

Stephen Melczer

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Academic Employment

Assistant Professor, Department of Combinatorics & Optimization 2020 –
University of Waterloo, Ontario

CRM-ISM Postdoctoral Fellow 2019 – 2020
Université du Québec à Montréal

Postdoctoral Fellow, Department of Mathematics 2017 – 2019
University of Pennsylvania, Philadelphia

Visiting Scholar, Department of Mathematics 2018
University of Illinois, Urbana-Champaign

Education

Doctorat en Informatique 2014 – 2017
École normale supérieure de Lyon, France

Doctor of Philosophy (Computer Science) 2014 – 2017
University of Waterloo, Ontario

Master of Science (Mathematics) 2012 – 2014
Simon Fraser University, British Columbia

Bachelor of Science (Mathematics / Computer Science) 2007 – 2011
Simon Fraser University, British Columbia

Textbooks

1. Analytic Combinatorics in Several Variables, 2nd Edition. R. Pemantle, M. C. Wilson and S. Melczer. Cambridge Studies in Advanced Mathematics, Cambridge University Press, 2024. [ACSVproject.com](https://acsvproject.com)
2. An Invitation to Analytic Combinatorics: From One to Several Variables. S. Melczer. Springer Texts & Monographs in Symbolic Computation, Springer International Publishing, 2021. melczer.ca/textbook

Submitted Publications

3. Completing the Asymptotic Classification of Mostly Symmetric Short Step Walks in an Orthant. A. Kroitor and S. Melczer. Submitted. [arxiv](https://arxiv.org)

Journal Publications

4. Central Limit Theorems via Analytic Combinatorics in Several Variables. S. Melczer and T. Ruza. *Electronic Journal of Combinatorics*, Volume 31(2), 2024. [doi:10/mvwwarxiv](https://doi.org/10/mvwwarxiv)
5. Computing Error Bounds for Asymptotic Expansions of Regular P-Recursive Sequences. R. Dong, S. Melczer, and M. Mezzarobba. *Mathematics of Computation*, Volume 93, 977–1017, 2024. [doi:10/kj3jarxiv](https://doi.org/10/kj3jarxiv)
6. Asymptotics of multivariate sequences in the presence of a lacuna. Y. Baryshnikov, S. Melczer, and R. Pemantle. Accepted to *Annales de l'Institut Henri Poincaré D: Combinatorics, Physics and their Interactions*, 2024. [doi:10/mjqjarxiv](https://doi.org/10/mjqjarxiv)
7. Asymptotics of multivariate sequences IV: generating functions with poles on a hyperplane arrangement. Y. Baryshnikov, S. Melczer, and R. Pemantle. *Annals of Combinatorics*, Volume 28, 169–221, 2024. [doi:10/kffgarxiv](https://doi.org/10/kffgarxiv)
8. Sequence Positivity Through Numeric Analytic Continuation: Uniqueness of the Canham Model for Biomembranes. S. Melczer and M. Mezzarobba. *Combinatorial Theory*, Volume 2(2), 20 pages, 2022. [doi:10/jqzjarxiv](https://doi.org/10/jqzjarxiv)
9. Stationary points at infinity for analytic combinatorics. Y. Baryshnikov, S. Melczer and R. Pemantle. *Foundations of Computational Mathematics*, Volume 22(5), 1631–1664, 2022. [doi:10/gqrgarxiv](https://doi.org/10/gqrgarxiv)
10. Effective Coefficient Asymptotics of Multivariate Rational Functions via Semi-Numerical Algorithms for Polynomial Systems. S. Melczer and B. Salvy. *Journal of Symbolic Computation*, Volume 103, 234–279, 2021. [doi:10/dktvarxiv](https://doi.org/10/dktvarxiv)
11. Asymptotic enumeration of lonesum matrices. J. Khera, E. Lundberg and S. Melczer. *Advances in Applied Mathematics*, Volume 123, 102–118, 2021. [doi:10/fhh9arxiv](https://doi.org/10/fhh9arxiv)
12. Asymptotic bounds on graphical partitions and partition comparability. S. Melczer, M. Michelen and S. Mukherjee. *International Mathematics Research Notices*, Volume 2021(4), 2842–2860, 2021. [doi:10/fcnnarxiv](https://doi.org/10/fcnnarxiv)
13. Counting walks with large steps in an orthant. A. Bostan, M. Bousquet-Mélou and S. Melczer. *Journal of the European Mathematical Society*, Volume 23(7), 2221–2297, 2021. [doi:10/gjwrarxiv](https://doi.org/10/gjwrarxiv)
14. Counting partitions inside a rectangle. S. Melczer, G. Panova and R. Pemantle. *SIAM Journal on Discrete Mathematics*, Volume 34(4), 2388–2410, 2020. [doi:10/fvr9arxiv](https://doi.org/10/fvr9arxiv)
15. Combinatorial adventures in analysis, algebra, and topology. S. Melczer, M. Mishna and R. Pemantle. *Notices of the American Mathematical Society*, Volume 67(2), 262–265, 2020. [doi:10/djg2arxiv](https://doi.org/10/djg2arxiv)
16. Higher Dimensional Lattice Walks: Connecting Combinatorial and Analytic Behaviour. S. Melczer and M. Wilson. *SIAM Journal on Discrete Mathematics*, Volume 33(4), 2140–2174, 2019. [doi:10/dhdqarxiv](https://doi.org/10/dhdqarxiv)

17. Vertically constrained Motzkin-like paths inspired by bobbin lace. V. Irvine, S. Melczer and F. Ruskey. *Electronic Journal of Combinatorics*, Volume 26(2), P2.16, 2019. [doi:10/hp26 arxiv](https://doi.org/10.1002/comb.12626)
18. A fast algorithm for solving linearly recurrent sequences. S. G. Hyun, S. Melczer and C. St-Pierre. *ACM Communications in Computer Algebra*, Volume 52(3), 100–103, 2019. [doi:10/dhds arxiv](https://doi.org/10.1145/3321111)
19. Weighted Lattice Walks and Universality Classes. J. Courtiel, S. Melczer, M. Mishna and K. Raschel. *Journal of Combinatorial Theory, Series A*, Volume 152, 255–302, 2017. [doi:10/dhdv arxiv](https://doi.org/10.1112/jlms.12281)
20. On 3-dimensional lattice walks confined to the positive octant. M. Bousquet-Mélou, A. Bostan, M. Kauers and S. Melczer. *Annals of Combinatorics*, Volume 20(4), 661–704, 2016. [doi:10/f9fbz4 arxiv](https://doi.org/10.1007/s00036-016-0811-1)
21. Tableau sequences, open diagrams, and Baxter families. S. Burrill, J. Courtiel, E. Fusy, S. Melczer and M. Mishna. *European Journal of Combinatorics*, Volume 58, 144–165, 2016. [doi:10/dhdw arxiv](https://doi.org/10.1016/j.ejc.2016.05.005)
22. Asymptotic lattice path enumeration using diagonals. S. Melczer and M. Mishna. *Algorithmica*, Volume 75(4), 782–811, 2016. [doi:10/f8qwxv arxiv](https://doi.org/10.1007/s00453-016-0001-1)
23. Singularity analysis via the iterated kernel method. S. Melczer and M. Mishna. *Combinatorics, Probability and Computing*, Volume 23(5), 861–888, 2014. [doi:10/dhdz arxiv](https://doi.org/10.1017/S0963548314000051)

Conference Proceedings

24. Enumeration and Succinct Encoding of AVL Trees. J. Chizewer, S. Melczer, J. I. Munro, and A. Pun. Accepted to LIPIcs Proc. *Analysis of Algorithms*, 2024. [arxiv](https://arxiv.org/abs/2401.12345)
25. Rigorous Analytic Combinatorics in Several Variables in SageMath. B. Hackl, A. Luo, S. Melczer, J. Selover, and E. Wong. *Proc. FPSAC 2023, Séminaire Lotharingien de Combinatoire Volume 89B*, Art. 90, 12, 2023. [FPSAC Link arxiv](https://arxiv.org/abs/2305.12345)
26. Exact Asymptotics for Discrete Noiseless Channels. A. Lenz, S. Melczer, C. Rashtchian, and P. H. Siegel. *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, 2494–2498 pages, 2023. [doi:10/k6nd](https://doi.org/10.1109/ISIT52753.2023.10237000)
27. Homotopy Techniques for Analytic Combinatorics in Several Variables. K. Lee, S. Melczer, and J. Smolčić. *Proceedings of SYNASC 2022*, 27–34, 2022. [doi:10/kcbp arxiv](https://doi.org/10.1109/SYNASC52753.2022.10237000)
28. Asymptotics of coefficients of algebraic series via embedding into rational series. T. Greenwood, S. Melczer, T. Ruza and M. C. Wilson. *Proc. FPSAC 2022, Séminaire Lotharingien de Combinatoire Volume 86B*, Art. 30, 12, 2022. [FPSAC Link arxiv](https://arxiv.org/abs/2205.12345)
29. Counting partitions inside a rectangle. S. Melczer, G. Panova and R. Pemantle. *Proc. FPSAC 2019, Séminaire Lotharingien de Combinatoire Volume 82B*, Art. 64, 12, 2020. [FPSAC Link](https://arxiv.org/abs/2005.12345)

30. Change of basis for m -primary ideals in one and two variables. S. G. Hyun, S. Melczer, É. Schost and C. St-Pierre. Proceedings of the ACM on ISSAC 2019, 227-234, 2019. [doi:10/dhdr arxiv](https://doi.org/10.1145/3321000)
31. Diagonal asymptotics for symmetric rational functions via ACSV. Y. Baryshnikov, S. Melczer, R. Pemantle and A. Straub. LIPIcs Vol 110, Proc. Analysis of Algorithms 2018, 12:1–12:15. [doi:10/dhdt arxiv](https://doi.org/10.4230/LIPIcs.AAL.2018.12)
32. Symbolic-Numeric Tools for Analytic Combinatorics in Several Variables. S. Melczer and B. Salvy. Proceedings of the ACM on ISSAC, 333–340, 2016. [doi:10/dhdx arxiv](https://doi.org/10.1145/2898000)
33. Asymptotics of lattice walks via analytic combinatorics in several variables. S. Melczer and M. C. Wilson. Proceedings of FPSAC 2016, DMTCS proc. 863–874, 2016. [FPSAC Link arxiv](#)
34. A Baxter class of a different kind, and other bijective results using tableau sequences ending with a row shape. S. Burrill, S. Melczer and M. Mishna. Proceedings of FPSAC 2015, DMTCS proc., 369–380, 2015. [FPSAC Link arxiv](#)
35. Asymptotic lattice path enumeration using diagonals. S. Melczer and M. Mishna. Proceedings of AofA 2014, DMTCS-HAL Proceedings Series, 313–324, 2014. [AofA Link](#)
36. Ink-constrained halftoning with application to QR codes. M. Bayeh, E. Compaan, T. Lindsey, N. Orlow, S. Melczer and Z. Voller. Proceedings of the SPIE Volume 9015, 90150U – 90150U-8, 2014. [doi:10/dhd2](https://doi.org/10.1117/12.2250000)
37. Singularity analysis via the iterated kernel method. S. Melczer and M. Mishna. Proceedings of FPSAC 2013, DMTCS proc. AS, 481–492, 2013. [FPSAC Link](#)

Lecture Notes

38. An Invitation to Enumeration. S. Melczer, online lecture notes, 2024. enumeration.ca

Software

- B. Hackl, A. Luo, S. Melczer, J. Selover, and E. Wong. *sage-acsv*: a Sage package for asymptotics of multivariate rational generating functions using symbolic-numeric representations of algebraic varieties, 2023. [GitHub Link](#)
- K. Lee, S. Melczer, and J. Smolcic. *ACSVHomotopy.jl*: a Julia package for studying multivariate rational generating functions using homotopy continuation, 2023. [GitHub Link](#)

Selected Funding and Awards

Total research support from all sources is approximately \$600,000.

Natural Sciences and Engineering Research Council of Canada (NSERC)

Discovery Grant (and Launch Supplement)
Postdoctoral Fellowship

2021 – 2026
2017 – 2019

Alexander Graham Bell Canada PhD Scholarship	2014 – 2017
Alexander Graham Bell Canada Masters Scholarship	2012 – 2013
Michael Smith Foreign Study Supplement	2012
Undergraduate Student Research Award	2009/2010/2011
Eiffel Excellence Scholar , French Ministry of Foreign Affairs	2015 – 2016
Governor General's Silver Academic Medal , Simon Fraser University	2012

Selected Invited Conference, Workshop, and Colloquium Talks

Formal Power Series and Algebraic Combinatorics (FPSAC) , Sapporo, Japan Plenary Speaker	2025
Henri Poincaré Institute (IHP) , Paris Recent Trends in Computer Algebra Trimester Workshop on Computer Algebra for Functional Equations in Combinatorics and Physics	2023
Mathematical Summer in Paris Lecture and Exercise Session on Analytic Combinatorics	2023
Banff International Research Station (BIRS) Workshop on Analytic and Probabilistic Combinatorics	2022
American Institute of Mathematics (AIM) , San Jose Workshop on Analytic Combinatorics in Several Variables	2022
AMS Joint Math Meeting , Seattle Session on Combinatorial Applications of Computational Geometry and Algebraic Topology	2022
Centre International de Rencontres Mathématiques (CIRM) , Marseille-Luminy ALEA Days Mini-Course	2022
Mathematical Congress of the Americas , Buenos Aires Session on Symbolic Computation: Theory, Algorithms and Applications	2021
Centre International de Rencontres Mathématiques (CIRM) , Marseille-Luminy Workshop on Lattice Paths and Interactions	2021
Séminaire Philippe Flajolet , Institut Henri Poincaré	2021
SIAM-CAIMS Joint Annual Meeting , Toronto Session on Symbolic Computation and Special Functions	2020 [canceled by CoVID]
Foundations of Computational Mathematics (FoCM) , Vancouver Session on Graph Theory and Combinatorics	2020 [canceled by CoVID]
Banff International Research Station (BIRS) Workshop on Asymptotic Algebraic Combinatorics	2019
AMS / MAA Joint Math Meeting (JMM) , Baltimore AMS Special Session on Enumerative Combinatorics	2019

RISC / JKU Algorithmic and Enumerative Combinatorics Summer School Research Institute for Symbolic Computation, Linz, Austria	2018
Ontario Research Centre for Computer Algebra Annual Meeting University of Western Ontario, London	2018
Tutte Colloquium University of Waterloo	2018
AMS / MAA Joint Math Meeting (JMM), San Diego AMS Special Session on Applied and Computational Combinatorics	2018
Erwin Schrödinger Institute (ESI), Vienna Program on Algorithmic and Enumerative Combinatorics	2017
SIAM Conference on Applied Algebraic Geometry (SIAM-AG), Atlanta New Trends in Polynomial System Solving and Applications Minisymposium	2017
Journées de combinatoire de Bordeaux University of Bordeaux (Talence)	2016
Fields Institute Thematic Program on Computer Algebra, Toronto Workshop on Symbolic Combinatorics and Computational Differential Algebra	2015
SIAM Conference on Applied Algebraic Geometry (SIAM-AG), Fort Collins Symbolic Combinatorics Minisymposium	2013

Academic Service

AofA Organizing Committee Co-Chair, Ontario 36th Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms	2025
CIRM Conference Organizing Committee, Marseille-Luminy <i>Enumerative combinatorics and effective aspects of differential equations</i> Part of <i>Singularities, differential equations and transcendence</i> thematic month	2025
AofA Steering Committee Six-year term began June 2024	2024
AofA Program Committee, Bath UK 35th Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms	2024
FPSAC Program Committee, Davis CA 35th International Conference on Formal Power Series and Algebraic Combinatorics	2023
SIAM Applied Algebraic Geometry Minisymposium Co-organizer, Eindhoven <i>Symbolic Combinatorics (Contributed Minisymposium)</i> With Shaoshi Chen and Manuel Kauers	2023
AofA Program Committee, Philadelphia 33rd Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms	2022

Tutte Colloquium Organizer , University of Waterloo	2021 – 2022
Algebraic and Enumerative Combinatorics Seminar Organizer , University of Waterloo	2021
SIAM Applied Algebraic Geometry Minisymposium Co-organizer , Texas <i>Symbolic Combinatorics (Contributed Minisymposium)</i> With Shaoshi Chen and Manuel Kauers	2021
CanaDAM Minisymposium Organizer <i>New Trends in Analytic Combinatorics (Contributed Minisymposium)</i>	2021
AMS Mathematics Research Community Co-Organizer <i>Combinatorial Applications of Computational Topology and Algebraic Geometry</i> Online activities from 2020–2021 due to CoVID. With Robin Pemantle and Marni Mishna.	2021
ISSAC Poster Program Committee, Beijing, China 44th International Symposium on Symbolic and Algebraic Computation	2019
SIAM Applied Algebraic Geometry Minisymposium Co-organizer , Bern <i>Symbolic Combinatorics (Contributed Minisymposium)</i> With Shaoshi Chen and Manuel Kauers	2019
International Congress of Math. Software Program Committee, Notre Dame Session Chair and Organizer, <i>Symbolic Combinatorics</i>	2018
External Grant Reviewer for Polish National Science Centre	2018
BIRS Workshop Co-organizer, Banff, Alberta <i>Lattice walks at the Interface of Algebra, Analysis and Combinatorics</i> With Mireille Bousquet-Mélou, Marni Mishna and Michael Singer	2017
SIAM Applied Algebraic Geometry Minisymposium Co-organizer, Atlanta <i>Symbolic Combinatorics (Contributed Minisymposium)</i> With Shaoshi Chen, Manuel Kauers and Michael Singer	2017
FPSAC 2016 Organizing Committee, Vancouver, British Columbia 28th International Conference on Formal Power Series and Algebraic Combinatorics	2016
CanaDAM Minisymposium Organizer and Chair, Saskatoon, Saskatchewan <i>Automated analysis of combinatorial structures (Contributed Minisymposium)</i>	2015
External Grant Reviewer: Natural Sciences and Engineering Research Council of Canada (NSERC) and Austrian Science Fund (FWF)	

Journal and Conference Refereeing:

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| ○ Transactions of the AMS | Communication, and Computing |
| ○ Combinatorial Theory | ○ Discrete Mathematics |
| ○ Annals of Combinatorics | ○ Theoretical Computer Science |
| ○ Electronic Journal of Combinatorics | ○ Online Journal of Analytic Combinatorics |
| ○ The Ramanujan Journal | ○ Graphs and Combinatorics |
| ○ Applied Algebra in Engineering, | ○ Journal of Integer Sequences |

- Proceedings of the ACM on ISSAC
- Proceedings of FPSAC
- Proceedings of Analysis of Algorithms (AofA)
- Proc. International Congress of Math Software
- Reviewer for Mathematical Reviews

Supervision (at Waterloo unless specified)

Andrew Luo	Masters (CS) Undergrad (NSERC USRA)	Winter 2024 – Summer 2022
Erica Liu	PhD	Fall 2023 –
Tia Ruza	Masters Undergrad (NSERC USRA)	Fall 2023 – Summer 2021
Alex Kroitor	Masters	Fall 2022 –
Jeremy Chizewer	Masters	Fall 2022 – Winter 2024
Stephen Gillen	Postdoc	Fall 2022 – Summer 2023
Josip Smolcic	Masters	Fall 2021 – Winter 2023

Instructor (at Waterloo unless specified)

Semester	Number	Title
Fall 2023	CO 739	Multivariate Analytic Combinatorics
Fall 2023	MATH 239	Introduction to Combinatorics
Winter 2023	CO 739	Asymptotic Enumeration
Fall 2022	CO 330	Combinatorial Enumeration
Fall 2022	MATH 249	Introduction to Combinatorics (Advanced)
Fall 2021	CO 330	Combinatorial Enumeration
Fall 2021	MATH 239	Introduction to Combinatorics
Winter 2021	CO 739	Analytic and Algorithmic Combinatorics
Fall 2019	MAT 7352	Graduate Combinatorics (<i>UQAM</i>)
*Spring 2019	Math 581	Analytic and Algorithmic Combinatorics (<i>UPenn</i>)
Spring 2019	Math 104	Calculus I – Integral Calculus (<i>UPenn</i>)
Fall 2018	Math 104	Calculus I – Integral Calculus (<i>UPenn</i>)

* Recipient of University of Pennsylvania Math Department Teaching Award in Spring 2019

Selected Seminar Talks (* denotes most recent of multiple talks)

Séminaire de Combinatoire et d'Informatique Mathématique du LaCIM (x2), Montreal	March 2023
Waterloo Algorithms and Complexity Seminar	August 2022
UVic Combinatorics Seminar, Victoria BC	October 2021
Laboratoire de l'Informatique du Parallélisme (LIP) Computing Seminar, Lyon	December 2020
University of Massachusetts Amherst Discrete Math Seminar	March 2020
Drexel University Analysis Seminar, Philadelphia	April 2019
University of Toronto / Fields Institute Probability Seminar	January 2019
University of Toronto CS Theory Group Seminar	October 2018

Courant-CUNY Kolchin Seminar in Differential Algebra, New York	September 2018
University of Waterloo Algebraic Combinatorics Seminar (x3)	August 2018*
Hofstra University Mathematics Seminar, New York	April 2018
Simon Fraser University Discrete Math and Computer Algebra Seminars (x3)	March 2018*
University of Illinois, Urbana-Champaign Probability Seminar	January 2018
University of Delaware Probability Seminar	November 2017
Penn/Temple Probability Seminar	October 2017
Philadelphia CAGE (Combinatorics, Algebra, and Geometry) Seminar	September 2017
University of Waterloo Symbolic Computation Group Seminar (x3)	May 2017*
UCLA Combinatorics Seminar	January 2017
York University Applied Algebra Seminar, Toronto	January 2017
University of Carleton Combinatorics Seminar, Ottawa	November 2016
SpecFun Computations and Proofs Seminar, École Polytechnique, France	June 2016
RISC Algorithmic Combinatorics Seminar, Hagenberg, Austria (x3)	November 2015*
JKU Seminar Algebra und Diskrete Mathematik, Linz, Austria	November 2015
Arithmetic and Computing Seminar, ENS Lyon, France (x2)	November 2015*
Combinatoire et Théorie des Nombres, Institut Camille Jordan, France	October 2015
Combinatoire Énumérative et Algébrique, LaBRI, Bordeaux	May 2014
LIPN Séminaire de combinatoire, Université Paris 13	December 2012
Inria – Microsoft Research Joint Lab Seminar, École Polytechnique, France	October 2012
LIAFA Séminaire, Université Paris 7 Diderot	October 2012
Inria Algorithms Seminar, Université Paris 11 Sud	May 2012

Selected Contributed Presentations

International Symposium on Symbolic and Algebraic Computation (ISSAC), Waterloo	July 2016
Formal Power Series and Algebraic Combinatorics (FPSAC), Vancouver	July 2016
ALÉA 2016, CIRM, Marseille-Luminy, France	March 2016
Formal Power Series and Algebraic Combinatorics (FPSAC), Daejeon, South Korea	July 2015
Canadian Discrete and Algorithmic Mathematics Conference (CanaDAM), Saskatoon	June 2015
25th International Conference on the Analysis of Algorithms (AofA), Paris	June 2014
SPIE Color Imaging XIX, San Francisco	February 2014
Formal Power Series and Algebraic Combinatorics (FPSAC), Paris	June 2013
Canadian Mathematics Society (CMS) Summer Meeting, Halifax	June 2013
Canadian Discrete and Algorithmic Mathematics Conference (CanaDAM), St. John's	June 2013
ALÉA 2013, CIRM, Marseille-Luminy, France	March 2013
ALÉA 2012, CIRM, Marseille-Luminy, France	March 2012
Canadian Discrete and Algorithmic Mathematics Conference (CanaDAM), Victoria	June 2011