

MARSCEPTION 2024

Marsception 2024 | Νικητές Διαγωνισμού

Archetype team - 30/07/2024

International design competition platform Volume Zero Competition has announced the results of the Marsception 2024 Architecture Competition. The Marsception 2024 Architecture competition challenged participants to create a self-sustaining living space for the initial habitants, a group of five researchers, of the Red Planet. Participants envisioned a utopian tomorrow, transforming humanity into a multi-planetary species.

The participants had to select a location anywhere on the topography of Mars with interplanetary travel for humans, not a far-fetched idea and innovations made every day to make it a reality soon. Participants from over 32 countries came up with their creative and sustainable design solutions to cater to this spatially challenging Architectural problem.

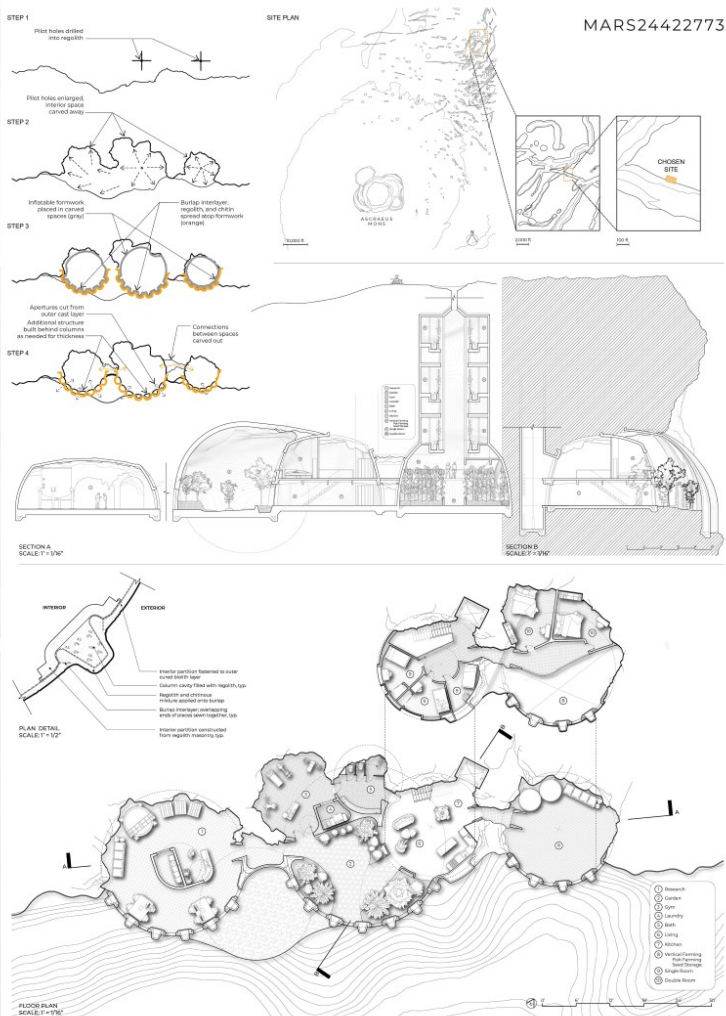
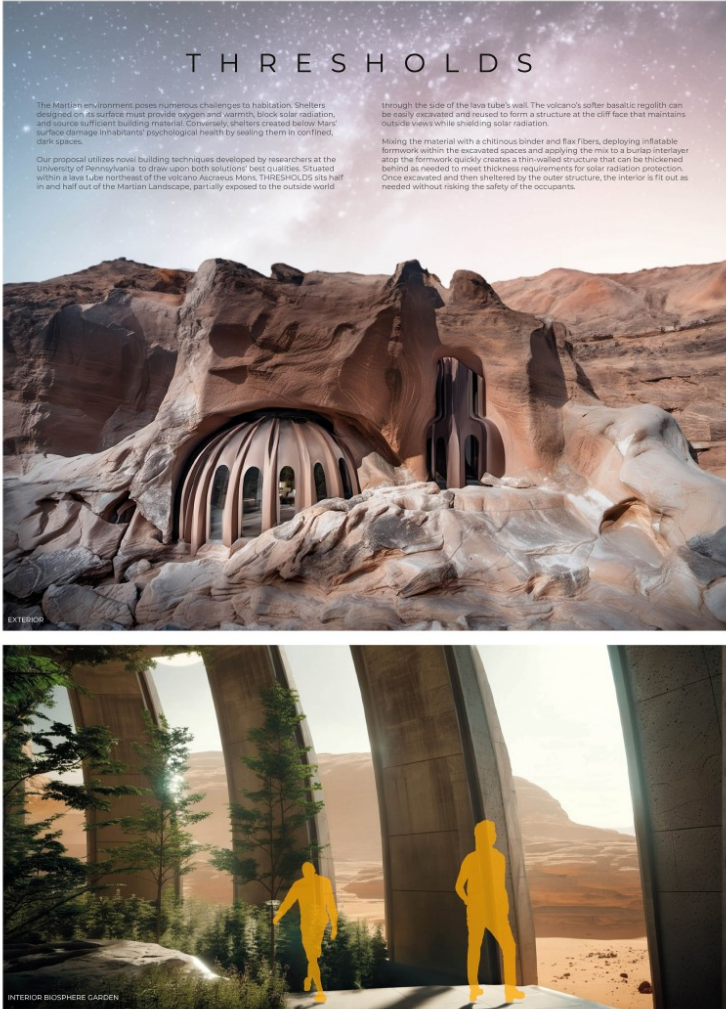
Volume Zero Competition thanks all the competitors for participating in this competition and for contributing to this competition's research.

The esteemed jury for judging this competition consisted of Aroty Panyang (Studio Aro), Carsten Primdahl (Cebra Architecture), Georgi Petrov (SOM), Sushant Verma (rat[LAB] Studio), YU Ting (Wutopia Lab), Yuko Sono (Clouds Architecture Office), Edouard Cabay (Institute for Advanced Architecture of Catalonia [IAAC]), Chenchen Hu (HCCH Studio), Eva Bo Geisler (SPACON & X).

The top three winners were awarded total prize money of \$4,000 while ten entries received HonorableMentions. Here are the winning entries.

FIRST PLACE
THRESHOLDS

Alec Naktin and Natalie Perri, United States

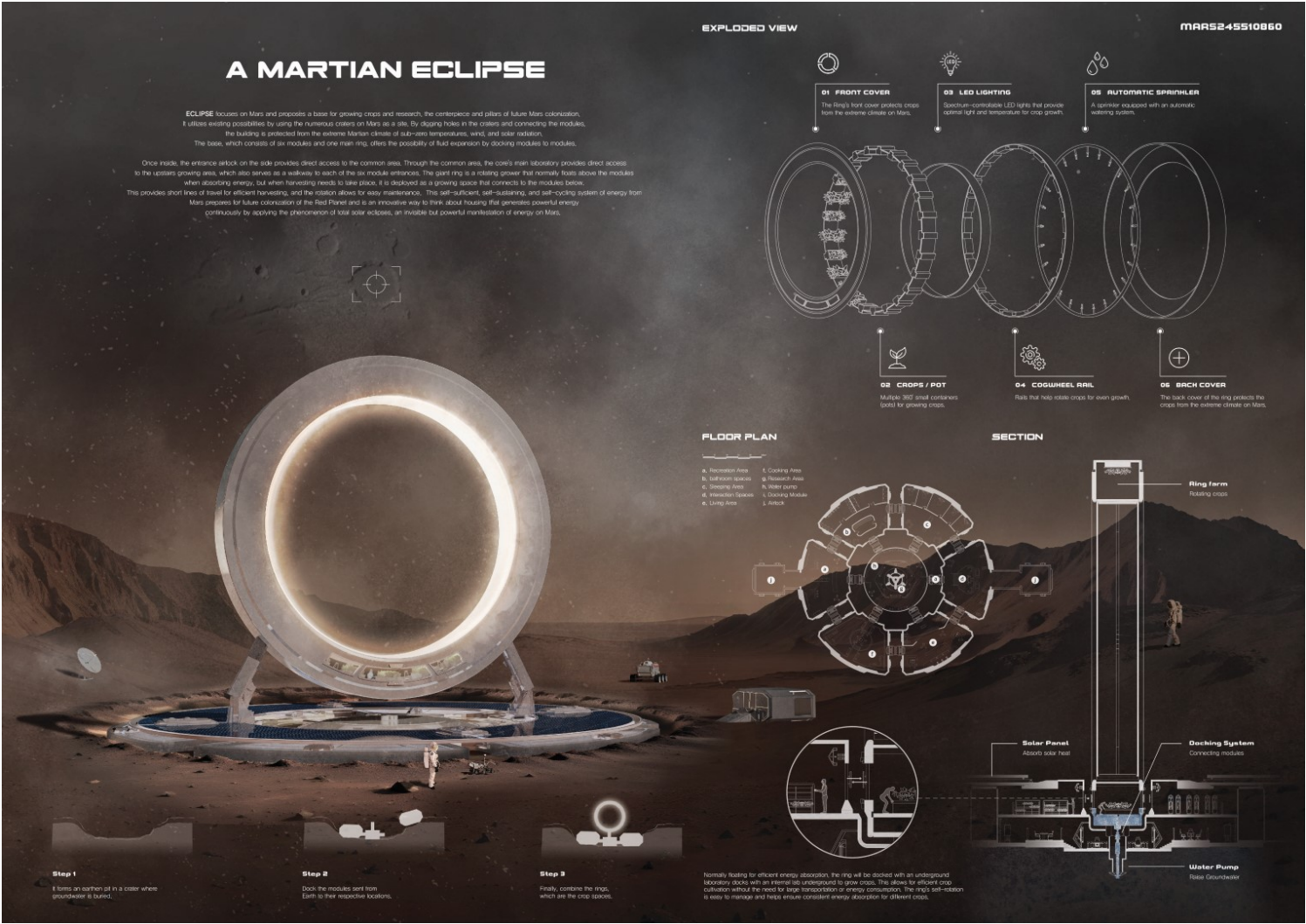


The Martian environment poses numerous challenges to habitation. Shelters designed on its surface must provide oxygen and warmth, block solar radiation, and source sufficient building material. Conversely, shelters created below Mars surface damage inhabitants psychological health by sealing them in confined, dark spaces.

Our proposal utilizes novel building techniques developed by researchers at the University of Pennsylvania to draw upon both solutions best qualities. Situated within a lava tube northeast of the volcano Ascreaus Mons, THRESHOLDS sits half in and half out of the Martian Landscape, partially exposed to the outside world through the side of the lava tube’s wall. The volcano’s softer basaltic regolith can be easily excavated and reused to form a structure at the cliff face that maintains outside views while shielding solar radiation.

SECOND PLACE
A MARTIAN ECLIPSE

Park Seo-an and Ju Yeon Hong, Korea South



ECLIPSE focuses on Mars and proposes a base for growing crops and research, the centerpiece and pillars of future Mars colonization. It utilizes existing possibilities by using the numerous craters on Mars as a site. By digging holes in the craters and connecting the modules, the building is protected from the extreme Martian climate of sub-zero temperatures, wind, and solar radiation. The base, which consists of six modules and one main ring, offers the possibility of fluid expansion by docking modules to modules.

Once inside, the entrance airlock on the side provides direct access to the common area. Through the common area, the core's main laboratory provides direct access to the upstairs growing area, which also serves as a walkway to each of the six module entrances. The giant ring is a rotating grower that normally floats above the modules when absorbing energy, but when harvesting need to take place, it is deployed as a growing space that connects to the modules below. This provides short lines of travel for efficient harvesting, and the rotation allows for easy maintenance. This self-sufficient, self-sustaining and self-cycling system of energy from Mars prepares for future colonization of the Red Planet and is an innovative way to think about housing that generates powerful energy continuously by applying the phenomenon of total solar eclipses, an invisible but powerful manifestation of energy on Mars.

THIRD PLACE
CELESTIAL GENESIS
Alp Arda, Italy



The Celestial Genesis begins with the Craft Lancer pod, as rockets land around the designated “Gale Crater”. Upon touchdown, hatches open to release AI-equipped, remotely controlled robots that manually link the three rockets. Excavation commences, and the collected Martian soil and materials are transformed by onboard 3D printers initiate construction based on pre-planned designs, allowing the rockets to continuously craft new structures and expand the Martian base as needed.

Amidst Martian construction, the “Life Pod Core” rocket, carrying five researchers, serves as the central hub of the burgeoning complex. It contains essential systems, food, and necessities, featuring a dynamic cockpit that doubles as the complex’s elevator system. The Habitat Hub houses research and sleeping areas, while the Active Hub offers spaces for exercise, relaxation, and dining. Above, the Terra Dome cultivates Earth-sourced seeds. Encircling this hub, solar panels harness solar energy, sustaining the outpost on Mars.

Honourable Mentions:

Honourable Mention 1: Ever-Grow

Goh Zheng Rong and Loy Xin Yi, Malaysia

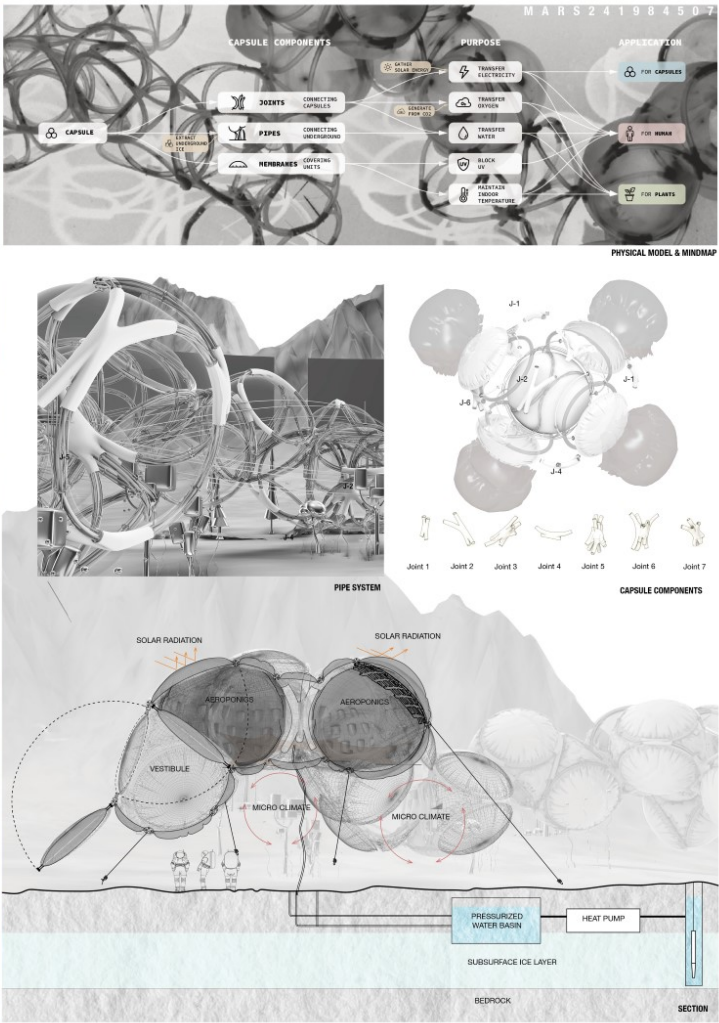
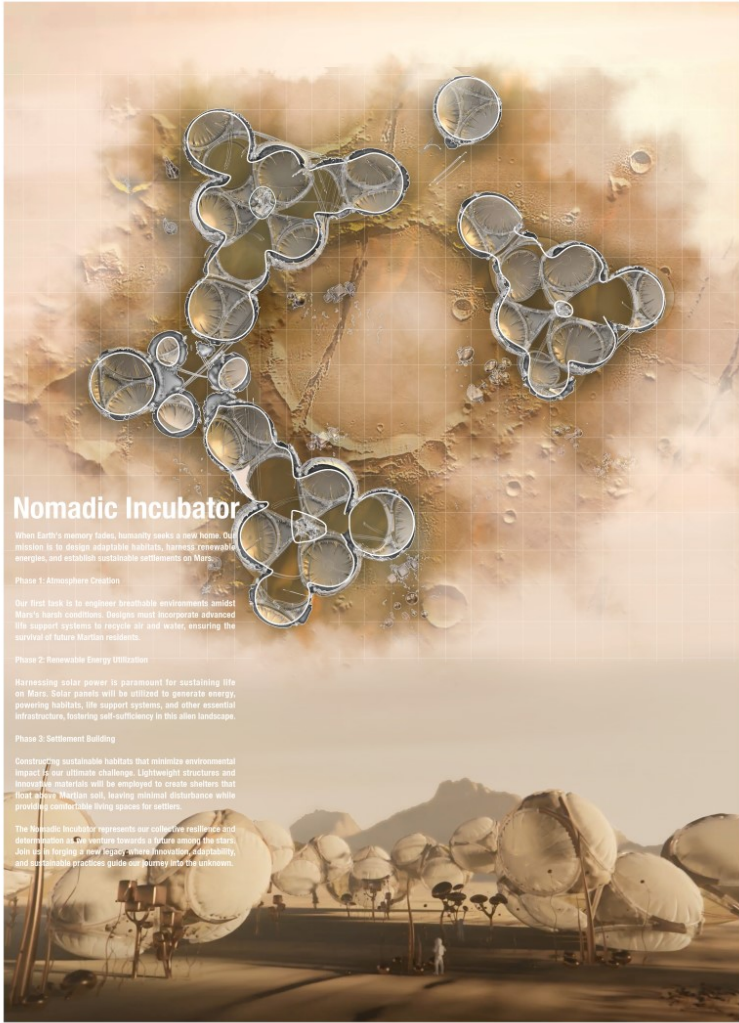
Ever - Grow

The beginning of a new exploration.
A giant leap of mankind.



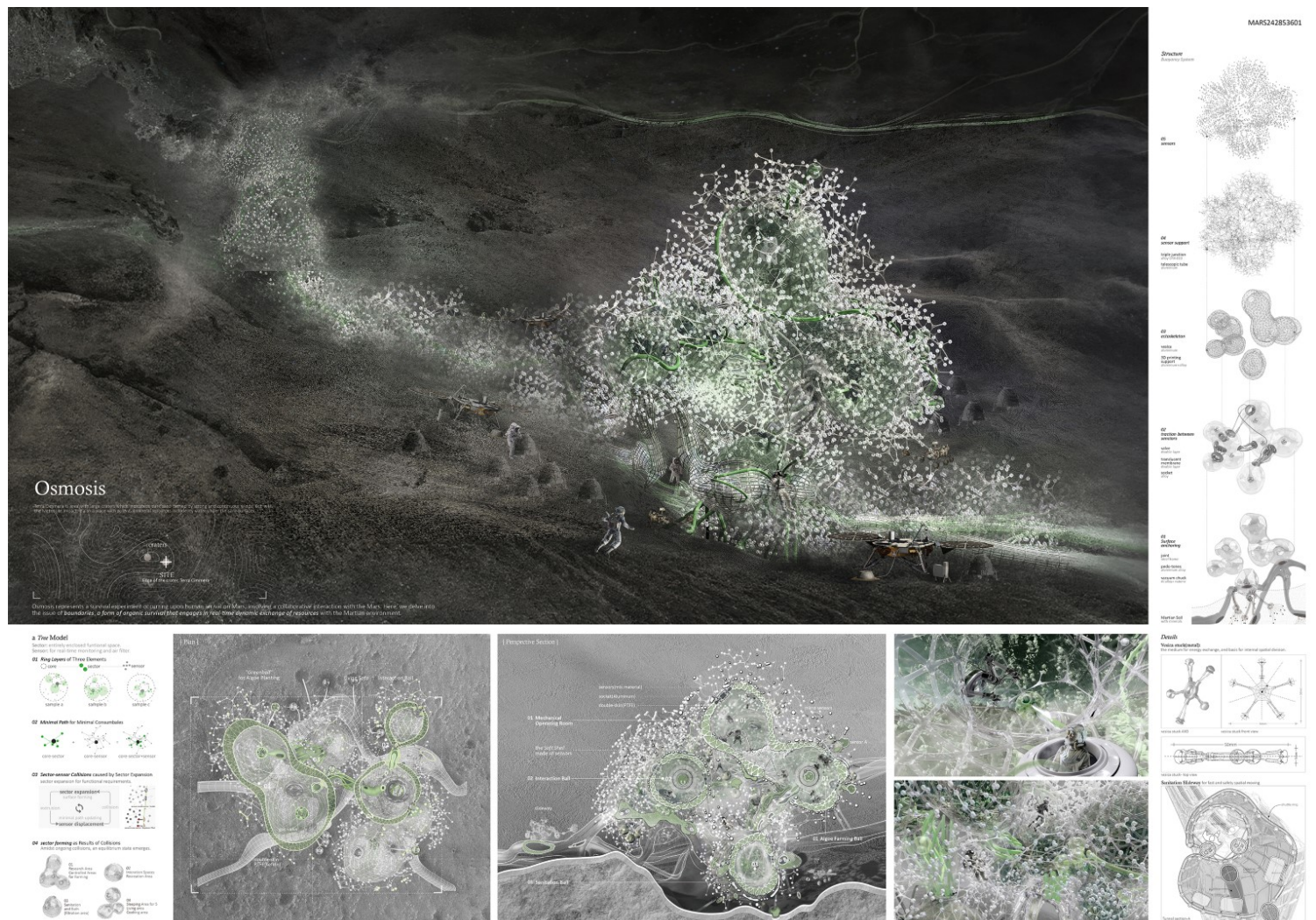
Honourable Mention 2: Nomadic Incub

Jiaqi Kang, Jiamin Huang and Lejia Li, United States



Honourable Mention 3: Osmosis

Wan Zilin and Ren Yinghui, China



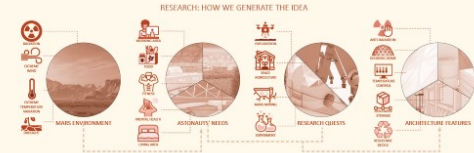
Honourable Mention 4: Nomadica: The Mobile Haven on Mars

Xueyan Wang and Jiahao Du, Australia

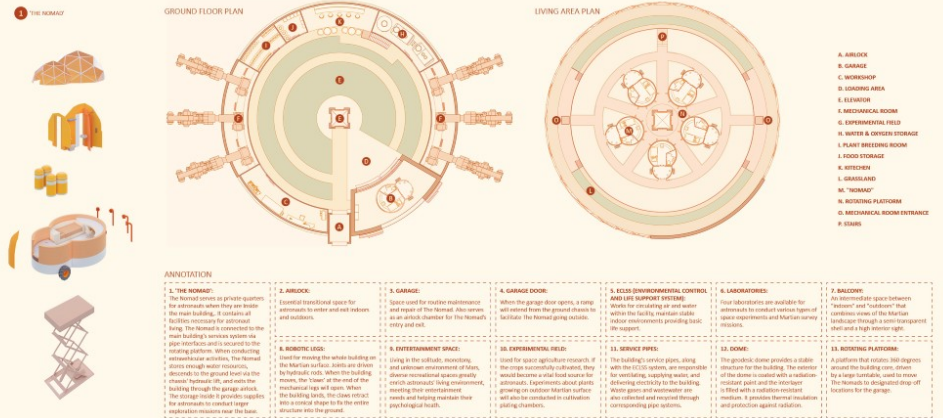


The Nomadica, a habitat that offers a lifeline for astronauts, providing vital atmospheric support, temperature regulation, and radiation shielding in Mars' harsh conditions. Designed for five researchers, it's a self-sustaining sanctuary equipped with living quarters, research labs, and recreational areas. A massive Geodesic Dome shields the habitat while structurally supporting its interior. Spread across four levels, it includes transition spaces, living quarters, recreational zones, and research facilities. Mobility is key, facilitated by six mechanical legs enabling exploration across the Martian terrain.

Agricultural sustainability is prioritized, with astrovents conducting experiments to cultivate crops within the habitat's confines. Specialized "mini greenhouses" aid in this endeavor, fostering plant growth and supplementing their diet with homegrown produce. Our habitat embodies sustainability and adaptability, serving as a beacon of innovation for humanity's expansion into the cosmos.

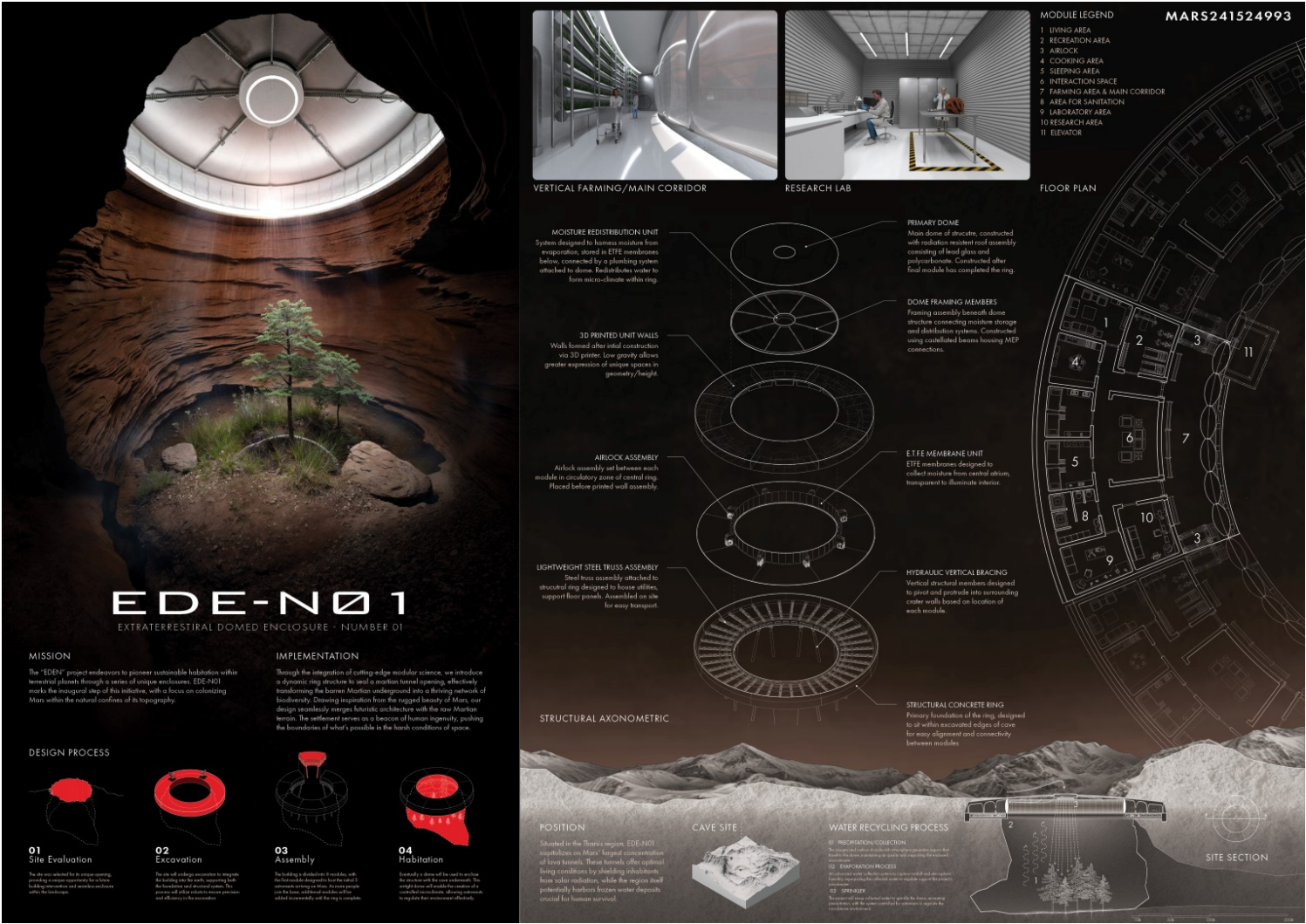


Nomadica: The Mobile Haven on Mars



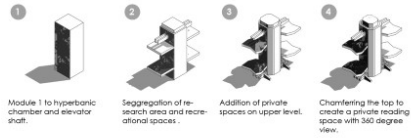
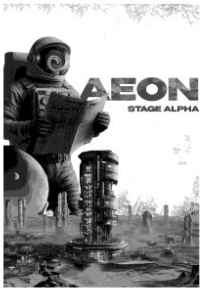
Honourable Mention 5: EDE-NO 1

Jeffery Moisant, Ian Simon and Simon Chiquito, United States



Honourable Mention 6: AEON

Kush Nitesh Bhansali, Aryan Samudre and Mohit Prakash Ingle, India



THE CONCEPT -

Named "AEON" this dwelling unit embodies a culmination dreams of visionaries, scientists, and dreamers alike. Inspired by the timeless works of Isaac Asimov, providing ideal spaces to cater to one's personal and research-oriented lifestyle. Here, the bedrooms and living spaces have been separated from the workspaces to ensure privacy and undisturbed environment for both. Constructed of two levels the first floor, deals with research and development along with recreational spaces next to it. The second level, has bedrooms, kitchen and a living room. This is followed by a 3 and much smaller private lounge that also serves a 360 panoramic view of Mars with utmost quiet suitable for one's own "me-time". This unit comes in as a set of detachable modules dropped from the space station, aligning mid-air landing on top of each other directly to the desired coordinates. This is followed by an air locking system within the modules, that locks itself with each other. This also triggers the "heart" of the dwelling, that is, the air filter to kick in right after.



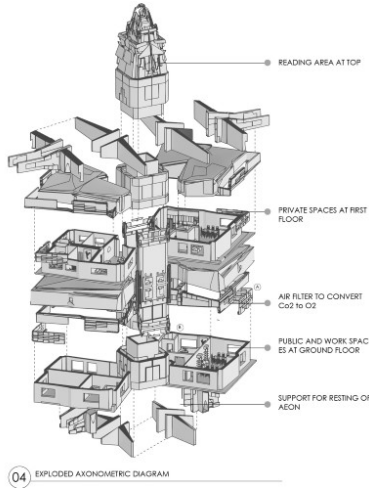
LIVING ROOM, DEPICTING HARMONIOUS BLEND OF COMFORT AND STYLE.



GREEN HOUSE MODULE ELEVATED FROM GROUND AND DIRECTLY CONNECTED TO WORKSTATION.



RESEARCH WORK STATION FOR RESEARCH AND DEVELOPMENT.

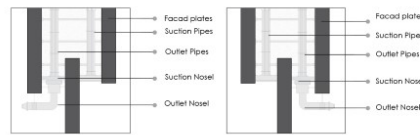


04 EXPLODED AXONOMETRIC DIAGRAM



- | GROUND FLOOR LEGENDS - | FIRST FLOOR LEGENDS - |
|---------------------------|---------------------------|
| 1. Recreational Area | 1. Dining and Kitchen |
| 2. Guest Bedroom | 2. Drawing Area |
| 3. Depressurizing Chamber | 3. Depressurizing Chamber |
| 4. Elevator | 4. Elevator |
| 5. Workstation | 5. Bedrooms |
| 6. Agricultural Module | 6. Private Living Area |

DETAILS AT A AND B -

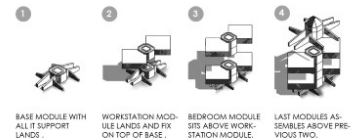


AIR FILTER THAT INTAKES CO2 FROM MARS ATMOSPHERE AND CONVERTS TO O2.

AIR FILTER THAT EXPELS OUT THE WASTE CO2 FROM THE INTERNAL ATMOSPHERE OF HOUSE.

ASSEMBLING OF MODULES -

ALL THE 4 MODULES START THEIR ALIGNMENT IN LITHOSPHERE -



BASE MODULE WITH ALL IT SUPPORT LANDS.

WORKSTATION MODULE LANDS AND FIX ON TOP OF BASE.

BEDROOM MODULE SITS ABOVE WORKSTATION MODULE.

LAST MODULES ASSEMBLES ABOVE PREVIOUS TWO.

Honourable Mention 7

Muzhi Wang and Ruoxuan Hu, United States

high production, easy growing, abundant nutrients



soil condition, soil moisture level & depth, Plant Height

Water Requirement
All these stages of plants require abundant watering. Use 1/2 inch of water daily.

Medium Level
All these stages of plants require medium soil with good drainage.
Soil: 1/2 inch (10-15 cm) deep.

Soil Plant Height
Soil: 1/2 inch (10-15 cm) deep.

Seed Plant Height
Seedling: 1/2 inch (10-15 cm) deep.

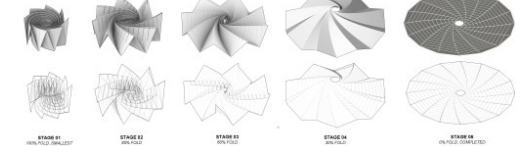
Water Plant Height
Water: 1/2 inch (10-15 cm) deep.

Soil Plant Height
Soil: 1/2 inch (10-15 cm) deep.

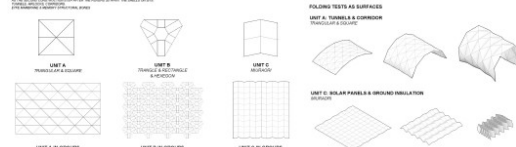
Water Plant Height
Water: 1/2 inch (10-15 cm) deep.

FAST KIDSMILE & FAST CONSTRUCTION
FOLDABLE STRUCTURES FOR SOLAR PANELS, WASHING

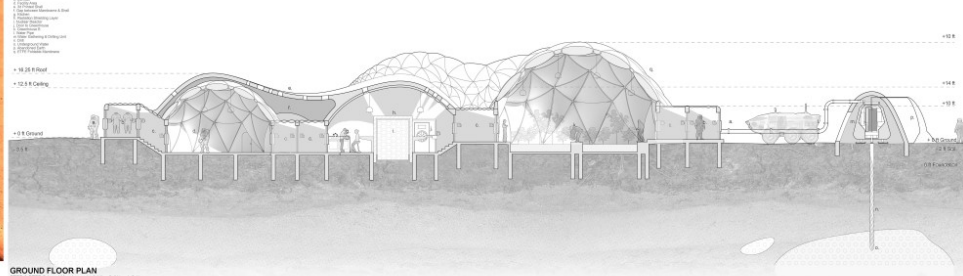
SOLAR PANEL ORANGE!
 Every 10th grade student in the state of Florida is required to complete a solar panel project. The project is designed to teach students about the importance of solar energy and how it can be used to power homes and businesses. The project is a great way for students to learn about renewable energy and how it can help to reduce our carbon footprint.



QUICK CONSTRUCTION DIAGRAM



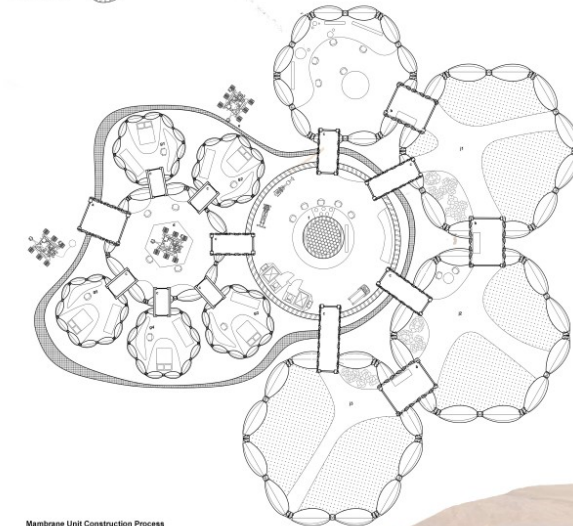
a. Base Entry
b. Attack
c. Frontal



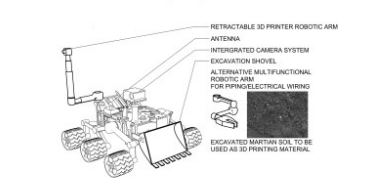
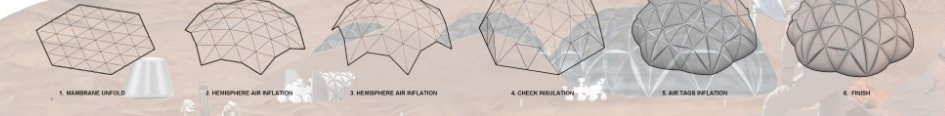
ETFE & PTFE: Organic Membrane Unrolling & Airing Inflation

- a. Steel Erection
- b. Airtight
- c. Canister

- a. Virology/Cell Biochemistry Area
- b. 32 Protein Structure/Protein Chem
- c. Infectious Disease/Genetics/Cell
- d. Nuclear Fusion/Energy/Cell
- e. Molecular Biophysics/Protein
- f. Research/ Laboratory
- g. Nuclear Physics
- h. Genomics
- i. Protein Engineering & Design Unit

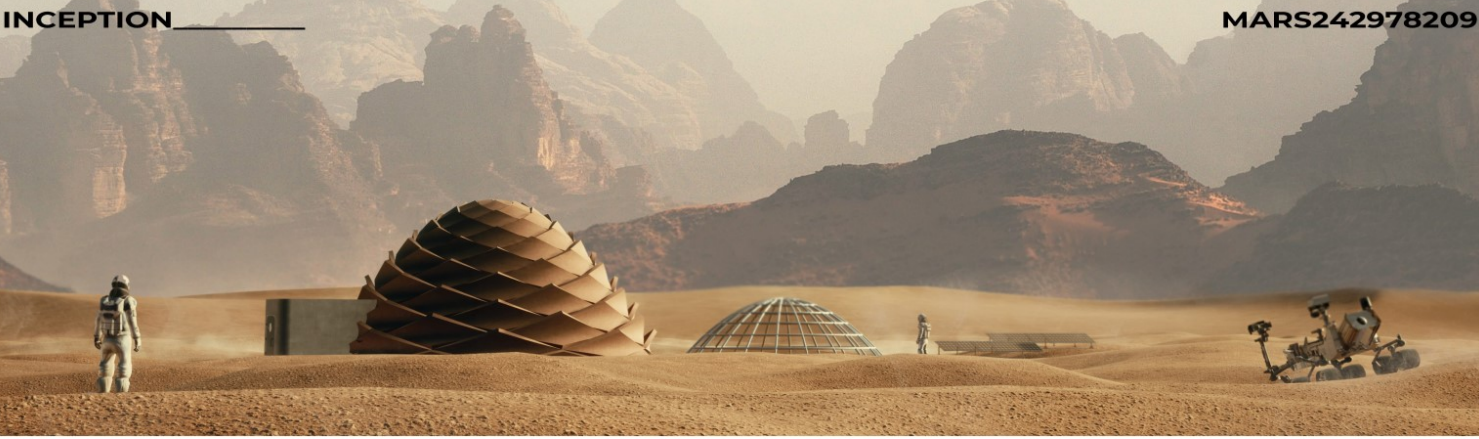


ETFE & PTFE Organic Membranes: Unfolding & Aesthetics Inflation



CONSTRUCTION ROVER

Mayur Mehta, India

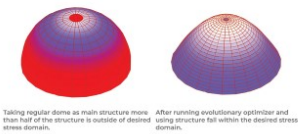


Mars, an empty, red planet, where every breath is a battle against the unforgiving elements. In this endeavor, our task is to fashion a world within a world—a sanctuary where humanity can establish its foothold, exploring the boundless possibilities of a new frontier. Architecture stands as a linchpin, a bastion of support for those embarking on this odyssey. With this vision in mind, we embarked on our journey, first identifying the constraints and challenges that await us upon the surface of Mars.

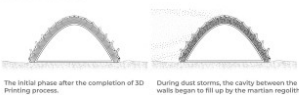
Our primary objective is to conceive a structure capable of enduring with the limited natural resources afforded by Mars. The design features double walls with a cavity in between, strategically perforated to allow Martian regolith to infiltrate, naturally reinforcing the structure against the rigors of the Martian environment and shielding internal areas from the relentless barrage of radiation. To enhance structural integrity, the inner wall incorporates *Aspergillus nidulans*—a biogenic crack-repairing fungus.

In pursuit of structural stability, evolutionary optimization techniques were employed, resulting in the elegant form of a catenary-shaped dome. To facilitate agricultural endeavors on Martian soil, a combination of sunlight and aeroponic systems will be implemented, providing solution for farming in this extraterrestrial habitat.

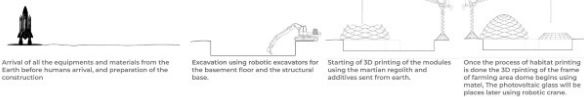
STRUCTURAL STRESS ANALYSIS



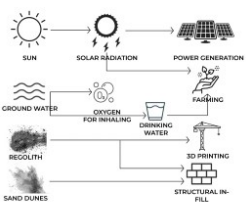
CAVITY FILLING



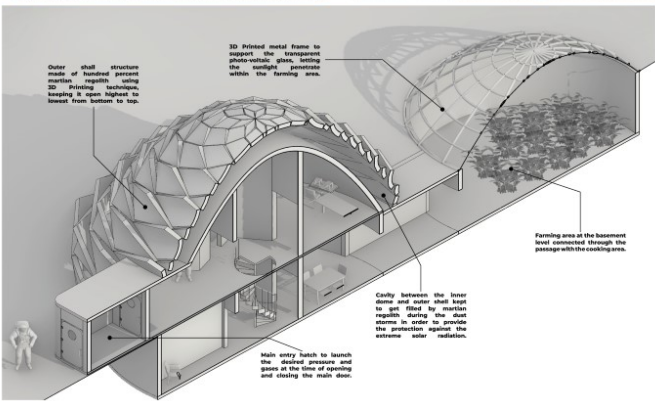
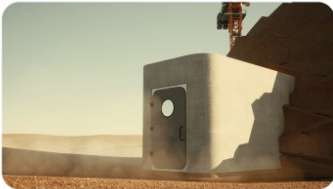
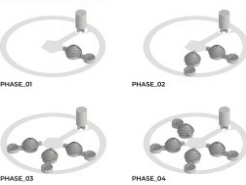
CONSTRUCTION PHASES



RESOURCE MANAGEMENT



FUTURE EXPANTION



BASEMENT LAYOUT



GROUND FLOOR LAYOUT



Honourable Mention 9-INTERLOCK

Sylvana Kam, Jayden Chan and Moxiao Guo, Canada

INTERLOCK

Perfection may seem impossible for a project with an infinite number of details and potential mishaps. The Interlock however, fosters limitless growth potential, expanding with modular pods in accordance to foreseeable needs. Situated in the Jezero Crater, a location scouted by past missions, it was chosen for its historical traces of life. The pilot mission has five unique pods, each designed to fit specific programming. The base is equipped with the tools and resources to repair, expand and improve, allowing for complete independence from our home planet. The form itself takes inspiration from nature, mimicking the efficient honeycomb patterns of bees nests, and truly being infinitely expandable. The pods themselves are manufactured with a combination of printable, high-density composite, insulative materials, and sealant. Most new parts can be directly created within the pod, while any other specialized parts can be delivered by future Mars endeavors.

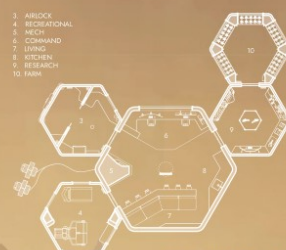
Its name, Interlock, shows that the individual pods connect with one another to create a larger ecosystem. However, another feat achieved was that they interlock vertically as well, allowing for not only efficient expansion, but a breakthrough way of living in the pod, whilst voyaging through space towards it's final destination.



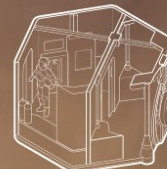
JEZERO CRATER



SECOND FLOOR PLAN 1:100



GROUND FLOOR PLAN 1:100

AIRLOCK/STORAGE
POD

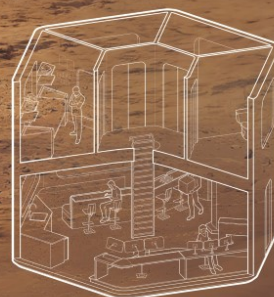
RESEARCH POD



FARMING POD



RECREATIONAL POD

REST/KITCHEN/MAIN
POD

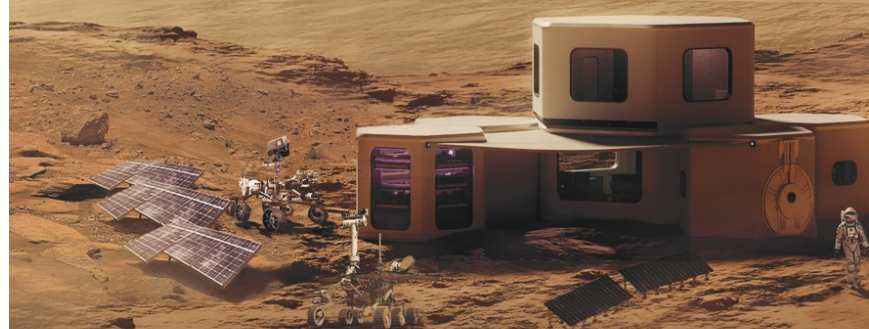
MODULAR DIAGRAM



SECTION 1:100



ELEVATION 1:100



Honourable Mention 10-CIRCLE OF LIFE

Lorenzo Bavelloni, Italy

MARSCEPTION 2024

The Circle of Life project on Mars harnesses large-scale 3D printing and Earthworks to craft a sustainable habitat from Marlon regolith, reflecting life's perpetual cycle. This endeavor is structured around four crucial clusters: Human Sustainability, Scientific Research, Infrastructure and Technology, and Communication and Exploration, each featuring essential laboratories.

The habitat's architecture, designed with three radial arms, embodies flexibility to adapt to Mars' challenges. These arms segregate the habitat into zones for habitation, research, and agriculture, allowing efficient space utilization and operational flexibility. The underground design curtails radiation exposure to Mars' harsh radiation, enhancing crew safety. Powered by solar panels, nuclear and geothermal renewable resources and designed with passive features, the ecosystem operates sustainably and autonomously. The use of renewable energy sources and an inflatable core for pressurization and thermal insulation underscores a commitment to sustainability and resilience.

The underground space, divided into concentric rings, accommodates research, living quarters, and equipment for efficiency and community well-being. On the upper floors, a sustainable farming system integrates vertical, hydroponics, farming, and insect incubation. A robotic arm tends crops, optimizing resources for sustainable food production and ecosystem balance, encapsulating the Circle of Life's commitment to a self-sustaining, harmonious existence on Mars.



-1 floor
Circle 2 female / radiation protection

1. Earthworks



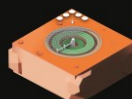
2. Tunnelling



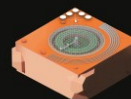
3. 3D printing



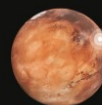
4. Inflatable



5. Form



Elysium Planitia



-2 floor
Suite 1120



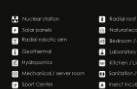
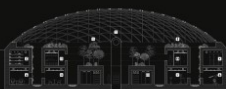
Radial Program

Ground floor
Scale 1:100



Radical Form

Section



Masterplan