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Memory and inertial oscillations in bubble break-up LAURA E. SCHMIDT, WENDY W. ZHANG, University of Chicago — The break-up of a submerged air bubble has been observed to exhibit an exceptional singularity dynamics, one that retains a memory of small asymmetries in the initial shape [Keim et al. PRL **97**, 144503 (2006)]. To understand the origin of this memory, we observe that the slender-body model of cylindrically symmetric break-up dynamics has a Hamiltonian structure. It therefore retains a precise memory of the energy distribution at the onset of break-up. Moreover, our analysis shows this memory is preserved when the dynamics is perturbed from cylindrical symmetry. The initial asymmetry simply excites inertial oscillations of approximately constant amplitude about the $O(1)$ radial collapse. Finally, to connect our results with shape oscillations that have been recently observed in experiments [Keim & Nagel, DFD07], we include effects of surface tension. Surface tension effects are significant just after onset and act to speed up the oscillation and increase its amplitude. However, as the break-up singularity approaches, the growth of the inertial oscillation amplitude due to surface tension becomes negligible. Surface tension merely distorts the initial energy distribution, which is then remembered by the singularity.

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