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Growth of icosahedral quasicrystals JOSHUA SOCOLAR, CONNOR HANN, Duke University, PAUL STEINHARDT, Princeton University — The discovery of an icosahedral quasicrystal that formed naturally in a rock sample originating from a meteorite highlights fundamental questions about quasicrystal formation.[1] ?The growth of a well-ordered quasicrystal through kinetics dominated by local energetics is known to be possible in principle for 2D systems: a Penrose tiling, for example, can be grown from a particular type of small seed by adding tiles only to surface sites where the tile type and orientation are unambiguously determined by already placed tiles that share a vertex.[2] We consider the generalization of this result to icosahedral quasicrystal tilings comprised of Ammann rhombohedra. Numerical simulations strongly suggest that infinite, well-ordered, icosahedral quasicrystals can be generated. Unlike the 2D case, defects are generated outside the original seed, but the number of such defects appears to grow only linearly with the cluster radius. Analysis of the lift of the tiling to a 6D hypercubic lattice provides key insights into the growth mechanism.

[1]Bindi, Steinhardt, Yao, and Lu. *Science*, **324**:1306 (2009).
[2]Onoda, Steinhardt, DiVincenzo, and Socolar, *PRE* **60**:2653 (1988).

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