

# Innovations in Engineering Education, Curriculum, and Infrastructure (IEECI)

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Archived and replaced by [NSF 10-502](#)

## Program Announcement

NSF 08-610

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*Replaces Document(s):*

NSF 08-542

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**National Science Foundation**

Directorate for Engineering  
Engineering Education and Centers

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

March 11, 2009

## REVISION NOTES

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A revised version of the *NSF Proposal & Award Policies & Procedures Guide (PAPPG)*, [NSF 09-1](#), was issued on October 1, 2008 and is effective for proposals submitted on or after January 5, 2009. Please be advised that the guidelines contained in [NSF 09-1](#) apply to proposals submitted in response to this funding opportunity. Proposers who opt to submit prior to January 5th, 2009, must also follow the guidelines contained in [NSF 09-1](#).

One of the most significant changes to the PAPPG is implementation of the mentoring provisions of the America COMPETES Act. Each proposal that requests funding to support postdoctoral researchers must include, as a separate section within the 15-page project description, a description of the mentoring activities that will be provided for such individuals. Proposals that do not include a separate section on mentoring activities within the Project Description will be returned without review (see the PAPP Guide Part I: *Grant Proposal Guide* Chapter II.C.2. d for further information).

This announcement introduces minor revisions to the Exploratory Projects.

## SUMMARY OF PROGRAM REQUIREMENTS

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### General Information

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**Program Title:**

Innovations in Engineering Education, Curriculum and Infrastructure (IEECI)

**Synopsis of Program:**

The Innovations in Engineering Education, Curriculum, and Infrastructure (IEECI) program supports research which addresses four aspects of engineering education: (1) how students best learn the ideas, principles, and practices to become creative and innovative engineers, and how this learning is measured

(2) how application of cyberlearning resources of networked computing and communication, interactive visualization capabilities, and well designed user interfaces can be used to develop easily transportable tools and systems with low barriers to adoption which significantly improve learning, (3) integration of sustainability into engineering education, and (4) future directions of U.S. engineering doctoral programs.

**Cognizant Program Officer(s):**

- Susan C. Kemnitzer, telephone: (703) 292-5347, email: [skemnitz@nsf.gov](mailto:skemnitz@nsf.gov)
- Sally Wood, 585N, telephone: (703)292-7107, fax: (703) 292-9057, email: [slwood@nsf.gov](mailto:slwood@nsf.gov)
- John L. Daniels, telephone: (703) 292-5360, email: [jdaniels@nsf.gov](mailto:jdaniels@nsf.gov)

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

- 47.041 --- Engineering

**Award Information**

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**Anticipated Type of Award:** Standard Grant or Continuing Grant

**Estimated Number of Awards:** 35 to 40 Two types of awards will be supported: Expansion Projects (approximately 10 grants are anticipated) will only be available for area (1), Innovations in Teaching and Learning. Exploratory Projects (25-30 grants are anticipated) will be available in areas (2-4).

**Anticipated Funding Amount:** \$150,000 to \$400,000 Anticipated Funding Amount: The total anticipated funding in FY09 for projects associated with this announcement is \$8,500,000. Funding is contingent upon availability of appropriations. Expansion Projects will be funded at a level of up to \$400,000. Exploratory Projects will be funded at a level up to \$150,000, but exploratory projects involving multiple universities may apply for grants up to \$200,000.

**Eligibility Information**

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**Organization Limit:**

None Specified

**PI Limit:**

None Specified

**Limit on Number of Proposals per Organization:**

None Specified

**Limit on Number of Proposals per PI:**

None Specified

**Proposal Preparation and Submission Instructions**

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**A. Proposal Preparation Instructions**

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

• **Full Proposals:**

- 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](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg).
- 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/pubs/policydocs/grantsgovguide607.pdf>)

**B. Budgetary Information**

- **Cost Sharing Requirements:** Cost Sharing is not required under this solicitation.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

**C. Due Dates**

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

March 11, 2009

**Proposal Review Information Criteria**

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**Merit Review Criteria:** National Science Board approved criteria apply.

**Award Administration Information**

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**Award Conditions:** Standard NSF award conditions apply.

**Reporting Requirements:** Standard NSF reporting requirements apply.

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## I. INTRODUCTION

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Engineering education today is facing an unprecedented array of challenges and opportunities. As a national resource that drives economic growth, the quality of engineering education has a direct impact on our ability as a nation to compete in the increasingly competitive global environment of the 21st century. The National Science Board (*Moving Forward to Improve Engineering Education*, 2007) emphasizes that “engineering education must change in light of changing workforce demographics and needs.” The 21st century engineer must be able to deal with a rapid pace of technological change, a highly interconnected world, and complex problems that require multidisciplinary approaches and effective use of human and natural resources.

Much has been written about the need to transform engineering education, but potential proposers are also asked to pay special attention to:

- Akay, A. A Renaissance in PhD Engineering Education. *European Journal of Engineering Education*, August 2008.
- The Journal of Engineering Education, Special Issue: Educating Future Engineers: Who, What, and How, July 2008.
- *Moving Forward to Improve Engineering Education*, National Science Foundation National Science Board, 2007.
- *Assessing the Capacity of the U.S. Engineering Research Enterprise to Meet the Future Needs of the Nation*, National Academy of Engineering, 2005.
- The Journal of Engineering Education, Special Issue: The Art and Science of Engineering Education Research, January 2005.
- *Educating the Engineer of 2020: Adapting Engineering Education to the New Century*, National Academy of Engineering, 2005.
- *The Engineer of 2020: Visions of Engineering in the New Century*, National Academy of Engineering, 2004.
- *Innovate America*, Council on Competitiveness, 2004.
- *How People Learn: Bridging Research and Practice*, M. Suzanne Donovan, John D. Bransford, and James W. Pellegrino, editors. Committee on Learning Research and Educational Practice Commission on Behavioral and Social Sciences and Education National Research Council, 2000.

## II. PROGRAM DESCRIPTION

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The Division of Engineering Education and Centers seeks proposals in the four areas described below.

### 1. Innovations in Teaching and Learning (Expansion)

Projects will be supported that contribute to significant breakthroughs in understanding how students learn engineering so that our undergraduate and graduate programs prepare engineers to meet the needs of the changing economy and society. Specifically, we are interested in research that addresses the following:

- **Engineering Epistemologies:** Research on what constitutes engineering thinking and knowledge within current and future social and economic contexts.
- **Engineering Learning Mechanisms:** Research on engineering learners’ developing knowledge and competencies in context, with special interest in evolving areas such as nanotechnology, service learning, and the intersection of biology and engineering.
- **Engineering Learning Systems:** Research on the instructional culture, institutional infrastructure,

and epistemology of engineering educators. Of special interest here is research on effective learning systems for the burgeoning role of distance education.

- **Engineering Diversity and Inclusiveness:** Research on how diverse human talents contribute solutions to the social and global challenges and relevance of the profession.
- **Engineering Entrepreneurship:** Research on, and the development of, entrepreneurial behavior.

In *How People Learn*, (NRC 2000) practitioners emphasized the continuing need for dialogue between researchers and the practitioners in the classroom, therefore research teams submitting proposals to the *Innovations in Teaching and Learning* topic must include at least one tenured engineering faculty with an exemplary teaching record. In this manner, the research project will be informed by experienced and successful practitioners, and an early path for dissemination will be designed into the project as well.

## 2. Educational Opportunities Using Cyberinfrastructure and Virtual or Mixed Reality (Exploratory)

Applications of networked computing and communication, sophisticated user input, and dynamic visualization have only begun to realize the potential benefit of these new technologies to improve, enhance, and extend engineering education. Many innovative projects in cyberlearning, virtual environments and laboratories, interactive visualizations and tutoring systems have required the development of new technology. However, as these technologies are becoming more mature and established, research is needed which will build on earlier successes to develop easily transportable applications with well documented learning improvements for engineering students.

IEECI seeks proposed research efforts which will use existing computing, communication, and interactive technology to improve learning in engineering. The proposed project must use technology reasonably available to universities and must not require custom or unusually high cost or high maintenance products so that the barrier to widespread adoption is low. The project must demonstrate improved learning and/or improved retention and include dissemination of the project product as well as the research results.

Specifically, we seek proposals that will advance one or more of the following:

- How can interactive visualization be used to increase students' understanding of abstract concepts or phenomena which are not directly observable?
- How can interactive advanced simulations of social as well as technical context be used to increase students' experience with more complex, integrated, and realistic engineering problems?
- How can collateral pathways through course material be provided to match a diversity of learning styles?
- How can wider access be provided to either unique resources available only at large universities or research centers or to instrumentation and observation in environments with a high access cost (e. g. inside a volcano, under the sea, in space?)
- What are the most effective professional development resources that can be made widely available to students in engineering programs and life-long learners?

A comprehensive view of opportunities in cyberlearning can be found in NSF publications (*Fostering Learning in the Networked World*, 2008) and (*Cyberinfrastructure Vision for 21st Century Discovery*, 2007).

## 3. Integrating Sustainability into Engineering Education (Exploratory)

IEECI seeks proposals which develop greater student understanding of and technical expertise in critical issues of sustainability. Sustainability means "meeting the needs of the present without compromising the ability of future generations to meet their needs." (Brundtland Report, World Commission on Environment and Development, 1987.) Sustainable development marries two important themes: that environmental protection does not preclude economic development and that economic development must be ecologically viable now and in the long run. Dealing with sustainability requires the ability to think creatively about complex systems from an engineering, environmental, ethical and economic perspective simultaneously. At present our undergraduate and graduate students have too few opportunities to develop this important

capability, and we seek proposals which will reverse this situation.

Proposal may address one or more of the following:

- How can principles of sustainability be infused into traditional courses and design projects?
- How can engineering programs be improved by the development of new minors, or majors, or even more innovative strategies?
- How can engineering programs integrate hands-on approaches of engaging students in internships with companies with exemplary sustainable operations, or research experiences involving sustainability questions?

Maximum flexibility is encouraged in the design of efforts to increase awareness of and capability in solving sustainability challenges. However, the proposal must fully document the rationales for choosing the efforts to be undertaken, including relevant results from efforts that have been undertaken at the proposer's or other institutions in the past.

#### **4. Future Directions for U.S. Doctoral Programs (Exploratory)**

Compared to the natural and social sciences, the engineering profession is uniquely confronted by several challenges in the context of advanced education. One challenge is the dichotomy between practice and research, which is extraordinarily acute in engineering. Faculty are largely trained in engineering science and most often rewarded for success in narrowly defined research areas. Experience in practice or registration as a professional engineer is the exception, as is formal training in educational pedagogy. Yet the vast majority of engineering students move to practice oriented positions. Even at the Ph.D. level, less than 20% of engineering graduates move on to academic posts within 6 years of their degree.

A second challenge is the balance between specialization and multidisciplinary education. While specialization in the engineering Ph.D. has created immense technological changes heretofore, the consensus is (e.g., Engineer of 2020, Rising above the Gathering Storm, etc.) that narrow specialization is becoming an inadvertent impediment in the context of the emergence of globalization and multidisciplinary advances. The need to meld discovery, innovation and entrepreneurship challenges universities to provide students with a broader context while retaining technical prowess.

In addition, fewer US citizens are pursuing engineering PhDs each year, with more than 65% of all engineering PhDs awarded to foreign nationals. The marketplace echoes this lackluster interest, with median salary increases for PhDs reported to be 62% less than MS degrees and 43% less than BS degrees for the time period of 1993 to 2003 (NSB S&E Indicators).

To address these challenges, some basic questions for the engineering Ph.D. need to be considered. For example:

- Why are fewer domestic students pursuing a Ph.D. in engineering? What are the barriers? How do undergraduates view this opportunity?
- What are the desired outcomes of an engineering Ph.D. program and attributes of the recipient? How are these measured and assessed? It is now recognized that many of the features of a Ph.D. program exist on the basis of legacy and history at the expense of purpose and meaning.
- Would the engineering Ph.D. be more attractive if there was a more definitive timetable for completion? How much of a barrier is the current indeterminacy? Would an integrated path utilizing industry internship provide an attractive option? What is the current track record of such programs?
- How can the engineering Ph.D. evolve from an indeterminate byproduct of faculty directed research to a more thoughtful process that is valued by potential students and the marketplace?

We seek proposals for exploratory projects on a wide range of ideas motivated by the foregoing questions. For example, what are current attitudes of undergraduates toward pursuing a Ph.D. and academic career? How much do stipends and career earnings expectations impact student decisions? What changes might recently graduated PhDs suggest? What are the significant differences among disciplines? Are college

management practices, like promotional and tenure guidelines, in alignment with improving pedagogy in Ph. D. programs? How does one measure quality in PhD programs? Partnerships across universities and other interested parties are particularly encouraged.

### Important Project Features

**Quality, Relevance, and Impact:** Projects should address an identified need or opportunity in engineering education, clearly indicate how they will meet this need, and be innovative in their production and use of new materials, processes, and ideas, or in their implementation of tested ones. They should be based on an accurate and comprehensive understanding of the disciplinary field and utilize appropriate technology in all learning environments.

The relevant research or knowledge base that supports the effectiveness of the proposed efforts should be included. If innovative strategies are proposed, the proposal should include compelling arguments for why these strategies are expected to produce results. At the end of the project, the Principal Investigator should be able to describe how student learning has changed, and how our knowledge of how students learn has increased.

For projects that include two or more partners, the proposal should clearly articulate how the partnership will leverage the resources and initiatives beyond that of the individual entities. Moreover, in all cases, the proposal should address the issue of long-term sustainability and how, when executed, the proposal will become a strategic initiative of each organization.

**Expected Measurable Outcomes:** Projects should have goals and objectives that have been translated into a set of expected measurable outcomes that can be monitored using quantitative or qualitative approaches or both. These outcomes should be used to track progress, guide the project, and evaluate its ultimate success.

**Project Evaluation:** All projects should have an evaluation plan that includes both a strategy for monitoring the project as it evolves to provide feedback to guide these efforts (formative evaluation) and a strategy for evaluating the effectiveness of the project in achieving its goals and for identifying positive and negative findings when the project is completed (summative evaluation). These efforts should be based on the project's specific expected measurable outcomes defined in the proposal and should rely on an appropriate mix of qualitative and quantitative approaches in measuring the outcomes.

**Project Reporting:** The project results need to be communicated widely in addition to annual and final reporting requirements. Projects should plan to make their results available through the NSF-sponsored National STEM Digital Library.

## III. AWARD INFORMATION

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**Anticipated Type of Award:** Standard Grant or Continuing Grant

**Estimated Number of Awards:** 35 to 40 Two types of awards will be supported: Expansion Projects (approximately 10 grants are anticipated) will only be available for area (1), Innovations in Teaching and Learning. Exploratory Projects (25-30 grants are anticipated) will be available in areas (2-4).

**Anticipated Funding Amount:** The total anticipated funding in FY09 for projects associated with this announcement is \$8,500,000. Funding is contingent upon availability of appropriations. Expansion Projects will be funded at a level of up to \$400,000. Exploratory Projects will be funded at a level up to \$150,000, but exploratory projects involving multiple universities may apply for grants up to \$200,000.

## IV. ELIGIBILITY INFORMATION

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The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the [Grant Proposal Guide](#), Chapter I, Section E.

**Organization Limit:**

None Specified

**PI Limit:**

None Specified

**Limit on Number of Proposals per Organization:**

None Specified

**Limit on Number of Proposals per PI:**

None Specified

## V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

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### A. Proposal Preparation Instructions

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program announcement 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](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 [pubs@nsf.gov](mailto:pubs@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 announcement 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/pubs/policydocs/grantsgovguide607.pdf>). 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 [pubs@nsf.gov](mailto:pubs@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.3 of the Grant Proposal Guide provides additional information on collaborative proposals.

### B. Budgetary Information

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**Cost Sharing:** Cost sharing is not required under this solicitation.

### C. Due Dates

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

March 11, 2009

#### **D. FastLane/Grants.gov Requirements**

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- **For Proposals Submitted Via FastLane:**

Detailed technical instructions regarding the technical aspects of proposal 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](mailto: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 announcement 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. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at:

<http://www.grants.gov/CustomerSupport>. 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](mailto: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 announcement should be referred to the NSF program staff contact(s) listed in Section VIII of this announcement.

**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**

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Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal preparation requirements. 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 who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with the 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.

##### **A. NSF Merit Review Criteria**

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All NSF proposals are evaluated through use of the two National Science Board (NSB)-approved merit review criteria: intellectual merit and the broader impacts of the proposed effort. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two NSB-approved merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review

criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which the reviewer is qualified to make judgements.

**What is the intellectual merit of the proposed activity?**

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

**What are the broader impacts of the proposed activity?**

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

Examples illustrating activities likely to demonstrate broader impacts are available electronically on the NSF website at: <http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf>.

NSF staff also will give careful consideration to the following in making funding decisions:

***Integration of Research and Education***

One of the principal strategies in support of NSF's goals 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 diversity of learning perspectives.

***Integrating Diversity into NSF Programs, Projects, and Activities***

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- 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.

**B. Review and Selection Process**

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Proposals submitted in response to this program announcement 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

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### A. Notification of the Award

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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

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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](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 [pubs@nsf.gov](mailto:pubs@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](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag).

### C. Reporting Requirements

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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 before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after expiration of a grant, the PI also is required to submit a final project report.

Failure to provide the required annual or final project reports will delay NSF review and processing of any future funding increments as well as any pending proposals for that PI. 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 FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete.

## VIII. AGENCY CONTACTS

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General inquiries regarding this program should be made to:

- Susan C. Kemnitzer, telephone: (703) 292-5347, email: [skemnitz@nsf.gov](mailto:skemnitz@nsf.gov)
- Sally Wood, 585N, telephone: (703)292-7107, fax: (703) 292-9057, email: [slwood@nsf.gov](mailto:slwood@nsf.gov)

- John L. Daniels, telephone: (703) 292-5360, email: [jdaniels@nsf.gov](mailto:jdaniels@nsf.gov)

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: [fastlane@nsf.gov](mailto: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](mailto:support@grants.gov).

## IX. OTHER INFORMATION

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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, MyNSF (formerly the Custom News Service) 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 Regional 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. MyNSF 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

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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 40,000 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 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: [pubs@nsf.gov](mailto:pubs@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:

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