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Pessimal shapes for packing YOAV KALLUS, Princeton University — The question of which convex shapes leave the most empty space in their densest packing is the subject of Reinhardt's conjecture in two dimensions and Ulam's conjecture in three dimensions. Such conjectures about pessimal packing shapes have proven notoriously difficult to make progress on. I show that the regular heptagon is a local pessimum among all convex shapes, and that the 3D ball is a local pessimum among origin-symmetric shapes. Any shape sufficiently close in the space of shapes to these local pessima can be packed at a greater efficiency than they. In two dimensions and in dimensions above three, the ball is not a local pessimum, so the situation in 3D is unusual and intriguing. I will discuss what conditions conspire to make the 3D ball a local pessimum and whether we can prove that it is also a global pessimum.

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