

**GLOBAL CONNECTIONS AMONG EARTH SCIENCES, HEALTH, AND POLICY:  
ANNUAL SYMPOSIUM OF THE BOARD ON INTERNATIONAL SCIENTIFIC ORGANIZATIONS**

SEPTEMBER 25, 2008



On September 25, 2008 more than 60 participants gathered at the Keck Center of The National Academies in Washington, DC for the day-long symposium *Global Connections among Earth Sciences, Health, and Policy*. The event brought together interested scientists, policy makers and students to explore synergies among these fields and their implications.

**MORNING SESSIONS**

The opening session of the symposium featured remarks by **José Centeno**, Armed Forces Institute of Pathology, and **Diana Wall**, University of Colorado, who introduced many of the issues that would be considered throughout the day. Dr. Centeno highlighted a few recent initiatives that have addressed issues at the intersection of the earth sciences and health, including the formation of the International Medical Geology Association (2006), the release of the National Research Council report *Earth Materials and Health: Research Priorities for Earth Science and Public Health* (2007) and the United Nations designation of the International Year of Planet Earth (2007-2008), which includes Earth and Health as one of its themes. He also raised several key questions for participants to reflect on during the meeting, including: How can earth and health scientists make their capabilities known among the two research areas? What types of studies can be done jointly? In which health areas are earth science information and tools needed? And how can the relevancy of geosciences to public health be best demonstrated?

Dr. Wall expanded on these themes and particularly focused on the interrelationships of soil habitats, soil microorganisms, and health. She noted the many services soil biota provide, including transferring earth-derived elements and minerals and transforming pollutants, and she gave examples of the ways in which land-use changes, climate changes, and other soil disturbances can alter microorganism patterns. She discussed the ways in which earth sciences knowledge could contribute to understanding and predicting incidences of disease caused by soil-borne microorganisms and closed her remarks by emphasizing the need for interdisciplinary, collaborative, and global teams to help connect pieces across multiple disciplines.

The symposium featured three presentations exploring examples of the relationships between health issues and geological systems of water, air, and soil. **Joseph Graziano**, Columbia University, reviewed the health effects of arsenic in drinking water and shared lessons learned from groundwater well remediation efforts in Bangladesh. By linking arsenic levels to an understanding of underlying aquifers, predictions could be made of the likely safe depth to drill wells, and this information could be effectively disseminated to the public, increasing drinking water safety.

**Geoffrey Plumlee**, U.S. Geological Survey, discussed the toxicology of airborne particulate matter. He gave examples of local-scale concerns such as asbestos exposure from geologic formations, regional concerns such as airborne materials generated by wildfires or drying lake beds, and global phenomena such as the trans-oceanic distribution of dusts. He also emphasized the role of the earth sciences in characterizing sources, types, and properties of particulate matter to help inform studies of health effects, and a partnership between earth and health sciences that would improve understanding of exposure risks.

**Elizabeth Snyder**, University of Florida, shared experiences developing a university course exploring both soils and public health. After reviewing important functions and properties of soil, she highlighted several areas she saw as educational needs, including: soil characteristics and reactions that enable estimates of how contaminants move, react, and dissipate in a dynamic soil environment; factors which influence exposure pathways and health outcomes as they relate to soil properties and management; processes of site evaluation, health impact assessment, data reporting, and public communication; remediation techniques and strategies to prevent soil contamination; and how to critically review, understand, and apply information in water/soil science and public health literature.

### **AFTERNOON SESSIONS**

The afternoon sessions built on the morning presentations to consider the integration of scientific research and risk assessments into policy strategies at the state, national, and international levels.

**Joel Scheraga**, Environmental Protection Agency, spoke about some of the challenges to communicating timely and useful scientific information to policy makers and resource managers to enable more informed decision making. He stressed the importance of developing assessments and decision support tools that address the information needs of stakeholders, and reminded the audience that policy decisions often take into account multiple social factors in addition to scientific information. As just one example, Dr. Scheraga noted the development of a Climate Assessment Tool within the EPA BASINS model that can help agencies understand how climate changes might impact regional, state, and local water resources. He also encouraged participants to watch for the results of a current National Research Council study to assess strategies for decision support activities related to climate change.

**Kristie Ebi**, ESS, LLC, expanded the discussion of global climate change risks to consider some of the international implications for human health and public policy. She began by emphasizing some of the ways in which risks from climate change do not fit neatly into standard risk assessment models, including the complex range of systems and effects involved, the temporal and spatial variation, and the lack of a no-exposure control group. Dr. Ebi also stressed the importance of local vulnerability in influencing the impacts that are likely to be observed from climate change and suggested that both top-down policy solutions and community-based engagement and adaptation will be needed to address these challenges.

**Sharon Hrynkow**, National Institute of Environmental Health Sciences, National Institutes of Health, next discussed the role of NIEHS in understanding interactions between environmental factors and human disease. She reported that converging trends in the fields of earth sciences and health, particularly in response to concerns about climate change, have led to new agency initiatives to encourage broader research collaboration. Dr. Hrynkow noted that NIH has traditional funding mechanisms in place that can be used to address questions at the intersection of earth and health sciences and highlighted a new mechanism, the Transformative RO1, which is targeted at innovative and high-risk research and is specifically designed to help advance critical research needs.

The day-long symposium concluded with a panel discussion that invited speakers and audience members to engage in thinking about science and policy linkages between earth sciences and human health. **Ian Pepper**, University of Arizona, moderated this session and asked participants to come up with “grand challenges” in several areas. Organizing his themes around the interactions of the

environment with the human body, he invited suggestions for major unaddressed issues on the subjects “what we eat or drink,” “what we breathe,” and “what we touch.” A challenge identified by many participants was how to promote and conduct effective multidisciplinary and cross-disciplinary research, and how to support such research with institutional structures. Although researchers, universities, and funding agencies may increasingly understand the need to draw on the expertise of multiple disciplines to tackle complex problems, many symposium participants felt that this continued to be a critical goal. Other top challenges identified addressed the adequacy of food and water supplies, especially considering the importance of balancing the protection of soil and water quality with meeting the needs of growing global populations and the challenges that may be posed by worldwide climate change. Many participants also highlighted the importance of better understanding of social aspects of decision-making, including motivating people to make changes necessary to mitigate risks and better understanding of socioeconomic dimensions of sustainable resource use.

The symposium was organized by the Board on International Scientific Organizations (BISO) of The National Academies, and was made possible with support from the National Science Foundation. Additional support was provided by the American Geological Institute and the Geological Society of America. BISO was assisted in planning the event by José Centeno, Armed Forces Institute of Pathology, Bernard Goldstein, University of Pittsburgh Graduate School of Public Health, and Ian Pepper, University of Arizona.

#### **SYMPOSIUM AGENDA**

9:00 am Welcome from BISO Director, **Kathie Bailey Mathae**  
Opening Remarks by **José Centeno**, Armed Forces Institute of Pathology

9:20 am Connecting Earth Sciences and Human Health in a Changing World  
**Diana Wall**, Colorado State University

*A few examples of issues at the intersection of earth sciences and health:*

10:00 am Water and Health Case Study: Poisons in the Well: Exposure, Consequences and Remediation of Arsenic in Drinking Water in Bangladesh  
**Joseph Graziano**, Columbia University

11:00 am The “Geotoxicology” of Airborne Particulate Matter: Implications for Public Health, Public Policy, and Environmental Security  
**Geoffrey Plumlee**, U.S. Geological Survey

11:40 am Soil and our Health  
**Elizabeth H. Snyder**, University of Florida

*Connecting science to policy making:*

1:30 pm From Science to Policy: The Challenge of Providing Timely and Useful Information to Policymakers  
**Joel Scheraga**, Environmental Protection Agency

2:10 pm International Perspective on Addressing the Health Risks of Global Change  
**Kristie Ebi**, ESS, LLC

3:10 pm Converging Trends in the Health and Earth Sciences  
**Sharon Hrynkow**, National Institute of Environmental Health Sciences, NIH

3:50 pm Panel Discussion on Policy and Science Linkages  
Moderated by **Ian Pepper**, University of Arizona

5:00 pm Adjournment

### **SYMPOSIUM PLANNING COMMITTEE**

*BISO thanks the ad hoc planning committee that assisted in the organization of this symposium*

José Centeno, Department of Environmental and Infectious Disease Sciences, Armed Forces  
Institute of Pathology

Bernard D. Goldstein, Department of Environmental and Occupational Health, University of  
Pittsburgh Graduate School of Public Health

Ian L. Pepper, National Science Foundation Water Quality Center, University of Arizona

### **SYMPOSIUM SPONSORS**

The National Academies  
National Science Foundation  
American Geological Institute  
Geological Society of America

**Disclaimer:** *This meeting recap was prepared by National Research Council (NRC) staff at the request of the Board on International Scientific Organizations (BISO) as an informal record of issues that were discussed during BISO's annual symposium on September 25, 2008. This document was prepared for information purposes only and as a supplement to the meeting agenda included above. This document has not been peer-reviewed and should not be cited or quoted, as the views expressed do not necessarily reflect the views of the symposium planning committee, the National Research Council, the Board on International Scientific Organizations, or its sponsors.*