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**Probing The Dynamics Of Flow Within A 3D Porous Medium, From The Pore Scale Up** SUJIT DATTA, HARRY CHIANG, Department of Physics, Harvard University, T.S. RAMAKRISHNAN, Schlumberger-Doll Research, Cambridge MA, DAVID WEITZ, Department of Physics, Harvard University —
Flows through micro and nano scale pores are ubiquitous; they arise in everyday situations, such as in forcing fluid out of a wet sponge, to important technological applications, including oil recovery, groundwater remediation, geological $CO_2$ storage, and even nutrient transport through mammalian tissues. Such flows are typically modeled using a simple continuum approach, which neglects local, pore scale variations in the flow. Here, we present an experimental technique to directly visualize flow within a 3D porous medium over a broad range of length scales, from the scale of individual pores to that of the entire medium. We quantify the dynamics of the flow, both without and with residual trapping of an additional, immiscible fluid within the medium. The pore space is highly complex and interconnected; nevertheless, we find excellent agreement between our measurements and a dramatically simplified mean-field picture of flow.

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