PHYSICAL MATHEMATICS SEMINAR

Faraday wave-droplet dynamics: a hydrodynamic quantum analogue

MATTHEW DUREY

Massachusetts Institute of Technology

ABSTRACT:

A millimetric droplet may bounce and self-propel on the surface of a vertically vibrating bath, where its horizontal 'walking' motion is induced by repeated impacts with its accompanying Faraday wave field. This hydrodynamic pilot-wave system exhibits many features that were previously thought to be exclusive to the quantum realm, including quantized dynamics and emergent wavelike statistics. We develop a discrete-time iterative map to analyze the pilot-wave dynamics in a number of settings, employing a sophisticated fluid model to capture the intricacies of the Faraday wave evolution neglected by previous works. We first study the stability of bouncing and walking dynamics, and elucidate further features of the droplet's wave-induced added mass. We also explore the periodic and chaotic dynamics arising when the droplet is subjected to a harmonic potential or a Coriolis force. Finally, we modify our fluid model to account for interactions with submerged boundaries, allowing us to rationalize the pilot-wave dynamics in a circular corral.

TUESDAY, OCTOBER 2, 2018
2:30 pm
Building 2, Room 136

Reception following in Building 2, Room 290
(Math Dept. Common Room)

http://math.mit.edu/seminars/pms/

Massachusetts Institute of Technology