Investigating the Final Frontier: Engineering the Future of Space Exploration

Session Co-Chairs: Jessica Samuels, Jet Propulsion Laboratory, and Allison Anderson, University of Colorado Boulder

Advancing human knowledge through space exploration requires engineering systems under some of the most highly constrained conditions. The harsh environment, limited mass/power/volume resources, and the high data quality required on each mission necessitates advanced engineering. By their very nature, missions of exploration must be designed and optimized under uncertainty. The hardware sent on these expeditions are often the first of their kind to visit their ultimate destination and thus require new and evolved methods in doing so. Every element must be engineered from the beginning to achieve its science and exploration mission

Space exploration comes in many forms. It may include sending satellites, probes, or rovers to explore on-site at a moon, planet, or asteroid. Alternatively, it could be gathering information through observation and sensing beyond our solar system to understand our galaxy and the Universe. Finally, sending people with their advanced reasoning, ingenuity, and adaptability to explore our Moon or Mars is the future of human space exploration. The speakers in this session will discuss the importance of engineering for space exploration and how their work will contribute to the next major advances in understanding our planet, solar system, and universe.

Speakers:

Exploring Time and Space: The Future of Space-based Astronomical Observatories
Allison Barto, Ball Aerospace

Bio: Allison has spent her career supporting large, complex, multi-disciplinary challenges and excels in making the complex clear. She spent 17 years in both technical and leadership roles for the James Webb Space Telescope at Ball Aerospace, where she led the team responsible for both delivery of the optics and electronics for the 22-foot-wide Telescope, as well the overall optical design, verification, and on-orbit optical phasing and commissioning of the Observatory. She is currently managing a mission to provide next-generation microwave imaging to measure ocean surface vector winds and snow-ice depth. In addition to direct mission-level leadership, Allison is looking to the future of space telescopes through involvement in NASA's recent in-Space Assembled Telescope study, participation in the National Academies Astro2020 decadal survey, and as a member of the Management Advisory Committee for the European Southern Observatory's Extremely Large Telescope program. During her 22-year career at Ball, Allison has also contributed to the Hubble Space Telescope science instruments, the Large Synoptic Survey Telescope, and Earth-observing missions and is a fellow with SPIE. When not building the next generation astronomical observatories and earth-sensing systems, Barto works to promote in-space assembly and servicing capabilities to enhance space-based infrastructure and fuels her passions for STEM by participating in education outreach, promoting inquiry based learning, and educational equity and opportunity. Barto served as the co-lead of the Ball Corporation Women's Resource Group from 2012-2018, supporting the corporation's Diversity & Inclusion goals to support women at Ball and the next generation of female STEM professionals.
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Design of Space Systems to Enable In-space Assembly and Servicing
Bo Naasz, NASA

Bio: Bo Naasz currently leads NASA's agency-level Rendezvous and Capture System Capability Leadership Team and is the primary editor of NASA STMD's On-Orbit Servicing, Assembly, and Manufacturing (OSAM) Strategic Technology Plan. Bo Naasz is a graduate of Virginia Tech, with Bachelor's and Master's Degrees in Aerospace Engineering. His current duties include stewardship, strategy, and advising of NASA leadership on issues relevant to capabilities in Rendezvous and Capture and OSAM. Previously, Bo Naasz served as technical authority and Mission System Engineer for the OSAM-1 (formerly Restore-L) satellite servicing mission, and Project Manager for the Asteroid Redirect Mission's Capture Module, both at NASA's Goddard Space Flight Center. While his most recent duties are directed towards Agency-level strategy, mission systems engineering, and project management, his background is in spacecraft guidance navigation and control (GNC), with a focus on navigation and control of multiple spacecraft and robotics for formation flying and autonomous rendezvous, proximity operations, and capture, and small-body terrain relative navigation and control.
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Gathering Asteroid Dust, Guided by OSIRIS-Rex Images
Daniella DellaGiustina, University of Arizona
Bio: Daniella ("Dani") DellaGiustina is an R&D Engineer/Scientist IV at the University of Arizona's Lunar and Planetary Laboratory in Tucson, Arizona. Her research focuses on the remote sensing of asteroid surfaces and planetary seismology. In particular, she investigates data sets collected by robotic spacecraft and through fieldwork in terrestrial "analogs", which are sites on Earth that have similarities to other places in the solar system. She is a co-investigator on NASA's OSIRIS-REx sample return mission currently visiting asteroid Bennu, where she leads the image processing team. The OSIRIS-REx (acronym for "Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer) mission is NASA's latest engineering endeavour to collect pristine carbonaceous regolith from Bennu to understand both the role that primitive asteroids may have played in the origin of life on Earth and how they served as one of the fundamental "building blocks" of planet formation.
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Mars-Walking: Enabling Capabilities for Crew Health and Performance during Exploration Extravehicular Activty
Andrew Abercromby, NASA Johnson Space Center

Bio: Andrew has fourteen years' experience as an engineer, scientist, research diver, and human guinea pig at NASA's Johnson Space Center in Houston, Texas, working on the design and testing of spacecraft and spacesuits. Andrew is the lead of NASA's EVA Physiology Laboratory (EVA = spacesuits) and also serves as EVA Scientist for the Biomedical Research and Environmental Sciences Division, which means that he tries very hard to coordinate spacesuit-related research activities across a lot of different laboratories and tests. Andrew's work at NASA has included leading tests, and being tested upon, in a variety of laboratory and field environments including NASA's Neutral Buoyancy Laboratory, reduced-gravity research aircraft, the Arizona desert, an impact crater in the High Arctic, and a glacier in Antarctica. Andrew lived underwater for two weeks in the Aquarius research habitat four miles off the coast of Florida as a crewmember on the NASA Extreme Environment Mission Operations (NEEMO) 14 mission and piloted a single-person submersible during NEEMO 16, which was really cool. Andrew enjoys being asked to dive while at work and has been fortunate to do so as a NEEMO Working Diver in the Florida Keys, as a Scientific Research Diver in the lakes of British Columbia, and as a Really Quite Cold

Research Diver beneath 4 meters of ice in the mountain lakes of Antarctica. Andrew has previously worked on the design and testing of spacesuits and spacecraft in NASA's Neurosciences Laboratory, Anthropometry and Biomechanics Facility (ABF), Multi-Mission Space Exploration Vehicle project, and the X-38 project in NASA's Flight Mechanics Laboratory. Andrew spends much of his time working from the Pacific coast of California where he lives with his wife and two young daughters and also works as a paid-call firefighter with CAL FIRE / San Luis Obispo County Fire.

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