

# 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	Ergodic theory, topological dynamics, 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>Bernoulli shifts with bases of equal entropy are isomorphic</b> Submitted. <b>The Koopman representation and positive Rokhlin entropy</b> Submitted. <b>Continuous combinatorics of abelian group actions</b> (with S. Gao, S. Jackson, and E. Krohne) Submitted. <b>Positive entropy actions of countable groups factor onto Bernoulli shifts</b> To appear in Journal of the American Mathematical Society. <b>Krieger’s finite generator theorem for actions of countable groups III</b> (with A. Alpeev) Submitted. <b>Følner tilings for actions of amenable groups</b> (with C. Conley, S. Jackson, D. Kerr, A. Marks, and R. Tucker-Drob) Mathematische Annalen 371 (2018), no. 1-2, 663–683.	

**Hyperfiniteness and Borel combinatorics** (with C. Conley, S. Jackson, A. Marks, and R. Tucker-Drob)  
To appear in Journal of the European Mathematical Society.

**Weak containment and Rokhlin entropy**  
Submitted.

**Cost,  $\ell^2$ -Betti numbers, and the sofic entropy of some algebraic actions** (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**  
To appear in Journal of Modern Dynamics.

**Krieger's finite generator theorem for actions of countable groups I**  
To appear in Inventiones Mathematicae.

**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
- The Michael Brin Dynamical Systems Prize for Young Mathematicians, Oct. 2018.
  - ProQuest Distinguished Dissertation Award, University of Michigan, Feb. 2016.
  - The Sumner Myers Thesis Prize, University of Michigan, Oct. 2015.
  - The Wirt and Mary Cornwell Prize in Mathematics, University of Michigan, May 2015.
  - National Science Foundation Graduate Student Research Fellowship, Sept. 2010 - Aug. 2014.
  - Outstanding Undergraduate in Mathematics Award, University of North Texas, May 2008.
- CURRENT AND PAST TEACHING
- New York University, *Assistant Professor/Courant Instructor*
    - Spring 2018      Math UA-121 Calculus I
    - 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 underprivileged 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
- Served on the scientific committee of Workshop: Entropies and Soficity held by the Milyon Labex in Lyon, France Jan. 15 - 19, 2018.
  - Co-organized the 2017 Graduate Summer School: Classification problems in ergodic theory, held at the University of California at Irvine, Aug. 14 - 25, 2017.
  - Refereed for: Advances in Mathematics, Algebraic & Geometric Topology, Compositio Mathematica, Ergodic Theory and Dynamical Systems, Geometria Dedicata, Geometric and Functional Analysis, Inventiones Mathematicae, Journal of Functional Analysis, Journal of Symbolic Logic, etc.

- 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
- Bernoulli shifts with bases of equal entropy are isomorphic.* Geometry, Groups, and Dynamics Seminar. École Normale Supérieure de Lyon, Lyon, France. June 13, 2018.
- $L^2$ -Betti numbers and the Juzvinskii addition formula.* Workshop in the thematic program “ $L^2$ -invariants and their analogues in positive characteristic.” Instituto de Ciencias Matemáticas, Madrid, Spain. June 8, 2018.
- Bernoullicity and treeability.* Borel Combinatorics and Ergodic Theory Conference. École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland. Feb. 8, 2018.
- Bernoullicity and treeability.* Workshop: Entropies and Soficity. Milyon Labex, Lyon, France. Jan. 18, 2018.
- Bernoulli shifts with bases of equal entropy are isomorphic.* Workshop: Entropies and Soficity. Milyon Labex, Lyon, France. Jan. 16, 2018.
- The Borel chromatic number of  $\mathbb{Z}^2$ .* Logic Seminar. Rutgers University, Piscataway, New Jersey. Dec. 11, 2017.
- Positive entropy actions of countable groups factor onto Bernoulli shifts.* Functional Analysis Seminar. University of California, Los Angeles, California. Nov. 8, 2017.
- 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

Descriptive Set Theory Conference. École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland. June 18-22, 2018.

Workshop in the thematic program “ $L^2$ -invariants and their analogues in positive characteristic.” Instituto de Ciencias Matemáticas, Madrid, Spain. June 4 - 8, 2018.

Borel Combinatorics and Ergodic Theory Conference. École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland. Feb. 5 - 9, 2018.

Workshop: Entropies and Soficity. Milyon Labex, Lyon, France. Jan. 15 - 19, 2018.

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.