



XXV



SPACE RESOURCES ROUNDTABLE

CONFERENCE PROGRAM

**Colorado School of Mines
Golden, Colorado, USA
June 3-6, 2025**

Message

Welcome all to the Space Resources Roundtable Silver Jubilee! The Steering Committee of the 2025 SRR is happy to host the twenty-fifth edition of this conference that started back in 1999 with just a few enthusiasts in the space resources field. Given the record attendance, number of presentations and posters, and variety of topics at this meeting, there is plenty to celebrate the growth of this field in the past 25 years.

New studies, projects, and missions incorporating space resources objectives are being conducted for cislunar space, the Moon, Mars, and small bodies by government agencies around the world and the commercial space sector. This year alone, the Moon will be visited by several countries and companies demonstrating their landers, as well as deploying prospecting equipment. Interestingly, coinciding with our special anniversary, a spacecraft will be landing on the Moon and delivering several space-resources payloads during this SRR!

In the legal and policy arena, the Artemis Accords now include more than 50 countries that have agreed to extract and utilize space resources to support safe and sustainable space exploration, while an initial draft set of recommended principles for space resource activities has been released by the UN COPUOS. Large aerospace companies and dozens of start-ups are now strategically positioning themselves in the various links of the space resources value chain. As current plans focus on the Moon as a destination for renewed robotic and human exploration, while paving the way to small bodies and the Red Planet, space resources are moving ever closer to enabling future exploration, expanding economic activity beyond our planet, and increasing societal benefits on Earth.

The diverse expertise of our rapidly growing community is needed more than ever to provide the scientific, technical, business, legal, and policy guidance to integrate space resources into public and private space initiatives in an efficient, economically sustainable, fair, and responsible way. As we reflect on the significant progress achieved in the last 25 years, we invite all meeting participants to actively contribute to this discussion to ensure an exciting and productive future in this field.



– Angel Abbud-Madrid
President & Chair SRR XXV, 2025

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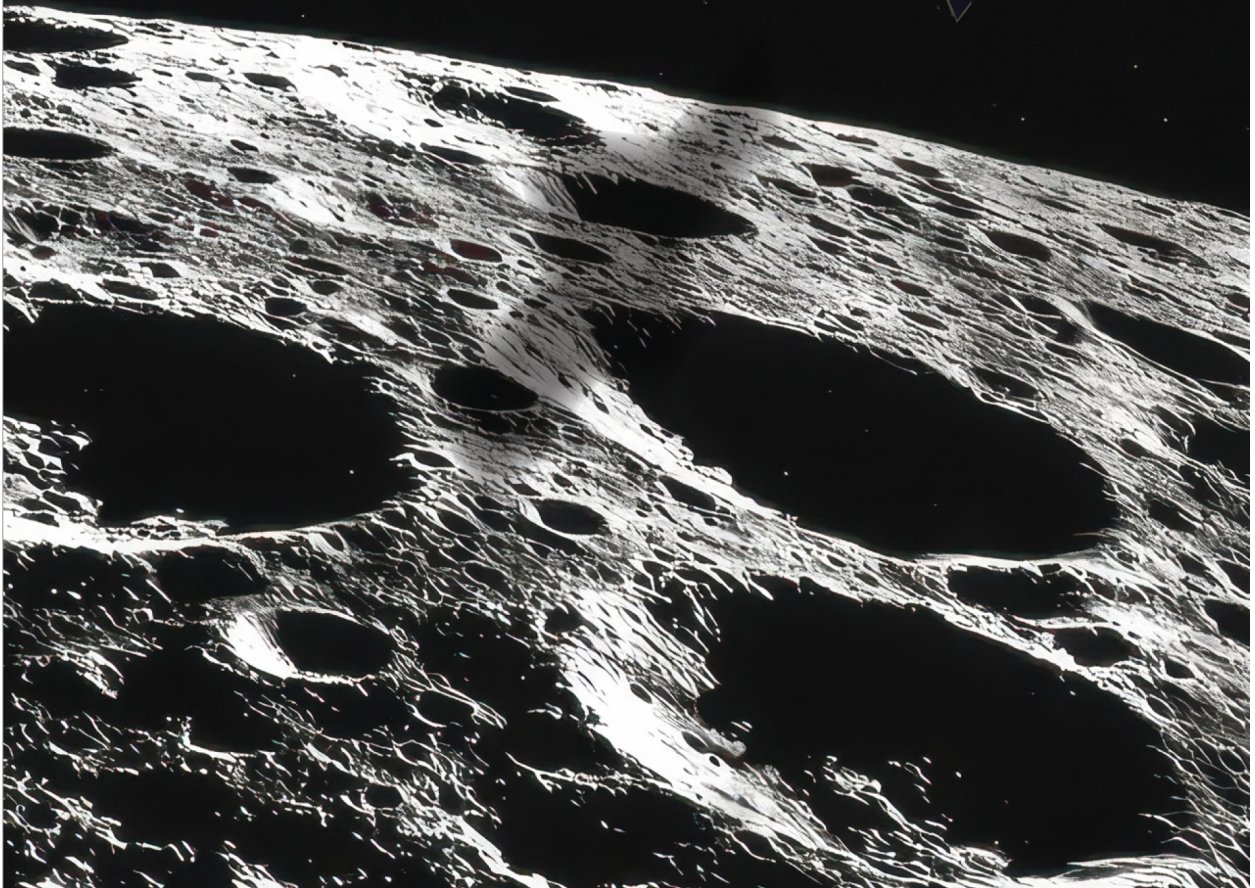
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Program Schedule

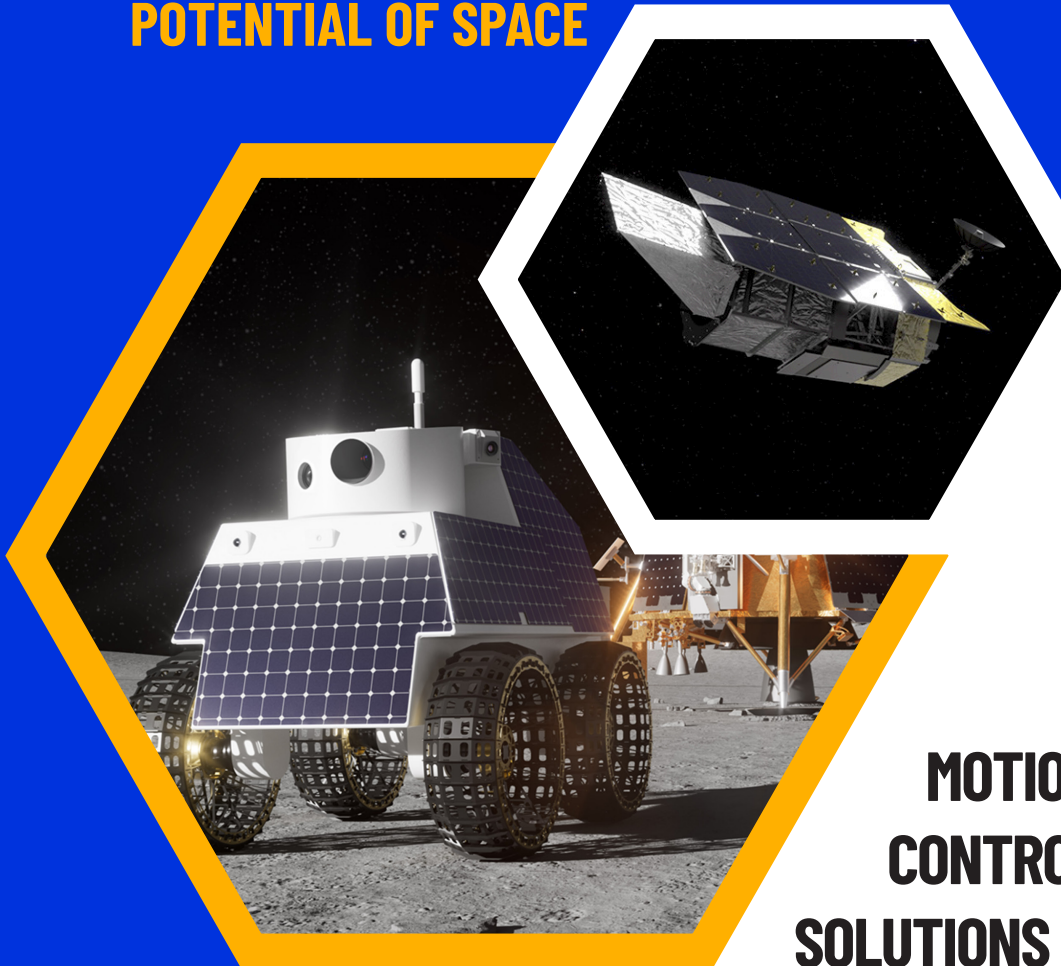
TUESDAY, JUNE 3, 2025

7:30	Continental Breakfast (CSM Ben Parker Student Center)	
8:00	Opening Remarks	Angel Abbud-Madrid, SRR President Walter Copan, VPRTT, Colorado School of Mines
Session 1 – National Plans & Priorities Panel		
Session Chair: Angel Abbud-Madrid, Colorado School of Mines		
8:20	Update on ISRU in NASA’s Artemis Program Gerald Sanders, NASA Johnson Space Center	
8:30	The Lunar Surface Innovation Consortium In-Situ Resource Utilization Group: Status Update and Path Forward Karl Hibbitts, Johns Hopkins University Applied Physics Laboratory	
8:40	Space Resources in Luxembourg: Growing and Supporting European Expertise Kathryn Hadler, European Space Resources Innovation Centre, Luxembourg	
8:50	Global Britain to Galactic Britain: ISRU Capabilities Across the Value Chain Joshua Rasera, Imperial College, London, United Kingdom	
9:00	Introduction to New Developments in Space Resource Activities in Korea Kyeong Ja Kim, Korea Institute of Geoscience and Mineral Resources, Korea	
9:10	ISRU Mission Objectives and Technology Development at JAXA Jun Shimada, Japan Aerospace Exploration Agency (JAXA)	
9:40	Coffee Break	
Session 2 – Economic, Business, Legal, and Policy Considerations		
Session Chair: Eric Wilson, CEO, The CPI Group, Inc.		
10:00	The Space Resources Fund: A Proposal for Benefit Sharing and Investment in Space Resource Utilisation Ben McKeown, University of New South Wales, Australia	
10:20	Economic Evaluation of Lunar Mining Projects Gaspard Smith-Vaniz, University of Zurich, Switzerland	
10:40	The European Space Resources Innovation Center: A Unique Excellence Centre with ISRU Commercialization Programmes Dedicated to Early-Stage Ventures Lari Cujko, European Space Resources Innovation Centre, Luxembourg	
11:00	The Lunar Development Cooperative: A Proposed Solution for Avoiding the Tragedy of the Commons Michael Castle-Miller, Lunar Development Cooperative	

11:20	Keeping Up with Space Law: The First Draft United Nations Principles on the Governance of Space Resource Activities Antonino Salmeri, Lunar Policy Platform
11:40	Should We Care About the Moon Agreement? Melissa de Zwart, University of Adelaide, Australia
12:00	Lunch (CSM Ben Parker Student Center)
Session 3 – Resource Prospecting & Exploration	
Session Chair: David Karl, Technische Universitaet Berlin, Germany	
1:30	Optimizing Lunar Resource Extraction: Cut-Off Grades for Reserves Estimation Carlos Espejel, Space RS, Luxembourg
1:50	Assessing Lunar Rare Earth Element Resources Lazlo Keszthelyi, U.S. Geological Survey
2:10	Making In Situ Resource Utilization (ISRU) a Reality on the Moon with the International Lunar Resource Prospecting Campaign (ILRPC): Prospecting, Science, and Planetary Protection Clive Neal, University of Notre Dame
Session 4 – Regolith Properties	
Session Chair: David Karl, Technische Universitaet Berlin, Germany	
2:30	Data Analysis Results from Cryogenic Vacuum Testing of a Percussive Hot Cone Penetrometer Ellie Zimmermann, Michigan Technological University
2:50	SPARTA: A Planetary Regolith Characterization Multitool for Space Resource Utilization and Infrastructure Development Jared M. Long-Fox, University of Central Florida
3:10	Coffee Break
3:30	Compaction Dependent Thermal Properties of Icy Lunar Regolith in Vacuum Travis Wavrunek, Michigan Technological University
3:50	SAMPLR – A Lunar Regolith Geophysical Evaluation Instrument and Development of an In Situ Calibration Method Christopher Dreyer, Colorado School of Mines
4:10	Roundtable Discussion
5:00-7:00	Poster Session & Reception (CSM Ben Parker Student Center)



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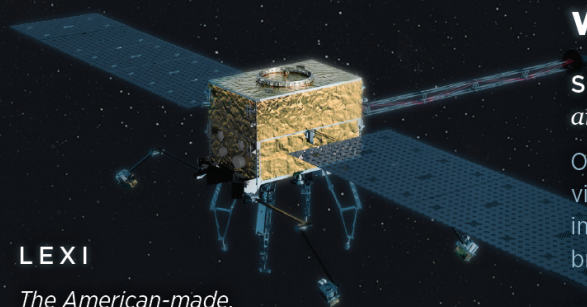
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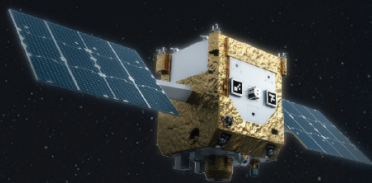
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WEDNESDAY, JUNE 4, 2025

7:30	Continental Breakfast (CSM Ben Parker Student Center)
8:00	LESSONS LEARNED: RECENT SPACE RESOURCES MISSIONS PANEL • Benjamin Bussey, Intuitive Machines • Hunter Williams, Lunar Outpost • Isabel King, Honeybee Robotics • Demyan Lantukh, AstroForge Panel Chair: George Sowers, Colorado School of Mines
Session 5 – Regolith Excavation	
Session Chair: Frankie Zhu, Colorado School of Mines	
9:00	LISTER Pneumatic Regolith Excavation at Mare Crisium: Preliminary Drilling Report from Blue Ghost Mission 1 Luke Sanasarian, Honeybee Robotics
9:20	Lunar Demonstration of PlanetVac: A Sample Acquisition and Delivery System for Instruments and Sample Return Zachary Fitzgerald, Honeybee Robotics
9:40	Excavation and Driving Performance of the PRIMROSE Rover during the Break the Ice Lunar Challenge Marcello Guadagno, Michigan Technological University
10:00	Experimental Results for the Compaction and Consolidation of Lunar Regolith Containing Discrete Water Ice in 1 Atm Pressure – A Reference for Lunar Tests Andrew Hazelton, Interstellar Mapping
10:20	Coffee Break
Session 6 – Regolith Handling and Conveyance	
Session Chair: Christopher Dreyer, Colorado School of Mines	
10:40	Advancements in Vibrational Segregation for Particle Size Classification Joshua Rasera, Imperial College, London, United Kingdom
11:00	Three-Dimensional Lunar Regolith Bucket Conveyor - LUREBUCON3D Piotr Kulinowski, AGH University of Krakow, Poland
11:20	The Australian Rover Challenge – Capability Building Through Competition David Harvey, The University of Adelaide, Australia
11:40	Regolith as a Service: Enabling End-To-End ISRU Operations Suleyman Salihler, Polimak Space

12:00	Lunch (CSM Ben Parker Student Center)
Session 7 – Resource Extraction & Processing: Water & Volatiles	
Session Chair: Ian Jehn, Colorado School of Mines	
1:20	Lunar Capillary Absorption Spectrometer (LuCAS) for Isotopic and Abundance Analysis of Lunar Volatiles Isabel King, Honeybee Robotics
1:40	STARMINE: A Full-Stack Lunar Propellant Production System David Aden, Starpath
2:00	Feasibility Study of Lunar ISRU Plants by Japanese Plant Engineering Company Yoshitoki Tanaka, JGC Corporation, Japan
2:20	Water Extraction Experiment Assuming Lunar Icy Regolith for In-Situ Resource Utilization on the Moon Suzuna Okamoto, Japan Aerospace Exploration Agency (JAXA), Japan
2:40	LUWEX Preliminary Results: Water Extraction, Capturing, and Purification from Lunar Icy Regolith Simulant Luca Kiewiet & Mateo Rejón López, German Aerospace Center, Germany
3:00	Coffee Break
Session 8 – Resource Extraction & Processing: Oxygen	
Session Chair: Daniel Johnson, McMurchie Engineering	
3:20	Gas Characterization during Thermal Treatment of Regolith Simulants in a Vacuum Environment Lucy Somervill, NASA Kennedy Space Center
3:40	Development of the Volatile Monitoring Oxygen Measurement System Deborah Essumang, NASA Kennedy Space Center
4:00	Key Findings and Path Forward from the Oxygen from Regolith (O2fR) Collaborative Systems Interface Study Paul Burke, Johns Hopkins University Applied Physics Laboratory
4:20	Roundtable Discussion
5:30-8:00	Banquet (Friedhoff Hall, Green Center)

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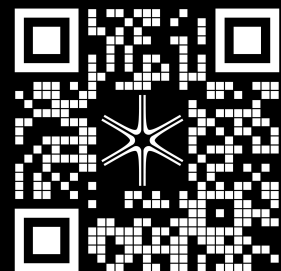


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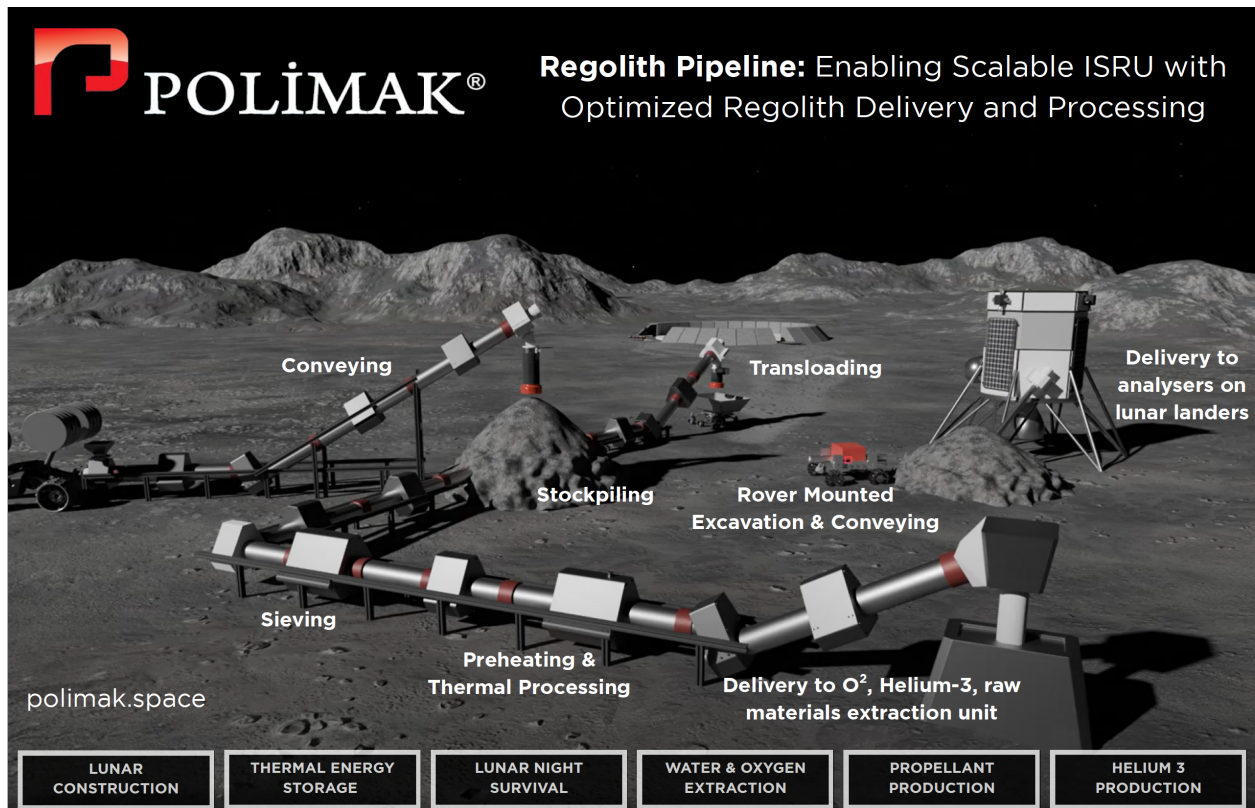
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LUNAR CONSTRUCTION	THERMAL ENERGY STORAGE	LUNAR NIGHT SURVIVAL	WATER & OXYGEN EXTRACTION	PROPELLANT PRODUCTION	HELIUM 3 PRODUCTION
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THURSDAY, JUNE 5, 2025

7:30	Continental Breakfast (CSM Ben Parker Student Center)
8:00	LOOKING AHEAD: UPCOMING SPACE RESOURCES MISSIONS PANEL • Benjamin Bussey, Intuitive Machines • Hunter Williams, Lunar Outpost • Kevin Hubbard, Honeybee Robotics • Daynan Crull, Karman+ Panel Chair: Angel Abbud-Madrid, Colorado School of Mines
Session 9 – Resource Extraction & Processing: Oxygen and Metals	
Session Chair: Jared Long-Fox, University of Central Florida	
9:00	Integrated Solar Testing and TRL 6 Thermal Vacuum Test Results for a Fully Automated, Demonstration-Scale Carbothermal Reactor Brant White, Sierra Space
9:20	Ultra-High Vacuum Thermal and Carbothermal Reduction of Lunar Regolith Simulants for Oxygen and Construction Materials Shaspreet Kaur, Georgia Institute of Technology
9:40	Molten Regolith Electrolysis: Core Sample Analysis Annie Meier, NASA Kennedy Space Center
10:00	Coffee Break
10:20	Thermochemical Modeling of Molten Regolith Electrolysis Supporting Assessment of Metallic Product Compositions and Dynamic Oxide Properties Ben Schneiderman, Colorado School of Mines
10:40	On the Melting Behaviour of Metals Extracted From LHS-1 Regolith Simulant by Electrolysis in Molten Salt Timon Schild, European Space Resources Innovation Centre, Luxembourg
Session 10 – Cislunar and Lunar Surface Infrastructure	
Session Chair: George Sowers, Colorado School of Mines	
11:00	Spectrum Management for Cislunar Space in the Era of Commercial Missions Arvind Aradhya, University of Colorado at Boulder
11:20	Preliminary Design of Intuitive Machines' Lunar Data Network Constellation Shaun Stewart, Intuitive Machines

11:40	Characterizing the Lunar Night Survival Challenge Jacob Matthews, Zeno Power
12:00	Towards a Self-Sustaining Lunar Base: An LSIC Community South Pole Master Planning Approach Jibu Abraham, Johns Hopkins University Applied Physics Laboratory
12:20	Lunch (CSM Ben Parker Student Center)
	Session 11 – Space Manufacturing
	Session Chair: Joshua Rasera, Imperial College London, United Kingdom
1:40	Solar On-Orbit Welder for Assembly, Repair, and Manufacturing Alan Carter, Outward Technologies
2:00	Mineralogical Characterization of Cast Lunar Regolith Simulants Kyla Edison, Colorado School of Mines
2:20	A Novel Approach to Increase Flowability of Planetary Regolith: Agglomeration of Regolith Simulants for Powder-Based SRU Coatings on Metallic Surfaces via Thermal Spraying David Karl, Technische Universitaet Berlin, Germany
2:40	Electron Beam Additive Manufacturing of Aluminum Derived from a Lunar Highlands Regolith Simulant Xavier Walls, Carleton University, Canada
3:00	Coffee Break
	Session 12 – Space Construction I
	Session Chair: Christopher Dreyer, Colorado School of Mines
3:10	Vibratory Plate Compaction of BP-1 & LHS-1 Utilizing the Planetary Automated Compaction Tool (PACT) Evan Bell, NASA Kennedy Space Center
3:30	Development of Landing Pads Using Regolith Blocks for Lunar Base Construction Tatsuya Nukushina, National Institute of Technology, Tokuyama College, Japan
3:50	Comparative Experimental Study of Terrestrial Compaction Methods on Lunar Regolith Simulant Christi LeCaptain, Michigan Technological University
4:10	Roundtable Discussion
5:00-7:00	Poster Session & Reception (CSM Ben Parker Student Center)

FRIDAY, JUNE 6, 2025

7:30	Continental Breakfast (CSM Ben Parker Student Center)
Session 13 – Space Construction II	
	Session Chair: Paul van Susante, Michigan Technological University
8:00	Pressure-Sinkage Testing of Lunar Regolith Simulants in Ambient Pressure and Vacuum Robert P. Mueller, NASA Kennedy Space Center
8:20	Floatinator: A Low Gravity Simulator to Study Plume-Surface Interactions Travis Vazansky, Astrobotic Technology
8:40	Low Gravity, High Stakes: Engineering Shake-Resistant Lunar Infrastructure Nerma Caluk, Skidmore, Owings & Merrill
9:00	Using CAPSTONE's Mission Extension to Navigate the Future of Cislunar Technology Alec Forsman, Advanced Space
Session 14 – Mars Resources	
	Session Chair: Michael Hecht, Massachusetts Institute of Technology
9:20	Climate Enhancing Resource Utilization Through CO₂ Valorization on Mars Alex A. Fertig, Faraday Technology, Inc.
9:40	Mars Oxygen and Methane System (MOMS) Michele Hollist, OxEon Energy, LLC
10:00	Coffee Break
10:20	De-Risking Production of Mars Return Propellant and Bootstrapping of Mars Agriculture Using Imported Ammonia George Lordos, Massachusetts Institute of Technology
10:40	Harvesting Water Frost on Mars Using Focused Solar Radiation Isaac B. Smith, York University & Planetary Science Institute
Session 15 – Life Support Systems	
	Session Chair: Angel Abbud-Madrid, Colorado School of Mines
11:00	Insights for Microbiomes in Regolith Based Agriculture (RBA) for Future Off World Habitats Based on Simulant Growth Experiments Laura Fackrell, Rhodium Scientific
11:20	Living Off the Land: How ISRU Can Benefit Early Habitation Life Support Systems James Johnson, Colorado School of Mines

Session 16 – Small Bodies & Beyond	
Session Chair: Angel Abbud-Madrid, Colorado School of Mines	
11:40	Mining Asteroids Versus Mining the Moon – Can You Have Your Cake and Eat it? Alex Ellery, Carleton University, Canada
12:00	Exploring Venus with Electrolysis: Atmospheric ISRU for Long Duration Aerial Missions Michael Hecht, Massachusetts Institute of Technology Haystack Observatory
12:20	Final Roundtable Discussion
1:00	ADJOURN



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POSTER PRESENTATIONS

Poster presentations will be divided into two sessions on Tuesday and Thursday evenings

Tuesday, June 3, 2025 (5:00-7:00 PM)	
Location: Ballrooms D&E (CSM Ben Parker Student Center)	
1	Detection of Light Elements on the Moon Surface Using Combined Techniques Inna Uwarowa, Lightigo Space, Luxembourg
2	Design of a Portable Hand-Held Centrifuge Capable of Separating Helium 3, Helium 4, and Other Gases Evan Karavolos, NTB Holdings LLC
3	A Review on the Comparison of Volatile Evolution from a Lunar Simulant Conducted at KIGAM Kyeong Ja Kim, Korea Institute of Geoscience and Mineral Resources, Korea
4	Soft Robotics for Space Applications: Technologies for Resource Utilization in Extreme Environments William Foster-Hall, The University of Adelaide, Australia
5	Test Stand for the Analysis of Excavation Forces in a Simulated Lunar Environment F. D. Gaertner, Michigan Technological University
6	Modeling Excavation Forces for Chain Driven Mechanisms with Buckets and Picks Marcello Guadagno, Michigan Technological University
7	AiSTRAEUS: Adaptive Integrated Space Trajectory Resource Allocation & Economic Utility System Santiago Gonzalez Aguado, AiSTRAEUS
8	In-Orbit and Re-Entry Qualification of Hardware, Electronics, and Software by Neurospace: Insights from Artemis 2 and TEC Mission Possible Campaigns Irene Selvanathan, Neurospace GmbH, Germany
9	Lunar Surface Characterization with the LUNASAT Sensor Network Barbra Sobhani, University of Colorado at Boulder
10	Optimizing a Megawatt Scale Lunar VSAT Installation Accounting for Self-Shading William Butler
11	A Path to Space-Based Power Transmission Using Space Resources: Additive Manufacturing Demonstration of a Cavity Magnetron for Solar Power Satellites Anjana Valsalan, Carleton University, Canada
12	Can We Build Nuclear-Electric Propulsion Systems from Lunar Resources? Alex Ellery, Carleton University, Canada

13	Update on Rechargeable Lithium Battery Development for Surviving the Lunar Night Brian Elliott, TDA Research, Inc.
14	Lunar-Pro: Lunar Unified Network for Assessing Resource-Driven Power Requirements and Operations Daria Opekunova, Colorado School of Mines
15	Lunar Power Grid: Dynamic Modeling of Grid Synchronization Using 3 KV AC and 1000 Hz Using Only Solar Power Generation Kenneth Liang, Orbital Mining Corporation
16	In-Situ Propellant Production Technology at NASA Kennedy Space Center Jessica Schwend, NASA Kennedy Space Center
17	Scaled-Up Usage of Solid-Oxide Electrolysis Cell (SOEC) Technology for Production of Rocket Fuel on the Moon Based on Experimentally Benchmarked Models David Dickson, Colorado School of Mines
18	Advancing ISRU Through Terrestrial Ice Resource Modeling: A Case Study from Galena Creek Rock Glacier Aaron Russell, Planetary Science Institute
19	Characterization and Discrete Element Modeling of Icy Lunar Regolith Under Compression Qiushi Chen, Clemson University
20	TRL 5 Testing Results & Design Advancements for the Mason Suite of Construction Tools Patrick Flowers, Redwire Space
21	Artemis Program In-Situ Resource Utilization Realities and a Critical New Role for Commercial Surface Crew John Culton, The University of Adelaide, Australia
22	Ecomine: A Bioregenerative Approach to Lunar Regolith Mining Naiara Doherty Garcia, Space Lab Technologies
23	Space Biomanufacturing: Intersection of Space Resource Utilization and Terrestrial Innovation Daven Northrup-Kuder, Rhodium Scientific
24	Use of the National Aeronautics and Space Administration's Global Reference Atmospheric Model Software for Modeling Gas Capture at the Martian Surface Jerry Drew, U.S. Army Command and General Staff College
25	Initial Assessment of In-Situ Resource Utilization for Human Missions to Titan Bill O'Hara, University of North Dakota & Explore Titan, Inc

Thursday, June 5, 2025 (5:00-7:00 PM)	
Location: Ballrooms D&E (CSM Ben Parker Student Center)	
1	Experimental Testing and Numerical Calibration of the Regolith Simulants Discrete Element Models Damian Pietrusiak, Wroclaw University of Science and Technology, Poland
2	Regolith Flowability in Lunar Gravity and Vacuum Anastasia Stepanova, Colorado School of Mines
3	Parabolic Flight Testing of Regolith Beneficiation for Lunar ISRU Daoru Han, Missouri University of Science and Technology
4	Mitigating Lunar Dust Hazards: Understanding Toxicity and Advancing Sustainable Filtration Joshua Rasera, Imperial College London, United Kingdom
5	Evaluation of Heat Storage and Structural Materials Using Resin-Coated Regolith Yohei Shimizu , Resonac Corporation, Japan
6	Advancing Regolith Simulants for High-Temperature Applications Kyla Edison, Colorado School of Mines
7	Electron Beam Regolith Separation (EBRS) System for Lunar In-Situ Resource Utilization Annalise Cabra, University of Colorado at Boulder
8	Baseline Characterization of Moisture Adsorption and Thermal Variation in LHS-1E for Lunar Rover Operations Abigail Glover, The University of Central Florida
9	SSERVI Lunar Lab and Regolith Testbeds at NASA Ames Research Center Joseph Minafra, NASA Ames Research Center
10	Design and Research Work of the Spaceteam AGH Scientific Club on Lunar Technological and Transport Systems Piotr Kulinowski, AGH University of Krakow, Poland
11	Optimal Lunar ISRU Plant Deployment Under Oxygen Demand Uncertainty Using Model Predictive Control Kosuke Ikeya, Imperial College London, United Kingdom
12	25-kg Regolith Feed, O₂ Extraction and Slag Extrusion Demonstration Payload Jon Zelon, Terraxis, Inc.
13	In Situ Extraction of Metals from Lunar Regolith Kamalesh Kumar Singh, Indian Institute of Technology (IIT), India
14	Progress on Aluminum Production from Lunar Regolith Simulants through Molten Salt Electrolysis Jacob Ortega, Missouri University of Science and Technology

15	Debris To Delta-V: Leveraging Man-Made Space Resources for Mobility Lee Steinke, CisLunar Industries
16	Additive Manufacturing of Reconfigurable Modules for Lunar In-Situ Resource Utilization Kevin Sankar, Carleton University, Canada
17	Tubular Truss Additive Manufacturing Lunar Utility Tower Jack Sorensen, Opterus Research and Development
18	A Novel Method of Heat Rejection and Storage Using Laser VMX Process on Lunar Regolith Ronald Hayes, ICON
19	The First Lunar Roads? Thermoplastic and Regolith Surface Improvement Vacuum Demonstration and Durability Testing G. Johnson, Michigan Technological University
20	Automated Site Preparation – ASPECT Christopher Dreyer, Colorado School of Mines
21	Site Preparation Tooling for Operations on Mobility Platforms (STOMP) Marco Gudino, NASA Kennedy Space Center
22	Deflection Characteristics of CSM-LHT-T Determined Through Standard and Trident Footpad Static Plate Testing Ian Jehn, Colorado School of Mines
23	Challenges of Utilizing Mars' Resources to Warm Mars Edwin Kite, University of Chicago
24	Synthesizing Chemicals on the Moon and Mars Using Solid-Oxide Electrolyzers Neal P. Sullivan, Colorado School of Mines
25	Retrieving Subsurface Properties of Mars-Analog Glaciers with Drone-Based GPR Roberto Aguilar, Lunar and Planetary Laboratory, University of Arizona
26	Forging the Regolith Age: Scalable Mechanical and Chemical Asteroid Simulants for ISRU Innovation Luke Bowersox, Karman+
27	Compact Electrostatic Dust Analyzer (CEDA) for Measuring Dust Lofting from Asteroids Xu Wang, University of Colorado at Boulder

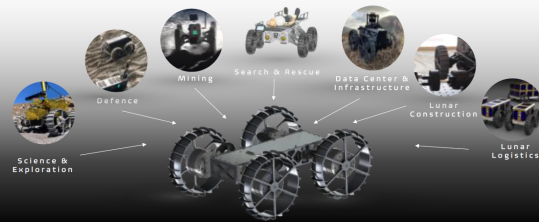


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Angel Abbud-Madrid, Colorado School of Mines
Christopher Dreyer, Colorado School of Mines
Leslie Gertsch, NASA Glenn Research Center/MS&T
George Sowers, Colorado School of Mines
Frankie Zhu, Colorado School of Mines

Session Chairs

Angel Abbud-Madrid, Colorado School of Mines
Christopher Dreyer, Colorado School of Mines
Michael Hecht, Massachusetts Institute of Technology
Ian Jehn, Colorado School of Mines
Daniel Johnson, McMurchie Engineering
David Karl, Technische Universitaet Berlin, Germany
Jared Long-Fox, University of Central Florida
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