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Periodic buckling of constrained cylindrical elastic shells JOEL MARTHELOT, PIERRE-THOMAS BRUN, FRANCISCO LOPEZ JIMENEZ, PEDRO M. REIS, MIT — We revisit the classic problem of buckling of a thin cylindrical elastic shell loaded either by pneumatic depressurization or axial compression. The control of the resulting dimpled pattern is achieved by using a concentric inner rigid mandrel that constrains and stabilizes the post-buckling response. Under axial compression, a regular lattice of diamond-like dimples appears sequentially on the surface of the shell to form a robust spatially extended periodic pattern. Under pressure loading, a periodic array of ridges facets the surface of the elastic cylindrical shell. The sharpness of these ridges can be readily varied and controlled through a single scalar parameter, the applied pressure. A combination of experiments, simulations and scaling analyses is used to rationalize the combined role of geometry and mechanics in the nucleation and evolution of the diamond-like dimples and ridges networks.

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