SPACE RESOURCES ROUNDTABLE

XXII SPACE RESOURCES ROUNDTABLE

Final Program

Colorado School of Mines
Golden, Colorado, USA
June 7-10, 2022

Message

Welcome to the twenty second Space Resources Roundtable (SRR). It was in 1999 when the first SRR was held at the Colorado School of Mines, where a few space resources enthusiasts gathered to discuss what was then an obscure topic of interest in space circles. Oh, what a difference two decades make!

As we can see from the large number of participants and variety of topics presented at this year's meeting, this is undoubtedly the most exciting time for the space resources community. Interest is now coming from a variety of players with a wider set of objectives. New studies and projects incorporating ISRU technologies are being conducted for cislunar space, the Moon, Mars, and asteroids by space agencies around the world and the commercial space sector. As we gather for this meeting, oxygen is being extracted from the Martian atmosphere and surface prospecting equipment is expected to be launched to the Moon later this year. Legislation has been advanced in several countries for commercial space-resource exploration and utilization, while a broader legal framework is being actively pursued at the international level. Many start-up companies have appeared in the past few years positioning themselves in the various links of the space resources value chain, highlighting the growing interest and opportunities in this field. As current plans focus on the Moon as a destination for renewed robotic and human exploration, as well as paving the way to the Red Planet, it is now sufficiently clear that the use of space resources will enable both further exploration and commercialization of space.

This increased attention calls for greater involvement from our growing community. Our expertise is needed more than ever to provide the scientific, technical, economic, business, legal, and policy guidance to integrate space resources into public and private space initiatives. We invite all meeting participants to actively contribute to this discussion keeping in mind the objectives outlined in our first Roundtable back in 1999, which will surely continue guiding us in the exciting and productive years ahead.

"The fundamental message is that it is not possible to develop space resources in a vacuum. One must have three things: ***a recoverable resource, technology to recover it, and a customer*** *… All three must be integrated in a space resource program. That is what the Space Resources Roundtable, initiated with this meeting, will bring together."*

– Michael B. Duke
Space Resources Roundtable I, 1999

– Angel Abbud-Madrid
President & Chair, SRR XXII, 2022

Sponsors

On behalf of the SRR Steering Committee, we would like to express our sincere appreciation to this year's sponsors.

Program Schedule

TUESDAY, JUNE 7, 2022

7:30 AM	**Continental Breakfast (Metals Hall, Green Center)**	
8:00	Opening Remarks	Angel Abbud-Madrid
Session 1 –Setting the Scene (Program Updates)		
Session Chair: Angel Abbud-Madrid, Colorado School of Mines		
8:20	**NASA ISRU Envisioned Future Priorities** Gerald Sanders, NASA Johnson Space Center	
8:40	**A Review of the LSIC ISRU Activities Over the Past Year and Future Initiatives** Karl Hibbitts & Michael Nord, Johns Hopkins University Applied Physics Laboratory	
9:00	**ESA Space Resources Initiative – An Overview** Melchiorre Conti, European Space Agency (ESA)	
9:20	**The Luxembourg Space Resources Week: Highlights and Key Themes** Kathryn Hadler, European Space Resources Innovation Centre (ESRIC), Luxembourg	
9:40	**NASA Innovative Advanced Concepts Supports ISRU** Ron Turner, NIAC Senior Science Advisor	
10:00	**Coffee Break (Metals Hall, Green Center)**	
Session 2 – Resource Prospecting & Exploration		
Session Chair: Leslie Gertsch (Missouri University of Science and Technology)		
10:20	**A Proposed Methodology for Quantitative Lunar Resource Assessments (QLRA)** Laszlo Kestay, U.S. Geological Survey, Astrogeology Science Center	
10:40	**A Strategy for Prospecting for Lunar Resources Using Remote Sensing and In-situ (XRF/XRD) Chemical and Mineralogical Analyses** Jeffrey Taylor, Hawaii Institute of Geophysics and Planetology, Univ. of Hawaii	
11:00	**ISRU Potential Water Mine Site Preliminary Evaluation for NASA Artemis Campaign** Julie Kleinhenz, NASA Glenn Research Center	
11:20	**The VIPER Mission, a Resource-Mapping Mission on Another Celestial Body** Kimberly Ennico Smith, NASA Ames Research Center	
11:40	**Electromagnetic Reflection Characterization of Simulated Lunar Ice Using Ground Penetrating Radar** Caleb Kaminiski & Paul van Susante, Michigan Technological University	

12:00	**Method of Volatile Detection in Lunar Regolith, Percussive Hot Cone Penetrometer Thermal Testing and Modeling** George Johnson & Paul van Susante, Michigan Technological University
12:20	**SMART: Instrumented Drill for ISRU Investigations on the Moon** Carter Fortuin, Honeybee Robotics
12:40	**TransAstra Commercialization of Orbital Logistics: Maturing Technology for Lunar Polar Power/Infrastructure Towers & Telescopes to Prospect for Asteroidal ISRU** Joel Sercel, TransAstronautica Corporation
1:00	**Lunch (Friedhoff Hall, Green Center)**
	Session 3: Economic Considerations and Business Opportunities
	Session Chair: Michael Nord, Johns Hopkins University APL
2:00	**Economic Modeling of the Competitiveness of Lunar Water over Earth-Launched Water, Including Wright's Law, Optimization of Reliability, and Economies of Scale** Phil Metzger, Florida Space Institute, University of Central Florida
2:20	**An Economic Comparison of Lunar Propellant Production Methods** George Sowers, Colorado School of Mines
2:40	**European Space Resources Innovation Centre (ESRIC) Start-up Support Programme** Lari Cujko, European Space Resources Innovation Centre (ESRIC), Luxembourg
3:00	**Comparison of Oil and Gas Industry Business Planning with Space Resource Industry Planning** William Butler, Shell Oil Company
3:20	**Coffee Break**
3:40	**Roundtable Discussion**
4:40	**Session 4 - Individual Poster Presentations (1-min Short Talks)**
	Session Chair: Angel Abbud-Madrid, Colorado School of Mines
	How To Finance a Space Mining Operation on The Moon and Near-Earth Asteroids Zephyr D. Benton
	Integrating ISRU into a Broader Evolving Space Architecture Frederick A. Slane, Space Infrastructure Foundation
	Applying Super-Resolution to the Field of Space Resources and Planetary Science Steven Coutts, Colorado School of Mines
	Towards Mining Resources on The Moon: Prospecting with Artemis Gabrielle Hedrick, The MITRE Corporation
	Mapping and Comparing Natural Landing Pads on Mars Joshua Menges, Colorado School of Mines

	Current Capabilities of the Planetary Surface Technology Development Lab Ben Wiegand & Paul van Susante, Michigan Technological University
	Thermal Vacuum Test Facility Thomas Viviano, NASA Johnson Space Center
	Predictive Modeling of Mass Flow Rates of Lunar Regolith Simulants Jared Long-Fox, University of Central Florida
	Michigan Technological University Lunar Highland Simulant MTU-LHT-1A Chuck Carey & Paul van Susante, Michigan Technological University
	Characterizing Detailed Grain Shape and Size Distribution Properties of Lunar Regolith Steven Coutts, Colorado School of Mines
	Development of an Instrumented Percussive Cone Penetrometer for In-Situ Characterization of Lunar Regolith Geotechnical Properties Marcello Guadagno & Paul van Susante, Michigan Technological University
	Multi-Objective Optimization Using Genetic Algorithms to Design the Optimal Excavator Joseph Kenrick, Lunar Outpost, Inc.
	Lunar Auger Dryer ISRU (LADI) Mechanical Testing and Supporting Models Koorosh Araghi, NASA Johnson Space Center
	Parameters Impacting Columnated Granular Soil Pneumatic Seal Performance Jackson Stewart, NASA Glenn Research Center
	Preliminary Results from The Polar Ice Capture Experiment Beau Compton, NASA Glenn Research Center
	Pore Wetting Behavior of Ionic Liquids in Polymeric Membranes Bharath Tata, University of Colorado at Boulder
	Combustion of Lithium and Magnesium Powders for Space Power Evgeny Shafirovich, University of Texas at El Paso
	Additive Manufacturing of Iron and Steel Alloys Derived from Lunar Regolith: Tests on Reduced Simulant and Analog Alloys Peter Corwin, Colorado School of Mines
	Space Resources at Scale: Extraction and Processing of 100MT of Metals from the Moon Elizabeth Scott, Colorado School of Mines
5:10	**Poster Session (Green Center)**

Monday,
June 6, 2022.

Outpost Gazette

Breaking News from the Final Frontier

Issue #42

Company aims to end resource scarcity

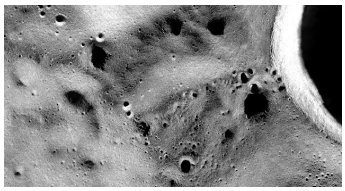
A new hope for humanity

Golden, CO. Lunar Outpost, Earth's leader in commercial planetary rover mobility, seeks to do more than build rovers. "Lunar Outpost's goal is to end resource scarcity for all people by utilizing the unlimited resources of space." said Dr. Forrest Meyen, CSO of Lunar Outpost. "Our flagship mobility platform, MAPP is a prospecting rover designed to explore and locate resources. Our next generation rovers will build and deploy infrastructure on the surface to prepare the way for resource extraction and utilization."

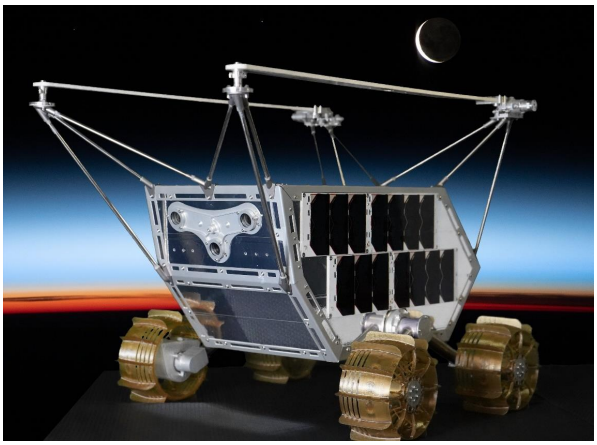
The company creates value for commercial partners by enabling them to demonstrate their sensor and ISRU technologies on the moon by providing mobility-as-a-service. Lunar Outpost makes payload onboarding simple and handles all contracting between launch and lander providers, making them a one stop shop to get your system to the moon.

Five payloads have already been onboarded with customers from academia, governments, and industry. There are opportunities for onboarding on Mission 1 as well as to purchase private mission data. Reservations are open for custom missions.

To book a mission with Lunar Outpost, email info@lunaroutpost.com



A data visualization showing Shackleton Connecting Ridge and the area near the lunar South Pole that is in consideration for Lunar Outpost's MAPP Rover's Traverse.



Lunar Outpost's Mission 1 Mobile Autonomous Prospecting Platform. The flight spare rover for their first mission is complete and undergoing aggressive environmental and functional testing. Lunar Outpost is on track to produce 4 flight ready rovers this year.

Two bold lunar missions funded

Company scores a 1-2 punch in lunar exploration. Invites all to join.

Just West of Denver is a moon rover factory packed with talented engineers creating cutting edge rovers for surface exploration. The building vibrates with excitement, the whirr of clean room fans, and the buzz of a CNC mill producing fresh rover hardware.

This flurry of activity is in response to unprecedented partnerships secured as NASA pushes to the moon with the CLPS and Artemis programs.

"We're living at a time where dependable and repeatable commercial access to the lunar surface with lunar landers is a reality. Lunar Outpost is sprinting alongside leading commercial, government, and research organizations towards the Moon, soon to be one of the few organizations operating systems on three planetary bodies," said Lunar Outpost founder and CEO Justin Cyrus.

The first mission will be a chilly one. MAPP is traveling to the lunar South Pole. The environment hosts extreme lighting conditions and permanently shadowed regions. This commercial mission is providing mobility services to Nokia to test their 4G/LTE lunar comms technology. The 2023 mission could make MAPP the first rover to travel near the **Lunar South Pole** and will return data that will forever alter our understanding of the region.

In 2024, Lunar Outpost will be sending another MAPP rover to the Moon. This time to **Reiner Gamma**, a location on the moon known for its magnetic lunar swirl. Mission partners include JHU-APL and NASA.

Want to make history? Lunar Outpost is Looking to build their team. Go to https://lunaroutpost.com/careers

Company Go Kart Champion Crowned

The Secret to Success

In a gut-wrenching race to the finish, Space Resource Engineer, Joseph Kenrick was crowned Lunar Outpost's 2022 Go Kart Champion...

Page 3

Lunar Outpost raises $12 MM in VC Deal

New Rovers and More

Investors recently bet big on Lunar Outpost, signaling that the cislunar economy is ready to take off. The team is forging ahead deploying capital to...

Page 12

Lunar Outpost Expansion in CO

Bigger Better Facilities

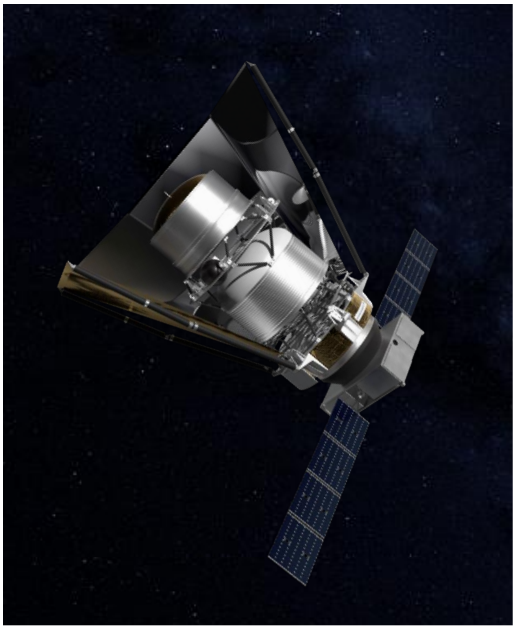
As Lunar Outpost continues to expand its rover lines and capabilities, manufacturing and state-of-the art facilities are being produced...

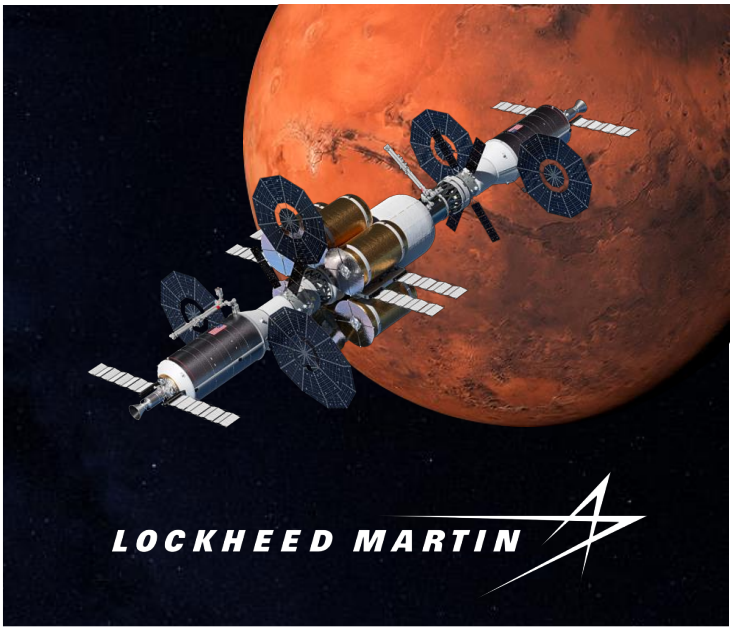
Page 29

WEDNESDAY, JUNE 8, 2022

7:30 AM	**Continental Breakfast (Metals Hall, Green Center)**
Session 5 – Regolith Conveyance & Beneficiation	
Session Chair: (Diane Linne, NASA Glenn Research Center)	
8:00	**The Inaugural Over the Dusty Moon Challenge** Kevin Cannon, Colorado School of Mines
8:20	**Three Lunar Regolith Conveying Methods Being Developed for ISRU** Jason Noe, Planetary Surface Technology Development Lab, Paul van Susante, Michigan Technological University
8:40	**Vertical Regolith Transport System for Lunar and Mars ISRU Applications** Aaron D.S. Olson, NASA Kennedy Space Center
9:00	**Simulator for Planetary Interactions of Dust and Regolith (SPIDR): A New Tool for Predicting Dust Transport from Lunar Surface Operations** Daniel Britt, University of Central Florida
9:20	**ISRU Research at Imperial College London, a Status Update** Joshua Rasera, Imperial College London
9:40	**Fluxed Melting for Rapid Regolith Digestion** Joren Bowling, University of Alaska, Fairbanks
10:00	**Coffee Break**
Session 6 – Robotic Mobility & Excavation	
Session Chair: Paul van Susante (Michigan Technological University)	
10:20	**Completing Contact Tasks with High-Latency Mobile Manipulation within a Supervised Autonomy Framework** Emmanuel Akita, Nuclear and Applied Robotics Group, Univ. Texas at Austin
10:40	**Building a Solar System Civilization – How OffWorld's Terrestrial Swarm Robotic Mining and Construction Robots will Operate on Earth and the Moon** Jim Keravala, OffWorld
11:00	**Lunar Outpost Cosmos Surface Mission CONOPS Planning Tool: Maximizing Science Return Through Rapid Data Fusion** A. J. Gemer, Lunar Outpost, Inc.
11:20	**The Flexible Logistics & Exploration (FLEX) Rover and Bucket Drum Excavation Tool** Andrew Welter, Venturi Astrolab, Inc.

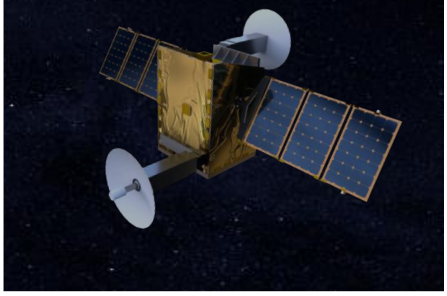
11:40	**High-Fidelity Simulation of the Advanced Planetary Excavator (APEX) Manipulator for In-Situ Resource Utilization Technology Development** Alexander Schepelmann, NASA Glenn Research Center
12:00	**ISRU Pilot Excavator - Development of Autonomous Excavation Algorithms** Bradley Buckles, NASA Kennedy Space Center
12:20	**Lunabotics Robotic Mining Competition for Universities** Robert Mueller, NASA Kennedy Space Center
12:40	**Lunch (Friedhoff Hall)**
Session 7 – In-space Logistics & Processing	
Session Chair: Laurent Sibille (Southeastern Universities Research Association, NASA KSC)	
1:40	**Cislunar Logistics Center** Joseph Kenrick, Lunar Outpost, Inc.
2:00	**CAPSTONE: A Unique Cubesat Platform for a Navigation Demonstration in Cislunar Space** Tom Gardner, Advanced Space, LLC
2:20	**Building the First Micro Space Foundry Prototype and the Path to Transforming Space Debris into a Space Resource** Joseph Pawelski, CisLunar Industries
2:40	**Informing the National Strategy for In-space Logistics** Gordon Roesler, Robots in Space, LLC
3:00	**Coffee Break**
	Session 8 – Lunar Infrastructure
	Session Chair: Kevin Cannon, Colorado School of Mines
3:20	**Supporting Water ISRU In Lunar PSRs with the Self-Erectable Lunar Tower for Instruments (SELTI)** George Lordos, MIT Space Resources Workshop
3:40	**LUNENCO – A Business Case Study for Commercial Lunar Energy** Elizabeth Engeldrum, Colorado School of Mines
4:00	**Dust Tolerant Electrical Connector for a Modular Open-Source Architecture** Hunter Williams, Honeybee Robotics
4:20	**Lunar Surface Wireless Power/Infrastructure and Ancillary Services** Brad Blair, Xtraordinary Innovative Space Partnerships (XISP), Inc.
4:40	**Roundtable Discussion**
5:40	**Banquet (Friedhoff Hall)**





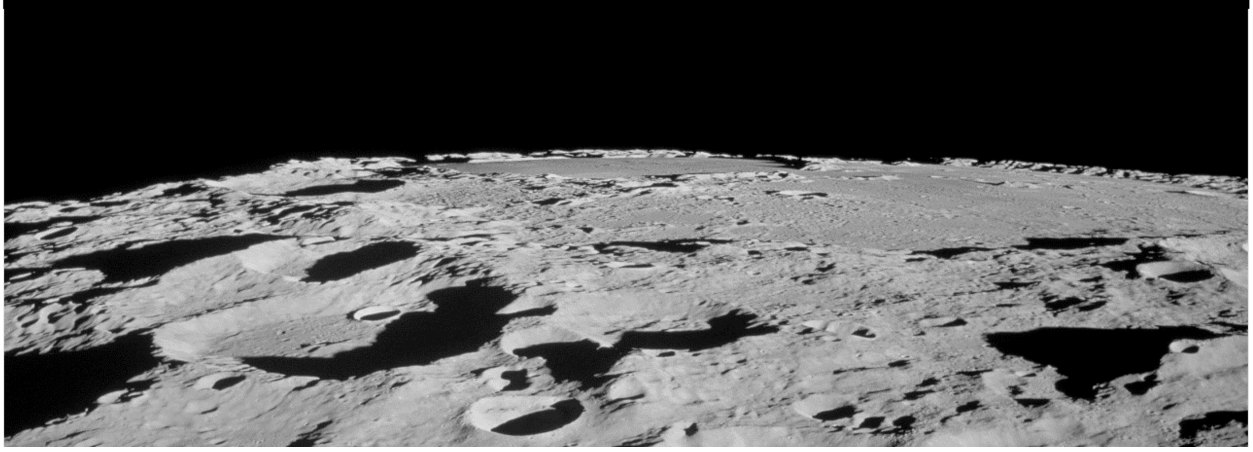
Join Our Team Today!

Lockheed Martin
Your Mission is Ours®



SPACE MINING ROBOTS

HONEYBEE ROBOTICS



THURSDAY, JUNE 9, 2022

7:30	**Continental Breakfast (Metals Hall, Green Center)**
Session 9 – Legal & Policy Issues	
Session Chair: George Sowers, Colorado School of Mines	
8:00	**What is a Celestial Body?** Michelle Hanlon, University of Mississippi
8:20	**Frameworks for Space Resource Activities and the Due Regard Principle** Andrea Harrington, Air University
8:40	**Filling the Void - A Conversation about Space, Policy, and Public Narratives** Joseph Kenrick, Lunar Outpost, Inc.
Session 10 – Extraction of Lunar Oxygen & Metals	
Session Chair: George Sowers, Colorado School of Mines	
9:00	**Moon to Mars Oxygen and Steel Technology Update** Michael W. Riley, Pioneer Astronautics
9:20	**GALORE (Gaseous Lunar Oxygen from Regolith Electrolysis): Recent Technology Advances for a Cold-Walled Molten Regolith Electrolysis Reactor** Kevin Grossman, NASA Kennedy Space Center
9:40	**Implications of Phenomena Observed during Molten Regolith Electrolysis** Hunter Williams, Honeybee Robotics
10:00	**Coffee Break**
Session 11 – Lunar Volatile Extraction	
Session Chair: Julie Kleinhenz (NASA Glenn Research Center)	
10:20	**The Feasibility of Helium-3 as the Low Hanging Fruit of Lunar Commercial Mining** Marshall Eubanks, Space Initiatives, Inc.
10:40	**High-Yield DiHydrogen-Monoxide Retrieval and Terrain Identification on New Worlds III (HYDRATION III)** George Lordos, MIT Space Resources Workshop
11:00	**Modeling the Thickness and Shape of Lunar Volatile Stability Zones** Hunter Danque, Colorado School of Mines
11:20	**Sandworm Polar Volatile Extraction and Ore Concentration** Brad Blair, OrbChem, LLC
11:40	**A Novel Method for Icy Lunar Regolith Production** Daniel Johnson, Colorado School of Mines
12:00	**Waste Heat-Based Thermal Corer for Lunar Ice Extraction** Kuan-Lin Lee, Advanced Cooling Technologies, Inc.

12:20	**Drill Don't Dig: Subterranean Lakes on The Moon as an Economic Resource** Marshall Eubanks, Space Initiatives, Inc.
12:40	**Lunch (Friedhoff Hall)**
	Session 12– Lunar Propellant Production
	Session Chair: Adam Marcinkowski, Lockheed Martin
1:40	**Contaminant Tolerant Scroll Vacuum Pump for Lunar Oxygen ISRU Air Lock Vapor Recovery** Anthony Skipworth, Air Squared, Inc.
2:00	**Testing of Solid Oxide Electrolysis System and Balance of Plant for H_2/O_2 Production from Lunar Water** David Dickson, Colorado School of Mines
2:20	**A Universal ISRU Analysis Engine and Propellant-Metal Production Case Study to Optimize Symbiotic ISRU Processes and Identify Technology Gaps** Aiden O'Leary, Orbit Fab Inc.
2:40	**In Situ Lunar Production of Monopropellant Hydrazine** Oliver Greener, Colorado School of Mines
3:00	**Coffee Break**
3:20	**Roundtable Discussion**
4:20	**CSM Space Resources Facilities Tour**
5:30	**Reception (Mines Museum of Earth Science)**

INFO SUMMARY JUNE 2022

AI-POWERED SWARM ROBOTIC LUNAR MINING

COMPANY
OffWorld, Inc. www.offworld.ai

CONTACT
Jim Keravala, CEO
jim.keravala@offworld.ai

PROGRAMS
- Customer contracts with top terrestrial mining companies for deployment of Swarm Robotic Mining (exploration, excavation, directed energy, processing, refining and transport)
- First deployments in underground mines
- Major Space Agency contract for robotic lunar propellant processing
- Robotic deep space constellation
- Robotic space debris mining program feasibility study underway
- Industrial grade Robotics-as-a-Service (*RaaS*) platform development
- Task-agnostic machine learning (ML) architecture to create teachable robots in progress

CORPORATE STATUS
- Incorporated January 2016
- Engineering facilities: 70,000 sqft
- Team: 70 staff

JOIN OUR TEAM AT OFFWORLD!
- Senior Perception Engineer
- Senior Software Systems Engineer
- Full Stack Software Engineer
- Robotics Software Test Engineer
- Software DevOps Engineer
- Robotics Program Director
- Lead Space Systems Engineer
- Satellite Subsystems Engineer
- Spacecraft Propulsion Engineer
- Lunar Geologist
- Machine Learning Robotics Engineering Manager
- Senior Machine Learning and Robotics Engineer
- Reinforcement Learning for Robotics Research Scientist
- Senior RF Test Engineer
- Senior Mechanical Engineer

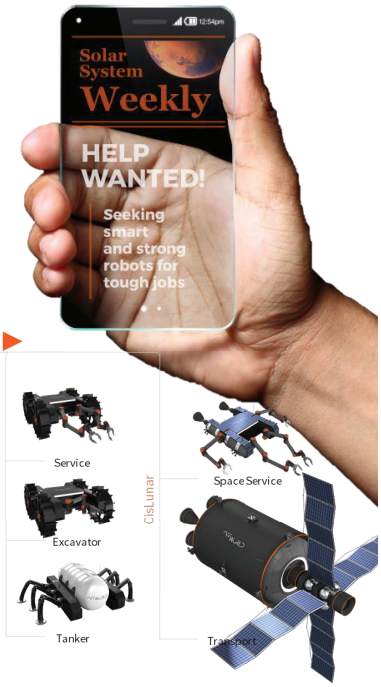
Apply Now: joinus@offworld.ai

Enabling Human Expansion off our Home Planet ▶

1. Life insurance policy
2. Sustainable development on Earth
3. The new frontier

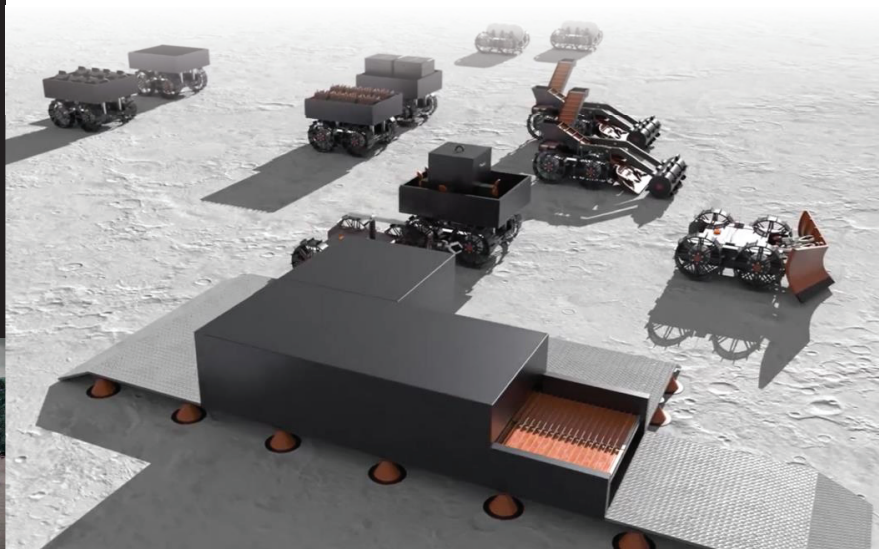
We Need Robots for Tough Jobs ▶

- build landing pads
- excavate underground habitats
- extract water ice and materials
- make drinkable water, breathable air and rocket propellant
- manufacture basic structures and solar cells
- produce electricity
- …and eventually replicate themselves



Solar System Toolkit Ad Astra per Terram ▶

Robotic Lunar Water Ice Mining Program Underway ▶



FRIDAY, JUNE 10, 2022

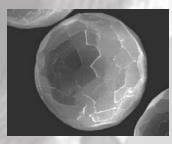
7:30 AM	**Continental Breakfast (Metals Hall, Green Center)**
Session 13 – Space Manufacturing & Construction	
Session Chair: Christopher Dreyer, Colorado School of Mines	
8:00	**Casting Lunar Regolith for Manufacturing Construction Materials** Kyla Edison, Colorado School of Mines
8:20	**Low-Energy Additive Construction for the Moon and Mars** Travis Vazansky, Masten Space Systems
8:40	**Lunar Regolith: Small Scale Robotic Site Preparation and Geotechnical Experiments with Scoops** Robert Mueller, NASA Kennedy Space Center
9:00	**The Importance of Plume Surface Interaction Ejecta Velocity Measurements for Planetary Landers** Austin G. Langton, NASA Kennedy Space Center
9:20	**Coffee Break**
Session 14 – Mars Resources	
Session Chair: Angel Abbud-Madrid, Colorado School of Mines	
9:40	**MOXIE: A Year of ISRU On Mars** Michael Hecht, MIT Haystack Observatory
10:00	**Solid Oxide Electrolysis Technology Development for the First Ever Successful ISRU Demonstration** Nathan Davis, OxEon Energy
10:20	**Site Characterization for the Redwater ISRU System** Aaron Russell, Planetary Science Institute
10:40	**RedWater: Scaled Ice Melting Probe – Martian Environment Testing For ISRU** George Johnson, Planetary Surface Technology Development Lab, Paul van Susante, Michigan Technological University
11:00	**Final Roundtable Discussion**
12:00	**ADJOURN**

TECHNOGENIA
Lasercarb® Oklahoma, Inc.

WHY LaserCarb®
Numerous industries use tools that require high resistance to abrasion and erosion. The LaserCarb® process is a hard surfacing process that adds an anti-abrasion material to the wear parts. The LaserCarb® process resolves numerous problems caused by welding.

PRINCIPLE
The process consists of using the energy of a Laser beam to melt the deposition powder (Ni-Cr or other material) on the part. A weld occurs between the deposit and the base metal.

BENEFITS
The hardness and toughness of Spherotene® (cast tungsten carbide spheres produced by Technogenia) united with the unique properties of a high energy laser produces a weld deposit. The cast spheres exhibit hardness of 3000 + 500 HV, they pack close together to produce a dense deposit. The spherical shape also increases toughness in the carbide grain and the overall deposit.



Use of powders based on cast spherical Tungsten Carbide Spherotene®
• High hardness: 3000 HV ‡ 500 • Spherotene® is not affected by LaserCarb®
• Low heat affected zone (0.030") • Almost total absence of porosity
• Large range of thickness deposit • Metallurgical bond

APPLICATIONS:
Mining, Geodrilling, Tunneling, Mixing Equipment, Industrial, Oil & Gas, Agriculture, Construction.

☎+1(405)470 33 50 www.technogeniaUSA.com

Credits

Technical Steering Committee

Angel Abbud-Madrid, Colorado School of Mines
Kevin Cannon, Colorado School of Mines
Christopher Dreyer, Colorado School of Mines
Lisa Gaddis, Lunar and Planetary Institute
Leslie Gertsch, Missouri University of Science and Technology
George Sowers, Colorado School of Mines

Session Chairs

Angel Abbud-Madrid, Colorado School of Mines
Kevin Cannon, Colorado School of Mines
Christopher Dreyer, Colorado School of Mines
Leslie Gertsch, Missouri University of Science and Technology
Julie Kleinhenz, NASA Glenn Research Center
Diane Linne, NASA Glenn Research Center
Adam Marcinkowski, Lockheed Martin
Michael Nord, Johns Hopkins University Applied Physics Laboratory
Laurent Sibille, Southeastern Universities Research Association/NASA Kennedy Space Center
George Sowers, Colorado School of Mines
Paul van Susante, Michigan Technological University

Conference Organization and Logistics

Continuing and Professional Education Services (CPES)

Melody Francisco
Julie Gorman-Farquhar
Becca Guillen
Richard Tyrrell Ead

Center *for* Space Resources

SPACE RESOURCES PROGRAM
COLORADO SCHOOL OF MINES

Space.Mines.edu