

**Invitation for Comments on the “Short List” Candidates for the
EPA Science Advisory Board (SAB)
SAB *Ad Hoc* All-Ages Lead Model (AALM) Review Panel
EPA Science Advisory Board (SAB) Staff Office**

The EPA Science Advisory Board (SAB) Staff Office is forming the **SAB *Ad Hoc* All-Ages Lead Model (AALM) Review Panel** (“Panel”). This *ad hoc* panel will provide advice and recommendations to the EPA Administrator, via the chartered SAB, on the AALM, which was recently developed by EPA’s National Center for Environmental Assessment, Research Triangle Park, NC (NCEA-RTP). The *ad hoc* panel will be chaired by a member of the SAB, and other SAB members may serve on the panel as well.

Nominations for technical experts for this *ad hoc* panel were requested in the *Federal Register* (70 FR 9642) on February 28, 2005. Information on the panel and the nomination process is found in the above-referenced *Federal Register* notice and on the SAB Web site at: http://www.epa.gov/sab/panels/ad_hoc_aalm_rev_panel.htm. Pursuant to the *Federal Register* notice, national and international experts were sought in one or more of the following six (6) areas:

- (1) **Lead Exposure Pathway Assessment**. Expertise in the physical and chemical properties of lead and the biogeochemical processes involved in the multimedia pathways leading to human exposure to lead. These pathways should include:
 - (a) air (both direct inhalation and deposition to surfaces likely to be contacted by humans);
 - (b) drinking water (from typical sources, including municipal distribution systems, commercially bottled water, public drinking water systems, and private wells);
 - (c) food (including commercial supermarket sources, home gardens and recreational and subsistence fishing/hunting); and
 - (d) soil/dust ingestion.
- (2) **Lead Uptake/Absorption**. Expertise in the process of the human uptake and/or absorption of lead from oral and/or inhalation intake.
- (3) **Internal Biokinetic Distribution of Lead**. Expertise on the human physiological processes concerning the distribution, mechanisms of transport, accumulation, concentrations at the organ/tissue level, residence times (or other measures of potential impact), and elimination of absorbed lead.
- (4) **Human Growth and Activity Patterns**. Expertise on growth patterns and typical human activity patterns from prenatal to elderly, including recreational, occupational, leisurely, household activities. This would include knowledge of published studies and other modeling applications.

(5) **Exposure and Risk Assessment Modeling**. Experience in relating a lifetime of human exposure to a potential health outcome, and the quantification of risk related to this health outcome.

(6) **Statistical Treatment of Data Input and Model Output, and Model Code**. Expertise in assessing the quality of data typically used for model input or the quality of probabilistic input data sets generated by models. Expertise in assessing the statistical interpretation and presentation of model outputs. Expertise in computer programming language; specifically, C++ using XML data format.

The SAB Staff Office has reviewed the nominations and identified 19 candidates to serve on the SAB *Ad Hoc* AALM Review Panel. Biosketches on these candidates are provided below. *We hereby invite comments from members of the public for relevant information or other documentation that the SAB Staff Office should consider in the selection of this ad hoc 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 final selection of this *ad hoc* panel, the combined information will be reviewed and evaluated for any possible financial 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 *Ad Hoc* AALM Review Panel.

Please e-mail your comments no later than **August 25, 2005** to Mr. Fred Butterfield, SAB *Ad Hoc* AALM Review Panel Designated Federal Officer (DFO), at: butterfield.fred@epa.gov.

SAB *Ad Hoc* ALL-AGES LEAD MODEL (AALM) REVIEW PANEL CANDIDATES

Dr. Henry Anderson [M.D.]

Dr. Henry Anderson received his MD degree in 1972 from the University of Wisconsin (UW) –Madison. He was certified in 1977 by the American Board of Preventive Medicine with a sub-specialty in occupational and environmental medicine and in 1983 became a fellow of the American College of Epidemiology. In 1980, Dr. Anderson joined the Wisconsin Department of Health and Social Services as the State Environmental and Occupational Disease Epidemiologist. In 1991, he also assumed the duties of Chief Medical Officer. Dr. Anderson holds adjunct Professorships at UW – Madison, Department of Population Health and the UW Institute for Environmental Studies, Center for Human Studies.

Dr. Anderson has been a member of the U.S. EPA Science Advisory Board (SAB) since 1996 as a member, the Chair of the Integrated Human Exposures Committee, the Chair of the Environmental Health Committee, a member of the Executive Committee (EC), and the chair of the EC Policy and Procedures Subcommittee. He has published on a broad spectrum of environmental, occupational and public health topics. Dr. Anderson's expertise includes public health, preventive, environmental and occupational medicine, respiratory diseases,

epidemiology, human health risk assessment and risk communication. His active research interests include: environmental health indicators and disease surveillance, childhood asthma, child and adult lead poisoning, reproductive and endocrine health hazards of sport fish consumption, arsenic in drinking water, chemical and nuclear terrorism, occupational and environmental respiratory disease, occupational fatalities and occupational injuries to youth.

Dr. Anderson was a founding member of the Agency for Toxic Substances and Disease Registry (ATSDR) Board of Scientific Councilors (1988-1992). He served on the National Academy of Sciences/Institute of Medicine (NAS/IOM) committees that developed the reports "Injury in America" and "Nursing, Health & Environment." Dr. Anderson currently serves on the IOM committee, "Committee to Evaluate Measures of Health Benefits for Environmental, Health, and Safety Regulation" and the NAS' "Committee on Toxicity Testing and Assessment of Environmental Agents." He was a member of the Armed Forces Epidemiology Board and is a past president of the Council of State and Territorial Epidemiologists. Dr. Anderson serves on the Presidential Advisory Board on Radiation Worker Compensation. He is a fellow of the *Collegium Ramazzini* and the American Association for the Advancement of Science (AAAS). In addition, Dr. Anderson is associate editor of the American Journal of Industrial Medicine and serves on the editorial board of Cancer Prevention International.

Dr. Mary Jean Brown

Dr. Mary Jean Brown is Chief of the Lead Poisoning Prevention branch at the U.S. Centers for Disease Control and prevention and is an Adjunct Professor of Society, Human Development and Health at the Harvard School of Public Health. Dr. Brown received a Doctor of Science (Sc.D.) degree from the Harvard School of Public Health in 2000. She is also a registered nurse (R.N.) with a Bachelor of science degree from Boston College in 1982.

Dr. Brown has had extensive experience as a public health practitioner and scientist. She designed and directed a recently-completed, community-based randomized trial designed to evaluate the impact of home visiting on the blood lead levels and home environments of children with moderate lead poisoning. Dr. Brown was principle investigator for the Massachusetts site of the Department of Housing and Urban Development's Lead-Based Paint Hazard Control Program. She has also recently completed a study identifying community-level housing factors that predict risk for non-fatal pediatric injuries, an analysis of the costs and benefits of removing lead paint from housing before children are lead-poisoned, and a study of the effect of housing policies on the blood lead levels of poisoned children.

Dr. Brown has served on the board of directors for the National Center for Healthy Housing and was a member of the U.S. Department of Health and Human Services (HHS) Advisory Committee on Lead Screen for Children Enrolled in Medicaid. In addition, she is the Designated Federal office for the CDC Advisory Committee on Childhood Lead Poisoning. As a Federal employee, Dr. Brown has not received any outside grant funding since June 2003.

Dr. John P. Christopher

Dr. John Christopher has been a Staff Toxicologist for 18 years with the Human & Ecological Risk Division of the California Department of Toxic Substances Control (DTSC).

He holds no other positions. Dr. Christopher's responsibilities with DTSC are: regulatory review of risk assessments submitted by responsible parties for hazardous waste sites, especially military and other Federal facilities; review of toxicity criteria and exposure models developed by California or Federal regulatory agencies for applicability in risk assessment; development of exposure criteria and guidelines for their use in risk assessments; and development of risk-based criteria for classifying metals as hazardous waste using probabilistic methods. He received a Bachelor of Science in Biology from Georgetown University (1967), a Master of Arts in Pharmacology from Stanford University (1971), and a Ph.D. in Biological Science, Oregon State University (1979; Thesis Title: "Biochemical Effects of Tumorigenic Enhancers").

Dr. Christopher's expertise is general toxicology and risk assessment, especially exposure assessment. With respect to general toxicology and risk assessment, he has served on approximately 30 expert panels since 1995 reviewing animal studies and human epidemiological data supporting proposed Reference Doses, Reference Concentrations, and estimates of cancer potency. Sponsors have included EPA, U.S. Departments of Defense and Justice (DoD, DOJ), Health Canada, industry consortia, and Toxicology Excellence for Risk Assessment (TERA). Regarding exposure assessment, Dr. Christopher has served since 1999 as the principal resource person for LeadSpread, a spreadsheet model developed at DTSC in 1990 for estimating blood lead in adults and children; this model was recently reviewed favorably by EPA. He advises risk assessors daily both in and out of government on exposure to lead, use of LeadSpread, and development of health-based cleanup goals for lead in soil at hazardous waste sites. Dr. Christopher is the principal resource within DTSC for statistical analysis of ambient concentrations of metals, and he has written guidance on this topic. He is the principal resource person in DTSC for statistical methods for estimating exposure point concentrations.

Dr. Christopher is a member of the Society of Toxicology (SOT) and the Society for Risk Analysis. He is a founding member of the Risk Assessment Specialty Section of SOT (1988), and he served as its President in 1995-1996. The Specialty Section honored Dr. Christopher in 2004 for "Sustained Superior Service." He was President of the Northern California Regional Chapter of SOT in 1996-1997, and he received a service award from the Chapter in 1990. DTSC has honored Dr. Christopher three times for contributions to cleanup at military bases and developing hazardous waste criteria using probabilistic methods of exposure assessment. He was certified in general toxicology by the American Board of Toxicology, Inc. in 1984, and re-certified in 1989, 1994, 1999, and 2004. Dr. Christopher served as a Board member in 1998-1999. From 1996 to the present, he has served on peer review panels organized by TERA. Since 2003, Dr. Christopher has been a permanent member of the Expert Review Panel for health effects of non-lethal weapons, sponsored by DoD and DOJ. He was named this to be a core panel member on the Voluntary Children's Chemical Evaluation Program, sponsored by EPA and the American Chemistry Council. Dr. Christopher receives no outside grant or research funding.

Dr. Deborah Cory-Slechta

Dr. Deborah Cory-Slechta received her Ph.D. degree from the University of Minnesota in 1977 and worked as a junior staff fellow of the National Center for Toxicological Research (NCTR) beginning in 1979. She was appointed to the faculty of the University of Rochester Medical School in 1982 and rose through the ranks. In 1998, Dr. Cory-Slechta was appointed

Chair of the Department of Environmental Medicine and Director of the National Institute of Environmental Health Sciences (NIEHS) Environmental Health Sciences Center at the University of Rochester. From July 2000- July 2002, she was the Dean for Research and Director of the Aab Institute for Biomedical Sciences, a newly established post at the University and as such, became the first female dean in the history of the Medical School.

Dr. Cory-Slechta has served on numerous national research review and advisory panels, including committees of the National Institutes of Health (NIH), the NIEHS, the Food and Drug Administration (FDA), NCTR, the U.S. Environmental Protection Agency (EPA), the National Academy of Sciences (NAS), the Institute of Medicine (IOM), and the Agency for Toxic Substances and Disease Registry (ATSDR), Centers for Disease Control (CDC). In addition, Dr. Cory-Slechta has served on the editorial boards of several journals, including: *Neurotoxicology*, *Toxicology*, *Toxicological Sciences*, *Fundamental and Applied Toxicology*, *Neurotoxicology and Teratology*, and *American Journal of Mental Retardation*. She has held the elected positions of President of the Neurotoxicology Specialty Section of the Society of Toxicology, President of the Behavioral Toxicology Society, and been named a Fellow of the American Psychological Association (APA).

Dr. Cory-Slechta's research has focused largely on environmental neurotoxicants as risk factors for behavioral disorders and neurodegenerative disease. Specifically, this has included work on the impact of lead on learning and attention and associated neurochemical mechanisms, and, more recently on the role of pesticides as risk factors for Parkinson's disease. Currently she has also begun to examine mixtures of neurotoxic chemicals and risk modifiers for effects of neurotoxicants as well. These research efforts have resulted in over 100 papers and book chapters to date.

Dr. Bruce Fowler

Dr. Bruce A. Fowler, Fellow A.T.S., received a B.S. degree in Fisheries (Marine Biology) from the University of Washington in 1968 and a Ph.D. in Pathology from the University of Oregon Medical School in 1972. He was a staff scientist at the National Institute of Environmental Health Sciences from 1972 until 1987, when he became Director of the University of Maryland System-wide Program in Toxicology and Professor of Pathology at the University of Maryland School of Medicine. In 2001, Dr. Fowler became Professor and Director of the Laboratory of Cellular and Molecular Toxicology in the Department of Epidemiology at the University of Maryland School of Medicine. From 2002-2003 he was a Senior Research Advisor to the Agency for Toxic Substances and Diseases Registry (ATSDR) in the Division of Toxicology. Dr. Fowler was appointed as the Assistant Director for Science in the Division of Toxicology and to the Senior Biomedical Research Service (PHS) at ATSDR in November 2003.

Dr. Fowler, who is an internationally recognized expert on the toxicology of metals has served on a number of State, National and International Committees in his areas of expertise. These include the Maryland Governor's Council on Toxic Substances (Chair), National Academy of Sciences/National Research Council (NAS/NRC) Committees on Toxicology, Toxicology Information Committee, Committee on Women in Science and Engineering, Measuring Lead in Critical Populations (Chair), Biological Markers of Urinary Toxicology, Committee on the Evaluation of Augmenting Potable Water Supplies with Reclaimed Water, and

the Subcommittee on Arsenic in Drinking Water of the Committee on Toxicology. He has also served as a temporary advisor to the World Health Organization (WHO) and the International Agency for Research Against Cancer (IARC). Dr Fowler has been honored as a Fellow of the Japanese Society for the Promotion of Science (1990), as a Fulbright Scholar and a Swedish Medical Research Council Visiting Professor at the Karolinska Institute, Stockholm, Sweden (1994-995), and was elected as a Fellow of the Academy of Toxicological Sciences (2000).

Dr Fowler was selected as Colgate-Palmolive Visiting Professor of In Vitro Toxicology at the University of Washington in 1998. He served as Chairman of the Scientific Committee on the Toxicology of Metals under the International Commission on Occupational Health (ICOH) 1996-2002, as a consultant to the U.S. EPA Science Advisory Board (SAB) and a member of the Fulbright Scholarship review committee for Scandinavia (1999-, Chair, 2000-2001). Dr Fowler has been a member of the AAAS Recruitment and Screening Committee for the Court-Appointed Scientific Experts (CASE) Demonstration Project since 2000. He is currently a member of the SAB Metals Risk Assessment Framework Panel. Dr Fowler is also a current member of the Council of the Society of Toxicology (2005-2007).

Dr. Fowler is the author of over 200 research papers and book chapters dealing with molecular mechanisms of metal toxicity and biomarkers for early detection of metal-induced cell injury. He has been the editor or co-editor of 5 books or monographs on metal toxicology and mechanisms of chemical-induced cell injury. Dr Fowler's current research is focused on the toxicology of chemical mixtures involving metals, particularly in relation to semiconductors, lead, cadmium, arsenic mixtures and the role(s) of lead-binding proteins in mediating the toxicity of this ubiquitous metal to the kidney and brain. He serves on the editorial boards of a number of scientific journals in toxicology and environmental health. Dr. Fowler has previously received peer-reviewed research funding from the EPA STAR Grant Program and the National Institutes of Health.

Dr. Philip Goodrum

Dr. Philip Goodrum is senior scientist at Syracuse Research Corporation. He received a Ph.D. in Environmental Engineering from SUNY College of Environmental Science and Forestry (ESF) in 1999; an M.S. in Environmental Engineering from SUNY ESF in 1995; and a B.S. in Environmental Technology from Cornell University in 1989. Dr. Goodrum's Ph.D. dissertation was entitled, "Uncertainty Analysis of Childhood Lead Exposure Using the Integrated Stochastic Exposure Model."

Dr. Goodrum has 16 years of experience in environmental modeling and applications of probability and statistics to human health and ecological risk assessment. He is the co-Principal Investigator for the Center for Probabilistic Risk Assessment (PRA) in Central New York, which provides training, develops software tools, and develops new methods in PRA. Dr. Goodrum also serves as SRC's program manager for PRA, with responsibility for model development, guidance development, and reviews of PRAs submitted to EPA's Superfund program (OSRTI) and Office of Pesticides (OPP/EFED). He developed the Integrated Stochastic Exposure Model for lead, which uses Monte Carlo simulation to quantify variability and uncertainty in childhood blood lead concentrations based on variability and uncertainty in exposures.

Dr. Goodrum's current research activities include developing a generic probabilistic model for human health risk assessment that simulates short term variability in activity patterns. He is also developing a probabilistic model to quantify variability and uncertainty in both exposure and dose response for ecological receptors exposed to pesticides. Dr. Goodrum has also collaborated with colleagues at SRC to develop the Geospatial Exposure Model (GeoSEM), which simulates the 95% upper confidence limit (95UCL) of the mean exposure concentration within an exposure area defined using a GIS mapping tool. Current activities include simulating daily exposures to ecological receptors that exhibit different movement behaviors based on defined habitat use preferences.

Dr. Goodrum is on the adjunct faculty at SUNY ESF, where he teaches a graduate course on Environmental Modeling and serves on graduate committees for M.S. and Ph.D. candidates. He was an invited speaker by U.S. EPA National Center for Exposure Assessment, RTP, for the National Air Quality Criteria for Lead Workshop held in Chapel Hill, NC, Feb. 1-3, 2005. Dr. Goodrum also served on a peer review panel for U.S. EPA National Center for Exposure Assessment, RTP for the All-Ages Risk Model in 2000. With SRC, Dr. Goodrum received grant and contract funding in the past two years from U.S. EPA (Probabilistic Risk Assessment Center of Central New York; and as subcontractor to Syracuse Environmental Research Associates, for Probabilistic Risk Assessment for EPA Office of Pesticides Ecological Fate and Effects Division).

Dr. Robert Goyer [M.D.]

Dr Robert Goyer is a Clinical Pathologist with special interests in pediatric pathology, toxicology and research in health effects of toxic metals. After serving in the U.S. Navy at the end of World War II, Dr. Goyer graduated from the College of the Holy Cross (B.S., 1950) and the St. Louis University School of Medicine (1955). He interned at St. Francis Hospital in Hartford Connecticut and completed a residency in Pathology at the St. Louis University Hospitals.

Dr. Goyer held a National Foundation Research Fellowship and was a postdoctoral research fellow in the Medical Unit of University College Hospital Medical School, London, England. Professional appointments included Director of Laboratories at the Cardinal Glennon Hospital for Children in St. Louis; Professor of Pathology at the University of North Carolina at Chapel Hill; and Deputy Director of the National Institute of Environmental Health Sciences (NIEHS) at Research Triangle Park NC. He also served two terms as Professor and Chairman of the Department of Pathology at the University of Western Ontario, London, Canada.

Dr. Goyer has published over 175 research papers, reviews and book chapters on toxicity of metals and interactions of toxic metals with nutritionally-essential metals. He has co-edited three books on the toxicology of metals. Dr. Goyer is an internationally-recognized expert in health effects of toxic and nutritionally-essential metals, and has served on number of committees for U.S. and international health agencies, including: the National Institutes of Health (NIH), the Environmental Protection Agency (EPA), the National Research Council (NRC) of the National Academy of Sciences (NAS), and the World Health Organization (WHO) International Programme for Chemical Safety. Dr Goyer was recognized at an International Conference on Metal-Binding proteins in 1998 "for his outstanding lifetime contribution to the

understanding of the actions and effects of metals on living organisms.” In 2001, he was recognized by the NAS “for extraordinary service to the National Academies as advisor to the nation in matters of science, engineering and health.” Dr. Goyer was also awarded the 2003 Merit Award from Society of Toxicology for “in recognition of a distinguished career in toxicology.” Dr. Goyer is retired as Professor Emeritus of Pathology, University of Western Ontario, Canada, but continues to contribute to various national and international agencies on matters of environmental health and toxicology. He currently resides in Chapel Hill, NC. Dr. Goyer receives no outside contract or grant support funding.

Dr. Roberto Gwiazda

Dr. Roberto Gwiazda has been an assistant researcher at the department of Environmental Toxicology at the University of California – Santa Cruz since the year 2000. He previously held postdoctoral positions in toxicology and in geochemistry. Dr. Gwiazda received a bachelor’s degree in geology from the Hebrew University of Jerusalem, Israel, in 1989, and a Master of Science and Ph.D. in geochemistry from Columbia University in New York, in 1992 and 1995, respectively. He is currently a member of the Society of Toxicology.

Dr. Gwiazda has focused his efforts in the application of geochemical tools, such as metal analysis and stable isotope measurements, to investigate biological systems. This area of research has encompassed evaluation of metal exposure in humans and wildlife as well as metals body disposition. His efforts in the area of lead toxicity have concentrated in the utilization of lead (Pb) isotopes to identify household sources of exposure to children and to quantify the magnitude and kinetics of internal sources of lead, such as the skeleton, to blood. In collaboration with researchers from Mexico City, Dr. Gwiazda is participating in an NIH-funded study aimed at evaluating the role of calcium supplementation during pregnancy on blood and plasma lead levels, and on indices of neurological development of infants.

Dr. Gwiazda has published his work on lead toxicity and lead isotopes in *Environmental Health Perspective*, *Environmental Sciences and Technology*, and the *Journal of Analytical Atomic Spectrometry*. Other areas of interest include evaluation of exposure to depleted uranium of American soldiers of the Gulf War, and the mechanism of manganese neurotoxicity and identification of biomarkers of manganese exposure. Work in these areas has been published in *Health Physics*, *Neurotoxicology and Teratology*, and *Neurotoxicology*, whereas earlier work in the field of geochemistry has been published in *Nature*, *Paleoceanography*, the *Journal of Glaciology*, *Earth and Planetary Science Letters*, the *Canadian Journal of Earth Sciences* and *Global Biogeochemical Cycles*.

Current and recent funding received of Dr. Gwiazda originates from: (1) NIH: “The role of Mn in neurodegenerative disease,” a grant aimed at unraveling the mechanisms of manganese neurotoxicity. (2) U.S. Housing and Urban Development, “The efficacy of interventions to reduce household lead exposures, and the role of the skeleton as an endogenous source of lead exposure to children determined using stable lead isotopes.” (3) Charitable Leadership Foundation: “The Efficacy of PQQ to Reduce Brain Lead Levels;” this study investigated the potential of the vitamin pyrroloquinoline quinone as a chelating agent for Pb using a rat model of lead metabolism. (4) The University of California Institute for Mexico and the United States (UC MEXUS), “Bone Lead Contribution to Blood in Children Determined Using Stable Lead

Isotopes;” this study evaluated the contribution to blood lead of bone lead releases in children. Sources of honoraria included the California Environmental Protection Agency, Office of Environmental Health Hazards Assessment, for a review of the document “Public Health Goal for hexavalent chromium in drinking water;” and U.S. EPA, in compensation as speaker at the U.S. EPA’s Air Quality Criteria for Lead Workshop, Chapel Hill, NC.

Mr. Sean Hays

Mr. Sean Hays is the President and founder of Summit Toxicology, a toxicology and risk assessment consulting firm. Mr. Hays received his B.S. in Biomedical Engineering from Texas A&M University in 1989, a M.S. in Physiology from the University of Vermont in 1992, and a M.S. in Chemical Engineering from Colorado State University in 1997. Mr. Hays specializes in conducting exposure assessments, deriving acceptable exposure limits (*i.e.*, reference doses and reference concentrations, cancer slope factors, permissible exposure limits, and minimal risk levels), developing pharmacokinetic (PK) and physiologically based pharmacokinetic (PBPK) models, and in developing methods for interpreting biomonitoring data in a health risk context.

Mr. Hays has developed PBPK models for a wide range of chemicals and metals (including collaborating with Dr. Ellen O’Flaherty to develop a PBPK model for chromium), and has specialized in developing models for pregnancy and the developing child. He has over nine years of experience performing pharmacokinetic modeling of lead in humans and in using the O’Flaherty lead PBPK and IEUBK models to assess potential health risks for a wide range of potential exposure scenarios. Mr. Hays has used the lead PBPK model to set site-specific clean-up goals for numerous lead impacted properties, to model the potential for elevated blood lead levels among children exposed to elevated levels of lead in school drinking water supplies, and for modeling the likely changes in blood lead levels among astronauts who experience rapid and substantial bone loss while on extended space travel. Mr. Hays has experience using U.S. EPA’s IEUBK model for risk assessment purposes and has performed detailed analyses to evaluate the scientific differences between the various lead pharmacokinetic models and to evaluate in which risk assessment scenarios each lead model is scientifically valid for predicting changes in blood lead levels.

Mr. Hays is a member of the Society of Toxicology, the International Society of Regulatory Toxicology and Pharmacology, the American Conference of Governmental Industrial Hygienists, the International Society of Exposure Analysis, and the Society of Risk Analysis. He is currently serving as the Vice President-Elect of the Biological Modeling Section of the Society of Toxicology. Over the past two years, Mr. Hays has received funding related to lead from Wyle Laboratories (a subcontractor to NASA) to develop a lead PBPK to predict the potential impact that extended periods of exposure to microgravity would have on the blood lead levels of astronauts. He has also received funding from a large school district in the Pacific Northwest to help model the likely blood lead levels of children who had been exposed to elevated levels of lead in their school drinking water. In Mr. Hays’ other consulting efforts, he has received funding from the U.S. EPA to develop PBPK models, from private industry to develop PBPK models and exposure and risk assessments for a variety of chemicals and to develop methods for interpreting biomonitoring data.

Dr. Meryl Karol

Dr. Meryl Karol is Associate Dean for Academic Affairs and Research and is Professor of Environmental and Occupational Health at the University of Pittsburgh's Graduate School of Public Health. Dr. Karol received a B.S. in Microbiology (1961) from Cornell University and a Ph.D. in Immunochemistry from Columbia University (1967). Dr. Karol has specialized in the study of mechanisms of chemical allergy and asthma, and indoor air quality.

Dr. Karol has been active in several scientific and professional societies. She was the first female President of the Society of Toxicology (1994-5), was a Director of the International Union of Toxicology (IUTOX) (1995-98), and Secretary-General of IUTOX (1998-2004). She is a Fellow and a previous member of the Board of Directors of the American Toxicology Society. Dr. Karol serves on the National Research Council's Committee on Toxicology and Chairs the Subcommittee on the Toxicological and Radiological Effects from Depleted Uranium. In addition, she is the Chair of the Subcommittee on Pharmaceutical Toxicology of the Advisory Committee for Pharmaceutical Science for the Food and Drug Administration's Center for Drug Evaluation Research.

Dr. Karol is the recipient of numerous awards including the Rachel Carson Award, Women in Science Award, the Award for Outstanding Contributions to Public Health, and the Frank R. Blood Award. Her studies on chemical allergens and pulmonary toxicants have been supported by the NIEHS, NIOSH, USDA, Bayer, USA and the International Isocyanate Institute.

Ms. Rosemary Mattuck

Ms. Rosemary Mattuck, a Senior Associate with Gradient Corporation, is an environmental engineer specializing in human health risk assessment, exposure assessment, blood lead modeling, geochemical modeling, and litigation support for toxic tort and product liability cases. She received an M.S. in Civil (Environmental) Engineering from University of Connecticut in 1994, and a B.A. in Chemistry from University of Vermont in 1984. Ms. Mattuck has a total of 20 years of experience in environmental consulting. At Gradient, her responsibilities include conducting human health risk assessments, exposure modeling using analytical exposure models, blood lead modeling, statistical programming, and assisting in preparation of expert reports.

Ms. Mattuck has conducted blood lead modeling using the Integrated Exposure Uptake Biokinetic (IEUBK) model, EPA's Adult Lead model, and the O'Flaherty model, and worked on the development of a stochastic physiologically-based pharmacokinetic model for lead. She has worked on regulatory comments for the proposed TSCA Section 403 regulations that resulted in EPA's Final Residential Lead Hazard Standards, and evaluated assumptions and results used in EPA's Residual Risk Assessment Case Study for the Secondary Lead Smelter Source Category. Ms. Mattuck has researched and published articles on the decline of childhood blood lead levels, and the comparison of observed data and model predictions for the IEUBK model. She has not served on other advisory committees. Ms. Mattuck receives no outside contract or grant support funding. Gradient Corporation is a consulting firm with a variety of industrial and other clients, and the industrial clients include those in the primary and secondary lead industries.

Dr. Marlin H. Mickle

Dr. Marlin Mickle is currently Nickolas A. DeCecco Professor in the School of Engineering of the University of Pittsburgh. He holds appointments as Professor of Electrical and Computer Engineering (Primary), Professor of Computer Engineering, Professor of Telecommunications, and Professor of Industrial Engineering. Dr. Mickle is the Executive Director of the Swanson Center for Product Innovation. He received the B.S.E.E., M.S.E.E., and the Ph.D. degrees from the University of Pittsburgh in 1961, 1963, and 1967, respectively. Dr. Mickle is currently active in the areas of energy harvesting and high technology applications. He is co-author and co-editor of over 20 books. In addition, Dr. Mickle has over 125 publications in refereed journals, conference proceedings, etc. He holds patents on a magnetically levitated gyro, a gyro optical sensor, energy harvesting and antennas on a CMOS chip. Dr. Mickle has held engineering positions with the IBM and Westinghouse Electric Corporation and has also served as Program Director of the Systems Theory and Applications Program of the National Science Foundation.

Dr. Mickle is a member of the Scientific, Product or Technical Advisory Boards of MandalMed, Inc., and E-SOC, Inc. both in San Francisco; SmartWear Technologies, San Diego; FireFly Power Technologies, LLC, Ligonier, PA; and ClearCount, Inc., Pittsburgh, PA. He is a member of the team that won Honorable Mention at the 2004 Carnegie Science Center Awards for Excellence 2004; a 1988 Recipient of the Systems Research and Cybernetics Award of the International Institute for Advanced Studies in Systems Research and Cybernetics; a Life Fellow of the IEEE; Faculty Honor Roll 2001; an advisor or co-advisor of four teams selected by the NCIIA for March Madness for the Mind with displays at the Smithsonian in Washington, D.C. (3 times) and at the Boston Museum of Science. Dr. Mickle is the recipient of the Carnegie Science Center Award for Excellence in Corporate Innovation, 2005.

Dr. Mickle was Co-chairman of the Pittsburgh Modeling and Simulation Conference for over 20 years, and previously served as: member, Editorial Board of *IEEE Micro, Integrated Computer - Aided Engineering Journal*; New Products Editor, *IEEE Micro*; Associate Editor of the *IEEE Transactions on Systems, Man and Cybernetics*; founding Co-Editor of the *Journal of Interdisciplinary Modeling and Simulation*; Editor, *International Journal of Radio Frequency Identification Technology and Applications*, Vice-President, Conference and Meetings, of the IEEE Systems, Man and Cybernetics Society; and Editor-in-Chief of the *Journal of Parallel and Distributed Systems and Networks*. He is a member of the Boards of Directors of University Research and Development Associates, Inc.; Asbury Heights, Mount Lebanon, PA; and is President of the Board of Directors of Emory Senior Housing. Dr. Mickle has previously served as: member of the Board of Trustees, Albright College; First Vice President, Asbury Heights, President, Board of Directors, Asbury Heights; a Member of the Board of Directors of Wesley Hills of Mt. Lebanon, Mickle Computer Technologies, Inc., Power Resources, Inc., and Specialty Phones, Inc.

Dr. Mickle's research, development and educational activities have been supported by grants and/or contracts from the Department of Housing and Urban Development (HUD), the National Science Foundation (NSF), the United States Army, the Urban Mass Transportation Administration, NASA, the Bureau of Mines, the Department of Commerce, the Pittsburgh

Foundation, the Pennsylvania Power and Light Company, American Sterilizer Company, Contraves Goertz Corporation, PPG, Inc., the Electric Power Research Institute (EPRI), Intel, Digital Equipment Corporation, Tandy, Motorola, Texas Instruments Corporation, Ben Franklin Program, WesDyne, the Lemelson Foundation, Argonne Laboratory, EPA, Coleman Foundation, DARPA, the Pittsburgh Digital Greenhouse, Medrad, Siemens, Vocollect, Mobile Aspects, Matthews Marking Corp., ChemDAQ, Syracuse Research Corporation, Gnostic Systems, Identifi Technologies, FireFly, ADCUS, SSI, Inc. He has also served as a Consultant to NSF, Battelle, Contraves Goertz Corporation, ASC, Inc., Westinghouse, III Systems, the American University in Cairo, George Mason University, TI, Inc., Compunetics, ATEC, DEC, CSR, Ben Franklin Center of Western PA, innovex, U. S. Navy and others. Dr. Mickle is listed in numerous biographical records including *Who's Who in Religion*, *Who's Who Among America's Teachers*, *Who's Who in Business and Finance*, *Who's Who in Engineering*, and *Who's Who in America*.

Dr. Paul Mushak

Dr. Paul Mushak is a principal in PB Associates, Durham, N.C., a consulting partnership in toxicology and health risk assessment. He specializes in the exposure and health risk assessment of elements such as lead, arsenic, cadmium and mercury. Dr. Mushak holds a Ph.D. in metal chemistry and biochemistry (1970), University of Florida (UF)-Gainesville, FL with extensive training in metal toxicology at the UF School of Medicine. His post-doctoral training was in nutrient and toxic metal enzymology, Department of Molecular Biophysics and Biochemistry, Yale University. Dr. Mushak was formerly a full-time member of the faculty at the University of North Carolina-Chapel Hill School of Medicine, Department of Pathology (1971-1985) and adjunct full professor in that department (1986 through 1993).

Dr. Mushak currently has an affiliation with the Albert Einstein College of Medicine as an unsalaried visiting professor in the Department of Pediatrics. Research interests include measurement and predictive modeling of toxic metal exposure biomarkers in humans and the factors affecting them. He has authored or coauthored about 175 papers, book chapters, conference abstracts. Dr. Mushak was a principal coauthor of many expert consensus documents for Federal, National Academy of Sciences, and international health agencies. He has served on numerous peer-review panels, and chaired two peer review panels for U.S. EPA reports to Congress on mercury emissions. Dr. Mushak has testified on several occasions before the U.S. Congress regarding childhood lead exposures. He has been qualified in a number of Federal and state courts as an expert in the toxicology and health risk assessment of lead and other metals.

Dr. Mushak has served on a number of SAB panels in the past, including two panels dealing with peer evaluation of EPA's Integrated Exposure-Uptake Biokinetic Model for use in assessing lead exposures around point source lead emissions and Superfund sites and a panel evaluating risk posed by chromated copper arsenate-treated lumber to young children. In addition, he served on an *ad hoc* EPA committee examining the first version of the all-ages lead model. Dr. Mushak has no outside contract or grant support related to the IEUBK or All-Ages Lead Model.

Dr. Joel G. Pounds

Dr. Joel Pounds is a Senior Staff Scientist in Cell Biology & Biochemistry, Biological Sciences Division and Science Advisor to the Environmental Biomarkers Initiative at Battelle – Pacific Northwest National Laboratory in Richland, WA. He received his B.A. in Zoology and Chemistry from Olivet Nazarene College (1971), his M.S. in Environmental Toxicology from the University of Wisconsin (1973), and a Ph.D. in Toxicology (1977) from the University of Wisconsin.

Dr. Pounds has directed research programs in Government (National Center for Toxicological Research, 1977-1985); National Laboratories (Brookhaven National Laboratory, 1985-1990), and Academia (Wayne State University, 1990-1999). He has focused his research on the cellular and molecular toxicity of lead and other metals, metal-metal interaction, and mathematical modeling of the response to metal mixtures. Dr. Pounds' current research includes use of mass-spectrometry based proteomic and NMR-based metabolomic instrumentation for characterization of biological responses to nanomaterials and other airborne toxicants.

Dr. Pounds has served on numerous NIH, ATSDR, and EPA advisory committees related to toxicology of lead, metals, mixtures, and risk assessment. In addition, he has many peer-reviewed publications, abstracts, and proceedings; edited volumes; and invited lectures, seminars and symposia in which he participated. Dr. Pounds' current active and pending research support pertains to proteomics, biomarkers, and systems toxicology, and includes: Battelle Memorial Institute (Implementation of Systems Toxicology for an Animal Model of Emphysema; Proteomic Characterization of Human Blood plasma); the Agency for Toxic Substances and Disease Registry (ATSDR) (Methods for Joint Toxicity Assessment of Environmental Mixtures); PNNL (Environmental Biomarker Initiative, Particulate Matter Impacts on Respiratory Health); and several private sector research contracts (Protein Biomarkers for Chronic Obstructive Pulmonary Disease; Proteomic Analysis of Plasma Proteins for Biomarkers of Stress).

Dr. Michael Rabinowitz

Dr. Michael Rabinowitz is a geochemist with over 20 years of experience with lead. He holds an S.B. in Physics (1968) from the Massachusetts Institute of Technology; an M.S. in Planetary Sciences (1970) from the University of California, Los Angeles; and a Ph.D. in Geochemistry (1975) from UCLA. From 1974-1975, he was a NIEHS Post-Doctoral Fellow in Nephrology at the UCLA-Wadsworth VA Hospital. His current positions are: Clinical Instructor in Neurology, Harvard Medical School, Boston; Library Reader, Marine Biological Laboratory, Woods Hole; and Assistant Dockmaster, Herreshoff Maritime Museum.

Dr. Rabinowitz conducted several pioneering research projects on the environmental sources and pathways of lead contamination and the movement of lead within human body compartments by feeding stable isotope tracers to adult human volunteers in a metabolic balance ward. He is familiar with paint, rock, soil, vegetation, air, water, and tissue sampling in urban, rural and remote settings. Dr. Rabinowitz has established several clean-room laboratories for trace lead determinations in Massachusetts and Taiwan. He has experience with statistical analysis and data interpretation, including work on sources of lead to children and lead's effects on child development, and he is familiar with the factors which influence environmental uptake

and absorption of lead. Dr. Rabinowitz has studied the history of the American lead paint industry, visited most of the production sites and analyzed available soil, metal, and paint samples to document this anthropogenic flow of lead.

Dr. Rabinowitz has not served on other advisory committees or professional societies. He participated in a U.S. EPA workshop on modeling lead exposure and bioavailability in 1998 and a more recent review of an uptake and distribution model (so-called LEAD5). His sources of recent grant and/or contract support include Westat, Syracuse Research Corporation, Battelle, and the Eagle Picher Personal Settlement Injury Trust.

Dr. Joel Schwartz

Dr. Joel Schwartz is a Professor in the Departments of Epidemiology and Environmental Health at the Harvard School of Public Health, and in the Department of Medicine at Harvard Medical School. He is also a faculty member in the Environmental Biostatistics Program at the School of Public Health. Dr. Schwartz received his B.A. (1969) and Ph.D. (1980) from Brandeis University. He is a member of the International Society for Environmental Epidemiology, and the American Thoracic Society.

Dr. Schwartz served as a member of the Center for Disease Control's Committee on Preventing Childhood Lead Poisoning from 1994 to 2002, and as a member of two National Research Council Committees (Committee on Assessing Lead Exposure in Critical Populations, Committee on Environmental Epidemiology). Dr. Schwartz was a recipient of a John D. and Catherine T. MacArthur Fellowship, and a World Congress Award from the International Union of Environmental Protection Associations. His expertise is in epidemiology, biostatistics, and cost benefit analysis. Dr. Schwartz's major subject matters include air pollution and lead. His research has involved cross-sectional, time-series, cohort and panel studies of the acute and chronic health effects of air pollution, including both respiratory and cardiovascular endpoints, and he has a particular interest in questions of susceptibility.

In the last two years, Dr. Schwartz received funding from the National Institutes for Health (NIH) for environmental biostatistics, for studies of aeroallergen exposure and asthma, for studies of lead, for a study of the association between particulate air pollution and heart attacks, and for a study of socioeconomic gradients in breast cancer. He has received funding from EPA as the PI for Epidemiology of the Harvard PM Research Center, and from the Health Effects Institute (HEI) for the APHENA project, which aims to combine North American and European time series analyses of air pollution, morbidity, and mortality.

Dr. Alan H. Stern

Dr. Alan Stern is the Section Chief for Risk Assessment in the Division of Science, Research and Technology of the New Jersey Department of Environmental Protection; Adjunct Associate Professor in the Department of Environmental and Occupational Health of the University of Medicine and Dentistry of New Jersey-School of Public Health; and Adjunct Associate Professor in the Department of Environmental and Occupational Medicine of the University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School. He received a received a bachelor's degree in biology from the State University of New York at

Stony Brook (1975), a master's degree in cellular and molecular biology from Brandeis University (1978), a master of public health degree (1981) and a doctorate in public health from the Columbia University School of Public Health (1987). Dr. Stern is board-certified in toxicology by the American Board of Toxicology (Diplomate of the American Board of Toxicology).

Dr. Stern's areas of expertise include risk assessment and exposure assessment including the application of probabilistic techniques to quantitative estimation of exposure and risk. His research interests have focused on heavy metals including lead, mercury, chromium and cadmium. Dr. Stern was a member of the National Research Council/National Academy of Sciences Committee on the Toxicology of Methylmercury (1999-2000). Other recent panels, committees and workshops Dr. Stern has participated in by invitation include: the U.S.EPA Colloquium on Soil/Dust Ingestion Rates and Mouthing Behavior for Children and Adults (May 24-25, 2005, Arlington VA); U.S.EPA Toxicological Review of Toluene In Support of Summary Information on the Integrated Risk Information System (IRIS) (Feb. 5, 2004, Washington, D.C. – Panel Chair); U.S.EPA Expert Panel on Development of Dose-Response Functions for the Neurotoxicity of Methylmercury (Nov. 4, 2002, Washington, D.C.); U.S.EPA Peer-Review Panel for the Reference Dose and Reference Concentration Process (June 19, 2002, Washington, D.C.); and SCOPE (Scientific Committee on Problems of the Environment) Environmental Cadmium in the Food Chain: Sources Pathways and Risks. (September 13-16, 2000, Brussels, Belgium). Dr. Stern has authored numerous articles in peer-reviewed journals, and has recently contributed a book chapter on Exposure Assessment for Neurotoxic Metals in "Human Developmental Neurotoxicology" D. Bellinger, ed. (in press). He also regularly teaches the graduate course in Environmental Health Risk Assessment in the Univ. of Medicine & Dentistry of New Jersey-School of Public Health.

As a full-time employee of state government, Dr. Stern does not routinely solicit or receive grants for research from outside agencies or organizations. Within the last two years, however, he received one contract from the U.S.EPA for research: EPA Order No. 3W-1182-NAGX "Reconstruction of the Maternal Methylmercury Intake Dose from Cord Blood Data," initiated 3/2003, completed 7/2004; total payment (to NJ Dept. of Environmental Protection): \$30,020.

Dr. Ian von Lindern

Dr. Ian von Lindern is Chairman and CEO of TerraGraphics. He received his B.S. in Chemical Engineering (1971) from Carnegie-Mellon University, Pittsburgh, PA; and his M.S. in Biometeorology and Atmospheric Studies (1973) and Ph.D. in Environmental Science and Engineering (1980) from Yale University, New Haven, CT.

Dr. von Lindern has 30 years of environmental engineering and science experience in Idaho. He has directed over 30 major environmental investigations, involving solvent contamination of groundwater in the Southwest, an abandoned petroleum refinery, secondary smelters and battery processors, landfills, uranium mill tailings, and several major lead sites including: Dallas, TX; the Niagara and Riverdale Projects in Toronto, Canada; the Marjol Battery Site in Throop, PA; ASARCO/Tacoma, WA; East Helena and Butte/Anaconda in MT; Anzon Industries in Philadelphia, PA and the Rudnaya Pristan-Dalnégorsk Mining District, Russian Far East. Through TerraGraphics, Dr. von Lindern has worked continually for Idaho

Department of Environmental Quality on various projects since the company's inception in 1984. He has been the lead Risk Assessor for the Bunker Hill Superfund Site in north Idaho, communicating associated risk issues at many public meetings in the community. In the last few years, Dr. von Lindern directed and completed the Union Pacific Railroad "Rails-to-Trails Risk Assessment;" the exhaustive Five-Year Review of the Populated Areas of the BHSS; the Human Health Risk Assessment for the Basin; and several other technical tasks.

Dr. von Lindern has served as a U.S. EPA Science Advisory Board (SAB) Member on three occasions: the Review Subcommittee for Urban Soil Lead Abatement Demonstration Project, 1993; the Subcommittee Assessing the Consistency of Lead Health Regulations in U.S. EPA Programs, Special Report to the Administrator, 1992; and the Review Subcommittee Assessing the Use of the Biokinetic Model for Lead Absorption in Children at RCRA/CERCLA Sites, 1988. He also served on the U.S. EPA Clean Air Scientific Advisory Committee (CASAC) Subcommittee on Exposure Assessment Methodology, 1988; and was a member of U.S. EPA Criteria Assessment Committee for Lead in the Ambient Air from 1975-1986.

Dr. Bernard Weiss

Dr. Bernard Weiss is Professor of Environmental Medicine and Pediatrics at the University of Rochester School of Medicine and Dentistry, where he has been a member of the faculty since 1965. He received his B.A. degree in Psychology from New York University (1949) and his Ph.D. in Psychology from the University of Rochester (1953). Before joining the faculty at Rochester, Dr. Weiss served on the faculty of the Johns Hopkins School of Medicine, and, earlier, held an appointment at the U.S. Air Force School of Aviation Medicine.

Dr. Weiss has served as a member of many committees and panels devoted to toxicology and environmental health, including those organized by the U.S. Environmental Protection Agency's (EPA) Science Advisory Board (SAB), such as the Dioxin Reassessment Review Panel and the Subcommittee on Human Testing of Pesticides; and the National Academy of Sciences (SAB), *e.g.*, the recent Committee on Air Quality in Passenger Aircraft). He is especially concerned with risk assessment issues arising from the effects of environmental chemicals on brain development and brain aging. In 1986 Dr. Weiss was named Scientist of the Year by the Learning Disabilities Association of America, and, in 1990, he was awarded the Stokinger Prize by the American Conference of Governmental Industrial Hygienists (ACGIH). In 2003, Dr. Weiss received a Distinguished Investigator Award from the Neurotoxicology Specialty Section of the Society of Toxicology.

Dr. Weiss has served as president of several organizations in the area of neurotoxicology and also serves as a member of several public advisory groups. In addition, he lectures frequently to lay audiences. Dr. Weiss is the editor or co-editor of seven books and monographs and author or co-author of over 200 articles. His special interests and publications lie primarily in areas that involve chemical influences on behavior; these include the neurobehavioral toxicology of metals such as lead, mercury and manganese; endocrine disruptors such as dioxin; solvents such as toluene and methanol; drugs such as cocaine; and air pollutants such as ozone. Dr. Weiss's recent research support has come from NIEHS and ATSDR.