## **VCU** Discrete Mathematics Seminar

Bootstrap Percolation Thresholds in Plane Tilings using Regular Polygons

## Prof Dan Cranston VCU!

Wednesday, Feb. 21 1:00-1:50 4145 Harris Hall



We study bootstrap percolation, which is an example of a cellular automaton, sometimes called a 0-player game. We fix a positive integer k and start with a plane graph T, in which some faces are "infected". Once a face is infected, it remains so forever. If a face, f, is uninfected, but has at least k infected neighbors, then f becomes infected. The *percolation percolation threshold* is the largest integer k such that if we infect each face independently with probability 1/2, then with probability at least 1/2 eventually the whole graph becomes infected.

We consider bootstrap percolation in tilings of the plane by regular polygons. A *vertex type* in such a tiling is the (cyclic) order of the faces that meet a common vertex. Let T denote the set of plane tilings T by regular polygons such that if T contains one instance of a vertex type, then it contains infinitely many instances of that type. We show that no tiling in T has threshold 4 or more. Further, we show that the only tilings in T with threshold 3 are four of the Archimedean lattices. Finally, we describe a large subclass of T with threshold 2.

This is joint work with Neal Bushaw.

For the DM seminar schedule, see:

http://www.people.vcu.edu/~dcranston/DM-seminar