

Van T. Cyr

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Research Interests Dynamical systems, ergodic theory. My recent work is in symbolic dynamics and has focused in several areas: the characteristic measures problem for subshifts, finding complexity thresholds where ergodic properties are obstructed in \mathbb{Z} - and \mathbb{Z}^d -subshifts, and the automorphisms and ergodic theory of zero entropy symbolic systems. I also have interests in thermodynamic formalism.

Employment **Bucknell University**
Associate Professor 2019-Present
Assistant Professor 2013-2019

Northwestern University
Ralph Boas Assistant Professor 2010-2013

Short term and visiting positions **Northwestern University**
Visiting Associate Professor (sabbatical) 2019-2020
Institut Henri Poincaré
Research in Paris May-June 2013

Education **The Pennsylvania State University**
Ph.D., Mathematics, August 2010; Advisor: Omri Sarig
University at Buffalo, The State University of New York
B.S., Mathematics, *summa cum laude*, May 2005

Grants AMS-Simons Travel grant 2011-2013

- Publications**
1. V. Cyr and O. Sarig: *Spectral Gap and Transience for Ruelle Operators on Countable Markov Shifts*, Communications in Mathematical Physics, **292**, 637-666 (2009).
 2. V. Cyr: *Countable Markov Shifts with Transient Potentials*. Proceedings of the London Math. Soc. **103** (6) 923-949, (2011).
 3. V. Cyr: *A Number Theoretic Question Arising in the Geometry of Plane Curves and in Billiard Dynamics*, Proceedings of the Amer. Math. Soc, **140**, 3035-3040 (2012).
 4. I. Benjamini, V. Cyr, E. Procaccia, R. Tessler: *Harmonic Labelings of Graphs*. Discrete Mathematics, **313**, 1726-1745 (2013).
 5. V. Cyr and B. Kra: *Nonexpansive \mathbb{Z}^2 -subdynamics and Nivat's conjecture*. Transactions of the Amer. Math. Soc. **367**, 6487-6537 (2015).
 6. V. Cyr and B. Kra: *Complexity of short rectangles and periodicity*. European Journal of Combinatorics **52**, 146-173 (2016).
 7. V. Cyr and B. Kra: *The automorphism group of a shift of subquadratic growth*. Proceedings of the Amer. Math. Soc., **144**, 613-621 (2016).
 8. R. Broderick, V. Cyr, and B. Kra: *Complexity and directional entropy in two dimensions*. Israel Journal of Mathematics, **215**, 135-162 (2016).

9. V. Cyr and B. Kra: *The automorphism group of a shift of linear growth: beyond transitivity*. Forum of Mathematics, Sigma, Vol. 3, e5, doi:10.1017/fms.2015.3 (2015).
10. V. Cyr and B. Kra: *Counting generic measures for a subshift of linear growth*. Journal of the European Mathematical Society **21**, no. 2, 355-380 (2019).
11. V. Cyr and B. Kra: *Free ergodic \mathbb{Z}^2 -systems and complexity*. Proceedings of the Amer. Math. Soc., **145**, no. 3, 1163-1173 (2017).
12. V. Cyr and B. Kra: *The automorphism group of a minimal shift of stretched exponential growth*. Journal of Modern Dynamics **10**, 483-495 (2016).
13. V. Cyr, J. Franks, and B. Kra: *The spacetime of a shift endomorphism*. Transactions of the Amer. Math. Soc. **371**, 461-488 (2019).
14. V. Cyr, J. Franks, B. Kra, and S. Petite: *Distortion and the automorphism group of a shift*. Journal of Modern Dynamics **13**, 147-161 (2018).
15. V. Climenhaga and V. Cyr: *Positive entropy equilibrium states*. Israel Journal of Mathematics **232**: 899-920. <https://doi.org/10.1007/s11856-019-1891-5> (2019).
16. V. Cyr and B. Kra: *The automorphism group of a shift of slow growth is amenable*. Ergod. Th. & Dyn. Sys., **40**, no. 7, 1788-1804 (2020)
17. V. Cyr and B. Kra: *Realizing ergodic properties in zero entropy subshifts*. Israel J. Math **240**, 119-148 (2020)
18. V. Cyr and B. Kra: *Boshernitzan's condition, factor complexity, and an application*. Proc. Amer. Math. Soc., Ser. B, **9** 95-110 (2022)
19. V. Cyr, A. Johnson, B. Kra, & A. Şahin: *The complexity threshold for the emergence of Kakutani inequivalence*. Israel J. Math., **251**, 271-300 (2022)
20. V. Cyr and B. Kra: *Characteristic measures for language stable subshifts*. Monatsh. Math. **201**, no. 3, 659-701 (2023)
21. V. Cyr, B. Kra, and S. Petite: *Strong approximation of shifts and the characteristic measures problem*, submitted.
22. V. Cyr, B. Kra, and S. Schmieding: *Chaotic almost minimal actions*, submitted.

Honors and Awards

Excellence in Teaching Award (Northwestern)	2012
Pritchard Dissertation Fellowship (Penn State)	2010
Distinguished Honors Scholar (Full Academic Scholarship - U. Buffalo)	2001-2005
Phi Beta Kappa (University at Buffalo)	2005

Teaching Experience

<i>Bucknell University</i>	
Topics in Calculus (Math 192)	Sp 2022, Sp 2023
Calculus I (Math 201)	Fa 2013, Fa 2014, Fa 2020, Fa 2021
Calculus II (Math 202)	Sp 2015, Sp 2016, Fall 2018, Sp 2021, Fa 2023
Calculus III (Math 211)	Sp 2014, Fa 2017, Sp 2019
Differential Equations (Math 212)	Fa '16, Sp '17, Sp '18, Sp '19, Sp '23, Sp '24
Linear Algebra (Math 245)	Fa 2016
Logic, Sets, and Proofs (Math 280)	Sp 2016
Probability (Math 303)	Sp 2018, Fa 2022
Real Analysis I (Math 308)	Sp 2014, Sp 2017, Sp 2024
Number Theory (Math 311)	Fa 2014
Topology (Math 333)	Fa 2023
Advanced Linear Algebra (Math 345)	Fa 2018, Fa 2021
Complex Analysis (Math 362)	Sp 2021
Modern Applied Mathematics (Math 416)	Fa 2020
Cryptocurrency and Society (Foun 098)	Fa 2022

Northwestern University

Single Variable Differential Calculus (Math 220-1)	Wi 2020
Calculus II (Math 224)	Fa 2010
Linear Algebra (Math 290-1)	Fa 2010, Fa 2011, Fa 2012
Differential Multivariable Calculus (Math 290-2)	Wi 2011, Wi 2012, Wi 2013
Integral Multivariable Calculus (Math 290-3)	Sp 2011, Sp 2012
Independent Study in Dynamical Systems (Math 399)	Wi 2012
Topics in Dynamical Systems (Math 513)	Wi 2013, Sp 2020

Penn State University

Finite Mathematics (Math 17)	Sp 2006, Su 2008
College Algebra II (Math 22)	Sp 2008
Plane Trigonometry (Math 26)	Fa 2007
Trigonometry and Analytic Geometry (Math 41)	Fa 2007
Calculus II (Math 141)	Su 2007, Su 2009, Su 2010
Differential Equations (Math 250)	Sp 2007

Penn State University (as a teaching assistant)

Finite Fields and their Applications	Fa 2006
Elliptic Curves and Applications	Fa 2008

Course Coordinator for Math 290 at Northwestern University 2012-13

- Coordinated instruction and exams across five course sections

Graduate Assistant for Penn State Mathematics REU Summer 2006

**Honors Theses
Directed**

Eben Blaisdell - Class of 2019
Extensions of the Morse-Hedlund Theorem (Defended Spring 2018)

Conference Talks

58 th Spring Topology and Dyn Conf (Christopher Newport U.), 40 min	March 2025
Carolina Dynamics Symposium (UNC Charlotte), 1 hour	April 2024
Workshop on Low Complexity Dyn. Syst. (U. Maryland), 50 min	October 2023
AMS Special Session (U. Buffalo), 50 min	September 2023
Chicago Action Now mini-conference (Northwestern), 50 min	October 2022
AMS Special Session (U. Denver - online), 20 min	May 2022
54 th Spring Topology and Dynamics Conference (Murray State - online)	May 2021
One day online session for symb. dyn. (hosted by U. Chile & Northwestern)	May 2020
Joint Mathematics Meetings 2020 (Denver), 20 min	January 2020
Dyn., Geom. and Combin. workshop at EPFL (Lausanne, Switzerland)	October 2019
Symbolic Dynamical Systems Workshop at CMO (Oaxaca, Mexico), 50 min	May 2019
Mathematical Congress of the Americas (Montréal, Canada), 30 min	July 2017
Analysis on Groups and Measured Group Theory (Northwestern)	April 2017
AMS Special Session (U. of Denver), 20 min	October 2016
Transversal Aspects of Tilings (Oléron, France), 3 hours	June 2016
Workshop on Dynamics and Related Topics (U. of Maryland), 25 min	April 2016
AMS Special Session (Loyola University Chicago), 20 min	October 2015
AMS Special Session (Dalhousie University), 20 min	October 2014
2014 Pingree Park Dynamics Workshop (U. of Denver), 30 min	July 2014
Mathematical Congress of the Americas (Guanajuato, Mexico), 30 min	August 2013
Ergodic Theory with Connections to Arithmetic (Heraklion, Greece)	June 2013
SubTile 2013 (Marseille, France), 20 min	January 2013
Semi-Annual Workshop in Dynamical Systems (Penn State), 50 min	October 2012

Modern Dynamics and its Interactions (Będlewo, Poland), 30 min	July 2011
Midwest Dynamical Systems (Northwestern), 50 min	October 2010
Workshop on Infinite Ergodic Theory (Weizmann Inst., Israel), 45 min	June 2010
Bicentennial Workshop on Dyn. Sys. (San Pedro, Chile), 50 min	June 2010
Workshop on Dynamics and Related Topics (U. of Maryland), 25 min	April 2010
Conformal Structures and Dynamics (Będlewo, Poland), 25 min	September 2009
Dynamical Systems II (U. of North Texas), 40 min	May 2009
Workshop on Dynamics and Related Topics (U. of Maryland), 25 min	April 2009
Semi-Annual Workshop in Dynamical Systems (Penn State), 25 min	October 2008

Seminar Talks

Dynamical Systems Seminar (Northwestern Univ.), 1 hour	May 2024
Special REU Seminar (Northwestern), 50 min	August 2023
Dynamical Systems Seminar (Penn State), 50 min	March 2023
Ergodic Theory and Statistical Mechanics (Princeton), 1 hour	<i>Cancelled - pandemic</i>
Dynamical Systems Seminar (U. of Maryland), 2 hours	February 2020
CDSNS Colloquium (GA Tech), 1 hour	November 2019
Dynamical Systems Seminar (U. Chicago), 1 hour	November 2019
Dynamical Systems Seminar (Northwestern Univ.), 1 hour	October 2019
Dynamical Systems Seminar (Penn State), 1 hour	January 2019
MASS Colloquium (Penn State), 1 hour	September 2018
Ergodic Theory and Probability Seminar (Ohio State), 1 hour	February 2018
Operator Algebras and Dynamics Seminar (US Naval Acad.), 1 hour	December 2016
Center for Dynamics and Geometry Seminar (Penn State), 1 hour	September 2016
Analysis Seminar (George Washington Univ.), 1 hour	March 2016
Symbolic Dynamics Minicourse (Northwestern Univ.), 3 hours	November 2015
Mathematics Colloquium (U. Houston), 1 hour	September 2015
Dynamical Systems Seminar (U. Houston), 1 hour	September 2015
Dynamical Systems Seminar (Northwestern Univ.), 1 hour	January 2015
Algebra etc Seminar (Bucknell), 1 hour	October 2014
Mathematics Department Student Colloquium (Bucknell), 1 hour	March 2014
Dynamical Systems Seminar (U. of Maryland), 2 hours	March 2014
Dynamical Systems Seminar (Northwestern Univ.), 1 hour	January 2014
Ergodic Theory Seminar (U. Paris - Jussieu), 90 min	May 2013
Automata Seminar (Paris 7), 1 hour	May 2013
Dynamical Systems Seminar (U. Houston), 1 hour	November 2012
Ergodic Theory Seminar (U. Illinois), 1 hour	November 2012
Dynamical Systems Seminar (Northwestern Univ.), 1 hour	April 2012
Dynamical Systems Seminar (U. Chicago), 1 hour	February 2012
Geometry, Topology, and Dynamics Seminar (UIC), 1 hour	November 2010
Geometric Functional Analysis Seminar (Weizmann Inst.), 1 hour	November 2009
Dynamics Systems Seminar (Hebrew University), 1 hour	November 2009
Horowitz Seminar (Tel Aviv U.), 1 hour	October 2009
Ergodic Theory and Probability Seminar (Ohio State), 1 hour	May 2009
Rainwater Seminar (U. of Washington), 1 hour	April 2009
Dynamical Systems Seminar (U. of Maryland), 2 hours	February 2009
Center for Dynamics and Geometry Seminar (Penn State), 1 hour	November 2008

Service

CAS Curriculum Committee	2023-2026
VPHR Search Committee (co-chair)	2022
Committee on Staff Planning (co-chair Fall 2021-2023)	Spring 2021-23
Faculty Committee on Honorary Degrees (chair 2017-2019)	2016-19
Presidential Fellows Selection Committee Member	2017-18
Dept of Math Curriculum Committee	2023-24

Dept of Math Hiring Committee	2016-17, 2018-19, 2020-22
Dept of Math Talks Committee	2014-15, 2016-18, 2023-24
Dept of Math Computer Committee	2013-14
Dept of Math Assessment Committee	2013-15, 2021-2023
Dept of Math Student Recruitment and Scholarships Committee (chair)	2017-18
Dept of Math Student Activities and Resources Committee	2018-19, 2020-21
Graduate School Advisor - Department of Mathematics (Bucknell)	2014-15, 2016-17
Prep for Success Workshop	Jan 2022, Aug 2022
<i>RAMP Up!</i> Program (led College Math Skills session)	August 2014, 2015
Phi Beta Kappa Awards Committee (chair in 2016, 2017)	2014-17
Delegate from Bucknell's Chapter at Φ BK Triennial Council (Denver, CO)	2015

Have refereed for

- *Ergodic Theory and Dynamical Systems*
- *Discrete Analysis*
- *Discrete and Continuous Dynamical Systems*
- *Stochastics and Dynamics*
- *Theoretical Computer Science*
- *Transactions of the American Mathematical Society*
- *Mathematische Zeitschrift*
- *Contemporary Mathematics*

**Professional
Experience**

<i>Rapporteur</i> on the PhD thesis of Bastián Espinoza	June 2023
Organizer of Dynamical Systems seminar (Northwestern)	2010-2013
Copy Editor for "Electronic Research Announcements"	2008-2010