



# Lunar Surface Innovation

C O N S O R T I U M

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## LSIC ISRU Focus Group Monthly

<http://lsic.jhuapl.edu/>

<http://lsic-wiki.jhuapl.edu/> (“Confluence” sign-up required)

**Aug 18, 2021**

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# Agenda

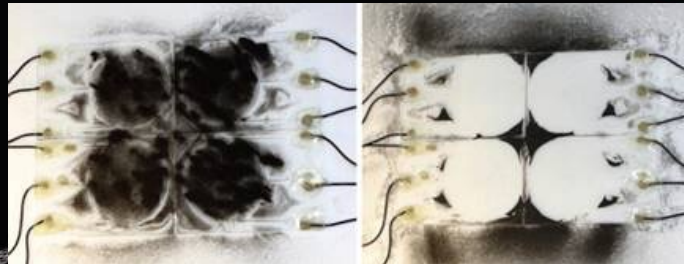
- 3:00 – General updates
- 3:10 – Break-out Group Updates
  - Facilities survey. <https://forms.gle/TxXbvb1LwN4XzQT47>
  - NASA AO's formulation discussion.
- 3:25 – Technology showcase talk
  - Michael Miller, SwRI on volatile extraction
- 3:40 – Focused talk
  - Clive Neal, Notre Dame, International Lunar Water-Ice Prospecting Campaign
- 3:50 - Move to our respective breakout groups (WaterIce Prospecting, O2 Extraction, ValueChain Analysis, Facilities). As before these Zoom rooms for the respective breakout groups will remain open until 430 EDT.
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- \*\* 35 minutes in a randomly assigned room (you can switch rooms immediately afterwards to your breakout room of choice).
- Networking rooms will be mapped to the themes of the Breakout Groups.
  - Water. Moderator: Karl Hibbitts
  - O2 tech. Moderator: Michael Nord
  - Value Chain. Moderator: Kirby Runyon
  - Laboratory Facilities. Moderator: Jodi Berdis
- The conversations will be recorded.

# Updates

- Day 2 of the Lunar Surface Science Workshop, Aug 19. Significant ISRU discussions tomorrow. <https://www.hou.usra.edu/meetings/lunarsurface2020/>
- LSIC Excavation & Construction Workshop. Friday. Aug 20. 2pm EDT. 2-hour duration.
- The LSIC Fall meeting is Nov 3- 4.
- ASCEND. 15-17 Nov. Registration open. Session topics include: regolith processing, ISRU economics.
- Continue to check out the Resources page on Confluence at: <https://lsic-wiki.jhuapl.edu/pages/viewpage.action?pageId=6258941>.
- There are new updates on Confluence associated with the ISRU breakout sessions.
- Extreme Access has a data resources page with a focus on s/c data and tools: <https://lsic-wiki.jhuapl.edu/display/EA/Resources>
- “Who’s Who in ISRU” at <https://lsic-wiki.jhuapl.edu/display/ISRU/Who%27s+Who+in+ISRU>

# Dust Mitigation FG Update

- Next Dust Mitigation Focus Group meeting:
  - Thursday, August 26 at 12 PM EDT
- Sign-up to join the Dust Mitigation Subgroups:
  - Please fill out the short survey at the link below if interested or would like to sign-up:
  - [Dust Mitigation Subgroups](#)
- Help us improve the Dust Mitigation Focus Group!
  - Please fill out the feedback survey:
  - [Dust Mitigation Year One Feedback](#)



# LSIC Power Beaming for the Lunar Surface workshop



- General consensus is that power beaming is a pragmatic solution for H<sub>2</sub>O prospecting and deep PSR exploration. Marginal cost of extending range is trivially small for laser PB. Could also be used to connect regions with complementary illumination.
- Current PB hardware is not space-qualified but could be rapidly advanced
- Power Beaming Figure of Merit currently under consideration for WoTM is not ideal, especially for laser power beaming
- PB reduces complexity compared to cabled-power for exploration
- Thermal management complicates design of high-power systems, but waste heat may be beneficial for some scenarios.

# Facilities Survey Goals & Real-time Participation

Jodi Berdis, APL

- To obtain information about your needs for ISRU facilities and to compile and provide that information to NASA in the form of a recommendation.

<https://forms.gle/TxXbvb1LwN4XzQT47>

(link will be put into the chat box)



# Community input on NASA Announcements of Opportunities

Kirby Runyon, APL

- To obtain information about how NASA can write AO's to better meet the needs of and increase the participation by, the community. We're asking you to be "NASA for a day" and to write example solicitations: AOs, BAAs, RFPs etc. as though you were NASA asking yourself (and the community) for a proposal.

Email: Kirby.Runyon@jhuapl.edu

Participate in Confluence discussions as part of the ValueChain Analysis at:  
<https://lsic-wiki.jhuapl.edu/display/ISRU/Value+Chain+Analysis>

# Technical Presentation 1

## Volatile Extraction from Regolith

Michael Miller, SwRI



## Technical Presentation 2

# International Lunar Water-Ice Prospecting Campaign

Clive Neal, Notre Dame

# Wrap-Up and Transition to Breakout Groups

Water. Moderator: Karl Hibbitts

O<sub>2</sub> tech. Moderator: Michael Nord

Value Chain. Moderator: Kirby Runyon

Laboratory Facilities. Moderator: Jodi Berdis

# ISRU Focus Group Break-out groups

- Water prospecting and mining
  - what we need to understand about the abundance, distribution, and form of ice in PSRs in order to use it as a resource, and what measurements are needed to obtain this information.
  - Is it useful to do demo's even not knowing water-ice situation? This answer may be different for each water ice mining effort being developed.
  - At least one product will be a short white paper with recommendations to be submitted to STMD.
- O<sub>2</sub> extraction and metals
  - ensuring we have an effective and holistic system approach.
  - Map regolith properties to preferred extraction tech. More a system perspective; less a focus on individual O<sub>2</sub> extraction technologies. For instance, identify the common needs/attributes/requirements between the various O<sub>2</sub> extraction technologies. Metal purity needs for metal use.
  - One product will likely be a recommendation list of which technologies/components/etc would benefit from being demonstrated on a lunar lander.
- Value Chain Development for ISRU
  - ensuring industry and government efforts are linked to customer (future) needs and the right technologies are being identified for development.
  - One product can be the development of a roadmap.
- Laboratory Facilities for ISRU
  - ensuring we have what is needed and access to it, for testing ISRU technologies.
  - One product will likely be a report to STMD with recommendations for what specific facility capabilities including access/costs/use policies/frequency of use/... are needed by the community. NASA and private industry may have different needs.



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Ideas: consider a demonstrator that is agnostic to water ice form/distribtion/etc.

Jeff Plate: likely disseminated ice. Maybe part of regolith grains or not. Global survey followed by rovers for ground truth.

Define the problem: How well do we know water ice? How well do we need to know it?

Interstellar mining: 2% is cut-off for abundance. Wants a sub 1.5km circle. To then send rover to prospect to 100m with rover.

What missions do we need to accomplish this? Are there other ideas for needs?

Fly mining equipment that is agnostic to ice form.

May need about a dozen points to characterize any one homogenous area.

Chandrayaan 3 has L and S band SAR. Will it map large blocks of water ice?

Show a visceral demonstration with public appeal of the existence of water ice on the Moon.