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Generalized Bistability in Origami Cylinders AUSTIN REID, North Carolina State University, MOKHTAR ADDA-BEDIA, FREDERIC LECHENAULT, Laboratoire de Physique Statistique de l'ENS — Origami folded cylinders (origami bellows) have found increasingly sophisticated applications in space flight, medicine, and even experimental nuclear physics. In spite of this interest, a general understanding of the dynamics of an origami folded cylinder has been elusive. By solving the fully constrained behavior of a periodic fundamental origami cell defined by unit vectors, we have found an analytic solution for all possible rigid-face states accessible from a cylindrical Miura-ori pattern. Although an idealized bellows has two rigid-face configurations over a well-defined region, a physical device, limited by nonzero material thickness and forced to balance hinge with plate-bending energy, often cannot stably maintain a stowed configuration. We have identified and measured the parameters which control this emergent bistability, and have demonstrated the ability to fabricate bellows with tunable deployability.

Austin Reid
North Carolina State Univ

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