

**NATIONAL SCIENCE FOUNDATION
DIRECTORATE FOR BIOLOGICAL SCIENCES**

BIO ADVISORY COMMITTEE

November 2-3, 2006

Room 375

Summary Minutes

Thursday, November 2, 2006

Welcome and Approval of Minutes

Dr. Susan Stafford, Chair of the Advisory Committee for Biological Sciences (BIO AC), convened the Fall 2006 meeting at 8:00 am with a welcome to members and guests. Dr. Stafford noted members not in attendance – Jelinski, Mares, Hawley, and Schaal. Dr. James P. Collins, Assistant Director for the Biological Sciences (BIO), greeted the BIO AC and asked for those in attendance to introduce themselves. The minutes for the April 2006 meeting were unanimously approved by the Committee.

Discussion of BIO's vision and the role of the AC, Dr. James Collins, Assistant Director, BIO

Dr. Collins presented an overview of the BIO directorate, and discussed its mission and vision to enable the discoveries for understanding life. BIO incorporates several core values throughout all of its activities, including the integration of research and education, broadening participation, international partnerships, and aligning with administration and agency priorities (such as the American Competitiveness Initiative [<http://www.whitehouse.gov/stateoftheunion/2006/aci/>] and the NSF Strategic Plan [http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf0648]). Dr. Collins also discussed three overarching scientific themes for the Directorate: the role of theory in biology, systems biology/living systems, and biology and society. The Advisory Committee was encouraged to take an active role in providing advice to the BIO directorate.

The BIO AC discussed:

- How BIO's vision was aligned with the NSF Strategic Plan
- The need to expand the frontier of theoretical biology while reinforcing consolidation of ideas
- Timeframe of the NSF Strategic Plan

Update from the Impact of Proposal and Award Management Mechanisms (IPAMM) Working Group: Dr. Joanne Tornow, Senior Advisor, BIO

Dr. Tornow updated the Advisory Committee on activities of the IPAMM working group and reviewed the charge to IPAMM – to identify the best practices to achieve an appropriate balance between proposal success rates, award sizes, and award duration with an emphasis on individual, investigator-initiated grants. Issues included: increased proposal submissions, decreased success rates, potential impacts on merit review, and the potential loss of capacity. The BIO AC engaged in a spirited discussion, and expressed concern about the potential impacts of declining success rates on beginning investigators.

The BIO AC discussed:

- Additional interpretations of the data
- The impact of rejection on PIs – does it affect career choices?
- Concerns about effects of limiting the scope of solicitations on narrowing range and variety of science, recognizing that there is a need for focused programs but cautioning against over-focusing.

- What are the demographics of those that are being declined (i.e., are minorities, etc. disproportionately affected?)
- How many projects are deserving of funding that cannot be funded?
- Why are there differing trends in success rates for different directorates?
- Can success rate be measured by ideas, rather than individual proposals?
- Is the increase in submissions due to the push for broadening participation?
- Given budgetary hopes, what is the prediction for success rate?
- Concerns about the effect of success rate on shaping policy

Orientation for New Members: *Dr. Joann Roskoski, Executive Officer, BIO*

Dr. Roskoski welcomed returning members of the BIO AC and thanked them for their continued service. To help orient the new members, Dr. Roskoski presented an overview of NSF's history and organization, NSF's strategic plan, and BIO's organizational structure. Dr. Roskoski explained the origin of the NSF as an independent agency that is overseen by the National Science Board (NSB). Approximately 20% of all federally supported research conducted by America's colleges and universities is funded by NSF. Dr. Roskoski went on to describe the organization of NSF and specifically, the BIO directorate. She explained that while BIO has various divisions, there also are cross-cutting activities that span all divisions and directorates. She described the linkage between the American Competitive Initiative (ACI), NSF's strategic goals, and stated the BIO mission: to enable the discoveries for understanding life. She also described the role of the Advisory Committee in providing advice, recommendations, and oversight to the NSF, and explained the duties, duration and membership of the Advisory Committee, as well as the rules and regulations that apply (including Federal Advisory Committee Act [FACA; <http://www.nsf.gov/od/ogc/faca.jsp>] and Conflicts of Interest laws).

The BIO AC discussed:

- Mission of BIO
- Difference and relationship between the AC and Committees of Visitors
- Cluster-level vs. program-level budgets (throughout much of BIO, the budgets for related individual programs have been combined into larger cluster budgets, which are managed cooperatively by teams of program directors)

FY 2007 Budget: *Sonya Mallinoff, Senior Advisor, BIO*

Sonya Mallinoff updated the Committee on the status of the FY 2007 Budget Request. She reviewed NSF budget history, explained that NSF is on schedule to double over the next 10 years via the ACI, and discussed the Major Research Equipment and Facilities Construction Account (MREFC). Ms. Mallinoff explained that while the budget is slated for increase, the ACI does not specifically address BIO. She noted that in both the House and Senate FY 2007 appropriations bills, NEON is slated to be funded.

The BIO AC discussed:

- Comparison of NSF and other agency funding through ACI.

Cyberinfrastructure (CI) Discussion: *Dr. Manfred Zorn, Program Director, BIO/DBI and Dr. Christopher Greer, Program Director, OCI*

Dr. Zorn described NSF's CI vision (developed by the Office of Cyberinfrastructure) to revolutionize science and engineering through cyberinfrastructure. The CI vision framework contains 4 components: 1) high performance computing, 2) data, data analysis, and visualization, 3) virtual organizations, and 4) learning and workforce development. He then discussed the BIO activities that map onto the vision framework and BIO's plans for the future. Recommendations were made that included: establishing a portfolio of applications, forming collaborative teams, cultivating innovative uses, and fostering the growth of a community of biologists that use High Performance Computing resources.

Dr. Greer reported on activities of the Plant Science Cyberinfrastructure Collaborative (PSCIC) working group. The focus of the PSCIC is on grand challenge questions in plant science and catalyzing new synthesis through interactions between biologists, computer and information scientists, and other disciplines. The anticipated outcome is to fund one award for up to \$50 million over 5 years. It was noted that this center would not support the collection of primary data. The solicitation was published in August 2006 and a prospective PI meeting was held in September 2006 in which 160 potential PIs participated. The full proposal target date is April 2007.

Dr. Robert Robbins, BIO AC liaison to the Advisory Committee for Cyberinfrastructure (ACCI) reported on the major events from the ACCI meeting on October 31 and November 1, 2006. Four task forces were set up to collect information, inform, and make recommendations. The task forces were to cover: 1) analysis of the current NSF CI portfolio, 2) digital data, 3) CI and competitiveness, and 4) CI-Learning, discovery, and broadening participation. A report is due back to the ACCI within 2 months.

The BIO AC discussed:

- How the PSCIC investment will be integrated with other on-going activities
- The relative merits of funding one large award rather than several smaller awards
- The value of collaborations and partnerships

Joint Session with EHR Advisory Committee

The BIO and EHR Advisory Committees met in joint session for a working lunch to discuss two topics of common interest—undergraduate education and broadening participation, both as they relate to the biological sciences. BIO and EHR had formed joint working groups over the summer to explore ways in which the two directorates could work together to address these issues; presentations from the two working groups set the context for the subsequent discussion among the AC members.

- ***Broadening Participation in the Biological Sciences, Dr. Thomas Brady, Division Director, BIO/IOB, Dr. Roosevelt Johnson, Program Director, EHR/HRD***

Drs. Brady and Johnson, members of the BIO/EHR Working Group on Broadening Participation, discussed the need for broadening participation, and the progress that the working group has made in identifying potential mechanisms for BIO/EHR collaborations, as well as strategies to assess success. They noted that the two directorates had complementary approaches that could be leveraged through collaboration. The future of potential collaborations was discussed with examples of collaborative activities given.

- ***Undergraduate Education in the Biological Sciences, Dr. Penelope Firth, Acting Division Director, BIO/DEB, Dr. Daniel Litynski, Acting Division Director, EHR/DUE***

Drs. Firth and Litynski, members of the BIO/EHR Working Group on Undergraduate Education, discussed some of the critical challenges identified by the working group, which include increasing interdisciplinarity, development of new technologies, and an increased emphasis on incorporating research experiences into educational programs. Key issues that were discussed included determining the critical skills and knowledge that should be expected of graduates, reconsidering the undergraduate curriculum, creating integrated research opportunities, and making it all relevant to everyday life and work.

After the presentations, the AC members met in small groups (with representatives from both directorates) to brainstorm about potential mechanisms for addressing the following issues: how to engage students in science early, mentoring, and the biology curriculum.

The BIO and EHR ACs discussed:

- Curriculum and broadening participation as inseparable issues
- The importance of engaging students through introductory science courses

- Improved teacher preparation and the impact on engaging students
- “Pick battles small enough to win but big enough to matter”
- The importance of NSF taking the lead in curriculum reform
- Expanding science career options beyond medicine
- Strengthening relevance between science and everyday life
- How to Incorporate more technology in education
- Increasing the use of active learning
- Creating mechanisms to engage science faculty members in professional development
- Creating research experiences for average or high-risk students

Status of Developing Activities:

Neuroscience: Dr. Rae Silver, Senior Advisor, Office of the Director

Dr. Silver briefed the Advisory Committee on current neuroscience activities at NSF, including efforts to engage the community in articulating new research opportunities through a series of workshops. She reported on the recommendations that came out of the two workshops that were held over the summer and discussed plans for a third workshop to be held in March 2007. In the subsequent discussion, the AC members identified evolutionary and comparative neuroscience as an important area of research that NSF was uniquely suited to support.

The BIO AC discussed:

- Research opportunities in the field of brain and cognitive evolution, and in memory and learning
- Enhancing research in the field of evolutionary neuroscience
- Data handling of neuroscience
- Linking to CI for modeling and outcome predictions
- Relationships of the other systems (e.g., endocrine, sensory) to neuroscience

Theoretical Biology: Dr. Saran Twombly, Program Director, BIO/DEB

Dr. Twombly led a discussion on advancing the conceptual basis of biology, which is the focus of an ongoing NRC study and which was the topic of a recent workshop at NSF. One of the ideas discussed was that theory transcends disciplines and would be particularly useful in addressing the challenges of scaling dynamics across organizational levels, linking structure and function within interacting networks, and incorporating adaptive dynamics or feedbacks. Participants in the recent workshop indicated that theory would be critical for understanding how complex biological phenomena emerge from the dynamic interactions of less complex elements. The AC members provided input on how BIO might shape a solicitation in this area.

The BIO AC discussed:

- Value of theory in solving biological problems (e.g., spread of infectious diseases)
- Concerns about separating theory and experiments, and the continuing need for additional empirical data to address current challenges
- How education will be incorporated
- The need to engage the rest of the Foundation in this activity, and incorporate the skill sets of physicists and mathematicians

National Ecological Observatory Network (NEON): Dr. Elizabeth Blood, Program Director, Division of Biological Infrastructure (DBI)

Dr. Blood briefed the AC on recent NEON activities, including the design of the infrastructure mechanisms, cross-observatory activities, and the new NEON website (www.neoninc.org), which

includes workshop reports and a calendar of all NEON activities. Dr. Blood explained the structure of the NEON project, which includes the NEON Senior Management Team, the NEON Project Office at AIBS, Technical Services Contractors, and the NEON Advisory Board. Dr. Blood also discussed funding and the pending Conceptual Design Review, to be held in San Diego the following week. Beginning construction is expected in September 2007. The AC discussed the role of industry in this project, and how NSF can partner with industry more generally.

The BIO AC discussed:

- Concerns regarding the funding for NEON
- Mechanisms to encourage industry partnerships
- Feasibility of including socio-economic impact in the data that are collected

Discussion of Systems Biology: *Dr. Machi Dilworth, Division Director, BIO/DBI*

Dr. Dilworth led a discussion on the topic of systems biology, and the potential for identifying a unique NSF role to enhance new research opportunities in this burgeoning field. After a spirited discussion, a subgroup of the AC was charged to develop a short white paper on systems biology and the role that NSF might play in advancing the field.

The BIO AC discussed:

- The meaning of the term “systems biology”
- Fundamental importance of integrating information to understand emergent properties
- Analogies with other fields (such as condensed matter physics)
- The role of both theory and empirical data in systems biology research
- Extant university programs
- Communication between disciplines

Reports

Emerging Frontiers Virtual Division COV: *Dr. Christopher Comer, BIO AC*

Dr. Comer reported that the COV gave a favorable review of EF and the subset of EF programs that they reviewed. They were particularly enthusiastic about the Research Coordination Networks program. He also briefed the Committee on several recommendations from the EF COV report, including improving the panel summaries to provide more substantive feedback to the PIs and to provide greater emphasis on broader impacts, creating a new program modeled on the RCN program but with a focus on education, and emphasizing assessment. The BIO AC accepted this report unanimously.

Division of Environmental Biology COV: *Dr. Michael Mares BIO AC (via teleconference)*

Dr. Mares reported that the COV gave a favorable review of DEB, and briefed the Committee on some of the concerns raised in the COV report, including the impact of increased workload on DEB Program Officers, decreasing success rates related to flat funding compounded with increased submissions, and the implications of balancing basic research with innovative and risky ventures. The BIO AC accepted this report unanimously.

CEOSE Report, *Dr. Muriel Poston, CEOSE liaison to the BIO AC*

Dr. Poston discussed the history and goals of the Committee on Equal Opportunities in Science and Engineering (CEOSE), which are to review and provide advice to NSF about all of its programs, including those for underrepresented groups. She concluded with a discussion of ongoing CEOSE activities, including a mini symposium on identifying ways to facilitate broadening participation, and creation of a biennial report on the effectiveness of the broader impact review criterion on broadening

participation. The report from the Committee will be made available to the BIO AC at the April meeting.

Friday, November 3, 2006

Reports (continued)

AC-ERE Report, Dr. Susan Stafford, Chair and BIO AC liaison to the AC-ERE

Dr. Susan Stafford discussed the history and goals of the Advisory Committee for Environmental Research and Education (AC-ERE), which are to provide advice to NSF on its portfolio of environmental research and education activities, identify future opportunities and act as a liaison to other NSF Advisory Committees. Topics of discussion included greenhouse gases, biosphere preservation, and sustainability.

The BIO AC discussed:

- Activities of the AC-ERE in the area of sustainability
- Curriculum reform

Discussion of Institutional Barriers to Recruiting POs and DDs, Dr. Maryanna Henkart, Division Director, BIO/MCB

Dr. Henkart explained to the Committee that NSF's ability to fulfill its mission depends on recruiting a significant number of "rotating" Program Officers (POs) and Division Directors (DDs) every year. She requested the Committee's advice on identifying and addressing potential institutional barriers that may be affecting BIO's ability to recruit POs and DDs. The AC recommended potential steps to increase the prestige of NSF service and to help educate institutions on the long-term benefits of sending their faculty to NSF as a rotator. They also suggested that NSF consider ways to help faculty address potential issues related to maintaining research funding while serving as a rotator and immediately after returning to their home institutions. Finally, the AC discussed how NSF might address family and housing issues that potential rotators face.

The BIO AC discussed:

- Actively recruiting POs at HBCUs and small colleges
- Educating university and college administrations about the value of serving at NSF
- Raising the prestige of NSF service
- Mechanisms to compensate Program Officers for potential loss of research productivity while serving at NSF
- Family and housing issues, including personal circumstances of rotators, cost of living differences, and relocation costs
- Alternatives to relocation (teleworking, flex-time, etc.)

Discussion with Dr. Arden Bement, Director, NSF and Dr. Kathie Olsen, Deputy Director, NSF

Dr. Bement opened the discussion with the BIO AC with comments about Administration priorities, a continued emphasis on homeland security, growing opportunities for science and engineering communities to address national needs, growing sophistication of research tools as enablers, and workforce issues. He stated the NSF budget had passed the full House and Senate subcommittee, but had not yet passed the full Senate, and noted that he expected a rescission due to increased funding needed for the defense bill.

The BIO AC and Drs. Bement and Olsen discussed:

- Issues associated with declining success rates

- How to assess progress in broadening participation and broader impacts, including the possibility of changing the reporting forms to require that these topics are specifically addressed
- NSF's role in supporting neuroscience
- BIO's role in the ACI
- The role of industry in large MREFC projects (including NEON),
- Joint BIO/EHR activities that might address curricular reform at the undergraduate level.

Future Business

- Michael Mares will become the BIO AC Chair at the Spring 2007 meeting.
- Joseph Travis will be the new AC-ERE liaison.
- Three working groups were created:
 - Education
 - J.K. Haynes
 - Mary Lou Guerinot
 - Ellen McCulloch-Lovell
 - BIO liaison—Penelope Firth (subsequently changed to Judith Skog)
 - Systems Biology
 - Susan Bryant
 - Warren Burggren
 - Richard McCombie
 - Christopher Comer
 - BIO liaison—William Zamer
 - Sustainability
 - Christopher Comer
 - Joseph Travis
 - Daniel Wubah
 - Richard McCombie
 - Ellen McCulloch-Lovell
 - BIO liaison—Alan Tessier (subsequently changed to Penelope Firth)
- Possible dates for 2007 meetings
 - Spring – April 19-20 or 26-27
 - Fall – November 18-19 or 25-26

Around the Table Comments Included:

- Enthusiasm for richness of BIO AC meetings
- Appreciation of the broadness and diversity of BIO
- Requests for more discussion times with fewer presentations
- Request for future meeting to have an old business section
- Excitement to have more joint directorate interactions

The Fall BIO Advisory Committee meeting was adjourned at 12 pm.

APPROVED:

Susan Stafford, Chair

Date