

# Brandon Seward

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CONTACT INFORMATION	Courant Institute of Mathematical Sciences New York University 251 Mercer St. New York, New York 10012	Office 1122 Warren Weaver Hall bseward@cims.nyu.edu <a href="http://www.cims.nyu.edu/~bseward/">http://www.cims.nyu.edu/~bseward/</a>
AREAS OF RESEARCH	Dynamical systems, descriptive set theory, group theory	
EDUCATION	<b>University of Michigan</b> Ph.D. in Mathematics, September 2009 - May 2015 <ul style="list-style-type: none"><li>• Adviser: Ralf Spatzier</li><li>• Thesis: “Krieger’s finite generator theorem for ergodic actions of countable groups”</li></ul> <b>University of North Texas</b> M.A. in Mathematics, August 2008 - July 2009 <ul style="list-style-type: none"><li>• Adviser: Su Gao</li><li>• Thesis: “On the density of minimal free subflows of general symbolic flows”</li></ul> B.S. in Mathematics, August 2006 - December 2008	
EMPLOYMENT	<b>The Courant Institute of Mathematical Sciences, New York University</b> Assistant Professor/Courant Instructor, Sept. 2016 – present	
PAST POSITIONS	<b>The Hebrew University of Jerusalem</b> Postdoctoral Fellow, Aug. 2015 – July 2016	
PAPERS	<b>Krieger’s finite generator theorem for actions of countable groups III</b> (with A. Alpeev) Preprint. <b>Følner tilings for actions of amenable groups</b> (with C. Conley, S. Jackson, D. Kerr, A. Marks, and R. Tucker-Drob) Submitted. <b>Hyperfiniteness and Borel combinatorics</b> (with C. Conley, S. Jackson, A. Marks, and R. Tucker-Drob) Submitted. <b>Weak containment and Rokhlin entropy</b> Preprint. <b>Cost, <math>\ell^2</math>-Betti numbers, and the sofic entropy of some algebraic actions</b> (with D. Gaboriau) To appear in Journal d’Analyse Mathématique.	

**Forcing constructions and countable Borel equivalence relations** (with S. Gao, S. Jackson, and E. Krohne)  
Submitted.

**Krieger's finite generator theorem for actions of countable groups II**  
Preprint.

**Krieger's finite generator theorem for actions of countable groups I**  
Submitted.

**Borel structurability on the 2-shift of a countable group** (with R. Tucker-Drob)  
Annals of Pure and Applied Logic 167 (2016), no. 1, 1–21.

**Every action of a non-amenable group is the factor of a small action**  
Journal of Modern Dynamics 8 (2014), no. 2, 251–270.

**Locally nilpotent groups and hyperfinite equivalence relations** (with S. Schneider)  
Submitted.

**Arbitrarily large residual finiteness growth** (with K. Bou-Rabee)  
To appear in Journal für die reine und angewandte Mathematik (Crelle's Journal).

**Ergodic actions of countable groups and finite generating partitions**  
Groups, Geometry, and Dynamics 9 (2015), no. 3, 793–810.

**Finite entropy actions of free groups, rigidity of stabilizers, and a Howe–Moore type phenomenon**  
Journal d'Analyse Mathématique 129 (2016), no. 1, 309–340.

**A subgroup formula for f-invariant entropy**  
Ergodic Theory and Dynamical Systems 34 (2014), no. 1, 263–298.

**Group colorings and Bernoulli subflows** (with S. Gao and S. Jackson)  
Memoirs of the American Mathematical Society 241 (2016), no. 1141, 1–241.

**Generalizing Magnus' characterization of free groups to some free products**  
(with K. Bou-Rabee)  
Communications in Algebra 42 (2014), no. 9, 3950–3962.

**Burnside's Problem, spanning trees, and tilings**  
Geometry & Topology 18 (2014), no. 1, 179–210.

**A coloring property for countable groups** (with S. Gao and S. Jackson)  
Mathematical Proceedings of the Cambridge Philosophical Society 147 (2009), no. 3, 579–592.

#### AWARDS

National Science Foundation

- Graduate Student Research Fellowship grant DGE 0718128, September 2010 - August 2014.
- Research grant DMS 05010319 (P.I. Su Gao), May 2007 - August 2009

University of Michigan

- ProQuest Distinguished Dissertation Award, February 2016.
- The Sumner Myers Thesis Prize, October 2015.
- The Wirt and Mary Cornwell Prize in Mathematics, May 2015.
- Fellowship through an NSF RTG grant in Geometry, January 2015 - April 2015.
- Mathematics Departmental Fellowship, September 2009 - August 2013.

University of North Texas

- E.H. Hanson Mathematics Scholar, August 2008 - May 2009
- Mary D. Walsh Endowed Scholarship, August 2008 - May 2009
- 2008 Putnam Exam - score: 45; rank: 162 of 3627
- Outstanding Undergraduate in Mathematics Award, May 2008

CURRENT AND  
PAST TEACHING

New York University, *Assistant Professor/Courant Instructor*

- Fall 2017          Math UA-121: Calculus I
- Spring 2017        Math UA-121: Calculus I
- Fall 2016          Math UA-211: Math for Economics I

University of Michigan, *Teaching Assistant*

- Fall 2014          Math 215: Calculus III

University of Michigan, *Graduate Student Instructor*

- Spring 2013        Math 116: Calculus II
- Fall 2012          Math 115: Calculus I
- Spring 2010        Math 105: Data, Functions and Graphs
- Fall 2009          Math 105: Data, Functions and Graphs

COMMUNITY  
ENGAGEMENT

The Wolverine Express

A University of Michigan initiative to visit nearby high schools located in economically disadvantaged areas and promote college aspirations.

- Jackson High School. February 1, 2011.
- Pontiac High School. February 17, 2011.

Study Abroad and Student Opportunities Seminar

A panel discussion on study abroad opportunities. Delivered by a few participants of the Second International Conference on the Mathematical Sciences, including myself.

- University of Buea, Buea, Cameroon. May 12, 2011. Audience consisted of students of the University of Buea and residents of Buea.
- English learning center and GRE test taking center, Douala, Cameroon. May 14, 2011. Audience consisted of students of the learning center and residents of Douala.

PROFESSIONAL  
ACTIVITIES

Referee Work

- *Compositio Mathematica*
- *Ergodic Theory and Dynamical Systems*
- *Forum of Mathematics, Sigma*
- *Fundamenta Mathematicae*

- Geometria Dedicata
- Geometric and Functional Analysis
- Groups, Geometry, and Dynamics
- Indiana University Mathematics Journal
- Journal of Symbolic Logic

- LECTURE SERIES
- 2017 Graduate Summer School: Classification problems in ergodic theory, University of California at Irvine, Irvine, California. Aug. 14 - 25, 2017. (multiple lectures, 12.5 hours)
- Bernoulli shifts and entropy theory.* Ergodic Theory and Operator Algebras. Texas A&M University, College Station, Texas. June 5 - 9, 2017. (Three 1 hour lectures)
- Entropy theory for actions of non-amenable groups.* The Hebrew University of Jerusalem, Jerusalem, Israel. March 8, 15, 22, and 29, 2016. (Five 90 minute lectures)
- Sofic and Rokhlin entropy.* Measured Group Theory Winter School. The Erwin Schrödinger International Institute for Mathematical Physics, Vienna, Austria. Feb. 1 - 4, 2016. (Four 1 hour lectures)
- TALKS
- Positive entropy actions of countable groups factor onto Bernoulli shifts.* Mean Dimension and Sofic Entropy Meet Dynamical Systems, Geometric Analysis and Information Theory. Banff International Research Station, Banff, Canada. July 25, 2017.
- Positive entropy actions of countable groups factor onto Bernoulli shifts.* Analysis Seminar. State University of New York at Buffalo, Buffalo, New York. May 3, 2017.
- Bernoullicity and treeability.* Subfactor Seminar. Vanderbilt University, Nashville, Tennessee. April 28, 2017.
- The geometric Burnside's problem.* Geometry Analysis and Topology Seminar. Courant Institute of Mathematical Sciences, New York, New York. Feb. 22, 2017.
- Entropy theory for actions of non-amenable groups.* Algorithms and Geometry Meeting. Simons Foundation, New York, New York. Feb. 10, 2017.
- Rokhlin entropy.* Dynamics Seminar. Universidad de Chile, Santiago, Chile. Jan. 11, 2017.
- Sofic entropy.* Dynamics Seminar. Universidad de Chile, Santiago, Chile. Jan. 11, 2017.
- Positive entropy actions of countable groups factor onto Bernoulli shifts.* Measured Group Theory. Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany. Aug. 29, 2016.
- Positive entropy actions of countable groups factor onto Bernoulli shifts.* Entropy Theory in Dynamics. Banff International Research Station, Banff, Canada. Aug. 9, 2016.
- The Ornstein isomorphism theorem for countably infinite groups.* Horowitz Seminar on Probability, Ergodic Theory and Dynamical Systems. Tel Aviv University, Tel Aviv, Israel. June 6, 2016.
- Positive entropy actions of countable groups factor onto Bernoulli shifts.* Geometry, Dynamical Systems and Groups Seminar. École Normale Supérieure de Lyon, Lyon, France. April 27, 2016.

- Positive entropy actions of countable groups factor onto Bernoulli shifts.* Groups and Graph Limits Seminar. Alfréd Rényi Institute of Mathematics, Budapest, Hungary. April 20, 2016.
- Positive entropy actions of countable groups factor onto Bernoulli shifts.* Random Spatial Processes and Dynamics. Texas A&M University, College Station, Texas. April 11, 2016.
- Developments in entropy theory.* Mathematics Colloquium: Sumner Myers Thesis Prize. The University of Michigan, Ann Arbor, Michigan. April 5, 2016.
- Positive entropy actions of countable groups factor onto Bernoulli shifts.* Measured Group Theory. The Erwin Schrödinger International Institute for Mathematical Physics, Vienna, Austria. Feb. 15, 2016.
- Positive entropy actions of countable groups factor onto Bernoulli shifts.* Ergodic Theory and Probability Seminar. The Hebrew University of Jerusalem, Jerusalem, Israel. Dec. 8, 2015.
- Every action of a non-amenable group is the factor of a small action.* Groups, Dynamics and Related Topics. Technion, Haifa, Israel. Dec. 3, 2015.
- Positive entropy actions of countable groups factor onto Bernoulli shifts.* Action Now Seminar. Technion, Haifa, Israel. Dec. 1, 2015.
- Entropy for actions of non-amenable groups.* Mathematics Colloquium. Ben Gurion University of the Negev, Be'er Sheva, Israel. Nov. 24, 2015.
- Cost,  $\ell^2$ -Betti numbers, and the sofic entropy of some algebraic actions.* Ergodic Theory, Fractals, and Groups. The Hebrew University of Jerusalem, Jerusalem, Israel. Oct. 13, 2015.
- Krieger's finite generator theorem for ergodic actions of countable groups.* Subfactor Seminar. Vanderbilt University, Nashville, Tennessee. April 10, 2015.
- Krieger's finite generator theorem for ergodic actions of countable groups.* Ergodic Theory / Probability Seminar. Ohio State University, Columbus, Ohio. Feb. 5, 2015.
- Krieger's finite generator theorem for ergodic actions of countable groups.* Dynamical Systems Seminar. Pennsylvania State University, State College, Pennsylvania. Nov. 3, 2014.
- Krieger's finite generator theorem for ergodic actions of countable groups.* Concentration Week on Groups, Groupoids, and Dynamics. Texas A&M University, College Station, Texas. June 9, 2014.
- Krieger's finite generator theorem for ergodic actions of countable groups.* Logic, Dynamics, and Their Interactions II. University of North Texas, Denton, Texas. June 6, 2014.
- Locally nilpotent groups and hyperfinite equivalence relations.* Cabal Seminar. University of California, Los Angeles, California. May 9, 2014.
- Every action of a non-amenable group is the factor of a small action.* Logic Seminar. California Institute of Technology, Los Angeles, California. May 7, 2014.
- Every action of a non-amenable group is the factor of a small action.* Logic Seminar. Cornell University, Ithaca, New York. April 8, 2014.

- Borel structurability on the 2-shift of a countable group.* AMS Western Spring Sectional, Special Session on Descriptive Set Theory and its Applications. University of New Mexico, Albuquerque, New Mexico. April 5, 2014.
- A subgroup formula for  $f$ -invariant entropy.* Geometry and Dynamics Seminar. École Normale Supérieure de Lyon, Lyon, France. January 22, 2014.
- Every action of a non-amenable group is the factor of a small action.* Measurable Dynamics Working Seminar. École Normale Supérieure de Lyon, Lyon, France. January 20, 2014.
- Factors of Bernoulli shifts.* Arbeitsgemeinschaft: Sofic Entropy. Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany. October 6, 2013.
- Locally nilpotent groups and hyperfinite equivalence relations.* Descriptive Set Theory Workshop. The Erwin Schrödinger International Institute for Mathematical Physics, Vienna, Austria. October 3, 2013.
- A subgroup formula for  $f$ -invariant entropy.* Dynamics, Geometry, and Operator Algebras. Texas A&M University, College Station, Texas. August 8, 2013.
- The geometric Burnside's problem.* Geometric and Asymptotic Group Theory with Applications. City College of New York, New York, New York. May 28, 2013.
- The geometric Burnside's problem.* Topology and Geometric Group Theory Seminar. Cornell University, Ithaca, New York. April 9, 2013.
- Countable locally nilpotent group actions and hyperfinite equivalence relations.* Logic Seminar. Cornell University, Ithaca, New York. April 9, 2013.
- Borel complete sections on Bernoulli shifts.* AMS Southeastern Spring Sectional, Special Session on Set Theory and Its Applications. University of Mississippi, Oxford, Mississippi. March 3, 2013.
- The geometric Burnside's problem.* LaWiNe (Lausanne–Wien–Neuchâtel) Seminar on Sofic Groups. Université de Genève, Geneva, Switzerland. September 21, 2012.
- Actions with finite  $f$ -invariant entropy.* LaWiNe (Lausanne–Wien–Neuchâtel) Seminar on Sofic Groups. Université de Genève, Geneva, Switzerland. September 21, 2012.
- Group colorings and Bernoulli subflows.* RTG Conference: Logic, Dynamics, and their Interactions, with a Celebration of the Work of Dan Mauldin. University of North Texas, Denton, Texas. June 4, 2012.
- The geometric Burnside's problem.* Spring Topology and Dynamics Conference. Universidad Nacional Autónoma de México, Mexico City, Mexico. March 24, 2012.
- The geometric Burnside's problem.* Topology/Geometry Seminar. Yale University, New Haven, Connecticut. October 25, 2011.
- The geometric Burnside's problem.* Topology Seminar. University of Michigan, Ann Arbor, Michigan. October 20, 2011.
- New directions in symbolic dynamics.* Second International Conference on the Mathematical Sciences. University of Buea, Buea, Cameroon. May 11, 2011.
- Tilings of groups.* Spring Topology and Dynamics Conference. University of Texas, Tyler, Texas. March 18, 2011.

*The isomorphism of minimal free subshifts of  $2^G$  is a nonsmooth Borel equivalence relation.* Spring Topology and Dynamics Conference. University of Florida, Gainesville, Florida. March 11, 2009.

CONFERENCES  
ATTENDED

Mean Dimension and Sofic Entropy Meet Dynamical Systems, Geometric Analysis and Information Theory. Banff International Research Station, Banff, Canada. July 24 - 28, 2017.

Ergodic Theory and Operator Algebras. Texas A&M University, College Station, Texas. June 5 - 9, 2017.

Measured Group Theory. Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany. Aug. 29 - Sept. 2, 2016.

Entropy Theory in Dynamics. Banff International Research Station, Banff, Canada. Aug. 9 - 13, 2016.

Measured Group Theory. The Erwin Schrödinger International Institute for Mathematical Physics, Vienna, Austria. Feb. 15 - 19, 2016.

Measured Group Theory Winter School. The Erwin Schrödinger International Institute for Mathematical Physics, Vienna, Austria. Feb. 1 - 12, 2016.

Ergodic Theory, Fractals, and Groups. The Hebrew University of Jerusalem, Jerusalem, Israel. Oct. 11 - 15, 2015.

Manifolds and Groups. Ventotene, Italy. September 7 - 12, 2015.

Summer School on Graph Limits, Groups and Stochastic Processes. Alfréd Rényi Institute of Mathematics, Budapest, Hungary. June 22 - 27, 2014.

Concentration Week on Groups, Groupoids, and Dynamics. Texas A&M University, College Station, Texas. June 9 - 14, 2014.

Logic, Dynamics, and Their Interactions II. University of North Texas, Denton, Texas. June 2 - 6, 2014.

AMS Western Spring Sectional, Special Session on Descriptive Set Theory and its Applications. University of New Mexico, Albuquerque, New Mexico. April 4 - 6, 2014.

Arbeitsgemeinschaft: Sofic Entropy. Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany. October 6 - 11, 2013.

Descriptive Set Theory Workshop. The Erwin Schrödinger International Institute for Mathematical Physics, Vienna, Austria. September 30 - October 3, 2013.

Geometric and Analytic Group Theory. Ventotene, Italy. September 9 - 14, 2013.

Dynamics, Geometry, and Operator Algebras. Texas A&M University, College Station, Texas. August 5 - 9, 2013.

Geometric and Asymptotic Group Theory with Applications. City College of New York, New York, New York. May 28 - 31, 2013.

Rice Dynamics Meeting. Rice University, Houston, Texas. May 3 - 5, 2013.

AMS Spring Southeastern Sectional, Special Session on Set Theory and Its Applications. University of Mississippi, Oxford, Mississippi. March 1 - 3, 2013.

RTG Conference: Logic, Dynamics, and their Interactions, with a Celebration of the Work of Dan Mauldin. University of North Texas, Denton, Texas. June 4 - 8, 2012.

Spring Topology and Dynamics Conference. Universidad Nacional Autónoma de México, Mexico City, Mexico. March 22 - 24, 2012.

International Conference on Ergodic Geometry. Université Paris-Sud, Orsay, France. May 23 - 27, 2011.

Second International Conference on the Mathematical Sciences. University of Buea, Buea, Cameroon. May 10 - 13, 2011.

Group Actions on Measure Spaces. Texas A&M University, College Station, Texas, USA. March 24 - 27, 2011.

Texas Ergodic Theory Workshop. University of Houston, Houston, Texas, USA. March 22 - 23, 2011.

Spring Topology and Dynamics Conference. University of Texas at Tyler, Tyler, Texas, USA. March 17 - 19, 2011.

Group Actions and Dynamics. Université de Montréal, Montreal, Quebec, Canada. October 4 - 9, 2010.

Complexity and Group Based Cryptography. Université de Montréal, Montreal, Quebec, Canada. August 30 - September 3, 2010.

Topics in Algorithmic and Geometric Group and Semigroup Theory. Université de Montréal, Montreal, Quebec, Canada. August 23 - 27, 2010.

Geometric, Asymptotic, Combinatorial Group Theory with Applications. Université de Montréal, Montreal, Quebec, Canada. August 15 - 19, 2010.

Spring Topology and Dynamics Conference. University of Florida, Gainesville, Florida, USA. March 7 - 11, 2009.