SEMINAR - סמינר

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ב' 4.12.2017 (ט"ז בכסלו, תשע"ח), בבניין דן קאהן, אודיטוריום 1, 14:30.

מרצה:

Dr. Naomi Oppenheimer

Flatiron Institute at the Simons Foundation, USA

על הנושא:

Beyond Stokes' law - motion of a sphere in a viscous fluid

The seminar will be given in English

להלן תקציר ההרצאה:

We will examine two cases of a sphere moving in a viscous fluid at low Reynolds number, showing pronounced qualitative dynamics that conventional Stokes flow fails to describe. In the first case we will see that rotation and translation are coupled even for a geometrically spherical particle. In the second case, a particle falling in a viscous fluid near a wall will start to move away from the wall. In both cases, the seemingly mysterious effects come from coupling between hydrodynamics and an additional field. In the first — heat; in the second — elasticity.

In the main part of the talk, we will explore the motion of a hot particle in a viscous fluid, which is inspired by recent experiments of thermally driven Brownian particles. The difference in temperature between the particle and the ambient fluid causes a spatial variation of the viscosity in the vicinity of the solid body. In the low Péclet limit, it is possible to derive a general analytical expression determining the force and the torque acting on the particle. Among other results, we find that for a general heat distribution there is a coupling between translational and rotational motions; a coupling which is absent in an isothermal fluid.

In the second part, we will see that a small particle moving along an elastic mem- brane through a viscous fluid is repelled from the membrane due to hydro-elastic forces. The viscous stress produces an elastic disturbance leading to particle-wave coupling. We will derive an analytic expression directly for the particle trajectory in the lubrication limit, bypassing the need to construct the detailed velocity and pressure fields. Measurements of the normal displacement of spheres sedimenting along an elastic membrane will be presented, showing quantitative agreement with our theoretical predictions with no fit parameters. This effect is powerful enough for particle separation and sorting. Such a repulsive force is significant for bio-membranes as well, suggesting possible utilization for membrane elasticity measurements.

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המארח: פרופ' יורם הלוי

בברכה,

פרופ"א מתי"ו סאס

מרכז הסמינרים