

## Darij Grinberg

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*Web:*

<http://www.cip.ifi.lmu.de/~grinberg/> (research)

<http://www-users.math.umn.edu/~dgrinber/> (teaching)

### Field of research

algebraic combinatorics / Hopf algebras / Young tableaux / combinatorial representation theory / noncommutative algebra / invariant theory

### Education and affiliations

**2016–** Dunham Jackson Assistant Professor at [University of Minnesota](#), working with Victor Reiner.

**2016, June 3** Ph.D. in Mathematics at [Massachusetts Institute of Technology](#), advised by Alexander Postnikov. ([Thesis](#)<sup>1</sup>.)

**2011–2016** Graduate student at [Massachusetts Institute of Technology](#).

**2011, July 1** Diploma (rough equivalent to M.S.) in Mathematics at the [Ludwig-Maximilians-Universität München](#) (Munich), with a minor in Computer Science. ([Thesis](#); comprehensive grade “very good”).

**2006–2011** Undergraduate at the [Ludwig-Maximilians-Universität München](#) (Munich).

### Publications and preprints (peer-reviewed marked with #)

**2018** *Shuffle-compatible permutation statistics II: the exterior peak set*, arXiv:1806.04114, submitted.

**2018** *The  $n$  body matrix and its determinant*, joint with Peter J. Olver, arXiv:1802.02900, submitted.

**2017** *Noncommutative Abel-like identities*, in progress.

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<sup>1</sup>Thesis committee: Alexander Postnikov, Pavel Etingof, Ira Gessel.

All material in this thesis also appears in the preprints and papers listed below.

- 2017** *On binomial coefficients modulo squares of primes*, arXiv:1712.02095, submitted.
- 2017** *Critical groups for Hopf algebra modules*, joint with Jia Huang, Victor Reiner, arXiv:1704.03778, submitted.
- 2017** *t-unique reductions for Mészáros's subdivision algebra*, arXiv:1704.00839, submitted.
- 2016** *From Chio Pivotal Condensation to the Matrix-Tree theorem*, joint with Karthik Karnik, Anya Zhang, arXiv:1606.08193 (report of student research).
- 2016** *A note on non-broken-circuit sets and the chromatic polynomial*, arXiv:1604.03063.
- 2016** *The Bernstein homomorphism via Aguiar-Bergeron-Sottile universality*, arXiv:1604.02969.
- # **2016** *Proof of a conjecture of Bergeron, Ceballos and Labbé*, joint with Alexander Postnikov, arXiv:1603.03138, *New York Journal of Mathematics* **23** (2017), pp. 1581–1610.
- # **2015** *Double posets and the antipode of  $QSym$* , arXiv:1509.08355, published in the *Electronic Journal of Combinatorics* (2016).
- # **2015** *Refined dual stable Grothendieck polynomials and generalized Bender-Knuth involutions*, joint with Pavel Galashin and Gaku Liu, arXiv:1509.03803, published in the *Electronic Journal of Combinatorics* (2016).
- 2015** *The signed random-to-top operator on tensor space (draft)*, arXiv:1505.01201.
- # **2014** *Dual immaculate creation operators and a dendriform algebra structure on the quasisymmetric functions*, arXiv:1410.0079, *Canadian Journal of Mathematics* **69** (2017), pp. 21–53.
- 2014** *Hopf Algebras in Combinatorics*, joint with Victor Reiner, arXiv:1409.8356 (extended lecture notes).
- # **2014** *Iterative properties of birational rowmotion*, joint with Tom Roby, arXiv:1402.6178. This has been split in two parts and submitted to the *Electronic Journal of Combinatorics*; the first part has been published in 2016, whereas the second has been published in 2015.
- # **2013** *Boolean Witt vectors and an integral Edrei-Thoma theorem*, joint with James Borger, arXiv:1311.5031, *Selecta Mathematica*, 22(2), pp. 595–629 (doi:10.1007/s00029-015-0198-6).

**2011** *Poincaré-Birkhoff-Witt type results for inclusions of Lie algebras*, diploma thesis (link to updated version) under supervision of Andreas Rosen-schon and guidance by Damien Calaque and Giovanni Felder. The thesis has not been submitted to a journal but has already been cited twice.

**2011** *Zeckendorf family identities generalized*, arXiv:1103.4507.

**2007–2012** Various [problems and solutions](#) submitted to mathematical magazines.

# **2002–2004** Four publications in *Forum Geometricorum* on elementary geometry: *The Apollonius Circle as a Tucker Circle* (2002), joint with Paul Yiu; *On the Kosnita point and the reflection triangle* (2003); *Orthopoles and the Pappus Theorem* (2004), joint with Atul Dixit; *A Generalization of the Kiepert Hyperbola* (2004), joint with Alexei Myakishev; and problem 11025 proposed in the *American Mathematical Monthly* (joint with Floor van Lamoen).

### Conference proceedings (peer-reviewed marked with #)

# **2018** Erik Aas, Darij Grinberg, Travis Scrimshaw, *Multiline queues with spectral parameters (extended abstract)*, accepted as a talk for FPSAC 2018.

# **2017** Darij Grinberg, *Double Posets and the Antipode of QSym (extended abstract)*, Séminaire Lotharingien de Combinatoire, 78B.33 (2017), 12 pp. (FPSAC 2017).

# **2014** Darij Grinberg, Tom Roby, *The order of birational rowmotion (extended abstract)*, DMTCS Proceedings vol. AT, 26th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2014), pp. 753–764.

### Teaching

**2018** lecturer at UMN in [Math 4707 \(Combinatorics\)](#).

**2017** lecturer at UMN in [Math 4990 and Math 4707 \(two combinatorics classes\)](#).

**2017** lecturer at UMN in [Math 5707 \(Graph Theory\)](#).

**2016** lecturer at UMN in [Math 4242 \(Applied Linear Algebra\)](#).

- 2012–2015** mentor in [the MIT’s PRIMES program](#), supervising [two projects](#) (2012, 2013) by William Kuszmaul and [one](#) (2014) by Eric Neyman, as well as a reading course by two new students (2015). In 2015, I was sponsored by a [George Lusztig PRIMES mentorship](#).
- 2015** teaching assistant at MIT in 18.781 (Theory of Numbers) by Ju-Lee Kim.
- 2014** teaching assistant and recitation leader at MIT in 18.06 (Linear Algebra) by Alexander Postnikov.
- 2013** teaching assistant at MIT in 18.310A (Principles of Discrete Applied Mathematics) by Neil Olver, and in 18.S996 (Category Theory for Scientists) by David Spivak.
- 2009** teaching assistant and recitation leader at LMU Munich in a Euclidean geometry class by Rudolf Fritsch.
- 2007** teaching assistant and recitation leader at LMU Munich in an Abstract Algebra I class by Hans-Jürgen Schneider.

### Selected talks

- 2018** at [University of Minnesota Student Combinatorics Seminar, Minneapolis](#) (expository talk).
- 2018** at [University of Washington, Seattle](#) and at [University of Illinois Urbana-Champaign](#) (slightly streamlined version of above talk); also, expository pre-talk for the latter talk.
- 2017** at [University of Wisconsin, Madison](#).
- 2017** at [Combinatorial Algebra meets Algebraic Combinatorics, UQAM, Montréal](#), and at [Cornell](#) (slightly extended version of Montréal talk).
- 2016** at [AMS Sectional Meeting, University of St. Thomas, Minneapolis](#).
- 2016** at the [Combinatorics Seminar at Brandeis](#) and at [Massachusetts Institute of Technology](#) (thesis defense).
- 2015** at [University of Minnesota Combinatorics Seminar, Minneapolis](#) and at [AMS Sectional Meeting, Chicago](#).
- 2014** at [The Applied Algebra Seminar, York University, Toronto](#).
- 2014** at [Arbeitsgemeinschaft Diskrete Mathematik, Vienna](#).
- 2013** at [University of Connecticut](#) (expository talk).

## Various contributions

- 2018** Organizing committee: [SageDays@ICERM](#), July 2018.
- 2012–** [Programming and code review](#) for the [SageMath project](#).
- 2010–** Member of [MathOverflow](#) and [math.stackexchange](#), contributing over 400 answers.
- 2005–** Mathematical exposition at various levels (mostly undergraduate) on [website](#).

## Awards and Honors

- 2015** [George Lusztig PRIMES mentorship](#) for “exceptional mentor service in past years”.
- 2008** first place in the 15th [Vojtěch Jarník Annual International Mathematical Competition](#) (a contest for university students).
- 2006–2011** scholarship from the [Studienstiftung des Deutschen Volkes](#).
- 2006** gold medal in the [International Mathematical Olympiad](#).
- 2004–2005** silver medals in the International Mathematical Olympiad.
- 2003–2006** Bundessieger (national-level award) in the [Bundeswettbewerb Mathematik Deutschland](#) (German national mathematical olympiad).