Meeting of the BIO Advisory Committee Summary Minutes October 20-21, 1997

MONDAY, OCTOBER 20 - MORNING SESSION

Welcome and Introduction of New Members
Dr. Lydia Villa-Komaroff, Chair of the Advisory Committee for Biological Sciences (BIOAC), convened the meeting at 9:00 am with a welcome to members and guests.

Dr. Mary Clutter, Assistant Director for the Biological Sciences (BIO), introduced new advisory committee members (Dr. Ellen Goldberg, Dr. Ralph Quatrano, Dr. Marvalee Wake, and Dr. Robert Horsch). She noted that Dr. George Jones was also a new member but was not in attendance at the meeting.

Dr. Clutter also introduced new BIO senior staff:

- Dr. Bruce Hayden, Division Director, Division of Environmental Biology
- Dr. Charles Liarakos, Deputy Division Director, Division of Molecular and Cellular Biosciences
- Dr. Machi Dilworth, Acting Division Director, Division of Biological Infrastructure
- Dr. Maryanna Henkart, Division Director, Division of Molecular and Cellular Biosciences.

Dr. Clutter announced that Dr. Frank Harris is the new Chair Designate and that Dr. Benjamin Hart is the new CEOSE representative.

Remarks and Approval of Minutes
The minutes for the April 1997 meeting were unanimously approved by the BIOAC.

FY 1998 Budget
Dr. Clutter reviewed the current status of the FY 1998 Budget for NSF. Dr. Clutter then reviewed BIO's budget and proposal trends within the last decade. In particular, she noted trends in BIO's proportion of NSF's Research and Related Activities (R&RA) budget, proposal success rate, award size and duration, and modes of support. Dr. Clutter finished her

presentation with a review of follow on actions from recommendations made by the BIOAC in FY 1997. In particular, she discussed Small Grants for Exploratory Research (SGER), multidisciplinary proposal review, the new merit review criteria, postdoctoral fellowships, graduate student support, molecular evolution and the NSF Government Performance and Results Act (GPRA) Strategic Plan.

The BIOAC discussed:

- How the $40M for plant genome research was added to NSF's budget and how that amount compares to other Federal genome initiatives.

Report on BIO Management Retreat
Dr. James Edwards, Deputy Assistant Director for the Biological Sciences, gave an overview of BIO's annual planning process and reported on the FY 1997 BIO Senior Management Retreat. The topics Dr. Edwards covered from the retreat included:

- The BIO Issues Working Group, particularly the Working Group's charge, assumptions they worked under, problems they encountered and interim recommendations.
- A new genomics working group to develop a Plant Genome initiative.
- The possibility of a new molecular evolution panel. Dr. Villa-Komaroff addressed this issue further by stating that there first needed to be an evaluation of the criteria for establishing new panels before this specific topic could be addressed.
- Decision tree developed by the Special Competitions Working Group.
- Impacts of FastLane on BIO staff and the reviewer community.
- Need to increase the numbers of individuals from under-represented groups in the scientific community and at NSF.
- Congressional scrutiny of NSF's rotator program.

The BIOAC discussed:

- The benefits of using evaluative tools such as the decision tree to meet GPRA requirements.
- How BIO will address increased workload from the Plant Genome initiative.

Dr. Neal Lane, Director, NSF
Dr. Clutter opened the session by reviewing the outcomes of the National Science Board (NSB) meeting in Houston, Texas (October 8-10, 1997). She noted that graduate and postdoctoral education was a major topic of discussion at the meeting.

Dr. Neal Lane further elaborated on the NSF FY 1998 Budget and discussed GPRA with the BIOAC. He noted that NSF submitted its GPRA strategic and performance plans with the OMB FY 1999 Budget. Dr. Lane stressed that NSF will continue to need Advisory Committee input on implementing GPRA. Dr. Lane stated that the scientific community needs to address the issue of under-represented groups in science and engineering, and asked that the BIOAC provide its thoughts on this problem. He also noted that we need to find ways to identify outstanding young people who are not at the top research institutions and bring them into first rate research laboratories.

The BIOAC discussed:

- How to bridge the perceived disconnect between excellence in science and the need to broaden the diversity of the scientific community.
- If NSF's approach to the development of its budget has changed in light of the $40M for plant genome research. Dr. Lane noted that NSF still goes through the same budget development process.

Graduate Education and Human Resources Development Working Group Report
Dr. George Hill summarized the report from the Graduate Education and Human Resources Development Working Group. Dr. Hill was very pleased with the report and noted that it will be very important for Division Directors and Program Officers to be fully involved and committed to human resources goals.

BIOAC response: Research Experiences for Graduate Students (REGS)

- Supported the REGS program, and noted that in particular it ensures that good graduate students are coupled with first-rate research laboratories. They expressed concern that sometimes recipients of Graduate and Minority Graduate Fellowships end up in laboratories that have little or no funding.
- Expressed concern that adequate support should be provided to first year graduate students.
- Expressed concern that the requirement to identify graduate students and address human resource development issues in proposals may make Principal Investigators (PIs) more likely to ask for support for technicians and postdoctoral fellows, rather than graduate students.

Other issues

- Discussed if under-represented groups are rejecting jobs in academia or are more likely to go into medicine. Noted that we need to ensure that both the undergraduate and graduate environment are supportive.
- Noted that another important constraint is the lack of money available to graduate students for supplies.
- Suggested the development of teaching fellowships for graduate students to teach at the middle and high school levels. This would improve science education at these levels and provide graduate students with valuable teaching experience outside of the university.
- Recommended that the National Science Board ask the National Research Council to review the use of average GRE scores as a major criterion for ranking graduate programs.

MONDAY, OCTOBER 20 - AFTERNOON SESSION

Working Lunch

BIOAC Workshops Report and Discussion
Dr. Gregory Florant reported on the workshop he organized at Colorado State University on "Integrating the Life Sciences: Meeting the Needs of the 21st Century." In reviewing the recommendations, he focused on actions NSF could take, such as expanding the Systemic

Reform Initiative to include post-secondary education and augmenting the Research Experiences for Undergraduates (REU) program.

The BIOAC discussed:

- The reduction in number and complexity of undergraduate laboratory courses.
- The need to encourage universities to view mentorship by faculty as a valuable activity.
- The importance of curriculum reform at the undergraduate level.
- The importance of specifically addressing graduate student education needs when developing interdisciplinary programs.
- The benefits of program officers meeting with RTG/IGERT students during site visits.
- The need for more BIOAC workshops.
- The need for NSF to consider increasing the diversity of rotators.

NSF Rotator Program- Role and Purpose
Dr. Bruce Umminger, Division Director for Integrative Biology and Neuroscience, reviewed the role and purpose of NSF's rotator program. He noted that currently about 50% of BIO's scientific staff are rotators and that the program is under increased scrutiny. Dr. Umminger mentioned the Science article on the rotator program and noted that not all rotators are paid for out of research funds, just those hired under the Intergovernmental Personnel Act (IPA). Dr. Umminger noted the following points to consider:

- Rotators bring new ideas to NSF to keep current with trends and opportunities in science.
- Rotators bring first hand knowledge of the working environment, its opportunities and constraints, of university and college scientific faculty members.
- Rotators gain excellent experience they can take back to their home institutions.
- Recruitment of rotators is increasingly difficult.
- NSF's institutional memory is difficult to sustain, especially in programs staffed largely or entirely by rotators.
- Attention to annual training and team building is required.

Dr. Umminger asked the BIOAC to consider:

- The appropriate balance of rotators and permanent staff.
- Standardizing the program so that all rotators are some sort of IPA employee.
- Encourage rotators to maintain a relationship with NSF, such as participating in outreach activities, after they return to their home institutions.

The BIOAC discussed:

- The possibility of partnering the rotator program with certain schools, perhaps a business school, to enable rotators to get "credit" with their home institutions for training in science management. This could be beneficial in preparing individuals for academic management positions, such as deanships or department chairs. Overall, the BIOAC agreed that there needs to be some mechanism to enrich the rotator program.
- Making the rotator program competitive so that it is more attractive to faculty and academic institutions.
- The importance of the rotator program in bringing valuable knowledge back to home

institutions and the need to promote this benefit with academic institutions. One option discussed was to use former rotators in public relations activities.

The BIOAC felt that the current mix of rotator and permanent staff in BIO seemed appropriate.

Introduction to Breakout Groups (Maryanna Henkart)
Dr. Maryanna Henkart, Division Director for Molecular and Cellular Biosciences, asked for the BIOAC's assistance in developing NSF's goals in supporting genomic studies, infrastructure, and post-genome functional research. She noted that genome data is accumulating at an increasing rate. Dr. Henkart also reviewed the history of the Arabidopsis genome project and noted that it is a good model for approaching genome projects. Dr. Henkart presented a number of issues for the BIOAC to consider in their breakout groups.

The BIOAC met in breakout groups to discuss NSF's role in genomics from 2:20-4:00 p.m.

Report on Interdisciplinary Experiment (John Fray)
Dr. John Fray, Deputy Division Director for Integrative Biology and Neuroscience, presented the outcomes of the multidisciplinary experiment (MULE). In particular, Dr. Fray noted that 30% of the proposals reviewed by the MULE panel were recommended for funding, while the home program recommended 26% of the MULE proposals for funding. The home program panel's overall funding rate was 27%. Three proposals were recommended by both the MULE and home program panels for funding. Fray also discussed the MULE panel's views on what makes a "perfect" review system for multidisciplinary proposals, including selection of panelists and ad hoc reviewers, assignment of proposals, and how to define multidisciplinary.

The BIOAC discussed:

- The role of the program officer and NSF management in making funding decisions.
- The need to ensure that program officers and panels are sensitive to the broader societal impacts of research, including education and diversity issues.

TUESDAY, OCTOBER 21- MORNING SESSION

Committee of Visitors Reports and Approval
Dr. Clutter began this session by stating to the BIOAC that NSF needs advice on how to best integrate COV reports with Advisory Committee reports in order to demonstrate achievements within the context of GPRA.

The following COV reports were discussed by the BIOAC:

- Long Term Projects in Environmental Biology COV (reviewed by Dr. Frank Harris)
- Cell Biology COV (reviewed by Dr. Lydia Villa-Komaroff)
- Division of Integrative Biology and Neuroscience COV (reviewed by Dr. Gwen Jacobs)

The BIOAC discussed:

- The importance of providing award abstracts that are easily understood by the general public and ways to encourage PIs to write abstracts that meet this need.
- If NSF is funding enough SGERs.
- Various mechanisms to facilitate faster award decisions. Overall, the BIOAC strongly supported BIO's use of panels.
- The IBN COV's suggestion that NSF provide fellowships to support students who are at least two years into their graduate programs. Some members of the BIOAC felt that the first two years of graduate school were a better indication of future success than the undergraduate record. Others stressed the importance of continuing first year fellowships to allow graduate students to immerse themselves in their programs before they start teaching assistantships.

The BIOAC approved the COV reports.

Follow On to SGER Discussion:
Dr. Clutter followed up on the earlier discussion of SGERs by noting that from 1990-1996, across all of NSF 2272 SGERs were submitted and 1506 awards were made (66% success rate). In BIO, 577 proposals were submitted and 355 awards were made (62% success rate). Dr. Marvin Cassman (NIH) noted that NIH has tried funding high risk/high impact proposals through their regular programs without much success, but that this year they are trying it as a separate program. Dr. Aristides Patrinos (DOE) noted that DOE looks at funding such proposals after the regular panel has made its recommendations. He noted that this method has met with mixed success.

Government Performance and Results Act (GPRA)
Dr. Clutter asked the BIOAC to consider how advisory committees should assimilate COV reports and reviewed several models for how this could be achieved.

The BIOAC discussed:

- The models presented and generally supported the idea of a Directorate-wide COV that focused on a particular issue, such as education or infrastructure. This topic will be discussed again at the Spring meeting, when the report on the Directorate for Geosciences' COV will be available (addressed education, human resources, and facilities).

Dr. Clutter introduced a general discussion of how different types of institutions are addressing accountability issues and how NSF can apply these ideas to meet GPRA's accountability requirements. She asked the following BIOAC members to address this topic from the perspective of their institutions:

- Dr. Rita Colwell- University
- Dr. Ellen Goldberg- Research Institute
- Dr. Robert Horsch- Industry

Dr. Rita Colwell, University of Maryland
Dr. Colwell discussed the collaboration the University of Maryland has with Sweden and Norway. She noted that the success of this collaboration depended on significant investment in cutting-edge telecommunications technology and commitment on the part of faculty to take on

the challenges of lecturing via a telecommunications system. Another aspect of reinvention Dr. Colwell discussed was the University's decision to change to a merit-based pay system. She noted that this system allows employees and supervisors to interact in a meaningful away about their performance and to develop benchmarks for accomplishments. Currently, the University is looking at how to measure students' accomplishments, including the development of self-paced classes and an examination of student advising. Dr. Colwell recommended that it might be useful for NSF staff to visit universities to get a better sense of the kinds of changes they are making.

The BIOAC discussed:

- How universities can develop teaching performance evaluation mechanisms for faculty.

Dr. Ellen Goldberg, Santa Fe Institute
Dr. Goldberg reviewed the history of the Santa Fe Institute and noted that it is very experimental, multidisciplinary, and highly risk-oriented in nature. She also noted that up until very recently, the Institute felt that it did not need accountability measures. This philosophy changed once funding agencies began to require them. Dr. Goldberg discussed areas of accountability used by the Institute:

- Founding Workshops bring experts together to explore areas that may develop into new programs.
- Success of the Institute's programs is often measured by publications that represent breakthroughs in a scientific area. The challenge here is to communicate that although these breakthroughs are often picked up by the universities, they originate at the Santa Fe Institute. The Institute also looks for examples of how it has transferred ideas to universities and promoted the development of multidisciplinary programs.
- Looks for examples of where Institute-fostered collaborations among disparate fields have resulted in changing the focus of a field or the development of a new one.

Other areas discussed by Dr. Goldberg include:

- The Institute's summer school program on complexity for graduate students, postdoctoral fellows, young faculty, and some advanced undergraduates. They are tracking how these students do after they leave and it appears that many are up and coming interdisciplinary scientists.
- The development of a network of businesses interested in the Santa Fe Institute's work. The activity involves constant evaluation of how the Institute's work benefits businesses and how this connection to business impacts the Institute.
- A current effort to look at methods to address diversity issues at the Institute.

The BIOAC discussed:

- The Institute's pre-print paper series as a mechanism to educate the scientific community about the Institute's accomplishments.

Dr. Robert Horsch, Monsanto Life Sciences Company
Dr. Horsch stated that for industry, stock price change is the bottom line in terms of accountability- everything else are indicators that lead up to this. He noted that since most of

Monsanto's work is long term, developing accountability indicators in the near term is a challenge when impact will be several years away. Some measures Monsanto relies on include net present value calculations and the balanced score card model to evaluate the effects of current actions on future stock prices.

Working Lunch

Reports from Breakout Groups and Action Agenda
Dr. Nina Fedoroff reported for the first breakout group. She noted that while it will be difficult to effectively distribute the $40M for plant genome research, it can be done. This breakout group stressed that it is important to finish sequencing the Arabidopsis genome quickly, but that a large fraction of the money should not go to production sequencing of plant genomes in general. They felt the focus should be on international collaboration and the development of biological and technological advances aimed at understanding gene function, extracting information from sequences, and best approaches to understanding how families of sequences work. They also noted the need to promote the integration of sequence information with scientific knowledge from higher levels of biological organization (i.e., evolution, physiology, ecology).

Dr. Ralph Quatrano reported on the discussion of the second breakout group. This group largely concurred with the recommendations of the first group. In addition, they noted the need to interact closely with industry, as they have already undertaken some of this work. The group also supported the recommendations of the IWG on Plant Genomes, especially the recommendation to support studies and technology development in the area of functional genomics.

The BIOAC discussed:

- The need to invest in functional genomics while also ensuring that sequencing activities are completed.
- The opportunity available to NSF to develop a leadership role in genomic science.
- The importance of preparing a well-developed plan before activities are undertaken.
- The need to address the informatics component early on in this activity.
- The importance of not undertaking this activity via traditional centers. The idea of virtual centers was supported by the BIOAC.

Future Business
The BIOAC will consider April 6-7 or April 8-9, 1998 as dates for the next meeting.

Dr. Villa-Komaroff asked if anyone would be interested in holding a workshop and if the BIOAC should continue to hold them. The BIOAC supported the idea of additional workshops. Two new workshops will be held over the next year, in addition to the one already planned by Dr. Rita Colwell:

- Dr. Laura Hoopes- life sciences and computing
- Dr. Lydia Villa-Komaroff and Dr. George Hill- multidisciplinary graduate education

Any other BIOAC members interested in planning a workshop should contact Dr. Mary Clutter or Mrs. Peggy Weber.

Dr. Villa-Komaroff stated that she will write a draft response to the Science article on NSF's rotator program and will send it to the BIOAC for comment. Carbon copies of the response will also be sent to Dr. Neal Lane, Director, NSF and Dr. Richard Zare, Chairman, National Science Board.

Hardcopy minutes approved by: Lydia Villa-Komaroff, Chair

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