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**Coupling geometrical frustration with mechanical instabilities to design surfaces with three dynamically changing states** SUNG KANG, SICONG SHAN, KATIA BERTOLDI, Harvard University — The interplay between mechanical instabilities and non-linear deformation in soft, porous structures give us the exciting opportunities to design materials that can suddenly change from one shape to another in response to an external stimulus. Based on this approach, there have been an increasing number of studies demonstrating reversible pattern formation between two states. Inspired by triple-shape-memory polymers [1], here we show a new mechanism to generate three-state ordered pattern formation using athermal process by exploiting buckling and geometrical frustration of cellular structures. Our new approach allows dynamical switching among three successive states simply by varying the external stimuli. Moreover, our scale-independent mechanism based on geometry and mechanical instability can provide a unique opportunity for studying dynamics of complex pattern formation with tunable surface properties. Reference: [1] I. Belin, S. Kelch, R. Langer, and A. Lendlein, Proc. Natl. Acad. Sci. USA, 103, 18043-18047 (2006).

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