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Forces and Flows in Non-Newtonian Suspensions[1] MELODY LIM, JONATHAN BARES, ROBERT BEHRINGER, Duke University — Above a certain solid mass fraction, suspensions of dense granular particles in water exhibit non-Newtonian behavior, including impact-activated solidification. Although it has been suggested that solidification depends on interactions with the suspension boundary, quantitative experiments on the boundary forces have not been reported. In the present experiments, we determine the magnitude and timings of impactor-driven events in both the boundaries and body of the suspension using high-speed video, tracer particles, and photoelastic container boundaries. We observe a shock-like propagation in the cornstarch suspension during impact. The dynamics of the shockfront are strongly correlated to those of the intruder. We also observe a second extremely fast shockfront, associated with the propagation of forces to the boundaries of the suspension. The dynamics of this shockfront do not depend on the intruder dynamics, but are correlated to the volume fraction of cornstarch particles in the suspension. The observed shockfront propagates at a speed which is faster than the sound speed in the experiment container.

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Melody Lim
Duke University

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