DFD15-2015-002507

Abstract for an Invited Paper
for the DFD15 Meeting of
the American Physical Society

Visualization in quantum fluids[1]

DANIEL LATHROP, University of Maryland

The motion of quantized vortices, which are topological phase defects analogous to crystalline dislocations, substantially controls the dynamics of quantum fluids. Quantized vortices have been observed in superfluid 4He and AMO trapped atom systems, and have been inferred in superfluid 3He and neutron stars. Long-range quantum order underlies a number of related physical phenomena, including superfluidity, trapped-atom Bose-Einstein condensates, superconductivity, ferromagnetism, anti-ferromagnetism, lasers, and the Higgs mechanism. While superfluidity in 4He is one of the first discovered of these phenomena, it is one of the least understood, given that the strongly interacting nature of helium makes theory difficult, and that development of local experimental probes is lagging. The advent of flow visualization of particles that trace quantized vortices has led to many advances. That progress was caused by repeated suggestions from Russ Donnelly, Joe Niemela, and Joe Vinen. Those suggestions led the team, including Gregory P. Bewley, K.R. Sreenivasan and myself, to venture into the quantum fluid realm.

[1]We acknowledge the support of NSF DMR/CMP 0906109 and 1407472.