

Expeditions in Computing

PROGRAM SOLICITATION NSF 10-564

REPLACES DOCUMENT(S): NSF 08-568



National Science Foundation

Directorate for Computer & Information Science & Engineering
Division of Computing and Communication Foundations
Division of Information & Intelligent Systems
Division of Computer and Network Systems

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

September 10, 2010

March 10, 2012

September 10, 2013

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

May 10, 2011

December 10, 2012

May 10, 2014

IMPORTANT INFORMATION AND REVISION NOTES

A revised version of the *NSF Proposal & Award Policies & Procedures Guide (PAPPG)*, [NSF 13-1](#), was issued on October 4, 2012 and is effective for proposals submitted, or due, on or after January 14, 2013. Please be advised that the guidelines contained in [NSF 13-1](#) apply to proposals submitted in response to this funding opportunity. Proposers who opt to submit prior to January 14, 2013, must also follow the guidelines contained in [NSF 13-1](#).

Please be aware that significant changes have been made to the PAPPG to implement revised merit review criteria based on the National Science Board (NSB) report, [National Science Foundation's Merit Review Criteria: Review and Revisions](#). While the two merit review criteria remain unchanged (Intellectual Merit and Broader Impacts), guidance has been provided to clarify and improve the function of the criteria. Changes will affect the project summary and project description sections of proposals. Annual and final reports also will be affected.

A by-chapter summary of this and other significant changes is provided at the beginning of both the [Grant Proposal Guide](#) and the [Award & Administration Guide](#).

Please note that this program solicitation may contain supplemental proposal preparation guidance and/or guidance that deviates from the guidelines established in the [Grant Proposal Guide](#).

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. Proposers who opt to submit prior to January 18, 2011, must also follow the guidelines contained in [NSF 11-1](#).

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.

Revision Notes

The following changes have been made:

- The preliminary proposal and full proposal deadlines dates have changed. The Expeditions program will now host a competition every 18 months instead of every 12 months.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Expeditions in Computing

Synopsis of Program:

The far-reaching impact and rate of innovation in the computing and information disciplines has been remarkable, generating economic prosperity and enhancing the quality of life for people throughout the world. But the best is yet to come!

The Directorate for Computer and Information Science and Engineering (CISE) has created the Expeditions in Computing (*Expeditions*) program to provide the CISE research and education community with the opportunity to pursue ambitious, fundamental research agendas that promise to define the future of computing and information. In planning *Expeditions*, investigators are encouraged to come together within or across departments or institutions to combine their creative talents in the identification of compelling, transformative research agendas that promise disruptive innovations in computing and information for many years to come.

Funded at levels up to \$2,000,000 per year for five years, *Expeditions* represent some of the largest single investments currently made by the directorate. Together with the Science and Technology Centers CISE supports, *Expeditions* form the centerpiece of the directorate's award portfolio. With awards funded at levels that promote the formation of research teams, CISE recognizes that concurrent research advances in multiple fields or sub-fields are often necessary to stimulate deep and enduring outcomes.

The awards made in this program will complement projects supported by other CISE programs, which target particular computing or information disciplines or fields.

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.

- Mitra Basu, telephone: (703) 292-8910, email: mbasu@nsf.gov

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

- 47.070 --- Computer and Information Science and Engineering

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 3 to 4 awards in each 18-month competition.

Anticipated Funding Amount: \$30,000,000 total for each competition, subject to the availability of funds. Expeditions projects with annual budgets up to \$2,000,000 for durations of five years will be supported.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- U.S. academic institutions accredited in, and having a campus located in the U.S., with undergraduate, masters, and doctoral programs in computer and information science and engineering fields may submit proposals as lead or collaborative institutions. Subawardees may include two- and four-year colleges, non-profit non-academic organizations such as independent museums, institutes, observatories, professional societies and similar organizations in the US that are directly associated with education or research activities in the computing and information fields. Other organizations such as national laboratories, for-profit organizations and organizations in other countries may participate in the proposed activities if they have independent sources of support; they will not be supported by NSF.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 1

- An individual may participate in no more than one preliminary or full proposal as PI, co-PI, or senior personnel.

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 Proposals:**
 - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
 - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- **Cost Sharing Requirements:** Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

- **Preliminary Proposal Due Date(s) (*required*)** (due by 5 p.m. proposer's local time):
 - September 10, 2010
 - March 10, 2012
 - September 10, 2013
- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):
 - May 10, 2011
 - December 10, 2012
 - May 10, 2014

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 computer and information science and engineering community has made significant contributions to society over the past fifty years, generating research and education outcomes that have fueled economic growth, revolutionized healthcare, improved national security, and resulted in products and services that have transformed the everyday lives of people world-wide.

However, the best is yet to come! The Expeditions in Computing (*Expeditions*) program has been created to tap the great reservoir of opportunities that fundamental research advances in computing and information promise for the future. The program is underconstrained by design, to inspire the research and education community to be as creative and imaginative as possible in the design of bold *Expeditions* that explore new scientific frontiers. Investigators in the computer and information science and engineering fields and beyond are encouraged to come together within and/or across departments or institutions in the development of compelling, transformational research agendas that promise disruptive innovations in computing and information for many years to come.

II. PROGRAM DESCRIPTION

The *Expeditions* program has three goals:

- To catalyze far-reaching research explorations motivated by deep scientific questions or hard problems in the computing and information fields, and/or by compelling applications that promise significant societal benefits;
- To inspire current and future generations of Americans, especially those from under-represented groups, to pursue rewarding careers in computer and information science and engineering; and
- To stimulate significant research and education outcomes that, through effective knowledge transfer mechanisms, promise scientific, economic and/or other societal benefits.

Projects supported by the *Expeditions* program comprise the following characteristics:

- Foster research climates that nurture creativity and informed risk-taking, and value complementary research and education contributions such that the whole *Expedition* is greater than the sum of its parts;
- Draw upon well-integrated, diverse teams of investigators from one or more disciplines within computer and information science and engineering, as well as investigators from other fields where necessary;
- Stimulate effective knowledge transfer; and
- Demonstrate experimental systems or support shared experimental facilities (including instruments, platforms and/or testbeds), where necessary, to enable discovery and learning.

Expeditions represent some of the largest single investments made by CISE. Together with the Science and Technology Centers the directorate supports, *Expeditions* form the centerpiece of the directorate's award portfolio. CISE is working towards the steady-state support of ten or more *Expeditions* that together demonstrate the tremendous potential of computing and information innovations.

III. AWARD INFORMATION

Estimated program budget is \$30,000,000 for each competition, subject to the availability of funds. Three to four new awards will be made in each competition. Expeditions projects with annual budgets up to \$2,000,000 for durations of five years will be supported.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- U.S. academic institutions accredited in, and having a campus located in the U.S., with undergraduate, masters, and doctoral programs in computer and information science and engineering fields may submit

proposals as lead or collaborative institutions. Subawardees may include two- and four-year colleges, non-profit non-academic organizations such as independent museums, institutes, observatories, professional societies and similar organizations in the US that are directly associated with education or research activities in the computing and information fields. Other organizations such as national laboratories, for-profit organizations and organizations in other countries may participate in the proposed activities if they have independent sources of support; they will not be supported by NSF.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 1

- An individual may participate in no more than one preliminary or full proposal as PI, co-PI, or senior personnel.

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.

Preliminary Proposal Preparation Instructions: When preparing a preliminary proposal, proposers are advised to review the Program Description, the Proposal Review Information and the preliminary proposal preparation instructions described below. A preliminary proposal will consist only of the following:

(1) Cover Sheet. For planning purposes, enter a start date that is approximately 15 months after the pre-proposal due date.

(2) Project Summary (1 page). Provide a rationale for the *Expedition*, describing the unique opportunities to be pursued, and indicating the potential impact of the project. The summary should be informative to other persons working in the same or related fields and, insofar as possible, understandable to a scientifically or technically literate lay reader. Provide a clear description of the proposed *Expedition*, its overarching goals, its distinguishing features and foci. The names of the collaborative institutions involved and the major contribution of each to the project must be included in the description. The *Intellectual Merit* and *Broader Impacts* merit review criteria must be addressed in separate statements (see NSF's Grant Proposal Guide (GPG) for additional instructions).

(3) Table of Contents (automatically generated by FastLane).

(4) Project Description. The Project Description must address Sections (4.a) and (4.b) below. Section (4.c) should be addressed, where appropriate. The Project Description is **limited to 10 pages** including tables and illustrations, regardless of the number of research groups or themes. URL's may not be used (see GPG for additional information). The Broader Impacts resulting from the proposed project must be addressed and described as an integral part of the narrative. Results from Prior NSF Support should **not** be included in the Project Description.

(4.a) Describe the overarching vision and goal(s) of the proposed *Expedition*. Describe the contributing research, education and knowledge transfer themes or components, emphasizing how "the whole" *Expedition* is greater than the sum of the individual theme or component parts. Describe how the project will contribute to realization of the *Expedition* program goals (address all three as described in the *II. Program Description* section of this solicitation) and demonstrate the *Expedition* characteristics (addressing all four as described in the *II. Program Description* section of this solicitation). Provide sufficient detail to allow assessment of the Intellectual Merit and Broader Impacts of the project and the necessity for support at the requested investment level.

(4.b) Leadership and collaboration. Describe the organizational structure of the *Expedition*, including plans for integrating and managing all organizations and individuals involved in all components of the *Expedition* to ensure the project goals are met. Explain how collaboration across individuals and organizations will be assured. Describe how effective collaboration will lead to enhanced project outcomes.

(4.c) Experimental systems or shared experimental facilities (where appropriate). Describe the experimental system to be demonstrated and/or shared experimental facilities (e.g., instruments, platforms, and testbeds) to be used or established and describe how these activities add value to the project.

(5) Budget (see NSF GPG). Provide a one-page budget summary for the full five year period. This should be entered in Budget Year 1 in FastLane. (FastLane will automatically generate a cumulative budget that is identical to the full five-year budget you entered in Year 1.) The proposed budget should be consistent with the needs and complexity of the proposed activity. The budget justification should provide some information for each year of the full five-year period, showing how funds will be allocated to the project components during the start-up phase, and shared facilities that will be required (where necessary).

(6) References Cited (two-page limit). Use the instructions from the NSF GPG when observing the two-page limit.

(7) Biographical Sketches (two-page limit per person). Biographical sketches are required for all personnel who have a role in the *Expedition*. Follow instructions provided in the NSF GPG. Copies of publications should not be included or sent to NSF.

(8) Special Information and Required Supplementary Documents: (Required information to be entered in the Supplementary Documents section of FastLane except for collaborative proposals, where **only** the lead institution should provide the information described below.)

(8.a) Lists of Partner Institutions and Project Personnel. Provide current, accurate information for the two required lists described below. This information provides NSF and reviewers with a comprehensive list of personnel and institutions involved in the *Expedition*, and will be used when determining conflicts of interest in the review process.

Partner Institutions. List all institutions and organizations for which there are corresponding project personnel. List all partner organizations at the time of submission of the preliminary proposal. Organize the list of institutions involved in the *Expedition* into the following categories, as applicable: Academic Institutions (colleges, universities), National Laboratories, Federal Government, Industry, Non-Governmental Organizations, State and Local Government, International, and Other. For each category, list the partner institutions for that category in alphabetical order.

Project Personnel. List all the personnel who have a role in the *Expedition*. For each person listed, provide the first name, last name, and institution/organization.

(8.b) Projected Commitments by Source (one-page limit). Provide a synopsis of institutional commitments for the proposed project, if any.

(8.c) Results of Prior Support for PIs and co-PI's (2 pages). Provide information only for the PI(s) and each co-PI, for contributions to research and education in science and engineering over the past five years (from any funding source). Include a brief statement of results of funded projects.

(9) Required information to be submitted to NSF via the FastLane Single Copy Documents Section, except for collaborative proposals, where **only** the lead institution should provide the information described below.

The following information should be provided in the Single Copy Document section of FastLane as a PDF file/document.

(9.a) Project Personnel. This is the same information as entered in Section (8.a), Project Personnel.

(9.b) Collaborators/Individuals with Conflicts of Interest. Provide the names of all persons, participants and affiliates with potential conflicts of interest as specified in the NSF GPG. For each person, enter the first name, last name, and institution/organization. For each person listed on the project personnel list, include all co-authors/editors and collaborators (within the past 48 months); list all graduate advisors and advisees; list all subawardees who would receive funds through the *Expeditions* award.

No other items or appendices are to be included. Information pertaining to "Current and Pending Support", and "Facilities, Equipment and Other Resources" is not required for preliminary proposals and should not be included. Preliminary proposals containing items other than those required above will not be reviewed or considered for NSF funding.

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

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

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

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

Important Proposal Preparation Information: FastLane will check for required sections of the proposal, in accordance with *Grant Proposal Guide* (GPG) instructions described in Chapter II.C.2. The GPG requires submission of: Project Summary; Project Description; References Cited; Biographical Sketch(es); Budget; Budget Justification; Current and Pending Support; Facilities, Equipment & Other Resources; Data Management Plan; and Postdoctoral Mentoring Plan, if applicable. If a required section is missing, **FastLane will not accept the proposal.**

Please note that the proposal preparation instructions provided in this program solicitation may deviate from the GPG instructions. If the solicitation instructions do not require a GPG-required section to be included in the proposal, insert text or upload a document in that section of the proposal that states, "Not Applicable for this Program Solicitation." Doing so will enable FastLane to accept your proposal.

A full proposal may be submitted by invitation only, based on the evaluation of the preliminary proposal. Full proposals will be accepted **ONLY IF INVITED** by NSF. Unsolicited full proposals will be returned without review.

When preparing a full proposal for this competition, proposers are advised to review the Program Description and the Proposal Review Information found in this solicitation for general information pertinent to this program. Proposers are encouraged to review the most current NSF Grant Proposal Guide (GPG) or NSF Grants.gov Application Guide.

Every effort should be made to update information that was provided in the preliminary proposal and to fully address issues raised in the merit review of the preliminary proposal. Required proposal components and additions to or differences from the NSF GPG or Grants.gov Application Guide are given below.

(1) Cover Sheet. For planning purposes, enter a start date that is approximately 15 months after the preproposal due date.

(2) Project Summary (1 page). Provide a rationale for the *Expedition*, describing the unique opportunities to be pursued, and indicating the potential impact of the project. The summary should be informative to other persons working in the same or related fields and, insofar as possible, understandable to a scientifically or technically literate lay reader. Provide a clear description of the

proposed *Expedition*, its overarching goals, its distinguishing features and foci. The names of the collaborative institutions involved and the major contribution of each to the project must be included in the description. The *Intellectual Merit* and *Broader Impacts* merit review criteria must be addressed in separate statements (see NSF's Grant Proposal Guide (GPG) for additional instructions).

(3) Table of Contents (automatically generated by FastLane).

(4) Project Description. The Project Description must address Sections (4.a) through (4.c) below. Section (4.d) should be addressed, where appropriate. The Project Description is **limited to 20 pages** including tables and illustrations, regardless of the number of research groups or themes. URL's may not be used (see GPG for additional information). The Broader Impacts resulting from the proposed project must be addressed and described as an integral part of the narrative. Results from Prior NSF Support need **not** be included in the Project Description.

(4.a) Describe the overarching vision and goal(s) of the proposed *Expedition*. Describe the contributing research, education and knowledge transfer themes or components, emphasizing how "the whole" *Expedition* is greater than the sum of the individual theme or component parts. Describe how the project will contribute to realization of the *Expedition* program goals (address all three as described in the *II. Program Description* section of this solicitation) and demonstrate the *Expedition* characteristics (address all four as described in the *II. Program Description* section of this solicitation). Provide sufficient detail to allow assessment of the Intellectual Merit and Broader Impacts of the project and the necessity for support at the requested investment level.

(4.b) Leadership and collaboration. Describe the organizational structure of the *Expedition*, including plans for integrating and managing all organizations and individuals involved in all components of the *Expedition* to ensure the project goals are met. Explain how collaboration across individuals and organizations will be assured. Describe how effective collaboration will lead to enhanced project outcomes.

(4.c) Intellectual property and ethics (up to 1 page). Provide a clear statement of the *Expedition's* policies on intellectual property and ethics. Discuss the nature of the research, methodologies used, ownership and ideas, and roles and responsibilities with respect to intellectual property. Describe the program of ethics to be implemented (required), which should include all project and subawardee staff (including faculty, visiting faculty, industrial fellows, postdoctoral researchers, graduate and undergraduate students).

(4.d) Experimental systems or shared experimental facilities (where appropriate). Describe the experimental system to be demonstrated and/or shared experimental facilities (e.g., instruments, platforms, and testbeds) to be used or established and describe how these activities add value to the project.

(5) Budget (see NSF GPG or Grants.gov Application Guide). Provide a detailed budget for each of the five years. FastLane or Grants.gov will automatically generate a cumulative budget. The budget and budget justification should account for start-up time at the commencement of the *Expedition*. The budget should include funds for travel to the Washington, DC area for an annual one-day meeting of awardees. Submit a separate budget and budget justification (two-page limit) for each subawardee institution in cases where the budget exceeds \$100,000 per year. Identify items of equipment costing more than \$10,000. Full justification of the latter is required.

(6) References Cited. Follow the instructions from the NSF GPG or Grants.gov Application Guide.

(7) Biographical Sketches (two-page limit per person). Biographical sketches are required for all personnel who have a role in the *Expedition*. Follow instructions provided in the NSF GPG or Grants.gov Application Guide. Copies of publications should not be included or sent to NSF.

(8) Special Information and Required Supplementary Documents: (Required information to be entered in the Supplementary Documents section of FastLane or Grants.gov except for collaborative proposals, where **only** the lead institution should provide the information described below.)

(8.a) Lists of Partner Institutions and Project Personnel. Provide current, accurate information for the two required lists described below. This information provides NSF and reviewers with a comprehensive list of personnel and institutions involved in the *Expedition*, and will be used when determining conflicts of interest in the review process.

Partner Institutions. List all institutions and organizations for which there are corresponding project personnel. List all partner organizations at the time of submission of the preliminary proposal. Organize the list of institutions involved in the *Expedition* into the following categories, as applicable: Academic Institutions (colleges, universities), National Laboratories, Federal Government, Industry, Non-Governmental Organizations, State and Local Government, International, and Other. For each category, list the partner institutions for that category in alphabetical order.

Project Personnel. List all the personnel who have a role in the *Expedition*. For each person listed, provide the first name, last name, and institution/organization.

(8.b) Projected Commitments by Source (one-page limit). Provide a synopsis of institutional commitments for the proposed project, if any.

(8.c) Results of Prior Support for PIs and co-PI's (2 pages). Provide information only for the PI(s) and each co-PI, for contributions to research and education in science and engineering over the past five years (from any funding source). Include a brief statement of results of funded projects.

(8.d) Postdoctoral Researcher Mentoring Plan (one-page limit). 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.

(8.e) Data Management Plan (see Chapter II.C.2.j of the NSF GPG for further information about this requirement).

(9) Required information to be submitted to NSF via the FastLane Single Copy Documents Section, except for collaborative proposals, where **only** the lead institution should provide the information described below.

The following information should be provided in the Single Copy Document section of FastLane as a PDF file/document.

(9.a) Project Personnel. This is the same information as entered in Section (8.a), Project Personnel.

(9.b) Collaborators/Individuals with Conflicts of Interest. Provide the names of all persons, participants and affiliates with potential conflicts of interest as specified in the NSF GPG. For each person, enter the first name, last name, and institution/organization. For each person listed on the project personnel list, include all co-authors/editors and

collaborators (within the past 48 months); list all graduate advisors and advisees; list all subawardees who would receive funds through the *Expeditions* award.

(10) Information pertaining to "Current and Pending Support", and "Facilities, Equipment and Other Resources" is required for full proposals. Follow the instructions in the NSF GPG.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

C. Due Dates

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

September 10, 2010

March 10, 2012

September 10, 2013

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

May 10, 2011

December 10, 2012

May 10, 2014

D. FastLane/Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

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

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

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

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

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

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. 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 either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with 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. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in the GPG as [Exhibit III-1](#).

A comprehensive description of the Foundation's merit review process is available on the NSF website at: <http://www.nsf.gov/bfa/dias/policy/meritreview/>.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in [Empowering the Nation Through Discovery and Innovation: NSF Strategic Plan for Fiscal Years \(FY\) 2011-2016](#). These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the core strategies in support of NSF's mission 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 variety of learning perspectives.

Another core strategy in support of NSF's mission is broadening opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which 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.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. ([GPG Chapter II.C.2.d.i](#) contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including [GPG Chapter II.C.2.d.i](#), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
 - a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 - b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited

to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

As an elaboration of the Intellectual Merit and Broader Impacts criteria, reviewers will be asked to consider the following guidance when evaluating both preliminary and full proposals.

(1) Value-added of funding the activity as an *Expedition*: Are the identified research and education goals of sufficient import, scale, and/or complexity to justify this type of investment? Will the proposed activity contribute to realization of the Expeditions in Computing program goals and is it likely to demonstrate the characteristics described in the solicitation? Where necessary, comment on the value of the experimental systems or shared experimental facilities proposed.

(2) Leadership and Collaboration Plan: Does the leadership team convincingly demonstrate the goals, experience, and capacity to manage a complex, multi-faceted, and innovative research, education, and knowledge transfer enterprise? What is the likely effectiveness of the proposed leadership and collaboration plan? Is there documentation of institutional and other commitments to the proposed activity? Is the requested budget appropriate for the scope and complexity of the research, education and knowledge transfer projects proposed? Does the proposed collaboration approach promise significant value added?

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review, or Reverse Site Review.

Following the merit review of preliminary proposals, no more than twenty proposing teams will be invited to submit full proposals. NSF expects to notify proposers of the outcome of the preliminary proposal review process approximately four to five months after the preliminary proposal due date. Full proposals will be accepted **ONLY IF INVITED** by NSF. Unsolicited full proposals will be returned without 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: It is anticipated that each *Expedition* will be merit reviewed in a site visit conducted at the end of Year 2 to assess project progress and to determine if the project warrants continued support in Years 3 through 5.

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 prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). Within 90 days following 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 all identified PIs and co-PIs on a given award. 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 Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also 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.

More comprehensive information on NSF Reporting Requirements 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.

In addition, Expeditions awardees must:

- produce three project outcome "highlights" annually, that are prepared for a lay audience; these highlights will be used in NSF reporting and outreach;
- create and maintain an active project web site that shares information about the project; and
- attend a PI meeting at least once each year to share information about the project.

VIII. AGENCY CONTACTS

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:

- Mitra Basu, telephone: (703) 292-8910, email: mbasu@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: 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.

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>.

The *Expeditions* program provides CISE investigators with access to a diverse set of CISE funding opportunities. CISE core programs provide funding for projects ranging from modest single investigator activities through larger multi-investigator efforts funded at levels of approximately \$1,000,000 per year. *Expeditions* complement these

investments, supporting ambitious, multi-investigator projects requiring annual investments up to \$2,000,000. For research and education projects with scopes that require even larger funding levels, PIs are encouraged to consider the opportunities provided by NSF's Engineering Research Center (ERC) and Science and Technology Center (STC) programs. The ERC and STC programs support projects with annual budgets of \$3,000,000 to \$4,000,000 for up to ten or eleven years.

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 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
 - 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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