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**Geometrically Cohesive Granular Materials**[1]

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Geometrically cohesive granular materials (GCGM) are collections of particles whose individual shape leads to entanglements that resist extension forces, resulting in a non-zero Young's modulus. Examples include long, thin (anisometric) rods, arcs of varying length, and U-shaped staples. I will report on experimental and computational work that investigates the peculiar rigidity of GCGM. These include canonical stress-strain and vibration-induced melting experiments on U-shaped staples that have revealed a non-monotonic dependence of collective rigidity on particle shape. For concave particles, rigidity appears proportional to an "entanglement number" — the number of neighbors that pass through the area partially bounded by the particle. Computational and analytic work on arcs and staples confirm the non-monotonic behavior of the entanglement number, and simulations that match the experimental conditions are underway to confirm entanglement as the basic mechanism of GCGM's rigidity.

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