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Quantum turbulence[1] D.P. LATHROP, M.S. PAOLETTI, M.E. FISHER, University of Maryland, K.R. SREENIVASAN, International Centre for Theoretical Physics — Long range quantum order underlies a number of related physical phenomena including superfluidity, superconductivity, the Higgs mechanism, Bose-Einstein condensates, and spin systems. While superfluidity in Helium-4 was one of the earliest discovered of these, it is not the best understood, owing to the strong interactions (making theoretical progress difficult) and the lack of local experimental probes. Approximately three years ago, our group discovered that micron-sized hydrogen particles may be used to label quantized vortices in flows of superfluid helium. Particles not on vortices trace the motion of the normal component of the superfluid. This ability has given a new perspective on an old subject. By directly observing and tracking these particles, we have directly confirmed the two-fluid model, observed vortex rings and reconnection, characterized thermal counterflows, and taken local observations of the very peculiar nature of quantum turbulence.

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