Abstract of talks

François Ledrappier
CNRS- University Notre Dame

Entropies for cover of compact manifold

Abstract: We consider different growth rates associated with the geometry (distance, volume, heat kernel) on a cover of a compact Riemannian manifold. We present general inequalities. We discuss the rigidity results and questions in the case of negative curvature.

Non-stationary normal forms for non-uniform contractions.

Boris Kalinin – Penn State

We consider a diffeomorphism f of a compact manifold M which contracts, an invariant foliation W with smooth leaves. If the differential of f on TW has narrow band spectrum, there exist coordinates $H _x:W_x \to T_x W$ in which $f_W(x)$ is a polynomial in a finite-dimensional Lie group G.
We construct H_x that depend smoothly on x along the leaves of W and give an atlas with transition maps in G. Our results apply, in particular, to C^1-small perturbations of algebraic systems. Further, we construct polynomial normal forms for smooth extensions of measure preserving systems by non-uniform contractions and obtain the above results for the stable "foliation" of an arbitrary measure preserving diffeomorphism f. This yields an f-invariant structure of a G homogeneous space on almost every leaf.

Spherical averages in the space of marked lattices

Ilya Vinogradov – Princeton University

A marked lattice is a d-dimensional Euclidean lattice, where each lattice point is assigned a mark via a given random field on Z^d. We prove that, if the field is strongly mixing with a faster-than-logarithmic rate, then for every given lattice and almost every marking, large spheres become equidistributed in the space of marked lattices. A key aspect of our study is that the space of marked lattices is not a homogeneous space, but rather a non-trivial fiber bundle over such a space. As an application, we prove that the free path length in a crystal with random defects has a limiting distribution in the Boltzmann-Grad limit.
Joint work with Jens Marklof (Bristol).

Badly approximable vectors in conformal fractals

Tushar Das -University of Wisconsin- La Crosse

Abstract:

Since the last decade or so there has been a growing interest in computing the Hausdorff dimension of the intersection of the set of badly approximable vectors with various fractal sets. We prove that the badly approximable vectors form a set of full Hausdorff dimension in the limit set of an irreducible conformal iterated function system (with either finite or countably infinite alphabet). The same is true for the radial Julia set of an irreducible meromorphic function (either rational or transcendental). The method of proof, which goes back to Kleinbock–Weiss (Israel J. Math. 2005), is to find subsets of the limit set that support absolutely friendly and Ahlfors regular measures of large dimension. This is joint work with David Simmons (York), Lior Fishman (UNT) and Mariusz Urbanski (UNT).

Pressure type metrics on spaces of metric graphs
Lien-Yung Kao – University Notre Dame

We will discuss two Riemannian metrics on a moduli space of metric graphs. Both of them are constructed via the thermodynamical formalism and could be thoguth of as analogues of the Weil- Petersson metric on the moduli space of metric graphs. In particular, we will discuss and compare geometric features of these two metrics with the "classic" Weil-Petersson metric in Teichmuller theory. This work is motivated by an earlier work of Pollicott and Sharp.

Mobius disjointness for analytic skew products
Zhiren Wang – Penn State

Sarnak's Mobius disjointness conjecture states that the Mobius function is disjoint to every topological dynamical system of zero entropy. In this talk, we will explain why this is true for every analytic skew product map on the two torus over a rotation of the circle of arbitrary rotation number. If time allows, we will also discuss some progress in the case of smooth skew products.

Ergodic planar Eaton lens configurations
Martin Schmoll – Clemson University

Abstract:
An Eaton lens is a retroreflector lens that reflects light backwards, that is the direction of the light is reversed after passing through the lens.
We construct families of Eaton Lens configurations in the plane parameterized by the direction of the light, i.e. families over a circle, such that the direction foliations are ergodic in almost every direction. To do so we use a description of surfaces in the determinant locus by Hubert-Griveaux to construct genus one quadratic

differentials with vanishing Lyapunov spectrum. Vanishing Lyapunov spectrum implies the direction foliations of the quadratic differential pulled back to the plane, the universal cover of the genus one surface, are ergodic for almost every direction. We "represent" each direction foliation of that quadratic differential by a planar Eaton lens pattern that will not change the foliation significantly, in particular ergodicity is preserved.
This is joint work with **Krzysztof Frączek .**

Rigidity of actions of higher-rank lattices on tori and nilmanifolds.

Aaron Brown – University of Chicago

Abstract: I will discuss some recent results regarding actions of higher-rank lattices on tori and nil-manifolds. In particular, I will discuss the recent result on global smooth rigidity for Anosov actions on tori and nilmanifolds: if an Anosov action of a higher-rank lattice on a nilmanifold lifts to an action on the universal cover then the action is smoothly conjugate to an affine action. If time permits, I will also some results in progress for local rigidity of affine actions and projective actions on spheres and boundaries. This is joint work with Federico Rodriguez-Hertz and Zhiren Wang.

Ergodicity and partial hyperbolicity

Raúl Ures –
Imerl-Universidad de la República – Uruguay

We will review some recent advances on the description of how abundant is ergodicity among partially hyperbolic diffeomorphisms on 3-manifolds.
A diffeomorphism is partially hyperbolic if the tangent bundle of the ambient manifold splits into three invariant subbundles, TM = Es $\oplus$ Ec $\oplus$ Eu, in such a way that df contracts the vectors of Es and expands the vectors of Eu while the vectors of Ec have an intermediate behavior.
We will describe the state of the art in case the ambient manifold has solvable fundamental group and, present some new advances in case it is the unit tangent bundle of a hyperbolic surface.

A proof of Ghys theorem on lattice actions on the circle.

Federico Rodriguez Hertz- Penn State

Abstract: As an application of our work with A. Brown and Z. Wang, we

obtain a proof of the fact that smooth actions on the circle by higher rank lattices on semi-simple Lie groups without PSL(2,\R) factors are trivial. In this talk we shall show a complete proof of this fact.

Autocorrelation functions for quantum particles on a nilmanifold

Francesco Cellarosi

Abstract: The ergodic properties of Heisenberg nilflows are well understood, and the mixing properties of time-changes of such flows were recently described by Avila, Forni and Ulcigrai. Instead of classical flows, we consider quantum particles moving freely in a Heisenberg nilmanifold, and study their autocorrelation functions. Our main result is a limiting theorem for the autocorrelation function (at random time) for particles that are a superposition of N eigenmodes, as N tends to infinity.
In the context of spectral geometry, these results concern the (Fourier transform of the) pair correlation density for the eigenvalues of the Laplace-Beltrami operator on a nilmanifold, in the spirit of Berry-Tabor conjecture. Our methods use some dynamical results of J. Marklof and the speaker.