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The bifurcations of nearly flat origami¹

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Self-folding origami structures provide one means of fabricating complex, three-dimensional structures from a flat, two-dimensional sheet. Self-folding origami structures have been fabricated on scales ranging from macroscopic to microscopic and can have quite complicated structures with hundreds of folds arranged in complex patterns. I will describe our efforts to understand the mechanics and energetics of self-folding origami structures. Though the dimension of the configuration space of an origami structure scales with the size of the boundary and not with the number of vertices in the interior of the structure, a typical origami structure is also floppy in the sense that there are many possible ways to assign fold angles consistently. I will discuss our theoretical progress in understanding the geometry of the configuration space of origami. For random origami, the number of possible bifurcations grows surprisingly quickly even when the dimension of the configuration space is small.

¹EFRI ODISSEI-1240441, DMR-0846582