An Aperiodic Monotile

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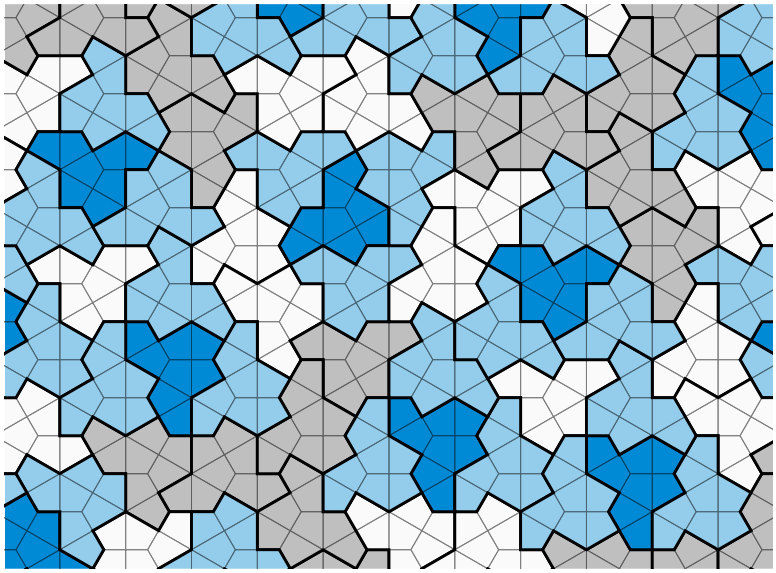

Figure 1: *Copies of the "hat" tile, assembled to cover a rectangular region with no gaps and no overlaps.*

Wang first proposed the notion of an aperiodic tiling in 1961, conjecturing that none existed [4]. Not long after, Berger found the first aperiodic set of tiles, comprising more than 20,000 shapes [1]. His work precipitated a search for smaller sets. For nearly fifty years, sets of size two by Penrose and others were the smallest known [2]. Could there exist an "einstein", a *single shape* that tiles the plane aperiodically?

Earlier this year, David Smith, Joseph Samuel Myers, Chaim Goodman-Strauss and I discovered that a simple shape we call "the hat" (Figure 1), a union of eight kites, is such an einstein [3]. In this talk I will present a brief overview and history of aperiodic tilings and then discuss the hat, the proof of its aperiodicity, its potential connection to other mathematical ideas, and some of the artistic endeavours it has inspired.

References

[1] R. Berger. *The Undecidability of the Domino Problem*. ser. Memoirs of the American Mathematical Society. American Mathematical Soc., 1966. no. 66.

[2] R. Penrose. "Pentaplexity." *Eureka*, vol. 39, 1978, pp. 16–22.

[3] D. Smith, J. S. Myers, C. S. Kaplan, and C. Goodman-Strauss. "An aperiodic monotile." 2023. https://arxiv.org/abs/2303.10798.

[4] H. Wang. "Proving Theorems by Pattern Recognition – II." *The Bell System Technical Journal*, vol. 40, no. 1, 1961, pp. 1–41.