

Integrative Graduate Education and Research Traineeship Program (IGERT)

PROGRAM SOLICITATION NSF 09-519

REPLACES DOCUMENT(S):
NSF 08-540



National Science Foundation

Directorate for Education & Human Resources
Division of Graduate Education

Directorate for Biological Sciences

Directorate for Computer & Information Science & Engineering

Directorate for Engineering

Directorate for Geosciences

Directorate for Mathematical & Physical Sciences

Office of Polar Programs

Directorate for Social, Behavioral & Economic Sciences

Office of International Science and Engineering

Preliminary Proposal Due Date(s) (required) (due by 5 p.m. proposer's local time):

March 13, 2009

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

September 14, 2009

BY INVITATION ONLY

REVISION NOTES

1. A Resource Center was competed in the previous year and is not being competed this year.
2. The limit of the number of full proposals that may be submitted (By Invitation Only) is changed from three to four by an institution, either as a single institution or lead institution in a multi-institution full proposal

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

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Integrative Graduate Education and Research Traineeship Program (IGERT)

Synopsis of Program:

The Integrative Graduate Education and Research Traineeship (IGERT) program has been developed to meet the challenges of educating U.S. Ph.D. scientists and engineers who will pursue careers in research and education, with the interdisciplinary backgrounds, deep knowledge in chosen disciplines, and technical, professional, and personal skills to become, in their own careers, leaders and creative agents for change. The program is intended to catalyze a cultural change in graduate education, for students, faculty, and institutions, by establishing innovative new models for graduate education and training in a fertile environment for collaborative research that transcends traditional disciplinary boundaries. It is also intended to facilitate diversity in student participation and preparation, and to contribute to a world-class, broadly inclusive, and globally engaged science and engineering workforce.

Cognizant Program Officer(s):

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

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

Award Information

Anticipated Type of Award: Continuing Grant

Estimated Number of Awards: 18 Eighteen new and renewal awards depending upon the quality of proposals and availability of funds.

Anticipated Funding Amount: \$10,800,000 - Up to \$3.0M per award over 5 years. For new awards in first year up to \$400K and additional \$200K for start-up. In addition for new/renewal awards up to \$200K total per award for approx. 10 projects with integrated international research activities in Years 2 - 5.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- U.S. academic institutions in the United States, its territories or possessions that grant the Ph.D. degree in the sciences and engineering may submit proposals. Projects may involve more than one institution, but a single institution must accept overall management responsibility. Non-Ph.D. granting institutions, nonacademic, and international organizations may serve as collaborating organizations.

PI Limit:

The PI must be on the faculty of the submitting institution.

Limit on Number of Preliminary and Full Proposals per Organization:

- There is a limit of four (4) preliminary proposals that may be submitted by an institution either as a single institution or as a lead institution in a multi-institution preliminary proposal.

A multi-institutional proposal is defined as one that has at least one co-PI at a different academic institution than that of the PI, a subaward to a different academic institution than that of the PI, or both.

Limit on Number of Proposals per PI:

Any given individual may participate as PI or co-PI in only one proposal submission. That restriction applies to preliminary proposals as well as full proposals. A PI or co-PI on one proposal may serve as a faculty participant on other proposals.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposals:** Submission of Preliminary Proposals is required. Please see the full text of this solicitation for further information.

- **Full Proposal Preparation Instructions:** This solicitation contains information that supplements the standard NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full text of this solicitation for further information

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required under this solicitation.
- **Indirect Cost (F&A) Limitations:**

Partial reimbursement of indirect costs not to exceed 8% of total direct costs, excluding equipment and cost-of-education allowances, but not excluding participant support. Please note this is in variance with Chapter II.C.2.g.v of the Grant Proposal Guide.

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

C. Due Dates

- **Preliminary Proposal Due Date(s) (required)** (due by 5 p.m. proposer's local time):

March 13, 2009

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

September 14, 2009

BY INVITATION ONLY

Proposal Review Information Criteria

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

Award Administration Information

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

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

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I. INTRODUCTION

The National Science Foundation continues the Integrative Graduate Education and Research Traineeship (IGERT) program into its eleventh annual competition. Proposals for new and renewal IGERT projects will be accepted. The IGERT program has been developed to meet the challenges of educating U.S. Ph.D. scientists and engineers who will pursue careers in research and education with the interdisciplinary backgrounds, deep knowledge in chosen disciplines, and technical, professional, and personal skills to become, in their own careers, leaders and creative agents for change. The program is intended to catalyze a cultural change in graduate education, for students, faculty, and institutions, by establishing innovative models for graduate education and training in a fertile environment for collaborative research that transcends traditional disciplinary boundaries. It is also intended to contribute to a world-class, broadly inclusive, and globally engaged science and engineering workforce.

IGERT is an NSF-wide endeavor involving the Directorates for Biological Sciences (BIO), Computer and Information Science and Engineering (CISE), Education and Human Resources (EHR), Engineering (ENG), Geosciences (GEO), Mathematical and Physical Sciences (MPS), Social, Behavioral, and Economic Sciences (SBE), the Office of Polar Programs (OPP), the Office of Integrative Activities (OIA), the Office of Cyberinfrastructure (OCI), and the Office of International Science and Engineering (OISE). The IGERT program is managed by the Division of Graduate Education in EHR.

II. PROGRAM DESCRIPTION

Proposals submitted to the IGERT program must describe integrative, research-based, graduate education and training activities in emerging areas of science and engineering. The IGERT project should be organized around an interdisciplinary theme that is based on transformative interdisciplinary research in science/technology/engineering/mathematical sciences. The proposed IGERT should involve a diverse group of faculty members and other investigators with appropriate expertise in research and teaching. The interdisciplinary theme provides a framework for integrating research and education and for promoting collaborative efforts within and across departments and institutions. Students should gain the breadth of skills, strengths, and understanding to work in an interdisciplinary environment while being well grounded with depth of knowledge in a major field. As an opportunity for faculty to experiment with new approaches to graduate education, the IGERT project should provide students with experience relevant to both academic and nonacademic careers. This experience may involve such activities as internships and mentoring in industrial, national laboratory, academic, or other settings. Globalization of research and career opportunities provides students with an international perspective. This perspective may be gained through programs within the institution, or through strongly integrated, collaborative research experiences and/or fieldwork at foreign institutions and sites. The graduate experience should contribute to the professional and personal development of the students and equip them to understand and integrate scientific, technical, business, social, ethical, policy and global issues to confront the challenging problems of the future.

The IGERT project may draw upon investigators from one or more academic departments within a single institution or from more than one institution. The primary emphasis should be on integrative, innovative approaches to education and training of doctoral students. While IGERT stipends are primarily for supporting doctoral students, they may also be used to support students from minority-serving masters-granting institutions for the purpose of broadening participation of groups underrepresented in science and engineering disciplines. For these purposes, "underrepresented" is defined as American Indian/Alaskan Native, Black, Hispanic, Pacific Islander (native of Hawaii, Guam, Samoa), persons with disabilities, and/or female. In such cases, the minority-serving institution must be a collaborating partner in the IGERT program and the proposal must include a concrete plan for a Masters-to-PhD bridging program. Lists of Historically Black Colleges and Universities, Tribal Colleges and Hispanic-Serving institutions may be found at the following websites:

<http://www.ed.gov/about/inits/list/whhbcu/edlite-list.html> ;

<http://www.ed.gov/about/inits/list/whhc/edlite-tclist.html> ;

http://www.hacu.net/assnfe/CompanyDirectory.asp?Style=2&Company_Type=1,5. Participation of individuals at the undergraduate level is encouraged. However, IGERT funding itself may not be used to support undergraduates. If awarded, IGERT projects have a wide variety of sources for funding undergraduates through existing NSF programs such as Louis Stokes Alliances for Minority Participation (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13646&org=HRD&from=home) and Research Experiences for Undergraduates (REU). IGERTs can draw upon a vast pool of REU sites for undergraduates (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5517) as well as seek support for undergraduate research experiences through REU supplements to NSF research grants. For IGERTs that contain a component of research that would be funded by the Biological Sciences Directorate, the IGERT can seek students and potential undergraduate support from http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=500036&org=DBI Undergraduate Research and Mentoring in the Biological Sciences (URM).

All stipend recipients supported by IGERT funds must be citizens or permanent residents of the U.S., its territories or its possessions. However, individuals, including foreign students, who are supported by other sources of funds may participate in all IGERT activities; those who do will be considered IGERT associates. In contributing to a diverse science and engineering workforce for the future, the IGERT project must include strategies for recruitment, mentoring, and retention aimed at members of groups underrepresented in science and engineering, including women, racial and ethnic minorities, and persons with disabilities.

IGERT awardees may compete in the two-stage competition for a renewal award. IGERT awards may be renewed only once. Renewal proposals compete in the same pool as new proposals. Renewal proposals must demonstrate excellence and significant achievements in the dimensions of interdisciplinary research in science and/or engineering; educational and curricular development; trainee outcomes; recruitment, retention and successful progress of women, underrepresented minorities, and persons with disabilities; and institutional impacts. The proposal must address the expected added value, innovative and cutting-edge aspects of each of these dimensions. Institutional letters should explicitly explain why a renewal is needed and explicitly how this renewal will contribute to sustainability, what will be sustained and how it will be sustained. If a substantial number of the leaders of the proposed IGERT (including the PI and co-PIs) and/or a substantial number of the faculty participants in the proposed IGERT have participated in a prior IGERT award, then this proposal will be considered a renewal. For a renewal, the Renewal Box on the cover sheet must be checked.

Features of IGERT Projects

IGERT projects are expected to incorporate and integrate the following features:

- A comprehensive interdisciplinary theme, appropriate for doctoral-level research, that serves as the foundation for traineeship activities and is based on transformative interdisciplinary research in science/technology/engineering/mathematical sciences;
- Integration of the interdisciplinary research with innovative graduate education and training mechanisms, curricula enhancement, and other educational features that foster strong interactions among participating students and faculty and develop an appreciation for the global nature and context of the proposed interdisciplinary theme;

- An environment that exposes students to a broad base of state-of-the-art research instruments and equipment and educational tools and methodologies;
- Career development opportunities, provision for developing professional and personal skills, fostering an international perspective, and instruction in ethics and the responsible conduct of research;
- Program strategy and plan for recruitment, mentoring, retention, and graduation of U.S. graduate students, including efforts aimed at members of groups underrepresented in science and engineering (a member of an underrepresented group is American Indian/Alaskan Native, Black, Hispanic, Pacific Islander (native of Hawaii, Guam, Samoa), a person with a disability, and/or female);
- Strategy and methodology for formative assessments of the project's effectiveness by individuals internal and external to the institution and program improvements based on these assessments;
- Administrative plan and organizational structure that ensures effective management of the project resources;
- Plan for dissemination of innovative graduate education activities both within and outside the institution; and
- Institutional commitment to facilitating and furthering the plans and goals of the IGERT project, to creating a supportive environment for integrative research and education, to creating a supportive environment for cyber-enabled audio and video collaboration (see Collaboration Conferencing System requirements in Special Award Conditions) and to institutionalizing the successful elements of the project after NSF funding ends.

Proposals are expected to address all of the above topics.

Principal Investigator

The Principal Investigator (PI) shall be the Director of the IGERT project and is expected to be an essential participant in its educational and research activities. The lead institution will have overall responsibility for administration of the award and the PI will have the overall responsibility for the management of the project and interactions with the NSF.

Two-Stage IGERT Competition

Proposers for new and renewal IGERT projects compete in a two-stage process. In the first stage, proposers must submit a preliminary proposal (limit four per institution) that outlines the planned IGERT project. In the second stage, based on panel review of the preliminary proposals, successful proposers will be invited to submit full proposals. Only those proposers invited to submit full proposals may do so, consistent with the institutional limitations discussed in Section IV. ELIGIBILITY INFORMATION (below). For renewal proposals, site visits may be conducted as part of the review process.

III. AWARD INFORMATION

NSF plans to make approximately 18 new and renewal IGERT awards from this competition as continuing grants, depending on the quality of the proposals and the availability of funds. The anticipated funding amount in FY 2010 is \$10,800,000. For new projects, the first year award will be up to \$400,000 and in amounts up to \$600,000 for each of the next four years. For renewals, awards will be made in amounts up to \$600,000 per year for five years. Projects requiring substantially lower levels of funding may also be proposed.

- **For new IGERT projects only:** Additional funds of up to \$200,000 may be provided in Year 1 for purposes appropriate to the new IGERT project, including shared research equipment, special-purpose research materials, software, and databases, and faculty release time for development of new curricula. (See Section V. for additional information on Budget and Allowable Costs.)
- **For new and renewal IGERT projects:** If proposed, additional funding up to a total of \$200,000 PER AWARD may also be provided for IGERT projects that include strongly integrated international training activities in Years 2 through 5. These activities should be designed to significantly enhance the research, education, and training experiences of the IGERT students. NSF plans on allocating up to \$2,000,000 from this competition to support well integrated international research activities for approximately 10 of the IGERT awards.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- U.S. academic institutions in the United States, its territories or possessions that grant the Ph.D. degree in the sciences and engineering may submit proposals. Projects may involve more than one institution, but a single institution must accept overall management responsibility. Non-Ph.D. granting institutions, nonacademic, and international organizations may serve as collaborating organizations.

PI Limit:

The PI must be on the faculty of the submitting institution.

Limit on Number of Preliminary and Full Proposals per Organization:

- There is a limit of four (4) preliminary proposals that may be submitted by an institution either as a single institution or as a lead institution in a multi-institution preliminary proposal.

A multi-institutional proposal is defined as one that has at least one co-PI at a different academic institution than that of the PI, a subaward to a different academic institution than that of the PI, or both.

Limit on Number of Proposals per PI:

Any given individual may participate as PI or co-PI in only one proposal submission. That restriction applies to preliminary proposals as well as full proposals. A PI or co-PI on one proposal may serve as a faculty participant

on other proposals.

Additional Eligibility Info:

Limit on Number of Preliminary Proposals: Projects involving research in any of the areas appropriate for funding by the NSF are eligible. An institution may submit no more than four preliminary proposals either as a single institution or as a lead institution in a multi-institution preliminary proposal. A multi-institution proposal is defined as one that has at least one co-PI at a different academic institution than that of the PI, a sub-award to a different academic institution than that of the PI, or both.

Limit on Number of Full Proposals: Full proposals are by invitation only.

Proposals for new IGERT projects as well as proposals for the renewal of existing IGERT projects may be submitted. However, the limit on the number of preliminary and full proposals an institution may submit as lead institution applies to a combined total of new and renewal IGERT proposals. There is no limit on the number of multi-institution full proposals on which an institution may participate as non-lead institution.

For purposes of this IGERT solicitation, separate institutions are defined as those with separate Sponsored Projects Offices (SPO), even if those institutions are different campuses of the same multi-campus university. For example, if PIs at two different campuses of an academic institution each submit a preliminary or a full proposal through the same SPO, then both preliminary proposals and both full proposals are counted toward the maximum for that institution.

Limit on Renewals: IGERT awards may be renewed only once. If more than half of the leaders of the proposed IGERT (including the PI and co-PIs) and/or more than half of the faculty participants in the proposed IGERT have participated in a prior IGERT award, then this proposal will be considered a renewal.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals (required): Preliminary proposals are required and must be submitted via the NSF FastLane system.

All preliminary proposals submitted in response to this solicitation must be submitted via the NSF FastLane system. IGERT does not accept collaborative proposals as separate submissions from multiple organizations.

PRELIMINARY PROPOSAL CONTENT

Preliminary proposals must contain the items listed below and adhere to the specified page limitations and follow the GPG margin and spacing requirements. No additional information may be provided by links to web pages. At the preliminary proposal stage, up to five letters of commitment from the submitting institution or other organizations may be included. Letters from collaborating institutions are strongly encouraged. Proposers should carefully review the requirements that will be expected at the full proposal stage to better understand how to prepare their preliminary proposals.

Cover Sheet: Select the IGERT program solicitation number shown at the beginning of this solicitation from the pull down menu, and then select IGERT preliminary proposal for the program unit from the ensuing screen. A short informative title for the proposed IGERT project, that begins with "IGERT: ", must be provided. Check the box indicated for preliminary proposal. FastLane allows one PI and at most four Co-PIs to be designated. Additional lead personnel should be designated as non co-PI Senior Personnel. If international activities are proposed, the international activities box should be checked and the countries involved listed. If the proposal is a renewal application, the appropriate box should be checked and the original proposal number indicated on the cover sheet. If more than half of the leadership team, including the PI and co-PI(s), and/or more than half of the participants in this proposal have participated as faculty in a prior IGERT award, then this proposal will be considered a renewal.

- A. **Project Summary** (1-page limit): Provide a summary description of the IGERT project, including its research theme and key education and training features, in a manner that will be informative to a general technical audience. The project summary must consist of 4 parts: (1) At the top of this page include the title of the IGERT project, the name of the PI, and the lead institution. Also list any other participating institutions/organizations and indicate whether this is a multi-institution proposal; (2) provide a succinct summary of the intellectual merit of the proposal using "Intellectual Merit" as a heading; (3) describe the broader impacts for the proposed IGERT project using "Broader Impacts" as a heading; and (4) at the end of the project summary provide up to 4 key words. Select up to 3 key words from the list provided below that best describe the major themes of the interdisciplinary research proposed in their order of importance:

- Biology
- Chemistry
- Computer Science/Information Technology
- Engineering
- Environmental Science
- Geoscience
- Materials Research
- Mathematics
- Physics
- Polar Sciences
- Social Science; Behavioral and Cognitive Science

In addition one key word of the proposer's own choosing may be included at the end of the list.

- B. **Table of Contents:** For all proposals submitted, a Table of Contents is generated and cannot be edited.

- C. **Project Description:** The project description contains the following items: 1 through 7, which are limited to a combined total length of 9 pages, inclusive of tables, figures, or other graphical data. The research and education discussions in items 3 and 4 should be balanced in length.

1. **List of Participants** (1-page limit): Include departmental and institution/organization affiliation of all faculty

members and other senior personnel expected to have an important role in the project.

2. **Vision, Goals, and Thematic Basis:** Describe the vision, goals, and anticipated impact of the proposed IGERT project. Describe the thematic basis and unifying aspects of the interdisciplinary research and educational activities to be offered including how trainees will develop an appreciation for the global nature and context of the proposed interdisciplinary theme, whether or not funds for international work are requested. Include a discussion of what is currently missing from graduate education and training or what could be done more effectively, and how the proposed project will address these issues. Summarize the value-added aspects of the proposed project, and be specific about what is new and innovative. Proposals must clearly articulate project objectives, planned outcomes with respect to recruitment, retention, degree conferral, career placement of trainees, project monitoring guidelines, and how outcomes will be measured. The elements of the project that can be sustained after NSF funding ceases should be identified. Renewal proposals must describe how they will add further value, innovation and cutting-edge aspects with respect to interdisciplinary research/science/engineering; education/curriculum, trainee outcomes; recruitment, retention, and successful progress of women, underrepresented minorities, and persons with disabilities; and institutional impacts.
3. **Major Research Efforts:** Describe the major research efforts, their transformative aspects, and how they are interwoven and integrated to form the thematic basis for the interdisciplinary project. The research efforts should be described in sufficient detail for reviewers to assess their scientific merit and relevance to the project theme. If an international component requiring funding is included, describe how it is to be integrated in the core research, education, and training activities of the IGERT project. Renewal proposals must explicitly address the added value of this interdisciplinary research effort beyond that of the previous IGERT.
4. **Education and Training:** Describe the graduate education and training mechanisms that are central to the IGERT project, the logic and evidence to support them, and how they are to be integrated with the research and across the disciplines. Novel aspects should be emphasized to enable assessment of their innovation and potential impact. Discuss how trainees will develop an appreciation for and the skills required to be successful in the global context of the proposed interdisciplinary theme, whether or not funding for an international component is requested. If additional funding for international activities is requested, discuss the benefits of these international research experiences (e.g., quality of research partners, development of long-term international research partnerships, etc.) Discuss plans for how students will be recruited and mentored as well as career development opportunities, provisions for developing professional and personal skills, fostering an international perspective and ability to work in diverse teams, and integrating instruction in ethics and the responsible conduct of research. Discuss the strategies and plans for recruiting and retaining students from groups underrepresented in science and engineering. Describe the nature and extent of connections with recruitment, retention, and professional development programs available at the institution, particularly those supported by NSF such as Alliances for Graduate Education and the Professoriate, Louis Stokes Alliances for Minority Participation, Tribal Colleges and Universities Program, Historically Black Colleges and Universities-Undergraduate Program, and the Centers for Research Excellence in Science and Technology (<http://www.nsf.gov/div/index.jsp?div=HRD>) If your campus participates in an NSF-sponsored program to enhance diversity (AGEP, LSAMP, HBCU-UP, TCUP, CREST) you are strongly encouraged to partner with them as part of your overall recruitment strategy. NSF REU sites provide a vast pool of undergraduates from which to recruit, and for IGERT proposals that contain a component of research that would be funded by the Biological Sciences Directorate, the IGERT can seek students from Undergraduate Research Mentoring in the Biological Sciences (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=500036&org=DBI). Renewal proposals must explicitly address the added value of the proposed education and training effort beyond that of the previous IGERT.
5. **Institutional Commitment** (1-page limit): Describe the commitment that the institution will make to facilitating and furthering project plans and goals and to creating a supportive environment for interdisciplinary research and education. Indicate how student and faculty diversity will be promoted as an integral part of the project. Describe any plans for collaborating with recruitment, retention, and professional development programs available at the institution, particularly those supported by NSF such as those listed above. If your institution already has one or more IGERT awards, describe how the proposed IGERT will interact with, learn from, and build upon the existing award(s). Proposals from institutions that have received one or more previous IGERTs must include an explicit explanation of the impact of previous IGERTs on graduate education and interdisciplinary science at the institution and the intended institutional impact of the currently proposed IGERT must be included. Renewal proposals must explicitly address the added value of this institutional commitment beyond that of the previous IGERT.
6. **Other Resources and Connections** (1-page limit): Describe anticipated resource commitments to the IGERT project by other participating organizations, such as industry, government, non-U.S. institutions, and private foundations. Describe the nature and extent of connections with existing NSF multidisciplinary and industry-related programs such as those listed under "Full Proposal-Organization, Management, and Institutional Commitment." Proposers proposing international activities may wish to consult the OISE (Office of International Science and Engineering) member of the IGERT Coordinating Committee; the list of members is available at <http://www.nsf.gov/crssprgm/igert/cc.jsp>.
7. **Recent Traineeship Experience** (if applicable): Describe prior experience of the PI and/or Co-PIs with and outcomes of any related graduate traineeship project, including IGERT projects, during the past five years. Address the outcomes of the previous award(s) including but not limited to trainee outcomes, interdisciplinary science, institutional impacts, or other outcomes relevant to the specific project or institution. If more than half of the leadership team, including the PI, and co-PIs, and/or more than half of the participants in a proposal have participated as faculty in a prior IGERT award, then this proposal will be considered a renewal. For an IGERT renewal, the outcomes of the prior award must be addressed with respect to demonstrated excellence and significant achievements in the dimensions of the interdisciplinary research in science and/or engineering; education/curriculum; trainee outcomes; recruitment, retention, and successful progress of women, underrepresented minorities, and persons with disabilities; and institutional impacts. The renewal box on the cover sheet must be checked.

D. **References Cited** (1-page limit). Cite references relevant to both the scientific and educational plans.

E. **Biographical Sketches and Current and Pending Support:** A maximum of 20 biographical sketches may be included. Additional individuals may be included in the List of Participants, Section(C).1. Prepare the standard 2-page biographical sketches in accordance with the Grant Proposal Guide. In choosing what to include, emphasize information that will be

helpful for understanding the strengths, qualifications, and specific impact the individual brings to the IGERT project.

Current and pending support information is not required for preliminary proposals.

- F. **Budget:** No budget is required for preliminary proposals; however, please enter \$2 in the Requested Amount box on the FastLane cover sheet (this entry allows correct FastLane processing). The PI should examine the budget instructions for the Full Proposal so that the activities proposed are congruent with the budget framework.
- G. **Supplementary Documentation:** Because the IGERT program seeks to catalyze institutional change in graduate education, indications of institutional commitment for the program and its sustainability, through whatever means seem most appropriate, must be included in the proposal. Up to five letters of commitment, including one that must be from the senior administration of the submitting institution, may be provided as part of the proposal. All IGERT preliminary proposals must include at least one internal letter of commitment, which should come from the appropriate senior institutional administrator. Letters of commitment from the lead institution should specify how the institution will facilitate implementation of the IGERT and support its goals over the life of the award, including broadening participation; they should also specify what features are expected to be sustained after the award has ended, and how they will be sustained. Letters from the lead institution may be up to two pages in length. Letters of commitment from outside the lead institution, if appropriate, must be included from major key outside partners (institutions, organizations, or individuals) involved in the IGERT, as well as from any outreach organization that may be assisting the IGERT to broaden participation of underrepresented groups in its program. These external letters should include a description of the role that the partner will play in the IGERT (i.e., provide internships, access to laboratories, industry mentors, field logistics, outreach to groups underrepresented in science and engineering, etc.). External letters should also include specific details regarding the partner's contribution to the IGERT, such as location and specified period for the internships, access to specific instrumentation, laboratory or computing facilities, specific plan for recruitment of diverse IGERT participants, etc.). Each external letter must be one page or less in length.

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

FULL PROPOSAL CONTENT

Only those proposers invited to submit full proposals may do so. No additional information may be provided by links to web pages. Proposals that exceed the specified page limitations may be returned without review. IGERT does not accept collaborative proposals submitted as separate submissions from multiple organizations. One representative from the leadership team (PI, co-PI, or project coordinator) of each preliminary proposal invited for development and submission as a full proposal will be strongly advised to participate in a web based discussion prior to full proposal submission. All major aspects of proposal development and preparation will be covered. Topics will include Frequently Asked Questions (FAQs) on each of the important aspects of the proposal such as the interdisciplinary theme, educational plan, plans for broadening participation, international activities (if proposed), as well as the budget. The letter of full proposal invitation sent to the PI will include a list of dates for the web-based discussions.

Cover Sheet: For proposals submitted via FastLane, select the IGERT program solicitation number shown at the beginning of this solicitation from the pull down menu, and then select IGERT Full Proposal for the program unit from the ensuing screen. For proposals submitted via FastLane, a short informative title for the proposed IGERT project, that begins with "IGERT: ", must be provided. Enter the related preliminary proposal number in the appropriate box. If international activities requiring funding are proposed, the international cooperative activities box should be checked and the countries involved listed. If the proposal is a renewal proposal, check the appropriate box and type in the proposal number. A starting date of July 1, 2010 or later should be listed.

- A. **Project Summary** (1-page limit): Provide a summary description of the IGERT project, including its research theme and key education and training features, in a manner that will be informative to a general technical audience. The project summary must consist of 4 parts: (1) At the top of this page include the title of the IGERT project, the name of the PI, and the lead institution. Also list any other participating institutions/organizations, and indicate whether this is a multi-institution proposal; (2) provide a succinct summary of the intellectual merit of the proposal using "Intellectual Merit" as a heading; (3) describe the broader impacts for the proposed IGERT program using "Broader Impacts" as a heading; and (4) at the end of the project summary provide up to 4 key words. Select up to 3 key words from the list provided below that best describe the major themes of the interdisciplinary research proposed in their order of importance:

- Biology
- Chemistry
- Computer Science/Information Technology
- Engineering
- Environmental Science
- Geoscience
- Materials Research
- Mathematics
- Physics
- Polar Sciences
- Social Science; Behavioral and Cognitive Science

In addition one key word of the proposer's own choosing may be included at the end of the list.

- B. **Table of Contents:** For all proposals submitted, a Table of Contents is generated and cannot be edited.
- C. **Project Description:** The project description section contains the following items: 1 through 10. Items 1 through 8 are limited to a combined total length of 25 pages, inclusive of tables, figures, or other graphical data. The research and education discussions in items 3 and 4 (below) should be balanced in length.
1. **List of Participants** (1-page limit): Include departmental and institutional/organizational affiliation of all faculty members and other senior personnel expected to have an important role in the project.
 2. **Vision, Goals, and Thematic Basis:** Discuss the vision, goals, and broader impacts of the proposed IGERT project. Describe the thematic basis and unifying aspects of the interdisciplinary research and educational activities to be offered. Include a discussion of what is currently missing from graduate education and training or what could be done more effectively, and how the proposed project will address these issues. Benefits to be realized from opportunities for interdisciplinary collaboration in research and education should be emphasized. Describe how trainees will develop an appreciation for the global nature and context of the proposed interdisciplinary theme whether or not funds for the international component

are requested. Summarize the value-added aspects of the proposed project, and be specific about what is new and innovative. Proposals should clearly articulate project objectives, planned outcomes with respect to recruitment, retention, degree conferral, and career placement of trainees; project monitoring guidelines; and how outcomes will be measured. Renewal proposals based on existing IGERT projects must specifically address how they will add value and cutting-edge aspects in this new proposal with respect to interdisciplinary research/science/engineering; education/curriculum; trainee outcomes; recruitment, retention, and successful progress of women, underrepresented minorities and persons with disabilities; and institutional impacts. Renewal proposals must clearly indicate what improvements and innovations are proposed for the renewal period, the plans for evaluating the impact of the project, documenting and disseminating to the appropriate professional communities what was learned from the project, and sustaining the essential elements of the project after NSF funding ceases.

3. **Major Research Efforts:** Describe the major interdisciplinary research efforts, their transformative aspects, and how the interdisciplinary research efforts are interwoven and integrated to form the thematic basis for the interdisciplinary project. For each research area described, specify the faculty members and other principals involved, and provide sufficient detail to enable assessment of the scientific merit and relevance to the overall project theme. Needs for special materials, shared equipment, travel to research sites, or interdisciplinary curriculum development must be justified in the context of the research theme and breadth of challenges involved. If an international component requiring funding is proposed, describe how it is to be integrated into the core research, education, and training activities of the IGERT project. Renewal proposals must explicitly address the added value of the proposed research effort over and above that of the previous IGERT.
4. **Education and Training:** Describe the graduate education and training mechanisms that are central to the IGERT project, the logic and evidence to support them, and how they are to be integrated with the research and across the disciplines. Novel aspects should be emphasized to enable assessment of the innovation and potential impact. Specify faculty members and other participants with primary responsibility for these integrative efforts. Describe strategies for developing a community of students. Discuss plans for providing career development opportunities, developing professional and personal skills, fostering an international perspective and ability to work in diverse teams, and integrating instruction in ethics and the responsible conduct of research. If planned student training includes internships, fieldwork, or other opportunities, domestic and foreign, identify the potential mentors and discuss how the opportunity is intended to strengthen both a student's graduate experience and the IGERT project. If an international component is proposed for funding, discuss the benefits of international research experiences (e.g. quality of research partners, development of long-term international research partnerships, etc.). Whether or not an international experience requiring funding is proposed, discuss how trainees will develop an appreciation for and the skills required to be successful in the global context of the proposed interdisciplinary theme. Supporting letters from host organizations should document willingness to receive students and the expected role of individual mentors. Show typical student pathways through the program and the effect on expected time to degree and career progression. The role of undergraduates in this project, if proposed, must be fully described. IGERT programs are encouraged to consider involving undergraduate students via the REU Site Program (http://www.nsf.gov/crssprgm/reu/reu_search.cfm). Renewal proposals must explicitly address the added value of the proposed education and training effort beyond that of the previous IGERT.
5. **Organization, Management, and Institutional Commitment:** Describe plans and procedures for the organization and management of the IGERT project. The plans should be specific and include use of a formal mechanism that assures the fair and effective allocation of IGERT resources and enables faculty members, students, and others to interact effectively in furthering project goals. Plans should include provision for an external advisory body. Indicate the institutional or departmental obstacles you foresee in implementing your project, and how you plan to address them. Describe the commitment of the institution at all appropriate administrative levels to facilitating and furthering the plans and goals of the IGERT project and to creating a supportive environment for integrative research and education. Address how your institution will create a supportive environment for cyber-enabled audio and video collaboration in alignment with the IGERT Collaboration Conferencing capability (for details and specific requirements see Special Award Conditions). A supporting letter of commitment from the senior administration of the submitting institution must accompany this proposal. For institutions that have received one or more previous IGERTs, the supporting letter must also include an explicit explanation of the impact of previous IGERTs on graduate education and interdisciplinary science at the institution and the intended institutional impact of the currently proposed IGERT. Should a multi-institution project be proposed, then provide a careful justification that considers the administrative complexity and the expected benefits to student experiences. Discuss the role of any other academic institutions or organizations such as industry, government, non-U.S. institutions, or private foundations that are expected to participate in the IGERT project. Describe the nature and extent of connections with existing NSF multidisciplinary and industry-related programs such as the Science and Technology Centers (<http://www.nsf.gov/od/oiia/programs/stc/>), Science of Learning Centers (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5567), Engineering Research Centers (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5502), Materials Research Science and Engineering Centers (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5295), Grant Opportunities for Academic Liaison with Industry (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf07522&org=NSF), and other IGERT awards at the participating institutions. Discuss plans for sustaining the key features of the IGERT project after NSF funding is completed. Renewal proposals must explicitly address what was learned from the management, organizational and institutional commitment efforts of the previous IGERT and describe the added value of the proposed effort beyond that of the previous IGERT.
6. **Performance Assessment / Project Evaluation:** Describe an annual evaluation plan that will be used by the project team to evaluate success in meeting project goals. The plan should include project goals for students, faculty, and departments to be evaluated; measurable evaluation questions and indicators based on the project goals; and a summary design of the proposed evaluation, including proposed data collection methods, timeline, and assignment of responsibilities. Address the following priorities in the plan, plus any others that may be appropriate: assessing effectiveness of recruitment strategies, including efforts to recruit women, minorities, and persons with disabilities; assessing effectiveness of training and mentoring activities; examining trainee progress, achievements, skills development, and career preparation over time; identifying project impacts on participating faculty and departments/institutions, especially with respect to interdisciplinary graduate education; and providing formative assessment to improve the project. Projects should use evaluators external to the project to

help plan and conduct evaluations, in addition to internal mechanisms and advisory committees. In annual reports to the NSF, project PIs will be asked to assess project success in fostering trainee growth and summarize academic and professional training accomplishments, institutional impacts, and assessment and evaluation activities. Renewal proposals must explicitly address what was learned from the evaluation efforts of the previous IGERT and describe the added value of the proposed effort beyond that of the previous IGERT.

7. **Recruitment, Mentoring, and Retention:** Describe plans for recruitment, mentoring, and retention of U.S. graduate students, including specific provisions, beyond the norm, aimed at members of groups underrepresented in science and engineering. (A member of an under-represented group is American Indian/Alaskan native, Black, Hispanic, Pacific Islander (native of Hawaii, Guam, Samoa), disabled, and/or female. Discuss how new students will be staged into the program, the Ph.D. programs in which the IGERT graduate students may enroll, the duration and level of their support with IGERT funds, and provisions for continued support through the completion of degree. IGERT support for two years (24 months) or longer for each student is strongly recommended. Alternative plans for student support, if appropriate, must be justified in the proposal. Describe the diversity makeup of faculty participating in the IGERT project. If applicable, discuss how undergraduate student participation will be used to further the goals of attracting and graduating members of underrepresented groups. Describe the nature and extent of connections with recruitment, retention, and professional development programs available at the institution, particularly those supported by NSF such as Alliances for Graduate Education and the Professoriate, Louis Stokes Alliances for Minority Participation, Tribal Colleges and Universities Program, Historically Black Colleges and Universities - Undergraduate Program, and the Centers for Research Excellence in Science and Technology (<http://www.nsf.gov/div/index.jsp?div=HRD>). If your campus currently participates in an NSF-sponsored program to enhance diversity (AGEP, LSAMP, HBCU-UP, TCUP, CREST, etc.) you are strongly encouraged to partner with them as part of your overall recruitment strategy. Renewal proposals must explicitly address what was learned from the recruitment, mentoring and retention efforts of the previous IGERT and describe the added value of the proposed effort beyond that of the previous IGERT.
8. **Recent Traineeship Experience and IGERT Renewals** (if applicable; up to 5 pages, within the 25-page limit for project description): Describe the experience of the PI and/or co-PIs with any related graduate traineeship project, including IGERT projects, during the past 5 years. Address the outcomes of the previous award(s) including but not limited to trainee outcomes, interdisciplinary science, institutional impacts, or other outcomes relevant to the specific project or institution. If more than half of the leadership team, including the PI and co-PIs, and/or more than half of the faculty in this proposal have participated in a prior IGERT award, then this proposal will be considered a renewal proposal. For an IGERT renewal, the outcomes of the prior award must be addressed with regard to demonstrated excellence and significant achievements in the dimensions of: the interdisciplinary research in science and/or engineering; education/curriculum; trainee outcomes; recruitment, retention, and successful progress of women, underrepresented minorities, and persons with disabilities; and institutional impacts. The Renewal Box on the cover sheet must be checked.
9. **International Collaboration** (for applicants requesting additional funds of up to a total of \$200,000 per award; 2-page limit): Describe the procedures and arrangements for selecting, preparing, and sending IGERT students to foreign sites for collaborative research and education. Discuss the capabilities and resources to be made available to IGERT students at the foreign host institution. Explain the nature and content of activities abroad (e.g., mentoring and training) and how these experiences will be integrated into and benefit the overall IGERT project, including trainees who do not travel. Address the practical aspects of sending U.S. students abroad, including logistical arrangements, language and cultural issues, and supervision abroad to ensure the student's welfare.
10. **Recruitment and Retention History** (1 page per participating department/program): Explain your capacity to host an IGERT project, and past performance, resources, and ability to attract well-qualified U.S. graduate students in science and engineering, including those from underrepresented groups. Provide specific information in a tabular format for the last three years, regarding recruitment and retention of students in the participating departments/programs and compare it to the national data in the respective fields (<http://www.nsf.gov/statistics/>). These data will be used by reviewers to help them evaluate your recruitment/retention strategies and plans. For renewal proposals provide these data for all students participating in the project. Renewal proposals must also clearly address efforts made and results achieved toward increasing participation of women and minority student, and persons with disabilities, both students and faculty, and outline new approaches, if appropriate, to increase or sustain the diversity goals. These data will help reviewers to evaluate success in this part of the IGERT mission. Templates for both new and renewal projects are provided below. Individual students may be counted in each category for which they are appropriate.

NEW PROPOSALS					
Provide data on US citizens and permanent residents only for the past 3 academic years for each participating department in the proposed IGERT.					
	SAMPLE				
PhD-granting Department or Equivalent	Mathematics				
	W	Min	D	Other	Total
No. applicants to PhD program	10	3	0	37	50
No. applicants accepted by program	5	1	0	14	20
No. that matriculated	3	1	0	11	15
No. students who withdrew	1	0	0	1	2

No. PhDs awarded	1	1	0	4	6
No. currently enrolled	1	0	0	6	7
Provide employment information (employer, position) for all US citizens or permanent residents who have received PhD in department during past 3 years. Add additional lines as needed. Enter "unknown" in cases when you are unsure of place of employment and/or position.					
	Employer Name	Position			
SAMPLE - Do not provide student name	Univ Alaska	Asst Prof			
Legend: W-women; Min-minorities; D-persons with disabilities					
RENEWAL PROPOSALS					
Provide data on US citizens and permanent residents only for the past 3 academic years for the original IGERT award - see above template					

D. **References Cited** (3-page limit) in FastLane.

E. **Biographical Sketches and Current and Pending Support:** A maximum of 20 biographical sketches may be included, with up to 5 additional biographical sketches of international participants when international activities requiring funding are proposed. The standard NSF 2-page biographical sketches for the PI, co-PI's, and participants listed on the first page of the project description should be prepared in accordance with instructions in the Grant Proposal Guide. Current and pending support is required only for the PI and co-PI's.

F. **Budget and Allowable Costs:** Provide a budget for each year of support requested. For new awards, the amount requested should not exceed \$400,000 for the first year and \$600,000 each year for years two through five. The first-year budget for new awards only may include up to an additional \$200,000 as a special allocation for purposes discussed below. For renewal awards the budget should not exceed \$600,000 each year.

In addition to the amounts described above, for either new or renewal awards, if a funded international component has been proposed in years 2-5, additional funds not to exceed a total of \$200,000 per award may be included to support this effort. The additional funds requested for international activities should be sufficient and appropriate to enable IGERT students to benefit from the unique experience of conducting research and education in a foreign setting. International activities should benefit both the IGERT trainees who travel and those that do not. All international activities are expected to complement or enhance the interdisciplinary IGERT theme.

The preponderance of international support is intended to benefit graduate students through internships (university, government and industry), collaborative research and/or fieldwork with foreign collaborators, or in other settings appropriate to the research area. Time spent abroad should be of sufficient duration to acculturate the student and should provide a meaningful research and education experience. Funds may be used to prepare students to be successful in the international setting (pre-departure orientations, language or special training). Funds may also be used for short-term visits by IGERT faculty to foreign sites for supervising students, coordinating research and networking with foreign scientists. Requests for travel for the sole purpose of attending international conferences or workshops are not appropriate. In addition to trainee stipends, funds may be used for trainee international and in-country travel, living expenses, and limited support for research and education related costs abroad such as bench fees and/or field guides. Funds cannot be used to defray the costs of non-IGERT personnel. Reciprocal visits by foreign researchers and students to the U.S. institutions are encouraged, but NSF funds cannot be used to support such visits. Country-specific conditions apply. Proposers should consult the Office of International Science and Engineering (OISE) member of the IGERT Coordinating Committee. Please refer to the web link provided in section VIII.

A cumulative budget will automatically be generated for the proposal. Awarded funds not expended in the specific year requested may be carried over only with appropriate justification provided in the annual report to NSF and with the approval of the cognizant program officer.

The major portion of the funds must be used for doctoral student stipends and educational and training activities. A limited amount of funds may be budgeted for necessary administrative support (including personnel for management/administration), support of short-term visitors, and to partially defray the costs of research and publication by students. No funds for faculty salaries will be provided, with the following exceptions: (a) one month per year of salary support for the Principal Investigator for management purposes; (b) up to 4 months total of faculty salary support for development of IGERT curricula. The faculty salary support for development of curricula should be requested from within the first-year special allocation; however, its expenditure may be extended over the first two years of IGERT project activity. The budget should also include funds for travel for the PI, one graduate student and one administrator to attend the annual IGERT PI meeting in the Washington DC area, and in year 1 only, for the PI to attend a one-day orientation meeting in the Washington DC area.

The NSF contribution to graduate student stipends is currently \$30,000 per year per IGERT trainee for a 12-month appointment, and budgeting for stipends should be made on this basis for each year of the award. All IGERT-supported students are expected to be full-time IGERT trainees. IGERT support for 2 years (24 months per student) or longer is strongly recommended. Alternative plans for graduate student support must be justified in the proposal. NSF also provides a cost-of-education allowance for tuition, health insurance, and normal fees of \$10,500 per year per student (for 12 months.) If this allowance is not fully required, then it may be used to support other IGERT student-related activities. Funds requested for graduate student trainees should be entered under Participant Support. The number of trainees anticipated, along with the durations of the appointments, should be listed and consistent with the requested stipend funds. All stipend recipients must be citizens or permanent residents of the U.S., its territories or its possessions.

Purchase of shared research equipment, special-purpose research materials, software and databases that cost more than \$5,000 per item may be requested within the first-year special allocation, and should be listed under Equipment. Any of those items that cost \$5,000 or less per item should be listed under Materials and Supplies. Costs for developing collaboration conference audio and video capability for collaborations including within the proposed IGERT, among IGERT projects and between the NSF and the proposed IGERT in alignment with the IGERT Collaboration Conferencing System requirements (for details see Special Award Conditions) may be

requested as a part of the first-year special allocation; personnel and shop costs for developing and constructing special instruments may be requested within the regular yearly budget. Funds for facility renovation or for equipment installation or maintenance are not allowed. Awards will carry an 8% allowance for indirect costs based on the total direct cost, excluding equipment and cost-of-education allowances, but not excluding participant support. Please note this is in variance with Chapter II.C.2.g.v of the Grant Proposal Guide.

For multi-institution projects, the lead institution shall submit the proposal, with other participating institutions included under sub-awards. Budgets shall be provided for the overall project as well as individually for the lead institution and for each participating institution/organization that receives a sub-award.

Budget Justification (3-page limit): Provide a justification for the funds requested for the overall project in each budget category. Describe the proposed allocation of funds in the major budget categories with sufficient clarity to show how resources will be utilized in carrying out the planned IGERT project activities. Indicate the total number of graduate students to be supported and the staging and duration and FTE level of their support on IGERT funds. If the first-year special allocation of funds for new awards is requested, describe in a separate table how the funds are to be used. If additional funds are requested for international activities, describe in a separate table the requested amount and allocations over the project duration, beginning with Year 2 of the award. Provide details of anticipated resource commitments of any other organizations expected to participate in the IGERT project, such as government, industry, non-U.S. institutions, or private foundations. Appropriate letters of commitment from participating organizations should be included in Supplementary Documentation (below). Cost sharing is not required under this solicitation. Any information provided here and in similar places in this solicitation will not be auditable as cost sharing.

- G. **Facilities, Equipment and Other Resources** (1-page limit): Provide a description of facilities and major instruments that are available to the project and require no additional support from NSF.
- H. **Supplementary Documentation:** No cost sharing funds are required for IGERT proposals. However, because the IGERT program seeks to catalyze institutional change in graduate education, indications of institutional support for the program and its sustainability, through whatever means seem most appropriate, must be included in the proposal. Up to eight supporting letters, including one that must be from the senior administration of the submitting institution, may be provided as part of the proposal, with up to four additional letters when international activities requiring NSF funding are proposed. Letters of endorsement from foreign counterparts should discuss the benefits and foreign commitment to the project.

All IGERT full proposals must include at least one internal letter of commitment, which should come from the appropriate senior institutional administrator. Internal letters of commitment should specify how the institution will facilitate implementation of the IGERT and support its goals over the life of the award, including broadening participation; they should also specify what features are expected to be sustained after the award has ended, and how they will be sustained. Internal letters of commitment should also specify what features are expected to be sustained after the award has ended, and how they will be sustained; they should also describe how they will create a supportive environment for cyber-enabled audio and video collaboration (see Collaborative Conferencing System requirements under Special Award Conditions). The letter of commitment from the senior administrator of the submitting institution may be up to two pages in length; all of the other letters may be no longer than one page.

For institutions that have received one or more previous IGERTs, the supporting letter must also include an explicit explanation of the impact of previous IGERTs on graduate education and interdisciplinary science at the institution and the intended institutional impact of the currently proposed IGERT.

For renewals, institutional letters must explicitly explain why a renewal is needed and explicitly address how this renewal will contribute to sustainability, what will be sustained and how it will be sustained.

External letters, if appropriate, must be included for each major key outside partner (institution, organization, or individual) involved in the IGERT, as well as from any outreach organization that may be assisting the IGERT to broaden participation of under-represented groups in the science or engineering in its program. External letters should include a description of the role that the partner will play in the IGERT (i.e., provide internships, access to laboratories, industry mentors, field logistics, outreach to groups underrepresented in science and engineering, etc.). External letters should also include specific details regarding the partner's contributions to the IGERT, such as location and specified period for the internships, access to specific instrumentation, laboratory or computing facilities, specific plan for recruitment of diverse IGERT participants, etc.). Each external letter must be one page or less in length.

Proposers are reminded to identify the program solicitation number (NSF 09-519) in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost Sharing: Cost sharing is not required under this solicitation.

Indirect Cost (F&A) Limitations:

Partial reimbursement of indirect costs not to exceed 8% of total direct costs, excluding equipment and cost-of-education allowances, but not excluding participant support. Please note this is in variance with Chapter II.C.2.g.v of the Grant Proposal Guide.

Other Budgetary Limitations: The NSF contribution to graduate student stipends is currently \$30,000 per year per IGERT trainee for a 12-month appointment and budgeting for stipends should be made on this basis for each year of the award. All IGERT-supported students are expected to be full-time IGERT trainees. IGERT support for 2 years (24 months per student) or longer is strongly recommended. Alternative plans for graduate student support must be justified in the proposal. If there is an increase in the approved stipend amount beyond \$30,000, requests for additional project funding during the five-year period may be granted, depending on funds available. All stipend recipients must be citizens or permanent residents of the U.S., its territories or possessions.

C. Due Dates

- **Preliminary Proposal Due Date(s) (required)** (due by 5 p.m. proposer's local time):

March 13, 2009

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

September 14, 2009

BY INVITATION ONLY

D. FastLane Requirements

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

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

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

A. NSF Merit Review Criteria

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

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

What is the intellectual merit of the proposed activity?

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

What are the broader impacts of the proposed activity?

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

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

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

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

Integration of Research and Education

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

Integrating Diversity into NSF Programs, Projects, and Activities

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

and supports.

Additional Review Criteria:

In responding to the standard NSF review criteria, reviewers will be asked to place emphasis on the following IGERT program objectives:

- Integration and coherence of the interdisciplinary theme in its effectiveness as an intellectual focus for all participating scientists, engineers, and educators;
- Quality of the proposed research efforts, and their comprehensive interdisciplinary theme, and their appropriateness for doctoral-level research, that serves as the foundation for traineeship activities and the extent to which the efforts are based on transformative science/technology/engineering/mathematical sciences;
- Quality and innovation in the planned graduate education and training mechanisms, and in their integration with the research and in developing an appreciation for the global context of the interdisciplinary theme;
- Effectiveness of career development opportunities, provision for developing professional and personal skills, fostering an international perspective and ability to work in diverse teams, and instruction in ethics and the responsible conduct of research;
- Quality of the international collaborative activities and benefits to the U.S. participants, if funds are requested for those activities (optional);
- Effectiveness of the strategy for recruitment, mentoring, retention, degree completion, and career progression of U.S. graduate students, including those from groups underrepresented in science and engineering: a partial list of examples of effective strategies might include development of new approaches in information technology or connectivity to engage members of underrepresented groups; collaborations with students and/or faculty who are members of underrepresented groups or are affiliated with minority-serving institutions (MSI); campus visits/presentations at MSI; regular publication of bulletins/newsletters to enhance cross-cultural/gender communication; and monitoring of graduate student retention. Plans for effective recruitment and assessment should be specific and detailed;
- Appropriateness of the plans for assessment of project performance in meeting objectives and expanding the knowledge base in STEM (Science, Technology, Engineering, and Mathematics) graduate education and disseminating results to appropriate professional communities; (full proposals only)
- Appropriateness of the administrative plan and organizational structure in assuring effective allocation of project resources and participation by project members; (full proposals only)
- Commitment of the institution to facilitating and furthering the plans and goals of the IGERT project, to creating a supportive environment for integrative research and education, to creating a supportive environment for cyber-enabled communication, and to sustaining the successful elements of the project after NSF funding ceases; and
- For institutions that have received one or more previous IGERTs, the impacts of the previous IGERTs on graduate education and interdisciplinary science and the intended institutional impact of the currently proposed IGERT.

Additional criteria for renewal projects:

- Demonstrated excellence and significant achievements from the previous IGERT in the dimensions of interdisciplinary research/science/engineering; education and curricular development; trainee outcomes; recruitment, retention and successful progress of women, underrepresented minorities, and persons with disabilities; and institutional impacts;
- Added value in each of the dimensions above;
- Institutional commitment defining why a renewal is needed and explicitly how this renewal will contribute to sustainability, what will be sustained and how it will be sustained.

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.

Special Award Conditions:

Collaboration Conferencing System requirements: The IGERT program requires the ability to collaborate among IGERT projects and between IGERT projects and the National Science Foundation in a time and cost effective manner. CyberInfrastructure (CI), which includes various high-speed (broad-band) computer networks (i.e. Internet 2) that span across distant geographical locations will allow IGERT projects to synthesize their knowledge and engage in collaborative activities in real-time. The CI collaboration capability will allow real-time audio and video communication among multipoint locations and organizations. The software technology selected to enable this CI collaborative capability should allow forward expandability of new or improved collaborative services and application protocols. The hardware and network bandwidth requirements should support a wide range of current and future solutions. Ease of use and maintainability are key factors. It should function with standard "off-the-shelf" hardware and operating systems. This solution will establish a baseline that can be applied to all IGERT projects.

Collaboration systems interoperable with version 3.0 (or later) access grid middleware provide the required framework to allow the above solution to be implemented. A minimum set of software and hardware requirements are outlined below. A portion of first year IGERT start-up funding may be used for some or all of the costs of the collaboration conference system.

Access Grid Middleware Information

For detailed information about Access Grid Middleware, please go to

<http://www.accessgrid.org/>.

PC Requirements

Desktop/Shared system (Minimum) – Cost is 2-5K each

- Pentium Core 2 Duo t7200 or AMD Athlon 64 X2 6000
- 2 250 GB hard drive - Configured as Mirrored RAID 1 for redundancy - May have to purchase RAID PCI-E card if the motherboard does not support RAID.
- Nvidia GeForce 7900 or ATI X1950 video card
- 2 to 4 GB of main RAM memory
- Firewire or USB external Web camera. A capture card with analog (example S/Video) video may be also be used.
- Onboard or add on Sound card with headset and Microphone OR echo Cancellation system (Example Clear One [Clear One website](#))
- 2 LCD Monitors of 20inch in size or one large 30inch+ 16x9 LCD Display
- OS Windows XP or Mac OS

Network/Bandwidth Requirements

- Network must be capable of receiving and transmitting multicast network traffic OR allow firewall exceptions for incoming unicast traffic (both TCP and UDP). To be determined by qualified institution personnel.
- Collaboration System should have access to a minimum of 10Mb/s inbound bandwidth and 10Mb/s outbound traffic to the internet. Internet2 connectivity and service is preferred.

C. Reporting Requirements

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

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

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of

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

In addition IGERT PIs are required to submit their annual project reports through a special IGERT web-based reporting system that standardizes the evaluation across all IGERT sites. Any proposed carrying forward of funds must be justified in the annual report. Within 90 days after the expiration of the IGERT award, PIs are required to submit their final project reports through the same web-based reporting system. For both the annual and final project reports, a document will then be generated from the web-based report and sent to the PI for the PI to submit via FastLane to meet NSF reporting requirement.

The Division of Graduate Education (DGE) will conduct an on-going evaluation to determine how effectively the IGERT program is achieving its goal to respond to the nation's need for a globally prepared diverse science and engineering workforce. Additionally, it is highly desirable to have a structured means of tracking trainees beyond graduation to gauge the extent to which they follow a career path consistent with the intent of the program and to assess the impact the NSF traineeship has had on their graduate education experience. Accordingly, trainees will be contacted during and after the completion of this award for updates on various aspects of their employment history, professional activities and accomplishments, and other information helpful in evaluating the impact of the program. Trainees, participating faculty, and affiliated institutions should be prepared to cooperate in program-level evaluations conducted by the NSF and/or contracted evaluators.

The National Science Foundation claims no rights to any inventions or writings that might result from its fellowship or traineeship grants. However, fellows and trainees should be aware that the NSF, another Federal agency, or some private party may acquire such rights through other support for particular research. Also, fellows and trainees should note their obligation to include an Acknowledgment and Disclaimer in any publication.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Melur K. Ramasubramanian, telephone: (703) 292-5089, email: mramasub@nsf.gov
- Carol Van Hartesveldt, Program Director for IGERT, 875, telephone: 703-292-8112, fax: 703-292-9048, email: cvanhart@nsf.gov
- Yvette D. Jackson, IT Specialist, telephone: (703) 292-4925, email: yjackson@nsf.gov
- Gabrielle Hrycyszyn, Science Assistant, telephone: (703) 292-2949, email: ghrycysz@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.
- Yvette D. Jackson, IT Specialist, telephone: (703) 292-4925, email: yjackson@nsf.gov

IGERT Coordinating Committee members are listed on the IGERT web page, at <http://www.nsf.gov/crssprgm/igert/cc.jsp>.

IX. OTHER INFORMATION

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

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

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

NSF receives approximately 40,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels

and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

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

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

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

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

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

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

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

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

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