

THE DYNAMICAL SYSTEMS, ERGODIC THEORY, AND PROBABILITY CONFERENCE
DEDICATED TO THE MEMORY OF NIKOLAI CHERNOV

Sunday, May 17

5:00-7:00pm, Welcoming reception, Education Building

Monday, May 18

8:15-8:25 Bob Palazzo, Dean of College of Arts and Sciences, *Welcoming remarks*

8:30-9:30 Joel Lebowitz, *Kolya and me: a scientific collaboration*

9:30-10:00 break

10:00-11:00 Dmitry Dolgopyat, *Kolya's ideas in dynamics and mathematical physics*

11:00-11:30 break

11:30-12:30 Parallel Sessions

12:30-2:00 **Lunch break**

2:00-3:00 Leonid Bunimovich, *On transport in phase space*

3:00-3:30 break

3:30-6:00 Parallel Sessions.

Tuesday, May 19

8:30-9:30 Yakov Pesin, *Thermodynamics of the Katok map*

9:30-10:00 break

10:00-11:00 Roberto Markarian, *Stochastic perturbations of convex billiards*

11:00-11:30 break

11:30-12:30 Parallel Sessions

12:30-2:00 **Lunch break**

2:00-3:00 Russell Lyons, *Random walks on groups and the Kaimanovich-Vershik conjecture*

3:00-3:30 break

3:30-4:30 Parallel Sessions

5:00 **Conference banquet, Fish Market Restaurant, 612 22nd Street South**

Wednesday, May 20

8:30-9:30 Domokos Szasz, *The rare interaction limit in a fast-slow mechanical system*

9:30-10:00 break

10:00-11:00 Konstantin Khanin, *Hyperbolicity of minimizers for random Lagrangian systems*

11:00-11:30 break

11:30-12:30 Parallel Sessions

12:30-2:00 **Lunch break**

2:00-3:00 Nandor Simanyi, *Homotopical rotation vector of billiards*

3:00-3:30 break

3:30-5:00 Parallel Sessions.

Parallel Section Schedules and Details

Monday, May 18

Ergodic Theory Education Bldg 145		
Organizers: Lex Oversteegen		
11:30-12:00	Hongkun Zhang	Optimal correlation decay rates for nonuniformly hyperbolic systems
12:00-12:30	Marco Lenci	Infinite mixing for one-dimensional maps
3:30- 4:00	Carl Dettmann	Infinite horizon Lorentz gases
4:00- 4:30	Renato Feres	Dynamics and differential geometry of non-standard billiard models
4:30- 5:00	Dmitry Kleinbock	Kolya Chernov and shrinking targets
5:00- 5:30	Alexander Grigo	On Certain Classical Models in Statistical Mechanics
5:30- 6:00	Alexey Korepanov	Averaging for perturbed fast-slow systems
Dynamical Systems Education Bldg 133		
Organizers: Alexander Blokh		
11:30-12:00	Rajinder Mavi	Random nonmonotonic multichannel Schrödinger operators
12:00-12:30	Eleonora Catsigeras	Conditions for positive entropy of diffeomorphisms with dominated splitting
3:30- 4:00	Gregory Galperin	Bouncing in Gravitational Field
4:00- 4:30	Yunping Jiang	Introduction to Geometric Gibbs Theory
4:30- 5:00	Daniel Thompson	Uniqueness of equilibrium states for geodesic flows in manifolds of nonpositive curvature
5:00- 5:30	Sinisa Slijepcevic	Invariant measures of extended scalar dissipative systems
5:30- 6:00	Sasa Kocic	Generic rigidity of circle diffeomorphisms with a break
Probability and Related Topics Education Bldg 146		
Organizers: Paul Jung		
11:30-12:00	Jerome Rousseau	Concentration inequalities for sequential dynamical systems of the unit interval
12:00-12:30	Matthew Nicol	Almost sure invariance principle for non-stationary dynamical systems
3:30- 4:00	Huyi Hu	Polynomial decay of correlations for some almost Anosov diffeomorphisms
4:00- 4:30	Andrew Torok	Polynomial loss of memory for maps of the interval with a neutral fixed point
4:30- 5:00	Vaughn Climenhaga	Specification, statistical properties, and towers
5:00- 5:30	William Ott	Searching for SRB measures
5:30- 6:00	Chad Wilson	Practical Applications of Probability in a Changing Business Environment

Tuesday, May 19

Ergodic Theory		Education Bldg 145
Organizers: Lex Oversteegen		
11:30-12:00	Peter Balint	The flow of two falling balls mixes rapidly
12:00-12:30	Mark Demers	Decay of Correlations for the Sinai Billiard Flow
3:30- 4:00	Bruce Turkington	A Statistical Reduction Method for High-Dimensional Hamiltonian Dynamics
4:00- 4:30	Maria Correia	The orbit stability and ergodicity in a new class of billiards
Dynamical Systems		Education Bldg 133
Organizers: Alexander Blokh		
11:30-12:00	Michael Jakobson	Attractors in Folklore-type theorems
12:00-12:30	Michael Tsiflakos	Global ergodicity of N falling balls
3:30- 4:00	Jinxin Xue	Noncollision singularities in a planar four-body problem
4:00- 4:30	Joseph Rosenblatt	Coboundaries in Dynamical Systems
Probability and Related Topics		Education Bldg 146
Organizers: Paul Jung		
11:30-12:00	Nicolai Haydn	Exponential Law for Random Maps on Compact Manifolds
12:00-12:30	Cheng Ouyang	Fractal properties of rough differential equations driven by fractional Brownian motions
3:30- 4:00	Shannon Starr	Coarse bounds in random matrices
4:00- 4:30	Francesco Cellarosi	Autocorrelations for quantum particles on a manifold

Wednesday, May 20

Ergodic Theory		Education Bldg 145
Organizers: Lex Oversteegen		
11:30-12:00	Federico Bonetto	Kac particles interacting with a thermal bath
12:00-12:30	Peter Nandori	Non equilibrium density profiles in Lorentz tubes with thermostated boundaries
3:30- 4:00	Jacopo De Simoil	Dispersing Fermi-Ulam models
4:00- 4:30	Peyman Eslami	Decay of correlations for skew products with singularities
4:30- 5:00	Fan Yang	Hitting times distribution for dynamical balls
Dynamical Systems		Education Bldg 133
Organizers: Alexander Blokh		
11:30-12:00	Henry van den Berdem	Characterizing spatiotemporal ensembles of biomolecules
12:00-12:30	Jianyu Chen	Exponential mixing of torus extension over expanding maps
3:30- 4:00	Alena Erchenko	Topological and metric entropies for surfaces of negative curvature
4:00- 4:30	Nikita Selinger	Decidability of combinatorial equivalence of Thurston maps
4:30- 5:00	Pengfei Zhang	Homoclinic intersections for the geodesic flow on 2-spheres
Probability and Related Topics		Education Bldg 146
Organizers: Paul Jung		
11:30-12:00	Benjamin Webb	Self-Avoiding Modes of Motion in a Deterministic Lorentz Lattice Gas
12:00-12:30	Mrinal Kanti Roychowdhury	Quantization dimension and other dimensions of probability measures
3:30- 4:00	Timothy Chumley	Random motion of a rigid body with surface temperature
4:00- 4:30	Nsoki Mavinga	Bifurcation from infinity for reaction-diffusion equations subject to nonlinear boundary conditions
4:30- 5:00	Areeg Abdallah	Treating Uncertainty and Vagueness in data

Plenary Talks

Monday, 08:30 AM - 09:30 AM

Joel Lebowitz
Kolya and me: a scientific collaboration

Location: EB 230

I will give an overview of some of my work with Kolya beginning in 1992 and left incomplete by his tragic untimely death. This falls into three groups: 1. Electrical Conduction in a thermostated Sinai billiard. 2. Shear flow in a fluid driven by Maxwell-demon boundaries. 3. Thermalization of the notorious piston.

Monday, 10:00 AM - 11:00 AM

Dmitry Dolgopyat
Kolya's ideas in dynamics and mathematical physics

Location: EB 230

I will describe several important mathematical ideas which I learnt from the works of Nikolai Chernov.

Monday, 2:00 PM - 3:00 PM

Leonid Bunimovich
On transport in phase space

Location: EB 230

I will discuss some results and conjectures on transport in phase spaces of dynamical and stochastic systems.

Tuesday, 8:30 AM - 9:30 AM

Yakov Pesin
Thermodynamics of the Katok Map

Location: EB 230

I will describe an area-preserving map of the 2-torus with non-zero Lyapunov exponents known as the Katok map. I will then outline a construction of equilibrium measures for the geometric potential and discuss ergodic properties of these measures including decay of correlations and the Central Limit Theorem.

Tuesday, 10:00 AM - 11:00 AM

Roberto Markarian
Stochastic Perturbations of Convex Billiards

Location: EB 230

We consider a strictly convex billiard table with C^2 boundary, with the dynamics subjected to random perturbations. Each time the billiard ball hits the boundary its reflection angle has a random perturbation. The perturbation distribution corresponds to the physical situation where either the scale of the surface irregularities is smaller than but comparable to the diameter of the reflected object, or the billiard ball is not perfectly rigid. We prove that for a large class of such perturbations the resulting Markov chain is uniformly ergodic, although this is not true in general. Joint work with L.T. Rolla, V. Sidoravicius, F.A. Tal, M.E. Vares.

Tuesday, 2:00 PM - 3:00 PM

Russell Lyons
Random walks on groups and the Kaimanovich-Vershik conjecture

Location: EB 230

In the 1980s, much progress was made in understanding random walks on groups. In particular, characterizations of when there are non-constant bounded harmonic functions were given using asymptotic entropy. Later, Kaimanovich gave criteria for identifying all bounded harmonic functions. However, a conjecture of Kaimanovich and Vershik from 1979 remained open, with the first breakthrough by Erschler in 2011. We present a full proof in joint work with Yuval Peres.

Wednesday, 8:30 AM - 9:30 AM

Domokos Szasz

Location: EB 230

The rare interaction limit in a fast-slow mechanical system

Gaspard and Gilbert (2008) suggested a two-step strategy to derive the 'macroscopic' heat equation from the 'microscopic' kinetic equation for a chain of localized and rarely interacting hard disks or balls. For a paradigm, billiard model - realizing the first, truly dynamical part of the GG-strategy - we obtain the 'mesoscopic' master equation describing a Markov jump process for the energies of the particles. A foot-stone of the proof is based on Kolya Chernov's 2007 bound on correlation decay for billiard flows and our approach uses heavily the standard pairs of Chernov and Dolgopyat. Joint with P. Balint, P. Nandori and IP. Toth.

Wednesday, 10:00 AM - 11:00 AM

Konstantin Khanin

Location: EB 230

Hyperbolicity of minimizers for random Lagrangian systems

We show that for a large class of random Lagrangian systems the unique global minimizer is almost surely hyperbolic. Furthermore, we prove that the unique forward and backward viscosity solutions for the corresponding Hamilton-Jacobi equation, though in general only Lipschitz, are smooth in a neighborhood of the global minimizer. Related results in the one-dimensional case were obtained by E, Khanin, Mazel and Sinai (Annals, 2000). However the methods of the above paper cannot be extended to the case of higher dimensions. In this talk based on a joint paper with Ke Zhang we present a different approach to the problem of hyperbolicity.

Wednesday, 2:00 AM - 3:00 AM

Nandor Simanyi

Location: EB 230

Homotopical rotation vector of billiards

In a billiard system in $\mathbb{R}^n/\mathbb{Z}^n \setminus \text{obstacles}$ one lifts the billiard orbit to the universal covering space \mathbb{R}^n of $\mathbb{R}^n/\mathbb{Z}^n$, and takes the average displacement vector in \mathbb{R}^n as the rotation vector of the considered orbit. For systems with one obstacle, the topological study of the arising rotation vectors and sets was carried out by A. Blokh, M. Misiurewicz and N. S. in 2006. The next step is to consider 2D billiard system in a billiard table Q with highly non-commutative (hyperbolic) fundamental group $\pi_1(Q)$, and to lift the billiard orbits to the Cayley graph of the group $\pi_1(Q)$, and investigate the following: in what directions ω and at what speed s can the lifted path converge to a point on the infinite horizon of (the Cayley graph of) the group $\pi_1(Q)$? The ordered pair (ω, s) will be called the "homotopical rotation number" of the investigated orbit. Initial results for some 2D billiards were obtained by L. Goswick and myself in 2011. We present a research plan, joint with C. Moxley, on getting generalizations of those results for some higher-dimensional billiards with intriguing fundamental groups $\pi_1(Q)$.