

A.2.14 MARS FUNDAMENTAL RESEARCH PROGRAM

1. Scope of Program

1.1 Statement of Objectives

Mars offers a uniquely dynamic "natural laboratory" for scientific research pertaining to silicate planets with active atmospheric, climatological, and geologic processes. The Mars Fundamental Research (MFR) program seeks to cultivate and pursue the best and most innovative scientific research concerning the myriad of unknowns about these processes on Mars, and in doing so also offers opportunities to those researchers interested in Mars but who are not yet prepared to work exclusively with actual mission data.

The MFR program is expected to include investigations that use: (i) both theoretical studies and experimental activities to study the basic physics of the coupled atmospheric and geological systems on Mars; (ii) quantitative terrestrial field experiments that promise to further understanding of the *in situ* measurements that have been or that will be made on Mars; and (iii) any other innovative research activities that demonstrate relevance to NASA's overarching program goals for the scientific exploration of Mars. As such, this program solicitation is intentionally broad, with only a few underlying ground-rules and boundary conditions, as follows:

- 1) Investigations submitted to this program must demonstrate how the research to be undertaken will directly further our understanding of Mars relative to the current state-of-the art;
- 2) Research activities must not duplicate those that involve data analysis of flight mission data (such investigations may be submitted to Mars Data Analysis program, Program Element A.2.5 in this NRA);
- 3) All proposed research must demonstrate traceability and relevance to the overarching scientific research directions of the Mars Exploration Program (MEP, <http://mars.jpl.nasa.gov>), as summarized in the July 2001 Mars Exploration Payload Analysis Group (MEPAG) report that may be found in JPL Document 01-7 (<http://mars.jpl.nasa.gov/tech/sciencestrategy.pdf>), as well as in the recent Space Studies Board report of the Committee for Planetary Exploration (COMPLEX) at <http://www.nationalacademies.org/ssb/bib1.html> - 2001;
- 4) Research involving field experiments must demonstrate how the proposed activities directly relate to current questions about the environment of Mars;
- 5) Laboratory experiments submitted to this MFR program must relate directly to questions about the Martian environment and Mars-relevant materials, and there must be clear indication of the uniqueness of the approach;
- 6) Proposals to develop of basic datasets about geochemical, biogeochemical, and geophysical properties of Mars-relevant materials are permitted provided there is sufficient justification for such measurements in the context of the MEP during the coming decade;

- 7) All investigations must discuss relevance of anticipated research results to the overall NASA MEP, which includes innovative research relevant to the 2007 Mars Scout mission to be selected by the end of 2002) and other openly competed flight missions (Note: Investigations in this program must NOT be posed as extensions of flight experiments that are part of ongoing or soon-to-be active science missions; rather investigators must state how any proposed activities that pertain to flight missions are independent of those to be pursued by the typical mission-related science team activities); and
- 8) Investigations in which innovative information technology (IT) approaches for understanding Mars as a system, including field experiments that clearly demonstrate the potential of IT solutions to substantially increase the scientific yield (and scope) of planned investigations, are permitted (e.g., IT solutions that could radically improve the time required for field deployable rovers to approach rocks and other interesting targets, etc.), provided scientific products are proposed as an end product (that is, technology demonstrations are NOT relevant to this NRA).

As part of this research solicitation, NASA encourages innovative research approaches involving the full spectrum of possibilities listed above in items (1) – (8) above, as well as others that can be scientifically justified..

Finally, topical science conferences, workshops, and symposia related to MFR program may also be proposed as part of the research investigations submitted to this program.

1.2 Background

NASA's newly restructured Mars Exploration Program (MEP) (<http://mars.jpl.nasa.gov>) is a science-driven program that focuses on understanding the planet Mars as a "system." The MEP is characterized by a suite of core program flight missions, as well as fully-competed Scout missions, whose aim is to provide new observational and measurement data concerning Mars.

NASA's Mars Data Analysis program (MDAP; Section A.2.5 in this NRA) treats research that is based upon flight mission data from the suite of flight experiments that have flown or are currently collecting data concerning Mars. Key to understanding Mars as a dynamic system in space and time are a broad variety of fundamental research investigations, some of which are not directly linked to the flight experiment data that have either recently been collected or will be in the near future (i.e., by the Mars Odyssey Orbiter, and Mars Global Surveyor).

1.3 Sources of Information and Data

It is the responsibility of the investigator to acquire any required data. Before submitting a proposal, each proposer should determine that the required data are available. MPF, MGS, and MO, as well as data from previous Mars missions, are available from the Planetary Data System (PDS). The PDS home page can be accessed at

<http://pds.jpl.nasa.gov/>. Proposers who wish to use photographic and cartographic materials may find such data at the nearest Regional Planetary Image Facility (RPIF). Locations of RPIF's are listed on the RPIF home page at URL <http://cass.jsc.nasa.gov/library/RPIF/RPIF.html>.

Documents that describe the research priorities for Mars exploration include: Assessment of Mars Science and Mission Priorities [2001] prepared by the Committee on Planetary and Lunar Exploration (COMPLEX), of the Space Studies Board (National Research Council), and published by the National Academy Press in November 2001. This document includes summaries of Mars scientific priorities from MEPAG, former reports by COMPLEX, and others. These documents are available from the Space Studies Board, National Research Council, 2101 Constitution Ave, NW, Washington DC 21418.

Goals, Objectives, Investigations, and Measurement Priorities for Mars Exploration [2001], edited by R. Greeley as Chair of the NASA Mars Exploration Payload Analysis Group (MEPAG), and included in the July 2001 JPL document JPL 01-7, is available on-line at <http://mars.jpl.nasa.gov/tech/sciencestrategy.pdf>, as well as via the NASA HQ Mars web site at: <http://www.hq.nasa.gov/mars>.

Finally, a special collection of research articles was published in the journal Nature, Volume 412, No. 6843, 12 July 2001, pp. 207-253, that includes invited review articles about the state-of-the-art with respect to current thinking about key areas of Mars research.

2. Programmatic Information

The anticipated resource base for the initial year of this program is \$2.5M, which is expected to support 30 to 50 investigations given the submission of an adequate number of proposals of merit. Proposals may request periods of performance of up to three years duration. The goal is to increase the budget for this MFR program on a yearly basis up to 1.5% of the overall budget for NASA's Mars exploration program as a direct means of supporting Mars-related research that is not directly coupled to flight mission science teams or to other data analysis programs.

IMPORTANT INFORMATION

As discussed in the *Summary of Solicitation* of this NRA, the Office of Space Science (OSS) is now using a single, unified set of instructions for the submission of proposals. This material is contained in the document entitled *NASA Guidebook for Proposers Responding to NASA Research Announcement – 2001* (or *NASA Guidebook for Proposers* for short) that is accessible by opening URL <http://research.hq.nasa.gov>, and linking through the menu item "Helpful References," or may be directly accessed online at URL <http://www.hq.nasa.gov/office/procurement/nraguidebook/>. This NRA's Summary of Solicitation also contains the schedule and instructions for the

electronic submission of a *Notice of Intent* (NOI) to propose and a proposal's *Cover Page/Proposal Summary*, which now also includes the required *Budget Summary*, and the mailing address for the submission of a proposal.

Questions about this program element may be directed to the cognizant Discipline Scientist:

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