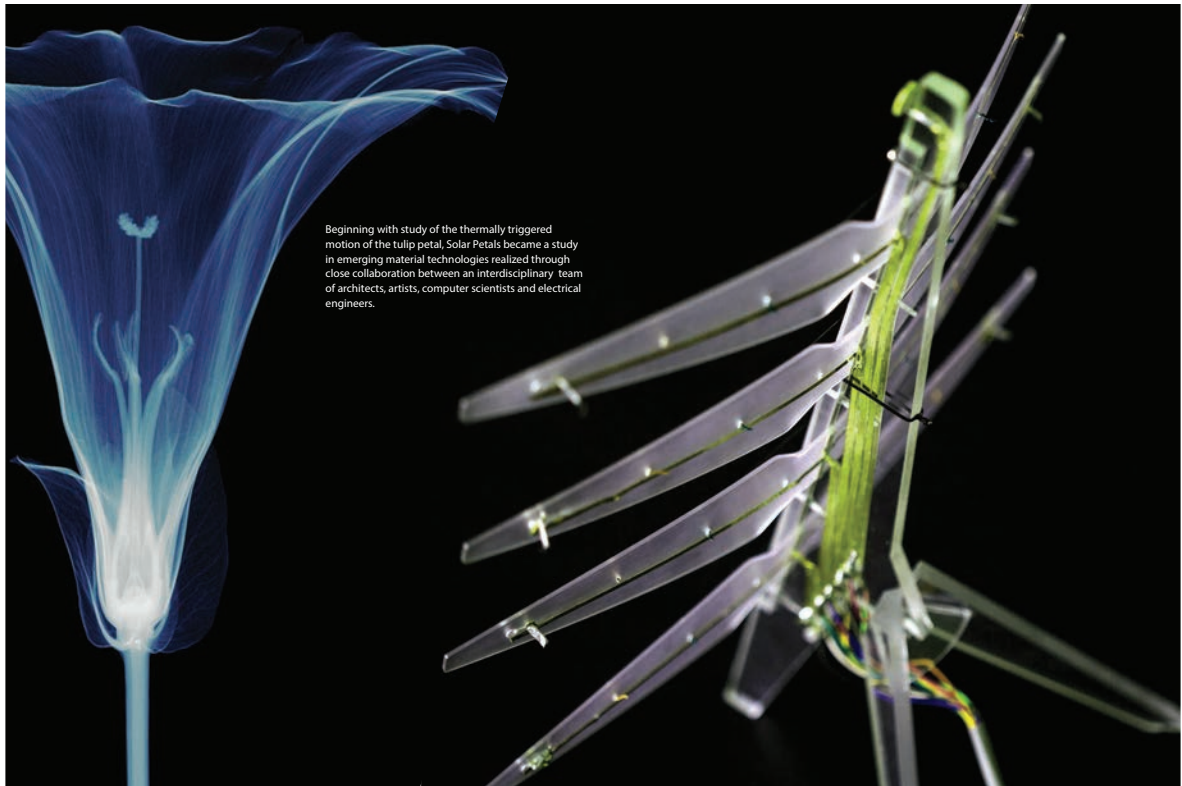
The petal array is designed to sense changes in sunlight levels and translate this phenomena to coded electrical signals that activate the petal field. Petals become more active with increasing solar intensity, imparting an awareness of subtle environmental fluctuation to building occupants. We view this technology as a step in making architecture more adaptive and responsive to environmental change.

## **BIO\_LOGIC MISSION**

To better understand the porous boundaries between living and non-living systems we look

to nature as a model network of interactive systems that produce no waste; observe that animals and plants have evolved a large variety of reliable and relatively simple mechanisms to adapt to environmental fluctuation; understand that the inherent complexity of biological mechanisms is an emergent property based on simple rule sets. Specifically we develop responsive building technologies that operate in accordance with the biologic condition of homeostasis – the ability for an organism to maintain equilibrium in response to fluctuating environmental conditions.

[biologicarchitecture.com](http://biologicarchitecture.com)



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bio\_logic

design group at Cal Poly, SLO

## RESPONSIVE BUILDING TECHNOLOGY: RESPONSIVE LUMINOSITY – SOLAR PETALS

RESPONSIVE BUILDING TECHNOLOGY:  
ADVANCING ARCHITECTURAL HOMEOSTASIS THROUGH  
OBSERVATIONS OF BIOLOGICAL ADAPTATIONS.

bio\_logic

Design Team  
Dale Clifford (PI)  
Jacob Douanias  
Zach Jacobson-Waever  
Jake Marsico



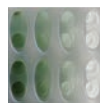
Artificial Bone



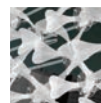
Cactus Tiles



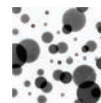
Phase Change Materials



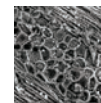
Acoustic Blocks



Responsive Shading



Polarized Filters



Micrographs



Water Walls



# Thermally Responsive Materials

**DALE CLIFFORD**

California Polytechnic State University

**JEFF PONITZ**

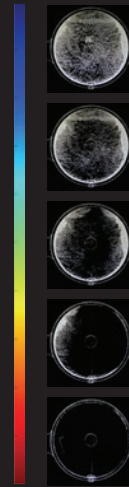
California Polytechnic State University

Presented are a series of design experiments that demonstrate the potential to make architecture more responsive to local temperature variation. Design examples are given of recent work with an emerging class of organic phase change materials (PCMs). PCMs are substances with a high heat of fusion and are capable of storing and releasing large amounts of latent heat. Two novel temperature stabilization devices are presented that address the problem of low thermal conductivity of organic PCMs and render the material more effective at thermal transfer. Each is designed to visually convey their operation and modulate temperature swings in interior environments. The devices are stand-alone systems for retrofit scenarios or for new construction. Implicit in each project is the visual demonstration of thermodynamic material properties that can make buildings more communicative of their operation and to building occupants. The application presented is a collaborative effort between architects, materials consultants, and engineers to help meet the energy goal of the Living Building Challenge for the Frick Environmental Center in Pittsburgh, PA.

Broader questions are raised concerning the reinvention of our relationship with the natural world through the filter of architecture, materials and technology. The project speculates on the visual properties of responsive architectural systems and the ability of visualization to influence human behavior in response to awareness of local environmental change and energy usage.

Keywords: Phase Change Materials, Responsive Architecture, Thermal Transfer

The work is situated within an environmental center and designed to artfully engage children, inspire wonder, and get them to ask questions about the sustainable technology. On a personal scale, the thermal tiles are designed to be touched, the tiles register, and hold, the heat of the hand.



bio\_logic

design group at CalPoly, SLO  
biologicarchitecture.com

## Responsive Thermal Tiles

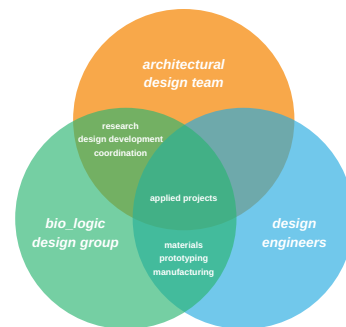
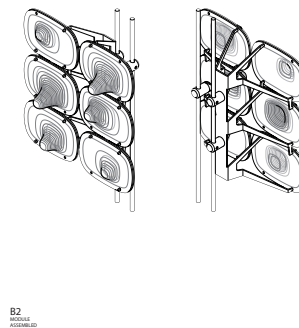
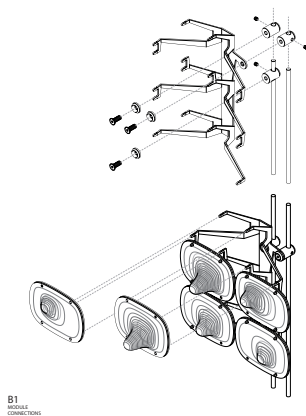
Faculty Advisors

Dale Clifford and Jeff Ponitz

Our team introduced phase change materials (PCMs) to help meet the Living Building Challenge for the Frick Park Environmental Center in Pittsburgh, PA by Bohlin Cywinski Jackson. Our innovation is the design and engineering of a thermal battery system that lowers reliance on mechanical conditioning and provides a visual translation of thermal cycles to building occupants. By packaging PCM in thin transparent containers the Thermal Tiles optimize heat transfer between the material and the surrounding environment. As important, our work is situated within an environmental center and designed to artfully engage children, inspire wonder, and get them to ask questions about the sustainable technology. On a personal scale, the thermal tiles are designed to be touched, the tiles register, and hold the heat of the hand. On the building scale, the tiles absorb solar energy during the day and release it in the evening.

The intent of the project is to visually augment our 'tactile' mode of thermal sensing and reopen pathways between people and the environment through heightened awareness of variation. The Thermal Tiles express naturally occurring material properties that contribute to lowering building energy consumption and occupant behavior. We've found that phase change materials exhibit crystalline patterns are similar to those found in snowflakes.

Most recent iterations were designed and fabricated by faculty and students of architecture at Cal Poly, San Luis Obispo





# Materials and Media Investigations



# Agency of Materials

**DANIEL M. BAERLECKEN**

Georgia Institute of Technology

**KATHERINE WRIGHT**

Georgia Institute of Technology

**NORA MUELLER**

RWTH Aachen University

**JUDITH REITZ**

DESIGNDEVELOPBUILD

**BERNADETTE HEIERMANN**

RWTH Aachen University

Following the idea to integrate real-world design and construction experience with service learning in a collaborative environment three international universities have joined collaboration to self-build a multifunctional theatre in a township in Cape Town in South Africa.

Starting from the first design the students of the Peter Behrens School of Arts (Düsseldorf), the Georgia Institute of Technology (Atlanta) and the RWTH Aachen University (Aachen) have developed within three years sketches and concept models to detailed design plans and the realized project.

The students experienced in the process all phases of a building project. Apart from detail design and calculating quantities, scheduling, financing and cost control were also part of the task. Next to the unique building process and cultural impact on the township the project aimed to rethink South African vernacular materials and the reuse of existing materials for building.

While building the local community was encouraged to join workshops on clay and earthwork. The participative workshops were

a catalyst to open the local community to re-learn the old African vernacular techniques and to open a discussion to integrate new technologies.

90 % of the theatre is recycled or donated material found in the area around the township, just the structural system as well as the roof are contemporary new materials, was acquired in the local industry.

The project focuses on combining research about re-used or recycled waste materials with traditional earth construction methods as a neo-vernacular low cost construction method in developing countries. The Guga S' Thebe theater serves as pilot project for the research strategy.

The multi-functional theater is constructed from a system of loosely stacked sea freight containers surrounding a central theater space. The container's structural performance is maximized by minimal modifications, advocating an honest use versus a highly engineered condition, which tends to introduce a high amount of additional, hidden structure in support of a purely aesthetic vision. The containers incorporate spaces such as backstage

areas, a soup kitchen, a recording studio, an exterior stage and other educational and music training facilities. In order to improve the interior climate, the paneling system uses a straw and clay construction as the thermal skin of the theater. The straw-clay panels are covered with recycled local wood from fruit crates. The facade adapts a vernacular South African textile.

The re-use of materials in Africa often holds connotations of poverty. Especially building with earth and clay is the typical rural building strategy. Combining the recycled/ re-used materials with smart energy concepts, as well as the sustainable earth constructions is a solution to create an affordable, highly ornamented building.

Within the township the combination of ornament - using recycled or re-used waste materials - with a new typology of shipping containers as poche, has changed the societal acceptance of 'dirty', poor materials as earth and straw.



1.

## AGENCY OF MATERIALS

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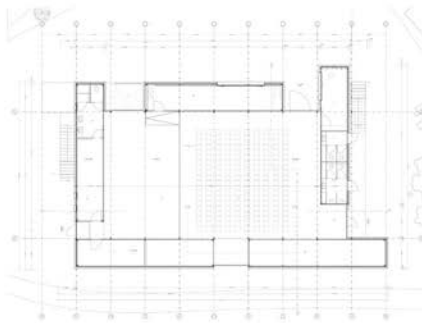
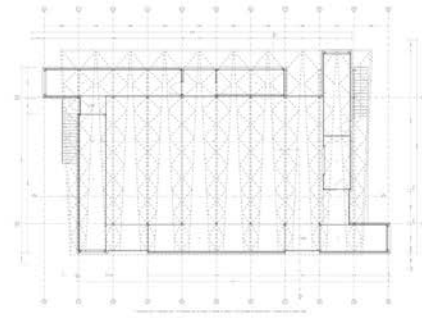
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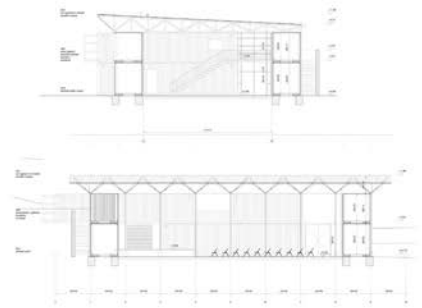
1. fruit crates as cladding material
2. mud and straw panels as insulation
3. shipping containers as poché



2.



3.



# Choreographing a Logic of Assembly

KRISTOPHER PALAGI

Louisiana State University

Choreographing a Logic of Assembly: An investigation of tensile formwork for in situ Concrete casting.

Targeting the excessive economic costs and loss of embodied energy in traditional and digitally fabricated in situ concrete formwork, this poster presents a series of material studies investigating the weaving of an adaptive cable network into tensile formwork. Inspired by Frei Otto's cable net structures, the fabric formwork studies by Mark West at CAST, and the soft use of digital fabrication by William Massie, this work aims to engage site responsive design strategies by creating an assembly system that embraces the complexity and variation possible when casting concrete. Through a series of phases, these objectives are accomplished by developing a logic of assembly, testing the assembly for limitations through parametric and physical modeling, analyzing the resulting form, and then comparing the results with other methods of assembly.

## PHASE 1: SWELLING

The initial stage distinguishes the variables in the formwork that control the overall gestural form from those that incite variation through the funicular swelling during the casting process. These explorations began with a series of plaster then concrete casts. With consistent

use of a casting materials and textiles, the number and location of control points defined the potential fidelity of the cast, while the amount of pre-tensioning and staging of lifts became key in facilitating swelling.

## PHASE 2: LOGIC OF ASSEMBLY

While the first investigations relied on tension directly on the textile, this second phase aims to develop a scalable cable net system. Loose primary lines gesturing the intended form are bound taunt to their context (a steel frame) by a secondary system. Repetition, rhythm, and transition are refined within this second supporting layer. A tertiary netting weaves between the primary and secondary systems as an open definition of the fabric formwork to come. During the pour, the textile panels are allowed to swell against and distend beyond the tertiary netting.

## PHASE 3: EMBEDDED SYSTEMS

Intrigued by Kiel Moe's reflections on the complex vs. the complicated, the cable net system is refined to address structural and thermal relevance. Here are specific opportunities:

Structure: By substituting and composing the established network connection types, a building roadmap choreographs the structural systems and articulates the future framing logic.

Thermal Gain: By adjusting the pre-tension level in the secondary system, the severity of the swell can be manipulated to best utilize surface exposure for thermal gain.

Thermal resistance: By reversing the intended use of Sonotubes, an encapsulated negative space is cast, thus improving thermal resistance.

Radiant heat: By strategically placing radiant heat systems in the cast, the variable thickness allows for maximum influence.





## Choreographing a Logic of Assembly: An investigation of tensile formwork for in situ Concrete casting.

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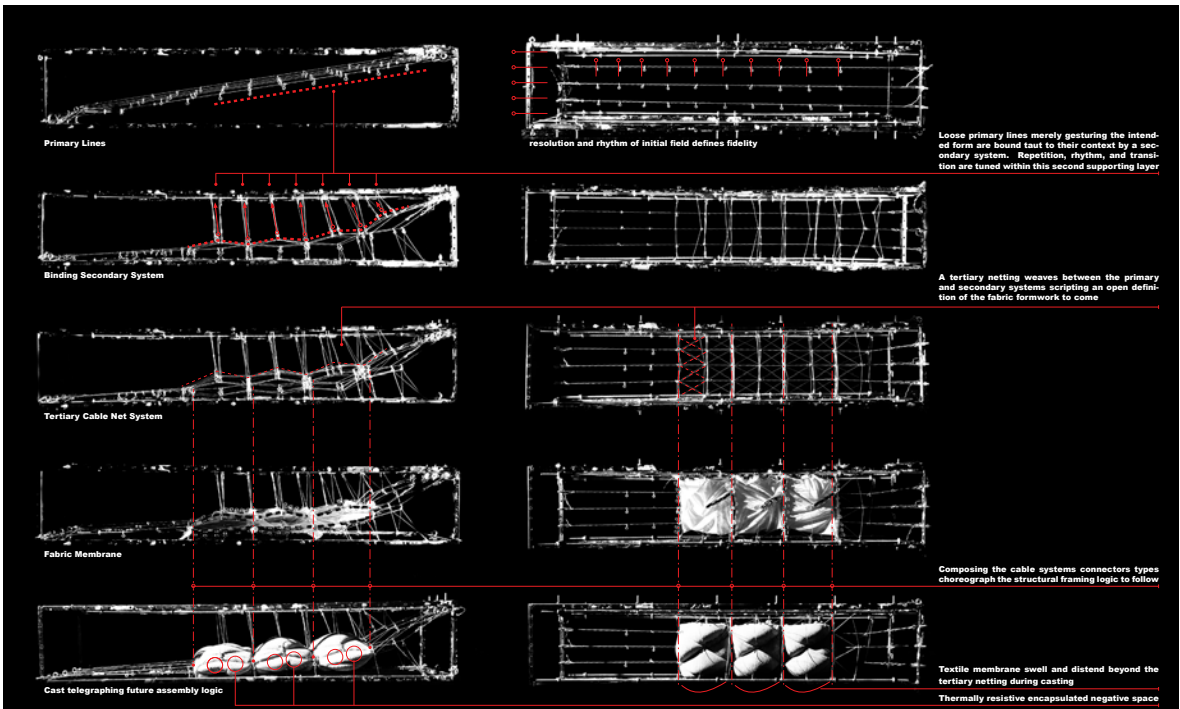
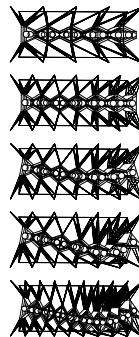
Intrigued by Kiel Moes' reflections on the complex vs. the complicated, the cable net system is refined to address structural and thermal relevance. Specific opportunities:

Structure: By substituting and composing the established network connection types, a building roadmap choreographs the structural systems and articulates the future framing logic.

Thermal Gain: By adjusting the pre-tension level in the secondary system, the severity of the swell can be manipulated to best utilize surface exposure for thermal gain.

Thermal resistance: By reversing the intended use of Sonotubes, an encapsulated negative space is cast, thus improving thermal resistance.

Radiant heat: By strategically placing radiant heat systems in the cast, the variable thickness allows for maximum influence.



### Phase 1: Swelling

The initial stage distinguishes the variables in the formwork that control the overall gestural form from those that incite variation through the funicular swelling during the casting process. The explorations began with a series of plaster and concrete casts. With consistent use of a casting material (concrete) and textile (PET filter fabric), the number and location of control points defined the scope of the cast, while the amount of pretensioning and staging of lifts were key in facilitating swells.



### Phase 2: Logic of Assembly

While the first investigations relied on tension directly on the textile, this second phase aims to develop a scalable cable net system. Loose primary lines merely gesturing the intended form, are bound taut to their context (a steel frame) by a secondary system. Repetition, rhythm, and transition are refined within this second supporting layer. A tertiary netting weaves between the primary and secondary systems as an open definition of the fabric formwork to come. During the pour, the textile panels are allowed to swell against and distend beyond the tertiary netting.





# Glass House

**JIN YOUNG SONG**

University at Buffalo, SUNY

**PAUL BATTAGLIA**

University at Buffalo, SUNY

Our research is concerned with the potential use of glass in spaces for music in order to reframe the function of Music Halls as a Public Event in fluid interaction with the City, while not losing the quality of sound.

## **EVENT, PERFORMANCE AND INTERACTION IN THE CITY**

Designing a space for musical performance has always focused on the engineering of sound quality. Modern knowledge about reflections, absorption and reverberation has been applied to panels for reflection, various geometric forms and use of absorptive materials. However, the new technologies of recorded performance and electronic sound reinforcement with speakers have developed dramatically such that excellent quality of music can be achieved without sitting in front of an orchestra. We no longer attend performances for the best musical quality; it is an event for diverse people and heterogeneous desire. Therefore, the engineering-oriented auditorium design outlined by thick, opaque walls must be changed toward the event space, and toward true performance and interaction with the city.

## **GLASS AUDITORIUM**

In this mission, the research focuses on the Glass House, a transparent music center where pedestrians can see the performances from the street. Audiences inside viewing the stage also possess a view of the city as a background for the concert – the city as the second stage. In order to maximize the glass exposure

in the music hall without compromising the acoustic quality, parametric modeling with fragmented glass panels has been explored.

## **FRAGMENTED GLASS PANELS FOR SOUND ENGINEERING**

The Glass panels are designed to efficiently distribute the sound to every seat in the audience. The fragmented glass wall is inspired by a herringbone pattern to control the angle of reflections which also allows controlled penetration and absorption through the reveals between panels. This special house of music will provide very unique, crisp and accurate delivery of music.

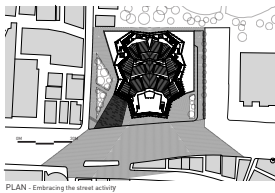


## Glass House

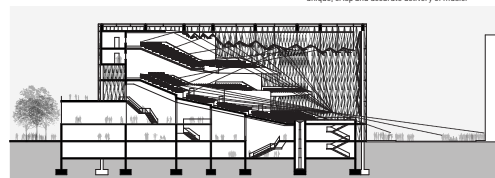
**Event, Performance and Interaction in the city**  
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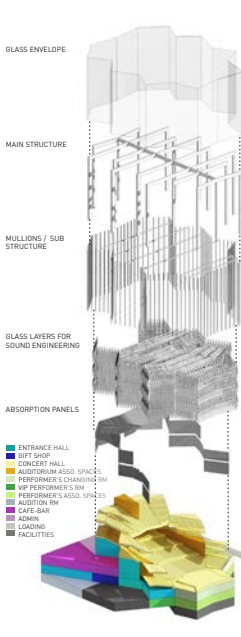
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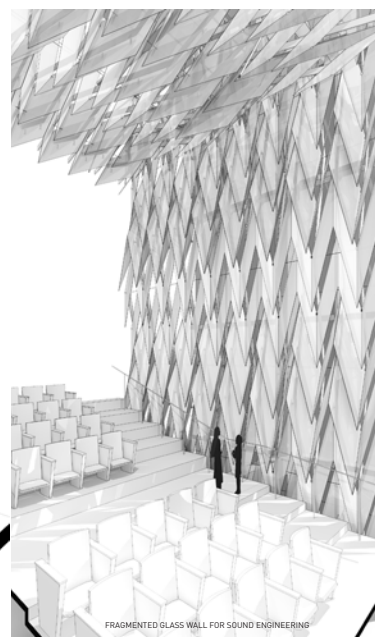
PLAN - Embracing the street activity



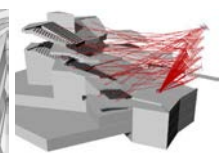
SECTION - Ceiling glass panels can be installed to efficiently reflect the sound



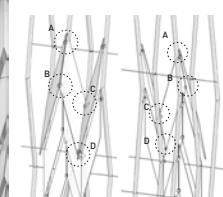
WALL SECTION



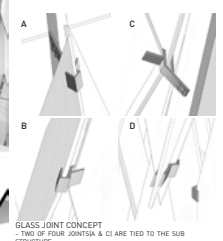
FRAGMENTED GLASS WALL FOR SOUND ENGINEERING



SOUND REFLECTION MODELING



GLASS WALL FABRICATION CONCEPT  
- ALL GLASS PANELS ARE IDENTICAL  
- METAL FRAMING ARE TIED BY STL CABLE



GLASS JOINT CONCEPT  
- TWO OF FOUR JOINTS (A & C) ARE TIED TO THE SUB-STRUCTURE

# Medusa, Making Ways and Ways of Making

OLIVIER OTTEVAERE

The University of Hong Kong

Medusa is a full scale built prototype for an umbrella structure, providing shade for public use.

Three interlocking concrete legs describe a central void and articulate a continuous transition from column to slab; an alteration of a mushroom column archetype.

The prototype reinterprets Felix Candela's umbrella projects with radically different formwork methods, responses to material properties and construction procedures.

The fabrication of the project explores means of conceiving concrete formworks that are more responsive and adaptive to the casting process by exploiting the short lived gap between liquid to solid. In doing so, the formwork is constructed from a range of materials, hard and soft, all accomplices in interacting with gravity loads, pressure and water seeping.

On making ways: With a group of architecture students, we took residency in a large precast factory in the Pearl River Delta, a region of China often labeled 'the factory of the world'. There, for three weeks we lived and worked with factory workers, learnt from their various trades and fully experienced how such a plant, geared towards mass production of precast elements, operates professionally but also socially. By meeting half-way in the realization of the prototype, productive working relationships were forged between students

and factory workers, at each stage of the process.

On ways of making: The temporary formwork was constructed upside down to make full use of gravity. After curing, the concrete prototype was flipped in its intended position. The main intention for the project was to influence the process of architectural design in reverse; that is by synthesizing an architectural proposal from the findings emerging out of a succession of built experiments. Throughout a trial and error process, geometry is employed as regulator of a short lived liquid mass in space and not as form making. During the casting process, geometry orchestrated the different interactive roles, given to each elements of the formwork, until a solid formation was finally reached.



# MEDUSA



## MAKING WAYS AND WAYS OF MAKING

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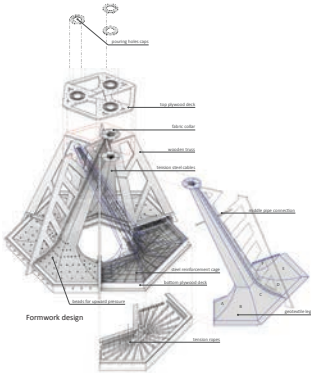
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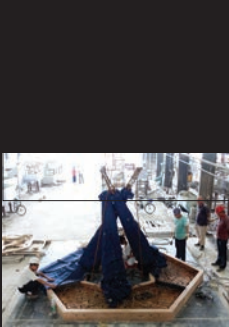
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### 1. LEVELLING AND DECKING



### 2. REINFORCING



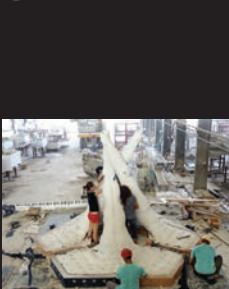
### 3. FABRIC FORMING



### 4. PROPPING AND TENSIONING



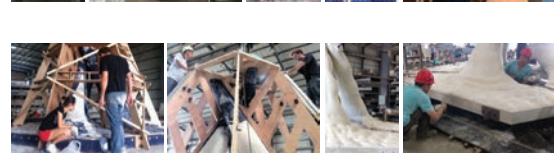
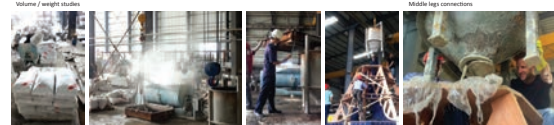
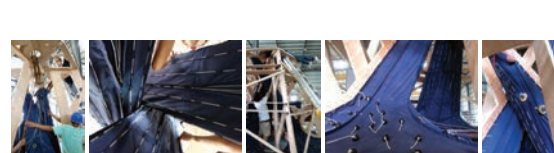
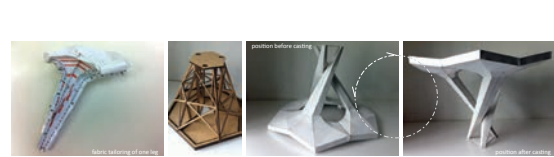
### 5. CONCRETING



### 6. DEMOULDING



### 7. RIGGING, LIFTING AND FLIPPING





# Nameless Curves

MARK ERICSON

Woodbury University

A circle is defined by a point rotating about another point at a fixed distance, and can be precisely described by the mechanical drafting tool of a compass. This simplicity allows for it to be easily dismissed, within the complexities of contemporary digital work in which a wide variety of curves can be described through software built-in computational processes. However, it is exactly the simplicity of the circle that enabled architects to use it to engender a wide variety of complex forms in the history of architectural drawing. As Robin Evans has pointed out, the orthographic deformations of a circle remain “commensurable” through the direct relationship with a measurable source figure. Circular deformation through orthographic projection allowed for the generation of numerous related and yet “nameless” curvatures whose linear connection to the circle allowed them to be both measured and built.<sup>1</sup> What Evans did not point out, and what was central to the construction of drawings of vaults with cross sectional profiles of “nameless” curvature, was a practice that had much more to do with computation than it did with representation. This practice, as studied in the following work, offers a historical counterpoint to the role of both curvature and computation in contemporary practice.

In the texts of Albrecht Durer, Juan Caramuel Lobkowitz, and Guarino Guarini there appears a wedge shaped figure from Euclid’s Elements (300 B.C.E) that defines proportional relationships between distances along intersecting

lines.<sup>2</sup> The wedge is a representation of the “intercept theorem” and it allows for a set of divisions along a line to be transferred proportionally to another line that intersects the original.<sup>3</sup> Guarino Guarini utilized the wedge in parallel with orthographic projection to produce a variety of architectural forms. This project explores the historical use of this figure in the two specific operations: the deformation of curves through orthographic projection, and the plotting of points along proportionally related curves that define three dimensional non-spherical surfaces. The first operation allows for the construction of a series of non-circular curves that maintain a connection, through parallel lines, with the flat and measurable source figure of the semi-circle (Figs 1-3). The second operation allows curves produced through the first operation to be developed into three-dimensional surfaces of distinct but proportionally related curvature (Figs 4-5). Importantly, while the first operation of deformation is entirely dependent on orthographic projection, and therefore constructed views of the curves understudy, the second operation produces only distances to points on a surface from a fixed center. This second operation was required to develop Evans’s “nameless” curves into three-dimensional architectural surfaces, and points to an alternate history of architectural drawing in which orthography is at times superseded by drawing techniques that rely on computation. Furthermore, it begins to suggest the manner in which historical drawing practices do not simply precede contemporary practices in a

linear history of representational progress. Instead they can be seen as conceptually and operational related practices, that rely on different tool set and media for their realization.

## ENDNOTES

1. Evans, Robin. “Translations from Drawing to Buildings.” In *Translations from Drawing to Building*, 153–89. Cambridge: MIT Press, 1997.

2. See for example: Caramuel Lobkowitz, Juan. (1678). *Architectura Civile Recta y Obliqua*. Vigevano: Camillo Corrado. Durer, Albrecht. (1977). *The Painters Manual*. Translated by Walter Strauss. New York: Abaris.. Guarini, Guarino. (1737). *Architettura civile*. Turin: G. Mairesse.

3. Field, J.V., and J.J. Gray. (1987). *The Geometrical Work of Girard Desargues*. New York: Springer Verlag.



FIGURE 1: Twenty elongations of a semi-circle along a single axis.

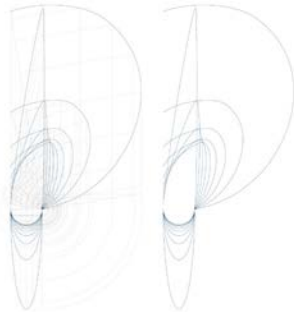


FIGURE 2: Twenty elongations of a semi-circle along two axes.

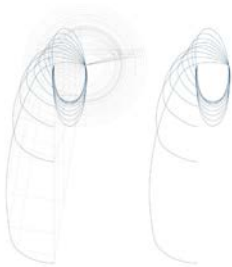


FIGURE 3: Twenty deformations of a semi-circle along a folded plane.

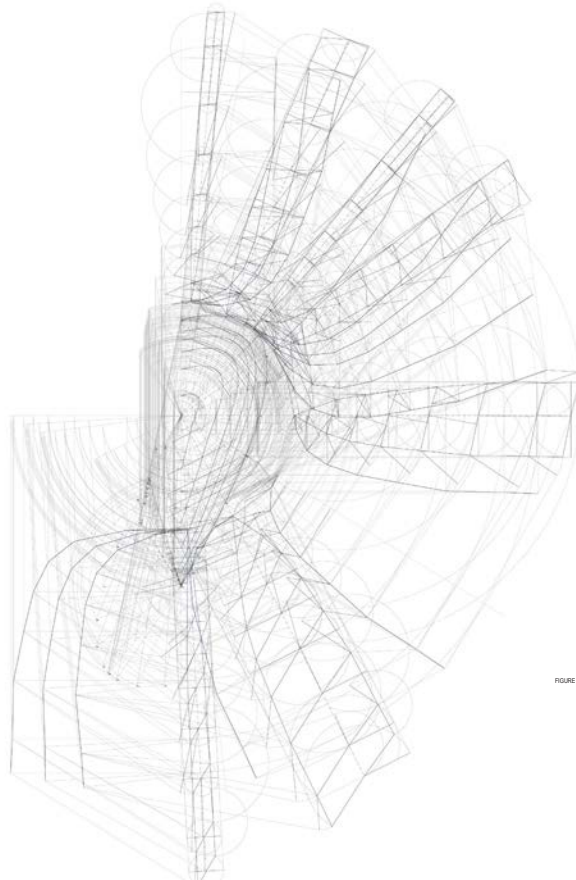


FIGURE 4: Euclid's wedge and a vault of parabolic curves.

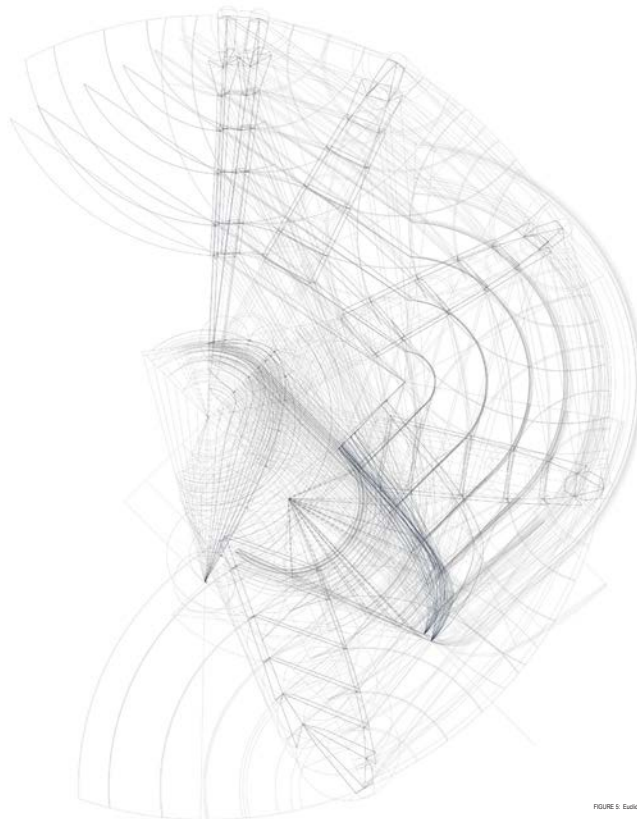


FIGURE 5: Euclid's wedge and a vault of nameless curves.

# Osnap!

**LEE SU HUANG**

University of Florida

**GREGORY SPAW**

American University of Sharjah

Initially inspired by the material efficacy of commercial plastic packaging, Osnap! is a project exploring the pairing of digital fabrication with traditional vacuforming, each employed to their own unique advantages. Digital fabrication techniques ensured the consistent precision and quality of the working molds, while allowing for fast turnaround times in iterative design development and proofing of concepts. Vacuforming enabled immediate testing and swift mass-production of a sufficient number of modules for effective evaluation of performance. Cohesively these processes resulted in time-effective inquiries and development of different joinery techniques, geometries, and optimized production workflows.

The resulting installation employs the inherent thermoforming capabilities of PETG plastic laminated with laser-etched dichroic film, which is fashioned through the use of CNC milled molds. These similar units are in turn tectonically joined through their innate geometry without the use of foreign fasteners or joinery. Consisting of 666 body modules and 333 joined cap units, the design incorporates snap joints, folds, friction fit button joints, and tension slip joints into one cohesive whole. The dichroic film creates a multitude of filtered optical effects depending on the prevailing lighting conditions and the observers' relative angle of reflection to the units. Thus a dialogue is created between the observer, the construct and broader environment.

This research opens possibilities regarding speed/ease of deployment of units on an architectural scale, with advantages such as weight, flat packing, tool-less assembly, adjustable geometry, variable opacity and recyclability. While the forefront of digital fabrication is obsessed with mass-customization of unique parts in unprecedented numbers, Osnap! endeavors to find an advantageous middle ground in utilizing both new and old technologies selectively, achieving hybridized benefits while working within an economy of means.





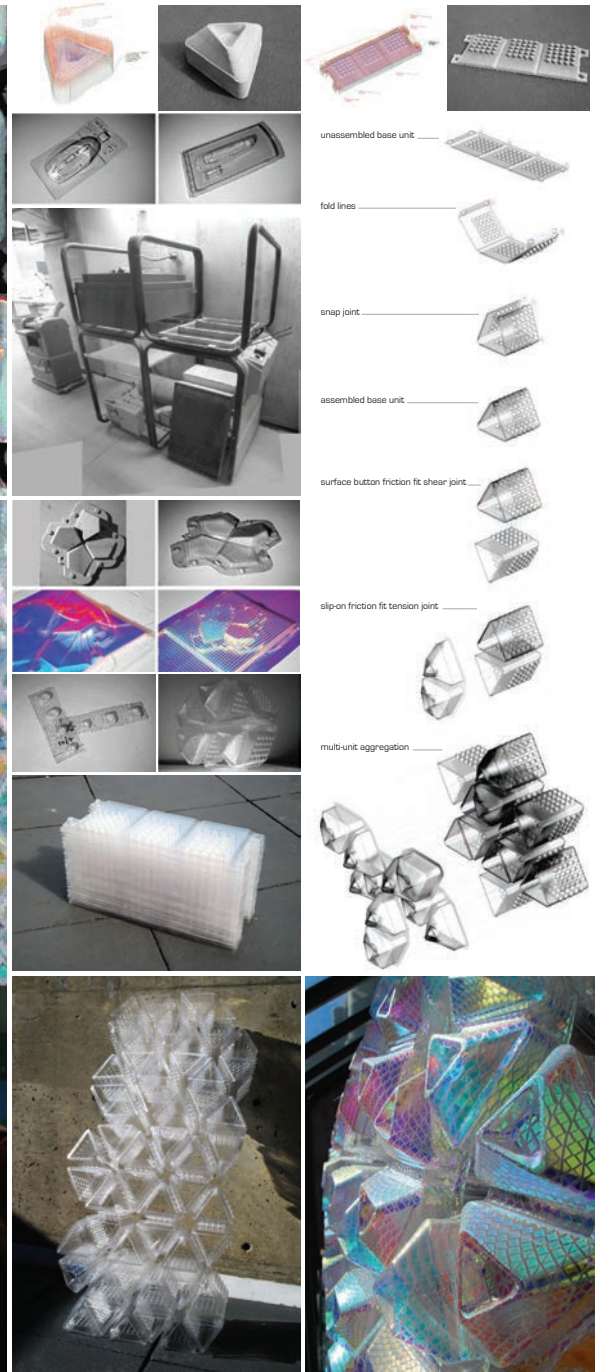
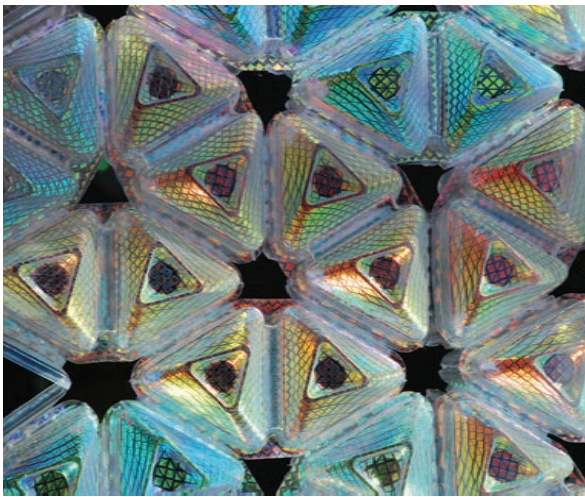
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Lee-Su Huang & Gregory Thomas Spaw

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# Pattern to Volume: Drawing for Fabrication in Expanded Surfaces

**JEFF PONITZ**

California Polytechnic State University

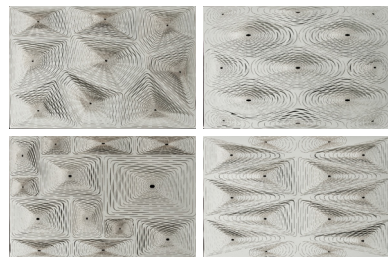
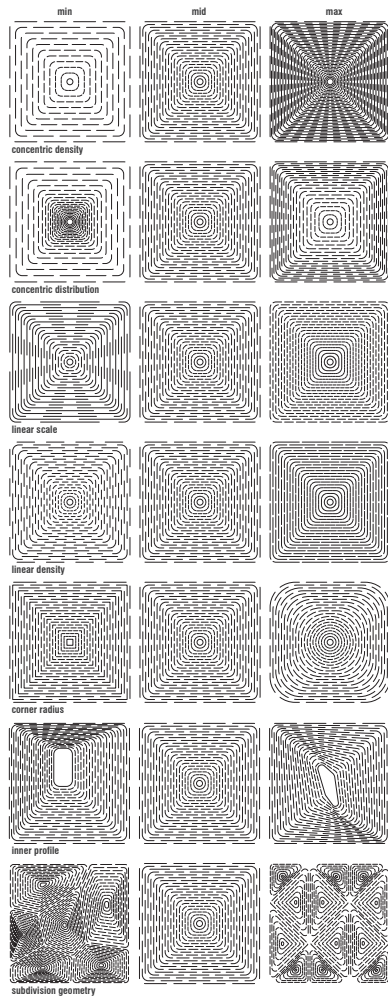
Digital modeling and parametric software make it fairly easy to design complex forms, which often need to be re-engineered for manufacturing, or at the very least translated into a suitable format such as cut sheets or G-code. This research takes a different approach, investigating how two-dimensional drawing and patterning techniques can directly translate to the manufacturing of highly variable volumetric surfaces. Expanded metal surfaces, which use a pattern of offset slits to produce a rigid and permeable sheet with zero material waste, provides a precedent for this work. Parametric software is used to control a series of 2D geometric variables, which collectively choreograph the intricate reactions that give form and structure to the material. The final form is highly dependent on the amount and direction of force applied to the cut sheet, allowing for a high degree of variability even with standardized parts. This workflow attempts to blur the boundary between representation, fabrication, and customization as acts of design.

# PATTERN-TO-VOLUME

## DRAWING FOR FABRICATION IN EXPANDED SURFACES

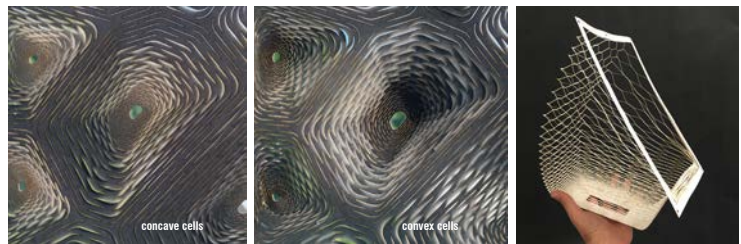
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### patterning variable matrix



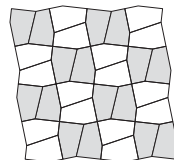
### 2D PATTERNING

Several patterning variables are parametrically controlled using Grasshopper and laser cut, allowing for rapid iteration and testing. For each variable, minimum and maximum values are found that can be successfully expanded; producing a range of volumetric possibilities.

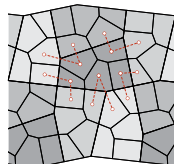


### VOLUMETRIC EXPANSION

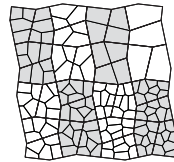
The cut sheet is secured within the Expand-O-Matic™ frame, and force is applied at a single point. As force is distributed through the material network, they undergo plastic deformation at predetermined locations, giving the sheet substantial rigidity and a semi-permanent form. A surface may be expanded to create either concave or convex volumes, which capture and reflect light differently. A single 2D cut pattern can yield a wide range of volumes and light conditions, depending on the amount and direction of force applied.



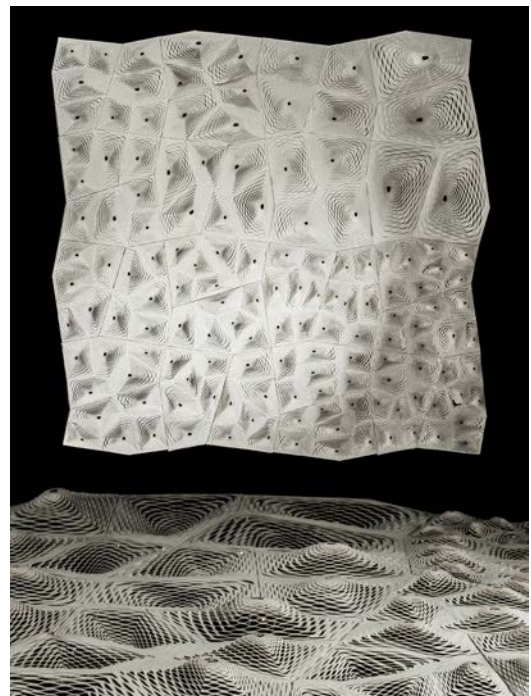
A single repeating panel is tiled through rotational and reflectional symmetry. This assembly uses a modified Cairo pentagonal tiling.



Panels are subdivided to maintain continuity at panel joints throughout panel rotation and reflection.

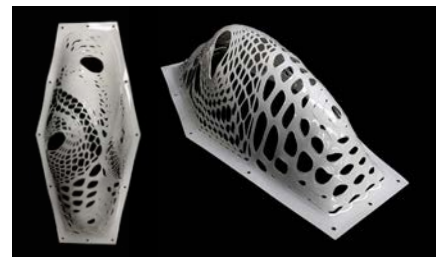


In the assembly shown at right, panels incrementally progress from a single subdivision to right.



### TESSELLATION AND PANELIZATION

Tessellation is used at the scale of a single surface and at the scale of a modular assembly, to minimize the perception of panelization and repetition, instead creating an impression of continuity and variation. Parametric software is used to test combinations of panel geometry and subdivision geometry, finding combinations that use rotational and reflectional symmetries to create alignments across panel joints. While panel and subdivision variation is possible, a single standardized component maximizes efficiency of manufacturing.



### MATERIAL APPLICATIONS

These concepts and processes are being applied to a range of materials. The process of expanding light gauge aluminum is similar to that of paper, using a steel Expand-O-Matic™ frame and a two-ton gantry crane to create an expanded surface that can support hundreds of pounds with minimal deflection. PETG plastic can be heated and slump-formed, using gravitational force to create catenary forms with intricate tracery.

# The Strange Loop

**MARA MARCU**

University of Cincinnati

**MING TANG**

University of Cincinnati

In music, the strange loop, refers to the phenomenon in which a pattern set by a composer is then broken only to return whole again, as in Bach's canons. As Hofstadter remarks, implicit to the concept of the strange loop is the concept of infinity, since "what else is a loop but a way of representing an endless process in a finite way?" As seen in Escher's 'Metamorphosis', infinity plays a large role. Copies of one single theme often fit into each other, forming visual analogues to the canons of Bach. Through a process of incremental mutation, various taxonomies were developed. The following of a 'paste special' methodology lead to the breeding of multiple offshoots. The outcome became in itself, an abstracted strange loop of tectonic permutations.

Using CATIA, a total of 66 cells with variable inputs were instantiated within an armature via a knowledge pattern that automated the insertion of each user-defined-feature (UDF). Each UDF morphed function of the knowledge pattern that linked the coordinates for the insertion points to inner parameters controlling the resolution of the base unit. Eight sheets of high-density foam were flip-milled and joined with a two-part epoxy adhesive. Following assemblage, the installation was coated with thin layers of latex primer and gold metallic paint.

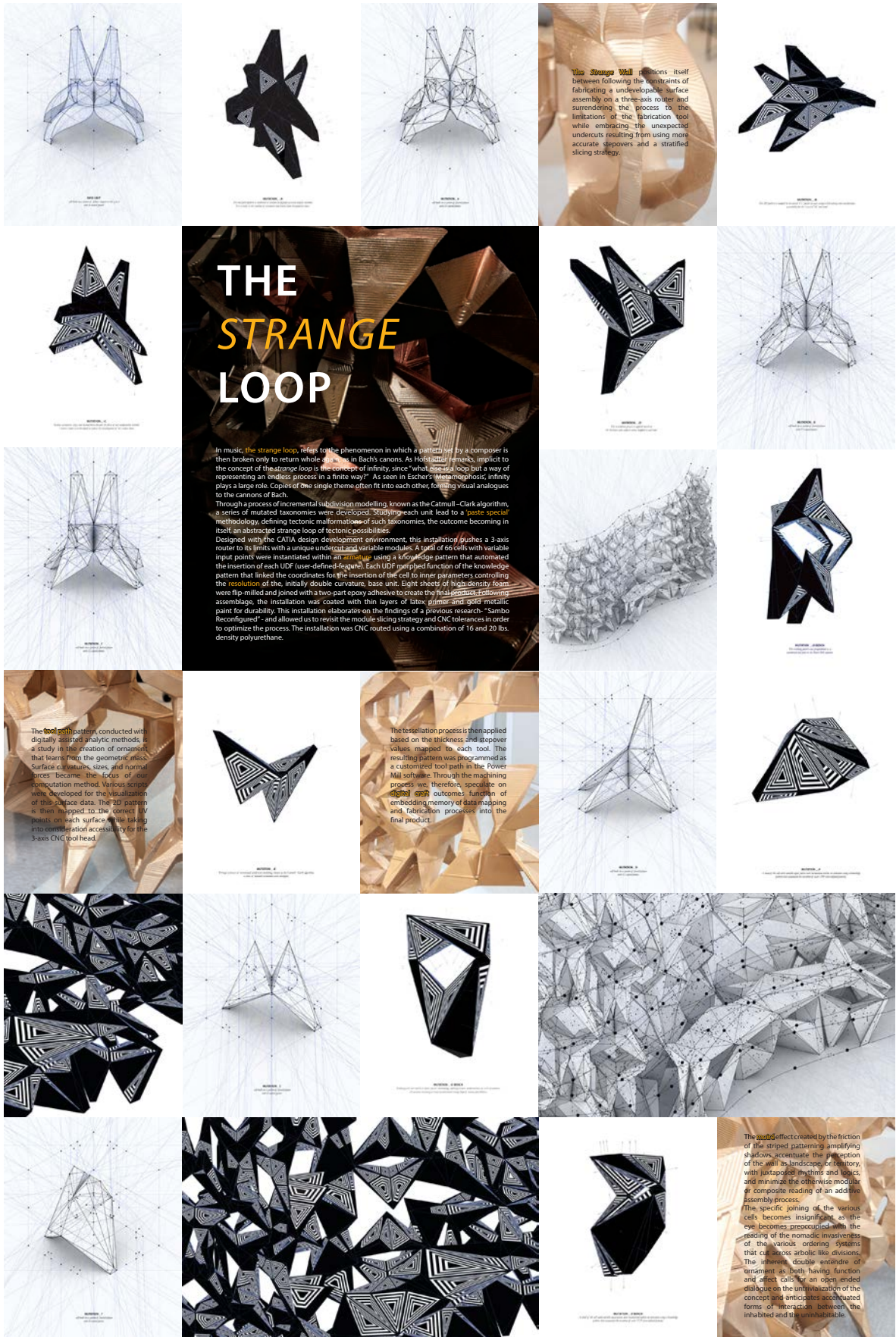
The tool path pattern conducted in relation to digitally assisted analytic methods is a study in the creation of ornament that learns from

the geometric mass. Surface curvatures, sizes, and normal forces became the focus of our computation method. Various scripts were developed to aid the visualization of this surface data. The 2D pattern is then mapped to the correct UV points on each surface while taking into consideration accessibility for the CNC tool head. The tessellation process is then applied based on the thickness and step-over values mapped to each tool. The resulting pattern was programmed as a customized tool path in the Power Mill software, embedding memory of data mapping and fabrication processes into the final product.

The moiré effect created by the friction of the striped patterning amplifying shadows accentuate the perception of the wall as landscape, or territory, with juxtaposed rhythms and logics, and minimize the otherwise modular or composite reading of an additive assembly process.

The specific joining of the various cells becomes insignificant as the eye becomes preoccupied with the reading of the nomadic invasiveness of the various ordering systems that cut across arbolic like divisions. The inherent double entendre of ornament as both having function and affect calls for an open ended dialogue on the untrivialization of the concept and anticipates accentuated forms of interaction between the inhabited and the uninhabitable.









# Urbanism, History, and Theory

# Atomizing the Smart City: Towards a Flexible Infrastructural Urbanism

ROY C. CLOUTIER

University of British Columbia

In cities across the developing world, a new spin on High Modernist central planning is coming into style. Fueled by the promise of big data and new technologies of urban sensing, the technocratic managerialism of modernism has found a new host in current urban discourse: the Smart Cities paradigm. Placed in the context of rapidly-urbanizing India—and more specifically, in the promises of Prime Minister Narendra Modi to build one hundred Smart Cities between and atop existing Indian urban centers—this centralized, managerial model raises many questions: What of the unplanned or unforeseen? What of the crucial role that informality plays in current Indian cities? Most fundamentally, what of the agency and ingenuity of the Indian people themselves?

In Fall 2015, a research group of sixteen architecture students from the University of British Columbia traveled to Chandigarh, India—the epitome of High Modernist urbanism, and the site of a proposed Smart City—to study and speculate on exactly these questions and challenges. The varied experiments, each focusing on one major corridor of the city, sought to recast both the notion of the Smart City and the current condition of Chandigarh, testing novel urban ideas against the backdrop of a projected 50% increase in inhabitants in a city designed to hold only half of its current population.

Situating itself against dominant discourses that prioritize control and centralization of power—on one hand, the city as utopia of technocratic technophilia; on the other, the city as untouched preservationist relic—the atomized smart city seeks to not merely accommodate but actively harness the entrepreneurial creativity of the city's occupants. Scrupulously maintaining the stated goals of the Smart City while radically intervening in its methods and architectures, the proposal overlays onto the Corbusian diagram of Chandigarh's urban structure a new network—one primed for the social and ecological challenges of the 21st century.

The project is predicated on a decentering of the notion of infrastructure, seeing it not as a means of managerial control of a populace, but rather as a flexible platform for resource provision on which new possibilities may unfold in ways both presupposed and unforeseen. Crafted as an atomized network, this overlay of infrastructure—both material and immaterial—allows a great degree of flexibility, experimentation, and appropriation, all the while strengthening a larger sense of order and reinforcing the urban diagram of the city. In effect, the project serves as an armature for localization, creating sites in which ideas and technologies from a variety of disparate sources are allowed to collide with everyday Indian life, be experimented with and experimented on, and ultimately be

adopted, altered, or rejected without undermining the viability of the urban whole. The architecture of the distributed interventions plays a mediating role, creating a system for elaboration that can suspend potential conflicts between contradictory programs.

The decentralized urbanism that results emphasizes redundancy and flexibility over rigid efficiency; experimentation and failure over a reliance on generalized solutions; and flexible systems of building and unbuilding over a desire for fixed, singular intervention—in short, a Smart City gone live.

# ATOMIZING THE SMART CITY: TOWARDS A FLEXIBLE INFRASTRUCTURAL URBANISM

ROY CLOUTIER | UNIVERSITY OF BRITISH COLUMBIA

In cities across the developing world, a new spin on High Modernist central planning is coming into style. Fueled by the promise of big data and new technologies of urban sensing, the technocratic manipulation of modernism has found a new host in current urban discourse: the Smart Cities paradigm. Placed in the context of rapidly-urbanizing India—and more specifically, in the promises of Prime Minister Narendra Modi to build one hundred Smart Cities between and atop existing Indian urban centers—this centralized, managerial model raises many questions: What of the unplanned or unforeseen? What of the crucial role that informality plays in Indian cities? Most fundamentally, what of the agency and ingenuity of the Indian people themselves?

This project, the result of a research studio based in Chandigarh, India—the epitome of High Modernist urbanism, and the site of a proposed Smart City—studies and speculates on precisely these questions and challenges. Situating itself against dominant discourses that prioritize control and centralization of power, the atomized smart city seeks to not merely accommodate but actively harness the entrepreneurial creativity of the city's occupants. Scrupulously maintaining the stated goals of the Smart City while radically intervening in its methods, technologies, and architectures, the proposal overlays onto the Corbusian diagram of Chandigarh's urban structure a new network—one primed for the social and ecological challenges of the 21<sup>st</sup> century.

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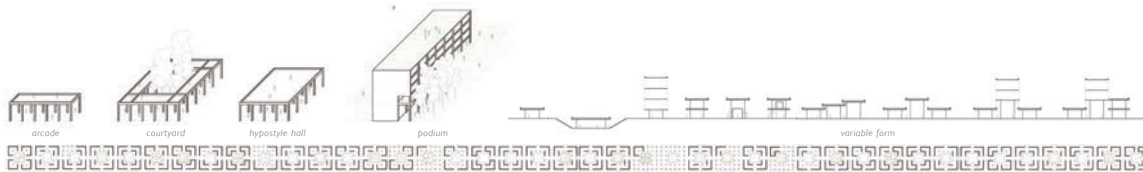
## Conduit

these infrastructures create a mesh of mobility and resource availability



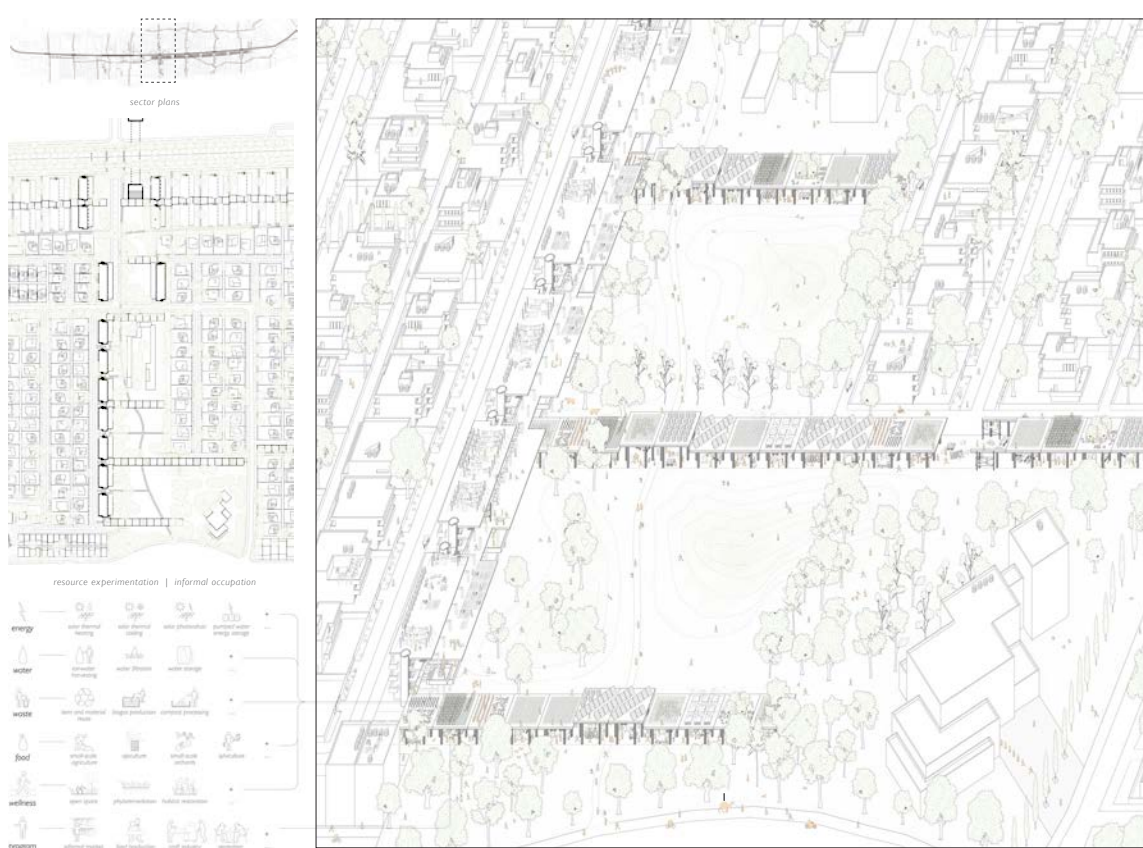
## Fleet

low-cost canopy infrastructures hook into and aggregate along the conduits, providing diverse zones for resource experimentation and informal programming



## Distribution

as a multitude of experiments play out in the fleet of canopy-structures, individual structures can be added, modified, deleted or duplicated with ease





# Building for the Other 90%: Design Agency + Cultural Housing

ASHLIE LATIOLAIS

University of Louisiana at Lafayette

“The word ‘design’ usually elicits images of modern architecture in the pages of *Dwell*, Bryant Park runways during Fashion Week, the font face Helvetica, or the latest Apple product. While the aesthetics and utility of modern design are debatable, the following is true: new designs are made for consumers with disposable income – the top 10 percent of people in the world.”

Economic drivers draws people towards cities, but overpopulation and rapid urbanization has forced people to migrate to the suburbs surrounding the city. This shift leads to the formation of informal settlements, or slums, where residents live in inhumane conditions without basic food, water, or shelter. This poster entry explores design agency by harnessing cultural influences in the natural disaster zone of the Philippines. The studio project participated in the Spring 2015 ‘DenCity’ Design Competition as hosted by Shelter Global. Student teams were established to develop understandings of real world issues and posing problems to address the question: what is architecture for the other 90%?

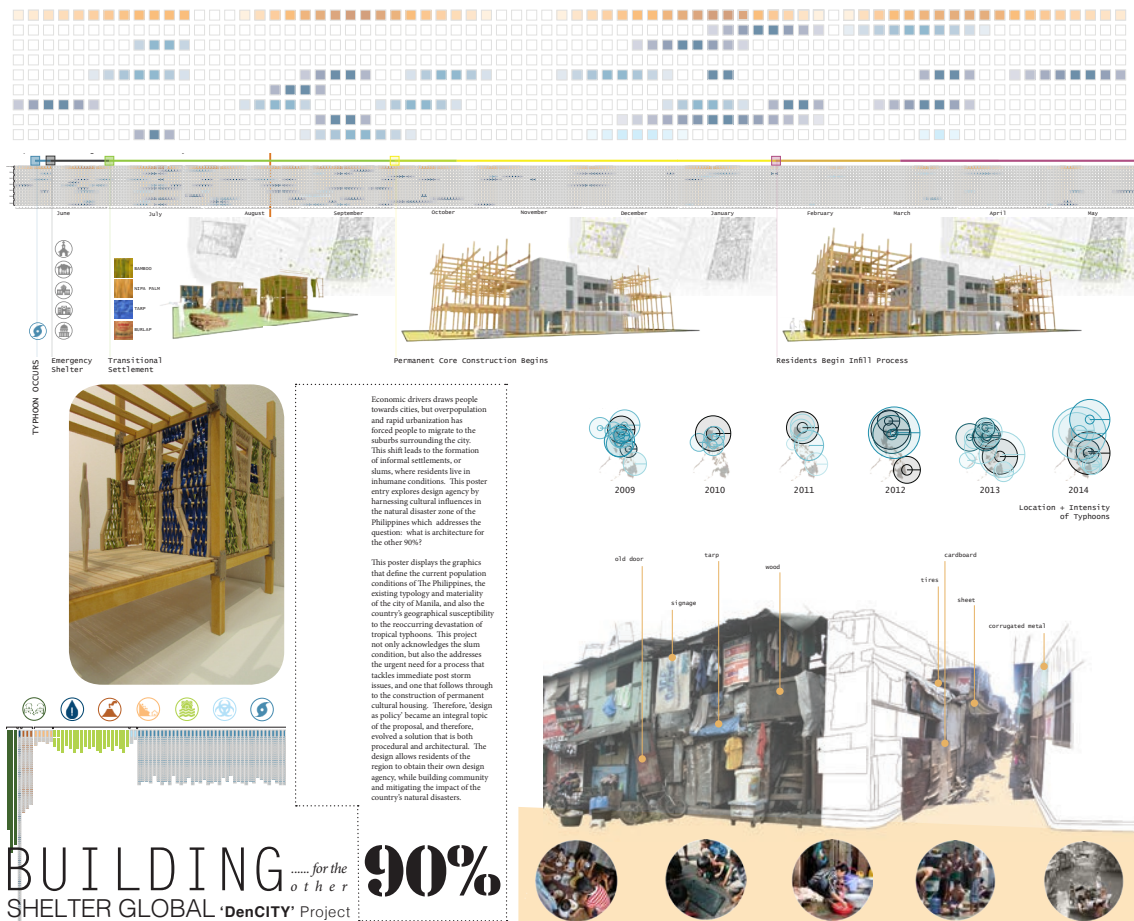
Students began the project by gathering data and creating graphic representations / diagrams to visualize alarming relationships. Research in their infancy began to develop into more complex diagrammatic understandings of site dynamics – social, cultural, and geographical. This poster displays the graphics that define the current population conditions

of The Philippines, the existing typology and materiality of the city of Manila, and also the country’s geographical susceptibility to the reoccurring devastation of tropical typhoons. This project not only acknowledges the slum condition of the country, but also addresses the urgent need for a process that tackles immediate post storm issues, and one that follows through to the construction of permanent cultural housing. Therefore, ‘design as policy’ became an integral topic of the proposal, and therefore, evolved a solution that is both procedural and architectural.

This project uses the hypothetical occurrence of a typhoon making landfall near the city of Manila and, more specifically, the impoverished Tondo District to explain a recovery process that begins post storm. These steps can be seen in the ‘Construction Phasing’ timeline graphic. To increase community resilience, the concept of “core” and “infill” are incorporated heavily into the progression of this process.

There are three main stages to this project’s design implementation: Emergency settlement, Transitional settlement, and Permanent settlements. The designed process of building, specific to the culture of the Philippines, will improve living conditions within impoverished areas as well as increase the resilience of communities so they can respond more effectively to the reoccurring typhoons. The intention is for government entities to regulate the transition of these three phases, as

well as provide material that will act as framework for residents to install infill materiality of their choosing. Therefore, the new building typology is extracted from existing Philippine building knowledge, without losing the strong sense of community that is evident in the area. This will in turn give the residents of the region their own design agency, while building community and mitigating the impact of the country’s natural disasters.



# Capriccio

JAMES MICHAEL TATE

University of Michigan

**DRAWING ON HISTORY** – This undergraduate course challenged students to articulate a project using the representational genre of a capriccio, propagating a generative fiction. The deliverable asked for a representation of considerable virtuosity, one executed to a size that suggested the spatial inhabitation of a tragic, comedic, or satirical scene. Each student contemplated ideas about the design of history, the reciprocal exchange between received and speculative disciplinary and cultural narratives. Students were exposed to a variety of approaches and methods for interpreting, comparing, and translating historical references, infusing history and creative work as a discursive design project. The semester began with selecting an architect and studying the body of work. Each student then identified an issue to elaborate on and advance within a contemporary physical or intellectual context. The next six weeks was spent developing architectural ideas and concepts through design strategies. Beyond illustrating and documenting existing artifacts or retelling the story of a historical figure, the capriccio became a generative design medium. Students were encouraged to interact with physical and digital archives, ways of curating and assembling dense collections of material in different and unconventional ways. The creative re-organizing and re-invention of source material and the embrace of counterfactual histories encouraged denying definite conclusions about historical projects. Throughout the course we discussed ideas

about concurrently telling discrete micro histories and intentionally not confirming or validating dominant narratives; ways of rendering history active. Three selected projects are presented:

**NOWHERE** – Leonardo Da Vinci: The investigation pushes Da Vinci's work through the lens of defamiliarization. It does so by suppressing the foregrounded figures in his paintings and sketches in order to focus attention on the less discussed middle and background content. The project assumes that behind the figures is an unexplored territory where the unrealized architectural proposals and inventions exist. Through the specific proliferation and organization of Da Vinci's less familiar architectural sketches, new spatial orders and perspectives are produced.

**DYMAXION 2.0** – Buckminster Fuller: Despite his failures, many continue to subscribe and have excessive faith in the unrealized potentials of Fuller's view of design at the scale of the world. Armed with the knowledge of successes and failures of the original Dymaxion system, Dymaxion 2.0 rethinks and re-tools the original, deploying it in the Amazon basin. Dymaxion 2.0 enters the world at a moment when the destructive effects of climate change seem irreversible. While utopian in scale, built into the design of each element is its imminent obsolescence.

**RECASTING** – Michael Graves: This project

constructs an argument about historicism – its pitfalls and productive possibilities. The participatory nature of an architectural language based on recognizable forms promotes ways design can enter every-day life, how design can be experienced and appreciated by both a broader public and learned architects. The proposal considers the design of architectural objects at a variety of scales, and across socio-economic strata. The work draws upon concepts of cultural reception, archetypal form, and the role that drawing lines can play in the articulation of volume and surface.



## DRAWING ON HISTORY

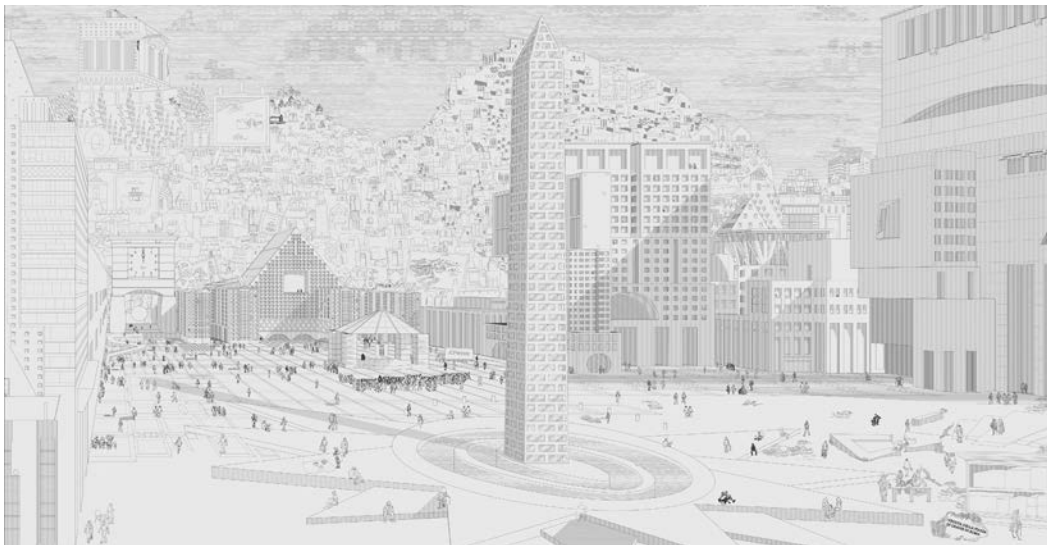
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# Green Point Food District

**TORREY TRACY**  
University of Nevada, Las Vegas

**STEVEN CLARKE**  
University of Nevada, Las Vegas

**DAVID B. BAIRD**  
University of Nevada, Las Vegas

**UNDERSTANDING THE PROPOSAL:**

This submission is a single, continuous, steel framed building, strategically situated in a repurposed industrial zone and woven through the Greenpoint neighborhood of Brooklyn. This proposed structure establishes a comprehensive food system seamlessly integrated with housing, commercial, civic and public spaces. Its modest, pragmatic form gets its power by creating flexible infrastructure, making connections and celebrating our interdependence—a foundation for economic growth and prosperity in the 21st century. This project is also fitting for a burrow that’s official motto is Eendraght Maeckt Maght - “In unity, there is strength.”

The two ends of this structure rise well above the existing fabric of the Greenpoint Neighborhood. These towers serve as beacons or markers for the food district and offer residents and visitors unmatched views of Brooklyn and the Manhattan skyline. The spaces atop these towers are open to the public and designed to support small civic events as well as private celebrations.

**UNDERSTANDING THE CONTEXT:**

Greenpoint is the northern most neighborhood in Brooklyn. During the 18th and 19th century much of this area was farmland and many of the streets still bear the names of the original farming families such as Meserole and Calyer. Farmers in those days used long boats to travel to Manhattan to sell their

farm produce. Today Brooklyn is redefining its agricultural traditions with high-end organic food companies like McClure’s Pickles, Brooklyn Soda Works, Steve’s Ice Cream and Madécasse, which all currently operate production facilities in Brooklyn.

The industrial land used for this proposal is part of the 175 block rezoning effort in the Greenpoint and Williamsburg neighborhoods that was passed by the New York City’s Department of City Planning in 2005. The plan was designed to bring over 16,000 new residents to the area with corresponding commercial capacity and civic amenities. The plan included a public park on the east river that would extend to Newtown Creek.

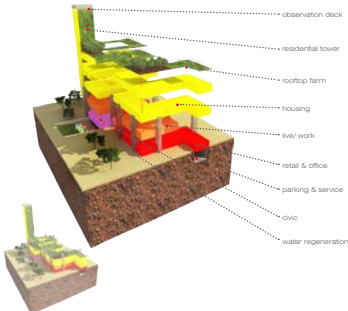
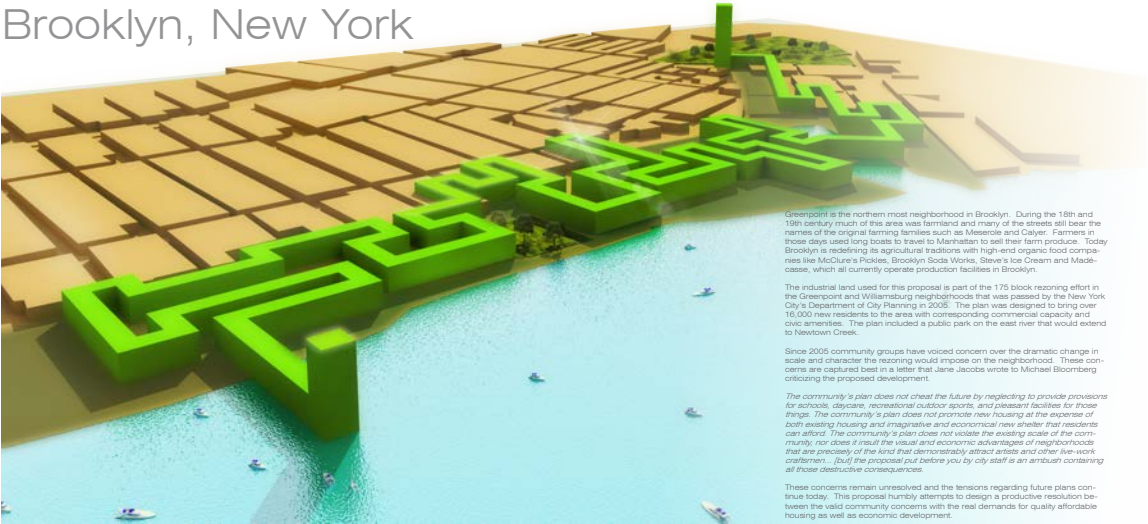
**GREENPOINT FOOD DISTRICT  
GOALS AND OBJECTIVES:**

- create a dense, safe, vibrant, mixed use, mixed income, walkable development that connects users to existing built/natural systems and supports healthy living;
- address the needs of a mixed income, diverse population by seamlessly integrating systems of support for those in need;
- develop a progressive, non-hierarchical, non-stratified infrastructure that celebrates our symbiotic interdependence with our environment and one another;

- expand opportunities to train a 21st century food industry workforce and educate the community about the ecological challenges as they relate to our food systems and our long-term health and prosperity;
- utilize water and other resources to produce high quality organic agricultural products for residents, local restaurants as well as the broader community;
- create buildings that are flexible and can readily adapt to evolving community needs.
- use passive and active strategies to make the district efficient and a net energy producer;
- utilize existing transportation and civic infrastructure and augment gaps in that infrastructure with integrated amenities such as car sharing, a library, classrooms, community meeting space, community gardens and parks.

# Greenpoint Food District

## Brooklyn, New York



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# NM House, Pantano de San Juan, Madrid

**DIEGO GARCIA-SETIAN**

Arizona State University

**SILVIA SANCHEZ**

Winner of an open public competition, “Arrivals” is a public art + infrastructure project at the Mosher St. Underpass in Holyoke, Massachusetts. The project transforms a key gateway between downtown Holyoke and an adjacent residential neighborhood into a safe, inviting, and creative attraction. The intention of the project is to contrast the singular image of the city with the multiple voices of residents’ arrival stories, and in doing so, capture Holyoke’s rich immigrant and migrant experience. The \$35,000, CDBG-funded creative placemaking project is a direct response to the immediate context of its site, which is adjacent to the historic gateway to the city--H.H. Richardson’s former train station.

Completed in August 2015, the project consists of a thirty-foot long LED-lit wall of digitally fabricated perforated panels that depict a historic Main Street scene which represents Holyoke’s past as an industrial city producing textiles and paper. Set within the wall are three “story boxes” comprising excerpts of Holyoke resident’s arrival stories. The stories, gathered through a series of public engagement sessions at different venues throughout the city, capture a diverse cross section of residents—from those who were born here in the early part of the twentieth century to those who have recently arrived. Importantly, the story panels’ are in Spanish and English, which speaks to the current Latino/a demographics of adjacent neighborhoods, inviting participation in the public domain of a city that has not always been accessible.

“Arrivals” operates in many ways. As public infrastructure, it lights a formerly desolate underpass, providing a safe physical connection between a lower income neighborhood and the city’s central business district. As public art, it reflects the many voices and the many cultures that have shaped, and continue to shape, Holyoke’s past, present and future. As a public engagement process, it provides a model for creating community receptivity for creative placemaking—and the collected stories included on the project website create the capacity to be an ever-evolving archive as a community resource. As a local production, its perforated panels and LED lighting highlight the advanced capabilities of regional fabricators. Finally, the project also signals municipal commitment to reinvestment in the neighborhood and aims to galvanize support for the future development of the historic, but now unused, H. H. Richardson train station.

Since its founding in 1848, Holyoke has long been home to successive waves of immigrants and migrants. For over 150 years, people from Ireland, Canada, Italy, Germany, Poland and Puerto Rico have flocked to the “Paper City” to create a better life for themselves and their families, and with each successive wave of immigrants and migrants, its new inhabitants have redefined Holyoke. This project acknowledges that those diverse voices influence both the historic and the contemporary understanding of public space in the city. The work seeks not to simply beautify the underpass site, but to use art as a means to connect

the aesthetic, historic, social and everyday perceptions of public art and public life.

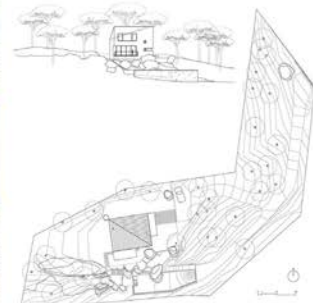




## NM house

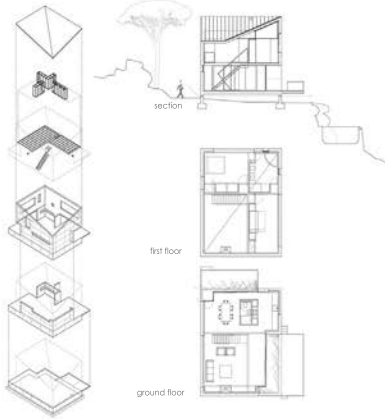


single family house at Pantano de San Juan  
San Martín de Valdeiglesias Madrid Spain

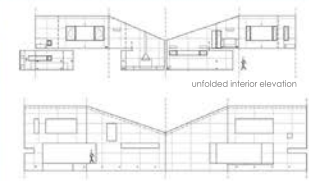


elevation and site plan

structure:  
well and dry works



tectonics



unfolded exterior elevation

At the top of the plot and occupying a clearing in a pine forest, sits the NM house on a granite cliff and looks towards the horizon and the panorama.  
An original parallelepiped was deformed and adjusted to a more convenient and efficient form-factor. The result of this adjustment is a volume with its truncated corners and a folded roof, forming a valley on its diagonal.  
The weekend house program is resolved on two levels. The lower level concentrates the common areas: living and dining room, a kitchen and toilet, plus two outdoor porches at potential extensions of the house. The higher level or mezzanine is equipped with two bedrooms and one shared and fully equipped bathroom.  
The works were divided into two phases:  
The well phase concerned the house layout made in reinforced concrete. Oriented Strand Boards (OSB) were used as the formwork, to have its wooden chips texture printed on the concrete's outer surface, characterizing its materiality, halfway between pine bark and bark growing on granite.  
The dry phase integrated the house's interior furnishing, conceived as a large wooden cabinet on metal substructure.  
The same OSB boards were used as the finished material for the inner face of the roof, which was kept in the same textured concrete.  
The holes left by the formwork in the concrete walls were sealed with stainless steel balls, which reflect the sun and moon's light, producing frames during the day and subtly punctuating the darkness in the night.







**Open**

# 30 x 30: Celebrating the first 30 years of the International Archive of Women in Architecture

PAOLA ZELLNER-BASSETT

Virginia Tech

The International Archive of Women in Architecture (IAWA) was founded by Dr. Milka T. Bliznakov in 1985. Born in Varna, Bulgaria in 1927, Dr. Bliznakov earned a M.Arch degree from the State Polytechnic University of Sofia, Bulgaria, in 1951, and ran her practice throughout that decade. She escaped Europe and immigrated to the United States in 1961 after practicing in France for two years. Bliznakov received her doctoral degree in architectural history from Columbia University in 1971, and after teaching at University of Texas for two years finally joined the faculty at Virginia Tech in 1974 until her retirement in 1998.

Responding to the need for a balanced history of the discipline and to “help bridge the gap in historical knowledge about women’s professional achievements,” Bliznakov founded the IAWA to collect and preserve the work of women, and promote research. In order to acquire collections Bliznakov started by sending letters to over a 1,000 women in Europe and USA, two years prior to the creation of the IAWA, a statement to the clarity of her vision and her determination. In this initial letter Bliznakov introduced the mission of the IAWA: “The scope of the archives will be international and will include work from the beginning of women’s involvement in architecture in any capacity up to the present time.”

The IAWA currently holds the work of 342 women representing a total of 47 of the 196 countries of the world. Much work remains to be done.

Now on its 30th anniversary, the crafting of a vision for the next 30 years clearly underlines the need to update forms and means of dissemination and publicizing of the IAWA, as key aspects to increase its holdings, and position the IAWA as a centralized resource for research and dissemination of the contributions women have made to architecture and design related disciplines.

Within the new forms of dissemination the digital exhibit 30 x 30 celebrates the first 30 years of the IAWA by showcasing the work of 30 women from the archives, and the diversity of papers and artifacts held in the archive as a whole.

The large-scale immersive environment of 30 x 30 provides a slow space for reflection, for recognition and for learning about contributions made to the built environment by women.

The exhibit explores the potential of the New Visual Archive Project, an ongoing effort to digitize the collections in order to expand the reach of the IAWA and facilitate research. 30 x 30 is not a video but has been designed as a framework, a (Max 7) script that executes the projection by retrieving stored images. This allows the exhibit to be changed and updated as collections are digitized, producing variations with relative ease.

Supporting the goals to increase awareness and record the formative history of women

in architecture, the exhibit maps the range of the archive, offers a preview of the treasures within, and reminds us all of the urgency of saving collections otherwise too easily lost to time.





INTERNATIONAL ARCHIVE OF  
WOMEN IN ARCHITECTURE  
30 \* ANNIVERSARY, 1985 - 2015

FOUNDED BY MILKA BLIZNAKOV IN 1985 THE INTERNATIONAL ARCHIVE OF WOMEN IN ARCHITECTURE CURRENTLY HOLDS THE WORK OF 342 WOMEN OF THE PAST TWO CENTURIES, REPRESENTING A TOTAL OF 47 COUNTRIES. OFFERING AN IMMERSIVE SPACE OF REFLECTION, THE DIGITAL EXHIBIT 30 x 30 CELEBRATES THE FIRST 30 YEARS OF THE IAWA BY SHOWCASING THE WORK OF 30 WOMEN FROM THE ARCHIVES. FIRST SHOWN DURING THE 18 \* UIFA CONGRESS, JULY 2015, THE EXHIBIT EXPLORES THE POTENTIAL OF THE NEW VISUAL ARCHIVE PROJECT, AN ONGOING EFFORT TO DIGITIZE THE COLLECTIONS IN ORDER TO EXPAND THE IAWA'S REACH AND FACILITATE RESEARCH. SUPPORTING THE GOALS TO INCREASE AWARENESS AND RECORD THE FORMATIVE HISTORY OF WOMEN IN ARCHITECTURE, THE EXHIBIT MAPS THE RANGE OF THE ARCHIVE, OFFERS A PREVIEW OF THE TREASURES WITHIN, AND REMINDS US OF THE URGENCY OF SAVING COLLECTIONS OTHERWISE TOO EASILY LOST TO TIME.



# Centennial Chromograph

ADAM MARCUS

California College of the Arts

Centennial Chromograph is a life-size representation of the history of the University of Minnesota School of Architecture. The project is an exercise in data spatialization: using computational design tools to generate formal and spatial constructions with large quantities of data—in this case, information collected over the School's 100-year history. Centennial Chromograph, constructed as a centerpiece for the School's Centennial celebration, questions the medium of the architectural installation by embracing an aesthetic tension between didactic representation and atmospheric experience, both conveying information as a timeline and producing abstract effects of light and color. In this regard, Centennial Chromograph resists either quantitative or qualitative readings and instead oscillates between the two.

The installation consists of 100 robotically-routed plywood ribs, joined together with 8,080 colorful #2 pencils. The curvature of the ribs expresses major historical eras and periods of the School, while the color of the pencils reflects the changing composition of the School's degree programs over its first century.

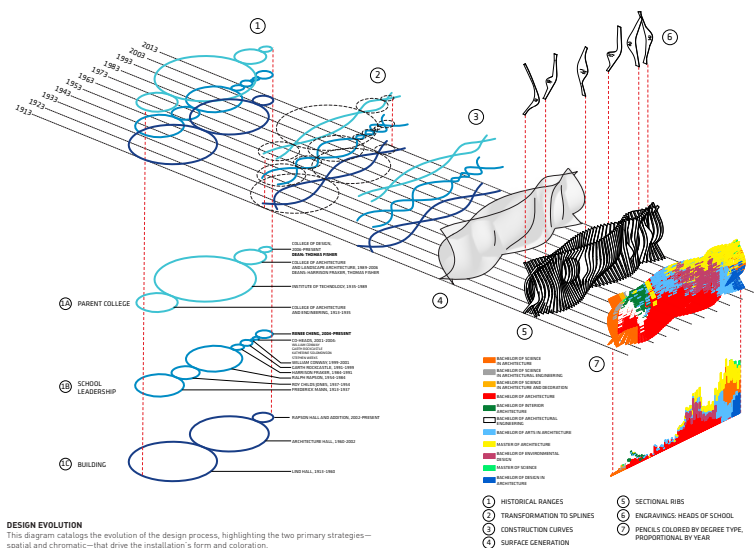
The design process began with a mapping analysis of the School's alumni archives. Computational design software was employed to visualize this data, in relation to class sizes, degree types, and geographic locations of the School's graduates through time. The data

mapping yielded two primary design strategies: spatial and chromatic. First, the installation's curved form is derived from broad ranges from the school's history: the tenures of its leadership, the buildings it has occupied, and the colleges it has belonged to. This information, chronologically mapped and diagrammatically abstracted through superimposed curves, drives the installation's overall form. Second, a more granular data set of degrees granted by the School drives the distribution of color throughout the installation. The chromatic logic allows one to read the evolution of the School's degree programs through time.

The pencils, colored according to each of the different degrees granted by the School over the past 100 years, become the medium through which the logic of data is overlaid onto the logic of assembly. Their granular resolution enables a calibrated sequence of scalar readings: the installation as sculptural object, the localized swells representing significant moments in the School's history, the global color gradient that represents the evolution of the School's programs over time, the dissolution of this gradient into an abstract field of color, and the final understanding of the single pencil as structural joint.

In its multiplicity of representational and abstract perceptual readings, Centennial Chromograph demonstrates an approach to computational design—so frequently utilized in contemporary architecture for

either strictly quantitative applications or purely qualitative exercises in formal exuberance—that synthetically balances data-driven techniques with experiential effects. It also suggests a new model for integrating computation into architectural design, whereby the artifacts of the algorithm—the subtle gradation of color, the deletion of pencils that would otherwise collide, the slight meander of the pencil holes along the rib—contribute to an emergent sense of craft. This sensibility is rooted in computational processes, yet it transcends the purely digital by interfacing directly with longstanding architectural notions of detail, ornament, pattern, and effect.



# Citadel Beacon

**JAMES C. FORREN**

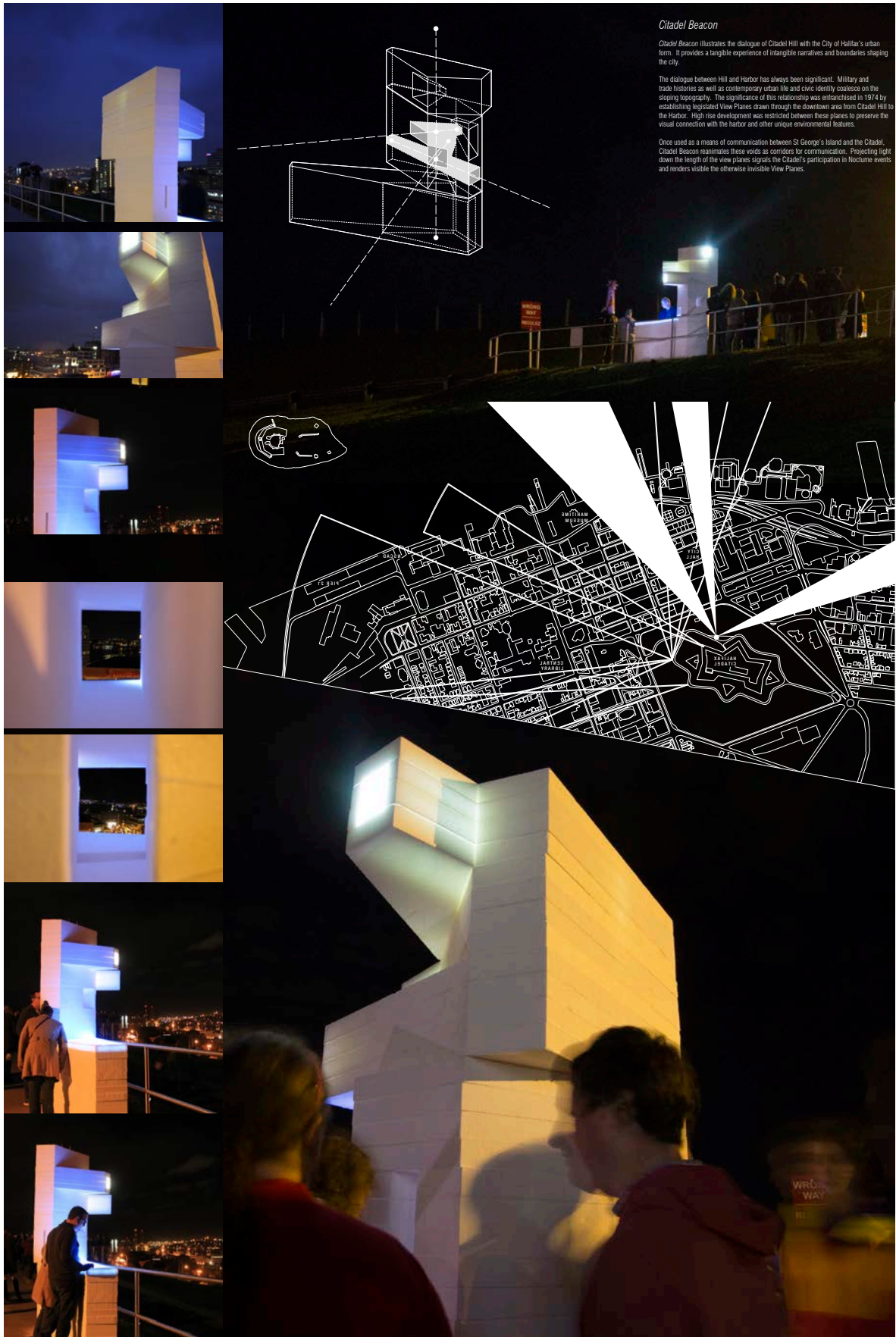
Dalhousie University

Citadel Beacon illustrates the dialogue of Citadel Hill with the City of Halifax's urban form. It provides a tangible experience of intangible narratives and boundaries shaping the city.

The dialogue between Hill and Harbor has always been significant. Military and trade histories as well as contemporary urban life and civic identity coalesce on the sloping topography. The significance of this relationship was enfranchised in 1974 by establishing legislated View Planes drawn through the downtown area from Citadel Hill to the Harbor. High rise development was restricted between these planes to preserve the visual connection with the harbor and other unique environmental features.

Once used as a means of communication between St George's Island and the Citadel, Citadel Beacon reanimates these voids as corridors for communication. Projecting light down the length of the view planes signals the Citadel's participation in Nocturne events and renders visible the otherwise invisible View Planes.





# Hyper-Media Wall

## MATTHEW GINES

University of New Mexico

## TIM CASTILLO

University of New Mexico

The design and fabrication of the “Hyper-Media Wall” began with a series of 3-D models presented to a collaborative team of University Communication and Marketing (UCAM) and two research labs; ARTS Lab (Art Research Technology and Science) and CRAFT (Center for Research in Advanced Fabrication and Technology) at The University of New Mexico. These models were manipulated over several weeks to accommodate the need of the visualization, aesthetic and marketing components of the project.

The first scaled mock-up was CNC milled from a solid block and vacuum-formed with polystyrene to create a smooth screen-like surface for projection mapping. Through the applied mapping of this first surface it was determined some of the elements, including angles and undercut surfaces were not appropriate for the projection. After additional iterative 3-D modeling a second scale prototype was fabricated in the same solid block CNC milled subtraction process.

The full-scale mock-up resulted in two minor changes to address some fall-off pixelization. The full-scale mock-up demonstrated the egg-crate strength and durability were not appropriate for the needs of the traffic the airport generates. These issues were addressed in a final mock-up built for the visualization team to begin mapping the content.

The final façade was broken down into seven triangulated parts that come together to make the final façade assembly. The team redesigned the assembly sets to be CNC milled with 2-dimensional panels, using the router to digitally control the milled angles in order to join the flat pieces in to triangulated assemblies. This process allowed the panels to come together quickly, reducing weight and shipping costs. The seven forms were sent to Warner Bros. Studio in Los Angeles, CA. Warner Bros. vacuum formed the panels and shipped only the skins back to the fabrication team. The structural system was updated for maximum durability. The design used CNC milled aluminum sub-frames on a cross-braced rigid back structure. The sub-structure used racing parts and rod extenders to attach the skin at each angle, removing the need for custom-made brackets at each moment.

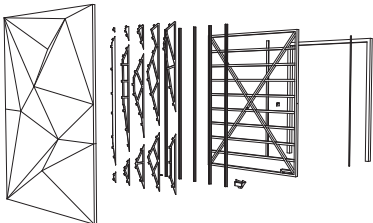
# Hyper-Media Wall

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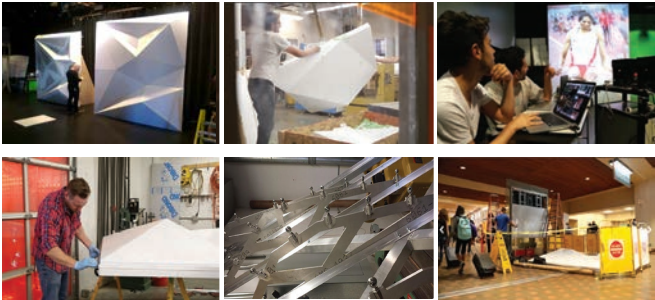
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Assembly Sets



TimeLapse



Fabrication





# Integration at Its Finest: Case Study of 3 Federal High Performing Buildings

**RENEE CHENG**

University of Minnesota

**CARRIE DOSSICK**

University of Washington

Three General Services Administration (GSA) high performing buildings recently won AIA COTE Top Ten Awards, achieving design excellence, implementing innovative energy systems while at the same time meeting stringent Federal guidelines. This case study research highlighted the team practices that supported collaborative decision-making and effective leadership. All three buildings achieved a high level of technical sophistication, using systems not commonly seen such as geothermal piles, radiant cooled ceilings, phase-change salts and a historic-preservation-compatible solar array. The decision-making process used to develop these unusual applications reveals the importance of investment in partnering, framing of common goals and the development of “swift trust”.

Through interviews and surveys, the researchers produced an interactive report that enables the reader to compare and contrast among projects, or to follow along one project narrative. Connections to the literature review are managed through hyperlinks, showing how peer reviewed research connects with these particular case studies.

Academic research into the professional practice of architecture is primarily authored by construction management faculty, sometimes with business or organizational expertise. This research team of architects and construction management faculty focused on design ideas, building technology and construction

processes. Using a holistic approach, they explain stories about building design and construction and recommend best practices for integrated teams.

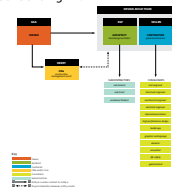


PRINCIPAL INVESTIGATOR: RENÉE CHENG, AIA, SCHOOL OF ARCHITECTURE, UNIVERSITY OF MINNESOTA  
CARRIE STURTS DOSSICK, PHD, PE, DEPARTMENT OF CONSTRUCTION MANAGEMENT, UNIVERSITY OF WASHINGTON

External Strategic	Leadership Strategic	Project Leaders	<ul style="list-style-type: none"> <li>Equal Accountability</li> <li>Clear Objectives</li> <li>Prepares for complexity</li> <li>Communicating</li> <li>Clear roles</li> <li>Support collaboration input</li> <li>Quality and reliable information</li> </ul>	<ul style="list-style-type: none"> <li>Collaboration</li> <li>Alignment</li> <li>Shared Trust &amp; respect</li> </ul>
		Product & Project Service	<ul style="list-style-type: none"> <li>Working Independently</li> <li>Working &amp; Collaborating</li> <li>Coaching &amp; Mentoring</li> <li>Coaching Meetings</li> <li>Right People</li> <li>Clear</li> <li>Clear OKRs, Metrics</li> </ul>	<ul style="list-style-type: none"> <li>Team Performance</li> <li>Effective communication</li> <li>Clear messaging</li> <li>Quality &amp; efficient decision-making</li> </ul>
		<ul style="list-style-type: none"> <li>Technological Tools</li> <li>Clear Vision</li> </ul>		
		Team Culture	<ul style="list-style-type: none"> <li>Alignment</li> <li>Shared trust &amp; respect</li> <li>Effective Communication</li> </ul>	



**Federal Center South Building 1202**  
design-build team

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	Overview	High Performance	Commercial Strategies	Leadership Strategies	Logistics & Project Safety	Building Systems
Executive Summary						
Research Methodology						
Research Review						
COMPANY PROFILE						
Company and Products						
MARKET ANALYSIS						
MARKET ANALYSIS & CONSEQUENCE						
Market Overview						
Market Segmentation						
Market Size						
Market Growth						
Market Outlook						
MARKET CHALLENGES						
Market Challenges						
Market Opportunities						
MARKET TRENDS						
Market Trends						
MARKET PROJECTIONS						
Market Projections						
MARKET CONCLUSIONS						
Market Conclusions						
MARKET RECOMMENDATIONS						
Market Recommendations						
MARKET APPENDICES						
Market Appendices						
MARKET REFERENCES						
Market References						
MARKET GLOSSARY						
Market Glossary						
MARKET INDEX						
Market Index						
MARKET CONTACTS						
Market Contacts						
MARKET SUMMARY						
Market Summary						

### Test Action

On this page, the test results are presented in a table format. The table is organized into columns for the test name, test type, test status, test results, and test comments. The test results are presented in a table format, with the test name in the first column, the test type in the second column, the test status in the third column, the test results in the fourth column, and the test comments in the fifth column. The test results are presented in a table format, with the test name in the first column, the test type in the second column, the test status in the third column, the test results in the fourth column, and the test comments in the fifth column.

Test Name	Test Type	Test Status	Test Results	Test Comments
Test 1	Test 1 Type	Test 1 Status	Test 1 Results	Test 1 Comments
Test 2	Test 2 Type	Test 2 Status	Test 2 Results	Test 2 Comments
Test 3	Test 3 Type	Test 3 Status	Test 3 Results	Test 3 Comments
Test 4	Test 4 Type	Test 4 Status	Test 4 Results	Test 4 Comments
Test 5	Test 5 Type	Test 5 Status	Test 5 Results	Test 5 Comments
Test 6	Test 6 Type	Test 6 Status	Test 6 Results	Test 6 Comments
Test 7	Test 7 Type	Test 7 Status	Test 7 Results	Test 7 Comments
Test 8	Test 8 Type	Test 8 Status	Test 8 Results	Test 8 Comments
Test 9	Test 9 Type	Test 9 Status	Test 9 Results	Test 9 Comments
Test 10	Test 10 Type	Test 10 Status	Test 10 Results	Test 10 Comments

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Test Name	Test Type	Test Status	Test Results	Test Comments
Test 1	Test 1 Type	Test 1 Status	Test 1 Results	Test 1 Comments
Test 2	Test 2 Type	Test 2 Status	Test 2 Results	Test 2 Comments
Test 3	Test 3 Type	Test 3 Status	Test 3 Results	Test 3 Comments
Test 4	Test 4 Type	Test 4 Status	Test 4 Results	Test 4 Comments
Test 5	Test 5 Type	Test 5 Status	Test 5 Results	Test 5 Comments
Test 6	Test 6 Type	Test 6 Status	Test 6 Results	Test 6 Comments
Test 7	Test 7 Type	Test 7 Status	Test 7 Results	Test 7 Comments
Test 8	Test 8 Type	Test 8 Status	Test 8 Results	Test 8 Comments
Test 9	Test 9 Type	Test 9 Status	Test 9 Results	Test 9 Comments
Test 10	Test 10 Type	Test 10 Status	Test 10 Results	Test 10 Comments

# Interactive Form-Making Installation

**SALEH KALANTARI**

Washington State University

**EBRAHIM POUSTINCHI**

Washington State University

## PURPOSE

This project is an interactive art installation that explores the possibilities of real-time adaptation in design, materiality, and form. Using contemporary digital technologies, this design blurs the boundaries between designer and user. Employing a flexible mesh and a tessellated fabrication method, ROBOBBLE allows audiences to modify the installation's overall geometry, using basic methods of digital modeling such as push, pull, and soft-transformations. Audience members who interact with ROBOBBLE are able to create customized sculpted forms through the use of a simple Smartphone application, and to see the real-time results in physical space. The sculpture constantly changes based on different audience members' taste and input.

## CONTEXT

New technological and social developments are rapidly leading toward the advancement of interactive architectural structures, which promise to open new horizons in our understanding of the built environment (Fox & Kemp, 2009). The design incorporates and expands upon earlier work in which designers and researchers attempted to fabricate smart surfaces to satisfy specific movement-based behavior scenarios. In this case, however, this project is not limited to a two-dimensional surface or to specific design scenarios; it is a three-dimensional object that can be continually transformed through interactive design.

## METHOD

The basic material-technical system of the project consists of spandex fabrics covering a dandelion-like core that is made out of linear actuators. The core is a CNC milled plywood icosahedron, where each face contains an actuator that moves perpendicularly to the face. Inside of the core, the Arduino kits and servos that control the actuators are capable of receiving instructions from a design-oriented cell phone application. The end-arms of the actuators (made out of Styrofoam) create soft connections with the surrounding spandex fabric shell. The shell itself has the capacity to expand up to 2.5 times its resting size, which allows the overall geometry of the sculpture to take on a variety of forms and scales.

## OUTCOME

The aesthetic and playful side of the project belies its serious purpose in demonstrating new ways of bridging the digital and physical worlds. The use of real-time, linked digital and physical meshes expands the boundaries of the form-making medium, and has the potential to be a transformative tool in the hands of designers and artists. The use of this technology can help to merge formal studies in digital space with hands-on conceptualization in the physical world, thereby heightening the qualities and possibilities of both approaches. The design, fabrication, and installation of the project involved a forward-looking collaboration of researchers from the interior

design, architecture, and robotic-engineering fields, incorporating diverse technologies into a seamless product. Bringing these different sets of technologies together in design and fabrication reflects the future of interior space, which will increasingly integrate active human behavior with interactive form designs.

## REFERENCES

- Farahi, B. (2012). Alloplastic architecture. Master's thesis, University of Southern California, Los Angeles.
- Fox, M., & Kemp, M. (2009). Interactive architecture (Vol. 1 ). Princeton, NJ: Princeton Architectural Press.
- Probst, K., Seifried, T., Haller, M., Yasu, K., Sugimoto, M., & Inami, M. (2011 ). Move-it: Interactive sticky notes actuated by shape memory alloys. In Ext.Abs!. CHI '11, ACM (pp. 1393–1398).
- Raffle, H., Joachim, M. W., & Tichenor, J. (2003). Super cilia skin: An interactive membrane. In CHI '03, Extended Abstracts on Human Factors in Computing Systems (pp. 808–809). Ft. Lauderdale, FL: PUBLISHER.

# INTERACTIVE FORM-MAKING INSTALLATION

## Purpose

ROBOBBLE is an interactive art installation that explores the possibilities of real-time adaptation in design, materiality, and form. Using contemporary digital technologies, ROBOBBLE blurs the boundaries between designer and user. Employing a flexible mesh and a tessellated fabrication method, ROBOBBLE allows audiences to modify the installation's overall geometry, using basic methods of digital modeling such as push, pull, and soft-transformations. Audience members who interact with ROBOBBLE are able to create customized sculpted forms through the use of a simple Smartphone application, and to see the real-time results in physical space. The sculpture constantly changes based on different audience members' taste and input.



## Context

New technological and social developments are rapidly leading toward the advancement of interactive architectural structures, which promise to open new horizons in our understanding of the built environment (Fox & Kemp, 2009). The design of ROBOBBLE incorporates and expands upon earlier work in which designers and researchers attempted to fabricate smart surfaces to satisfy specific movement-based behavior scenarios (Probst et al., 2011; Farahi, 2012; Raffle, 2013). In this case, however, ROBOBBLE is not limited to a two-dimensional surface or to specific design scenarios; it is a three-dimensional object that can be continually transformed through interactive design.

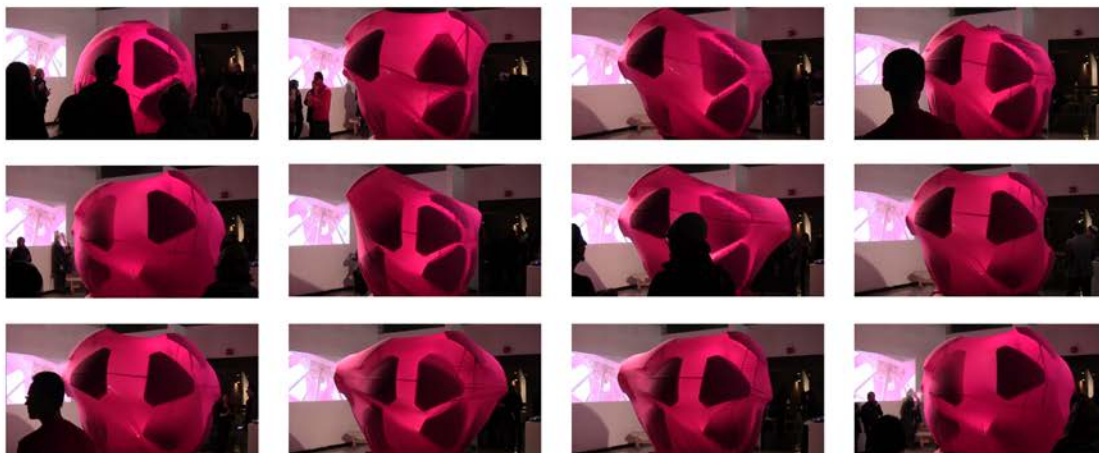
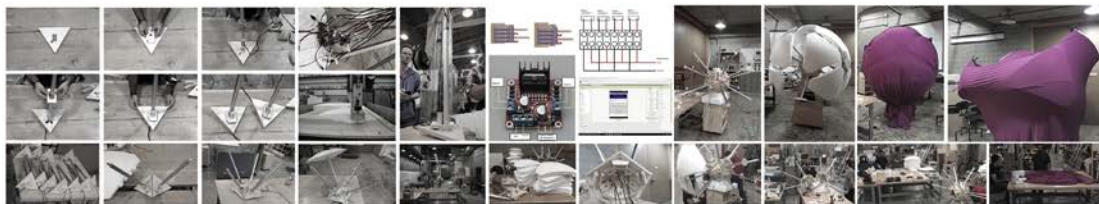
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**PROJECTS FROM THE 2016 ASSOCIATION OF COLLEGIATE SCHOOLS OF ARCHITECTURE  
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