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Bending, force recovery, and D-cones in origami inspired model geometries[1] THERESA ELDAR, DAMITH ROZAIRO, ANDREW B. CROLL, North Dakota State Univ — The need for materials with advanced functionality has driven a considerable amount of modern materials science. One idea that has gained significant traction is combining of the ideas Origami and Kirigami with existing materials to build in advanced functionality. In most origami damage is induced in order to trap areas of high curvature in desirable locations in a material. However, the long term and dynamic consequences of local failure are largely unknown. In order to gauge the complex interplay of material properties, relaxation and failure in a set of model thin films, a series of bending and force recovery experiments were carried out. We focus on three materials; polydimethylsiloxane (PDMS), polycarbonate (PC), and polystyrene (PS) chosen for their varying responses to stress. We first measured the load bearing capacity of a single bend in each material, examining the force recovery of bends at various curvatures. Next we examined a doubly folded system in which a single developable cone was created in a similar manner. While the D-cone clearly has massive local consequences for each system, it plays an insignificant role in the systems overall behavior. Finally, we considered higher order combinations of d-cones, ridges and bends.

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