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Dynamical Instabilities of a Brownian Particle in Weak Adhesion. DEEPAK KUMAR, SHANKAR GHOSH, SHOBO BHATTACHARYA, Tata Institute of Fundamental Research, DEPARTMENT OF CONDENSED MATTER PHYSICS AND MATERIALS SCIENCE TEAM — Dynamical processes involved in weak adhesion are explored through a single cycle of an optically trapped Brownian colloidal silica particle detaching from, and reattaching to, a glass substrate immersed in a fluid in the presence of an externally applied force. Micro-rheology, video-microscopy and Nyquist noise measurements reveal both stochastic and deterministic dynamics of the process. When analyzed in terms of the viscoelastic response of the stress coupling medium between the objects, the unsticking instability shows remarkable similarities with yielding and fracture-mechanics of macroscale solids. The resticking dynamics demonstrates stochastic instabilities through a spatio-temporally punctuated descent of the particle down an energy landscape with a hierarchy of metastable minima.

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