Physical Mathematics Seminar

A Hydrodynamic Pilot Wave Model: Generation and Propagation

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ABSTRACT:

Yves Couder and coworkers reported on walking droplets on the surface of a Vibrating bath and discussed their properties previously thought to be peculiar to the microscopic, quantum realm John Bush and coworkers reproduced and extended some of these experiments which were then compared to predictions made through elaborate reduced dynamical systems which contain the wave field. In this presentation we introduce a hydrodynamic wave model which follows from a modified potential flow, coupled to a trajectory equation for the bouncing droplet. The resulting wave model has a damped Bernoulli and kinematic condition. The wave dynamics starts from rest. The fluid domain is vibrated according to the Faraday theory. Then through an appropriate forcing term waves are generated. Will this model capture the bifurcation mechanism which differentiates a steady-bouncing from a walking-droplet regime? Will this model generate and accordingly propagate pilot waves which guide a bouncing droplet? These are some of the questions which are addressed through numerical simulations. Having a model which provides a full description of the wave-particle dynamics, from generation to propagation, is of great potential value.

This work is in collaboration with John Bush (MIT), Paul Milewski (University of Bath) and Carlos Galeano Rios (IMPA).

TUESDAY, October 23, 2012
2:30 PM
Building 4, Room 145

Reception at 3:30 PM in Building 2, Room 290
(Math Dept. Common Room)

http://math.mit.edu/pms

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