

Ethical and Responsible Research (ER2)

PROGRAM SOLICITATION

NSF 22-526

REPLACES DOCUMENT(S):

NSF 19-609



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 Target Date(s):

February 17, 2022

January 23, 2023

January 21, Annually Thereafter

IMPORTANT INFORMATION AND REVISION NOTES

This solicitation has been revised in two major ways. The first is the replacement of the limitation of one proposal per institution with a limitation of two proposals per Principal Investigator (PI) or Co-PI.

The synopsis, introduction and program description have been updated to reflect NSF priority areas as well as to clarify what types of research questions are of interest to the program.

Important Information

Innovating and migrating proposal preparation and submission capabilities from FastLane to Research.gov is part of the ongoing NSF information technology modernization efforts, as described in [Important Notice No. 147](#). In support of these efforts, research proposals submitted in response to this program solicitation must be prepared and submitted via Research.gov or via Grants.gov, and may not be prepared or submitted via FastLane.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) ([NSF 22-1](#)), which is effective for proposals submitted, or due, on or after October 4, 2021.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Ethical and Responsible Research (ER2)

Synopsis of Program:

Ethical and Responsible Research (ER2) research projects use fundamental research to produce knowledge about what constitutes or promotes responsible or irresponsible conduct of research and why, as well as how to best instill responsible conduct of research into

researchers, practitioners, and educators at all career stages. In some cases, projects will include the development of interventions or applications to ensure ethical and responsible research conduct.

The program funds research projects that identify:

1. factors that are effective in the formation of ethical science, technology, engineering, and mathematics (STEM) researchers;
2. approaches to developing those factors in all STEM fields that NSF supports; and
3. why and how those factors and approaches increase responsibly conducted research.

Proposals from or involving substantial collaboration with [minority-serving institutions](#), women's colleges, or organizations primarily serving persons with disabilities are strongly encouraged. Proposals that include international collaborations are encouraged if the unique resources, expertise, facilities, or locations of international partners enhance the merit of the proposed work. International partners are required to find non-NSF funding. Please see NSF's PAPPG for further guidance on international collaborations.

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 (SBE), Program Director, telephone: (703) 292-7283, email: fkronz@nsf.gov
- Wenda Bauchspies (OISE), Program Director, telephone: (703) 292-5034, email: wbauchsp@nsf.gov
- William Bainbridge (CISE), Program Director, telephone: (703) 292-7470, email: wbainbri@nsf.gov
- Jumoke Ladeji-Osias (ENG), Program Director, telephone: (703) 292-7708, email: jladejio@nsf.gov
- Elizabeth L. Rom (GEO), Program Director, telephone: (703) 292-7709, email: elrom@nsf.gov
- George Richter-Addo (MPS), Program Director, telephone: (703) 292-7528, email: grichter@nsf.gov
- Michael D. Steele (EHR), Program Director, telephone: (703) 292-4313, email: msteele@nsf.gov
- Edda Thiels (BIO), Program Director, telephone: (703) 292-8421, email: ethiels@nsf.gov
- Alexander A. Romero, Program Specialist, telephone: (703) 292-2184, email: alromero@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
- 47.083 --- Office of Integrative Activities (OIA)
- 47.084 --- NSF Technology, Innovation and Partnerships

Award Information

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 10 to 15

Anticipated Funding Amount: \$5,200,000

This solicitation will consider proposals for four types of projects:

- **Conference Projects** with a total budget of \$50,000 and a maximum duration of 12 months.
- **Incubation Projects** with a total budget of up to \$90,000 and a maximum duration of 12 months.
- **Research Grants** with a total budget of up to \$400,000 and a maximum duration of 3 years.
- **Institutional Transformation Research Grants** with a total budget of up to \$700,000 and a maximum duration of 5 years.

Project durations and budgets must be commensurate with the scope of the work proposed and with guidance provided elsewhere in this solicitation regarding anticipated program resources. NSF anticipates a portfolio of awards with a range of budgets and durations up to these maximums.

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

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:

Proposals must include project teams with appropriate expertise. This might include expertise in the STEM domains on which the project focuses, or 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:

There are no restrictions or limits.

Limit on Number of Proposals per PI or co-PI: 2

An individual may appear as PI, co-PI, or Senior Personnel on no more than two proposals submitted in response to this solicitation.

In the event that an individual exceeds this limit, proposals received within the limit will be accepted based on earliest date and time of proposal submission (i.e., the first two proposals received prior to the deadline will be accepted and the remainder will be returned without review). This limitation includes proposals submitted by a lead organization and any subawards included as part of a collaborative proposal involving multiple institutions. **No exceptions will be made.**

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 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 Target Date(s):**

February 17, 2022

January 23, 2023

January 21, Annually Thereafter

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review criteria 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

In August of 2017, the NSF director sent an important notice to universities, colleges, and other NSF grantee organizations [reiterating NSF's requirement to conduct effective training on the responsible conduct of research](#) and to improve strategies for fostering research integrity. NSF's responsible conduct of research requirement applies to all NSF awards and individuals supported by NSF, including students of all educational levels and post-doctoral researchers. 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 program encourages research that supports and extends our understanding of how and why research approaches, practices, and norms foster or hinder the training of STEM researchers and practitioners. The program aims to support the formation, reproduction, and dissemination of ethical academic and research practices and to cultivate institutional cultures that value, expect, and reward academic and research integrity (NASEM 2016, NASEM 2017, NASEM 2019). Ethical issues in emerging scientific and technological areas are of particular interest as are new ethical issues created by changing cultural norms. Those topics include, but are not limited to:

- environmental change, climate mitigation and adaptation research
- artificial intelligence and robotics
- sensor data and other digital representations of human experiences
- quantum research
- bioeconomy ecosystems: society and biotechnology
- advanced communications technologies
- equity and inclusion in STEM research
- the prevention of sexual harassment in STEM
- the ethical norms of indigenous and international STEM research.

The program ultimately aims to increase the number of students, postdoctoral fellows, and faculty members exposed to multiple levels and dimensions of responsible conduct of research (Herkert, J.R. 2004). The program also seeks to motivate, inform, and educate students and faculty to explore and be cognizant of the ethical dimensions of STEM to ensure responsible and ethical conduct of research that is responsive to the needs, values, and norms of society.

Project funded previously by the program developed ethics education materials and approaches for STEM graduate students at U.S. organizations and their affiliates. Results included courses, case studies, and modules that are now available at one or more of the online ethics resource centers funded by NSF, including the following:

1. Ethics Education Library. Illinois Institute of Technology (<http://ethics.iit.edu/eelibrary/>)
2. IDEESE: International Dimensions of Ethics Education in Science & Engineering. University of Massachusetts Amherst (<http://www.umass.edu/sts/ethics/>)
3. National Center for Professional & Research Ethics. University of Illinois (<https://ethicscenter.csl.illinois.edu/>)
4. Online Ethics Center. University of Virginia (<https://onlineethics.org/>).

Some of the materials focus on discipline-specific issues while others are aimed at broader issues; 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 2017 National Academies of Sciences, Engineering and Medicine synthesis report, responsible conduct of research training is most effective when it is a part of a comprehensive approach to enhance an organization's research enterprise including: responding to and reporting detrimental research practices; fostering research integrity; and recognizing multiple standards of practice, regulatory requirements, and stakeholders.

II. PROGRAM DESCRIPTION

The Ethical and Responsible Research (ER2) program accepts proposals for innovative research projects that contribute to understanding what fosters, hinders, or challenges ethical STEM research in all STEM fields, including interdisciplinary, inter-institutional, and international contexts. ER2 research projects will use basic research to produce knowledge about what leads to responsible or irresponsible research; to create just or unjust scientific cultures, practices, and sociotechnical systems and why; to enable responsible and ethical conduct of research; and to instill this knowledge in faculty and students.

Considering social norms and culture are important in the creation of a comprehensive approach to ethical STEM that will not only influence individuals' behavior but will maintain and reproduce ethical institutional culture. Thus, principal investigators might consider factors such as equity, values, honor codes, professional ethics codes, licensing requirements, and ethics of service curricula, social group memberships, and institutional cultures and norms in developing research proposals. Research questions of interest to the program can address ethics involving inclusion, equity, diversity, bias, representation, culture, values, transparency, sexual harassment, environmental ethics, and data governance, as well as the following:

- What constitutes responsible conduct of research (RCR) and why?
- Which cultural and institutional contexts and incentives promote ethical STEM research and practice and why?
- What are emerging areas of ethical research, and what are their implications and impacts for ethical and responsible research?
- 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?
- What are the ethical issues that pervade the relationships among research participants, their data, and researchers who gather and analyze such human subject's data? How can research participants be empowered amidst these relationships?
- What are the data governance and other ethics-related issues shaping and impacting data use in STEM, and how are they supporting, disrupting, and challenging responsible research in an ever-broadening international research environment?

Projects can include qualitative and/or quantitative approaches, and mixed methods approaches are encouraged. When working with research partners, the program expects to see best practices of responsible research being used to co-create knowledge equitably as well as to develop durable relationships on international projects. Proposals should specify plans to disseminate 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 (with potential alternation between in-person PI meetings and virtual PI meetings). PIs are responsible for covering the expenses of participating in these PI meetings throughout the tenure of their award and should include these costs in their budget.

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.

TYPES OF PROPOSALS

STANDARD RESEARCH GRANTS

Proposed research should seek to provide answers to the questions indicated in the introduction above. Standard Research Grant proposals can be collaborative and may be requested for up to 3 years. See the Special Reporting Requirements section of this solicitation for pertinent information concerning Standard research awards. **Budget Guidelines for Standard Research Grants**

Research Grants with a total budget of up to \$400,000 and a maximum duration of 3 years.

INSTITUTIONAL TRANSFORMATION RESEARCH GRANTS

Institutional Transformation Research Grants are designed to support the development, implementation, and evaluation of innovative systemic change strategies that promote responsible and ethical conduct of research within an institution of higher education for faculty, staff, students, and communities. 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. Investigators are expected to gather and report baseline data in the first annual report. Institutional Transformation Research Grant proposals can be collaborative and may be requested for up to 5 years.

See the Special Reporting Requirements section of this solicitation for pertinent information concerning Institutional Transformation research awards. **Budget Guidelines for Institutional Transformation Research Grants**

Institutional Transformation Grants with a total budget of up to \$700,000 and a maximum duration of 5 years.

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. Although conference proposals may be submitted at any time, they may also be reviewed by review panels along with other 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). Please

follow those instructions while keeping in mind the ER2 program's specific interests and limitations

Budget Guidelines for Conference Proposals

ER2 conference support is typically no more than \$50,000 in total costs. The ER2 program will consider requests for conferences that exceed this amount given special circumstances.

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. Project Incubation proposals provide only one year of support. They may include a pilot study and/or workshop(s). 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.

Budget Guidelines for Project Incubation Proposals

ER2 Project Incubation Grant support is typically no more than \$90,000 in total costs. 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.

III. AWARD INFORMATION

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 10-15

Anticipated Funding Amount: \$5,200,000

Estimated total annual funding amount is \$5,200,000 subject to the availability of funds. The maximum amount for 5-year awards is \$700,000 (including indirect costs), and the maximum amount for 3-year awards is \$400,000 (including indirect costs).

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:

Proposals must include project teams with appropriate expertise. This might include expertise in the STEM domains on which the project focuses, or 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:

There are no restrictions or limits.

Limit on Number of Proposals per PI or co-PI: 2

An individual may appear as PI, co-PI, or Senior Personnel on no more than two proposals submitted in response to this solicitation.

In the event that an individual exceeds this limit, proposals received within the limit will be accepted based on earliest date and time of proposal submission (i.e., the first two proposals received prior to the deadline will be accepted and the remainder will be returned without review). This limitation includes proposals submitted by a lead organization and any subawards included as part of a collaborative proposal involving multiple institutions. **No exceptions will be made.**

Additional Eligibility Info:

Other types of organizations can be included only as 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 Research.gov or Grants.gov.

- 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 Research.gov. 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 Target Date(s):**

February 17, 2022

January 23, 2023

January 21, Annually Thereafter

D. Research.gov/Grants.gov Requirements

For Proposals Submitted Via Research.gov:

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 Research.gov user support, call the Research.gov Help Desk at 1-800-673-6188 or e-mail rgov@nsf.gov. The Research.gov Help Desk answers general technical questions related to the use of the Research.gov system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: <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 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 *Leading the World in Discovery and Innovation, STEM Talent Development and the Delivery of Benefits from Research - NSF Strategic Plan for Fiscal Years (FY) 2022 - 2026*. 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 other underrepresented groups 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 for the Institutional Transformation Research Grant (ITRG) proposals because of ITRG's focus on 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.

- 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?
- Are there adequate supporting materials to document commitment from those individuals and institutions playing a substantive role in the 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, or Internal NSF Review.

ER2 will utilize Ad hoc Reviews and/or Panel Reviews, or Internal NSF Reviews.

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 or the Division of Acquisition and Cooperative Support 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 an NSF Grants and Agreements Officer. 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.

Administrative and National Policy Requirements

Build America, Buy America

As expressed in Executive Order 14005, [Ensuring the Future is Made in All of America by All of America's Workers](#) (86 FR 7475), it is the policy of the executive branch to use terms and conditions of Federal financial assistance awards to maximize, consistent with law, the use of goods, products, and materials produced in, and services offered in, the United States.

Consistent with the requirements of the Build America, Buy America Act (Pub. L. 117-58, Division G, Title IX, Subtitle A, November 15, 2021), no funding made available through this funding opportunity may be obligated for an award unless all iron, steel, manufactured products, and construction materials used in the project are produced in the United States. For additional information, visit NSF's [Build America, Buy America](#) webpage.

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 the "Accomplishments" section of 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 Institutional Transformation Research Grants, 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:

- Frederick M. Kronz (SBE), Program Director, telephone: (703) 292-7283, email: fkronz@nsf.gov
- Wenda Bauchspies (OISE), Program Director, telephone: (703) 292-5034, email: wbauchsp@nsf.gov
- William Bainbridge (CISE), Program Director, telephone: (703) 292-7470, email: wbainbri@nsf.gov
- Jumoke Ladeji-Osias (ENG), Program Director, telephone: (703) 292-7708, email: jladejio@nsf.gov
- Elizabeth L. Rom (GEO), Program Director, telephone: (703) 292-7709, email: elrom@nsf.gov
- George Richter-Addo (MPS), Program Director, telephone: (703) 292-7528, email: grichter@nsf.gov
- Michael D. Steele (EHR), Program Director, telephone: (703) 292-4313, email: msteele@nsf.gov
- Edda Thiels (BIO), Program Director, telephone: (703) 292-8421, email: ethiels@nsf.gov
- Alexander A. Romero, Program Specialist, telephone: (703) 292-2184, email: alromero@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>.

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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>

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 - Send an e-mail to: nsfpubs@nsf.gov
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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

X. APPENDIX

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