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# Joint DMS/NIGMS Initiative to Support Research at the Interface of the Biological and Mathematical Sciences (DMS/NIGMS)

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## PROGRAM SOLICITATION NSF 13-570

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REPLACES DOCUMENT(S):  
NSF 12-561

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National Science Foundation

Directorate for Mathematical & Physical Sciences  
Division of Mathematical Sciences



National Institutes of Health

National Institute of General Medical Sciences

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

September 23, 2013

September 15, 2014

September 15, 2015

## IMPORTANT INFORMATION AND REVISION NOTES

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The deadline has been shifted to approximately two weeks earlier than previous competitions to facilitate program management.

**Three significant requirements impact the format of the proposal and deviate from GPG or NSF Grants.gov Application Guide guidelines.**

**Project Description:** The project description should consist of two distinct parts. (1) No more than 12 pages addressing the NSF criterion of *Intellectual Merit*. Note that this NSF criterion corresponds with the NIH criteria of Significance, Investigators, Innovation, Approach, and Environment. (2) Up to 3 additional pages addressing the NSF criterion of *Broader Impacts*.

**Protection of Human Subjects/Use and Care of Vertebrate Animals:** Both NSF and NIH have rules regarding the use of human subjects and/or vertebrate animals in research. Proposals that involve human subjects or use vertebrate animals **MUST INCLUDE** the information required by both agencies. See the NSF Grant Proposal Guide (Proposal Preparation, Special Guidelines) AND the NIH PHS Form 398 for additional information. Information on the use of human subjects and/or vertebrate animals is considered in the review of the proposals and should be submitted separately as a **Supplementary Document**.

**Results from Prior NSF and/or NIH Support:** If any PI or co-PI identified on the project has received prior NSF and/or NIH funding in the past five years, information on the award(s) is required. Each PI and co-PI who has received more than one award (excluding amendments) must report on the award most closely related to the proposal. The following information must be provided:

- a. the NSF and/or NIH award number, amount and period of support;
- b. the title of the project(s) supported by NSF and/or NIH;
- c. a summary of the results of the completed work under NSF and/or NIH support, including accomplishments related to the Broader Impact activities supported by the award and, for a research project, any contribution to the development of human resources in science and engineering;
- d. publications resulting from the NSF and/or NIH award(s);
- e. evidence of research products and their availability, including, but not limited to: data, publications, samples, physical collections, software, and models, as described in any Data Management Plan.

Reviewers will be asked to comment on the quality of the prior work described in this section of the proposal. Please note that the proposal may contain up to five total pages to describe the results. Results of prior NSF and/or NIH support may be summarized in either the 12-page section on Intellectual Merit or in the 3-page section on Broader Impacts, at the discretion of the principal investigator.

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:

Joint DMS/NIGMS Initiative to Support Research at the Interface of the Biological and Mathematical Sciences (DMS/NIGMS)

### Synopsis of Program:

The Division of Mathematical Sciences in the Directorate for Mathematical and Physical Sciences at the National Science Foundation and the National Institute of General Medical Sciences at the National Institutes of Health plan to support research in mathematics and statistics on questions in the biological and biomedical sciences. Both agencies recognize the need and urgency for promoting research at the interface between the mathematical sciences and the life sciences. This competition is designed to encourage new collaborations, as well as to support existing ones.

### 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.*

- Mary Ann Horn, Program Director, NSF/DMS, 1025, telephone: (703) 292-4879, email: [mhorn@nsf.gov](mailto:mhorn@nsf.gov)
- Nandini Kannan, Program Director, NSF/DMS, 1025, telephone: (703) 292-8104, email: [nakannan@nsf.gov](mailto:nakannan@nsf.gov)
- Rosemary Renaut, Program Director, NSF/DMS, 1025, telephone: (703) 292-2112, email: [rrenaut@nsf.gov](mailto:rrenaut@nsf.gov)
- Paul Brazhnik, Program Director, NIH/NIGMS, telephone: (301) 451-6446, email: [brazhnikp@nigms.nih.gov](mailto:brazhnikp@nigms.nih.gov)
- Janna Wehrle, Program Director, NIH/NIGMS, telephone: (301) 594-0828, email: [wehrlej@nigms.nih.gov](mailto:wehrlej@nigms.nih.gov)

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

- 47.049 --- Mathematical and Physical Sciences
- 93.859 --- National Institute of General Medical Sciences

## Award Information

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**Anticipated Type of Award:** Standard Grant or Continuing Grant

**Estimated Number of Awards:** 15 to 20 Awards from this competition may be made by either NSF or NIH at the option of the agencies, not the grantee.

**Anticipated Funding Amount:** \$5,000,000 per year for new applications (\$2,000,000 from NSF, \$3,000,000 from NIGMS), subject to availability of funds and receipt of proposals of adequate quality. Award sizes are expected to range from \$100,000 to \$400,000 (total costs) per year with durations of 3-5 years.

## Eligibility Information

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### Who May Submit Proposals:

None Specified

### 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:** Not Applicable

## C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):
  - September 23, 2013
  - September 15, 2014
  - September 15, 2015

## 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 extraordinary growth of data-rich biology has created revolutionary opportunities for mathematically-driven advances in biological research. In this initiative, the National Institute of General Medical Sciences (NIGMS) and the National Science Foundation's Division of Mathematical Sciences (NSF/DMS) join together to promote research at the interface of the biological and mathematical sciences. The expertise of the DMS in the mathematical and statistical sciences, and of the complementary expertise of NIGMS in biological and biomedical research are expected to create new opportunities in quantitative biological research.

This competition is designed to support research in mathematics and statistics on questions in the biological and biomedical sciences. A direct relationship between a biological application and the mathematical and/or statistical work is expected. Research teams that include scientists from both the life sciences community and the mathematical and statistical sciences communities are encouraged. Both new and existing collaborations will be supported. Proposals from individual investigators will need to make the case that the individual has expertise in both fields.

Successful proposals will either involve the formulation of new mathematical, computational or statistical models and tools whose analysis poses significant mathematical challenges or identify innovative mathematics or statistics needed to solve an important

biological problem. Research that would apply standard mathematical or statistical techniques to solve biological problems is not appropriate for this competition and should be submitted directly to NIH. Similarly, proposals with research in mathematics or statistics that is not tied to a specific biological problem should be submitted to the appropriate DMS program at NSF. Proposals designed to create new software tools based on existing models and methods will not be accepted in this competition.

## II. PROGRAM DESCRIPTION

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The Division of Mathematical Sciences (DMS) within the Directorate of Mathematical and Physical Sciences (MPS) and the National Institute of General Medical Sciences (NIGMS) anticipate supporting research in the mathematical and statistical sciences with biological applications. Appropriate application areas are those currently supported by the National Institute of General Medical Sciences (see <http://www.nigms.nih.gov/Research/>).

Proposals that are not appropriate for funding by NIGMS or NSF will be returned without review. Investigators are strongly encouraged to talk with an NIGMS or NSF contact person before submitting a proposal. Other questions should be addressed to the appropriate person in the list of contacts.

Examples of areas of research that are appropriate under this competition include the following:

- Evolutionary or ecological population dynamics;
- Differentiation and developmental processes;
- Explanatory and predictive models of cellular behavior;
- Molecular and cellular networks;
- Novel and unique approaches to the prediction of molecular structure;
- Simulations of the human systemic responses to burn, trauma and other injury;
- New approaches to understanding system-wide effects of pharmacological agents and anesthetics, and their genetic and environmental modifiers.

These areas of research are examples only. They are not meant to be inclusive. Mathematical scientists, pure, applied, and/or statistical, and others capable of developing the mathematical and statistical tools envisioned are encouraged to apply. The work that is supported under this initiative must impact biology and advance mathematics or statistics. Thus, collaborations between the mathematical scientists and appropriate biological scientists are expected. Other methods to ensure impact are also possible and should be specified in the proposal.

## III. AWARD INFORMATION

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It is estimated that approximately \$5 million (\$2 million from NSF, \$3 million from NIGMS) will be available for each year of this competition to fund new applications. Award sizes are expected to range from \$100,000 to \$400,000 per year (total costs) with durations of 3-5 years. Estimated program budget, number of awards and average award size/duration are subject to the availability of funds and receipt of proposals of adequate quality.

Upon conclusion of the review process, meritorious proposals may be recommended for funding by either NIGMS or NSF, at the option of the agencies, not the proposer. Subsequent grant administration procedures will be in accordance with the individual policies of the awarding agency.

## IV. ELIGIBILITY INFORMATION

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### Who May Submit Proposals:

None Specified

### 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).

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.5 of the Grant Proposal Guide provides additional information on collaborative proposals.

See Chapter II.C.2 of the **GPG** for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the GPG instructions.

**The following instructions deviate from guidelines in the GPG and NSF Grants.gov Application Guide.**

**Project Description:** The project description should consist of two distinct parts. (1) No more than 12 pages addressing the NSF criterion of *Intellectual Merit*. Note that this NSF criterion corresponds with the NIH criteria of Significance, Investigators, Innovation, Approach, and Environment. (2) Up to 3 additional pages addressing the NSF criterion of *Broader Impacts*.

**Results from Prior NSF and/or NIH Support:** If any PI or co-PI identified on the project has received NSF or NIH funding in the past five years, information on the award(s) is required. Each PI and co-PI who has received more than one award (excluding amendments) must report on the award most closely related to the proposal. The following information must be provided:

- a. the NSF award number, amount and period of support;
- b. the title of the project;
- c. a summary of the results of the completed work, including accomplishments related to the Broader Impact activities supported by the award and, for a research project, any contribution to the development of human resources in science and engineering;
- d. publications resulting from the NSF award; and
- e. evidence of research products and their availability, including, but not limited to: data, publications, samples, physical collections, software, and models, as described in any Data Management Plan.

Reviewers will be asked to comment on the quality of the prior work described in this section of the proposal. Please note that the proposal may contain up to five pages to describe the results. Results may be summarized in either the 12-page section on Intellectual Merit or in the 3-page section on Broader Impacts, at the discretion of the principal investigator.

**Biographical Sketches:** Biographical Sketches are limited to **THREE PAGES** each (in contrast to the two page limit in the GPG) and are required for all senior personnel. **In addition to the information required by the GPG, each Biographical Sketch MUST INCLUDE a paragraph describing that person's role in the project.** In particular, the additional page permitted in each biographical sketch may be used to include information addressing the following NIH requirement:

- **Multiple PD/PI Leadership Plan:** For applications designating multiple PD/Pis, a rationale for choosing a multiple PD/PI approach should be described. This description may be incorporated into the biosketches, where the role of each investigator must be discussed. The governance and organizational structure of the leadership team and the research project should be described, including communication plans, process for making decisions on scientific direction, and procedures for resolving conflicts. The roles and administrative, technical, and scientific responsibilities for the project or program should be delineated for the PD/Pis and other collaborators. If budget allocation is planned, the distribution of resources to specific components of the project or the individual PD/Pis must be delineated in the Leadership Plan. In the event of an award, the requested allocation may be reflected in a footnote on the Notice of Grant Award (NOGA).

**Protection of Human Subjects/Use and Care of Vertebrate Animals:** Both NSF and NIH have rules regarding the use of human subjects and/or vertebrate animals in research. Proposals that involve human subjects or use vertebrate animals **MUST INCLUDE** the information required by both agencies. See the NSF Grant Proposal Guide (Proposal Preparation, Special Guidelines) AND the NIH PHS Form 398 for additional information. Information on the use of human subjects and/or vertebrate animals is considered in the review of the proposals and should be submitted separately as a **Supplementary Document**.

## B. Budgetary Information

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

## C. Due Dates

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

September 23, 2013

September 15, 2014

September 15, 2015

## 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

Both NIH and NSF review criteria will be used in evaluating proposals. See the next section on the Review and Selection Process for further details related to current NIH review criteria.

## 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 Internal NSF Review.

The review will be conducted jointly by NSF and NIH. Program staff from NIGMS are given access to every proposal submitted to the Joint DMS/NIGMS Initiative, as well as to all review information. Awards may be made by either NSF or NIH, at the option of the agencies, not the grantee.

Proposals submitted to this competition will be evaluated based on their value in advancing mathematical or statistical theory or methodology, as well as their impact on important biological problems. Both NIH and NSF review criteria will be used. When responding to the NIH review criteria, reviewers will provide an overall NIH impact score between 1 and 9 to reflect their assessment of the likelihood for the project to exert a sustained, powerful influence on the research field(s) involved, in consideration of the following five scored review criteria, and additional review criteria. An application does not need to be strong in all categories to be judged likely to have major scientific impact. The five core review criteria for NIH are:

- **Significance:** Does the project address an important problem or a critical barrier to progress in the field? If the aims of the project are achieved, how will scientific knowledge, technical capability, and/or clinical practice be improved? How will successful completion of the aims change the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field?

- **Investigator(s):** Are the PD/PIs, collaborators, and other researchers well suited to the project? If Early Stage Investigators or New Investigators, or in the early stages of independent careers, do they have appropriate experience and training? If established, have they demonstrated an ongoing record of accomplishments that have advanced their field(s)? If the project is collaborative or multi-PD/PI, do the investigators have complementary and integrated expertise; are their leadership approach, governance and organizational structure appropriate for the project?
- **Innovation:** Does the application challenge and seek to shift current research or clinical practice paradigms by utilizing novel theoretical concepts, approaches or methodologies, instrumentation, or interventions? Are the concepts, approaches or methodologies, instrumentation, or interventions novel to one field of research or novel in a broad sense? Is a refinement, improvement, or new application of theoretical concepts, approaches or methodologies, instrumentation, or interventions proposed?
- **Approach:** Are the overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project? Are potential problems, alternative strategies, and benchmarks for success presented? If the project is in the early stages of development, will the strategy establish feasibility and will particularly risky aspects be managed?
- **Environment:** Will the scientific environment in which the work will be done contribute to the probability of success? Are the institutional support, equipment and other physical resources available to the investigators adequate for the project proposed? Will the project benefit from unique features of the scientific environment, subject populations, or collaborative arrangements?

In addition to the above review criteria, the following criteria will be addressed and considered in the determination of scientific merit and the rating:

- **Protections for Human Subjects:** For research that involves human subjects, the reviewers will evaluate the justification for involvement of human subjects and the proposed protections from research risk relating to their participation according to the following five review criteria: 1) risk to subjects, 2) adequacy of protection against risks, 3) potential benefits to the subjects and others, 4) importance of the knowledge to be gained, and 5) data and safety monitoring for clinical trials. For research that involves human subjects and meets the criteria for one or more of the six categories of research that are exempt under 45 CFR Part 46, the reviewers will evaluate: 1) the justification for the exemption, 2) human subjects involvement and characteristics, and 3) sources of materials.
- **Inclusion of Women, Minorities, and Children:** When the proposed project involves clinical research, the reviewers will evaluate the proposed plans for inclusion of minorities and members of both genders, as well as the inclusion of children. Public Law requires that women and minorities must be included in all NIH-supported clinical research projects involving human subjects unless a clear and compelling rationale establishes that inclusion is inappropriate with respect to the health of the subjects or the purpose of the research. NIH requires that children (individuals under the age of 21) of all ages be involved in all human subjects research supported by the NIH unless there are scientific or ethical reasons for excluding them.
- **Vertebrate Animals:** The committee will evaluate the involvement of live vertebrate animals as part of the scientific assessment according to the following five points: 1) proposed use of the animals, and species, strains, ages, sex, and numbers to be used; 2) justifications for the use of animals and for the appropriateness of the species and numbers proposed; 3) adequacy of veterinary care; 4) procedures for limiting discomfort, distress, pain and injury to that which is unavoidable in the conduct of scientifically sound research including the use of analgesic, anesthetic, and tranquilizing drugs and/or comfortable restraining devices; and 5) methods of euthanasia and reason for selection.
- **Biohazards:** If materials or procedures are proposed that are potentially hazardous to research personnel and/or the environment, the adequacy of the proposed protection will be assessed.

As applicable for the project proposed, reviewers will address each of the following review considerations, but will not give NIH scores for these items and should not consider them in providing an overall NIH impact score.

- **Budget and Period Support:** Reviewers will consider whether the budget and the requested period of support are fully justified and reasonable in relation to the proposed research. For more details, please see Budget Information.
- **Additional Comments to the Applicant:** Reviewers may provide guidance to the applicant or recommend against resubmission without fundamental revision.

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:** Grants made by NSF will be subject to NSF's award conditions. Grants made by NIH will be subject to NIH's award conditions (see <http://grants.nih.gov/grants/policy/awardconditions.htm>).

## 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).

Grants made by NSF will be subject to NSF's reporting requirements. Grants made by NIH will be subject to NIH's reporting requirements.

## 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:

- Mary Ann Horn, Program Director, NSF/DMS, 1025, telephone: (703) 292-4879, email: [mhorn@nsf.gov](mailto:mhorn@nsf.gov)
- Nandini Kannan, Program Director, NSF/DMS, 1025, telephone: (703) 292-8104, email: [nakannan@nsf.gov](mailto:nakannan@nsf.gov)
- Rosemary Renaut, Program Director, NSF/DMS, 1025, telephone: (703) 292-2112, email: [rrenaut@nsf.gov](mailto:rrenaut@nsf.gov)
- Paul Brazhnik, Program Director, NIH/NIGMS, telephone: (301) 451-6446, email: [brazhnikp@nigms.nih.gov](mailto:brazhnikp@nigms.nih.gov)
- Janna Wehrle, Program Director, NIH/NIGMS, telephone: (301) 594-0828, email: [wehrlej@nigms.nih.gov](mailto:wehrlej@nigms.nih.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](#).

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 Institute of General Medical Sciences

The mission of the National Institute of General Medical Sciences (NIGMS) is to support research that increases understanding of life processes and lays the foundation for advances in disease diagnosis, treatment, and prevention. NIGMS-funded researchers seek to answer important scientific questions in fields such as cell biology, biophysics, genetics, developmental biology, pharmacology, physiology, biological chemistry, bioinformatics, computational biology, selected aspects of the behavioral sciences, and specific cross-cutting clinical areas that affect multiple organ systems. NIGMS also provides leadership in training the next generation of scientists and increasing the diversity of the scientific workforce to assure the vitality and continued productivity of the research enterprise.

For more information, go to the NIGMS website at <http://www.nigms.nih.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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