
March 2024 CoMFRE Newsletter

Message from the Director

Welcome to our March 2024 Newsletter. We are in the midst of our spring semester where students are trying to wrap-up coursework and projects before May, and faculty are doing the same. It is also time to observe the many multiphase flows around us. It could be experiencing rain on one day and then snow the next (or both!). And if you were in central Iowa on Monday, March 25, you would have noticed the very dirty rain that fell. This was due to dust being picked up by strong winds over New Mexico, Texas, and other states in that region, and then transported to the upper jet stream. The dust particles were great nuclei for rain drops that fell over central Iowa, which then left a thick coating of brown dust on everyone's car when the rain dried up. These are notable examples of gas-solid, gas-liquid, and gas-liquid-solid multiphase flows.

In addition to our crazy weather, multiphase flows can be found in March Madness, from a team running a pick-and-roll on the court to the fans exiting the arena after the game. We will also start seeing the many spring farming operations from spraying, tilling, and planting, and all are multiphase flow examples.

Enjoy the spring flowers and take a moment to observe the multiphase flows of spring.



Theodore (Ted) J. Heindel
Director, Center for Multiphase Flow Research and Education
University Professor
Bergles Professor of Thermal Sciences

CoMFRE and CoMFRE Affiliates in the News

Two CoMFRE assistant professors receive NSF CAREER Award

John Jonghyun Lee, assistant professor of mechanical engineering, has received a National Science Foundation CAREER Award for research to identify the concentration-dependent structural evolution of pre-nucleation clusters (PNCs) in aqueous salt solutions as well as the influence of solution structure on the crystallization pathways and the final crystal structure.

Lee's CAREER project is "**Unveiling the structure and stability of prenucleation clusters and their roles in crystallization pathway and final crystal structure.**" The award's total value is \$660,224 beginning March 1, 2024, for an estimated five-year period. Read [MORE](#)



Ethan Secor, assistant professor of mechanical engineering, has received a National Science Foundation CAREER Award for research on additive manufacturing technologies for electronic materials.

Secor's CAREER project is "**Graded and Reliable Aerosol Deposition for Electronics (GRADE): Understanding Multi-Material Aerosol Jet Printing with In-Line Mixing.**" The award's total value is \$621,008 beginning July 1, 2024, for an estimated five-year period. More can be found [HERE](#)



Mechanical engineering faculty recently named ASME Fellow

Adarsh Krishnamurthy, associate professor has been named Fellow by the American Society of Mechanical Engineers (ASME). The ASME Committee of Past Presidents confers the Fellow grade of membership on worthy candidates to recognize their outstanding engineering achievements.



To be nominated, candidates must have 10 or more years of active practice and at least 10 years of active corporate membership in the organization.

Full story [HERE](#)

CoMFE's Dennis Vigil developing a continuous Taylor Vortex bioreactor

Dennis Vigil, Reginald R. Baxter Endowed Department Chair of Chemical and Biological Engineering and CoMFRE faculty researcher, alongside Zengyi Shao, associate professor of chemical and biological engineering and Hershel B. Whitney Professor, Global Initiatives, are leading the development of a continuous bioreactor that integrates product extraction and separation into the design, so less equipment is needed to complete the process. Continuous flow

operation also reduces equipment size, which in turn lowers capital costs. Vigil's project is funded by BioMADE. Read more [HERE](#)

Alumni in the News

Olivia Tyrrell launches NASA career from CoMFRE undergrad research experience

Thanks to CoMFRE undergrad research experience, Olivia Tyrrell shot for the moon... and made it

Olivia Tyrrell (mech engr '21) recently landed research on the moon in an area she has worked on since she was an undergrad researcher in the Center for Multiphase Flow Research and Education.

As a junior, she joined the Multiphase Reacting Flow Lab, working under the mentorship of **James Michael**, associate professor of mechanical engineering and CoMFRE faculty research.

"Dr. James Michael introduced me to research in the department and encouraged me to get involved with a project in his lab. The work I did with ultrafast imaging systems and laser-based flow diagnostics was a huge asset for me with obtaining a NASA internship and full-time position in the same research areas," Tyrrell says. Please read more [HERE](#)

Recent Journal Publications

Note that CoMFRE affiliates are identified by **bold** names

- Pillers, R.A., and **Heindel, T.J.**, "Plume Spreading Due to Floor Conditions of a Plunging Liquid Jet Using Stereographic Backlit Imaging," *Journal of Fluids Engineering*, 146(4): Paper 041202, 2024.
<https://doi.org/10.1115/1.4064004>.
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Student Honors and Awards

Recent Degrees Granted to Students Working on Multiphase Projects

- Nick Schnoebelen recently graduated (Fall 2023) with his MSME degree. His thesis was entitled "Low-cost Fabrication Methods for Creating an Inertial-based, Multiphase Microfluidic Bioaerosol Sampler." Nick was co-advised by **Pranav Shrotriya** and **Todd Kingston**
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