

Science and Technology Studies (STS)

PROGRAM SOLICITATION NSF 19-610

REPLACES DOCUMENT(S): NSF 15-506



National Science Foundation

Directorate for Social, Behavioral and Economic Sciences

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

February 03, 2020

February 2, Annually Thereafter

Standard and Collaborative Research, Scholars, Professional Development, Research Community Development, and Conference Proposals

August 03, 2020

August 3, Annually Thereafter

Standard and Collaborative Research, Scholars, Professional Development, Research Community Development, Conference and DDRIG Proposals

IMPORTANT INFORMATION AND REVISION NOTES

1. The program name has been changed from "Science, Technology, and Society" to "Science and Technology Studies" to best connect in an inclusive manner with the research communities that are served by the program.
2. Eligibility requirements for Scholars Awards have been changed; these grants are to be made to U.S. Institutions of Higher Education and to U.S. Non-profit, Non-academic Organizations. Unaffiliated scholars are no longer eligible for Scholars Awards.
3. Postdoctoral Fellowship proposals are no longer supported by the program. Postdoctoral Fellowship proposals should be submitted to the SBE Postdoctoral Research Fellowship Program, [NSF 18-584](#).
4. The caps set on Doctoral Dissertation Research Improvement Grants and on Conference Support have been increased.
5. The Program Description provides an updated list of examples of STS research areas, topics, and approaches; the list has been revised based on current characterizations of the field by a broad range of STS departments and programs. A list of the main subfields of STS is also provided in the Program Description, and it is similarly based.
6. The Program Description includes explicit reference to a broader range of grant types that are now supported by the program, NSF wide grant opportunities, and two new types of grants: Professional Development Grants, and Research Community Development Grants.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) ([NSF 19-1](#)), which is effective for proposals submitted, or due, on or after February 25, 2019.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Science and Technology Studies (STS)

Synopsis of Program:

The Science and Technology Studies (STS) program supports research that uses historical, philosophical, and social scientific methods to investigate the intellectual, material, and social facets of the scientific, technological, engineering and mathematical (STEM) disciplines. It encompasses a broad spectrum of topics including interdisciplinary studies of ethics, equity, governance, and policy issues that are closely related to STEM disciplines.

The program's review process is approximately six months. It includes appraisal of proposals by ad hoc reviewers selected for their expertise

and by an advisory panel that meets twice a year. The deadlines for the submission of proposals are February 2nd for proposals to be funded as early as July, and August 3rd for proposals to be funded in or after January. There is one exception: Doctoral Dissertation Improvement Grant proposals will have only one deadline per year, August 3rd.

The Program encourages potential investigators with questions about the program to contact one of the Cognizant Program Directors. Potential investigators who have concerns about whether their proposal fits the goals of the program are encouraged to send a one-page prospectus of their proposal idea to the Cognizant Program Directors. Guidelines for developing one-page prospectuses are provided below under Guidelines for Developing Effective STS Proposals.

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.

- Frederick M. Kronz-Program Director, telephone: (703) 292-7283, email: fkronz@nsf.gov
- Wenda Bauchspies-Program Director, telephone: (703) 292-5034, email: wbauchsp@nsf.gov

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

- 47.075 --- Social Behavioral and Economic Sciences

Award Information

Anticipated Type of Award:

Standard Grant or Continuing Grant

Estimated Number of Awards: 40

Anticipated Funding Amount: \$6,200,000

Approximately \$6,200,000 will be made available in FY 2020 to support an estimated 40 awards.

Estimated program budget and number of awards are subject to the availability of funds.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Organization limit varies by the type of proposal:
 - Standard Research Grants and Grants for Collaborative Research: U.S. Institutions of Higher Education and U.S. Non-profit, Non-academic Organizations.
 - Scholars Awards: U.S. Institutions of Higher Education and U.S. Non-profit, Non-academic Organizations.
 - Professional Development Grants: U.S. Institutions of Higher Education and U.S. Non-profit, Non-academic Organizations.
 - Research Community Development Grants: U.S. Institutions of Higher Education and U.S. Non-profit, Non-academic Organizations.
 - Doctoral Dissertation Research Improvement Grants: U.S. Institutions of Higher Education.
 - Conference Support: No limitations. See NSF's [PAPPG](#), Chapter I, Section E for categories of proposers eligible to submit proposals to NSF.

See [PAPPG Chapter I.E.](#) for a description of each eligible category of proposer

Who May Serve as PI:

PI eligibility limit varies by the type of proposal. See Section II. Program Description for detailed information about each type of proposal.

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

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.
- Full Proposals submitted via Research.gov: *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.
- 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?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):

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Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria apply.

Award Administration Information

Award Conditions:

Standard NSF award conditions apply.

Reporting Requirements:

Standard NSF reporting requirements apply.

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I. INTRODUCTION

Science and Technology Studies (STS) is an interdisciplinary field that investigates the conceptual foundations, historical developments, and social contexts of science, technology, engineering, and mathematics (STEM). The STS program supports proposals across a broad spectrum of research that uses historical, philosophical, and social scientific methods to investigate STEM theory and practice. STS research may be empirical or conceptual; specifically, it may focus on the intellectual, material, or social facets of STEM including interdisciplinary studies of ethics, equity, governance, and policy issues.

II. PROGRAM DESCRIPTION

STS is an interdisciplinary field of research that uses historical, philosophical, and social scientific methods to investigate STEM theory and practice. It may focus on history and socio-cultural formation, philosophical underpinnings, or the impacts of science and technology on broader societal concerns including quality of life, ethics, and culture. STS researchers strive to understand the research assumptions of STEM fields, and the co-production of STEM and society, meaning the many ways in which cultural, economic, historical, social and political contexts influence developments in STEM, and how those developments reciprocally influence these contexts.

STS research encompasses a wide range of methods and disciplines. Some researchers rely on primary data collected during fieldwork or existing sources of secondary data, others use data from historical or governmental archives, while others develop conceptual or social analyses to answer theoretical or ethical questions. More generally, STS researchers draw on the resources and methods of a wide range of disciplines, including anthropology, communication studies, economics, history, philosophy, political science, psychology, and sociology. STS researchers come from a broad range of fields in addition to those already mentioned, including the natural and physical sciences, engineering, liberal arts and humanities. Recognized subfields of STS include social and cultural studies of science and technology, history and philosophy of science and technology, environmental history, and interdisciplinary studies of ethics, equity, and policy issues in the STEM fields. STS professional societies include the Society for Social Studies of Science (4S), the Society for the History of Technology (SHOT), the History of Science Society (HSS), and the Philosophy of Science Association (PSA). Departments, centers, and programs that are primarily oriented towards STS research have a variety of names; the two most common names are "Science and Technology Studies," and "Science, Technology, and Society." Other names include "History and Philosophy of Science and Technology," "History and Sociology of Technology and Science," "Science, Technology, and Values," and "Science in Human Culture."

STS research focuses on the intellectual, material, and social facets of STEM. It endeavors to understand how scientific knowledge is produced and sanctioned, and how it is challenged and changes. It may examine the theoretical foundations of science, bring to light underlying presuppositions and alternative interpretations, or study the reliability of research methods. STS research also studies how materials, devices, and techniques are designed and developed; how and by whom they are diffused, used, adapted, and rejected; how they are affected by social and cultural environments; and how they influence quality of life, culture, and society. It also explores how socio-cultural values are embedded in science and technology, and how issues of governance and equity co-evolve with the development and use of scientific knowledge and technological artifacts. Finally, it may provide insights into the relationship between STEM and basic categories of social thought including race and gender, poverty and development, trust and credibility, participation and democracy, health and pathology, risk and uncertainty, globalization, and environmental concerns.

The STS program supports proposals across the broad spectrum of STS research areas, topics, and approaches. They include, but are not limited to:

1. Studies of societal aspects of an emerging technology such as artificial intelligence, robotics, big data analysis, neuroscience, synthetic biology, nanotechnology, and quantum technologies (computers, sensors, and encryption).
2. Research on the social organization of scientific work (e.g., organizations, groups, and collaborations) and how this shapes the knowledge that gets produced and its intellectual and social impacts.
3. Issues relating science and engineering to broader societal concerns including ethics, policy, governance, equity, race and gender, inclusion, trust, reliability, risk and uncertainty, sustainability, user-centeredness, and globalization.
4. Research on the historical and conceptual foundations of any of the natural, social, or formal sciences including its nature and fundamentals, its origins, or its place in modern politics, culture, and society.
5. Mixed methods (qualitative and quantitative) approaches, and approaches that integrate traditional STS perspectives (historical, philosophical, social scientific) with each other or with innovative perspectives from the arts or humanities.
6. Interdisciplinary projects on topics of broad societal concern that engage in integrative collaborative research involving at least one STS expert and one in some other STEM field with prospective outcomes that serve to advance both fields.

Types of Proposals

The STS program supports several distinct types of proposals in order to accommodate the diverse research needs of the STS community. Types of proposals include Standard Research Grants and Grants for Collaborative Research, Scholars Awards, Conference Support, and Doctoral Dissertation Research Improvement Grants.

To assist the program in reviewing the same types of proposals together, you must include a prefix in the title of the proposal that indicates the type of proposal being requested; for example, if the conference title is "On the Reliability of Evidence in Forensic Science," the conference proposal title should be "Conference: On the Reliability of Evidence in Forensic Science."

1. STANDARD RESEARCH GRANTS and GRANTS FOR COLLABORATIVE RESEARCH

These grants support proposals for basic STS research. They also support proposals for infrastructure development that serves to enhance STS research; program support of infrastructure projects is directed towards scholarly research and data production, rather than administrative or logistical activities.

Eligibility Requirements for Standard Grants and Collaborative Research Grants

These grants are made to U.S. Institutions of Higher Education and to U.S. Non-profit, Non-academic Organizations.

Budget Guidelines for Standard Grants and Collaborative Grants

- These grants are governed by NSF's general policy, which limits salary compensation for senior project personnel to no more than two months of their regular salary in any one year. Other restrictions apply; see NSF's *Proposal and Award Policies and Procedures Guide* (PAPPG) for details. Additional program guidelines and restrictions follow.
- Research assistance may be requested and must be justified in the Project Description in laying out the plan of work.
- Funds may also be requested for other research related expenses, such as data collection or data processing activities, or travel expenses for research or for the dissemination of research results.
- Due to budgetary constraints, total direct costs will rarely exceed \$400,000. (Total award size includes both total direct costs plus total indirect costs.) The duration is typically for two to three years.
- Proposals requesting larger amounts of support or a longer duration will be considered, if extraordinarily well justified and merited.

The deadlines for the submission of all proposals, except Doctoral Dissertation Improvement Grant proposals, are February 2nd for proposals to be funded as early as July, and August 3rd for proposals to be funded in or after January.

2. SCHOLARS AWARDS

Scholars Awards provide up to full-time release for an academic year and a summer to conduct research. This time can be distributed over two or more years. In exceptional circumstances, longer releases can be requested. Some of the budgetary guidelines for Scholars Awards indicated below deviate from NSF's [PAPPG](#). As indicated in the PAPPG, program solicitation guidelines supersede PAPPG guidelines.

Eligibility Requirements for Scholars Awards

Scholars Awards grants are to be made to U.S. Institutions of Higher Education and to U.S. Non-profit, Non-academic Organizations.

Budget Guidelines for Scholars Awards

- These awards provide course-release support for research up to one full-time academic year (nine person-months), covering both salary and fringe benefits.
- They may also provide support for up to two months, including salary and fringe benefits.
- Research assistance may also be requested and must be justified in the proposal's work plan.
- Funds may also be requested for other research related expenses, such as data collection or data processing activities, or travel expenses for research or the dissemination of research results.
- Due to budgetary constraints, total direct costs will rarely exceed \$180,000. (Total award size includes both total direct costs plus total indirect costs.) The duration is typically for one year.
- Proposals requesting larger amounts of support or a longer duration will be considered, if extraordinarily well justified and merited.

3. PROFESSIONAL DEVELOPMENT GRANTS

The STS program supports specialized methodological training for post-PhD researchers in STS who have active research programs that would be enhanced by such training. The goal of the program is to improve STS research skills by affording researchers the opportunity to undertake training not normally available on their home campuses. Support may be requested to learn any methodological skill that will advance their research agenda, as justified in the proposal with reference to results from prior work.

Please note that these are training awards, not research awards. The proposal must include a detailed study plan that indicates sponsorship by a senior expert (who should not have been involved with the proposer's Ph.D.) with whom the proposer will study and/or who will supervise the planned program of study. A signed statement affirming sponsorship must be included in the proposal (as a Supplementary Document). Proposals should show how this additional expertise would improve the proposer's ability to do research by referring to specific ongoing research projects and publications. Requests for support of a general upgrading of quantitative or methodological skills, for coursework routinely available on university campuses, or for language training, will not be successful. Professional Development Grant proposals should be submitted in accordance with the PAPPG requirements.

Eligibility Requirements for Professional Development Grants

These grants are made to U.S. Institutions of Higher Education and to U.S. Non-profit, Non-academic Organizations.

Budget Guidelines for Professional Development Grants Proposals

Professional Development Grants have a ceiling of \$75,000 and a maximum duration of 36 months. They may include requests for summer salary, academic year release time, per diem, travel, equipment, supplies, and other training expenses, as well as applicable indirect costs.

4. RESEARCH COMMUNITY DEVELOPMENT GRANTS

The STS Program supports community development activities for graduate students and faculty. Such activities include field schools in the United States and abroad; summer training programs for both graduate students and faculty; software development; a program for mid-project research team meetings; and small awards for preparation of materials for archiving by retiring researchers. Researchers who intend to submit a Research Community Development proposal should consult with a cognizant NSF Program Officer before submitting to ascertain the suitability of the envisioned activity. These proposals should be submitted to one of the usual target dates. Proposers should follow the guidance in the PAPPG, adapting the Project Description as needed for the particulars of the project.

Eligibility Requirements for Research Community Development Grants

These grants are made to U.S. Institutions of Higher Education and to U.S. Non-profit, Non-academic Organizations.

Budget Guidelines for Research Community Development Activities Proposals

There is no award ceiling, but please be advised that a typical research community development grant award in the Science and Technology Studies Program is expected to be in the range of \$75,000-\$100,000 per year of the project, inclusive of indirect costs, for up to 36 months. The PAPPG provides guidance about allowable and unallowable costs.

5. CONFERENCE SUPPORT

These proposals should be prepared in accordance with NSF's [PAPPG Chapter II.E.7](#). Additional program guidelines and restrictions are provided below. **Conference proposals must be submitted via FastLane or Grants.gov.**

The STS program provides financial support for national and international conferences including symposia, and research workshops. The program is particularly interested in proposals that promote new research networks between researchers in STS and scientists and engineers, or between STS scholars and members of scholarly communities not normally in contact with each other. A goal of the gathering should be development of a new field of scholarship, pedagogy, or research.

Proposals for conference support should describe the need for the gathering, the proposed date and location, topics and persons who will be involved, prior related meetings, publicity, and expected outcomes. Conferences may be carried out as special sessions in regular meetings of professional societies if justified. Conferences, conducted as workshops, may be held at NSF at no charge provided that meeting-room space is available. Meetings usually should be open. Every effort should be made to include younger scholars and members of underrepresented groups as speakers, organizers, attendees and in other pertinent roles; these efforts should be described in the Project Description component of the proposal. NSF encourages the convening in the U.S. of major international conferences

Eligibility Requirements for Conference Support

All categories of proposers recognized by NSF are eligible to apply. See [PAPPG Chapter I.E.](#) for a description of each eligible category of proposer.

Budget Guidelines for Conference Support

- Support for conferences typically do not exceed \$25,000 in direct costs, plus applicable indirect costs.
- Expenses (travel, stipends, etc.) for attendees should be entered on the Participant Support line of the budget.
- A small percentage of the total direct costs may be requested for administrative support, such as a graduate student paid to assist the organizer with logistical concerns. Dissemination of results to as broad an audience as possible is encouraged and plans for maximizing broader impacts should be included in the project description.

6. DOCTORAL DISSERTATION RESEARCH IMPROVEMENT GRANTS (DDRIGs)

DDRIGs provide funds for dissertation research expenses not normally available through the student's university. The dissertation director is the Principal Investigator on these proposals; the doctoral student should be listed as Co-Principal Investigator.

DDRIG proposals should be prepared in accordance with the guidelines for regular research proposals specified in NSF's [PAPPG](#) except where noted below. Doctoral Dissertation Improvement Grant proposals have only one deadline per year, August 3rd.

Awards are not intended to cover the full costs of a student's doctoral dissertation research. Funds may be used only for valid research expenses which include, but are not limited to, conducting field research in settings away from campus that would not otherwise be possible, data collection costs, payments to subjects or informants, supplies, travel to archives, special collections or seminars, and facilities or field research locations, and partial living expenses for conducting necessary research away from the student's university. Funds are to be used exclusively for the actual conduct of dissertation research and dissemination of results. These funds may not be used as a student stipend, for tuition, textbooks, journals, or for the typing, reproduction, or publication costs of the student's dissertation. Funds may be requested for research assistants only in very special circumstances, which should be carefully justified.

1. The Project Description should not exceed 10 pages and should describe the scientific significance of the work, including its relationship to other current research, and the design of the project in sufficient detail to permit evaluation. The Project Description should also present and interpret progress to date if the research is already underway.
2. The Results from Prior NSF Support section is not required for DDRIG proposals.
3. The proposal must include a letter from the dissertation director. This letter is not intended as a traditional recommendation, but should evaluate the student's promise as a researcher, the student's capabilities for undertaking this project, and the value and status of the proposed research. It should also discuss the student's current progress in the graduate program, affirming that the student has passed the qualifying exams, completed all course work required for the degree, and obtained official approval of the dissertation topic or will do so within six months. The letter should be placed in the Supplementary Documents section of the FastLane proposal.
4. If the doctoral student will use the award for travel expenses to work with a specialist, the proposal should provide a justification for this choice and a letter of collaboration from the specialist agreeing to work with the student. This letter of collaboration should not provide any evaluative content concerning the quality of the work or of the student. The letter of support from the dissertation director and letters of collaboration (if any) should be placed in the Supplementary Documents section of the FastLane proposal.

Eligibility Requirements for Doctoral Dissertation Research Improvement Grants

- Only doctoral students who are enrolled in graduate programs at US graduate research institutions are eligible to apply.
- Doctoral students must have passed the qualifying exams, have completed all course work required for the degree, and have official approval of the dissertation topic prior to receiving the award.

Budget Guidelines for Doctoral Dissertation Research Improvement Grants

- Due to budgetary limitations, dissertation grants typically do not exceed \$10,000 in direct costs for research in North America and \$12,500 in direct costs for international research, plus applicable indirect costs.
- Neither the PI (the dissertation director) nor any of the Co-PIs (including the dissertation student) should be listed on the Senior Personnel Listing on the Budget page, since DDRIG proposals do not provide funds for salaries or stipends for the doctoral student, the dissertation

director, or other faculty advisors. After the PI and the Co-PI(s) are entered on the Cover Sheet, their names should be manually removed from the Senior Personnel Listing on the budget pages to avoid construal as voluntary committed cost sharing, which is not permitted.

7. OTHER GRANT OPPORTUNITIES

The STS Program also participates in Foundation-wide initiatives such as [CAREER](#), [ADVANCE](#), and Ethical and Responsible Research. Investigators may also wish to view the [SBE Office of Multidisciplinary Activities \(SMA\) web site](#) for additional funding opportunities.

III. AWARD INFORMATION

Anticipated Type of Award: Continuing Grant or Standard Grant

Estimated Number of Awards: 40

Anticipated Funding Amount: \$6,200,000

Approximately \$6,200,000 will be made available in FY 2020 to support an estimated 40 awards.

Estimated program budget and number of awards are subject to the availability of funds.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Organization limit varies by the type of proposal:
 - Standard Research Grants and Grants for Collaborative Research: U.S. Institutions of Higher Education and U.S. Non-profit, Non-academic Organizations.
 - Scholars Awards: U.S. Institutions of Higher Education and U.S. Non-profit, Non-academic Organizations.
 - Professional Development Grants: U.S. Institutions of Higher Education and U.S. Non-profit, Non-academic Organizations.
 - Research Community Development Grants: U.S. Institutions of Higher Education and U.S. Non-profit, Non-academic Organizations.
 - Doctoral Dissertation Research Improvement Grants: U.S. Institutions of Higher Education.
 - Conference Support: No limitations. See NSF's [PAPPG](#), Chapter I, Section E for categories of proposers eligible to submit proposals to NSF.

See [PAPPG Chapter I.E.](#) for a description of each eligible category of proposer

Who May Serve as PI:

PI eligibility limit varies by the type of proposal. See Section II. Program Description for detailed information about each type of proposal.

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

A. Proposal Preparation Instructions

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

- 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) 292-8134 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 Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal and Award Policies and 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) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.
- 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). 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) 292-8134 or by e-mail from 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.

Please refer to Section II, Program Description, for special proposal preparation information and instructions.

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):

February 03, 2020

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D. FastLane/Research.gov/Grants.gov Requirements

For Proposals Submitted Via FastLane or Research.gov:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. To prepare and submit a proposal via Research.gov, see detailed technical instructions available at: https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparationandSubmission.html. For FastLane or Research.gov user support, call the FastLane and Research.gov Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov or rgov@nsf.gov. The FastLane and Research.gov Help Desk answers general technical questions related to the use of the FastLane and Research.gov systems. 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: <https://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 or Research.gov may use Research.gov 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: 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 *Building the Future: Investing in Discovery and Innovation - NSF Strategic Plan for Fiscal Years (FY) 2018 – 2022*. 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.

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 https://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 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* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

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* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

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:

- Frederick M. Kronz-Program Director, telephone: (703) 292-7283, email: fkronz@nsf.gov
- Wenda Bauchspies-Program Director, telephone: (703) 292-5034, email: wbauchsp@nsf.gov

For questions related to the use of FastLane or Research.gov, contact:

- FastLane and Research.gov Help Desk: 1-800-673-6188
FastLane Help Desk e-mail: fastlane@nsf.gov.
Research.gov Help Desk e-mail: rgov@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 <https://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 (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: nsfpubs@nsf.gov
 - or telephone: (703) 292-8134
- **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 [System of Record Notices](#), NSF-50, "Principal Investigator/Proposal File and Associated Records," and NSF-51, "Reviewer/Proposal File and Associated Records." 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



National Science Foundation, 2415 Eisenhower Avenue, Alexandria, Virginia 22314, USA
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