

Geometry Seminar
Tuesday, May 04, 2010
Room 201 WWH at 6:00 P.M.

Packings of regular tetrahedra: A combined analytical and numerical search

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Joint work with E.R. Chen, A. Haji-Akbari, and S.C. Glotzer.

Packing problems are one area where mathematics meet puzzles. There are no generally applicable approaches to find dense packings, and the search often relies on the creativity of the researcher or on numerical methods. The packing of regular tetrahedra has received considerable interest over the last few years. Previous work involves constructions of lattice packings, packings motivated by the Weaire-Phelan foam, and crystalline nonamer packings.

Here I report on a numerical search using Monte Carlo simulations. For large systems with thousands of tetrahedra, a dodecagonal quasicrystal is spontaneously formed, and for small systems with up to 16 particles, dense double dimer packing are observed. By analytic optimization within a restricted three-dimensional parameter space, we generalize previous results by Kallus-Elser-Gravel and Torquato-Jiao and find the currently densest known tetrahedron packing with density $\phi = 4000/4671$.

For more information please visit the seminar website at:
http://www.math.nyu.edu/seminars/geometry_seminar.html.