

Computer and Information Science and Engineering (CISE) Research Initiation Initiative (CRII)

PROGRAM SOLICITATION

NSF 17-552

REPLACES DOCUMENT(S):
NSF 16-565



National Science Foundation

Directorate for Computer & Information Science & Engineering
Division of Advanced Cyberinfrastructure
Division of Computing and Communication Foundations
Division of Computer and Network Systems
Division of Information & Intelligent Systems

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

August 09, 2017

Second Wednesday in August, Annually Thereafter

IMPORTANT INFORMATION AND REVISION NOTES

This is a revision of NSF 16-565, the solicitation for the CISE Research Initiation Initiative (CRII). The program solicitation has been revised to clarify:

- A submission checklist has been added.
- The set of programs accepting CRII proposals has been updated. Cyberlearning and Future Learning Technologies (Cyberlearning) and Smart and Connected Health (SCH) were removed. Cyberinfrastructure (ACI) was renamed Advanced Cyberinfrastructure (OAC). STEM+C Partnerships is now Computer Science for All (CSforAll).
- A spreadsheet listing Collaborators and Other Affiliations is required as a Single Copy Document.
- The submission date was revised.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 17-1), which is effective for proposals submitted, or due, on or after January 30, 2017.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Computer and Information Science and Engineering (CISE) Research Initiation Initiative (CRII)

Synopsis of Program:

With the goal of encouraging research independence immediately upon obtaining one's first academic position after receipt of the PhD, the Directorate for Computer and Information Science and Engineering (CISE) will award grants to initiate the course of one's independent research. Understanding the critical role of establishing that independence early in one's career, it is expected that funds will be used to support untenured faculty or research scientists (or equivalent) in their first three years in a primary academic position after the PhD, but not more than a total of five years after completion of their PhD. One may not yet have received any other grants or contracts in the Principal Investigator (PI) role from any department, agency, or institution of the federal government, including from the CAREER program or any other program, post-PhD, regardless of the size of the grant or contract, with certain exceptions noted below. Serving as co-PI, Senior Personnel, Postdoctoral Fellow, or other Fellow does not count against this eligibility rule. Grants, contracts, or gifts from private companies or foundations; state, local, or tribal governments; or universities do not count against this eligibility rule.

It is expected that these funds will allow the new CISE Research Initiation Initiative PI to support one or more graduate students for up to two years. Faculty at undergraduate and two-year institutions may use funds to support undergraduate students, and may use the additional RUI designation (which requires inclusion of a RUI Impact Statement) -- see http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5518 for additional information. In addition, submissions from all institutions may use funds for postdoctoral scholars, travel, and/or research equipment.

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.

- Almadena Y. Chtchelkanova, Program Director, CCF, 1115, telephone: (703) 292-8910, email: achtchel@nsf.gov
- Ephraim P. Glinert, Program Director, IIS, 1125, telephone: (703) 292-8930, email: eglinert@nsf.gov
- Mimi McClure, Associate Program Director, CNS, 1175, telephone: (703) 292-8950, email: mmcclure@nsf.gov
- Sushil Prasad, Program Director, ACI, 1145, telephone: (703) 292-8970, email: sprasad@nsf.gov

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

- 47.070 --- Computer and Information Science and Engineering

Award Information

Anticipated Type of Award:

Standard Grant

Estimated Number of Awards: 55 to 60

CISE expects to make 55 to 60 awards each year.

Anticipated Funding Amount: \$10,000,000

CISE expects the total funding to be up to \$10,000,000 each year, subject to the availability of funds.

Each award will be up to \$175,000 for up to 24 months.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

Who May Serve as PI:

Only one principal investigator per proposal is allowed; co-principal investigators and senior personnel are not permitted. Please see Additional Eligibility Information below for more information on who is eligible.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

A PI may submit one proposal per annual competition.

In addition, a Principal Investigator may not participate in more than two CRII competitions. Proposals that are not reviewed (i.e., are withdrawn before review or are returned without review) do not count toward the two-competition limit.

Proposal Preparation and Submission Instructions

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=papp.
 - 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).

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. submitter's local time):

August 09, 2017

Second Wednesday in August, Annually Thereafter

Proposal Review Information Criteria

Merit Review Criteria:

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

Award Administration Information

Award Conditions:

Standard NSF award conditions apply.

Reporting Requirements:

Standard NSF reporting requirements apply.

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I. INTRODUCTION

The Directorate for Computer and Information Science and Engineering's (CISE) mission is to promote the progress of computer and information science and engineering research and education, and advance the development and use of cyberinfrastructure across the science and engineering enterprise; to promote understanding of the principles and uses of advanced computer, communications, and information systems in service to society; and to contribute to universal, transparent, and affordable participation in an information-based society. CISE supports ambitious long-term research and research infrastructure projects across the many sub-fields of computing as well as cyberinfrastructure for all areas of science and engineering; contributes to the education and training of all computing professionals; and more broadly informs the preparation of a US workforce with computing and computational competencies essential to success in an increasingly competitive global market.

The goal of this program is to contribute to the growth and development of future generations of scientists and engineers who will dedicate their careers to advancing research and education in the areas that CISE funds.

II. PROGRAM DESCRIPTION

This solicitation encourages potentially transformative proposals in any area of CISE research from PIs who are in their first academic position post-PhD. The goal is for the PI to achieve research independence early in his or her career. (See Section IV: Additional Eligibility Information later in this document.)

The CISE Research Initiation Initiative (CRII) is part of CISE's strategy to increase its investments in the development and growth of the research capabilities of future generations of computer and information scientists and engineers, including computational and data scientists and engineers. This solicitation provides the opportunity for early-career researchers to recruit and mentor their first graduate students (or undergraduate students, in the case of faculty at undergraduate and two-year institutions), which is one critical step in a career pathway that is expected to lead to research independence and a subsequent stream of projects, discoveries, students and publications.

CRII awards will be given to researchers to undertake exploratory investigations, to acquire and test preliminary data, develop collaborations within or across research disciplines, and/or develop new algorithms, approaches, and system designs/prototypes, which together or separately may lead to improved capacity to write successful proposals submitted to other programs in the future. In preparing this proposal, PIs should refer to Section V.A for guidance about the organization of the proposal. PIs should be aware that reviewers will be asked to consider the following: 1) the appropriateness of the research objectives for the relatively short duration of the CRII award; 2) the potential of the research initiation activities to produce sufficient preliminary results to serve as the basis for future competitive research proposals; and 3) whether the activities are seen to be the necessary and critical steps for the PI to achieve research independence.

Early-career researchers who are members of underrepresented groups are especially encouraged to apply. Underrepresented groups include the following: women, persons with disabilities, and ethnic/racial groups that are in the minority in computer and information science and engineering, specifically African Americans, Hispanics, Native Americans, Alaska Natives, and Pacific Islanders. Statistical information about underrepresented groups may be found in the report 'Women, Minorities, and Persons with Disabilities in Science and Engineering', available at <https://www.nsf.gov/statistics/2017/nsf17310/>.

III. AWARD INFORMATION

CISE expects to make 55 to 60 awards each year. CISE expects the total funding to be up to \$10 million each year, subject to the availability of funds.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

Who May Serve as PI:

Only one principal investigator per proposal is allowed; co-principal investigators and senior personnel are not permitted. Please see Additional Eligibility Information below for more information on who is eligible.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

A PI may submit one proposal per annual competition.

In addition, a Principal Investigator may not participate in more than two CRII competitions. Proposals that are not reviewed (i.e., are withdrawn before review or are returned without review) do not count toward the two-competition limit.

Additional Eligibility Info:

Principal Investigators are eligible to apply to this CRII solicitation only if **all** the following criteria are met **as of the submission deadline**. The PI should:

- Hold a primary appointment (or if applying to the CISE Office of Advanced Cyberinfrastructure, hold a full- or part-time appointment) in computer and/or information science and/or engineering, or in a related field of computational or data science (where the PI would normally submit proposals to CISE programs);
- Be untenured; and
- Be in the first three years of a tenure-track or research science or education position (or equivalent). The number of years includes any academic position held post-PhD, exclusive of postdoctoral appointments. Only official leaves of absence (for illness, family, etc.) may be subtracted from the total time in the position, as certified by the PI's department chair/head in the required letter, to be included in the Supplementary Documents section of the proposal.

In addition, **as of the submission deadline**, the PI may not have received any other grants or contracts in the PI role from any department, agency, or institution of the federal government. (One could have received an award as a co-PI or Senior Personnel on another grant or contract.) The following are the only exceptions to the limits on funding from the federal government in the PI role:

- Workshop or student conference travel awards;
- Doctoral dissertation improvement grants;
- Postdoctoral research fellowship awards, such as SEES Fellows or CI Fellows;
- A Graduate Research Fellowship or similar fellowship award from NSF;
- REU or RET awards; and
- SBIR or STTR awards that were received while the PI worked in industry.

Positions with titles such as Visiting Assistant Professor are considered as postdoctoral appointments, and hence not considered against the three-year limit, **only** if all of the following are true: (1) the position is not tenure-track; (2) someone in that position is not permitted by the institution to submit a proposal as a PI; and (3) the position is supervised by another faculty member in a fashion similar to that of a postdoctoral fellow. In this case, the department chair/head letter should explicitly describe any such positions and their conditions.

Similarly, positions with titles such as Research Associate or Visiting Research Professor do not count against the three-year limit **only** if all of the following are true: (1) the position is not tenure-track; (2) someone in that position is not permitted by the institution to submit a proposal as a PI; and (3) the person is supervised by another member of the research staff in a fashion similar to that of a researcher without a PhD. In this case, the department chair/head letter should explicitly describe any such positions and their conditions.

Regardless of time spent in postdoctoral positions, time outside academia, or other time, the PI must be no more than five years since PhD granting. Exceptions may be granted only in cases of family or medical leave; consult with an NSF program officer for details.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF 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. 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. 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). 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.

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 information SUPPLEMENTS (note that it does NOT replace) the guidelines provided in the Proposal and Award Policies and Procedures Guide ([PAPPG](#)).

Cover Sheet:

The primary division for submission could be any CISE Division or Office [Office of Advanced Cyberinfrastructure (OAC); Division of Computing and Communication Foundations (CCF); Division of Computer and Network Systems (CNS); and Division of Information and Intelligent Systems (IIS)], but must represent the area closest to the PI's own research interests and expertise.

Furthermore, the title of the research project must begin with "CRII: " in the title section of the NSF Cover Sheet, followed by the acronym of the CISE office or program closest to the PI's research interests and expertise from the list of possible programs noted below.

- Advanced Cyberinfrastructure (OAC)
- Algorithmic Foundations (AF)
- Communications and Information Foundations (CIF)
- Software and Hardware Foundations (SHF)
- Computer Systems Research (CSR)
- Networking Technology and Systems (NeTS)
- Information Integration and Informatics (III)
- Cyber-Human Systems (CHS)
- Robust Intelligence (RI)
- Cyber-Physical Systems (CPS)
- Secure and Trustworthy Cyberspace (SaTC)

Computer Science for All (CSforAll)

As a pair of examples, the title of a proposal submitted to the Algorithmic Foundations core program within CCF would take the form **CRII: AF: Title**; and the title of a proposal submitted to the Secure and Trustworthy Cyberspace (SaTC) crosscutting program led by CNS would take the form **CRII: SaTC: Title**.

Co-principal investigators and senior personnel are not permitted.

Project Description (10-page limit):

Because this award is for up to two years, **the project description is limited to 10 pages in length.**

Proposers are reminded that, as specified in PAPPG Chapter II.C.2.d.i:

- **The Project Description must contain, as a separate section within the narrative, a section labeled “Broader Impacts.”** This section should provide a discussion of the broader impacts of the proposed activities.

Proposals without this distinct section (including the heading “Broader Impacts” within the Project Description) may be returned without review.

Budget:

Prepare a realistic budget that is consistent with the proposed activities not to exceed \$175,000 for up to 24 months. No summer salary, course buyouts, or academic year salary costs are allowed for the PI. Most of the funds should go toward student(s). Funds may be used toward postdoctoral scholars, travel, and/or research equipment. Undergraduate and graduate students, and postdoctoral scholars, may receive summer and/or academic year support.

Supplementary Documents:

1. **Department Chair/Head Letter (required):** A letter from the PI's department chair/head must be submitted as a Supplementary Document, certifying that the PI meets the eligibility criteria, including that, as of the CRII submission deadline, he or she is (a) in the first three years of a tenure-track or research science or education position (or equivalent); (b) untenured; and (c) no more than five years since being granted a PhD. Only official leaves of absence (for illness, family, etc.) may be subtracted from the total time in the position or from the total time since being granted a PhD, as certified by the PI's department chair/head in this required letter.

2. **Data Management Plan (required):** Proposals must include a Supplementary Document of no more than two pages labeled “Data Management Plan.” This Supplementary Document should describe how the proposal will conform to NSF policy on the dissemination and sharing of research results.

See [PAPPG Chapter II.C.2.j](#) for full policy implementation.

For additional information, see: <http://www.nsf.gov/bfa/dias/policy/dmp.jsp>

For specific guidance for proposals submitted to the CISE Directorate, see: http://www.nsf.gov/cise/cise_dmp.jsp.

Single Copy Documents:

Collaborators and Other Affiliations Information: In lieu of the instructions specified in the PAPPG, Collaborators and Other Affiliations Information must be submitted as follows.

For this solicitation, the Collaborators & Other Affiliations (COA) information specified in the PAPPG should be submitted using the spreadsheet template found at <https://www.nsf.gov/cise/collab>. For each proposal, a completed spreadsheet for the PI must be uploaded directly into Fastlane in .xls or .xlsx format as a “Collaborator and Other Affiliations” Single Copy Document. NSF staff use this information in the merit review process to help manage reviewer selection; the spreadsheet will ensure the COA information has a common, searchable format. Submitters using Grants.gov may upload this document as a PDF.

Submission Checklist:

In an effort to assist proposal preparation, the following checklists are provided as a reminder of the items that should be checked before submitting a CRII proposal. These are a summary of the requirements described above. For the items marked with (RWR), the proposal will be returned without review if the required item is noncompliant at the submission deadline.

All proposals:

- Title must start with **CRII:** followed by the acronym of the CISE office or program closest to the PI's research interests and expertise.
- (RWR) Must not include any co-PIs or senior personnel.
- (RWR) Maximum budget on the cover page and on the budget sheets must not exceed \$175,000.
- (RWR) Project description must be no longer than 10 pages.
- Letters of Collaboration are permitted as Supplementary Documents. *Letters of Support are not allowed; reviewers will be instructed not to consider these letters in reviewing the merits of the proposal.*
- (RWR) Must include as a Supplementary Document a department chair letter, certifying that the PI meets the eligibility criteria.
- Must include the Collaborators & Other Affiliations (COA) list following the spreadsheet template as a Single Copy Document.

The following items are not specific to this solicitation, but are included as reminders, and apply to all NSF proposals unless otherwise noted by the solicitations (see the PAPPG for further information). **This is a summary of key items, but does not replace the complete set of requirements in the PAPPG.**

- (RWR) Within the Project Description, a section labeled “Broader Impacts of the Proposed Work”.
- (RWR) Within the Project Description, a description of Results from Prior NSF Support, including intellectual merit and broader impacts (or a specific statement if the PI has no prior NSF support).
- If the budget includes postdoctoral fellows, a one-page Postdoctoral Mentoring Plan must be included as a Supplementary Document.
- (RWR) A Data Management Plan, not to exceed two pages, must be included.
- PIs from predominantly undergraduate institutions should include a Research in Undergraduate Institutions (RUI) Impact Statement and Certification of RUI Eligibility, and should also include **RUI:** immediately before the proposal title (e.g., **CRII: CPS: RUI: Title**).

- Similarly, PIs submitting Grant Opportunities for Academic Liaison with Industry (GOALI) proposals should include **GOALI:** immediately before the proposal title (e.g., **CRII: SaTC: GOALI: Title**).

Proposals that do not comply with the requirements marked as RWR will be returned without review.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

C. Due Dates

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

August 09, 2017

Second Wednesday in August, Annually Thereafter

D. FastLane/Grants.gov Requirements

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. 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. 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

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: http://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

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.

Additional Solicitation Specific Review Criteria

Additional review criteria include:

- 1) the appropriateness of the research objectives for the relatively short duration of this award;
- 2) the potential of the research initiation activities to produce sufficient preliminary results to serve as the basis for future competitive research proposals; and
- 3) whether the activities are seen to be the necessary and critical steps for the PI to achieve research independence.

B. Review and Selection Process

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

Reviewers will be asked to 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

A. Notification of the Award

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

B. Award Conditions

An NSF award consists of: (1) the award 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. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from 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* (PAPP) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer 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* (PAPP) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp.

VIII. AGENCY CONTACTS

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:

- Almadena Y. Chtchelkanova, Program Director, CCF, 1115, telephone: (703) 292-8910, email: achtchel@nsf.gov
- Ephraim P. Glinert, Program Director, IIS, 1125, telephone: (703) 292-8930, email: eglinert@nsf.gov
- Mimi McClure, Associate Program Director, CNS, 1175, telephone: (703) 292-8950, email: mmclure@nsf.gov
- Sushil Prasad, Program Director, ACI, 1145, telephone: (703) 292-8970, email: sprasad@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: 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.

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "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 SCIENCE FOUNDATION

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

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

NSF receives approximately 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 (FASED) 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 <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

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
Arlington, VA 22230

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