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**Capillary trapping on a rough surface**[1] JASON WEXLER, IAN JACOBI, MELISSA CHOW, HOWARD STONE, Princeton University — Recent research has shown that rough or patterned surfaces infused with a lubricating liquid can display superhydrophobic properties. However, if such a surface is exposed to external flow, the shear induced by the outer fluid can drain the lubricating layer, causing regions of the surface to transition to a hydrophilic Wenzel state. In addition, the high specific gravity of lubricating liquids means that this loss can be driven by gravity alone, in the absence of flow. We examine the shear- and gravity-driven failure modes of liquid-infused patterned surfaces experimentally, and develop a unified model to predict the dynamics of drainage via these two types of forcing. We find that the dynamic evolution of the two drainage mechanisms takes on a single functional form. Under the influence of gravity, we show that a finite length of the surface will remain filled indefinitely; this is a variant of the familiar capillary rise height. Under the influence of external shear, the steady-state liquid retention depends on the outer flow velocity field.

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Jason Wexler
Princeton University

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