

Speaker and Panelist Biographical Information

Christopher P. Austin is Director of the NIH Chemical Genomics Center (NCGC) at the U.S. National Institutes of Health (NIH), and Senior Advisor to the Director for Translational Research at the National Human Genome Research Institute. The NCGC is an ultrahigh-throughput screening, informatics, and chemistry center that profiles small molecule libraries for biological activity using its qHTS technology, and develops novel compounds as probes of biology and starting points for the development of new drugs for rare and neglected diseases. A founding partner with NTP and EPA in the Tox21 Program, the NCGC also develops new paradigms to increase the efficiency and genome-wide reach of assay, screening, chemistry, and informatics technologies. In his role as Senior Advisor for Translational Research, Dr. Austin was a principal architect of several large initiatives to translate the human genome sequence into biological function and therapeutics, including the NIH Molecular Libraries Initiative, a multifaceted program of small molecule technologies in the public sector, and the Knockout Mouse Project, which is producing knockout mice for all mouse genes. Most recently, he has developed and launched the new NIH Therapeutics for Rare and Neglected Diseases (TRND) program. Before joining NIH in 2002, Dr. Austin directed research programs genomics-based target discovery, pharmacogenomics, and DNA microarray technologies at Merck, with a focus on neuropsychiatric diseases. Dr. Austin received his A.B. in biology summa cum laude from Princeton, and his M.D. from Harvard Medical School. He completed clinical training in internal medicine and neurology at the Massachusetts General Hospital, and a postdoctoral fellowship in developmental genetics at Harvard.

Tina Bahadori* is the managing director for the Long-Range Research Initiative (LRI) program at the American Chemistry Council (ACC). Through the LRI, ACC members sponsor research designed to advance scientific knowledge concerning the potential impacts of chemicals on human health. The 2009-2015 LRI Research Strategy focuses on research to interpret health implications of data from the new technologies for toxicological testing that are revolutionizing risk-based decision-making; innovative tools to characterize biologically relevant environmental exposures and their implication for health risks; and, improved assessments of susceptible populations, by understanding genetic influences and gene-environment interactions. Dr. Bahadori is the president (2009-2010) of the International Society of Exposure Science (ISES). She currently serves as an expert and reviewer on a number of scientific panels for the National Academy of Sciences, Environmental Protection Agency, and several major particulate matter studies. She was also a member of the Chemical Exposure Working Group on the National Children's Study and is on the Editorial Board of the Journal of Exposure Science and Environmental Epidemiology. Prior to joining ACC, Dr. Bahadori held positions at the Electric Power Research Institute (EPRI) and Arthur D. Little Inc. She holds a DSc in environmental science and engineering from the Harvard School of Public Health.

Elaine Cohen Hubal is currently a senior scientist in U.S. EPA's National Center for Computational Toxicology (NCCT). The NCCT has a mission to integrate modern computing and information technology with molecular biology to improve Agency prioritization of data requirements and risk assessment of chemicals. Dr. Cohn Hubal leads the center research program in exposure science to support chemical prioritization and toxicity testing. Her primary research interests are in characterizing human exposure and developing approaches for using human exposure metrics to inform health studies and public health policy. The current focus of her research is on applying a systems approach to characterize complex relationships between environmental factors and health outcomes with an emphasis on vulnerable populations. Previously, she was Acting Associate Director for Human Exposure Modeling in the Human Exposure and Atmospheric Sciences Division of the U.S. EPA's National Exposure Research Laboratory (NERL) where she worked to develop and direct NERL's human exposure modeling

* Committee on Emerging Science for Environmental Health Decisions

NAS Workshop

The Exposome: A Powerful Approach for Evaluating Environmental Exposures and Their Influences on Human Disease

research program. Dr. Cohen Hubal has published in the areas of children's exposure and human health risk modeling. Dr. Cohen Hubal has served as an expert on a variety of scientific panels and committees including the Voluntary Children's Chemical Evaluation Program (VCCEP) Peer Consultation Panel and the Study Design Working Group for the National Children's Study. Currently, she serves as chair of the US EPA Community of Practice in Exposure Science (ExpoCoP). Dr. Cohen Hubal also serves as an associate editor for the Journal of Exposure Science and Environmental Epidemiology; on the National Children's Study Data Access and Confidentiality Committee; and as a WHO Temporary Adviser to plan the IPCS International Symposium "Identifying Early Life Stages for Characterizing Chemical Exposures." Dr. Cohen Hubal received her Ph.D. and M.S. in Chemical Engineering from North Carolina State University and a S.B. in Chemical Engineering from Massachusetts Institute of Technology.

Elissa S. Epel is an Associate Professor in the UCSF Department of Psychiatry. She is also a faculty member in the Health Psychology Postdoctoral Program, the Osher Center for Integrative Medicine, the Robert Wood Johnson Health and Society Postdoctoral Scholars Program, and a leader of the new UCSF Center on Obesity Assessment, Study, and Treatment (COAST). She has longstanding interests in social and psychobiological stress mechanisms, and impact of stress physiology on food intake, insulin resistance, obesity, and premature aging at the cellular level. She collaborates with Drs. Elizabeth Blackburn and Jue Lin to understand how stress can affect the telomere/telomerase maintenance system. She studies family caregivers, and attempts to understand, from a psychobiological and genetic perspective, why some people are vulnerable and others are resilient to the chronic stress of caregiving. She is also involved in trials examining effects of stress reduction on immune system aging in HIV, and on stress-eating and fat distribution in obese men and women. She has been awarded the Neal Miller New Investigator award and an APA Early Career Award in Health Psychology. Dr. Epel received her PhD in psychology from Yale University.

Susan J. Fisher* is a professor at the University of California, San Francisco in the Department of Obstetrics, Gynecology and Reproductive Sciences where she directs the Human Embryonic Stem Cell Program, and in the Institute for Regeneration Medicine. She studies human embryonic/extraembryonic development and biomedical mass spectrometry. With regard to development, her group focuses on the mechanisms used by trophoblast cells of the human placenta to invade the uterus during normal pregnancy. They also use information about molecular aspects of trophoblast function in normal pregnancy to search for defects that are associated with pregnancy complications. Additionally, the Fisher lab studies the earliest stages of human development using human embryonic stem cell models. They recently discovered that the cells exhibit apical-basal polarity and are currently investigating how this highly specialized phenomenon is related to pluripotency. With support from the California Institute for Regenerative Medicine (CIRM) her group is constructing a fate map of the human embryo. They are also collaborating with investigators on the national epigenome project to investigate other mechanisms that regulate gene expression in stem cells. With regard to mass spectrometry-based approaches, they are developing assays for environmental toxicology, mining the salivary proteome for diagnostic potential, and developing platforms to identify biomarkers of early-stage tumors in body fluids. Dr. Fisher is a past chair the NIH Reproductive Biology study section, received the National Institute of Child Health and Human Development Sadler Award, an NIH MERIT award, and numerous university awards. Dr. Fisher earned her PhD in anatomy from the University of Kentucky-Lexington, where she did a postdoctoral fellowship in mass spectrometry.

* Committee on Emerging Science for Environmental Health Decisions

NAS Workshop

The Exposome: A Powerful Approach for Evaluating Environmental Exposures and Their Influences on Human Disease

Howard Frumkin is special assistant to the director for climate change and health at the U.S. Centers for Disease Control and Prevention. Dr. Frumkin is an internist, environmental and occupational medicine specialist, and epidemiologist. From 2005 to 2010 he directed the National Center for Environmental Health and Agency for Toxic Substances and Disease Registry (NCEH/ATSDR) at the CDC. During his tenure NCEH/ATSDR created its Climate Change program; launched training programs for college students, doctoral students, and post-docs; expanded its Built Environment, Biomonitoring, and Environmental Health Tracking programs; and launched its National Conversation on Public Health and Chemical Exposures. Previously, he was Professor and Chair of the Department of Environmental and Occupational Health at Emory University's Rollins School of Public Health and Professor of Medicine at Emory Medical School. Dr. Frumkin previously served on the Board of Directors of Physicians for Social Responsibility (PSR); as president of the Association of Occupational and Environmental Clinics (AOEC); as chair of the Science Board of the American Public Health Association (APHA), and on the National Toxicology Program Board of Scientific Counselors. He currently serves on the Institute of Medicine Roundtable on Environmental Health Sciences, Research, and Medicine. In Georgia, he was a member of the state's Hazardous Waste Management Authority, the Department of Agriculture Pesticide Advisory Committee, and the Pollution Prevention Assistance Division Partnership Program Advisory Committee, and is a graduate of the Institute for Georgia Environmental Leadership. He was named Environmental Professional of the Year by the Georgia Environmental Council in 2004. His research interests include public health aspects of the built environment; air pollution; metal and PCB toxicity; climate change; health benefits of contact with nature; and environmental and occupational health policy, especially regarding minority communities and developing nations. He is the author or co-author of over 180 scientific journal articles and chapters, and his books include *Urban Sprawl and Public Health*, *Emerging Illness and Society*, *Environmental Health: From Global to Local*, *Safe and Healthy School Environments*, and *Green Healthcare Institutions: Health, Environment, Economics*. Dr. Frumkin received his A.B. from Brown University, his M.D. from the University of Pennsylvania, his M.P.H. and Dr.P.H. from Harvard, his Internal Medicine training at the Hospital of the University of Pennsylvania and Cambridge Hospital, and his Occupational Medicine training at Harvard. He is Board-certified in Internal Medicine and Occupational Medicine, and is a Fellow of the American College of Physicians, the American College of Occupational and Environmental Medicine, Collegium Ramazzini and the Royal College of Physicians of Ireland.

John Groopman received his Ph.D. degree from the Massachusetts Institute of Technology and was also a post-doctoral fellow at MIT. He received further training as a staff fellow at the National Cancer Institute in the Laboratory of Human Carcinogenesis. Dr. Groopman has for over twenty-five years devoted his research efforts to developing biomarkers for use in human studies of environmental toxicant exposures and applying these biomarkers to interventions in high-risk populations. This work has resulted in over 230 publications, many of which are co-authored with members of the current program team. Dr. Groopman is currently the Anna M. Baetjer Professor and Chairman of the Department of Environmental Health Sciences at the Bloomberg School of Public Health. He also holds an appointment as Professor of Oncology at the Johns Hopkins School of Medicine and is the Associate Director of the Sidney Kimmel Comprehensive Cancer Center for Cancer Prevention and Control. Dr. Groopman is also the Director of the NIEHS supported Center in Urban Environmental Health (P30 ES003819). Prior to arriving at Johns Hopkins in 1989, Dr. Groopman served as Associate Dean at the Boston University School of Public Health.

NAS Workshop

The Exposome: A Powerful Approach for Evaluating Environmental Exposures and Their Influences on Human Disease

Patricia Hartge is the Deputy Director of the Epidemiology and Biostatistics Program, a component of the Division of Cancer Epidemiology and Genetics at the National Cancer Institute (NCI) in Bethesda, MD. Dr. Hartge has conducted research as an epidemiologist at the NCI since 1977. She has investigated the etiology of lymphoma, melanoma, and cancers of the ovary, breast, bladder and pancreas, with results reported in more than 250 peer-reviewed articles. The studies she has led, typically interdisciplinary and often multi-center, have included cohort, case-control and cross-sectional designs. She has developed, adapted, and tested a variety of widely used epidemiologic methods. Dr. Hartge chaired the NCI Cohort Consortium from 2006 through 2009. In that role, she initiated a genome-wide study of pancreatic cancer in 12 prospective cohorts and 8 case-control studies (PanScan), a multi-cohort prospective study of vitamin-D levels in serum and six cancers, and a very large pooled analysis of body mass and mortality. Beginning in 1992, she helped to design, direct, and analyze the PLCO cancer screening trial and cohort study. She has also served as an advisor to the Radiation Technologists Cohort and the Chernobyl cohorts. She now serves on the external advisory panel for the NIEHS-led Sister Study and on the NIH-AARP Study Steering Committee. She co-founded the international lymphoma case-control study consortium (InterLymph) in 2001 and organized the initial round of pooling projects of the consortium. Dr. Hartge has served as the Assistant Editor of the American Journal of Public Health, on the Board of Directors of the American College of Epidemiology, and on the Governing Council of the American Public Health Association. She currently serves on the editorial board of the American Journal of Epidemiology, and as an adjunct professor at George Washington University. Dr. Hartge received her BA from Radcliffe College, her MA in economics from Yale University and her ScD in epidemiology from the Harvard School of Public Health.

John Howard is the director of the U.S. Centers for Disease Control and Prevention's (CDC) National Institute for Occupational Safety and Health (NIOSH). In addition to being the director of NIOSH, he also serves as the World Trade Center Programs coordinator for HHS. Dr. Howard received a doctor of medicine degree from the Stritch School of Medicine at Loyola University of Chicago in 1974, a master of public health degree from the Harvard University School of Public Health in 1982, a doctor of laws from the University of California, Los Angeles in 1986, and a master of laws degree in administrative law and economic regulation from George Washington University in 1987. Dr. Howard was a distinguished consultant at the CDC and served as NIOSH director from 2002 through 2008. He also served as coordinator of HHS' World Trade Center Health Programs from 2006 to 2008. Howard was instrumental in the allocation and release of more than \$390 million dedicated to treatment and in working with the medical and scientific communities to develop a plan to help those who are or became ill from 9/11. Dr. Howard is board-certified in internal medicine, legal medicine, and occupational medicine. He is also admitted to the practice of medicine and law in the state of California and in the District of Columbia, and he is a member of the U.S. Supreme Court bar. He has written numerous articles on occupational health, law, and policy, and serves as a professorial lecturer in environmental and occupational health in the School of Public Health and Health Services at The George Washington University.

Dean Jones is a professor in the Department of Medicine (Pulmonary Division) at Emory University, Atlanta, GA. His central research focus is on redox mechanisms of oxidative stress. He currently directs the Emory Clinical Biomarkers Laboratory, which is focused on oxidative stress biomarkers and applications of 1H-NMR spectroscopy and Fourier-transform mass spectrometry for high-throughput clinical metabolomic analyses of nutritional and environmental factors in human health and disease. Recent studies have addressed mitochondria superoxide production during apoptosis, the antioxidant functions of GSH in the retinal pigment epithelium in association with oxidative injury and the role of ascorbate in protection against hyperoxic injury in the lung. Dr. Jones received his PhD in biochemistry from Oregon Health Sciences University.

NAS Workshop

The Exposome: A Powerful Approach for Evaluating Environmental Exposures and Their Influences on Human Disease

R. Craig Postlewaite is the Acting Director for Force Health Protection and Readiness Programs and the Director for Force Readiness and Health Assurance in the Office of Secretary of Defense for Health Affairs. In this capacity he writes policies, develops programs, provides oversight, and advocates for medical research. Specific areas and programs under his purview include Individual Medical Readiness, Human Performance Optimization, Global Medical Surveillance, Deployment Occupational and Environmental Health Surveillance, and Deployment Medical/Health Information Management Systems all focused on the health protection of Service members. Dr Postlewaite is a retired Air Force Colonel having served for 26 years on active duty in thfirst as a veterinarian and later as a public health officer, in a wide variety of base-level and command positions, including four years on the faculty at the US Air Force Academy. He has a DVM and a Masters degree in Public Health with an emphasis in occupational and environmental health.

Stephen M. Rappaport* received his B.S. degree in Chemistry from the University of Illinois in 1969 and his Ph.D. in Environmental Sciences and Engineering from the University of North Carolina in 1973. Between 1976 and 1990 he was Professor of Environmental Health at the University of California, Berkeley. He left Berkeley in 1990 to join the faculty of the University of North Carolina, and, in 2006, he returned to his former position at Berkeley. Professor Rappaport is Director and Principal Investigator of the Berkeley Center for Exposure Biology, a multidisciplinary program that brings together Berkeley researchers from Public Health, Chemistry, and Electrical Engineering to develop a new generation of biomarkers and biosensors for environmental epidemiology. He is a pioneer in the emerging field of 'Exposure Biology', and much of his current research involves the development and application of blood protein adducts as biomarkers of exposure to toxic chemicals arising from inhalation, ingestion, and endogenous processes. He has used environmental measurements and biomarkers to elucidate the metabolism of benzene, styrene, and polycyclic aromatic hydrocarbons in exposed people and to quantify interindividual variability in biomarker levels due to genetic, environmental and lifestyle factors. Prof. Rappaport has also published extensively in areas related to the assessment of long-term chemical exposures for purposes of controlling workplace hazards and of investigating exposure-response relationships. He has more than 200 peer-reviewed publications and has collaborated extensively with investigators throughout the world.

Nathaniel Rothman received an AB from Harvard College, a MD from Northwestern University Medical School, and a MPH and MHS from Johns Hopkins University School of Hygiene and Public Health. He is board-certified in Internal Medicine and Occupational Medicine/Preventive Medicine. He joined NCI in 1990 and is a Senior Investigator and Head of Molecular Epidemiology Studies in the Occupational and Environmental Epidemiology Branch of the Division of Cancer Epidemiology and Genetics. His research focuses on the molecular epidemiology of known or suspected occupational and environmental carcinogens including aromatic amines, benzene, formaldehyde, TCE, PAHs, and organochlorines. He uses biomarkers of exposure, intermediate endpoints, and genetic susceptibility, in particular, in studies of bladder, kidney, and lung cancer, and leukemia and lymphoma. He is the author of over 300 publications and lead editor of the next edition of *Molecular Epidemiology: Principles and Practices*.

* Committee on Emerging Science for Environmental Health Decisions

NAS Workshop

The Exposome: A Powerful Approach for Evaluating Environmental Exposures and Their Influences on Human Disease

Enrique Schisterman is a senior investigator at the NIH National Institute of Child Health and Human Development. His current research interest focuses on exposure assessment, with emphasis on the use of biomarkers. Dr. Schisterman has a long-standing interest in issues related to oxidative stress and its impact on general health, and particularly as it relates to women's health (i.e., endometriosis, infertility, and menstrual cycle function). He also has worked to develop new analytical tools that are closely tied to etiological questions. Dr. Schisterman earned both his master's degree and his doctorate degree from the State University of New York, Buffalo.

Martyn T. Smith is a professor of Environmental Health Sciences at the UC Berkeley School of Public Health. Dr. Smith's research interest is in the causes of blood cancers (leukemia & lymphoma) in adults and children and to develop new therapies for their treatment. His laboratory is developing biomarkers that will allow identification of persons at risk of leukemia and lymphoma and are examining the effects of chemicals linked with these diseases, such as benzene, formaldehyde and chlorinated solvents, in molecular epidemiology studies of exposed human populations. Studies on the basic biology of these diseases in cell culture aim to understand the role of stem cells, chromosome changes, epigenetic changes, and immunological dysfunction in the development of these diseases and elucidate targets for potential therapy. Dr. Smith received his PhD from St. Bartholomew's Hospital College in London.

Tyler C. Smith serves as the director of the DoD Center for Deployment Health Research, located at the Naval Health Research Center in San Diego, CA. He leads a team of more than 30 research professionals in large strategic studies of military occupational and reproductive health. The team's research portfolio includes many large studies of 1991 Gulf War veterans and current veterans of the wars in Iraq and Afghanistan. The team maintains the US Department of Defense Birth and Infant Health Registry and the largest prospective study in US military history – the Millennium Cohort. Dr. Smith received a BS in mathematics with an option in statistics, a MS in statistics from the University of Kentucky, and a PhD in epidemiology from the University of California, San Diego. With 14 years at the DoD Center and more than 80 peer-reviewed publications focusing on military health relevant topics, his responsibilities pivot around the Millennium Cohort Study and other deployment health related studies.

Paolo Vineis is chair of environmental epidemiology at Imperial College London, UK. He also is adjunct professor of epidemiology at the Mailman School of Public Health at Columbia University. His current research examines the relationships between risk factors for cancer and the molecular mechanisms by which they exert their action (molecular epidemiology). In particular, he conducts research on genetic susceptibility related to DNA repair and the metabolism of carcinogenic substances, and on intermediate markers such as DNA adducts. Such research is conducted in the context of site-specific case-control studies and in a large European cohort on diet and cancer, EPIC. In addition, Dr. Vineis has a strong interest in philosophical issues related to causality in medicine, a subject on which he has written a book and several papers.

NAS Workshop

The Exposome: A Powerful Approach for Evaluating Environmental Exposures and Their Influences on Human Disease

Linda S. Wennerberg applies her 36 years of experience in the assessment, development, and integration of cost-effective and defensible environmental management policies and strategies. Dr. Wennerberg focuses on the integration of applicable aspects of environmental law, institutional economics, scientific information, and strategic planning to promote innovation and compliance. Her clients included Federal (EPA, DoD, and DOE) and state agencies, as well as, large and small private sector firms and academic institutions. Currently, she provides expert advice to NASA on a variety of strategic positioning issues to identify and address new or changing regulatory and policy requirements (including Climate Change and Green House Gases, chemicals of interest, and nanomaterials) and formulation of the agency-wide risk management process.

Christopher Wild is director of the International Agency for Research on Cancer (IARC) and honorary chair in epidemiology at the University of Leeds. Dr Wild's main research interest is to understand the interplay between environmental and genetic risk factors in the causation of human disease. He has particularly sought to apply biomarkers in population-based studies in order to address this research area. He has focused on the causes and prevention of liver and oesophageal cancers and has a particular interest in the impact of mycotoxins on human health. Dr. Wild obtained his PhD in 1984 from the University of Manchester, UK whilst working on the production of monoclonal antibodies to detect low levels of methylated DNA bases. He was awarded a post-doctoral fellowship from IARC to work in Lyon, France and subsequently a UK Royal Society European Exchange Fellowship to spend a year at the Netherlands Cancer Institute in Amsterdam. In 1987 he rejoined IARC as a staff scientist and later became Chief of the Unit of Environmental Carcinogenesis. In 1996 he was appointed to the Chair of Molecular Epidemiology at the University of Leeds, was Head of the Centre for Epidemiology and Biostatistics and later became Director of the Leeds Institute of Genetics, Health and Therapeutics in December 2005. He was elected Director of IARC in May 2008 and he took office on 1st January 2009. He has published over 170 peer-reviewed scientific papers. Dr. Wild was Chair of the UK Molecular Epidemiology Group (2001-2005) and was awarded the UK Molecular Epidemiology Group 10th Anniversary Medal in 2006 for his contributions to the discipline over the previous decade. He was also a founding member of the Ethics and Governance Council of the UK Biobank.