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Effects of Particle Shape on the Deformation of Granular Pillars MATT HARRINGTON, DOUGLAS DURIAN, University of Pennsylvania — Disordered systems are characterized by bulk properties such as yield strength and strain localization that are heavily influenced by local interactions. This general phenomenon can be observed in systems spanning a wide range of length scales, from nanoparticle assemblies to colloidal and granular packings, and can arise from several factors including friction and cohesion. In this study, we probe the effects of particle shape on the global and local behavior of a two-dimensional granular pillar undergoing uniaxial compression. This geometry allows for direct measurement of global material response, as well as tracking of all individual particles. The pillar is comprised of either discrete grains (monomers), pairs of grains bonded together (dimers), or groups of three bonded in a triangle (trimers). We find that pillars comprised of dimers are the strongest, and this effect is influenced by orientational ordering. In addition, while the three particle shapes cause the pillar to dilate at distinct rates, we find that local amorphous structure remains robust through the definition of a metric that quantifies local over-/under-packing. Finally, we highlight how particle shape and local structure impact the likelihood, severity, and spatial extent of local deformation.

Matt Harrington
University of Pennsylvania

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