National Science Foundation
Directorate for Biological Sciences

BIO Advisory Committee Meeting
September 5 and 6, 2012
NSF Room 1235

Summary Minutes

BIO AC Members in Attendance:

Dr. José Onuchic, Chair	Dr. Jonas S. Almeida
Dr. David J. Asai	Dr. David Burgess
Dr. Sean Decatur (Sept. 6th)	Dr. Michael J. Donoghue
Dr. Jacquelyn S. Fetrow	Dr. Katherine L. Gross
Dr. Robert M. Hazen	Dr. Gaetano Montelione (Sept. 5th)

BIO AC Members attending via telephone:
Drs. Nalini N. Nadkarni and Carol Brewer

BIO AC Members not in attendance:
Drs. Hopi Hoekstra, Peter Wyse Jackson, and Wendy Raymond, CEOSE Liaison

Wednesday, September 5, 2012

8:30 AM: Dr. Jose Onuchic, Advisory Committee chair, convened the meeting by welcoming Bio AC members, NSF staff and guests and requesting introductions. After minor changes, the minutes from the April 2012 virtual Bio AC meeting were approved unanimously.

Approval of DEB COV report – Dr. Katherine Gross
After stating the COV found no major problems, Dr. Gross highlighted two major points from the DEB COV report for years 2009-2011:

- During the COV, the common theme of concern was that there is not enough money. The COV discussed possible reasons for and solutions to the precipitous decline in funding rates over the last decade.
- The new pre-proposal review system raised concerns early on regarding its impact on the scientific community and the review process. The committee agreed that innovative ways to bring new ideas forward are needed (*e.g.*, Ideas Labs) but was unsure if the new system was the best way.

The committee discussed the funding rate for single investigators versus collaborative projects in DEB, the overall low funding rate, staff morale, and the sense of frustration regarding utilization of Program Officers' expertise and the approach to the implementation of NEON. ***The DEB COV report was approved unanimously by the BIO AC.***

Welcoming Remarks – Dr. John Wingfield, Assistant Director, Directorate for Biological Sciences
Dr. Wingfield provided an update on One NSF, the Director's initiative that has resulted in a large number of collaborative projects. Looking forward to how science will become integrative, BIO has been looking at how to draw on the expertise in the BIO AC. Dr. Wingfield introduced a vision for BIO called "Strategic Innovation for the Biological Sciences" (SIBS). The strategy of SIBS is a three-fold approach to create an integrated system to achieve a deep temporal and spatial understanding of life on earth. This strategy is still focused on the 5 Grand Challenges identified in the 2009 NRC report but provides a new context for addressing them. He provided examples of new integrative science programs and immediate challenges to creating an integrative system. Dr. Wingfield described current BIO initiatives, how they fit into SIBS and how they were addressing aspects of the immediate SIBS challenges and the Grand Challenges.

Key issues noted were how biologists will manage data in the future and the multiple questions that flow from biological data concerns. Four priorities identified during a BIO Centers Cyberinfrastructure (CI) Workshop were: (1) increased data storage capacity, (2) coordinated access/interoperability, (3) increased collaboration and (4) CI reuse

and research guided CI investments. A new activity called DataWay (a community-based CI activity to support integration of data and information for knowledge management) was described.

Committee members commented on topics of interest missing from the presentation including the need for complex modeling, links to science education and science workforce groups, and workforce diversity. They also asked for clarity regarding involvement of social computing, utilization of application programming interface (API) to create new linkages/communication between existing data sources, connections with scientists in applied mathematics and computer science, development of a communication plan to communicate needs to representatives in these fields, integration of SIBS with other groups at NSF, involvement of MCB programs in SIBS, and the definition of the charrette mechanism (a workshop with broader engagement).

The committee provided suggestions for implementation of the SIBS strategy such as bringing other Biological fields to the level of MCB modeling and using a bottoms up approach instead of a top down one to implement and communicate the SIBS initiative.

Summary of BIO Centers Cyber-infrastructure Meeting – Reed Beaman
Dr. Beaman described the awardee meeting held June 27, 2012 at SESYNC, which was attended by representatives of 12 funded centers and center-like activities: BEACON, LTER, UC-CEIN, NIMBioS, CEINT, NESCent, C•MORE, NCEAS, iDigBio, iPlant, NEON, and SESYNC. The emphases of the meeting were areas of strengths, overlap, and gaps in CI, which were identified as advanced computational infrastructure (ACI), data, software, collaboration, and coordination. Dr. Beaman presented several questions raised at the meeting. The meeting attendees felt NSF could best assist by enhancing opportunities through existing funding vehicles. Dr. Beaman detailed coordination, accountability, and post-award management activities and supplements recently funded by Office of Cyberinfrastructure (OCI) and BIO in response to the OCI DCL for large-scale coordination.

The committee discussed the emphasis on large centers, the investment in centers and center-like activities ($30M) in comparison to BIO's budget ($700M), engagement of single investigators by centers, the use of best practices across BIO where the large data sets have gained wide-acceptance, data challenges identified by the Protein Structure Initiative (PSI), the identification of new challenges, the need for greater coordination among agencies and groups, and the rationale for supplements and "plus-ups" to engage individual researchers.

Summary of draft strategic plan: Cyber-infrastructure for the Life Sciences – Craig Stewart
Dr. Stewart began by stating BIO is making and has made significant investments in CI. In FY12, BIO invested $90M on CI aligned with the five BIO priority areas. He described the investments across scope, scale, and point in life cycle. Cyberinfrastructure for the Life Sciences (CILS) has 5 strategic goals: 1) BIO data assimilation and integration, 2) visualization, knowledge representation, and collaboration science for BIO, 3) better attune national CI to BIO research needs, 4) future computational tools, and 5) workforce development. Dr. Stewart defined the overlap of BIO priorities and the CILS strategic goals. He described opportunities for NSF to assist achievement of CILS goals and the next steps for the strategic plan.

Following the presentation the AC discussed mechanisms for feedback; mechanisms for reward; physical storage options; alignment of investments with strategic goals; changes in operating practices within the biological community; challenge to engage underrepresented groups and young scientists; implementation of the strategic plan; and the diversity of needs for biologists.

BIO AC "DATA" Subcommittee preliminary report and discussion
Dr. Almeida presented the white paper developed by the subcommittee between April 2012 and August 2012. The executive summary of the paper discussed the fast pace of the technological development in the CI/Data field. The subcommittee provided recommendations for specific actions with a focus on close involvement of the research community and opportunities to experiment. The recommendations included providing resources to assist communities in defining priorities and processes and to improve communication between information scientists and the biological community, adding data driven components to existing education and outreach programs, experimenting with different funding models, and including data generation components.

Dr. Tyler reported on the subcommittee's views of sharing and mining of data via the Semantic Web and several challenges that need to be solved in parallel. The challenges selected were:

- Which data should be archived and shared?
- Standards for describing and annotating data and associated metadata, *e.g.* MIAME
- How to get data into RDF format?
- Where should data be hosted and how funded?
- How to realize the value of shared data?

Dr. Tyler expounded on the challenges and resources needed to address them. Overall, the subcommittee thought that the biological community should be stimulated and funded to come together to make decisions, and that emergent value could be realized through mining highly diverse interoperable data sets and synergistic value from collaborations between biologists and information scientists.

The committee was complementary of the report and framework provided. Topics discussed were:

- need for a broader term of information science;
- data storage and scale;
- which recommendations to work towards;
- how to decide which database should be funded;
- data.gov and dissemination plans;
- usability of data;
- utilization of Data Management Plans;
- the shopping mall illustration used as a framework for CI and the need of good "anchor stores";
- implementation of the recommendations; and
- expansion of the subcommittee's two-pager submitted.

Dr. Liarakos suggested that the subcommittee Chairs participate in the DataWay charrette should one occur.

BIO AC "Broadening Participation" Sub-committee preliminary report and discussion

Ms. Alison Beason introduced the topic by providing background and other groups' efforts to focus on and assess Broadening Participation (BP). Dr. Gross stated the topic for the day's discussion was to think about the question of what to do. Led by the subcommittee, the AC members and BIO staff began discussing the data and literature available regarding BP which included underrepresented minorities in leadership roles and as faculty, the definition of "broader impacts" (BI), math preparedness and application, retention rates for STEM degrees and careers, disproportionate underfunding of minorities, and interactions as an important factor in the retention and increase of underrepresented minorities. Several needs were identified: institutional support and accountability for BP in science, relevant data reported at the proposal and directorate levels, an analysis of funding of underrepresented minorities at NSF, and to view this an opportunity to explore instead of a problem to be solved.

Other questions were: Where should the investment be made? How is the number of students who transfer into STEM majors tracked? Where in the workforce do you want to see broadening diversity? What is at the end of the pipeline? What should be measured?

Suggestions for BIO included defining outcomes of the pipeline other than academic jobs and to work with EHR to develop better opportunities.

It was decided to keep the subcommittee in place with Drs. Asai, Burgess, and Gross as co-chairs. The next steps are to identify the added values of successful initiatives and a particular outcome that can be numerically described.

Preparation for the meeting with Drs. Suresh and Marrett

In preparation for the discussion with Drs. Subra Suresh and Cora Marrett, the committee developed questions and comments. Dr. Roskoski noted some topics of discussion such as how to model the complex system, how the BIO AC will be a part of the decision process, NSF communications – survival skill in order to get funding for science and One NSF. Topics for discussion with the Director and Deputy Director included:

- resourcing data science;
- BIO's interaction with other parts of NSF;
- bio-economy;
- funding for data repositories;

- increased interaction between BIO and engineering and mathematics
- CREATIV;
- funding rates for young PIs, and
- integration of climate change research throughout NSF.

Meeting with Drs. Suresh and Marrett

Dr. Onuchic welcomed Drs. Suresh and Marrett. The interesting interactions between BIO and MPS and other directorates were briefly discussed. Questions/concerns addressed with the Director and Deputy Director include:

- Are there funding challenges related to integration across directorates?
    - Biology interfaces with so many other disciplines and the process is accelerating. These interactions are pervasive but no one mechanism will work. Because of this, traditional boundaries cannot be carved out and there exists a need for multiple models.
- Is NSF ready to provide deep data storage?
    - This is part and parcel of open access and many factors/issues come into this. Open access is parsed into publication, vetted data, unvetted data, software, and the policies associated. Who policies it and is authorized to police it? There are overhead costs associated with this as well.
- Are there metrics and stages in the development of young scientists that should be targeted for BP?
    - 15 agencies are a part of a committee with different definitions of BP and until some of the definitions are carefully addressed, metrics will be questionable. What are best practices to recruit women and why are female scientists leaving the work force. There is a need to be clear on what your goals are and the measurement of the goals.
- Shouldn't international communications be advancing toward a solution for data management?
    - Resources must be set aside across fields to do this and it must be made a part of policy. NSF needs to make sure data issues are addressed in newer programs. The next step is engaging with other agencies and leverage their resources and experience. (BIO AC discussion was summarized for the guests).
- What are your thoughts on a shared response re BP between grantees and grantee institutions?
    - AAU plans to address this issue with a pilot program. This goes back to the issue of metrics, i.e., should the institution be held to the aggregate successes? It should be a shared response, but if the burden is diffused in a large organization, no one is responsible. An example of a program that is trying to address this concern is Widening Implementation and Demonstration of Evidence-based Reforms (WIDER).
- Concerns of the review process and proposal submission were broached.
    - The spirit with which the changes were started was the question: how do you minimize the time young PIs spend on writing and submitting proposals? There are many ways to handle this. Communication of expectations is a factor affecting funding rates. There are workload issues and a cost issue.

Dr. Suresh expressed his appreciation to the committee members for giving their time to serve.

Discussion: Training grant program for graduate biology - Jose Onuchic

Dr. Liarakos provided background for the discussion. Dr. Onuchic presented the types of graduate training vehicles available in BIO and the numbers of grants awarded. He detailed what training grants should accomplish, issues with applying for training grants, and other questions to stimulate the discussion. Dr. Wingfield added that some institutions do not give credit for teaching graduate courses associated with training grants for discussion.

BIO AC members discussed value added programs, the NIH approach to graduate student training, the lack of positions available for all graduate students and post-doctoral fellows, advantages of training grants, workloads associated with applying for IGERTs, IRS view of training and research grants, vehicles for awarding training grants, balance of the types of grants, primary support for graduate students, types of proposals funded in a targeted training grant program, effect of training grants on overhead, prestigious of being awarded a fellowship, and leveraging institutional dollars.

Several committee members requested data detailing the success rate of the different fellowships, including NIH training grants and value added programs for discussion at the next BIO AC meeting.

Dr. Onuchic requested the AC members think about which kind of program they would prefer and how it would be implemented.

The group also discussed the current budget climate, sequestration, and BIO's submission of proposed budgets.

Dr. Liarakos described the remaining meeting logistics.

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

Thursday, September 6, 2012

9:00 AM: Dr. Onuchic reconvened the meeting and introduced the morning's topics.

NEON research platform/ PBS video – Liz Blood
Dr. Blood presented the design of the National Ecological Observatory Network and an update of the construction of the Observatory. She also presented the first Airborne Observatory Platform research mission over the Hyde Park fire in Colorado. She concluded with a video produced by National Public Radio. The discussion that followed focused on genomic information collection, the potential of NEON to enable studies of the perturbations of the environment, the need for NSF to be recognized in public relations, and education capacity of NEON.

LTER research – Saran Twombly
Dr. Twombly reiterated that the Long-Term Environmental Research Program is fundamentally a research program with 26 sites in the US and 2 international sites chosen to address fundamental ecological and ecosystem questions. Drs. Almeida and Twombly talked about improvements that have been made in data management. Dr. Twombly provided an update since the last AC meeting:

- Mini-symposium,
- Renewal review panel in April (11 sites up for renewal: 9 were renewed and 2 were put on probation),
- LTER Science Council Meeting in May (discussed a new and broader plan for LTER),
- Network Office Mid-term Site Review in May, and
- $2M in information management supplements.

She then detailed samples of LTER in the news and future activities such as the Sept 2012 All Scientists' Meeting; community workshops to revision the Network Office and identify exciting research directions, and midterm site reviews planned for 2013.

MCB 8-month proposal cycle – Parag Chitnis
Dr. Chitnis provided the rationale to switch from a 6-month proposal cycle to an 8-month cycle. For the PIs, positive impacts were a higher funding rate for resubmissions than in past years (possibly due to the extra time to revise the proposal) and an increase in the diversity of proposal types. Negative impacts included confusion with deadlines (not the same every year) and a review cycle that was out of sync with the academic year. For the staff, positive impacts were more time to collaborate with other divisions and dedicated time for scheduling other activities such as training, oversight, and outreach. Negative impacts included difficulties in co-review of proposals with other divisions, which have annual deadlines, and difficulties in Budget planning for fiscal years with alternating one and two proposal review cycles. Dr. Chitnis indicated the division would evaluate the input to see how the solicitation will be revised. When asked, Dr. Chitnis indicated he would prefer to go to an annual cycle or go to the 6-month cycle.

IOS/DEB pre-proposal system – John Wingfield
Dr. Wingfield began by stating this change has drawn the most reaction from the community. He introduced the DDs and DDDs for DEB and IOS. The goals of the new systems are to continue to fund innovative projects, make the same number of awards (adjusted for budgets), reduce workload internally and externally, and maintain portfolio balance. Dr. Wingfield outlined the comparative metrics that will be used to make adjustments to the solicitations, which include a project metric, an awards metric, a portfolio balance metric, a community workload metric, and a BIO workload metric. He indicated BIO is open to suggestions from the community of what should be measured. BIO has received a letter from ESA (EES Community Open Letter) that expressed two major concerns: the new system is "slowing the pace of science to inform solutions to tough environmental problems" and "does not insure that the best science is funded with the limited resources that are available". Dr. Wingfield briefed the AC members on other concerns received from the letter, calls, and emails. He stated that adjustments will be made on a divisional basis and

aligned to the communities being served but on varying time scales. He identified some unanticipated positive results: more pre-proposal applications from PUI, more EAGER awards based on pre-proposals, and the redistribution of internal workload gives PDs more time for scientific review. For responding to the community during the fall of 2012, the staff will have pre-proposal follow-up webinars, wiki sites for dialogue with the community and constructive suggestions and an analysis of first year experience will be made public.

NEON/LTER Discussion
The first discussion that followed the presentations related to the interaction between NEON, LTER, and the ecological communities. The topics discussed included the NEON discussion in the DEB COV, the handling of a new facility by BIO, incentives to use NEON, the metrics for success to support the continued investment in NEON, the new vision of BIO and MCB's role, NEON entering the arena of BigData, the tie in of successful Education and Outreach programs into NEON, the need to balance reality and perception and to provide more education of the BIO community, and the inclusion of diverse groups in the outreach of NEON and the LTER Program.

Proposal review Discussion
Dr. Silverthorne, DD for IOS, began the discussion by noting that virtual panels were primarily used for IOS pre-proposal review. The importance of a standardized, complete panel summary was also noted. The AC expressed concerns regarding communication plans for decisions and adjustments made to the solicitation/review process, the rationale for PI limitations and its effects, and the need for longer term strategies and discussion with the community regarding the changes.

One committee member requested more data detailing the feedback and a summary of the metrics and asked BIO to begin to track quality of reviews and number of reviews with the changes to the proposal system.

Wrap-up and Adjourn

- It was decided the "Data" paper needed a section identifying the needs for modeling, which should be added to the package.
- BP remained an on-going discussion. The subcommittee was tasked with developing a few concrete ideas.
- Dr. Onuchic again requested AC members to think about which graduate training grant program they would prefer. Dr. Verbeke asked for specifics on the data the BIO AC wanted provided by the next meeting to be sent to her via email.
- Dr. Asai reiterated the need to define the role of the BIO AC and what NSF wants the committee to provide. He suggested having fewer topics to be discussed upon which the AC advises BIO.

Dr. Wingfield thanked all of the participants.

11:30 AM: Dr. Onuchic adjourned the meeting.