Universal hidden order in amorphous cellular geometries
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Optimal quantization of space, that is, a partitioning into cells, is central to many fields of science and technology. The "Quantizer problem" searches for an optimal "cell centrality". Here we use an iterative optimization of each cell to demonstrate the existence and stability of an amorphous state with a hidden long-range order. Akin to a thermodynamic phase, this state is universal;irrespective of the level and type of the initial disorder, the system converges to the same state, as measured by the structure factor and energy distribution.

This highly degenerate state exhibits an anomalous suppression of long-range density fluctuations, known as hyperuniformity. Our findings open the search for thermodynamically stable, hyperuniform phases in systems related to the Quantizer problem, such as self-assembled copolymers.