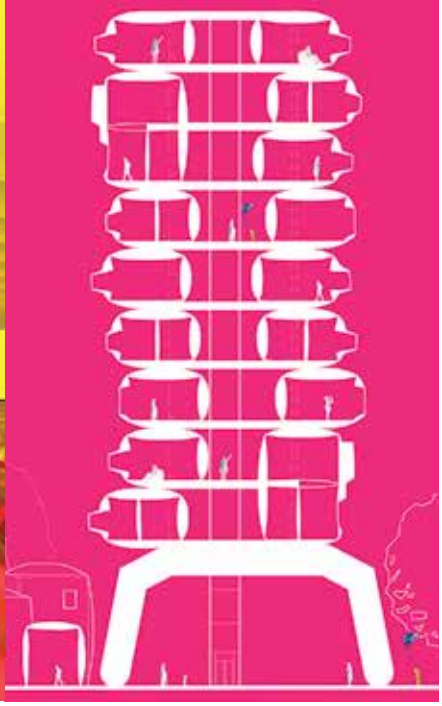
Amazingly Affordable

The winning projects in the 19th annual Steel Design Student Competition rethink affordable housing.



SIXTEEN EXCEPTIONAL STUDENT DESIGN PROJECTS have been recognized as winners in the 19th annual Steel Design Student Competition for the 2017-2018 academic year. Administered by the Association of Collegiate Schools of Architecture (ACSA) and sponsored by AISC, the competition encourages architecture students from across North America to explore the many functional and aesthetic uses for steel in design and construction. A total of $14,000 in cash prizes was awarded to the winning students and their faculty sponsors.

More than 900 students and faculty participated in this year's competition, and more than 300 entries were submitted. Students participated in one of two categories. The Affordable Housing category challenged students to design affordable multi-family housing in an urban context. In the Open category, students were given the flexibility to select a site and building program.

The jurors for the affordable housing category were Margaret Griffin, Griffin Enright Architects & Southern California Institute of Architecture; Hans C. Herrmann, Mississippi State University; and Joanna Zhang, Skidmore Owings & Merrill. The jurors for the open category were Diogo Burnay, Dalhousie University; Ming Hu, University of Maryland; Elizabeth Martin-Malikian, Kennesaw State University.

The selected projects will be on view at the 107th ACSA Annual Meeting, March 28-30 in Pittsburgh and at the 2019 NASCC: The Steel Conference, April 3-5 in St. Louis (see **www.aisc.org/nascc** for more information). You can get more information and see more renderings of all the winners at **www.acsa-arch.org**.

WINNERS: CATEGORY I – AFFORDABLE HOUSING

First Place **Balloonité**

Students: Austin Vandepoll and Nathalie Altamirano, University of North Carolina at Charlotte
Faculty Sponsor: Marc Anthony Manack

Charlotte, North Carolina's "Leading on Opportunity Task Force Report" (**www.leadingonopportunity.org**) identifies strategies to mitigate the city's perceived lack of upward mobility. Key to the strategy's success is developing housing that does not overburden residents in terms of cost and also allows a variety of people to stay in established neighborhoods. Balloonité addresses this urgent need for affordable housing with a vivid and experimental architectural response.

The project seeks to re-animate the architectural approach of Le Corbusier's Unité d'Habitation through the use of inflatable steel technology. While most inflated steel experiments have been rendered as small objects and intimate installations, they have revealed the technology's capacity to produce thin-shelled, strong and rapidly deployable structures. From the housing unit to the structural frame and shell, Balloonité capitalizes on the potential of this technology at various scales within the project.

Inflated steel works as a relatively simple procedure. First, two 18-gauge steel sheets are cut into a desired shape. Next, edges and seams are welded together, making sure to keep the blowhole open. Lastly, 90-psi air is pumped into the cavity. Extrapolated as a modular building system, the time-saving prefabrication, coupled with the material efficiency of the Balloonité components, results in tremendous construction cost savings. Given that structural steel is already highly recycled and recyclable and has a long life cycle, and also that project's construction is very low-maintenance, Balloonité a truly sustainable approach, one that can help bring life, creativity and innovation to a rapidly growing city. The project's aesthetic appeal could help Charlotte move past the affordable housing stigma of "not in my backyard" and push culture forward in the way people think about affordable housing—as well as help rethink modern social housing projects in a fresh, eclectic and humane way.

WINNERS: CATEGORY I – AFFORDABLE HOUSING

Second Place **The Beta Commune**

Student: Cera Yeo, California College of the Arts
Faculty Sponsors: Christopher Falliers and Antje K. Steinmuller

San Francisco has long been seen as a creative, bohemian haven. However, the growing influx of tech workers into the city has generated conflict due to displacement of the former residents, making the need for more affordable housing options for artists greater than ever. The Beta Commune tackles this by offering communal living for both groups.

The formal design was developed via case studies of clustering systems for housing, such as Moshe Safie's Habitat 67 and Kisho Kurokawa's Capsule Tower. But instead of the concrete structures explired by those projects, the Beta Commune introduces an innovative use of steel.

The Beta Commune is structured to hold communal spaces with individual room units. Five types of minimalist units will plug into a steel frame, with long-span trusses running throughout the communal spaces. These trusses then hold up cantilevering plug-in units on perpendicular sides of the building. The steel structure forms large, open spaces that are sectionally divided. A 5-ft difference produces visual boundaries for social spaces that occur within the clusters. There are a total of 90 units that range from 200 sq. ft to 400 sq. ft, housing a total of 148 residents (some units can hold two inhabitants).

The units are constructed with insulated steel panels. Panelization can be factory-built, with insulation and electrical embedded, a method that allows the plug-in units to be built with a high degree of precision, ultimately leading to less work on the site.

The communal spaces include routine areas such as living, dining and kitchen spaces, and the ground floor holds a social space for the community to interact with residents. The abstract exterior cladding tucks away the life of the building and relates

Third Place **Pressing Matters of Affordability**

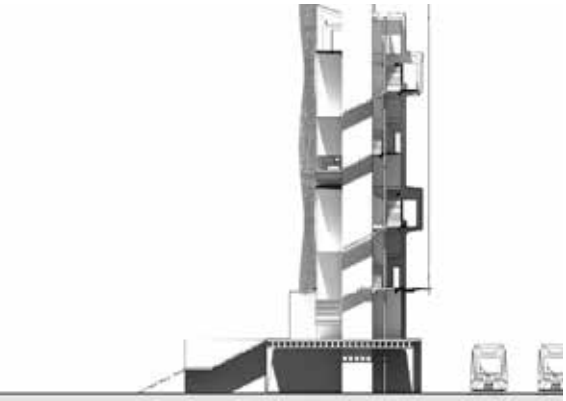
Students: Arturo Lujan, Pedro Pinera-Rodriguez and Ryan Smith, University of North Carolina at Charlotte
Faculty Sponsors: Peter L. Wong and Christopher Jarrett

The strength of modern structural steel supports both the aesthetic and functional attributes required of buildings. In the early years of structural steel, the development of modern structural analysis and the advent of industrial standards helped anchor the use of steel framing as a kit-of-parts for a structure that was regular, repetitive and rational. The frame expressed a system, a universalizing order that shaped the quality and memory of contemporary building space.

Today, steel can be used in more specific and singular ways in construction. As architects and engineers can now accommodate more complex program arrangements, steel framing systems have become even more innovative, challenging and fun. Steel is now called upon to balance the individualized and often dramatic relationships in new and complex building configurations. We can cite OMA's use of a 100-ft-long double-wide-flange strut reaching to support the diagrid envelope at the Seattle Public Library as an example of the unique and powerful use of steel.

Our proposal for an affordable housing complex in a former industrial zone seeks to shift from the heroic use of steel to a softer, smoother state. We propose that pressure-forming metal via stamping and tooling processes can advance steel as a more subtle and seamless alternative to tectonic techniques. Sheet materials offer sophisticated shaping opportunities, demand lower energy use and provide lateral resistance due to their planar and stress-skinned capabilities. In order to test these techniques, we imagine this design as an innovative use of blanking, stamping, drawing and piercing methods common to automotive and other industrial

to protrusions generated by modern bay windows that will coexist peacefully with the urban fabric of the neighborhood. The Beta Commune has the potential to be recreated at larger scales and using the same steel fabrication method.



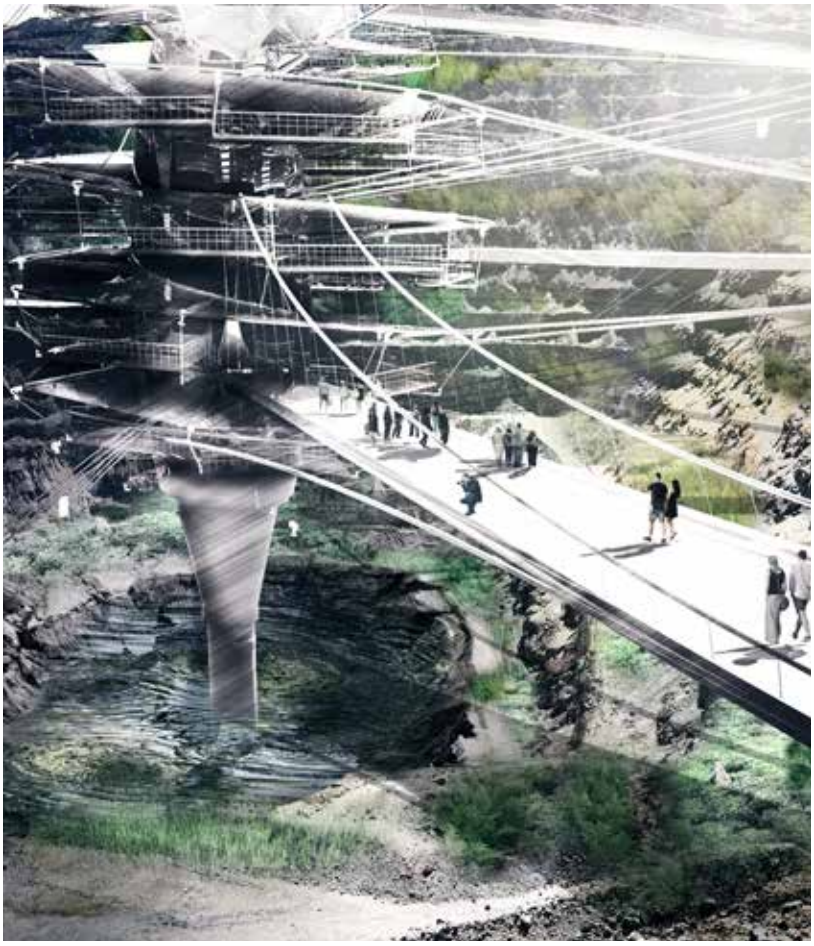
manufacturing. A series of customized unitized frames function as vertical supports running the length of the building, while a system of double-layered, stress-skinned floor plates comprises the horizontal structure. Lateral support is afforded by external skins and panels serving both structural and shading roles.

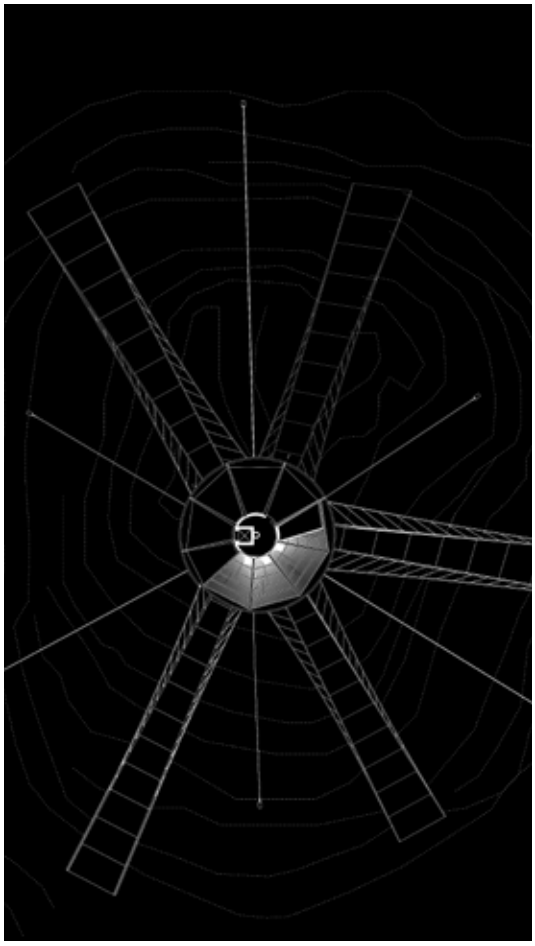
Pressing serves as an activity for the smoothness of this reconsidered technology. It also imagines the bumpy yet urgent matter of housing opportunity in urban areas of gentrification.

WINNERS: CATEGORY II – OPEN

First Place UPROOT
Student: Tatiana Estrina, Ryerson University
Faculty Sponsor: Vincent Hui

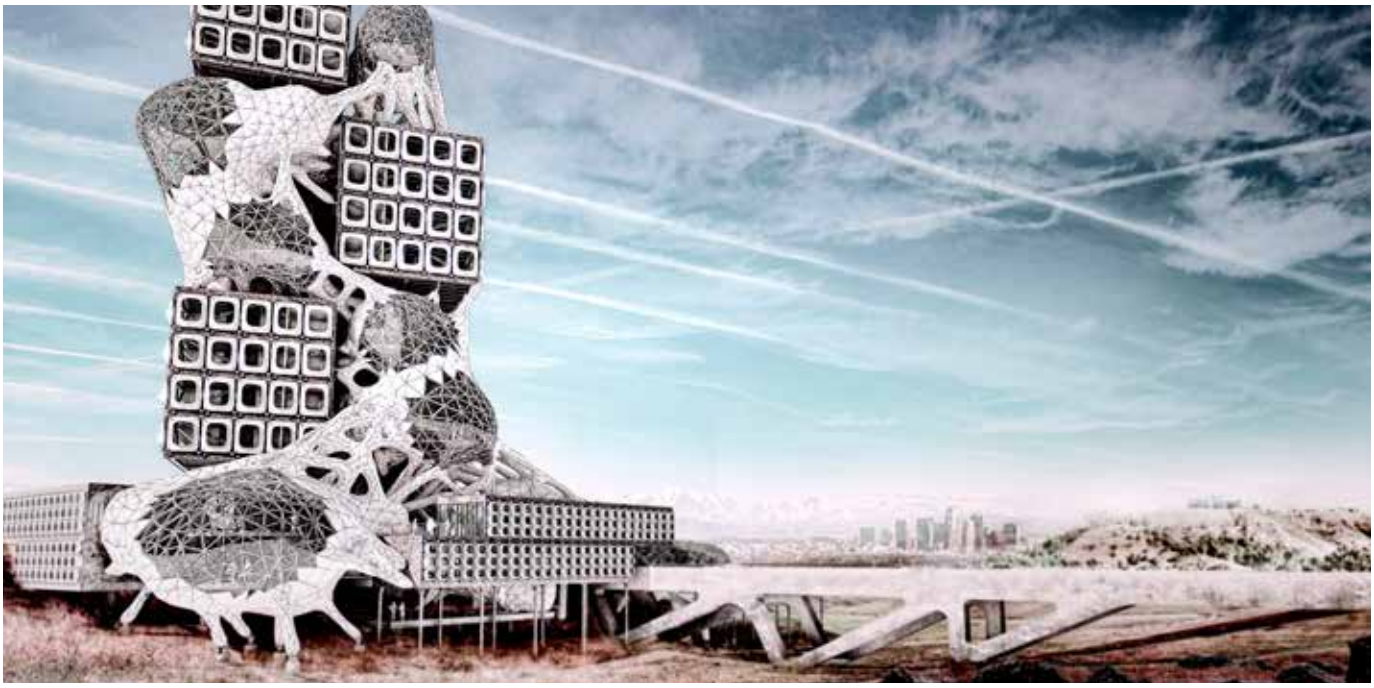
In Northern Ontario, open-pit mining is frequently used to extract minerals such as gold and diamonds. However, when the mine closes, the area is often left empty while the miners' families face unemployment and uncertainty. In anticipation of the closure of several Ontario's mines, UPROOT provides a structure with an alternative use for these areas. UPROOT calls for the redevelopment of open-pit mines into terraced community farmland, offering new possibilities for its use after closure. It provides a sustainable solution to global environmental concerns regarding abandoned mines and also creates new opportunities in response to Ontario laws requiring the mining industry to take responsibility for regenerating an area after its natural resources are depleted. The design itself acts as a linkage within the pit as well as reestablishes the relationship between towns and their local food production. By taking advantage of structural steel's strength under tension, UPROOT becomes a suspended hub for agricultural and social activities.





WINNERS: CATEGORY II – OPEN

Second Place **Contagion**
Student: Tyler Armstrong, California Polytechnic State University
Faculty Sponsor: Margarida Yin



There is an open wound that festers within the fabric of Los Angeles. Exposed by the economic forces that once served to stitch the region together, the Inglewood Oil Field is one of the few visible reminders of a resource that was in many ways the genesis of modern Southern California. This resource? Black gold, aka oil. As the British historian Reyner Banham once stated, "Los Angeles floats on an ocean of oil." But over the course of decades, this ocean has been steadily drained to fuel the urbanism-on-overdrive that has spread across the surface of the region. Contagion seeks to speculate upon not just the future of the Inglewood Oil Field but also upon the very nature of Los Angeles' continued relationship with fossil fuels. The project explores the notions of a deferred authorship through computational design, architectural succession within the landscape of Los Angeles and the built form as a kind of cultural layer cake.

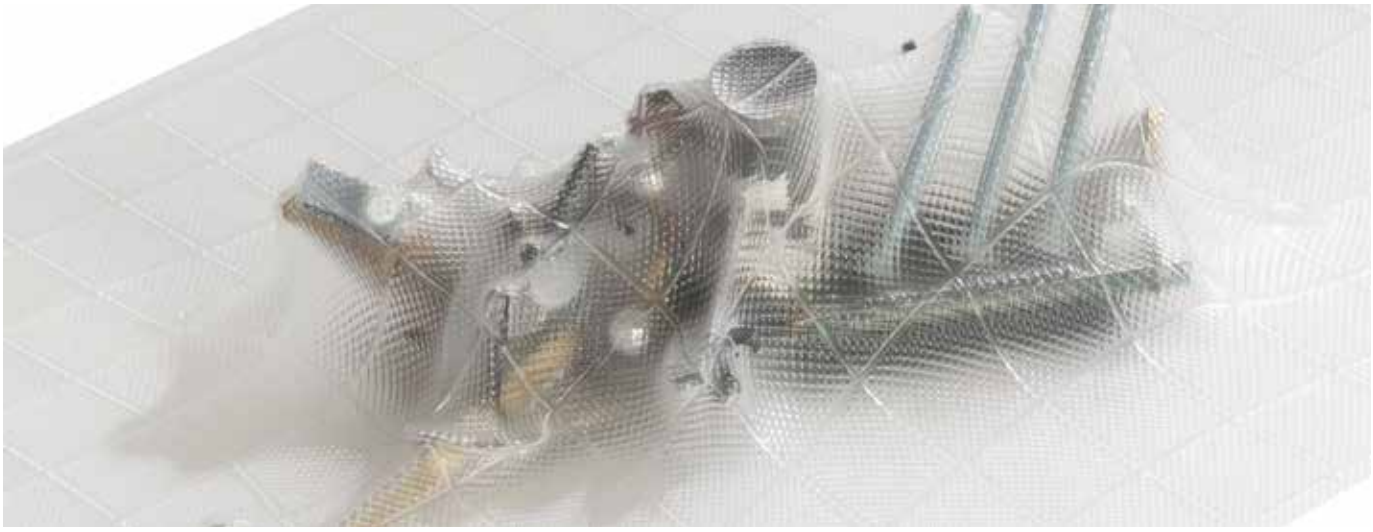
The idea of a deferment of authorship was formulated in response to the architecturally spontaneous nature of Southern California. The fluid forms are a result of a generative algorithm that uses swarming logics to simulate the growth of moss-like blob structures over rigid boxes. The next design driver, architectural succession, is tied to the rather linear nature of Southern California development, from virgin landscapes to resource extraction and finally to a kind of decentralized urbanism in which the land is carved up between numerous areas of dense wealth and sprawling poverty. This issue of the social and economic fragmenting of Los Angeles through architectural means is simultaneously accepted and rejected by the project, which possesses elements both freshly written and half-erased by time.

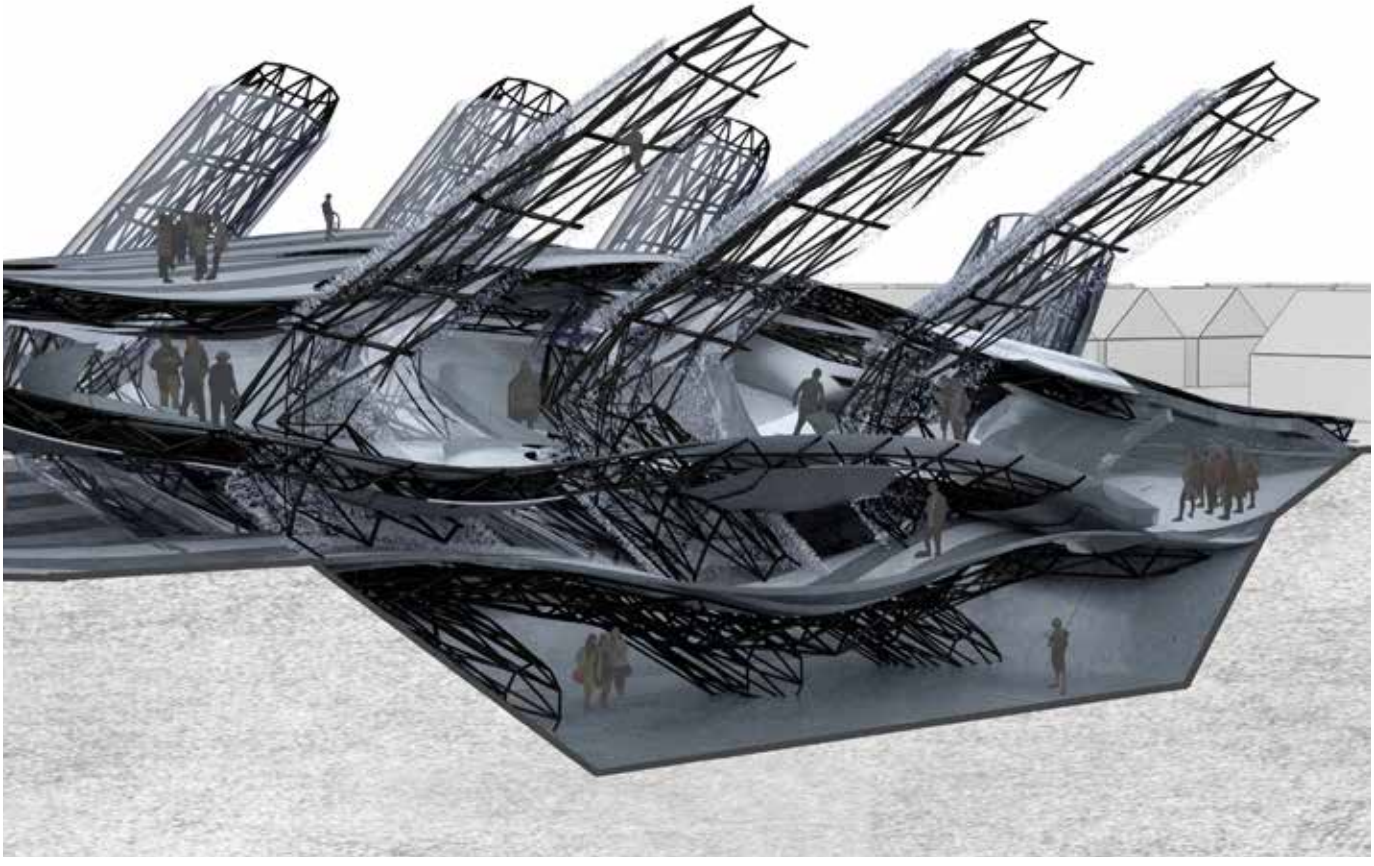
Third Place **Exocarpic Interceptor**

Students: Stephen Breaux and Cutler Price, California Polytechnic State University
Faculty Sponsor: Thomas Fowler

The skyline of Detroit was once defined by the endless valleys and peaks of the gables of single-family homes, punctuated by the occasional mid-rise factory or exhaust tower and its endless trail of vapor fading into the sky. Today, this skyline has eroded, the once constant landscape of gables has become sparse, many mid-rises are in mid-collapse and the vapors all but evaporated.

Our project introduces a new industry to revitalize Detroit through hyper-efficient vertical farming towers. The farming tower, whose verticality harkens to the prosperity of a younger Detroit, creates a new industry on a sustainable foundation for future generations to rely upon. Just as the economic viability of the towers impacts the social fabric of the city, the structures interpolate the topography of the site, generating spaces in which community vitality can gather and flourish around the new industry of the city.





HONORABLE MENTION: CATEGORY I – AFFORDABLE HOUSING

Affordable Housing
Students: Alnaim Ahmad and Anas Mahjoob,
University of Colorado Denver
Faculty Sponsor: Osman Attmann

The goal of our affordable housing design is to have a building that is able to adjust to social, economic, cultural, political, environmental, ecological and physical changes throughout time, regardless of where it is placed within a city. At the same time, we also want to create some sort of continuity in all aspects of the project—the concept, envelope, structure, materiality and program as well. In this spirit of continuity, steel is woven throughout the project as a folded ribbon of sorts.

The site is in downtown Denver, the main financial, commercial and entertainment district for the city, and is bounded by the 16th Street Mall, the area's primary corridor and an important transit connector for locals and visitors to the region. It is also located next to a light rail station and close to multiple bus stops, thus enhancing accessibility to the site.

Margin
Student: Kengo Kawagashira, Texas A&M University
Faculty Sponsor: Ahmed K. Ali

From ancient times to now, human beings have always found ways to adapt to their immediate environment. No matter the shape of the physical environment, we seek to manipulate the boundaries around us. For example, in Austin, Texas, there are throngs of musicians who play at the "margins" of buildings and engage with the public. The same can be said for those enjoying activities on the river, in the grass and in the parks around town. These people are released from their fixed atmospheres and can enjoy a freeing self-defined life.

These moments should also be found within architecture. In architecture that contains "margins," people would actively help to create their own suitable space. In other words, this is open-ended architecture, with the idea that people have the right to decide the future of their own built environments. This seems to be an extremely necessary form of architecture in the current world, where numerous types of lifestyles and values are coming to the forefront.

This creates a compelling opportunity for affordable housing. In a residential unit that contains only three or four walls, residents could be released from a fixed atmosphere and create a space that works for them. In turn, the total cost of the building would decrease due to the small number of components. Additionally, where the "margin" and "void" meet, there would be great spaces for tenants' hobbies like playing musical instruments, singing, reading books, taking a nap and so on. In this open-ended architecture, people would live in a space of their own margins and populated by the activities they partake in.

Interstitial Fabric

Students: Stephanie Kortman, Kirk Paisley and Alin Codreanu, Lawrence Technological University
Faculty Sponsor: Scott Gerald Shall

Housing as currently constructed is not sustainable. Consider that housing sizes are averaging the largest in history and mortgage costs are reaching 50% of the average income. On top of that, our skilled labor force is limited while building materials and energy are dwindling. In response, the Airscraper proposes an urban architecture that focuses on adaptable multi-generational housing within a parametric steel envelope crafted to enhance the quality of life.

Although Airscrapers can be of value in any setting, the designers chose Pittsburgh as the site for the first version due to mapping of steel manufacturing plants and pollution zones. This approach was combined with an overlap of existing zones of affordable housing to locate the project so as to not reinforce the cycle of poverty.

The formal shape of the building was determined through rigorous wind tests, defining wind eddies that funnel polluted air into exterior and interior air gardens located throughout the structure. The interior air garden housed in the double-skin facade cleans the air of toxins, allowing residents to open their windows to newly fresh air.

Units are crafted to adapt to the ever-changing family makeups and allow aging-in-place in the most efficient footprint at each life phase, thus maximizing the usage of residential program space.

To keep steel manufacturing efficient and cost-effective, we have taken an iterative approach using parametric software to produce a solution with a reduced amount of unique steel shapes. Our diagrid system on the perimeter of the building, coupled with vertical columns inside the core, achieved our goal.

Through adaptability and efficiency, we are able to keep the cost of the base project elements down while investing the remaining available resources back into the occupants.

The Void

Student: Adan Ramos, University of Maryland
Faculty Sponsor: Peter Noonan

An architect cannot create community, but The Void can help cultivate it. Located in Southwest Baltimore on West Baltimore Street, the site is a key piece to the revitalization of the area. Reaching out to the University of Maryland Bio Park and downtown to its northeast and James McHenry Elementary and residential community to its southwest, The Void is at a key intersection in the urban fabric of the city. Using growing, cooking and eating food as a catalyst, The Void seeks to turn vacancy into vibrancy.

The building's public spaces include a courtyard, grand stair, greenhouse, outdoor food vendors, teaching kitchens, restaurants and retail spaces. To facilitate social interaction among residents, access to shared kitchens, balconies, a gym and other common spaces was incorporated.

The facades on this courtyard building use a weathering steel skin on outward-facing elevations and expose steel framing on inward-facing elevations to represent a need to look past the facade of the neighborhood and find the community within. Through this articulation and the theme of growth, The Void represents the intangible human potential of Baltimore.

The large retail acts as a "food lab" featuring a greenhouse, teaching kitchens and food stands. This was inspired by the food desert designation of the site as well as its proximity to an elementary school and a higher education science facility.

Additionally, the residential program features shared kitchens on each floor, allowing for the kitchens in the units to be slightly smaller and providing social opportunities. Lastly, the second-floor outdoor public space doubles the amount of storefront area for the retail program while allowing light to enter the center of the retail space on the first floor. These three program augmentations help to cultivate community in this disinvested Baltimore neighborhood.

HONORABLE MENTION: CATEGORY I – AFFORDABLE HOUSING

118 Main Street Revival
Student: Shane Powers, Virginia Tech
Faculty Sponsor: Heinrich Schnoedt

There exists an opportunity to introduce a new architecture to the downtown community in order to support Blacksburg, Virginia's estimated growth of 5,000 Virginia Tech students by 2020. What currently exists as a mostly vacant city block hosting the local U.S. Postal Service is to be repurposed as a residential mid-rise tower and commercial/retail center, though the post office shell must be retained for historic preservation purposes.

Morphologically driven by infill constraints of structures and easements within proximity, the building footprint is sensitive both to its low-lying neighbors and adjacent streetscapes. Typologically, the building is a series of cantilevered floor plates synchronized around a collection of rigid "outdoor" circulation cores. Steel and masonry are the primary building materials, though the brickwork is predominantly a tribute to the existing downtown vernacular. Heavy emphasis was placed on revealing the building's structure and program rather than concealing it, as well as on the architecture's ability to connect people to each other and the outdoors.

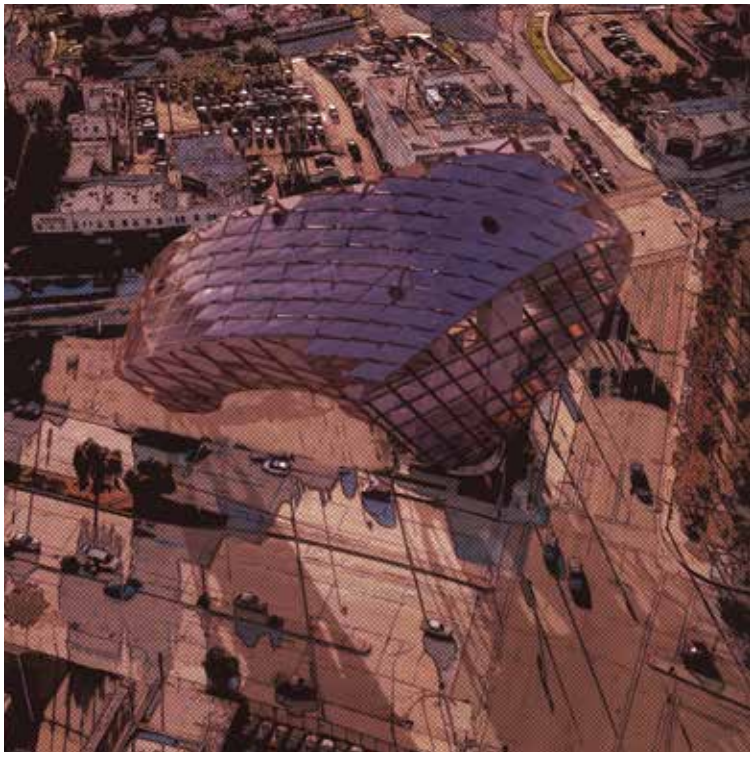
The Sheath
Students: Ariel Adhidevara and Saul Serrano, Diablo Valley College
Faculty Sponsor: Daniel Abbott

This is a tower whose modus operandi is layering. The structure's living, circulation and public spaces are all components of this concept. Within the structural layers, the tower employs a double-diagrid that eliminates the function of the concrete core. By doing so, we open up space for a vertical atrium.

The project is a residential tower with 22 micro-units, 19 medium-size units and five luxury units. Between these various programs are sky lobbies. The tower also includes a base with a lobby, retail space and a public roof garden/atrium to enjoy the city.

HONORABLE MENTION: CATEGORY II – OPEN

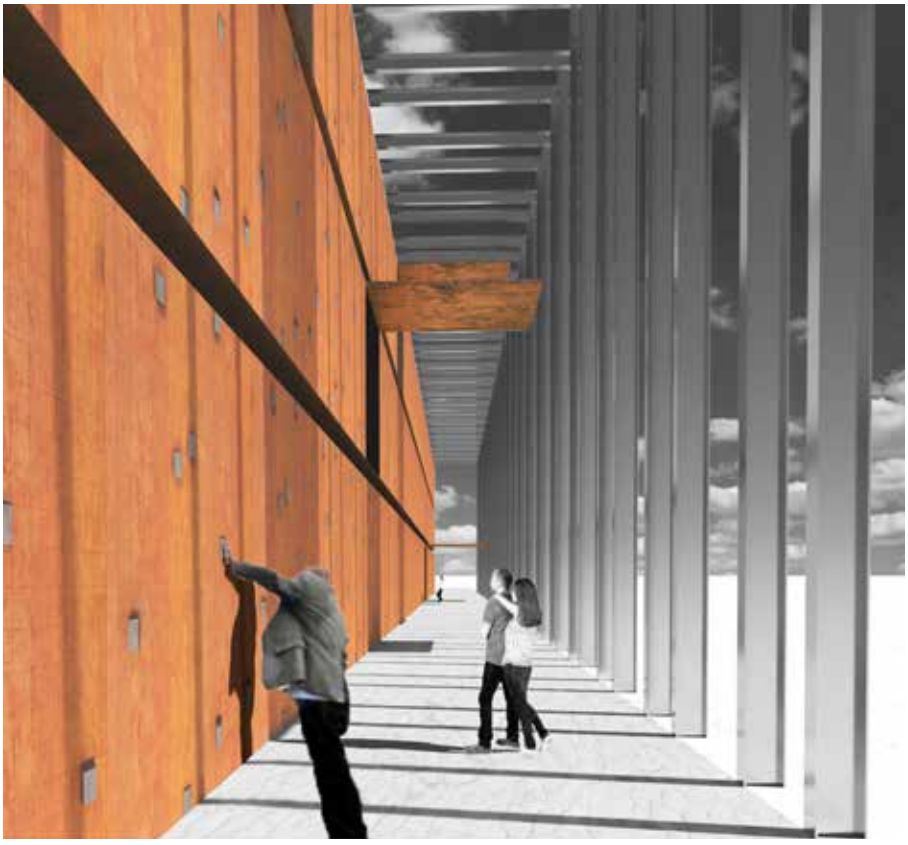
The Silhouette: Kara Walker's Art Museum
Students: Jesse Gomez and Hanshi Li,
Woodbury University
Faculty Sponsor: Duane McLemore



The steel structure for the Silhouette is orientated around the skin, according to the same solar angle that creates its form. The steel tubes have multiple functions, including acting as light tubes, forming the main structure and facilitating escalator travel through the building. And twice a year, the light tubes are in perfect align with the sun and cast a spotlight in the center of the shadows. In addition to these light tubes, a steel grid on the skin of the building also acts as the structural system. The project is a cultural response to the neighborhood, introducing Kara Walker as the main artist.

The ground level conveys the overall spatial requirements of the building, site and strategy for how people enter the building. The fourth level is where the program is broken down into each individual space, but also allows for public and private circulation.

The project acts as a giant showcase in the middle of a park, where it will attract visitors and welcome them to the neighborhood. Not only does it interact with the park, but it also and acts as an extension of it since the entire ground level and sunken sculpture garden are essentially woven into it.



Storing Memories
Student: John Harlan, University of Illinois, Urbana-Champaign
Faculty Sponsor: Erik M. Hemingway

Taking advantage of the rise in the self-storage industry, Storing Memories is a U.S. infrastructure project designed for the American Southwest. Rather than sprawling across the horizontal ground plane, this storage center is a three-level steel wall that has the capacity for expansion. A single storage unit is an 18-ft by 18-ft by 18-ft weathering steel module. Each module is connected to a rigid frame and can be rented out to the public. Weathering steel was selected for its capacity to express the passage of time while ensuring the security of the modules' contents. The Storage Wall can be expanded infinitely as geography allows. In Storing Memories, the public can invest in the future.

HONORABLE MENTION: CATEGORY II – OPEN

The Coney Express

Students: Dana Cameron and Zhi Mankin, California Polytechnic State University
Faculty Sponsor: Thomas Fowler, IV

Passengers of the Coney Express can travel from station to station, enjoying exciting features and events that are unique to each one. This fosters a sense of community identity and pride while simultaneously inviting non-local residents to engage in events across Detroit.

While the system's humongous, steel-framed and ETFE-clad buses house eclectic programs from speakeasies, restaurants, crop storage facilities and more, the immobile parts of the system aim to provide a supportive "docking" space for these programs.

The bus stations will be strategically placed on vacant lots around Detroit, addressing the city's issue of urban blight. By locating the stations in areas with increased property abandonment, we will create a network of community strongholds and begin to repair Detroit's urban fabric. In Hamtramck specifically, we aim to attract citizens to the bus station to promote the area's blooming multicultural integration and introduce people to its preciously odd offering of eateries, shops and traditions.

Imagine walking into Hamtramck's Coney Express station with the intent of jumping on a bus to go across town. You take the escalator from the front, lifting you into the main floor. You are immediately drawn to the kiosk for tickets, but you find there is an anathema of wild activity happening all around you in this greater, open space. You can see three buses stationed on their hydraulic jacks. One of them is blasting homemade funk music and spilling neon lights from its rear. One worker allows travelers to board the bus, and then slaps the door affectionately as the bus lowers itself through the void in the floor and rolls away, resolutely on its way to the next station. You turn around to see the restaurant bus, which looks like it's being rented by the local sausage factory for a promotion; chefs, kids, workers and gardeners all pour out with delicious samples of Hamtramck sausages. From the roof above, a troublemaking kid on a field trip drops an onion through the elevator shaft and it lands next to you with a thud. You glance up to wave your fist but are instead shocked by the realization that there is an expanse of urban farming plots up there! You've always been curious about how to grow your own food, so you push the button on the sausage bus and board, waiting eagerly for the bus to ascend.

These buses and their stations use a double-layered ETFE pillow cladding system, which invites diffused light into the spaces while adding an insulation zone between the inside and the harsh winter environment. On pleasant days, voids in the roof and second floor created by the bus elevator cores may be kept open for stack ventilation and flush-cooling.

The structural nature of the Coney Express is based on local industrial steel vernacular but adds a secondary cladding system holding the diamond-gridded pillows of ETFE in place. We further celebrate the industrial motif with exposed castellated beams supporting the double-story roof space and custom-built hydraulic jacks that elevate the buses.

Dynamic Force on Context Student: Guanzhou Ji, University of Washington Faculty Sponsor: Wyn Bielaska

Our project, Glass School, is located in the Uptown area of Seattle. The school will feature a large working hot shop with an audience chamber and will employ a huge chimney for the shop's ventilation. It will also accommodate cold-working shops and a large mock-up space for large-scale projects. It will include two galleries, a black box and a natural light-filled space, as well as back-of-house areas at each gallery for assembly and repairs. There will be six studio apartments for the visiting artists and their teams. An outdoor space for glass casting and display will serve as a third gallery space. Retail space and a small café will complete the facility.

Diagonal lines define the spaces, including the chimney, which reaches out as a landmark to convey the image of a gateway or anchor rather than being hidden inside the building. The design incorporates a steel truss as the main support frame to create the open and flexible interior space and also displays the building's materiality on the facades. ■