Clarkson™ ESF State University of New York College of Environmental Science and Forestry

CENTER OF EXCELLENCE IN

Healthy Water Solutions

A New York State-Designated Center of Excellence

1st Annual Meeting

A Conversation on Advances in Water Science and Technology

March 12-13, 2023

Syracuse, New York

Vision

To ensure a healthy and sustainable future through the protection and conservation of water resources.

Mission

To generate solutions that help protect and improve waters for sustainable natural environments, healthy populations, resilient communities and sound economies.

Steering Committee

Co-Director
Stefan Grimberg, PhD, P.E., BCEE
Professor, Civil and Environmental Engineering
Clarkson University
sgrimber@clarkson.edu

Co-Director
Stephen Shaw, PhD, P.E.
Associate Professor, Environmental Resources Engineering, SUNY ESF
sbshaw@esf.edu

Members

Silvana Andreescu, PhD
Professor / Chair of Chemistry & Biomolecular Science
Clarkson University

Gyu Leem, PhD
Assistant Professor, Polymer and Environmental Chemistry
SUNY ESF

Sharon Moran, PhD
Associate Professor, Environmental Studies
SUNY ESF

Lee Newman, PhD
Associate Professor and Chair of Chemistry
SUNY ESF

Roxanne Razavi, PhD
Assistant Professor, Environmental Biology
SUNY ESF

Tyler Smith, PhD
Associate Professor and Executive Officer, Civil & Environmental Engineering
Clarkson University

Yang Yang, PhD
Assistant Professor, Civil & Environmental Engineering
Clarkson University

NEW YORK STATE OF OPPORTUNITY. Division of Science, Technology & Innovation
A Division of Empire State Development

In 2019 New York State designated Clarkson University and SUNY College of Environmental Science & Forestry (ESF) to co-lead the Center of Excellence (CoE) in Healthy Water Solutions. NYS Centers of Excellence are funded by the New York State Department of Economic Development's Division of Science, Technology, and Innovation (NYSTAR) to foster collaboration between the academic research community and the business sector to develop and commercialize new products and technologies, to promote critical private sector investment in emerging high-technology fields in New York State, and to create and expand technology-related businesses and employment. Any opinions, findings, conclusions or recommendations expressed are those of the author(s) and do not necessarily reflect the views of the New York State Department of Economic Development.

Agenda at a Glance

Sunday, March 12, 2023		
5:00 PM	**Networking Dinner**	*Sheraton Syracuse University Hotel & Conference Center*

Monday, March 13, 2023		
9:00 AM	**Check-in and Continental Breakfast**	*Gateway Center*
9:30 AM	**Welcome from the Center of Excellence in Healthy Water Solutions** **Stefan Grimberg**, Professor Civil & Environmental Engineering, Clarkson University **Stephen Shaw**, Associate Professor, Environmental Resources Engineering, SUNY ESF	*Gateway Center*
9:45 AM	**Roundtable Discussion: Emerging Needs of Academia, Industry, and Regulatory Agencies**	*Gateway Center*
10:30 AM	**Break**	
10:45 AM	**Breakout Session I: Getting Ahead of Research Needs**	
	• **PFAS** (per- and polyfluoroalkyl substances)	*Gateway Center*
	• **HABs** (harmful algal blooms)	*Illick Hall, Room 5*
11:45 AM	**Poster Session**	*Gateway Center*
12:30 PM	**Lunch**	*Gateway Center*
1:30 PM	**Breakout Session II: Academic Capabilities and Partnerships**	
	• **Water Needs of Semiconductor Fabrication Facilities**	*Illick Hall, Room 5*
	• **Climate Change Adaptation and Resilience**	*Gateway Center*
2:30 PM	**Report Out – Breakout Session Takeaways**	*Gateway Center*
3:00 PM	**Adjourn**	

Roundtable Discussion

[Gateway Center]

Emerging Needs of Academia, Industry, and Regulatory Agencies

Drawing on the academic, entrepreneurial, government, and industry perspectives of the panel, this session will explore challenges and opportunities for innovation and problem solving as related to water, with an emphasis on identifying possible new collaborations.

Moderator: **Michelle Crimi**
Interim Vice Provost for Research & Technology
Clarkson University

Discussants: **Emad Rahim**
Surge Entrepreneurship Manager
CenterState Corporation for Economic Opportunity

Alexander J. Smith
Bureau Director, Water Assessment and Management, Division of Water
NYS Department of Environmental Conservation

John Stella
Vice President for Research
SUNY ESF

Breakout Session I:
Getting Ahead of Research Needs

PFAS (per- and polyfluoroalkyl substances) *[Gateway Center]*

Moderator: **Michelle Crimi**
Interim Vice Provost for Research & Technology, Clarkson University

Presenters: **Gary Ginsberg**
Director, Center for Environmental Health (CEH), NYS Department of Health

Brief summary of the public health approaches to PFAS regulation, research needs and risk communication.

Scott Grieco
Global Technology Leader – PFAS & Emerging Contaminants, Jacobs

A Focus of PFAS in our Water Cycle: Summary of Regulatory Drivers, Current Treatment, Data Gaps, and Research Needs

Selma Mededovic
Professor of Chemical & Biomolecular Engineering, Clarkson University

Challenges and Opportunities in PFAS Treatment by Electrical Discharge Plasmas

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HABs (harmful algal blooms) *[Illick Hall, Room 5]*

Moderator: **Roxanne Razavi**
Assistant Professor, Environmental Biology, SUNY ESF

Presenters: **Rebecca Gorney**
Physical Scientist, U.S. Geological Survey (USGS)

Rebecca will provide an overview of USGS surveillance and research tools and studies of waterbodies in New York State.

Igor Mrdjen
Founder, BloomOptix

Igor will present on how new technologies allow us to more rapidly detect and classify HABs, as well as empower citizens, create global monitoring communities and democratize data in HABs, water quality and other applications.

Anthony Prestigiacomo
Research Scientist, Finger Lakes Watershed Hub, NYS Department of Environmental Conservation

Tony will discuss the state of HABs in New York and DEC activities to understand and control blooms.

Breakout Session II:
Academic Capabilities and Partnerships

Water Needs of Semiconductor Fabrication Facilities
[Illick Hall, Room 5]

Moderator: **Stefan Grimberg**. Professor of Civil & Environmental Engineering, Clarkson University

Presenters: **Shannon Harty, P.E.**
Commissioner, Onondaga County Water Environment Protection

Ms. Harty will be discussing Onondaga County's approach to planning wastewater conveyance and treatment services to serve Micron NY, which will be located in the Oak Orchard Wastewater Treatment Plant service areas.

Jim Lozier
Global Technology Leader
Membrane Treatment/Advanced Water Solutions, Jacobs

Presentation will outline key issues and challenges with the water needs and wastewater discharges associated with a large semiconductor facility. And discuss approaches to mitigating these issues and challenges through onsite and offsite wastewater reuse.

David Speed
Distinguished Member Of Technical Staff, GlobalFoundries

Manufacturing semiconductors requires complex and sophisticated materials and processes. R&D is needed to develop environmentally preferable materials where possible, and implement cost effective recycling or destruction of residual chemicals where alternatives are not available.

Climate Change Adaptation and Resilience *[Gateway Center]*

Moderator: **Stephen Shaw**, Assoc. Professor, Environmental Resources Engineering, SUNY ESF

Presenters: **Jayme Breschard**
Climate Action Specialist, Barton & Loguidice

Drawing on over 20 years of experience in floodplain management and local government assistance, Jayme will discuss the benefits of public-private partnerships and roles that consultants can play in helping municipalities build their capacity to mitigate and adapt to climate change.

Elizabeth Carter
Assistant Professor of Civil and Environmental Engineering, Syracuse University

Liz will highlight new data analysis techniques for better integrating land use, hydrologic, and hydraulic data to predict flood risk and the potential to automate these analyses across large geographic areas.

Kristen Hychka
Research and Outreach Specialist, NYS Water Resources Institute

NYS communities are on the frontlines of adapting to changes in flooding. Kristin will outline some of the barriers to adaptation faced by NYS communities, highlight several innovative strategies used to overcome those barriers, and suggest pathways to equitably scale up these efforts.

Posters

1 Cerium-based Metal-organic Framework for the Efficient Uptake of Phosphate from Water

Jehad Abdelnabi, Mohamed H. Hassan, Silvana Andreescu

Phosphate-based fertilizers are in widespread use around the world to increase agricultural yields in areas that would otherwise be unable to sustain substantial growth. With the amount of phosphate being added to soils, it is no surprise that much of the phosphate not utilized by plants is leached out of the soil and accumulates in waterways. Harmful plants and algae can grow much faster with increasing phosphate concentrations in the water, leading to algal blooms and potential ecological harm (eutrophication). To mitigate eutrophication caused by runoff, smart sorbent materials are being developed in order to remove phosphate from water bodies. Among these materials, a cerium-based metal-organic framework was selected due to its exceptional stability, high surface area, microporous structure, and its ability to bind strongly with phosphate through cerium nodes demonstrated by our DFT calculations. This work demonstrates for the first time the exceptional ability of this material to remove phosphates from water with a removal capacity of 179 mg/g in less than 4 minutes. The results show a remarkable maximum adsorption capacity and fast kinetics over the current state-of-the-art crystalline porous materials. This study suggests that cerium-based metal-organic frameworks are highly effective and durable sorbents that can be used to develop future-generation technology to address challenges related to water eutrophication.

2 Improved salt removal capacity of manganese oxide electrodes using a phosphate buffer for brackish water desalination

Paul Akinyemi and Taeyoung Kim

The use of manganese oxides offers a promising means to supply freshwater owing to their ability to electrochemically remove salt from low salinity waters such as brackish groundwater. We examined manganese oxide electrodes coupled with phosphate, of which salt removal capacity increased nearly 3 times greater than without phosphate.

3 Chasing short-chain per- and polyfluoroalkyl acid (PFAS) compound in aqueous film-forming foam (AFFF) affected groundwater

E. Dee Dee Brown, Raj Kamal Singh, Tom Holsen, Selma Mededovic Thagard

This research project is focusing on mitigating the formation and treatment of short-chain and ultra-short chain per- and polyfluoroalkyl acid (PFAS) compounds that are generated via non-thermal plasma treatment of aqueous film-forming foam (AFFF) impacted groundwater sources.

4 Field Demonstrations of Enhanced Contact Plasma to Treat PFAS Impacted Waters at Military Sites: Wright-Patterson Air Force Base, Pease Air Force Base, and Fort Leavenworth Army Installation

E. Dee Dee Brown, Chase Nau-Hix, William Knutson, Steve Richardson, Nate Hagelin, Selma Mededovic Thagard, Thomas M. Holsen

Mobile plasma-based water treatment systems, using enhanced contact plasma reactors, were deployed to three military installations (Wright-Patterson Air Force Base, Pease Air Force Base, and Fort Leavenworth Army Installation) to treat per- and polyfluoroalkyl substances (PFAS) in impacted groundwater and ion-exchange still bottoms.

5 Ammonia removal and recovery from wastewater using electro-driven functional membranes

Weikun Chen[1], Stefan Grimberg[1,2], Shane Rogers[1,2], and Taeyoung Kim[1,3]
[1]*Institute for a Sustainable Environment, Clarkson University*
[2]*Department of Civil and Environmental Engineering, Clarkson University*
[3]*Department of Chemical and Biomolecular Engineering, Clarkson University*

We demonstrated the use of bipolar membrane electrodialysis to separate ammonium while simultaneously producing acid and base streams. We achieved ammonia removal up to 80% with energy consumption less than 10 kWh kg−1 N. The separated ammonia was recovered (>90%) in a subsequent membrane contactor.

6 Aquatic photochemistry of the livestock feed additive Ractopamine

Sarah A. Crane, Maxwell B. Horsford, and Nicholas C. Pflug

Ractopamine, a synthetic β-adrenergic agonist, is a livestock feed additive that has been detected at low levels in surface waters and wastewater effluent across the world. We explored the aquatic photochemistry of RAC to simulate its fate in agriculturally impacted surface waters.

7 Diving beneath the surface: Spatial profiling of microbiome in the St. Lawrence River

Kelsey Cullen[1], Austin Marshall[1], Maria Pelusi[2], Michael Twiss[1], Shantanu Sur[1]
[1] *Department of Biology, Clarkson University*
[2] *Institute for Sustainable Environment, Clarkson University*

The St. Lawrence River headwater consists of freshwater from great lakes which is at considerable risk of contamination by tributary confluences and effluents. We aimed to evaluate the water quality along the course of the river by spatially profiling the bacterial composition through nanopore sequencing of the conserved 16S region in the bacterial genome. Through longitudinal and transactional analysis of water mass microbiomes, a detailed spatial profile is built in the hopes of contributing significantly to the continuing efforts of understanding the factors critical to the establishment and maintenance of health of this important water system.

8 Bio-tower Application to a Decentralized Waste Water System- A Project for a Better Environment

Dr. Klaus Doelle

According to the Environmental Protection Agency (EPA), one of every five households in the United States operates a decentralized wastewater treatment system, also known as septic system. Human waste from underperforming decentralized wastewater treatment systems might contribute to the pollution of nearby water bodies and can cause nitrification and increase in phosphorus components, which can increase algae growth mostly during warm summer month in the water body and can affect the environment, public health, and the economy. The presented research shows results from a bio-tower application on a decentralized wastewater system from the laboratory scale to a commercial scale. The overall performance of the various system showed comparable results to municipal wastewater treatment plants discharge effluent levels. Therefore, upgrading decentralized wastewater treatment system with a bio-tower will enhance the systems treatment capacities and decrease discharge loading to the adjunct drain field and therefore can improve the environmental footprint of the system.

9 i-Tree HydroPlus Tools for Water Resources Management

Theodore Endreny and Li Zhang

i-Tree HydroPlus is a collection of peer-reviewed environmental models that measure the effects of landscape characteristics and tree benefits. It features i-Tree Hydro, simulating land cover effects on water quality/quantity with the installations of Green Infrastructure for managing nutrient loading from diffuse runoff, and i-Tree Buffer maps nutrient hotspots based on CADA NPS water quality model and now has a Stochastic Export Coefficient Model to simulate annual variations in nutrients loading.

10 Visible light Induced Decomposition of Disinfection Byproducts in Drinking Water

Matt Frame[1], Rowan Nothnagle[1], Neli McMillan[3], Benjamin Sherman[3], Leanne C. Powers[1], Gyu Leem[1, 2]
[1]Department of Chemistry, State University of New York College of Environmental Science and Forestry
[2]The Michael M. Szwarc Polymer Research Institute, Syracuse, New York
[3]Department of Chemistry and Biochemistry, Texas Christian University

Disinfection byproducts (DBPs) are generated by reactions of disinfectants with dissolved organic matter (DOM) during the treatment of drinking water and wastewater and have shown enough toxicity to be regulated by the EPA. Strategies have been used to minimize DOM concentrations prior to disinfection, such as rapid/slow sand filtration, UV irradiation, coagulation, and activated carbon filtration. Here, this study focuses on photocatalytic degradation of DOM (prior to disinfection) and DBPs(post disinfection) under aerobic conditions with solar or visible light illumination with a continuous flow process coupling dye-sensitized photoelectrochemical cells (CFP-DSPECs). This CFP-DSPEC process allows homogeneous irradiation of aqueous samples, reduces of heat generation, generates reactive species (i.e., hydroxyl radicals), which leads to an efficient oxidative photocatalytic degradation process for DOM .Various photocatalysts (bismuth vanadate, titanium dioxide, carbon dots, etc.) and reaction conditions (ionic strength, pH and temperature) were tested and we found that neutral pH and room temperature was ideal for running the system. In this system DOM and DBP concentrations decreased in 24 hours (as quantified by organic carbon concentrations and qualitatively evaluated as UV-Vis absorption spectra). Using two model DBP compounds (2,5-dichloro-1,4-halobenzonquinone and 2-chloro-1,4-benzoquinone) we studied the photocatalytic degradation mechanisms by using density functional theory modeling and triple-quadrupole LC-MS/MS, which showed degradation happening even after doubling the concentration of the DBPs in the cell.

11 Deep destruction of PFAS in complicated water matrices by integrated electrochemical oxidation and UV-sulfite reduction

Yunqiao Guan[1], Nanyang Yang[1], Shasha Yang[1], Luz Esteffanny[1], Jinyong Liu[2], Yang Yang[1]
[1] Department of Civil and Environmental Engineering, Clarkson University
[2] Department of Chemical and Environmental Engineering, University of California, Riverside

~100% conversion of PFAS to F- by the integrated treatment.
~100% conversion of dilute AFFF to F- by the integrated treatment
Future work will optimize the treatment train system to minimize the energy consumption.

12 Riverine Microplastic Pollution: Protocol of sample collection, preparation and identification

Addrita Haque, Abul B.M. Baki, Thomas M. Holsen

Quantification of riverine microplastics has been challenging for the lack of standardized methods and identification procedures. In this study, a sample processing method has been developed and found to have a 97.4% recovery rate. Following the method, microplastic abundance in the Raquette river has been determined for three different sites.

13 Assessing the inhibition of nitrifying activated sludge microorganisms from selective components of semi-conductor manufacturing waste

Philip Hekeler, Stefan Grimberg, Clarkson University

Certain azoles and hydrogen peroxide coming from semi-conductor waste effluent have been known to inhibit the microbial activity of nitrification in a wastewater treatment plant. This study aims to repeat an experiment completed in 2017 to determine if the microorganisms have adjusted or remain inhibited by the chemicals of interest.

14 Fast adsorption of short- and long-chain PFAS on β-zeolites covered with cationic coatings

M. Shahadat Hossain, T. Dwyer Stuart, Bandaru V. Ramarao, Mario Wriedt, David Kiemle, Mike Satchwell, Deepak Kumar

β-zeolites retain large quantities of amphiphilic aqueous contaminants, leading to exploration for PFAS adsorption. In this study, β-zeolites are coated with cationic surfactant (CTAB) or polyelectrolyte (PDADMAC) to enhance PFAS retention. Batch adsorption kinetic and equilibrium studies showed fast uptake and high capacity on β-zeolites for short- and long-chain PFAS.

15 Dynamics of microplastics in riverine system

Usama Ijaz, Professor Abul Basar Baki

We investigated the impact of large roughness elements (LREs) on in-stream transport and retention of the ubiquitous polystyrene-microplastics (PS-MPs). Scaled experiments were conducted with and without LREs in an ecohydraulics flume. Our findings indicate the dependance of the MPs' retention on hydraulic parameters. Our ongoing study illustrates the settling behavior of MPs in ambient flows.

16 Glycine Decorated Hexanuclear Ce(IV) Clusters for the Fluorometric Detection of PFOA and PFNA

*Reem Khan, Mohamed H. Hassan and Silvana Andreescu**

Per- and Polyfluoroalkyl Substances (PFAS) are group of chemicals that has been extensively used in many products since 1940s. Due to their widespread use, the presence of these compounds became persistent in the environment posing serious risk to human. Developing portable sensors and easy to use assays to detect PFAS on site without the need of using heavy lab equipment is of high importance. This work focuses on the development of a fluorimetric assay for PFAS detection in water. The method is highly selective to the –COOH terminated PFAS due to the chemistry between fluorophore and analyte.

17 Elucidating Per- and Polyfluoroalkyl Substances (PFAS) Fish Trends Across Freshwaters of New York State

Eric Levanduski, Wayne Richter, Jesse Becker, Rebecca Quail, Yasaman Hassanzadeh, Roxanne Razavi

An overview of the NYSDEC's PFAS sampling locations and dataset characteristics, set to be analyzed over the course of the following year for species bioaccumulation, biomagnification, and geographical trends.

18 Genomic Characterization of Microbes within the St. Lawrence River using Advanced Metagenomic Techniques

Austin Marshall, Kelsey Cullen, Michael Twiss, Shantanu Sur

The St. Lawrence River is a vital ecosystem that supports a range of aquatic and terrestrial life. In this study, we applied sophisticated metagenomics to examine microbes along the St. Lawrence River. We identified antimicrobial resistance (AMR) and horizontal gene transfer (HGT) sites within bacteria that may impact the health of those who depend on this river.

19 Influence of Emerging Contaminants on Great Lakes Fish Gut Microbiomes

Amina F. Mughal[1], Susan Bailey[2], Thomas M. Holsen[3,4], Sujan Fernando[3], Yaqi You[1]
[1] *Department of Environmental Resources Engineering, SUNY College of Environmental Science and Forestry*
[2] Department of Biology, Clarkson University
[3] Department of Civil and Environmental Engineering, Clarkson University
[4] Center for Air and Aquatic Resources Engineering and Science, Clarkson University

The Great Lakes contain one fifth of the world's surface freshwater, where human activity has introduced emerging contaminants such as pesticides and pharmaceuticals. This study aims to investigate the microbiomes in lake trout (Salvelinus namaycush) from contaminated sites in Lakes Erie, Huron, and Superior, and their correlation with contaminant profiles.

20 Partnering on Eurasian Watermilfoil Management: One Lake Association's Wish List, What's on Your List?

Jane Oppenlander, E. Kurt TeKolste, Mike Schaffer, James Niles

Many Adirondack lakes are infested with milfoil; considerable resource is expended to manage its spread. Lake associations engage in many activities to control milfoil and would welcome collaboration with academic and industry partners. In this interactive poster, we present our wish list and ask conference attendees to suggest ideas for collaboration.

21 Upcycling Papermill Waste Fibers for Efficient PFAS Adsorption

Mandeep Poonia, Chang Geun Yoo

Papermill waste fibers were upcycled by cationic modifications for PFAS capturing. The structural and morphological properties of modified waste fibers were analyzed by FTIR, SEM, zetasizer, and particle charge detector. The PFAS adsorption with the modified waste fibers was explained by their adsorption isotherm and kinetics.

22 Induced electro-Fenton as a versatile wastewater treatment process without chlorinated byproduct formation

Estefanny Quispe-Cardenas [1,2], Parker Deptula [1], Cynthia Huerta [1], Zhu Chonglin [3], Yinyin Ye [3], Siwen Wang [1], Yang Yang[1]
[1] *Civil and Environmental Engineering Department, Clarkson University*
[2] *Institute for a Sustainable Environment, Clarkson University*
[3] *Department of Civil, Structural and Environmental Engineering, University at Buffalo*

In this study, we constructed a chemical-free induced-EF process for the onsite wastewater treatment. We used an IrO_2 anode, and a recently reported composite gas diffusion electrode (GDE: for H_2O_2 production) as the cathode. Importantly, we used an iron plate as the induced electrode for the slow release of Fe^{2}+ catalyst to initiate •OH-mediated oxidation.

23 Detection and Removal of PFAS Compounds using Redox Species

Abd Ur Rehman, Swapnil Tiwari, Silvana Andreescu

Per and poly-fluoroalkyl substances (PFAS) are the emerging class of harmful organic micropollutants that adversely affect the environment. Their bioaccumulation and toxic effects on humans, animals, and the aquatic environment. Conventional water treatment processes have been demonstrated to be ineffective for removal or destruction of PFAS. In this presentation, we describe the development of redox-switchable sorbent materials for the removal of PFAS and further extended the study to develop a colorimetric and electrochemical sensor platform for detection of PFOS in water samples.

24 Robust Automatic Identification of Microplastics using AI vision

Md Abdul Baset Sarker, Usama Butt, Masudul H Imtiaz, Abul Basar Baki

Microplastics (<5 mm - >0.001 mm) are now becoming a global pollution concern, and still there is a lack of technologies for the real-time detection of microplastics in the water bodies. Therefore, this study aims to develop AI-vision-enabled techniques to detect microplastics in aquatic environments. This study uses a high-resolution camera and customized deep-learning model for tiny object detection and tracking microplastic.

25 Efficient Removal of Per- and Polyfluoroalkyl Substances from Water with Zirconium-Based Metal−Organic Frameworks

Arefeh Mir Sharifian, Shefa Alomari, Mario Wriedt

Per- and polyfluoroalkyl substances (PFAS) are an emerging class of contaminants raising increased levels of concern due to their toxic, bioaccumulative, and persistent nature. Current solutions for removing PFAS from contaminated water rely on adsorption-based methods where commonly used sorbents, e.g. activated carbons and ion-exchange resins, exhibit low adsorption capacity and long equilibration time. Motivated by the generally deficient performance of these current materials, this work addresses the need for the discovery of advanced sorbents for high capacity and efficient PFAS removal. The zirconium-based metal-organic framework (MOF) NU-1000 was characterized for the adsorption of three perfluorosulfonic acids (PFSAs, C4-C8) and six perfluorinated carboxylic acids (PFCAs, C1-C9) from aqueous solution. Results indicate that NU-1000 exhibits outstanding adsorption capacities of 400-620 mg/g for PFSAs and 201-604 mg/g for PFCAs coupled with ultrafast adsorption kinetics featuring equilibrium times of <1 min. Complementary density functional theory calculations reveal that the PFAS@MOF adsorption mechanism is dominated by a combination of hydrogen bonding, electrostatic, and hydrophobic non-covalent PFAS—MOF interactions. Excellent regeneration and reusability characteristics were found, particularly nearly quantitative removal and recovery rates of NU-1000 after five consecutive ad- and desorption cycles of PFAS. Additional adsorption testing using PFAS-contaminated groundwater samples obtained from U.S. Air Force bases revealed impressive PFAS removal rates of 75-98% within 10 min regardless of the presence of co-contaminants. To the best of our knowledge, the suite of herein presented PFAS sorption characteristics—capacity, kinetics, regeneration and reusability—significantly outperforms other current sorbents; rendering NU-1000 as a promising platform for the rapid and effective removal of PFAS from aqueous media.

26 Design and Characterization of Zwitterionic Cerium(III)-based MOFs

Kirti Sharma, Dr. Mario Wriedt

Metal-Organic Frameworks (MOFs) are an emerging class of crystalline nanoporous materials which have shown promising properties for diverse applications such as gas storage, small molecule separation, catalysis, and sensing. Zwitterionic (ZW) ligand incorporation into MOFs has shown as promising means to introduce lewis-acidic charged organic surfaces which have the potential to polarize guest molecules and thus improving their host-guest interactions. This research work focuses on the design and synthesis of two new 3D Ce(III)-based ZW MOFs using the rigid di-topic ZW ligand [1-(4-carboxybenzyl)-4'-carboxypyridinium bromide, H_2LBr]. This ligand features both cationic (pyridinium) and anionic moieties (carboxylate) to bind cerium(III) under solvothermal and hydrothermal conditions. The resulting charge separated MOFs feature interesting coordination, electronic, and optical properties. Both new MOFs structures were characterized by single-crystal X-ray diffraction, thermogravimetric analysis (TGA), powder X-ray diffraction (PXRD) and UV-vis diffuse reflectance spectroscopy.

27 Removal of Per- and Polyfluoroalkyl Substances from Contaminated Groundwater using a Novel Cationic Porous Organic Polymer

Charlene VanLeuven[1], Sivachandiran Loganathan[2], Selma Mededovic[2], Thomas M. Holsen[3], and Mario Wriedt[1]

[1] *Department of Chemistry & Biomolecular Science, Clarkson University*
[2] *Department of Chemical and Biomolecular Engineering, Clarkson University*
[3] *Department of Civil and Environmental Engineering, Clarkson University*

A cationic porous organic polymer (cPOP) was designed for selective adsorption of anionic contaminants, including per- and polyfluoroalkyl substances. Demonstrated under environmentally relevant conditions the cPOP shows high adsorption capacities coupled with ultrafast adsorption kinetics reaching equilibrium, and near 100% removal, in < 10 min.

28 Characterizing Benthic Cyanobacteria and Their Toxicity in the Finger Lakes of New York State

Abby M. Webster, Lisa B. Cleckner, Gregory L. Boyer, Bofan Wei, Roxanne Razavi

As planktonic harmful algal blooms (HABs) continue to receive most of the attention, benthic algae proliferations remain far understudied and are an increasing threat to water quality. We present two major questions: 1) What makes up the cyanobacterial community of nearshore benthic algae in the Finger Lakes, and 2) Are they toxic?

29 Photoelectrocatalytic decomposition of perfluorooctanoic acid by using In2O3 electrode

Udani K Wijethunga, Ramachandra Legundapati, Shasha Yang, Yang Yang, Chang Geun Yoo, Gyu Leem

This study focuses on photoelectrochemical (PEC) decomposition towards perfluorooctanoic acid (PFOA) by utilizing mesoporous In2O3. Photocatalytic studies using In2O3 photoandoes have been shown to photochemically degradation of PFOA in aqueous phase under UV illumination. Mechanistic studies were conducted to investigate the degradation pathway of PFAS.

30 Solvent-Free Nonthermal Destruction of AFFF and PFAS-contaminated sediment by Piezoelectric Ball Milling

Nanyang Yang; Yang Yang

In this study, we developed a solvent-free, non-thermal approach for destroying AFFF and PFAS-contaminated sediment using piezoelectric ball milling. Over 80% of 21 targeted PFAS were removed from PFAS-contaminated sediment after six-hour treatment. Additionally, a complete defluorination was achieved for 100 μL AFFF treatment under the same conditions.

31 Mitigation of harmful algal bloom (HAB) by electrochemical oxidation: from bench-scale study to field application

Shasha Yang, Estefanny Quispe, Nada Shetewi, Michael Twiss, Sujan Fernando, Siwen Wang, Stefan Grimberg, Yang Yang

Harmful algal bloom (HAB) containing cyanotoxins has been a rising concern for surface water safety. This work developed a fast-paced electrochemical oxidation (EO) process to remove cyanobacteria and cyanotoxins simultaneously. Based on the lab-scale study, a boat-mount EO system with low energy consumption was designed and deployed in HAB-impacted lake water.

State University of New York College of Environmental Science and Forestry

Parking and Accessibility Map

University Police 470-6667

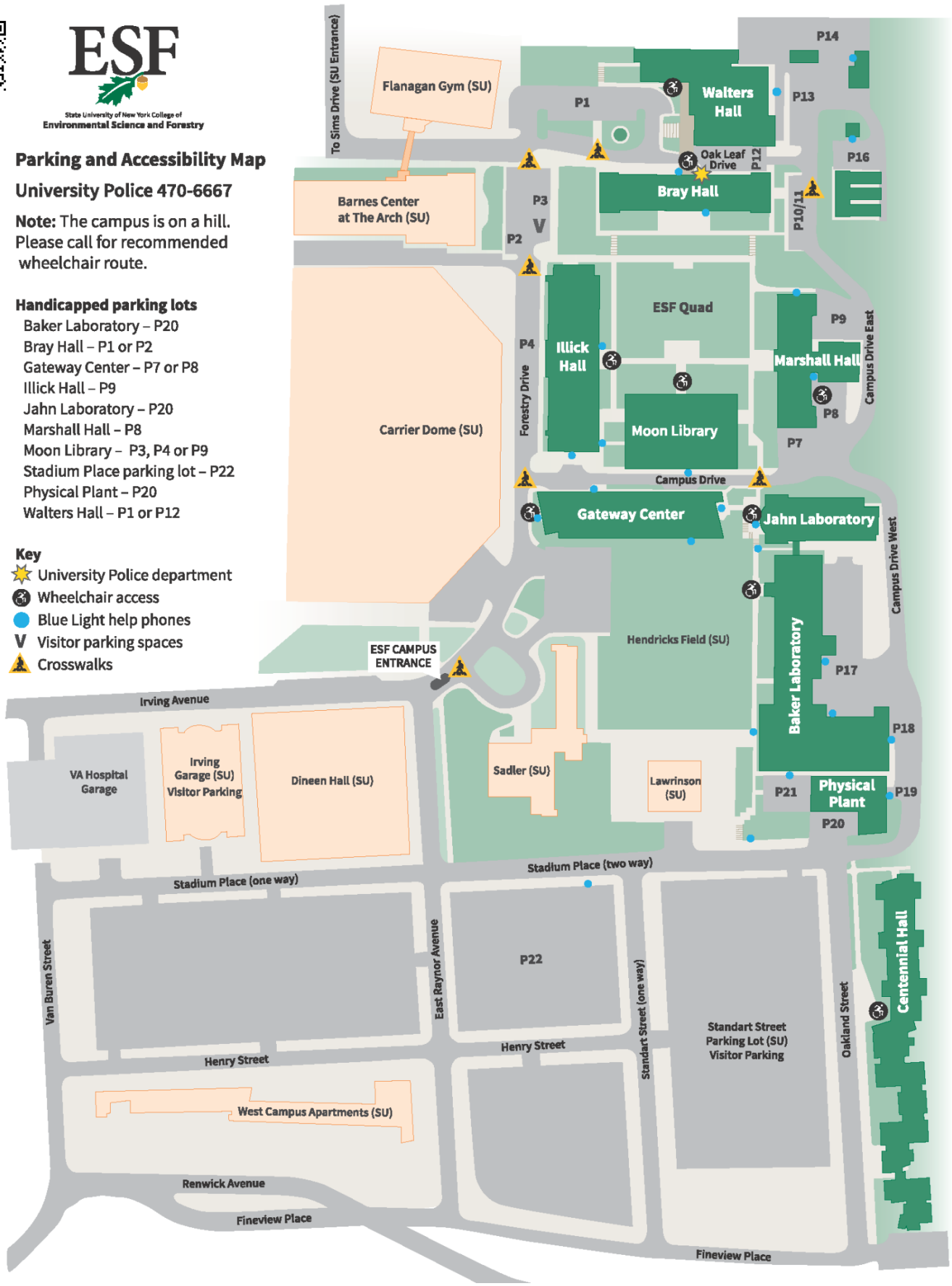
Note: The campus is on a hill. Please call for recommended wheelchair route.

Handicapped parking lots

- Baker Laboratory – P20
- Bray Hall – P1 or P2
- Gateway Center – P7 or P8
- Illick Hall – P9
- Jahn Laboratory – P20
- Marshall Hall – P8
- Moon Library – P3, P4 or P9
- Stadium Place parking lot – P22
- Physical Plant – P20
- Walters Hall – P1 or P12

Key

- University Police department
- Wheelchair access
- Blue Light help phones
- V Visitor parking spaces
- Crosswalks



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