

Patrick Naylor

Curriculum Vitae

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Research Interests:

Low dimensional topology: in particular, questions about 3- and 4-manifolds, knotted surfaces, and homotopy spheres

Employment

2021 – **Postdoctoral Research Fellow**, *Princeton University*

Education

2016 – 2021 **PhD, Pure Mathematics**, *University of Waterloo*
Thesis: Trisections of non-orientable 4-manifolds. Advised by Doug Park.

2015 – 2016 **MMath, Pure Mathematics**, *University of Waterloo*

2011 – 2015 **BSc Honours, Pure Mathematics**, *University of Manitoba*

Research Visits

Fall 2019 **Visiting Researcher**, *Max Planck Institute for Mathematics*

Fall 2018 **Visiting Student**, *University of Georgia*

Awards and Honours

2021 – 2023 **NSERC Postdoctoral Fellowship**, *Princeton University*

2022 **Governor General's Academic Medal – Gold**, *University of Waterloo*
Nationally recognized medal awarded to the doctoral student with the highest academic standing

2022 **Mathematics Doctoral Prize, First Place**, *University of Waterloo*
Awarded for outstanding academic achievement by a graduating student in the Faculty of Math

2021 **Ontario Graduate Scholarship**, *University of Waterloo*

2017 – 2020 **NSERC Alexander Graham Bell CGS-D Scholarship**, *University of Waterloo*
Awarded to top NSERC doctoral scholarship applicants

2016 – 2020 **President's Graduate Scholarship**, *University of Waterloo*

2018 **NSERC CGS-D MSFSS Scholarship**, *University of Waterloo*
Awarded to support research experience abroad

2018 **David Johnston International Experience Award**, *University of Waterloo*

2016 **NSERC CGS-M Scholarship**, *University of Waterloo*

2015 **Special Graduate Scholarship**, *University of Waterloo*

2013 & 2014 **Agnes Stewart Hart Award in Mathematics**, *University of Manitoba*
Awarded for high standing in an Honours Mathematics program

2013 **Faculty of Science Undergraduate Research Award**, *University of Manitoba*

- 2013 **Track & Field/Cross Country Athletic Award**, *University of Manitoba*
- 2012 & 2013 **President's Scholarship**, *University of Manitoba*
- 2011 **Canadian Association of Physicists Award**
Awarded for high performance on the CAP national physics contest
- 2011 **Governor General's Academic Medal – Bronze**, *Miles Macdonell Collegiate*
Awarded to the student with the highest overall standing

Papers and Preprints

8. **Doubling Gluck twists: a 5-dimensional approach**, with D. Gabai and H. Schwartz. In preparation.
7. **Multisections of 4-manifolds**, with G. Islambouli. arXiv:2010.03057. Submitted.
6. **Negacyclic weighing matrices**, with R. Craigen, C. Desmarais, and T. Eaton. Submitted.
5. **Trisections of non-orientable 4-manifolds**, with M. Miller. arXiv:2010.07433. To appear in the Michigan Mathematical Journal.
4. **Trisection diagrams and twists of 4-manifolds**. arXiv:1906.0149. *Comptes Rendus Mathématique* 360:845–866, 2022.
3. **Gluck twisting roll-spun knots**, with H. Schwartz. arXiv:2009.05703. *Algebraic & Geometric Topology* 22(2), 973–990, 2022.
2. **From automorphisms of Riemann surfaces to smooth 4-manifolds**, with A. Beyaz, S. Onaran, and D. Park. *Math. Res. Lett.* 27(3), 629–645, 2020.
1. **Testing bi-orderability of knot groups**, with A. Clay, and C. Desmarais. *Canad. Math. Bull.* 59(3), 472–482, 2016.

Organizational Activities

- Oct 2022 Co-organized “Special Session on Knotted Surfaces and Concordances” at the 2022 AMS Fall Western Sectional Meeting (with Mark Hughes and Maggie Miller)
- Apr 2022 Co-organized “Special Session on Knot Theory in Dimension Four,” at the virtual Joint Mathematics Meetings (with Jeffrey Meier and Maggie Miller).
- 2022 – Co-organizer of the Princeton Topology Seminar

Service and Extracurricular

- 2021 – **Scholarships & Fellowships Selection Committee**, *NSERC*
Committee for doctoral and postdoctoral scholarships in the Mathematical Sciences
- 2020 – **Contest Committee**, *CEMC, University of Waterloo*
Committee to develop difficult problems for internationally recognized math contests (~250,000 students enrolled yearly), organized by the Centre for Education in Math and Computing (CEMC)
- 2020 – **Problem of the Month Committee**, *CEMC, University of Waterloo*
Committee to generate difficult “problems of the month” for high school students across Canada
- 2020 – **Math Circles Presenter**, *CEMC, University of Waterloo*
Ran a variety of online and in-person math enrichment workshops for high school students

- 2020 **Camp Euclid Mentor**, *Euclid Lab*
Mentor for an online mathematical research-based summer program for talented high school students, organized by David Gay (University of Georgia)
- 2016 – **Contest Marker**, *CEMC, University of Waterloo*
Marker for high school math contests organized by the CEMC

Teaching and Mentorship

- Fall 2022 **Instructor**, *Princeton University*
MAT 203: Advanced Vector Calculus
- Summer 2022 **Mentor**, *Princeton University*
Supervised an undergraduate summer research project on enumeration of knotted surfaces
- Spring 2022 **Preceptor**, *Princeton University*
MAT 204: Advanced Linear Algebra with Applications
- Spring 2020 **Instructor**, *University of Waterloo*
Math 235: Linear Algebra 2 for Honours Math (Online)
- 2015 – 2021 **Teaching Assistant**, *Department of Pure Mathematics, University of Waterloo*
TA for a wide variety of undergraduate, graduate, and online math courses
- 2013 – 2015 **Teaching Assistant**, *Departments of Mathematics & Statistics, University of Manitoba*
TA for introductory mathematics and statistics courses

Selected Invited Talks

- Dec 2022 CMS Winter Meeting Topology Session, Toronto
- Nov 2022 Topology in Dimension 4.5, Banff International Research Station
- Sep 2022 Topology Seminar, Princeton University
- Jun 2022 New Developments in Four Dimensions (conference lightning talk), University of Victoria
- Apr 2022 Topology Seminar, University of Georgia
- Apr 2022 Topology Seminar, Binghamton University
- Jul 2021 Tech Topology Summer School (online lightning talk), Georgia Tech
- Mar 2021 Virtual Trisectors Seminar (online)
- Nov 2020 Topology Seminar, MIT (online)
- Oct 2020 AMS Special Session on Knotted Surfaces and Concordances (online)
- Sep 2019 Workshop on 4-manifolds (conference lightning talk), Max Planck Institute for Mathematics
- Jun 2019 CMS Summer Meeting Topology Session, University of Regina
- May 2019 Quantum Gravity Seminar, Perimeter Institute for Theoretical Physics
- Mar 2019 Joint Pure Math and C&O Graduate Student Colloquium, University of Waterloo
- Mar 2018 Geometry and Topology Seminar, McMaster University