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Soft modes near the buckling transition of icosahedral shells
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of Technology, Sweden, DAVID NELSON, Harvard University — Closed shells com-
prised of pentamers and hexamers may be smooth and nearly spherical, or sharply
faceted and icosahedral, depending on the elastic constants of the shell. We inter-
pret the transition from smooth to faceted as a soft-mode transition. Our analysis is
based on the phonon spectrum of a simplified mass-and-spring model of the shell. In
contrast to the case of a disclinated planar network, where the transition is sharply
defined, the mean curvature of the sphere smooths the transition rather like a mag-
netic field smears out a ferromagnetic phase transition. We define susceptibilities
of the transition as the response to forces applied at vertices, edges and faces of an
icosahedron. At the soft-mode transition the vertex susceptibility is largest, but as
the shell becomes faceted the edge and face susceptibilities greatly exceed the vertex
susceptibility.

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