Portfolio Personal Statement

I am an aspiring Architect and urban designer. My portfolio showcases my ability to think across multiple scales and to investigate details deeply. The selected works transition from large programs, to organized systems thinking, to experiential design, and finally to building systems. The first few projects display works close to what I hope to do in the future. The latter show that I am able to put together technical and design thinking, a unique skill that creates innovative and lasting design. I am interested in pursuing both urban and architectural-scale design centered on people and the planet.

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As our cities rapidly grow and resources decline, housing models need to be rethought. How will we fit and accommodate waves of new people, keeping it affordable and comfortable to live in?

Ruthven Hills responds to questions of urbanization, novel housing models, affordability and inclusivity, a cooperative housing complex responding to the contextual opportunities and issues in Polish Hill, Pittsburgh. The project reaches the needs of a 2000 Watt society framework, where an individual’s carbon footprint does not exceed certain thresholds. Composed of multiple flexible unit types, it is designed consciously for the demographic makeup of Polish Hill and its neighboring districts.

THIS PROJECT WAS FEATURED IN THE 2021 CMU SOA EX-CHANGE PUBLICATION.
The project site is an important node intersecting three neighborhoods, zoned for transit-oriented development, and offering a beautiful post-industrial landscape view. The neighborhood has few commercial spaces, few green spaces, and no grocery stores. We took advantage of these factors to create a multi-purpose and high-development complex.
The project was treated as an urban village condition wrapping around a semi-public courtyard with four main elements: private dwelling spaces, communal areas, activated circulation, and public garden terraces. The typical apartment hallway was rethought to be a living room and winter garden for all residents, integrated with activity pockets like work pods, laundry rooms, communal kitchens, and indoor farms. This fosters an environment of chance encounters, resource sharing, and collaboration.
This systems diagram shows how the self-sustaining building circulates reproductive and productive labor. Productive labor, labor that produces capital, is supported by micropilot stall, work pods, energy-generating solar panels, and a rain garden producing organic food. Capital can be invested into building maintenance and community programs. Reproductive labor, labor for domestic work, through food growing and daily chores provides for the commune and creates kinship amongst residents.
Walk from upper Polsh Hill  

Building & courtyard entry  

Birdseye of ribbon roof & communal terraces  

Winter garden on North side
Each apartment type is designed to have flexible layout options and multi-use furniture to fit different household makeups and living situations. For example, Polish Hill has many visiting artists. In a Combo Apartment, an artist could use the room as a bedroom and bigger space as a studio, which also faces the balcony, getting great views and interaction with neighbors.
This project explores the urban solar energy transition from multiple scales and perspectives. My work encompasses the creation of an Urban Performance Method, data analysis through ARCGIS and mapping, community engagement through community meetings and feedback, experiential explorations of solar installation forms, and systems thinking to showcase the holistic world of solar energy from a designer’s angle.

The Available-Viable-Preferred (AVP) Method is a universal guide to find the best possible places for large-scale energy generation. The framework starts with mainly computer analysis, considering factors such as sun availability and space types. To move on to “preferred” locations, priorities inspired by and cocreated with community representatives were speculated. The AVP Process is one where computational findings are refined and challenged by the grounding truths of community input.
NEIGHBORHOOD CASE STUDIES

To create a universal guide translatable to all cities, the studio used three Pittsburgh neighborhoods and one borough outside the city as proof-of-concept test sites. Through three community meetings with neighborhood representatives, we were able to refine our findings and give key recommendations for installing solar in their community.

This is an example of applying the Available-Viable-Preferred Framework to the borough of Etna.

Key Recommendations

Open Spaces

Etna is developing walking trails along Pine Creek and the Riverfront that could integrate with solar installations. Artful technologies can make these trails more enjoyable overall by providing shading, rain protection, wayfinding, and safety.

Large Buildings

Because Etna’s commercial activity is aligned along Butler Street, solarizing the large buildings there would create a clearly visible and emblematic solar cluster. Doing so can provide on-site energy generation, shading and rain protection for building roof activities, and open up other areas such as rooftop community gardens.

Green Areas

Solarizing all of Etna’s parking lots could cover 40% of its energy demand annually.
How much of the city’s energy use can be covered with solar energy? What spaces offer the most viable energy generation? These are the questions the AVP Method explores.

This is an example of applying the Available-Viable-Preferred Framework to the city of Pittsburgh. Because of the lack of community representation throughout the whole city, the “preferred” locations could not be found but only estimated using our existing data and information.

Using a predictor that 10% of viable areas would be preferable for solar implementation to a community (Predictor comes from 4 neighborhood case studies)
SOLAR TREE NURSERY
This project done with Ammar Hassonjee explores the intersection of energy generation and ecological restoration. Designed to be installed along Pittsburgh’s highly unmaintained Hazelwood Greenway, Solar Trees is a network of mirror lens and PVs to clear invasive plants with heat, nurture a plant seedling to repopulate the site with healthy trees, while collecting solar energy. The energy harvested lights up the installations at night and is fed back into the grid for the surrounding community’s use.

1. Invasive vines and plants introduced on the site
2. They latch onto surrounding surfaces and climb up
3. Vines form a dense mat and smother native plants
THE WORLD OF SOLAR
When thinking of “going solar”, people usually imagine solar panels slapped over buildings or isolated land areas for maximum efficiency and low visibility. This personal initiative project seeks to expand the world of solar by visually documenting relationships between solar technology opportunities and other commonly considered factors, including budget, efficiency, and lifespan. The pieces are moveable so that anyone hoping to install solar can learn about solar technology options, its capabilities and co-benefits.
UNEARTHED is an award-winning, net zero, affordable and structurally simple prototype for portable urban farming campuses, a “proof of concept” design in Hazelwood Green, Pittsburgh.

Designed for the non-profit organization Center of Life, it is the trial run model of a future campus serving as a learning, job-training, research, event, business and farmer’s market space. The modularity of the project makes it adaptable to other locations, promoting urban farming practices, providing public amenities and involving community participation.

The campus integrated passive ventilation techniques, optimized building form to capture winter sun and expel summer heat, and solar panel roofs to create a self-sustaining energy system. Furthermore, rainwater was collected from rooftops for crop watering, drip irrigation on the building facade, and potable water use.

Because of this project, I am able to design dynamic structures for the ever-changing built environment.

THIS PROJECT WAS AWARDED THE 2021 PAYETTE PRIZE IN BUILDING SCIENCE.
STRATEGIES TO NET ZERO

Challenges with temporality and energy efficiency led to the question of how to incorporate passive design techniques into the movable parts. One method was using daylighting and thermal zone simulations to find the greenhouse form as well as window sizes and placements. The project was meant to be built with Grownspan structural elements, so the shape was as simple as possible. EUI simulations were used to determine the most efficient angles for the greenhouse. Daylight and thermal simulations were used to figure out window to wall ratios and shading devices.

The second way was through improving material and assembly. For the greenhouse, high-performance insulation was achieved using phase-change material in the wall and roof, and polycarbonate for glazing rather than glass. Furthermore, the structure attaches to the ground with ground screws to prevent leaving a big footprint on the site.
04. Weatherization Kit

Pittsburgh, PA
Freedom by Design CMU Chapter
2018 - present
Project Contributions: Design Collaborator, Public Relations Co-Chair

In the winter, 66% of Pittsburgh families have to decide between paying rent and energy bills. This project addresses that by offering free insulating materials to lower income Pittsburgh families, suitable for both renters and homeowners.

My role was in researching and finding manageable and packable insulating materials, such as weatherstripping and window plastic. Later, I co-headed the annual distribution workshop, where we met community members and taught them how to install the weatherizing materials. Through this project, I learned that sustainable design is a relational and life-changing field, having the power to address issues of social equity and community well-being.

THIS PROJECT WAS AWARDED THE
FOUNDER’S CHOICE FBD TOP 15 (2019),
NOMA SEED AWARD (2020), AND
FEATURED IN THE AIAS GRASSROOTS
CONFERENCE IN DC.

SUPPLEMENTAL INSTRUCTION BOOKLET

Do not cut or tamper with any wires on the duplex receptacle.
Do not insert screws or screwdriver into wall socket ports.
Do not push insulators too far into socket.

The following should be considered before installing electric outlet and switch sealing processes. The goal of weatherstripping is to keep interior air in, thus saving energy from the elements. The term can also refer to the materials used to carry out such sealing of these spaces. This reduces heating bills, and keeps the temperature inside more comfortable and consistent.

WHY?

For windows, a well-functioning weatherstripping system stops drafts, moisture, and outside insects. The draft protection against colder outdoor temperatures can save energy and reduce energy bills up to 10%.

Weatherstripping is the process of sealing openings such as doors, windows, and trunks using products that stop this exchange include:

1. Weatherstripping (GOOD FOR RENTERS):
   - Can be installed through the pre-drilled holes in the socket. The use of existing holes through the wall ensures the weatherstripping will fit properly.
   - Screwdriver (Included)

2. Door Sweeps / Draft Stoppers:
   - A door sweep is a small piece of plastic or rubber, attached to an aluminum carrier strip that is fitted across the bottom of a door. It provides a weatherproof seal and prevents drafts from coming in under the door. Door sweeps have the ability to protect against drafts, moisture, and outside insects. The draft protection against colder outdoor temperatures can save energy and reduce energy bills up to 10%.9
   - Products that stop this exchange include:
     a. Door Sweeps (GOOD FOR RENTERS)
     b. Door Sweeps (GOOD FOR OWNERS)

3. Weatherization Kit boxes were designed, laser cut, spray-painted, and assembled by our students.

45 boxes and 65 boxes were given out in 2019 and 2020 respectively.

20 ARABIC SPEAKING HOUSEHOLDS

29 ENGLISH SPEAKING HOUSEHOLDS

ANNUAL DISTRIBUTION EVENT
05. Hoop House
Pittsburgh, PA
Instructor: Vivian Loftness
Project Partners: Emily Edlich, Grant Johnson, Julita Przybylska, Robert Rice
Fall 2018

The Hoop House is an experiment with tensile design, a miniature greenhouse made of heat-trapping plastic stretched over an aluminum frame. For this project, I came up with an unprecedented joint assembly. We call it the “flower joint” because it opens up like a flower to attach on to other metal tubes, intersecting 3 or more together.

The overall form had three sizes of door openings, allowing the plastic to wrap the wireframe in a dynamic way. Pairing the flower joint and taut plastic together create a sturdy structure with moments of tension and freedom. This project was installed at Phipps Conservatory, and sustained herbs and vegetables throughout the harsh Pittsburgh winter which the local cafe harvested and used in their dishes. Because I did this project, I am able to think about the urban context through experimentation and form-finding.

06. Retrofit Notebook
Pittsburgh, PA
Instructor: Vivian Loftness
Spring 2021

This notebook was given to a home owners of a 4-story brick house in Oakland, Pittsburgh to suggest retrofits for energy and money saving.

I started with a site analysis looking at climate conditions and drainage patterns. Then I made heat loss calculations on thermal efficiency for all parts of the building enclosure. Next, I examined home energy use using their gas and electricity bills. These informed retrofit recommendations, along with how much money they can save and payback time if the changes were made. Finally, I recommended a passive solar redesign for alternative spatial layouts based on passive solar strategies. Through this project, I learned the importance of residents taking home management into their own hands and the power of environmental strategies.

THIS PROJECT WAS AWARDED THE 2021 PAYETTE PRIZE IN BUILDING SCIENCE.
**07. 48-Hr Competition: EPIC Metals Mobile Eco-Lab**
Pittsburgh, PA  
Project Partner: Ying Ying Yan  
Spring 2020

The mission of this mobile eco-lab is to bring plant education directly to the doorsteps of community members. The project showcases five pedagogies important to my Environmental Learning Center: connection with nature, efficient water use, air purification and energy efficiency.

This project pushes the boundaries of EPIC metal structures, creating unique features such as rolling vertical gardens, rain water collection on the roof, and sloped PV panels to collect energy to run the mobile. The rolling vertical gardens allow for flexible programming in the mobile, creating spaces like a classroom and gallery exhibit.

Designed and represented in 48 hours, this project was submitted to an annual CMU School of Architecture Steel Deck Competition with EPIC Metals.

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**ASSEMBLY & DISASSEMBLY**

1. 2. 3. 4. 5. 6. 7.

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**FLEXIBLE PROGRAMMING WITH ROLLING GARDENS**

- After Unfolding
- Lab Setup
- Classrooms Setup
- Maker Space
- Gallery
08. Personal Projects

- Traveling to overseas on-site painting competitions
- Recipe development, baking photography, baking blog curation & management