# Center for Environmental & Applied Fluid Mechanics

## "Visualization Study of Quantum Fluid Dynamics in Superfluid $^4$He"


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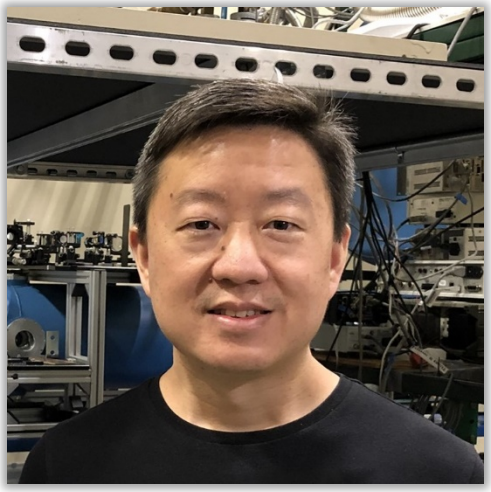

Helium-4 in the superfluid phase, known as He II, is a fascinating two-fluid system that exhibits remarkable quantum fluid dynamics. This system holds great significance in both scientific research and engineering applications. One of its notable features is the support for an extremely efficient heat-transfer mechanism called thermal counterflow. Additionally, it allows the generation of flows with exceptionally high Reynolds numbers, making it suitable for turbulence modeling. However, our understanding and utilization of He II's hydrodynamics have been hindered by the lack of precise flow measurement tools. To overcome this challenge, significant efforts have been made in recent years to develop quantitative flow visualization techniques specifically applicable to He II. Two types of techniques based on the use of either particle tracers (i.e., micron-sized frozen particles) or molecular tracers (i.e., $He_2^*$ excimer molecules) have been developed. I will discuss our contributions in this field and highlight our recent progress in imaging quantized vortex dynamics and investigating the law of the wall in high Reynolds number He II pipe flows. Finally, I will provide a brief introduction to the application of our molecular-tagging technique for diagnosing superconducting particle accelerator cavities.

## Fall 2023 CEAFM Seminar Series

September 22, 2023 ✦ 3:00 PM ✦ Hodson Hall 210

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