McCormick

Northwestern Engineering

Engineering Sciences and Applied Mathematics

ESAM Seminar Series Presents:

A Trajectory Equation for Walking Droplets: Hydrodynamic Pilot-Wave Theory

Presented by:

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Yves Couder and coworkers have demonstrated that millimetric droplets walking on a vibrating fluid bath exhibit several features previously thought to be peculiar to the microscopic quantum realm, including single-particle diffraction, tunneling, quantized orbits, and wave-like statistics in a corral. We here develop an integro-differential trajectory equation for these walking droplets with a view to gaining insight into their subtle dynamics. We then rationalize the emergence of orbital quantization in a rotating frame by assessing the stability of the orbital solutions. The stability analysis also predicts the existence of wobbling orbital states reported in recent experiments, and the absence of stable orbits in the limit of large vibrational forcing. In this limit, the complex walker dynamics gives rise to a coherent statistical behavior with wave-like features. We conclude by demonstrating the existence of hydrodynamic spin states, which exhibit a macroscopic analogue of Zeeman splitting.

Thursday, January 15th, 11:15am
Technological Institute M416

For further information see http://www.esam.northwestern.edu

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