Approaches to Combat Terrorism (ACT)

Opportunities in Basic Research in the Mathematical and Physical Sciences with the Potential to Contribute to National Security
A Partnership Between the NSF Directorate of Mathematical and Physical Sciences and the Intelligence Community

Program Solicitation
NSF 04-561
***Replaces Document* nsf03569**

National Science Foundation
Directorate for Mathematical and Physical Sciences
Division of Astronomical Sciences
Division of Chemistry
Division of Materials Research
Division of Mathematical Sciences
Division of Physics

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

June 14, 2004

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Approaches to Combat Terrorism (ACT)
Opportunities in Basic Research in the Mathematical and Physical Sciences with the Potential to Contribute to National Security
A Partnership Between the NSF Directorate of Mathematical and Physical Sciences and the Intelligence Community

Synopsis of Program:

The National Science Foundation's Directorate for Mathematical and Physical Sciences (MPS) and the Intelligence Community (IC) are coordinating efforts to identify bold new concepts in basic research and workforce development in the MPS disciplines with the potential to contribute to national security. This solicitation is intended to inform researchers in disciplines supported by the MPS Directorate--the Divisions of Astronomical Sciences, Chemistry, Materials Research, Mathematical Sciences, and Physics--that NSF welcomes proposals for Small Grants for Exploratory Research that promote the objectives of the ACT program.

Cognizant Program Officer(s):

- Andrew W. Clegg, Program Manager, Directorate for Mathematical & Physical Sciences,

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

- 47.049 --- Mathematical and Physical Sciences

Eligibility Information

- **Organization Limit:**

  No limit, except that no ACT award funds may go directly to industry, government laboratories or international institutions.

- **PI Eligibility Limit:**

  The PI must be affiliated with a U.S. academic institution or non-profit research organization. Other investigators may be affiliated with U.S. academic institutions, non-profit research organizations, industry, government laboratories, or international institutions. Unaffiliated

scientists may also be eligible for support under a proposal submitted by an eligible institution.

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

Award Information

- **Anticipated Type of Award:** Standard Grant
- **Estimated Number of Awards:** 15 to 20 - Small Grants for Exploratory Research (SGERs) will be supported up to a total of $200,000 each
- **Anticipated Funding Amount:** $3,500,000 in FY 2004, pending availability of funds

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Full Proposal Preparation Instructions:** This solicitation contains information that deviates from the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full text of this solicitation for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required.
- **Indirect Cost (F&A) Limitations:** Not Applicable.
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

- **Full Proposal Deadline Date(s)** (due by 5 p.m. proposer's local time):
  June 14, 2004

Proposal Review Information

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

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I. INTRODUCTION

The National Science Foundation's charter states that the agency's mission is "to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense." From digital imaging and data mining techniques to tools for sequencing biopathogens, basic research supported by NSF's MPS Directorate has led to breakthroughs in technology that have contributed to our national security. This element of NSF's mission has assumed even greater significance since the attacks of September 11, 2001 and subsequent bioterrorism attacks.

The MPS scientific community represented by the MPS Advisory Committee addressed the critical role that MPS basic research plays in national security in the document "Reinvestment Initiative in Science and Engineering" (available at http://www.nsf.gov/mps/activities/acweb/may02/rise.pdf). In May 2002, the MPS Advisory Committee issued a document entitled "Recommended MPS Response to the Hart-Rudman Report" (available at http://www.nsf.gov/mps/activities/acweb/may02/recommend_hartrudman_0502.pdf) responding directly to the February 2001, Hart-Rudman Report, "Road Map for National Security: Imperative for Change." In essence, the Advisory Committee urged the MPS Directorate to develop partnerships with appropriate agencies that can lead to joint programs through which the MPS scientific community can contribute to basic research and workforce development relevant to national security.

In response to the Advisory Committee's recommendations, the NSF and the Intelligence Community (IC) held a joint workshop on "Approaches to Combat Terrorism (ACT): Opportunities for Basic Research" in Chantilly, VA on November 19-21, 2002. Chaired by Ernest Moniz, Massachusetts Institute of Technology, and John Baldeschwieler, California Institute of Technology, the workshop brought together approximately 60 individuals from academic, industrial and government laboratories with representatives from NSF and the IC. The workshop report (available at http://www.mitre.org/public/act/10_22_final.pdf) identifies representative areas where MPS basic research can make contributions, including energy sources, mathematical techniques, image reconstruction and analysis, sensors and detectors, and optical spectroscopies. While there is considerable activity currently supported by the MPS Directorate in these and related areas, the workshop revealed the need to embolden the MPS community to identify approaches with the potential to provide "quantum leaps" in technology through the support of basic research. The workshop also identified the development of a scientific workforce trained in the MPS disciplines as critical to national security.

As a result of the workshop, the five Divisions comprising the MPS Directorate and the MPS Office of

Multidisciplinary Activities (OMA) joined with the IC to support innovative basic research and workforce development projects that would enhance the MPS community's ability to contribute to national security. The MPS Directorate and IC initiated the ACT program with a first solicitation in FY03. The present, second solicitation calls for proposals for Small Grants for Exploratory Research (SGERs) with the potential to contribute to national security.

II. PROGRAM DESCRIPTION

Informed by the aforementioned joint NSF-IC workshop, each of the five Divisions has identified basic research opportunities. Although listed below by Division, many of the areas are interdisciplinary. A prime example, and one of considerable interest to the IC, is power sources – advances in this area could be of major benefit to the capabilities needed by IC. Power options beyond traditional battery systems are encouraged, including mechanical or other means. Practical hydrogen storage is a key need for practical implementation of hydrogen as a fuel for energy and power generation both in commercial and specialized IC activities. Efficient conversion of liquid fuels into usable energy and power is an ongoing IC need with high payoff possibilities. Similarly, improved methods for harvesting solar and electromagnetic energy from the IR through the visible and into the UV are needed. Methods to efficiently convert small temperature differences (less than10 degrees Celsius) into usable electric currents are of interest. Improved capabilities for modeling the energy conversion process, particularly at interfaces in both existing battery systems as well as newly developed energy conversion systems, are of interest. Other interdisciplinary examples include biosensors, where the IC faces a rapidly growing threat and new techniques are urgently needed; the automated processing of large numbers of images, with objectives like feature categorization, automatic registration, target identification and change detection; and chemical sensing, which might couple recognition, transduction, and signal processing elements. Hence, interdisciplinary efforts are particularly encouraged, including those involving participants whose area of expertise lies outside the MPS disciplines. Such efforts must be led by a Principal Investigator from an MPS discipline and technically centered in areas supported by the MPS Directorate. A number of possible research areas are presented below. The examples provided are only meant to be illustrative and not exhaustive. Unanticipated approaches to enhancing national security are especially valuable. Remediation, drugs, and military applications are not of interest.

Astronomical Sciences: Activities involving remote sensing and image reconstruction over the full spectral range are of interest. Advanced optical designs, including miniaturization, adaptive optics, and the measurement and characterization of atmospheric turbulence are all of relevance. Astronomy is well known for its sensitive detectors in radio frequencies. Their further use in personal security applications, surveillance, localization, and tracking are potential areas for development. The broad range of issues associated with image reconstruction and analysis -- particularly the pursuit of techniques for management of vast datasets, the presentation and visualization of metadata and images, speeding real-time analysis and assuring the quality and reliability of detections -- are all areas where important contributions can be made.

Of particular interest to the IC are new techniques and technologies to remotely measure spectroscopic signatures in the atmosphere. These techniques should improve the state-of-the-art in detection and characterization; instrumentation should drive towards lessening the complexity of spectrometers that would lead to longer life and reduction in required maintenance.

Chemistry: New types of energy conversion schemes and catalysts are of considerable interest. Innovations involving high-energy fuels, electrode materials, and membranes and their incorporation into batteries and fuel cells could lead to useful new technologies and applications, including those that involve miniaturization. New types of energy delivery systems may be derived from biological, nuclear, and photochemical sources. Hybrid organic/inorganic nanotechnology might be applied to increase charge storage and to make needed electrochemical cell components and connections. Theory, modeling, and simulation studies can contribute greatly to improving IC capabilities in each of these areas.

Spectroscopic advances that could be beneficial include greater understanding and use of terahertz

spectroscopy, combinations of spectroscopic signatures of chemical and biological agents and explosives, and improved sources and detectors.

Future sensors might be founded on new sensing principles, such as those used by insects. Efforts in molecular electronics could make possible simultaneous recognition and signal transduction in single molecular complexes. Instrumentation advances could have a profound impact, since miniaturization and cost-reduction of, e.g., mass spectrometers and nuclear magnetic resonance instruments could substantially broaden their usefulness in security applications. The ability to detect and characterize trace quantities of chemical species is essential. Schemes for persistent, non-contact, wide-area sensing technologies to identify trace quantities is vital to the IC. Both active and passive methods of interrogating effluents should be considered.

The emerging threat of biological weapons used by terrorist groups makes sensing related to biological threats of particular current interest to the IC. In addition to the topics on Sensors and Detectors suggested in the Workshop Report, Section 2.4, the IC has interest in interdisciplinary research supporting the development of biosensors such as PCR-less techniques for characterizing target analytes, methods to stabilize target analytes post-capture, methods for impregnating biosides that do not interfere with analytical techniques, new materials with enhanced magnetic and magnetostrictive properties, and techniques to concentrate target analytes prior to injection into a sensor.

Materials Research: Sensor materials, including those for identification, detection and source location of chemicals and biological species, and materials for energy storage and conversion, including photovoltaics, batteries, fuel cells, thermoelectrics and hybrid materials are of considerable interest. Novel nanoscale materials such as quantum dots and nanowires may afford revolutionary performance for portable electronic and photonic components and for devices, communication, and instrumentation. Adaptive or 'smart' materials could provide enhanced surveillance capabilities and human protection.

Mathematical Sciences: Important areas of opportunity are analysis and information synthesis from multimodal large datasets such as text and speech, often in multiple languages, and imagery, including video. Key issues in every area are mathematical techniques to represent, manipulate, and analyze data, and effective models, algorithms, and implementations. Analysis and information synthesis involves problems of uncertainty, data fusion, feature extraction, data synopsis and metadata, partial disclosure, and high dimensionality. Image recognition and analysis involves the same issues with the complication that the data are images. Other problems include feature detection, landmarks and registration and characterization of natural images. Data presentation is a critical issue, especially of metadata and in processes that require human mediation. Other important areas include new mathematical approaches to materials, processes, and devices such as fuel cells, miniature mass spectrometers, and other sensors; optimization problems such as the choice of placement and components in sensor arrays; mathematical epidemiology; and multiscale models of complicated diffusion and transport processes.

Especially important for IC applications are new mathematical techniques in knowledge discovery in such areas as social network analyses traditionally done on contact graphs of transactional data (business transactions, communications between individuals, etc.) with the content contained in the transactions. A second area of particular interest is the identification (postulation) of missing data given a hypothesis or identification of data that would change an analytic conclusion. Pattern recognition algorithms that are robust to missing data, erroneous data and ambiguity are of considerable interest. Finally, incorporation of both temporal and geospatial information within text, speech and imagery pattern recognition and data mining algorithms are important in analyzing data that is widely distributed in both space and time.

An additional area of interest in imagery is the study of the effects of steganographic techniques (e.g., watermarking and fingerprinting) on image quality and on the efficiency of image retrieval, including retrieval of derived images. Both still and video imagery are of interest.

In image analysis, the IC has particular interest in research that ultimately supports computational techniques that improve the speed and reliability with which images can be automatically analyzed.

Such analysis is referred to as Automated Data Extraction (ADE). ADE is construed to include automated registration (AR), change detection (CD), automated feature extraction (AFE) and automated target recognition (ATR). These are loosely defined as follows:

AR: the means of bringing two or more images into congruence so that pixels of one image can be matched to corresponding pixels of other images. AR generally requires knowledge of the sensor geometry models as well as the physics of the imaging systems.

CD: the means of detecting differences between two or more images that are in some way significant. Changes may be major or minor in extent, such as the presence of a vehicle in one image and its being missing in another. Major changes that are "normal," such as effects due to temporal changes (lighting conditions, moisture changes, other seasonal variations) must be recognized and accounted for so as to not result in false positives.

AFE: the means of identifying and categorizing predefined "features" in the image. These features include but are not limited to roads, buildings, vegetation, bodies of water and lines of communications. In some instances, it is of interest to attribute the characteristics of the features; e.g., road materials such as asphalt vs. concrete and types of trees such as deciduous, conifer or mixed.

ATR: the means of identifying targets, typically of intelligence value. These include traditional military targets such as ships, tanks and aircraft. However, non-traditional targets are becoming increasingly important. ATR also includes the detection and potential identification of hidden objects such as a facility or vehicle camouflaged or concealed in woods, tunnels and by other means.

The images of interest to which the above techniques will be applied include electro-optical visible, IR, radar, and spectral, and combinations thereof. Research interest is in three broad areas: (i) Extending the state of the art (i.e., improving speed and/or reliability) of currently available techniques such as pixel classification and statistical pattern recognition; (ii) Investigating alternative techniques such as those employing neuroscience-based approaches; and (iii) Work which shows/proves the theoretical limits of existing techniques affiliated with either (i) or (ii). The last area is of interest because years of work, especially in the traditional approaches (i.e., those in area (i) above) seem to indicate that correct results rarely exceed the 80-90% threshold.

Research in ancillary areas will also be considered. For example, techniques for compression, super-resolution, shape and edge detection, de-blurring, and de-noising of images will be considered to the extent that they **directly** enhance the speed and/or reliability of automatically performing AR, CD, AFE and ATR techniques. However, such techniques do not address the main problem faced by the IC in image analysis, which is the automated extraction of information from images as embodied by the ADE processes.

Physics: Several large Physics Division Programs are involved in basic research that might have applicability to improved detection methods and other intelligence needs. As examples, the Laser Interferometer Gravitational-Wave Observatory that is being commissioned has developed laser techniques to observe motion at the level of 1/1000 of a proton diameter. The Global Grid permits unprecedented rates of data transmission. Quantum information research may provide new strategies for ultra-secure communication and code breaking. Laser technology at the frontiers of peak power and programmed pulses could lead to coherent control and remote characterization of materials. Research in complex systems by mathematical physicists may also prove valuable in national security contexts. Research in physics is key to the realization of many of the capabilities noted in the Workshop Report under Sensors and Detectors, Optical Spectroscopy and Energy Sources, and such supporting and enabling research is encouraged.

Scientific Workforce: An important cross-MPS theme is the development of a scientific workforce. Research proposals that have the potential to contribute to the long-range goal of increasing our workforce capabilities and public understanding of science associated with national security are encouraged.

III. ELIGIBILITY INFORMATION

Organization Limit:

No limit, except that no ACT award funds may go directly to industry, government laboratories or international institutions.

PI Eligibility Limit:

The PI must be affiliated with a U.S. academic institution or non-profit research organization. Other investigators may be affiliated with U.S. academic institutions, non-profit research organizations, industry, government laboratories, or international institutions. Unaffiliated scientists may also be eligible for support under a proposal submitted by an eligible institution.

Limit on Number of Proposals: None Specified.

IV. AWARD INFORMATION

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 15-20 Small Grants for Exploratory Research (SGERs) will be awarded

Anticipated Funding Amount: $3,500,000 in FY 2004, pending availability of funds

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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/cgi-bin/getpub?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.

Small Grants for Exploratory Research (SGERs) are described in the Grant Proposal Guide, http://www.nsf.gov/pubs/2004/nsf042/2.htm#IID1. The project description for SGERs is limited to 5 pages. The maximum SGER award amount is $200,000. The project's duration will normally be one year but may be up to two years.

All PIs should budget travel funds to attend a grantees conference in Washington DC during the Spring of 2005.

Partnerships between academia and industry are encouraged via GOALI supplements http://www.nsf.gov/pubsys/ods/getpub.cfm?nsf98142 . In addition, industrial and government laboratory scientists may be included in SGERs.

As is usual for SGER proposals, Principal Investigators should first contact the cognizant Program Officer with appropriate expertise (see Section VIII. CONTACTS FOR ADDITIONAL INFORMATION).

Proposers are reminded to identify the program announcement/solicitation number (04-561) in the program announcement/solicitation block on the proposal Cover Sheet. 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 in proposals submitted under this Program Solicitation.

Other Budgetary Limitations:

SGER proposals are limited to $200,000. Principal Investigators are strongly urged to discuss their project and appropriate budgets with a cognizant Program Officer (see Section VIII. CONTACTS FOR ADDITIONAL INFORMATION) before preparing their proposal.

Budget Preparation Instructions:

PIs should budget travel funds to attend a grantees conference in Washington DC in Spring 2005.

C. Due Dates

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

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

June 14, 2004

D. FastLane Requirements

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: 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 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

A. NSF Proposal Review Process for ACT Proposals

ACT proposals for SGERs will be reviewed internally by MPS and IC personnel, with the possibility of additional external review as needed.

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.
Additional Review Criteria:

- Potential for future contribution to technology for the Intelligence Community
- Relevance of MPS discipline(s) for the proposed research and/or workforce development

B. Review Protocol and Associated Customer Service Standard

Internal review will be conducted by MPS and IC personnel, with the possiblity of additional external review as needed. The Program Officer assigned to manage the review will consider the advice of reviewers and will formulate a recommendation. The proposer will receive a summary explanation of the decision to award or decline funding.

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.

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 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

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/home/grants/grants_gac.htm. 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 is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/cgi-bin/getpub?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.

Special Award Conditions:

Principal Investigators (PIs) are required to attend workshops as appropriate to report on the progress of their research. One workshop per year is anticipated to involve only ACT awardees, sponsoring agency representatives, and other invited guests. Travel funds for PIs to attend these meetings should be included in the budget request.

All materials produced as part of this project, including electronic components such as World Wide Web pages, must include a clear indication of source(s) of support (both NSF and any other contributors). Publications, presentations and workshop reports must acknowlege ACT funding in the following format: "This material is based upon work supported by the National Science Foundation and the Intelligence Community through the joint "Approaches to Combat Terrorism" Program (NSF grant number).

The joint support of the National Science Foundation and the Intelligence Community also must be orally acknowledged during all news media interviews, including popular media such as radio, television and news magazines.

C. Reporting Requirements

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

General inquiries regarding this program should be made to:

- Andrew W. Clegg, Program Manager, Directorate for Mathematical & Physical Sciences, Division of Astronomical Sciences, 1045 S, telephone: (703) 292-4892, fax: (703) 292-9034, email: aclegg@nsf.gov

- Katharine J. Covert, Program Director, Directorate for Mathematical & Physical Sciences,

Division of Chemistry, 1055 S, telephone: (703) 292-4950, fax: (703) 292-9037, email: kcovert@nsf.gov

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- Leland M. Jameson, Program Director, Directorate for Mathematical & Physical Sciences, Division of Mathematical Sciences, 1025 N, telephone: (703) 292-4883, fax: (703) 292-9032, email: ljameson@nsf.gov
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- Thomas Lucatorto, Program Director, Directorate for Mathematical & Physical Sciences, Division of Physics, 1015 N, telephone: (703) 292-7373, fax: (703) 292-9255, email: tlucator@nsf.gov
- Lynn Schneemeyer, Program Director, Directorate for Mathematical & Physical Sciences, Division of Chemistry, 1055 S, telephone: (703) 292-4945, fax: (703) 292-9037, email: lschneem@nsf.gov
- Nigel A. Sharp, Program Director (Acting), Directorate for Mathematical & Physical Sciences, Division of Astronomical Sciences, 1030 S, telephone: (703) 292-4905, fax: (703) 292-9034, email: nsharp@nsf.gov
- Michael H. Steuerwalt, Program Director, Directorate for Mathematical & Physical Sciences, Division of Mathematical Sciences, 1025 N, telephone: (703) 292-4860, fax: (703) 292-9032, email: msteuerw@nsf.gov

Proposers are strongly urged to contact an appropriate ACT Contact before preparing or submitting a proposal to this solicitation.

For questions related to the use of FastLane, contact:

- Kim S. Elliott, Computer Specialist, Directorate for Mathematical & Physical Sciences, Division of Astronomical Sciences, 1053 S, telephone: (703) 292-4894, email: kelliott@nsf.gov
- Maxine E. Jefferson-Brown, Computer Specialist, Directorate for Mathematical & Physical Sciences, Division of Materials Research, 1065 N, telephone: (703) 292-4918, fax: (703) 292-9035, email: mjeffers@nsf.gov
- Florence Rabanal, Electronic Business Coordinator, Directorate for Mathematical & Physical Sciences, 1005 N, telephone: (703) 292-8808, fax: (703) 292-9151, email: frabanal@nsf.gov
- Paul G. Spyropoulos, Computer Specialist, Directorate for Mathematical & Physical Sciences, Division of Chemistry, 1055 S, telephone: (703) 292-4968, fax: (703) 292-9037, email: pspyropo@nsf.gov
- Ramona Winkelbauer, Computer Specialist, Directorate for Mathematical & Physical Sciences,

Division of Physics, 1015 N, telephone: (703) 292-7390, fax: (703) 292-9078, email: rwinkelb@nsf.gov

- FastLane HelpDesk, telephone: 1-800-673-6188, email: fastlane@nsf.gov

IX. OTHER PROGRAMS OF INTEREST

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 Custom News Service (http://www.nsf.gov/home/cns/start.htm) to be notified of new funding opportunities that become available.

Related Programs:

- Sensors and Sensor Networks (NSF 04-522)

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- **To Order Publications or Forms:**
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  or telephone: (703) 292-7827
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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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