

Emerging Models and Technologies for Computation (EMT)

Program Announcement

NSF 04-530



National Science Foundation

Directorate for Computer and Information Science and Engineering
Division of Computing & Communication Foundations

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

March 15, 2004

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Emerging Models and Technologies for Computation (EMT)

Synopsis of Program:

This cluster seeks to advance the fundamental capabilities of computer and information sciences and engineering by incorporating insights from areas such as biological systems, quantum phenomena, nanoscale science and engineering, and other novel computing concepts. To bring fundamental changes to software, hardware and architectural design aspects of future computational models, collaborations among computer scientists, engineers, mathematicians, biologists and other disciplinary scientists are imperative.

Research of interest should move beyond evolutionary technological advances to innovations that enable fundamentally different ways of computing. These innovations should promise much higher speeds or should solve more complex problems than traditional approaches currently permit.

The cluster supports cross- and inter-disciplinary research and education projects that explore ideas, theory and experiments which go beyond conventional wisdom and venture into a range of uncharted territories in order to advance computing capabilities. Explicit efforts will be made to support untested theories and approaches that provide plausible but high-risk opportunities. Proposals that are not clearly collaborative and/or interdisciplinary in nature are likely to be less competitive.

Cognizant Program Officer(s):

- Mitra Basu, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1160 N, telephone: (703) 292-8910, fax: (703) 292-9059, email: mbasu@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:** 30 to 40 - Average award of \$125,000 per year for 3 years
- **Anticipated Funding Amount:** \$12,000,000 pending the availability of funds

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Full Proposal Preparation Instructions:** Standard GPG Guidelines apply.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required.
- **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. proposer's local time):
March 15, 2004

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

This cluster seeks to advance the fundamental capabilities of computer and information sciences and engineering by incorporating insights from areas such as biological systems, quantum phenomena, nanoscale science and engineering, and other novel computing concepts. To bring fundamental changes to software, hardware and architectural design aspects of future computational models, collaborations among computer scientists, engineers, mathematicians, biologists and other disciplinary scientists are imperative.

Research of interest should move beyond evolutionary technological advances to innovations that enable fundamentally different ways of computing. These innovations should promise much higher speeds or should solve more complex problems than traditional approaches currently permit.

The cluster supports cross- and inter-disciplinary research and education projects that explore ideas, theory and experiments which go beyond conventional wisdom and venture into a range of uncharted territories in order to advance computing capabilities. Explicit efforts will be made to support untested theories and approaches that provide plausible but high-risk opportunities. Proposals that are not clearly collaborative and/or interdisciplinary in nature are likely to be less competitive.

II. PROGRAM DESCRIPTION

The EMT cluster will support research and education projects that investigate frameworks and foundations for novel computing models. Anticipated activities include but are not limited to modeling and simulation of biosystems, design of computing models based on characteristics of biosystems, investigation of various aspects of quantum-based approaches to understanding and processing information, and nanoscale science approaches that will lead to better computing and communication systems. There are significant interdependencies among areas of interest in this cluster. The cluster seeks to promote interaction among these areas, while ultimately identifying promising new theoretical and experimental computing models.

Because of the exploratory nature of the work supported by EMT, the areas described in this solicitation are not limitations, rather they are illustrations of research that is encouraged.

Principal investigators range from faculty members beginning their careers to teams of senior investigators. Collaborations between computer scientists, engineers, and other disciplinary scientists are imperative because they have the potential to strengthen the resulting emerging models and technologies.

While each area described below deals with a set of specific topics internal to the subfield of interest, research issues inevitably spill over artificially imposed programmatic boundaries. The EMT cluster encourages proposals that transcend the confines of each of the sub-areas elaborated.

Computational biology

This area promotes understanding of biological systems in order to use them as models for new computing paradigms. Biology can serve as an existence proof that certain desirable behaviors are possible. Many biological behaviors and functions are desirable in a computing context. In-depth understanding of biological processes can provide (1) new insights on the strategic application of biology to advance computing and (2) new perspectives on computational approaches that are enabled by the direct and active involvement of biology. In this respect, the emphasis of this research topic is on better techniques for modeling and simulation. The advancement of computational sciences has provided some avenues for simulation of living systems; however, a wide range of computational methods is required for adequate biological simulations. At one end are quantum, chemical and molecular dynamics, which predict behavior of biological systems at the atomic scale. These methods are currently limited by their need for high-end computing. At a higher scale of system complexity and size are methods that combine experimental gene and protein sequence and structure data, as well as mathematical methods and physical simulations that predict the structure and function of proteins.

Examples of sub-areas of interest include, but are not limited to:

- Mathematical/stochastic modeling techniques for simulation and analysis of biosystems
- New mathematical, computational and algorithmic tools/techniques specifically designed to deal with the complexity of biological systems
- Modeling of genetic and biochemical networks at various scales
- Novel techniques for protein structure modeling and prediction and genome analysis

Biologically motivated computational models

This area seeks to advance novel computational paradigms that draw inspirations from a systems biology perspective (e.g., multi-cell systems, organs, whole organisms and populations of organisms from bacteria to human). Systems biology

examines the structure and dynamics of cellular and organismal function, rather than the characteristics of isolated parts of a cell or organism. Critical properties of biological systems such as complexity, robustness, reliability and degeneracy arise from the interactions of the components of a system as well as the features of those components. Although the dependence of these properties on the structure and features of biological systems are far from being well understood, they still might provide guidelines for design of artificial systems.

Use of biological systems as metaphors can lead to efficient information systems and technologies. There are many sources of inspirations from the cell, tissue and higher levels that suggest new models of computation such as understanding the relationships between parallel architectures and the range of cell and tissue signaling systems with respect to improving latency and throughput. Another example is the exploitation of the parallel, distributed and emergent computational capabilities of particular genomic systems such as bacteria, yeast and *C. elegans* for developing robust adaptive evolving systems. Systemic metaphors can provide a basis for model development and a general framework for integrating a range of key constructs such as hierarchy and organization. The idea of cognitive systems as metaphors may provide a basic conceptual structure to encapsulate general notions about networks, hierarchies and nesting across scale and time. The self-governance property (self-configuration, self-maintenance and self-optimization) of nervous system may offer insight on designing and managing large complex dynamical systems.

Examples of sub-areas of interest include, but are not limited to:

- Theories and models of computation that exploit biological properties such as degeneracy to maintain robustness and show promise for new kinds of information technologies and systems
- Models inspired by small multi-cellular organisms for better rendering of a small set of vital biological functions
- Theories that exploit similarities in biological network structures (from gene regulatory networks and biochemical networks to social networks) to model self-organization and self-assembly
- Theories and architecture inspired by biological immune system components and processes
- Theories and architecture that mimic the neurophysiological basis of behavior, including adaptive responses to a changing environment.
- Novel computer architectures using nano/silicon/hybrid materials whose primary objective is to achieve essential capabilities of biological systems

Quantum information science

The goal of this area is to facilitate new insights and understanding in the area of Quantum Information Science (QIS), ultimately leading to deeper unification of information sciences, quantum foundations, and molecular biology. This would lead to significant advances in computing capabilities.

QIS includes quantum computers, quantum communication, quantum optics, and other quantum-based and related approaches to processing and understanding information. There are two more fundamental, long-term issues in QIS: (1) research that probes the physical foundations that are relevant not only to QIS but to other areas of possible future technology; (2) strategies to develop quantum computing principles for general-purpose computing and systems-level computing design, and special-purpose algorithms that transcend the limitations of special purpose algorithms now available for niche applications such as cryptography and number theory.

Examples of sub-areas of interest include, but are not limited to:

- Understanding of fundamental decoherence effects
- Better understanding of novel types of entanglement
- Development of a broad and general collection of quantum algorithms
- Extension of concepts of information theory to the realm of quantum foundations and experiments
- Quantum simulation of quantum systems (e.g. molecular modeling)
- Novel approaches to fault tolerance and to managing the stochastic errors in quantum systems.

Nanotechnology applications to computing and communication

The NSF-wide Nanoscale Science and Engineering program supports broad nanoscience research (NSF 03-043, <http://www.nsf.gov/pubs/2003/nsf03043/nsf03043.pdf>). In the EMT cluster, the focus is in nanoscale areas that aid and advance the physical design/realization of novel computing, communication and information processing models. There is considerable evidence that building a physically stable structure molecule by molecule is quite feasible. For example, self-assembly - a method of fabrication that relies on chemicals forming larger structures without centralized or external control - is potentially an important technique for producing computing components at the nanoscale. Both theoretical and experimental research with proper emphasis on education are encouraged.

Examples of sub-areas of interest include, but are not limited to:

- Nanoscale architectures
- Computing models at the nanometer scale
- Experimental system technologies at the nanometer scale.

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.

Anticipated Type of Award: Standard or Continuing Grant

Estimated Number of Awards: 30 to 40 - Average award of \$125,000 per year for 3 years

Anticipated Funding Amount: \$12,000,000 pending the availability of funds

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Instructions:

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/cgi-bin/getpub?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 the program announcement/solicitation number (04-530) 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.

B. Budgetary Information

Cost Sharing:

Cost sharing is not required 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. proposer's local time):

March 15, 2004

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this announcement/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 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>

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 applicants whether their proposals have been declined or recommended for funding within six months. 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 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 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 Website at http://www.nsf.gov/home/grants/grants_gac.htm.

Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website 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 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:

- Mitra Basu, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1160 N, telephone: (703) 292-8910, fax: (703) 292-9059, email: mbasu@nsf.gov

For questions related to the use of FastLane, contact:

- Velma Lawson, Program Specialist, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1145 S, telephone: (703) 292-8910, fax: (703) 292-9059, email: vlawson@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 [Custom News Service](http://www.nsf.gov/home/cns/start.htm) (<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, although some programs may have special requirements that limit eligibility.

Facilitation Awards for Scientists and Engineers with Disabilities (FASSED) 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 or (800) 281-8749

- **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

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.