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Extraordinary Elasticity of the Distorted Kagome Lattice ANTON SOUSLOV, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA 19104, KAI SUN, Joint Quantum Institute and Condensed Matter Theory Center, University of Maryland, College Park, MD 20742, XIAOMING MAO, TOM LUBENSKY, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA 19104 — J. C. Maxwell discovered that a system of particles in d-dimensions will be marginally rigid, or *isostatic*, if each particle interacts on average with $2d$ of its neighbors. Isostatic models have been used to describe such diverse soft phenomena as the jamming transition and the elasticity in networks of semi-flexible polymer gels. We develop models based on the isostatic kagome lattice, which has a subextensive number of floppy phonon modes. We show that these can be extended into soft deformations by changing the particle configurations while keeping the bond lengths fixed. Thus, we create families of novel isostatic lattices, which exhibit highly tunable elastic properties as a consequence of isotropic linear elasticity with a zero bulk modulus. They have a negative Poisson ratio, or auxetic (anti-rubber) behavior. Further, we find no bulk soft phonons at large length scales due to conformal symmetry. We discuss the intimate relationship between various symmetries and soft response in these models as well as the relation of these models to other marginally rigid systems.

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