

**Contact Information**

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**Positions**

2019-present	Associate Professor Department of Mathematics & Computer Science Wesleyan University
2012-2019	Assistant Professor Department of Mathematics & Computer Science Wesleyan University
2009-2012	L.E. Dickson Instructor Department of Mathematics University of Chicago Sponsor: Benson Farb
Fall 2009	Visiting Postdoc Hausdorff Institute for Mathematics Bonn, Germany

**Education**

2004-2009	<b>University of Michigan</b> Ph.D. in Mathematics Advisor: Ralf Spatzier
2000-2004	<b>Eastern Nazarene College</b> B.S. in Mathematics B.S. in Physics

**Research**

- **Research Interests:** Riemannian geometry, dynamics, rigidity, metric geometry, homogeneous dynamics, Lie groups, symmetric spaces, representation varieties, pseudo-Riemannian geometry

### Accepted or Published Work

1. Joint with Ilesanmi Adeboye and Harrison Bray, *Entropy rigidity and Hilbert volume*, Discrete and Continuous Dynamical Systems, **39** No. 4, (2019) 1731-1744.
2. Joint with Jean-François Lafont and Daniel Thompson, *The weak specification property for geodesic flows on  $CAT(-1)$  spaces*, to appear in Groups, Geometry, and Dynamics (29 pages).
3. Joint with Jon Chaika, *Quantitative shrinking target properties for rotations and interval exchanges*, Israel Journal of Mathematics, **230** No. 1, (2019) 275-334.
4. Joint with Jon Chaika, *A quantitative shrinking target result on Sturmian sequences for rotations*, Discrete and Continuous Dynamical Systems, **38** No. 10 (2018), 5189-5204.
5. Joint with Jean-François Lafont, *Marked length rigidity for Fuchsian buildings*, to appear in Ergodic Theory and Dynamical Systems (29 pages).
6. Joint with Jean-François Lafont, D. Benjamin McReynolds and Daniel Thompson, *Fat flats in rank-one manifolds*, Michigan Mathematics Journal **68** (2019), 251-275.
7. *Marked length spectrum rigidity in nonpositive curvature with singularities*, Indiana University Mathematics Journal **67** No. 6 (2018), 2337-2361.
8. Joint with Jean-François Lafont, *Marked length rigidity for one dimensional spaces*, to appear in Journal of Topology and Analysis (37 pages).
9. Joint with Joanna Furno, *Everywhere divergence of the one-sided ergodic Hilbert transform for circle rotations by Liouville numbers*, New York Journal of Mathematics **23** (2017), 273-294.

10. Joint with Jean-François Lafont, *On the Hausdorff dimension of  $CAT(\kappa)$  surfaces*, Analysis and Geometry in Metric Spaces **4** (2016), 266-277.
11. *Compact Clifford-Klein forms – geometry, topology and dynamics*, In “Geometry, Topology, and Dynamics in Negative Curvature,” 110-145. London Mathematical Society Lecture Notes Series **425**, Cambridge Univ. Press, Cambridge, 2016.
12. *2-Frame flow dynamics and hyperbolic rank-rigidity in nonpositive curvature*, Journal of Modern Dynamics **2** (2008), no. 4, 719-740.
13. *Lengths of finite dimensional representations of PBW algebras*, with M. Darnall, Linear Algebra and its Applications **395** (2005) 175-181.

### Submitted Work

1. Joint with Jean-François Lafont and Daniel Thompson, *Strong symbolic dynamics for geodesic flow on  $CAT(-1)$  spaces and other metric Anosov flows*, (25 pages).

### Graduate Students

Noelle Sawyer (Ph.D. student, current)

Cameron Bishop (Ph.D. student, current)

### Honors and Awards

- National Science Foundation Graduate Research Fellowship, 2004-2009
- Alice Webber Glover in Math Scholarship, University of Michigan, Summer 2006

### Professional Activities

#### Invited Talks:

- Summer Wasatch Topology Conference (Midway, Utah), August 14-16, 2019
- Arches Topology Conference (Hurricane, Utah), April 24-27, 2019

- University of Michigan Geometry Seminar, Mar 29, 2019, Jan 13, 2009, & Mar 13, 2007
- Wesleyan University, Dynamics Seminar, Sept 2018 & Oct 2012
- University of Connecticut Awards Day Colloquium, Apr 25, 2018
- Ohio State University Ergodic Theory Seminar, Jan 18, 2018; Jan 19, 2017; & Nov 12, 2015
- City College of New York Colloquium, Nov 16, 2017
- Spring Topology and Dynamics Conference (New Jersey City University), semi-plenary speaker, March 8-11, 2017
- Wesleyan University Topology et al Seminar, September 28, 2016
- Dartmouth University Colloquium, May 5, 2016
- Tufts University Colloquium, Apr 1, 2016
- University of Chicago Dynamics Seminar, Oct 19, 2015, Feb. 24, 2009 & Oct. 31, 2007
- Ohio State University Topology Seminar, Sept 8, 2015, Jan 14, 2014 & Dec 2, 2011
- *Ahlfors-Bers Colloquium, parallel session in Dynamics*, Yale University, Oct 26, 2014
- Binghamton University Geometry and Topology Seminar, Oct 9, 2014 & Oct 23, 2008
- *Special Session on Wild Algebraic and Geometric Topology and Special Session on Groups and Topology, Joint DMV-PTM meeting*, Poznan (Poland), Sept 17-20, 2014
- University of Connecticut, PDE and Differential Geometry Seminar, Sept 30, 2013
- University of Massachusetts Amherst, Applied Analysis & Computation Seminar, Sept 10, 2013
- CUNY Graduate Center, Complex Analysis and Dynamics Seminar, Dec 7, 2012
- Yale University, Dynamics of Group Actions Seminar, Oct 29, 2012
- Brown University, Group Actions, Dynamics and Geometry Seminar, Oct 18, 2012
- *Cartan connections, geometry and topology of homogeneous spaces*, Erwin Schrödinger Institute, Vienna, Austria, July 18-22, 2011.

- University of Illinois at Chicago, Geometry, Topology and Dynamics Seminar, Mar 14, 2011
- University of Chicago Geometry Seminar, Apr. 13, 2010
- Princeton University Group Actions Seminar, Apr. 6 2010
- Indiana University Geometry Seminar, Mar. 25, 2010
- University of Illinois Urbana-Champaign, Differential Geometry Seminar, Mar 18, 2010
- Northwestern University Dynamical Systems Seminar, Feb. 2, 2010 & Nov 27, 2007
- *Geometry, Topology and Dynamics in Negative Curvature*, Raman Research Institute, Bangalore, India, satellite to ICM, August 2-7, 2010.
- *AMS Special Session on Group Actions on Homogeneous Spaces and Applications*, Joint Mathematics Meetings, Washington, DC, Jan 5-9, 2009
- *Dynamical Systems: Geometric Structures and Rigidity Workshop* (Banach Center, Będlewo, Poland) July 7-26, 2008
- *Special Session in Differential Geometry and Its Applications*, AMS Sectional Meeting, Chicago, IL, Oct. 6 2007
- Ohio State University Geometric Group Theory Seminar, May 9, 2007
- Oklahoma University Geometry and Topology Seminar, April 18, 2007
- *Special Session in Metric Geometry*, Joint AMS-MMS Meeting, Zacatecas, Mexico, May 23-26, 2007
- *Special Session in Geometric Topology*, AMS Sectional Meeting Oxford, OH, Mar. 17, 2007
- Indiana University Differential Geometry Seminar, Feb. 15, 2007

**Selected Research Conferences Attended:**

- *Equilibrium states for dynamical systems arising from geometry* American Institute of Mathematics, Jul 15-19, 2019
- *Geodesics on Real Hyperbolic Manifolds* Connecticut College, Aug 9-11, 2018

- *No Boundaries: Groups in Algebra, Geometry, and Topology* University of Chicago, Oct 27-29, 2017.
- *Geometries, Surfaces and Representations of Fundamental Groups* University of Maryland, June 22-24, 2016.
- *Midwest Dynamical Systems Meeting* Ohio State University, Oct 30-Nov 1, 2015.
- *Ahlfors-Bers Colloquium* Yale University, Oct 23-26, 2014
- *Teichmüller theory and surfaces in 3-manifolds* Centro di Ricerca Matematica Ennio De Giorgi, Pisa, May 26-June 20, 2014
- *Second GEAR Network Retreat* University of Maryland, March 17-21, 2014
- *Workshop in Dynamical Systems* Penn State University, Oct 4-7, 2018; Oct. 17-20, 2013; & Nov. 2-5, 2006
- *Cube complexes and 3-manifolds*, University of Illinois-Chicago, Chicago, May 20-30 2013
- *Geometric Structures and Representation Varieties Summer Retreat*, University of Illinois, Urbana-Champaign, IL, July-August 2012
- *Cartan connections, geometry and topology of homogeneous spaces*, Erwin Schrödinger Institute, Vienna, Austria, July 18-22, 2011
- *International Conference on Ergodic Geometry*, University Paris-Sud, Orsay, France, May 23-27, 2011
- *Geometry, Topology and Dynamics in Negative Curvature*, Raman Research Institute, Bangalore, India, satellite to ICM, August 2-7, 2010
- *Dynamical Systems: Geometric Structures and Rigidity* Banach Center, Będlewo, Poland, July 7-26, 2008
- *Equidistribution on Homogeneous Spaces* Ohio State University, June 9-13, 2008
- *Geometry, Rigidity and Group Actions: In Honor Of Robert J. Zimmer's 60th Birthday* University of Chicago, Sept. 7-9, 2007
- *Clay Summer School on Homogeneous Flows, Moduli Spaces and Arithmetic* Pisa, Italy, June 11 - July 6 2007
- *Geometry, Topology and Their Interactions* Morelia, Mexico, Jan. 8-13, 2007

- *Future Directions in Riemannian Geometry* University of Maryland, Sept. 22-24, 2006
- *International Conference on Global Dynamics Beyond Uniform Hyperbolicity* Northwestern University, May 17-22, 2006
- *Bloomington Geometry Workshop* Indiana University, April 7-9, 2006

**Teaching Conferences Attended:**

- *Directed Reading Program Workshop* MIT, May 25-26, 2018
- *Inquiry-Based Learning Workshop* Kenyon College, June 23-26, 2014

**Committee Work:**

- McNair Program Faculty Advisory Committee, 2018-19
- University Prizes and Examination Committee, 2018-19
- Space Committee, 2017-18
- Master's Thesis Committee for Max Ryan, Wesleyan University, 2016
- Curriculum Committee, Spring 2016
- Math Department Hiring Committee, 2015
- College of Integrative Sciences Steering Committee, 2015, 2019
- Faculty Advisor to Undergraduate Math Club, 2014-15
- Colloquium Chair, 2013-14, 2016-17
- Master's Thesis Committee for Randy Linder, Wesleyan University, 2014
- Master's Thesis Committee for Ian Hoffman, Wesleyan University, 2013
- Graduate Education Committee, Wesleyan University, 2012-13
- Outside reader for Natalie McGathey's Ph.D. Thesis *Invariant measures and homeomorphisms of boundaries*, University of Illinois at Chicago, 2011

**Seminars Organized:**

- Dynamics and Analysis Seminar, Wesleyan University, 2013-present

- Colloquium, Wesleyan University, 2013-2014, 2016-2017
- Geometry/Topology Seminar, University of Chicago, 2010-2012
- Student Topology/Geometry Seminar, University of Michigan 2007-2008

**Memberships:**

- American Mathematical Society, 2005-present

**Teaching Experience****Wesleyan University:**

- Introductory Calculus, Fall 2014
- Elementary Statistics, Spring 2019 & Fall 2016
- Problem Solving for the Putnam, Fall 2018
- Vectors and Matrices, Spring 2018, Spring 2013 & Fall 2013
- Fundamentals of Analysis, Spring 2017, Spring 2014 & Spring 2013
- Discrete Mathematics, Spring 2018
- Differential Equations, Fall 2014 & Fall 2017
- Introduction to Probability, Fall 2013
- Mathematical Statistics, Spring 2019, Spring 2017 & Spring 2015
- Differential Geometry, Spring 2016 & Fall 2012
- Fundamentals of Analysis II, Fall 2018
- Graduate Analysis I (Real), Spring 2014
- Graduate Analysis I (Complex), Spring 2016
- Graduate Analysis II: Periodic Orbits and Dynamical Zeta Functions, Fall 2018; Lie Theory and Symmetric Spaces, Fall 2017; Symplectic Geometry, Fall 2016; Hyperbolic Dynamics, Spring 2015; & Riemannian Geometry, Fall 2012
- General Relativity (informal tutorial with Joseph Schindler, Physics Master's student), Spring 2013
- Mathematical Statistics – tutorial with Hannah Korevaar and Chris Skyeck, Fall 2013; tutorial with Jeanne Li, Spring 2018



- Geometry and General Relativity – tutorial with Ty Holzschuh, Spring 2014
- Partial Differential Equations and Economics – tutorial with Joyee Sun, Fall 2018
- Honors Projects: Borworn Satayopas, Spring 2015; Ty Holzschuh & Brian Gapinski, Spring 2014

**University of Chicago:**

- Honors Abstract Algebra III, Spring 2012 & Spring 2011
- Honors Abstract Algebra II, Winter 2012
- Honors Abstract Algebra I, Fall 2011
- Point-Set Topology, Winter 2011 & Winter 2012
- Abstract Algebra I, Fall 2010
- Analysis in  $\mathbb{R}^n$  III, Spring 2010
- Introduction to Analysis and Linear Algebra, Winter & Spring 2010
- Linear Algebra, Winter 2010

**University of Michigan:**

- Calculus I, Fall 2005
- Calculus II, Winter 2006, Winter 2008
- Assistant Course Coordinator, PreCalculus, Fall 2007

**Special Projects****University Lecture:**

- Christopher Rasmussen (Math), Abigail Hornstein (Econ) and I proposed and were awarded funding from the Allbritton Center for the Study of Public Life for a University Lecture. We hosted Cathy O'Neil for a talk on the role of math, finance, and data science in public life on May 21, 2016.

**Science Writing Talks:**

- In collaboration with the Writing at Wesleyan Program, I organized two science writing talks aimed at undergraduates: Evelyn Lamb (Nov 6, 2012) and Anna Haensch (Apr 30, 2015).

**3D Printing of Mathematical Models:**

- Jointly with Illesanmi Adeboye, I obtained a GISOS Pedagogy grant from Wesleyan for a project to involve students in conceiving, designing and 3D printing models of various mathematical objects. See <http://3dmathmodels.site.wesleyan.edu/> for a description of the project and our work. 2013-2014.

**Research with Undergraduates****Wesleyan Summer Science Research Program:**

- Research mentor for Jeanne Li, *Topological pressure and coding sequences in DNA*; and Alejandra Marcelino, *Dynamical systems in neuroscience*, 2017
- Research mentor for Fanying Chen, *Geometry and intersection distribution for curves*, 2016
- Research mentor for Narin Luangrath and Melissa Mischell, *Length spectrum rigidity for metric graphs*, 2015

**University of Chicago REU:**

- Lecture series (with William Lopes), *Lies, damned Lies and geometry*, Summer 2012
- Lecture series (with D. Ben McReynolds), *Geometry and dynamics on tori*, Summer 2011
- Research mentor, Summer 2011
  - Michael Wong, *The Riemann-Roch Theorem and Abel's Theorem*
  - Daphne Kao, *Angle Rigidity for  $\mathbb{T}^2$*
  - Jahan Claes, *Spectral rigidity on  $\mathbb{T}^n$*
  - Alexander Tolish, *The Effect of Gravitational Radiation on the Observational Period of Pulsars*
  - Petar Yanakiev, *The Uniformization Theorem and Universal Covers*
  - Ian Alevy, *Expander Graphs and Property (T)*
  - Kao Zi Chong, *Classical Mechanics: the Three-Body Problem*
- Research mentor, Summer 2010
  - Watee Srinin, *Measure theoretic aspects of dynamical systems*