2010 Project

PROGRAM SOLICITATION
NSF 09-514

REPLACES DOCUMENT(S):
NSF 07-591

National Science Foundation

Directorate for Biological Sciences
Division of Biological Infrastructure
Division of Environmental Biology
Division of Integrative Organismal Systems
Division of Molecular and Cellular Biosciences

Full Proposal Target Date(s):

February 19, 2009

January 12, 2010

REVISION NOTES

Please be advised that the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) includes revised guidelines to implement the mentoring provisions of the America COMPETES Act (ACA) (Pub. L. No. 110-69, Aug. 9, 2007.) As specified in the ACA, each proposal that requests funding to support postdoctoral researchers must include a description of the mentoring activities that will be provided for such individuals. Proposals that do not comply with this requirement will be returned without review (see the PAPP Guide Part I: *Grant Proposal Guide* Chapter II for further information about the implementation of this new requirement).

This solicitation contains four changes from the 2007 solicitation:

- This is the terminal solicitation for the last two competitions of the 2010 Project program.
- Proposals should be submitted to the 2010 Project through the disciplinary cluster whose thematic focus is most closely related to the project.
- The description of the thematic focus areas has been modified in response to community input.
- Only one appendix is now required, which should describe the data management plan.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

2010 Project
To determine the functions of all genes in *Arabidopsis thaliana* by the year 2010

Synopsis of Program:

The Directorate for Biological Sciences (BIO) of the National Science Foundation (NSF) announces its intention to continue support of research to determine the functions of all genes in the model plant *Arabidopsis thaliana* by the year 2010. Individual investigators or groups of investigators will be supported to conduct creative and innovative, genome-wide or systems-level research designed to determine, using all available means, the functions of *Arabidopsis* genes. In the final two years, the Program will continue to support genome-wide analyses and research on biological networks using high throughput methods and integrating modeling with experimental data. Proposals are encouraged in, but not limited to, the following thematic areas: (1) metabolic biology, particularly relevant to energy capture and use; (2) adaptation to the environment, (3) multi-scale analysis of genome evolution and genetic systems, and (4) developing resources for genome-wide experimental approaches to determine gene function in Arabidopsis. Resource proposals will only be accepted in FY 2009.

Cognizant Program Officer(s):

- Thomas Jack, Program Director, 685S, telephone: (703) 292-8417, email: bio-2010@nsf.gov
- Diane Jofuku Okamuro, Program Director, 690 N, telephone: (703) 292-4400, email: bio-2010@nsf.gov

- Elizabeth Vierling, Program Director, 655 S, telephone: (703) 292-7139, email: bio-2010@nsf.gov

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

- 47.074 --- Biological Sciences

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 25 - Approximately 25 awards each in FY2009 and FY2010 competitions.

Anticipated Funding Amount: $13,000,000 Approximately $13M for new FY 2009 awards, pending the availability of funds with individual award amounts as noted in Section III.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Proposals are accepted only from US academic institutions, US non-profit research organizations including museums, research laboratories, professional societies and similar organizations in the US that are directly associated with educational or research activities, and consortia of such organizations with appropriate research and educational facilities. The eligibility criteria apply to both the main and sub-awardees.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposal Preparation Instructions:** This solicitation contains information that deviates from the standard NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full text of this solicitation for further information.

B. Budgetary Information

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

C. Due Dates

- **Full Proposal Target Date(s):**

  February 19, 2009

  January 12, 2010

Proposal Review Information Criteria

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

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

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

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I. INTRODUCTION

The Directorate for Biological Sciences (BIO) of the National Science Foundation (NSF) announces its intention to continue support of research to determine the function of all genes in the model plant *Arabidopsis thaliana* by the year 2010. This represents a continuation of the *Arabidopsis* genome research initiative BIO has supported since 1990 and of the 2010 Project begun in FY 2001. The program continues to be a BIO Directorate-wide activity. It is also part of an international effort on the functional genomics of *Arabidopsis*, called "The Multinational Coordinated *Arabidopsis thaliana* Functional Genomics Project: Beyond the Whole Genome Sequence"
(see http://www.nsf.gov/pubsys/ods/getpub.cfm?bio0202.)

The year 2005 was the mid-point of the 2010 Project. The North American *Arabidopsis* Steering Committee held a workshop in August 2005 to assess the status of the Project, to recommend the objectives for the remaining five years, and to ensure that the Project can reach its original goals by the year 2010. The workshop report is posted at http://www.arabidopsis.org/info/2010_projects/AT2010WorkshopFinal.pdf. NSF revised the scope of the 2010 project in FY 2006, incorporating some of the recommendations of the workshop as well as other inputs such as the annual report of the Multinational Coordinated *Arabidopsis thaliana* Functional Genomics Project (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=biorpt073106). In FY 2008, two workshops were held by the Arabidopsis and broader plant communities to identify the future directions for the Arabidopsis community (http://arabidopsis.org/portals/masc/workshop2020.pdf and http://arabidopsis.org/portals/masc/2020_European_Vision.pdf). Both workshops recognized the importance of translating Arabidopsis research to the problems of economic and environmental importance. The recommendations of these workshops were used to identify the thematic focus areas described in this solicitation.

The 2010 Project is distinct from the Plant Genome Research Program. The Plant Genome Research Program will not consider proposals in which *Arabidopsis* is the only research focus, although it will consider proposals that transfer the knowledge gained in *Arabidopsis* to studies of fundamental biological processes in economically important plants (see NSF 08-607 for details). Arabidopsis researchers should also consult the "Life in Transition (LiT) Dear Colleague Letter (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf08078) and the Research Coordination Networks in Biological Sciences program (http://www.nsf.gov/pubs/2006/nsf06567/nsf06567.htm) for additional funding information.

Proposals that are not responsive to this program solicitation or are inappropriate for funding under the 2010 Project may be transferred to an appropriate disciplinary program, or be returned without review if such transfer is deemed inappropriate. Proposals submitted to the disciplinary programs that are deemed appropriate for the 2010 Project may be transferred to the 2010 Project at the discretion of the managing program director and the 2010 Project program directors.

II. PROGRAM DESCRIPTION

In FY 2009 and 2010, the 2010 Project will continue to encourage proposals for genome-wide analyses and the use of computational, modeling and experimental approaches to exploring networks and systems in Arabidopsis. Similarly, proposals that develop new methods and tools for the benefit of plant biology research using Arabidopsis as the test model will be encouraged. In the last two years of the 2010 Project, proposals are especially encouraged in, but not limited to, the following thematic areas:

1. Metabolic biology, particularly relevant to energy capture and use

To address future energy challenges, bioinspired energy resources and technologies are likely to be critical. Studies on metabolic biology, from a molecular to organismal to ecological perspective, will provide critical information about the energy management of living systems. The molecular underpinnings for potentially useful strategies for producing novel biological materials as energy resources will be encouraged in the 2010 Project.

2. Adaptation to the environment

   Efforts to determine the function of genes and gene networks will continue to be supported in FY 2009 and 2010. Proposals that seek to determine the function of Arabidopsis genes and gene networks involved in plant responses to the environment and in adaptation to biotic or abiotic conditions will be especially encouraged. Studies on adaptation-related biological processes in plants, including physiological and metabolic processes, as well as on meta-networks connecting these processes, are encouraged. Such projects are expected to include protein-coding genes, genes for functional non-protein coding RNAs, or both. The 2010 Project encourages proposals that will take a holistic view of systems biology to incorporate the biology of Arabidopsis in the context of interacting species as well as the environment.

3. Multi-scale analysis of genome evolution and genetic systems

   Proposals that seek to understand the molecular basis of evolutionary change, genomic robustness and diversity will be encouraged. Comparative analyses that include species in addition to *Arabidopsis* are considered appropriate. Proposals that address questions related to the genomic basis of biological properties and the evolution of biological organization at various levels will be particularly welcomed.

4. Developing resources for genome-wide experimental approaches to determine gene function in Arabidopsis

   The 2010 Project will continue to support development of biological resources and informatics tools in FY 2009. Resource proposals will not be accepted in FY 2010. Special consideration will be given to proposals that seek to complete development of currently available biological tools and resources. Proposals that focus on the development of tools and resources needed to address questions related to metabolic biology, adaptation, genome evolution and genetic systems will also be accepted for consideration. It is expected that these research resources will provide quantitative readouts, are cost effective and comprehensive, and can be readily adopted by the scientific community. Special attention should be paid to methods and tools that will enable genome-wide functional analysis of genes of unknown function and classes of genes that have been underrepresented (e.g. non-protein coding RNAs). Proposals should be justified in terms of potential demand and efficiency.

NSF recognizes that many projects will encompass two or more emphases discussed here. For all projects, high throughput and cost-effective approaches will be encouraged. Although the thematic areas listed above are the focus of the FY 2009 and FY 2010 competitions, all imaginative and innovative proposals will be considered as long as they are justified on the basis of the goal of the 2010 Project.

While keeping in mind the emphases as described above, proposers are strongly encouraged to consult the scope of the awards in the previous years of the 2010 Project Program (see the lists of previous awards at http://www.nsf.gov/bio/pubs/awards/2010awards.htm), as well as those of projects funded elsewhere in the world including the German *Arabidopsis* Functional Genomics Network Program (http://www.uni-tuebingen.de/plantphys/AFGN) and GARNET, the genomic *Arabidopsis* Resource Network in the U.K. (http://garnet.arabidopsis.org.uk/). Proposers are further encouraged to coordinate proposed activities with funded projects prior to submission of new proposals. If activities similar to an already funded project are to be proposed, the proposal must describe clearly a mechanism to coordinate with ongoing activities as well as a rationale based on benefits to the overall goal of the 2010 Project. NSF encourages participation of investigators and institutions that have not been involved in the previously funded 2010 Project activities.

For required items to be included in the proposal, please see "Proposal Preparation and Submission Instructions" under Section V.A. below.

Additional considerations:

Sharing of the project outcome: Success of the 2010 Project will be ultimately measured by the extent that its products (data, information, research tools, biological resources and human resources) impact the advances in our understanding of the function of genes in *Arabidopsis*. NSF believes that one way to ensure success is to make available the outcomes of 2010 Projects openly, widely, rapidly, and in an easily accessible manner. NSF expects biological materials resulting from 2010 projects to be deposited at an established public depository (i.e., the *Arabidopsis* Biological Resource Center-ABRC, the Nottingham *Arabidopsis* Stock Centre-NASC, etc.). In terms of information and data, NSF expects them to be made available through an established public database (i.e., the *Arabidopsis* Information Resources-TAIR, NCBI databases, etc.), in addition to the project website. ABRC and TAIR are supported by NSF and they are expected to assist researchers in determining the most efficient and least cumbersome ways to make biological and data resources available to the public.

International collaboration: The 2010 Project encourages laboratory-to-laboratory interactions between US and foreign laboratories whenever such opportunities exist. NSF 2010 Project funds may be requested to support foreign investigators and students to work in US laboratories and for US investigators and students to work in international laboratories. However, foreign counterparts should secure support for their projects from their own national programs. A list of *Arabidopsis* functional genomics projects in other countries can be found at http://www.arabidopsis.org/info/2010_projects/index.jsp.

Integration of research and education, and broadening participation: As in all other NSF programs, investigators are expected to integrate research and education in proposals submitted to the 2010 Project. Activities that promote participation of under-represented and under-served groups, including investigators at small institutions, minority-serving institutions, and community colleges are especially encouraged. Both activities should be well integrated into the proposed project, taking advantage of the opportunities the proposed project can uniquely offer.

Coordination among projects: If research similar to the proposed project is already funded in another NSF 2010 award (http://www.arabidopsis.org/info/2010_projects/index.jsp) or in similar functional genomics programs in other countries, the PI should provide a plan for coordinating activities with the funded project. If two or more proposals with substantially overlapping goals and scope remain in consideration for funding after initial merit review, the PIs of those proposals may be asked to collaborate, and to submit a coordination plan prior to the final funding decision.

Intellectual property: When the project involves the use of proprietary data or materials, any data or materials resulting from NSF-funded research must be made promptly available, without any restrictions, to the users of such data or materials. It should be noted that prospective awardee institutions may be requested, prior to an award decision, to submit copies of any intellectual property agreements or material transfer agreements that any of the key project personnel have signed, or are planning to sign, that would impact the unrestricted and timely distribution of the outcomes of the NSF-funded research. Only NSF officials will review this

material. In the case of a multi-institutional proposal, the lead institution will be responsible for coordinating and managing the intellectual property resulting from the 2010 Project award.

Industrial interactions: NSF recognizes that some of the resources and technologies needed to address the next set of challenges in *Arabidopsis* functional genomics exist in industry and encourages the use of their services if it would result in cost-savings and more rapid progress of the project. Such arrangements would usually involve purchase of resources or services from industry, and must be made without any restrictions on sharing the research outcomes with other researchers or on depositing information and physical resources in the *Arabidopsis* Information Resources (http://www.arabidopsis.org/) and the *Arabidopsis* Biological Resources Center (http://www.biosci.ohio-state.edu/~plantbio/Facilities/abrc/abrchome.htm), respectively. In these cases, the usual procurement procedures and rules of the grantee institution must be followed. Another mode of industrial interactions may involve equal partnerships between academia and industry. Under such an arrangement, NSF funds may not be used to support the industrial collaborators. Both parties are expected to bring their own resources to the project and share the results openly and quickly with the rest of the community according to the policy applicable to all awards funded under this program solicitation.

III. AWARD INFORMATION

It is anticipated that approximately $13 million will be made available for an estimated 25 new awards in each of the last two competitions, contingent upon the quality of proposals received and the availability of funds.

Awards are expected to range up to a total of $5 million for up to 4 years. However, the award duration for proposals to build community resources may not exceed 3 years. Budget requests must be justified in relation to the proposed activities. Although the maximum total award size may range up to $5 million for four-year duration, the median size of an award is likely to be no more than $250,000 per year.

Funding decisions are anticipated by the end of July 2009, with awards expected to start by December 2009. Awards will be made as standard or continuing grants.

IV. ELIGIBILITY INFORMATION

Organization Limit: Proposals may only be submitted by the following:

- Proposals are accepted only from US academic institutions, US non-profit research organizations including museums, research laboratories, professional societies and similar organizations in the US that are directly associated with educational or research activities, and consortia of such organizations with appropriate research and educational facilities. The eligibility criteria apply to both the main and sub-awardees.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Additional Eligibility Info:

None Specified

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

The following additions or modifications apply to proposals submitted in response to this solicitation:

The Cover Sheet:

- **Program Solicitation Number.** Select the 2010 Project program solicitation from the drop-down menu.
- **Unit of Consideration.** Select at least one specific disciplinary program from the drop-down list in FastLane as the unit of consideration. For assistance in determining which program to choose, refer to the web page of the NSF Directorate for Biological Sciences, which provides descriptions of NSF's research-supporting programs.
- **Project Title.** The project title must begin with "Arabidopsis 2010:" and follow with an informative title.

Project Summary (1 page):

The project summary should consist of three parts in the following order:

1. A list of senior personnel (PI, Co-PIs, and Key Collaborators) along with their home institutions (please note that more than 4 senior personnel including the Co-PIs may be listed here although the Cover Page allows only 4 official co-PIs)
2. The intellectual merit of the proposed project
3. Broader Impacts of the proposed research project (details at http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf)

Please note that a project summary that does not include both the intellectual merit and the expected broader impacts will be returned without review.

Project Description (maximum 15 pages including figures and tables):
In addition to the standard description in the GPG, the following guidelines must be followed:

- **Results from Prior NSF Support (up to 5 pages):** Only the most relevant prior awards should be included in this section for the PI and any of the Co-PIs listed in "Project Summary". If the PI or any of the Co-PIs has had a 2010 award, dissemination of the outcomes from the prior award must be described in this section.

- **Justification:** Briefly explain how the proposed activities meet the goals of the 2010 Project as described in this solicitation.

- **Research plan:** Describe the goals of the project, scientific and technical approaches, including informatics where appropriate, with expected outcomes. Descriptions must be sufficiently detailed to allow adequate review. All projects are expected to contain information about how the investigators plan to add their results to the community-wide effort to update and add value to the primary sequence information in GenBank as well as a projected timetable for accomplishing the stated proposal goals. If research tools and resources such as mutants and global expression data are produced during the course of the proposed project, the proposal should describe a plan for their public release and coordination with the existing distribution mechanisms. NSF expects biological materials resulting from 2010 projects to be deposited at an established public depository (i.e., the *Arabidopsis* Biological Resource Center). In terms of information and data, NSF expects them to be made available through an established public database (i.e., the *Arabidopsis* Information Resources, NCBI databases, etc.), in addition to the project website.

- **Broader impacts:** The broader impacts of the proposed activities must be described within the Project Description. [See "NSF Review Process" below for examples of "broader impacts"]. Plans for integration of research and education must be described within the context of the proposed activity.

- **Post-doctoral mentoring plan:** Effective January 5, 2009, all proposals that request funding to support postdoctoral researchers must include a description of the mentoring activities that will be provided for such individuals. Examples of mentoring activities include, but are not limited to: career counseling; training in preparation of grant proposals, publications and presentations; guidance on ways to improve teaching and mentoring skills; guidance on how to effectively collaborate with researchers from diverse backgrounds and disciplinary areas; and training in responsible professional practices. The mentoring plan will be evaluated during the merit review process, under the Broader Impacts criterion. Proposals that do not comply with this requirement will be returned without review.

For proposals aimed exclusively at developing research methods, tools, and resources for the *Arabidopsis* functional genomics community, the following information must be included: (1) a list of deliverables including necessary informatics tools; (2) experimental plans to develop the methods/resources/tools including mechanisms of quality assessment; (3) project timetable; (4) a detailed plan for public release of the resources/tools; (5) any conditions to be placed on users, e.g. material transfer agreement, if any; (6) a plan to maintain and distribute the resource after NSF support has ended. It should be noted that resources (biological materials, software, etc.) produced with the support of the 2010 Project must be made available as soon as their quality is checked to satisfy the specifications described in the proposal and approved by reviewers. Further, they must be made available to all segments of the scientific community. Budgeting for short-term and long-term distribution of the project outcomes needs to be described in the proposal. A reasonable user charge is permissible, but the fee structure must be clearly outlined in the proposal. If accessibility differs between industry and the academic community, the differences must be clearly described. It will be permissible to use a qualified commercial operation for long-term maintenance and distribution of the project outcomes, if appropriate; however, such an arrangement should be made clear in the proposal.

Proposal Budget:
Provide a summary budget and a yearly budget for the duration of the proposed project. When subawards are involved, summary and yearly budgets are required for each subaward. A Budget Justification should be provided for both the proposer and any subawardees. Institutions that do not meet the eligibility criteria in Section IV above may not participate as subawardees. The 2010 Project program is fully committed to provide sufficient funds to complete any project it supports. A careful and realistic budget will add to the overall strength of a proposal. Funds for facility construction or renovation may NOT be requested. It is expected that foreign collaborators' projects will be supported by their national sources. NSF funds may be used for US investigators, postdoctoral fellows and students on exchange visits to their foreign collaborator's laboratory or to cover expenses associated with hosting foreign collaborators in the US investigator's laboratory.

Special Information and Supplementary Documentation:
Only the allowable and applicable items listed below or noted in the GPG are allowed. Include the materials in the FastLane submission by transferring them as PDF files through the "Supplementary Docs" module of the FastLane system.

(A-1) Data Management Plan (maximum 1 page): Development and adherence to community-wide standards for collection and presentation of data, such as microarray or interactome data, are highly encouraged. Large-scale datasets must be made available in a format that enables rapid comparison and effective utilization of reproducible information. All proposals must include a detailed data management plan if the project is expected to generate significant digital data for preservation (maximum 1 page). The contents of the data management plan should include:

- The types of data to be produced
- The standards that would be applied for format, metadata content, etc.
- Provisions for archiving and preservation
- Access policies and provisions
- Plans for eventual transition or termination of the data collection after the NSF funding period

Single-Copy Document(s):

A "conflict of interest" list must be included as an "additional single-copy document" at the time of proposal submission. This document must be in the form of a **single alphabetized table** that includes full names of all conflicts of interest for all senior personnel (PI and Co-PIs) as well as for any named personnel whose salary is requested in the project budget. Conflicts to be

identified are (1) PhD thesis advisors or advisees, (2) collaborators or co-authors for the past 48 months, and (3) any other individuals or institutions with which the investigator has financial ties (please specify type).

An alphabetized list of suggested reviewers can be submitted through the single-copy document module of FastLane.

Proposals that are not compliant with the guidelines may be returned without review.

Proposal Checklist:

NSF again stresses the importance of reading the program solicitation and GPG, and following the guidelines and requirements before the SRO submits the proposal through FastLane. Below is a checklist of items that, if not compliant, will most likely result in proposals being returned without review. This is not meant to be an exhaustive checklist. It is the submitting organization's responsibility to ensure that the proposal is totally compliant with the applicable guidelines.

- Project Title starts with "Arabidopsis 2010:..."
- Project summary is one page and consists of the three required parts.
- Project description is no more than 15 pages including tables and figures, using the correct font size and margin as required by the GPG. (It might be useful to print the submitted proposal from within the FastLane module to check for font size and margins because Acrobat-PDF conversions may cause changes in the NSF-viewable version of your proposal.)
- Biographical sketches for all personnel listed on the project summary page are included, and each is no longer than 2 pages and follows the format in the GPG.
- Current and pending support information is provided for all personnel listed on the project summary page.
- Budget and budget justifications – yearly and summary budgets with a budget justification of no more than 3 pages: the same applies to any subaward budget.
- Supplemental documents – All applicable and/or required items included. Unallowable items (e.g., letters of general endorsement or reprints) should not be included.
- Conflict of interest list conforms to the required format and is submitted through the single-copy document module of FastLane.
- No extraneous materials are included.

Proposers are reminded to identify the program solicitation number (NSF 09-514) in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

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

Budget Preparation Instructions: Awards are expected to range up to a total of $5 million for up to 4 years. However, the award duration for proposals to build community resources may not exceed 3 years. Budget requests must be justified in relation to the proposed activities. Although the maximum total award size may range up to $5 million for four-year duration, the median size of an award is likely to be no more than $250,000 per year.

C. Due Dates

- **Full Proposal Target Date(s):**

  February 19, 2009

  January 12, 2010

D. FastLane Requirements

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

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

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal

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

A. NSF Merit Review Criteria

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

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

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

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

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

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

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

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

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

Additional Review Criteria:

See "Additional considerations" in section II. Program Description of this solicitation.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad Hoc and Panel Review.

The PI will select the most appropriate core program for the review and management of the proposal. If needed, the program directors may reassign the proposal to another program that may be more appropriate for the proposal than the one selected by the PI. The proposals will be discussed in one or more panels in the core programs. All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

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

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

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

personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

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

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

C. Reporting Requirements

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

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

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

In addition to the standard items outlined in the FastLane annual report template, the PI will be required to submit the following information in the report:

- Progress toward the goals, research plan, and timetable described in the awarded proposal
- If the project has generated community research resources/tools/methods (specified deliverables), description of, what, when and how they are being shared with the community.
- URL for the project website
- Significant findings
- Significant delays and difficulties encountered; and how the PI has overcome them
- Plan for the coming year if different from the original plan
- New collaborations formed since the start of the project with other US investigators including other 2010 PIs, industry labs, and international colleagues
- Outreach activities, efforts to broaden participation of under-represented and/or under-served groups
- Any publicity materials the project has produced

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Thomas Jack, Program Director, 685S, telephone: (703) 292-8417, email: bio-2010@nsf.gov
- Diane Jofuku Okamuro, Program Director, 690 N, telephone: (703) 292-4400, email: bio-2010@nsf.gov
- Elizabeth Vierling, Program Director, 655 S, telephone: (703) 292-7139, email: bio-2010@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.
- Jennifer MacKellar, telephone: (703) 292-8084, email: jmackell@nsf.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.

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

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

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

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

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

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

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

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center)**:** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

  Send an e-mail to: nsfpubs@nsf.gov

  or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

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