

## APPENDIX C. PLANETARY SCIENCE RESEARCH PROGRAM

### C.1 PLANETARY SCIENCE RESEARCH PROGRAM OVERVIEW

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#### 1. Introduction

The Planetary Science Research Program supports investigations to help ascertain the content, origin, and evolution of the Solar System and the potential for life elsewhere, consistent with the strategy for Planetary Science Exploration embodied in the [2014 NASA Science Plan](#). The Planetary Science Research portfolio contains specific program elements aimed at addressing these strategic objectives.

## 1.1 Changes from Recent Years

NASA ROSES (Research Opportunities in Space and Earth Sciences) program element C.1 (Planetary Science Research Overview), this document, was substantially revised last year. Proposers are encouraged to read C.1 in its entirety. Several changes to program element C.1 are highlighted here:

- Section 3.1 includes a revised description regarding the prohibition of duplicate proposals.
- Updated information regarding Data Management Plans (DMPs) is provided in Section 3.6.1. Note the addition of: 1) the inclusion of astromaterials planned to be collected or purchased over the course of the research in the DMP and 2) software/code for possible inclusion in the DMP and a revised method for submitting DMPs as part of the main proposal.
- Program elements supporting the publication of geologic maps have been clarified (Section 3.8).
- Information pertaining to Planetary Major Equipment and Facilities (C.17), Early Career Fellowships (C.16 and C.21), and Topical Workshops, Symposia, and Conferences (E.2) has been added to program element C.1.
- The Habitable Worlds program is now a Cross-Divisional program with the Astrophysics Division (see program element E.4).
- No contracts will be issued in response to proposals submitted to any program elements in Appendix C, unless otherwise noted in the individual program elements.

## 1.2 Program Elements Covered by this Overview

This document pertains to all of the program elements in Appendix C of ROSES, as well as to the cross-divisional research program element E.4 Habitable Worlds, but not E.3 the Exoplanet Research Program.

## 2. Proposal Submission Processes

### 2.1 NOI submission process

Some program elements covered by program element C.1 request a Notice of Intent (NOI), which may or may not be mandatory. See Section IV(b)vi of the ROSES *Summary of Solicitation*.

### 2.2 Two-step submission process

To facilitate the early recruitment of a conflict-free review panel and ensure that proposals are submitted to the appropriate program, most program elements covered by program element C.1 will use a two-step proposal submission process (see Section IV. (b) vii of the ROSES *Summary of Solicitation*). For program elements using the two-step process, a Step-1 proposal is required and must be submitted electronically by an AOR. No budget is required. Only proposers who submit a Step-1 proposal are eligible to submit a full, or Step-2 proposal. Such Step-2 proposals must address the same broad scientific goals proposed in the Step-1 proposal. The PI cannot be changed and proposers who want to add funded investigators between the Step-1 and Step-2 proposals must inform the point(s) of contact identified in the summary table of key

information and cc [sara@nasa.gov](mailto:sara@nasa.gov) at least two weeks in advance of the Step-2 due date. Additions of funded investigators within two weeks of the Step-2 deadline require explicit permission from the NASA point of contact. Submission of a Step-1 proposal does not obligate the proposer to submit a Step-2 (full) proposal later.

The Scientific/Technical/Management section of a Step-1 proposal is restricted to the 4000-character text box on the NSPIRES web interface cover pages. PDF attachments will not be accepted through NSPIRES for Step-1 proposals submitted to program elements covered by program element C.1.

A Step-1 proposal must cover the following topics:

- The goals and objectives to be addressed
- The approach and methodology to be used to address the goals and/or objectives
- The reasons why the work proposed is within the scope of the program element and why this program element is the most appropriate for the work proposed

Following the submission of a Step-1 proposal, most proposers will be notified through NSPIRES whether the Step-1 proposal has been designated as "encouraged" or "discouraged," at which point the proposer will be able to create a Step-2 proposal. No evaluation of intrinsic merit will be performed on Step-1 proposals. The perceived relevance of the proposed work to the particular program element will be the main factor in deciding whether submission of a Step-2 proposal will be encouraged. Please note that the Step-2 proposal relevance evaluation is independent of the Step-1 evaluation.

In rare cases, including the cases where the Step-1 proposal was not compliant with the requirements outlined above or the proposed work could not be funded due to NASA, SMD, or Planetary Science Division (PSD) policy, a Step-1 proposal may be declined. In these cases, a Step-2 proposal may not be submitted.

### 2.3 Full or Step-2 Proposal submission process

Full and Step-2 proposals are synonymous, with the term Step-2 mainly used in program elements that use the two-step submission process.

Table 1 within the NASA ROSES solicitation provides a checklist of required information to be included in full proposals. Proposers should also refer to the PDF entitled "Instructions for Submitting a Step-2 Proposal" that appears under "Other Documents" on the NSPIRES page for the program of interest.

All proposals submitted to ROSES must strictly conform to the instructions regarding proposal format and content. Non-compliance will be taken into consideration, either before or during the selection process. In particular, any detected violation of these rules determined by the selecting official to give the proposer an advantage over competing proposers is grounds for the proposal to be rejected without review or declined following review.

Note the order of precedence guidelines described in Section I(g) of the ROSES *Summary of Solicitation: Guidebook* and ROSES instructions may be superseded or modified by this document (program element C.1) for all covered program elements,

and each individual program element may have its own rules that supersede all of the above.

In previous years, problems with the following aspects of proposal formatting have been noted. Planetary Science proposals must adhere to the following formatting rules as outlined in Section IV(b)ii of the ROSES *Summary of Solicitation*:

- Length of the Scientific/Technical/Management section: 15 pages, unless otherwise specified in the program element.
- Margins: 1 inch on all sides, with a page size of 8.5 × 11 inches.
- Font: 12-point or larger. The selected font must meet the requirement of having, on average, no more than 15 characters per inch (e.g., Times New Roman and Arial). Proposers may not adjust the character spacing or otherwise condense a font from its default appearance.
- Line spacing: Font and line spacing settings must produce text that contains no more than 5.5 lines per inch. Proposers may not adjust line spacing settings for a selected font below single spaced.
- Figure captions: Captions must follow the same font and spacing rules as the main text.
- Figures and tables: For text in figures and tables, font and spacing rules listed above do not apply, but all text must be judged to be legible to reviewers without magnification above 100%. Expository text necessary for the proposal may not be located solely in figures or tables, or their captions.

### 3. Requirements for Full Proposals

#### 3.1 Prohibition on Duplicate Proposals

Proposers may not submit full proposals for the same or essentially the same work to more than one program element covered by program element C.1 concurrently. This prohibition is active for a particular submitted proposal until the PI is notified through NSPIRES that the proposal was declined or until the proposal is withdrawn. The prohibition on duplicate proposals applies across ROSES years as well (e.g., a duplicate of a pending ROSES-2017 proposal may not be submitted in response to ROSES-2018).

If a second proposal is submitted while a duplicate proposal is still pending in another program element, only the first proposal will be evaluated; the duplicate proposal may not be evaluated or considered and may be returned without review.

If a second proposal contains substantive changes in areas that are critical to the intrinsic merit evaluation, then it is not considered to be a duplicate proposal. Such areas include:

- The proposing institution
- Funded investigators and unfunded Co-Investigators (Co-Is) who would perform a significant portion of the work
- Concepts, ideas, goals, and objectives
- Implementation (methods, approaches, instrumentation)

Changes to a proposed project or investigation that would not be considered substantive include aspects of the proposal that are not covered by the merit evaluation. Two proposals that differ only in these sections may be considered duplicates:

- Current and pending support section
- Relevance statement
- Budget section
- Data management plan

In addition, minor changes to aspects of a proposal covered by the merit evaluation (team, concepts, implementation, target, etc.) may not be considered substantive.

If it is unclear whether changes to a proposal are substantial enough that it should not be considered a duplicate proposal, or it is unclear to which program a proposal should be submitted, proposers should contact the point of contact for the program element most likely to be appropriate for the proposal.

### 3.2 Restriction on Funding for Mission-Related Activities

Unless otherwise specified in the program element, proposals containing work for a mission team member, or for a worker who will directly collaborate with a mission team, may not request funding that is intended to help the mission meet its science requirements or achieve mission success. These proposals may also not request funding for work that is close in scope to a mission's funded activities.

This restriction applies regardless of the mission team-member's or collaborator's role on the proposal (e.g., PI, Co-I, collaborator, postdoc, student) or role on the mission. It applies when the mission is in phases A through F, unless otherwise specified in the program element.

If a proposal includes workers on, or collaborating with, a mission team and contains work that is relevant to that mission, it must demonstrate how the tasks to be funded by the proposal do not violate this restriction. This demonstration should be included in the proposal's Budget Justification section and does not count against the page limit of the Scientific/Technical/Management section.

### 3.3 Award Durations and Types

The typical award duration is three years. Proposals for less than three years are encouraged for projects that can be completed on shorter timescales. For those program elements that permit longer awards, funding for more than three years must be explicitly justified in the proposal, i.e., to allow the completion of individual tasks that require more than three years. In these cases, the proposal must contain a discussion of why it is impractical or impossible to complete such tasks within three years.

Note that no contracts will be issued for awards made under the program elements covered by program element C.1 unless otherwise noted in the individual program element.

### 3.4 Use of Mission Data

Spacecraft mission data to be used in proposed work must be available in the Planetary Data System (PDS) or an equivalent, publicly accessible archive at least 30 days prior to the full proposal submission deadline, unless otherwise specified in the program call.

### 3.5 Discussion of Relevance

All proposals will be evaluated for relevance to the individual program element to which the proposal has been submitted (see Section VI (a) of the ROSES *Summary of Solicitation*).

Some program elements covered by program element C.1 require an explicit relevance statement be placed into a mandatory (4000-character) text box on the cover pages via the NSPIRES web interface. For those program elements that require it, this required relevance text is outside of the 15-page Scientific/Technical/Management section and the relocation of the relevance discussion does not decrease that 15-page limit. This requirement supersedes the default in the *NASA Guidebook for Proposers* and the *ROSES Summary of Solicitation*. For these calls, the omission of a relevance statement on the cover pages is sufficient reason for a proposal to be returned without review.

Regardless of whether an explicit statement of relevance is required, all proposals will be evaluated for their relevance to the program element to which they have been submitted. Proposers are urged to consult the appropriate program element to which they are proposing for detailed information on whether an explicit relevance statement is required and/or how relevance will be evaluated.

### 3.6 Data Management Plans and Archiving

#### 3.6.1 *Data Management Plans*

In order to broaden access to the results of NASA-funded research, proposals submitted to ROSES are required to include a data management plan (DMP). The guiding philosophy behind this requirement is that all relevant data should be made publicly available (i.e., without fee or restriction of use) at the time of publication, or at the earliest practical time thereafter, through a stable and long-term supported data repository.

Individual program elements may provide instructions that supersede and/or amplify the requirements described here. For example, the Planetary Data Archiving, Restoration and Tools (PDART, program element C.7) program element includes the data management discussion in the body of the proposal. The instrument development, Early Career Fellowship and Planetary Major Equipment calls (Appendices C.12, C.13, C.16, C.17, C.21, and C.22) do not require DMPs.

Proposers requiring a Data Management Plan (DMP) are strongly encouraged to use the PSD DMP template, which may be downloaded as a word doc, or a latex template in the form of a .txt file from the SARA web page at <https://science.nasa.gov/templates-planetary-science-division-appendix-c-roses-proposals>.

DMPs must be placed in a special section of the proposal, entitled "Data Management Plan." All proposals to program elements that require DMPs must contain this section. The DMP may not exceed two pages in length, and should immediately follow the references and citations for the Scientific/Technical/Management (S/T/M) portion of the proposal. The two-page DMP section does not count against the 15-page limit of the S/T/M section. Formatting requirements for DMPs are the same as for the S/T/M section. When appropriate or required, letters of support from data archives (e.g. Section 3.6.2 of this document) must be included in a Statements of Commitment and Letters of Support, Feasibility and Endorsement section of the proposal (see ROSES *Summary of Solicitation*, Table 1).

The DMP must cover any data needed to validate the scientific conclusions of peer-reviewed publications, particularly data underlying figures, maps, and tables.

The DMP should also cover any other data and software that would enable future research or the replication/reproduction of published results. Software, whether a stand-alone program, an enhancement to existing code, or a module that interfaces with existing codes, created as part of a NASA award should be made publicly available when it is practical and feasible to do so and when there is scientific utility in doing so. Stand-alone code that is not straightforward to implement or whose utility is significantly outweighed by the costs to share it is not expected to be made available. NASA expects that the source code, with associated documentation sufficient to enable the code's use, will be made publicly available via GitHub (<https://github.com/NASA-Planetary-Science>), the PDS (for mission-specific code, when appropriate), or an appropriate community-recognized depository (for instance, the homepage of the code base for which a module was developed). Archiving software in a public repository does not require the proposer to maintain the code. Awards that derive from proposals including plans to post code in GitHub will contain a Rights in Data clause reflecting this expectation.

New in ROSES 2018, the DMP should also cover any astromaterials planned to be collected or purchased over the course of the research. These include meteorites, micrometeorites, and cosmic dust. The DMP should demonstrate that any such astromaterials with scientific value not consumed during the proposed research will be made publicly available. Proposers are also encouraged, but not required, to discuss how other physical materials collected, purchased, or synthesized during the planned research would be made publicly available when it is practical and feasible to do so and when there is scientific utility in doing so. These might include analog materials collected or synthesized or analytical standards developed.

For proposals that use non-mission data (e.g., laboratory results, Earth-based observations) that are not publicly available (in the PDS or other archive, in the literature, etc.), the project is expected to make the data available following the Data Management Plan guidelines.

"Data" does not include preliminary and other unpublished data, data in prepublication documents, private communications, or certain other types of information that have been specifically exempted from the DMP requirement.

In the case of a project that would produce no data, as defined above, or only data specifically exempted, the DMP should state that no data preservation or data sharing is

needed, but must also explain why. In a case where no appropriate archive exists for a particular data set, the DMP should discuss alternative methods for making the data publicly available.

The DMP must contain the following elements, as appropriate to the project, in adequate detail for review:

- A description of data types, volume, formats, and (where relevant) standards;
- A description of the schedule for data archiving and sharing;
- A description of the intended repositories for archived data, including mechanisms for public access and distribution;
- A discussion of how the plan enables long-term preservation of data;
- A discussion of roles and responsibilities of team members in accomplishing the DMP. (If funds are required for data management activities, these should be covered in the normal budget and budget justification sections of the proposal.)

DMPs will be reviewed as part of the overall NASA research proposal review process. Proposals that do not address each of these items in their DMP, even if determined to be selected or selectable for funding, may not be funded until an adequate DMP is submitted. Funded researchers, research institutions, and NASA centers are responsible for ensuring and demonstrating compliance with the DMPs approved as part of their awards. Awardees who do not fulfill the intent of their DMPs may have continuing funds withheld and this may be considered in the evaluation of future proposals.

For more information on DMPs, please see the Planetary Science Division Frequently Asked Questions (FAQs) on data management plans in ROSES, which will appear under "Other Documents" on the NSPIRES webpage for the Planetary Science Division program elements.

### 3.6.2 Data Archiving in the Planetary Data System (PDS)

For proposals where derived data products will be deposited in the Planetary Data System, these data products must be in PDS4 format. Guidelines for planning for the submission data in this format to the PDS are available at <http://pds.nasa.gov/pds4>.

Proposers intending to make use of the PDS should refer to the most recent version of the following documents for information on PDS compliance:

Document	Hyperlink
Proposer's Archive Guide	<a href="http://pds.nasa.gov/pds4/propose/proposing.shtml">http://pds.nasa.gov/pds4/propose/proposing.shtml</a>
Standards Reference	<a href="http://pds.nasa.gov/pds4/doc/sr/">http://pds.nasa.gov/pds4/doc/sr/</a>

Proposers should communicate with the PDS Discipline Node responsible for curating similar data (links to the PDS Discipline Nodes are at <http://pds.nasa.gov/>) to discuss procedures and requirements prior to proposing to a Planetary Science Division ROSES program element. Proposers intending to archive data or products in the PDS must obtain and include confirmation, in the form of a letter of support from the appropriate Discipline Node, that the PDS is willing to accept their submission. This letter must be included in the proposal package and placed in a section for Statements of Commitment

and Letters of Support, Feasibility and Endorsement (see ROSES *Summary of Solicitation*, Table 1).

### 3.7 Table of Personnel and Work Effort

All proposals must include a Table of Personnel and Work Effort. If the program element allows contracts, and it is anticipated by the proposer that the proposal will result in a contract, this table must be within the budget narrative section. All other proposals should include this table as a separate section before the Budget Justification section and follow the instructions presented here.

Proposers are strongly encouraged to use the PSD Table of Personnel and Work Effort template, which may be downloaded as a word doc, a latex template, or a pdf from the SARA web page at <https://science.nasa.gov/templates-planetary-science-division-appendix-c-roses-proposals>.

The Table of Personnel and Work Effort should list the names (if known) and titles of every person who will do work on the proposal, regardless of whether that person would receive money, and regardless of their role on the project. It should cover all personnel, including those covered by any sub-awards, sub-contracts, or who work at any NASA center or federal agency that may receive money separately from the main award. The table must have entries covering each proposed award year (do not provide a separate table divided by federal fiscal years), and should distinguish between the effort to be funded by NASA and non-funded efforts. All work efforts listed in the table should be made in fractions of a work-year.

Note that this section may not contain any narrative description of tasks to be performed by proposal personnel; such information should be placed in the 15-page Scientific/Technical/ Management section of the proposal.

### 3.8 Publication of Geologic Maps

Geologic mapping is an investigative process designed to go beyond standard image analyses to determine the geologic history of a region of interest, whether it is local, regional, or global. Thus, geologic maps are key tools to aid in identification of this geologic history. Below are some guidelines about where to propose geologic mapping investigations.

#### 3.8.1 *Program Elements Supporting Geologic Mapping*

If a geologic map would be created as part of a hypothesis-driven science investigation (i.e., to address specific scientific objectives or questions about a region of interest) and uses data from planetary missions identified in a Data Analysis Program (DAP), then the proposal should be submitted to the appropriate DAP. Examples:

- MESSENGER-based Mercury maps: Discovery DAP (program element C.11)
- Lunar maps: Lunar DAP (program element C.8)
- Mars maps: Mars DAP (program element C.9)
- Dawn-based Vesta or Ceres maps: Discovery DAP (program element C.11)
- Cassini-based Saturnian satellite maps: Cassini DAP (program element C.10)
- Pluto and Charon maps: New Frontiers DAP (program element C.19)

If a geologic map would be created as part of a hypothesis-driven science investigation using data from missions not covered by a current DAP (e.g., Venus missions) or as part of a comparative planetology science investigation not responsive to a single DAP, then the proposal should be submitted to whichever of the non-DAP research program elements the proposal is most relevant (e.g., Solar System Workings, Emerging Worlds, Habitable Worlds).

If a geologic map would be created without an accompanying hypothesis-driven science investigation, then the mapping proposal should be submitted to PDART (program element C.7).

### *3.8.2 Maps Published by the U.S. Geological Survey*

Proposals that include the publication of a Scientific Investigations Map (SIM) by the U.S. Geological Survey (USGS) should check the relevant box on the proposal cover page and clearly indicate this intention in the Proposal Summary, as well as in the text of the proposal. Investigators who choose to produce a geologic map as a USGS product will be required to follow current guidelines for the production and submission of digital products, including the generation of maps that are compatible with Geographic Information System (GIS) software packages for review, edit, and publication. To support this requirement, the USGS will provide a GIS project that contains the projected, geographically rectified, and scaled mapping base or mosaic, as well as other relevant global- or regional-scale data sets (if available and needed). Investigators selected to publish USGS geologic maps will be expected to (1) provide peer reviews for two geologic maps generated by other planetary mappers during their grant period, and (2) attend the annual Planetary Geologic Mappers Meeting to present map status to the mapping community and receive updates on current guidelines. Proposers should include travel funding to attend the Planetary Geologic Mappers Meeting, justifiable because of NASA requirements. Further information pertaining to the production of USGS geologic maps (e.g., map bases, scales, extents, formats, guidelines) is available at <http://planetarymapping.wr.usgs.gov/> or by contacting Jim Skinner at the USGS ([jskinner@usgs.gov](mailto:jskinner@usgs.gov)).

Investigators who intend to produce a USGS geologic map are required to include in their Step-2 (full) proposal a Confirmation of Technical Specification document obtained from the USGS Map Coordinator. This document will identify (1) latitude/longitude boundaries of the map region, (2) scale of the proposed map, (3) required base map, (4) projection of the base map, and (5) key supplemental data. This document is only a confirmation and does not fulfill any requirement that the mapping effort be described and justified within the 15-page body of the proposal. Selection of a proposal for funding is contingent upon the inclusion of this document. Investigators are encouraged to contact the USGS early in the proposal preparation process. For the USGS Map Coordinator's contact information, please refer to <http://planetarymapping.wr.usgs.gov/Page/view/Contacts>.

### 3.9 Access to the Antarctic

Unless otherwise stated in a program element, Appendix C is no longer accepting proposals for work in Antarctica.

### 3.10 Additional Funding for Relevant Instrumentation Construction or Upgrade

The Planetary Major Equipment and Facilities (PMEF) program element (C.17) allows proposals for upgrading the analytical, computational, telescopic, and other instrumentation required by investigations for certain programs elements sponsored by the Planetary Science Division Research and Analysis Program. All new analytical instrumentation requests, as well as requests for upgrades to existing instruments, costing more than \$50,000, must be requested according to the PMEF guidelines in C.17. Two types of instrumentation requests are permitted: (1) a PMEF request may be made as a special section that is appended to a new research proposal in an eligible program element; or (2) a stand-alone PMEF proposal may be prepared and submitted to a special PMEF proposal deadline. All requests for facility instruments must now be of the second type. See C.17 for details on how to prepare both types of PMEF requests. Programs elements eligible for PMEF are listed in C.17:

### 3.11 Planetary Science Division Early Career Fellowship Program

The purpose of the Planetary Science Division (PSD) Early Career Fellowships (ECF) program (described in program elements C.16 and C.21) is to support the development of the individual research programs of outstanding scientists early in their careers and to stimulate research careers in the areas supported by PSD. This program is based on the idea that supporting key individuals is a critical mechanism for achieving high impact science that will lead the field forward with new concepts, technologies, methods, and more.

Those seeking to be named fellows should see C.21, The New Early Career Fellowship Program, for information on the new fellowship application process and the criteria for evaluating candidates. Those who have already been named fellows (i.e., received an award letter for the proposal to which the ECF was appended) based on prior applications who are seeking start-up funds should refer to program element C.16 the Early Career Fellowship Start-up Program for Named Fellows.

### 3.12 Topical Workshops

All proposals for topical conferences, workshops, or symposia related to the Planetary Science Division Research and Analysis Program must be submitted in response to program element E.2, Topical Workshops, Symposia, and Conferences, of this NRA. Proposers to E.2 should specifically identify the PSD research program element to which the conference, workshop, or symposium is most closely related and refer to the goals and objectives of that program element in demonstrating relevance.

## 4. Resources Available to Proposers

### 4.1 Data and Information Resources

- The Planetary Data System (PDS)

The Planetary Data System (PDS) archives and distributes scientific data from NASA planetary missions, astronomical observations, and laboratory measurements. The archives can be found through the PDS home page at <http://pds.nasa.gov/>. PDS is supported by six science discipline nodes (Atmospheres, Geosciences, Imaging,

Planetary Plasma Interactions, Rings, and Small Bodies) distributed around the U.S. Each node serves data from NASA's planetary missions and documentation sufficient to use those data. Data searches and requests can be initiated from the PDS home page or at any of the science discipline node pages accessible there. Guides and tools for using data, preparing an archive, and archiving data can be found at <http://pds.nasa.gov/tools/>. Contact the PDS Operator ([pds\\_operator@jpl.nasa.gov](mailto:pds_operator@jpl.nasa.gov)) or the appropriate node's point-of-contact for assistance.

- The National Space Science Data Center (NSSDC)

NSSDC archives digital and other data from historic and completed flight missions, and its archives are complementary to those of the PDS. Such data include lunar and planetary photographs, digital planetary images, tabular and experiment data from numerous flight missions, and cartographic products. Investigators are responsible for acquiring the data needed for their proposal. Modest requests for data are free of charge, while charges will be incurred for large-volume requests. Requests from U.S. investigators for data products and information may be made through the Coordinated Request and User Support Office at the NSSDC ([nssdc-request@lists.nasa.gov](mailto:nssdc-request@lists.nasa.gov)). For more information, see [http://nssdc.gsfc.nasa.gov/nssdc/obtaining\\_data.html](http://nssdc.gsfc.nasa.gov/nssdc/obtaining_data.html).

- The Lunar and Planetary Institute (LPI)

LPI provides one of the most concentrated and easily accessible collections of data and other information in lunar and planetary science, including extensive digital map and imagery collections, computational tools for the lunar community, and a vast collection of educational products and resources. These resources, along with an extensive range of electronic tools to enhance science activities and effective communication within the planetary science community, can be found on the LPI's website at <http://www.lpi.usra.edu>.

- Regional Planetary Image Facilities (RPIFs)

RPIFs contain nearly half a million images of the planets and their satellites taken both from Earth and manned and unmanned spacecraft, as well as topographic and geologic maps produced from these images. The RPIFs, located at institutions worldwide, are intended for use by individuals and groups who use photographic and cartographic materials of the planets and satellites in their research programs. These programs include geologic, photometric, colorimetric, photogrammetric, and atmospheric dynamical studies. Send inquiries to the director of the nearest RPIF. Note that, although these centers may be used for onsite study and selection of planetary and satellite images, they are not facilities for the production of photographs for users. Instead, such materials may be obtained from the NSSDC (see above). Additional information, including a listing of RPIF locations worldwide, can be found on the RPIF home page at <http://www.lpi.usra.edu/library/RPIF>.

- Planetary Cartography Program

NASA has a long-term agreement with the USGS to provide a variety of cartographic support functions for NASA researchers through its Planetary Cartography Program. This support includes:

- Integrated Software for Imagers and Spectrometers (ISIS, <http://isis.astrogeology.usgs.gov/>);

- Search capability for raw planetary image data (PILOT, <http://pilot.wr.usgs.gov>);
- On-demand production of higher level data products (Map Projection On the Web, <http://astrocloud.wr.usgs.gov/>, and Map-A-Planet, <http://www.mapaplanet.org/>);
- Coordination of IAU approval of nomenclature <http://planetarynames.wr.usgs.gov/>;
- Training in planetary GIS methods (MRCTR GIS Lab, <http://astrogeology.usgs.gov/facilities/mrctr>);
- Training in the generation of topographic data from stereo images (Photogrammetry Guest Facility, <http://astrogeology.usgs.gov/facilities/photogrammetry-guest-facility>);

For cartography support beyond what is provided by the Planetary Cartography Program, the USGS is willing to join proposal teams to produce or assist in the production of specific cartographic tools or products. However, the USGS is required to recoup the full cost of such activities in the proposal budget. Visit <http://astrogeology.usgs.gov/> or E-mail [laz@usgs.gov](mailto:laz@usgs.gov) for further information.

#### 4.2 Astromaterials

NASA's Astromaterials Acquisition and Curation Office at the NASA Johnson Space Center provides access to all NASA-controlled samples of astromaterials, including those returned by the Apollo program and the Genesis and Stardust missions, a subset of particles returned by the Japan Aerospace Exploration Agency (JAXA) Hayabusa mission, interplanetary dust particles collected by high-altitude aircraft, meteorites collected in Antarctica by U.S. field parties, and a variety of space-flown microparticle impact collectors. Peer review of sample requests are provided by the Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM). For information on how to obtain any of the specimens in these collections, see <http://curator.jsc.nasa.gov/> or contact:

Office of the Curator  
 Code KT  
 Johnson Space Center  
 National Aeronautics and Space Administration  
 Houston, TX 77058-3696

#### 4.3 Research Facilities

The following facilities are available to supported investigators. If their use is anticipated, this use must be discussed and justified in the submitted proposals (especially note the provision for such discussion in the proposal section entitled Facilities and Equipment). Also note that, per the directions in the *NASA Guidebook for Proposers*, a letter of support may be required from any facility required for the proposed effort.

- NASA-provided High-End Computational (HEC) Facilities

Those investigators whose research requires high-performance computing should refer to the *Summary of Solicitation*, Section I(d), "NASA-provided High-End Computing Resources." This section describes the opportunity for successful proposers to ROSES

to apply for computing time on either of two NASA computing facilities at the NASA Goddard Space Flight Center's (GSFC's) Computational and Information Sciences and Technology Office or at the NASA Ames Research Center's (ARC's) Advanced Supercomputing Division. Proposers needing access to these facilities should follow the instructions in Section I(d) of the ROSES *Summary of Solicitation*. Further information on computing capabilities may be found at the NASA High-End Computing website, <http://www.hec.nasa.gov/>.

- Planetary Aeolian Facility (PAL)

The Planetary Aeolian Facility at the NASA Ames Research Center consists of wind tunnels to simulate atmosphere-surface interactions on Earth, Mars and Titan. For more information, contact David Williams at [David.Williams@asu.edu](mailto:David.Williams@asu.edu) or find the PAL Guidebook for Proposers at:

[http://rpif.asu.edu/documents/PAL\\_Proposers\\_Guidebook\\_2015\\_v6.pdf](http://rpif.asu.edu/documents/PAL_Proposers_Guidebook_2015_v6.pdf).

- Reflectance Experiment Laboratory (RELAB)

The RELAB facility at Brown University provides a mechanism for researchers to obtain high quality laboratory spectra of natural or synthetic materials for use in compositional, geologic, and remote sensing applications. RELAB is partially supported by NASA as a multiuser spectroscopy facility, and researchers are invited, but not required, to visit the laboratory in person during sample measurements. Laboratory time and most sample measurements are made available at no charge to investigators funded by NASA. If a proposal to NASA requires acquisition of new spectra via RELAB in the VIS/NIR or mid-IR, then the scope and justification must be provided in the submitted proposal. Data acquired as part of NASA-funded research are made available to the investigator immediately after measurement and are made publicly available three years after measurement. Additional information about this facility, a RELAB user's manual, sample submittal forms, and access to RELAB spectroscopy data can be found at

<http://www.planetary.brown.edu/relab/>. For further information, contact the Science Manager of RELAB, Ralph Milliken ([Ralph.Milliken@brown.edu](mailto:Ralph.Milliken@brown.edu)) or the Operations Manager, Takahiro Hiroi ([Takahiro.Hiroi@brown.edu](mailto:Takahiro.Hiroi@brown.edu)).

- NASA Ames Vertical Gun Range (AVGR)

The NASA AVGR is a national facility funded by the NASA Science Mission Directorate to enable investigations of impact phenomena and processes. Exploratory or proof-of-concept programs requiring a limited number of experiments can be accommodated at no cost. More extensive programs are subject to review in order to assess feasibility and cost effectiveness. Any need for extensive use of the AVGR should be explicitly described in the proposal. The proposal budget should include an estimate of usage costs. A letter of support from the AVGR is required. For more information, potential users of the AVGR should contact John Karcz ([john.s.karcz@nasa.gov](mailto:john.s.karcz@nasa.gov)).

- NASA Venus In-situ Chamber (VICI)

The Venus In-situ Chamber Investigations (VICI) is a NASA pressure chamber that enables testing of components and small instruments under temperatures and pressures that simulate Venus surface conditions. Lower temperatures and pressures can also be accommodated. Exploratory or proof-of-concept programs requiring a limited number of experiments/tests can be accommodated for minimal cost. Extensive

use of the chamber should be described in the proposal and is subject to review by VICI personnel to assess feasibility and cost effectiveness. Any use of the chamber and its corresponding costs should be included in the proposal budget. A letter of support from the VICI facility is required. For additional information, please contact Natasha Johnson ([natasha.m.johnson@nasa.gov](mailto:natasha.m.johnson@nasa.gov)).

- NASA Glenn Extreme Environment Rig (GEER)

The Glenn Extreme Environment Rig (GEER) is a simulation rig designed to provide the scientific and engineering communities an asset to perform laboratory experiments and/or technology developments or instrument/hardware qualification in extreme environments. When fully operational, GEER can accurately simulate the temperatures, pressures, and chemistry of the atmospheres of planetary bodies, including the conditions found on the surface of Venus. The chamber is of cylindrical shape with interior dimensions of three feet in diameter and four feet long. The chamber is rated for pressures up to 100 bar at 500°C and eight individually controllable gas streams are available. Interested parties should contact Dan Vento ([Daniel.M.Vento@nasa.gov](mailto:Daniel.M.Vento@nasa.gov)) or Tibor Kremic ([Tibor.Kremic@nasa.gov](mailto:Tibor.Kremic@nasa.gov)) for questions regarding status, availability, and any proposal related intentions. Some additional information on the GEER is available at <http://microgravity.grc.nasa.gov/SSPO/SS/Extreme/>.

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