



MOON BASE 2124

Artemis Centenary Design Competition

<https://competitions.uni.xyz>



Moon Oasis by Samer El Sayary

Premise

In 1969, the **Space Race** peaked with the successful **Apollo 11 mission**, which allowed the first man to walk on the moon.

Between 1969 and 1972, there have been **six successful manned missions to the Moon, all from the USA**. In total, 12 people (all male) have walked on the lunar surface.

Nobody has ever walked on the surface of the Moon since 1972.

Today, nearly half a century later, **new technological advances and a renewed desire on space exploration have ignited a new race**. Attention is moving back to the Moon. This time, however, we are tired of just walking... what we want is to inhabit! Space Architecture is becoming a growing field with the desired outcome to: **kick-start space tourism, expand our scientific knowledge, and ultimately make mankind a multi-planetary / galactic species.**



Buildup

The **Artemis program** is an ongoing **crewed spaceflight program** carried out predominately by **NASA**, **U.S. commercial spaceflight companies**, and international partners such as the **European Space Agency (ESA)**, the **Japan Aerospace Exploration Agency (JAXA)**, and the **Canadian Space Agency (CSA)** with the goal of landing "**the first woman and the next man**" on the Moon, specifically at the lunar south pole region by 2024. NASA sees Artemis as the next step towards the long-term goal of establishing a sustainable presence on the Moon, laying the foundation for private companies to build a lunar economy, and eventually sending humans to Mars.

The **Moon Base competition 2124** asks architects and engineers "What will living on the Moon in the future look like in the 100th anniversary of Artemis program?"

We challenge students, architects, designers, scientists, and visionaries to propose **ideas on how the lunar settlement in 2124 would be constructed**. Ideas could be realistic, actually analyzing how we may live on the Moon in the next 104 year, or creative fantasies of how the Moon can serve the human race. Moon base 2124 consists of the planning and design of a **phase three colonization on the Moon** to support a **resident staff of a minimum viable population of 160 person**. The primary purpose of Moon Base 2124 is to provide a permanent commercial, science, and technology development facility on the Moon.

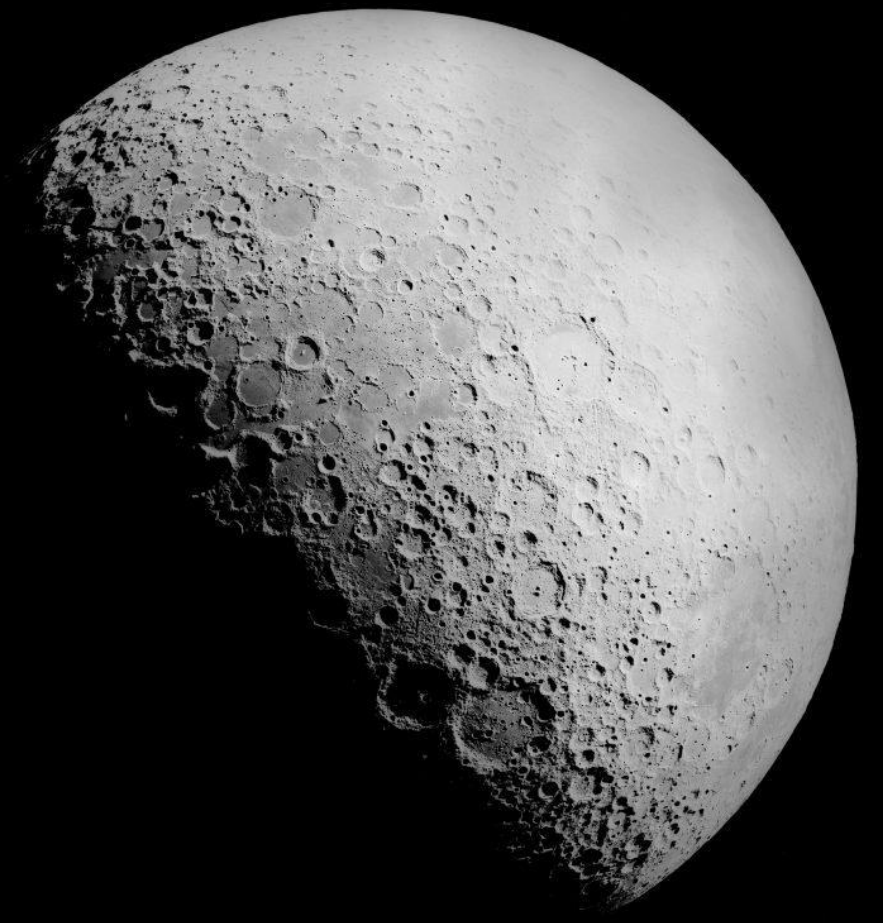


Task

TASK:

To design a **Self-sufficient, Self-sustaining lunar settlement with a closed loop system and a modular nature designed for ease of future expansion, construction and assembly.** It will be much more advanced in achieving self-sufficiency such as food production and regenerative life support. **To be a stepping stone for outer space exploration (i.e. Mars).**

Legal Ownership



LEGAL OWNERSHIP OF MOON BASE 2124:

According to the **United Nations Outer Space Treaty**, signed by every space-faring country, **no nation can claim sovereignty over Earth's lunar satellite. 102 countries have entered into to the 1967 accord.**

In 1979, the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (also known as the "Moon Treaty") was put forward by the United Nations. **Its goal was to place control of the Moon and other celestial bodies into the hands of the international community.**

Under the treaty, any use of the Moon should benefit all states and all peoples. **No country should use the Moon or its resources without the approval or benefit of all nations.** The ownership, financing and governing body for the base will be an **international consortium of space agencies (CSA, ESA, RSA, JAXA, NASA, etc).**



Powering

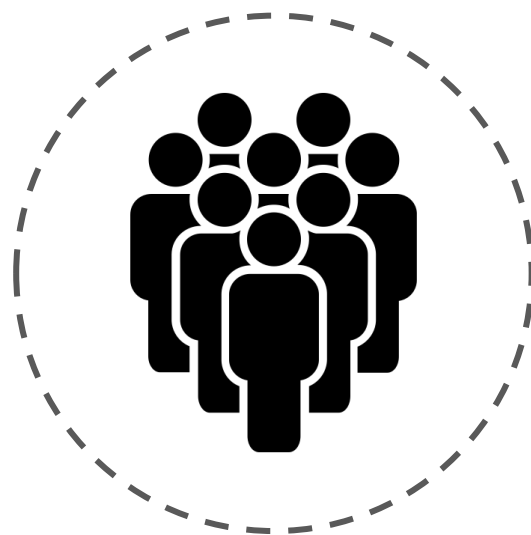
BASE POWERING:

The contestant may explore one or a combination of new technologies like:

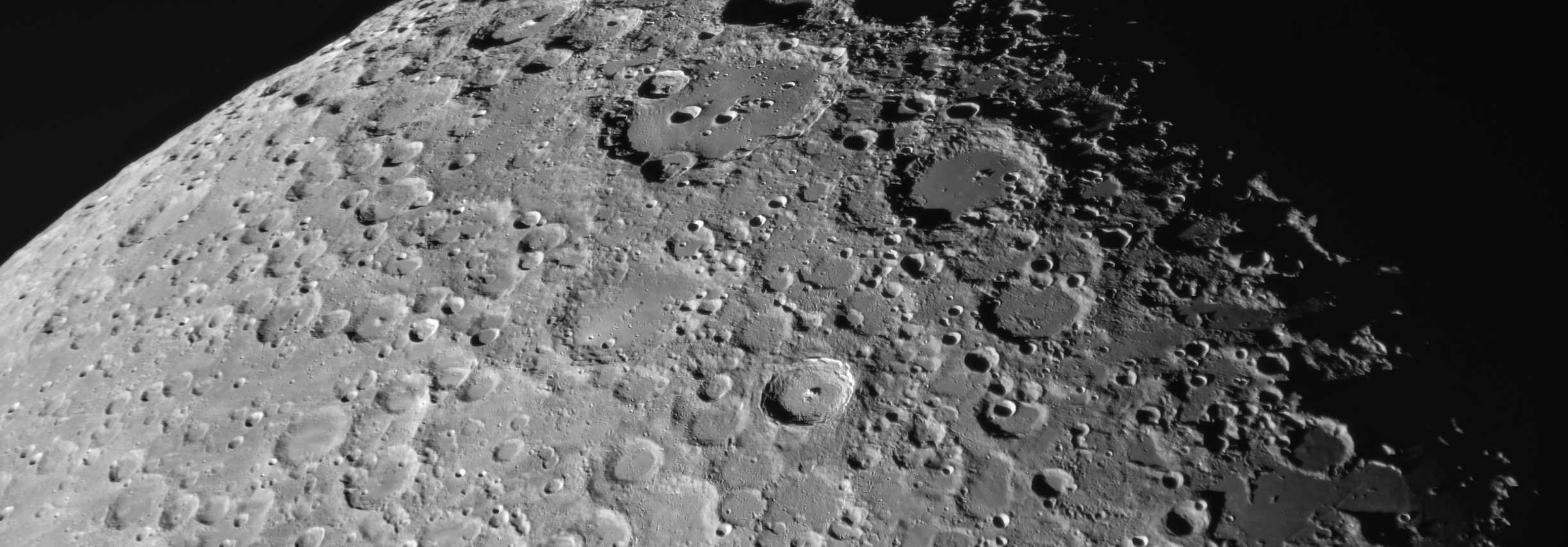
1. Solar satellites beaming power to the dark areas of the moon
2. Solar sails to be used as a passive tool to generate energy? Can we utilize solar sails as a solar turbine generating energy?
3. Or would you like to go with the traditional nuclear batteries
4. Or perhaps it is preferable to use the fusion reactors that will be developed in the next few decades due to availability of Helium 3 on Moon.



Demographics



The base should be designed to house a **minimum viable population (MVP)** of **200 persons** composed of **scientists, engineers, entrepreneurs, medical specialists, technicians**, in addition to specialists representing the arts, humanities, and spiritual leaders.



Colonization

COLONIZATION WILL GO THROUGH 4 PHASES AS WE LEARNED FROM HISTORY OF COLONIZATION:

1. Expedition campaigns that didn't last long, Started already in the 60es of the last century
2. Small missions in which some of them stayed with the aid of private sector
3. Larger scale colony that ship back the resources to Earth
4. Colony declaring independence with a self-replicating robot to construct more settlements independently from Earth. With the first extraterrestrial generation children born on this settlement.

Our Moon Base is destined to be **Phase 3 Colony**



Inspiring Facts

- 1 moon day lasts **29 earth days**.
- Temperatures varies from **127 to -173 degree centigrade** between sun lit and dark areas on moon surface.
- Moon has an **electrostatic surface** due to continuous exposure to cosmic radiation
- The Moon surface is always **bombarded by all sizes of meteors and asteroids**
- The **Moon regolith** is a fine hazardous dust
- The moon gravity is **16.8 % of Earth gravity** enabling heavy equipment to operate easily and longer spans constructions to exist.
- Proximity from Earth is a key benefit of Moon to be a station to Mars. **We can reach moon from Earth in around 3 days which make it a perfect base for future space exploration**



Future Technologies

FUTURE TECHNOLOGIES THAT YOU CAN USE AFTER INVESTIGATION

- It is expected that these **technologies will advance rapidly** in the next few coming decades, You are free to use and imagine whatever you need to complete you design
- **4D printing and memory shaped alloys** for self-repairing structures.
- **Thermoluminescence materials** might be used as a source of artificial lights
- **Bio-molecular 3D printing to 3D print any organic materials** for probable medical or biological use including for example organs transplanting...etc



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Program

1. **Moon mining facility for excavation and extraction** of rare Earth elements like Uranium, titanium, helium 3, gold and platinum...etc) then shipping them back through a space elevator.
2. **Hazard biological experiments, Low gravity industries and advanced Nanotechnology research labs.**
3. **Spaceport to other celestial bodies like Mars**
4. **Space safe time capsule** buried under moon ground carrying our history, sciences and arts.
5. **Lunar tourism facility** where moon will be a place for contemplation and sanctuary from the materialistic planet Earth.
6. **Living areas including sleeping pods, exercising areas and living spaces** with regard of Human psychological and physiological well being (Circadian Rhythm,..etc)
7. **Aeroponics and/or hydroponics farms with 4 types of plants** (Medical, Oxygen bomb, Vegetables and fruits for nutrition, Construction wood trees).
8. **Communication center** connecting the base with Earth and with the Satellites around Moon.
9. **Power station** protected from the surface environment.
10. **Surface Access Unit** including airlock system for crew and lunar terrain vehicles with purification zone from Moon harmful regolith.

Living Conditions



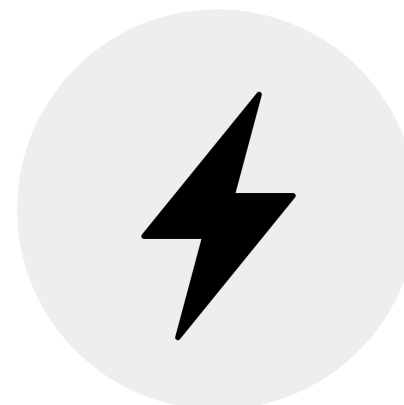
Usable and Safe



Food and Water



Oxygen and Heat



Power

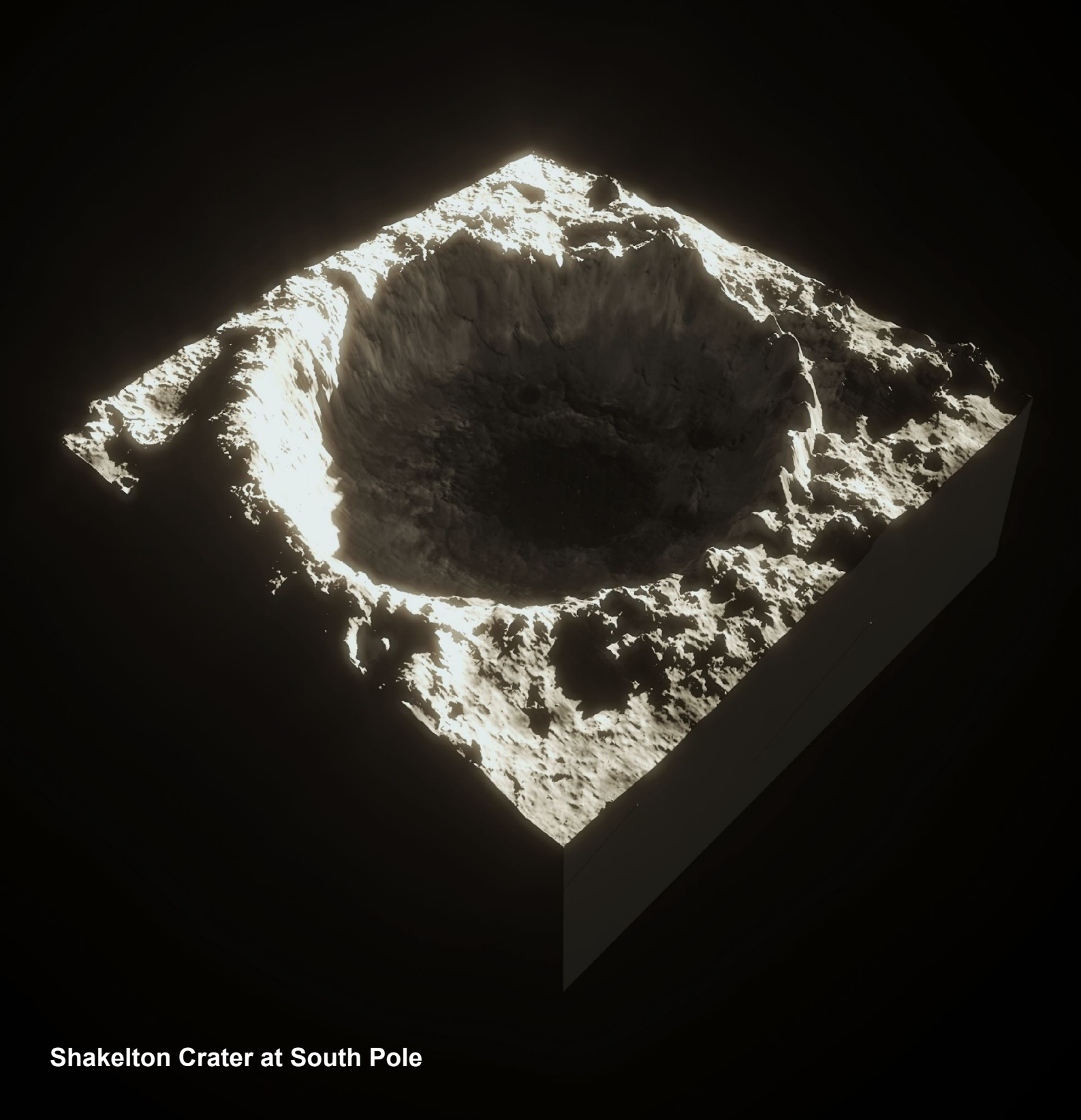
The following objectives can be a point of beginning to conceive this design. Participants can assume their own contexts and users before initiating their design process.

The base should carry 8 features essential for life support: Usable, safe, providing oxygen, water, food, heat and power.

All habitable spaces will hold an atmosphere of **101.35kPascal (14.7psi)** in an Earth-normal gas mix at sea level.



Lava Volcanic Tubes

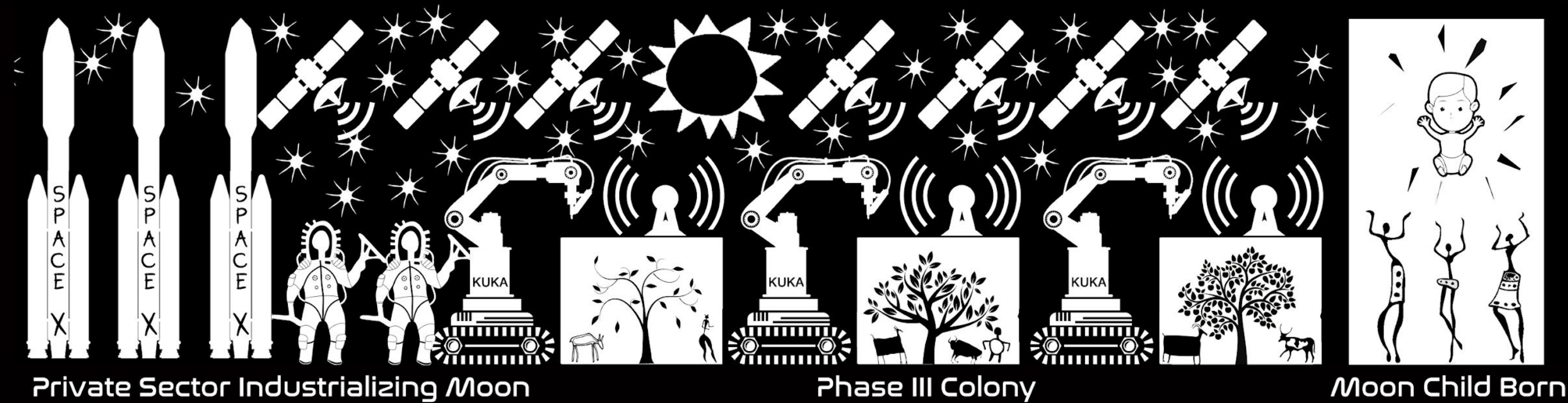
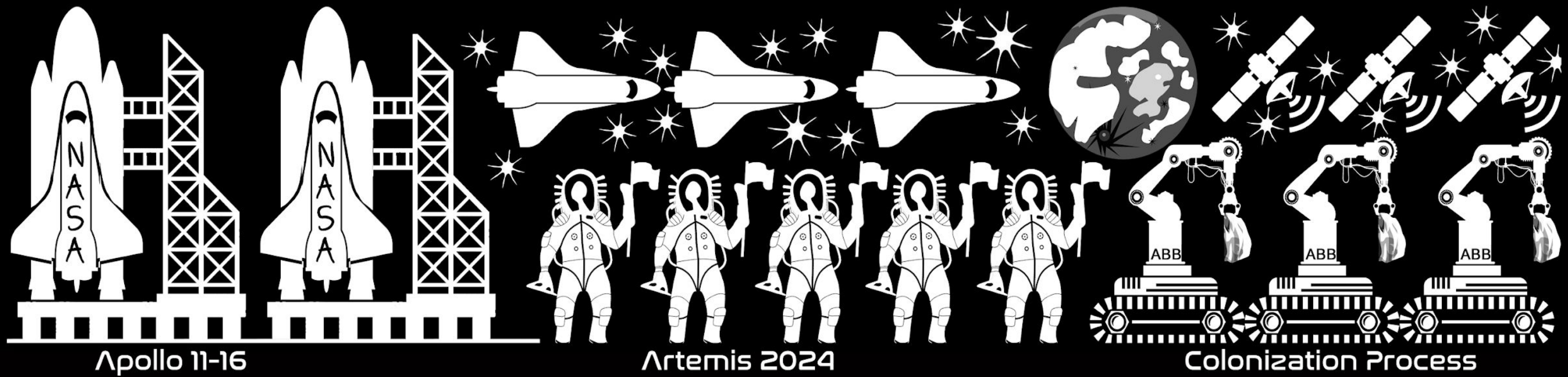


Shakelton Crater at South Pole

Probable Sites

1. South pole craters because of the presumed availability of recoverable water ice by placing the base Core underground with minimum required thickness of regolith above of 3m for protection of harsh moon environment.
2. Underground lava tubes as a natural Shield from meteors and radiation with an average width of 500 meters and several kilometers long.

You are free to choose whatever site, Also feel free to choose another site than the indicated based on your research



[Moon timeline by Samer El Sayary](#)

Construction Guidelines

A hybrid method between: 3D printing technology, pre-integrated modules and inflatable structures would be recommended to reduce landed payload-mass and mass that the construction process.

Dividing the project into multiple self-sustaining units or clusters improves safety and reliability of the whole base.

Submission

You have to deliver an architectural outcome on the following site, based on the given outlines.

- Recommended number of boards/presentation images/sheets - **6 (Six)** – Size [**2362px x 3544px**] or [**400mm x 600mm** in **150 dpi**] in portrait digital format (JPEG only). **Minimum 3 (Three)** & **No maximum sheet limit**.
- Each image should be less than **15MB**. (Do not submit PNG format)

This additional resources folder contains: FAQ Questions

Minimum requisites are sheets/boards + Cover image containing:

This is the link for new file sizes, [here](#).

- Site plan (Compulsory)
- Key conceptual sections x 1 (Minimum)
- 3D views x 4
- Cover image/Thumbnail of size 2000 x 1000 px or larger in aspect ratio 2:1.
- Floor plans, images, sketches (if any) can be added to support the entry in the form of additional images.
- Answer 6 FAQ questions in the discussion section as given on the '[additional resources folder](#)'.

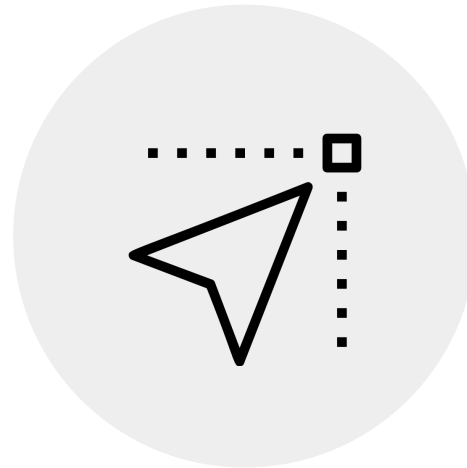
-
- + The team limit for this competition is 4 members maximum.
 - + Use exploded views to discuss multi levelled conceptual models better.
 - + Ensure that the final sheets which are submitted do not include your name or any other mark of identification.
 - + Mention sheet number on corner of every sheet.
 - + This is a design ideas challenge only. There is no built commission/realization associated with the problem
 - + Plagiarism of any idea / form / design / image will be disqualified with a notice.

Registration page here: <https://competitions.uni.xyz/moon-base-2124>

Discover the competition schedule and deadlines here: [Schedule](#)

Judging Criteria

The entries will be judged by an international jury of the competition on the following criteria:



Presentation

The fundamental to a good entry is a good presentation.



Concept/Idea

Quality of thought and intent in pre-design phase.



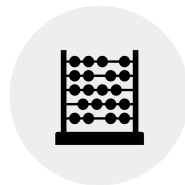
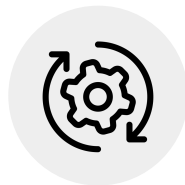
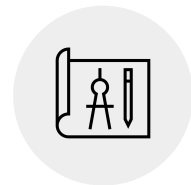
Spaces/Programme

How the spaces are calculated and ordered.



Design Output

The final architectural outcome of the solution.



The judging panel can also add other criterions based on their internal discussions - which will be in line with the problem statement. Participants are advised to fulfil above given criterions first in their design.

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Curator



Samer El Sayary

Architect, PhD. Mars City Design Ambassador
Samer El Sayary Architects
Lebanon

Samer El Sayary (1978) is an assistant professor of Architecture, researcher and award-winning architect. Over 30 award and prize till the year 2019 from prestigious institutes like Mars City foundation (Los Angeles, 2017), Jacques Rougerie Foundation (Paris, 2018), Kuala Lumpur Architectural Festival (Kuala Lumpur, 2019) to name few, His work has been featured in Discovery channel UK, Dutch TV, California Dreamers, Wired magazine 2017 and L'arca magazine, to name few. He is experimental architect who participated in numerous workshops in 13 different country. He continuously explores the relationship between the past and future trying to redefine it using modern technology. The main outlines of his architectural school could be summarized in three main principles; 1. Digging deep in the knowledge and science accumulated through thousands of years to capture hidden values and intangible strengths of legacy. 2. Rethinking those values using cutting edge technologies to create a state or art architecture that carries the spirit of the past, not in its shape or form, but in its experience. 3. Teaching future generations how to use technology to develop their Heritage.



Rewards

Grants of up to a total of **20,000\$** can be won on this challenge. Learn more about the full conditions on the competition page [here](#).

X-plor is an exploratory ideas arm of Uni, where participants are exposed to challenges with an entirely new subject / premise in terms of design. X-Plor competitions allow participants learn simultaneously, beyond traditional problems and invite fresh design ingenuity to solve them. Primary theory associated with these problems are supplied with the problem statement. The design outcomes are judged by the combinations of logics applied in resonance to proven + speculative ideas that stand most innovative amongst all.

Queries: support@uni.xyz

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