Stephen Melczer

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Academic Employment

CRM-ISM Postdoctoral Fellow, LaCIM *September 2019 – present*
Université du Québec à Montréal
- Supervisors: François Bergeron and Hugh Thomas

Postdoctoral Fellow, Department of Mathematics *July 2017 – August 2019*
University of Pennsylvania, Philadelphia
- Supervisor: Robin Pemantle

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

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)
- 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 *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

1. *Critical points at infinity for analytic combinatorics.* Y. Baryshnikov, S. Melczer and R. Pemantle. Submitted May 2019.
`http://arxiv.org/abs/1905.05250`

2. *Effective Coefficient Asymptotics of Multivariate Rational Functions via Semi-Numerical Algorithms for Polynomial Systems.* S. Melczer and B. Salvy. Submitted May 2019.
`https://arxiv.org/abs/1905.04187`

3. *Asymptotics of multivariate sequences in the presence of a lacuna.* Y. Baryshnikov, S. Melczer and R. Pemantle. Submitted May 2019.
`https://arxiv.org/abs/1905.04174`

4. *Counting partitions inside a rectangle.* S. Melczer, G. Panova and R. Pemantle. Submitted Feb 2019. [Extended abstract in Proc. FPSAC 2019, Séminaire Lotharingien de Combinatoire]
`https://arxiv.org/abs/1805.08375`

5. *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`

Publications

6. *Higher Dimensional Lattice Walks: Connecting Combinatorial and Analytic Behaviour.* S. Melczer and M. Wilson. Accepted to SIAM Journal on Discrete Mathematics September 2019.
`https://arxiv.org/abs/1810.06170`

7. *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.
`https://www.combinatorics.org/ojs/index.php/eljc/article/view/v26i2p16`

8. *Change of basis for $\mathfrak{m}$-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.
`https://doi.org/10.1145/3326229.3326268`
`http://arxiv.org/abs/1905.04614`

9. *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.
`http://dx.doi.org/10.1145/3313880.3313894`
`https://arxiv.org/abs/1806.03554`

10. *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`

11. *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`

12. *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`

13. *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

14. *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

15. *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

16. *Asymptotic lattice path enumeration using diagonals.* S. Melczer and M. Mishna. Algorithmica, Volume 75(4), 782–811, 2016. [Extended abstract in Proc. AofA 2014, DMTCS]
http://dx.doi.org/10.1007/s00453-015-0063-1
http://arxiv.org/abs/1402.1230

17. *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

18. *Singularity analysis via the iterated kernel method.* S. Melczer and M. Mishna. Combinatorics, Probability and Computing, Volume 23(5), 861–888, 2014. [Ext. abstract in FPSAC 2013, DMTCS]
http://dx.doi.org/10.1017/S0963548314000145
http://arxiv.org/abs/1303.3236

19. *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

Selected Honours and Awards

NSERC Postdoctoral Fellowship (PDF)	**Sept 2017 – Aug 2019**
Natural Sciences and Engineering Research Council of Canada (NSERC)	$90,000
Alexander Graham Bell Canada Graduate Scholarship (PhD)	**Sept 2014 – Aug 2017**
Natural Sciences and Engineering Research Council of Canada (NSERC)	$105,000
David R. Cheriton Graduate Scholarship	**Jan 2015 – Aug 2017**
Cheriton School of Computer Science, University of Waterloo	$26,666
President's Graduate Scholarship	**Sept 2014 – Aug 2017**
University of Waterloo	$30,000
Eiffel Excellence Scholarship	**Sept 2015 – May 2016**
French Ministry of Foreign Affairs	€11,200

C.D. Nelson Memorial Graduate Entrance Scholarship **Sept 2012 – Aug 2014**
Simon Fraser University $30,000

Alexander Graham Bell Canada Graduate Scholarship (MSc) **Sept 2012 – Aug 2013**
Natural Sciences and Engineering Research Council of Canada (NSERC) $17,500

Michael Smith Foreign Study Supplement **Sept 2012 – Dec 2012**
Natural Sciences and Engineering Research Council of Canada (NSERC) $5,500

Office for Science and Technology Research Award **Sept 2012 – Dec 2012**
Embassy of France in Canada $6,400

Governor General's Silver Medal (Top Undergraduate at SFU) **June 2012**

NSERC Undergraduate Student Research Award **May 2009/2010/2011**
Natural Sciences and Engineering Research Council of Canada (NSERC) $3 \times$ $4,500

Invited Conference, Workshop and Colloquium Talks

Asymptotic regime change for multivariate generating functions **March 2019**
Banff International Research Station (BIRS)
Workshop on Asymptotic Algebraic Combinatorics

Asymptotic regime change for multivariate generating functions **January 2019**
AMS / MAA Joint Math Meeting, Baltimore
AMS Special Session on Enumerative Combinatorics

An Invitation to Analytic Combinatorics in Several Variables **July 2018**
RISC / JKU Algorithmic and Enumerative Combinatorics Summer School
Research Institute for Symbolic Computation, Linz, Austria

Counting partitions inside a rectangle **May 2018**
Ontario Research Centre for Computer Algebra Annual Meeting
University of Western Ontario, London

Generating Functions: Theory, Algorithms, and Applications **April 2018**
Tutte Colloquium, University of Waterloo

Analytic Combinatorics in Several Variables: Applications and Effective Methods **January 2018**
AMS / MAA Joint Math Meeting, San Diego
AMS Special Session on Applied and Computational Combinatorics

Multivariate singularity analysis and hyperplane arrangements **November 2017**
Schrödinger Institute Program on Algorithmic and Enumerative Combinatorics, Vienna
Workshop on Computer Algebra in Combinatorics

Polynomial System Solving and Analytic Combinatorics in Several Variables **August 2017**
SIAM Conference on Applied Algebraic Geometry, Atlanta
New Trends in Polynomial System Solving and Applications Minisymposium

Diagonals, asymptotics, and lattice path enumeration **January 2016**
Journées de combinatoire de Bordeaux

Effective Analytic Combinatorics in Several Variables **September 2015**
Fields Institute Thematic Program on Computer Algebra, Toronto
Workshop on Symbolic Combinatorics and Computational Differential Algebra

Towards a Classification of Restricted Lattice Walks **August 2013**
SIAM Conference on Applied Algebraic Geometry, Fort Collins
Symbolic Combinatorics Minisymposium

Student Supervision

Keith Richie (Brown Math Undergrad & Presidential Scholar) **June – August 2019**
Higher order asymptotics and limit theorems for lattice path enumeration

Andrew Martin (Penn CS Undergrad) **June – August 2019**
Development of Julia code for multivariate asymptotics

Academic Service

AMS Mathematics Research Community Co-Organizer **Summer 2020**
Running program, *Combinatorial Applications of Computational Topology and Algebraic Geometry*, including conference to introduce math pure math postdocs and PhD students to combinatorics research. With Robin Pemantle and Marni Mishna.

ISSAC Poster Program Committee, Beijing, China **July 2019**
44th International Symposium on Symbolic and Algebraic Computation

SIAM Applied Algebraic Geometry Minisymposium Co-organizer, Bern **July 2019**
Symbolic Combinatorics (Contributed Minisymposium)
With Shaoshi Chen and Manuel Kauers

International Congress of Math. Software Program Committee, Notre Dame **July 2018**
Session Chair and Organizer, *Symbolic Combinatorics*

External Grant Reviewer for Polish National Science Centre **2018**
MAESTRO funding scheme (grant of $\approx$ \$950,000)

Penn Undergraduate Math Society Faculty Contact **2018–2019**
Helped facilitate events for undergraduate math students at Penn

BIRS Workshop Co-organizer, Banff, Alberta **September 2017**
Lattice walks at the Interface of Algebra, Analysis and Combinatorics
With Mireille Bousquet-Mélou, Marni Mishna and Michael Singer

SIAM Applied Algebraic Geometry Minisymposium Co-organizer, Atlanta **August 2017**
Symbolic Combinatorics (Contributed Minisymposium)
With Shaoshi Chen, Manuel Kauers and Michael Singer

FPSAC 2016 Organizing Committee, Vancouver, British Columbia **July 2016**
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:

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

Teaching Experience (University of Pennsylvania)

Semester	Assignment	Duties
Spring 2019	Grad 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)

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)

Summer School on Algorithmic and Enumerative Combinatorics **July 2018**

Developed and taught one of three courses at the summer school to ∼70 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)

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)

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

University of Waterloo Fundamentals of University Teaching program
Optional certificate program, completed December 2016
Coursework:

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

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

Drexel University Analysis Seminar	**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 Conference Presentations (* denotes poster)

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**
SFU Computational Math Day, Burnaby, British Columbia	**August 2011**
Canadian Discrete and Algorithmic Mathematics Conference (CanaDAM), Victoria	**June 2011**
PIMS Young Researchers Conference, Vancouver	**May 2011**
*UBC Rising Stars of Research, Vancouver	**August 2010**

Additional Research Experience

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

Additional Conference and Workshop Attendance

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

Personal

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