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The Underlying Physics in Wetted Particle Collisions[1] CARLY DONAHUE, CHRISTINE HRENYA, ROBERT DAVIS, University of Colorado — Wetted granular particles are relevant in many industries including the pharmaceutical and chemical industries and has applications to granulation, filtration, coagulation, spray coating, drying and pneumatic transport. In our current focus, we investigate the dynamics of a three-body normal wetted particle collision. In order to conduct collisions we use an apparatus called a "Stokes Cradle," similar to the Newton's Cradle (desktop toy) except that the target particles are covered with oil. Here, we are able to vary the oil thickness, oil viscosity, and material properties. With a three particle collision there are four possible outcomes: fully agglomerated (FA); Newton's Cradle (NC), the striker and the first target ball are agglomerated and the last target ball is separated; Reverse Newton's Cradle (RNC), the striker is separated and the two targets are agglomerated; and fully separated (FS). Varying the properties of the collisions, we have observed all four outcomes. We use elastohydrodynamics as a theoretical basis for modeling the system. We also have considered the glass transition of the oil as the pressure increases upon impact and the cavitation of the oil as the pressure drops below the vapor pressure upon rebound. A toy model has been developed where the collision is modeled as a series of two-body collisions. A qualitative agreement between the toy model and experiments gives insight into the underlying physics.

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Carly Donahue
University of Colorado

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