THE NATIONAL ACADEMIES

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Integrating Environmental Health Data to Advance Discovery

January 10-11, 2013

SPEAKERS/MODERATORS/PANELISTS BIOSKETCHES

Stanley C. Ahalt, Ph.D. came to the University of North Carolina at Chapel Hill in September 2009 to serve as director of the Renaissance Computing Institute (RENCI), an institute that builds and deploys advanced cyberinfrastructure to enable university research. He is also a professor in the UNC Department of Computer Science and in 2011, was named Director of the Biomedical Informatics Service of the North Carolina Translational and Clinical Sciences Institute (NC TraCS), UNC's Clinical Translational Science Award, where he has leveraged the expertise and resources of RENCI to foster clinical and translational research across the UNC campus.

Before coming to North Carolina, Dr. Ahalt was executive director of the Ohio Supercomputer Center (OSC) from 2003 - 2009 and a professor in the Department of Electrical and Computer Engineering at The Ohio State University for 22 years. He is a member of Microsoft's Technical Computing Advisory Committee, a member of the Council on Competitiveness High Performance Computing Advisory Committee, and an extramural member of the National Cancer Institute's Advanced Biomedical Computing Center Oversight Committee. He served as president of the Board of the Great Lakes Consortium for Petascale Computation (2011 – 2012), and as Chair of the Coalition for Academic Scientific Computation (2009 – 2010).

A native of Virginia, Dr. Ahalt holds a Ph.D. in electrical and computer engineering from Clemson University and master's and bachelor's degrees in electrical engineering from Virginia Polytechnic Institute and State University.

Ewan Birney, Ph.D., is Associate Director of the EMBL-European Bioinformatics Institute (EMBL-EBI). He is one of the founders of the Ensembl genome browser and other databases, and has played a key role in many large-scale genomics projects, notably the sequencing of the Human Genome in 2000 and the analysis of genome function in the ENCODE project. He has been Lead Analysis Coordinator for ENCODE since 2007; he also coordinated data analysis in the "1% Pilot". Dr Birney has played a vital role in annotating the genome sequences of the human, mouse, chicken and several other organisms; this work has had a profound impact on our understanding of genomic biology. His research group currently focuses on genomic algorithms and inter-individual differences in human and other species.
As Associate Director of EMBL-EBI, Dr Birney shares strategic oversight of EBI services with Rolf Apweiler (co-Associate Director). EMBL-EBI hosts some of the world's most important collections of biological data, including DNA sequences, the genomes of animals and plants , three-dimensional molecular structures, data from gene expression experiments, Protein mass spectroscopy, small molecules of biological interest,their drug/protein target interactions and pathways. Many of these resources are developed in close collaboration with our patners at Swiss Institute of Bioinformatics, Sanger Institute, and Ontario Institute for Cancer Research. The EBI leads the European Elixir project which aims to broaden and deepen these relationships in Europe to provide an stable bioinformatics infrastructure that works well in the national, transnational and international contexts. As well as these strategic aspects, Ewan Birney still does research, working on aspects such as DNA Compression, Functional genomics analysis (eg, a recent paper with the Furlong lab) and using inter individual differences to understand basic biology (eg, a paper of CTCF binding in two families)

C. Titus Brown, Ph.D. received his BA in Math from Reed College in 1997, and his PhD in Developmental Biology at Caltech in 2006. He has worked in digital evolution, climate measurements, molecular and evolutionary developmental biology, and both regulatory genomics and transcriptomics. He is now an Assistant Professor at Michigan State University where his current focus is on using novel computer science data structures and algorithms to explore big sequencing data sets from metagenomics and transcriptomics.

Elaine Cohen Hubal, Ph.D., currently serves as Interim Deputy National Program Director for EPAs Chemical Safety for Sustainability (CSS) Research. The CSS Research Program has the goal of advancing integrated chemical evaluation strategies and decision support tools that promote human and environmental health and are protective of vulnerable species and populations. 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. Prior to her current appointment, Dr Cohen Hubal developed and led ExpoCast, the EPA research program focused on exposure science to support chemical prioritization and toxicity testing. 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 research program.

Dr. Cohen Hubal has published in the areas of children's exposure, human health risk modeling, and exposure science to inform design and interpretation of HTP toxicity testing. 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 WHO IPCS working group on "Identifying Important Life Stages for Monitoring and Assessing Risks from Exposures to Environmental Contaminants." Dr. Cohen Hubal also serves on the editorial board for the Journal of Exposure Science and Environmental Epidemiology. 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.

George P. Daston, Ph.D., has been employed at Procter & Gamble Company since 1985, where he is Victor Mills Society Research Fellow. Dr. Daston has spent his entire career in research to understand the effects of exogenous chemicals on biological systems, especially the developing embryo, fetus and child. His research interests include teratogenic mechanisms, in vitro methodologies, and risk assessment. He has published over 100 peer-reviewed articles, reviews and book chapters, and has edited three books. Dr. Daston's professional activities include serving as Councilor of the Society of Toxicology (2001-03); President (1999-2000) of the Teratology Society; member of the National Academy of Sciences Board on Environmental Studies and Toxicology (1995-98); member of the EPA Board of Scientific Counselors (2002-08); member of the U.S. National Toxicology Program Board of Scientific Counselors (2003-06, Chair in 2006); member of the National Children's Study Advisory Committee (2003-06); and member of EPA's Endocrine Disrupter Screening and Testing Advisory Committee (EDSTAC). He has served on several NRC committees, including the Committee on Developmental Toxicology, Committee on Research Opportunities and Priorities for EPA, and the Subcommittee on Arsenic in Drinking Water. Dr. Daston has served on the organizing committees for numerous government and private sector-organized workshops on reproductive toxicity, risk assessment, and non-animal alternatives. He chaired NIEHS/ICCVAM working groups evaluating the state of validation of the Frog Embryo Teratogenesis Assay - Xenopus (FETAX) assay for teratogen screening and receptor binding and transcriptional activation assays for estrogens and androgens. Dr. Daston is Editor-in-Chief of Birth Defects Research: Developmental and Reproductive Toxicology. Dr. Daston is an Adjunct Professor in the Department of

Pediatrics and Developmental Biology Program at the University of Cincinnati and Children's Hospital Research Foundation. Dr. Daston received his Ph.D. from the University of Miami and post-doctoral training at the U.S. EPA's laboratories in Research Triangle Park, North Carolina.

Allen Dearry, Ph.D., is Director of the Office of Scientific Information Management (OSIM) at the National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health (NIH). In this role, he provides senior leadership in the effort to define, plan, and evaluate scientific data and knowledge management approaches in environmental health. OSIM includes the NIEHS Library; an informationist program, designed to provide experts with both information and scientific expertise to research labs and program offices; and a data science program to facilitate access to data and collaboration among researchers. Dr. Dearry serves on a number of trans-NIH and interagency coordinating committees to enhance communication and cooperation on bioinformatics, computational biology, and "big data." Dr. Dearry has been honored to receive three DHHS Secretary's Awards for Distinguished Service: for providing outstanding leadership on issues related to possible health effects of exposure to Pfiesteria toxins (1998); for generating a public health and research response to the World Trade Center disaster (2002); and for dedicated support for the health and safety of victims of Hurricanes Katrina and Rita along the Gulf Coast (2006). He also received a Distinguished Service Award from the Environment Section of the American Public Health Association (2008). Before coming to NIH, Dr. Dearry received a Ph.D. in Anatomy from the University of Pennsylvania; was a postdoctoral fellow at the University of California, Berkeley; and an Assistant Professor of Cell Biology and Ophthalmology at Duke University Medical Center, where he cloned the gene for the human D1 dopaminergic receptor. He has two US patents for this and subsequent investigations.

Francesca Dominici, Ph.D., is Professor of Biostatistics in the Harvard School of Public Health and Associate Dean of Information Technology. Dr. Dominici received her Ph.D. in Statistics at the University of Padua in 1997. From 1997 to 2009 she was at the Bloomberg School of Public at Johns Hopkins University and in 2009 moved to the School of Public Health at Harvard University.

Dr. Dominici's research has focused on the development of statistical methods for the integration of large data to assess and monitor health risks associated to air pollution and climate change. She has developed statistical methods for the analysis of large databases on air pollution and health. She has gained experience with the analysis of Medicare data and their linkage by geography and time to other data sources, such us air pollution, weather, and socioeconomic status. She has developed statistical methods for the adjustment of measured and unmeasured confounders, Bayesian hierarchical models, causal inference methods, and missing data methods.

Dr. Dominici is the recipient of the first Walter A. Rosenblith Young Investigator Award from The Health Effects Institute, Boston, MA; the Diversity Recognition Award, from Johns Hopkins University, 2009; of the Myrto Lefkopoulou Distinguished Lectureship Award, from the Department of Biostatistics, School of Public Health, Harvard University, 2007, and of the Mortimer Spiegelman Award, from Statistics Section of the American Public Health Association, 2006.

Dr. Dominici has served on a number of National Academies' committees including the Committee on Gulf War and Health: Review of the Medical Literature Relative to Gulf War Veterans' Health; the Committee to Assess Potential Health Effects from Exposures to PAVE PAWS Low-level Phased-array Radiofrequency Energy; the Committee on The Utility of Proximity-Based Herbicide Exposure Assessment in Epidemiologic Studies of Vietnam Veterans, and the Committee to Review ATSDR's Great Lakes Reports.

Greg K. Farber, Ph.D., has a B.S. from Penn State University in chemistry (1984) and a Ph.D. from MIT in physical chemistry (1988). Dr. Farber's research in graduate school involved determining the three

dimensional structure and mechanism of the enzyme xylose isomerase in the laboratory of Dr. Gregory A. Petsko. After graduate school, Dr. Farber received a Life Sciences Research Fellowship to work on mechanistic enzymology with Dr. W. W. Cleland at the University of Wisconsin. Following his postdoctoral fellowship, Dr. Farber returned to Penn State as an Assistant Professor of Biochemistry and rose to the rank of Associate Professor by 1998. His research included work on structural movies of enzyme action, molecular evolution, and mechanistic enzymology.

Following a sabbatical year in the Division of Biological Infrastructure at the National Science Foundation, Dr. Farber decided to stay in government service. He moved to the National Center for Research Resources (NCRR), part of NIH, in 2000. At NCRR, he originally managed a number of technology development, bioinformatics, and interdisciplinary research centers.

Dr. Farber then became the Director of the Office of Extramural Activities at NCRR. The Office of Extramural Activities oversees the Office of Grants Management and the Office of Review. Dr. Farber also served as the Director of the Office of Construction Grants. That Office managed $1B in construction awards made using American Recovery and Reinvestment Act funds. In addition to the Construction program, Dr. Farber supervised all of the other American Recovery and Reinvestment Act activities at NCRR.

In June 2011, Dr. Farber became the Director of the Office of Technology Development and Coordination at the National Institute of Mental Health. That office is responsible for coordinating all technology development and bioinformatics activities at NIMH, the National Database for Autism Research, and also oversees the SBIR program.

Stephen Friend, Ph.D., is an authority in the field of cancer biology and a leader in efforts to make large scale, data-intensive biology broadly accessible to the entire research community. He has more than a decade of experience using large datasets and integrating system biology approaches to complex diseases. This includes work pioneering the field of the genetics of gene expression. Dr. Friend is the President of Sage Bionetworks and Director of the new Sage Bionetworks Center for Cancer Systems Biology where he actively leads an interdisciplinary team of network, systems and computational biologists. Sage Bionetworks' mission is to develop predictive disease models based on globally coherent datasets built from clinical data and multiple layers of genomic data using Bayesian and co-expression approaches.

Dr. Friend has been a senior advisor to the NCI and several biotech companies, a Trustee of the AACR and recently was made a AAAS Fellow. After receiving a PHD in biophysics Dr. Friend did his clinical training at Children's Hospital of Philadelphia and the Dana-Farber Cancer Research Institute in Boston. He had lab training in the Weinberg lab at the Whitehead Institute where he lead the team that cloned the first tumor suppressor gene p53 and characterized its role in controlling the cell cycle. Dr. Friend next joined Dr. Leland Hartwell at the FHCRC to establish the Seattle Project and explore how model organisms could provide insights into cancer and chemotherapeutic responses. In 1997 they co-founded Rosetta Inpharmatics where they showed that expression patterns could provide detailed functional snapshots linking yeast and man. After Rosetta was bought by Merck & Co. Inc. in 2001 Dr. Friend was recruited to become a senior Vice President at Merck, head their molecular profiling effort and form a new oncology unit which placed seven new chemical entities into clinical trials in seven years. Recognizing that genetic datasets were too fragmented and siloed and data and model sharing was inadequate, he left Merck in 2009 to form Sage Bionetworks, a non-profit foundation with Dr. Eric Schadt. Dr. Friend is also co-leader of the Arch2POCM initiative that is building an open, pre-competitive research infrastructure for collaborative pre-clinical and proof of concept in man drug development.

Kevin T. Gallagher, M.S., serves as the Associate Director, Core Science Systems and oversees the USGS' Geologic Mapping, Geological and Geophysical Data Preservation, Geospatial, Biological Information, and Science Informatics Programs as well as the world's largest Earth Science Library. From 2002-2010, Mr. Gallagher served as the USGS Chief Information officer and Chief Technology Officer where he oversaw the operation of information technology systems and networks supporting bureau wide computing and telecommunications.

Before joining the USGS, Mr. Gallagher held a number of information technology and management positions at various Federal agencies, including Chief, Operations Division, U.S. Coast Guard Operations Systems Center, where he oversaw the development and operations of computer systems supporting Search and Rescue, Environmental Protection, Marine Safety, and Law Enforcement; and Software Developer with the Department of the Navy and Naval Research Laboratory, where he developed computer applications supporting Research and Development and Environmental Preparedness, Prevention and Response.

Mr. Gallagher has written articles on software development and the role of information technology in enhancing mission performance and has co-authored a number of strategic plans including the USGS 10-year science strategy entitled, *Facing Tomorrow's Challenges, U.S. Geological Survey Science in the Decade 2007-2017*.

Mr. Gallagher holds a Master of Science, Information Systems degree from Syracuse University, a Chief Information Officer Certificate from the National Defense University, and a Bachelor of Science degree in Management Information Systems from James Madison University. He has also completed the Harvard Senior Executive Fellows Program at Harvard University.

Suzanne Iacono, Ph.D., serves as the Deputy Assistant Director in the Directorate for Computer and Information Science and Engineering (CISE) at the National Science Foundation (NSF). Among other responsibilities, she serves as the co-chair of the Big Data Senior Steering Group, the focal point for USG interagency Big Data activities under the Networking Information Technology Research and Development (NITRD) program. Over the past fifteen years at NSF, she has served in many capacities, including Division Director (DD) and Deputy DD for Information and Intelligent Systems, DD for the Division of Computer and Network Systems (CNS), CISE Senior Science Advisor and CISE Acting Deputy. Prior to coming to NSF, she held a faculty position at Boston University, was a Visiting Scholar at the Sloan School, Massachusetts Institute of Technology, and was a Research Associate at the Public Policy Research Office at the University of California, Irvine. Over the years, she has written journal articles, book chapters and conference papers on Social Informatics, an area of interdisciplinary research and education that integrates aspects of computer and social sciences. Suzi received her PhD from the University of Arizona in Information Systems and her MA and BA from the University of California, Irvine in Social Ecology.

Matthew T. Martin, Ph.D., a research biologist within NCCT, earned both his M.S. (Environmental Science and Engineering) and Ph.D. (Environmental Science with an additional focus on Bioinformatics and Computational Biology) from the University of North Carolina at Chapel Hill. He earned his B.S. (Integrated Science and Technology) from James Madison University. His doctorate work focused on developing predictive models of reproductive toxicity and the application of those models toward chemical prioritization and integrated testing strategies. Matt started his career at Versar Inc. as an environmental scientist working at EPA doing antimicrobial pesticide risk assessment and eventually to CH2M Hill Inc. as a database analyst. Matt began his career at EPA as part of the EPA Intern Program (now called the Environmental Careers Program) where he was able to do rotations across different parts of the agency, including the Office of Pesticide Programs and Office of Pollution Prevention and Toxics. He is now a research biologist within NCCT, where he is part of the EPA ToxCast team and leads the

Toxicity Reference Database (ToxRefDB) effort. Matt also serves as the Chemical Safety for Sustainability (CSS) research program's task lead for developing predictive models of toxicity using high throughput screening data and as the CSS project action lead for the development of program office dashboard web applications.

Carolyn Mattingly, Ph.D., is Associate Professor in the Department of Biology at North Carolina State University. Dr. Mattingly received a B.A. in Art History from Oberlin College. She attended Tulane University and received a Ph.D. in molecular toxicology where she investigated the effects of TCDD on vertebrate development. She then pursued postdoctoral training at the Weill Medical College of Cornell University where she investigated the effects of retinoids on differentiation in prostate epithelial cells and mechanisms by which environmental chemicals, including AHR ligands, interfered with retinoid signaling. "Our laboratory is interested in understanding more about the complex connections between our environment and human health. Specifically, we employ bioinformatics and comparative genomics approaches to identify and explore molecular pathways that are targeted by environmental exposures. We expect that clarification of these pathways will provide insights into the mechanisms underlying environmentally influenced birth defects and diseases. One major focus of the laboratory is our ongoing development of the freely available Comparative Toxicogenomics Database (CTD; http://ctdbase.org). CTD contains curated and integrated data sets that facilitate development of novel hypotheses about the connections between chemicals, genes and proteins, and diseases. Another major focus of the laboratory is to leverage the experimental tractability of the zebrafish (Danio rerio) model to explore potential mechanisms underlying the developmental and health effects of a variety of ubiquitous environmental compounds (e.g., 2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD, bisphenol A, arsenic)."

Ann Richard, Ph.D., obtained her PhD from the University of North Carolina Chapel Hill in Theoretical Physical Chemistry in 1983. She has been a Principal Researcher within EPA's Office of Research & Development for almost 22 years, 17 of those years in the Environmental Carcinogenesis Division. In 2005 she was recruited to be a member of EPA's newly formed National Center for Computational Toxicology. She has served on multiple editorial boards and is considered an international expert in the area of structure-activity relationships (SAR) applied to toxicology. Her research activities have ranged from the application of computational chemistry and SAR methods to problems in environmental toxicology to, more recently, the development of cheminformatics capabilities in support of predictive toxicology based on high-throughput screening within the ToxCast and Tox21 programs. Within NCCT, she is the lead for the DSSTox chemical database project and heads up chemical information management for the ToxCast and Tox21 projects. Her current research is working to better integrate chemical information with biological modeling and high-throughput screening (HTS) data through utilization of biologically informed chemical feature sets and chemotypes that can be used to guide and inform biological modeling efforts and improve predictive models.

Brian Schwartz, M.D., is a Professor in the Division of Occupational and Environmental Health in the Department of Environmental Health Sciences in the Johns Hopkins Bloomberg School of Public Health. He is jointly appointed in the Department of Epidemiology in the School of Public Health and in the Department of Medicine in the School of Medicine. He is also a Senior Investigator in the Geisinger Center for Health Research in Danville, PA. He served as director of the Division of Occupational and Environmental Health from 1996 to 2006 and as director of the Occupational and Environmental Medicine Residency from 1993 to 1998. He is currently co-director of the Program on Global Sustainability and Health and co-director of the Geisinger Environmental Health Institute. Dr. Schwartz received a B.S. degree in chemistry from Tufts University; an M.D. degree from Northwestern University Medical School; and an M.S. degree in clinical epidemiology from the University of Pennsylvania School of Medicine. He completed a residency in internal medicine at the Hospital of the University of Pennsylvania, and then was a Mellon Foundation Scholar in Clinical Epidemiology and a fellow in General Medicine at the same institution. He completed a fellowship in occupational and environmental

medicine at the Johns Hopkins School of Hygiene and Public Health, then joined the faculty there as an Assistant Professor.

Dr. Schwartz's research uses epidemiologic methods to evaluate the public health impacts of occupational and environmental exposures. He has studied the health effects of a variety of chemical and metal toxicants in several large-scale, longitudinal studies. More recently, he has been evaluating the public health implications of energy use, land use, food systems, the built environment, and related sustainability issues. He helped found the Geisinger Environmental Health Institute in 2007 in the Geisinger Center for Health Research. The Institute is engaged in a number of environmental epidemiology studies using electronic health record data from the health system on over 400,000 primary care and over 1,000,000 specialty care patients. Ongoing studies include those of animal feeding operations and risk of antimicrobial-resistant infections (including methicillin-resistant *Staphylococcus aureus* [MRSA]); the food, physical activity, land use, and social environments and body mass index in children; the built environment and the burden of abandoned coal mine lands and their associations with type 2 diabetes outcomes; and the public health considerations of unconventional natural gas development (Marcellus shale).

Barbara Wold, Ph.D., is the Bren professor of molecular biology and Director of the Beckman Institute at Caltech. She began working on genome structure and gene regulation during embryo development for her Ph.D. thesis at Caltech, and developed ways to assay cis-regulatory element function during postdoctoral work at Columbia. She established joined the biology faculty at Caltech in 1981 where she and her colleagues have focused on learning the architecture and logic of gene networks that drive cell state transitions. They study skeletal muscle development, degeneration and regeneration as a favored model system. Recent work emphasizes new ways to quantitatively map the inputs and outputs of gene networks in a genome-wide manner using "next generation" ultra-high throughput DNA sequencing, and applying these methods to muscle and brain networks.

Richard Woychik, Ph.D., is Deputy Director of the National Institute of Environmental Health Sciences, NIEHS. He is a molecular geneticist with a Ph.D. in molecular biology from Case Western Reserve University and postdoctoral training with Dr. Philip Leder at Harvard Medical School. He spent almost 10 years at Oak Ridge National Laboratory rising in the ranks to become head of the Mammalian Genetics Section and then director of the Office of Functional Genomics. In August 1997, he assumed the role of vice chairman for research and professor in the Department of Pediatrics at Case Western Reserve University. In 1998, he moved to the San Francisco Bay area, first as the head of the Parke-Davis Laboratory for Molecular Genetics and then as chief scientific officer at Lynx Therapeutics. He returned to academics as the president and CEO of The Jackson Laboratory in August 2002 and served in that role until January 2011. He has been in his current position since February 2011.