

Major Research Instrumentation Program (MRI-R²) Recovery and Reinvestment

PROGRAM SOLICITATION NSF 09-561

REPLACES DOCUMENT(S):
NSF 09-502



National Science Foundation

Office of the Director
Office of Integrative Activities

Directorate for Biological Sciences

Directorate for Computer & Information Science & Engineering

Directorate for Education & Human Resources

Directorate for Engineering

Directorate for Geosciences

Directorate for Mathematical & Physical Sciences

Directorate for Social, Behavioral & Economic Sciences

Office of Polar Programs

Office of Cyberinfrastructure

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

August 10, 2009

REVISION NOTES

The Major Research Instrumentation (MRI) program is announcing a call for proposals that is separate from the standard January submission deadline. Awards made in response to this solicitation will be funded under the American Recovery and Reinvestment Act of 2009 (ARRA) (Public Law 111-5), and have special award conditions. Unless otherwise specified, ARRA funding should be considered one-time funding.

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

The parameters of this **Major Research Instrumentation-Recovery and Reinvestment (MRI-R²)** competition differ from those for the regular MRI competition. **For this MRI-R² competition only:**

- Eligible organizations¹ may submit a maximum of three (3) proposals, independent of the number of proposals that may have been submitted under the [NSF 09-502](#) MRI competition. However, proposals that wholly or substantially duplicate those that were accepted for review under [NSF 09-502](#) will not be accepted for this competition. A maximum of two submissions can be for instrument acquisition. If three proposals are submitted, at least one submission must be for instrument development.
- An organization may be included as a funded subawardee/subcontractor in another organization's **development** proposal, at a level of 20% or less of that proposal's budget, without affecting the subawardee's/subcontractor's submission limit. Inclusion as a funded subawardee/subcontractor in a development proposal at a budgetary level in excess of 20%, or in any acquisition proposal, must be counted against proposal submission limits.
- Proposal budgets may include requests from NSF in the range \$100,000-\$6 million from Ph.D.-granting institutions of higher education and non-degree granting organizations; up to \$6 million (there is no minimum request) from non-Ph.D. granting institutions of higher education or the disciplines of mathematical sciences or social, behavioral, and economic sciences at any eligible organization.
- Cost-sharing is required in the MRI/MRI-R² program, with non-Ph.D.-granting academic institutions of higher education exempt from the cost-share requirement. As authorized in section 7036(c)(2)(A) of the America COMPETES Act, **for this MRI-R² competition only**, cost-sharing will be further waived for those institutions of higher education that are not ranked

among the top 100 of those receiving Federal research and development funding (as documented by the statistical data published by the Foundation). The list of the top 100 institutions can be found at <http://www.nsf.gov/statistics/infbrief/nsf09313/>. Each proposal for which this waiver is applicable **must** also include a certification from the institution's President or Provost stating that the project will 1) make a substantial improvement in the institution's capabilities to conduct leading-edge research; 2) provide research experiences for undergraduate students using leading-edge facilities; and 3) broaden the participation in science and engineering research by women, underrepresented minorities and persons with disabilities. **This certification, with the specified format, must be submitted as a single copy document as described in Section V.**

- Full proposals must be submitted by 5:00 p.m. (submitter's local time) by the deadline date. PIs are strongly encouraged to submit as early as possible before this deadline.

¹ Unless otherwise specified, the term "organization" refers to all categories of proposers. Universities and two- and four-year colleges (including community colleges) are also referred to as institutions of higher education.

Proposals must meet administrative and technical requirements to be accepted for the MRI-R² competition. The following are some key reasons for Return without Review:

- Proposals that do not contain, as a supplemental document, a signed statement from the sponsored research office classifying the performing organization as either non-Ph.D.-granting, Ph.D.-granting, or non-degree-granting (see Section IV);
- Proposals that wholly or substantially duplicate those that were accepted for review under [NSF 09-502](#);
- Applicable proposals that do not indicate appropriate levels of cost-sharing (Line M of the budget in Fastlane), *and* that do not contain required documentation demonstrating organizational cost-sharing commitment (Sections V.A and V.B);
- Proposals from institutions of higher education that are not ranked among the top 100 of those receiving Federal research and development funding must include a signed letter from the institution's President or Provost to be eligible for the cost-sharing exemption. The letter must certify that the proposal will: 1) make a substantial improvement in the institution's capabilities to conduct leading-edge research; 2) provide research experiences for undergraduate students using leading-edge facilities; and 3) broaden the participation in science and engineering research by women, underrepresented minorities and persons with disabilities (Sections V.A and V.B). Applicable proposals indicating exemption from cost-sharing that do not contain this explicit certification will be returned without review;
- Proposals that do not separately address the Intellectual Merit and Broader Impacts review criteria in the Project Summary;
- Proposals requesting funding to support postdoctoral researchers that do not include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. The mentoring plan must not exceed one page;
- Proposals describing activities that fall outside of the scope of those supported by the MRI-R² program (Section II.A);
- Proposals describing activities that fall outside of the scope of those supported by NSF (Section II.B);
- Proposals that exceed an organization's submission limit (Section IV);
- Proposals that represent standard research projects that are appropriate for submission to regular grants programs at NSF (Section II.A);
- Proposals to place an instrument at a facility of another Federal agency or one of their FFRDCs that are not submitted by consortia (Section IV);
- Proposals for instruments that augment the scope of a project currently receiving funding through the NSF Major Research Equipment and Facilities Construction (MREFC) account (Section IV);
- Proposals that do not contain required supplemental documentation, or that contain supplemental documentation other than those required and/or encouraged by the MRI program (as prescribed in Section V.A) and by the Grant Proposal Guide (GPG);
- Proposals that do not conform to font, margin and page limitations;
- Proposals that do not contain a Management Plan in the Project Description (Section V.A);
- Applicable proposals that do not contain Results from Prior MRI Support in the Project Description (Section V.A).

As announced on May 21, 2009, proposers must prepare and submit proposals to the National Science Foundation (NSF) using the NSF FastLane system at <http://www.fastlane.nsf.gov/>. This approach is being taken to support efficient Grants.gov operations during this busy workload period and in response to OMB direction guidance issued March 9, 2009. NSF will continue to post information about available funding opportunities to Grants.gov FIND and will continue to collaborate with institutions who have invested in system-to-system submission functionality as their preferred proposal submission method. NSF remains committed to the long-standing goal of streamlined grants processing and plans to provide a web services interface for those institutions that want to use their existing grants management systems to directly submit proposals to NSF.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Major Research Instrumentation Program (MRI)

Synopsis of Program:

The Major Research Instrumentation Program (MRI) serves to increase access to shared scientific and engineering instruments for research and research training in our Nation's institutions of higher education, museums and science centers, and not-for-profit organizations. This program especially seeks to improve the quality and expand the scope of research and research training in science and engineering, by providing shared instrumentation that fosters the integration of research and education in research-intensive learning environments. Development and acquisition of research instrumentation for shared inter- and/or intra-organization use are encouraged, as are development efforts that leverage the strengths of private sector partners to build instrument development capacity at academic institutions.

To accomplish these goals, the MRI program assists with the acquisition or development of shared research

instrumentation that is, in general, too costly and/or not appropriate for support through other NSF programs. For the purposes of the MRI Program, proposals must be for *either* acquisition or development (see Section II.A.2). Instruments are expected to be operational for regular research use by the end of the award period. A key recommendation of a 2006 National Academies report on "Advanced Research Instrumentation and Facilities" (ARIF) was that the NSF should expand the MRI program so that it includes "mid-scale" instrumentation whose capital costs are greater than \$2 million, but with costs that are not appropriate for NSF's Major Research Equipment and Facilities Construction account. As a result of the enactment of the American Recovery and Reinvestment Act of 2009, NSF is holding a competition that is separate from the regular MRI competition. **For this MRI-R² competition only**, proposals will be accepted for instrument development or for acquisition of a single instrument or a system of related instruments that share a common or specific research focus in the range \$100,000-\$6 million from Ph.D.-granting institutions of higher education and non-degree-granting organizations; up to \$6 million (there is no minimum request) from non-Ph.D.-granting institutions of higher education or the disciplines of mathematical sciences or social, behavioral, and economic sciences at any eligible organization.

Cognizant Program Officer(s):

- Dr. Randy L. Phelps, Staff Associate, telephone: (703) 292-8040, email: rphelps@nsf.gov

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

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences
- 47.050 --- Geosciences
- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources
- 47.078 --- Office of Polar Programs
- 47.079 --- Office of International Science and Engineering
- 47.080 --- Office of Cyberinfrastructure
- 47.081 --- Office of Experimental Program to Stimulate Competitive Research

Award Information

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 400 awards: Proposal budgets may include requests from NSF in the range \$100,000-\$6 million from Ph.D.-granting institutions and non-degree-granting organizations; up to \$6 million (there is no minimum request) from non-Ph.D.-granting institutions and the disciplines of mathematical sciences or social, behavioral, and economic sciences at any eligible organization.

Anticipated Funding Amount: \$200,000,000 (Proposals submitted in response to this program solicitation will be competing for about \$200 million, pending availability of funds, and quality of proposals. Up to \$40 million of these funds will be available for the acquisition or development of instruments costing between \$2 million - \$6 million, i.e., "mid-scale" instrumentation.)

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Organizations that are eligible to submit proposals to NSF's MRI-R² Program ("submission-eligible organizations") are divided into three categories: Ph.D.-granting institutions of higher education, non-Ph.D.-granting institutions of higher education, and non-degree-granting organizations. Organizations that do not fit into these categories are not eligible to submit MRI-R² proposals (Note: Section 1604 of the American Recovery and Reinvestment Act precludes the use of ARRA funds by any state or local government, or any private entity, for any casino or other gambling establishment, aquarium, zoo, golf course, or swimming pool).

For the purposes of the MRI-R² program:

1. Ph.D.-granting institutions of higher education are academic institutions that have produced more than 20 Ph.D.s or D.Sci.s in all NSF-supported fields of science, mathematics or engineering during the combined previous two academic years (please review NSF's Guide to Programs for NSF supported fields of science, mathematics and engineering: http://www.nsf.gov/funding/browse_all_funding.jsp).
2. Non-Ph.D.-granting institutions of higher education are two- and four- year colleges and universities that have produced 20 or fewer Ph.D.s or D.Sci.s in all NSF-supported fields of science, mathematics, and engineering during the combined previous two academic years.
3. Non-degree-granting organizations are independent not-for-profit organizations, museums and science centers, or consortia of organizations working in NSF-supported fields of science, mathematics, and engineering.

MRI-R² proposals may be submitted by the following:

1. US colleges, universities and institutions of higher education located in the US, its territories and possessions. Distinct academic campuses (e.g., that award their own degrees, have *independent* administrative structures, admissions policies, alumni associations, etc.) within multi-campus systems qualify as separate institutions.
2. US independent museums and science centers located in the US, its territories and possessions. (These organizations must have an *independent* administrative structure, e.g., an office of

sponsored research.)

3. US independent not-for-profit organizations located in the US, its territories and possessions. (Such an organization must have an *independent* administrative structure, e.g., an office of sponsored research, and have 501(c)(3) tax status).
4. To facilitate access to unique instrumentation for a broad user base, and to encourage collaboration and sharing of instrumentation, the MRI program has historically accepted proposals from consortia of organizations. Hence, MRI-R² consortium proposals may be submitted as follows:

4a. Legally incorporated not-for-profit consortia consisting of submission-eligible members may submit proposals on behalf of the consortium. Such a consortium is one with an independent administrative structure, e.g., an office of sponsored research, and 501(c)(3) status.

4b. Other consortia may submit MRI-R² proposals through a submission-eligible consortium member as described in items (1), (2) and (3) above. The cover sheet must clearly indicate the consortium nature of the proposal in the title, and it must identify a PI and co-PI(s) from at least 2 submission-eligible consortium organizations (i.e., for a consortium acquisition proposal, employees from 2 or more submission-eligible organizations must be identified as primary users; for a consortium development proposal, employees from 2 or more submission-eligible organizations must be active participants in the development effort). These proposals may also include partners that are not otherwise eligible to submit MRI proposals (e.g., government labs and US small businesses located in the US, its territories and possessions).

4c. The MRI-R² program will accept proposals for instrumentation to be located at a facility of another Federal agency or one of their Federally Funded Research and Development Centers (FFRDCs), **but only** through a submission-eligible organization as a consortium proposal that includes the facility/FFRDC as a non-lead partner. Such instruments must make unique contributions to the needs of researchers elsewhere or establish access to new multi-user facilities. The current list of FFRDCs can be found at: <http://www.nsf.gov/statistics/nsf05306/>. Note: The MRI-R² program will not accept proposals for instruments that augment the scope of a project currently receiving funding through the NSF Major Research Equipment and Facilities Construction (MREFC) account.

5. US small businesses located in the US, its territories and possessions are eligible for instrument development support as private sector partners with submitting organizations; they may not submit proposals as a lead organization.

Prospective PIs may contact the cognizant MRI program officer regarding questions relating to organizational eligibility, and for information on other NSF funding opportunities for instrumentation (see also Section IX for a list of related NSF programs for research instrumentation).

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

Three (3) as described below.

Proposals that wholly or substantially duplicate MRI proposals that were submitted under NSF 09-502, and were accepted for review, will not be accepted for this MRI-R² competition.

- To provide a balanced instrumentation award portfolio at diverse organizations, across varied research topics, and that serves to train and support a broadly inclusive science and engineering workforce across the entire nation, the MRI-R² competition requires that an organization may, as a performing organization, submit or be included as a significantly funded² subawardee/subcontractor in no more than three MRI-R² proposals. No more than two proposal submissions may be for instrument acquisition.
- To promote instrumentation development, the MRI-R² competition requires that if an organization submits or is included as a significantly funded² subawardee/subcontractor in three MRI-R² proposals, at least one of the three proposals must be for instrument development. NSF reserves the right to carefully examine development proposals to ensure that they meet the requirements for this proposal type (Section II), and that submission limits have not been exceeded.

²An unfunded collaboration does not count against the submission limit. An organization may be included as a funded subawardee/subcontractor in another organization's *development* proposal, at a level of 20% or less of that proposal's budget, without affecting the subawardee's/subcontractor's submission limit. Inclusion as a funded subawardee/subcontractor on a development proposal at a budgetary level in excess of 20%, or on any acquisition proposal, must be counted against proposal submission limits.

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposal Preparation Instructions:** This solicitation contains information that supplements the standard NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full text of this solicitation for further information

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is Specialized. Please see the full text of this solicitation for further information.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

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

August 10, 2009

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions: Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements: Additional reporting requirements apply. Please see the full text of this solicitation for further information.

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I. INTRODUCTION

A. Program Goals

The Major Research Instrumentation (MRI) Program serves to increase access to shared scientific and engineering instruments for research and research training in our Nation's institutions of higher education, museums and science centers, and not-for-profit organizations. This program especially seeks to improve the quality and expand the scope of research and research training in science and engineering, by providing shared instrumentation that

fosters the integration of research and education in research-intensive learning environments. Development and acquisition of research instrumentation for shared inter- and/or intra-organization use is encouraged, as are development efforts that leverage the strengths of private sector partners as appropriate to the goals of the MRI Program. The MRI Program is intended to assist with the acquisition or development of research instrumentation that is, in general, too costly and/or not appropriate for support through other NSF programs. Instruments are expected to be operational for regular research use by the end of the award period.

B. Recent History

In 2006, the National Academy of Sciences Committee on Advanced Research Instrumentation released a study, entitled "Advanced Research Instrumentation and Facilities (ARIF)" (http://books.nap.edu/catalog.php?record_id=11520), assessing the needs among academic and national laboratory researchers for mid-scale instrumentation, and exploring how the federal funding agencies could best meet these needs. One key recommendation was that NSF should increase the limit on the MRI Program in order to support the acquisition of instrumentation with capital costs greater than \$2 million but less than that appropriate for NSF's Major Research Equipment and Facilities Construction account. The same ARIF report noted a decline in instrumentation development efforts in academic settings. The America COMPETES Act of 2007 (Public Law 110-69) directed NSF to increase the maximum award limit for MRI commensurate with the appropriated budget. As a result of the enactment of the American Recovery and Reinvestment Act (ARRA) in 2009, **for this MRI-R² competition only**, proposals will be accepted for instrument development or for acquisition of a single instrument or a system of related instruments that share a common or specific research focus in the range \$100,000-\$6 million from Ph.D.-granting institutions of higher education and non-degree-granting organizations; up to \$6 million (there is no minimum request) from non-Ph.D.-granting institutions of higher education or the disciplines of mathematical sciences or social, behavioral, and economic sciences at any eligible organization. Consistent with Congressional guidance accompanying the ARRA, the MRI-R² program has highlighted a goal of supporting the acquisition and development of instrumentation that contributes to advancements in supercomputing technology.

Consistent with the requirements in the America COMPETES Act, cost-sharing is required in the MRI/MRI-R² program, with non-Ph.D.-granting academic institutions of higher education exempt from the cost-share requirement. As authorized in section 7036(c)(2)(A) of the America COMPETES Act, **for this MRI-R² competition only**, cost-sharing will be further waived for those institutions of higher education that are not ranked among the top 100 of those receiving Federal research and development funding (as documented by the statistical data published by the Foundation). The list of the top 100 institutions can be found at <http://www.nsf.gov/statistics/infbrief/nsf09313/>. Each proposal for which this waiver is applicable **must** also include a certification from the institution's President or Provost stating that the project will 1) make a substantial improvement in the institution's capabilities to conduct leading edge research; 2) provide research experiences for undergraduate students using leading edge facilities; and 3) broaden the participation in science and engineering research by women, underrepresented minorities and persons with disabilities.

II. PROGRAM DESCRIPTION

A. General Information

1. MRI-R² Program Purpose and Goals

The primary purpose of the MRI-R² program is to facilitate scientific and engineering research and research training through the acquisition or development of research instrumentation. Therefore, the MRI-R² program will not support the acquisition or development of instrumentation used primarily for standard science and engineering education courses, or for general purpose instrumentation that does not have a common or specific research focus. Other uses of the instrumentation may serve to facilitate the broader impacts of the project.

Proposals to the MRI-R² program should conform to one or more of its goals:

- Supporting the acquisition of major state-of-the-art instrumentation, thereby improving access to, and increased use of, modern research and research training instrumentation by scientists, engineers, and graduate and undergraduate students;
- Fostering the development of the next generation of instrumentation, resulting in new instruments that are more widely used, and/or open up new areas of research and research training;
- Enabling academic departments, disciplinary and cross-disciplinary units, and multi-organization collaborations to create well-equipped research environments that integrate research with education;
- Supporting the acquisition and development of instrumentation that contributes to advancements in supercomputing technology, and/or takes advantage of existing investments in cyberinfrastructure while avoiding duplication of services already provisioned by NSF investments. The NSF document, "Cyberinfrastructure Vision for the 21st Century" (<http://www.nsf.gov/pubs/2007/nsf0728/index.jsp>) provides an evolving vision that will help guide the Foundation's future investments in cyberinfrastructure;
- Promoting substantive and meaningful partnerships for instrument development between the academic and private sectors (i.e., small businesses). Such partnerships have the potential to build capacity for instrument development in academic settings and to create new products with wide scientific and commercial impact. Partnerships with applicability to the Industry/University Cooperative Research Centers (I/UCRCs) program are encouraged.

2. MRI-R² Program Scope

The MRI-R² program assists in the acquisition or development of major research instrumentation that is,

in general, too costly or not appropriate for support through other NSF programs. For the purposes of the MRI-R² program, proposals must be either for **acquisition** or **development** (see below).

The MRI-R² program will NOT support proposal requests for:

- General purpose equipment, including general purpose computers or assorted instruments that do not share a common or specific research or research training focus;
- Instrumentation used primarily for science and engineering education courses. Other programs at NSF (e.g., the Course, Curriculum, and Laboratory Improvement program) provide funding for the development of exemplary courses and teaching practices, including instrumentation to support such projects;
- Renovation or modernization of research facilities, supporting equipment, and general purpose platforms. The term "research facilities" refers to the bricks-and-mortar physical plant in which sponsored or unsponsored research activities (including research training) takes place, including routine sustaining infrastructure (e.g., standard electrical and plumbing systems, standard computer networks, standard safety features), general purpose systems (e.g., HVAC and power systems, toxic waste removal systems, telecommunications equipment), and supporting equipment. The term "supporting equipment" refers to basic, durable components of a research facility that are integral to its operation (e.g., clean rooms, fume hoods, elevators, laboratory casework). The term "general purpose platform" refers to major fixed or non-fixed structures, vehicles, and/or environments that host an instrument, but do not otherwise contribute directly to data gathering. Other opportunities (e.g., the Academic Research Infrastructure program) may be available to support these types of projects.

Proposals requesting support that falls into these categories are considered to be inappropriate for the MRI-R² program.

a. Instrument Acquisition

The academic research enterprise relies on the availability of modern instrumentation, much of which can be acquired with little/no modification from existing sources. For this reason, acquisition proposals are characterized by a rapid implementation requiring limited personnel, and as having little risk to complete. MRI-R² acquisition proposals may also be characterized by a demonstrated need for the purchase or upgrade of generally available, yet sophisticated, instruments with little or no modification for shared use among a group of researchers. Acquisition proposals must meet these guidelines to be considered for the MRI-R² program.

b. Instrument Development

The academic research enterprise relies on new generations of sophisticated research instrumentation and NSF encourages individual investigators, and teams of researchers, to apply for instrument development support. Development proposals are characterized by a demonstrated need for new or upgraded instruments that can provide enhanced or potentially transformative use and performance, open up new areas of research and research training, and/or have potential as commercial products. "Performance" may include accuracy, reliability, resolving power, throughput speed, sample capacity, flexibility of operation, breadth of application, user-friendliness, and/or new types of measurement or information gathering. MRI-R² development proposals are characterized by a need for longer timescales involving design, construction, testing and commissioning such that equipment costs may not themselves represent the largest portion of the budget. Development proposals also tend to involve greater risk to complete.

Development proposals must describe the added performance of the new instrument and the expected impact on the broader research community, and the development of instrumentation that takes advantage of new opportunities enabled by investments in cyberinfrastructure is encouraged. The MRI-R² program does not consider the acquisition of individual pieces of equipment simply combined in a new system, the mere purchase of an upgrade, or the development of enabling technologies, devices, products or techniques to constitute instrument development.

Development proposals must meet the above guidelines to be considered for the MRI-R² program. NSF reserves the right to carefully examine development proposals to ensure that the proposed development program is not a standard research project that would otherwise be reviewed in the existing research programs.

B. Eligible Fields of Science and Engineering

Proposals for instrumentation will be considered for all NSF-supported fields of science, mathematics, and engineering. Researchers using this instrumentation need not be supported by NSF or the Federal government.

The program will not provide support for instrumentation to be used in medical education (such as medical school courses). Instrumentation intended for research with disease-related goals, including work on the etiology, diagnosis or treatment of physical or mental disease, abnormality, or malfunction in human beings or animals, is normally not supported. Instrumentation for research on animal models of such conditions or the development or testing of drugs or other procedures for their treatment also is not eligible for support. However, instrumentation for bioengineering research, with diagnosis- or treatment-related goals that applies engineering principles to problems in biology and medicine, while also advancing engineering knowledge, is eligible for support. Instrumentation for bioinformatics and bioengineering research to aid persons with disabilities also is eligible.

III. AWARD INFORMATION

Proposals submitted in response to this program solicitation will be competing for about \$200 million, pending availability of funds and quality of proposals.

The maximum request is \$6 million for both acquisition and development proposals. The minimum request is \$100,000 from Ph.D.-granting institutions and non-degree-granting organizations, with no minimum request from non-Ph.D.-granting institutions and the disciplines of mathematical sciences or social, behavioral, and economic sciences at any eligible organization.

Proposers may request an award period up to three years for acquisition proposals and up to five years for development proposals. The anticipated earliest starting date is December 31, 2009.

Special American Recovery and Reinvestment Act award conditions apply.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- Organizations that are eligible to submit proposals to NSF's MRI-R² Program ("submission-eligible organizations") are divided into three categories: Ph.D.-granting institutions of higher education, non-Ph.D.-granting institutions of higher education, and non-degree-granting organizations. Organizations that do not fit into these categories are not eligible to submit MRI-R² proposals (Note: Section 1604 of the American Recovery and Reinvestment Act precludes the use of ARRA funds by any state or local government, or any private entity, for any casino or other gambling establishment, aquarium, zoo, golf course, or swimming pool).

For the purposes of the MRI-R² program:

1. Ph.D.-granting institutions of higher education are academic institutions that have produced more than 20 Ph.D.s or D.Sci.s in all NSF-supported fields of science, mathematics or engineering during the combined previous two academic years (please review NSF's Guide to Programs for NSF supported fields of science, mathematics and engineering: http://www.nsf.gov/funding/browse_all_funding.jsp).
2. Non-Ph.D.-granting institutions of higher education are two- and four- year colleges and universities that have produced 20 or fewer Ph.D.s or D.Sci.s in all NSF-supported fields of science, mathematics, and engineering during the combined previous two academic years.
3. Non-degree-granting organizations are independent not-for-profit organizations, museums and science centers, or consortia of organizations working in NSF-supported fields of science, mathematics, and engineering.

MRI-R² proposals may be submitted by the following:

1. US colleges, universities and institutions of higher education located in the US, its territories and possessions. Distinct academic campuses (e.g., that award their own degrees, have *independent* administrative structures, admissions policies, alumni associations, etc.) within multi-campus systems qualify as separate institutions.
2. US independent museums and science centers located in the US, its territories and possessions. (These organizations must have an *independent* administrative structure, e.g., an office of sponsored research.)
3. US independent not-for-profit organizations located in the US, its territories and possessions. (Such an organization must have an *independent* administrative structure, e.g., an office of sponsored research, and have 501(c)(3) tax status).
4. To facilitate access to unique instrumentation for a broad user base, and to encourage collaboration and sharing of instrumentation, the MRI program has historically accepted proposals from consortia of organizations. Hence, MRI-R² consortium proposals may be submitted as follows:
 - 4a. Legally incorporated not-for-profit consortia consisting of submission-eligible members may submit proposals on behalf of the consortium. Such a consortium is one with an independent administrative structure, e.g., an office of sponsored research, and 501(c)(3) status.
 - 4b. Other consortia may submit MRI-R² proposals through a submission-eligible consortium member as described in items (1), (2) and (3) above. The cover sheet must clearly indicate the consortium nature of the proposal in the title, and it must identify a PI and co-PI(s) from at least 2 submission-eligible consortium organizations (i.e., for a consortium acquisition proposal, employees from 2 or more submission-eligible organizations must be identified as primary users; for a consortium development proposal, employees from 2 or more submission-eligible organizations must be active participants in the development effort). These proposals may also include partners that

are not otherwise eligible to submit MRI proposals (e.g., government labs and US small businesses located in the US, its territories and possessions).

4c. The MRI-R² program will accept proposals for instrumentation to be located at a facility of another Federal agency or one of their Federally Funded Research and Development Centers (FFRDCs), **but only** through a submission-eligible organization as a consortium proposal that includes the facility/FFRDC as a non-lead partner. Such instruments must make unique contributions to the needs of researchers elsewhere or establish access to new multi-user facilities. The current list of FFRDCs can be found at: <http://www.nsf.gov/statistics/nsf05306/>. Note: The MRI-R² program will not accept proposals for instruments that augment the scope of a project currently receiving funding through the NSF Major Research Equipment and Facilities Construction (MREFC) account.

5. US small businesses located in the US, its territories and possessions are eligible for instrument development support as private sector partners with submitting organizations; they may not submit proposals as a lead organization.

Prospective PIs may contact the cognizant MRI program officer regarding questions relating to organizational eligibility, and for information on other NSF funding opportunities for instrumentation (see also Section IX for a list of related NSF programs for research instrumentation).

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

Three (3) as described below.

Proposals that wholly or substantially duplicate MRI proposals that were submitted under NSF 09-502, and were accepted for review, will not be accepted for this MRI-R² competition.

- To provide a balanced instrumentation award portfolio at diverse organizations, across varied research topics, and that serves to train and support a broadly inclusive science and engineering workforce across the entire nation, the MRI-R² competition requires that an organization may, as a performing organization, submit or be included as a significantly funded² subawardee/subcontractor in no more than three MRI-R² proposals. No more than two proposal submissions may be for instrument acquisition.
- To promote instrumentation development, the MRI-R² competition requires that if an organization submits or is included as a significantly funded² subawardee/subcontractor in three MRI-R² proposals, at least one of the three proposals must be for instrument development. NSF reserves the right to carefully examine development proposals to ensure that they meet the requirements for this proposal type (Section II), and that submission limits have not been exceeded.

²An unfunded collaboration does not count against the submission limit. An organization may be included as a funded subawardee/subcontractor in another organization's *development* proposal, at a level of 20% or less of that proposal's budget, without affecting the subawardee's/subcontractor's submission limit. Inclusion as a funded subawardee/subcontractor on a development proposal at a budgetary level in excess of 20%, or on any acquisition proposal, must be counted against proposal submission limits.

Limit on Number of Proposals per PI:

None Specified

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

___1. Cover Sheet

Select this program solicitation number from the pull down list. Where asked to identify the NSF Unit of Consideration, select the most appropriate Division within an NSF Directorate or the most appropriate Office to consider your proposal. "Major Research Instrumentation" will be automatically selected as the program for your proposal. Selection of more than one unit for consideration is encouraged for multi-/cross-/trans-disciplinary efforts (PIs are especially encouraged to submit a list of suggested reviewers, as a **Single-Copy Document**, for these types of proposals – see the GPG for additional information).

The project title must be concise and convey the primary purpose of the proposal, e.g., "MRI-R²: Acquisition of ___", or "MRI-R²: Development of ___". Consortium project titles must also be identified in the title: "MRI-R²

Consortium: Acquisition of _____", or "MRI-R Consortium: Development of _____".

NSF applications identify only a single PI and up to four co-PIs with those titles. For the purposes of the MRI-R² program any other major participants may be indicated as "senior personnel", and they should be listed in the Proposal Budget, even if receiving no support.

2. Project Summary (maximum length, 1 page). Describe the proposed major research instrumentation, the type of research and/or research training it will enable and make more tractable, and the activities that would result if NSF funds the project. Proposals that do not **separately** address both merit review criteria (**intellectual merit and broader impacts**) within the one-page Project Summary will be returned without review.

3. Project Description (maximum length, 15 pages, including all figures and charts). *The project description must include subsections (a)-(e), and address the intellectual merits and broader impacts of the proposed effort.* Suggested lengths for individual subsections are provided for guidance only.

- a. **Instrument Location.** *Indicate in a single separate sentence the physical location of the proposed instrumentation.*
- b. **Research Activities to be Enabled** (suggested length: 9 pages for instrument acquisition; 4 pages for instrument development). Describe the research and research training activities and projects that will be enabled with the desired instrumentation, and any sources (current and/or planned) that will support those activities and projects. In narrative or tabular form describe the personnel by research area, number, and type (e.g., senior personnel, postdoctoral fellows, graduate students, undergraduate students). Include only those who will most actively use the instrumentation for research and research training on a regular basis. Other more minor users of the instrument, when applicable, should be described in a more condensed format.

This section must include Results from Prior NSF MRI Support if the PI or co-PIs have participated as PIs or co-PIs in NSF MRI awards within the past five-year period. This section also should include information on the operations and maintenance, downtime and usage history on the previously funded instrument. Standard GPG reporting requirements for Results from Prior NSF Support should be followed if the PI or co-PIs have not participated as PIs or co-PIs in NSF MRI awards within the past five-year period, with preference given to a discussion of any instrumentation awards.

- c. **Description of the Research Instrumentation and Needs** (Suggested length: 2 pages for instrument acquisition; 6 pages for instrument development).

Acquisition proposals should include a technical description of the requested instrumentation, including manufacturer and model number where appropriate. The description of needs should be comprehensive enough to allow reviewers to evaluate the extent to which the equipment is essential and appropriate. The proposal should clearly explain why the requested equipment is needed, given similar and/or related instrumentation at or near the performing organization or otherwise available as cyberinstrumentation. The existence and availability of comparable instrumentation (particularly in close geographical proximity) should be outlined in the Facilities, Equipment & Other Resources - see Section 8 below.

For development proposals, present the rationale for the new instrumentation, the design concept, and the development strategy and methods in sufficient detail to allow for the evaluation of its technical feasibility. Reviewers must be able to evaluate the expected capabilities of the instrument upon completion, and its likely availability for shared use at the end of the award period. Provide appropriate preliminary results from existing equipment, or appropriate calculations and/or models to indicate the added utility or enhanced performance (e.g., reliability, sensitivity, capacity, stability, resolution, or signal-to-noise ratio) to be achieved by the new instrument. Justify the necessity and adequacy of the new instrumentation for the proposed research projects, with reference to instruments that are currently available.

- d. **Impact on Research and Training Infrastructure** (suggested length: 2 pages). Describe how the project will make a substantial improvement in the institution's capabilities to conduct leading-edge research, and the potential impact of the instrument on the infrastructure goals of the participating organizations. For example, indicate how the instrumentation will attract researchers and students, and particularly how it will contribute to broaden the participation in science and engineering research by women, underrepresented minorities, and persons with disabilities, and how it will improve the quality of research and research training.

Describe how the instrument will be used by students, including how it can provide research experiences for undergraduate students using leading-edge facilities. Indicate how student education will be enhanced by their involvement in the planned efforts. Any proposal requesting direct student support in operations and maintenance or development efforts must justify that involvement in terms of both project needs and the training of the next generation of instrumentalists – reviewers will be asked to evaluate the appropriateness of this type of involvement.

Proposals requesting over \$2 million must address the potential impact of the instrument at both the National level and on the research community of interest. Concrete plans for enabling access by external users (including those from non-Ph.D. and/or minority-serving institutions) through physical access and/or cyberinfrastructure must be presented, and the uniqueness of the requested instrumentation must be described.

- e. **Management Plan** (suggested length: 2 pages for instrument acquisition; 3 pages for instrument development). To be considered by the MRI-R² program, all proposals **must** include a management plan, as outlined below.

Instrument acquisition proposals. Given the relatively high operation and maintenance costs of major research instrumentation, investigators seeking support for such instrumentation **must** provide detailed business and management plans with information on space, technical staffing for operation, maintenance and training of users, access for external users, and the sources of funding and plans for long-term operation and maintenance, i.e.:

- Describe the facility in which the instrument will be placed.
- Specify how and by whom the requested instrumentation will be operated and maintained (both during the award period and longer-term). Any proposal requesting direct student involvement in operations and maintenance must justify both the need and appropriateness of this type of involvement. Inclusion of a letter documenting the organization's commitment to operations and maintenance is required as a supplemental document.
- Describe the anticipated costs and the technical expertise needed to maintain and operate the instrument. If the expertise is not currently available, describe how it will be obtained.
- Describe procedures for allocating the instrument time, if appropriate, and describe plans for attracting and supporting new users. Include information on usage and downtime.

Sufficient detail should be given to enable reviewers to evaluate whether the project includes sufficient technical expertise and infrastructure to allow effective usage of the instrument by the end of the award period, as well as facilitate multi-user accessibility.

Instrument development proposals. Given the often complex nature of instrument development efforts, investigators seeking support for such instrumentation **must** provide detailed management plans for the design, construction and commissioning phases of the project, including discussion of required personnel and anticipated costs in each phase of the project, risk mitigation, and knowledge transfer upon completion, i.e.:

- Describe the design, construction and commissioning phases of the project, including the work breakdown schedule of the project activities (i.e., activities broken into tasks). Include a description of parts and materials, the estimated deliverables, associated timelines and the anticipated cost of each activity.
- Describe the technical expertise that is needed, and that will be available, to execute each activity. Describe the organization of the project staff and methods of assessing performance. For each member of the team, include a description of the responsibilities and explain why a given position is necessary for the completion of the design and construction of the new instrument.
- Assess the risks associated with each activity and describe potential methods for mitigating the risks, and for re-analyzing and modifying the project plan to keep it within scope, schedule and budget.
- Include plans for making the instrument design readily available to other researchers, for example by means of publications, by transferring the technology to other U.S. academic, industrial, or government laboratories, and/or by commercializing the instrument.
- Include plans for the operations and maintenance of the instrument. Inclusion of a letter documenting the organization's commitment to operations and maintenance is required as a supplemental document.

Sufficient detail should be provided to allow reviewers to analyze the cost and likely success of the development effort.

4. References Cited. The format must follow the guidelines as given in the GPG.

5. Biographical Sketches. The proposal must include two-page biographical sketches of the PI and any Co-PI(s) (i.e., those personnel listed on the cover sheet), as well as any designated senior personnel (see Section V.A.1) who are major users/developers of the relevant research instrumentation. If applicable, also provide a separate biographical sketch of the individual responsible for the management of the instrument. *These are the only Biographical Sketches that are allowed.* The format for biographical sketches **must** follow the guidelines as given in the GPG.

6. Budget and Budget Justification. Provide yearly and cumulative budget pages, listing those eligible project costs that NSF is being asked to fund. The total requested amount represents NSF's contribution to the project and does not include the organization's cost sharing (when applicable). All budget requests (particularly those for operations and maintenance in acquisition proposals and personnel support in development proposals) must be well-justified and commensurate with the scale and complexity of the instrumentation and/or development effort. Cost-sharing, when required, should be shown explicitly in the proposal budget pages. The budget justification, which must not exceed three pages, should itemize and explain all eligible project costs, assigning each to either the NSF request or the organization's cost-sharing, and explaining the basis for all cost estimates. The total project cost should be clearly stated. Specify the sources and amounts of eligible cost-sharing funds (see Section V.B below for further information on cost-sharing) and a projection of when they will be available. *Note that cost-sharing, when applicable, must occur during the award period.*

7. Current and Pending Support. Provide a listing for only the PI and Co-PIs (i.e., those listed on the cover sheet), as well as designated senior personnel (see Section V.A.1).

8. Facilities, Equipment, and Other Resources. Provide a listing of similar and/or related instrumentation at or near the performing organization as "Other Resources".

9. Supplementary Documents.

Required:

- For all proposals: Provide a statement from the sponsored research office classifying the performing organization as either non-Ph.D.-granting, Ph.D.-granting, or non-degree-granting (as defined in Section IV).**
- Include a letter (one-page maximum) documenting the organization's commitment for operation and maintenance of the instrument.

- c. **When applicable:** Proposals that include subawards/subcontracts (except for development proposals with subawards/subcontracts to institutions that do not exceed 20% of the proposal budget), **must** include statements from sponsored research offices, acknowledging that this proposal is included as part of their submission limit. Otherwise, an organization may exceed its submission limit, with the result that the proposal including the subaward/subcontract will be returned without review.
- d. **When applicable:** A letter (one-page maximum) documenting the organization's commitment for required cost-sharing, if applicable, **must** be included.
- e. **When applicable:** If a proposed effort involves a private sector or institutional partner, a letter (one page maximum) confirming the collaboration **must** be included.
- f. **When applicable:** Each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. The mentoring plan must not exceed one page.
- g. **When applicable:** If the proposal involves organizations other than the submitting organization, list all partners.

Encouraged:

- a. Include relevant, itemized vendor quotes.
- b. Statements from individuals, on institutional letterhead, confirming substantive collaboration efforts and/or usage of the instrument may be submitted, but they **must** follow *only* the format indicated below.

To: NSF MRI Coordinator

By signing below I acknowledge that I am listed as a collaborator and/or instrument user on this MRI proposal, entitled "_____ proposal title _____", with _____ PI name _____ as the Principal Investigator. I agree to perform the tasks assigned to me, as described in the proposal, and I commit to provide or make available the resources therein designated to me.

Signed: _____ Print Name: _____

Date: _____ Institution: _____

The proposal body itself should document the nature and need for a collaboration, and/or describe the users and their need for the instrument. Statements of collaboration beyond that specified above, including letters of support/endorsement, are not allowed. Each statement must be signed by the designated collaborator/user. Requests to collaborators for these statements should be made by the PI well in advance of the proposal submission deadline, since they must be included at the time of the proposal submission.

Not Allowed:

- a. Statements of collaboration beyond that specified above, including letters of support/endorsement, are not allowed.
- b. Impact Statements and Eligibility Statements from the NSF "Research in Undergraduate Institutions" (RUI) program are not allowed (the certification statement indicating the type of performing organization, as defined by the MRI program, is instead required for MRI-R² proposals).
- c. Documentation that refers to other proposals being submitted by an organization (e.g., letters indicating which projects were selected through an internal competition) are not allowed.
- d. Other documentation not specifically required or encouraged above is not allowed.

10. Single Copy Documents

Required when Applicable:

Certification Letter for Cost-Share Waiver As authorized in section 7036(c)(2)(A) of the America COMPETES Act, **for this MRI-R² competition**, cost-sharing may be waived for those institutions of higher education that are not ranked among the top 100 of those receiving Federal research and development funding (as documented by the statistical data published by the Foundation). The list of the top 100 institutions can be found at <http://www.nsf.gov/statistics/infbrief/nsf09313/>. Each proposal for which this waiver is applicable **must** include, on institutional letterhead, the following certification from the institution's President or Provost :

To: NSF MRI Coordinator

By signing below I certify that this proposed project will 1) make a substantial improvement in the institution's capabilities to conduct leading-edge research; 2) provide research experiences for undergraduate students using leading-edge facilities; and 3) broaden the participation in science and engineering research by women, underrepresented minorities and persons with disabilities.

Signed: _____ Print Name: _____

Date: _____ Institution: _____

Encouraged:

List of Suggested Reviewers (optional, but encouraged). Proposers are encouraged to submit a list of suggested reviewers (including affiliation) whom they believe are especially well qualified to review the proposal as a "Single-Copy Document" - *this is especially encouraged for multi/inter/trans-disciplinary proposals*. Proposers may also list persons they would prefer not review the proposal, indicating why.

NOTES:

1. **Proposals containing items other than those required (or encouraged) above, and/or by the Grant Proposal Guide, may be returned without review.**
2. **The following information applies only for those MRI-R² proposals that will be reviewed in the Office of Polar Programs:**

The Office of Polar Programs (OPP) strongly encourages MRI-R² proposals related to all aspects of polar research supported by the Foundation. For any proposals requiring access to the polar regions, investigators must contact appropriate OPP Science Program Officers (http://www.nsf.gov/staff/staff_list.jsp?org=OPP&from_org=OPP) for guidance about submitting information needed to assess logistical support requirements (if any); this (in coordination with the cognizant MRI-R² program officer to ensure MRI-R² compliance) should be done during the proposal development. Before submitting proposals requiring field support in the Arctic contact Patrick Haggerty (703-292-9082; phaggert@nsf.gov); for the Antarctic - Alexandra Isern (703-292-9080; aisern@nsf.gov).

Proposers are reminded to identify the program solicitation number (NSF 09-561) in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost Sharing: The proposed cost sharing must be shown on Line M on the proposal budget. Documentation of the availability of cost sharing must be included in the proposal. Only items which would be allowable under the applicable cost principles, if charged to the project, may be included as the awardee's contribution to cost sharing. Contributions may be made from any non-Federal source, including non-Federal grants or contracts, and may be cash or in-kind (see OMB Circular A-110, Section 23). It should be noted that contributions counted as cost-sharing toward projects of another Federal agency may not be counted towards meeting the specific cost-sharing requirements of the NSF award. All cost-sharing amounts are subject to audit. Failure to provide the level of cost-sharing reflected in the approved award budget may result in termination of the NSF award, disallowance of award costs and/or refund of award funds to NSF.

Information related to cost sharing can be found in **OMB Circular A-110**, Sub Part C.23 "Cost Sharing or Matching." For additional information on cost principles consult: **OMB Circular A-21** (Cost Principles for Educational Institutions) and/or **OMB Circular A-122** (Cost Principles for Non-Profit Organizations).

- a. **General Information:** Cost-sharing is required in the MRI/MRI-R² program, with non-Ph.D.-granting academic institutions of higher education exempt from the cost-share requirement. As authorized in section 7036(c)(2)(A) of the America COMPETES Act, **for this MRI-R² competition only**, cost-sharing will be further waived for those institutions of higher education that are not ranked among the top 100 of those receiving Federal research and development funding (as documented by the statistical data published by the Foundation). The list of the top 100 institutions can be found at <http://www.nsf.gov/statistics/infbrief/nsf09313/>. Each proposal for which this waiver is applicable **must** also include a certification from the institution's President or Provost stating that the project will 1) make a substantial improvement in the institution's capabilities to conduct leading edge research; 2) provide research experiences for undergraduate students using leading edge facilities; and 3) broaden the participation in science and engineering research by women, underrepresented minorities and persons with disabilities.
- b. **Calculating Cost-share Amounts**

The following sections explain how to calculate the cost-sharing requirements for your MRI-R² proposal, how to enter your cost-sharing amount and requested amount in the proposal budget, and what costs may be included in your cost-sharing.

To calculate cost sharing:

- Add all eligible project costs (see below) for your project to determine the total project cost.
- Calculate 30 percent of your total project cost. This is the cost-share amount that must be shown on Line M of the proposal budget in FastLane.
- All proposal budget entries in the column titled "Funds Requested by Proposer", and summed on Line L in the FastLane budget, will account for 70 percent of the total project cost, and reflect only those costs that are requested from NSF.
- The total project cost is reflected in the sum of Line L and Line M on FastLane budget.

Note: Manufacturers' discounts are strongly encouraged for reducing project cost but they may not be designated as cost sharing.

Other Budgetary Limitations:

Eligible Project Costs

The amount of the NSF request should be based on the net price of the instrumentation, including all academic discounts and other special purchase arrangements.

- a. **Acquisition proposals:** Eligible project costs are limited to instrument purchase, installation, commissioning, and calibration, and the direct and indirect costs of operation, maintenance, and other appropriate technical support during the award period. Requests for operations and maintenance must be justified in terms of the scale and scope of the instrumentation. Salary support, including fringe benefits and indirect costs, is allowed *only* for personnel directly involved in the operation and maintenance of the instrument. Any request for personnel must justify the skill level and time commitment of the person responsible for operations and maintenance. Any proposal requesting direct student support in

operations and maintenance must justify the involvement in terms of both instrument needs and the training the next generation of instrumentalists – reviewers will be asked to evaluate the appropriateness of this type of involvement. Training costs that are directly related to proper operations and maintenance are eligible, but expenses associated with the training of users are not allowed. Support for research to be conducted with the instrument, outreach, and publication costs are not allowed, nor is travel associated with conferences and/or collaborations.

- b. **Development proposals:** Eligible project costs are limited to parts and materials needed for the construction of the instrument, commissioning costs (including relevant operations and maintenance expenses), as well as the direct and indirect costs associated with support of personnel engaged strictly in the instrument development effort. Requests for personnel support must include a description of the responsibilities of the project co-workers and explain why a given position is necessary for the completion of the design, construction and commissioning of the new instrument. Any proposal requesting direct student support in development efforts must justify the involvement in terms of both project needs and training the next generation of instrumentalists – reviewers will be asked to evaluate the appropriateness of this type of involvement. Sufficient detail should be given to allow reviewers to analyze the cost of the new technology. Support for research to be conducted using the instrument *after* development, along with operations and maintenance, is not allowed. Travel costs that are integral to the development work are eligible expenses, but travel associated with conferences and training is not allowed.

Checklist

___ Is the subject matter appropriate for the MRI-R² program? Refer to Section II.A for General Information on the MRI-R² program.

___ Is the subject matter appropriate for NSF? Refer to Section II.B: Eligible Fields of Science and Engineering.

___ Is the performing organization adhering to the proposal submission limit? Refer to Section IV.

___ Are font sizes and margins consistent with the Grant Proposal Guide?

___ Cover Sheet: Is the proposal properly identified as “MRI-R²:Acquisition”, “MRI-R²:Development”, “MRI-R² Consortium:Acquisition”, or “MRI-R² Consortium:Development” on the Cover Sheet? If the instrument is to be placed at a facility of another Federal agency or one of their FFRDCs, has the proposal been properly structured and identified as a Consortium proposal? Refer to Section V.A: Full Proposal Preparation Instructions.

___ Project Summary: Is the Project Summary 1 page or less in length, and does it separately address both Intellectual Merit and Broader Impacts? Refer to Section V.A: Full Proposal Preparation Instructions.

___ Project Description: Is the Project Description 15 pages or less in length, and does it also address both Intellectual Merit and Broader Impacts? Are Results from Prior MRI Support, if applicable, *properly* addressed? Has the location of the instrument been identified and explained? Has an adequate management plan been included in a separate section? Refer to Section V.A: Full Proposal Preparation Instructions.

___ Budget: Are all of the items in the budget eligible costs (Refer to Section V.B on Budgetary Information)? Is the magnitude of the budget request consistent with the solicitation and the proposed project? Is a subaward/subcontract included as part of the proposal? If yes, has the amount of the subaward/subcontract been included in the Budget Pages, and has a separate subaward/subcontract budget been included? If applicable, is there a statement from the subawardee/subcontractor sponsored research office certifying that this proposal is included in the organization's proposal limit?

___ Is cost-sharing required? If yes, is there a letter (one-page maximum) of commitment from the organization, included in the supplemental documentation, confirming the source and availability of funds? Is the correct amount of the cost-sharing listed on the Budget Pages in FastLane?

___ Supplemental Documents: Refer to Section V.A: Proposal Preparation Instructions.

___ Is there a statement indicating the type of performing organization (Ph.D.-granting institution of higher education, non-Ph.D.-granting institution of higher education, or non-degree-granting organization)?

___ If applicable, is a letter from the Provost or President included as part of the cost-sharing waiver requirement?

___ If applicable, is a postdoctoral mentoring plan included?

___ Is the format of any supplemental documentation followed?

___ Has all required supplemental documentation been included?

___ Have all subawardees/subcontractors (if applicable) included statements acknowledging that this proposal is included in their submission limit?

___ Has any unallowed documentation been included?

___ Single Copy Documents

___ If applicable, for institutions that are not in the top 100 of those receiving Federal research and development funding, is a certification from the institution's President or Provost included, stating that the project will 1) make a substantial improvement in the institution's capabilities to conduct leading-edge research; 2) provide research experiences for undergraduate students using leading-edge facilities; and 3) broaden the participation in science and engineering research by women, underrepresented minorities and persons with disabilities?

___ Is an optional, but encouraged, list of suggested reviews included?

C. Due Dates

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

August 10, 2009

D. FastLane Requirements

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

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

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

A. NSF Merit Review Criteria

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

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

What is the intellectual merit of the proposed activity?

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

What are the broader impacts of the proposed activity?

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

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

Mentoring activities provided to postdoctoral researchers supported on the project, as described in a one-page supplementary document, will be evaluated under the Broader Impacts criterion.

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

Integration of Research and Education

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

Integrating Diversity into NSF Programs, Projects, and Activities

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

Additional Review Criteria:

In addition to the evaluation criteria stated above, MRI-R² program reviewers will assess the following:

All Proposals.

- The extent to which the proposed project will make a substantial improvement in the institution's capabilities to conduct leading edge research, to provide research experiences for undergraduate students using leading edge

facilities, and to broaden the participation in science and engineering research by women, underrepresented minorities and persons with disabilities.

Instrument Acquisition Proposals.

- The extent of shared use of the instrumentation for research and/or research training.
- Whether the management plan includes sufficient infrastructure and technical expertise to allow effective usage of the instrument; and provides the organization's commitments for operations and maintenance.
- Whether the request for operations and maintenance is justified and reasonable in magnitude. If direct support for student involvement in operations and maintenance is requested, reviewers will be asked to evaluate the involvement in terms of both instrument needs and training the next generation of instrumentalists.
- Plans for using the new or enhanced research capability in teaching, training or learning.
- In addition, for mid-scale instrument acquisition proposals: the impact of the instrumentation at the state or national level, and the detailed plans for funding of operation and maintenance.

Instrument Development Proposals:

- The adequacy of the management plan. Does the plan have a realistic, detailed schedule? Are mechanisms in place to deal with potential risks?
- The availability of appropriate technical expertise to design and construct the instrument. If direct support for student involvement in development efforts is requested, reviewers will be asked to evaluate the involvement in terms of both project needs and training the next generation of instrumentalists.
- The appropriateness of the cost of the new technology.
- The need for development of a new instrument. Will the proposed instrument enable enhanced performance over existing instruments, or new types of measurement or information gathering? Is there a strong need for the new instrument in the larger user community?

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (GC-1); * or Research Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

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

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is

contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

Special Award Conditions:

The following special award conditions apply to awards made with funds appropriated under the American Recovery and Reinvestment Act of 2009 (ARRA):

American Recovery and Reinvestment Act of 2009 Award Terms

The Recovery Act mandates a significant level of transparency and accountability. The law and implementing guidance identify specific award conditions for awards made with Recovery Act funding. As such, recipients of ARRA funds must comply with standard NSF award conditions (Research Terms and Conditions or Grant General Conditions, as applicable) as well as the requirements set forth in ARRA, including, but not limited to, the reporting requirements specified in the award term entitled, "Reporting and Registration Requirements under Section 1512 of the American Recovery and Reinvestment Act of 2009, Public Law 111-5", as well as the accompanying OMB guidance (available on the Recovery.gov website.) Awardees are advised that failure to submit timely reports may result in NSF taking administrative action, including disallowance of costs or suspension or termination of the award.

All ARRA-funded awards will incorporate the following language:

"This award is funded under the American Recovery and Reinvestment Act of 2009 (ARRA) (Public Law 111-5) and is subject to the ARRA Terms and Conditions, dated April 2009, available on the NSF website at: http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF

Given the goals of the Recovery Act, awardees also are advised that they are expected to expend funds in a timely manner on allowable award costs and that NSF will be monitoring awards for expenditures. If, after 12 months, no allowable expenditures have taken place, NSF may consider reducing or terminating the award and reallocating the funds.

ARRA Award-Specific

There also may be ARRA award specific terms, as necessary and appropriate.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after expiration of a grant, the PI also is required to submit a final project report.

Failure to provide the required annual or final project reports will delay NSF review and processing of any future funding increments as well as any pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete.

The following topics should be addressed in all MRI-R² annual and final project reports:

For Instrument Acquisition Proposals

- Status of order, delivery, and installation;
- Brief description of research projects that were enabled by the instrument;
- Number of students with hands-on experience, to include demographic information (indicate undergraduate or graduate, gender, ethnicity/race, disability, major). Note: provide percentages for demographic data; do NOT identify specific students by ethnicity, race or disability status;
- A list of the research groups granted access and the titles of the research and institutional affiliation, to include both on-campus and outside users;
- Data on usage and downtime;
- A short description of the management plan, noting deviations from the plan as described in the proposal;
- Changes in sources and/or scheduling of cost-sharing;
- Description of setbacks and resulting change of plans; and
- Information on broader impacts activities to date.

For Instrument Development Proposals

- Status of development effort to date;
- Number of student participants, to include demographic information (indicate undergraduate or graduate, gender, ethnicity/race, disability, major). Note: provide percentages for demographic data; do NOT identify specific students by ethnicity, race or disability status;
- Information on broader impacts activities to date;
- New industrial partnerships;
- Technology transfer (e.g., design and/or instrument);
- A short description of the management plan, noting deviations from the plan as described in the proposal;
- Changes in sources and/or scheduling of cost-sharing;
- Description of setbacks and resulting change of plans; and
- Modifications in timeline.

Special reporting requirements apply to awards funded under the American Recovery and Reinvestment Act of 2009 (ARRA). Please refer to the Special Award Conditions in Section VII.B. of this solicitation for additional information.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Dr. Randy L. Phelps, Staff Associate, telephone: (703) 292-8040, email: rphelps@nsf.gov

For questions related to the use of FastLane, contact:

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

Additional contact information for NSF's Major Research Instrumentation Program is as follows:

Office of Integrative Activities
Major Research Instrumentation Program
National Science Foundation, Room 1270
4201 Wilson Boulevard
Arlington, VA 22230
(703) 292-8040

E-Mail: mri@nsf.gov

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, National Science Foundation Update is a free e-mail subscription service designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the [NSF web site](#).

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this new mechanism. Further information on Grants.gov may be obtained at <http://www.grants.gov>.

RELATED NSF PROGRAMS FOR RESEARCH INSTRUMENTATION

Program Title	Brochure
BIO: Improvements in Facilities, Communications, and Equipment at Biological Field Stations and Marine Laboratories (FSML)	NSF 05-550
BIO: Instrument Development for Biological Research (IDBR)	NSF 08-566
CISE/CNS: Computing Research Infrastructure (CRI)	NSF 08-570
ENG: Small Business Innovation Research and Small Business Technology Transfer Programs Phase I (SBIR/STTR)	NSF 08-548
GEO/ATM: Atmospheric Sciences Mid-Size Infrastructure Opportunity	NSF 07-602
GEO/ATM: Graduate Student and Optical Instrumentation Support Related to the Advanced Modular Incoherent Scatter Radar (AMISR)	NSF 05-564
GEO/EAR: Earth Sciences: Instrumentation and Facilities (EAR/IF)	NSF 09-517
GEO/OCE: Oceanographic Centers and Facilities: Oceanographic Instrumentation	NSF PD 98-5410
GEO/OCE: Oceanographic Technology and Interdisciplinary Coordination Program (OTIC)	NSF PD 98-1680
MPS/AST: Advanced Technologies and Instrumentation (ATI)	No Publication Number
MPS/CHE: Chemistry Research Instrumentation and Facilities: Departmental Multi-User Instrumentation (CRIF:MU)	NSF 08-539
MPS/CHE: Chemistry Research Instrumentation and Facilities: Instrumentation Development (CRIF:ID)	NSF 04-534
MPS/CHE: Chemistry Research Instrumentation and Facilities: Cyberinfrastructure and Research Facilities (CRIF:CRF)	no longer offered
MPS/DMR: Instrumentation for Materials Research	NSF 07-600
MPS/DMR: Instrumentation for Materials Research - Major Instrumentation Projects (IMR-MIP)	no longer offered
MPS/DMS: Scientific Computing Research Environment for the Mathematical Sciences (SCREMS)	NSF 07-502
Crosscutting: Cyberinfrastructure for Environmental Observatories: Prototype Systems to Address Cross-	NSF 06-505

Cutting Needs (CEO:P)	
Crosscutting: High Performance Computing System Acquisition: Towards a Petascale Computing Environment for Science and Engineering	NSF 08-573

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 40,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <http://www.nsf.gov>

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information**
(NSF Information Center): (703) 292-5111
- **TDD (for the hearing -impaired):** (703) 292-5090
- **To Order Publications or Forms:**
 - Send an e-mail to: nsfpubs@nsf.gov
(703) 292-7827
 - or telephone:
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing

instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

Suzanne H. Plimpton
Reports Clearance Officer
Division of Administrative Services
National Science Foundation
Arlington, VA 22230

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

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