DFD15-2015-020016

Abstract for an Invited Paper
for the DFD15 Meeting of
the American Physical Society

Acrivos Award Talk

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Filtering water and brewing coffee are familiar examples of forcing a fluid through a porous material. Such flows are also crucial to many technological applications, including oil recovery, groundwater remediation, waste CO2 sequestration, and even transporting nutrients through mammalian tissues. I will present an experimental approach by which we directly visualize flow within a disordered 3D porous medium over a broad range of length scales, from the scale of individual pores to that of the entire medium. I will describe how we use this approach to learn about fluctuations and instabilities in single-phase and multi-phase flows.