Emerging Contaminants in the Environment Conference

Hilton Garden Inn       May 21-22, 2019       Champaign, IL
Emerging Contaminants in the Environment Conference

May 21-22, 2019

Hilton Garden Inn
Champaign, Illinois

Organizers
Illinois Sustainable Technology Center
Illinois-Indiana Sea Grant

Funding provided in part by
Illinois Hazardous Waste Research Fund
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Illinois Water Resources Center
Illinois-Indiana Sea Grant

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Conference At-A-Glance

Monday, May 20 – Hilton Lobby

5:00 – 7:00 p.m. Networking Mixer

Tuesday, May 21 – Spartans/Golden Gophers Ballroom

7:30 a.m. Check In and Breakfast
8:30 a.m. Welcome
8:45 a.m. Keynote
9:30 a.m. Break
9:45 a.m. Oral Presentations
10:45 a.m. Break
11:00 a.m. Oral Presentations
12:00 p.m. Lunch and Networking - Fighting Illini Ballroom

1:00 p.m. Keynote
1:45 p.m. Break
2:00 p.m. Oral Presentations
3:00 p.m. Break
3:15 p.m. Oral Presentations
4:15 p.m. Day 1 Closing Remarks
4:30 - 6:00 p.m. Poster Session and Reception - Fighting Illini Ballroom

Wednesday, May 22 – Spartans/Golden Gophers Ballroom

7:30 a.m. Check In and Breakfast
8:30 a.m. Welcome
8:45 a.m. Panel Discussion
9:45 a.m. Break
10:00 a.m. Oral Presentations
11:00 a.m. Break
11:15 a.m. Keynote
12:00 a.m. Lunch and Networking - Fighting Illini Ballroom

1:00 p.m. Oral Presentations
2:00 p.m. Break
2:15 p.m. Oral Presentations
3:15 p.m. Closing Remarks
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EXPANDED AGENDA

Monday, May 20

5:00 - 7:00 p.m.  Networking Mixer
Join us for a pre-conference networking mixer at the Hilton Garden Inn. This event will be a chance to meet many conference attendees and presenters in an informal setting. Appetizers and a cash bar will be available.

Tuesday, May 21

7:30 a.m.  Check in and Breakfast

8:30 a.m.  Welcome: Nancy Holm - Assistant Director for Sponsored Research, Public Engagement, and Communications, Illinois Sustainable Technology Center; Reitumetse Obakeng Mabokela - Vice Provost for International Affairs and Global Strategies and Professor in Education Policy, Organization and Leadership, University of Illinois at Urbana-Champaign; Kevin OBrien - Director for the Illinois Sustainable Technology Center and the Illinois State Water Survey

Moderator  Nancy Holm - Illinois Sustainable Technology Center

8:45 a.m.  Keynote: Susan Richardson - Arthur Sease Williams Professor of Chemistry in the Department of Chemistry and Biochemistry at the University of South Carolina; Emerging Contaminants: State of the Art and New Discoveries

9:30 a.m.  Break

9:45 a.m.  Amy Soli  Environmental Assessments to Evaluate Pharmaceutical Risks to Ecologic Systems

10:00 a.m.  Laura Hubbard  Chemical and Biological Characterization of Wastewater from Food, Beverage, and Feedstock Processing Plants Discharging to the Environment

10:15 a.m.  Krista Wigginton  Recent Advancements in Virus Detection and Monitoring

10:30 a.m.  Katie Nyquist  Effective Communication for Emerging Contaminants: Using Audience-Focused Strategies to Overcome Challenges

10:45 a.m.  Break

11:00 a.m.  Erin Ussery  Ecotoxicological Effects of Metformin on Japanese medaka

11:15 a.m.  Kevin Tucker  Quantitation and Localization of Endocrine Disruptor Compounds Accumulation in Fathead Minnows by Orthogonal Mass Spectrometry Techniques
11:30 a.m. Yaochun Yu  Biotransformation of Sulfonamide Antibiotics by Different Ammonia Oxidizers
11:45 a.m. Joanne Parrott  Assessing the Effects of Environmentally Relevant Concentrations of Antidepressant Mixtures to Fathead Minnows Exposed Over a Full Life Cycle
12:00 p.m. Lunch
1:00 p.m. **Keynote: Thomas Bruton** - PFAS Research and Policy Lead, Green Science Policy Institute; *Getting Ahead of Emerging Contaminants with the Class Concept*
1:45 p.m. Break
2:00 p.m. Harry Behzadi  The Next Frontier on PFAS Contamination, Sediment, Surface Water and Fish Tissue
2:15 p.m. Jinyong Liu  Degradation of Per- and Polyfluoroalkyl Substances (PFASs): Structural Dependence and Implications to PFASs Remediation and Management
2:30 p.m. Jeffrey Warren  Establishing a Collaborative Per- and Polyfluoroalkyl Substances (PFAS) Testing Network in North Carolina
2:45 p.m. Graham Peaslee  Total Fluorine Analysis to Screen for PFAS in Personal Care Products
3:00 p.m. Break
3:15 p.m. Jonathan Ali  The Road to Developing Maximum Contaminant Levels (MCLs) for Four PFAS: Lessons Learned from the New Hampshire Perspective
3:30 p.m. Charles Neslund  Lessons Learned from the Application of Total Oxidizable Precursors (TOP) Assay on Environmental Samples
3:45 p.m. Guomao Zheng  Brominated and Organophosphate Ester Flame Retardants and PFAS in Sentinel Fish on St. Lawrence Island, Alaska
4:00 p.m. Shaorui Wang  Indoor Ambient and Personal Exposures to Brominated Flame Retardants and Organophosphate Esters in Central Appalachia
4:15 p.m. Daniel Peipert  Cyanobacteria and Human Disease
4:30 - 6:00 p.m. **Poster Session and Reception in the Fighting Illini Ballroom**
Hors d'oeuvres will be served.
Wednesday, May 22

7:30 a.m.  Check in and Breakfast

Moderator    Elizabeth Meschewski - Illinois Sustainable Technology Center

8:30 a.m.  Welcome and Introduction to Panel
Panel Moderator    Patrice Charlebois - Illinois-Indiana Sea Grant

Panelists:
- Thomas Bruton - Green Science Policy Institute
- Iseult Lynch - University of Birmingham, UK
- Yujie Men - University of Illinois at Urbana-Champaign
- Katie Nyquist - Minnesota Department of Public Health
- Heiko Schoenfuss - St. Cloud State University
- Krista Wigginton - University of Michigan

9:45 a.m.  Break

10:00 a.m.  Lance Schideman  Fate and Transport of Manure Estrogenic Compounds During Integrated Treatment for Water Quality and Bioenergy Production

10:15 a.m.  Andrea Funk  Facilitated Transport of Antibiotics by Biochar under Rainfall Simulations

10:30 a.m.  Heiko Schoenfuss  Contaminants of Emerging Concern in The North American Great Lakes: Evidence of Reproductive Disruption from Field and Laboratory Studies

10:45 a.m.  Tracie Baker  Environmental Contaminants in the Lake Huron to Erie Corridor: Effects on Zebrafish

11:00 a.m.  Break

11:15 a.m.  Keynote: Rob Hale - Professor in the Department of Aquatic Health Sciences at Virginia Institute of Marine Science; Microplastics: A Global, Multi-Media Concern

12:00 p.m.  Lunch

1:00 p.m.  Stefan Krause  Fate and Transport of Microplastics in Freshwater Ecosystems - The 100 Plastic River Network

1:15 p.m.  Iseult Lynch  The Effect of Chemical and Biological Conditioning on the Toxicity of Microplastics to Daphnia magna
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<td>Patricia Corcoran</td>
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<td>3:00 p.m.</td>
<td>Javier Gonzalez</td>
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Keynote Speakers

Getting Ahead of Emerging Contaminants with the Class Concept

Thomas Bruton - PFAS Research and Policy Lead, Green Science Policy Institute; tom@greensciencepolicy.org

Abstract: Growing concern about the presence of highly fluorinated chemicals (PFAS) in drinking water has brought increased recognition of broader emerging contaminants issues. Policy makers and the public are gaining a newfound appreciation for the multitude of little-studied and unregulated industrial chemicals to which we are routinely exposed. For some emerging contaminants, gains in scientific understanding have outpaced development of new regulations. Many more contaminants remain largely unstudied. The traditional risk management approach that deals with substances individually is time-consuming and poorly suited to address the large volume of chemicals that needs to be addressed. In response, there is a growing interest in using class-based approaches for chemicals management. This talk will use the case of PFAS to highlight the utility of (and challenges associated with) class-based chemicals management. Examples will include initiatives at the local, state, and international levels to regulate PFAS in products and in drinking water, as well as efforts by manufacturers to reduce their reliance on this class of chemicals.

Biography: Thomas Bruton received his Ph.D. in environmental engineering at UC Berkeley, where his research focused on using in-situ chemical oxidation for remediation of chemical contaminants, including PFAS, in soil and groundwater. In 2017, Tom joined the Green Science Policy Institute, which works collaboratively with partners in academia, government, business, and the nonprofit sector to reduce the use of harmful chemicals in products. Tom currently leads the Institute’s research and policy work on PFAS. He is the author of several peer-reviewed papers on PFAS, and is frequently interviewed by the news media.

Microplastics: A Global, Multi-Media Concern

Robert C. Hale - Professor of Marine Science, Virginia Institute of Marine Science; hale@vims.edu

Abstract: Plastics are increasingly used in Global Society. Their low cost incentivizes careless disposal & their entry into the marine environment is projected to double in 10 years. Polymers eventually fragment, as a function of composition & environmental factors, into microplastics. These take the form of irregular particles or fibers, with sizes extending down into the nanoparticle range. Microbeads are also intentionally manufactured. Small particle size accentuates reactive surface areas & analytical difficulties. While the impacts of large debris on charismatic mega-fauna have been recognized for decades, concern over threats from microplastics is recent. Smaller fragment size places minute, but ecologically important organisms at risk. Microplastics also present threats to humans, where exposure is likely greatest from inhalation & ingestion of indoor dust, not seafood consumption. Chemicals are added to plastics at % levels during manufacturing to achieve desired properties. Additives include flame retardants, which pose particular risks to children. Environmental pollutants also concentrate on polymer surfaces. In aquatic organisms filter feeders ranging from oysters to whale sharks may be at particular risk from physical & chemical impacts. Plastic debris may also serve as novel substrates for aquatic biofilms & their transport may carry exotics substantial distances. Wastewater treatment removes >90% of microplastics from effluents, but these may later be reintroduced to the environment by land application.
Biography: Rob Hale’s research focuses on the sources, multi-media fate, bioavailability and effects of persistent, bioaccumulative & toxic (PBT) pollutants. Recent interests include flame retardants and microplastics. Matrices of concern have ranged from local fish tissues and sediments, Antarctic wastewater sludge, plastics, to indoor & World Trade Center dust. Over the last 30 years he has published >100 journals articles, which have been cited >7000 times.

Rob was born in Detroit, MI. He received bachelor degrees in both chemistry and biology (Wayne State University), as well as a Ph.D. in Marine Science (William & Mary). He initially worked as a Research Environmental Chemist for Mobil Corp. in Princeton, NJ, before returning to VIMS, where he is now a Professor in the Dept. of Aquatic Health Sciences.

Emerging Contaminants: State of the Art and New Discoveries
Susan D. Richardson - Arthur Sease Williams Professor of Chemistry, University of South Carolina; richardson.susan@sc.edu

Abstract: Environmental research continues to expand beyond traditional, regulated contaminants to emerging contaminants, such as sucralose and other artificial sweeteners, nanomaterials, perfluorinated compounds, pharmaceuticals, hormones, drinking water and swimming pool disinfection by-products (DBPs), 1,4-dioxane, sunscreens/UV filters, flame retardants, benzotriazoles, naphthenic acids, algal toxins, and new contaminants on the horizon: ionic liquids and microplastics. These are now frequently being found in water samples, including rivers, lakes, ground water, and drinking water. Moreover, understanding their fate and transport in the environment and in wastewater/drinking water treatment is vitally important, and as such, one of the major trends continues to be in identifying their transformation products. Because environmental samples are inherently complex mixtures with trace-level contaminants, the development of sensitive and modern analytical tools has been key for their identification and measurement. This presentation will provide an overview of the state of the science for emerging contaminants, their formation and transformation in the environment, and the modern tools used to measure them.

Biography: Susan D. Richardson is the Arthur Sease Williams Professor of Chemistry in the Department of Chemistry and Biochemistry at the University of South Carolina. Prior to coming to USC in January 2014, she was a Research Chemist for several years at the U.S. EPA’s National Exposure Research Laboratory in Athens, GA. Susan is the recipient of the 2008 American Chemical Society Award for Creative Advancements in Environmental Science & Technology, has received an honorary doctorate from Cape Breton University in Canada (2006), and was recently recognized as an ACS Fellow (2016). Susan was also recently elected as the Vice President/President Elect for the American Society for Mass Spectrometry.
Panelists

**Thomas Burton** - PFAS Research and Policy Lead, Green Science Policy Institute; tom@greensciencepolicy.org

**Biography:** Thomas Burton received his Ph.D. in environmental engineering at UC Berkeley, where his research focused on using in-situ chemical oxidation for remediation of chemical contaminants, including PFAS, in soil and groundwater. In 2017, Tom joined the Green Science Policy Institute, which works collaboratively with partners in academia, government, business, and the nonprofit sector to reduce the use of harmful chemicals in products. Tom currently leads the Institute’s research and policy work on PFAS. He is the author of several peer-reviewed papers on PFAS, and is frequently interviewed by the news media.

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**Iseult Lynch** - Professor and Chair of Environmental Nanosciences at the School of Geography, Earth and Environmental Sciences, University of Birmingham; i.lynch@bham.ac.uk

**Biography:** Professor Iseult Lynch is Chair of Environmental Nanosciences at the School of Geography, Earth and Environmental Sciences, University of Birmingham. She holds a bachelor’s degree in chemistry and a Ph.D. in physical chemistry from University College Dublin. She undertook postdoctoral training in Lund University, applying a range of biophysical methods to assess the interaction of proteins with thermo-responsive hydrogel nanoparticles, leading to the concept of the nanoparticle protein (biomolecule) corona. Her current research focusses on developing a molecular level understanding and predicting the dynamics of the biomolecule corona (proteins, polysaccharides and small molecules/metabolites) and its consequences for nanoparticle and microplastics' human and environmental health and safety. She is an Associate Editor for Environmental Science: Nano, a Fellow of the Royal Society of Chemistry, and leads the UoB Institute of Global Innovation theme on Environmental Pollution Solutions. She has published over 120 papers, with a h-index of 56 (Google Scholar, Jan 2019) and was listed as a Highly Cited Researcher (cross-field) in 2018.

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**Yujie Men** - Assistant Professor in Civil and Environmental Engineering at University of Illinois, Urbana-Champaign; ymen2@illinois.edu

**Biography:** Dr. Yujie Men is an Assistant Professor in Civil and Environmental Engineering at University of Illinois, Urbana-Champaign. She earned her Ph.D. from University of California, Berkeley, B.S. and M.S. from Tsinghua University. Before she joined UIUC in 2016, she worked as a postdoc scientist in environmental chemistry at Eawag, Switzerland. Her research focuses on engineering applications of environmental microbiology and microbial ecology principles, such as bioremediation of environmental organic contaminants, sustainable wastewater treatment and resource recovery.

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**Katie Nyquist** - Principal Planner for the Contaminants of Emerging Concern Initiative at the Minnesota Department of Health; katie.nyquist@state.mn.us

**Biography:** Katie Nyquist is a Principal Planner for the Contaminants of Emerging Concern Initiative at the Minnesota Department of Health. Katie’s work focuses specifically at the intersection of science communication, environmental engagement, and public health. She
enjoys using what we learn through the biophysical data and social science data to mutually support the health of people and the health of ecosystems. She has a Masters of Public Health degree from the University of Minnesota and a degree in political science and psychology from North Dakota State University.

**Heiko Schoenfuss** - Director of Aquatic Toxicology Laboratory and Professor of Anatomy at St. Cloud State University; hschoenfuss@stcloudstate.edu

**Biography:** Dr. Schoenfuss is the director of the St. Cloud State University Aquatic Toxicology Laboratory and a professor of anatomy. His research on contaminants of emerging concern has identified links between treated wastewater effluent discharge and compromised fish health, between septic discharge and reduced reproduction in lake fish, and between stormwater discharge and environmental contaminant loads. Dr. Schoenfuss chairs the SETAC Endocrine Disruptor Testing and Risk Assessment Steering Committee and has served on the EPA Science Advisory Board.

**Krista Wigginton** - Assistant Professor in the Department of Civil and Environmental Engineering at the University of Michigan; kwigg@umich.edu

**Biography:** Krista Rule Wigginton received a B.S. degree in chemistry (2001) at the University of Idaho, and M.S. and Ph.D. degrees in environmental engineering (2004, 2008) at Virginia Tech under the guidance of Prof. Peter Vikesland. After conducting her postdoctoral research at École Polytechnique Fédérale de Lausanne in Lausanne, Switzerland (2008-2010) under the guidance of Prof. Tamar Kohn, she joined the faculty of the University of Maryland, College Park (2011-2012) in the Department of Civil and Environmental Engineering. Currently an assistant professor in the Department of Civil and Environmental Engineering at the University of Michigan, her research team focuses on the mechanistic fate of viruses in treatment processes, and on improving virus detection in water. She is the recipient of the NSF CAREER award and Paul L. Busch Award.

**Moderator:** Patrice Chalebois - Outreach Program Leader at the Illinois-Indiana Sea Grant; charlebo@illinois.edu

**Biography:** Pat leads the development, expansion, and delivery of science-based outreach programming that helps communities and individuals make informed choices when managing and interacting with our natural resources. She helps connect IISG’s specialists with scientists and potential partners and enhances our existing partnerships with Illinois Extension, Purdue Extension, and the Prairie Research Institute. Before becoming our program leader, Pat was IISG’s aquatic invasive species outreach specialist and coordinator for over 20 years. She received both her B.S. and M.S. degrees in Biology with a concentration in Aquatic Ecology from the University of Notre Dame.
Oral Presentations

The Road to Developing Maximum Contaminant Levels (MCLs) for Four PFAS: Lessons Learned from the New Hampshire Perspective
Jonathan Ali - Toxicologist at New Hampshire Department of Environmental Services; jonathan.ali@des.nh.gov
Co-authors: Mary Butow, David Gordon

Abstract: Perfluoroalkyl substances (PFAS) are a unique class of emerging contaminants due to their environmental persistence and bio-accumulative properties in humans. Water contamination represents a major source of exposure to PFAS, with a growing number of drinking water supplies reporting PFAS contamination. In lieu of immediate federal action to establish national drinking water standards, several states have proposed their own drinking standards such as maximum contaminant levels (MCLs) for certain PFAS. This problem is specifically challenging for New Hampshire where two communities were exposed to PFAS through contaminated drinking water supplies. In January 2019, New Hampshire’s Department of Environmental Services proposed MCLs for four PFAS including perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA) and perfluorohexanesulfonic acid (PFHxS). This presentation will discuss the process, challenges and application of emerging tools necessary for regulating this class of emerging contaminants. Additionally, we highlight the research and regulatory needs for approaching surface water standards for these and other PFAS in the context of New Hampshire’s various surface water designations.

Biography: Dr. Ali is the current toxicologist for the New Hampshire Department of Environmental Services where he is working on the development of ground and surface water standards for perfluoroalkyl substances. He obtained his Ph.D. in Environmental Toxicology from the University of Nebraska Medical Center, and conducted his postdoctoral research with the Department of Civil Engineering at the University of Nebraska-Lincoln.

Environmental Contaminants in the Lake Huron to Erie Corridor: Effects on Zebrafish
Tracie Baker - Assistant Professor, Institute of Environmental Health Sciences and Department of Pharmacology at Wayne State University; tracie.baker@wayne.edu
Co-authors: Danielle Meyer, Emily Crofts, Jeremiah Shields, Camille Akemann, Bridget Baker

Abstract: Contaminants of emerging concern (CECs) and endocrine-disrupting chemicals (EDCs) include pharmaceutical, personal care, agricultural, and industrial byproducts that enter waterways via effluent, runoff, aging infrastructure, and inadequate wastewater treatment. The Detroit River is an Area of Concern, but the drinking water source for ~4 million people, hub of >30% of Michigan’s fishing effort, and home to vital habitats. Zebrafish are advantageous for such complex issues due to short generation times and large numbers of synchronously developing fish. We investigate early development or chronic exposure of zebrafish to Detroit River water and evaluate changes in embryonic development, behavior, reproductive capacity, sex ratio, offspring survival, transcriptome, and epigenome. We also analyze water samples in the Lake Huron to Erie corridor for CECs and EDCs, and then evaluate the same endpoints in zebrafish exposed to these chemicals at environmentally-relevant levels, either singly or in mixtures. This multi-pronged approach has implications for local human and fish health, water treatment/sewage infrastructure, remediation/restoration efforts, natural resource management, public education, and community revitalization.

Biography: Tracie Baker earned her M.S. in marine biology (University of Alaska) and a Doctorate of Veterinary Medicine and Ph.D. in molecular and environmental toxicology (University of Wisconsin). Her lab
focuses on multidisciplinary, translational research that bridges human, animal, and environmental health. She provides critical insights into environmentally-induced disease by using the zebrafish model to uncover the etiology of adverse health endpoints related to contaminant exposure.

The Next Frontier on PFAS Contamination, Sediment, Surface Water and Fish Tissue
Harry Behzadi - VP of Business Development at SGS; harry.behzadi@sgs.com

Abstract: PFAS are a class of synthetic fluorinated chemicals used in many industrial and consumer products, including defense-related applications. They are persistent, found at low levels in the environment, and bio-accumulate.

Studies have shown these compounds being detected more often in surface water, sediments and/or bioaccumulated into fish tissue. Because of greater affinity of longer chain PFAS compounds for fish than other environmental matrices, certain compounds are often found in fish tissue, but not in the water or sediment.

More generally, PFAS is the compound that has generated the most concern in fish due to its frequent occurrence in the environment, its bioaccumulation in fish tissue, its potential human health risk, and the availability of health effects information needed to develop fish consumption advisories.

In summary, PFAS compounds are widely distributed in many bodies of waters all over US due to historic and current industrial activities, as well as the presence of military facilities. These compounds are of concern because they do not break down in the environment, bioaccumulate in humans and biota, and may pose risks to human health.

Biography: Dr. Harry Behzadi is currently Vice President of Business Development for SGS-EHS North America. Prior to joining SGS, he was the Vice President of Operations for the Eastern Region at Test America, Inc., and VP of Operations and Corporate Technical Director for Accutest Laboratories, Inc. Dr. Behzadi was one of the original partners of Accutest Laboratories (now SGS Accutest) where he had spearheaded growth and expansion of Accutest Corporation in the Southeast and beyond to the West Coast.

Lake-wide Distribution of Microplastics in Nearshore and Offshore Bottom Sediments of Lake Huron, North America
Sara Belontz – Ph.D. Candidate at the University of Western Ontario; sbelontz@uwo.ca

Co-authors: Patricia Corcoran, Paul Helm

Abstract: Microplastics have been detected and quantified in surface waters of the Great Lakes, receiving considerable attention as an emerging contaminant. Despite this, relatively few studies have examined microplastics in benthic sediment of lakes. This project aims to determine the factors controlling the abundance, distribution, morphology and composition of microplastics in Lake Huron by examining 92 nearshore and offshore benthic sediment samples. To date, microplastics have been extracted from sediment using a 1.5 g/cm³ density separation solution of Sodium Polytungstate, and microplastics from 12 samples have been visually identified and counted using a stereomicroscope. Preliminary results show that in Georgian Bay, offshore depositional sites contain greater average abundances of microplastics with 134,477 kg⁻¹ dry weight sediment, in comparison to nearshore sediment containing 39,587 kg⁻¹. Representative particles will be chemically analyzed by Fourier Transform Infrared Spectroscopy. This study will provide the first comprehensive analysis of benthic microplastics across the entirety of one of the Great Lakes. The results will enable assessment of current and future trends in microplastic abundance in the Lake Huron basin.

Biography: Sara Belontz is a Ph.D. candidate in the Department of Earth Sciences at the University of Western Ontario. Her research interests include microplastics in sediments, environmental policy, and sustainability.
A Pan-Great Lakes Study of Plastic Pellet Distribution
Patricia Corcoran - Associate Professor at The University of Western Ontario; pcorcor@uwo.ca
Co-authors: Sara L. Belontz, Ian Arturo, Carolyn M. Hill

Abstract: Plastic pre-production pellets were first identified in the natural environment in the 1970s. Most commonly found on surface waters and beaches, pellets litter shorelines worldwide, even in regions remote from plastic production facilities. Because of their global distribution, pellets pose threats to epipelagic organisms and seabirds that mistake the pellets for food. We conducted a pan-Great Lakes sampling program for plastic pellets to determine: (1) the most contaminated sites, (2) the potential sources of waste pellets, and (3) the pathways of pellets into the lakes. In October 2018, we surveyed 67 Great Lakes beaches for pellets and other plastic debris. The number of pellets ranged from 0-7371/m², with the greatest numbers near Rossport and Katherine Cove (Superior), Sheboygan and Bay View (Michigan), Sarnia and Goderich (Huron), Holiday Harbour and Fort Erie (Erie), and Oakville and Burlington (Ontario). All but one of these sites are located within 5 km of a tributary, indicating that rivers and creeks are the main pathways for pellets to the lakes. Other factors controlling pellet distribution include proximity to plastic manufacturers, surface water current patterns, and sites of pellet spills during transport.

Biography: Patricia Corcoran is an Associate Professor of Earth Sciences at The University of Western Ontario. One significant element of her research concerns the distribution, accumulation and degradation of plastic debris in shoreline and nearshore benthic sediment of lakes, rivers and oceans. Dr. Corcoran is investigating the potential for this plastic debris to become part of the future rock record, thereby representing a symbol of humankind’s global effect on Earth’s environment.

Facilitated Transport of Antibiotics by Biochar under Rainfall Simulations
Andrea Funk - Master’s Candidate at the Purdue University; funka@purdue.edu
Co-authors: Javier Gonzalez, Cliff Johnston, Wei Zhang

Abstract: Manure application to soils is a common practice; however manure may have antibiotics that may end up in waterways via surface or subsurface transport. Biochar, pyrolyzed biomass in an oxygen-absent environment, sorbs antibiotics which could keep these compounds in the soil until they degrade. In this study we used indoor rain simulations to determine the losses of antibiotics lincomycin, monensin, and tylosin in infiltration and runoff water samples using three different biochar rates (0, 1, and 2% w/w) and two rainfall rates (50 and 100mm/hr). Monensin was found in the highest quantities in infiltration water with recovery as high as 34% of total monensin applied, followed by lincomycin and tylosin respectively. Conversely, lincomycin had the highest recovery in water runoff with 0.90% recovered followed by monensin and tylosin respectively. Losses of antibiotics were dependent on the amount of biochar and rainfall rates across all rainfall simulations.

Biography: Andrea Funk graduated with a Bachelor of Science degree in soil and hydrologic sciences from Purdue University in 2014. She is currently finishing her master’s degree in soil chemistry from the Purdue University Agronomy Department with plans to graduate spring of 2019.

Imidacloprid and Atrazine Trends in NE Indiana at the Catchment Scale
Javier Gonzalez – Research Soil Scientist at the United States Department of Agriculture, Agricultural Research Service, National Soil Erosion Research Laboratory; javier.gonzalez@ars.usda.gov
Abstract: Pesticides help to keep productivity in agricultural systems to supply food and fiber to the growing population of the world; however, some pesticides may impair the environment. The trends of imidacloprid, an insecticide to treat soybean seeds, and atrazine, the most common herbicide to control broadleaf weeds in corn in the US Midwest, were investigated in a 193 km² watershed in NE Indiana with 74% of the area dedicated to agriculture. During the growing seasons from 2010 to 2014, daily samples were collected and analyzed for imidacloprid and atrazine. The results showed that from 2010 to 2014, the annual loading of atrazine decreased by 50% and of imidacloprid by 3%. However, from 2010 to 2014 the flow-weighted mean concentration (FWMC) of atrazine did not change, whereas the FWMC of imidacloprid increased by 106%. In addition, the results indicated that these pesticides are seasonal-dependent, higher concentrations were observed from May to July relative to the rest of the growing season.

Biography: Javier M Gonzalez is a Research Soil Scientist at the USDA, Agricultural Research Service, National Soil Erosion Lab (West Lafayette, IN). His research includes conservation practices to improve water and soil quality.

Re-emergence or Have They Emerged? Same Old Contaminants but New Tricks
Anne-Marie Hanson - Assistant Professor at the University of Illinois at Springfield; ahans4@uis.edu
Co-author: Thomas Rothfus

Abstract: There is a quickly growing and global concern surrounding plastics in aquatic environments. Plastic is now ubiquitous to most bodies and water bodies. While there is no shortage of alarming plastic statistics at the global scale, the social impacts related to freshwater plastic pollution in inland areas are poorly understood. This presentation will discuss the preliminary results of an interdisciplinary study of freshwater plastic pollution in Central Illinois conducted in 2017-2018 at three sites: Lake Springfield; Emiquon National Wildlife Refuge; and Anderson Lake. Stakeholder interviews, participatory clean-up events, and shoreline macro-plastic surveys were a few of the methods we engaged to explore the relations between the physical presence of macro-plastic pollution, watershed attributes, site management decisions, and diverse perspectives on littering, consumption, risk, and governance of plastics near inland freshwater systems. Importantly, the presentation highlights research and educational activities carried out by UIS faculty and students that integrate social and natural science methods to understand how freshwater plastic pollution causes social and/or physical harm, to whom, and through what governance mechanisms.

Biography: Anne-Marie Hanson is an Assistant Professor of Environmental Studies at University of Illinois Springfield. Her research/teaching interests include feminist political ecology; garbage, recycling, and marine litter; environmental justice and urban sustainability; gender and global environmental change.

Chemical and Biological Characterization of Wastewater from Food, Beverage, and Feedstock Processing Plants Discharging to the Environment
Laura Hubbard – Hydrologist at the United States Geological Survey; lhubbard@usgs.gov
Co-authors: Dana Kolpin, Carrie Givens, Michael Meyer, Edward Furlong, James Gray, Mark Sandstrom, R. Blaine McCleskey, Kristin Romanok, Paul Bradley

Abstract: Commercial food, beverage, and feedstock processing plants produce wastewater with potentially complex chemical and biological signatures which, in many cases, is discharged into the environment with unknown effects to the aquatic environment. These wastewaters are monitored by federal and state programs, and while requirements are tailored to individual facilities, each focus on basic analytical monitoring (e.g., dissolved oxygen, suspended solids, nutrients, chlorine, fecal indicator bacteria). However,
these wastewaters likely have complex chemical and biological signatures related to the production material origin, the production process, and the treatment technologies used. We collected wastewater from 23 food, beverage, and feedstock processing plants in 17 US states to characterize chemical and biological wastewater signatures, including over 580 analytes (e.g., pharmaceuticals, pesticides, hormones, PFAS, antibiotics, antibiotic resistant genes, bacteria). Chemical and biological results from processing plant discharges were compared by plant type and to well-documented anthropogenic wastewater sources to determine food, beverage, and feedstock wastewater importance as contaminant sources to the environment.

**Biography:** Laura Hubbard is a Hydrologist at the USGS Upper Midwest Water Science Center. Laura earned a B.S. in geological sciences from the University of Wisconsin and an M.S. in earth sciences (hydrology) from Indiana University. As a member of the USGS Environmental Health Mission Area, she has been involved in national studies investigating urban and agricultural contaminants in groundwater and surface water, including viruses and pathogens, hormones, disinfection by-products, and pharmaceuticals.

**Fate and Transport of Microplastics in Freshwater Ecosystems - The 100 Plastic River Network**
Stefan Krause - Professor at the University of Birmingham, UK; S.Krause@bham.ac.uk
*Co-authors: Holly Nel, Iseult Lynch, Greg Sambrook Smith, Anna Kukkola*

**Abstract:** The fate and transport of microplastics in freshwater ecosystem is critically understudied, suffering from a severe lack of consistence in sampling and extraction methods between emerging case studies. The 100 Plastic River network aims to develop a generally applicable methodology for microplastic sampling and extraction, deployed for both surface water and sediment sampling across all continents. We will present the validated field methodology and results from first citizen science sampling campaigns across European river estuaries, discussing the challenges and opportunities for such community approach. We will discuss how the derived global information of flow weighted surface water plastics concentrations and depth profiled streambed sediment plastic samples will help to identify source area contributions of primary and secondary microplastics in rivers world-wide. We will further present future approaches of langrangian plastics monitoring in selected large river systems in order to elucidate how hydrodynamic conditions and plastic properties control microplastic degradation and ageing as well as deposition and accumulation in freshwater ecosystems – potentially resulting the generation of a pollution legacy for generations to come.

**Biography:** Stefan is professor and chair of Ecohydrology and Biogeochemistry, University of Birmingham, UK. Stefan is also the director of the Birmingham Water Council and leads the Physical Geography Research Theme. He has 15+ years of experience in international research leadership in the fields of contaminant hydrology, ecohydrology, and biogeochemistry, with a particular focus on groundwater-surface water interfaces.

**Degradation of Per- and Polyfluoroalkyl Substances (PFASs): Structural Dependence and Implications to PFASs Remediation and Management**
Jinyong Liu - Assistant Professor at the University of California, Riverside; jyliu@engr.ucr.edu
*Co-authors: Michael J. Bentel, Yaochun Yu, Lihua Xu, Bryan M. Wong, Yujie Men*

**Abstract:** The removal of per- and polyfluoroalkyl substances (PFASs) from drinking water has been the USEPA’s national priority. Although many novel technologies have been developed for the defluorination (i.e., C–F bond cleavage) of legacy C8 PFOA/PFOS, studies on the destruction of other PFASs have been very limited. In fact, PFAS pollutants with variable structures, lengths, and functional groups has been detected in wastes
from fluorochemical industries, fire-fighting, and landfills. It is imperative to obtain a thorough understanding of the structure-reactivity relationship for (1) developing technologies to treat all PFASs in the environment and (2) designing new fluorochemical formulations to prevent future release of recalcitrant PFASs. This talk will present critical structure-reactivity relationships within >60 representative PFASs undergoing defluorination treatment. Cross comparison of experimental results and theoretical calculations for various PFAS structures suggest strong correlations and novel mechanistic insights regarding the rate and extent of PFAS degradation and multiple structural features of PFASs. The results are expected to significantly advance technologies and strategies for PFASs remediation and management.

Biography: Jinyong Liu received his B.S. in chemistry at Tsinghua University and his Ph.D. in environmental engineering at UIUC. He joined the Department of Chemical and Environmental Engineering at UC Riverside in 2016 as an Assistant Professor. His lab is developing innovative and practical methods for PFAS treatment. He is the recipient of the 2018 ES&T Letters Excellence in Review Award, 2014 C. Ellen Gonter Environmental Chemistry Award, and 2013 Graduate Student Award in Environmental Chemistry.

The Effect of Chemical and Biological Conditioning on the Toxicity of Microplastics to Daphnia magna
Iseult Lynch – Professor and Chair of Environmental Nanosciences at the School of Geography, Earth and Environmental Sciences, University of Birmingham, UK; i.lynch@bham.ac.uk

Co-authors: Katie Reilly, Fatima Nasser, Laura-Jayne Ellis, Jon Sadler

Abstract: Microplastics are increasingly recognized as a contaminant of concern in the environment. Recent research has discussed the potential of microplastics to act as vectors to chemicals (co-pollutants) commonly found in the environment, often termed the Trojan Horse effect when co-pollutants bind to the plastic surface and are thus carried into organisms in higher concentrations than they would otherwise achieve based on chemical potential and equilibrium processes.

Previous research highlighted that micro/nano plastics are “conditioned” by substances in the environment, such as natural organic matter, proteins, and polysaccharids binding to their surface. These molecules will change the surface structure and properties of the plastics and therefore the potential of other interactions with chemicals in the environment.

Daphnia magna are a model organism commonly used for chemical toxicity testing. In this work, we assessed the combined effect of a range of chemicals (co-pollutants) such as DEET, triclosan, and diclofenac and polyethylene (PE) on D. magna, and compared the uptake pathways and effects of these chemicals under different chemical and biological conditioning scenarios, leading to different levels of competition for the PE surface.

Biography: Iseult holds a bachelor’s degree in chemistry and a Ph.D. in physical chemistry from University College Dublin. She undertook postdoctoral training in Lund University. Her current research focusses on developing a molecular level understanding and predicting the dynamics of the biomolecule corona and its consequences for nanoparticle and microplastics human and environmental health and safety.

Lessons Learned from the Application of Total Oxidizable Precursors (TOP) Assay on Environmental Samples
Charles Neslund - Scientific Officer at Eurofins Lancaster Laboratories Environmental, LLC; charlesneslund@eurofinsus.com
Abstract: Perfluoroalkyl and polyfluoralkyl substances (PFAS) have been manufactured and in use for many years. The many uses include surfactants used as processing aids and in aqueous film forming foams (AFFF), water repellant coatings in consumer products and as aids in several manufacturing processes. One of the approaches to assessing the hidden mass of PFAS is based on the transformation to the terminal acids that can be facilitated as described by Erika Houtz and David Sedlak (Environ. Sci. Technol. 46, 9342-9349 (2012)). The process has been has been deployed in our laboratory and others as one tool available to assess the hidden mass. However, in the course of applying the technique to environmental samples, several hurdles have been encountered based on a variety of parameters observed in environmental samples. The incorporation of additional parameters allows the analyst to assess the “goodness” of the analytical product, but potentially more important, may allow one to optimize the reaction conditions to sample matrix types. The presentation will describe many of the problems seen with the application of the TOP assay to a wide range of matrices.

Biography: Charles J. Neslund is the Scientific Officer at Eurofins Lancaster Laboratories Environmental, LLC. Mr. Neslund is responsible for the HRGC/HRMS laboratory, the LC and GC Triple Quad section and the Method Development group of the Environmental Division. His responsibilities include management of dioxin/furan and PCB congener analysis on water, soil and tissue samples and development and management of the PFAS Analytical group.

Effective Communication for Emerging Contaminants: Using Audience-Focused Strategies to Overcome Challenges
Katie Nyquist - Communications Planner at the Minnesota Department of Health; katie.nyquist@state.mn.us

Abstract: As our scientific understanding of emerging contaminants grows through improved analytical methods, increased environmental monitoring, and ongoing health risk assessment we also face a growing challenge to communicate about emerging contaminants and the work we do to understand them better. Successful communication about emerging contaminants requires us to approach difficult topics such as uncertainty, evolving and complex science, and, in many cases, a lack of regulatory standards applied to emerging contaminants. The Minnesota Department of Health will share their challenges and successes in communicating about per- and polyfluoroalkyl substances, disinfection byproducts, and other emerging contaminants affecting water resources.

This presentation will explore these challenges from an audience-centric perspective, highlighting the role of risk perception and science literacy in communication about emerging contaminants. The presentation will also include a discussion of the Minnesota Department of Health’s multi-pronged approach to improving communications about emerging contaminants in water, highlighting a new toolkit for drinking water systems and outreach and education grants to local partners.

Biography: Katie Nyquist is a Principal Planner for the Contaminants of Emerging Concern Initiative at the Minnesota Department of Health. Her work focuses at the juncture of science communication, environmental engagement, and public health. She uses what we learn through the biophysical data and social data to support mutually the health of people and ecosystems. She has a master’s of Public Health degree (University of Minnesota) and a degree in political science and psychology (North Dakota State University).

Assessing the Effects of Environmentally Relevant Concentrations of Antidepressant Mixtures to Fathead Minnows Exposed Over a Full Life Cycle
Joanne Parrott - Senior Research Scientist at the Environment and Climate Change Canada; joanne.parrott@canada.ca
Co-author: Chris D. Metcalfe
Abstract: Fathead minnow were exposed over a full lifecycle to a mixture of five antidepressants at 1x the concentrations found in an Ontario MWWE and at 10x those. Measured concentrations of venlafaxine, citalopram, fluoxetine, sertraline, and bupropion were 2,300, 160, 110, 7, and 0 ng/L, respectively, in the 1x Mix. During the 168 d exposure, no significant changes were observed in survival. When male fish from the exposed treatments reached maturity, their weights were increased (10x Mix) and secondary sex characteristics were enhanced (1x Mix) compared to control males. There were no differences relative to controls in condition factor, gonads or liver sizes. Exposed fish produced similar numbers of eggs as control fish. There were no changes in nest-defense behaviors of male minnows. Egg quality, % fertilization, and % hatching in F1 fry were unaffected. Eggs hatched 0.5 d earlier, deformities in fry were 50% lower, and there were transient decreases in length of 8 d old F1 larvae from the 10x Mix in comparison to controls. Overall, exposure to the antidepressant mixture at environmentally relevant concentrations caused no adverse effects. Exposure to the 10x Mix increased the weight of adult male minnows and caused subtle effects in F1 offspring.

Biography: Dr. Joanne Parrott is a Senior Research Scientist with the Water Science and Technology Directorate of Environment and Climate Change Canada. For 26 years, her research program has investigated the effects environmental contaminants in fish. She has studied various chemicals such as pharmaceuticals, effluents from pulp mills and municipal wastewaters, and chemicals from oil sands, and has published over 90 peer-reviewed journal articles.
Methylamino-L-alanine (BMAA), has been implicated as an environmental risk factor for amyotrophic lateral sclerosis (ALS). Addresses collected from ALS patients in northern New England have indicated increased ALS incidence surrounding several waterbodies in Vermont and New Hampshire, where CB blooms may take place. Proximity to CB has been demonstrated to be a risk factor for liver disease as well. Our epidemiologic studies of waterbodies with CB blooms in northern New England suggest that inhalation of CB may be a possible mode for exposure to cyanotoxins. In our ongoing research, we are attempting to better understand CB exposure risk and its relationship to neurodegeneration.

**Biography:** Dan is a research assistant at Dartmouth-Hitchcock Medical Center in Lebanon, NH in Dr. Stommel’s laboratory. He received his B.S. in neuroscience from the University of Vermont in 2016. Dr. Stommel is a neurologist at Dartmouth-Hitchcock and professor of neurology at Dartmouth’s Geisel School of Medicine.

### Fate and Transport of Manure Estrogenic Compounds During Integrated Treatment for Water Quality and Bioenergy Production

Lance Schideman - Senior Research Scientist at the Illinois Sustainable Technology Center, Prairie Research Institute, University of Illinois at Urbana-Champaign; schidema@illinois.edu

**Co-authors:** Young-Hwan Shin, Michael Plewa, Peng Zhang, John Scott, Yuanhui Zhang

**Abstract:** An integrated manure treatment system, including a mixed algal-bacterial bioreactor (MABB) and hydrothermal conversion of biosolids to biofuels, was found to remove 76-97% of the total estrogenic hormones from the liquid portion of animal manure. The resulting biosolids mixture could be hydrothermally converted into either biocrude oil with a yield of up to 40% yield, or syngas with a yield of up to 54%. Adding biologically activated carbon in the MABB enhanced the removal of estrogenic hormones (+7.2%), cytotoxicity (+58%), and heavy metals (+10%). Thus, the novel manure treatment system proposed in this study highlights a new paradigm that can simultaneously reduce the release of emerging contaminants from animal manure to the environment and provide value-added bioenergy co-products to help offset the cost of providing environmental benefits.

**Biography:** Dr. Schideman works in the Applied Research on Industrial Environmental Systems Group at the Illinois Sustainable Technology Center. His research interests focus on water purification with adsorption, membranes, anaerobic bioreactors, algae, and hydrothermal biofuel processes. His research program is supported by several state and federal agencies and has earned prestigious awards from the EPA STAR Program, American Water Works Assn., Henry Luce Foundation, and Consulting Engineers Council.

### Contaminants of Emerging Concern in The North American Great Lakes: Evidence of Reproductive Disruption from Field and Laboratory Studies

Heiko Schoenfuss - Professor at St. Cloud State University; hschoenfuss@stcloudstate.edu

**Co-authors:** L. M. Thomas, L. C. Wang, N. Cipoletti, Z. G. Jorgenson, S. M. Elliot

**Abstract:** Analysis of water samples collected at 54 sites in the Great Lakes Watershed confirmed the ubiquitous presence of Contaminants of Emerging Concern (CECs). Cluster analyses of CECs suggest that the co-occurrence of CECs is linked to dichotomous urban or agricultural land use. Urban mixtures contained steroidal estrogens, BPA, alkylphenols, pharmaceuticals and personal care products. Agricultural samples contained herbicides, pesticides, BPA, and alkylphenols. Resident and caged sunfish were collected from 27 sampling sites and analyzed for indicators of stress associated with CEC exposure. At high aqueous CEC
concentrations, glucose concentrations spiked in sunfish plasma and liver cells exhibited toxic stress response. Canonical correspondence analyses revealed that concurrent with indicators of toxic stress, biomarkers of reproductive potential declined. To further examine the population level consequences, fathead minnows were exposed in the laboratory for three generations to the empirically derived CEC mixtures at environmentally relevant concentrations and found to alter fecundity. This integrated series of studies indicates that CECs in Great Lakes tributaries may impact fish population health and sustainability.

Biography: Dr. Schoenfuss directs the St. Cloud State University Aquatic Toxicology Laboratory. His research on contaminants of emerging concern has identified links between treated wastewater effluent discharge and compromised fish health, between septic discharge and reduced reproduction in lake fish, and between stormwater discharge and environmental contaminant loads. He chairs the SETAC Endocrine Disruptor Testing and Risk Assessment Steering Committee and has served on the EPA Science Advisory Board.

Microplastics Identification by Pyrolysis Gas Chromatography Mass Spectrometry (py-GCMS)
John Scott - Senior Chemist at the Illinois Sustainable Technology Center, Prairie Research Institute, University of Illinois at Urbana-Champaign; zhewang@illinois.edu

Abstract: Since the emergence of mass produced plastics in the 1940s, the global appetite for these materials has skyrocketed. Due to the widespread use and disposal of plastics, the presence of microplastics (MP) is now ubiquitous in the environment. Identification of MP found in environmental samples is important for source apportionment and the evaluation of the adverse health effects to humans and wildlife. Analysis can be difficult due to the complex nature of these materials and their small sizes. Infrared spectroscopy (IR) has been demonstrated as an appropriate technique to characterize these materials; however limitations occur in the detection of small sample sizes. Pyrolysis gas chromatography mass spectrometry (py-GCMS) is a technique that can overcome many of the analytical challenges associated with very small sample sizes. This method also provides more detail concerning the structure of these materials such as differentiating low-density versus high-density and various forms for polyesters (PET, PTT, PBT). We have developed a method using pv-GCMS for MP identification and have analyzed MP samples from surface waters, karst waters, and sediments.

Biography: John Scott has been at the Illinois Sustainable Technology Center (ISTC) since 2001 and is a senior analytical chemist in the Applied Research on Industrial and Environmental Systems (ARIES) group. His current research interests include microplastics, emerging contaminants in the environment, and utilization of waste materials.

Environmental Assessments to Evaluate Pharmaceutical Risks to Ecologic Systems
Amy Soli - Environmental and Occupational Toxicologist at AbbVie; amy.soli@abbvie.com

Abstract: Studies have found pharmaceutical products in surface and ground water resources, causing concern over the ecological impacts of these compounds in the environment. In response, regulatory agencies (FDA, EMA, and Health Canada) require an assessment of the potential environmental impact of pharmaceuticals as a component of the registration process for new drug applications. These assessments range from a simple analysis demonstrating that the compound will not pose a threat to the environment to very complex assessments requiring numerous studies. In some cases, the applicant may request a categorical exclusion from environmental testing based upon a low predicted concentration at the point of entry into the aquatic environment or due to intrinsic properties of the compound (e.g., biologics are generally excluded because they are expected to degrade rapidly before or after
excretion from the treated patient population). However, other compounds, such as those with estrogenic, androgenic, and thyroid activity are coming under increasing scrutiny with more complex studies being required. This presentation will provide an overview of environmental assessment requirements for pharmaceuticals. A case study will also be presented.

Biography: Amy Soli has a Ph.D. from the Marine-Estuarine-Environmental-Sciences Program at the University of Maryland and over 20 years’ experience in the field of environmental science. Amy is currently an environmental toxicologist at AbbVie; prior to this position, she was the Science Director at an environmental non-profit and an environmental consultant. Amy's area of expertise is environmental and ecological assessments, environmental and pharmaceutical regulations, and permit applications.

Quantitation and Localization of Endocrine Disruptor Compounds Accumulation in Fathead Minnows by Orthogonal Mass Spectrometry Techniques
Kevin Tucker - Assistant Professor of Chemistry at Southern Illinois University Edwardsville; kevtuck@siue.edu, @ktucker1222
Co-authors: Rachel Davis, Sarah Rizzo, Jackson Hoang, Bobbi Potter

Abstract: Endocrine disrupting compounds (EDCs) are chemicals that can block or mimic natural hormones in the endocrine system. EDCs are resistant to biodegradation and are highly water soluble, leading to limited removal by wastewater treatment plants. As a result, the compounds can easily enter the aquatic environment biologically active and risk exposure to aquatic organisms’ behavior, anatomy, and physiology. There is not sufficient research on the effects of EDCs on aquatic vertebrates to have a full understanding of the damage done to these organisms. Exposing fathead minnows at environmentally relevant concentrations allows for an accurate representation of how EDCs affect and accumulate in aquatic vertebrates. After acute seven-day exposure, LC-MS and MALDI Imaging were employed to analyze the entire organism. LC-MS results show after seven days of exposure there is significant accumulation of EDCs in the fathead minnows. MALDI Imaging results show the accumulation of both the EDCs in the brain and gut preferentially. The brain and gut of the minnow were dissected and analyzed by LC-MS for quantitative analysis.

Biography: Dr. Kevin Tucker received his Ph.D. in analytical chemistry from the University of Illinois at Urbana-Champaign under the supervision of Prof. Sweedler in 2011. Dr. Tucker’s research lies at the nexus of food, energy, and water. We focus on the detection of pharmaceutical and personal care products and within local and regional waterways and the surrounding soil systems including agricultural fields as well as modeling laboratory exposure on model organisms.

Ecotoxicological Effects of Metformin on Japanese Medaka
Erin Ussery - Research Scientist at the Environment and Climate Change Canada; Erin.Ussery@Canada.ca
Co-authors: Kristin Bridges, Barney Venables, Zacharias Pandelides, John Guchardi, Douglas Holdway

Abstract: In recent years, environmental research has recognized the occurrence and fate of pharmaceuticals in the aquatic environment as an emerging issue in aquatic toxicology. Currently, one of the most prevalent contaminants is the type-2 diabetic drug, metformin. Metformin has been measured in the ng-µg/L concentration range in surface waters and wastewater effluent. Our recent research shows that male Japanese medaka (Oryzias latipes) exposed to metformin from embryo through 28-days post hatch have a significant decrease in length and wet weight when compared to control fish. Metabolomics and proteomics are emerging as an efficient method for understanding sub-lethal effects on organisms by assisting in determining the biochemical mode of action in response to exposure to a particular contaminant. This current
study showed significant changes in the metabolome of 28-day-old medaka exposed to metformin, indicating significant dysregulation in fatty acid and lipid metabolism including metabolites associated with cellular energetics and central nervous system health. Additionally, expression of critical genes involved in lipid metabolism were also significantly affected.

Biography: Erin Ussery is currently a post-doctoral fellow at Environment and Climate Change Canada in the Aquatic Contaminants Research Division under Dr. Mark McMaster. She is originally from the great state of Texas, and moved to Canada to pursue her Ph.D. in aquatic toxicology at the University of Ontario Institute of Technology under Dr. Douglas Holdway. In her spare time she loves exploring the beautiful parks Canada has to offer and trying any type of new and delicious food she can get her hands on!

Indoor Ambient and Personal Exposures to Brominated Flame Retardants and Organophosphate Esters in Central Appalachia
Shaorui Wang - Research Associate at Indiana University - Bloomington; sw16@iu.edu
Co-authors: Kevin A. Romanak, Michael Hendryx, Amina Salamova, Marta Venier

Abstract: Health disparities still exist in rural Appalachian coal mining communities and environmental pollution from activities of the mining industry can contribute to population health inequities. We used passive air samplers using polyurethane (PAS-PUFs) to investigate the levels of BFRs and OPEs in indoor air and silicone wristbands to examine personal exposure to these chemicals in 8 communities in central Appalachia. PAS-PUFs were deployed indoors for 30 days in 101 residential homes during March 2017 – July 2018. One resident in each of these homes wore a silicone wristband for 7 days. The median total concentrations for PBDEs, nBFRs, and OPEs were 211, 58.5, and 24,107 pg/m3 in PAS-PUFs and 50.5, 115, and 2,818 ng/g wristband in wristbands, respectively. The most abundant chemicals in both air and wristbands were BDE-47 and BDE-99 among PBDEs, 2-ethylhexyl 2,3,4,5-tetrabromobenzoate (EHTBB) and bis(2-ethylhexyl) tetrabromophthalate (BEHTBP) among nBFRs, and tris[(2R)-1-chloro-2-propyl] phosphate (TCIPP) and tris(2-butoxyethyl) phosphate (TBOEP) among OPEs. In multiple regression analysis, higher levels of self-reported illness symptoms were associated with higher PBDEs in PUFs.

Biography: Dr. Shaorui Wang received his Ph.D. in 2015 from Guangzhou Institute of Geochemistry (GIG), Chinese Academic Sciences. Prior to beginning his post-doctoral research at Indiana, Dr. Wang was a research assistant at GIG. Dr. Wang’s research focuses on the anthropogenic organic pollutants in the environment. His recent research extends to ambient and human exposure to anthropogenic organic chemicals in mining communities of central Appalachia.

Establishing a Collaborative Per- And Polyfluoroalkyl Substances (PFAS) Testing Network in North Carolina
Jeffrey Warren - Research Director at the North Carolina Policy Collaboratory, UNC Chapel Hill; jeff.warren@unc.edu, @DrJeffWarren and @NCCollaboratory
Co-author: Kasia Grzebyk

Abstract: In 2016, researchers from NC State University and the US EPA published data showing high levels of fluorochemical GenX in the Cape Fear River, a drinking water source for nearly 1.4 million. In June 2018, the North Carolina General Assembly (NCGA) appropriated $5,013,000 to create a network of 348 discrete public surface and well water sampling locations across the State. The PFAST (Per- and Polyfluoroalkyl Substances Testing) Network is comprised of eight research teams from universities across the State (UNC Chapel Hill, NC State, UNC Wilmington, UNC Charlotte, NC A&T, East Carolina University, and Duke). The scopes of work for the five primary teams correlate to the specific study requirements mandated by the legislature as follows: PFAS water sampling and analysis, private well risk modeling, PFAS removal performance testing, air emissions
and atmospheric deposition, and applied research. These core teams are assisted by three additional teams with data management, communications, and analytical support. This presentation will highlight initial PFAST Network data and illustrate the effectiveness of the Collaboratory’s unique approach addressing complex science policy issues through a legislative/university partnership.

**Biography:** Formally trained as a marine geologist, Jeff Warren has spent the past 15 years in state-level science policy positions with the NC Div of Coastal Mgmt (‘04-'10), as the science advisor for the NC Senate (‘11-'17) and as the research director for the NC Policy Collaboratory at UNC Chapel Hill (‘17-present). Warren earned a BSc from U of AZ, a MSc from Auburn, and a Ph.D. from UNC Chapel Hill with fieldwork including the SE US, northern Mexico, the East/South China Seas, and Antarctica.

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**Recent Advancements in Virus Detection and Monitoring**

Krista Wigginton - Assistant Professor in the Department of Civil and Environmental Engineering at the University of Michigan; kwigg@umich.edu

**Abstract:** Viruses are important pathogens that are commonly associated with contaminated water. Norovirus, for example, is a waterborne virus that is responsible for 10x more illnesses in the U.S. than the next most common waterborne pathogen. To address risks of waterborne virus illnesses, drinking water standards include enteric virus reduction requirements; however the utility of these standards is limited in the absence of methods that can demonstrate they are achieved. Viruses are very difficult to concentrate, purify, and identify. Detection typically relies on culture-based or PCR-based methods; however, most viruses are not readily cultured, and their lack of conserved genes and rapid evolution complicates PCR primer development and sequencing efforts. In this presentation, I will report on our work focused on improving virus detection and monitoring in wastewater and drinking water.

**Biography:** Krista Rule Wigginton received a B.S. in chemistry (2001) at the University of Idaho, and M.S. and Ph.D. in environmental engineering (2004, 2008) at Virginia Tech under the guidance of Prof. Peter Vikesland. After conducting her postdoctoral research at École Polytechnique Fédérale de Lausanne in Lausanne, Switzerland (2008-2010) under the guidance of Prof. Tamar Kohn, she joined the faculty of the University of Maryland, College Park (2011-2012) in the department of Civil and Environmental Engineering. Currently an assistant professor in the Department of Civil and Environmental Engineering at the University of Michigan, her research team focuses on the mechanistic fate of viruses in treatment processes, and on improving virus detection in water. She is the recipient of the NSF CAREER award and Paul L. Busch Award.

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**Evolution Towards Antibiotic Resistance Induced by Environmental-Level Pesticides**

Yue Xing - Ph.D. student at the University of Illinois at Urbana-Champaign; yuexing2@illinois.edu

**Co-authors:** Shuaiqi Wu, Yujie Men

**Abstract:** Antibiotic resistance is one of the most challenging issues in public health. One way of bacteria gaining antibiotic resistance is the selection of de novo mutants under certain selection pressures. Antibiotics at low concentrations and some non-antibiotic chemicals can act as selection pressures in selecting antibiotic resistance. Herein, we investigated whether exposure to pesticides also has an impact on antibiotic resistance development. We designed evolutionary experiments with a susceptible Escherichia coli strain being exposed to pesticides only, and co-exposed to ampicillin and pesticides for 500 generations. Resistant mutants were randomly picked and their minimal inhibitory concentrations (MICs) were tested. Higher MICs were found in resistant mutants when exposed to high-level pesticides and co-exposed to ampicillin and pesticides comparing to control groups. The resistant mechanism of these mutants was identified by whole-genome sequencing. The main conclusions are: (1) pesticides alone could induce streptomycin resistance
when present at high concentrations; and (2) pesticides at environmental concentrations and low sub-MIC levels of ampicillin could exert synergistic effect in developing antibiotic resistance.

Biography: Yue is a third-year Ph.D. student in the Department of Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign. Broadly, her research focuses on the biotransformation and fate of emerging contaminants, especially antimicrobial reagents, and their impacts on antibiotic resistant bacteria. She has obtained a B.S. and a M.S. in environmental engineering from China Agricultural University.

Contaminants of Emerging Concern in The North American Great Lakes: Evidence of Reproductive Disruption from Field and Laboratory Studies
Yaochun Yu - Ph.D. student at the University of Illinois at Urbana-Champaign; yyu54@illinois.edu, @Yaochun_Yu

Co-authors: Li-Jun Zhou, Ping Han, Baozhan Wang, Yujie Men, Michael Wagner, Qinglong L. Wu

Abstract: Sulfonamides (SAs) as one of the biggest families of antibiotics are widely used as human and animal drugs. The detection of sulfonamide antibiotics in natural environments raises emerging concerns about the potential risks of these contaminants to ecosystems and public health. Previous studies have demonstrated that ammonia oxidizers were able to biotransform many emerging organic contaminants. Here, to better understand the roles of ammonia oxidizers in sulfonamides biotransformation, we investigated the biotransformation capability of *Nitrospira inopinata* (complete ammonia-oxidizing bacteria), *Nitrososphaera gargensis* (ammonia-oxidizing archaea) and *Nitrosomonas nitrosa* Nm90 (ammonia-oxidizing bacteria) for 7 sulfonamide antibiotics (i.e. sulfadiazine, sulfadoxine, sulfamethazine, sulfamethoxazole, sulfamonemethoxine, sulfamerazine, sulfathiazole). The removals and protein-normalized biotransformation rate constants indicated that *N. gargensis* exhibited the highest SA biotransformation rates, followed by *N. inopinata* and then *N. nitrosa* Nm90. The transformation products of sulfadiazine, sulfamethazine, and sulfamethoxazole and the biotransformation mechanisms were also evaluated. Details will be presented during the conference.

Biography: Yaochun currently works at the Department of Civil and Environmental Engineering, the University of Illinois at Urbana-Champaign as a Ph.D. student. Yaochun's research focuses on understanding the roles played by microorganism during emerging organic contaminants (EOCs) biotransformation.

Brominated and Organophosphate Ester Flame Retardants and PFAS in Sentinel Fish on St. Lawrence Island, Alaska
Guomao Zheng - Visiting Research Associate at Indiana University; gzheng@iu.edu

Co-authors: Pamela Miller, Frank A. von Hippel, C. Loren Buck, Amina Salamova

Abstract: The Arctic contains thousands of contaminated formerly used defense (FUD) sites dating from the Cold War, many of which are significant sources of organic contaminants. Here, we have established a community-based participatory research project in collaboration with the communities of St. Lawrence Island in Alaska to address multiple exposure routes to contaminants, including those originating locally at FUD sites. We collected a sentinel fish species, the ninespine stickleback (*Pungitius pungitius*), from Troutman Lake adjacent to the village of Gambell and both FUD and solid waste disposal sites. We measured the concentrations of polybrominated diphenyl ethers (PBDEs), organophosphate esters (OPEs), and per- and polyfluoroalkyl substances (PFAS) in stickleback, and found that BDE-47 and -99, tri(n-butyl) phosphate (TNBP), and perfluorooctanesulfonic acid (PFOS), were the most abundant contaminants. Median concentrations were 204 ng/g lw, 187 ng/g lw, and 156 ng/g lw for ΣPBDEs, ΣOPEs, and ΣPFAS, respectively. These concentrations were higher than those in fish from other lakes and comparable to several high trophic level fish species and marine mammals in Alaska, indicating higher contamination levels in Troutman Lake.
Biography: Guomao Zheng currently works at the Department of Environmental Science, Indiana University. Guomao does research in environmental chemistry and analytical chemistry. Guomao is working on a project funded by NIH aimed at studying the environmental exposures to organic flame retardants and polychlorinated biphenyls in Alaska Native communities.
17. Comparative Phenotypic and Transcriptomic Responses to Multiple Endocrine Disrupting Chemicals in Zebrafish
Camille Akemann - Graduated Research Assistant at Wayne State University; gi2263@wayne.edu
Co-authors: Jeremy Shields, Nemer Hijazi, Zoha Siddiqua, Adam Pedersen, David Pitts, Tracie R. Baker

Abstract: Endocrine disrupting compounds (EDCs) are contaminants of emerging concern found ubiquitously in the environment that can cause a wide range of adverse effects, the full extent of which are currently unknown. We used zebrafish as a model to determine and compare the effects of nine EDCs (4-nonylphenol, atrazine, bisphenol-A, chlorpyrifos, dieldrin, metformin, triclocarban, and triclosan). Zebrafish are an NIH accepted model system for human health that have 70% homology with the human genome, transparent larvae (allowing observation of internal development), large numbers of offspring, and a sequenced genome. We exposed zebrafish to three concentrations of EDCs for either 1 or 5 days during early development and identified adverse developmental and behavioral outcomes. RNASeq and pathway analyses was performed to determine specific gene expression changes, as well as the critical pathways affected. Many differentially expressed genes overlapped across chemicals and some of the main pathways affected include reproductive diseases, endocrine system disorders, and estrogen synthesis and regulation. This study brings us closer to identifying the full extent of adverse effects of EDCs and the mechanisms through which these effects occur.

Biography: Camille Akemann received her B.S. in biochemistry at the University of Michigan and is now a Ph.D. student in the pharmacology program at Wayne State University concentrating in environmental toxicology. She is a part of the T-RUST (Transformative Research in Urban Sustainability Training) program at Wayne State, which is an interdisciplinary program focused on Urban Sustainability. She is researching effects of endocrine disrupting chemicals using a zebrafish model in the lab of Dr. Tracie Baker.

13. Treatment Design for 1,2,3-Trichloropropane Impacts to Potable Water Supply at a Manufacturing Facility in California
Sarah Bassett - Environmental Engineer at Roux Associates, Inc.; sbassett@rouxinc.com
Co-author: Timothy Adams

Abstract: A manufacturing facility in California operates two high-capacity potable water wells for process and potable water needs. Routine compliance groundwater sampling identified the presence of 1,2,3-trichloropropane (1,2,3-TCP) at the facility water wells at concentrations above the California drinking water maximum contaminant limit (MCL). The California State Water Board required the well operator/owner to develop a compliance plan and implement a corrective action response to mitigate 1,2,3-TCP impacts at the plant. Roux prepared an Alternatives Options Analysis (AOA) to evaluate treatment options including granular-activated carbon (GAC), advanced oxidation, air stripping, reverse osmosis, biological treatment, and alternative water source. The comparative matrix parameters included cost, performance, constructability, and recommendations for both short-term and long-term implementation benefits. The AOA findings presented GAC as the selected treatment option. Roux completed a 100% engineering design for the installation of a GAC treatment system to treat extracted groundwater for potable water use at the facility.
Biography: Sarah Bassett, E.I.T. is a Project Engineer at Roux Associates Inc. Ms. Bassett has a B.S. in civil engineering from the University of Illinois and has over 4 years of experience in the environmental consulting industry. Ms. Bassett has varied experience in the industry including significant projects in engineering design and field construction oversight, due diligence investigation and remediation, and stormwater compliance.

7. Degradation of 6:2 Fluorotelomer Sulfonate in Amphibians and Moss
Chloe de Perre - Analytical Chemist at Purdue University; cdeperre@purdue.edu
Co-author: Youn Jeong Choi, Sarah A. Abercrombie, Gary M. Hoover, Jason T. Hoverman, Maria S. Sepúlveda, Linda S. Lee

Abstract: 6:2 fluorotelomer sulfonate (6:2 FTS) has been shown to undergo slow aerobic degradation in activated sludge; however, little is known in other media. Juvenile amphibians (frogs, salamanders, and toads) were exposed dermally for one month through moss (sediment bedding substitute) soaked in 10, 100, and 1000 ppb of 6:2 FTS in water. Similar experiments were conducted with PFOA, PFOS and PFHxS individually, which are non-biologically degradable perfluoroalkyl acids (PFAAs). Chemicals were quantified in moss and amphibians (whole body for anurans and livers for salamanders due to their size). After 30 days, 6:2 FTS levels in moss were one to two orders of magnitude lower than the initial concentrations, while moss PFAA concentrations were stable over time. 6:2 FTS was detected in only toads with up to 85 ng/g dw for the highest exposure level. PFAA levels were 3 to 133 times higher in toad tissue versus 6:2 FTS. Similar PFAA levels were in frog and salamander. In another experiment, salamanders were fed 6:2 FTS-dosed crickets. Again 6:2 FTS was absent in salamander livers, while persistent PFAAs bioaccumulated. 6:2 FTS metabolites differed depending on species and media.

Biography: Chloe de Perre is an analytical chemist at Purdue University. Her analytical expertise includes maintenance and troubleshooting of a wide range of instruments for organic and inorganic chemical analyses, including mass spectrometry techniques. Her applied research experience includes fate and toxicity studies of organic contaminants of concern, for which she has developed and validated multiple methods of extraction and analyses of various media and biota.

12. Presence of Antibiotics and Antibiotic Resistance at a Long-Term Wastewater Reuse Site Spray Irrigating Effluent on Agricultural Lands
Alison Franklin - Graduate Research Assistant at Pennsylvania State University; amy125@psu.edu
Co-authors: Clinton Williams, Danielle Andrews, Jean McLain, Emily Woodward, John Watson

Abstract: With water supplies diminishing, wastewater treatment plant (WWTP) effluent is often reused to irrigate agricultural lands. Antibiotics are typically found in effluent due to limited removal during WWTP processes. Concern has arisen about their environmental fate and impacts on antibiotic resistance. This study examined the environmental impacts of spray irrigating with WWTP effluent by quantifying three antibiotics: sulfamethoxazole (SMX), trimethoprim (TMP), and ofloxacin (OFL), in WWTP effluent, soil, groundwater, and wheat and analyzing antibiotic resistance. Antibiotics were present in WWTP effluent and groundwater year round with seasonal variation in effluent (2 - 22,000 ng/L) and concentrations in groundwater that ranged up to 313 ng/L. Only OFL and SMZ were quantified in wheat grain (2.3 Âµg/kg and 640 ng/kg, respectively). Antibiotic concentrations of SMX, OFL, and TMP were measured in soil (50 - 700 ng/kg). Antibiotic resistance was elevated in soil bacteria. These findings indicate that spray irrigating with effluent leads to antibiotic concentrations in the environment and possible impacts on antibiotic resistance in soil bacteria.

Biography: Alison is a Ph.D. candidate in soil science and biogeochemistry at Penn State University. She received her B.S. in toxicology and M.S. in soil science from Penn State University in 2012 and 2015. Her
research focuses on emerging contaminants in the environment due to reuse of wastewater treatment plant (WWTP) effluent, specifically antibiotics and antibiotic resistance. Alison is interested in long-term ecological issues and toxicological impacts of reusing wastewater.

**8. Child Care Providers’ Knowledge and Attitudes Towards Environmental Influences on Children’s Health**

Elinor Fujimoto - Project Coordinator at Family Resiliency Center, Department of Human Development and Family Studies, University of Illinois Urbana-Champaign; efujimo2@illinois.edu

Co-authors: Brenda D. Koester, Stephanie Sloane, Barbara H. Fiese

Abstract: Early childhood is a critical window for development in which children are particularly vulnerable to the health effects of environmental toxins. Child care providers are an important target audience for children’s environmental health as the majority of young children spend a significant portion of waking hours in non-parental care. While research has indicated that children are exposed to toxins in early care settings, little is known about providers’ knowledge and beliefs about environmental influences on children’s health. To address this gap, we conducted semi-structured phone interviews with 36 home- and center-based Illinois child care providers to better understand the environmental health literacy of child care providers. We assessed providers’ conceptualization and baseline knowledge of children’s environmental health, understanding of environmental toxins and their effects on children, and the health behaviors they engage in to protect children’s environmental health. Our results indicated that many providers had a limited understanding of how the environment influences children’s health. Our findings highlight the importance of increasing the environmental health literacy of child care providers.

Biography: Elinor Fujimoto is a Project Coordinator for the Family Resiliency Center. She is responsible for coordinating activities for the Children’s Environmental Health Center’s Communication Outreach and Translation Core and several other projects. Fujimoto holds a B.S. in interdisciplinary health sciences, B.F.A. in dance, and M.P.H. from the University of Illinois at Urbana-Champaign, where she developed a passion for health equity and research translation.

**1. Are Microplastics a Vector for Chemical Contaminants in Muskegon Lake?**

Lee Green - Chemist at the Illinois Sustainable Technology Center, Prairie Research Institute, University of Illinois at Urbana-Champaign; leegreen@illinois.edu

Co-author: Nancy Holm, John Scott, Maggie Oudsema, Rick Rediske, Alan Steinman

Abstract: Pollution of the aquatic environment by anthropogenic debris (plastics) is globally ubiquitous. Persistent organic pollutants (POPs) are a class of hydrophobic and bioaccumulative contaminants. POPs can adsorb to plastics at concentrations greater than the surrounding environment, whereupon they can be consumed by organisms feeding either on plastics or on biofilm attached to the plastic. We deployed three plastic types at near surface and near bottom in Muskegon Lake, MI. Environmental samples were also collected and analyzed for background POP concentrations. Removal of the exposed plastics took place one-month and three-months after deployment. Data from measurements of representative POPs on the microplastics show that chemical contaminants do concentrate on microplastics. The overall trend concerning plastic type and overall POP concentrating is polyethylene (PE) > polypropylene (PP) > polyester (PET). Within one-month, polyaromatic hydrocarbons concentrated by a factor of 30 to 280 times the aqueous concentration. Organochlorine pesticides concentrated only on PE and PP, while polychlorinated biphenyls concentrated only on PE. Even greater concentrations are associated with the three-month deployed plastics.
**Biography:** Lee Green has been at the Illinois Sustainable Technology Center (ISTC) since March 2018 and is a chemist in the Applied Research on Industrial and Environmental Systems (ARIES) group at ISTC. Previously, she was a chemist and laboratory manager with the Illinois State Water Survey for 11 years. The current project that Lee is working on plastic debris as an exposure source for POPs in aquatic biota.

14. **Microplastics, a Carrier for Perfluorinated Contaminants?**

Kathryn Gunderson - Research Assistant at the Illinois Sustainable Technology Center, Prairie Research Institute, University of Illinois at Urbana-Champaign;
kggunde2@illinois.edu

*Co-authors: John Scott, Lee Green, Nancy Holm, Alan Steinmen, Rick Redske, Maggie Oudsema*

**Abstract:** Per- and polyfluoroalkyl substances (PFASs) are contaminants with the potential to impose adverse health effects on wildlife and human health through introduction into food webs. Bioaccumulation in the aquatic environment is a known mechanism for PFASs to transfer into the food chain at different trophic levels. The longevity of PFASs in the environment is due to its thermally stable, oxidatively recalcitrant and resist microbial degradation properties. Given the prevalence of PFASs and microplastics in the environment, these contaminants may act synergistically in food webs. To investigate this hypothesis, microplastics have been deployed in Lake Muskegon, MI, and were retrieved at select time-points for PFAS analysis. Environmental samples were also collected and analyzed for background PFAS concentrations. The purpose of this analysis is to determine to what extent microplastics concentrate PFAS in surface waters. The results from this study will provide a deeper understanding into how microplastics may be a vector for pollution.

**Biography:** Kathryn Gunderson is a research assistant at the Illinois Sustainable Technology Center, currently working on PFAS analysis. She received a B.S. in chemistry from Loyola University Chicago in 2018 and has interests in water quality research.

10. **Expanding the Soil and Water Assessment Tool for Modeling the Transport of Contaminants of Emerging Concern in Agricultural Watersheds**

Lidiia Iavorivska - Postdoctoral Scholar at The Pennsylvania State University;
lui100@psu.edu

*Co-authors: Heather E. Gall, Tamie L. Veith, John E. Watson*

**Abstract:** Contaminants of emerging concern (CECs), such as hormones and pharmaceuticals, have been detected in water bodies worldwide with potential ecotoxicological implications for aquatic organisms and human health. Despite short half-lives, hormones are found in agricultural fields long after land application of manure and wastewater effluent. To better understand the impacts of manure application on water quality, we expanded the Soil and Water Assessment Tool (SWAT) to model the fate and transport of hormones. The new SWAT module, based on the Hormone Export and Recovery Dynamics (HERD) model (Gall et al., 2016), will be developed and incorporated into SWAT source code. The HERD-SWAT simulation results can be used to understand ecological risks due to seasonal differences and land management scenarios. The model can then be used to make recommendations that recognize tradeoffs between nutrient availability and CEC runoff/leaching. The model will aid in predicting whether manure application regimes may result in lower CEC runoff but higher potential for CEC legacy build-up in the soil profile. The module will be tested and validated using data collected at intensely monitored agricultural research plots in Central Pennsylvania.

**Biography:** Lidiia Iavorivska is currently a Postdoctoral Scholar at Penn State University focusing on hydrologic modeling tools that can support agricultural management decisions towards improved water quality. She received a master’s degree from the Ukrainian National Forestry University in Lviv, and came to Penn State as
a Fulbright Scholar to achieve master’s and Ph.D. degrees. Dr. Iavorivska’s previous postdoctoral position was at the Annis Water Resources Institute of Grand Valley State University.

### 3. Exploration of Antibiotics in Soil: Method Development

**Soyeon Lee** - Graduate Student at Southern Illinois University Edwardsville; soylee@siue.edu

**Co-authors:** Nicholas Grunloh, Nicholas Howard, Kevin Tucker

**Abstract:** The concerns about antibiotic resistance have been growing around the world for several decades. Many researchers have explored antibiotics level in waterways, but there have been only a few studies on antibiotics in soils. Research on the fate of antibiotics in soil is a significant area since soil is a major source of antibiotics in the environment. Development of a robust and reproducible method for quantifying antibiotics needs to be achieved to trace the fate of antibiotics. In this study, ultrasonic assisted extraction (UAE) and microwave assisted extraction (MAE) have been compared for efficacy for the extraction of fluoroquinolone and macrolide classes of antibiotics. Citric acid and acidified acetone were used for the extraction solvent for both methods and clay, top soil and silt were investigated. Solid phase extraction (SPE) was utilized to clean up extracts, followed by liquid chromatography-tandem mass spectrometry (LC-MS-MS). LC-MS-MS was performed for fluoroquinolones and macrolides based on calibration curves with R-squared values above 0.998.

**Biography:** Soyeon Lee joined a master’s degree program in environmental sciences at Southern Illinois University Edwardsville in spring 2018. She began working in Dr. Kevin Tucker’s lab in fall 2018 with her research project on method development for antibiotic extraction and detection from soil. She is currently in the process of developing a robust, reproducible, and “green” method for quantifying antibiotics in various types of soil samples using liquid chromatography mass spectrometry (LC-MS/MS).

### 18. Identifying the Ecological and Human Health Risks of Developmental and Chronic Exposure to Microplastics in a Zebrafish Model

**Danielle Meyer** - Graduate Research Assistant at Wayne State University; et9988@wayne.edu

**Co-authors:** Adam Pedersen, Anna-Maria Petriv, Emily Crofts, Yongli Zhang, Tracie R. Baker

**Abstract:** Microplastics (MPs) are a ubiquitous pollutant detected not only in marine and fresh water bodies, but also in tap and bottled water. Despite human and aquatic animal exposure to MPs, there has been minimal assessment of the corresponding health risks and ecological impact. To address this, we have designed a study that assesses the health impact of exposure to multiple types and sizes of MPs using zebrafish, an NIH-validated model organism ideal for studies in developmental toxicology. At both early developmental and later-life time points, we exposed zebrafish to a dosing range (1-10,000 parts per billion) of MPs – encompassing environmentally relevant concentrations as well as higher, previously validated doses. Using fluorescent MPs, we determined dose-dependent increased accumulation in the liver and GI tract of exposed larval fish and identified and quantified changes in survival, behavior, gene expression, developmental abnormalities, and fertility in MP-exposed fish. The uniquely broad scale of this study provides crucial multidimensional characterization of the health effects of MP exposure, which will inform the development of targeted control strategies to mitigate such effects.

**Biography:** Danielle is a doctoral candidate in Pharmacology at Wayne State University. She earned degrees in biology and psychology, minoring in neuroscience, from Hope College in 2015, joining Dr. Tracie Baker’s environmental toxicology zebrafish lab in 2016. She is currently researching the mechanism through which...
hormone disruption during reproductive development leads to inherited infertility. When not in the lab, she enjoys reading, theater, cuddling her pets, and voice performance!

**9. Quantifying the Bioaccumulation of Silver Nanoparticles in Daphnia Magna Through Dietary and Waterborne Exposures Using ICP-MS Analysis**

Bobbi Potter - Undergraduate Research Assistant at Southern Illinois University Edwardsville; bopotte@siue.edu

*Co-authors: Cole Hoffmann, Silwana Tiwari, Kevin Tucker*

**Abstract:** Nanoparticles (NPs) are microscopic particles that are less than 100 nanometers in diameter. Many NPs, such as silver nanoparticles (Ag-NPs), are used in a large variety of consumer products due to their antibacterial and conductive properties. The Ag-NPs can easily be washed out of these products where they will eventually collect into a wastewater treatment facility. Currently, there is a low rate of NP removal in water treatment facilities, allowing the NPs to slowly collect into aquatic environments from the facility’s effluent. There is little investigation on the effects of exposure to NPs on aquatic organisms. The exposure of water fleas to NPs at environmentally relevant concentrations will give an adequate model to represent how aquatic invertebrates are affected by NPs. ICP-MS will be used for the data analysis to determine the concentration of nanoparticles accumulated during an exposure period.

**Biography:** Bobbi Potter is a senior undergraduate chemistry major at Southern Illinois University Edwardsville planning to begin the master’s program in fall 2019. She has been performing research in Dr. Kevin Tucker’s lab since summer 2017 working on projects involving analytical chemistry and environmental toxicology. Bobbi’s research is supported by the SIUE Undergraduate Research and Creative Activities program.

**5. Occurrence of Pharmaceuticals in Municipal Landfill Leachate in North Carolina**

Amirhossein Rezaei Adaryani - Ph.D. Student/Research Assistant at the University of North Carolina at Charlotte; arezaeia@uncc.edu

*Co-authors: Olya Keen*

**Abstract:** The ultimate depository for assorted mixture of waste from residential, commercial, and industrial sources are landfills. These sites have the potential to generate leachate comprising a complex mixture of contaminants of emerging concern. When pharmaceuticals are disposed into solid waste and exposed to liquids in a landfill, they likely will dissolve into landfill leachate (LL). To detect the variability of pharmaceuticals in LL, we collected three sets of leachate samples from five municipal landfills around North Carolina, including five open cells, two closed cells with less than five years of closure and one closed cell with more than five years of closure in summer 2018. Our target compounds were over-the-counter analgesic acetaminophen, anticonvulsant carbamazepine, and common antibiotics doxycycline, ciprofloxacin, sulfamethoxazole, trimethoprim, and azithromycin. Carbamazepine was previously found ubiquitously in LL around U.S. Analytes were isolated from LL using solid-phase extraction, and analysis was performed by liquid chromatography–tandem mass spectrometry (LC-MS/MS).

**Biography:** Amirhossein was born and raised in Isfahan, Iran. He holds a bachelor’s degree in civil engineering and a master’s degree in environmental engineering. He is currently a Ph.D. student in Infrastructure and Environmental Systems (INES) program at UNC Charlotte. Since 2016, he has been receiving Environmental Research & Education Foundation (EREF) scholarship to study biodegradation of emerging contaminants (e.g. bisphenols and pharmaceuticals) by white-rot fungi in landfill leachate.
16. The Veterinarian's Role and Attitude in the Disposal of Unwanted Medications
William Sander - Assistant Professor at University of Illinois - College of Veterinary Medicine; wsander@illinois.edu
Co-authors: Sarah Zack

Abstract: Pharmaceutical compounds from medications have been detected in waterways for over two decades throughout the United States and internationally. Veterinarians play a significant role in prescribing, directing, and administering medications to all animal patients ranging from dogs and cats to cattle and swine. Better understanding attitudes and practices of veterinary disposal practices provides an avenue to address environmental concerns through education, policy discussion, and possible interventions. While prescribing and disposal practices are well characterized in human healthcare, much less has been done in veterinary healthcare. A cross-sectional survey of pharmaceutical disposal practices amongst veterinarians in the Great Lakes Region (Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, and Pennsylvania) was administered electronically in the spring of 2019. The survey gathered information on each veterinarian’s disposal practices as well as their instruction to clients. By better understanding these practices, a greater impact can occur on reducing medication entering the waterways and the environment.

Biography: Dr. Sander received his DVM from University of Wisconsin and MPH from Yale University. While spending 6 years in Washington, D.C., Dr. Sander spent two years as an American Association for the Advancement of Science (AAAS) Policy Fellow at U.S. Environmental Protection Agency’s Office of Water focused on pharmaceuticals in water and potential health impacts. He joined the Veterinary Clinical Medicine Department in the College of Veterinary Medicine in August 2018 directing the DVM/MPH program.

6. Northern Pakistan Rivers Sampled for Emerging Contaminants Using an On-Site High Volume Sampling and Solid-Phase Extraction System
Maria Schilling - Ph.D. Student at Purdue University; mschill@purdue.edu
Co-authors: Maria C. Schilling, Peyman Yousefi, Chloé de Perre, Bushra Khan, Linda S. Lee

Abstract: Limited information is available on the presence of emerging contaminants in the surface waters of Pakistan. In June 2018 during the high flow season, we evaluated the occurrence of organic chemical contamination in the Swat and Kabul rivers located in the KPK province (Northern Pakistan) to inform future research and regional environmental stewardship. A total of 20 samples were taken by pumping river water at 100 ml/min for 30 min on-site through a 47 mm Atlantic HLB-H Solid phase extraction (SPE) disk with a pre-screen glass filter (5 µM) all housed in a reusable cartridge. SPE disks were dried, kept cold and brought back to the USA for extraction and analysis. Target and non-target screening for contaminants were performed using ultrahigh pressure liquid chromatography (uPLC) with a quadruple time of flight (QToF) detector. Numerous pesticides, pharmaceuticals, plasticizers and personal care product-derived chemicals were among those detected and subsequently quantified. QA/QC studies were performed to evaluate the effectiveness and challenges of the in-situ active sampling strategy, which will be presented along with the occurrence results.

Biography: Christina Schilling is a first year Ph.D. student in Purdue University’s Interdisciplinary Ecological Sciences and Engineering program. She conducts research in Dr. Linda S. Lee’s lab with interest in elucidating water quality concerns internationally. Prior to joining Dr. Lee’s lab she was an Environmental Health Specialist in Maricopa County, Arizona. She obtained a B.S. from the University of Evansville in chemistry and environmental science in 2016.
15. Fate and Transport of Chemicals of Emerging Concern (CECs) in an Integrated Swine Manure Systems Combining Algal-Bacterial Bioreactor and Hydrothermal Processes for Improved Water Quality

Young Hwan Shin - Post Doctoral Researcher in the Department of Crop Sciences at the University of Illinois at Urbana-Champaign; shin.younghwan7@gmail.com

Co-authors: Lance Schideman, Peng Zhang, John Scott, Michael Plewa, Yuanhui Zhang

Abstract: This study investigates the effects of novel manure management systems that simultaneously produce usable energy and reduce the discharge of CECs.

An integrated manure treatment system, including a mixed algal-bacterial bioreactor (MABB) and hydrothermal processing of biomass solids, was found to remove 76.4-97.0% of the total estrogenic hormones (estrone (E1), 17β-estradiol (E2), and estriol (E3)) from the liquid portion of animal manure (LPAM), while simultaneously converting biomass into either biocrude oil with a 40.0% yield via hydrothermal liquefaction (HTL) or syngas with a 54.4% yield via catalytic hydrothermal gasification (CHG). Adding granular activated carbon (GAC) in the MABB enhanced the removal of estrogenic hormones (+7.2%), cytotoxicity (+58%), and heavy metals (+10.5%). After the integrated system with the MABB, HTL, and CHG processes, the overall percent removal of heavy metals from the LPAM ranged from 27.1 to 40.3%. The concentrations of potentially toxic heavy metals (lead (Pb), copper (Cu), zinc (Zn), cadmium (Cd), nickel (Ni), chromium (Cr)) in the aqueous phase after HTL and CHG tests ranged from 0.01 to 25.3 mg/L.

Biography: Young Hwan is currently a Post Doctoral Researcher in the Department of Crop Sciences at the University of Illinois at Urbana-Champaign. He earned his Ph.D. in agricultural and biological engineering at the University of Illinois. He earned an M.S. in environmental engineering and a B.S. in civil & environmental engineering at Korea University, Seoul, South Korea.

2. Inadequate Disposal of Animal Healthcare Services Waste in Southern Brazil: One Health at Risk

Ana Emilia Siegloch - Professor at Universidade do Planalto Catarinense; asiegloch@gmail.com

Co-authors: Kelly Scherer de Oliveira, Larissa Morello, Simone Vassem de Oliveira, Lenita Agostinetto, Bruna Fernanda da Silva

Abstract: Brazilian animal husbandry is in full expansion, but linked to the use of veterinary drugs, which may be considered as emerging contaminants. Thus, the one health approach provides an opportunity for understanding of the impacts of improper disposal of these wastes on human, animal, and environmental health. The study aimed to know the practices adopted for the disposal of animal healthcare service waste (AHSW), especially of veterinary drugs generated in cattle sanitary management on rural properties in southern Brazil. Eighty-four cattle ranchers were interviewed in two rural areas through a structured questionnaire about drugs use and disposal of the AHSW. The active ingredients of drugs most used in the properties were the antiparasitic ivermectin (68% of properties) and the antimicrobial oxytetracycline (48%). After the use, the main practices adopted for the disposal of the AHSW, including expired drugs, waste treatment and packaging, was the disposal next to the domestic trash, burning and disposal in the soil. In summary, the disposal practices of the AHSW adopted in the properties are still in disagreement with the Brazilian legislation in force and may cause adverse effects on human, animal and environmental health.

Biography: Ana Emilia earned her bachelor’s degree in biological sciences at the Federal University of Santa Maria, a master’s and Ph.D. in entomology at the University of São Paulo and a postdoctoral degree in ecology by Federal University of Santa Catarina. Currently, she is a professor at the University of the Planalto.
Catarinense, where she works in the Postgraduate Program in Environment and Health, teaches classes, and guides master's students in the area of waste management.

11. Histopathological Investigation of Lake Chub in The Ells River Adjacent to Oil Sands Activity
Erin Ussery - Research Scientist at Environment and Climate Change Canada; Erin.Ussery@Canada.ca
Co-authors: Jessie Cunningham, Abby Wynia, Thomas Clark, Gerald Tetreault, Mark McMaster

Abstract: The Fort McMurray region is part of the larger Athabasca Oil Sands deposit found in the province of Alberta, Canada. Exposed bitumen beds found in the Fort McMurray region are rich in natural sources of polycyclic aromatic hydrocarbon (PAH) compounds. The Canadian and Alberta governments developed monitoring programs aimed to investigate fish health, of the lower Athabasca River and its tributaries in 2009. Numerous oil companies conduct surface mining in the areas around Fort McMurray and adjacent to the Athabasca River, extracting this naturally occurring bitumen for its petroleum. Thus, resident fish in the Athabasca and its tributaries may be exposed to either naturally occurring sources of bitumen or anthropogenically refined sources through surface mining. The Ells River serves as the predominant drinking water source for the community of Fort McKay, thus the health of this tributary is of high importance. The literature reports effects (i.e., vision impairments, reproductive effects, etc.) in fish exposed to various sources of PAHs. This study investigates/compares the histopathological changes of various organs in Lake Chub exposed to natural and anthropogenic PAH related compounds in the Ells River.

Biography: Erin is currently a post-doctoral fellow at Environment and Climate Change Canada in the Aquatic Contaminants Research Division under Dr. Mark McMaster. She is originally from the great state of Texas and moved to Canada to pursue a Ph.D. in aquatic toxicology at the University of Ontario Institute of Technology under Dr. Douglas Holdway. In her spare time, she loves exploring the beautiful parks Canada has to offer and trying any type of new and delicious food she can get her hands on!

4. Detection of Emerging Contaminants in Roof-Harvested Rainwater via Co-Created Citizen Science by High-Resolution Liquid Chromatography-Tandem Mass Spectrometry (HR-LC-MS/MS)
Norma Nohemi Villagómez-Márquez - Ph.D. Student at the University of Arizona; nnv@email.arizona.edu
Co-authors: F.J. Montijo, L. Abrell, S. Buxner, A. Kilungo, J.E. Mclain, R. Root, F. Sandoval, M.D. Ramirez-Andreotta

Abstract: Project Harvest (PH) is a citizen scientist driven program that teaches communities across the state of Arizona the scientific method. Over the course of three years, participants will collect roof-harvested rainwater samples and send them to be analyzed for bacteria, organic and inorganic contaminants at the University of Arizona by our team of scientists. Herein the organic chemistry aspect of this project is described including sample preparation, analytical method development, and preliminary results. Project Harvest seeks to fortify informal science learning in underserved communities and help generate water quality guidelines and recommendations for non-potable roof-harvested rainwater domestic use. We aim to investigate the presence of thirty target analyte chemicals in roof-harvested rainwater by applying high-resolution liquid chromatography-tandem mass spectrometry (HR-LC-MS/MS).

Biography: Norma Villagómez-Márquez is a Ph.D. student in Soil Water Science at the University of Arizona. She has a background in environmental engineering investigating the role of advanced membrane
technologies in water treatment, primarily desalination. In 2018, she was selected as a Singapore UNLEASH Innovation Lab Talent by the UN Sustainable Development Goals (SDGs) Program to participate in the development of solutions for SDG # 6 Clean Water and Sanitation.

ABOUT THE ORGANIZERS AND FUNDING ORGANIZATIONS

Illinois Sustainable Technology Center

The Illinois Sustainable Technology Center (ISTC) is a division of the Prairie Research Institute on the University of Illinois at Urbana-Champaign campus. Its mission is to encourage and assist citizens, businesses, and government agencies to prevent pollution, conserve natural resources, and reduce waste to protect human health and the environment of Illinois and beyond.

To learn more, visit istc.illinois.edu.

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Illinois International is at the nexus of all global activities and international studies on the University of Illinois Urbana-Champaign campus—simultaneously serving as the administrative, programmatic, and strategic unit responsible for many of the international activities Illinois is involved in, both on campus and abroad.

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Illinois Water Resources Center

The Illinois Water Resources Center is a part of University of Illinois Extension and promotes water research and education for the people of Illinois.

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