

Assistant Professor  
Department of Mathematics  
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### Employment History

2005–present Assistant Professor, University of Kansas  
2002–2005 NSF Postdoctoral Fellow, University of Minnesota  
2001–2002 Instructor, Illinois Institute of Technology  
1997–2000 Teaching Assistant, University of California, San Diego

### Education

Ph.D. in mathematics, University of California, San Diego, 2002  
M.A. in mathematics, University of California, San Diego, 1998  
A.B. in mathematics, *magna cum laude*, Harvard University, 1996

### Research Grants

NSA Young Investigators Grant, awarded June 2007 (\$30,000)  
University of Kansas New Faculty General Research Fund grant, awarded June 2006 (\$8,000)

### Summary of Research Interests

Combinatorics, algebraic geometry, discrete geometry, computational commutative algebra, and the connections between them. Particular subjects of interest: graphs, matroids, simplicial complexes and their invariants; tree enumeration; configuration spaces; Stanley-Reisner theory; and combinatorial rigidity.

### Research Activities

#### Published research articles

- (1) Simplicial matrix-tree theorems (with A.M. Duval and C.J. Klivans), *Transactions of the American Mathematical Society* **361** (2009), no. 11, 6073–6114.
- (2) Updown numbers and the initial monomials of the slope variety (with J.D. Wagner), *Electronic Journal of Combinatorics* **16**, no. 1 (2009), Research Article #R82.
- (3) On distinguishing trees by their chromatic symmetric functions (with M. Morin and J.D. Wagner), *Journal of Combinatorial Theory, Series A* **115** (2008), 237–253.
- (4) Random geometric graph diameter in the unit ball (with R.B. Ellis and C. Yan), *Algorithmica* **47**, no. 4 (2007), 421–438.

- (5) Harmonic algebraic curves and noncrossing partitions (with D. Savitt and T. Singer), *Discrete and Computational Geometry* **37**, no. 2 (2007), 267–286.
- (6) Classification of Ding’s Schubert varieties: finer rook equivalence (with M. Develin and V. Reiner), *Canadian Journal of Mathematics* **59**, no. 1 (2007), 36–62.
- (7) Rigidity theory for matroids (with M. Develin and V. Reiner), *Commentarii Mathematici Helvetici* **82** (2007), 197–233.
- (8) The Mathieu group  $M_{12}$  and the  $M_{13}$  game (with N.D. Elkies and J.H. Conway), *Experimental Mathematics* **15**, no. 2 (2006), 223–236.
- (9) The slopes determined by  $n$  points in the plane, *Duke Mathematical Journal* **131**, no. 1 (2006), 119–165.
- (10) Cyclotomic and simplicial matroids (with V. Reiner), *Israel Journal of Mathematics* **150** (2005), 229–240.
- (11) Random geometric graph diameter in the unit disk with  $\ell_p$  metric (with R.B. Ellis and C. Yan), Proceedings of the 12th International Symposium on Graph Drawing (New York, October, 2004), Springer Lecture Notes in Computer Science **3383** (2005) (J. Pach, ed.), 167–172.
- (12) On the topology of graph picture spaces, *Advances in Mathematics* **191**, no. 2 (2005), 312–338.
- (13) Factorizations of some weighted spanning tree enumerators (with V. Reiner), *Journal of Combinatorial Theory, Series A* **104**, no. 2 (2003), 265–285.
- (14) Geometry of graph varieties, *Transactions of the American Mathematical Society* **355**, no. 11 (2003), 4151–4169.
- (15) Ruling out (160,54,18) difference sets in some nonabelian groups (with J. Alexander, R. Balasubramanian, K. Monahan, H. Pollatsek, and A. Sen), *Journal of Combinatorial Designs* **8**, no. 4 (2000), 221–231.

### Submitted for publication

- (1) Cellular spanning trees and Laplacians of cubical complexes (with A.M. Duval and C.J. Klivans), arXiv:0908.1956.

### Theses

- (1) *Graph varieties*, Ph.D. thesis, University of California, San Diego, 2002.
- (2) *The Mathieu group  $M_{12}$  and Conway’s  $M_{13}$  game*, A.B. thesis, Harvard University, 1996.

### Invited Plenary Talks at Conferences

- *Simplicial matrix-tree theorems*, KUMUNU VIII, Lincoln, NE, September 2007

### Invited Talks at AMS Special Sessions

- *A simplicial matrix-tree theorem, I: General Results*, AMS Central Section Meeting, Chicago, October 2007
- *Rigidity theory for matroids*, AMS Eastern Section Meeting, Storrs, CT, October 2006
- *A simplicial matrix-tree theorem (preliminary report)*, AMS Central Section Meeting, Cincinnati, October 2006
- *Finer rook equivalence and cohomology of Ding’s Schubert varieties*, AMS Western Section Meeting, San Francisco, April 2006

- *Harmonic algebraic curves and noncrossing partitions*, AMS Central Section Meeting, Notre Dame, IN, April 2006
- *Harmonic algebraic curves and noncrossing partitions*, AMS Western Section Meeting, Eugene, OR, November 2005
- *On the topology of multigraph picture spaces*, AMS Eastern Section Meeting, Binghamton, NY, October 2003
- *Ordered planar trees and the slope variety of the complete graph*, AMS Central Section Meeting, Ann Arbor, MI, March 2002
- *The Stanley-Reisner simplicial complex of the slope variety*, Joint Mathematics Meetings, San Diego, January 2002

### Contributed Talks at Conferences

- *On distinguishing trees by their chromatic symmetric functions*, CombinaTexas, El Paso, TX, April 2008
- *On the chromatic symmetric function of a tree*, 18th International Conference on Formal Power Series and Algebraic Combinatorics [FPSAC XVIII], San Diego, June 2006
- *Rigidity theory for matroids*, FPSAC XVII, Taormina, Italy, June 2005 (poster)
- *Poincaré meets Tutte*, FPSAC XVI, Vancouver, Canada, June 2004
- *Towards a bijective enumeration of spanning trees of the hypercube*, CombinaTexas, College Station, TX, April 2004
- *Combinatorial and geometric properties of graph varieties*, FPSAC XII, Tempe, AZ, May 2001 (poster)

### Invited Seminar Talks (other than at home institution)

- *Simplicial, cubical and cellular spanning trees*, Combinatorics Seminar, University of Kentucky, April 2009
- *Counting simplicial and cubical spanning trees*, Texas A&M University, October 2008
- *Simplicial and cellular matrix-tree theorems*, Combinatorics Seminar, University of Minnesota, May 2008
- *When is a tree determined by its chromatic symmetric function?*, Combinatorics Seminar, Massachusetts Institute of Technology, March 2007
- *Graph varieties*, Algebra Seminar, University of Missouri, September 2006
- *Harmonic algebraic curves and noncrossing partitions*, Combinatorics Seminar, Université de Québec à Montréal, March 2006
- *Harmonic algebraic curves and noncrossing partitions*, Combinatorics Seminar, Indiana University, December 2005
- *Rigidity theory for matroids*, Combinatorics Seminar, University of Pennsylvania, April 2005
- *Rigidity theory for matroids*, Combinatorics Seminar, Ohio State University, January 2005
- *Combinatorics and geometry of graph varieties*, Combinatorics Seminar, Mount Holyoke College, October 2004
- *Finer rook equivalence: classifying Ding's Schubert varieties*, Combinatorics/Geometry Seminar, University of Washington, May 2004
- *Finer rook equivalence: classifying Ding's Schubert varieties*, Combinatorics Seminar, University of California, Berkeley, May 2004
- *Pictures of graphs*, Combinatorics Seminar, Massachusetts Institute of Technology, March 2003
- *Combinatorics and geometry of graph varieties*, Applied Algebra Seminar, York University (Toronto, Canada), October 2002

- *Calculating the degree of the slope variety*, Combinatorics Seminar, University of Illinois at Chicago, November 2001
- *Graph varieties*, Combinatorics/Geometry Seminar, University of Washington, October 2001
- *Graph varieties*, Combinatorics Seminar, University of Minnesota, June 2001
- *Graph varieties*, Algebraic Geometry Seminar, University of Illinois at Chicago, October 2000

### Research Workshops Attended

- Institute for Pure and Applied Mathematics:  
Workshop on Combinatorial Geometry, October 2009
- American Institute of Mathematics Research Conference Center:  
Workshop on Rigidity and Polyhedra, Palo Alto, CA, December 2007
- Institute for Advanced City/Park City Mathematics Institute:  
Summer Session on Geometric Combinatorics, Park City, UT, July 2004

### Teaching Activities

#### Courses Taught

##### *University of Kansas*

- Math 725, Graph Theory (Spring 2010)
- Math 141, Honors Calculus I (Fall 2009)
- Math 409, Topics in Geometry for Secondary and Middle School Teachers (Spring 2009)
- Math 410, Topics in History of Mathematics for Secondary and Middle School Teachers (Spring 2009)
- Math 996, Topics in Algebraic Combinatorics (Fall 2008)
- Math 796, Algebraic Combinatorics (Spring 2008)
- Math 141, Honors Calculus I (Fall 2007)
- Math 223, Vector Calculus (Spring 2007)
- Math 996, Topics in Combinatorial Commutative Algebra (Fall 2006)
- Math 290, Elementary Linear Algebra (Fall 2006)
- Math 725, Graph Theory (Spring 2006)
- Math 141, Honors Calculus I (Fall 2005)

##### *University of Minnesota*

- Combinatorial Optimization (Spring 2005)
- Graph Theory and Non-Enumerative Combinatorics (Fall 2004, Fall 2003)
- Excursions in Mathematics (Fall 2003)

##### *Illinois Institute of Technology*

- Introduction to Discrete Mathematics (Spring 2002)
- Calculus I (Spring 2002, Fall 2001)

##### *University of California, San Diego*

- Calculus I (Spring 2000)

### Graduate Advisees at KU

- Jenny Buontempo (M.A., May 2008)
- Tom Enkosky (Ph.D. candidate; passed preliminary exam January 2008)
- Brandon Humpert (Ph.D. candidate; passed preliminary exam September 2007)

### Undergraduate Advisees at KU

- C.J. Harries (reading course, Fall 2009)
- Justin Smith (Honors Research Development Program, Summer 2008)
- Nick Tobaben (undergraduate research project, Summer–Fall 2008)

### Former Students

- Tom Whipple, U. of Minnesota senior project, Spring 2005

### Teaching Activities with High School Students

- Duke Talent Identification Program Scholar Weekend: Developed and taught a short course on “Mathematics, Games and Strategy”, November 2008)
- Presenter, KU Math Awareness Day, April 2007
- Canada/USA Mathcamp: Visiting faculty (2003, 2004, 2006); Co-organizer (1998); Mentor (1997, 1998)
- University of Minnesota Institute of Technology Center for Educational Programs: Guest lecturer and workshop leader (2004, 2005)

## Department, University and Professional Service

### Departmental Service

- Center for Teaching Excellence Ambassador, 2009–2010
- Member, Computer Committee, 2009–2010
- Member, Honors Committee, 2005–present
- Coach, KU Putnam Exam team, 2005–present
- Director, KU Undergraduate Mathematics Competition, 2006–present
- Member, Chair Search Committee, 2008–2009
- Member, Combinatorics VAP Recruiting Committee, 2007–08
- Member, Algebra Recruiting Committee, 2006–07

### Dissertation and Thesis Committees

- Ryan Fox (D.M.A. candidate; passed oral exam, 2009)
- Tod Fish (D.M.A., 2009)
- Manoj Kummini (Ph.D., Mathematics, 2007)
- Bridget Franklin (B.S. with departmental honors, Mathematics, 2006)

### Seminars Organized

- Combinatorics Seminar, University of Kansas, Spring 2006–present

- Study seminar on systems of polynomial equations, University of Minnesota, Spring 2003
- Study seminar on Stanley-Reisner theory, University of Minnesota, Fall 2002

### University Service

- Participant, Faculty Food for Thought (organized by University Advising Center), 2007, 2008, 2009
- Numerous reference letters for KU undergraduate students

### Professional Activities

- Co-organizer (with Art Duval, University of Texas at El Paso), Special Session on Geometric Combinatorics, AMS Western Section Meeting, Albuquerque, NM, April 2010
- Organizer, Kansas Collegiate Mathematics Competition, May 2009
- Co-organizer (with Atanas Stefanov, KU), Kansas Collegiate Mathematics Competition, May 2008
- R.L. Moore Project NExT Fellow, 2006–2007
- Member, Program Committee, 20th International Conference on Formal Power Series and Algebraic Combinatorics (Valparaiso, Chile, June 2008)
- Co-organizer (with Julia Bergner, Kansas State University, and Tara Holm, Cornell University), *Mentoring Graduate Students*, panel discussion, Joint Mathematics Meetings, New Orleans, January 2007
- Referee for the following research journals:
  - Advances in Applied Mathematics
  - Advances in Mathematics (twice)
  - Computational Geometry: Theory and Applications
  - Discrete Mathematics
  - Electronic Journal of Combinatorics
  - Journal of Algebraic Combinatorics (twice)
  - Journal of Combinatorial Theory, Series B (twice)
  - Journal of Mathematical Analysis and Applications
  - Mathematical Research Letters
  - Pacific Journal of Mathematics
  - Rocky Mountain Journal of Mathematics (twice)
- Reviewer for *Mathematical Reviews* (25 items reviewed)