

Explosives and Related Threats: Frontiers in Prediction and Detection (EXP)

Program Solicitation

NSF 07-528

Replaces Document(s):

NSF 05-526



National Science Foundation

Directorate for Biological Sciences

Directorate for Computer & Information Science & Engineering

Directorate for Education & Human Resources

Directorate for Engineering

Directorate for Geosciences

Directorate for Mathematical & Physical Sciences

Directorate for Social Behavioral & Economic Sciences

Office of Cyberinfrastructure

Office of International Science and Engineering

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

March 01, 2007

REVISION NOTES

In furtherance of the President's Management Agenda, NSF has identified programs that will offer proposers the option to utilize Grants.gov to prepare and submit proposals, or will require that proposers utilize Grants.gov to prepare and submit proposals. Grants.gov provides a single Government-wide portal for finding and applying for Federal grants online.

In response to this program solicitation, proposers may opt to submit proposals via Grants.gov or via the [NSF FastLane](#) system. 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.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Explosives and Related Threats: Frontiers in Prediction and Detection (EXP)

Synopsis of Program:

In FY 2007, NSF will invest in leading edge, frontier research on sensors and other areas, including social and behavioral sciences, that are potentially relevant to the prediction and detection of explosives and related threats. This is an NSF-wide effort, in coordination with the efforts of other agencies, which seeks to advance fundamental knowledge in new technologies for sensors and sensor networks, and in the use of sensor data in control and decision making, particularly in relation to the prediction and detection of explosives and related threats. This research is seen as critical to our nation's ability to deploy effective homeland security measures, and to protect civilians and our military forces throughout the world.

Proposals outside of the scope described in this solicitation will be returned without review.

Research on prediction and detection of biological, toxic chemical, and nuclear weapons is excluded from the scope of this solicitation.

Cognizant Program Officer(s):

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- Zeev Rosenzweig, Program Director, Analytical & Surface Chemistry Program, MPS/CHE, 1055 S, telephone: (703) 292-7719, email: zrosenzw@nsf.gov
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- Sylvia Spengler, Program Director, Information Integration & Informatics, CISE/IIS, 1125 S, telephone: (703) 292-8930, email: sspengle@nsf.gov
- Amber Story, Program Director, Social Psychology, SBE/BCS, 995 N, telephone: (703) 292-7249, email: astory@nsf.gov

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

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences
- 47.050 --- Geosciences
- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences
- 47.075 --- Social, Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources
- 47.079 --- Office of International Science and Engineering
- 47.080 --- Office of Cyberinfrastructure

Award Information

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 35 to 40 About 25 small awards (up to an all-inclusive total, including both direct and indirect costs, of \$400,000, over a duration not to exceed three years) and 10-12 large awards (up to an all-inclusive total, including both direct and indirect costs, of \$800,000, over a duration not to exceed three years). Large awards are required to involve collaboration spanning multiple disciplines with significant involvement of two or more investigators from different disciplinary backgrounds (e.g., engineering and social science; chemistry and biology; computer science and geoscience; etc.).

Anticipated Funding Amount: \$20,000,000 from the National Science Foundation, subject to availability of funds and the quality and appropriateness of proposals received.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Academic Institutions located in the U.S.: U.S. universities and colleges located in the U.S.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 1

An individual researcher may not be named as a participant on more than one proposal submitted to this solicitation. This limitation includes participation as a PI, co-PI, senior researcher, consultant, or any other role for which financial remuneration is requested.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable

- **Full Proposals:**
 - Full Proposals submitted via FastLane: 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.

 - 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/bfa/dias/policy/docs/grantsgovguide.pdf>)

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required by NSF.

- **Indirect Cost (F&A) Limitations:** Not Applicable

- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

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

March 01, 2007

Proposal Review Information Criteria

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

Award Administration Information

Award Conditions: Standard NSF award conditions apply

Reporting Requirements: Standard NSF reporting requirements apply

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I. INTRODUCTION

In FY 2007, NSF will invest in leading edge, frontier research on sensors and other areas, including social and behavioral sciences, that are potentially relevant to the prediction and detection of explosives and related threats.

Recent advances in sensor research have yielded innovative applications that have been of tremendous value to our national security, healthcare, environmental safety, and energy resource management. Additional frontier research in areas critical to our nation will yield similar advances. This is particularly true for the detection of explosives and related threats, including improvised explosive devices (IEDs).

This is an NSF-wide effort, in coordination with the efforts of other agencies, which seeks to advance fundamental knowledge in new technologies for sensors and sensor networks, and in the use of sensor data in control and decision making, particularly in relation to the prediction and detection of explosives and related threats. NSF investments will coordinate with and leverage on research currently underway in other areas of the federal government. The Department of Defense, the Department of Energy, the Department of Homeland Security, and others each support active research into predicting and detecting explosive devices, including IEDs. By integrating research in the field, effective technologies and systems to counter such threats can best be implemented. This research is seen as critical to our nation's ability to deploy effective homeland security measures, and to protect civilians and our military forces throughout the world.

Research Related to Prediction

New fundamental research into the scientific and engineering principles of prediction will enable the recognition of explosives and other threats earlier than current technologies allow. The ultimate goal is to

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identify and isolate a threat at or before the point of device assembly and placement. Research toward this goal might include mathematical, behavioral, and cognitive modeling, including algorithms and sensor systems that may predict the possible assembly and placement of explosive devices. This may involve the recognition of emplacement patterns, behavioral pattern recognition from video and other innovative sensing systems, human intelligence and social network analysis of terrorist networks, analysis of communications, and knowledge-management systems.

The key to prediction will be the ability to develop novel models and theoretical frameworks and to integrate data from diverse sources, which may include sensor information, psychology and sociology of terrorists, artificial intelligence, pattern recognition, and information management areas in which NSF has long been active.

Specific topics of research may include the 1) recruitment and indoctrination of potential bombers, the detection of preparatory activities related to the planning and construction phases of bombings; 2) the detection of suspicious behaviors presaging imminent attacks, mathematical modeling of dynamic hybrid systems that include physical systems and human behavior; 3) new sensors and sensor networks that will quickly detect and predict the assembly and placement of explosive devices; 4) fully reconfigurable mechatronic stationary and mobile devices that will optimize in real-time the probability of tracking suspicious devices, substances or people; and 5) the enhanced use of available signal, image, and sensor data in decision-making and planning processes.

Research Related to Detection

The sensitivity and fine resolution of sensors often determine what can be detected, at what location, and how quickly. This is particularly important for the detection of explosive devices, since the earlier a threat can be identified, the easier it is to address.

Once an explosive device is in place, its detection will rely on scientific and engineering concepts that permit rapid, standoff identification and localization of explosives. This research includes the remote surveillance and possible identification of an explosive's unique characteristics. The purpose is to distinguish real threats in an environment, with minimal to no false alarms. Topics in this category include sensor technologies, signal processing, data fusion, and autonomous system technologies.

Specific areas of research may include the development of new detectors based on a fundamental understanding of biosensor systems with an emphasis on new biorecognition principles that extend beyond currently employed schemes involving antibody-antigen interactions. An example is an electronic nose modeled after the olfactory response in mammals such as dogs. Additional research may go toward the development of new detectors that can identify specific chemical signatures. These may be based on new spectroscopic, electrochemical and mass spectrometry methods. Other areas of research include self powered wireless networks of mobile platforms with enhanced sensing capabilities, such as those mimicking the five human senses, for accurate detection.

More broadly, miniaturization of chemical analyzers is needed. Nanostructured materials like single-walled nanotubes, nanowires, magnetic nanoparticles and luminescent semiconductor quantum dots are especially promising in the miniaturization of electronics and photonics; research is needed on the synthesis and characterization of chemical and electronic materials such as these. Also, in order to maintain active sensors in the field, small reliable power sources are required, including sources capable of long-term unattended operation and/or energy extraction from the local environment.

Complementing this sensor research would be advances in tagging and tracing explosives to aid in forensic investigations. There are limited chemical approaches available now because of the difficulty of effectively hiding this information while not interfering with the other chemical and physical properties of the material.

Detection capabilities can be enhanced by the development of novel multi-functional smart materials and smart structures with embedded sensing, actuation, morphing, self-healing, reconfiguration and camouflaging capabilities. These advances will lead to new capabilities that will be complemented by distributed data analysis similar to biological brain and nerve systems.

Additional perspective is provided in the 2004 report of the National Research Council of the National Academies entitled "Existing and Potential Standoff Explosives Detection Techniques" (<http://newton.nap.edu/catalog/10998.html>).

II. PROGRAM DESCRIPTION

Under the broad categories of prediction and detection, examples of possible topics that build on previous NSF-supported research include:

- **Science and Engineering of Materials, Concepts, and Designs for New Sensors and Sensing Systems.** Proposed research should have the potential to lead to sensors that are sensitive, selective, and stable with rapid response times. A unifying theme is to stimulate fundamental advances for in situ and remote sensing systems with a goal toward observing, modeling and analyzing a wide range of complex materials, compounds, life forms, and processes. Proposed research should leverage recent advances in microelectronics, photonics, telemetry, robotics, wireless communication, sensor networks, and other methods for highly resolved spatial and temporal sensing.

Techniques from nuclear science, such as those using neutrons or gamma rays, can also be used for the detection of conventional explosives. The development of new detection technologies may be applicable both to basic science and to security requirements, and existing technologies may be made exportable from basic science use to robust field-based implementation.

Specific topics of research may include real-time investigation of the detonation process and mechanisms to initiate detonation in explosives. This research will enhance our capabilities in efficient detection, sensing, and control of explosive devices.

- **Science and Engineering Applications of Networked Sensors; Interpretation of Data; Responsive Action.** This area addresses system-level application areas. Research issues include: 1) decision and control theory for sensed information, 2) sampling, pattern recognition and false alarms in sensed data and 3) research that incorporates uncertainty and risk into decision making for use with imperfectly sensed data.
- **Information Management of Sensing Systems.** In the area of information management, basic research is needed on innovative approaches to tagging data to facilitate subsequent retrieval, and on compression algorithms useful for transmitting large data files, such as high resolution image files. Innovative new signal processing techniques and algorithms, together with test bed experiments, are needed for feature extraction of anomalies associated with explosives and related activity.
- **Social and Behavioral Science of Prediction.** It is increasingly clear that explosives and related threats defy a completely technical solution. Research findings from psychologists, sociologists, cultural anthropologists, geographers and others can enhance our ability to respond, either through enhanced understanding of the threat leading to better prediction, or through enhanced understanding and usage of sensor data leading to better detection.

Research on prediction and detection of biological, toxic chemical, and nuclear weapons is excluded from the scope of this solicitation.

This NSF-wide research program encourages PI's to consider the development of education programs for the training of graduate and undergraduate students in this important area. A unique opportunity exists for collaboration to develop interdisciplinary courses with a view toward the establishment of a comprehensive framework for addressing the prediction and detection of explosives and related threats (e.g., social science and engineering). Also encouraged are innovative approaches that provide students with substantial opportunities to gain deeper knowledge and expertise in this area. This program seeks to integrate research and education, which is a key strategy that NSF supports and promotes. Proposals with an international dimension are welcome.

TYPES OF SUPPORT

Projects funded under this solicitation will support research activities of the following types: 1) Explosives and Related Threats Small Award (EXP-SA) and 2) Explosives and Related Threats Large Award (EXP-LA):

1. Explosives and Related Threats Small Award (EXP-SA) proposals should involve innovative and high-risk research, with potential for high impact. The requested budget may be for up to an all-inclusive total, including both direct and indirect costs, of \$400,000, over a duration not to exceed three years.

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2. Explosives and Related Threats Large Award (EXP-LA) proposals must involve fundamental contributions in research, with the potential to be innovative and transformative, by two or more investigators from different disciplines (e.g., engineering and social science; chemistry and biology; computer science and geoscience; etc.). EXP-LA proposals should generate new concepts and approaches that are enabled by the synergistic interaction of diverse fields. The PI and up to four co-PI's must be listed on the cover page of the proposal, and have the diverse skills necessary to pursue the research objectives. The requested budget may be for up to an all-inclusive total, including both direct and indirect costs, of \$800,000, over a duration not to exceed three years.

A grantees conference at NSF (Arlington, Virginia) at the end of the first year will enable the principal investigators of grants awarded through this solicitation to review progress, exchange information, and promote collaborations. At least one investigator from each funded grant will be required to participate. Funds should be included in the proposal budget for attendance at this conference.

III. AWARD INFORMATION

Estimated program budget, number of awards, and average award size or duration are subject to the availability of funds, and the quality and appropriateness of proposals received.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- Academic Institutions located in the U.S.: U.S. universities and colleges located in the U.S.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 1

An individual researcher may not be named as a participant on more than one proposal submitted to this solicitation. This limitation includes participation as a PI, co-PI, senior researcher, consultant, or any other role for which financial remuneration is requested.

Additional Eligibility Info:

The organization limit applies to both the main awardee and subawardees.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

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

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.

Cover Sheet:

Project Title Block: The project title for EXP-SA proposals must begin with "EXP-SA:" and follow with an informative title. Project titles for EXP-LA proposals must begin with "EXP-LA:" followed by an informative title.

Program Selection Block: This will be populated automatically upon selecting the EXP solicitation (see next program block).

Program Solicitation Block:

- **FastLane Users:** Select the EXP program solicitation number from the pull-down list. Entries on the cover sheet are limited to the principal investigator and a maximum of four co-principal investigators. Additional project leaders or senior personnel should be listed on the Project Summary page and entered into FastLane as senior investigators.
- **Grants.gov Users:** The EXP program solicitation number will be pre-populated by Grants.gov on the NSF Grant Application Cover Page. NSF allows one principal investigator and a maximum of four co-principal investigators to be identified on a proposal. Instructions for entering additional senior project participants are included in Section V.5. of the NSF Grants.gov Application Guide.

PI/co-PI's Block: For EXP-LA proposals, the PI and up to four co-PI's must be listed on the cover page of the proposal and must have the diverse skills necessary to pursue the research objectives.

Project Summary:

In addition to addressing the intellectual merit and broader impacts of the proposal, the Project Summary **must also include a brief but explicit statement on how the proposed research relates to prediction and/or detection of explosives or related threats. Omission of this statement will result in the proposal being returned without review.**

Project Description:

Descriptor Codes: To facilitate the proposal review process, at the beginning of the project description, each proposal must specify a primary review code chosen from the following list:

Primary Review Codes (specify one and only one)

BIO (for Biological Sciences)

CISE (for Computer & Information Science & Engineering)

EHR (for Education & Human Resources)

ENG (for Engineering)

GEO (for Geosciences)

MPS (for Mathematical and Physical Sciences)

SBE (for Social Behavioral and Economic Sciences)

CI (for Cyberinfrastructure)

IDP (for Interdisciplinary: optional designation for proposals that are broadly interdisciplinary or for which no single disciplinary area stands out as primary).

Also, to underscore multidisciplinary collaborations (especially for Large Award submissions), up to two secondary review codes chosen from the list below may be specified below the primary review code:

Secondary Review Codes (specify from none up to two)

BIO (for Biological Sciences)

CISE (for Computer & Information Science & Engineering)

EHR (for Education & Human Resources)

ENG (for Engineering)

GEO (for Geosciences)

MPS (for Mathematical and Physical Sciences)

SBE (for Social Behavioral and Economic Sciences)

CI (for Cyberinfrastructure)

INT (for International: optional designation for proposals that include a significant international dimension.)

IDP (for Interdisciplinary: optional designation for proposals that are broadly interdisciplinary or for which no single disciplinary area stands out).

Describe the vision and goals of the proposed research, approaches and methodologies to attain the goals, and the expected outcomes. The project description **must present a clear and compelling explanation of the cutting edge nature of the proposed research and its potential for the prediction and/or detection of explosives or related threats. High risk proposals with the potential for high impact are encouraged.**

Describe the relationship of the proposal to any other awards or pending proposals on explosives and related threats in which the PI or co-PI's are involved.

The EXP website can be found at <http://www.nsf.gov/eng/cbet/exp/>.

In addition, proposers must send the following two documents via e-mail immediately after submission of their proposal. After receipt of the NSF proposal number, send an e-mail to exp2007@nsf.gov. The subject heading of the e-mail should note the proposal number and the lead institution. Attach an Excel spreadsheet (use template available at <http://www.nsf.gov/eng/cbet/exp/>) containing two lists: one lists the last names, first names and institutional affiliations of all senior personnel (PI and co-PI's) and any named personnel whose salary is requested in the project budget; the second one lists the full names and institutional affiliations of all people having conflicts of interest with any senior personnel (PI and co-PI's) or named personnel whose salary is requested in the project budget. These lists will be used by NSF to check for conflicts of interest in assembling the review community. Remember to e-mail this document; do not use FastLane or Grants.gov.

A link to Frequently Asked Questions (FAQs) can also be found at the EXP website. Applicants are encouraged to check the FAQs for reference.

B. Budgetary Information

Cost Sharing: Cost sharing is not required by NSF in proposals submitted to the National Science Foundation.

Budget Preparation Instructions: A grantees conference at NSF (Arlington, Virginia) at the end of the first year will enable the principal investigators of grants awarded through this solicitation to review progress, exchange information, and promote collaborations. At least one investigator from each funded grant will be required to participate. Funds should be included in the proposal budget for attendance at this conference.

C. Due Dates

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

March 01, 2007

D. FastLane/Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

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

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

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

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. 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. 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

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application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program and, if they meet NSF proposal preparation requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF 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 with the proposer.

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 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.

Additional Review Criteria:

Clear and compelling explanation of the cutting edge nature of the proposed research and its potential for the prediction and/or detection of explosives or related threats.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Adhoc Review 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 date of receipt. 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 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. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from 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 *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpm.

C. Reporting Requirements

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For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after expiration of a grant, the PI also is required to submit a final project report.

Failure to provide the required annual or final project reports will delay NSF review and processing of any future funding increments as well as any pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Lenore Clesceri, Program Director, Biotechnology/Biochemical Engineering, ENG/CBET, 565 S, telephone: (703) 292-5313, email: lclescer@nsf.gov
- Radhakishan Baheti, Program Director, Power, Controls and Adaptive Networks, ENG/ECCS, 675 S, telephone: (703) 292-8339, email: rbaheti@nsf.gov
- Debasish Dutta, Advisor, EHR/OAD, 805 N, telephone: (703) 292-8600, email: ddutta@nsf.gov
- Michael Ellis, Program Director, Geomorphology and Land Use Dynamics, GEO/EAR, 785 S, telephone: (703) 292-8551, email: mellis@nsf.gov
- Anne Emig, Program Director, East Asia and Pacific Program, OD/OISE, 935 N, telephone: (703) 292-7241, email: aemig@nsf.gov
- Michael Foster, Division Director, Division of Computing and Communication Foundations, CISE/CCF, 1115 N, telephone: (703) 292-8910, email: mfoster@nsf.gov
- Bruce Hamilton, Program Director, Biochemical Engineering, ENG/CBET, 565 S, telephone: (703) 292-7066, email: bhamilto@nsf.gov
- Helen Hansma, Program Director, Research Resources, BIO/DBI, 615N, telephone: (703) 292-8470, email: hghansma@nsf.gov
- Leland Jameson, Program Director, Computational Mathematics, MPS/DMS, 1025 N, telephone: (703) 292-4883, email: lameson@nsf.gov
- Ashwani Kapila, Program Director, Applied Mathematics Program, MPS/DMS, 1025 N, telephone: (703) 292-8104, email: akapila@nsf.gov
- Bradley Keister, Program Director, Nuclear Astrophysics, MPS/PHY, 1015N, telephone: (703) 292-7377, email: bkeister@nsf.gov
- Shih Liu, Program Director, Sensor Technologies for Civil and Mechanical Systems, ENG/CMMI, 545 S, telephone: (703) 292-8360, email: sliu@nsf.gov
- Eduardo Misawa, Program Director, Dynamical Systems, ENG/CMMI, telephone: (703) 292-5353, email:

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emisawa@nsf.gov

- David Nelson, Coordinator, Solid State Chemistry, Polymers, Biomaterials, MPS/DMR, 1065 N, telephone: (703) 292-4932, email: dnelson@nsf.gov
- Lucille Nowell, Program Director, Office of Cyberinfrastructure, OD/OCI, 1145, telephone: (703) 292-8970, email: lnowell@nsf.gov
- Eric Peterson, Program Director, Chemical and Biological Separations Program, ENG/CBET, 525 N, telephone: (703) 292-8371, email: epeterso@nsf.gov
- Zeev Rosenzweig, Program Director, Analytical & Surface Chemistry Program, MPS/CHE, 1055 S, telephone: (703) 292-7719, email: zrosenzw@nsf.gov
- Sandra Schneider, Division Director, Division of Behavioral and Cognitive Sciences, SBE/BCS, 995 N, telephone: (703) 292-8740, email: sschneid@nsf.gov
- Sylvia Spengler, Program Director, Information Integration & Informatics, CISE/IIS, 1125 S, telephone: (703) 292-8930, email: sspengle@nsf.gov
- Amber Story, Program Director, Social Psychology, SBE/BCS, 995 N, telephone: (703) 292-7249, email: astory@nsf.gov

For questions related to the use of FastLane, contact:

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

For questions relating to Grants.gov contact:

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

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, 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>.

Other Programs of Interest

Active Nanostructures and Nanosystems (ANN) ([NSF 06-595](#))

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
 - 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

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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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