

New tiling shape is discovered

Across an infinite two-dimensional surface, a regular grid of squares or an array of equilateral triangles can fit together without gaps or overlaps. It's a periodic arrangement because no matter what location you zoom in on, the tiling of the shapes has the same pattern, so you don't need to rotate the individual shapes. Or, in mathematics parlance, the tiling pattern has translational symmetry. But for at least 60 years, researchers have been searching for whether a single shape can tile a 2D plane aperiodically. David Smith—a retired engineer from Yorkshire, UK, who likes to tinker with shapes—and his collaborators report in a March arXiv paper that such a shape exists; here ones in several colors tile the entire page in a unique pattern. The blue shapes are reflected versions of the other ones.

It's not the first aperiodic tiling pattern ever discovered. Roger Penrose, for example, learned in the 1970s that a pair of different rhombuses forms an aperiodic tiling (see the Quick Study by Luca Bindi and Paul Steinhardt, *PHYSICS TODAY*, May 2022, page 62). But it and all the other previous arrangements either required more than one shape or certain edge-matching and substitution rules. In a follow-up arXiv paper in May, the team found that modifying the shape's edges to be curved allowed it to become weakly chiral, and that new shape can tile a surface aperiodically and without any reflections of itself. (D. Smith et al., <https://arxiv.org/abs/2303.10798>; D. Smith et al., <https://arxiv.org/abs/2305.17743>; image courtesy of Craig Kaplan.)

—AL

TO SUBMIT CANDIDATE IMAGES FOR **BACK SCATTER** VISIT <https://contact.physicstoday.org>.