

Invitation for Comment on “Short List” of Potential Members for the Regulatory Environmental Modeling (REM) Guidance Advisory Panel of the Environmental Protection Agency (EPA) Science Advisory Board (SAB)

The EPA Science Advisory Board (SAB) Staff Office is forming the SAB Regulatory Environmental Modeling (REM) Guidance Advisory Panel. Nominations for technical experts to serve on this SAB Panel were requested in the Federal Register (68FR 46602) on August 6, 2003. The notice provided background information on the advisory, including document availability, the proposed charge, the process for submitting nominations, and expertise needed for consideration as a candidate for the Ad Hoc Panel. Pursuant to the Federal Register notice, any interested person or organization may nominate qualified individuals for membership on the Panel, and individuals should have expertise in one or more of the following areas:

- (a) Hazardous Waste,
- (b) Atmospheric Transport, Transformations and Removal,
- (c) Groundwater Hydrology,
- (d) Water Quality,
- (e) Indoor Air,
- (f) Multi-Media Environmental Fate and Transport,
- (g) Environmental Management,
- (h) Terrestrial and Aquatic Ecology,
- (i) Epidemiology,
- (j) Public Health,
- (k) Sensitivity Analysis,
- (l) Uncertainty Analysis,
- (m) Exposure and Risk Assessment,
- (n) Environmental Law,
- (o) Decision Analysis,
- (p) Economics,
- (q) Computer Sciences,
- (r) Spatial Modeling,
- (s) Model documentation,
- (t) Nomenclature for Environmental Models,
- (u) Statistics, and
- (v) Information Quality Guidelines, Data Quality and Quality Assurance Procedures.

The SAB Staff Office has reviewed the nominations and identified 35 candidates who have the relevant expertise and who are willing and available to serve as members of the *Ad Hoc* SAB REM Guidance Advisory Panel. Brief biographical sketches (“biosketches”) on these expert consultant candidates are provided below. We hereby invite comments from members of the public for relevant information, analysis or other documentation that the SAB Staff Office should consider in the selection of the *Ad Hoc* SAB REM Guidance Advisory Panel.

Any information furnished by the public in response to this web site posting will be combined with information already provided by the candidates, and gathered independently by the SAB Staff Office. Prior to the final panel selection, the combined information will be reviewed and evaluated for any possible conflict of interest or a possible appearance of a lack of impartiality. The information will also be used to ensure appropriate balance and breadth of expertise needed to address the charge to the panel. The SAB Staff Office Director makes the final decision concerning who will serve on the SAB REM Guidance Advisory Panel.

Please e-mail your comments no later than September 10, 2004 to Dr. K. Jack Kooyoomjian, Designated Federal Officer, SAB REM Guidance Advisory Panel, at : kooyoomjian.jack@epa.gov.

Shortlist Biosketches

Regulatory Environmental Modeling (REM) Guidance Advisory Panel

Allen, David T.

University of Texas

Dr. David Allen is the Gertz Professor of Chemical Engineering and the Director of the Center for Energy and Environmental Resources at the University of Texas at Austin. His research interests lie in environmental reaction engineering, particularly issues related to air quality and pollution prevention. He is the author of four books and over 150 papers in these areas. The quality of his research has been recognized by the National Science Foundation (through the Presidential Young Investigator Award), the AT&T Foundation (through an Industrial Ecology Fellowship) and the American Institute of Chemical Engineers (through the Cecil Award for contributions to environmental engineering). Dr. Allen was a lead investigator in one of the largest and most successful air quality studies ever undertaken: the Texas Air Quality Study. His current research is focused on using the results from that study to provide a sound scientific basis for air quality modeling and management in Texas. His modeling activities focus on using the results of field measurements to improve the description of chemical and physical processes in photochemical grid models, such as the Comprehensive Air Quality Model with extensions (CAMx). Dr. Allen received his B.S. degree in Chemical Engineering, with distinction, from Cornell University in 1979. His M.S. and Ph.D. degrees in Chemical Engineering were awarded by the California Institute of Technology in 1981 and 1983. He has held visiting faculty appointments at the California Institute of Technology, the University of California, Santa Barbara, and the Department of Energy.

Batterman, Stuart

University of Michigan

Dr. Stuart Batterman is Professor of Environmental Health Sciences (EHS) at the University of Michigan (UM); Director of the National Institute for Occupational Safety and Health (NIOSH) /Environmental Protection Agency (EPA) Hazardous Substances Academic Training Program; and Associate Chair of the EHS Department. He has a B.S. from Rutgers University (Environmental Science, New Brunswick, NJ) and MS and PhD from the Massachusetts Institute of Technology (Civil & Environmental Engineering, Cambridge MA). He has over 20 years of experience and over 200 publications, reports, and conference presentations regarding air pollution measurements, modeling, exposure and risk assessment, and air pollution epidemiology. He served as technical advisor/consultant to the Detroit Air Toxics Project Team; State of Michigan, various community-based organizations, chair of the U.S. Working Group on FT/IR Spectroscopy for the Measurement of Air Pollution, International Organization of Legal Metrology, government of South Africa on air quality management, and others. Dr. Batterman is an Associate Editor of the Journal of Environmental Engineering. His current teaching in the Environmental Health Sciences program includes the following courses: Environmental Impact Assessment; Environmental Management of Hazardous Substances; and the Doctoral Seminar. He also lectures in the Exposure and Risk Assessment courses. Research activities over the past 10 or so years include urban scale modeling of air pollutants; human exposure and risk assessment; air pollution epidemiology; biological monitoring; air pollution control engineering; environmental statistics. uncertainty analysis; human health risk assessment; measurement of volatile organic compounds in ambient air, indoor air, and soils; Fourier transform infrared spectroscopy; indoor air quality assessment and management; aspects of industrial and environmental hygiene; characterization of disinfection by-products in drinking water; and hazardous waste management. The range and scope of these activities are reflected in publications that have appeared in the following journals (as well as in books, proceedings and reports): American Journal of Public Health, Analytical Chemistry, Applied Occupational and Environmental Hygiene, Archives of Environmental Health, Atmospheric Environment, Environmental Research, Environmental Science and Technology, Human and Ecological Risk Assessment, Indoor Air, International Archives of Occupational and Environmental Hygiene, International Journal of Heating, Ventilating and Air Conditioning Research (HVAC&R), Journal of Environmental Engineering, Journal of Environmental Management, Journal of Environmental Monitoring, Journal of Environmental Toxicology and Chemistry, Journal of Exposure Assessment and Environmental Epidemiology, Journal of Life Cycle Analysis Journal of the Air Pollution Control Association, Journal of the American Industrial Hygiene Association, Analysis Modeling and Simulation, The Science of the Total Environment, Water Research, and others. Research support comes from the National Institutes of Health (NIH), the National Science Foundation (NSF), the US Environmental Protection Agency (EPA), American Chemistry Council (ACC), Agency for Toxic Substances Disease and Registry (ATSDR), US Department of Energy (DOE), and others.

Biddinger, Gregory

ExxonMobil Biomedical Sciences, Inc.

Dr. Gregory Biddinger is an Environmental Sciences Advisor with ExxonMobil Refining & Supply Company. In his current position he is responsible for science and regulatory issues related to aquatic environments and science policy related to the assessment and management of risk. Additionally, he participates in strategic environmental business planning processes, the creation of international standards on environmental management and providing leadership and technical support to business lines on wildlife conservation initiatives. In addition to his work on the USEPA SAB he has been active in numerous expert panels and peer reviews for US EPA, Organization for Economic Cooperation and Development (OECD) and the Society for Environmental Toxicology and Chemistry (SETAC). His many other professional activities have included chairmanships with the American Society for Testing and Materials (ASTM), American Chemistry Council (ACC) and the International Standards Organization (ISO) technical committees. Dr. Biddinger was the founding chair of SETAC's Ecological Risk Assessment Advisory Group (1992-2002). His publications include the area of aquatic toxicology on inorganic Arsenicals, Phthalate Esters, chemical dispersants, and the use of microcosms in estimation of tropic transfer of contaminants. Dr. Biddinger has also published and edited proceedings on ecological risk assessment and risk management, including such topics as the ecological risks of contaminated sediments, decision support systems, sustainable environmental management and integrated environmental decision-making. His current technical and policy focus is improving the utility of environmental science to make effective and sustainable environmental management decisions.

Braden, John

University of Illinois

Dr. John Braden is Professor in the Department of Agricultural and Consumer Economics and Affiliate of the Institute of Government and Public Affairs, University of Illinois at Urbana-Champaign. He teaches and conducts research on environmental economics and policy. Dr. Braden joined the University of Illinois in 1979 and was promoted to Professor in 1989. At the University, he previously served as Director of the Illinois Water Resources Center (1994-1998 and 2002), Director of the Environmental Council (1999-2002), and Associate Provost (1998-2001). Professor Braden's specialty is environmental economics and policy. He is most recognized for his studies of dispersed-source water pollution and environmental valuation. With respect to model development and use, some of the highlights of his work (often with collaborators) are: A. Spatial simulation and optimization: In the 1980s, he developed and applied spatially-detailed simulation and optimization models (known as SEDEC for Sediment Economics) to study the targeting of incentives for pollution mitigation. This work is reported in *Amer. J. Agr. Econ.* (1989), *Water Resour. Res.* (1989 (2)), *Manage. Sci.* (1990), and *J. Oper. Res. Soc.* (1994). B. Models of bargaining behavior: In markets that are small or fragmented, agents may attempt to influence prices. Such behavior may fail to produce efficient outcomes. Building on SEDEC, Braden developed and applied models that simulate bargaining behaviors in transferable discharge permit markets for nonpoint source pollution and analyze the effects of different trading rules (*Water Sci. Tech.* 1993 and *J. Env. Manage.* 2001). Along similar lines, he developed bargaining models for water markets (*Land Econ.* 1991). C. Market- and survey-based valuation: Braden's work in this field includes a edited state-of-the-art volume (1991) on valuation theory and methods and commentaries on these methods (*Water Res. Update* 1997, *J. Water Res. Plan. Manage* 2000). In applications, he has used both continuous hedonic property valuation and a discrete-choice conjoint survey, together with appropriate econometric models, to estimate the value of contaminated site remediation (papers in review at three journals). He developed and used discrete choice models to analyze a conjoint choice survey on coal quality for electric generating stations (*Energy Pol.* 2001). In the 1980s, with environmental engineers, Dr. Braden developed spatially-detailed simulation and optimization models to study the targeting of incentives for pollution mitigation. Recently, in response to policy debates in the Great Lakes region, he has conducted econometric modeling, using both market-based and survey techniques, to estimate the economic benefits of cleaning up contaminated sites. Professor Braden is the author, co-author, or editor of more than 150 scholarly papers including six books, 37 chapters, and 48 scholarly articles. His work appears in economics, engineering, and law publications as well as in interdisciplinary outlets. Professor Braden was elected President of the Universities' Council on Water Resources in 1998. He served as an editor of the *American Journal of Agricultural Economics* and on the Boards of the Association of Environmental and Resource Economists and the Universities' Council on Water Resources. Professor Braden has served on economics, ecology, and water-and-watershed review panels for the NSF and USEPA, an expert panel for the National Oceanic and Atmospheric Administration (NOAA), and a National Research Council panel studying the planning methods of the Corps of Engineers. The University of Illinois conferred on Professor Braden the honor of Fellow in the Center for Advanced Study (1983), University Scholar (1989), the College Faculty Award for Excellence in research (1989), and the Funk Recognition Award (1996). He was selected as a Fulbright Research Scholar in 1990 (New Zealand) and a Fellow of the American Council on Education in 1992. He was a visiting scholar at the Catholic University of Leuven (Belgium), Canterbury and Lincoln Universities (New Zealand), Wageningen University (the Netherlands) and U.S. Environmental Protection Agency-Region 5, and a lecturer for the World Bank in India. Professor Braden completed his B.A. degree at Miami University (Ohio) and his M.S., M.A., and Ph.D. degrees in Agricultural Economics at the University of Wisconsin-Madison. In the past five years, Professor Braden has received research funding from the National Science Foundation (river management and assessment of bio-based industrial feedstocks), the U.S. Environmental Protection Agency (capacity building for small water systems), the Conservation Research Institute (sustainable management of urban storm water), and the Northeast-Midwest Institute (economic benefits of contaminated site remediation). Additional grant applications are pending with US EPA. Overall, he has attracted more than \$6 million in extramural support.

Brown, Linfield

Tufts University

Dr. Linfield C. Brown is Professor and former Chairman of the Civil and Environmental Engineering Department at Tufts. Professor Brown earned his Bachelor of Science Degree in Civil Engineering (BSCE) and MS from Tufts and his Ph.D. in Sanitary Engineering at the University of Wisconsin-Madison. His research has covered a broad range of topics in sampling strategies, flow equalization, oxygen transfer, and most recently, uncertainty analysis in water quality modeling, multi response parameter estimation, and the use of genetic algorithms for model calibration. Dr. Brown has served as consultant to both industry and government. As a research engineer with the National Council for Air and Stream Improvement (NCASI), he developed their national program in mathematical water quality modeling. While on sabbatical leave at the US EPA Center for Exposure Assessment Modeling (CEAM), he designed and implemented a computational framework for incorporating uncertainty analysis into the water quality model, QUAL2E. Dr. Brown is the author of over 50 technical papers and reports covering the fields of environmental engineering and statistics and has offered over two dozen workshops in the US, Spain, Poland, England, and Hungary on water quality modeling and control. He is co-author of the book *Statistics for Environmental Engineers*, which describes the practical application of statistics to a variety of environmental engineering problems. He founded and was academic director of an innovative multi-disciplinary Masters program in Hazardous Materials Management, and initiated a similar program in Environmental Science and Management for mid-career professionals, targeted specifically for women and minorities. He received from Tufts, the prestigious Lillian Liebner Award for excellence in teaching and advising. Dr. Brown currently serves as consultant to the Environmental Models Sub-committee of the USEPA Science Advisory Board and is director of the Tufts ABET accredited BSEvE program. In addition to his university support, Dr. Brown receives funding from the New England Water Pollution Control Commission, which, in turn receives that funding from EPA Region I.

Chien, Calvin

E. I. DuPont Company

Dr. Calvin C. Chien is a Senior Environmental Fellow with DuPont Company, the highest ranking technical environmental professional with the company. He has, since 1991, been the leader of the Company's Environmental Remediation Technology Development team focusing on Environmental Modeling and Subsurface Containment/Treatment Barrier Technologies. Besides the work with technology development, he also has the responsibility for technical environmental support and oversight for DuPont's operations in the Asia-Pacific Region since 1987. He served on the Groundwater Modeling Group of the Chemical Manufacturing Association (CMA, now American Chemistry Council) as a member and two years later as the Chairperson from 1986 to 1992. He turned over his CMA responsibility from 1993 when he was appointed by EPA to serve as a consultant to the Environmental Engineering Committee (EEC) of the Science Advisory Board (SAB). He was appointed as a member on the EEC in 1994 and was reappointed twice and served on the ECC until 2000. He has since been invited by the SAB to serve on special review committees or panels including a three-year term on the Science and Technology Achievement Award (STAA) Panel starting in 2003. He was invited by the Chinese EPA in 2003 to serve on a national expert committee similar to STAA as the only foreign member on the panel and was invited again to serve on the 2004 panel for the selection of the winners for the award. During his years serving on SAB's committees from 1993 until now, Dr. Chien has been involved in the reviews of all major models and modeling programs proposed by the agency, including Multi-Media Contaminant, Fate, Transport and Exposure Model (MMSOILS), Total Risk Integrated Methodology (TRIM), National-Scale Air Toxics Assessment (NATA) and others. In 1994, he served on a U.S. Department of Energy's (DOE) Outside Technical Peer Review Panel to review the department's modeling strategy and development. He was invited twice by the National Science Foundation (NSF) to serve on the technical review panels for the review and selection of the research proposals submitted to the foundation for funding. He has published several technical articles in the leading peer-reviewed journals and authored many DuPont internal technical research reports. Dr. Chien also served as a technical reviewer for papers submitted to Hydraulic Journal of ASCE (Am. Soc. of Civil Engineers) in late 1970s and early 1980s and served as member and secretary of the Society's Groundwater Management Committee between 1996 and 1999. In leading DuPont's Transport Modeling Development effort, he has been the driving force in the development of a number of major models for the groundwater remediation: Subsurface Barrier Transport Diffusion Model, Comprehensive In-situ Remediation Model, and Groundwater Optimization Models. Among many awards and honors Dr. Chien has received in his career, he was the recipient of State University of New York (SUNY's) 1997 Engineering Achievement Award, the university's highest award to honor engineers. He was the first winner for this award of Asian descent and also an alumnus in the Award's 20 years of history. Dr. Chien also has received several Awards from DuPont, including three Major Contribution Awards, with significant amount of cash and an Invention Award from the Westinghouse Company. Dr. Chien has organized and chaired/co-chaired a number of international technical expert workshops and conferences, including the first International Containment Expert Workshop (1995) and Conference (1997), and the International Environmental Modeling Expert Workshop (2000). He was invited to organize and lead a Containment Expert Workshop (2002) focusing on the Long-term Performance Prediction and Verification for Containment/Treatment Barriers funded by the Department of Energy. Dr. Chien was the planner for the well-known book prepared from the 1995 Containment Workshop and the principal editor of a modeling book, "Contaminated Groundwater and Sediment : Modeling for Management and Remediation", published in 2004 by CRC Publishers. Among the many awards and honors Dr. Chien has received in his career, he was the recipient of SUNY's 1997 Engineering Achievement Award, university's highest award to honor the engineers. Dr. Chien also has received several Awards from DuPont, including three Major Contribution Awards. He also received a Westinghouse Invention Award for a U.S. Patent registered in his name when he was with the company in 1979. Dr. Chien earned an M.S. E. and a Ph.D. in hydrology and environmental modeling from the State University of New York (SUNY) at Buffalo in 1970 and 1974, respectively. He received his B.S.E. in Hydraulic Engineering from the National Cheng-Kung University in Taiwan in 1966.

DePinto, Joseph

Limno-Tech, Inc.

Dr. DePinto is currently a Senior Scientist at Limno-Tech, Inc.(LTI), an environmental consulting company specializing in the development and application of water quality and ecosystem models for addressing a myriad of problems in aquatic ecosystems. He joined LTI in June, 2000 after spending 27 years in academia, including 10 years as Director of the great lakes program at the University of Buffalo. Dr. DePinto received his Ph.D. in Environmental Engineering in 1975 from the University of Notre Dame. During his professional career, Dr. DePinto has directed projects involving the development and application of models applied to a wide range of topics, including nutrient-eutrophication, toxic chemical exposure analysis, contaminated sediment analysis and remediation, aquatic ecosystem trophic structure and functioning, and watershed management. His studies have led to over 100 publications and the direction of more than 45 master's theses and 12 Ph.D. dissertations. Dr DePinto's recent modeling research projects (with funding sources in parentheses), both prior to and subsequent to joining LTI, that are relevant to the subject SAB panel include: development and application of an integrated exposure model for PCBs in Green Bay, Lake Michigan (EPA-ORC); development and application of sediment and contaminant fate and transport models to assess and evaluate remediation of contaminated sediments in several river systems, including the Buffalo River (EPA-Great lakes National Program Office (GLNPO)), St. Clair River (Ontario Ministry of Environment), Lower Fox River (Fox River Group), Kalamazoo River (Kalamazoo River Study), Niagara River, and Hudson River (EPA-Region 2 through TAMS); led a team of scientists and engineers at the University at Buffalo in the development of a Geographically-based Watershed Analysis and Modeling System (GEO-WAMS), a Modeling Support System that coupled a Geographic Information System (ARC-INFO) with existing and newly developed watershed and water quality models (EPA-ORD); led the development and application of a trophic transfer model for lake Ontario intended to evaluate the role of fish management practices relative to phosphorus levels in top predator fish production in that system (New York Sea Grant); was the technical director of a project to develop a model for dissolved oxygen in the Black River (OH) system to quantitatively assess the cause of low dissolved oxygen in the deep navigational portion of the river, which exhibited two-dimensional, stratified flow conditions because of Lake Erie seiche effects; co-investigator on a project to model the flux of PCBs and other organic chemicals across the air-water interface of lake Michigan (EPA-GLNPO); and led the development of a linked fine-scale hydrodynamic model (POM) with a toxic chemical (hydrophobic organic chemicals and mercury) transport, fate, and bioaccumulation model (LOTOX2) for support of the Lake Ontario Lake-wide Management Planning (LaMP) process and a PCB (Total Maximum Daily Loading) TMDL for Lake Ontario (EPA-Region 2 and EPA-GLNPO through the University at Buffalo). Dr. DePinto has been a leader in the development and application of aquatic ecosystem models aimed at providing a quantitative understanding of the impacts of multiple stressors acting in concert on aquatic systems to produce multiple response endpoints. This new paradigm of modeling allows simultaneous consideration of several management areas, such as nutrient load control, toxic chemical exposure, fish harvesting/stocking practices, aquatic nuisance species invasions, and water use and resource management. Probably the best example of this work in the development of the Saginaw Bay Aquatic Ecosystem (SAGEM), funded by EPA-ORD and EPA-GLNPO. SAGEM is a deterministic process model designed to examine the ecological processes of Saginaw Bay, lake Huron to the invasion of zebra mussels (*Dreissena polymorpha*). In particular, the model was developed to illustrate the processes governing the effect of zebra mussels on nutrient cycling and phytoplankton production and speciation, on cycling and bioaccumulation of PCBs, and on the impact of zebra mussels on the relative contribution of phytoplankton and benthic algae to primary production in the system. Recently, Dr. DePinto has been working on the development of linked modeling frameworks that allow the evaluation of water use or levels/flow regulation on a range of ecological endpoints. He is directing a project, funded by the International Joint Commission through the USACE-Institute for Water resources, with the objective of developing an Integrated Ecological Response Model (IERM) that quantitatively relates water level/flow regulation in the Lake Ontario/St. Lawrence River system to important ecological performance indicators such as wetland plant diversity and wildlife abundance. In a similar vein, Dr. DePinto has led the development of a prototype linked model framework (GLECO) to relate water withdrawals/diversions to ecological responses in river-based watersheds in the great Lakes basin (funded by the great Lakes Protection Fund). Dr. DePinto has also had considerable experience in evaluating models and providing guidance for the use of models in the TMDL process. He is the lead author on a peer-reviewed paper in press that presents modeling principles for TMDL modeling practitioners. He has reviewed or is in the process of reviewing several model development and application programs for TMDLs, including a review of a Hg TMDL pilot study in the Everglades for the State of Florida; modeling consulting to the Delaware River Basin Commission in their effort to develop a PCB TMDL model (linked hydrodynamic and PCB mass balance) for the Delaware River/Estuary; serving on a modeling guidance panel for the application of the WARMF model for use in the development of a phosphorus-chlorophyll a TMDL for the

Catawba River system in South Carolina; and is an invited member of the Model Evaluation Group (MEG) for the Contaminant Assessment and Reduction Project (CARP) of the New York/New Jersey Harbor Estuary Program (supported by the Hudson River Foundation). Finally, Dr. DePinto has served on many councils and committees to develop research needs for aquatic system management and modeling. For example, he is currently a member of the International Joint Commission, Council of Great Lakes Research Managers, which has as one of its missions the identification of research needs in Great Lakes to support the Great Lakes Water Quality Agreement.

Fabryka-Martin, June

Los Alamos National Laboratory

Dr. June Fabryka-Martin is a Staff Scientist in the Environmental and Earth Sciences Division at Los Alamos National Laboratory (LANL) in Los Alamos, NM. She holds a PhD and MS in Hydrology and Water Resources from the University of Arizona and received a BA degree in Geography from the University of Delaware. Her dissertation dealt with terrestrial production of radioactive isotopes by natural nuclear reactions initiated by cosmic rays and a wide variety of energetic subatomic particles. Dr. Fabryka-Martin's work experiences span a broad range of topics related to radiological issues, including the use of Monte Carlo N-Particle (MCNO) transport code to model radiation fluxes and nuclear reaction rates in geologic media as part of international studies pertaining to the geochemistry of long-lived fission products and plutonium in uranium ore deposits; interpreting geochemical and isotopic compositions as indicators of groundwater flow paths and residence times; characterizing transuranic waste streams produced by LANL activities, including data quality assessments; and developing and evaluating the effectiveness of methods to mitigate the production and dispersion of particulates during open-air experiments. Her Yucca Mountain studies of spatial distributions of chloride and chlorine-36 in the subsurface played significant roles in the development and testing of hydrologic process models for assessing the viability of this site as a geologic repository for radioactive waste, in particular by highlighting the potential role of fast transport paths in this geologic setting. Her data were used to develop and test alternative conceptual models of site infiltration, to calibrate and bound numerical site infiltration models, to constrain property values used in the unsaturated-zone site-scale flow and transport model FEHM (Finite Element Heat and Mass Transfer Code), and to calibrate the Unsaturated-Zone Radiological Transport Model (UZ RTM) using the software codes FRACL, TOUGH2, and T2R3D. Dr. Fabryka-Martin contributed to two recent books dealing with transport in the unsaturated zone, including development of the conceptual model of unsaturated zone hydrology at Yucca Mountain, and iodine-129 in a text on environmental tracers in subsurface hydrology. She has published over 35 refereed journal articles and conference papers in published proceedings and has frequently reviewed manuscripts that use modeling codes to predict production and transport rates of particles and chemical species. Dr. Fabryka-Martin has served as a member of the US EPA Science Advisory Board's Radiation Advisory Committee, and was senior editor for the SAB's recent review of the Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) Manual. She has contributed to over 10 SAB reports and advisories over the past decade, including those reviewing the Agency's use of such models as the Multi-Media Contaminant, Fate, Transport and Exposure Model (MMSOILS), PATHRAE (a US EPA low-level radioactive waste environmental transport and risk assessment code, methodology & user's manual), Prediction of Radiological Effects due to Shallow Trench Operations (PRESTO), and Residual Radioactive Materials Guidelines (RESRAD). As a LANL employee, Dr. Fabryka-Martin works for the University of California on projects funded by the US Department of Energy and the National Nuclear Security Agency.

Georgopoulos, Panos

UMDNJ-Robert Wood Johnson Medical School

Dr. Georgopoulos is Professor of Environmental and Occupational Medicine at the University of Medicine and Dentistry of NJ - Robert Wood Johnson Medical School. He is also a member of the Graduate Faculties of Chemical and Biochemical Engineering and of Environmental Sciences at Rutgers University, and of the Environmental and Occupational Health Sciences Institute (EOHSI), which is a joint project of UMDNJ-RWJMS and Rutgers. Dr. Georgopoulos received his M.S. and Ph.D. Degrees in Chemical Engineering from the California Institute of Technology (Caltech) and his Dipl. Ing. Degree from the national Technical University of Athens. At EOHSI he established and directs the Computational Chemodynamics Laboratory (CCL, www.ccl.rutgers.edu), a state-of-the-art facility for Informatics and Modeling of Complex Environmental and Biological Systems. Furthermore, he directs the State-funded Consortium for Risk Evaluation with Stakeholder Participation (CRESP); and he co-directs the USEPA-funded Center for Exposure and Risk Modeling (CERM), all at EOHSI. Also, through CCL, Dr. Georgopoulos has directed research efforts in the areas of physiologically based toxicokinetic and toxicodynamic modeling, in support of activities of the National Institute of Environmental Health Sciences (NIEHS) Center of Excellence at EOHSI. Currently he is a member of the Editorial Board of Stochastic Environmental Research and Risk Assessment. Selected examples of model development and application activities for Dr. Georgopoulos include the following: He has directed the development - and multiple applications - of two comprehensive, source-to-dose modeling systems intended to support environmental health risk assessments for individuals and populations: EDMAS (Exposure and Dose Modeling and Analysis System), which was developed with base funding from ATSDR; and MENTOR (Modeling Environment for Total Risk studies), which is currently under continuing development with base funding from USEPA-ORD. Two specific implementations of MENTOR, called (MENTOR/SHEDS-1A and MENTOR/SHEDS-4M) are actually included in the listing of the CREM models (under SHEDS-MENTOR-1A and SHEDS-MENTOR-4M); they both incorporate USEPA's SHEDS (Stochastic Human Exposure and Dose Simulation) approach, expanded and recoded within the MENTOR system. The "1A" implementations (for "One Atmosphere") supports calculations of inhalation exposures to multiple co-occurring contaminants (including ozone, PM, and various air toxics); it utilizes various GIS (Geographic Information Systems) tools and incorporates "computational links" to various state-of-the-art EPA models, such as Models-3/CMAQ (Community Multiscale air Quality Model). The "4M" implementation of MENTOR/SHEDS is designed to address cumulative and aggregate exposures from "Multiple routes and Multiple pathways to Multiple contaminants in Multiple media"; comprehensive source-to-dose applications have focused on simultaneous inhalation, oral and dermal exposures of populations to co-occurring multimedia contaminants such as arsenic and trichloroethylene. During the last 20 years, Dr. Georgopoulos has directed numerous projects involving the application and evaluation of environmental fate and transport models, of microenvironmental and exposure models, and of biologically-based dosimetry and dose-response models. A partial list of such models includes prognostic atmospheric models such as MM5 (Mesoscale Meteorological model) and RAMS (Regional Atmospheric Modeling System); atmospheric dispersion models such as the ISC (Industrial Source Complex), ASPEN (Assessment of Pollutant Exposures Nationwide), AERMOD, CALPUFF, HPAC (Hazard Prediction Assessment Capability), and HYPACT (Hybrid Particle and Contaminant Transport) models; atmospheric chemistry/transport models such as RPM (Reactive Plume Model), UAM (Urban Airshed Model) IV and V - including the locally developed "AERO" modifications, MAQSIP, CAMx, REMSAD and Models-3/CMAQ (Community Multiscale air Quality Model); groundwater flow and transport models such as EPACMTP, MODFLOW, and FACT (Flow and Contaminant Transport); the municipal water network model EPANET; multimedia models such as 3MRA and MEPAS (Multimedia Environmental Pollution Assessment System); and various indoor air, exposure, and dosimetry models. One of Dr. Georgopoulos currently ongoing projects involves the systematic comparison, and evaluation with field data, of comprehensive modeling systems for inhalation exposures, that include, in addition to MENTOR/SHEDS, USEPA's APEX (Air Pollution Exposure) model and HAPEM (Hazardous Air Pollutant Exposure Model); this particular three-year effort is pursued with funding from ACC (the American Chemistry Council). Dr. Georgopoulos has participated in both research and teaching in the graduate programs of Rutgers and UMDNJ-RWJMS and has developed innovative course materials in modeling and informatics related to environmental health applications. He has been the primary doctoral thesis advisor to eighteen students, with eight Ph.D. degrees awarded since 1997, and mentor to sixteen post-doctoral fellows. His research interests involve the development and application of novel mathematical and computational methods for diagnostic and mechanistic studies of multipathway physiochemical transport and fate processes taking place in environmental and biological systems. Aim of this research is to improve the understanding and quantification of human exposure, biological mechanism-based dosimetry, and risk assessment, for environmental toxics; and to develop a consistent mechanistic computational framework for source-to-dose modeling of toxicant dynamics. Outcomes of this research

include quantitative estimates of delivered/metabolized target tissue doses from inhalation, dietary and non-dietary ingestion, and dermal absorption of multi-pollutant mixtures. Dr. Georgopoulos has received research funding as Principal or co-Principal Investigator, from various federal, state, and private sector agencies and organizations, including among others the USEPA, USDOE, NJDEP, NJDHSS, NIEHS, ATSDR/CDC, API, ACC, etc. He has lectured as an invited speaker at various universities, such as the Harvard School of Public Health, Johns Hopkins University, Stanford University, Illinois Institute of technology, University of Minnesota, and others. He has published research articles in several scientific journals, including Aerosol Science and Technology, AIChE Journal, Atmospheric Environment, Bioinformatics, Chemical Engineering Science, Environmental Fluid Mechanics, Environmental Health Perspectives, Environmental Science & Technology, Environmental Toxicology and Chemistry, International Archives of Environmental Health, Journal of the Air & Waste Management Association, Journal of the American Water Resources Association, Journal of Chemical Physics, Journal of Colloid and Interface Science, Journal of Computational Chemistry, Journal of Exposure Analysis and Environmental Epidemiology, Journal of Physical Chemistry, Journal of Toxicology and Environmental health, Journal of Toxicology and Industrial Health, Marine Environmental Research, Physical Review E, Regulatory Toxicology and Pharmacology, Risk Analysis, Telus, and Water Resources Research. He is also the author or co-author of a number of State and federal Government Documents and of numerous technical reports. He has received awards and honors including the National Award of the Society of Toxicology for best Presentation in Risk Assessment; the DuPont Education and research Award for his work on air pollution; and USEPA's Certificate of Appreciation. He served as Associate Editor of JAWMA, the scientific journal of the International Air and Waste Management Association, from January 1995 to June 2001, and as Guest Editor of special supplement issues of Epidemiology and of Environmental Health Perspectives. He was Co-Chair of the 1999 Joint Conference of the International Society of Exposure Analysis (ISEA) and the International Society for Environmental Epidemiology (ISEE). He currently serves as member of various national and technical committees on environmental issues.

Hansen, D. Alan**Electric Power Research Institute (EPRI)**

Since 1985, D. Alan Hansen has been the Manager of Tropospheric Studies for the Environment Department of the Electric Power Research Institute (EPRI). Dr. Hansen received his Ph.D. in Chemistry from the University of California, Irvine in 1973, and his B.A. in Chemistry from Southern Illinois University in 1967. Dr. Hansen's technical specialties include planning and managing fundamental and applied research on topics related to atmospheric chemistry and physics, including the study of issues related to ozone nonattainment, aerosols, acidic deposition, visibility, air toxics, source-receptor relationships, regional air quality, and global climate. The disciplines involved in his research include the design of environmental monitoring systems, numerical model development and evaluation, including uncertainty analysis, measurement methods development, environmental data analysis and interpretation, including receptor modeling, chemical kinetics, biogeochemical cycling, analytical chemistry, computer science, and quality assurance. Dr. Hansen's experience includes managing the Aerosol Research and Inhalation Epidemiological Study (ARIES), an air quality and exposure measurement and epidemiological study of the health effects of exposure to ambient aerosols in Atlanta, Georgia, and the Southeastern Aerosol Research and Characterization Study (SEARCH), a study of atmospheric gases, meteorology, and aerosols over a four-state area, which involves developing new measurement methods, characterizing aerosol properties as well as biases in methods for determining them, and investigating source-receptor relations. Dr. Hansen also serves as Coordinator for the North American Research Strategy for Tropospheric Ozone (NARSTO) Model Comparison and Evaluation Study, which is comparing the performance of regional air quality models used for regulatory purposes in the United States and Canada. He served three years as the chairman of the Project Management Group for the bi-national Eulerian Model Evaluation and Field Study. He has also chaired the Steering Committee for the Consortium for Advanced Modeling of Regional Air Quality (CAMRAQ) that coordinated research among 20 collaborating agencies with the goal of developing a comprehensive modeling system for the troposphere. Dr. Hansen has served on numerous peer review and other committees including the Air Quality Modeling Subcommittee for the Advisory Council on Clean Air Compliance Analysis, the Synthesis Team that authored the 2000 Ozone Assessment for NARSTO, the Advisory Committee for the North American Air Monitoring and Modeling Project of the Commission for Environmental Cooperation, the Modeling and Chemistry Team of NARSTO, and the Photochemical Modeling Oversight Group for the Texas Commission on Environmental Quality, and currently serves on the External Advisory Committee for the Community Modeling and Analysis System, supporting development and applications of EPA's Models-3. As detailed in his resume, Dr. Hansen's work has been published in numerous peer-reviewed publications. As a research manager for an institute that outsources most of its research, Dr. Hansen manages primarily research conducted by other organizations. Most of his funding derives from EPRI member dues although he has received additional funding from the Illinois Department of Commerce and Economic Opportunity, US Department of Energy, Ontario Ministry of the Environment, Environment Canada and the American Petroleum Institute.

Heeringa, Steven**University of Michigan**

Dr. Steven G. Heeringa is a Research Scientist and Director of the Statistical design Group at the University of Michigan Institute for Social Research (ISR) where he oversees research design for population-based studies in the social sciences, education, demography, public health and medicine. Steve has a Ph.D. in Biostatistics from the University of Michigan and is a specialist in statistical design and analysis for studies of human and animal populations. Dr. Heeringa has over twenty-five years of statistical design experience directing the development of the ISR National Sample design as well as sample designs for ISR's major longitudinal and cross-sectional survey programs. During this period he has been actively involved in research and publication on statistical methods and procedures such as sample design methods and procedures, such as sample design, weighting, variance estimation and the imputation of missing data that are required in the analysis of sample survey data. He is an advisor to panels of the National Institutes of Health (NIH) and the World Health Organization (WHO). Since 2003, he has been a permanent member of the EPA's Federal Insecticide, Fungicide, Rodenticide Act (FIFRA) Science Advisory Panel (SAP). He is the Director of the ISR Summer Institute in Survey Research Techniques and has been a teacher of survey sampling methods to U.S. and international students. He has served as a sample design consultant to a wide variety of international research programs based in countries such as: Russia, the Ukraine, Uzbekistan, Kazakhstan, India, Nepal, China, Iran, Chile and Egypt.

Hope, Bruce

Oregon Department of Environmental Quality

Dr. Bruce K. Hope is with the Oregon Department of Environmental Quality (DEQ), where he serves as senior environmental toxicologist for the Air Quality Division and is presently responsible for establishing the Air Toxics Science Advisory Committee (ATSAC), researching reviewing and recommending air toxics benchmarks to the ATSAC for approval, and proposing recommended benchmarks for adoption as administrative rules. Previous assignments have included developing an aquatic food web biomagnification model for mercury and preparing a mercury mass balance analysis in support of the Willamette River Total Maximum Daily Loading (TMDL) process, reviewing human health and ecological risk assessments for specific cleanup sites, developing risk assessment guidance (human health, ecological, probabilistic) to support implementation of Oregon's cleanup law, and leading the State's efforts to implement probabilistic human health and population-level ecological risk assessments. Prior to joining DEQ in 1995, he was a consultant in the private sector managing human health and ecological risk assessment projects for commercial and government clients at Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and Base Realignment And Closure (BRAC) sites throughout the U.S. and Pacific Rim. In 2000-01, he was on leave from DEQ as an American Association for the Advancement of Science (AAAS) risk policy fellow at the U.S. Department of Agriculture in Washington, DC, where he worked on food safety, microbial risk, and bioterrorism issues. Dr. Hope has served on several U.S. EPA advisory panels including a Scientific Advisory Panel addressing probabilistic analyses under the Federal Insecticide, Fungicide, and Rodenticide Act, the Science Review Board for the Food Quality Protection Act, a peer review workshop on the Process for Conducting Probabilistic Risk Assessment for Superfund and a Risk Assessment Forum workshop on probabilistic assessments. He has written peer-reviewed and technical publications on exposure modeling for human and ecological receptors, risk assessment, toxicology, and geochemistry. His modeling experience focuses on development of specialized exposure models. These have included a food web bioaccumulation model for mercury in a large river system, a series of probabilistic, spatially-explicit exposure models, and a model to enable state environmental regulators to perform population-level risk assessments. Dr Hope is currently the Vice-President elect of the Pacific Northwest Chapter of the Society of Environmental Toxicology and Chemistry (SETAC), chair of the Scientific Program Committee for the 2004 Fourth SETAC World Congress, and was a participant in the recent SETAC Pellston workshop on population-level ecological risk assessment. Dr. Hope is an adjunct faculty member at Oregon Health & Science University (in both the Oregon Graduate Institute and the School of Nursing), Concordia University (Portland), and the Portland State University. He holds M.S. and Ph.D. degrees in biology (aquatic toxicology) from the University of Southern California and a B.A. degree from the University of California (Santa Barbara).

Jayjock, Michael

Rohm and Haas Co.

Dr. Michael A. Jayjock is Senior Research and EHS Fellow and Manager, Risk Assessment, in the Toxicology Department of Rohm and Haas Company, where he has served in various technical positions since 1969. In his current position he is responsible for determining the human health risk from exposure to company products, reactants, and intermediates. He has a Ph.D. in Environmental Engineering from Drexel University, Philadelphia, Pennsylvania, where he also received his Master of Science degree in Environmental Science and Occupational Health. Dr. Jayjock is a Fellow of the American Industrial Hygiene Association and Diplomat of the American Board of Industrial Hygiene (CIH). He has served on various committees of the American Industrial Hygiene Association: Committee on Exposure Assessment Strategies, Exposure Strategies Modeling Subcommittee, Exposure Strategies Expert System Subcommittee, Committee on Risk Assessment, and Low-Dose Estimation Task Group. He is a Member of the British Occupational Hygiene Society and ASTM member of Committee D22 on Sampling and Analysis of Atmospheres. In addition, he has served as a Governing Board Member of the International Society for Exposure Analysis (ISEA) 1995-1998, President of the Philadelphia Chapter of Society for Risk Analysis 1993-1994, Councilor for the Philadelphia Chapter of the Society of Risk Analysis 1994-1996, and Advisory Board Member for the Drexel School of Environmental Science, Engineering and Policy 1998-2002. Dr. Jayjock is an employee of Rohm and Haas Company. He has expertise in such areas as exposure modeling and human exposure to environmental pollutants, human health risk assessment, and uncertainty analysis. He has published extensively in peer-reviewed publications and served from 1998-2003 as an Editorial Board Member for the American Industrial Hygiene Journal. He has made numerous technical presentations, including at the American Industrial Hygiene Conference, International Society of Exposure Assessment Conference, and the Air Toxics Monitoring Workshop to Support EPA's Integrated Urban Air Toxics Strategy. His wide service on advisory committees includes: U.S. EPA – Office of Pollution Prevention & Toxics – Voluntary Children's Chemical Evaluation Program (VCCEP); Peer Consultation Panel on Flame Retardants, 2003; U.S. EPA Science Advisory Board, Executive Committee, Human Health Research Strategy Panel, November 2002; U.S. EPA Science Advisory Board Consultant 2001! -2003 – Integrated Human Exposure Committee; U.S. EPA Science Advisory Board Member 1998-2001 – Integrated Human Exposure Committee (IHEC); and National Research Council – National Academy of Sciences, as a Member of the Committee to Review Risk Management in the DOE's Environmental Remediation Program, the Committee on Advances in Assessing Human Exposure to Airborne Pollutants, and the Committee on Toxicology – Subcommittee on Risk Assessment of Flame-Retardant Chemicals. In addition, Dr. Jayjock has extensive teaching experience, including his work as Course Director – Instructor: Risk Assessment and Intermediate Exposure Modeling – University of North Carolina Education Research Center, Summer Institute 1995-2001 and as Guest Lecturer – University of Pennsylvania Medical School – Residency Program for Occupational Medicine 1998-Present. As a current employee of Rohm and Haas Company, Dr. Jayjock receives an annual salary. Relative to grant and/or contract support, the only money Dr. Jayjock has received recently is from his expenses for working on a SAB Panel in the Fall of 2002 (approximately \$60 - \$70) and a \$150 contract that was given to Dr. Jayjock by EPA as payment for participating on a EPA personnel promotion review panel in late July 2003. Dr. Jayjock is also receiving the normal honorarium granted to VCCEP Panelists (Dr. Jayjock was an ad hoc panelist) for 3 brominated flame-retardants at \$2500 per compound.

Jeffries, Harvey E.**University of North Carolina**

Dr. Harvey E. Jeffries has been a Professor of Atmospheric Chemistry in the Department of Environmental Sciences and Engineering at the University of North Carolina at Chapel Hill since 1971. He teaches graduate courses on atmospheric chemistry and photochemical modeling, including object-oriented design and programming. His research interests focus on gas-phase atmospheric chemistry, specializing in volatile organic compound photooxidation with oxides of nitrogen to produce ozone, and the mathematical modeling of urban air chemistry, specifically, the development of numerical simulation models of photochemistry that become components of large scale Eulerian models incorporating meteorological and emissions sub-models. He has performed photochemical experimental and simulation research in smog chambers for 30 years and has been the lead investigator in the creation and implementation of a new photochemical reaction simulation methodology that uses morphemes (time varying, shape-shifting molecules) to simulate the complex organic chemistry. Now, in collaboration with researchers from the UNC School of Medicine, he is conducting gas-phase and particle experiments to test air quality effects on human lung cells. Dr. Jeffries has also been active in using these models to plan public policy for air pollution control. He is a scientific advisor to the NC state regulatory agency for the 8-hour ozone non-attainment modeling for the North Carolina SIP. He is a scientific advisor to the Business Coalition for Clean Air Appeal Group for the Houston Texas - 1-hour ozone nonattainment modeling. He is a member of the California Air Resources Board Reactivity Scientific Advisory Board. He was a founding member (since 1998) of the Reactivity Research Working Group, a public/private research coordinating effort involving US EPA, academia, and industry. He is a member (since 1999) of the Research Advisory Committee for the Texas Air Research Center at Lamar University in Beaumont. He is a member (since 2002) of the Science Advisory Committee of the Texas Environmental Research Consortium operated by the Houston Advanced Research Center. He was a member (1995-1997) of the US EPA's FACA Subcommittee for the Implementation of New Standards for Ozone, Particulate Matter (PM), and Regional Haze; he received an Exceptional Leadership Award from the US EPA (1997) as Cochair of Science and Technical Workgroup for this Federal Advisory Committee Act (FACA) Subcommittee.

Kachel, Wayne M.**Mele Associates**

Dr. Wayne M. Kachel is a Senior Environmental Health & Safety Associate with MELE Associates, a consulting firm in the Rockville, MD area. His activities involve developing innovative programs to implement private industry best practices through the U.S. Air Force environmental management program. In particular, he is responsible for creating a strategic plan to achieve environmental compliance through pollution prevention and the elimination of environmental permits, as well as resolving safety and occupational health issues. His current work with the U.S. Air Force focuses on developing and implementing an Oracle-based Environmental Management Information System. He previously was employed with Lockheed Martin Corp. and Exxon Company, USA in Corporate environment, safety and health, as well as environmental compliance. Dr. Kachel has developed zero waste water discharge systems for Exxon, prepared Resource Conservation and Recovery Act (RCRA) permit applications, published a corporate bioremediation guide, and established the American Petroleum Institute's (API's) Land Treatment Technical Task Force. He is the holder of a patented reuse process. He has designed environmental technologies for the synthetic fuels process, and has dealt with numerous ground water issues. He serves on the SAB, having chaired an SAB Subcommittee on developing innovative risk reduction methodology as a part of the Integrated Risk Project, a Subcommittee that reviewed the Agency's Superfund Innovative Technology Evaluation (SITE) Program. He participated in an SAB Subcommittee that reviewed the Agency's Transport and Fate Models, and other efforts, such as the Hazardous Waste Identification Rule (HWIR), as well as aspects of the Clean Air Act Section 812 benefit-cost study. His publications cover topics such as environmental compliance, pollution prevention, cost and risk reduction via compliance through pollution prevention, cost-effective environmental, occupational health and safety management at federal facilities, identification, development and selection of risk reduction options, the fate of hydrocarbons during oily sludge disposal in soil, and waste reuse and recovery in the petroleum refining industry. Dr. Kachel has a Ph.D. and M.S. in Environmental Systems Engineering from Clemson University and a B.S. in Mathematics from Waynesburg College. Dr. Kachel's Ph.D. Dissertation topic was on mathematical modeling of advanced wastewater treatment systems. He is a registered Professional Engineer and Diplomat of the American Academy of Environmental Engineers.

Krupnick, Alan J.

Resources for the Future

Dr. Alan J. Krupnick is a Senior Fellow and Director of the Quality of the Environment Division at Resources for the Future. He is widely published in the areas of cost-benefit analysis and instrument design, with research on such topics as: the value on reduced morbidity and mortality, issues associated with revision of ozone and PM standards, optimal adders for environmental damage by public utilities, social costing of electricity, global warming and urban smog, alternative fuels, the external costs of nuclear power, measuring the effects of urban transportation policies on the environment, weighing environmental uncertainties, the benefits and cost of Superfund cleanups and many other related topics. He has served as Senior Economist in the Council of Economic Advisors (1993-94), consultant to the US Agency for International Development (US AID), World Bank, Health Canada, the European Commission, the Harvard Institute for International Development, the US Congressional Office of Technology Assessment, the University of Missouri, the State of Maryland, the National Commission on Water Quality and other organizations. He has extensive experience in using models for estimating the benefits and costs of environmental policies. He is one of the founders of the Tracking and Analysis Framework (TAF), a series of models based in Analytica which is available on the web. This model uses a damage function approach to estimate the health and other benefits from air emissions reductions. He also has used Analytica to build a model of the benefits of fish advisories for mercury. The paper is available on RFF's website and from the National Oceanic and Atmospheric Administration (NOAA). He has also made much use of the emissions and cost database from Pechan and Associates, tied to TAF, for estimating the benefits and costs of alternative air pollution trading policies. This work has been published in numerous places. He also has been a Principal Investigator (PI) for path breaking work on the development of source-receptor matrices from use of the Georgia Tech air quality model, one of the feeder models to MODELS-3. In addition, he has been a peer reviewer for models of this type, for the European Union (EU), the United Kingdom (UK's) EPA, and most recently, for EPA's BENMAP. Dr. Krupnick has provided expert testimony to the U.S. Congress on implementation and enforcement of the Clean Air Act, the Regulatory Reform Bill in Congress, reforming Superfund risk assessment, cost-effectiveness and cost-benefit analysis and related topics. Dr. Krupnick has been a reviewer for over a dozen journals in the topics of valuation, cost-benefit analysis and related topics. He is currently serving on several Panels organized by the National Academy of Sciences' Transportation Research Board, and has served on many other expert committees, including one from the Royal Society of Canada on the socioeconomic analysis of possible Canada-wide ozone and fine particulate standards. He was also a co-chair of a major EPA-led stakeholder process on implementation of new ozone and fine particulate ambient air quality standards. Dr. Krupnick has his Ph.D and M.A. in Economics from the University of Maryland, and his B.S. in Finance from Pennsylvania State University.

Levin, Leonard

Electric Power Research Institute

Currently: Technical Leader, EPRI; Program Manager, Air Toxics Health & Risk Assessment, EPRI; Mercury Issue Manager, EPRI Education: B.S., MIT in Earth, Atmospheric & Planetary Sciences; M.S., University of Washington in Atmospheric Sciences; Ph.D., University of Maryland in Fluid Dynamics & Applied Mathematics Expertise/research: environmental modeling; air and multimedia quality; human exposure; risk assessment; atmospheric physics and circulation Service: EPA Peer Review Panels: Mercury Study Report to Congress; Mercury Research Strategy. American Chemistry Council, proposal reviews on multimedia studies. U.S. Department of Energy: panel on multimedia modeling for haz waste mitigation; panelist, Valuing Externalities workshop (NETL); curriculum committee, Environmental Management, University of California at Berkeley; president, Society for Risk Analysis, Northern California Recent support: primarily EPRI member base funding; awardee, contract with DOE NETL, competitive bid, Mercury Chemistry in Power Plant Plumes; awardee, competitive bid, State of Wisconsin Focus on Energy

Linkov, Igor

Cambridge Environmental, Inc.

Dr. Linkov is a Senior Scientist with Cambridge Environmental Inc. in Cambridge, MA, and Adjunct Professor of Engineering and Public Policy at Carnegie Mellon University, Pittsburgh, PA. Prior to joining Cambridge Environmental, Dr. Linkov was a Senior Risk Assessor and Team Leader at ICF Consulting, where he conducted environmental risk assessments in support of government and commercial clients. Dr. Linkov has a BS and MSc in Physics and Mathematics (Polytechnic Institute, Russia) and a Ph.D. in Environmental, Occupational and Radiation Health (University of Pittsburgh). He completed his postdoctoral training in Biostatistics and Toxicology and Risk Assessment at Harvard University. He has performed state-of-the-art ecological and human health risk assessments and investigations for environmental threats in both the United States and abroad. Dr. Linkov has developed models and software for fate and transport of environmental contaminants, environmental policy decision support, and also risk assessment. He recently completed modeling efforts which include the Forrest Path (FORESTPATH) model for radionuclide transport in forests, developed for the US Nuclear Regulatory Commission (NRC) and International Atomic Energy Agency (IAEA), and the FISHRAND model for PCB bioaccumulation in fish, used by the EPA for risk assessment in the Hudson River. He currently supports development of the Army Risk Assessment Modeling System (ARAMS), the Risk-Trace model for spatially explicit ecological risk assessment for the American Chemistry Council (ACC), and the Questions and Decision (QnD) model for environmental management for the US Army Corps of Engineers. He has published widely on environmental policy, environmental modeling, and risk analysis, including five books and over 70 peer-reviewed papers and book chapters. Dr. Linkov has organized and directed five international conferences on risk assessment and modeling. He serves as a Scientific Advisor to the Toxic Use Reduction Institute, a position that requires nomination by the Governor of Massachusetts, and he is President of the Society for Risk Analysis (SRA)-New England. He is also the Past Chair of the SRA Ecological Risk Assessment Specialty Group and participates in several SRA and Society for Environmental Toxicology and Chemistry (SETAC) Committees. Additionally, Dr. Linkov has served on many other review and advisory panels for the US and international agencies. Over the last two years, his research has been supported by the US Army, Army Corps of Engineers, US Environmental Protection Agency (EPA), US Department of Transportation (DOT), US Department of Energy (DOE), the National Oceanic and Atmospheric Administration (NOAA), North Atlantic Treaty Organization (NATO), US Chamber of Commerce, American Chemistry Council (ACC), Dow Chemical, Chevron, and private clients.

Maddalena, Randy

Lawrence Berkeley National Laboratory

Dr. Randy L. Maddalena, Ph.D., is a Scientist in the Chemical Exposure and Risk Analysis Group within the Environmental Energy Technologies Division at Lawrence Berkeley National Laboratory. He received his BS in Environmental Toxicology (1992) and his Ph.D. in Agricultural and Environmental Chemistry (1998) from the University of California, Davis. The primary focus of his research is development, evaluation and application of models that predict chemical fate in multiple environmental media (air, water, soil, vegetation, sediment) and chemical exposures through multiple pathways (drinking water, food, feed, indoor air) for both human and ecological receptors. He also develops tools and methods for performing probabilistic risk assessment and sensitivity analysis applied to complex regulatory models. His most recent work combines the use of models and experimental data to investigate how vegetation influences the environmental fate and transport of semivolatile organic pollutants and how the uptake of these pollutants into ecological or agricultural food chains might contribute to dietary exposures. Dr. Maddalena is a Co-Chair of the Society of Environmental Toxicology and Chemistry (SETAC) Advisory Group on Fate and Exposure Modeling where he serves as an Editor of the SETAC Globe's Fate and Exposure Modeling column. He is a member of the SAB's Integrated Human Exposure Committee (IHEC) and has participated in several recent SAB reviews including Ranking Air Toxics Indoors, The Human Health Research Strategy and the Multi-Media, Multi-Pathway, and Multi-Receptor Risk Assessment (3MRA) Model Review Panel. In the last five years, Dr. Maddalena had received funding from the EPA's National Exposure Research Lab. for fate and exposure model development; the DOE's Fossil Energy Program for experimental work on plant uptake of petroleum related hydrocarbons; the DOE's Office of River Protection for a Merit Panel review of the C-Tank Farm Closure Performance Assessment at the Hanford Nuclear Reservation; the EPA's Office of Air Quality Planning and Standards for work on the Total Risk Integrated Methodology (TRIM.FaTE) model; and the EPA's Office of Emergency and Remedial Response for method development related to probabilistic risk assessment.

McKone, Thomas E.**University of California**

Thomas E. McKone is a Senior Staff Scientist and Deputy Department Head at the Lawrence Berkeley National Laboratory and an Adjunct Professor and researcher with the School of Public Health at the University of California, Berkeley. His research interests include the development and use of multimedia exposure models in health-risk assessments, chemical transport and transformation in the environment, and the health and environmental impacts of energy, industrial, and agricultural systems. He is responsible for the development of CalTOX, a model first used by the California Environmental Protection Agency to conduct multimedia risk assessment for hazardous waste and air pollutants. More recently, CalTOX has been used for assessing the behavior of persistent pollutants and for life-cycle impact assessments. In addition to his research and teaching activities with the University of California, Dr. McKone is active in other research, regulatory, and professional organizations. He has been a member of several National Academy of Sciences Committees and served six years on the EPA Science Advisory Board. He is past-president of the International Society of Exposure Analysis (ISEA) and has been on consultant committees for the Organization for Economic Cooperation and Development (OECD), the World Health Organization, the International Atomic Energy Agency, and the Food and Agriculture Organization. He is a member of the Expert Working Group, California Environmental Health Tracking Planning Project and is also currently a member of the Advisory Council of the American Center for Cycle Assessment and a member International Life-Cycle Initiative Panel, a joint effort of the United Nations Environment Program (UNEP) and the Society for Environmental Toxicology and Chemistry (SETAC). Dr. McKone received his M.S. and Ph.D. in engineering from the University of California at Los Angeles.

Merrill, David**Gradient Corp.**

Mr. David Merrill, a Principal at Gradient Corporation, has 15 years of experience in negotiating technically sound and cost effective solutions to environmental contamination problems. His expertise includes directing large-scale, multi-disciplinary risk assessments, multimedia chemical fate and transport modeling, complex data analysis, and database design for systems such as landfills, lagoons, chemical plants, Manufactured Gas Plants (MGPs), river systems, and groundwater contaminant plumes. With his extensive risk assessment experience and strong engineering background, he has negotiated risk-based cleanup levels and remedial strategies, interpreted complex site investigation data into effective conceptual site models, and evaluated many types of contaminant transport conditions, including multimedia transport in water, sediments, and air. He has worked extensively with Polychlorinated Bi-Phenyls (PCBs), solvents, metals and Non-Aqueous Phase Liquids (NAPLs) and has served as an expert on cases involving Potentially Responsible Party (PRP) cost allocation disputes. Mr. Merrill has prepared technical comments on behalf of industry and trade organizations on Agency regulations including the PCB Megarule and multimedia modeling and risk assessment aspects of the Land Disposal Rule (LDR) and the Hazardous Waste Identification Rules (HWIR). All of Mr. Merrill's professional work is performed for Gradient. Gradient's client base includes Fortune 500 companies, law firms, trade associations, and to a lesser extent state and local municipalities and regulatory agencies. Over the last two years Mr. Merrill's clients have included law firms representing individual companies and PRP groups, trade associations, chemical companies, natural gas pipeline and oil companies, energy generation companies, and the U.S. EPA. Mr. Merrill received his B.S. in Soil and Water Science from the University of California at Davis, and his M.S. in Agricultural Engineering (Civil/Environmental Engineering focus) from Cornell University where he also completed the course work and qualifying exams toward a doctorate degree.

Middleton, Paulette

Panorama Pathways

Dr. Middleton has 30 years experience leading air quality programs that inform air quality policy using air quality and related assessment tools. For example, she developed and applied a number of urban aerosol dynamics models, was a leader on the modeling team that created the Regional Acid Deposition Model (RADM), extended RADM to include aerosol dynamics -- DAQM (Denver Air Quality Model) and applied DAQM to studies of visibility in the Front Range of Colorado, led the development and application of the integrated assessment of scenarios (i.e., linking air quality to economic, environmental and social impacts and driving forces using a variety of modeling approaches) for visibility protection in the Western US as the cornerstone of the Grand Canyon Visibility Transport Commission efforts, created and applied a Visibility Assessment Screening Technique to illustrate differences in visibility changes resulting from SO₂ and NO_x emission reductions in different areas of the US, modified and applied ICST and related models to explore the impacts of chemical by-products in the vicinity of point sources, led the design of integrated analysis systems applied to air quality and climate related problems, lead author of air quality modeling and application reviews, and has been serving as an expert advisor to a number of programs using integrated modeling systems as well as individual air quality models. Dr. Middleton's previous EPA Science Advisory Board service includes: Chair of the Air Quality Modeling Subcommittee (AQMS) evaluating EPA's assessment of the benefits and costs of the Clean Air Act; Member of the Environmental Modeling Committee responsible for the recent review of the National Air Toxics Assessment, which included an evaluation of mercury and toxic VOC risk assessment; Member of the Research Strategy Advisory Committee, which provided direction to EPA on critical research needs; Member of the Clean Air Science Advisory Committee during its review of the current ozone and fine particulate matter standards; and Member of the Environmental Futures Subcommittee developing guidelines for EPA foresight. Dr. Middleton has been director of the NSF and NASA funded Global Emissions Inventory Activity (GEIA) Center, located at <http://geiacenter.org/>, since GEIA's inception in 1990. Currently, she is a Special Advisor, providing advice on adequacy of air quality modeling and developing issue papers to help inform policy for several organizations, including Environmental Defense, Western Resource Associates, Yellowstone Coalition, Northern Cheyenne Indian tribe, EPA Region 8, Colorado Department of Public Health & the Environment; U.S. Department of Justice; and State of New Jersey, Division of Law. Previously she held research, program development and leadership/executive positions at the National Center for Atmospheric Research, Atmospheric Sciences Research Center at the State University of New York at Albany, Science & Policy Associates, and RAND. In 2002, she created Panorama Pathways, <http://panoramapathways.net>. She has developed and applied a variety of air quality models, has over 100 publications, most of which are peer-reviewed, and has led a number of programs using air quality modeling to improve policymaking.

Milford, Jana

University of Colorado

Dr. Jana Milford is employed part time as Associate Professor in the Department of Mechanical Engineering at the University of Colorado at Boulder and part time as a senior scientist with the nonprofit organization Environmental Defense. Her expertise includes urban and regional scale photochemical air quality modeling, atmospheric chemistry, development and application of uncertainty analysis and parameter estimation techniques for photochemical air quality models, receptor modeling and air pollution policy and management. Her current research projects involve development of an expanded secondary organic aerosol module for the Community Model for Air Quality (CMAQ) and application and evaluation of receptor models including Positive Matrix Factorization (PMF), to personal exposure measurements for particulate air pollution. Dr. Milford recently served on the National Academy of Sciences committee on Air Quality Management in the United States. She is a member of the editorial advisory board for Environmental Science and Technology and has served as a consultant to four committees of the EPA Science Advisory Board. Her work with the SAB has included reviews of EPA's Total Risk Integrated Methodology (TRIM) and Generation II (GENII) modeling systems. Dr. Milford recently coauthored a textbook entitled "Integrated Environmental Modeling: Pollutant Transport, Fate and Risk in the Environment," which is currently in press. Dr. Milford has a B.S. in Engineering Science from Iowa State University, an M.S. in Civil Engineering and a Ph.D. in Engineering and Public Policy from Carnegie Mellon University, and a J.D. from the University of Colorado School of Law. Dr. Milford has received research funding from the U.S. Environmental Protection Agency, the National Science Foundation, the California Air Resources Board, the Electric Power Research Institute, the Auto-Oil Air Quality Improvement Research Program, EG&G Rocky Flats, the Phillip Morris Foundation, the National Aeronautics and Space Administration and the National Renewable Energy Laboratory.

Murarka, Ishwar

ISH Inc.

Dr. Ishwar P. Murarka currently is Chief Scientist and President of Ish Inc. – a minority owned environmental consulting business. He holds a position of visiting research associate at the University of Illinois in Chicago. Dr. Murarka holds a Ph.D. in Soil Science and Statistics (1971) and an MBA in Management Science (1974). His areas of expertise and research activities include Environmental Science and Technology topics pertaining to: management of solid and liquid wastes, characterization and Assessment of contaminated sites, in-situ Treatment Technologies (e.g. Chemical oxidation), and remediation and restoration of impacted land, groundwater, and sediments. His research activities cover transport, transformation, and fate of metals and organic compounds in the land and water environments. He has served on other advisory committees, professional societies, especially those associated with issues under discussion in this review. He serves on the External Advisory Committee of the Institute for Environmental Science & Policy for University of Illinois in Chicago. He serves as a Peer Reviewer on Mercury Studies for EPA. He continues to be a consultant for the EPA Science Advisory Board. He also is involved in a US Expert Panel for a US Agency for International development (USAID) project in India. Dr. Murarka has been involved in modeling activities with the US EPA SAB for some time. He was involved with the SAB's Environmental Engineering Committee (EEC) as a member and also as Chair of the EEC, in a wide variety of modeling issues since 1990. He served as Chair of the Environmental Modeling Subcommittee (EMS) of the SAB's Executive Committee. He Co-Chaired the Hazardous Waste Identification Rule (HWIR) with the Environmental Processes and Effects Committee (EPEC) of the SAB. He was involved in Total Risk Integrated Methodology (TRIM), the Council for Regulatory Environmental Modeling (CREM) Charter, Model Use Acceptability Criteria, and most recently as a member of the Multi-Media, Multi-Pathway, and Multi-Receptor Risk Assessment (3MRA) Review Panel. Dr. Murarka's sources of recent grant and/or contract support include research grant funding from the U.S. Department of Energy Combustion ByProducts Research Consortium (USDOE/CBRC), the Electric Power Research Institute (EPRI), Gas Technology Institute (GTI), and the New York Gas Group (NYGAS). He also receives contract support on projects involving characterization and remediation of contaminated sites from various utility companies (e.g., Duke Energy, New York State Electric & Gas (NYSEG), Rochester Gas & Electric (RG&E), Consumers Energy, Georgia Power, We Energy, First Energy, NISOURCE, SCANA and others).

Nicolich, Mark

ExxonMobil Biomedical Sciences, Inc.

Mark Nicolich is the ExxonMobil Biomedical Sciences, Inc. (EMBSI) site biostatistician where he develops and applies statistical methods in the areas of epidemiology, toxicology (including analysis of laboratory studies), environmental science, industrial hygiene, and human factors. He has been associated with EMBSI for about 20 years. He has a Bachelor of Mechanical Engineering from Rensselaer Polytechnic Institute, an MS from Rensselaer Polytechnic Institute in Engineering Science (mathematics), and an MS and PhD in Statistics from Rutgers University where he was a NDEA and NSF Fellow. He taught statistics at the university level at Rutgers University, the University of Medicine and Dentistry of New Jersey, and Rider University. After leaving academia he was a statistical consultant in private practice for 12 years. His areas of interest are model building and fitting, interpretation of data, and general application of basic statistics including multivariate analysis, experimental design, and time series analysis. He is familiar with and uses current statistical techniques such as general additive models, mixed effects models, Bayesian analysis techniques, and robust methods. His doctoral thesis was titled "A Nonlinear Urban Air Pollution Model: Development and Statistical Evaluation Based on the Gaussian Plume Model with Nonuniform Area Source." He is currently active in the model building and evaluation of the various areas particulate matter (PM) research, low dose extrapolation modeling, and the initiative to reduce the number of animals used in laboratory testing. He is part of the evaluation and testing group for the EPA Benchmark Dose Program, and was an evaluator of several commercial scientific computer programs such as ToxTools and Mathad

Nordhaus, William

Yale University

Dr. William D. Nordhaus is Sterling Professor of Economics at Yale University, New Haven, Connecticut, USA. He completed his undergraduate work at Yale University and received his Ph.D. in Economics in 1967 from the Massachusetts Institute of Technology, Cambridge, USA. He has been on the faculty of Yale University since 1967 and has been Full Professor of Economics since 1973. He is a member of the National Academy of Sciences and a fellow of the American Academy of Arts and Sciences. He is on the research staff of the Cowles Foundation and of the National Bureau of Economic Research and has been a member and senior advisor of the Brookings Panel on Economic Activity, Washington, DC since 1972. Professor Nordhaus is current or past editor of several scientific journals and has served on the Executive Committees of the American Economic Association and the Eastern Economic Association. He serves on the Congressional Budget Office Panel of Economic Experts and is Chairman of the Advisory Committee for the Bureau of Economic Analysis. He is the Chairman of the newly formed American Economic Association Committee on Federal Statistics. From 1977 to 1979, he was a Member of the President's Council of Economic Advisers. From 1986 to 1988, he serves as the Provost of Yale University, and from 1992 to 1993, he was Vice President for Finance and Administration at Yale. He has served on several committees of the National Academy of Sciences (NAS) including the Committee on Nuclear and Alternative Energy Systems, the panel on Policy Implications of Greenhouse Warming, the Committee on National Statistics, the Committee on Data and Research on Illegal Drugs, and the Committee on the Implications for Science and Society of Abrupt Climate Change. He recently chaired a Panel of the NAS; this committee produced a report, Nature's Numbers, which recommended approaches to integrate environmental and other non-market activity into the national economic accounts. More recently, he has directed the Yale Project on Non-Market Accounting, supported by the Glaser Foundation. He is the author of many books, among them *Invention, Growth and Welfare, Is Growth Obsolete?*, *The Efficient use of Energy Resources*, *Reforming Federal Regulations*, *Managing the Global Commons*, *Warming the World*, and (joint with Paul Samuelson), the classic textbook, *Economics*, whose eighteenth edition will be published in the fall of 2004. His research has focused on economic growth and natural resources, as well as the question of the extent to which resources constrain economic growth. Since the 1970's, he has developed economic approaches to global warming, including the construction of integrated economic and scientific models (the Dynamic Integrated Climate-Economy (DICE) and Regional Integrated Model of Climate and the Economy (RICE) models) to determine the efficient path for coping with climate change. Professor Nordhaus has also studied wage and price behavior, augmented national accounting, the political business cycle, productivity, the costs and benefits of regulation, and the "new economy." His 1996 study of the economic history of lighting back to Babylonian times found that the measurement of long-term economic growth has been significantly underestimated. He returned to Mesopotamian economics with a study in 2002 of the costs of a war in Iraq.

O'Melia, Charles

Johns Hopkins University

Dr. Charles R. O'Melia is the Abel Wolman Professor of Environmental Engineering in the Department of geography and Environmental Engineering at The Johns Hopkins University in Baltimore, Maryland. He received his B.C.E. (1955) from Manhattan College and his M.S.E. (1956) and Ph.D. in Sanitary Engineering from the University of Michigan in Ann Arbor. He was employed by Hazen and Sawyer, Engineers in 1956-57. From 1961 to 1964 he served as Assistant Professor of Sanitary Engineering at the Georgia Institute of technology. In 1964-66 he was a postdoctoral fellow and lecturer in water chemistry at Harvard University. He joined the University of North Carolina (UNC) at Chapel Hill in 1966 as Associate Professor and became Professor in 1970. From 1977 to 1980 he served as Deputy Chairman of the Department of Environmental Sciences and Engineering at UNC. In 1973-74 he was visiting Professor of Environmental Engineering Science at the California Institute of Technology while on sabbatical leave. He assumed the position of Professor of Environmental Engineering at Johns Hopkins in 1980 and was Department Chairman from 1990 to 1995. In 1988-89 and again in 1996 while on sabbatical leaves he was Guest Professor at Swiss Federal Institute of Technology (ETH)-Zurich with the Swiss Federal Institute for Environmental Science and Technology (EAWAG). Dr. O'Melia was elected to the National Academy of Engineering in 1989. In 2000 he was awarded the Clarke Prize for excellence in water science and technology. He has received the 1965 and 1985 Publications Awards, the 1989 Research Division Best Paper Award and the 1990 A.P. Black Research Award from the American Water Works Association, the 1969 Award of the American Society of Civil Engineers for the Application of Research to Practice, the 1972 Distinguished Faculty Award, the 1975 Environmental Science Award, the 1988 and 1996 CH2M-Hill Awards, the 1984, 1991 and 2002 Outstanding Paper Awards, the 1995 Founders Award, and was selected as the 1982 Distinguished Lecturer of the Association of Environmental Engineering Professors. He was twice given the Best Lecturer Award by the engineering students in his department while at the University of North Carolina. In 1985 he was selected to present the American Society of Civil Engineers (ASCE) Simon W. Freese Lecture and in 2004 he received the American Society of Civil Engineers (ASCE) EMMC Award for Achievement in Environmental Engineering Education. He received the International Association of Water Pollution Research Congress (IAWPRC - now known as the International Water Association, IAW)-Pergammon Publications medal in 1988 and the Gordon Maskew Fair medal for Environmental Education from the Water Environment Federation (WEF) in 1993. In 2000 he received the Engineering Alumni Society Merit Award from the University of Michigan. He is a member of National Academy of Engineering (NAE), American Society of Civil Engineers (ASCE), American Chemical Society (ACS), American Academy of Environmental Engineers (AAEE), American Water Works Association (AWWA), Water Pollution Control Federation (WPCF - now known as the Water Environment Federation, WEF), American Society of Limnology and Oceanography (ASLO), Association of Environmental Engineering Professors (AEEP - now known as the Association of Environmental Engineering and Science Professors, AEESP), Tau Beta Pi, Chi Epsilon, and Sigma Xi. He has served as Director, Vice President, and President of the Association of Environmental Engineering Professors. Dr. O'Melia's research interests are in water and wastewater aquatic colloid chemistry, and modeling of natural and subsurface waters.

Roland-Holst, David

University of California

Dr. David Roland-Holst is the James Irvine Professor of Economics at Mills College and Director of the Rural Development Research Consortium at the University of California, Berkeley. Dr. Roland-Holst is one of the world's leading authorities on empirical policy modeling, computable general equilibrium (CGE) models and social accounting matrices. He has extensive research experience on environment, economic development, and international trade. Professor Roland-Holst has served in several academic posts in Europe and the U.S. He also worked with public institutions including a variety of Federal and state agencies, the Asian Development bank, Inter-American Development Bank, Organization for Economic Cooperation and Development (OECD), World Bank, and the United Nations, as well as governments in Asia, Latin America, Europe and the U.S. Professor Roland-Holst holds a Ph.D. from the University of California Berkeley and is a US citizen. Dr. Roland-Holst has undertaken applied research in over 25 countries, and constructed empirical policy models of more than twenty national and regional economies, and has authored three books, and over 80 journal articles and chapters in books. During the early 1990's, he supervised the development and implementation of the OECD's GeneRal Equilibrium ENvironmental (GREEN) model, and has constructed environmental models of several developing countries (including China, Indonesia, Vietnam, Mexico, and Chile) since then. During the last five years, Dr. Roland-Holst has received funding from three international organizations, the Asian Development Bank, World Bank, United Nations Food and Agriculture Organization (FAO), and United Nations Industrial Development Organization (UNIDO), for his work on sustainable development and environment in China and other countries. During the same period, he has worked with Danish government funding on economic growth, environment, and poverty in Vietnam. Finally, for the past two years, Dr. Roland-Holst has led a project to develop a detailed environment-economy model for California, funded by the California Energy Commission.

Smith, Douglas

ENSR International

Dr. Douglas G. Smith, Sc.D. currently serves as Principal Environmental Health Scientist in the Risk Assessment Department of ENSR International, an environmental consulting company with a total of 70 worldwide offices. Dr. Smith's academic background includes a BA in Physics from Franklin and Marshall College and an MS and Sc.D. in Environmental Health Sciences from Harvard University School of Public Health. His specialties in environmental health sciences include air pollution transport and risk analysis, radiological health, as well as chemical process safety and related emergency preparedness assessment and planning. Dr. Smith has more than 25 years experience as an environmental risk assessment and risk management consultant. Early in his career he worked as a researcher in the Harvard Air Cleaning Laboratory working on detection methods for trace levels of rare gases in the atmosphere. His subsequent service in the U.S. Public Health Service Bureau of Radiological Health involved research on the dispersion of radioactive gases from reprocessing nuclear fuels, and the comparison of field test data with the early versions of the Pasquill/Gifford/Turner atmospheric dispersion models that were being applied for chemical pollutants by the newly formed US EPA. After completing a thesis related to micro scale atmospheric dispersion near buildings, in 1974 he joined Environmental Research and Technology (ERT, now ENSR) to work on the development and verification testing of new versions of air transport models, such as the Egan-Mahoney 2-dimensional grid advection diffusion model (EGAMA) for automotive and aircraft sources, including a custom model for dispersion of the Concorde's emissions at Dulles Airport. For later mobile source permitting projects EGAMA use was replaced by CALINE (California Line Source model). For power plants, his experience with application and sensitivity testing of ERT's MPSDM-6 (Multiple Point Source Dispersion Model 6), and the addition of its building-wake submodel, led to his own team's development of NPSDM (Nuclear Plant Source Dispersion Model) for site safety analysis, plus a customized EGAMA-like model: SEABREEZE (Sea Breeze Model), which was accepted by the Nuclear Regulatory Commission for use at the Pilgrim Nuclear Plant site - - based on successful comparison with site and near-site data. Subsequently, in the 1980's, Dr. Smith led a privately funded field verification study of the Industrial Source Code (ISC) model with a team that performed dual-tracer releases from 500-ft and 1000-ft stacks (with aerial and ground-level sampling) for an Ohio Edison power plant on the Ohio River. In the mid-80's and 90's he turned to model development and applications needed for assessing risks near chemical plants and incinerators. He led a team in developing HASTE (Hazard Assessment System for Toxic Emissions), a real-time accidental chemical and spill modeling system that incorporated AIRTOX (Air Toxicity exposure model), an ENSR model accepted by EPA and several individual states as an accepted alternative to the RMP*COMP (Risk Management Plan Computation) model available from EPA. Although original development funding was provided by ENSR, HASTE was sold as a package system to several large chemical, manufacturing, and oil companies to be used primarily for training and preparedness planning. Dr. Smith has authored more than 25 publications and technical presentations on air and multipathway model application to hazardous air pollutant issues, accidental release assessment and risk communication. Although his consulting work has historically included applied R&D projects for state and federal agencies, but over the last fifteen years has primarily been providing clients in chemical, pharmaceutical, paper, food, and energy production industries with practical advice of the functional, regulatory, and training requirements for their short-term and long-term risk management programs, particularly the incineration of hazardous waste materials to minimize environmental impacts. Current research activities have been limited to those supported by ENSR's internal R&D, with occasional cooperative programs funded by industry trade organizations (such as the Electric Power Research Institute, the Louisiana Chemical Association, the American Chemistry Council), but none are currently active. Dr. Smith's experience on practical model application includes critical analyses (circa 1995-6) of the role/form of submodels for dioxin deposition used with ISCST3 (Industrial Source Code Short-Term 3) and its interim (draft) predecessor ISCSTDFT (industrial Source Code Draft), and in the application with these models to a set of associated fate and exposure and risk models at more than a dozen sites. Dr. Smith served on a peer review panel in 2000 for the U.S. EPA's review of their "Combustor Risk Assessment" guidance. In 2003 he was appointed to serve on the SAB panel reviewing the Multi-Media, Multi-Pathway, and Multi-receptor Risk Assessment (3MRA) Modeling System. The 3MRA System includes ISCST3 and a similar set of models and statistical tools designed to help EPA assess on a national basis the benefits from alternative risk management practices for classification, storage and disposal of RCRA-regulated materials. His work on that SAB panel has now essentially concluded, as the final report is proceeding through the SAB and EPA administrative review process.

Smith, James H.

Texas Commission on Environmental Quality

Dr. James H. Smith is the lead photochemical modeler in Texas Commission on Environmental Quality, and the state expert on all modeling activities, including management for State Implementation Plan (SIP) activities for the Houston/Galveston/Brazoria ozone nonattainment area in Southeastern Texas. He is responsible for coordinating all phases of modeling for demonstrating compliance with federal clean air standards in the area, including development of modeling protocols, conceptual models, modeling inventories, model performance evaluation, evaluation and interpretation of model results, and documentation. Dr. Smith is recognized and consulted at a global level in the area of photochemical modeling and air quality research in general, including atmospheric transport, transformation and removal, sensitivity analysis, exposure assessment, decision analysis, computer sciences, spatial modeling, statistics, and quality assurance procedures. As one of the top modeling experts in the country, he frequently presents his findings to national audiences at the highest levels of technical expertise, as well as to the general public and government officials. In support of SIP development activities, Dr. Smith is also involved with modeling analyses conducted for the Beaumont/Port Arthur and Dallas/Fort Worth ozone nonattainment areas. Recently, he coordinated the incorporation of the 2000 Texas Air Quality Study analysis into modeling for the Texas Gulf coast area. Dr. Smith has very broad-based experience in regulatory modeling. With a Ph.D. in Mathematics, and focus on statistics, he began his career with the Texas air program in 1992 performing a variety of programming and analytical tasks. Besides running the Urban Airshed Model, Dr. Smith developed emissions input data for Area, Nonroad Mobile, Onroad Mobile, Point, and Biogenic sources for the state of Texas and the entire modeling domain, which extends to the eastern half of the country. He was instrumental in launching the Texas air program on a path of developing the most advanced modeling inventory in use in any regulatory application in the world. Dr. Smith also developed sophisticated graphical tools to quality assure model input and output, and to present results in a clear and concise manner. In his twelve years with the Texas air program, Dr. Smith has acquired considerable experience in personnel management, contract administration, budgeting, and project management. Prior to working for the State of Texas, Dr. Smith worked for three years at the Johnson Space Center developing automated remote sensing systems for agricultural applications, then for seven years at a software company developing, coding, and supporting a commercially marketed modeling system for mainframe computer system capacity management. Dr. Smith has authored or co-authored over twenty journal articles or significant conference presentations and hundreds of presentations for smaller groups such as local Air & Waste Management Association meetings, user group meetings, EPA workshops, and stakeholder groups. He has authored and/or edited substantial portions of twelve major revisions of the Texas State Implementation Plan. Dr. Smith has twice been honored as an Employee of the Year, and twice as a Team of the Year member by the Texas Commission on Environmental Quality. He is a member of the Air & Waste Management Association. As a member of the Texas Commission on Environmental Quality's Science Coordinating Committee for Air Research, Dr. Smith has been one of the primary advocates for application of federal and state grants for the advancement of air research, that on an annual basis typically exceed \$5M. He also participates in the assessment phase of projects selection for various research institutions in the Texas, and has been the technical manager for various subcontracted air research projects by the Technical Commission on Environmental Quality.

Theis, Thomas

University of Illinois at Chicago

Professor Thomas L. Theis is Director of the Institute for Environmental Science and Policy at the University of Illinois - Chicago (UIC), a center that focuses on the development of new cross-disciplinary research initiatives in the environmental area. He was most recently at Clarkson University, where he was the Bayard D. Clarkson Professor and Director of the Center for Environmental Management. Professor Theis received his doctoral degree in environmental engineering, with a specialization in environmental chemistry, from the University of Notre Dame. Professor Theis' areas of expertise include the mathematical modeling and systems analysis of environmental processes, the environmental chemistry of trace organic and inorganic substances, interfacial reactions, subsurface contaminant transport, hazardous waste management, industrial pollution prevention, and industrial ecology. He has been principal or co-principal investigator on over fifty funded research projects totaling in excess of eight million dollars, and has authored or co-authored over one hundred papers in peer reviewed research journals, books, and reports. He is a member of the US EPA Science Advisory Board, and has been involved in a number of modeling-related reviews, including Model Use Acceptability Criteria, Total Risk Integrated Methodology (TRIM), and his most recent activity as Chair of the Multi-Media, Multi-Pathway and Multi-Receptor Risk Assessment (3MRA) Panel of the SAB, as well as other modeling related activities. He is past editor of the Journal of Environmental Engineering and has served on the editorial boards of The Journal of Contaminant Transport, and Issues in Environmental Science and Technology. From 1980-1985 he was the co-director of the Industrial Waste Elimination Research Center (a collaboration of Illinois Institute of Technology and University of Notre Dame), one of the first Centers of Excellence established by the USEPA. In 1989 he was an invited participant on the United Nations' Scientific Committee on Problems in the Environment (SCOPE) Workshop on Groundwater Contamination, and in 1998 he was invited to by the World Bank to assist in the development of the first environmental engineering program in Argentina. He is Principal Investigator of the Environmental Manufacturing Management Program, one of the Integrative Graduate Education Research and Training (IGERT) grants of the National Science Foundation, which involves research on industrial pollution prevention problems emphasizing a systems approach. In 2002, he became the first permanent director of the UIC Institute for Environmental Science and Policy, a cross-disciplinary unit dedicated to promoting collaborative research on the environment.

Whelan, Gene

Washington State University

Dr. Gene Whelan is Chief Engineer, Natural Resources Division, Pacific Northwest National Laboratory (PNNL) and Adjunct Assistant Professor, with a joint appointment in the Civil and Environmental Engineering Department and Environmental Sciences Department of Washington State University in Richland, WA. He holds a PhD in Civil and Environmental Engineering (Environmental Emphasis, Soil Chemistry Minor at Utah State University, 1992); Graduate Courses in Civil Engineering (Colorado State University, 1981 & 1982); MS in Mechanics and Hydraulics (Iowa Institute of Hydraulic Research, University of Iowa, 1980); BS in Civil Engineering (Pennsylvania State University, 1977); Undergraduate classes in Civil Engineering (University of Massachusetts, Transferred 1974). Dr. Whelan has over 25 years experience in all aspects associated with hazardous waste site assessments and evaluations. He has managed and been the Principal Investigator on over \$8M worth of contract research. During the first 10 years, Dr. Whelan investigated and developed computer-based multimedia (i.e., intermedia) contaminant migration and fate methodologies. Initially, he specialized in overland and instream fluid mechanics, hydraulics, and sedimentation engineering and eventually expanded into the area of multimedia contaminant transport and exposure/risk assessments. While at the Iowa Institute of Hydraulic Research, University of Iowa, he investigated overland water runoff and sediment erosion through numerical modeling. He is a principal researcher in the development of several multimedia environmental exposure assessment methodologies. He has been the lead researcher in applying these methodologies at numerous Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) sites and on a number of Federal activities associated with the National Environmental Protection Act (NEPA) and CERCLA. He has developed, co-developed, and reviewed many models pertaining to the movement of flow, sediment (where applicable), and contaminants in overland, instream, and subsurface environments. These models have ranged from simple analytical models to simple mixing-tank models to complex finite difference/element contaminant transport models. For four of the 25 years, he focused his efforts on new and innovative treatment technologies for remediating hazardous waste sites contaminated with organics. For example, he used the principles of natural humification to polymerize, and possibly immobilize and detoxify, recalcitrant organics through abiotic catalysis. He also initiated the development of a computer-based methodology that is being developed to help analysts determine the most appropriate remedial alternatives for cleaning-up hazardous waste sites. Dr. Whelan is involved with a number of conferences and committees. A selected list of activities includes the following: International Scientific Advisory Committee, and Symposium Organizer/Chairman, Multimedia Modeling and Assessment Symposium, 2nd International Conference on Prevention, Assessment, Rehabilitation and Development of Brownfield Sites, Cadiz, Spain, September 2-4, 2002, and Siena, Italy, June 14-16, 2004; Invited Lecturer to the NATO Advanced Study Institute on Risk Assessment Activities for the Cold War Facilities and Environmental Legacies, Bourgas, Bulgaria, May 2-11, 2000. Chairman/Organizer of the Environmental Software Systems Compatibility and Linkage Workshop, located at the U.S. Nuclear Regulatory Commission Headquarters, Rockville, Maryland, USA, March 6-10, 2000; Invited International Atomic Energy Agency Panel Member on Comparative Assessment of Health and Environmental Effects of Waste from Different Energy System Fuel Chains, Vienna, Austria, 1997-2000; Invited Lecturer and Panel Member for the U.S. Nuclear Regulatory Commission Groundwater Modeling Related to Dose Assessment, 1999; Invited Lecturer and Panel Member for the U.S. Nuclear Regulatory Commission Review of Dose Modeling Methods for Demonstration of Compliance with the Radiological Criteria for License, 1998; American Nuclear Society Session Chairman for Pathway Model Assessment, Conference on Risk-Based Performance Assessment and Decision Making, Pasco, Washington, April 5-8, 1998; Technical Peer-Review Panel Member for the Nevada Risk Assessment Management Program (NRAMP) Phases I & II, 1996-1997; Co-Chairman of the International Conference for Integrated Risk Assessment in Areas Subject to Pollution: Modern Technologies for Data Preparation (MTDP) for Decision Making to Reduce Risks to Populations and Nature. Moscow, Russia. June 19-23, 1995; 1993 Federal Laboratory Consortium Award for Excellence; Full member of both the American Chemical Society and American Society of Civil Engineers. Dr. Whelan's recent funding includes the following selected list: 2001-2004, Technical Support (several contracts) for the Development of Army Risk Assessment Modeling System (U.S. Army Corps of Engineers, Engineer Research and Development Center (formerly Waterways Experiment Station), Vicksburg, Mississippi, \$1.2M); 2003-2004, FRAMES-3MRA Software Technical Support for Sensitivity/Uncertainty (U.S. Environmental Protection Agency, EPA-Athens Environmental Laboratory, Office of Research and Development, Athens, Georgia, \$104K); 2002-2003, Technology Support (several contracts) for FRAMES-3MRA (HWIR), (U.S. Environmental Protection Agency, EPA-Athens Environmental Laboratory, Office of Research and Development, Athens, Georgia, \$200K); 2001-2003, Development of EPA's GENII Pathway Model, FRAMES-2.0 Standard Automated Testing Protocol, and Multimedia Modeling Support (U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Washington, DC, \$137K); 2002-2004, FRAMES Software Development and

Linkages to GMS, (U.S. Nuclear Regulatory Commission, Rockville, Maryland, \$469K); 2001-2002, Italian Performance Assessment of Repository Sites, (Italian National Agency for New Technology, Energy, and the Environment, Rome, Italy, \$125K); 2001-2002, Design of the Comprehensive Chemical Exposure Framework (American Chemistry Council, Arlington, Virginia, \$175K).

Wilcoxon, Peter**Syracuse University**

Peter J. Wilcoxon is an Associate Professor in the Departments of Economics and Public Administration at Syracuse University's Maxwell School, and he is also a Nonresident Senior Fellow at the Brookings Institution. He received his BA in physics from the University of Colorado and his AM and PhD in economics from Harvard University. Dr. Wilcoxon's principal area of research is the effect of environmental and energy policies on economic growth, international trade, and the performance of individual industries. His work often involves the design, construction and use of large-scale intertemporal general equilibrium models. He is coauthor of the Jorgenson-Wilcoxon Model, a thirty-five-sector econometric general equilibrium model of the US economy that has been used to study a wide range of environmental, energy and tax policies. He is also coauthor of G-Cubed, an eight-region, twelve-sector general equilibrium model of the world economy, that has been used to study international trade and environmental policies. In addition, he is a coauthor of a graduate-level textbook on general equilibrium modeling. Many of his recent publications have focused on national and international policies to control climate change. Dr. Wilcoxon's past positions include: Associate Professor of Economics, the University of Texas at Austin; Assistant Professor of Economics, the University of Texas at Austin; Visiting Fellow, the Brookings Institution; Visiting Scholar, Harvard University, and Senior Research Fellow, the University of Melbourne in Australia. His research has been funded by the Environmental Protection Agency, the Department of Energy, the US Geological Survey and the National Science Foundation.

Zaleski, Rosemary**Exxon Mobil Biomedical Sciences, Inc.**

Ms. Zaleski is a Scientific Associate at Exxon Mobil Biomedical Sciences, Inc. (EMBSI), with 14 years experience in environmental fate and effects and exposure assessment, including multimedia and exposure modeling. She earned a M.S. in Environmental Sciences from Rutgers and a B.A. in Biochemistry from Cook College, and is completing a PhD in Environmental Sciences from Rutgers. Her current principal responsibilities at EMBSI lie in exposure assessment, where she is manager of EMBSI's Exposure Sciences programs. Ms. Zaleski contributed as a reviewer to the development of the Organization for Economic Cooperation and Development (OECD) Research and Demonstration (R&D) Tools database on environmental and exposure models. She is an invited member of the international Steering Committee of ExpoFacts, a project to develop an exposure factors database for European populations. She contributed to development of the general exposure resources on the Alliance for Chemical Awareness (ACA) website, including co-leading development of an ecological exposure framework. She is chairing a session on key elements of exposure estimation and modeling for the upcoming ACA/ EPA/American Industrial Hygiene Association Workshop on Chemical Exposure Assessment and Modeling. Ms. Zaleski has expertise in children's exposure assessment, serving as an expert panelist at the EPA/American Chemistry Council (ACC) Voluntary Children's Chemical Evaluation Program (VCCEP) workshop in December 2001, and as an invited speaker at the ACC VCCEP Sponsor Workshop in April 2002, and authored the exposure section of a recent VCCEP submission. She participated in reviews of beta versions of Exposure and Fate Assessment Screening Tool (E-FAST) Wildlife Contaminant Exposure Exposure Model (WCEM), and the Persistence, Bioaccumulation and Toxicity (PBT) Profiler. Other modeling experience includes application of: Probabilistic Methodology for Improving Solvent Exposure Assessment (PROMISE), Multi-Chamber Concentration and Exposure Model (MCCEM), Cumulative and Aggregate Risk Evaluation System (CARES), Estimation and Assessment of Substance Exposure (EASE), Estimations Programs Interface for Windows (EPIWIN) suite of programs, Equilibrium Criterion Concentration (EQC), and Areal Locations of Hazardous Atmospheres (ALOHA). Relevant experience also includes Quality Assurance and Quality Control (QA/QC) and air quality science.