

Research for Mixed Signal Electronic Technologies: A Joint Initiative Between NSF and SRC

Program Solicitation

NSF 01-23

NSF

**DIRECTORATE FOR ENGINEERING
DIVISION OF ELECTRICAL AND COMMUNICATIONS SYSTEMS
DIVISION OF DESIGN, MANUFACTURE, AND INDUSTRIAL INNOVATION
DIRECTORATE FOR COMPUTER & INFORMATION SCIENCE & ENGINEERING
DIVISION OF COMPUTER-COMMUNICATIONS RESEARCH**

SRC

**NANOSTRUCTURE & INTEGRATION SCIENCES
COMPUTER-AIDED DESIGN & TEST SCIENCES
INTEGRATED CIRCUITS & SYSTEM SCIENCES**

**Deadline Date: March 23, 2001
5:00 PM your local time**



NATIONAL SCIENCE FOUNDATION



SEMICONDUCTOR RESEARCH CORPORATION



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- **TDD (for the hearing-impaired):** (703) 292-5090
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Send an e-mail to: pubs@nsf.gov
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- **To Locate NSF Employees:** (703) 292-5111

SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Title: Research for Mixed Signal Electronic Technologies: A Joint Initiative Between NSF and SRC

Synopsis of Program: The goal of this initiative is to support research activities directed at the development of innovative research for mixed signal electronic technologies. In the context of this initiative mixed signal electronic technology relates to the integration of analog and digital components on a single chip with the ultimate goal of a system-on-a-chip. The challenge of this initiative, and its goal, is the creation of new knowledge that will lead to new mixed signal systems with orders of magnitude performance improvement in terms information throughput, reduced power consumption and cost reduction. The research needs associated with advancing Mixed Signal Technology encompass all ideas, approaches, and techniques that ultimately lead to a system on a chip. Research topics may range from basic research to more applied research in design, manufacturing and technology. The development of this capability will have a profound impact on the performance of current and future fabrication facilities.

Cognizant Program Officers:

Dr. James W. Mink, Program Director, ENG/ECS; 703-292-8339; jmink@nsf.gov.

Dr. Lawrence Goldberg, Senior Engineering Advisor, ENG/ECS; 703-292-8339; lgoldber@nsf.gov.

Dr. Rajinder Khosla, Acting Division Director, ENG/ECS; 703-292-8339; rkhosla@nsf.gov.

Dr. Robert Grafton, Program Director, CISE/CCR; 703-292-8936; rgrafton@nsf.gov.

Dr. Kamal Abdali, Acting Division Director, CISE/CCR; 703-292-8910; kabdali@nsf.gov.

Dr. Delcie Durham, Program Director, ENG/DMII; 703-292-7060; ddurham@nsf.gov.

Dr. James A Hutchby, Director, SRC/NIS; 919-941-9451; hutchby@src.org.

Dr. William H. Joyner, Jr., Director, SRC/CADTS; 919-941-9472; joyner@src.org.

Dr. Justin E. Harlow, III, Director, SRC/ICSS; 919-941-9464; harlow@src.org.

Dr. Harold Hosack, Manager, SRC/PI; 919-941-9485; hosack@src.org

Applicable Catalog of Federal Domestic Assistance (CFDA) Number:

47.041 (ENG); 47.070 (CISE)

ELIGIBILITY INFORMATION

Organization Limit: Proposals may be submitted by U.S academic institutions in support of single investigators or teams of 2 to 3 investigators

PI Eligibility Limit: An applicant may submit only one proposal as PI or co-PI

Limit on Number of Proposals: None

AWARD INFORMATION

Anticipated Type of Award: Continuing Grant

Estimated Number of Awards: 12-15

Anticipated Funding Amount: \$6,000,000 over 3 years from NSF and SRC, subject to availability of funds.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Proposal Preparation Guidelines: Standard Grant Proposal Guide (GPG) preparation guidelines

B. Budgetary Information

Cost Sharing Requirements: Cost Sharing is not required

Indirect Cost (F&A) Limitations: None

Other Budgetary Limitations: The awards made in this joint initiative will be up to \$100,000/year for a single investigator and a maximum of \$300,000/year for any award, for up to three years.

C. Deadline Date

Letter of Intent: None

Preproposal: None

Full Proposal Due Date: March 23, 2001, by 5:00PM your local time

D. FastLane Requirements

FastLane Submission: Required

FastLane Contact: FastLane user support services, fastlane@nsf.gov

PROPOSAL REVIEW INFORMATION

Merit Review Criteria: National Science Board approved criteria.

AWARD ADMINISTRATION INFORMATION

Award Conditions: Each award will be co-supported by both NSF and SRC. Additional award conditions apply. Please see the program solicitation for further information.

Reporting Requirements: Additional reporting requirements apply. Please see the program solicitation for further information.

I. INTRODUCTION

The National Science Foundation (NSF), through its Divisions of Electrical and Communications Systems (ECS) and Design, Manufacturing, & Industrial Innovation (DMII) of the Engineering Directorate and the Division of Computer-Communications Research (CCR) of the Directorate for Computer & Information Science & Engineering, and the Semiconductor Research Corporation (SRC), through its Science Areas of Nanostructure & Integration Sciences (NIS), Computer-Aided Design & Test Sciences (CADTS), and Integrated Circuits & Systems Sciences (ICSS), plan jointly to support innovative research activities for mixed signal electronic technologies. In the context of this initiative, mixed signal electronic technology relates to the integration of analog and digital components on a single chip with the ultimate goal of a system-on-a-chip. The challenge of this initiative and its goal is the creation of new knowledge that will lead to new mixed signal systems with orders of magnitude performance improvement in terms of information throughput, reduced power consumption, and cost reduction.

Historically, the performance of digital semiconductor systems have followed Moore's law, doubling every 18 months. Analog systems have followed similar, although, somewhat less spectacular performance enhancements. The voracious growth of the communications market is beginning to drive the demand for new semiconductor components far beyond those of the more traditional processor (desktop, laptop, server and workstation) markets. Add to this the demands for new semiconductor components driven by other growth markets (e.g., transportation, consumer products, power management, etc.) and one can begin to understand the dramatic changes the semiconductor industry faces to maintain its competitiveness. The current trend toward wireless or tether-free systems, which contain digital, analog, and RF sub-systems, mandates the need for mixed signal systems. These new markets are being driven by migration of required but widely disparate analog, RF and digital functions onto fewer, and eventually onto a single, mixed signal chip. If system cost is to continue to decline and system functionality is to continue to increase, the need for new architectures, systems and circuits design and methodologies must be developed. The mixed signal architecture brings together analog and digital circuits as well as MEMS and other technologies in close proximity to each other. Undesired cross coupling between active devices becomes a more important consideration as feature size and device spacing continue to decrease, to the fundamental limit of the distance between molecules. As systems approach this limit, cross coupling effects may become a dominant mechanism, and new architectures may be required that take advantage of this phenomenon and transform an effect usually considered as undesirable to one that is useful.

II. PROGRAM DESCRIPTION

The goal of this solicitation is to initiate research which can lead to significant advances in the state of the art of mixed signal electronic technology. The initiative is intended to provide support for single investigators or teams of two to three investigators who are interested in solving fundamental problems that enable systems-level performance improvements and establish new and innovative research areas critical to future mixed signal systems. Proposals should discuss effective ways in which education is integrated within the research program. The research may address current technology with critical device feature size measured in the micron range to future technology with critical feature size measured in nanometers, near the molecular level. It is extremely important that

the research not be performed in the absence of a test bed (real or virtual) for experimental validation. Experimental validation should leverage available infrastructure and data to the maximum extent possible. Industrial interaction is strongly encouraged, but not mandatory. More detailed discussion of potential research needs may be found in a Semiconductor Research Corporation document entitled "Research Needs for Mixed Signal Technologies" (<http://www.src.org>. From this home page go to: Explore/Science Areas/Nanostructures and Integration Sciences/Research Needs).

Proposal topics may range from basic to more applied research addressing the categories listed below. The categories listed are intended to be illustrative, but not limiting.

1. System Architectures: Research should address new systems architectures that are more suited to single chip integration. New systems architectures will be required to deal with limitations imposed due to the trend toward nano-scale devices and systems. Mixed Signal issues like noise, cross-talk, power consumption and dynamic range are ultimately important because they limit our ability to implement large scale, complex systems on a chip. Research is required to understand how these issues will impact our ability to reliably build systems in deep sub-micron technologies.

2. Circuit Design: Emphasis on mixed signal circuit design research is essential to compete effectively in the fast moving communications markets of the future. This is especially true in the present environment of deep submicron technology scaling where the confluence of daunting physical limitations threatens to impede the pace of future performance gains and the transition to nano-scale systems. Mixed signal circuit design research is of interest due to the growing concern over design challenges of the mixed signal environment and the expected shortage of graduating engineers skilled in this design discipline.

3. Computer Aided Design (CAD): Mixed signal design requires CAD tools that are state of the art in both the digital and analog domains, and these robust tools must be tightly integrated for co-design in the mixed signal domain. Circuits and systems then emerge from a careful evaluation of analog and digital strengths and weaknesses in a particular process technology setting to determine the best overall architecture. Neither analog nor digital portions of chips and packages can be designed independently of the other portion, but must be designed within the constraints of each other and with an awareness of the total environment. With analog and digital RF circuits on a single chip along with the continuing emphasis toward smaller (nano scale) feature size, CAD tools are needed to handle multiple signal domains and interfaces covering a broad frequency and technology spectrum.

4. Test and Evaluation: Testing of increasingly complex system on chip designs is a challenging area with long term issues. Needed to improve capability of testing mixed signal devices include fault models, defect models, and measurement methods for analog and mixed signal circuits. Additionally, test metrics of fault and defect coverage with measurement precision are desired in order to provide the quantification needed in mixed signal testing.

5. Advanced Devices and Technologies: Mixed signal integrated circuits place many new demands on device design and process technology. Many current wireless applications, for example, use bipolar devices fabricated from materials other than silicon for the RF, and silicon CMOS for the control and logic, and an array of passive components. Performing all the tradeoffs needed for choosing the optimum technology within the mixed signal environment require knowledge of device

performance and perhaps new classes of devices. New devices may range from derivatives of current devices to new classes of devices based upon nano-scale phenomena.

6. Packaging, Interconnections and Passives: Mixed signal applications typically fall into the low-cost and hand-held categories. Manufacturing and assembly cost constraints and customer preferences often restrict package choices. Trends toward increased integration and miniaturization may demand multicomponent packages (MCPs) that encompass a variety of high-performance passive devices (e.g. MEMs, piezo-electric filters, transformers) as well as semiconductor chips. The problem of packaging analog and mixed signal circuits is made more difficult by the inability to realize high quality-factor passive components in semiconductor technology, resulting in the need for large numbers of external components and connections. Meeting the needs for mixed signal systems utilizing improved on-chip passive components is likely to require the incorporation of new materials and manufacturing technologies in the IC fabrication process.

7. Other Innovative Mixed Signal Issues: Mixed signal systems are among the most dynamic from a research, technology and manufacturing point of view. As a result, new concepts rapidly evolve. Such new concepts are of interest and are encouraged. Investigators are encouraged to contact one of the listed program directors before the submission of a proposal in this category to determine its appropriateness to this initiative.

III. ELIGIBILITY INFORMATION

Proposals may be submitted by U.S academic institutions for single investigator projects or projects involving small groups of two to three investigators. The principal investigator (PI) must be from the submitting institution. An individual may be named as PI or co-PI on only one proposal. Researchers from foreign academic institutions who bring essential expertise to the project may participate as a group member. Synergistic collaborations or partnerships with industry or government are encouraged when appropriate, though no funds will be provided to these organizations. Industrial participation need not be limited to SRC member companies.

For collaborations between university and industry, applicants should provide a letter from the industrial partner that confirms the participation of a co-PI from industry, who should be listed on the proposal cover sheet. This letter should describe the plan of interaction with the academic institution, the time commitment of the industrial researcher(s), and the nature of the work. Also, if there is cost sharing by industry it should be described. An intellectual property agreement between the university and collaborating industrial organization is required before an award can be made. This intellectual property agreement must be consistent with the one required by SRC (see section VII. B).

IV. AWARD INFORMATION

The awards made under this initiative will be up to \$100,000/year for a single investigator and a maximum of \$300,000/year for any award, for up to three years. The intent is to support single investigators or small groups of two to three investigators and their students under this initiative. It is anticipated that the total funds available from NSF and SRC for this initiative will be approximately

\$6 million over three years. The final number of awards will be subject to the availability of funds and the quality of the proposals. Each award will be co-supported by both NSF and SRC.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Proposals submitted in response to this program 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?nsf012>. 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.

Proposers are reminded to identify the program solicitation number (NSF 01-23) in the program solicitation block on the NSF Form 1207, 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 is not required in proposals submitted under this solicitation. The awards will be up to \$100,000/year for a single investigator and a maximum of \$300,000/year for any award, for up to three years.

C. Deadline Date

Proposals must be submitted by 5:00 PM your local time on March 23, 2001.

D. FastLane Requirements

Proposers are required to prepare and submit proposals using the NSF 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.

Submission of Signed Cover Sheets. For proposals submitted electronically, the signed copy of the proposal Cover Sheet (NSF Form 1207) must be postmarked (or contain a legible proof of mailing date assigned by the carrier) within five working days following proposal submission and be forwarded to the following address:

National Science Foundation
DIS – FastLane Cover Sheet (NSF 01-23)
4201 Wilson Blvd.
Arlington, VA 22230

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

All proposals are subject to the guidelines and merit review criteria of the National Science Foundation. Proposal review will be managed jointly by a working group of program officers from the NSF and the SRC. The review process will involve a panel of outside experts to determine both the intellectual merit and broader impacts of the proposed research. Reviewers will be selected jointly by the NSF and the SRC, and will include both academic and industrial researchers with expertise in the substantive area of the proposed research. NSF and SRC invite 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. Based upon the panel review process, the working group will make its recommendations of proposals for funding. These recommendations will be submitted for concurrence to the cognizant NSF Division Directors and the SRC Research Management Committee.

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.

B. Review Protocol and Associated Customer Service Standard

Proposals submitted in response to this solicitation will be reviewed by a panel of experts. The panel will formulate a recommendation to either support or decline each proposal. The working group will consider the advice of the review panel in making their recommendation.

For each proposal, a summary rating and accompanying narrative of the panel deliberations (panel summary) will be completed and signed by the panel. An individual rating and accompanying narrative will also be completed and signed by at least three reviewers on the panel assigned to provide written review of the proposal. In all cases, reviews are treated as confidential documents.

Proposers will be contacted by a Program Officer of the NSF and SRC working group after the recommendation to award or decline funding has been approved by the respective organizations. This informal notification is not a guarantee of an eventual award. The proposals recommended for funding will be forwarded to the NSF's Division of Grants and Agreements for review of business, financial and policy implications and the processing and issuance of a grant. At the same time, the proposal will be forwarded to the SRC for issuance of an independent, but co-equal, award from the SRC.

Applicants are cautioned that only an NSF Grants 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 member of the working group. A principal investigator or organization that makes financial or personnel commitments in the absence of a grant signed by the NSF Grants Officer does so at its own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

The final award recommendations will be a joint decision of the NSF and SRC working group with concurrence by their corresponding management review. Each award will be co-supported by both the NSF and the SRC with separate funding instruments from each. Notification of the award is made to the submitting organization by an NSF 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 the individual reviews and panel summary, excluding the names of the reviewers, will be made available to the applicant. In addition, the applicant will receive an explanation of the decision to award or to decline funding. Applicants will receive notice of the outcome of the competition within six months following the submission deadline.

B. Award Conditions

Awards made as a result of this solicitation are administered in accordance with a memorandum of understanding approved by both NSF and SRC. Projects supported will be jointly funded at an equal base level of support by NSF and SRC. Funds for each project will be provided by the award of a grant by the NSF and a contract by the SRC. Beyond the base level of support, either organization may supplement a project for special purposes, such as education or development, without requiring the other party to provide any additional funds. The NSF/SRC joint initiative awards will be made for a three-year period.

NSF awards must be consistent with the intellectual property provisions of the Bayh-Dole Act.

SRC awards must include an executed agreement on intellectual property, including publication and patent rights, signed by representatives of the university and the SRC (See: <http://www.src.org>. From this home page go to: Explore/Intellectual Assets/Policy and Guidelines).

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 NSF brochure, program guide, solicitation or other NSF issuance that may be incorporated by reference in the award letter. 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, (NSF 95-26) 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

All annual reports shall be submitted jointly to both NSF and SRC. For multi-year grants, the PI must submit an annual project report to the cognizant NSF and SRC Program Officers at least 90 days before the end of the current budget period.

In addition, grantees of this initiative will be expected to attend, and shall budget for, three SRC grantee review meetings for the purpose of sharing research progress with SRC member company representatives as well as other interested individuals. The first such meeting will be held approximately nine months after the awards are made, and succeeding meetings will be held every 12 months thereafter. Thirty days before each of these meetings, the principal investigator will provide the SRC an annotated PowerPoint viewgraph presentation of research results for posting on the SRC Web site.

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. INQUIRIES

Questions concerning this joint program should be addressed, preferably via e-mail, to the following NSF or SRC program staff:

Dr. James W. Mink, Program Director, ENG/ECS; 703-292-8339; jmink@nsf.gov.

Dr. Lawrence Goldberg, Senior Engineering Advisor, ENG/ECS; 703-292-8339; lgoldber@nsf.gov.

Dr. Rajinder Khosla, Acting Division Director, ENG/ECS; 703-292-8339; rkhosla@nsf.gov.

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Dr. Harold Hosack, Manager, SRC/PI; 919-941-9485; hosack@src.org

For questions related to the use of FastLane, contact FastLane help desk at fastlane@nsf.gov.

IX. OTHER PROGRAMS OF INTEREST

The NSF Guide to Programs, available electronically at <http://www.nsf.gov/cgi-bin/getpub?gp>, is a compilation of funding for research and education in science, mathematics, and engineering. 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 listed in Appendix A of the GPG. 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, at <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 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.

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