

Ethical and Responsible Research (ER2)

PROGRAM SOLICITATION

NSF 19-609

REPLACES DOCUMENT(S): NSF 18-532



National Science Foundation

Directorate for Social, Behavioral and Economic Sciences
SBE Office of Multidisciplinary Activities

Office of International Science and Engineering

Directorate for Mathematical and Physical Sciences

Directorate for Computer and Information Science and Engineering

Directorate for Geosciences

Directorate for Engineering

Directorate for Biological Sciences

Directorate for Education and Human Resources

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

February 24, 2020

February 22, Annually Thereafter

IMPORTANT INFORMATION AND REVISION NOTES

This solicitation has been revised in two major ways. The first is a name change from Cultivating Cultures for Ethical STEM (CCE STEM) to Ethical and Responsible Research (ER2). The second is two new funding categories:

1. Conference proposals designed to bring together researchers and students to foster new ER2 research and the development of new ethical standards for STEM research.
2. Project Incubation proposals designed to support the development of full proposals by two or more organizations.

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:

Ethical and Responsible Research (ER2)

Synopsis of Program:

Ethical and Responsible Research (ER2) funds research projects that identify (1) factors that are effective in the formation of ethical STEM researchers and (2) approaches to developing those factors in all STEM fields that NSF supports. ER2 solicits proposals for research that explores the following: "What constitutes responsible conduct for research (RCR), and which cultural and institutional contexts promote ethical STEM research and practice and why?" Do certain labs have a "culture of academic integrity?" What practices contribute to the establishment and maintenance of ethical cultures and how can these practices be transferred, extended to, and integrated into other research and learning settings?" Factors one might consider include: honor codes, professional ethics codes and licensing requirements, an ethic of service and/or service learning, life-long learning requirements, curricula or memberships in organizations (e.g. Engineers without Borders) that stress responsible conduct for research, institutions that serve under-represented groups, institutions where academic and research integrity are

cultivated at multiple levels, institutions that cultivate ethics across the curriculum, or programs that promote group work, or do not grade. Successful proposals typically have a comparative dimension, either between or within institutional settings that differ along these or among other factors, and they specify plans for developing interventions that promote the effectiveness of identified factors.

ER2 research projects will use basic research to produce knowledge about what constitutes or promotes responsible or irresponsible conduct of research, and how to best instill this knowledge into researchers and educators at all career stages. In some cases, projects will include the development of interventions to ensure ethical and responsible research conduct.

Proposals for awards from minority-serving institutions (e.g., Tribal Colleges and Universities, Historically Black Colleges and Universities, Hispanic-Serving Institutions, Alaska Native or Native Hawaiian Serving Institutions), women's colleges, and organizations primarily serving persons with disabilities are strongly encouraged. Proposals including international collaborations are encouraged when those efforts enhance the merit of the proposed work by incorporating unique resources, expertise, facilities or sites of international partners. If possible, the U.S. team's international counterparts should obtain funding through other sources.

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.

- Wenda Bauchspies (SBE), telephone: (703) 292-5034, email: wbauchsp@nsf.gov
- Frederick M. Kronz (SBE), telephone: (703) 292-7283, email: fkronz@nsf.gov Cassandra
- M. Dudka (OISE), telephone: (703) 292-7250, email: cdudka@nsf.gov Edda Thiels (BIO),
- telephone: (703) 292-8421, email: ethiels@nsf.gov
- Elizabeth L. Rom (GEO), telephone: (703) 292-7709, email: elrom@nsf.gov Leonard Spinu
- (MPS), telephone: (703) 292-2665, email: lspinu@nsf.gov
- Michael D. Steele (EHR), telephone: (703) 292-4313, email: msteele@nsf.gov Jumoke
- Ladeji-Osias (ENG/EEC), telephone: (703) 292-7708, email: jladejio@nsf.gov
- Andrew (Andruid) Kerne (CISE/IIS), telephone: (703) 292-8574, email: akerne@nsf.gov

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

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences
- 47.050 --- Geosciences
- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources
- 47.079 --- Office of International Science and Engineering

Award Information

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 6 to 8

Anticipated Funding Amount: \$3,550,000

Estimated total annual funding amount is \$3,550,000 subject to the availability of funds. The maximum amount for 5-year awards is \$600,000 (including indirect costs) and the maximum amount for 3-year awards is \$400,000 (including indirect costs). The average award is \$275,000.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- 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:

NSF expects project teams to include persons with appropriate expertise. This might include expertise in the domain or domains of science or engineering on which the project focuses, in ethics, values, evaluation, and pedagogy. For Institutional Transformation Research Grant proposals, it is highly recommended that one or more senior members of the administration (e.g., Provost, VP, and/or President) serves as a PI.

Limit on Number of Proposals per Organization: 1

Only one proposal may be submitted by an eligible organization, as defined above, in which a member of their organization serves as the PI. Potential PIs are advised to contact their organizational office of research regarding processes used to select proposals for submission. Organizations submitting more than one proposal will be notified and given one week from notification to select one proposal for consideration.

If one is not selected in that period, all of those proposals will be returned without review. There is no limit on the number of proposals under which an organization may be included as a non-lead collaborator or subawardee.

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:**

Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

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

February 24, 2020

February 22, 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:

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

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I. INTRODUCTION

NSF continues its support for responsible conduct of research and program development. Past solicitations have funded projects that developed ethics education materials and approaches for STEM researchers being trained as graduate students at US organizations and their affiliates. Results included courses, case studies, and modules--materials that are now available at one or more of the online ethics resource centers that NSF has funded including the following:

Ethics Education Library. Illinois Institute of Technology (<http://ethics.iit.edu/eelibrary/>).

IDEESE: International Dimensions of Ethics Education in Science & Engineering. University of Massachusetts Amherst (<http://www.umass.edu/sts/ethics/>);

National Center for Professional & Research Ethics. University of Illinois (<https://ethicscenter.csl.illinois.edu/>).

Online Ethics Center. National Academy of Engineering (<http://www.onlineethics.org/>).

Some of the materials focused on discipline-specific issues, others aimed at issues more broadly shared, but regardless of content, they were directed at changing individual and collective behavior through instruction and fostering research integrity throughout the research enterprise. Some pedagogical approaches are demonstrably more effective than others for promoting effective STEM ethics education. For instance, active learning typically works better than lecturing (Prince, 2004; Loui 2010; Pavlidis 2013). Overall, commonly used instructional approaches are of limited efficacy and are sometimes even counterproductive (Waples et al 2008; Sekerka 2009; Ellison 2013; Mumford 2009; Anderson 2009; Cech 2014). According to a recent National Academies of Sciences, Engineering and Medicine (NASEM) synthesis report (2017), responsible conduct of research training is most effective when it is a part of a comprehensive approach to enhance an organization's research enterprise.

That same NASEM report highlights the importance of vigilance in responding to and reporting detrimental research practices. The research landscape is changing in ways that require innovative approaches to fostering research integrity. Research today is increasingly interdisciplinary, involving multiple standards of practice, and subject to expanding regulatory requirements. Research is also increasingly international and includes greater emphasis on industry sponsorship. The complexity of today's research environment has also given rise to new forms of detrimental research practices.

Given how important social norms and culture are for influencing individuals' behavior, the ER2 solicitation places paramount emphasis on them. The program invites research proposals that seek to provide answers to the following: "What constitutes effective ethical STEM research and practice? Which cultural and institutional contexts promote ethical STEM research and practice and why? Are there specific vulnerabilities to fostering research integrity for research that is interdisciplinary, and cross-cutting domains? What additional ethics related issues arise in data intensive (e.g., big data) approaches? How are concerns about reproducibility evident in training in ethical STEM? Do certain labs have a "culture of integrity"? What practices contribute establishing and maintaining cultures that foster research integrity and how can these practices be transferred, extended to, and integrated into other research and learning settings?" Factors one might consider include: honor codes, professional ethics codes and licensing requirements, an ethic of service and/or service learning, life-long learning requirements, curricula or membership in organizations that stress responsible conduct of research (e.g., Engineers without Borders), institutions that serve under-represented groups, institutions where academic and research integrity are cultivated at multiple levels, institutions that instill ethics across the curriculum, or programs that promote group work, or do not grade.

In August of 2017, the Director of NSF sent an Important Notice to universities, colleges, and other NSF grantee organizations to remind them of the need to achieve and demonstrate the effectiveness of responsible conduct of research training and to improve strategies for fostering research integrity (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=in140). NSF's Responsible Conduct of Research (RCR) requirement applies to the breadth of research disciplines the Foundation funds and the different educational levels of the students and post-doctoral researchers the agency supports. Results of the Ethical and Responsible Research (ER2) program may contribute to resources and best practices to inform implementation of Section 7009 of the America COMPETES Act (H.R. 2272), which requires institutions to "provide appropriate training and oversight in the responsible and ethical conduct of research."

The ER2 program encourages novel research approaches for fostering the formation of STEM researchers who are committed to ethical academic and research practices and to cultivating institutional cultures that value, expect, and reward academic and research integrity. The program ultimately aims to increase the number of students, postdoctoral fellows, and faculty members exposed to 'macro' and 'micro' ethical research training (i.e., responsible conduct of research) (Herkert, J.R. 2004). The ER2 program also seeks improved approaches to motivating student and faculty interest in exploring and being cognizant of the ethical dimensions of STEM.

II. PROGRAM DESCRIPTION

The Ethical and Responsible Research (ER2) program accepts proposals for innovative research projects that contribute to understanding what it takes to foster ethical STEM research in all STEM fields, including within interdisciplinary, inter-institutional, and international contexts. ER2 research projects will use basic research to produce knowledge about which factors lead to responsible or irresponsible, just or unjust scientific cultures, practices, and sociotechnical systems, and how to best instill this knowledge in faculty and students.

Projects can include qualitative and/or quantitative approaches, and mixed methods approaches are encouraged. Proposals should specify plans to disseminating findings to appropriate research and educational communities and assist them to implement projects or programs based on the findings. ER2 awardees must share their findings with others via the Online Ethics Center for Engineering and Science (Award #1355547) and at the biennial PI meetings held at NSF. PIs are responsible for covering the expenses of participating in these PI meetings throughout the tenure of their award and should indicate this and include these costs in their budget.

TYPES OF PROPOSALS

STANDARD RESEARCH GRANTS AND INSTITUTIONAL TRANSFORMATION RESEARCH GRANTS

Proposed research should seek to provide answers to the following: "What constitutes ethical STEM research and practice? Which cultural and institutional contexts promote ethical STEM research and practice and why? Do certain labs have a "culture of academic integrity"? What practices contribute to the establishment and maintenance of ethical cultures and how can these practices be transferred, extended to, or integrated into other research and learning settings?" Factors one might consider include: honor codes, professional ethics codes and licensing requirements, an ethic of service and/or service learning, life-long learning requirements, curricula or membership in organizations (e.g. Engineers without Borders) that stress responsible conduct for research, institutions that serve under-represented groups, institutions where academic and research integrity are cultivated at multiple levels, institutions that cultivate ethics across the curriculum, or programs that promote group work, or do not grade. Successful proposals typically have a comparative dimension, either (1) between or within institutional settings that differ along the factors suggested or other factors, or (2) over time-- before and after an intervention. For Institutional Transformation Research Grants, investigators are expected to gather and report baseline data in the first annual report. Both Standard and Institutional Transformation Research Grant proposals can be collaborative.

See the Special Reporting Requirements section of this solicitation for pertinent information concerning both types of awards.

CONFERENCE PROPOSALS

The ER2 program supports thematic conferences designed to bring together researchers and students to foster new ER2 research, synthesize results across previously funded ER2 projects, and develop new ethical standards for STEM research. It does not support gatherings whose purpose is primarily to convey the results of completed research. Conference proposals can focus on any topic within STEM ethics, but they should do so from a perspective that moves beyond explaining unethical behavior at the level of the individual researcher and towards more collective, cultural explanations and solutions for advancing ethical and responsible STEM. *Conference proposals should generally be submitted a year in advance of the proposed event.* The ER2 program encourages including graduate students and members of underrepresented groups as active conference participants. While conference proposals may be submitted at any time, they may also be reviewed by review panels along with other senior research proposals submitted to the regular target dates. For general guidance about conferences, including a list of required elements and budget exclusions, follow the PAPPG guidance for preparing Conference Proposals (PAPPG Chapter II.E.7). Please follow those instructions while keeping in mind the ER2 program's specific interests and limitations. **Conference proposals must be submitted via FastLane or Grants.gov.**

Budget Guidelines for Conference Proposals

ER2 conference support is typically around \$30,000 in direct costs. The ER2 program will consider requests for conferences that exceed this amount given special circumstances. Indirect costs are in addition to this direct cost limitation and are subject to the awardee's current Federally negotiated indirect cost rate. We encourage seeking support from multiple agencies and organizations.

PROJECT INCUBATION PROPOSALS

ER2 supports small Project Incubation proposals that provide funds for STEM researchers and administrators *from multiple organizations* to collaborate to develop and submit a full ER2 STANDARD Grant. Proposers must span at least two organizations. Those who intend to submit a Project Incubation proposal must consult with a cognizant NSF Program Officer before submitting to ascertain the suitability of the envisioned activity. These proposals are reviewed along with other senior research proposals and should be submitted to one of the deadline dates for this solicitation. Project Incubation proposals provide only one year of support. Proposers should follow the guidance in the PAPPG, adapting the Project Description as needed for the particulars of the project.

Budget Guidelines for Project Incubation Proposals

ER2 Project Incubation Grant support is typically around \$60,000 in direct costs. The ER2 program will consider requests for Project Incubation proposals that exceed this amount given special circumstances. Indirect costs are in addition to this direct cost limitation and are subject to the awardee's current Federally negotiated indirect cost rate. We encourage seeking support from multiple agencies and organizations. Proposals for awards from minority-serving institutions (e.g. Tribal Colleges and Universities, Historically Black Colleges and Universities, Hispanic-Serving Institutions, Alaska Native or Native Hawaiian Serving Institutions), women's colleges, and organizations primarily serving persons with disabilities are strongly encouraged.

Note: NSF does not consider proposals for medical research and hence, the ER2 program will not consider proposals focused on ethics for medical students or in medical education. It will consider proposals that address medical informatics, biomedical engineering, systems engineering, and social scientific studies of health and medicine.

III. AWARD INFORMATION

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 6 to 8

Anticipated Funding Amount: \$3,550,000

Estimated total annual funding amount is \$3,550,000 subject to the availability of funds. The maximum amount for 5-year awards is \$600,000 (including indirect costs) and the maximum amount for 3-year awards is \$400,000 (including indirect costs). The average award is \$275,000.

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

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- 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:

NSF expects project teams to include persons with appropriate expertise. This might include expertise in the domain or domains of science or engineering on which the project focuses, in ethics, values, evaluation, and pedagogy. For Institutional Transformation Research Grant proposals, it is highly recommended that one or more senior members of the administration (e.g., Provost, VP, and/or President) serves as a PI.

Limit on Number of Proposals per Organization: 1

Only one proposal may be submitted by an eligible organization, as defined above, in which a member of their organization serves as the PI. Potential PIs are advised to contact their organizational office of research regarding processes used to select proposals for submission. Organizations submitting more than one proposal will be notified and given one week from notification to select one proposal for consideration. If one is not selected in that period, all of those proposals will be returned without review. There is no limit on the number of proposals under which an organization may be included as a non-lead collaborator or subawardee.

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

There are no restrictions or limits.

Additional Eligibility Info:

Other types of organizations can be included only as non-lead collaborators or subawardees. In addition, accredited U.S. colleges and universities and U.S. professional associations can be non-lead collaborators or subawardees.

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.

Other Budgetary Limitations:

Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

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

February 24, 2020

February 22, Annually Thereafter

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.

Additional Solicitation Specific Review Criteria

The following additional review criteria are given because of the program's emphasis on the comparative dimension of different approaches to the formation of STEM researchers who are committed to ethical academic and research practices and to the cultivation of institutional cultures that value, expect, and reward academic and research integrity.

Reviewers will be asked to apply the following special criteria to all proposals in this program:

- Is this an innovative effort?
- Does the project include adequate grounding in the relevant research literature?
- Do potential results have promise for broad utility?
- Are there adequate supporting materials to document commitment from those individuals and institutions playing a substantive role in the project?

Additional review criteria for Institutional Transformation Research Grant (ITRG) proposals:

- How significant will the contribution of the study of the proposed innovative components and other institutional transformation activities be to the institutional transformation knowledge base?
- How strong are the indicators of institutional readiness for institutional transformation and commitment to the project activities and goals?
- Does the proposal include well-formulated, feasible plans for evaluation of the effectiveness of the intervention?
- How well are the proposed activities linked to the institutional context and data?
- How well is the relevant social science literature incorporated into the design of the proposed innovative components and other institutional transformation activities?
- Are mechanisms planned that ensure long-term sustainability beyond the duration of the funded project?

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.

The following reporting requirements are given because of the program's emphasis on the comparative dimension of different approaches to the formation of STEM researchers who are committed to ethical academic and research practices and to the cultivation of institutional cultures that value, expect, and reward academic and research integrity.

- In annual and final reports, PIs are required to report on the following: "What actions have been taken as a result of ER2 that directly or indirectly lead to the formation of ethical STEM researchers and to greater attention to the goal of and means for creating ethical sociotechnical systems?" How is the effectiveness of these interventions being measured?
- For ITRGs, the PIs will also report on: "What actions have been taken by institutions as a result of the ER2 program that have directly or indirectly contributed to a culture that prizes academic and research integrity?" How is the effectiveness of these actions being measured?

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:

- Wenda Bauchspies (SBE), telephone: (703) 292-5034, email: wbauchsp@nsf.gov
- Frederick M. Kronz (SBE), telephone: (703) 292-7283, email: fkronz@nsf.gov Cassandra
- M. Dudka (OISE), telephone: (703) 292-7250, email: cdudka@nsf.gov Edda Thiels (BIO),
- telephone: (703) 292-8421, email: ethiels@nsf.gov
- Elizabeth L. Rom (GEO), telephone: (703) 292-7709, email: elrom@nsf.gov Leonard
- Spinu (MPS), telephone: (703) 292-2665, email: lspinu@nsf.gov
- Michael D. Steele (EHR), telephone: (703) 292-4313, email: msteele@nsf.gov Jumoke
- Ladeji-Osias (ENG/EEC), telephone: (703) 292-7708, email: jladejio@nsf.gov
- Andrew (Andruid) Kerne (CISE/IIS), telephone: (703) 292-8574, email: akerne@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
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 - Send an e-mail to: nsfpubs@nsf.gov
 - or telephone: (703) 292-8134
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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
Policy Office, Division of Institution and Award Support
Office of Budget, Finance, and Award Management
National Science Foundation
Alexandria, VA 22314

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