Building Engineered Complex Systems (BECS)

PROGRAM SOLICITATION
NSF 09-610

National Science Foundation

Directorate for Engineering
Emerging Frontiers in Research and Innovation
Division of Chemical, Bioengineering, Environmental, and Transport Systems
Civil, Mechanical and Manufacturing Innovation
Electrical, Communications and Cyber Systems

Directorate for Mathematical & Physical Sciences
Division of Mathematical Sciences

Submission Window Date(s) (due by 5 p.m. proposer's local time):

December 14, 2009 - January 19, 2010

IMPORTANT INFORMATION AND REVISION NOTES

Please be advised that the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) includes revised guidelines to implement the mentoring provisions of the America COMPETES Act (ACA) (Pub. L. No. 110-69, Aug. 9, 2007.) As specified in the ACA, each proposal that requests funding to support postdoctoral researchers must include a description of the mentoring activities that will be provided for such individuals. Proposals that do not comply with this requirement will be returned without review (see the PAPP Guide Part I: *Grant Proposal Guide* Chapter II for further information about the implementation of this new requirement).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Building Engineered Complex Systems (BECS)

Synopsis of Program:

The Directorate for Engineering (ENG) and the Division of Mathematical Sciences (DMS) in the Directorate for Mathematical and Physical Sciences (MPS) at the National Science Foundation (NSF) are collaborating in this solicitation to provide "seed funding" for small teams of innovative engineers and mathematical scientists (mathematicians or statisticians) to seek and develop a theoretical basis of complex systems, with the aim of developing formal methods for the design of engineered complex systems. A complex system is characterized by its display of patterns of structure or behavior at one level of organization of the system that are diagnostic of interactions among parts of the system at other levels; the emergent behaviors or structures are not evident from considering only the system's separate components. This solicitation has been motivated by the observation that many natural, social, and engineered systems have been recognized to be complex systems, in which the traditional reductionist approach to science and engineering fails to predict and explain the patterns and behaviors that emerge from the functioning of these systems. Many engineered systems fall into this category and unexpected failures and other consequences have been experienced as these systems function near the edge of their expected performance capacity, for example in power grids, traffic systems, critical civil infrastructures, materials, chemical industrial systems, manufacturing and service enterprises, and environmental systems. Although these unexpected behaviors can be undesirable, it has also been recognized that complex systems with their ability to display emergent behaviors can be designed to be resilient and robust, features that are desirable in engineered systems.

The proposals submitted in response to this solicitation must meet the requirements delineated in this solicitation.

Cognizant Program Officer(s):

- Eduardo A. Misawa, ENG/CMMI, telephone: (703) 292-5353, email: emisawa@nsf.gov
- Michael Steuerwalt, MPS/DMS, telephone: (703) 292-4860, email: msteuerw@nsf.gov
- James Alexander, MPS/DMS, telephone: (703) 292-8104, email: jaalexan@nsf.gov
- Maria K. Burka, ENG/CBET, telephone: (703) 292-7030, email: mburka@nsf.gov
- Rathindra DasGupta, ENG/IIP, telephone: (703) 292-8353, email: rdasgupt@nsf.gov
- Semahat S. Demir, ENG/CBET, telephone: (703) 292-7950, email: sdemir@nsf.gov

- Suhada Jayasuriya, ENG/CMMI, telephone: (703) 292-7014, email: sjayasur@nsf.gov
- Dagmar Niebur, ENG/ECCS, telephone: (703) 292-8339, email: dniebur@nsf.gov
- Lynn Preston, ENG/EEC, telephone: (703) 292-5358, email: lpreston@nsf.gov
- Thomas F. Russell, OD/OIA and MPS/DMS, telephone: (703) 292-4863, email: trussell@nsf.gov
- Robert L. Smith, ENG/CMMI, telephone: (703) 292-7902, email: rlsmith@nsf.gov
- Andreas Weisshaar, ENG/ECCS, telephone: (703) 292-8339, email: aweissha@nsf.gov

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

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 12 to 20

Anticipated Funding Amount: $4,000,000 - Pending availability of funds, a minimum of $4,000,000 will be available in FY 2010 for proposals submitted in response to this solicitation.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.

PI Limit:

Principal Investigators (PI) must be at the faculty level as determined by the submitting organization. At least one co-PI must be an engineer and at least one co-PI must be a mathematical scientist (a mathematician or statistician). Proposals that do not meet this requirement will be returned without review.

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 2

An individual may participate as Principal Investigator (PI), co-Principal Investigator (Co-PI) or other Senior Personnel in at most two proposals in each annual competition. Any individual whose biographical sketch is provided as part of the proposed activity will be considered a PI, Co-PI or Senior Personnel in the activity, with or without financial support from the project. If a person appears on more than two proposals, all proposals in which that individual is participating will be returned without review.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposal Preparation Instructions:** NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) proposal preparation guidelines apply.

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

- **Submission Window Date(s)** (due by 5 p.m. proposer's local time):

  December 14, 2009 - January 19, 2010

Proposal Review Information Criteria

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

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

TABLE OF CONTENTS

I. INTRODUCTION

Many natural, social, and engineered systems have been recognized to be complex systems, that is, systems characterized by their display of patterns of structure or behavior at one level of system organization that are diagnostic of interactions among parts of the system at other levels; the emergent behaviors or structures are not evident from considering only the system's separate components. For such systems the traditional reductionist approach to science and engineering fails to predict and explain the patterns and behaviors that emerge from the functioning of these systems. Many engineered systems fall into this category and unexpected failures and other consequences have been experienced as these systems function near the edge of their expected performance capacity, for example in power grids, traffic systems, critical civil infrastructures, materials, chemical industrial systems, manufacturing and service enterprises, and environmental systems. Although these unexpected behaviors can be undesirable, it has also been recognized that complex systems with their ability to display emergent behaviors are often resilient and robust, features that are desirable in engineered systems. The need to enhance the engineering methods and enable the engineering of complex systems has been recognized. This solicitation supports innovative exploratory research and aims to provide "seed funding" for small teams of engineers and mathematical scientists to seek and develop the theoretical basis of complex systems that will result in formal methods for design and management of engineered complex systems. Teams, in which at least one of the members has demonstrated high expertise in engineering and another of whom has demonstrated high expertise in mathematics or statistics, are required. The goal here is to create a new modality of linking engineering and the mathematical sciences to develop potentially transformative paradigms in an area of significant promise.

Proposals that address the national grand challenges such as energy, climate change, health care, critical civil infrastructure, transportation systems, and national safety and security systems are especially welcome.

II. PROGRAM DESCRIPTION

The study of complex systems in the mathematical, physical, biological, and social sciences and engineering has captured much recent attention. The challenge posed by complex systems is that the ability to reduce everything to simple fundamental laws does not imply the ability to start from those laws and reconstruct the universe. In other words, decomposing a complex system and analyzing its subparts may not necessarily give a clue to the behavior of the system as a whole. The hallmarks of complex systems are adaptation, self-organization, or emergence. The key to the use of complex systems in science and engineering is clever

exploitation of the dominant levels of description, the ones that distill, focus and transmit the system's physical knowledge. Complex systems are not simply complicated ones. A jet plane, under normal operating condition, is complicated, consisting of many parts and interacting systems, but it is not a complex system. On the other hand, a single unicellular organism is a complex system. The essential operational difference is that the organism can respond and adapt to changes in its environment, a property which emerges from the myriad chemical interactions and regulatory systems that make up the cell and which is a characteristic of a complex system.

We are just now beginning to understand the basic principles of complexity and emergence. Recent advances have brought us to the threshold of exciting new insights that promise a whole new level of skill in our very human urge to make new things. Further research into the nature of complex systems will improve our ability to develop new resilient materials, devices, and systems that are able to respond and adapt to environmental changes. Our chances of success become greater as techniques for combining increasingly diverse and dynamic building blocks become available.

Research on the core issues of complex systems is interdisciplinary, with a broad range of applications, including atmospheric sciences, biology, chemical systems, communication and power systems, economics, enterprise systems, environmental systems, finance, fluid mechanics, nanoscience, oceanography, transportation systems, solid mechanics, social sciences, etc. The promise of complex systems research is that universal principles learned from one area could lead to exciting breakthroughs in seemingly unrelated disciplines.

Unanswered and challenging questions arise when we extend existing theories such as the theory of dynamical systems, game theory, information theory, network science, and the theory of stochastic processes to address the core questions about complex systems. What are the fundamental aspects of a complex system? How can complex systems be analyzed, optimized, and synthesized, beyond ad-hoc methods based on simulations?

The key question that the research supported by this solicitation should aim to answer is "How can we take advantage of the fundamental theories of complex systems to design resilient engineered complex systems? To do this, one must expose the underlying relationships within the systems, the mathematical/statistical features of the essential aspects of complex systems, and use these features in developing design tools. Although it is recognized that implementation of successful tools will be through computational methods, algorithms, and tools, the expected outcome of successful projects from this solicitation will be advances in the theory of complex systems together with application of these advances to engineered complex systems.

The Directorate for Engineering (ENG) and the Division of Mathematical Sciences (DMS) in the Directorate for Mathematical and Physical Sciences (MPS) of the National Science Foundation (NSF), recognizing the need for basic research in complex systems, will consider short-term (no more than two years) solicited innovative exploratory research proposals that address cross-cutting topics in one or more aspects of complex systems as a focused topic area. These topics are expected to lead to tools to design "engineered complex systems" and to a more comprehensive theoretical understanding of complex systems. **Exploration of promising transformative novel approaches is strongly encouraged.**

Proposals should be commensurate with levels of effort typical in unsolicited proposals entertained by core programs in ENG and DMS, or of an EArly-concept Grants for Exploratory Research (EAGER) proposal (see the NSF Grant Proposal Guide, section II.D.2). Principal Investigators (PIs) are encouraged to contact the appropriate program director to discuss the research idea and research effort prior to submitting the proposal.

III. AWARD INFORMATION

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 12 to 20

Anticipated Funding Amount: $4,000,000 - Pending availability of funds, a minimum of $4,000,000 will be available in FY 2010 for proposals submitted in response to this solicitation.

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

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.

PI Limit:

Principal Investigators (PI) must be at the faculty level as determined by the submitting organization. At least one co-PI must be an engineer and at least one co-PI must be a mathematical scientist (a mathematician or statistician). Proposals that do not meet this requirement will be returned without review.

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 2

An individual may participate as Principal Investigator (PI), co-Principal Investigator (Co-PI) or other Senior Personnel in at most two proposals in each annual competition. Any individual whose biographical sketch is provided as part of the proposed activity will be considered a PI, Co-PI or Senior Personnel in the activity, with or without financial support from the project. If a person appears on more than two proposals, all proposals in which that individual is participating will be returned without review.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Instructions: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the guidelines specified in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-PUBS (7827) or by e-mail from nsfpubs@nsf.gov.

Proposers are reminded to identify the program solicitation number (Populated with NSF Number at Clearance) 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.

B. Budgetary Information

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

Other Budgetary Limitations: Budgets are limited to two years.

C. Due Dates

- **Submission Window Date(s)** (due by 5 p.m. proposer's local time):

  December 14, 2009 - January 19, 2010

D. FastLane Requirements

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

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

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

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.

Mentoring activities provided to postdoctoral researchers supported on the project, as described in a one-page supplementary document, will be evaluated under the Broader Impacts criterion.

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 addition to responding to the standard NSF review criteria, reviewers will be asked to assess the proposal responsiveness to following BECS objectives:

- The proposal should explain how one can consider classes of engineered systems to formulate new theory of complex systems.
- The proposal should articulate how the proposed research will potentially lead to formal methods for design or synthesis of engineered complex systems.
- The proposal should define an innovative and potentially transformative research program that will lead both to increased mathematical understanding of complex systems and to engineered complex systems.
- The proposal should draw on productive intellectual partnerships that capitalize upon knowledge and expertise synergies in multiple fields in engineering and mathematical sciences.
- Teams, in which at least one of the members has demonstrated high expertise in engineering and another of whom has demonstrated high expertise in mathematics or statistics, are required.

Special emphasis will be placed on proposals that address national grand challenges and promise to enhance competitiveness, innovation, earth sustainability, safety and security in the United States

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (GC-1); * or Research Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

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

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

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days 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, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report will delay NSF review and processing of any future funding increments as well as any pending proposals for 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. The project outcomes report must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Eduardo A. Misawa, ENG/CMMI, telephone: (703) 292-5353, email: emisawa@nsf.gov
- Michael Steuerwalt, MPS/DMS, telephone: (703) 292-4860, email: msteuerw@nsf.gov
- James Alexander, MPS/DMS, telephone: (703) 292-8104, email: jaalexan@nsf.gov
- Maria K. Burka, ENG/CBET, telephone: (703) 292-7030, email: mburka@nsf.gov
- Rathindra DasGupta, ENG/IIP, telephone: (703) 292-8353, email: rdasgupt@nsf.gov
- Semahat S. Demir, ENG/CBET, telephone: (703) 292-7950, email: sdemir@nsf.gov
- Suhada Jayasuriya, ENG/CMMI, telephone: (703) 292-7014, email: sjayasur@nsf.gov
- Dagmar Niebur, ENG/ECCS, telephone: (703) 292-8339, email: dniebur@nsf.gov
- Lynn Preston, ENG/EEC, telephone: (703) 292-5358, email: lpreston@nsf.gov
- Thomas F. Russell, OD/OIA and MPS/DMS, telephone: (703) 292-4863, email: trussell@nsf.gov
- Robert L. Smith, ENG/CMMI, telephone: (703) 292-7902, email: rlsmith@nsf.gov

- Andreas Weisshaar, ENG/ECCS, telephone: (703) 292-8339, email: aweissha@nsf.gov

For questions related to the use of FastLane, contact:

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

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, National Science Foundation Update is a free e-mail subscription service 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 when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the NSF web site.

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

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

NSF receives approximately 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: nsfpubs@nsf.gov

  or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

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