

# Curriculum Vitae

## KAROLA MÉSZÁROS

Work Address: Department of Mathematics  
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### Employment

2014 – **Assistant Professor of Mathematics**, Cornell University.  
2012 – 2014 **H.C.Wang Assistant Professor**, Department of Mathematics, Cornell University.  
2011 – 2012 **NSF Fellow**, Department of Mathematics, University of Michigan, Ann Arbor.  
2010 – 2011 **Lecturer**, Department of Mathematics, MIT.

### Education

2005 – 2010 **Ph. D. in Mathematics**, Massachusetts Institute of Technology.  
Thesis: *Root polytopes, triangulations, and subdivision algebras*,  
advised by Richard P. Stanley

2001 – 2005 **B.S. in Mathematics**, Massachusetts Institute of Technology.

### Grants and Fellowships

2019 – 2024 CAREER National Science Foundation Grant, [DMS-1847284](#)  
2018 – 2019 von Neumann Fellowship at the Institute for Advanced Study  
2015 – 2019 National Science Foundation Grant [DMS-1501059](#)  
2011 – 2014 National Science Foundation Postdoctoral Research Fellowship  
2009 – 2010 MIT Department of Mathematics Graduate Student Appreciation Fellowship

### Honors

2016 Jan. Invitée Paris 7, Invited Scholar at Université Paris 7 Diderot.

### Research Interests

Algebraic combinatorics, discrete geometry.

### Publications and Preprints

- preprints
1. Alex Fink, Karola Mészáros and Avery St. Dizier, *Zero-one Schubert polynomials*. [arXiv:1903.10332](#)
  2. Ricky I. Liu, Karola Mészáros and Avery St. Dizier, *Schubert polynomials as projections of Minkowski sums of Gelfand-Tsetlin polytopes*. [arXiv:1903.05548](#)
  3. Ricky I. Liu, Karola Mészáros and Avery St. Dizier, *Gelfand-Tsetlin polytopes: a story of flow and order polytopes*. [arXiv:1903.08275](#)
  4. Samuel C. Gutekunst, Karola Mészáros and T. Kyle Petersen, *Root cones and the resonance arrangement*. [arXiv:1903.06595](#)
  5. Karola Mészáros and Avery St. Dizier, *From generalized permutahedra to Grothendieck polynomials via flow polytopes*. [arXiv:1705.02418](#)
- 2019
6. Karola Mészáros and Alejandro H. Morales, *Volumes and Ehrhart polynomials of flow polytopes*. Math. Z. accepted.
  7. Karola Mészáros, Alejandro H. Morales and Jessica Striker, *On flow polytopes, order polytopes, and a certain face of the alternating sign matrix polytope*. Discrete Comput. Geom. accepted.

8. Sylvie Corteel, Jang Soo Kim and Karola Mészáros, *Volumes of generalized Chan-Robbins-Yuen polytopes*. Discrete Comput. Geom. accepted.
9. Karola Mészáros, Connor Simpson and Zoe Wellner, *Flow polytopes of partitions*. Electron. J. Combin. accepted.
- 2018 10. Alex Fink, Karola Mészáros and Avery St. Dizier, *Schubert polynomials as integer point transforms of generalized permutahedra*. Adv. Math. 332 (2018), 465–475.
11. Ricky I. Liu, Karola Mészáros and Alejandro H. Morales, *Flow polytopes and the space of diagonal harmonics*. Canadian Journal of Mathematics, accepted. [arXiv:1610.08370](https://arxiv.org/abs/1610.08370)
12. Laura Escobar and Karola Mészáros, *Subword complexes via triangulations of root polytopes*. Algebr. Comb. 1 (2018), no. 3, 395–414.
- 2017 13. Sylvie Corteel, Jang Soo Kim and Karola Mészáros, *Flow polytopes with Catalan volumes*. C. R. Math. Acad. Sci. Paris 355 (2017), no. 3, 248–259.
14. Patricia Hersh and Karola Mészáros, *SB-labelings and posets with each interval homotopy equivalent to a sphere or a ball*. J. Combin. Theory Ser. A, (2017), 152, 104–120.
15. Karola Mészáros, Alejandro H. Morales and Brendon Rhoades, *The polytope of Tesler matrices*. Selecta Mathematica, 23 (2017), no. 1, 425–454.
16. Karola Mészáros, *Calculating Greene’s function via root polytopes and subdivision algebras*. Pacific J. Math., 286 (2017), no. 2, 385–400.
- 2016 17. Laura Escobar and Karola Mészáros, *Toric matrix Schubert varieties and their polytopes*. Proc. Amer. Math. Soc., 144 (2016), no. 12, 5081–5096.
18. Karola Mészáros, *Pipe dream complexes and triangulations of root polytopes belong together*. SIAM J. Disc. Math., 30 (2016), no. 1, 100–111.
19. Karola Mészáros,  *$h$ -Polynomials of Reduction Trees*. SIAM J. Disc. Math., 30 (2016), no. 2, 736–762.
20. Jonah Blasiak, Ricky I. Liu and Karola Mészáros, *Subalgebras of the Fomin-Kirillov algebra*, Journal of Algebraic Combinatorics, 44 (2016), no. 3, 785–829.
- 2015 21. Karola Mészáros and Alejandro H. Morales, *Flow polytopes of signed graphs and the Kostant partition function*. Int. Math. Res. Notices (2015) no. 3: 830–871.
22. Louis J. Billera, Lionel Levine and Karola Mészáros, *How to decompose a permutation into a pair of labeled Dyck paths by playing a game*. Proc. Amer. Math. Soc. 143 (2015), no. 5, 1865–1873.
23. Karola Mészáros, *Product formulas for volumes of flow polytopes*. Proc. Amer. Math. Soc. 143 (2015), no. 3, 937–954.
24. Karola Mészáros,  *$h$ -Polynomials via Reduced Forms*. Electron. J. Combin. 21. 22(4) (2015), #P4.18
- 2014 25. Karola Mészáros, Greta Panova and Alexander Postnikov, *Schur times Schubert via the Fomin-Kirillov algebra*. Electron. J. Combin. 21 (2014), no. 1, Paper 1.39, 22 pp.
26. Jang Soo Kim, Karola Mészáros, Greta Panova and David B. Wilson, *Dyck tilings, increasing trees, descents, and inversions*. J. Combin. Theory Ser. A 122 (2014), 927.
- 2013 27. Karola Mészáros and Alexander Postnikov, *Branched polymers and hyperplane arrangements*. Discrete Comput. Geom. 50, Issue 1 (2013), Page 22-38.
28. Karola Mészáros, *Labeling the regions of the type  $C_n$  Shi arrangement*, Electron. J. Combin. 20, Issue 2 (2013), P31.

- 2012 29. Karola Mészáros, *Demystifying a divisibility property of the Kostant partition function*. Pacific J. Math. 260-1 (2012) 215-225.
- 2011 30. Karola Mészáros, *Root polytopes, triangulations, and the subdivision algebra, II*. Trans. Amer. Math. Soc. **363**: # 11, 6111–6141, 2011.
31. Karola Mészáros, *Root polytopes, triangulations, and the subdivision algebra, I*. Trans. Amer. Math. Soc. **363**: # 8, 4359–4382, 2011.
- 2008 32. Alexander Holroyd, Lionel Levine, Karola Mészáros, Yuval Peres, James Propp, and David Wilson, *Chip-firing and rotor-routing on finite digraphs*. In and out of Equilibrium II, “Progress in Probability,” Birkhäuser (2008), 331-364.
33. Karola Mészáros, *On low degree  $k$ -ordered graphs*. Discrete Math. 308, Issue 12 (2008), 2418-2426.
34. Karola Mészáros, *On 3-regular 4-ordered graphs*. Discrete Math. 308, Issue 11 (2008), 2149-2155.
35. Karola Mészáros, *Latin squares and their defining sets*. Discrete Math. 308, Issue 12 (2008), 2366-2378.
- 2007 36. Karola Mészáros, *On the number of genus one labeled circle trees*, Electron. J. Combin. 14 (2007), #R68.

### Teaching

- 2018 Spring MATH 6410: Enumerative Combinatorics, Cornell graduate course
- 2017 Spring MATH 2310: Linear Algebra with Applications, Cornell undergraduate course
- 2016 Spring MATH 6410: Enumerative Combinatorics, Cornell graduate course
- 2015 Fall MATH 4410: Introduction to Combinatorics I, Cornell undergraduate course
- 2015 Spring MATH 4550: Applicable Geometry, Cornell undergraduate course
- 2014 Fall MATH 4410: Introduction to Combinatorics I, Cornell undergraduate course
- 2014 Spring MATH 6410: Enumerative Combinatorics, Cornell graduate course
- 2013 Spring MATH 4550: Applicable Geometry, Cornell undergraduate course

### Supervised Reading and Research

- 2019 Spring MATH 4900: Supervised Research, Cornell undergraduates
- 2019 Spring MATH 7900: Supervised Reading & Research, Cornell graduates
- 2018 Fall MATH 4900: Supervised Research, Cornell undergraduates
- 2018 Fall MATH 7900: Supervised Reading & Research, Cornell graduates
- 2018 Spring MATH 4900: Supervised Research, Cornell undergraduates
- 2017 Fall MATH 4900: Supervised Research, Cornell undergraduates
- 2017 Fall MATH 7900: Supervised Reading & Research, Cornell graduates
- 2017 Spring MATH 4900: Supervised Research, Cornell undergraduates
- 2017 Spring MATH 7900: Supervised Reading & Research, Cornell graduates
- 2016 Fall MATH 4900: Supervised Research, Cornell undergraduates
- 2013 Fall MATH 4901: Supervised Reading, Cornell undergraduates

### Invited and Seminar talks

- 2020 July (upcoming) Plenary Speaker, FPSAC, Israel.
- 2019 May Invited Speaker, Mid-Atlantic Algebra, Geometry & Combinatorics Workshop, Drexel University, Philadelphia, PA
- Apr. Colloquium, UIUC, Urbana-Champaign, IL

- Apr. MIT Combinatorics Seminar, Cambridge, MA  
Apr. Computer Science/Discrete Mathematics Seminar, Institute for Advanced Study, Princeton, NJ  
Mar. University of Szeged Combinatorics Seminar, Szeged, Hungary  
Mar. LaCIM Combinatorics Seminar, Montréal, Canada  
2018 Dec. IAS Members' Seminar, Institute for Advanced Study, Princeton, NJ  
Nov. Invited Speaker, Subtraction-Free combinatorics, a conference in honor of Sergey Fomin's 60th birthday, Ann Arbor, MI  
Nov. Colloquium, Haverford College, Haverford, PA  
Apr. Invited Speaker, Graduate Student Combinatorics Conference, University of Texas, Dallas, TX  
Mar. Invited Speaker, Triangle Lectures in Combinatorics, NCSU, Raleigh, NC  
2017 Oct. Colloquium, George Mason University, Fairfax, VA  
Sept. AMS Sectional Meeting, Polynomials in enumerative, algebraic and geometric combinatorics, University at Buffalo, SUNY, Buffalo, NY  
Jun. Invited speaker, Algebraic and Geometric Combinatorics of Reflection Groups, CRM/LaCIM, Montréal, Canada  
Apr. Combinatorics Seminar, Georgia Tech, Atlanta, GA  
Feb. Cornell Discrete Geometry and Combinatorics Seminar, Ithaca, NY  
Jan. Colloquium, Technische Universität, Berlin, Germany  
2016 Nov. UC Berkeley Combinatorics Seminar, Berkeley, CA  
Nov. Invited Speaker, AIM Workshop on Polyhedral geometry and partition theory, San Jose, CA  
Nov. Combinatorics Seminar, University of Washington, Seattle, WA  
Jan. LIAFA: Enumerative and analytic combinatorics seminar, Université Paris 7, Paris, France  
2015 Nov. Combinatorics Seminar, University of California, San Diego, CA  
Nov. Combinatorics Seminar, University of Washington, Seattle, WA  
Oct. Enumerative, algebraic and geometric combinatorics, AMS Sectional Meeting at Loyola University, Chicago, IL  
May. University of Szeged Combinatorics Seminar, Szeged, Hungary  
Apr. MIT Combinatorics Seminar, Cambridge, MA  
Mar. Kempner Colloquium, University of Colorado, Boulder, CO  
Mar. Applied Algebra Seminar, York University, Toronto, CA  
Feb. Cornell Discrete Geometry and Combinatorics Seminar, Ithaca, NY  
Feb. Invited speaker, Perspectives in Lie Theory, Pisa, Italy  
2014 June. Invited speaker, Stanley's 70th birthday conference, Cambridge, MA  
June. Discrete Geometry Seminar, Freie Universität, Berlin, Germany  
May. Plenary speaker, ALGECOM, Urbana-Champaign, IL  
Apr. University of Szeged Combinatorics Seminar, Szeged, Hungary  
Feb. NCSU Algebra and Combinatorics seminar, Raleigh, NC  
Jan. Invited speaker, AMS joint meetings, Session on Geometric applications of Algebraic Combinatorics, Baltimore, MD  
2013 Oct. LACIM Combinatorics Seminar, Montreal, Canada  
Oct. Cornell Discrete Geometry and Combinatorics Seminar, Ithaca, NY  
Sep. UMN Combinatorics Seminar, Minneapolis, MN  
Sep. Invited speaker, COMETA, Cortona, Italy  
2012 Nov. Cornell Discrete Geometry and Combinatorics Seminar, Ithaca, NY  
Apr. UM Combinatorics Seminar, Ann Arbor, MI  
2011 Aug. Invited speaker, Cluster Algebras and Statistical Physics, ICERM, Providence, RI

- Feb. UBC Mathematics Colloquium, Vancouver, Canada
- Feb. UBC Combinatorics Seminar, Vancouver, Canada
- Jan. UMN Combinatorics Seminar, Minneapolis, MN
- 2010 Sep. Cornell Discrete Geometry and Combinatorics Seminar, Ithaca, NY
- May. Plenary speaker, Discrete Math Day, Worcester, MA.
- 2009 Dec. UM Combinatorics Seminar, Ann Arbor, MI
- Nov. Dartmouth Combinatorics Seminar, Hanover, NH
- Oct. UW Combinatorics Seminar, Seattle, WA
- Oct. Brown University Discrete Mathematics Seminar, Providence, RI
- May. SFSU Algebra-Geometry-Combinatorics Seminar, San Francisco, CA
- Apr. UC Berkeley Discrete Mathematics Seminar, Berkeley, CA
- Apr. AMS Special Session on Matroids in algebra and geometry, San Francisco, CA
- Apr. UC Davis Algebra and Discrete Mathematics Seminar, Davis, CA
- Feb. MIT Combinatorics Seminar, Cambridge, MA
- 2008 Dec. ELTE Egerváry Seminar, Budapest, Hungary
- Dec. University of Szeged Combinatorics Seminar, Szeged, Hungary
- Nov. Dartmouth Combinatorics Seminar, Hanover, NH

### Mentoring and Outreach

- 2018- mentoring undergraduate student Linus Setiabrata on a research project (start date August 2018)
- 2018 mentored undergraduate student Kabir Kapoor on a research project
- 2017 mentored Amherst College undergraduate student Sylvia Frank on a reading and research project
- 2017- mentoring ORIE graduate student Samuel Gutekunst on a research project (start date January 2017)
- 2016-2018 mentoring undergraduate students Connor Simpson and Zoe Wellner on a research project
- 2016- supervising the research of mathematics graduate student Avery St. Dizier (start date May 2016)
- 2014-2016 Involved graduate students Kai Fong Ernest Chong and Laura Escobar and undergraduates Ethan Koenig and Aravind Gollakota in research
- 2016 Presented on *Combinatorial Enumeration* to interested non-math majors in the Totally Awesome Math Course at Cornell (MATH 1600)
- 2016 Presented on *Ehrhart polynomials of integer polytopes* in the Cornell Undergraduate Math Club
- 2016 Presented on *Catalan numbers* to an audience of Central NY high school teachers (MATH 5080)
- 2014 Presented on *Fibonacci numbers* to an audience of Central NY high school teachers (MATH 5080)
- 2014 Presented on *Enumerative Combinatorics* to interested non-math majors in the Totally Awesome Math Course at Cornell (MATH 1600)
- 2013 Designed a reading course on *Combinatorics and Polytopes* for Cornell undergraduate Bradford Aymes
- 2013 Presented on *Polytopes and Magic Squares* in the Cornell Undergraduate Math Club

2015-2016, 2017-2018 Graduate Admissions Committee

2012-2016 Math Club Committee

2014-2015, 2016-2018 Computer Committee

### Professional Activities

2017 – 2018 Program Committee member for FPSAC (Formal Power Series and Algebraic Combinatorics)

2017 Organized lecture series by Luca Moci at Cornell “A survey on vector partition functions: quasi-polynomiality and beyond”

2014 – Co-organizer of the Cornell Discrete Geometry and Combinatorics seminar since Fall 2014

2006 – Reviewer for mathematics journals (International Mathematical Research Notices; Transactions of the American Mathematical Society; Mathematische Zeitschrift; Comptes Rendus Mathématique Acad. Sci. Paris; Symmetry, Integrability and Geometry: Methods and Applications; Journal of Combinatorial Theory Series A; Journal of Algebraic Combinatorics; Combinatorics, Probability and Computing; SIAM Journal of Discrete Mathematics; European Journal of Combinatorics; Discrete Mathematics; Electronic Journal of Combinatorics) and for conferences FPSAC (Formal Power Series and Algebraic Combinatorics) and SODA (Symposium on Discrete Algorithms)