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IOWA STATE UNIVERSITY

Center for Multiphase Flow Research and Education

June 2020 CoMFRE Newsletter

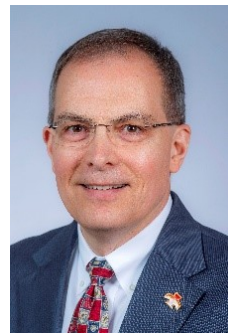
Message from the Director

The summer is now officially upon us. Cumulus clouds and rain, typical of summertime, are great examples of environmental multiphase flows. Splashing in your local community swimming pool is another example of a multiphase flow, but most are not experiencing this because of continued restrictions due to COVID-19. As I write this, businesses and states are slowly reopening but fear of a rebound outbreak is ever-present and cases in Story County (where ISU is located) are spiking. August will bring the start of another semester at ISU. We are currently planning to start the semester on August 17 (one week early) and complete finals on November 25. ISU is planning virtual instruction for classes larger than 50, with live instruction for selected Freshman courses as well as laboratory and design courses. It will be an interesting fall semester.

With kind regards,



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



Changes in the CoMFRE Leadership Team and Structure

CoMFRE implemented a slight reorganization of the Leadership Team in April:

- We are pleased to announce that Hui Hu has agreed to join our Leadership Team. He has replaced Baskar Ganapathysubramanian, whose commitments have grown well beyond CoMFRE. We thank Baskar for his service on the leadership team and for his continued commitment to CoMFRE.
- Alberto Passalacqua has agreed to be our sole Associate Director; many thanks to Alberto for accepting this position.

Going forward, the CoMFRE Leadership Team will have three permanent members and three revolving members. For each of the revolving members, one will be replaced (or renewed) each year through nominations and voting by the CoMFRE affiliated faculty. This process will start next year (March 2021).

With these changes, our current leadership team composition is:

Permanent members:

1. Director – Ted Heindel (ME)
2. Executive Director – Rodney Fox (CBE)
3. Associate Director – Alberto Passalacqua (ME)

Revolving members with 3-year terms, which can be renewed:

1. Hui Hu (AeroE) – 3 years left in term
2. Shankar Subramaniam, Founding Director (ME) – 2 years left in term
3. Dennis Vigil (CBE) – 1 year left in term

Fall Membership Meeting: Save the Date

As we plan our 2020 CoMFRE Annual Meeting, we are unsure what the fall will bring. Even if things open up, we are sure there will be uneasiness in travel. Because of the uncertainties, we are planning to have a virtual annual meeting, where the goal is to provide our member companies an update on CoMFRE and the CoMFRE-supported projects. Only member companies and affiliated faculty will be invited. Here are the details:

What: 2020 CoMFRE Annual Meeting

Where: Virtual through WebEx

When: Tuesday, October 27, 2020, 9 am – noon central time.

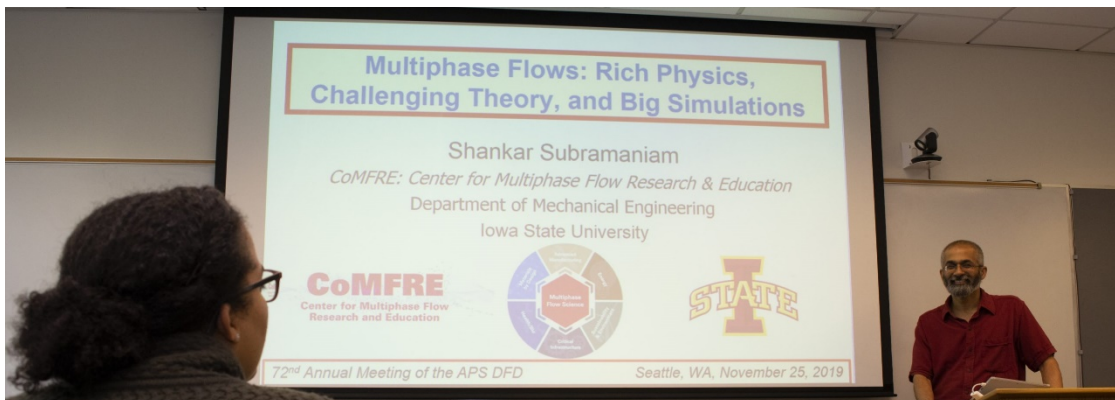
CoMFRE and CoMFRE Affiliates in the News

Quadrature-based Moment Method (QBMM) software simulates multiphase flow behavior: Alberto Passalacqua, Associate Professor of ME and Associate Director of CoMFRE, is leading the development of OpenQBMM. This is an open-source multiphase flow computational fluid dynamics (CFD) software designed to simulate the behavior of flows with particles, bubbles, or droplets. While its applications span many industries, it has an extremely timely application: it allows health industry researchers to understand the spread of droplets released while breathing, which may spread infections.



<https://news.engineering.iastate.edu/2020/06/17/openqbmm-software-simulates-multiphase-flow-behavior/>

Multiphase flow course offers unique hands-on learning and research experiences: ME/ChE 632, backed by CoMFRE, gives students hands on learning in the area of multiphase flows. Shankar Subramaniam teaches this unique course giving students the opportunity to apply their skills from reading, lectures and activities to a multiphase flow project of their interest.



<https://news.engineering.iastate.edu/2020/06/10/multiphase-flow-course-offers-unique-hands-on-learning-and-research-experiences/>

Recent Promotions for CoMFRE-affiliated Faculty

Promotion to Associate Professor with Tenure:

- **Adarsh Krishnamurthy**, Mechanical Engineering
- **Leifur Leifsson**, Aerospace Engineering

Recent Degrees Granted to Students Working on Multiphase Flow Projects

- Vahid Tavanashad, PhD, “Analysis of dispersed multiphase flow using fully-resolved direct numerical simulation: flow physics and modeling”; Primary Advisor: **Shankar Subramaniam**, Co-Advisor: **Alberto Passalacqua**.

Recent Awards for CoMFRE-affiliated Faculty

- **Ming-Chen Hsu** received the College of Engineering Early Achievement in Research Award.
- **Chris Rehmann** received the University level Regents Award for Faculty Excellence.
- **Soumik Sarkar** received the University level Early Achievement in Research.
- **Travis Sippel** received the Engineering Student Council Award for Outstanding Student Organization Advisor of the Year.

A full list of CoMFRE faculty affiliates can be found here:

<https://comfre.iastate.edu/faculty-2-2/page/1/>

Student Awards

- Roy Pillers, Graduate College Teaching Excellence Award; Advisor: **Ted Heindel**
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Recently Funded Research Awards

Feel free to contact the CoMFRE affiliates directly if you have any questions on the projects below.

- “Advancing Predictive Strategies for Wall-Bounded Turbulence by Fundamental Studies and Data-driven Modeling”; **Paul Durbin**; Funding source: DOD – Office of Naval Research (ONR); New funding amount: \$1,000,000.
 - “ISU Task 77: Anti-icing Design Test”; **Hui Hu**; Funding source: Industry; New funding amount: \$60,000.
 - “Wind Turbines in Cold Climates: Icing Physics and Novel Strategies for Wind Turbine Icing Mitigation”; **Hui Hu**; Funding Source: Iowa Economic Development Authority; New funding amount: \$303,587.
 - “A Fundamental Study Toward Innovative Plasma-Based Anti-/De-icing Strategies for Aircraft Icing Mitigation”; **Hui Hu**; Funding Source: NSF; New Funding Amount: \$320,000.
 - “Three Dimensional Printed Scaffolds for Understanding Effect of Cavitation on Blood Brain Barrier”; **Nicole Hashemi**, Reza Montazami; Funding Source: DOD-ONR; New Funding Amount: \$101,000.
 - “CM: Machine-Learning Driven Decision Support in Design for Manufacturability”; **Adarsh Krishnamurthy** and **Soumik Sarkar**; Funding source: NSF; New funding amount (amendment): \$60,000.
 - “Strategies for Building Soil Carbon and Generating Carbon Negative Energy in Iowa Counties”, **Mark Mba-Wright**, Zhiyou Wen; Funding Source: Iowa Economic Development Authority; New Funding Amount: \$280,000.
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Recent Journal Publications

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

- G. Avalos, **P.G. Geredeli**, Boris Muha: "Wellposedness, spectral analysis and asymptotic stability of a multilayered heat-wave-wave system", *Journal of Differential Equations*, 2020, 269:7129-7156

- A.D. Ilgun, **A. Passalacqua**, **R.O. Fox**, A quadrature-based conditional moment closure for mixing-sensitive reactions, *Chemical Engineering Science*, 2020, 226:115831. <https://doi.org/10.1016/j.ces.2020.115831>.
- D. Minglani, A. Sharma, H. Pandey, R. Dayal, J.B. Joshi, **S. Subramaniam**, “A review of granular flow in screw feeders and conveyors”; *Powder Technology*, 2020, 366:369-381.
- B.B Patel, MC. McNamara, L.S. Pesquera-Colom, E.M. Kozik, J. Okuzonu, **N.N. Hashemi**, D.S. Sakaguchi, “Recovery of encapsulated adult neural Progenitor Cells from Microfluidic-Spun Hydrogel Fibers Enhances proliferation and neuronal differentiation”, *ACS Omega*, 2020, 5, 14, 7910–7918, <https://doi.org/10.1021/acsomega.9b04214>.
- A.H. Wrede, M.C. McNamara, R. Baldwin, J. Luo, R. Montazami, A. Kanthasamy, **N.N. Hashemi**, “Characterization of astrocytic response after experiencing cavitation In vitro”, *Global Challenges*, 2020, 1900014, <https://doi.org/10.1002/gch2.201900014>.

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