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Elastoswellability: Will it bend or will it buckle? DOUGLAS HOLMES, ANUPAM PANDEY, Virginia Tech — Soft mechanical structures such as biological tissues and gels exhibit motion, instabilities, and large morphological changes when subjected to external stimuli. Swelling is a robust approach for inducing structural change as it occurs naturally in humid environments and can be easily adapted for industrial design. Small volumes of fluid that interact favorably with a material can cause large, dramatic, and geometrically nonlinear deformations including beam bending, plate buckling, and surface wrinkling. In this talk we address an overarching question regarding swelling-induced deformations: will the structural change occur globally, or will it be confined to the material's surface? We introduce a materials and geometry defined transition point that describes a fluid-structure's characteristic "elastoswellability" lengthscale. By locally swelling unconstrained slender beams and plates with solvents of varying solubility, we identify a transition between local surface wrinkling and global structural bending.

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