

# Astronomy and Astrophysics Research Grants (AAG)

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## PROGRAM SOLICITATION

NSF 16-574

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### REPLACES DOCUMENT(S):

NSF12-589

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National Science Foundation

Directorate for Mathematical & Physical Sciences  
Division of Astronomical Sciences

#### Submission Window Date(s) (due by 5 p.m. submitter's local time):

September 15, 2016 - November 15, 2016

September 15 - November 15, Annually Thereafter

## IMPORTANT INFORMATION AND REVISION NOTES

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The Program Synopsis has been simplified and clarified. Importantly, proposals about the astronomy and astrophysics of our Sun, the rest of our Solar System, and/or Extrasolar Planets will be handled under a companion NSF solicitation.

Significant changes required by the NSF Proposal & Award Policies & Procedures Guide (PAPPG) apply. Changes in the following areas are specifically called out: When to Submit Proposals (Chapter I.F); Collaborators & Other Affiliations Information (Chapter II.C.1.e); Biographical Sketch(es) (Chapter II.C.2.f); Current and Pending Support (Chapter II.C.2.h); and Special Information and Supplementary Documentation (Chapter II.C.2.j). Full details about these and other changes may be found in the PAPPG link below.

**Co-Author Listings:** In the required Collaborators & Other Affiliations single-copy document, proposals should list for the PI, co-PI, and Senior Personnel only the first three (3) authors on multi-authored papers (> 3 authors) published during the 48 months preceding the submission of the proposal (this amends NSF Proposal & Award Policies & Procedures Guide (PAPPG) II.C.1.e). If the proposing individual is one of the first three authors on a paper, then only the other two authors should be listed. Instructions in PAPPG II.C.1.e having to do with the listing of Co-Editors, Graduate Advisors, and Postdoctoral Sponsors are unchanged.

Information is included about special proposals that are described in the PAPPG.

The Division will continue to encourage submissions from junior investigators, investigators at primarily undergraduate institutions, investigators in Experimental Program to Stimulate Competitive Research (EPSCoR) states, and investigators who are underrepresented minorities.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) ([NSF 18-1](#)), which is effective for proposals submitted, or due, on or after January 29, 2018.

## SUMMARY OF PROGRAM REQUIREMENTS

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### General Information

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#### Program Title:

Astronomy and Astrophysics Research Grants (AAG)

#### Synopsis of Program:

The Astronomy and Astrophysics Research Grants (AAG) Program provides individual investigator and collaborative research grants for observational, theoretical, laboratory, and archival data studies in astronomy and astrophysics. Acceptable research areas include the following: stellar astronomy and astrophysics; the astronomy and astrophysics of our Galaxy; extragalactic astronomy and astrophysics; and cosmology. Proposals for projects and tools that enable and enhance research in those areas are also acceptable. Proposals that are solely or predominantly for the acquisition, analysis, or interpretation of space-based data from NASA-supported missions will be returned without review.

Importantly, proposals about the astronomy and astrophysics of our Sun, the rest of our Solar System, and/or Extrasolar Planets will be handled under a companion NSF solicitation, not under the AAG Program.

#### **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.

- James E. Neff (Lead), Coordinator, Individual Investigator Programs, W9137, telephone: (703) 292-2475, email: [jneff@nsf.gov](mailto:jneff@nsf.gov)
- Richard E. Barvainis, Extragalactic, W9134, telephone: (703) 292-4891, email: [rbarvai@nsf.gov](mailto:rbarvai@nsf.gov)
- Linda French, W9157, telephone: (703) 292-5313, email: [lfrench@nsf.gov](mailto:lfrench@nsf.gov)
- Harshal Gupta, Lab Astro, W9154, telephone: (703) 292-5039, email: [hgupta@nsf.gov](mailto:hgupta@nsf.gov)
- Hans A. Krimm, Stellar, W9147, telephone: (703) 292-2761, email: [hkrimm@nsf.gov](mailto:hkrimm@nsf.gov)
- Peter L. Kurczynski, W9251, telephone: (703) 292-7248, email: [pkurczyn@nsf.gov](mailto:pkurczyn@nsf.gov)
- Glen Langston, Galactic, W9253, telephone: (703) 292-4937, email: [glangsto@nsf.gov](mailto:glangsto@nsf.gov)
- Joseph E. Pesce, W9159, telephone: (703) 292-7373, email: [jpesce@nsf.gov](mailto:jpesce@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:** Standard Grant or Continuing Grant

**Estimated Number of Awards:** 85

About 85 projects will be funded per year, pending availability of funds.

**Anticipated Funding Amount:** \$35,000,000

in fiscal year 2017 for new and continuing awards, pending availability of funds.

## **Eligibility Information**

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#### **Who May Submit Proposals:**

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the *NSF Proposal & Award Policies & Procedures Guide (PAPPG)*, Chapter I.E.

#### **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 (PAPPG)* guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: [https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=pappg](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg).
  - 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: [https://www.nsf.gov/publications/pub\\_summ.jsp](https://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

- **Submission Window Date(s)** (due by 5 p.m. submitter's local time):

September 15, 2016 - November 15, 2016

September 15 - November 15, Annually Thereafter

## Proposal Review Information Criteria

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### Merit Review Criteria:

National Science Board approved criteria apply.

## Award Administration Information

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### Award Conditions:

Standard NSF award conditions apply.

### Reporting Requirements:

Standard NSF reporting requirements apply.

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## I. INTRODUCTION

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The Division of Astronomical Sciences (AST) of the National Science Foundation is the primary source of support for ground-based astronomy in the U.S. The Division supports a broad range of activities from funding national observational facilities to the research programs of individual scientists and graduate students. As of October 1, 2016, AST supports the development and operation of six national astronomy centers: the National Optical Astronomy Observatory (NOAO), the National Solar Observatory (NSO), the National Radio Astronomy Observatory (NRAO), the Green Bank Observatory (GBO), the Long Baseline Observatory (LBO), and the Arecibo Observatory (AO). AST supports the construction of the Daniel K. Inouye Solar Telescope (DKIST) and the Large Synoptic Survey Telescope (LSST). The Division provides the U.S. share of funding for two international facilities—the operation of the Gemini Observatory and the operation of the Atacama Large Millimeter/submillimeter Array (ALMA). Division programs also support the development of advanced technologies and instrumentation, mid-scale projects, the planning and design for future observational facilities and major collaborative projects in astronomy, and the management of the electromagnetic spectrum for scientific use.

The Division supports individual investigators and small groups engaged in a broad array of observational, theoretical, laboratory, and archival data studies. Special grants and fellowship programs for junior faculty, postdoctoral fellows, and undergraduate students are designed to encourage the activities of researchers engaged in education and outreach, and to increase the participation of underrepresented minorities in science. More information about the Division and its programs can be found at <https://www.nsf.gov/div/index.jsp?org=AST>.

## II. PROGRAM DESCRIPTION

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The Astronomy and Astrophysics Research Grants (AAG) Program provides a flexible, coordinated, and inclusive funding opportunity for disciplinary, interdisciplinary, and multidisciplinary research in the astronomical sciences.

The AAG Program provides individual investigator and collaborative research grants for observational, theoretical, laboratory, and archival data studies in astronomy and astrophysics. Acceptable research areas include the following: stellar astronomy and astrophysics; the astronomy and astrophysics of our Galaxy; extragalactic astronomy and astrophysics; and cosmology. Proposals for projects and tools that enable and enhance research in those areas are also acceptable. Proposals that are solely or predominantly for the acquisition, analysis, or interpretation of space-based data from NASA-supported missions will be returned without review.

Importantly, proposals about the astronomy and astrophysics of our Sun, the rest of our Solar System, and/or Extrasolar Planets will be handled under a companion NSF solicitation, not under the AAG Program.

Proposals to the AAG Program may span multiple disciplines and/or areas of study and may utilize multiple techniques. Please see the [NSF Proposal & Award Policies & Procedures Guide \(PAPPG\)](#) for allowable costs that may be requested, which include the acquisition of equipment and instrumentation necessary for the conduct of the proposed research.

Proposals to the AAG Program are grouped by NSF staff for review along disciplinary lines, and evaluated by experts in the disciplinary areas that cover each such group. Proposers should ensure that both their Project Summary and Project Description clearly place their work within the appropriate field of study. Please contact a program officer if you have any questions about proposal preparation and submission.

### **Additional Funding Opportunities Inside the AAG Program**

The AAG Program will accept Research in Undergraduate Institutions (RUI) proposals. RUI submissions must be received by the deadlines listed in this AAG solicitation. Information on the scope of RUI projects and the format of these proposals can be found at [https://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=5518](https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5518).

The AAG Program will accept proposals for the funding opportunity in Computational and Data Enabled Science and Engineering (CDS&E). CDS&E proposals submitted to the AAG program must meet the AAG requirements, guidelines, and deadlines. In addition, proposals must explicitly address the CDS&E program goals within the 15-page Project Description. Please see the program description PD 12-8084 for the CDS&E program at [https://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=504813](https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504813).

### **Additional Funding Opportunities Outside the AAG Program**

The guidelines in this solicitation do not apply to proposals submitted in response to other solicitations, such as CAREER. This AAG solicitation also does not apply to proposals about the astronomy and astrophysics of our Sun, the rest of our Solar System, and/or Extrasolar Planets, which are handled under a separate solicitation. This AAG solicitation also does not apply to conference and workshop proposals, requests for supplemental funding, and Grants for Rapid Response Research (RAPID) or EARly-concept Grants for Exploratory Research (EAGER) proposals. For these last classes of proposals that are not the subject of a separate solicitation, proposals should be submitted by selecting "In response to PAPPG" on the proposal cover sheet and then selecting the appropriate box on the cover sheet.

### *Supplemental Funding Requests*

In order to receive full consideration, requests for [Research Experiences for Undergraduates](#) (REU), Research Opportunity Awards (ROA), Research Experiences for Teachers (RET), Alliances for Graduate Education and the Professoriate (AGEP) and other supplemental funding requests should be submitted by April 1 in the year for which the supplemental funds are requested. Later submissions of supplemental funding requests should be discussed with your AST program officer before submission. Guidance for PIs preparing supplemental funding requests is given in the [NSF Proposal & Award Policies & Procedures Guide](#).

### Conference Proposals

AST supports conferences, symposia and workshops (meetings) in areas of science supported by AST that bring experts together to discuss current research, to expose other researchers or students to new research methods, and to discuss future directions. Conferences may be supported only if equivalent results cannot be obtained at regular meetings of professional societies or other established conference series. These proposals must be submitted in response to the PAPPG. For Guidance on preparing Proposals for Conferences see Chapter II.D.9. in the most recent version of the NSF Proposal & Award Policies & Procedures Guide (PAPPG) ([https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=pappg](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg)).

In particular, such proposals should be submitted at least 12 months before the anticipated conference or meeting date. Proposers are encouraged to contact an AST Program Officer prior to submission about the suitability of the proposed activity for support.

### Early-concept Grants for Exploratory Research (EAGER)

The EAGER funding mechanism may be used to support exploratory work in its early stages on untested, but potentially transformative, research ideas or approaches. This work may be considered especially "high risk-high payoff" in the sense that it, for example, involves radically different approaches, applies new expertise, or engages novel disciplinary or interdisciplinary perspectives. These exploratory proposals may also be submitted directly to an NSF program at any time, but the EAGER mechanism should not be used for projects that are appropriate for submission as "regular" (i.e., non-EAGER) NSF proposals. PI(s) must contact the NSF program officer(s) whose expertise is most germane to the proposal topic prior to submission of an EAGER proposal. This will aid in determining the appropriateness of the work for consideration under the EAGER mechanism; this suitability must be assessed early in the process. These proposals must be submitted in response to the PAPPG. For guidelines, see Chapter II.D.2. in the most recent version of the NSF Proposal & Award Policies & Procedures Guide (PAPPG) ([https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=pappg](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg)).

### Grants for Rapid Response Research (RAPID)

The RAPID funding mechanism is used for proposals having a severe urgency with regard to availability of, or access to, data, facilities, or specialized equipment, including quick-response research on natural or anthropogenic disasters and similar unanticipated events. PI(s) must contact the NSF program officer(s) whose expertise is most germane to the proposal topic before submitting a RAPID proposal. This will aid in determining whether the proposed work is appropriate for RAPID funding. These proposals must be submitted in response to the PAPPG. For guidelines, see Chapter II.D.1. in the most recent version of the NSF Proposal & Award Policies & Procedures Guide (PAPPG) ([https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=pappg](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg)).

## III. AWARD INFORMATION

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

**Estimated Number of Awards:** About 85 projects will be funded per year, pending availability of funds.

**Anticipated Funding Amount:** \$35,000,000 anticipated in FY17 for new and continuing awards, pending availability of funds.

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

## IV. ELIGIBILITY INFORMATION

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### Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), Chapter I.E.

### 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 Proposal & Award Policies & Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: [https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=pappg](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg). Paper copies of the PAPPG 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: ([https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=grantsgovguide](https://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. PAPPG Chapter II.D.3 provides additional information on collaborative proposals.

See PAPPG Chapter II.C.2 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 PAPPG instructions.

The following supplements and/or deviates from the guidance in the PAPPG and NSF Grants.gov Application Guide.

**Co-Author Listings:** In the required Collaborators & Other Affiliations single-copy document, proposals should list for the PI, co-PI, and Senior Personnel only the first three (3) authors on multi-authored papers (> 3 authors) published during the 48 months preceding the submission of the proposal (this amends Proposal & Award Policies & Procedures Guide (PAPPG) II.C.1.e). If the proposing individual is one of the first three authors on a paper, then only the other two authors should be listed. Instructions in PAPPG II.C.1.e having to do with the listing of Co-Editors, Graduate Advisors, and Postdoctoral Sponsors are unchanged.

## B. Budgetary Information

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### Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

## C. Due Dates

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- **Submission Window Date(s)** (due by 5 p.m. submitter's local time):
  - September 15, 2016 - November 15, 2016
  - September 15 - November 15, Annually Thereafter

## 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 PAPPG Exhibit III-1.

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

## 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.

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 generally be completed and submitted by each reviewer and/or panel. 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 [https://www.nsf.gov/awards/managing/award\\_conditions.jsp?org=NSF](https://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 *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at [https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=papppg](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papppg).

### 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 no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 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 Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at [https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=papppg](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papppg).

## 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:

- James E. Neff (Lead), Coordinator, Individual Investigator Programs, W9137, telephone: (703) 292-2475, email: [jneff@nsf.gov](mailto:jneff@nsf.gov)
- Richard E. Barvainis, Extragalactic, W9134, telephone: (703) 292-4891, email: [rbarvai@nsf.gov](mailto:rbarvai@nsf.gov)
- Linda French, W9157, telephone: (703) 292-5313, email: [lfrench@nsf.gov](mailto:lfrench@nsf.gov)
- Harshal Gupta, Lab Astro, W9154, telephone: (703) 292-5039, email: [hgupta@nsf.gov](mailto:hgupta@nsf.gov)
- Hans A. Krimm, Stellar, W9147, telephone: (703) 292-2761, email: [hkrimm@nsf.gov](mailto:hkrimm@nsf.gov)
- Peter L. Kurczynski, W9251, telephone: (703) 292-7248, email: [pkurczyn@nsf.gov](mailto:pkurczyn@nsf.gov)
- Glen Langston, Galactic, W9253, telephone: (703) 292-4937, email: [glangsto@nsf.gov](mailto:glangsto@nsf.gov)
- Joseph E. Pesce, W9159, telephone: (703) 292-7373, email: [jpesce@nsf.gov](mailto:jpesce@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](#).

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>.

### Related Programs:

## 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 (FASSED)* provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See the *NSF Proposal & Award Policies & Procedures Guide* Chapter II.E.6 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 <https://www.nsf.gov>

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
- **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: [nspubs@nsf.gov](mailto:nspubs@nsf.gov)
  - or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

## PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

Suzanne H. Plimpton  
Reports Clearance Officer  
Office of the General Counsel  
National Science Foundation  
Alexandria, VA 22314

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