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Viscous peeling with capillary suction GUNNAR PENG, JOHN LISTER, University of Cambridge — If an elastic tape is stuck to a rigid substrate by a thin film of viscous fluid and then peeled off by pulling at a small angle to the horizontal, then both viscous and capillary forces affect the peeling speed (McEwan and Taylor, 1966). If there is no capillary meniscus (e.g. if the peeling is due to viscous fluid being injected under the tape), then the peeling speed is given by a Cox–Voinov-like law, and is an increasing function of the peeling angle. We show that, with a meniscus present, the effect of the capillary forces is to suck down the tape, reducing the effective peeling angle and hence the peeling speed. When surface tension dominates and the peeling speed tends to zero, the system transitions to a new state whose time-evolution can be described by a system of coupled ordinary differential equations. These asymptotic results are confirmed by numerical calculations. Similar results hold for the peeling-by-bending of elastic beams, with "angle" replaced by "curvature" (i.e. bending moment).

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