Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Dynamic Buckling and Fragmentation in Brittle Rods JOSEPH GLADDEN, NESTOR HANDZY, ANDREW BELMONTE, The Pennsylvania State University, EMMANUEL VILLERMAUX, IRPHE, France — We present experiments on the dynamic buckling and fragmentation of slender rods axially impacted by a projectile. By combining the results of Saint-Venant and elastic beam theory, we derive a preferred wavelength λ for the buckling instability, and experimentally verify the resulting scaling law for a range of materials including teflon, dry pasta, glass, and steel. For brittle materials, buckling leads to the fragmentation of the rod. Measured fragment length distributions show two peaks near $\lambda/2$ and $\lambda/4$. The non-monotonic nature of the distributions reflect the influence of the deterministic buckling process on the more random fragmentation processes.

Joseph Gladden
The Pennsylvania State University

Date submitted: 10 Dec 2004 Electronic form version 1.4