

THE ACTION & REACTION

Newsletter of the Mid-Michigan Section of the American Institute of Chemical Engineers

Volume 26 Issue 1 March 2023

UNDERGRADUATE CHEMICAL ENGINEERING EDUCATION SCHOLARSHIP

Who

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What

Renewable scholarship awarding \$2000 over the course of four years for the study of chemical engineering

Where

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Deadline

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Words from the Chair

BY MIAO WANG, CHAIR

Mar 2023

Greetings, MMAICChE members! As Spring approaches and brings with it warmer weather and longer days, I hope you're all feeling energized and excited for the year ahead. For those who were impacted by the snow, please stay safe while traveling and take care of yourselves.

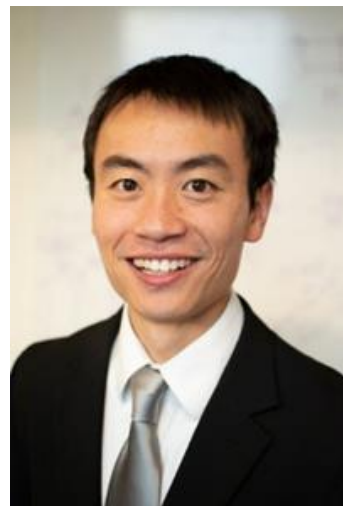
We kicked off the year with two thought-provoking seminars on tradeoffs in sustainability and engineering biomass conversion. Thanks to experts Mark Jones and Nicholas Thornburg for delivering such engaging sessions. Our program chairs have done an excellent job leveraging virtual seminars to provide quality chemical engineering education to all members. This tradition also allows us to showcase a diverse array of speakers from the chemical technology community across the nation.

Our EDI and STEM outreach committees are continuing to inspire the next generation of students and raising awareness of the crucial role that chemical engineers play in society. In January, we teamed up with Mid-Michigan ACS to organize a successful outreach event at SVSU, bringing together industrial scientists and mid-Michigan students. Our EDI committee is also developing a virtual seminar series featuring chemical engineers with varied

career paths, aimed at a broader audience across Michigan. If you have connections to local universities, please help us spread the word about these opportunities to connect with practicing scientists and engineers. Our STEM outreach committee is also partnering with SWE to represent our section at Delta College's Girl's Day Out in March. We appreciate our members who have volunteered to assist with our STEM outreach modules.

I'm thrilled to announce that our annual banquet will be held on May 4th at the Midland Country Club. This is a fantastic opportunity to celebrate our accomplishments and network with fellow engineers. The program will include dinner, a keynote speaker, and award presentations for the Young Chemical Engineer of the Year and Chemical Engineer of the Year. We'll also announce the student scholarship winner and the new executive committee for 2023-2024. Stay tuned for more details, and I look forward to seeing you there.

Lastly, as we approach the banquet, we are also gearing up for our yearly section election. If you're interested in any of our committees, please don't hesitate to reach out to our Executive Committee members or myself, and we will be happy to guide you through the process. As we prepare for the transition to new section leadership, I would like to express my gratitude for the



opportunity to serve as your leader. It has been an honor and privilege to work with such a wonderful group of people in this organization. I am confident that the MMAICChE will continue to serve as a platform for mutual understanding and collaboration, contributing to the creation of a better community.

Sincerely,

Miao Wang

My MM-AIChE Journey

BY RICH HELLING, FORMER CHAIR AND AIChE MEMBER FOR 43 YEARS
MAR 2023

I've been in AIChE since 1980, starting as a senior in engineering at Harvey Mudd College. I hadn't had all the core ChemE classes yet – those would come later – but I was attracted to Chem E by the close ties between the engineering discipline and the related science of chemistry. For the next 30 years, I paid my dues, went to some local section seminars, and a dozen or so conferences, giving presentations at half of those. But I felt it was time to do something more – or quit. Fortunately, I found, and followed, a path to do something more - thanks to MMAIChE!



At the same moment that I was pondering my future in AIChE, I got a call from Tim Frank, who was then the section chair. He asked if I wanted to be a candidate for chair-elect. It was perfect timing! I said yes, and ramped up my involvement with our section. It has been a good and enjoyable experience! I started with the three years in the chair cycle (elect, active, past), which included revisions to the by-laws. The by-laws work was perhaps not the most exciting thing to do, but is important for the organization and turned out to be an experience I have since leveraged into my service since then on two other boards (American Center for Life Cycle Assessment and Midland County Emergency Food Pantry Network).

As my time as chair came to an end, the State of Michigan had revised the rules for maintaining a Professional Engineering (PE) license. Documented continuing education was now required. I was one of the few ChemE with a PE license active in MMAIChE at that time, so set up and managed the system to offer the documentation of our seminars to other PE. Since our first qualified seminar on December 10, 2013, 79 individuals have received credit for 439 hours, with 13 individuals getting 10 or more hours. I obtained my initial PE license in California in the mid-90s when it looked like a mid-career exit to consulting was imminent! I didn't make step to consulting until late last year, but am grateful that our section has enabled through our seminars a low-cost way to receive interesting and relevant information.

MMAIChE is a key reason I have, and will continue, to stay active in AIChE. MMAIChE provides opportunities to interact with peers, to learn new and interesting aspects of the advances and applications of chemical engineers, to learn non-technical leverageable skills, all in a supportive and low-cost environment! It's the great local home for chemical engineers.

Chat GPT's views on "future of chemical engineering"

BY OPEN AI*

Prompt: Write a page long article on ChatGPT's view of the future of chemical engineering.

Answer:

Chemical engineering is one of the most important branches of engineering, dealing with designing, developing, and optimizing chemical processes and products. From petrochemicals to pharmaceuticals, chemical engineers play a crucial role in shaping our world. As technology advances, the field of chemical engineering is also evolving rapidly with new innovations and applications emerging every year.

Recently, a new technology called Generative Pre-training Transformer (GPT) has gained widespread attention for its potential to revolutionize many industries, including chemical engineering. GPT is an artificial intelligence (AI) system that uses deep learning algorithms to understand and predict human language patterns. By analyzing vast amounts of text data, GPT can generate highly accurate and natural-sounding responses to questions and prompts.

Unlike other AI systems that require significant manual input from humans to operate, GPT is a self-learning machine that can improve its performance over time with minimal supervision. Its ability to understand context, recognize patterns, and generate coherent responses has already led to significant breakthroughs in fields such as natural language processing, speech recognition, and machine translation.

So, *what does the future hold for chemical engineering with the emergence of GPT technology?* Here are some ideas on how GPT could shape the field's development:

1. Accelerated process design: Developing new chemical processes is a time-consuming and labor-intensive task that involves trial and error. With GPT's help, chemical engineers could generate designs more efficiently by feeding the system with data on different materials, reactions, and reaction conditions. GPT could then suggest optimized designs that reduce the time and cost of experiments.

2. Improved product development: GPT could also help chemical engineers to develop new products by predicting their properties and behaviors more accurately. By training GPT on data from previous successful product formulations, chemical engineers could explore new combinations of raw materials and production methods with greater confidence and fewer errors.

3. Enhanced safety measures: Chemical engineers need to ensure the safety of workers, the environment, and the public when designing and operating chemical plants. GPT could help to anticipate potential hazards by analyzing data from previous accidents and near-misses. It could also assist in training workers on best practices and identifying opportunities to improve safety protocols.

4. Sustainable solutions: The world is facing pressing environmental challenges such as climate change, pollution, and resource depletion. Chemical engineers have a crucial role to play in developing sustainable solutions that reduce carbon emissions, waste generation, and water consumption. GPT could accelerate progress in this area by suggesting more efficient production processes, reducing the use of harmful chemicals, and optimizing product recyclability.

In conclusion, the emergence of GPT technology brings exciting possibilities for the future of chemical engineering. With its powerful capabilities in language understanding and prediction, GPT could accelerate progress in process design, product development, safety measures, and sustainability initiatives. As the technology continues to evolve, chemical engineers will need to adapt their skills and workflows to fully harness its potential. With GPT's support, chemical engineering could achieve new levels of innovation, efficiency, and impact on society.

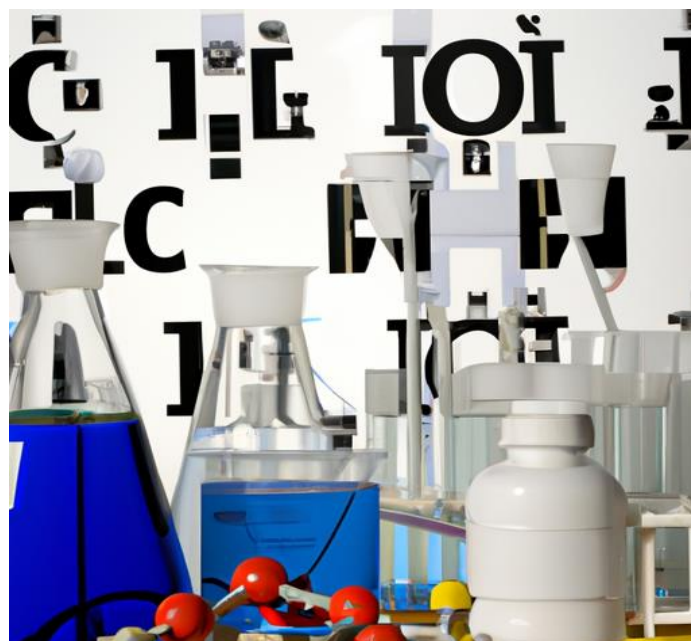


Figure 1: Image from open AI for the prompt: "chemical engineering"

* The author generated this text in part with GPT-3, OpenAI's large-scale language-generation model. Upon generating draft language, the author (editor) reviewed, edited, and revised the language to their own liking and takes ultimate responsibility for the content of this publication



2023 BEST Symposium

An engaging symposium primarily intended for Black, Latinx and Native American U.S. doctoral and post-doctoral scientists to learn more about **exciting science and careers at Dow**.

Dates:

July 24 - 27, 2023

Application Deadline:

April 30, 2023

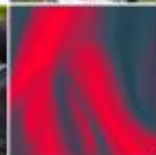
Location:

Midland, Michigan

Questions?

BEST@dow.com

To learn more about the 2023 Best Symposium please scan below.



BEST participants can expect to learn more about Dow's:

- Technology, capabilities and expertise
- Commitment to inclusion & diversity
- Wide array of Industrial R&D careers
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<https://corporate.dow.com/en-us/careers/work-at-dow/best-symposium.html>

A Day in the Life of an Industrial Scientist

Mid-Michigan AIChE Equity, Diversity, and Inclusion Committee and Midland ACS Diversity and Inclusion Committee co-hosted Day in the Life of an Industrial Scientist on Jan. 28, 2023 at SVSU, funded by an ACS Local Section Diversity, Equity, Inclusion and Respect Grant. The purpose of the event was to highlight STEM careers in industry and graduate school as a potential pathway post-undergraduate education. The day featured a problem-solving challenge where students and volunteer industrial mentors worked in groups to solve a problem, a poster session from the mentors to highlight their work, and plenty of time for networking. We had approximately 30 students in attendance from across the Great Lakes Bay Region including Delta College, Central Michigan University, Alma College, Kettering University, Mid-Michigan Community College, UM-Flint, SVSU, and Michigan State University with 17 mentors representing Dow and DuPont. The day was a great success with overwhelmingly positive feedback from the students and professors in attendance! A big thank you to all our volunteer mentors and our problem-solving challenge facilitators: Brian Clark, Anna Zink, and Deboleena Chakraborty who made the day a success!



Mentors:

Kimberly Dinh, Anne-Catherine Bedard, Justin Massing, Tricia Wilson, Soham Dutta, Alyssa Fielitz, Jessica Nichols, Aayush Singh, Gaurav Kumar, Yiyong He, Edouard Niyonsaba, Laryssa Cesar, Margaret Hwang, Jennifer Larimer, Victor Sussman, Juan Venegas

Not pictured: Angelar Muthike

Facilitators:

Brian Clark, Anna Zink, and Deboleena Chakraborty

2023 Seminar Series

Ensemble calculations from summative 2-D axisymmetric model predictions

- Ensemble calculations derived from 'weighted-average' summation of four individual particle model extraction curves
 - Depicted data is from compositional analysis of spent, bulk solids (i.e., no sieving performed)
 - Overall, excellent agreement of fractional extraction data with 'blind' ensemble models!
 - Good uniformity provides confidence for making other predictions of bulk feedstock behavior

With David Brandner and Michelle Reed

Acknowledgement

National Renewable Energy Laboratory

- Peter N. Ciesielski
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- Lintao Bu
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- Vivek S. Bharadwaj
- Yudong Li
- Xiaowen Chen
- David A. Sievers
- Edward J. Wolfrum
- Michael G. Resch
- M. Brennan Pecha
- Jacob S. Kruger
- Rui Katakira
- Gregg T. Beckham

NREL U.S. DEPARTMENT OF ENERGY Energy Efficiency & Renewable Energy fcic CCPC

Reaction engineering in planta? Tales of mass transfer limitations and their catalytic consequences at the mesoscale for next-generation biorefining

February seminar by Dr. Nicholas (Nick) Thornburg

Abstract:

Between the molecular and reactor scales—familiar favorites to the chemical engineering community—lies an intermediate regime termed the “mesoscale” where chemical reaction kinetics and transport phenomena compete along similar time and length scales. However, little is known about the coupled chemistry and physics of biomass conversion at the mesoscale. These entangled phenomena govern effective rates of organic component extraction from plant cell walls during biorefinery feed fractionation processes, and often also during “one-pot” catalytic transformations. First, I will introduce an experimentally validated simulation framework that determines transport-independent kinetic rate constants upon incorporating realistic feedstock characteristics for an exemplary process that combines hardwood solvolysis and reduction catalysis. This generalizable mesoscale reaction–diffusion modeling approach will then be extended to validate and predict the alkaline deacetylation of corn stover, an emerging biorefinery pretreatment method that removes acetyl from hemicellulose prior to mechanical refining to improve downstream enzymatic sugar yields. Reaction–diffusion models are developed and validated for three major anatomical fractions (cobs, husks and stalks), and model findings categorize experimental feedstock performance into kinetic-controlled vs. diffusion-controlled regimes based on the particle size and microstructural attributes of each tissue type. Critically, the model predicts that typical corn stover particles as small as ~2.3 mm in length are entirely diffusion-limited for acetate extraction, with experimental effectiveness factors calculated to be 0.50 for such processes. Overall, this presentation highlights opportunities to improve biomass fractionation and catalytic conversion via reaction engineering and provides actionable kinetic information to guide the design and scale-up of emerging biorefinery strategies.



Chemical Engineering Applications in Brewing and Distilling

January seminar by Dr. Nicole Shriner

Abstract:

Chemical Engineering applications are found nearly everywhere in the world including petroleum, cosmetics, pharmaceuticals, alternative energy and even fermented beverage production. Brewing and distilling involves thermodynamics, heat transfer, fluid flow, reaction engineering, and separations. This unique application allows chemical engineering core concepts to be demonstrated while producing and enjoying a tasty product.

Retractable lead... THE REASON WHY AMERICA'S CARS ARE BEING TUNED UP ... NOT DOWN?

THE ETHYL GASOLINE CORPORATION, manufacturers of anti-knock fluids used by all competitors to improve gasoline

THE TOXIC EFFECTS OF LEAD

- BRAIN & NERVE DAMAGE
- DECREASED MENTAL ABILITY & LEARNING DIFFICULTIES
- SPEECH, LANGUAGE & BEHAVIOUR PROBLEMS
- HEARING PROBLEMS
- ANAEMIA
- HIGH BLOOD PRESSURE
- REDUCED GROWTH
- KIDNEY DAMAGE
- REPRODUCTIVE PROBLEMS (ADULTS)
- DIGESTIVE PROBLEMS

CHILDREN

- Brain: Behavior problems, lower IQ, hearing loss, learning disabilities
- Body: Decreased bone and muscle growth
- Kidneys: Damage
- Nervous system: Damage
- Blood: Anemia

MJPhD

World Health Organization

Tradeoffs on the Road to More Sustainable

January seminar by Mark Jones

Abstract:

Trying to make one thing better frequently makes another worse. Tradeoffs dot the sustainability landscape. Some chemical industry history will serve as a launching point for a discussion of toxic releases caused by chemistry designed to be more sustainable, though sustainable wasn't the descriptor used at the time. The thought experiment of whether a toxic material, like lead, could be used today to meet environmental goals will be considered.

MMAIChE travels to Phoenix for brewing competition at AIChE Annual Meeting

By Patrick Heider



PORTER COLADA



The Mid-Michigan AIChE's brewing group competed for a fifth time at the AIChE Beer Brewing Competition (<http://www.aiche.org/brewbeer>). This continues our unbroken stream of entering beers at each competition since the founding of the event in 2017. This year, the competition occurred in Phoenix, Arizona at the AIChE Annual Meeting on November 13.

We said goodbye to a few long-time team members this year, but introduced new members wanting to learn more about home brewing. The team was made up of Sayli Bote, Preetam Giri, Julia Heider, Patrick Heider, Scott Tipler, and Miao Wang. Patrick Heider represented the team at the conference in Phoenix.

As a team, we wanted to improve on a very well-reviewed porter that we entered the previous year. We made some modifications to the grains used to include slightly more roast and malt flavor but learned quickly how substantial a small change in ingredients can be. We changed from chocolate malt to pale chocolate and this resulted in a noticeable bitter flavor not desirable in a porter. We went back to a mash bill closer to our previous year and entered that as "Hey Porter" American Porter.

That left us with a batch of slightly bitter porter which we used to experiment using flavor extracts to create a flavored porter that accepted the slight bitter deficiency. We recruited a panel of 10 dedicated beer tasters to sample 11 combinations of six different extracts at varying levels in the porter. As we found last year making our maple porter, the recommended amount of extract on the bottle was often excessive to the point of making the beer overly flavored, often sweet and completely out of character for a porter. Ultimately, the team settled on a consensus of two different combinations that we scaled up to mix into the bitter porter batch and into some remaining porter from our improved batch.

The bitter porter ended up being a caramel-esspresso porter called "Porter Espresso". The espresso extract sat nicely on top of the slight bitterness and created a profile that matched more of a caramel coffee flavor. The other beer was a coconut-vanilla extra porter called "Porter Colada". This was a favorite of several of the testers requiring careful balancing of both extracts so as to not overpower the beer or each separate extract. If you appreciated the punny names, you might also like the corresponding logos shown here. In a nod to the increased interest in AI present at the Annual Conference, the Porter Espresso logo contains an image formed by a stable diffusion algorithm fed with a prompt mentioning trains and beer.





If you are interested in learning how to brew and want to join the team next year or if you want to enter a team yourself, please contact Patrick Heider (plheider@dow.com). The competition is open to anyone interested in learning about the beer brewing process or wants to try their skills out in a judged event.

Career Paths of Chemical Engineers

Join Mid-Michigan AIChE and SWE for a speaker series to learn about the diverse career paths available to chemical engineers!

Who: Students pursuing or interested in pursuing a chemical engineering degree

Calendar Invite



Where: [Microsoft Teams meeting](#)

Meeting ID: 243 929 361 34 Passcode: pc63BF

Speaker Schedule

All talks begin at 5:30 pm

- Mar. 20 – Kyle Mick, Sr. Business Development Manager, Encapsys LLC
- Apr. 11 – Janelle Trowhill, Environmental Engineer, Michigan Dept. of Environment, Great Lakes and Energy

Dinner for first 30 students to be subsidized: [RSVP here](#)

Questions? Email Kim Dinh (kdinh@dow.com) or Jennifer Larimer (j.larimer@dow.com)



Donating to Support a Future Engineer through Mid-Michigan AIChE is Easy!



The Mid-Michigan Section of AIChE is involved in STEM educational outreach. We provide classroom demonstrations and support aspiring engineers through scholarships for summer camps and chemical engineering degrees. Your donation will be used to help Mid-Michigan AIChE sustain the scholarship fund that sends high school students to the Michigan Technological University Summer Youth Program or to an accredited university or college for a degree in chemical engineering.

You can choose to donate using a PayPal account or with a Debit or Credit card.

The PayPal link is:

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OR scan the QR Code on your smartphone – it takes seconds!

Donations are tax-deductible and our secretary can provide you with a receipt. We sincerely thank you for financially supporting aspiring chemical engineers.



MMAIChE 2022-2023 Executive Committee



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The Mid-Michigan Section of AIChE gratefully acknowledges the support provided by the following sponsors.



2023 Banquet announcement – Stay tuned for more details!

Mid-Michigan AIChE to Hold Spring Banquet

Featuring Guest Speaker Mukund Parthasarathy, *VP Business R&D, Dow*

Mark your calendar! The Mid-Michigan Section of the American Institute of Chemical Engineers (AIChE) cordially invites you to attend the annual Spring Banquet on Thursday, May 4th, 2023, at the Midland Country Club in Midland. Our special guest speaker for the evening will be Mukund Parthasarathy. More details to follow in the coming days!

When: Thursday, May 4th, 2023

Where: Midland Country Club

Agenda: 5:30 – 6:00 PM: Social time with cash bar

6:00 – 7:55 PM: Dinner and awards program

8:00 – 8:45 PM: Keynote Speech by **Mukund Parthasarathy**



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