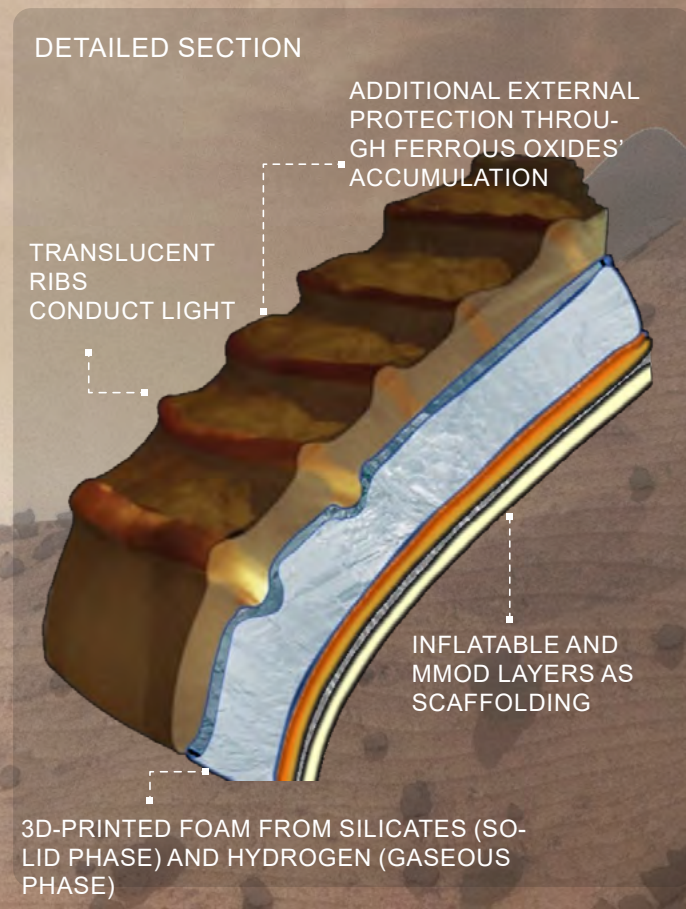
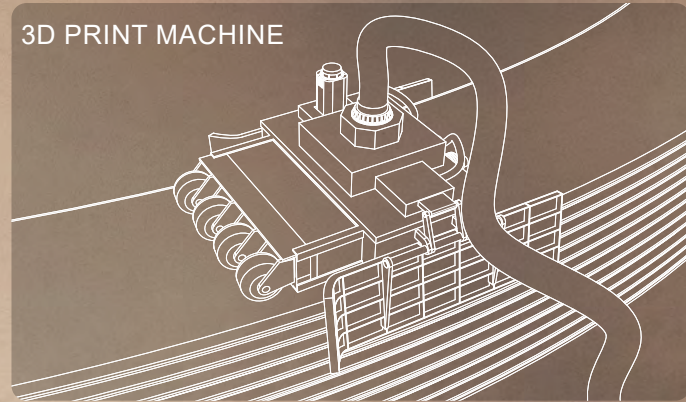
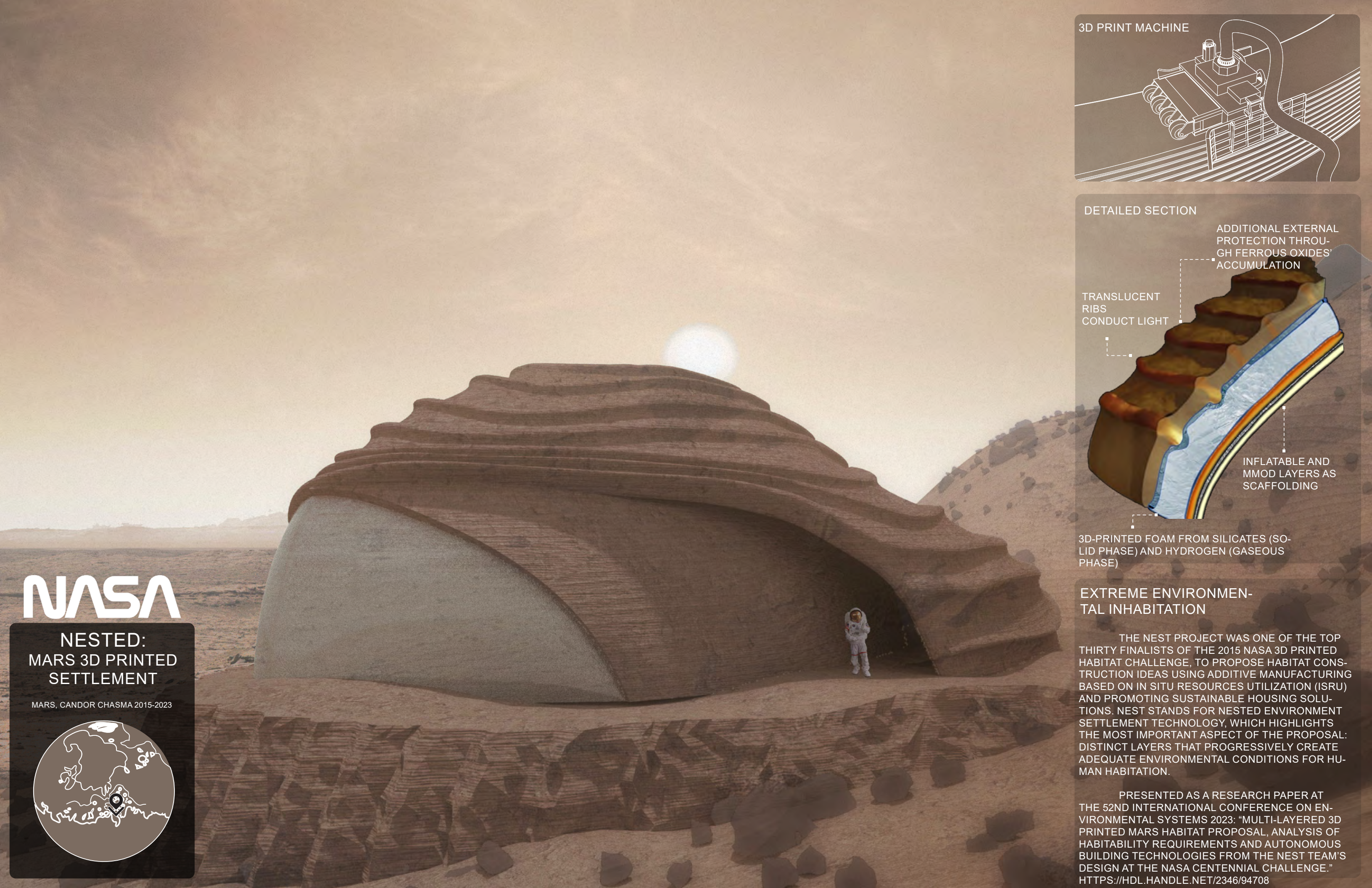




PORTFOLIO

2023

JOSE-MIGUEL ARMÍJO



NASA

**NESTED:
MARS 3D PRINTED
SETTLEMENT**

MARS, CANDOR CHASMA 2015-2023

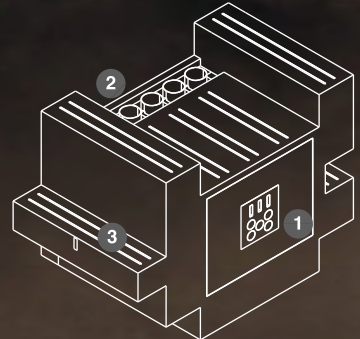


**EXTREME ENVIRONMENTAL
INHABITATION**

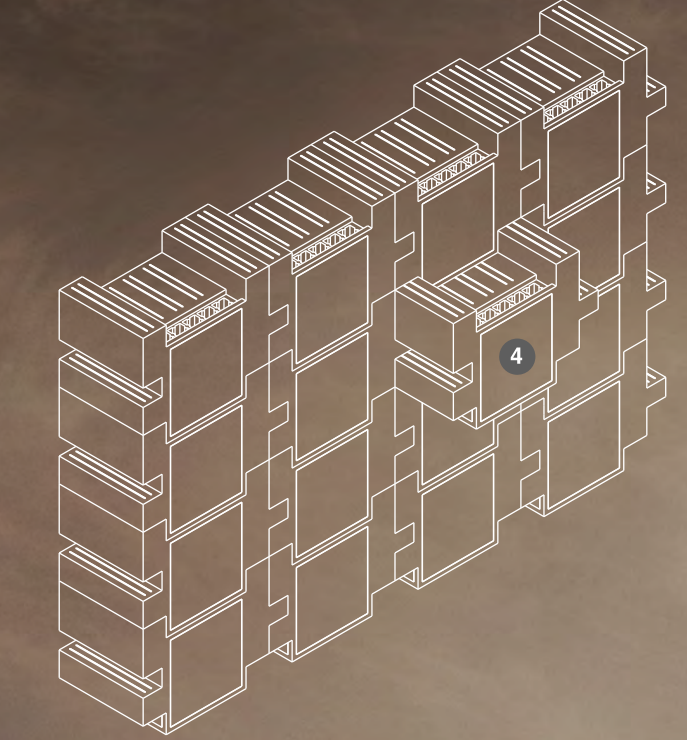
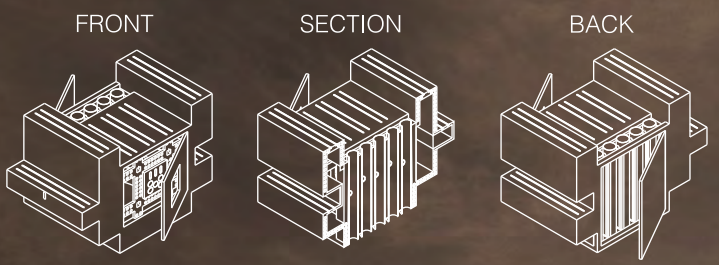
THE NEST PROJECT WAS ONE OF THE TOP THIRTY FINALISTS OF THE 2015 NASA 3D PRINTED HABITAT CHALLENGE, TO PROPOSE HABITAT CONSTRUCTION IDEAS USING ADDITIVE MANUFACTURING BASED ON IN SITU RESOURCES UTILIZATION (ISRU) AND PROMOTING SUSTAINABLE HOUSING SOLUTIONS. NEST STANDS FOR NESTED ENVIRONMENT SETTLEMENT TECHNOLOGY, WHICH HIGHLIGHTS THE MOST IMPORTANT ASPECT OF THE PROPOSAL: DISTINCT LAYERS THAT PROGRESSIVELY CREATE ADEQUATE ENVIRONMENTAL CONDITIONS FOR HUMAN HABITATION.

PRESENTED AS A RESEARCH PAPER AT THE 52ND INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SYSTEMS 2023: "MULTI-LAYERED 3D PRINTED MARS HABITAT PROPOSAL, ANALYSIS OF HABITABILITY REQUIREMENTS AND AUTONOMOUS BUILDING TECHNOLOGIES FROM THE NEST TEAM'S DESIGN AT THE NASA CENTENNIAL CHALLENGE." [HTTPS://HDL.HANDLE.NET/2346/94708](https://hdl.handle.net/2346/94708)

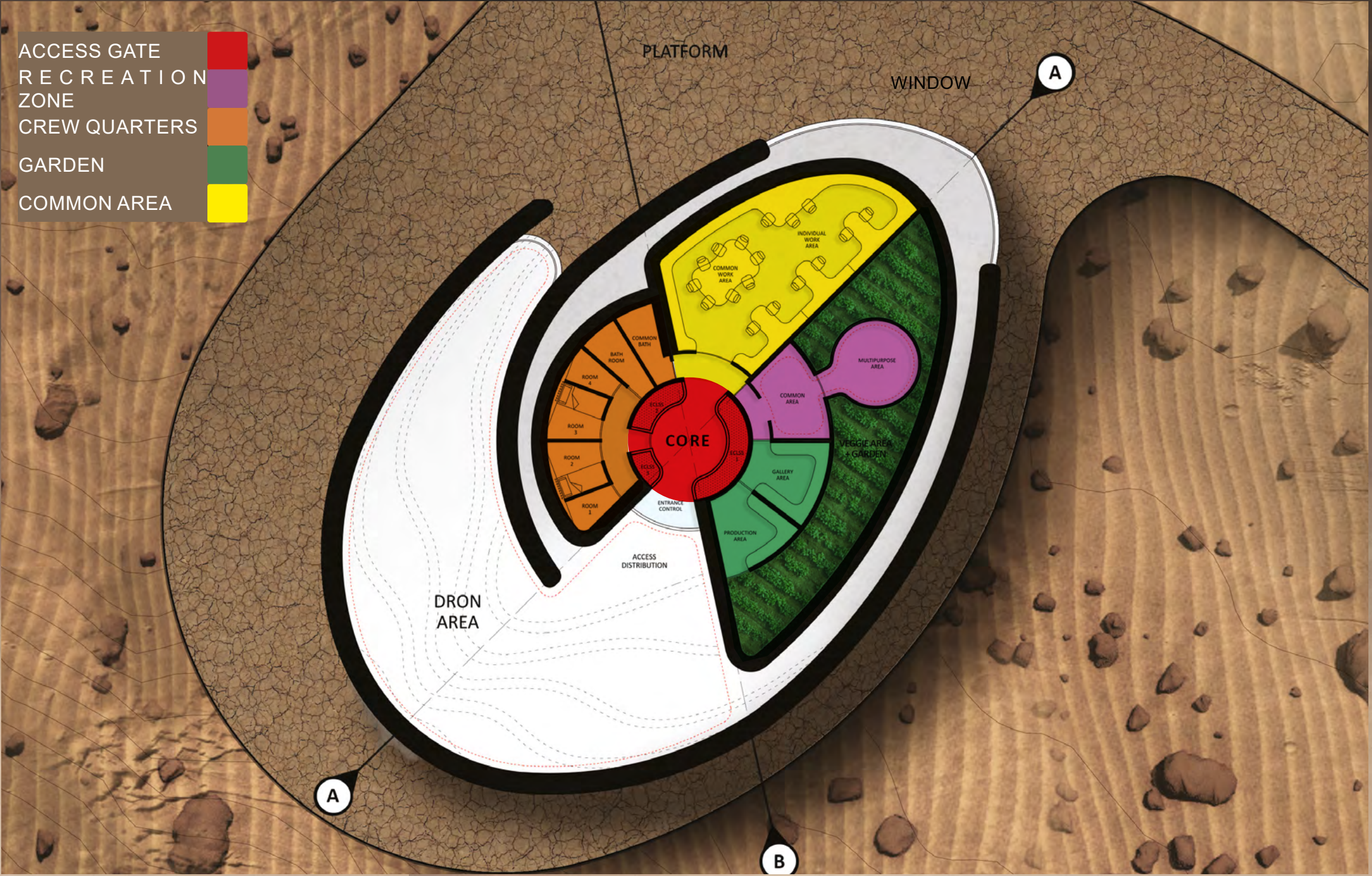
PLUG AND PLAY INTERIOR CONCEPT



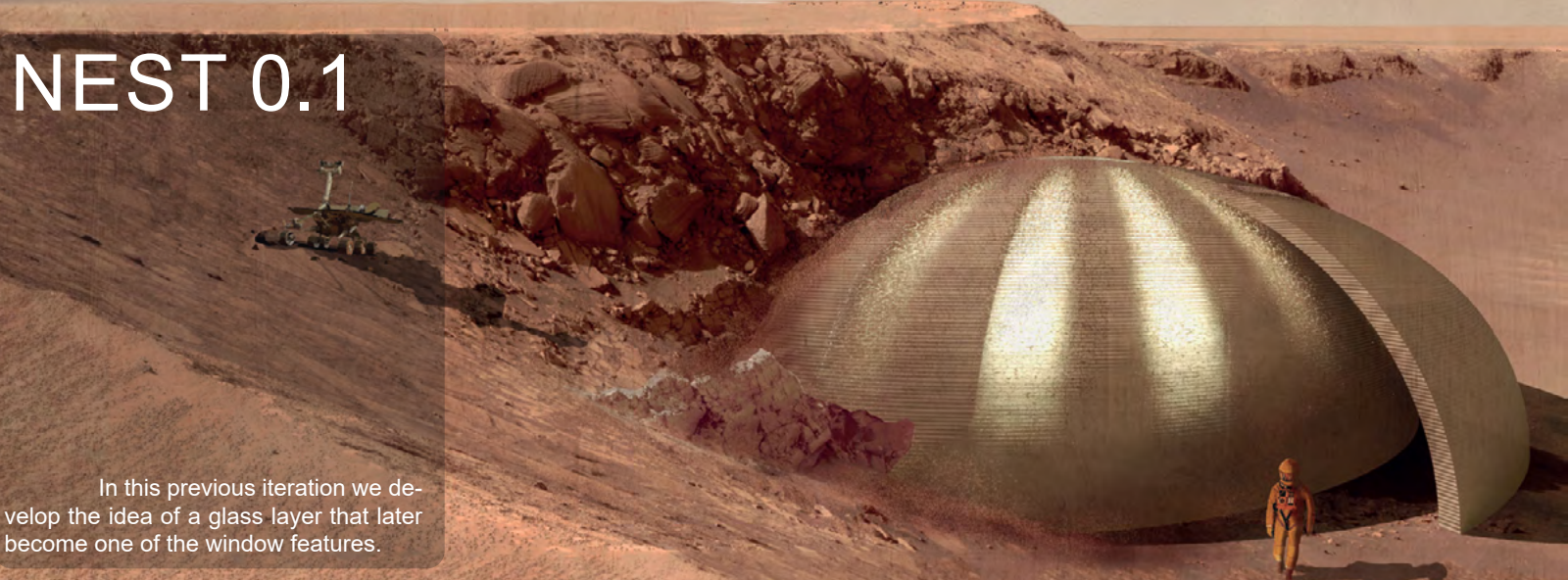
- 1 Universal plugin for connecting equipment modules
- 2 Pipe: water, air and drainage conduits
- 3 Ball bearing system for sliding modules
- 4 Example of a module being removed from assembled wall



- ACCESS GATE
- RECREATION ZONE
- CREW QUARTERS
- GARDEN
- COMMON AREA



NEST 0.1



In this previous iteration we develop the idea of a glass layer that later become one of the window features.

NEST 0.2



The second iteration, we developed the idea of aligning multi-material printing with Topologic optimization



CREW QUARTERS



COMMON AREA

HABITABILITY

Habitability in an architectural plan refers to the design and provision of adequate living conditions for the occupants of a building. It encompasses a wide range of factors that contribute to the comfort, quality, and planned distribution of zone; aiming to enhance the daily conditions of its inhabitants. A space habitat integrates these factors with the increased complexity of maintaining internal conditions that ensure the life and well-being of the occupants by deploying different hardware throughout the structure.



GARDEN



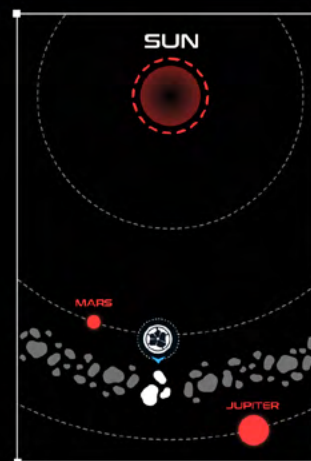
ASTEROID MINING CITY

ASTEROID BELT 2020

KURA FOR SPACE MINING

In the language of South America's Mapuche culture, Kura means stone. The Mapuche believe that stones are a connection between life and the environment surrounding it. And with Kura, we aim to celebrate this belief in the strong and cyclical relationships found in nature. We believe a design focused on peace and synergy will have incredible political and social outcomes for the community and environments thriving inside.

Throughout history, mining industries have transformed small mining towns into large commercial cities. This spirit of enterprise will continue our human expansion into the solar system. Aided by science and technology, communities will boost their growth and economy by processing asteroid materials. However, to avoid repeating human errors like pollution and resource depletion, Kura is needed. Kura considers both mining and the future of design simultaneously while terraforming in space.

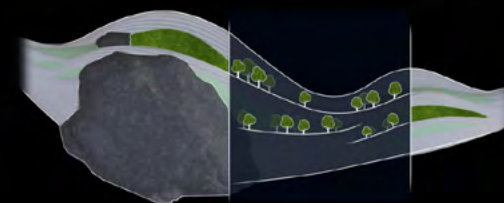


INTO THE ASTEROID BELT

Water is the most precious resource for a space outpost. It will be needed by inhabitants as well as propulsion systems. Our current technology allows us to mine water from asteroids in nuclei methane ice form, sustaining human missions and growing outposts. In the long term, other extracted minerals such as silicates, metallic & carbon compounds, and even undiscovered elements, could become both commodities and building material. This is why we chose the asteroid belt between Jupiter and Mars, to maximize the potential of these found materials and new economic possibilities.

ECOSYSTEM

A self-sufficient, adaptable, and mutualistic ecosystem is needed to sustain a community in extreme environments like space. With Kura, we propose a resilient partnership process that adapts its environment to the incredible uncertainty of space. This evolutive process consists of a biological reciprocity between vegetation and humans. Forests and bacteria will transform carbon dioxide into oxygen and depurate water, while humans monitor and maintain vegetation health through water and soil management.



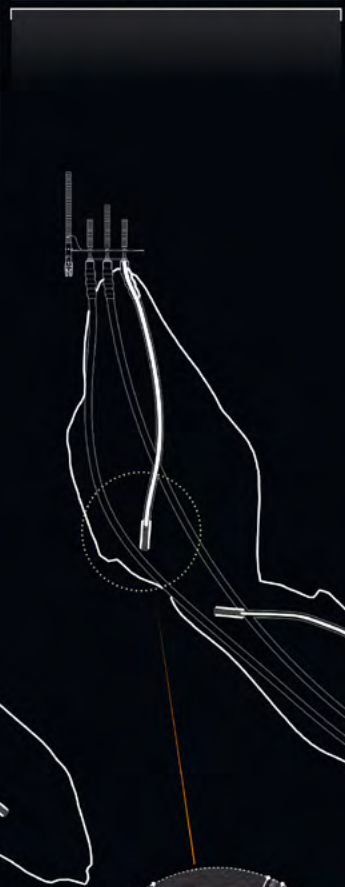
ASTEROID MINING CITY GROWTH

The process begins with the transport and landing of a rocket cargo onto a carefully studied asteroid. A sandy crater area is easy to drill into which will secure the harbor facilities. Automated boring and tunneling systems will then break through the ground, creating the extraction paths.

The foundation stage generates the main tubes. These tubes create distribution channels within the asteroid to transport material and machinery. The drilling and construction technology will be capable of boring, extracting, processing, on-site 3D printing, and will transfer the exhausted material to the harbor. Eventually, the inhabitants will use these channels for water, transportation, and oxygen distribution.

During this stage there will be additional mining activity along the asteroid that includes secondary and smaller boring machinery to extract and further connect the main tubes.

Kura's Inter-paraterraforming approach begins with underground structures. But thanks to the combination of material distribution, 3D printing, and zero gravity, Kura will grow habitat towards the asteroid's outside. Terraformed asteroids will be connected through these pipe structures, adding other mining operations while creating a bishop ring to produce artificial gravity by means of centrifugal force.



A HARBOR & MATERIAL STORAGE

After mining and processing the material at the boring machines, minerals are propelled through pipes and stored at the docking zone. Materials are contained in units made of aluminum and zinc cloth-like material. As a result, the units can be loaded into rockets and sent to other communities on other asteroids and planets.



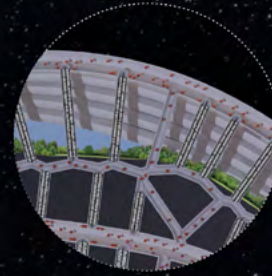
B MAIN BORING & TUNNELING

The machines with 3D printer tunneling capabilities will process the asteroid rock while moving along the designed path, thus generating a tube through which the minerals and water move to storage and distribution.



C SECONDARY BORING MACHINES

Smaller boring machines will drill channels to create human dwelling by 3D printing.



D EXTREME HUMAN HABITAT

All the structures used for mining will be repurposed for human habitats that resemble city life. While some parts will become buildings, dwellings and schools, others will become autonomous magnetic transportation channels and support. We have even designed vegetation and forest zones to sustain life and maintain the community's health.

ROCKETS & CARGO

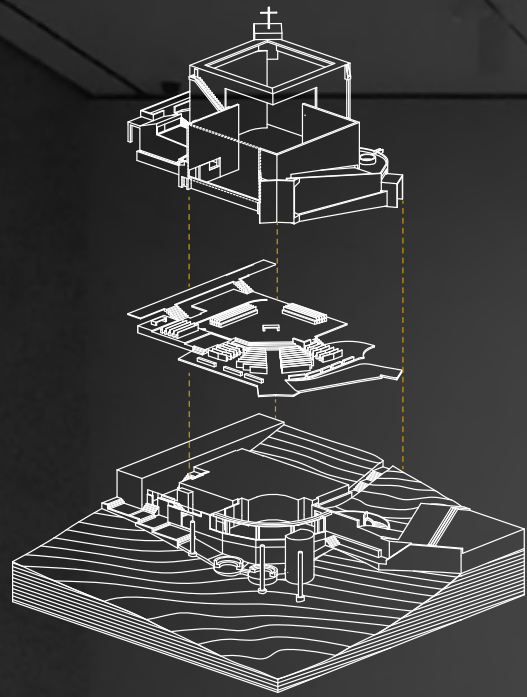
The vehicle to transport machinery consists of a super heavy propellant rocket, able to move 100 tons of automated mining and construction technologies through deep space.



ENERGY

During the first stage, the required energy will be solar farm based. However, we will further include other sources like nuclear fusion.





0_ARCHITECTURAL SURVEY

MoMA NY BENEDICT'S TEMPLE

"LATIN AMERICA IN CON-
STRUCTION: ARCHITECTURE
1955-1980". 2015 EXHIBITION



1_CNC BASE AND LASER CUT WALLS



2_ENSEMBLE



3_PREPARE AND TRAVEL



Management, modeling and digital
fabrication for a scale-model exhibi-
tion.

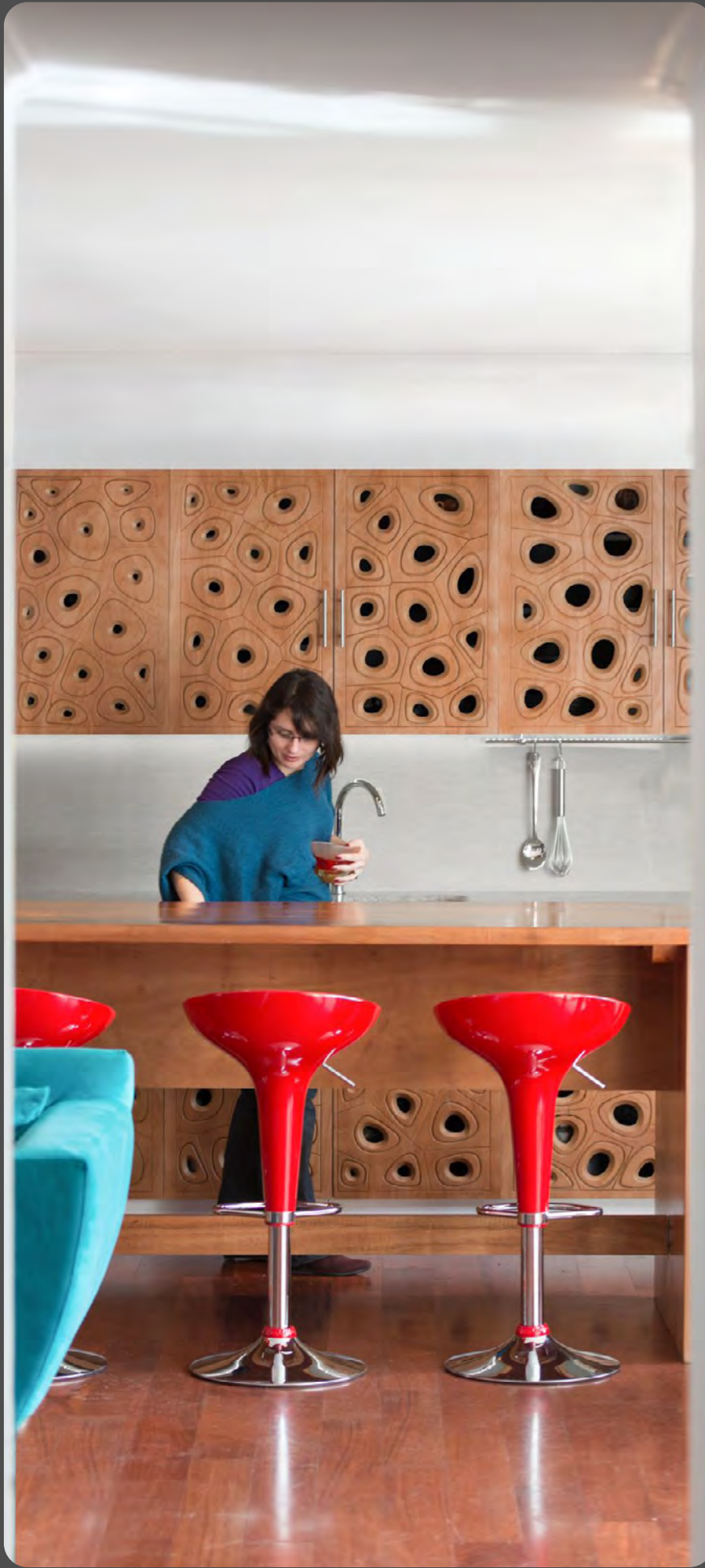
SANTIAGO CHILE - NYC 2014-15



4_DISPLAY



CNC MACHINE-FABRICATED KITCHEN BOARDS AND CENTRAL BAR TABLE

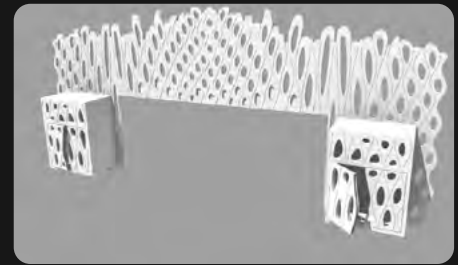


COLOR MATERIAL AND FINISHINGS

PENTHOUSE FOR MEDICS

Interior design, building management and digital fabrication to renew a downtown apartment in Santiago de Chile

CHILE 2011



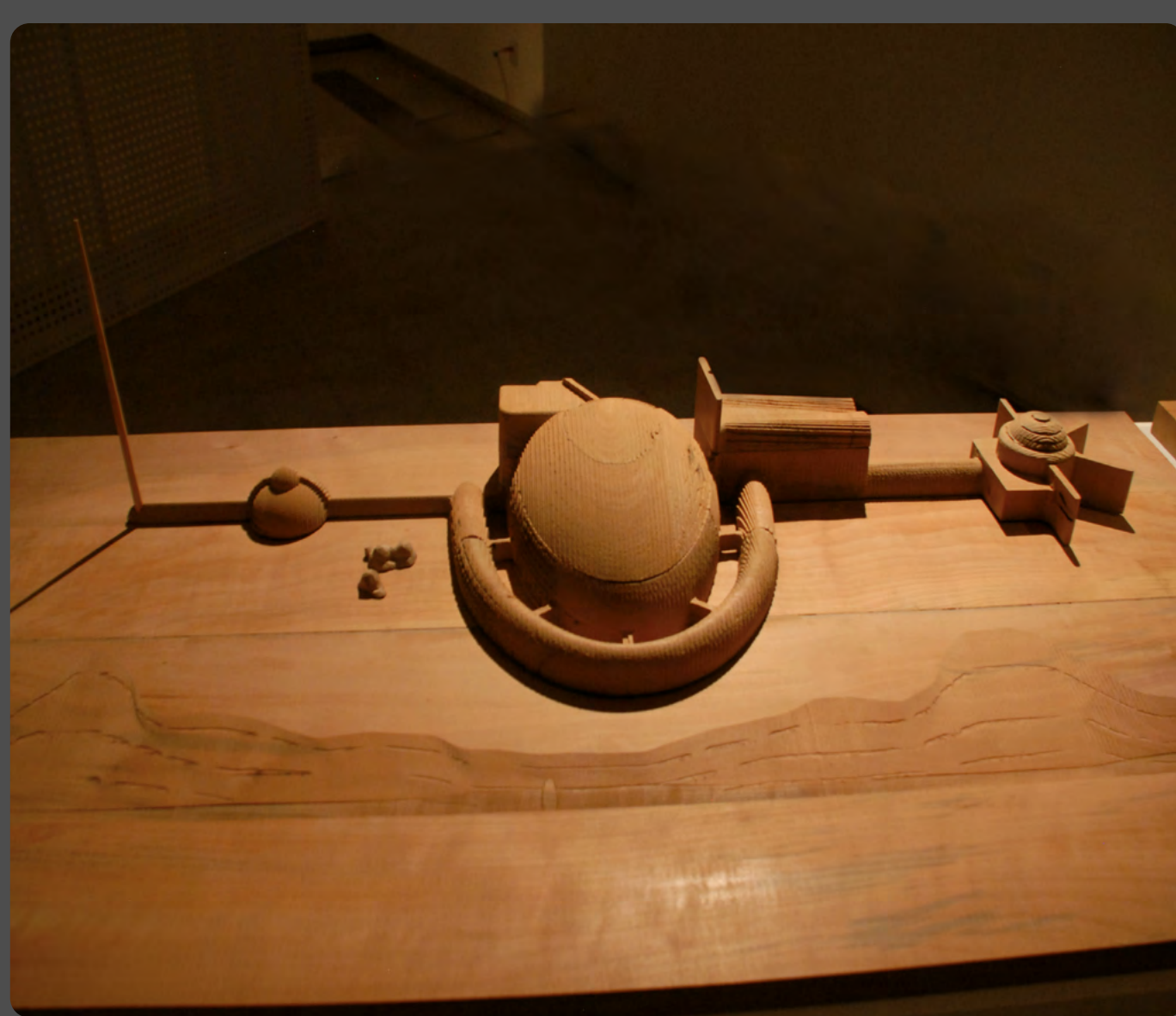
CNC MACHINE-FABRICATED BED



KITCHEN REMODELING 2009



WINE RACK 2011



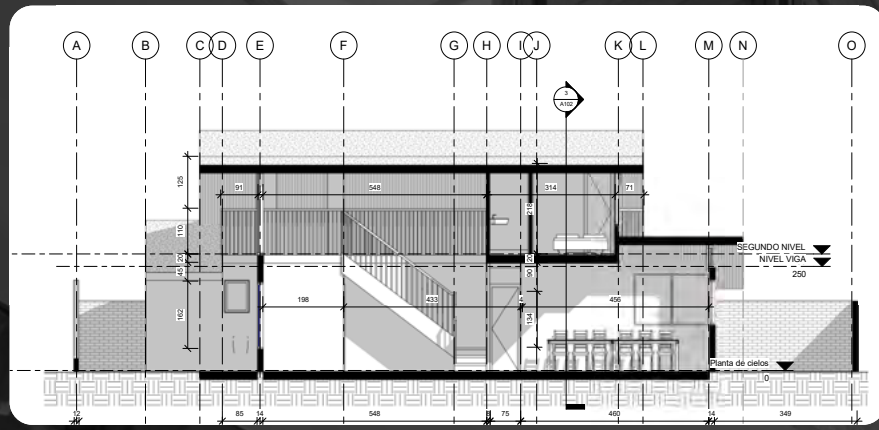
ROBERTO MATTA CNC WOOD EXHIBITION MODEL 2013

BUILDS AND CRAFTS

CHILE 2009-2014



PARKING DAY 2010, RECYCLED PLYWOOD STRUCTURE



BIM MODELING AND CONSTRUCTION MANAGEMENT



HOME AND RECLAIMED PLYWOOD STAIR

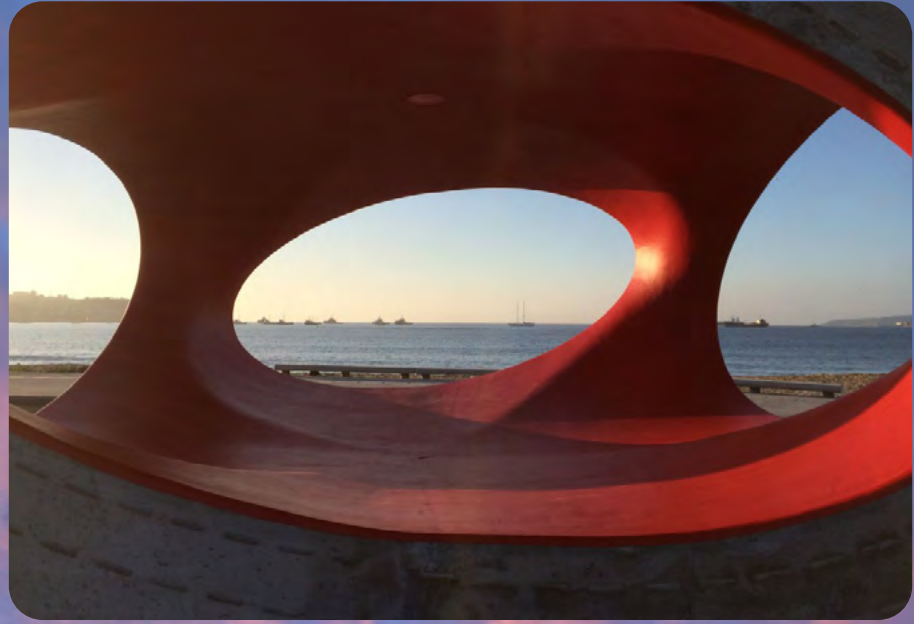
Interior design, building management and digital fabrication to restore and renew a home

CHILE 2012



CNC MACHINE-FABRICATED STAIR USING QUALITY RECALIMED PLYWOOD FROM THE ORIGINAL 80'S CONSTRUCTION





WARPED URBAN SPACE

Modeling and CNC fabrication for molds using flexible plywood. Resulting in a concrete and red painted piece.

This urban art was conceptualized by a sculptural practice located on the coast of central Chile.

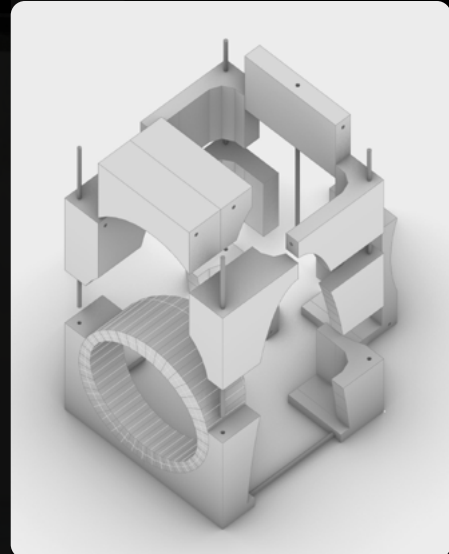
CHILE 2012





The structure supported ceramics, soft goods, lights and people.

3D print and prototype as part of the review process.



Coordinate structure with aluminum vendor and engineering for modular parts

DIFFA GALA MODULE

Concept, modeling, and fabrication for an exhibition module for the Design Industries Foundation Fighting AIDS gala held in New York. Work with vendors and consultants for ceramic, soft goods and structural integration

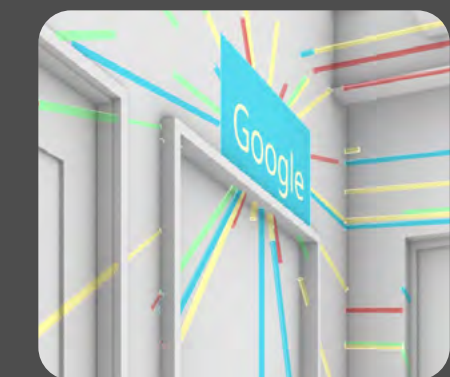
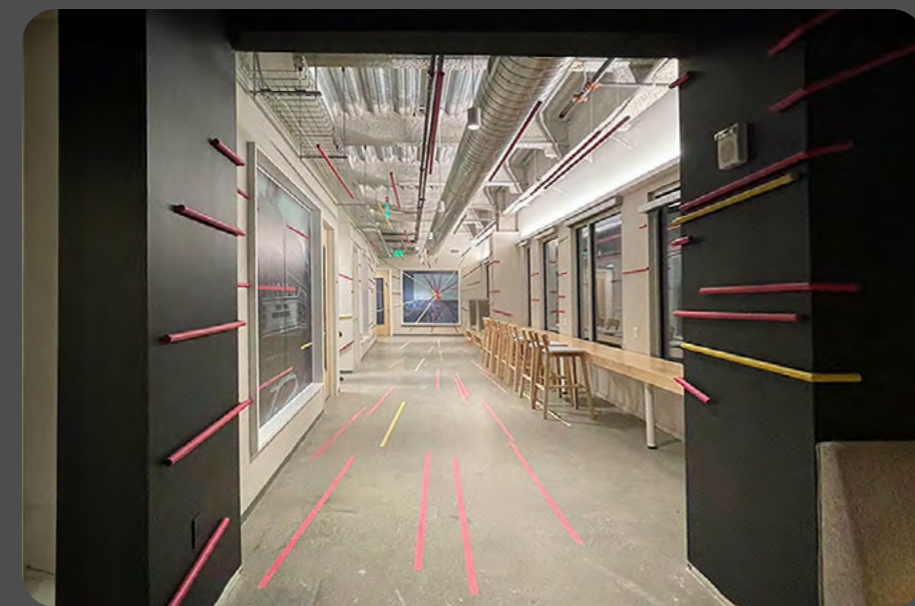
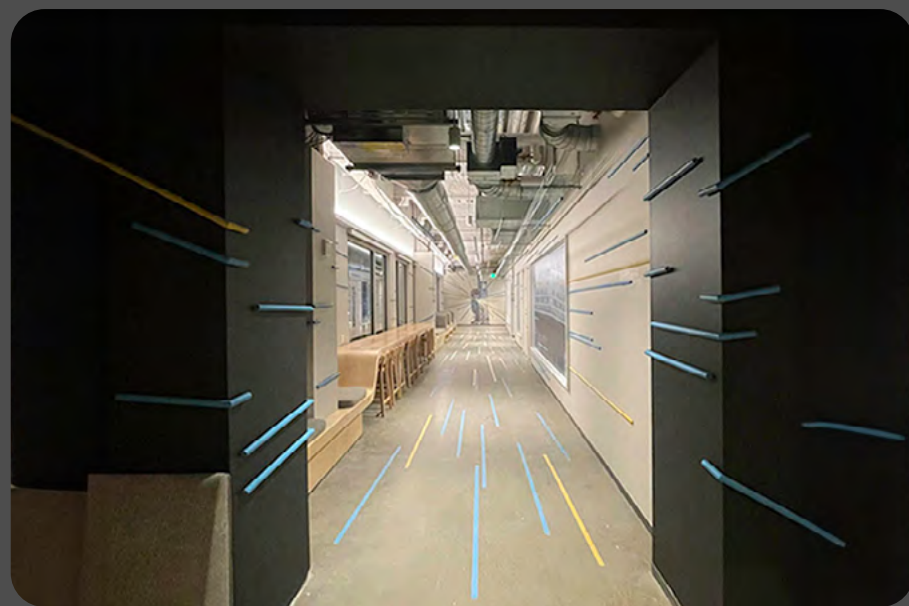
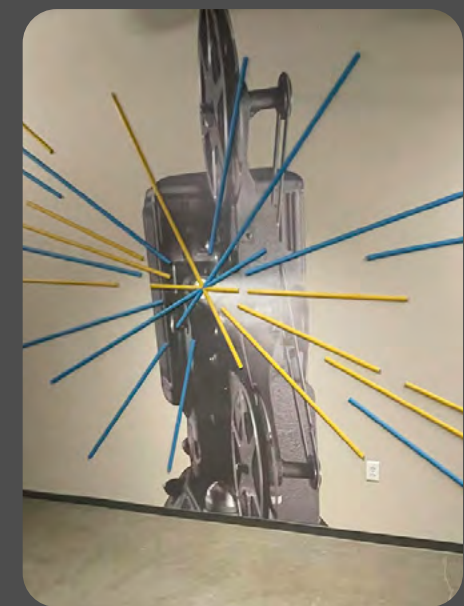
NYC 2020



Worked with Perkins Eastman interior design department to show materials and design expertise.



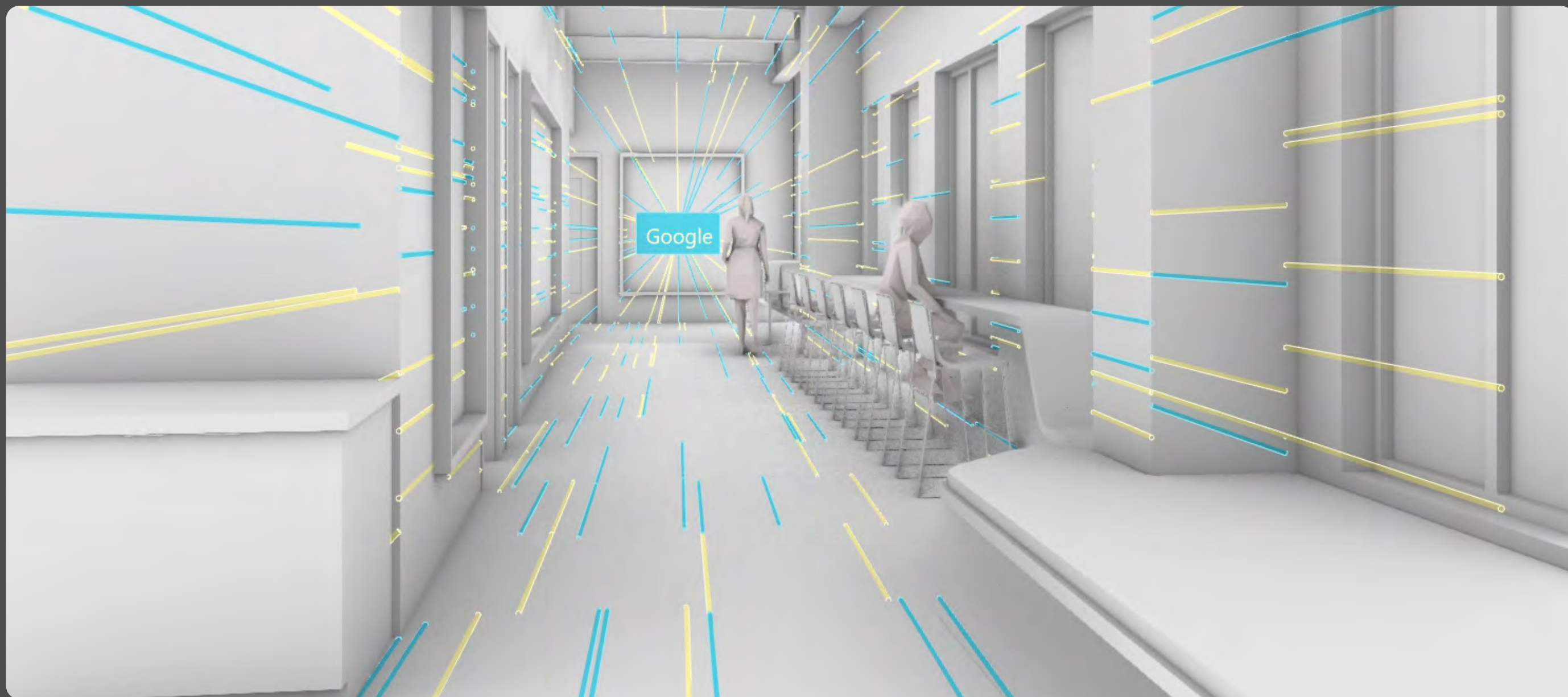
SOCIAL MEDIA AND PRESS COVERED THE GALA AND THE MODULE



GOOGLE WORKSPACE PITTSBURGH

Created an illusion of depth and speed along two corridors using paint and vinyl in matching colors, with precisely cut and installed moldings. The design casts the appearance of colorful "rays", like a warp drive for the software engineers at google.

PITTSBURGH 2019





The fluid pieces were a result of intentionally changing the parameters for overheating the 3D printing

FLUID CHILE

The pieces merged ideas on the process of the Chilean revolts of 2019 while attending the NYC Crit Club workshop; embodying the fluidity of identity and culture, social structure and anarchy, conformity and revolution.

NYC 2019



Part of the NYC Crit Club workshop and exhibition fall of 2019

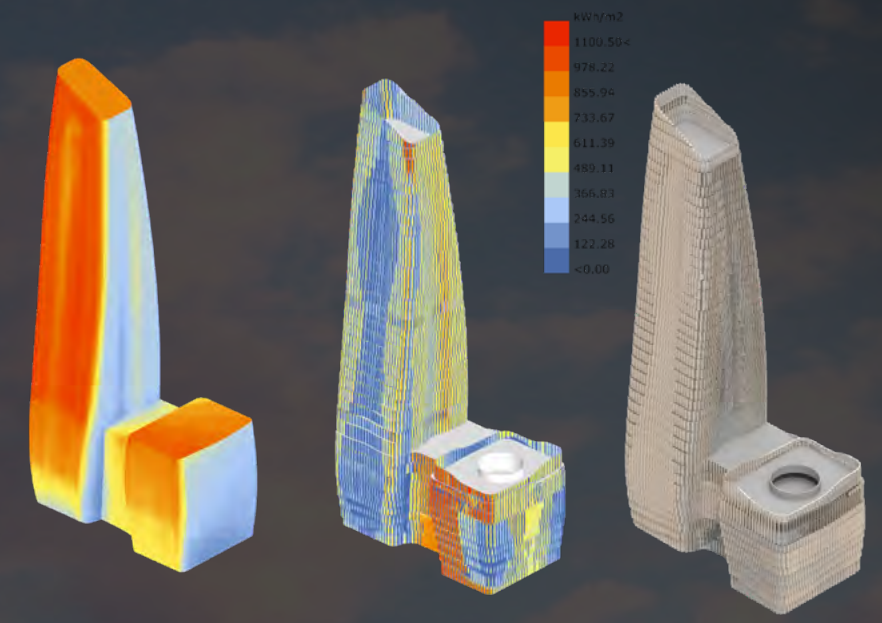
VERTICAL DUNE

Massing modeling and area efficiency calculations script. Façade design workflow integrating solar radiation, view analysis and internal program. Automation of 3D printings and laser cut outputs.

KUWAIT CITY 2019



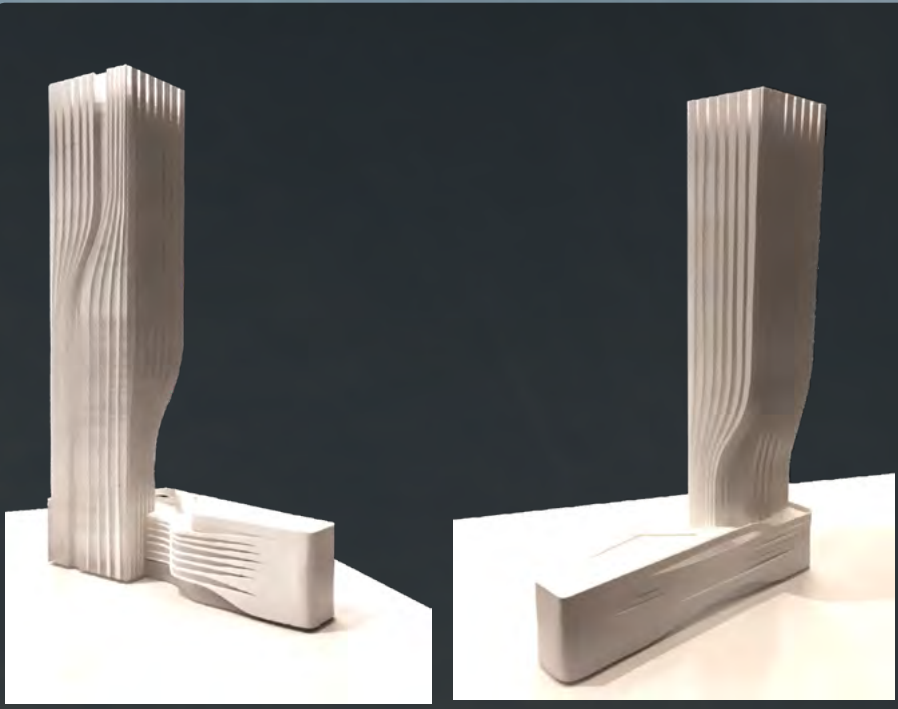
FACADE SCRIPT



PANELING : 68% REDUCTION OF DIRECT SOLAR RADIATION



INTERIOR DESIGN SCRIPT



Model making for client office exhibition

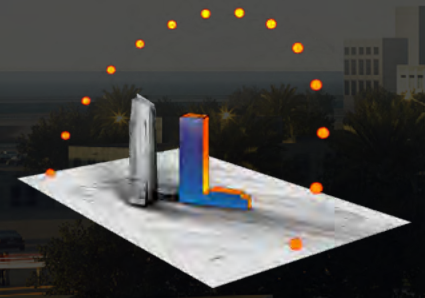


Facade ideation and fabrication.

SOLAR VEIL

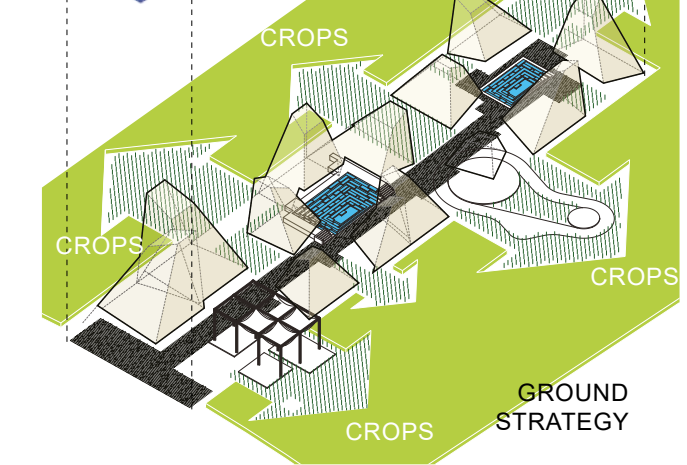
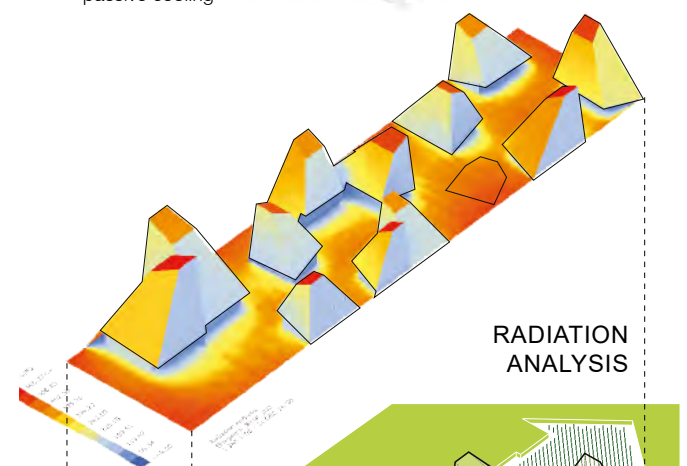
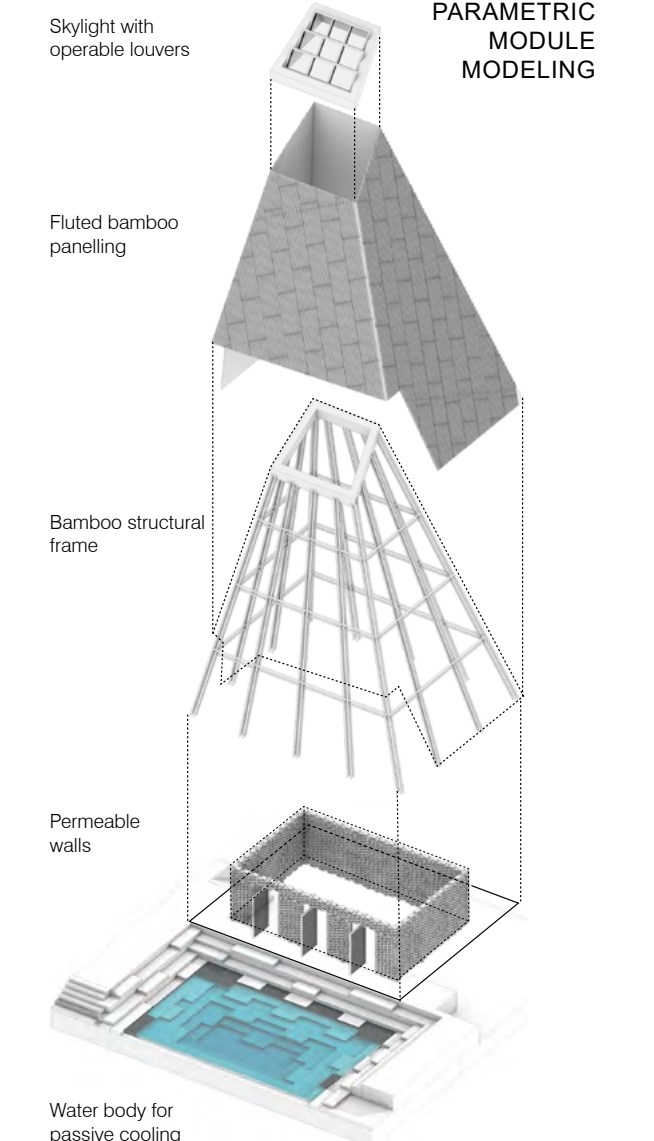
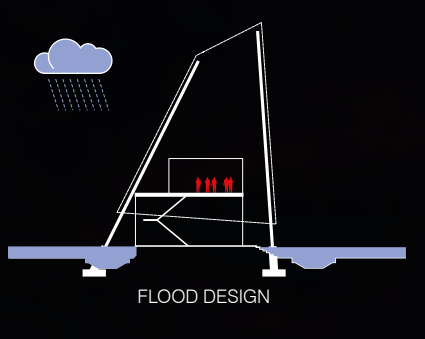
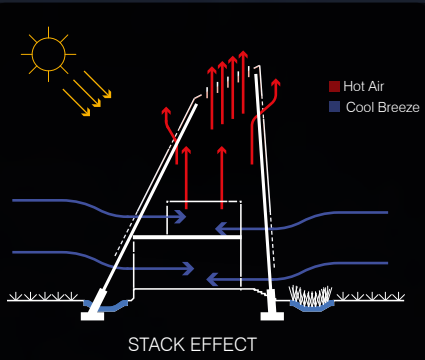
Massing alternatives by combining shadow analysis and view analysis. Automation of model prototypes layout output for presentation.

KUWAIT CITY 2017



Solar and shadow analysis





NOMI

Safe working and living community for women at risk and survivors of human trafficking

BIHAR INDIA 2016





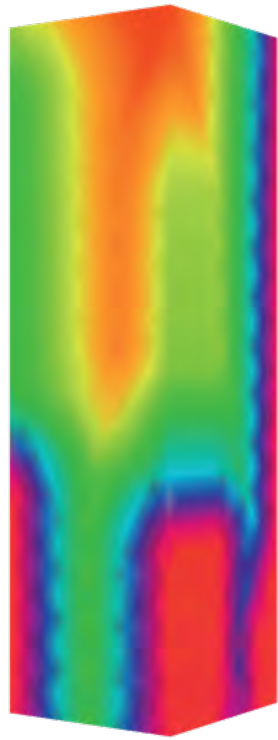
Structural Skin became my college go to book for digital technologies, structural topologic optimization, high-rise history, passive sustainability strategies, and aesthetics.

STRUCTURAL SKIN

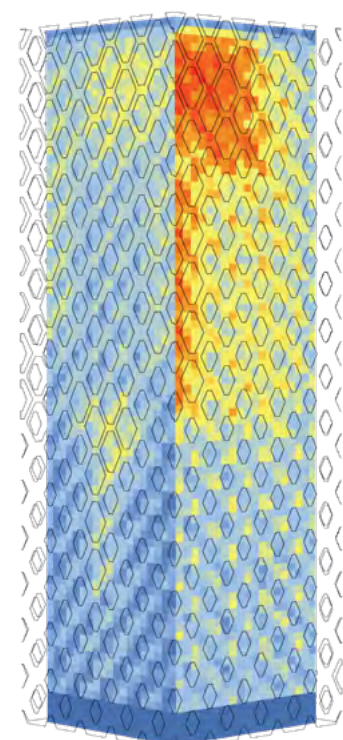
View analysis, Solar Radiation analysis, and Topological Evolutionary Structural Optimization, resulting in a Structural Skin. This process was documented and published as a Master Thesis at UC Chile.



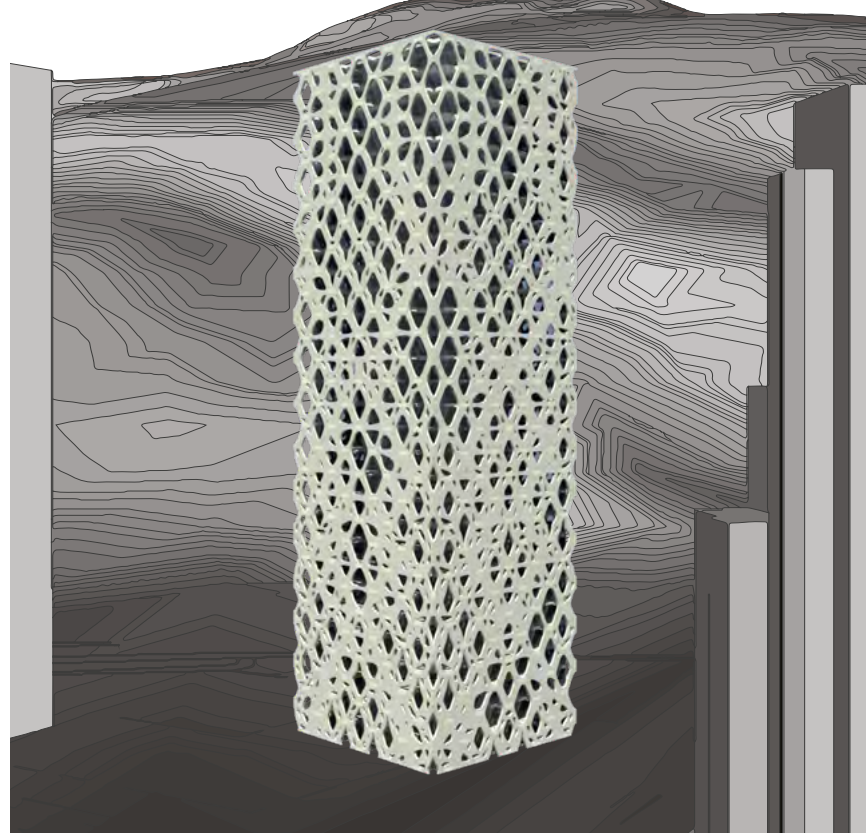
URBAN OCCLUSION INDEX



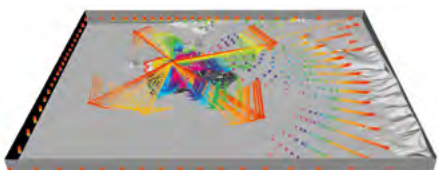
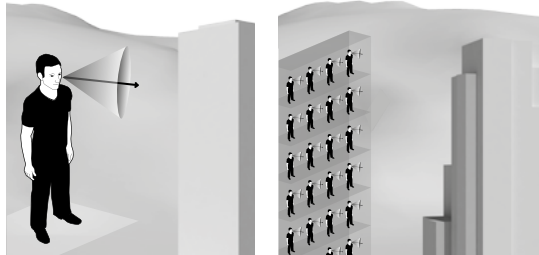
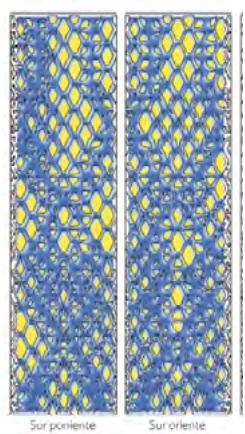
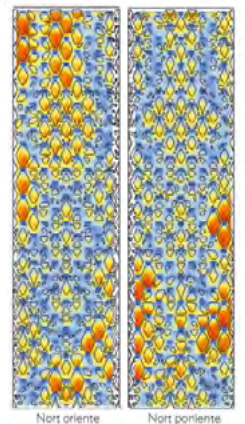
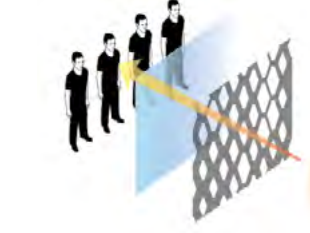
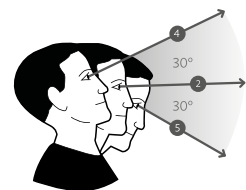
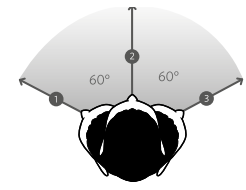
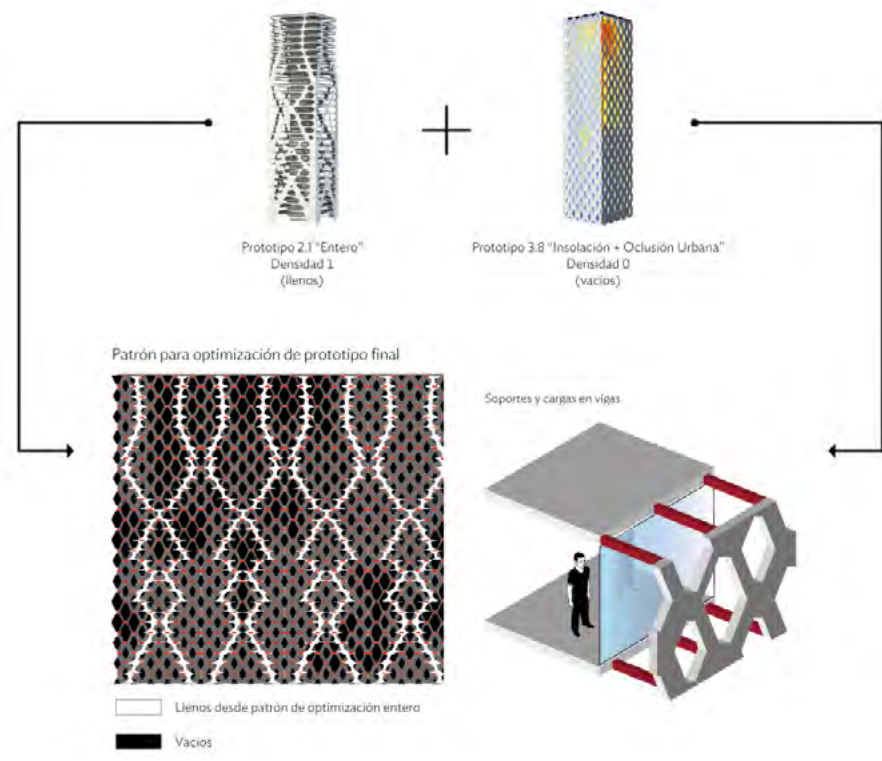
SOLAR RADIATION STRATEGY



STRUCTURAL TOPOLOGICAL OPTIMIZATION



FINAL PROTOTYPE

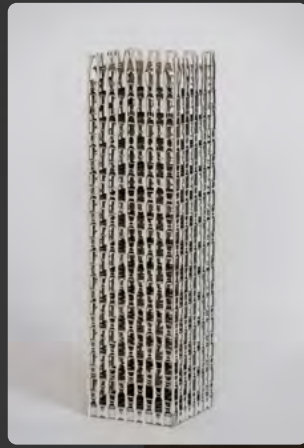




FIRST STRUCTURAL OPTIMIZATION



AESTHETIC INTERPRETATION



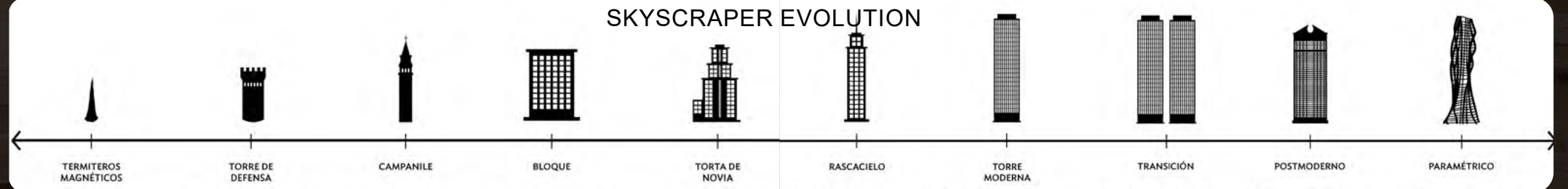
PANELING STRUCTURAL OPTIMIZATION

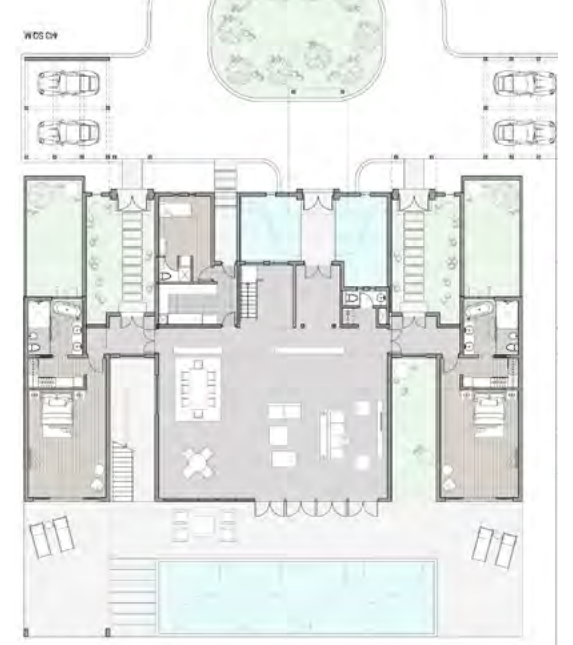
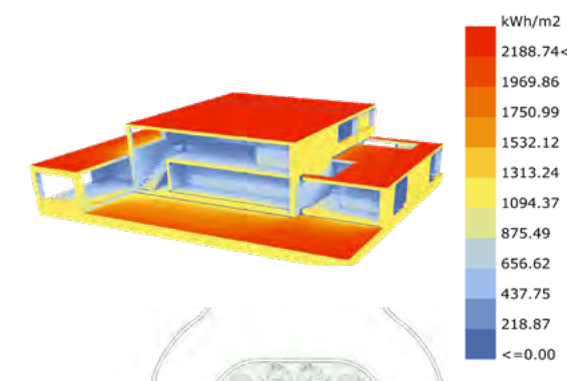
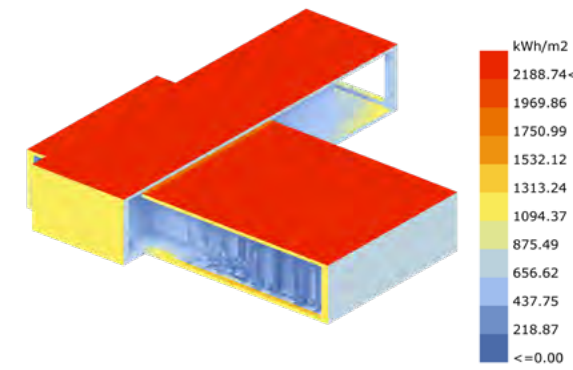


FACADE TOPOLOGIC STRUCTURAL OPTIMIZATION



SKYSCRAPER EVOLUTION





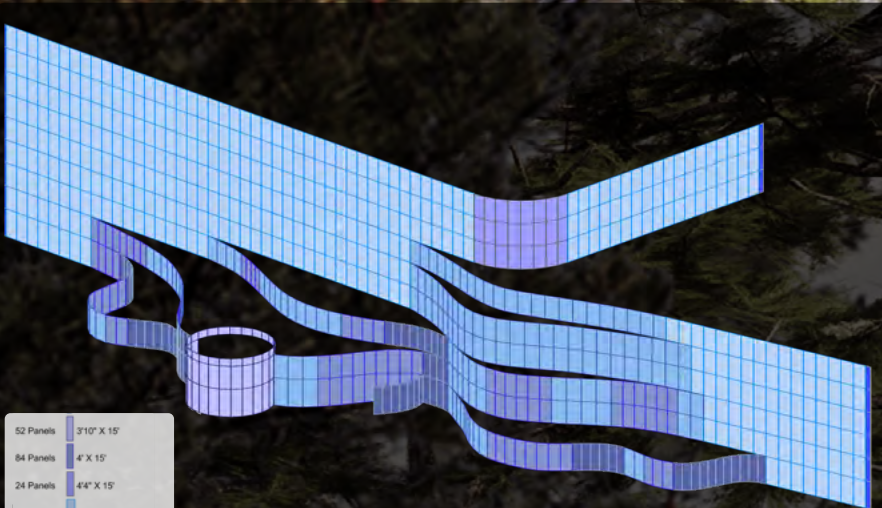
VILLAS' ISLAND RESORT

Executive, over water and presidential villas designed while implementing solar radiation analysis.

BAHRAIN - 2017



PRESIDENTIAL VILLA



52 Panels	3'10" X 15'
64 Panels	4' X 15'
24 Panels	4'4" X 15'
413 Panels	5' X 15' (Parallel)
145 Panels	5' X 15' (Variable)

Modular facade building



Bring the garden concept into the facade

CHILDREN'S HEALTHCARE HOSPITAL

Generative Design workflow for a curved glass façade optimization allowing larger in-between spaces for inpatient children's play and recovery.

ATLANTA 2015



Generative iteration for reducing the amount of different panels while maintaining the curved shape.

