

# Advanced Learning Technologies (ALT)

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## Program Solicitation

NSF 05-561



### National Science Foundation

Directorate for Computer and Information Science and Engineering  
Division of Information and Intelligent Systems  
Directorate for Education and Human Resources  
Division of Research, Evaluation and Communication

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

May 26, 2005

## SUMMARY OF PROGRAM REQUIREMENTS

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### General Information

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#### Program Title:

Advanced Learning Technologies (ALT)

#### Synopsis of Program:

Through the Advanced Learning Technologies (ALT) program, the CISE and EHR Directorates of NSF support research that (1) enables radical improvements in learning through innovative computer and information technologies, and (2) advances research in computer science, information technology, learning, and cognitive science through the unique challenges posed by learning environments and learning technology platforms. Integrative research approaches that build across disciplines and establish tight linkages among theory, experiment, and design are strongly encouraged. Technology goals may include systems for tutoring or assessment, modeling and sensing of cognitive or emotional states, context awareness, natural language interfaces, collaboration, knowledge management, and non-traditional goals that redefine the roles of technology in learning. Educational foci for ALT projects must include an area of science, technology, engineering, or mathematics (STEM), or general cross-cutting skills directly relevant to STEM.

#### Cognizant Program Officer(s):

- John C. Cherniavsky, Senior EHR Advisor for Research, Directorate for Education & Human Resources, Division of Research, Evaluation & Communication, 855 S, telephone: (703) 292-5136, fax: (703) 292-9046, email: [jchernia@nsf.gov](mailto:jchernia@nsf.gov)
- Karen Kukich, Program Director, Directorate for Computer & Information Science & Engineering, Division of Information and Intelligent Systems, 1125 S, telephone: (703) 292-8930, fax: (703) 292-9073, email: [kkukich@nsf.gov](mailto:kkukich@nsf.gov)
- Elizabeth VanderPutten, Program Director, Directorate for Education & Human Resources, 855 S, telephone: (703) 292-5147, fax: (703) 292-9046, email: [evanderp@nsf.gov](mailto:evanderp@nsf.gov)
- Kenneth Whang, Program Director, Directorate for Computer & Information Science & Engineering, Division of Information and Intelligent Systems, 1125 S, telephone: (703) 292-5149, fax: (703) 292-9073, email: [kwhang@nsf.gov](mailto:kwhang@nsf.gov)

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

- 47.070 --- Computer and Information Science and Engineering
- 47.076 --- Education and Human Resources

#### Eligibility Information

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- **Organization Limit:** None Specified.
- **PI Eligibility Limit:** In response to this solicitation, an investigator may participate as PI, or Co-PI in no more than one proposal.

Proposals that violate this requirement will be returned without review by NSF.

- **Limit on Number of Proposals:** None Specified.

#### Award Information

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- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 6 to 10 - standard or continuing grants
- **Anticipated Funding Amount:** \$2,700,000 pending availability of funds

#### Proposal Preparation and Submission Instructions

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##### A. Proposal Preparation Instructions

- **Full Proposal Preparation Instructions:** Standard GPG Guidelines apply.

##### B. Budgetary Information

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

##### C. Due Dates

- **Full Proposal Deadline Date(s)** (due by 5 p.m. proposer's local time):  
May 26, 2005

#### Proposal Review Information

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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**

Research on learning technologies has unique potential to transform learning and educational opportunities, while at the same time advancing the state of the art in underlying areas of computer science and learning research. Recent advances have built on a broad base of cognitive, computational, and crossover areas of research, including reasoning, problem solving, knowledge representation, cognitive development, language and communications, human-computer interaction, information and knowledge discovery, visualization, machine learning, pedagogy, educational assessment, and numerous other fields. Learning technologies research involves core problems from both cognitive and computational research and offers an applications context well suited for integration and testing. The Computer and Information Science and Engineering (CISE) and Education and Human Resources (EHR) Directorates of the National Science Foundation aim to fully exploit both the educational potential of technology and the research potential of learning environments and learning technology platforms.

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**II. PROGRAM DESCRIPTION**

Through the Advanced Learning Technologies (ALT) program, CISE and EHR support learning technologies research that (1) enables radical improvements in learning through innovative computer and information technologies, and (2) advances research in computer science, information technology, learning, and cognitive science through the unique challenges posed by learning environments and learning technology platforms. Integrative research approaches that build across disciplines and establish tight linkages among theory, experiment, and design are strongly encouraged.

Under this program, CISE and EHR will support research and prototyping work that is built around well defined learning and technology goals, and leads to generalizable advances in knowledge and technology. Large-scale studies, infrastructure, large-scale system development, or educational materials development will not be supported under this program. Both learning and technology goals are expected to be well articulated and significant: educational applications of off-the-shelf technologies or projects that neither model nor measure learning will not be supported under this program. **Proposals that do not address both learning and technology goals may be returned without review by the program.**

Technology goals may include (but are not limited to): systems for tutoring or assessment, modeling and sensing of cognitive or emotional states, context awareness, natural language interfaces, collaboration, and knowledge management. Non-traditional goals that redefine the roles of technology in learning are encouraged.

Educational foci for ALT projects must include an area of science, technology, engineering, or mathematics (STEM), or general cross-cutting skills directly relevant to STEM. ALT projects may be targeted toward learning settings from pre-K through adulthood. Generalization, transfer, and learning of abstract concepts and relationships are of high interest to the program.

Learning and technology goals are expected to drive an integrative research strategy that builds on appropriate expertise in computer science and learning research, and facilitates close interactions among theoretical, experimental, and design aspects of a project. Proposals to ALT are expected to clearly delineate:

1. Specific learning and technology goals

2. Research context upon which new work will build
3. Proposed new work, including methods, measures, assessment and evaluation
4. Research plan, integrative research strategy, and preliminary timetable

Proposals to ALT should not overlap with other proposals to NSF. Proposers with pending projects in the Division of Information and Intelligent Systems (IIS) of CISE or the Division of Research, Evaluation and Communication (REC) of EHR are strongly advised to discuss their project ideas with an ALT program officer prior to submitting to the ALT program.

### III. ELIGIBILITY INFORMATION

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The categories of proposers identified in the [Grant Proposal Guide](#) are eligible to submit proposals under this program announcement/solicitation.

In response to this solicitation, an investigator may participate as PI, or Co-PI in no more than one proposal.

Proposals that violate this requirement will be returned without review by NSF.

### IV. AWARD INFORMATION

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

The program anticipates that most projects will have budgets of approximately \$100,000 to \$200,000 per year over three years.

The estimated number of awards will be 6 to 10 standard or continuing grants. The anticipated funding amount is \$2,700,000 pending availability of funds.

### V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

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#### A. Proposal Preparation Instructions

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##### **Full Proposal Instructions:**

Proposals submitted in response to this program announcement/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 the program announcement/solicitation number (05-561) in the program announcement/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.

#### B. Budgetary Information

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##### **Cost Sharing:**

Cost sharing is not required in proposals submitted under this Program Solicitation.

#### C. Due Dates

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Proposals must be submitted by the following date(s):

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

May 26, 2005

**D. FastLane Requirements**

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Proposers are required to prepare and submit all proposals for this announcement/solicitation through the FastLane system. Detailed instructions for 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/solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this announcement/solicitation.

*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. Proposers are no longer required to provide a paper copy of the signed Proposal Cover Sheet to NSF. Further instructions regarding this process are available on the FastLane Website at: <http://www.fastlane.nsf.gov>

**VI. PROPOSAL REVIEW INFORMATION**

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**A. NSF Proposal Review Process**

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Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

The National Science Board approved revised criteria for evaluating proposals at its meeting on March 28, 1997 ([NSB 97-72](#)). All NSF proposals are evaluated through use of the two merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

On July 8, 2002, the NSF Director issued [Important Notice 127](#), Implementation of new Grant Proposal Guide Requirements Related to the Broader Impacts Criterion. This Important Notice reinforces the importance of addressing both criteria in the preparation and review of all proposals submitted to NSF. NSF continues to strengthen its internal processes to ensure that both of the merit review criteria are addressed when making funding decisions.

In an effort to increase compliance with these requirements, the January 2002 issuance of the GPG incorporated revised proposal preparation guidelines relating to the development of the Project Summary and Project Description. Chapter II of the GPG specifies that Principal Investigators (PIs) must address both merit review criteria in separate statements within the one-page Project Summary. This chapter also reiterates that broader impacts resulting from the proposed project must be addressed in the Project Description and described as an integral part of the narrative.

Effective October 1, 2002, NSF will return without review proposals that do not separately address both merit review criteria within the Project Summary. It is believed that these changes to NSF proposal preparation and processing guidelines will more clearly articulate the importance of broader impacts to NSF-funded projects.

The two National Science Board approved merit review criteria are listed below (see the [Grant Proposal Guide](#) Chapter III.A for further information). 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 he/she is qualified to make judgments.

**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 and original 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?

NSF staff 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 Protocol and Associated Customer Service Standard**

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All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this announcement/solicitation will be reviewed by Ad Hoc 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.

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 Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

NSF is striving to be able to tell proposers whether their proposals have been declined or recommended for funding within six months. The time interval begins on the closing date of an announcement/solicitation, or the date of proposal receipt, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

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 Division 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.A. 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 (NSF-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 agreement awards also are administered in accordance with NSF Cooperative Agreement Terms and Conditions (CA-1). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

\*These documents may be accessed electronically on NSF's Website at <http://www.nsf.gov/awards/managing/>. 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 is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website at [http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=gpm](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpm). The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Website at <http://www.gpo.gov>.

### C. Reporting Requirements

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For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for the PI and all Co-PIs. 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. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, 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.

## VIII. CONTACTS FOR ADDITIONAL INFORMATION

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General inquiries regarding this program should be made to:

- John C. Cherniavsky, Senior EHR Advisor for Research, Directorate for Education & Human Resources, Division of Research, Evaluation & Communication, 855 S, telephone: (703) 292-5136, fax: (703) 292-9046, email: [jchernia@nsf.gov](mailto:jchernia@nsf.gov)
- Karen Kukich, Program Director, Directorate for Computer & Information Science & Engineering, Division of Information and Intelligent Systems, 1125 S, telephone: (703) 292-8930, fax: (703) 292-9073, email: [kkukich@nsf.gov](mailto:kkukich@nsf.gov)
- Elizabeth VanderPutten, Program Director, Directorate for Education & Human Resources, 855 S, telephone: (703) 292-5147, fax: (703) 292-9046, email: [evanderp@nsf.gov](mailto:evanderp@nsf.gov)
- Kenneth Whang, Program Director, Directorate for Computer & Information Science & Engineering, Division of Information and Intelligent Systems, 1125 S, telephone: (703) 292-5149, fax: (703) 292-9073, email: [kwhang@nsf.gov](mailto:kwhang@nsf.gov)

For questions related to the use of FastLane, contact:

- Lisa R. Wilson, Integrative Activities Specialist, Directorate for Computer & Information Science & Engineering, Division of Information and Intelligent Systems, 1125 N, telephone: (703) 292-8463, fax: (703) 292-9073, email: [lwilson@nsf.gov](mailto:lwilson@nsf.gov)

## IX. OTHER PROGRAMS OF INTEREST

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The NSF *Guide to Programs* is a compilation of funding for research and education in science, mathematics, and engineering. The NSF *Guide to Programs* is available electronically at <http://www.nsf.gov/cgi-bin/getpub?gp>. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF *E-Bulletin*, which is updated daily on the NSF Website at <http://www.nsf.gov/home/ebulletin>, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's *MyNSF News Service* (<http://www.nsf.gov/mynsf/>) to be notified of new funding opportunities that become available.

### Related Research Opportunities

NSF supports related areas of computer science and educational research primarily through the programs of the Division of Information and Intelligent Systems (<http://www.nsf.gov/div/index.jsp?div=IIS>) and the Division of Research, Evaluation, and Communication (<http://www.nsf.gov/div/index.jsp?div=REC>). In addition, the Interagency Education Research Initiative (<http://www.nsf.gov/cgi-bin/getpub?nsf04553>) offers support for large-scale studies of technology-based educational interventions. The Science of Learning Centers program (<http://www.nsf.gov/slc>) supports long-term large-scale centers focused on learning research. The CISE Computing Research Infrastructure program (<http://www.nsf.gov/cgi-bin/getpub?nsf04588>) supports the acquisition, development, enhancement, and operation of research infrastructure.

### Educational Materials Development

NSF supports the development of educational materials and infrastructure primarily through the Divisions of Undergraduate Education (<http://www.nsf.gov/div/index.jsp?div=DUE>) and Elementary, Secondary, and Informal Education (<http://www.nsf.gov/div/index.jsp?div=ESIE>). Opportunities include support for K-16 curricula and educational materials, the National STEM Digital Library, and information technology learning experiences for students and teachers.

## ABOUT THE NATIONAL SCIENCE FOUNDATION

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The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities and persons with disabilities to compete fully in its programs. In accordance with Federal statutes, regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF, although some programs may have special requirements that limit eligibility.

*Facilitation Awards for Scientists and Engineers with Disabilities* (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the GPG Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.



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

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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; 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 applicant 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 needing information as part of the review process or in order to coordinate programs; 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," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). 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 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 this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne Plimpton, Reports Clearance Officer, Division of Administrative Services, National Science Foundation, Arlington, VA 22230.

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The National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230, USA  
Tel: (703) 292-5111, FIRS: (800) 877-8339 | TDD: (800) 281-8749

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