

Advisory Committee Meeting Minutes
Directorate for Biological Sciences
September 28-29, 2015
National Science Foundation
Room 1235

BIO AC Members in Attendance:

May Barenbaum	Wilfredo Colon	Greg Florant
Steve Goldstein	Katherine Gross, Chair	Linda Hyman
Elizabeth Kellogg	Susan Marqusee	Gaetano Montelione
Randy Nelson	Michael Purugganan	Wendy Raymond
Stacia Sower	Joan Strassmann	Brett Tyler
Paul Turner		

BIO AC Members in Remote Attendance: Richard McCombie

BIO AC Members not in attendance: Hannah Carey and Margaret McFall-Ngai

Monday, September 28

Welcome – Kay Gross, Chair, BIO AC

Dr. Kay Gross opened the meeting by welcoming everyone, asking for introductions of the committee members, NSF staff, and guests, and then reviewing the agenda.

Dr. Chuck Liarakos provided an overview of the meeting logistics including Federal Advisory Committee Act rules, the role of the AC in providing advice to BIO. There is a need to appoint a representative to the Advisory Committee for Environmental Research and Education (ACERE) as Dave Schimel has had to resign from the BIO AC

The summary minutes from the April 2015 BIO AC meeting were approved.

Public access – Melissa Cragin, BIO, Office of the Assistant Director

Dr. Cragin presented two items that are important to directorate-level activities:

- guidance for reviewers and program officers to consistently review Data Management Plans (DMP); and
- updates to BIO's guidance on data management plans for investigators.

The AC discussed the availability of an electronic version of the guidance, and the availability of guidance on evaluating the DMP during review.

INFEWS – Paula Mabee, DD, DEB

Dr. Mabee reviewed the cross-cutting nature of Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS) and its importance in helping us understand and mitigate changes that affect the environment. The INFEWS Dear Colleague Letter (DCL) released in the spring of 2015, resulted in 17 workshop award recommendations totaling \$1.2M. Supplements totaling \$6 million were provided to awards across the foundation. Dr. Mabee reported on a DCL issued by Chemistry and Engineering to advance understanding of nitrogen and phosphorus cycles, and the development of a cross-directorate FY2016 INFEWS solicitation with the National Institute of Food and Agriculture (NIFA) as a potential partner.

Following the presentation, the AC discussed the inclusion of food-related foci, working with USDA, and inclusion of funds into programs to support the initiative.

Reproducibility – Jim Olds, AD, BIO

Dr. Olds shared results from a recent meeting at which the White House discussed concerns about research reproducibility. For NSF, this relates to the robustness of the research the Foundation supports. Dr. Olds acknowledged that heterogeneity exists in domains across the science that the Foundation supports and so a one-size approach may not work. Dr. Olds pointed out that scientific misconduct is often being confused with science reproducibility, and communicating that reproducibility issues are not the same as science misconduct is important.

The AC discussed the impact of the reproducibility issue and how the issue is considered in different areas of biological science research. The committee spoke to issues of sample size, the idiosyncratic nature of some research, and that the specifics of protocols can all affect reproducibility, and the primary importance of responsible conduct of research.

Understanding the Rules of Life (URL) - Jim Olds

Dr. Olds presented an overview of his vision of the BIO Directorate that focuses on how rule sets can yield incredible diversity and complexity. The question that frames his vision is, is there a rule set for life? The challenge for biology is not just to define the rules of biology as we know it, but to consider how these rules change across biological scales and levels of complexity. Dr. Olds described how initiatives in BIO, such as synthetic biology, genotypes to phenotypes, and INFEWS, could inform the understanding of the rules of life. He emphasized the importance of training and infrastructure to accomplishing the vision. His vision includes understanding the landscape of research that BIO supports, and the universal role the cycle of observation, experimentation, and theory and modeling will play in elucidating the rules of life.

Following Dr. Olds' presentation the BIO AC discussed opportunities for using this framework as a focus of BIO. The AC expressed enthusiasm to work with BIO to fulfill the vision.

NEON community engagement – Jim Olds and Kay Gross

Dr. Olds provided an update on the challenges that the NEON scientific and administrative team has faced and the steps that are being made to address this. Dr. Olds reviewed the history of events leading to the current status of NEON and the corrective process that has occurred since June 2015. Dr. Olds made clear that BIO is dedicated to making the necessary changes to the management of the organization that will ensure delivery of NEON on time, within budget, and able to deliver the scientific infrastructure that it was intended to support.

Dr. Gross shared a letter written by the current and past ESA presidents to the community. The letter stressed the support of the ecological community for the project and their enthusiasm for working with NEON to achieve its potential. She also detailed a charge to a subcommittee of the BIO AC to evaluate the revised proposed scope of the project in comparison to its original design. She named the potential members of the subcommittee and the BIO representative. The requested delivery date for the report is Nov. 1st, 2015.

Highlighted topics of discussion include:

- technology refreshment;
- innovation;
- community engagement;
- increased communication of NEON's capabilities;
- monitoring of NEON progress towards goals; and
- expectations of issues associated with ambitious, complex projects.

Big Data and Research Directions Discussion – Jim Deshler, DDD, DBI

Dr. Deshler presented a summary of activities in BIO in regard to Big Data needs for research and led a discussion of two questions:

- More and more facilities are producing complex data sets. How will large and diverse data collections, cross-disciplinary funding initiatives, and multidisciplinary collaborative research teams change the practice of biological research?
- What can BIO do to promote (and support) these evolving opportunities?

Data producers are not always data consumers and new efforts must be informed by past efforts. Dr. Deshler provided examples of how BIO addressed big data challenges. He detailed two types of science drivers: NSF-wide drivers (e.g., BRAIN initiative and INFEWS) and drivers within BIO (e.g., genomes to phenomes and multi-scale integration). He described the parameters that matter for labor-intensive efforts, such as the scale of investments, time-phased efforts, and the scope of investments.

The AC's discussion was premised on BIO being the driving force on the proposed ideas and highlighted topics included:

- opportunities for partnering with other directorates;
- increasing community engagement related to "big science;"
- broadening participation in analyzing and accessing data;
- providing research awards for smaller institutions to engage with larger ones;
- centers for infrastructure development and tools;
- prioritization of emergent technology or analysis of data; and
- training to use tools already available.

Dr. Gross wrapped-up the discussion by asking the BIO AC to think about whether a subcommittee should be formed to address any of these topics.

Breakout Sessions with BIO AC and BIO Senior Managers:

BIO organized breakout groups composed of AC members and BIO senior managers to solicit expert opinion on graduate and postdoctoral education. The three areas of inquiry were:

1. NSF Investments in Graduate Education: Five Year Strategic Plan
 - a. What are we doing and is it effective?
 - b. Does this promote diversity in biology graduate education?
2. NSF investments in postdoctoral training
 - a. What are we doing and is it effective?
 - b. Does this promote diversity in the scientific workforce?
3. Big Data and Graduate/Postdoctoral Education
 - a. What are opportunities for collaborating with other agencies and organization?

Breakout Session Reports and General Discussion

Group 1 (Randy Nelson):

The group led with the concern that these questions are difficult to address without outcome data and data related to how students are supported. The group recognized the difficulty of addressing outcomes because of the potential diversity of the outcomes; e.g., how can outcomes that are not in academia be tracked? Mechanisms may already exist that could be used for tracking. The group reached a consensus on the importance of investing in understanding outcomes, and suggested that grants also include graduate student mentoring plans paralleling what is currently required for postdocs.

There was also discussion of the need for graduate programs to establish a more welcoming environment to promote diversity, and suggested that training grants and additional support for alternative career tracks may play important roles in improving diversity. Key questions raised in discussion included: should there be a mentoring plan in the broadening participation section of the proposal, and could the REU program be used as a clearinghouse for training opportunities? Finding effective ways to promote diversity in applicant pools and sharing experiences that are successful for recruitment and retention need to be identified and supported, perhaps as part of the Broader Impacts of proposals.

Group 2 (May Barenbaum):

Post-docs provide cost-effective and important skills needed to advance science. The group felt that funding through the Postdoctoral Research Fellowships in Biology (PRFB) program should be targeted and made available directorate-wide rather than “top down”. The group discussed a need to recognize a career track similar to *research associate* that would be available for individuals after fulfilling NSF (and other) post-doctoral traineeships/fellowships. Lacking the ability to track careers was noted as a hindrance to answering the second question.

The BIO AC discussed the constraints that the current 2-month salary cap for senior project personnel (i.e., principal investigators and faculty associates/members) on NSF-sponsored projects and its implications for retaining professionals who are not post-docs or faculty.

Group 3 (Elizabeth Kellogg):

Group 3 also discussed concerns about career tracking, particularly for post-doctoral trainees with strong computational skills. The group proposed retraining post-docs in computational methods to teach workshops or be at institutions in computational training/mentoring positions. The group suggested it may be important to add a training track on data analysis and techniques.

The group grappled with how to address the *Understanding the Rules of Life* (URL) concept in terms of big data and computation. Being able to visualize URL was seen as an important aspect. What collaborations could exist with other agencies or groups like DARPA, CISE, or private organizations? Highlights of the discussion include:

- inclusion of scientists from different career stages and disciplines on major challenges;
- student training and tuition support from NSF;
- alignment of post-doctoral training years and child bearing years;
- heterogeneity of “post-doctoral trainee” definition; and
- public-private partnerships for the training of students.

Preparation for Director’s visit

The BIO AC identified three topics for its discussion with Dr. Córdoba.

Visit with Dr. France Córdoba, Director, NSF

Dr. Gross welcomed Dr. Córdoba and asked for an update on public engagement and workforce diversity efforts.

Dr. Córdoba thanked the AC and provided an update on several topics including: NSF’s public access activities and guidance related to the repository system and Data Management Plans; projects and programs focused on workforce diversity; and potential activities related to the collection of data on graduate student training and tracking of students.

Dr. Córdoba and the advisory committee members discussed several topics including Dr. Olds’ vision for BIO and the BIO AC’s excitement to assist in implementing the Understanding the Rules of Life theme as a focus for BIO and developing a strategic vision for BIO. There was also discussion of training needs and assessment. Dr. Córdoba summarized the status of NEON and discussed with the AC the importance of communication about NEON and the review of its scope. The session ended with discussion of the *Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science* program and related topics, which included scaling of best practices, funding for community colleges, REU-like programs for community colleges, alternative research experiences for students, and private industry partners for community college programs.

Dr. Gross concluded the session by stating the AC looks forward to the challenges ahead. Dr. Córdoba expressed appreciation of the BIO AC’s support.

The Chair adjourned the meeting for the day.

Tuesday Sept 29

Reconvened at 9 am by the Chair.

DEB COV Report and BIO Response – Paul Turner, BIO AC

Dr. Turner provided a summary of the Committee of Visitors (COV) evaluation of DEB and applauded DEB for its dedicated staff and responsiveness to the committee's requests.

The COV found no major problems within DEB, but their report produced 23 recommendations and identified four areas of concern that were in the DEB COV report, specifically for years 2012-2014:

- The preliminary proposal process: A major concern was that panel reviews of pre-proposals may not be providing sufficient and substantive feedback to investigators. There is a concern that the reviews are only justifying the invite/do not invite decision. The COV was concerned there may also be inadequate broader impact and methodology details included in the proposals, and a corresponding lack of feedback after the panel.
- Confusion surrounding evaluation of broader impacts: There appears to be a continuing diversity of opinions among proposal reviewers on how to evaluate broader impacts.
- Diversity of reviewers in pre-proposal panels: Challenges remain in composing pre-proposal panel-only reviews that have sufficient expertise.
- Workload concerns: There remains a need for additional staffing support for the program officers. Additional support would allow program officers to focus more on scientific issues and less on administrative activities.

Dr. Alan Tessier (DDD, DEB) responded that the COV report represented a fair evaluation of the key issues. He stated it is important to not underestimate how fundamental the change was to transition to the pre-proposal process. The division is comfortable with the way the process has unfolded. An external assessment of the process will take place, it will be accomplished through a contract, and will take one year to complete.

The AC discussed staffing progress, the breadth of pre-proposal panels, the external evaluation of the pre-proposal process, the confusion surrounding the development and review of broader impacts, and the unexpected consequences of changes to ease workload challenges.

The DEB COV report and response were unanimously approved.

The role of the Division of Biological Infrastructure (DBI) in enabling the changing practice of biological research and education - Jim Deshler and Anne Maglia, DBI

Dr. Deshler reviewed DBI's mission, structure, and function. DBI's mission is to empower biological discovery by supporting the development and enhancement of biological resources, human capital, and centers. Dr. Deshler stated that the leadership in DBI wants to understand how well DBI programs support the scientific research in MCB, IOS, and DEB. He pointed out the need to understand the "sticky edges" and overlap of DBI's community with the other divisions' research communities. He presented data from DBI's portfolio, including a general portfolio evaluation in which proposals were tagged for their relevancy to other divisions' programs, and reviewed a survey of DBI-funded investigators.

Following Dr. Deshler's presentation, the BIO AC members discussed several related topics, including: collection of data using social media; tracking students funded by DBI; the size and duration of research improvement grants; Centers' relevant activities, such as community building and storage and analysis of data; the increased utilization of iPlant; the potential National Brain Observatory and the inclusion of an international component; increased investments in developing tools to assist in the analysis of big data; and the need for a broadening participation report.

Strategic Planning and Wrap-up

Dr. Gross asked the BIO AC members to think about focal areas for a strategic vision for the biological sciences, asked for input on this, and on a schedule for implementing the plan to deliver that vision. She asked AC members to consider nominations of new members to the AC to replace those whose terms have ended. Dr. Olds asked the BIO AC to focus on developing a strategy for BIO, rather than tactics because the strategy would help BIO lead the

tactical implementation of the vision. It would be useful to BIO for the AC to identify the sticky edges between the areas of science BIO represents and to identify the low hanging fruit or paradigm-breakers that BIO should focus on.

The BIO AC debated the use of the title “Understanding the Rules of Life” and the connotations associated with its use and approaches to overcome potential obstacles as a theme for a strategic plan for BIO.

Dr. Gross agreed to develop a draft outline of the report and a plan for developing the report that would involve the full AC.

Meeting dates:

It was decided that 2 weeks in April and September would be identified for the BIO AC to schedule next year’s meetings.

The Chair adjourned the meeting at 12:05 pm.