AIChE Environmental Division Newsletter
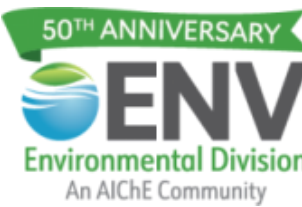
50TH ANNIVERSARY

ENV
Environmental Division
An AIChE Community

Dear Colleagues,

Welcome to the second division newsletter of 2024. At this time of year, we have recently completed the selection of division awards. This year, it includes the selection of awardees for the Lawrence K. Cecil Award, the Dr. Peter B. Lederman Award for Service, the Early Career Award, and the Graduate Student Paper Award (3 awardees). Please find the announcement of these award winners below in this newsletter. I wish to thank the committee chairs, Dr. Kerry Kelly, Dr. Kirti Yenkie, Dr. Jason Trembly, and Dr. Coty Jen, and also their committee members for the work they put into these determinations.

This year, our webinar committee has continued a great program of informative webinars for you. This year's webinar series theme is decarbonization and sustainable solutions and we have heard from Michael Wong, Josh Pearson Hamish Gordon, and Christos Maravelias so far this year, with a couple more planned for the remainder of the year. You can find recordings of the recent past webinars at https://www.aiche.org/community/sites/divisions-forums/environmental-division/webinars-0 or at our division's LinkedIn page http://linkedin.com/company/aiche-environmental-division/

Another important activity this time of year is division elections. Our past chair Kerry Kelly has worked to develop a list of candidates for the positions second vice-chair, directors, and division treasurer, presented below in this newsletter. The email containing a link to the online ballot for this election will be sent soon. Please take just a few moments to complete the ballot.

We continue to solicit individual donations for the endowed fund to continually finance our most prestigious division award, the Cecil Award, which serves to recognize each year one individual for outstanding chemical engineering contributions in the preservation or improvement of the environment. I hope you will consider contributing to the effort to endow this particular award this year. You may find a link to give at our division webpage -- https://www.aiche.org/community/sites/divisions-forums/environmental-division or you will have the opportunity to contribute at the time of your membership renewal.

Finally, I wish to invite all of you that may be attending national conference in San Diego in late October to join us for the division dinner (co-hosted with management and environment and the law divisions). It will be held on Monday evening October 28th at 6 pm at the Old Spaghetti Factory in San Diego.

Matthew Alexander
AIChE Environmental Division Chair (2024)

Editors:
Kerry E. Kelly
Stephen Tzikas

2024 AWARD WINNERS

LAWRENCE K. CECIL AWARD

Congratulations to Dr. Fenqi You. Dr. You is the Roxanne E. and Michael J. Zak Professor in Energy Systems Engineering at Cornell University. He also serves as the Chair of Ph.D. Studies in Systems Engineering, Co-Director of the Cornell University AI for Science Institute (CUAISci), Co-Lead of the Schmidt AI in Science Program at Cornell, and Co-Director of the Cornell Institute for Digital Agriculture (CIDA). His research centers on fundamental theory and methods in systems engineering and artificial intelligence, with applications spanning materials informatics, quantum computing, energy systems, and sustainability. He has an *h*-index of 80 and authored over 250 refereed articles in journals such as *Science*, *Nature Sustainability*, *Nature Communications*, *Science Advances*, and *PNAS*. He has received over 20 major national/international awards over the past six years from professional organizations including the American Institute of Chemical Engineers (AIChE), American Chemical Society (ACS), American Society for Engineering Education (ASEE), and American Automatic Control Council (AACC). These recognitions are in addition to his multiple best paper awards. He is an elected Fellow of the AIChE, RSC, and AAAS.
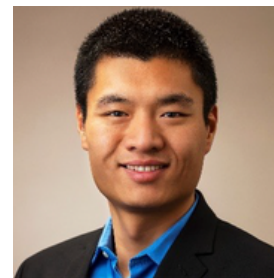
EARLY CAREER AWARD

Congratulations to Dr. El-Sayed, winner of the early career award. Dr. El-Sayed is an assistant professor in environmental engineering in the civil engineering department at Embry-Riddle Aeronautical University (ERAU). El-Sayed's research interests lie in characterizing the processes and sources of atmospheric pollutants to better understand how humans perturb these processes to ultimately quantify their impact on climate change, policy making, and human health. She has over a dozen publications and presented her work in several national and international conferences. El-Sayed received her PhD at University of Maryland, Baltimore County (UMBC) in Chemical, Biochemical & Environmental Engineering working on air pollution projects which focus on characterizing atmospheric aerosols particularly in the eastern United States. She holds a Masters degree from the University of Cambridge in the United Kingdom in Engineering for Sustainable Development. She received an M.Sc. and a B.Sc. degrees in Chemical Engineering with honors from Cairo University in Egypt.

DR. PETER. B. LEDERMAN ENVIRONMENTAL DIVISION SERVICE AWARD

Congratulations to Dr. Alexander Orlov for being selected for the service award. Dr. Orlov is a Professor of Materials Science and Chemical Engineering at State University of New York, Stony Brook. He is also a faculty member of the Consortium for Interdisciplinary Environmental Research, an affiliate faculty of the Chemistry Department and the Institute for Advanced Computational Science at Stony Brook University. He serves as an Editor of Chemical Engineering Journal and editorial board member of Current Opinion in Chemical Engineering and Materials Letters journals. In addition, Dr. Orlov is a Past Chair of the AIChE Environmental Division and Research and New Technology Committee (RANTC). He is currently Co-Chair of the AIChE SEF Education Committee and IFS Board Member.

2024 AWARD WINNERS

GRADUATE PAPER AWARD WINNERS

| First	Devashish P. Gokhale, MIT	Multifunctional zwitterionic hydrogels for the rapid elimination of organic and inorganic micropollutants from water
Second	Vitor Gama, West Virginia University	Process Operability Analysis of Membrane-Based Direct Air Capture for Low-Purity CO2 Production
Third	Abhimanyu Raj Shekhar, Purdue University	A hybrid mechanistic machine learning approach to model industrial network dynamics for sustainable design of emerging carbon capture and utilization technologies

2024 ELECTIONS

Vote now through September 21
https://aiche.org/election/571

SECOND VICE CHAIR CANDIDATE, CHAD ABLE

Dr. Chad Able is a Senior Engineer with KeyLogic Systems, serving the National Energy Technology Laboratory (NETL) and broader Department of Energy (DOE) in its mission to decarbonize the energy sector. He has a PhD and a BS in Chemical Engineering. His work is focused on water treatment in the fossil energy sector (including coal and natural gas fired power plants and water produced from hydraulic fracturing) as well as critical mineral recovery from these waste streams with over 16 publications. He has also worked in tutoring underprivileged students in calculus and physics for over a decade. As the programming chair of AIChE's Environmental Division, he has initiated new sessions in the treatment of per- and polyfluoroalkyl substances (PFAS) and microplastics, and has facilitated continued dialogue between AIChE programming and the numerous section and area chairs for scheduling.

DIRECTOR CANDIDATE, DORA LOPEZ DE ALONZO
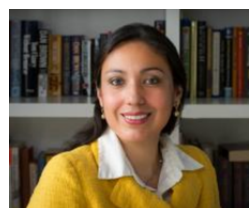
Dr. Dora Lopez de Alonzo has over two decades of experience in the fields of energy and sustainability. Her career trajectory has been marked by engagements across government agencies, academia, private enterprises, NGOs, and intergovernmental organizations, where she consistently exhibits exemplary expertise and dedication. As a consultant, she has lent her insights to prestigious entities like the Sustainability Accelerator at Stanford University, IRENA, and USAID. During her time with the Federal Aviation Administration (FAA), she spearheaded collaborative efforts among multiple agencies, focusing on refining life cycle assessment (LCA) methodologies. Dora also served as a technical advisor for the Advanced Research Project Agency Energy (ARPA-E), contributing significantly to the inception

DIRECTOR CANDIDATE, DORA LOPEZ DE ALONZO (CONT)

inception and development of innovative programs like BIOMINING, WiX, MIDAS, INSULATE, CABLES, FLECCS, and REUSE. Presently, she is an Adjunct Professor at the University of Oklahoma, where she teaches Environmental Sustainability and Low-Carbon Energy Markets within the Natural Gas Engineering Management (NGEM) M.S. Program. Additionally, she is currently serving as program vice-chair for the AIChE Environmental Division. She holds a Ph.D in Chemical Engineering from Clemson University.

DIRECTOR CANDIDATE, ENOCH NAGELI

Dr. Enoch Nagelli is an Associate Professor and the Director of Chemical Engineering in the Department of Chemistry and Life Science at the US Military Academy West Point. He is the principal investigator of an inter-disciplinary research group of cadets majoring in chemical engineering, life science, and chemistry. He earned his Ph.D. in Chemical Engineering from Case Western Reserve University in Cleveland, OH. His Ph.D. dissertation focused on the controlled synthesis, functionalization and assembly of carbon nanomaterials for novel energy storage and conversion devices through an Air Force Research Lab (AFRL) fellowship at the Wright-Patterson Air Force Base (WPAFB). Following his doctoral studies, Dr. Nagelli worked as a post-doctoral fellow on an ARPA-E project funded by the DoE on large-scale high energy capacity all-iron flow batteries at CWRU in the Electrochemical Engineering and Energy Lab under the mentorship of Prof. Robert Savinell and Prof. Jesse Wainright. In this role, Dr. Nagelli worked on the performance diagnostics of flowable slurry electrodes for redox flow batteries and electrochemical flow capacitors. He is a member of the American Institute of Chemical Engineers (AICHE) and an Officer in the Environment Division of AICHE. He is also a member of the American Chemical Society (ACS) and the Electrochemical Society (ECS).

DIRECTOR CANDIDATE, YUAN YAO

Dr. Dr. Yuan Yao is an Assistant Professor of Industrial Ecology and Sustainable Systems and Chemical & Environmental Engineering at Yale University, expected to be promoted to Associate Professor in July 2024. She earned her Ph.D. in Chemical Engineering from Northwestern University. Her research focuses on understanding the potential environmental impacts of emerging technologies and biomass utilization. Dr. Yao has received many awards, including the U.S. National Science Foundation CAREER Award, the 35 Under 35 Award from the American Institute of Chemical Engineers, and the Laudise Medal from the International Society of Industrial Ecology. She serves as an Associate Editor for the journal Resources, Conservation & Recycling. Yao has contributed her expertise to several high-profile committees and organizations. She served on the Technical Advisory Group for the LEAP Partnership in the Food and Agriculture Organization of the United Nations and the provisional committee for the U.S. National Academies to assess current life cycle analysis methods for low-carbon transportation fuels in the United States. She has published over 50 papers in high-impact journals, including Science, Nature Sustainability, Environmental Science & Technology, and Annual Review of Chemical and Biomolecular Engineering. She has mentored numerous students, including many master's students and 8 PhD students since 2016, most of whom are women and minorities. She has been an active member of the AIChE Environmental Division and presented a webinar in the 2023 series on Decarbonization and Sustainable Solutions.

2024 ELECTIONS

TREASURER CANDIDATE, GERARDO RUIZ-MERCADO

Dr. Gerardo J. Ruiz-Mercado is a Senior Research Chemical Engineer in the Office of Research and Development, U.S. Environmental Protection Agency. Gerardo leads projects on decision support tools, techniques, economics, and planning for the sustainable management of end-of-life materials. Gerardo holds a Ph.D. from the University of Puerto Rico - Mayaguez and a B.S. from Universidad del Atlántico - Colombia. Also, Gerardo volunteers his time as an Adjunct Professor at the Universidad del Atlántico and an executive member of the American Institute of Chemical Engineers (AIChE). His publications and presentations include over 70 peer-reviewed articles, book chapters, a book, and more than 160 talks at technical conferences and meetings. Moreover, he is a peer reviewer for 50 indexed journals and a mentor for Ph.D., MSc, and B.S. students. Gerardo received the EPA Scientific and Technological Achievement Award 2021, 2015, and 2014 and the 2022 Federal Service Excellence Diversity Award.

UPCOMING TRAINING OPPORTUNITIES

The EPA Tools and Resources Webinars are held the third Wednesday of every month from 3:00-4:00 PM (ET).
See https://www.epa.gov/research-states/epa-tools-and-resources-webinar-series
- September 18, 2024: Assessing Community Vulnerabilities to Potential Contaminant Releases from Extreme Events

The EPA Air, Climate, & Energy Research Webinar Series hosts webinars quarterly on the third Tuesday of the month from 3 to 4 PM (ET). See https://www.epa.gov/air-research/air-climate-energy-research-webinar-series
- November 19, 2024: Airborne Survey: Methane from US Landfills

The EPA Water Research Webinar Series, found at https://www.epa.gov/water-research/water-research-webinar-series has a seminar planned on PFAS Treatment for
- October 30, 2024: PFAS Treatment Using In Situ Groundwater Remediation Techniques

The EPA Small Drinking Water Systems Webinar Series, found at https://www.epa.gov/water-research/small-drinking-water-systems-webinar-series has the following webinars scheduled:
- 8/27/2024: PFAS Regulatory Updates

An interdisciplinary field experience opportunity for applied hydrology will be available through the 2024 Geological Association of New Jersey annual conference and field excursion set for October 18 and 19 at the Watershed Institute in Pennington, NJ. While geology focused, the applied hydrogeology skills, conceptual site modeling, characterization techniques and remediation may be of interest for environmental engineers employed in this field. The regular attendee cost (among 3 options) is $75 per day. See details at https://www.ganj.org/index.php

2024 AICHE AND DIVISION EVENTS

AICHE ANNUAL MEETING

2024 AIChE Annual Meeting

October 27, 2024 to October 31, 2024

San Diego Convention Center, Hilton San Diego Bayfront

Registration link:
https://www.aiche.org/conferences/aiche-annual-meeting/2024/2024-registration-info

DIVISION HIGHLIGHTED EVENTS

Join us at our open executive committee meeting at the annual meeting (10:30 - 11:30 AM, location TBD).

Awards Presentation, Monday October 28 (8 - 10:30 am, Sapphire Ballroom I, 4, Hilton Bayfront).

Annual Dinner October, Monday October, 28 (6 pm, Old Spaghetti Factory in San Diego).

2024 LEADERSHIP

Chair: Dr. Matthew Alexander, PE	Treasurer: Dr. Gerardo J Ruiz-Mercado
1st Vice-Chair: Dr Kirti Maheshkumar Yenkie	Director: Dr. Sage Hiibel
2nd Vice-Chair: Dr. Jason Trembly	Director: Dr. Coty Jen
Past Chair: Dr. Kerry Kelly	Director: Mr. David Russell
Secretary: Dr. Robert Peters	Director: Dr. Shweta Singh
Director: Dr. Michael Wong	Director: Dr. Ana I. Torres
Programming: Chad Able	Programming: Dora Lopez de Alonzo

2024 ENVIRONMENTAL DIVISION ENDOWMENT FUND

We're pleased to announce the Environmental Division Endowment Fund. The fund will support the Lawrence K. Cecil Award in perpetuity. The Cecil award recognizes an AIChE member for their outstanding chemical engineering achievements in the preservation or improvement of the environment. Our goal is to raise $50,000. Join us with your gift today!

https://www.aiche.org/giving/impact/stories/announcing-environmental-division-endowment-fund&ved=2ahUKEwiCwvKrwuuHAxWSIUQIHSLUMMkQFnoECBMQAQ&usg=AOvVaw0LCjr13xq6tHEm-cSDCT6N

Environmental Division Programming Update 2024

We are looking forward to two new sessions focusing on Per- and Polyfluorinated Substances (PFAS) treatment and analysis, as well as research papers on microplastics ecosystem impacts and mitigation strategies.

Do you have ideas for new sessions? Are there specific topics you'd like to see covered? We invite you to share your suggestions and proposals for session topics that would enrich our program and address emerging trends in environmental chemical engineering. Additionally, if you're interested in co-chairing sessions, we'd love to hear from you. Please don't hesitate to reach out with your feedback, proposals, or expressions of interest. You can email the Environmental Division programing vice chair, Dr. Dora Lopez de Alonzo, at dora.e.lopez.de.alonzo-1@ou.edu. Don't miss this opportunity to engage with leading experts and expand your knowledge in this dynamic field!

Environmental Division Webinar Series

2023-2024 FREE WEBINAR SERIES
Decarbonization and Sustainable Solutions
Thanks to Marwa El-Sayed for organizing this series

August 26th, 5:30 pm ET
Artificial Intelligence and Machine Learning for Sustainable Molecular-to-Systems Engineering
Dr. Alexander Dowling, the University of Notre Dame

Register here:
https://lnkd.in/evjHvsTQ

November Webinar
Darshan Karwat, Arizona State University
More information coming soon

Interview with 1st Vice Chair, Kirti Yenkie

In 2019 you were selected as one of the 20 Outstanding Young Chemical Engineering Educators by the Computer Aids for Chemical Engineering Committee for teaching methodology to incorporate computational tools and design thinking for explaining theoretical concepts. How might your work help model developers optimize modeling assumptions and data with various anomalies?

The CACHE committee selected me for this honor based on the pedagogical approach of integrating Design Thinking (DT) principles in the Chemical Engineering undergraduate curriculum at Rowan University. This led to enhanced learning through systematic integration of theory and computational tools. DT is composed of five stages: (1) Empathize; (2) Define; (3) Ideate; (4) Prototype; and (5) Test. In a typical engineering curriculum, the focus is on stages 2 to 5, which leads to a skewed perspective and sometimes incorrect or incomplete problem definition. Stage#1-empathize involves asking questions or finding relevant information about the intended community/stakeholders that will be affected by the solution. Thus, it enables the students to identify the immediate as well as long-term needs and availability of resources and potential timeline. This allows for complete problem identification and formulation with realistic assumptions and appropriate data, which leads to holistic and long-term relevant solutions.

To demonstrate the effectiveness of this approach, I would like to share the example of implementation in my elective course on 'Process Optimization'. The course covers the basics of optimization, such as the existence of degree of freedom, objective and constraint formulation, linear programming, nonlinear programming, discrete programming (integer and mixed integer linear/nonlinear, probabilistic methods), multiobjective optimization, introduction to uncertainty and dynamic optimization. To supplement the theoretical principles, I developed computer labs for each topic which allowed the students to formulate mathematical optimization problems using tools like Matlab/GAMS. Toward the end of the course, the students work in teams of ~4 selecting a real-world case study and then formulating the optimization problem. They demonstrate their problem formulation, solution strategy, results, and implications in a technical presentation and final report. These team projects have covered a diverse range of topics, such as, budget management, designing optimized solar cells, optimizing plastics recycling, location of ventilator distribution centers in NJ during COVID, farming and nutrient recovery, and wartime resource management. A few of them also resulted in peer-reviewed journal papers.

You have a background in many promising areas, such as health, sustainability, connectivity, and environmental engineering. Can you provide some examples of how artificial intelligence might change these research areas and how better ontology might integrate previously disparate fields of study?

Healthcare, environmental management, and sustainability assessment research areas can benefit from the use of artificial intelligence because of the vast availability of information and datasets. However, one major issue is that the current information is not standardized and is in disparate locations. With recent AI tools, it is possible to extract data from several locations and data-preprocessing methods allow for uniformity and scaling (representing data ontology – structure and organization) such that valuable inferences can be drawn from systematic analysis.

To demonstrate the utility of AI in sustainability assessment, our research team at Rowan University has explored disparate datasets. These included physical and chemical properties, molecular structure, spatial arrangement, functional groups, etc. for chemicals as well as their environmental impacts in terms of Life Cycle Inventory (LCI) labels such as Global Warming, Resource Utilization, and Human Health

impacts per unit mass of the chemical. The chemical and molecular information is readily available for ~2 million chemicals, however, the LCIs for the same might be limited to ~1000 data points. Through the application of targeted Machine Learning algorithms, we were able to develop predictive models for LCIs based on their chemical, structural, and molecular properties with reasonable accuracy. We were also able to address missing data, unit inconsistencies, and order of magnitude differences for each feature set and label set.

Thus, I strongly believe that AI can help in creating better data organization and structure, and on application of machine learning models for regression or classification will lead to connections in disparate fields and identification of new correlations where theoretical-, first principles-based models are non-existent.

You received a grant from the US EPA to determine still-unknown properties of novel chemicals to evaluate whether they are safer and more eco-friendly substitutes for commonly used chemicals. This grant was one of the first pollution-prevention awards under the Bipartisan Infrastructure Law (BIL). What advice can you give others who may also want to tap into this funding?

Developing collaborations with industry and federal agencies was important to the P2 BIL grant. Another important aspect of the BIL grant was finding a problem of national interest that can be extended to other parts of the country as well as internationally. For example, the currently funded BIL project for developing ML algorithms to predict Life Cycle Inventory (LCI) for early-stage sustainability assessment of novel chemicals is relevant beyond the local region. Moreover, it has the potential for transformative impacts in early-stage sustainability assessment and new process development for any industry.

Also, the P2 BIL program has specific areas of emphasis in each cycle and this aspect is made clear by attending the grant webinars and participating in the Q&A sessions. The Notice of Funding Opportunity (NOFO) for each cycle also provides some details of the selection criteria and points system which should be paid attention to while planning and preparing the grant proposals. For example, Environmental Justice and Reduction in Toxics use were some of the priority areas in the recent cycle.

As a previous director of the AIChE Environmental Division, what did you find as your most challenging aspect of that position? What would you have liked to accomplish but did not have enough time to realize it?

I joined the AIChE Environmental Division in 2018 and was elected to serve as the Director in 2020. Initially it took me some time to learn about the Division activities and AIChE contacts that can assist us in our tasks. I am very grateful to the senior members of the Division, as well as the current and prior Executive committee members who helped me with the resources and information to understand my role and complete the responsibilities.

As the Director, I served on the Webinar Committee for 3 years. The challenging aspect of the webinar organization was to ensure that these were advertised ahead of time with a way to track the registrations, as well as send timely reminders for maximum attendance and follow-up.
The major lesson in my role as the Director was to ask for help when in doubt, learn from the discussions during the Executive Committee meetings, and not be afraid to try new things like social media.

One aspect that I wanted to accomplish was to have more involvement and feedback from the Industrial Advisory Board so that we could plan more activities that would cater to the industry members of our division. In recent years, we have seen more participation, and I would like to continue these efforts in my current role as the 1st Vice Chair.