Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Sedimentation of polygonal tiles[1] NARAYANAN MENON, ALYSSA CONWAY, Department of Physics, U. of Massachusetts Amherst, RAHUL CHAJWA, TIFR International Center for Theoretical Sciences, RINTARO KIRIKAWA, Department of Physics, U. of Massachusetts Amherst, SRIRAM RAMASWAMY, Department of Physics, Indian Institute of Science — We study the stokesian sedimentation of planar shapes by experiments in which polygonal tiles are placed in a vertical plane and sedimented at low Reynolds number in a quasi-two-dimensional container. We first focus on the effect of shape-polarity by studying isosceles triangles of varying apex angles. Unlike nonpolar shapes, a triangle rotates as it sediments due to coupling between the orientational and translational degrees of freedom, and asymptotically approaches a stable orientation [Jayaweera, Mason, J. Fluid Mech. 22 (1965)]. For small apex angles the triangle is stable with apex pointing down along the gravity direction. As the apex angle is increased we find a transition at $\pi/3$ for which all orientations of the triangle are stable and for apex angles greater than $\pi/3$, the triangle is stable with apex pointing up. We understand the experimental results with a model of three stokeslets fixed to the vertices of a triangle. The transition described above, and the coupling of orientation to horizontal drift are captured by this model. We also test generalizations of this discrete-stokeslet model to other regular and irregular polygons and to concave shapes.

[1]NM, AC acknowledge funding through NSF DMR 1507650.

Narayanan Menon
Department of Physics, UMass Amherst

Date submitted: 01 Aug 2019 Electronic form version 1.4