# June 2025 CoMFRE Newsletter

## Message from the Director

Welcome to the June CoMFRE newsletter. Summer is a time for faculty to catch up on paper writing, proposal writing, student advising, conference attending, and class preparation. Some of us attended the 2025 International Conference on Multiphase Flow (ICMF) in Toulouse, France in May. There were over 1200 attendees from all over the world that were there to present and learn about multiphase flow research!

You can hear about our multiphase flow research at CoMFRE's student poster competition that will be held the afternoon of October 21, 2025. This will replace the 1.5-day annual meeting. Students can start planning their posters now.

Summer also involves a lot of multiphase flows, from the lawnmower expelling grass clippings to splashing at the pool to fireworks in the sky. Take some time to enjoy the multiphase flows of summer and rest and regenerate for the fall semester.

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

## Save the Date:

Save the date for a CoMFRE student poster competition to be held on October 21, 2025, in place of an annual meeting. Students should start thinking about what they would like to present. Details to follow.

## CoMFRE and CoMFRE Affiliates in the News

### Understanding how force is transferred

In an essay for The Conversation, **Jacqueline Reber**, earth, atmosphere, and climate professor, discusses how force on small, hard particles -- for example, sand grains or pills -- is transmitted on more than a single layer of the particles. A better understanding of these "granular systems" may lead to a better understanding of why things like rockslides occur. Read the entire article HERE

### Wyatt Curtis lifts-off from undergraduate research to doctoral innovation

Working in **Ted Heindel's** multiphase flow lab as a mechanical engineering undergrad spurred Wyatt Curtis' passion for research and paved the way for his decision to continue his educational path at Iowa State.
Today, Heindel is Wyatt's major professor and remains a voice of clarity and guiding hand as Wyatt navigates the mechanical engineering doctoral program and autonomous research.
"I couldn't ask for a better mentor," Wyatt says. "It's a good, deep relationship that I hope to deepen further as time progresses." Read the full article HERE

### CoMFRE researchers are making an impact in digital twins

**Baskar Ganapathysubramanian, Adarsh Krishnamurthy,** and **Ming-Chen Hsu** are making an impact in digital twins. So, what is a digital twin? The National Academies' report says it's a virtual construct that "mimics the structure, context, and behavior of a natural, engineered or social system." Read more about their contribution HERE

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## Faculty Honors and Awards

### Promotions

Promoted to full Professor:

**Adarsh Krishnamurthy** - Mechanical Engineering

**Mark Mba-Wright** - Mechanical Engineering

**Jacqueline Reber** - Earth, Atmosphere and Climate, Liberal Arts and Sciences

Promoted to Associate Professor with Tenure:

**Ethan Secor** - Mechanical Engineering

## Award for Interdisciplinary Team Research

Recognizes an interdisciplinary team (two or more faculty researchers) with outstanding achievements that has made a significant contribution to the university's research and scholarship mission through successful interdisciplinary collaborations.
**Soynomics team**

- **Baskar Ganapathysubramanian**, professor, mechanical engineering; Joseph and Elizabeth Anderlik Professorship in Engineering
- **Adarsh Krishnamurthy**, associate professor, mechanical engineering

The full list of awardees can be found HERE

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## Recent Journal Publications

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

- Ahasan, K., Hu, H., **Shrotriya**, **P**., and **Kingston, T.A**., “Heterogeneous condensation on simplified viral envelope protein structures,” *ACS Applied Materials & Interfaces*, 17, 19, 27829-27838, 2025. https://pubs.acs.org/doi/10.1021/acsami.5c01789 .
- Nagawkar, B., **Subramaniam, S**., Brown, R. C., and **Passalacqua, A**., “Computational models for the prediction of yields in the autothermal pyrolysis of biomass”, *Chemical Engineering Science*, 311 (2025) 121599. https://doi.org/10.1016/j.ces.2025.121599
- Naidu S., Pandey H., **Passalacqua, A**., Hameed, S., Joshi, J., and Sharma, A., “Advancements in modeling and simulation of biomass pyrolysis: A comprehensive review”, *Journal of Analytical and Applied Pyrolysis* 188 (2025) 107030. https://doi.org/10.1016/j.jaap.2025.107030.
- Villafañe, L., Aliseda, A., Ceccio, S., DiMarco, P., Machicoane, N., and **Heindel, T.J.**, “50 Years of International Journal of Multiphase Flow:

Experimental Methods for Dispersed Multiphase Flows," *International Journal of Multiphase Flow*, 109, Paper 105239, 2025. https://doi.org/10.1016/j.ijmultiphaseflow.2025.105239.
- Xiang, Z., Chen, X., Liu, S., and **Heindel, T.J.**, "X-ray Computed Tomography (XCT) Study of Jetting in a Fluidized Bed: Effects of Two-Component Fluidization," *Particuology*, 102, pp. 264-274, 2025. https://doi.org/10.1016/j.partic.2025.04.017.

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## Recent Conference Publications and Presentations

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

- Al-Subaey, M.Y., **Passalacqua, A**., and **Heindel, T.J.**, "Investigation of Air Entrainment at the Gas-Liquid Interface in Stirred Tank Reactors," *12th International Conference on Multiphase Flows (ICMF 2025)*, May 12-16, 2025, Toulouse, France, Contribution ID: 573.
- Brunkhorst, A., Asadollahi, D., and **Mukherjee, S**., "Numerical Modeling of perivascular cerebrospinal fluid-induced optic disc edema in astronauts" *ISGC Spring Research Symposium,* April 15, 2025, Ames, Iowa
- Poddar, S., Ray, M., and **Passalacqua, A**., "Kinetic theory closures with finite contact time for electrostatic charge generation and transport", *12$^{th}$ International Conference on Multiphase Flows (ICMF 2025)*, May 12-16, 2025, Toulouse, France.
- Ray, M, Hannan, S., **Fox, R. O**., Obligado, M., and **Passalacqua, A**., "Validation of volume fraction profiles and velocity PDFs in a pilot scale bubble column", *12$^{th}$ International Conference on Multiphase Flows (ICMF 2025)*, May 12-16, 2025, Toulouse, France.
- Stafford, C. P. and **Fox, R. O**., "A kinetic-based model for incompressible, polydisperse, fluid-particle flows", *12$^{th}$ International Conference on Multiphase Flows (ICMF 2025)*, May 12-16, 2025, Toulouse, France.
- Vasquez-Giuliano, L., **Passalacqua, A**., and **Fox, R. O**., "Application of conditional quadrature method of moments to conditional moment closure for multiphase turbulent combustion", *12$^{th}$ International Conference on Multiphase Flows (ICMF 2025)*, May 12-16, 2025, Toulouse, France.

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## Student Honors and Awards

### Recent Degrees Granted to Students Working on Multiphase Projects

- Sigel, A.E., "Impact of gas flow rate on void fraction and bubble size distribution in a large-scale bubble column," MSME Thesis, Iowa State University, May 2025. Advisor: **Ted Heindel**.

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