

The Lunar Surface Innovation Consortium is administered by the Johns Hopkins Applied Physics Laboratory, and operates in collaboration with the NASA Space Technology Mission Directorate under the Lunar Surface Innovation Initiative. Its purpose is to harness the creativity, energy, and resources of the nation to help NASA keep the United States at the forefront of lunar exploration. To find out more, sign up to participate, or access past additions of this newsletter, please visit lsic.jhuapl.edu.

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Focus Area Monthly Telecon Schedule

Dust Mitigation

Third Thursdays at 12PM Eastern

Excavation & Construction

Last Friday at 3PM Eastern

Extreme Access

Second Thursdays at 3PM Eastern

Extreme Environments

Second Tuesdays at 3PM Eastern

In Situ Resource Utilization

Third Wednesdays at 3PM Eastern

Surface Power

Fourth Thursday at 11AM Eastern

If you'd like to participate in a focus area's monthly telecon, please sign up on the

LSIC website here: [lsic.jhuapl.edu/Events/
survey.php](http://lsic.jhuapl.edu/Events/survey.php)

Director's Update

Over the last year, we've worked hard to get LSIC and its focus groups up and running. With 2020 coming to a close, we're planning to take a little time to think about how to reorganize our website to make sure that we serve our goals of connecting our community members with existing resources and adding new resources, where appropriate. In particular, a couple of the aspects we plan to develop are a mentoring portal and a more substantial portal for learning more about Space Tech funding opportunities, tips for proposing to them, etc.

One of the activities I am most looking forward to in 2021 is getting our first Executive Committee actively involved in developing our charter and goals (focus groups and LSIC-wide). We have a wealth of experience on the Executive Committee, as you will see below. One of our first actions when we meet in January will be to discuss exactly where LSIC fits into the greater landscape of lunar advocacy and exploration-related groups, and how to maximize LSIC's impact. Another action will be to formalize institutional memberships. While we will continue to welcome anyone to participate in LSIC, institutions who formally become members of LSIC will be asked to provide a single point of contact for communications to better understand their capabilities and needs. We will also be seeking input on our mentoring and outreach plans.

Thank you to all for your participation in LSIC thus far. I hope you have a wonderful remainder of the year, and I look forward to many great discussions as we move into 2021!



Rachel Klima

Director, Lunar Surface Innovation Consortium
SES-LSIC-Director@jhuapl.edu

Funding Opportunities

TECH DEVELOPMENT OPPORTUNITIES

Lunar Vertical Solar Array Technology (<https://nspires.nasaprs.com/external/solicitations/summary!init.do?solId={68A7EFE3-1B4F-5AA1-A169-119D97C8DB8F}&path=open>)

Seeking proposals for the design and prototype fabrication of autonomously deployable and relocatable lunar surface solar arrays for future missions during the “Sustainment Period” of lunar South Pole exploration. Contracts resulting from this Appendix will include a Base period focused on design and analysis tasks to ensure basic feasibility of the proposed system, and an Option period that focuses on the build and test of a prototype of the proposed system concept.



Proposal Deadline: 14 December 2020

Watts on the Moon Centennial Challenge (<https://www.herox.com/WattsOnTheMoon>)

Teams will propose solutions for energy distribution, management, and/or storage that address NASA technology gaps and can progress toward flight readiness and future operation on the lunar surface. Such solutions may also have important synergies with terrestrial energy needs, and this Challenge is expected to help advance similar technologies for terrestrial application and commercialization.

Phase 1 Registration and Submission Deadline: 25 March 2021

Break the Ice Lunar Challenge (<https://breaktheicechallenge.com/>)

Design a system architecture to excavate icy regolith and deliver acquired resources in extreme lunar conditions. Up to \$500,000 in Phase I prizes is available. The Mission Scenario takes place in and around a permanently shadowed region (PSR) near the lunar South Pole. In this scenario, the mission will last 365 Earth days. The Challenge seeks solutions to maximize water delivery and minimize energy use and the mass of equipment required to be transported to the lunar surface.

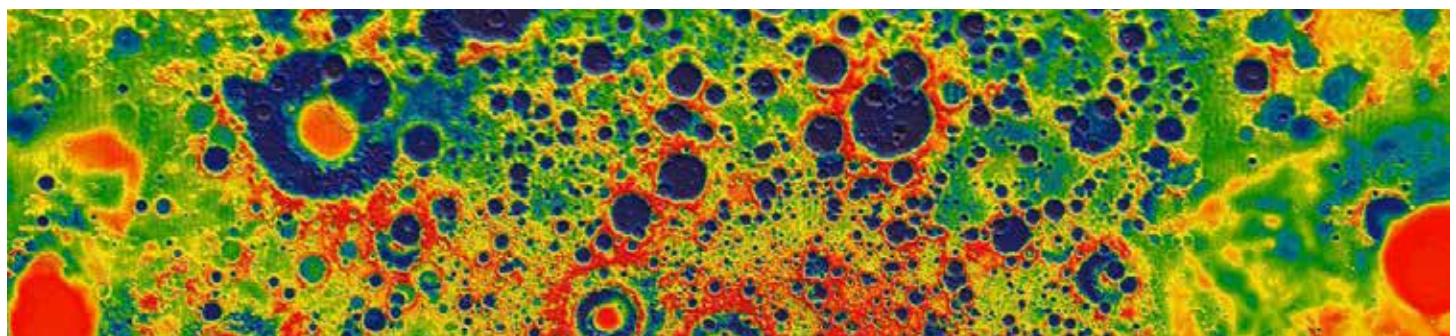
Registration and System Architecture Submission Deadline: 18 June 2021

STUDENT TECH DEVELOPMENT OPPORTUNITIES

Big Idea Challenge: 2021 Lunar Dust Challenge (<http://bigidea.nianet.org/2021-challenge/>)

Through the 2021 BIG Idea Challenge, NASA seeks innovative ideas from the academic community for a wide range of lunar dust mitigation solutions for issues including reducing dust clouds upon landing, dust removal from spacesuits and other surfaces, dust obstruction of optical systems, and reducing in-cabin particulate levels, among others.

Project Plan Proposal and Video Deadline: 13 December 2020



[PIA16587](#): GRAIL Gravity Field of the Moon - This map shows the gravity field of the moon as measured by NASA GRAIL mission.

2020 LSIC Fall Meeting Overview

The Lunar Surface Innovation Consortium (LSIC) Fall Meeting was held virtually on October 14-15th, 2020. Over 500 people participated, with 90% of the registrants distributed almost evenly between academia, government, and industry and the remaining 10% from non-profit institutions. This article discusses the technical findings of the meeting generally, but you can find out more by attending the Surface Power Monthly Meeting being held this Thursday, 03 December at 11:00AM EST. For details on how to join, please contact Andrea Harman at ams573@alumni.psu.edu.

The meeting objectives were to:

1. Present to the community an update of the work that the NASA Space Technology Mission Directorate (SpaceTech) is supporting through funding opportunities, the Lunar Surface Innovation Initiative (LSII), and the Lunar Surface Innovation Consortium (LSIC)
2. Provide a forum for the community to share and discuss recent technology-focused research and advancements, especially in the context of surface power
3. Foster discussions among the community to identify the most critical technical gaps that need to be overcome in order to attain a sustained presence on the lunar surface by the end of the decade.

Day 1 Overview

The first day of the meeting was comprised of high-level informational presentations from NASA & JHU / APL (covering LSII and LSIC activities), a feature about ongoing projects and work by hosting partner Arizona State University (ASU), and a technical poster and networking session. The contributed talks and poster sessions allowed community members to share the high-level results of their projects. Lightning talks were chosen by the planning committee from the pool of poster presenters. All the presentations and meeting materials available for dissemination are posted on the event website here: <http://lsic.jhuapl.edu/Events/102.php>

Day 2 Overview

The second day focused on technical content, including sustainable power, power infrastructure, and technology gaps in the context of an envisioned future lunar base with different levels of power available. The breakout discussions allowed for constructive discussion and collaborative idea-building centered around one of three scenarios: a future with low (~10 kW), medium (~100 kW with a 70% duty cycle), and high (> 1 MW) power availability. The goal was to explore what challenges, obstacles, and opportunities exist in each of the scenarios, then to identify actions (both short- and long-term) that would help make progress towards each of the scenarios. A description of each level and some of the interesting and highly ranked suggested actions identified in the discussions are broken out by power level below:

Low Power (~10 kW)

In this paradigm, the group envisioned that the weak business case for participation with restricted power would limit commercial and sustained operations. Many activities would be sortie driven and focus on science, with continuous power enabling survival rather than operations.

- Develop standards
- Model power grid development
- Develop lunar rated components via a public-private partnerships

Medium Power (~100 kW with a 70% duty cycle)

The medium power group expressed a need for understanding economics / supply and demand of potential lunar activities, and a desire to leverage anchor customers as well as international cooperation to enhance long-term stability.

- Maintain and grow international partnerships
- Build supply and demand cases for economic development

High Power (> 1 MW)

Knowledge of NASA's plans and technology gaps was deemed critical to the success of rapid, large-scale development made possible the availability of high power. Involvement of terrestrial partners and frequent flight demonstrations were further cited as critical to success in this scenario.

- Understand NASA's plans and known gaps ASAP
- Involve more terrestrial companies with relevant experience
- Fly technology demonstrations

Many themes were also shared between groups, including calls for more in-depth information about Space Tech opportunities and how to write relevant and compelling proposals, the need to define what a "sustainable presence" means on the lunar surface, and a continued interest in international collaboration.

We are now actively working to sculpt this input into actions for the consortium to take on together. The LSIC will continue on several internal and external initiatives expand the consortium's membership, coalesce member opinions into feedback, and develop actionable plans to advance our overall goal. Following the experiences we had during the meeting, we have also expanded our communication toolset to facilitate the interactions and discussions needed in the wider community.

Executive Committee Introductions

The Executive Committee had their first meeting in November, and you can expect to hear more about their progress in the new year. Their tasking includes working with LSIC leadership to develop an organizational charter, build a mentorship portal for members, and create an outreach strategy to engage underrepresented institutions of all types.

We're delighted to introduce the exceptional individuals who comprise LSIC's inaugural Executive Committee! Insights and feedback from them will guide the Consortium's ongoing work. Their varied backgrounds and many accomplishments make for a team that will provide wonderful perspective to the organization overall as we pursue our goals and objectives in the future.

AHSAN CHOUDHURI

Dr. Ahsan Choudhuri is Associate Vice President for Aerospace Center and Professor of Mechanical Engineering at the University of Texas at El Paso (UTEP). He is the founding Director of UTEP NASA MIRO Center for Space Exploration and Technology Research (cSETR) and holds the endowed Mr. and Mrs. MacIntosh Murchison Chair II in Engineering. He has mentored 7 Research Assistant Professors, been the research supervisor of 27 Ph.D. and 86 M.S. graduates, and co-authored more than 160 technical publications with his students. The focus of Dr. Choudhuri's activities is to catalyze a regional talent and technology development ecosystem by providing strategic capabilities in Aerospace and Defense Technologies and Advanced Manufacturing. Dr. Choudhuri has received numerous awards and recognitions, including recognition for Faculty Award for Research Innovation from NASA, multiple Best Paper Awards from the American Institute of Aeronautics and Astronautics (AIAA), and Millionaire Research Awards, Outstanding Leadership Award, and Outstanding Performance for Securing Extramural Funding Award from UTEP. He is a proud alumnus of Khulna University of Engineering and Technology where he received his B.S. in Mechanical Engineering, and went on to receive his M.S. and Ph.D. from the University of Oklahoma School of Aerospace and Mechanical Engineering.



ARIEL EKBLAW

Ariel Ekblaw is the founder and Director of the MIT Space Exploration Initiative, a team of over 50 graduate students, staff, and faculty actively prototyping the artifacts of our sci-fi space future. Founded in 2016, the Initiative now includes a portfolio of 40+ research projects focused on life in space (from astrobiology to space habitats), and supports an accelerator-like R&D program that enables a broad range of payload development. For the Initiative, Dr. Ekblaw drives space-related research across science, engineering, art, and design, and charters an annually recurring cadence of parabolic flights, sub-orbital, and orbital launch opportunities. Dr. Ekblaw forges collaborations on this work with MIT departments and space industry partners, while mentoring Initiative research projects and providing technical advice for all mission deployments. The Initiative is preparing for its first lunar payload, as part of an MIT-wide effort, in 2024. Dr. Ekblaw brings a humanist approach to her research at MIT, with undergraduate degrees in Physics, and Mathematics and Philosophy from Yale University, a master's in distributed systems from the MIT Media Lab, and her recent MIT PhD in self-assembling space structures for space architecture, via the TESSERAE platform.



LINDY ELKINS-TANTON

Dr. Lindy Elkins-Tanton is the Principal Investigator of the NASA Psyche mission, Managing Director of the Interplanetary Initiative at Arizona State University, and co-founder of Beagle Learning, a tech company training and measuring collaborative problem-solving and critical thinking. Her research and efforts are focused on a positive human space exploration future, the effective leadership of teams, and education for the future of society. She has led four field expeditions in Siberia. She served on the Planetary Decadal Survey Mars panel, and the Mars 2020 Rover Science Definition Team, and now serves on the Europa Clipper Standing Review Board. In 2010 she was awarded the Explorers Club Lowell Thomas prize. Asteroid (8252) Elkins-Tanton is named for her. In 2013 she was named the Astor Fellow at Oxford University. She is a fellow of the American Geophysical Union, and of the American Mineralogical Society, and in 2018 she was elected to the American Academy of Arts & Sciences. In January 2020, she was awarded The Arthur L. Day Prize and Lectureship, by the National Academy of Sciences, for her lasting contributions to the study of the physics of Earth, and for illuminating the early evolution of rocky planets and planetesimals. Dr. Elkins-Tanton received her B.S., M.S., and Ph.D. from MIT. Together we are working toward a positive space exploration future, and toward creating a generation of problem-solvers.



JOSE HURTADO

Dr. Hurtado's research expertise is in field geology; remote sensing (including Unmanned Aerial Systems); and terrestrial/planetary tectonics and geomorphology. He applies this expertise in two broad research areas: lunar geology and active tectonics in the Bhutan Himalaya. Dr. Hurtado's lunar geology work has focused on the use of remotely-sensed datasets to investigate the potential resources on the Moon and their geologic context. This has included using thermal infrared data to discover and characterize caves in the lunar subsurface, hyperspectral data to map the presence of water and titanium, and topographic data to identify water-related volcanic



features. He has also conducted work at planetary analog sites to show how shallow geophysical tools (e.g., gravity, magnetics, GPR) can be used to characterize water-related explosive volcanic features on other planets as well as how other field deployable instrumentation can be used for planetary surface exploration. His Bhutan work has focused on field studies of Quaternary geomorphologic features (river terraces, fault scarps, etc.) that record ongoing tectonic uplift in the Himalaya. The objective of this work is to evaluate models for the evolution of the Bhutan Himalaya and assess seismic hazards. In addition to these research areas, Dr. Hurtado also has expertise in human space exploration through ongoing collaborations with NASA in mission simulation activities and astronaut crew training. Dr. Hurtado has also worked on various commercial spaceflight projects, including passenger training program and vehicle development with Virgin Galactic.

SANDRA MAGNUS

Dr. Sandra H. “Sandy” Magnus, is the Principal at AstroPlanetview, LLC and the former Deputy Director of Engineering in the Office of the Secretary of Defense Research and Engineering. Prior to joining the DoD she served as the Executive Director of the American Institute of Aeronautics and Astronautics (AIAA), the world’s largest technical society dedicated to the global aerospace profession. Selected to the NASA Astronaut Corps in April, 1996, Dr. Magnus flew in space on the STS-112 shuttle mission in 2002, and on the final shuttle flight, STS-135, in 2011. In addition, she flew to the International Space Station on STS-126 in November 2008, served as flight engineer and science officer on Expedition 18, and returned home on STS-119 after four and a half months on board. Following her assignment on Station, she served at NASA Headquarters in the Exploration Systems Mission Directorate. Her last duty at NASA, after STS-135, was as the deputy chief of the Astronaut Office. Before joining NASA, Dr. Magnus worked for McDonnell Douglas Aircraft Company from 1986 to 1991, as a stealth engineer. While at McDonnell Douglas, she worked on internal research and development and on the Navy’s A-12 Attack Aircraft program, studying the effectiveness of radar signature reduction techniques.



SEAN MAHONEY

Sean Mahoney is the CEO of Masten Space Systems, an aerospace R&D and flight services company that creates and deploys reliable, reusable rocket vehicles and components. Since joining Masten in 2010 as Director of Business Operations, Sean has focused on building a sustainable, customer-funded business. He has been instrumental in establishing Masten as one of the rising stars in the New Space movement. He served as COO during 2011-2012 and was named CEO in 2013. Sean has over 15 years of corporate and technology industry experience, having founded and led a number of technology start-up ventures, and raised multiple rounds of private funding. Sean began his career overseeing technical sales and building internal organizations as a manager at AT&T’s Enterprise hosting division. Sean received his MBA from Emory University’s Goizueta Business School and serves in a leadership capacity for a number of entrepreneurship and environmental non-profit organizations.



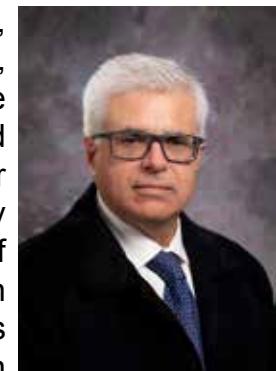
CANDICE MATTHEWS BRACKEEN

As a general partner at Lightship Capital, Candice Matthews Brackeen finds and funds tech innovators operating in underserved cities throughout the Midwest. Since the launch of the venture fund this year, under Candice's leadership Lightship Capital has raised nearly \$40MM for investment into minority owned, tech driven businesses ranging from Healthtech to Foodtech. Candice also directs programming at Hillman, a tech focussed entrepreneur education program, and NewMe, a bootcamp enriching startup founders with instruction in product development, brand building, leveraging artificial intelligence for business, fundraising, and more. Her dedication to minority innovation is tireless, as she lends herself to countless underrepresented tech startups and organizations as an advisor and mentor. Candice's early work as an involved organizer and recruiter for the Cincinnati tech ecosystem has contributed significantly to the city's startup growth, and on the legislative level, influenced equitable allocation Ohio of state funds to minority entrepreneurs. Her constant advocacy for underestimated regions and founders is motivated by her own experiences as a Black tech founder struggling to find meaningful mentorship and funding in and outside Silicon Valley. This foundation creates a personal connection to the founders Candice helps, each day.



MICHAEL MILLER

Dr. Michael Miller has over 36 years of experience as a physical and synthetic chemist, specializing in materials science, surface science, solid-state chemistry and physics, as well as molecular spectroscopy. The main thrust of his work has been on the development of first-principles theoretical models and experimental methods aimed at predicting or determining physical and chemical pathways for the formation or disposition of molecules and materials. He directs SwRI's Sorption Science Laboratory (S3L) – a research facility dedicated to investigating the gas sorption properties of natural and synthetic materials over a broad range of thermodynamic conditions. In the area of planetary studies, he has contributed to the needs of future lander missions that include the development of chemical processes for in situ propellant production (ISPP) on Mars, and led a team of scientist to develop an inverted surface enhanced Raman spectroscopy (iSERS) technique for biomarker detection. Most recently, he has been working on the experimental and theoretical determination of noble gas fractionation in Mars analogue systems, non-binary computing architectures based on photonic-molecular transduction, and modeling MW-IR and MW-Raman double resonance effects in molecular systems as the foundation for stand-off detection technologies.



DAVID MURROW

Dave Murrow is the Senior Manager of Deep Space Exploration Strategy and Business Development for Lockheed Martin's Corporation Space. In his current role he is responsible for positioning the company to support missions and technology development beyond earth orbit. He is focused on extending Lockheed Martin's proven heritage in robotic and human spaceflight into the next phase of exploration activities. Dave previously served as capture manager for NASA proposals, in both the science and human space flight areas. Dave has worked on space science and exploration missions in various roles such as navigator and systems engineer at Lockheed Martin, the Jet Propulsion Laboratory, Ball Aerospace, and as the owner of a small business. He was responsible for the launch campaigns of the 2 Mars '98 and the Stardust spacecraft, which were successfully launched in December 1998, January 1999, and February 1999. Dave has a Master's and Bachelor's degrees in Aerospace Engineering from the



University of Texas at Austin ('87) and the University of Colorado ('84). He has received several individual and group achievement awards for his work.

MICHELLE RODRIGUES

Michelle Rodrigues is Vice President, Federal Partnerships, and leads SRI International's federal business development and government relations teams. Michelle joined SRI in 2001 and has 20 years of experience delivering federal research and development funding across a range of scientific disciplines and federal agencies. She leads a team responsible for the full range of business development activities including opportunity identification, qualification and development; client relationship management; trend analysis; partnership development; capture strategy; and proposal support. She has experience working across life sciences, education and policy, computer sciences, engineering, physics, and technology transition markets. Before joining SRI, Michelle was an Administrative Manager in the Animal Nutrition Division at Cargill Inc. supporting buying and manufacturing of their animal feed line. She holds a B.S. in Animal Science and Management from the University of California, Davis and an M.B.A. from The George Washington University.



JESSY KATE SCHINGLER

Jessy Kate Schingler is the Director of Policy and Governance at the Open Lunar Foundation, which works to advance peaceful and cooperative futures on the Moon through policy and institutional design. She was one of the original researchers on the Space Security Index and one of the founding members of the Space Generation Advisory Council at UNISPACE III. Her background is in software engineering, where she worked on the founding team of the NASA Nebula cloud computing project (which became Open Stack), developed flight software for Astra's rockets 1.0 and 2.0, and Open Government data with the Sunlight Foundation. Jessy Kate is an affiliate researcher at the Berkman Klein Center at Harvard and the French Centre National de la Recherche Scientifique (CNRS). She is an alumnus of the Fellowship for Good at the Institute of the Future, and the Innovation Fellowship at the City and County of San Francisco. She achieved a B.Sc. in Astrophysics from Queen's University, Canada, and an M.Sc. in Computer Science at the Naval Postgraduate School in Monterey, CA, and has 2 years towards a PhD in distributed computing.



GREG SCHMIDT

Greg Schmidt serves as Director of the Solar System Exploration Research Virtual Institute (SSERVI), located in the NASA Research Park at Ames Research Center. Prior to his current position, Schmidt served as Associate Director for Strategic Planning in the Ames Research Center Science Directorate. He also was a co-founder of the NASA Ames Space Portal, an organization which promotes activities in Entrepreneurial Space, in which he led development of an effort studying a commercially leveraged lunar science campaign. Within the Space Portal he also established the first known class in space entrepreneurship and established a Center for Space Biotech at San Jose State University. As Associate Director, Schmidt also established the Space Tech Center at the NASA Research Park, and led development of NASA's Generations initiative through the Office of Biomedical



and Physical Research, which was proposed to Congress in the FY2001 budget. Schmidt was one of the core team who developed the science of astrobiology in the late 1990s, leading the team that developed the first Astrobiology Roadmap and heading the Astrobiology Integration Office at Ames Research Center. In the mid-1990s Schmidt served at the NASA HQ Life Sciences Division, where his work led to two successful Space Shuttle demonstrations of “electronic nose” and miniature mass spectrometer experiments. At NASA HQ, he also co-developed the Advanced Human Support Technologies program, and led a collaboration with the National Cancer Institute which leveraged NASA and DOD technologies for the early detection of breast cancer. Schmidt is an Associate Fellow with the American Institute for Aeronautics and Astronautics and has received multiple awards from NASA for his accomplishments.

GEORGE SOWERS

Dr. George Sowers has 30 years of experience in the space transportation field working for Martin Marietta, Lockheed Martin and the United Launch Alliance (ULA). In 2017, he retired from his position as Vice President and Chief Scientist at ULA where his team developed an architecture for fully reusable in-space stages fueled by propellant mined, refined and distributed in space. Dr. Sowers is now a professor at the Colorado School of Mines as part of the world's first and only graduate program in space resources. His current research interest is developing the ice resources of the Moon to fuel the cislunar economy. He holds a BS in Physics from Georgia Tech and a PhD in Physics from the University of Colorado. Dr. Sowers is a fellow of the American Institute of Aeronautics and Astronautics (AIAA).



NIKI WERKHEISER

Niki Werkheiser serves as the Director for Technology Maturation in the Space Technology Mission Directorate (STMD) at NASA Headquarters. In this role, she leads the advancement of key technologies for future space missions, including establishing policy, formulating budgets, and providing the technical leadership required for implementation. The technology maturation portfolio includes the Game Changing Development (GCD) Program, as well as the Lunar Surface Innovation Initiative (LSII), which spurs the creation of novel technologies needed for lunar surface exploration. Ms. Werkheiser has over 25 years of experience developing and flying new technologies and has cultivated a proven approach to managing complex projects. She is particularly passionate about creating competitive programs and public-private partnerships across government, industry, academia, and non-profit organizations. She has received numerous awards and honors, including NASA's Silver Snoopy and Outstanding Leadership Medal and the American Astronautical Society Space Technology Award. Ms. Werkheiser holds a Master of Science Degree from the University of Alabama at Huntsville with an emphasis in Gravitational and Space Biology, as well as a Bachelor of Science in Biology and a Bachelor of Arts in Russian Language and Studies.



KRIS ZACNY

Dr. Kris Zacny focuses on robotic space mining and drilling, sample handling, geotechnical systems, and Situ Resource Utilization (ISRU). Previously, Dr. Zacny managed mining projects and production in South Africa. Dr. Zacny earned a Ph.D. in extraterrestrial drilling and mining, and an ME in Petroleum Engineering from University of California, Berkeley, as well as a B.Sc. in Mechanical Engineering from University of Cape Town. Dr Zacny has over 200 publications, including several edited books. He participated in drilling expeditions to Antarctica, the Atacama Desert, the Arctic, Greenland, Mauna Kea, and the Mojave Desert. Dr. Zacny has over 40 NASA New Technology Records and four NASA Group Achievement Awards. He is a PI of PlanetVac pneumatic sample delivery system for CLPS and TRIDENT ice mining drill for VIPER and PRIME1.



[LRC-1965-B701_P-04813](#): Lunar Landing Research Facility (LLRF) in operation - The Lunar Landing Research Facility at Langley Research Center has been put into operation.

NASA News

New NASA Partnerships to Mature Commercial Space Technologies, Capabilities

09 November 2020 (Release 20-113) – NASA has selected 17 U.S. companies for 20 partnerships to mature industry-developed space technologies for the Moon and beyond. The NASA and industry teams will design a 3D printing system for NASA's Artemis lunar exploration program, test a simple method for removing dust from planetary solar arrays, mature a first-stage rocket recovery system for a small satellite launch provider, and more. Various NASA centers will work with the companies, ranging from small businesses and large aerospace companies to a previous NASA challenge winner, to provide expertise and access to the agency's unique testing facilities. The partnerships aim to accelerate the development of emerging space capabilities. [Click here](#) to read more.

NASA Seeks New Partners to Help Put All Eyes on Artemis Moon Missions

05 November 2020 (Release 20-110) – NASA is seeking new partners to help the agency tell the story of human exploration at the Moon with the Artemis program in ways that engage, excite, and inspire a worldwide audience. Through the end of this decade, NASA will explore more of the lunar surface than ever before and will establish a sustainable human presence with Artemis in preparation for future human missions to Mars. The agency has released an Announcement for Proposals calling for submissions of potential partnerships to visually bring the public along for the ride in new ways, starting as early as a trip around the Moon with astronauts on the Artemis II mission, targeted for 2023. Proposals are due by 11:59 p.m. EST, Dec. 11, 2020. [Click here](#) to read more.

Community Bulletin Board

Hawaii Volcanic Basalt: ISRU Research and Development for the Moon and Mars

Submitted by Rodrigo Romo and Chris Yoakum, PISCES

One of the key challenges for a sustained human presence on the Moon is identifying ways to utilize lunar resources to build durable infrastructure. Launch and landing pads, roadways, livable habitats and other structures will require a sturdy and proven ISRU process that can turn raw, native resources into useable materials. One of the best mediums for finding solutions to this problem may be Hawaiian volcanic rock. The Pacific International Space Center for Exploration Systems (PISCES), a state-funded Hawaii aerospace agency, has been researching how volcanic basalt can inform ISRU construction applications on the Moon and Mars. Hawaii's barren volcanic landscapes share the desolate appearance of the lunar surface and also possess a similar chemical composition, making them a good simulant for ISRU processes. [Click here](#) to read the full article.

Lunar Open Architecture

Submitted by Ariel Ekblaw, MIT Space Exploration Initiative

How can we ensure a future for lunar exploration and settlement that is open, collaborative, and sustainable?

This fall, the MIT Space Exploration Initiative launched the [Lunar Open Architecture](#) (LOA), a project in collaboration with Open Lunar Foundation, to coalesce past and present mission data into an industry-wide knowledge map of exploration activity. The LOA tool offers an open-access view for technology trends and development roadmaps as we chart the future of the moon, together.



MIT Media Lab Research Takes Flight

Submitted by Ariel Ekblaw, MIT Space Exploration Initiative

Over the past few years, space research at the MIT Media Lab has visibly flourished, driven by both faculty and student initiatives, and largely led by women. Learn more about this work, and our presence this year at ASCEND: <https://medium.com/mit-media-lab/media-lab-research-takes-flight-c7f032d6e182>

Rice Space Institute, Canada agree to collaborate

Submitted by David Alexander, Rice Space Institute

Rice University's Rice Space Institute (RSI) and the Consulate General of Canada in Dallas have signed a memorandum of understanding to collaborate on science and technology related to the space industry. The agreement will facilitate Canada's participation in the already strong connections between Rice, NASA and its international partners, and the burgeoning commercial space industry. The agreement signed in a virtual event Nov. 20 sets up annual meetings between RSI and Canada's space administrators and industries to discuss potential collaborations that include robotics, life sciences, artificial intelligence, space vehicles and communications. [Click here](#) to read more.

Japanese Lunar Lander Company ispace Opens U.S. Office

Submitted by Kyle Acierno, ispace

ispace inc has opened its newest office in Denver, CO. The company will be focused on developing a large lunar lander to deliver ISRU equipment to the Moon. We are hiring a large team and there are many positions open now. [Click here](#) to read more.