

Ethics Education in Science and Engineering (EERE)

PROGRAM SOLICITATION

NSF 11-514

REPLACES DOCUMENT(S):
NSF 08-530



National Science Foundation

Directorate for Social, Behavioral & Economic Sciences
Division of Social and Economic Sciences

Directorate for Biological Sciences

Directorate for Computer & Information Science & Engineering

Directorate for Education & Human Resources

Directorate for Engineering

Directorate for Geosciences

Directorate for Mathematical & Physical Sciences

Office of International and Integrative Activities

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

March 14, 2011

March 01, 2012

March 01, 2013

IMPORTANT INFORMATION AND REVISION NOTES

A revised version of the *NSF Proposal & Award Policies & Procedures Guide (PAPPG)*, [NSF 13-1](#), was issued on October 4, 2012 and is effective for proposals submitted, or due, on or after January 14, 2013. Please be advised that the guidelines contained in [NSF 13-1](#) apply to proposals submitted in response to this funding opportunity.

Please be aware that significant changes have been made to the PAPPG to implement revised merit review criteria based on the National Science Board (NSB) report, [National Science Foundation's Merit Review Criteria: Review and Revisions](#). While the two merit review criteria remain unchanged (Intellectual Merit and Broader Impacts), guidance has been provided to clarify and improve the function of the criteria. Changes will affect the project summary and project description sections of proposals. Annual and final reports also will be affected.

A by-chapter summary of this and other significant changes is provided at the beginning of both the [Grant Proposal Guide](#) and the [Award & Administration Guide](#).

Please note that this program solicitation may contain supplemental proposal preparation guidance and/or guidance that deviates from the guidelines established in the [Grant Proposal Guide](#).

Revision Summary

This solicitation has a new list of priority areas of inquiry. It also explicitly encourages research and theory building while continuing to call for creative curriculum development and evaluation.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Ethics Education in Science and Engineering (EERE)

Synopsis of Program:

The Ethics Education in Science and Engineering (EERE) program funds research and educational projects that improve ethics education in all fields of science and engineering that NSF supports, with priority consideration given to interdisciplinary, inter-institutional, and international contexts. Although the primary focus is on improving

ethics education for graduate students in NSF-funded fields, the proposed programs may benefit advanced undergraduates as well.

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.

- Linda Layne, telephone: (703) 292-5026, email: llayne@nsf.gov
- Donna M. Riley, telephone: (703) 292-7107, email: driley@nsf.gov
- Ephraim Glinert, Program Director, Directorate for Computer and Information Science and Engineering, Human Centered Computing Cluster, 1125 S, telephone: (703) 292-8930, fax: (703) 292-9073, email: eglinert@nsf.gov
- Jill Karsten, Program Director for Diversity and Education, Directorate for Geosciences, 705 N, telephone: (703) 292-7718, fax: (703) 292-9042, email: jkarsten@nsf.gov
- Joseph A. Akkara, telephone: (703) 292-4946, email: jakkara@nsf.gov
- Carter Kimsey, Program Manager, Directorate for Biological Sciences, 615 N, telephone: (703) 292-8470, fax: (703) 292-9063, email: ckimsey@nsf.gov
- Cassandra M. Dudka, telephone: (703) 292-7250, email: cdudka@nsf.gov
- Susan Finger, telephone: (703) 292-4639, email: sfinger@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 --- International and Integrative Activities (IIA)

Award Information

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 6 to 10

Anticipated Funding Amount: \$3,000,000 subject to the availability of funds

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Only colleges and universities located and accredited in the U.S. or U.S.-based professional associations are eligible to apply to this program. Other types of organizations can be included only as non-lead collaborators or sub-awardees. In addition, accredited U.S. colleges and universities and U.S. professional associations can be non-lead collaborators or sub-awardees.

PI Limit:

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, in educational research, and in pedagogy.

Limit on Number of Proposals per Organization:

An eligible organization, as defined above, may submit only one proposal as the lead organization. Organizations submitting more than one proposal as the lead organization will be notified and given one week from notification to select one proposal for consideration. If one is not selected in that time 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 sub-awardee.

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposals:**

- o Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
- o Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- **Cost Sharing Requirements:** Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** 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. proposer's local time):
 - March 14, 2011
 - March 01, 2012
 - March 01, 2013

Proposal Review Information Criteria

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

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

The 21st Century finds science and engineering facing increasingly complex and encompassing ethical and social issues. Science and engineering practices are also increasingly interdisciplinary and international, and operate in many organizational and societal contexts. Many professional associations are involved in developing codes of ethics, hosting conferences on ethical problems in research practice, or exploring relationships among science, engineering, and society. This diversity of interests creates a need for

connections among the range of fields, disciplines, organizations, and situations in which these ethical concerns arise.

Prior research and educational activities related to ethics, supported through the National Science Foundation and other government and private agencies and organizations, provide a background from which to develop relevant theory and methods to improve ethics education in science and engineering and to provide better resources for organizations concerned with ethics in these fields. Building on the Foundation's prior support for ethics-related research and program development, the NSF Directorates for: Biological Sciences; Computer and Information Science and Engineering; Education and Human Resources; Engineering; Geosciences; Mathematical and Physical Sciences; Social, Behavioral and Economic Sciences, and the Office of International Science and Engineering have joined together to continue the Ethics Education in Science and Engineering (EERE) program.

Results of the EERE program will contribute to resources that institutions may utilize in complying with Sec 7009 of the America COMPETES Act (H.R. 2272), which requires institutions to "provide appropriate training oversight in the responsible and ethical conduct of research." EERE awardees should also offer their findings and curriculum to the Ethics in Science, Mathematics, and Engineering Online Resource Center (Award# 1045412). The Ethics Online Resource Center aims to provide ethics curriculum, best practices for ethics education and training, encyclopedia entries, and other resources.

II. PROGRAM DESCRIPTION

The Ethics Education in Science and Engineering (EERE) program aims to deepen the understanding of ethical dilemmas in science and engineering, and provide cutting edge, effective research and educational materials to train the next generation of scientists and engineers. The EERE program accepts proposals for innovative research and educational projects to improve ethics education in all of the fields of science and engineering that NSF supports, including within interdisciplinary, inter-institutional and international contexts. Proposals must focus on improving ethics education for graduate students in those fields or on developing summer post-baccalaureate ethics-education activities or other activities that transition students from undergraduate to graduate education. The Principal Investigator team should be truly multi-disciplinary, and involve people with different disciplinary backgrounds.

The program will entertain proposals in graduate ethics education in science and engineering generally and will continue to support exploration of new ethical questions in engineering, biology, computer science, and other fields. Priority areas include but are not limited to:

- global/international challenges in science and engineering ethics;
- a general framework for the ethics of emerging technologies;
- issues of privacy and confidentiality in relation to data mining;
- fields for which there are few resources in ethics education or research;
- ethical issues related to robotics;
- intersection of the choices that society makes between natural resource development and utilization (e.g., energy sources) and environmental consequences;
- ethical issues associated with natural hazards, risk management, decision-making and the role of scientists in defining and negotiating the consequences of natural hazards in the face of scientific uncertainties.

Proposals should contribute to a theory of ethics education in science and engineering—one that addresses the individual motivators, societal incentives, and cultural beliefs that lead to ethical dilemmas. Many forms of expertise (e.g. philosophy, social science, engineering, life sciences) have contributed to the study of ethics in science and engineering. This diverse and often separate research provides an important empirical base that researchers can use to develop a theoretical approach to ethics education. The EERE program welcomes proposals that aim to contribute to theory building as part of the proposed research or education project.

The EERE program is interested in encouraging innovative research and education projects likely to create long-term improvement in ethics education for graduate students in science and engineering. EERE invites proposals for research projects, education projects, and combinations of the two.

Research projects that examine ethics education for graduate students in science and engineering are eligible for consideration in EERE. Research projects should suggest and explore creative, original, or potentially transformative concepts. Projects can include qualitative and/or quantitative approaches. The expectation is that project results will help in developing better ethics-education programs for graduate students; thus, proposals should specify plans to deliver findings to appropriate research and educational communities and assist them to implement projects or programs based on the findings. Research projects may also include a focus on ethical issues arising in educational research or in ethics education for graduate students. An example of such a context would be educating students with diverse cultural backgrounds. Proposals that focus on international topics should empirically explore different national practices, and not assume that one country's viewpoint or practices are superior to another.

Education projects must be based on research findings or theory that indicate successful ways to enhance ethics education for graduate students. They may include a wide range of activities such as mentoring programs, infrastructure-development activities, faculty capacity-building activities, training of postdoctoral fellows to implement programs, and graduate-student involvement in program development. The EERE program encourages applicants who think creatively about ethics education, and go well beyond standard approaches such as developing online modules, providing students with a series of scenarios and having a discussion about them, or holding workshops and seminars with invited speakers, and then asking students to rate the activities on a survey form. Projects to develop and test creative, new materials or tools or teaching techniques are also eligible. Such materials or tools should go beyond existing materials; they should take ethics education into new pedagogical strategies or topics.

A common, often-effective approach in educational projects is to develop graduate-student programs. Another approach may focus on improving the ability of faculty to mentor students or create ethics-education programs and materials in collaboration with graduate students. A national or international training activity for graduate students would be yet another appropriate strategy.

EERE education projects should test the feasibility and effectiveness of their activities or programs in **more than one institution**, incorporate ways to diffuse project activities even further, and evaluate project effectiveness, including assessment of expected student outcomes. Proposals are expected to include substantial and persuasive information about how this will be done. Proposals should specify plans to disseminate findings widely. Collaborations with appropriate professional associations are encouraged in this regard.

Proposals may also combine research and education components. For instance, the first year of a project might examine ethics education for graduate students in a scientific or engineering field. The second year might implement programs on several campuses based on what was discovered. Repetition and modification, evaluation and diffusion might occur during the third year.

EERE awardees should also offer their findings and curriculum to the Ethics in Science, Mathematics, and Engineering Online Resource Center. The Ethics Online Resource (NSF Award#1045412) aims to provide ethics curriculum, best practices for ethics

education and training, encyclopedia entries, and other resources.

Note: NSF does not consider proposals for medical research. The EESE program will not consider proposals focused on ethics for medical students or in medical education. The EESE program does, however, encourage proposals that address ethical issues related to medical informatics or systems engineering. EESE will not consider proposals that will start or provide incremental improvements to formal or informal educational activities responsive to Federal mandates for research integrity or human-subjects training requirements.

III. AWARD INFORMATION

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds. The maximum award amount is \$300,000. Collaborative proposals for the purpose of disseminating best practices in graduate ethics education will be eligible for a maximum award amount of \$400,000 (for example, projects that include partnerships between universities and scientific or engineering societies to distribute curriculum and/or research findings). Anticipated funding amount is \$3 million for an estimated 6 to 10 Standard Grants. The maximum award duration is 36 months.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- Only colleges and universities located and accredited in the U.S. or U.S.-based professional associations are eligible to apply to this program. Other types of organizations can be included only as non-lead collaborators or sub-awardees. In addition, accredited U.S. colleges and universities and U.S. professional associations can be non-lead collaborators or sub-awardees.

PI Limit:

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, in educational research, and in pedagogy.

Limit on Number of Proposals per Organization:

An eligible organization, as defined above, may submit only one proposal as the lead organization. Organizations submitting more than one proposal as the lead organization will be notified and given one week from notification to select one proposal for consideration. If one is not selected in that time 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 sub-awardee.

Limit on Number of Proposals per PI:

None Specified

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

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. Chapter II, Section D.4 of the Grant Proposal Guide provides additional information on

collaborative proposals.

Important Proposal Preparation Information: FastLane will check for required sections of the full proposal, in accordance with *Grant Proposal Guide* (GPG) instructions described in Chapter II.C.2. The GPG requires submission of: Project Summary; Project Description; References Cited; Biographical Sketch(es); Budget; Budget Justification; Current and Pending Support; Facilities, Equipment & Other Resources; Data Management Plan; and Postdoctoral Mentoring Plan, if applicable. If a required section is missing, **FastLane will not accept the proposal.**

Please note that the proposal preparation instructions provided in this program solicitation may deviate from the GPG instructions. If the solicitation instructions do not require a GPG-required section to be included in the proposal, insert text or upload a document in that section of the proposal that states, "Not Applicable for this Program Solicitation." Doing so will enable FastLane to accept your proposal.

Applicants should read carefully the Introduction, Program Description, and Additional Review Criteria sections of this solicitation, to ensure that their proposals are responsive to program requirements. In addition, they should attend to the following instructions:

In addition to the requirements specified in the GPG, the **project summary** overview section should indicate whether the proposal is for an education project or a research project, or a combination of the two.

In addition to the requirements specified in the GPG, the **project description** must include:

1) *a project rationale*. This should include a synopsis of the research literature or findings on which the project will draw, or which it will test, with appropriate citations. Education projects should briefly document current practices in ethics education at the proposing institution(s).

2) *a project plan*. For education projects, this should include the overall project goals, methods, strategies, recruitment and activities; plans for testing project results at more than one institution; and plans for evaluation and assessment. For research projects, this should include a description of the research question(s) to be investigated and the possible impact of findings on ethics education for graduate students in science or engineering, and a research plan describing methods and activities appropriate to answering the research question(s).

3) *an evaluation plan, for education and combined education/research projects only*. This should include a description of how the effectiveness of the proposed education project will be measured, including the criteria and indicators that will be used. Researchers may consult [The 2002 User-Friendly Handbook for Project Evaluation](#).

4) *a list of key personnel*. This should include descriptions of the duties and responsibilities of senior personnel and any others critical to project success. Projects may involve diverse sets of participants. Project teams will usually include faculty with disciplinary or cross-disciplinary content expertise, ethics expertise, and expertise in educational methodologies or pedagogy. Biographical sketches and letters of commitment should be provided for all key senior personnel, collaborators, consultants, and others playing substantive roles in the project. Graduate students should be involved as project assistants as well as recipients of program activities or subjects of research. Projects that develop activities involving underrepresented groups in science and engineering are particularly encouraged. Discussion of prior related work of the PI(s) should include results of previous funding.

5) *a project management plan*. A description, table, or diagram should specify project tasks, completion dates, and identify the responsible personnel that should be included. A monthly schedule with indications, for example, of meetings of project personnel or scheduled student seminars, helps to demonstrate that the plan is well thought out.

6) *appropriate plans for dissemination of results*. This should include plans for assistance to relevant research and educational communities in their adoption and adaptation. All projects must have a dissemination plan to deliver findings to professional peers and appropriate research and educational communities. Applicants should provide detailed information about how models or findings from the projects will be diffused and assistance provided in their adoption or adaptation, as appropriate. All projects are expected to make resources developed through the EESE program accessible online through such portals as the National STEM Digital Library.

7) *a list of any partnering organizations*. The roles of any cooperating organizations or institutions should be described. All proposals should include letters from any project partners or cooperating organizations, and from research or educational program sites, documenting collaborative arrangements. These letters should be provided in the Supplementary Documentation section of the proposal.

8) *sustainability plan*. Education projects should describe how the ethics education activities will be continued after the grant period. Letters of support from institution(s) will be accepted if administrators describe in detail how the longer-term institutionalization of EESE activities will occur (for example, if a newly required course will be added to the catalog).

An important reminder about research with human subjects: Research involving human subjects must either have approval from the organization's Institutional Review Board (IRB) before issuance of an NSF award, or identify the applicable subsection exempting the proposal from IRB review. This requirement is in the Common Rule (Federal Policy for the Protection of Human Subjects, 45 CFR Section 690). See the NSF Grant Proposal Guide for more details. The NSF proposal cover sheet requires provision of the relevant information, as appropriate.

Other General Information

Experience indicates that proposals do better in review if they include specific information on such components as how often project team meetings are scheduled, how many seminars or other educational activities are expected to occur, who is responsible for what aspects of the project, and how project success will be gauged. Strong proposals specify the pedagogical standards that will be used in project activities and assessment. They involve graduate students as assistants for the project. As appropriate, they address plans to integrate teaching and research and to modify the project as needed.

EESE will not accept videotapes, diskettes, textbooks, CD-ROMs, or any other materials as part of proposal packages.

Investigators wishing to apply for support are encouraged to discuss their ideas with one of the contacts listed in the solicitation.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

Other Budgetary Limitations:

The maximum award amount is expected to be \$300,000 inclusive of indirect costs; maximum duration is expected to be 36

months. Projects that include partnerships (for example, between universities and scientific societies) for the purpose of disseminating best practices in graduate ethics education will be eligible for a maximum award amount of \$400,000.

Budget Preparation Instructions:

Funds for the principal investigator or an appropriate designee to attend two meetings, at NSF or another appropriate venue, for discussion and interaction with other awardees, must be included.

C. Due Dates

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

March 14, 2011

March 01, 2012

March 01, 2013

D. FastLane/Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

Detailed technical instructions regarding the technical aspects of preparation and submission via FastLane are available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Website at: <https://www.fastlane.nsf.gov/fastlane.jsp>.

- **For Proposals Submitted Via Grants.gov:**

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: http://www07.grants.gov/applicants/app_help_reso.jsp. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding 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.

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 the GPG as [Exhibit III-1](#).

A comprehensive description of the Foundation's merit review process is available on the NSF website at: http://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 [Empowering the Nation Through Discovery and Innovation: NSF Strategic Plan for Fiscal Years \(FY\) 2011-2016](#). 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 core strategies 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 provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students, and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the variety of learning perspectives.

Another core strategy in support of NSF's mission is broadening 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. ([GPG 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 [GPG 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

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

1. Is this an innovative effort? Is it likely to create long-term improvement in ethics education for graduate students in science

- or engineering?
- 2. Does the project include adequate grounding in the relevant research literatures? Does it include relevant multi-disciplinary collaboration?
- 3. Do potential results have promise for broad utility? Is there a feasible plan for widespread dissemination, adoption or adaptation?
- 4. Are there adequate supporting materials to document commitment from those individuals and institutions playing a substantive role in the project?
- 5. For proposals involving international collaborations, does the project involve mutual benefits, true intellectual collaboration with the foreign partner(s), benefits to be realized from the expertise and specialized skills, facilities, sites and/ or resources of the international counterpart, and active research engagement of U.S. students and early-career researchers, where such individuals are engaged in the research?

For education proposals, and those combining research and education, additional special criteria are:

- 1. Does the proposal include appropriate plans to test results beyond one institution?
- 2. Does the proposal include well-formulated, feasible plans for evaluation of effectiveness?

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 formulate a recommendation to either support or decline each proposal. 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 is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, 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.

In all cases, 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 and 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.

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 letter, 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 letter; (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 letter. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the *NSF Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

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 at least 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). Within 90 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 Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

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:

- Linda Layne, telephone: (703) 292-5026, email: llayne@nsf.gov
- Donna M. Riley, telephone: (703) 292-7107, email: driley@nsf.gov
- Ephraim Glinert, Program Director, Directorate for Computer and Information Science and Engineering, Human Centered Computing Cluster, 1125 S, telephone: (703) 292-8930, fax: (703) 292-9073, email: eglinert@nsf.gov
- Jill Karsten, Program Director for Diversity and Education, Directorate for Geosciences, 705 N, telephone: (703) 292-7718, fax: (703) 292-9042, email: jkarsten@nsf.gov
- Joseph A. Akkara, telephone: (703) 292-4946, email: jakkara@nsf.gov
- Carter Kimsey, Program Manager, Directorate for Biological Sciences, 615 N, telephone: (703) 292-8470, fax: (703) 292-9063, email: ckimsey@nsf.gov
- Cassandra M. Dudka, telephone: (703) 292-7250, email: cdudka@nsf.gov
- Susan Finger, telephone: (703) 292-4639, email: sfinger@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "My NSF" 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. "My NSF" also is available on NSF's website at <http://www.nsf.gov/mynsf/>.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this new mechanism. Further information on Grants.gov may be obtained at <http://www.grants.gov>.

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately

11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <http://www.nsf.gov>

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information**
(NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
Send an e-mail to: nsfpubs@nsf.gov
or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

Suzanne H. Plimpton
Reports Clearance Officer
Division of Administrative Services
National Science Foundation
Arlington, VA 22230

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