

# Integrative Graduate Education and Research Traineeship Program-CIF21 Track (IGERT-CIF21)

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## PROGRAM SOLICITATION

NSF 12-555



### National Science Foundation

Directorate for Biological Sciences

Directorate for Computer & Information Science & Engineering

Office of Cyberinfrastructure

Directorate for Education & Human Resources  
Division of Graduate Education

Directorate for Engineering

Directorate for Geosciences

Office of Integrative Activities

Office of International Science and Engineering

Directorate for Mathematical & Physical Sciences

Office of Polar Programs

Directorate for Social, Behavioral & Economic Sciences

**Letter of Intent Due Date(s) (required)** (due by 5 p.m. proposer's local time):

June 04, 2012

IGERT-CIF21 Letter of Intent

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

August 06, 2012

IGERT-CIF21 Full Proposal

## IMPORTANT INFORMATION AND REVISION NOTES

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### Important Information

This solicitation is an amendment to the IGERT solicitation ([NSF 11-533](#)). This solicitation amendment announces:

A new targeted opportunity for research communities to apply for a new track in the NSF's Integrative Graduate Education and Research Traineeship (IGERT) program as a mechanism to address the training and education needs in computational and data enabled science and engineering (CDS&E) and cyberinfrastructure research.

1. Proposals submitted to the track must be clearly in the targeted interdisciplinary areas described for the track in contrast to the regular IGERT program ([NSF 11-533](#)) where any interdisciplinary theme will be entertained.
2. Proposals determined to be non-responsive to the target area description for the IGERT-CIF21 track as described in this amendment to the IGERT solicitation will be returned without review.
3. Institutions are allowed to submit at most one IGERT through this solicitation, which can be in addition to one IGERT proposal submitted to the regular IGERT solicitation ([NSF 11-533](#)).
4. All other instructions, terms and conditions indicated in [NSF 11-533](#) shall apply to proposals submitted in response to this targeted track opportunity.

### Important Reminders

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

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

**Data Management Plan:** The PAPPG contains a clarification of NSF's long standing data policy. All proposals must describe plans for data management and sharing of the products of research, or assert the absence of the need for such plans. FastLane will not permit submission of a proposal that is missing a Data Management Plan. The Data Management Plan will be reviewed as part of the intellectual merit or broader impacts of the proposal, or both, as appropriate. Links to data management requirements and plans relevant to specific Directorates, Offices, Divisions, Programs, or other NSF units are available on the NSF website at:

<http://www.nsf.gov/bfa/dias/policy/dmp.jsp>. See [Chapter II.C.2.j](#) of the GPG for further information about the implementation of this requirement.

**Postdoctoral Researcher Mentoring Plan:** As a reminder, each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. Please be advised that if required, FastLane will not permit submission of a proposal that is missing a Postdoctoral Researcher Mentoring Plan. See [Chapter II.C.2.j](#) of the GPG for further information about the implementation of this requirement.

## SUMMARY OF PROGRAM REQUIREMENTS

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### General Information

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#### Program Title:

Integrative Graduate Education and Research Traineeship Program-CIF21 Track (IGERT-CIF21)

#### 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 with interdisciplinary backgrounds, deep knowledge in chosen disciplines, and technical, professional, and personal skills. The program is intended to establish 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.

Building upon the IGERT platform, the purpose of this IGERT solicitation is to support new models in graduate education in which students are engaged in an environment that supports innovation to learn through hands-on experience how their own research may contribute in new ways to benefit society and to learn the processes for the successful implementation of such contributions.

Within the Cyberinfrastructure Framework for 21st Century Science and Engineering (CIF21) and IGERT, NSF recognizes the need to educate and support a next generation of researchers able to address fundamental challenges in 1) core techniques and technologies for advancing big data science and engineering; 2) analyzing and dealing with challenging computational and data enabled science and engineering (CDS&E) problems, and 3) researching, providing, and using the cyberinfrastructure that makes cutting-edge CDS&E research possible in any and all disciplines.

Through this amendment to the IGERT solicitation [NSF 11-533](#), a new IGERT-CIF21 track has been created as a mechanism to address the training and education needs in CDS&E and cyberinfrastructure research. The CIF21 activity is part of the NSF-wide IGERT activity, as described in [http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=12759](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12759).

#### Cognizant Program Officer(s):

*Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.*

- Melur K. Ramasubramanian, Program Director-IGERT, 875, telephone: (703) 292-8696, email: [igert@nsf.gov](mailto:igert@nsf.gov)
- Carol F. Stoel, Program Director-IGERT, 875, telephone: (703) 292-8696, email: [igert@nsf.gov](mailto:igert@nsf.gov)
- Richard Boone, Program Director-IGERT, 875, telephone: (703) 292-8696, email: [igert@nsf.gov](mailto:igert@nsf.gov)
- Mimi McClure, Program Director-Office of Cyberinfrastructure, telephone: (703) 292-5197, email: [mmclure@nsf.gov](mailto:mmclure@nsf.gov)

#### 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

### Award Information

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**Anticipated Type of Award:** Standard Grant or Continuing Grant

**Estimated Number of Awards:** 2

This IGERT-CIF21 track anticipates making up to two awards subject to availability of funds.

**Anticipated Funding Amount:** \$6,000,000

- Up to \$3.3M per award over 5 years pending availability of funds. This includes the \$200K Competitive Innovation Incentive Fund per award for Trainees for research and innovation activities. Additional funds up to \$200K per award, may be available to support integrated international research activities.

## Eligibility Information

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### Organization Limit:

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

### PI Limit:

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

### Limit on Number of Proposals per Organization: 1

- Institutions are allowed to submit at most one proposal in response to this IGERT-CIF21 track solicitation, which can be in addition to one regular IGERT proposal submitted in response to [NSF 11-533](#).

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 a PI or co-PI in only one IGERT proposal submission (either the regular IGERT in response to [NSF 11-533](#) or this solicitation, the IGERT-CIF21 track). However, a PI or co-PI on one IGERT proposal may serve as a faculty participant on the other.

## Proposal Preparation and Submission Instructions

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### A. Proposal Preparation Instructions

- **Letters of Intent:** Submission of Letters of Intent is required. Please see the full text of this solicitation for further information.
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposals:**
  - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: [http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=gpg](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg).
  - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: [http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=grantsgovguide](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide))

### B. Budgetary Information

- **Cost Sharing Requirements:** Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

### C. Due Dates

- **Letter of Intent Due Date(s) (required)** (due by 5 p.m. proposer's local time):

June 04, 2012

IGERT-CIF21 Letter of Intent

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

August 06, 2012

IGERT-CIF21 Full Proposal

## Proposal Review Information Criteria

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**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

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**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

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The purpose of this IGERT solicitation is to support new models in graduate education in which students are engaged in an environment that supports innovation to learn through hands-on experience how their own research may contribute in new ways to benefit society and to learn the processes needed for successful implementation of such contributions. Building upon the IGERT platform, this solicitation intends to catalyze an institutional change to integrate innovation education and training in addition to interdisciplinary research, team work and professional skills. For the purpose of this solicitation, innovation in the STEM (Science, Technology, Engineering, and Mathematics) disciplines is grounded in the interdisciplinary research theme of the proposal, and is defined as the spectrum of work that may ultimately utilize the results and discoveries from the interdisciplinary research for the development of creative and implementable solutions to societal challenges and benefit global society.

Students are expected to develop a foundation of experience and expertise that enables them to participate in the processes leading from discoveries in their research, to identification of relevant societal needs for which they may develop creative solutions based on their ideas and discoveries and learn the processes for successful implementation of such ideas and solutions as appropriate to their interdisciplinary topic. This training is also intended to contribute to a world-class, broadly inclusive, and globally engaged science and engineering workforce that has the skills to take their science, engineering and technology research beyond the level of discovery in order to address societal and economic needs. Projects funded by the IGERT program have been highly successful in educating graduate students to carry out research that crosses disciplinary lines and to prepare them for a wide variety of careers (see the evaluation of the initial impacts of the IGERT program, NSF 06-17 (<http://www.nsf.gov/pubs/2006/nsf0617/nsf0617.pdf>), and a follow-up study of IGERT graduates

([http://www.abtassociates.com/reports/ES\\_IGERT\\_SUMMARY\\_REPORT\\_October\\_2010.pdf](http://www.abtassociates.com/reports/ES_IGERT_SUMMARY_REPORT_October_2010.pdf)). The National Science Foundation's vision for a Cyberinfrastructure Framework for 21<sup>st</sup> Century Science and Engineering (CIF21) views an integrated, scalable, and sustainable cyberinfrastructure along with foundational advances in computing and information science and technology as crucial for innovation in science and engineering (see [www.nsf.gov/cif21](http://www.nsf.gov/cif21)). Within this framework, NSF recognizes the need to educate and support a next generation of researchers able to address fundamental challenges in 1) core techniques and technologies for advancing big data science and engineering; 2) analyzing and dealing with challenging computational and data enabled science and engineering (CDS&E) problems, and 3) researching, providing, and using the cyberinfrastructure that makes cutting-edge CDS&E research possible in any and all disciplines.

NSF encourages research communities to consider the new track in the NSF's Integrative Graduate Education and Research Traineeship (IGERT) program described in this solicitation as a mechanism to address the training and education needs in CDS&E and cyberinfrastructure research.

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 interdisciplinary research proposed may include research elements from any of these directorates or offices. The IGERT program is managed by the Division of Graduate Education in EHR, with the advice and assistance from the NSF-wide IGERT Coordinating Committee (ICC).

## II. PROGRAM DESCRIPTION

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Proposals submitted to the IGERT-CIF21 track must describe integrative, research-based, graduate education and training activities in emerging areas of science and engineering, and must address the training and education needs in computational and data enabled science and engineering (CDS&E) and cyberinfrastructure research. The interdisciplinary research proposed may include research represented in any of the sponsoring directorates or offices listed on the program solicitation masthead, including the

Directorate for Social, Behavioral, and Economic Sciences and the Directorate for Education and Human Resources. This traineeship proposal should be organized around an interdisciplinary theme that is based on transformative interdisciplinary research in science/technology/engineering/mathematical (STEM) sciences. The interdisciplinary theme should provide 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.

**The interdisciplinary theme as well as the collaboration across disciplines should serve as a platform for creating an environment that supports innovation and preparation of the trainees with skills needed for becoming successful innovators. Students should be educated to recognize how their research might be utilized for an economic or societal benefit, and should learn the processes that would be required to implement them in practice through hands-on experience.** As an opportunity for faculty to devise new approaches to graduate education, the IGERT project should provide students with experience relevant to both academic and nonacademic careers. In order to facilitate the innovation skills training component, a competitive innovation incentive fund (CIIF) is available as part of the budget.

IGERT recognizes that globalization of research and career opportunities require students to acquire 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. IGERT budget allows for this international component, described subsequently in this document. 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. Outreach activities involving K-12 teachers and students to engage and inspire future STEM innovators, and provide teachers with state-of-the-art knowledge emanating from the interdisciplinary themes, are encouraged.

Trainees must be citizens or permanent residents of the U.S., its territories or its possessions. Additionally, trainees must be enrolled full-time in a Ph.D. program in one of the NSF-supported STEM fields of study. Individuals studying for professional degrees, such as law degrees, medical degrees, veterinary medicine degrees, business degrees, clinical psychology degrees, etc., are not eligible to receive NSF IGERT funding. Students obtaining joint degrees, such as M.D./Ph.D. or J.D./Ph.D. or D.V.M./Ph.D., are also ineligible for NSF IGERT funding. Individuals who are not eligible to receive NSF IGERT funding (e.g., foreign students, students in non-STEM fields, those obtaining professional degrees, etc.) may participate in all IGERT activities as IGERT associates, but they may not receive any NSF IGERT funding.

In order to contribute 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. 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. Projects are also encouraged to recruit graduate students who are veterans of the U.S. Armed Services.

The one exception to the rule that only Ph.D. students are eligible for NSF IGERT support is when a proposal includes an explicit Master's-to-PhD bridging program with a Master's-granting minority-serving institution (MSI). In this case, Master's students at the minority-serving institution can be supported as trainees. The bridge program must be an integral part of the proposal, and the Master's trainees must be integrated fully into the proposed education and research activities. Additionally, the proposal must include a concrete plan for the Master's students at the MSI to continue their Ph.D. studies at the majority institution. A non-exhaustive list of institutions of higher education enrolling populations with significant percentages of minority students, or that serves certain populations of minority students under various programs created by Congress can be found at <http://www.ed.gov/about/offices/list/ocr/edlite-minorityinst.html>. As with the Ph.D. trainees, Master's trainees must be citizens or permanent residents of the U.S., its territories or its possessions, and must be enrolled full-time in a Master's program in one of the NSF-supported fields of study.

#### **Key Features of IGERT Projects include:**

- 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 novel graduate education and training mechanisms.
- Program strategy and plan for recruitment, mentoring, retention, and graduation of U.S. Ph.D. students in NSF-supported STEM fields, including efforts aimed at members of groups underrepresented in science and engineering;
- A plan to establish a supportive environment for innovation and for learning and practicing the steps involved in transforming research outcomes and ideas into successfully implemented solutions for societal needs and challenges through hands-on experience that is most appropriate for the particular theme; this plan should be integrated into the interdisciplinary research theme.
- Career development opportunities, provision for developing professional and personal skills, fostering an international perspective, instruction in ethics and the responsible conduct of research, and training in communication of the substance and importance of research to nonscientist audiences;
- Strategy and methodology for formative assessments of the project's effectiveness and program improvements based on these assessments;
- Administrative plan and organizational structure that ensures effective management of the project resources and any international cooperative activities; and
- Institutional commitment to facilitating and furthering the plans and goals of the IGERT project.

#### **Additional IGERT-CIF21 Track requirements:**

Of particular interest for this track are focused interdisciplinary efforts that involve

- Partnerships between computational, mathematical and statistical, and computer and information sciences on the one hand and the science and engineering domains on the other, that drive interdisciplinary research in cyberinfrastructure (software, data and visualization, networks, advanced computational infrastructure, etc.);
- Foundational and applied research in a variety of tools essential for advanced scientific discovery and engineering innovation in collaboration with domain sciences. Such tools could include computational models and the underlying mathematical and statistical theory and methodology; parallel programming languages; novel algorithmic techniques; real-time visualization; scalable data mining; effective utilization and optimization of computing, storage, and communications resources;
- Research and development of novel end-to-end science-driven scenarios that integrate and leverage major cyberinfrastructure investments including high-end supercomputers, cloud environments, real-time and remote visualization, provisionable networks, distributed data archives and software frameworks;
- Integration of educational and training opportunities with major cyberinfrastructure investments such as
  - XSEDE, Open Science Grid, FutureGrid, DataNet partners, the Global Environment for Network Innovation (GENI), International Research Network Connection sites, *et al.*; (see [www.nsf.gov/cif21](http://www.nsf.gov/cif21) for a more extensive list of cyberinfrastructure components)
  - ongoing NSF Major Research Equipment and Facilities Construction (MREFC) projects or other large scale efforts

- o such as iPlant or Network for Computational Nanotechnology;
  - o cyberinfrastructure-related facilities managed by NSF, by other states or US federal agencies, or internationally;
- Synergies in cyberinfrastructure and CDS&E research with ongoing and emerging activities in CIF21;
- Significant impact on new curricula and career possibilities for cyberinfrastructure and/or CDS&E;
- Research, education and outreach activities that are expected to have a significant impact in developing an increasingly diverse STEM workforce that is inclusive of women and men, underrepresented minorities, and persons with disabilities.

#### 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.

### III. AWARD INFORMATION

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**Anticipated Type of Award:** Continuing Grant or Standard Grant

**Estimated Number of Awards:** 2

This IGERT-CIF21 track anticipates making up to two awards subject to availability of funds. **Anticipated Funding Amount:** \$6,000,000

- Up to \$3.3M per award over 5 years pending availability of funds. This includes the \$200K Competitive Innovation Incentive Fund per award for Trainees for research and innovation activities. Additional funds up to \$200K per award, may be available to support integrated international research activities.

### IV. ELIGIBILITY INFORMATION

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#### Organization Limit:

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

#### PI Limit:

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

#### Limit on Number of Proposals per Organization: 1

- Institutions are allowed to submit at most one proposal in response to this IGERT-CIF21 track solicitation, which can be in addition to one regular IGERT proposal submitted in response to [NSF 11-533](#).

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 a PI or co-PI in only one IGERT proposal submission (either the regular IGERT in response to NSF 11-533 or this solicitation, the IGERT-CIF21 track). However, a PI or co-PI on one IGERT proposal may serve as a faculty participant on the other.

#### Additional Eligibility Info:

**Limit on Renewals:** IGERT awards may be renewed only once. If more than half of the leaders of the proposed IGERT-CIF21 (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

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#### A. Proposal Preparation Instructions

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##### Letters of Intent (required):

A one-page Letter of Intent (LOI) is required. One LOI per lead institution for the IGERT-CIF21 track will be accepted, in addition to the one for the regular IGERT (NSF 11-533). Letters of Intent are not reviewed but are used to judge the overall response and requirements for reviewers. They are not used as pre-approval mechanisms for the submission of full proposals and no feedback is provided to the submitters. The letter should be submitted via FastLane no later than the deadline for the LOI specified in this solicitation. Any proposal submitted without the aforementioned required Letter of Intent will be returned without review.

Submit your one page LOI through FastLane, including each of the following categories ONLY:

- The name and departmental affiliation of the Principal Investigator.
- The name(s) and departmental affiliation(s) of the Co-PI(s).

- The lead institution and any other participating institutions.
- Project title: The project title should begin with "IGERT-CIF21:" and should reflect the interdisciplinary theme.
- Synopsis (maximum of 200 words in this section). Provide a brief statement of the vision and goals of the proposed training program including a brief statement of the interdisciplinary theme. The theme should be clearly responsive to the goals of this IGERT-CIF21 track.
- Key Words: Up to four key words that reflect the established disciplines whose boundaries will be crossed in the interdisciplinary theme, in the order of their emphasis in the proposal. For example: Computer Science, Engineering, Economics, Physics.

#### Letter of Intent Preparation Instructions:

When submitting a Letter of Intent through FastLane in response to this Program Solicitation please note the conditions outlined below:

- Sponsored Projects Office (SPO) Submission is required when submitting Letters of Intent
- A Minimum of 0 and Maximum of 4 Other Senior Project Personnel are allowed
- A Minimum of 0 and Maximum of 10 Other Participating Organizations are allowed
- Up to 4 keywords is required when submitting Letters of Intent
- Submission of multiple Letters of Intent is not allowed

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

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

#### FULL PROPOSAL CONTENT

Full proposals must contain the items listed below and adhere to the specified page limitations and follow the GPG margin and spacing requirements ([http://www.nsf.gov/pubs/policydocs/pappguide/nsf11001/gpg\\_2.jsp](http://www.nsf.gov/pubs/policydocs/pappguide/nsf11001/gpg_2.jsp)). Proposals that exceed the specified page limitations may be returned without review. No additional information may be provided by links to web pages within the proposal, except as part of citations in the References Cited section. IGERT does not accept collaborative proposals submitted as separate submissions from multiple organizations.

**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 or Grants.gov, a short informative title for the proposed IGERT project, that begins with "IGERT-CIF21:", must be provided. If international activities requiring funding are proposed (regardless of whether they are to be funded through the IGERT award), 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 August 1, 2013 should be listed.

- 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 four keywords that reflect the established disciplines whose boundaries will be crossed in the interdisciplinary theme, in the order of their emphasis in the proposal. For example: Computer Science, Engineering, Economics, Physics.
- Table of Contents:** For all proposals submitted, a Table of Contents is generated and cannot be edited.
- Project Description:** The project description section contains 10 required items. Items 1 through 7 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. Items 8 and 9 are limited to an additional 2 pages each.
  1. **List of Participants** (1-page limit): For up to 20 faculty members and other senior personnel expected to have the greatest roles in the project include: name, project role (PI, co-PI, faculty participant), departmental and institution/organization affiliation, disciplines and/or areas of expertise, and the award numbers of any IGERT in which the faculty member was a named participant and their role in that IGERT (PI, co-PI, faculty participant). These should be the same key faculty members and other senior personnel for which biographical sketches are later included. Other participants may join an IGERT project at a later date if it is awarded. If funded international activities are proposed, up to 5 additional collaborators from the international institutions may be included in the list. These should be the same international participants for which biographical sketches are later included. Include the same information as for domestic participants, as well as the host country of the international collaborator. Required templates for projects with or without the optional international funding component are provided below.

| Name                     | Role                | Institution / Organization | Expertise                   | Previous IGERT experience? (Award #, Role) |
|--------------------------|---------------------|----------------------------|-----------------------------|--|
| PI name                  | PI                  | Department, Institution    | Relevant areas of expertise |  |
| Co-PI name               | Co-PI               | Department, Institution    | Relevant areas of expertise | 0123456, Faculty participant               |
| Faculty participant name | Faculty participant | Department, Institution    | Relevant areas of expertise |  |

If funded international activities are proposed:

| Name                       | Role                       | Institution / Organization | Country  | Expertise                   |
|----------------------------|----------------------------|----------------------------|----------|-----------------------------|
| International collaborator | International collaborator | International institution  | Location | Relevant areas of expertise |

Acronyms may be used if defined.

- 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, with particular emphasis on creating an environment for facilitating innovation. For proposals submitted to this IGERT-CIF21 track, the PIs should explicitly state how their proposed theme is responsive to the priorities of this solicitation track. Describe the opportunities to take the interdisciplinary research findings beyond the level of discovery, as appropriate to the interdisciplinary theme. Describe how the trainees will learn and practice the processes involved in taking their ideas and discoveries, transforming them into possible components of solutions to societal challenges, and the processes involved in successfully implementing such solutions. 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. 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 an existing IGERT projects must specifically address how they will add value to all the critical elements of an IGERT, and describe the institutional impacts of receiving a renewal.
- 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. Describe the potential for economic and/or societal benefit in the interdisciplinary research proposed.
- 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 interdisciplinary research and across the disciplines. Discuss plans for providing career development opportunities, developing professional and personal skills, instruction in communicating the substance and importance of their research to nonscientist audiences, fostering an international perspective and ability to work in diverse teams, and integrating instruction in ethics and the responsible conduct of research. Discuss plans to develop and foster a supportive environment for innovation and plans for integrating training in skills important for discovery, recognition of societal challenges and their relationships to one's own research, creativity and inventiveness, and the processes involved in transforming their ideas and discoveries into successfully implementable solutions (as appropriate to the project topic) to societal challenges, into the interdisciplinary research and educational plans, drawing upon the relevant literature. Describe the use of the Competitive Innovation Incentive Fund (See F. Budget and Allowable Costs) as a mechanism to enhance original thinking, interdisciplinary research, and innovation skills. 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.
- 5. Organization, Management, and Institutional Commitment:** Describe plans and procedures for the organization and management of the IGERT project. Plans must include provision for an external advisory body. 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.

Should a multi-institution project be proposed, 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. Discuss plans for sustaining the key features of the IGERT project after NSF funding is completed.

**6. Performance Assessment / Project Evaluation:**

Projects should include internal mechanisms and advisory committees to assist in project evaluation. However, projects are also required to use evaluators external to the project and external to any of the participating institutions. The external project evaluation should be conducted yearly and may be budgeted at no more than \$20,000 per year.

Describe the 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; and provide a formative assessment to improve the project.

- 7. Recruitment, Mentoring, and Retention:** Include the table below at the beginning of this section; provide the relevant responses in the second column:

|   |  |
|---|--|
| How many individual trainees will be supported over the course of the 5-year award? | [e.g., 22. Most IGERTs support between 20-30 trainees, for two years each, over the course of the 5-year award]  |
| How many years of funding will trainees receive?                                    | [e.g., 2 years each. It is expected that trainees will receive NSF IGERT support for 2 years (24 months per student) or longer, and that they will be supported in 12-month increments.] |
| How will students be supported when they  | [e.g., Research Assistantships, Teaching Assistantships]   |



|  |   |
|--|---|
| are no longer receiving NSF IGERT funding?   |   |
| From which departments or programs will NSF-funded IGERT trainees receive their degrees? | [Reminder: NSF-funded trainees must be full-time students, receiving their degrees in one of the NSF-supported science and engineering disciplines. See Section II ("IGERT Program Description") for more information.] |
| List the institutions at which any NSF-supported IGERT trainees will be enrolled.        | [e.g., Duke University, University of Minnesota, University of California-Merced]   |

Describe plans for recruitment, mentoring, and retention of U.S. graduate students, including specific provisions 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), disabled, and/or female. Describe the diversity makeup of faculty participating in the IGERT project. Projects are also encouraged to recruit graduate students who are veterans of the U.S. Armed Services.

8. **Recent Traineeship Experience and IGERT Renewals** (Up to 2 pages): Describe the experience of any of the named faculty participants with any related graduate traineeship project, including IGERT projects, during the past 5 years. Address the outcomes of the previous award(s) relevant to the specific project or institution. Describe explicitly any overlap with previous or existing graduate traineeship programs, and explain how the proposed IGERT differs. If none of the participants has experience with graduate traineeship projects, state this explicitly.

Renewal proposals compete in the same competition as new proposals, and are evaluated in the same pool as new proposals. Renewal proposals must demonstrate excellence and significant achievements and must address the expected added value that will result from the renewal. Renewal proposals must explicitly address what was learned from the evaluation efforts of the previous IGERT in all dimensions and describe the added value of the proposed effort beyond that of the previous IGERT. Institutional letters should explicitly explain why a renewal is needed.

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 including plans for monitoring their progress. The international collaboration may focus on mutually beneficial links with exemplary innovation activities or models abroad. International activities should benefit both the IGERT trainees who travel and those that do not.
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 current IGERT project, instead of the departmental data.

|  |                  |                              |                           |       |       |
|--|------------------|------------------------------|---------------------------|-------|-------|
| <b>NEW PROPOSALS</b>   |                  |                              |                           |       |       |
| 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  | Computer Science |                              |                           |       |       |
|  | Women            | Under-represented Minorities | Persons with Disabilities | Other | Total |
| No. applicants to PhD program  | 11               | 4                            | 1                         | 34    | 48    |
| No. applicants accepted by program   | 5                | 2                            | 1                         | 13    | 19    |
| No. that matriculated  | 4                | 1                            | 0                         | 11    | 15    |
| No. students who withdrew  | 1                | 0                            | 0                         | 1     | 2     |
| No. PhDs awarded   | 1                | 2                            | 0                         | 4     | 6     |
| No. currently enrolled   | 6                | 3                            | 1                         | 15    | 23    |
| 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 <b>not</b> provide student name  | Univ of Alabama  |                              | Asst Prof                 |       |       |
| <b>RENEWAL PROPOSALS</b>   |                  |                              |                           |       |       |
| 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; or **Bibliography & References Cited** in Grants.gov.

E. **Biographical Sketches and Current and Pending Support**: A maximum of 20 biographical sketches may be included, and must be the same as the individuals on the List of Participants. If an international component is proposed, up to 5 additional biographical sketches for these individuals (also on the List of Participants) may be included. 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 should be provided only for the PI and co-PIs.

- F. **Budget and Allowable Costs:** Provide a budget for each year of support requested. The total amount requested for all five years should not exceed \$3.3M without a funded international component and \$3.5M with a international component. The budget for any given year cannot exceed \$700,000. The first-year budget only may include fund requests for equipment as a special allocation. Up to \$200,000 for the Competitive Innovation Incentive Fund should be proposed within the limits of the total budget.

**Trainee Support:** The major portion of the funds must be used for doctoral student stipends and educational and training activities. 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 enrolled in a Ph.D. program in one of the NSF-supported fields in science and engineering. The one exception to the rule that only Ph. D. students are eligible for NSF IGERT support is when a proposal includes an explicit Master's-to-PhD bridging program with a Master's-granting minority-serving institution (MSI). See Section II ("IGERT Program Description") for more information. It is expected that trainees will receive NSF IGERT support for 2 years (24 months per student) or longer, and that they will be supported in 12-month increments. 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 trainee-related activities. Tuition and required fees may not be charged to the trainee. Funds requested for graduate student trainees and their activities should be entered under Participant Support.

**Competitive Innovation Incentive Fund:** PIs should propose funds not to exceed \$50,000 per year (for a total of \$200,000 per award) as a Competitive Innovation Incentive Fund for integrated interdisciplinary research and innovation as a part of Participant Support Costs. These funds are intended to provide interdisciplinary teams of graduate students with the incentives and opportunities to carry out projects of their own devising both for interdisciplinary research and innovation activities, within the general theme of the proposed IGERT. With clear justification supported expenses include but not limited to prototyping costs (software and/or hardware), focus groups, pilot studies, trainee travel, and provisional patent filing fees.

**Funded International Component:** While optional, a funded international component is encouraged. For either new or renewal awards, if a funded international component has been proposed, additional funds not to exceed \$50,000 per year (for 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 trainees 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.

Funds may be used to prepare students to be successful in the international setting (pre-departure orientations, language or special training). 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 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 funds for the sole purpose of attending international conferences or workshops are not appropriate. Funds cannot be used to defray the costs of non-IGERT personnel, including students who are IGERT Associates. 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.

**Faculty salaries:** The only faculty salaries allowed are the following:

- a. one month per year of salary support for the Principal Investigator for management purposes;
- b. up to 6 months total of faculty salary support for the development of IGERT curricula as part of a special allocation, which includes faculty salaries, benefits, and equipment costs, and applicable indirect costs on these items.

**Other budget items:** A limited amount of funds may be requested for necessary administrative support (including personnel for management/administration) and to partially defray the costs of research and publication by trainees. The budget should also include funds for travel for the PI, one graduate student and one administrator to attend the annual IGERT Project meeting, and in year 1 only, for the PI to attend a one-day orientation meeting in the Washington D.C. area.

Purchase of shared research equipment, special-purpose research materials, software and databases that cost more than \$5,000 is allowed in the first year only, and should be listed under Equipment and noted in the first-year special allocation table.

The total of all faculty salaries (excluding that of the PI), fringe benefits, and equipment costs cannot exceed \$300,000. A special allocation table showing faculty salaries, fringe benefits, equipment costs, applicable indirect costs, and the total should be provided in the proposal.

The budget should include funds to conduct the external annual program assessment/evaluation as outlined in Section C, Item 6 ("Performance Assessment / Project Evaluation") above. The maximum yearly cost for this is \$20,000.

Funds for facility renovation or for equipment installation or maintenance are not allowed.

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.

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.

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).

For the special allocation of funds for faculty salaries and equipment, 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.

Inclusion of voluntary committed cost sharing is prohibited.

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:**

Inclusion of voluntary committed cost sharing is prohibited for IGERT proposals. However, because this IGERT program seeks to catalyze institutional change in graduate education, indications of institutional plans to facilitate the success of the program and its sustainability, through whatever means seem most appropriate, must be included in the proposal. One internal letter of commitment, up to 2 pages in length, from the appropriate senior institutional administrator is required. This letter should specify how the institution will facilitate implementation of the IGERT and support its goals over the life of the award, including broadening participation. The internal letter of commitment should also confirm that tuition and fees will not be charged to the trainee. For institutions that have received one or more previous IGERTs, the internal 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.

Up to seven additional supporting letters, each one page in length, may be provided. Supporting letters should be provided 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.).

If international activities requiring NSF funding are proposed, five additional letters, each one page in length, may be included in addition to the internal letter from the senior administrator, and the up to seven domestic letters.

Data Management Plan. All proposals are required to include a Data Management Plan of up to two pages. It should be submitted as a separate Supplementary Document with the heading, Data Management Plan. It should describe how the proposal will conform to the NSF policy on dissemination and sharing of research results. This plan will be reviewed as a part of the intellectual merit and/or broader impacts of the proposal. See Chapter II.C.2 of the Grant Proposal Guide (GPG) for further information on the implementation of this requirement on the NSF website at: [http://www.nsf.gov/pubs/policydocs/pappguide/nsf11001/gpg\\_2.jsp#dmp](http://www.nsf.gov/pubs/policydocs/pappguide/nsf11001/gpg_2.jsp#dmp)

## B. Budgetary Information

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**Cost Sharing:** Inclusion of voluntary committed cost sharing is prohibited

#### **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. It is expected that trainees will receive NSF IGERT support for 2 years (24 months per student) or longer, and that they will be supported in 12-month increments. All stipend recipients must be citizens or permanent residents of the U.S., its territories or possessions, and they must be enrolled in one of the NSF-supported fields of study. See Section II ("IGERT Program Description") for more information.

## C. Due Dates

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- **Letter of Intent Due Date(s) (required)** (due by 5 p.m. proposer's local time):

June 04, 2012

IGERT-CIF21 Letter of Intent

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

August 06, 2012

IGERT-CIF21 Full Proposal

## D. FastLane/Grants.gov Requirements

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- **For Proposals Submitted Via FastLane:**

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

in Section VIII of this funding opportunity.

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

- **For Proposals Submitted Via Grants.gov:**

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: [http://www07.grants.gov/applicants/app\\_help\\_reso.jsp](http://www07.grants.gov/applicants/app_help_reso.jsp). In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: [support@grants.gov](mailto:support@grants.gov). The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

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

## VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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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

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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 judgments.

**What is the intellectual merit of the proposed activity?**

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

#### Additional Solicitation Specific Review Criteria

For the IGERT-CIF21 track described in this solicitation, a proposal that is non-responsive to the priorities articulated for this track and that is not strongly cyberinfrastructure centric in its interdisciplinary theme will be returned without review.

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.

## B. Review and Selection Process

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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

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### A. Notification of the Award

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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

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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](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](mailto: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](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag).

#### Special Award Conditions:

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.

### C. Reporting Requirements

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

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

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and

organizational), publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

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

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*Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.*

General inquiries regarding this program should be made to:

- Melur K. Ramasubramanian, Program Director-IGERT, 875, telephone: (703) 292-8696, email: [igert@nsf.gov](mailto:igert@nsf.gov)
- Carol F. Stoel, Program Director-IGERT, 875, telephone: (703) 292-8696, email: [igert@nsf.gov](mailto:igert@nsf.gov)
- Richard Boone, Program Director-IGERT, 875, telephone: (703) 292-8696, email: [igert@nsf.gov](mailto:igert@nsf.gov)
- Mimi McClure, Program Director-Office of Cyberinfrastructure, telephone: (703) 292-5197, email: [mmcclure@nsf.gov](mailto:mmcclure@nsf.gov)

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: [fastlane@nsf.gov](mailto:fastlane@nsf.gov).

For questions relating to Grants.gov contact:

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

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

## IX. OTHER INFORMATION

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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

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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 55,000 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 Arctic 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](mailto: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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The National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230, USA  
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