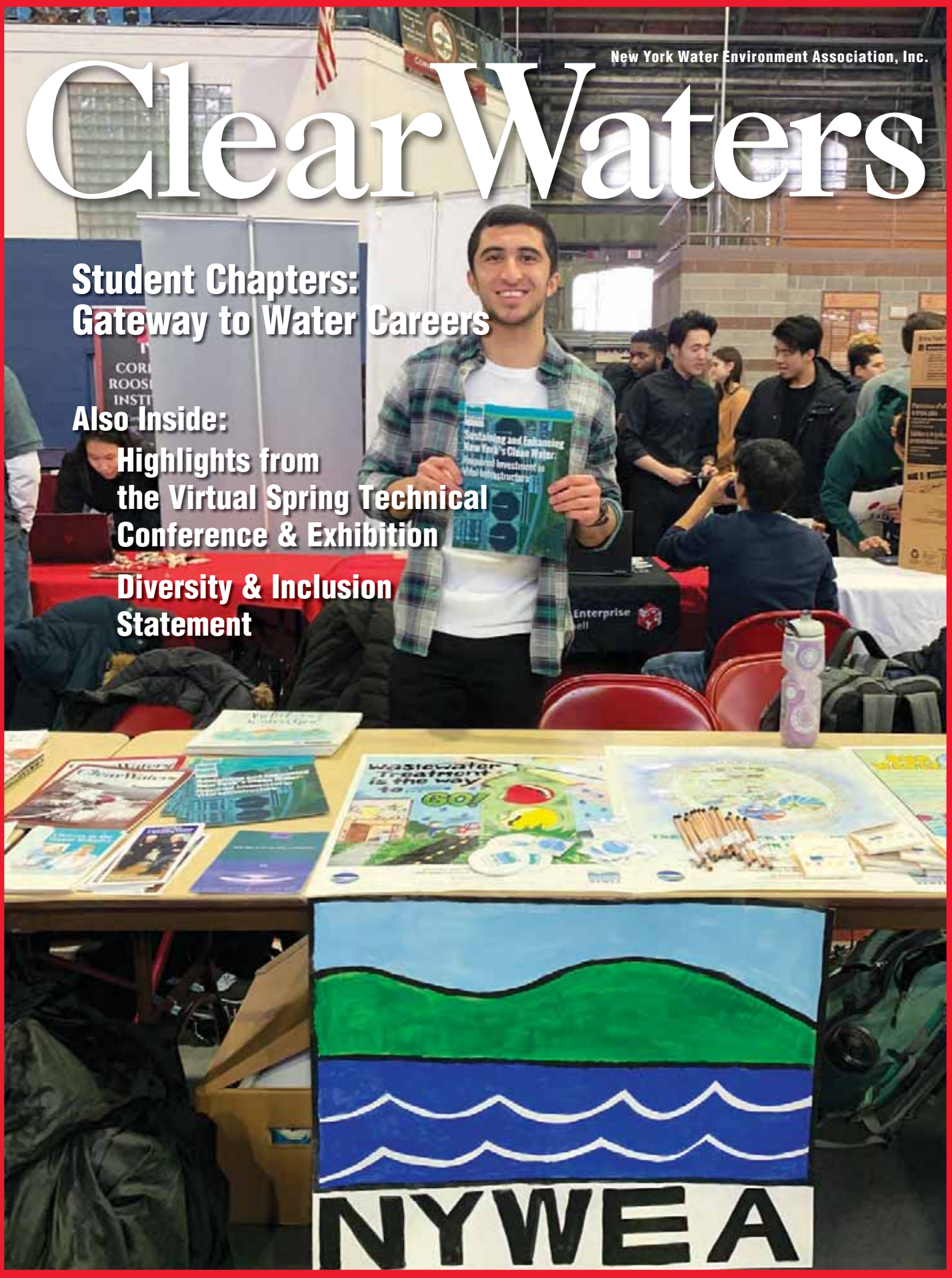
Summer 2020, Vol. 50, No. 2

New York Water Environment Association, Inc.

ClearWaters



Student Chapters: Gateway to Water Careers

Also Inside:

- Highlights from the Virtual Spring Technical Conference & Exhibition
- Diversity & Inclusion Statement

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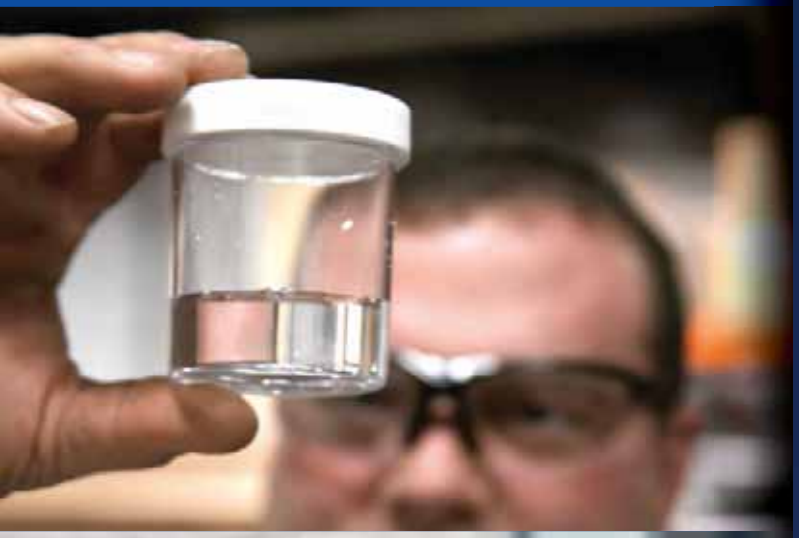

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ATTITUDE MAKES THE DIFFERENCE

Summer 2020, Vol. 50, No. 2

Clear Waters

New York Water Environment Association, Inc.

Cover: ClubFest is an event that showcases many of Cornell University's student organizations to promote member recruitment. Staffing the NYWEA Student Chapter booth at ClubFest is Dhruv Girgenti, Cornell Engineering Class of 2022. *Lydia LaGorga*

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♻ **Clear Waters** ***is printed on recycled paper, using soy-based ink.***

Happy summer everyone! I hope you are enjoying this welcomed change in the seasons and are doing so mindful of the social distancing guidelines in place for everyone's safety. While being cooped up for the past three months has been difficult, there is some light at the end of the tunnel.

As mentioned in my first *Clear Waters* message, I am honored to be the first Young Professional to hold the position of president of NYWEA. This issue of *Clear Waters* focuses on our connection to students and young professionals. My involvement with this great organization started when I was an undergraduate at RPI and continued in my graduate work at Manhattan College. I am living testimony that getting involved with NYWEA as a student helped shape my personal leadership, my career and my future.

Statement from the NYWEA Executive Committee

The Executive Committee members, in conjunction with the leaders of the Diversity & Inclusion Task Force, have developed a statement in response to the recent civil uprisings. This statement was unanimously approved by the NYWEA board of directors. We have been working on bringing attention to the inequity and lack of diversity in the workforce, and feel we have an opportunity to share our commitment to the greater membership on these issues. If you have not seen the notice, which came out over *Currents* as well as NYWEA's social media accounts, please take some time and read this important message *(see page 8)*.

First Virtual Spring Technical Conference

NYWEA offered its first ever virtual conference on June 8-12. For those who did not attend, the format was two sessions per day, two hours each session, beginning at 8 a.m. and concluding at 1 p.m. to allow a flexible schedule for attendees. A new way for exhibitors to get their messages to the members was also implemented during the breaks. These consisted of short videos for exhibitors to showcase their latest offerings. Over 18 educational credits were offered for a very cost-effective registration fee.

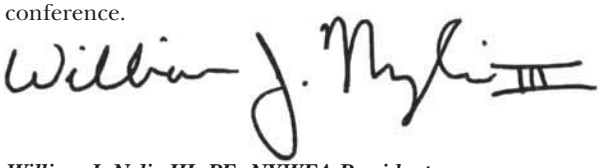
Presentations included Suffolk County watersheds, nitrogen removal, wet weather flow controls, corrosion control measures, I&I removal and data collection utilizing mobile GIS technology. In additional to the technical presentations, a Young Professional Trivia event was held Tuesday night. For those that were unable to watch the WEF documentary *Brave Blue World* Wednesday evening, an additional viewing is being coordinated for the upcoming Watershed Conference, which will be virtual as well.

While many of us would have preferred an in-person event, NYWEA's mission to offer quality technical content for all our members still stands. This Spring Technical Conference was a step toward fulfilling NYWEA's obligation, and the members responded with 175 conference registrations. At the end of the day, this event was a great success from technical, programmatic and financial viewpoints. If you attended this conference and have not provided input on the feedback survey, please do. Your comments will help inform decisions on future conferences both virtual and in person.

Lastly, I would like to thank the many members who helped to make this conference a successful one. Thank you to volunteers from the Spring Conference Planning Committee, Program Committee, moderators, and the Syracuse University Environmental Finance Center's Tess Clark, Savanah Betkowski and Khris Dodson for their technical assistance. Also thank you to Lisa Derrigan, chair of the Program Committee for her leadership, and our appreciation goes out to all of the members of the Program Committee who helped to put together such a great technical program! And finally, none of this would be possible without our esteemed speakers who are willing to share their experiences and expertise.

Upcoming Events

We hope you can join us for the New York City Watershed Science and Technical Conference that will be held virtually Sept. 9–10. This conference showcases the great work being done in the New York City watershed. Please mark your calendar and join us for this conference.



William J. Nylic III, PE, NYWEA President

How Would You Like to Be President in 2024?

If you are interested in a long-term, career-enriching opportunity, please consider applying for this important position. Being an officer is a rewarding experience, but it is also a commitment of five years (Vice President-Elect, Vice President, President-Elect, President, Immediate Past President). When reviewing applicants, the Nominating Committee will take the following items into consideration (no one is expected to have all of these items in their resume):

- Leadership skills.
- Vision and managerial skills.
- Active and viable state committee chair.
- Active and viable state committee involvement.
- Continuous membership tenure greater than 7 years.
- Chapter endorsement (in writing).
- Active member of Chapter Executive Board.
- NYWEA award recipient.
- Chapter representative.
- Chapter officer.
- Regular attendance at state meetings.
- WEF Board of Directors service.

Please submit an electronic resume with a cover letter that highlights any of the attribute areas above to:
Patricia Cerro-Reehil, Executive Director, Email pcr@nywea.org

Nomination deadline is August 9, 2020. All members are eligible to apply!

Adapting to Our New Life Circumstances

As I write this message, we are three months into our new world since the COVID-19 pandemic arrived. Besides feeling vulnerable at times, most of us have found ways to adapt.

Timing is Everything

We all rely on schedules and timelines and NYWEA's programs rely heavily on volunteer-driven ideas and actions. Thankfully, the abstracts for the Spring Meeting had been received and ranked when we realized an in-person Spring Meeting was unlikely. The timing was perfect to reach out to the speakers to ask if they could give their presentations "virtually" and the positive responses were welcome! With the tremendous technical assistance from the Syracuse University Environmental Finance Center, Khris Dodson, and the members of the Virtual Spring Meeting Task Force, the virtual conference was pulled together in short order. By doing so we were able to stay true to the organization's educational mission, and still provide quality virtual sessions to 175 registrants.

Although we missed the face to face engagement and the all-important networking experiences, a virtual meeting format had its advantages. In my personal opinion, these virtual formats give speakers and moderators *even greater exposure* beyond the walls of an in-person conference. By going virtual, attendees (and speakers) could dial in and hook up from *anywhere*, and that was very powerful!

Some of the positive feedback we received about the virtual meeting format included lower travel expenses, less time away from family and work, and the flexibility to make the decision to listen in at the last minute. The negative feedback was primarily the lack of networking and in-person contact. As we live through this pandemic, I would encourage you to share your experiences with us; if you have a story to tell, submit an abstract for NYWEA's 93rd Annual Meeting. The world is your oyster – seize the opportunity!

NYWEA's Member Education events are also transitioning to a virtual format, thanks to speakers' willingness to reconfigure a full day meeting into a series of events. We kicked off the virtual meetings with Kevin Crane's membrane bioreactor training. Look for more virtual offerings, as our educational mission has not changed even though we can't meet in person. Many thanks to the leaders of the Member Education Committee, Madison Quinn and the chapter leaders for helping to make sure this program continues.

Work in Water-WEF Grant

I am so thrilled to report NYWEA has received a grant from the Water Environment Federation for $20,000 to develop a Work in Water (WIW) program. Even with a delayed start due to the pandemic, we anticipate that this grant will be used to foster municipal engagement with potential recruits from a younger workforce through the experience of internships. Thanks in large part to Khris Dodson and the staff at the Syracuse University Environmental Finance Center, this grant builds off the success of Wichita State University's Work in Water program. The WIW program includes hands-on science activities, critical thinking discussion forums, career exploration opportunities and real-world experiences for high school students to learn about water careers that could develop into internships. Ultimately, the goal is to create a platform for municipalities to interact with students who could one day evolve into water quality professionals. One of our important responsibilities is to bring greater exposure to water quality careers to attract the next generation of water professionals, and this grant is a step in that direction.

This grant dovetails nicely with NYWEA's 2019 WEF MA Grant to help alleviate the current workforce situation faced by many municipalities, which includes 30-40% vacancy rates, staffing shortages, mandated overtime and denied vacation requests. We know each one of these issues results in poor employee morale. All of these factors are exacerbated by the pandemic. We need a larger and stronger water workforce to protect public health and the environment.

Full Circle

As we reflect on the success of NYWEA's scholarship program, it is important for us to circle back with them and see where they are in life.

You may ask the question, how do our scholarship winners go on to make a difference in the environment and water quality? On pages 13 and 54 you'll see a few success stories. More can be found on the NYWEA website. The scholarship program has resulted in a deeper connection to the students who will ultimately go on to have successful environmental careers and be NYWEA leaders. We are making a difference!

NYWEA now has 14 student chapters at various colleges and universities throughout New York state. We are delighted to have Cornell University join the ranks! As a result of the hard work of the faculty advisors and the Student University Committee, we now have 556 student members; this is an all time high for NYWEA. Many of the student chapters network and find common areas of interest with other nonprofit organizations. On the state level, as this issue goes to print, we are working with NYSAWWA to structure a joint student membership. Stay tuned, we are hopeful that we can work this out to benefit the students by giving exposure to both organizations, and the work that is carried out by our members.

Heartfelt Appreciation to Essential Workers

During this pandemic, and every day, we extend our heartfelt appreciation to the essential water professionals whose work is largely invisible; however, the impact of what you do is vital to life as we know it. We are so grateful to each one of you for your hard work!

Patricia Cerro-Reehil, pcr@nywea.org

Highlights from NYWEA's Virtual Spring Meeting

One hundred seventy-five people participated in NYWEA's Virtual Spring Technical Conference & Exhibition held during the week of June 8-12, 2020. This unique conference was NYWEA's first foray into a virtual format, and was brought about due to the situation caused by the COVID-19 pandemic. The conference was originally scheduled to take place in person in Hauppauge, New York. Featured here are the speakers and moderators who stepped forward to share their knowledge. The technical focus included presentations on local Long Island water quality initiatives, nutrient removal, collection systems and wet weather, stormwater, regulatory issues, research and innovation, pretreatment, asset management, workforce sustainability, resiliency and energy savings as well as on-site systems. The program involved over 40 speakers sharing their knowledge. During the breaks exhibitor videos were featured. Many thanks to the sponsors and exhibitors who helped support this meeting.

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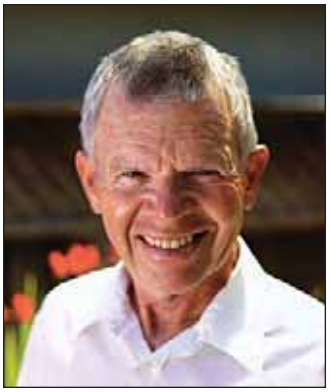

Daniel Smith
AET Tech
Session 2

Nathaniel Smith
AET Tech
Session 2

Ralph Pacifico
Pacifico Engineering
Session 2

Dahlia Thompson, Moderator
Hazen and Sawyer
Session 3

Zarine Ali
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Session 4

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Stony Brook University
Session 5

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Session 10

NYWEA
LEADING THE WAY IN
WATER QUALITY MANAGEMENT

From the Executive Committee of NYWEA

The New York Water Environment Association is an organization that considers all members of the water workforce our fellow colleagues. This role we hold in the water sector gives us the unique opportunity to share our commitment to equality with our membership and, in turn, influence the organizations and companies they are associated with. The leaders of NYWEA recognize that there is a historic issue of inequity in the water sector that continues to persist. We can see it through the attendees at our meetings and the students we meet who are pursuing water-related careers.

Recognizing it is not enough.

At NYWEA, we acknowledge the systemic barriers and discrimination that perpetuates racism and inequality needs to be dismantled in New York and across the country. We know it will be challenging. Its roots are much deeper than what we can see in our industry. Knowing this, we stand in support of those who are peacefully protesting the senseless killings of Eric Garner, Amadou Diallo, Ahmaud Arbery, Breonna Taylor, George Floyd and many others, in addition to protesting the inequities that continue to persist in the communities we serve as clean water professionals.

Acknowledging it is not enough.

Knowing that our membership is not reflective of the communities we serve, last year NYWEA created a Diversity & Inclusion Task Force to foster an environment of belonging in the organization, among other guiding principles. Through that task force and other initiatives, we are working to encourage water careers for students from minority and underserved high schools through the Rise High program. We have also sought to engage college students through the INFLOW program.

Initiatives are not enough.

We will continue to work with our membership to advance our vision and create a diverse, equitable, and inclusive community of water professionals. We challenge and encourage all NYWEA members to pause, examine, and implement actions to remove barriers that divide us. As dedicated members of NYWEA and our communities, we cannot stop trying to make a difference until all of our current and future members of the water workforce feel a sense of belonging in the water sector and NYWEA.

Only then will our actions prove to be enough.

William J. Nylic, III President	Lauren M. Livermore President-Elect	Khristopher Dodson Vice President
Donna Bee Vice President-Elect	Robert E. Wither Immediate Past President	Oluwole McFoy WEF House of Delegates
Anthony Della Valle Treasurer	Timothy Taber Assistant Treasurer	Patricia Cerro-Reehil Executive Director

COVID-19 Times

Many thanks to all of you for your dedication and perseverance during these difficult times. Basic sanitation is a bedrock element of protecting the public health and environment. It must continue unabated, and thanks to the dedicated corps of operators and engineering experts in NYWEA, it has.

If you have not done so already, please take advantage of the excellent technical guidance concerning management and safety during this pandemic. Useful, science-based information is available through a quick word search of websites maintained by the World Health Organization, Centers for Disease Control and Prevention, Occupational Safety and Health Administration and U.S. Environmental Protection Agency. Safety first.

A team of experts operating under the auspices of the Water Environment Federation has also posted a very useful technical summary of how the COVID-19 virus functions and how to best operate during the pandemic. This was an excellent public service by WEF at a critical time. I recommend it highly.

As you know, numerous wastewater upkeep and upgrade projects are underway and in planning. The Environmental Facilities Corporation and DEC have been glad to be your grant funding and financing partners on many of these initiatives.

We realize, however, that the financial picture is murky. We do not know whether or when a federal stimulus will arrive in the form of funding for municipal governments, or grant dollars to bolster current construction projects or get new ones underway.

I've been here before. My advice is to keep up with basic maintenance – a big cost saver in the short and long term. Also, keep going with the design of projects, and even better, get those bid packages ready.

As the saying goes, you need to "be in it to win it." Should a stimulus arrive, the dollars will flow rapidly to those who are ready to go. Really. This happened in 2010 when well over $400 million in federal grants dollars arrived in New York alone. Those communities who had readied projects in tough times to the point of bid (and you know who you are) received major grants.

Thinking and investing in this longer-term manner could save your rate-payers substantial amounts. These investments produce jobs; economic models show that 160 jobs are created or maintained for each $10 million invested in clean water infrastructure. And, of course, it saves operators the angst and community embarrassment associated with environmental insults and enforcement actions.

So, once again, thank you. Keep going, stay safe, and remain strategic in your planning and maintenance efforts to allow us to continue to meet New York's critical public health mission now and in the future.

– James Tierney, Deputy Commissioner for Water Resources
NYS Department of Environmental Conservation

Mentoring is a Relationship

When I graduated college years ago, embarking on a career was a different landscape than it is now. I was basically on my own trying to figure out my path and my daily work.

My first job was with an established fruit tree nursery farm. My training? See it, do it, make sure it's right. One day, I was told to use a propane-powered forklift to move pallet boxes. I was nervous since it was my first time using the forklift. But I did it, and I did not kill anyone in the process. Well, except I almost killed myself when leaking propane hit me like a cannonball. I woke up in a wash sink with a raging headache and confusion. Nothing like asphyxiating yourself with propane. I left after about a year, when I realized that this environment was either going to maim me or beat me. So, in later years when I had a chance to supervise a summer intern, I thought this young woman could benefit from my colorful experiences. And I could lessen my backlog of data entry. Bonus.

My intern was smart as a whip, spouting facts and figures with a snap of her fingers. One day, she made a comment that showed that she did not know the location of a U.S. state, although she had boasted that she could recite all the states and their capitals. I copied a map of the U.S. with just the state outlines and asked her to fill in the state names. But beyond New York, Alaska, Hawaii, California and Texas, she was just guessing. My intern said that she did not need to know these things because she was going to be a lawyer. Huh?

During her internship with me I tried so many ways to show her that life was more than reciting a collection of facts and figures. Life is a murky, interwoven fabric based both on what happened in the past and what we might influence in the future. It was a long summer. I did not feel that I could mentor her at all, and I am sure that she thought I was overbearing. What I learned that summer was that mentoring is a relationship. The intern needs to be open to learning new things while the mentor needs to find a way to present ideas and experiences in a way that is relevant.

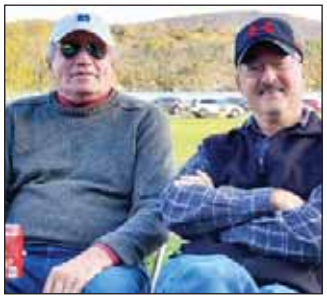
I have four pieces of advice for young professionals. First, knowing facts is not the same thing as having knowledge. Second, allowing yourself to admit when you do not know the answer is a crucial step in self-awareness. Third, confidence in yourself means nothing if you do not allow people to have confidence in you. Lastly, any walls you erect around yourself for protection will sometimes leave you sitting, metaphorically, in a wash sink.

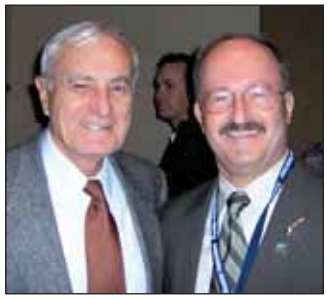
– Eileen M. Reynolds, Certified Safety Professional
Owner, Coracle Safety Management

In Memoriam – Thomas J. Lauro

Treasurer Emeritus, Water Ambassador and President, A True Gentleman and Good Friend to Many

by Patricia Cerro-Reehil





On April 23rd, due to complications from COVID-19, we lost a wonderful NYWEA member and friend, Thomas J. Lauro. For someone who dedicated his life to water quality and the environment, Tom's passing on Earth Day is somehow a tribute, a way we will always remember him. Our sincere and deep condolences to his wife Kathleen and their family, and his close NYWEA friends. As this magazine goes to print, we are working on a way to commemorate him in an appropriate manner.

He is survived by his wife of 44 years, Kathleen O'Connor Lauro, his son and daughter-in-law, John and Jackie Lauro and his daughter and son-in-law, Katelyn and Erik Dier, his grandchildren Tommy, Lucy and Chris Lauro and his mother Irene Lauro. Tom was born in Brooklyn to Vito and Irene Lauro and grew up in Valley Stream, New York. He was a graduate of Manhattan College, receiving a Bachelor of Science in Engineering and a Master of Environmental Engineering. He served in the New York Army National Guard from 1972 to 1978. After working as a consultant, Tom joined Westchester County's Department of Environmental Facilities in 1980 and served as Commissioner from 2007 to 2017 before retiring. He was an avid New York Mets and New York Jets fan, loved golf and served as a volunteer for the St. Vincent de Paul Society at Transfiguration Parish in Tarrytown. He raised awareness and funds for NYWEA, he was a supporter of Concern Worldwide *(concernusa.org)*, a humanitarian non-profit organization that works with the poorest people on the globe to transform their lives and recover from disaster. A loving husband, father and proud grandfather, Tom's great sense of humor, kindness and ability to fix just about anything will also be missed by his large extended family and his many treasured friends.

As many of you know, Tom's dedication to NYWEA was incredible. He was a member for over 40 years and he served as President of NYWEA in 2007. He also held several leadership positions in the Lower Hudson Chapter. Not only was he an ex-officio member of NYWEA's Finance Committee, he was working with his fellow alumni from Manhattan College to make sure an article was featured in this issue on the new lab. Tom was also a routine participant in the Utility Executives and Government Affairs Committee meetings. He worked with elected officials and the environmental advocacy community representing the interest of our utilities across the state. Tom's passion for communicating NYWEA's clean water mission was evident when he attended the WEF Washington, D.C. Fly-ins. Tom received numerous awards from NYWEA, including being inducted into the Select Society of Sanitary Sludge Shovelers and the Golden Manhole Society. His dedication to NYWEA's mission ran deep, as he was also in the process of reviewing the 2020 scholarship finalists. For those of us who have worked with Tom over the years, you know what a beautiful soul he was. Generous and thoughtful, Tom was one of the foundational supporters of the organization's scholarship program.

There has been an outpouring of emails from people who knew and loved Tom, a couple are shared here.

"One of our beacons of light has gone on to join Bob Hennigan and Nick Bartilucci, they shine together through their memories and inspiration guiding us to continue our mission as environmental stewards."

Treasurer, Tony Della Valle

"Such shocking and sad news. I know Tom's passing hits home for all of us. We've lost a close friend, a trusted colleague and the veritable patriarch of NYWEA. Tom's calm demeanor and thoughtful guidance will be dearly missed. Let's offer our thoughts and prayers to Kathleen and their family during this time of profound sorrow."

Water Ambassador, Mike Garland

Thomas J. Lauro will be long remembered and greatly missed.

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Where Are They Now?
Scholarship Success Stories in the Water Workforce

by Madison Quinn

Each year, NYWEA awards $50,000 in scholarships to afford students opportunities to advance their careers. We looked back through past winners of NYWEA scholarships to see where they are now. We found Fazena Bacchus, Elaine LaBate, and Elizabeth Urban Ricci, who won awards in 2018, 2008 and 2005, respectively. So, where are they now?

Fazena Bacchus, 2018 N.G. Kaul Memorial Scholarship Winner

Fazena Bacchus earned a Master of Engineering degree in environmental engineering with a concentration in water resources at Manhattan College. She graduated debt-free in December 2018, thanks in part to the N.G. Kaul Memorial Scholarship. Fazena is a Guyanese immigrant and the first college graduate in her family. After graduating from Columbia University with a Bachelor of Science degree in earth and environmental engineering in 2016, she saved up for graduate school while working at Arcadis on resiliency projects following Hurricane Sandy. She aided in the planning and design of long-term flood protection for critical infrastructure in the face of future storms.

Fazena Bacchus is a 2018 N.G. Kaul Memorial Scholarship winner and is working in the water environment field at Mott MacDonald. *Photograph provided by Fazena Bacchus*

Following her master's degree, Fazena is continuing her work in the water environment field at Mott MacDonald. She has developed a range of design and modeling experience in the stormwater management, corrosion remediation and water treatment sectors. Fazena has taken an active role in the NYWEA Met Chapter Young Professionals Committee where she is the social media coordinator and helps organize and participate in events and discussion panels.

Elaine LaBate, 2008 NYWEA Scholarship Winner

Elaine LaBate is a 2008 NYWEA Scholarship winner, who is now an Associate at Hazen and Sawyer. *Photograph provided by Elaine LaBate*

Elaine is an Associate at Hazen and Sawyer, where she focuses primarily on hydraulic modeling of collection systems, stormwater management and CSO mitigation. She has been working as a consultant engineer in New York City for the last 10 years.

Elaine graduated from Manhattan College in 2009 with a bachelor's degree in environmental engineering. During her time at Manhattan College, Elaine served as the president of the student chapter of NYWEA for approximately two years. During her time as president, Elaine organized several student events, including educational field trips, on campus events to promote recycling, and environmental forums during which professionals shared their experiences with students. Upon graduating, Elaine began working full time while pursuing her master's degree in environmental engineering, also from Manhattan College.

Over the past 10 years, Elaine has had the opportunity to work on a wide variety of exciting and challenging projects. She has a strong background in hydrologic and hydraulic modeling and has been able to apply her skills to both natural and built systems. For the past seven years, she has been working to support New York City's Green Infrastructure and Long-Term Control Plan (LTCP) programs.

Elizabeth Urban Ricci, 2005 NYWEA Scholarship Winner

Elizabeth Urban Ricci is a 2005 NYWEA Scholarship winner and oversees the coordination of wastewater projects for the EFC. *Photograph provided by Elizabeth Urban Ricci*

Liz joined the New York State Environmental Facilities Corporation (EFC) in Albany in 2014 as an environmental engineer, providing technical assistance to municipalities seeking low-cost financing for their water quality infrastructure projects. Since 2015, EFC has awarded grant funds across the state to municipalities to upgrade their water and wastewater infrastructure. Liz became the manager of the Western Project Section at EFC in 2017, overseeing the coordination of wastewater projects in Central New York, Southern Tier and Western regions of the state. She also has managed the New York State Water Infrastructure Improvement Act (WIIA) and Intermunicipal Grants (IMG) grant programs on behalf of EFC.

Before joining EFC, Liz worked as a water/wastewater engineer at Barton & Loguidice, D.P.C. in the Albany area. Liz earned a Bachelor of Science degree in civil and environmental engineering, with a minor in industrial hygiene and mathematics from Clarkson University, where she was also a member of the NYWEA student chapter. As an enthusiast of the outdoors and wildlife, she loves to travel and is an avid hiker, so you can often find her on the trails in the High Peaks region of the Adirondacks.

Madison Quinn is the Communications Manager and Scholarship Program Administrator for NYWEA and may be reached at madison@nywea.org.

To Our Water and Wastewater Operations and Maintenance Staff, We Thank You

by Sara Igielski

It is 7 p.m. on a spring evening in New York City, 2020. We pause. We step outside. We clap. Together, at a safe social distance, we clap for our front-line workers, showing our gratitude to our health care professionals, our first responders, our pharmacists and our grocery store workers, among others. During this unprecedented COVID-19 health crisis, we have heard and will continue to hear many well-deserved words of praise for these essential workers, but let us pause, and consider those who are not always in the spotlight.

While many may take clean, safe drinking water and uninterrupted sanitation services for granted, as members of the water and wastewater community we understand the effort that goes into providing these services. We know these individuals and have developed personal relationships with many of them throughout the course of our careers; we collaborate with them every day; we rely on them. These individuals bear an immeasurable responsibility to the communities they serve. And, in New York City, the Department of Environmental Protection's (DEP) Operations and Maintenance Staff (O&M Staff) have continued to provide these essential services over the course of the stay-at-home order that was enacted in mid-March 2020.

I spoke with some of our DEP O&M Staff, who graciously provided their firsthand accounts so we might gain a better understanding of the many challenges they face in their day-to-day work.

Samy Phlamon, the Hunts Point Wastewater Resource Recovery Facility (WRRF) Plant Chief, and his Deputy, Stefanos Hatzistefanis, explained that P.E.P. – Personnel, Equipment and Process – has and continues to guide their daily priorities. In order of importance, the O&M Staff prioritizes personnel first, then equipment and finally, process. At the Rockaway WRRF, Kevin McCormick, the Plant Chief, echoed similar sentiments, noting that while individual tasks or priorities have not changed due to COVID-19, the way they communicate undoubtedly has changed. Both Hatzistefanis and McCormick stressed the importance of

A few of our *Thank You Video* participants sharing personalized messages to the NYCDEP water and wastewater professionals. From left to right, Top: Madison Quinn, Tanya Jennings, Sundaram Solai, Fazena Bacchus and Ellen Obenshain. Middle: Mark Supplee, Patricia Cerro-Reehil, Sara Igielski, Ody Donovan and Steve Martino. Bottom: Percy Feral-Goldstein and Walter Walker.

safety at their facilities.

It may come as no surprise that the COVID-19 protocols disrupted some level of normal operations. Like all of us, O&M Staff practice social distancing, and thus, have much less social interaction with one another. However, if O&M Staff cannot maintain a 6-foot distance, they wear face masks. Personal protective equipment (PPE) has always been important; however, McCormick suggested that during a global health crisis, PPE such as facemasks took on another meaning. As Hatzistefanis stated, "We all understood the importance [of adhering to DEP COVID-19 protocols, and] therefore, we trusted that our sacrifice would protect our O&M Staff, [our families] and ourselves."

At Rockaway WRRF, O&M Staff no longer sign-in on pen and paper. Instead, McCormick conducts a roll call at the beginning of the 7 a.m. shift. The frequency of meetings has also been reduced. Previously, the daytime shift had 7 a.m. and 2 p.m. daily meetings in the lunchroom, the facility's designated area of assembly. McCormick has relocated the 7 a.m. meeting to the Blower Room and canceled the 2 p.m. meeting altogether. In comparison to the lunchroom, the Blower Room is significantly larger and offers O&M Staff the ability to stand further apart, and practice social distancing. Of course, due to the clangor of the blower equipment, the team meetings are relatively brief.

Despite these added challenges, McCormick emphasized that this unprecedented situation only reinforced his staff's admirable work ethic. While McCormick acknowledged that "nobody likes change," they remained committed to their job; they accepted and adapted to "new normal" at work. Hatzistefanis recognized that "[their] whole job shifted in a good way."

Perhaps Mark Supplee says it best: in our industry silence is an indication of a job well-done. But today that does not suffice. So, the NYWEA Metropolitan Young Professionals (YPs) decided to challenge this norm and redefine the response to a "job well done." How can we applaud them? How can we recognize them? How can we express the value of their work? To do so, we spearheaded a *Thank You Video* initiative for our DEP O&M Staff. We asked for the support and participation of our YPs and relied on them to further broadcast this initiative to members of our water and wastewater community.

From all our participants, who represented all facets of the industry, our message was simple: Thank You! As Patricia Cerro-Reehil described in the video's closing moments, "There is a bond that we all share in water quality, [and] that we have in the New York Water Environment Association. So, [this video] sought to promote recognition publicly for water professionals, and [to] elevate the profession, while at the same time elevate the spirits of our wastewater resource recovery operators and water operators working on the front lines not only at New York City DEP but throughout New York state."

Although this video serves as a moment of recognition for our O&M Staff, we hope that this initiative fulfills a larger purpose. May it encourage you to share your knowledge with those who may not understand and offer your sincerest gratitude to these essential workers on a job well done. Let us teach others a broader definition of front-line workers. Let us reflect on the sacrifices and risks our O&M Staff accept on a daily basis. As we all wash our hands and clean our homes, let us remember and remind others of the source of this water and where it goes.

I want to extend my thanks to Samy Phlamon, Stefanos Hatzistefanis, and Kevin McCormick for your time, your words and of course, your leadership. To my YP Metropolitan Board Members – Ellen Obenshain, Abigail Farrell and Scottie Donovan – thank you for your creativity, kind-spirit and commitment.

Sara Igielski is a project engineer with Greeley and Hansen, as well as chair of the NYWEA Metropolitan Young Professionals. She may be reached at sigielski@greeley-hansen.com or yp@nyweametro.org.

Manhattan College's Engineering and Science Center to Be Centerpiece of College's South Campus

by Peter McHugh

Thanks to a leadership gift of $5 million from Patricia G. Higgins, Ph.D., and Cornelius J. (Neil) Higgins '62, Ph.D., Manhattan College in Riverdale, New York, is ready to open a 30,000-square foot academic facility on its South Campus, adjacent to Leo Hall.

Slated for completion in the fall of 2020, the Patricia and Cornelius Higgins '62 Engineering and Science Center is the cornerstone of Manhattan College's modernization of facilities that support its engineering and science programs.

"Manhattan College had the greatest influence on what I had to do after graduation, provided me with an excellent basis, both moral and academic, to continue in graduate education and in an engineering career. It's really where my heart is," Neil Higgins said.

"We felt we needed to do this," said Patricia Higgins. "We're both first-generation college students. Contributing to Manhattan, with its support of first-generation students, is very important for us."

Cornelius J. Higgins '62, Ph.D., is a founder and chairman emeritus of Applied Research Associates Inc., a national engineering and science firm headquartered in Albuquerque, New Mexico. He held the position of principal and chief executive officer from 1979 until his retirement in 2010.

After graduating from Manhattan College, Higgins served as a civil engineering officer in the U.S. Air Force in Albuquerque, Taiwan and Vietnam. Upon completing his service in the Air Force, he joined the defense analysis industry as assistant division manager for Mechanics Research Inc., and later as vice president of Civil/Nuclear Systems Corp. In 1975, Higgins joined the University of New Mexico as chief of the geotechnical analysis division of the civil engineering research facility, where he directed and performed studies on explosive ground shock and cratering, soil dynamics, wave propagation, soil-structure interaction and earthquake engineering. His technical areas of specialization include applied mechanics, dynamics, experimental simulation, systems engineering and probabilistic analysis.

A registered professional engineer and a member of the American Society of Civil Engineers, Higgins received a B.S. in civil engineering from Manhattan College in 1962, an M.S. in astronautics from the Air Force Institute of Technology in 1964, a Ph.D. in civil engineering from the University of New Mexico in 1978, and an executive MBA from the University of New Mexico in 1987. He also received an M.A. in liberal arts from St. John's College in 2007. He was elected to the Manhattan College board of trustees in October 2003.

Patricia G. Higgins, Ph.D., served on the faculty of the College of Nursing of the University of New Mexico from 1980 to her retirement in 2000, rising from visiting instructor to full professor. Her specialty was Maternal-Child Nursing. Before her academic career, she taught health occupations at Rio Grande High School in Albuquerque, New Mexico, and nursing refresher courses at Albuquerque Technical-Vocational Institute. In her earlier career, and while teaching, she raised three children.

A registered nurse and a member of the Association of Women's Health, Obstetric and Neonatal Nursing, Higgins received a diploma in nursing from the Bellevue and Mills School of Nursing in 1963. After raising her family, she entered the University of New Mexico to receive a B.S. in health education in 1975 and a B.S. in nursing in 1978. She then received an M.S. in nursing from the University of Arizona and returned to the University of New

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Exterior of the Higgins Engineering and Science Center, under construction in February 2020. *Laura Meoli Ferrigon*

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Mexico for a Ph.D. in Health Education in 1984.

What the Higgins Center Will Look Like

The Higgins Center will provide the necessary resources for a 21st-century education in engineering and the sciences. A grand atrium will welcome students and faculty to the three-story structure. Fourteen ultramodern laboratories will support and expand teaching and research in each of the college's engineering and science disciplines. There also will be space for collaborative learning and interdisciplinary partnerships among students and faculty.

"The Higgins Engineering and Science Center is a magnificent, state-of-the-art addition to our facilities," said Brennan O'Donnell, president of Manhattan College. "This is the first step in a comprehensive program of renewal of our labs and classrooms on South Campus."

Strategically located across from the Research and Learning Center, the new facility will be connected to a refurbished Leo Hall. Together, the structures will feature 140,000 square feet of academic space for engineering and the sciences. They also will anchor Manhattan College's new South Campus.

Manhattan College's History of Engineering

For much of its long history, Manhattan College has moved forward by heading north.

It began in the winter of 1852, only a few years after the founders opened a struggling academy on the Lower East Side. They were Brothers of the Christian Schools, five selfless educators, four of whom had crossed the Atlantic in 1848.

Followers of Saint John Baptist de La Salle, patron of teachers, the Brothers embraced a revolutionary concept of learning: that all students deserve access to a quality education, regardless of means; and with it, the opportunity to make the world better. That charism had transformed the way young people learn throughout Europe.

Now they would do likewise in America's biggest city. At the behest of Rev. John Joseph Hughes, New York's first Catholic archbishop, the Brothers launched their school on Canal Street. Students clamored for admission as "paying boarders," "paying day scholars" and "poor scholars." Their cramped building quickly ran out of space.

The Brothers looked uptown. Mulberry Street was first, with room for a growing number of "day scholars." Next, a group of "Catholic gentlemen," among the first of many loyal supporters, helped locate a suitable tract up in Manhattanville. The Academy of the Holy Infancy opened there in May 1853. Ten years later, the State of New York chartered the newly named Manhattan College.

Quality is its own advertisement. Along with poor, working and middle-class students, our college also attracted some of the city's leading Catholic families. Within 50 years, Manhattan College outgrew its second campus. Alumni and friends helped the Brothers choose a site even farther north, to Riverdale, at the city's edge. Construction began in November 1921. Two years later, they moved for the last time.

A New Era of Tradition and Change

Manhattan College has flourished on its hilltop campus for close to 100 years. Visible for miles around, its stately gables and cupolas are now part of the college's identity.

The move north offered more than a permanent campus, and for a time, there was room to grow. As Manhattan settled into its Riverdale home, it drew even more applicants from a wider range of circumstances. And like its peers, the college needed to prepare students for a marketplace altered by industrialization.

Ever pragmatic, the college rose to the challenge. Building upon its strengths in the Arts and Science (1853), Manhattan went on to establish the Schools of Engineering (1892), Education and Health (1921), Business (1927), and Continuing and Professional Studies (1970). As options grew, dedicated lay faculty joined the Brothers in the classrooms.

Academic growth sparked much-needed expansion. In a century's time, the number of campus buildings grew from six to 20, with newer ones encircling the historic quadrangle like satellites: Cardinal Hayes Library (1938), Hayden Hall (1952), Jasper Hall (1957), Thomas Hall (1960) and the Draddy Gymnasium (1978).

The need for space even compelled Manhattan College to reverse its historic trajectory. The college turned its attention a few blocks south. A 10,000-square-foot building on Broadway became Paulian Laboratories. Just across Manhattan College Parkway, the former Fannie Farmer factory reopened as the Leo Engineering Building, and a neighboring furniture warehouse was converted into the Research and Learning Center.

Engineering and Science Center Plays Key Role in Campaign

The Higgins Engineering and Science Center is the newest addition to Manhattan College's South Campus, and a vital part of Manhattan College's capital campaign, *Invest in the Vision: The Campaign for Manhattan,* which was officially launched in September 2019.

Invest in the Vision is the most ambitious fundraising effort in Manhattan College's 167-year history. It is a historic $165 million campaign to secure and strengthen the college's educational mission at a time of unprecedented technological, social and economic change.

Invest in the Vision has identified three top priorities:

1) Enhancing facilities on the college's North and South campuses.
2) Growing endowment for scholarships and faculty development.
3) Securing unrestricted support for academic programming and student support services.

"For 166 years, our college has prepared students from across the economic spectrum for ethical leadership in their communities and careers," O'Donnell said. "With the support of loyal alumni and friends, we will remain a beacon of opportunity for all students, regardless of means."

"We remain dedicated to making a quality education accessible to all students who are academically prepared," O'Donnell continued. "College expenses are placing an increasing strain on a growing number of families, and our alumni and friends are coming forward to help close the financial gap. In doing so, they are investing in our students and in our future."

To learn more, or to make a gift to the *Invest in the Vision* campaign, visit *https://manhattan.edu/giving/Invest-in-the-vision/index.php* or contact Kevin Courtney, Director of the Capital Campaign, at *kcourtney01@manhattan.edu* or (718) 862-7714.

Peter McHugh is the Director of Media Relations & Strategic Communications for Manhattan College and may be reached at peter.mchugh@manhattan.edu.

At Manhattan College, Collaboration is Key

by Matthew L. Sweeney

Although our semester has been cut short and our lives interrupted by the COVID-19 pandemic, the Manhattan College Chapter of the New York Water Environment Association had an eventful 2019-2020 school year. The chapter began the school year with a general meeting to inform new and returning students about the programming they could expect from us. Every semester, the Executive Board of the Manhattan College Chapter strives to provide ample opportunities for local volunteering, professional networking and educational panels.

One of the best initiatives that we carried throughout the 2019-2020 school year was rebooting the NYWEA Manhattan College Chapter Instagram page. We started this during the 2018-2019 school year but took it to new heights this year. We started during summer 2019 by posting profiles of our Executive Board listing our hometowns, hobbies and why we joined NYWEA. We followed this with postings of our events as well as utilizing the Story feature to promote our events. This proved to be a great avenue for expanding awareness of our club on campus, leading to interactions where students had heard of us on Instagram before meeting the board in person. This is an initiative that we look forward to expanding in the semesters to come.

During the fall 2019 semester, the Manhattan College Student Chapter hosted a movie night, a drinking water treatment plant field trip, and a Halloween activity for local youth. In addition to these activities, the chapter collaborated on a leaf composting event, an ice cream social, a wetlands restoration, a networking dinner and a beach cleanup. Our members participated in a weekly climate strike and I led a discussion on the intersection of faith and environmentalism.

Weekly climate strikes, inspired by Greta Thunberg, were held on the Manhattan College campus to promote awareness of environmental issues. Various clubs including the Manhattan College Chapter of NYWEA were represented. *Pamela Chasek*

Coney Island Beach Cleanup

On Sept. 21, 2019, our chapter traveled to Coney Island to assist in beach cleanup activities. The event was hosted by the American Littoral Society, supported by dozens of volunteers from across New York City. We were given free Aquaman sun visors, left over from the previous year's cleanup. I love when popular culture can provide a platform for environmental advocacy!

The primary garbage that our group encountered were plastic bottles and cigarette butts. Although I would primarily associate Coney Island with its amusement rides and aquarium, I often forget

The Manhattan College Chapter of NYWEA after a day of cleaning trash off the beach at Coney Island early in the 2019-2020 school year. *American Littoral Society*

that it has natural features. One can only imagine what this locale looked like a few hundred years ago, when salt marshes teemed with life and open beaches extended for miles.

The Coney Island beach cleanup was the ideal event to start off our volunteer opportunities for the fall semester, generating enthusiasm for the club. Some of our members were inspired to start planning garbage cleanups for their local beaches, such as Orchard Beach in our home borough of the Bronx. The group came to the consensus that Coney Island beaches were decently clean as compared to our local spots and received far greater care. We lived out the lesson we learned through this experience through expanding our participation in events in Van Cortlandt Park and Brust Park.

Long Island Field Trip to Roosevelt Field

Following our excursion to the Borough of Brooklyn, the Manhattan College Chapter of NYWEA took a trip to Nassau County on Long Island. Considering that we learn in a classroom setting primarily at the college, this field trip provided an excellent opportunity to see the practical side of our design classes. The site selected was the Roosevelt Field Water Treatment Plant, which supplies water to the Roosevelt Field Mall and the surrounding buildings. I had previously shadowed the Water Bureau at the Nassau County Department of Health and had traveled to this site as part of that program. The Roosevelt Field Mall is the second largest mall in New York state and was built upon the same field that Charles Lindbergh took off from in his famous transatlantic flight.

This site was popular for tours because it showcased many of the different technologies necessary to properly treat Long Island groundwater. The treatment plant was equipped with an air stripper tower to remove volatile organic compounds (VOCs), a tank of granular-activated carbon (GAC) to remove nutrients such as nitrogen and phosphorus, and a lime injection system to lower the

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The Manhattan College Chapter of NYWEA after touring the Roosevelt Field Water Treatment Plant in Westbury, New York, which provides water for the second largest mall in New York state.
Nassau County Department of Health

Poster for the Ice Cream Social hosted by Students for Fair Trade and the Manhattan College Chapter of NYWEA. Students could enjoy a cup of Ben and Jerry's ice cream while learning about agriculture's impact on the environment and how to create a more equitable food production network. *Matthew Sweeney*

water's pH, as Long Island water tends to be slightly acidic. I was pleased that I could include this site visit as part of programming to complement our volunteering and educational efforts with the technical aspects of the water industry.

For anyone that has lived on Long Island in recent years, the term volatile organic compound has been synonymous with the Grumman Plume under Bethpage, New York, which has been spreading for decades in the groundwater supply. Long Island residents depend entirely on the groundwater system for their water supply needs and the VOC of concern with the Grumman Plume is called 1,4-dioxane. This served as a reminder that the work of the environmental engineer is to protect the public's health. This issue was another reason I thought the site would be an excellent place to visit for the budding environmental engineers at Manhattan College, including myself.

It is incredible to think that we may play a role in safeguarding our communities through proper research and implementation of engineering principles. It is the ingenuity of the engineer that allows us to not become overwhelmed at the prospect of a polluted water supply but rather develop a method to treat it before it is distributed to customers. We found that all our group's concerns about water treatment had been considered in the design of the plant. Behind every healthy community is a thoughtful engineer. The engineer's work would be wasted if not for the trained operators keeping the plant running and the contractors installing the equipment. I am grateful that the New York Water Environment Association honors all these links in the chain of water treatment and distribution, without which we could not exist.

Collaboration On and Off Campus

Our chapter increased our collaborative efforts this school year with on-campus and neighborhood groups. On Oct. 16, 2019, our chapter assisted the Students for Fair Trade with a Climate Change Ice Cream Social during which we explained the connection between workers' rights and environmental stewardship. Ben and Jerry's ice cream was served, a notable brand that utilizes fair trade products for its company. Our members volunteered at a wetland restoration event Oct. 19 in Van Cortlandt Park, a spot where Manhattan College students frequently spend their time. To conclude the month of October, Manhattan College hosted an annual Safe Halloween for the local youth that our chapter participated in through creating activities to spark interest in water resources.

The month of November 2019 was an especially busy month for our chapter with four events taking place. We continued our movie night series, which started in spring 2019, with our Nov. 8 showing of *The Lorax*. Our chapter hoped to attract students outside of the engineering disciplines with events such as these, through partnering with other campus environmental groups such the Green Club and Mother Nature Club.

On Saturday, Nov. 9, the Stewards of Brust Park and the New York City Department of Sanitation (DSNY) hosted a Leaf Crunch event, which collected leaves for DSNY's composting program. Our group of Manhattan College students, working with members from the community, collected almost 200 bags of leaf litter at the neighborhood event! The event was a major success for community involvement and promoting awareness for the city's composting program.

To conclude our chapter's November collaborations, we cosponsored a networking dinner with our American Society of Civil Engineers chapter. I led a discussion on how faith and environmentalism can serve to benefit one another, and our chapter participated in a bake sale with the Mother Nature Club to benefit relief efforts for the Brazilian oil spill and California wildfires. I was able to discover these groups through creating the Jasper Environmental Coalition, which seeks to facilitate better communication between the clubs interested in environmentalism through cosponsoring events such as the bake sale and movie night.

What the Future Holds

Spring 2020 was planned to be a semester full of events for the Manhattan College Chapter of NYWEA before the cancellation of the school year in response to the COVID-19 pandemic. A March 10 Young Professionals Panel had been organized, as well as an Earth Day street tree care event, partnered with DSNY. We were also going to fill our calendar with Van Cortlandt Park and Brust

Park cleanup events.

Despite cancellation of our planned events, we were able to host our first general meeting of the semester as well as attend the 92nd Annual NYWEA Conference in February at the Marriott Marquis Hotel in Manhattan. Our chapter was honored to receive the second place Student Chapter Award and I was grateful to have received the Outstanding Student Service Award.

As we are unsure of what the fall semester will look like, our chapter has yet to plan events. We would like to continue to collaborate with the groups that we have already worked with, as well as expand our efforts. Our traditions of a movie night each semester and volunteer events in Van Cortlandt Park and Brust Park are ones that we would like to continue as well. Our hope is that we will be able to connect better with the other NYWEA Student Chapters and that this will lead to intercollegiate collaborations beyond the University Night.

The Manhattan College Chapter is always ready to discuss our organization with anyone interested, from the engineering school to the business school, from freshmen to seniors. We would not be able to accomplish all that we do without the help of professors Kevin Farley, Jessica Wilson and Walter Saukin. Most of our membership was first introduced to the organization by Professor Saukin in the freshmen year engineering course, ENGS 115. In addition to our great faculty mentorship, our club would not function without our executive board headed by Ms. Leicy Ortiz-Jupiter. Although she will be graduating this year, we hope to have her back as soon as possible to speak about her postgraduate experience.

I want to thank the New York Water Environment Association for supporting our student chapter efforts in the New York City metropolitan region and the Manhattan College Chapter looks forward to the year to come.

Matthew L. Sweeney, Class of 2021, is vice president of the Manhattan College Chapter of the New York Water Environment Association. He is studying civil and environmental engineering at Manhattan College and may be reached at msweeney01@manhattan.edu.

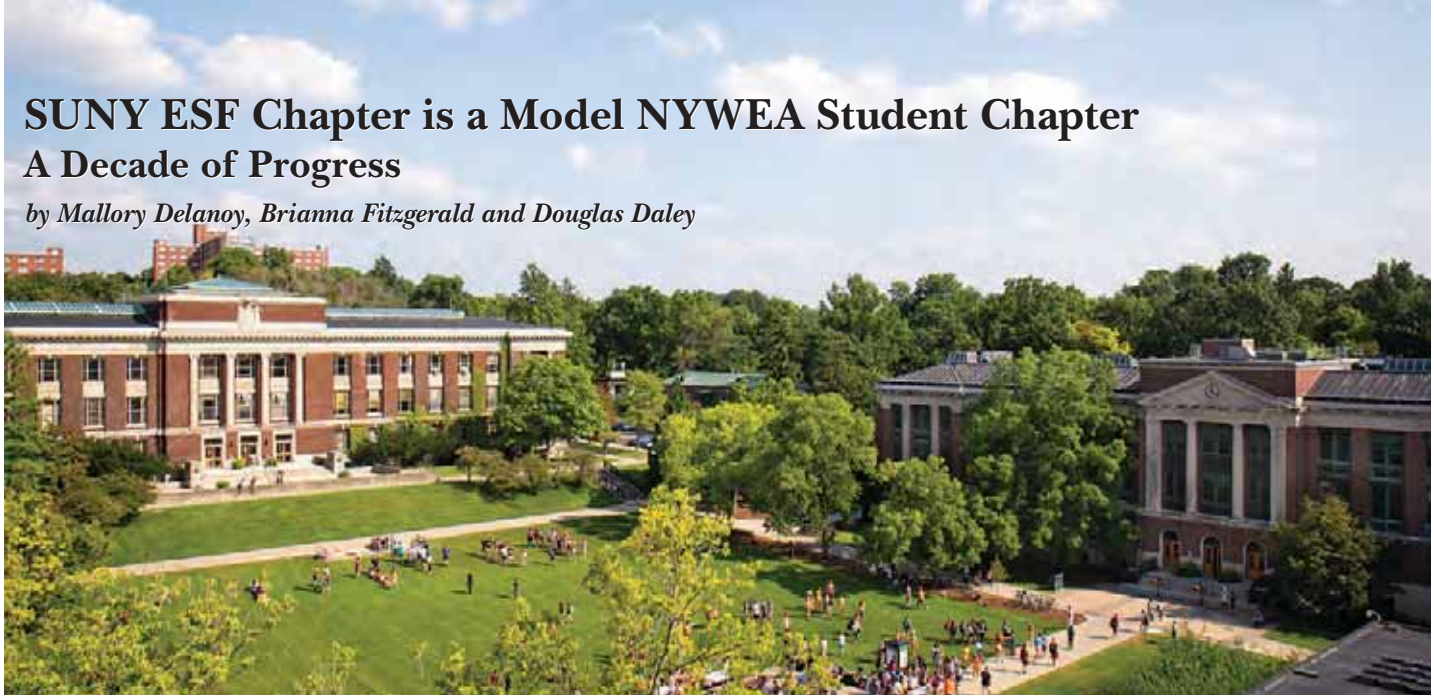
The Manhattan College Chapter of NYWEA at Leaf Crunch 2019, Brust Park. Participants and community residents raked up almost 200 bags of leaves for the New York City Department of Sanitation composting program. *Stewards of Brust Park*

The Manhattan College Chapter of NYWEA after the first general meeting of the semester for the 2019-2020 school year.
NYWEA Manhattan College Chapter

SUNY ESF Chapter is a Model NYWEA Student Chapter

A Decade of Progress

by Mallory Delanoy, Brianna Fitzgerald and Douglas Daley



View of the SUNY ESF campus in the fall of 2018. *SUNY ESF Communications Office*

Founded in 1911, the State University of New York (SUNY) College of Environmental Science and Forestry (ESF) in Syracuse, New York, is one of the nation's premier colleges focused exclusively on studying the environment, developing renewable technologies and building a sustainable future. The college is a recognized leader in the practice of sustainability; close to being one of the first carbon-negative institutions in the nation, it is consistently ranked as one of the top two "greenest" colleges in the nation.

ESF's Syracuse campus occupies 18 acres and the college operates 25,000 acres of experimental and demonstration forests, field stations and research sites across Central New York and the Adirondacks. The ESF student body consists of more than 1,800 undergraduate and 350 graduate students.

The college offers 26 undergraduate and 41 graduate degree programs, including bachelor's, master's and doctoral degrees in the environmental sciences, landscape architecture, forest and natural resources management, environmental engineering, bioprocess engineering and related areas of scholarship and transdisciplinary studies. The Syracuse campus also offers online options, while associate degrees may be earned at ESF's Ranger School in Wanakena, New York, at the 2,800-acre campus in the heart of the Adirondack Park.

SUNY ESF NYWEA Student Chapter

The ESF NYWEA student chapter is a very close-knit group of motivated and driven individuals. Over the past decade, the chapter has grown from a relatively moribund condition into a well-organized and active chapter, thanks to our academic adviser and with the support of the professionals in Central New York. Perennially, our chapter members engage with Water Environment Federation (WEF) members at the local chapter, state association and federation levels, and participate in professional development and service activities in the local community. Highlights include attending the Water Environment Federation Technical Conference (WEFTEC) over the past several years; students typically use their travel and time to support the service projects sponsored by the Young Professionals (YP), along with attending technical sessions. At the 2018 WEFTEC in New Orleans, eight student volunteers helped construct and decorate a rain garden at a recreation center in New Orleans. For the first time in the chapter's history, several members competed in the 2020 WEFTEC Student Design Challenge against other students from over 24 teams from across the United States and abroad.

Collaboration with the Central Chapter

At the state level, we communicate closely with NYWEA's Central chapter, especially in YP-sponsored events such as hockey night and networking events. With financial support from the Central chapter, along with funding from both student government and chapter events, the ESF chapter has consistently brought at least 12 students to the NYWEA annual meeting in New York City for the past decade. Each year, we usually have one or two ESF students presenting papers and/or posters in the University Forum, several of whom have been awarded prizes for their quality of presentation. Our chapter adviser, Doug Daley, an associate professor in environmental resources engineering, often gives research presentations that are faithfully attended by the student members. The ESF students also participated in the wastewater design challenge held during the student chapter luncheon, which has been a successful activity for the past three years that increases networking amongst the student chapters. For the past three years, teams containing ESF students have won the friendly and fun competition.

The Central chapter has been a staunch supporter of our endeavors to grow into a high-functioning student chapter of NYWEA. Together, we have organized networking events between the young professionals and the students. Our chapter members enjoy getting advice from engineers and other water professionals currently in the workforce. For the past decade, at the NYWEA Central chapter's annual spring meeting in Central New York, the chapter has reserved speaking slots for at least two student presentations, and chapter members are regularly in attendance. This has always been a great event for our student members to attend and experience a local professional conference event.

Public Outreach and Volunteering

Water resource conservation and stewardship is what brings our chapter members together. Our students volunteer at local events

like the Onondaga County Clean Water Fair and the Great New York State Fair. The Clean Water Fair is held at the Metropolitan Syracuse Wastewater Treatment Plant (Metro) every fall. Our students help with setup and cleanup, as well assisting during the event. Students also help community members obtain rain barrels through the Save the Rain Program in Onondaga County. During the Great New York State Fair in the early fall, the ESF chapter will usually hold a tabling event to promote water resource conservation. Students also lend a hand to the NYWEA executive office staff and professional members who host an information booth during the fair.

Our on-campus events are structured to involve nonmembers as well as members; these events are important to fulfilling our mission. We do volunteer work on campus, like maintaining green infrastructure (GI). ESF has many rain gardens that demonstrate and solidify the college's place as a leader in environmental sustainability. Our members attended training to lead groups maintaining on-campus green infrastructure. As a chapter, we weeded the GI on campus to kick off the start of the academic year.

Other hands-on chapter meeting activities include building models for water filtration. Students were given various materials to construct a gravity filter for cleaning dirty water. After everyone's filter was tested the meeting wrapped up with a lesson about how sand filters work, and how difficult it is to build a water filter with simple items one might have at home. This emphasizes the importance of resilient water infrastructure and aid especially during natural disasters, as clean water becomes a luxury in desperate times. We then partnered with Acorns to Action, a natural disaster relief club on campus, to bring this educational activity and message to a campus fundraiser to support the Bahamas after Hurricane Dorian.

Opportunities to Learn and Share

When our chapter is not conducting hands-on activities, we have informational meetings. We have had guest speakers share their experiences at our meetings. Some were ESF alumni talking about life after graduation, what they wish they had done during their undergraduate studies and what advice they would give our students to prepare for the real world.

For the past three years, the ESF chapter has co-sponsored a Women in Science and Engineering guest speaker panel, which is open to the whole student body. We invite women from various backgrounds in the science and engineering disciplines to learn about and discuss their experiences as women in these fields. Our students seek advice on how to overcome some common challenges and how to minimize the discrimination women experience in the workplace.

SUNY-ESF students receive 1st Place for the Student Chapter Recognition Grants at 92nd Annual Meeting in New York City. *Trent Wellot*

We also frequently aid students with preparing for career fair events throughout the year. Over the course of the year, we worked with career services to host interactive professional development workshops during our scheduled meeting times. Workshops have included resume building tips, elevator pitches, how to prepare and follow up after networking events, and mock interviews. Mock interviews were hosted and led by students, allowing us to tackle typical tough job interview questions in the comfort and safety of their chapter peers and allow them to figure out the best way to answer.

Our Successes

With our driven and motivated chapter members, we have been able to build a successful NYWEA student chapter. Our chapter and its members have been recognized with multiple awards for our hard work. Our ESF student chapter has received the Association Student Chapter Recognition Grant for each of the last six years, based on a number of criteria such as our student newsletter, our interdisciplinary and service efforts, and the various events previously described. Many of our students have received individual awards for their contributions to their NYWEA student chapter and to the Association, including recent awardees Elena Araya, Mallory Delanoy and Brianna Fitzgerald.

A large part of our success is due to our chapter's ability to recruit new members with the same passion for our water environment. With a constant stream of new members, our chapter can transition seamlessly as seniors graduate and newcomers take their place in leadership positions. To advertise our chapter presence, the ESF chapter participates in campus outreach events like fall, winter and spring activity fairs. Our largest event is the fall activity fair because there is a large pool of first-year students looking to find a way to become more involved on their campus and find a niche. Once students start becoming serious about finding an internship or job, they turn to our chapter's fluency in professional development and our renowned professional conference attendance. Because of this, we tend to have our greatest number of students usually being in the sophomore or junior years of their undergraduate studies.

Despite this odd recruitment pattern, we always manage to have a smooth transition of leadership as each year of students graduate and move on to their professional careers. Perhaps most importantly, our academic adviser, Doug Daley, works closely with us in planning our annual events, challenges us to recruit new members from across disciplines, presents opportunities for growth, and works behind the scenes to maintain the long-term relationships with the water environment professionals. He regularly attends the annual meeting and WEFTEC, providing mentoring and guidance in helping students find their place in the water environment.

Mallory Delanoy is past president of the NYWEA SUNY ESF student chapter and may be reached at mldelano@syr.edu. Brianna Fitzgerald is president of the NYWEA SUNY ESF student chapter and may be reached at bmfitzge@syr.edu. Douglas Daley, associate professor at SUNY ESF, is the student chapter adviser and may be reached at djdaley@esf.edu.

Center of Excellence in Healthy Water Solutions Ready to Work with Water Industry to Solve Environmental Problems

by Stephen Shaw and Stefan Grimberg

Clarkson University and the State University of New York College of Environmental Science and Forestry (SUNY ESF) have recently launched the Healthy Water Solutions Center of Excellence with funding from the Empire State Development's Division of Science, Technology and Innovation (NYSTAR) program. With the backing of New York state senators Rachel May and Joseph Griffo, the Center was formalized by the state in July 2019. The Healthy Water Solutions Center is one of 13 Centers of Excellence within New York. This Center, as with the others, is intended to build relationships between academia and the private sector in order to attract new business, develop and commercialize new products, train the workforce, and identify innovative solutions to water-related problems facing the state.

The joint Center of Excellence between Clarkson and SUNY ESF combines water-centric expertise from both institutions. SUNY ESF faculty and staff have a focus in environmental monitoring and management of natural systems. This entails specialty areas in remote sensing, restoration ecology and environmental chemistry. Research areas at Clarkson span process development in physio-chemical and biological treatment, remediation technologies, assessing pollutant transport in the environment, and water resources engineering with its focus on understanding river systems.

In its first year, the Center concentrated its activities on two priority areas: harmful algal blooms (HABs) and per- and polyfluoroalkyl substances (PFAS).

PFAS

In December 2019, a workshop on PFAS brought together industry, academia and government participants at Clarkson's Beacon Institute to explore collaborative research projects related to PFAS detection and removal. Workshop participants discussed resource needs and resources that can be leveraged to address emerging contaminants. Opportunities were identified to enhance partnerships with industry, new technology development startups, the Development Authority of the North Country (DANC works on regional infrastructure needs and provides technical services to municipalities), small water and wastewater treatment facilities, and county-level representatives. Enhancing partnerships, in turn, provides opportunity to leverage existing facilities and can help toward creating technology test beds and advance workforce development.

Technology development has resulted in two startup companies at Clarkson, as well as opportunities to build more permanent industry partnerships and support new small-businesses that specialize in PFAS treatment technologies. Two processes developed by Clarkson faculty are currently undergoing testing. DMAX Plasma LLC uses plasma to destroy PFAS in water. According to the co-investigators, professors Thomas Holsen and Selma Mededovic Thagard, "Through fundamental investigations of processes that occur at interfaces of plasmas with liquids containing harmful chemicals, they discovered that plasma processing is extremely effective for the degradation of PFAS." The enhanced contact plasma reactor ***(Figure 1)*** developed at Clarkson University is the most effective and efficient technology available today for degrading these compounds, requiring only minutes to transform them into less harmful products. The reactor has been installed into a mobile trailer and successfully field demonstrated at the Wright-Patterson Air Force Base in Ohio.

Figure 1: The enhanced contact plasma reactor.

DMAX Plasma LLC

The second process is an in situ ultrasonic treatment system as an option for destructive PFAS remediation developed by RemWell LLC, led by engineering professor Michelle Crimi and Fiona Laramay, a recent Ph.D. graduate in environmental science and engineering. Cavitation produced by ultrasound in liquids causes microlevel increases in temperature and pressure up to approximately 5000 degrees Kelvin and 1000 bar, respectively. Ultrasonic degradation of PFAS can occur in situ by implementing one or more reactors in a horizontal well. These horizontal wells are installed at shallow depths, relative to horizontal wells used in the oil industry, and passively capture the surrounding groundwater, eliminating the need for ex situ groundwater pumping ***(Figure 2)***. The reactor has been investigated through laboratory and modeling studies and is being prepared for pilot demonstrations.

In addition to the faculty associated with the two recently formed startup companies, other faculty at SUNY ESF and Clarkson are investigating novel approaches for the treatment of PFAS. Yang Yang, assistant professor in Civil and Environmental Engineering at Clarkson, is working with colleagues on applying an electrochemical filtration process where PFAS-bearing water is passed through the porous anode where the contaminant is destroyed. Yang's lab at Clarkson University developed a series of microporous (5-50 micrometer) filter anodes. The process on the lab scale has shown to be efficient and it is currently being studied on landfill leachate.

HABS

In the realm of HABs, the Center has been working with the New York State Department of Environmental Conservation to develop innovative technologies capable of mitigating small algal blooms as part of an emergency response. While there are a wide range of preventative strategies to reduce the likelihood of algal blooms, there remain few options for trying to eliminate algal blooms once

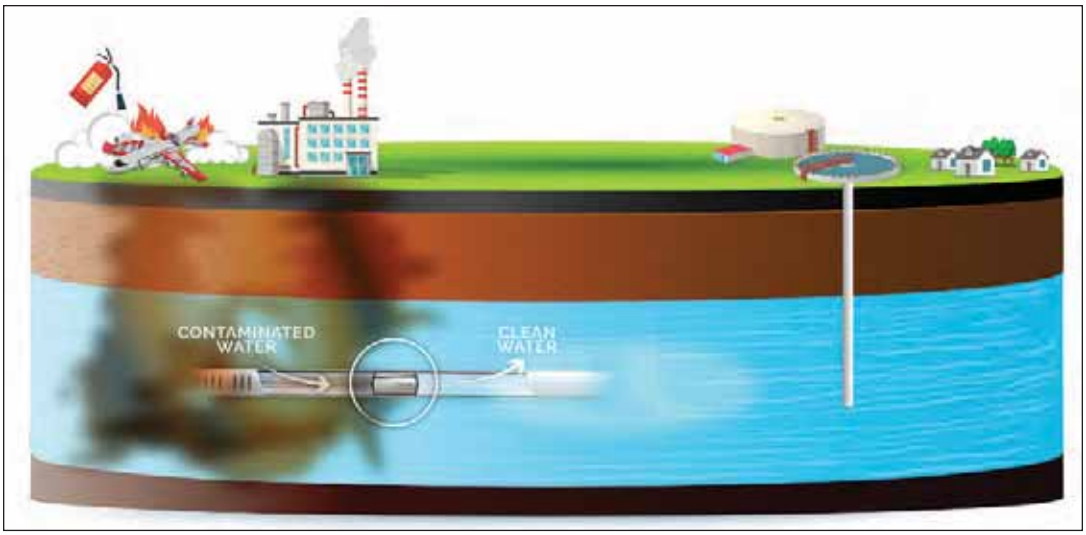


Figure 2. Schematic of in situ PFAS treatment process. *RemWell LLC*

they emerge. Clarkson, under the direction of Yang Yang, has been developing a novel electrochemical oxidation filtration technology to treat HABs where water passes through a porous filter anode ***(Figure 3)***. SUNY ESF has been integrating chemical oxidation with a hydrodynamic cavitation process that enhances chemical mixing and also appears to independently damage algae. Both technologies have been successfully tested in the laboratory, and they are currently being scaled up for field testing in the summer of 2020.

Seed Grants and Resources

To strengthen researcher collaboration among the two institutions and potential industry, the Center has funded three seed-grant projects, two of which are further exploring research to manage and mitigate HABs. Professors Giorgos Mountrakis (SUNY ESF) and Tyler Smith (Clarkson) are investigating new methods of detecting algal blooms using remote sensing. Professors Sitaraman Krishnan (Clarkson) and Bandaru Ramarao (SUNY ESF) are studying new bio-based polymers that can be used for the flocculation and removal of harmful cyanobacteria. The third seed-grant project, led by professors Gyu Leem (SUNY ESF), Yang Yang (Clarkson) and Chang Geun Yoo (SUNY ESF), will focus on PFAS research. Their project is entitled "Heterogeneous Photoelectrocatalytic Decomposition of Perfluorooctanoic Acid with a Mesoporous Structured Photoanode." Results from the three seed-grant projects will be available in the coming year.

The Center of Excellence will also help promote resources on the SUNY ESF and Clarkson campuses that are available to outside users. SUNY ESF has recently invested $3 million in new analytical chemistry equipment for a lab focused on contaminants of emerging concern ***(Figure 4)***. The facility is designed to have the capabilities of doing both targeted (known) and untargeted (unknown) analysis of water, wastewater, air and solid samples using different mass spectrometry equipment. The facility is expected to become operational during the summer of 2020.

Unique to the Healthy Water Solutions Center of Excellence is an awareness that for the solutions to environmental problems, economic benefits do not just come from the commercialization of new products and technologies. Economic benefits may come through savings of public funds, preserving of property values, maintaining recreational and tourism opportunities, and avoiding treatment costs in the first place. Thus, the Center is broadly interested in partnering to explore ways to enhance all these direct and indirect economic benefits in addition to the more traditional approaches to economic development. For more details on the resources offered by SUNY ESF and Clarkson contact the Center's email address: *coe@clarkson.edu*.

Figure 3. Assistant professor Yang Yang, right, and graduate students displaying the HAB elimination prototype. *Yang Yan*

Figure 4. Thermo Fisher Scientific gas chromatograph/mass spectrometer Orbitrap in a new SUNY ESF lab focused on contaminants of emerging concern. *David Kiemle*

Stephen Shaw is an associate professor in Environmental Resource Engineering at the State University of New York College of Environmental Science and Forestry and may be reached at sbshaw@esf.edu. Stefan Grimberg is a professor in Civil and Environmental Engineering at Clarkson University and may be reached at grimberg@clarkson.edu. The authors are co-directors of the Healthy Water Solutions Center of Excellence.

Clarkson University NYWEA Student Chapter

by Lauren Howard, Hannah Beebie and Madison Quinn

Lauren Howard and Hannah Beebie both joined Clarkson University's student chapter of NYWEA in their freshman year in 2017. They have been highly active representing the Clarkson student chapter at both NYWEA and Water Environment Federation (WEF) events, including attending NYWEA's annual meeting and the WEF Technical Exhibition and Conference (WEFTEC).

On Sept. 21, 2019, Hannah and Lauren joined students and young professionals from across the nation to participate in the WEF Service Project at WEFTEC 2019 in Chicago, Illinois. The 200 volunteers worked together to build "El Jardin de Agua", a rain garden and bioswale project at Maria Saucedo Scholastic Academy in Chicago. The service project engaged WEFTEC volunteers to make a positive impact on the local community by improving on-site stormwater management to keep children's feet dry on their way to school.

At NYWEA's 92nd Annual Meeting, on Feb. 4, 2020, the Clarkson student chapter was recognized with a NYWEA Student Recognition Grants award.

The Clarkson NYWEA student chapter meets jointly with another environmental student group, Synergy. Together the two groups have participated in on-campus events to raise awareness about sustainability. The students hosted a career event last year, featuring two water professionals, Jamie Howard, regional manager at DN Tanks, and Kevin Hickey, project manager at C2AE. Jamie and Kevin shared their experiences working in the field of water quality with the students over dinner. The student groups also had the chance to do some team building and networking by participating together in an escape room challenge.

Hannah Beebie (left) and Lauren Howard at the WEFTEC 2019 Service Project, building a rain garden at Maria Saucedo Scholastic Academy in Chicago. *Hannah Beebie*

Lauren Howard, Clarkson Class of 2021, serves as the president of the NYWEA student chapter. She is majoring in environmental engineering. Hannah Beebie, Clarkson Class of 2021, serves as vice president of the NYWEA student chapter. She is majoring in biology with a minor in environmental engineering. Madison Quinn is the Communications Manager and Scholarship Program Administrator for NYWEA and may be reached at madison@nywea.org.

Hannah Beebie (left) and Lauren Howard, with NYWEA President Robert Wither and Clarkson University Student Chapter Advisor Stefan Grimberg, accept the Student Chapter Recognition Grants award at NYWEA's 92nd Annual Meeting in New York City. *Trent Wellot*

Clear Waters Summer 2020 30

2020 NYWEA SCHOLARSHIPS WINNERS

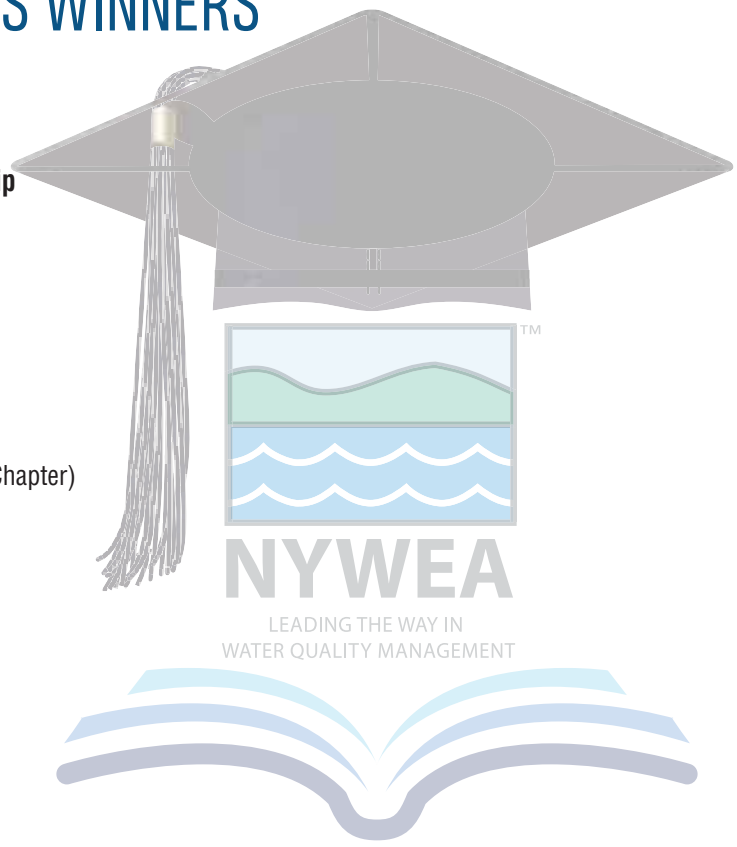
$12,000 Environmental Career Scholarship
Eric Smith (Niagara County, Western Chapter)

$8,000 Nicholas J. Bartilucci Environmental Scholarship
Sarah Nace (Suffolk County, Long Island Chapter)

$4,000 General High School Scholarships
Lucy Smith (New York, Metropolitan Chapter)
Kiernan Beckett (Monroe County, Genesee Chapter)

$4,000 Child of Member Scholarships
Lauren Howard (Clarkson University Student Chapter, Capital Chapter)
Jacob Sullivan (Steuben County, Genesee Chapter)

$4,000 College Student Chapter Scholarships
Matthew Sweeney (Manhattan College, Metropolitan Chapter)
Julie Yaish (CCNY, Metropolitan Chapter)
David Ip (CCNY, Metropolitan Chapter)
Timothy Webb-Horvath (SUNY ESF, Central Chapter)



CONGRATULATIONS!

Cornell Joins the Club

by Lydia LaGorga, Brian Rahm and Jery Stedinger

Our Chapter

NYWEA's Student Chapter of Cornell University is an interdisciplinary professional development club, passionate about water quality. Established in 2019, we have worked hard to foster an educational and fun community. Our student chapter offers connections within a specialized network of water quality professionals and peers; we have hosted NYWEA professionals for informative presentations, and trivia nights to stimulate our own curiosity. This year NYWEA Cornell learned about wastewater treatment, river restoration and general water pollution problems. We advertised at Cornell ClubFest, traveled to New York City for the annual NYWEA conference, and hosted a resume workshop. On the horizon we will be hosting a documentary night to show *"NOVA: Poisoned Water,"* which details the water crisis in Flint, Michigan. We also hope to work in collaboration with the State University of New York College of Environmental Science and Forestry and Clarkson University student chapters to grow our network of student peers and professionals.

Our Officers

Lydia LaGorga, President

Lydia LaGorga is currently a sophomore at Cornell University, pursuing a bachelor's degree in environmental engineering. She aspires to use her degree to connect underserved communities with sustainable drinking and wastewater infrastructure. Last summer Lydia worked at a water resource recovery facility assessing infrastructure and creating a computerized maintenance management system with geographic information systems (GIS). Outside of NYWEA, Lydia is a member of AguaClara Cornell's wastewater research team and plays ultimate Frisbee. Lydia is also an avid hiker, who loves to play piano and bake.

Lydia LaGorga, NYWEA Cornell president, enjoys hiking in her spare time. *John LaGorga*

Bridget Childs, Secretary

Bridget is currently a junior studying environmental engineering at Cornell University. Her future career goals include promoting environmental sustainability and increasing access to clean water. She is super excited to have been one of the founding members of the NYWEA student chapter at Cornell. She spent last summer as an undergraduate intern for the New York State Water Resources Institute (NYSWRI) working on projects related to community outreach. This semester, she joined AguaClara Cornell, a project team dedicated to clean drinking water technologies. Outside of academics, Bridget is an enthusiastic flute player in the Big Red Marching Band. She also loves making soups and exploring Ithaca's gorges and natural areas.

Bridget Childs is secretary for NYWEA Cornell and revels in the natural areas around Ithaca. *Zach Siper*

Rebecca Holstein, Treasurer

Rebecca Holstein is currently a junior at Cornell University, pursuing a bachelor's degree in environmental engineering. She hopes to take what she has learned into the financial industry, specifically through sustainable financing. Outside of NYWEA, Rebecca is a project manager for Cornell's biomedical engineering project team, a member of AguaClara Cornell's investment team, and a Cornell Ambassador. Apart from extracurriculars, Rebecca spends her time exploring Ithaca's beautiful gorges and state parks.

Rebecca Holstein is treasurer of NYWEA Cornell and appreciates Ithaca's beautiful gorges and state parks. *Austin Jennings*

Two Colleges, One Chapter

The Cornell NYWEA Student Chapter is open to all students from Cornell's colleges, schools and majors. Major participation

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comes from two colleges: the College of Engineering and the College of Agriculture and Life Sciences. Chapter members access expertise and training from an array of disciplines, ranging from water and wastewater process engineering to natural resources and hydrology, ecology, water management and social sciences.

Brian G. Rahm is the director of the NYSWRI and faculty adviser from the College of Agriculture and Life Sciences. "I think we are coming to understand more and more that today's water resource issues are not just engineering challenges, but complex social, economic and governance problems," said Rahm. "Students looking to make positive change in the world of water management can do so from many perspectives, and I think Cornell's diverse faculty helps them understand that."

Jery Stedinger is the Dwight C. Baum Professor in Engineering and faculty adviser from the College of Engineering. "I am delighted that Cornell now has a NYWEA student chapter. It will give our students a valuable link to the real world of water resources management with their engagement in an active professional organization," said Stedinger. "Cornell has students and faculty interested in water resources management in a number of departments and colleges; this organization will give students and professionals a place to meet each other and engage in important discussions."

The New York State Water Resources Institute (NYSWRI)

Cornell Student Chapter members have worked closely with NYSWRI, one of 54 institutes across the country that together constitute The National Institutes for Water Resources. This system of institutes, federally established under Water Resources Research Act of 1964, is tasked with identifying and addressing critical water resource issues in each state. In New York, state legislation established NYSWRI at Cornell in 1987, and directed the institute to engage in research, outreach and training in support of state agencies, water resource managers and the public.

To fulfill its training mission, NYSWRI established a student summer internship program about nine years ago. Interns are responsible for independent research and outreach activities that address NYSWRI-identified water resource challenges in the state of New York. Students meet with NYSWRI staff and, when appropriate, with Cornell and external faculty who have expertise in relevant disciplines. A weekly group meeting is held with all interns to encourage critique and discussion, and to provide a venue for interns to present and refine their communication skills. Throughout the summer session, NYSWRI staff organize a series of field trips highlighting important aspects of water resources. Examples include trips to:

- Cornell University water filtration facility.
- Cornell University Lake Source Cooling and hydroelectric facilities.
- Onondaga County Save the Rain stormwater management project.
- Ithaca Area Wastewater Treatment Facility (IAWWTF).

NYSWRI interns appear as co-authors on peer-reviewed publications, professional papers, conference talks and posters. NYSWRI maintains contact with alumni as they pursue their professional and academic careers with the goal of developing a peer group with broad water resource interests.

To learn more about the NYWEA Cornell, or NYSWRI, please contact the authors or visit the websites:

NYWEA Cornell: *https://cornell.campusgroups.com/nywea/home/*
NYSWRI: *https://wri.cals.cornell.edu*

Lydia LaGorga is president of NYWEA Cornell and may be reached at lcl66@cornell.edu. Brian Rahm is the director of NYSWRI and NYWEA Cornell's faculty adviser from the College of Agriculture and Life Sciences and may be reached at bgr4@cornell.edu. Jery Stedinger is the Dwight C. Baum Professor in Engineering and faculty adviser to NYWEA Cornell from the College of Engineering and may be reached at jrs5@cornell.edu.

Cornell University in Ithaca, New York. *istockphotos.com, kickstand*


MTA-LIRR Third Track


Ronkonkoma Vision Project


Clean & Green Biosolids Processing Facility


Bergen Point WWTP


Glen Cove WPCP


Hofstra / Northwell School of Medicine


Greater Atlantic Beach Water Reclamation District


NCDPW Barnes Ave SSO Correction


Museum of American Armor


Courthouse Commons Pump Station


FDNY


Village of Greenport BNR


Lawrence-Cedarhurst Consolidation


Sacred Heart Academy


Baxter Pond


Massapequa Creek Preserve


Garvies Point


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The City College of New York: We're the Original and We're Still Meeting the Need

by Krish Ramalingam

Since 1847, The City College of New York (CCNY) has provided a high quality and affordable education to generations of New Yorkers in a wide variety of disciplines. CCNY embraces its role at the forefront of social change.

Located in the heart of New York City, CCNY is home to such important "firsts" as:

- The first college explicitly founded on the ideal of educating the "whole people".
- The first documentary film program in the U.S.
- The first intercollegiate lacrosse game played in the U.S.
- The first student government in the nation.
- The longest running Alumni Association in the U.S.

It is ranked number one by The Chronicle of Higher Education out of 369 selective public colleges in the U.S. on the overall mobility index. This measure reflects both access and outcomes, representing the likelihood that a student at CCNY can move up two or more income quintiles. In addition, the Center for World University Rankings places CCNY in the top 1.2% of universities worldwide in terms of academic excellence. More than 16,000 students pursue undergraduate and graduate degrees in eight professional schools and divisions, driven by significant funded research, creativity and scholarship. CCNY is as diverse, dynamic and visionary as New York City itself.

Outstanding programs in architecture, engineering, education and the liberal arts and sciences prepare our students for the future and produce outstanding leaders in every field. Whether they are drawn to the traditional fields, like philosophy or sociology, or emerging fields like sonic arts or biomedical engineering, our baccalaureate graduates go on to graduate programs at Stanford, Columbia or the Massachusetts Institute of Technology, or they stay right here in one of our 50 master's programs or our doctoral programs in engineering, the laboratory sciences and psychology.

Nowhere else in the city do undergraduates have so many opportunities to conduct research with professors and publish and present their findings. In our science, engineering and social science programs, more than 300 undergrads work alongside senior researchers in funded projects. Leading the City University of New York (CUNY) system in funded research, we house several research centers, and recently two new advanced research centers have risen on South Campus. Nearly all our full-time faculty hold Ph.D.s or, like our architecture faculty, maintain professional practices. Art professors exhibit their work, film professors make films, and music professors perform in venues around the country.

The campus is alive with student activity. CCNY fields 16 varsity teams that compete in NCAA Division III. Students workout in an equipment-rich fitness center and socialize in more than 100 student clubs. And our students come from around the corner and world, representing over 150 nationalities. CCNY is an integral part of the civic, urban and artistic energy of New York City and inseparable from its history. We are the City that built this city.

Student Chapter Activities

The mission of the NYWEA CCNY Student Chapter is to promote

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Shepherd Hall and the City College campus. *Joann Huang*

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Krish Ramalingam, center, with CCNY student group attending the NYWEA 92nd Annual Meeting in New York City. *Trent Wellot*

knowledge about sustainable water quality management in the CCNY community. We will be hosting trips, seminars, workshops, and other events throughout the year. Examples of past trips include:

- October: Governor's Island Composting Facility Tour – Students spent the afternoon touring the island and learning more about composting and minimizing waste.
- February: NYWEA 92nd Annual Meeting – Students spent the day listening to workshops, networking with engineering professionals, and becoming more acquainted with the water field.
- April: NYWEA Young Professionals Resume Critique Event – NYWEA Young Professionals (YP) members critiqued students' resumes and gave advice on how to apply for jobs and internships.

The current executive board members are President Elaine Famutimi, Vice President Julie Yaish, Treasurer David Ip, and secretaries Cho Than and Rebecca Nguyen.

President Elaine Famutimi

Elaine Famutimi is a senior undergrad studying environmental engineering. Her interests include water resources, spatial modeling and habitat conservation. In her free time, she enjoys learning about birds and tracking their migration data on QGIS. She hopes to eventually work in a field related to water quality analysis or planning for habitat conservation under changes due to climate change.

Vice President Julie Yaish

Julie Yaish is a senior studying environmental engineering at CCNY in the honors undergraduate program. She is currently working in an environmental research lab in which she is exploring various methods of water purification and water testing and its application in the monitoring of wastewater treatment within New York City. Julie plans to continue down the path of water-quality analysis and is constantly looking for new opportunities to bring her closer to her desired career path.

Treasurer David Ip

David Ip is a junior majoring in environmental engineering. During his free time, he likes to hang out with friends and play chess. He has interned with Earth Matter, a nonprofit composting facility that seeks to educate the public about recycling habits and composting. This past summer, he also participated in the National Science Foundation's Research Experiences for Undergraduates (NSF REU), a federally funded research program, at Texas A&M University at Kingsville. There, he assisted in testing the effectiveness of hydrologic models to predict water levels in South Texas.

Secretary Cho Than

Cho Than is a junior-year student in the environmental engineering program. She transferred to CCNY from LaGuardia Community College in fall 2019. Engineering inspires her by how green technology can help people live in a sustainable way with the least detrimental effects on the environment. Her goal right now is to get an undergraduate degree in environmental engineering. As a next step, she wishes to study abroad for her graduate degree in Germany for green technology. Her hope is to ultimately go back to Myanmar and conduct survey/research to help the local community.

Secretary Rebecca Nguyen

Rebecca Nguyen is currently a junior studying earth system science and environmental engineering. This year she had the privilege of shadowing the e-board of this club and from this opportunity she has learned many things that she will be using in the remaining time as a student at CCNY.

Krish Ramalingam is the Director of Research with CCNY-NYCDEP Applied Research Program and may be reached at kramalingam@ccny.cuny.edu. Photographer Joann Huang is a Creative Design Specialist with the Office of Institutional Advancement and Communications at CCNY.

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NYU Tandon:
Street-level Flood Sensing for Research and Community Advocacy

by Tega Brain, Elizabeth Henaff, Andrea Silverman, Junaid Khan, Charlie Mydlarz, Praneeth Sai Venkat Challagonda, Mwale Chiyenge and Catherine Hoar

The floorboards creak as you dash downstairs and out in the misty morning air. On the street, you suddenly stop in your tracks. The end of your street is flooded again. Did it rain that much last night? Edging up to the suspiciously murky water, it is impossible to see where it is coming from. How are you going to get past it to the subway? Do you take off your shoes and wade through the slowly swirling pond? You are going to be late. Again!

This is an increasingly likely scenario for many Americans. Of the myriad impacts that are predicted to accompany climate change, flooding is expected to have an outsized influence on public health, infrastructure and mobility in urban areas. In New York City, sea level rise and an increase in the occurrence of high-intensity rainstorms have already led to a dramatic increase in flood risk, particularly in low-lying and coastal neighborhoods *(Talke et al 2014)*. More intense rain means more water flowing into a stormwater system that has been sized for climate conditions of the past, leading to backups, overflows and water on the streets and sidewalks.

Street flooding in the Gowanus neighborhood in Brooklyn, New York.
Andrea Silverman

Standing water in urban environments can present many risks. It can impede mobility and expose pedestrians to a cocktail of contaminants, including industrial and household chemicals, fuels and sewage. And yet little data exists on the frequency and extent of urban surface flooding, exposing a need for hyperlocal information on the presence and depth of street-level floodwater. Access to real-time information on flooding would help cities to make better decisions about infrastructure investments as well as assist residents to identify navigable transportation routes and make informed decisions to avoid exposure to flood water contaminants.

To address this knot of problems, we formed Flood Sense, a project that brings together our group of environmental engineers, biologists and designers at New York University's (NYU) Tandon School of Engineering, to investigate ways to collect better information about urban flooding. The focus of this work is not catastrophic flooding that accompanies sudden disasters like hurricanes, but smaller, more frequent rain- and tide-related floods that cause regular risk and damage in urban areas. Already in 2019, 3,221 calls were placed to New York City's 311 service request portal reporting street-level flooding, suggesting that this issue already impacts the lives of many.

Flood Information Applications

A key component of the Flood Sense project is the collection of real-time flood data to address the distributed and often unpredictable challenge posed by urban flooding. We envision that flood data could be incorporated with urban mobility tools like navigation applications to steer commuters or Community Emergency Response Teams (CERT) away from flooded areas. It would be valuable for policymakers who need to understand infrastructure capacities when making decisions on rezoning and development as well as for public utilities managing flood control improvements. This data would also be useful for advocacy groups involved in how these decisions impact their constituency. A local example of these stakeholders exists in the debate surrounding planned rezoning of Brooklyn's Gowanus neighborhood to increase the number of high-density residential units. Community groups feel that the neighborhood's already chronic flood problem is being exacerbated by the increased load on sewer systems from the additional residential units. Local flooding data could provide all parties with vital information to make data-driven decisions to address these concerns in the planning process.

To produce this data, we are prototyping a networked, low-cost flood sensor that can detect standing water and share this data with relevant stakeholders. These sensors will be deployed on sidewalks and streets where flooding has been reported and will record a range of data points including flood frequency and water depth. A central part of this project is to critically evaluate different sensor options, taking into consideration issues like privacy and surveillance, cost, durability, accuracy and stakeholder priorities.

Our research team will also benefit from the availability of real-time flood data in a parallel project that seeks to understand the microbiological hazards in urban stormwater in Gowanus. Stormwater overflow from combined sewer systems contains raw sewage; these combined sewer systems are common in most neighborhoods in New York City. We are investigating whether sewage-related microbes within stormwater could deposit and persist on sidewalks and surfaces after a flood event, and the related the public health implications of this.

A key aspect of this project is having the capacity to collect water samples during and after flood events. After spending several afternoons standing in the pelting rain at project sites where flooding had previously been reported and finding no flooding at all, we realized that street-level flooding is a complex and understudied issue resulting from the confluence of dynamics including weather, tides, time of year, and infrastructure loads to name a

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few. Real-time information that alerts our research team to the occurrence and severity of a flood event would be invaluable.

Flood Information for Public Health

Sewage contains several contaminants of concern to environmental and human health, including high concentrations of microorganisms like bacteria, viruses and protozoa. Some of these are harmless commensal organisms, while others are pathogenic. The pathogens include bacteria and viruses that cause a range of illnesses, such as gastroenteritis, hepatitis and respiratory illness. Additionally, the commensal microorganisms that are indigenous to the gut and sewage are quite different from the population encountered in the general urban environment.

Microbial communities are an essential part of our ecosystems, and all environmental surfaces support microbiomes whose diversity and identities reflect the history of that environment. Different surfaces can support different communities due to surface properties and chemistry. Disruptions, such as flooding, can change a microbial community profile in ways that reflect the disruption itself and yet little metagenomic data exists on the extent and form of this impact. The little data that does exist shows evidence of a shift in the microbial population in the aftermath of a flood, away from its stable population and toward a population that mirrors that of the flood water. One recent study of the microbiome of the New York City subway system *(Afshinnekoo et al 2015)* illustrated this: after the South Ferry subway station in lower Manhattan flooded with seawater during Hurricane Sandy, the microbial community switched from a profile typical of train stations (predominantly human skin microbes and those used in fermented foods) to that of a marine environment. The microbiome of a surface often serves as its environmental memory.

High school students conducting research with the Flood Sense team work with Ph.D. student Mwale Chiyenge to collect swab samples. DNA from samples is sequenced to evaluate the impact of floodwaters on the urban microbiome. *Elizabeth Henaff*

Several questions anchor our ongoing project on the impact of floodwaters on urban microbiomes: How does the microbiome change in an urban place that experiences regular flooding by stormwater or sewage? It is possible that these communities may also shift to reflect those of the floodwaters and include both commensal and pathogenic organisms. This, in turn, raises many questions related to the evolution of the microbial community on different surfaces. How does the community fingerprint reflect the flood event? And are there lingering health risks from sewage microorganisms after floodwaters recede? In the context of the current global climate change, we urgently need to know more about our local microbiomes and the role these lifeforms have in our lives.

Community Engagement in Design and Deployment

The Gowanus area is located a few minutes from the NYU Tandon campus. This is a neighborhood that regularly experiences street-level flooding during high-intensity rainstorms. It is also home to the Gowanus Canal, which is emblematic of many post-industrial sites across the country. Once an important site for production and manufacturing, these industries have since moved elsewhere, leaving a material, economic, and social legacy of toxicity and pollutants. Following the 2013 designation of the canal as a Superfund site by the U.S. Environmental Protection Agency, plans were announced to remediate the waterway. These plans coincided with the rapid gentrification of the area, deepening economic inequality and residential displacement of historic communities who have disproportionately been affected by the contaminated environment. The community organizations Gowanus Canal Conservancy and Gowanus by Design both have stakes in data-driven advocacy for their constituents and are active contributing members to the design and deployment of the sensors and data infrastructures for Flood Sense.

Tega Brain is Industry Assistant Professor of Integrated Digital Media in the Tandon School of Engineering, NYU and may be reached at brain@nyu.edu. Other Flood Sense team members are Elizabeth Henaff, Andrea Silverman, Junaid Khan, Charlie Mydlarz, Praneeth Sai Venkat Challagonda, Mwale Chiyenge and Catherine Hoar.

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Brooklyn College Earth and Environmental Sciences

by Jennifer Cherrier

The Department of Earth and Environmental Sciences (EES) at Brooklyn College, City University of New York (CUNY) provides a comprehensive undergraduate and graduate curriculum that explores Earth's dynamic processes and gives students the knowledge and understanding of the relationship between humans and the environment.

Students in EES test waters and analyze soils, find fossils and minerals, and examine rock outcrops to understand Earth's history. Through this work, students learn how the environment affects humans and how, in turn, human activities have impacted our environment. EES students also explore sustainable solutions for offsetting these environmental impacts and develop marketable skills in geographic information systems (GIS) analysis.

The Brooklyn College Library with its clock tower is an iconic landmark in the borough. *Brooklyn College*

Brooklyn College offers Bachelor of Arts, Bachelor of Science, Master of Arts and Master of Science degrees in earth and environmental sciences with curricula in each program designed to prepare students for competitive careers in government, private or nongovernmental sectors. EES also partners with the School of Education's Secondary Education program to offer degrees for earth science teachers at both the undergraduate (Bachelor of Arts) and graduate (Master of Arts in Teaching) levels.

EES faculty members have experience and skills across the full spectrum of the earth and environmental sciences to help students navigate the rocks, soils, landscapes, coastline, and waters of New York City and beyond. EES has established partnerships with Aquatic Research and Environmental Assessment Center (AREAC) and Science and Resilience Institute at Jamaica Bay (SRI@JB), as well as municipal, nongovernmental and private sector partners all of whom work on water-related activities. These partnerships provide important experiential learning opportunities for students, where students can apply skills learned in the classroom to address pressing questions and problems related to earth-water systems and environment. For example, in EES capstone courses, students have worked on client-directed projects with the New York City Department of Environmental Protection (NYCDEP) and the Hudson River Foundation's Harbor Estuaries Program to study and address real issues impacting New York City's waters.

EES Department Faculty with Water-Focused Research Interests

Professor Jennifer Cherrier serves as departmental chair of EES. Her areas of expertise include biogeochemistry of aquatic environments with emphasis on carbon and nitrogen cycling and flux; aquatic microbial ecology; harmful algal blooms; natural solutions for offsetting pollutant loading to aquatic systems and integrated water management; water resource sustainability; urban ecology, hydrocarbon bioremediation; coastal zone management; and science communication. Cherrier's research group has developed a novel smart-sensor hybrid technology (eco-WEIR™, patented) that augments green infrastructure to control stormwater retention times, maximize pollutant removal efficiencies, and allows for water storage and reuse.

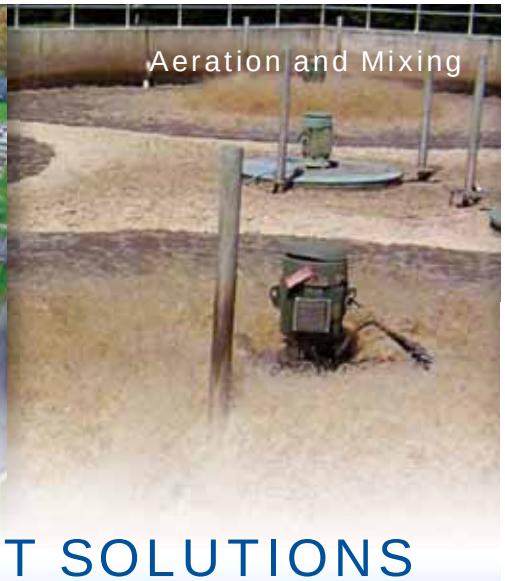
Associate professor Brett F. Branco is the interim director of the SRI@JB. Branco is interested in the dynamic interactions between physics, biology and chemistry in shallow aquatic environments. He has worked on the impacts of daily stratification and mixing on biogeochemical cycles in shallow lakes; the interactions between submerged canopies and hydrodynamics; and the coupling between sediments and the water column. His interests take him wherever there are interesting water quality or ecological issues associated with dynamic shallow waters.

Professor John F. Marra serves as director of the AREAC. His work focuses on marine phytoplankton, the microscopic marine plants that live in the uppermost, lighted layer in the ocean. Marra is interested in how physical processes – such as wind, waves, solar radiation and various kinds of motion and mixing – regulate photosynthesis and the growth of these marine plants. Like trees, these plants contribute significantly to the atmosphere's oxygen and take up atmospheric carbon dioxide.

For more information on EES and the faculty profiled, visit these websites:

- EES website. *http://www.brooklyn.cuny.edu/web/academics/schools/naturalsciences/undergraduate/environmental.php*
- Jennifer Cherrier faculty profile. *https://www.brooklyn.cuny.edu/web/academics/faculty/faculty_profile.jsp?faculty=1256*
- Brett F. Branco faculty profile. *https://www.brooklyn.cuny.edu/web/academics/faculty/faculty_profile.jsp?faculty=840*
- John F. Marra faculty profile. *https://www.brooklyn.cuny.edu/web/academics/faculty/faculty_profile.jsp?faculty=662*

Jennifer Cherrier, Ph.D., is a professor and chair of the Department of Earth and Environmental Sciences at Brooklyn College–The City University of New York. She is a Stanford Woods Leopold Leadership Fellow for Sustainability as well as a National Academy of Sciences Frontiers of Science Kavli alum. Her 26 years of research expertise are in aquatic carbon and nitrogen biogeochemistry. More recently, Cherrier has focused on water resource sustainability and nature-based approaches for offsetting the human impacts on marine and freshwater systems. She can be reached at Jennifer.Cherrier18@brooklyn.cuny.edu.



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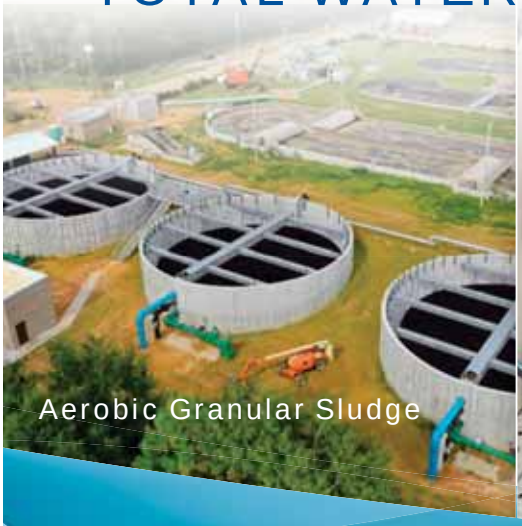

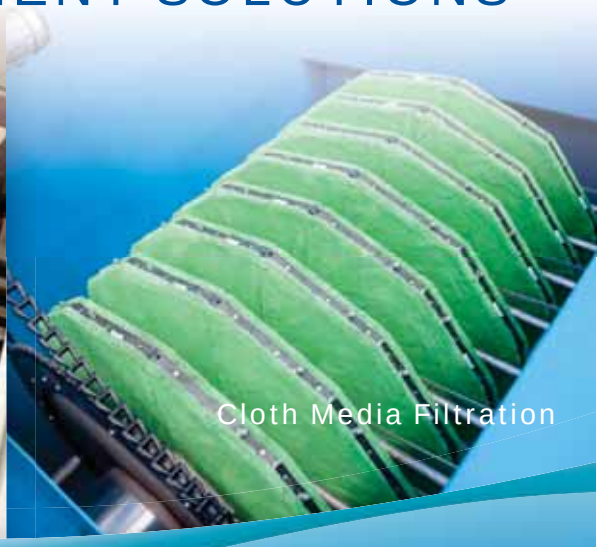

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New York Institute of Technology: Environmental Technology and Sustainability

by David Nadler

New York Institute of Technology (NYIT) Environmental Technology and Sustainability program brings together aspects of engineering, environmental science, sustainability, ecology, law, pollution prevention, climate change, contamination mitigation, and technology needed in today's modern world. The technologies and practices presented in the program are the foundation of all modern efforts aimed at improving environmental conditions and advancing sustainability goals. Students in the program learn to understand and apply the best methods and practices used in environmental systems for air, water and waste.

The Environmental Technology and Sustainability graduate program prepares graduates for rewarding careers in environmental science, management and infrastructure. Our new laboratory on our Long Island campus allows students and researchers to conduct research using x-ray fluorescence, spectrophotometry, microscopy, weather stations, aerial and marine drones, 3-D printing, and a variety of field sampling equipment *(bit.ly/beLAB)*. Our on-site wastewater facility provides a hands-on learning and research environment for students to work with a municipal wastewater stream. The curriculum allows students to choose from courses ranging from hydrology and air pollution to ones in toxicology and life cycle assessments.

Our faculty are highly active in the environmental community. Professor Sarah Meyland, J.D., was appointed to the New York State Drinking Water Quality Council to safeguard New York drinking water supplies. One of her tasks has been to establish maximum contaminant levels for PFOA, PFOS and 1,4-dioxane. She is the Director of the Center for Water Resources Management, which provides leadership, technical expertise, educational opportunities, and professional interaction for a wide array of stakeholders. Chairperson David Nadler, Ph.D., has become active in researching emerging contaminants. His current research is conducting fate analyses of PFOA using ultraviolet, oxidation and biological treatments. Recently he began working with United Nations Environment in reviewing their Global Outlook for Cities report, their flagship assessment of the state of the global environment. He is now engaged with the New York City Department of Environmental Protection's Bureau of Water Supply conducting research of wastewater technologies for potential implementation.

For more information, visit the website at: *https://www.nyit.edu/departments/environmental_technology_and_sustainability*

David Nadler is chair of the Environmental Technology and Sustainability Department at New York Institute of Technology and can be reached at dnadler@nyit.edu.

On-site wastewater treatment facility. *David Nadler*

Hofstra University: Three Departments Focused on Water Resources

Hofstra University is located 25 miles east of New York City, on Long Island in Hempstead, New York. The university was founded in 1935 and offers undergraduate, graduate and postgraduate programs of study.

Three departments at Hofstra offer programs relating to water resources in engineering, biology and geology.

Civil Engineering Department

If you imagine yourself leading a team that plans and builds roads, tunnels and bridges; constructs massive buildings, airports and transportation hubs; or designs and develops dams and complex water treatment projects, you'll find your future in Hofstra's Civil Engineering program. Civil engineering students at Hofstra eventually concentrate on either structural or environmental engineering.

In environmental engineering, Margaret A. Hunter, Ph.D., teaches a course on Water Quality for Environmental Engineers that examines the chemical, physical and biological water quality parameters necessary for the design of water and wastewater treatment processes and operations. Students learn basic physical and chemical parameters of pH, turbidity, alkalinity, suspended solids, hardness, chlorine residual, dissolved oxygen and metal analyses through laboratory exercises.

Partnerships

Hofstra has been a partner with the Town of Hempstead (TOH) Department of Conservation and Waterways (C&W) since the department's inception and assisted with early water quality studies. This association has continued, with Hofstra alumni on the department's staff collaborating with Hofstra researchers.

The marine laboratory associated with the TOH's water quality monitoring program started in a trailer in a partnership with Hofstra University in the 1960s. In 1968, a permanent laboratory facility was constructed, formalizing the effort that would result in 50 years of water quality monitoring by TOH in this area. During this time, the program has introduced new instruments and expanded beyond the original monthly sampling of the estuary at one-meter depth to include:

- In situ measurements of water quality parameters across vertical depth profiles using YSI sondes.
- Monthly sampling of tributaries of Hempstead Bay.
- Use of continuous water quality monitoring devices at strategic locations within Hempstead Bay.

The study area for monitoring activities includes the Town of Hempstead and parts of Nassau County outside the town borders, but largely within the South Shore Estuary Reserve watershed.

The current monitoring program includes a new network to sample atmospheric deposition of inorganic nitrogen species, which are an important but understudied portion of nitrogen inputs to urban and suburban watersheds. Hofstra University is leading the atmospheric deposition monitoring efforts, which include measurement stations throughout the southern half of Nassau County (TOH and portions of the Town of Oyster Bay). Based on data from other urbanized areas, atmospheric nitrogen deposition is expected to be higher than predicted by national-scale monitoring networks, which purposely locate measurement sites far from urbanized areas. The national networks were designed to capture large-scale regional patterns rather than local nitrogen pollution sources, which leaves a major gap in our understanding of atmospheric nitrogen deposition in urban and suburban watersheds.

Geology, Environment and Sustainability Department

The Department of Geology, Environment and Sustainability has a multifaceted curriculum that teaches students geology and history of the planet, safeguarding and managing the environment for future generations, and solving the problems of living sustainably now.

E. Christa Farmer, Ph.D., teaches Environmental Geology, which explores the basic functioning of Earth's systems, including the cycling of solid materials, water and nutrients. The course includes a unit on local nitrogen pollution in the waters surrounding Long Island. Students study anthropogenic impacts on these systems that present challenges to the sustainability of human societies as well as quantitative techniques that geologists use to analyze environmental problems.

J. Bret Bennington, Ph.D., teaches Hydrology. Students learn hydrologic principles and quantitative analysis of aquifers and groundwater movement. The course also addresses groundwater contamination and remediation, with attention to the problems relating to Long Island.

For more information, contact:

- ***Department of Engineering: Margaret Hunter, Ph.D., an associate professor of engineering (Margaret.A.Hunter@hofstra.edu).***
- ***Department of Biology: Steve Raciti, Ph.D., an assistant professor of biology (Steve.M.Raciti@hofstra.edu).***
- ***Department of Geology, Environment, and Sustainability: E. Christa Farmer, Ph.D., an associate professor of environmental geology (geoecf@hofstra.edu).***

Hofstra University is one of a few universities throughout the country that uniquely features two mascots: Kate and Willie Pride, a lion and lioness. The two mascots are named after the University's benefactors William Hofstra and his wife Kate Davidson. *Hofstra University*

NYWEA Student Chapters at Colleges and Universities across New York

In addition to the student chapters highlighted elsewhere in this issue of *Clear Waters,* NYWEA also has student chapters and faculty advisors established at the following colleges and universities:

- Columbia University in the City of New York (Columbia University)
- Cooper Union for the Advancement of Science and Art (Cooper Union)
- Rensselaer Polytechnic Institute (RPI)
- State University of New York at Stony Brook (Stony Brook University)
- State University of New York at Buffalo (University of Buffalo)

Columbia University

Faculty Advisor: Kartik Chandran (*kc2288@columbia.educ)*

Columbia Engineering, the Fu Foundation School of Engineering and Applied Science, is committed to pushing the frontiers of knowledge and translating our discoveries to meet the needs of society. These aspirations have been fundamental since our early origins in 1864 as a school devoted to metallurgy and mining.

Over the years, our faculty and students have made remarkable contributions to technological and social progress, and today, we carry on our tradition of innovation as engineering transforms nearly every aspect of life, from the purity of the water we drink, the quality and accessibility of our health care, and the sustainability of the natural and built environments, to our ability to connect with others anywhere in the world.

Attracting the greatest minds in engineering and applied science, of diverse backgrounds from across the country and around the world, has always been part of our DNA and a key to our success. Our faculty represents leading experts in their fields who are dedicated to teaching, to pushing research frontiers, and to increasing interdisciplinary collaborations across the School, the University and with external partners. We offer students a unique educational opportunity providing a foundational education in engineering and applied science in the depth and breadth of a premier Ivy League university centered in New York City – a cultural and financial hub that is fast becoming a world-renowned center for high-tech research and development. We believe that engineering is in a renaissance, and that the time is now for engineering to step forward as a force for the future to create a sustainable, healthy, connected, secure and creative humanity.

An impressive classical building, at the alma mater of President Obama. The name of the statue is Alma Mater (nurturing mother), created in 1903 by noted artist Daniel Chester French.

istockphotos.com, peterspiro

Cooper Union's Civil Engineering Program

Faculty Advisor: Constantine Yapijaki, *(yapi@cooper.edu)*

Mission Statement

Cooper Union's Mission is to prepare students as civil engineering professionals who will have the depth and breadth of knowledge, sense of social and ethical responsibility, commitment to a safe and sustainable environment, and a desire to serve society in leadership positions.

Program Educational Objectives

Our civil engineering graduates are engaged in life-long learning to stay abreast of the latest body of knowledge and professional practices in civil engineering and allied disciplines throughout their careers.

- Our graduates are excelling in teamwork, interdisciplinary concepts, organizational skills and problem-solving methodologies in their professional careers.
- Our graduates have attained positions of leadership as professional practitioners, government officials, academicians, inventors, researchers, etc., during their professional careers.
- Our graduates are committed to excellence, independent thinking, innovation, and modern professional practices throughout their careers.
- Our graduates are committed to professional and ethical responsibility during their careers.
- Our graduates who pursue careers in engineering have successfully achieved professional licensure in their chosen field.

Program Description

Civil engineering, earliest of the engineering professions, has evolved into a broad spectrum of specialties: structural, geotechnical, hydraulic, environmental, transportation, urban planning, construction management, sustainable design, urban security and infrastructure rehabilitation. Depending on his or her interests and abilities, the modern civil engineer may also become involved in research, design, and development related to projects in alternative energy sources, space structures, protection against natural and human-made disasters, etc. The civil engineer also studies

The Cooper Union for the Advancement of Science and Art, commonly known as Cooper Union or The Cooper Union and informally referred to, especially during the 19th century, as "the Cooper Institute", is a privately funded college located in Cooper Square in the East Village neighborhood of Manhattan, New York City. *istockphotos.com, mizoula*

and develops new materials, new structural systems, and new strategies for optimizing design. Basic research, especially in the areas of applied and experimental mechanics, often arises either as a preliminary or adjunct requisite to these studies.

The civil engineer who wishes to practice creatively in any of these fields must be thoroughly grounded in the basic sciences, mathematics and applied mechanics, structures and structural mechanics, engineering sciences and computer applications. Members of the civil engineering faculty are actively engaged in research in their specialties, which include modern advances in structural engineering and materials, geotechnical engineering, alternative energy sources, green design of buildings, water pollution control technologies, water resources engineering and urban security.

Within the civil engineering program, students may elect to pursue specialized study through an appropriate choice of electives in two areas:

- Structural and Geotechnical Engineering.
- Water Resources and Environmental Engineering.

Rensselaer Polytechnic Institute

Faculty Advisor: Raphael Rodrigues *(rodrir9@rpi.edu)*

Rensselaer Polytechnic Institute (RPI), founded in 1824, is America's first technological research university. Perched on a 275-acre hilltop campus overlooking the Hudson River in the historic city of Troy, in the heart of upstate New York's Tech Valley, Rensselaer Polytechnic Institute has long been a leader in educating men and women in vanguard technological and scientific fields. The university offers bachelor's, master's and doctoral degrees in engineering; the sciences; information technology and web sciences; architecture; management; and the arts, humanities and social sciences. Rensselaer faculty advance research in a wide range of fields, with an emphasis on biotechnology, nanotechnology, computational science and engineering, data science, and the media arts and technology. The Institute has an established record of success in the transfer of technology from the laboratory to the marketplace, fulfilling its founding mission of applying science "to the common purposes of life." We usher along new discoveries and inventions that benefit humankind, protect the environment and strengthen economic development, shaping the very way we live in the 21st century.

RPI School of Engineering

Rensselaer Engineering has a been a vibrant and evolving source of discovery and innovation for nearly two centuries: a place where students and faculty come together and work to solve the grand challenges facing humanity from human health and mitigation of diseases, energy and the environment, and infrastructure resilience, stewardship and sustainability, among others. We educate a new generation of engineers who not only obtain a deep knowledge in their respective fields but are also able to work across disciplines to solve the complex problems of our times.

Rensselaer School of Engineering is home to seven departments offering 11 undergraduate and 19 graduate degrees. The School has a diverse student body representing gender, race, geographical and intellectual diversity. Students come from across the United States and many countries around the world.

In addition to a strong base in fundamental sciences and rigorous courses in engineering disciplines, our curriculum includes broad exposure to humanities, arts and social sciences. Student experience is further enhanced by opportunities to participate in numerous co-curricular activities, leadership and teamwork, and community engagement. Pedagogical innovations, focused on

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experiential learning, innovation and entrepreneurship, and integration of new technology into classrooms place us at the leading edge of 21st century technological education.

RPI Faculty and Alumni

Our faculty include members of National Academy of Engineering, National Academy of Inventors, Fellows of many national and international societies, and many winners of National Science Foundation, Office of Naval Research and Department of Energy awards. The School of Engineering research attracts over $50 million in external research funding in areas closely aligned with those of the Institute, aimed at solving the grand challenges facing the society and the planet.

Rensselaer School of Engineering has many notable alumni including Steven Sasson, inventor of the first digital camera; Howard Isermann, inventor of sunscreen lotion; and many winners of the National Medal of Technology, including Dr. Jay Baliga, inventor of the insulated gate bipolar transistor.

For more information, please visit *http://www.rpi.edu*.

Stony Brook University

Faculty Advisor: Alexander Orlov *(aorlov@notes.cc.sunysb.edu)*

Stony Brook University, widely regarded as a State University of New York (SUNY) flagship, was established in 1957 as a college for the preparation of secondary school teachers of mathematics and science. The first campus was in Oyster Bay, Long Island, on the grounds of a former Gold Coast estate. In 1962, a new campus was built near the historic village of Stony Brook on land donated by local philanthropist Ward Melville. Part of the State University of New York system, the University has grown tremendously and is now recognized as one of the nation's important centers of learning and scholarship – carrying out the mandate given by the State Board of Regents in 1960 to become a university that would "stand with the finest in the country."

The University campus lies about 60 miles east of Manhattan and 60 miles west of Montauk Point. It is only a short distance to the Atlantic beaches of the south shore and the vineyards of the East End. Situated on 1,039 acres on the north shore of Long Island, Stony Brook University has a four-season climate, tempered by proximity to the Atlantic Ocean and Long Island Sound.

The University has a five-part mission:

- To provide comprehensive undergraduate, graduate, and professional education of the highest quality.
- To carry out research and intellectual endeavors of the highest international standards that advance knowledge and have immediate or long-range practical significance.
- To provide leadership for economic growth, technology, and culture for neighboring communities and the wider geographic region.
- To provide state-of-the-art innovative health care, while serving as a resource to a regional health care network and to the traditionally underserved.
- To fulfill these objectives while celebrating diversity and positioning the University in the global community.

University of Buffalo

Faculty Advisor: Ning Dai *(ningdai@buffalo.edu)*

Undergraduate Education

Certain engineering topics such as introductory electric circuits, introductory programming, statics, dynamics, etc., are required to be taken by students in multiple engineering majors. Department of Engineering Education professors are the primary instructors for these lower-division engineering courses. The department is also developing a two-course, interdisciplinary lab sequence and a two-course, interdisciplinary capstone design sequence that can be taken as electives by students in any engineering major. We are pursuing the establishment of a BS degree program in Engineering Science that will similarly cut across multiple engineering majors.

Sign of University at Buffalo at North Campus. The State University of New York at Buffalo is a public research university.

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Technical Communication

Undergraduate students in every engineering major are required to take a course on technical communication. This course examines a range of communication skills including technical communication, oral presentations, visual design and data visualization. The Department of Engineering Education teaches this course; it also teaches a graduate-level technical communication course that can be taken, as an elective, by any interested graduate engineering students. The department also is pursuing the establishment of an undergraduate technical communication minor.

Graduate Education

The department offers courses and research opportunities for students who aspire to a career in engineering education. To this end, we are pursuing the establishment of MS and Ph.D. degree programs in Engineering Education. The department additionally offers courses on the practical application of research-proven best practices for engineering education. These courses are intended for students pursuing a career in another branch of engineering who wish to utilize research-proven education practices in the context of their chosen field. To this end, we are pursuing the establishment of an advanced certificate in Engineering Pedagogies and Practices.

Congratulations to the 2020 N.G. Kaul Memorial Scholarship Winners

by Madison Quinn

N.G. Kaul

N.G. Kaul was a highly respected engineer, an immigrant from India who fulfilled the American dream of opportunity realized. He had a distinguished career in public service, first with New York City and then with the New York State Department of Environmental Conservation, rising to the position of Director of the Division of Water in 1992. That service was capped off, upon his retirement in 2002, by his appointment as Director of the U.S. Environmental Protection Agency's effort to implement the dredging of PCB-polluted sediments in the Hudson River. He died in February 2004.

In 2006, NYWEA created the N.G. Kaul Memorial Scholarship, and over the years has granted $72,500 to 43 students pursuing graduate or doctoral degrees in environmental/civil engineering or environmental science concentrating on water quality, who show a commitment to government service. A total of $7,500 is being awarded this year to three graduate students receiving N.G. Kaul Memorial scholarships in 2020: Courtney Powell, Fiona Dunn and Kathryn Pendelberry.

Courtney Powell, University of Central Florida, Awarded $3,500 Scholarship

Courtney Powell is enrolled in the environmental engineering Ph.D. program at UCF.
University of Texas Southwestern Medical Center

Courtney Powell is enrolled in the environmental engineering Ph.D. program at UCF. Before her doctoral research, she was involved in academic research in the chemistry and molecular biology fields. She earned her Master of Science degree in cell and molecular biology from the University of Texas Southern Medical Center (UTSW) and a Bachelor of Science degree in chemistry from UCF.

Powell's dissertation at UCF will focus on synthetic membrane processes in potable water treatment, working with the City of Boynton Beach's West Nanofiltration Membrane Water Treatment Plant. She is utilizing her diverse academic training to develop an alternative pretreatment strategy to reduce the frequency of membrane fouling and the plant's dependence on sulfuric acid due to cost and safety risks.

Powell plans to pursue a career in government service, utilizing her broad educational background to make informed decisions and to be part of solutions that ensure the quality of water for the public and for future generations. Additionally, she aims to educate the public on their water supply and the steps taken to provide safe, affordable drinking water.

Fiona Dunn, New York University, Awarded $2,000 Scholarship

Fiona Dunn is a Ph.D. candidate in civil and environmental engineering at NYU.
New York University

Fiona Dunn is a Ph.D. candidate in civil and environmental engineering at NYU. She decided to specialize in environmental engineering after participating in two Manhattan College service trips to Port-au-Prince, Haiti, where she saw the reality of access to clean water as a global issue. She saw the devastating results of the 2010 earthquake as well as the overwhelming need for adequate infrastructure including access to clean water. The tap water was undrinkable due to contamination and many residents had no access to clean water. The school she visited had its own water filtration system and provided clean water to the neighboring community at a low cost.

As an environmental engineer, Dunn hopes to pursue research questions that contribute to solutions to water issues at regional, national and global levels. She wants to enact change through a career in government by using her background in environmental engineering to influence and better inform policy. She aims to work at the intersection of policy, academia, and research in environmental engineering to directly impact and address issues related to water, the environment and climate.

Kathryn Pendelberry, University of Oxford, Awarded $2,000 Scholarship

Kathryn Pendelberry is pursuing a Master of Science degree in water science, policy, and management at the University of Oxford.
Kristina Pendelberry

Kathryn Pendelberry is pursuing a Master of Science degree in water science, policy, and management at the University of Oxford, U.K. She graduated magna cum laude with a Bachelor of Science in environmental engineering with a minor in environmental studies at Bucknell University and received the Michael D. LaGrega Award for Excellence in Environmental Engineering. Pendelberry has gained wide-ranging research and internship experience at a wastewater utility, an engineering consulting firm, and a state park. After graduate school, Pendelberry intends to complete a policy fellowship in Washington, D.C., then work at a state or federal government agency.

Contact Scholarship Program Administrator Madison Quinn at madison @nywea.org to learn more about this and other NYWEA scholarships or visit www.nywea.org/SitePages/Scholarships.

Well Done!

How Can Handwashing Protect from COVID-19 When You're Short of Water?

by Stefan Krause, David M. Hannah and Iseult Lynch *(University of Birmingham Op-Ed issued May 4, 2020)*

The current COVID-19 pandemic makes us acutely aware how crucial access and ability for adequate hand hygiene are for reducing transmission risks of communicable diseases. Good hand hygiene is critical to protecting your health and those around you.

Indeed, regular and thorough handwashing is promoted as one of the most important contributions individuals and households can make to reducing transmission of diseases, including COVID-19.

Advice to 'wash your hands' thoroughly – 20-seconds of lathering with soap – may seem easy to follow, yet millions globally cannot reliably access the water and soap necessary for handwashing. Moreover, more frequent handwashing places further demands on already limited water supplies, exacerbating the challenges faced by communities in water scarce areas. Climate change, population growth, and displacement of people present additional challenges by altering water availability, accessibility and demand.

Water insecurity and limited opportunities for sanitation and hygiene are everyday challenges in many communities across our planet. U.N. data (2017) indicates that 40% of the world population (64% in low income countries) lack basic handwashing facilities with soap and water at home – that's 3 billion people at increased risk from COVID-19.

Opportunities to follow best practices for hand hygiene are limited severely for many people in lower- and middle-income countries (LMICs) where two out of every five individuals lack access to a basic handwashing facility. This can be because of meteorological or hydrological limitations in water availability; many who are unable to wash their hands and sanitize appropriately are living in arid and semi-arid environments or informal settlements with limited water infrastructure.

Additionally, problems with quality and accessibility of water often present barriers to handwashing. Water may be supplied, but too expensive, too inaccessible or too polluted for hygiene. Limited access to adequate sanitation becomes an increasing problem in higher income countries, for example, some 15 million people in the United States are without access to water as they cannot afford their water bills. In many Western societies in particular, poor people being forced to use communal and shared public facilities puts them at extra risk.

While safe water for handwashing and hygiene is a major challenge in many LMICs, the COVID-19 pandemic highlights markedly that poorer households in higher income nations do not have reliable access to safe water for handwashing.

According to the World Health Organization, diarrhea, predominantly caused by polluted water and water borne diseases is the second biggest cause of death in children under 5 years old (after malnutrition); and there are around 1.7 billion cases of childhood diarrheal disease annually (of which approximately 2 million die).

Never has the urgent call for action on Sustainable Development Goal (SDG) 6 to *"ensure availability and sustainable management of water and sanitation for all"* been so evident to so many people.

The current COVID-19 pandemic makes it clear that access to water and sanitation is a basic human right. Clean water allows

good hand hygiene and is, of course, also vital for drinking and preparing food. We must invest now in water infrastructure and water governance – that's to say the way water is managed and provisioned. This will help to ensure that communities and individuals everywhere can wash their hands safely.

For those with access to stable water supplies, reeducation as to the value of water and how to use it sustainably is needed urgently; supplies will not continue to meet demand as populations grow and human demands change. We need to address these 'wicked water problems' to combat the current and anticipated future critical disease outbreaks and, in turn, improve livelihoods and save lives.

- ***Stefan Krause is a professor of Ecohydrology and Biogeochemistry at the University of Birmingham. His interdisciplinary research group on coupled groundwater and surface water systems investigates the multifaceted impacts of global environmental change on hydrological fluxes, biogeochemical cycling and contaminant transport, and ecohydrological feedback functions in complex landscapes.***
- ***David M. Hannah is a professor of Hydrology, UNESCO Chair in Water Sciences and director of research of the College of Life and Environmental Sciences at the University of Birmingham. His research aims to understand water cycle processes, hydrological events (flood, drought) and water-related impacts under climate and other drivers of change.***
- ***Iseult Lynch is a professor of Environmental Nanosciences and associate editor for Environmental Science: Nano, and deputy director for the Facility for Environmental Nanomaterials Analysis and Characterisation (FENAC) at the University of Birmingham. Her research focuses on the environmental interactions of nanoparticles and nanostructured surfaces with biological entities from macromolecules to organisms.***

- ***With thanks to Sera L. Young and Joshua Miller from the Department of Anthropology, Institute for Policy Research, Northwestern University, Chicago, as well as Feng Mao, Cardiff University, for their valuable contributions to this discussion.***

- ***The University of Birmingham is ranked amongst the world's top 100 institutions, its work brings people from across the world to Birmingham, including researchers and teachers and more than 6,500 international students from over 150 countries.***

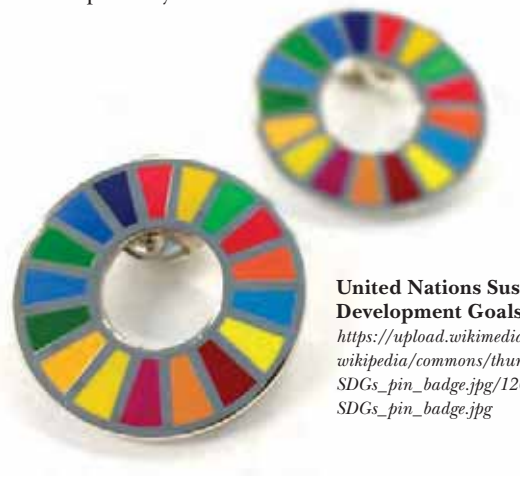
For more information, please contact Tony Moran, International Communications Manager, University of Birmingham on +44 (0)7827 832 312 or t.moran@bham.ac.uk. For out-of-hours enquiries, please call +44(0) 7789 921 165.

From wef hq Leading-edge updates from the Water Environment Federation

Do the SDGs Apply to Me? A Resounding Yes!

by Barry Liner

A relatively new and colorful lapel pin is becoming more common throughout Water Environment Federation (WEF; Alexandria, Virginia) events and throughout the water sector. This 25-mm (1-in.) circle is decked out with 17 multicolored pie slices. It evokes the vision of an old Trivial Pursuit game piece on steroids and packs a lot of meaning and promise for making the world a better place by 2030.



United Nations Sustainable Development Goals pin. *https://upload.wikimedia.org wikipedia/commons/thumb/7/7c/ SDGs_pin_badge.jpg/1200px-SDGs_pin_badge.jpg*

The circle and colors depicted on these pins represent the United Nations Sustainable Development Goals (SDGs). Water professionals contribute toward meeting nearly all SDGs but focus their passion and dedication to preserving the environment and protecting public health most directly on SDG 6 – Clean Water and Sanitation.

SDGs at a Glance

In 2015, the United Nations member states adopted the 2030 Development Agenda titled, *Transforming Our World: the 2030 Agenda for Sustainable Development*. This call-to-action for all countries was designed to work toward peace and prosperity for people and the planet. The agenda outlined 17 SDGs related to thematic areas such as water, energy and climate, with associated targets and indicators.

SDG 6, appropriately associated with bright blue, features targets for water reuse, access, efficiency, affordability, resiliency, integrated water resources management, reduction in untreated wastewater, and enhanced research and development for water technologies. By definition, water professionals worldwide contribute to achieving SDG 6 every day, as they have been for as long as water and wastewater professionals have existed.

WEF Actions

In 2019, WEF released a position statement in support of the objectives of the SDGs and recognizing the work that our members, Member Associations, and the water sector as a whole contribute to furthering progress. The SDGs align directly with four WEF Strategic Goals:

- Catalyze Innovation.
- Enhance the Value of Water.
- Provide a Broad Range of Content.
- Leverage Global Network of Water Professionals.

WEF will continue to foster progress toward achievement of the SDGs by increasing water sector and public awareness of the SDGs and their importance. WEF also will promote the work that water professionals are doing to further progress toward achievement of these goals. In addition, WEF is always seeking opportunities to build upon the work currently being done and to collaborate with our Member Associations and partners worldwide; this effort also supports SDG 17 – Partnership.

The SDGs represent the evolution of the Millennium Development Goals (MDGs). At the Millennium Summit in 2000, U.N. Leaders adopted the United Nations Millennium Declaration, committing their nations to a new global partnership to reduce extreme poverty. This declaration set out a series of time-bound targets, with a deadline of 2015 to meet the eight MDGs focused on developing countries. One of the critical goals was MDG Target 7.C: "Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation." The world met the target of halving the proportion of people without access to improved sources of water, five years ahead of schedule. Between 1990 and 2015, 2.6 billion people gained access to improved drinking water sources. Worldwide 2.1 billion people have gained access to improved sanitation. Despite the impressive progress, 2.4 billion are still using unimproved sanitation facilities, including 946 million people who are still practicing open defecation.

Framing the Plan

The SDGs build on the lessons learned from the MDGs. At the heart of the 17 SDGs is an urgent call for action by all countries in a global partnership. These goals recognize that ending poverty and other deprivations must go hand in hand with strategies that improve health and education, reduce inequality and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

The 17 goals also encompass 169 targets that are measured by 232 indicators. For example, SDG 6 challenges the world to "ensure availability and sustainable management of water and sanitation for all." The eight targets identified for the water sector *(see sidebar on p. 57)* demonstrate the full breadth and scope of the work of water professionals.

Beyond SDG 6

Water professionals are the front line in public health, the circular economy and sustainable communities. It would only make sense that water also directly affects most of the other SDGs including:

- SDG 2 – Zero Hunger.
- SDG 3 – Good Health and Well-Being.

- SDG 5 – Gender Equality.
- SDG 7 – Affordable and Clean Energy.
- SDG 9 – Industry, Innovation and Infrastructure.
- SDG 11 – Sustainable Cities and Communities.
- SDG 12 – Responsible Consumption and Production.
- SDG 13 – Climate Action.
- SDG 14 – Life below Water.
- SDG 15 – Life on the Land.

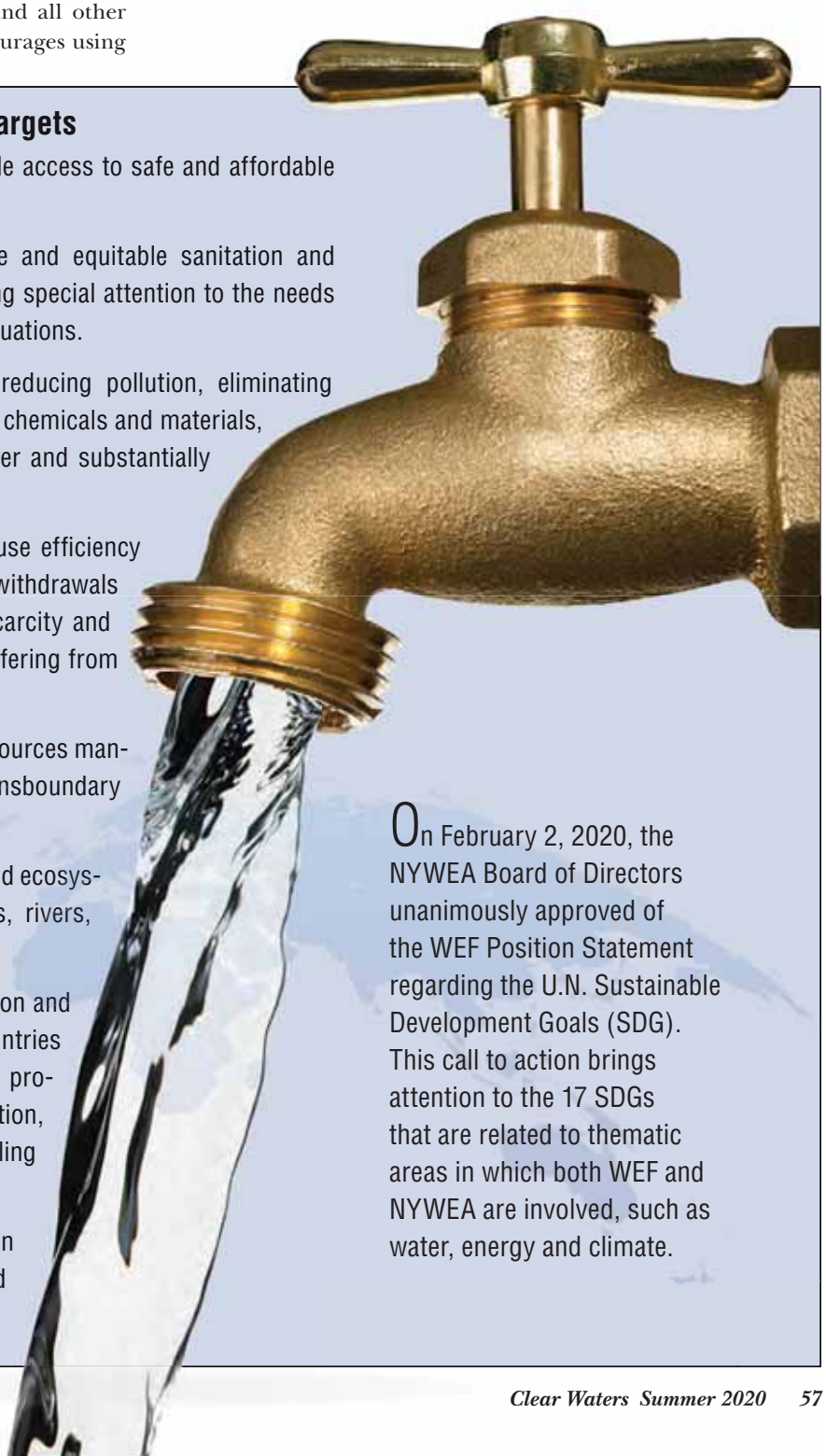
Understanding the SDGs recognizes the value, both locally and globally, of the work that water, wastewater and stormwater professionals already do, and will continue to do. The framework enables water, wastewater, and stormwater utilities and organizations to increase legitimacy in their relations with customers and stakeholders, provides a sense of pride to operators, engineers, regulators, managers, academics, businesspeople, and all other professionals who work in the water sector and encourages using the global perspective on water resources to facilitate watershed-based solutions on a local level.

More information on all of the SDGs, including their targets and measures can be found at *https://sustainabledevelopment.un.org*.

Barry Liner, Ph.D., PE, BCEE is Chief Technical Officer at the Water Environment Federation and leads WEF's Water Science and Engineering Center.

SDG 6 – Clean Water and Sanitation Targets

- **6.1** – By 2030, achieve universal and equitable access to safe and affordable drinking water for all.
- **6.2** – By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
- **6.3** – By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
- **6.4** – By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.
- **6.5** – By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.
- **6.6** – By 2030, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.
- **6.a** – By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programs, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.
- **6.b** – Support and strengthen the participation of local communities in improving water and sanitation management.



On February 2, 2020, the NYWEA Board of Directors unanimously approved of the WEF Position Statement regarding the U.N. Sustainable Development Goals (SDG). This call to action brings attention to the 17 SDGs that are related to thematic areas in which both WEF and NYWEA are involved, such as water, energy and climate.

From wef hq Leading-edge updates from the Water Environment Federation

WEF Headquarters: Finding and Training the Operator of the Future

by Katherine Saltzman

Amid retirement surges across the water workforce, there are ongoing discussions about the urgency to recruit, train and retain new professionals. Part of this effort involves establishing the water sector as an attractive career path that supports essential infrastructure and protects public health and the natural environment.

However, the water sector faces additional challenges that most sectors do not. Training requirements and certification expectations vary among states and naturally among utilities that differ in size, revenue and process capacity. But the challenges go deeper. They include limited access to updated, peer-reviewed training materials; inadequate time and money for operators to study or maintain continuing education requirements; and the challenges to keep pace with rapid technological changes. These challenges are in addition to equipping employees with the complex science, technology, engineering and mathematics (STEM) components necessary to be a water operator.

However, solutions are emerging to overcome these challenges and secure the workforce of the future. Organization, states, and utilities are finding ways to attract and train the essential employees who will protect our infrastructure, environment and public health.

Water Sector Uniqueness

As highlighted in the 2018 Brookings Institution report, *Renewing the Water Workforce: Improving Water Infrastructure and Creating a Pipeline to Opportunity,* many of the water sector's concerns about its workforce reflect similar social, labor, and economic concerns across all U.S. sectors. These concerns include high retirement rates, limited pools of qualified replacements, and fear of technical knowledge loss. The report calls these concerns "emblematic of bigger economic trends and broader policy issues facing the country, including the continued need to support a new generation of workers amid mounting retirements, changing technologies and other labor market shifts."

But where the water sector stands apart is the need for greater upfront preparation in terms of extensive training, skills and knowledge competency. The Brookings report states a U.S. Bureau of Labor Statistics finding that water sector jobs have a higher threshold for entry.

More than 78% of water workers need at least one year of related experience and 16% of water workers need four or more years prior to joining the water workforce. Moreover, about 44.7% of water workers need at least one year of on-the-job training to qualify for their positions.

Compare this to the national average of 5.6% of jobs across all occupations that need more than one year of on-the-job training, according to the data.

In addition to on-the-job training, water workers are required to operate various technologies and tools as part of their daily responsibilities. These requirements add additional complexity to operator jobs and training. According to the Brookings report, "Water workers embody the definition of skilled trades. On average, water workers use 63 different tools and technologies each, compared to the six tools and technologies typically used by workers in all occupations nationally."

Entering the Water Workforce

Even though most sector newcomers lack operational experience, each still is required to passing a Level 1 certification exam and possess hands-on experience as prerequisites for employment. With these considerations, utilities typically hire entry-level employees without a license and provide a certain amount of time for the employee to study for and pass a certification examination. Those who pass are then promoted to a full-time, certified operator position. This pre-certification period ranges from 30 days in some states up to a year in others.

"We have a chicken and egg system here: you can't get hands-on experience unless you have a license, but you can't get a license without hands-on experience," said Sidney Innerebner, principal and owner of Indigo Water Group LLC, a wastewater consulting and operator training company. Innerebner also is authoring WEF's new Wastewater Treatment Fundamentals series.

Supporting Continual Operator Training

Once hired, operators are expected to continue studying for higher certifications and collect continuing education units (CEUs). Larger utilities may have an in-house trainer who develops CEU curriculum related to facility processes or equipment. This trainer works with the entire operations staff to help prepare them for certification exams. However, midsize and small facilities, which make up most treatment systems in the U.S., typically don't have the resources to support in-house training; therefore, operators self-study and use external trainers and online courses to prepare for examinations.

Despite the options available, there is concern among operators and trainers that the Need-to-Know (NTK) Criteria, which is tested for in certification exams and incorporated into curriculums for CEUs, may not always apply to the processes at an operator's facility or be relevant to their daily responsibilities, Innerebner said. NTK Criteria is extensive but lacks detail on which topics are necessary for exam preparation or responsibilities in the field, making it difficult for operators to study, she explained.

"One of the big issues with training is that it's often geared toward more complicated systems. If you look online, you could probably find 100 classes on activated sludge but more than 85% of the treatment plants in the U.S. are lagoon systems," Innerebner said. "It's hard to find training on lagoon systems or classes on wastewater treatment ponds."

Additionally, acquiring CEUs and preparing for a certification exam requires time. In some cases, operators are given working time to prepare and test; this requires them to get shifts covered. In other cases, operators must use time-off to maintain their licenses and training.

In Colorado, for example, there are weeklong operator training classes that would meet the entire training requirements for three years, Innerebner said. But this requires coverage at the facility as well as travel expenses.

Other options include online training, which provides more scheduling flexibility. Indigo Water Group has about 650 operators enrolled in online training classes.

"Operators like it better so you can do it over time, it's a little easier to incorporate in the day," Innerebner said.

Updating Materials

A significant portion of operator training materials, including U.S. Environmental Protection Agency (EPA) manuals, have not been updated since the late 1970s or the 1980s, Innerebner said. She added that training materials typically have been based on work practices at facilities instead of scientific research.

"We have learned a lot about wastewater treatment in the last 40 years, a lot of stuff has changed how we teach, has changed our understanding of the process" she said.

"We've been in a cycle of asking people in the field what they do every day at work and then basing training materials on that instead of setting standard practices based on scientific research. The result is a cycle that always looks backward instead of forward," she explained. To provide new training materials, WEF developed the Wastewater Treatment Fundamentals series. In addition to being double peer-reviewed by water sector experts, the series aims to assist in translating the world of wastewater treatment to individuals who have held technical jobs outside of the water sector.

"I try to take new concepts and relate back to what people already know. It's easier to hang things on your framework, than to build a new framework all together," Innerebner said. Because many operators come from mechanical backgrounds, it helps to relate new topics to familiar ones, she explained. For example, biology and bacteria can be compared, albeit imperfectly, to engines.

"Live with the imperfect analogy until you can get a better understanding of what's actually happening," Innerebner said. "That goes a long way with helping people learn."

Keeping Pace with Technology

Utilities and trainers work to keep pace with rapid technological changes to ensure their staff and operators are prepared to handle new equipment. This has led to training that focuses primarily on technology at a facility. While this training is valuable, it needs to be coupled with education on the general curriculum.

"I am seeing more clients asking for very specific training on the technology they have at their location, on-site training for specific technology," said Scott Jameson, a water and wastewater operator trainer and consultant in British Columbia, Canada, who offers classroom courses and on-site training for utilities in the region.

Sometimes the tech training is to reduce a knowledge gap after losing a senior operator, other times, however, utilities are trying to multitask and prepare operators for certification exams and train them on new technology at the same time, Jameson said.

"I find them more and more willing to pay to have an instructor to come to their sites," Jameson said, "This is tied into the idea that they want training focused on the technology they are using."

He cautioned, however, that this doubling up doesn't work well, if the goal is to pass a certification exam. Jameson said he takes the time to sort out this difference with his clients. He works with them to clarify their objectives to provide the training truly needed.

Laboratory work is an important component of all WRRFs.

istockphotos.com, Ivan-balvan

The Operations Challenge competition held annually at WEFTEC, and similar state and regional events are examples of programing that combines operations training and skill development with practice on new technologies. To keep the competition fresh and challenging, the events are redesigned periodically. These events introduce competitors to new processes and technologies and provide hands-on experience with new and different equipment.

Apprentice Programs and Technical Schools

One highly visible path for newcomers to enter a water sector career is through apprenticeship programs or technical schools. Some utilities have created these programs or built partnerships with local colleges to help facilitate the education and hands-on training necessary for an operator position.

South Platte Water Renewal Partners (formerly known as the Littleton Englewood Wastewater Treatment Plant) has done both. Cindy Goodburn, a WEF member who now works as an independent consultant to help organizations improve workforce development and organizational skills, started the apprentice program in the 1990s when the utility struggled to fill Operator A positions.

"At the time, we were focused on the A certification. Most A operators are really secure where they are working. They have the 'golden chain,' fully vested in all of their retirement stuff, maxed out on vacation – all those benefits that make it difficult to leave and start with a new organization," she explained. "Our answer to the golden chain was that we would build our own."

Though there have been some changes, the goals of the apprentice program remain the same. Operators are given a designated time frame in which to obtain higher certification levels; they are incentivized with pay increases.

"Each time the person passed a new certification, they got promoted to a new operator certification and payline raise. We paid for all of their schooling, their books, certification exam," Goodburn said. "But their end of the deal was that they had a certain timeframe in which to complete these [tasks]. The goal was to get all our operators A certified and there was a maximum amount of time. If at any of those points, they couldn't pass the exam, we would have to terminate employment. But we've only had to do that a couple of times over all these years [that we have had this program]. It's just been a huge success."

continued on page 60

continued from page 59

This facility also maintains a partnership with a local community college with a water quality management program. Many of the college students interned at the facility as part of their curriculum. These same students later joined the apprentice program to become operators.

Goodburn noted that utilities can help direct curricula at technical colleges to ensure colleges are preparing students for workforce needs. For example, when supervisory control and data acquisition (SCADA) systems were introduced to the facility, few staff possessed the needed skills to use them. As Goodburn searched for employees or students to fill the role, she discovered that the community college was providing outdated curriculum.

"The instrumentation and controls [curriculum] were in the electrical degree programs and it was so antiquated it wouldn't do us any good," she said. "That's kind of my soap box on partnering with local educational institutions and helping them understand what is needed in the industry for their students to graduate and get into a job."

Taking this collaboration one step farther, the Water Engineering Technology (WET) Program at Okanagan College in Kelowna, British Columbia, Canada, has a curriculum recognized by the Environmental Operators Certification Program (EOCP), which is the main certifying entity for the region. The WET program also is a nationally accredited engineering technology program. All certified engineering technology programs are mandated to meet regularly with an advisory committee to determine curriculum and skills needed for the workforce.

"We have to keep in contact with the industry. All of the Engineering Technology programs are mandated to have a Program Advisory Committee that is comprised of individuals from different industries that our students would go and work in," said Allison O'Neill, chair of the Water Engineering Technology Department. These committees "advise us on changes in the industry. We also ask them about our curriculum [and] when we propose curriculum changes, they review those changes to ensure it fits with the need of the industry."

The committees include members from public and private sectors organizations, including the local municipalities, the water resource recovery facility, consultants, urban planners as well as representatives from the Province of British Columbia's Ministries of Environment & Climate Change Strategies, and Forest, and Lands and Natural Resources.

"We make sure that we have broad representation, we also try to make sure that our advisory committee includes WET graduates who are working in the industry because they understand both the curriculum and the industry," O'Neill said.

Interactive Development

The Brookings report also includes recommendations to involve stakeholders in training development. The report suggests that since water workers are required to maintain continuing education units, utilities and other water employers should provide additional frameworks and "develop competency models – or customize existing models – to promote continued learning and skills development among staff."

Tasks associated with this development include defining and measuring types of knowledge, skills, and abilities needed among water workers within the organization. The report also recommends creating more robust programs to introduce younger, nontraditional workers to the water sector to acquire hands-on experience.

Goodburn noted that the success of the apprentice program is based on supporting staff and operators at each level of their career and providing training and opportunities to move upward.

"One of things we were successful at was developing people in their careers," Goodburn said. "I used to tell my staff – and it would freak them out – 'I want you to work yourself out of your job every five years, but I want your new job to be here, with us, at Littleton/Englewood.'

"I think that's philosophically what the management was looking for: those people that really wanted to reach, grow, and really make a career out of it, not just a job. I think that has really been the success in the apprentice program and throughout the rest of the organization because people do have the opportunity to grow."

Katherine Saltzman is a publications assistant at the Water Environment Federation (Alexandria, Virginia) where she works on WEF's Operator Initiative programs.

A well-trained workforce is essential to the efficient operation of WRRFs. *istockphotos.com, llucky78*

Operator Quiz Summer 2020 – Pumping Safety

The following questions are designed for individuals/trainees pursuing certification as they prepare to take the ABC wastewater operator test. It is also designed for existing operators to test their knowledge. Each issue of *Clear Waters* will have more questions from a different process of wastewater treatment. Good luck!

1. Coliform bacteria and the procedures used to test for them are divided into the two categories of:
   a. MF and MTF.
   b. LTB and BGB.
   c. Total and fecal coliforms.
   d. M-Endo and M-FC.

2. Assume that the typical pH of the influent at your treatment plant is about 7.2. As you are reviewing new lab data, you notice that the pH in the influent this morning was measured to be 6.1. This decrease is most likely be caused by:
   a. A caustic substance in the influent.
   b. A corrosive – acidic substance in the influent.
   c. A change in outside temperature.
   d. Too much alkalinity in the influent.

3. Which is a type of positive displacement pump?
   a. Axial.
   b. Turbine.
   c. Eductor.
   d. Gear.

4. What is the vertical distance between the elevation of the free water surface at the suction and that of the free water surface at the discharge of a pump called?
   a. Discharge head.
   b. Dynamic head.
   c. Velocity head.
   d. Static head.

5. What is an air gap device used for?
   a. Backflow prevention.
   b. Insulation.
   c. To prime pumps.
   d. To seal valves.

6. How often should inactive valves be exercised?
   a. Daily.
   b. Weekly.
   c. Monthly.
   d. Quarterly.

7. In a circular clarifier, what is the function of the centrally located drive unit?
   a. To operate the RAS/WAS pumps.
   b. To adjust the height of the effluent weirs.
   c To rotate the sludge collection mechanism.
   d. To rotate the catwalk to a desired location

8. What pair of parameters is most typically used to adjust chlorine feed rates?
   a. Chlorine residual and temperature.
   b. Chlorine residual and pH.
   c. Chlorine supply and flow rate.
   d. Chlorine residual and wastewater flow

9. When using a progressing cavity pump to pump sludge, in what condition must the pump intake be to ensure safe operation?
   a. Submerged.
   b. Primed.
   c. Dry.
   d. Hot.

10. What is the primary operational concern for using a float level indicator in an open channel?
    a. Heavy flows.
    b. Turbulent flow.
    c. Solids, debris or ice
    d. The type of counterweight used.

Answers on page 62.

For those who have questions concerning operator certification requirements and scheduling, please contact Tanya May Jennings at 315-422-7811 ext. 4, tmj@nywea.org, or visit www.nywea.org.

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Clear Waters

New York Water Environment Association, Inc.

Operator Quiz Summer 2020

Answers from page 61:

1. (c) Total and fecal coliforms.
2. (b) A corrosive-acidic substance in the influent is typically the cause of such a large pH drop in the influent.
3. (d) Gear.
4. (d) Static head.
5. (a) Backflow prevention.
6. (d) Quarterly.
7. (c) To rotate the sludge collection mechanism.
8. (d) Chlorine residual and wastewater flow.
9. (a) Submerged.
10. (c) Solids, debris or ice. The accumulation of these on the float or well can drastically skew the reading from this type of unit.

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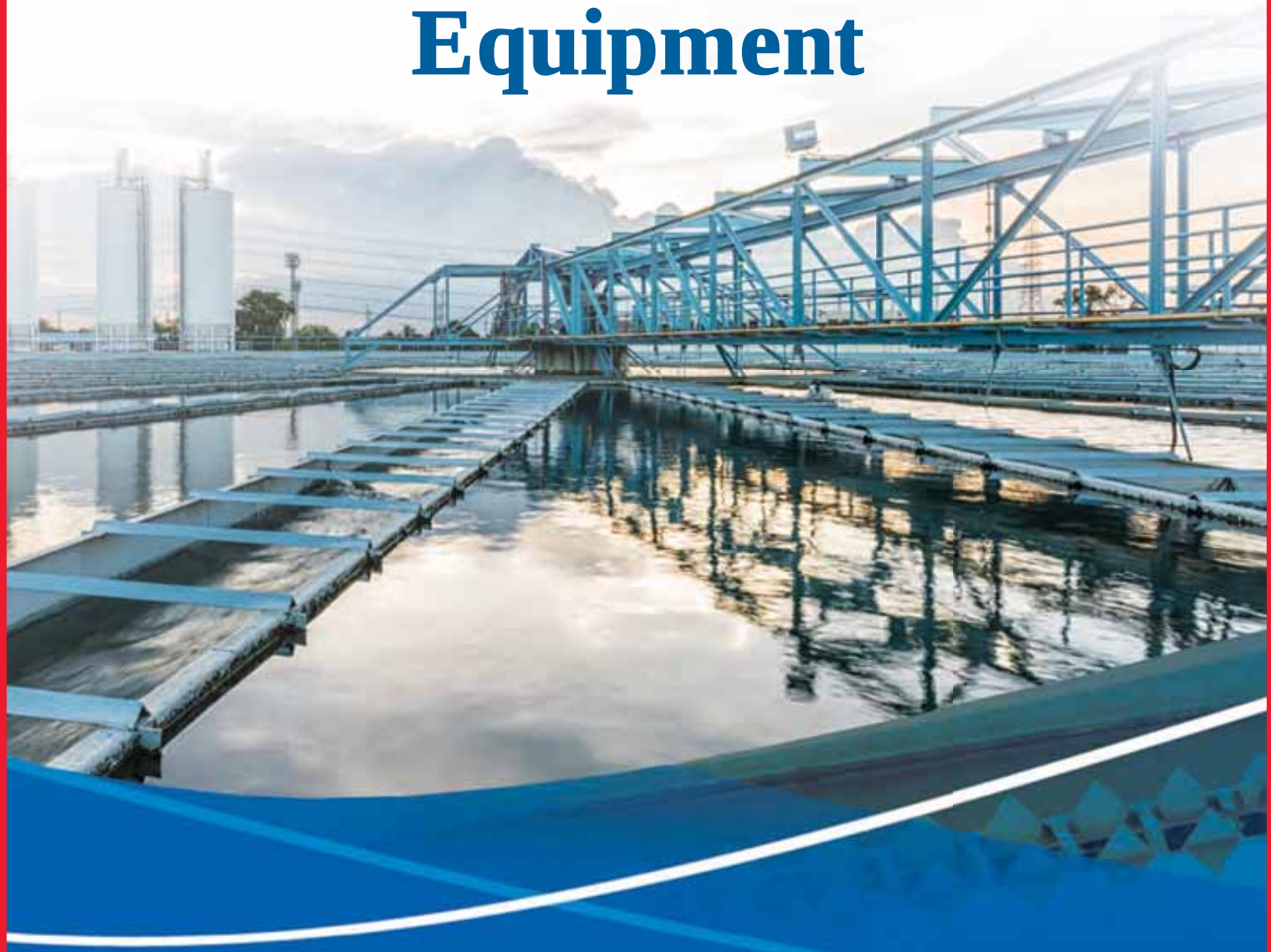

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