Designing the energy landscape of folded structures

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ABSTRACT

We show that multistability is an inherent feature of planar folded objects. By systematically exploring the energy landscape of the simplest such system, i.e., a single vertex fold connecting four rigid plates where all elastic energy is stored in the folds, we show that bistability is generally expected. With simple design rules we can add a third or even a fourth-stable state. Under exceptional circumstances, we can "remove" one minima to create effectively monostable systems. Tiling such structures allows us to design metamaterials with functional stability landscapes.