

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

2. An Invitation to Analytic Combinatorics: From One to Several Variables. S. Melczer. Springer Texts & Monographs in Symbolic Computation, Springer International Publishing, 2021. (*More than 10k chapter downloads / accesses on SpringerLink, not including hardcopies sold*)

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 Link](#)

4. A Compact Representation for AVL Trees. J. Chizewer, S. Melczer, J. I. Munro, and A. Pun. Submitted. [arxiv Link](#)
5. Central Limit Theorems via Analytic Combinatorics in Several Variables. S. Melczer and T. Ruza. Submitted. [arxiv Link](#)

Journal Publications

6. 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/kj3j](#) [arxiv Link](#)
7. 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/mjqj](#) [arxiv Link](#)
8. 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/kffg](#) [arxiv Link](#)
9. 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/jqzj](#) [arxiv Link](#)
10. 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/gqrg](#) [arxiv Link](#)
11. 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/dktv](#) [arxiv Link](#)
12. Asymptotic enumeration of lonesum matrices. J. Khera, E. Lundberg and S. Melczer. *Advances in Applied Mathematics*, Volume 123, 102–118, 2021. [doi:10/fhh9](#) [arxiv Link](#)
13. 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/fcnn](#) [arxiv Link](#)
14. 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/gjwr](#) [arxiv Link](#)
15. 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/fvr9](#) [arxiv Link](#)
16. 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/djg2](#)

17. 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/dhdq](#)
[arxiv Link](#)
18. 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 Link](#)
19. 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 Link](#)
20. 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 Link](#)
21. 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 Link](#)
22. 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 Link](#)
23. Asymptotic lattice path enumeration using diagonals. S. Melczer and M. Mishna. *Algorithmica*, Volume 75(4), 782–811, 2016. [doi:10/f8qwvx](#)
[arxiv Link](#)
24. 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 Link](#)

Conference Proceedings

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 Link](#)
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](#)
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 Link](#)
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 Link](#)
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](#)

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 Link](#)
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 Link](#)
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 Link](#)
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 Link](#)
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 Link](#)
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](#)
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, 2023. [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

Henri Poincaré Institute (IHP) , Paris	2023
Recent Trends in Computer Algebra Trimester	
Workshop on Computer Algebra for Functional Equations in Combinatorics and Physics	
Mathematical Summer in Paris	2023
Lecture and Exercise Session on Analytic Combinatorics	
Banff International Research Station (BIRS)	2022
Workshop on Analytic and Probabilistic Combinatorics	
American Institute of Mathematics (AIM) , San Jose	2022
Workshop on Analytic Combinatorics in Several Variables	
AMS Joint Math Meeting , Seattle	2022
Session on Combinatorial Applications of Computational Geometry and Algebraic Topology	
Centre International de Rencontres Mathématiques (CIRM) , Marseille-Luminy	2022
ALEA Days Mini-Course	
Mathematical Congress of the Americas , Buenos Aires	2021
Session on Symbolic Computation: Theory, Algorithms and Applications	
Centre International de Rencontres Mathématiques (CIRM) , Marseille-Luminy	2021
Workshop on Lattice Paths and Interactions	
Séminaire Philippe Flajolet , Institut Henri Poincaré	2021
SIAM-CAIMS Joint Annual Meeting , Toronto	2020
Session on Symbolic Computation and Special Functions	[canceled by CoVID]
Foundations of Computational Mathematics (FoCM) , Vancouver	2020
Session on Graph Theory and Combinatorics	[canceled by CoVID]
Banff International Research Station (BIRS)	2019
Workshop on Asymptotic Algebraic Combinatorics	
AMS / MAA Joint Math Meeting (JMM) , Baltimore	2019
AMS Special Session on Enumerative Combinatorics	
RISC / JKU Algorithmic and Enumerative Combinatorics Summer School	2018
Research Institute for Symbolic Computation, Linz, Austria	

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

Academic Service

AofA Organizing Committee Co-Chair, Ontario	2025
36th Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms	
CIRM Conference Organizing Committee, Marseille-Luminy	2025
<i>Enumerative combinatorics and effective aspects of differential equations</i>	
Part of <i>Singularities, differential equations and transcendence</i> thematic month	
AofA Program Committee, Bath UK	2024
35th Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms	
FPSAC Program Committee, Davis CA	2023
35th International Conference on Formal Power Series and Algebraic Combinatorics	
SIAM Applied Algebraic Geometry Minisymposium Co-organizer, Eindhoven	2023
<i>Symbolic Combinatorics (Contributed Minisymposium)</i>	
With Shaoshi Chen and Manuel Kauers	
AofA Program Committee, Philadelphia	2022
33rd Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms	
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	2021
<i>Symbolic Combinatorics (Contributed Minisymposium)</i>	
With Shaoshi Chen and Manuel Kauers	
CanaDAM Minisymposium Organizer	2021
<i>New Trends in Analytic Combinatorics (Contributed Minisymposium)</i>	
AMS Mathematics Research Community Co-Organizer	2021
<i>Combinatorial Applications of Computational Topology and Algebraic Geometry</i>	
Online activities from 2020–2021 due to CoVID. With Robin Pemantle and Marni Mishna.	
ISSAC Poster Program Committee, Beijing, China	2019
44th International Symposium on Symbolic and Algebraic Computation	
SIAM Applied Algebraic Geometry Minisymposium Co-organizer, Bern	2019
<i>Symbolic Combinatorics (Contributed Minisymposium)</i>	
With Shaoshi Chen and Manuel Kauers	
International Congress of Math. Software Program Committee, Notre Dame	2018
Session Chair and Organizer, <i>Symbolic Combinatorics</i>	
External Grant Reviewer for Polish National Science Centre	2018
BIRS Workshop Co-organizer, Banff, Alberta	2017
<i>Lattice walks at the Interface of Algebra, Analysis and Combinatorics</i>	
With Mireille Bousquet-Mélou, Marni Mishna and Michael Singer	
SIAM Applied Algebraic Geometry Minisymposium Co-organizer, Atlanta	2017
<i>Symbolic Combinatorics (Contributed Minisymposium)</i>	
With Shaoshi Chen, Manuel Kauers and Michael Singer	
FPSAC 2016 Organizing Committee, Vancouver, British Columbia	2016
28th International Conference on Formal Power Series and Algebraic Combinatorics	
CanaDAM Minisymposium Organizer and Chair, Saskatoon, Saskatchewan	2015
<i>Automated analysis of combinatorial structures (Contributed Minisymposium)</i>	
External Grant Reviewer: Natural Sciences and Engineering Research Council of Canada (NSERC) and Austrian Science Fund (FWF)	

Journal and Conference Refereeing:

- Transactions of the AMS
- Combinatorial Theory
- Annals of Combinatorics
- Electronic Journal of Combinatorics
- The Ramanujan Journal
- Applied Algebra in Engineering, Communication, and Computing
- Discrete Mathematics
- Theoretical Computer Science
- Online Journal of Analytic Combinatorics
- Graphs and Combinatorics
- 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 / Fall 2022
Jeremy Chizewer	Masters	Fall 2022 –
Alex Kroitor	Masters	Fall 2022 –
Stephen Gillen	Postdoc	Fall 2022 – Summer 2023
Josip Smolcic	Masters	Fall 2021 – Winter 2023
Keith Richie	Undergrad (Brown Presidential Scholar)	Summer 2019
Andrew Martin	Undergrad (UPenn)	Summer 2019

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