Information and Intelligent Systems (IIS): Core Programs

PROGRAM SOLICITATION
09-557

REPLACES DOCUMENT(S):
NSF 08-575

National Science Foundation

Directorate for Computer & Information Science & Engineering
  Division of Information & Intelligent Systems

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

Medium Projects: August 1, 2009 - August 30, 2009, August 1 - August 30, Annually Thereafter

Large Projects: November 1, 2009 - November 28, 2009, November 1 - November 28, Annually Thereafter

Small Projects: December 1, 2009 - December 17, 2009, December 1 - December 17, Annually Thereafter

REVISION NOTES

The Division's interest in and support for research in the areas of computer graphics and visualization has been clarified.

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

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Information and Intelligent Systems (IIS): Core Programs

Synopsis of Program:

CISE's Division of Information and Intelligent Systems (IIS) supports research and education projects that develop new knowledge in three **core programs:**

- The Human-Centered Computing program;
- The Information Integration and Informatics program; and
- The Robust Intelligence program.

IIS is also responsible for managing the review process for proposals in computer graphics and visualization; these proposals may be submitted to any of the three core programs described above.

Proposers are invited to submit proposals in three project classes, which are defined as follows:

- Small Projects - up to $500,000 total budget with durations up to three years;
- Medium Projects - $500,001 to $1,200,000 total budget with durations up to four years; and
- Large Projects - $1,200,001 to $3,000,000 total budget with durations up to five years.

A more complete description of the three project classes can be found in section *II. Program Description* of this document.

CISE investments in Small, Medium and Large projects complement the directorate's investments in the Expeditions in Computing program, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503169&org=CISE, where projects are funded at levels of up to $10,000,000 total for durations up to 5 years.

Cognizant Program Officer(s):

- William S. Bainbridge, Point of Contact, Human-Centered Computing (HCC), 1125, telephone: (703) 292-8930, email: wbainbri@nsf.gov

- Ephraim P. Glinert, Point of Contact, Human-Centered Computing (HCC), 1125, telephone: (703) 292-8930, email: eglinert@nsf.gov

- Lawrence E. Brandt, Point of Contact, Information Integration and Informatics (III), 1125, telephone: (703) 292-8930, email: lbrandt@nsf.gov

- Maria Zemankova, Point of Contact, Information Integration and Informatics (III), 1125, telephone: (703) 292-8930, email: mzemanko@nsf.gov

- Douglas H. Fisher, Point of Contact, Robust Intelligence (RI), 1125, telephone: (703) 292-7356, email: dhfisher@nsf.gov

- Kenneth Whang, Point of Contact, Robust Intelligence (RI), 1125, telephone: (703) 292-8930, email: kwhang@nsf.gov

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

Estimated Number of Awards: 200 - It is anticipated that up to 200 awards will be made each year.

Anticipated Funding Amount: $90,000,000 Approximately $90 million each year, dependent upon the availability of funds.

Eligibility Information

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 2

In any contiguous August through December period, an individual may participate as PI, Co-PI or Senior Personnel in no more than **two** proposals submitted in response to the *coordinated solicitation* (where *coordinated solicitation* is defined to include the *Information and Intelligent Systems (IIS): Core Programs*, the *Computer and Network Systems (CNS): Core Programs* and the *Computing and Communication Foundations (CCF): Core Programs* solicitations). For example, between August 2009 and December 2009, an individual may participate as PI, co-PI or Senior Personnel in one proposal submitted to a core program in CCF and in a second proposal submitted to a core program in CNS, or an individual may participate as PI, co-PI or Senior Personnel in two proposals submitted to an IIS core program, etc.

These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently. In the event that an individual exceeds this limit, proposals received within the limit will be accepted based on earliest date and time of proposal submission (i.e. the first two proposals received will be accepted and the remainder will be returned without review). **No exceptions will be made.**

The limit on the number of proposals per PI, co-PI or Senior Personnel applies only to the *coordinated solicitation.*

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 deviates from 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

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

    Medium Projects: August 1, 2009 - August 30, 2009, August 1 - August 30, Annually Thereafter

    Large Projects: November 1, 2009 - November 28, 2009, November 1 - November 28, Annually Thereafter

    Small Projects: December 1, 2009 - December 17, 2009, December 1 - December 17, Annually Thereafter

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

The Division of Information and Intelligent Systems (IIS) studies the inter-related roles of people, computers, and information. IIS supports research and education activities that 1) develop new knowledge about the role of people in the design and use of information technology; 2) increase our capability to create, manage, and understand data and information in circumstances ranging from personal computers to globally-distributed systems; and 3) advance our understanding of how computational systems can exhibit the hallmarks of intelligence.

II. PROGRAM DESCRIPTION

IIS CORE PROGRAMS

IIS supports three core programs as described below

- ***Human Centered Computing (HCC)***

Human beings, whether as individuals, teams, organizations, or societies, play an integral role in all stages of the creation and use of computational systems. Moreover, computing technologies and human societies co-evolve, transforming each other in the process. Human Centered Computing (HCC) research explores creative ideas, novel theories, and innovative technologies that advance our understanding of the complex and increasingly coupled relationships between people and computing.

HCC research targets diverse computing platforms such as traditional computers, handheld and mobile devices, robots, and wearable computers, at scales ranging from an individual device with a single user to large, evolving, heterogeneous socio-technical systems that are emerging from the increasingly pervasive availability of networking technologies. Environments of interest range from physical interaction with a single device to systems in which places and people, both physical and virtual, merge. As all electronic communications media become digital and interconnected, computing is also playing a central role in how humans communicate, work, learn, and play, dramatically transcending traditional geographical and cultural boundaries. HCC research explores and improves our understanding of new human-computer and human-human interactions, collaboration, and competition, developing systems that are aware of their social surroundings and of the conceptualizations, values, preferences, abilities, special needs, and diverse ranges of capability of the people that use them. HCC researchers and educators explore systems that interact with people using various and possibly multiple modalities such as innovative computer graphics, and haptic, audio, and brain-machine interfaces. HCC research outcomes are expected to transform the human-computer interaction experience, so that the computer is no longer a distraction or worse yet an obstacle, but rather a device or environment that empowers the user at work, in school, at home and at play, and that facilitates natural and productive human-computing integration.

The HCC program encourages research on how humans, in various roles and domains, perceive computing artifacts as they design and use them, and on the wider social implications of those artifacts. HCC supports social and behavioral scientists as well as computer and information scientists whose research contributes to the design and understanding of novel computing technologies and systems.

More information on topics of interest to the HCC program is available at:
http://www.nsf.gov/cise/iis/hcc_pgm.jsp

- *Information Integration and Informatics (III)*

Recent years have seen massive growth in the scale, diversity, and complexity of data. Moreover, the data are often used in unanticipated and new ways that frequently require repurposing, transforming, and/or integrating multiple, uncoordinated, and sometimes variously restricted data sources over which data users have no control. The abundance and heterogeneity of data and data sources have created increasing demands on and opportunities for information technologies.

The Information Integration and Informatics (III) program focuses on the processes and technologies involved in creating, managing, visualizing, and understanding diverse digital content in circumstances ranging from individuals through groups, organizations, and societies, and from individual devices to globally-distributed systems. Further, data are only part of a "knowledge life cycle" that progresses from data through knowledge and insight and, ultimately, to action. III funds innovative information technology research that can transform all stages of the knowledge life cycle.

III-funded projects are expected to lead to advances that are driven by specific information-technology challenges. Projects directed mainly at data-collection building and use, that apply existing data technologies to (perhaps) novel data sets, or that propose other activities with limited computing and information technology research potential are not appropriate for this program. III-supported activities can range from theoretical investigations to projects grounded in multi-disciplinary collaborations where data are central to the III-area research. In the case of multi-disciplinary projects proposers should explain the utility of the proposed work to the application domain and demonstrate expertise in that domain among the project participants. Regardless of research modality, proposals should make clear what computing and information technology challenges are being addressed and how the effectiveness of the work will be assessed.

More information on topics of interest to the III program is available at:
http://www.nsf.gov/cise/iis/iii_pgm.jsp

- *Robust Intelligence (RI)*

The Robust Intelligence (RI) program encompasses all aspects of the computational understanding and modeling of intelligence in complex, realistic contexts. In contrast to systems that use limited reasoning strategies or address problems in narrow contexts, robust intelligence may be characterized by a system's flexibility, resourcefulness, use of a variety of modeling or reasoning approaches, and use of real-world data in real time, demonstrating a level of intelligence and adaptability seen in humans and animals. The RI program advances and integrates the research traditions of artificial intelligence, computer vision, human language research, robotics, machine learning, computational neuroscience, cognitive science, and related areas.

Researchers across all areas of RI are addressing progressively richer environments, larger-scale data, and more sophisticated computational and statistical approaches, looking to nature in many cases to model cognitive and computational processes. Interactions across traditional disciplines are also of increasing importance. For example, speech and dialogue research seeks to understand the cognitive psychological underpinnings of conversation that contribute to the robustness of human speech perception and intention understanding. Computer vision is exploring approaches developed in language processing to represent the semantic information in images and video in ways useful for mining, navigation, and robotic interaction, and working with ideas developed in computer graphics and physics-based modeling to understand and depict collections of images. A cognitive architecture may bridge sophisticated planning and problem solving modules with perception and action modules, perhaps accounting for certain human or animal behaviors. Robotic systems need to understand and interact with humans in unfamiliar and unstructured environments. Computational understanding of neurons, networks, and the brain increasingly draws on computer vision, robotics, and machine learning, and provides insights into the coding, representations, and learning underlying intelligent behavior in nature.

These examples are meant to convey the general goals of RI, not to limit its scope. The program supports projects that will advance the frontiers of all RI research areas, as well as those that integrate different aspects of these fields.

More information on topics of interest to the RI program is available at:
http://www.nsf.gov/cise/iis/ri_pgm.jsp

To reflect the changing landscape of research in computer graphics and visualization, particularly the increasing interest that IIS has in them, IIS now leads CISE's management of the review process for proposals in computer graphics and visualization. Graphics research targets all topics within the modeling, rendering, and display pipeline for computer graphics and closely related topics. Visualization research targets the use of computer graphics and closely related themes to facilitate the understanding of wide-ranging types of information. Computational geometry proposals not tightly coupled to computer graphics should be submitted to the Algorithmic Foundations core program within CCF.

Proposals in these areas are handled by a team of Program Directors spanning all three core programs. To simplify our Program Directors' identification of proposals in this area, we ask PIs to include "computer graphics" or "visualization" as key words in their Project Summary as described in Section V.A below.

PROJECT CLASSES

Proposals submitted to this solicitation must be consistent with one of three project classes defined below. Proposals will be considered for funding within their project classes.

- **Small Projects, with total budgets up to $500,000 for durations of up to three years,** are well suited to one or two investigators (PI and one co-PI or other Senior Personnel) and at least one student and/or postdoc.
- **Medium Projects, with total budgets ranging from $500,001 to $1,200,000 for durations up to four years,** are well-suited to one or more investigators (PI, co-PI and/or other Senior Personnel) and several students and/or postdocs. Medium 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 Collaboration Plan is **required** for all Medium proposals with more than one investigator. The length of and level of detail provided in the Collaboration Plan should be commensurate with the complexity of the proposed project. Please see *Proposal Preparation Instructions* Section V.A for additional submission guidelines.
- **Large Projects, with total budgets ranging from $1,200,001 to $3,000,000 for durations of up to five years**, are well-suited to two or more investigators (PI, co-PI(s), or other Senior Personnel), and a team of students and/or postdocs. Large 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 Collaboration Plan is **required** for all Large proposals. The length of and degree of detail provided in the Collaboration Plan should be commensurate with the complexity of the proposed project. Please see *Proposal Preparation Instructions* Section V.A for additional submission guidelines.

CISE investments in Small, Medium and Large projects complement the directorate's investments in the Expeditions in Computing program, where projects are funded at levels of up to $10,000,000 total for durations of up to 5 years. The Expeditions solicitation can be accessed at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf08568&org=NSF.

IMPORTANT PROJECT CHARACTERISTICS

The submission of far-reaching, creative research and education projects is encouraged. Funds will be used to support potentially transformative research with high-impact potential. In this way, CISE will catalyze exciting new research activities with the potential to make significant advances in the state-of-the-art.

Interdisciplinary, international and/or academic-industry collaborations that promise to result in major science or engineering advances are welcome. The directorate hopes to attract proposals from faculty at a broad range of academic institutions, including faculty at minority-serving and predominantly undergraduate institutions.

Proposals submitted should demonstrate that enriching learning experiences will be provided for a diverse population of students, and may describe the development of innovative curricula or educational materials that advance literacy about and expertise in areas supported by CISE.

Proposals that extend beyond the scope of one CISE core program are welcome. In such cases, PIs should identify the most relevant program(s) in the proposal submission process (see *Proposal Preparation Instructions* later in this document). CISE Program Officers will work with their NSF colleagues to ensure that these proposals are appropriately co-reviewed and considered for funding.

III. AWARD INFORMATION

Approximately $90 million each year, dependent upon the availability of funds, for up to 200 awards. Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

IV. ELIGIBILITY INFORMATION

Organization Limit:

    None Specified

PI Limit:

    None Specified

Limit on Number of Proposals per Organization:

    None Specified

Limit on Number of Proposals per PI: 2

In any contiguous August through December period, an individual may participate as PI, Co-PI or Senior Personnel in no more than **two** proposals submitted in response to the *coordinated solicitation* (where *coordinated solicitation* is defined to include the *Information and Intelligent Systems (IIS): Core Programs*, the *Computer and Network Systems (CNS): Core Programs* and the *Computing and Communication Foundations (CCF): Core Programs* solicitations). For example, between August 2009 and December 2009, an individual may participate as PI, co-PI or Senior Personnel in one proposal submitted to a core program in CCF and in a second proposal submitted to a core program in CNS, or an individual may participate as PI, co-PI or Senior Personnel in two proposals submitted to an IIS core program, etc.

These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently. In the event that an individual exceeds this limit, proposals received within the limit will be accepted based on earliest date and time of proposal submission (i.e. the first two proposals received will be accepted and the remainder will be returned without review). **No exceptions will be made.**

The limit on the number of proposals per PI, co-PI or Senior Personnel applies only to the *coordinated solicitation.*

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 pubs@nsf.gov.

The following information SUPPLEMENTS (not replaces) the guidelines provided in the NSF Grant Proposal Guide (GPG).

Proposal Titles: Proposal titles must begin with an acronym that indicates the most relevant core program. Select an acronym from the following list:

- Human-Centered Computing: HCC
- Information Integration and Informatics: III
- Robust Intelligence: RI

The acronym should be followed with a colon, then the project class followed by a colon and the title of your project. For example, if you are submitting a Small proposal to Human-Centered Computing core program, then your title would be **HCC: Small:Title**. If you submit a proposal as part of a set of collaborative proposals, the title of the proposal should begin with the acronym that indicates the most relevant core program followed by a colon, then the project class followed by a colon, then "Collaborative Research" followed by a colon, and the title. For example, if you are submitting a collaborative set of proposals for a Large project to the Robust Intelligence core program, the title of each would be **RI: Large:Collaborative Research: Title.** Proposals from PIs in institutions that have RUI (Research in Undergraduate Institutions) eligibility should begin their proposal title with the acronym that indicates the most relevant core program, followed by a colon then the project class, followed by a colon then "RUI", followed by a colon and then the title, for example, **III:Medium:RUI:Title.**

Proposals that extend beyond the scope of one CISE core program are welcome.   In such cases, PIs should identify the acronym for the **most relevant** core program, followed by any other relevant program acronym(s) separated by colons (for example, **III:RI:Small:Title**). CISE Program Officers will work with their NSF colleagues to ensure that these proposals are appropriately co-reviewed and considered for funding.

Project Summary: All proposals must provide up to 6 sets of key words at the end of the Project Summary. These key words should describe the main scientific/engineering areas explored in the proposal. Key words should be prefaced with "Key Words" followed by a colon and each key word separated by semi-colons. Key words should be of the type used to describe research in a journal submission. They should be put at the end of the project summary and might appear, for example, as **Key Words: formal logic; computer graphics; multi-modal interfaces; sensor networks; information visualization; privacy.**

Project Description: 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, all Medium proposals that include more than one investigator and all Large proposals must include a Collaboration Plan. *Relevant Medium proposals and all Large proposals that fail to include a Collaboration Plan will be returned without review.* While the length of the Project Description for Small proposals is limited to 15 pages, for Medium and Large proposals up to 3 additional pages are allowed for Collaboration Plans. The length of and degree of detail provided in the Collaboration Plan should be commensurate with the complexity of the proposed project. Where appropriate, the Collaboration Plan might include: 1) the specific roles of the project participants in all organizations involved; 2) information on how the project will be managed across all the investigators, institutions, and/or disciplines; 3) identification of the specific coordination mechanisms that will enable multi-investigator, 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) specific references to the budget line items that support collaboration and coordination mechanisms.

Proposals that incorporate curriculum development activities should describe the curriculum development activities in a separate section of the Project Description entitled "Curriculum Development Activities."

Supplementary Documents: In the Supplementary Documents Section, include a list of all PIs, Co-PIs, Senior Personnel, paid Consultants, Collaborators and Postdocs to be involved in the project. 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

PIs from predominantly undergraduate institutions should also include a Research in Undergraduate Institutions (RUI) Impact Statement and Certification of RUI Eligibility in this Section.

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

B. Budgetary Information

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

C. Due Dates

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

  Medium Projects: August 1, 2009 - August 30, 2009, August 1 - August 30, Annually Thereafter

  Large Projects: November 1, 2009 - November 28, 2009, November 1 - November 28, Annually Thereafter

  Small Projects: December 1, 2009 - December 17, 2009, December 1 - December 17, Annually Thereafter

D. FastLane Requirements

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

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

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

A. NSF Merit Review Criteria

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

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

What is the intellectual merit of the proposed activity?

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

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

Examples illustrating activities likely to demonstrate broader impacts are available electronically on the NSF website at: http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf.

NSF staff also will give careful consideration to the following in making funding decisions:

Integration of Research and Education
One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities
Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

Additional Review Criteria:

For Medium and Large proposals only, reviewers will be asked to:

- Comment on the extent to which the project scope justifies the level of investment requested, and the degree to which the participating investigators will work synergistically to accomplish the project objectives.
- Comment on the Collaboration Plan.

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 pubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *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:

- William S. Bainbridge, Point of Contact, Human-Centered Computing (HCC), 1125, telephone: (703) 292-8930, email: wbainbri@nsf.gov

- Ephraim P. Glinert, Point of Contact, Human-Centered Computing (HCC), 1125, telephone: (703) 292-8930, email: eglinert@nsf.gov

- Lawrence E. Brandt, Point of Contact, Information Integration and Informatics (III), 1125, telephone: (703) 292-8930, email: lbrandt@nsf.gov

- Maria Zemankova, Point of Contact, Information Integration and Informatics (III), 1125, telephone: (703) 292-8930, email: mzemanko@nsf.gov

- Douglas H. Fisher, Point of Contact, Robust Intelligence (RI), 1125, telephone: (703) 292-7356, email: dhfisher@nsf.gov

- Kenneth Whang, Point of Contact, Robust Intelligence (RI), 1125, telephone: (703) 292-8930, email: kwhang@nsf.gov

For questions related to the use of FastLane, contact:

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

In addition to the Program Officers identified as program points of contact above, the following IIS Program Officers also support IIS core programs as indicated below:

Human-Centered Computing (HCC)

- Amy L. Baylor, (703) 292-8491, abaylor@nsf.gov , Room 1125
- David McDonald, (703) 292-8074, dmcdonal@nsf.gov, Room 1125

Information Integration & Informatics (III)

- Jim French, (703) 292-8930, jfrench@nsf.gov , Room 1125
- Sylvia Spengler (703) 292-8930, sspengle@nsf.gov , Room 1125
- Stephen M. Griffin, (703) 292-8930, sgriffin@nsf.gov , Room 1125
- Frank Olken, (703) 292-7350, folken@nsf.gov , Room 1125

Robust Intelligence (RI)

- Qiang Ji, (703) 292-8738, qji@nsf.gov, Room 1125
- Tatiana (Tanya) Korelsky, (703) 292-8930, tkorelsk@nsf.gov , Room 1125
- Paul Oh, (703) 292-7838, poh@nsf.gov, Room 1125
- Jie Yang, (703) 292-4768, jyang@nsf.gov, Room 1125

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.

In addition to the *coordinated solicitation* discussed in this document, NSF provides funding opportunities for the computing community via the following programs and their solicitations:

Discovery Research Programs

Advanced Learning Technologies (ALT), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12834&org=NSF&sel_org=NSF&from=fund

CAREER: Faculty Early Career Development, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5262

CISE Cross-cutting Programs: FY 2010, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13451

Collaborative Research in Computational Neuroscience (CRCNS), http://nsf.gov/funding/pgm_summ.jsp?pims_id=5147

Community-Based Data Interoperability Networks (Interop), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=502112&org=CISE&sel_org=CISE&from=fund*

CreativeIT, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501096&org=IIS&from=home

Cyber-enabled Discovery and Innovation (CDI), http://www.nsf.gov/crssprgm/cdi/

Cyber-Physical Systems (CPS), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503286&org=NSF&sel_org=NSF&from=fund

Engineering Research Centers (ERCs), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5502&org=NSF&sel_org=NSF&from=fund*

Expeditions in Computing, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503169&org=NSF&sel_org=NSF&from=fund

Foundations of Data and Visual Analytics (FoDaVA), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501081&org=NSF&sel_org=NSF&from=fund

Grant Opportunities for Academic Liaison with Industry (GOALI), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13706&org=CISE&sel_org=CISE&from=fund*

High-End Computing University Research Activity (HECURA), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13645&org=NSF&sel_org=NSF&from=fund

Industry/University Cooperative Research Centers Program (I/UCRC), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5501&org=CISE&sel_org=CISE&from=fund*

Partnerships for International Research and Education (PIRE), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12819&org=CISE&sel_org=CISE&from=fund*

Research in Undergraduate Institutions (RUI), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5518&org=CISE&sel_org=CISE&from=fund*

Science of Learning Centers (SLCs), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5567&org=CISE&sel_org=CISE&from=fund*

Science and Technology Centers (STCs), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5541&org=CISE&sel_org=CISE&from=fund*

Sustainable Digital Data Preservation and Access Network Partners (DataNet), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503141&org=CISE&sel_org=CISE&from=fund*

Education and Workforce Development Programs

ADVANCE: Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383&from=fund

Advanced Technological Education (ATE), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5464*

Broadening Participation in Computing (BPC), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13510&org=NSF&sel_org=NSF&from=fund

CISE Pathways to Revitalized Education in Computing (CPATH), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=500025&org=NSF&sel_org=NSF&from=fund

Computational Science Training for Undergraduates in the Mathematical Sciences (CSUMS), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13655&org=EHR&sel_org=EHR&from=fund*

Course, Curriculum, and Laboratory Improvement (CCLI), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5741&org=EHR&sel_org=EHR&from=fund*

Developing Global Scientists and Engineers [International Research Experiences for Students (IRES) and Doctoral Dissertation Enhancement Projects (DDEP)], *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12831&org=CISE&sel_org=CISE&from=fund*

Discovery Research K-12 (DR-K12), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=500047&org=EHR&sel_org=EHR&from=fund*

Federal Cyber Service: Scholarship for Service (SFS), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5228*

Graduate Research Fellowships (GRF), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=6201&org=DGE&from=home

Integrative Graduate Education and Research Training (IGERT), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12759

International Research Fellowship Program (IRFP), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5179&org=CISE&sel_org=CISE&from=fund*

Information Technology Experiences for Students and Teachers (ITEST), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5467&org=EHR&sel_org=EHR&from=fund*

NSF Graduate Teaching Fellows in K-12 Education (GK-12), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5472&from=fund

NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM), *http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5257&org=EHR&sel_org=EHR&from=fund*

Research Experiences for Undergraduates (REU) Sites and Supplements, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5517&from=fund

Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5488&org=EHR&sel_org=EHR&from=fund

Research Infrastructure Programs

Computing Research Infrastructure (CRI), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12810&org=NSF&sel_org=NSF&from=fund

EPSCoR Research Infrastructure Improvement Grant Program, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5672&org=CISE&sel_org=CISE&from=fund

Major Research Infrastructure (MRI), http://www.nsf.gov/od/oia/programs/mri/

For more information on these programs, please consult the NSF web site.

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: pubs@nsf.gov

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

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal 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

| Policies and Important Links | | Privacy | | FOIA | | Help | | Contact NSF | | Contact Web Master | | SiteMap |

NSF The National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230, USA
Tel: (703) 292-5111, FIRS: (800) 877-8339 | TDD: (800) 281-8749

Last Updated:
11/07/06
Text Only