

**BOARD OF SCIENTIFIC COUNSELORS NATIONAL CENTER FOR ENVIRONMENTAL  
RESEARCH (NCER) STANDING SUBCOMMITTEE****Face-to-Face Meeting Summary****Westin Grand Hotel****2350 M Street, NW****Washington, DC****February 2 - 3, 2009****MONDAY, FEBRUARY 2, 2009****Welcome and Opening Remarks***Dr. Martin Philbert, University of Michigan, Subcommittee Chair*

Dr. Martin Philbert, Chair of the Board of Scientific Counselors (BOSC) National Center for Environmental Research (NCER) Standing Subcommittee, thanked the Subcommittee members and U.S. Environmental Protection Agency (EPA) participants for attending. He asked participants to introduce themselves.

Dr. Philbert reminded Subcommittee members that they would not be discussing budget items, as these items have not been approved by the appropriate office. The purpose of this meeting is to gather information regarding the two charge questions. One charge question deals with the proposal by NCER senior management that the BOSC Executive Committee help NCER identify emerging areas and use its resources efficiently. The second question concerns the strategic decision to focus the limited resources of the Greater Research Opportunities (GRO) Fellowships Program on undergraduate fellowships to capture students earlier in the process and groom the next generation of environmental scientists and engineers.

**BOSC DFO Remarks***Ms. Susan Peterson, EPA/Office of Research and Development (ORD), Subcommittee Designated Federal Officer (DFO)*

Ms. Susan Peterson, Designated Federal Officer (DFO) for the NCER Standing Subcommittee, stated that the BOSC is chartered as a Federal Advisory Committee and subject to Federal Advisory Committee Act (FACA) rules and regulations. Therefore, all Subcommittees of the BOSC are subject to FACA requirements. As the DFO for the Subcommittee, Ms. Peterson serves as the liaison between the Subcommittee and EPA's Office of Research and Development (ORD). She is responsible for ensuring that the Subcommittee's activities comply with FACA; thus, this meeting was open to the public and time was designated on the agenda for public comment. She noted that no requests for public comment were submitted prior to the meeting, but she will call for public comments at the designated time on the agenda. She asked that all comments be limited to 3 minutes. An ORD contractor, Beverly Campbell from SCG, was present to take notes and capture the presentations and discussions. Following the meeting, she will prepare the meeting minutes, which will be made available to the public on the BOSC Web Site after certification by the Subcommittee Chair.

As required by FACA, a notice of this meeting was published in the *Federal Register*. An electronic public docket for the meeting was established on the Federal Docket Management System (FDMS), which can be accessed at <http://www.regulations.gov>. The *Federal Register* notice and the agenda were available to the public on the docket. As DFO, Ms. Peterson ensures that the Subcommittee members receive ethics training and complete confidential disclosure forms. She asked members to notify her immediately if any potential conflict of interest arises during the meeting. Ms. Peterson indicated that Drs. David Baker and Seth Tuler were unable to attend this Subcommittee meeting.

This face-to-face meeting was preceded by one conference call, which was held on January 12, 2009; a follow-up conference call likely will be scheduled in March 2009. BOSC meetings are open to the public in accordance with FACA rules. Notes of the meeting are being taken by a contractor, Beverly Campbell from SCG, who will prepare the meeting minutes. The minutes will be available to the public on the BOSC Web Site after they have been certified by the Subcommittee Chair.

Each BOSC member should have received a notebook of materials prior to the meeting. Ms. Peterson reminded the members and other attendees to sign in at the registration desk if they had not done so already. She asked the Subcommittee members to complete their homework sheets and provide her their hotel receipts and receipts for any expenditures exceeding \$75 prior to the conclusion of the meeting.

### **Opening Remarks**

*Ms. Becki Clark, EPA/ORD, Deputy Director, National Center for Environmental Assessment (NCEA)*

Ms. Becki Clark welcomed the Subcommittee members and explained that Dr. William Sanders, Director of NCER, was unable to attend the meeting. She had agreed to fill in for him because, prior to becoming Deputy Director of NCEA, Ms. Clark was a Division Director in NCER for 6-7 years. She noted that this is the second review by this Subcommittee.

The new organizational structure for NCER was described during the January 12, 2009, conference call. The charge has two components. The first charge question attempts to capitalize on the BOSC's knowledge of ORD and its programs to identify emerging areas of research and provide a methodology for merging this research into NCER's portfolio. The second component of the charge deals with the restructuring of the GRO Fellowships Program to focus on undergraduate students. She thanked the Subcommittee members for their willingness to review NCER's programs. The Center staff looks forward to the discussions.

Dr. Philbert asked how the questions were developed. Ms. Clark explained that a long-standing issue within NCER has been how best to identify emerging issues and incorporate new research to address these issues. Ms. Alva Daniels, NCER Senior Science Advisor, added that the Center is seeking a prioritization methodology that will allow it to disinvest from certain areas that are drawing to a close and invest in new emerging areas. If the methodology is effective, NCER will share it with all of ORD.

### **NCER Research Budgets by Research Programs**

*Ms. Tara Porter, EPA/ORD, Chief of Staff, NCER*

Ms. Tara Porter provided an overview of the Science To Achieve Results (STAR) Program budget, which includes grants and fellowships. STAR funding for human health research has remained relatively stable during the past 8-9 years, whereas STAR funding for air research saw a significant drop in funding in fiscal year (FY) 2004. This drop coincided with an across-the-board ORD decrease, but air research funding has returned to FY2001 levels. STAR fellowship funding has decreased since FY2004. STAR funding for global change research declined in FY2003, also mirroring an across-the-board ORD

decrease, and has since returned to its previous levels. The STAR budget for drinking water decreased significantly in FY2002 in response to an ORD need to supply funds for its research on arsenic in drinking water; funding levels have since returned to their pre-FY2002 levels.

Dr. Hansen asked whether these levels had been adjusted for inflation, and Ms. Porter responded that they had not been adjusted. Ms. Porter noted that the exploratory grants would be discussed in depth later and provided a graph as a frame of reference for those discussions. She also provided information about the budget reductions for the STAR ecosystems and pollution prevention programs. Some grants in these programs, funded in FYs 2001 and 2002, still are active, but no new awards will be made. In response to a Subcommittee members' question, she noted that NCER has the option of funding the entire grant at the time of award or providing it incrementally; NCER opted to fund the entire grant at the time of award to ensure that the grants are fully funded.

Dr. Sallie Keller-McNulty noted that funding for many of the programs decreased during FY2003. Is this because ORD experienced an overall budget decrease? Ms. Porter explained that the budget for some programs decreased but the budgets for other programs may have increased during that time.

Mr. David Rejeski asked about the average duration and size of grants. Ms. Porter responded that this varied by program, but she would provide a program-by-program breakout to the Subcommittee members as soon as possible.

Dr. Philbert asked whether NCER monitored the progress of the grants. Is funding guaranteed or can NCER hold back funding for poor performance? Ms. Porter responded that the grants are monitored and NCER staff members work closely with researchers to ensure that they are performing as expected.

Dr. Philbert asked whether NCER had ever halted the funding for a grant. Ms. Porter responded that, in her 15 years of experience with government grants, she had seen that happen only once and it was not at EPA.

Mr. Rejeski asked how long it took from the time a decision is made to develop a Request for Applications (RFA) to the time the grantee receives the money. His experience in examining the many steps of this process at several agencies showed that it took approximately 2.5 years. Can this timeframe be accelerated? Ms. Porter explained that the process generally takes 18-24 months, and the Agency is examining the process to determine where it can be shortened, including the step of writing and developing the RFA. Mr. Rejeski noted that the scientific integrity of the process should not be compromised, but there may be steps that can be shortened.

Dr. Keller-McNulty asked how long the process took from the time the Agency received proposals until funding was disbursed. Ms. Porter replied that it takes approximately 3 months to assemble the peer-review panel, a few weeks to perform the peer review, 2 months to perform the programmatic review, and 2-3 months to put the package together—which includes receiving additional information from grantees—before it is sent off to the awards office. The overall process takes about 6 to 9 months. Dr. Philbert mentioned his recent experience with a peer review for the National Institutes of Health's (NIH) Center for Scientific Review. The process involved an electronic, asynchronous review so that the study sections could proceed in much faster timeframe than is possible with a face-to-face meeting. Ms. Sherry Sterling, Director of NCER's Peer Review Division, noted that the Center is experimenting with options that will shorten the peer-review process and examining what other agencies have implemented. Teleconferencing is one option that can reduce time and costs.

## **Integrated Multidisciplinary Research Approach**

*Dr. Audrey Levine, EPA/ORD, National Program Director (NPD), Drinking Water Research Program*

Dr. Audrey Levine explained that ORD's vision of the future is to be at the forefront of integrated multidisciplinary research that addresses problems of broad national and international significance. This research should translate scientific and technological advances and findings into information that can be used directly to support environmental decision-making. ORD aspires toward stronger research leadership to restore and sustain a healthy environment and provides the Agency with the tools it needs for implementing specific congressional mandates.

Dr. Hansen asked for clarification of the term "integrated multidisciplinary research," noting that it is necessary multidisciplinary research requires integration. Dr. Levine agreed that it was somewhat redundant, but after working with this concept for several months, she recognizes that ORD conducts multidisciplinary research but needs better integration. The multidisciplinary approach involves more than one discipline and is an additive approach; activities are coordinated initially and knowledge is combined at the end. This approach involves cooperation. Integrated multidisciplinary research combines multiple disciplines in an integrated approach that synthesizes knowledge at all phases; it is true collaboration. Communication is a large part of the approach. Dr. Hansen noted that as long as it is made clear that this approach was created to increase communication between researchers in ORD who previously were not communicating, then the apparent redundancy disappears. Dr. Levine added that there is background information regarding this approach in journals, and this information can be provided to the Subcommittee upon request. Ultimately, ORD thinks that it can be more effective if its researchers are more integrated.

Dr. Levine explained that ORD is transforming itself and adopting a new business approach which recognizes that the nature of the environmental issues the nation faces are increasingly multimedia and global and require an integrated multidisciplinary approach. The new approach draws on ORD's strengths and unique capabilities and acknowledges that ORD should conduct research on issues of broad national and international significance in addition to research and technical support targeted to address specific program and regional office priority needs.

Integrated multidisciplinary research is a cumulative approach that synthesizes the perspectives of the individual disciplines and integrates during all phases of the approach to a question or problem; true collaboration beyond mere cooperation is essential to successful integrated multidisciplinary research. The overarching goal is to deliver research and development products and advice that inform and enable decisions and actions that protect public health and safeguard the environment.

Dr. Hansen asked whether everything will be approached through integrated multidisciplinary research or whether there is some flexibility. Dr. Levine responded that there will be a balance because some things require a more focused approach.

Dr. Dennis Clifford asked whether this approach was developed in response to the critique that the research was not integrated. How was the approach derived? Dr. Levine explained that the Science Advisory Board (SAB) stated that regulations could not continue to solely drive research. In addition, declining budgets make it more important to focus resources on high priorities. This is a different method of packaging a research program, and it was a budget-driven, natural evolution. In the past there was too much breadth and not enough depth, and this was identified as a possible pathway to the future. She noted that the initial trigger was the declining budget.

Dr. Keller-McNulty asked whether this approach also was being applied to research funded by NCER. Given the interest in collaboration and the organization of ORD, is this being done to break down existing "stovepipes"? Dr. Levine responded that extramural funding is linked to research programs, and these

grants generally are integrated into the programs. Dr. Keller-McNulty noted that the STAR grants at her institution are highly interdisciplinary. Does ORD view these grants as being more successful at integration than the intramural research programs? Dr. Levine responded that she was not aware of any distinction between the extramural and intramural programs. She added that STAR grants always are reviewed with the program reviews. The integration of extramural research projects could possibly be a model for ORD's many laboratories and centers.

Dr. Philbert asked for clarification regarding the budget driving integrated multidisciplinary research. A targeted, less expensive approach to research is possible; integrated multidisciplinary research is inherently more expensive. Dr. Levine responded that the goal was to have a bigger impact with less money. Targeted programs do not have as broad an impact as multidisciplinary integrated approaches.

Dr. Hansen asked if the approach was being attempted because of its perceived ability to stimulate more funding. Has ORD considered what would appeal to Congress? Dr. Levine explained that as ORD evolves as the leader in integrated multidisciplinary research, ORD should be better able to address complex issues of national significance as they arise. Dr. Hansen noted that ORD must make Congress aware of these changes so that the country can take advantage of this capability. Dr. Levine explained that this was only recently launched, and it is a work in progress. It is in the first round of vetting. Mr. Rejeski noted that the goal would be for EPA to be rewarded for solving difficult and complex problems. Integrated multidisciplinary research involving many researchers may be what is needed for a particular problem; however, it is possible that the problem could be solved by the efforts of one brilliant person. Mr. Rejeski indicated that there are emerging models to solve tough problems. Dr. Philbert commented that being multidisciplinary is a tactic versus a strategy.

Dr. Levine explained that one benefit of integrated multidisciplinary research is that a systems approach provides a framework for formulating research questions and setting boundaries. Within this systems approach, research can be defined and developed to accomplish more comprehensive objectives and researchers become more aware of the issue, particularly how the different components of the problem interrelate in the larger environmental, technical, and social context. Another benefit is the increased capacity to tackle larger, more challenging problems and increased leveraging across programs. It links the research life cycle with drivers and end use, allowing researchers to be more aware of the consequences of their research, as real-world environmental problems do not align with a single discipline.

Dr. Levine highlighted work on water issues as an example of how to apply this approach. The approach was to identify research needed to inform decisions that sustainably address the deterioration and overextension of U.S. water infrastructure. The efforts provided an opportunity to integrate condition assessment, advanced treatment options, and infrastructure rehabilitation with innovative approaches to green infrastructure, water reuse, security, and decentralized treatment.

The importance of partnering is clear. ORD's goal is to solve problems of national significance and support its program and regional partners' needs. By focusing on strengths and using integrated multidisciplinary research, ORD will inform and enable decisions that protect public health and the environment. Producing tangible results that significantly inform environmental policy will establish ORD as the foremost environmental research organization; this recognition will attract supporters and stakeholders needed for support. Anticipated benefits of the evolution of ORD from target, issue-driven research to issues of broad national significance include a more effective use of resources, an increased capacity to address complex problems, and the improved ability to meet the Agency's mission.

The concept of integrated multidisciplinary research was introduced across ORD in late 2008. A series of meetings was conducted with program offices and BOSC reviews to identify high-priority topics. Currently, the BOSC Executive Committee, NPDs, Assistant Directors, Deputy Directors, and Assistant

Laboratory and Center Directors are working toward developing pilot programs in identified high-priority areas.

Dr. Philbert asked whether work on this was on hold until a new Assistant Administrator for ORD is confirmed. Dr. Levine responded that work is moving forward because it will be 1-2 years before pilot programs are implemented. The FY2010 budget is being developed.

Dr. Hansen asked what mechanism was in place to educate the new administration. Ms. Clark responded that a briefing book has been developed for the new administration and ORD Assistant Administrator. The Directors of ORD's laboratories, centers, and offices meet regularly. Dr. Levine added that a transition team is working across the Agency. Ms. Clark mentioned that all senior managers were interviewed by the transition team.

Dr. Hansen asked about the probability that this new model will be supported. Ms. Clark responded that it is difficult to predict, but senior managers realized that a new approach was needed given the decreasing budget. She summarized the concepts found in *Good to Great*, a book by Jim Collins that inspired this approach: find a niche, do the best work, and increase impact. Dr. Clifford thought that this was a good idea that would be hard to implement. Dr. Philbert added that international collaborations are common within academia, and communication tools and models already may be available. Ms. Stacey Katz, EPA/NCER, noted that air research is multidisciplinary, but it could benefit from increased integration. Mr. Rejeski cautioned that the paradigm described in *Good to Great* may not work in the public sector; he noted that it is not a bad thing to have generalists.

With regard to the statement that ORD's goal is to solve problems of national significance, Mr. Rejeski suggested that changing it to globally significant problems. This would magnify ORD's impact. Solutions can be transferred from the United States to other countries. Dr. Levine agreed that issues with global significance should be of higher priority.

### **NCER Scientific Leadership Examples**

*Dr. Darrell Winner, Dr. Devon Payne-Sturgis, Dr. Diana Bauer, Dr. Nora Savage, Ms. Angela Page, and Ms. Stacey Katz, EPA/ORD/NCER*

Dr. Darrell Winner stated that he would highlight one example of scientific leadership within NCER: research on the impact of climate change on regional air quality. He explained that a warming climate may worsen air quality, and the human health impacts and costs of control for the United States are large compared to the other global warming impacts for the nation. Air quality assessment requires a combination of intramural and extramural research, with the goal of connecting those working on global problems with those working on regional problems. ORD worked to define the problem from 1999 to 2001, when few researchers were examining how climate change would affect air quality. ORD researchers asked: What are others doing? Does ORD have a role? Is ORD research filling a gap? This area of research is multidisciplinary and requires patience and time to define a problem. Dr. Winner presented a diagram of the Air Quality Assessment Framework, which highlights how STAR researchers and EPA's Office of Air and Radiation (OAR) and ORD's National Exposure Research Laboratory (NERL) worked together on global and regional change scenarios. Most ORD laboratories and centers were engaged in the process, and three OAR customers were involved. In December 2001, a workshop was held on program design, problem definition, and future directions. Researchers realized that it was necessary to find a focus and stick to it; they also found that redundancy is important.

Dr. Keller-McNulty asked whether the original teams are still working on the problem. Dr. Winner responded that some are because they were funded during a second solicitation. Most grants were funded for 4 years, some went for 5 years, and one is still going at 6 years. The scale of the research went from global to a 4-km grid scale; the goal was to link the global and regional scales.

Dr. Winner shared data from some of the grants that indicated that the impact on air quality from climate-induced ozone changes is significant. He also provided a brief overview of internal and external projects that are examining the effect of climate change on ozone air quality. The program is disseminating the results widely in journal articles and meetings. NCER continues to explore the impact of global change on air quality, focusing on helping state and regional planners. Additionally, NCER is part of a new effort to research the impact of global change on water quality, building on the lessons learned from the air quality effort. NCER values the contributions of its ORD laboratory partners, which allowed the transition of results to OAR. Thirty-six STAR grants totaling more than \$30 million explore the effect of climate, land use, technology, and demographic change on ozone, particulate matter, mercury, and precursor emissions.

Mr. Rejeski asked about press coverage of the efforts. Dr. Winner responded that in 2004, researchers from Harvard University released the first paper, which generated some press coverage. There was a good deal of coverage when the Supreme Court ruled that EPA should regulate greenhouse gas emissions. Dr. Levine noted that there is a communications group within the Agency that works on press releases. Mr. Rejeski noted that press coverage is necessary to inform Congress; he noted that the EurekAlert! Web Site is free and can drive other press inquiries. Dr. Winner added that results are disseminated at numerous meetings, and they also have been mentioned in congressional testimony.

Dr. Clifford asked how the Agency funds exploratory research. Dr. Winner explained that these grants were not funded as exploratory research.

Dr. Keller-McNulty asked for clarification regarding the \$30 million budget for STAR grants. Dr. Winner responded that the program was funded at this level for a considerable time period. Dr. Keller-McNulty asked about the current budget for this research. Dr. Winner replied that it is approximately \$25 million.

Dr. Devon Payne-Sturgis said that she would be providing examples of NCER's scientific leadership within the field of human health research. The Human Health Research Program, one of ORD's larger programs, is cross-cutting by design and provides research results that the Agency uses to solve environmental health problems across environmental media. NCER stays current with the science, influences the direction of human health research within ORD, and identifies areas of research in which to invest. There is a growing interest in environmental health indicators that combine health and environmental data to track trends in environmental health and assess the public health benefits of regulatory or other policy decisions; several national reports highlight this trend. EPA began its *Report on the Environment* effort to describe the state of the environment. The Agency also undertook this effort in response to the Government Performance Results Act (GPRA) and Office of Management and Budget (OMB) reviews, which encouraged EPA to use existing data to develop indicators to measure the Agency's progress in meeting goals. NCER issued the first environmental health outcome indicators RFA in 2006 and added a fourth Human Health Research Program Long-Term Goal to evaluate risk management decisions in response to the 2007 BOSC mid-cycle review. Additionally, the Center developed the 2007 *Framework for Assessing the Public Health Impacts of Risk Management Decisions*, issued a second RFA in 2007, and hosted a workshop in 2008. Dr. Payne-Sturgis stated that ORD uses the exposure-to-effect continuum as a conceptual model for indicator research. Process, exposure, and health outcome indicators inform NCER research, which results in data, tools, and methods to predict risk and aid decision-makers in making decisions.

Dr. Hansen asked whether modeling was intentionally excluded. Dr. Payne-Sturgis responded that it was unintentionally overlooked. She noted that modeling is playing a large role.

Dr. Payne-Sturgis provided an overview of the STAR "Development of Environmental Health Outcome Indicators" RFA, including its goals and examples of results and impacts. NCER sponsored a workshop in early 2008 that brought experts together to discuss the state-of-the-science of assessing public health

impacts of risk management decisions, determine critical gaps in the research, and build collaborations with scientists outside of EPA. NCER is committed to this area and is developing a third RFA.

Dr. Philbert noted that there was no mention of the Superfund Basic Research Program in the presentation. He asked whether there was any linkage between EPA and the National Institute of Environmental Health Sciences' (NIEHS) Superfund Basic Research Program. Dr. Payne-Sturgis responded that EPA and NIEHS worked together on children's environmental health issues. Dr. Philbert commented that NCER should consider ways to leverage its research with NIEHS' Superfund Basic Research Program.

Mr. Rejeski asked how long it takes to publish environmental data on the EPA Web Site. He noted that EPA possesses a significant amount of data on lead, asthma, and other topics. Dr. Payne-Sturgis mentioned that the Pew Environmental Health Commission's *America's Environmental Health Gap: Why the Country Needs a Nationwide Health Tracking Network* report addressed this question. Later this month, the Centers for Disease Control and Prevention will be launching the Environmental Public Health Network to make data readily accessible. Dr. Hansen pointed out that there must be a customer base for the data. Mr. Rejeski stated that there is a customer base for lead; researchers also may be interested in uploading data. Dr. Hansen commented that it is not easy to obtain air quality data. Dr. Payne-Sturgis mentioned that there are two things to consider: (1) how to get databases to talk to each other, and (2) choosing the right indicators relative to health outcomes. How do researchers and decision-makers know when reducing exposure has a public health benefit? Dr. Philbert stated that this is the entire purpose of the Superfund Basic Research Program, and Dr. Payne-Sturgis agreed to contact NIEHS about this program.

Dr. Diana Bauer highlighted NCER's leadership in the area of sustainability. When NCER was created in 1995, Congress instructed the Center to work with the National Science Foundation (NSF) to establish grant programs, and the Technology for a Sustainable Environment (TSE) grants program was one of three programs launched in partnership with the NSF. At the time, it was a new way to think about engineering, technology, and the environment. The program focused on preventing pollution at the source rather than dealing with it at the "end of the pipe" and provided important support to the academic fields of green chemistry and green engineering when they were in their infancy. The collaboration with the NSF lasted from 1995 through 2003; \$57 million was invested overall, including \$26.8 million from EPA. Currently, there is a strong intra-Agency connection with EPA's Office of Prevention, Pesticides, and Toxic Substances' Green Chemistry and Green Engineering Program and intramural research and development program. Pollution prevention is the preferred risk-management approach, and the Green Chemistry and Green Engineering Research Program is focused on development of tools and technologies for the fundamental redesign of the inherent nature of molecules, materials, processes, and energy to eliminate or minimize hazardous solvents, emissions, and waste; increase the use of renewable feedstocks; maximize water, materials, and energy use efficiency; and address the full life cycle. Seven of the nine Presidential Green Chemistry Challenge Academic Award winners between 1997 and 2005 were TSE grantees. Additionally, grantees developed numerous patents and published highly cited papers. When the program was evaluated in 2004, it was found to be an important program in that it was "educating a new generation of scientists and technologists that will bring about a paradigm shift in environmental science from command-and-control to prevention and conservation." NCER financial investment in the TSE grant program was discontinued in 2003, and since then, NCER staff has continued to provide input to NSF on the development and management of additional programs relating to engineering and sustainability. NCER staff members also are working with NSF on identifying research needs in the area of green buildings.

In response to a question regarding the lack of budget for this program, Dr. Bauer explained that the research agenda published in fall 2008 indicates a planned research investment in this area with the U.S. Department of Energy (DOE) and the National Institute of Standards and Technology. Ms. Porter pointed out that the budget charts she presented show the enacted level; decisions made within ORD can affect

program budgets as well. Dr. Hansen asked why this was the case. Dr. Bauer explained that the program received a poor rating by OMB's Program Assessment Rating Tool (PART). As a result, the pollution prevention extramural research budget was reduced.

Dr. Keller-McNulty asked whether there were plans for NCER to work with NSF in the future. Dr. Bauer stated that NCER is poised to do this because, in this challenging budgetary climate, the Center has been trying to leverage with other agencies and organizations.

Dr. Keller-McNulty asked when EPA will decide which pilot areas will be chosen for integrated multidisciplinary research. Ms. Porter responded that this decision takes place at a higher level within ORD. Ms. Daniels added that the Laboratory and Center Directors are aware of the funding situation for the TSE Program because they were the ones who made the decision to reduce it. Dr. Keller-McNulty stated that this sustainability research was an excellent example of the integrated multidisciplinary approach, and if ORD does not fund it, then she did not think ORD was serious about pursuing this integrated multidisciplinary approach. She stressed that the area of sustainability is important. She also noted that the EPA and NSF collaboration was very fruitful and generated a great deal of research. Dr. Bauer agreed noting that it was very useful to get the different perspectives.

Dr. Nora Savage illustrated NCER's leadership in the field of nanotechnology. She provided a brief overview of nanoscience and what nanotechnology entails. Nanotechnology requires the ability to manipulate and control nanomaterials in a useful manner. The National Nanotechnology Initiative (NNI) was created as a federal initiative in 2001, and its goals are to maintain a world-class research and development program to realize the full potential of nanotechnology; facilitate the transfer of new technologies into products for economic growth; develop the education, workforce, infrastructure, and tools to advance nanotechnology; and support the responsible development of nanotechnology. EPA examines nanotechnology from two aspects: implications and applications. Implications include the various impacts on human health and ecosystems, alterations in transport and migration capacities, unknown exposure potential, and changes in ultimate fate. Applications include improved monitoring and detection capabilities, more effective and rapid remediation and treatment of contaminants, reduction in resource and energy usage, and reduction in generation of pollution/wastes. EPA also has an interest in a wide variety of consumer products.

To fulfill the Agency's mission, meet statutory requirements, and provide leadership, EPA's nanotechnology research must improve scientific data on potential effects, explore the complete life cycle of nanomaterials, develop appropriate risk management strategies, and provide predictive tools for complex materials. Dr. Savage highlighted the STAR grants devoted to nanotechnology since 2001. In 2004 and 2005, the focus shifted to environmental and health effects of nanomaterials. Another solicitation will be announced within the next 30 days. Approximately \$13 million has been awarded for applications research and \$30 million for implications research between 2002 and 2008 from all sources. Two 5-year center awards have been made to the University of California, Los Angeles (UCLA) and Duke University. Risk assessment research examines the life-cycle perspective; the entire cycle must be examined to identify exposure. Current research focuses on fate and transport, exposure, monitoring and detection, and effects. Because it is impossible to test each nanomaterial, it is necessary to develop predictive tools and examine emerging compounds that enter the environment. NCER has internal, national, and international partnerships to further this research.

In summary, NCER's leadership in the area of nanotechnology has guided Agency research, steered additional federal resources, built a national research community, stimulated an international research community, and initiated policy and regulatory discussion.

Dr. Philbert commented that it appeared that the primary focus was on exposure and environmental pathways of exposure. Dr. Savage responded that fate and transport in ecological and biological systems also are being explored.

Dr. Philbert asked what NCER's total contribution was to the NNI. Dr. Savage responded that NCER contributed \$10 million to the \$1 billion initiative, but it EPA has an active voice in getting other agencies to consider the environmental issues of nanotechnology.

Mr. Rejeski noted that EPA's funding has shifted to implications despite the importance of initially promoting applications. He noted that nanotechnology production is not green. EPA plays an important role and funds research that the NSF will not. He commented that budgetary fluctuations destroy expectations in academia. Dr. Savage responded that she too has heard that comment. She noted that the NSF considers the research to be too applied. With a limited \$5 million budget, NCER has transferred its focus to implications.

Ms. Angela Page explained that she would present a snapshot of the success of the STAR component of the Drinking Water Research Program. Following the largest documented waterborne disease outbreak in U.S. history in 1993 in Milwaukee, Wisconsin, the Safe Drinking Water Act (SDWA) was amended in 1996 to include drinking water protection along a source-to-tap continuum. EPA was required to determine its internal expertise. Two surface water studies had been completed, but required groundwater epidemiological studies had not been completed. STAR changed its focus to include an increased emphasis on microbial research to respond to the SDWA revisions. In 2001 and 2003, the program solicited research on microbial risk in drinking water. Research focused on methodologies and analytical tools to help estimate the extent of gastrointestinal illness that could be attributed to populations served by surface or groundwater supplies to determine the cause of illness. Ms. Page provided an overview of one of the studies conducted in Wisconsin. EPA's Office of Water (OW) has concluded that the STAR Program is generating meaningful data, and the Drinking Water Research Program received positive comments from the BOSC regarding its STAR solicitations. She noted that this program has been regulatory driven.

Dr. Hansen noted that he did not see anything that addressed epidemic disease, only endemic. Ms. Page responded that three of 11 funded research projects were epidemiologic studies. Dr. Hansen noted that epidemiological studies do not necessarily examine epidemics; they examine the incidence and the presumed cause. He also commented that one of the BOSC comments dealt with anticipatory research and stated that the assumption was that in the absence of exploratory research, RFAs are prescriptive rather than open-ended. Ms. Page explained that the BOSC wanted the STAR Program to become more exploratory in its research endeavors and be on the forefront of major issues and challenges. OW is regulatory driven; it works on rules and does not look too far into the future. One way STAR can fill this niche is to be more open-ended in its RFAs. Dr. Hansen remarked that this BOSC comment was made 4 years ago. Ms. Page replied NCER recognized the need to become more innovative prior to the BOSC review, and this is reflected in the 2003 RFA. The 2005 BOSC review indicated that more of this was necessary. Dr. Philbert asked whether the funds to perform more open-ended research are coming from another "pot" of funding. Ms. Page explained that the program is changing the manner by which it solicits research with its funding. The program has been doing its best at implementing the previous BOSC recommendation, and Ms. Page welcomes further input from this Subcommittee.

Ms. Page explained that STAR drinking water research is making a difference in multidisciplinary research and cross-program research and influencing and informing revisions to federal, state, and local government regulations. Research results are influencing OW thinking regarding rules and regulations. STAR researchers are fostering scientific leadership through collaboration, participation at EPA-sponsored scientist-to-scientist meetings and national scientific meetings, and publishing in high impact journals. The next step is to move the "Innovative and Integrative Approaches for Advancing Public Health Protection through Water Infrastructure Sustainability" RFA forward. The program also is poised to become a leader in the area of distribution systems.

Dr. Philbert asked whether multidrug resistance and the ability to remove virulence were being examined. Ms. Page responded that no current grants examine these issues.

Dr. Clifford noted a successful example of research funded under an open-ended drinking water STAR RFA. Ms. Page responded that the program must be responsive to current OW needs while performing exploratory research that will be needed to address problems faced in the next 5 to 10 years.

Dr. Philbert asked whether the budget for this program was expected to remain stable. Ms. Porter responded that it has been relatively stable in the past and, although there is uncertainty about the new administration and the economic stimulus package, it is expected to continue to be so.

### **Public Comment Period**

Ms. Peterson called for public comments at 1:50 p.m. No comments were offered.

### **NCER Scientific Leadership Examples (continued)**

Ms. Katz presented information about STAR leadership in environmental cardiology and air pollution research. About 10 years ago, epidemiological studies reported an increase in particulate matter (PM) associated with premature mortality, EPA set the new fine particle National Ambient Air Quality Standards (NAAQS) in 1997, and there were concerns about scientific uncertainties. Although there was epidemiological evidence linking PM to cardiac mortality and hospital admissions, the biological mechanism to explain the adverse health effects of low-level PM was not known. In 1998, heart disease accounted for approximately 30 percent (700,000) of all annual deaths; in 2004, the rate increased to 36 percent, or 870,000 deaths. In 1998, Congress increased the EPA PM research program budget by \$22.4 million per year, with the mandate that it establish a National Academy of Sciences (NAS)/National Research Council (NRC) expert panel on research priorities, expand and redirect its intramural program, expand the STAR PM grants program, create up to five multidisciplinary PM research centers, and coordinate with other federal agencies. As a result, there have been several changes in the last 10 years, including the American Heart Association's scientific statement to clinicians on the public health implications of air pollution, the emphasis on the EPA AIRNow Web Site regarding cardiac risks, an active NIEHS cardio listserv that connects environmental cardiology researchers, and a *New England Journal of Medicine* article on PM and life expectancy that received national press. Additionally, in 2008 the National Heart, Lung and Blood Institute (NHLBI) contacted EPA to help assess the feasibility of an air pollution intervention study to reduce cardiovascular deaths. In 10 years, uncertainty has been replaced with credible evidence and the emergence of environmental cardiology as a specialty. This is the result of NCER's role of stimulating an explosion of new science on the role of air pollutants in cardiovascular disease, which involved world-class investigators, as well as the close collaboration between the Agency's intramural and extramural research programs. NCER also coordinated with other sources of funding (e.g., NIEHS, Health Effects Institute, California Air Resources Board), and NCER leadership established PM center grants, conducted the first cardio/air pollution workshop, developed RFAs that addressed PM exposure and cardiovascular disease, and partnered with the NHLBI and NIEHS to develop workshops and an RFA, respectively.

The current challenge is to determine the effects of long-term exposure on fine PM. In response to repeated calls by the NAS/NRC for more research on the long-term cumulative risks of PM exposure, NCER has developed a two-pronged strategy that includes the creation of a retrospective RFA and investment in a long-term, prospective study, which is the largest grant award in EPA history and required senior-level ORD support and waivers of the 10-year grant period limit. The project is the Multi-Ethnic Study of Atherosclerosis (MESA) Air Pollution Study headquartered at the University of Washington. MESA involves 7,000 participants at nine locations in six states and is providing state-of-the-art air pollution exposure estimation. The technology is available now to detect cardiovascular disease as it is developing, including asymptomatic cases. The MESA Air Study, a component of MESA, has many benefits in that it leverages the NHLBI investment and provides a platform for additional air pollution studies. An external peer-review panel recently reviewed the MESA Air Study and expressed its broad support for continuing the study; the panel complimented the excellent scientific leadership of the

research team, fostering of talented young investigators, and responsiveness to the study's external Science Advisory Committee.

Several factors contributed to NCER's overall success in this area, including congressional funding, NAS/NRC recommendations, OAR and regulatory support, and leveraging and partnerships. This made it possible for NCER to provide leadership to shape the cardiovascular research program and stimulate the field of environmental cardiology. The next step is to examine particles in mixtures, moving from single pollutants to multipollutants. Funding will not be forthcoming unless the research is integrated; EPA's atmospheric science researchers and epidemiologists are working together to develop an RFA.

In response to a question from Dr. Hansen regarding the MESA Air ancillary studies, Dr. Barbara Glenn explained that each study is very different. The studies are funded for 4 years or less, and some utilize the measurements from the original study. Four NHLBI clinical visits are funded, with a fifth jointly supported by NHLBI and EPA. Ms. Katz added that the STAR air research budget is approximately \$15 million annually, and the PM centers, which address health and PM composition, receive about one-half of that amount.

Dr. Keller-McNulty asked whether all of the research conducted by the PM centers was related to cardiovascular effects. Ms. Katz responded that the centers are multidisciplinary and, in addition to cardiovascular disease, their research examines diabetes, pulmonary disease, and other health effects. Dr. Keller-McNulty then inquired about the funding levels for each center. Ms. Katz replied that each center receives approximately \$1.6 million/year. An SAB review determined that individual grants could not achieve the same multidisciplinary approach as that taken by the centers and vice versa; a balance of individual and center grants is needed to address the research questions in this field.

Mr. Rejeski asked whether the health effects of nanoparticles had been considered. Ms. Katz responded that the UCLA and University of Rochester Medical Center PM Centers are investigating nanoparticles. Dr. Philbert asked whether the centers are studying ambient exposures or laboratory nanoparticles. Ms. Katz replied that the centers are examining ambient air quality and using the principles learned from this research to inform nanoparticle research studied under additional grants. The PM Center in Rochester specializes in ultrafine particles, so the connection to nanoparticles was in place.

Dr. Hansen noted that ambient work is much more challenging because of the low concentrations, and ambient health effects are very difficult to study. Mr. Rejeski commented that it may be more relevant to study ambient health effects in indoor air.

## **2007 BOSC Recommendations**

*Ms. Alva Daniels, EPA/ORD/NCER, Senior Science Advisor*

Ms. Daniels explained that NCER's actions in response to the 2007 BOSC recommendations were intended to accomplish a three-fold purpose: (1) assist in achieving the NCER vision of accelerating transformational science, (2) increase the relevance of the Center's research portfolio by linking investments to stakeholder-identified short- and long-term research issues, and (3) effectively disseminate research results and information to a variety of audiences.

In response to Recommendation 15—NCER should consider implementation of cost-benefit analyses to measure return on investment—NCER sought to complete a return-on-investment analysis of its research portfolio by October 30, 2008. The target date was not met, but the analysis has been initiated and data have been gathered on budget and productivity. The Center is investigating a permanent set of metrics to conduct the analysis; this action is approximately one-half completed.

In response to Recommendation 12—NCER should develop case studies of how research funded by the Center facilitates change in tangible indicators of environmental performance ("results") in addition to how the research is cited, read, and otherwise increases knowledge—NCER determined that it would

finalize the summary analysis document template by January 31, 2009. The target date was not met, but it is close to completion.

In response to Recommendation 9—NCER should revitalize the exploratory grant mechanism and expand it considerably from its current sole focus on nanotechnology—an internal workgroup will develop a “path forward” framework by June 30, 2009. In response to Recommendation 2—NCER should initiate a dialogue with EPA program offices and outside stakeholders about what information is most needed for its mission—NCER will develop and implement a communication strategy to disseminate results and solicit new research areas by June 30, 2009. Both of these actions are in progress.

Two NCER actions have completion dates that occur on an annual basis. In response to Recommendation 4—NCER should increase its efforts on cross-media, multiple-substance, and life-cycle research—NCER will increase the number and scope of media-integrated RFAs with at least one integrated RFA released each FY. In response to Recommendation 8—NCER should seek input on possible emerging areas of science from a broader community of stakeholders, not simply from funded scientists—NCER will continue to work with a variety of stakeholders to maintain a robust research agenda and will host at least one scientific workshop annually.

Dr. Philbert commented that Recommendation 8, from the view of the Subcommittee, involved the broad community of stakeholders and asked whether the workshops were designed to receive input from community partners, nongovernmental organizations, and academia. Ms. Daniels responded that they were. Dr. Philbert asked whether this was true for all workshops. Ms. Daniels responded that not all workshops are designed in this manner, but NCER is committing to designing at least one workshop per year to include a broad range of stakeholders from inside and outside of the Agency. Dr. Philbert asked for confirmation that the workshops are issue-driven rather than overarching and whether they examined the overall portfolio of research. Ms. Daniels confirmed this.

Dr. Hansen commented that in examining each recommendation and response it appears that this is an *ad hoc* approach that examines each recommendation in isolation in context of the programmatic content and structure. There was a very successful period of bringing together diverse groups and constructing the comparative risk assessment research portfolio based on their input and programmatic and structural constraints. This paradigm appears to have been forgotten in recent years. In constructing a research portfolio that looks ahead and responds to regulatory pressures, a comparative risk assessment framework is a powerful method by which to engage the diverse group of stakeholders. Diverse constraints and relative risks can be included. This should be considered in the risk assessment program within EPA and across ORD, as it would be a fruitful manner to approach the construction of the research portfolio. Ms. Daniels asked whether Dr. Hansen was referring to ORD’s 1995 reorganization around the risk paradigm. Dr. Hansen confirmed that his comment did relate to the ORD structure. The first article published on comparative risk analysis prompted EPA to embrace the idea, and the approach was sensible. It spread to the regions, which had online tools on how to design a comparative risk analysis development program for soliciting ideas and responding to regulations.

Dr. Keller-McNulty stated that this was embedded in the recommendation regarding the return on investment. Dr. Hansen thought the recommendation should be more explicit. Dr. Philbert added that NCER’s issue-driven response to Recommendation 8 also removes the element of comparative risk. Ms. Daniels stated that NCER is a part of ORD and acknowledged that this must be done within the Center and across ORD. Dr. Hansen commented that the procedure is incredibly complex and probably cannot be accomplished in one workshop. A series of workshops may be more appropriate and would require serious thought about designing a comparative risk analysis that considers the following questions: Who should be engaged? At what point should they be engaged? Are there successive levels of engagement? Are there parallel levels of engagement? There are experts in this field (e.g., Dr. John D. Graham, Carnegie Mellon), and those within ORD with a higher level of expertise (e.g., NCEA) need to consider

this to satisfy the expectations of a larger universe of stakeholders and the need to use resources in the most efficient manner. Dr. Philbert cautioned that this could be both expensive and time-consuming.

Mr. Rejeski commented that another issue is how to obtain multiple stakeholder input in areas in which risks are not known (e.g., nanotechnology). Working with the Engineering and Physical Sciences Research Council, NSF is beginning to develop “sandpits”; the first sandpit will look for innovative methods to explore future developments in synthetic biology. A call for participation was released for the first 5-day sandpit, to be held March 30-April 3, 2009, in Warrenton, Virginia. It will include a real-time peer review to get a sense of whether the sandpits are viable. Sandpits have been run in England; the name is derived from the analogy of a child playing in a sandbox (known as a “sandpit” in England). It is a process used to examine emerging science issues. Dr. Philbert and Mr. Rejeski noted that it would be useful for NCER to observe how the upcoming sandpit is run.

### **Public Comment**

Since the call for public comment earlier in the day, a participant signed up to make a comment. Because the Subcommittee was ahead of schedule, the DFO and Subcommittee Chair decided to allow the comment. Ms. Cindy Olson, a sustainability professional, commented that there has been an incredible “sea change” in the last year or two, and people are continually asking her about EPA’s research in this area. She said that she could not stress the importance of Recommendation 8 enough; people need information at all levels of understanding. This is a period of incredible crisis, but it also is exciting because EPA has information that could help address the crisis. She noted that people are willing to change when they understand the benefits of that change. Ms. Olson noted that institutions are making major decisions that will change how things are done. She thanked the Subcommittee for giving her the opportunity to comment. Dr. Philbert thanked Ms. Olson for her comment and then called for the next presenter.

### **Fellowships Program and Fellowships Program Restructure and Status**

*Dr. Brandon Jones, EPA/ORD/NCER, Acting Team Lead, Fellowships Program and Mr. Ted Just, Ms. Georgette Boddie, Ms. Maggie Breville, and Ms. Gladys Cobbs-Green, EPA/ORD/NCER, Fellowships Team*

Dr. Brandon Jones explained that NCER’s two primary fellowship programs—STAR and Minority Academic Institution (MAI) Fellowships—have included both undergraduate and graduate students in the past. One of the two programs provided fellowships to undergraduate and graduate students attending minority academic institutions. In 2002 or 2003, EPA made the decision to change the fellowship eligibility requirements for the program that targeted students at minority institutions. This decision was made in response to court cases involving the use of race as an eligibility requirement for admissions and funding. It was decided that fellowship eligibility for the program could no longer be limited to minority institutions so that the MAI Fellowships Program was changed to the GRO Fellowships Program. The GRO fellowships were limited to undergraduate and graduate students attending institutions that receive \$50 million or less in federal research and development funding; the funding threshold was later lowered to \$35 million. In 2008, an internal decision was made to further restructure the GRO Fellowships Program so that the graduate portion was phased out, and those funds and resources were shifted to undergraduate students. Currently, NCER’s fellowship programs include the graduate STAR fellowships and undergraduate GRO fellowships.

Mr. Ted Just presented information about Recommendation 1A from the 2006 STAR/GRO BOSC review, which was to develop an overall information collection strategy that includes the design of an appropriate database. At the time the BOSC made this recommendation, NCER was developing its database and inventory. During the first 5 years, the Fellowships Program accumulated hundreds of hard-copy files, including a hard-copy thesis for each fellow. In 2000, a simple Excel spreadsheet was developed to enable extraction of data from these files; this spreadsheet eventually led to the development

of the inventory database to collect and manage information about fellows, including their jobs, publications, and awards. This online database includes an individual page for each fellow to which the fellow has access; each fellow is responsible for keeping the data current. To encourage fellows to keep their information up to date, information about current research, grants, and job opportunities has been added. Biographies of fellows are available to other fellows, and EPA Project Officers have a “snapshot” of their fellows. The system allows uploading of PDF files and serves as an electronic filing system for the fellows’ publications.

Dr. Keller-McNulty asked how the fellows have responded to this system. Mr. Just replied that they are doing a good job of entering their information. Currently, it is voluntary but NCER would like to require fellows to keep their information up to date for a period of 5 years following graduation. Dr. Philbert noted that NIH training grants require information for 10 years following graduation; he noted that the recipient institution must provide the information. Dr. Jones commented that STAR fellowships are awarded to the individual rather than the institution; therefore, NCER cannot require the institution to update the information. NCER could consider a longer requirement, but because there is no way to enforce the requirement, it probably will be difficult to get former fellows to continue reporting for 5 years following graduation. Mr. Rejeski commented that many of the fellows may have pages on the Facebook Web Site. Dr. Jones responded that NCER is exploring the Facebook and YouTube Web Sites to determine if they could be used to collect information on former fellows. The Google Scholar Web Site also yields useful information, but NCER does not have the manpower or financial resources to perform exhaustive searches. Dr. Philbert suggested providing incentives for former fellows to update their information. Is there some way to link it to the budgeting process? Dr. Jones responded that this would require EPA attorneys to change the terms and conditions of the fellowships. Dr. Philbert commented that incentives could be funded by a separate “compliance fund.” Mr. Just explained that there are many alumni who currently update their data in the system. He indicated that it is possible to sort the information to determine who has updated their record within a given timeframe.

Dr. Keller-McNulty asked how many former fellows update their profiles each year. Mr. Just responded that at the high point, approximately 140 to 160 profiles were updated annually. Currently, the annual number of updates is approximately 50. Dr. Keller-McNulty then asked about the length of the fellowships. Mr. Just replied that doctoral students are funded for 3 years, and master’s students are funded for 2 years.

Ms. Georgette Boddie provided an update on the undergraduate GRO alumni. NCER wanted to determine the number of former fellows who pursue a graduate degree, work, or study in an environmentally related field. Between 2003 and 2006, 55 undergraduate GRO fellowships were awarded. Postfellowship information is available on 65 percent (36 of 55) of these fellows. Of these 36 fellows, 28 are pursuing advanced degrees. Of the 28, eight already have obtained an advanced degree, four currently are pursuing a doctoral degree, and 20 are working in an environmentally related field. Of the 36 respondents, 28 are working and/or studying in an environmentally related field.

Dr. Jones noted that Ms. Boddie manages the entire GRO undergraduate program and contacts former fellows to obtain information. In response to questions from Dr. Philbert, Ms. Boddie explained that she uses phone and e-mail to contact the fellows and also contacts their mentors and performs Internet research to obtain information.

Dr. Philbert asked whether the doctoral students were pursuing environmentally related doctoral degrees. Ms. Boddie responded that she believed that the degrees were in environmental disciplines.

Dr. Keller-McNulty asked how many of the 55 were awarded STAR fellowships. Ms. Boddie responded that at least two of the GRO fellows received STAR fellowships, but these were awarded before 2003. Dr. Jones stated that those two fellows were not included in this cohort.

Dr. Keller-McNulty asked about the funding that an undergraduate receives as a GRO fellow. Ms. Boddie responded that fellows are funded during their last 2 years of undergraduate study, and they receive \$46,500 for the 2 years, which includes \$10,000 for tuition and fees, a \$700/month stipend, \$2,500 for expenses (e.g., books, scientific conferences), and \$8,000 for the summer internship at an EPA facility. Dr. Jones added that the summer internship is a component that is unique to GRO.

Dr. Philbert asked about postfellowship contact. Ms. Boddie explained that in addition to her attempts to maintain communications with former fellows, some of them contact her to provide information. She also mentioned that NCER distributes a quarterly newsletter to former GRO fellows.

Dr. Keller-McNulty asked for confirmation that approximately 18-20 fellows are funded each year. Ms. Boddie replied that the number varies; 15 were funded last year, and 20 will be funded this year.

Mr. Rejeski asked whether NCER had information on the career fields entered by former fellows for those who did not pursue environmental careers. Ms. Boddie responded that some enter private industry, some teach elementary school, and so forth. Dr. Philbert asked whether the data in the inventory can be sorted by field. Ms. Boddie responded that it can be sorted by field but it requires that the former fellows enter the information into the inventory database.

Dr. Clifford asked what type of undergraduate research is performed by the students. Ms. Boddie replied that the undergraduate fellows are not required to perform research, although some do and publish papers with their professors. Dr. Clifford noted that the term "Greater Research Opportunities" implies research. Dr. Jones explained that one of the reasons that the decision was made to shift funds from graduate to undergraduate research fellowships was to increase research opportunities at the undergraduate level.

Dr. Jones explained that Recommendation 1F from the 2006 BOSC review of the STAR and GRO Fellowships Programs was to seek additional funding within the next few years to maintain the value of the individual fellowships without resorting to funding fewer fellows. The recommendation was adopted by ORD, and a strategic plan has been developed to describe activities to address this and the other recommendations; the strategic plan was included in the meeting materials.

Dr. Hansen asked whether maintaining the value of the fellowships means keeping up with inflation. Dr. Jones responded that he agreed with Dr. Hansen's interpretation.

Dr. Jones explained that Recommendation 1G from the 2006 BOSC review was to add a mentoring component to the program so that there is a specific individual within EPA who would serve as a resource for each fellow. ORD has adopted a mentoring program on a pilot basis. Dr. Hal Zenick, who has performed a good deal of outreach to local universities in North Carolina, has volunteered to help NCER develop a mentoring component for the Fellowships Program.

Ms. Maggie Breville presented information on Recommendations 2A and 3, which involve restructuring of the GRO fellowships. She reported that adoption of these recommendations is under consideration. The graduate portion of the GRO Fellowships Program was discontinued in early 2008, and the resources for the undergraduate component were increased. Resources for outreach also were increased, and more visits were made to conferences that target the universities and students targeted by the GRO Program. NCER also examined the pros and cons of the recommended Regional Consortium Fellowships Model. Although EPA cannot limit fellowships to minority students, a consortium would have more flexibility in that regard. One drawback to the consortium model is that some geographic regions would be excluded because current resources would only allow NCER to support one or two consortia. Additionally, the administrative burden of the consortia would decrease the money available to the students.

Dr. Hansen asked for some background as to why the BOSC recommended the consortium model. Ms. Breville responded that she did not have the historical knowledge to answer this question, but the consortium or center model has been successful in many cases. Dr. Hansen noted that the program's

strategic direction has been to move away from centers and toward individuals. Dr. Jones commented that this is the major reason that this recommendation is under consideration and has not been implemented.

Dr. Hansen asked why GRO graduate fellowships were completely eliminated rather than increasing outreach to target groups as part of the STAR Fellowships Program. Ms. Breville responded that the decision was made to enhance outreach for both programs to underrepresented groups. As there was some redundancy between the two fellowship programs, it was decided that if the GRO Program targets the undergraduate level it will help build capacity at the graduate and career levels for environmental science.

Dr. Philbert commented that an unanticipated benefit of the consortia model would be that the institution would be required to provide postfellowship follow-up information. He asked about the probability of NCER adopting the consortia model. Ms. Breville explained that the model is being considered, and a hybrid of the recommendations has been adopted. With the new administration, the budget is unknown, and that will impact NCER's decision. Dr. Jones added that another factor that would affect adoption is the necessary legal involvement required to change the structure of the fellowships. He explained that under the current programs, the funding goes directly to the student rather than the institution. Ms. Breville noted that under the consortia model it is unclear how geographic and minority distribution would be assured.

Dr. Hansen commented that under the consortia model, NCER would have less control over which students receive awards. Ms. Breville explained that NCER compiles, reviews, and selects the students who will receive fellowships to ensure that congressional mandates are met.

Dr. Clifford asked whether this was an annual, national competition. Ms. Breville responded that it was. Dr. Clifford then asked whether there is a wide distribution of applications from across the United States and Dr. Jones replied that he would be showing data on the distribution.

Mr. Rejeski asked whether NCER had considered what can be done at the high school level to encourage students to pursue environmental degrees. Dr. Jones responded that there have been efforts to work with high school students and build the next generation of environmental scientists. Dr. Roger Cortesi, EPA/NCER, added that he has been asked to review fellowship applications, and the program is attracting high-caliber students. Ms. Breville confirmed this and explained that the GRO Program funds "Excellent" and "Very Good" candidates but the STAR Fellowship Program is able to fund only the "Excellent" candidates because of limited resources.

In response to a question by Dr. Philbert, Dr. Jones confirmed that the undergraduate recommendation was adopted. Ms. Breville added that it has been adopted, but the strategic plan still is in draft form. Dr. Philbert asked whether the adoption was reversible; Ms. Breville stated that it could be reversed.

Dr. Jones stated that Recommendation 2B dealt with the impacts on the GRO Program following the determination that competition for program awards cannot legally be limited to minority-serving institutions. Currently, EPA is the only federal agency that funds science, technology, engineering, and mathematics related fellowships that does not have a minority-focused program. In 2003, 90 percent of MAI fellowship applicants were from minority academic institutions. In 2004, following the conversion to GRO, 10 percent of applicants were from minority academic institutions. In 2003, 60 percent of applicants reported as minorities (20 percent reported as Caucasian, and 20 percent did not report). Following 2003, the number and percentage of minorities applying decreased, and during the past 2 years there has been a strong trend of not reporting race/ethnicity. As such, the number of GRO fellowships awarded to minorities and students at minority academic institutions has decreased.

Mr. Just explained that ORD adopted Recommendation 5A to review and compile the publication records of fellows. The inventory database allows for the up-to-date listing of alumni publications. ORD also

adopted Recommendation 5B to require fellows to provide links to their professional Web pages in the information that they submit to EPA; the inventory database allows input of this information.

Dr. Jones explained that ORD adopted Recommendation 6 to consider the following as potential metrics as data become available: (1) the number of minority students who obtain advanced degrees in environmental disciplines, (2) the distribution or dispersion of students across eligible institutions, and (3) the number of awards to students pursuing master's degrees relative to the number of awards to students pursuing doctoral degrees. Dr. Jones provided several charts, maps, and graphs that illustrated the data collected in the adoption of this recommendation.

Dr. Keller-McNulty commented that the data were limited by the number of fellows who provide postgraduation information. She also noted that the map illustrating the distribution of STAR fellowship awards did not reflect the actual distribution of environmental research funding, doctoral degrees, or Hispanics with engineering degrees by state as illustrated by the cases of Alaska and Puerto Rico.

Dr. Philbert asked whether the distribution of states receiving STAR and GRO fellowships reflects their application rates or whether some states submit better applications. Dr. Jones responded that some states submit better applications than others. California students, for example, have a high success rate because they submit better applications.

Ms. Gladys Cobbs-Green explained that in response to Recommendation 7A, which involved strengthening communication efforts and developing a user-friendly Web site and listserv for fellows, the program is building a virtual communication tool, the STAR Fellows Communication Forum Web Site, which debuted at the 2006 Graduate Fellowship Program Expo. It allows fellows to meet other fellows to share job opportunities, identify room sharing opportunities for the forum, and other topics of discussion.

In response to comments from Dr. Philbert regarding participation in the Fellows Forum, Ms. Cobbs-Green explained that attendance at the expo at which the forum debuted was not mandatory, so the numbers were expected to be low. Dr. Jones added that the numbers are expected to increase substantially in 2009. Dr. Philbert commented that the Forum is a very government-oriented Web site, and fellows do not appear eager to use the Web site. Ms. Cobbs-Green acknowledged that students have provided mixed reviews. Dr. Jones pointed out that the Forum is linked to the inventory database.

Dr. Jones stated that, in response to Recommendation 7B about marketing the STAR Fellowships Program to minorities, NCER is including communication and outreach strategies in the Fellowship Program Strategic Plan. He reiterated that there is an increasing trend for students not to report race/ethnicity. Dr. Keller-McNulty asked how the program asks about race/ethnicity. Dr. Jones responded that it was done in the standard federal manner. Dr. Keller-McNulty stated that her institution revised its approach to include multiracial category reporting, and responses have increased. She asked about gender reporting. Dr. Jones responded that these data are available, but he did not include them in the presentation.

Dr. Jones explained that there has been an overall decline in the number of STAR applicants during the past few years, and there was a sharp drop in the number of minority applicants in 2008. Dr. Hansen remarked that applicants who are unsure of which category to select will not report, so the numbers actually may be higher than indicated by the data.

Dr. Jones explained that ORD adopted Recommendations 7C and 7D, which dealt with increasing the number of applicants to the GRO Program and communicating awards, results, and successes. NCER staff members attend conferences to publicize the program, and NCER always receives significantly more applications than can be funded. The percentage of minorities applying for GRO fellowships (out of those reporting race/ethnicity) has increased compared to the previous 2 years, so outreach efforts appear to be successful. Dr. Jones provided a summary of the regular outreach efforts as well as additional

strategic outreach efforts undertaken by NCER. Fellowship staff members also are following media trends to determine how best to advertise the fellowships.

### **Subcommittee Working Time**

#### *BOSC NCER Standing Subcommittee*

The Subcommittee discussed the first charge question and the strategy for defining and addressing it. It appears to be a request for the Subcommittee to evaluate a proposal put forward by NCER senior management. This Subcommittee needs to consider whether this is the best use of the BOSC Executive Committee members' time, especially given the schedule of program and mid-cycle reviews for ORD programs that must be completed prior to the PART reviews. The Subcommittee members discussed the criteria and performance metrics used to determine how to rate each program and the emphasis placed on whether the program succeeded in meeting its goals. The ability of the Subcommittee Chairs to articulate needs also was discussed. Dr. Philbert noted that there is a broad range of forward-thinking expertise among the Executive Committee members. Dr. Keller-McNulty suggested that the NCER Standing Subcommittee as well as the Executive Committee could serve as sources of external input on emerging needs. Dr. Philbert was concerned that the charge question did not articulate any other mechanisms for identifying emerging issues. He agreed that that Subcommittee could generate ideas that filter up to the Executive Committee, but input is needed from many other entities.

Mr. Rejeski stated that another issue is prioritization. Stakeholder input to EPA when designed by EPA is myopic; he noted that the system has not changed much over the years. Dr. Hansen pointed out that the charge question itself is myopic. Dr. Philbert commented that there is no strategic framework in place that defines the priorities; NCER has not completed the first step. Perhaps the Executive Committee could be the coordinating body for a comparative risk analysis, but the Executive Committee alone could not develop a comprehensive comparative risk assessment. Dr. Keller-McNulty stated that the Subcommittee should encourage NCER to adopt innovative formats for collecting input on emerging issues (e.g., sandpit).

NCER's new vision appears to be an integrated multidisciplinary research approach and a broadening of its focus to address problems of national and global significance. Dr. Philbert stated that the fundamental question is whether, as a regulatory agency, the focus should be on basic research or application. Dr. Hansen noted that ORD is not a regulatory office; however, ORD's clients include the regulatory offices. Dr. Philbert stated that ORD's research should feed into evidence-based decisions and rulemaking, but this was not clearly stated during any of the day's presentations. Dr. Hansen commented that some areas of NCER research are somewhat behind the curve; however, some areas are cutting edge. To increase the Center's ability to be on the cutting edge, NCER must broaden its access to different stakeholder groups. Mr. Rejeski commented that NCER needs to look at what others are doing to identify emerging issues and implement the approaches that make the most sense.

Dr. Philbert commented that there is a profound gap between real and perceived threats to the environment, and this will catch up with humanity some day, especially as the trend continues toward urbanization and the pressures it exerts. Examining this problem is the type of proactive research that NCER needs, but this requires a level of input that cannot be supplied by the BOSC Executive Committee alone. Dr. Keller-McNulty suggested that the President's Council of Advisors on Science and Technology (PCAST) may be one resource. Dr. Hansen agreed that NCER could identify innovative ways of getting fresh and important ideas by having the support of groups such as PCAST rather than getting the ideas from these groups. Dr. Clifford stated that the issue is not only prioritizing research but bringing more attention to environmental issues. Dr. Keller-McNulty was not convinced that ORD's budget would continue to decline. She was optimistic that the new administration might increase funding for research and development. Therefore, EPA needs to reposition itself to receive money for fellowships as well as for research and development. She acknowledged that EPA's budget is small relative to other agencies, but she emphasized that the Agency is important.

In terms of NCER's proposal that the BOSC Executive Committee advise the Center on emerging issues, Dr. Keller-McNulty stated that the Executive Committee can be one of the groups that advises NCER; however, the Center needs to reach out to the broad stakeholder community. The NCER Standing Subcommittee could help identify methods and approaches that can be used by the Center to accomplish this. Mr. Rejeski commented that NSF is involved in a discussion of how to restructure the discovery process; EPA must do this as well. The BOSC Executive Committee can be one source of input, but NCER must have at least five or six different methods to scan for new ideas. Dr. Keller-McNulty suggested that the BOSC Executive Committee could be the conduit for defining the other methods.

Dr. Philbert stated that the second charge question regarding the undergraduate focus of the GRO Program was straightforward, especially as it already has been implemented by NCER. Dr. Keller-McNulty wondered why NCER had not attempted to adopt the consortia model. The Subcommittee members discussed the feasibility of adopting this model, recognizing that it would increase indirect costs, decrease the number of fellowships that could be awarded, move it from a national program to a regional program, and possibly not be worth the faculty members' time. Dr. Keller-McNulty stated that there were many other models that could be implemented to accomplish this, such as NSF's model—Vertical Integration of Research and Education in the Mathematical Sciences or VIGRE, which could better integrate students' interests into a community. Ms. Beverly Campbell of The Scientific Consulting Group, Inc., who had provided writing support for the BOSC's review of the STAR and GRO Fellowship Programs, helped clarify the BOSC's rationale for recommending the consortia model. This recommendation was made because the BOSC Subcommittee thought that consortia would be more effective than the current model in helping NCER to achieve its stated goal of building capacity at underfunded and minority institutions. Dr. Keller-McNulty considered whether there are other models that can build relationships between EPA and academic institutions; programs that fund one or two students at a university do not promote integration with the faculty and do not build capacity at the institution. A partnership with the Department of Education may be another possibility for consideration by NCER.

Mr. Rejeski stated that as long as EPA is seen as a minor player, the Agency will not attract the interest of the best students. He predicted that EPA will see a massive migration of talent away from the Agency to other federal agencies within the next 6 months, as these agencies make the case for increased budgets. There is a link between being in the forefront and attracting the next generation of students. Dr. Clifford concurred, noting that enrollment in environmental programs doubled when Superfund issues were at the forefront of the media. To some extent, young people will enter fields that they view as important. Dr. Philbert stated that at the Annual Biomedical Research Conference for Minority Students, which attracts thousands of the "best and brightest" minority students, the students indicated that they were more interested in the biomedical field rather than environmental field because it is more lucrative. Minority students, in particular, are driven to pursue more lucrative careers so that they can be more successful than their parents. There needs to be a culture shift at EPA to attract students to environmental careers and the Agency must make it clear that there are good jobs in the environmental field.

Dr. Hansen commented that NCER is trying to attract undergraduate students to the environmental field before they are drawn to other fields. The Center is attempting to develop metrics that assess whether its undergraduate fellows are pursuing graduate degrees and careers in the environmental field. Mr. Rejeski pointed out that this is a supply-side strategy. Dr. Keller-McNulty stated that the most popular club on her campus is Engineers Without Borders, which is entirely environmentally driven and self supported. Students are passionate about changing the world they care about what is happening to the environment. Green programs and sustainability generate a great deal of interest, and EPA must capitalize on this. Dr. Hansen stated that ORD's de-emphasis of sustainability and ecosystem research appears to be moving the Agency in the opposite direction, which indicates that EPA has become disconnected from the larger community and the direction of the future. ORD must look to the outside when making plans to re-invent itself. Dr. Keller-McNulty recognized that EPA's role as a regulatory agency affects how the Agency

proceeds. Dr. Philbert stated that the Agency has become disconnected because it does not have broad stakeholder input.

The Subcommittee members discussed their strategy for tomorrow's working session before Dr. Philbert thanked them for their productive discussion and recessed the meeting at 5:40 p.m.

## **TUESDAY, FEBRUARY 3, 2009**

### **Subcommittee Working Time**

#### *BOSC NCER Standing Subcommittee*

Dr. Philbert reconvened the meeting at 9:05 a.m., and welcomed Dr. Adam Finkel who had been unable to attend the meeting on Monday. He then summarized the strategy for the working session and opened discussion on the second charge question.

Dr. Keller-McNulty suggested that NCER examine what other agencies, particularly NSF, are doing to engage undergraduates in research and benchmark their progress against other programs. The Subcommittee members discussed the requirements for the GRO Program and its target groups and the possibility of rolling it into the STAR Program. Dr. Keller-McNulty thought that the amount of money invested to attract undergraduate students into environmental science graduate programs or careers appears to be high given that only eight alumni from 2003 to 2006 entered environmental science graduate programs. Mr. Rejeski thought that the regional consortia may be a mechanism to draw younger students into environmental sciences earlier. He suggested that NCER could release a Request for Proposals (RFP) that defines its fellowship goals (e.g., younger students, more minorities) to increase the Center's access to creative ideas for attracting students into environmental fields. The Subcommittee members discussed possible goals, such as reaching more students as early as possible and increasing diversity among students. Dr. Finkel added that students pursuing degrees in other fields could be exposed to environmental curricula so that they understand that there is an environmental component to many careers. EPA should enhance its presence in the classroom to promote the environment in other curricula (e.g., required green design courses for architecture students). Mr. Rejeski noted that there could be metrics of success other than advanced degrees in the environmental sciences. Dr. Keller-McNulty suggested that GRO-eligible institutions could partner with Tier 1 universities to get those faculty engaged and raise the educational capabilities across the board. Dr. Finkel mentioned a network of Occupational Safety and Health Administration (OSHA) continuing education sites that may provide a model for NCER.

Dr. Philbert suggested alternative methods of education delivery—distance learning, Podcasts, electronic offerings, and so forth—that could be accessed on a national level. Mr. Rejeski suggested that students could help create the curricula. Dr. Keller-McNulty also noted that EPA faces challenges that could be taken on by integrated teams of undergraduates, graduates, postdoctoral fellows, and faculty members. Mr. Rejeski pointed out that EPA would not be obligated to fund any of the proposals if none of them offer to be innovative and effective in achieving the program's goals. Dr. Finkel suggested that EPA have a presence on campus, perhaps during freshman orientation.

Dr. Philbert summarized the Subcommittee members' discussion. NCER should be encouraged to support undergraduate programs rather than individuals, especially given that \$46,500 is a significant investment in an individual. The Fellowships Program should have clearly defined goals and priorities that encourage applications from minorities and women. These goals should include:

- ✧ Reach students as early as possible.
- ✧ Increase diversity.
- ✧ Promote environmental sciences as a viable career or component of other careers.
- ✧ Define other metrics of success.

Another concept introduced during the discussion was that every student at a university could be reached by EPA via:

- ✧ A coordinated center that provides for vertical and cross-institutional integration that allows the faculty members to be engaged and raise the educational capabilities across the board.
- ✧ A catalog of EPA-relevant courses for undergraduates.
- ✧ Utilization of available electronic means for dissemination and distance and personalized learning.
- ✧ A series of environmental “grand challenges” for undergraduates (i.e., competition/exhibition).
- ✧ Revision and modernization of the Web portal.
- ✧ Facebook and YouTube mechanisms.

Dr. Keller-McNulty noted that the new integrated multidisciplinary research approach could be part of the RFP. Dr. Finkel stated that the EPA office that focuses on environmental education could be a resource for NCER. The NSF Integrative Graduate Education and Research Traineeship was mentioned as a possible model. Dr. Keller-McNulty suggested that K-12 outreach be included.

Dr. Finkel commented that the method of interaction must be changed. The current model for graduate fellowships cannot be used to attract younger students; a new model is needed. It appears that NCER is changing only the age group and not the model. Dr. Keller-McNulty remarked that administrative mentorship may not be the best type of mentorship for the fellows. An advantage of the consortia model is that the faculty members are available to mentor and provide career guidance to the fellows. Dr. Clifford noted that the GRO Program evolved from a program that was designed to increase the number of minority students in environmental careers; with the change in eligibility requirements for GRO fellowships that aspect has disappeared.

Dr. Philbert commented that the Web interface for students is unsatisfactory, and this prevents full engagement with students. EPA must become more facile in engaging younger students. The Subcommittee members discussed whether women should be included in the diversity goals; it was stressed that NCER must be sure that the demographics are balanced before deciding not to target women. The term “underrepresented populations” includes women and minorities and is a more appropriate term than “minorities.”

Dr. Keller-McNulty pointed out that the VIGRE Program also encourages a review of the institution’s curriculum. Dr. Philbert commented that EPA has a series of socially relevant problems that are intrinsically difficult to implement and heavily under-resourced, so it is necessary to appeal to students’ altruism to attract them to the field. Therefore, the Agency must make environmental careers appealing to students at all levels. Currently, this is not being done as well as it should be, partially because of the poorly defined goals. The Subcommittee discussed a variety of models that could be implemented to attract students to environmental sciences and environmental engineering; perhaps a combination of multiple models is the solution.

Possible partners for the Fellowships Program include: NSF, DOE, Department of Defense (DoD), National Aeronautics and Space Administration, and National Oceanic and Atmospheric Administration. In terms of comparing stipend amounts and requirements of various agency fellowship programs, Mr. Rejeski stated that he knows high school students who change careers as a result of the \$4,000/student NIH fellowship. This program attracts students at a younger age for less cost. This program does not necessarily reach underrepresented groups, however. The Subcommittee members discussed the reasoning and feasibility of targeting institutions that receive \$35 million or less in federal research

dollars in terms of reaching underrepresented groups. Dr. Keller-McNulty stated that this is where partnering GRO-eligible institutions with Tier 1 universities becomes important.

In response to a question from Dr. Philbert, Ms. Daniels explained that three fellows are known to have been hired by EPA. The program is attempting to develop a series of questions to ask during exit interviews, including whether the fellows considered the EPA internship beneficial, whether they would consider applying for a job within the Agency, and so forth. She explained that NCER had examined many of the fellowships programs at other agencies and understands their partnerships with Tier 1 universities. One major difference with EPA's program is that it is a fellowships program being operated as a grants program; therefore, the overt recruitment of fellows into EPA is not allowed and EPA cannot benefit directly from the fellows' research.

Dr. Keller-McNulty stated that it would help to examine programs that connect to students other than fellowships. Perhaps EPA could offer more internships than grants. Additionally, some level of cost sharing from industrial partners may help. If done correctly, these become prestigious awards for the institution. Dr. Philbert cautioned that the resources required for Tier 1 partnerships to make a meaningful connection with students may exceed current levels of funding. There must be a balance between the quality of the interaction and the number of students impacted. Dr. Finkel noted that if the goal is to grow the field, then quantity should be valued over intensity. Then again, perhaps NCER should focus on reaching people one person at a time via the other educational components at EPA. Dr. Hansen remarked that the Subcommittee may be expecting NCER to do more than its mission. Dr. Finkel suggested that NCER seek the involvement of the EPA education office, which is responsible for broad-scale national environmental education. Ms. Daniels stated that NCER is not trying to educate the public about environmental policy but is trying to increase the number of people who enter the environmental field.

Dr. Keller-McNulty noted that the budget for the GRO Program is \$2 million/year, which is not an insignificant amount of money to implement these programs. This money could be spread across a range of activities. NCER could release an RFP and see what types of ideas are proposed. Dr. Philbert noted that, rather than completely eliminating the current individual model, NCER could initiate a pilot by issuing an RFP and make two awards at \$500,000 each; that would leave \$1 million funding for the GRO undergraduate fellowships in their current form. In developing this RFP, NCER should examine other agencies' language and use the best examples.

The Subcommittee discussion moved to the first charge question. Dr. Finkel thought it was odd that NCER is deferring setting priorities for another year and asking for methods by which to do it. There are well-structured approaches to thinking about what is most valuable, as was covered in the 2007 Subcommittee report. This charge question asks the Subcommittee to "provide a potential methodology for prioritizing emerging research areas." Dr. Finkel thought this was covered in the 2007 report, which may indicate that the Center was not responsive to the previous suggestions. During the last review, the Subcommittee discussed the value-of-information (VOI) theory. It is not just the size of the knowledge gap but what is missing because of the lack of knowledge; the knowledge gap is preventing optimal decision-making. The idea was to foster the right dialogue between NCER and the stakeholders to determine what issues the stakeholders are working on that are the most precarious as a result of the knowledge gap so that NCER can issue RFAs to respond to the most critical needs. If the Center was not responsive to the previous ideas, Dr. Finkel said he was unsure how to answer the current charge question.

Ms. Daniels commented that NCER has not communicated with the program offices in the most effective manner to determine their long-term priority needs. ORD is trying to move in that direction, and the integrated multidisciplinary research approach is a step toward that. Within each research program, the program offices have identified their highest priority areas. NCER must decide which areas should receive the limited funds. All are considered high priority by the individual program offices, so how can

NCER prioritize them across programs? The charge question is not asking the Subcommittee how to dialogue with stakeholders; it is asking the Subcommittee how NCER should prioritize the priorities that already have been communicated by the stakeholders. Dr. Philbert noted that some of this was addressed in the five-step approach highlighted in the 2007 report: (1) initiate a dialogue with regional and program offices; (2) fund meta research about the VOI theory; (3) increase efforts on cross-media, multiple-substance, and life-cycle research; (4) add back into the extramural research portfolio projects that focus on social science, cognitive science, and engineering research; and (5) use the “grant summaries” and “state-of-the-science papers” to begin a dialogue about important gaps in decision-relevant information with EPA decision-makers and external scientists. Ms. Daniels explained that many of the programs fall along media lines the way the programs currently are structured. NCER is seeking advice on how to prioritize across the programs.

Dr. Keller-McNulty noted that there appear to be two issues: (1) tapping the stakeholders in an innovative manner, and (2) prioritizing among the various research needs. Dr. Philbert stated that the program and regional offices already have identified their priorities, and a research portfolio already is in place. Can an internal gap analysis be conducted to determine what is not being funded?

Dr. Finkel commented that he sees two problems with the existing process of asking NPDs to identify program priorities. First, each NPD will think their program’s research needs are important. Second, NCER is encouraging people to come back to the Center with disembodied requests. NCER needs to understand the material better to triage it. Perhaps one approach is to ask the program and regional offices to explain why the research is a priority; the reasons may help NCER prioritize among the various research needs. If the program and regional offices cannot identify why a particular need is important, then it probably is not a priority. In the 2007 report, the Subcommittee recommended that NCER use a structured methodology that says the most valuable information is what improves decisions.

Ms. Daniels explained that each research program has undergone at least one BOSC review; in some cases the Subcommittee Chairs have been involved in more than one review. The knowledge possessed by the BOSC Executive Committee members could help NCER in understanding ORD’s existing portfolio. By obtaining input on the highest priorities from the Executive Committee, NCER would not be looking at a “laundry list” of research needs. Dr. Keller-McNulty suggested that a set of questions could be developed. Perhaps the second suggestion from the previous report to fund meta research is too daunting for EPA. The BOSC Executive Committee probably could help NCER develop an appropriate set of questions to be used in establishing priorities. Dr. Philbert stated that a good deal of discussion has focused on how to use VOI ORD-wide to enhance activities and selection of priorities. Dr. Finkel stated that rather than asking program and regional offices what they are working on and what they need, perhaps NCER should ask what actions the program and regional offices are contemplating regarding their environmental problems and what information would help them make better decisions.

Dr. Philbert asked whether the Subcommittee members could add detail to the five-step process included in the 2007 report or suggest alternative methods to help NCER determine priorities among the research programs. Dr. Finkel suggested initiating a pilot program that would bring in experts to help elicit the kind of information necessary. Dr. Keller-McNulty stated that the Subcommittee could provide specific references and examples.

Dr. Philbert remarked that VOI experts say that VOI must be done quantitatively; he stressed the need to separate the VOI approach in a qualitative sense from the classical quantitative approach. Dr. Keller-McNulty cautioned that there were two examples given during the previous day’s discussion in which classic VOI may not have yielded results: climate/air and PM/cardiovascular disease. Dr. Finkel thought that VOI would have helped determine the importance of air pollution and cardiovascular disease. Mr. Rejeski summarized four of EPA’s decisions, most of which did not involve context-setting; the decisions that did include this involved external pressure to do so.

Dr. Finkel noted that one criterion for priority setting is that if something does not improve decision-making, it is not a high priority for the Agency. There are many degrees of rigor and complexity. One possibility is to examine a proposed portfolio and identify what within the portfolio is important because it feeds into impending decisions (e.g., upcoming re-evaluation of the NAAQS). Dr. Philbert noted that one output would be to have a pure qualitative rank order. All are priorities, but some will be pressing because of time, importance, and so forth. Dr. Finkel noted that the focus should be the stakes of the problem rather than intellectual curiosity. The high-priority research area is the one that, for the money invested, has a greater amount of benefit compared to others. Dr. Hansen noted that the criterion is the monetized benefit versus the cost of obtaining the answer. Dr. Finkel agreed and stated that before making a decision on a \$1 billion issue, decision-makers want to know where to look for the answer to reduce the uncertainty in the decision. What is the lack of knowledge preventing action?

Dr. Finkel noted that NCER can identify items that are most important and state that these items are of highest priority because the expectation is that by answering these questions the programs will be able to produce increased incremental benefit compared to items lower on the list. Dr. Keller-McNulty commented that this is an area in which studies can be performed to help prioritize and make the case for growing resources. Although EPA cannot lobby for money, the BOSC members and other outsiders can do so. The Subcommittee members agreed that NCER should be a recipient of any increases in research and development funding coming from the stimulus package.

Dr. Hansen noted that if there is no flexibility in the budget to shift funds between research programs, then there is no need to prioritize among programs. Does NCER have this flexibility? Ms. Daniels responded that ORD needs a standardized, defensible process for making these decisions. Dr. Philbert reiterated that the question is whether the BOSC Executive Committee has the expertise to identify such a process. The Subcommittee, however, can reinforce its impression that this must be done by an expert panel.

Dr. Keller-McNulty explained that she advocates for research and development funding through a policy forum, and EPA is not represented among the groups for which this forum advocates. EPA must take steps to change this; she agreed to raise this issue at the policy forum. Dr. Philbert stated that this is an incredibly important point, and it emphasizes why the stakeholder process is so important. Stakeholders can lobby for ORD and increases in its budget. The Subcommittee can identify this as a major deficiency in terms of outreach. Mr. Rejeski stated that the focus can be on portions of the research agenda that are problematic. He pointed out that it is difficult to get funding to invest in new ways of doing things at the Agency; EPA tends to be reactive rather than proactive.

To ensure that the BOSC Executive Committee engages in a serious discussion on how to help NCER prioritize its research, the Subcommittee can draft a letter to the Executive Committee articulating its concerns and issues that go beyond the current charge. The Subcommittee can explain that it continues to encounter issues that are structural “hamstrings” for NCER. Drs. Keller-McNulty and Hansen agreed to draft the letter.

Dr. Philbert summarized the discussion regarding the first charge question:

- ✧ The previous Subcommittee report provided much advice on processes for setting priorities, but it is not clear that the advice is useful to NCER in its current form.
- ✧ NCER can work with a receptive office to develop a VOI approach to setting priorities, using a qualitative VOI approach rather than classical quantitative VOI approach. It was noted that VOI has limitations related to its use in designing research strategies for emerging issues.
- ✧ NCER could implement multiple innovative approaches, including an expert panel, sandpits, and so forth, to seek broad stakeholder input in identifying issues and challenges.

- ✧ NCER can perform a review of stakeholder priorities that determines the rationale for each priority (i.e., the “why is this important?”).
- ✧ If the research does not support a decision, then NCER should not consider it a priority.
- ✧ The comparative risk assessment approach to setting priorities requires a buy-in from the scientific and other communities and may present problems with implementation. It must be guided by a number of knowledgeable individuals and requires a prioritized list of research items. This may or may not be a viable course of action for setting current and future priorities for research.
- ✧ NCER could use two methods (comparative risk assessment and VOI) to identify overlapping priorities. It must be noted, however, that this cannot be a one-time activity; there must be commitment to an ongoing process for this to be of value.
- ✧ The process that is ultimately implemented should improve decision-making, defend the call for greater resources, and supply ammunition for external stakeholders to provide greater resources for NCER.
- ✧ ORD should prioritize its extramural research.
- ✧ The Subcommittee may not have the requisite expertise to address the specifics of a process for prioritization, and its report should highlight the need to establish a process that could be achieved through expert advice, consultants, and so forth.

### **Future Discussion/Future Business**

*Dr. Martin Philbert, University of Michigan, Subcommittee Chair*

Dr. Philbert stated that the bullets developed during the working session clearly expressed the Subcommittee’s thoughts. He asked for a lead volunteer to convert the bullets regarding the first charge question into prose and provide specific examples when possible. During the February 9-10, 2009, BOSC Executive Committee meeting, Dr. Philbert will brief the BOSC about the progress on the report and notify them to expect the letter. Although there is no published timeframe for submitting the report, it should be completed by the May 2009, BOSC Executive Committee face-to-face meeting. It would be beneficial to draft the letter, if possible, before next week’s Executive Committee meeting so that the Committee can begin discussing some of the items. Dr. Philbert noted that the BOSC Chair can choose to introduce the letter during the meeting even if it is not on the agenda.

Mr. Rejeski agreed to take the lead in drafting the response to the first charge question with help from Dr. Finkel on the VOI portion of the response. Dr. Philbert stated that concrete examples with references (e.g., Web pages, documents, articles) must be included. Dr. Clifford volunteered to draft the response to the second charge question. Dr. Philbert will e-mail the bulleted discussion to the Subcommittee members so that they can use the list to draft their sections of the report. Dr. Philbert cautioned that the responses to the charge questions should avoid the theoretical and emphasize the practical.

Ms. Daniels stated that she had some information that was requested during Monday’s session, specifically, the RFA information summarized by research program. She agreed to e-mail the information to Ms. Peterson who will distribute it to the Subcommittee members. Ms. Daniels indicated that the average timeframe for a grant is 4 years, and the average award is \$600,000. She asked if it would be helpful to have the lead NPD describe the integrated multidisciplinary research approach to the Subcommittee on the next conference call. Dr. Keller-McNulty said she would be interested in hearing more about this approach and particularly how the Agency intends to implement it. Dr. Hansen added that he would like to hear more about the timelines for implementing the approach.

In response to a question from Dr. Keller-McNulty, Dr. Philbert explained that once the Subcommittee has finalized its report, it will be submitted to the BOSC Executive Committee for review at its May 2009, meeting. The report will be vetted by one or two Executive Committee members and the BOSC may or may not ask the Subcommittee Chair to revise the report. Once the report is approved by the Executive Committee, it will be submitted to ORD. Dr. Keller-McNulty asked if this report concludes the work of the Subcommittee and Dr. Philbert replied that this is a standing Subcommittee, so he will work with Dr. Sanders, the Director of NCER, to identify and develop new charge questions to be addressed in the future.

Ms. Peterson said she would send an e-mail to the Subcommittee members to schedule a follow-up conference call; Dr. Hansen indicated that he was not available February 18-24, 2009.

Dr. Philbert thanked everyone for their participation and adjourned the meeting at 12:01 p.m.

### **Action Items**

- ✧ Dr. Keller-McNulty will raise the issue of lobbying for EPA research and development funding at the policy forum.
- ✧ Drs. Keller-McNulty and Hansen will draft a letter from the Subcommittee to the Executive Committee articulating its opinion about providing external advice about research priorities and issues that go beyond the current charge.
- ✧ Dr. Philbert will e-mail the bulleted list of discussion points to the Subcommittee members.
- ✧ Mr. Rejeski will take the lead in drafting the response to the first charge question with help from Dr. Finkel on the VOI portion of the response.
- ✧ Dr. Clifford will draft the response to the second charge question.
- ✧ Ms. Daniels will e-mail the RFA information summarized by research program to Ms. Peterson who will distribute it to the Subcommittee members.
- ✧ Ms. Peterson will e-mail the Subcommittee members to schedule a follow-up conference call.

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**NCER STANDING SUBCOMMITTEE  
MEETING AGENDA  
February 2-3, 2009  
Westin Grand Hotel  
2350 M Street, NW  
Washington, DC 20037  
Phone: (202) 429-0100**

**Monday, February 2, 2009**

9:00 a.m.–9:30 a.m.	Registration	
9:30 a.m.–9:40 a.m.	Welcome and Opening Remarks - Introductions - Overview of Charge	Dr. Martin A. Philbert, Chair, NCER Standing Subcommittee
9:40 a.m.–9:45 a.m.	DFO Remarks - Administrative Issues	Ms. Susan Peterson, Office of Research and Development
9:45 a.m.–9:55 a.m.	Opening Remarks - Goal(s) of Review	Ms. Becki Clark Deputy Director, NCEA
9:55 a.m.–10:00 a.m.	NCER Research Budgets by Research Programs	Ms. Tara Porter Chief of Staff, NCER
10:00 a.m.–10:15 a.m.	Break	
10:15 a.m.–10:45 a.m.	Integrated Multidisciplinary Research (IMD) Framework - Discussion and Q&A	Dr. Audrey Levine ORD National Program Director
10:45 a.m.–12:05 p.m.	NCER Scientific Leadership Examples - Global Climate Change - Human Health - Sustainability - Nanotechnology	Research Program Leads Dr. Darrell Winner Dr. Devon Payne-Sturges Dr. Diana Bauer Dr. Nora Savage
12:05 p.m.–1:05 p.m.	Lunch	
1:05 p.m.–1:45 p.m.	Scientific Leadership Examples (Cont.) - Water - Air	Research Program Leads Ms. Angela Page Ms. Stacey Katz
1:45 p.m.–1:50 p.m.	2007 BOSC Recommendations	Ms. Alva Daniels

**Monday, February 2, 2009 (Continued)**

1:50 p.m.–2:00 p.m.	Public Comment	
2:00 p.m.–2:15 p.m.	Break	
2:15 p.m.–4:00 p.m.	Fellowships Program - Goal(s) of Review	Dr. Brandon Jones Acting Team Lead, Fellowships Program
	Program Restructure and Status - Discussion and Q&A	Fellowships Team Dr. Brandon Jones Ms. Maggie Breville Ms. Gladys Cobbs-Green Mr. Ted Just Ms. Georgette Boddie
4:00 p.m.–5:00 p.m.	Subcommittee Working Time	NCER Standing Subcommittee

**Tuesday, February 3, 2009**

9:00 a.m.–11:00 a.m.	Subcommittee Working Time	NCER Standing Subcommittee
11:00 a.m.–12:00 p.m.	Future Discussion/Future Business - Identify Additional Needs - Schedule Second Teleconference	Dr. Martin A. Philbert, Chair, NCER Standing Subcommittee
12:00 p.m.	Adjourn	