

## RENATO FERES

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### PROFESSIONAL PREPARATION

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- Universidade Estadual de Campinas, Brazil B.S. in Physics, 1984
- Universidade Estadual de Campinas, Brazil M.S. in Mathematics, 1985
- California Institute of Technology Ph.D. in Mathematics, 1989
- Mathematical Sciences Research Institute Post-doctoral fellow, 1989-1990
- University of Chicago L.E. Dickson Instructor, 1990-1993

### APPOINTMENTS AND VISITING POSITIONS

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- Standing as Prof. of Comp. Sci. and Eng. McKelvey School of Eng., September 1st, 2019 - present
- U Mass, Amherst Visiting professor (sabbatical), September 1, 2016-October 5, 2016
- U Mass, Amherst Visiting professor (sabbatical), September 1, 2009-December 1, 2009
- Université Paris-Sud 11 - Orsay Visiting professor, June 2008
- Washington University Professor, 2005 - present
- Washington University Associate professor, 1997- 2005
- ETH Zürich Visiting researcher, April 2001-July 2001
- École Normale Supérieure de Lyon Visiting professor (sabbatical), September 2000-April 2001
- Washington University Assistant professor, 1993-1997

### PUBLICATIONS

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Pdf files of the not too ancient articles can be obtained at my personal web page.

#### Articles submitted and under review:

- *Chaotic lensed billiards*, with T. Chumley, M. Covey, C. Cox., 2013.

#### Articles in print or accepted for publication:

- *Revisiting Maxwell-Smoluchowski theory: low surface roughness in straight channels*  
with T. Chumley, L.G. German, G. Yablonski. Chemical Engineering Science, 284 (2024) 119477  
(online: November 2023).
- *Exact Discretization of Harmonic Tensors*  
with M. Wallace and T. Chumley. Potential Analysis. 56, 409-421 (2022).
- *Knudsen diffusivity in random billiards: spectrum, geometry, and computation*  
with T. Chumley and L. G. German. SIADS (SIAM Journal on Applied Dynamical Systems)  
2021, Vol. 20, No. 3: pp. 1655-1682.
- *Rolling systems and their billiard limits*  
with C. Cox, B. Zhao. Regular and Chaotic Dynamics, 2021  
Vol. 26, Issue 1, pages 1-21.
- *Entropy Production in Random Billiards*  
with T. Chumley. Discrete and Continuous Dynamical Systems-A, 2021, 41(3): 1319-1346.
- *Rolling and no-slip bouncing in cylinders*  
with S. Cook, C. Cox, and T. Chumley. Journal of Geometric Mechanics, 12 (1) 2020, 53-84.

- *Explicit Formulas for Reaction Probability in Reaction-Diffusion Experiments*  
with M. Wallace, A. Stern, and G. Yablonski. Computers & Chemical Engineering, Volume 125, 9 June 2019, Pages 612-622.
- *Stability of periodic orbits in no-slip billiards*  
with C. Cox and H.-K. Zhang. Nonlinearity 31 (2018) 4443-44471.
- *Reaction-diffusion on metric graphs: from 3D to 1D*  
with Matt Wallace and Gregory Yablonsky. Computers & Mathematics with Applications, Volume 73, Issue 9, 2017, p. 2035-2052.
- *No-slip billiards in dimension 2*  
with Christopher Cox. Contemporary Math. Volume 698 (2017) 91-110.
- *Differential Geometry of Rigid Bodies Collisions and Non-standard Billiards*  
with Christopher Cox. Discrete and Continuous Dynamical Systems-A, 33 (2016) no. 11, 6065-6099.
- *Diffusivity in multiple scattering systems*  
with Timothy Chumley and Hong-Kun Zhang. Trans. Amer. Math. Soc. 368 (2016), 109-148.
- *Multiple scattering in random mechanical systems and diffusion approximation*  
with Jasmine Ng and Hongkun Zhang. Commun. Math. Phys. V. 323, N. 2 (2013).
- *From billiards to thermodynamics*  
with Tim Chumley and Scott Cook., Computers and Mathematics with Applications, Vol. 65, n. 10 (2013), p. 1596-1613.
- *Random billiards with wall temperature and associated Markov chains*  
with Scott Cook, Nonlinearity 25 (2012) 2503-2541.
- *Spectral gap for a class of random billiards*  
with Hong-Kun Zhang, Commun. Math. Phys. 313, 479-515 (2012).
- *Harmonic functions over group actions*  
with E. Ronshausen. in Geometry, Rigidity and Group Actions, Ed. B. Farb and D. Fisher, University of Chicago Press, 2011, 59-71.
- *The spectrum of the billiard Laplacian of a family of random billiards*  
with Hong-Kun Zhang, Journal of Statistical Physics, V. 141, N.6 (2010) 1030-1054.
- *Higher order approximations of isochrons*  
with D. Takeshita, Nonlinearity **23** (2010) 1303-1323.
- *A general formula for reactant conversion over a single catalyst particle in TAP pulse experiments*  
with A. Cloninger, G.S. Yablonsky, and J.T. Gleaves. Chemical Engineering Science, 64 (2009) 21, 4358-4364.
- *Harmonic functions on  $\mathbb{R}$ -covered foliations and group actions on the circle*  
with S. Fenley and K. Parwani. Erg. Th. Dyn. Syst. 29 (2009) 4, 1141-1161.
- *Probabilistic analysis of transport-reaction processes over catalytic particles: theory and experimental testing*  
with G.S. Yablonsky, A. Mueller, A. Baernstein, X. Zheng, J.T. Gleaves. Chemical Engineering Science, 64 (2008) 3, 568-581.
- *Random walks derived from billiards*  
in Dynamics, Ergodic Theory, and Geometry. Ed. B. Hasselblatt. Mathematical Sciences Research Institute Publications 54, 2007, pages 179-222.
- *Probing Surface Structure via time-of-escape analysis of gas in Knudsen regime*  
with G. Yablonsky. Chemical Engineering Science, Vol. 61, Issue 24, December 2006, pages 7864-7883.
- *Dynamics on the space of harmonic functions and the foliated Liouville problem*  
with A. Zeghib. Ergod. Th. & Dynam. Sys. 25 (2005), 1-14.
- *A differential-geometric view of normal forms of contractions*  
in Modern Dynamical Systems and Applications, Eds.: M. Brin, B. Hasselblatt, Y. Pesin, Cambridge University Press, (2004) 103-121.

- *Knudsen's cosine law and random billiards*  
with Gregory Yablonsky, Chemical Engineering Science 59 (2004) 1541-1556.
- *Leafwise holomorphic functions*  
with A. Zeghib. Proceedings of the American Mathematical Society, V. 131, n. 6, 1717-1725, 2003.
- *Groups that do not act by automorphisms of codimension-one foliations*  
with D. Witte. Pacific Journal of Math, Vol. 204, No. 1, 2002, 31-42.
- *Cartan geometries and Dynamics*  
with P. Lampe, Geometriae Dedicata 80 (2000), 29-41.
- *Topological Superrigidity and Anosov Actions of Lattices*  
with Francois Labourie, Annales Scientifiques de l'ENS, 4e. serie, t. 31, 1998, p. 599-629.
- *Actions of discrete linear groups and Zimmer's conjecture*  
Journal of Differential Geometry, vol.42, no. 3, 1995, 554-576.
- *The invariant connection of a  $\frac{1}{2}$ -pinched Anosov diffeomorphism and rigidity*  
Pacific Journal of Mathematics, vol. 171 No. 1, 1995, 139-155.
- *Hyperbolic dynamical systems, invariant geometric structures, and rigidity*  
Mathematical Research Letters 1, 11-26, 1994.
- *The center foliation of an affine diffeomorphism*  
Geometriae Dedicata 46, 233-238, 1993.
- *Affine actions of higher rank lattices*  
Geometric and Functional Analysis Vol. 3. No. 4 1993 p.370-394.
- *Connection-preserving actions of lattices in  $SL(n, R)$*   
Israel Journal of Math. 79, 1992, 1-21.
- *Geodesic flows on manifolds of negative curvature with smooth horospheric foliations*  
Ergod. Th. & Dynam. Sys. (1991), 11, 653-686.
- *Anosov flows with smooth foliations and rigidity of geodesic flows in three-dimensional manifolds of negative curvature*  
with A. Katok. Ergod. Th. and Dynam. sys. 10 (1990) 657-670.
- *Invariant tensor fields of dynamical systems with pinched Lyapunov exponents and rigidity of geodesic flows*  
with A. Katok. Ergod. Th. and Dynam. sys. 9 (1989) 627-632.

#### Articles not submitted for publication:

- *The Minimal Entropy Theorem and Mostow Rigidity* (after Besson, Courtois, Gallot), 1996.  
<http://www.math.wustl.edu/~feres/mostow.pdf>
- *Bounded Representations of Amenable Groupoids and Transference* (with S. Durand), 1994.  
<http://www.math.wustl.edu/~feres/durand.pdf>
- *Geodesic Flows on Manifolds of Negative Curvature with Smooth Horospheric Foliations*, Caltech thesis, May 10, 1989.  
[https://www.math.wustl.edu/~feres/Feres\\_PhD\\_Thesis89.pdf](https://www.math.wustl.edu/~feres/Feres_PhD_Thesis89.pdf)

#### Book, book chapters, and expository articles

- *Rigidité, groupe fondamental et dynamique*, with Martine Babillot and Abdelghani Zeghib; Edited by Patrick Foulon. Panoramas et Synthèses (Société Mathématique de France) n. 13, 2002.
- *An introduction to cocycle super-rigidity*. In: Rigidity in dynamics and number theory, Eds.: M. Burger and A. Iozzi. Springer, 2002.
- *Ergodic Theory and Dynamics of G-spaces*, with A. Katok. Chapter 9 of Handbook of Dynamical Systems, Vol. Ia, Elsevier, 2002.

- *Dynamical Systems and Semisimple Groups - an introduction*. Tracts in Mathematics, 126, Cambridge University Press, 1998.

## GRADUATE AND UNDERGRADUATE RESEARCH ADVISING

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### Current Ph.D. students

- Zain Siddiqui
- Zhenyi Zhang
- Eric Pasewark

### Past Ph.D. students

- Bowei Zhao (Geometry and dynamics of rolling systems, August 2022.)
- Josh Covey (Classical and quantum Markov chains derived from billiard-like systems, May 2022.)
- Luis Garcia German (Computation of Knudsen diffusivity in Domains with Boundary Micro-Structure, 2020.)
- Christopher Cox (No-slip billiards, 2015)
- Matthew Wallace (Reaction-diffusion on metric graphs and conversion probability, 2014.)
- Timothy Chumley (Central limit theorems and diffusions associated to billiard-Markov models, 2013).
- Jasmine Ng (Random billiards and spectrum, 2011)
- Josh Brady (Navier-Stokes equations, joint with Eliot Fried, 2011)
- Scott Cook (Statistical mechanics, joint with John Shareshian, 2010)
- Emily Ronshausen (Harmonic functions over group actions, 2009)
- Michele Penner (Foliations and property T, 1997)
- Peter Lamp (Rigidity of actions of Lie groups, 1996)

### Undergraduate research advisees

- Noah Waldman (present) Theory of unbounded operators on quantum graphs
- Anthony Hong (present) Ricci curvature of Cayley graphs
- Shuheng Harry Li (present) Symmetric powers of metric graphs
- Charles Trautman (present) Concentration of measures
- Joseph Mollo (present) Mechanics and control of a rolling ball
- Jared Lieberman (3/2022) Diffusion and topology in mixed boundary polygonal billiard systems.
- Collin Szczepanski (3/2022) Cycles, entropy, and probability: Markov chain thermodynamics.
- Barry Henaku (2021)
- Collin Szczepanski (2021)
- Shuhao Li (2020)
- Jason Hammerman (2019)
- Xinyi Wu (2019)
- Ben Grande (2019)

- David Shen (2019)
- Shuhao Li (2019)
- Yiwen Ju (2019)
- Alex Mason (2017)
- Zach Virgilio (2016)
- Fangzhu Xiao (2015)
- Harry Ho (co-advising with Xang Tang) (2015)
- Alan Talmage (2014)
- Tyler Ellison (2014)
- Stephen Rong (2014)
- Madison Cannon (2014)
- Zhe Jiang (2013)
- Edward Bryden (2013)
- Qing Liu (2013)
- Alec Koppel (2011)
- Matt Gokel (2011)
- Alex Cloninger (2009)
- Jeremy Diepenbrock(2008)
- Alex Mueller (2007)
- Lawrence Hellman

## **JPP MENTORING**

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### **Post-baccalaureate (JPP) mentoring**

- Imhotep Hogan (2023-2024)
- Jake Garcia (2021-2022)
- Rachel Wu (2021-2022)
- Luke Seaton (2021-2022)
- Adeli Hutton (2019-2021)
- Carlos Samuels (2019-2020)
- Janelle Walker (2017-2019)
- Atzimba Marinez (2017–2019)
- Jesus Oyola Pizzaro (2015-2017)
- Deodat Kimuene (2015-2017)

## FUNDING AND GRANTS

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- Research support from the ETH Zürich during by stay at the ETH department of mathematics, April 2001 - July 2001
- Centre National de la Recherche Scientifique research funding during my stay at the Ecole Normale Supérieure de Lyon, September 2000 - April 2001
- National Science Foundation research grant DMS-9623109, 1996-1998.

## COMMITTEES AND SERVICE

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- Mentor in the F-GAP program, The National Alliance for Doctoral Studies in the Mathematical Sciences, since 2016.
- Minority Recruiting, Post-Baccalaureate and Summer Orientation Committee, 2021-2022
- Undergraduate Research Committee, 2021-2022
- A&S Office of Graduate Studies Advisory Council 2022
- Faculty Libraries Council, starting Spring 2021-2022
- Hiring committee on applied/computational math, 2020-2021
- Represented the WashU Math/Stats department at the annual meeting of the Mathematical Alliance, November 6, 2020
- Chaired the hiring committee on applied/computational math, 2019-2020
- Co-organizer of special session on Billiard Systems at the 1141st AMS Meeting, the University of Delaware, 9/29-30, 2018
- Member of the Assembly Series and Science Matters/Compton-Ferguson Lectures Committee 2017-2019
- Member of the Math Alliance, a nationwide organization dedicated to increasing the representation of minority students in mathematics at the doctoral level. I serve as mentor to students in the alliance.
- Helping to put in place a post-baccalaureate program in mathematics; first year of operation: since 2015
- External member of the physics department hiring committee, 2015-2016
- Chancellor's Fellowship Committee, 2015-2017
- Organizer (jointly with Mark Demers, Matthew Nicol, and Hongkun Zhang) of conference at the American Institute of Mathematics on *Stochastic methods for non-equilibrium dynamical systems*, June 1 to June 5, 2015, San Jose, CA.
- Organizer (jointly with Hong-Kun Zhang and Tim Chumley) of special session on *Statistical Properties of Dynamical Systems*, at the October 18-20, 2013 St. Louis 1094th Meeting of the AMS.
- Chancellor's Fellowship Committee, 2014
- Served on Chancellor's Fellowship Committee, 2013
- Member of the mathematics department executive committee
- Currently heading the department minorities recruiting initiative. Also a member (mentor) in the National Alliance for Doctoral Studies in Mathematics, which is aimed to increase the participation of students from underrepresented background in mathematics in doctoral programs
- Served on the department undergraduate committee (Fall 2008-Spring 2009)
- Scientific Committee, International Workshop on Mathematics in Chemical Kinetics and Engineering, MACKIE-2009, Ghent, Belgium (February 2009)
- On the editorial board of journal *Discrete and Continuous Dynamical Systems* since 12/2005.

- Served on the special lectures committee of the mathematics department (2006)
- Organizer of the undergraduate math club during the Fall 2006 - Spring 2007
- Member of the University Judicial Board, 2004-2005
- Mathematics department hiring committee, 2005
- Chairman of the Missouri Section of the Mathematical Association of America, during 2003. I organized the association's last annual meeting, which took place April 3-6 2003, at Washington University.
- I have served on the W. H. Roever Lectures Series in Geometry committee for the past four years. These are lectures given annually by distinguished mathematicians to memorialize W. H. Roever, who was a professor of the math department during the first half of the twentieth century. Recent speakers have included Gregory Margulis, Alice Chang, Micha Kapovich.
- I have twice in the past (2001 and 2003) traveled to China to interview prospective students applying for admission in our graduate program. This is an initiative of both the chemistry and the mathematics department whose main purpose is to evaluate the student's proficiency in English.
- Served on the mathematics department undergraduate committee. Some of the committee's attributions are to regularly review the math curriculum, orient the instructors of problem sessions regarding general procedures and duties (proctoring exams, teaching evaluations), among others.
- Served on the mathematics department graduate committee during 2002-2003. This involves reviewing and selecting applications of prospective graduate students, advising first year students in choosing courses and academic activities, reviewing the students performance in the qualifying courses, making decisions about the curriculum, among other attributions.
- Served for several years on the mathematics department Library committee, which involved the selection of new books and decision whether to place them at Olin or math library.

## INVITED TALKS

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- Workshop on *Billiards and other dynamical systems* dedicated to the memory of Nikolai Chernov. UAB, March 15-17, 2023. Invited talk on *Chaotic lensed billiards*.
- AMS Fall Eastern Sectional Meeting (Special Session on Connections between theoretical and applied dynamical systems: a session in honor of the 60th birthdays of Renato Feres and Boris Hasslblatt II, 10/01/2022), invited talk on *Non-holonomic billiards and rolling flows*.
- AMS Fall Southeastern Sectional Meeting (Special Session on Topological, Measurable, and Symbolic Dynamics, and Interactions with Geometry, 10/15/2022), invited talk on *Non-holonomic billiards and rolling flows*.
- Analysis seminar, Clemson, School of Mathematical and Statistical Sciences, October 7, 2020, invited talk on *Quantum Stochastic Processes*.
- Quantum Science Colloquium, Washington University, February 13, 2020, invited talk on *What is a quantum Markov chain: a beginner's look into non-commutative probability*.
- SIAM Conference on Dynamical Systems, Snow Bird, Utah, May 19-23, 2019, invited talk on *Thermodynamics of random billiard systems*.
- Invited talk at the AMS Meeting, University of Delaware (9/29/18), Special session on billiard dynamics. Organized by T. Chumley, C. Cox, R. Feres.
- Lecture given at the inaugural meeting of the Gateway Math Alliance (9/22/18), St. Louis University.
- Workshop on Billiard Dynamics at Mount Holyoke College (from 6/10 to 6/16, 2018), organized by Tim Chumley.
- Graduate Colloquium (3/29/18) and Department Seminar (3/30/18) at Northern Illinois University.
- BIRS Workshop on *New Developments in Open Dynamical Systems and Their Applications*, Banff, Canada, March 18 -23, 2018.

- JMM Session on *Dynamical Systems: Smooth, Symbolic, and Measurable*. San Diego, January 11, 2018.
- SQuaRE (Structured Quartet Research Ensembles) meeting on the topic *Stochastic thermodynamics and random billiards*, at the American Institute of Mathematics, San Jose, CA, June 19-23, 2017.
- *Non-standard billiards*. Invited special lecture at Eastern Illinois Integrated Conference in Geometry, Dynamics, and Topology, April 9, 2017.
- SQuaRE (Structured Quartet Research Ensembles) meeting on the topic *Stochastic thermodynamics and random billiards*, at the American Institute of Mathematics, San Jose, CA, May 9-13, 2016.
- *Geometry and dynamics of no-slip billiards*, International Conference on Statistical Properties of Nonequilibrium Dynamical Systems, July 27-August 2, 2016, SUSTech, Shenzhen, China.
- *Billiards and thermodynamics*, Carolina Dynamics Symposium, April 1-3, 2016, Furman University Greenville, SC.
- SQuaRE (Structured Quartet Research Ensembles) meeting on the topic *Stochastic thermodynamics and random billiards*, at the American Institute of Mathematics, San Jose, CA, July 20-14, 2015.
- *Explicit formulas for reaction probability in reaction-diffusion experiments*. Talk given at the Mathematics in (bio)Chemical Kinetics and Engineering conference, at Ghent University, Belgium, July 3, 2015
- *From billiards to thermodynamics*. Talk given at the conference on *Stochastic methods for non-equilibrium dynamical systems* at the American Institute of Mathematics, June 2, 2015
- *Dynamics and differential geometry of non-standard billiard models*. Talk given at conference in honor of the memory of Professor Nikolai Chernov, at the University of Alabama at Birmingham, May 18, 2015.
- *Statistical mechanics of random billiard systems*. Talk given at A. Katok's 70th birthday conference, Banff International Research Station, August 10-15, 2014.
- *From Knudsen Diffusivity to Stochastic Thermodynamics*. Featured speaker at the Mathematics in (bio) Chemical Kinetics and Engineering, MACKIE. Ghent University, Belgium, May 28 2014.
- *A course in statistical mechanics*. A series of 4 lectures given at the Houston Summer School on Dynamical Systems, University of Houston, May 14-22, 2014.
- *Statistical Physics of Simple Billiard Systems*. Talk given at the *Geometry Day* meeting at Eastern Illinois U., April 26, 2014.
- *Statistical Physics of Simple Billiard Systems*. Talk given at the dynamical systems seminar at Penn State, March 24, 2014.
- *Geometry in (very) high dimensions*, undergraduate talk given at the Sixth Annual Field of Dreams Conference (aimed at mathematics students from underrepresented groups interested in pursuing graduate school), Phoenix, AZ, November 2012.
- *Random dynamical systems with microstructure*, Workshop on Cartan Connections, geometry of homogeneous spaces, and dynamics, organized by A. Cap, C. Frances, and K. Melnick, at the Erwin Schrödinger International Institute for Mathematical Physics, Vienna, July 10-23, 2011.
- *Mechanics and probability*, AMS sectional meeting, special section on Symplectic and Poisson Geometry, organized by Lin, Pelayo, Ziegler, Statesboro, GA, March 12-13, 2011.
- *Billiards, Markov chains, and classical scattering*, AMS Southeastern Section Meeting, Richmond, Virginia. (In "Statistical properties of Dynamical Systems.") November 06, 2010.
- *Billiards with micro-structure: spectrum and diffusion*, Institut Henri Poincaré, Progress in Dynamics, Paris, November 2009.
- *Random Billiards*, Colloquium at Tufts University, October 2009.
- *Discrete harmonic functions and dynamics*, Dynamical systems seminar, Tufts University, October 2009.
- *Reactant conversion in a simple reaction-diffusion system*, Applied Math seminar, U. Mass., Amherst, November 2009.
- *Discrete harmonic functions over group actions*, Applied Math seminar, U. Mass., Amherst, October 2009.



- *Harmonic functions and dynamics*, Geometry/Dynamics day, EIU, April 2009.
- *Random billiards*, Applied math seminar, U. Mass., Amherst, March 2009.
- *Actions on the circle and the Liouville property*, U. of Chicago, dynamics seminar, October 2008.
- *Harmonic functions and group actions*, Université Paris-Sud 11, Orsay, seminar at the Topology/Dynamics group, June 2008.
- *Harmonic functions and Brownian motion on foliated manifolds*. DePaul University meeting of the American Mathematics Society, October, 2007. (Organized by I.D. Ugarcovici and M. Gidea.)
- *Probing surface structure via time-of-escape analysis of gas in Knudsen regime*. Mathematics in Chemical and Biochemical Kinetics and Engineering (MACKiE-2), Houston, February 8, 2007.
- *Harmonic functions on foliated spaces*. Conference in honor of professor Francesco Mercuri. December 19, 2006, University of Campinas, Brazil.
- *The foliated Liouville problem*. Talk given at the geometry seminar, Indiana University, Bloomington, April 6, 2006.
- *Random Walks and Diffusion*. Talk given at the IGERT seminar (Dynamics of Complex Systems in Science and Engineering.) Northwestern University, February 3, 2006.
- *Dynamics on Networks*. Talk given at the Laboratory for Neuro-dynamics, University of St. Louis, MO, August 26, 2005. (Organized by Sonya Bahar.)
- *Random walks derived from billiards*. Conference on billiard dynamics and geometry, Eastern Illinois University, November 5, 2005. (Organized by P. Coulton, G. Galperin, and G. Ronsse.)
- *The dynamical Liouville problem*. BIRS workshop on Rigidity, Group Actions, and Dynamics. Banff, Canada, July 9-14, 2005. (Organized by D. Fisher, E. Lindenstrauss, D. Witte Morris, R. Spatzier.)
- *Random Billiards and Diffusion*, Workshop on Probabilistic Limit Laws for Dynamical Systems. International Center for Mathematical Sciences, Edinburgh, Scotland, June 13-17, 2005. (Organized by H. Bruin, I. Melbourne, M. Pollicott, M. Nicol, R. Sharp.)
- *Leafwise harmonic functions on foliated spaces* (series of three lectures). Instituto de Matemáticas, Unidad Morelia, Morelia, Mexico, November 2004.
- *The foliated Liouville problem*, Differential Geometry Day, at Eastern Illinois University, November 2004.
- *Random walks derived from billiards*, workshop in dynamical systems at Penn State U., October 2004.
- *Non-stationary local normal forms and differential geometry* (series of three lectures). Troisième Cycle Romand de Mathématiques (universities of the Rhône-Alpes region). Diablerets, Switzerland, March 2002. Meeting organized by E. Ghys and P. de la Harpe.
- *The foliated Liouville problem*. ETH (Swiss Federal Institute of Technology, Zürich), two talks, May and June 2001. (Invited by M. Burger.)
- *A survey of rigidity theory of semisimple group actions*. Ecole Normale Supérieure de Lyon, two talks, February and March, 2001. (Seminar organized by A. Zeghib and T. Barbot.)
- *Topological superrigidity*, series of three lectures given at a meeting at the Isaac Newton Institute for Mathematical Sciences, Cambridge U.K., January, 2000. (Organized by G. Margulis et al.)
- *Rigid geometric structures and actions of semisimple Lie groups*, series of three lectures for the meeting Etat de la Recherche organized by the Société Mathématique de France, Institut de Recherche Mathématique Avancée, Strasbourg, June 1999. (Organizer: P. Foulon.)
- *Knudsen Diffusivity in a channel with rough wall surface*. Annual meeting of the American Institute of Chemical Engineers in Dallas, Texas, November 1999. (Session organized by L. Nitsche and J. Nitsche.)
- *Topological superrigidity*, series of three lectures, Conference in Ergodic Theory, Geometry and Arithmetic, at the Erwin Schroedinger Institute, Vienna, February 1997. (Organized by A. Katok et al.)
- *Fluxos geodésicos com foliações de Anosov diferenciáveis*. Colóquio Brasileiro de Matemática, IMPA Rio de Janeiro, Summer 1997. (Session organized by A. Rigas.)

- *Cocycle superrigidity and geometry*. Series of four lectures given at Penn State University, April 1996. (Invited by A. Katok.)
- *Actions of  $SL(n, \mathbb{Z})$  on tori*. Hebrew University (Givat Ram) – First joint meeting of the American Math. Society and the Israel Math. Union. (Presentation given at the Group Theory session, organized by S. Mozes.) May, 1995.
- *Half-pinching and invariant connections*. The University of Warwick – Math. Research Centre. Workshop on Ergodic Theory on Riemannian Manifolds, July 1995. (Organized by M. Pollicott.)
- *Actions of semisimple groups and Zimmer's conjecture*. Stefan Banach International Math. Center, Warsaw – Conference on Dynamical Systems, June 1995.
- *Anosov flows with smooth foliations*. LMS Durham Symposium on Dynamical Systems, England, July 1988. (Organized by P. Manning.)
- Regular participant of the annual *Workshop on Rigidity of geometric structures*, since 1988.
- Seminar talks given at various places, among which: University of Seattle, Mathematical Sciences Research Institute, University of California at Berkeley, University of Maryland, Northwestern University, University of Chicago, University of Illinois at Chicago, PennState University, University of Minnesota, University of Michigan (Ann Arbor), University of Illinois at Urbana-Champaign, University of Florida at Gainesville, IMPA (Rio de Janeiro), University of Campinas (São Paulo).

## COURSES TAUGHT

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(SINCE 2001)

- Math 401 - Honors research seminar in Math - Freiwald Scholars (Spring 2023)
- Math 5047 - Geometry/Topology III: Differential Geometry (Fall 2022)
- Math 444 - The Mathematics of Quantum Theory (Fall 2022)
- Math 4171 - Topology I, Fall 2020
- Math 5047 - Geometry/Topology III: Differential Geometry, Fall 2020
- Math 310 - Foundations for Higher Mathematics, Fall 2019
- Math 406 - Stochastic Differential Equations, Fall 2019
- Math 528 - Mathematics of Quantum Theory, Spring 2019
- Math 5041 - Geometry I, Fall 2018
- Math 497 - Representations of Finite and Lie Groups, Fall 2018
- Math 312 - Diff. Equations and Dynamical Systems, Spring 2018
- Math 493 - Probability, Fall 2017
- Math 523 - Intro to Information Theory for Math Students, Fall 2017
- Math 4121 - Introduction to Lebesgue Integration, Spring 2017
- Math 495 Stochastic Processes, Spring 2017
- Math Grad. Orientation - Topics in Modern Probability, Summer 2016
- Math 495 - Stochastic Processes, Spring 2016
- Math 523 - Self-adjoint operators in Hilbert spaces, Spring 2016
- Math 496 - Lie groups, Lie algebras, and representations, Fall 2015

- Grad. Orientation - Introduction to p-adic analysis, Summer 2015
- Math 407 - An introduction to differential geometry, Spring 2015
- Math 495 - Stochastic processes, Spring 2015
- Math 553 - Stochastic dynamical systems, Fall 2014
- Math 523 - Quantum Mechanics for Math Students, Spring 2014
- Math 493 - Probability, Fall 2013
- Grad. Orient. - Introduction to p-adic analysis, Summer 2013
- Math 3200 - Statistics and Data Analysis, Spring 2013
- Math 547 - Symplectic Geometry and Mechanics, Spring 2013
- Math 350 - Introduction to Monte Carlo methods, Fall 2012
- Math 449 - Numerical Applied mathematics - Fall 2012
- Grad. Orient. - Introduction to p-adic analysis, Summer 2012
- Math 233 - Calculus III (sections 1 and 2), Fall 2011
- Grad. Orient. - Invitation to modern dynamics, Summer 2011
- Math 5043 - Algebraic topology, Spring 2011
- Math 5041 - Geometry I, Fall 2010
- Math 543 - Geometry of Physics, Fall 2010
- Math 350 - Simulation analysis of random processes, Spring 2010
- Math 553 - Brownian motion on Riemannian manifolds, Spring 2010
- Graduate Orientation Course - p-Adic Analysis, Summer 2009
- Math 5052 - Measure Theory and Functional Analysis II, Spring 2009
- Math 5051 - Measure Theory and Functional Analysis I, Fall 2008
- Math 545 - Geometry of Physics, Fall 2008
- Math 132 - Calculus II - Sections 1, 2, Spring 2008
- Math 450 - Computational random processes, Spring 2007
- Math 523 - Introduction to Ergodic Theory Fall 2006
- Math 449 - Numerical Applied Mathematics Fall 2006
- Math 5032 - Algebra II, Spring 2006
- Math 5031 - Algebra I, Fall 2005
- Math 535 - Spectral Graph Theory, Fall 2005
- Math 309 - Matrix Algebra Spring 2005
- Math 495 - Stochastic Processes Spring 2005
- Math 545 - Discrete Subgroups of Lie Groups, Fall 2004
- Math 308 - Mathematics for the Physical Sciences Spring 2004

- Math 485 - Groups, Representations, and Physics Spring 2004
- Math 350 - Mathematics of Reaction-Diffusion Systems, Fall 2003
- Math 308 - Mathematics for the Physical Sciences Spring 2003
- Math 418 - Intro to Topology and Modern Analysis Spring 2003
- Math 417 - Intro to Topology and Modern Analysis Fall 2002
- Math 441 - Geometry I Fall 2002
- Math 100 - Foundations for Calculus Spring 2002
- Math 545 - Stochastic calculus on Riemannian manifolds, Fall 2001