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Grow or perish: Dynamics of a pendant drop sliding on a thin film ETIENNE JAMBON-PUILLET, Department of Chemical and Biological Engineering, Princeton University, Princeton, NJ, USA, PIER GIUSEPPE LEDDA, FRANOIS GALLAIRE, Laboratory of Fluid Mechanics and Instabilities, Ecole Polytechnique Federale de Lausanne, CH-1015 Lausanne, Switzerland, P.-T. BRUN, Department of Chemical and Biological Engineering, Princeton University, Princeton, NJ, USA — Anyone who has ever painted a ceiling knows that thin coatings can destabilize into drops spontaneously under the action of gravity via the Rayleigh-Taylor instability. Once formed, these pendant drops interact with the thin film on which they lie on, producing interesting non-linear dynamics; they spontaneously move even on perfectly horizontal surfaces. Using experiments and numerical simulations we study the dynamics of such pendant drops on slightly inclined pre-wet substrates. We show that for a given film thickness, both the drop size evolution and its velocity on the substrate are highly sensitive to the inclination angle. For sufficiently large angles ($\sim 1-2$ deg), the drop shrinks and leaves a thicker film in its wake, i.e. a rivulet, while at lower angles the drop grows and depletes the thin film as it moves. Steady motion only occurs at the transition, when the drop neither grows nor shrinks.

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