

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.

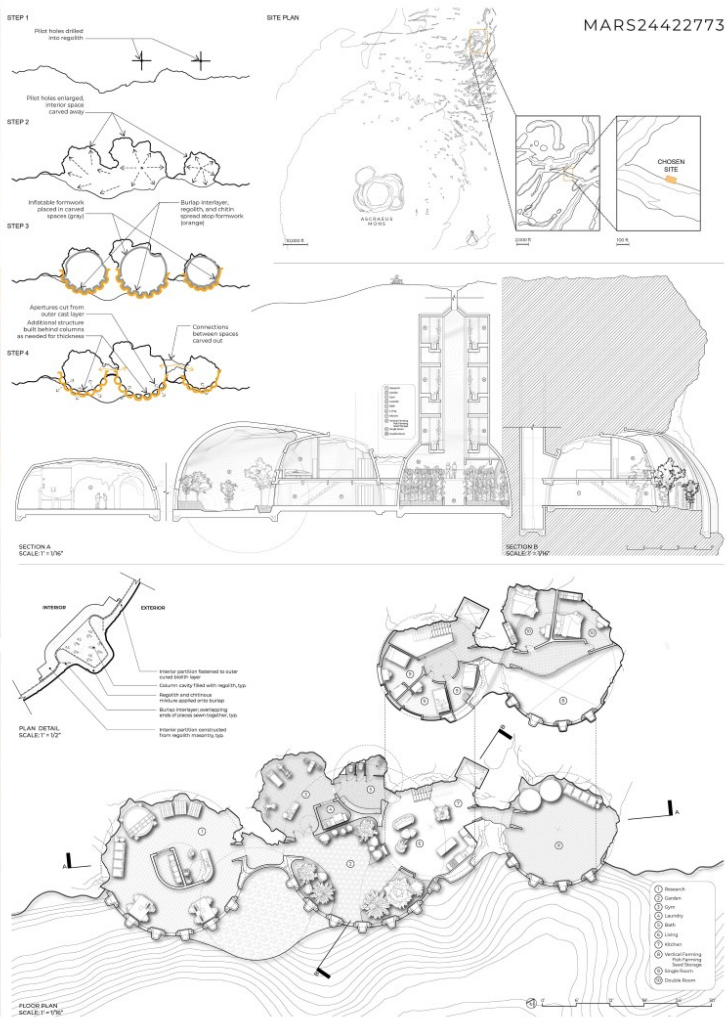
Volume Zero Competition thanks all the competitors for participating in this competition and for contributing to this competition's research.

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

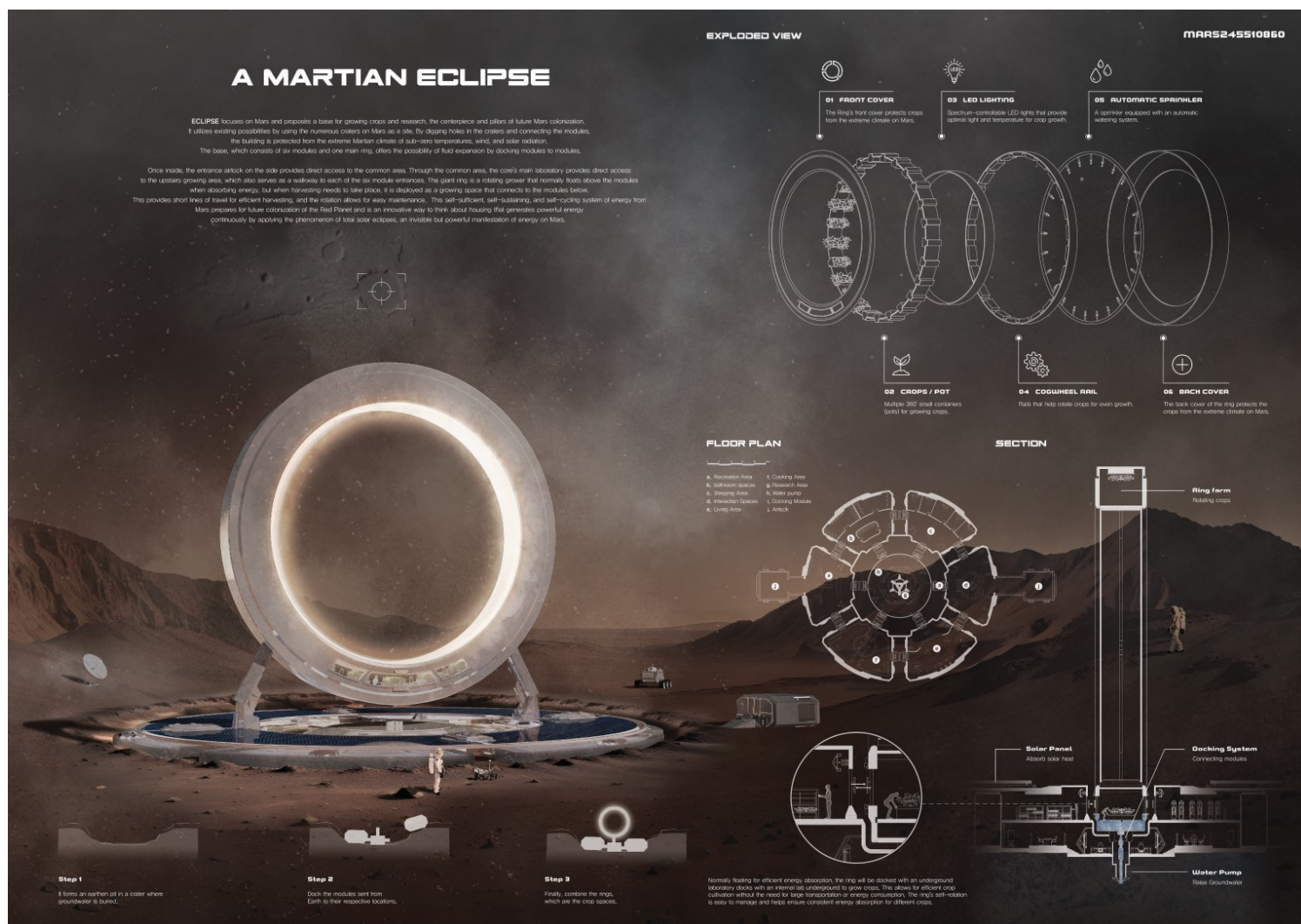


The Martian environment poses numerous challenges to habitation. Shelters designed on its surface must provide oxygen and warmth, block solar radiation, and source sufficient building material. Conversely, shelters created below Mars surface damage inhabitants psychological health by sealing them in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

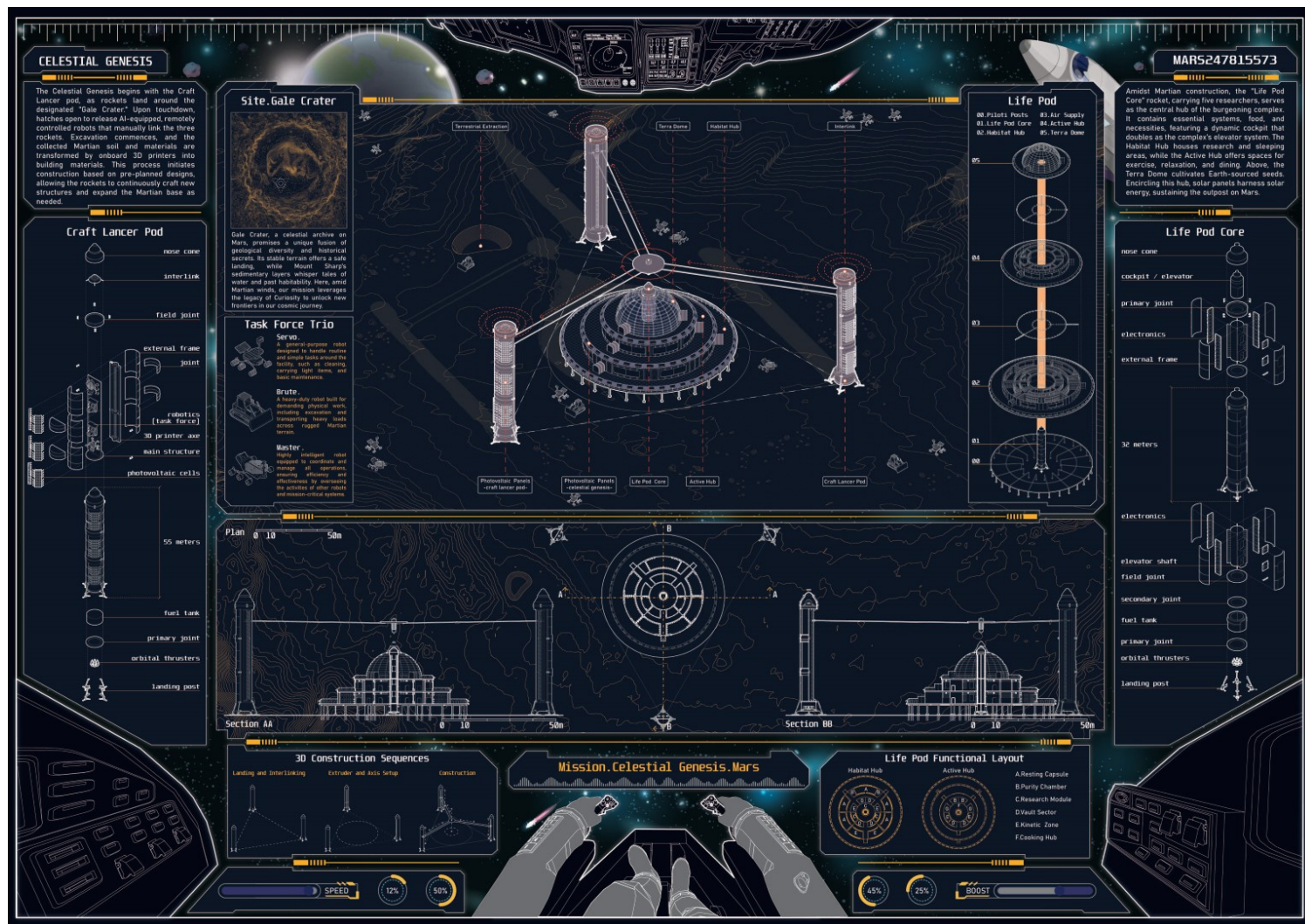
Park Seo-an and Ju Yeon Hong, Korea South



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

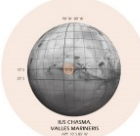


Ever - Grow

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

To Survive


On Mars, we have environment is harsh with radiation dust storms and scarcity of materials. Several strategies are proposed to ensure the safety and efficiency of lives on Mars. Self-sustainable base system using reusable planting and fish farming act as food source. With frequent dust storm cleaner solar panels, reflective by absorbing sunlight, geodesic induction system is used to generate energy.



NO CHIMNEY, VALLEY WINDMILLS

To Thrive


With Mars located in the astronomically second home, post-robotic well-being is a crucial consideration. The dwelling is carved out of Martian cliff with most part of building constructed deep in it, as a safe haven from radiation yet allowing sunlight and view. Vertical living spaces with central access junctions allow flows from public to private spaces, allowing solid inspection also killing origin of privacy needs.



1. Vertical living space
2. Central access junction
3. Public space
4. Private space
5. Inspection space
6. Killing origin of privacy needs

To Execute

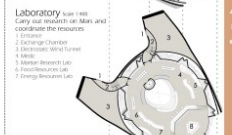
To ensure resources, transportation, recyclable and mostly available materials. Recycle is performed. A combination of 3D printing for the shell & framework, a prefabricated material for the interior. The design considers the future population, including modular framework will expand for future settlers to make it with their respective goals from Earth. The previous study bring an idea to bring a module.



1. Modular framework
2. Central access junction
3. Public space
4. Private space
5. Inspection space
6. Killing origin of privacy needs

Community Space


Size: 1000
Living space for community to create an Earth-like landscape.
1. Entrance
2. Entrance
3. Entrance
4. Entrance



1. Entrance
2. Entrance
3. Entrance
4. Entrance

Laboratory


Size: 1000
Carry out research on Mars and coordinate the resources.
1. Entrance
2. Entrance
3. Entrance
4. Entrance
5. Entrance
6. Entrance
7. Entrance



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

Family Area


Size: 1000
Building space for the family.
1. Entrance
2. Entrance
3. Entrance
4. Entrance
5. Entrance
6. Entrance
7. Entrance



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

Controlled Farming


Size: 1000
Exclusive farm for Multitasking Farming.
1. Entrance
2. Entrance
3. Entrance
4. Entrance
5. Entrance
6. Entrance
7. Entrance



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

Accommodation


Size: 1000
Future abatement according to the population.
1. Entrance
2. Entrance
3. Entrance
4. Entrance
5. Entrance
6. Entrance
7. Entrance



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

Controlled Farming


Size: 1000
A Backup Food resources.
1. Entrance
2. Entrance
3. Entrance
4. Entrance
5. Entrance
6. Entrance
7. Entrance



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

Accommodation Pod

Size: 1000
A backup pod provides a personalized living space, providing an individual attention and response with all support systems.

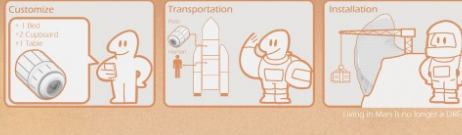


1. Entrance
2. Entrance
3. Entrance
4. Entrance
5. Entrance
6. Entrance
7. Entrance

MARS241804347

HOW TO GO TO MARS 101

Customer Transportation Installation



1. Customer
2. Transportation
3. Installation

Translucent ETE skin

Protection using mass



1. Translucent ETE skin
2. Protection using mass

Ground level park

Electrostatic induction system to generate electricity



1. Ground level park
2. Electrostatic induction system to generate electricity

Energy core

Hydroponic farming system



1. Energy core
2. Hydroponic farming system

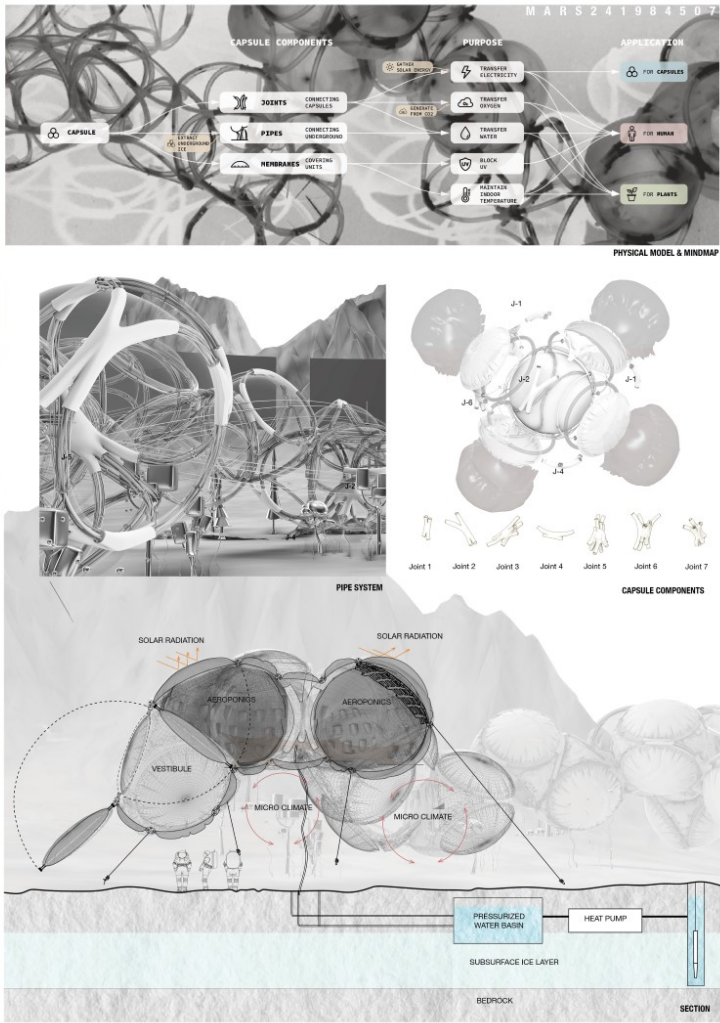
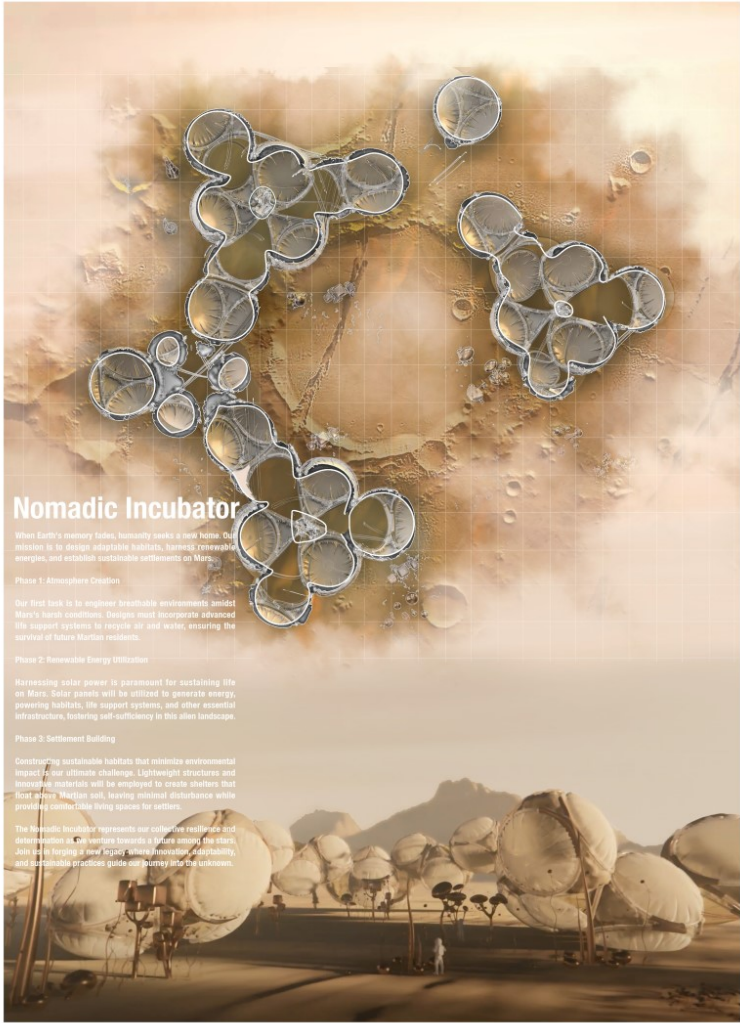
Central atrium

Central atrium



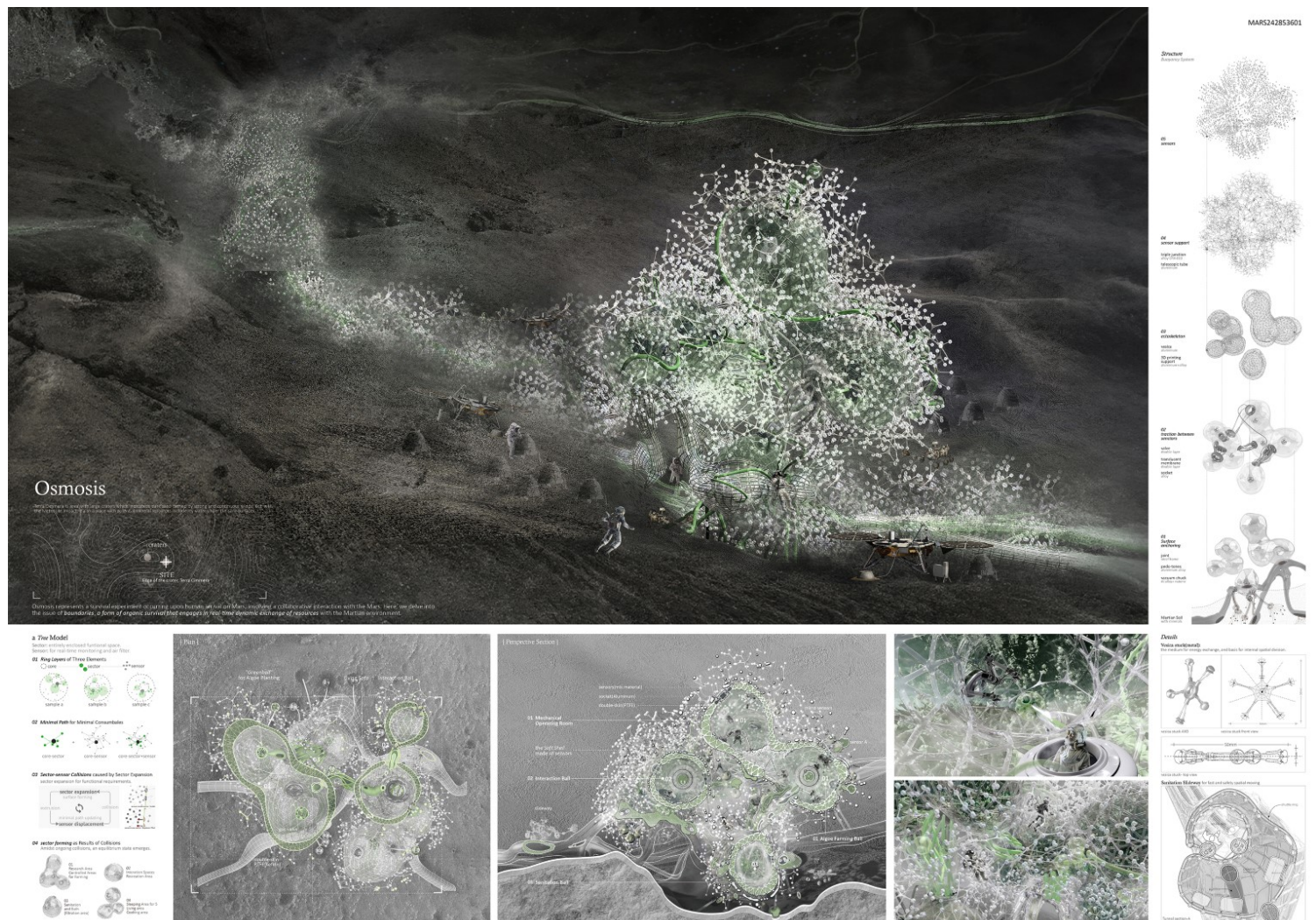
1. Central atrium

Honourable Mention 2: Nomadic Incubator
Jiaqi Kang, Jiamin Huang and Lejia Li, United States



Honourable Mention 3: Osmosis

Wan Zilin and Ren Yinghui, China

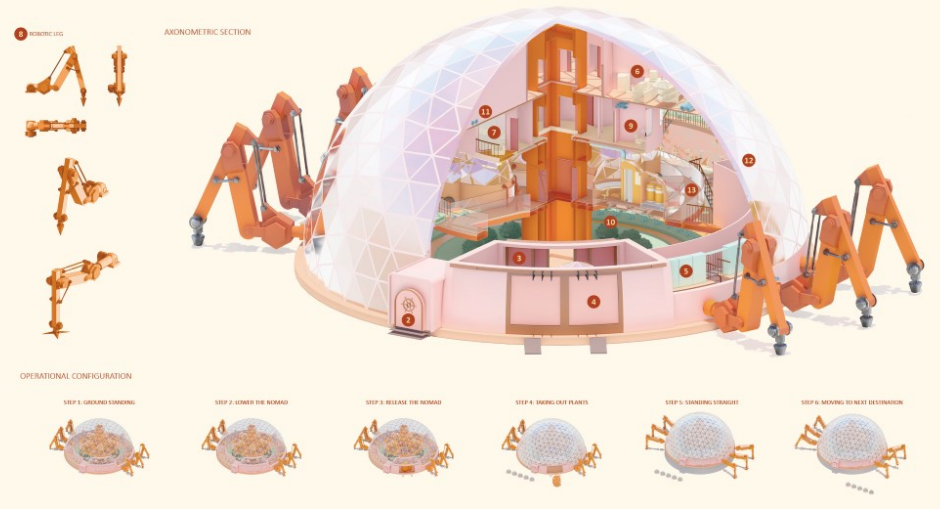
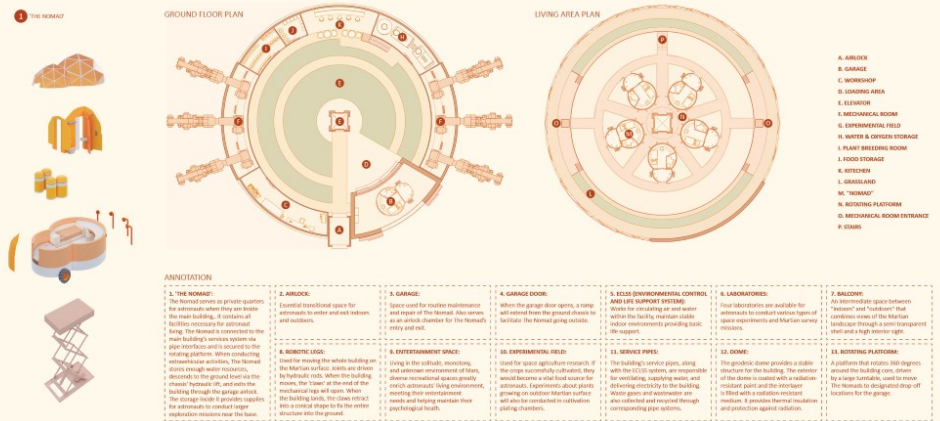


Honourable Mention 4: Nomadica: The Mobile Haven on Mars
 Xueyan Wang and Jiahao Du, Australia

Agricultural sustainability is prioritized, with astronauts 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.

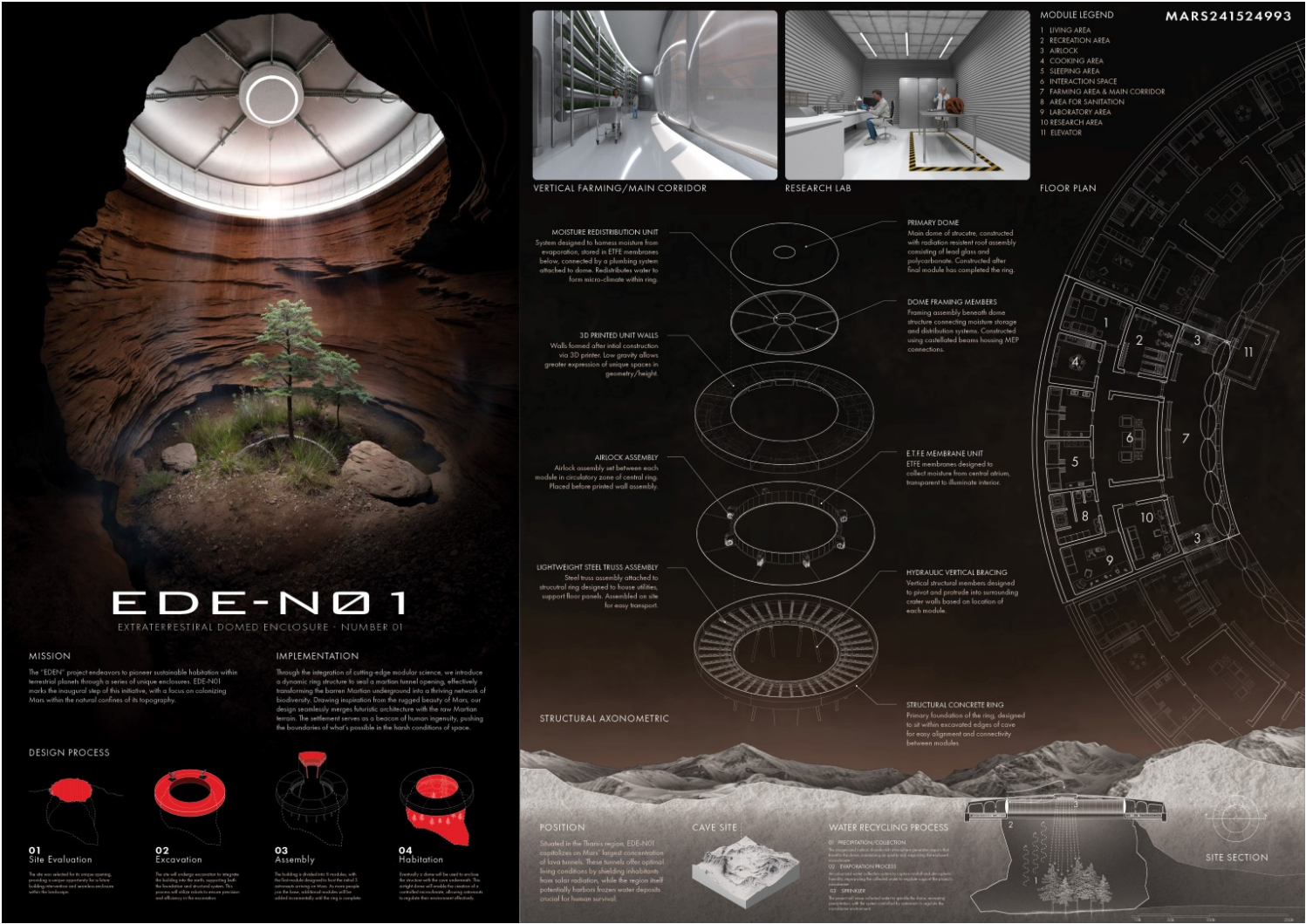


Nomadica: The Mobile Haven on Mars



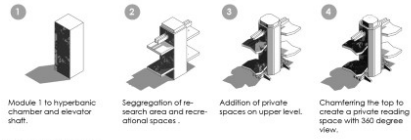
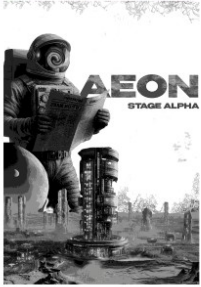
Honourable Mention 5: EDE-NO 1

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 at 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.



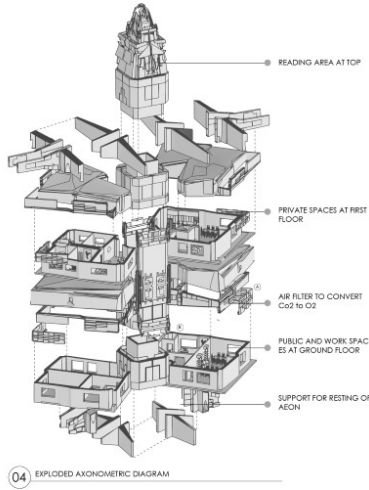
LIVING ROOM. DEPICTING HARMONIOUS BLEND OF COMFORT AND STYLE.



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



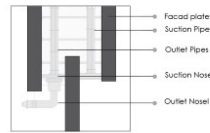
RESEARCH WORK STATION FOR RESEARCH AND DEVELOPMENT.



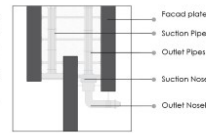
04 EXPLODED AXONOMETRIC DIAGRAM



DETAILS AT A AND B -



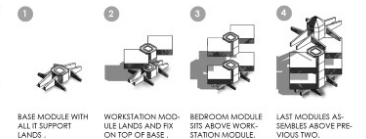
AIR FILTER THAT INTAKES CO₂ FROM MARS ATMOSPHERE AND CONVERTS TO O₂.



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 -



Honourable Mention 7

Muzhi Wang and Ruoxuan Hu, United States

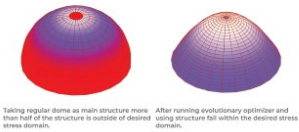


Mars, an empty, red planet, where every breath is a battle against the unforgiving elements. In this endeavor, our task is to fashion a world within a world—a sanctuary where humanity can establish its foothold, exploring the boundless possibilities of a new frontier. Architecture stands as a linchpin, 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.

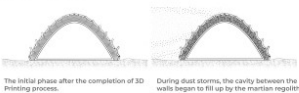
Our primary objective is to conceive a structure capable of enduring with the limited natural resources afforded by Mars. The design features double walls with a cavity in between, strategically perforated to allow Martian regolith to infiltrate, naturally reinforcing the structure against the rigors 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.

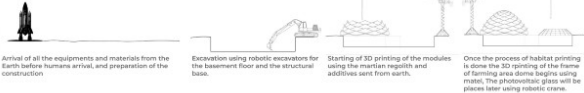
STRUCTURAL STRESS ANALYSIS



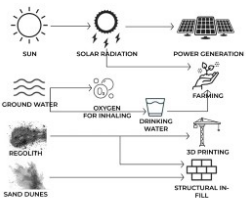
CAVITY FILLING



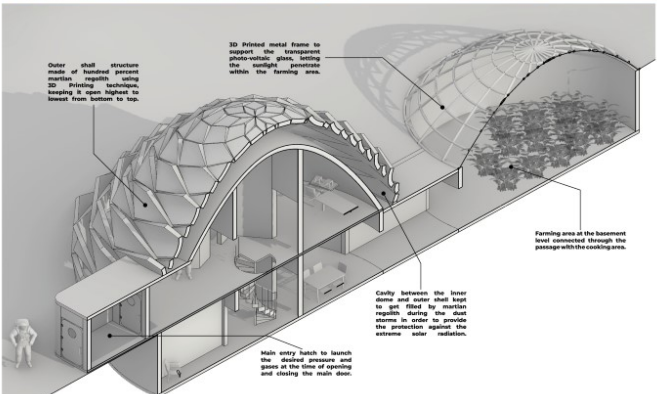
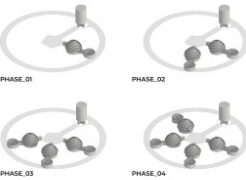
CONSTRUCTION PHASES



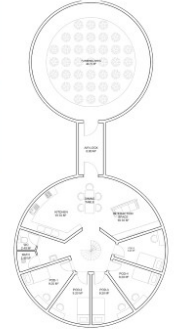
RESOURCE MANAGEMENT



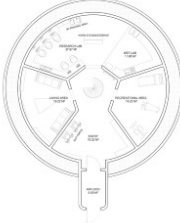
FUTURE EXPANTION



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

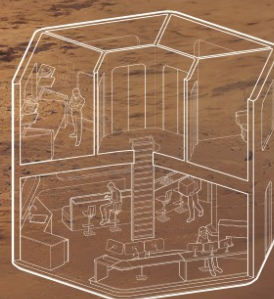
RESEARCH POD



FARMING POD



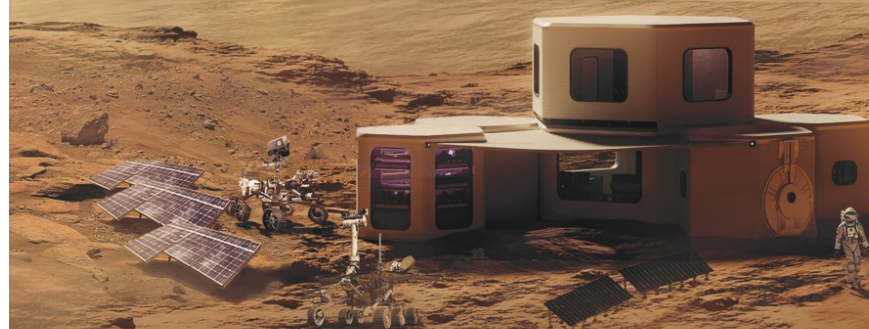
RECREATIONAL POD

REST/KITCHEN/MAIN
POD

SECTION 1:100



ELEVATION 1:100



Honourable Mention 10-CIRCLE OF LIFE

Lorenzo Bavelloni, Italy

The Circle of Life project on Mars harnesses large-scale 3D printing and Earthworks to craft a sustainable habitat from Martian 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 crucially mitigates exposure to Mars' harsh radiation, enhancing crew safety. Powered by solar panels, nuclear and geothermal renewable resources and designed with positive feedback, 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. Earthworks



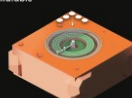
2. Tunnelling



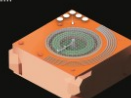
3. 3D printing



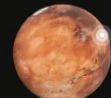
4. Inflatable



5. Form



Fluvium Planitia



-2 floor



Radical Program

Ground floor



Radical Form

Masterplan