U.S. Environmental Protection Agency
Office of Research and Development

BOARD OF SCIENTIFIC COUNSELORS EXECUTIVE COMMITTEE MEETING

Research Triangle Park, NC
May 13-14, 2004

Thursday, May 13, 2004

Welcome, Introductions, and Overview

Dr. Jerry Schnoor (University of Iowa), Chair of the Board of Scientific Counselors (BOSC), called the meeting to order at 9:00 a.m., and recognized the three new Executive Committee members—Drs. Clifford Duke (Ecological Society of America), John Giesy (Michigan State University), and Gary Sayler (University of Tennessee). He asked each of the attendees to provide a few sentences of introduction about themselves for the benefit of the new members. Following the introductions, he quickly reviewed the agenda and asked if there were any comments. The agenda includes remarks from Dr. Paul Gilman (EPA/ORD); briefings on the Biotechnology Research Strategy, Numerical Modeling/Grid Computing, Council for Regulatory Environmental Modeling (CREM), and independent expert review of EPA's research programs; discussion of the one-pagers on risk assessment, public health outcomes, interagency relationships, and homeland security; reports from the Mercury, Computational Toxicology, Endocrine Disruptors, and Global Change Subcommittees; report on Science Advisory Board (SAB) activities; and future business for the BOSC.

Approval of the January 2004 BOSC Meeting Minutes

Dr. Schnoor asked for comments on the January meeting minutes. Dr. George Daston (P&G) noted that his name was spelled incorrectly and asked that it be corrected. When there were no other comments on the minutes, Dr. Schnoor asked for a motion to approve them with the requested revision. Dr. Jim Johnson (Howard University) moved that the minutes be approved, and Dr. Juarine Stewart (Clark Atlanta University) seconded the motion. The January minutes were approved unanimously by the BOSC.

Remarks from the AA/ORD

Dr. Paul Gilman, Assistant Administrator for Research and Development (AA/ORD), thanked the Board members for serving on the BOSC and welcomed the three new members. He extended a special thank you to the three members whose terms on the Board expire later this month—Drs. Jerry Schnoor, Ann Bostrom (Georgia Institute of Technology), and Dan Acosta (University of Cincinnati).

Dr. Gilman reported that he accompanied the EPA Administrator, who headed the U.S. delegation for the Global Earth Observation Summit, to Tokyo in April. Representatives from 47 countries and more than 24 international organizations met to achieve the goal of an integrated earth monitoring network to provide data on environmental factors for both scientific and humanitarian purposes. Dr. Gilman noted that EPA has a leadership role in this initiative. A global monitoring program will require interaction of thousands of databases and considerable effort will be needed to get the developing countries on board with this effort. Dr. Gilman noted that EPA is playing a critical role in the planning and implementation

of the global observation network. The Agency will need to determine how to integrate the Environmental Monitoring Assessment Program (EMAP) and other EPA monitoring efforts into this global system. He noted that new thinking is needed in developing a monitoring system that will identify emerging issues—we cannot continue to monitor only in response to regulations.

For the coastal monitoring program, 24 states have tentatively agreed to implement the same methods for monitoring and sampling so that the data will be scientifically and statistically comparable across the states and regions. The lack of such data was evident in the Report on the Environment prepared by EPA. The states are buying into the coastal monitoring program because it is better and less expensive than the alternative. Dr. Gilman stated that ORD is developing the Regional Vulnerability Assessment (ReVA) tool to identify those ecosystems most vulnerable to being lost or permanently harmed in the next 5 to 25 years and to elucidate which stressors are likely to cause the greatest risk. The pilot assessment will be done for the Mid-Atlantic region and builds on data collected for EMAP. ReVA represents a new risk paradigm for EPA that will require innovative approaches to combine existing knowledge, focus new research, and synthesize many types of information into a meaningful assessment designed to inform environmental decision-makers about future environmental risk. It is clear that EPA needs to develop a new monitoring system that is flexible and able to adapt new technologies. Dr. Gilman asked the BOSC to help ORD think through this new monitoring system and the use of the data for decision-support tools.

The risk assessment staff paper is being reviewed by a broad range of constituents including the American Chemistry Council and the Natural Resources Defense Council. Dr. Gilman said that the reviewers have been complimentary of EPA's efforts to consolidate risk assessment practices and address the criticisms that have been leveled at the Agency's risk assessment efforts. EPA is trying to be responsive to these criticisms and has initiated discussions about its practices and risk assessment research. This is one of the areas in which Dr. Gilman is seeking input from the BOSC.

Dr. Gilman reported that ORD is continuing its work in computational toxicology. New partnerships are being developed with other organizations; for example, ORD is working with Gene Logic on databases for predictive toxicology, and is collaborating with the National Institute of Environmental Health Sciences (NIEHS) and the Department of Energy (DOE). There also are plans to work with the Food and Drug Administration (FDA) to learn from their staff how to incorporate genomics into a regulatory framework. One of the drivers for this collaboration is the desire to use genomics in microbial source tracking. The enforcement arm of EPA wants to be able to track microbial contamination back to its source and genomics would make this possible. The Regions also are interested in microbial source tracking.

Dr. Gilman will testify next week regarding Homeland Security Presidential Directive 10. He noted that EPA has a major focus in that directive with regard to water security and decontamination research. EPA has responsibility for developing specific standards, protocols, and capabilities to address the risks of contamination following a biological weapons attack and developing strategies, guidelines, and plans for decontamination of persons, equipment, and facilities. ORD's National Homeland Security Research Center (NHSRC), established in September 2002, is a virtual center that was scheduled to sunset in 3 years after its creation. The Center has been productive and it has focused on real-world issues of concern to homeland security, including guidance on shelter-in-place—when it is appropriate and when it is not. In developing the research agenda for homeland security, ORD consulted building managers, architects, water treatment facilities, and others to determine their needs and concerns. The NHSRC also examined thousands of threat-based scenarios and worked with security agencies to assess the feasibility and health and ecological consequences of these scenarios. Dr. Gilman noted that no other agency has used threat-based scenarios to prioritize its research agenda.

As the BOSC discusses the one-pagers on risk assessment and homeland security, and the Computational Toxicology Subcommittee considers its path forward, Dr. Gilman asked the BOSC members to help ORD think through the big questions that must be addressed to focus the research agenda. How do we want to approach doing better risk assessments? Which default assumptions can be improved through research? What are the most important questions and what questions would benefit the most from research? Should ORD develop a computational toxicology research center similar to the NHSRC? What is the best way to organize the cross-ORD efforts on computational toxicology?

Dr. Herb Windom (Skidaway Institute of Oceanography) commented on the importance of EPA's involvement with the Global Earth Observation Summit (GEOS). He stressed the importance of involving the user community (of which EPA is a member) in the design of a global monitoring system and encouraged EPA to take a leadership role in this initiative. Dr. Sayler asked Dr. Gilman to elaborate on the virtual center for computational toxicology and Dr. Gilman responded that ORD is not trying to get into the chip business, but rather is trying to interact with commercial enterprises that believe there is a commercial opportunity in the environmental arena. ORD is trying to figure out how the Agency can use proteomics and genomics to better accomplish its mission. With regard to endocrine disruptors, EPA is mandated to develop screening tests and ORD is looking for opportunities to apply these new approaches. Dr. Gilman mentioned that the Science Policy Council (SPC) issued policy on the use of genomics, and the Agency is looking to ORD for leadership in this area.

Dr. Bostrom asked about the testimony of Dr. Genevieve Matanoski before the Subcommittee on Environment, Technology, and Standards, particularly her remarks about program assessment. Dr. Gilman explained that there is a new tool, the Program Assessment Rating Tool (PART), that was used to evaluate selected EPA programs. He noted that there is a change in philosophy from assessing outputs (e.g., number of permits issues, number of papers published) to outcomes (e.g., the water is cleaner, or the research provided the tools that made the water cleaner). There were three ORD programs reviewed using this tool in the last review cycle. He noted that the pollution prevention (P2) program, which is aimed at developing fundamental knowledge for use by industry to prevent pollution, did not score well. As a result, there was a reduction in funding for this research. Dr. Gilman mentioned that some of the P2 funding was transferred to other parts of the Agency that had demonstrated results. Some in the Office of Management and Budget (OMB) are realizing that PART is less appropriate for research, particularly fundamental research, and EPA is trying to convince OMB to adopt some alternative assessment approaches. He said that ORD is revising the Multi-Year Plans (MYPs) to consider outcomes rather than outputs. Endocrine disruptors will soon undergo a PART review, and he is hopeful that its score will be better based on what the Agency has learned from the criticisms received in the last reviews.
Dr. Anna Harding (Oregon State University) stated that she is concerned about budget cuts in ORD. Is there anything the BOSC can do to encourage restoration of funding for P2 and other environmental research? Dr. Gilman replied that the BOSC can help by assisting ORD in identifying outcomes and preparing for these program assessments. He noted that ORD asked for increases in particulate matter (PM), asthma in children, the Integrated Risk Information System (IRIS), and other programs and all of the increases were denied. Dr. George Lambert (University of Medicine and Dentistry of New Jersey) asked if EPA has looked for ways to improve interactions with other agencies/organizations to leverage its research dollars. Should the BOSC look at this issue? Dr. Gilman responded that EPA always looks for opportunities to work with other agencies. He recently met with National Cancer Institute (NCI) staff to talk about collaborating on environmental stressors research. He added that there may be some opportunities for the BOSC to identify ways for EPA to interact with other agencies. Dr. William Farland (EPA/ORD) provided an example of how EPA is working with FDA on mercury in fish. FDA has viewed the issue in terms of the commercial fishing enterprise, and EPA has viewed this issue in terms of sports fishing. The two agencies had inconsistent approaches so now they are trying to work together to issue consistent guidance on fish consumption.

Discussion of Risk Assessment One-Pager

Dr. Rogene Henderson (Lovelace Respiratory Research Institute) prepared a draft one-pager on risk assessment principles and practices. She noted that EPA has released a comprehensive paper on how risk assessment is conducted at the Agency. The paper is easy to read and is organized in a question and answer format. EPA would like to engage interested parties in a dialogue about risk assessment principles and practices to improve the practice of risk assessment. The BOSC can facilitate this process by sponsoring a workshop in which various interested parties are brought together to discuss the most controversial issues in the risk assessment process. The one-pager lists five topics that could be discussed at the workshop: (1) conservatism in risk assessment, (2) use of rigid default assumptions, (3) degree of transparency in risk assessment, (4) uncertainty and variability in risk assessment, and (5) ecological risk assessment—an opportunity for the future? The 2½-day workshop could include presentations from EPA staff on their methods, followed by presentations of different view points from the affected community.

Dr. Daston said he is looking at the workshop as one of the many steps needed towards harmonizing risk assessment practices (harmonize the approach for human versus ecological versus microbial risk assessment). If that is the focus of the workshop, it will be easier to engage stakeholders. Dr. Henderson expressed some concern that such a focus would not provide EPA the feedback it is seeking on improving its risk assessment process. Dr. Farland suggested looking at these five areas in the context of harmonization. Dr. Sayler mentioned the importance of including shareholders outside the Washington, DC, area in the workshop. Dr. Farland noted that this could be accomplished through Webcasting or videoconferencing. Dr. Bostrom pointed out that the workshop approach is relatively new for the BOSC—the Communicating Research Results: Best Practices Workshop was the first undertaking by the Board. She recommended narrowing the focus on the workshop and designing it to achieve the desired outcome. Ask the participants to prepare white papers similar to that developed by EPA before the workshop to facilitate the discussions and to maximize the workshop's impact. Dr. Elaine Dorward-King (Rio Tinto) thought the workshop was an excellent idea and recommended including uncertainty and transparency as topics. She also suggested that the workshop could be helpful in understanding how the results of a risk assessment can be used and communicated in a meaningful way to the public.

Dr. Schnoor asked if Dr. Henderson would chair a BOSC subcommittee on risk assessment, and she agreed. Drs. Duke and Daston also volunteered to serve on the subcommittee.

Discussion of Public Health Outcomes One-Pager

Dr. Daston prepared a one-pager titled, Placing Biomonitoring Data in the Context of Risk. The one-pager proposed a BOSC-sponsored multistakeholder workshop to develop specific recommendations for evaluating and communicating biomonitoring data in the context of risk. Alternatively, the BOSC could review EPA's plans to evaluate and communicate biomonitoring data in a risk context. The workshop will be designed to develop specific recommendations for analyzing and communicating risk information that includes biomonitoring data. It was mentioned that the International Life Science Institute (ILSI) is planning a workshop on this issue, and EPA is informally involved with this effort. Dr. Daston suggested that the BOSC endorse EPA's participation in the ILSI workshop and defer any further action until the outcome of that workshop is available. Dr. Farland noted that the ILSI workshop will address how to communicate knowledge of what is in urine and blood, but he is not sure that it will explain the relevance of this to public health. EPA has had discussions with the National Academy of Sciences (NAS) and the Centers for Disease Control and Prevention (CDC) about making biomonitoring data more useful to public health. He noted that the ILSI workshop is scheduled for fall 2004. Perhaps the BOSC could monitor the ILSI and NAS activities, review their findings and recommendations, and work with EPA to develop a plan to implement them. Dr. Clark suggested broadening the scope to include ecological monitoring (soil, food chain, etc.) as well as biological monitoring. There is a need to explain what the

biomonitoring data means for the ecology. Dr. Lambert carried it one step further and said EPA needs to be able to explain how individuals got exposed and how they can prevent further exposure.

Biotechnology Research Strategy

Dr. Larry Reiter (EPA/ORD) mentioned that he is serving as the Acting Director for the National Risk Management Research Laboratory (NRMRL) until ORD has recruited a new Director for NRMRL. A search committee has been created and Dr. Ray Loehr has agreed to chair it. Dr. Reiter asked that the BOSC mention this opportunity to colleagues who may be interested in the position.

Dr. Reiter said that EPA received $5 million to initiate a biotechnology research program, and ORD has been laying out a science framework for the program. The acreage of genetically modified (GM) crops in the United States has increased from less than 20 million in 1997 to more than 90 million in 2002 (140 million acres worldwide), and this number is expected to continue to increase in the future. EPA is interested in this issue because under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the Agency is responsible for registering all pesticides, including crops with pest-protective genetic modifications. EPA must determine that these pesticides and pest-protective crops will not pose an unreasonable risk of harm to human health and the environment. For plant incorporated protectants (PIPs), EPA considers risk to human health, risks to non-target organisms and the environment, the potential for gene flow, and the insect resistance/management plan. Dr. Reiter stated that three NAS reports recommended assessment of the risks of allergenicity from GM foods, assessment of the possibility for gene transfer and the ecological risks associated with GM crops, and management of gene transfer and resistance.

Dr. Reiter noted that food allergies occur with an incidence of about 5 percent in children and 1-2 percent in adults. There is some concern that novel proteins introduced into food through bioengineering could be allergens. Currently, there are no models to evaluate food allergenicity, but EPA is attempting to modify a rodent model to evaluate allergenicity of GM crops and explore the susceptibility issue. The framework for developing this model, includes identifying endpoints for use in an animal screening model, understanding the mechanisms, relating digestability to allergenicity, determining potency relative to known allergens, and identifying windows of vulnerability during early development.

In December 2002, EPA and NIEHS sponsored a workshop on assessment of the allergenic potential of GM foods. The proceedings of this workshop identified a number of research needs. A solicitation is being drafted under the Science To Achieve Results (STAR) Program that will focus on improving the Agency's understanding of the basis for human sensitization to dietary allergenicity and developing methods to assess dietary allergenicity. ORD also is recruiting a post-doc to modify and adapt the mouse model.

Dr. Reiter identified three research needs to address potential ecological risks related to GM crops: (1) understand the likelihood and impact of gene transfer, (2) characterize the impacts on non-target species, and (3) determine/manage pesticide resistance. ORD needs to evaluate the potential for the transfer of novel genetic material from GM crops to non-target plants, as well as the unintended ecological consequences.

ORD's strategy is to design molecular markers to detect transgenes in plants, verify the target gene in transgenic plants, screen for the gene in potential crop/noncrop hybrids, confirm expression of transgenes and potential effects on other genes, and evaluate fitness and ecological effects of crop/noncrop hybrids. ORD has documented pollen movement and gene flow between crops (creeping bentgrass), and identified species-level markers for Agrostis and confirmed hybridization in plants from the field study. ORD is simultaneously developing models to address "what if" questions. Mathematical models show expected

changes in plant community dynamics, depending upon type of gene (e.g., herbicide resistance, pesticide production, etc.), and plant competition strategy. The next steps are to repeat the field study for pollen flow/gene transfer, initiate field study for gene introgression and fitness effects in resident grasses, establish/monitor/model plant communities in mesocosms for 3-5 years, complete the Agrostis phylogeny studies, and initiate the gene expression studies.

Bacillus thuringiensis (Bt) proteins have narrow-spectrum insecticidal activity and no serious anticipated effects on non-target organisms. Long-term monitoring is needed to identify unanticipated outcomes and to quantify cost/benefits. The non-target monitoring network will evaluate sites near both traditional and Bt agroecosystems (corn, cotton). The evaluation will include novel methods for sensitive exposure monitoring, genetic methods to evaluate population structure, and temporal patterns in population sizes and allele frequencies of response genes. The utility of the monitoring program will be assessed after 3 years.

Ground beetles communities have been selected as an excellent indicator of ecological biodiversity and environmental quality. Preliminary gene expression studies to identify gene expression markers for exposure to Bt have been completed. The next steps are to: (1) begin non-target species collection in the agroecosystem, (2) measure exposure of non-targets to Bt and traditional pesticides, (3) evaluate genetic markers to identify population structure and gene flow of ground beetle populations across the United States, and (4) organize a conference on strategic monitoring for ecological impacts from PIPs (scheduled for August 2004).

Dr. Reiter indicated that resistance evolution in insects is common. EPA requires resistance management plans to prolong the usefulness of Bt crops. This is an effort to prevent the return to the use of broad-spectrum pesticides if GMO crops are less risky. If resistance develops, Bt spray applications widely used in organic farming would be rendered ineffective. EPA requires implementation of a "high dose, structured refuge" strategy for resistance management. In this strategy, if a few resistant individuals survive, they mate with susceptible individuals from refugia to produce susceptible offspring. The resistance management approach is model-based, but is dependent on accurate biological parameterization. The parameters include local population sizes, dispersal patterns, and mating patterns; number and importance of resistance genes; and resistance allele frequencies in the fields.

EPA has established an Interagency Agreement (IAG) with the U.S. Department of Agriculture (USDA) for insect culture and artificial selection, as well as a material transfer agreement with Monsanto for Bt-seed and purified protein. A stable long-term laboratory culture of western corn rootworm has been established, and genetic mapping populations have been created. In 2003, field sampling of western and northern corn rootworm was completed across the U.S. corn growing regions. ORD has developed molecular markers (microsatellite and candidate genes) to use for gene flow and population size estimation across the Midwest. Preliminary screening of these markers is underway to detect resistance to Bt products. The next steps in the investigation of insect resistance are to: (1) conduct high throughput genotyping of rootworm populations collected in 2003 using microsatellite markers to assess gene flow and population structure; (2) develop a molecular genetic screen for detecting resistance alleles in western corn rootworm; (3) sample for western, northern, and Mexican corn rootworm across corn growing regions in the Unites States for 2004 and 2005; (4) collect additional western and Mexican rootworm to use in mapping and selection experiments; (5) artificially select for Bt resistance in the laboratory; and (6) develop inbred lines to use for mapping and identification of Bt resistance genes.

ORD has initiated research with the National Aeronautics and Space Administration (NASA) on remote sensing to differentiate conventional/bioengineered corn and to identify Aphid-infested soybean fields. ORD has completed a model evaluation workshop and plans to hold a workshop on toxin detection techniques in summer 2004. A workshop on pollen dispersion also is planned. In addition, field and

imaging research/planting compositions have been selected. The next steps for risk management include: (1) developing a standardized compendium of experimental practices for use in the field evaluation of non-target insect effects related to Bt crops, and (2) initiate field studies during the 2004 growing season.

Dr. Reiter concluded his presentation with a charge for the BOSC. Has ORD developed a research program that addresses the major scientific questions to meet the stated Program Office needs? Is the program scientifically sound? Given the focus of EPA's needs, does the program appear to be well designed? He noted that a cross-ORD workgroup developed this research framework and others provided input as well.

Dr. Johnson said that the BOSC has agreed to do a letter review of the biotechnology research program framework. Drs. Schnoor, Johnson, Daston, and Clark have agreed to draft this letter for review by the entire Executive Committee. Dr. Johnson asked if each of these individuals had received the CD on the Biotechnology Research Program. Because a few had not, Dr. Reiter provided additional copies for distribution to the Board members. Dr. Johnson said the next steps are to accept the charge, subdivide the tasks, and prepare the draft letter report. He suggested that these steps be discussed in a conference call. Dr. Johnson asked other members who would like to participate in drafting the letter report to notify him.

Dr. Clark asked if FDA has responsibility for ensuring that crops are safe for human consumption. Dr. Janet Andersen (EPA/OPPTS) replied that EPA is responsible for the safety of pesticides and FDA is responsible for the food crops (nutrients, vitamin changes, etc.). Dr. Clark asked if allergenicity is the responsibility of EPA. Dr. Andersen responded that it is EPA's responsibility as it relates to the PIPs. Dr. Lambert asked if FDA has any Phase 3 or 4 studies examining allergens. Maryjane Selgrade (EPA/NHEERL) replied that it is difficult to do allergenicity studies because only 1-2 percent of the adult population has food allergies. She added that the CDC has done adverse events analyses. Dr. Andersen stated that EPA is looking at the proteins and amino acid structure in modified food products and trying to determine how the proteins might breakdown. Dr. Jack Fowle (EPA/NHEERL) said that, based on input from other agencies, ORD's biotechnology research program is complimentary to the research efforts of other agencies.

Dr. Dorward-King asked how ORD plans to balance the research between non-target (ecological protection) and target resources. Dr. Reiter responded that ORD relied on the NAS reports to identify research needs, and the proposed approach is driven by the law that EPA is required to administer. Dr. Dorward-King pointed out that ORD would benefit from taking a long-term view. What questions will EPA be asked to address in the future? She noted that this is an emotional and controversial issue and the Agency will need good science to support its decisions. Dr. Daston commented that ORD's program should be narrowly focused at the present, but he suggested that ORD move beyond this framework for future assessments. Can the Bt work be extrapolated for future assessments? He mentioned that the University of Nebraska is developing something on allergens. Currently, no good animal model exists, and they are using a tiered system and epitope mapping to rule things out. Dr. Selgrade said that the World Health Organization (WHO) has proposed some animal models, but at present most of the work is based on digestibility. She added that it is too soon to use structure-activity relationships to predict allergenicity. Dr. Elaine Francis (EPA/NCER) commented that the National Center for Environmental Research (NCER) will be issuing a solicitation to engage the academic community to work on animal models for allergenicity.

Dr. Reiter indicated that ORD is trying to use a genetic approach to evaluate exposure and resistance development. Dr. Giesy commented that it will be difficult to know where to start looking genetically because there is no evidence of existence from the monitoring program. Dr. Andersen stated that there are two known cases of resistance. Dr. Sayler asked if companies such as Monsanto and Dow are involved in ORD's research efforts. Dr. Reiter replied that ORD is working with industry through

Cooperative Research and Development Agreements (CRADAs); industry also has been invited to meetings to provide input, but the primary target to date has been other federal agencies. Dr. Selgrade mentioned that industrial representatives were involved in developing the research questions. Dr. Giesy noted that industry is involved and informed on this topic and industrial input is very valuable. Dr. Sayler commented that EPA could provide guidance to USDA and FDA on gene flow.

Dr. Bostrom pointed out that items in the food supply often show up in unexpected places. There is no spatial contiguity once a product enters the food chain. How can EPA address this? Also, does EPA have any information on the social and economic effects of issuing permits on genetically engineered microorganisms (GEMs)? What impact will it have on agriculture? Dr. Andersen replied that the proteins in these modified crops probably breakdown rapidly so there should not be many found in sewage. She added that EPA's Office of Pesticide Programs (OPP) is not looking at the social and economic effects of these products. USDA has tried to examine the impact of genetically modified products on farming practices. USDA is responsible for the regulation of organic farmers. Dr. Andersen stated that organic farming is a process used to grow a crop; it is not a certification that the product contains no pesticides. Dr. Windom asked if EPA plays a role in the importation of crops. Dr. Andersen responded that any imported crop containing a pesticide is covered by EPA. The Agency works with the Foreign Agricultural Service to educate producers around the world about EPA's standards. In addition, imported crops are inspected by Customs Agents at the U.S. borders.

Dr. Giesy asked if the role of the beetles was to identify genes that might be responding to Bt, and Dr. Reiter replied in the affirmative. Bt is of major interest so ORD selected it as an early target. Dr. Clark asked about the nature of the coordination with USDA, FDA, and other agencies. Are the interactions formalized? Are they structured and required? At what level do the interactions occur? Dr. Reiter responded that the interactions occur at the researcher level. ORD made a concerted effort to involve numerous federal agencies in the development of its research framework. He was surprised to find out how little was being done in this area in other agencies. Dr. Reiter said that ORD has had a series of follow-up discussions with USDA as the areas on which to focus ORD's research became more defined. These interactions have been informal, but there are more formal interactions with the regulatory staff at EPA. Dr. Francis said that USDA was tapping the academic community to look at a number of ecological issues of concern to EPA; therefore, ORD decided to focus its efforts on allergenicity. ORD discussed with NIEHS and the National Institute of Allergy and Infectious Diseases (NIAID) the possibility of partnering on the allergencity research, but these agencies have not yet indicated their willingness to participate. Nevertheless, ORD will continue to seek partners for its biotechnology research. One participant commented that ILSI considers allergenicity an important issue, and will convene a group at the White House level to address it. Dr. Henderson asked why EPA and not USDA is concerned about the development of resistance. Dr. Andersen responded that if the pests become resistant, this technology will be replaced by the use of many toxic pesticides and the environmental benefits that have been gained in reducing the chemical pesticide loading will be lost.

Numerical Modeling/Grid Computing

Dr. Larry Cupitt (EPA/NERL) opened his presentation by defining grid computing. Grid computing is applying the resources of many computers in a network to a single problem at the same time—usually to a scientific or technical problem that requires a great number of computer processing cycles or access to large amounts of data. Grid computing can be thought of as distributed and large-scale cluster computing and as a form of network-distributed parallel processing. There are a number of advantages to grid computing—it allows the Agency to access large data sets not stored on EPA's computers and it allocates processing power across numerous CPUs. Grid computing will enable EPA to: (1) do its job of protecting human health and the environment more effectively, (2) exploit new technologies (e.g.,

"omics," bioinformatics, systems biology, information technology), and (3) develop scientifically sound decision and implementation tools.

Dr. Cupitt identified a number of potential applications for grid computing: Center for Excellence for Computational Environmental Science, Global Earth Observing System of Systems, computational toxicology, homeland security modeling, regulatory environmental modeling, and indicators/outcomes. There are challenges associated with grid computing. EPA must revolutionize its thinking with out-of-the-box solutions to: (1) relate, conjoin, merge, and connect huge amounts of environmental information; (2) mine information to detect patterns and linkages between environmentally relevant events (molecular to global); and (3) evolve environmental data into information—and then into knowledge—to solve real problems in real places. Grid computing would expand the data sources available to EPA, and enhance the Agency's information technology and tools (computational models, optimized Community Multiscale Air Quality model).

With grid computing, the location of the data is unimportant; the only issue is accessing the data. The user enters a data request, the data are located, and brought back to the user with a "wrapper" that explains how to make the data transparent. Grid computing increases resource use, flexibility, productivity, reliability, and availability, and it decreases complexity and total cost of ownership. A number of organizations are cooperating on the development of standards for grid computing. To illustrate the power of grid computing, Dr. Cupitt presented a diagram that identified the potential contributions (measurement and monitoring data, models, decision support tools, and programs) to the Global Earth Observation System of Systems.

EPA plans to launch the Center of Excellence for Computational Environmental Science (CoE). The CoE will integrate cutting edge science and emerging information technology to transform environmental decision making. It will enable collaboration from within and without; provide a flexible, dynamic computing and information infrastructure; and ensure optimized and appropriate access of EPA resources. Air quality has been selected as a CoE pilot area because it is computationally demanding, scientifically challenging, and central to EPA's mission. Three air quality pilots have been selected: (1) State of New York/Northeast States for Coordinated Air Use Management (NESCAUM), (2) Western Regional Air Partnership (WRAP), and (3) State of North Carolina/Visibility Improvement State and Tribal Association of the Southeast (VISTAS).

These pilots were selected because these partners are leaders in developing and applying air quality models and high-end computing and networking, bring wide geographic coverage (Northeast, Southeast, and Western United States), and are interested in expanding use of air quality simulation and prediction at the State or Regional level. These pilots also support earth observations that can enhance simulation and prediction quality, and they complement National Oceanic and Atmospheric Administration's (NOAA) planned New England field campaigns.

Dr. Cupitt stated that internal EPA partnerships are critical for the air quality pilots. The Office of Air and Radiation (OAR) plays a vital role in regulatory policy, forecasting, and data assimilation efforts. The Office of Environmental Information (OEI) enables collaboration through a dynamic computing and information infrastructure. EPA also is partnering with other agencies on these pilots. NASA, NOAA, DOE, and CDC bring unique expertise to the partnership. NOAA's 50-year partnership with EPA continues to provide critical weather, air quality modeling, and forecasting expertise, as well as operational satellite program expertise. NASA/NOAA could significantly enhance the availability and richness of air quality information through the assimilation of satellite data. DOE applies advanced information technology capabilities to enhance air quality modeling, and CDC is partnering to investigate approaches to explore potential linkages between air quality and human health.

The New York Air Quality Pilot includes a number of partners. ORD, OEI, and IBM are enabling the grid computing; DOE/Sandia National Laboratory is providing model optimization; CDC is providing public health tracking; NOAA is providing air quality forecasting; NASA is providing air quality satellite data; and the State of New York is implementing air quality planning and forecasting. The pilot is coordinated by the CoE.

EPA partnered with DOE/Sandia National Laboratory to speed up the scientifically robust Community Multiscale Air Quality (CMAQ) model, and New York is the test bed for evaluating this latest version of CMAQ. The model will be delivered to the user community in New York in August 2004. The user community also will be provided remote access to newly available data to estimate influences outside the boundaries of interest. The three selected pilots will use the optimized CMAQ in air quality planning activities, and it will be incorporated into the new aerosol module developed by WRAP.

For air quality forecasting in the pilots, NOAA and EPA provide remote access to daily air quality forecast guidance for ozone. New York will use this to develop local forecasts and inform public/personal decisions about mitigation actions. New York, supported by the partners, will apply CMAQ to prototype predictions of $PM_{2.5}$ and other pollutants—pushing the state-of-the-science. Satellite measurements of aerosol optical depth by NASA/NOAA will be evaluated for potential to improve the quality of the air quality modeling and forecasting of $PM_{2.5}$.

In collaboration with CDC, New York will investigate the potential relationships between air quality and human health data. EPA will work with CDC and the states to provide improved predictions of air pollutant concentrations. These data could potentially be used to explore possible relationships between air quality and human health. Dr. Cupitt mentioned that EPA led a session on available air quality data and approaches for combining data at the CDC Environmental Public Health Tracking Conference in March 2004.

The New York Air Quality Pilot is well underway. The initial data exchange between New York and EPA has been accomplished (16 GB/day). New York will remotely run CMAQ on an EPA platform to demonstrate the grid computing capability. Boundary condition and forecasting datasets will be directly accessed by New York, and EPA will archive $PM_{2.5}$ prototype forecasting data generated by New York. Dr. Cupitt mentioned that the New York pilot will be presented at the EPA Science Forum in June 2004.

Dr. Cupitt identified a number of additional applications for grid computing. It could enable the creation of a virtual metabonomics center with ORD, DOE, and academia. Grid computing also could be used to examine chemical effects in biological systems. It could bring together metabonomics, genomics, and proteomics data with bioinformatics expertise (collaboration with NIEHS, IBM, DOE, and others). Other potential applications include the Global Earth Observing System of Systems and human exposure modeling in urban environments.

Dr. Lambert asked if the New York pilot included New York City, and Dr. Cupitt replied that the city was included. Dr. Clark asked about the size (in dollars) of the grid computing effort. Dr. Cupitt responded that it is not a large effort, about $2-4 million, but EPA has an application that can show the relevance of the work of other agencies. Dr. Gilman noted that the enhanced CMAQ model is a big success story for grid computing—the Agency gained increased performance and improved accuracy for very little investment (about $50K). Dr. Duke asked if there is any formal interagency relationship with the National Science Foundation (NSF) in the area of cyber infrastructure. Dr. Gilman replied that there is no formal arrangement, but the two efforts will probably be integrated in the future. Dr. Farland noted that the Committee on Environment and Natural Resources (CENR) is a good forum for discussing potential collaboration with NSF. Dr. Lambert asked if there are plans to include National Health and Nutrition Examination Survey (NHANES) data. Dr. Cupitt replied that NHANES data will be included once the

datasets are wrapped so that they are transparent. He noted that the primary limitation with health data is the issue of attribution. EPA selected air for the pilot because it has the highest probability of success. Dr. Daston asked about integrating the many datasets generated by laboratories working in the "omics" fields. Dr. Gilman responded that integration is not required. It is more of a cultural change—investigators have to be willing to share data before they are published. This is probably the biggest issue, but there also are concerns about quality assurance and quality control. Dr. Harding asked if grid computing is being used by other programs, such as global climate, oceans, and human health. Dr. Gilman replied that most of the global climate work relies on integrated models run at certain facilities; EPA interprets the output from those models. He added that grid computing is just coming into use and the work on GEOS will address many of the issues, especially those relating to international datasets.

Tour of the EPA Facilities

For the remainder of the afternoon, the BOSC members participated in a guided tour of EPA's state-of-the-art facilities in RTP.

Friday, May 14, 2004

BOSC Issues

Dr. Schnoor asked Dr. Johnson to assume his role as the incoming Chair of the BOSC for the second day of the meeting. Dr. Johnson asked the BOSC members to determine their availability for the January and May 2005 meetings. He suggested the week of January 16 or 23 and the week of May 15. He asked the BOSC members to notify him of their availability during these 3 weeks so that the future meeting dates can be finalized. Dr. Farland asked if the BOSC would like to consider meeting at one of the other laboratories for the January or May meeting. Dr. Johnson asked for suggestions from the BOSC members regarding the venues for the January and May meetings. He proposed scheduling time for the subcommittees to meet in conjunction with these meetings.

Lori Kowalski, participating by conference call, indicated that her fax number had been changed to 202-565-2911. She also reported that all *Federal Register* notices for the BOSC will be published on EDOCKET. Several action items from last meeting were not completed so they should be added to the list for this meeting.

Dr. Farland indicated that the BOSC charter is being renewed and is in the Administrator's Office for signature. This should be signed by May 31. He welcomed the three new BOSC members and thanked Dr. Johnson and the members of the Nominations Subcommittee for the excellent group of nominees. He asked that Dr. Johnson continue to chair this Subcommittee until three additional members have been selected. If possible, these new members will be appointed by the September meeting.

As mentioned at the previous meeting, both the BOSC and the SAB are involved in reviewing the MYPs. Dr. Farland asked if it would be appropriate for the BOSC to combine these with a program review. The program review would be retrospective and prospective. He indicated that Dr. Clark has agreed to serve as the BOSC liaison for the SAB review of the Contaminated Sites and RCRA MYP. Dr. Farland asked if any member is interested in serving as the liaison for the SAB review of the PM MYP. Dr. Henderson said that she would be willing to participate in that review.

Dr. Farland provided an update on the status of the National Program Directors (NPDs). ORD initiated the process to recruit NPDs. The pay scale for these positions will be equivalent to that for the Senior Executive Service (SES) and the National Laboratory/Center Directors. They will be responsible for leadership on the science and direction for a particular program. They will work across the

Laboratories/Centers and each NPD will probably be responsible for one or two MYPs. Recruitment began in fall 2003, and EPA received 7-23 qualified applicants for each of the 9 positions. He added that an individual could apply for more than one NPD position. Applications were accepted through April 16, 2004. EPA has gone back to the applicants and asked them to provide more information on their scientific leadership and strategic planning experience as well as their ability to foster cross-agency cooperation, manage multidisciplinary research programs, and serve as a spokesperson for a group—influencing priorities, directions, and outcomes. EPA also asked them to provide information on their personal research interests. Three-member panels (two internal and one external to EPA) were established to review the applications and the written responses to the additional questions posed by EPA. Each member scored the applicants and then the panel discussed each applicant. The panel identified three or more highly qualified individuals from the applicants they reviewed. Next week, a group of ORD staff will meet to review and compile the results, and forward them to Dr. Gilman. Dr. Farland will serve on this group as well as Henry Longest, II, and one or more of the Laboratory/Center Directors. This review should be completed by May 24, and some of the NPD positions may be filled by July 31. If most of the nine NPD positions are filled from this first round of recruitment, EPA may wait for 6 months before soliciting a second round of applications. Dr. Farland said that he should be able to announce the names of the new NPDs at the September meeting.

Dr. Windom asked where the NPDs will be located. Dr. Farland replied that they will be located in Washington, DC; RTP, NC; or Cincinnati, OH. He noted that it would be best for the NPDs to be located at one of these three major locations. Dr. Johnson asked if Dr. Gilman would be interviewing the candidates. Dr. Farland replied that Dr. Gilman is the selecting official and would have the option to interview them. Dr. Daston asked about the mix of candidates, and Dr. Farland replied that there was a good mix—some from inside EPA, a number from other agencies, and some from industry. Dr. Schnoor commended ORD for this move, noting that it was one of the recommendations of the BOSC. Dr. Farland said that it has not been without controversy because ORD is establishing another level of management to interact with the Laboratory and Center Directors. Nevertheless, ORD believes that a single spokesperson for each program will be a real benefit. Dr. Farland agreed to update the BOSC on the status of the NPDs at the September meeting.

Dr. Farland reminded the BOSC that ORD has made the Science Inventory available to the public. He asked if any of the members had taken a moment to look at the Inventory. He said that ORD is seeking feedback on how the Inventory is being used and if users are finding it to be helpful. Dr. Farland mentioned that the request for updates was recently distributed, and the Science Inventory will be updated on an annual basis. Each year, the Office of Science Policy (OSP) will audit the system to ensure the information is correct and the fields have been completed. If information is missing, OSP will request that information.

Dr. Farland said that at the January meeting, Dr. Hal Zenick briefed the BOSC on public health outcomes, and yesterday Dr. Cupitt's presentation focused on grid computing. ORD is seeking informal advice from the BOSC on these areas. Some ideas for presentation at the September meeting include nanotechnology and the National Coastal Condition Report. He noted that the National Coastal Condition Report has been released and is available for download from the Web at http://www.epa.gov/owow/oceans/nccr/downloads.html. Dr. Farland agreed to send copies of the report to the BOSC members. Dr. Farland indicated that the report is directly related to EMAP tools—applying the tools to determine the condition of our nation's coastal areas. He noted that EMAP is evolving and will be moving in new directions.

Dr. Reiter commented that EMAP was focused initially on water bodies to establish baseline conditions. Now, the focus is moving toward large rivers. The real challenge is using the ability to determine conditions to diagnose stressors responsible for degrading conditions. The Regions and states need tools

to help them understand what is causing the problems so that they can take corrective action. We need to link EMAP data with landscape data so that we know where to look for these causes. ReVA, which was mentioned yesterday by Dr. Gilman, is ORD's attempt at such integration. ReVA will integrate research on human and environmental health, ecorestoration, landscape analysis, regional exposure and process modeling, problem formulation, and ecological risk guidelines.

Dr. Farland asked if the BOSC was interested in any of these topics for the September meeting. Dr. Johnson stated that the BOSC will be reviewing the National Coastal Condition Report in the future. Dr. Farland said the BOSC could do a letter review of the report before it is finalized this fall. Dr. Daston expressed interest in the nanotechnology briefing. Dr. Reiter mentioned that the Institute of Medicine's Roundtable on Environmental Health Sciences will be discussing nanotechnology and environmental health at the May 27 meeting.

On behalf of Dr. Gilman and the ORD staff, Dr. Farland thanked the three departing BOSC members for their service and the excellent advice they have provided to ORD over the past several years. He thanked Dr. Bostrom specifically for her efforts to improve ORD's communication of research results, and he thanked Dr. Schnoor for his 8 years of outstanding service, both as a member and then as Chair of the BOSC.

Council for Regulatory Environmental Modeling (CREM)

Neil Stiber (EPA/ORD/OSP) provided an overview of the CREM. The Council includes representatives from all EPA Program and Regional Offices. In February 2003, the EPA Administrator directed the CREM to work on: (1) guidance to develop, evaluate, and use models; (2) Web-based Knowledge Base of EPA models; (3) NAS report on modeling; (4) Regional workshops on modeling; and (5) stakeholder consultations.

In January 2004, EPA released two products to improve the Agency's use of environmental models—Draft Guidance on the Development, Evaluation, and Application of Regulatory Environmental Models and the Models Knowledge Base. These two complementary products work in tandem to describe and document good modeling practices. The guidance provides a process for generating information to determine if a model and its results are of a sufficient quality to serve as the basis for a decision. The guidance recommends best practices to help determine when a model, despite its uncertainties, can be appropriately used to inform a decision. The guidance recommends a preference for non-proprietary models; however, for proprietary models, adherence to the guidance should be documented and to the extent practicable, provide means to replicate the model results.

The CREM Knowledge Base is a Web-accessible database of information on some of EPA's most frequently used models. It is intended to be a living demonstration of the recommendations from the Guidance for Environmental Models. The Guidance recommends what information about models to document, while the Knowledge Base serves as a repository where this information is documented. The records in the database were written and reviewed by the appropriate "model owners," and a spectrum of models are included in the Knowledge Base. Currently, the Models Knowledge Base contains about 100 models, but this is not a comprehensive set. Each model's record may contain general information (abstract, contact information, Web links), information on model use (requirements, download information, User's Guide, basics of use), and the science of the model (conceptual basis, scientific detail, model evaluation). The models can be identified and selected by three tools: the listing of all available models, keyword search, and browse for models by selecting environmental indicators.

Dr. Stiber presented the results of a browse by environmental indicators search. After selecting "CWA" and "Exposure or Uptake," a list of models appears. To illustrate the types of information in a record, Dr.

Stiber presented the record for one of the models on the list (i.e., Aquatox). Both the Guidance and the Knowledge Base are available from the CREM Web Site at http://www.epa.gov/crem.

There are a number of research needs identified by the CREM, including the integration of models across multiple scales of time and space, and the integration of models into a larger modeling system. Dr. Stiber mentioned the symposium on meta-modeling to be held at the Wilson Center on May 24. Dr. Johnson asked Dr. Stiber to provide more information on the symposium to the BOSC.

Both the Guidance and the Knowlege Base are undergoing review by the SAB, after this external peer review, public comments will be solicited. There are plans to conduct a model evaluation training camp in an effort to make the "black box" models as transparent as possible. EPA also is collaborating on a Regional symposia series, the Wilson Center symposium, state Total Maximum Daily Loads (TMDLs), and a technical paper on meta-modeling.

Dr. Acosta asked for a specific example of how policy making has been improved by CREM's efforts. Dr. Stiber replied that it is probably too early to identify a specific example, but the goal is to effect a culture change about how models are developed and used. Dr. Bostrom asked how CREM defines "model" and if CREM is distinguishing between model types, and Dr. Stiber replied that "model" is define broadly and could include mental models and that the Knowledge Base currently includes only computer models.

Independent Expert Review of EPA's Research Programs

Dale Pahl's (EPA/NERL) presentation covered three topics: (1) communicating how environmental research contributes to outcomes, (2) the growing emphasis on evaluation, and (3) independent expert review of EPA's research programs.

EPA follows a systematic approach to organize, integrate, synthesize, and evaluate research that informs environmental decisions. EPA develops an integrated risk assessment framework to synthesize available information about a specific environmental problem and identifies knowledge gaps, research questions, and uncertainties. EPA also creates a research portfolio needed to develop knowledge and evaluate evidence related to the gaps, questions, and uncertainties. The Agency monitors progress in implementing the research portfolio, and synthesizes and evaluates advances in research knowledge.

EPA develops MYPs to describe how applied and basic research help achieve outcomes, and the distinction between these two types of research typically is not clear cut. EPA's research programs create the scientific foundation for environmental decisions by specific clients (setting or revising standards; designing or implementing compliance, restoration, or control strategies; and developing environmental indicators that measure progress and accountability for achieving long-term outcomes). The link between research, environmental decisions by specific clients, and outcomes distinguishes EPA's research from that of other federal research programs.

Dr. Pahl used a diagram to illustrate how ORD research enables clients to make environmental decisions and achieve desired outcomes. ORD involves clients in research program design, planning, and accountability. ORD also aligns the research outputs with the clients' needs. The clients react to and apply the research outputs to achieve outcomes. The National Research Council (NRC) Committee on Research and Peer Review recommended that EPA substantially increase efforts to disseminate ORD's products and ongoing projects, to explain their significance, and to assist others inside and outside the Agency in applying them. There also is a need to transfer research knowledge to EPA Regions, state and tribal partners, the public, and the regulated community.

ORD transfers knowledge to the states, Regions, and the regulated community. There is a strong need for transfer as well as a need to ensure that the research is being used appropriately. The role of the state environmental agencies in implementing EPA regulations and monitoring environmental conditions is growing during an era of declining resources. As expenditures to comply with environmental regulations approach $180 billion per year, there is a critical need for scientific knowledge and tools that increase the effectiveness of environmental decisions. Performance goals are selected to represent advances in scientific knowledge (or reduction in uncertainty) that respond to key research questions. Across the scope and lifetime of this research program, a small number of performance goals define a critical path linking research, environmental decisions by specific clients, and short-term outcomes. When accompanied by information about the baseline of scientific knowledge against which progress is measured, independent expert panels are able to evaluate progress to achieve performance goals and outcomes.

By 1997, Congress and the General Accounting Office (GAO) recognized that federal program managers face significant challenges in managing research to achieve outcomes. In recent reports, the NRC recommended that federal agencies: (1) describe how an investment in basic research enables an agency to achieve its mission and strategic goals; (2) manage applied research to achieve practical outcomes; and (3) evaluate federal research using independent, expert, evaluation panels that include client input. The systematic use of independent expert judgment is appropriate when it is difficult to measure program progress or outputs needed to achieve outcomes, it is difficult to determine when outcomes can be attributed to the program, and agency programs involve research, regulation, or external partners such as state agencies. Given these criteria, independent expert review is appropriate for EPA's research programs.

Jennifer Robbins (EPA/ORD) described OMB's PART. Agencies must submit evidence to assess a research program's design and purpose (Section I: 20 percent of the total score), strategic planning (Section II: 10 percent of the total score), management (Section III: 20 percent of the total score), and results (Section IV: 50 percent of the total score). Federal research programs submit results from independent expert evaluations of adequate scope to verify compliance with the Office of Science and Technology Policy (OSTP)/OMB Research & Development Investment Criteria.

According to OMB guidance, outcomes must be external to the research program, and relevant to, and important for, the intended client, the agency, and the public. Performance goals and measures describe the most important aspects of the program's mission and priorities, and include clear links to a program outcome. The performance goals and measures reflect the program's progress toward the outcome (and indicate how well the program is performing). In addition, they include a baseline against which performance is measured and plans for verification (e.g., by an independent panel or with data of known quality). Federal R&D programs must address the core set of PART questions (common to all federal programs) as well as supplemental questions specific to research programs. Ms. Robbins noted that the federal budget and agency Congressional budget justifications highlight PART findings and recommendations. This year, OMB emphasizes in its PART guidance the importance of submitting results from independent expert evaluations of adequate scope to address the OSTP/OMB Research & Development Investment Criteria. These results inform agency and OMB decisions about the value of investments in research programs.

The Research & Development Investment Criteria require verification of a program's relevance, performance, and quality. R&D programs must be able to articulate why their investment is important, relevant, and appropriate. Programs must have well-conceived plans that identify program goals and priorities, and identify linkages to national and client needs and to the agency mission. Program relevance must be assessed prospectively and retrospectively through expert review. R&D programs must have the plans and management processes in place to monitor and document how well their

investment is performing, and how funds will be allotted to ensure quality R&D. Program managers must define appropriate outcome measures and milestones that can be used to track progress towards goals, and assess whether funding should be enhanced or redirected. Programs allocating funds through means other than a competitive procurement-based process must justify these exceptions and document how quality is maintained. Program quality must be assessed prospectively and retrospectively through expert review.

With regard to relevance, the purpose of the research program must be clear; the program must respond to a specific existing environmental problem relevant to EPA's mission, national priorities, and primary clients; and it must demonstrate an outcomes-oriented design. In addition, the program's benefits should be unique or extend beyond similar government or private sector contributions, and program coordination should be effective in minimizing or avoiding duplication. There should be a small number of performance goals focused on scientific progress to answer key questions (or reduce uncertainty) linked to the program's outcomes.

In assessing the quality of a research program, merit-based procedures are used to ensure the program's scientific quality and leadership. The program should compare favorably to similar programs (e.g., in other agencies). Merit-based competition and independent review by subject matter experts should be used to allocate funds extramurally and to ensure relevance to the program's objectives. Appropriate merit-based procedures should be used when allocating funds non-competitively.

For evaluating performance, the program should identify relevant inputs (e.g., stakeholder guidance, human capital, research infrastructure, information technology) to ensure that implementation actually results in the intended research activities and outputs. The program should demonstrate the ability to manage in a manner that produces identifiable results. In addition, research progress and priorities should be assessed periodically as new scientific knowledge is developed. The program should demonstrate that it meets performance goals, obtains client feedback, and is making progress to achieve the desired outcomes.

Dr. Pahl identified some of the lessons learned with regard to evaluation of the airborne PM research program. Recent NRC experience demonstrates that independent expert panels are able to evaluate research programs and contributions to environmental decisions and outcomes. The NRC panel recently completed its fourth evaluation in 5 years for the 13-year PM research plan. The panel found that progress to date on several of the research topics is encouraging and demonstrates that key uncertainties can be quickly addressed with targeted research initiatives. The NRC panel indicated that "much has been learned in the last 5 years, and the evidence gained already is being used by decision-makers." Dr. Pahl commented that 5 years is a good time period for the qualitative measurement of a program's success.

A framework for integrating research that illustrated priority research questions for airborne PM was presented. The answers to these questions must be understood to achieve the desired outcomes. This framework is essential to contributing to Agency decisions that relate to public health. Dr. Pahl presented a diagram that illustrated how the research outputs are transferred to achieve short-term outcomes.

In closing, Dr. Pahl identified the following objectives for expert peer review of EPA's research:

- ✧ Verification of compliance with R & D Investment Criteria at the program level.
- ✧ Application of an evaluation model that responds to PART objectives and focuses on program improvement and accountability.
- ✧ Scope of panel expertise sufficient to address complexity of integrated research, environmental decisions, and evaluation objectives.

- ✧ Selection of a review interval that is sufficient for development and publication of new research knowledge and for qualitative assessment of research progress.

- ✧ Documentation of panel evaluation and EPA response to each panel recommendation.

- ✧ Panel procedures are consistent with recent OMB guidance on peer review.

Virginia Houk (EPA/NHEERL) described an interactive model for expert panel evaluation. This model combines presentations with poster sessions, which allows presentation of finer scientific detail as well as interaction between reviewers and scientists. The focus is to evaluate the quality of the science and the impact of the science on meeting the Agency's needs and problems. Dr. Hal Zenick (EPA/NHEERL) commented that it has taken 5-6 years for the Agency to develop this model. After four evaluations, EPA moved to this interactive model because it was obvious that the presentations were not adequate to address impacts and outcomes. Primary and secondary reviewers are assigned to each theme. There is 20 minutes of background presentation, a poster discussion session, and then 20-30 minutes of panel discussion to determine if the program is focusing on the right science and doing it correctly. Before departing, the panel has developed a draft report. Dr. Zenick noted that the posters put the research in the context of the problem being addressed, how the science will be used to address the problem, and the future directions for the science.

Dr. Johnson said that the scores received by EPA programs have not been reflective of the quality of the Agency's research. To improve, EPA will need to do a better job of communicating how the research is helping the Agency to achieve its goals. Dr. Acosta asked if budget decisions are based on the evaluation scores, and if so, why was the STAR Program budget cut. Dr. Pahl replied that the Executive Branch is creating a function to evaluate the effectiveness of government programs and budget decision-making will be based on both the results of PART and achievement of Government Performance Review Act (GPRA) goals and measures. The evaluation function is endorsed by Congress but they want a stronger connection between PART and GPRA. Dr. Reiter pointed out that STAR is a program on one level, but in the context of PART, STAR's components would be evaluated as part of the overall research program of a specific area. STAR is just a mechanism for funding the extramural research.

Dr. Henderson suggested that the BOSC address the PART review areas when conducting the MYP reviews. Dr. Johnson agreed and suggested that the BOSC follow the PART model. Dr. Windom said that PART was not in place when the MYPs were developed so it may be difficult to review them with those criteria. Dr. Johnson noted, however, that the programs will be evaluated using PART so the BOSC review should use PART as well. Dr. Daston pointed out that the PART review seemed to focus on outcomes for the public good. Has ORD developed any measures for positive outcomes for public good? Dr. Pahl replied that ORD has not developed a systematic way to measure outcomes for public good. Dr. Sayler said that he is on the SAB subcommittee that is reviewing the Drinking Water Quality MYP. He commented that the layout for the Pollution Prevention MYP was much better than that for the Drinking Water MYP. Will the MYPs be more consistent in the future? Dr. Pahl responded that ORD is working to improve the MYPs and make them more consistent. The key issue is the shift from a collection of research activities to a plan that outlines the research in the context of the program's contributions to achieving desired outcomes. Dr. Harding asked for more information on PART, and Ms. Robbins agreed to provide the PART questions and the R&D Investment Criteria to the BOSC. Dr. Pahl said that this and other information pertaining to PART is available on the OMB Web Site (http://www.omb.gov/part). Dr. Bostrom mentioned that CDC is conducting a program evaluation workshop and suggested that EPA may want to be involved in that workshop. Dr. Lambert said that NIH evaluates its research programs every 4-5 years; perhaps EPA could gain some wisdom from these NIH reviews.

Ms. Kowalski commented that the BOSC could use the NHEERL model for review of the Endocrine Disruptors and Global Change programs. Dr. Johnson agreed that these MYP reviews will be converted to program reviews. He said that the expertise for the two subcommittees may need to change as a result of this conversion.

Subcommittee Reports

Dr. Windom reported that the Mercury Subcommittee has made little progress. The charge questions were made consistent at the last BOSC meeting (see page 26 of the January 2004 meeting summary). The Subcommittee members reviewed the list of SAB consultants to identify potential Subcommittee members. Dr. Cindy Gilmore is interested in participating in the review, and her expertise, coupled with that of Dr. Windom, covers fate and transport. Dr. Henderson covers ecotoxicology and Dr. Lambert, if he agrees to serve on the Subcommittee, could cover human exposure. Dr. Lambert volunteered to serve on the Mercury Subcommittee to fill this need. Ms. Kowalski pointed out that it might be helpful to add someone with expertise in mercury control technology. She has the names of a few individuals with such expertise and will share them with the Subcommittee members. Neurotoxicity is another area of expertise that might be needed on the Subcommittee. Dr. Lambert indicated that he should be able to cover neurotoxicity. He also mentioned that his Center has funding from EPA and the Center does some research on mercury. Mr. Kowalski agreed to determine if this would be a conflict of interest. Dr. Johnson asked the Subcommittee to move forward with the potential members and have the Subcommittee ready to begin the review by September. Dr. Windom said that he would like to start the review before September. He plans to divide the questions among the Subcommittee members and ask them to prepare a draft. The Subcommittee then will meet to discuss the draft and develop a collective response. The Subcommittee members may want input from the program staff at that stage. Dr. Windom indicated that he would like to have a draft to present to the Executive Committee at the September meeting. He agreed to work with Ms. Kowalski to staff the Subcommittee as soon as possible. Ms. Kowalski mentioned that the Subcommittee could hold a conference call prior to the face-to-face meeting to discuss the draft. Dr. Windom said that he would like the Subcommittee to include himself, Dr. Johnson, Dr. Henderson, Dr. Lambert, Dr. Gilmore, and someone with control technology expertise. Dr. Johnson suggested that he and Dr. Windom discuss the names with Ms. Kowalski before the individuals are invited to serve on the Subcommittee. Dr. Giesy asked if these individuals become members of the BOSC, and Dr. Johnson replied that they do not become members of the Executive Committee, just members of the subcommittees.

Dr. Daston reported that there is a need for the Computational Toxicology Subcommittee to be formed quickly to provide input on the proposals being received and reviewed by ORD. The Subcommittee could provide useful external review of the proposals. However, if the Subcommittee cannot be staffed in the next few weeks, the Subcommittee may not be able to support this need. The Subcommittee currently includes Drs. Daston, Clark, and Clegg. Ms. Kowalski has been helping to identify individuals to cover three areas of expertise. Dr. Daston said that experts to cover two of the three areas have been identified; a third expert is needed to cover proteomics. Ms. Kowalski commented that a number of the individuals who are interested in participating in the review have conflicts of interest that prevent them from doing so. Dr. Daston asked if it would be possible to staff the Subcommittee in time to support the proposal review. Ms. Kowalski responded that it may be 6-8 weeks before the Subcommittee members are approved. The proposal review must be completed in July; therefore, the Subcommittee may be able to support this effort. Dr. Sayler said that he could recommend some experts in proteomics; he agreed to send their names to Dr. Daston. Dr. Johnson asked Dr. Sayler to serve on the Subcommittee if an appropriate expert could not be identified within the next week or so.

Dr. Harding said that the Endocrine Subcommittee will need an additional member because Dr. Acosta is leaving the BOSC. A number of experts have been identified for the Subcommittee, including Dr. Giesy,

who is willing to serve. The names already have been submitted for approval. Dr. Johnson asked if additional expertise will be needed for a program review (as opposed to an MYP review). Given the larger scope, Dr. Harding requested a Vice Chair to assist with the Subcommittee. Dr. Johnson asked Dr. Giesy to serve as the Vice Chair of the Subcommittee to assist Dr. Harding, and Dr. Giesy agreed. Dr. Giesy mentioned that he has received a major grant on endocrine disruptors from EPA; it was included on the disclosure form he completed. Dr. Giesy asked if that disqualified him from serving on the Subcommittee. Ms. Kowalski agreed to determine if this would be a conflict. Dr. Johnson asked Dr. Giesy to serve as the Vice Chair, pending the determination regarding his potential conflict of interest.

Dr. Harding asked if the BOSC could be provided some guidance on how to use PART. Dr. Johnson said that each member will be sent information on PART. If after reviewing that information additional guidance is needed, he will ask EPA to provide that guidance. Dr. Harding asked if the charge for the Subcommittee review should be revised to reflect the conversion to a program review. Dr. Johnson suggested that the Endocrine Disruptors Subcommittee work with the Global Change Subcommittee to develop a generic charge for the program reviews. Dr. Dorward-King agreed but suggested that the two subcommittees develop specific questions for the program as well. Dr. Johnson agreed with this suggestion.

Dr. Dorward-King reported that the Global Change Subcommittee has not made much progress. Three experts have been invited to join the Subcommittee; two declined and one accepted. A social scientist also has been identified whose expertise is needed. Given Dr. Schnoor's departure from the BOSC, Dr. Dorward-King thought additional expertise is needed. Expertise in atmospheric fate and transport, climate modeling, ecosystems and fate, and aquatic systems are still needed. She suggested that a conference call be scheduled following receipt and review of the information on PART. Dr. Johnson asked Dr. Duke if he would be interested in serving on this Subcommitee; Dr. Duke replied that he could suggest a number of qualified experts to Dr. Dorward-King. Dr. Johnson asked him and the other BOSC members to submit any suggestions they may have to Dr. Dorward-King or Ms. Kowalski.

Dr. Johnson said that he would like to develop a timeline for the subcommittee reviews and take a look at the subcommittee assignments and distribution of the workload. He suggested developing a charge for the Endocrine Disruptors and Global Change Subcommittees that incorporates PART. It was agreed that the subcommittees will develop specific questions to accompany the generic charge questions. The two Chairs—Drs. Harding and Dorward-King will each select an individual on their respective Subcommittees to work together with them to review the PART and develop a revised charge. Dr. Harding agreed to convene the conference call to develop the revised charge. The following BOSC members agreed to participate in the call: Drs. Harding, Dorward-King, Bostrom, Giesy, and Johnson. Dr. Stiber and Ms. Kowalski also will participate in that conference call. These five BOSC members will modify the charge and distribute it to the Executive Committee for approval. Additional specific questions will be developed by each subcommittee. Dr. Dorward-King said that she would like to have time for the members to review the PART information before the conference call. Dr. Johnson agreed and asked them to modify the charge within 30 days of receiving the materials on PART. If further guidance on PART is needed, Dr. Johnson will ask EPA for assistance. Dr. Bostrom suggested including someone with evaluation expertise on these subcommittees and she and Dr. Harding agreed to provide the names of several experts to Staci Gatica (EPA/OSP) or Ms. Kowalski.

Dr. Sayler asked if the consultants who become Subcommittee members are Special Government Employees (SGEs). Ms. Kowalski responded that they become SGEs for a specific time period. Dr. Johnson asked Ms. Kowalski about the deadline for the members' homework sheets; she replied that there is no specific date for submission, but the sooner they are submitted to EPA, the sooner the members' are reimbursed for their time. She asked the members to submit the paperwork for their hotel bills before

departing the meeting. She suggested that they submit their homework sheets for the past 3 months at each BOSC meeting. That might be the most effective way to track their homework hours.

Dr. Schnoor indicated that ORD had responded to the Laboratory and Center reviews prepared by the BOSC. He will provide them to Dr. Johnson, and prepare a brief letter acknowledging the receipt of ORD's responses for the record. The responses will be distributed to the BOSC at the September meeting and Dr. Johnson can determine if the Board should take any additional action. Dr. Schnoor also agreed to prepare the biotechnology program letter report. He will prepare a draft and send it to Drs. Daston, Henderson, Clark, and Johnson. If Dr. Schnoor cannot finalize the letter report by May 31, 2004, Dr. Daston will be responsible for managing its completion. Dr. Sayler indicated that he would be interested in serving on this Subcommittee; Dr. Johnson agreed and asked Dr. Schnoor to include Dr. Sayler in the distribution of the draft letter report.

Dr. Johnson prepared a table that identified the subcommittee assignments and the approximate timeframe for the subcommittee activities (see Table 1). He estimated that each MYP will take about 9 months and the program reviews will take about 12 months. The risk assessment workshop will take about 12 months, and the biotechnology program letter review should be completed in 1 month. The work of the Computational Toxicology Subcommittee will be ongoing and this could become a standing Subcommittee. Dr. Johnson hoped that the biotechnology program letter report would be completed, the Computational Toxicology Subcommittee fully staffed, and the three vacant BOSC positions filled by the September meeting. Dr. Johnson did not think the BOSC should attempt to review the National Coastal Condition Report until after some of the current activities have been completed. Dr. Farland commented that the coastal health report will be released in November 2004; therefore, if the BOSC is to have an impact on that report, the Board will have to review it in the next 4 months. Dr. Johnson suggested that Dr. Windom may be able to lead an effort to review the National Coastal Condition Report.

At 1:00 p.m., Ms. Kowalski asked if there was anyone from the public who would like to make any comments. No one indicated that they would like to make a public comment.

Discussion of Interagency Relationships One-Pager

Dr. Lambert stressed the importance of EPA working with other agencies, particularly in these times of budgetary constraints. He cited the Report on the Environment as an example for the need for better collaboration with other agencies. That report indicated that although there are many environmental data collected by 22 different agencies around the country, the data are not compatible. The White House is very supportive of more effective collaboration among federal agencies. Congress has asked that CDC track disease related to the environment. EPA was not included in that discussion and the Agency needs to be involved if the tracking system is to be successful. The BOSC could sponsor a workshop to identify opportunities to improve collaboration. Dr. Farland said the EPA is very committed to interagency collaboration. He asked if there is something the BOSC can do to raise the visibility of the collaboration that is ongoing within ORD. It would be helpful if the BOSC could identify areas where interaction is high and areas where interaction could be enhanced. The BOSC could do some telephone interviews, collect information, and prepare a letter report. This may be more useful to ORD than a workshop.

Dr. Bostrom pointed out that several groups already have examined interagency collaboration, including FIXIT and CENR. She asked if EPA has done an assessment of its Memoranda of Understanding (MOUs) and other agreements to demonstrate collaboration. Dr. Farland replied that no assessment has been done, but there are many informal collaborations that are not tracked. There is no source of information on these informal collaborations. Dr. Johnson suggested focusing on collaboration for one or two areas. Perhaps EPA could provide presentations of their collaborative efforts in these one or two areas and the BOSC could offer suggestions for improvement. Dr. Lambert was

Table 1. BOSC Subcommittee Assignments and Timeline

Months Out ➜	10.5	3 + Q	14	14	12	1	4	2	C					
BOSC Members	**Subcommittees**													
	Hg	Comp Tox	EDC	Global Change	Risk Assmt Wkshp	Biotech Ltr	Coastal Con-dition	Nomin-ation	Other	Inter-agency	Homeland Security	Nanotech	EMAP	Decision-Making
Schnoor						✓C								
Johnson	✓					✓		✓C						
Acosta			✓											
Bostrom				✓										
Clark		✓				✓	✓C		RCRA MYP		✓C			
Clegg		✓												
Daston		✓C			✓	✓								
Dorward-King				✓C										
Duke				✓-	✓		✓							
Giesy			✓?		✓									
Harding			✓C					✓			✓			
Henderson	✓				✓C	✓		✓	PM MYP					
Sayler		✓-				✓			DW MYP					
Stewart			✓					✓			✓			
Windom	✓C						✓	✓						
Lambert	✓													

Q = Quarterly
✓C = Subcommittee Chair
✓- = To provide names of qualified individuals, but will serve if no one is recruited.
✓? = Pending determination of conflict of interest.

concerned that the two programs selected may not be representative of the other programs; they may represent the best cases of interaction. Dr. Farland said that he did not believe that this issue rises to the level of importance of the other topics being addressed by the BOSC. Dr. Clark commented that EPA appears to actively seek collaboration, but few agencies approach EPA to collaborate with them. What can the BOSC do to encourage other agencies to actively seek collaboration/interaction with EPA. Dr. Johnson suggested focusing on a case study—perhaps homeland security. Dr. Bostrom stated that climate change is an area in which collaboration is critical. Dr. Farland suggested including interagency collaboration as a point in each of the MYP and program reviews. It can be highlighted in the specific questions prepared by the subcommittees. Dr. Farland commented that global change would probably be the best benchmark for interagency collaboration. He noted that the National Coastal Condition Report and computational toxicology would show different aspects of collaboration. Dr. Johnson suggested that the BOSC look at collaboration in the global change, homeland security, and National Coastal Condition Report reviews. Dr. Daston asked what the BOSC would be trying to accomplish by reviewing interagency collaboration. He did not think this was a problem within ORD. Dr. Johnson replied that it might be helpful to ORD if the BOSC looks at collaboration on these three topics.

Discussion of Homeland Security One-Pager

Dr. Farland stated that the BOSC was first briefed on the activities of the National Homeland Security Research Center (NHSRC) in January 2003, shortly after the Center was organized. The BOSC was updated on the Center's accomplishments in the areas of safe buildings, water security, rapid risk assessment, and the Environment Technology Verification (ETV) program in September 2003. At the September meeting, it was suggested that the BOSC might continue to assist the NHSRC by reviewing other products of the Center. Dr. Farland indicated that the BOSC could review NHSRC management approaches and the newly formed SAB Committee on Homeland Security could review synthesis products (guidance, models, methods). This will focus the two groups on different types of activities.

By fall 2004 there will be two NHSRC products ready for review by the BOSC. These are the NHSRC Communication Plan and the NHSRC Long-Term Management Plan. The Communication Plan is just being developed and is designed to lay out to what audiences the key products will be delivered. A draft will be available this summer and it could benefit from a BOSC review late summer or early fall.

Dr. Farland reminded the BOSC members that the NHSRC was designed to sunset after 3 years of operation. However, there is rather strong sentiment within EPA and among external stakeholders to continue the work of the NHSRC beyond its initial 3-year charter. The Agency will determine the future of the Center in the next several months as the FY06 budget proposal is developed. The NHSRC has submitted several options to Dr. Gilman and will be developing more detailed management proposals for the most desirable options. The Center could benefit from the BOSC taking a scientific look at the structure and priorities for research, as well as the organizational approach options, in the fall or early winter. Dr. Farland stated that the BOSC may want to consider review of the Long-Term Management Plan in the fall (considered a higher priority by ORD), followed by a review of the Communication Plan.

Dr. Henderson expressed her support for continuation of the NHSRC. Dr. Farland replied that, by fall, the Agency has to decide whether to maintain the Center as it is (a virtual center), establish a real center, or disperse the activities of the NHSRC back into the other ORD Laboratories and Centers. Dr. Stewart asked if EPA has assessed the effectiveness of the NHSRC to date. Dr. Farland responded that there has been some assessment. Dr. Lambert said that he did not think the SAB planned to look at either of these plans, so he thought it would be appropriate for the BOSC to review them. Dr. Johnson outlined one option for reviewing the Long-Term Management Strategy. If it is available before the September meeting, it could be distributed to the Subcommittee for review prior to the meeting, a detailed briefing could be provided by ORD at the meeting (along with a question and answer session), and a draft letter report could be prepared at the meeting. Dr. Sayler asked if anyone is reviewing the Center's products. Dr. Farland replied that the SAB Committee will probably

be reviewing NHSRC products in 2005. Dr. Clark indicated that he is very interested in reviewing the Long-Term Management Plan. Dr. Farland asked Ms. Kowalski to check with Tim Oppelt about the possibility of distributing the draft plan to the BOSC prior to the September meeting and she agreed to contact him. Dr. Johnson asked Dr. Farland to develop a draft charge on the review of the Long-Term Management Plan and he agreed to do so. Dr. Giesy disclosed that his institution just received a large homeland security grant, but it is not funded by EPA so it should not pose a conflict of interest.

Interagency Relationships and Risk Assessment Workshop Discussion (Continued)

Dr. Johnson returned to the topic of interagency collaboration/interaction. He asked if the BOSC members wanted to include it as part of the other reviews rather than making it an independent activity. He pointed out that PART already includes interagency interaction. Dr. Farland suggested that the BOSC may want to develop a letter report on interagency collaboration, looking at it from a cross-cutting perspective.

Dr. Henderson distributed a revised draft of the risk assessment workshop one-pager that incorporated the changes suggested during yesterday's discussion. She noted that the workshop focus has been narrowed to three topics. Dr. Johnson commented that with three topics, a 1½-day workshop will allow us to devote ½-day to each topic. It will include presentations on current practices by EPA and time for stakeholders to discuss use and options for improvement. Dr. Sayler asked how the workshop will be funded. Dr. Farland responded that the BOSC will submit a request for support for a workshop to Dr. Gilman, who would decide whether to fund the workshop. Dr. Henderson asked if a workshop would be responsive to Dr. Gilman's request and Dr. Farland replied in the affirmative, but indicated that Dr. Gilman would probably need more information. Dr. Henderson asked for EPA's assistance in organizing the agenda and identifying presenters and invitees for the workshop. Dr. Johnson commented that Drs. Bostrom and Harding may be able to provide some useful input as well. Dr. Giesy asked if this would be a stand-alone workshop or conducted in combination with a larger meeting. What will be the deliverable? What is the ultimate goal of the workshop? Dr. Henderson replied that the purpose of the workshop is to respond to Dr. Gilman's request to publicize EPA's risk assessment paper and to open a dialogue with the stakeholders on this topic in an effort to improve risk assessment practices within the Agency. Dr. Farland pointed out that it is not a review of the document.

Dr. Daston thought harmonization of risk assessment practices reflected the spirit of the EPA document. The idea is to help users select the best practices from the options available. He suggested that the workshop focus on the best practices in each of the three topics. Experts with differing view points could make presentations so the participants could gain an understanding of the boundaries of the opinions. Dr. Giesy asked if the deliverable would be a report. Dr. Henderson said that she thought it would be a summary of the workshop—a proceedings document similar to that resulting from the communications workshop. Dr. Sayler expressed some concern about engaging stakeholders in a single workshop held in Washington, DC. Dr. Johnson suggested using videoconferencing or Webcasting to encourage stakeholders to participate. Dr. Bostrom stated that the BOSC Executive Committee provided input for the communications workshop and EPA provided input on who to invite to speak and participate.

Dr. Henderson said that she will revise the risk assessment workshop one-pager based on this discussion and distribute it to the Subcommittee members. She also asked that EPA's risk assessment report be distributed to the BOSC members.

SAB Activities

Dr. Lambert reported that the SAB will meet on June 3, 2004, in Washington, DC, to discuss the Board's advisory on the FY05 science and research budgets, the OMB Peer Review Guidelines, and candidate projects for SAB action during FY05. The SAB also will consider the approval of two SAB Panel reports on Agency research strategies and discuss and plan for the remaining Board meetings for 2004. The Clean Air Scientific

Advisory Committee (CASAC) Panel will meet July 20-21, 2004, in RTP, NC, to review the fourth draft of the EPA Air Quality Criteria Document for PM. The SAB also plans to review the National Air Monitoring Strategy in August 2004. The Board will review the analytical blue print for Section 812 of the Clean Air Act Amendments in September 2004.

Dr. Lambert pointed out that Dr. Matanoski's testimony on EPA's FY05 Science and Research Budget Request was provided in the meeting notebook. He said that the Board would like to be involved earlier in the budget development process, and provide a longer-term analysis of the budget. He mentioned that the SAB recently reviewed the Report on the Environment. He thought the Board provided some excellent comments on that report and recommended that this report be published on a periodic basis.

In May, the SAB will complete its review of the EPA Drinking Water MYP. Also in May, the Board will provide a consultation on the valuation of mortality in risk reduction. In late June, the SAB will review the methodology for identifying ecologically significant areas in EPA Region 5 (vulnerability assessment integration tools). In July, the Board will review the risk assessment staff paper, and the Contaminated Sites and RCRA MYP (July 7-9). In August, the SAB will meet to discuss illegal competitive advantage, and in September, the Board will review the Multimedia, Multipathway, and Multireceptor Risk Assessment (3MRA) Modeling System. The Formaldehyde Review Panel and the Metals Assessment Framework Review Panel will meet in September. In October, the SAB will finalize its review of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) and Supplement. The Perfluorooctanoic Acid Human Health Risk Assessment Review Panel (PFOA Review Panel) will meet in November.

Dr. Farland asked if this list of SAB activities is on the SAB Web Site. Dr. Lambert replied that he thought it was posted. It was suggested that the SAB Web Site and the BOSC Web site be linked.

Future BOSC Business

Dr. Johnson asked if there was interest in reviewing the coastal health report. Dr. Clark said that he would be interested in that review. Dr. Schnoor asked if the report is currently available, and Dr. Farland replied that it is posted on the Web. Dr. Johnson said the BOSC will need a draft charge for reviewing the National Coastal Condition Report. Dr. Farland said that he would prepare a draft charge and distribute it to the BOSC members via e-mail. Dr. Johnson asked if the Communications Subcommittee should be continued. If not, how should its activities be integrated into the other subcommittees?

Dr. Johnson identified the following potential topics for the September meeting agenda: (1) NHSRC Long-Term Management Plan and Communication Plan, (2) Risk Assessment Workshop Proposal,
(3) Subcommittee Reports, (4) National Coastal Condition Report, (5) Biotechnology Letter Report,
(6) Nanotechnology Briefing, (7) EMAP Evolution, and (8) AA/ORD Briefing. Dr. Sayler thought the timing of the nanotechnology briefing was important; he cautioned EPA to stay ahead of the curve on this issue. Dr. Farland stated that if the NHSRC reports are not ready for review, EPA will do the nanotechnology briefing. Dr. Johnson said that he hopes to set aside about 1½ hours at the September meeting to allow the subcommittees to meet.

Dr. Bostrom suggested that the Communications Subcommittee be converted to a standing Subcommittee and its membership expanded. Dr. Johnson suggested that perhaps communications should become a point of consideration by all subcommittees, just as the Board is planning to do with interagency collaboration. Dr. Johnson agreed to discuss this further at the September meeting. When there was no additional discussion, Dr. Johnson asked for a motion to adjourn the meeting. Dr. Henderson moved to adjourn the meeting, and Dr. Stewart seconded the motion. The meeting was adjourned at 2:25 p.m.

Action Items

- ✧ BOSC members will send via e-mail nominations for the BOSC Executive Committee with expertise in behavioral science and air pollution to Lori Kowalski. Curricula vitae (CV) should be attached to the nominations.

- ✧ Dr. Farland and Ms. Kowalski will investigate the possibility of including the BOSC members on a listserv similar to that used to keep SAB members informed of EPA activities and announcements.

- ✧ Dr. Schnoor asked the Subcommittee Chairs to develop and submit their lists of self-study questions to Ms. Kowalski quickly, as well as requests for materials to review and a list of individuals to be interviewed.

- ✧ Dr. Henderson agreed to chair the BOSC Subcommittee on Risk Assessment. Drs. Clifford and Daston volunteered to serve on the Subcommittee.

- ✧ Dr. Johnson suggested that the next steps for the Biotechnology Program review be discussed in a conference call. Drs. Schnoor, Johnson, Daston, and Clark have agreed to draft this letter for review by the entire Executive Committee. Dr. Johnson also asked other members who want to participate in drafting the letter report to notify him.

- ✧ Dr. Johnson asked the BOSC members to notify him of their availability for the January and May 2005 meetings. He suggested the week of January 16 or 23 and the week of May 15. Dr. Johnson also asked for suggestions from the BOSC members regarding the venues for the January and May meetings.

- ✧ Dr. Clark agreed to serve as the BOSC liaison for the SAB review of the Contaminated Sites and RCRA MYP.

- ✧ Dr. Henderson volunteered to serve as the BOSC liaison for the SAB review of the PM MYP.

- ✧ Dr. Farland agreed to update the BOSC on the status of the NPDs at the September meeting.

- ✧ Dr. Farland agreed to send copies of the National Coastal Condition Report to the BOSC members. He noted that the report is available for download from the Web at http://www.epa.gov/owow/oceans/nccr/downloads.html.

- ✧ Dr. Stiber agreed to provide more information on the symposium on meta-modeling to be held at the Wilson Center on May 24 to the BOSC members. He provided this information to the members prior to the conclusion of the meeting.

- ✧ Ms. Robbins agreed to provide more information on the PART, including the frequently asked questions, the R&D Investment Criteria, and how to use the tool, to the BOSC. This and other information pertaining to PART is available on the OMB Web Site (http://www.omb.gov/part). Dr. Johnson will ask EPA to provide additional guidance to the subcommittees if it is necessary.

- ✧ Dr. Lambert agreed to serve on the Mercury Subcommittee. Ms. Kowalski will provide the names of several mercury control technology experts for consideration by the Subcommittee.

- ✧ Dr. Sayler will provide the names of some experts in proteomics to Dr. Daston for consideration by the Computational Toxicology Subcommittee. Dr. Sayler agreed to serve on the Subcommittee if an appropriate expert cannot be identified quickly.

- Dr. Giesy agreed to serve as the Vice Chair of the Endocrine Disruptors Subcommittee to assist Dr. Harding. Ms. Kowalski will determine if Dr. Giesy's grant on endocrine disruptors from EPA constitutes a conflict on interest.

- Dr. Johnson asked the Endocrine Disruptors Subcommittee to work with the Global Change Subcommittee to review PART and develop a generic charge for the program reviews. Dr. Harding will convene a conference call with Drs. Dorward-King, Bostrom, Giesy, and Johnson to discuss the charge. Dr. Stiber and Ms. Kowalski also will participate in that conference call. The modified charge will be distributed to the Executive Committee for approval.

- Dr. Schnoor will provide the ORD responses to the Laboratory and Center reviews to Dr. Johnson, and prepare a brief letter acknowledging their receipt for the record. The responses will be distributed to the BOSC at the September meeting.

- Dr. Schnoor agreed to prepare the biotechnology program letter report. He will prepare a draft and send it to Drs. Daston, Henderson, Clark, and Johnson. If Dr. Schnoor cannot finalize the letter report by May 31, 2004, Dr. Daston will be responsible for managing its completion. Dr. Sayler indicated that he would be interested in serving on this Subcommittee; Dr. Johnson asked Dr. Schnoor to include Dr. Sayler in the distribution of the draft letter report.

- Ms. Kowalski will check with Tim Oppelt about the possibility of distributing the draft NHSRC Long-Term Management Plan and Communication Plan to the BOSC prior to the September meeting.
- Dr. Farland agreed to develop a draft charge on the review of the NHSRC Long-Term Management Plan.

- Dr. Henderson will revise the risk assessment workshop one-pager based on the input from the Board and distribute it to the Subcommittee members. She asked that EPA's risk assessment report be distributed to the BOSC members.

- One participant suggested that the SAB Web Site and the BOSC Web site be linked.

- Dr. Farland will prepare a draft charge for review of the National Coastal Conditions Report and distribute it to the BOSC members via e-mail.

- Dr. Johnson agreed to discuss the issue of converting the Communications Subcommittee to a standing Subcommittee or options for incorporating communication into all reviews at the September meeting.

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