

Interdisciplinary Training for Undergraduates in Biological and Mathematical Sciences (UBM)

PROGRAM SOLICITATION

NSF 08-510

REPLACES DOCUMENT(S):

NSF 07-539



National Science Foundation

Directorate for Biological Sciences

Directorate for Education & Human Resources
Division of Undergraduate Education

Directorate for Mathematical & Physical Sciences
Division of Mathematical Sciences
Office of Multidisciplinary Activities

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

February 21, 2008

February 12, 2009

Second Thursday in February, Annually Thereafter

IMPORTANT INFORMATION AND REVISION NOTES

A revised version of the NSF Proposal & Award Policies & Procedures Guide (PAPPG), [NSF 11-1](#), was issued on October 1, 2010 and is effective for proposals submitted after January 18, 2011. Please be advised that the guidelines contained in [NSF 11-1](#) apply to proposals submitted in response to this funding opportunity.

Cost Sharing: The PAPPG has been revised to implement the National Science Board's recommendations regarding cost sharing. Inclusion of voluntary committed cost sharing is prohibited. In order to assess the scope of the project, all organizational resources necessary for the project must be described in the Facilities, Equipment and Other Resources section of the proposal. The description should be narrative in nature and must not include any quantifiable financial information. Mandatory cost sharing will only be required when explicitly authorized by the NSF Director. See the PAPP Guide Part I: Grant Proposal Guide (GPG) [Chapter II.C.2.g\(xi\)](#) for further information about the implementation of these recommendations.

Data Management Plan: The PAPPG contains a clarification of NSF's long-standing data policy. All proposals must describe plans for data management and sharing of the products of research, or assert the absence of the need for such plans. FastLane will not permit submission of a proposal that is missing a Data Management Plan. The Data Management Plan will be reviewed as part of the intellectual merit or broader impacts of the proposal, or both, as appropriate. A link to data management requirements and plans relevant to EHR is available [here](#) on the NSF website. See [Chapter II.C.2.j](#) of the GPG for further information about the implementation of this requirement.

Postdoctoral Researcher Mentoring Plan: As a reminder, each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. FastLane will not accept submission of proposals that seek postdoctoral support without a Postdoctoral Researcher Mentoring Plan. See [Chapter II.C.2.j](#) of the GPG for further information about the implementation of this requirement.

Revision Notes

Proposals for the Pre-Engineering Education Collaboratives (PEEC), STEM Teachers of Excellence Education Projects (STEEP), and Innovation through Institutional Integration (I³) tracks are not being accepted for the 2011 competition. In addition to tracks for Planning Grants and Initiation Projects, this solicitation includes the following new tracks: Targeted STEM Infusion Projects (TSIP), Broadening Participation Research in STEM Education (BPR), and Research Initiation Awards (RIA).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Interdisciplinary Training for Undergraduates in Biological and Mathematical Sciences (UBM)

Synopsis of Program:

The goal of the Undergraduate Biology and Mathematics (UBM) activity is to enhance undergraduate education and training at the intersection of the biological and mathematical sciences and to better prepare undergraduate biology or mathematics students to pursue graduate study and careers in fields that integrate the mathematical and biological sciences. The core of the activity is jointly-conducted long-term research experiences for interdisciplinary balanced teams of at least two undergraduates from departments in the biological and mathematical sciences. Projects should focus on research at the intersection of the mathematical and biological sciences. Projects should provide students exposure to contemporary mathematics and biology, addressed with modern research tools and methods. That is, projects must be genuine research experiences rather than rehearsals of research methods. Projects must involve students from both areas in collaborative research experiences and include joint mentorship by faculty in both fields. In addition, it is expected that projects will strengthen the research and education capacity, infrastructure, and culture of the participating institutions. To this end, projects should create models for education in the mathematical and biological sciences and influence the direction of academic programs for a broad range of students. It is expected that project leadership will come from faculty in both the mathematical and biological sciences. UBM is a joint effort of the Education and Human Resources (EHR), Biological Sciences (BIO), and Mathematical and Physical Sciences (MPS) Directorates at the National Science Foundation (NSF).

Cognizant Program Officer(s):

- Mary Ann Horn, Program Director, MPS, telephone: (703) 292-4879, email: mhorn@nsf.gov
- Deborah E. Allen, telephone: (703) 292-4653, email: deallen@nsf.gov
- Weiqing Gu, telephone: (703) 292-4884, email: wgu@nsf.gov
- Timothy K. Kratz, telephone: (703) 292-7870, email: tkratz@nsf.gov

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

- 47.049 --- Mathematical and Physical Sciences
- 47.074 --- Biological Sciences
- 47.076 --- Education and Human Resources

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 6 to 9

Anticipated Funding Amount: \$3,300,000 in FY2008 pending availability of funds

Eligibility Information

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- Letters of Intent: Not Applicable
- Preliminary Proposal Submission: Not Applicable
- Full Proposals:
 - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
 - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- Cost Sharing Requirements: Inclusion of voluntary committed cost sharing is prohibited.
- Indirect Cost (F&A) Limitations:

An administrative allowance, limited to 25% of the participant support stipend amount (Line F.1. on the FastLane budget) only, is allowed for UBM awards as partial reimbursement of indirect costs. That amount should be entered under Total Indirect Costs (Line I on the FastLane budget).

- Other Budgetary Limitations: Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

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

February 21, 2008

February 12, 2009

Second Thursday in February, Annually Thereafter

Proposal Review Information Criteria

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

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

The goal of the Undergraduate Biology and Mathematics (UBM) activity is to enhance undergraduate education and training at the intersection of the biological and mathematical sciences and to better prepare undergraduate biology or mathematics students to pursue graduate study and careers in fields that integrate the mathematical and biological sciences. UBM aims to broaden undergraduate research experiences and enhance capacity for, infrastructure in support of, and commitment to excellence in undergraduate education. It is a joint effort of the Education and Human Resources (EHR), Biological Sciences (BIO), and Mathematical and Physical Sciences (MPS) Directorates at the National Science Foundation (NSF).

There has been an explosion of knowledge in the life sciences over the past twenty years that cuts across all levels from molecules to ecosystems. Current research is often characterized by integrative and interdisciplinary approaches. At the center of this explosion of knowledge is a revolution in instrumentation, computational abilities, information systems, and mathematical tools.

There has been a parallel growth in understanding in the mathematical sciences. Theoretical advances in complexity, dynamical systems, and uncertainty, coupled with advances in modeling and in computational methods, have helped mathematicians and statisticians put ideas into action. This has enabled expansion in the use of mathematics and statistics beyond the traditional fields of physical science and engineering. As that expansion has taken hold, the life sciences and other fields are posing new kinds of questions for the mathematical sciences, stimulating further the growth of mathematical ideas.

Thus, the intersection of the biological and mathematical sciences is a fertile field for both sets of disciplines, where results in one area lead to

advances in the other. However, currently there are comparatively few people able to work in this intersection. The UBM program aims to transcend traditional boundaries in educating biological and mathematical scientists. The program contributes to the American Competitiveness Initiative by building a well-educated and skilled workforce for these cutting-edge interdisciplinary areas that are primed to drive economic growth during the coming decades. It expands the community of faculty capable of working at the intersection of the disciplines and better prepares students for more advanced work in both the biological and mathematical sciences.

UBM projects must involve students from both areas in collaborative research projects and include joint mentorship by faculty in both fields. Projects should create models for education in the mathematical and biological sciences and influence the direction of academic programs for a broad range of students. Individually, UBM projects will have a significant impact on the undergraduate programs of participating institutions. Collectively, they will strengthen the nation's research enterprise by providing new mechanisms for attracting a larger, more diverse group of students to careers that involve both the mathematical and biological sciences.

II. PROGRAM DESCRIPTION

UBM provides opportunities for funding of undergraduate education and training efforts that integrate the biological sciences and mathematical sciences. Such efforts are expected to:

- Be grounded in research activities involving both mathematical and biological sciences;
- Connect to regular academic studies, influencing the direction of academic programs for a broad range of students;
- Involve students from both areas in significant joint research projects that connect to research at the intersection of the disciplines; and
- Show commitment to joint mentorship and leadership by faculty in both fields.

Research activities should focus on areas funded by the Division for Mathematical Sciences and the Directorate for Biological Sciences. NSF does not normally support bioscience research with disease-related goals, including work on the etiology, diagnosis or treatment of physical or mental disease, abnormality, or malfunction in human beings or animals.

Proposals may be of either large scope (Institutional projects) or small scope (Group projects).

INSTITUTIONAL PROJECTS

Institutional projects are expected to be of five years duration, should assemble a diverse team of senior personnel, and in addition to research experiences and mentoring should address institutional curricular change that broadly engages the biological and mathematical sciences. It is expected that an institutional project will have leadership (not just participation) drawn from faculty in both the biological and mathematical sciences. These long-term projects will be reviewed in the third year and continuation of funding in years four and five will depend on a successful outcome.

Projects must include:

- Student involvement in original research at the intersection of the biological and mathematical sciences;
- Annual recruitment of students organized into multiple teams. Each team should consist of at least two students, and include a balance of students from the mathematical and biological sciences, working and learning together on a joint research project;
- Annual cohorts of no fewer than eight students;
- Long-term involvement of each student with project activities - more than a semester or a summer - to provide immersion, intense involvement in research, and mutual reinforcement between the research and classroom activities;
- Extensive, interdisciplinary mentoring, conducted jointly by faculty from each discipline;
- A diversity of students with attention to ethnic and gender diversity;
- Use of program models to motivate curriculum changes and faculty development;
- The ability to affect programs and students beyond those directly involved in the project; and
- A plan to monitor and assess student and programmatic outcomes.

GROUP PROJECTS

Group projects are expected to be of three years duration, and should emphasize joint mentoring and research projects for undergraduate students at the interface of biological and mathematical science. In general, group projects are smaller in scale than institutional projects, and may involve only one or two mentorship teams.

Projects must include:

- Student involvement in original research at the intersection of the biological and mathematical sciences;
- Annual recruitment of students organized into multiple teams. Each team should consist of at least two students, and include a balance of students from the mathematical and biological sciences, working and learning together on a joint research project;
- Annual cohorts of no fewer than four students;
- Long-term involvement of each student with project activities - more than a semester or a summer - to provide immersion, intense involvement in research, and mutual reinforcement between the research and classroom activities;
- Extensive, interdisciplinary mentoring, conducted jointly by faculty from each discipline;
- A diversity of students with attention to ethnic and gender diversity; and
- A plan to monitor and assess student outcomes.

ALL PROJECTS

UBM will include annual meetings of awardees to share information and encourage student/faculty exchanges among awardees. Opportunities for partnering across institutions and for developing international collaborations are welcome. Fieldwork may be appropriate. While the core of UBM research projects and educational activities is the intersection of the biological and mathematical sciences, it is open to projects that include other disciplines as appropriate such as the physical sciences, social sciences, computer sciences, and engineering. However, UBM funds can only be used for students or other personnel from the biological or mathematical sciences.

Dissemination of information about project outcomes to a broader audience is also important. UBM aims to create new models for approaches to interdisciplinary education and training. UBM projects should strengthen educational capacity, infrastructure, and culture at participating institutions, as reflected in the number and inclusiveness of participating mentors and students and the quality of their research experience. Educational culture is linked to campus resource investment and to the value placed on participation by mentors in the undergraduate research enterprise by the institution. Educational culture also embraces the fostering of student learning and professional development and an appreciation for the integration of research and education. UBM projects should contribute substantially to an enhanced and sustainable undergraduate educational enterprise that strengthens mathematical training or education for those students studying biology, and interdisciplinary training for those studying mathematics.

The program encourages collaborations that bring together biological and mathematical scientists from associate, baccalaureate, masters, or Ph.D. granting institutions, minority serving institutions, national and regional organizations, and that may involve industrial or government laboratories.

III. AWARD INFORMATION

NSF anticipates making 6 to 9 standard grants, including 2 to 3 institutional awards and 4 to 6 group awards.

The anticipated funding amount is \$3.3 million in FY 2008 pending the availability of funds.

The duration of projects may be up to five years (for Institutional projects), or up to three years (for Group projects), and we strongly encourage projects of these durations. Institutional projects longer than three years will be reviewed in the third year, and further funding will depend on the outcome of this review.

Total award sizes for Institutional projects should not exceed an average of \$200,000 per year. For example, an award for a project of five years duration is limited to a maximum of \$1 million. Total award sizes for Group projects should not exceed \$80,000 per year. For example an award for a project of three years duration is limited to a maximum of \$240,000.

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

IV. ELIGIBILITY INFORMATION

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the [Grant Proposal Guide](#), Chapter I, Section E.

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.4 of the Grant Proposal Guide provides additional information on collaborative proposals.

The following instructions supplement the GPG guidelines.

(1) Cover Sheet. The title of the project should begin "UBM- Institutional:", or "UBM-Group:..." depending on type of proposed project.

(2) Project Description. The project description is not to exceed 15 pages in length and should contain the following items:

(a) Results from Prior NSF Support (if applicable).

(b) Overview. Provide a brief description of the objectives of the proposed UBM project (including the central theme(s) of the research projects), the targeted student participants, the intellectual focus and innovative strategies, the organizational structure and timetable, and institutional endorsement of the UBM activity. Endorsement letter(s) from appropriate institutional administrators should be included as supplementary documents.

(c) Nature of Student Activities. Proposals should address the approach to undergraduate research training, including description of current or planned courses that will expose student participants to both the mathematical and the biological sciences important for their research immersion experience, detailed descriptions or examples of the interdisciplinary research projects that teams of students will pursue, and plans for presentation and dissemination of research results, including any travel to scientific meetings. Any other activities (e.g., seminars, group discussions, lectures, workshops) should be discussed as well as the activities for providing a group experience. A schedule of the year-round activities should be provided.

(d) Connection to Regular Academic Studies. Institutional proposals should describe the ways in which the UBM activity will influence academic programs for a broader range of students, including curriculum development and changes to strengthen mathematical training for biology students, and interdisciplinary training (especially biology) for mathematics students.

(e) Research Environment and Mentoring Activities. Proposals should describe the collaborative structure for joint mentoring of student teams by mathematical and biological sciences faculty. For senior personnel who will serve as research mentors, proposals must describe the mentoring activities planned and the past experience and record of involvement with undergraduate research.

(f) Student Recruitment and Selection. The recruitment plan should be described with as much specificity as possible, including any requirements or expectations for student backgrounds and prior experiences. NSF is particularly interested in increasing the participation in research of women, underrepresented minorities, and persons with disabilities. Underrepresented minorities are African-Americans, Hispanics, Native Americans, and Native Pacific Islanders. Only undergraduate students who are citizens or permanent residents of the United States or its possessions can be supported with NSF funds.

(g) Project Management. A clear management plan should be described, including mechanisms for dealing with possible changes in faculty participation over the course of the project. Institutional projects are expected to have leadership (not just participation) drawn from faculty in both the biological and mathematical sciences.

(h) Project Evaluation and Reporting. A plan for qualitative and quantitative evaluation of the proposed project must be provided. The objective of the evaluation process is to measure qualitatively and quantitatively the success of the project in achieving its goals, particularly the degree to which students have strengthened their capacity to do research at the intersection of the mathematical and biological sciences. The evaluation plan should include metrics on such key issues as the number of mathematics and biology majors supported, the biology and mathematics research fields served, and the impact on the programs at the organizations involved. Demographic data on the students supported must also be reported. Although not required, the principal investigator may wish to engage educational research specialists in planning and implementing the project evaluation. Additionally, it is highly desirable to have a structured means of tracking participating students beyond graduation with the aim of gauging the degree to which the research experience has been a lasting influence as they follow their career paths.

Evaluation may involve periodic measures throughout the project to ensure that it is progressing satisfactorily according to the project plan, and may involve pre- and post-project measures aimed at determining the degree of student learning that has been achieved as a result of the project. In particular, for Institutional projects a mid-term assessment (at the end of the third year) is deemed critical. For guidance, proposers may wish to consult the NSF on-line document, "User-Friendly Handbook for Project Evaluation" (NSF 02-57), <http://www.nsf.gov/pubs/ods/getpub.cfm?nsf02057>.

(3) Biographical Sketches. The standard guidelines for biographical material apply; however, senior personnel are encouraged to include publications with undergraduate co-authors (with the student labeled by an asterisk) and other activities or accomplishments relevant to a successful UBM activity. Senior personnel are the principal investigator, any co-principal investigators, and any other faculty/professionals who are anticipated to serve as research mentors.

(4) Project Budget. Project costs should include student stipends, and may include laboratory use fees, housing (if appropriate during the summer months) and travel for student participants. Enter those amounts on the appropriate participant support category on Line F on the FastLane budget. The budget may also include items such as faculty salaries, salaries for graduate students or post-doctoral scholars to the extent that they serve as auxiliary mentors for the undergraduates, support for coordination activities, and equipment and other direct costs (e.g., materials, publication costs). Funds should also be budgeted for travel to an annual awardees meeting. As a guide to budget development, participant support costs (Line F in FastLane) plus the administrative allowance (Total Indirect Costs-- Line I in FastLane) should be at least 50% of the total budget request, and faculty salaries should be limited to 2 weeks annual support except for the lead P.I., who may request 1 month each year.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

Indirect Cost (F&A) Limitations:

An administrative allowance, limited to 25% of the participant support stipend amount (Line F.1. on the FastLane budget) only, is allowed for UBM awards as partial reimbursement of indirect costs. That amount should be entered under Total Indirect Costs (Line I on the FastLane budget).

Other Budgetary Limitations:

Total award sizes are limited to an average of \$200,000 per year for Institutional awards, and \$80,000 per year for Group awards; for example, an Institutional award with a five-year duration is limited to a maximum of \$1 million, and a Group award with a three-year duration is limited to a maximum of \$240,000.

C. Due Dates

- Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):
 - February 21, 2008
 - February 12, 2009

D. FastLane/Grants.gov Requirements

- For Proposals Submitted Via FastLane:

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

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

- For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: http://www07.grants.gov/applicants/app_help_reso.jsp. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

A. NSF Merit Review Criteria

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

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

What is the intellectual merit of the proposed activity?

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

What are the broader impacts of the proposed activity?

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

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

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

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

Integration of Research and Education

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

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

Integrating Diversity into NSF Programs, Projects, and Activities

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

Additional Review Criteria:

All proposals will be evaluated on the extent to which they include commitment and collaboration of both mathematical and biological scientists in the project, and the degree of student participation and immersion in the proposed activities.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed 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.

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

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

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

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

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the *NSF Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

C. Reporting Requirements

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

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

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Mary Ann Horn, Program Director, MPS, telephone: (703) 292-4879, email: mhorn@nsf.gov
- Deborah E. Allen, telephone: (703) 292-4653, email: deallen@nsf.gov
- Weiqing Gu, telephone: (703) 292-4884, email: wgu@nsf.gov
- Timothy K. Kratz, telephone: (703) 292-7870, email: tkratz@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.
- Erin (Liz) Lawrence, telephone: (703) 292-8997, email: elawrenc@nsf.gov

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

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

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

Related Programs:

- Research Experiences for Undergraduates ([NSF 07-569](#))
- Undergraduate Research and Mentoring in the Biological Sciences ([NSF 06-591](#))
- Computational Science Training for Undergraduates in the Mathematical Sciences (CSUMS) ([NSF 06-559](#))
- Research in Undergraduate Institutions ([NSF 00-144](#))
- Science of Learning Centers ([PD 07-7278](#))
- Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP) ([NSF 07-570](#))
- NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) ([NSF 07-524](#))
- Alliance for Broadening Participation in STEM (ABP) ([NSF 07-566](#))
- Robert Noyce Scholarship Program ([NSF 07-529](#))
- Course, Curriculum, and Laboratory Improvement (CCLI) ([NSF 07-543](#))

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

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

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

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

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

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

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

- Location: 4201 Wilson Blvd. Arlington, VA 22230
- For General Information (NSF Information Center): (703) 292-5111
- TDD (for the hearing-impaired): (703) 292-5090
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The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

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

Suzanne H. Plimpton
Reports Clearance Officer
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