Abstract Submitted
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The Larger the Viscosity, the Higher the Bounce MENACHEM STERN, MARTIN KLEIN SCHAARSBERG, IVO PETERS, KEVIN DODGE, WENDY ZHANG, HEINRICH JAEGER, The Physics Department and the James Franck Institute, The University of Chciago — A low-viscosity liquid drop can bounce upon impact onto a solid. A high-viscosity drop typically just flattens, i.e., it splats. Surprisingly, our experiments with a droplet made of densely packed glass beads in silicone oil display the opposite behavior: the low-viscosity oil suspension drop splats. The high-viscosity oil suspension bounces. Increasing solvent viscosity *increases* the rebound energy. To gain insight into the underlying mechanism, we model the suspension as densely packed elastic spheres experiencing viscous lubrication drag between neighbors. The model reproduces the observed trends. Plots of elastic compression and drag experienced by the particles show that rebounds are made possible by (1) a fraction of the impact energy being stored during initial contact via elastic compression, (2) a rapid broadening of local lubrication drag interactions at the initial impact site into a spatially uniform upward force throughout the drop. Including finite wall drag due to the presence of ambient air into the numerical model diminishes and eventually cuts off the rebound.

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