

Assistant Professor  
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### Education and Employment

Assistant Professor, Oberlin College, 2006-present.

Visiting Assistant Professor, University of California, Berkeley, 2005-2006.

NSF Postdoctoral Fellow in Mathematics, University of California, Berkeley, 2004-2006.

Ph.D. in Mathematics, University of Michigan, Alexander Barvinok, advisor, 2004.

B.S., Summa cum Laude, with Honors in Mathematics, Wake Forest University, 2000.

### Publications (available at <http://www.oberlin.edu/faculty/kwoods/papers.html>)

Computing Shapley value in cooperative supermodular games (with David Liben-Nowell, Alexa Sharp, and Tom Wexler), preprint.

The Price of Civil Society (with Russell Buehler, Zachary Goldman, David Liben-Nowell, Yuechao Pei, Jamie Quadri, Alexa Sharp, Sam Taggart, and Tom Wexler), Proceedings of *WINE: Workshop on Internet and Network Economics* (2011), to appear.

A finite calculus approach to Ehrhart polynomials (with Steven Sam), *The Electronic Journal of Combinatorics*, 17 (2010), #R68.

An implementation of the Barvinok-Woods integer projection algorithm (with Matthias Koeppel and Sven Verdoolaege), Proceedings of the *International Conference on Information Theory and Statistical Learning* (2008), 53-59.

Maximal periods of (Ehrhart) quasi-polynomials (with Matthias Beck and Steven Sam), *Journal of Combinatorial Theory, Series A*, 115 (2008), 517-525.

Counting with generating functions (with Sven Verdoolaege), *Journal of Symbolic Computation* 43 (2008), 75-91.

The probability of choosing primitive sets (with Sergi Elizalde), *Journal of Number Theory*, 125 (2007), 39-49.

Bounds on the number of inference functions of a graphical model (with Sergi Elizalde), *Statistica Sinica*, 17 (2007), 1395-1415.

Parametric alignment of Drosophila genomes (with Colin Dewey, Peter Huggins, Bernd Sturmfels, and Lior Pachter), *PLoS Computational Biology*, 2 (2006), 606-614.

Neighborhood complexes and generating functions for affine semigroups (with Herbert Scarf), *Discrete and Computational Geometry*, 35 (2006), 385 - 403.

Computing the period of an Ehrhart quasi-polynomial, *The Electronic Journal of Combinatorics*, 12 (2005), #R34.

Short rational generating functions and their applications to integer programming (with Ruriko Yoshida), *SIAG/OPT Views and News*, 16 (2005), 15-19.

Parametric Sequence Alignment (with Colin Dewey). In *Algebraic Statistics for Computational Biology*, Lior Pachter and Bernd Sturmfels, eds, Cambridge University Press (2005), 193-205.

The minimum period of the Ehrhart quasi-polynomial of a rational polytope (with Tyrell McAllister), *Journal of Combinatorial Theory, Series A*, 109 (2005), 345-352.

*Rational Generating Functions and Lattice Point Sets*, Ph.D. thesis, University of Michigan (2004).

Short rational generating functions for lattice point problems (with Alexander Barvinok). *Journal of the American Mathematical Society*, 16 (2003), 957-979.

Parametric inference of HIV recombinant genomes (with Niko Beerenwinkel and Colin Dewey), unpublished manuscript.

## Teaching

### *At Oberlin College:*

Math 113, Statistical Methods for the Social Sciences, Fall 2006, Spring 2007, Fall 2007, Fall 2011 (2 sections).

Math 131, Calculus Ia, Fall 2006.

Math 220, Discrete Mathematics, Spring 2008 (2 sections), Fall 2008 (2 sections), Spring 2011 (2 sections).

Math 328, Computational Algebra and Algebraic Geometry, Fall 2010.

Math 335, Probability, Fall 2007.

Math 343, Combinatorics, Spring 2009.

Math 345, Information Theory, Spring 2007, Spring 2009, Spring 2011.

Math 348, Graphical Models, Spring 2008.

FYSP 179, Symmetry in Science, Art, and Life (First Year Seminar), Fall 2008, Fall 2010.

### *At the University of California, Berkeley:*

Math 113, Abstract Algebra, Spring 2006.

Math 172, Combinatorics, Fall 2005.

### *At the University of Michigan:*

Math 115, Calculus I, Winter 2001.

Math 105, Data, Functions, and Graphs, Fall 2001.

## Undergraduate Research Students Mentored

Steven Sam, University of California, Berkeley, 2005-2007.

Sam Cole, David Leibovic, Elara Willett, Jamie Quadri (with Alexa Sharp, Oberlin College), Summer 2009.

Fifteen students (with Alexa Sharp and Tom Wexler, Oberlin College; and David Liben-Nowell, Carlton College), Summer 2010.

### **Honors Students**

Nicholas Lowery, 2008.

Liam Solus, 2010-2011.

### **Teaching Interests**

Combinatorics, Linear Algebra, Abstract Algebra, Probability.

Statistics, Calculus, Discrete Mathematics.

Topics courses such as Convexity, Information Theory, Discrete Probability Models, Theory of Algorithms, and Computational Biology.

Interdisciplinary or broad audience courses such as Symmetry, Fair Division, Game Theory, and Voting Theory.

### **Research Interests**

Discrete and Computational Geometry.

Algorithmic Game Theory.

Computational biology from a combinatorial perspective.

Algorithms, generating functions, lattice points in polyhedra, integer programming (including test sets), geometry of numbers, complexity theory.

Applications in combinatorics, commutative algebra, logic, theoretical computer science.

### **Grants, Fellowships, and Scholarships**

Research Status (competitive across Oberlin College), 2009-2010.

Project NeXT Fellowship, 2006-2007.

NSF Postdoctoral Fellowship, 2004-2007.

Clay Liftoff Fellowship, August 2004.

NSF Graduate Research Fellowship, 2000-2004.

VIGRE Graduate Fellowship, University of Michigan, 2000-2004.

Reynolds Scholarship, Wake Forest University, 1996-2000.

Raynor Scholarship in Mathematics, Wake Forest University, 1999-2000.

National Merit Scholarship, 1996.

### **Professional Activities**

Member AMS, MAA.

Co-organizer and Program Co-chair, Midstates Conference for Undergraduate Research in Computer Science and Mathematics, Oberlin College, November 2009.

Co-organizer, Special Session on the Linear Diophantine Problem of Frobenius, AMS-MAA Joint Meetings, January 2008.

Co-organizer, Combinatorics Seminar, University of California, Berkeley, 2004-2006.

Organizer, VIGRE/Undergraduate Colloquium 2003-2004.

Member, Committee on Academic Affairs, Wake Forest University, 1998-2000.

*Journals refereed for:*

Mathematics of Operations Research (2003, 2007, 2009, 2011)

College Mathematics Journal (2008, 2009, 2010)

American Mathematical Monthly (2010)

Discrete Mathematics (2004, 2010)

INTEGERS (2010)

Discrete Optimization (2010)

IMA Volumes in Mathematics and its Applications (2009)

Bulletin of Mathematical Biology (2009)

Journal of Combinatorial Theory – Series A (2005, 2007, 2008)

Discrete and Computational Geometry (2003, 2007, 2008)

Journal of Pure and Applied Algebra (2008)

Communications in Algebra (2008)

Linear Algebra and its Applications (2008)

Snowbird Research Conference Proceedings (2007)

Algorithmica (2005, 2006)

Journal of Number Theory (2006)

Australasian Journal of Combinatorics (2004)

Combinatorica (2003)

Discrete Applied Mathematics (2003)

*Mathematical Reviews (the primary journal and database containing written summaries/reviews of mathematical articles):*

Hans-Gill, R. J.; Raka, Madhu; Sehmi, Ranjeet, “Estimates on conjectures of Minkowski and Woods,” *Indian J. Pure Appl. Math.* 41 (2010), no. 4, 595--606.

Adhikaria, Sukumar Das and Granville, Andrew, “Visibility in the plane,” *Journal of Number Theory* 129 (2009), 2335-2345.

Henk, Martin and Tagami, Makoto, “Lower bounds on the coefficients of Ehrhart polynomials,” *European Journal of Combinatorics* 30 (2009), 70-83.

Joswig, Michael; Rörig, Thilo, “Neighborly cubical polytopes and spheres,” *Israel Journal of Mathematics* 159 (2007), 221-242.

Bey, Christian; Henk, Martin; Wills, Jörg M., “Notes on the roots of Ehrhart polynomials,” *Discrete and Computational Geometry* 38 (2007), 81-98.

- Verdoolaege, Sven; Seghir, Rachid; Beyls, Kristof; Loechner, Vincent; Bruynooghe, Maurice, "Counting integer points in parametric polytopes using Barvinok's rational functions," *Algorithmica* 48 (2007), 37-66.
- Patras, Frédéric; Solé, Patrick, "The coordinator polynomial of some cyclotomic lattices," *European Journal of Combinatorics* 28 (2007), 17-25.
- Braun, Benjamin, "An Ehrhart Series Formula For Reflexive Polytopes," *Electronic Journal of Combinatorics* 13 (2006), N 15.
- Leemans, Dimitri, "Almost simple groups of Suzuki type acting on polytopes" *Proceedings of the American Mathematical Society* 134 (2006), 3649-3651.

## Presentations

### *Solving Lattice Point Problems Using Rational Generating Functions*

- Discrete CATS Seminar, University of Kentucky, April 2010.
- Research Seminar, Colorado College, February 2010.
- Combinatorics Seminar, Institute for Pure and Applied Mathematics, UCLA, November 2009.
- Combinatorics Seminar, University of California, San Diego, November 2009.
- Faculty Seminar, Oberlin College, May 2009.
- Colloquium, Case Western Reserve University, October 2008.
- Colloquium, Cleveland State University, November 2007.
- Colloquium, Kent State University, November 2007.
- BAD (Bay Area Discrete) Math Day, October 2004.
- Geometry Seminar, Georgia Institute of Technology, February 2004.
- Microsoft Research, Redmond, WA, January 2004.
- Workshop on Combinatorial and Discrete Geometry, MSRI, November 2003.
- Combinatorics Seminar, Massachusetts Institute of Technology, October 2003.
- Integer points in Polyhedra, AMS-IMS-SIAM Joint Summer Research Conference, Snowbird, Utah, July 2003.
- Combinatorics/Geometry Seminar, University of Washington, Seattle, April 2003.
- Cowles Foundation, Yale University, March 2003.
- Discrete Mathematics Seminar, University of California, Davis, January 2003.
- Miniworkshop on Algebraic Statistics, University of California, Berkeley, January 2003.
- Combinatorics Seminar. University of Michigan, January 2003.
- VIGRE Seminar, University of Michigan, September 2003.

### *Generating Functions and the Two Stamp Problem*

- Colloquium, Claremont Colleges, December 2009.
- Departmental Spring Banquet, Ohio Wesleyan University, April 2009.
- Colloquium, Denison University, March 2009.
- Colloquium, Franklin and Marshall College, January 2009.
- Colloquium, Ursinus College, December 2008.
- Undergraduate Colloquium, Kent State University, November 2007.
- Colloquium, Kenyon College, March 2007.

Colloquium, Bard College, January 2006.  
Colloquium, Oberlin College, December 2005.  
Colloquium, Carleton College, February 2005.  
Colloquium, Bucknell University, February 2005.  
Colloquium, Washington and Lee University, January 2005.  
Session on Combinatorics, AMS-MAA Joint Meetings, January 2005.  
Colloquium, Wake Forest University, January 2005.

*Neighborhood Complexes and Rational Generating Functions*

Faculty Seminar, Oberlin College, March 2010.  
Algebra / Number Theory / Combinatorics Seminar, the Claremont Colleges,  
November 2009.  
Session on Combinatorics, AMS-MAA Joint Meetings, January 2006.

*Counting with Rational Generating Functions*

Geometric Combinatorics minisymposium, SIAM Conference on Discrete  
Mathematics, June 2010.  
Workshop on Dedekind sums in geometry, topology, and arithmetic, BIRS, Banff,  
October 2009.  
Discrete Mathematics and Representation Theory Seminar, University of California,  
Davis, April 2005.  
Algebra-Geometry-Combinatorics Seminar, San Francisco State University, April  
2005.  
MSRI post-doc seminar, November 2004.

*Cubing the Pyramid: or, Why We Need Calculus (and Measure Theory)*

Undergraduate Colloquium, Colorado College, February 2010.  
Student Research Colloquium, Oberlin College, July 2009.  
Undergraduate Colloquium, Kent State University, July 2009.  
Student / Faculty Lunch, Oberlin College, March 2007.

*A Finite Calculus Approach to Ehrhart Polynomials*

Special Session on Algebra and Number Theory with Polyhedra, AMS Western  
Sectional, April 2009.

*Combinatorics and Graphical Models: investigating inference functions*

Special Session on Applications of Algebraic and Geometric Combinatorics, AMS  
Southeastern Sectional, April 2009.

*Squooching the Cube*

Student/Faculty Lunch, Oberlin College, March 2008.

*Parametric Inference for Graphical Models*

Algebraic Statistics Seminar, Ohio State University, November 2007.

*Periods of Ehrhart quasi-polynomials*

Integer points in Polyhedra, AMS-IMS-SIAM Joint Summer Research Conference,  
Snowbird, Utah, August 2006.

Special Session on Enumerative Aspects of Polytopes, AMS Western Sectional, April 2006.

*Computing the Period of an Ehrhart Quasi-polynomial*

Mini-workshop on Ehrhart Quasipolynomials, Mathematisches Forschungsinstitut Oberwolfach, August 2004.

*Various topics:*

Summer School on Computing the Continuous Discretely, August 2005.

Mathematics Undergraduate Student Association Lecture Series, University of California, Berkeley, May 2005.

Student Combinatorics Seminar, University of Michigan, November 2001, November 2002, October 2003.

Student Theoretical Computer Science Seminar, University of Michigan, October 2003.

Mathematics Awareness Day. North Carolina A&T State University. April 2000.

Special Session on Undergraduate Research, Joint Meetings, Washington DC, January 2000 (with J. DeBlois, N. Boethe, L. Powell).

Poster Presented. Poster Session on Undergraduate Research, Joint Meetings, Washington DC, January 2000.

**Conferences Attended**

*External Support Received:*

R.L. Moore Legacy Conference, Austin, TX, June 2010.

Workshop on Dedekind sums in geometry, topology, and arithmetic, Banff International Research Station for Mathematical Innovation and Discovery (BIRS), October 2009.

MAA MathFest, San Jose, August 2007.

Data Analysis in Law Enforcement and Homeland Security, DyDAn Reconnect Conference, Rutgers University, August 2007.

Inquiry-Based Learning Workshop, Orange County, California, June 2007.

R.L. Moore Legacy Conference, Austin, April 2007.

AMS-MAA Joint Meetings, New Orleans, January 2007.

MAA MathFest, Knoxville, August 2006.

Integer points in Polyhedra, AMS-IMS-SIAM Joint Summer Research Conference, Snowbird, Utah, June 2006.

Summer School on Computing the Continuous Discretely, Banff International Research Station for Mathematical Innovation and Discovery (BIRS), August 2005.

Mini-workshop on Ehrhart Quasipolynomials, Mathematisches Forschungsinstitut Oberwolfach, August 2004.

Integer points in Polyhedra, AMS-IMS-SIAM Joint Summer Research Conference, Snowbird, Utah, July 2003.

*Other:*

The Mathematics of Klee & Grünbaum, University of Washington, Seattle, July 2010.  
SIAM Conference on Discrete Mathematics, Austin, June 2010.  
AMS-MAA Joint Meetings, San Francisco, January 2010.  
Program on Combinatorics: Methods and Applications in Mathematics and Computer Science, Institute for Pure and Applied Mathematics, September – December 2009.  
Special Session on Algebra & Number Theory with Polyhedra, AMS Western Sectional, April 2009.  
Special Session on Applications of Algebraic and Geometric Combinatorics, AMS Southeastern Sectional, April 2009.  
AMS-MAA Joint Meetings, Washington, DC, January 2009.  
Special Session on the Linear Diophantine Problem of Frobenius, AMS-MAA Joint Meetings, January 2008 (Co-organizer).  
Special Session on Enumerative Aspects of Polytopes, AMS Western Sectional, April 2006.  
AMS-MAA Joint Meetings, San Antonio, January 2006.  
AMS-MAA Joint Meetings, Atlanta, January 2005.  
Workshop on Combinatorial and Discrete Geometry, MSRI, November 2003.  
Miniworkshop on Algebraic Statistics, University of California, Berkeley, January 2003.

### **Honors and Awards**

Horace H. Rackham Distinguished Dissertation Award (given to eight theses university-wide), University of Michigan, 2005.  
Sumner Myers Prize (“for the best Ph.D. dissertation in mathematics”), University of Michigan, 2004.  
Wirt and Mary Cornwell Award (“to a student who, during the four previous years, has demonstrated the greatest intellectual curiosity and has given the most promise of original study and creative work in mathematics”), University of Michigan, 2004.  
William and Ruth Archie Award (“for the student who best exemplifies the ideals of a liberal arts education”), Wake Forest University, 2000.  
The John Y. Phillips Prize in Mathematics, Wake Forest University, 2000.  
Outstanding Winner of the Mathematical Contest in Modeling, and SIAM Prize Recipient, 2000 (with D. Durand and J. Kline).  
Participated in the Rose Hulman REU program in mathematics, 1999 (under S.A. Broughton).  
Honorable Mention (Top 50) in the Putnam Mathematical Competition, 1999.