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Marangoni-induced symmetry-breaking pattern selection on viscous fluids[1] LI SHEN, FABIAN DENNER, Imperial College London, NEAL MORGAN, Shell Global Solutions Ltd, BEREND VAN WACHEM, DANIELE DINI, Imperial College London — Symmetry breaking transitions on curved surfaces are found in a wide range of dissipative systems, ranging from asymmetric cell divisions to structure formation in thin films. Inherent within the nonlinearities are the associated curvilinear geometry, the elastic stretching, bending and the various fluid dynamical processes. We present a generalised Swift-Hohenberg pattern selection theory on a thin, curved and viscous films in the presence of non-trivial Marangoni effect. Testing the theory with experiments on soap bubbles, we observe the film pattern selection to mimic that of the elastic wrinkling morphology on a curved elastic bilayer in regions of slow viscous flow. By examining the local state of damping of surface capillary waves we attempt to establish an equivalence between the Marangoni fluid dynamics and the nonlinear elastic shell theory above the critical wavenumber of the instabilities and propose a possible explanation for the perceived elastic-fluidic duality.

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