

## **Course, Curriculum, and Laboratory Improvement (CCLI)**

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### **PROGRAM SOLICITATION**

NSF 08-546

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### **REPLACES DOCUMENT(S):**

NSF 07-543

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**National Science Foundation**

Directorate for Education & Human Resources  
Division of Undergraduate Education

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

May 20, 2008

For Phase 1 proposals from submitting organizations located in states or territories beginning with A through M.

May 21, 2008

For Phase 1 proposals from submitting organizations located in states or territories beginning with N through W.

January 12, 2009

For Phase 2 and 3 proposals.

### **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).

The following items are major revisions to the previous program solicitation:

The requirement that Phase 2 and 3 proposals address multiple components of the program has been modified so that now Phase 2 and 3 proposals can focus on single or multiple components.

The NSF Grant Proposal Guide has been modified recently in several places, for example, the allowable font type and required size have been changed. Proposers should review this document carefully before submitting their proposals.

The solicitation contains restrictions limiting the use of project funds.

### **SUMMARY OF PROGRAM REQUIREMENTS**

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#### **General Information**

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##### **Program Title:**

Course, Curriculum, and Laboratory Improvement (CCLI)

##### **Synopsis of Program:**

The Course, Curriculum, and Laboratory Improvement (CCLI) program seeks to improve the quality of science, technology, engineering, and mathematics (STEM) education for all undergraduate students. The program supports efforts to create, adapt, and disseminate new learning materials and teaching strategies, develop faculty

expertise, implement educational innovations, assess learning and evaluate innovations, and conduct research on STEM teaching and learning. The program supports three types of projects representing three different phases of development, ranging from small, exploratory investigations to large, comprehensive projects.

**Cognizant Program Officer(s):**

- Russell Pimmel, Lead Program Director, telephone: (703) 292-4618, email: [rpimmel@nsf.gov](mailto:rpimmel@nsf.gov)
- Myles Boylan, Lead Program Director, telephone: (703) 292-4617, email: [mboylan@nsf.gov](mailto:mboylan@nsf.gov)
- Terry Woodin, Lead Program Director, telephone: (703) 292-4657, email: [twoodin@nsf.gov](mailto:twoodin@nsf.gov)

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

- 47.076 --- Education and Human Resources

## Award Information

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

**Estimated Number of Awards:** 119 to 142 including 90 to 100 Phase 1 awards, 25 to 35 Phase 2 awards, and 4 to 7 Phase 3 awards

**Anticipated Funding Amount:** \$35,800,000 in FY 2009 for new and ongoing awards, pending availability of funding.

## 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:**

An individual may be the Principal Investigator (PI) on only one proposal submitted for any deadline. In applying this eligibility criterion, each proposal in a collaborative submission will be considered a separate proposal with a distinct PI. There is no restriction on the number of proposals for which an individual may serve as a co-PI.

## 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:** 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):

May 20, 2008

For Phase 1 proposals from submitting organizations located in states or territories beginning with A through M.

May 21, 2008

For Phase 1 proposals from submitting organizations located in states or territories beginning with N through W.

January 12, 2009

For Phase 2 and 3 proposals.

## Proposal Review Information Criteria

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**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

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

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

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## I. INTRODUCTION

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The vision of the Course, Curriculum, and Laboratory Improvement (CCLI) program is excellent science, technology, engineering, and mathematics (STEM) education for all undergraduate students. Toward this vision, the program supports projects based on high-quality science, technology, engineering or mathematics, and recent advances in research on undergraduate STEM learning and teaching. The program seeks to stimulate, evaluate, and disseminate innovative and effective developments in undergraduate STEM education through the introduction of new content reflecting cutting edge developments in STEM fields, the production of knowledge about learning, and the improvement of educational practice. The CCLI program design reflects current challenges and promising approaches reported in recent seminal meetings and publications sponsored by organizations concerned with the health of national STEM education. These are reviewed in the remainder of this section.

The National Research Council (NRC) notes several challenges to effective undergraduate education in STEM disciplines. These challenges include providing engaging laboratory, classroom and field experiences; teaching large numbers of students from diverse backgrounds; improving assessment of learning outcomes; and informing science faculty about research on effective teaching (2003, "Evaluating and Improving Undergraduate Teaching in Science, Technology, Engineering, and Mathematics," <http://www.nap.edu/books/0309072778/html/>).

Promising approaches to meeting these challenges have been identified by several national organizations. The NRC emphasizes the importance of teaching subject matter in depth, eliciting and working with students' preexisting knowledge, and helping students develop the skills of self-monitoring and reflection (2005, "How Students Learn", <http://www.nap.edu/books/0309074339/html/> and 2000, "How People Learn" <http://books.nap.edu/catalog/9853/html>). The NRC further emphasizes the importance of creating a body of knowledge about effective practices in STEM undergraduate education ("a STEM education knowledge base") and of creating a community of scholars who can act as resources for each other and for those seeking information.

The NRC also describes several strategies for improving the assessment of learning outcomes. It recommends that research on effective teaching should: pose significant questions that can be investigated using empirical techniques; have the potential for replication and generalization across educational settings; and be publicized and subjected to professional critique (2002 "Scientific Research in Education", <http://www.nap.edu/books/0309082919/html/>).

The value of working with a community of people within or across specific STEM disciplines, or pursuing similar educational innovations, is highlighted in a recent report from Project Kaleidoscope that calls for "collective action" to share ideas and materials so that projects build on, connect to, and enhance the work of others (Project Kaleidoscope, 2002, "Recommendations for Action in Support of Undergraduate Science, Technology, Engineering, and Mathematics," <http://www.pkal.org/documents/ReportOnReports.pdf>). The need for collective action is also emphasized in a report from the National Academies (2003, "Improving Undergraduate Instruction in Science, Technology, Engineering and Mathematics," (<http://www.nap.edu/books/0309089298/html/>)), which identifies the importance of expanding faculty and scholarly networks to promote effective instruction and to support rapid dissemination and adaptation of successful educational innovations.

Subsequent reports have reiterated the need for moving away from lecture-mode approaches in undergraduate STEM education, and they emphasized the importance of increasing innovation and diversity in STEM education programs and the increasingly urgent need for change (2005, "Innovate America: Thriving in a World of Challenge and Change, Council on Competitiveness, <http://innovateamerica.org/webscr/report.asp> and 2006, "Recommendations for Urgent Action", Project Kaleidoscope, <http://www.pkal.org/documents/ReportOnReportsII.cfm>).

The CCLI Program supports the development of exemplary courses and teaching practices (including the acquisition of equipment needed to support these developments) and assessment and research efforts that build on and contribute to the pool of knowledge concerning effective approaches in STEM undergraduate education. The Program recognizes the value of a cadre of STEM faculty committed to improving undergraduate STEM education and sharing their findings with each other, forming a "community of scholars".

The report "Invention and Impact: Building Excellence in Undergraduate Science, Technology, Engineering and Mathematics Education" (2005, [http://www.aaas.org/publications/books\\_reports/CCLI](http://www.aaas.org/publications/books_reports/CCLI)) describes some of the successful efforts supported by the CCLI program and its predecessors (the Course and Curriculum Development (CCD), Instruction and Laboratory Improvement (ILI), and Undergraduate Faculty Enhancement (UFE) programs). Additional information about funded projects is available through the NSF award search engine (<http://www.nsf.gov/awardsearch/>).

## II. PROGRAM DESCRIPTION

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The CCLI program is based on a cyclic model of the relationship between knowledge production and improvement of practice in undergraduate STEM education. The model is adapted from the report, "Mathematical Proficiency for All Students" (see <http://www.rand.org/publications/MR/MR1643/>). In this model, research findings about learning and teaching challenge existing approaches, thus leading to new educational materials and teaching strategies. New materials and teaching strategies that show promise give rise to faculty development programs and methods that incorporate these materials. The most promising of these developments are first tested in limited environments and then implemented and adapted in diverse curricula and educational institutions. These innovations are carefully evaluated by assessing their impact on teaching and learning. In turn, these implementations and assessments generate new insights and research questions, initiating a new cycle of innovation.

### A. Project Components

All proposals must contribute to the development of exemplary undergraduate STEM education. Proposals may focus on one or more of the components of this cycle.

**Creating Learning Materials and Teaching Strategies:** Projects developing new learning materials and tools, or creating new and innovative teaching methods and strategies, should be guided by research on teaching and learning, by evaluations of previous efforts, and by advances within the disciplines. Projects may also revise or enhance existing educational materials and teaching strategies, based on prior results. All projects should lead to exemplary models that address the varied needs of the Nation's diverse undergraduate student population. They may include activities that help faculty develop expertise in adapting these innovations and incorporating them effectively into their courses as the next steps in the cycle.

**Developing Faculty Expertise:** Using new learning materials and teaching strategies often requires faculty to acquire new knowledge and skills and to revise their curricula and teaching practices. Projects focused on developing faculty expertise or including it as a component can range from short-term workshops to sustained activities that foster new communities or networks of practicing educators. Successful projects should provide professional development for a diverse group of faculty so that new materials and teaching strategies can be widely implemented.

**Implementing Educational Innovations:** To ensure their broad based adoption, successful educational innovations (such as newly developed learning materials, teaching strategies, faculty development materials, and assessment and evaluation tools) and the research relating to them should be widely disseminated. These innovations may come from CCLI projects or from other sources in the STEM community. Funds may be requested for local adaptation and implementation projects, including instrumentation to support such projects. Results from implementation projects should illuminate the challenges to and opportunities for adapting innovations in diverse educational settings, and may provide a foundation for the development of new tools and processes for dissemination. They also may provide a foundation for assessments of learning and teaching.

**Assessing Student Achievement:** Implementing educational innovations will create new needs to assess student learning. Projects for designing tools to measure the effectiveness of new materials and instructional methods are appropriate. Some projects may develop and share valid and reliable tests of STEM knowledge; other projects may collect, synthesize, and interpret information about student reasoning, practical skills, interests, or other valued outcomes. Projects that apply new and existing tools to conduct broad-based evaluations of educational programs or practices are appropriate if they span multiple institutions and are of general interest. In discussing these aspects of curricular change, projects should carefully document population characteristics and context for abstracting what can be generalized. Results obtained using these tools and processes should provide a foundation that leads to new questions for conducting research on teaching and learning. Assessment projects likely to have only a local impact are discouraged.

**Conducting Research on Undergraduate STEM Education:** Results from assessments of learning and teaching as well as from projects emphasizing other components in the cyclic model provide a foundation for developing new and revised models of how undergraduate STEM students learn. Research to explore how effective teaching strategies and curricula enhance learning is appropriate. Some research results may compel faculty to rethink STEM education for the future. Other projects will have a practical focus. All projects should lead to testable new ideas for creating learning materials and teaching strategies that have the potential for a direct impact on STEM educational practices.

## B. Project Phases

The CCLI program is accepting proposals under this solicitation for three types of projects representing different phases of development. These phases reflect the maturity of the proposed educational innovation and the number of academic institutions, students, and faculty involved in the project. All proposals should include an explicit and thorough discussion of prior work showing how the proposed project is informed by and builds upon that work. They also should include an evaluation plan appropriate to the size and scope of the project.

**Phase 1 Projects:** Total budget up to \$150,000 (\$200,000 when four-year colleges and universities collaborate with two-year colleges) for 1 to 3 years.

Phase 1 projects typically will address one program component and involve a limited number of faculty members at one academic institution. However, larger scale projects can be proposed provided they can be done within the Phase 1 budget limitations. Proposed evaluation efforts should be informative, based on the project's specific expected outcomes, and consistent with budget limitations and the scope of a Phase 1 project. An extensive evaluation of student learning or use of an independent external evaluator may be included as needed but is not a requirement. Some evaluation is needed to monitor progress in achieving the project's goals and expected outcomes. (See Project Evaluation in Section II. C.) In order to encourage collaboration between four-year colleges and universities and two-year colleges, projects involving such collaboration may request an additional \$50,000. The distribution of effort and funds between the four-year institution and the community college should reflect a genuine collaboration. Results from Phase 1 projects are expected to be significant enough to contribute to the undergraduate STEM education knowledge base.

**Phase 2 Projects:** Total budget up to \$500,000 for 2 to 4 years.

Phase 2 projects build on smaller-scale projects that have produced promising results, such as those produced by successful Phase 1 projects, and refine and test these with diverse users in several settings. Projects may address single or multiple components. For example, a materials development project might include professional development and dissemination efforts, such as workshops for faculty to scale up its implementation in a number of other academic institutions. Phase 2 projects should carry the development to a state where the results are conclusive so that successful products and processes can be distributed widely or commercialized when appropriate. At a minimum, the innovation, if successful, should be institutionalized at the participating colleges and universities.

**Phase 3 Projects:** Total budget up to \$2,000,000 for 3 to 5 years.

Phase 3 projects are intended to support large scale efforts and may focus on a single or multiple components. These projects might be focused on faculty professional development, transformative curriculum projects with national impact, or educational assessment or research projects addressing significant questions in undergraduate education. Proposals should include an explicit discussion of the results and evidence produced by the work on which the proposed project is based. Phase 3 projects are expected to include a diversity of academic institutions and student populations. Proposals should include a description of evaluation activities that are focused on impact and based on sampling a broad spectrum of the population served by the project. For example, in a faculty professional development project the evaluation plans should be designed to measure the impact of the project's activities on a large number of the attending faculty members and their students and at a wide range of academic institutions. Dissemination and outreach activities that have national impact are an especially important element of Phase 3 projects.

**Connections Between Phases:** Although it is expected that some Phase 1 projects will lead to Phase 2 projects and some Phase 2 projects to Phase 3 projects, there is no requirement that a proposal in either of these phases be based on CCLI-funded work. While it is unlikely that the program would be able to support a single multi-year project to address all components in depth at a large scale, a succession of grants might support such an effort. In all cases the funds requested should be consistent with the scope and scale of the project.

## C. Important Project Features

Although projects may vary considerably in the number of components they address, in the number of academic institutions involved, in the number of faculty and students that participate, and in their stage of development, all promising projects should share certain characteristics.

**Quality, Relevance, and Impact:** Projects should address a recognized need or opportunity in the discipline, 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 have the potential to produce exemplary materials, processes, and models, or important assessment and research findings. They should be based on an accurate and current understanding of the disciplinary field and should utilize appropriate technology in student laboratories, classrooms and other learning environments. These projects, even those that involve a local implementation, should address issues that have the potential for broad application in undergraduate STEM education. The results of these projects should advance knowledge and understanding within the discipline and within STEM education in general.

**Student Focus:** Projects should have a clear relation to student learning, with definite links between project activities and improvements in STEM learning. Moreover, they should involve approaches that are consistent with the nature of today's students, reflect the student's perspective and, when possible, solicit student input in the design of the project.

**Use of and Contribution to Knowledge about STEM Education:** Projects should reflect high quality science, technology, engineering, and mathematics. They should have a clear and compelling rationale, use methods derived from the existing knowledge-base concerning undergraduate STEM education, and acknowledge existing projects of a similar nature. They also should have an effective approach for adding to this knowledge-base by disseminating their results.

**STEM Education Community-Building:** Projects should include interactions between the investigators and others in the undergraduate STEM education community. As appropriate to the scope and scale of the project, these interactions may range from informal contacts with a few colleagues to the establishment of a formal body of scholars. These interactions should enable the project to benefit from the knowledge and experience of others in developing and evaluating the educational innovation. This collaborating network should involve investigators working on similar or related approaches in the proposer's discipline or in other STEM disciplines and may also include experts in evaluation, educational psychology or other related fields.

**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. Expected measurable outcomes should pay particular attention to student learning, contributions to the knowledge base, and community building.

**Project Evaluation:** All projects, regardless of the phase or main component of the cyclic model they represent, 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.

#### D. Program Evaluation

The Division of Undergraduate Education (DUE) conducts an on-going program evaluation to determine how effectively the CCLI program is achieving its goal to stimulate, disseminate, and institutionalize innovative developments in STEM education through the production of knowledge and the improvement of practice. In particular, the program seeks to understand how effectively its projects are using current learning models in developing their innovations, contributing to the knowledge base on STEM education, and building a community of scholars in undergraduate STEM education. In addition to project-specific evaluations, all projects are expected to cooperate with this third party program evaluation and respond to all inquiries, including requests to participate in surveys, interviews and other approaches for collecting data needed to evaluate the CCLI Program.

### III. AWARD INFORMATION

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NSF anticipates having \$35.8 million in FY 2009 for new and ongoing CCLI awards, pending the availability of funds. The awards will be made as standard or continuing grants. The number and size of awards will depend on the quality of the proposals received and the availability of funds. The expected number of awards, and duration and range of total NSF/DUE support over the lifetime of a CCLI project, including indirect costs, are as follows:

- **Phase 1: Exploratory Projects** – 90 to 100 awards expected, each with a total budget up to \$150,000 (\$200,000 when four-year colleges and universities collaborate with two-year colleges) for 1 to 3 years.
- **Phase 2: Expansion Projects** – 25 to 35 awards expected, each with a total budget up to \$500,000 for 2 to 4 years.
- **Phase 3: Comprehensive Projects** – 4 to 7 awards expected, each with a total budget up to \$2,000,000 for 3 to 5 years.

For collaborative projects, these limits apply to the total project budget.

### IV. 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:

An individual may be the Principal Investigator (PI) on only one proposal submitted for any deadline. In applying this eligibility criterion, each proposal in a collaborative submission will be considered a separate proposal with a distinct PI. There is no restriction on the number of proposals for which an individual may serve as a co-PI.

#### Additional Eligibility Info:

Proposals are invited from all organizations and in any field eligible under the standard GPG guidelines. Specifically excluded are projects that address solely professional training in clinical fields such as medicine, nursing, and clinical psychology. There is no limit on the number of proposals an organization may submit.

### 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 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](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 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/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.

### Additional Full Proposal Instructions:

The following information supplements the GPG and the NSF Grants.gov Application Guide:

- Proposers should make sure that their proposals respond to the list of questions provided both in the general review criteria and in the additional program-specific review criteria in Section VI.A below. They should review the discussion of the components, phases, and important features in Section II above. Additional information on writing proposals can be found in "A Guide for Proposal Writing" ([http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf04016](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf04016)).
- Principal Investigators are strongly encouraged to match their proposed budgets carefully to the scope and scale of a project. Excessive or poorly justified budgets indicate that the project is not well designed.
- Projects that plan to use the World Wide Web as a component of their overall dissemination strategy should contribute the project's website and associated pages to the National Science Digital Library (NSDL). The proposal should describe how the web pages will be tagged with descriptive metadata (see <http://dublincore.org>) so that that information about the project, its resources, and its outcomes becomes part of the NSDL. The following website <http://nsdl.org/contribute/> provides information and instructions for connecting the project's website.
- All projects must comply with the section of the GPG on Proposals Involving Human Subjects ([http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=gpg](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg)). The proposer should mark the Human Subjects box on the cover sheet and then indicate that the proposed project is exempt, approved, or pending. The process is pending if the IRB has not yet approved a submitted application or if the proposer has not yet submitted an application. This section should not be left blank.
- While all material relevant to determining the quality of the proposed work must be included within the 15-page Project Description or as part of the budget justification, proposers may, as a part of the Supplementary Documentation, include letters showing collaborator commitments and organizational endorsement. In addition, for those projects whose deliverables include a final product, samples of these products (such as excerpts from book chapters, assessment tools, screen shots of software, sample teaching modules and other project deliverables) may be placed within the Supplementary Documentation section. These sample materials should be concise and relevant.

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## B. Budgetary Information

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

### Other Budgetary Limitations:

- NSF funds may not be used to support expenditures that would normally be made in the absence of an award, such as costs for routine teaching activities (including curriculum development) and laboratory upgrades.

NSF project funds may not be used for:

- equipment or instrumentation that is not mainly for use in the project;
- replacement equipment or instrumentation that does not significantly improve instructional capability;
- teaching aids (e.g., films, slides, projectors, "drill and practice" software);
- vehicles, laboratory furnishings, or general utility items such as office equipment (including word-processing equipment), benches, tables, desks, chairs, storage cases, and routine supplies;
- maintenance equipment and maintenance or service contracts;
- the modification, construction, or furnishing of laboratories or other buildings;
- the installation of equipment or instrumentation (as distinct from the on-site assembly of multicomponent instruments--which is an allowable charge).

## C. Due Dates

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

May 20, 2008

For Phase 1 proposals from submitting organizations located in states or territories beginning with A through M.

May 21, 2008

For Phase 1 proposals from submitting organizations located in states or territories beginning with N through W.

January 12, 2009

For Phase 2 and 3 proposals.

Proposers should allow sufficient time for all organizational approvals and for correction of errors in uploading the proposal in FastLane or Grants.gov. No corrections to submitted proposals will be accepted after the deadline. Proposals received after the deadline will be returned without review. PROPOSALS THAT DO NOT MEET THE REQUIREMENT FOR SEPARATELY AND EXPLICITLY ADDRESSING INTELLECTUAL MERIT AND BROADER IMPACTS IN THE PROJECT SUMMARY WILL BE RETURNED WITHOUT REVIEW. Proposals that do not comply with the formatting requirements (e.g., page limitation, font size, margin limits, and organizational structure) specified in the GPG or NSF Grants.gov Application Guide will be returned without review.

## D. FastLane/Grants.gov Requirements

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- **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](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 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. 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 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

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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.

**Additional Review Criteria:**

In reviewing CCLI proposals, the standard criteria will be expanded to include the following additional review criteria as appropriate to the phase and main component of the proposed work:

**Intellectual Merit:** Will the project produce exemplary material, processes, or models that enhance student learning? Will it yield important assessment or research findings related to student learning, as appropriate to the goals of the project? Does the project build on the existing STEM education knowledge base? Are appropriate expected measurable outcomes explicitly stated and are they integrated into an evaluation plan? Is the evaluation effort likely to produce useful information?

**Broader Impacts:** Will the project contribute to the STEM education knowledge base? Will the project help build the STEM education community? Will the project have a broad impact on STEM education in an area of recognized need or opportunity?

## **B. Review and Selection Process**

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Proposals submitted in response to this program solicitation will be reviewed by 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 Federal Demonstration Partnership (FDP) 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/general\\_conditions.jsp?org=NSF](http://www.nsf.gov/awards/managing/general_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.

There are two special CCLI reporting requirements. When CCLI PIs submit interim and final reports through FastLane, they will be asked to provide additional information for the *Project Information Resource System (PIRS)*. In addition, PIs of CCLI grants will also be expected to cooperate with data collection associated with the CCLI program evaluation conducted by a third party organization supported by NSF.

## VIII. AGENCY CONTACTS

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General inquiries regarding this program should be made to:

- Russell Pimmel, Lead Program Director, telephone: (703) 292-4618, email: [rpimmel@nsf.gov](mailto:rpimmel@nsf.gov)
- Myles Boylan, Lead Program Director, telephone: (703) 292-4617, email: [mboylan@nsf.gov](mailto:mboylan@nsf.gov)
- Terry Woodin, Lead Program Director, telephone: (703) 292-4657, email: [twoodin@nsf.gov](mailto:twoodin@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).
- Antoinette T. Allen, Division of Undergraduate Education, telephone: 703-292-4646, email: [duefi@nsf.gov](mailto:duefi@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).

**Proposers are encouraged to contact a DUE Program Director in their discipline:**

### Biological Sciences

- V. Celeste Carter, Program Director, telephone: (703) 292-4634, email: [vcarter@nsf.gov](mailto:vcarter@nsf.gov)
- Joan T. Prival, Program Director, telephone: (703) 292-4635, email: [jprival@nsf.gov](mailto:jprival@nsf.gov)
- Daniel Udovic, Program Director, telephone: (703) 292-4766, email: [dudovic@nsf.gov](mailto:dudovic@nsf.gov)
- Terry S. Woodin, Program Director, telephone: (703) 292-4657, email: [twoodin@nsf.gov](mailto:twoodin@nsf.gov)

## Chemistry

- Susan H. Hixson, Program Director, telephone: (703) 292-4623, email: [shixson@nsf.gov](mailto:shixson@nsf.gov)
- Eileen L. Lewis, Program Director, telephone: (703) 292-4627, email: [ellewis@nsf.gov](mailto:ellewis@nsf.gov)
- Pratibha Varma-Nelson, Program Director, telephone: (703) 292-4653, email: [pvarmane@nsf.gov](mailto:pvarmane@nsf.gov)

## Computer Science

- Stephen C. Cooper, Program Director, telephone: (703) 292-4645, email: [sccooper@nsf.gov](mailto:sccooper@nsf.gov)
- Timothy V. Fossum, Program Director, telephone: (703) 292-5141, email: [tfossum@nsf.gov](mailto:tfossum@nsf.gov)

## Engineering

- Kathleen A. Alfano, Program Director, telephone: (703) 292-4641, email: [kalfano@nsf.gov](mailto:kalfano@nsf.gov)
- Lesia L. Crumpton-Young, Program Director, telephone: (703) 292-4629, email: [lcrumpto@nsf.gov](mailto:lcrumpto@nsf.gov)
- Russell L. Pimmel, Program Director, telephone: (703) 292-4618, email: [rpimmel@nsf.gov](mailto:rpimmel@nsf.gov)
- Sheryl A. Sorby, Program Director, telephone: (703) 292-4647, email: [ssorby@nsf.gov](mailto:ssorby@nsf.gov)

## Geological Sciences

- Jill K. Singer, Program Director, telephone: (703) 292-5323, email: [jksinger@nsf.gov](mailto:jksinger@nsf.gov)

## Interdisciplinary

- Herbert H. Richtol, Program Director, telephone: (703) 292-4648, email: [hrichtol@nsf.gov](mailto:hrichtol@nsf.gov)
- Curtis T. Sears, Program Director, telephone: (703) 292-4639, email: [csears@nsf.gov](mailto:csears@nsf.gov)

## Mathematics

- Daniel P. Maki, Program Director, telephone: (703) 292-4620, email: [dmaki@nsf.gov](mailto:dmaki@nsf.gov)
- Ginger H. Rowell, Program Director, telephone: (703) 292-5108, email: [growell@nsf.gov](mailto:growell@nsf.gov)
- Elizabeth J. Teles, Program Director, telephone: (703) 292-8670, email: [ejteles@nsf.gov](mailto:ejteles@nsf.gov)
- Lee L. Zia, Program Director, telephone: (703) 292-5140, email: [lzia@nsf.gov](mailto:lzia@nsf.gov)

## Physics/Astronomy

- Warren W. Hein, Program Director, telephone: (703) 292-4644, email: [whein@nsf.gov](mailto:whein@nsf.gov)
- R. Corby Hovis, Program Director, telephone: (703) 292-4625, email: [chovis@nsf.gov](mailto:chovis@nsf.gov)
- Duncan E. McBride, Program Director, telephone: (703) 292-4630, email: [dmcbride@nsf.gov](mailto:dmcbride@nsf.gov)

## Research/Assessment

- Myles G. Boylan, Program Director, telephone: (703) 292-4617, email: [mboylan@nsf.gov](mailto:mboylan@nsf.gov)
- Russell L. Pimmel, Program Director, telephone: (703) 292-4618, email: [rpimmel@nsf.gov](mailto:rpimmel@nsf.gov)

## Social Sciences

- Myles G. Boylan, Program Director, telephone: (703) 292-4617, email: [mboylan@nsf.gov](mailto:mboylan@nsf.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:

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

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