Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Statistical mechanics of thin spherical shells ANDREJ KOSMRLJ, Princeton University, DAVID R. NELSON, Harvard University — We explore how thermal fluctuations affect the mechanics of thin amorphous spherical shells via renormalization group calculations. It is well known that for flat solid membranes thermal fluctuations effectively increase the bending rigidity and reduce the bulk and shear moduli. This is still true for spherical shells. However, the additional coupling between the shell curvature, the local in-plane stretching modes and the local out-of-plane undulations leads to novel phenomena. In spherical shells thermal fluctuations effectively produce negative surface tension, which is equivalent to applying external pressure. We find that small spherical shells are stable, but for sufficiently large shells this thermally generated pressure becomes big enough to crush spherical shells. Such shells can be reinflated by increasing internal pressure, where the effective shell size grows non-linearly as a function of internal pressure with a power law exponent characteristic for thermally fluctuating flat membranes under uniform tension.

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Date submitted: 03 Nov 2015 Electronic form version 1.4