National Aeronautics and
Space Administration

SSERVI
Cooperative Agreement Notice 4 (CAN-4)
Town Hall Meeting

April 28, 2022

Solar System Exploration Research

Virtual Institute

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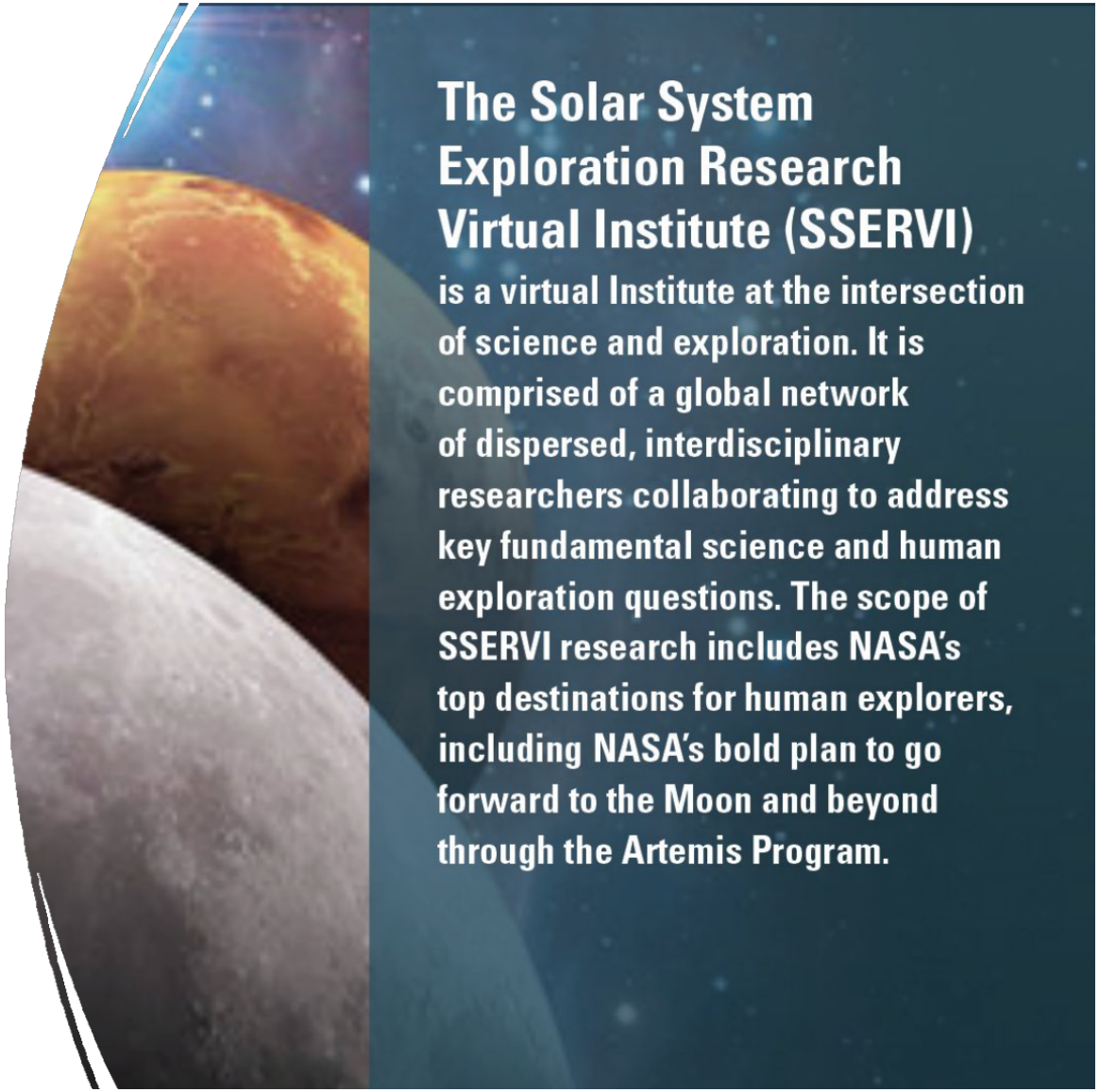
Deputy Director, NASA SSERVI



SSERVI as a Virtual Institute

SSERVI was established in the virtual institute model to:

- Advance lunar science and human exploration through cooperative, peer-reviewed teams
- Support and develop the community

SSERVI

- Was founded in 2008 as NASA Lunar Science Institute
- In 2013, NASA HQ broadened research topics for SSERVI to include NEAs and Martian moons in response to Administration direction
- SSERVI has also responded to Artemis by pivoting with increased focus on lunar exploration research

Jointly funded by HEOMD/ESDMD and SMD since inception, SSERVI is a major bridge between the two directorates, with a focus on…

science *enabling* human exploration and science *enabled by* human exploration

SSERVI utilizes the Cooperative Agreement funding method which complements Research and Analysis (R&A) opportunities in Space and Earth Science (ROSES) grants within the R& A Program.

R&A Grants	SSERVI
Shorter Duration (~2-3 yrs)	Longer Duration (5+ years)
Smaller Award Amounts	Larger Award Amounts
Focused Tasks	Responsive Research
Drives Competition	Promotes Collaboration

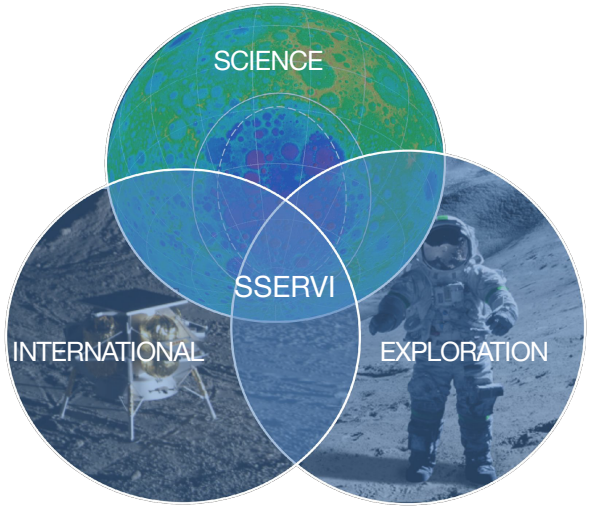
SSERVI Cooperative Agreements promote:

- Cooperation vs. competition
- Stable /long term funding = Efficiency
- Enables/promotes early career scientist and diversity on teams
- Flexibility to respond to novel results

SSERVI Overview

SSERVI Program Elements:

- Currently 12 overlapping domestic teams, funded in 2017 and 2019, each with 5-year cooperative agreements (see: https://sservi.nasa.gov/sserviteams/)
  - Over 1100 publications since institute became SSERVI in 2013
  - Over 250 funded researchers and students
- 11 international partners with major focus on lunar science and missions
- Solar System Treks Project (SSTP) – a visualization tool for missions and science
- Central Office
  - Leadership and overall institute direction
  - Planning and management of domestic teams and international partnerships
  - Community development and support through a wide variety of activities



Current SSERVI US Teams

CAN-2 Teams (2017-2022)

- NESS - Network for Exploration and Space Science

  Prof. Jack Burns, University of Colorado, Boulder, CO

- ESPRESSO - Exploration Science Pathfinder Research for Enhancing Solar System Observations

  Dr. Alex Parker, Southwest Research Institute, Boulder, CO

- TREX - Toolbox for Research and Exploration
  Dr. Amanda Hendrix, Planetary Science Institute, Tucson, AZ

- REVEALS - Radiation Effects on Volatiles and Exploration of Asteroids & Lunar Surfaces

  Prof. Thomas Orlando, Georgia Tech, Atlanta, GA

CAN-3 Teams (2019-2024)

- CLASS - Center for Lunar and Asteroid Surface Science

  Prof. Daniel Britt, University of Central Florida, Orlando, FL

- ICE FIVE-O - Interdisciplinary Consortium for Evaluating Volatile Origins

  Dr. Jeffrey Gillis Davis, Washington University, St. Louis, MO

- RISE2 - Remote, In Situ, and Synchrotron Studies for Science and Exploration 2

  Prof. Timothy Glotch, Stony Brook University, Stony Brook, NY

- RESOURCE - Resource Exploration and Science of OUR Cosmic Environment

  Dr. Jennifer L. Heldmann, NASA Ames Research Center, Moffett Field, CA

- IMPACT - Institute for Modeling Plasma, Atmospheres and Cosmic Dust

  Prof. Mihaly Horanyi, University of Colorado, Boulder, CO

- LEADER - Lunar Environment And Dynamics for Exploration Research

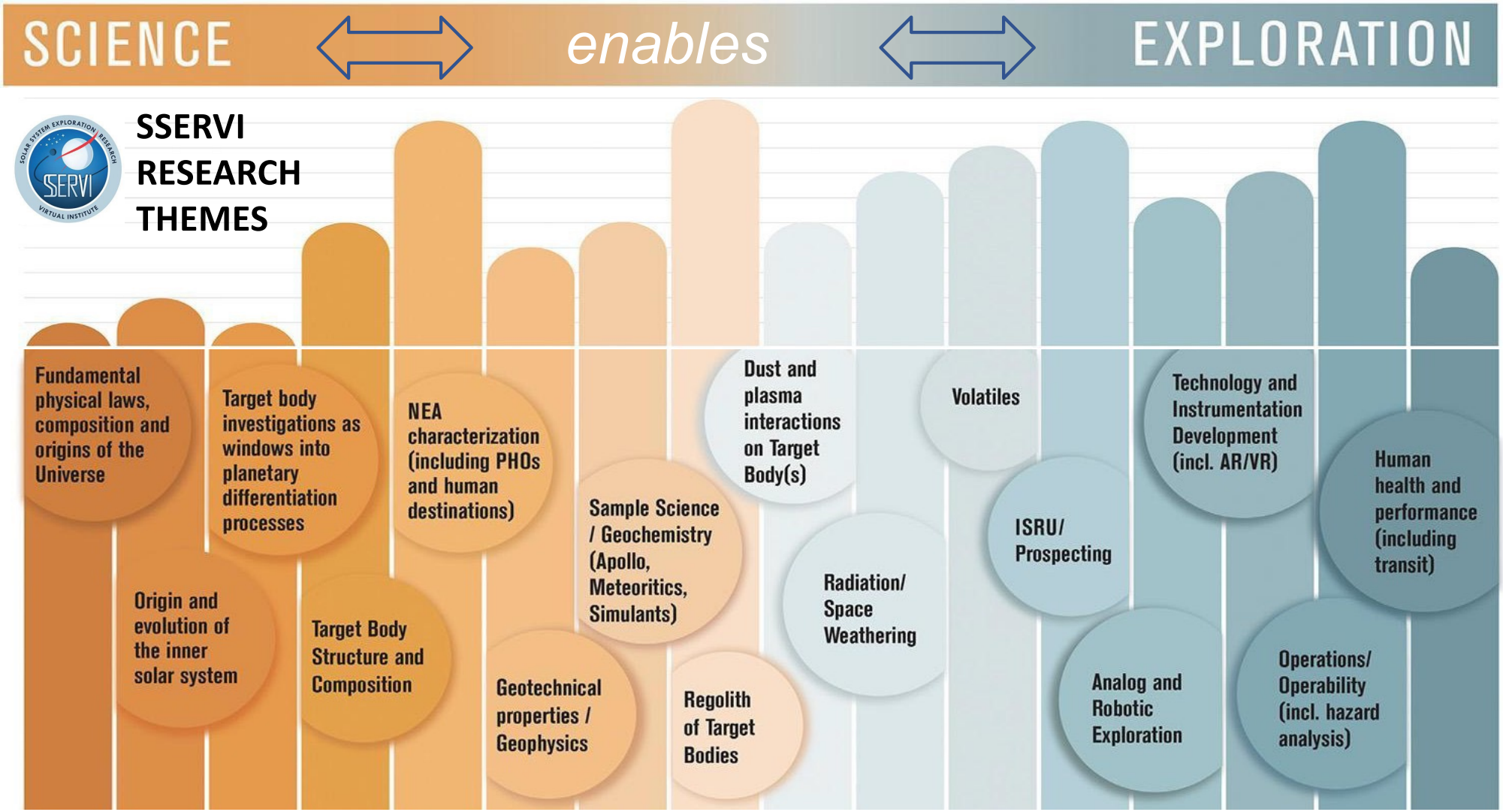
  Dr. Rosemary Killen, NASA Goddard Space Flight Center, Greenbelt, MD

- CLSE – Center for Lunar Science and Exploration

  Dr. David A. Kring, Lunar and Planetary Institute, Houston, TX

- GEODES - Geophysical Exploration Of the Dynamics and Evolution of the Solar System

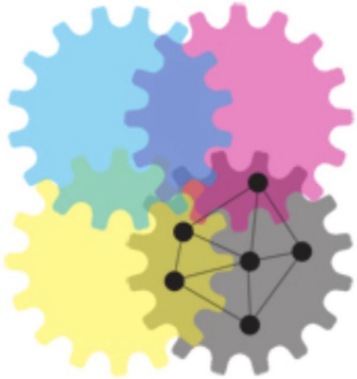
  Dr. Nicholas Schmerr, University of Maryland, College Park, MD


SCIENCE
enables
EXPLORATION
SSERVI
RESEARCH
THEMES
Fundamental physical laws, composition and origins of the Universe
Origin and evolution of the inner solar system
Target body investigations as windows into planetary differentiation processes
Target Body Structure and Composition
NEA characterization (including PHOs and human destinations)
Geotechnical properties / Geophysics
Sample Science / Geochemistry (Apollo, Meteoritics, Simulants)
Regolith of Target Bodies
Dust and plasma interactions on Target Body(s)
Radiation/ Space Weathering
Volatiles
ISRU/ Prospecting
Analog and Robotic Exploration
Technology and Instrumentation Development (incl. AR/VR)
Operations/ Operability (incl. hazard analysis)
Human health and performance (including transit)

SSERVI Mission Statements

1. Advance human exploration of the solar system through scientific discovery

2. Conduct cross-disciplinary research between the science and exploration communities



3. Provide scientific, technical, and mission-defining analyses for relevant NASA programs, planning, and space missions as requested by NASA

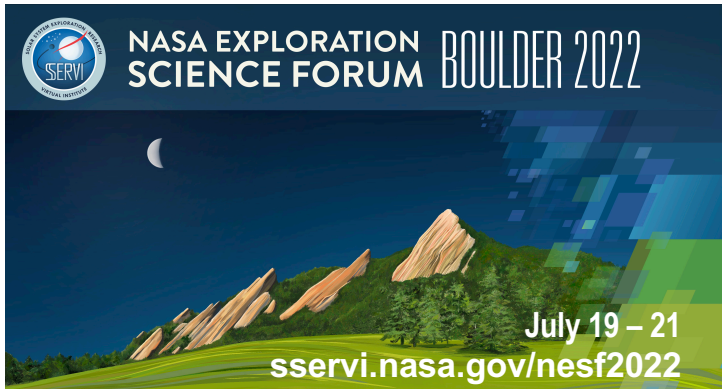
4. Explore innovative ways of using information technology for scientific collaboration and information dissemination across geographic boundaries

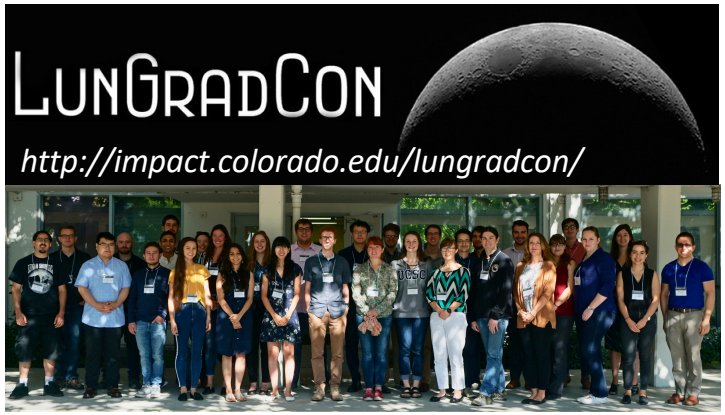
5. Train the next generation of explorers and encourage global public engagement

Team Collaboration

- The virtual institute structure derives its strength from the interdisciplinary and collaborative nature of its Teams.
  - Each selected Team will be expected to (non-exhaustive list):
    - Participate in **monthly SSERVI Executive Council meetings** (PI or Deputy PI(s) only) which serve as a forum for the exchange of technical and scientific information, as well as the exchange of individual viewpoints concerning priorities and opportunities for further collaboration.
    - Host visiting SSERVI Central Office personnel and other Team PIs for **Team site visits**
    - Have Team representative(s) participate in the **annual NASA Exploration Science Forum (NESF)**, including serving on the Science Organizing Committee as requested
    - Make scientifically useful information, such as scientifically relevant publications, data, and software, publicly available
    - Support **SSERVI's IDEA activities** via the IDEA Focus Group and periodic virtual or in-person IDEA meetings
    - Provide several types of routine reports as outlined in the CAN

Community Development

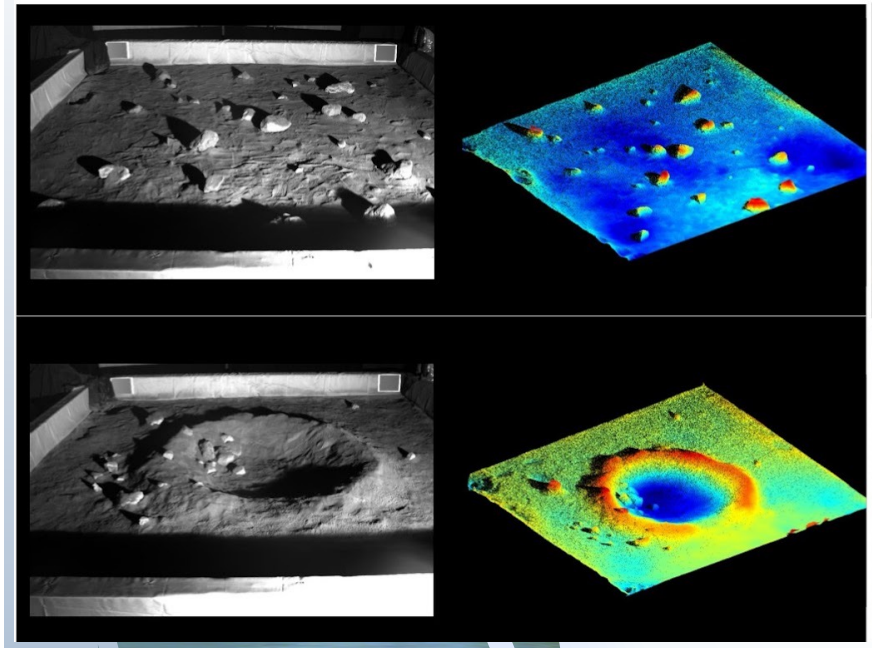


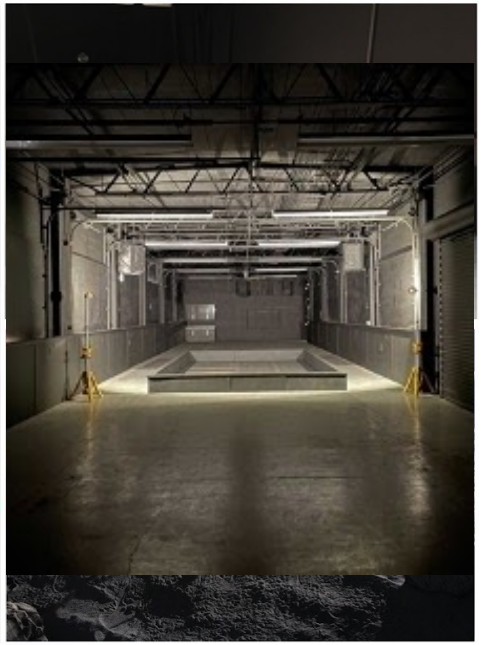


SSERVI Central supports numerous events and programs to help develop the planetary science and exploration communities. These include, but are not limited to:

- SSERVI sponsors **community-led Focus Groups**. Topics are identified and organized by community members. Current active groups include the following (more info at https://sservi.nasa.gov/focus-groups/):
  - Field Analogs
  - Inclusion, Diversity, Equity and Accessibility (IDEA)
  - Volatiles
- The annual **NASA Exploration Science Forum (NESF)** unites science and exploration-related research related to lunar objectives of Artemis and other future human and robotic exploration.
- SSERVI supports the annual **LunGradCon** with networking opportunities, public presentation experience, as well as funding for travel and lodging.
- The **NASA Postdoctoral Program (NPP)** prepares future leaders for NASA and the academic community.
- SSERVI sponsors the **European Lunar Symposium (ELS)** which has helped rebuild the European lunar community and foster international collaborations. (May 24-26, 2022: https://sservi.nasa.gov/els2022/)

Lunar Regolith Testbed at NASA Ames





The SSERVI-managed Regolith Testbed is available to the planetary science community-- including commercial and international developers-- to conduct studies on optical sensing, drill testing, ISRU ID and extraction techniques, and remote robotic activities.

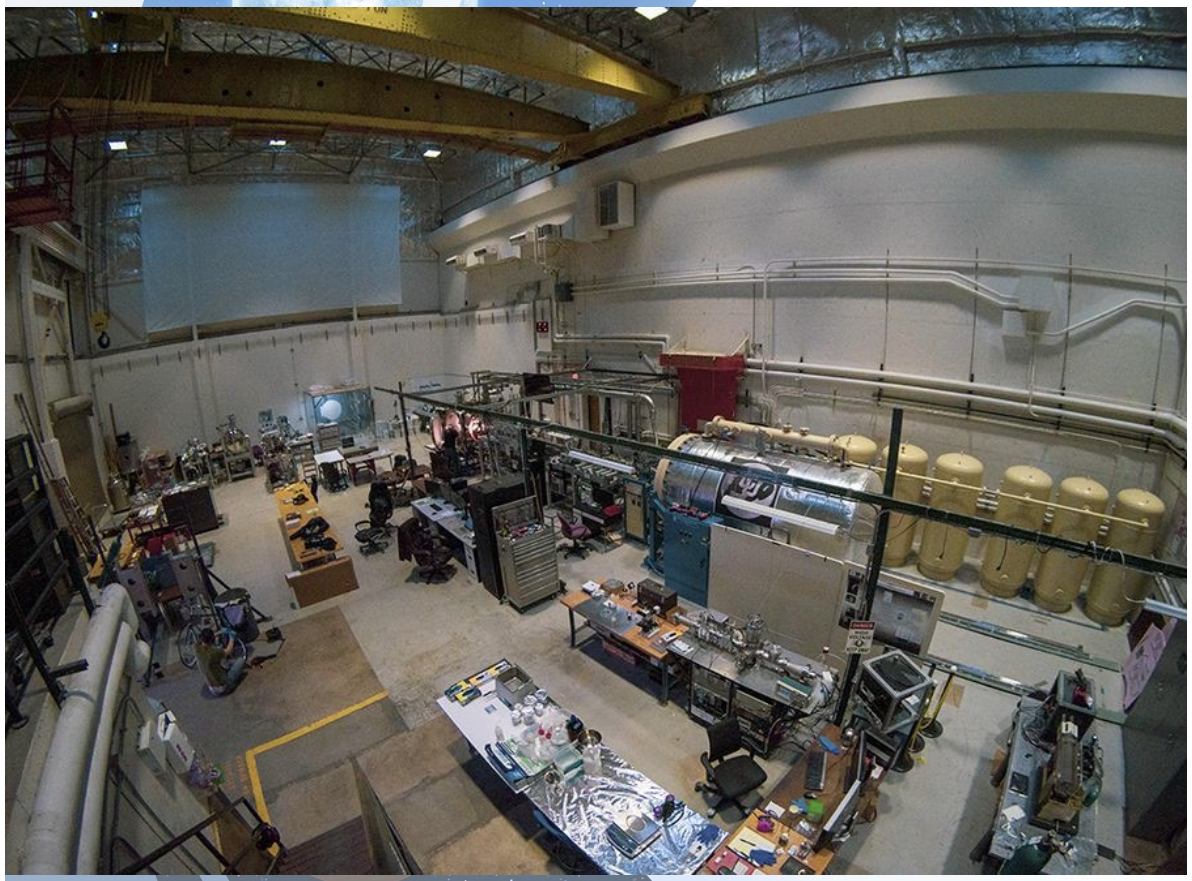
The Regolith Testbed is an excellent test environment for the next phases of the Artemis Program.

The facility contains two testbeds: one 4m x 4m testbed with ~8 tons of JSC-1A lunar lowlands regolith simulant, and a second testbed with over 20 tons of Anorthosite highlands simulant with basaltic glasses.

Past users include:

- NASA VIPER Mission;
- Ames Research Center Intelligent Systems Division and Planetary Systems Branch;
- Universal Studios,
- and SSERVI Teams.

Hypervelocity Dust Accelerator: IMPACT Team, PI M. Horanyi



SSERVI funding enabled development of a unique facility for accelerating dust particles to high velocities (0.5 – 120 km/s).

Continued development through multiple funding cycles resulted in extended capabilities:

a) cryogenic targets to study ice erosion in permanently shadowed lunar polar regions, as well as ices in the outer solar system; and b) gas targets to study meteoroid ablation in our atmosphere to improve the analysis of decades-long meteor radar observations and improve our models of the near-Earth dust environment.

The facility was used to develop, test and calibrate dust detectors for NASA missions: the Lunar Dust Experiment (LDEX) flown onboard LADEE, the Surface Dust Analyzer (SUDA) for the upcoming Europa Clipper and the Interstellar Dust Experiment (IDEX) for the IMAP missions. It continues to support several NASA missions, including the ongoing Parker Solar Probe and New Horizons missions.

The facility is open to the US and international lunar, planetary, and heliospheric communities.

Other SSERVI Facilities

Other SSERVI Facilities available to the community include**:**

- **PLANETAS Lab** at NASA Ames (field portable instrumentation available to the community).
- **Exolith Regolith Simulant Manufacturing** Lab (U. Central Florida)
  - Provides simulant for important exploration and science tests
  - Largest supplier in world; shipped >2418 Kg to 352 unique customers
- **Ultra High Vacuum Ice and Gas Target** Chambers (U. Colorado)
- **Radiation Facility** (NASA GSFC)
- **Microgravity Drop Tower** (U. Central Florida)
- **Vibrational Spectroscopy Lab** (Stonybrook U., NY)
- **Physical Properties Lab** (U. Central Florida)

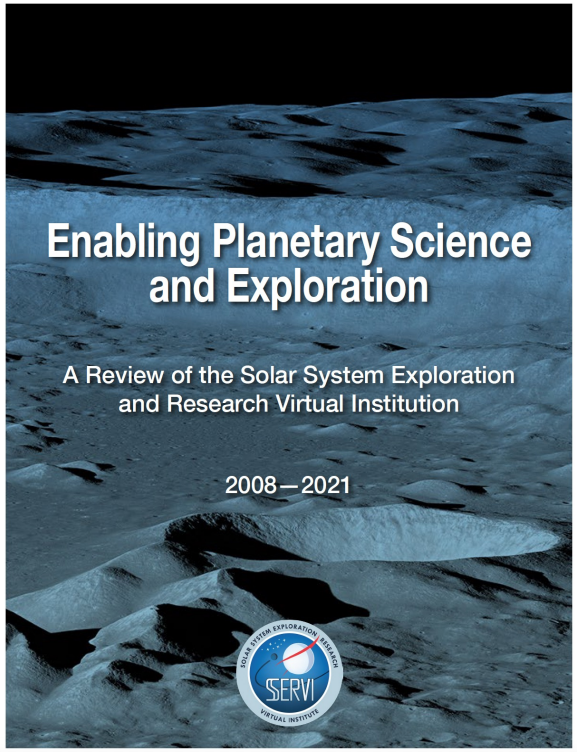
SSERVI
Facilities Website: https://sservi.nasa.gov/science/facilities/

INTERNATIONAL COLLABORATIONS

A network of 11 International teams leverage government, academia, and industry to advance science and engineering technologies on a no-exchange-of-funds basis.

U.S. proposers are encouraged to foster collaborations involving international partners, particularly existing SSERVI international partners (http://sservi.nasa.gov/internationals/), on a no-exchange-of-funds basis. Note that this CAN does not solicit for international lead institutions.

SSERVI Review



At the request of NASA's Director for the Planetary Science Division within the Science Mission Directorate (SMD) and in response to the mid-term Planetary Science Decadal Survey, a Senior Review Panel was tasked with conducting a formal Institute Review in 2021.

The Senior Review Panel findings were published in a report "Enabling Planetary Science and Exploration" which provided helpful direction for the Artemis era: https://www.lpi.usra.edu/NASA-academies-resources/sservi-report-300-dpi-01072022.pdf

SSERVI CAN Overview

Sarah Noble, SSERVI Program Scientist
Amanda Nahm, SSERVI Deputy Program Scientist
Jake Bleacher, Chief Exploration Scientist for ESDMD

SSERVI Proposal Requirements

Research Plan
The proposed research focus including objectives, expected significance, methodology, technology and general plan of work.

Other Institute Objectives
Proposals must include separate Inclusion and IDEA Plans, Code of Conduct, Science Activation, Citizen Science, and Public Engagement (SA/CS/PE), and SSERVI Mission Plans.

Budget
The proposal budget consists of 1) the Budget Narrative and 2) the Budget Details.

Data and Sample Management Plan
The guiding philosophy behind this requirement is that all relevant scientific information should be made publicly available and preserved.

Additional Requirements for Field Work
Proposals including field research must include a description of their field site that demonstrates a respect for the values of other users of the site and a field code of conduct for field teams.

Science Management Plan
Proposals should thoughtfully address the approach to Team management, discussing how Team members and their individual contributions would be integrated into a productive whole.

Relevance section
Demonstration of the proposal's relevance to the Institute's guiding premise that science and exploration are fundamentally entwined and the defined CAN scope.

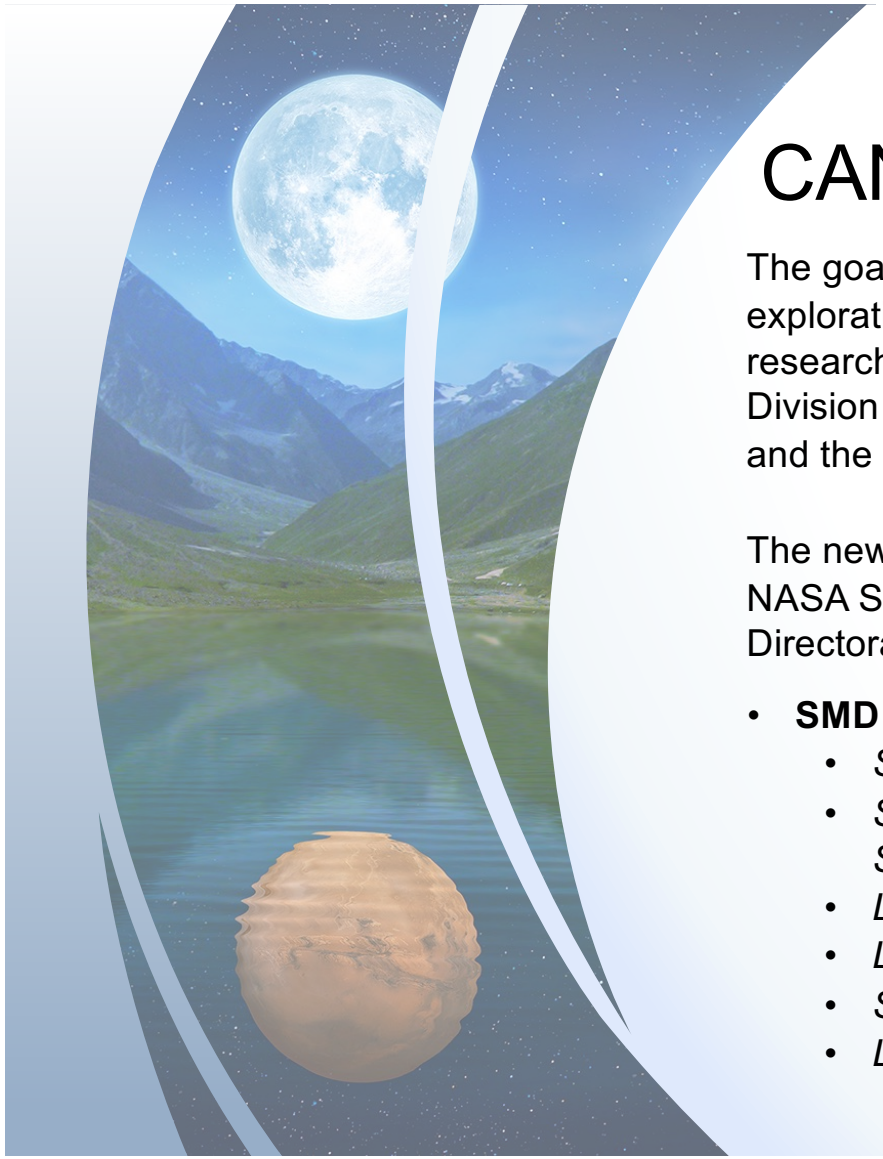
Key Attributes for a Successful Team

Proposed research has a multi-disciplinary and collaborative approach and proposal themes all relate to the overall research focus

Innovative questions and approaches for scientific and/or exploration research

Demonstrated understanding and commitment of the PI and team will be an active participant in the other Institute's objectives and cooperative endeavors (e.g., video seminars, workshops, focus groups, mentoring of students, IDEA, public engagement)

Creative approach to creating inclusive, diverse, equitable and accessible teams supported by strong codes of conduct for team collaboration and field work

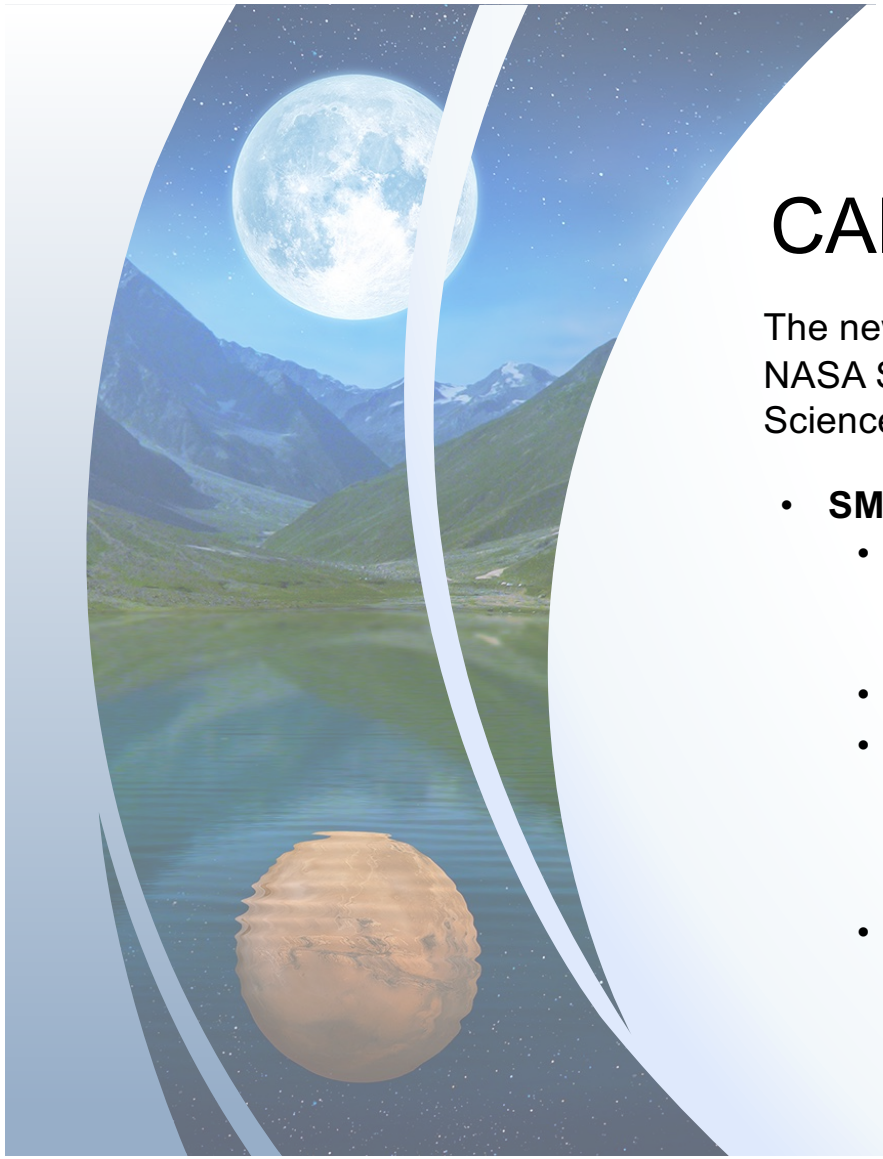


CAN Objectives Overview (Sec. 1.3)

The goal for SSERVI proposals is an integrated approach to science and exploration research that complements planetary science and exploration research goals of the Science Mission Directorate (SMD) Planetary Science Division (PSD) and the Biological and Physical Sciences Division (BPS), and the Exploration Systems Development Mission Directorate (ESDMD).

The new lunar focus includes the following research areas relevant to the NASA Science Mission Directorate (SMD) Planetary Science Mission Directorate (PSD):

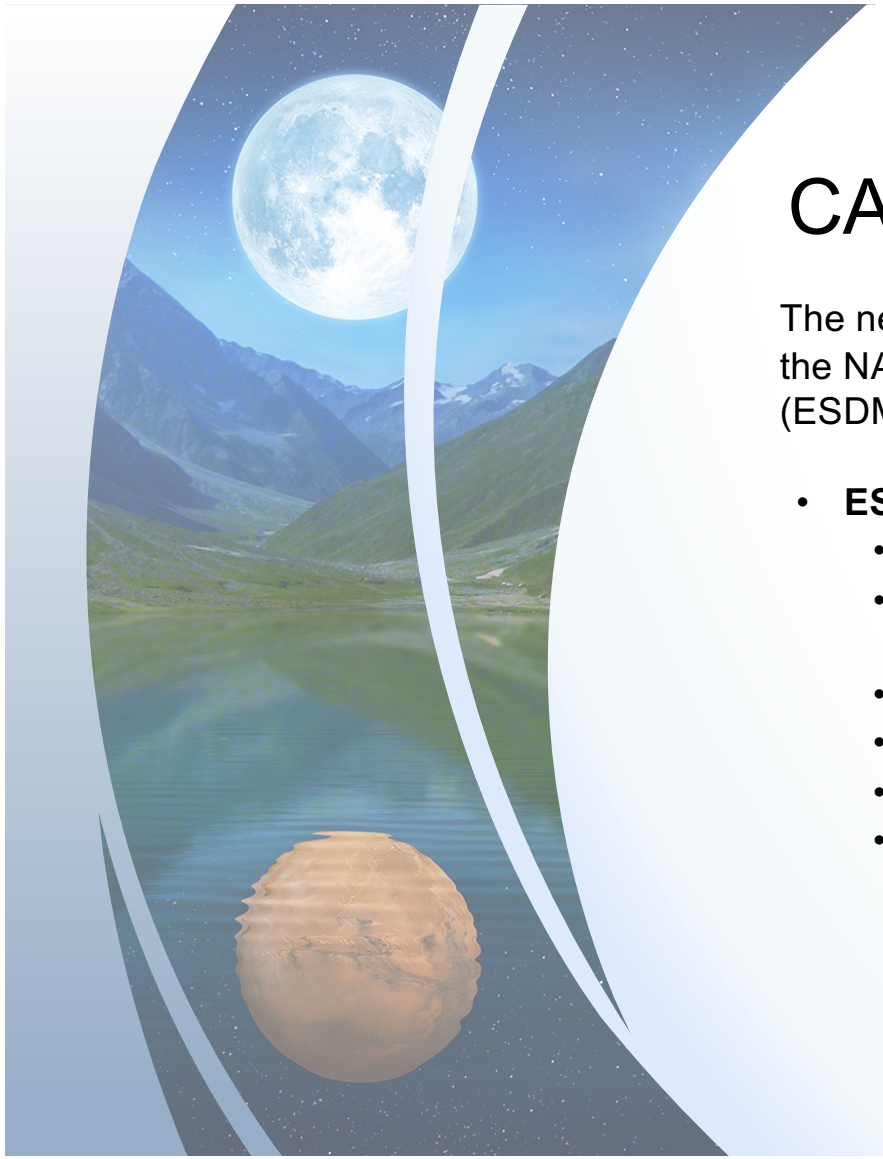
- **SMD PSD:**
  - *Studies of the Moon*
  - *Studies of the origin and evolution of the planetary bodies, the Solar System, and universe as informed by the Moon*
  - *Lunar volatiles and permanently shadowed regions (PSRs)*
  - *Lunar regolith*
  - *Sample science, including returned lunar samples and meteorites*
  - *Lunar dust*



CAN Objectives Overview (Sec. 1.3)

The new lunar focus includes the following research areas relevant to the NASA Science Mission Directorate (SMD) Biological and Physical Sciences (BPS) Division:

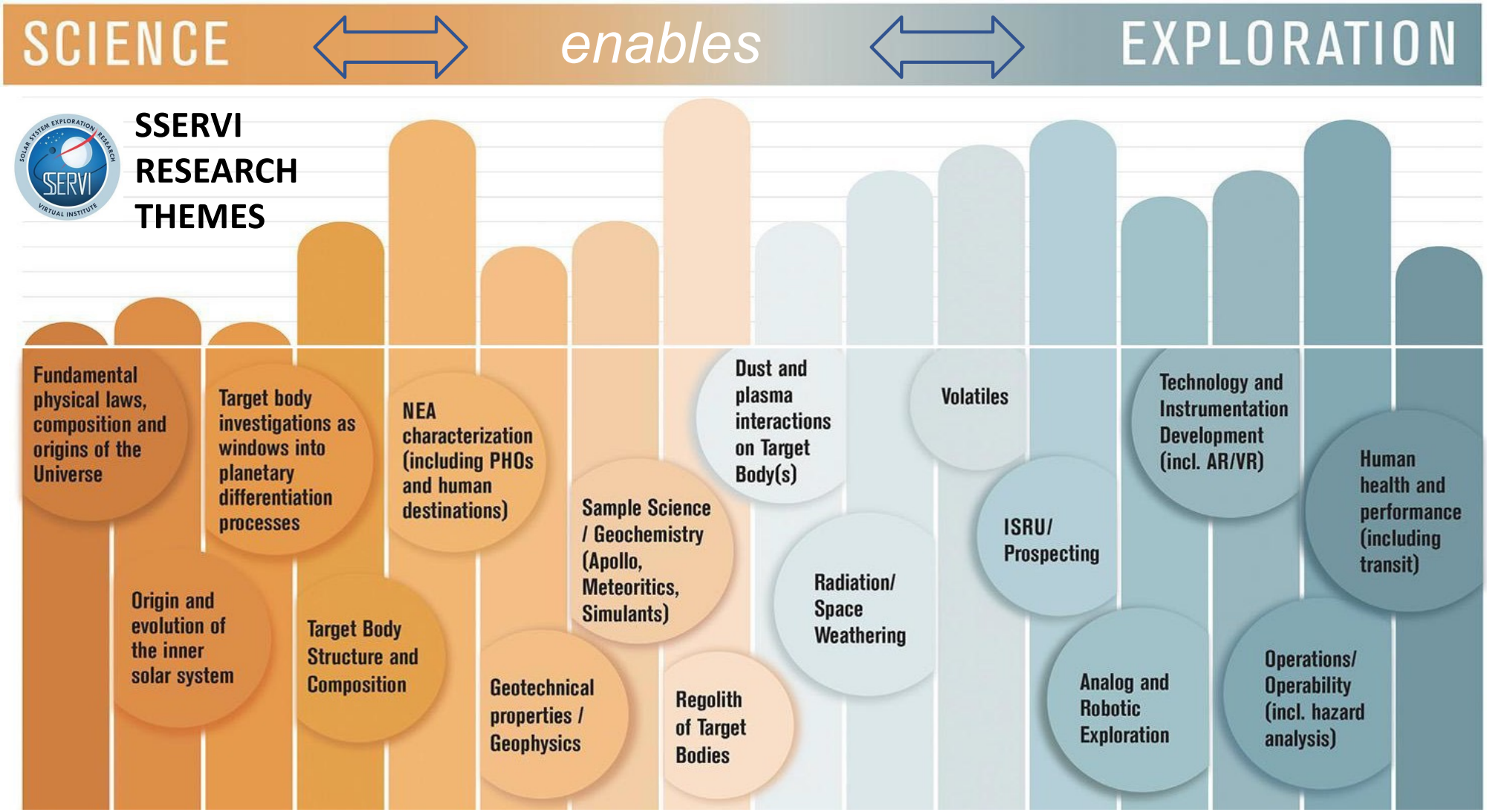
- **SMD BPS:**
  - *Leverage exploration of the Moon in order to advance our understanding of fundamental physical laws*
  - *Characterization of plant growth and development*
  - *Effects of partial gravity using a regolith simulant, including analyses of the mineral composition of the simulant and extracts and comparison to actual lunar samples*
  - *Acute and chronic effects on animals*



CAN Objectives Overview (Sec. 1.3)

The new lunar focus includes the following research areas relevant to the NASA Exploration Systems Development Mission Directorate (ESDMD).

- **ESDMD:**
  - *Traverse Planning*
  - *Characterization of Shadowed and Permanently Shadowed Regions (PSRs):*
  - *Lunar Sample Collection and Sample Handling Operations*
  - *Characterizing Physical/Chemical Regolith or Dust Properties*
  - *Automated Laboratory Systems*
  - *Planetary Protection*


SCIENCE
enables
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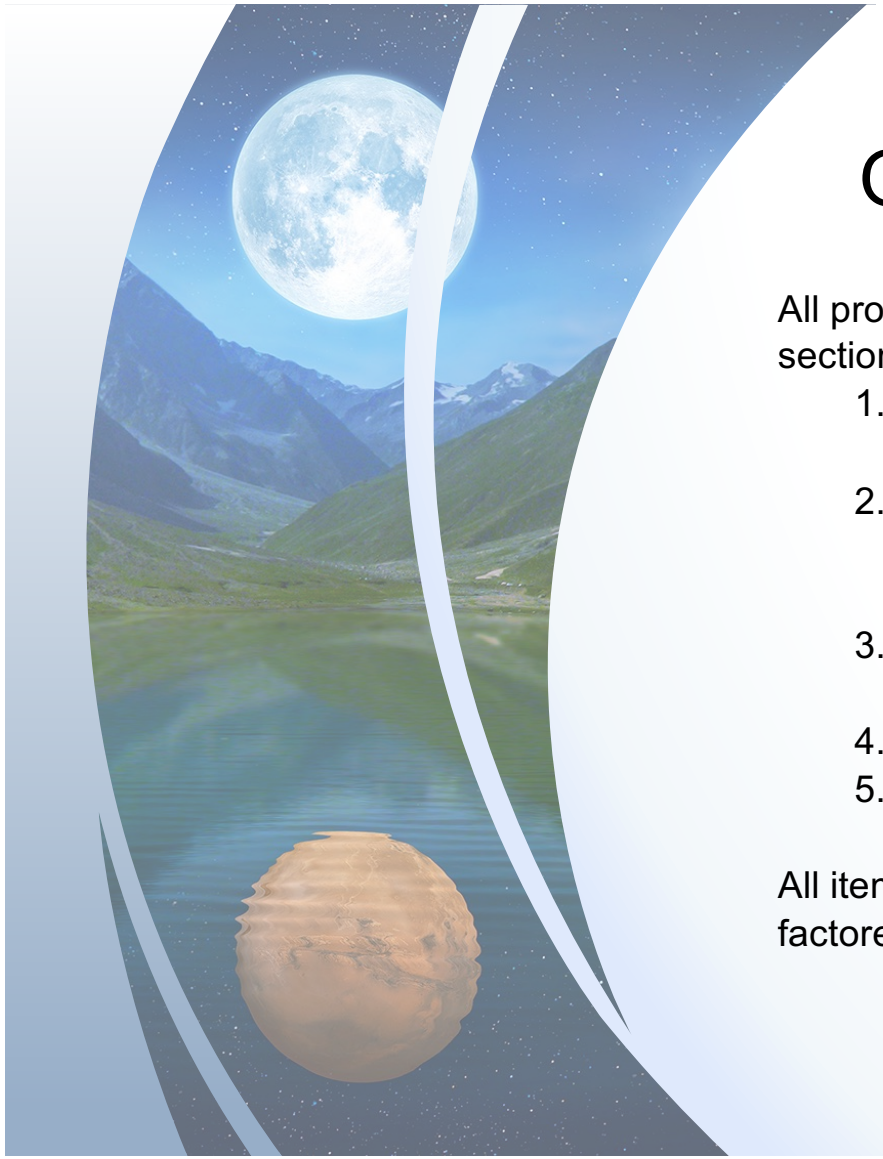
RESEARCH
THEMES
Fundamental physical laws, composition and origins of the Universe
Origin and evolution of the inner solar system
Target body investigations as windows into planetary differentiation processes
Target Body Structure and Composition
NEA characterization (including PHOs and human destinations)
Geotechnical properties / Geophysics
Sample Science / Geochemistry (Apollo, Meteoritics, Simulants)
Regolith of Target Bodies
Dust and plasma interactions on Target Body(s)
Radiation/ Space Weathering
Volatiles
ISRU/ Prospecting
Analog and Robotic Exploration
Technology and Instrumentation Development (incl. AR/VR)
Operations/ Operability (incl. hazard analysis)
Human health and performance (including transit)



Other Institute Objectives (OIO)

All proposals are required to address Other Institute Objectives. This section will consist of the following five documents:

1. Inclusion Plan
   - Focuses on the internal proposal team
2. Inclusion, Diversity, Equity & Accessibility (IDEA) Plan
   - Focuses on development of IDEA initiative(s) within the community
3. Science Activation / Citizen Science / Public Engagement (SA/CS/PE) Plan
4. Team Code of Conduct
5. Contributions to SSERVI and the NASA Mission Plan

All items listed above, including the Inclusion and IDEA Plans, will be factored into the score for the proposal.

Additional Requirements for Field Work

For Proposals including field work, the proposal must include a:

1) Statement regarding Field work Location and
2) Field Work Code of Conduct

(For reference, see previous work done by SSERVI Teams in this area:
https://www.hou.usra.edu/meetings/lpsc2022/pdf/2811.pdf)

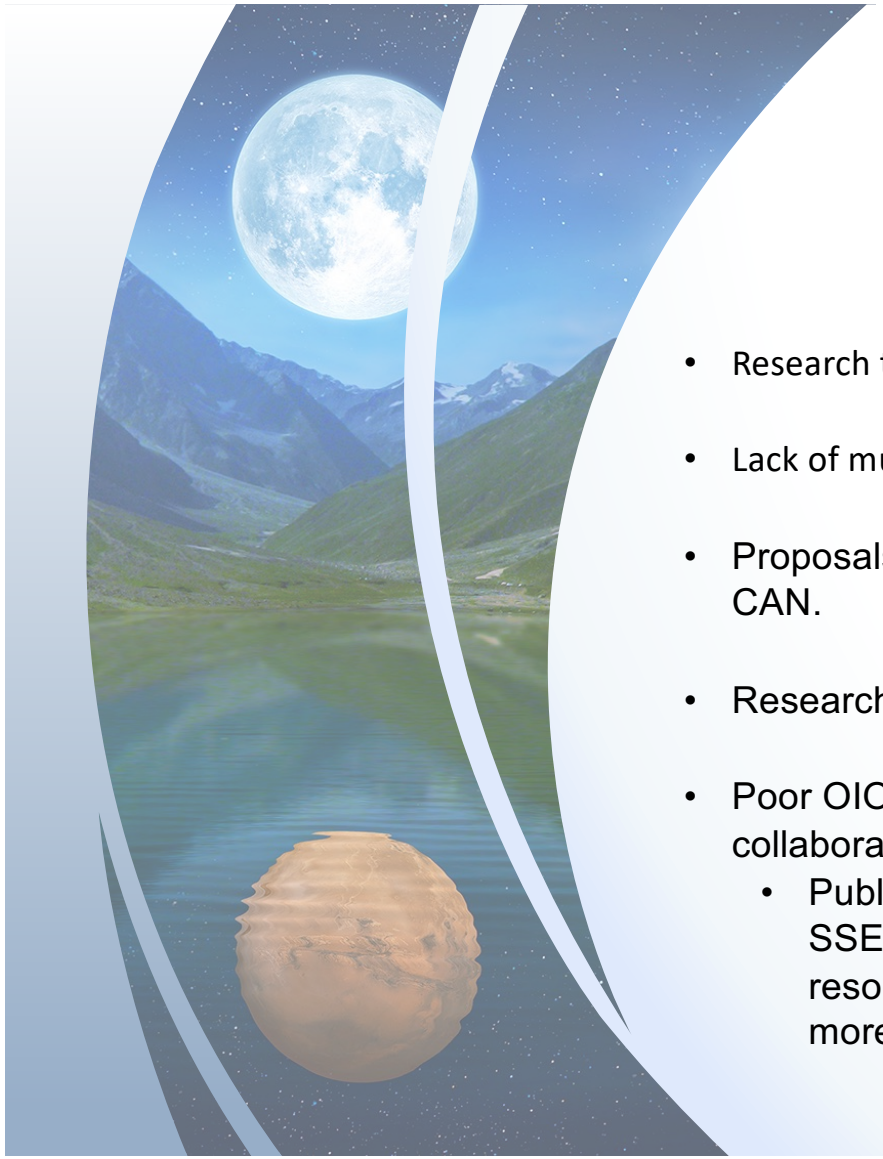
SSERVI CAN Criteria

Step-1 proposal Evaluation Criteria:

- The compelling nature of the focus of the proposed research program and the appropriateness of its scope.
- The relevance of the proposed research program to the goals of SSERVI, SMD, and ESDMD.
- The complementarity of the proposed research program to the research programs of the SSERVI teams selected through SSERVI CAN-3.

Step-2 Evaluation Criteria (note Step-2 proposals may **only** be submitted by PIs who submitted a Step-1 proposal):

- Scientific and Technical Merit (50%)
- Merit of the plan to support other Institute and NASA objectives (30%)
- Merit of the Science Management Plan (10%)
- Merit of the Data and Sample Management Plan (5%)
- Cost Reasonableness (5%)



Past Issues with Non-Selected Proposals

- Research themes that do not support NASA or SSERVI's overall research focus
- Lack of muti-disciplinary and integrated approach
- Proposals cannot be missing elements/sections that are required in the CAN.
- Research that duplicates efforts funded through other NASA organizations
- Poor OIO – some proposals don't demonstrate a commitment to the collaborative nature of the institute.
  - Publicly available information, like the SSERVI website, the NASA SSERVI Senior Review document, recorded talks, and other resources can help you better understand the institute and how its more than just a collection of teams.

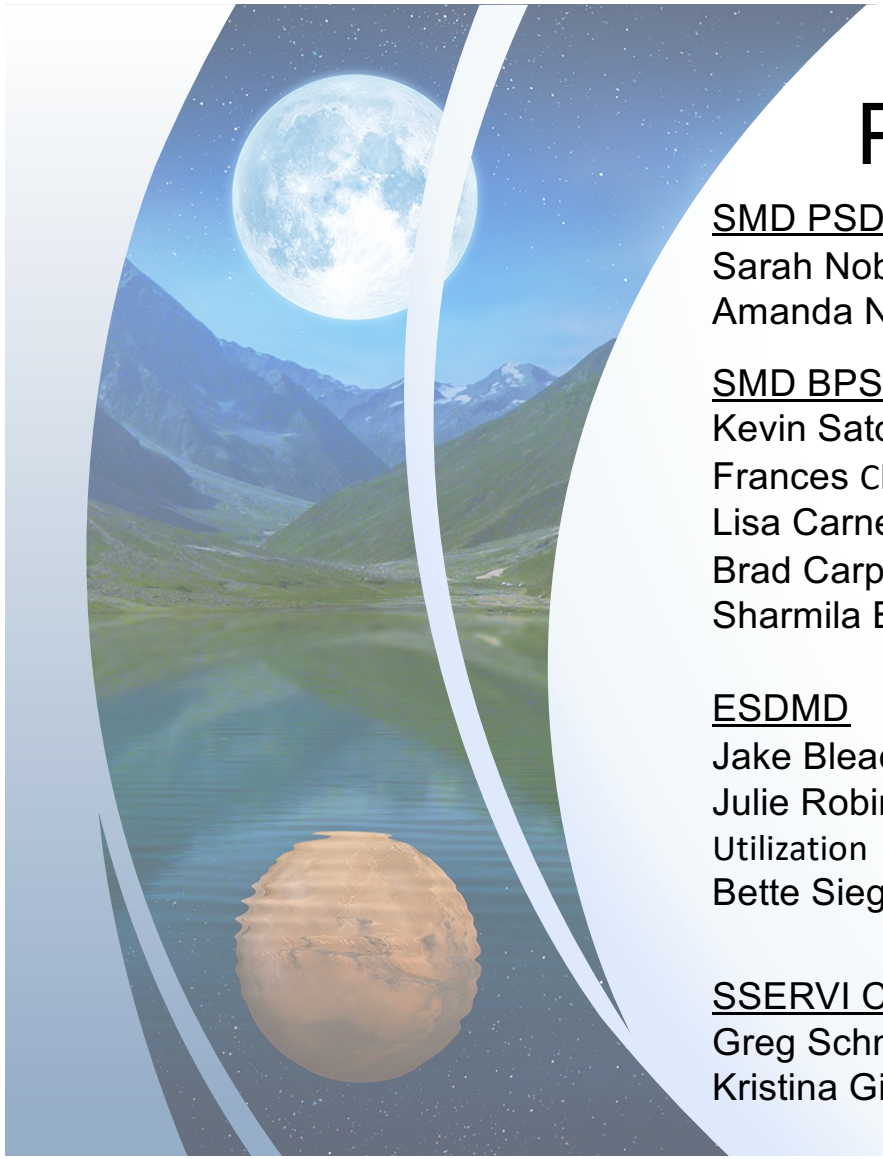
SSERVI CAN Schedule

Science & Exploration Research Cooperative Agreement Notice (CAN) Initial announcement of funding opportunity
ANNOUNCEMENT NUMBER: NNH22ZDA011J

KEY DATES

- Draft CAN Released: 4/19/22
- SSERVI CAN Town Hall: 4/28/22
- Public Comment Period Ends: 5/5/22
- Final CAN Release: Target Summer 2022
- Step 1 due: 30-days after final CAN released
- Step 2 due: 90-days after final CAN released

NSPIRES Website:
https://nspires.nasaprs.com/external/solicitations/summary.do?solId=%7b771714AA-C6CA-75D8-6DA1-13197D16C152%7d&path=&method=init



Program Representatives

SMD PSD

Sarah Noble, SSERVI Program Scientist
Amanda Nahm, SSERVI Deputy Program Scientist

SMD BPS

Kevin Sato, Program Scientist for Exploration
Frances Chiaramonte, Program Scientist for Physical Sciences
Lisa Carnell, Program Scientist for Translational Research
Brad Carpenter, Program Scientist for Fundamental Physics
Sharmila Bhattacharya, Program Scientist for Space Biology

ESDMD

Jake Bleacher, Chief Exploration Scientist for ESDMD
Julie Robinson, Chief Scientist and Manger (Acting) Science and Technology Utilization
Bette Siegel, Program Executive, Science & Technology Utilization

SSERVI Central

Greg Schmidt, SSERVI Director
Kristina Gibbs, SSERVI Deputy Director


NASA
EXPLORE MOON to MARS
MOON LIGHTS THE WAY

Back-Up Information

OIO: Inclusion, Diversity, Equity and Accessibility

SSERVI values the strengths of an increasingly diverse and inclusive workforce with an aim to fully engage varied talents, ideas, and perspectives; moving toward this goal is one of the Institute's highest priorities. (section 1.5.1)

- Teams are encouraged to develop diverse representation within their proposed Team, both in discipline knowledge, as well as the Team members themselves, to make SSERVI reflect our diverse country.
- Each Team is expected to provide opportunities and/or develop programs to use and empower the nation's diverse talent pool and increase its participation in planetary science and exploration. Innovation in achieving these goals is highly encouraged in proposals to this CAN.
- Prospective Teams are expected to demonstrate their commitment to advancing core values of inclusion, diversity, equity, and inclusion in their proposals.
    - This applies to both the internal composition and organization of the Team as well as to how the Team interacts with the greater community.
- To that end, each proposal must include the following two plans:
    1. Proposals shall include an Inclusion Plan that will detail the steps that will be taken to ensure that the Team reflects inclusion and diversity in the Team's composing membership and maximizes the benefits arising from this.
    2. The proposals must also include an IDEA plan that will detail what actions the Team will take to advance inclusion, diversity, equity, and accessibility in the greater community as well as in our society, noting the Team's significant opportunity to serve as an important, positive example, and to provide opportunity and inspiration where they are most needed.

OIO: SA / CS/PE Plan

- All proposals are required to provide a Science Activation, Citizen Science, and Public Engagement Plan that outlines the team's commitment to some aspect(s) of STEAM engagement. (section 1.5.2)
  - **SA/CS/PE Plan**:
    - Plan which will concentrate on one or more of the approaches mentioned below.
    - Each Team should identify a SA/CS/PE Liaison to coordinate efforts within and between Teams and that will be available, as needed, to interact with SMD's STEAM partner teams.
    - Proposals shall identify Subject Matter Experts (SMEs), as well as any supporting personnel/materials and corresponding budgets within the "Other Institute and NASA Objectives" section.
    - Proposals do not need to address all of the below items.
      - For **science education**, proposers are encouraged to leverage SMD's Science Activation (SciAct) efforts (SciAct is funded outside of this CAN, for more info see: https://science.nasa.gov/science-activation-team).
      - **Citizen science projects** must include professional practicing scientists and must incorporate two-way communication between volunteers and scientists. Implementing citizen science activities may be greatly facilitated by partnering with existing programs (e.g., https://www.nasa.gov/solve/index.html and https://science.nasa.gov/citizenscience).
      - SciAct and citizen science proposals should include an **external evaluation process** at regular intervals.
      - **Public engagement** activities should be designed to share scientific discoveries and the excitement of science but should not include formal education objectives.

OIO: Support of SSERVI and the NASA Mission

- Because SSERVI is more than a collection of disparate research projects, it is important that Teams contribute to the missions described in the SSERVI Mission Statement (https://sservi.nasa.gov/overview/).
- Proposals will include a plan explaining how a Team will contribute to the professional community, training of the next generation, collaboration, commercial space, and/or support of the NASA mission.
- A more detailed, non-exhaustive list is provided in Section 4.2.3.2.
  - While Teams are not expected to support all these elements, they must explain which and how they will contribute.

OIO: Team Code of Conduct

- **Team Codes of Conduct**: Proposals must clearly describe the expected team norms (i.e., important aspects of interpersonal and team interaction, such as communication and interaction between team members and team problem solving and conflict resolution).
  - Examples of codes of conduct for teams or what could be included in a code of conduct can be found here: https://projectinclude.org/writing_cocs and https://neid.psu.edu/code-of-conduct/.