Lunar Surface Innovation Consortium

NASA

APL Johns Hopkins Applied Physics Laboratory

LSIC Excavation & Construction Focus Group

Monthly Meeting

June 26th, 2024

Sarah Hasnain & Jibu Abraham

LSIC Excavation & Construction Focus Group Co-Facilitators

LSIC E&C Focus Group

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Agenda

- LSIC Sign-Ups & Call for Speakers
  - Email Jibu.Abraham@jhuapl.edu and Sarah.Hasnain@jhuapl.edu
- Opportunities & Conferences
- Habitat Construction
  - Ethan Butler, Chief Product Officer at DEEP
    - DEEP Sentinel Modular Undersea Habitat System
  - Dr. Nerma Caluk, Designer, Structural Engineering at SOM
    - Modular Lunar Infrastructure Doctoral Research
- Breakout Discussions (30 mins)
  - Habitat Construction in Extreme Environments – Community Perspectives on Infrastructure Planning

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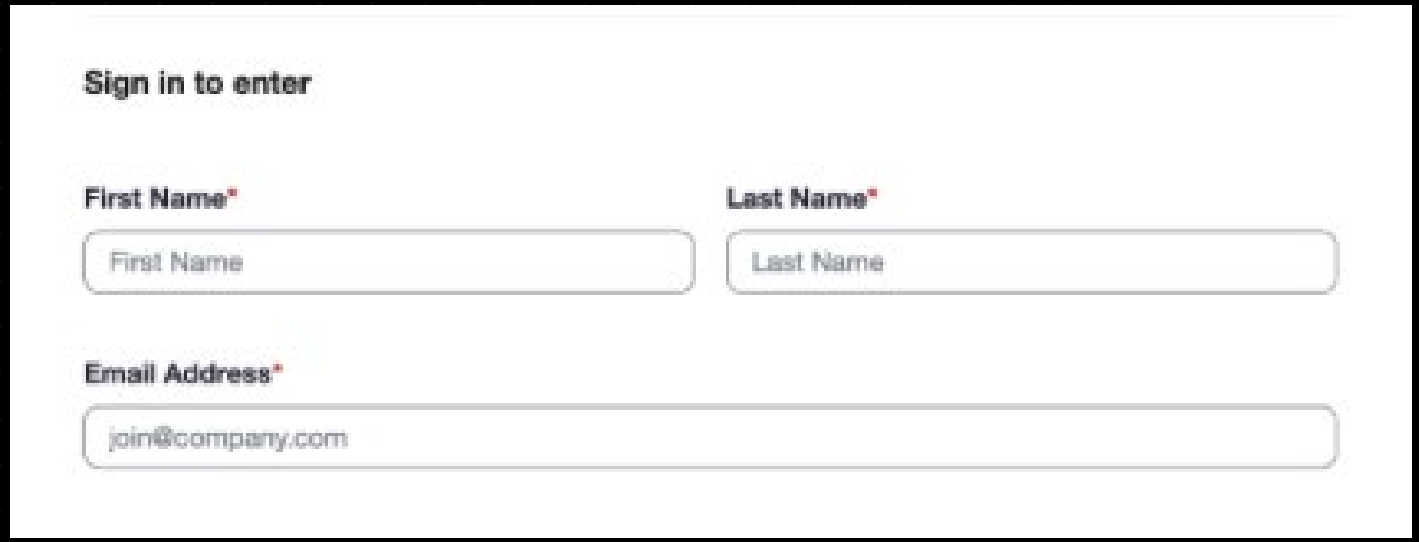
LSIC Monthly Meetings Update
New Zoom Links

LSIC is updating our zoom sign-in! To better serve the community and contact attending members, our zoom links will now require First and Last Name and email addresses. This will not affect how the monthly meetings are attended, and no passcode will be required. If you have any questions or concerns, please reach out to your Focus Area Lead.

New Zoom links start
July 1st



Break the Ice Challenge Awardees Announced

California Teams Win $1.5 Million in NASA's Break the Ice Lunar Challenge

https://www.nasa.gov/general/california-teams-win-1-5-million-in-nasas-break-the-ice-lunar-challenge/

"The husband-and-wife duo of Terra Engineering took home the top prize for their "Fracture" rover. Team lead Todd Mendenhall competed in NASA's 2007 Regolith Excavation Challenge, facilitated through NASA's Centennial Challenges, which led him and Valerie Mendenhall to continue the pursuit of solutions for autonomous lunar excavation."

"A small space hardware business, Starpath Robotics, earned the second-place prize for its four-wheeled rover that can mine, collect, and haul material. The team, led by Saurav Shroff and lead engineer Mihir Gondhalekar, developed a robotic mining tool that features a drum barrel scraping mechanism for breaking into the tough lunar surface. This allows the robot to mine material quickly and robustly without sacrificing energy."

Upcoming Conferences & Events

July 30 - August 1 / AIAA ASCEND

The annual AIAA **A**ccelerating **S**pace **C**ommerce, **E**xploration, and **N**ew **D**iscovery (ASCEND) conference is taking place in Las Vegas, Nevada this July. https://www.ascend.events/

November 13 - 16 / Sustainable Humanities and Technologies for Future Space Habitats (Moon and Mars) and Analog Space Habitats Event

Virtual Event. Organized by Habitat Marte Space Analog Station, Space Renaissance Initiative (SRI), Mars Society Brazil and Universidade Federal do Rio Grande do Norte (UFRN). Call for Papers is open, due August 30th. https://spacehabitatevent.blogspot.com/2024/04/space-habitat-event-2024.html

November 19 - 21 / International Symposium on AI, Robotics and Automation in Space

The theme for i-SAIRAS 2024 is New Frontiers: Harnessing AI, Automation and Robotics for Space Exploration and Earth's Challenges. Hosted by Australia's national science agency, CSIRO, this in-person event will mark the first time that this international symposium will be hosted in Australia in its 25-year history. https://www.isairas2024.org/

Lunar Surface Innovation CONSORTIUM

LSIC Excavation and Construction Focus Area Virtual Lunar Launch and Landing Facilities Workshop – July 23rd

- Sessions:
  - Vision for Deploying Landing and Launch Facilities (LLFs) for a sustained presence on the Moon
  - Top-Level Design Expectations for LLF
  - LLF Trade Space Considerations
  - State of the Art Landing Pad Analyses - Plume Surface Interaction Analyses and Failure Modes
  - Construction Options and Supporting Infrastructure


Mark Hilburger (NASA-LARC)


Michelle Munk (NASA-HQ)


Sam Ximenes (Astroport)


Phil Metzger (Univ Central FL)


Ian Jehn (Colorado School of Mines)


Evan Jensen (ICON)


Jason Foley (AFRL)


Greg Autry (ASU)


Brandon Dotson (Univ Central FL)


Kevin Cannon (Ethos Space)

Interested in Presenting? Email Jibu.Abraham@jhuapl.edu or Sarah.Hasnain@jhuapl.edu


Image Credit: NASA

Join LSIC - LSIC.JHUAPL.EDU

Registration is free and required – Closes July 11th

Ethan Butler (DEEP)

- Ethan Butler is the Chief Product Officer at DEEP. Ethan has over 20 years of experience in the execution of complex commercial and government product programs from conceptualization to delivery, including autonomous underwater vehicles – integrating agile innovation, robotics, and power utilization in extreme environments.
- Ethan earned Master's Degrees in Engineering Management, as well as Ocean Engineering, from MIT, following a Bachelor's Degree in Physics and Marine Science from the University of Miami.

Dr. Nerma Caluk (SOM)

SOM

- Dr. Caluk is an Intermediate Designer in Structural Engineering at Skidmore, Owings & Merill (SOM), an architectural, urban planning and engineering firm. Dr. Caluk's dissertation focused on the design and analysis of lunar habitat systems made from modular blocks and the effect of seismicity on future lunar structural components. She is an expert core contributor to working groups on initial lunar design guidelines and the assessment of loads.
- Dr. Caluk earned her PhD and Master's Degree in Structural Engineering, as well as Bachelor's Degree in Civil Engineering, at Florida International University.

Breakout Discussions

Habitat Construction in Extreme Environments: Community Perspectives on Infrastructure Planning

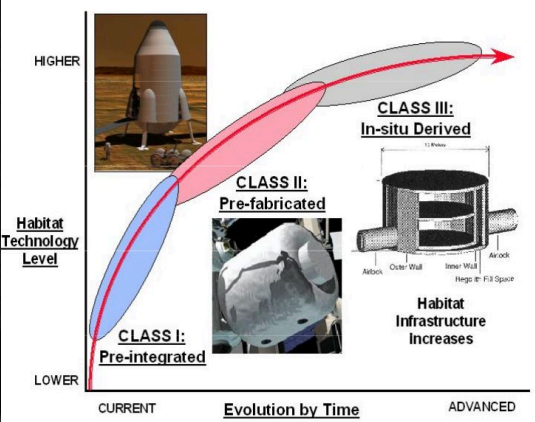


Figure 1. Habitat Classifications

Kriss Kennedy. "The Vernacular of Space Architecture," AIAA 2002-6102. *AIAA Space Architecture Symposium*. October 2002.

Guiding Questions:

What technologies and lessons learned can we apply from habitat construction in terrestrial extreme environments, to the lunar surface?

What are some top-priority human factors to consider when constructing and outfitting a lunar habitat? How might we integrate these considerations into system design and testing?

What might autonomous construction look like for Class I, II, and III habitat systems?

What would you like to hear more about on the topic of lunar habitat construction?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