

Joseph Vandehey

Curriculum Vitae

The Ohio State University

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POSITIONS HELD

University of Georgia at Athens

Postdoctoral Research and Teaching Associate

Fall 2013 – Spring 2016

The Ohio State University

Zassenhaus Assistant Professor

Fall 2016 –

EDUCATION

University of Oregon

Bachelor of Science, Mathematics

2005 – 2008

University of Illinois at Urbana-Champaign

Ph. D. program, Mathematics

2008 – 2013

RESEARCH INTERESTS

Number Theory and Ergodic Theory

Normal numbers, continued fractions and their applications to hyperbolic geometry, radix expansions and their variants, symbolic dynamics, Diophantine approximation, asymptotic analysis, exponential sums

PAPERS

- [1] **Containment in (s, t) -core partitions** 2008
Undergraduate thesis at the University of Oregon under the direction of Professor Marie Vitulli
- [2] **On Multiplicative Functions with Bounded Partial Sums** 2012
Integers **12** no. 4, 741–755
- [3] **On certain statistical properties of continued fractions with even and with odd partial quotients** (with F. Boca) 2012
Acta Arithmetica **156** no. 3, 201–221
- [4] **The normality of digits in almost constant additive functions** 2013
Monatshefte für Mathematik **171** no. 3-4, 481–497
- [5] **On non-intersecting arithmetic progressions** (with R. de la Bretèche and K. Ford) 2013
Acta Arithmetica **157**, 381–392

- [6] **On an incomplete argument of Erdős on the irrationality of Lambert series** 2013
#A58 *Integers* **13**
- [7] **Error term improvements for van der Corput transforms** 2014
Quarterly Journal of Mathematics **65**, no. 4, 1461–1502.
- [8] **A simpler normal number construction for simple Lüroth series** 2014
The Journal of Integer Sequences Article 14.6.1, Vol. 17
- [9] **Some normal numbers generated by arithmetic functions** (with P. Pollack) 2015
Canadian Mathematical Bulletin **58**, no. 1, 160–173
- [10] **Continued fractions on the Heisenberg group** (with A. Lukyanenko) 2015
Acta Arithmetica **167**, 19–42
- [11] **Besicovitch, Bisection, and the normality of 0.(1)(4)(9)(16)(25)...** (with P. Pollack) 2015
American Mathematical Monthly **122**, no. 8, 757–765
- [12] **Lagrange’s Theorem for continued fractions on the Heisenberg group** 2015
Bulletin of the London Mathematical Society **47**, no. 5, 866–882
- [13] **Normality preserving operations for Cantor series expansions and associated fractals part II** (with D. Airey and B. Mance) 2015
New York Journal of Mathematics **21**, 1311–1326
- [14] **Diophantine properties of continued fractions on the Heisenberg group** 2016
International Journal of Number Theory **12**, no. 2, 541–560
- [15] **Continued fraction normality is not preserved along arithmetic progressions** (with B. Heersink) 2016
Archiv der Mathematik **106**, no. 4, 363–370
- [16] **New normality constructions for continued fraction expansions** 2016
Journal of Number Theory **166**, 424–451
- [17] **Normal number constructions for Cantor series with slowly growing bases** (with D. Airey and B. Mance) 2016
Czechoslovak Mathematical Journal **66(141)**, no. 2, 465–480
- [18] **Absolutely abnormal, continued fraction normal numbers** 2016
Bulletin of Australian Mathematical Society **94**, no. 2, 217–223
- [19] **Non-trivial matrix actions preserve normality for continued fractions** 2017
Compositio Mathematica **153**, no. 2, 274–293
- [20] **Uncanny subsequence selections that generate normal numbers** 2017
Uniform Distribution Theory **12**, no. 2, 65–75
- [21] **On the binary digits of $\sqrt{2}$** 2018
#A30 *Integers* **18**
- [22] **Differencing methods for Korobov-type exponential sums**
Preprint: <https://arxiv.org/abs/1606.07911> (to appear in *Journal d’Analyse Mathématique*)
- [23] **Towards a sharp converse of Wall’s Theorem on arithmetic progressions**
Preprint: <https://arxiv.org/abs/1711.07047> (to appear in *Pacific Journal of Mathematics*)

- [24] **A hot spot proof of the generalized Wall's theorem** (with V. Bergelson)
(to appear in *American Mathematical Monthly*)
- [25] **Squares in polynomial product sequences** (with P. Spiegelhalter)
Preprint: <http://arxiv.org/abs/1107.1730> (submitted)
- [26] **On the joint normality of certain digit expansions**
Preprint: <http://arxiv.org/abs/1408.0435> (submitted)
- [27] **Intrinsic Diophantine approximation in Carnot groups and in the Siegel model of the Heisenberg group** (with A. Lukyanenko)
Preprint: <http://arxiv.org/abs/1510.06033> (submitted)
- [28] **Ergodicity of Iwasawa continued fractions via markable hyperbolic geodesics** (with A. Lukyanenko)
Preprint: <https://arxiv.org/abs/1805.09312> (submitted)
- [29] **Calculations of the invariant measure for Hurwitz continued fractions** (with G. Hiary)
Preprint: <http://arxiv.org/abs/1805.10151> (submitted)
- [30] **A proof of the infinitude of primes via continued fractions**
(submitted)

SELECTED PRESENTATIONS

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| Integers Conference 2011 (University of West Georgia) | October 26, 2011 |
| ‘On Multiplicative Functions with Bounded Partial Sums’ | |
| UGA Math Club (University of Georgia at Athens) | October 16, 2013 |
| ‘The abnormality of normal numbers’ | |
| Video link: http://www.youtube.com/watch?v=G3MwnMo7tio | |
| Integers Conference 2013 (University of West Georgia) | October 26, 2013 |
| ‘Combinatorial methods in normal number proofs’ | |
| 2014 Midwest Number Theory Conference for Graduate Students and Recent PhDs (University of Illinois at Urbana–Champaign) | June 3, 2014 |
| ‘Heisenberg points with periodic continued fraction expansions’ | |
| Palmetto Number Theory Series XXII (South Carolina State University) | September 6, 2014 |
| ‘Periodic multi-dimensional continued fractions’ | |
| Illinois Number Theory Conference (University of Illinois at Urbana-Champaign) | August 13-14, 2015 |
| ‘Comparing different types of normality’ | |
| UGA Math Club (University of Georgia at Athens) | September 3, 2015 |
| ‘The great mechanical planetarium’ | |
| Radical Pi (The Ohio State University) | September 21, 2016 |
| ‘Continued fractions and the great mechanical planetarium’ | |
| Integers Conference 2016 (University of West Georgia) | October 7, 2016 |
| ‘Breaking decimal normality with continued fractions’ | |

Invited Talks

- Spring Southeastern Sectional Meeting, Special Session on Modern Methods in Analytic Number Theory** March 2, 2013
 ‘Exponential sums, the van der Corput transform, and Cornu spirals’
- University of South Carolina, Number Theory Seminar** October 4, 2013
 ‘Continued fractions on the Heisenberg group’
- University of North Texas, RTG Logic and Dynamics Seminar** November 22, 2013
 ‘Normal number construction for Lüroth series’
- The Ohio State University, Number Theory Seminar** February 3, 2014
 ‘The unexpected strength of continued fractions on the Heisenberg group’
- Georgia Southern University, Colloquium** November 14, 2014
 ‘The unexpected strength of continued fractions on the Heisenberg group’
- Spring Southeastern Sectional Meeting, Special Session on Analytic Methods in Elementary Number Theory** March 29, 2015
 ‘New constructions of normal continued fraction expansions’
- Central Fall Sectional Meeting, Special Session on Metric Spaces: Geometry, Group Theory, and Dynamics** October 4, 2015
 ‘Continued fractions and the Heisenberg group’
- University of Illinois, Number Theory Seminar** Oct. 13, 2016
 ‘Analyzing rationals by simpler rationals’
- Workshop on “Normal numbers: arithmetic, computational and probabilistic aspects” at the Erwin Schrödinger International Institute for Mathematics and Physics** Nov. 16, 2016
 ‘Skew-products, automata, and normality’
- Eastern Illinois University, Number Theory Seminar** Oct. 6, 2017
 ‘Normality vs. determinism’
- University of Illinois, Number Theory Seminar** Oct. 11, 2018
 ‘Higher-dimensional frontiers in continued fractions’
- University of Illinois, Graduate Student Number Theory Seminar** Oct. 11, 2018
 ‘Combinatorial methods for ergodic proofs’

TEACHING EXPERIENCE

Zassenhaus Assistant Professor, The Ohio State University

<i>Math 4551: Vector Analysis</i>	Fall 2016
<i>Math 4551: Vector Analysis</i>	Spring 2017
<i>Math 4573: Elementary Number Theory</i>	Spring 2017
<i>Math 3345: Foundations of Higher Mathematics</i>	Fall 2017
<i>Problem-solving seminar</i>	Fall 2017
<i>Math 5152: Introduction to Number Theory</i>	Spring 2018
<i>Math 1172: Engineering Mathematics A</i>	Fall 2018
<i>Problem-solving seminar</i>	Fall 2018

Postdoctoral Research and Teaching Associate, University of Georgia at Athens

<i>Math 2250: Calculus I</i>	Fall 2013
<i>Math 2260: Calculus II</i>	Spring 2014
<i>Math 3200: Introduction to Higher Mathematics</i>	Spring 2014
<i>Math 2250: Calculus I</i>	Fall 2014
<i>Math 4400/6400: Number Theory</i>	Spring 2015
<i>Math 8440: Number Theory and Dynamical Systems</i>	Fall 2015
<i>Math 2260: Calculus II</i>	Spring 2016

Teaching Assistant, University of Illinois at Urbana-Champaign

<i>Math 221: Calculus I</i>	Fall 2008
<i>Math 117: Elementary Mathematics</i>	Spring 2009
<i>Math 241: Calculus III - Calculus and Mathematica</i> (★, †)	Fall 2009
<i>Math 241: Calculus III</i> (★)	Spring 2010
<i>Math 220: Calculus I</i>	Fall 2010
<i>Math 231: Calculus II</i> (★)	Spring 2011
<i>Math 220: Calculus I</i> (†)	Fall 2011

(★) Made UIUC's "List of teachers ranked as excellent" based on exceptional student evaluations.

(†) Stand-alone course

ADDITIONAL ACTIVITIES

Supervisor for Illinois Geometry Lab group	2012–2013
Lead undergraduate research groups	
Organizer for Midwest Number Theory Conference for Graduate Students and Recent Ph.D.s	Fall 2012
UGA Math Camp	Summer 2014
I taught a week-long course in cryptography	
Organizer for special session on "Connections in Number Theory" at AMS South-eastern Sectional Meeting	Fall 2014
YouTube channel: "Math and Tea"	Summer 2016–
I have produced a number of short videos designed for mathematically interested viewers	
Coordinator for the Ohio State University Putnam team	Fall 2017–
Teacher at the Ross Mathematics Program for pre-college students	2017–
Organizer for special session on "Geometry and Dynamics of Continued Fractions" at the Joint Mathematics Meetings	January 2019

HONORS AND AWARDS

University of Illinois

Bateman Fellowship	Spring 2012
Bateman Prize in Number Theory	Spring 2013
Department TA Instructional Award	Spring 2013

REFERENCES

Florin Boca
Department of Mathematics
University of Illinois
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Kevin Ford
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