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Controlling Elastic Instabilities: From Complex Pattern Formation to Functionality ELISABETTA MATSUMOTO, RANDALL KAMIEN, University of Pennsylvania — Exploiting elastic instability in thin films has proven a robust method for creating complex patterns and structures across a wide range of lengthscales. Even the simplest of systems, an elastic membrane with a lattice of pores, under stress, generates a plethora of complex patterns featuring long-range orientational order. Harnessing the underlying elastic instability allows for the rational design of materials with highly desirable properties: from a film with a switchable photonic bandgap to a material with a negative Poisson ratio. Within the framework of linear elasticity, we model the system as a lattice of interacting deformation elements, or "dislocation dipoles," which captures the configuration and orientational order present in any conceivable deformation of the system. In addition, when we promote this system to a curved surface, a novel set of features, patterns and broken symmetries appears.

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