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Cracks in Sheets Draped on Curved Surfaces NOAH P. MITCHELL, James Franck Institute, University of Chicago, VINZENZ KONING, VINCENZO VITELLI, Instituut-Lorentz for Theoretical Physics, Universiteit Leiden, WILLIAM T.M. IRVINE, James Franck Institute, University of Chicago — Conforming materials to surfaces with Gaussian curvature has proven a versatile tool to guide the behavior of mechanical defects such as folds, blisters, scars, and pleats. In this talk, we show how curvature can likewise be used to control material failure. In our experiments, thin elastic sheets are confined on curved geometries that stimulate or suppress the growth of cracks, and steer or arrest their propagation. By redistributing stresses in a sheet, curvature provides a geometric tool for protecting certain regions and guiding crack patterns. A simple model captures crack behavior at the onset of propagation, while a 2D phase-field model successfully captures the crack's full phenomenology.

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