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Observations of hysteresis and mode coupling in capillary bridge oscillations. PHILIP L. MARSTON, WEI WEI, DAVID B. THIESSEN, Washington State University — Large amplitude axisymmetric oscillations of a liquid bridge in a Plateau tank were excited by applying oscillating Maxwell stresses. The liquids were selected to have unusually small kinematic viscosities. The modal frequency response was measured by incrementing the drive frequency. In a narrow range of frequencies the response depended on the direction (downward or upward) of the increments in a way consistent with a lumped-parameter model of hysteresis for a weakly-damped oscillator having a mode-softening nonlinearity. The driven mode was the (3,0) mode having three-halves of an axial wavelength. The slenderness of the bridge was selected so that the third harmonic was the natural frequency of a higher-order mode, the (5,0) mode that has five-halves of a wavelength. The response of that mode at the third harmonic also exhibited hysteresis. The observations are strongly suggestive of a mode-coupling term in the potential energy of the surface deformation. [Supported by NASA.]

Philip L. Marston
Washington State University

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