CCSU

DEPARTMENT OF MATHEMATICAL SCIENCES

COLLOQUIUM

Friday, September 18

2:00 – 3:00 PM

Maria Sanford, Room 101

SYMMETRIES, ORBIFOLDS AND TILINGS

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Abstract

When a symmetry group is a discrete group of isometries of a metric space, then the orbifold, or the quotient space of the original space by the isometry group has a unique geometry of its own that characterizes the isometry group. It also sometimes has a topology that might not be anticipated from the topology of the original space, and it has an Euler characteristic (with slightly different rules for the graphs and for counting) that may be different from the Euler characteristic it has when viewed purely as a topological object.

We review Thurston's classification of the symmetry groups of repeated patterns of the frieze, the plane and the sphere that is based on their orbifolds. The audience will actively participate by helping to classify some sample patterns and by using paper, scissors and tape to create the orbifolds for certain examples. We will then turn our attention to Heesch types versus the more general isohedral types of tilings which are invariant under the symmetry group. Finally, we will consider some infinitely repeated patterns of the plane for which the symmetry group is just the identity mapping and the fundamental region is the entire plane -- in other words, aperiodic tilings of the plane by a single tile. Some of these tilings are not just random but have a unique pattern which can't be described by an isometry group.

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