# Hannah Cairns


Contact information

Department of Mathematics and Statistics
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Research interests

Probability and applications of probability to analysis. Scaling limits of discrete models. Computational power of planar abelian networks.

Education

**McGill University**

Postdoctoral researcher, Mathematics, May 2023–ongoing

**Cornell University**

Visiting Assistant Professor, Jan 2023–May 2023

Ph.D. candidate, Mathematics, Sep 2013–Dec 2022

**Université de Genève**

SwissMAP master class in planar statistical physics, September 2015–June 2016

**University of British Columbia**

M.S. in Mathematics, Sep 2011–Dec 2013

*Ellipse Packing*: a shape packing theorem of Schramm can be used to get quasiconformal maps that approximately solve a variation of the Beltrami equation.

B.S. Honours in Mathematics, Sep 2007–Apr 2011

Papers

Cairns, H. (2022). The smash sum is the unique sum of open sets satisfying a natural list of axioms. To appear in the *Journal d'Analyse Mathematique*.

Cairns, H. (2021). Perron's Theorem in an Hour. *American Mathematical Monthly,* 128(8), 748–752. DOI: 10.1080/00029890.2021.1944755

Addario-Berry, L., Cairns, H., Devroye, L., Kerriou, C., & Mitchell, R. (2020). Hipster random walks. *Probability Theory and Related Fields,* 178, 437–473. Arxiv: 1909.07367

Cairns, H. (2018). Some halting problems for abelian sandpiles are undecidable in dimension three. *SIAM Journal on Discrete Mathematics,* 32(4), 2636–2666. Arxiv: 1508.00161

Preprints

Cairns, H., Ganguly, S., Levine, L. (2022). The critical sleep rate for activated random walk on the cycle with one chip per vertex. Current version: https://hannahcairns.info/files/activated-random-walk-on-full-cycle.pdf

Cairns, H. (2016) An acceleration and simplification of Ramachandran and Schild's algorithm for stabilizing sandpiles on trees. Explanation: https://hannahcairns.info/files/rsrs-explanation.pdf and code is at https://github.com/cairnsh/fast-tree-sandpile.

Teaching experience

**Postdoctoral researcher, McGill University**

Sep 2023–Dec 2023:
Teaching Math 141 (Calculus 2), covering integration methods and series.

**Visiting Assistant Professor, Cornell University**

Jan 2023–May 2023:
Taught Math 4740 (Stochastic Processes), covering discrete and continuous-time Markov chains, martingales, and a little bit of stochastic calculus.

**Teaching Assistant, Cornell University**

Jan 2022–Apr 2022:
Recitation sessions and grading for Kelly Delp, Math 1910 (Calculus for Engineers)

Sep 2021–Dec 2021:
Grading for Camil Muscalu, Math 6110 (Real Analysis)

Jan 2020–Apr 2021:
Grading for Lionel Levine, Math 6720 (Probability II) and Math 6710 (Probability I)

Sep–Dec 2016:
Grading two small courses:
Farbod Shokrieh, Math 6210 (Measure Theory and Lebesgue Integration) and Michael Nussbaum, Math 6740 (Mathematical Statistics II)

Jan–Apr 2015:
Grading for Birgit Speh, Math 3110 (Introduction to Analysis)

Sep–Dec 2014:
Grading for Camil Muscalu, Math 4130 (Honors Real Analysis I)

**Teaching Assistant, University of British Columbia**

Sep–Dec 2011, Sep 2012–Apr 2013: Grading:
Juan Souto (Linear Systems),
Yura Burda (Differential Calculus),
Gordon Slade (Probability with Physical Applications)

## Awards

Undergraduate awards:

Lorraine Schwartz Prize in Statistics and Probability
Reginald Palliser-Wilson Scholarship
G C Webber Memorial Prize
Trek Excellence Scholarship

Graduate awards:

Robert J Battig Graduate Prize for Excellence in Research

## Scholarships

2015–2016
Master class 2015/16 in planar statistical physics, SwissMAP

2014–2015, 2016–2017, 2020–2022
Teaching Assistantship at Cornell University

2013–2014
Research Training Group Graduate Assistantship at Cornell University

2011–2013
Faculty of Science Graduate Award at the University of British Columbia