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Head-on collisions of Newtonian and granular jets JAKE ELLOWITZ, WENDY W. ZHANG, Department of Physics and the James Franck Institute at the University of Chicago — When a wide fluid jet collides head-on with a narrow jet, incompressibility, together with energy and momentum conservation requires that the excess forward momentum flux be transported away from the impact zone by two identical symmetrically-angled ejecta streams. The central impact zone itself remains fixed. Introducing any kind of dissipation breaks time-reversal symmetry, thus allowing the excess forward momentum flux to be partitioned between the ejecta streams and the impact zone. Such a partition would cause the impact zone to drift steadily over time rather than remaining fixed. Motivated by the potential relevance of this mechanism to splash formation and microreactors from impinging jets, we simulate head-on collisions of two Newtonian jets and compare it against collisions of two densely packed granular jets. In both cases, the steady-state solutions display impact zones moving with finite drift speeds. Increasing the dissipation, either by increasing the viscosity of the Newtonian liquid or by increasing the coefficient of friction in the granular system, increases the drift speed. To our surprise, plotting the drift speeds against the total dissipation rates collapses results for Newtonian and granular jets.

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