

Mathematics Colloquium

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Volume and Angle
Structures on 3-Manifolds

Abstract: We introduce a finite-dimensional variational approach to find constant-curvature metrics on triangulated closed 3-manifolds. The approach is based on the Schläfli formula for the volumes of tetrahedra. The Schläfli formula suggests that the volume should be expressed in terms of dihedral angles. Based on this observation, we defined the concept of an angle structure on a tetrahedron and on a triangulated closed 3-manifold, and defined their volume. These are natural generalizations of constant sectional curvature metrics and their volume. It is shown that the volume functional can be extended continuously to the compact closure of the moduli space of angle structure, verifying a conjecture of John Milnor. The main result shows that for a 1-vertex triangulation of a closed 3-manifold if the volume function on the moduli space of all angle structures has a local maximum point, then either the manifold admits a constant-curvature Riemannian metric, or the manifold is reducible.

Wednesday, October 4

4:00-5:00 pm
204 Smith Hall