

Sam Hopkins

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Academic appointments

Howard University

Assistant Professor

Washington, DC

August 2021-

University of Minnesota

NSF Postdoctoral Fellow; Mentor: Prof. Victor Reiner

Minneapolis, MN

September 2018-May 2021

Education

Massachusetts Institute of Technology

PhD in Mathematics; Advisor: Prof. Alexander Postnikov

Cambridge, MA

June 2018

Reed College

B.A. in Mathematics

Portland, OR

January 2013

Academic interests

I study algebraic combinatorics. I have a particular interest in dynamical algebraic combinatorics.

Research papers (ordered by when they appeared as preprints on the arXiv)

“Homomesy via toggleability statistics,” with Colin Defant, Svetlana Poznanović, and James Propp.
Preprint, 2021, [arXiv:2108.13227](https://arxiv.org/abs/2108.13227). Submitted.

“On the q-enumeration of barely set-valued tableaux and plane partitions,” with Alexander Lazar and Svante Linusson. Preprint, 2021, [arXiv:2106.07418](https://arxiv.org/abs/2106.07418). Submitted.

“Symmetry of Narayana numbers,” with Colin Defant. *Forum of Mathematics, Sigma*, 9, 2021.

“The birational Lanne-Kreweras involution,” with Michael Joseph. Preprint, 2020, [arXiv:2012.15795](https://arxiv.org/abs/2012.15795). Submitted.

“Plane partitions of shifted double staircase shape,” with Tri Lai. *Journal of Combinatorial Theory, Series A*, 183, 2021.

“Order polynomial product formulas and poset dynamics.” Preprint, 2020. [arXiv:2006.01568](https://arxiv.org/abs/2006.01568). For the AMS volume on Open Problems in Algebraic Combinatorics, to accompany the 2021 conference at the University of Minnesota.

“Promotion of Kreweras words,” with Martin Rubey. *Selecta Mathematica (N.S.)*, 28(1), 2022.

“Cyclic sieving for plane partitions and symmetry.” *SIGMA Symmetry Integrability Geom. Methods Appl.*, 16, 2020.

“Minuscule doppelgängers, the coincidental down-degree expectations property, and rowmotion.” Preprint, 2019. [arXiv:1902.07301](https://arxiv.org/abs/1902.07301). To appear in *Experimental Mathematics*.

“The CDE property for skew vexillary permutations.” *Journal of Combinatorial Theory, Series A*, 168, 2019.

“A positive formula for the Ehrhart-like polynomials from root system chip-firing,” with Alexander Postnikov. *Algebraic Combinatorics*, 2(6), 2019.

“Root system chip-firing II: Central-firing,” with Pavel Galashin, Thomas McConville, and Alexander Postnikov. *International Mathematics Research Notices*, 2021, no. 13.

- “Root system chip-firing I: Interval-firing,” with Pavel Galashin, Thomas McConville, and Alexander Postnikov. *Mathematische Zeitschrift*, 292(3-4), 2019.
- “Sorting via chip-firing,” with Thomas McConville and James Propp. *Electronic Journal of Combinatorics*, 24(3), 2017.
- “The CDE property for minuscule lattices.” *Journal of Combinatorial Theory, Series A*, 152, 2017.
- “Quantum integer-valued polynomials,” with Nate Harman. *Journal of Algebraic Combinatorics*, 45(2), 2017.
- “Fourorientation activities and the Tutte polynomial,” with Spencer Backman and Lorenzo Traldi. *European Journal of Combinatorics*, 67, 2018.
- “The expected jaggedness of order ideals,” with Melody Chan, Shahrzad Haddadan, and Luca Moci. *Forum of Mathematics, Sigma*, 5, 2017.
- “Parking functions and tree inversions revisited,” with Petar Gaydarov. *Advances in Applied Mathematics*, 80, 2016.
- “Fourorientations and the Tutte polynomial,” with Spencer Backman. *Research in the Mathematical Sciences*, 4, 2017.
- “A note on statistical averages for oscillating tableaux,” with Ingrid Zhang. *Electronic Journal of Combinatorics*, 22(2), 2015.
- “Interlacing networks: birational RSK, the octahedron recurrence, and Schur function identities,” with Miriam Farber and Wuttisak Trongsiriwat. *Journal of Combinatorial Theory, Series A*, 133, 2015.
- “Another proof of Wilmes’ conjecture.” *Discrete Mathematics*, 323, 2014.
- “Bigraphical arrangements,” with David Perkinson. *Transactions of the American Mathematical Society*, 368(1), 2016.
- “Pattern avoidance in poset permutations,” with Morgan Weiler. *Order*, 33(2), 2016.
- “Orientations, semiorders, arrangements, and parking functions,” with David Perkinson. *Electronic Journal of Combinatorics*, 19(4), 2012.

Teaching & mentorship experience

Teaching at Howard University:

- Math 274 (Graduate combinatorics II), Spring 2022.
- Math 273 (Graduate combinatorics I), Fall 2021.

Teaching at the University of Minnesota (UMN):

- Math 4707 (Combinatorics and graph theory), Spring 2021 and Spring 2020.
- Math 4990, UMTYMP (University of Minnesota Talented Youth Mathematics Program) Advanced Topics Course on Combinatorics, Fall 2020.
- Math 8668 (Graduate combinatorics I), Fall 2019.

Teaching assistant experience at the Massachusetts Institute of Technology (MIT):

- 18.03 (Diff. Eq.), Spring 2018; 18.05 (Prob. & Stats), Spring 2017; 18.06 (Lin. Alg.), Spring 2016.

Other mentorship experience:

- Faculty, BEAM Discovery Los Angeles, Summer 2020 and Summer 2021.
- Faculty, Bridge to Enter Advanced Mathematics (BEAM) Saturday school program, 2020–2021.
- Mentor for the Research Experiences for Undergraduates (REU) program at UMN, Summer 2019.
- Mentor for two students (Ingrid Zhang and Petar Gaydarov) in the Research Science Institute (RSI) program for research for high-schoolers at MIT, Summer 2014.

Awards & honors

NSF Mathematical Sciences Postdoctoral Research Fellowship, January 2018.

National Science Foundation (NSF) Graduate Research Fellowship, April 2015.

Phi Kappa Beta, May 2013.

High honors, Budapest Semesters in Mathematics, December 2011.

Commendation for excellence in scholarship, Reed College, May 2010 and May 2011.

Selected presentations & conferences, workshops, et cetera attended

George Washington University Combinatorics and Algebra Seminar, January 2022. “Enumeration of barely set-valued tableaux and plane partitions.”

St. Petersburg Seminar on Representation Theory and Dynamical Systems, December 2021. “Groups generated by involutions acting on combinatorial objects.”

BIRS – University of British Columbia, Okanagan (UBCO) hybrid workshop on Dynamical Algebraic Combinatorics, online & in Kelowna, Canada, November 2021. “Promotion, webs, and plabic graphs.”

Howard University Mathematics Colloquium, September 2021. “(Piecewise-linear and birational) involutions on Dyck paths.”

Session on Enumerative Combinatorics, Canadian Mathematical Society (CMS) Winter Meeting, December 2020. “Promotion of Kreweras words.”

BIRS online workshop on Dynamical Algebraic Combinatorics, Banff, Canada, October 2020. “Symmetry of Narayana numbers and rowvacuation of root posets.”

University of Minnesota Combinatorics Seminar, September 2020. “Order polynomial product formulas and poset dynamics.”

JMM, San Diego, CA, January 2020. AMS Special Session on Combinatorial Structures and Integrable Systems. “Cyclic sieving for plane partitions and symmetry.”

FPSAC, Ljubljana, Slovenia, July 2019. “The CDE property for skew vexillary permutations” (poster).

AMS Spring Central and Western Sectional Special Session on Dynamical Systems and Algebraic Combinatorics, Honolulu, HI, March 2019. “The coincidental down-degree expectations (CDE) property and dynamical algebraic combinatorics.”

BIRS workshop on Asymptotic Algebraic Combinatorics, Banff, Canada, March 2019, participant.

FPSAC, Hanover, NH, July 2018. “Root system chip-firing,” with Pavel Galashin, Thomas McConville, and Alexander Postnikov.

Brandeis Combinatorics Seminar, March 2018. “Ehrhart polynomial of a polytope plus dilating zonotope.”

JMM, San Diego, CA, January 2018. AMS Special Session on Dynamical Algebraic Combinatorics. “The coincidental down-degree expectations (CDE) property for posets and homomesy.”

MSRI Geometrical and Topological Combinatorics Program, Berkeley, CA, Fall 2017, Program Associate under Alexander Postnikov.

AMS Fall Central Sectional Special Session on Geometric Combinatorics and Combinatorial Commutative Algebra, Denton, TX, September 2017. “Root system chip-firing,” with Pavel Galashin, Thomas McConville, and Alexander Postnikov.

FPSAC, London, England, July 2017. “Sorting via chip-firing,” with Thomas McConville and James Propp (poster).

Centre de Recherches Mathématiques (CRM) school and workshop on Algebraic and Geometric Combinatorics of Reflection Groups, Montréal, Canada, June 2017, participant.

AMS Fall Central Sectional Special Session on Chip-Firing and Divisors on Graphs and Complexes, Minneapolis, MN, October 2016. “Sorting via chip-firing,” with Thomas McConville and James Propp.

AMS Fall Eastern Sectional Special Session on Algebraic and Enumerative Combinatorics, Brunswick, ME, September 2016. “The coincidental down-degree expectations (CDE) property for posets.”

Mathematical Research Sciences Institute (MSRI) Summer Graduate School on chip-firing and tropical curves, Berkeley, CA, July 2016, participant.

FPSAC, Vancouver, Canada, July 2016. “Fourientation activities and the Tutte polynomial: Extended abstract,” with Spencer Backman and Lorenzo Traldi (poster).

Joint Mathematics Meetings (JMM), Seattle, WA, January 2016. American Mathematical Society (AMS) Special Session on Algebraic and Topological Methods in Combinatorics. “The expected jaggedness of order ideals,” with Melody Chan, Shahrzad Haddadan, and Luca Moci.

Banff International Research Station (BIRS) – Casa Matemática Oaxaca (CMO) workshop on sandpile groups, Oaxaca, Mexico, November 2015. I took notes for this workshop; the notes are on my website.

Cornell Probability Seminar, September 2015. “Fourientations and the Tutte polynomial.”

Workshop on New Directions for the Tutte Polynomial, Royal Holloway University of London, England, July 2015. “Fourientations and the Tutte polynomial,” with Spencer Backman (poster).

AIM workshop on dynamical algebraic combinatorics, San Jose, CA, March 2015. I took notes for this workshop; the notes are on my website.

Formal Power Series and Algebraic Combinatorics (FPSAC), Chicago, IL, July 2014. “Bigraphical arrangements,” with David Perkinson.

MIT Pure Mathematics Grad Student Seminar (PuMaGraSS) talks: “Riemann-Roch for graphs,” 2014; “Combinatorial Reciprocity Theorems,” 2015; “The Cyclic Sieving Phenomenon,” 2018.

American Institute of Mathematics (AIM) workshop on generalizations of chip-firing and the critical group, Palo Alto, CA, July 2013. I took notes for this workshop; the notes are on my website.

Permutation Patterns Conference, Paris, France, July 2013. “Pattern Avoidance in Poset Permutations,” with Morgan Weiler.

Professional activities

Referee for: *Advances in Applied Mathematics*; *Algebraic Combinatorics*; the *Annals of Combinatorics*; the *Australasian Journal of Combinatorics*; *Combinatorial Theory*; the CRC Monographs and Research Notes in Mathematics; *Discrete & Computational Geometry*; *Discrete Mathematics*; the *Electronic Journal of Combinatorics*; the *European Journal of Combinatorics*; *Forum of Mathematics, Sigma*; the *Journal of Algebraic Combinatorics*; the *Journal of Combinatorial Theory: Series A*; the *Journal of Combinatorics*; *Mathematische Zeitschrift*; the *Proceedings of the American Mathematics Society*; *Selecta Mathematica*; Springer Books; *SIGMA (Symmetry, Integrability and Geometry: Methods and Applications)*.

Reviewer for Mathematical Reviews/MathSciNet.

Active user on MathOverflow.

Website administrator for the UMN Open Problems in Algebraic Combinatorics 2022 conference.

Co-moderator for the Open Problems in Algebraic Combinatorics blog (realopacblog.wordpress.com).

Co-organizer of the University of Minnesota combinatorics seminar, academic year 2018-2019.

Organizer of the MIT Math Department Retreat, 2015.

Co-organizer of the Pure Math Grad Student Seminar (PuMaGraSS) at MIT, academic year 2014–2015.