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Rotational Motion of Axisymmetric Marangoni Swimmers
JONATHAN ROTHSTEIN, NICK UVANOVIC, Univ of Mass - Amherst — A series of experiments will be presented investigating the motion of millimeter-sized particles on the surface of water. The particles were partially coated with ethanol and carefully placed on a water interface in a series of Petri dishes with different diameters. High speed particle motion was driven by strong surface tension gradients as the ethanol slowly diffuses from the particles into the water resulting in a Marangoni flow. The velocity and acceleration of the particles where measured. In addition to straight line motion, the presence of the bounding walls of the circular Petri dish was found to induce an asymmetric, rotational motion of the axisymmetric Marangoni swimmers. The rotation rate and radius of curvature was found to be a function of the size of the Petri dish and the curvature of the air-water interface near the edge of the dish. For large Petri dishes or small particles, rotation motion was observed far from the bounding walls. In these cases, the symmetry break appears to be the result of the onset of votex shedding. Finally, multiple spherical particles were observed to undergo assembly driven by capillary forces followed by explosive disassembly.

Jonathan Rothstein
Univ of Mass - Amherst

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