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**Delayed onset in viscous fingering** THOMAS VIDEBAEK, SIDNEY NAGEL, Department of Physics, University of Chicago — The viscous fingering instability occurs at the evolving interface between two viscous fluids confined to a thin gap. We investigate the onset of the instability in both radial and rectilinear geometries for both miscible and immiscible pairs of fluids. In all four cases we observe a region of stable growth, $L_{\text{stable}}$, before fingers start to develop. While the initial stability in the radial cell has been ascribed to the velocity profile associated with point-source injection, this explanation is much too small to explain our observations. The region of stable growth before onset that we observe in the linear cell is unexpected. For miscible fluids, $L_{\text{stable}}$ can be tied to the distance it takes to form steady-state, interfacial structures in the gap. For immiscible fluids, where no internal structure is apparent, there is no obvious explanation for $L_{\text{stable}}$, which we find also depends on the capillary number. These results are not accounted for by current analyses of fingering dynamics. We suggest that this is because the experiments are by nature always quasi-two dimensional with an important length set by the gap size.

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