

C. **1. Creative projects**

Sonic Sphere
CL-Omni
Paraboloid Audio
Bentopiccola
PediSedan
Little Jewels
Ear-ear-ring
Camaleonda ++
Sidetable 1
Visual Art

A. **2. Prior academics**

Glass Structures
PBL

P. **3. Professional work**

Portland International Airport
Data Driven Design
Structural Engineering
Foster + Partners
BIG and Heatherwick

All design, making, engineering, and imagery presented is my own, unless specifically noted otherwise.

Professional work and consulting has been highly team-oriented; personal contributions are described explicitly.



Sonic Sphere installation in NYC, 2023 (render).
Opening in The Shed in June 2023, with artists
including The XX, Yaeji, Carl Craig, Igor Levit,
UNIQ3, Steve Reich, and Madame Gandhi.
(Render by others)



Sonic Sphere installation in Miami, 2023. Shown
here part-way through assembly with lighting and
speaker install underway, and acoustically trans-
parent net flooring hoisted to listening height.

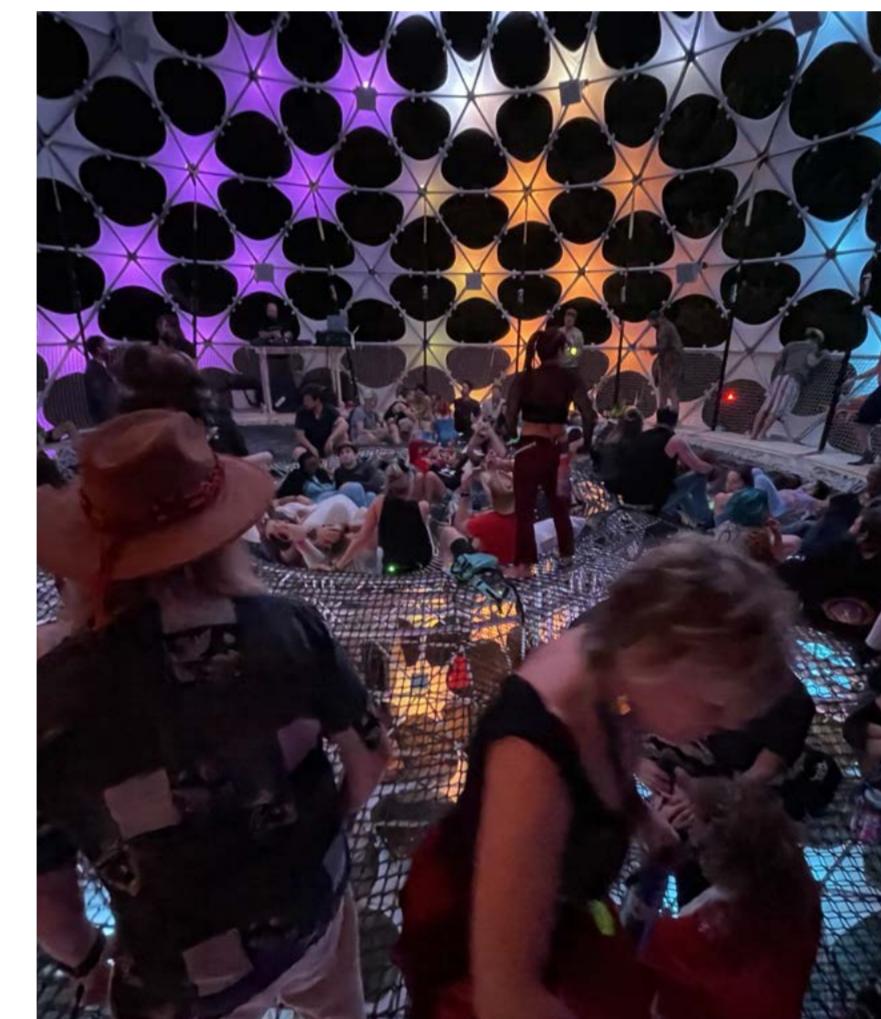
Sonic Sphere

In collaboration with:

Ed Cooke, Merijn Royaards,
Jessica Lair, Nicholas Christie,
Fatemeh Miri [et al.](#)

THE SHED

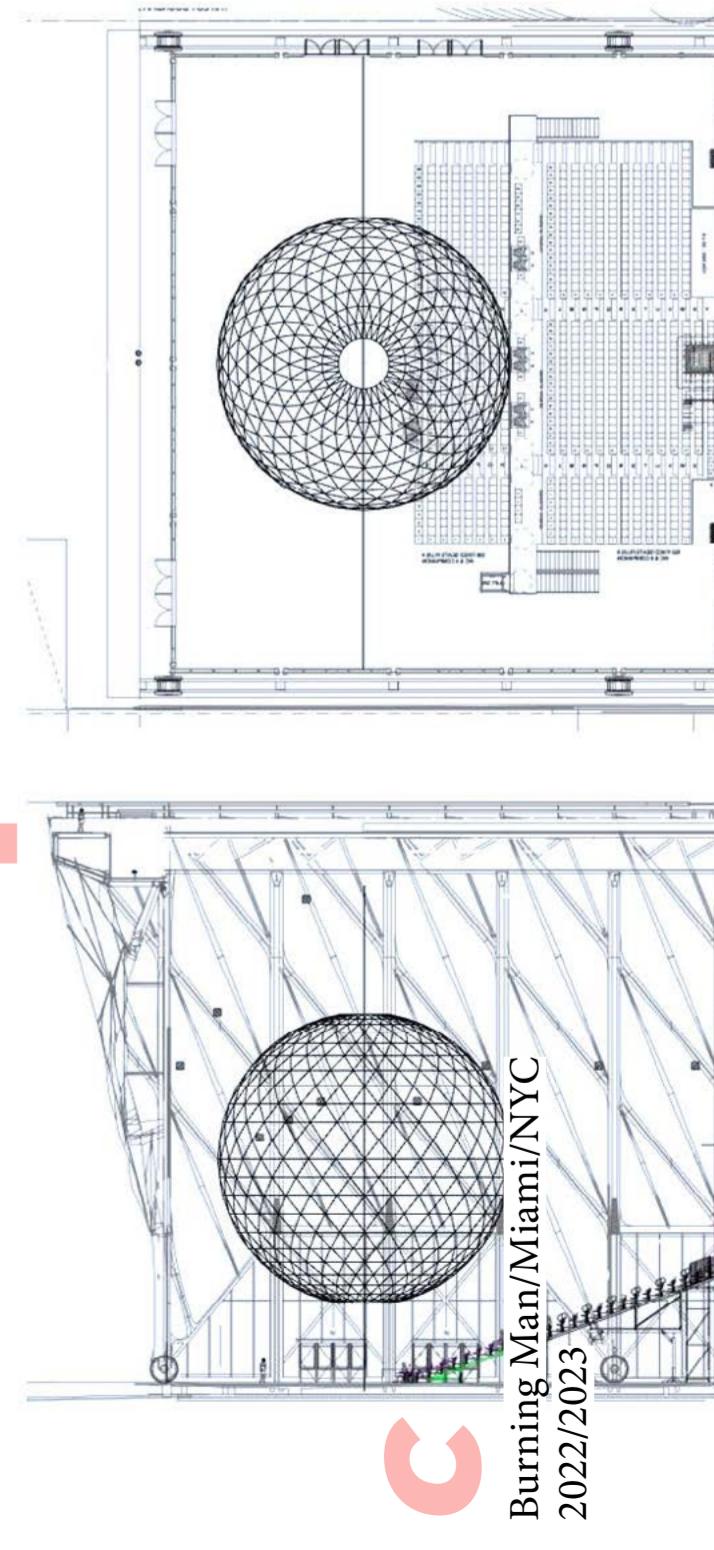
HARMAN



Sonic Sphere is a collaboration with a growing group of artists/designers/engineers/musicians/makers toward spherical spatial audio experiences. Joining at Burning Man 2022, I've now been involved through three iterations of the sphere, primarily contributing to new design work for Miami (prototyping for NYC), and ultimately the NYC show at The Shed.

**toward spherical spatial
audio experiences**

Serving as a surface designer, and structural vibration/acoustics engineer, I've helped design and construct new floor and seating systems with minimal acoustic attenuation/coloring. Beyond this I've contributed widely to the design and engineering of sphere execution, and learned from our spatial audio and lighting teams.

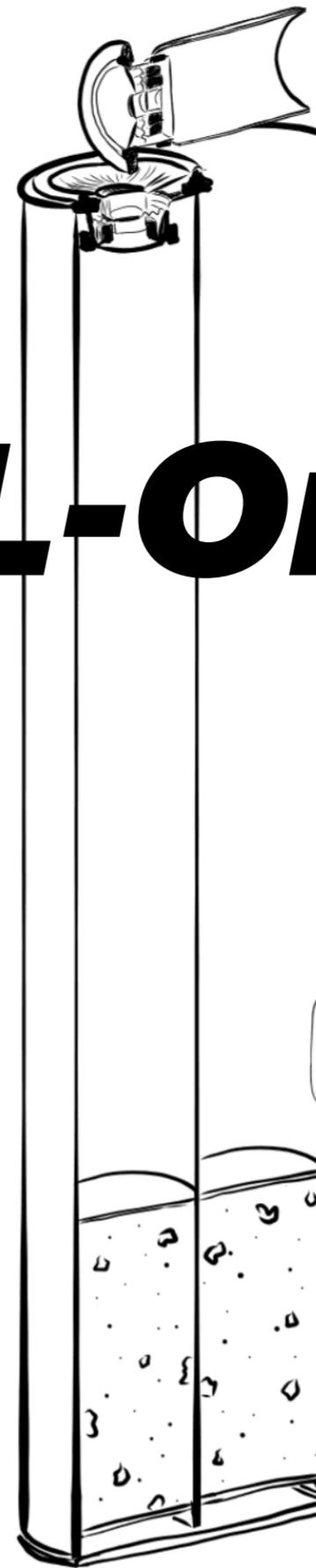


Burning Man/Miami/NYC
2022/2023



Two iterations of the prototype design, rendered alongside Charles Rennie Mackintosh's DS3 to reference scale/context. After exploring earlier designs paying homage to David Lewis' work at Bang & Olufsen, the final prototypes settle on straight-forward styling to better present the unique driver configuration.

CL-Omni

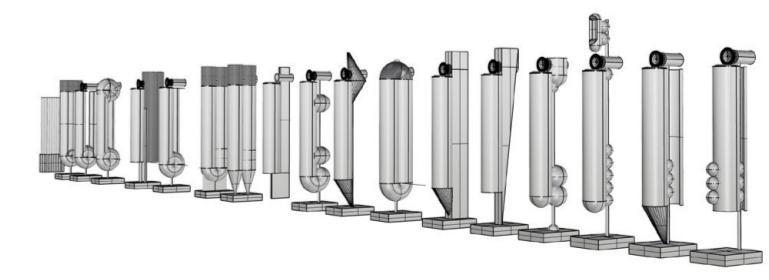


Following an interest in room acoustics, I set out to explore omnidirectional approaches to audio by designing + building my own loudspeaker.

The folded waveguide surrounding the tweeter has been designed to minimize spurious reflections from the midrange driver, while housing a diffuser to reduce wall-tweeter interaction.

exploring an omnidirectional approach to audio reproduction

Renders produced in Blender, original design in Rhino (DS3 chair also Rhino/Blender).



Paraboloid Audio

Having pursued optics and transparency through most of my hot casting work to date, this parabolic acoustic reflector represents a last minute pivot away from the realm of the visible, opting to explore a different kind of lensing: acoustic.

The spiked geometry of this glass form is intended to perfectly transform a spherical wavefront into a perpendicular cylindrical wave, which has interesting scientific and acoustic reproduction applications. As an object however, it remains a compelling lens, seemingly producing holes in the objects it occludes.

The work is pictured here with a functioning concentric loudspeaker driver, enabling us to experience and experiment with the form's acoustic effects. Alongside is a series of drinking vessels from a 3-part toroidal mold. The vessels represent experiments with different casting techniques producing a variety of surface finishes, including different pour speeds, sandblasting, and fire polishing.

All objects were produced with much assistance from the hot casting class of F2021, with thanks to Prof. Salstrom.



Bentopiccola

Inspired by an enthusiasm for espresso and Italian design, this home espresso maker is based on the mechanism of a mid 1980s La Pavoni Europiccola.

As a prototype for a product to make this method of hands-on espresso preparation more accessible to newcomers, I have redesigned the base to integrate several new features.

1. Brew pressure can be back calculated from load cells positioned within the base, avoiding the need for an expensive external pressure gauge
2. All interaction points unified with handcrafted timber components to clarify the user workflow
3. Integrated scale for espresso pulled, enabled by a load cell in the brew platform assembly
4. Reflective brew platform, allowing the user to view the underside of the portafilter
5. Analogue instrumentation is embedded in the reflective brew platform, allowing the user to simultaneously reference brew pressure and progress

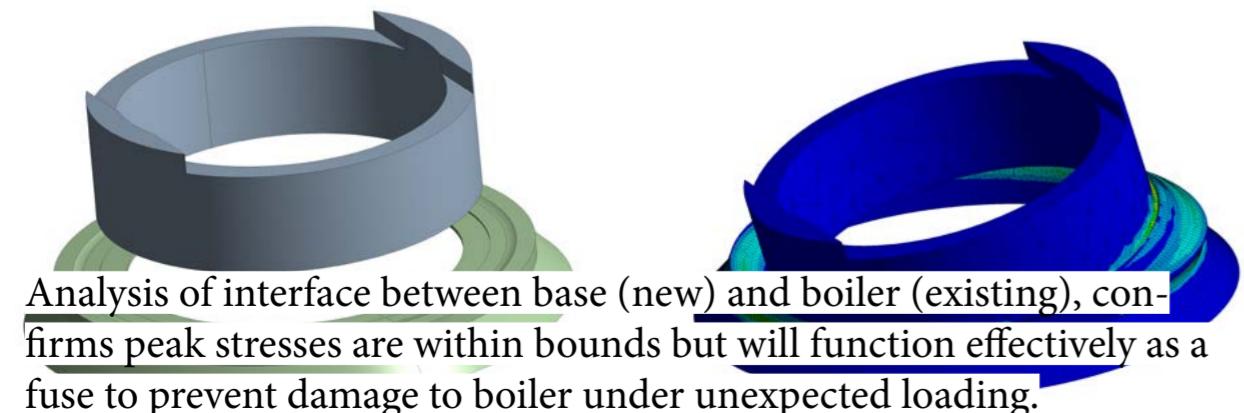
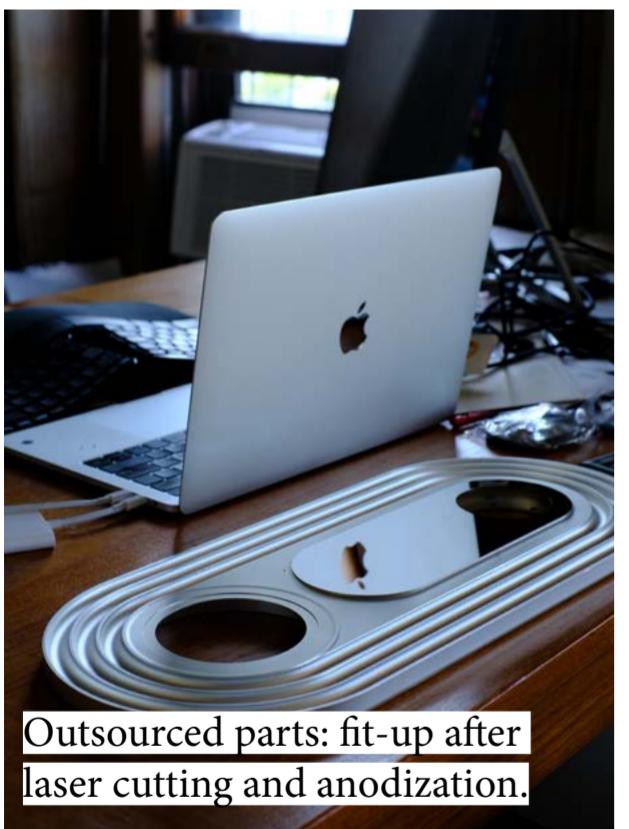
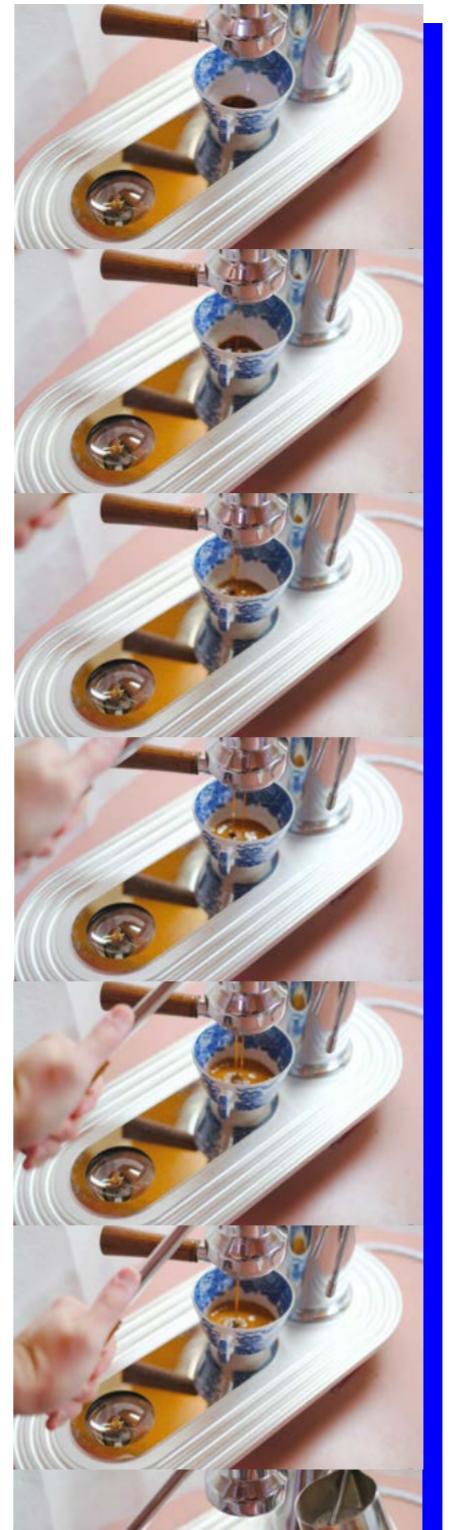
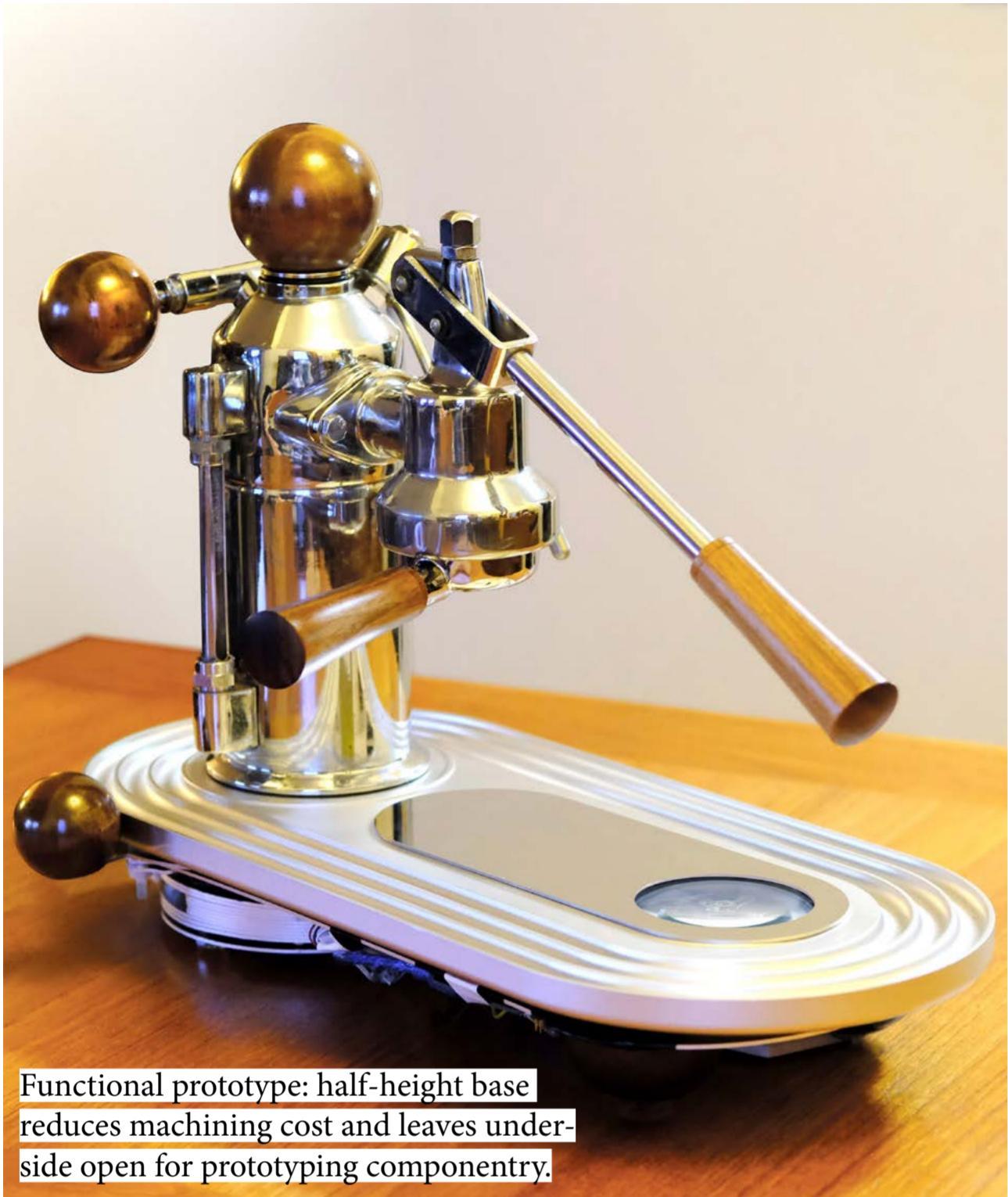
Analogue gauges minimize distraction from the tactile experience of brewing

The racetrack scallops of the top surface are designed for efficient CNC milling, and function as the drip-tray, exceeding the capacity of comparable machines.

Designed and assembled in Boston, with CNC work, laser cutting, and anodization being outsourced.



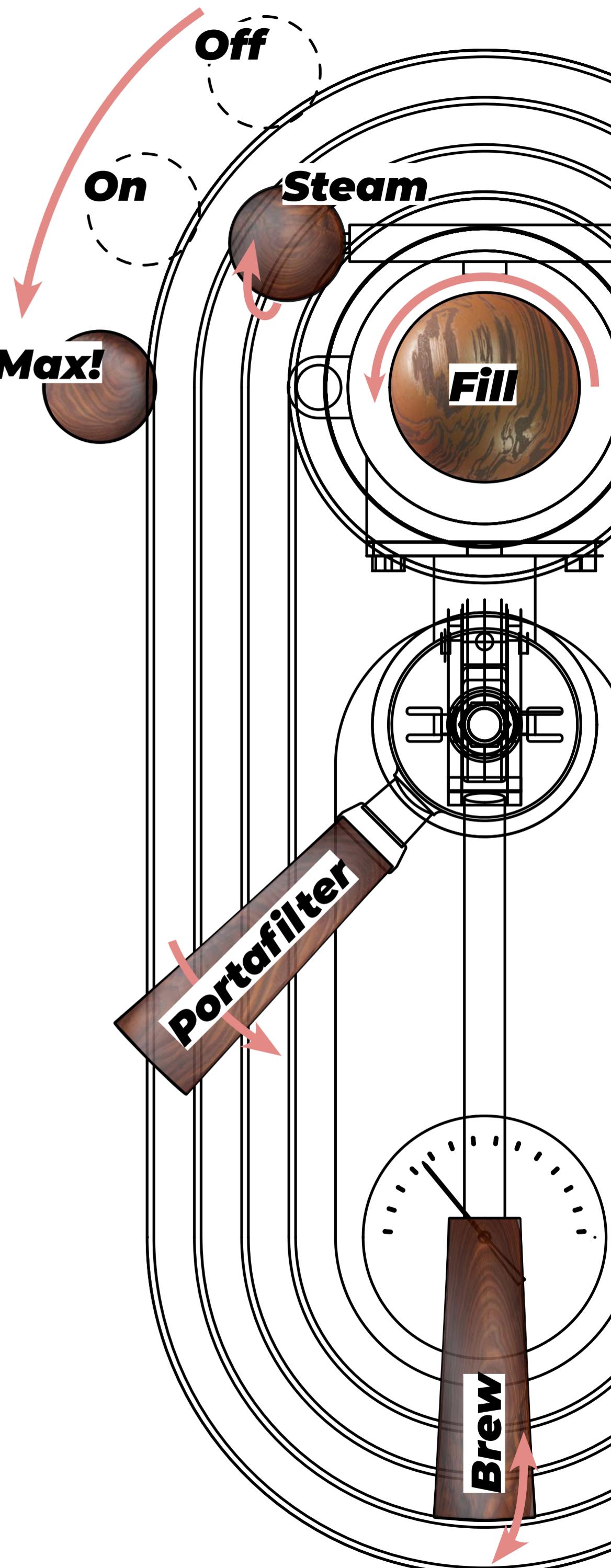
Early conceptual design, developed in Rhinoceros and rendered using Blender.

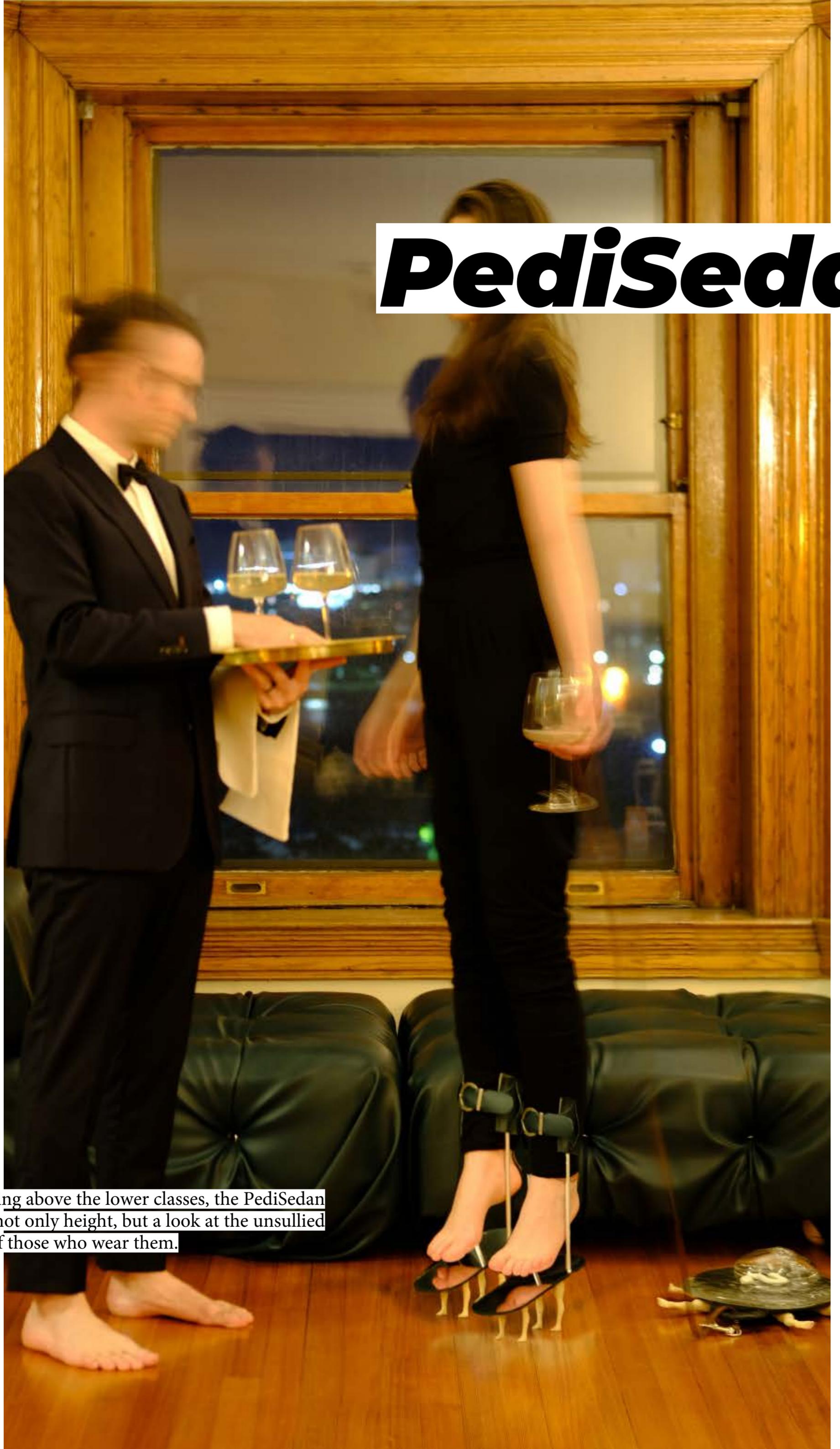


Each gesture is an intuitive rotation about the central body; spherical touch points rotate, while cylinders act as levers. This offers experiential consistency with the core brewing mechanism, and is a commitment to this differentiating aspect versus typical pump-based machines.

Each interaction point is unified in materiality and gesture.

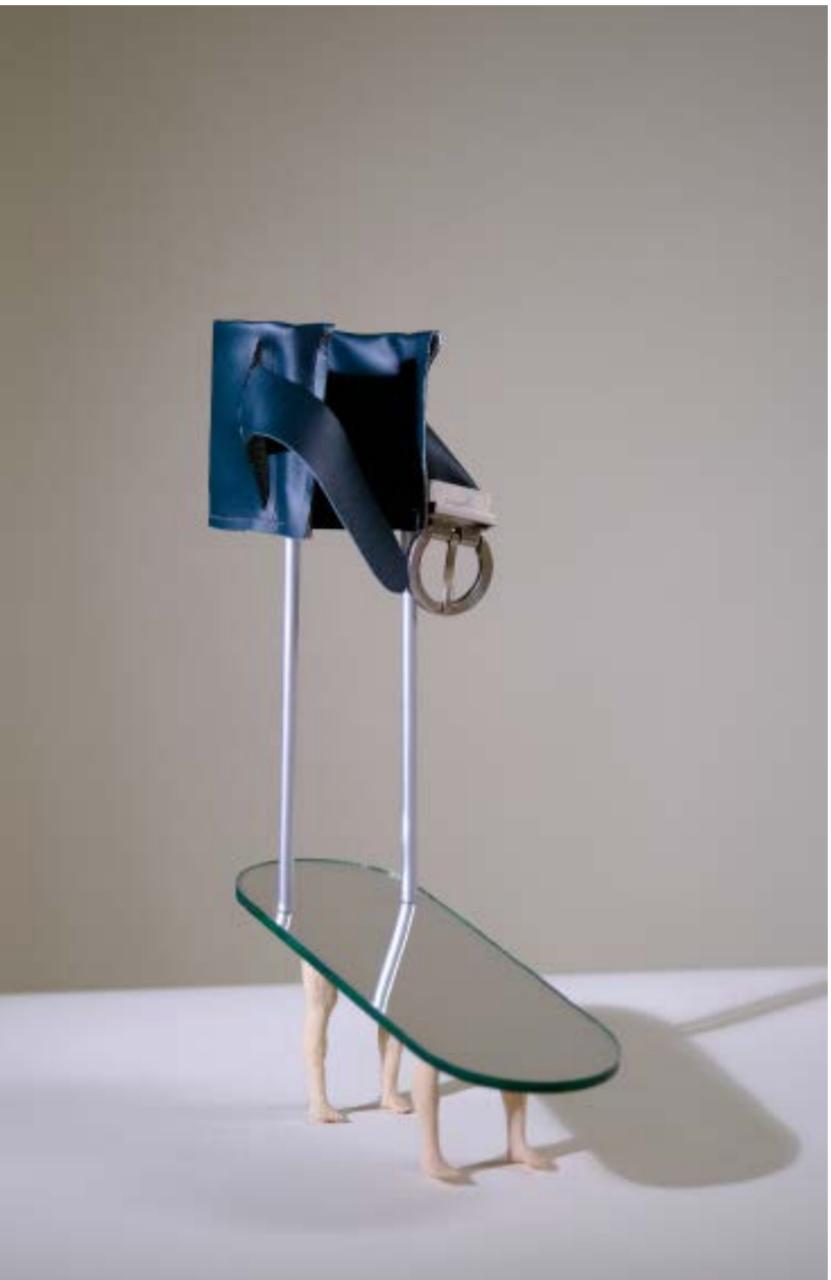
Analogue gauges embedded in the brew platform were selected to minimize distraction from the tactile experience of brewing, and are enabled by a pair of Arduino Nanos. These parallelize the sensing duties to reduce measurement/display latency, keeping the response time low enough that it feels intuitive and mechanical.





PediSedan

Towering above the lower classes, the PediSedan offers not only height, but a look at the unsullied soles of those who wear them.



This biomechanical foot-sedan exists as a discursive object interested in class and social structure. Challenged to create a product for a parallel present without shoes, I fictionalized a number of products that offer comfort for barefoot living. But, the most interesting narrative came from imagining the lives of those who choose not to embrace a barefoot lifestyle, despite it being the norm.

a product from a parallel present against shoes

Using optics to create surprising views, projections, and imagery is an important part of my work. This particular product adopts the visual language of luxury along with the surprising reflection of the sole to offer a simultaneously whimsical yet critical lens to the products and behaviours associated demonstrating exclusivity.



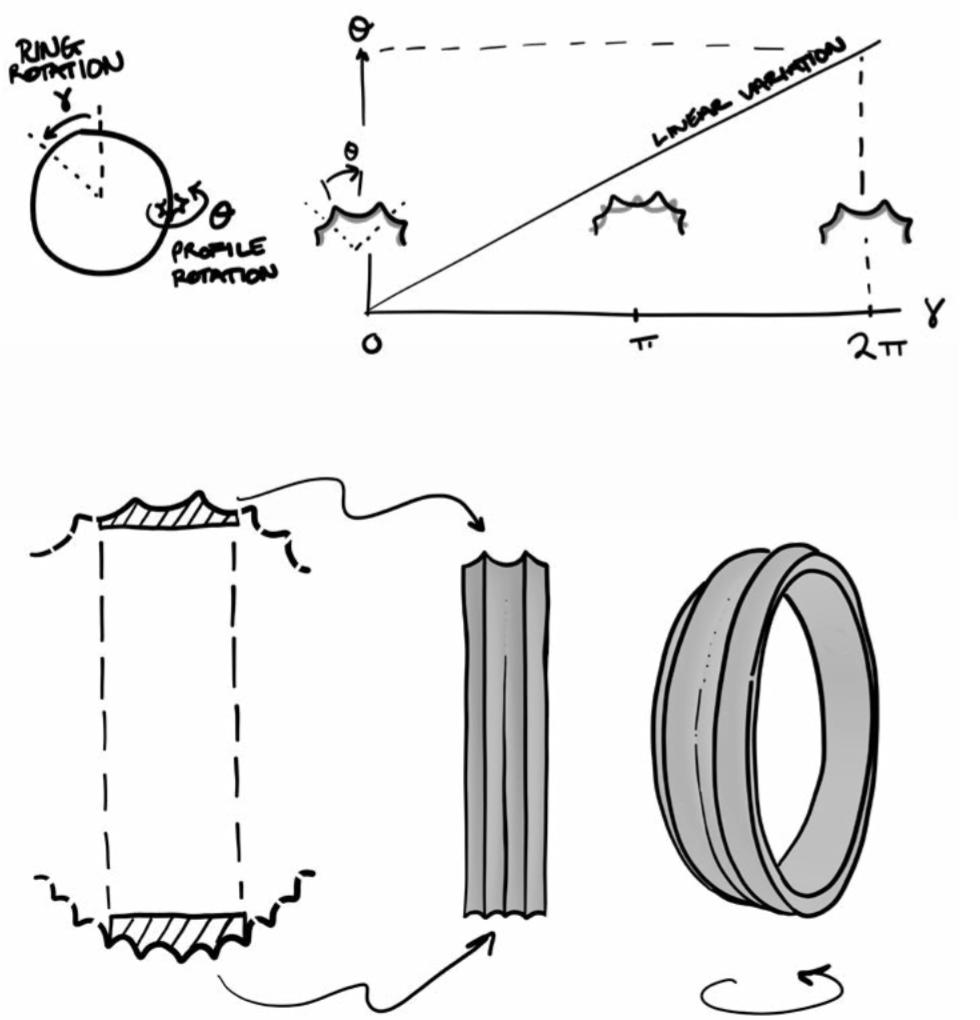
Little Jewels

This jewelry collection is based on the geometry used by Gaudi to sculpt the columns of la Sagrada Familia.

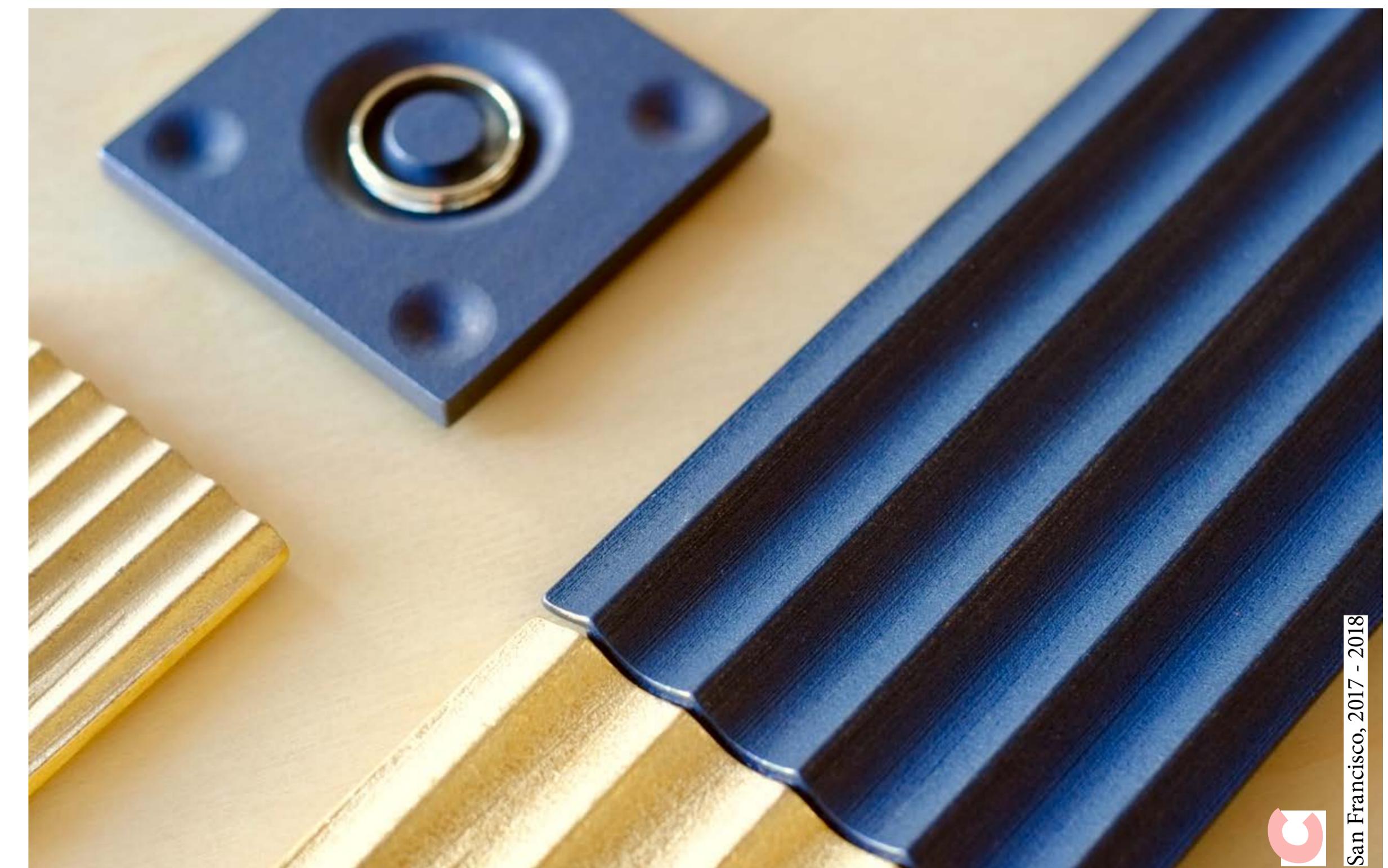
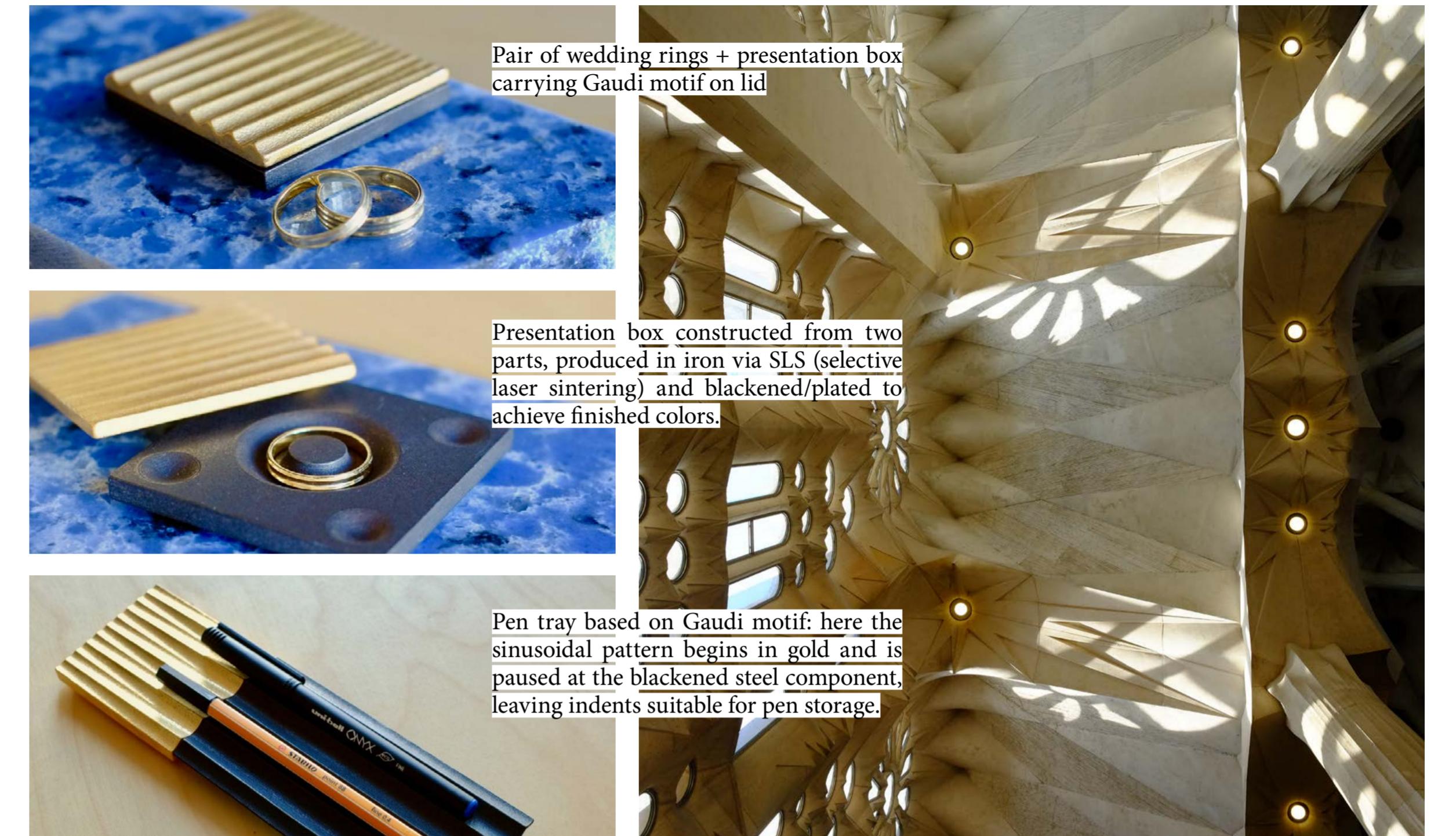
Deeply inspired by the ideal of mathematical beauty that Gaudi had pursued in his work as a form of worship, this project began as a set of wedding rings and has now grown to include two additional pieces that use the same motif. The particular geometry in use here is inspired by Gaudi's elegant solution for subtractive manufacturing of his columns, which involved two counter-rotating sinusoidal guides. The result is a surface that can be described as the minima of two sine waves, beginning out of phase and passing through one another - or better yet, the result of taking a giant potato peeler to one of the columns.

"taking a giant potato peeler to one of the columns"

Prototyped in San Francisco, and finally realized in 10k gold casting + iron SLS, working with a fabricator in Belgium to cast and hallmark the gold.



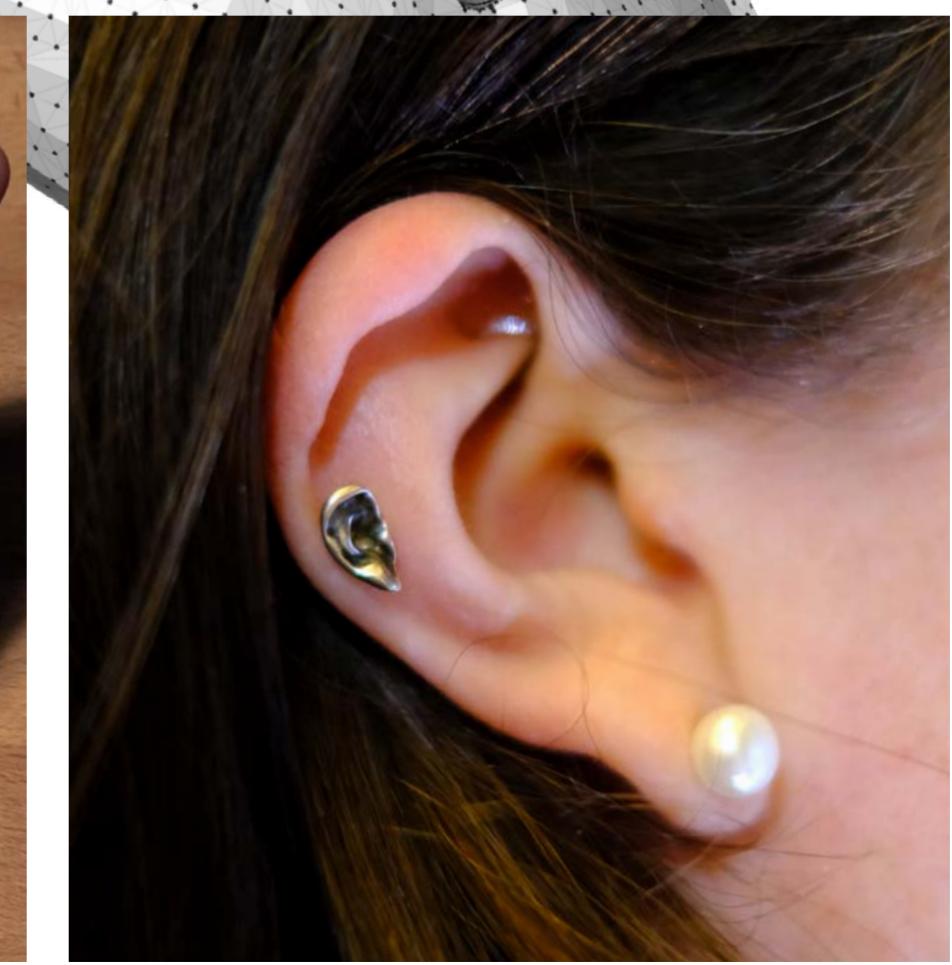
Each ring is printed in a lost-wax compatible resin, then cast in 10k gold.



Ear-ear- ring

Having originally produced this model for a whimsical project in 2016 when photogrammetry was emerging as an accessible technique, it wasn't until 2018 that I realized I had missed the obvious: it had to become an earring for the very ear it was scanned from.

Lost-wax compatible 3d printed resin, cast in sterling silver by i.materialise.

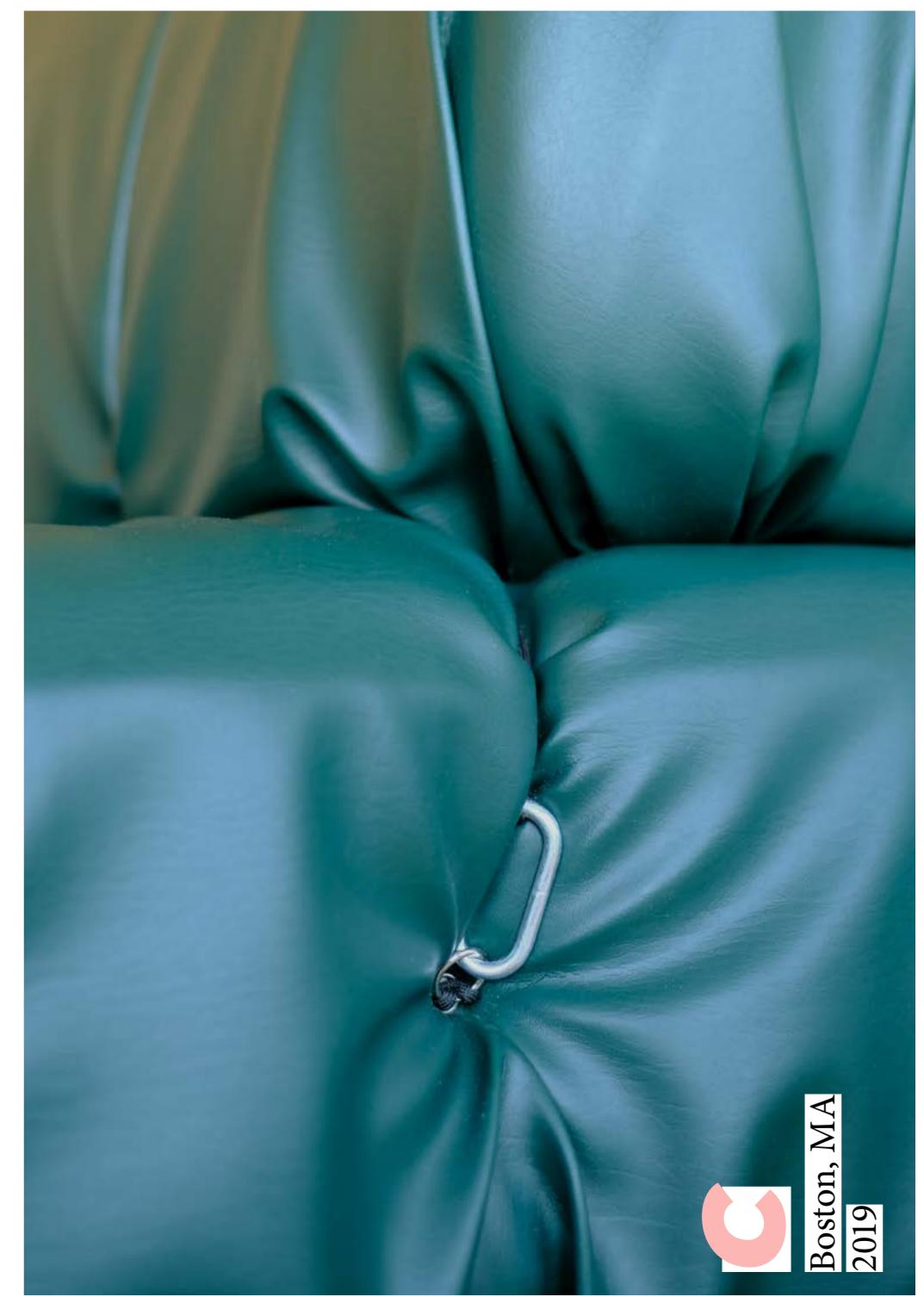
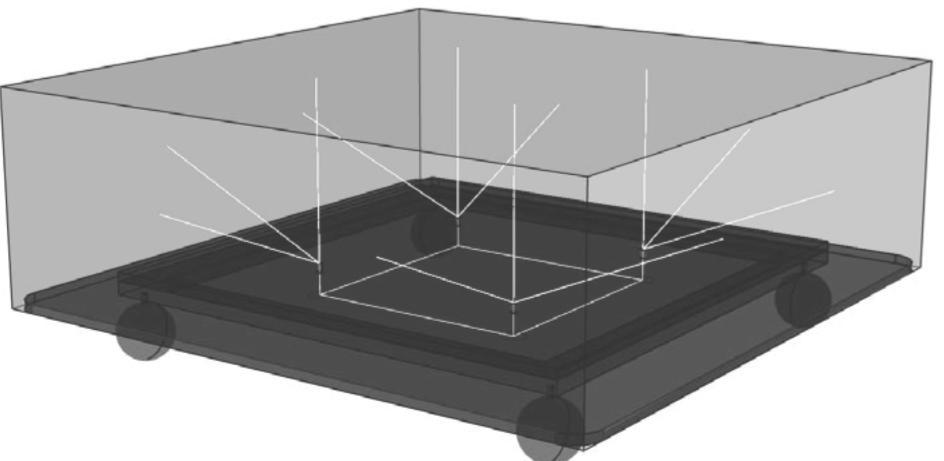


Cama-leonda ++

Strongly drawn to Mario Bellini's late 60's design for the Camaleonda modular sofa collection, and similarly strongly lacking the funds to purchase a vintage example, I took on the task of reverse engineering the hidden tensile structure that gives the sofa its elegant form and modular reconfigurability. Beyond this tension network, Bellini has achieved an elegance in both subtle functional details and design for manufacturing that I would never have understood without making my own.

Camaleonda ++ borrows its "plus plus" from the 80's full fat approach to leather upholstery, leaving us with a design that might respond to "what if de Sede had manufactured Bellini's Camaleonda?"

This project was realized in our apartment's common hallway based on an inexpensive foam mattress, using marker pens, a bread knife, punch kit, a particularly helpful chopstick, and a sewing machine, keeping the budget comfortably under 1/50th of a vintage example.



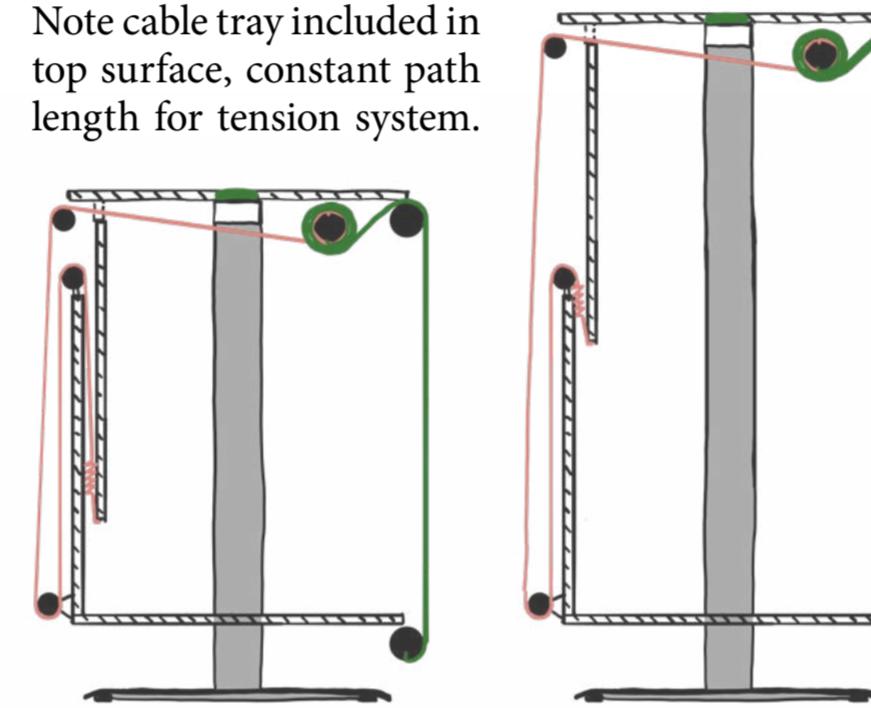
Side-table 1

Sidetable 1 is the second in a series of pieces of active multi-functional furniture enabled through simple mechanization. This piece is designed to function as a side table, storage unit, piano keyboard base, and sit-stand desk with motion through only a single degree of freedom. Each function lies on a continuum of height adjustment, with pre-programmed options to quickly switch between them.

The wider ambition for these pieces is as a networked collection that is able to learn the user's behaviour and make adjustments predictively in concert, facilitating meaningfully different configurations of the space with minimal input required from the user.

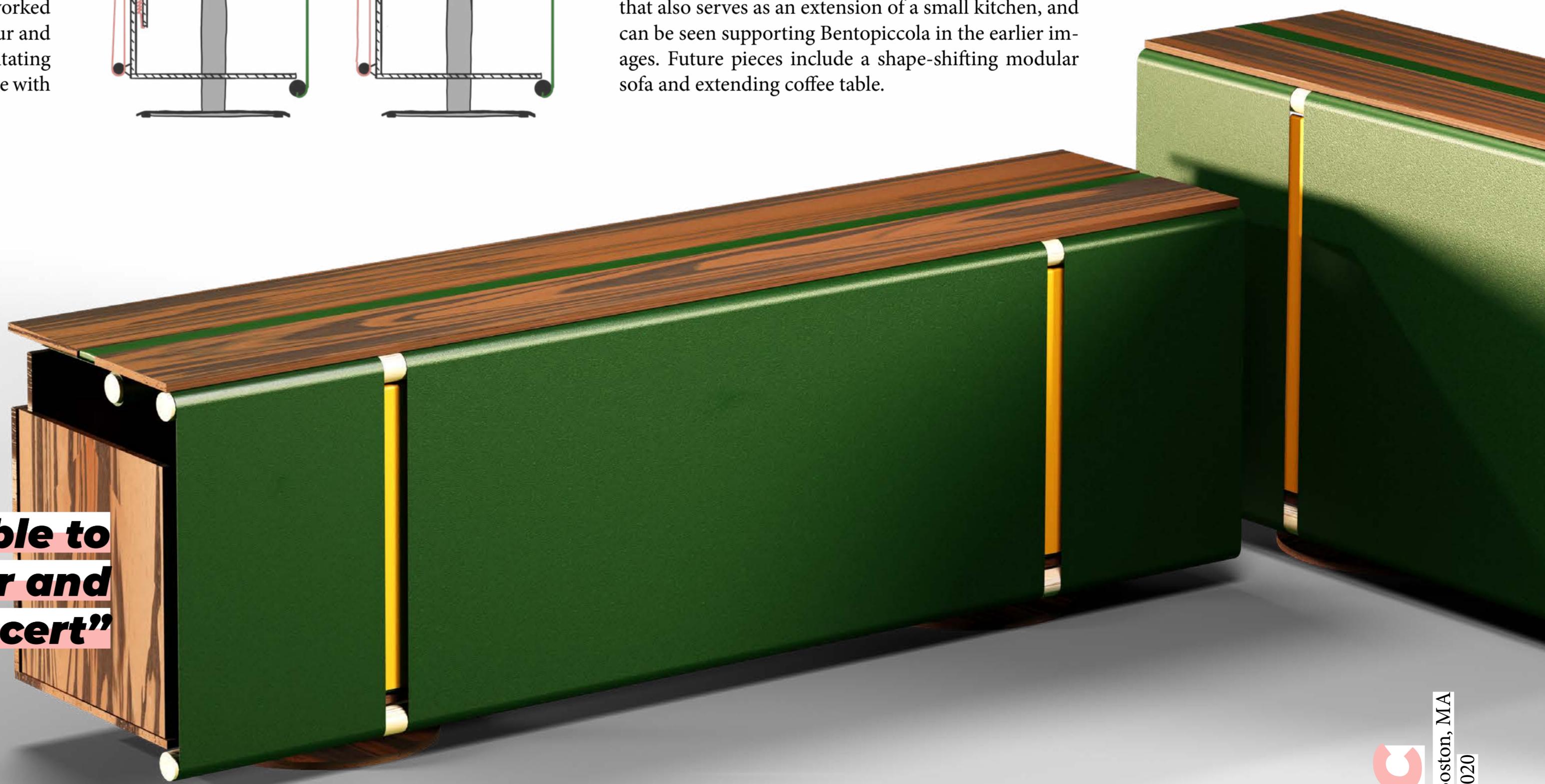


Note cable tray included in top surface, constant path length for tension system.



In order to present a clean enclosed facade while accommodating a wide range of heights, the front enclosure is made with a roller mounted textile that maintains a constant tension throughout the full range of adjustment. The user simply unhitches the bottom timber catch and the front textile is retracted like a roller door.

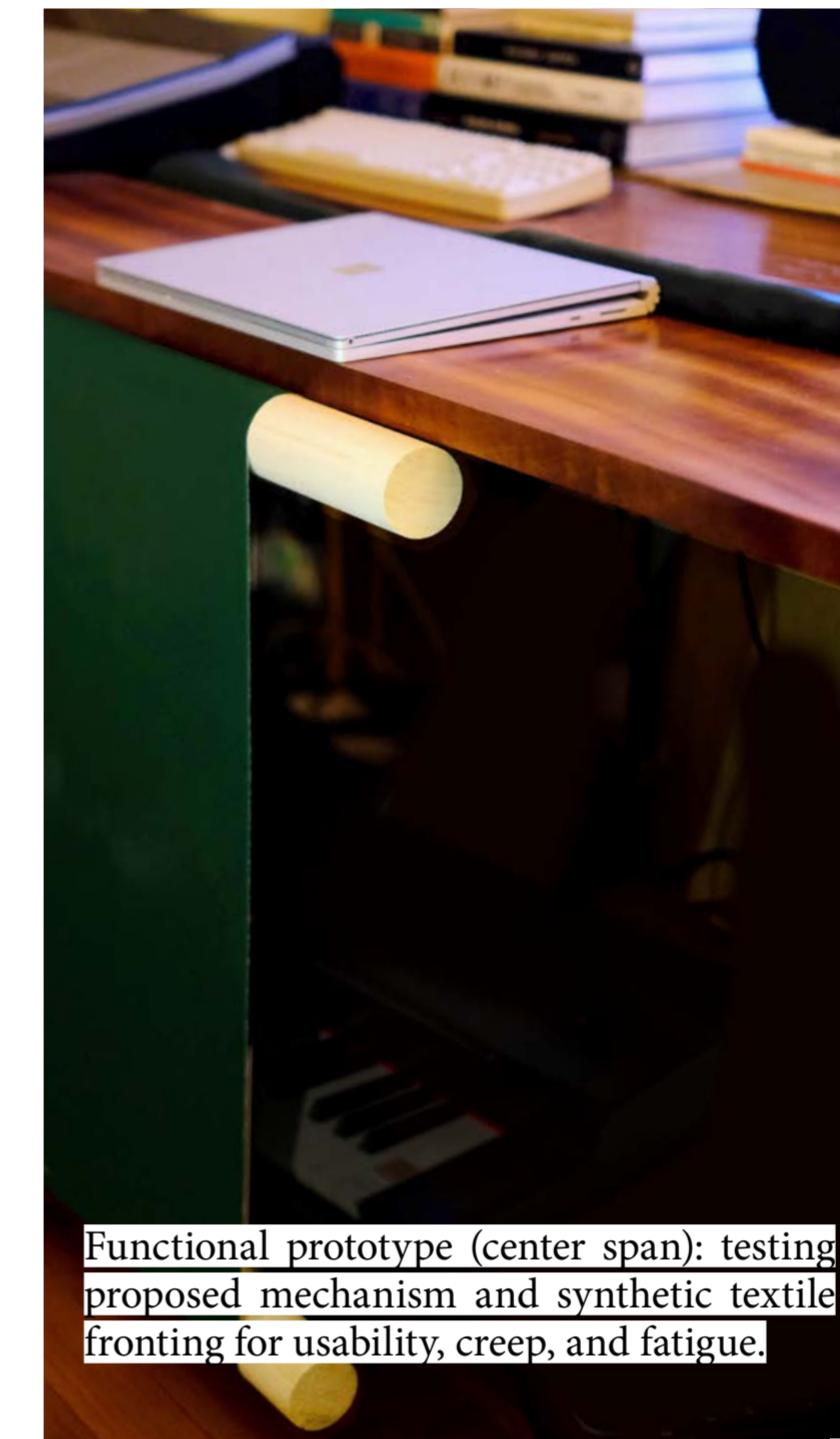
The prior piece in this series is a simple sit-stand desk that also serves as an extension of a small kitchen, and can be seen supporting Bentopiccola in the earlier images. Future pieces include a shape-shifting modular sofa and extending coffee table.



"a networked collection able to learn the user's behaviour and make adjustments in concert"



The back face is to be finished to allow for placement away from walls as desired, and also demonstrates the functional components of the constant-tension system.



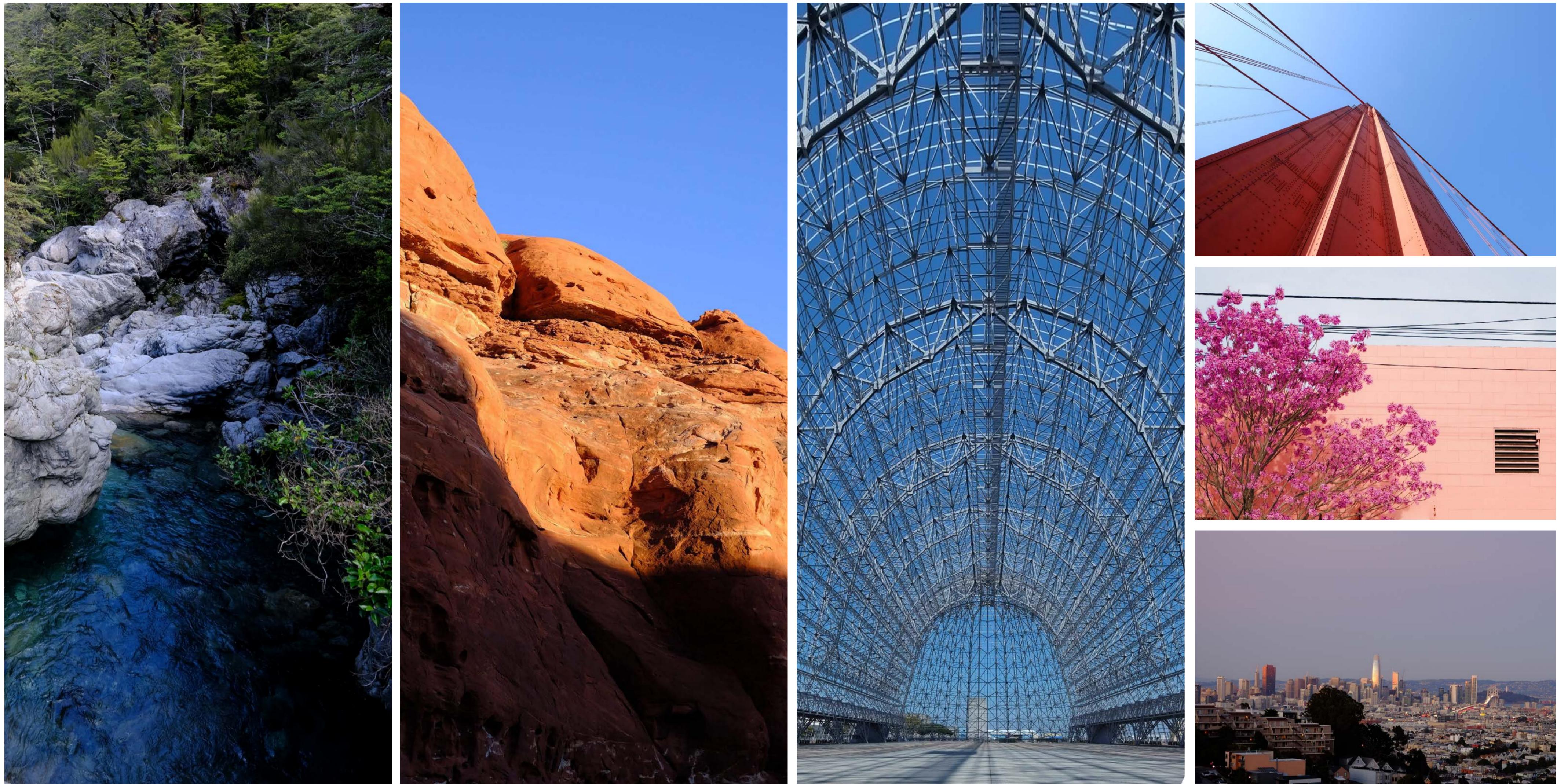
Functional prototype (center span): testing proposed mechanism and synthetic textile fronting for usability, creep, and fatigue.

I'm passionate about designs that seem mystifying from a distance, but explain themselves through function upon closer examination. I'm optimistic that this approach to design has a subtle role in promoting mechanically inquisitive thought in users and potentially society more widely.

A clearly expressed external mechanism, functionally honest to the end user.

The structural trick at work here is offering sufficient rigidity in the side table's top panel to avoid the need for a continuous bottom plate. This allows both the seated workstation and enclosed piano keyboard configurations as these modes are reliant on unimpeded space to pull in a chair or access pedals.

Renders produced in Blender, original design in Rhino.

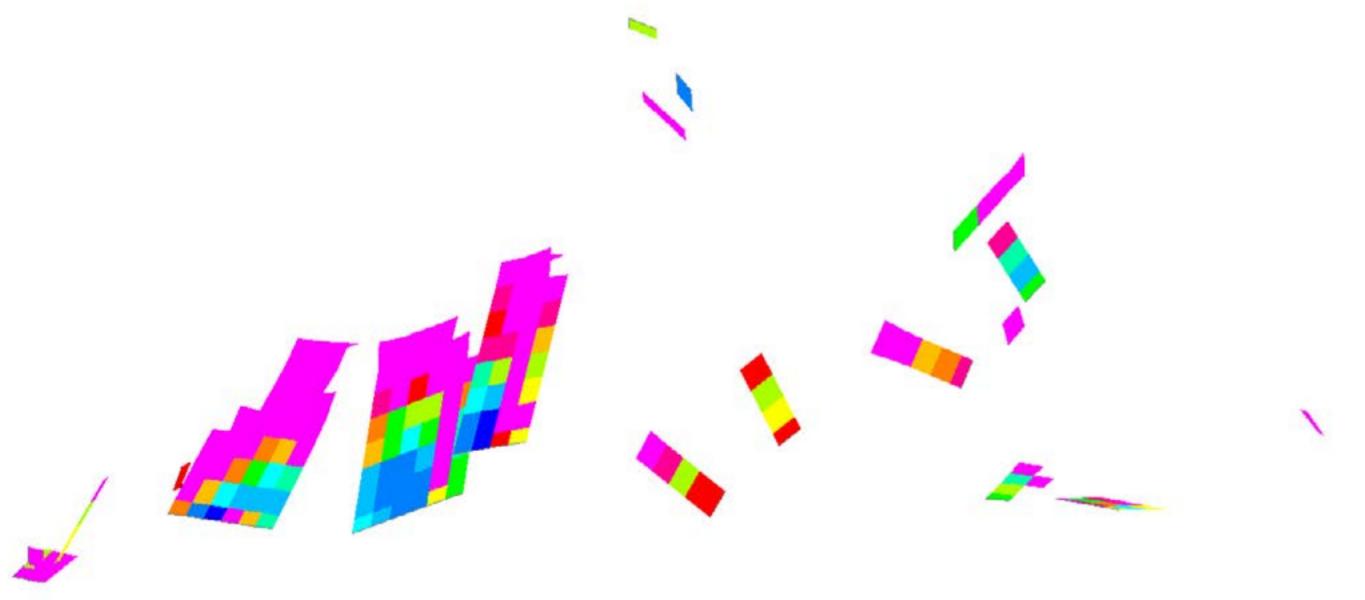


Photography

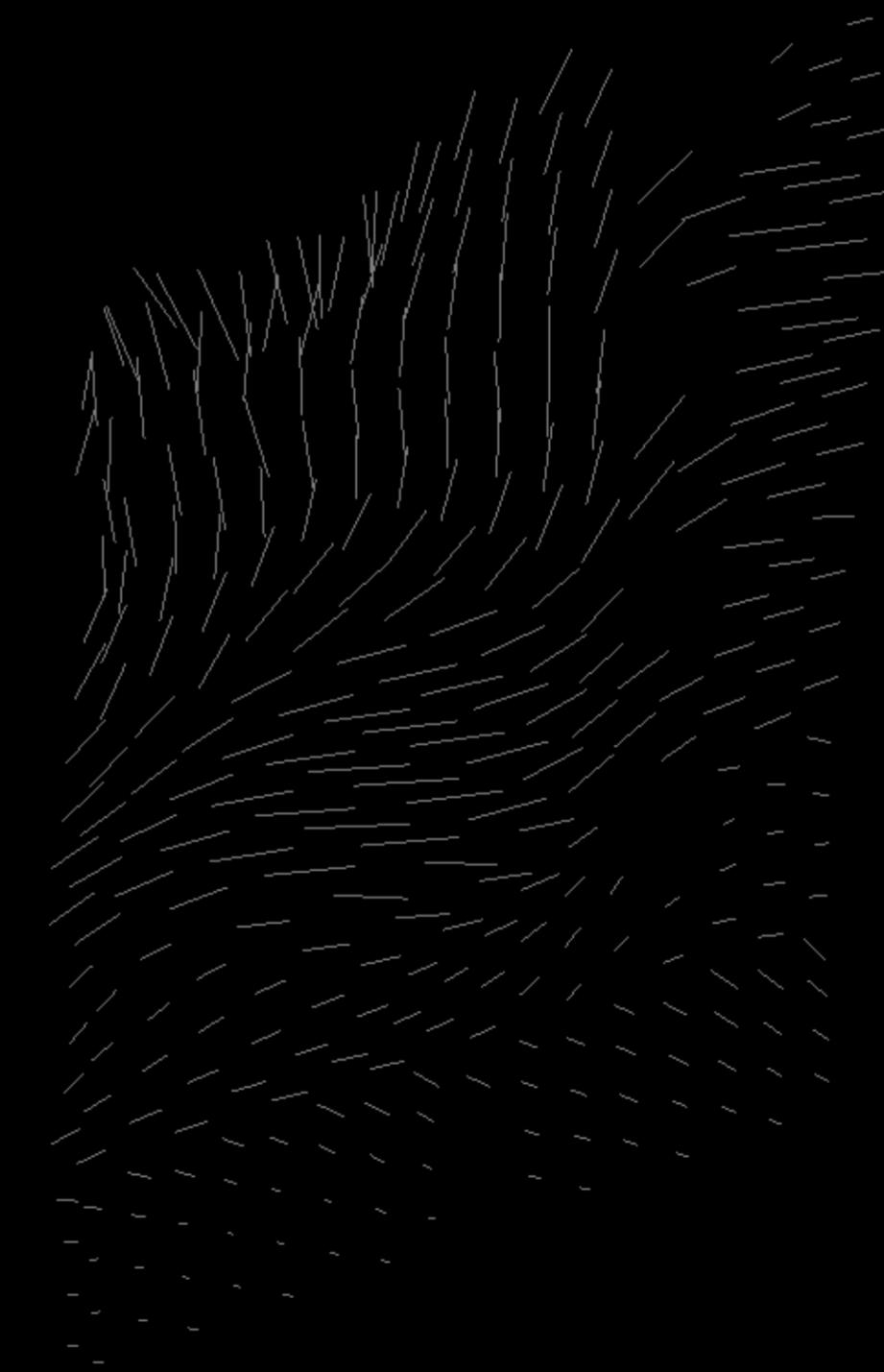
Left to Right: Arthur's Pass, New Zealand. Moab Desert, UT. Hangar One, Moffett Federal Airfield, CA.

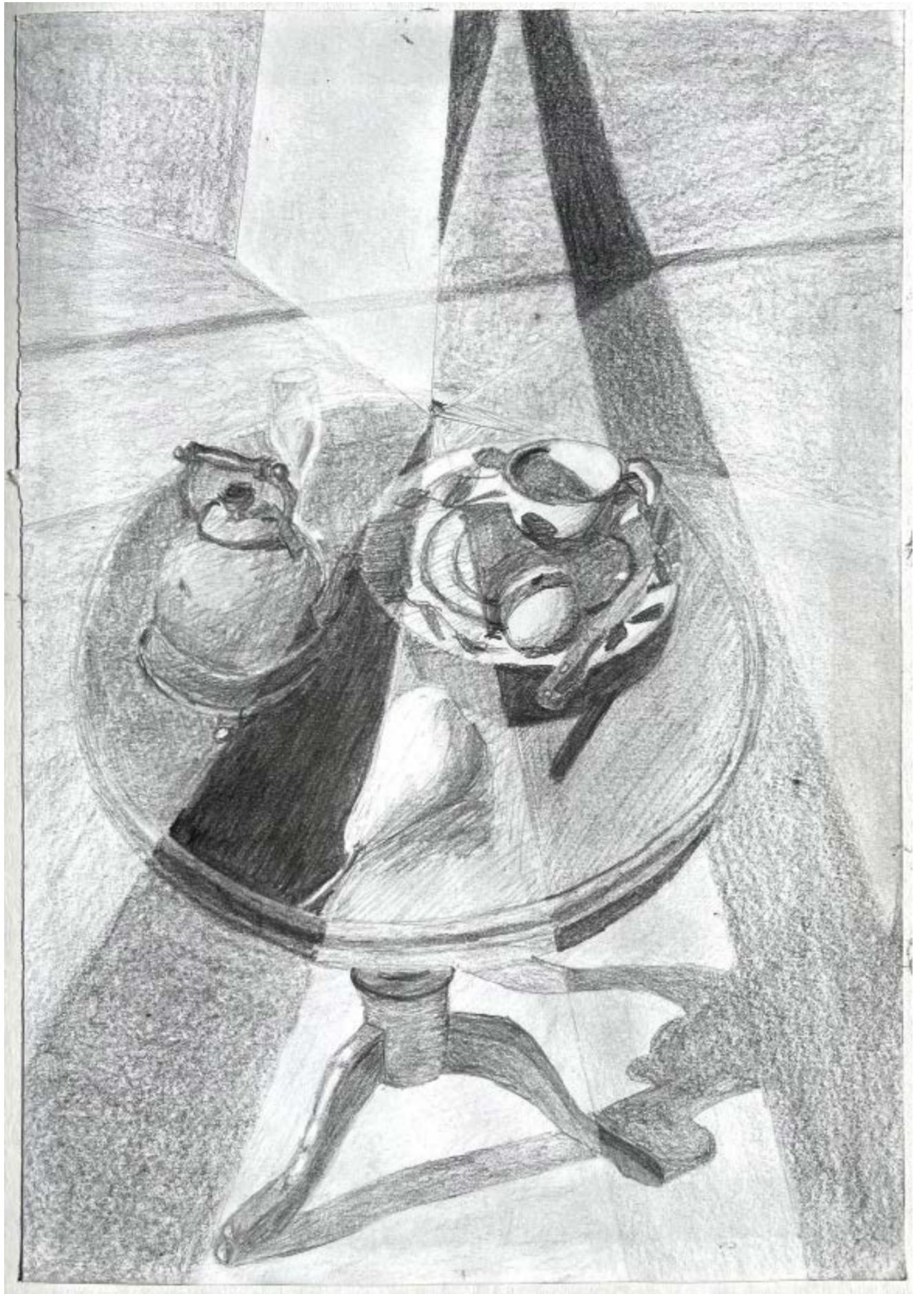
From top: San Francisco, CA.
Los Angeles, CA. San Francisco, CA.

This selection is intended to represent an affection for the built environment and the stark contrast it presents with our (often extreme) surroundings, seen through places I hold a personal connection with. Images are presented as shot, adjusted to crop/align.



Visual Art

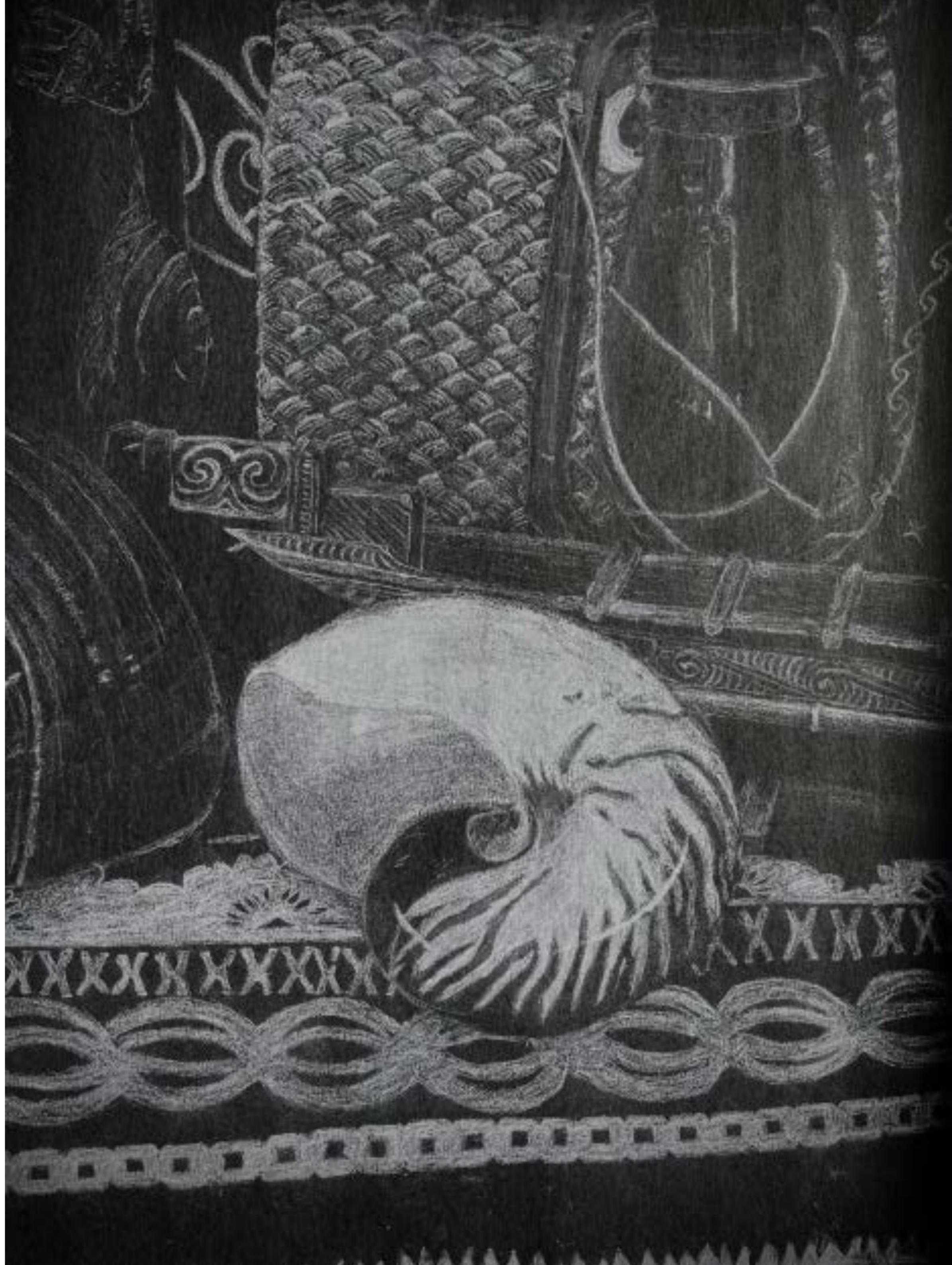




Sketches

Top: Daylight intensity study, pencil.

Right: Still life; found objects from the Pacific, pastel/chalk on black paper.

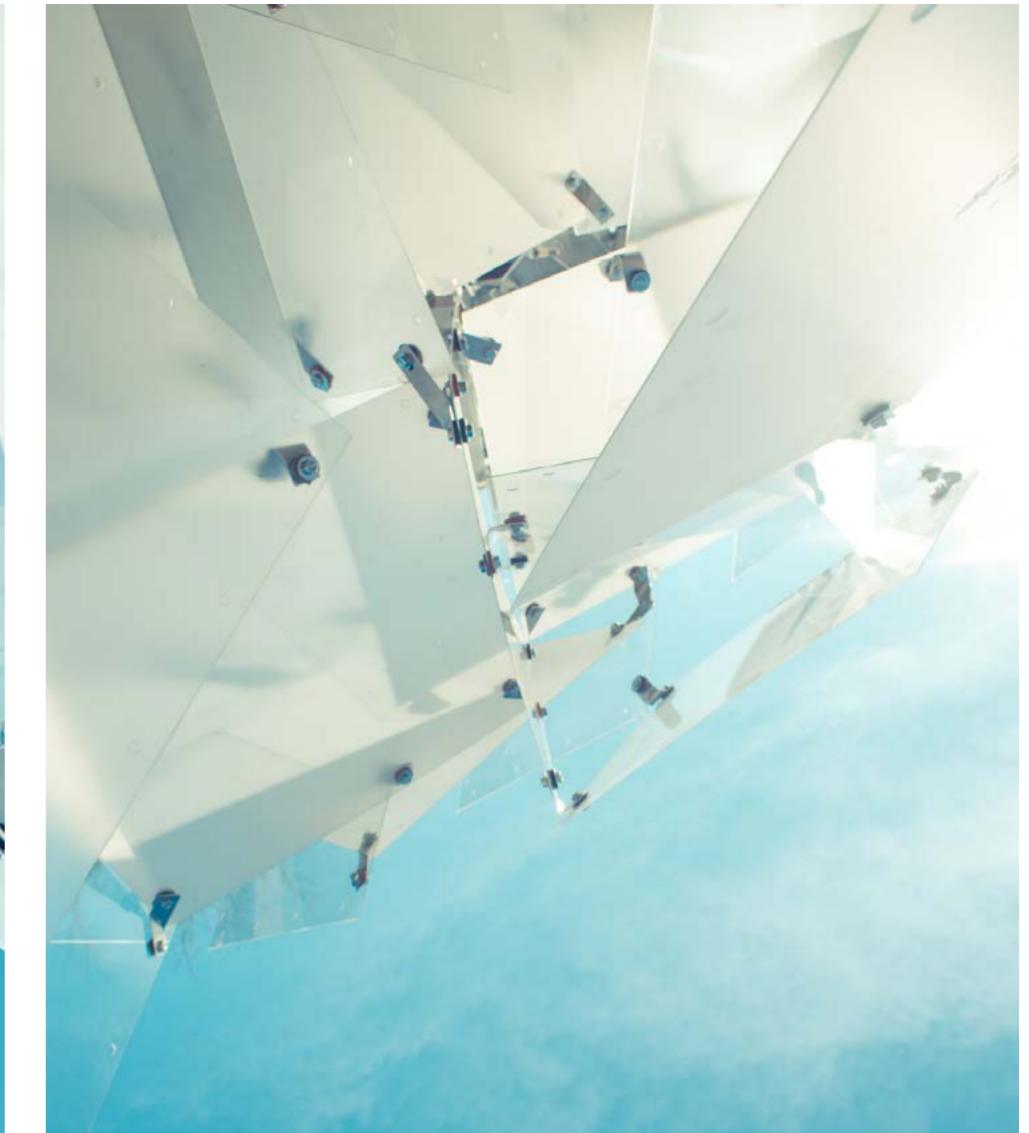
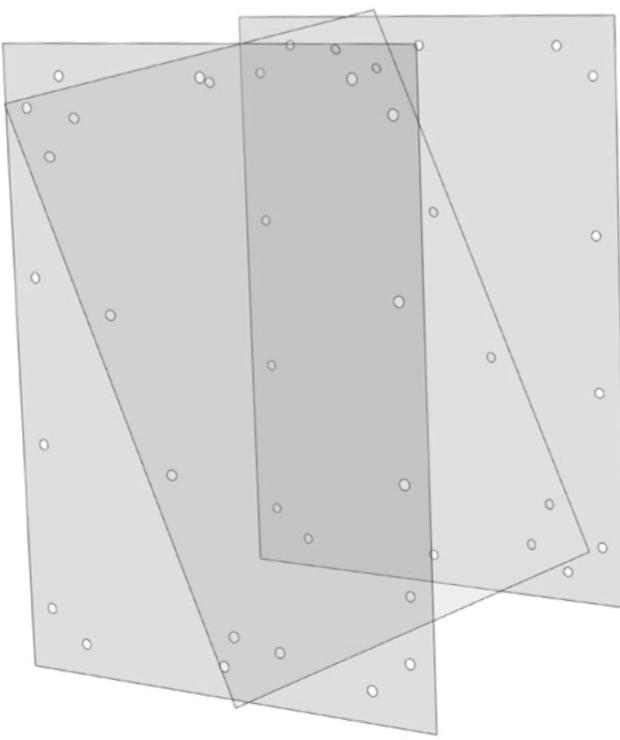


Glass Structures

This work was undertaken as a student project while at Stanford University with an enthusiast group focused on transparent structures. We worked with Professor Jun Sato from University of Tokyo whose research program with Asahi Glass Co. provided access to this [in-development architectural glass product derived from smartphone screen technology](#).

My personal contribution was to define the adaptable 3-panel unit that would serve as the building block for our desired arch form. In addition to assisting Professor Jun Sato with defining the structural capabilities of this flexible hardened glass material, I was also a part of the final construction team.

Photography courtesy of Nick Xu.



Stanford University, 2015
Student Research Project

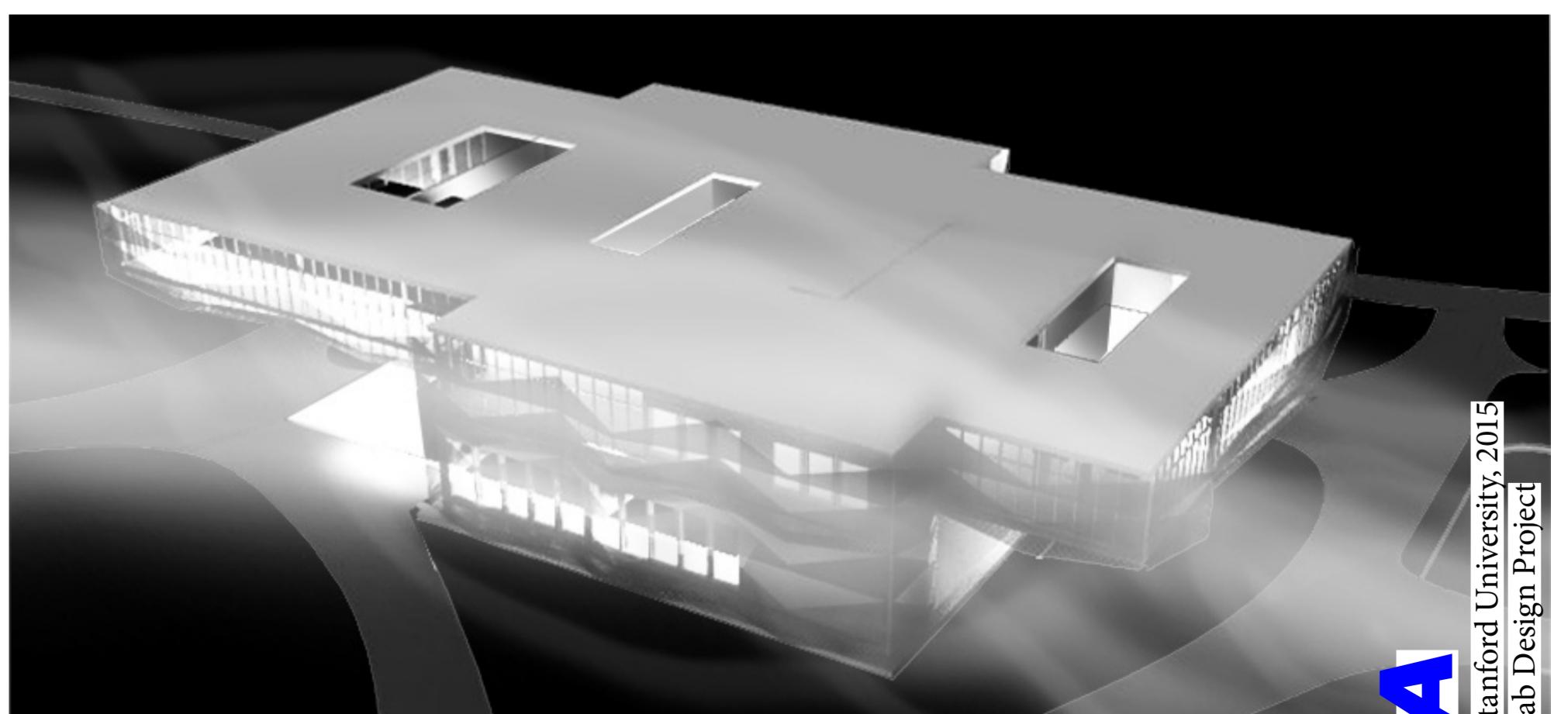
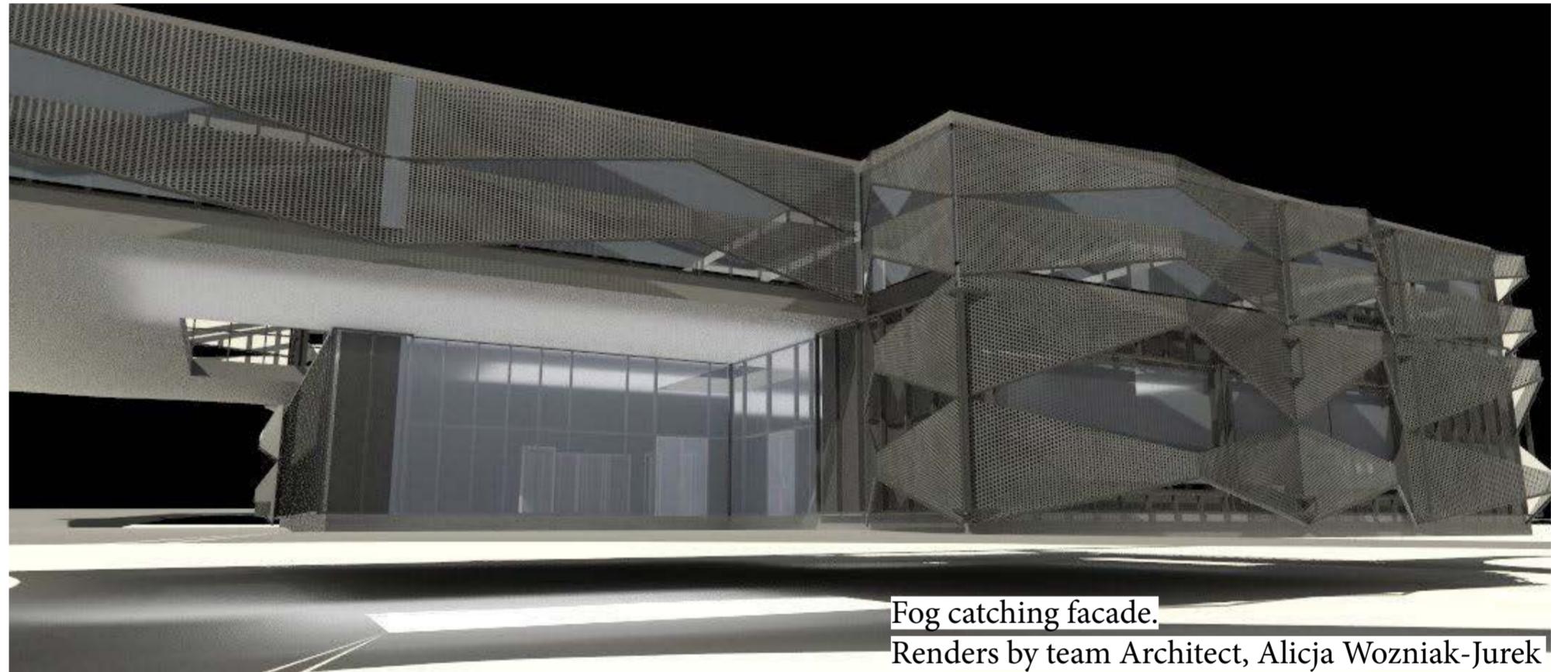
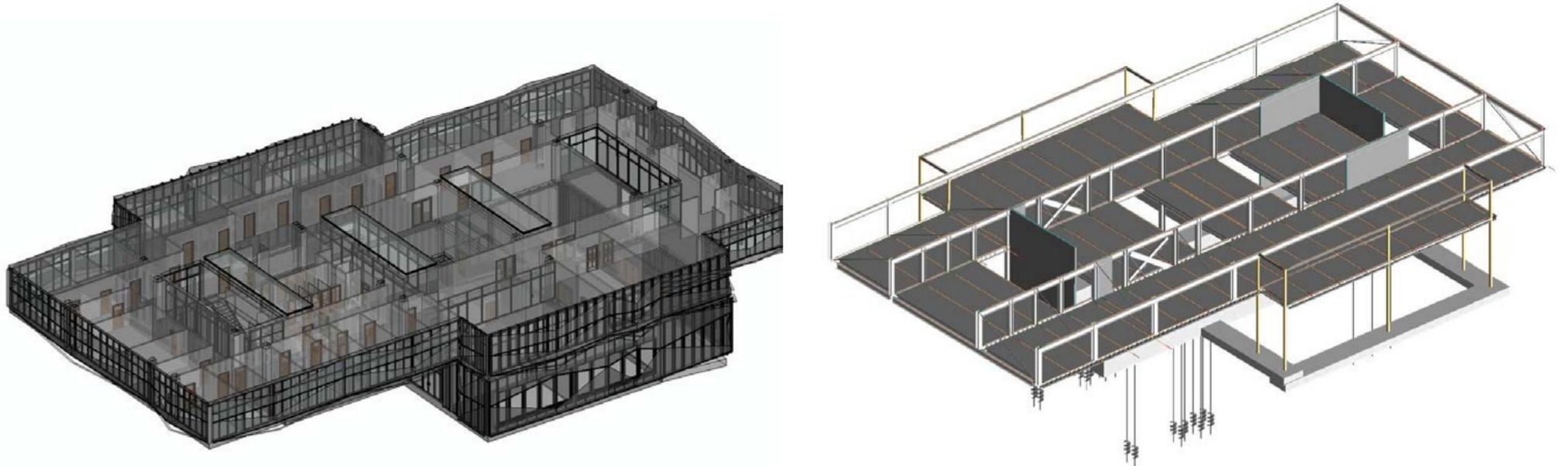
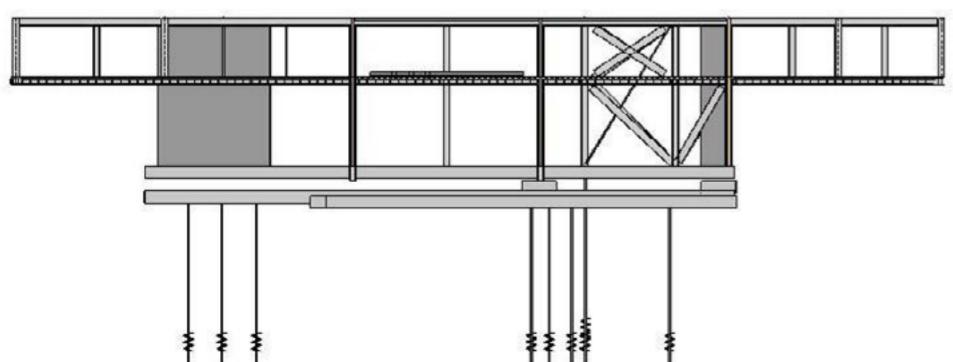
Stanford PBL Lab

Our team were awarded as design project winners, receiving the DPR Challenge Award. My role was as structural engineering team lead, but for our final presented building I took on development of the architectural concept and floorplan in addition to the structural responsibilities.

The use of cantilevers and openings was a response to the design brief which constrained our ground floor plan, a solution that was only achievable with close integration of architecture and structure. The double cantilever of the upper floor yields sufficient space to accommodate our program, avoiding the need for a third floor.

Prefabricated heavy timber floor units were proposed to enable the double cantilever.

Our novel fog-catching facade system was patented with the Stanford Office of Technology Licensing after this project.



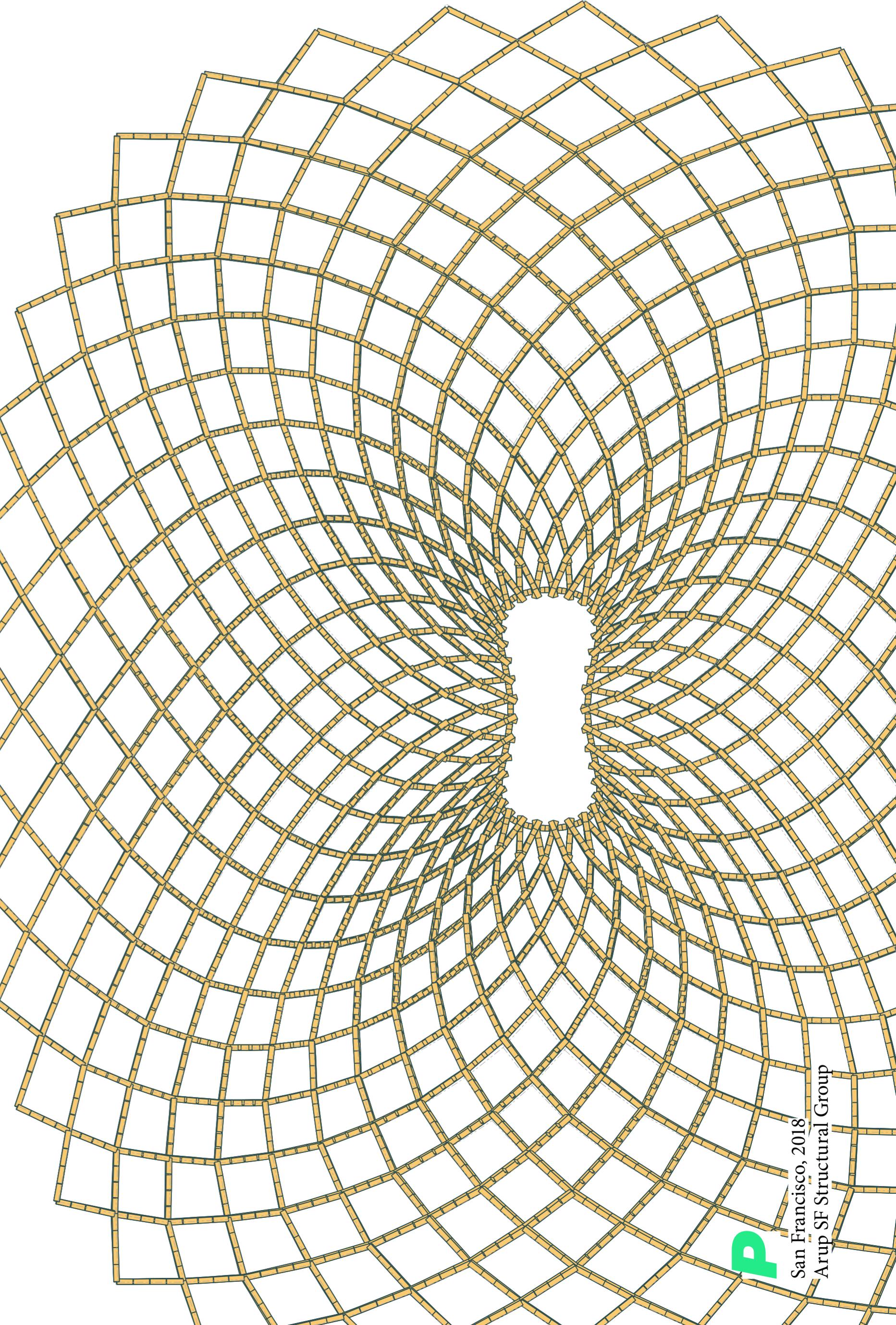


Portland International Airport, ZGF

Computational design of optimized funicular canopy system based on repeating bloom-like geometry.

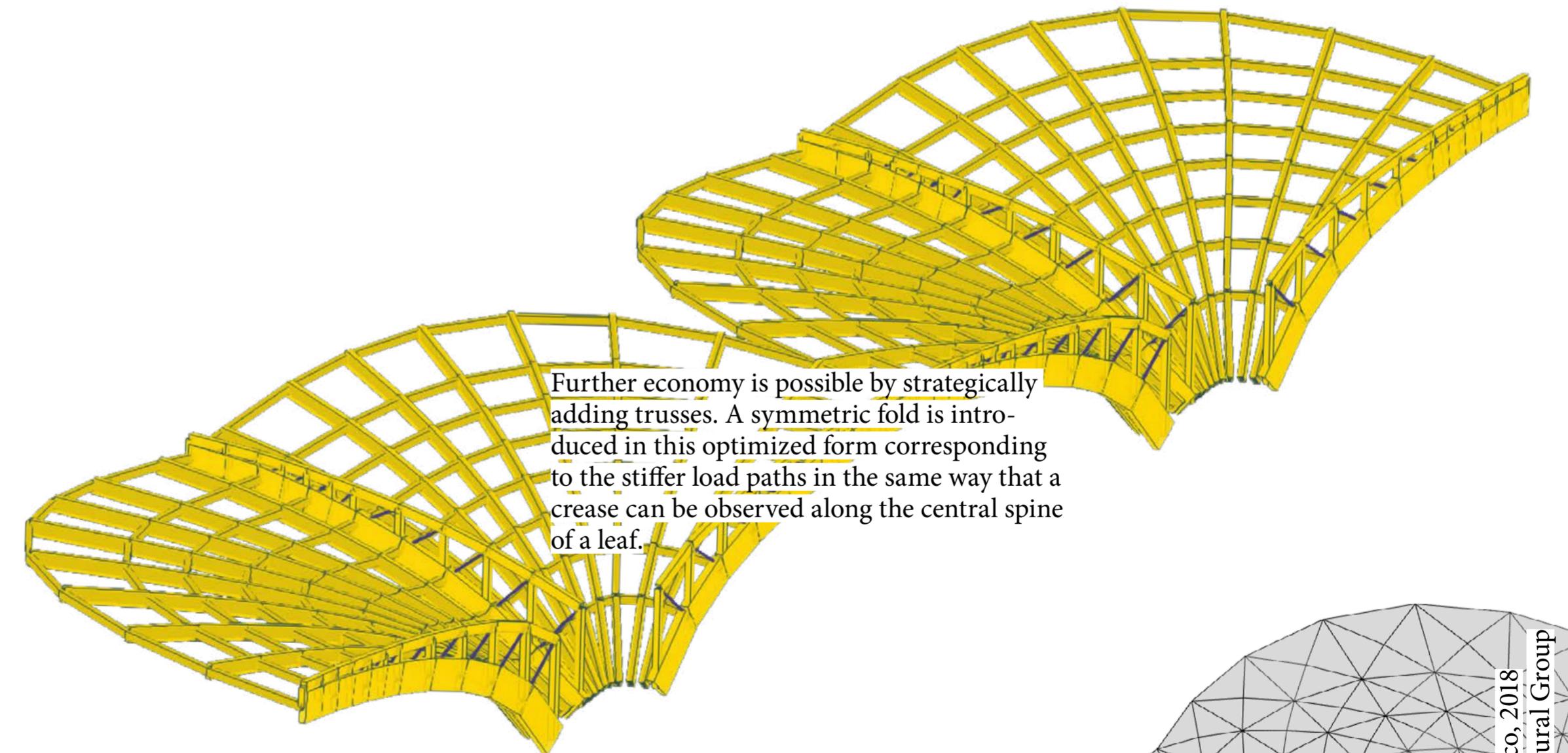
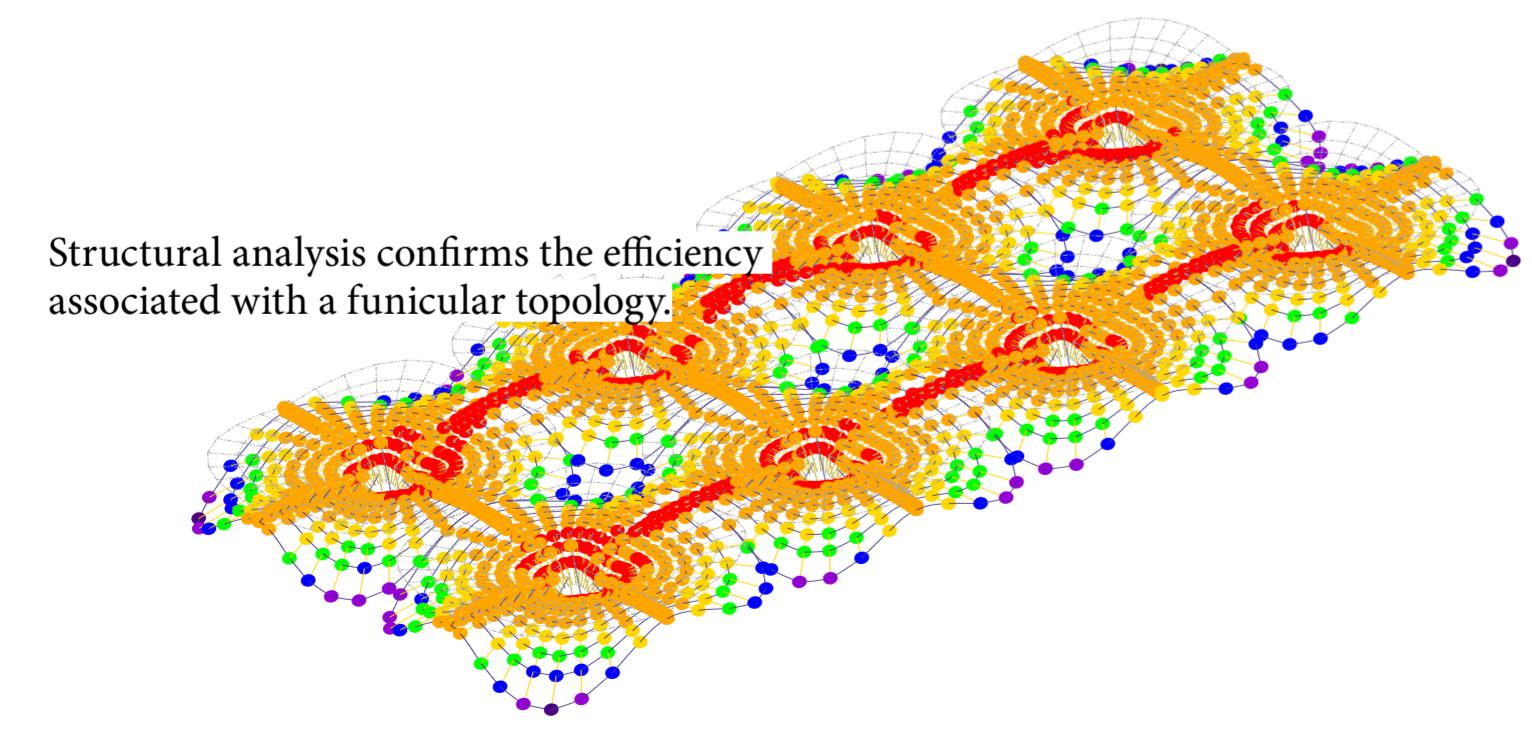
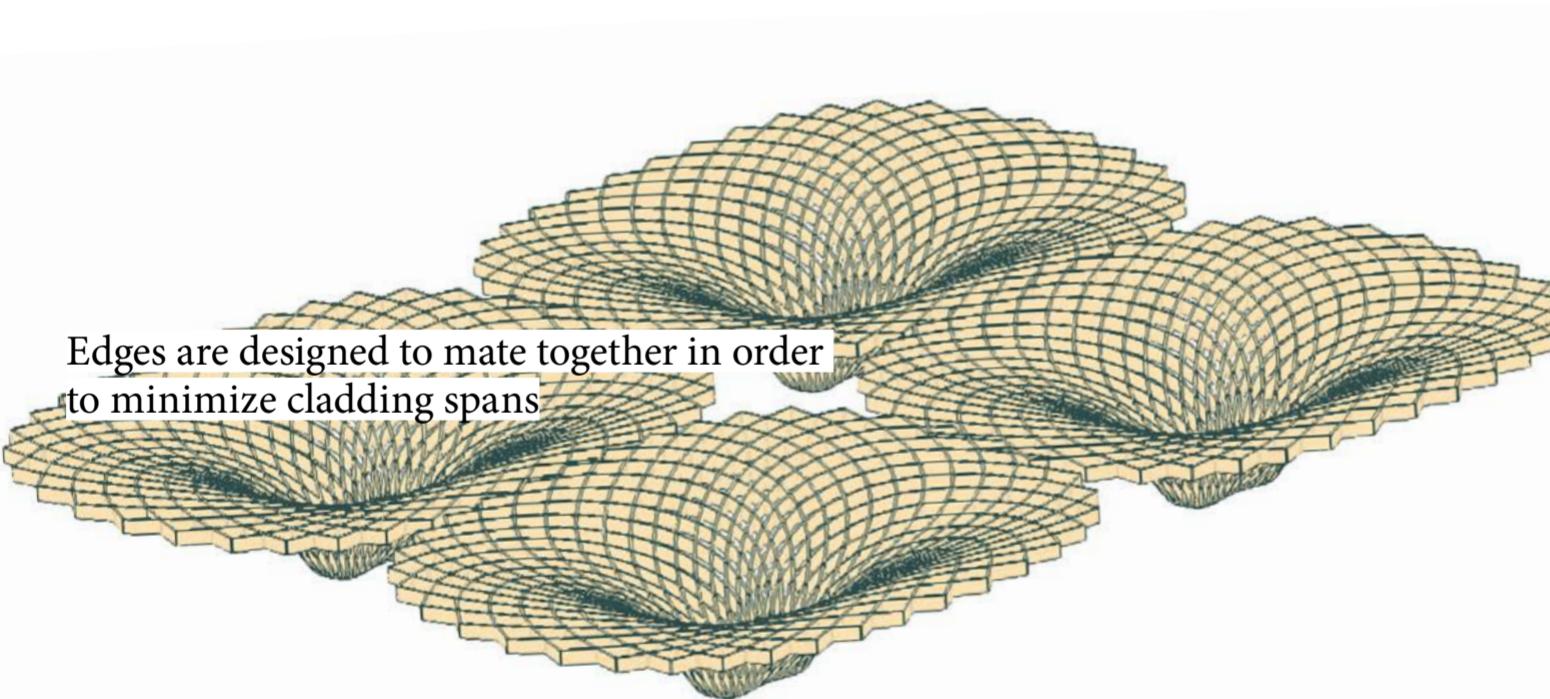
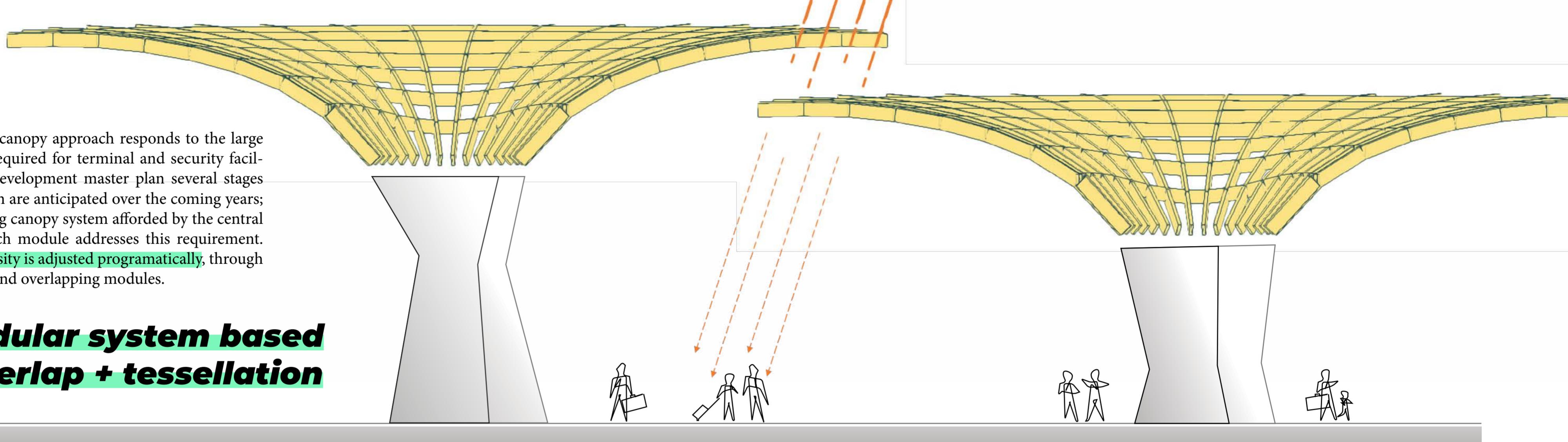
Discretized design in order to use locally produced heavy timber sections, enabling economic construction with biophilic form. Varying double curvature of system is approximated using straight boards cut only at nodes. Two proposed configurations are presented here.

Served as design proposal lead for canopy concept, developing the form and engineering in tandem. All engineering and visual work my own. Engaged by ZGF Architects to promote divergent thinking and use of locally sourced timber within the core project team.



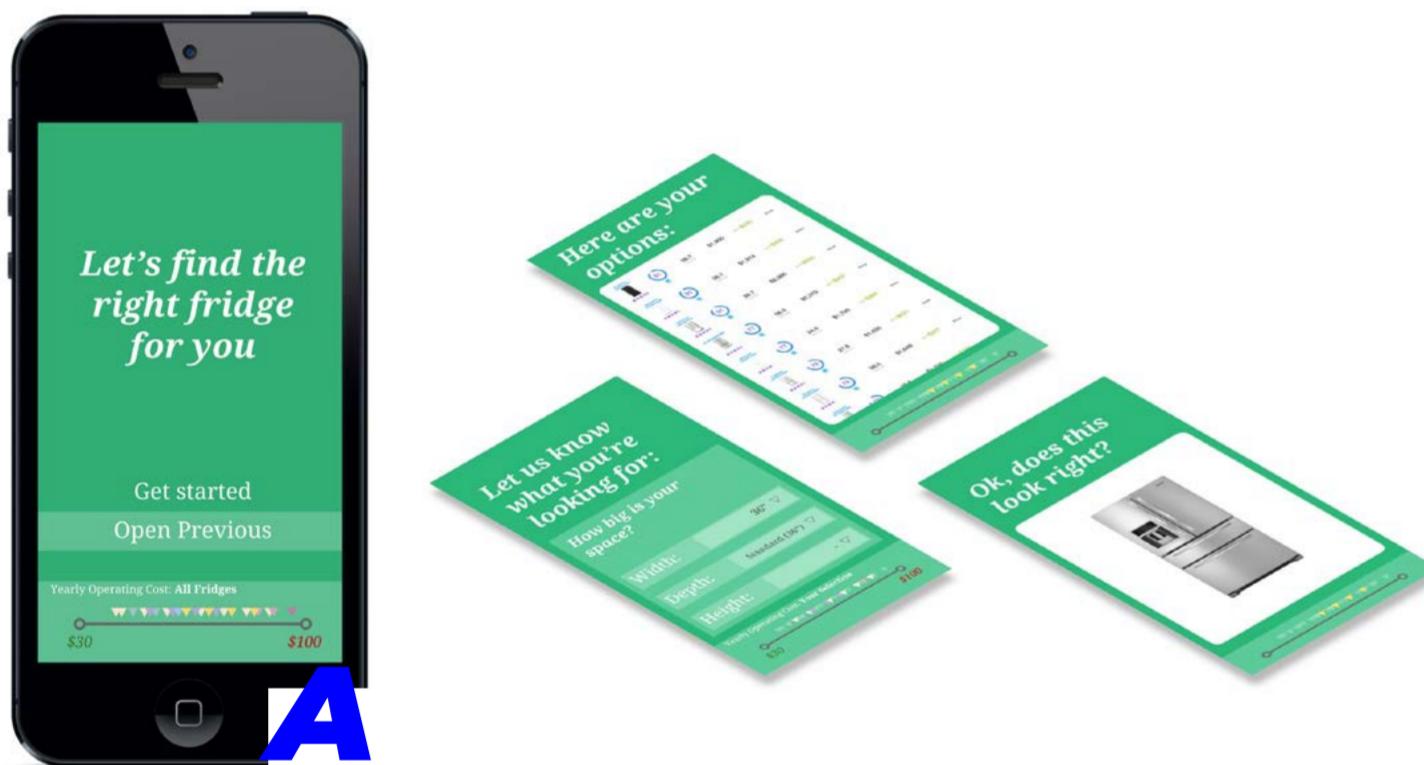
This modular canopy approach responds to the large open spaces required for terminal and security facilities. As a redevelopment master plan several stages of construction are anticipated over the coming years; the overlapping canopy system afforded by the central support to each module addresses this requirement. **Lighting intensity is adjusted programmatically**, through varying infill and overlapping modules.

A Modular system based on overlap + tessellation



Data Driven Design

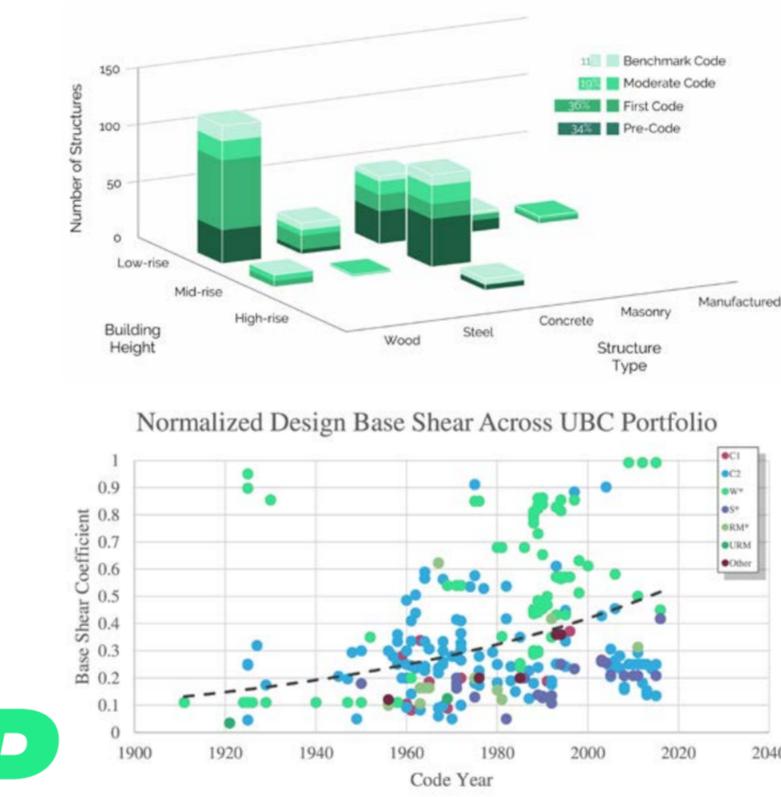
Working with large datasets to enable and inform design has been a constant thread in my professional and academic work. These projects rely on back-end development using Python, Julia, MongoDB, and node.js, and serve up visualization through live web interface plots or Grasshopper.



A
Stanford University, 2015
Graduate Research Project

ARPA-E Energy Behaviour Initiative: UX design, prototyping an app that helps people consider energy use when buying large appliances. Performed needfinding with users in their homes + at point-of-sale locations.

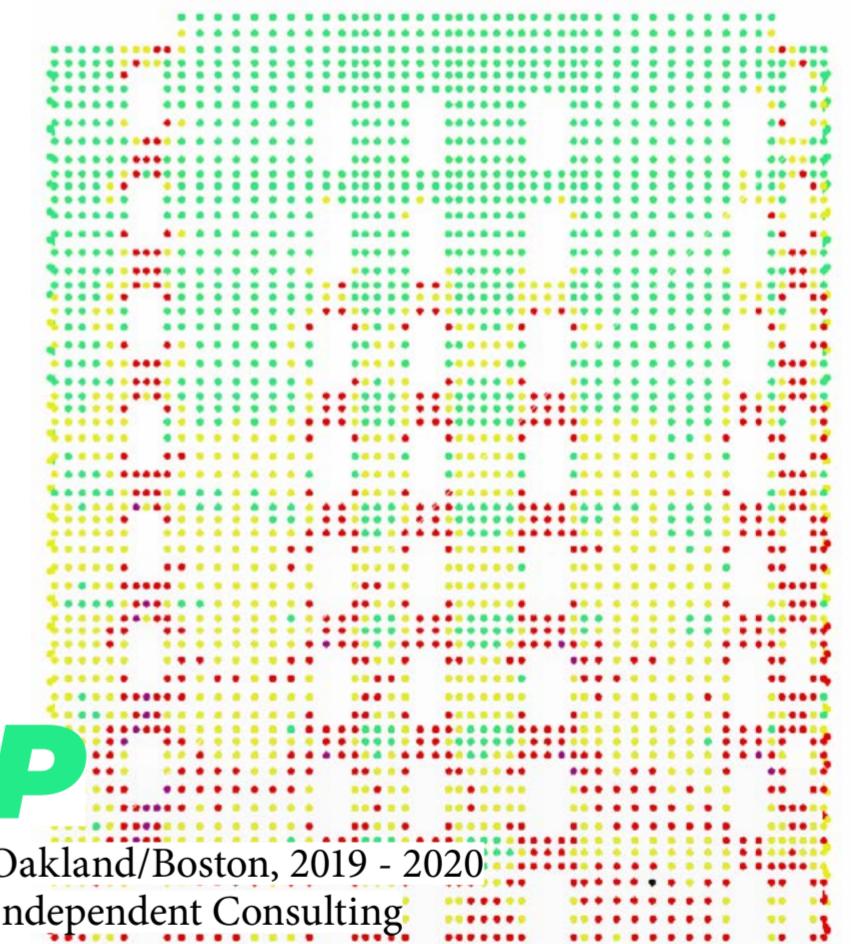
Influences energy use choices through a persistent efficiency range comparison based on scraped data, an approach supported by research to positively bias buying decisions toward energy efficient products.



P
San Francisco, 2017
Arup Advanced Technology + Research

Portfolio Risk study for the University of British Columbia: Automated the analysis of structural performance for the 328 building portfolio, enabling us to consider over 100 ground motions for each structure.

The scale of this project was an opportunity to develop a novel automation strategy covering all buildings, using both a scalable approach to FEA in LS-DYNA, and a data driven approach harnessing hundreds of thousands of analyses reflecting typical Canadian construction types. Web-based interactive front-end for client.



P
Oakland/Boston, 2019 - 2020
Independent Consulting

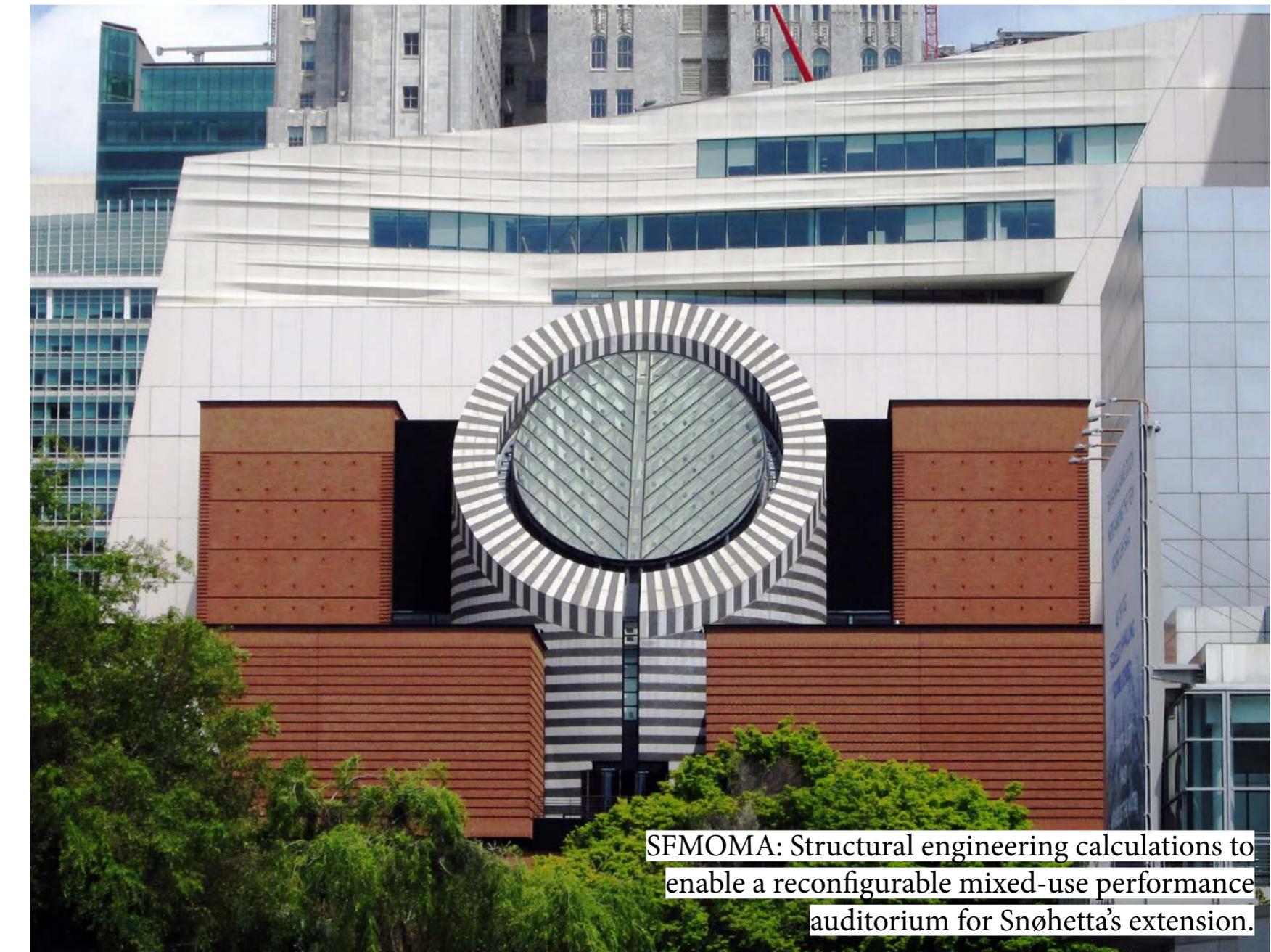
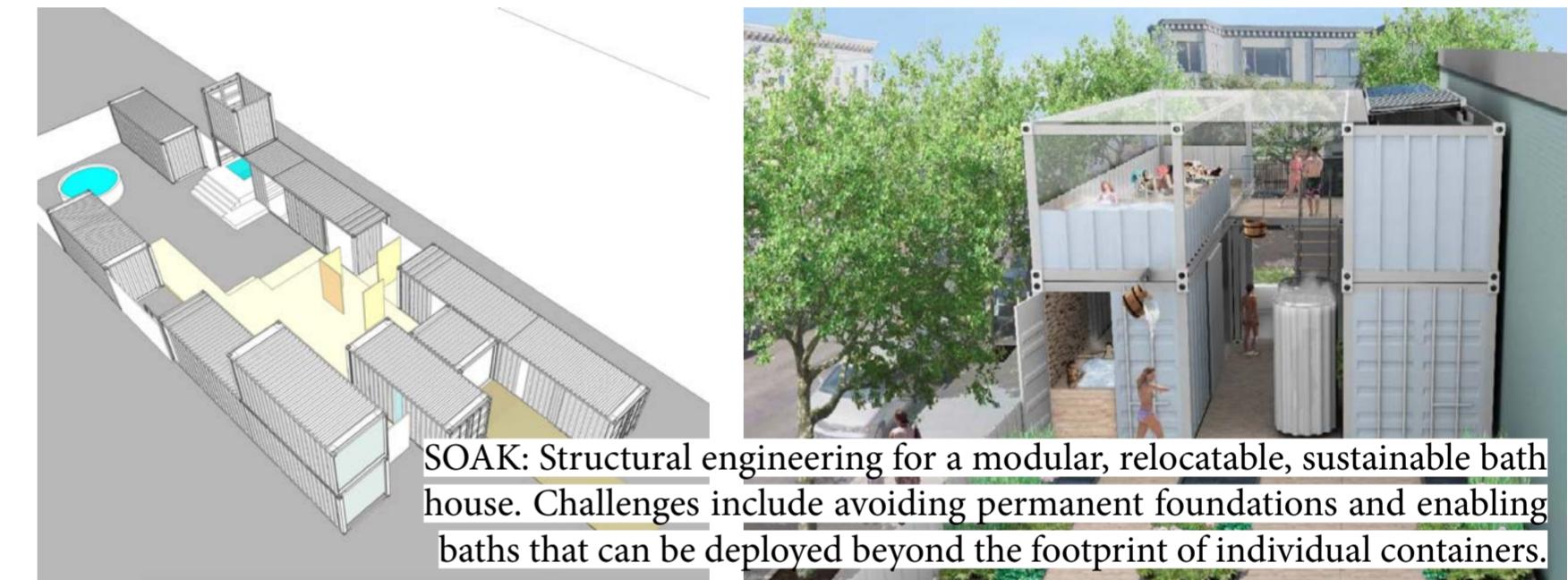
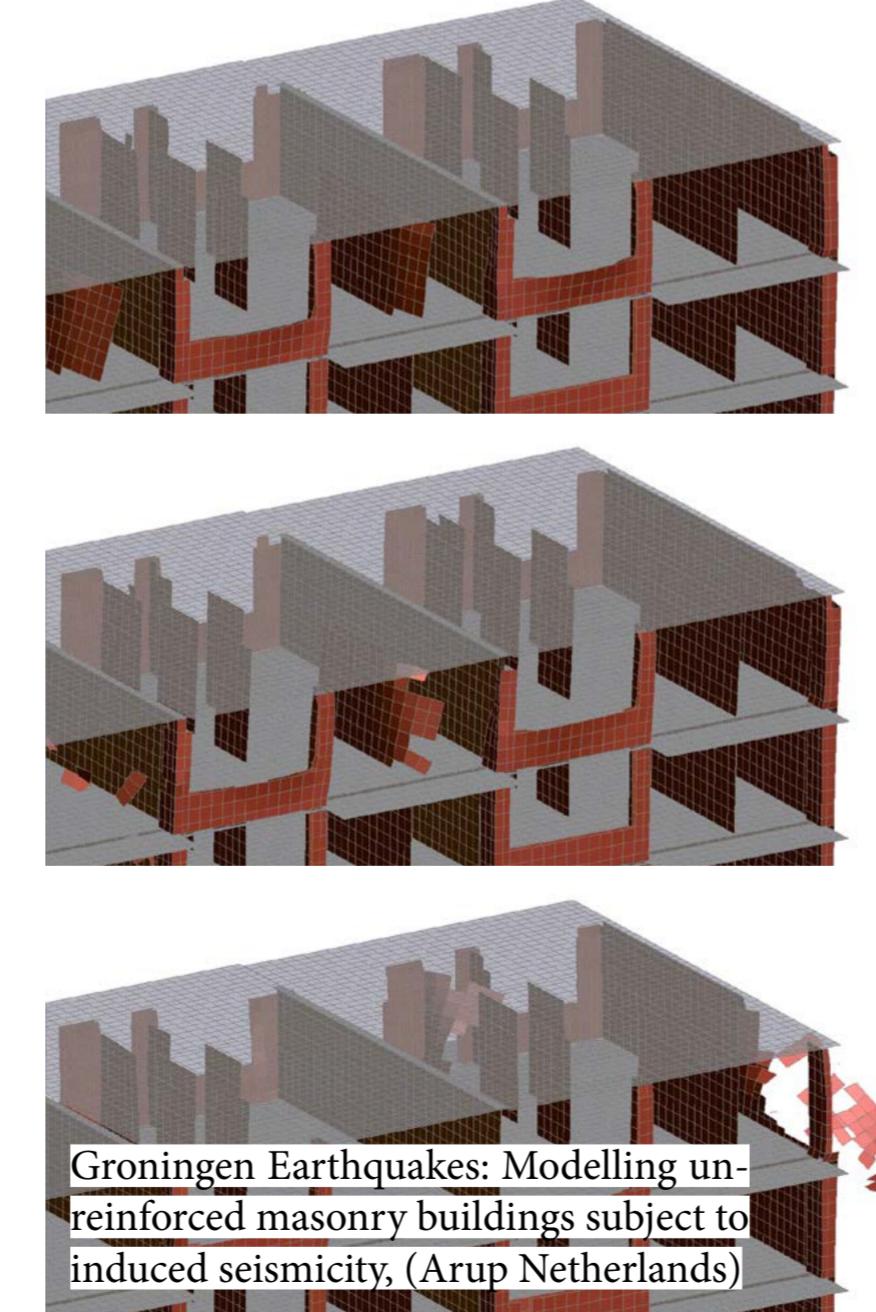
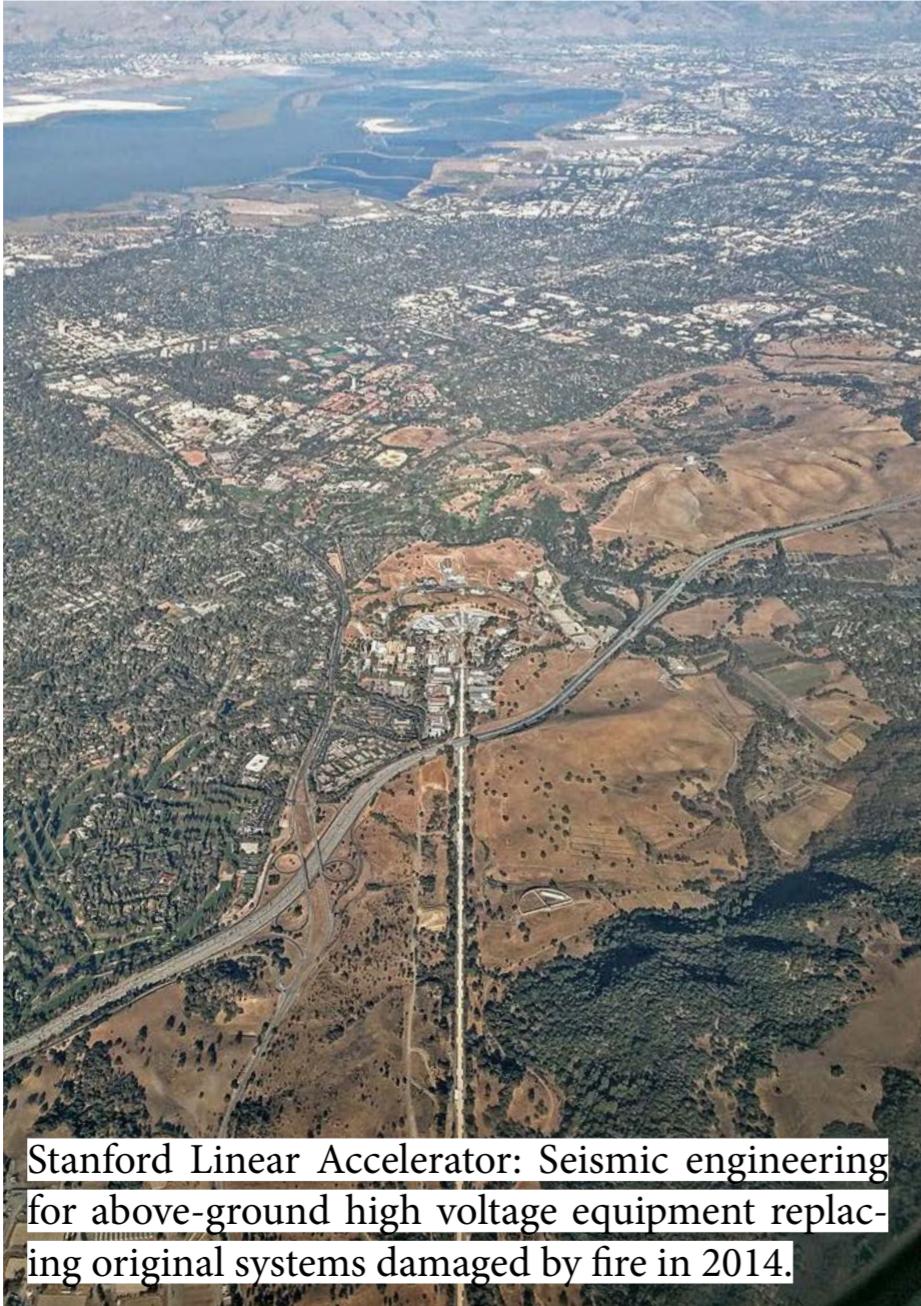
Monocoque Steel Design Methodology: Buckling governed design for a novel modular construction system.

Behaviour is contingent on automated processing of an analysis database consisting of hundreds of thousands of results, in order to consider the many permutations necessary for design of this technology. Python + Grasshopper for 3D visualization directly on the architectural model.

Structural Engineering

This collection of projects represents work where my contribution may be of interest, but was strictly technical and occurred after the aesthetic intent of the project was defined.

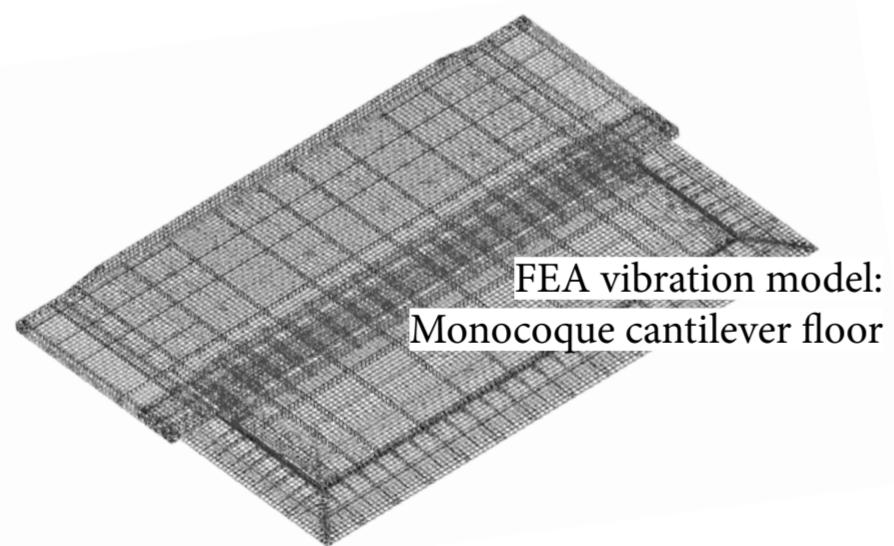
Specific contributions are called out for each project. Models are my own, and images representing each project come from the architect team or public domain.



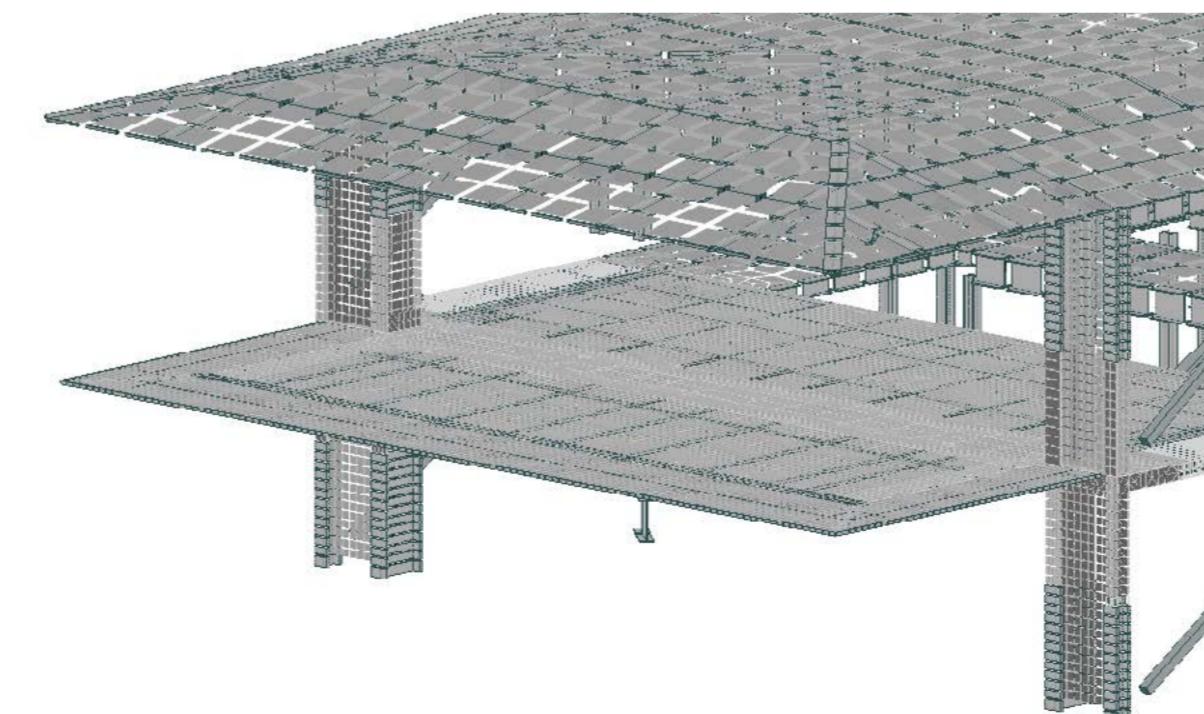
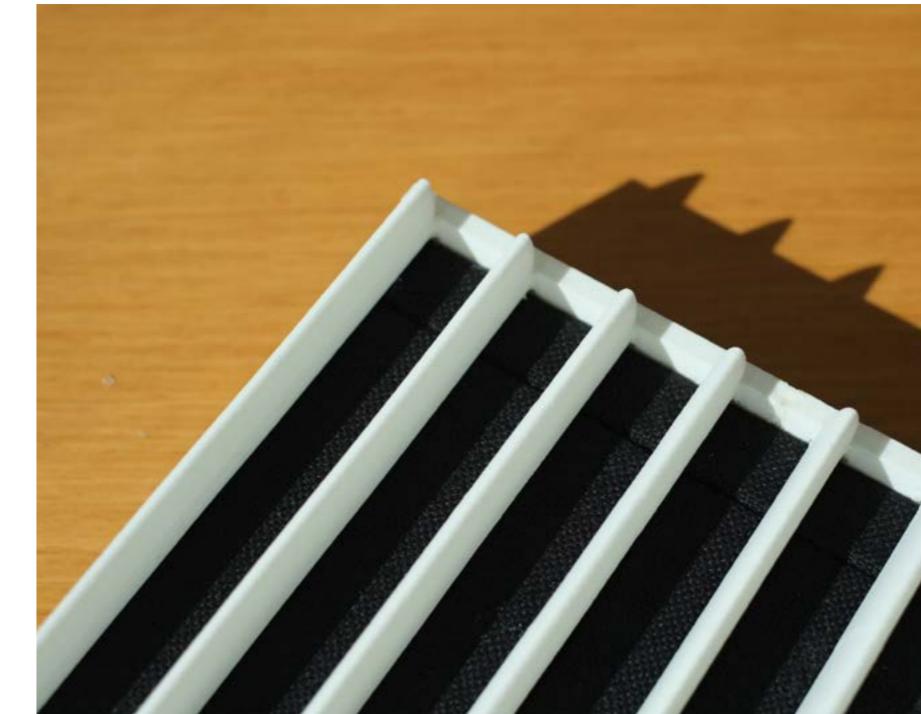
Foster + Partners

This body of work represents my efforts as a consultant to Foster + Partners while at Arup, San Francisco. This was a fortuitous opportunity to be involved in some of their key projects with Apple, including Apple Park and several flagship retail projects.

Specific contributions are called out for each project. Images representing finished work come from Apple/Foster + Partners public communication with the exception of the 3d models, 3d printed sample, and Apple Park group photograph which are my own.



The monocoque steel design approach we developed for the Mexico City flagship's cantilever would become the basis of my subsequent consulting work in the modular construction space.



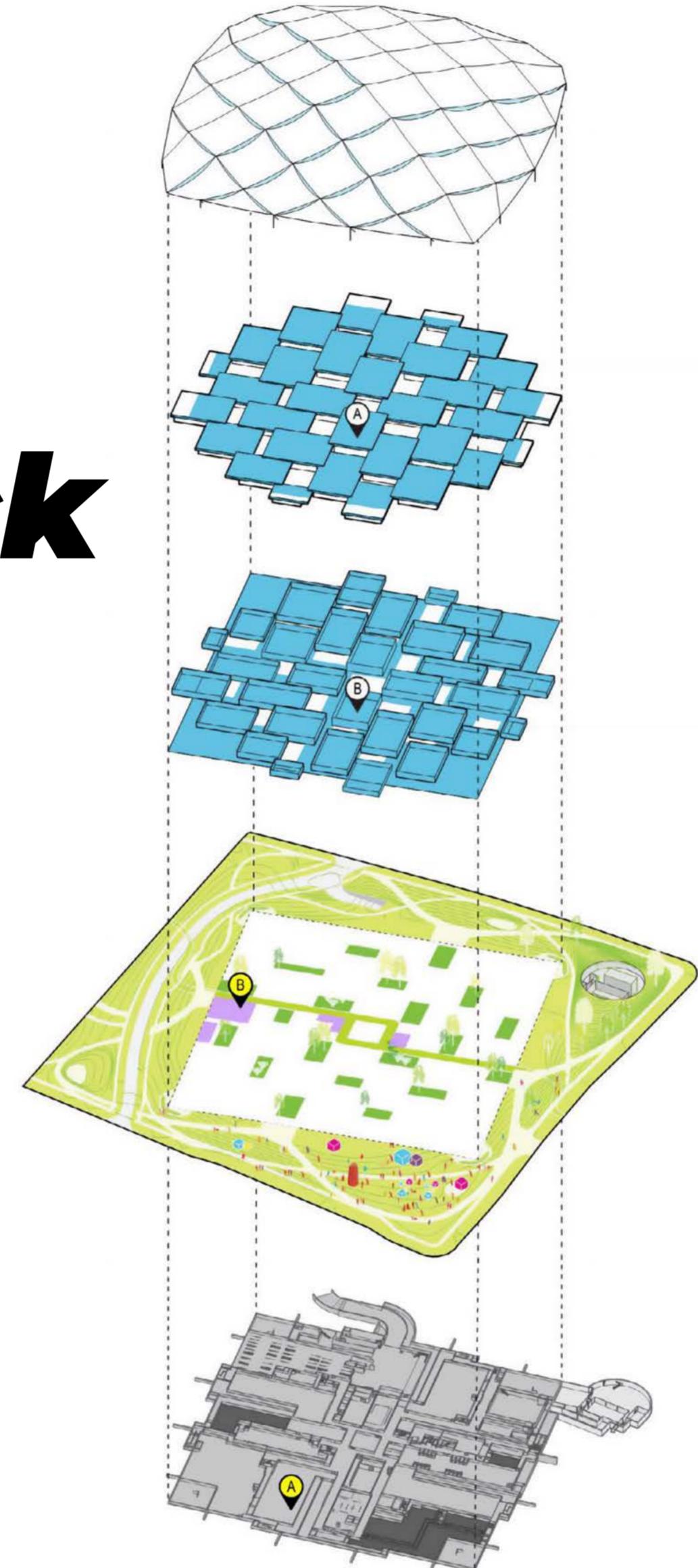
BIG & Heatherwick

This collection of projects was undertaken alongside Bjarke Ingels Group and Heatherwick Studio who were engaged by Google across a range of moonshot built-environment projects, including two new campus projects, an aerospace research facility, and a 100,000 person off-site events facility.

Much of this work remains confidential - images and collaborating architects are limited to those that have been publicly disclosed, consequently omissions have been made. Personal role in each of these projects was supporting Google founders in pursuing their vision during masterplanning, acting as a researcher vetting emerging technologies to enable historically impossible buildings.



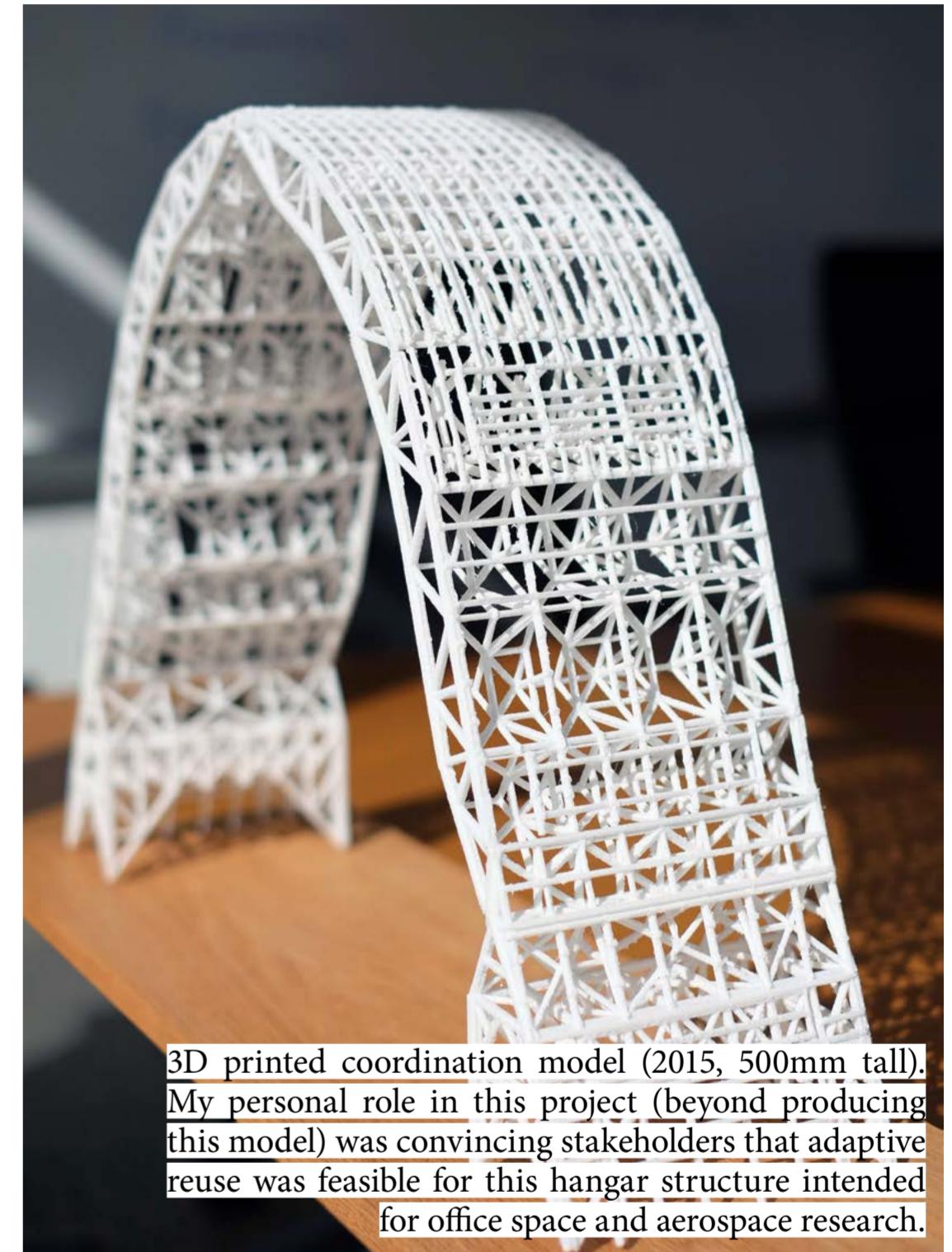
I conducted engineering studies to validate canopy system spans and materials, investigate the feasibility of robotic construction/maintenance, and inform interior air quality, energy, and water use projections. I also produced a series of large-scale 3D printed models to express our engineering concepts for each project.



At Charleston East, my contributions during masterplanning assisted in establishing technical confidence in the draped catenary design and in winning Arup scope as engineer of record. This city-like collection of structures within a larger tented canopy was a core focus of my research. Imagery: BIG + Heatherwick Studio plan submittal to City of Mountain View.



600,000 sqft Charleston East Campus Building
Imagery: BIG + Heatherwick Studio plan submittal to City of Mountain View.



3D printed coordination model (2015, 500mm tall). My personal role in this project (beyond producing this model) was convincing stakeholders that adaptive reuse was feasible for this hangar structure intended for office space and aerospace research.



Materials and feasibility research for ambitious campus project (largest ever enclosed structure). Personal focus on tensile material engineering, gallery curation, and biophilic/biomimetic/bio-based materials.