PHYSICAL MATHEMATICS SEMINAR

Against the current: Three examples of paradoxical flows

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ABSTRACT:

When water is poured into a teacup, it seems self-evident that material in the cup will not make its way upstream into the teapot. Similarly, when chemicals are pipetted onto a culture plate, we take it for granted that cells from the plate will not contaminate the chemical source. In this talk, I briefly describe three examples in which the second law of plumbing is violated, and material can travel in the opposite direction from the obvious flow. First, we demonstrate that floating particles can contaminate upstream reservoirs, even climbing up short waterfalls. Second, we show that shear thickening suspensions such as cornstarch in water necessarily produce rapid "rod climbing" jets when a rod is vibrated vertically in a container of fluid. Finally, we describe nonlinear conditions under which surface electrical charges can travel against the direction of an applied field to yield exponentially growing polarizations and charges. We confirm these findings in simple models and experiments.

TUESDAY, MARCH 17, 2015
2:30 PM
Building E18, Room 466A

Reception following in Building E17, Room 401A
(Math Dept. Common Room)

http://math.mit.edu/pms/

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