Extraordinary Elasticity of the Distorted Kagome Lattice AN-
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ING 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 config-
urations 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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