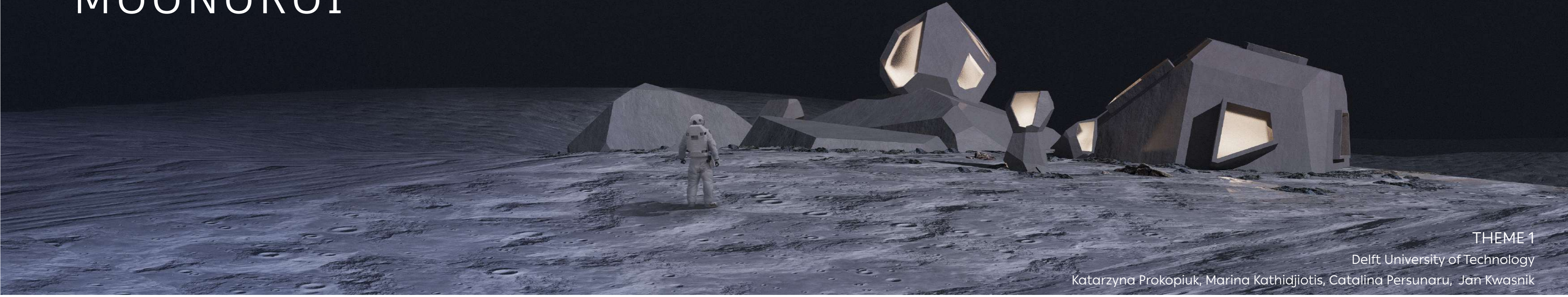


# MOONOROI



THEME 1

Delft University of Technology

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## APPROACH

The concept of the Moon habitat is based on using locally available materials and low-impact technologies. The construction follows the principle of voronoi modules, which allows for functional and structural flexibility. The habitat is designed to be built in a human-robot interaction (HRI) process.

## SITE

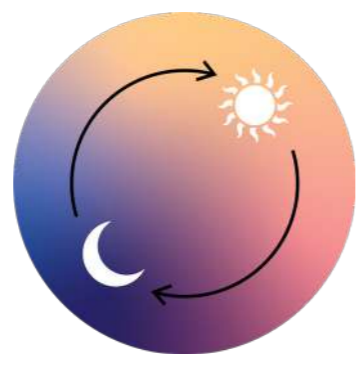
The choice of the site on the Lunar South Pole is informed by scientific studies. Building near the Sverdrup-Henson crater allows for an optimal terrain slope. Moderate radiation is sufficient for energy production while reducing the required protective measures. The habitat is situated close to water sources and the launch pad. The chosen location is characterised by nearly constant daylight.

## IN-SITU RESOURCES

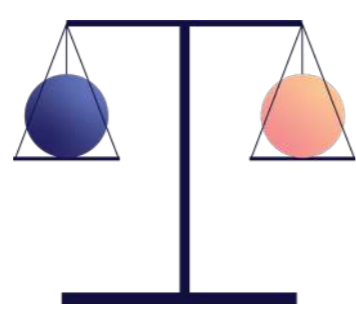


Lunar regolith

## CONCEPT



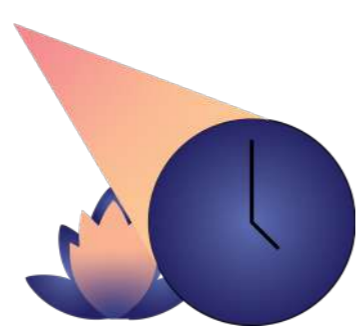
Circadian rhythms prepare our bodies for expected changes in the environment.



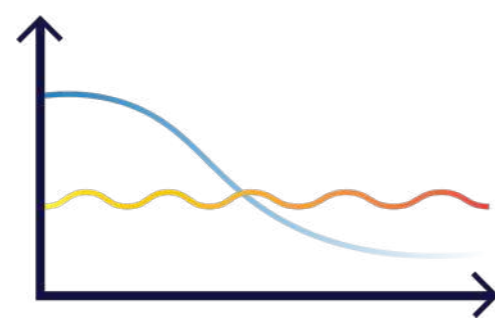
Darkness at night is as important as brightness during the day.



It is important to have a variety of stimuli

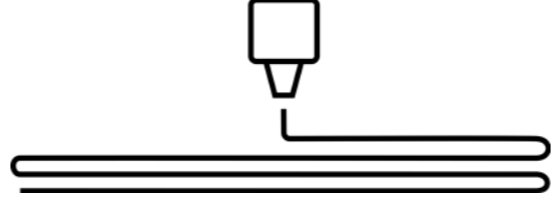


Bright light regulates hormones production and sleep-wake cycles.



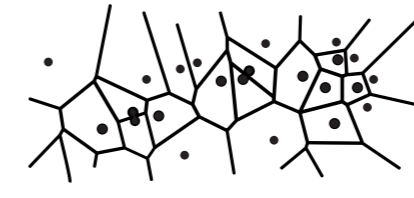
Disruptions affect psychiatric health, metabolism, and possibly the immune system.

## EFFICIENT BUILDING STRATEGIES



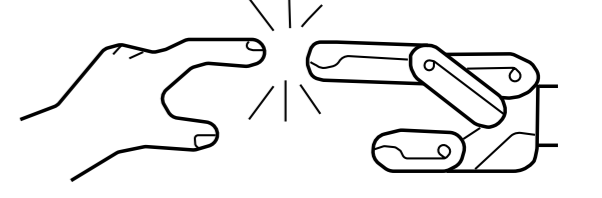
3D printing

## FORM FINDING



Voronoi

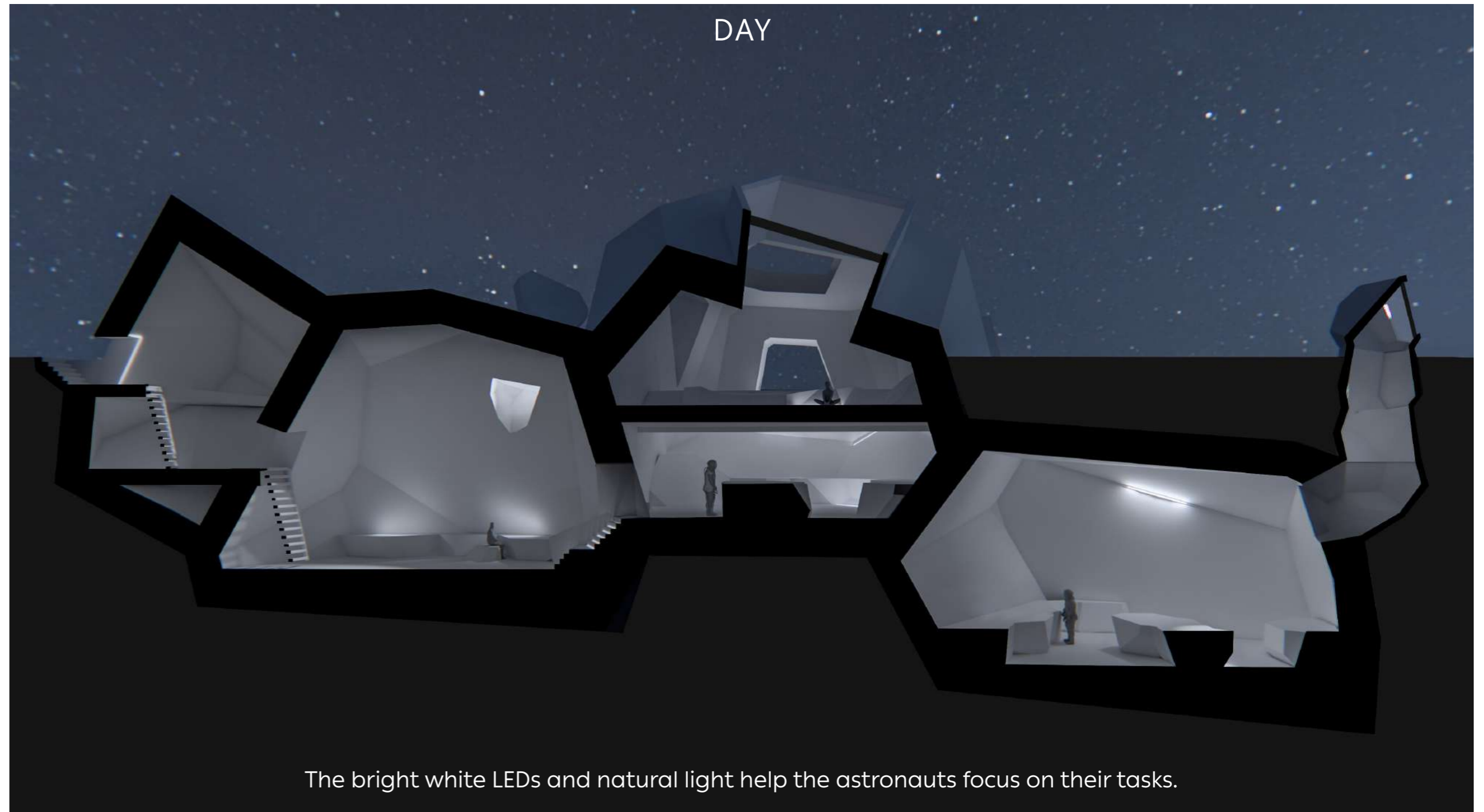
## INNOVATIVE ASSEMBLY STRATEGIES



Human-Robot Interaction (HRI) & Design to Robotic Production and Assembly (D2RP&A)

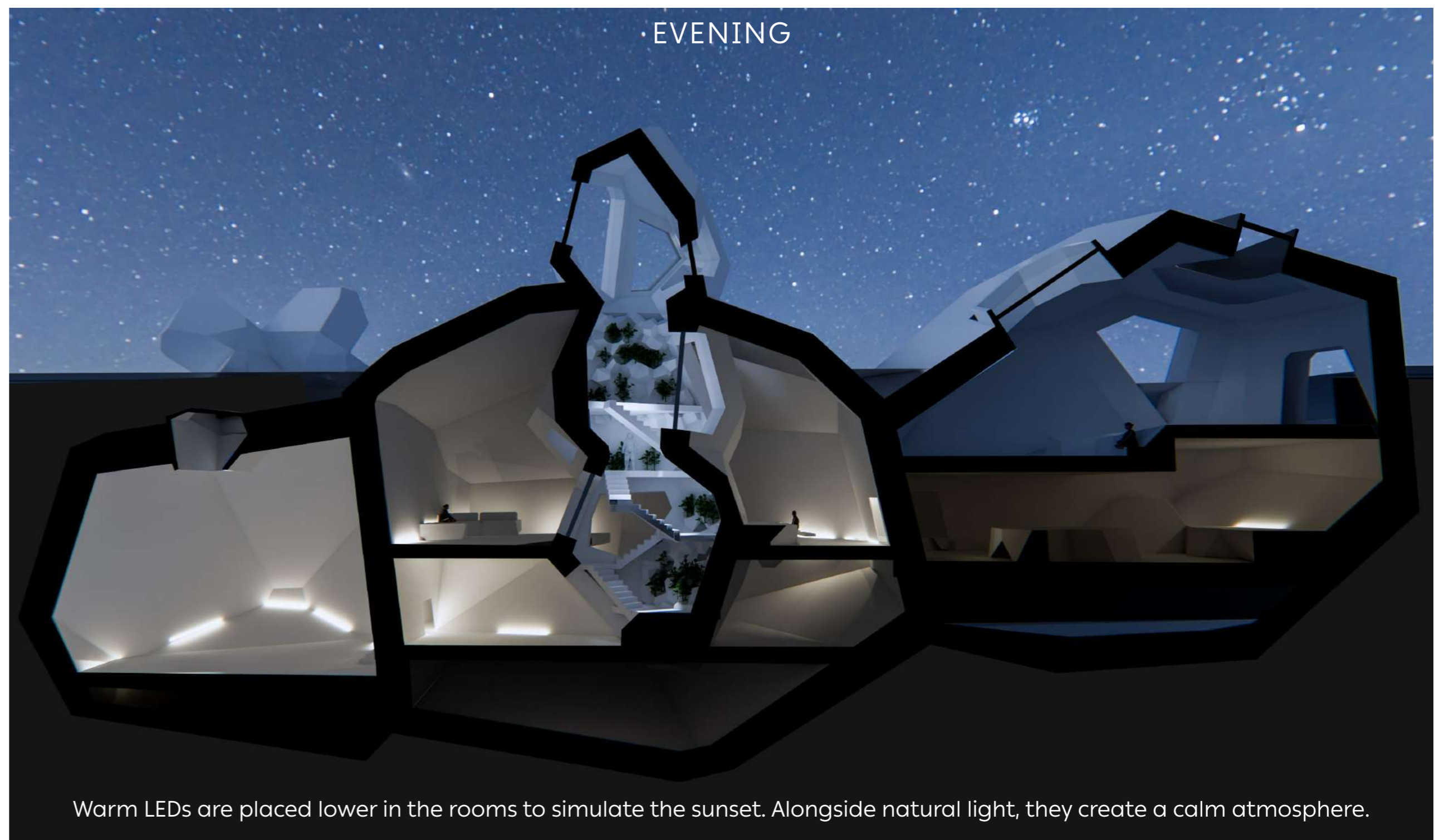
## SIMULATION OF EARTH DAY CYCLES

### DAY



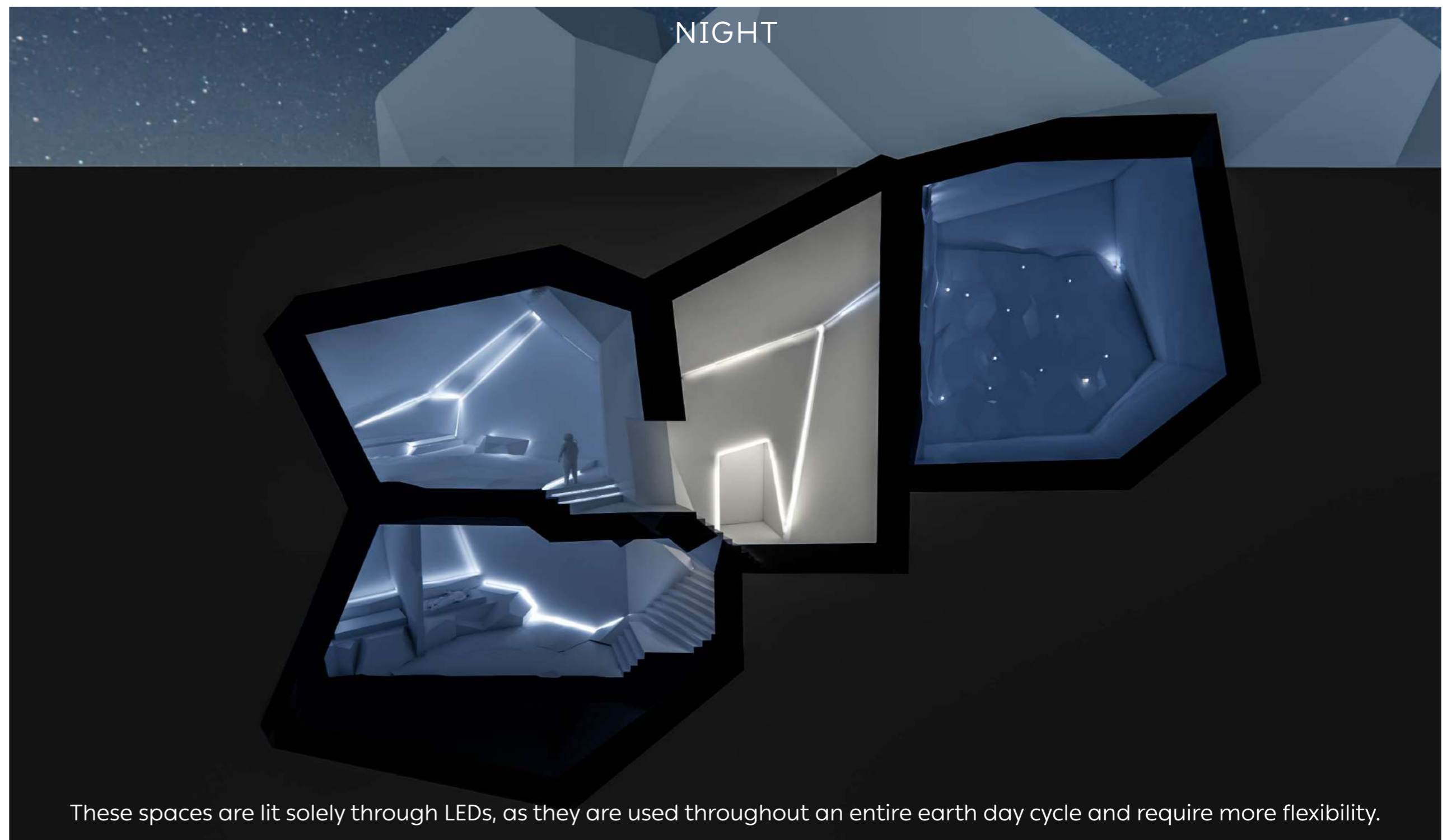
The bright white LEDs and natural light help the astronauts focus on their tasks.

### EVENING

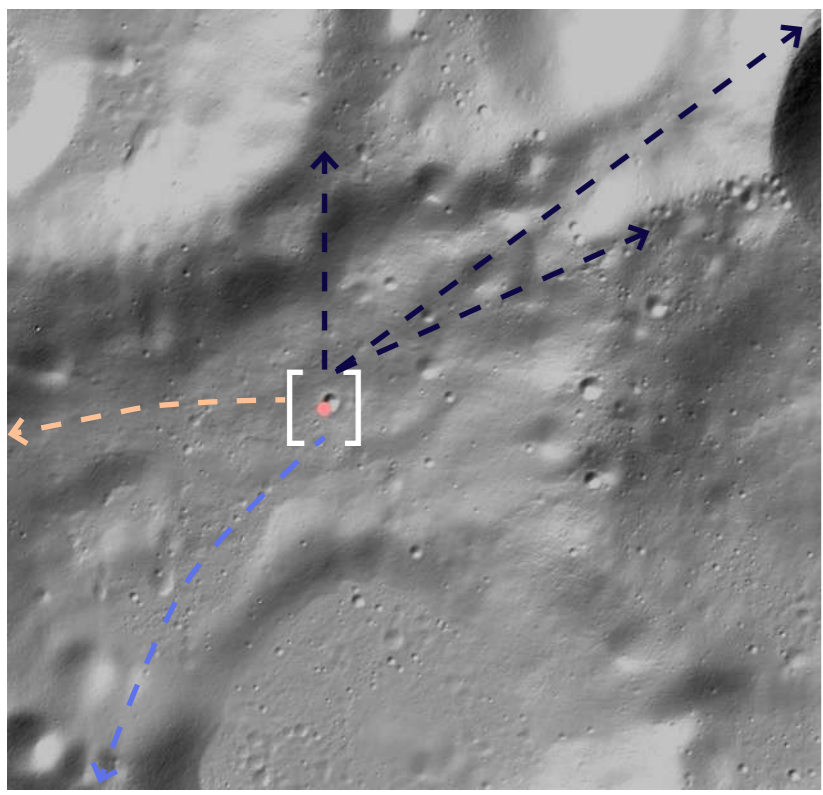
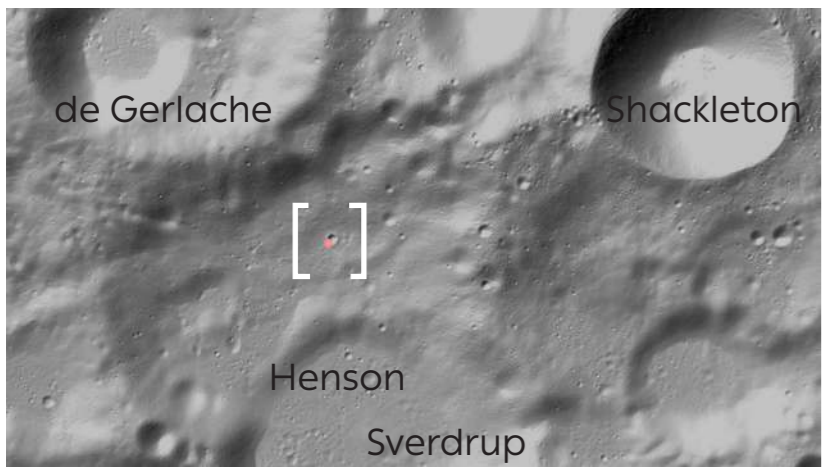


Warm LEDs are placed lower in the rooms to simulate the sunset. Alongside natural light, they create a calm atmosphere.

### NIGHT



These spaces are lit solely through LEDs, as they are used throughout an entire earth day cycle and require more flexibility.

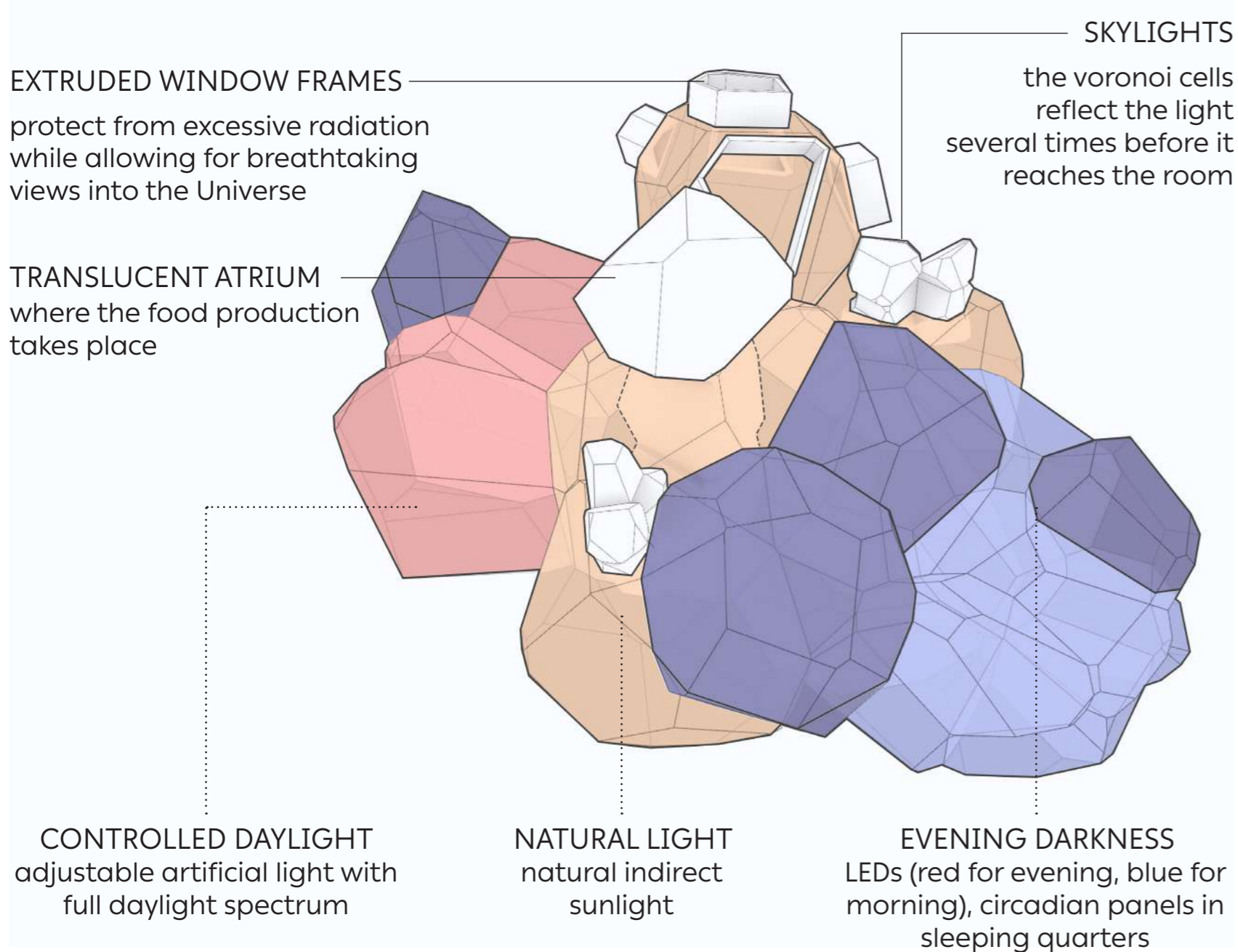


- human base
- access to launch pad
- access to water ice points
- access to antennas & solar panels

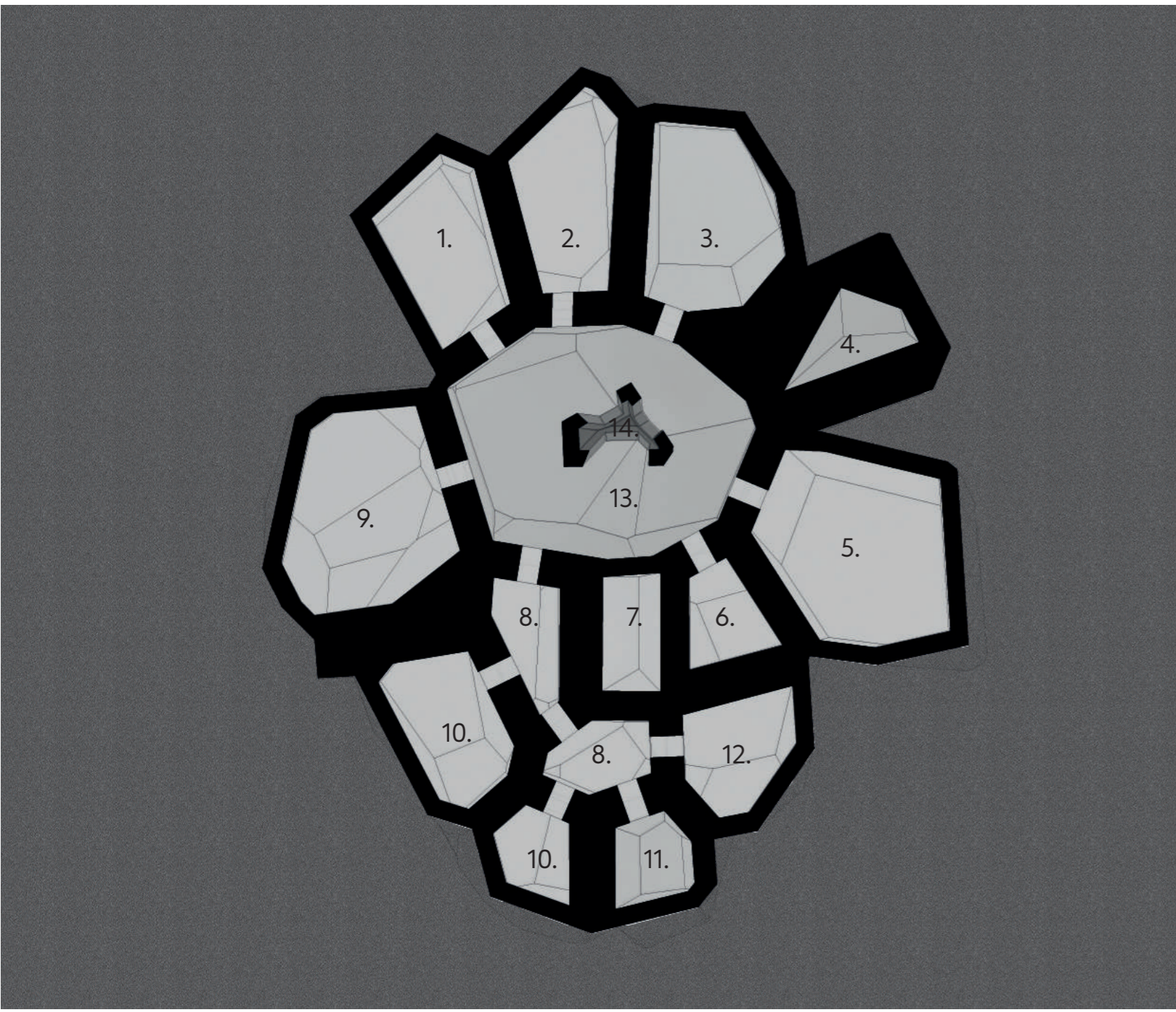
## MASTERPLAN



## SIMULATING EARTH DAY CYCLES & LIGHTING STRATEGIES



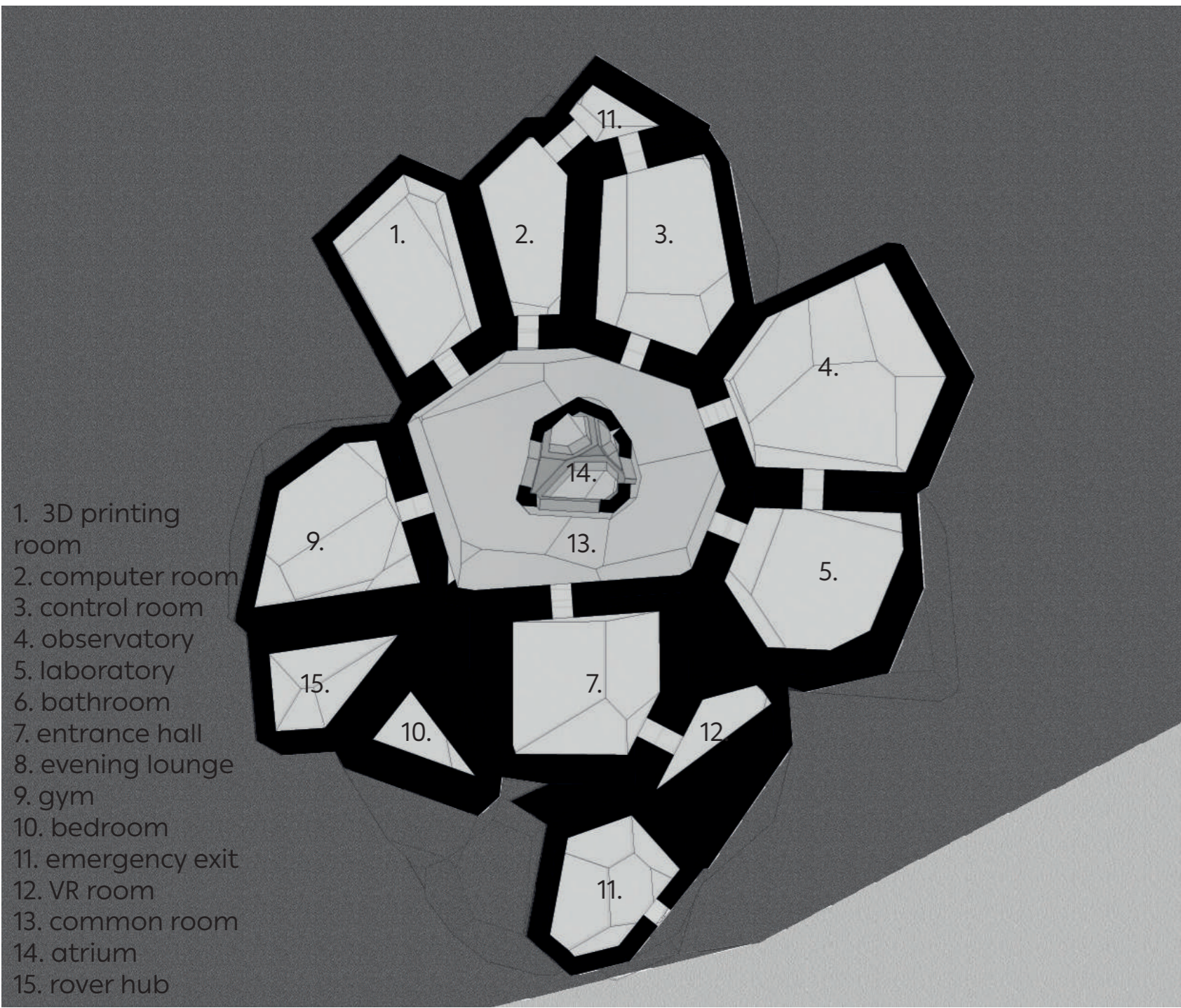
LEVEL -1



HUMAN HABITAT NESTED WITHIN THE LUNAR SOIL



LEVEL 0



- 1. 3D printing room
- 2. computer room
- 3. control room
- 4. observatory
- 5. laboratory
- 6. bathroom
- 7. entrance hall
- 8. evening lounge
- 9. gym
- 10. bedroom
- 11. emergency exit
- 12. VR room
- 13. common room
- 14. atrium
- 15. rover hub

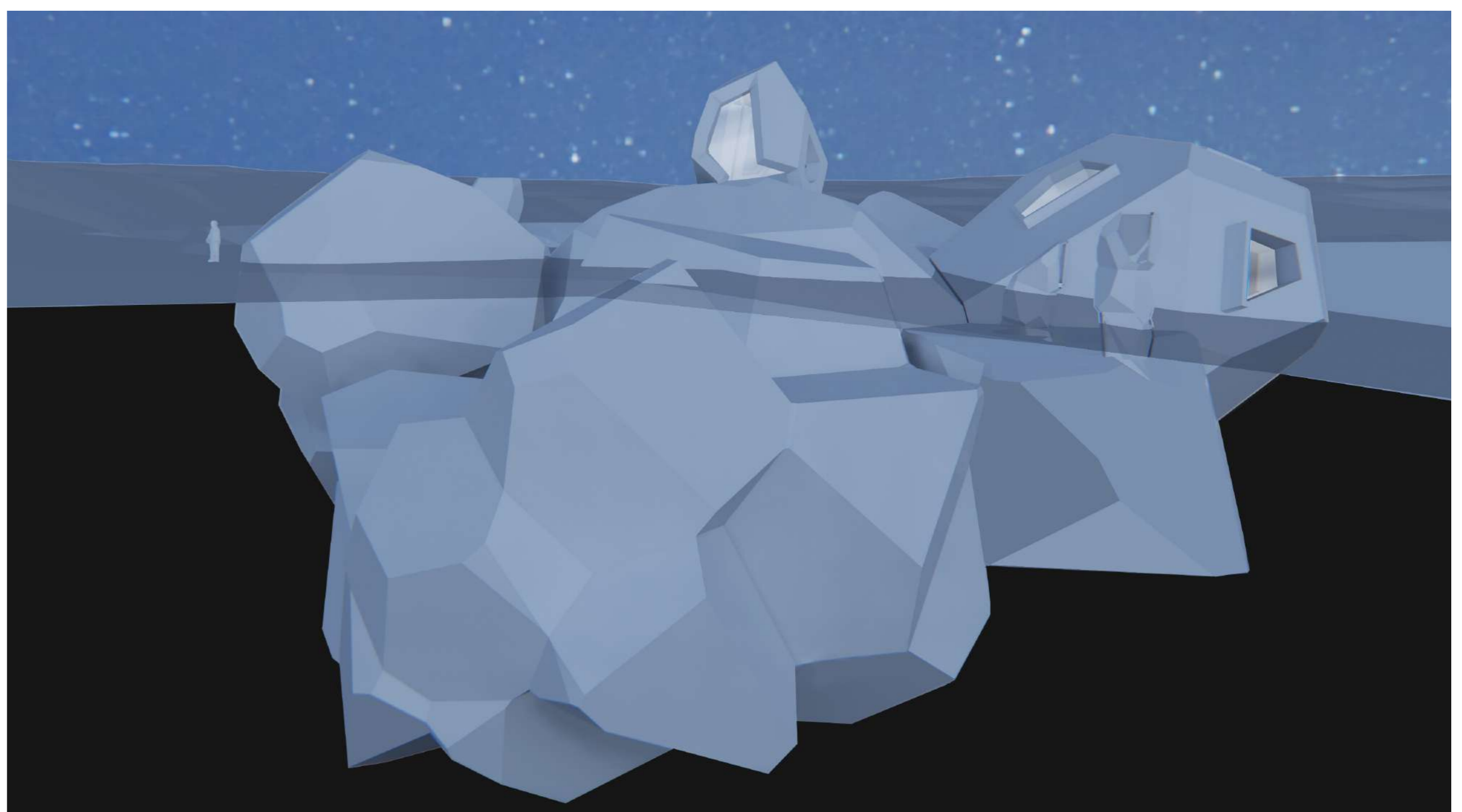
FOOD PRODUCTION SPACE



DETAIL SECTION THROUGH THE ATRIUM

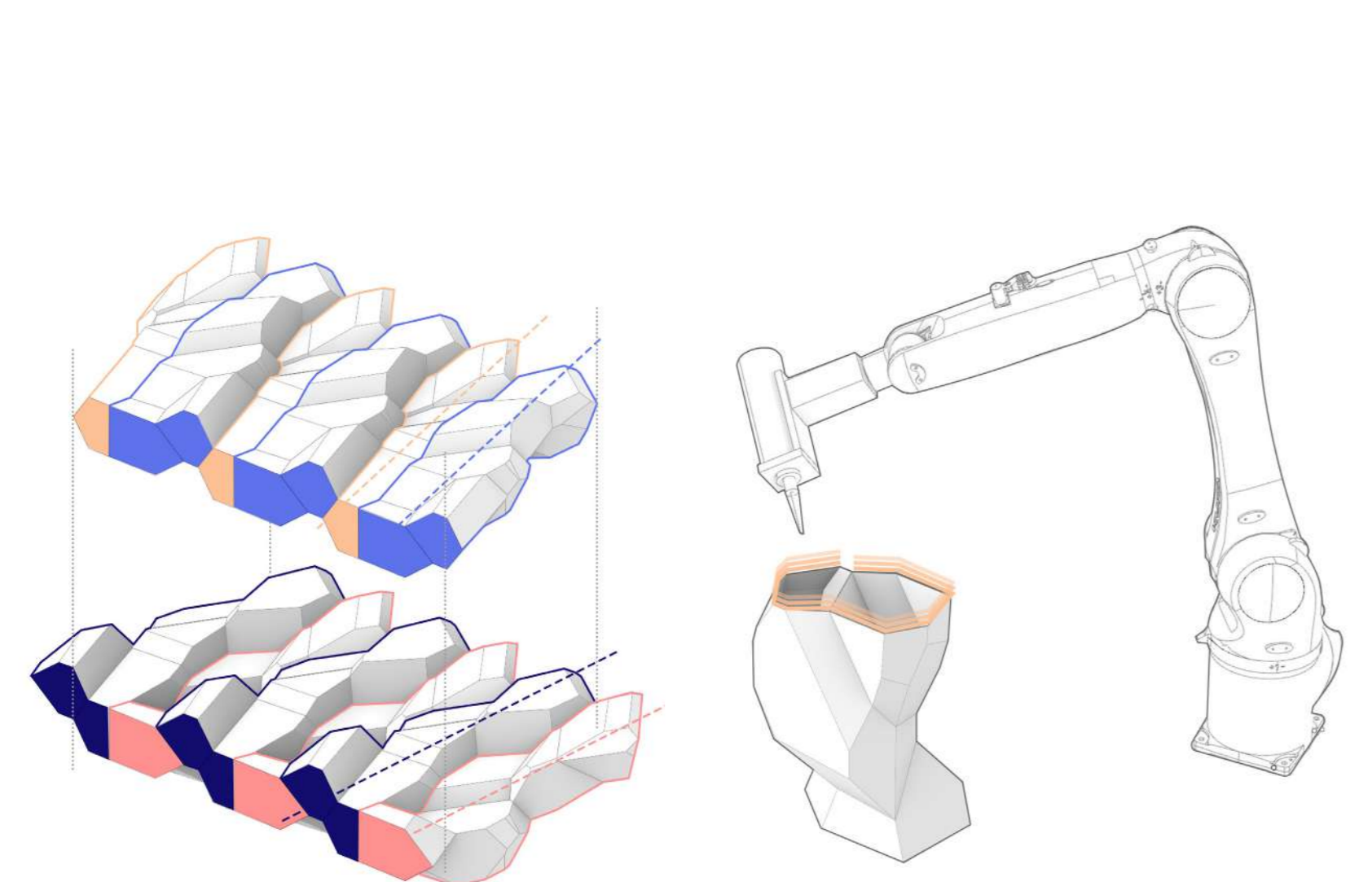


ELEVATION



PROTOTYPES

PRODUCTION

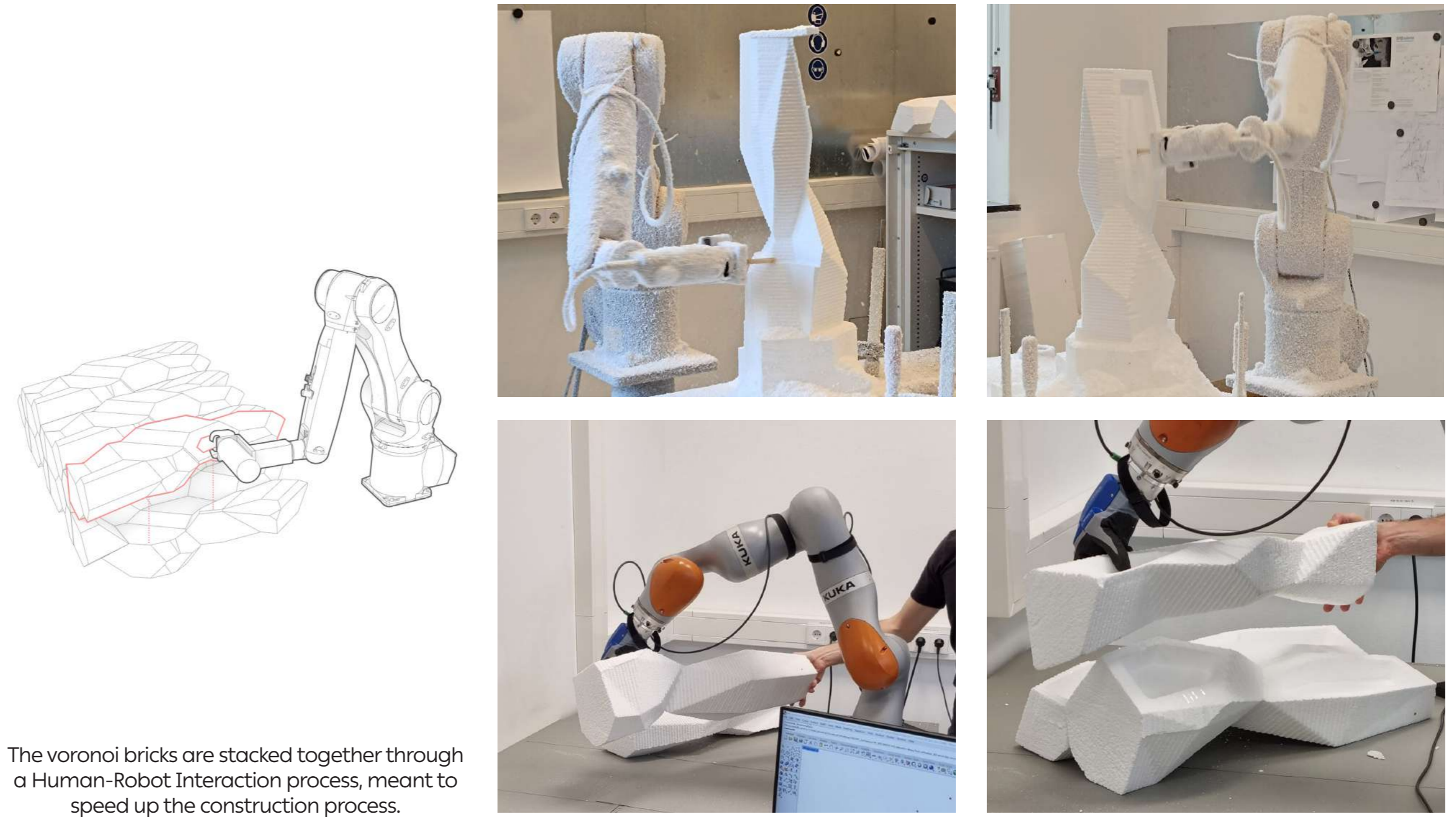


Modular voronoi bricks repeat every 2 layers and interlock at an angle of 26° in order to improve the structural stability of the habitat.

Construction rovers 3D print the voronoi bricks on site using lunar regolith to produce durable modules suitable for construction on the moon.

ASSEMBLY (HRI)

DESIGN TO ROBOTIC PRODUCTION AND ASSEMBLY (D2RP&A)



The voronoi bricks are stacked together through a Human-Robot Interaction process, meant to speed up the construction process.