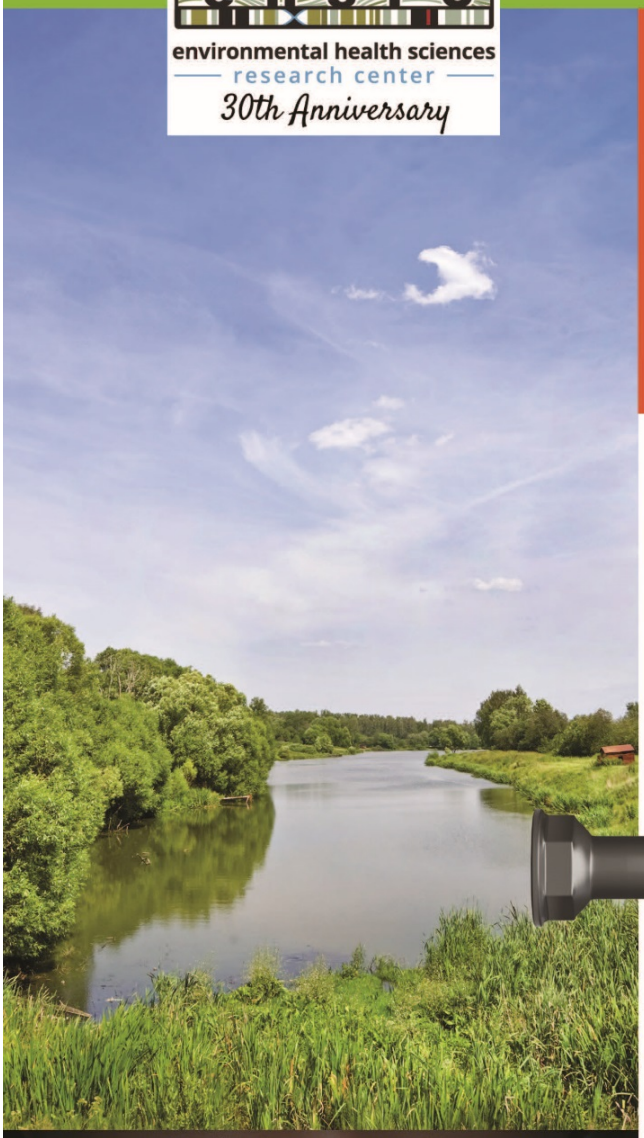
environmental health sciences research center
30th Anniversary

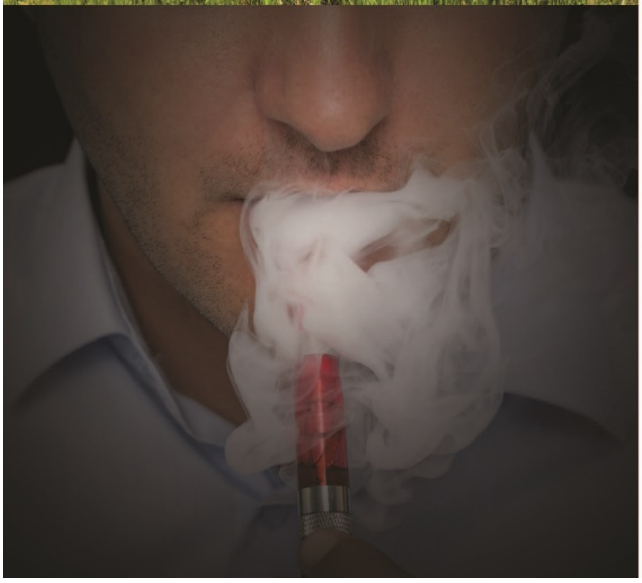
ANNUAL MEETING

# Environmental Health Sciences Core Centers (EHSCC)

NIH National Institute of Environmental Health Sciences

June 20 - 21, 2019





For more information about the meeting, please visit:

ehsrc.org

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# SCIENTIFIC AGENDA

30th Anniversary environmental health sciences research center

## WEDNESDAY, JUNE 19, 2019

| | | |
|---|---|---|
| 4:00 – 5:30pm | **Community Engagement Pre-Conference Workshop**<br>Evaluation of Report Back to communities – Kathy Vandiver, PhD, Ellen Hahn, PhD, Kathleen Gray, PhD | C217AB CPHB |

## THURSDAY, JUNE 20, 2019

| | | |
|---|---|---|
| 7:00 am | **Director's Breakfast** Meeting with Linda Birnbaum, PhD, Gwen Collman, PhD, and Claudia Thompson, PhD | N512 CPHB |
| 7:00 am | **CEC Breakfast** | C217AB CPHB |
| 7:00 am | **ESI Breakfast** with Christie Drew, PhD | S302 CPHB |
| 8:30 am | **Welcome** Peter Thorne, PhD, Director EHSRC, Session Moderator<br>Edith Parker, DrPH, Dean, College of Public Health | N110 CPHB |
| 8:45 am | **Keynote Presentation** – *A new paradigm for supplying safe drinking water*<br>Jerald Schnoor, PhD, Allen S. Henry Chair in Engineering, Co-Director, Center for Global and Regional Environmental Research, University of Iowa | |
| 9:30 am | **Keynote Presentation** – *Drinking water contaminants in the Cape Fear watershed*<br>Detlef Knappe, PhD, S. James Ellen Distinguished Professor, Department of Civil, Construction, and Environmental Engineering, NC State University | |
| 10:15 am | *Break* | |
| 10:30 am to 2:50 pm | CEC Sessions<br>Administrators Sessions | C217AB CPHB<br>S106AB CPHB |
| 10:30 am to 12:05 pm | **Early Stage Investigator poster presentations** (15 min presentation+5 min passing time)<br>1 - Mary Regina Boland, PhD, University of Pennsylvania<br>2 - Daniel P. Croft, MD, MPH, University of Rochester Medical Center<br>3 - Anna Goodman Hoover, PhD, University of Kentucky<br>4 - Folami Y. Ideraabdullah, PhD, University of North Carolina at Chapel Hill<br>5 - Jeanette Anne Stingone, MPH, PhD, Columbia University | Atrium CPHB |
| 12:05 pm | **Lunch (all groups)** | Atrium CPHB |
| 1:05 pm to 3:00 pm | **Early Stage Investigator Poster Presentations** (15 min presentation+5 min passing time)<br>6 - Justin Colacino, PhD, University of Michigan<br>7 - Michael Cowley, PhD, North Carolina State University<br>8 - Hong Ji, PhD, University of California - Davis<br>9 - Zachary D. Nagel, PhD, Harvard School of Public Health<br>10 - Lauren M. Petrick, PhD, Icahn School of Medicine at Mt. Sinai<br>11 - Bogdan Fedeles, PhD, Massachusetts Institute of Technology | Atrium CPHB |
| 3:00 pm | *Break* (Photo for Early Stage Investigators and their Center Directors with Linda Birnbaum) | |

# SCIENTIFIC AGENDA

30th Anniversary environmental health sciences research center

**THURSDAY, JUNE 20, 2019 (CONTINUED)**

| | | |
|---|---|---|
| 3:15 pm to 4:15 pm | **Concurrent breakouts** | |
| | *Disaster Research Response (DR2)*<br>Aubrey Miller, MD, Nicole Errett, PhD, moderators | C301 CPHB |
| | *Best practices for transitioning pilot grants to NIEHS applications*<br>Carmen Marsit, PhD, Hans Lehmler, PhD and Tom Peters, PhD, moderators | S025 CPHB |
| | *Translational research exchange*<br>Christie Drew, PhD, Claudia Thompson, PhD, moderators | S030 CPHB |
| | *Reporting back research results: benefits and opportunities*<br>Liam O'Fallon, MA, moderator | C217AB CPHB |
| | *Single cell analysis: genomics and other -omics at the single cell level,*<br>Andrea Baccarelli, MD, PhD, Justin Colacino, PhD, and<br>Dana Dolinoy, PhD, moderators | N110 CPHB |
| | *Emerging issues with pesticides: glyphosate & neonicotinoids*<br>Terry Kavanagh, PhD, Bill Field, PhD, moderators | N120 CPHB |
| 4:20 pm | Roundtable Reports – Co-Chairs; Hans Lehmler, PhD, moderator | N110 CPHB |
| 5:00 pm | Adjourn | |
| 6:00 pm | Evening Social, "The John Rapson Trio" | Stanley Cafe |
| 7:00 pm | Dinner | Hancher Stage |
| | After-dinner entertainment:<br>Christopher Merrill, MA, Poet, Director of the International Writing Program, University of Iowa<br>Jasper Halekas, PhD, Experimental Space Physicist, Department of Physics, University of Iowa | Hancher Stage |

**Friday, June 21, 2019**

| | | |
|---|---|---|
| 7:00 am | **CEC Breakfast** Meeting with Linda Birnbaum, PhD, Claudia Thompson, PhD, and Liam O'Fallon, MA | C217AB CPHB |
| 8:30 am | **NIEHS Update** - Director: Linda Birnbaum, PhD | N110 CPHB |
| 9:30 am | **Emerging issues with electronic nicotine delivery systems (E-cigarettes)**<br>9:30 am *Community engagement on vaping* - Dana Haine, MS<br>9:50 am *Toxicology of E-cigs* – Judith Zelikoff, PhD<br>10:10 am *Human health studies of E-cig use* – Irfan Rahman, PhD | N110 CPHB |
| 10:30 am | **Panel Discussion** – Alejandro Comellas, MD, moderator | N110 CPHB |
| 11:00 am | *Break* | |
| 11:15 am | **Introduction to new EHSCC research**<br>Dana Dolinoy, PhD - *Epigenetics and the use of piRNA for epigenome editing in EH research*<br>Vaia Lida Chatzi, MD, PhD - *Developmental exposure to perfluoralkyl substances and pediatric liver disease*<br>Georg Wondrak, PhD - *Molecular potentiation of cutaneous and systemic damage inflicted by co-exposure to solar UV radiation and chlorination stress originating from swimming pool disinfectants*<br>Hans Lehmler, PhD - *Dysbiosis of the microbiome: A missing link in PCB-induced neurotoxicity?* | N110 CPHB |
| 11:15 am | CEC Session | C217AB CPHB |
| 12:30 pm | Adjourn Meeting – Peter Thorne, PhD | |
| 12:30 pm | Lunch, Box Lunches – Eat In or Take Away | Atrium CPHB |

# COMMUNITY ENGAGEMENT AGENDA

**This agenda outlines specific CEC sessions, please use main agenda for general session information**

## Wednesday, June 19, 2019

| | | |
|---|---|---|
| 3:30 to 4:30pm | **Registration** | East Entrance of CPHB |
| 4:00 to 5:30pm | **Community Engagement Pre-Conference Workshop** | C217AB CPHB |

***Evaluation of report back to communities*** –Kathy Vandiver (MIT), Ellen Hahn (KY), Kathleen Gray (UNC)
This interactive workshop will illustrate different approaches to environmental report-back and its evaluation including personalized report back, low-literacy materials, and evaluation methods and challenges. Colleagues representing three EHSCC CECs will share report-back processes, tools, and evaluation strategies, followed by 'hands-on' breakout sessions focused on 1) designing personalized report-back tools; 2) improving report-back using an environmental health literacy lens; and 3) examining evaluation methods and challenges.

## Thursday, June 20, 2019

| | | |
|---|---|---|
| 7:00 to 10 am | **Registration** | East Entrance of CPHB |
| 7:00 am to 8:30 am | **CEC breakfast**<br>Grab breakfast from the buffet in the atrium and bring to C217. Round robin introductions, welcome new CEC directors. Discussion of what participants hope to get out of the meeting | C217AB CPHB |

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| | | |
|---|---|---|
| 8:30 am to 10:15 am | **General Meeting Programming- Welcome and Keynote Presentations**<br>Check main agenda for details | |

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| | | |
|---|---|---|
| 10:30 am to 11:15 am | ***Translating environmental health science to policy***<br>Robert Laumbach (Rutgers), Marilyn Howarth (Penn), Katrina Korfmacher (Rochester)<br>There are many ways that CECs and scientists can influence policy, ranging from activities that increase general public awareness and knowledge to more-focused efforts to include scientific knowledge in the deliberations of policymakers. How can we intentionally maximize our impact and promote environmental public health by informing policy? In this session, the CECs will share experiences in small and large group discussions with the goal of identifying strategies to work with Center scientists, community stakeholders, and the media to positively influence public policy | C217AB CPHB |

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| | | |
|---|---|---|
| 11:15 am to 12:00 pm | ***E-Cigarettes and community engagement***<br>Judy Zelikoff (NYU), Ellen Hahn (UK), Dana Haine (UNC)<br>This session will describe current efforts underway by CECs to engage communities in learning about e-cigarettes, to discuss challenges associated with community engagement around this topic, and to identify current and future community needs that can be addressed by CECs | C217AB CPHB |

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| | | |
|---|---|---|
| 12:05 pm | **Lunch** | Atrium CPHB |

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|---|---|---|
| 1:10 pm to 1:55 pm | ***Engaging with the media***<br>Brandi Janssen, Jackie Curnick and Tom Snee (U Iowa), Lyle Muller (Iowa Watch)<br>This session will explore success stories and pitfalls when working with print, online, and television media. Presenters will share templates and curricula for media-focused events and best practices for communicating scientific information through media channels. The conversation will include a local journalist who runs an investigative journalism non-profit and a university communications officer. | C217AB CPHB |
| 2:05 pm to 2:55 pm | ***University and community partnerships***<br>Kerry Butch (Rutgers) and Liam O'Fallon (NIEHS)<br>This 45 minute session will use a World Café Approach to energize participants and stimulate ideas related to community (broadly defined) engagement approaches used by CECs. Participants will discuss three questions as they move around the room. Questions will focus on elements that have worked well, what could be improved upon, and what the role of the CEC is in advancing these community engagement models. | C217AB CPHB |
| 3:15 pm to 5:00 pm | General Meeting Programming- Concurrent Breakout Sessions<br>Check main agenda for details | |
| 6:00 pm to 9:00 pm | **General Meeting Programming- Evening Social**<br>Check main agenda for details | |

## Friday, June 21, 2019

| | | |
|---|---|---|
| 7:00 am to 8:15 am | **CEC Breakfast with Dr. Linda Birnbaum**<br>Grab breakfast from the buffet in the atrium and bring to C217. | C217AB CPHB |
| 8:30 am to 11:00 am | General Meeting Programming- NIEHs update and E-Cigarette panel<br>Check main agenda for details | |
| 11:15 am to 12:30 pm | **Breakout groups** (45 min for breakout and 30 min for group report back)<br>Topics:<br>***Manuscript development***, Melanie Pearson (Emory)<br>This session will focus on manuscript development for CECs and working collaboratively to publish together. We will discuss the topics of previous collaborative publications, the process for collaborative manuscript development, and explore topics for future projects and manuscripts.<br><br>***Alternative funding sources,*** Marti Lindsey (Arizona) and Ellen Hahn (KY)<br>The alternative funding sources session will discuss the importance of a broad portfolio of resources to enhance and support CEC and other environmental health science funding. Potential sources for alternative funding will be identified. The differences between competing for NIEHS and other sources will be outlined, specifically how to submit applications for EPA, NSF, Foundations, City and County governments, and private donors will be described.<br><br>***Social science approaches***, Jonathan London and Krista Haapanen (UC Davis)<br>This will be an interactive session about our collective experiences using social science in our environmental health work. The 45 minutes will consist of role playing activities and group discussions, as well as case studies of different environmental health science and social science collaborations.<br><br>Participants with all levels of social science knowledge are encouraged to attend. | C217AB CPHB<br>(and other rooms TBA) |

# BUSINESS ADMINISTRATORS AGENDA

30th Anniversary environmental health sciences research center

| Thursday, June 20, 2019 | | |
|---|---|---|
| 7:00 am | Breakfast and Registration | CPHB Atrium |
| 8:30 – 8:45 | Meeting Welcome | N110 CPHB |
| 8:45 – 10:15 | Keynote Presentations | N110 CPHB |
| | **Keynote Presentation** – *A new paradigm for supplying safe drinking water*<br>Jerald L. Schnoor, PhD, Allen S. Henry Chair in Engineering, Co-Director, Center for Global and Regional Environmental Research<br>**Keynote Presentation** – *Drinking water contaminants in the Cape Fear watershed*<br>Detlef Knappe, PhD, S. James Ellen Distinguished Professor, Department of Civil, Construction, and Environmental Engineering, NC State University | |
| 10:15 – 10:30 | Break | CPHB Atrium |
| 10:30 – 10:45 | Business Administrator Welcome and Introductions | S106AB CPHB |
| 10:45 – 11:30 | Martha I. Barnes, MS, Program Analyst<br>Human Subjects | |
| 11:30 – 12:05 | Round Table Discussion Topics | |
| 12:05 – 1:05 | **Lunch** | CPHB Atrium |
| 1:05- 2:05 | Dr. Claudia Thompson<br>EHS Core Centers Program Director | S106AB CPHB |
| 2:05 – 3:00 | Round Table Discussion Topics | CPHB Atrium |
| 3:00- 3:15 | Break | |
| 3:15– 4:15 | NIEHS presentation | S106AB CPHB |
| | Bryann Benton and James Williams<br>NIEHS Grants Management Officers | |
| 4:15 – 5:00 | Round Table Discussion Topics | S106AB CPHB |
| 6:00 | Evening Social, “The John Rapson Trio” | Stanley Cafe |
| 7:00 | **Dinner**<br>After dinner entertainment:<br>Christopher Merrill, MA, Poet, Director of the International Writing Program, University of Iowa<br>Jasper Halekas, PhD, Experimental Space Physicist, Department of Physics, University of Iowa | Hancher Stage |

# BUSINESS ADMINISTRATORS AGENDA

30th Anniversary environmental health sciences research center

**Friday, June 21, 2019**

| | | |
|---|---|---|
| 7:00 | Breakfast | CPHB Atrium |
| 8:30 – 9:15 | NIEHS Update - Director: Dr. Linda Birnbaum | N110 CPHB |
| 9:30 – 10:30 | Dr. Linda K. Bass<br>NIEHS Scientific Review Officer | S106AB CPHB |
| 10:30 – 12:00 | Round Table Topics | |
| 12:30 pm | ***2019 Business Administrators Session Adjourned*** | |
| | **Lunch, Box Lunches – Eat In or Take Away** | CPHB Atrium |

# TRANSPORTATION AND MAPS

## HOTEL AND MEETING SITE BUS SCHEDULE


University of Iowa Cambus will transport participants to and from the hotels, meeting site (CPHB), and evening out at Hancher Auditorium. The black and yellow buses will be available at the times and locations listed below.

At the close of the meeting, on June 21, participants should arrange their own transportation to the Eastern Iowa Airport. A list of shuttle/taxi contacts is included in this packet.

A walking map is also provided at the back of this packet.

**June 20, 2019 (morning)**

6:35 a.m. Pick up outside Hilton Garden Inn main entrance
6:40 a.m. Pick up outside Graduate Iowa Hotel at the corner of Burlington and Dubuque Streets*
Deliver to CPHB

8:00 a.m. Second pick up outside Hilton entrance
8:10 a.m. Pick up outside Graduate Iowa Hotel at the corner of Burlington and Dubuque Streets*
Deliver to CPHB

**June 20, 2019 (evening)**

5:15 p.m. Pick up at CPHB, take to Hilton Garden Inn and Graduate Iowa Hotel

6:30 p.m. Pick up outside Hilton entrance
6:40 p.m. Pick up outside Graduate Iowa Hotel at the corner of Burlington and Dubuque Streets*
Deliver to Hancher Auditorium for dinner

8:45 p.m. Pick up at Hancher Auditorium, deliver to Hilton Garden Inn and Graduate Iowa Hotel
9:10 p.m. Second pick up at Hancher

**June 21, 2019 (morning)**

6:35 a.m. Pick up outside Hilton Garden Inn entrance
6:40 a.m. Pick up outside Graduate Iowa Hotel at the corner of Burlington and Dubuque Streets*
Deliver to CPHB

8:00 a.m. Second pick up outside Hilton entrance
8:10 a.m. Pick up outside Graduate Iowa Hotel at the corner of Burlington and Dubuque Streets*
Deliver to CPHB

*The large buses cannot make the turnaround at Graduate Iowa Hotel, so have set this location for pickup.

# TRANSPORTATION AND MAPS

## GROUND TRANSPORTATION TO THE EASTERN IOWA AIRPORT (CID)

### Shuttle Services

**Airport Express**

www.express-limos.com

Local: 319.626.5466
Long Distance: 800.383.2219

**Airport Shuttle Service**
*(Located inside the terminal)*

www.crshuttle.com

Local: 319.365.0655
Long Distance: 800.725.8460

**Anaman Concierge Services, LLC**

www.anamancs.com

Local: 319.471-2347

### Taxi Services

**American Class Taxi**

www.americanclasstaxi.com

319.363.8294

**Master Cab of Iowa**

319.202.7070

**Yellow Cab Iowa City**

www.yellowcabic.com

319.338.9777

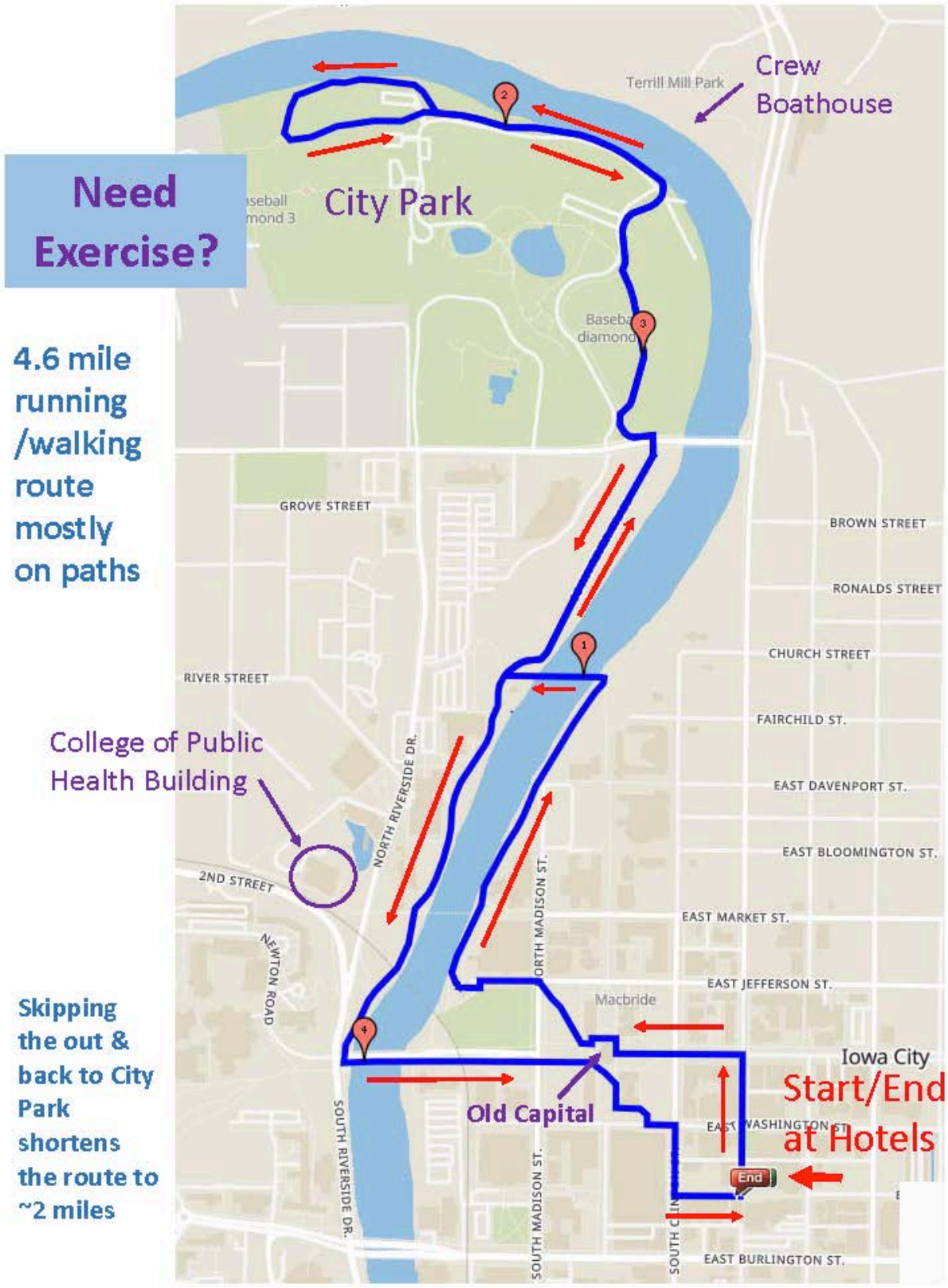
**Rideshare Services**

Lyft: www.lyft.com

Uber: www.uber.com


Iowa City
UI Campus Map
https://maps.uiowa.edu
Walking
CPH to Hancher
.6 miles, 13 minutes
CPH to IMU
.3 miles, 5 minutes
CPH to Graduate Hotel
.8 miles, 17 minutes
HOTELS
1. Graduate
210 S. Dubuque St
2. Hilton Garden
328 S. Clinton St
3. Hotel Vetro
201 S. Linn St
4. Iowa House
125 N Madison St
PARK RD.
HANCHER
HANCHER FOOTBRIDGE
DUBUQUE ST
TO I80
CHURCH ST
FAIRCHILD ST
LINN ST
MARKET ST
CLEARY WALKWAY
BLOOMINGTON AT
CPH
CORALVILLE
IMU FOOTBRIDGE
RIVERSIDE DR.
4
IMU
E MARKET ST
E JEFFERSON ST
N MADISON ST
OLD CAPITOL
N CLINTON ST
DUBUQUE ST
IOWA AVE
WASHINGTON ST
Old Capitol Town Center
CAPITOL ST
1
3
LINN ST
GILBERT ST
BURLINGTON ST
2
COURT ST
University of Iowa College of Public He
Choose destination, or click on the map...
Wayfinding via Directions in Google maps
Type in "University of Iowa College of Public Health"
Click on "Directions", then the walking figure icon
Type in desired destination
Google will suggest route and show distance and time.

# TRANSPORTATION AND MAPS



## EHSCC 2019 SPEAKERS AND ENTERTAINMENT

**Linda S. Birnbaum**, PhD, is director of the National Institute of Environmental Health Sciences (NIEHS) of the National Institutes of Health, and the National Toxicology Program (NTP). A board-certified toxicologist, Birnbaum has served as a federal scientist for nearly 39 years. Prior to her appointment as NIEHS and NTP Director in 2009, she spent 19 years at the U.S. Environmental Protection Agency (EPA), where she directed the largest division focusing on environmental health research.

Birnbaum has received many awards and recognitions. In 2016, she was awarded the North Carolina Award in Science. She was elected to the Institute of Medicine of the National Academies, one of the highest honors in the fields of medicine and health. She was also elected to the Collegium Ramazzini, an independent, international academy comprised of internationally renowned experts in the fields of occupational and environmental health and received an honorary Doctor of Science from the University of Rochester and a Distinguished Alumna Award from the University of Illinois. She also received an Honorary Doctorate from Ben-Gurion University, Israel; the Surgeon General's Medallion 2014; and 14 Scientific and Technological Achievement Awards, which reflect the recommendations of EPA's external Science Advisory Board, for specific publications.

Birnbaum is an active member of the scientific community. She was vice president of the International Union of Toxicology, the umbrella organization for toxicology societies in more than 50 countries, and former president of the Society of Toxicology, the largest professional organization of toxicologists in the world. She is the author of more than 800 peer-reviewed publications, book chapters, and reports. Birnbaum's own research focuses on the pharmacokinetic behavior of environmental chemicals, mechanisms of action of toxicants including endocrine disruption, and linking of real-world exposures to health effects. She is also an adjunct professor in the Gillings School of Global Public Health, the Curriculum in Toxicology, and the Department of Environmental Sciences and Engineering at the University of North Carolina at Chapel Hill, as well as in the Integrated Toxicology and Environmental Health Program at Duke University.

A native of New Jersey, Birnbaum received her M.S. and Ph.D. in microbiology from the University of Illinois at Urbana-Champaign.

**Edith Parker,** PhD, serves as Dean of the University of Iowa College of Public Health. She also directs the Prevention Research Center for Rural Health, based in the University of Iowa College of Public Health. She formerly served as Departmental Executive Officer of the University of Iowa Department of Community and Behavioral Health.

Dr. Parker's research has been funded by the National Institutes of Health and the Centers for Disease Control and Prevention and focuses on the design of community health promotion interventions that address social determinants of health and health disparities.

A nationally recognized expert on Community-Based Participatory Research (CBPR), her work centers on engaging community members in the design, implementation, and evaluation of research interventions, and translating and disseminating research findings for program and policy change. She has consulted on community-academic partnerships in Alabama, California, North Carolina, Ohio, Oregon, Pennsylvania, Puerto Rico, and Canada, and has published extensively on the use and evaluation of such partnerships.

Dr. Parker holds a bachelor's degree from Davidson College, as well as Master of Public Health and Doctor of Public Health degrees from the University of North Carolina, Chapel Hill. She served on the faculty of the School of Public Health at the University of Michigan before joining the University of Iowa in 2010.

**Peter S. Thorne**, PhD has been a member and core director of the University of Iowa, Environmental Health Sciences Research Center (EHSRC) since its inception in 1990. He assumed the role of Director in 2000. Dr. Thorne is also Professor and Head of the Department of Occupational and Environmental Health at the U.I. College of Public Health. He is associate director of the Interdisciplinary Graduate Program in Human Toxicology.

In addition to his roles as Director and Core Leader in the EHSRC, Dr. Thorne serves as PI of a U01 NHIR nanotoxicology research project, PI of the AESOP Project (a community-based research study) and a project on Toxicity and Risk of Inhaled PCB Mixtures for the Iowa Superfund Research Program. He runs a productive research laboratory engaging his students in studies of environmental risk factors for asthma, health effects of inhaled air pollutants including PCBs, endotoxin-induced immunomodulation, nanotoxicology, and novel methodology for exposure assessment to airborne toxicants. He is widely recognized for his discoveries in the exacerbation of asthma and other respiratory diseases associated with domestic and occupational exposures to bioaerosols.

Dr. Thorne has served on a wide variety of review boards for scientific journals, government agencies, and academia. From 2003 to 2006, he served on the NIH National Advisory Environmental Health Sciences Council. From 2011 to 2017, he served on the U.S. Environmental Protection Agency's Science Advisory Board and served as Chair of the Board from 2015-2017. Dr. Thorne is currently a member of the National Academy of Sciences (NAS) Board on Environmental Studies and Toxicology and the NAS Committee on Toxicology.

Dr. Thorne has received recognition for his research and teaching including the College of Public Health Distinguished Faculty Award, the Iowa Board of Regents Award for Faculty Excellence and the University of Iowa Scholar of the Year Award. He received his BS in chemical engineering, MS in biomedical engineering and PhD in toxicology from the University of Wisconsin-Madison and completed a postdoctoral fellowship in immunotoxicology at the University of Pittsburgh.

**Hans Lehmler,** PhD, is a Professor of Environmental Health in the College of Public Health and a Research Scientist in the IIHR-Hydroscience & Engineering at the University of Iowa. He serves on the faculty of the Interdisciplinary Graduate Programs in Human Toxicology and in Neuroscience, and is a member of the University of Iowa Water Sustainability Initiative, a University initiative aimed at fostering transdisciplinary research on water and sustainability. He received his PhD in synthetic organic chemistry from the University of Bonn, Germany, and subsequently worked as a postdoctoral fellow at the University of Kentucky. During this time, he received broad training in organic chemistry, analytical chemistry and chemical toxicology. After moving to the University of Iowa in 2003, he received a mentored career development award entitled *"Distribution of PCB atropisomers"* from NIEHS.

The discoveries from his K25 award led to an active NIEHS-funded research program investigating the disposition and adverse neurodevelopmental effects of polychlorinated biphenyls (PCBs) across the lifespan. He is internationally recognized for his studies on the disposition and toxicity of chiral, neurotoxic PCBs. His recent findings suggest that dysbiosis of the intestinal microbiome represents a currently unexplored link between developmental PCB exposure and neurotoxic outcomes. Other ongoing research projects investigate the link between exposure to bisphenol A (BPA) substitutes and adverse health outcomes, such as obesity and diabetes, using the NIH Heterogenous Stock rat, a population based rat model. To address water quality concerns relevant to the rural Midwest, Dr. Lehmler works with EHSRC members in the College of Public Health and College of Engineering to study the occurrence, transport and fate of agrochemicals in surface and well waters and engineered drinking water systems. These studies focus on neonicotinoids and plant protection products (or safeners) used in Iowa.

Dr. Lehmler has served as the EHSRC Deputy Director and director of the Career Development Program since 2006. He is a member of the Center's Exposure Science Facility, and co-directs the Oxidative

Stress and Metabolism and the new Water Quality Thematic Areas of the EHSRC. In addition, he is a member of the NIEHS-funded Iowa Superfund Research Program, where he not only leads the Synthesis Core, but also oversees the targeted and untargeted analysis of polychlorinated biphenyls (PCBs) and their metabolites in tissue samples through the Analytical Core. He has mentored over 20 postdoctoral fellows and numerous undergraduate and graduate students. Several of his trainees have moved on to successful faculty positions in the United States or abroad. He teaches graduate level courses on global environmental health and advanced toxicology, and an undergraduate course called Health, Work and Environment. He also serves as Academic Editor of PLOSone and on grant review panels from NIH and NSF.

**Jerald L. Schnoor**, PhD, PE, BCEE, is the Allen S. Henry Chair in Engineering; Professor, Civil & Environmental Engineering, Professor, Occupational and Environmental Health; and Co-Director, Center for Global and Regional Environmental Research at The University of Iowa. Schnoor is a registered professional engineer and a member of the National Academy of Engineering (elected in 1999) for his pioneering work using mathematical models in science policy decisions for environmental protection. He testified several times before Congress on the environmental effects of acid deposition and the importance of passing the 1990 Clean Air Act. Schnoor was the Chair of the Iowa Climate Change Advisory Council, 2007-2009, appointed by Governor Chester J. Culver. In addition, Schnoor serves as a Project Leader of the Iowa Superfund Research Program and leads the W.M. Keck Phytotechnology Laboratory, which specializes in using plants to help clean and protect the environment, while reducing chemical exposures to humans.

Serving as Editor-in-Chief of Environmental Science and Technology 2002-2014, Jerry guided the leading journal in both environmental science and environmental engineering (ISI Web of Science, Thomson-Reuters). His editorial writings on environmental protection have been widely accessed by the international community. Schnoor chaired the Board of Scientific Counselors for the U.S. Environmental Protection Agency, Office of Research and Development from 2000-2004 and was a councilor on the National Advisory Environmental Health Sciences Council to the National Institute of Environmental Health Science (NIEHS). Recently, he served as Chair of the National Research Council (NRC) Committee on Science for Environmental Protection in the 21st Century. He was also Chair of the 2008 National Research Council report on The Water Implications of Biofuels in the U.S. Schnoor and his students pioneered phytoremediation, the use of plants to help clean the environment which is widely used at full-scale installations now.

Schnoor's publications cover a wide range of topics including water sustainability, water quality modeling, phytoremediation, and climate change. Jerry won the 2010 Clarke Prize from the National Water Research Institute for his work on water sustainability. In 2013, he was honored as an Einstein Professor by the Chinese Academy of Sciences and lectured widely on water and climate change. A major honor from his peers came in 2015 when Jerry received the Perry L. McCarty AEESP Founders Award for excellence in environmental engineering education, research and practice from the Association of Environmental Engineering and Science Professors.

**Detlef Knappe**, PhD is the S. James Ellen Distinguished Professor of Civil, Construction, and Environmental Engineering at NC State University, where he is also a member of the NIEHS-funded Center for Human Health and the Environment. After receiving his PhD in Environmental Engineering at the University of Illinois at Urbana-Champaign, he joined the faculty at NC State University, where he has taught and conducted research for the last 23 years. Current efforts in the Knappe group focus on (1) developing and evaluating physical-chemical (and sometimes biological) treatment processes for the control of organic contaminants in drinking water, and (2) overcoming gaps between the Clean Water Act and the Safe Drinking Water Act by developing information about the effects of reactive and unregulated wastewater contaminants on drinking water quality and treatment. Knappe serves on the North Carolina Secretaries' Science Advisory Board that was convened

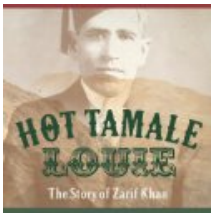
by the NC Departments of Environmental Quality and Health and Human Services, and, until recently, he served on the Drinking Water Committee of the EPA Science Advisory Board. He also serves as Trustee for the Water Science and Research Division of the American Water Works Association (AWWA), and he is a member of AWWA's Organic Contaminants Research Committee and Activated Carbon Standards Committee.

Research in the Knappe group has highlighted that high levels of unregulated industrial pollutants (e.g. per- and polyfluoroalkyl substances (PFAS), 1,4-dioxane, bromide) occur in the Cape Fear River basin. This watershed is the largest in North Carolina and serves as a drinking water source for about 1.5 million people. In 2016, Knappe co-authored a paper in *Environmental Science and Technology Letters* that helped bring to light high levels of fluorochemical contamination in the drinking water of about a quarter million North Carolina residents. The findings had direct implications on water quality and policy. In June 2017, the fluorochemical manufacturer started collecting process wastewater that had been the source of elevated GenX levels in the lower Cape Fear River basin for 37 years. And in July 2017, the North Carolina Department of Health and Human Services developed a provisional health goal for GenX in drinking water (140 ng/L). Many of our current research efforts focus on developing the science to help answer community questions related to contaminants of emerging concern. The Knappe group works collaboratively with colleagues in the Center for Human Health and the Environment as well as with state agencies (e.g. NC Department of Environmental Quality), local governments (e.g. town councils), drinking water and wastewater utilities, consulting engineers, citizen groups (e.g. Haw River Assembly, Cape Fear River Watch), and residents in impacted communities (e.g. GenX exposure study). The presentation today will provide an overview of these research efforts along with key results.

**John Rapson** is a composer, trombonist, pianist and recording artist for *MoMu Records*, *Music and Arts, Sound Aspects* and *Nine Winds* whose work mixes ethnic and experimental elements with more conventional jazz forms. Jazz historian Mark Gridley has characterized his music as "extending several trends that were first demonstrated by Charles Mingus and George Russell." He has been professor of music at the University of Iowa since 1993. Gramaphon magazine ranked his album *Water and Blood* as a "10; highly recommended" in its *Guide to Good CDs*. He has held previous positions at Westmont College in Santa Barbara, California (1980-90) and at Wesleyan University in Middletown, Connecticut (1992-93).

Rapson has written jazz compositions for ensembles of all stripes and recorded 27 albums, thirteen of which are under his own leadership and feature his compositions. In 2002, he won first prize in the Julius Hemphill Competition sponsored by the Jazz Composers Alliance for *Riff Bass Bridge Head*, from the album ***Daydreams from the Prairie***. He received critical acclaim for two albums, ***Dances and Orations*** with Anthony Braxton and ***Water and Blood*** with Billy Higgins, which feature new compositions built from free improvisations by jazz masters. A third album in the trilogy, ***Mystery and Manners*** with Brazilian artists Nene Lima and Vinicius Dorin was released in 2011. His most recent album is ***The Night Sky and Turquoise Sea*** (2013) with eight new compositions for jazz orchestra.

He recently completed an innovative project, "Hot Tamale Louie: The Story of Zarif Khan," inspired by a *New Yorker* article titled, "Citizen Khan" by Kathryn Schultz. The project combines original jazz compositions and images depicting the life and struggles of a remarkable immigrant, Zarif Khan, who came to the U.S. from Afghanistan at the turn of the 20th century and settled in Wyoming.




**Hot Tamale Louie: The Story of Zarif Khan**
John Rapson, 2017

# SPEAKERS AND ENTERTAINMENT

**Christopher Merrill** has published six collections of poetry, including *Watch Fire*, for which he received the Lavan Younger Poets Award from the Academy of American Poets; many edited volumes and translations; and six books of nonfiction, among them, *Only the Nails Remain: Scenes from the Balkan Wars, Things of the Hidden God: Journey to the Holy Mountain, The Tree of the Doves: Ceremony, Expedition, War*, and *Self-Portrait with Dogwood*. His writings have been translated into nearly forty languages; his journalism appears widely; his honors include a Chevalier des Arts et des Lettres from the French government and a Guggenheim Fellowship. As director of the International Writing Program at the University of Iowa, Merrill has conducted cultural diplomacy missions to more than fifty countries. He serves on the U.S. National Commission for UNESCO, and in April 2012 President Barack Obama appointed him to the National Council on the Humanities.

**Jasper Halekas**, PhD is an Associate Professor in the Department of Physics and Astronomy at the University of Iowa. Dr. Halekas's research focuses on the interaction between the solar wind that streams out from our Sun and the planets and moons in our solar system. His group designs and builds spaceflight instruments to make high-fidelity measurements of charged particles, and uses them to understand the fascinating plasma physics that occurs in the interplanetary medium and the environments near the planets and moons of our solar system. Dr. Halekas's research spans the intersection between planetary science and pure space plasma physics, touching on planetary geology and atmospheres, magnetic reconnection, shocks, plasma sheaths, and plasma waves and turbulence. A unifying theme of his work is the use of charged particle measurements to remotely infer plasma processes around planetary bodies, and their implications for planetary evolution.

Dr. Halekas blames Carl Sagan for his love of science. As a youth, he devoured science fiction of all flavors (and still does today). After reading Carl Sagan's novel "Contact", he discovered Sagan's popular scientific works, which first launched him along the path to a scientific career. Dr. Halekas received B.S. degrees in Physics and Math from the University of Washington in 1998, and then received his Ph.D. in 2003 from the University of California Berkeley. After graduating, he remained as a postdoctoral researcher and then research scientist at U.C. Berkeley for the next eleven years, before joining the faculty at the University of Iowa in 2014.

**Dana Brown Haine**, MS, K-12 Science Education Manager for the Center for Public Engagement with Science in the UNC Institute for the Environment, leads science education efforts for the Community Engagement Core of the UNC Center for Environmental Health and Susceptibility (CEHS). In this role, Haine shares scientific findings emerging from Center scientists with K-12 audiences and members of the general public.

Haine has been engaged in science education for over twenty years and was a member of the UNC Superfund Research Program's Research Translation Core from 2007-2017. Haine's research translation and curriculum development skills enable her to deliver cutting edge environmental science content and innovative activities to K-12 teachers, informal educators and high school-aged youth. In 2018, Haine received NC's Outstanding Informal Educator Award in Science, Mathematics, and Technology Education from the North Carolina Science, Mathematics, and Technology Education Center for her success developing and implementing extracurricular science enrichment programs for youth.

Most recently, Haine has been collaborating with CEHS scientist Ilona Jaspers, PhD and her research team to develop standards-aligned educational materials that biology teachers can use to convey the health effects of electronic cigarettes while promoting data literacy among students. In 2018, Haine presented these materials to teachers at the 2018 National Association for Biology Teachers Annual Meeting and the National Science Teachers Association Regional Conference in Charlotte, NC.

Haine received her MS in Biology from Wake Forest University and her BS in Biology with a minor in chemistry from Appalachian State University. Prior to joining the Institute for the Environment in 2007, Haine

was a science educator for DESTINY, UNC's Traveling Science Learning Program, and before that she was a member of the biology faculty at Central Piedmont Community College in Charlotte, NC.

**Irfan Rahman,** PhD is a Dean's Professor of Environmental Medicine, Medicine (Pulmonary), Public Health Sciences, and Dentistry at the University of Rochester, Rochester Medical Center, Rochester, NY. After postdoctoral work at the University of Miami, Georgetown University, and leading to faculty appointment at the University of Edinburgh, Scotland, he joined the University of Rochester as an Assistant Professor in 2004 and promoted to Associate Professor in 2007, full tenured Professor in 2012, and Dean's endowed professor in 2018. He has chaired and participated in numerous symposia and published over 270 peer-reviewed research original articles (H-index 92), reviews, and invited to write chapters in text books and editorials in various journals in understanding the pathogenesis and therapeutic targets of Chronic Obstructive Pulmonary Disease (COPD), fibrosis, and oral/periodontal diseases. His research is funded by the National Institutes of Health (NIEHS, NHLBI, NIDA and NCI), USA. His research focuses on understanding the mechanisms of environmental particulates and tobacco products (environmental tobacco smoke/second-hand smoke, e-cigarettes, and cigars/cigarillos and emerging flavors via mitochondrial dysfunction, cellular senescence, exosomes, molecular clock, and DNA damage/repair in the pathogenesis of chronic lung inflammatory diseases (including COPD) and identifying biomarkers and their molecular targets for interventions.

Dr. Rahman is an Associate Editor (Nature Scientific Reports, International Journal of COPD, Journal of Inflammation, Frontiers in Respiratory Pharmacology, and Experimental Lung Research), past Associate Editor of European Respiratory Journal, and currently a member of the editorial boards of several international journals, such as Am. J. of Respiratory Cell & Molecular Biology, American J of Respiratory Critical Care Medicine, Toxicology and Applied Pharmacology, Therapeutic Advances in Respiratory Disease, Current Respiratory Medicine Reviews, Respiratory Research, and Antioxidants Redox Signaling.

He is the author/editor of a book on 'Inflammation, Aging, Diet and Nutrition' Elsevier publisher (2013), and awarded as Highly Cited Researchers, 2014, 2015, and 2016 by Thomson Reuters http://highlycited.com/, and Vice President of the IRSS-Society of Toxicology, SOT (past councilor), a member of the scientific committee of the Respiratory Cell & Molecular Biology (RCMB), American Thoracic Society (ATS), and now Chair of Lung Aging Research section of the ATS. Dr. Rahman won numerous awards, such as an outstanding Senior Investigator Award by the Oxygen Society of California, USA in 2006 and Senior Toxicologist Award by the ASIO-Society of Toxicology in 2017. He has been nominated as an American Thoracic Society Fellow in 2018. He is the site PI of the recently awarded TCORS from the NCI/FDA with Roswell Park Cancer Institute, Buffalo, NY.

**Judith Zelikoff**, PhD is a tenured full professor in the Department of Environmental Medicine at the NYU School of Medicine. She has over 30 years of experience using animal models for assessing the toxicology of inhaled single contaminants and complex mixtures including metals, nanoparticles, gaseous and particulate (PM) air pollutants, electronic cigarette aerosols, and smokeless and combustible products from cigarettes, biomass burning, and diesel exhaust. Her early work in inhalation toxicology focused on the effects of inhaled gaseous air pollutants on the pulmonary immune response, particularly emphasizing innate immunity in the deep lung. Over the last decade, studies in her laboratory has moved to investigate the effects of early life exposure (prenatal, neonatal and adolescent exposures) to environmental toxicants, including particulate air pollution and electronic cigarette aerosols on neurodevelopment, fetal cardiovascular structure/function, obstetric consequences, and later life disorders including obesity, heart disease, immune dysfunction, cognitive behavior and reproductive success in male and female juvenile and adult offspring. Her tobacco-based murine studies have demonstrated that prenatal exposure to a maternal dose of cigarette smoke equivalent to smoking <1 pack of cigarettes/day increases later life risk factors in the offspring associated with

cardiovascular disease, asthma, immune dysfunction, cancer, and behavior in a sex-dependent manner. Her studies with smokeless tobacco products have demonstrated dyslipidemia and non-alcoholic steatohepatitis in adult offspring. The work she will discuss in this presentation was supported by the NYU Center Pilot Program and will demonstrate how prenatal/perinatal exposure of mice to electronic cigarette aerosols affects the developing brain and later life health.

Dr. Zelikoff is also the Director of the NYU NIEHS P30 Community Engagement program. Through this role, she has partnered with several environmentally-impacted minority and underserved communities, including a Tribal Nation throughout the New York metropolitan area to help build community capacity in environmental health. Through a 2018 Center Supplement with MIT and the University of New Mexico's Center for Native American Health, enrichment programs on "electronic cigarette: fact and fiction" were given on the Cheyenne River Sioux Reservation to nurses from Missouri Breaks, a not-for-profit foundation working with the Tribal members, as well as to K-12, college students and their teachers, and the community members, at large. These joint studies are currently being prepared for publication.

Dr. Zelikoff has/have served in a variety of leadership roles including in the Society of Toxicology as Secretary of the Society, president of the: Metals; Ethical, Legal and Societal; Inhalation and Respiratory; and Immunotoxicology Specialty Sections where she was awarded the Lifetime Achievement Award in Immunotoxicology. She also received a Mentoring Award from the SOT Women in Toxicology and the SOT Education Award in 2018. She has served as a standing member of the NIEHS Systemic Injury by Environmental Exposure (SIEE) and the NIH Innate Immunity and Inflammation study sections subsequent to her early membership on AlTox-1. Dr. Zelikoff served/serves on several Federal/State Advisory Panels including the Institute of Medicine and National Research Council, EPA, NASA, National Toxicology Program, FDA, NY City Housing Authority and the NJ Department of Environmental Protection. In addition to serving as an Associate Editor and Editorial Board member for five toxicology/environmental health journals, she also currently serves as a member of the NYU School of Medicine Faculty Council, Grievance Committee, IACUC and the University Senate.

Dr. Zelikoff also has an active teaching program in toxicology and has mentored/advised over 35 master students and 20 doctoral candidates. She received a Mentoring Award in 2015 from SOT Women in Toxicology and in 2018 she was awarded the SOT Education Award.

## MORNING: 10:30 – 12:05

### #1

Early Stage Investigator Name: Mary Regina Boland, PhD, University of Pennsylvania

**Mapping Regional Effects of Exposure to Hydraulic Fracturing Fluid Chemicals and their Link with Toxicity**

Exposure to hydraulic fracturing fluid has been linked to multiple health conditions, including preterm birth. However, large-scale analyses of exposure to various toxic chemicals found within fracturing fluid remains under-explored. We used data from FracFocus (https://fracfocus.org/) on hydraulic fracturing fluids and their known chemical ingredients and linked this information with the CDC's Agency for Toxic Substances and Disease Registry (ATSDR). We calculated the total number of active wells with chemicals in the ATSDR per state and per year. We also linked chemical ingredients with proteins affected using the Toxin Exposome Database (http://www.t3db.ca/). We mapped out the regions affected by exposure to specific chemicals, both those listed as toxic by the ATSDR versus those listed as non-toxic. We also mapped the effects of chemicals on various hormonal pathways as recorded in the Toxin Exposome Database. We report regional differences in these data. **Interpretation:** Exposure to toxicants in hydraulic fracturing fluid is important for exposome related research and also when comparing geographic regions to each other. Exposure to hydraulic fracturing fluids may be important in understanding an individual's entire exposome. Some clustering by geographic region was observed for certain fracturing compounds.

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### #2

Early Stage Investigator: Daniel P. Croft MD, MPH

**Triggering of influenza by source specific particulate matter in New York State**

Fine particulate air pollution ($PM_{2.5}$) has been linked to respiratory infections including influenza, but the response of respiratory infections to source specific PM concentrations (e.g. traffic, wood smoke) remains an area of active research. In our prior study in NY State, we observed an increased rate of emergency department visits for influenza associated with acute increases in $PM_{2.5}$. Using source specific $PM_{2.5}$concentrations generated from Positive Matrix Factorization analyses at 6 urban sites in New York State (Buffalo, Rochester, Albany, Queens, Bronx, and Manhattan), we examined the association between source specific $PM_{2.5}$ and the rate of emergency department (ED) visits for influenza. We retrieved all hospital admissions and ED visits with a primary diagnosis of influenza from 2005 to 2016 from the Statewide Planning and Research Cooperative System (SPARCS) database. Using a case-crossover design and conditional logistic regression, we estimated the rate of influenza associated with increased concentrations of source specific $PM_{2.5}$ including ammonium sulfate (AS), ammonium nitrate (AN), biomass burning (BB), pyrolyzed organic carbon (OP), road dust (RD), residual oil (RO), diesel (DIE) and spark-ignition (GAS) vehicle emissions. Interquartile range increases (IQR) in concentrations of GAS (Excess rate (ER)= 9.2%; 95% CI: 4.3%, 14.3%) and DIE (ER= 3.9%; 95% CI: 1.1, 6.8%) in the previous 4 days (and other lag times) were associated with increased rate of ED visits for influenza. No consistent pattern of effect was observed for Influenza ED visits and other source specific $PM_{2.5}$ Increased relative rates of ED visits for influenza were observed for vehicle related source specific $PM_{2.5}$. This may indicate that for viral respiratory infections, vehicle related sources may be an important contributor to the toxicity of air pollution mixtures. Further study of the impact of source specific particles on the body's immune response to infection is underway.

## #3

Early Stage Investigator: Anna Goodman Hoover, MA, PhD, University of Kentucky

**"Nor Any Drop to Drink": Revealing Water Resources Knowledge and Concerns in Appalachian Eastern Kentucky**

Kentucky underperforms much of the nation in environmental health protections, including the proportion of the population served by community water systems that consistently adhere to applicable health-based and non-health-based standards. In Appalachian Eastern Kentucky in particular, water quality is among the chief environmental health concerns, with residents experiencing higher numbers of drinking water violations than in other counties. The region also is home to well-documented disparities in chronic health conditions that have been linked to environmental contaminants. As water-related concerns have grown, so has the need to ensure appropriate evidence-based communication resources that can inform health-protective individual and community actions. To develop such tools, data are needed to describe stakeholders' baseline water-related knowledge and skills, as well as their information preferences. This poster presentation will describe Phase One of a pilot study that aims to develop, pilot, and validate a survey assessing Appalachian Kentuckians' water-related Environmental Health Literacy (EHL). We will conduct key informant interviews with more than 30 water utility technicians and watershed watch volunteers in Eastern Kentucky counties to explore, using qualitative methods, each group's perceptions about the knowledge and skills residents need in order to make health-protective decisions about water usage. This poster will share emerging qualitative findings from these groups regarding: 1) perceived levels of water-related EHL needed in the region; 2) suspected water-related knowledge gaps; 3) stakeholder information preferences; and 4) the effectiveness of extant tools designed to communicate water-related environmental health data, risks, and protective actions. This exploratory study will engage diverse regional stakeholders to begin to systematize the development of context-driven EHL measurement instruments, providing a model for scientists seeking to assess knowledge gaps for a variety of contaminants and health outcomes across diverse geographic settings. By developing such models, the emerging EHL field will enhance scientists' ability to create relevant information materials that can help minimize real-world exposures.

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## #4

Early Stage Investigator: Folami Y. Ideraabdullah, PhD, University of North Carolina at Chapel Hill

**Modeling the Role of Parental Genome in Developmental Programming of Adult Phenotypes**

Under the Developmental Origins of Health and Disease (DOHaD) hypothesis, adverse environmental conditions such as dietary deficiency and toxicant exposures during development can disrupt health long after environmental insults have been removed. Epigenetic reprogramming is a key mechanism of DOHaD and refers to developmental stages when the soma and germline undergo erasure and re-establishment of epigenetic landscapes essential to healthy development. *Our work focuses on understanding how environmental disruption of early programming events leads to the establishment of aberrant epigenetic landscapes, how these epimutations persist to cause disease later in life, and how the genome (DNA sequence) increases/decreases susceptibility to these effects.* We have assessed two animal models of *in utero* environmental exposure, an endocrine disruptor model (vinclozolin) and a dietary vitamin D deficiency model. In both models, developmental exposure caused increased bodyweight and fat mass and decreased germline DNA methylation levels later in adulthood. Using congenic mice carrying targeted mutations, we showed that mutation of 8 CpGs at the DNA element regulating *H19/Igf2* imprinted expression (*regulates growth & metabolism*) increased susceptibility to vinclozolin-induced bodyweight, adiposity, and sperm

methylation changes [*Pietryk et al. 2018*]. Interestingly, susceptibility was only increased when the dam carried the mutation, sire and pup mutation had no effect. Furthermore, first-generation 8nrCG male offspring only propagated effects to second-generation pups (decreased neonatal growth) when mated to unexposed wild-type females, mating to similarly exposed mutant females had no effect. Our vitamin D deficiency model using Collaborative Cross mouse strains demonstrated similar multigenerational effects of maternal genotype on developmental programming [*Xue et al. 2016*]. Taken together, our work provides specific evidence that even minor differences in parental genotypes play a critical role in multigenerational susceptibility to developmental programming by environment. This work informs future models by our lab and others aimed at elucidating the causal genetic/epigenetic mechanisms.

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## #5

Early Stage Investigator: Jeanette Anne Stingone, MPH, PhD, Columbia University

**Data Science in the Investigation of Combined Exposures to Air Toxics and Children's Academic Achievement: An Application to Children's Environmental Health Research**

Previous research has found associations between exposure to single air pollutants and children's cognitive health but has often lacked the ability to investigate combined impacts of pollutants. Characterizing the effects of combined exposures can provide a more realistic assessment of health effects for burdened communities, as well as identify interactions between pollutants. Identifying interpretable associations and interactions within the context of high-dimensional exposure data presents a computational challenge that cannot feasibly be addressed with standard epidemiologic models. Methods from domains such as data science can be incorporated into our analytic toolbox to address this challenge. Results from these data-driven approaches need to produce interpretable results that can be followed by targeted techniques. The objective of this research is to utilize tree-based methods, such as random forest, to develop an analytic pipeline to discover interpretable combinations of air toxics associated with children's academic outcomes. Residence at birth was used to link EPA data on estimated ambient concentrations of 40 air toxics to an administrative data linkage of public health and education registries for approximately 220,000 children born and raised in New York City. A random forest algorithm was applied to a 1/3 subset of the data in order to generate a collection of regression trees that identify the combinations of air toxics associated with 3rd grade standardized test scores in math and English language arts. Methods to account for confounding and validation of identified combinations were assessed and then compared in a second 1/3 subset, with the remaining data held out for final analyses. Our results suggest that early-life exposure to air toxics is associated with lower test scores but high correlation between pollutants and with social factors remains a challenge for interpretation. Future enhancements of the proposed analytic pipeline, including incorporation of toxicological knowledge of correlated pollutants, will be discussed.

## AFTERNOON: 1:05 – 3:00

### #6

Early Stage Investigator Name: Justin Colacino, PhD, University of Michigan

**Chemical exposure differences in US women: Drivers of triple negative breast cancer disparities?**

African American women are 2 to 3 times more likely to be diagnosed with triple negative breast cancer, relative to European American women. The biological basis for this disparity is not well understood, but is likely due to an interaction between genes and environmental exposures. To better understand environmental factors which may impact triple negative breast cancer risk, we sought to comprehensively quantify differences in chemical exposures in US women by race. Chemical biomarkers (n=148), measured in urine or blood, were compared between women of various race/ethnicities in a nationally representative sample of US women (n=38,080) by the US Centers for Disease Control and Prevention as part of the National Health and Nutrition Examination Survey using survey weighted linear regression analyses. Across age groups, African American women had significantly higher concentrations of many chemicals in their bodies, including methyl paraben (2.39-fold), propyl paraben (2.09-fold), mono-ethyl phthalate (1.74-fold), and 2,5-dichlorophenol (4.56-fold), relative to non-Hispanic white women. Parallel analyses using high throughput toxicity screening data from the EPA's ToxCast program show that the detectable concentrations of these chemicals in African American women are sufficient to alter biological activity of multiple processes associated with breast cancer, including estrogen receptor signaling. To assess the relevance of these exposures in breast cancer disparities, we have adapted the conditional reprogramming (CR) methodology of Liu et al., 2017 to establish a living biobank of normal breast epithelial cells from matched African American (n=8) and European American women (n=10) for toxicological assessment. Single cell RNA-seq analyses comparing samples before and after CR show maintenance of luminal and myoepithelial lineages. CR also enriches for cells expressing stem cell markers *ALDH1A3* and *ITGA6*. Breast lines from this biobank are now being used to conduct ancestry-environment interaction studies in a dish to understand environmental and genetic impacts on breast cancer disparities.

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### #7

Early Stage Investigator: Michael Cowley, PhD, North Carolina State University

**The Imprinted Gene Network in the programming of non-alcoholic fatty liver disease by developmental cadmium exposure**

Non-alcoholic fatty liver disease (NAFLD) is a public health crisis, affecting 30-40% of the US adult population. NAFLD can be programmed by the environment during early life. Interestingly, multiple environmental stressors, including heavy metals, endocrine disruptors and maternal over-nutrition all program NAFLD susceptibility, suggesting convergence on a common mechanism. However the nature of that mechanism is unknown, creating a barrier to identifying targets for NAFLD treatment and prevention. The heavy metal cadmium (Cd) is one of ten chemicals of major public health concern identified by the World Health Organization. Our preliminary work using mice has shown that exposure to a low, environmentally-relevant dose of Cd during early life is sufficient to program NAFLD in adulthood. To understand the underlying mechanisms, we used RNA-seq to profile hepatic gene expression. Cd exposure is associated with activation of a network of imprinted genes, including up-regulation of the network's master transcription factor ***Zac1***. Importantly, activation of this **Imprinted Gene Network** (**IGN**) in cultured hepatocytes by over-expressing *Zac1* is sufficient to induce molecular signatures of lipid accumulation, extracellular matrix production and fibrosis, key processes in the progression of NAFLD.

Hepatocytes over-expressing *Zac1* and the IGN also secrete more TGF-β1, a key activator of pro-fibrotic hepatic stellate cells that play a central role in disease progression. Furthermore, we find that *Zac1* and the IGN are activated in other models of NAFLD induced by the developmental environment, including maternal over-nutrition. Together, these data strongly suggest that *Zac1* and the IGN are critical players in driving NAFLD, and that they represent a convergent mechanism linking multiple environmental stressors to this disease. We hypothesize that activation of *Zac1* and the IGN is dependent on chromatin remodeling mediated by the ATP-dependent helicase Atrx, a potentially novel epigenetic mechanism linking the early life environment to NAFLD.

## #8

Early Stage Investigator Name: Hong Ji, PhD, University of California - Davis

**Long-term health effects of air pollution through the epigenome**

Epigenetic mechanisms have been proposed to imprint the impact of environmental exposures on the genome and contribute to the etiology of complex diseases by modifying gene expression programs. As a unique and significant contributor to air pollution, wildfires are increasingly recognized as an important public health issue and have been associated with increased risk of respiratory illness due to the particulate in wildfire smoke. Infants and young children are especially susceptible to the negative effects of wildfire smoke due to extended development of respiratory tract and immune system, although the long-term health effects of wildfire smoke exposure in pediatric populations remain unclear. We have performed an epigenome-wide association study in children ages 5-17 and showed that exposure to traffic-related air pollution during infancy is associated with epigenetic variations in airway epithelial cells. Interestingly, some of these epigenetic differences are also associated with severity of asthma symptoms in children, supporting that the epigenome may mediate long-term health effects of early life exposures to traffic-related air pollution. Evidence from an existing cohort of rhesus monkeys exposed to wildfire during infancy in the summer of 2008 supported the long-lasting, sex-specific modulation of immune function and lung function till adolescence by early life exposure to wildfire. The mechanisms accounting for such long-term effects of wildfire smoke is unknown and persistent epigenetic changes induced by early life exposure may play an intermediary role. Beyond functioning as a physical barrier, airway epithelium provides the first line of immune defense towards airway irritants. With UC Davis EHSC pilot funding, an unbiased genome-wide analysis is being conducted to determine persistent effects of wildfire smoke on epithelial responses in the lung. We expect our pilot study will provide novel insights into the possible mechanism(s) mediating the long-term negative effects of wildfire smoke on respiratory system.

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## #9

Early Stage Investigator: Zachary D. Nagel, PhD, Harvard University

**Measuring DNA Repair to Identify Susceptible Individuals**

Environmental DNA damaging agents including sunlight, radon gas, and air pollution are ubiquitous. Left unrepaired, the damage from these agents can lead to cell death, mutations, and diseases including cancer. Our research is focused on understanding why these exposures lead to disease for some individuals, but not for others. It has long been hypothesized that inter-individual differences in DNA repair capacity play a major role in susceptibility to environmental DNA damaging agents. However it has been difficult to test this idea because DNA damage is repaired by at least 6 major pathways, and the available technology has not been capable of assessing all of them simultaneously at the scale of populations. We have used recently developed

fluorescence multiplex host cell reactivation (FM-HCR) assays to carry out a first-of-it's-kind functional analysis of DNA repair by all major repair pathways in lymphocytes from a group of healthy individuals. This unprecedented functional dataset enables an assessment of how the activities of multiple DNA repair pathways vary with respect to each other, among individuals, and within an individual over time. We have also used FM-HCR to carry out a comprehensive analysis of DNA repair capacity in different types of resting and proliferating blood cells. These data reveal large absolute differences in DNA repair capacity between cell types and when comparing cells that are resting vs. proliferating, but also provide evidence that relative differences in DNA repair capacity between individuals are preserved across cell types. Our findings provide new insights into how DNA repair capacity varies among cell types, and provide a foundation for carrying out comprehensive functional analyses of DNA repair in human populations. Our ongoing research is building upon these findings to use DNA repair capacity in lymphocytes to predict clinical radiation sensitivity and lung cancer susceptibility.

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## #10

Early Stage Investigator: Lauren M. Petrick, PhD, Icahn School of Medicine at Mount Sinai; University of California at Berkeley

**Prospective exposomic analysis of archived newborn blood spots in childhood leukemia**

Newborn dried blood spots (DBS) are collected from almost all U.S. and European live births and often stored for future research. As the origins of many diseases arise in fetal life, DBS provide a valuable resource to go 'back in time' and directly measure early life exposures and biological response, *prior to onset of clinical symptoms*. We pioneered the development of untargeted DBS technology and validated it in archived samples stored at -20°C. Here, we describe its application to a childhood leukemia study as proof-of-principle. Early-life environment plays an important etiologic role in the development of pediatric acute lymphoblastic leukemia (ALL), but prospective data are difficult to obtain due to sample size needs. Therefore, we applied our 'exposomic' assay to archived neonatal DBS in a nested case-control study of 334 ALL cases and 324 matched controls in the California Childhood Leukemia Study. Untargeted analysis was performed on extracts of DBS punches (4.7-mm, ~ 8 µL of blood), with an Agilent 1290 UHPLC system connected to a 6550 QTOF HRMS (Santa Clara, USA) in ESI (-) mode. Subjects were stratified by early (1-5 y) and late (6-14 y) diagnosis, and an ensemble of feature-selection methods used to pinpoint metabolites predictive of case status. Covariates representing risk factors for ALL were also evaluated. Mutually-exclusive sets of lipids and fatty acids were associated with ALL phenotypes, including 9 and 19 metabolites in the early- and late-diagnosis groups, respectively. In the late-diagnosis group, a prominent cluster of metabolites contained molecules with 18:2 fatty-acid chains, suggesting that newborn exposure to the essential nutrient, linoleic acid, increased ALL risk. Interestingly, abundances of these 18:2 lipids were greater in infants who were fed formula rather than breast milk (colostrum) and increased with the mother's pre-pregnancy body mass index, suggesting possible etiologic roles of newborn nutrition.

## #11

Early Stage Investigator: Bogdan Fedeles, PhD, MIT

**Mutational spectra of environmental carcinogens: detection and molecular origins**

In a multicellular organism, somatic mutations represent a permanent record of the past chemical and biochemical perturbations experienced by a cell in its local microenvironment. Akin to a perpetual recording device, with every replication, genomic DNA accumulates mutations in patterns that reflect: i) the sequence context dependent formation of DNA damage, due to environmental or endogenous reactive species, including spontaneous processes; ii) the activity of DNA repair pathways, which, depending on the type of lesion, can erase, ignore or exacerbate the mutagenic consequences of that DNA damage; and iii) the choice of replication machinery that synthesizes the nascent genomic copy. These three factors result in a richly contoured sequence context-dependent mutational spectrum that, from appearances, is distinct for most individual forms of DNA damage. Such a mutagenic legacy, if appropriately decoded, can reveal the local history of genome-altering events such as chemical or pathogen exposures, metabolic stress, and inflammation, which in turn can provide an indication of the underlying causes and mechanisms of genetic disease. Modern tools have positioned us to develop a deep mechanistic understanding of the cellular factors and pathways that modulate a mutational process and, in turn, provide opportunities for better diagnostic and prognostic biomarkers, better exposure risk assessment and even actionable therapeutic targets. This poster exemplifies two such tools: 1) Duplex consensus sequencing (DCS), which is a type of highly accurate sequencing that allows the recording of mutational spectra characteristic of environmental carcinogens from heterogenous collections of cells; 2) The site-specifically modified vector (SSMV), coupled with deep sequencing, which is a biochemical tool for recording the sequence-context dependent mutational properties of DNA lesions and the modulatory effects of DNA repair pathways and replicative polymerases. DCS is employed here to detect the mutational imprint of aflatoxin B1 exposure in a mouse model of liver cancer, whereas SSMV is employed to reconstruct the mutational spectrum of 8-oxoguanine, a prevalent oxidative DNA lesion induced by many factors, both endogenous and environmental.

# CONCURRENT BREAKOUT SESSIONS

## June 20, 2019

### EHSCC 2019 CONCURRENT BREAKOUT SESSIONS

**Disaster Research Response (DR2)** Time-critical environmental health research in response to disasters and other emerging threats is vital to the well-being of our workers and communities. Since 2012, NIEHS has led the development and coordination of the NIH Disaster Research Response (DR2) Program. Over the past several years, the DR2 program has increased disaster research coordination, resources, training, funding, and outreach, in the U.S. and globally. This roundtable will provide an update on the NIH DR2 Program, new U.S. initiatives, EHSCC efforts, and opportunities. Additionally, the discussion will focus on the roll-out of a new NIEHS trans-Center and interested grantee working group to build a novel "community of practice" to foster the visibility and contributions of the diverse EHS scientific enterprise going forward.

**Single Cell Analysis: genomics and other -omics at the single cell level** Single cell 'omics represent a class of breakthrough technologies that have recently generated substantial new insights into development and disease. In particular, single cell RNA sequencing has allowed for reconstruction of developmental processes and mapping of cellular heterogeneity in normal and diseased tissues at unprecedented resolution. These technologies also hold great promise for understanding the cell type specific effects of environmental exposures but have yet to be widely applied in environmental health sciences. This breakout session will discuss the capabilities and limitations of current single cell 'omics technologies as well as highlight cutting-edge applications of single cell methods in detecting environmental perturbations of cellular states in health and disease.

**Best practices for transitioning pilot grants to NIEHS applications** A key element of all EHSCCs is the pilot program, which aims to support the development of new research directions and collaborations in order to support the development of new research proposals. Depending on the center, these programs may be targeted at new investigators, established environmental health researchers, or even researchers from other fields interested in incorporating the environment in their research programs. This interactive session will allow EHSCC investigators to share challenges that they have encountered in assuring investigators use the pilot program to develop new research proposals, and to offer solutions and best practices used by their centers to support their investigators.

**Translational Research Exchange** The purpose of this session is to provide an opportunity for an in depth discussion on translational research (TR) and the role for the environmental health sciences core centers in advancing TR. This will be an interactive session to: learn how you are implementing TR at your center; answer your questions; discuss future needs/structures to promote and support TR.
*Who should attend?* Anyone actively engaging in TR, interested in wanting to be more involved, or just wanting to learn more.
*Why discuss now?* We have a TR framework recently published by Pettibone et al., (EHP; vol 16; July 2018) that defines a new construct for TR for the environmental health sciences (www.niehs.nih.gov/translation); and 2. NIEHS released its new Strategic Plan 2018-2023 with a major theme focused on Promoting Translation – Data to Knowledge to Action. (https://www.niehs.nih.gov/about/strategicplan/index.cfm).

**Reporting back research results: benefits and opportunities** Community engagement is a central component of the NIEHS strategic plan (Theme 2) and is a required element of funded Environmental Health Science Core Centers (EHSCCs). At the 2018 Partnerships for Environmental Public Health (PEPH) meeting, grantees and research partners came together to discuss the advances in, challenges facing, and promising practices of reporting back research results. Inspired by the recent NAS report and growing experience with the practice (for example, Silent Spring's DERBI, University of Cincinnati's "Growing up Female," and University of Arizona's "Garden Roots"), the meeting was organized around the why, who, how, and what of

report back. During the meeting, the role of the Community Engagement Core (CEC) was highlighted as a useful resource in the advancement of reporting back research approaches; however, participants recognized the need to engage with Center Directors and Center members as they work to inform a broader conversation. The purpose of this session will be to reprise the main themes of the PEPH meeting with a focus on implications for researchers: what do researchers need to support effective report-back to participants and the communities they come from? What challenges/barriers do they face? How can the NIEHS core center community contribute to promoting appropriate approaches for report-back of environmental health research results?

**Emerging issues with pesticides: Glyphosate & neonicotinoids** The session will provide a summary of a recent meta-analysis of studies examining the potential association between glyphosate exposure and Non-Hodgkin Lymphoma risk as well as glyphosate's potential association with chronic kidney disease. The second part of the session will focus on the occurrence of neonicotinoid pesticides in well water samples obtained from participants of the Agricultural Health Study who reside in an "at-risk" area for groundwater contamination.

# NEW EHSCC RESEARCH

## INTRODUCTION TO NEW EHSCC RESEARCH

**Dana Dolinoy**, PhD, NSF International Chair of Environmental Health Sciences Professor of Environmental Health Sciences & Nutritional Sciences University of Michigan School of Public Health

### *Epigenetics and the Use of piRNA for Epigenome Editing in Environmental Health Research*

Toxicant exposures early in life adversely affect health outcomes in both animals and humans, in part due to epigenetic mechanisms (e.g. DNA methylation). Studies also indicate that exposure impact on the epigenome can be tissue and cell specific. Yet, epigenetic epidemiology analysis of toxicants, is often limited to biologically available or "surrogate" (e.g. blood, saliva) samples. Using lead (Pb) and bisphenol A (BPA) as representative toxicants, we evaluate tissue-specific epigenetic alterations associated with perinatal exposures and disease outcomes. These analyses include a multi-omics integration of DNA methylation and hydroxymethylation, chromatin accessibility, and gene expression data in an effort to inform epigenetic epidemiology studies with an environmental focus. Our approach evaluates sex differences and conducts analyses immediately following perinatal exposure in target tissues (e.g. liver and brain) and in surrogate tissues of human relevance (e.g. blood leukocytes), as well as longitudinally into adulthood to identify persistent exposure-dependent epigenetic changes. Once regions of altered methylation are identified, precision modification of the epigenome holds great promise for our ability to modify environmentally induced changes in gene expression, yet is currently out of reach using common techniques (drugs, transgenics, etc). Until recently, it was widely believed that Piwi Like RNA-Mediated Gene Silencing (PIWIL) gene expression was confined to the germ line of animals, and neither PIWILs nor piRNAs were present or active in somatic tissues. Our research overturns this accepted knowledge by finding widespread PIWIL expression in multiple somatic tissues of the mouse. Thus, we are now using this class of RNA to develop in-vivo technology to target specific genes and loci for stable, mitotically heritable, silencing at pre-determined genomic locations. This research is providing sorely needed evidence clarifying the roles and activity of piRNA in somatic tissues of mammals and will be used to develop piRNA targeted methylation for the wider toxicological research and therapeutic communities.

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**Vaia Lida Chatzi,** MD, PhD, Associate Professor of Preventive Medicine, Keck School of Medicine of USC

### *Developmental exposure to perfluoralkyl substances and pediatric liver disease*

The prevalence of non-alcoholic fatty liver disease (NAFLD) in children has almost tripled over the past 20 years. Pediatric NAFLD is a public health crisis – not only is it the most prevalent liver disease among children world-wide and the leading cause of liver transplant in adults, it leads to substantial morbidity and mortality through cardiometabolic consequences. Mounting experimental evidence suggests that early life environmental exposures contribute to the etiology of NAFLD, however human evidence is scarce. To address these gaps, we have built a research program focused on the developmental origins of NAFLD, first through a pilot project award (*NIEHS-supported Southern California Environmental Health Sciences Center, PI Chatzi*), and more recently with a NIH funded grant (*R21 ES029681, PI Chatzi*). In this multidisciplinary/multi-institutional project we leverage the unique resources of the "Human Early Life Exposome (HELIX)" project, which provides completely harmonized data for environmental exposures, geospatial data and omics biomarkers for 1200 pregnant mothers from 6 European countries and their children, followed prospectively to age of 6-10 years. *We hypothesize that higher exposure to perfluroalkyl substances (PFAS) during pregnancy are associated with subsequent child liver injury and associated dysregulation of metabolic and inflammatory pathways.*

Concentrations of perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), perfluorohexane sulfonic acid (PFHxS) and perfluorononanoic acid (PFNA) were measured in serum samples of the HELIX mothers in the first trimester of pregnancy, and liver injury markers, including alanine aminotransferase (ALT), aspartate aminotransferase (AST) and γ-glutamyl transferase (GGT), were measured in 1129 children at ages

6-10 years. Associations of PFAS mixtures with child liver injury biomarkers levels were assessed using Bayesian Kernel Machine Regression (BKMR) models. A metabolome-wide association study coupled with pathway analysis was performed to evaluate metabolic dysregulation associated with PFAS.

In the BKMR analysis, higher exposure to PFAS mixture was associated with elevated ALT, AST and GGT levels in childhood. Increased prenatal PFAS concentrations were also associated with significant alterations in numerous lipid pathways, including glycerospholipids, acylcarnitines and sphingomyelins, key metabolic pathways previously found to be altered in NAFLD. A structural integrated analysis identified a cluster of children with suspected NAFLD, characterized by increased prenatal PFAS serum concentrations and altered child metabolite profiles.

**Conclusion:** In utero exposure to PFAS may contribute to pediatric NAFLD pathogenesis. Further studies are needed to replicate these results and explore susceptibility and underlying mechanisms of hepatotoxic effects of PFAS in humans.

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**Georg Wondrak,** PhD, Associate Professor, Pharmacology and Toxicology, The University of Arizona Health Sciences

*Investigating the molecular potentiation of cutaneous and systemic damage inflicted by co-exposure to solar UV radiation and chlorination stress originating from swimming pool disinfectants*

Hypochlorous acid (HOCl) is the active oxidizing principle released by standard swimming pool disinfectants used on a global scale, but the health consequences of human exposure inflicted by HOCl remain largely unknown, posing a major public health concern relevant to populations around the world. Environmental exposure to solar ultraviolet (UV) radiation is a causative factor in skin photocarcinogenesis, and immune suppression is a key mechanism underlying detrimental effects of acute and chronic UV exposure. Our preliminary data indicate that HOCl exposure greatly potentiates the genotoxicity of solar UV photons thought to originate from oxidative DNA base modifications caused by this potent electrophile. Moreover, we have observed that the key modulators of UV-induced systemic immunosuppression, cutaneous dendritic cells (Langerhans cells), are hypersensitive to the cytotoxic effects of HOCl, suggesting a potentiation of immunotoxic effects of solar UV, relevant to skin barrier function, systemic inflammatory disease, and carcinogenesis. Our ongoing research explores the molecular potentiation of UV-induced cutaneous and systemic damage by co-exposure to HOCl-based swimming pool disinfectants, examined in cell culture, skin tissue models, and mouse models of UV-induced skin damage and cancer.

**Significance:** The public health relevance of human exposure to chlorination stress (mediated by HOCl) and solar radiation in the context of recreational swimming pool use creates an urgent need for detailed molecular investigations. The ultimate goal of this research is to substantiate occurrence and molecular nature of adverse health effects that result from this relevant environmental co-exposure, representing an unrecognized risk to public health that may be preventable by alternative disinfection approaches and improved photoprotection strategies.

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**Hans-Joachim Lehmler,** PhD, Professor, The University of Iowa

*Dysbiosis of the microbiome: A missing link in PCB-induced neurotoxicity?*

Exposures to polychlorinated biphenyls (PCBs) and disruption of the gut microbiome have independently been implicated in the etiology of neurodevelopmental disorders. Building on these observations, we hypothesize that PCB-induced changes in the gut microbiome disrupt normal neurodevelopment by *(1)* altering the profile of neuroactive microbial metabolites distributed to the brain; and *(2)* affecting PCB distribution to the brain by altering host and microbial metabolism of PCBs. To test this hypothesis, we investigated the effect of oral PCB exposure on the gut microbiome and PCB disposition in mice. Briefly, adult female conventional and germ-free mice were

orally exposed to corn oil (control) or PCBs (6 or 30 mg/kg) once daily for 3-consecutive days. These preliminary studies revealed changes in the $\alpha$ and $\beta$ diversity of the gut microbiota of PCB-exposed conventional mice compared to controls. Bacteria that were altered in PCB-exposed mice included *Bifidobacterium*, *Akkermansia muciniphila*, and *Mogibacteriaceae*. Metabolomic analyses demonstrated that PCB exposure differentially affected levels of neuroactive bile acids and tryptophan metabolites in germ-free compared to conventional mice. Importantly, PCB levels in the brain of PCB-exposed mice revealed groupings based on enterotype. In a non-targeted analysis of pooled feces samples, we observed hundreds of excreted PCB metabolites. The fecal metabolite profiles differed between enterotypes in a manner that is consistent with the role of microbial metabolism in the disposition of PCB metabolites. Further studies are needed to demonstrate that developmental exposure to an environmentally relevant PCB mixture alters the gut microbiome to modulate: *(a)* the profile of neuroactive microbial metabolites, *(b)* the distribution of PCBs and their metabolites to the developing brain, and *(c)* adverse neurodevelopmental outcomes.

# ABOUT THE EHSRC

*Environmental Health Sciences Research Center*
145 Riverside Drive, S300 CPHB
The University of Iowa
Iowa City, IA  52242

For nearly 30 years, the Environmental Health Sciences Research Center (EHSRC) at the University of Iowa (U.I.) has advanced and translated research that addresses environmental health problems across the urban-rural continuum. Early EHSRC research was focused on organic dust exposure and lung disease, pesticide exposure and cancer, rural childhood asthma, and community health problems arising from industrialized livestock production. Research in the last decade has expanded to include studies of innate immunity and the inflammasome in lung disease; the role of the microbiome in asthma; high throughput-data rich methods for assessing the toxicity of engineered nanomaterials; state-of-the-art biomedical imaging combined with advanced computational modeling; epigenetic susceptibility to air pollutants; and applications for distributed sensor networks and data analytics for exposure monitoring. To advance this research, we have applied innovations in advanced genomics and metabolomics, citizen-engaged science, exposomics and advanced pulmonary physiomic imaging.

The EHSRC remains devoted to the recruitment and mentoring of new and mid-level investigators in the environmental health sciences.  In addition, the Center operates a rigorous, competitive Pilot Grant Program to develop new research initiatives, support the career development of junior investigators, and establish new collaborations. As future environmental health issues come to light, we will continue to address the challenges they bring through rigorous, transformative research and robust community engagement.

## EHSRC STRATEGIC VISION

*The Center vision is to be the primary environmental health resource for improving the health of rural residents by stimulating and translating innovative environmental health sciences research. This is accomplished by gaining new insights into rural exposures; population health; susceptibilities; and pathways of toxicity, disease and repair; and then translating these insights to medicine, public health practice and regulatory policy.*

## CENTER THEME

*The theme of the Environmental Health Sciences Research Center is research and engagement on the adverse health effects of current and emerging environmental contaminants, especially among rural and agricultural populations.*

# ABOUT THE EHSRC

## ADMINISTRATIVE CORE

Center Director: Peter S. Thorne, PhD

Center Deputy Director: Hans Lehmler, PhD

Center Coordinator: Nancy Wyland, MFA

Center Administrator: Mindy Sickels, BBA

## RESEARCH THEMES

*INFLAMMATION & INNATE IMMUNITY*

Co-Directors: Paul B. McCray, Jr., MD and Jerrold P. Weiss, PhD

*NANOTOXICOLOGY*

Co-Directors: Peter S. Thorne, PhD and Aliasger Salem, PhD

*POPULATION HEALTH*

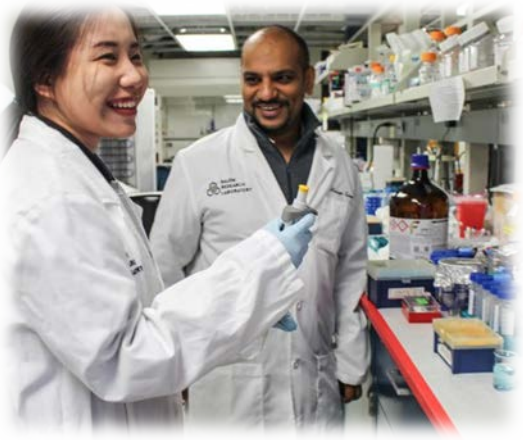
Co-Directors: R. William Field, PhD and Diane S. Rohlman, PhD

*SYSTEMS AND REDOX TOXICOLOGY*

Co-Directors: Hans Lehmler, PhD and Jonathan Doorn, PhD

*WATER QUALITY*

Co-Directors: David Cwiertny, PhD and Hans Lehmler, PhD



## CORE FACILITIES

*EXPOSURE SCIENCE FACILITY*

Director: Patrick T. O'Shaughnessy, PhD

*INTEGRATIVE HEALTH SCIENCES FACILITY*

Director – Clinical: Alejandro Comellas, MD

Associate Director – Imaging: Eric A. Hoffman, PhD

*PULMONARY TOXICOLOGY FACILITY*

Director: Peter S. Thorne, PhD

## COMMUNITY ENGAGEMENT CORE

Director: Brandi Janssen, PhD

Coordinator: Jackie Curnick, MDP

## NOTES

## NOTES

Dr. Thorne, Dr. Lehmler and the members of the EHSRC wish to thank NIEHS for their support of the 2019 EHSCC Annual Meeting, The University of Iowa College of Public Health for technical assistance and use of its facilities, and Ms. Nancy Wyland, EHSRC Coordinator, for her tireless efforts to make the conference a success.