Science and Engineering Information Integration and Informatics (SEIII)

Program Announcement

NSF 04-528
***Replaces Document* NSF 01-156**

National Science Foundation
Directorate for Computer and Information Science and Engineering
Division of Information and Intelligent Systems
Division of Shared Cyberinfrastructure

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

March 04, 2004

December 15, 2004

December 15, annually

REVISIONS AND UPDATES

In furtherance of the President's Management Agenda, in Fiscal Year 2005, NSF has identified 23 programs that will offer proposers the option to utilize Grants.gov to prepare and submit proposals. Grants.gov provides a single Government-wide portal for finding and applying for Federal grants online.

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

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

A. Collaborative Proposals. All collaborative proposals must be submitted via the NSF FastLane system. This includes collaborative proposals submitted:
   - by one organization (and which include one or more subawards); or
   - as separate submissions from multiple organizations.

   Proposers are advised that collaborative proposals submitted in response to this Program Solicitation via Grants.gov will be requested to be withdrawn and proposers will need to resubmit these proposals via FastLane. (Chapter II, Section D.3 of the Grant Proposal Guide provides additional information on collaborative proposals.)

B. All Other Types of Proposals That Contain Subawards. All other types of proposals that contain one or more subawards also must be submitted via the NSF FastLane system.

The following Revisions and Updates were included in the original program solicitation NSF 04-528:

The Dear Colleague Letter, "Proposal Submission Deadlines for the Division of Information and Intelligent Systems [IIS]," (NSF 01-156 dated September 6, 2001) established two annual proposal submission deadlines, March 1 and November 16. The Dear Colleague Letter is being replaced by individual IIS program solicitations, each with one annual proposal submission deadline. Please see the IIS Web site (http://www.cise.nsf.gov/iis) for additional information.

Effective on the day this program solicitation is posted by NSF, the deadline for Science and Engineering Information Integration and Informatics proposals is March 4, 2004, December 15, 2004 and December 15, annually, thereafter. Proposals submitted in anticipation of a November 16, 2003 deadline will be accepted and reviewed with those submitted for the March 4, 2004 deadline.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Science and Engineering Information Integration and Informatics (SEIII)

Synopsis of Program:

The Science and Engineering Information Integration and Informatics (SEIII) program focuses on advancing the state of the art in the application of advanced information technology to science and engineering problems in specific domains, such as astronomy, biology, the geosciences, public health and health care delivery. Since many scientific problems have common needs for information management and data analysis, the advancement of these technologies is central to SEIII. Similarly, within computer science, the study of complex distributed computer and network systems requires the collection and analysis of timely, accurate and reliable information. Although methods for the analysis of scientific data and information will be supported by the program, a special emphasis will be placed on domain-specific and general-purpose tools for integrating information from disparate sources. Such integration is a key step of many projects yet is rarely addressed in full generality. The SEIII program will have two separate components to address these research areas: Science and Engineering Informatics (SEI) and Information Integration (II).

Within this program, the NSF intends to support a group of projects that will advance the understanding of technology to enable scientific discovery, and that will creatively integrate research and education for the benefit of technical specialists and the general population.

Cognizant Program Officer(s):

- James C. French, Program Director, Directorate for Computer & Information Science & Engineering, Division of Information and Intelligent Systems, 1125 S, telephone: (703) 292-8930, fax: (703) 292-9073, email: jfrench@nsf.gov
- Sylvia Spengler, Program Director, Directorate for Computer & Information Science & Engineering, Division of Information and Intelligent Systems, 1125 N, telephone: (703) 292-8936, fax: (703) 292-9073, email: sspengle@nsf.gov

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

- 47.070 --- Computer and Information Science and Engineering

Eligibility Information

- **Organization Limit:** None Specified.
- **PI Eligibility Limit:** None Specified.
- **Limit on Number of Proposals:** None Specified.

Award Information

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 25 to 30
- **Anticipated Funding Amount:** $14,500,000

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Full proposals submitted via FastLane:**
  - Grant Proposal Guide (GPG) Guidelines apply

Full proposals submitted via Grants.gov:

- NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/bfa/dias/policy/docs/grantsgovguide.pdf) To obtain copies of the Application Guide and Application Forms Package: click on the Apply tab on the Grants.gov website, then click on the **Apply Step 1: Download a Grant Application Package and Application Instructions** link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button.

This solicitation contains information that supplements the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full text of this solicitation for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required by NSF.
- **Indirect Cost (F&A) Limitations:** Not Applicable.
- **Other Budgetary Limitations:** Not Applicable.

C. Due Dates

- **Full Proposal Deadline Date(s)** (due by 5 p.m. submitter's local time):
  March 04, 2004
  December 15, 2004
  December 15, annually

Proposal Review Information

- **Merit Review Criteria:** National Science Board approved criteria apply.

Award Administration Information

- **Award Conditions:** Standard NSF award conditions apply.
- **Reporting Requirements:** Standard NSF reporting requirements apply.

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I. INTRODUCTION

The efficiency and progress of the scientific enterprise has been chronically hampered by inadequate access to appropriate data and tools for analyzing and visualizing scientific data. Domain informatics specifically recognizes the importance of domain-specific information and data, and analysis methods necessary to support significant advances in data-driven inquiry. The Science and Engineering Information Integration and Informatics (SEIII) program supports research and related educational programs with the goal of maximally exploiting data and information to enable new scientific discovery in the areas of science and engineering that are supported by the various Directorates of NSF.

The importance of a coordinated SEIII effort cannot be overstated. SEIII seeks to catalyze and capitalize on synergies between general information technology and domain-specific informatics. Data-driven inquiry requires evaluating multiple competing hypotheses using multiple types of evidence and relating new findings to the existing knowledge and literature in a field. Throughout the nation and the world, huge quantities of data are gathered at great expense; the scientific community as a whole is deluged with new data from a variety of sources; yet each individual scientist sees only a small fraction of this data. Widely dispersed, multidisciplinary groups collaborating to enable scientific discovery produce large amounts of incongruous data. The challenge for SEIII is to exploit these assets so that science can be done more efficiently and to represent data in such a way as to make it useful for discovery. In particular, the plethora of data formats, interface protocols and vocabulary differences across disciplines must be tamed.

Within the study of complex computer and network systems, requirements for timely, accurate and reliable information integration are becoming increasingly critical to ensure enhanced performance for existing technologies such as the Internet and to enable new functionalities through emerging ubiquitous information technologies such as sensors.

Our society relies on a well trained and diverse workforce to develop new ideas and make the technical advances affecting its well-being. The SEIII program supports activities directed toward improving the tools and environment available to researchers and the use of the tools in educational environments. The goal is to revolutionize the education of researchers in science and engineering to accelerate the pace of knowledge discovery for future generations.

II. PROGRAM DESCRIPTION

OBJECTIVES

The goal of the Science and Engineering Information Integration and Informatics (SEIII) program is to focus information technology research on addressing problems that will enable scientific discovery via analysis of large data sets or information resources. There are typically two steps in this problem: the assembly of empirical data and other information, and their subsequent analysis to generate or test hypotheses. Specifically, this program encompasses two related components: (1) Science and Engineering Informatics (SEI); and (2) Information Integration (II). The SEIII program has the following two objectives.

1. **Stimulation of multi-disciplinary research** in Science and Engineering Informatics (SEI) that addresses significant,

real requirements of an application domain. Understanding of the requirements should be derived through collaboration with the domain scientists or engineers. An ideal project will have three key elements:

a. A significant domain challenge;

b. A significant computer science problem that is a barrier to achieving the domain challenge; and

c. Demonstrated expertise in these two aspects.

2. Information Integration (II) research that leads to a uniform interface to a multitude of heterogeneous, independently developed data sources. The goal is to free users from having to locate the data sources, interact with each data source in isolation, and manually combine data from multiple formats and multiple sources.

To take maximum advantage of these SEIII activities, innovative approaches are needed in education so that capable students participate in research and so that research results are quickly integrated into the educational process.

AREAS OF INTEREST

Proposals are encouraged on methodologies and tools for the representation and manipulation of large volumes of science or engineering data in distributed or heterogeneous environments. In this context, projects in two related areas are encouraged:

A. Science and Engineering Informatics (SEI)

1. **Science and Engineering Data Models and Systems**. Theoretical foundations for the representation and manipulation of advanced data types (e.g., temporal, spatial and image data, textual data, spectrum data, engineering design data, materials data, chemical compounds, sequences, graphs, user-defined objects with inheritance and encapsulation, or declarative extensions); data/knowledge calibration and validation; and handling and visualization of uncertainty in the underlying data. Systems issues include system extensibility; rapid prototyping support; development of user-transparent, multi-level storage management (main memory through tertiary storage); multi-media data indexing; partial match retrieval algorithms; archiving; and version control. Research in this area must consider the special data and information characteristics associated with a science or engineering domain necessary to make a contribution to a particular science or engineering problem.
2. **Analysis of Science Databases and Information Resources**. Topics span computing environment transparency; establishing baseline patterns, data examination, selection, analysis and manipulation of temporally or spatially related data; knowledge discovery algorithms; information extraction (e.g., from abstracts of publications), citation analysis, scientific visualization; parallel model execution and cross-validation on large volumes of data; automated knowledge acquisition; incorporation of new knowledge into a system; and audit trail provisions including data provenance. The research in this area must be done in connection with a specific science or engineering problem. Computer science problems are not excluded in this context. It would be quite appropriate, for example, to propose a new method for gathering and analyzing operational network data (the tool) with the goal of supporting real-time network adaptation (the problem).
3. **Analysis of Scientific and Engineering Images**. A key research challenge in many research problems is to derive measurements or abstract features from 2-D, 3-D and multispectral images and to use this derived information for generating or evaluating hypotheses.
4. **Shared Resources Environments**. The construction of shared, archived, and documented data, publication, or software resources that can accelerate the rate of scientific discovery.

The topics listed above are not intended to represent the complete set of issues comprising the area; they are intended to be suggestive rather than limiting.

Scope and Scale of Support of Science and Engineering Informatics (SEI)

The awards are anticipated to provide support for inter-disciplinary teams, that is, researcher(s) in computer and information science and engineering collaborating with domain scientist(s) or engineer(s). A typical award is expected to be for 3 years, although awards of longer duration are possible. The fiscal year 2004 plan includes $6.5 million for awards under this part of the solicitation, contingent on the quality of projects proposed and the availability of funds.

B. Information Integration (II)

Traditionally, an individual researcher developed hypotheses, designed experiments to test these hypotheses, collected

observational data, and published results based on experiments. The data were often published in print to allow others to build upon or verify the results. In nearly every field of 21st century science and engineering, including all of the disciplines funded by the NSF, research is now achieved by teams of researchers analyzing data sets that are far too large to publish in journals and sometimes collected independently by other scientists with different goals in mind. The goal of information integration research is to provide the necessary foundations to provide science and engineering researchers seamless access to a multitude of independently developed, heterogeneous data sources.

Information integration seeks to maximally exploit available information to create new scientific knowledge. Effective information integration will also enhance public education by facilitating comprehensive access to distributed information resources. Even though the Information Integration effort is directed specifically at science and engineering information, the research results developed under this research activity are expected to be broadly applicable to information of all kinds. The focus of this area is integrating information, not manipulating it after the integration.

The information integration environment should have the following capabilities:

- Integrate many different, disparate and possibly distributed sources;
- Support automated discovery of new data sources and information within them;
- Facilitate configuration, management and system maintenance;
- Incorporate structured, semi-structured, text, image, video, time-series, 3D images, citations, graphs, and data streams; and
- Provide flexible querying of the sources and the data.

Some of the specific challenges include:

1. **Unifying Data Models and System Descriptions**: There is a need to develop stronger theoretical foundations for the representation and integration of information of various types from extant data models (e.g., temporal, spatial and image data, textual data, spectrum data, engineering design data, materials data, chemical compounds, sequences, graphs, user-defined objects) as well as the scientific literature into conceptually coherent views. Specific topics include: metadata management and integration; the automated collection of metadata from instruments and processes that transform data, ontologies and taxonomies; data/knowledge calibration; heterogeneity of data type and format; scale of distributed systems; rapid integration of new information sources. Research in this area must consider the special data characteristics associated with science and engineering disciplines.
2. **Reconciling heterogeneous formats schemas and ontologies**: The fundamental problem in any data sharing application is that systems are heterogeneous in many different aspects, such as different ways of representing data and/or knowledge about the world, different representation mechanisms (e.g., relational databases, legacy systems, XML schemas, ontologies), different access methods and policies. In order to share data among heterogeneous sources, approaches to form a semantic mapping of their respective representations are needed to avoid manual intervention in each step of converting and merging data resources.
3. **Web semantics**: Data on the web needs to be defined and linked in a way that it can be used by machines not just for display purposes, but also for automation, integration and reuse of data across various applications. Supported research topics will include frameworks for describing resources, methods of automating inferences about web data and resources, and the development of interoperable ontologies, mark up languages and representations for specific scientific domains.
4. **Decentralized data-sharing**: Traditional data integration systems use a centralized mediation approach, in which a centralized mediator, employing a mediated schema, accepts user queries and reformulates them over the schemas of the different sources. However, mediated schemas are often hard to agree upon, construct and maintain. For example, labs conducting geosciences research share their experimental results with each other, but may do it in an ad hoc fashion. A similar scenario is found in data sharing among government agencies. Architectures and protocols that enable large-scale sharing of data with no central control are needed.
5. **Data-sharing on advanced cyberinfrastructure:** Research topics will include models for federating information resources in advanced grid computing and/or Web services, integration and understanding of sensor information, the collection of metadata from sensors including models and tools to cope with the scale, pervasiveness, concurrency and redundancy of sensor data. Effective integration of network management information will be critical to enable basic networking functions such as routing, overlay node placement, denial-of-service detection, and fault recovery. The integration of network management information will facilitate adapting network resources to changing conditions.
6. **On-the-fly integration**: Currently, data integration systems rely on relatively static configurations with a set of long-lived data sources. On-the-fly integration refers to scenarios where one wants to integrate data from a source immediately after discovering it. We may use a source only a few times for a particular set of tasks. The challenge is to significantly reduce the time and skill needed to integrate data sources so that scientists can focus on domain problems instead of information technology problems.
7. **Information Integration Resources**: Proposals are encouraged that create toolkits for data integration that can be shared among researchers. These toolkits should remove the need for implementing an entire data integration system from scratch for every project and will facilitate large-scale collaborations. There will also be a need for a small number of test beds to validate the techniques being pursued by the funded projects in this theme area. More definite progress will be made if competing techniques can be evaluated on a level playing field. Thus, proposals for

innovative test beds and evaluation methodology are also encouraged.

Scope and Scale of Support of Information Integration (II)

The awards are anticipated to provide support for inter-disciplinary teams, that is, researcher(s) in computer and information science and engineering collaborating with domain scientist(s) or engineer(s). A typical award is expected to be for 3-5 years. The fiscal year 2004 plan includes $8 million for awards under this part of the solicitation, contingent on the quality of projects proposed and the availability of funds.

EDUCATION AND WORKFORCE DEVELOPMENT

Education to develop and maintain both a highly skilled SEIII workforce and an informed populace is essential to the nation. To develop, maintain, and enhance this critical educational infrastructure, all proposals must include an educational component. Proposals must specifically describe their educational contributions. Appropriate goals include integration of research and education, promotion of knowledge transfer, reaching diverse populations and promoting diversity.

Sample activities include: developing materials to integrate SEIII into existing courses; providing access to science data, both raw and refined, to the general public; mentoring faculty of K-12 institutions; creating tutorial material to bring an understanding of the applicability of state-of-the art information technology to specific scientific communities; and developing online resources for faculty and students.

III. ELIGIBILITY INFORMATION

The categories of proposers identified in the Grant Proposal Guide are eligible to submit proposals under this program announcement/solicitation.

IV. AWARD INFORMATION

Estimated program budget, number of awards, and average award size/duration are subject to the availability of funds. The NSF anticipates making 25-30 Standard or Continuing Grants under this solicitation in FY 2004. The estimated program budget for FY 2004 is $14.5 million.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Instructions:

- Full proposals submitted via FastLane:

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

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

- Full proposals submitted via Grants.gov:

Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/bfa/dias/policy/docs/grantsgovguide.pdf). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the **Apply Step 1: Download a Grant Application Package and Application Instructions** link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

Supplemental Proposal Preparation Instructions For Use Whether Submitting via either FastLane or Grants.gov:

Special attention should be paid to the following items when submitting a proposal to SEIII Program:

Proposal Titles: To assist NSF staff in sorting proposals for review, proposal titles should begin with "SEI:" or "II:", corresponding to the major technical areas of the solicitation. The title may be prefixed with "SEI+II:" when significant aspects of both technical areas are involved. Proposals for SEI projects involving applications in a particular scientific discipline may also choose to give the label of the NSF directorate primarily concerned with that research area [e.g., a title may begin with "SEI(GEO):" or "SEI(BIO):"]. NSF will, however, make the final decision on where to review each proposal.

B. Budgetary Information

Cost Sharing:

Cost sharing is not required by NSF in proposals submitted under this Program Announcement.

C. Due Dates

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

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

March 04, 2004

December 15, 2004

December 15, annually

D. FastLane / Grants.gov Requirements

- For proposals submitted via FastLane:

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

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Proposers are no longer required to provide a paper copy of the signed Proposal Cover Sheet to NSF. Further instructions regarding this process are available on the FastLane Website at: http://www.fastlane.nsf.gov

- For proposals submitted via Grants.gov:

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

  The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: http://www.grants.gov/CustomerSupport. In addition, the NSF Grants.gov Application Guideprovides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

  Submitting the Proposal. Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

The National Science Board approved revised criteria for evaluating proposals at its meeting on March 28, 1997 (NSB 97-72). All NSF proposals are evaluated through use of the two merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

On July 8, 2002, the NSF Director issued Important Notice 127, Implementation of new Grant Proposal Guide Requirements Related to the Broader Impacts Criterion. This Important Notice reinforces the importance of addressing both criteria in the preparation and review of all proposals submitted to NSF. NSF continues to strengthen its internal processes to ensure that both of the merit review criteria are addressed when making funding decisions.

In an effort to increase compliance with these requirements, the January 2002 issuance of the GPG incorporated revised proposal preparation guidelines relating to the development of the Project Summary and Project Description. Chapter II of the GPG specifies that Principal Investigators (PIs) must address both merit review criteria in separate statements within the one-page Project Summary. This chapter also reiterates that broader impacts resulting from the proposed project must be addressed in the Project Description and described as an integral part of the narrative.

Effective October 1, 2002, NSF will return without review proposals that do not separately address both merit review criteria within the Project Summary. It is believed that these changes to NSF proposal preparation and processing guidelines will more clearly articulate the importance of broader impacts to NSF-funded projects.

The two National Science Board approved merit review criteria are listed below (see the Grant Proposal Guide Chapter III.A for further information). The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which he/she is qualified to make judgments.

What is the intellectual merit of the proposed activity?
How important is the proposed activity to advancing knowledge and understanding within its own field or across

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

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

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

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

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

B. Review Protocol and Associated Customer Service Standard

All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this announcement/solicitation will be reviewed by Ad Hoc 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.

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 Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

NSF is striving to be able to tell proposers whether their proposals have been declined or recommended for funding within six months. The time interval begins on the closing date of an announcement/solicitation, or the date of proposal receipt, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program Division

administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See section VI.A. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (NSF-GC-1); * or Federal Demonstration Partnership (FDP) Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

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

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpm. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Website at http://www.gpo.gov.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for the PI and all Co-PIs. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project reporting system, available through FastLane, for preparation and submission of annual and final project reports. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding this program should be made to:

- James C. French, Program Director, Directorate for Computer & Information Science & Engineering, Division of Information and Intelligent Systems, 1125 S, telephone: (703) 292-8930, fax: (703) 292-9073, email: jfrench@nsf.gov
- Sylvia Spengler, Program Director, Directorate for Computer & Information Science & Engineering, Division of Information and Intelligent Systems, 1125 N, telephone: (703) 292-8936, fax: (703) 292-9073, email: sspengle@nsf.gov

Other divisions within CISE and other Directorates within NSF are interested in aspects of this solicitation. PIs are encouraged to designate additional programmatic interest in their submissions to this solicitation.

For questions related to the use of Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representative (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of the application, please contact via telephone: 1-800-518-

4726; e-mail: support@grants.gov.

For questions related to the use of FastLane, contact:

- Velma J. Swales, Lead Program Assistant, Directorate for Computer & Information Science & Engineering, Division of Information and Intelligent Systems, 1125 S, telephone: (703) 292-7845, fax: (703) 292-9073, email: vswales@nsf.gov

IX. OTHER PROGRAMS OF INTEREST

The NSF *Guide to Programs* is a compilation of funding for research and education in science, mathematics, and engineering. The NSF *Guide to Programs* is available electronically at http://www.nsf.gov/cgi-bin/getpub?gp. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF E-Bulletin, which is updated daily on the NSF Website at http://www.nsf.gov/home/ebulletin, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's MyNSF News Service (http://www.nsf.gov/mynsf/) to be notified of new funding opportunities that become available.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities and persons with disabilities to compete fully in its programs. In accordance with Federal statutes, regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF, although some programs may have special requirements that limit eligibility.

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the GPG Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

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; project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to applicant institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies needing information as part of the review process or in order to coordinate programs; and to another Federal agency, court or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to an information collection unless it displays a valid OMB control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne Plimpton, Reports Clearance Officer, Division of Administrative Services, National Science Foundation, Arlington, VA 22230.

OMB control number: 3145-0058.