Plant Genome Research Program (PGRP)

FY 2015 Competition

PROGRAM SOLICITATION

NSF 15-548

REPLACES DOCUMENT(S):

NSF 14-533

National Science Foundation

Directorate for Biological Sciences
Division of Integrative Organismal Systems

Full Proposal Target Date(s):

May 27, 2015

IMPORTANT INFORMATION AND REVISION NOTES

The Mid-Career Investigator Awards in Plant Genome Research (MCA-PGR) will continue to be available in FY 2015.

A new opportunity, **Early Career Investigator Awards in Plant Genome Research (ECA-PGR)**, will be available in FY 2015.

The Advancing Basic Research in Economically Important Crop Plants (ABR-PG) will not be offered in FY 2015.

Please note that proposals at all scales are welcome, from single investigator to multi-investigator consortium projects, commensurate with the scope and scale of the proposed research.

Letters of Collaboration: The use of a template form for submitting letters of collaboration is no longer required for preparation of letters of collaboration.

Conflict of Interest document: The provided template must be used to generate the Conflict of Interest document.

Important Information

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 16-1), which is effective for proposals submitted, or due, on or after January 25, 2016.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Plant Genome Research Program (PGRP)

Synopsis of Program:

This program is a continuation of the Plant Genome Research Program (PGRP) that began in FY 1998 as part of the National Plant Genome Initiative (NPGI). Since the inception of the NPGI and the PGRP, there has been a tremendous increase in the availability of functional genomics tools and sequence resources for use in the study of key crop plants and their models. Proposals are welcomed that build on these resources to develop conceptually new and different ideas and strategies to address grand challenge questions in plants of economic importance on a genome-wide scale. There is also a critical need for the development of novel and creative tools to facilitate new experimental approaches or new ways of analyzing genomic data. Especially encouraged are proposals that provide strong and novel training opportunities integral to the research plan and particularly across disciplines that include, but are not limited to, plant physiology, plant breeding, quantitative genetics, biochemistry, bioinformatics and engineering.

Activities in four focus areas will be supported in FY 2015: (1) Genomics-empowered plant research (RESEARCH-PGR) to tackle fundamental questions in plant sciences on a genome-wide scale; (2) Development of tools and resources for plant genome research (TOOLS-PGR) including novel technologies and analysis tools to enable discovery; (3) Mid-Career Investigator Awards in Plant Genome Research (MCA-PGR) to increase participation of investigators trained primarily in fields other than plant genomics; and, (4) Early Career Investigator Awards in Plant Genome Research (ECA-PGR) to increase the participation of early-career scientists in plant genome research.

Proposals addressing these opportunities are welcomed at all scales, from single-investigator projects through multi-investigator, multi-institution projects, commensurate with the scope and scale of the work

proposed. The PGRP encourages proposals from investigators and institutions that have not participated in the program before.

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.

- Diane Jofuku Okamuro, Program Director, 685N, telephone: (703)292-4400, email: dbipgr@nsf.gov
- Anne W. Sylvester, 675.01N, telephone: (703)292-4400, email: dbipgr@nsf.gov
- Timothy Nelson, 685N, telephone: (703)292-4400, email: dbipgr@nsf.gov
- C. Eduardo Vallejos, 685N, telephone: (703)292-4440, email: cvallejo@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 or Cooperative Agreement

Estimated Number of Awards: 10 to 20

Anticipated Funding Amount: $15,000,000

Up to $15 million is available for FY 2015 new awards, pending availability of funds.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Proposals may only be submitted by U.S. academic institutions accredited in, and having a campus located in the U.S., U.S. non-profit research organizations including museums, research laboratories, professional societies and similar organizations in the U.S. that are directly associated with educational or research activities, and consortia of only the eligible organizations listed here. When a consortium of eligible organizations submits a proposal, it must be submitted as a single proposal with one organization serving as the lead and all other organizations as subawardees. Separately submitted collaborative proposals will be returned without review. Organizations ineligible to submit to this program solicitation may not receive subawards.

Who May Serve as PI:

For the Mid-Career Investigator Awards in Plant Genome Research [MCA-PGR] only: Individuals should have an independent, non-tenure track or tenure track position at a U.S. academic or non-profit research institution, have an active research program, and have received training primarily in fields other than plant genomics. Individuals eligible for a MCA-PGR award will be seeking training in a new area of plant research that employs genomics technologies and resources.

For the Early Career Investigator Awards in Plant Genome Research (ECA-PGR) only: Individuals must hold an appointment as an Assistant Professor or equivalent at a U.S. academic or non-profit research institution and have been in that position no longer than 24-months at the time of proposal submission. There will be no exceptions.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 1

Please note that there continues to be a limit on the number of proposals in which an investigator can be included. An investigator may submit only **one** proposal as a principal investigator, co-principal investigator, or senior personnel for whom funds are requested in response to this Program Solicitation. Proposals received in excess of this single proposal limit will be returned without review.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **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

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

  May 27, 2015

Proposal Review Information Criteria

Merit Review Criteria:

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

Award Administration Information

Award Conditions:

Standard NSF award conditions apply.

Reporting Requirements:

Standard NSF reporting requirements apply.

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I. INTRODUCTION

The National Science Foundation (NSF) announces its intention to continue to support plant genome research through the Plant Genome Research Program (PGRP). Since its inception in 1998 as part of the National Plant Genome Initiative (NPGI), the NSF PGRP has followed the long-range plans for the NPGI and, working closely with the other agencies participating in the NPGI, has

contributed to tremendous advances in plant genomics and plant sciences. The program is currently following the fourth five-year plan 2014-2018; http://www.whitehouse.gov/sites/default/files/microsites/ostp/NSTC/npgi_five-year_plan_5-2014.pdf). Following the goals set out in this plan, the PGRP encourages new, innovative ideas in the form of basic research and tool development projects that will advance the whole field of plant biology and accelerate basic discovery and innovation in economically important crop plants to meet societal needs. Potentially high-risk, high-payoff proposals or proposals that present unconventional ideas are especially encouraged. The list of ongoing projects available at http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5338&org=BIO should be consulted to ensure that, if funded, a planned project would make a significantly new scientific contribution to the field and would add to the current scientific portfolio for the PGRP.

Simultaneous submission of proposals to this program and another federal agency is permissible with prior written approval of the agencies involved. By contrast, a proposal from the same submitter that is a duplicate of, or substantially similar to, a proposal already under consideration by NSF will be returned without review.

II. PROGRAM DESCRIPTION

Since 1998, the PGRP and the NPGI have contributed to advancing basic knowledge in plant genomics with broad impact on the scientific research community and society in general. The resulting wealth of plant genomic resources, along with advances in technology and bioinformatics, have enabled plant scientists to address fundamental questions and achieve a systems-level understanding of economically important plants and plant processes, critical for advancing crop improvement. Despite these exciting achievements, new tools and methodologies are still needed to advance plant biology, to tackle questions that are intractable using current approaches, and to facilitate the translation of this newfound knowledge to improve the practice of agriculture, reduce demands on environmental resources, and address challenges posed by global climate change. Finally, there remains a critical need for training in the use of these new tools and technologies, especially for those scientists who possess expertise in traditional fields of plant biology, such as plant anatomy, breeding, physiology, and biochemistry.

Activities in four focus areas will be supported in FY 2015: (1) Genomics-empowered basic research (RESEARCH-PGR) to tackle fundamental questions in plant sciences on a genome-wide scale; (2) Development of tools and resources for plant genome research (TOOLS-PGR) including novel technologies and analysis tools to enable discovery; (3) Mid-Career Investigator Awards in Plant Genome Research (MCA-PGR) to increase participation of investigators trained primarily in fields other than plant genomics; and, (4) Early Career Investigator Awards in Plant Genome Research (ECA-PGR) to increase the participation of scientists at the early stage of their careers in plant genome research.

Proposals in all four focus areas are solicited from single investigators, small groups, or multi-institution "virtual centers." To be eligible, projects should be relevant to and include significant research activities in a crop plant(s). The scope of the project should be developed on a whole genome, whole organelle or whole network scale. The management plan should be appropriate for the proposed activities and include a carefully crafted budget and timetable with objectives linked to outcomes. Proposers are encouraged to think creatively, select appropriate experimental systems and take advantage of all available genomics tools and resources to address novel and important questions in economically important crop plants. This could include the limited use of model plant systems if necessary to rapidly test hypotheses and/or gene function.

Proposers should clearly justify the relevance of the research activities to the overarching goals of the PGRP as well as their potential downstream impacts. Proposals focused on individual genes or gene families and/or the exclusive use of a non-crop model plant system are more appropriate for funding through other BIO programs (http://www.nsf.gov/funding/pgm_list.jsp?org=BIO&ord=rect). Proposals that fall outside the scope of the PGRP will be returned without review. Proposers are strongly encouraged to contact a Program Director prior to submission to determine the suitability of the project for the PGRP.

The PGRP is committed to broadening participation. Currently, research tools and resources are widely available and should enable any institution to take part in plant genome research. Investigators who have not participated in the PGRP in the past and/or are from Primarily Undergraduate Institutions (PUI), Historically Black Colleges and Universities (HBCU), Hispanic Serving Institutions (HSI), and Tribal Colleges and Universities (TCU) are especially encouraged to apply. Early- and mid-career investigators considering submission of a ECA-PGR or MCA-PGR proposal, respectively, should contact a PGRP Program Director for further guidance.

Focus Areas for FY 2015

1. ***Genomics-empowered plant research to tackle fundamental questions in plant sciences on a genome-wide scale (RESEARCH-PGR)***

   The whole field of plant biology is being advanced by increased use of the new tools and resources that have become available through the NPGI. While there is still a need for some large community resources, those available now are more than sufficient to address many major unanswered questions in plant biology, some of which have not been tractable using traditional approaches. In keeping with the focus of the PGRP, hypothesis-driven research projects should be developed on a whole genome, whole organelle or whole network scale with a majority of the proposed work focused on economically important crop plants. In FY 2015, proposals are especially encouraged in the following areas:

   - Development of a genome-level understanding to link genes and pathways to physiological functions and phenotypes in crop plants
   - Development of a genome to systems-level understanding of plant-environmental interactions, especially with respect to adaptation to climate change and response to abiotic and biotic stresses
   - Systems-level approaches to understanding the interaction between the genome and the epigenome in the regulation of economically important processes in crop plants

2. ***Development of tools and resources for plant genome research including novel technologies and analysis tools to enable discovery (TOOLS-PGR)***

   While tremendous advances have been made in the development of tools and technologies for plant genome research, there remains a critical need for additional resources, particularly for innovations in high-throughput, high resolution phenotyping platforms to alleviate the constraint for effective utilization of genomics data and tools in the study of plants and plant processes. Proposers are encouraged to develop novel approaches focused on a specific problem or need. Potentially high-risk, high-payoff proposals or proposals that present unconventional ideas are welcomed. Priority will be given to the development of new or novel tools that are likely to contribute broadly to the advancement of the field of plant genomics. In FY 2015, proposals are especially encouraged in the following areas:

   - Novel and improved tools and resources for synthetic biology and the repurposing of plant gene activity on a

targeted or genome-wide scale
- Novel methodologies for high-throughput, semi-automated and automated plant phenotyping, especially under field conditions and over time
- Improved tools for data integration and analysis, especially to enable linkage of sequence data with data generated using high throughput phenotyping, proteomic and metabolomic technologies
- Improved data visualization tools
- Improved tools for genome sequence analysis from assembly to annotation to enable effective use of data produced by next- generation sequencing technologies in the absence of physical maps

Use of non-crop model systems is allowed in the development of tools and technologies if it is clear that the tools and technologies developed would be widely applicable for use in plants of economic importance.

Projects that develop community resources, either through production of research resources or novel tools or establishment of a service, must be justified in terms of potential demand, efficiency, and cost-effectiveness. A plan for release of project outcomes, including the timing and form of released resources, tools or materials, must be described explicitly along with the terms of access. If appropriate, plans for continued maintenance or operation of such a service should be described without assuming long-term NSF support.

3. ***Mid-Career Investigator Awards in Plant Genome Research (MCA-PGR)***

   New ideas, approaches and technologies are needed to advance the field of plant genomics to meet societal needs. Opportunities for mid-career plant researchers/scientists to move into genomics, or adopt genomics tools and technologies to solve relevant questions will greatly enhance the whole field. The PGRP continues to offer the Mid-Career Investigator Awards in Plant Genome Research (MCA-PGR) opportunity which seeks to increase participation of mid-career investigators primarily trained in fields other than plant genomics. Especially encouraged are proposals from investigators trained in plant anatomy, physiology or biochemistry. A "mid-career" investigator is defined here as any researcher who is post-tenure and not retired. Mid-career investigators trained in genomics of non-plant systems, informatics, and other disciplines that are critical to advancing the field of plant genome research (engineering, mathematics/statistics, physiology and quantitative genetics), are also encouraged to apply. Proposals submitted to the MCA-PGR opportunity should have a research theme that is consistent with the overall goals of the PGRP as well as critical training components proposed for the applicant. Proposers are encouraged to take advantage of opportunities to develop new curriculum or course offerings that build on outcomes of the MCA-PGR activities.

   NSF expects that MCA-PGR projects will take full advantage of data, materials, information, expertise, and facilities available through PGRP funded projects. Whenever appropriate, the applicant should network with existing PGRP-supported activities (consult http://www.nsf.gov/bio/pubs/awards/pgr.htm?WT.si_n=ClickedAbstractsRecentAwards&WT.si_x=1&WT.si_cs=1&WT.z_pims_id=5338& for a list of funded projects). Funds may be requested to support research visits to existing PGRP-supported laboratories, for participation in training opportunities offered by existing PGRP projects, and for use of genome research facilities not available at the applicant's institution. If necessary, funds may also be requested for salary support of the applicant during the training period(s).

   Investigators interested in the MCA-PGR opportunity are strongly encouraged to contact a Program Director for further guidance prior to submission of a proposal.

4. ***Early Career Investigator Awards in Plant Genome Research (ECA-PGR)***

   This funding opportunity seeks to increase the participation of early-career scientists in plant genome research, especially those who are broadening their capabilities in plant genomics. Applicants who have not received PGRP funding as a PI in the past are encouraged to apply. In addition to those trained in plant biology and plant breeding, new investigators trained in genomics of non-plant systems, informatics, and other disciplines that are critical to advancing plant genome research are also strongly encouraged to apply. To be eligible to submit to the ECA-PGR opportunity, the PI must hold an appointment as an Assistant Professor or equivalent for no longer than 24-months at the time of proposal submission. As long as the PI meets these eligibility requirements, co-PIs and other senior personnel may be included. As with all proposals for whom funds are requested in response to this Program Solicitation, an investigator may submit only one proposal as a PI, co-PI, or senior personnel.

   Proposals submitted should have a research theme consistent with the goals of the PGRP with an emphasis on crops of economic importance and plant processes of economic value. A list of PGRP- supported projects can be found at http://www.nsf.gov/bio/pubs/awards/pgr.htm?WT.si_n=ClickedAbstractsRecentAwards&WT.si_x=1&WT.si_cs=1&WT.z_pims_id=5338&.

   NSF expects that ECA-PGR projects will take full advantage of data, materials, information, expertise, and facilities available through prior PGRP-funded projects. Whenever appropriate, the applicant should network with existing PGRP-supported projects.

   Funds may be requested to visit existing PGRP laboratories, to participate in training opportunities offered by existing PGRP projects, or to use genome research facilities not available at the applicant's institution. ECA-PGR awardees will be required to attend the annual PGRP awardees meeting in Arlington, Virginia. Funds for this trip must be requested in the proposal.

   Eligible investigators interested in the ECA-PGR funding opportunity **should** contact a Program Director for further guidance prior to submission of a proposal.

Additional Considerations as Appropriate

Integration of Research and Education and Broadening Participation

Activities supported by the PGRP should provide an ideal environment for mentoring and training young scientists in modern research and technologies, introducing them to new paradigms in plant biology, and promoting increased participation by members of under-represented groups. Informatics skills are critical to making the maximum use of genome resources. Accordingly, proposers are expected to integrate informatics training into their projects at all levels, wherever appropriate. NSF expects proposers to take advantage of the unique opportunities the proposed project provides in terms of education and incorporate these into the plan at a scale that is commensurate with that of the proposed activity. Focused activities that fit well with the specific opportunities offered by the project would be viewed as a strength. Proposers are encouraged to take advantage of existing programs and networks where appropriate, building in additional opportunities unique to the project's research goals. New activities that link and/or enhance ongoing PGRP-supported training and outreach efforts and enable them to increase visibility and impact are encouraged.

Data Sharing

Massive amounts of data continue to be generated through PGRP activities. Proposers should consider their project outcomes in the context of the whole field of plant biology and ensure maximal accessibility and visibility. Outcomes are expected to meet current community standards for genomic data and must be deposited into existing long-lived community databases where appropriate. Projects that produce resources of utility to other researchers, whether part of a large-scale community resource project or not, are required to release outcomes as soon as appropriate, once specified quality standards have been met.

International Collaboration

Plant genome research is actively pursued all over the world. The PGRP encourages international research collaborations, particularly with investigators from developing countries, and especially where there is a common research focus or system. When applicable, the proposed research activities should be coordinated with similar efforts in other countries to maximize efficiency and avoid unnecessary duplication of effort.

It is expected that non-US participants will secure support for their component of the collaboration from their own national programs. The PI is encouraged to contact a PGRP Program Director for guidance regarding allowable costs when considering support of international collaborations.

Industrial Collaboration

Private industry has already made significant investments in plant genomic research. Innovative collaborations with industry are encouraged when they advance the goals of the PGRP. However, NSF funds may not be used to support the industrial collaborators. Participation of a company as a provider of a service should be managed according to the submitting institution's procurement policy. When private industry is involved, the proposer is responsible for ensuring that any intellectual property issues are handled according to NSF Policy (see section A-1 under Special Information and Supplementary Documentation below).

Additional Funding Opportunities

The PGRP will accept **Research in Undergraduate Institution** (RUI) proposals. Information on the scope of RUI projects and the format of these proposals can be found at http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5518&from=fund.

The PGRP will also accept **Research Coordination Network** (RCN) Proposals. Information on the scope of RCN projects and the format of these proposals can be found at http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=11691&org=BIO.

Proposals submitted to the **CAREER** program (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503214&org=BIO) will be considered by the PGRP. Early-career investigators who are considering submission of a CAREER proposal are strongly encouraged to contact a PGRP Program Director for further guidance.

Finally, proposers are encouraged to consider inclusion of activities described in the Dear Colleague Letter for **Developing Country Collaborations in Plant Genome Research** (NSF 04-563: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf04563). Proposed collaborative activities should focus on research problems important to developing countries that include scientist-to-scientist interactions potentially leading to long-term partnerships among participating laboratories. The exchange of ideas and people should be reciprocal and should be built on equal partnerships between U.S. scientists and scientists of developing nations. Examples of activities to be supported would include, but not be limited to, joint research projects and long-term (one year) or short-term (between one and three months) reciprocal exchange visits. Collaborations should be developed that bring complementary sets of expertise to bear on problems of importance to the participants from developing countries and that meet their identified needs. The described activities should meet the budgetary and organizational guidelines described in the Dear Colleague Letter.

Proposers are encouraged to contact a Program Director about the suitability of the activity for PGRP support prior to submission of these types of proposals.

Supplemental Funding Requests

March 1 annually (or next business day if that is a weekend or holiday) is the target date for most IOS programs for Research Experiences for Undergraduates (REU), Research Experiences for Teachers (RET), Research Assistantships for High School Students (RAHSS), and Research Opportunity Award (ROA) supplement requests as well as proposals for conferences. **Please note that supplemental funding is intended for unanticipated opportunities only and should be justified on this basis**. Guidance for IOS PIs preparing supplemental requests is posted at http://www.nsf.gov/bio/ios/suppopp.jsp. Proposers are encouraged to contact a Program Director about the suitability of the activity for PGRP support prior to submission of supplement proposals. **Requests for support of planned REU, RET, RAHSS, and ROA activities can be included in full proposals submitted in response to this solicitation.** Proposers should follow guidance in the current REU solicitation (http://www.nsf.gov/pubs/2013/nsf13542/nsf13542.pdf) when including a request for a supplement (REU, RET, RAHSS or ROA) as part of the proposal.

Conferences

The PGRP supports conferences in plant genomics that bring experts together to discuss current research, to expose other researchers or students to new research methods and approaches, and to discuss future directions of major research activities in plant genomics and bioinformatics. Conferences will be supported only if equivalent results cannot be achieved at regular meetings of professional societies or an established conference series. Funds should be used to broaden participation of women and individuals from underrepresented groups. More information about submission of proposals for conferences can be found at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Proposers are strongly encouraged to contact a Program Director prior to submission of these types of proposals.

EArly-concept Grants for Exploratory Research (EAGER)

The EAGER funding mechanism may be used to support exploratory work in its early stages on untested, but potentially transformative, research ideas or approaches. This work may be considered especially "high risk-high payoff" in the sense that it, for example, involves radically different approaches, applies new expertise, or engages novel disciplinary or interdisciplinary perspectives. These exploratory proposals may also be submitted directly to an NSF program, but the EAGER mechanism should not be used for projects that are appropriate for submission as "regular" (i.e., non-EAGER) NSF proposals. PI(s) must contact the NSF program officer(s) whose expertise is most germane to the proposal topic prior to submission of an EAGER proposal. This will aid in determining the appropriateness of the work for consideration under the EAGER mechanism; this suitability must be assessed early in the process. For guidelines, see the most recent version of the NSF Grant Proposal Guide (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg).

Grants for Rapid Response Research (RAPID)

The RAPID funding mechanism is used for proposals having a severe urgency with regard to availability of, or access to data,

facilities or specialized equipment, including quick-response research on natural or anthropogenic disasters and similar unanticipated events. PI(s) must contact the NSF program officer(s) whose expertise is most germane to the proposal topic before submitting a RAPID proposal. This will facilitate determining whether the proposed work is appropriate for RAPID funding. For guidelines, see the most recent version of the NSF Grant Proposal Guide (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg).

Grant Opportunities for Academic Liaison with Industry (GOALI)

Grant Opportunities for Academic Liaison with Industry (GOALI) promotes university-industry partnerships by making project funds or fellowships/traineeships available to support an eclectic mix of industry-university linkages. Special interest is focused on affording the opportunity for:

- Faculty, postdoctoral fellows, and students to conduct research and gain experience in an industrial setting;
- Industrial scientists and engineers to bring industry's perspective and integrative skills to academe; and,
- Interdisciplinary university-industry teams to conduct research projects.

GOALI targets high-risk/high-gain research with a focus on fundamental research, new approaches to solving generic problems, development of innovative collaborative industry-university educational programs, and direct transfer of new knowledge between academe and industry. GOALI seeks to fund transformative research that lies beyond that which industry would normally fund. More information can be found at http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504699.

III. AWARD INFORMATION

Depending on the nature of the proposed activity, projects will be supported either as standard of continuing grants or cooperative agreements. The award size will be determined based on the nature of activities and at a level that would be enabling, as well as the availability of funds. Proposers are strongly encouraged to develop a carefully crafted budget in line with the scope and scale of the project. The role and budget for each investigator (PI, co-PI, collaborator) should also be commensurate with the activities proposed. An investigator may submit only one proposal as a principal investigator, a co-principal investigator, or senior personnel for whom funds are requested in response to this Program Solicitation. Proposals received in excess of this single proposal limit will be returned without review. The estimated number of awards is 10-20, pending availability of funds. The earliest anticipated award date is October 2015. Approximately $15 million is available for new awards supported through this solicitation, pending availability of funds.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Proposals may only be submitted by U.S. academic institutions accredited in, and having a campus located in the U.S., U.S. non-profit research organizations including museums, research laboratories, professional societies and similar organizations in the U.S. that are directly associated with educational or research activities, and consortia of only the eligible organizations listed here. When a consortium of eligible organizations submits a proposal, it must be submitted as a single proposal with one organization serving as the lead and all other organizations as subawardees. Separately submitted collaborative proposals will be returned without review. Organizations ineligible to submit to this program solicitation may not receive subawards.

Who May Serve as PI:

For the Mid-Career Investigator Awards in Plant Genome Research [MCA-PGR] only: Individuals should have an independent, non-tenure track or tenure track position at a U.S. academic or non-profit research institution, have an active research program, and have received training primarily in fields other than plant genomics. Individuals eligible for a MCA-PGR award will be seeking training in a new area of plant research that employs genomics technologies and resources.

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Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 1

Please note that there continues to be a limit on the number of proposals in which an investigator can be included. An investigator may submit only **one** proposal as a principal investigator, co-principal investigator, or senior personnel for whom funds are requested in response to this Program Solicitation. Proposals received in excess of this single proposal limit will be returned without review.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

See Chapter II.C.2 of the GPG for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the GPG instructions.

Proposal Cover Sheet: For RESEARCH-PGR proposals only, the project title must start with "RESEARCH-PGR: ...". For TOOLS-PGR proposals only, the project title must start with "TOOLS-PGR: ...". For MCA-PGR proposals only, the project title must start with "MCA-PGR: ...". For ECA-PGR proposals only, the project title must start with "ECA-PGR: ...". When completing the Cover Sheet, click on the GO button at "Program Announcement/Solicitation/ Program Description No." Highlight Plant Genome Research Project and click on the Select button. Your proposal will automatically be assigned to IOS--Plant Genome Research Project. Grants.gov Users: The program solicitation number will be pre-populated by Grants.gov on the NSF Grant Application Cover Page. Grants.gov users should refer to SectionVI.1.2. of the NSF Grants.gov Application Guide for specific instructions on how to designate the NSF Unit of Consideration. Be sure to complete the remainder of the cover sheet information. Please note that a maximum of 4 Co-PIs can be listed on the cover page.

Additional Co-PIs and other Senior Personnel should be included in the complete list provided in the Project Summary.

BIO Proposal Classification Form (PCF): Complete the BIO PCF, an on-line coding system that allows the Principal Investigator to characterize his/her project when submitting proposals to the Directorate for Biological Sciences. Once a PI begins preparation of his/her proposal in the NSF FastLane system, selects any program within the Directorate for Biological Sciences as the first or only organizational unit to review the proposal, and saves the cover sheet, the PCF will be generated and available through the Form Preparation screen. Additional information about the BIO PCF is available in FastLane at http://www.fastlane.nsf.gov/a1/BioInstr.htm.

Grants.gov Users: Refer to Section VI.5. of the NSF Grants.gov Application Guide for specific instructions on how to submit the BIO Proposal Classification Form.

Project Summary: Project Summaries must include three sections:

- An Overview Section: In addition to the requirements in the GPG, this section must include a list of senior personnel (PI, Co-PIs, key-collaborators) along with their home institutions;
- A Statement on Intellectual Merit; and,
- A Statement on Broader Impacts.

The summary should be written in the third person, informative to those working in the same or related field(s), and understandable to a scientifically or technically literate reader. **Proposals that do not separately and explicitly address the overview and both intellectual merit and broader impacts in the Project Summary will not be accepted by FastLane or will be returned without review.**

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

- Results from prior NSF support (maximum 5 pages): Only the most relevant prior award (PGRP or non-PGRP) should be listed in this section for the PI and Co-PIs listed in the "Project Summary." In addition to results from relevant NSF awards, results from any other closely related awards from the Federal government should be described if applicable.
- Relevance and justification: Briefly, but explicitly, explain the relevance of the proposed research to the stated goals of the PGRP.
- 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. In addition, if there is a planned collaboration(s) for which a letter of collaboration is provided, the project description should also include a detailed description of the nature of collaboration, the role of collaborator(s), and the expected outcomes/deliverables.
- A statement of the broader impacts of the proposed activities. As per guidance in the GPG, the Project Description must contain, as a separate section within the narrative, a statement labeled "Broader Impacts of the Proposed Work". PIs can decide where to include this statement within the Project Description. The statement should include a discussion of the potential of the proposed activities to benefit society and contribute to the achievement of specific, desired societal outcomes. In addition, the statement should include a discussion of the planned activities that integrate research and education. NSF expects that each proposal will include a thoughtful training and/or educational component that takes advantage of unique and specific opportunities the proposed project would provide. The scale of the training and educational activities should be commensurate with the scale and scope of the proposed research and integrated well into the overall project plan. Broadening participation of members of underrepresented groups and small colleges and universities is especially encouraged. The following items should be included if larger scale training activities are proposed: (1) a well-designed plan to increase participation of members of under-represented groups and small colleges and universities that is specific to the proposed project; (2) a plan for a workshop to train other researchers in new concepts or techniques being developed by the project; (3) an education plan which can be (but is not limited to) a training plan for students at all levels, an outreach activity for secondary school teachers and students, or an outreach activity that brings science to the general public; and (4) a description of how these plans are integrated with the proposed research plan. A clear and realistic discussion of how the plan will be implemented along with metrics that will be used to gauge the outcome

of the activities should be included in the proposal. Simply describing general policies and ongoing efforts at the investigators' institutions or activities that are normally within the scope of the PI's employment, such as teaching and course development, will not be sufficient.

References Cited: Indicate with an asterisk any cited publications that resulted from prior research funded by NSF for the PI, or Co-PI when following the GPG guidelines for all references cited.

Biographical Sketches (2 pages each): Biographical sketches following the GPG guidelines must be listed for the PI, Co-PIs and each of the Senior Personnel listed on the Project Summary page.

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 each budget submitted. A careful and realistic budget that is consistent with the proposed activities will add to the overall strength of a proposal. Funds for facility construction or renovation may not be requested. Funds to cover the cost of attendance of the PI at each year's annual awardee meeting in Arlington, VA should be requested.

Current and Pending Support: Current and Pending Support following the GPG guidelines must be listed for the PI, Co-PIs and each of the Senior Personnel and Key Collaborators listed on the Project Summary page.

Facilities, Equipment and Other Resources: Provide a description of available facilities and priorities for their use. For projects requiring additional equipment, justify the need for these resources in the context of the innovative work proposed.

Special Information and Supplementary Documentation:

Include the following materials in addition to the Project Description. These materials should be labeled clearly and included in the Supplementary Documents section of FastLane or Grants.gov. Provide only the allowable and applicable items as noted in the GPG or NSF Grants.gov Application Guide and this section. Include the materials in the proposal by transferring them as .PDF files through the "Supplementary Docs" module of FastLane or Grants.gov.

(A-1) Sharing of Results and Management of Intellectual Property (maximum 3 pages): Describe the management of intellectual property rights related to the proposed project, including plans for sharing data, information, and materials resulting from the award. This plan must be specific about the nature of the results to be shared, the timing and means of release, and any constraints on release. The proposed plan must take into consideration the following conditions where applicable:

- Sequences resulting from high-throughput large-scale sequencing projects (low pass whole genome sequencing, BAC end sequencing, ESTs, full-length cDNA sequencing, etc.) must be released according to the currently accepted community standard (e.g. Bermuda/Ft. Lauderdale agreement) to public databases (GenBank if applicable), as soon as they are assembled and quality checked against a stated, pre-determined quality standard. "At publication" is not acceptable.

- Proposals that would develop genome-scale expression data through approaches such as microarrays or next-generation sequencing should meet community standards for these data (for example, Minimum Information About a Microarray Experiment or MIAME standards). The community databases (e.g. Gene Expression Omnibus) into which the data would be deposited, in addition to any project database(s) should be indicated.

- If the proposed project would produce genome-scale data sets generated using proteomics and/or metabolomics approaches, NSF expects that they be made available as soon as their quality is checked to satisfy the specifications approved prior to funding. The timing of release should be stated clearly in the proposal. The community databases into which the data would be deposited, in addition to any project database(s) should be indicated.

- If the proposed project would produce community resources (biological materials, software, etc.), NSF encourages that they be made available as soon as their quality is checked to satisfy the specifications approved prior to funding. The timing of release should be stated clearly in the proposal. The resources produced must be available to all segments of the scientific community, including industry. A reasonable charge is permissible, but the fee structure must be outlined clearly in the proposal. If accessibility differs between industry and the academic community, the differences must be clearly spelled out. If a Material Transfer Agreement is required for release of project outcomes, the terms must be described in detail.

- When the project involves the use of proprietary data or materials from other sources, the data or materials resulting from NSF funded research must be readily available without any restrictions to the users of such data or materials (no reach-through rights). The terms of any usage agreements should be stated clearly in the proposal.

- Budgeting and planning for short-term and long-term distribution of the project outcomes must be described in the proposal. If a fee is to be charged for distribution of project outcomes, the details should be described clearly in the proposal. Letters of commitment should be provided from databases or stock centers that would distribute project outcomes, including an indication of what activities would be undertaken and funds needed for these activities (if any).

- In case of a multi-institutional proposal, the lead institution is responsible for coordinating and managing the intellectual property resulting from the PGRP award. Institutions participating in multi-institutional projects should formulate a coherent plan for the project prior to submission of the proposal.

IMPORTANT: Appendix A-1 is submitted as a supplementary document in lieu of the DATA MANAGEMENT PLAN (DMP) required of all proposals submitted to NSF (see GPG Chapter II.C.2.j). Because the DMP is required, FastLane will not allow submission of a proposal with a DMP in excess of the 2-page maximum. For this reason, please submit as a supplementary document and add the text "SEE APPENDIX A-1 UPLOADED AS A SUPPLEMENTARY DOCUMENT" to the DMP field in FastLane.

(A-2) Management Plan (maximum 5 pages): Projects involving multiple investigators and multiple institutions, or which include a community service component, must provide a description of the management plan for coordinating the activities of the group or management of the service aspect.

- This description should include plans for internal means of communication, coordination of data and information management, evaluation and assessment of progress, allocation of funds and personnel, interaction with the customers in a service project, and other specific issues relevant to the proposed activities.

- For multi-investigator proposals, a table summarizing the role of each investigator is required. The exact time commitment of each key project member should be indicated in the management plan, regardless of any request for his/her salary from NSF. For community resource projects, a timetable with yearly goals should be provided that includes benchmarks for the major anticipated outcomes and expected dates for their release.

- If the proposal includes a service component such as a multi-user facility or production and distribution of community research resources, a description of how activities within the facility will be managed, how quality will be controlled, how

community input will be solicited, what methods will be used to make the community aware of the service to be rendered, and how the community will access resources to be produced, should be provided. The plan should also document institutional commitment to the facility, user fees if anticipated, and plans for long-term support after the end of the project. For a complex project, appointment of a project manager and/or administrator is strongly encouraged.

- The NSF encourages appointment of an outreach/education coordinator where appropriate. A postdoctoral fellow or a senior graduate student interested in education and outreach activities may be appointed to this role.

(A-3) Coordination with Outside Groups (maximum 2 pages): If the proposed activity is part of a national or international collaborative project, describe the relationship of the proposed activity to the overall collaborative project and how the components will be coordinated.

(A-4) Responses to Prior Reviewer Comments (**OPTIONAL**; maximum 1 page): If the proposal is a resubmission, describe any changes made in response to prior reviewer comments. Use of this Appendix is optional: you are not required to indicate whether or not a proposal is a resubmission or address prior reviewer comments. However, it is important to note that, as per the NSF Proposal & Award Policies & Procedures Guide (PAPPG), a proposal that was previously reviewed and declined by NSF will be returned without review if it has not been substantially revised since the last submission.

(A-5) Plans for Undergraduate and Graduate Student Mentoring (maximum 1 page):All proposals that include funding to support undergraduate or graduate students must include a description of the mentoring activities that will be provided for all such individuals, regardless of location. This part of the proposal will be evaluated under the Foundation's broader impacts merit review criterion.

(A-6) Training Plan (for MCA-PGR proposals only; maximum 1 page): A training plan for mid-career investigators should include: 1) a brief and informative introduction or background section on current research and expertise; 2) a statement of training objectives and plan for achieving them (these may include scientific as well as other career preparation activities); and 3) an explanation of how the proposed activities will enhance the applicant's career development and transition of research to the field of plant genomics; and 4) any curriculum development or enhancements that would result from the support.

Proposals that contain any material not specifically requested or in excess of the page allowances will be considered noncompliant and may be returned without review. It is the submitting institution's responsibility to ensure that the proposal is compliant with the guidelines.

Letters of Collaboration. Supplementary Documents may include letters of collaboration from individuals or organizations that are integral parts of the proposed project but are not supported by subawards. Such involvement may include subsidiary participation in some aspect of the project, cooperation on outreach efforts, or documentation of permission to access materials or data. Letters of collaboration should include a detailed description of the nature of the collaboration, the role of collaborators, and the expected outcomes/deliverables. All letters of collaboration should be uploaded as Supplementary Documents.

Letters of collaboration should not be provided from any individual designated as a principal investigator or senior personnel, nor are letters of collaboration required from any organization that will be a subawardee in the proposal budget.

Generic letters of general support are not allowed.

Combined Conflict of Interest Document. The template found at http://www.nsf.gov/bio/ios/ioscoitemplate.xlsx, contains a total of five tabs. Please read the Instructions carefully and follow guidance. Using the template, compile an Excel Workbook that identifies conflicts of interest (COIs) for all persons listed on the Proposal Cover Page, along with other senior personnel and/or collaborators and subaward lead(s). Conflicts to be identified are (1) Ph.D. dissertation advisors and advisees, (2) collaborators or co-authors, including postdoctoral researchers, for the past 48 months, (3) coeditors within the past 24 months, (4) spouse or other relative(s), and (5) any other individuals with whom, or institutions with which, the senior personnel (PI(s), co-PI(s), and any named personnel) have financial ties, including advisory committees (specify type), boards of directors, or prospective employees. With regard to publications developed by large consortiums, only co-authors that an individual has directly interacted with should be included as a conflict. Members of current Advisory Committees who receive reimbursement for travel or honoraria should be included in the last category. GPG Exhibit II-2 contains information on conflicts of interest that may be useful in preparation of this list.

Please follow the Instructions provided in the template. Do not use the temporary FastLane ID or a Research.Gov ID to fill out the COI template. You must use only an assigned NSF Proposal ID, which should be 7 digits long and will start with the fiscal year numbers (e.g., for FY15, all the Proposal ID's will start with "15"). Do not send in the COI template until you have been assigned the official NSF Proposal ID at the time of submission.

The completed Excel Workbook should be emailed to IOScoispreadsheet@nsf.gov**immediately after you submit your proposal, but no later than the proposal target date.**

In addition to the Conflict of Interest Document, other correspondence to the program not intended to be sent to reviewers can be uploaded as **Single Copy Documents**. Please note that key project personnel may be required, prior to an award decision, to submit copies of any intellectual property agreements or material transfer agreements they have signed, or are planning to sign, that would impact the unrestricted and timely distribution of the outcomes of the NSF funded research. Submission of a Single Copy Document will allow these documents to be reviewed by the NSF officials only, and they will remain confidential.

Checklist for Proposal Preparation

- **Title** - For RESEARCH-PGR proposals only, the project title must start with "RESEARCH-PGR: ...". For TOOLS-PGR proposals only, the project title must start with "TOOLS-PGR: ...". For MCA-PGR proposals only, title begins with "MCA-PGR: ....". For ECA-PGR proposals only, title begins with "ECA-PGR: ....".
- **Project Summary** consists of an overview, a statement on the intellectual merit of the proposed activity, and a statement on the broader impacts of the proposed activity.
- **Project Description** is 15 pages or less in length, including a separate section on the broader impacts of the proposed activities, as well as figures, tables, and information regarding planned collaborations for which letters of collaboration are provided
- **References Cited** includes publications resulting from prior research funded by NSF (marked*)
- **Biographical Sketches** (2 pages each) included for PI, Co-PIs and Senior Personnel listed in the Project Summary
- **Current and Pending Support Statements** included for PI, Co-PIs and Senior Personnel listed in the Project Summary
- **Appendices (A-1), (A-2), (A-3), (A-4), (A-5), and (A-6)** [if applicable] uploaded in Supplementary Documents
- **Supplementary documents** include letters of collaboration from databases or stock centers that would distribute project outcomes, if applicable. A **Postdoctoral Researcher Mentoring Plan** is required for proposal submission if support for postdoctoral researchers is requested. **Generic letters of support are not allowed.**
- **Combined Conflict of Interest document** generated using template and emailed to IOScoispreadsheet@nsf.gov immediately after submission of proposal, but no later than the proposal target date.

- It is highly recommended that **a list of 12 suggested reviewers** be entered into the appropriate tab on the **COI spreadsheet template**, including the individuals' names, institutions, and areas of expertise, email addresses and URLs if available. **Please contact a Program Director for guidance if you are unable to download the template .**

This checklist is not intended to be an all-inclusive repetition of the required proposal contents and associated proposal preparation guidelines. It is, however, meant to highlight certain critical items so they will not be overlooked when the proposal is prepared.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

C. Due Dates

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

  May 27, 2015

D. FastLane / Grants.gov Requirements

For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions 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.

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://www.grants.gov/web/grants/applicants.html. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical 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.

Proposers that submitted via FastLane are strongly encouraged to use FastLane to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

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/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. 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 strategic objectives 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 must recruit, train, and prepare a diverse

STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of 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

For proposals submitted to the MCA-PGR opportunity, reviewers will be asked to comment on the proposed training plan (Appendix A-6) and whether the proposed activities will enhance the applicant's career development and transition of research to the field of plant genomics.

For proposals submitted to the ECA-PGR opportunity, reviewers will be asked to comment on whether the proposed activities wll broaden the applicant's capabilities in plant genomics.

For proposals involving international collaborations, reviewers will be asked to assess the international collaboration in terms of mutual benefits, true intellectual collaboration among the international partners, benefits to be realized from the expertise and specialized skills, facilities, sites and/or resources of the international counterparts, and active research engagement of students and early-career researchers, where such individuals are engaged in the project.

For all proposals submitted, reviewers will be asked to comment on the data management plan (Appendix A-1) and the proposed plan for release of and access to project outcomes, including the timing and form of released resources, tools or materials. Reviewers will also be asked to assess plans for continued access, maintenance and/or operation of services past the lifetime of an award.

B. Review and Selection Process

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

Ad hoc and Panel Review.

One or two review panels will be assembled, depending on the number of proposals received. Some of the panelists may participate virtually.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. 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 strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

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. After an administrative review has occurred, Grants and Agreements Officers perform 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.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, 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.

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 notice, 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 notice; (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 notice. 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 no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 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.

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:

- Diane Jofuku Okamuro, Program Director, 685N, telephone: (703)292-4400, email: dbipgr@nsf.gov
- Anne W. Sylvester, 675.01N, telephone: (703)292-4400, email: dbipgr@nsf.gov
- Timothy Nelson, 685N, telephone: (703)292-4400, email: dbipgr@nsf.gov
- C. Eduardo Vallejos, 685N, telephone: (703)292-4440, email: cvallejo@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.
- Maya S. Anderson, 685N, telephone: (703)292-4400, email: manderso@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, "NSF Update" is an information-delivery system 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 Grants Conferences. Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. "NSF Update" also is available on NSF's website.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this 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 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:

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Reports Clearance Officer
Office of the General Counsel
National Science Foundation
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