

Response to Recommendations from the Committee of Visitors
Plant Genome Research Program
August 31 – September 2, 2010

Introduction

The Directorate for Biological Sciences (BIO) would like to thank the Committee of Visitors (CoV) for their efforts in evaluating the management and outcomes of the Plant Genome Research Program (PGRP) at NSF. BIO is aware of the extraordinary amount of work that the CoV members contributed before and during the meeting and is especially appreciative of their commitment to this important review. The thoughtful report that emerged from the CoV deliberations is appreciated highly by BIO and PGRP. BIO acknowledges the thoughtful responses to the questions posed to the CoV in Part C of this report. The recommendations regarding the ability to evaluate project outcomes and the CoV review process will be considered carefully and followed up to the extent possible.

Responses to the questions in Part D were also very thoughtful and will be helpful as the Program continues to evolve. PGRP plays a unique role within the National Plant Genome Initiative (NPGI) in supporting hypothesis-driven research at all scales as well as the development of tools and resources that impact directly or indirectly our understanding of the structure and functions of the genomes of economically important crop plants and plant processes of potential economic value. Within the NPGI and across NSF, there is the potential to coordinate efforts to best tackle the challenges of data management, access, analysis, and communication. PGRP can play a leadership role in this area. PGRP's role in training a new generation of scientists to best use the wealth of plant genome resources will be pivotal to achieving the maximum impact from its investments.

Recommendations and Responses

Recommendation: *If strong conclusions are to be made regarding the impact of efforts to improve participation of underrepresented groups, the PGRP needs to identify and implement ways to encourage the submission of demographic information by self-reporting.*

Response: BIO agrees that this information would be extremely useful and the PGRP will convey the COV's suggestions to the NSF-wide working group that is redesigning the NSF annual and final report templates. For its part, BIO will continue to ensure that all programs take steps to encourage self-reporting. Some strategies proposed included:

- Incorporating a discussion of why it is important to submit demographic info into outreach presentations and award letters
- Encouraging panelists to submit demographic information
- Encouraging PIs to report outcomes with respect to broadening participation when submitting progress reports
- Encouraging PGRP awardees to report outcomes at the Annual Awardee Meetings

Recommendation: *(With regard to the quality of the projects or the balance of the portfolio) The CoV feels that the concept of “appropriate balance” is one for which the program should provide more input about programmatic goals.*

Response: NSF is the only federal agency whose mission is to support research and education in all fields of fundamental science and engineering, except for the medical sciences. In addition to supporting cutting-edge basic research, NSF also strives to support “high risk, potentially high impact” research. Finally, the research supported by the NSF must be integrated fully with the education and training of the next generation of scientists. These considerations form the underlying guiding principles for achieving a well-balanced portfolio of research and education for all programs at NSF.

While these considerations are included in all BIO programs, projects that propose to create and/or use creative and novel approaches to address biological questions will always be the most competitive. BIO will continue to address portfolio balance at all levels in order to meet the NSF’s goals as articulated in the current Strategic Plan.

BIO also recognizes the importance of a balanced portfolio that addresses the mission of the PGRP as articulated by congressional mandate and by the current Five-Year plan for the NPGI. BIO plans to continue its efforts in this regard.

Recommendation: *The CoV strongly recommends adding another permanent program officer to PGRP.*

Response: BIO appreciates the CoV’s concern regarding staffing and has planned a search for a second permanent program officer for PGRP in FY 2011 with the goal of recruitment by September 2011. The scientific focus area for this position will include bioinformatics.

Recommendation: *The PGRP continue to use RAPID, EAGER, and challenge grants where a key emerging research opportunity is not yet generating sufficiently highly meritorious proposals in response to the annual program solicitation.*

Response: BIO agrees with this recommendation and will continue to encourage PGRP to use these funding instruments whenever appropriate. The Heterosis Challenge Grants, which were funded in FY 2009, will be evaluated to determine whether the outcomes provide new insights into a mechanistic understanding of heterosis. The RAPID and EAGER grants are relatively new and there is an opportunity to advertise these further in outreach presentations as a way to fund high-risk, high-payoff research. The PGRP plans to include a scientific session focused on currently funded EAGERS and RAPIDs at the 2011 Annual Awardee Meeting as a way to better inform the PI community about these funding opportunities.

Recommendation: *PGRP continues to support outreach activities to enhance science literacy for the general public and K-12 students, but not increase these efforts.*

Response: BIO infers from this recommendation that the CoV is satisfied with the level of support PGRP provides for outreach activities through its awards. Efforts will continue to encourage the leveraging and coordination of activities across PGRP-funded projects within and between institutions. In addition, projects with strong integration of research and outreach activities that enhance science literacy will be highlighted at the Annual Plant Genome Awardee Meeting to ensure that best practices are followed.

Recommendation: *PGRP should consider a postdoctoral fellowship program as part of PGRP to increase domestic competitiveness in plant genome-enabled research and translation.*

Response: BIO appreciates the CoV's recognition that postdoctoral training is essential for US competitiveness. BIO awards Postdoctoral Research Fellowships in Biology to recent recipients of a doctoral degree for research and training in selected areas supported by BIO and with special goals for human resource development in biology. Two areas have been selected for FY 2011: Broadening Participation in Biology and Intersections of Biology and Mathematical and Physical Sciences. PGRP is part of the National Plant Genome Initiative (NPGI), which is administered through the National Science and Technology Council Committee on Science Interagency Working Group on Plant Genomes (IWG-PG). The IWG-PG is in the planning stage of an umbrella NPGI Training Program, which would encompass existing programs within participating agencies and serve as a platform for cross-program training and mentoring, as well as development of interagency efforts at multiple levels. An interagency postdoctoral program with an emphasis on quantitative genetics, plant breeding, and bioinformatics is in development for FY 2011. PGRP plans to participate in this program in areas relevant to NSF and its mission.

Recommendation: *PGRP should consider implementation of a program-specific graduate training program competition. Additional funds may be required to underpin this effort.*

Response: BIO appreciates the need for training of graduate students and participates in NSF-wide programs such as the Integrative Graduate Education and Research Traineeship Program (IGERT). While there are currently no plans for a PGRP graduate program, it is in discussion under the umbrella NPGI Training Program. The Program recognizes that it will be important for there to be a focus area for an NPGI activity if the investments are to have maximum impact in areas relevant to the mission of PGRP.

Recommendation: *PGRP should encourage PIs to include project personnel (including PhD students, postdocs and undergraduates, if appropriate) to participate in all project meetings to further enhance the multidisciplinary nature of their training. If a postdoctoral program were established as recommended in Section A4.2, the CoV recommends that these postdoctoral associate be invited to participate in the annual PGRP Awardees meeting. Similarly a graduate training program would address this issue.*

Response: BIO appreciates these recommendations. Most PGRP projects include participation of all project personnel in project meetings and funds are provided in the awards to support their participation. Additional funds are often allocated to support exchange visits. In the past, the PGRP has also used its Annual Awardee Meeting to bring together beginning investigators with senior PIs for mentoring. Mentoring activities have included a luncheon with both young and senior PIs in attendance. The IWG-PG discussions of an NPGI Training program have also considered the importance of multidisciplinary training, something that is enhanced by the participation of multiple agencies.

Recommendation: *Continued encouragement and support of interagency standardization of data management and use of these databases is encouraged by this CoV.*

Response: BIO concurs with this recommendation. NSF support of these activities is informed by community input through workshops supported by NSF and BIO (e.g., the US-EC Task Force on Biotechnology Research Workshop on bioinformatics held in Hinxton, UK, December 2009, and the Genome Canada International Funders Forum on Data Release held in Toronto, May 2009). Coordination of activities, including NSF's iPlant Collaborative, the DOE KnowledgeBase, and ELIXIR in Europe, is enabled on a domestic level through the NPGI and on an international level through groups such as the US-EC Taskforce on Biotechnology.

Recommendation: *The CoV felt that additional efforts and funding mechanisms within PGRP are needed to improve data handling and widening community access to analytical software tools.*

Response: BIO is cognizant that a current bottleneck to extracting the maximum value from its investments in large-scale resources and datasets lies in data handling, analytical tools, and broad community access in the most useful formats. The “Tools and Resources for Plant Genome Research” (TRPGR) opportunity in the PGRP Program Solicitations includes as focus areas: “Improved tools for sequence assembly and analysis, especially to enable effective use of sequence data produced by next-generation machines” and “Improved annotation tools for plant genomes”. In FY 2011, the PGRP Program Solicitation will include “Challenge Grants for Improving Plant Genome Annotation (IPGA), which will provide support for the improvement of existing annotation software as well as the development of new tools and algorithms. These efforts are being coordinated with other investments in the iPlant Collaborative, as well as programs in Computer & Information Science & Engineering Directorate and in the Office of Cyberinfrastructure.

Recommendation: *The CoV calls attention to certain agency-wide issues, cognizant of the fact the PGRP is likely aware of them and that the issues may be in the process of resolution.*

Issue 1: Restricted ability to evaluate project outcomes

Issue 2: Lack of guidance in broader impacts text in proposals, either in new proposals or in describing results from prior support

Issue 3: Challenges in understanding the long-term goals and progress in broadening participation.

Response: BIO agrees that this information would be extremely useful and the PGRP will convey the COV’s suggestions to the NSF-wide working groups that are redesigning the NSF annual and final report templates as well as addressing the impacts of efforts to broaden participation at all levels.

Recommendation: *With respect to how to improve the CoV review process, format and report template,*

Recommendation 1: *Provide a more explicit set of instructions for the CoV Chair and panelists in the Readme File to facilitate a more efficient use of time at the meeting. Particularly helpful would be a potential breakdown of workload assignments for individuals or groups that reflect the aggregated wisdom of previous CoV committee Chairs (e.g., what to read ahead of time, things to avoid, etc.)*

***Recommendation 2:** It would be helpful if all components of a given jacket could be downloaded as a single document, or if specific parts of all jackets could be downloaded (e.g., all panel summaries for the portfolio)*

***Recommendation 3:** The panel Wiki should be made available for comments prior to the CoV meeting.*

Response: BIO appreciates these suggestions and will consider implementing them for future CoVs. In addition, these suggestions will be forwarded to the NSF-wide working group responsible for oversight of the CoV process.

***Recommendation:** The CoV strongly recommends broadening the PGRP's portfolio to encompass the diversity of both agronomic and non-agronomic plant species best suited to address the biological process under study.*

Response: As congressionally mandated, the mission of the PGRP is to focus on economically important crops and plant processes of potential economic value. Focusing on crops of economic importance to the U.S. has allowed NSF to capitalize on the expertise of the U.S. research enterprise to develop foundational tools for reference species and the linking resources to enable leveraging to address biological processes of agronomic importance. BIO agrees that the use of both agronomic and non-agronomic plant species is useful. In recognition of this, the PGRP has for many years supported projects through the Transferring Research from Model Systems (TRMS) focus area which seeks to transfer the knowledge gained in a model system to uncover basic mechanisms underlying important traits in plants of economic importance. In addition, two comparative sequencing competitions were offered by PGRP in FY 2006 and FY 2010, supporting resources for a wide range of non-crop plants. Throughout PGRP, a significant number of projects utilize resources available for model plant systems such as Arabidopsis to expedite gene function analysis and validation.

***Recommendation:** Many PGRP projects are interdependent on efforts of the iPlant initiative that is managed outside of IOS: PGRP should shepherd a more transparent coupling of research infrastructure development projects funded by PGRP with the iPlant initiative.*

Response: Many of the Principal and Co-Principal Investigators of PGRP-supported projects are already participating in the iPlant Collaborative Grand Challenge process. In addition, the iPlant Collaborative leadership (Stephen Goff and Dan Stanzione) have participated in the last two annual PGRP Awardee meetings to provide updates on the project and its activities. Within NSF, the BIO iPlant Management team includes a PGRP Program Director to ensure strong coordination across projects.

Recommendation: *The PGRP should continue to encourage the use of a few “standardized” databases for data deposition for PGRP-funded projects, e.g., for omics data, data visualization with existing standards for highly used data repositories, e.g., NCBI, TAIR, and Gramene*

Response: The Bio Directorate agrees with this recommendation. However, there are some constraints:

- PGRP does not dictate which database a community would use to access data; this is community-driven and often reflects the types of data involved.
- The PGRP policy has been to direct the PI to discuss with colleagues and with curators of the databases and provide the Program a plan for both short- and long-term storage and dissemination.
- It is not within the scope of PGRP to provide support for TAIR; this support comes from other NSF programs.

Recommendation: *The PGRP should cautious about funding new databases, but should maintain/improve the most highly used ones. While PGRP is committed to development of new software tools, it is not clear which agency has the role of long-term maintenance, organization and integration of them. This should be a topic under consideration by the IWG.*

Response: The Bio Directorate concurs with this recommendation and this has been a guiding principle for PGRP database investments from the beginning. For many years, although the PGRP has supported project databases for daily use by project personnel, it has always been the expectation that data be deposited and disseminated long-term by funded repositories such as GenBank, GEO, and ArrayExpress. At the time of funding, projects must have submitted both short- and long-term plans for data and germplasm storage and dissemination that include timelines for deliverables. The IWG-PG does indeed consider issues related to long-term maintenance, organization and integration. The USDA Agricultural Research Service (ARS) plays a leadership role since it provides long-term maintenance and operations support for the major crop databases.

Recommendation: *(With respect to the most effective approaches for ensuring that scientists at all levels are equipped with appropriate skills to participate in multidisciplinary, collaborative, and integrative research,) PGRP should consider being explicit in asking applicants to address the graduate student and postdoctoral experience in terms of this issue.*

Response: This is already required. The PGRP Program Solicitations clearly state that “proposals that provide strong and novel training opportunities integral to the research plan, and particularly across disciplines, are especially encouraged.” In addition, the current NPGI Five-Year Plan emphasizes the need for “interdisciplinary training in key areas such as bioinformatics, quantitative genetics, and breeding”.

Recommendation: *The CoV also notes its recommendation that PGRP consider program-specific postdoctoral fellowship and graduate training modules.*

Response: BIO participates in programs focused on providing support for postdoctoral fellows and graduate students. Proposals submitted to the IGERT and Postdoctoral Fellowships in Biology focused on training in the plant sciences would be competitive. As noted elsewhere, PGRP plans to participate in an NPGI postdoctoral training program in FY 2011.

Recommendation: *(With respect to encouraging or inviting scientists who might not otherwise “connect” into collaborative contexts,) The CoV encourages PGRP to continue such efforts, with the proviso that their success can be meaningfully evaluated.*

Response: The BIO Directorate agrees with this recommendation regarding broadening participation and assessing outcomes. BIO and the PGRP will continue to reach out to faculty at small colleges and primarily undergraduate institutions. The Division of Integrative Organismal Systems (IOS), which houses PGRP, has developed a coordinated plan for reaching out to scientific societies whose activities are relevant to the science it supports. The American Society for Plant Biologists (ASPB) is one of the societies contacted and the intention is to support outreach workshops that will broaden participation in PGRP.