Simons Center for Geometry and Physics
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Justin Kulp

Education and Academic Positions

2023–Present **Research Assistant Professor**, *Simons Center for Geometry and Physics & C.N. Yang Institute for Theoretical Physics*, Stony Brook, USA

Introduced homotopical descent techniques to general QFTs [5]. Studied discrete models of AdS/CFT correspondence in aperiodic systems [4]. Developed celestial and carrollian CFT dictionary for multiparticle states [3]. Initiated study of lightlike conformal defects [2]. Proved state-operator correspondence for non-relativistic CFTs [1]. Ongoing research also includes studies of categorical symmetries and analytic continuation of the path integral.

2019–2023 **PhD. Physics**, *University of Waterloo*, Canada

Perimeter Institute for Theoretical Physics, Resident PhD. Student.
Thesis Title: Topological Manipulations of Quantum Field Theories
Supervisors: Davide Gaiotto, Jaume Gomis.
Developed SymTFT formalism and applied it to construction of non-invertible defects, and bosonization and fermionization dualities [9-11]. Applied unitarity methods and CFT techniques to first finite coupling celestial CFT correlators [8]. Categorified supersymmetric index and revealed infinite dimensional symmetries in minimal BPS subsector of SQFTs [6,7].

2018–2019 **MSc. Physics**, *University of Waterloo*, Canada

Master's student in the Department of Physics at the University of Waterloo.
Essay Title: *Orbifolds, Anomalies, and Topological Field Theories*
Supervisor: Davide Gaiotto.

2018–2019 **Perimeter Scholars International**, *Perimeter Institute*, Canada

Student in Perimeter Scholars International at the Perimeter Institute for Theoretical Physics.

2013–2017 **HBSc. Mathematics and Physics Minor**, *Lakehead University*, Canada

Thesis Title: *Representation Theory and Quantum Mechanics*
Supervisor: Andrew J. Dean.
GPA: 99/100

Selected Honours and Awards

2024–2026 **NSERC Canada Postdoctoral Fellowship** ($70k/yr)

Nationally competitive postdoctoral research fellowship awarded by Natural Sciences and Engineering Research Council of Canada.

2020–2023 **NSERC Canada Graduate Scholarship - Doctoral** ($35k/yr)

Nationally competitive doctoral research scholarship awarded by Natural Sciences and Engineering Research Council of Canada on recommendation of the University of Waterloo.

2019-2020 **Traditional Fulbright Canada Student Award** ($20k)
Nationally and cross-disciplinary competitive scholarship for Canadian graduate students or professionals who wish to study and/or conduct research in the US. Declined award.

2017 **Canadian Governor General's Academic Silver Medal**
Awarded for having the highest average in an Honours Bachelor degree at a Canadian university.

Publications and Preprints

[1] Mathieu Boisvert, Shehab Hossam Fadda, Justin Kulp, and Ramtin M. Yazdi. "Revisiting Schrödinger CFTs: Factorization, Massless Particles, and a Path to the Bootstrap" (Oct. 2025). arXiv: 2510.26872 [hep-th].

[2] Rajeev S. Erramilli, Justin Kulp, and Fedor K. Popov. "Do null defects dream of conformal symmetry?" (Sept. 2025). arXiv: 2509.04578 [hep-th].

[3] Justin Kulp and Sabrina Pasterski. "Multiparticle states for the flat hologram". *JHEP* 08 (2025), p. 091. DOI: 10.1007/JHEP08(2025)091. arXiv: 2501.00462 [hep-th].

[4] Latham Boyle and Justin Kulp. "Holographic foliations: Self-similar quasicrystals from hyperbolic honeycombs". *Phys. Rev. D* 111.4 (2025), p. 046001. DOI: 10.1103/PhysRevD.111.046001. arXiv: 2408.15316 [hep-th].

[5] Davide Gaiotto, Justin Kulp, and Jingxiang Wu. "Higher Operations in Perturbation Theory" (Mar. 2024). arXiv: 2403.13049 [hep-th].

[6] Kasia Budzik, Davide Gaiotto, Justin Kulp, Brian R. Williams, Jingxiang Wu, and Matthew Yu. "Semi-chiral operators in 4d $\mathcal{N} = 1$ gauge theories". *JHEP* 05 (2024), p. 245. DOI: 10.1007/JHEP05(2024)245. arXiv: 2306.01039 [hep-th].

[7] Kasia Budzik, Davide Gaiotto, Justin Kulp, Jingxiang Wu, and Matthew Yu. "Feynman diagrams in four-dimensional holomorphic theories and the Operatope". *JHEP* 07 (2023). https://github.com/TwistedQFTs/laman-loopstrap, p. 127. DOI: 10.1007/JHEP07(2023)127. arXiv: 2207.14321 [hep-th].

[8] Diego García-Sepúlveda, Alfredo Guevara, Justin Kulp, and Jingxiang Wu. "Notes on resonances and unitarity from celestial amplitudes". *JHEP* 09 (2022), p. 245. DOI: 10.1007/JHEP09(2022)245. arXiv: 2205.14633 [hep-th].

[9] Ivan M. Burbano, Justin Kulp, and Jonas Neuser. "Duality defects in E_8". *JHEP* 10 (2022), p. 186. DOI: 10.1007/JHEP10(2022)187. arXiv: 2112.14323 [hep-th].

[10] Davide Gaiotto and Justin Kulp. "Orbifold groupoids". *JHEP* 02 (2021), p. 132. DOI: 10.1007/JHEP02(2021)132. arXiv: 2008.05960 [hep-th].

[11] Justin Kulp. "Two More Fermionic Minimal Models". *JHEP* 03 (2021), p. 124. DOI: 10.1007/JHEP03(2021)124. arXiv: 2003.04278 [hep-th].

[12] Hubert de Guise, Dylan Spivak, Justin Kulp, and Ish Dhand. "D-functions and immanants of unitary matrices and submatrices". *Journal of Physics A: Mathematical and Theoretical* 49.9 (Jan. 2016). arXiv: 1511.01851 [math-ph].

Invited Talks and Seminars

2025 **Revisiting Schrödinger CFTs**
– Institute for Advanced Study, CMP/QFT Group Meeting

2025 **Do null defects dream of conformal symmetry?**
– CERN, High Energy Theory Weekly Seminar
– University of Chicago, Leinweber Seminar
– Princeton University, High Energy Theory Seminar
– Harvard University, High Energy Theory Seminar

2025 **Null Defects and Non-Relativistic CFTs**
– University of Cincinnati, SPOCK Conference
– Perimeter Institute, Quantum Fields and Strings Seminar

2025 **Lectures on the BV Formalism**

2024–2025 **Twisted Tools for (Untwisted) Quantum Field Theory**
– ICTP, String Math 2024
– Harvard CMSA, Algebraic Geometry Seminar
– Perimeter Institute, Higher Categorical Tools for Quantum Phases of Matter
– Yale University, Geometry, Symmetry, and Physics Seminar
– Quiver Meeting
– University of Edinburgh, Physics Seminar
– CUNY, Physics Seminar
– Boston University, Weekly Mathematics Seminar
– University of Toronto, High Energy Theory Seminar
– Virgina Tech, High Energy Theory Seminar

2023–2025 **Self-Similar Quasicrystals and Hyperbolic Honeycombs**
– IHES, Séminaire de Physique Théorique
– Perimeter Institute, Quantum Fields and Strings Seminar
– University of Pennsylvania, High Energy Theory Seminar
– Simons Center for Gometry and Physics, Weekly Seminar
– Quantum Theories of Fields, Matter, and Strings
– University of British Columbia, High Energy Physics Seminar

2022 **Confinement and Holomorphic Twists of $\mathcal{N} = 1$ SYM**
– Harvard CMSA, Weekly Seminar
– Princeton Center for Theoretical Science, Simons Confinement Collaboration Inaugural Workshop
– Perimeter Institute, Quantum Fields and Strings Seminar
– Johns Hopkins University, High Energy Theory Seminar
– Institute for Advanced Study, PITP Gong Show

2022 **Quasicrystals and Decapods**
– Simons Center for Geometry and Physics, Generalized Global Symmetries, Quantum Field Theory, and Geometry
Selected talk and accompanying poster.

2022 **Holomorphic QFTs: Higher Structures and Bootstrap**
– University of Vienna, Strings 2022
Selected talk and accompanying poster. Gong show prize winner.

2022 **The $3d\ O(N)$ Model on the Celestial Circle**
– Princeton Center for Theoretical Science, Celestial Holography '22

2021–2022 **Duality Defects in E_8**
– Perimeter Institute, Global Categorical Symmetries
Invited talks and accompanying poster.

2021 **Topological Aspects of QFT**
– Perimeter Institute, PSI Seminar
Invited talk surveying role of topology in high energy physics.

2020 **Orbifold Groupoids**
– Harvard CMSA, Condensed Matter Seminar
– Perimeter Institute, Quantum Fields and Strings Seminar

2020 **Fermionization and Minimal Models**
– Perimeter Institute, Quantum Fields and Strings Seminar

2019 **Scattering in Chern-Simons Matter Theories**
– Perimeter Institute, Winter School
Discussed crossing-symmetry violation and scattering in Chern-Simons matter theories. Presented with Lorenzo di Pietro, Diego García, Jingxiang Wu, Matthew Yu, and Keyou Zeng.

2018 **Aperiodic Tilings in Physics**
– Perimeter Institute, PSI-minar
Introduction to quasicrystals and applications to AdS/CFT, topological insulators, and string compactifications.

2017 **Aperiodic Tilings: An Introduction**
– Lakehead University, Mathematics Colloquium
Introduction to aperiodic tilings and their defects.

2016 **Beta Testing ITk Modules**
– University of Toronto, ATLAS Canada Seminar
Discussed tests of ATLAS semiconductor detector. Presented with Nicholas Zutt.

2016 **Decays of the Higgs Boson**
– University of Toronto, HEPex Seminar
Overview of work investigating decays of the Higgs boson.

Academic Service and Volunteer Experience

2026
(Upcoming) **Conference Organizer**, *International Centre for Mathematical Sciences*, UK
Conference organizer for *Quasicrystals in Fundamental Physics*. Competitive application process; work included scheduling, making budgets, and securing additional funding through grants (from the Higgs Centre for Theoretical Physics).

2025 **Seminar Organizer**, *Simons Center for Geometry and Physics*, USA

2025 **Journal Club Organizer**, *Simons Center for Geometry and Physics*, USA

2024–Present **Journal Referee Communications in Mathematical Physics**, *Online*

2023–Present **Journal Referee SciPost**, *Online*

2022–Present	**Journal Referee JHEP**, *Online*
2022–Present	**Anomalology Moderator and Organizer**, *Online*
	Run and moderate the Anomalology community Discord server for "Global Categorical Symmetries," consisting of 300+ members, mainly graduate students, postdocs, and faculty. As well as organize and run the online Zoom seminar series and [YouTube channel](#).
2021–2023	**Science Faculty Council**, *University of Waterloo*, Canada
	Elected graduate student representative to university Science Faculty Council.
2020–2022	**PhysicsOH Community Contributor and Moderator**, *Online*
2019–2023	**Student Seminar Manager**, *Perimeter Institute*, Canada
2017–2018	**Visiting Graduate Student**, *Perimeter Institute*, Canada
	Supervised by Dr. Latham Boyle, Perimeter Institute for Theoretical Physics
	Studied AdS/CFT and "conformal quasicrystals." Computed packing densities of quasicrystals. Proved equivalencies between certain aperiodic tilings. Proved some important topological defects in quasicrystals cannot be classified by natural topological charges/invariants.
2017	**Research Assistant**, *Lakehead University*, Canada
	Supervised by Dr. Hubert de Guise, Department of Physics, Lakehead University
	Led research constructing $SU(N)$ "anticoherent states" and developed geometric representation for symmetrized $SU(N)$ states, generalizing known work on $SU(2)$.
2017	**Project Assistant**, *Lakehead University*, Canada
	Wrote labs and edited course notes for PHYS-2111 and PHYS-4113 at Lakehead University.
2016	**Lakehead University Annual Donor Reception**, *Lakehead University*, Canada
	Invited speaker on behalf of student body, spoke on topic of external donations and funding.
2016	**Student Researcher (NSERC USRA)**, *University of Toronto*, Canada
	Supervised by Dr. Robert Orr, Department of Physics, University of Toronto
	Tested trigger and detection system for semiconductor particle detector in ATLAS experiment. Prepared glue studies for ATLAS inner tracker.
2015	**Student Researcher (NSERC USRA)**, *University of Toronto*, Canada
	Supervised by Dr. Peter Krieger, Department of Physics, University of Toronto
	Analyzed faults in liquid argon forward calorimeter for the ATLAS experiment.
2014	**Research Assistant**, *Lakehead University*, Canada
	Supervised by Dr. Hubert de Guise, Department of Physics, Lakehead University
	Investigated "generalized determinants" of matrices and connections to Wigner D-functions.
2014–2017	**Math Contest Invigilator**, *Lakehead University*, Canada
	Northwestern Ontario High School Math Contest and Canadian Math Kangaroo Contest.
2014–2015	**Peer Tutor**, *Lakehead University*, Canada
	One-on-one and group tutoring in calculus, real analysis, and introductory physics.
2014–2015	**University Senator**, *Lakehead University*, Canada
	Student representative on Lakehead University Senate.
2014–2015	**University Academic Appeals Committee Member**, *Lakehead University*, Canada
	Student representative on Lakehead University Academic Appeals Committee.

Complete Honours and Awards

2024–2026 **NSERC Canada Postdoctoral Fellowship** ($70k/yr)

Graduate

2020–2023 **NSERC Canada Graduate Scholarship - Doctoral** ($35k/yr)

2020-2023 **University of Waterloo President's Graduate Scholarship** ($5k/yr)
Awarded to graduate students holding major federal/provincial competition-based scholarships.

2019-2020 **Traditional Fulbright Canada Student Award** ($20k)

2019 **University of Waterloo Marie Curie Award** ($883)

2018-2019 **NSERC Canada Graduate Scholarship - Masters** ($17.5k)
Nationally competitive master's research scholarship awarded by NSERC of Canada on recommendation of the University of Waterloo.

2018-2019 **University of Waterloo President's Graduate Scholarship** ($10k)

2018-2019 **Perimeter Scholars International Award** ($30k)
Awarded to attend Perimeter Scholars International at the Perimeter Institute.

Undergraduate

2017 **Canadian Governor General's Academic Silver Medal**

2017 **Lakehead University Dean's Medal for the Faculty of Science and Environmental Studies**
Awarded to the highest-ranking graduating student in Science and Environmental Studies.

2017 **Lakehead University Dean's Scholar Award for Mathematics**
Awarded to the highest-ranking graduating student in Mathematics.

2013–2017 **Lakehead University Presidential Scholarship** ($30k)
Awarded to up to two students each year for academic achievement and significant contributions to their school and community.

2013–2017 **C.D. Howe Scholarship Endowment Fund** ($22k)
Awarded for academic achievement, community, and extracurricular activities.

2013–2017 **Lakehead University Presidents List**
Awarded to eligible students who achieved a 90% or higher term average.

2013–2017 **Lakehead University Dean's List**
Awarded to eligible students who achieved a 80% or higher term average.

2017 **Department of Mathematical Sciences Award** ($500)
Awarded to a student for the highest average in mathematics at Lakehead University.

2016 **Quaestiones Naturales Article**
Interview highlighting my research at Lakehead University on *D-functions and immanants of unitary matrices and submatrices*. Featured in *Quaestiones Naturales* Volume 4, 2016.

2016 **NSERC Undergraduate Student Research Award Recipient** ($8k)
Nationally competitive undergraduate research scholarship awarded by NSERC of Canada on recommendation of the University of Toronto.

2016 **Department of Mathematical Sciences Award** ($100)

2015 **Dr. S. Penny Petrone Scholarship** ($2.1k)

2015 **NSERC Undergraduate Student Research Award Recipient** ($7.6k)
Nationally competitive undergraduate research scholarship awarded by NSERC of Canada on recommendation of the University of Toronto.

2014 **Lakehead University Bora Laskin Memorial Scholarship in Physics** ($650)
Awarded to a student based on academic performance and interest in physics.

2014 **Dr. S. Penny Petrone Scholarship** ($2k)