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Origami Mechanics: Bistability and Isometries MOKHTAR ADDA-BEDIA, FREDERIC LECHENAULT, Laboratoire de Physique Statistique de l'ENS, MORPHOGENESIS AND MULTISCALE PHENOMENA TEAM — Origami structures are usually seen as assemblies of rigid faces articulated around creases with hinge-like behaviour. Their deployment and degrees of freedom are purely kinematic, resulting only from the geometry of the crease network. However, in real folded structures, the base material can deform outside the creases. In such situations, face bending competes with crease actuation in a morphogenetic way. In order to rationalise this interplay, we investigate the mechanical behaviour of an infinite sheet on which one or more straight creases meet at a single vertex. We find that these structures generically exhibit bistability, in the sense that they can snap through from one metastable configuration to another. Furthermore, we uncover a new class of isometry of the plane, which corresponds to metastable states of a creased sheet for which the hoop stress vanishes, an instability mechanism that is also responsible for the wrinkling of thin plates.

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