EMERGING SCIENCE ON INDOOR CHEMISTRY AND IMPLICATIONS: AN INFORMATION-GATHERING WORKSHOP

HOSTED BY THE COMMITTEE ON EMERGING SCIENCE ON INDOOR CHEMISTRY

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Speaker Biographies

Gary Adamkiewicz is an associate professor of Environmental Health and Exposure Disparities at the Harvard T.H. Chan School of Public Health (HSPH), where much of his work focuses on the connections between housing and health, and in understanding disparities in environmental exposure. His research has included studies of indoor environmental conditions within the homes of children with asthma, and studies that aim to understand the factors that contribute to specific exposures such as: pesticides and other chemicals, allergens, secondhand smoke, particulate matter and other combustion by-products. He has worked with national, state and local agencies the on projects that aim to reduce the burden of disease from indoor environmental issues. Dr. Adamkiewicz has served as a member of the Science Advisory Committee for the National Center for Healthy Housing and has served on Environmental Protection Agency's Environmental Justice Technical Guidance Review Panel, under the auspices of the agency's Science Advisory Board. He has also served as an advisor to the World Health Organization's effort to establish indoor air quality guidelines. In 2012, the American Journal of Public Health awarded Dr. Adamkiewicz a 'Paper of the Year' honor for his work on housing as an environmental justice issue. Dr. Adamkiewicz holds a Ph.D. in chemical engineering from the Massachusetts Institute of Technology and an M.P.H. from HSPH.

Deborah Bennett is currently a Professor of Environmental and Occupational Health at the University California, Davis. Dr. Bennett's research focuses on the fate, transport, and exposure of organic compounds chemicals in multi-scale applications, including direct consumer product use, and indoor and outdoor multimedia environments within the context of both environmental epidemiology and environmental risk assessment. Her work utilizes both modeling and measurement techniques, bridging the gap between these two lines of inquiry. As an exposure scientist, she strives to expand the world of compounds under consideration, considering newly measured compounds and putting them into exposure with toxicity measures to evaluate potential risk, including work to expand the list of chemicals being measured in the Environmental influences on Child Health Outcomes project. She is involved in several projects focusing on environmental causes of Autism, determining exposures through measurements, models, and questionnaire data. Recent projects include the impact of air filtration interventions on asthma exacerbation, and exposures to heat, pesticides, and particulate matter among farmworker populations. She is on the U.S. Environmental Protection Agency (EPA) Charter Science Advisory Board. She has served as an Elected Councilor, Treasurer, and Chair of the

Awards Committee for the International Society of Exposure assessment. She has received funding from the American Chemistry Council, California Air Resources Board, EPA, and the National Institute for Environmental Health. She received her Ph.D. and M.S. in Mechanical Engineering from the University of California, Berkeley.

Richard L. Corsi is Dean of the Maseeh College of Engineering & Computer Science at Portland State University. He previously served on the faculty of the University of Guelph prior to 25 years in the Department of Civil, Architectural and Environmental Engineering at the University of Texas at Austin (UT Austin). At UT Austin he served as department chair, endowed research chair, and member of the Academy of Distinguished Teachers. Dr. Corsi and his research team have studied indoor air quality, from sources to fate and control of pollutants of both indoor and outdoor origin. His team was the first to incorporate a complex outdoor atmospheric chemistry algorithm into a model for indoor atmospheres, and also completed a modeling effort focused on cost-benefit analyses of indoor ozone control in a dozen cities, accounting for ozone reaction products. His team studied disinfectant interactions and by-product formation with a wide range of indoor materials, potential for passive removal materials to quench indoor chemistry, and indoor SOA formation in actual homes and laboratory chambers in the presence of common consumer products. Dr. Corsi has been honored as a Distinguished Alumnus of Humboldt State University and the College of Engineering at the University of California at Davis. He is past President of the Academy of Fellows of the International Society of Indoor Air Quality and Climate. Dr. Corsi's work has been featured in The Economist, National Geographic, NY Times, Washington Post, CBC The Nature of Things, NPR's Science Friday w/ Ira Flatow, and more. He received his M.S. and Ph.D. degrees in Civil Engineering from the University of California at Davis.

Hugo Destaillats is a Senior Scientist at the Lawrence Berkeley National Laboratory (LBNL), and is interested in the chemistry of the built environment and urban systems. Prior to joining LBNL in 2003, he was a postdoctoral researcher at Caltech and the University of California, Davis. His research focuses on the sources, transport, and chemical transformations of indoor pollutants, with the aim of preventing or mitigating harmful human exposures. A major initiative, funded by the State of California, is the study of thirdhand tobacco smoke, and the contaminants released by emerging alternatives such as electronic cigarettes, heated tobacco products, and cannabis concentrates. He is also interested in advancing new technologies and materials for healthy and energy-efficient built environments, including indoor air purification technologies. Dr. Destaillats is on the editorial board of the journal *Indoor Air*, and has been elected to the International Society for Indoor Air Quality and Climate Academy of Fellows. Dr. Destaillats has published almost 80 articles in peer-reviewed journals and two book chapters, and holds three U.S. patents. His work has been featured in *The Washington Post*, *US News & World Report*, *LA Times*, *Chemical & Engineering News*, *BBC News*, *The Telegraph*, *Radio Canada*, *BFMTV*, *Le Figaro*, and *Der Spiegel*, among other media outlets. In 2018, his team received the

LBNL Director's Award for Exceptional Achievements in the category Social Impact. He received his Ph.D. in chemistry from the University of Buenos Aires, Argentina, in 1998.

Kathie Dionisio is an associate national program director for the Chemical Safety for Sustainability research program in the U.S. Environmental Protection Agency's (EPA) Office of Research and Development. Previously, she spent nine years as a principal investigator with the EPA. She has wide ranging experience in the field of exposure science, spanning air quality modeling, personal exposure measurement, and generation of data streams to inform chemical exposure, including a stint in sub-Saharan Africa doing field work. Dr. Dionisio has a B.S. in biomedical engineering from Columbia University, a M.S. in mechanical engineering from the Massachusetts Institute of Technology, and a Ph.D. in environmental health, with a concentration in Exposure Science, from the Harvard School of Public Health.

Kristin Isaacs is a research physical scientist in the Center for Computational Toxicology and Exposure of the U.S. Environmental Protection Agency's Office of Research and Development (ORD). Since 2014, she has been a co-lead of ORD's Exposure Forecasting (ExpoCast) project under its Chemical Safety for Sustainability National Research Program. Her research focuses on characterizing chemical exposure pathways for human and ecological receptors and developing high-throughput approaches for quantifying exposures for use in chemical safety decision-making. She has co-authored over 40 peer-reviewed publications and serves on a variety of national and international workgroups related to advancing exposure science. She received additional training at EPA as a postdoctoral researcher, modeling lung dosimetry and pharmacokinetics of inhaled pollutants. She joined EPA as a researcher in 2010. Dr. Isaacs received her Ph.D. in Biomedical Engineering in 2002 from Vanderbilt University for research in quantitative physiology, in which she developed computational modeling methods for circulatory and pharmacokinetic systems.

William (Bill) Nazaroff is the Daniel Tellep Distinguished Professor Emeritus, Department of Civil and Environmental Engineering, University of California, Berkeley. His research career has focused on the physics and chemistry of air pollutants in proximity to people, especially in indoor environments. His research team also emphasized the development and application of methods for understanding mechanistically the relationships between emission sources and human exposure to pollutants. He is in the Academy of Fellows of the International Society of Indoor Air Quality and Climate and is also a Fellow of the American Association for Aerosol Research. He served as editor-in-chief of the journal Indoor Air. Dr. Nazaroff has served on four Academies' committees, most recently as a member of the Committee on Advancing Understanding of the Implications of Environmental-Chemical Interactions with the Human Microbiomes. He earned his Ph.D. in environmental engineering science from the California Institute of Technology, and also was awarded an honorary doctorate from the Technical University of Denmark.

Andrea Polidori is the advanced monitoring technologies manager at the South Coast Air Quality Management District (AQMD) in the Science and Technology Advancement Division. His primary responsibilities include the overall management of all South Coast AQMD special monitoring programs and related projects. He has been leading the design, development and implementation of the Air Quality Sensor Performance Evaluation Center, a program created to conduct comprehensive performance tests of commercially available low-cost air quality sensors. He is in charge of South Coast AQMD's fenceline monitoring program, which was created to demonstrate the capabilities of optical remote sensing technologies for measuring refinery and other industrial emissions. He is responsible for the implementation of South Coast AQMD's Rule 1180, which mandates the execution of real-time air quality measurements at or near the fenceline of all major refineries in the South Coast Air Basin, and in nearby communities. His is also responsible for implementing air monitoring strategies to satisfy the requirements of Assembly Bill (AB) 617, a State Law which was created to address the disproportionate impacts of air pollution in environmental justice communities. Dr. Polidori earned his Ph.D. in environmental science from Rutgers University.

Tunga Salthammer is the head of the Material Analysis and Indoor Chemistry Department at the Fraunhofer Institute for Wood Research, Wilhelm-Klauditz Institute (WKI). He joined WKI in 1990 and was appointed as head of the Department of Material Analysis and Indoor Chemistry. In 2010, he was the acting director of WKI, and in 2011, he was named the deputy director of the institute. Previously, Dr. Salthammer was a Professor of Indoor Hygiene at the University of Applied Sciences Braunschweig/Wolfenbuettel. Since 2007, Dr. Salthammer has been an Adjunct Professor at the Queensland University of Technology in Brisbane, Australia. In 2008, he received his habilitation from the Faculty of Life Sciences at the Technical University of Braunschweig and was appointed as a Professor in 2012. Dr. Salthammer was a Visiting Professor at the Technical University of Denmark and at Tsinghua University. He is a member, and is currently chairman, of the Indoor Air Hygiene Commission of the German Federal Environment Agency. Since 2008, he has been serving as an officer of the International Society of Indoor Air Quality and Climate Academy of Fellows, where he served as President from 2014 - 2016. His research interests include analytical chemistry, volatile organic compounds/ semivolatile organic compounds, emission studies on indoor materials using test chambers and cells, indoor chemistry, airborne particles, and settled dust. Dr. Salthammer earned his Ph.D. in physical chemistry from the Technical University of Braunschweig, Germany.

Jeffrey Siegel is a Professor of Civil and Mineral Engineering at the University of Toronto and a member of the university's Building Engineering Research Group. He holds joint appointments at the Dalla Lana School of Public Health and the Department of Physical & Environmental Sciences. He is international recognized for his work on indoor air quality generally and air cleaning specifically and is a fellow of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and a member of the Academy of Fellows of the International Society for Indoor Air and Climate. His research interests include healthy and

sustainable buildings, filtration and air cleaning, ventilation and indoor air quality in residential and commercial buildings, control of indoor particulate matter, and the impact of building systems on indoor microbiology and chemistry. Dr. Siegel has published over 100 journal articles on indoor topics and was an associate editor for the journal *Building and Environment* from 2015-2019. He is a member of authoring committees for position documents at ASHRAE and at the American Heart Association. He teaches courses in indoor air quality, sustainable buildings, and sustainable energy systems. He holds an M.S. and Ph.D. in Mechanical Engineering from the University of California, Berkeley.

John Wambaugh is a research physical scientist with the Center for Computational Toxicology and Exposure at the U.S. Environmental Protection Agency (EPA). Dr. Wambaugh's areas of active research include high throughput methods for chemical exposure, toxicokinetics, and toxicology. He co-leads the EPA "exposure forecasting" or "ExpoCast" project. He develops and evaluates predictive models using mathematics, machine learning, Bayesian methods, and other applied statistic techniques. Dr. Wambaugh collaborates on the design of new experiments (including non-targeted chemical analyses and in vitro methods) to refine models and reduce uncertainty. A primary focus of John's research is in vitro-in vivo extrapolation (IVIVE) including the development of high throughput toxicokinetics (HTTK). He leads development the R package "httk" which is downloaded roughly 1000 times monthly. Dr. Wambaugh has co-authored more than seventy peer-reviewed papers. He serves as an associate editor at Environmental Health Perspectives and is adjunct faculty in the Department of Environmental Sciences and Engineering at the University of North Carolina, Chapel Hill. He received his Ph.D. in physics and M.S. in computer science from Duke University. He trained as a post-doctoral researcher at EPA's CompTox center, where he studied toxicokinetics and Bayesian methods.

Frank Wania is currently professor of environmental chemistry at the University of Toronto Scarborough (UTSC). He joined UTSC in 1999. Previously, he spent two years as a scientist at the Norwegian Institute for Air Research, and three years as an independent researcher. He has wide-ranging research interests related to environmental contaminant fate, with a focus on gaining a mechanistic understanding of contaminant enrichment processes through a combination of fieldwork, laboratory experimentation and model simulations. In particular, he has made important contributions to understanding and quantifying cold-trapping phenomena of persistent organic pollutants on a global scale and along elevation gradients in mountains. Currently a member of the board for *American Chemical Society Environmental Science & Technology Water*, *Environmental Research Letters,* and *GAIA*, he was previously chair of the editorial board of *Environmental Sciences: Processes & Impacts*. Since 1990, he has published more than 255 peer-reviewed publications, that have been cited in excess of 23,000 times. He is a Fellow of the Royal Society of Canada since 2017, a Fellow of the Royal Society of Chemistry since 2011, won the Chemical Institute of Canada Environment Division Research & Development Dima Award in 2015 and is a UTSC Research Excellence Faculty Scholar in 2016-

2018. Dr. Wania received his Ph.D. in chemical engineering and applied chemistry from the University of Toronto in 1995.

Paul O. Wennberg, NAS, is R. Stanton Avery Professor of Atmospheric Chemistry and Environmental Science and Engineering and the Director of Ronald and Maxine Linde Center for Global Environmental Science at the California Institute of Technology. His research has improved our understanding of stratosphere and troposphere composition and anthropogenic impacts on climate, ozone depletion, and air quality. His laboratory has developed of state-of-the-art in situ laboratory, airborne, and ground-based instrumentation. These instruments have participated in numerous field campaigns across the world. Dr. Wennberg's laboratory has also been at the center of the development of space- and ground-based measurement of greenhouse gases by remote sensing. He has helped to create the Total Carbon Column Observing Network that is used as the ground-based standard for measurement of greenhouse gas column abundance. In an earlier life, he was an Industrial Hygienist. He was elected into the National Academy of Sciences in 2017 as a member of the geophysics section. Dr. Wennberg earned his Ph.D. in physical chemistry from Harvard University in 1994.

Charles J. Weschler has held positions at the Environmental & Occupational Health Science Institute, Rutgers University, and the International Centre for Indoor Environment and Energy, Technical University of Denmark since 2001. In 2010, joined the Building Science department at Tsinghua University as an ongoing Visiting Professor. From 1999-2005 Weschler served on the U.S. Environmental Protection Agency's Science Advisory Board. He has also served on four Academies' committees. Since 2012, he has also been an advisor to the Sloan Foundation's program on Chemistry in Indoor Environments. Previously, he worked at Bell Labs (Physical Chemistry Division) and its successor institutions for twenty-five years, where he was named Distinguished Member of Technical Staff in 1986. His research interests include chemicals in indoor environments, their sources, their chemistry, and their interactions with building occupants. He was elected to the International Academy of Indoor Air Sciences in 1999 and received the Pettenkofer Award, its highest honor, in 2014. Dr. Weschler has also received the 2017 Haagen-Smit Prize from Atmospheric Environment, was announced "Distinguished Visiting Professor" at Tsinghua University, was awarded "Doctor Technices Honoris Causa" from the Technical University of Denmark, and was elected a Fellow of the American Association for the Advancement of Science. After completing his Ph.D. in Chemistry at University of Chicago, Dr. Weschler did his postdoctoral studies with Fred Basolo at Northwestern University.