UNIVERSITY OF MICHIGAN
Department of Mathematics

Seminar & Events Bulletin: Geometry

01-01-2013 to 06-30-2013

Friday, January 18, 2013	
3:00pm-4:00pm	**Geometry** -- Christopher Mooney (Bradley University) *Old School Topology and Invariants of CAT(0) Group Boundaries* -- 3096 East Hall

Friday, February 01, 2013	
3:00pm-4:00pm	**Geometry** -- Amie Wilkinson (University of Chicago) *Absolute continuity, exponents, and rigidity* -- 3096 East Hall

Friday, March 15, 2013	
3:00pm-4:00pm	**Geometry** -- Dave Futer (Temple) *Surface quotients of hyperbolic buildings* -- 3096 East Hall

Friday, March 22, 2013	
3:00pm-4:00pm	**Geometry** -- Siu-Cheong Lau (Harvard) *An introduction to SYZ mirror symmetry* -- 3096 East Hall

Monday, April 01, 2013	
4:00pm-5:00pm	**Geometry** -- Jeff Danciger (UT Austin) *Geometric transitions in Lorentzian geometry I* -- EH 3096

Friday, April 05, 2013	
3:00pm-4:00pm	**Geometry** -- Gabor Szekelyhidi (Notre Dame) *Filtrations and test-configurations* -- 3096 East Hall

Friday, April 12, 2013	
3:00pm-4:00pm	**Geometry** -- Livio Flaminio (U Lille) *Cohomology and equidistribution for Abelian actions on nilmanifolds* -- 3096 East Hall

Friday, April 19, 2013	
3:00pm-4:00pm	**Geometry** -- Karsten Grove (U Notre Dame) *Tits Geometry and Positive Curvature* -- 3096 East Hall

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Abstracts

Geometry
Friday, January 18, 2013, 3:00pm-4:00pm
3096 East Hall
Christopher Mooney (Bradley University)
Old School Topology and Invariants of CAT(0) Group Boundaries

Recently there has been a surge of interest in "coarse invariants" of groups. This has led geometric group theorists to return to the classical notions of shape equivalence and cell-like equivalence. It has been shown by Bestvina and Geoghegan that all CAT(0) boundaries of a group are shape equivalent, and Bestvina has asked if they all satisfy the stronger notion of cell-like equivalence.

In joint work with Craig Guilbault, we have shown that the answer is "Yes" for an interesting family of groups introduced by Croke and Kleiner. This family includes many of the known examples of groups with multiple boundaries. This talk will begin with a crash-course review of shape equivalence and cell-like equivalence. It will then move to our approach and cover some of the important points in the proof of our theorem.

Geometry
Friday, February 01, 2013, 3:00pm-4:00pm
3096 East Hall
Amie Wilkinson (University of Chicago)
Absolute continuity, exponents, and rigidity

The geodesics in a compact surface of negative curvature display stability properties originating in the chaotic, hyperbolic nature of the geodesic flow on the associated unit tangent bundle. Considered as a foliation of this bundle, this collection of geodesics persists in a strong way when one perturbs of the Riemannian metric, or the geodesic flow generated by this metric, or even the time-one map of this flow: for any perturbed system there is a corresponding "shadow foliation" with one-dimensional smooth leaves that is homeomorphic to the original geodesic foliation. A counterpart to this foliation stability is a curious rigidity phenomenon that arises when one studies the disintegration of volume along the leaves of this perturbed shadow foliation. I will describe this phenomenon and its underlying causes. This is recent work with Artur Avila and Marcelo Viana.

Geometry
Friday, March 15, 2013, 3:00pm-4:00pm
3096 East Hall
Dave Futer (Temple)
Surface quotients of hyperbolic buildings

Bourdon's building is a negatively curved 2-complex built out of hyperbolic right-angled polygons. Its automorphism group is large (uncountable) and remarkably rich. We study, and mostly answer, the question of when there is a discrete subgroup of the automorphism group such that the quotient is a closed surface of genus g. This involves some fun elementary combinatorics, but quickly leads to open questions in group theory and number theory.

One consequence of our construction is that a lattice in the automorphism group of Bourdon's building always contains a surface subgroup. This proves a special case of Gromov's surface subgroup conjecture. Joint work with Anne Thomas.

Geometry
Friday, March 22, 2013, 3:00pm-4:00pm
3096 East Hall
Siu-Cheong Lau (Harvard)
An introduction to SYZ mirror symmetry

The study of mirror symmetry discovered by string theorists has led to revolutionary developments in enumerative geometry in the past two decades. In this talk, I will illustrate mirror symmetry by a simple example, and explain a mathematical approach to study mirror symmetry proposed by Strominger-Yau-Zaslow, which has closed relations with Lagrangian intersection theory.

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Geometry
Monday, April 01, 2013, 4:00pm-5:00pm
EH 3096
Jeff Danciger (UT Austin)
Geometric transitions in Lorentzian geometry I

A complete flat Lorentzian three-manifold is the quotient of the (2+1) dimensional Minkowski space by a group of isometries acting properly discontinuously. If the group acting is a free group, the quotient is called a Margulis space-time. We show that (most) Margulis space-times arise as rescaled limits of collapsing manifolds modeled on anti de Sitter (AdS) geometry, a negatively curved Lorentzian model geometry. This is joint work with FranÃƒÂ§ois GuÃƒÂ©ritaud and Fanny Kassel.
The talk will have two parts. Part I will develop a framework for geometric transitions. Specifically we explain how to make sense of paths of geometric structures that change geometry (e.g. from curved to flat). Part II will focus on the geometry and topology of Lorentzian manifolds, and then give the main construction.

Geometry
Friday, April 05, 2013, 3:00pm-4:00pm
3096 East Hall
Gabor Szekelyhidi (Notre Dame)
Filtrations and test-configurations

Test-configurations are certain degenerations of projective manifolds, used in the definition of K-stability, which in turn is related to the existence of special metrics. I will explain how filtrations of the homogeneous coordinate ring of a projective manifold can be thought of as sequences of test-configurations, and that they encode the limiting behavior of these sequences. Such filtrations arise naturally when studying the Calabi flow, or when trying to minimize the Calabi functional. I will also discuss how filtrations can be used to give a strengthening of the notion of K-stability, and why this is desirable.

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Geometry
Friday, April 12, 2013, 3:00pm-4:00pm
3096 East Hall
Livio Flaminio (U Lille)
Cohomology and equidistribution for Abelian actions on nilmanifolds

Following Katok we say that the cohomology of the action of a group P on a smooth manifold M is stable if the space of co-boundaries is closed in the smooth topology. A refinement of this is the notion of tame stability, a fundamental property for perturbation theory. We prove that the action of Abelian subgroups of the Heisenberg group H^{2n+1} on compact quotients of H^{2n+1} are tamely stable in all degrees, under a suitable Diophantine condition. As a consequence we derive precise asymptotics for the deviations of ergodic averages for these group actions. This is a work in collaboration with S.~Cosentino (University do Minho, Braga).

Geometry
Friday, April 19, 2013, 3:00pm-4:00pm
3096 East Hall
Karsten Grove (U Notre Dame)
Tits Geometry and Positive Curvature

There is a well known link between (maximal) polar representations and isotropy representations of symmetric spaces provided by Dadok. Moreover, the theory by Tits and Burns-Spatzier provides a link between irreducible symmetric spaces of non-compact type of rank at least three and irreducible topological spherical buildings of rank at least three. We discover and exploit a rich structure of a (connected) chamber system of finite (Coxeter) type M associated with any polar action of cohomogeneity at least two on any simply connected closed positively curved manifold. Although this chamber system is typically not a Tits geometry of type M, we prove that in all cases but one that its universal Tits cover indeed is a building. We construct a topology on this universal cover making it into a topological building in the sense of Burns and Spatzier. Using this structure we classify all polar actions on (simply connected) positively curved manifolds of cohomegeneity at least two.