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# Meeting of the BIO Advisory Committee Summary Minutes April 26-27, 2001

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## THURSDAY, APRIL 26 - MORNING SESSION

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### **Welcome and Introduction of New Members, Dr. Mary E. Clutter, Assistant Director for Biological Sciences (BIO)**

Dr. Clutter welcomed new members Dr. Vicki Chandler, Dr. George Liggins and Dr. Marian Johnson-Thompson. Dr. Norine Noonan, formerly an ex officio member, is now a full member. This meeting will focus on proposed priorities for the FY 2003 budget request.

### **Remarks, Dr. Ellen Goldberg, Chair**

#### **FY 2002 Budget and BIO Emphases, Dr. Mary E. Clutter**

Dr. Clutter presented slides on the FY 2002 request to Congress. Discussion areas included grant size and duration, and protecting core activities.

#### **Approval of Minutes (November 2000)**

The minutes of the previous meeting were approved by voice vote.

#### **Report on Advisory Committee for Environmental Research and Education (AC-ERE), February 2001, Dr. James Collins, Convenor and BIOAC Representative**

Dr. Collins reported on the second meeting of this AC. The AC established three task forces, Strategic Plans for R & D, Environmental Infrastructure, and Assessing Outreach and Education. The first meeting in October 2000, covered Biocomplexity, Environmental Research and Education, and Strategic Plans. The AC was formed as a result of NSB report recommendations that NSF develop an environmental science portfolio across the disciplines.

#### **NSF/BIO Education Activities:**

#### ***NSF Education Activities, Dr. Judith Sunley, Interim Assistant Director, Directorate for Education and Human Resources (EHR)***

Dr. Sunley presented slides on Education and Workforce Issues. NSF has a major role in the

Administration's FY 2002 Math and Science Partnerships initiative; in fact some aspects of the overall initiative were begun at NSF. Enhanced interaction between EHR and other NSF directorates is needed. Discussion centered on ways NSF can contribute to solving current problems in science education including outreach, encouraging scientists to become teachers, applying research on learning to teaching, catalyzing partnerships between school and business or universities, and helping underserved populations.

***BIO Education Philosophy, Dr. Judith Verbeke***

Dr. Verbeke presented a document that had been prepared by BIO Staff that attempts to define the directorate's role in education activities. BIO's role includes responding to changing paradigms in biology, education and technology; ensuring that investigator-initiated proposals integrate science and education; focusing on specific areas where BIO plays a unique role; and enhancing partnerships with EHR and others. Discussion issues included developing a list of suggested ways to interact with the education community.

**Working Lunch - Discussion with Dr. Rita Colwell, NSF Director**

Dr. Colwell discussed the April 25, 2001, House Science Committee hearing. Chairman Sherwood Boehlert favored an increase in the FY 2002 appropriation over the President's request. Other topics of discussion included the FY 2002 Math Science Partnership initiative, increasing grant size and duration and stipends, the international activities program, and community outreach.

**THURSDAY, APRIL 26 - AFTERNOON SESSION**

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**BIO Science Retreat**

***Introduction - Current Scientific Issues, Dr. James Edwards, Deputy Assistant Director, BIO***

Dr. Edwards presented slides on the results of the FY 2001 BIO Science Retreat. He discussed four guiding questions; the steps involved in selecting priority areas; and criteria for developing priorities. The retreat participants selected suggested areas for development: Genome-enabled Science, Biology of Complex Systems, and Beyond the Genome. Presentations on these three areas of emphasis followed.

***Genome-enabled Science, BIO Staff: Dr. Machi Dilworth, Dr. Maryanna Henkart, Dr. Judith Verbeke, Dr. Terry Yates; AC Members: Dr. Claire Fraser, Dr. Frank Harris, Dr. John Wooley***

Genome-enabled Science includes three more specific topics: Microbial Genomics, the Evolution of Development (EvoDevo) and the Tree of Life (ToL).

Dr. Henkart presented slides on the Microbe Project, within Microbial Genomics. Goals of the project include sequencing microbes of scientific and practical interest, developing tools for research, and enhancing support for new research.

Dr. Yates and Dr. Greene presented slides on EvoDevo and the ToL. EvoDevo intends to support the creation of Bacterial Artificial Chromosome and cDNA libraries for 100 key taxa, to

serve as resources for the community at large. These taxa will be selected by community consensus by means of a solicitation. The ToL project intends to determine the relationship of key branches on the phylogenetic tree, based on genomic, morphological and other data. The ToL will have predictive value in locating a gene of interest in a taxonomic group.

***Biology of Complex Systems, BIO Staff: Dr. Eve Barak, Dr. Frank Greene, Dr. Joann Roskoski, Dr. Mary Jane Saunders; AC Members: Dr. James Collins, Dr. Marvalee Wake***

Dr. Roskoski presented slides on this area which includes the study of interactions of parts of biological systems, from cells through ecosystems. Research would be encouraged by cross-disciplinary teams of individuals who understand both biological and physical (including mathematical) approaches.

***Beyond the Genome, BIO Staff: Dr. Frank Greene, Dr. Maryanna Henkart; AC Members: Dr. Ellen Goldberg, Dr. George Jones***

Dr. Henkart presented slides on this area. The ultimate goal of the effort is to understand how living systems work - from individual biomolecules to ecosystems. Two components include the use of sequence information to deduce structure and function, and the development of information (in addition to the information that can be deduced from genome sequence) that will be required for a complete understanding of living systems. Types of information that cannot be deduced from genome sequence include the architecture and dynamics of living systems. Discussion included the need to involve theorists and mathematicians.

***General Discussion - BIO Proposed Thrusts***

The BIOAC endorsed these areas, but were concerned about overlap among them, as well as with other agencies. The BIOAC recommended rethinking these areas and making them crisper and more distinctive.

Dr. Clutter thanked the group for their suggestions and noted the importance of having scientific priorities with well-defined goals.

**FRIDAY, APRIL 27 - MORNING SESSION**

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**BIOAC Activities - Status Reports**

***Annotation and Standards - Microbial Genomics, Dr. Claire Fraser, Dr. John Wooley***

Dr. Fraser and Dr. Wooley led the discussion, which focused on the need for standard terminology, interoperable databases, and timely release of information. They are planning a workshop, to be held in the Fall.

***Most Challenging Questions in Biology, Dr. Ellen Goldberg***

Dr. Krishtalka presented 11 highly challenging questions, ranging from the origin of the universe, through the Tree of Life, to the integration of all biological systems. A workshop is planned for the fall at the Santa Fe Institute, to refine and present a report to BIO.

***LTER 20-Year Review***

Dr. Krishtalka led the discussion. This independent review will examine past accomplishments, current challenges and future opportunities, and will build on the 10-year Long Term Ecological Research Program (LTER) review. There will be three meetings, including a site visit.

Questions to be asked include: what are the contributions of LTER to ecology; how has LTER capitalized on new technology such as GIS and genomics; how have events changed LTER; and how has LTER contributed to the education of new scientists, publications and long-term databases. A report will be submitted to BIO in December 2001 or early in 2002.

## **Management Issues**

### ***Long-Term Management of Databases - Informatics, Dr. Leonard Krishtalka***

Dr. Krishtalka noted that access to information is critical, and that, whenever possible, informatics standards should precede research. The longer it takes to develop standards for interoperability, the more balkanized information will be, the more likely data will be lost, and the more costly it will be to manage the data. Ideally, 40% of any research budget should be for informatics. Potential solutions involve workshops; an informatics organizing center such as a virtual center; help from disciplinary societies (provide standards; rethink their role beyond print journals and annual meetings); and funding from the Major Research Equipment account for databases. Dr. Edwards noted that preservation of legacy data should be part of this effort and that international implications/involvement should be considered.

### ***Information Infrastructure, BIO Staff: Dr. Mary Jane Saunders, Dr. Terry Yates; AC Members: Dr. Gwen Jacobs, Dr. Leonard Krishtalka***

Dr. Saunders noted that possible five-year goals include new techniques for data management, integration of disparate databases, common data management systems for PIs, and long-term management of databases. Immediate goals for FY 2002 include workshops and coordination with other Directorates in NSF. Potential competitions for FY 2003 include informatics aspects of the Microbe Project and of environmental programs. Discussion included ways to ensure information infrastructure is addressed, including requiring awardees to make tools available, and working with professional journals to disseminate information.

### ***Major Research Equipment (MRE) - BIO Possibilities, BIO Staff: Dr. Joann Roskoski, Dr. Terry Yates; AC Members: Dr. Burt Ensley, Dr. Kerri-Ann Jones, Dr. Larry Vanderhoef***

Dr. Yates reviewed the features of the National Ecological Observatory Network (NEON). As proposed in the FY 2001 budget, NEON would consist of 10 networked observatories that would serve as research platforms for integrated, cutting-edge research in field biology at a regional scale. This research would allow greater understanding of how ecosystems function and respond to change, and facilitate predictive modeling.

### ***Diversity, Dr. Marian Johnson-Thompson, CEOSE Liaison***

Dr. Clutter presented data on staffing and grantee demographics for NSF. For comparison, Dr. Johnson-Thompson presented preliminary data on NIH and NIEHS demographics, which will be refined and shared with the group by the next meeting. Discussion focused on ways to support minority students including encouragement and mentoring, and funding for institutions or programs that have a track record of success. Some factors are beyond our control, including a decline of interest in science among students as whole in favor of more lucrative professions, higher value placed on medical education, low pay for teaching, instant-

gratification culture, and loss of critical thinking skills as children spend less time reading.

### **BIOAC Working Groups Follow-on Activities**

The **Government Performance and Results Act** working group will consist of Dr. Steward Pickett, Dr. Claire Fraser, Dr. John Wooley, and Dr. Norine Noonan. The working group will use information posted on the BIOAC website (Committee of Visitors' reports, annual reports and the BIO self-evaluation) to produce an independent evaluation by November 8, 2001.

The **Major Research Equipment** working group will focus on large scale infrastructure needs and will be coordinated by Dr. John Wooley.

The **Most Challenging Questions** working group will be coordinated by Dr. Leonard Krishtalka.

The **Information Infrastructure** working group will focus on information infrastructure and the long term management of databases It will be coordinated by Dr. John Wooley.

The **LTER 20 year review** will be coordinated by Dr. Leonard Krishtalka and Dr. Frank Harris.

### **Future Meeting Dates:**

Fall 2001 - November 8 - 9, 2001

Spring 2002 - April 25 - 26, 2002

APPROVED:

*/S/ Ellen Goldberg*      11/9/01

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Ellen Goldberg, Chair      Date

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