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# Understanding Transport Phenomena in Multiphase Systems: Modeling, Experiments, and Machine Learning

## ABSTRACT:

The Complex Fluids and Multiphase Transport Laboratory focuses on advancing fundamental thermal-fluid, interfacial, and data sciences, and applying them to enable sustainable and biomanufacturing, effective thermal management solutions, and efficient energy conversion and storage systems. In this talk, I will summarize our combined use of multi-scale modeling, experimental, and data-driven approaches in understanding transport processes in multiphase systems with fluid flow, heat and mass transfer, phase change, electrochemistry, and pattern formation. Examples of capillary-driven assembly in additive manufacturing, spatiotemporally-resolved drop impact dynamics, interpretable unsupervised learning for boiling heat transfer, and indirect dry cooling of power plants will be discussed, aiming to discover new physical insights and to enable more efficient energy solutions and sustainable manufacturing processes

## BIOGRAPHY:

Dr. Ying Sun is Herman Schneider Professor and Head of Department of Mechanical and Materials Engineering at the University of Cincinnati. Prior to joining UC, she was Hess Family Endowed Chair Professor in Mechanical Engineering at Drexel University. In 2019-2022, Dr. Sun served as Program Director of the Thermal Transport Processes Program at NSF. Her research interests include multiphase flows and heat/mass transfer, complex fluids and interfacial phenomena, machine learning and data-driven methods, and multi-scale modeling with applications in energy systems and advanced manufacturing. Dr. Sun is an ASME Fellow and a recipient of the NSF CAREER Award, AFOSR Summer Faculty Fellowship, French CNRS Visiting Professorship, and Drexel College of Engineering Research Achievement Award. She serves as an Associate Editor for Journal of Electrochemical Energy Conversion and Storage, and was an ELATE Leadership Fellow and a visiting professor at Princeton University, Ecole Polytechnique, and Tsinghua University. Dr. Sun obtained her B.Eng. degree from Thermal Engineering at Tsinghua University, and M.S. and Ph.D. degrees in Mechanical Engineering both from University of Iowa.



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