

# PHYSICAL MATHEMATICS SEMINAR

## Spheres form strings, and a swimmer from a spring

**DAPHNE KLOTSA**

University of North Carolina, Chapel Hill

### ABSTRACT:

Rigid spherical particles in oscillating fluid flows form interesting patterns as a result of fluid mediated interactions. Here, through both experiments and simulations, we show that two spheres under horizontal vibration align themselves at right angles to the oscillation and sit with a gap between them, which scales in a non-classical way with the boundary layer thickness. A large number of spherical particles form strings perpendicular to the direction of oscillation. Investigating the details of the interactions we find that the driving force is the nonlinear hydrodynamic effect of steady streaming. We then design a simple swimmer (two-spheres-and-a-spring) that utilizes steady streaming in order to propel itself and discuss the nature of the transition at the onset of swimming as the Reynolds number gradually increases. We discuss implications and connections to biological systems, motility, and collective behavior of swimmers.

**TUESDAY, APRIL 11, 2017**

**2:30 PM**

**Building 2, Room 147**

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

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