



Meeting of the BIO Advisory Committee Summary Minutes April 6-7, 1998

MONDAY, APRIL 6 - MORNING SESSION

Welcome, Dr. Mary Clutter

Dr. Mary Clutter, Assistant Director for the Biological Sciences (BIO), introduced BIOAC members attending the meeting for the first time (George Jones and Benjamin Hart (CEOSE representative)). Dr. Clutter noted that Dr. Rita Colwell, former BIOAC member, has been nominated as the new NSF Director and that Dr. Neal Lane will be nominated as the new Assistant to the President for Science & Technology and Director, Office of Science & Technology Policy (OSTP).

Remarks and Approval of Minutes, Dr. Lydia Villa-Komaroff

The minutes for the October 1997 meeting were unanimously approved by the BIOAC.

Report on Advisory Committee Chairs Meeting, Dr. Lydia Villa-Komaroff

Dr. Villa-Komaroff reviewed the main points of discussion from the Advisory Committee Chairs meeting on February 20, 1998. These included:

- The NSF FY 1999 GPRA Performance Plan, especially the role of Committees of Visitors (COVs) and Advisory Committees (ACs)
- The proposed National Institute for the Environment (NIE)
- Integration of research and education
- The efficacy of programs targeted at increasing diversity in the scientific workforce and students interested in science.
- Increasing participation in NSF's rotator program
- Customer service standards, particularly the 6 month response goal for proposals

The BIOAC discussed:

- How other ACs view the importance of integrating research and education.
- The need to consider differences in state-level funding for research when determining

how to distribute federal funds.

- The difficulties some students have in finding jobs after they earn the Ph.D. and mechanisms to promote career development, such as workshops and seminars on alternative careers, dual degree programs and specialized postdoctoral programs. This was suggested as a good topic for a National Science Board (NSB) occasional paper or Science Resources Studies (SRS) evaluation.

Dr. Neal Lane, Director, NSF

Dr. Lane discussed his probable nomination as Assistant to the President for Science & Technology and stated that the timing of his Senate confirmation and Dr. Colwell's is still uncertain. He also reviewed the discussion topics at the Advisory Committee Chairs meeting, particularly noting the important role ACs will play in evaluating NSF's implementation of the FY 1999 GPRA Performance Plan. Dr. Lane discussed the tension between funding for "core" research versus "theme" areas and the increased demands on program officers' time in trying to encourage more multidisciplinary research. In particular, he mentioned the Plant Genome Research activity as very exciting, but that it would significantly increase workload. Dr. Lane went on to discuss the FY 1999 House Appropriations hearing and noted that we are requesting the largest dollar increase in NSF history. Dr. Lane stated that NSF faces many challenges in planning for FY 2000 and beyond. He stressed the importance of the budget themes (KDI, LEE, EFF) in helping NSF to describe the relevance of the research it supports to Congress and society.

The BIOAC discussed:

- The importance of NSF continuing to communicate closely with colleges and universities in order to ensure the continued effectiveness of NSF's programs.

CEOSE Report, Benjamin Hart

Dr. Hart gave an overview of the last CEOSE meeting. He stated that Dr. Luther Williams, Assistant Director for Education and Human Resources (EHR), reviewed data on how much money NSF has spent over the years on programs targeted for women and minorities. Dr. Williams stated that despite this investment, progress is difficult to document and asked CEOSE to look at other potential mechanisms to increase the representation of women and minorities in science. Dr. Hart noted that CEOSE discussed the need to examine the representation of women and minorities on panels. At the next CEOSE meeting, Dr. Hart may suggest holding grant workshops for groups that are not traditionally successful at garnering grants.

The BIOAC discussed:

- The need to look at the numbers of women and minorities at all points in the education and academic career pipeline to see where individuals are dropping out and why.
- The effects of Proposition 209 on minority student admission rates in California, and the ramifications of similar proposed measures elsewhere in the United States.

FY 1999 Budget Request, Dr. Mary Clutter

Dr. Clutter reviewed the FY 1998 budget priorities and the FY 1999 Budget Request.

The BIOAC discussed:

- If NSF is leading change through its budget, or following what is already occurring in the community. This was discussed particularly in the context of NSF's support for "collaboratories" through the Plant Genome Research activity and other collaborative research efforts.

Long Range Planning

BIO Science Retreat, Dr. Mary Clutter & Dr. James Edwards

Dr. Clutter reviewed the guiding questions that BIO uses in its planning process and BIO's criteria for developing priorities.

Dr. James Edwards, Deputy Assistant Director for the Biological Sciences, reviewed the steps in the BIO priority setting process and the outcomes of the FY 2000 BIO science retreat. He noted that the proposed BIO FY 2000 emphases are KDI, LEE, EFF, Microbial Biology, and Nanotechnology. In particular, he asked the BIOAC to consider what kinds of GPRA measurements can be used for the proposed FY 2000 emphases.

Reports from Division Directors

Knowledge and Distributed Intelligence (KDI) - Dr. Bruce Umminger

Dr. Bruce Umminger, Division Director for Integrative Biology and Neuroscience, reviewed the three elements of KDI: Knowledge Networking (KN), New Challenges in Computation (NCC), and Learning and Intelligent Systems (LIS). He went on to discuss the history of KDI and the proposed FY 2000 BIO emphases, which include genomics, complex biological systems, and infrastructure.

Life and Earth's Environment (LEE)- Dr. Bruce Hayden

Dr. Bruce Hayden, Division Director for Environmental Biology, reviewed the six components of LEE: Integrated Research Challenges, Environmental Observatories, Ecosystem Sustainability (new activity for FY 2000), Global Change, Life in Extreme Environments, Urban Communities and Engineered Systems. He noted that there are NSF wide and BIO working groups on LEE that are working concurrently on FY 2000 planning efforts.

Educating for the Future (EFF)- Dr. John Fray

Dr. John Fray, Deputy Division Director for Integrative Biology and Neuroscience, reviewed NSF's FY 1999 EFF focus areas: Learning and Early Development, Transition from Childhood to the Workforce, Systemic Reform of K-16 Education, Learning Technologies, and K-8 Mathematics Initiative. He went on to discuss five proposed BIO focus areas for FY 2000: expanded K-8 teacher training, new and improved Research Experiences for Undergraduates (REU)-Sites program, Research Opportunity Awards (ROA)-like program targeted for Ph.D.s who are not currently engaged in scientific research, and a new postdoctoral fellowship program. He noted that BIO is actively working to partner with EHR in some of these activities.

Microbial Biology- Dr. James Rodman

Dr. James Rodman, Acting Deputy Division Director for Environmental Biology, discussed BIO's current activities in microbial biology and proposed ones for FY 2000. In particular, he discussed:

- Continuing development of microbial observatories at LTER sites, Field Stations and Marine Laboratories (begun in FY 1999) and expanding the Biotic Surveys and

Inventories program.

- Continuing expansion of the LExEn program to include microbial genomics
- Promoting technology development (instrumentation and technique development, databases, collections)
- Developing a new postdoctoral fellowship in microbial biology and enhancing support for training through the Integrative Graduate Education and Research Training (IGERT) and Partnerships for Enhancing Expertise in Taxonomy (PEET) programs

MONDAY, APRIL 6 - AFTERNOON SESSION

Long Range Planning, continued

Working Lunch- Plant Genome Research Plans

Dr. Mary Clutter, NSF

Dr. Mary Clutter reviewed the chronology of events leading to the National Plant Genome Initiative (NPGI) report in January 1998 and the NPGI's five-year goals and guiding principles. She noted that this is a long-term, interagency effort.

Dr. Eileen Kennedy, USDA

Dr. Eileen Kennedy, Deputy Under Secretary for Research, Education and Economics, Department of Agriculture, discussed the USDA proposal for a food genome initiative to increase USDA investment in food genome research and public understanding of the benefits of agricultural research. She noted that this initiative feeds into both national and global agricultural priorities because investments in agricultural genomic research are an essential element in dealing with food security and global hunger. Dr. Kennedy reviewed the elements of the food genome initiative and noted that three USDA agencies are involved: the Agricultural Research Service (ARS), the Cooperative State Research, Education and Extension Service (CSREES), and the Economic Research Service (ERS). In FY 1999, USDA is requesting \$40 M for the initiative (\$17 M increment). Investments via the initiative will include accelerated Arabidopsis sequencing; partial sequencing focusing on corn, soybean, cattle, and pigs; and comparative genomics, which will comprise the major share. There will also be a special emphasis on biological informatics and a modest investment in microbial genomics. Dr. Kennedy noted that there would be a stakeholders meeting on April 15, 1998 in order to give USDA's partners the opportunity to react to the draft initiative. She stated that there would be considerable coordination with other agencies, including NSF, to avoid duplication of efforts.

The BIOAC discussed:

- How USDA might leverage funds at land grant schools through such mechanisms as Hatch funds and regional or state level cooperative efforts.
- The need to articulate the benefits of agricultural genome research and a coordinated message on this from the relevant agencies.
- The need to develop new training opportunities for students in order to bring new people into agricultural research.

Dr. Machi F. Dilworth, NSF

Dr. Dilworth discussed NSF's activities in plant genome research. She reviewed the overall program goals for NSF's Plant Genome Research activity and FY 1998 activities, which include a competition for Collaborative Research and Infrastructure and another for accelerated Arabidopsis genome sequencing. She noted that there is also up to \$2 M available for "venture funding" of proposals submitted to other programs that fit the goals of the Plant Genome Research activity. Dr. Dilworth also reviewed the current status of Arabidopsis genome sequencing and FY 1999 plans, which include a second Collaborative Research and Infrastructure competition.

Dr. Dilworth also gave an overview of the NASA/NSF program on plant biology, which is a "virtual center". Dr. Dilworth explained that individual investigators applied to the program and the nine awardees were asked to work together as a "virtual center". Dr. Dilworth noted that there was initially some resistance by the PIs, but now there are several collaborative efforts among them, including an annual meeting, exchanges of postdoctoral fellows and graduate students, the development of a Web site, and the identification of a research question that will involve all nine laboratories to answer.

Reports from Division Directors, (continued)

Nanotechnology- Dr. Maryanna Henkart

Dr. Maryanna Henkart, Division Director for Molecular and Cellular Biosciences, reviewed BIO's FY 2000 proposed activity in nanotechnology. In particular, she discussed the development of nanotechnology and noted that Nanoscience and Engineering was highlighted in the FY 1999 Budget Request. In FY 1998, BIO is participating in a multi-directorate, interdisciplinary competition in nanotechnology. Dr. Henkart concluded by discussing how the biological sciences interface with nanotechnology and noting several examples of research opportunities relevant to the biological sciences, such as the principles of biological self-assembly.

Long Range Planning Discussion

KDI

The BIOAC supported KDI as an emphasis for FY 2000 and discussed:

- How NSF will evaluate proposals, given the wide range of proposals NSF is likely to receive.
- The need to develop tools to extract data effectively from large databases as an area that should be supported under KDI.
- The need to expand how research collections are supported.
- Coordination with other agencies to avoid overlap in KDI.
- The need to define a clear role for BIO in KDI.

EFF

The BIOAC supported EFF as an emphasis for FY 2000 and discussed:

- The need to assess the benefits of postdoctoral fellowships and how long they should be. This could provide the basis to determine what should be included in postdoctoral fellowships. In particular, they noted the need to expand the range of experiences in a postdoctoral fellowship, including teaching and multidisciplinary experiences.

- The need to reestablish laboratory-based classes in high schools.
- How to train teachers so that they have more confidence teaching scientific concepts. This included a discussion of the need to collaborate with state-level funding bodies in order to forge connections between state and national policies on teacher training.
- The importance of establishing an evolutionary framework early on in science education.

Nanotechnology

The BIOAC supported Nanotechnology as an emphasis for FY 2000 and discussed:

- Concerns that in the past nanotechnology was driven by materials science and the need to establish a clear role for biology.

Introduction to Breakout Groups

Human Resources- Dr. Wanda Ward, NSF

Dr. Wanda Ward, Assistant to the Deputy Director, reviewed the presentation she gave to the NSB in February on human resources development. She noted that a major issue for NSF is what kind of outcome are we seeing given the significant investments we have made in human resource development. She also noted that a key question in preparing the NSB presentation was "What will the professoriate look like in the 21st Century and, at NSF, are we adequately prepared to produce and support this professoriate?" Dr. Ward then reviewed statistics on participation of women and minorities in the biological sciences. She noted that for women, there is parity at the baccalaureate level, but that this drops off at the Ph.D. and faculty levels. For minorities, there is no parity at the baccalaureate level, and this trend continues to a greater degree at the Ph.D. and faculty levels. However, she noted that some data suggest that we are moving in a positive direction. This includes a growing number of women and minority NSF grant applicants and awardees. Dr. Ward also discussed the Collaboratives to Integrate Research and Education (CIRE) program. She noted that it is an effort to establish long-term research and education relationships between NSF-supported facilities and centers and minority-serving institutions.

The BIOAC discussed:

- Programs at BIOAC members' institutions that foster the development of underrepresented minorities and women in science.

Research Resources - Dr. Marvin Cassman, NIH

Dr. Marvin Cassman, Director for the National Institute of General Medical Sciences, gave an overview of the synchrotron facilities in the United States. He stated that there are seven in existence, with five used heavily for structural biology research. Dr. Cassman noted that an increasing percentage of structures have been determined by synchrotrons, but that access to these facilities is difficult. He stated that the problem is not a need for more synchrotrons, but better access to existing facilities. Most facilities are currently underutilized because of the way beam lines are built, run, and operated. An interagency working group that includes facility operators has been established by the OSTP to address this problem. Issues the working group will consider include long range plans for facility upgrades, interagency mechanisms for facility support, and the priority levels of various facilities. This working group will determine needs, priorities, and short and long term plans for synchrotron facilities. He also noted that OSTP sees this working group as a model for the development of working groups for other

types of research resources, such as high field NMR.

The BIOAC discussed:

- The importance of well-trained technicians at synchrotron facilities.
- The role synchrotrons and other large facilities can play as a place for teachers and students to learn about science.

Preliminary Reports from Breakout Groups

Dr. Laura Hoopes gave a preliminary report for the human resources breakout group and Dr. Ralph Quatrano gave a preliminary report for the research resources breakout group.

TUESDAY, APRIL 7 - MORNING SESSION

IGERT

At the request of the BIOAC, Dr. Gerald Selzer reviewed the current status of the IGERT program. He stated that NSF is about to make 20 awards. In this first competition, 600 preproposals were received and 62 full proposals were invited. More than half of the awards have a biology component. Two more competitions are planned and then NSF will review the program and develop future plans. It is expected that 20 additional awards will be made in FY 1999.

National Institute for the Environment, Dr. James Edwards

Dr. Edwards reviewed the Congressional language directing NSF to prepare a report on how it would establish and operate an NIE, including potential costs. He also noted that there is a House bill, "The Sound Science for the Environment Act" (HR 2914), that would establish an NIE under the auspices of the NSF. Dr. Edwards went on to discuss the Committee for the NIE (CNIE), which is the organization that proposed the establishment of a NIE, and their proposal for what it would accomplish. Dr. Edwards noted that the NSB has passed a resolution on the proposed NIE stating that it supports additional funding for environmental research and education, but that establishing an NIE would likely isolate environmental research and education from related activities.

The BIOAC discussed:

- Which proposed NIE activities NSF and other agencies are already doing.
- The need for NSF to coordinate with other agencies on environmental matters.

Breakout Group Reports and Discussion

Human Resources - Dr. Laura Hoopes

Dr. Hoopes reviewed the final recommendations:

- NSF should consider using additional vocabulary to provide a different normative basis for its actions with respect to underrepresented groups, such as "educational or

economic disadvantage".

- Some members of the breakout group support using SAT/GRE scores as a threshold, rather than a selective factor, in the admissions process. Others advocated a comparison of underrepresented students who did well on these tests with those that did not in order to determine if there could be any particular reasons that point to areas where NSF support is needed.
- A longitudinal analysis from young school age through career development is needed in order to fully understand the factors involved in students entering and succeeding in careers in science.
- The REU program should be expanded to include incentives to institutions that serve a large number of minorities to participate. The REU program could also be expanded to encourage community college students to do research at REU-Sites.
- More incentives for underrepresented groups to consider careers in academia may be needed, as minority professors are powerful role models.
- Mentoring programs for assistant professors should be established at research universities to steer them towards career-building activities.
- Some felt that the CAREER program has unrealistically high expectations for research and education plans and that the program's goals are not compatible with some institutions' teaching development plans. All agreed that new investigators should retain the option to apply through the regular programs.
- NSF should consider a starter grant program that would match or partially match start-up funds given to incoming faculty members in the biological sciences.

BIOAC comments:

- Are department chairs taking the chair letter component of the CAREER application seriously? It seems that in many cases, the letters are perfunctory.
- The goals of the CAREER program need to be clearly identified to reviewers.
- It is important to ensure as much diversity as possible on all panels and among rotators.
- It is important to ensure that there are clear connections among NSF's programs for underrepresented groups.
- Policy training and other developmental activities should be brought into the rotator program in order to make it a strong research leadership development program.

Research Resources (Dr. Ralph Quatrano)

Dr. Ralph Quatrano reviewed the final recommendations:

- NSF should develop guidelines for what types of projects will be funded. The current BIO priority setting criteria could serve as a basis for developing these guidelines.
- A mechanism for long-term support of these resources should be developed. One option is for NSF to pay initial start-up costs, then bring in a user fee system involving universities, individuals, professional societies and other groups to support the resource for the long-term.
- Guidelines should also be developed for the storage of data.
- An analysis should be conducted of research resource users to identify other sources to help support these resources. For example, if a significant number of USDA-supported PIs are using a particular resource, then USDA should contribute to the cost.

- Guidelines need to be established to ensure greater public access to information and institutions will need to find ways to reduce or eliminate barriers to information.

BIOAC comments:

- Mechanisms should be developed to archive some research databases and collections once data are no longer being added to them.
- Consider incorporating a sliding scale into user fee systems to retain accessibility to resources.
- Another support option is to institute a data registration fee mechanism so that individuals who are depositing data in the database are also helping to support it.
- Long-term support mechanisms should be part of the shared resources review criteria.
- Another model to consider for reducing costs is the distributed database, where individuals keep and maintain their own data, rather than depositing them in a central database, but they are available to all users through a centralized access point.

Long Range Planning Discussion- (continued from 4/6)

LEE

Dr. Hayden continued the discussion by reviewing the outcomes of the LEE retreat and noted that there are three overarching and overlapping areas that NSF will likely focus on in FY 2000: Global Change, Biodiversity and Ecosystem Dynamics, and Human Dimensions of the Environment. He noted that a major challenge would be to devise a management structure for LEE.

The BIOAC supported LEE as an emphasis for FY 2000 and discussed:

- The need to ensure cooperation among the research directorates and EHR in activities targeted at integrating research and education.
- The need to ensure that LEE focuses on the basic research that needs to be done in these areas.
- The possibility of looking to multidisciplinary activities at universities as models for management.

Microbial Biology

The BIOAC supported Microbial Biology as an emphasis for FY 2000 and discussed:

- The need to inventory current U.S. and international activities in microbial biology to prevent overlap and promote coordination, especially in genomics.
- The importance of training activities that promote basic research skills and develop the next generation of microbiologists.

FY 1998 Committees of Visitors- BIOAC Liaisons

Ecological Studies Cluster/DEB (May 13-15) - Dr. Frank Harris

Instrumentation-Related Activities Cluster and Field Stations and Marine Laboratories/DBI (June 8-10) - to be determined

Physiology and Ethology Cluster/IBN (July 13-15) - to be determined

Molecular and Cellular Biosciences Division (MCB) (July 22-24) - Dr. Laura Hoopes

Status of BIOAC Workshops

The BIOAC discussed if the workshops should broaden beyond the Integration of Research and Education theme. The members agreed that it should and suggested possible future topics, such as factors influencing career choices in the sciences or the development and management of research resources.

Dr. Laura Hoopes' workshop on computing in the life sciences will be held on April 25, 1998. It will focus on two themes: (1) is computing bringing together research and teaching in the life sciences? and (2) what infrastructure needs and concerns can be identified for life sciences computing?

Dr. George Hill's and Dr. Lydia Villa-Komaroff's workshop on multidisciplinary in graduate education will be held in the fall.

Dr. Judith Ramaley volunteered to hold a workshop on biological informatics, with a focus on New England institutions.

Dr. Clutter then asked the BIOAC members for their thoughts on whether the integration of research and education is still a problem at universities and the efficacy of NSF's programs in this area.

BIOAC comments:

- NSF considers the integration of research and education to be a priority, but many still see it as impeding research.
- Monetary incentives are need to create enthusiasm among faculty for integrating research and education.
- Effective integration of research and education differs among institutions and even among departments within institutions. Much of it depends upon the institutional or departmental culture.
- One method to encourage integration at the undergraduate level is to make an investigative component a mandatory part of the B.S., although this may be more feasible at smaller institutions with fewer undergraduates. Summer research internships were also noted as being very successful.
- It might be useful to encourage or require graduate students to undertake some sort of service work, such as tutoring and community outreach activities.
- It is important to develop some sort of tracking system to see where undergraduates, graduates, and postdoctoral fellows who participate in NSF programs end up.

TUESDAY, APRIL 7 - AFTERNOON SESSION

Working Lunch- FY 1999 NSF Performance Plan- Dr. Judy Sunley

Dr. Judy Sunley, Assistant to the NSF Director, reviewed NSF's challenges in implementing the Government Performance and Results Act (GPRA), the outcome goals of the FY 1999 NSF GPRA Performance Plan, tools NSF has and will develop to assist with the assessment, and the role of ACs in reviewing NSF's activities under the Performance Plan. She noted that there

are several options for how ACs can evaluate NSF's performance and asked for input from the BIOAC on this issue. She stated that at the Fall 1998 AC meetings, NSF will probably ask the ACs to do a "mock assessment" in preparation for the real one in 1999.

BIOAC comments:

- Given time constraints, the AC role should probably be to review a report prepared by the Directorate and/or the COVs, rather than prepare a report itself.
- The BIOAC agenda is already very full and therefore it might be useful to recast some of their current assessment activities in terms of the Performance Plan.
- Implementing the Performance Plan will require considerable amounts of staff time to gather and analyze the data.
- NSF may want to look at the year's great discoveries in science and Nobel Prize winners and map them to related contributions that NSF has made.
- Perhaps NSF should require PIs to more clearly articulate the effects their contributions may have in the future to help NSF measure success. NSF could also examine success in its internal processes, rather than strictly scientific output.
- It is necessary to evaluate the outcomes of education, as well as research activities.

Future Business

The BIOAC will consider October 15-16 or October 22-23, 1998 as dates for the next meeting.

The meeting adjourned at 1:40 p.m.

Hardcopy minutes approved by W. Franklin Harris, Chair

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