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Stretching and Slipping Liquid Bridges near Cavities SHAWN DODDS, SATISH KUMAR, Dept of Chemical Engineering & Materials Science, University of Minnesota, MARCIO S. CARVALHO, Dept. of Mechanical Engineering, Pontificia Universidad Catholica, Brazil — The dynamics of liquid bridges are relevant to a wide variety of applications including high-speed printing, extensional rheometry, and floating-zone crystallization. Although many studies assume that the contact lines of a bridge are pinned, this is not the case for printing processes such as gravure, lithography, and microcontacting. To address this issue, we use the Galerkin/Finite-Element method to study the stretching of a finite volume of Newtonian liquid confined between two flat plates, one of which is stationary and the other moving. The contact lines are allowed to slip, and we evaluate the effect of the capillary number and contact angle on the amount of liquid transferred to the moving plate. Liquid transfer to the moving plate is found to increase as the contact angle of the stationary plate increases relative to that of the moving plate. When the contact angle is fixed and the capillary number is increased, the liquid transfer improves if the stationary plate is wetting, but worsens if it is non-wetting. The presence of a cavity on the stationary plate significantly affects the contact line motion, often causing pinning at the cavity corner. In these cases, liquid transfer is controlled primarily by the cavity shape, suggesting that the effects of surface topography dominate over those of surface wettability.

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