Information Technology Research (ITR)

Program Solicitation

NSF 01-149

DIRECTORATE FOR BIOLOGICAL SCIENCES
DIRECTORATE FOR COMPUTER AND INFORMATION SCIENCE AND ENGINEERING
DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
DIRECTORATE FOR ENGINEERING
DIRECTORATE FOR GEOSCIENCES
DIRECTORATE FOR MATHEMATICAL AND PHYSICAL SCIENCES
DIRECTORATE FOR SOCIAL, BEHAVIORAL, AND ECONOMIC SCIENCES
DIVISION OF INTERNATIONAL PROGRAMS
OFFICE OF POLAR PROGRAMS

PRELIMINARY PROPOSAL DUE DATES(S) (*required for large projects only*): November 9, 2001

FULL PROPOSAL DEADLINE(S) :

April 4, 2002	**Large projects: Pre-proposals are mandatory and are due by November 9, 2001. Only PIs with pre-proposals that are invited by NSF may submit a full proposal. NSF will return feedback to pre-proposal PIs by the week of February 15, 2002.**
November 13, 2001	**Medium projects: Proposals are due by November 13, 2001.**
February 6, 2002	**Small projects: Proposals are due by February 6 - 7, 2002. If you are submitting to a directorate other than CISE, the deadline is February 6th. All Small proposals submitting to CISE have a deadline of February 7th.**

NATIONAL SCIENCE FOUNDATION

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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: (301) 947-2722

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

SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Title: Information Technology Research (ITR)

Synopsis of Program: Information Technology (IT) today pervades science, engineering, education, and society in ways that are still changing and need to be understood. Much of US economic growth is attributed to IT developments, and we now rely on IT for research, education, entertainment, health care, and many other aspects of life. NSF supports research that extends IT, improves our understanding of IT and its effects, and helps prepare Americans for the Information Age.

In FY 2000, the NSF Information Technology Research (ITR) program focussed on IT fundamental research and education; in the second year, a focus on research and education activities that sought to apply information technology to science and engineering challenges at large was added; and in the current year, the program will expand further to enable research and education in multidisciplinary areas, focusing on emerging opportunities at the interfaces between information technology and other disciplines. This program seeks innovative projects in research and education that elucidate, expand and exploit IT.

Cognizant Program Officer(s):

- William Bainbridge, Dr., SBE, telephone: (703) 292-7470, e-mail: wbainbri@nsf.gov.
- John Cherniavsky, Dr., EHR, telephone: (703) 292-5136, e-mail: jchernia@nsf.gov.
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- Eugene Bruce, Dr., BIO, telephone: (703) 292-8413, e-mail: ebruce@nsf.gov.
- Ronald Rardin, Dr., ENG, telephone: (703) 292-7081, e-mail: rrardin@nsf.gov.
- Mark Suskin, Dr., INT, telephone: (703) 292-8702, e-mail: msuskin@nsf.gov.

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

- 47.074 --- Biological Sciences

- 47.070 --- Computer and Information Science and Engineering
- 47.076 --- Education and Human Resources
- 47.041 --- Engineering
- 47.050 --- Geosciences
- 47.049 --- Mathematical and Physical Sciences
- 47.078 --- Office of Polar Programs
- 47.075 --- Social, Behavioral and Economic Sciences

ELIGIBILITY INFORMATION

- **Organization Limit:** Only U. S. academic institutions and non-profit research institutions may submit pre-proposals and full proposals.

  NSF encourages proposers to collaborate with international researchers, for-profit corporations, and national laboratories. However, in keeping with the Agency's desire to stress educational benefits of this funding, proposals will only be accepted from U.S. institutions of higher education and from U.S. non-profit institutions with a strong educational component. For-profit organizations, government laboratories operated by other agencies and foreign institutions may not apply directly; they may receive subawards, but such subawards must be justified by explaining what unique capability is being made accessible. In no case will NSF support salaries of regular Federal employees of other agencies.

- **PI Eligibility Limit:** An individual may appear as PI, co-PI, or Senior Personnel on no more than two ITR proposals.

- **Limit on Number of Proposals:** Only as stated in the PI Eligibility Limit.

AWARD INFORMATION

- **Anticipated Type of Award:** Standard and Continuing grants for Small and Medium projects; Cooperative Agreements for Large projects. Please see Section IV. in the full solicitation for more details.

- **Estimated Number of Awards:** The number and type of awards are dependent upon available funding. Please see the full solicitation (Section IV.) for more information.

- **Anticipated Funding Amount:** NSF intends to spend approximately $130 Million in Fiscal Year 2002 on proposals received in response to this solicitation. The actual funding level depends on Congressional action.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

- **Preliminary Proposals:** Submission of Preliminary Proposals is required for large projects only. Please see the full program announcement/solicitation for further information.
- **Full Proposals:** Supplemental Preparation Guidelines
    - The program announcement/solicitation contains supplements to the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full program announcement/solicitation for further information.

B. Budgetary Information

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

C. Deadline/Target Dates

- **Letters of Intent (*optional*):** None
- **Preliminary Proposals (*required for large projects* only):** November 9, 2001
- **Full Proposal Deadline Date(s):**

April 4, 2002	**Large projects:** Pre-proposals are mandatory and are due by November 9, 2001. Only PIs with pre-proposals that are invited by NSF may submit a full proposal. NSF will return feedback to pre-proposal PIs by the week of February 15, 2002.
November 13, 2001	**Medium projects:** Proposals are due by November 13, 2001.
February 6, 2002	**Small projects:** Proposals are due by February 6 - 7, 2002. If you are submitting to a directorate other than CISE, the deadline is February 6th. All Small proposals submitting to CISE have a deadline of February 7th.

D. FastLane Requirements

- **FastLane Submission:** Required
- **FastLane Contact(s):**
    - FastLane User Support, telephone: (800) 673-6188, e-mail: fastlane@nsf.gov.

PROPOSAL REVIEW INFORMATION

- **Merit Review Criteria:** National Science Board approved criteria. Additional merit review considerations apply. Please see the full program announcement/solicitation for further information.

AWARD ADMINISTRATION INFORMATION

- **Award Conditions:** Standard NSF award conditions apply.

- **Reporting Requirements:** Additional reporting requirements apply. Please see the full program announcement/solicitation for further information.

I. INTRODUCTION

Today IT is essential for our economy, our research, our education, and many other areas of life. Critical national problems in health care, the environment, government operations, teaching and scholarship all require IT knowledge for their solution. This solicitation requests proposals that address fundamental research and education in IT; IT implications for individuals, society, and scholarship; or application areas at the intersection of IT and other science or engineering disciplines.

ITR support is available for up to five years to support long-term, multidisciplinary research and education projects. Project outcomes will augment the knowledge base and increase the workforce needed to enhance the value of Information Technology (IT) for everyone.

II. PROGRAM DESCRIPTION

Information Technology is a broad subject, with applications and effects throughout the sciences, engineering, education, the economy, the humanities, and society in general. IT deals with how we develop and use information, how we make sense of it, how we compute, and how we communicate and make decisions. In many cases, the scale and scope of opportunities and challenges require research approaches that cover many parts of the IT field and other areas.

In FY2002, NSF's ITR investments will be focused in three multidisciplinary areas: software and hardware systems; augmenting individuals and transforming society; and advancement of the frontiers of science via information technology. Examples of challenges that might be addressed in each of the three focus areas are described below. NSF understands that proposals may span more than one of these areas and encourages submission of such proposals.

1. SOFTWARE AND HARDWARE SYSTEMS

Proposals in this area should help create new complex systems for research and education. Proposed research and education activities might include:

• Balancing hardware and software and balancing computation and communication in systems architecture.

• Scaling up to very large systems, both in number of components, geographic distribution, and participation by people and devices.

• Learning how to predict reliability and performance in enormous systems and ensure robust and dependable operation.

• Communicating with devices embedded in many kinds of equipment and places, including needs for wireless connectivity and managing sensors and physically active devices.

• Understanding how to share information and instrumentation among groups of people and equipment, and how to build and best use information technology inside buildings, instruments, and other physical and engineering systems.

• Experimenting with information technologies included in physical systems.

Examples of these problems include Grid Computing, Virtual Reality / Telepresence, Hybrid and Embedded Systems, and High Performance Networking and Middleware Applications. Research and education in systems design will support IT in all areas of science, engineering and humanities, and extend access to world-class resources across the nation. (Projects in this focus area must involve new kinds of IT research and education; building production infrastructure is not responsive.)

2. AUGMENTING INDIVIDUALS AND TRANSFORMING SOCIETY

Projects in this focus area should aim at understanding how people use information, how they can use it more easily, and how more and more people can use IT for more and more tasks. We seek to amplify human physical, mental and sensory abilities, to enhance the performance and experiences of human beings in a variety of activities, occupations, and social contexts. Research and education activities should build upon the current knowledge base about human perception, cognition, communication, and physical response, in a way that adds to it. Proposed activities might include investigations of:

• Autonomous, highly automated, and mixed-initiative systems technologies to provide new human-enabling physical devices and systems that enhance physical capability, automate physical tasks, or deliver therapies or treatment. This includes interfaces for the differently-abled, including those whose abilities are changing due to aging.

• Better use of information for societal use, including new ways of searching, organizing, preserving, and interacting with large information resources in the sciences, engineering and in the humanities. The creation and support of interoperable, wide-area data systems or digital libraries which include a range of numerical, image, sound, video and textual data is encouraged.

• Multi-lingual systems to serve the needs of multi-national industry, collaborating science teams, or virtual cultural exchanges.

• Changes in business, labor and organizational processes, telecommuting, mobile and distributed work practices, organizational productivity, and new technologies and designs for reliable e-commerce and effective electronic markets.

• Technologies for assisting in teaching, learning, collaboration, and creating educational environments.

• Opportunities for informed citizen participation and improved interactions between government institutions and their constituents.

• Ethical and value-sensitive information design, information privacy, and intellectual property protection and infringements.

• Theories and methods for linking IT design to social and economic outcomes.

• Changes in the conduct of science, engineering, and the humanities driven by information technology.

In general, proposals to this focus area should improve the ability of people and of our society to use information technology effectively and in new ways.

3. SCIENTIFIC FRONTIERS AND INFORMATION TECHNOLOGY

This focus area will support research and education activities at the interfaces of information technology and science and engineering. Projects may be either theoretical or empirical. Among the kinds of projects encouraged are those that seek to:

• Create new instruments with new capabilities;

• Use computation to explore new science and/or engineering concepts;

• Develop new paradigms for computing (e.g., DNA or quantum computing).

Examples of such projects are:
• Acquiring spatial data and using it in large-scale predictive models;

• Computational methods for looking at stochastic and nonlinear dynamical factors in complex systems;

• Stochastic models of human interactions;

• Computational predictions of rare, catastrophic, or revolutionary events;

• Analysis, modeling and optimizing of multi-scale phenomena;

• Knowledge discovery, visualization and interpretation of large-scale heterogeneous data sets;

• Integrating data from multiple sources and creating consistent data sets over vast scales in space and time;

• New algorithms for geometrical objects;

• Hybrid discrete and continuous models of system designed to control physical systems;

• Tools for high-confidence software and systems;

• Construction of databases, and innovative database structures using districted and very dense storage systems, and novel methods for information retrieval; and

• Innovative uses of the Internet in science and engineering.

Some of the representative problems and subjects in science and engineering appropriate for this focus area are:

• Computational biology, including modeling and simulation at all scales from molecular to environmental. Examples are relating genomic and proteomic information to the development and function of organisms.

• Biological system informatics, such as the analysis, annotation and curation of genomic, organismal, or ecosystem information, and including data mining and data modeling in biological contexts and integrating primary databases. Relevant examples include techniques for parsing genomes; predicting structure from sequence in RNA and proteins; building and verifying complex biological networks; algorithms for designing, managing, and linking databases; development of new tools for analysis at all levels of biology; and development of innovative data structures for handling biodiversity data at many scales of time and space, as well as the millions of different species that are part of the Tree of Life.

• Comprehensive models that may include ensemble forecasting, nesting and/or data assimilation techniques to understand the complex interactions taking place in the Earth system and provide better predictive capability of phenomena ranging from natural hazards to biogeochemical cycles, space weather and climate change; methods and co laboratories for the integration of heterogeneous environmental data sets from multiple observatories into models.

• The physics of the universe, the interfaces of the mathematical and physical sciences with the biological and environmental sciences, quantum information sciences, computational materials research, science at the nanoscale, and novel computational methods, e.g., computational data grids for the collection and distributed analysis of massive data sets.

• High-end computing tools to accelerate the design of next generation IT manufacturing techniques in areas such as photonic crystals, optical and electronic switching devices, sensors, and detectors; simulation-based modeling and computing of multi-scale materials properties and microstructure-based materials design; and productivity tools for design, planning and control of spatially and ownership-distributed virtual manufacturing, supply chain and distribution systems.

• Activities in which psychology and language sciences collaborate closely with computer and information sciences to achieve advances in language-information technology, such as documentation and comparison of linguistic diversity to reveal the cognitive architecture that supports human language, and sophisticated study of variation in how individuals learn and use language.

For reviewing purposes, proposals are divided into three classes by size of budget. The Size Classes section below describes the criteria by which each class will be evaluated. PIs should familiarize themselves with these classes to ensure that they submit to the correct deadline.

SIZE CLASSES

1. Small Projects (up to $500,000 total budget)
These proposals should be individual or small-group projects, should be innovative and high risk, and must focus on activities in the focus areas above. The scope and budget of these projects are limited to a total budget of $500,000. All small proposals must be directed to a particular directorate, which will be responsible for proposal evaluation; the title of each

proposal should begin “ITR:” to identify it, as well as this program solicitation number when submitting in FastLane. Proposers should consult the directorate contact to determine whether the subject matter of the proposal is suitable and encouraged for the ITR competition in that directorate.

2. Medium Projects (up to $5 million total budget and no more than $1M/year)
In this size class, proposals should describe substantial and ambitious research and education projects (e.g., multi-disciplinary activities with multiple PIs and/or institutions). Similar to the expectations for Small projects, a high premium is placed on innovation in fundamental IT research, IT applications, and IT education and infrastructure. While high-risk and high-payoff proposals are encouraged, it is also expected that Medium project descriptions will provide preliminary results to justify their proposed approach. These projects should additionally explain why a budget of this size is required to carry out the proposed activities. Generally, the larger the budget, the more carefully its size must be justified. Proposals for Medium projects should describe plans for distributing the results of their research and should strive to assist scientists and engineers to use their results in ways that go beyond traditional academic publications.

3. Large Projects (up to $15 million, total budget and no more than $3 million/year)
Pre-proposals are required for Large projects. Pre-proposals will be peer reviewed in the usual way, and feedback from the pre-proposal evaluation process will be binding. Only pre-proposal PIs invited by NSF are eligible to submit full proposals. Only one full proposal (or set of collaborative proposals) may be submitted for each invited pre-proposal. In this size class, NSF seeks proposals that address very large, long-term, coordinated research and education efforts. Proposals for Large projects should address research that is innovative in terms of its ideas, scale, or integration of its parts. Proposals in this size class should carefully justify the need for an effort of such magnitude. It is very important that the project be an integrated whole rather than a collection of independent pieces. Proposals in this class must contain an explicit management plan that is appropriate to the coordination of the proposed activities and demonstrates the advantages of the large project structure.

NSF has particular responsibility for educational and community-extending activities. We expect that Large projects will include one or more community-extending concepts such as creative undergraduate education activities, programs to address the under-representation of women and minorities in IT, links to institutions with strong traditions of teaching, mentoring and workforce development, and/or participation by institutions in EPSCoR states.

NSF expects that knowledge generated by the Large projects will be useful to the science and engineering communities. Proposals in this class must address plans for distributing software, data or other products developed in the course of the research. The project should strive to assist users by 1) maintaining software repositories with documented, portable implementations of algorithms and other software tools, 2) hosting tutorials and workshops to promote community interest, understanding, and use of new methods, 3) increasing the level of education in IT-related disciplines at either the undergraduate or graduate level, 4) publishing technical specifications and schematics of hardware designs, 5) making databases and unique hardware accessible on the Web, or 6) some other alternative means. Note: Consult Grant Proposal Guide section VII.K on Legal Rights To Intellectual Property.

For additional information related to the ITR program, Awards Listings for ITR 2000 and ITR 2001, responses to Frequently Asked Questions (FAQ), and other notices, see the ITR Home Page at http://www.itr.nsf.gov/.

III. ELIGIBILITY INFORMATION

• Organization Limit: Only U. S. academic institutions and non-profit research institutions may submit pre-proposals and full proposals.

• PI Eligibility Limit: An individual may appear as PI, co-PI, or Senior Personnel on no more than two ITR proposals.

NSF encourages proposers to collaborate with international researchers, for-profit corporations, and national laboratories. However, in keeping with the Agency's desire to stress educational benefits of this funding, proposals will only be accepted from U.S. institutions of higher education and from U.S. non-profit institutions with a strong educational component. For-profit organizations, government laboratories operated by other agencies and foreign institutions may not apply directly; they may receive subawards, but such subawards must be justified by explaining what unique capability is being made accessible. In no case will NSF support salaries of regular Federal employees of other agencies.

IV. AWARD INFORMATION

Under this solicitation, proposals may be submitted in either of three size classes:
• Small projects up to $500K total award;

• Medium projects, $500K to $5 million in total, but no more than $1 million/year; and

• Large projects, $5-15 million in total budget, but no more than $3 million/year.

A proposal may request funding for up to five years. NSF expects to make awards in each of these size classes and in a variety of durations. The distribution of awards between the size classes will depend on the number and quality of proposals received in the competition in each class. If proposals follow past patterns, NSF expects to spend 30% of the funding on Small projects, 50-60% on Medium projects, and 10-20% on Large projects. It is difficult to estimate the number of awards; a possible scenario is 60-90 small awards, 40-50 medium awards, and 3-4 large awards. NSF expects to spend approximately $130M in FY02 on proposals received in response to this solicitation. The actual funding level depends on Congressional action. The anticipated date of awards for Small projects is June 30, 2002; for Medium projects is April 30, 2002; and for Large projects is August 31, 2002. The anticipated start date for Small awards is August 2002, Medium and Large awards is October 2002.

The anticipated type of awards are Standard and Continuing grants comprising (1) Small projects (cumulative budgets up to $500,000); and (2) Medium projects (cumulative budgets ranging from $500,000 to $5 million); Cooperative Agreements for (3) Large projects (cumulative budgets $5 million -$15 million). These budgets are total amounts including subaward and

indirect costs. In the case of collaborative proposals, the thresholds apply to the sum of the proposal budgets. No project may have a duration exceeding five years.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals: Preliminary proposals are required for Large projects only. No letters of intent are required. Proposers are reminded to identify the program solicitation number (NSF 01-149) in the program solicitation block on the proposal Cover Sheet (NSF Form 1207). Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may result in exclusion of the proposal from the ITR competition. "INFORMATION TECHNOLOGY RESEARCH" will automatically be entered as the first NSF organizational unit for consideration. On the screen that follows, select the ITR Program: ITR Large. Next, select one of the NSF CISE Directorate Divisions for primary consideration of your pre-proposal. After the primary CISE division has been selected, you may choose to select a secondary organizational unit from all of NSF. (Scroll down the screen to the “Show All NSF Units” button, and select the most appropriate area).

GPG guidelines should be augmented with the following additions:

1. Pre-proposal Titles: to assist NSF staff in sorting pre-proposals for review, pre-proposal titles should begin with “ITR:”.

2. Multi-institutional Projects: only one pre-proposal should be submitted. If a full proposal is invited, it may be submitted as a single proposal (with subawards), or as a set of collaborative ("linked") proposals.

3. Project Summary: A one-page project summary should be provided to assist in sorting and processing all pre-proposals.

4. Project Description: a pre-proposal project description is limited to five pages

• **Management Plan:** Up to one additional page is allowed in pre-proposals to discuss the management plan for the proposed activities. This page should be included in the project description section, which would bring the project description page count to six.

• **Prior Results:** Not required for pre-proposals.

5. References Cited: up to one page of references may be included

6. Biographical Information: limited to two pages per PI and co-PI in pre-proposals.

7. Budget: Prepare a one-page cumulative budget for the full duration of the project. The budget need not be detailed but should be sufficient for reviewers to grasp the intended scale of the proposed project. (In FastLane, enter your cumulative budget in Budget Year 1. FastLane will then automatically generate a cumulative budget for your proposal.) The lead institution should include the budget information for the other institutions as subawards. The budget justification

should describe the subawardee budgets in enough detail to judge the scope of the project at each institution; typically this would include total personnel, equipment, travel, and other direct and indirect costs.

8. Supporting Letters: Do not include letters of support with pre-proposals. If the PI(s) anticipates providing such letters with the full proposal, and believes that it is important for the referees to know about these letters, a brief description of the supporting information may be included in the 6-page project description of the pre-proposal.

9. Current or Pending Support: is required for pre-proposals for all PIs and co-PIs.

10. Cover Page (Form 1207)

11. List of all Personnel Associated with the Pre-Proposal: All pre-proposals must include one page in the Supplementary Documents section listing the names and institutional affiliations of all persons associated with the project. This information is necessary to identify conflicts with reviewers.

12. International Collaborations: Pre-proposals involving international collaborations must address the international aspects of the work in the management plan.

Full Proposal:

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 Web Site at: http://www.nsf.gov/cgi-bin/getpub?gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

No letters of intent are required. Proposers are reminded to identify the program solicitation number (NSF 01-149) in the program solicitation block on the proposal Cover Sheet (NSF Form 1207). Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may result in exclusion of the proposal from the ITR competition. "INFORMATION TECHNOLOGY RESEARCH" will automatically be entered as the first NSF organizational unit for consideration. On the screen that follows, select the ITR Program (ITR Small, ITR Medium, or ITR Large). Please follow the steps below for the following size classes:

• Medium and Large proposers must select one of the NSF CISE Directorate Divisions for primary consideration of your pre-proposal or proposal. After the primary CISE division has been selected, you may choose to select a secondary organizational unit from all of NSF. (Scroll down the screen to the “Show All NSF Units” button, and select the most appropriate area).

• Small proposals (under $500K) may select any NSF Unit appropriate to your proposal for primary consideration. A secondary organizational unit may also be selected. (Scroll down the screen to the “Show All NSF Units” button, and select the most appropriate area).

NSF expects to use the secondary organizational unit in assigning the proposal for review. However, NSF reserves the right to reassign proposals as needed to obtain the best technical review.

Only pre-proposal PIs that are invited by NSF are eligible to submit Large project proposals. Only one full proposal (or set of collaborative proposals) may be submitted for each invited pre-proposal.

GPG guidelines should be augmented with the following additions:

1. Proposal Titles: To assist NSF staff in sorting proposals for review, proposal titles should begin with "ITR:".

2. Project Summary: Project summaries should be carefully written to describe the project for a general science audience since this section has wide distribution within the Foundation as it plans review of the project and, in the case of an award, is often used to generate the public abstract of the resulting award.

3. Project Description: Project descriptions are limited to 15 pages total length, except for management plan descriptions for Medium and Large projects. Up to two additional pages are allowed to describe the management plan for Medium projects. Up to three additional pages are allowed for Large projects to discuss the management plan. Large projects should provide at least one person to deal with administration, evaluation and outreach functions in the management plan description.

• **International Collaborations:** proposals must address the international aspects of the work, if any. This may be done in the management plan and should identify the names and institutions of the international collaborators, the nature and goals of their activities, and the international synergies and benefits to be gained from the collaboration.

• **Prior Results:** should be included in the project description section, describing results from prior NSF support. This information must be covered within the 15 page limit, and only those results relevant to the proposed project should be described.

4. List of all Personnel Associated with the Proposal: All proposals must include one page in the Supplementary Documents section listing the names and institutional affiliations of all persons associated with a proposal. This information is necessary to identify conflicts with referees.

5. Cost Sharing Requirements
No cost sharing is required for this program. If cost sharing is offered and the project is funded, cost sharing will be monitored carefully.

Proposers are reminded to identify the program solicitation number (NSF 01-149) in the program announcement/solicitation block on the proposal Cover Sheet (NSF Form 1207). 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 is not required in proposals submitted under this Program Solicitation.

C. Deadline/Target Dates

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

Preliminary Proposals (*required for large projects only*): November 9, 2001
Full Proposals *by 5:00 PM local time*:

April 4, 2002	**Large projects:** Pre-proposals are mandatory and are due by November 9, 2001. Only PIs with pre-proposals that are invited by NSF may submit a full proposal. NSF will return feedback to pre-proposal PIs by the week of February 15, 2002.
November 13, 2001	**Medium projects:** Proposals are due by November 13, 2001.
February 6, 2002	**Small projects:** Proposals are due by February 6 - 7, 2002. If you are submitting to a directorate other than CISE, the deadline is February 6th. All Small proposals submitting to CISE have a deadline of February 7th.

All deadlines are 5:00 p.m. PI's local time (for example, the deadline for a university in Oregon will be 8 p.m. in Washington, DC). For multi-institutional collaborative proposals, the deadline applies to each submitting institution separately.

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this Program Solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: http://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call 1-800-673-6188 or e-mail fastlane@nsf.gov.

Submission of 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 certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane website at: http://www.fastlane.nsf.gov.

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

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.

Proposals will be reviewed against the following general review criteria established by the National Science Board. Following each criterion are potential considerations that the reviewer may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Each reviewer will be asked to address only those that are relevant to the proposal and for which he/she 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 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?

Principal Investigators should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both of the above-described NSF merit review criteria. NSF staff will give these elements careful consideration 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
Innovation in Information Technology and its Application to Science or Engineering
As a part of the intellectual merit of a pre-proposal or full proposal, ITR emphasizes the importance of novel, high-risk, and high-impact research. Is the proposal highly innovative, rather than an incremental improvement on standard ideas? Does it promise exciting advances, even if there is some chance of failure?

A summary rating and accompanying narrative will be completed and signed 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.

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 Mail 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.

NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months for 70 percent of proposals. The time interval begins on the date of receipt. The interval ends when the Division Director accepts the Program Officer's recommendation.

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

*These documents may be accessed electronically on NSF's Web site at http://www.nsf.gov/home/grants/grants_gac.htm. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 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 Web site at http://www.nsf.gov/cgi-bin/getpub?gpm. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Web site 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.

Large and Medium projects may be site visited one or more times. For Large projects, NSF anticipates that a successful review of progress after approximately two years of work will be essential for the authorization of later funding.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

NSF has implemented an electronic project reporting system, available through FastLane. 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 Information Technology Research should be made to:

- William Bainbridge, Dr., SBE, telephone: (703) 292-7470, e-mail: wbainbri@nsf.gov.
- John Cherniavsky, Dr., EHR, telephone: (703) 292-5136, e-mail: jchernia@nsf.gov.
- Eric Itsweire, Dr., GEO, telephone: (703) 292-8582, e-mail: eitsweir@nsf.gov.
- Michael Lesk, Dr., CISE, telephone: (703) 292-8930, e-mail: mlesk@nsf.gov.
- Dennis Peacock, Dr., OPP, telephone: (703) 292-8033, e-mail: dpeacock@nsf.gov.
- Barry Schneider, Dr., MPS, telephone: (703) 292-7383, e-mail: bschneid@nsf.gov.
- Eugene Bruce, Dr., BIO, telephone: (703) 292-8413, e-mail: ebruce@nsf.gov.
- Ronald Rardin, Dr., ENG, telephone: (703) 292-7081, e-mail: rrardin@nsf.gov.
- Mark Suskin, Dr., INT, telephone: (703) 292-8702, e-mail: msuskin@nsf.gov.

For questions related to the use of FastLane, contact:

- FastLane User Support, telephone: (800) 673-6188, e-mail: fastlane@nsf.gov.

IX. OTHER PROGRAMS OF INTEREST

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

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

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 (unless otherwise specified in the eligibility requirements for a particular program).

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 program announcement/solicitation for further information.

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, FIRS at 1-800-877-8339.

The National Science Foundation is committed to making all of the information we publish easy to understand. If you have a suggestion about how to improve the clarity of this document or other NSF-published materials, please contact us at plainlanguage@nsf.gov.

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.

Pursuant to 5 CFR 1320.5(b), 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, Information Dissemination Branch, Division of Administrative Services, National Science Foundation, Arlington, VA 22230, or to Office of Information and Regulatory Affairs of OMB, Attention: Desk Officer for National Science Foundation (3145-0058), 725 17th Street, N.W. Room 10235, Washington, D.C. 20503.

OMB control number: 3145-0058.