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Buckling, Jamming, and Structure Formation in Elastogranular Systems DOUGLAS HOLMES, DAVID SCHUNTER, Boston University, AHMAD MOJDEHI, Virginia Tech, SOPHIA PERRISEAU, REGINA CZECH, Boston University, DAVID DILLARD, Virginia Tech — The coupling of slender rods and disordered granular matter occurs during the growth of plant roots, the bending and buckling of oil pipelines and drill strings, and the creation of subterranean infrastructure with microtunneling and trenchless techonology. These highly nonlinear interactions also present a means to develop jammable, amorphous metamaterials that are disordered on the scale of their local constituent units, yet result in remarkably strong macroscale ordered structures. Elastogranular jamming consists of the disordered coupling of granular media and slender structures to generate structural integrity. In this talk, we will quantify the buckling of a partially inserted elastica into a bed of granular media, and describe structure formation in planar elastogranular systems within a 2D array of beads. Elastica confinement and granular disorder-to-order transitions lead to the emergence of periodically folded structures with a characteristic length scale dictated by the packing fraction of the granular media. We examine the role of local granular order on the resulting elastica confinement, and granular reconfiguration. The resulting 2D elastogranular arrays provide a framework for amorphous mechanical metamaterials that enable pourable, jammed structures.

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