

APPENDIX C. PLANETARY SCIENCE RESEARCH PROGRAM

C.1 PLANETARY SCIENCE RESEARCH PROGRAM OVERVIEW

NOTICE: Amended March 13, 2015. This amendment adds a requirement that investigators that would publish a geologic map through the U.S. Geological Survey (USGS) would include in their Step-2 (full) proposals a letter of technical specifications from the USGS Map Coordinator (Section 4.4.1) and adds text describing how to determine to what program element a proposal that includes the publication of a geologic map should be submitted (Section 4.4.2). The requirement of the letter of technical specifications does not alter the requirements for the 15-page main body of the proposal to adequately explain and justify the work proposed. This Amendment does not alter the deadlines for any program element.

1. Introduction

The Planetary Science Research Program supports investigations of all classes of objects in the Solar System, except those focused on the Earth and Sun, consistent with the strategy for Solar System Exploration embodied in the *Solar System Roadmap 2006* (available at <http://solarsystem.nasa.gov/multimedia/downloads.cfm>). A proposal submitted to any of the following programs in this section must present, within its Scientific/Technical/Management section, a clear description of a specific scientific problem, a description of how the attack on this problem will be carried out, and a discussion of the relevance of the proposed research to NASA's current and/or future programs. Proposals whose intent or purpose is to extend or directly supplement investigations already selected for approved space flight missions are not appropriate for this NRA. Investigators who are members of science teams of ongoing missions must delineate clearly between their mission responsibilities and any research efforts proposed through this NRA.

Proposals that include analysis of data from Planetary Science Division (PSD) space flight missions must use publicly available data released through the Planetary Data System (PDS) at <http://pds.jpl.nasa.gov/>. Proposals that utilize any data from Planetary Science Division space flight missions, in any amount, that is not yet publicly available on the PDS, will not be considered. Requirements for depositing derived data products in the Planetary Data System have been revised to require that all products be PDS4 conformant. This applies to such programs as Lunar Data Analysis (C.8), Mars Data Analysis (C.9), Cassini Data Analysis and Participating Scientists (C.10), and Discovery Data Analysis (C.11). Guidelines for planning data in this format are available at <http://pds.nasa.gov/pds4>.

The standard award duration is three years, and it is anticipated that most proposals will seek three years of funding. 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 years than three is contingent upon the need for the longer duration as sufficiently well justified in the proposal.

1.1 Changes from Last Year

Although Appendix C continues to use the Two-Step Proposal Submission Process, an uploaded PDF document is no longer required, merely text typed into the mandatory (4000-character) Proposal Summary box in the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) web interface, see Section 2, below.

The Planetary Science Division will not accept or evaluate duplicate Step-2 submissions for the same or essentially the same work, see Section 3.1 for details.

With the a few exceptions, proposers to Appendix C must provide a data management plan (DMP) or an explanation of why one is not necessary given the nature of the work proposed. See Section 4.3, below, and the SARA [Frequently Asked Questions \(FAQs\) for ROSES](#).

Some program elements in Appendix C (e.g., C.3-C.5 and C.10) require an explicit relevance statement, which will be collected in a mandatory (4000-character) text box on the cover pages via the NSPIRES web interface. See section 5, below.

2. The Two Step Proposal Submission Process

To facilitate the early recruitment of a conflict-free review panel, and to ensure proposals are submitted to the appropriate program, most calls in Appendix C will use a two-step proposal submission process (see Section IV. (b) vii of the ROSES *Summary of Solicitation*.)

A Step-1 proposal is required and must be submitted electronically by the Authorized Organizational Representative (AOR). No budget is required. Only proposers who submit a Step-1 proposal are eligible to submit a Step-2 proposal. Full (Step-2) proposals must broadly contain the same scientific goals proposed in the Step-1 proposal. The PI cannot be adjusted and proposers that 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 at least two weeks in advance of the Step-2 due date. Submission of the Step-1 proposal does not obligate the proposer to submit a Step-2 (full) proposal later.

2.1 Step-1 Proposal

The Scientific/Technical/Management section of the Step-1 proposal is restricted to the 4000 character text box on the NSPIRES web interface cover pages and should include a description of the science goals and objectives to be addressed by the proposal, a brief description of the methodology to be used to address the science goals and objectives, and the relevance of the proposed research to this call. The Step-1 proposal may be used to determine whether the proposal was submitted to the appropriate program element. No evaluation of intrinsic merit will be performed on Step-1 proposals. Proposers should refer to the "Instructions for Submitting a Step-1 Proposal" under "Other Documents" on the NSPIRES page for the program of interest.

NSPIRES will notify proposers whether their Step-2 proposal is encouraged or not, at which point they will be able to submit Step-2 proposals.

2.2 Step-2 Proposal

Proposers should refer to the PDF entitled "Instructions for Submitting a Step-2 Proposal" that will appear under "Other Documents" on the NSPIRES page for the program of interest. All proposals submitted to ROSES must strictly conform to the formatting rules in Section IV of the *Summary of Solicitation* and Chapter 2 of the *NASA Guidebook for Proposers*. Those that violate the rules may be rejected without review. In previous years, problems with the following aspects of formatting proposals have been noted. Proposers should pay particular attention to:

- Length of the Scientific/Technical/Management section: 15 pages, unless otherwise specified
- Margins: 1 inch on all sides, with a standard page size of 8.5 × 11 inches.
- Font: The *NASA Guidebook for Proposers* requires that proposers use a 12-point or larger font. 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 should 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: 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%. Do not place expository text in tables or figures in order to gain space.

3. Planetary Division Research Program Organization

The Planetary Science Division reorganized its calls for proposals in ROSES-2014 and that structure remains in place. Although some calls, such as, Mars Data Analysis (C.9), Cassini Data Analysis (C.10), and Discovery Data Analysis (C.11) remain, core research programs from past years, such as Planetary Astronomy, Planetary Atmospheres, and Planetary Geology and Geophysics have been recast into five new "Core" research calls that map to the five Planetary Science Division goals. In addition, two "Strategic" calls, narrower in scope and meeting strategic needs, and two "Focused" calls, narrow in scope and limited in the time, have been added. A cross-divisional call, Exoplanets (E.3) shared with the Astrophysics Division, has replaced the previous Origins of Solar Systems program.

1. The new "Core" research calls are:
 - Emerging Worlds, C.2
 - Solar System Workings, C.3
 - Habitable Worlds, C.4
 - Exobiology, C.5
 - Solar System Observations, C.6
2. The new "Strategic" calls are:
 - Planetary Data Archiving, Restoration, and Tools, C.7
 - Planetary Science and Technology from Analog Research, C.14

3. The new "Focused" calls are:
 - Lunar Data Analysis, C. 8
 - Hayabusa2 Participating Scientist Program, C.19

The new "Core" calls are organized by the themes of the science investigations. For some calls, this means a direct mapping from the old program elements to the new program elements. For a few of the old program elements, however, the proposals that would have gone into one program element together are now directed to separate programs (for instance, some proposals from Mars Fundamental Research Program will go to Solar System Workings, while others will go to Habitable Worlds). In addition, for other reasons, there may be regions of ambiguity in whether a proposal is appropriate for submittal to one program or to another.

PSD solicits proposals whose work efforts are primarily analysis of planetary mission data through the Data Analysis Programs. If a proposal would analyze data within the scope of more than one of the data analysis programs, in order to perform comparative studies across the Solar System, but is not appropriate to any one data analysis program, then submission to a Core Research Program is encouraged. If a proposal is not appropriate for one of the Data Analysis programs but does fit within the bounds of a Core Research Program (i.e., Solar System Workings or Emerging Worlds), it should be submitted to that Core Program.

3.1 Duplicate Proposals

If it is unclear to which program a proposal should be submitted, proposers should contact either the technical officer of the current award or the point of contact for the program element most likely to be appropriate for the proposal.

Proposers may not simply submit Step-2 proposals for the same project or investigation to more than one program element. The Planetary Science Division will not accept or evaluate duplicate Step-2 submissions for the same or essentially the same work more than once in a ROSES year. The first proposal will be evaluated, but any subsequent proposal submitted to Planetary Science via ROSES-2015 for the same work will not be evaluated or considered.

Substantive changes to a proposed project or investigation that would result in it no longer being the same, include aspects of the proposal that are covered by the merit evaluation, e.g.,

- The proposing institution
- Funded investigators and unfunded Co-Investigators (Co-Is) who are performing a significant portion of the work
- Concepts, ideas, goals and objectives
- Implementation (methods, approaches, instrumentation)
- Target (i.e., of measurements, observations, modeling)

Changes to a proposed project or investigation that would not be considered substantive and thus would not result in it being eligible for submission again in the same year, include aspects of the proposal that are not covered by the merit evaluation, e.g.,

- The Current and Pending Support Section

- Relevance statement
- Budget Section
- Minor changes, even to the prior list of aspects covered by the merit evaluation (Team, Concepts, Implementation, Target, etc.) will not necessarily be considered substantive.

This applies to all proposals being considered by the Planetary Science Division in response to program elements in Appendix C and also program element E.3. Proposals that are no longer under consideration, either because they were rejected or withdrawn, are not duplicates for the purpose of this rule.

4. Resources: Information, Data, and Facilities

4.1 Limits on Use of Mission Data

For proposals that contain mission data analysis, planetary spacecraft mission data to be used in proposed investigations must be available in the Planetary Data System (PDS) or equivalent publicly accessible archive at least 30 days prior to the proposal submission date. Spacecraft data that have not been obtained yet (i.e., future mission data) or those that have not been accepted for distribution in approved archives are not eligible for use in investigations. Regardless of the archive(s) used, if the data to be analyzed have issues that might represent an obstacle to analysis, the proposers must demonstrate clearly and satisfactorily how such potential difficulties will be overcome. Investigators funded by spacecraft missions who wish to apply, must demonstrate clearly how the proposed research does not overlap and is not redundant with data analysis, duties, or responsibilities already funded by their respective mission(s).

4.2 Facilities and Data Sources Available to Proposers

The following facilities and data sources are available to supported investigators. If their use is anticipated, this 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 Section 2.3 of the *NASA Guidebook for Proposers*, a letter of support may be required from any facility required for the proposed effort.

- 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) or the appropriate Node's point-of-contact for assistance.

- General Lunar and Planetary Information

The Lunar and Planetary Institute (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>.

- Data from Completed NASA Flight Programs

The National Space Science Data Center (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). For more information, see http://nssdc.gsfc.nasa.gov/nssdc/obtaining_data.html.

- Regional Planetary Image Facilities

Regional Planetary Image Facilities (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.

In addition to the local scientists and their associates who use these data on a daily basis, investigators throughout the world are encouraged to use the RPIFs. Send inquiries to the nearest facility in care of the Director, Regional Planetary Image Facility. Note that, while 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 at the NASA Goddard Space Flight Center at http://nssdc.gsfc.nasa.gov/nssdc/obtaining_data.html. 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 Cartographic Products

NASA has a long-term contract with the U.S. Geological Survey (USGS) to provide a variety of cartographic support functions for NASA researchers through the Planetary Cartography Program. This support includes:

- the Integrated Software for Imagers and Spectrometers (ISIS, <http://isis.astrogeology.usgs.gov/>);
- the management, review, and publication of geologic maps (Planetary Geologic Mapping Program, <http://planetarymapping.wr.usgs.gov/>);

- a search capability for raw planetary image data (PILOT, <http://pilot.wr.usgs.gov>);
- on demand production of higher level data products (Projection On the Web and Map and 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>);
- and free hardcopies of USGS planetary geologic maps and a wide variety of historical information through the USGS node of the Regional Planetary Information Facility (RPIF, <http://astrogeology.usgs.gov/rpif>) Network.

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 for further information.

- Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM)
An important goal of the Planetary Science Research Program is to facilitate access to extraterrestrial sample material for scientific purposes, including NASA-supported research projects. NASA's Johnson Space Center is responsible for the security of and access to all NASA-returned extraterrestrial samples (Apollo, Genesis, and Stardust), a subset of particles returned by The Japan Aerospace Exploration Agency's (JAXA's) Hayabusa mission, interplanetary dust particles collected by high-altitude aircraft, and meteorites collected in Antarctica by U.S. field parties. Peer review of sample requests is 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

- 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 include estimates of needed resources in the Budget Narrative section of their proposal. Further information on computing capabilities may be found at the NASA High-End Computing website, <http://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 or find the PAL Guidebook for Proposers at: <http://rpif.asu.edu/pal/>

- 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 research proposed to NASA sponsored programs through the ROSES announcement requires acquisition of new spectra 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, Dr. Ralph Milliken (Ralph_Milliken@brown.edu) or the Operations Manager, Dr. Takahiro Hiroi (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:

Dr. John S. Karcz

Planetary Systems Branch

NASA Ames Research Center

Moffett Field, CA 94035-1000

Telephone: (650) 604-5174

Email: 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.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 1518 psi at 1000 °F and eight individually controllable gas streams are available. Interested parties should contact Dan Vento (Daniel.M.Vento@nasa.gov) or Tibor Kremic (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/>.

4.3 Data Management Plans and Archiving

Proposals submitted to ROSES-2015 are required to include a data management plan (DMP), unless explicitly noted by the specific program element. The instrument development and Planetary Major Equipment calls (C.12, C.13, and C.17) do not require DMPs. Unless otherwise explicitly stated, DMPs must be submitted using the text box provided via the NSPIRES web interface. The DMP has an 8000-character limit, which will be automatically enforced by the NSPIRES web interface. Those who submit via Grants.gov will be held to the same requirements and length restriction. The DMP question is answered in a Grants.gov application by completing and attaching the relevant PSD.pdf form provided in the opportunity instructions document. NSPIRES will automatically incorporate the DMP into the proposal cover pages. 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, C.7) program element includes the data management discussion in the body of the proposal itself, rather than via the cover pages.

For more information on DMPs please see the [SARA FAQ on data management plans in ROSES-2015](#).

For purposes of the DMP, the term "data" includes scientific and technical information, associated calibration data, and metadata or other documentation necessary to use the data. "Data" does not include physical objects.

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 that would enable replication/reproduction of published results or future research. However, the DMP need not cover preliminary and other unpublished data, data in prepublication documents, private communications, or certain other types of information that have been specifically exempted (see the [SARA FAQ on data management plans in ROSES](#)).

Proposers should apply their own professional knowledge and experience in determining what data are scientifically appropriate for preservation and sharing, according to the standards of the relevant research communities.

In the case of a project that would produce no scientifically appropriate data, or only data specifically exempted, the DMP should simply 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 explain why the data cannot be archived in another way.

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

1. A description of data types, volume, formats, and (where relevant) standards.
2. A description of the schedule for data archiving and sharing.
3. A description of the intended repositories for archived data, including mechanisms for public access and distribution.
4. A discussion of how the plan enables long-term preservation of data.
5. 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.)

Typical DMPs will describe plans for the publication of data in scientific papers, in online supplemental material to scientific papers, in the Planetary Data System (PDS) or equivalent public archives, or on websites that serve as accepted community repositories for specific types of data.

DMPs will be reviewed as part of the overall NASA research proposal review process. NASA reserves the right to require the revision of the DMP prior to selection or funding. 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.

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

Document	Hyperlink
Proposer's Archive Guide	http://pds.nasa.gov/pds4/propose/proposing.shtml
Standards Reference	http://pds.nasa.gov/pds4/doc/sr/

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 should obtain and include

confirmation from the appropriate Discipline Node that the PDS is willing to accept their submission. It is the proposer's responsibility to conform to PDS standards.

4.4 Publication of Geologic Maps

Proposed science investigations of any planetary or satellite surface that are intended to result in 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. The scientific goal of such a geologic map product should be clearly explained and justified. 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, and (2) attend the annual Planetary Geologic Mappers Meeting to present map status to the mapping community and receive updates on current guidelines. ~~Proposers are required to contact James Skinner at USGS (jskinner@usgs.gov) in order to obtain further information pertaining to the production of USGS geologic maps (e.g., map bases, scales, extents, formats, guidelines), or visit <http://planetarymapping.wr.usgs.gov/>.~~ **Further information pertaining to the production of USGS geologic maps (e.g. map bases, scales, extents, formats, guidelines) are available at <http://planetarymapping.wr.usgs.gov/> or by contacting James Skinner at the USGS (jskinner@usgs.gov).**

4.4.1 Required Letter from USGS Map Coordinator

Investigators that intend to produce a USGS geologic map are required to include in their Step-2 (full) proposal a confirmation of technical specifications 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 main body of a proposal. Selection of a proposal for funding is contingent upon the inclusion of this document, and 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>.

4.4.2 Program Elements Supporting Geologic Mapping

Geologic mapping is an investigative process designed to go beyond standard image analyses to identify the geologic history of a local region, a large area, or a whole planetary object. Thus, geologic maps are tools to aid in identification of this geologic history. Below are some guidelines about where to propose geologic mapping investigations:

If the geologic map is being created as part of a science investigation (i.e., to address specific scientific objectives or questions about a local region, larger area, or planetary object) and uses imaging data from planetary missions identified in a Data Analysis Program (DAP), then the mapping proposals should be submitted to the appropriate DAP:

- a) MESSENGER-based Mercury maps: Discovery DAP
- b) Lunar maps: Lunar DAP
- c) Mars maps: Mars DAP
- d) Vesta or Ceres maps: Discovery DAP
- e) Saturnian satellite maps: Cassini DAP

If the geologic map is being created as part of a science investigation using imaging data from missions not covered by a current DAP, or a comparative planetology science investigation, then the mapping proposals should be submitted to the Solar System Workings Program. Examples:

- a) Venus maps
- b) Jupiter Galilean satellite maps
- c) Uranian or Neptunian satellite maps

If the geologic map is being created as a higher-order data product that does not have an accompanying science investigation, then the mapping proposals should be submitted to the Planetary Data Archiving, Restoration, and Tools (PDART) program.

Remember: Imaging data for all mapping projects must be available in the Planetary Data System 30 days prior to the proposal deadline. If you have questions about where to submit a mapping proposal, please contact Geologic Mapping Subcommittee Chair David Williams at David.Williams@asu.edu. [Section 4.4 was updated on March 13, 2015.]

5. Relevance

Although ROSES-2015 in general doesn't demand it (see Section VI (a) of the Summary of Solicitation) some program elements in Appendix C (e.g., C.3-C.5 and C.10) require an explicit relevance statement, which will be collected in 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. See the individual program elements.

As always, the argument for relevance must be made to the individual program element to which the proposal has been submitted. General statements of relevance to higher-level NASA or SMD goals and objectives may fail to convince NASA and or the peer reviewers.

6. Program Elements

A brief description of each program element offered in the Planetary Science Research Program is given below. The intent of these summary statements is to give the prospective proposer a brief overview. A detailed description of the types of research supported by each program element can be found in the Scope of Program section of the respective program element description.

Research in the area of Emerging Worlds (EW) aims to understand the formation and early evolution of the Solar System. The central goal of the program element is to understand how the Sun's family of planets, satellites, and minor bodies (including small bodies and rings) form and evolve. NASA is particularly interested in proposals for research projects that closely support its mission for exploring the Solar System, contribute to the development of future missions, or involve major interdisciplinary efforts to solve key questions. A wide range of investigations will be covered, including theoretical studies, analytical and numerical modeling, sample-based studies of extraterrestrial materials, laboratory studies, data synthesis, and observational studies of objects outside of our Solar System relevant to the formation of planetary systems. (C.2)

The Solar System Workings (SSW) program supports research into atmospheric, climatological, dynamical, geologic, geophysical, and geochemical processes occurring on planetary bodies, satellites, and other minor bodies (including rings) in the Solar System. This call seeks to address the physical and chemical processes that affect the surfaces, interiors, atmospheres, exospheres, and magnetospheres of planetary bodies. A wide range of investigations will be covered, including theoretical studies, analytical and numerical modeling, sample-based studies of extraterrestrial materials, laboratory studies, and data synthesis relevant to the physical and chemical processes affecting planetary systems. (C.3)

Research supported in Habitable Worlds (HW) seeks to use knowledge of the history of the Earth and the life upon it to determine the processes that create and maintain habitable environments, search for ancient and contemporary habitable environments, and explore the possibility of extant life beyond the Earth. (C.4)

The goal of research in Exobiology is to understand the origin, evolution, and distribution of life on Earth. Research is centered on the origin and early evolution of life on Earth and the potential of life to adapt to different terrestrial environments. This research is conducted in the context of NASA's ongoing exploration of our stellar neighborhood and the identification of biosignatures for *in situ* and remote sensing applications. (C.5)

Solar System Observations (SSO) supports both ground-based astronomical observations and suborbital investigations of our Solar System involving sounding rockets and balloons. Proposals are solicited for observations over the entire range of wavelengths, from the ultraviolet to radio, that contribute to the understanding of the Solar System. Additionally, Solar System Observations support NASA's commitment to discover and inventory potentially hazardous near Earth objects with sizes down to ~100 meters and to characterize that population through determination of their orbital elements. This program element will also consider proposals that

characterize a representative sample of these objects by measuring their sizes, shapes, and compositions. (C.6)

Recognizing that data access is important for the community, proposals addressing data archiving, restoration, and tools will be considered separately under a new strategic program. Planetary Data Archiving, Restoration, and Tools (PDART) is a program that will solicit research handling higher order data products, archiving and restoration of data, reference databases (i.e., Spectral libraries), digitization of nondigitized data, and tools. (C.7)

In order to take full advantage of the wealth of lunar data from recent and ongoing missions, the Lunar Data Analysis program (LDAP) will support data analysis of specific lunar missions. These include: [LRO](#), [GRAIL](#), [LADEE](#), [ARTEMIS](#), [LCROSS](#), and [Chandrayaan-1/M³](#). Data analysis from missions by other space agencies may be considered as well. (C.8)

The objective of the Mars Data Analysis Program (MDAP) is to enhance the scientific return from the Mars Atmosphere and Volatile Evolution, Mars Science Laboratory, Mars Pathfinder, Mars Global Surveyor, Mars Odyssey, Mars Exploration Rovers, Mars Express, Mars Reconnaissance Orbiter, and Phoenix missions by broadening scientific participation in the analysis of their respective data sets and to fund high-priority areas of research that support planning for future Mars missions. (C.9)

The objective of the Cassini Data Analysis and Participating Scientists (CDAPS) Program is to enhance the scientific return of the Cassini mission by broadening the scientific participation in the analysis and interpretation of the data returned by the mission. (C.10)

The objective of the Discovery Data Analysis Program (DDAP) is to enhance the scientific return of Discovery missions by broadening the scientific participation in the analysis of data collected by those missions. DDAP is intended to complement and not to overlap other active data analysis programs, e.g., Mars Data Analysis Program (MDAP), Cassini Data Analysis Program (CDAPS), and Lunar Data Analysis Program (LDAP).

The Planetary Instrument Concepts for the Advancement of Solar System Observations (PICASSO) Program supports the development of spacecraft-based instrument systems that show promise for use in future planetary missions. The goal of the program is to conduct planetary and astrobiology science instrument feasibility studies, concept formation, proof of concept instruments, and advanced component technology development to the point where they may be proposed in response to the Maturation of Instruments for Solar System Exploration (MatISSE) Program, C.13 – see below. (C.12)

The Maturation of Instruments for Solar System Exploration (MatISSE) Program supports the advanced development of spacecraft-based instruments that show promise for use in future planetary missions. The goal of the program is to develop and demonstrate planetary and astrobiology science instruments to the point where they may be proposed in response to future announcements of flight opportunity without additional extensive technology development (approximately technology readiness level (TRL) 6). The proposed instrument must address specific scientific objectives of likely future planetary science missions. This program is solicited

every other year; it was solicited in ROSES-2014 so it will not appear in ROSES-2015 and will next appear in ROSES-2016. (C.13)

The Planetary Science and Technology from Analog Research (PSTAR) program addresses the need for integrated interdisciplinary field experiments as an integral part of preparation for planned human and robotic missions. Furthermore, the program solicits proposals for investigations focused on exploring the Earth's extreme environments in order to develop a sound technical and scientific basis to conduct astrobiological research on other solar system bodies. The focus of this program element is on providing high-fidelity scientific investigations, scientific input, and science operations constraints in the context of planetary field campaigns. Funding provided in this program element is intended to enable researchers to conduct scientific investigations and integrate their instruments, projects, and/or protocols into field activities designed to help NASA plan for future exploration. The PSTAR solicitation is a consolidation of two previous calls: Astrobiology Science and Technology for Exploring Planets (ASTEP) and Moon Mars Analogue and Mission Activities (MMAMA). (C.14)

Planetary Protection Research (PPR) is aimed at the numerous areas of research in exobiology that have implications for the prevention of contamination of extraterrestrial environments by terrestrial organisms carried by spacecraft launched from Earth and, conversely, for understanding the potential hazards associated with possible extraterrestrial organisms that could be brought to Earth by sample-return missions. Research is required to allow NASA to understand the potential for both forward and backward contamination, as well as to set standards in these areas for spacecraft preparation and operating procedures and for returned-sample analysis. (C.15)

The Early Career Fellowships (ECF C.16) were established to facilitate the integration of early career planetary science researchers into the established research funding programs and to provide tools and experience useful when searching for a more advanced position. The ECF program is currently on hiatus pending revision. Participation is limited to proposers to the following Planetary Science Division science research programs offered in this solicitation:

- Emerging Worlds (C.2);
- Solar System Workings (C.3);
- Habitable Worlds (C.4);
- Exobiology (C.5);
- Solar System Observations (C.6);
- Lunar Data Analysis (C.8);
- Mars Data Analysis (C.9);
- Cassini Data Analysis and Participating Scientists (C.10);
- Discovery Data Analysis (C.11);
- Planetary Instrument Concepts for the Advancement of Solar System Observations (C.12);
- Maturation of Instruments for Solar System Exploration (C.13);
- Planetary Science and Technology from Analog Research (C.14);
- Laboratory Analysis of Returned Samples (C.18); and
- Exoplanets (E.3).

The Planetary Major Equipment (PME) program allows proposals for upgrading the analytical, computational, telescopic, and other instrumentation required by investigations sponsored by the following Planetary Science Division science research programs offered in this solicitation:

- Emerging Worlds (C.2);
- Solar System Workings (C.3);
- Habitable Worlds (C.4);
- Exobiology (C.5);
- Solar System Observations (C.6);
- Planetary Science and Technology from Analog Research (C.14);
- Planetary Protection Research (C.15);
- Laboratory Analysis of Returned Samples (C.18); and
- Exoplanets (E.3).

New instrumentation may also be proposed. Planetary Major Equipment proposals may be submitted only in conjunction with new science research proposals to this solicitation or as an augmentation to planetary science multiple year awards. Stand-alone proposals must be explicitly affiliated with an existing "parent" Planetary Science Division award. If the program that provided the "parent" award still exists then the PME should be submitted to that program. If the "parent" award is from a program that no longer exists (e.g., because of reorganization) then a PME may be submitted to a new program. Such a stand-alone PME request must explain the relevance of the parent award to the new program to which it is being submitted. (C.17).

The goal of the Laboratory Analysis of Returned Samples (LARS) program is to maximize the scientific return from extraterrestrial samples from NASA missions and to develop laboratory instrumentation and advanced analytical techniques. (C.18)

The Hayabusa2 mission will investigate the asteroid 1993 JU3 (C-type) and return a sample for analysis. The spacecraft will carry remote sensing instruments, as well as an impactor, small rovers, and a small lander. This Hayabusa2 Participating Scientist program will seek eight to nine scientists as Co-Investigators (Co-Is) to carry out research on the asteroid and analyze the sample after Earth return, planned for 2020. (C.19)

The Exoplanets Research program solicits basic research proposals to advance our knowledge and understanding of exoplanetary systems. This program is shared between the Planetary Science Division and the Astrophysics Division. Its objectives are the detection and characterization of planets and planetary systems outside of our Solar System, including the determination of their compositions, dynamics, energetics, and chemical behaviors. Research supported by this calls may include observational work, theoretical studies, and modeling work. (E.3)
