

# Stephen Melczer

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## Academic Employment

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**Postdoctoral Fellow, Department of Mathematics** *July 2017 – Present*

*University of Pennsylvania, Philadelphia*

- Supervisor: Robin Pemantle
- Partially funded by NSERC Postdoctoral Fellowship and funds from NSF Grant DMS-1612674

**Visiting Scholar, Department of Mathematics** *June – July 2018*

*University of Illinois, Urbana-Champaign*

- Ran workshop 'Algorithms for Analytic Combinatorics' as part of the NSF funded PI4 program
- Developed course, taught, and supervised early PhD students on original research projects

## Education

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**Doctor of Philosophy (Computer Science)** *September 2014 – June 2017*

*University of Waterloo, Ontario*

**Doctorat en Informatique**

*École normale supérieure de Lyon, France*

- Cotutelle dual degrees (completed all requirements and received doctorates from both schools)
- Thesis: Analytic Combinatorics in Several Variables: Effective Asymptotics and Lattice Path Enumeration
- Supervisors: George Labahn (Waterloo) and Bruno Salvy (ENS Lyon)

**Master of Science (Mathematics)** *September 2012 – May 2014*

*Simon Fraser University, British Columbia*

**Bachelor of Science, First Class Honours** *September 2007 – December 2011*

*Simon Fraser University, British Columbia*

- Mathematics (Major) and Computing Science (Minor)
- Top undergraduate (Governor General Award winner) in class of over 4500 students

## Submitted Publications

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1. *Higher Dimensional Lattice Walks: Connecting Combinatorial and Analytic Behaviour*. S. Melczer and M. Wilson. Submitted October 2018.  
<https://arxiv.org/abs/1810.06170>
2. *Counting partitions inside a rectangle*. S. Melczer, G. Panova and R. Pemantle.  
Submitted May 2018.  
<https://arxiv.org/abs/1805.08375>

3. *Counting walks with large steps in an orthant*. A. Bostan, M. Bousquet-Mélou and S. Melczer. Submitted May 2018.  
<https://arxiv.org/abs/1806.00968>
4. *Vertically constrained Motzkin-like paths inspired by bobbin lace*. V. Irvine, S. Melczer and F. Ruskey. Submitted April 2018.  
<https://arxiv.org/abs/1804.08725>

## Publications

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5. *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.  
<http://dx.doi.org/10.4230/LIPIcs.AofA.2018.12>  
<https://arxiv.org/abs/1804.10929>
6. *A fast algorithm for solving linearly recurrent sequences*. S. G. Hyun, S. Melczer and C. St-Pierre. Accepted to ISSAC 2018 Abstracts, ACM Communications in Computer Algebra.  
<https://arxiv.org/abs/1806.03554>
7. *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.  
<http://dx.doi.org/10.1016/j.jcta.2017.06.008>  
<http://arxiv.org/abs/1609.05839>
8. *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.  
<http://dx.doi.org/10.1007/s00026-016-0328-7>  
<http://arxiv.org/abs/1409.3669>
9. *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.  
<http://dx.doi.org/10.1016/j.ejc.2016.05.011>  
<http://arxiv.org/abs/1506.03544>
10. *Symbolic-Numeric Tools for Analytic Combinatorics in Several Variables*. S. Melczer and B. Salvy. Proceedings of the ACM on ISSAC 2016, 333–340, 2016.  
<http://dx.doi.org/10.1145/2930889.2930913>  
<http://arxiv.org/abs/1605.00402>
11. *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.  
<http://fpsac2016.sciencesconf.org/114341>  
<http://arxiv.org/abs/1511.02527>
12. *Asymptotic lattice path enumeration using diagonals*. S. Melczer and M. Mishna. Algorithmica, Volume 75(4), 782–811, 2016.  
<http://dx.doi.org/10.1007/s00453-015-0063-1>  
<http://arxiv.org/abs/1402.1230>

13. *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.  
<http://fpsac2015.sciencesconf.org/71001>  
<http://arxiv.org/abs/1411.6606>
14. *Singularity analysis via the iterated kernel method*. S. Melczer and M. Mishna. Combinatorics, Probability and Computing, Volume 23(5), 861–888, 2014.  
<http://dx.doi.org/10.1017/S0963548314000145>  
<http://arxiv.org/abs/1303.3236>
15. *Asymptotic lattice path enumeration using diagonals [Extended Abstract]*. S. Melczer and M. Mishna. Proceedings of AofA 2014, DMTCS-HAL Proceedings Series, 313–324, 2014.  
<http://hal.inria.fr/hal-01077251>
16. *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.  
<http://dx.doi.org/10.1117/12.2044217>
17. *Singularity analysis via the iterated kernel method [Extended Abstract]*. S. Melczer and M. Mishna. Proceedings of FPSAC 2013, DMTCS proc. AS, 481–492, 2013.  
<https://hal.inria.fr/hal-01229731>

## Honours and Awards

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NSERC Postdoctoral Fellowship (PDF) Natural Sciences and Engineering Research Council of Canada (NSERC)	<b>Sept 2017 – Aug 2019</b> \$90,000
Alexander Graham Bell Canada Graduate Scholarship (PhD) Natural Sciences and Engineering Research Council of Canada (NSERC)	<b>Sept 2014 – Aug 2017</b> \$105,000
David R. Cheriton Graduate Scholarship Cheriton School of Computer Science, University of Waterloo	<b>Jan 2015 – Aug 2017</b> \$26,666
President's Graduate Scholarship University of Waterloo	<b>Sept 2014 – Aug 2017</b> \$30,000
Eiffel Excellence Scholarship French Ministry of Foreign Affairs	<b>Sept 2015 – May 2016</b> €11,200
FCRF Cotutelle Scholarship The France-Canada Research Fund	<b>Sept 2015 – May 2016</b> \$16,320
C.D. Nelson Memorial Graduate Entrance Scholarship Simon Fraser University	<b>Sept 2012 – Aug 2014</b> \$30,000
Graduate Fellowship SFU Mathematics Department	<b>Jan 2014 – April 2014</b> \$6,250
Alexander Graham Bell Canada Graduate Scholarship (MSc) Natural Sciences and Engineering Research Council of Canada (NSERC)	<b>Sept 2012 – Aug 2013</b> \$17,500

Michael Smith Foreign Study Supplement Natural Sciences and Engineering Research Council of Canada (NSERC)	<b>Sept 2012 – Dec 2012</b> \$5,500
Office for Science and Technology Research Award Embassy of France in Canada	<b>Sept 2012 – Dec 2012</b> \$6,400
Governor General's Silver Medal (Top Undergraduate at SFU)	<b>June 2012</b>
NSERC Undergraduate Student Research Award Natural Sciences and Engineering Research Council of Canada (NSERC)	<b>May 2009/2010/2011</b> 3 × \$4,500

## **Invited Conference, Workshop and Colloquium Talks**

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<i>Asymptotic regime change for multivariate generating functions</i> <b>AMS / MAA Joint Math Meeting</b> , Baltimore AMS Special Session on Special Session on Enumerative Combinatorics	<b>January 2019</b>
<i>An Invitation to Analytic Combinatorics in Several Variables</i> <b>RISC / JKU Algorithmic and Enumerative Combinatorics Summer School</b> Research Institute for Symbolic Computation, Linz, Austria	<b>July 2018</b>
<i>Counting partitions inside a rectangle</i> <b>Ontario Research Centre for Computer Algebra Annual Meeting</b> University of Western Ontario, London	<b>May 2018</b>
<i>Generating Functions: Theory, Algorithms, and Applications</i> <b>Tutte Colloquium</b> , University of Waterloo	<b>April 2018</b>
<i>Analytic Combinatorics in Several Variables: Applications and Effective Methods</i> <b>AMS / MAA Joint Math Meeting</b> , San Diego AMS Special Session on Applied and Computational Combinatorics	<b>January 2018</b>
<i>Multivariate singularity analysis and hyperplane arrangements</i> <b>Schrödinger Institute Program on Algorithmic and Enumerative Combinatorics</b> , Vienna Workshop on Computer Algebra in Combinatorics	<b>November 2017</b>
<i>Polynomial System Solving and Analytic Combinatorics in Several Variables</i> <b>SIAM Conference on Applied Algebraic Geometry</b> , Atlanta New Trends in Polynomial System Solving and Applications Minisymposium	<b>August 2017</b>
<i>Diagonals, asymptotics, and lattice path enumeration</i> <b>Journées de combinatoire de Bordeaux</b>	<b>January 2016</b>
<i>Effective Analytic Combinatorics in Several Variables</i> <b>Fields Institute Thematic Program on Computer Algebra</b> , Toronto Workshop on Symbolic Combinatorics and Computational Differential Algebra	<b>September 2015</b>
<i>Towards a Classification of Restricted Lattice Walks</i> <b>SIAM Conference on Applied Algebraic Geometry</b> , Fort Collins Symbolic Combinatorics Minisymposium	<b>August 2013</b>

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

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University of Toronto Probability Seminar	<b>January 2019</b>
University of Toronto CS Theory Group Seminar	<b>October 2018</b>
Courant-CUNY Kolchin Seminar in Differential Algebra, New York	<b>September 2018</b>
University of Waterloo Algebraic Combinatorics Seminar (x3)	<b>August 2018*</b>
Hofstra University Mathematics Seminar, New York	<b>April 2018</b>
Simon Fraser University Discrete Math and Computer Algebra Seminars (x3)	<b>March 2018*</b>
University of Illinois, Urbana-Champaign Probability Seminar	<b>January 2018</b>
University of Delaware Probability Seminar	<b>November 2017</b>
Penn/Temple Probability Seminar	<b>October 2017</b>
Philadelphia CAGE (Combinatorics, Algebra, and Geometry) Seminar	<b>September 2017</b>
University of Waterloo Symbolic Computation Group Seminar (x3)	<b>May 2017*</b>
UCLA Combinatorics Seminar	<b>January 2017</b>
York University Applied Algebra Seminar, Toronto	<b>January 2017</b>
University of Carleton Combinatorics Seminar, Ottawa	<b>November 2016</b>
SpecFun Computations and Proofs Seminar, École Polytechnique, France	<b>June 2016</b>
RISC Algorithmic Combinatorics Seminar, Hagenberg, Austria (x3)	<b>November 2015*</b>
JKU Seminar Algebra und Diskrete Mathematik, Linz, Austria	<b>November 2015</b>
Arithmetic and Computing Seminar, ENS Lyon, France (x2)	<b>November 2015*</b>
Combinatoire et Théorie des Nombres, Institut Camille Jordan, France	<b>October 2015</b>
Combinatoire Énumérative et Algébrique, LaBRI, Bordeaux	<b>May 2014</b>
LIPN Séminaire de combinatoire, Université Paris 13	<b>December 2012</b>
Inria – Microsoft Research Joint Lab Seminar, École Polytechnique, France	<b>October 2012</b>
LIAFA Séminaire, Université Paris 7 Diderot	<b>October 2012</b>
Inria Algorithms Seminar, Université Paris 11 Sud	<b>May 2012</b>

## **Selected Contributed Conference Presentations (\* denotes poster)**

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

ALÉA 2013, CIRM, Marseille-Luminy, France	<b>March 2013</b>
ALÉA 2012, CIRM, Marseille-Luminy, France	<b>March 2012</b>
SFU Computational Math Day, Burnaby, British Columbia	<b>August 2011</b>
Canadian Discrete and Algorithmic Mathematics Conference (CanaDAM), Victoria	<b>June 2011</b>
PIMS Young Researchers Conference, Vancouver	<b>May 2011</b>
*UBC Rising Stars of Research, Vancouver	<b>August 2010</b>

## **Additional Conference and Workshop Attendance**

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Trimester on Combinatorics and its Interactions, Institut Henri Poincaré (IHP)	<b>Jan – March 2017</b>
Workshop in Analytic and Probabilistic Combinatorics, BIRS, Banff	<b>October 2016</b>
Conference in honour of Marcel-Paul Schützenberger, Bordeaux	<b>March 2016</b>
Journées Nationales de Calcul Formel, Cluny, France	<b>November 2015</b>
Closed Meeting on Analysis of Algorithms, Strobl, Austria	<b>June 2015</b>
ACM-SIAM Symposium on Discrete Algorithms (SODA), Portland	<b>January 2014</b>
Franco-British Workshop on Analytic Combinatorics, Oxford	<b>September 2012</b>
Formal Power Series and Algebraic Combinatorics (FPSAC), Nagoya, Japan	<b>August 2012</b>
SMS Probabilistic Combinatorics Workshop, Montreal	<b>July 2012</b>

## **Academic Service**

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<b>International Congress of Math. Software Program Committee, Notre Dame, IN</b>	<b>July 2018</b>
Session Chair and Organizer, <i>Symbolic Combinatorics</i>	
<b>External Grant Reviewer for Polish National Science Centre</b>	<b>2018</b>
MAESTRO funding scheme (grant of $\approx$ \$950,000)	
<b>Penn Undergraduate Math Society Faculty Contact</b>	<b>2018–2019</b>
Helped facilitate events for undergraduate math students at Penn	
<b>BIRS Workshop Co-organizer, Banff, Alberta</b>	<b>September 2017</b>
<i>Lattice walks at the Interface of Algebra, Analysis and Combinatorics</i>	
With Mireille Bousquet-Mélou, Marni Mishna and Michael Singer	
<b>SIAM Applied Algebraic Geometry Minisymposium Co-organizer, Atlanta</b>	<b>August 2017</b>
<i>Symbolic Combinatorics (Contributed Minisymposium)</i>	
With Shaoshi Chen, Manuel Kauers and Michael Singer	
<b>FPSAC 2016 Organizing Committee, Vancouver, British Columbia</b>	<b>July 2016</b>
28th International Conference on Formal Power Series and Algebraic Combinatorics	
First point of contact for participants (ran official email and webpage)	

**CanaDAM Minisymposium Organizer and Chair, Saskatoon, Saskatchewan** **June 2015**

*Automated analysis of combinatorial structures (Contributed Minisymposium)*

5th biennial Canadian Discrete and Algorithmic Mathematics Conference

**Referee:**

- o Electronic Journal of Combinatorics
- o Discrete Mathematics
- o Journal of Integer Sequences
- o Theoretical Computer Science
- o Online Journal of Analytic Combinatorics
- o Proceedings of the ACM on ISSAC
- o DMTCS Proceedings of FPSAC
- o Proceedings of Analysis of Algorithms (AofA)
- o Proc. International Congress of Math Software
- o Reviewer for Mathematical Reviews

**Additional Research Experience**

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**Inria - Microsoft Research Joint Centre**

**École Polytechnique, France**

*Research Internship*

*March – June 2012*

Topic: Algorithms classifying analytic properties of generating functions

Supervisors: Alin Bostan (Inria) and Manuel Kauers (RISC Linz)

**Simon Fraser University**

**Burnaby, British Columbia**

*Research Assistant (NSERC Undergraduate Summer Researcher)*

Asymptotic enumeration and analytic combinatorics (w/ Marni Mishna)

May – August 2011

Prime ideal decomposition; led to code added to Maple 16 (w/ Michael Monagan)

May – August 2010

Convex optimization and applications to PDE solvers (w/ Adam Oberman)

May – August 2009

**Teaching Experience (University of Pennsylvania)**

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<b>Semester</b>	<b>Assignment</b>	<b>Duties</b>
Spring 2019	Grad Topics Course in Computational Combinatorics	Instructor + Course Design
Spring 2019	Math 104 - Calculus I (Integral Calculus)	Instructor
Fall 2018	Math 104 - Calculus I (Integral Calculus)	Instructor

**Teaching Experience (University of Illinois)**

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*Ran 'Algorithms for Analytic Combinatorics' PI4 workshop*

**June – July 2018**

Taught 10 PhD students in NSF funded program: developed and delivered 10 hours of lecture followed by 5 weeks of supervision for students working on original extended research-level projects.

**Teaching (Research Institute for Symbolic Computation / JKU Linz)**

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*Summer School on Algorithmic and Enumerative Combinatorics*

**July 2018**

Developed and taught one of three courses at the summer school to ~60 PhD students, postdocs, and researchers from Europe, Asia, and North America. Gave five hours of lecture on computability and complexity results in enumerative combinatorics, together with two exercise sessions.

## Teaching Experience (University of Waterloo)

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Semester	Assignment (CS course #)	Duties
Winter 2015	Numerical Computation (370)	Marking and office hours
Fall 2014	Introduction to Computer Science 1 (115)	Ran labs, supervised upper year undergraduates teaching, marked

## Teaching Experience (Simon Fraser University)

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Semesters	Assignment (MATH course #)	Duties
Spring 2014	Combinatorial Theory (443/743)	Marking and covering lecture
Fall 2013	Complex Variables (322)	Tutorials and marking
Fall 2013	Measure Theory (425/725)	Marking
Spring 2013	Applied Discrete Mathematics (343)	Tutorials and marking
Spring 2013	Computer Algebra (401/819)	Marking
Fall 2011	Calculus Support Sessions	5 hours of tutorials a week for at risk students
Fall 2010 & Spring 2011	Applied Calculus Workshop	Workshop hours, marking, moderating discussion boards
Fall 2009 & Spring 2010	Algebra Workshop	Workshop hours, marking, preparing assignment solutions

## Teaching Certifications

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### University of Waterloo Fundamentals of University Teaching program

Optional certificate program, completed December 2016

Coursework:

- o Effective Lesson Plans
- o Teaching Methods
- o Giving Quality Feedback
- o Classroom Delivery Skills
- o Shaping Classroom Dynamics
- o Assessing and Improving Your Teaching

## Volunteer Experience

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### Reception House Waterloo Region

*Volunteer Tutor*

Volunteered as a tutor for newly arrived refugee high school students, teaching English, mathematics, history and the sciences.

**Kitchener, Ontario**

*January – June 2015*

### Simon Fraser University

*President, Mathematics Student Union*

**Burnaby, British Columbia**

*May 2010 – December 2011*



Ran events such as a 'Calculus Survival Night' to help prepare students for their first university exam, which regularly had more than 150 first year students in attendance. Gave lectures at local high schools designed to increase student's interest in mathematics (for instance, solving Sudoku using algebraic geometry).

## **Personal**

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- o Canadian and German citizenship (born in British Columbia)
- o Native English speaker, Intermediate French reading, speaking and oral comprehension