

# Weekly CEA FM Seminar: Spring 2018



JOHNS HOPKINS  
Center for Environmental  
& Applied Fluid Mechanics

Date: **Friday, March 16, 2018**  
Time: 3:00 PM  
Location: Gilman Hall # 132  
Speaker: **Prof. Rui Ni** (Pennsylvania State University)  
Title: ***"Turbulent Multiphase Flow with Finite-Sized Deformable Bubbles"***

## Abstract

A persistent theme throughout the study of multiphase flows is the need to model and predict the detailed behaviors of all involved phases and the phenomena that they manifest at multiple length and time scales. When combined with background turbulent flows with similar multiscale nature, they pose a formidable challenge, even in the dilute dispersed regime. For many applications, from nuclear thermal hydraulics to bubble-mediated air-sea gas exchange, the dispersed phase often consists of many bubbles, bounded by surface tension and separated from the surrounding fluid by a deformable interface. Although many analytic and empirical models of multiphase flows have been formulated strictly for spherical or spheroidal particles with fixed shapes, in turbulent flows, finite-sized bubbles are constantly deforming with altogether different dynamics and momentum couplings over a wide range of scales. In this talk, I will share some ongoing efforts on developing new experimental facilities and techniques to simultaneously measure both the bubble deformation and surrounding turbulent flows in a Lagrangian framework. These preliminary results unveil different mechanisms of bubble deformation and breakup and will help to validate future closure models for Eulerian-Eulerian and Eulerian-Lagrangian two-fluids simulations in a turbulent environment.

Dr. Ni is currently an Assistant Professor of Mechanical Engineering at Penn State holding the endowed Kenneth K. Kuo Early Career Professorship starting 2018. He received his Ph.D. in Physics Department in 2011 from the Chinese University of Hong Kong and worked as a postdoctoral scholar at Yale and Wesleyan University until joining Penn State in 2015. He won the NSF CAREER award in fluid dynamics and ACS-PRF New Investigator Award in 2017. His primary research focus is the development of advanced experimental methods for understanding gas-liquid and gas-solid multiphase flow as well as two-phase heat transfer problem. His other research interests include collective animal behaviors and physiological flows.

