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Inertial Rise in Short Capillaries OREST SHARDT, PRASHANT WAGHMARE, SUSHANTA MITRA, JOS DERKSEN, University of Alberta — We investigate the primarily inertial rise of liquid in vertical glass capillaries that are shorter than the equilibrium rise height (Jurin height). We focus on the behavior of the liquid upon reaching the top of the capillary and use high-speed imaging to observe the motion of the liquid-air interface with high spatial and temporal resolution. We examine the dependence of the interface behavior on the meniscus speed and capillary height and describe a new phenomenon. Upon reaching the upper edge of a sufficiently short capillary, the meniscus inverts, rises upward, and bulges out radially. The bulging liquid then wets the external surface of the capillary and slides down. The meniscus inside the capillary retracts, falling below the upper edge, and then oscillates vertically with decaying amplitude, inverting several times before reaching a steady shape. A theoretical analysis is used to interpret the conditions required for this phenomenon to occur. A key assumption in the analysis is that the transient flow is inertial and therefore the capillary driving force is balanced by the weight and inertia of the rising liquid column while viscous forces are comparatively small. The analysis points to the possibility of obtaining previously-unseen behavior under reduced gravity.

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