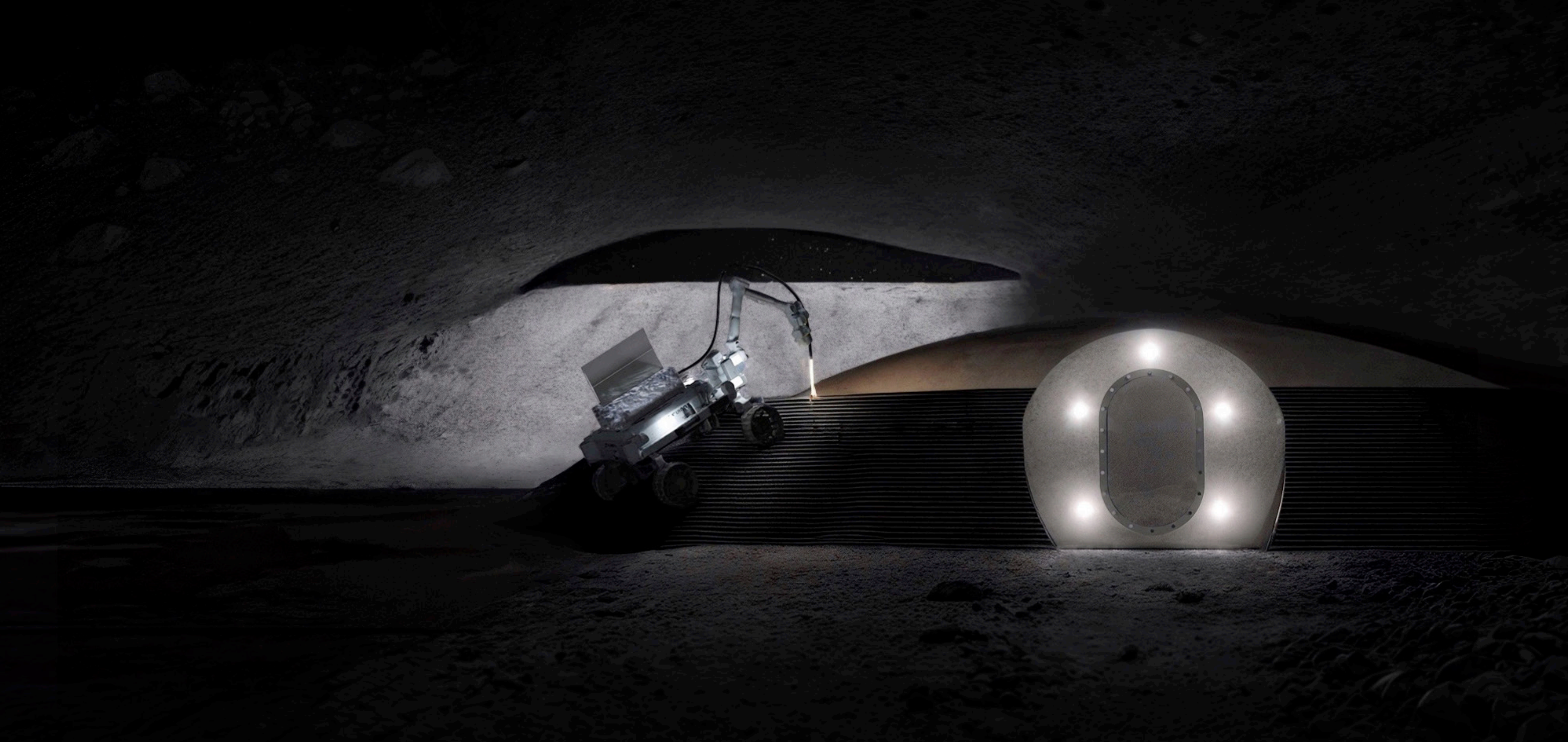
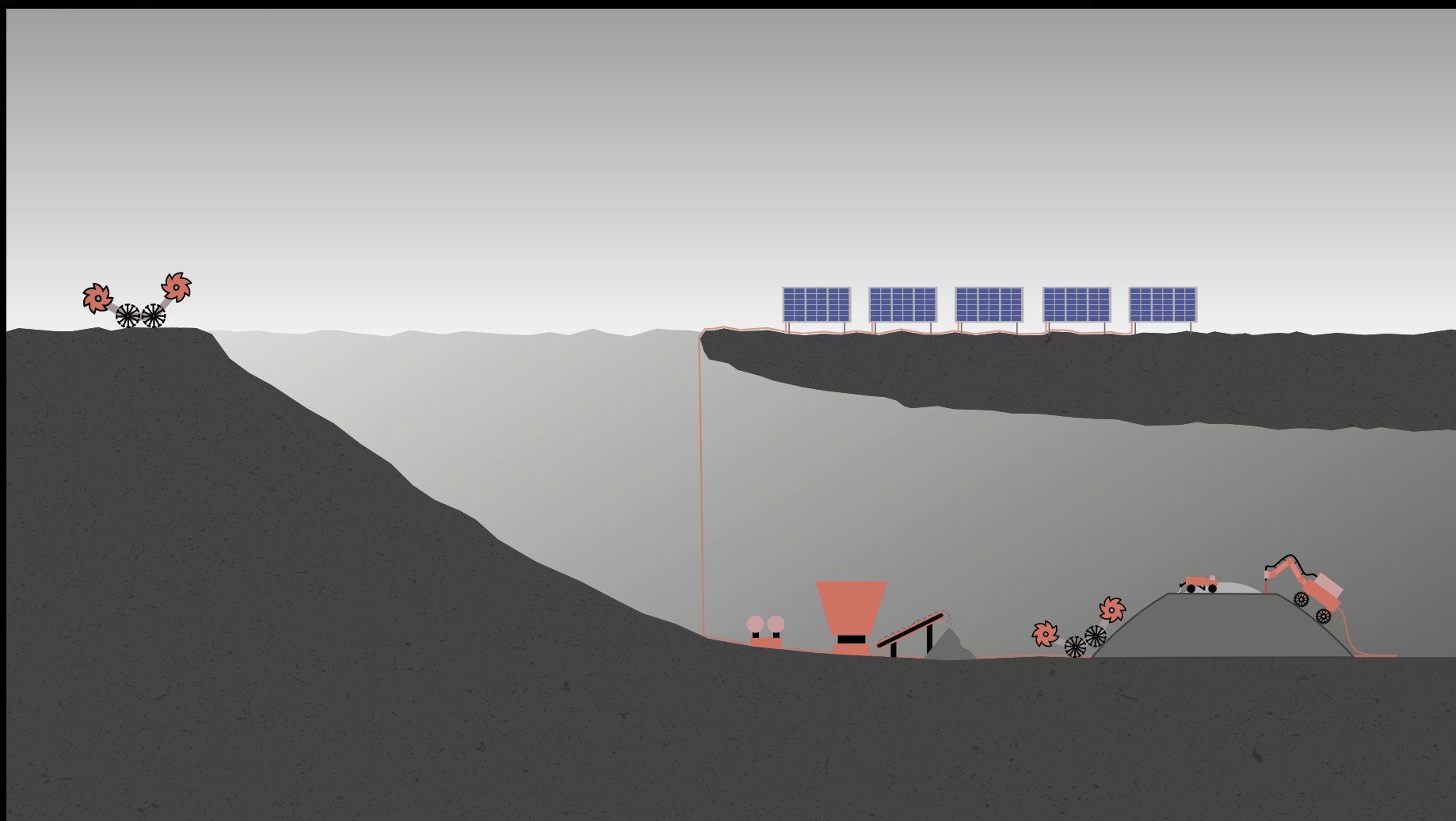


BACK TO THE MOON

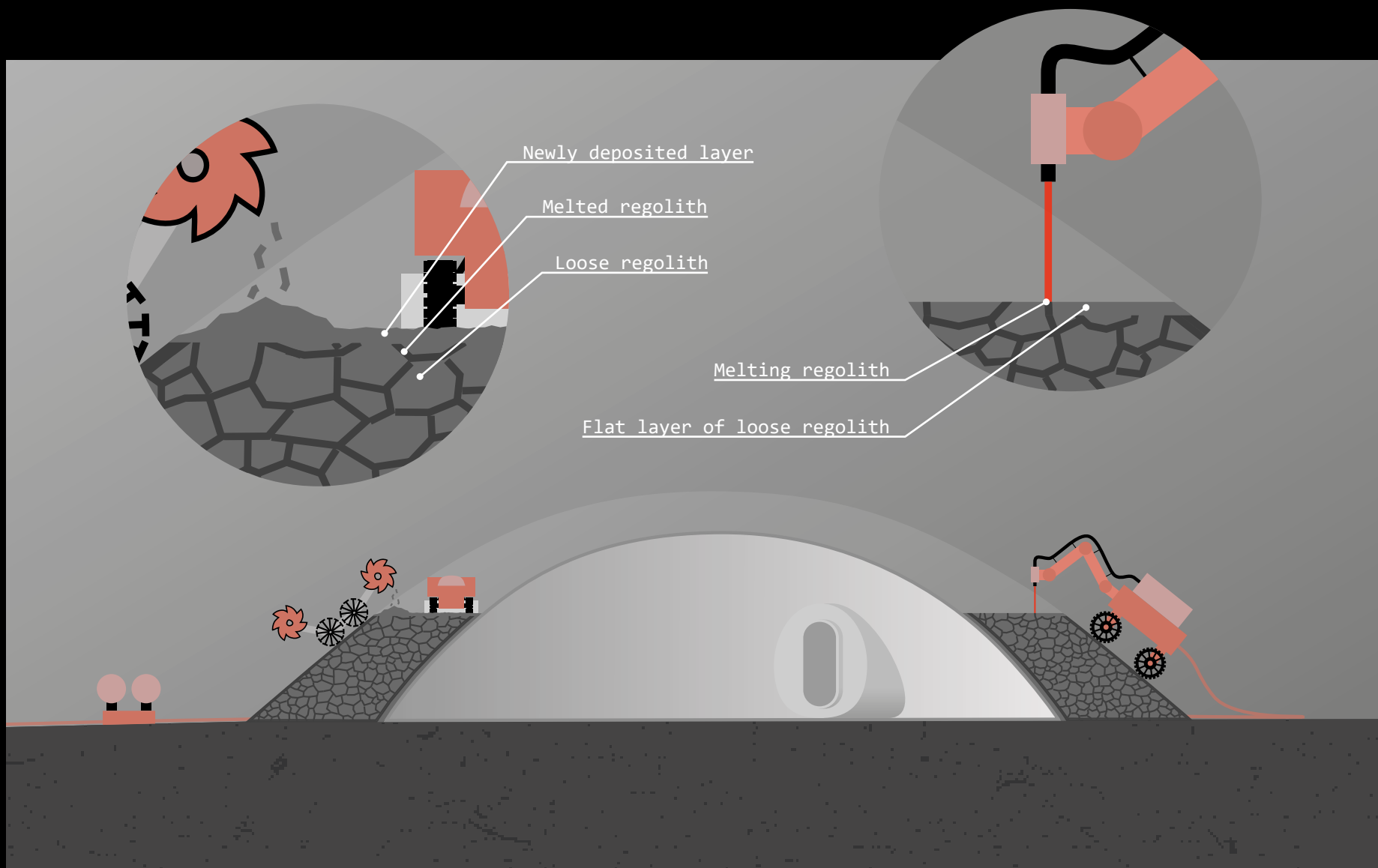
JIP Group 1.13.1 Architecture & Space Robotics



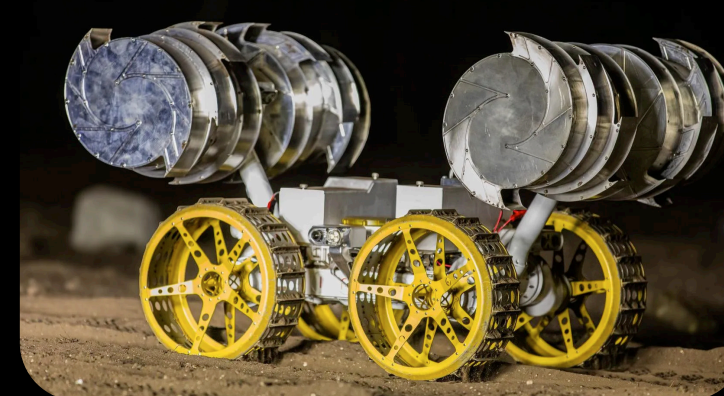
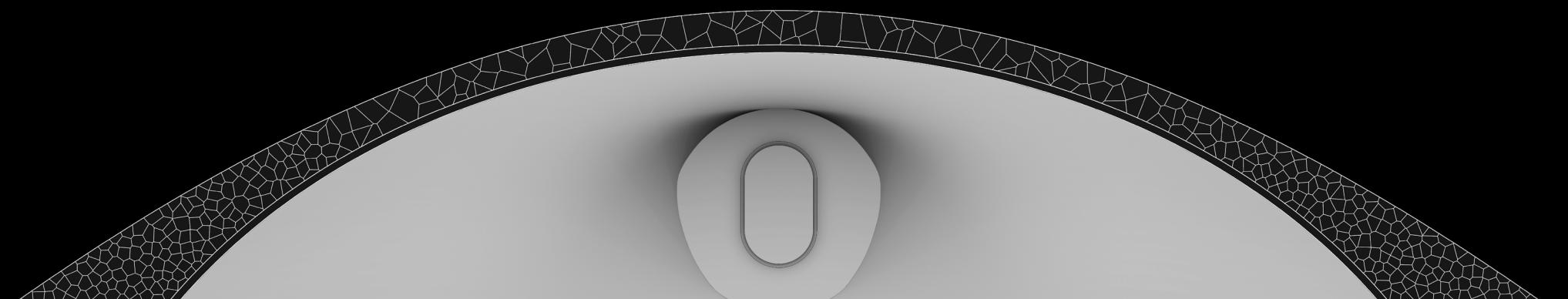
By combining **swarm robotics** and **additive manufacturing** of lunar regolith we have developed a solution to **autonomously construct** a protective habitat inside a **lava tube** to facilitate permanent human presence on the moon.



- Step 1: Power Setup
- Step 2: Site Preparation
- Step 3: Inflatable Membrane
- Step 4: Regolith Collection & Processing

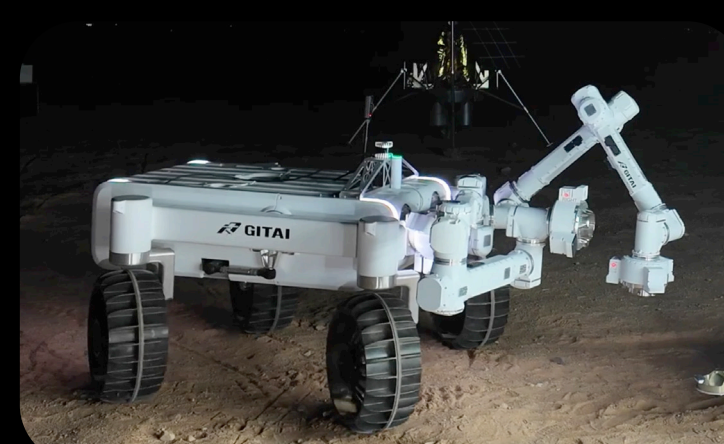
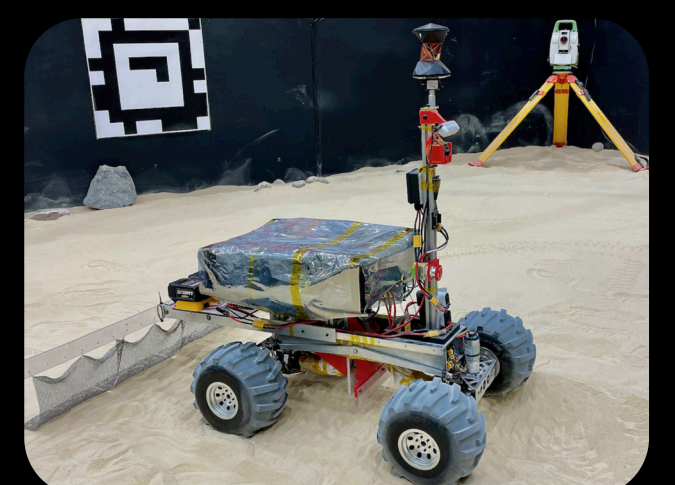


- Step 5: Habitat Construction
 - Depositing
 - Flattening
 - Melting
- Step 6: Post Construction Inspection



The robot responsible for collecting lunar material outside of the lava tube is based on NASA's IPEx concept. This 30 kg lightweight, battery-powered robot, equipped with two counterrotating drums, can collect and transport up to 30 kg of lunar regolith. This robot will also be used to precisely deposit the material required to construct each layer. Additionally, it will discard unusable material with a particle size > 2 mm at a designated location inside the lava tube.

This robot, called the flattener, is a 25 kg battery-powered machine designed to prepare an even layer of fine regolith for the melting process. It spreads out the deposited piles of processed regolith (with particles < 2 mm) and flattens it into a uniform 10 mm thick layer. Operating at a capacity of 50 m²/h, it ensures every layer is perfectly flat and ready for melting.



This laser melting robot is based on the GITAI Rover R1.5 platform. It features a long-reach robotic arm (almost 2 meters) equipped with a 1,5 kW laser, which is guided from a back-mounted box via a fiber-optic cable. The robot relies on cable power for energy-intensive melting tasks but uses batteries for other operations. Its design supports modular tools and can also be fitted with a manipulator arm for setup procedures.