Van T. Cyr

Department of Mathematics
Bucknell University
Lewisburg, PA 17837, USA

van.cyr@bucknell.edu
vancyr.scholar.bucknell.edu

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

Professor of Mathematics	2025-present
Associate Professor of Mathematics	2019-2025
Assistant Professor of Mathematics	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*, Math. Z. **309** (1) doi:10.1007/s00209-024-03628-z (2025)

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		
Bucknell University		
Topics in Calculus (Math 192)		Sp 2022, Sp 2023, Fa 2024
Calculus I (Math 201)		Fa 2013, Fa 2014, Fa 2020, Fa 2021
Calculus II (Math 202)		Sp '15, Sp '16, Fa '18, Sp '21, Fa '23, Sp '25
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, Sp 2025
Probability (Math 303)		Sp 2018, Fa 2022, Fa 2024
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	58th 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
	54th 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~~	*Cancelled - pandemic*
	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 (*co-chair* 2024-2025)	2023-2026
	Search Committee Member for Director of OAR	Fall 2024
	VPHR Search Committee (faculty *co-chair*)	2022
	Committee on Staff Planning (*co-chair* Fall 2021- Spring 2023)	Spring 2021-23
	Faculty Committee on Honorary Degrees (*chair* 2017-2019)	2016-19
	Selection Committee Member for Presidential Fellows	2017-18

Dept of Math DRC	2024-28
Dept of Math Curriculum Committee	2023-24
Dept of Math Hiring Committee	2016-17, 2018-19, 2020-22, 2204-25
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
EXCELerator Program (led Math Sessions)	June-July 2024
RAMP Up! 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 ΦBK 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		
	Rapporteur 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