Collaborations in Mathematical Geosciences FY2004 (CMG)

Program Solicitation
NSF 04-508
Replaces Document NSF 03-508

National Science Foundation
Directorate for Geosciences
Directorate for Mathematical and Physical Sciences
Division of Mathematical Sciences

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

January 14, 2004

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Collaborations in Mathematical Geosciences FY2004 (CMG)
Opportunities for Research Collaborations Between the Mathematical Sciences and the Geosciences

Synopsis of Program:

The purposes of the CMG activity are: (A) to enable collaborative research at the intersection of mathematical sciences and geosciences, and (B) to encourage cross-disciplinary education through summer graduate training activities. Research topics under (A) should fall within one of three broad themes: (1) mathematical and statistical modeling of large, complex geosystems, (2) representing uncertainty in geosystems, or (3) analyzing large geoscience data sets. Research projects supported under this activity should be essentially collaborative in nature. Research groups should include at least one mathematical scientist and at least one geoscientist. Projects under category (A) should be of three to four years in duration. It is not the intent of this activity to provide general support for infrastructure. Projects under category (B) are not restricted to topics (1) - (3). The award duration for category (B) will be two years.

Cognizant Program Officer(s):

- Xuming He, Directorate for Mathematical & Physical Sciences, Division of Mathematical Sciences, 1025 N, telephone: (703) 292-4876, fax: (703) 292-9032, email: xhe@nsf.gov
- Stephen Meacham, Directorate for Geosciences, Division of Atmospheric Sciences, 775 S, telephone: (703) 292-8527, fax: (703) 292-9022, email: smeacham@nsf.gov
- Elise Ralph, Directorate for Geosciences, Division of Ocean Sciences, 725 N, telephone: (703) 292-8582, fax: (703)

292-9085, email: eralph@nsf.gov

- Robin Reichlin, Directorate for Geosciences, Division of Earth Sciences, 785 S, telephone: (703) 292-8556, fax: (703) 292-9025, email: rreichli@nsf.gov

- Thomas F. Russell, Program Director, Directorate for Mathematical & Physical Sciences, Division of Mathematical Sciences, 1025 N, telephone: (703) 292-4863, fax: (703) 292-9032, email: trussell@nsf.gov

- Junping Wang, Directorate for Mathematical & Physical Sciences, Division of Mathematical Sciences, 1025 N, telephone: (703) 292-4488, fax: (703) 292-4856, email: jwang@nsf.gov

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

- 47.050 --- Geosciences
- 47.049 --- Mathematical and Physical Sciences

Eligibility Information

- **Organization Limit:** The categories of proposers identified in the Grant Proposal Guide are eligible to submit proposals under this program solicitation. Specific classes of NSF-funded research centers are also eligible to submit. Please see Section III in the full program solicitation for further information.
- **PI Eligibility Limit:** Unaffiliated scientists are not eligible to submit a proposal as a Principal Investigator, but may be eligible for support.
- **Limit on Number of Proposals:** None Specified.

Award Information

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 15 to 25
- **Anticipated Funding Amount:** $8,300,000 in FY2004, subject to the availability of funds.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Full Proposal Preparation Instructions:** This solicitation contains information that supplements the standard 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.
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- **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 Date(s)** (due by 5 p.m. proposer's local time):

January 14, 2004

Proposal Review Information

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

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I. INTRODUCTION

In many areas within the geosciences, researchers at the frontiers of theory, experimental science and modeling confront

problems for which currently applied mathematical or statistical approaches are insufficient. Such problems combine challenges in geosciences with challenges in mathematics or statistics and tackling them will advance the state of the art in both geosciences and mathematical sciences. To effectively meet these challenges requires the combined efforts of geoscientists and mathematical scientists.

The Division of Mathematical Sciences (DMS), within the Directorate for Mathematical and Physical Sciences (MPS), and the Directorate for Geosciences (GEO) of the National Science Foundation (NSF) expect to make a number of awards in FY 2004 that will support the activities of groups of investigators working at the frontiers of mathematical geosciences. They also anticipate making one or two awards that promote cross-disciplinary graduate student training in mathematical geosciences. This activity is a component of NSF's Mathematical Sciences Priority Area. For a list of awards funded in the FY 2002 and FY 2003 Collaborations in Mathematical Geosciences (CMG) competition, go to https://www.fastlane.nsf.gov/a6/A6SrchAwdf.htm. (Search for titles containing CMG with award numbers between 0221000 and 0223000, and between 0327000 and 0329000.) Proposals should provide a plan for making substantial progress on a topic of recognized or emerging importance to both the mathematical sciences and geosciences communities that falls within one of the two thematic areas listed below. They should bring together scientists from both communities in a truly collaborative effort.

Many potentially fruitful areas of research in mathematical geosciences have been identified by the research community. Because of the relatively modest amount of funds available, proposals in only three thematic areas are solicited in this competition. This is a deliberate choice aimed at maintaining a reasonable success rate and avoiding unnecessary burdens on the time of potential reviewers and investigators. If this competition continues to be successful, it is anticipated that, subject to availability of funds, additional topics will be included in future competitions. For the current competition, proposals are solicited on the following themes:

- **Mathematical and statistical modeling of large, complex geosystems**
- **Representing uncertainty in geosystems**
- **Analyzing large geoscience data sets**

These three themes are broader than, but still include, the themes of the earlier competitions. Proposals falling within the FY 2002 theme (**analyzing and modeling geosystems that contain a broad range of interacting scales**) will, therefore, still be welcome.

In addition to research proposals, the Division of Mathematical Sciences and the Directorate for Geosciences anticipate the funding of one or two interdisciplinary training activities for graduate students in the summer of 2005. These should bring together graduate students in the geosciences and the mathematical sciences, from multiple institutions, in a program built around an important research theme, or set of themes, that is relevant to both disciplines. Successful activities should create an environment that provides stimulating pedagogical material, exposure to interdisciplinary research, and strong mentoring support.

II. PROGRAM DESCRIPTION

The primary purpose of the CMG activity is to allow small groups of researchers to respond to recognized scientific needs of pressing importance, to take advantage of current scientific opportunities, or to prepare and solidify the ground for anticipated scientific developments in areas of research at the intersection of mathematical sciences and geosciences (proposal type A, hereafter). Topics should fall within the themes described below. Groups should include at least one mathematical scientist and at least one geoscientist. Projects supported under this activity should be essentially collaborative in nature and depend for their advancement on the interaction of the researchers in the group. Projects should be of three to four years duration. It is not the intent of this activity to provide general support for infrastructure.

Support is also available for graduate summer school training (proposal type B, hereafter).

PROPOSAL TYPE A:

Proposals are solicited in the following theme areas.

Mathematical and statistical modeling of large, complex geosystems.

A few examples of topics that fall within this theme include:

- Novel deterministic and/or stochastic approaches to representing ranges of dynamically active scales that are not explicitly resolvable.
- New approaches to representing and analyzing high-dimensional dynamical systems.
- Analysis of spatio-temporal pattern formation in geosystems with many degrees of freedom.
- Complex dynamics and critical behavior in discrete models of geosystems such as cellular automata and lattice gases.
- Research that links new insights about the internal dynamics of geosystems and novel methods of analyzing data sets; e.g. detection and representation of lower-dimensional features.
- New approaches to the mathematical modeling of geosystems for which classical methods have failed to yield progress in predictive modeling.
- Innovative approaches to tomography in geophysical settings.
- Coupled multi-domain systems with different processes in different regions.

Representing uncertainty in geosystems.

Some examples of topics falling within this theme include:

- Statistical measures of uncertainty in inverse problems.
- Global optimization methods and uncertainty in parameter estimation.
- Techniques for using observational data and models to characterize the uncertainty not revealed by ensembles of runs of models of geosystems.
- Formal assessments of the uncertainty of the predictions of modern approaches to modeling complex environmental systems.
- Techniques for predicting the reliability of complicated, spatially distributed, geoscience observing systems. General methods for extending observing system design techniques to represent better the role of uncertainty.

Analyzing large geoscience data sets

Some examples of topics falling within this theme include:

- Methods and techniques to analyze the structure of large data sets, to fit models robustly, and to identify and validate patterns.
- Research that links new insights about the internal dynamics of geosystems and novel methods of analyzing data sets; e.g. detection and representation of lower-dimensional features.
- Feature detection and characterization in large, streaming data sets and/or multiple data sets of disparate data types
- Data analysis methods that enhance the utility of geoscience observatory infrastructure.

The main themes are intentionally broad and it is not necessary for proposals to be related to any of the specific examples

given. The aim of the CMG activity is to support projects for which the collective effort by a group of researchers with complementary expertise is necessary to reach the scientific goals. Thus, proposals must explain why interaction and group effort are critical to the success of the project. The scientific personnel involved in the project should consist of at least two researchers. At least one researcher should be recognized as having mathematical science expertise and research experience; at least one researcher should be recognized as having geoscience expertise and research experience. The group researchers may come from more than one organization. Awards made under the CMG activity are intended to foster synergy between the disciplines and the group researchers that cannot be easily achieved with individual grants. In particular, researchers supported by this activity are expected to collaborate closely and intensely during the project. At the same time, supported projects should have the potential to contribute a significant, long-term impact.

NSF sponsors a number of programs which feature research collaborations, including interdisciplinary collaboration. Prospective investigators in the CMG program should carefully consider whether a planned proposal is best suited for the CMG program or for some other program, keeping in mind that NSF does not normally accept substantially overlapping proposals that are submitted to different programs simultaneously without prior approval. If in doubt, please consult one of the cognizant Program Officers before submitting a proposal.

Research that pursues an already established research agenda will be **less competititive** in the CMG activity and should be directed to the appropriate existing NSF disciplinary program(s). Proposals whose primary applicability is petroleum engineering and/or geo-technical engineering are not appropriate for CMG; however, proposals on related topics that also have significant and articulated applicability to problems that fall within the purview of the Directorate for Geosciences will be accepted for review. Proposers are encouraged to request support for, and provide mentoring to, research students and/or post-doctoral researchers in their proposals.

Examples of possible outcomes for CMG projects include the following:

- Substantial progress is made toward solution of a set of major open questions.
- New research directions that have become possible due to recent advances are identified, and significant progress is achieved.
- As a direct result of the group effort, an important area of research is substantially advanced.
- New opportunities for productive mutual exchange between areas in the mathematical sciences and in the geosciences are identified and progress is made towards exploiting these opportunities.

Additional possible outcomes include the following:

- Graduate students and postdoctoral researchers are trained in an important emerging area at the intersection of the mathematical sciences and the geosciences.
- Graduate students, postdoctoral researchers, and undergraduates are trained in new ways that prepare them to conduct interdisciplinary research of the type solicited in this competition.
- New and exemplary modes of collaboration are established.

Research groups are expected to remain open to the broader scientific community from which they are drawn and to disseminate the results of their work in a timely and effective way.

The section above lists just a few examples of topics and outcomes for CMG projects. Proposers are strongly urged to discuss their ideas for a project with one of the Program Officers listed at the beginning and end of this document.

PROPOSAL TYPE B:

To foster the development of new researchers who can make substantial contributions to interdisciplinary topics at the interface of mathematical sciences and geosciences, the Division of Mathematical Sciences and the Directorate for

Geosciences would like to make one or two awards in FY2004 to support interdisciplinary training activities for graduate students in the summer of 2005. These should bring together graduate students in geosciences and mathematical sciences from multiple institutions in a program built around an important research theme, or set of themes, that is relevant to both disciplines. Successful activities should create an environment that provides stimulating pedagogical material in areas relevant to the interdisciplinary theme of the summer program. They should convey the importance and excitement of interdisciplinary research in the program's theme area, provide strong mentoring support and prepare participating students to be contributors to such research.

The make-up of the summer program's "student body" is left to the discretion of the organizers. However, the proposal must contain a clear description of how potential students will be recruited and the criteria that will be used to select student participants. This description should include information about how the summer program will be advertised. The intent is that these summer training programs should help expand and diversify the pool of talented U.S. researchers at the forefront of interdisciplinary research in the mathematical sciences and the geosciences. Reviewers will be asked to comment on the degree to which the recruitment and selection plan is consistent with this goal.

III. ELIGIBILITY INFORMATION

The categories of proposers identified in the Grant Proposal Guide are eligible to submit proposals under this program announcement/solicitation. Specific classes of NSF-funded research centers are also eligible to submit. The NSF-funded University Corporation for Atmospheric Research (UCAR) and mathematical sciences institutes funded by the Division of Mathematical Sciences are eligible to submit proposals that are responsive to this solicitation, provided that these do not include costs already covered by other NSF awards.

Proposals involving investigators from more than one institution are encouraged and should be submitted as collaborative proposals (see instructions below). Prospective applicants are strongly urged to contact the Program Officers listed in this document for guidance.

Unaffiliated scientists are not eligible to submit a proposal as a Principal Investigator, but may be eligible for support.

IV. AWARD INFORMATION

NSF anticipates that approximately $8,300,000 will be available for making type A and B awards in FY 2004, subject to the availability of funds.

Proposals of type A may be for up to four years duration. PIs are encouraged to submit proposals for projects with durations of three to four years. The anticipated date of funding recommendations is July 2004. The final number of awards will depend on the quality of submissions and the availability of funds. In FY 2003, the average *annual* award size, per project, for awards of type A, was approximately $192,000.

The total amount of funds requested in a proposal of type B should not exceed $200,000. Funds may be requested to cover stipends and travel to the site of the program for the participating students, as well as travel and reasonable participant support costs for senior personnel actively participating in the program as mentors or teachers. For non-employees, these should be listed under participant support costs (see GPG, Chapter II.C.2.g.v.). Justified logistical support costs of up to 5% of the total direct costs may be requested. Logistical support costs should be included in the total direct costs. The award duration will be two years and the award instrument will be a standard grant. Each award is intended to cover a single program in the summer of 2005. The awards will be made in Summer 2004. It is expected that a successful summer program will require at least a year of preparation. Preference will be given to new interdisciplinary summer programs. NSF anticipates that up to a total of $400,000 will be available for type B awards in FY 2004. The number of awards will depend on the

quality of submissions and the availability of funds.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Instructions:

Proposals submitted in response to this program announcement/solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF *Grant Proposal Guide* (GPG). The complete text of the GPG is available electronically on the NSF Website at: http://www.nsf.gov/cgi-bin/getpub?gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

The following instructions supplement the GPG guidelines.

Proposers are reminded that both Broader Impacts and Intellectual Merits must be addressed explicitly in both the Project Summary and the Project Description.

1. Proposal (Type A)

All proposals of type A must be submitted via FastLane by 5:00 PM, proposer's local time, on Wednesday, January 14th, 2004. Proposals received after that will be returned without review.

Proposals involving investigators from more than one organization should be submitted as collaborative proposals. Proposers should consult the GPG Section II.D.3., "Collaborative Proposals."

(a) Cover page - To facilitate timely processing, the title of the proposed project should begin with the string "CMG RESEARCH:" or "CMG COLLABORATIVE RESEARCH:". The latter form should be used for multi-organizational proposals.

(b) Project Description

i) Proposed Research. Narrative, not to exceed fifteen pages, including the following items:

- An explanation of the scientific context and timeliness of the proposed project.
- A description of the proposed research.
- A justification for why a collaborative effort is necessary to carry out the proposed project.
- A timeline for the planned work and a justification for the duration.
- Plans for disseminating the results.
- Results from prior NSF support, whether or not applicable to the proposed activity. If not applicable, please explain why.

ii) Management Plan. Provide a management plan, describing how the group effort will be coordinated. This section may not exceed one page.

iii) Modes of Collaboration and Training. The following components, not to exceed an additional two pages in total, are optional and can be included if appropriate:

- A description of new modes of collaboration.
- A description of new modes of training graduate students, postdoctoral researchers, or undergraduates.
- A description of planned workshops and a list of tentative participants.

(c) Biographical sketches. For all key personnel, please provide a brief biographical sketch. Do not exceed two pages per person for the sketch. Up to five publications most closely related to the proposal and up to five other significant publications may be included, including those accepted for publication. For each individual, up to one additional page describing how that individual will contribute to the project may also be included. **Biographical Sketches must conform to the guidelines described in the GPG. Program Officers will pay close attention to whether sufficient information has been provided to permit the screening of potential reviewers for possible conflicts of interest.**

(d) A full description of the total level of current and pending support from all sources for the key personnel. It is important to identify the number of salary-months covered by each source and whether these are summer, academic or calendar months.

(e) A description of the facilities (including laboratories and computational facilities) that will be made available to the project.

2. Proposal (Type B)

All proposals of type B must be submitted via FastLane by 5:00 PM, proposer's local time, on Wednesday, January 14, 2004. Proposals received after that will be returned without review.

Proposals involving investigators from more than one organization should be submitted as collaborative proposals. Proposers should consult the GPG Section II.D.3., "Collaborative Proposals."

(a) Cover page - To facilitate timely processing, the title of the proposed project should begin with the string "CMG TRAINING:", or "CMG COLLABORATIVE TRAINING:" if the proposal is multi-organizational proposals.

(b) Project Description - Narrative, not to exceed fifteen pages including the following items:

- An explanation of the scientific context and timeliness of the proposed program topic.
- A description of the design of the summer program, including the intended number of students and senior participants, the intended pedagogical activities and personnel involved, the scope of student activities, the structure of the mentoring to be provided to the students, and the senior personnel who will be involved in mentoring. It is not necessary that all senior personnel who will be involved in the pedagogical or mentoring activities be co-PIs on the proposal but see (j) below.
- A description of how students will be recruited and selected. (See Program Description.)
- A timeline for and description of the advance preparation for the summer program.
- Results from prior NSF support, whether or not applicable to the proposed activity. If not applicable, please explain why.

(c) Biographical sketches. For all key personnel, please provide a brief biographical sketch. Do not exceed two pages per person for the sketch. Up to five publications most closely related to the proposal and up to five other significant publications may be included, including those accepted for publication. For each individual, up to one additional page describing how that

individual will contribute to the project, may be included. **Biographical Sketches must conform to the guidelines described in the GPG. Program Officers will pay close attention to whether sufficient information has been provided to permit the screening of potential reviewers for possible conflicts of interest.**

(d) A full description of the total level of current and pending support from all sources for the key personnel.

(e) A description of the facilities (including laboratories and computational facilities) that will be made available to the project.

(f) Letters of commitment to participate in the project from key personnel involved in the pedagogical and mentoring activities who are not co-PIs on the proposal.

Proposers are reminded to identify the program announcement/solicitation number (04-508) in the program announcement/ solicitation block on the proposal Cover Sheet. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost Sharing:

Cost sharing is not required in proposals submitted under this Program Solicitation.

Other Budgetary Limitations:

For proposals of type B, award size may be up to a total of $200,000 spread over two years and logistical support costs may not exceed 5% of the total direct costs requested. See Section IV. Award Information for further details.

C. Due Dates

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

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

January 14, 2004

D. FastLane Requirements

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

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Proposers are no longer required to provide a paper copy of the signed Proposal Cover Sheet to NSF. Further instructions regarding this process are available on the FastLane Website at: http://www.fastlane.nsf.gov

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

The National Science Board approved revised criteria for evaluating proposals at its meeting on March 28, 1997 (NSB 97-72). All NSF proposals are evaluated through use of the two merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

On July 8, 2002, the NSF Director issued Important Notice 127, Implementation of new Grant Proposal Guide Requirements Related to the Broader Impacts Criterion. This Important Notice reinforces the importance of addressing both criteria in the preparation and review of all proposals submitted to NSF. NSF continues to strengthen its internal processes to ensure that both of the merit review criteria are addressed when making funding decisions.

In an effort to increase compliance with these requirements, the January 2002 issuance of the GPG incorporated revised proposal preparation guidelines relating to the development of the Project Summary and Project Description. Chapter II of the GPG specifies that Principal Investigators (PIs) must address both merit review criteria in separate statements within the one-page Project Summary. This chapter also reiterates that broader impacts resulting from the proposed project must be addressed in the Project Description and described as an integral part of the narrative.

Effective October 1, 2002, NSF will return without review proposals that do not separately address both merit review criteria within the Project Summary. It is believed that these changes to NSF proposal preparation and processing guidelines will more clearly articulate the importance of broader impacts to NSF-funded projects.

The two National Science Board approved merit review criteria are listed below (see the Grant Proposal Guide Chapter III.A for further information). The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which he/she is qualified to make judgments.

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

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

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

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

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

Additional Review Criteria:

Proposals of type A (interdisciplinary research groups)

In addition to the National Science Board merit review criteria, reviewers will be asked to apply several specific criteria when reviewing CMG proposals. These criteria include:

- The extent to which the proposed research goes beyond existing approaches or ideas
- Extent to which the whole of the proposed group project will be greater than the sum of its parts
- Extent to which the group effort is focused on a cohesive, well-delineated goal
- Timeliness of the planned work
- Likelihood of substantial progress
- Long-term scientific impact of the proposed activity
- Appropriateness of the group members and group structure for the task
- Appropriateness of the proposed modes of collaboration
- Adequacy and appropriateness of the proposed timeline
- Adequacy of the management plan
- Adequacy of the plans for dissemination
- Adequacy and appropriateness of the budget

Proposals of type B (graduate summer training)

In addition to the National Science Board merit review criteria, reviewers will be asked to apply several specific criteria when reviewing CMG proposals for graduate summer training programs. These criteria include:

- Timeliness of the planned topic
- The degree to which the program does not duplicate opportunities already available in standard academic settings
- Long-term impact of the proposed activity
- The quality of the pedagogical and research opportunities for the participating students
- Appropriateness of the proposed senior personnel
- Adequacy of the plan for advance preparation for the program, including the process for recruiting and selecting student participants.
- Adequacy and appropriateness of the budget

CMG proposals are likely to be read by non-specialists at some stage of the review process. It is therefore particularly important that they be written to emphasize the impact of the projects in broad mathematical and geoscience contexts.

B. Review Protocol and Associated Customer Service Standard

All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this announcement/solicitation will be reviewed by Ad Hoc Review followed by Panel Review.

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

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

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

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/home/grants/grants_gac.htm. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/cgi-bin/getpub?gpm. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Website at http://www.gpo.gov.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

For awards of type (B), final reports should include:

- A detailed description of the activities that made up the summer program
- A summary of the backgrounds of the students who participated
- An assessment of the students' response to the program

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for the PI and all Co-PIs. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project reporting system, available through FastLane, for preparation and submission of annual and final project reports. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding this program should be made to:

- Xuming He, Directorate for Mathematical & Physical Sciences, Division of Mathematical Sciences, 1025 N, telephone: (703) 292-4876, fax: (703) 292-9032, email: xhe@nsf.gov
- Stephen Meacham, Directorate for Geosciences, Division of Atmospheric Sciences, 775 S, telephone: (703) 292-8527, fax: (703) 292-9022, email: smeacham@nsf.gov
- Elise Ralph, Directorate for Geosciences, Division of Ocean Sciences, 725 N, telephone: (703) 292-8582, fax: (703) 292-9085, email: eralph@nsf.gov
- Robin Reichlin, Directorate for Geosciences, Division of Earth Sciences, 785 S, telephone: (703) 292-8556, fax: (703) 292-9025, email: rreichli@nsf.gov
- Thomas F. Russell, Program Director, Directorate for Mathematical & Physical Sciences, Division of Mathematical Sciences, 1025 N, telephone: (703) 292-4863, fax: (703) 292-9032, email: trussell@nsf.gov
- Junping Wang, Directorate for Mathematical & Physical Sciences, Division of Mathematical Sciences, 1025 N, telephone: (703) 292-4488, fax: (703) 292-4856, email: jwang@nsf.gov

General FastLane Contact:

- Division of Mathematical Sciences, Directorate for Mathematical and Physical Sciences, Room 1005, telephone: 703-292-8808, e-mail: dmsfl@nsf.gov.

For questions related to the use of FastLane, contact:

- Brian E. Dawson, Directorate for Geosciences, 705 N, telephone: (703) 292-4727, fax: (703) 292-9042, email: bdawson@nsf.gov

IX. OTHER PROGRAMS OF INTEREST

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

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

funding opportunities that become available.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities and persons with disabilities to compete fully in its programs. In accordance with Federal statutes, regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF, although some programs may have special requirements that limit eligibility.

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the GPG Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

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

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

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center)**:** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090 or (800) 281-8749
- **To Order Publications or Forms:**

  Send an e-mail to: pubs@nsf.gov

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

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to applicant institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies needing information as part of the review process or in order to coordinate programs; and to another Federal agency, court or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to an information collection unless it displays a valid OMB control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne Plimpton, Reports Clearance Officer, Division of Administrative Services, National Science Foundation, Arlington, VA 22230.

OMB control number: 3145-0058.