National Science Foundation
Directorate for Biological Sciences

Advisory Committee Meeting
September 10 & 11, 2014
NSF Room 1235

Summary Minutes

BIO AC Members in Attendance:

David Asai (9/11)	May Berenbaum	Wilfredo Colon	Sean Decatur
Greg Florant	Steve Goldstein	Katherine Gross	Hopi Hoekstra
Linda Hyman	Elizabeth Kellogg	Susan Marqusee	Gaetano Montelione
Nalini Nadkarni	Randy Nelson	Michael Purugganan	David Schimel
Stacia Sower	Joan Strassmann	Paul Turner	Brett Tyler
Wendy Raymond (9/10)			

BIO AC Members not in attendance: Drs. Hannah Carey and Peter Wyse-Jackson

Wednesday, September 10

Welcome

Dr. John Wingfield, Assistant Director (AD) for the Directorate for Biological Sciences (BIO), opened the meeting at 8:30 AM by welcoming and thanking the AC members for their participation. He also noted that this is an exciting time for BIO given new interests in BIO funded research, a change in the chair of the BIO AC and a new AD for BIO.

Dr. Kay Gross, Chair, BIO AC also welcomed the committee, NSF staff and guests and asked all those in attendance to introduce themselves.

The summary minutes from March 2014 BIO AC meeting were approved unanimously.

Committee on Equal Opportunities in Science and Engineering (CEOSE) Report Introduction – Dr. Wendy Raymond, CEOSE Liaison to the BIO AC

Dr. Raymond described the role of CEOSE in advising the NSF on how to better address the challenges and opportunities for broadening participation in STEM education and research. The 2011-2012 CEOSE Biennial Report made a single recommendation to NSF: to develop a bold new initiative for broadening participation of underrepresented groups in STEM. Dr. Raymond described several ways to interpret this CEOSE recommendation and the use of the word "bold" by the CEOSE. She encouraged the BIO AC to carefully consider how the BIO Directorate could respond to the CEOSE recommendation.

The BIO AC discussed several ways that NSF could broaden participation including the application of the ADVANCE program model to promote institutional change, the potential for implementing the NSF BP Working Group's response to the CEOSE recommendation within BIO and the challenge of implementing effective and sustainable means for broadening participation.

Presentation by Dr. Michael S. Teitelbaum, Senior Research Associate, Harvard Law School and author of "Falling Behind, Boom Bust and the Global Race for Scientific Talent"

Dr. Teitelbaum described the many influential indicators that the USA has fallen behind in the race for scientific talent including President Obama's comments and the 2005 NRC Report: "Rising Above the Gathering Storm" and its 2010 NRC follow-up report, "Rising Above the Gathering Storm, Revisited". He presented a history of multiple alarm/boom/bust cycles in US support for research since WWII, and showed how the US actually could fall behind in education, research, and STEM workforce training. Dr. Teitelbaum proposes that STEM competency should be a fundamental skill acquired by all K-12 students. He described the current system for educating doctoral students and funding research and provided evidence for the causes and effects of the structural instability in the system. He said that the US is still globally predominant in STEM research and described as "misleading" the claim of general STEM workforce shortages in the US given the lack of credible evidence (although he also acknowledged that there are variations in the level and content of degrees across STEM fields). Dr. Teitelbaum concluded with the assertion that the US is likely in the middle of a 6th alarm/boom/bust cycle and challenged the BIO AC to consider potential system stabilizers.

The BIO AC engaged in extensive and wide-ranging discussion following the presentation and considered options for addressing the concerns about workforce development and how BIO could address these issues, including:

- Options for changing how NSF funds graduate students, postdoctoral associates and technical support staff (PhD level); differences between the NSF and NIH support models; and the potential impact of capping tuition support for graduate students on NSF awards;
- Does the current funding model encourage hiring Postdoctoral Fellows without adequate planning for future career prospects?
- Developing a greater public understanding of the value of basic research;
- Opportunities for providing students and faculty with information on "career paths" for STEM majors;
- The challenges to PIs from the growing pressure by the university administrators to bring in large and/or multiple grants and to use this money to support more students and postdocs
- Policies and incentives to guide PIs that would stabilize the system;

CEOSE Report Discussion (continued) – Dr. Wendy Raymond, CEOSE Liaison to the BIO AC

Dr. Raymond shared that CEOSE was interested the BIO AC members input on their recommendation to the NSF. CEOSE can also provide information to PIs and institutions on best practices and the value of early investments in undergraduate STEM education. The 2-page summary of the recommendation by CEOSE has been distributed widely including to Congress.

Dr. Scott Edwards, Division Director, DBI and co-chair of the NSF BP working group described the framework of a NSF strategic plan for BP that has been developed in response to the CEOSE report and activities that are being mobilized internally and externally.

Dr. Sally O'Connor. Program Director, DBI, provided a summary of different types of BP activities being done in BIO such as outreach at scientific meetings and conferences, BIO participation in NSF Day events at colleges and universities, grants to professional societies and institutions, and programs for underrepresented groups.

The AC discussed the recent DBI award to the American Indian Society of Engineering and Science (AISES) to track students through STEM education and careers. DEB has in place funding mechanisms for supporting RAHSS, RET and ROA supplements to increase participation of underrepresented groups. Despite these (and other) investments in BP, there remains a need for developing sustainable programs with demonstrated impact for BP. AC members provided two suggestions:

- Look for solutions beyond formal education, e.g., how does the rest of their lives affect whether the students stay in STEM?; and
- Convene a BIO AC subcommittee to investigate what data are needed to demonstrate impact, what aspects of successful programs are 'scalable', and what can be done to incentivize the needed institutional changes.

Perspective for the Future of Biology - Dr. John Wingfield, BIO AD

Dr Wingfield acknowledged the important role of the BIO AC in advising the NSF as well as the importance of input from the scientific community. He emphasized four key concepts that emerged during the discussion of broadening participation: scalability, sustainability, relevance, and inclusion. Dr. Wingfield described the framework of NRC reports (Research at the Intersection of the Physical and Life Sciences and Biology in the 21st Century) that has informed BIO's priorities during his 3-year term as BIO AD. He argued that BIO has focused on funding research that integrates across scales of size, space and time, and the large and diverse data sets being produced from molecular, organismal and environmental research. Dr. Wingfield discussed the big data challenge, the rapidly approaching the limits on our ability to manage all this data, and the need for integration of data across scales. He concluded that this is an exciting time for biology and that new programs and infrastructure will be needed to address the emerging challenges and opportunities.

The committee discussed the role of the Advisory Committee and the Biology Directorate in the future of biology, synthetic biology and associated ethical issues, the development of a strategic vision, cross cutting activities in an environment of low funding rates, the recent BRAIN initiative EAGER awards in FY2014, and communication strategies for sharing what NSF and BIO does.

Approval of the Committee of Visitors Report for the Division of Molecular and Cellular Biology (MCB) – Dr. Gaetano Montelione

Dr. Montelione provided a summary of the MCB COV report and provided an overview of areas of accomplishment and concern. The COV members were impressed with the process, organization, and types of projects being funded by MCB, and their flexibility in recognizing and providing funding for emerging fields such as synthetic biology. The COV pointed out that the capacity and willingness of MCB to fund interdisciplinary collaborations distinguished it from NIH. The COV also commended MCB's strategic use of EAGER and INSPIRE awards. The report included a few recommended improvements::

- Program officers should more clearly document how EAGER awards are being made
- Clarify for PIs and reviewers how Broader Impacts (BI) are considered in the proposal review

Dr. Montelione concluded by announcing that three of the recipients of the 2013 Nobel Prizes were MCB funded scientists. Dr. Marqusee, who served as a member of the COV, added that the MCB mission to support basic mechanistic research is being fulfilled and that MCB valued individual research equally

with large scale collaborations. Dr. Marqusee expressed appreciation for the thoughtful MCB response to the COV report.

The advisory committee discussed the implications of MCB co-funding proposals within and external to BIO, the total number of actions in MCB versus other Divisions, the impact of the change to one submission date per year, and how the pre-proposal process in IOS and DEB fit with the funding schedules of other Directorates that often co-fund with MCB.

The advisory committee approved the MCB COV report and MCB response.

Preparation for meeting with NSF Director, Dr. France Córdova

The BIO AC discussed several topics to be included in the meeting with the NSF Director Cordova; the following topics were prioritized for discussion:

- The future of NSF and especially the role of BIO (NSF v. NIH)
- The role of interdisciplinary science.
- Institutional accountability - How can NSF have an impact on encouraging institutional support for improving mentoring, broadening participation and developing of a more broadly trained STEM workforce?
- Broader impacts – Does NSF have a clear measure of appropriate metrics for this requirement?
- What does Dr. Cordova see as the role of NSF advisory committees?

The meeting was adjourned for the day at 5:00 PM.

Thursday, September 11

The BIO AC meeting was re-convened at 8:30 AM by the Chair.

Preparation for meeting with NSF Director, Dr. France Córdova (cont.)

The advisory committee reviewed the topics that were raised during the previous session and determined how to present them.

Meeting with Dr. Córdova

Dr. Cordova introduced Dr. James Olds, incoming Assistant Director for BIO who will begin his appointment in October 2014. She also introduced Dr. Richard Buckius who will serve as acting NSF Chief Operations Officer in the Office of the Director until there is a presidential appointment and Senate confirmation of a Deputy Director for NSF.

Dr. Cordova described her vision for NSF including her comment that "the cutting edge of physics is biology". She discussed with the BIO AC the challenges of increasing public interest in science; the importance of improving the diversity of the STEM workforce; the need for cross-cutting research at the intersections of physical sciences and biology, especially for studying the brain; the education and training of students and postdocs that recognizes the challenges of sustaining a science ready workforce; and NSF's contribution to a STEM literate society for better decision making, The discussion also touched on the need for university administrations to support and recognize the BP activities by faculty

including consideration in promotion and tenure decisions, and the potential role of funding agencies in changing the culture of universities and colleges. She recognized that there is also a need to identify appropriate metrics of BI and mechanisms for sharing best practices for improving BP in STEM.

Approval of the Committee of Visitors Report for the Division of Integrative Organismal Systems (IOS) – Dr. Hopi Hoekstra

Dr. Hoeskstra presented the IOS COV report and highlighted the dedication and hard work of the Program officers and staff. She provided a brief overview of the, organization of IOS and the data that was reviewed by the COV. She identified five areas of interest: 1) the review process; 2) pre-proposal process; 3) broadening participation; 4) workload; and 5) instruction and leadership. The COV felt that the Division was by in large functioning very well, but noted some instability in the Division due to delays in hiring new staff and Program Directors. The COV made several suggestions to improve transparency in hiring and to make it both more efficient and faster; they stressed the value of building in some overlap between new hires and the people they are replacing. The COV also reinforced the need to improve integration across all four BIO divisions.

Dr. Michelle Elekonich, acting DD for IOS, expressed appreciation for the recommendations from the COV and stated that the Division has begun to implementation where possible.

The AC discussed award rates for underrepresented groups in IOS and opportunities to increase proposal submissions by PIs from underrepresented groups. The AC also engaged in a general discussion of broader issues including: staffing levels and proposal submission numbers across the four BIO Divisions, recruitment procedures and transparency in the hiring process, distribution of the PI and panelist survey results regarding the pre-proposal system (DEB and IOS), the use of ad hoc reviews, joint funding by IOS with other Divisions, and the COI process and policy in the relation to the multidisciplinary nature of research.

The advisory committee approved the COV report and BIO response.

Approval of the Committee of Visitors Report for the Division of Biological Infrastructure (DBI) – Dr. David Asai

Dr. Asai introduced the COV as an opportunity for DBI to reflect on what it's doing in preparation for this review. He then described the circumstances of the COV meeting (convened in September 2013) and the problems encountered by the COV members due to the combination of a recent turnover in the Division senior leadership (DD and DDD) and the incomplete documentation provided for review. Dr. Asai suggested that the BIO leadership proactively provide more guidance to the new Division leadership and the COV. The tone of the report may reflect some of the logistical distractions experienced by the COV as well as an impression that DBI is a silo apart from the Directorate. The COV was impressed with the Division and the hard-working staff and felt the quality and integrity of the review process was high. The response from DBI addressed most of the issues and questions in the report. Dr. Asai commended those who developed the response.

Dr. Scott Edwards, DBI Division Director, presented DBI's response to the COV report and described the actions and policies DBI has initiated in response to the COV recommendations.

Dr. Asai reiterated the many ways DBI represents an opportunity for the BIO directorate.

The advisory committee approved the COV report and BIO response.

BIO AC Action Items/Subcommittees

Dr. Gross summarized several potential topics that had arisen in the meeting that could be focus areas for AC action:

- EAGER/INSPIRE – What is the role and importance of this type of funding? Are there metrics to evaluate the outcome of these awards – e.g. future funding?
- Broadening Participation – What data are needed and/or available to document the effectiveness of the variety of ways PIs propose to address this as part of Broader Impacts? If best practices are available (e.g., the CEOSE report) what are the options for communicating these to PIs?
- Strategic Vision – How can the AC help to develop a strategic vision for BIO?
- Scientific workforce - How can BIO work with other NSF STEM Directorates to provide guidance on what training and opportunities are needed to develop a sustainable scientific workforce? Would collaboration with other ACs (e.g. EHR) be an effective way to address this?

The AC discussed the limitations and merits of each area and the possibility of using the COV report as the basis for developing a vision statement for the Directorate. It was decided that sub-committees would be established to address two items: 1) Broadening Participation as part of the consideration of Broader Impacts in proposals and 2) a portfolio review of the funding in all of BIO to determine what opportunities may be available to increase funding opportunities. Dr. Gross tentatively appointed the following AC members to these subcommittees: "Developing metrics for documenting what works in BP - Drs. May Berenbaum, Greg Florant, Michael Puruggnaan and Joan Strassmann"Portfolio Review" d Drs. Steve Goldstein, Susan Marqusee, Randy Nelson, Dave Schimel, and Stacia Sower. Drs. Gross and Liarakos will develop charges for the subcommittees and appoint an NSF representative for each sub-committee.

Closing remarks – Dr. John Wingfield, BIO AD and Kay Gross, BIO AC Chair

Dr. Wingfield expressed appreciation for a good AC meeting, the extra effort associated with the kind of input that is needed. He reassured the committee that the general discussion by the AC members engage is viewed as helpful advice to BIO and the NSF. He thanked the AC Chair, the AC members and the NSF staff for their good work.

Dr. Wingfield presented certificates of appreciation to departing AC members, Drs. Hopi Hoekstra, Nalini Nadkarni, David Asai, and Sean Decatur.

He concluded by describing his experience at NSF as "incredible, a challenge, and an honor" and reiterating that this is a really interesting time for BIO.

Dr. Gross thanked Drs. Wingfield, Liarakos, and Silverthorne and expressed appreciation for the support she has received from the rest of the committee.

Dr. Liarakos informed the committee of the planned timeframe for the next meeting in late March or early April 2015.

The meeting was adjourned by the Chair at 11:45 AM.