

NSF/Intel Partnership on Cyber-Physical Systems Security and Privacy (CPS-Security)

PROGRAM SOLICITATION

NSF 14-571



National Science Foundation

Directorate for Computer & Information Science & Engineering
Division of Computer and Network Systems



Intel Labs University Collaboration Office

Preliminary Proposal Due Date(s) (optional):

July 29, 2014

Required for participation in the Ideas Lab workshop to be held August 12-16, 2014. Not required for full proposals that were not developed through the Ideas Lab.

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

October 28, 2014

All full proposals, whether or not developed through the Ideas Lab, must be received by the full proposal deadline. Proposers do not need to have participated in the Ideas Lab to submit a full proposal.

IMPORTANT INFORMATION AND REVISION NOTES

This joint solicitation from NSF and Intel seeks proposals to be considered for both NSF Grants and Intel Agreements. Intel Agreements contain provisions for possible direct, on-site participation in research by Intel researchers-in-residence (RinRs).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

NSF/Intel Partnership on Cyber-Physical Systems Security and Privacy (CPS-Security)

Synopsis of Program:

The national and economic security of the United States depends on the reliable function of critical infrastructure. An already-large and rapidly growing part of this infrastructure is being advanced through the integration of information and communication technologies (ICT), leading to cyber-physical systems (CPS). Advances in CPS will enable capability, adaptability, scalability, and usability that will far exceed the simple embedded systems of today. CPS technology will transform the way people interact with engineered systems -- just as the Internet has transformed the way people interact with information. New smart CPS will drive innovation and competition in sectors such as food and agriculture, energy, different modes of transportation including air and automobiles, building design and automation, healthcare and medical implants, and advanced manufacturing.

Cyber-physical systems are subject to threats stemming from increasing reliance on computer and communication technologies. Cybersecurity threats exploit the increased complexity and connectivity of critical infrastructure systems, placing the Nation's security, economy, public safety, and health at risk.

The goal of this partnership between NSF and Intel is to foster novel, transformative, multidisciplinary approaches that ensure the security of current and emerging cyber-physical systems, taking into consideration the unique challenges present in this environment relative to other domains with cybersecurity concerns. These challenges arise from the non-reversible nature of the interactions of CPS with the physical world; the scale of deployment; the federated nature of several infrastructures; the deep embedding and long projected lifetimes of CPS components; the interaction of CPS with users at different scales, degrees of control, and expertise levels; the economic and policy constraints under which such systems must often operate; and sensing and collection of information related to a large spectrum of everyday human activities. Historically, reliance on subtle assumptions at interface boundaries between hardware components, between hardware and software components, and between software components, as well as between a system and its operators and maintainers, has been a source of vulnerability and can be especially troublesome in these critical systems.

Specifically, this solicitation aims to foster a research community committed to advancing research and education at the confluence of cybersecurity, privacy, and cyber-physical systems, and to transitioning its findings into

engineering practice. To achieve these goals, NSF and Intel will together host an **Ideas Lab** to identify and develop novel ideas at the intersection of cyber-physical systems, cybersecurity, and privacy, and assist in the establishment of research partnerships. Concepts from the Ideas Lab can be submitted in response to this solicitation as (a) **NSF/Intel Synergy projects**, which must offer a significant advance in the science, engineering, and/or technology of protecting cyber-physical systems, taking into consideration the broader policy, economic, and socio-technical environment in which these systems operate; or (b) **NSF Breakthrough projects**, which seek to make more targeted, narrowly focused advances in science, engineering, and/or technology of protecting cyber-physical systems while at the same time fostering the creation and development of a CPS security and privacy research community. Participation in the Ideas Lab is not a prerequisite for submitting a Synergy or Breakthrough project proposal.

This NSF/Intel partnership combines CISE's experience in developing and managing successful large, diverse research portfolios with Intel's long history of building research communities in emerging technology areas through programs such as its Science and Technology Centers Program.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- David Corman, telephone: (703) 292-8754, email: dcorman@nsf.gov
- Jeremy Epstein, telephone: (703) 292-8950, email: jepstein@nsf.gov
- Angelos D. Keromytis, telephone: (703) 292-8061, email: adkeromy@nsf.gov
- Ralph Wachter, telephone: (703) 292-8950, email: rwachter@nsf.gov
- J. Christopher Ramming, telephone: (408) 765-4640, email: james.c.ramming@intel.com

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

- 47.070 --- Computer and Information Science and Engineering

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant or Intel Sponsored Research Agreement

Estimated Number of Awards: 6

2 Synergy awards (up to \$1,000,000 per year, up to 3 years), subject to the availability of funds.

4 Breakthrough awards (up to \$500,000 total, for up to 3 years), subject to the availability of funds.

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

Anticipated Funding Amount: \$8,000,000

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

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

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 2

The number of proposals in which an individual may participate as PI, co-PI, or senior personnel is limited to two (across both the Breakthrough and Synergy competitions). An individual may only serve as the PI at the lead institution of a project in at most one submission to each track (Synergy or Breakthrough). In the event that an individual exceeds these limits, proposals received within the limits will be accepted based on the earliest date and time of proposal submission. **No exceptions will be made.**

This limit on the number of proposals per PI, co-PI or Senior Personnel applies only to this CPS-Security solicitation.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposals:** Submission of Preliminary Proposals is optional. Please see the full text of this solicitation for

further information.

- **Full Proposals:**

- Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
- 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/publications/pub_summ.jsp?ods_key=grantsgovguide).

B. Budgetary Information

- **Cost Sharing Requirements:** Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

- **Preliminary Proposal Due Date(s) (optional):**

July 29, 2014

Required for participation in the Ideas Lab workshop to be held August 12-16, 2014. Not required for full proposals that were not developed through the Ideas Lab.

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

October 28, 2014

All full proposals, whether or not developed through the Ideas Lab, must be received by the full proposal deadline. Proposers do not need to have participated in the Ideas Lab to submit a full proposal.

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: 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

Cybersecurity and privacy has emerged as a major concern as a human rights issue, a commercial concern, and a national security issue affecting infrastructure, health services and safety. Threats to cyber systems can target many aspects of computer system design and successful attacks on any portion of a cyber system can result in total system compromise. The increasing intelligence and awareness of physical devices such as medical devices, cars, houses and utilities, and community utility services can dramatically increase the adverse consequences of poor cybersecurity. Some of these can be viewed as “existential threats” to society and individual lives. Finally, globalization has weakened effective national oversight of such cyber-physical systems and strengthened the commercial need for trust in cyber-physical (and other) systems that does not rely exclusively on national regulatory authority.

Cyber-physical systems are engineered systems that are built from, and depend upon, the seamless integration of computational algorithms and distributed physical components. Unlike small, single-sourced embedded systems, modern cyber-physical systems incorporate components from different providers using explicit interface standards that specify communication protocols, physical operation characteristics, real-time sensing and human operators informed by real-time data from the cyber-physical sensors. The trend towards distribution (and the concomitant need for interface standards, comprehensive component status and coordination) has recently accelerated as these systems have been employing the “Internet of Things” as a backbone. Entire system analysis is critical for security: integrity and conformance to expected behavior of computing devices controlling physical systems; assurance of software components; integrity and reliability of communications; effective, secure control in centralized systems like cloud services managing cyber-physical infrastructure; and appropriate social infrastructure to ensure adoption and use.

Proposals are sought for multidisciplinary teams to make significant contributions to enable secure cyber-physical systems. The aim is to refine an understanding of the key technical, social and legal issues at stake, to understand the range of technical issues affecting hardware and software in infrastructure components, as well as the integration of such systems. This solicitation affords researchers an opportunity to collaborate actively with Intel, potentially resulting in a strong ecosystem partner for implementing and adopting technology solutions as appropriate.

As a precursor to the submission of proposals, NSF with Intel participation will organize an Ideas Lab. The goal of the Ideas Lab will be to identify and develop novel ideas at the intersection of cyber-physical systems and cybersecurity, and to assist in the establishment of research partnerships. Participation in the Ideas Lab will be via invitation, following submission and review of preliminary proposals as described later in the solicitation. Participation in the Ideas Lab is not a prerequisite for submitting a full proposal. As security for cyber-physical systems constitutes an area of continued interest for NSF, it is expected that participation in the Ideas Lab will prove broadly beneficial to participants beyond the confines of this specific solicitation.

II. PROGRAM DESCRIPTION

The goal of this activity is to foster, novel, transformative, multidisciplinary approaches that address the problem of securing current and emerging cyber-physical systems, the infrastructures they form and those integrated with them. The activity includes two distinct but related components:

- An Ideas Lab will identify and develop novel ideas at the intersection of cyber-physical systems and cybersecurity and privacy, and assist in the establishment of research partnerships.
- Proposals are solicited for novel, multidisciplinary research that seeks to advance our understanding of protecting cyber-physical systems. **Proposal submission eligibility is not tied to participation in the Ideas Lab.**

The Ideas Lab

The Ideas Lab process entails participation in an intensive five-day residential workshop, including the development of multidisciplinary collaborative proposals through a real-time and iterative review process. The Ideas Lab process was modeled on the “IDEAs Factory” program developed by the Engineering and Physical Sciences Research Council (EPSRC) of the United Kingdom. The concept of the IDEAs Factory program is to organize intensive interactive multidisciplinary workshops (“Sandpits”) involving 20-30 participants, with the aim of developing new and bold approaches to address grand challenge questions for topics that could benefit from a new dimension in thinking. The participants are assisted by a team of professional facilitators and by a team of scientists with relevant expertise. These scientific experts, known as mentors, are not eligible for funds from the Ideas Lab, and therefore act as impartial referees of the process.

Interested PIs should respond to this solicitation by submitting preliminary proposals (see Preliminary Proposal Preparation Instructions) to apply for participation in the Ideas Lab activity, scheduled for August 12-16, 2014 in the Washington DC metropolitan area. Each potential participant must submit a preliminary proposal (1 preliminary proposal per person); no Co-PIs are permitted on the preliminary proposals. Proposals are limited to 2 pages and must be submitted through Fastlane. Between 20 and 30 participants will be selected on the basis of their interests and expertise as it relates to the goals of this activity, as described in their submitted preliminary proposals. Participants should be willing to engage in frank disclosure and assessment of ideas in a collegial and professional fashion. NSF program staff, in collaboration with partners from Intel, will assemble a team of mentors and provocateurs, selected for their relevant expertise, as well as professional facilitators to aid the workshop participants in the discussion of workshop topics and development of project ideas.

Submission of the preliminary proposal will be considered an indication of availability to attend and participate through the full course of the five-day residential workshop. The exact location of the Ideas Lab has not been finalized at the time of publication; information on the site, travel information, and other logistics will be provided to all selected participants. Travel and subsistence costs to attend the workshop will be reimbursed. It is currently expected that the Ideas Lab will take place on August 12-16, 2014 in the Washington DC metropolitan area.

Participants in the Ideas Lab will be encouraged to frame novel challenges related to the protection of cyber-physical systems and their dependent infrastructures. Mentors and participants will then engage in a real-time review process of constructive feedback to develop and refine promising ideas to address these challenges or novel approaches emerging from the Ideas Lab. Iterative project development activities will be used to explore the most meritorious, transformative, and innovative project ideas. It is expected that these activities and ideas will explore linkages with, and exploit leveraging from, other NSF activities such as the Cyber-Physical Systems (CPS; https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503286), Secure and Trustworthy Cyberspace (SaTC; https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504709), and Resilient Interdependent Infrastructure Processes and Systems (RIPS; https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504971) programs. It is expected that at least some of these ideas will form the foundation for Synergy and Breakthrough proposals.

The recommendations provided by the mentors are advisory to NSF. Within 7 to 14 days following the workshop, NSF will determine

which participant teams will be invited to submit full proposals. The final funding decision(s) will occur after the full proposals have been received and reviewed.

III. AWARD INFORMATION

Anticipated Type of Award: Standard Grant or Continuing Grant or Intel Sponsored Research Agreement.

Estimated Number of Awards: 6

2 Synergy awards (up to \$1,000,000 per year, up to 3 years), subject to the availability of funds.

4 Breakthrough awards (up to \$500,000 total, for up to 3 years), subject to the availability of funds.

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

Anticipated Funding Amount: \$8,000,000

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

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

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 2

The number of proposals in which an individual may participate as PI, co-PI, or senior personnel is limited to two (across both the Breakthrough and Synergy competitions). An individual may only serve as the PI at the lead institution of a project in at most one submission to each track (Synergy or Breakthrough). In the event that an individual exceeds these limits, proposals received within the limits will be accepted based on the earliest date and time of proposal submission. **No exceptions will be made.**

This limit on the number of proposals per PI, co-PI or Senior Personnel applies only to this CPS-Security solicitation.

Additional Eligibility Info:

Subawardees may include two- and four-year colleges, and non-profit non-academic organizations such as independent museums, institutes, observatories, professional societies and similar organizations in the US that are directly associated with education or research activities in the computing and information fields. Other organizations such as national laboratories may participate in the proposed activities if they have independent sources of support; they will not be supported by NSF or Intel.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals (optional):

Preliminary proposals are required for participation to the Ideas Lab and must be submitted via the NSF FastLane system, even if full proposals will be submitted via Grants.gov. **Submission of Preliminary Proposals is required for participation in the Ideas Lab but is not required for full proposals that were not developed through the Ideas Lab. Please note that the Preliminary Proposal must come from one individual and cannot include Co-PIs or collaborators.** Participants in the Ideas Lab will be selected on the basis of information submitted in the preliminary proposal.

The applications are limited to two pages of "Project Description," that should be submitted as a preliminary proposal in the NSF FastLane system ONLY, not through Grants.gov. Standard NSF formatting guidelines will apply. See the NSF Grant Proposal Guide (GPG) for guidance.

The Project Description section of the preliminary proposals should conform to the following guidelines:

1. Page one:
 - o Provide a brief summary of your professional background (no more than one-half page).
 - o The Ideas Lab requires you to work across and at the edge of different disciplines. What expertise do you bring to

meet the trans-disciplinary challenges associated with security and privacy of cyber-physical systems (no more than one-half page)?

2. Page two: Please spend some time considering your answers to the following questions. Your responses (no more than 150 words each) will help us assess your suitability to work in the ideas-driven, collaborative setting of an Ideas Lab (unrelated to your research track record).

- o What is your approach to working in teams?
- o How would you describe your ability to engage and work with non-experts or those with a different perspective to your own?
- o The Ideas Lab encourages a free exchange of ideas: enjoying the sharing, shaping and building over an intensive 5-day setting, working as an equal with individuals you may not know. Using a comparable experience or closest to it, how do you see yourself suited to this type of a setting?
- o What would you personally and professionally gain from participating in this Ideas Lab?

Applicants must include a Biographical Sketch and a Current and Pending Support document (prepared in accordance with standard NSF formatting guidelines). All other elements of a "full proposal" are waived (Project Summary, References Cited, Budget, Budget Justification, Facilities, Equipment and Other Resources). No appendices or supplementary documents may be submitted.

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 nsfpubs@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/publications/pub_summ.jsp?ods_key=grantsgovguide). 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 nsfpubs@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.4 of the Grant Proposal Guide provides additional information on collaborative proposals.

Important Proposal Preparation Information: FastLane will check for required sections of the full proposal, in accordance with *Grant Proposal Guide* (GPG) instructions described in Chapter II.C.2. The GPG requires submission of: Project Summary; Project Description; References Cited; Biographical Sketch(es); Budget; Budget Justification; Current and Pending Support; Facilities, Equipment & Other Resources; Data Management Plan; and Postdoctoral Mentoring Plan, if applicable. If a required section is missing, **FastLane will not accept the proposal.**

Please note that the proposal preparation instructions provided in this program solicitation may deviate from the GPG instructions. If the solicitation instructions do not require a GPG-required section to be included in the proposal, insert text or upload a document in that section of the proposal that states, "Not Applicable for this Program Solicitation." Doing so will enable FastLane to accept your proposal.

Please note that per guidance in the GPG, the Project Description must contain, as a separate section within the narrative, a discussion of the broader impacts of the proposed activities. Unless otherwise specified in this solicitation, you can decide where to include this section within the Project Description.

Proposal Titles

A proposal title must begin with the track of the competition to which the proposal is being submitted. Specifically, titles of Breakthrough proposals should take the form, "Breakthrough: Title", and of Synergy proposals, "Synergy: Title".

NSF/Intel Synergy Proposals

NSF and Intel welcome proposals that address cybersecurity and privacy for cyber-physical systems. Synergy proposals may request up to \$1,000,000 per year for up to 3 years. NSF and Intel seek to fund approximately two Synergy projects that take a holistic view of the challenges in protecting cyber-physical systems, accounting not only for technical solutions but also the human factors, policies, and economics of the future CPS marketplace. The larger award size is intended to enable more ambitious multidisciplinary exploration.

Project descriptions must be comprehensive and well integrated, and should make a convincing case that the collaborative contributions of the project team will be greater than the sum of each of their individual contributions. Rationale must be provided to explain why a budget of this size is required to carry out the proposed work.

Since the success of collaborative research efforts are known to depend on thoughtful coordination mechanisms that regularly bring together the various participants of the project, **a separate Collaboration Plan of up to 2 pages is required for all Synergy proposals and should be uploaded in the Supplementary Documents section.** The length of, and level of detail provided in, the Collaboration Plan should be commensurate with the complexity of the proposed project. The plan must articulate how the leadership team will regularly engage with an Intel program director and/or senior researcher. It must also afford opportunities for the engagement of part-time or full-time Intel researchers at the project level. **If a Synergy proposal does not include a Collaboration Plan, that proposal will be returned without review.**

Separate submission to Intel is not necessary. NSF will forward proposals received via Fastlane or Grants.gov to Intel.

Frequently Asked Questions (FAQs) as well as information on Intel requirements for the NSF/Intel Synergy program will be posted at: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505047&org=CISE&sel_org=CISE&from=fund.

NSF Breakthrough Proposals

NSF Breakthrough proposals, with total budgets of up to \$500,000 for durations of up to three years, encourage the collaboration of at least two PIs representing the cybersecurity and privacy as well as the cyber-physical systems communities.

In cases with more than one PI, Breakthrough project descriptions must be comprehensive and well integrated.

Additionally, since the success of collaborative research efforts are known to depend on thoughtful coordination mechanisms that regularly bring together the various participants of the project, **a separate Collaboration Plan of up to 2 pages is required for all Breakthrough proposals with more than one PI. This plan must be uploaded in the Supplementary Documents section.** The length of, and level of detail provided in, the Collaboration Plan should be commensurate with the complexity of the proposed project. **If a collaborative Breakthrough proposal does not include a Collaboration Plan, that proposal will be returned without review.**

Both types of proposals – Synergy as well as Breakthrough – must include the following in the Supplementary Documents section:

(1) A list of Project Personnel and Partner Institutions (Note: In collaborative proposals, only the lead institution should provide this information):

Provide current, accurate information for all personnel and institutions involved in the project. NSF staff will use this information in the merit review process to manage conflicts of interest. The list **must** include all PIs, Co-PIs, Senior Personnel, paid/unpaid Consultants or Collaborators, Subawardees, Postdocs, project-level advisory committee members, and writers of letters of support. This list should be numbered and include (in this order) Full name, Organization(s), and Role in the project, with each item separated by a semi-colon. Each person listed should start a new numbered line. For example:

1. Mary Smith; XYZ University; PI
2. John Jones; University of PQR; Senior Personnel
3. Jane Brown; XYZ University; Postdoc
4. Bob Adams; ABC Inc.; Paid Consultant
5. Mary White; Welldone Institution; Unpaid Collaborator
6. Tim Green; ZZZ University; Subawardee

(2) A list of Collaborators (Note: In collaborative proposals, only the lead institution should provide this information):

Provide current, accurate information for all active or recent collaborators of personnel and institutions involved in the project. NSF staff will use this information in the merit review process to manage conflicts of interest. **This list is distinct from (1) above in that it must include all active or recent Collaborators of all personnel involved with the proposed project.** Collaborators include any individual with whom any member of the project team -- including PIs, Co-PIs, Senior Personnel, paid/unpaid Consultants or Collaborators, Subawardees, Postdocs, and project-level advisory committee members -- has collaborated on a project, book, article, report, or paper within the preceding 48 months; or co-edited a journal, compendium, or conference proceedings within the preceding 24 months. This list should be numbered and include (in this order) Full name and Organization(s), with each item separated by a semi-colon. Each person listed should start a new numbered line.

1. Mary Smith; XYZ University
2. John Jones; University of PQR
3. Jane Brown; XYZ University
4. Bob Adams; ABC Inc.
5. Mary White; Welldone Institution
6. Tim Green; ZZZ University

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited.

Budget Preparation Instructions:

Budgets for Breakthrough projects should include funding for one or more project representatives (PI/co-PI/senior researcher or NSF-approved replacement) to attend the first SaTC Principal Investigators' (PI) meeting held after the beginning of the award in the Greater Washington, DC area.

C. Due Dates

- **Preliminary Proposal Due Date(s) (optional):**

July 29, 2014

;Required for participation in the Ideas Lab workshop to be held August 12-16, 2014. Not required for full proposals that were not developed through the Ideas Lab.

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

October 28, 2014

All full proposals, whether or not developed through the Ideas Lab, must be received by the full proposal deadline. Proposers do not need to have participated in the Ideas Lab to submit a full proposal.

D. FastLane/Grants.gov Requirements

For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions 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.

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. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: <http://www.grants.gov/web/grants/applicants.html>. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical 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 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.

Proposers that submitted via FastLane are strongly encouraged to use FastLane to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF 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 either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in the GPG as [Exhibit III-1](#).

A comprehensive description of the Foundation's merit review process is available on the NSF website at: http://nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which 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.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through

activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.

- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. ([GPG Chapter II.C.2.d.i.](#) contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including [GPG Chapter II.C.2.d.i.](#), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
 - a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 - b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

NSF engages in Partnership Programs with companies in order to increase the potential for research discoveries to become innovations with societal impact through market mechanisms. Presently, the broader beneficial impacts of Cyber Physical Systems are impeded by lack of a viable, holistic approach to CPS security. In terms of viability, it is a premise of this solicitation that technical security solutions divorced from the broader individual, social, economic, standards, and regulatory context are less likely to be impactful. Further, holistic solutions will arguably account not only for technical solutions, but the human factors, policies, and economics of the future CPS marketplace of which Intel is but one element. Successful approaches are likely to involve solutions that are intertwined with multiple products – networks, devices, software frameworks – in ways that no single company is poised to implement in isolation.

In this light, selected specific Broader Impacts that will be examined by Intel representatives of the Joint Working Group (JWG) include:

- The degree to which the Synergy project's technical research is likely to be informed by the broader security context in CPS (individual, social, economic, standards, and regulatory)
- The degree to which the project's plans both pursue the development of a systems perspective and drive toward demonstrations of interrelated component research ideas. These demonstrations, along with the research outcomes, should serve as a call to action by the CPS innovation ecosystem, specifically but not limited to Intel.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review, Reverse Site Review, or Internal Review by Intel Corporation.

Proposal review and award recommendations will be coordinated by a Joint NSF and Intel Working Group (JWG) of program officers from both NSF and Intel. Proposals and other relevant information about proposals including reviews will be shared between the participating organizations as appropriate. The JWG will recommend meritorious proposals for award.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will be completed and submitted by each reviewer. 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 strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

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. After an administrative review has occurred, Grants and Agreements Officers perform 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.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, 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.

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 notice, 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 notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

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

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

Special Award Conditions:

Each Synergy project will be jointly funded by the NSF and Intel through separate NSF and Intel funding instruments. NSF awards will be made as continuing or standard grants. Intel awards will be made as Intel agreements. NSF and Intel will manage their respective awards/agreements in accordance with their own guidelines and regulations.

1. Site visits, meetings, and annual retreats

It is anticipated that each Synergy project will be merit reviewed in a site visit conducted at the end of Year 2 to assess project progress and to determine if the project warrants continued support in Year 3. Additional site visits and/or reverse site visits may be required. PIs may be required to attend annual meetings that convene PIs of Frontiers projects (e.g., the SaTC and CPS Frontiers projects) as well as other programs such as *Expeditions in Computing*.

Intel and NSF will organize annual retreats for Synergy awardees which will bring together the academic community involved in the Synergy teams, along with NSF and Intel personnel who have interest in the projects. Intel and NSF will work with academic leadership to organize these events. They will involve reviews of the research underway in each project along with presentations from NSF and Intel on technical areas of interest related to each Synergy project. Ample time will be provided for face to face interaction between participants in these retreats.

2. Intellectual property, publishing, and licensing

Synergy awardees will be required to include appropriate acknowledgment of NSF and Intel support in reports and/or publications on work performed under the Synergy award. An example of such an acknowledgement would be: "This material is based upon work supported by NSF/Intel Partnership on Cyber-Physics Systems Security and Privacy Program under Award Title and No. [Recipient enters project title and awards number(s)]."

Synergy projects agree to distribute all source code that has been authored while working on an NSF/Intel Synergy award under a

BSD, Apache or other equivalent open source license. Software licenses that require as a condition of use, modification and/or distribution that the software or other software incorporated into, derived from or distributed with the software be licensed by the user to third-parties for the purpose of making and/or distributing derivative works are not permitted. Licenses not appropriate thus include any version of GNU's General Public License (GPL) or Lesser/Library GPL (LGPL), the Artistic License (e.g., PERL), and the Mozilla Public License.

Synergy projects that generate data or software in performing the work under an award agree not to incorporate any third-party code or background intellectual property, except by separate prearrangement with NSF and Intel, into this data or software that would limit or restrict its ability to be distributed under an open source license.

Awardees may file patent applications, providing that they grant to Intel a non-exclusive, worldwide, royalty-free, sub-licensable license to all intellectual property rights in any inventions or works of authorship resulting from research conducted under the joint award.

3. Intel participation in research

Intel may separately fund its own personnel to directly participate in NSF/Intel Partnership research, part-time or full-time, with the universities awarded NSF/Intel Partnership projects. These Intel researchers will work alongside the academic researchers, identifying opportunities for tech transfer, and being involved with the projects as advisors or as fellow researchers. Optional deployment of Intel Researchers in Residence (RinR) on campuses will require mutual consent by the Parties and respective awardees in the Project Management Plan for each NSF/Intel Partnership award. Further, Intel may designate one of its more senior, separately funded researchers to work alongside NSF/Intel Partnership academic lead PIs. This senior researcher would manage the project as a member of the Project Management Team. He/she would inject a perspective on commercial aspects and help with the day-to-day leadership of the center. He/she would also be responsible for working with the Intel Program Director to oversee the engagement of all other Intel researchers.

4. Program management

The Intel program director overseeing funded Synergy projects may become a member of the Synergy Project Management Team for the Intel award. Intel will conduct annual retreats and may require deliverable reports to monitor project progress. Annual on-site reviews may be conducted jointly by NSF and Intel. Intel may lead the organization of quarterly or more frequent phone calls with Synergy project teams; NSF may participate in these calls at its discretion. NSF and Intel may request visits to the research institutions or may ask PIs to visit NSF or Intel.

C. Reporting Requirements

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

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. 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 Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

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

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- David Corman, telephone: (703) 292-8754, email: dcorman@nsf.gov
- Jeremy Epstein, telephone: (703) 292-8950, email: jepstein@nsf.gov
- Angelos D. Keromytis, telephone: (703) 292-8061, email: adkeromy@nsf.gov
- Ralph Wachter, telephone: (703) 292-8950, email: rwachter@nsf.gov
- J. Christopher Ramming, telephone: (408) 765-4640, email: james.c.ramming@intel.com

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, "NSF Update" 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 [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. "NSF Update" also is available on NSF's website at https://public.govdelivery.com/accounts/USNSF/subscriber/new?topic_id=USNSF_179.

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

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

NSF receives approximately 55,000 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 Arctic 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.

ABOUT INTEL LABS

Intel Labs delivers breakthrough innovations to fuel Intel's growth and technology leadership. We focus our research in the areas of architecture and design, software and systems, security, integrated computing and user experience. Intel Labs is comprised of a worldwide network of research centers in nine countries including the U.S., China, India, Ireland, Russia, Egypt, Germany, Spain and Mexico. Our research has led to important Intel products and tech leadership including Xeon Phi, vPro, Atom, Thunderbolt and Quark.

Intel Labs collaborates with industry partners, government and academia throughout the world to leverage the brightest minds in research. We encourage open and collaborative innovation with researchers through our network of university-centered Intel Science and Technology Centers (ISTCs) in the U.S. and Intel Collaborative Research Institutes (ICRIs) abroad focused on projects aligned with Intel Labs' overall research agenda.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <http://www.nsf.gov>

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information**
(NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
 - Send an e-mail to: nsfpubs@nsf.gov
 - or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

Suzanne H. Plimpton
Reports Clearance Officer
Office of the General Counsel
National Science Foundation
Arlington, VA 22230

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