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Numerical Simulation of the Combined Bending, Stretching, and Wrinkling of Thin Sheets MICHAEL TAYLOR, Harvard University, DAVID STEIGMANN, University of California, Berkeley, KATIA BERTOLDI, Harvard University — A two-dimensional theory of plates and shells derived from three-dimensional finite elasticity is presented. The approach is based on a systematic small thickness expansion of the exact three-dimensional strain energy density of the plate or shell. The theory involves the small thickness explicitly and accounts for both bending and stretching in a unified framework. Thus, wrinkling instabilities in thin sheets are accommodated as a natural outgrowth of the model. The plate model is demonstrated numerically via a specially designed finite difference code utilizing the method of dynamic relaxation. The code is used to simulate several equilibrium deformations of thin sheets and plates undergoing finite deformation with wrinkling.

Michael Taylor
Harvard University

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