Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Formation of Granular Jets Observed by High-Speed X-ray Radiography[1] JOHN ROYER, ERIC CORWIN, BRYAN CONYERS, ANDREW FLIOR, MARIA-LUISA CORDERO, MARK RIVERS, PETER ENG, HEINRICH JAEGER, James Frank Institute, The University of Chicago — When a heavy sphere is dropped onto a bed of loose, fine sand, a large, focused jet of sand shoots upward.[2] [3] While similar looking jets are observed upon impact in fluid systems, their formations relies on surface tension. Surprisingly, the granular jet exists in the absence of both surface tension and cohesion. Previous work proposed that the jet is created solely by the gravity-driven collapse of a void left by the spheres descent through the pack. Here we present experimental evidence that granular jets are instead driven by a more complex process involving the interaction between the sand and interstitial air. Using high-speed x-ray radiography, and high-speed digital video, we observe the formation of the jet both inside and above the bed. We find that what previously was thought of as a single jet in fact consists of two components: a wispy, thin jet that varies little with pressure followed by a thick air-pressure-driven jet. The x-ray movies reveal that gravity-driven collapse produces the initial, thin jet, while the compression of an air pocket trapped below the surface drives up the thick jet.

[1]This work was supported by NSF and DOE.
[2]Thoroddsen, S. T. and Shen, A. Q. Phys. Fluids **13**, 4-6 (2001).
[3]Lohse, D. et al. Phys. Rev. Lett. **93** (2004).

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Date submitted: 04 Aug 2005 Electronic form version 1.4