Cyber-Enabled Discovery and Innovation (CDI)

PROGRAM SOLICITATION
NSF 10-506

REPLACES DOCUMENT(S):
NSF 08-604

National Science Foundation

Directorate for Biological Sciences

Directorate for Computer & Information Science & Engineering

Directorate for Education & Human Resources

Directorate for Engineering

Directorate for Geosciences

Directorate for Mathematical & Physical Sciences

Directorate for Social, Behavioral & Economic Sciences

Office of Cyberinfrastructure

Office of Integrative Activities

Office of International Science and Engineering

Office of Polar Programs

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

January 04, 2010 - February 04, 2010

Type I Full Proposal Submission Window

January 05, 2010 - February 05, 2010

Type II Full Proposal Submission Window

REVISION NOTES

Preliminary proposals are eliminated - PIs are asked to submit full proposals only. No invitation is required.

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

As announced on May 21, 2009, proposers must prepare and submit proposals to the National Science Foundation (NSF) using the NSF FastLane system at http://www.fastlane.nsf.gov/. This approach is being taken to support efficient Grants.gov operations during this busy workload period and in response to OMB direction guidance issued March 9, 2009. NSF will continue to post information about available funding opportunities to Grants.gov FIND and will continue to collaborate with institutions who have invested in system-to-system submission functionality as their preferred proposal submission method. NSF remains committed to the long-standing goal of streamlined grants processing and plans to provide a web services interface for those institutions that want to use their existing grants management systems to directly submit proposals to NSF.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Cyber-Enabled Discovery and Innovation (CDI)

Synopsis of Program:

Cyber-Enabled Discovery and Innovation (CDI) is NSF's bold five-year initiative to create *revolutionary* science and engineering research outcomes made possible by innovations and advances in computational thinking. Computational thinking is defined comprehensively to encompass computational concepts, methods, models, algorithms, and tools. Applied in challenging science and engineering research and education contexts, computational thinking promises a profound impact on the Nation's ability to generate and apply new knowledge. Collectively, CDI research outcomes are expected to produce paradigm shifts in our understanding of a wide range of science and engineering phenomena and socio-technical innovations that create new wealth and enhance the national quality of life.

CDI seeks ambitious, transformative, multidisciplinary research proposals within or across the following three thematic areas:

- **From Data to Knowledge:** *enhancing human cognition and generating new knowledge from a wealth of heterogeneous digital data;*
- **Understanding Complexity in Natural, Built, and Social Systems:** *deriving fundamental insights on systems comprising multiple interacting elements;* and
- **Virtual Organizations:** *enhancing discovery and innovation by bringing people and resources together across institutional, geographical and cultural boundaries*.

With an emphasis on bold multidisciplinary activities that, through computational thinking, promise radical, paradigm-changing research findings, CDI promotes transformative research within NSF. Accordingly, investigators are encouraged to come together in the development of far-reaching, high-risk science and engineering research and education agendas that capitalize on innovations in, and/or innovative use of, computational thinking. Research and education efforts around the world are beginning to address various aspects of the CDI themes, and CDI projects are expected to build upon productive intellectual partnerships involving investigators from academe, industry and/or other types of organizations, including international entities, that advance CDI objectives within the rapidly evolving global context.

Congruent with the three thematic areas, CDI projects will enable transformative discovery to identify patterns and structures in massive datasets; exploit computation as a means of achieving deeper understanding in the natural and social sciences and engineering; abstract, model, simulate and predict complex stochastic or chaotic systems; explore and model nature's interactions, connections, complex relations, and interdependencies, scaling from sub-particles to galactic, from subcellular to biosphere, and from the individual to the societal; train future generations of scientists and engineers to enhance and use cyber resources; and facilitate creative, cyber-enabled boundary-crossing collaborations, including those with industrial and international dimensions, to advance the frontiers of science and engineering and broaden participation in STEM fields.

Two types of CDI awards will be supported as a result of the FY 2010 CDI competition:

- Type I awards will require efforts up to a level roughly comparable to: summer support for two investigators with complementary expertise; two graduate students; and their collective research needs (e.g. materials, supplies, travel) for three years.
- Type II awards will require larger (than Type I) efforts up to a level roughly comparable to: summer support for three investigators with complementary expertise; three graduate students; one or two senior personnel (including post-doctoral researchers and staff); and their collective research needs (e.g. materials, supplies, travel) for four years. The integrative contributions of the Type II team should clearly be greater than the sum of the contributions of each individual member of the team.

In subsequent years, subject to availability of funds, funding opportunities will be provided for three classes of awards, Types I and II as defined above, and Type III as defined below:

- Type III awards will require the engagement of larger (than Type II) multidisciplinary teams, roughly comparable to multiple senior investigators with complementary expertise, multiple graduate students, several senior personnel, and their collective research needs (e.g. materials, supplies, travel) for up to five years. As for Type II awards, the integrative contributions of the Type III team should be clearly greater than the sum of the contributions of each individual member of the team.

Cognizant Program Officer(s):

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

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences
- 47.050 --- Geosciences
- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources
- 47.078 --- Office of Polar Programs
- 47.079 --- Office of International Science and Engineering
- 47.080 --- Office of Cyberinfrastructure
- 47.081 --- Office of Experimental Program to Stimulate Competitive Research

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 30 - In FY 2010, the number of Type I and Type II awards will be determined based on the results of separate review processes. There will be no Type III awards in FY 2010. In FY 2011 and beyond, subject to availability of funds, awards of Type I, II and III will be made based on the results of separate review processes.

Anticipated Funding Amount: $36,000,000 - Pending availability of funds, a minimum of $36,000,000 will be available in FY 2010 for proposals submitted in response to this solicitation.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

  Proposals that capitalize upon productive intellectual partnerships involving investigators from academe, industry and/or other types of organizations, including international entities, are encouraged. Partnerships between academe and other types of organizations, both foreign and domestic, promise the identification of compelling research challenges, and the more effective transformation of discoveries into innovations that create wealth and other societal impacts. While NSF will consider supporting CDI activities undertaken by SBIR-eligible organizations through subawards, other for-profit entities and international partners must support their participation in CDI projects from other funding sources.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 2

An individual may participate as Principal Investigator, co-Principal Investigator or other Senior Personnel in at most two full proposals in each annual competition. Any individual whose biographical sketch is provided as part of the proposal will be considered Senior Personnel in the proposed activity, with or without financial support from the project. After the proposal submission deadline, if a person appears on more than two full proposals, submitters have up to two weeks after the deadline to withdraw excess proposals to reduce that person's participation to two proposals. After that time, the first two submitted proposals (in FastLane time-stamp chronological order) in which that individual is participating will be accepted for review, and the remainder will be returned without review. For this purpose, a multi-institution collaborative project is treated as one proposal that is considered submitted when the last component proposal is submitted.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposal Preparation Instructions:** This solicitation contains information that supplements the standard NSF Proposal and Award Policies and Procedures Guide, Part I: 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 under this solicitation.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

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

  January 04, 2010 - February 04, 2010

  Type I Full Proposal Submission Window

  January 05, 2010 - February 05, 2010

  Type II Full Proposal Submission Window

Proposal Review Information Criteria

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

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

TABLE OF CONTENTS

I. INTRODUCTION

Our everyday lives have been transformed by the impact of computation and communication. This impact can be observed in the national economy where information technology has contributed in significant and numerous ways to growth in productivity, and to a plethora of new products and services. For example, advances in computing have led to improvements in healthcare diagnoses, access and delivery, in education where learning is increasingly mediated by information technologies, and in science and engineering where the conduct of research is being revolutionized by an increasingly pervasive and sophisticated cyberinfrastructure. There has also been an impact at a conceptual level. Applying computing to problem-solving has led to, and continues to engender, the development of new ways of conceptualizing, analyzing and solving problems, particularly problems related to complex systems where more traditional research tools afford only limited progress.

Motivated by compelling research challenges across the science and engineering frontier, NSF has been making investments in computational science and engineering research, education, and infrastructure for many years. The potential of an increasingly powerful and functionally-complete cyberinfrastructure to advance science and engineering discovery and learning recently culminated in the creation and initial implementation of the agency's

Cyberinfrastructure Vision for 21st Century Discovery.

Recognizing that contemporary advances in computational capabilities – most notably algorithms, architectures, data storage, languages, manipulation and visualization, networking, processing power, software systems, and a growing community of experienced computational scientists and engineers – place us on the threshold of a transformation in our understanding of the world around us, NSF has formulated a bold initiative called Cyber-Enabled Discovery and Innovation (CDI). All NSF directorates and programmatic offices are participating.

II. PROGRAM DESCRIPTION

The Cyber-Enabled Discovery and Innovation (CDI) initiative has been designed to yield *revolutionary* science and engineering research outcomes made possible by innovations and advances in computational thinking. Computational thinking is defined comprehensively to encompass computational concepts, methods, models, algorithms, and tools. Applied in challenging and compelling science and engineering research and education contexts, computational thinking promises a profound impact on the Nation's ability to generate and apply new knowledge. In addition, the challenge of applying computational thinking to very difficult

problems in science and engineering will stimulate further advances in computational thinking.

Collectively, CDI research outcomes will produce paradigm shifts in our understanding of a wide range of science and engineering phenomena and socio-technical innovations that create new wealth and enhance the national quality of life. CDI investigators are expected to generate groundbreaking multidisciplinary research and education outcomes across biological sciences, computer and information sciences, education, engineering, geosciences, mathematical sciences, physical sciences, and social, behavioral, and economic sciences. The development and creative use of computational thinking to enable discovery and innovation on all fronts of science and engineering is likely to stimulate advances that collectively accelerate development of an increasingly powerful cyberinfrastructure.

With an emphasis on bold, multidisciplinary activities that, through computational thinking, promise radical, paradigm-changing science and engineering outcomes, CDI promotes transformative research within NSF. Accordingly, investigators are encouraged to come together in the development of far-reaching, high-risk research and education agendas that capitalize on innovations in, and/or innovative use of, computational thinking to create new knowledge and societal impact far beyond today's capabilities. Research and education efforts around the world are beginning to address various aspects of the CDI themes, and CDI projects are expected to build upon productive intellectual partnerships involving investigators from academe, industry and/or other types of organizations, including international entities, that advance CDI objectives within the rapidly evolving global context.

A **competitive** CDI proposal will:

- Describe an ambitious research and/or education agenda that, through computational thinking, promises paradigm-shifting advances in more than one field of science, engineering, or education;
- Provide a compelling rationale for how innovations in, and/or innovative use of, computational thinking will yield the desired project outcomes; and,
- Draw on productive intellectual partnerships that capitalize upon knowledge and expertise synergies in multiple fields or sub-fields of science, engineering, or education, and/or in multiple types of organizations, including academic, for-profit, and not-for-profit entities, both foreign and domestic.

Projects that make use of existing computational concepts, methods, models, algorithms, and tools to significantly advance only one field of science or engineering should be submitted to an appropriate NSF program in that field instead of to CDI.

Motivated by transformative science and engineering research opportunities, CDI seeks bold research and education proposals within or across the following three thematic areas:

- **From Data to Knowledge:** *enhancing human cognition and generating new knowledge from a wealth of digital data*

  An abundance of digital data promises a profound impact in both the quality and rate of discovery and innovation in science and engineering, as well as in other societal contexts. Worldwide, researchers are producing, accessing, analyzing, integrating and storing massive amounts of digital data daily, through observation, experimentation and simulation, as well as through the creation of collections of digital representations of tangible artifacts and specimens. Modern experimental and observational instruments generate and collect large sets of data of varying types (numerical, video, audio, textual, multi-modal, multi-level, multi-resolution) at increasing speeds. Often, the data users are not the data producers, and they thus face challenges in harnessing data in unforeseen and unplanned ways. In many science or engineering applications, for example, in mesoscale weather prediction or critical infrastructure protection applications, the ability to gather, organize, analyze, model, and visualize large, multi-scale, heterogeneous data sets in rapid fashion is often crucial.

  New methods are required that create knowledge and understanding from an abundance of digital data across the science and engineering frontier, and that accelerate the transformation of knowledge into new products and services that stimulate economic growth as well as other societal benefits. Driven by compelling science and engineering research and education opportunities, new efforts to support the complex tasks of data analysis and discovery must be explored.

  The massive scale and often dynamic nature of science and engineering data dictate that relevant computational technologies be fast, flexible, and capable of operating at multiple levels of abstraction. Data of different types often must be synthesized into a single model that permits an emphasis on data meaning rather than on the forms in which the data were originally represented. Models may dynamically incorporate information via data assimilation and machine learning. Alternative models may be compared in exploratory data analysis. A key component of developing or parameterizing a model is often an inverse problem: deducing system properties and structures, parameter values, or underlying principles from data. Inverse problems are commonly non-unique or in some way ill-posed, so that the data may not determine a unique model, and selection of the best model may require careful optimization. Ultimately, the value of a model depends on the major challenge of validation against "ground truth"; feedbacks between mathematical, computational, and application-domain analyses, each influencing the next step in the others, are vital to real-world insight.

  Analysis of large data sets, both real-time and offline, demands scalable algorithms whose computational complexity grows as slowly as possible with the scale of the data. Research may require the development of novel algorithms that, for example, can discern and exploit parametric, geometric, and topological properties of data, as well as the development of novel data mining and dimension reduction methodologies that can expose the knowledge underlying science and engineering data. Some of the important ways of extracting information from data include data aggregation and annotation, pattern recognition, perturbation and sensitivity analysis, real-time manipulation, filtering and estimation, spectral graph analysis, statistical analysis, and stochastic simulation. New visualization methods can enhance human cognition, allowing scientists, engineers, researchers, educators, and students to detect and comprehend previously indiscernible abstract concepts, patterns, and important exceptions amidst vast data. Approaches informed by knowledge of human cognition and perception can amplify individuals' capability to perceive, understand, synthesize and reason about complex and often dynamic data. In some science and engineering domains, innovative technologies may also need to address the data confidentiality, privacy, security, provenance, and regulatory issues that often impact the use of data.

  Ambitious CDI projects in this area will allow investigators to confirm the expected and reveal the unexpected in multiple science or engineering domains. Under this theme, CDI seeks proposals for multidisciplinary efforts focused on the development and evaluation of new approaches to data mining, data federation, knowledge extraction and knowledge representation, and visualization in demanding scientific and engineering applications. New approaches in computational thinking applied in the context of From Data to Knowledge will support collaboration and teamwork, often among people of diverse backgrounds and levels and areas of expertise. Projects should promise to communicate the results of research findings in ways that both deepen and broaden their impact in a wide variety of application domains.

- **Understanding Complexity in Natural, Built, and Social Systems:** *deriving fundamental insights on systems comprising multiple interacting elements*

  Identifying general principles and laws that characterize complexity and capture the essence of complex systems is one of the major challenges of 21st century science and engineering. Complex systems are more than just complicated; they display distinct characteristics not encountered in "simple" systems, such as multi-scale interactions, emergent behavior, pattern formation, and self-organization, and they are often inherently stochastic or operate in unpredictable settings. Nonlinear couplings and feedbacks across multiple processes and scales typify these systems. They are not amenable to reductionism; finding constructs that persist through the dynamics is fundamental, and involves a major role for innovative computational experimentation. As well as advancing science and engineering, the understanding of complexity will enable the design, synthesis, and control of novel complex engineered systems. Furthermore, it will facilitate intervention in and analysis of complex natural and social systems. This theme therefore promotes the exploration and modeling of natural interactions, connections, complex relations, and interdependencies, scaling from sub-particles to galaxies, from subcellular to biosphere, and from the individual to the societal, across time, in order to understand, mimic, synthesize, and exploit complex systems.

  The functionalities offered by computational thinking allow “experiments” to take place entirely in cyberspace. In many situations, simulation through computation is the only feasible approach to a systematic investigation of realistic complex scientific phenomena, or is essential to the scientific basis for and design of "traditional" experiments. Key challenges include accuracy and resolution, efficiency, perturbation analysis, uncertainty, stochasticity, validation against “ground truth”, long-term dynamics, and predictive modeling. Simulations and computational experiments in mainstream and informal education can engage students and the public in the excitement of scientific and engineering discovery.

  Much of the understanding of complexity will come from mathematical and statistical modeling and analysis, based on both theoretical and empirical studies. Mimicking and synthesizing systems will exploit a wide variety of techniques. Complexity often requires advances in numerical methods for differential, algebraic, and discrete systems. Other approaches include agent-based modeling, neural networks, and dynamically interactive human-in-the-loop calculations. An important consideration for large systems is that scalable methods and tools be available in the working environments of scientists, engineers, and STEM educational researchers.

- **Virtual Organizations:** *enhancing discovery and innovation by bringing people and resources together across institutional, geographical and cultural boundaries*

  Virtual Organizations (VOs) can facilitate the conduct of cutting-edge, transformative research and learning within and across all fields of science and engineering. As complex, networked socio-technical systems supported by cyberinfrastructure, VOs promise to connect people and resources across institutional and geographic boundaries, to foster dynamic configurations of instruments, data streams, facilities, and researchers, and to enable new discoveries and new approaches to scientific inquiry and education through remote access to experimental tools, observational instruments, simulation systems, and globally dispersed individuals. Because they extend beyond traditional “brick and mortar” research institutions, VOs allow for more flexible boundaries, memberships, and lifecycles and for scientific inquiry to be performed at a scale and a distance never before possible. Achieving such radical scalability and seamless integration and interoperability will require the application of computational thinking to all levels of VO formulation, design, implementation, and maintenance.

  Successful projects that designate VO as their primary theme must produce paradigm-shifting research in two or more scientific disciplines, sub-disciplines or interdisciplinary science, engineering, or education areas (the science of virtual organizations may be one of the research areas). In addition, successful VO projects must include significant efforts to advance the understanding of VOs as new modalities of science, engineering, and education by means of well-designed evaluation and/or social scientific research. That is, a project must contribute systematic knowledge and principled understanding of factors that enable effective science and engineering VOs.

  VO proposals should address some of the myriad socio-technical challenges of formulating, designing, building, and advancing effective VOs for science, engineering, and education. As distributed, dynamic, and computationally-enhanced modes of operation and organization, VOs will need to overcome traditional boundaries in unprecedented ways and not only expand but diversify the research and educational opportunities and experiences available to researchers, students, and citizens. As such, VOs may also be explored as a primary vehicle for enhancing innovation and broadening participation in research and in STEM education.

  Understanding how to model and leverage VOs as socio-technical systems to generate and accelerate transformative research within and across different science and engineering disciplines necessarily requires the bringing together of domain scientists with expertise in, for example, network science, cognitive science, artificial intelligence and machine learning, game theory, workflow and value chain analysis, statistical physics, software/hardware design, information privacy and security, participatory and social computing, operations research, and organizational studies. Accordingly, CDI investigators of different disciplinary perspectives should collaborate on the formulation, design, development, implementation, and continuous improvement of VOs to test and verify proposed theories and models of distributed learning and discovery with specific problems, populations and purposes.

All three themes are inter-related. Realistic modeling and accurate, efficient solution of models are becoming possible for ever more complex phenomena, which defy understanding by other means. Such models and increasingly sophisticated scientific observations are described in terms of data of unprecedented scale, from which insight must be extracted through more ingenious techniques than before. Attacking these problems also requires larger organizations, often both geographically dispersed and intellectually diverse; empowerment of such groups is central to this transformation. Accordingly, proposals in one theme, or that cross two or more of the three themes, are encouraged.

In order to realize the full potential of cyber-enabled discovery and innovation, CDI will contribute to the preparation of a workforce trained in computational thinking, with broad participation that ensures inclusion of students and faculty from historically underrepresented populations, minority-serving institutions, and institutions serving students with disabilities.

Effective international collaborations involve true intellectual partnership in which successful outcomes depend on the unique contributions of U.S. and international partners. They engage junior researchers and students in the collaboration, taking advantage of cyber environments to prepare a globally-engaged workforce. Collaborations with industry to couple scientific with technical insight can foster education in innovation and broaden the identification of problems that can benefit from CDI.

For additional information about CDI, including frequently asked questions, see http://www.nsf.gov/crssprgm/cdi . Examples of motivating science and/or engineering research and education opportunities can also be found there. This list is provided for the purposes of illustration only; it is neither exhaustive, nor indicative of preference

regarding research areas. Similarly, proposals that address NSF-appropriate aspects (for clarification, see the Grant Proposal Guide, http://www.nsf.gov/pubs/policydocs/pappguide/nsf10_1/gpg_1.jsp#IB) of national science and technology priorities are welcome; an August 4, 2009, memorandum from the U.S. Office of Management and Budget and the Office of Science and Technology Policy outlines four practical challenges: "(a) Applying science and technology strategies to drive economic recovery, job creation, and economic growth; (b) promoting innovative energy technologies to reduce dependence on energy imports and mitigate the impact of climate-change while creating green jobs and new businesses; (c) applying biomedical science and information technology to help Americans live longer, healthier lives while reducing health care costs; and (d) assuring we have the technologies needed to protect our troops, citizens, and national interests, including those needed to verify arms control and nonproliferation agreements essential to our security."

III. AWARD INFORMATION

Two types of CDI awards will be supported in the FY2010 competition of CDI:

- Type I awards require efforts up to a level roughly comparable to: summer support for two investigators with complementary expertise; two graduate students; and their collective research needs (e.g. materials, supplies, travel) for three years.
- Type II awards require larger (than Type I) efforts up to a level roughly comparable to: summer support for three investigators with complementary expertise; three graduate students; one or two senior personnel (including post-doctoral researchers and staff); and their collective research needs (e.g. materials, supplies, travel) for four years. The integrative contributions of the Type II team should clearly be greater than the sum of the contributions of each member of the team.

In subsequent years (FY2011 and beyond), subject to availability of funds, funding opportunities will be provided for three classes of projects, Types I and II as defined above, and Type III as defined below:

- Type III awards require the engagement of larger (than Type II) multidisciplinary teams, roughly comparable to multiple senior investigators with complementary expertise, multiple graduate students, several senior personnel, and their collective research needs (e.g. materials, supplies, travel) for up to five years. As for Type II awards, the integrative contributions of the Type III team should be clearly greater than the sum of the contributions of each member of the team.

In FY 2010, the number of Type I and Type II awards will be determined based on the results of separate review processes; there will be no Type III awards. In FY 2011 and beyond, subject to availability of funds, awards of Type I, II and III will be made based on the results of separate review processes.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

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

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

  Proposals that capitalize upon productive intellectual partnerships involving investigators from academe, industry and/or other types of organizations, including international entities, are encouraged. Partnerships between academe and other types of organizations, both foreign and domestic, promise the identification of compelling research challenges, and the more effective transformation of discoveries into innovations that create wealth and other societal impacts. While NSF will consider supporting CDI activities undertaken by SBIR-eligible organizations through subawards, other for-profit entities and international partners must support their participation in CDI projects from other funding sources.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 2

An individual may participate as Principal Investigator, co-Principal Investigator or other Senior Personnel in at most two full proposals in each annual competition. Any individual whose biographical sketch is provided as part of the proposal will be considered Senior Personnel in the proposed activity, with or without financial support from the project. After the proposal submission deadline, if a person appears on more than two full proposals, submitters have up to two weeks after the deadline to withdraw excess proposals to reduce that person's participation to two proposals. After that time, the first two submitted proposals (in FastLane time-stamp chronological order) in which that individual is participating will be accepted for review, and the remainder will be returned without review. For this purpose, a multi-institution collaborative project is treated as one proposal that is considered submitted when the last component proposal is submitted.

Additional Eligibility Info:

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

Additional Full Proposal Preparation Instructions:

Cover Sheet:

Select the CDI program solicitation number from the Program Announcement/Solicitation pull down menu. Go to the Unit Selection Lists section. In the “Divisions" selection box, under "Directorate: O/D Office of the Director", you will see the Office of Integrative Activities (OIA). Go straight to the “Programs” selection box, and select the relevant CDI Type (Type I or II). The Type you choose will be added to the “Current List of selected NSF Units”. Then click “Go Back”, click “Go” button next to “Remainder of the Cover Sheet” to get to that section.

Provide a short informative title for the proposed CDI project. To assist NSF staff in sorting full proposals for review, for the FY 2010 competition, full proposal titles should begin with “CDI-Type I:” or “CDI-Type II:”. The system allows one PI and at most four Co-PIs to be designated for each proposal. If your project involves international partners, check the international activities box and list the countries involved. If needed, additional lead personnel should be designated as non co-PI, Senior Personnel on the Budget form.

Project Summary (1-page limit): At the top of this page enter the title of the CDI project, beginning with “CDI-Type I:” or “CDI-Type II:”, the name of the PI and the lead institution, and the primary and other relevant CDI themes. Provide a summary description of the CDI project, including its transformative research and education goals, and the innovations in, and/or innovative use of, computational thinking being proposed. In separate statements, provide a succinct summary of the intellectual merit and broader impacts of the proposed project. ***Full proposals that do not address the intellectual merit and broader impacts of the proposed project in separate statements will be returned without review.***

Coordination Plan (3-page limit, in addition to the usual 15-page limit for project description): Each proposal must contain a clearly labeled coordination plan (separate section of the project description), which includes 1) the specific roles of the PI, co-PIs, other senior personnel and paid consultants at all institutions involved, 2) how the project will be managed across institutions and disciplines, 3) identification of the specific coordination mechanisms that will enable cross-institution and/or cross-discipline scientific integration (e.g., yearly workshops, graduate student exchange, project meetings at conferences, use of the grid for videoconferences, software repositories, etc.), and 4) pointers to the budget line items that support these coordination mechanisms.

Proposals that designate Virtual Organizations as their primary theme must include, as part of the coordination plan, plans for carrying out and reporting rigorous evaluation and continuous improvement of the VO. At a minimum, such plans should address issues such as the VO's structure, governance and processes and the effects of these VO design choices on the nature of the resources and the support needed to create and maintain them, the nature of the participants (who they are, what activities they engage in, and why) and the VO's impacts on participants and on external stakeholders. Simple summative metrics such as counts of publications, website visits and member accounts are not adequate for evaluating VO effectiveness.

Exclusive of the coordination plan, the project description must be no longer than 15 pages.

Supplementary Documents: ***Full proposals that request funding for postdoctoral support and that fail to provide the following information will be returned without review.***

> **Postdoctoral Researcher Mentoring Plan.** As stated in the GPG (http://www.nsf.gov/pubs/policydocs/pappguide/nsf10_1/gpg_2.jsp#IIC2j), each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. In no more than one page, the mentoring plan must describe the mentoring that will be provided to all postdoctoral researchers supported by the project, irrespective of whether they reside at the submitting organization, any subawardee organization, or at any organization participating in a simultaneously submitted collaborative project. Proposers are advised that the mentoring plan may not be used to circumvent the 15-page project description limitation.

Single copy documents: ***Full proposals that do not provide the following information will be returned without review.***

> **Project Personnel (text-searchable PDF, in FastLane, under Additional Single Copy Documents).** List all Senior Personnel in the project. For each person, provide the last name, first name, and institution/organization. In the main body of the proposal, a corresponding biographical sketch should be provided for all individuals included on this list, as instructed in Section II.C.2.f of the Grant Proposal Guide.
>
> **Collaborators/Individuals with Conflicts of Interest (text-searchable PDF, in FastLane, under Additional Single Copy Documents).** Provide a list, in an alphabetized table, of the full names and institutional affiliations of all persons with potential conflicts of interest as specified in NSF’s Grant Proposal Guide. For each PI, Co-PI and other Senior Personnel, include all co-authors/editors and collaborators (within the past 48 months), all graduate advisors and advisees, and any other individuals or institutions with which the investigator has financial ties (please specify type). In addition, list all subawardees who would receive funds through the CDI award.
>
> **Electronic Documents (#1 in Excel, CSV format, e-mailed manually to cdi@nsf.gov after proposal submission, with subject heading referring to the 7-digit proposal number that starts with "10"; #2 entered on a web form and e-mailed automatically by submitting the form):**
>
> In addition, the proposers must send the following two documents immediately after submission of their proposal.
>
> 1. "List of Personnel, Collaborators and Affiliates": After receipt of the proposal number from FastLane, send an e-mail to cdi@nsf.gov. The subject heading of the e-mail should note the proposal number and the lead institution. Attach the document described below, prepared on a template that will be available at http://www.nsf.gov/crssprgm/cdi/. NSF personnel will use automated data handling of this document. To

facilitate this, the file should be in the CSV "flat text" format, with unformatted data entry under the column headings (Proposal Number, PI or SP Last_Name, etc.) in the template. Carriage returns, splitting items over multiple cells, extra spaces, etc., will interfere with automated handling. The document is an Excel spreadsheet containing two lists: one (columns C-E) lists the last names, first names and institutional affiliations of all PIs, Co-PIs, and other senior personnel; the second (columns F-H) lists the full names and institutional affiliations of all people having conflicts of interest with any PIs, Co-PIs, and other senior personnel. This list will be used by NSF to check for conflicts of interest in assembling the review community. The filename should be the proposal number (which begins with "10"; not the temporary proposal number used during proposal preparation) followed by the three characters "coi" (for example, for a proposal number 1012345, this file name will be 1012345coi.csv where the extension csv will be automatically added by Excel when saving the file using the CSV format). The 7-digit proposal number beginning with "10" should appear in every row of the file, in column B, as indicated by the sample that will be available at http://www.nsf.gov/crssprgm/cdi/. Each project participant in columns C-E should be listed (repeatedly) in all rows that name his/her conflicted individuals in columns F-H, as in the sample.

(There is redundancy between the Additional Single Copy Documents, which become part of the FastLane proposal file, and Electronic Document (1), which is used for automated data handling. At present, it is not technically possible for one document to perform both functions.)

2. "Themes and Keywords": After receipt of the proposal number from FastLane, go to the "Themes & Keywords Form" that will be available at http://www.nsf.gov/crssprgm/cdi/. Follow the instructions on the form and press "Submit" to send to NSF an automatic e-mail containing the information. This will identify the primary and other relevant **CDI themes** and up to **3 keywords** selected from the CDI keyword list (or of the PI's own choosing) that best describe the major areas of the multidisciplinary research and education being proposed. This information will be used internally to NSF to facilitate the review process and not to exclude areas that are not explicitly represented in the CDI keyword list.

    - **Themes:** "From Data to Knowledge", "Understanding Complexity", "Virtual Organizations"
    - **Keywords:** The CDI keyword list is available on http://www.nsf.gov/crssprgm/cdi/

    The template for document (1) and the web form for document (2) are available at: http://www.nsf.gov/crssprgm/cdi/

    Remember to e-mail document (1) to cdi@nsf.gov; do not use FastLane.

    NOTE: Full proposals that fail to provide these electronic documents with proper information and according to the required format will be returned without review.

No other items or appendices are to be included. ***Full proposals containing items other than those required above or by the Grant Proposal Guide (GPG) will not be reviewed or considered for NSF funding.***

Proposers are reminded to identify the program solicitation number (NSF 10-506) in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

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

Budget Preparation Instructions: Budgets should include travel funds for the PIs to attend annual CDI grantees' meetings.

C. Due Dates

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

    January 04, 2010 - February 04, 2010

        Type I Full Proposal Submission Window

    January 05, 2010 - February 05, 2010

        Type II Full Proposal Submission Window

D. FastLane Requirements

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

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

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal preparation requirements. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with the oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal.

A. NSF Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board (NSB)-approved merit review criteria: intellectual merit and the broader impacts of the proposed effort. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two NSB-approved merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which the reviewer is qualified to make judgements.

What is the intellectual merit of the proposed activity?
How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?
How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

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:

In responding to the standard NSF review criteria, reviewers will be asked to place emphasis on the following CDI objectives:

- The proposal should define a bold multidisciplinary research agenda that, through computational thinking, promises paradigm-shifting outcomes in more than one field of science and engineering. **Projects that make use of existing computational concepts, methods, models, algorithms and tools to significantly advance only one discipline should be submitted to an appropriate program in that field instead of to CDI.**
- The proposal should provide a clear and compelling rationale that describes how innovations in, and/or innovative use of, computational thinking will lead to the desired project outcomes.
- The proposal should draw on productive intellectual partnerships that capitalize upon knowledge and expertise synergies in multiple fields or sub-fields in science or engineering and/or in multiple types of organizations.

Reviewers will be asked to evaluate the coordination plan, as appropriate for the proposed project; in particular, proposals that designate Virtual Organizations as their primary theme will be expected to fulfill the criteria described above in the Coordination Plan section. Reviewers will also be asked to provide an evaluation of whether the proposed project has the potential for extraordinary outcomes, such as, revolutionizing entire disciplines, creating entirely new fields, or disrupting accepted theories and perspectives as a result of taking a fresh, multi-disciplinary approach. Special emphasis will be placed on proposals that promise to enhance competitiveness, innovation, or safety and security in the United States.

B. Review and Selection Process

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

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

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF is striving to be able to tell

applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

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

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

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

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

C. Reporting Requirements

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

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

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

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Eduardo Misawa, ENG/CMMI, telephone: (703) 292-8080, email: cdi@nsf.gov
- Thomas Russell, OD/OIA and MPS/DMS, telephone: (703) 292-8080, email: cdi@nsf.gov
- Kenneth Whang, CISE/IIS, telephone: (703) 292-8080, email: cdi@nsf.gov

For questions related to the use of FastLane, contact:

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

Drs. Misawa, Russell, and Whang are being assisted by a multidisciplinary team of Program Officers drawn from throughout NSF. CDI team members include: Kile Baker (GEO/ATM), Beverly Berger (MPS/PHY), Maria Burka (ENG/CBET), William Chang (OD/OISE), John Cherniavsky (EHR/OAD), Fahmida Chowdhury (SBE/OAD), Arlene Garrison (OD/OIA), Ping Ge (EHR/DGE), Anita La Salle (CISE/CNS), Dan Lubin (OD/OPP), Manish Parashar (OD/OCI), David Rockcliffe (BIO/MCB), Nigel Sharp (MPS/AST), Carl Taylor (BIO/DBI), Rita Teutonico (SBE/OAD), Susan Winter (OD/OCI), William Wiseman (OD/OPP), and Eva Zanzerkia (GEO/EAR).

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, National Science Foundation Update is a free e-mail subscription service designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the NSF web site.

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

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

NSF receives approximately 40,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

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

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

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center)**:** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

  Send an e-mail to: nsfpubs@nsf.gov

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

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

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