National Science Foundation
Directorate for Biological Sciences

BIO Advisory Committee Meeting
March 13 and 14, 2014
NSF Room 1235

Summary Minutes

BIO AC Members in Attendance

Jonas Almedia	David Asai	May Berenbaum	Sean Decatur	Linda Hyman
Gaetano Montelino	Nalani Nadkami	Jose Onuchic	Brett Tyler	

BIO AC Members participating by phone: Drs. Katherine Gross, Hopi Hoekstra and Wendy Raymond

BIO AC Members not in attendance: Drs. Carol Brewer and Peter Wyse-Jackson

Thursday, March 13

Welcome
Dr. Jose Onuchic, Chair, BIO AC began the meeting at 8:30 AM by welcoming the committee and inviting the self-introduction of BIO AC Members, NSF staff and guests.

The minutes from June 2013 (virtual) Bio AC meeting were unanimously approved.

The Chair began the meeting with a brief discussion of the development BIO AC meeting agendas. He then summarized changes in the Biology Directorate senior leadership in 2014 including: the departure of the current AD at the end of September, the retirement of the current deputy AD at the end of March, the appointment of a new deputy AD in April, the appointment of new Deputy Division Directors and the anticipated turnover of BIO Division Directors.

Preliminary information about the status of Cyberinfrastructure for the Life Sciences (CILS) and of CAREER awards with respect to continuing integration of teaching/education with the research was provided with further discussion postponed to later in the meeting.

Welcoming Remarks – Dr. John Wingfield, Assistant Director (AD), Directorate for Biological Sciences
Dr. Wingfield announced the Senate confirmation of Dr. France Cordova as the new NSF Director as well as changes in the senior leadership of the Biology Directorate. He also reported that virtual meetings would be continued on an as-needed basis consistent with the direction by OSTP, and welcomed comments from the committee.

Dr. Onuchic thanked Dr. Joann Roskoski, Deputy Assistant Director, for her service to BIO and NSF on the occasion of her retirement. The committee discussed the role of the AD in selection of a Deputy AD, the required process for filling SES positions such as the DAD, turnover of scientific staff at NSF, and community involvement in the AD search.

BIO Budget
Dr. Wingfield summarized the NSF FY15 Budget Request and discussed the breakdown of the request across the NSF and the Biology Directorate including major investments in biological research and education such as the National Ecological Observatory Network (NEON), and Brain Research through Advancing Innovative Neurotechnologies (BRAIN).

The committee discussed the effective distribution of research funds using the peer review process, the decision making process for funding and distribution of funds across Biology Directorate programs and initiatives, the connection between Congress and funding, and the FY2014 budget.

Approval of Plant Genome Research Program (PGRP) COV Report – Dr. Guy Montelione

Dr. Montelione described the COV review process, and reported that the COV was impressed with the dedication, leadership and accomplishments of the IOS Division Director and PGRP Program Director. The COV reported that sound decisions had been made for funding EAGER awards, which made up a small part of the PGRP portfolio. The COV report was positive overall, but recommended a few areas for improvement:

- Feedback to PIs did not include relevant Program Director comments, and some panel summaries were insufficient, in particular for the declinations;
- Evaluation of Broader Impacts was inconsistent. Better information about how to evaluate Broader Impacts should be provided to reviewers;
- Data Management Plans were inconsistent with no centralized database for data. It was recommended that NSF develop within the community to plan for better organization of the data.

The advisory committee discussed the ongoing efforts and resources associated with data, the importance of better panel summaries, fluidity of the guidelines for data management plans, understanding of NSF's Big Data Initiative in the community, communication of NSF's 5 year plan on data management to the community, funding of database improvements, and additional guidance about Broader Impacts from NSF.

The advisory committee approved the PGRP COV report and the BIO response.

Approval of Emerging Frontiers COV Report – Dr. Linda Hyman
Dr. Liarakos explained the nature of the EF COV review and the reason for Dr. Carol Brewer's (the BIO AC liaison to the EF COV) necessary absence from the BIO AC meeting.

Dr. Linda Hyman (substituting for Dr. Brewer) provided background information on the COV review and affirmed that the COV report was positive overall. The COV stated that communication and the proposal evaluation process was done with great care and integrity and that the MacroSystems Biology program remained an appropriate part of the EF portfolio. The EF COV offered three recommendations focused on issues of data:

- Review and revise strategic plans for data availability;
- Review the interoperability of data generated by awards with iPlant, DataONE, Neon, and Earth Cube and use of centralized data base (such as iDigBio) expanded to other agencies;
- Focus on data tool development.

Dr. Hyman summarized the BIO response after which the advisory committee approved the EF COV report and BIO response.

MPS Data Science Committee Report - Dr. Jonas Almeida
Dr. Almeida reported on his participation in the Mathematical and Physical Sciences Advisory Committee and the StatsNSF Subcommittee meeting, which included discussions of data science in the NSF context, underlying data challenges, the structure of a report being developed by the subcommittee, and recommendations in four categories: NSF Organization, NSF Research Initiatives, Workforce Development, and Proposal and Review Cycle. *Dr. Almedia requested feedback from the committee on the report structure and recommendations.*

The advisory committee discussed the perceived "disconnect" between "data experts" and researchers, multiple levels of big data challenges, issues related to publishing data in papers versus conferences, training of biostatisticians, and funding mechanisms for training.

Neuroscience, Cognitive Science and The BRAIN initiative – Dr. John Wingfield
Dr. Wingfield presented the NSF neuroscience investment history and recent efforts to accelerate neuroscience research from 2010 to the rollout of the BRAIN Initiative by President Obama. He described the BRAIN Initiative and the thematic areas developed from several recent community–organized workshops, recent awards in neuroscience consistent with the BRAIN Initiative and the BRAIN EAGER Dear Colleague Letter recently issued by DBI and IOS.

The advisory committee discussed related neuroscience efforts by NSF and NIH, novel models of computing, collaboration with European "brain" efforts, the opportunity to reinforce the importance of fundamental research, and inclusion of cellular and molecular biology and behavioral studies in the BRAIN Initiative.

NEON construction and activities – Dr. Joann Roskoski
Dr. Roskoski described the background of NEON's development and design, recent achievements, planned activities for the next 12 months, the trajectory for completion of construction, and the types of information obtained from early flights of the Airborne Observatory Platform (AOP). She also summarized some remaining challenges:

- Finishing on time and on budget,
- Transitioning to operations including intense interaction between staff and community,
- Development of scaling algorithms,
- Validation of the biological sampling protocols and the impact of standard protocols,
- Development of a process for using assignable assets.

Discussion by the BIO AC addressed taxonomic impediments, data availability and interoperability, data service, the importance of proper financial and scientific oversight, budget aspects related to three areas of NEON (construction, operations, and research), and community feedback regarding the scope of NEON.

Environmental Science: "What's next?" (Based in part on the report from the AC-ERE, which currently is being managed by BIO)– Dr. Penny Firth
Dr. Penny Firth, DEB Division Director, described the evolution of environmental initiatives by NSF, and attempts to predict what is on the environmental research/education horizon including cutting edge areas such as: rapid evolution, novel ecosystems, and changing species interactions. The current "event horizon" in environmental science includes:

- The movement of individual site based data collection to regional/continental data,
- The movement of specific question driven monitoring to standardized monitoring,
- Deliberately networked capabilities,
- Long-term observations,
- Use of new sensors/sensor systems,
- Increased data available online and in real-time.

Dr. Firth described a potential "Horizons" initiative that would focus on poorly understood biological functions and processes and especially processes that respond to rapid, large scale and novel change.

The advisory committee discussion included anthropogenic change research in DEB, inclusion of urban/agriculture systems potential partners, inclusion of citizen science in the vision, communication beyond the scientific community, funding models, initiatives that fund both large scale and smaller scale research, and ensuring there is a place for basic bottoms-up, curiosity driven research.

Synthetic Biology – research, environment and society – Drs. Parag Chitnis and Alan Tessier
Dr. Parag Chitnis, MCB Division Director, provided the background, areas at the intersection, and funding history of the BioMaPS (Research at the Intersection of the Biological, Mathematical and Physical Sciences and Engineering) program. Dr. Theresa Good, MCB PD, described the historical funding of synthetic biology by NSF, including examples of research projects and both current and new (FY2014) initiatives in synthetic biology. Dr. Froedrich Srienc, ENG PD, described the overlapping BIO and ENG interests and joint activities in synthetic biology and the engineering systems approach being employed to study biological systems. Dr. Tessier noted that although the genomics revolution has dramatically impacted the study of evolution and ecology, it is a limited tool for manipulative studies. He described the emerging focus in scientific literature on synthetic biology, such as the visionary book "*How Synthetic Biology will Reinvent Nature and Ourselves*". Dr. Fredrick Kronz, SBE PD, summarized some of the ethical, legal, and societal implications of synthetic biology research. He also discussed socio-technical collaborations and the role of public engagement.

Dr. Chitnis posed 3 questions to the advisory committee:

- Are there additional areas of synthetic biology that NSF should catalyze?
- How can we communicate the potential of synthetic biology to the external community?
- Are there other areas at the intersection of life sciences with physical and engineering sciences that we should emphasize in our portfolio of research investments?

The advisory committee discussed potential overlap between Ideas Labs and crowdsourcing mechanisms for project development, sociological impacts, students being able to differentiate between designing something and understanding how systems work, student assessments, ethical issues, catalyzing underfunded areas of research, and incentives for program officers to participate in similar programs.

Genomes to Phenomes (to Genomes): Biology Across Scales – Dr. Jane Silverthorne
Dr. Jane Silverthorne, IOS Division Director, described the rationale for a Genomes to Phenomes (G2P) initiative arising from the scientific community, including examples of ongoing projects,. At a minimum, the initiative would seek to understand the impact on phenomes of environmental, temporal and developmental variables. Dr. Silverthorne described interactions with the scientific community including efforts to use SI^2 to develop a community of accepted practice around phenotypic data, and workshops to discuss impediments and data issues in traversing the genomes to phenomes to genomes circuit. Additional community input is deemed essential for developing the scope of the G2P.

The advisory committee discussed the primary focus of the G2P initiative, potential intersection with ethical/social issues, SI^2, use of iPlant tools, the infinite dimensions of phenomes, amount of data needed, bringing modeling communities and biostatisticians together, programmatic clinical trials, and protecting science from stepping on proprietary domains. *A G2P wiki page will be communicated to BIO AC members once it is published.*

Meeting with Dr. Cora Marrett, Acting Director of the National Science Foundation
The committee members proposed topics of discussion in preparation for Dr. Cora Marrett's visit.

The BIO AC Chair began the discussion by thanking Dr. Marrett for her service. Topics discussed included:

- NEON oversight;
- Transparency and accountability;
- Exciting new programs;
- The BIO AD search and minimizing the time between ADs;
- Data Issues and the disconnect between the edge of data science and quantitative science;
- The NSF "presence" in America;
- Training at the intersection of life and physical sciences of mid-career scientists;
- National Research Training Grants
- Fostering groups that do not traditionally work together

Dr. Marrett thanked the committee for its dedication and hard work.

The meeting was adjourned for the day at 5 PM.

Friday, March 14

The BIO AC meeting was re-convened by the Chair at 9 AM.

Resources and Infrastructure – Dr. Scott Edwards
Dr. Scott Edwards, DBI Division Director, summarized the organization and portfolio of the Division of Biological Infrastructure (DBI). He reported that DBI has begun to conceptualize how to better use it resources, avoid intra-agency redundancy and visualize the impact of the scope, scale, and life cycle of its investments. Alignment with the BIO priorities and sustainability of research infrastructure is a major goal for DBI, with maximizing the impacts of DBI investments as a major challenge.

The advisory committee discussed coordination among the Collections in Support of Biological Research program, the Advancing Digitization of Biodiversity Collections/ iDigBio initiative and NEON, raising the stature of institutions that house collections, coordination between NSF and NIH in supporting living stock collections, exposure of APIs of cyberinfrastrucutre projects supported by DBI, sustainability efforts for centers, resources provided by iPlant, budget allocation of the clusters in DBI, use of DBI as a hub for BIO investments in education, and the development of and funding process for centers.

GoLife Data Model – Dr. Maureen Kearney

Dr. Maureen Kearney, DEB Program Director, introduced the research and data components and objectives of the Genealogy of Life (GoLife) program. The goals of GoLife are to resolve the phylogenetic history of life and to integrate this genealogical architecture with underlying organismal data. Several challenges to this integration include: incomplete connections between biodiversity related databases, lack of a centralized biodiversity portal and incomplete knowledge of phylogeny for biodiversity. Dr. Kearney also presented examples of projects and the recommendations from the "Where to Next with The Tree of Life?" workshop, and solicitation specifics and requirements.

The advisory committee was enthusiastic about GoLife and discussed use of the Ideas Lab process, resolution of the differences in phylogenies, the hope that consensus will emerge and dark areas of the tree will be revealed, the role of 3D structures, and the connection with other programs and divisions.

Graduate Education: NSF Research Training Grants – Dr. Jim Deshler

Dr. Jim Deshler, DBI Deputy DD, summarized the current investments in graduate student training by NSF and BIO. Two major issues facing traditional graduate student training are the training of nearly ten times more PhDs as the number of available academic faculty positions, and a graduate training culture that ignores or discourages alternative careers. Because of these issues, increasing the use of traineeships as a training vehicle is being encouraged. Dr. Deshler described the NRT solicitation's goals and proposed emphasis areas and possible benefits for the students.

The advisory committee members discussed the culture change that needs to occur, training for graduate students based on national priorities, career alternatives to academia, overhead costs of different funding vehicles for graduate training, use of RCNs, MPS approach to graduate training, and using funds to enable bridges between research and non-research careers.

Open discussion:

CEOSE Recommendation

Dr. Wendy Raymond, the CEOSE committee representative to the BIO AC, provided an overview of the committee's latest recommendation to NSF: implement a full new initiative focused on broadening participation in STEM similar in concept and scale to the Centers initiatives. The initiative should:

- Collect and make longitudinal data
- Define benchmarks
- Have financial support that supports the very broadened participation that is sought.

The committee is interested in engaging advisory committees in the conversation and the best way to help NSF to achieve its goals. *Dr. Liarakos confirmed that this topic would be added to the next advisory committee meeting agenda.*

Centers

The advisory committee members discussed need to protect single investigators, as well as the definitions, classes, and roles of centers, mechanisms for funding centers, negative feedback to centers, value of centers to scientific communities, the use of a report on evaluating AFRI competitive grants model in informing the discussion on the funding of centers, and establishing an on-going subgroup of committee members to look at funding centers. *Dr. Liarakos stated interest in participation in the subcommittee would be gauged in the next doodle poll.*

Advisory Committee Role

The advisory committee discussed their role as advisors to the Biology Directorate, the engagement of program officers in advisory committee meetings, and using themes for the interaction between the two groups.

Dr. Wingfield thanked the committee and the presenters for a good meeting.

The meeting was adjourned at 12 noon.