Organization of Projects on Environmental Research in the Arctic (OPERA)

PROGRAM SOLICITATION
NSF 09-599

National Science Foundation

Office of Polar Programs
Division of Arctic Sciences

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

December 11, 2009

REVISION NOTES

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).

As announced on May 21st, 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:

Organization of Projects on Environmental Research in the Arctic (OPERA)

Synopsis of Program:

This solicitation seeks proposals for activities to foster and sustain collaboration among projects funded by NSF that contribute to the US arctic environmental change research effort. Many of these projects began during the International Polar Year (IPY) and are currently affiliated with the US Study of Environmental Arctic Change (SEARCH) and the Arctic Observation Network. Others are supported outside of the auspices of SEARCH and IPY. The project or projects supported through this solicitation will provide resources to the scientific leadership that are needed to implement SEARCH's broad science agenda. The scope covers SEARCH generally and its component parts, observing, understanding and responding. One key additional effort, which has gained prominence during the IPY, is needed to tie all these together: a robust and modern approach to managing and enabling discovery of Arctic scientific data.

Cognizant Program Officer(s):

- Overall Lead-Neil R. Swanberg, telephone: (703) 292-8029, email: nswanber@nsf.gov
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Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.078 --- Office of Polar Programs

Award Information

Anticipated Type of Award: Continuing Grant or Cooperative Agreement

Estimated Number of Awards: 1 to 4

Anticipated Funding Amount: $10,000,000 to $15,000,000 is expected to be awarded over a three-year period, pending availability of funds. However, awards up to five years may be considered. More than half the funding is expected to support the data activity described in item 4. NSF will consider the use of a continuing grant or cooperative agreement for the award mechanism as appropriate. At the end of the award period NSF will recompete for these services in support of the research community.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- For-profit organizations: U.S. commercial organizations, especially small businesses with strong capabilities in scientific or engineering research or education.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

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 not required under this solicitation.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

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

  December 11, 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: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

Recent years have brought major events in the Arctic, including general warming, increased storm activity, changes in precipitation intensity and form, increased river runoff, significant decrease in thickness and extent of sea ice, melting of permafrost, reduction of ice volume in glaciers and ice sheets and changes in land cover and ecosystems. The Arctic is, in short, changing.

As these various changes have become evident, and as more and more of the links amongst them have been identified, the scientific community has improved its understanding of the scope, trajectory and potential impact of the suite of changes being observed. A planning effort begun in 1998 led to the establishment of a Study of Environmental ARrctic CHange (SEARCH). The SEARCH effort began with a fairly narrow focus on ocean and atmospheric physical coupling, but expanded quickly to an interdisciplinary collaboration of physicists, chemists, modelers, biologists and social scientists exploring the interconnectivity of the full spectrum of the many phenomena observed. SEARCH has engaged hundreds of scientists, is endorsed by the US Arctic Research Commission, and has multi-agency support established through the Interagency Arctic Research Policy Committee (IARPC). SEARCH research is being performed by academic and government institutions funded by, or working under the auspices of, eight agencies (NSF, NOAA, NASA, DOI, DOD, DOE, USDA, and Smithsonian), represented in an interagency program management committee.

The SEARCH planning effort produced a research plan, an implementation strategy and, by the beginning of the International Polar Year (IPY), a fairly detailed work plan for a broadly based environmental effort focused on observing, understanding and responding to change in the Arctic. Numerous pieces of a SEARCH observation network have now been funded, as well as individual projects aimed at understanding through synthesis and modeling of the system. These are supported by several US agencies and have counterparts in efforts underway in other countries and through international bodies. The component on Responding to Change is the least developed at present, but is ultimately envisaged to address how the system responds to change, especially how people in the Arctic respond to change and what the system responses might be to various actions human societies might take.

With numerous pieces of a broad and complex program (see SEARCH website) now begun, there is as yet little active effort to facilitate their interactions. Creating such an effort has clear benefits in preventing unnecessary overlap and fostering synergy amongst projects, as well as sharing of resources of people, platforms, instruments and data. The next step is for government and academic participants in the arctic research effort to link the various research components to enable aggregate results that reach beyond the scope of the separate projects. The purpose is to foster voluntary collaboration and by so doing optimize resources, ensure that equivalent measurements are made at comparable sites, that unnecessary duplication is avoided, and that data are made available in formats that are interchangeable. Moreover, linking observation sites facilitates the development of pan-arctic data discovery, and associating them with interdisciplinary synthesis efforts should enable timely identification of critical data needs, thus helping to optimize the observation network. Finally, developing a well implemented set of activities for data collection and understanding facilitates the exchange of data with similar activities ongoing in other national and international programs.

Successful proposals will provide key activities needed to foster collaboration among participants of the arctic environmental change research effort in the US. Much of this effort is currently affiliated with the interagency program SEARCH, but it is likely that it will be necessary to reach beyond what is generally considered SEARCH.

II. PROGRAM DESCRIPTION

Scientific leadership is needed to aid in implementing SEARCH's broad science agenda with its many connections - existing and potential - to partner agencies and programs. This solicitation seeks proposals for activities that would actively foster collaboration

and interdisciplinary synthesis among the suite of arctic environmental change projects funded by NSF but could also contribute to the arctic environmental change research effort across US agencies. Many of these projects are currently affiliated with SEARCH, but it is likely that it will be necessary to reach beyond what is generally considered SEARCH.

The major outcomes of the collective activities are expected to be:

- Improved linkages among projects and components of the overall research effort.
- A framework for research activities of an integrated nature that explore knowledge from disparate sources to achieve new insight.
- Implementation of improved data discovery tools and approaches.
- Science workshops, meetings and conferences that target a level of understanding that goes beyond what individual projects can achieve on their own.
- A forum for the discussion of scientifically priorities based on a rigorous analysis of research results.
- Communication, using appropriate means, with stakeholder groups, including the research community, policy makers, educators and students, the general public and providing research results that inform policy decisions.

NSF anticipates that this effort will be led by fully engaged scientists in an environment supportive of academic endeavors. A variety of approaches will be considered for support of collaboratory research, if they provide effective and strong scientific support and intellectual leadership with some mechanism to ensure acceptance of that leadership from the scientific community served. This means the effort must both lead, and be overseen by and responsive to, the research community it serves.

At a minimum the following components related to activities now supported by NSF are needed:

1. **Overall support of the US SEARCH effort:**

   SEARCH encompasses much of the organized US research effort for environmental change in the Arctic. Currently NSF funds a SEARCH Science Steering Committee through an award to the Arctic Research Consortium of the United States (ARCUS). This committee has provided the planning framework for SEARCH, and it also adheres to a developing international program called the International Study of Arctic Change (ISAC). Hitherto most aspects of the overall scientific leadership have been provided on a volunteer basis. This solicitation is for support for leadership of a collaboration and interdisciplinary synthesis effort to match the scale and pace of research in SEARCH. Although voluntary committee-based leadership is expected to continue, this step to a funded scientific support activity is needed to build on what has been accomplished and to move SEARCH and the overall study of arctic change forward.

   The overall support function is envisioned as providing, but not being limited to:

   1. strategic thinking on research directions for studying arctic change, including rigorous approaches to planning improvements to SEARCH implementation, possibly including efforts from other programs
   2. organization of periodic community-based review and assessment of SEARCH with regard to progress and challenges
   3. a research community point of contact for integration with other activities, especially international ones with global focus. The awardee will work closely with the appropriate funding agencies who will lead in developing agency to agency agreements
   4. continuous integration between community-based planning and the resulting implementation of individual research projects
   5. support for meetings of the SEARCH committee including organizing venue and travel, preparation of agenda and papers prior to meetings and making, keeping and publicizing records of meeting results
   6. science workshops, meetings and conferences that target a level of understanding that goes beyond what individual projects can achieve on their own
   7. improved linkages among projects and components of the overall research effort with effective communication and implementation of supportable group decisions, and
   8. communication using appropriate means with stakeholder groups, including the research community, policy makers, educators and students, the general public and research results that inform policy decisions.

   Such support can take any form and does not have to maintain the current structure. Meritorious proposals will have strong scientific underpinning, be able to demonstrate performance in terms of peer-reviewed publications and a willingness to be responsive to evolving scientific input and to cooperating closely with other efforts as appropriate.

2. **Leadership of the US portion of an Arctic Observing Network**

   The Arctic Observing Network (AON) supports the Observing Change Component of SEARCH, developed in response to needs identified by the reseach community to advance SEARCH goals (http://www.arcus.org/search/resources/reportsandscienceplans.php). There is a SEARCH panel charged with recommending development of an observing strategy *ad hoc*, but there is currently no designated seat of activity for its support. As the AON has developed, the need has grown for active scientific support and intellectual leadership in the research community. Such support can take any form, but must have strong scientific content, focus on attracting the various observation sources that exist within or outside of the auspices of SEARCH into a functioning network, and be prepared to engage its counterparts abroad. It is important for this effort to use cyberinfrastructure** to enable the communication, coordination and collaboration necessary to connect the dispersed, multi-disciplinary elements of AON. It is also important that such an effort forge strong links to the understanding change and the data components (items 3 and 4).

   The overall AON leadership function is envisioned as providing, but not being limited to:

   1. strategic thinking thinking to develop scientifically based priorities for future observation efforts
   2. a research community point-of-contact for identifying potential integration with observation efforts in other countries or with international bodies and facilitate their development
   3. helping to ensure, in collaboration with data services, that observational data are delivered in near real time and appropriate format
   4. communication using appropriate means with stakeholder groups, including the research community, policy makers, educators and students, the general public and providing research results that inform policy decisions
   5. continuity of action for planning and implementation of efforts supporting observation, and
   6. support for meetings of AON committee including organizing venue and travel, preparation of agenda and papers prior to meetings and making, keeping and publicizing records of meeting results.

3. **Leadership of efforts in Understanding Arctic Change**

Some specific activities have been funded under the auspices of a SEARCH panel devoted to Understanding Change. These need to be linked and, wherever possible, efforts need to be made to foster high level synthesis amongst them. However there are additional activities funded by NSF and other agencies that are not currently part of SEARCH. The programmatic boundaries do not comprise intellectual boundaries, however, and while these activities have flourished, it is recognized that more could be achieved by linking the various Understanding Change efforts, including selected process studies and modeling, and enabling strong connections to the Observing Change effort (see 2 above). Proposals are sought that address the need for active scientific support and intellectual leadership of Understanding Arctic Change. Such support can take any form , but must have strong scientific content, focus on welcoming the various projects into a functioning community, and be prepared to engage its counterparts abroad.

The overall Understanding function is envisioned as providing, but not being limited to:

1. research activities, especially of an integrated nature that explore knowledge from disparate pieces to achieve new insight
2. strategic thinking on research directions for understanding arctic change, including managing implementation planning, possibly including efforts from other programs. This should include close collaboration with observation group to develop rigorous scientifically based priorities for future research and observation efforts
3. communication using appropriate means with stakeholder groups, including the research community, policy makers, educators and students, the general public and providing research results that inform policy decisions
4. a point-of contact for similar activities in other countries and international bodies
5. continuity of action for planning and implementation of efforts supporting research and
6. supporting meetings of the Understanding Change committee including organizing venue and travel, preparation of agenda and papers prior to meetings and making, keeping and publicizing records of meeting results.

4. **Management of Arctic Data**

NSF is soliciting effective management of arctic data that result from this work including data storage and archiving, and enabling discovery of arctic environmental data. The prime focus is to improve data accessibly and use of results from NSF funded awards. There is no definitive data archive for arctic data, nor is one necessarily needed as arctic environmental data typically reside in numerous disciplinary (Ecology, Oceanography, Geophysics, Ice) archives. However, as arctic environmental data streams begin to flow from the observation network, and as modeling and synthesis activities demand more and more data from varied sources, and produce refined data products, there will develop a growing need for a data activity that serves the arctic research community. Proposals are sought that provide comprehensive data services and leadership for ingestion, archive facilitation (assisting PIs to get their data and meta data into data centers and tracking their location) and data discovery for various users. Such a project should, in collaboration with established data centers:

1. develop and execute a plan to identify, catalog, if necessary ingest, and package a comprehensive set of arctic environmental change data holdings
2. help PIs to meet agency data provision requirements, fully recognizing the special requirements for protecting human subjects data
3. assist researchers in the appropriate documentation of their data sets
4. ensure these data sets are archived and released at the appropriate time and
5. implement improved data discovery tools and approaches.

Proposed efforts can take any form but must demonstrate a willingness to interact with both the AON and Understanding components, and with data-related counterparts both national and international.

5. **Responding to Change component of SEARCH**

Finally, the Responding to Change component of SEARCH is not yet ready for implementation, but is increasing in importance as society seeks response options. Responding to Change needs more development and should include very strong input from researchers focused on social-cultural systems and environmental change. Proposers may request funds to support further community planning for Responding to Change.

General

Proposals are sought for activities that would provide one, several or all of these components. Innovative management models are encouraged such as establishing virtual organizations (see below). Clearly, if several awards are made to cover the full range of activity the successful grantees will have to work closely together to achieve their goals. Prospective PIs will have to demonstrate their ability to work with individuals and groups not explicitly party to the proposal. The proposals envisioned here are primarily intended to support the components of the research endeavor that are supported by NSF. However, as noted above, there should be clear linkages and demonstrated ability in working with multiple institutions, including academic and government research agencies, and the international research enterprise as it pertains to understanding the arctic system.

Researchers interested in proposing activities furthering arctic data management, data synthesis, computational thinking, or virtual organization (VO)* resources, are encouraged to consult the related reports provided by the NSF Office of Cyberinfrastructure, to align the proposed activity with NSF's current standards and expectations for cyberinfrastructure elements such as data archives, interoperability, metadata, VOs, or other concepts related to the proposed work.

*Definition: A virtual organization (VO) is a group of individuals whose members and resources may be dispersed geographically and institutionally, yet who function as a coherent unit through the use of cyberinfrastructure. A VO is typically enabled by, and provides shared and often real-time access to, centralized or distributed resources, such as community-specific tools, applications, data, sensors, and experimental operations. A VO may also be known as or be comprised of systems known as collaboratories, e-Science or e-Research, distributed work groups, or virtual teams, virtual environments, and online communities.

**Definition: Cyberinfrastructure (CI) is the comprehensive set of deployable hardware, software, and algorithmic tools that support research, education, and increasingly collaboration across and among all research disciplines, whether they are experimental, theoretical, and/or computational. CI consists of computing systems, data storage systems, data repositories and advanced instruments, visualization environments, sensors, people, and the necessary intellectual capital, all linked

together and made accessible by software and advanced networks. CI supports individuals, communities, and virtual organizations to sustain and improve scholarly productivity and enable breakthroughs in complex problems not only in science and engineering, but all areas.

III. AWARD INFORMATION

Anticipated Type of Award: Continuing Grant or Cooperative Agreement

Estimated Number of Awards: 1 to 4

Anticipated Funding Amount: $10,000,000 to $15,000,000 is expected to be awarded over a three-year period, pending availability of funds. However, awards up to five years may be considered. More than half the funding is expected to support the data activity described in item 4. NSF will consider the use of a continuing grant or cooperative agreement for the award mechanism as appropriate. At the end of the award period NSF will recompete for these services in support of the research community.

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- For-profit organizations: U.S. commercial organizations, especially small businesses with strong capabilities in scientific or engineering research or education.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

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.

Proposal Content

Successful proposals can achieve the goals of this competition through a variety of mechanisms ranging from a suite of separate activities that can link to one another once established, to a single project. NSF recognizes, however, that a range of activities is possible and urges broad and creative thinking about the form, structure, and mission of a support activity for arctic environmental research.

All proposals should address the following areas:

- *Rationale for the activity*: Clearly indicate what aspects of research support will be met by the proposed activity.
- *Description of Activities*: Describe in detail the range and modes of activities that the effort will support in sufficient detail to allow assessment of their merit. Explain the selection criteria and mechanisms for identification of any visiting or fixed-term personnel, individuals and groups.
- *Education and outreach*: Provide a detailed description of the educational and outreach activities the effort will undertake, including international activities.
- *Communication, knowledge transfer, and informatics*: Describe plans for linking with appropriate communities and institutions beyond the sponsoring institution, e.g., other colleges, universities, disciplinary subfields, other disciplines, nonprofit research organizations, government laboratories, or industry, to enhance involvement and knowledge transfer.

Describe plans for enhancing efforts with regard to informatics, data curation, and cross-disciplinary integration of data, including plans for logistic support for remote users of the project's capabilities.
- *Management plan*: Provide a description of the organizational structure of the activity. Outline mechanisms for engaging with participating scientific groups.
- *Institutional capabilities*: Provide a description of how the current capabilities and resources of the host institution will facilitate the proposed activities. Include information on organizational leadership, technical expertise, general support, and maintenance as well as space, infrastructure and technologies for synthesis, analysis, data management and communication as appropriate to the project mission. Describe how the probable location of the project will foster its success, including any unique characteristics of the institution or location, ease of travel to and accommodations for visitors at or near the activity.

Proposers are reminded to identify the program solicitation number (NSF 09-599) 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: Cost sharing is not required under this solicitation.

C. Due Dates

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

  December 11, 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:

Proposals responding to this call will be for projects to support colaboration and synthesis among projects research funded under other banners. Accordingly the intellectual merit may be somewhat different than that seen in most research proposals. Meritorious proposals will have strong scientific underpinning, be able to demonstrate performance in terms of peer-reviewed publications and a willingness to be responsive to evolving scientific input and to cooperating closely with other efforts as appropriate. The potential intellectual contribution will be evaluated as related to research goals that span the scope of the projects supported, but other criteria will apply as well.

In addition the proposals will be evaluated according to how well they can meet the needs of the communities they will serve. This includes all aspects of support, but also what plans are established to achieve and maintain community consensus and acceptance of the leadership role where applicable. In the case of the data function, the proposal will be evaluated largely on the demonstrated ability of the group to provide state-of-the-art data services to the communities it serves.

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.

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.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Overall Lead-Neil R. Swanberg, telephone: (703) 292-8029, email: nswanber@nsf.gov
- Lead for observing-Martin O. Jeffries, telephone: (703) 292-7442, email: mjeffrie@nsf.gov
- Lead for Data-Daniel Lubin, telephone: (703) 292-8029, email: dlubin@nsf.gov
- Anna M. Kerttula de Echave, telephone: (703) 292-7432, email: akerttul@nsf.gov
- Erica Key, telephone: (703) 292-8029, email: ekey@nsf.gov
- William J. Wiseman, telephone: (703) 292-4750, email: wwiseman@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.
- Linda Izzard, telephone: (703) 292-7430, email: lizzard@nsf.gov
- Tianay Robinson, telephone: (703) 292-7859, email: trobinso@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.

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:**

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  or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; 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:

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