

# Van T. Cyr

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**Research Interests** Dynamical systems, ergodic theory. My recent work is in symbolic dynamics and has focused in two areas: the automorphisms and ergodic theory of zero entropy subshifts, and Nivat's conjecture on  $\mathbb{Z}^2$  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. <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. doi:10.1017/etds.2018.126
17. V. Cyr and B. Kra: *Realizing ergodic properties in zero entropy subshifts* submitted.
18. V. Cyr and B. Kra: *Boshernitzan's condition, factor complexity, and an application* 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 (as the primary instructor)</i>	
Calculus I (Math 201)	Fa 2013, Fa 2014
Calculus II (Math 202)	Sp 2015, Sp 2016, Fall 2018
Calculus III (Math 211)	Sp 2014, Fa 2017, Sp 2019
Differential Equations (Math 212)	Fa 2016, Sp 2017, Sp 2018, Sp 2019
Linear Algebra (Math 245)	Fa 2016
Logic, Sets, and Proofs (Math 280)	Sp 2016
Probability (Math 303)	Sp 2018
Real Analysis I (Math 308)	Sp 2014, Sp 2017
Number Theory (Math 311)	Fa 2014
Advanced Linear Algebra (Math 345)	Fa 2018
<i>Northwestern University (as the primary instructor)</i>	
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
<i>Penn State University (as the primary instructor)</i>	
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** AIMS Special Session on Dyn. Sys., Diff. Eq. and Appl. (Atlanta), 20 min June 2020  
 Joint Mathematics Meetings 2020 (Denver), 20 min January 2020  
 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** Ergodic Theory and Statistical Mechanics (Princeton), 1 hour April 2020  
 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

Faculty Committee on Honorary Degrees (Chair beginning Spring 2017)	2016-2019
Presidential Fellows Selection Committee Member	2017, 2018
Dept of Math Hiring Committee	2016-17, 2018-19
Dept of Math Talks Committee	2014-15, 2016-18
Dept of Math Computer Committee	2013-14
Dept of Math Assessment Committee	2013-15
Dept of Math Student Recruitment and Scholarships Committee ( <i>Chair</i> )	2017-2018
Dept of Math Student Activities and Resources Committee	2018-2019
Graduate School Advisor - Department of Mathematics (Bucknell)	2014-15, 2016-17
<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 $\Phi$ BK Triennial Council (Denver, CO)	2015
Have refereed for	
<ul style="list-style-type: none"> <li>• <i>Ergodic Theory and Dynamical Systems</i></li> <li>• <i>Discrete Analysis</i></li> <li>• <i>Discrete and Continuous Dynamical Systems</i></li> <li>• <i>Stochastics and Dynamics</i></li> </ul>	

### Professional Experience

Organizer of Dynamical Systems seminar (Northwestern)	2010-2013
Copy Editor for "Electronic Research Announcements"	2008-2010