

# Curriculum Vitae

## Jonah David Blasiak

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### ADDRESS

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### CITIZENSHIP

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### WEBSITE

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### ACADEMIC POSITIONS

- 09/13 – present **Assistant Professor**, Drexel University.  
09/13 – 08/14 **Visiting Professor**, University of Southern California.  
09/10 – 08/13 **Hildebrandt Assistant Professor**, University of Michigan.  
Mentor: John Stembridge  
09/10 – 08/11 **NSF Postdoctoral Fellow**, University of Michigan.  
Sponsoring Scientist: John Stembridge  
07/09 – 08/10 **NSF Postdoctoral Fellow**, University of Chicago.  
Sponsoring Scientist: Ketan Mulmuley

### EDUCATION

- 09/04 – 05/09 **Ph.D. in Mathematics**, University of California, Berkeley.  
Advisor: Mark Haiman  
09/00 – 06/04 **A.B. in Mathematics**, Princeton University, *magna cum laude*.  
Advisor: Paul Seymour

### RESEARCH INTERESTS

Algebraic combinatorics, representation theory, and complexity theory.

### PUBLICATIONS

- (with J. Morse, A. Pun, and D. Summers) Catalan functions and  $k$ -Schur positivity. April 2018, [arXiv:1804.03701](https://arxiv.org/abs/1804.03701).
- (with R. Liu) Kronecker coefficients and noncommutative super Schur functions. *J. Combin. Theory Ser. A* **158**, (2018), 315–361.
- (with S. Fomin) Rules of Three for commutation relations. *J. Algebra* **500**, (2018), 193–220.
- (with T. Church, H. Cohn, J. A. Grochow, C. Umans) Which groups are amenable to proving exponent two for matrix multiplication?. December 2017, [arXiv:1712.02302](https://arxiv.org/abs/1712.02302).
- (with T. Church, H. Cohn, J. A. Grochow, E. Naslund, W. F. Sawin, C. Umans) On cap sets and the group-theoretic approach to matrix multiplication. *Disc. Analysis*, no. 3 (2017).
- (with S. Fomin) Noncommutative Schur functions, switchboards, and Schur positivity. *Selecta Math. (N.S.)* **23**, no. 1 (2017), 727–766.
- Haglund’s conjecture on 3-column Macdonald polynomials. *Math. Z.* **283**, (2016), 601–628.
- What makes a  $D_0$  graph Schur positive? *J. Algebraic Combin.* **44**, no. 3 (2016), 677–727.

(with R. Liu and K. Mészáros) Subalgebras of the Fomin-Kirillov algebra. *J. Algebraic Combin.* **44**, no. 3 (2016), 785–829.

Kronecker coefficients for one hook shape. *Sém. Lothar. Combin.* **77**, (2016), 40 pp.

(with K. Mulmuley and M. Sohoni) Geometric complexity theory IV: nonstandard quantum group for the Kronecker problem. *Mem. Amer. Math. Soc.* **235**, no. 1109 (2015).

Representation theory of the nonstandard Hecke algebra. *Algebr. Represent. Theory* **18**, no. 3 (2015), 585–612.

Nonstandard braid relations and Chebyshev polynomials. *J. Algebra* **423**, (2015), 375–404.

Quantum SchurWeyl duality and projected canonical bases. *J. Algebra* **402**, (2014), 499–532.

An insertion algorithm for catabolizability, *European J. Combin.* **33**, no. 2 (2012), 267–276.

Cyclage, catabolism, and the affine Hecke algebra, *Adv. Math.* **228**, no. 4 (2011), 2292–2351.

$W$ -graph versions of tensoring with the  $S_n$  defining representation, *J. Algebraic Combin.* **34**, no. 4 (2011), 545–585.

The toric ideal of a graphic matroid is generated by quadrics, *Combinatorica* **28**, no. 3 (2008), 283–297.

(with A. Berglund and P. Hersh) Combinatorics of multigraded Poincaré series for monomial rings, *J. Algebra.* **308**, no. 1 (2007), 73–90.

A special case of Hadwiger’s conjecture, *J. Combin. Theory Ser. B* **97**, no. 6 (2007), 1056–1073.

(with R. Durrett) Random Oxford graphs, *Stochastic Process. Appl.* **115**, no. 8 (2005), 1257–1278.

## AWARDS & HONORS

2016 – 2019 NSF Grant DMS-1600391: Tools for Positivity in Algebraic Combinatorics

2012 – 2015 NSF Grant DMS-1161280: Quantizing Schur Functors

2009 – 2011 Mathematical Sciences Postdoctoral Research Fellowship

2009 Clay Mathematics Institute Liftoff Fellow

2009 AIM Fellowship Finalist

2005 – 2008 National Science Foundation Graduate Research Fellowship

2004 Middleton Miller ’29 prize for outstanding senior thesis work

2001 Shapiro Prize for Academic Excellence

## TEACHING EXPERIENCE

2018 Winter Graduate algebra (Drexel U., Math 533)

2017 Fall Combinatorics (Drexel U., Math 222)

2016 Fall Graduate algebra (Drexel U., Math 533)

2016 Winter Discrete math (Drexel U., Math 221)

2015 Winter Linear algebra (Drexel U., Math 201)

2013 Spring Linear algebra (U. Michigan, Math 217)

2012 Fall Combinatorics and graph theory (U. Michigan, Math 565)

2012 Spring Combinatorial theory (U. Michigan, Math 566)

2005 Spring Graduate student instructor for linear algebra (UC Berkeley, Math 54)

2004 Fall Graduate student instructor for calculus (UC Berkeley, Math 1B)

2004 Summer Junior staff member at Hampshire College Summer Studies in Mathematics

## SELECTED TALKS

- 2018 Apr. **Northeastern University** Spring Eastern AMS Sectional Meeting (invited)  
 Apr. **Vanderbilt University** Spring Southeastern AMS Sectional Meeting (invited)  
*Catalan functions and  $k$ -Schur positivity.*
- 2017 June **CRM Workshop on Equivariant Combinatorics** (invited)  
*Catalan Hall-Littlewood polynomials and  $k$ -Schur functions.*
- 2016 Sep. **Bowdoin College** Fall Eastern AMS Sectional Meeting (invited)  
*Kronecker coefficients and noncommutative super Schur functions.*
- May **Drexel University** Analysis Seminar (invited)  
*The Rule of Three for commutation relations.*
- 2015 Oct. **University of Michigan** Algebra, Geometry, and Combinatorics Day (invited)  
*Noncommutative Schur functions.*
- 2014 Oct. **Penn/Drexel** Combinatorics and Algebraic Geometry Seminar  
*Generalized Knuth equivalence for Macdonald polynomials.*
- Sep. **Simons Institute at Berkeley** Workshop on Geometric Complexity Theory (invited)  
*Generalized Knuth equivalence for Schur positivity.*
- 2013 Nov. **University of California, Los Angeles** Combinatorics Seminar (invited)  
*Generalized Knuth equivalence for Macdonald polynomials.*
- Nov. **University of Southern California** Colloquium (invited)  
 Feb. **Arizona State University** Colloquium (invited)  
 Feb. **Michigan State University** Colloquium (invited)  
 Feb. **Drexel University** Colloquium (invited)  
 Jan. **IUPUI** Colloquium (invited)  
 Jan. **Ohio State University** Colloquium (invited)  
 Jan. **University of Wisconsin-Madison** Colloquium (invited)  
*Positivity, complexity, and the Kronecker problem.*
- 2012 Sep. **Duke University** Seminar Talk  
 Sep. **North Carolina State University** Algebra and Combinatorics Seminar  
 Sep. **University of Michigan** Combinatorics Seminar  
*Kronecker coefficients for one hook shape.*
- Mar. **George Washington University** Spring Eastern AMS Sectional Meeting (invited)  
*Combinatorics of crystal bases for the Kronecker problem.*
- Feb. **Berkeley** Representation Theory, Geometry & Combinatorics Seminar (invited)  
*A crystal basis for two-row Kronecker coefficients.*
- 2011 Dec. **Toronto** Algebraic Combinatorics session, CMS Winter Meeting (invited)  
 Nov. **University of Oregon** Algebra Seminar  
 Apr. **Dartmouth** Combinatorics Seminar  
 Apr. **Fields Institute** Southern Ontario Groups and Geometry Meeting (invited)  
*A crystal basis for two-row Kronecker coefficients.*
- 2010 Oct. **University of Michigan** Combinatorics Seminar  
 Oct. **University of Minnesota** Combinatorics Seminar (invited)  
*Nonstandard Hecke algebra for the Kronecker problem.*

- Aug. **SFSU** Formal Power Series & Algebraic Combinatorics (invited)  
*Canonical bases for Garsia-Procesi modules.*
- July **Fields Institute** Affine Schubert Calculus Workshop (invited)  
*Canonical bases for  $k$ -atoms.*
- May **UIUC** Algebra, Geometry and Combinatorics Seminar (invited)
- Feb. **Texas A&M** Algebra and Combinatorics Seminar (invited)  
*Nonstandard Hecke algebra for the Kronecker problem.*
- 2008 Dec. **MIT** Combinatorics Seminar (invited)
- Nov. **UC Davis** Discrete Mathematics & Representation Theory (invited)
- Sep. **Berkeley** Representation Theory, Geometry & Combinatorics Seminar
- June **Berkeley** Workshop on Representation Theory, Geometry and Combinatorics  
*Cyclage, catabolism, and the affine Hecke algebra.*
- May **Vanderbilt University** 21st Cumberland Conference on Graph Theory, Combinatorics, and Computing (invited)  
*A special case of Hadwiger's conjecture.*
- 2007 Dec. **Berkeley** Mini-Conference for Peter Teichner's course on super symmetric field theories and generalized cohomology  
*Classification of super Lie algebras.*
- 2005 Oct. **Berkeley** Combinatorics Seminar  
**Texas A&M** Combinatorics Seminar (invited)  
*The toric ideal of a graphic matroid is generated by quadrics.*
- Mar. **Berkeley** Commutative Algebra and Algebraic Geometry Seminar  
*The Berglund complex and multigraded Poincaré series.*

## PROGRAMMING EXPERIENCE

Good knowledge of Magma. Some knowledge of C++, Matlab, and Maple.

## MATHEMATICAL ACTIVITIES

- 2014 November AIM workshop on combinatorics and complexity of Kronecker coefficients.
- 2014 September Simons Institute workshop on Geometric Complexity Theory.
- 2011 August ICERM conference on Mathematical Aspects of **P** vs. **NP** and its Variants.
- 2010 July Geometric complexity theory workshop at Princeton.
- 2007 May CRM workshop on algebraic geometry and algebraic combinatorics.
- 2003 Fall Budapest Semesters in Mathematics.
- 2003 Summer Cornell University REU program (Supervisor: Rick Durrett).
- 2002 Summer East Tennessee State University REU program (Supervisor: Anant Godbole).

## STUDENTS

- 2016 – present Anna Pun (postdoc)
- 2016 – present Daniel Summers (graduate student)
- 2013 Benjamin Branman (undergraduate)
- 2012 Feng Wei (applied math Master's student)
- 2011 – 2012 Zeyin Zhang (undergraduate)