



Lunar Surface Innovation

C O N S O R T I U M

LSIC Excavation and Construction Focus Group

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

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APPLIED PHYSICS LABORATORY

Friendly Reminders

- Slides, chat and recording will be posted in our website in 2-3 days.
(<http://lsic.jhuapl.edu/Focus-Areas/Excavation-and-Construction.php>)
- Feel free to post your questions/suggestions in 'chat'.
 - We can move the discussion to Confluence.
- Please mute yourself if you are not speaking.

Focus Group Update

- Use Confluence for technical discussions, sharing resources, seeking feedback, etc.
 - <http://lsic-wiki.jhuapl.edu/> (sign-up required)
 - Contact Andrea Herman for access: ams573@alumni.psu.edu

Upcoming Events	Conversations	Recent space activity
<p>Excavation & Construction Monthly Meeting</p> <p> 04 Dec 2020 at 3PM EST</p>	<ul style="list-style-type: none">• E&C Topics for Discussion• Effect of E&C activities on lunar environment• Lunar Landing & Launch Pads (Rob Mueller)• Year 1 Goal Discussions	<p> Mamur Hossain</p> <p> E&C Topics for Discussion commented Dec 17, 2020</p>
<p>Past Meeting Records</p> <ul style="list-style-type: none">• 25 September 2020• 19 August 2020• 31 July 2020• 26 June 2020• 30 October 2020	<p>Resources</p> <ul style="list-style-type: none">• Lunar Open Architecture	<p> Athonu Chatterjee</p> <p> E&C Topics for Discussion commented Dec 15, 2020</p> <p> E&C Topics for Discussion commented Dec 15, 2020</p>
		<p> Leslie Gertsch</p> <p> E&C Topics for Discussion commented Dec 11, 2020</p>

Break the Ice Lunar Challenge (NASA Centennial Challenge)

Excavate icy regolith and deliver acquired resources in extreme lunar conditions.

- <https://breaktheicechallenge.com/>

Please join the NASA Centennial Challenges Program and Ensemble Consultancy for a **webinar on Thursday, February 25, 2021 at 11:00 am – 12:00 pm CST** to learn about the latest technologies for excavation in extreme environments on the Moon and Earth. We will also address questions about NASA's Break the Ice Lunar.

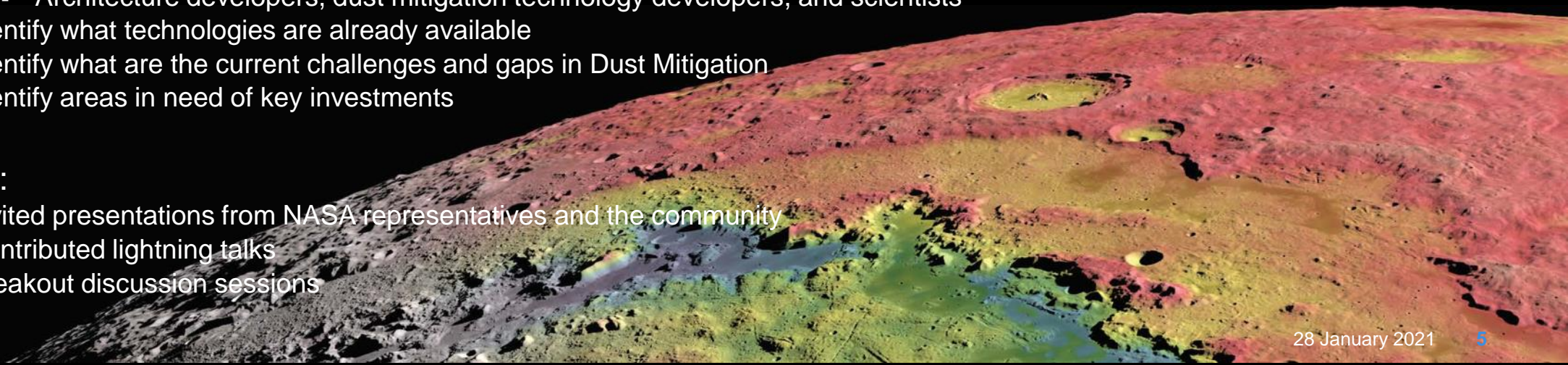
Registration link : https://zoom.us/webinar/register/WN_oyXzvaPcRLeXSTCRe66QaA

At the webinar, you'll hear from:

- Monsi Roman, Program Manager, NASA Centennial Challenges Program
- Don Thomas, Former NASA Astronaut
- Pete Carrato, Fellow Emeritus, Bechtel Corporation
- Kris Zacny, VP & Director, Exploration Technology, Honeybee Robotics
- Judson Kauffman, Co-CEO, Terradepth

LSIC Dust Mitigation Workshop

- Dates: Thursday, February 4
- Time: 11 AM to 5 PM Eastern Time
- Registration is required, closes January 31
- Workshop website (Includes Agenda):
- <http://lsic.jhuapl.edu/Events/Agenda/index.php?id=118>
- Workshop Objectives:
 - Bring together key stake holders:
 - Government, Industry, Academia, and Non-profit
 - Architecture developers, dust mitigation technology developers, and scientists
 - Identify what technologies are already available
 - Identify what are the current challenges and gaps in Dust Mitigation
 - Identify areas in need of key investments
- Format:
 - Invited presentations from NASA representatives and the community
 - Contributed lightning talks
 - Breakout discussion sessions



Agenda

Two ~20-minute presentations :

- (1) Rodrigo Romo: **HALO (Hawaiian Analogs for Lunar Operations)** and the work they are doing in the areas of **sintered basalt and lunar landing pad**. Rodrigo is the program director of Pacific International Space Center for Exploration Systems (PISCES) in Hawaii.
- (2) Daniel Inocente: **Architecture and Space, Dimensions for Design**. Daniel is a Senior Designer currently with Skidmore, Owings & Merrill in New York City. He has worked on many architectural landmarks such as Guggenheim Abu Dhabi, Battersea Development, Zhuhai Tower, Charenton Tower, Guiyang World Trade Center, Zhongtian Tower, Hangzhou Tower, and others.



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Habitat construction in lunar conditions. (Inflatable habitat, underground habitat, radiation shielding, multi-functional materials/structures)	70.5%
Manufacturing processes for lunar construction. (Additive manufacturing, sintering, regolith fiber pulling)	63.6%
Excavation technology for hard regolith/icy material. (Drilling, mining, lightweight construction equipment)	61.4%
Autonomous vehicles and robots for E&C on lunar surface.	59.1%
Lunar surface structure development. (Landing pads, berms, roads)	54.5%
Increased autonomy of operations.	34.1%
Virtual lunar terrain simulation.	29.5%
Beyond additive technology.	22.7%
Long duration robust , easily maintainable robot design for industrial scale use (not science)	2.3%
Subsurface and interior imaging and composition analysis	2.3%
Compressed, sifted regolith as a building material	2.3%
Spacecraft refueling station development	2.3%

LSII System Integrator - APL

A key tenet of LSII is to implement a multitude of novel collaborations across industry, academia, and government in order to successfully develop the transformative capabilities for lunar surface exploration.

Origin of the APL Task

- NASA was investigating using a University Affiliated Research Center (UARC) to bring efficiencies to development
- LSII initiated a tasked APL, to assess system integration role for the Lunar Surface Innovation Initiative
- APL established a Lunar Surface Consortium with academia and industry representatives, as well as NASA experts, that span a broad range of capabilities to execute timely studies, tasks, and/or acquisitions

The Consortium will assist NASA in

- Identifying lunar surface technology needs and assessing the readiness of relative systems and components
- Making recommendations for a cohesive, executable strategy for development and deployment of the technologies required for successful lunar surface exploration
- Providing a central resource for gathering information, analytical integration of lunar surface technology demonstration interfaces, and sharing of results



Timeline

