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Geometrically Frustrated Fracture Mechanics NOAH MITCHELL, James Franck Institute, University of Chicago, VINZENZ KONING, VINCENZO VITELLI, Instituut-Lorentz, Universiteit Leiden, WILLIAM T. M. IRVINE, James Franck Institute, University of Chicago — When a flat elastic sheet is forced to conform to a surface with Gaussian curvature, stresses arise in the sheet. The mismatch between initial and final metrics gives rise to new fracture behavior which cannot be achieved by boundary loading alone. Using experiments of PDMS sheets frustrated on 3D-printed surfaces and a linearized analytical model, we demonstrate the ability of curvature to govern the sheets' fracture phenomenology. In this talk, we first show that curvature can both stimulate and suppress fracture initiation, depending on the position and orientation of the initial slit. Secondly, we show that curvature can steer the path of a crack as it propagates through the material. Lastly, the curvature can arrest cracks which would otherwise continue to propagate.

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