

## Mathematical Sciences Research Institutes

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### PROGRAM SOLICITATION

NSF 10-592

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### REPLACES DOCUMENT(S):

NSF 08-565

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National Science Foundation

Directorate for Mathematical & Physical Sciences  
Division of Mathematical Sciences

**Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

February 04, 2011

### IMPORTANT INFORMATION AND REVISION NOTES

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A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), [NSF 11-1](#), was issued on October 1, 2010 and is effective for proposals submitted, or due, on or after January 18, 2011. Please be advised that the guidelines contained in [NSF 11-1](#) apply to proposals submitted in response to this funding opportunity. Proposers who opt to submit prior to January 18, 2011, must also follow the guidelines contained in [NSF 11-1](#).

**Cost Sharing:** The PAPPG has been revised to implement the National Science Board's recommendations regarding cost sharing. Inclusion of voluntary committed cost sharing is prohibited. In order to assess the scope of the project, all organizational resources necessary for the project must be described in the Facilities, Equipment and Other Resources section of the proposal. The description should be narrative in nature and must not include any quantifiable financial information. Mandatory cost sharing will only be required when explicitly authorized by the NSF Director. See the PAPP Guide Part I: *Grant Proposal Guide (GPG) Chapter II.C.2.g(xi)* for further information about the implementation of these recommendations.

**Data Management Plan:** The PAPPG contains a clarification of NSF's long standing data policy. All proposals must describe plans for data management and sharing of the products of research, or assert the absence of the need for such plans. FastLane will not permit submission of a proposal that is missing a Data Management Plan. The Data Management Plan will be reviewed as part of the intellectual merit or broader impacts of the proposal, or both, as appropriate. Links to data management requirements and plans relevant to specific Directorates, Offices, Divisions, Programs, or other NSF units are available on the NSF website at: <http://www.nsf.gov/bfa/dias/policy/dmp.jsp>. See [Chapter II.C.2.j](#) of the GPG for further information about the implementation of this requirement.

**Postdoctoral Researcher Mentoring Plan:** As a reminder, each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. Please be advised that if required, FastLane will not permit submission of a proposal that is missing a Postdoctoral Researcher Mentoring Plan. See [Chapter II.C.2.j](#) of the GPG for further information about the implementation of this requirement.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised NSF Proposal & Award Policies & Procedures Guide (PAPPG) ([NSF 15-1](#)), which is effective for proposals submitted, or due, on or after December 26, 2014. The PAPPG is consistent with, and, implements the new Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance) (2 CFR § 200).

### SUMMARY OF PROGRAM REQUIREMENTS

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#### General Information

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**Program Title:**

Mathematical Sciences Research Institutes

**Synopsis of Program:**

This program enables large-scale group efforts that involve broad segments of the scientific community. Projects supported by this program must involve the mathematical sciences in a significant way and have the scope to justify the funding, duration, and infrastructure of an institute. The goals of the program include advancing research in the mathematical sciences, increasing the impact of the mathematical sciences in other disciplines, and expanding the talent base engaged in mathematical research in the United States.

**Cognizant Program Officer(s):**

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- Joanna Kania-Bartoszyńska, 1025 N, telephone: (703) 292-4881, email: [jkaniaba@nsf.gov](mailto:jkaniaba@nsf.gov)

- Mary Ann Horn, 1025 N, telephone: On sabbatical, email: [mhorn@nsf.gov](mailto:mhorn@nsf.gov)
- Nandini Kannan, Program Director, 1025 N, telephone: (703) 292-8104, email: [nakannan@nsf.gov](mailto:nakannan@nsf.gov)
- Christopher W. Stark, 1025 N, telephone: (703) 292-4869, email: [cstark@nsf.gov](mailto:cstark@nsf.gov)

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

- 47.049 --- Mathematical and Physical Sciences

## Award Information

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**Anticipated Type of Award:** Continuing Grant

**Estimated Number of Awards:** 3 to 4

**Anticipated Funding Amount:** \$12,000,000 Up to this amount will be initially available for this activity in FY 2012, subject to availability of funds and quality of proposals.

## Eligibility Information

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**Who May Submit Proposals:**

Proposals may only be submitted by the following:

- Universities or four-year colleges accredited in and having a campus located in the United States, or nonprofit, nonacademic organizations in the US associated with educational or research activities. Multi-institutional consortia are permitted, but a single entity must accept overall management responsibility.

**Who May Serve as PI:**

There are no restrictions or limits.

**Limit on Number of Proposals per Organization:**

There are no restrictions or limits.

**Limit on Number of Proposals per PI or Co-PI:**

There are no restrictions or limits.

## Proposal Preparation and Submission Instructions

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**A. Proposal Preparation Instructions**

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **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](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/publications/pub\\_summ.jsp?ods\\_key=grantsgovguide](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)).

**B. Budgetary Information**

- **Cost Sharing Requirements:** Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

**C. Due Dates**

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

February 04, 2011

## Proposal Review Information Criteria

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**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

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**Award Conditions:** Additional award conditions apply. Please see the full text of this solicitation for further information.

**Reporting Requirements:** Additional reporting requirements apply. Please see the full text of this solicitation for further information.

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## I. INTRODUCTION

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The Division of Mathematical Sciences (DMS) of the National Science Foundation (NSF) supports a number of research institutes in the mathematical sciences through its Mathematical Sciences Research Institutes program. The goals of this program include advancing research in the mathematical sciences, increasing the impact of the mathematical sciences in other disciplines, and expanding the talent base engaged in mathematical research in the United States. Institutes have proven to be an effective means of achieving these goals. Two institutes were established in 1980; since then, the portfolio of mathematical sciences research institutes has expanded as a result of open competitions based on solicitations issued in 1997, 2000, and 2008. DMS now supports programs at seven US-based institutes: the American Institute of Mathematics (AIM) in Palo Alto, California; the Institute for Advanced Study (IAS) in Princeton, New Jersey; the Institute for Mathematics and Its Applications (IMA) in Minneapolis, Minnesota; the Institute for Pure and Applied Mathematics (IPAM) in Los Angeles, California; the Mathematical Biosciences Institute (MBI) in Columbus, Ohio; the Mathematical Sciences Research Institute (MSRI) in Berkeley, California; and the Statistical and Applied Mathematical Sciences Institute (SAMSI) in Research Triangle Park, North Carolina. The level of support varies among the institutes, and several institutes have programs other than those supported by DMS. Further information about existing institutes is available through the shared website: <http://www.mathinstitutes.org/>

Mathematical sciences research institutes exemplify large-scale projects that are effective in important ways:

- Institutes advance research in the mathematical sciences, encourage research that is potentially transformative and timely, and assist rapid and broad dissemination of new ideas;
- Institutes focus effort and excellence in the mathematical sciences, operating on a national scale to reach across the mathematical disciplines, to explore emerging frontiers of those disciplines, and to engage with scientific opportunities in other fields;
- Institutes provide intellectual infrastructure for research collaborations within the mathematical sciences and at the interface of the mathematical sciences and other disciplines;
- Institutes increase the impact of the mathematical sciences in other disciplines by sponsoring interdisciplinary activities;
- Institutes enhance synergistic approaches to significant scientific problems;
- Institutes provide opportunities for students and postdoctoral fellows to interact with leading researchers in the mathematical sciences and other disciplines;
- Institutes provide access to expertise in the mathematical sciences;
- Institutes support the exchange of information with industry and national laboratories;
- Institutes demonstrate leadership in promoting diversity and involvement of underrepresented groups in the mathematical sciences enterprise;
- Institutes provide opportunities for outreach to the education community and the public at large;
- Institutes play an important role in fostering international collaborations.

The mathematical sciences have gone through a period of spectacular growth and excitement. New ideas have been developed within the discipline, some significant long-standing open problems have been solved, and unification has replaced fragmentation as the dominant trend in the discipline. At the same time, the mathematical sciences have been embraced as an enabling technology in many areas of application, from the physical sciences and engineering to the life sciences and finance. The mathematical sciences research institutes have played a transformative role in these developments, and this role is expected to grow even more as the mathematical sciences reach out to new areas of human activity.

## II. PROGRAM DESCRIPTION

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The Division of Mathematical Sciences (DMS) of the National Science Foundation (NSF) seeks proposals for mathematical sciences research institutes that will advance research in the mathematical sciences, increase the impact of the mathematical sciences in other disciplines, and expand the talent base engaged in mathematical research in the United States. DMS is particularly interested in proposals that are creative, demonstrate vision, involve the fullest spectrum of the mathematical sciences appropriate to the proposed institute's mission, and increase the potential to transform the mathematical sciences landscape.

The mission and goals of the proposed institute must be clearly defined. The following examples are meant to stimulate the discussion and should NOT be construed as defining this solicitation.

- An institute may be focused on the advancement of fundamental research in the mathematical sciences (the proposed activities can be entirely within the discipline, or they can emphasize the linkage of the mathematical sciences with other disciplines, or they can do both).
- An institute may be focused on an emerging area of scientific research or a national need where the mathematical sciences can have a significant impact.
- An institute may be focused on the interaction of the mathematical sciences with other disciplines, with industry, or with other users of mathematics and statistics.
- An institute may be focused on discovery and innovation in the mathematical sciences through computational experiments and the use of advanced visualization techniques.

The structure of a proposed institute is unspecified. An institute may have a single location in physical space, or it may have multiple locations including locations in cyberspace. The Division of Mathematical Sciences encourages prospective applicants to consider the structure of the mathematical sciences research institutes currently supported by the Division and, where appropriate, propose alternative structures that complement the existing ones and increase the potential to transform the mathematical sciences landscape.

The proposal must describe the vision for the proposed institute as a national resource; the challenges behind this vision; and the rationale for an institute to address these challenges. It must define the mission and goals of the proposed institute; describe how these goals will be achieved, together with appropriate measures to evaluate progress toward these goals; and make a compelling case for the institute's national scope and anticipated impact on the mathematical sciences. It must indicate the governance and management structure of the proposed institute; describe the process of generating, evaluating, and selecting the activities of the proposed institute; and give criteria for the selection of participants and the allocation of funds. It must contain a coherent plan reflecting a proactive approach to diversity; describe how this plan will be implemented; and outline how its outcomes will be measured. It must address the ways in which education and training will be integrated with the research program of the proposed institute; and discuss plans for outreach activities and the dissemination of knowledge generated at the proposed institute.

Successful proposals in this competition will spell out the proposed institute's plans and prospects for the following.

- Becoming a national resource through communication and dissemination;
- developing national reach through national-scale recruitment of organizers and participants;
- growing national stature through nationwide representation and recruitment in the advisory bodies, governing boards, administrators and directorships.

Proposals from existing institutes seeking renewal under this solicitation must describe both the institute's past accomplishments and its plans for improvement in these areas.

## III. AWARD INFORMATION

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Up to four awards will be made depending on the quality of the submissions and the availability of funds. Depending on the budget, a total amount of up to \$12 million may be available in FY 2012 for this activity. Award amounts are anticipated to range from approximately \$1.5 million per year to \$4 million per year for up to five years. Awards are expected to be continuing grants; funds are released annually subject to approval by DMS and the availability of funds. Proposals must be written with a five-year plan. For new institute proposals, this plan must reflect a ramp-up of the institute's activities during Years 1 and 2, with a full complement of activities implemented no later than the beginning of Year 3. In the third year of the award, DMS will convene an external committee of experts to conduct an in-depth evaluation of the institute's activities. The committee will advise DMS whether the institute's activities meet the goals of this solicitation. Depending on the outcome of this third year review, NSF may choose to implement a phase-down plan for the last two years of the award. Successful institutes will continue to receive planned support through the remainder of the grant period. In Year 5, institutes are welcome to submit a renewal proposal for a subsequent five years of funding. These proposals are subject to review but are not part of an open competition. A renewal proposal may be funded depending on the results of prior support and merit review, always subject to the availability of funds. In Year 8 (that is, Year 3 of a renewal award), another external committee of experts will conduct an in-depth evaluation of the institute's activities and advise DMS on the nature and success of the work of the institute. Institutes will not be funded for more than ten years without going through an open competition.

## IV. ELIGIBILITY INFORMATION

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### Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities or four-year colleges accredited in and having a campus located in the United States, or nonprofit, nonacademic organizations in the US associated with educational or research activities. Multi-institutional consortia are permitted, but a single entity must accept overall management responsibility.

### Who May Serve as PI:

There are no restrictions or limits.

**Limit on Number of Proposals per Organization:**

There are no restrictions or limits.

**Limit on Number of Proposals per PI or Co-PI:**

There are no restrictions or limits.

## V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

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### A. Proposal Preparation Instructions

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**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](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 [nsfpubs@nsf.gov](mailto:nsfpubs@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/publications/pub\\_summ.jsp?ods\\_key=grantsgovguide](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)). 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 [nsfpubs@nsf.gov](mailto:nsfpubs@nsf.gov).

The proposal must conform to the GPG or NSF Grants.gov Application Guide requirements, with the following modifications:

a. Cover Page

Proposers are reminded to identify the program solicitation number, identify the DIVISION OF MATHEMATICAL SCIENCES as the organizational unit and the MATHEMATICAL SCIENCES RESEARCH INSTITUTES as the program to receive the proposal. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

b. Project Description

The project description is subject to page limits, as described below. **These page limits will be strictly enforced. Proposals not adhering to these page limits will be returned without further review.** The Project Description consists of each of the following topics:

- The intellectual focus of the proposed institute; the rationale for the proposed institute, its mission and goals, and its expected impact; plans for future growth and resource development; proposed steps toward developing its role as a national resource; and results of prior NSF support if applicable; (This section is not to exceed 20 pages total including results of prior NSF support, which may take up to 5 pages.)
- The scientific activities planned for the entire five-year period, and plans for a new institute must reflect a “ramp-up” period of up to two years, with a full complement of activities no later than the beginning of Year 3 of the award; (This section is not to exceed 5 pages total.)
- The governance and management structure of the proposed institute, including a list of individuals who have agreed to serve as members of a governing board or advisory council; mechanisms for focusing the proposed institute’s activities; criteria for selecting participants and allocating funds; and include a clear articulation of rationales for management practices that includes an evidence-based approach to decision making; (This section is not to exceed 5 pages total.)
- A plan reflecting the proposed institute’s approach to increasing diversity, broadening participation, and encouraging involvement of underrepresented groups; a description of how this plan will be implemented; and an outline of how its outcomes will be measured; (This section is not to exceed 3 pages total.)
- The plans for human resource development, including plans for the selection and mentoring of students and postdoctoral fellows and for the selection and involvement of researchers at all career levels; (This section is not to exceed 3 pages total.)
- The plans for outreach and dissemination of results; (This section is not to exceed 2 pages total.)
- Measures to evaluate progress toward the proposed institute’s goals; a procedure for quantitative and qualitative assessment of the impact of the proposed institute’s activities. (This section is not to exceed 3 pages total.)

c. Biographical Sketches

For all key personnel, provide a brief biographical sketch, using the standard format. Do not exceed two pages per person. For each individual, add up to one additional page describing how that individual will contribute to the mission and goals of the proposed institute.

d. Facilities

Include a description of the facilities (including laboratories and computational facilities) that will be made available to the institute.

e. Supplementary Documentation

The following items are the **only** items permitted as supplementary documentation or appendices. Supplementary documentation should be saved and uploaded as a single Portable Document Format (PDF) file.

- A spreadsheet indicating the expenditure of total expected funds for each year and the cumulative total for the five-year period. The spreadsheet may be submitted directly as a PDF file.
- A description of the mentoring activities for any postdoctoral researchers who will be involved in the proposed institute must be provided.
- A Data Management Plan (see Chapter II.C.2.j of the GPG for further information).
- Letters of commitment documenting other support for the proposed project, including commitments for space, faculty, and staff positions, equipment, and access to facilities. These letters may be submitted directly as PDF files. Letters of endorsement and letter of a laudatory nature for the proposed project are not acceptable.
- Documentation of collaborative arrangements of significance to the proposal through letters of commitment may be included. Only letters of commitment will be permitted; "endorsement" letters are not acceptable. These documents may be submitted directly as PDF files.

## B. Budgetary Information

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**Cost Sharing:** Inclusion of voluntary committed cost sharing is prohibited.

**Other Budgetary Limitations:**

Award amounts are anticipated to range from approximately \$1.5 million/year to \$4 million/year for proposals submitted in response to this solicitation.

## C. Due Dates

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- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

February 04, 2011

## D. FastLane/Grants.gov Requirements

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**For Proposals Submitted Via FastLane:**

To prepare and submit a proposal via FastLane, see detailed technical instructions 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](mailto: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.

**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. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: <http://www.grants.gov/web/grants/applicants.html>. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical 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](mailto: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.

Proposers that submitted via FastLane are strongly encouraged to use FastLane to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

## VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. 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 either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with 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. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in the GPG as [Exhibit III-1](#).

A comprehensive description of the Foundation's merit review process is available on the NSF website at: [http://nsf.gov/bfa/dias/policy/merit\\_review/](http://nsf.gov/bfa/dias/policy/merit_review/).

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which 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.

## A. Merit Review Principles and Criteria

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The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

### 1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

### 2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (*GPG Chapter II.C.2.d.i.* contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including *GPG Chapter II.C.2.d.i.*, prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
  - a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
  - b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research

projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

#### **Additional Solicitation Specific Review Criteria**

**IN ADDITION to the above criteria, the following will be used in the evaluation process:**

- The overall impact of the proposed scientific activities on the mathematical sciences;
- The quality of the stated missions and goals of the institute, its likely effectiveness in meeting these missions and goals, and its likelihood of attaining significance as a national resource;
- The breadth of involvement of appropriate subfields of the mathematical sciences;
- The capabilities of the institute leadership, including management and organizational ability of the proposed director(s), and the commitment of the proposed leadership team;
- The design, structure and management of the operation of the institute, including the quality and effectiveness of the management plan (including plans for interaction among the institute staff), the method of selection of activities and the method of selection of participants;
- The level of the institutional commitment to promoting diversity and the quality of the institute's plan to broaden participation in mathematical sciences research;
- The quality and appropriateness of the institute's education and training components, especially plans to attract, involve, and mentor researchers early in their career paths;
- The extent, where appropriate, to which communication and interaction with other areas of science and engineering are fostered;
- The quality and likely effectiveness of the proposed outreach activities and proposed strategies for dissemination of results;
- A formative evaluation plan, which means a plan for thoughtful, ongoing assessment (of all institute activities) that is used to inform and improve both daily institute operations and long range institute planning;
- The quality of the initial plans to evaluate progress toward the proposed institute's goals, including plans for gathering quantitative and qualitative data in support of evaluation practices;
- The reasonableness and appropriateness of the budget;
- The quality and likely effectiveness of plans for future institute growth and resource development;
- The quality and appropriateness of the infrastructure support for the institute (including, but not limited to space, administrative staff, equipment, and access to facilities) and the suitability of location with regard to office space, laboratory space if needed, computing environment, access to library facilities, and housing.

## **B. Review and Selection Process**

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

Refer to the Additional Review Criteria section of this solicitation.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will be completed and submitted by each reviewer. 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 strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

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. After an administrative review has occurred, Grants and Agreements Officers perform 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.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, 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.

## **VII. AWARD ADMINISTRATION INFORMATION**

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### **A. Notification of the Award**

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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

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An NSF award consists of: (1) the award notice, 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 notice; (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 notice. 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](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 [nsfpubs@nsf.gov](mailto:nsfpubs@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](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag).

### Special Award Conditions:

The project will be funded for up to five years. Any award will be a continuing grant; funds are released annually subject to approval by DMS and the availability of funds. In the third year of the award, DMS will convene a committee of external experts to conduct an in-depth evaluation of the institute's activities. The committee will advise DMS whether the institute's activities warrant a renewal proposal for an additional five-year period subsequent to the current award period, or whether a phase-down plan for the last two years of the current award must be put into effect.

## C. Reporting Requirements

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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 prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). Within 90 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. 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 Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

More comprehensive information on NSF Reporting Requirements 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](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag).

The grantee responsibilities include:

- The PI or his/her representative(s) will attend an annual meeting of DMS Institute PIs/Directors, at a time and place to be mutually agreed upon.
- The grantee must submit an Annual Progress Report to the cognizant Program Officer at least 90 days before the end of the current budget period. The Annual Progress Report must include:
  - A Participant List in a standardized and mutually agreed upon format;
  - A Financial Support List in a standardized and mutually agreed upon format;
  - An Income and Expenditure Report: A summary in spreadsheet form of the budget expenditures by activity and funding source for the reporting period;
  - A copy of the minutes of the most recent Institute Directors Meeting;
  - A Participant Summary Table providing the total number of participants and subtotals for the number of participants who are women, US citizens and permanent residents, and members of underrepresented groups.
- The grantee shall post on the Institute's website each Annual Progress Report, with proprietary information deleted but including Participant Summary tables.
- The grantee shall provide to DMS electronic source material for the Participants List and Financial Support list. The grantee and DMS will collaborate on the format and design for these files.

## VIII. AGENCY CONTACTS

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*Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.*

General inquiries regarding this program should be made to:

- Joanna Kania-Bartoszynska, 1025 N, telephone: (703) 292-4881, email: [jkaniaba@nsf.gov](mailto:jkaniaba@nsf.gov)

- Mary Ann Horn, 1025 N, telephone: On sabbatical, email: [mhorn@nsf.gov](mailto:mhorn@nsf.gov)
- Nandini Kannan, Program Director, 1025 N, telephone: (703) 292-8104, email: [nakannan@nsf.gov](mailto:nakannan@nsf.gov)
- Christopher W. Stark, 1025 N, telephone: (703) 292-4869, email: [cstark@nsf.gov](mailto:cstark@nsf.gov)

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: [fastlane@nsf.gov](mailto:fastlane@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](mailto:support@grants.gov).

## IX. OTHER INFORMATION

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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, "NSF Update" 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 [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. "NSF Update" also is available on NSF's website at [https://public.govdelivery.com/accounts/USNSF/subscriber/new?topic\\_id=USNSF\\_179](https://public.govdelivery.com/accounts/USNSF/subscriber/new?topic_id=USNSF_179).

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

## ABOUT THE NATIONAL SCIENCE FOUNDATION

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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 55,000 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 Arctic 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: [nsfpubs@nsf.gov](mailto:nsfpubs@nsf.gov)
  - or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

## PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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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  
Office of the General Counsel  
National Science Foundation  
Arlington, VA 22230

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