

OPPORTUNITIES FOR RESEARCH COLLABORATIONS BETWEEN THE MATHEMATICAL SCIENCES AND THE GEOSCIENCES (CMG)

Collaboration in Mathematical Geosciences

Program Solicitation

NSF 02-022

DIRECTORATE FOR MATHEMATICAL AND PHYSICAL SCIENCES
DIRECTORATE FOR GEOSCIENCES
DIVISION OF MATHEMATICAL SCIENCES

FULL PROPOSAL DEADLINE(S): February 25, 2002



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SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Title: OPPORTUNITIES FOR RESEARCH COLLABORATIONS BETWEEN THE MATHEMATICAL SCIENCES AND THE GEOSCIENCES (CMG)

Synopsis of Program: The purposes of the CMG activity are: (A) to enable 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, and (B) to encourage cross-disciplinary education through summer graduate training activities. Research topics under (A) should fall within a broad theme dealing with multi-scale phenomena. Research groups should include at least one mathematical scientist and at least one geoscientist. Research 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 scientifically focused, well-delineated, timely, and limited in duration to up to three years. It is not the intent of this activity to provide general support for infrastructure. Proposals for summer graduate training activities are not restricted to the topic of multi-scale phenomena.

Cognizant Program Officer(s):

- Tom Fogwell, Directorate for Mathematical and Physical Sciences, Division of Mathematical Sciences, Room 1025, telephone: 703-292-8104, e-mail: tfogwell@nsf.gov.
- Steve Meacham, Directorate for Geosciences, Division of Ocean Sciences, Room 725, telephone: 703-292-8581, e-mail: smeacham@nsf.gov.
- Robin Reichlin, Directorate for Geosciences, Division of Earth Sciences, Room 785, telephone: 703-292-8556, e-mail: rreichli@nsf.gov.
- Roddy Rogers, Directorate for Geosciences, Division of Atmospheric Sciences, Room 775, telephone: 703-292-8524, e-mail: rrogers@nsf.gov.
- John Stufken, Directorate for Mathematical and Physical Sciences, Division of Mathematical Sciences, Room 1025, telephone: 703-292-4881, e-mail: jstufken@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 announcement/solicitation. Specific classes of NSF-funded research centers are also eligible to submit. Please see the full program solicitation for further information.
- **PI Eligibility Limit:** Unaffiliated scientists are not eligible to submit a proposal, but may be eligible for support. The GPG guidelines (chapter I.C) apply in this case.
- **Limit on Number of Proposals:** None

AWARD INFORMATION

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 8-10
- **Anticipated Funding Amount:** \$4 million in FY2002, subject to the availability of funds.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

- **Full Proposals:** Deviations From Standard Preparation Guidelines
 - The program announcement/solicitation contains deviations from the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full program announcement/solicitation for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required.
- **Indirect Cost (F&A) Limitations:** Not Applicable.
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full program announcement/solicitation for further information.

C. Deadline/Target Dates

- **Letters of Intent (*optional*):** None
- **Preliminary Proposals (*optional*):** None
- **Full Proposal Deadline Date(s):** February 25, 2002

D. FastLane Requirements

- **FastLane Submission:** Required
- **FastLane Contact(s):**
 - Kandy Binkley, Directorate for Geosciences, Division of Ocean Sciences, Room 725, telephone: 703-292-8580, e-mail: ocefl@nsf.gov.
 - Division of Mathematical Sciences, Directorate for Mathematical and Physical Sciences, Room 1005, telephone: 703-292-8808, e-mail: dmsfl@nsf.gov.

PROPOSAL REVIEW INFORMATION

- **Merit Review Criteria:** National Science Board approved criteria. Additional merit review considerations apply. Please see the full program announcement/solicitation for further information.

AWARD ADMINISTRATION INFORMATION

- **Award Conditions:** Standard NSF award conditions apply.
- **Reporting Requirements:** Additional reporting requirements apply. Please see the full program announcement/solicitation for further information.

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, and the Directorate for Geosciences of the National Science Foundation (NSF) expect to make a number of awards in FY 2002 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. The successful research group proposals will be similar in spirit to projects funded as part of the Division of Mathematical Sciences' Focused Research Groups (FRG) competition (see NSF publication, [NSF01-125](#)). Proposals should provide a plan for making substantial progress on a topic, falling within the thematic area described below, of recognized or emerging importance to both the mathematical sciences and geosciences communities. 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 one thematic area 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 investigators and reviewers. If this competition is 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 theme:

- **Analyzing and modeling geosystems that contain a broad range of interacting scales.**

In addition to group 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 2003. These should bring together graduate students in the geosciences and the mathematical sciences, from one or several 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 theme 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 scientifically focused, well-delineated, timely, and limited in duration to up to three years. 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:

In the first year of this competition, proposals are solicited in the following theme area. Proposals not in this area will be deemed unresponsive and will not be reviewed. It is anticipated that the range of themes will broaden in subsequent years.

- **Analyzing and modeling geosystems that contain a broad range of interacting scales.** Many dynamical geosystems contain variability over a range of dynamically coupled scales. Typically, the full range of active scales cannot be directly represented in existing theoretical and numerical models of such systems. Instead, a sub-set of scales is often treated phenomenologically, parameterized in relatively simple ways, or ignored.

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

- Novel dynamical and/or statistical approaches to representing or exploring the impact of ranges of dynamically active scales that are not explicitly resolvable.
- New approaches to representing high-dimensional dynamical systems.
- Research on the links between the composition of geosystems with large numbers of degrees of freedom and the emergence of patterns of coherent spatio-temporal structure within such systems.
- Research that links new insights about the internal dynamics of geosystems and novel methods of analyzing data sets.

The following is a partial list of indicators that could suggest that a project may be appropriate for CMG support.

- Accumulated scientific results point to the possibility of a major breakthrough.
- A major recent breakthrough has created new possibilities for significant progress.
- An existing research topic needs close cooperation between several researchers for further advancement, or can be significantly accelerated through such cooperation.

- Significant opportunities for productive mutual exchange between areas within the mathematical sciences and the geosciences have recently become apparent.
- A substantial program of mathematical/geophysical research is ripe for formulation and exploitation, because a specific area in geosciences/mathematical sciences is ready for closer interaction with the mathematical sciences/geosciences.

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 member should be recognized as having geoscience expertise and research experience. The group members can come from more than one institution. Awards made under the CMG activity are intended to foster a crucial and unusual synergy between the disciplines and the group members 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.

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 projects and outcomes for CMG projects. Proposers are strongly urged to discuss their ideas for a project with one of the program directors listed at the 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 FY2002 to support interdisciplinary training activities for graduate students in the summer of 2003. These should bring together graduate students in geosciences and mathematical sciences from one or several 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. The NSF-funded University Corporation for Atmospheric Research (UCAR), Institute for Pure and Applied Mathematics (IPAM), Mathematical Sciences Research Institute (MSRI), and Institute for Mathematics and its Applications (IMA) 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 directors listed at the end of this document for guidance.

Unaffiliated scientists are not eligible to submit a proposal, but may be eligible for support. The GPG guidelines (chapter I.C) apply in this case.

For type B proposals (graduate summer training programs), preference will be given to PIs seeking to start a new program rather than continuing a well established program.

IV. AWARD INFORMATION

NSF anticipates that approximately \$4,000,000 will be available for making type A and B awards in FY 2002, subject to the availability of funds.

Under this solicitation, proposals of type A may be submitted for any funding amount up to \$240,000 per year, for up to three years. The anticipated date of awards is July 2002. The final number of awards will depend on the quality of submissions and the availability of funds.

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, 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, section C.6.e). 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 award. Each award is intended to cover a single program in the summer of 2003. The awards will be made in Summer 2002. 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 \$400,000 will be available for type B awards in FY2002. The anticipated date of awards is July 2002. The final 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:

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 Web Site at: <http://www.nsf.gov/cgi-bin/getpub?gpg>. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

1. Proposal (Type A)

All proposals of type A must be submitted via FastLane by 5:00 PM, proposer's local time, on Monday, February 25, 2002. Failure to meet the proposal deadline will disqualify a proposal from consideration.

Proposals involving investigators from more than one institution should be submitted as collaborative proposals. Proposers should consult the GPG Section II.C.11.b on simultaneous submission of collaborative proposals, specifically the submission of proposals from different organizations using electronic submission.

Proposals from lead institutions must contain the following elements in the order indicated.

NOTE THAT d(i) AND d(ii) DIFFER FROM THE REQUIREMENTS OF THE DIVISION OF MATHEMATICAL SCIENCES' FOCUSED RESEARCH GROUP COMPETITION. The general requirements given in the GPG apply, unless specified differently below. Proposers are reminded that a complete proposal must in addition contain single-copy documents as specified in the GPG, chapter II.C.

(a) Cover page - NSF Standard FastLane Form 1207. To facilitate timely processing, the title of the proposed project should begin with the string "CMG RESEARCH:".

(b) Project Summary, up to 250 words - NSF Standard FastLane Form

(c) Table of Contents - This form will be generated automatically by FastLane.

(d) Project Description - NSF Standard FastLane Form.

i) Proposed Research. Narrative, not to exceed seventeen 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, if applicable.

ii) Modes of Collaboration and Training. The following components, not to exceed an additional two pages 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.

iii) Management Plan. Provide a management plan, describing how the group effort will be coordinated and how decisions will be made regarding the conduct of the project. This section may not exceed one page.

(e) References Cited - NSF Standard FastLane Form

(f) Biographical sketches. For all key personnel, please provide a brief biographical sketch, using the standard FastLane Form. 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, include up to one additional page describing how that individual will contribute to the project.

(g) Budget. Include a proposed budget using the NSF Standard FastLane Form with separate annual budgets for each year and a detailed budget justification/explanation (up to 3 pages). A cumulative budget will be automatically generated by the FastLane system.

(h) A full description of the total level of current and pending support from all sources for the key personnel using the NSF Standard FastLane Form.

(i) A description of the facilities (including laboratories and computational facilities) that will be made available to the project. Use the NSF Standard FastLane Form.

The page limits and the limits on listed publications in the biographical sketches will be strictly enforced. Proposals not adhering to these limitations will be returned.

2. Proposal (Type B)

All proposals of type B must be submitted via FastLane by 5:00 PM, proposer's local time, on Monday, February 25, 2002. Failure to meet the proposal deadline will disqualify a proposal from consideration.

Proposals involving investigators from more than one institution should be submitted as collaborative proposals. Proposers should consult the GPG Section II.C.11.b on simultaneous submission of collaborative proposals, specifically the submission of proposals from different organizations using electronic submission.

Proposals from lead institutions must contain the following elements in the order indicated. The general requirements given in the GPG apply, unless specified differently below. Proposers are reminded that a complete proposal must in addition contain single-copy documents as specified in the GPG, chapter II.B.

(a) Cover page - NSF Standard FastLane Form 1207. To facilitate timely processing, the title of the proposed project should begin with the string "CMG TRAINING:".

- (b) Project Summary, up to 250 words - NSF Standard FastLane Form
- (c) Table of Contents - This form will be generated automatically by FastLane.
- (d) Project Description - NSF Standard FastLane Form.

Narrative, not to exceed fifteen pages, consisting of 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, if applicable.

(e) References Cited - NSF Standard FastLane Form

(f) Biographical sketches. For all key personnel, please provide a brief biographical sketch, using the standard FastLane Form. 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, include up to one additional page describing how that individual will contribute to the project.

(g) Budget. Include a proposed budget using NSF Standard FastLane Form 1030 (10/98), separate annual budgets for each year, and a detailed budget justification/explanation (up to 3 pages). A cumulative budget will be automatically generated by the FastLane system.

(h) A full description of the total level of current and pending support from all sources for the key personnel using NSF Standard FastLane Form.

(i) A description of the facilities (including laboratories and computational facilities) that will be made available to the project. Use NSF Standard FastLane Form.

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

The page limits and the limits on listed publications in the biographical sketches will be strictly enforced. Proposals not adhering to these limitations will be returned.

3. Signed Cover Sheet

Cover sheet: The proposal cover sheet must be submitted in accordance with the instructions presented in Section D ("FastLane Requirements") below.

Proposers are reminded to identify the program solicitation number (NSF 02-022) in the program announcement/solicitation block on the proposal Cover Sheet (NSF Form 1207). Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

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

Other Budgetary Limitations: Award size is limited to a maximum of \$240,000 per year for up to three years duration for proposals of type A and up to \$200,000 for two years for proposals of type B. For proposals of type B, logistical support costs may not exceed 5% of the total direct costs requested. See IV. Award Information for further details.

C. Deadline/Target Dates

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

Full Proposals by 5:00 PM local time: February 25, 2002

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this Program 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 1-800-673-6188 or e-mail fastlane@nsf.gov.

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 certifications within five working days following the electronic submission of the proposal. 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.

Proposals will be reviewed against the following general review criteria established by the National Science Board. Following each criterion are potential considerations that the reviewer may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Proposers are reminded that both the intellectual merit and the broader impacts of the work to be accomplished should be addressed. While reviewers are expected to address both merit review criteria, each reviewer will be asked to address only considerations that are relevant to the proposal and for which he/she is qualified to make judgements.

What is the intellectual merit of the proposed activity?

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

What are the broader impacts of the proposed activity?

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

Principal Investigators should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both of the above-described NSF merit review criteria. NSF staff will give these elements careful consideration in making funding decisions.

Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals

may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities

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

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 of the management plan
- Adequacy and appropriateness of the proposed timeline
- 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.

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.

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 Mail 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.

In most cases, proposers will be contacted by the Program Officer after his or her recommendation to award or decline funding has been approved by the Division Director. This informal notification is not a guarantee of an eventual award.

NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months for 70 percent of proposals. 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 its 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 Web site at http://www.nsf.gov/home/grants/grants_gac.htm. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

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

C. Reporting Requirements

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. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

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

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding OPPORTUNITIES FOR RESEARCH COLLABORATIONS BETWEEN THE MATHEMATICAL SCIENCES AND THE GEOSCIENCES should be made to:

- Tom Fogwell, Directorate for Mathematical and Physical Sciences, Division of Mathematical Sciences, Room 1025, telephone: 703-292-8104, e-mail: tfogwell@nsf.gov.
- Steve Meacham, Directorate for Geosciences, Division of Ocean Sciences, Room 725, telephone: 703-292-8581, e-mail: smeacham@nsf.gov.
- Robin Reichlin, Directorate for Geosciences, Division of Earth Sciences, Room 785, telephone: 703-292-8556, e-mail: rreichli@nsf.gov.
- Roddy Rogers, Directorate for Geosciences, Division of Atmospheric Sciences, Room 775, telephone: 703-292-8524, e-mail: rrogers@nsf.gov.

- John Stufken, Directorate for Mathematical and Physical Sciences, Division of Mathematical Sciences, Room 1025, telephone: 703-292-4881, e-mail: jstufken@nsf.gov.

For questions related to the use of FastLane, contact:

- Kandy Binkley, Directorate for Geosciences, Division of Ocean Sciences, Room 725, telephone: 703-292-8580, e-mail: ocefl@nsf.gov.
- Division of Mathematical Sciences, Directorate for Mathematical and Physical Sciences, Room 1005, telephone: 703-292-8808, e-mail: dmsfl@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 web site at <http://www.nsf.gov/home/ebulletin>, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's [Custom News Service](#) (<http://www.nsf.gov/home/cns/start.htm>) to be notified of new funding opportunities that become available.

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

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

Facilitation Awards for Scientists and Engineers with Disabilities (FASSED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the program announcement/solicitation for further information.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090, FIRS at 1-800-877-8339.

The National Science Foundation is committed to making all of the information we publish easy to understand. If you have a suggestion about how to improve the clarity of this document or other NSF-published materials, please contact us at plainlanguage@nsf.gov.

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

Pursuant to 5 CFR 1320.5(b), an agency may not conduct or sponsor, and a person is not required to respond to an information collection unless it displays a valid OMB control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne Plimpton, Reports Clearance Officer, Information Dissemination Branch, Division of Administrative Services, National Science Foundation, Arlington, VA 22230, or to Office of Information and Regulatory Affairs of OMB, Attention: Desk Officer for National Science Foundation (3145-0058), 725 17th Street, N.W. Room 10235, Washington, D.C. 20503.

OMB control number: 3145-0058.