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Leaping shampoo glides on a 500-nm-thick lubricating air layer ERQIANG LI, King Abdullah University of Science and Technology, SANGHYUN LEE, Texas A&M University, JEREMY MARSTON, King Abdullah University of Science and Technology, ANDREA BONITO, Texas A&M University, SIGURDUR THORODDSEN, King Abdullah University of Science and Technology — When a stream of shampoo is fed onto a pool in one's hand, a jet can leap sideways or rebound from the liquid surface in an intriguing phenomenon known as the Kaye effect. Earlier studies have debated whether non-Newtonian effects are the underlying cause of this phenomenon, making the jet glide on top of a shear-thinning liquid layer, or whether an entrained air layer is responsible. Herein we show unambiguously that the jet slides on a lubricating air layer [Lee et al., Phys. Rev. E, 87, 061001 (2013)]. We identify this layer by looking through the pool liquid and observing its rupture into fine micro-bubbles. The resulting micro-bubble sizes suggest that the thickness of this air layer is around 500 nm. This thickness estimate is also supported by the tangential deceleration of the jet during the rebounding, with the shear stress within the thin air layer sufficient for the observed deceleration. Particle tracking within the jet shows uniform velocity, with no pronounced shear, which would be required for shear-thinning effects. The role of the surfactant may primarily be to stabilize the air film.

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