

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Mr. Prathmesh Barapatre  
National Space Society (USA) -Mumbai chapter, India, prathameshbarapatre5@gmail.com

Ms. Rutuja Pilgar  
National Space Society (USA) -Mumbai chapter, India, pilgar.rutuja519@gmail.com

LUNAR CAVE EXPLORATION USING AUTONOMOUS ROVER SAMPLE COLLECTION &  
ANALYSIS

**Abstract**

This paper focuses on developing probable techniques used in geological sample collection from the “sky-light” to be specific Lunar Caves. These caves are prospective places for finding ice formation and other minerals to make rocket fuel. Exploring its environment for radiation intensity and unique geological features will serve as the basis for possible lunar outposts for human settlement. As lunar mineral contents are known, having samples from this place will help us consider it a candidate for mining sites on the lunar surface. To achieve these scientific goals, it will use an elevator mechanism attached to an rover consisting of a pair of robotics arms equipped with 2D LIDAR for autonomous working to drill and fetch samples from different layers of the volcanic crater; essential to study the formation of the moon and various elements available beneath the lunar surface. It will have a radiation sensor to calibrate the difference in radiation intensity on the lunar surface and inside the crater. This structure will expand to lower down rovers inside the basin without using any lander. It is done using a frame integrated with an elevator mechanism. The frame is a rectangular exoskeleton of an elevator, with four-slots for movement of the arm over it. It will serve as a vital point to gain or search for access to the cave. Power will be generated using solar panels and transmitted through an rover setup on the edge of the crater through which the mechanism operates, making it easier to send analyzed data of the sample to earth. Data processing is carried out using the APXS (Alpha Particle X-ray Spectrometer) onboard. This proposal overcomes the drawback of sending a rover inside the cave directly where it has to be powered up using a tether, increasing risk of power loss inside the cave and loss of communication due to lack of signal transmission. The proposed idea increases the durability of the mission while searching for access to the Lunar caves.