

Earth Sciences: Instrumentation and Facilities (EAR/IF)

PROGRAM SOLICITATION

NSF 09-517

REPLACES DOCUMENT(S):

NSF 07-553



National Science Foundation

Directorate for Geosciences
Division of Earth Sciences

Full Proposal Target Date(s):

February 23, 2009

July 08, 2009

Second Wednesday in July, Annually Thereafter

February 10, 2010

Second Wednesday in February, Annually Thereafter

REVISION NOTES

A revised version of the *NSF Proposal & Award Policies & Procedures Guide (PAPPG) NSF 09-1* was issued on October 1 2008 and is effective for proposals submitted on or after January 5 2009. Please be advised that the guidelines contained in *NSF 09-1* apply to proposals submitted in response to this funding opportunity. Proposers who opt to submit prior to January 5th 2009 must also follow the guidelines contained in *NSF 09-1*.

One of the most significant changes to the PAPPG is implementation of the mentoring provisions of the America COMPETES Act. Each proposal that requests funding to support postdoctoral researchers must include as a separate section within the 15-page project description a description of the mentoring activities that will be provided for such individuals. Proposals that do not include a separate section on mentoring activities within the Project Description will be returned without review (see the PAPP Guide Part I: *Grant Proposal Guide* Chapter II.C.2.d for further information).

This solicitation supercedes *NSF 07-553*. Major changes include: 1) Maximum allowable requests for *Acquisition or Upgrade of Research Equipment* and *Development of New Instrumentation, Analytical Techniques or Software* proposals are now limited to \$750,000 -- Requests to upgrade research group computing facilities remain limited to \$75,000; 2) The *Support of Research Technicians* subprogram of EAR/IF has been discontinued; however, opportunities for the inclusion of technical support as part of proposals for acquisition of new research equipment submitted by early career geoscientists remains and has been clarified in this solicitation under *Support for Early Career Investigators*; 3) Proposals to the EAR/IF Program will only be reviewed if the majority of research projects described within the proposal fall within areas supported by the Division of Earth Sciences; and 4) Proposals submitted to EAR/IF may now include up to \$10,000 in *Support of Outreach Activities*.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Earth Sciences: Instrumentation and Facilities (EAR/IF)

Synopsis of Program:

The Instrumentation and Facilities Program in the Division of Earth Sciences (EAR/IF) supports meritorious requests for infrastructure that promotes research and education in areas supported by the Division (see <http://www.nsf.gov/div/index.jsp?div=EAR>). EAR/IF will consider proposals for:

1. *Acquisition or Upgrade of Research Equipment* that will advance laboratory and field investigations, and student research training opportunities in the Earth sciences. The maximum request is \$750,000. The maximum request for upgrade of research group computing facilities is \$75,000;

2. **Development of New Instrumentation, Analytical Techniques or Software** that will extend current research and research training capabilities in the Earth sciences. The maximum request is \$750,000;
3. **Support of National or Regional Multi-User Facilities** that will make complex and expensive instruments or systems of instruments broadly available to the Earth sciences research and student communities;
4. **Development of Cyberinfrastructure for the Earth Sciences (Geoinformatics)** that will enable transformative advances in Earth science research and education through novel application, development or adaptation of information technologies.
5. Support for Early Career Investigators to facilitate expedient operation of new research infrastructure proposed by the next generation of leaders in the Earth Sciences. This opportunity allows for submission of a proposal for Acquisition or Upgrade of Research Equipment that includes budget line items associated with support of a new full-time technician who will be dedicated to manage the instrument(s) being requested. Any request for technical support under this opportunity is limited to three years duration and a declining schedule of maximum annual funding as follows: Year 1 = \$80,000, Year 2 = \$60,000 and Year 3 = \$40,000.

Planned research uses of requested instruments, software, facilities, and cyberinfrastructure must include basic research on solid-Earth and surface-Earth processes.

Support is available through grants or cooperative agreements awarded in response to investigator-initiated proposals.

Human resource development and education are expected to be an integral part of all proposals submitted to EAR/IF. Efforts to support participation of underrepresented groups in laboratory and/or field instrument use is encouraged.

All proposers to EAR/IF under the categories of **Acquisition or Upgrade of Research Equipment, Development of New Instrumentation, Analytical Techniques or Software, and Support for Early Career Investigators** may include up to \$10,000 in **Support for Outreach Activities** (please refer to Section V.B Budgetary Information).

Proposals requesting equipment, infrastructure or personnel that will also serve disciplines outside the Earth sciences may be jointly reviewed with other programs within the Foundation. EAR/IF will consider co-funding of projects with other NSF programs.

Cognizant Program Officer(s):

- David Lambert, Program Director, 785 S, telephone: (703) 292-8558, fax: (703) 292-9025, email: dlambert@nsf.gov
- Russell C. Kelz, Program Director, 785 S, telephone: (703) 292-4747, fax: (703) 292-9025, email: rkelz@nsf.gov
- Thomas J. Boyd, Program Director, 785 S, telephone: (703) 292-4742, fax: (703) 292-9025, email: tjboyd@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.050 --- Geosciences

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant or Cooperative Agreement

Estimated Number of Awards: 35 to 45

Anticipated Funding Amount: \$7,000,000 for new awards annually, pending availability of funds

Eligibility Information

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposals:**

- Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
- Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: <http://www.nsf.gov/pubs/policydocs/grantsgovguide607.pdf>)

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required under this solicitation.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

- **Full Proposal Target Date(s):**
 - February 23, 2009
 - July 08, 2009
 - Second Wednesday in July, Annually Thereafter
 - February 10, 2010
 - Second Wednesday in February, Annually Thereafter

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

The Division of Earth Sciences (EAR) supports meritorious proposals for research focused on improving the understanding of the structure, composition, and evolution of the Earth and the processes that govern the formation and behavior of the Earth's materials. The results of Earth Science research contribute to a better understanding of the Earth's changing environments, the natural distribution of its mineral, water, and energy resources, and provide methods for predicting and mitigating the effects of geologic hazards such as earthquakes, volcanic eruptions, floods, and landslides. EAR's research programs support studies of the Earth's interior and terrestrial surface, including freshwater systems and interactions with the biosphere and atmosphere. Detailed descriptions of research programs within EAR are available in the latest Earth Science Research Program Solicitations at: <http://www.nsf.gov/div/index.jsp?org=EAR>

The Instrumentation and Facilities Program in the Division of Earth Sciences (EAR/IF) supports meritorious proposals for infrastructure that promotes research and education in areas traditionally supported by the Division in five major funding areas:

1. **Acquisition or Upgrade of Research Equipment;**
2. **Development of New Instrumentation, Analytical Techniques or Software;**
3. **Support of National or Regional Multi-User Facilities;**
4. **Development of Cyberinfrastructure for the Earth Sciences (Geoinformatics);**
5. **Support for Early Career Investigators**

In all proposals, a common goal should be to advance research and research training in the Earth sciences.

Investigators interested in a recent history of EAR/IF awards and in learning more about supported national or regional multi-user facilities are encouraged to make use the NSF award search engine (<http://www.nsf.gov/awardsearch/tab.do?dispatch=2>) by entering Element Code 1580 and/or to browse the EAR/IF homepage at: <http://www.nsf.gov/geo/ear/iff/facil.jsp>

II. PROGRAM DESCRIPTION

The Instrumentation and Facilities Program in the Division of Earth Sciences (EAR/IF) supports meritorious requests for infrastructure that promotes research and education in areas traditionally supported by the Division. EAR/IF will consider proposals for:

1. **Acquisition or Upgrade of Research Equipment** that will advance laboratory and field investigations, and student research training opportunities in the Earth sciences;
2. **Development of New Instrumentation, Analytical Techniques or Software** that will extend current research and research training capabilities in the Earth sciences;
3. **Support of National or Regional Multi-User Facilities** that will make complex and expensive instruments or systems of instruments broadly available to the Earth sciences research and student communities;
4. **Development of Cyberinfrastructure for the Earth Sciences (Geoinformatics)** that will enable transformative advances in Earth science research and education through novel application, development or adaptation of information technologies.
5. **Support for Early Career Investigators** to facilitate expedient development and operation of new laboratory or field equipment resources proposed by the next generation of leaders in the Earth Sciences.

Planned research uses of requested instruments, software, facilities, and cyberinfrastructure must include basic research on solid-Earth and surface-Earth processes, including the non-marine hydrosphere.

Support is available through grants or cooperative agreements awarded in response to investigator-initiated proposals.

Human resource development and education are expected to be an integral part of all proposals submitted to EAR/IF. Efforts to support participation of underrepresented groups in laboratory and/or field instrument use and outreach activities are also encouraged.

Proposals requesting equipment, infrastructure or personnel that will serve disciplines outside the Earth sciences may be jointly reviewed with other programs within the Foundation. EAR/IF will consider co-funding of projects with other NSF programs.

EAR/IF submission is appropriate for proposals that include equipment only. However, equipment needs that are linked to the conduct of a specific research project being proposed to NSF/EAR may be included within the budget of a proposal submitted to an appropriate EAR research program. Examples might include environmental sensors or observational field equipment that will be installed *in situ*, equipment that could be considered expendable, individual desktop or laptop personal computers, analytical balances, or miscellaneous sample preparation equipment. In general, equipment requests included in proposals submitted to EAR research programs should not exceed a total of \$50,000. Investigators planning on submitting an EAR research proposal with a significant equipment budget are encouraged to discuss these plans with the relevant research program officer prior to submission.

Proposal Categories

Acquisition or Upgrade of Research Equipment

EAR/IF accepts proposals seeking support for the acquisition of new research equipment or the upgrade of existing equipment; **such proposals may be submitted to either of the two annual target dates.**

Analytical laboratory and field instrumentation and computational equipment often serve a range of scientific disciplines. EAR/IF will assess the level of financial support appropriate for awards and may seek to partner with other appropriate NSF programs and other Federal agencies.

The ability of organizations to maintain, operate and provide technical support for sophisticated analytical equipment during its expected lifetime will be a review criterion. Management plans for oversight, user access policies and anticipated user fees, if any, should be included in proposals.

Investigators interested in seeking NSF support for the acquisition or upgrade of research equipment might also wish to investigate the Major Research Instrumentation (MRI) Program. MRI maintains a January submission deadline each year and the goals and design of the MRI Program complement those of the EAR/IF Program. Investigators are encouraged to examine the latest MRI solicitation (<http://www.nsf.gov/od/oia/programs/mri/>).

Development of New Instrumentation, Analytical Techniques or Software

EAR/IF accepts proposals seeking support for the development of new instrumentation, analytical techniques and software that extend current research capabilities in the Earth sciences; **such proposals may be submitted to either of the two annual target dates.**

Investigators seeking to develop new instrumentation, analytical techniques and software should demonstrate that a community of geoscientists is actively interested in the new capability. EAR/IF expects that design details and/or schematics for developed research instrumentation and protocols for new analytical techniques will be published and are not proprietary. EAR/IF expects that developed software will support instrumentation or represent a unique means to solve analytical problems and will be open source and/or available for download via the Web or through distribution on appropriate media at no cost beyond that reasonable for duplication, media and shipping costs. Software development proposals seeking funds primarily for web service, web method, service oriented architecture or database development should be directed to the Development of Cyberinfrastructure for the Earth Sciences (Geoinformatics) category. EAR/IF will consider support of development projects that are collaborative between academic and industrial partners. EAR/IF does not typically support the sole commercial development of instrumentation or capabilities.

Investigators interested in seeking NSF support for the development of new research instrumentation might also wish to investigate the Major Research Instrumentation (MRI) Program. MRI maintains a January submission deadline each year and the goals and design of the MRI Program complement those of the EAR/IF Program. Investigators are encouraged to examine the latest MRI solicitation (<http://www.nsf.gov/od/oia/programs/mri/>).

Support of National or Regional Multi-User Facilities

EAR/IF accepts proposals seeking support for national or regional multi-user facilities; **such proposals may be submitted to either of the two annual target dates.**

Investigators seeking to establish or continue support of a national or regional multi-user facility are encouraged to contact an EAR/IF Program Officer prior to submission. In general, support for national or regional multi-user facilities is reserved for groups that seek to offer expensive or specialized analytical laboratory or field equipment and services to the broader geosciences community. Typically, EAR/IF looks for specialized leadership capabilities and the availability of adequate and appropriate supporting infrastructure and personnel.

Development of Cyberinfrastructure for the Earth Sciences (Geoinformatics)

EAR/IF accepts proposals seeking support to develop cyberinfrastructure for the Earth Sciences (Geoinformatics); **such proposals may only be submitted to the July target dates in odd-numbered years.**

Geoinformatics proposals should describe the development of enabling information technology platform(s) intended to facilitate the next generation of Earth science research. EAR/IF seeks proposed platform activities that are transformative, with impacts that extend beyond an individual investigator or small group of investigators. EAR/IF will accept Geoinformatics proposals seeking support for the development and implementation of databases, networks, information technology facilities, new information technology instrumentation, techniques, and methodologies that support the enhancement of Earth sciences research activities. EAR/IF is particularly interested in proposals that address priorities identified by the research and education communities in community workshop reports on science and cyberinfrastructure needs in the Earth sciences.

EAR/IF expects that Geoinformatics proposals will:

1. demonstrate an awareness of existing geoinformatics infrastructure and developments both within the Earth Sciences community and in other fields or programs that would impact the proposed work.
2. where appropriate, present plans for integration and compatibility of proposed geoinformatics platform(s) within the network of existing geoinformatics infrastructure,
3. adopt open source and platform independent development principles (see <http://www.opensource.org/> for open source license procedures),
4. address scalability,
5. involve computational scientists as co-investigators, collaborators, or consultants,
6. include a management plan that addresses potential out-year sustainability costs (operations, maintenance and other support costs) and potential mechanisms to cover these costs.
7. describe a plan to develop metrics that can be used to monitor and evaluate quantitatively how the geoinformatics platform is being used, and the impact of the platform on the community.

In addition to contacting an EAR/IF Program Officer, prospective principal investigators are encouraged to contact the Program Officer(s) in the core science program(s) most closely affiliated with the proposed Geoinformatics activity. This reflects the likelihood that the submitted proposal will be co-reviewed by EAR/IF and the appropriate core science program.

Proposals submitted solely for the development of instrument control or data acquisition, analysis or modeling software should follow guidelines detailed under Development of New Instrumentation, Analytical Techniques or Software.

Support for Early Career Investigators

EAR/IF accepts proposals from early career investigators (in a tenure track position but not tenured at the time of submission) who seek to establish new laboratory or field equipment facilities and would demonstrably benefit from the availability of dedicated full-

time technical support in the initial years following establishment; **such proposals may be submitted to either of the two annual target dates.**

Via this opportunity, EAR/IF seeks to facilitate expedient development and operation of new laboratory or field equipment resources proposed by the next generation of leaders in the Earth Sciences. The opportunity allows for submission of a proposal prepared as an **Acquisition or Upgrade of Research Equipment** submission but may include budget line items associated with support of a new full-time laboratory technician who will be dedicated to the instrument(s) being requested. Any request for technical support under this opportunity is limited to three years duration and a declining schedule of maximum annual funding in order to encourage investigators and their host institutions to carefully plan for future alternative sources for technical support (see details described in section *V.B Budgetary Information*).

III. AWARD INFORMATION

Approximately \$7,000,000 annually for 35-45 new awards, subject to the availability of funds. Awards may be standard or continuing grants or cooperative agreements.

IV. ELIGIBILITY INFORMATION

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the [Grant Proposal Guide](#), Chapter I, Section E.

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (<http://www.nsf.gov/pubs/policydocs/grantsgovguide607.pdf>). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.3 of the Grant Proposal Guide provides additional information on collaborative proposals.

Special attention should be paid to the following when submitting a proposal to EAR/IF:

1. Title

The title of the proposal should convey its main topic. Proposals for **Acquisition or Upgrade of Research Equipment, Development of New Instrumentation, Analytical Techniques or Software, Support of National or Regional Multi-User Facilities, Development of Cyberinfrastructure for the Earth Sciences (Geoinformatics), and Support for Early Career Investigators** should, respectively, have titles beginning with:

"Acquisition of ..."

"Upgrade of ..."

"Development of ..."

"Facility Support: ..."

"Geoinformatics: ..."

"Early Career: ..."

2. Project Description

Proposals for **Acquisition or Upgrade of Research Equipment** must include a description of the research projects of the principal investigator(s) and other non-casual users for which the equipment will be used. The description of the research projects and the equipment should be comprehensive enough to allow reviewers to evaluate the merit of the research and the extent to which the equipment is essential and appropriate.

Proposals for **Development of New Instrumentation, Analytical Techniques or Software** must include a description of the instrument design, technique, or code development that is sufficiently detailed for reviewers to evaluate its technical capabilities and potential benefit to research in the Earth sciences.

Proposals for **Support of National or Regional Multi-User Facilities** must include a description of the technical capabilities of the facility and the impact that these capabilities will make on the science. The size and nature of the science community that will make principal use of the facility should also be described, along with any evidence of that community's desire to pool resources in support of the facility.

Proposals for **Development of Cyberinfrastructure for the Earth Sciences (Geoinformatics)** must demonstrate that a community of Earth scientists is actively interested in and will utilize the new capability. Investigators should also demonstrate how Geoinformatics platforms will contribute to advancing research, education and diversity in the Earth sciences. Investigators should consider the degree to which the proposed development is integrated, or can be easily integrated, in larger existing community information infrastructure (network) for the Earth sciences and beyond, and the breadth of the proposed facility's or project's impact on the Earth science community.

Proposals for **Support for Early Career Investigators** should follow guidelines above provided for proposals submitted to the **Acquisition or Upgrade of Research Equipment** opportunity. In addition, proposals including a request for support of a full-time research technician must include a description of the laboratory and/or field responsibilities that will be assumed by the technician as well as the anticipated breakdown of the time distribution of their assignments.

3. Maintenance and Operation

Proposals for **Acquisition or Upgrade of Research Equipment, Support of National or Regional Multi-User Facilities, and Support for Early Career Investigators** must include a section describing the provisions for maintenance and operation of relevant laboratory or field equipment. This section should describe how and by whom the requested instrumentation is to be operated and maintained. If the instrument(s) being requested is/are for replacement of similar existing analytical equipment, available data on user charges and related income, machine downtime, cost of instrument service contacts or available technical support should be discussed. Details regarding user scheduling decision procedures, relevant safety provisions and plans for user training should also be included. Plans for data acquisition and archival that conform to relevant NSF/EAR data policies should also be discussed (see http://www.nsf.gov/geo/ear/EAR_data_policy_204.pdf). Biosketches should be included for relevant technical support personnel, whether or not NSF/EAR funding is requested for their support.

4. Inventory of Existing Equipment and Technician Positions

Proposals for **Acquisition or Upgrade of Research Equipment** must list all comparable items of equipment to which the applicants have access at the submitting organization or elsewhere.

Existing and relevant technical support personnel in the department and their source of funding should be described and relevant biosketches included.

5. Support of Outreach Activities

Proposals submitted to the EAR/IF Program may request up to \$10,000 in support of outreach activities related to the funding request to engage audiences that otherwise will not have access to the instrumentation and/or data generated. Budgetary requests for such activities may appear over multiple categories on the NSF Budget Form but the total should not exceed \$10,000. The budget justification section should summarize all planned outreach expenditures and their total separately from other line item justifications.

B. Budgetary Information

Cost Sharing: Cost sharing is not required under this solicitation.

Budget Preparation Instructions:

The maximum request for **Acquisition or Upgrade of Research Equipment** and **Development of New Instrumentation, Analytical techniques or software** proposals is \$750,000. The maximum request for upgrade of research group computing facilities is \$75,000. **Proposals that request support in excess of the maximums allowable will be returned without review.**

The budget section of proposals for **Acquisition or Upgrade of Research Equipment** should indicate the current price and any discounts available for the total equipment package requested, itemized by major components. Relevant manufacturers quotes must be included in the supplementary documents section of the proposal. **Proposals submitted without manufacturer price quotes will be returned without review.**

EAR/IF does not support instrument service contracts. **Proposals that request support for instrument service contracts will be returned without review.**

Personnel costs directly attributable to **Development of New Instrumentation, Analytical techniques or software**, or to **Support of National or Regional Multi-User Facilities** may be requested.

Personnel costs will not be supported through grant proposals for **Acquisition or Upgrade of Research Equipment**. An exception includes proposals submitted to the **Support for Early Career Investigators** opportunity. The inclusion of technical support on such proposals is limited to three years duration with a declining schedule of maximum annual funding for the total of salary, fringe benefits and related indirect costs as follows: Year 1 = \$80,000, Year 2 = \$60,000, Year 3 = \$40,000. The budget justification should demonstrate how the requested NSF support will result in a new full-time technical position.

C. Due Dates

- **Full Proposal Target Date(s):**

February 23, 2009

July 08, 2009

Second Wednesday in July, Annually Thereafter

February 10, 2010

Second Wednesday in February, Annually Thereafter

D. FastLane/Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

Detailed technical instructions regarding the technical aspects of preparation and submission via FastLane are available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal User Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Website at: <https://www.fastlane.nsf.gov/fastlane.jsp>.

- **For Proposals Submitted Via Grants.gov:**

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: <http://www.grants.gov/CustomerSupport>. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal preparation requirements. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with the oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal.

A. NSF Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board (NSB)-approved merit review criteria: intellectual merit and the broader impacts of the proposed effort. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two NSB-approved merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which the reviewer is qualified to make judgements.

What is the intellectual merit of the proposed activity?

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

Examples illustrating activities likely to demonstrate broader impacts are available electronically on the NSF website at: <http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf>.

NSF staff also will give careful consideration to the following in making funding decisions:

Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

Additional Review Criteria:

In addition to the general NSF merit review criteria (intellectual merit/broader impacts), criteria considered in the evaluation of **all** proposals submitted to EAR/IF include:

- the intrinsic merit of the research that will benefit from the equipment, technique, cyberinfrastructure, or multi-user facility;
- the number of investigators who will substantially benefit from the equipment, technique, cyberinfrastructure, or multi-user facility, and the strength of their research programs;
- the degree to which the equipment, technique, cyberinfrastructure or multi-user facility is appropriate and essential for the intended research;
- the degree to which core research projects supported by the Division of Earth Sciences will benefit from the proposed equipment, technique, cyberinfrastructure or multi-user facility

An additional criterion considered in the evaluation of proposals submitted to EAR/IF for ***Acquisition or Upgrade of Research Equipment*** includes:

- the ability to operate and maintain complex equipment during its expected lifetime.

An additional criterion considered in the evaluation of proposals submitted to EAR/IF for ***Support of National or Regional Multi-User Facilities*** includes:

- the ability to provide access to a facility intended to serve a national or regional research community.

Additional review criteria considered in the evaluation of proposals submitted to EAR/IF for ***Development of Cyberinfrastructure for the Earth Sciences (Geoinformatics)*** include:

- A description of the value of the geoinformatics platform in the context of a missing capability required by the earth science field, and specific examples of how the use of the geoinformatics platform will have a transformative impact on earth science research and education.
- A clear description of how the proposed geoinformatics approach compares to alternative or existing approaches (including commercial solutions).
- A compelling discussion of the need for this platform development and the potential use of the platform by the broader earth science community.
- A project plan with milestones and tangible metrics to measure the success of the platform development.
- A plan to make use of a build and test service such as NMI, or an NSF designated alternative, to support software development and testing if appropriate. Details of the NMI Build and Test facility can be found at: <http://nmi.cs.wisc.edu/>.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (GC-1); * or Research Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after expiration of a grant, the PI also is required to submit a final project report.

Failure to provide the required annual or final project reports will delay NSF review and processing of any future funding increments as well as any pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- David Lambert, Program Director, 785 S, telephone: (703) 292-8558, fax: (703) 292-9025, email: dlambert@nsf.gov
- Russell C. Kelz, Program Director, 785 S, telephone: (703) 292-4747, fax: (703) 292-9025, email: rkelz@nsf.gov
- Thomas J. Boyd, Program Director, 785 S, telephone: (703) 292-4742, fax: (703) 292-9025, email: tjboyd@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.
- Brian E. Dawson, Information Technology Specialist, 705 N, telephone: (703) 292-4727, fax: (703) 292-9042, email: bdawson@nsf.gov

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, MyNSF (formerly the Custom News Service) is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. MyNSF also is available on NSF's Website at <http://www.nsf.gov/mynsf/>.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this new mechanism. Further information on Grants.gov may be obtained at <http://www.grants.gov>.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 40,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <http://www.nsf.gov>

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

Send an e-mail to: pubs@nsf.gov

or telephone: (703) 292-7827

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records, " 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

Suzanne H. Plimpton
Reports Clearance Officer
Division of Administrative Services
National Science Foundation
Arlington, VA 22230

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