# HANK CHEN

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## EDUCATION AND RESEARCH EXPERIENCE

**University of Waterloo, Waterloo, Ontario**      *September 2019 —*
Doctorate in Applied Mathematics
Thesis (in preparation): *2-Hopf Algebras and Categorical Quantum Groups*

         Supervisor: Prof. Florian Girelli

Department of Applied Mathematics

**McMaster University, Hamilton, Ontario**      *September 2017 — September 2019*
Master in Physics
Thesis: *Topological Weyl Superconductivity*      Supervisor: Prof. Catherine Kallin
Department of Physics and Astronomy

**Simon Fraser University, Burnaby, British Colombia**      *September 2012 — August 2017*
Bachelor of Science, Mathematical Physics Honours.
Thesis: *Quantum Hall Edge States in Graphene in the Presence of Electron-Electron Interactions*
         Supervisor: Prof. Malcolm Kennett

Department of Physics

## TEACHING EXPERIENCE

**University of Waterloo**      *Jan. 2024 — May 2024*

- Math 138: Calculus II for Honours Mathematics

## TECHNICAL SKILLS

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| **Scientific Computing** | Mathematica, C++, MATLAB, Python, Fortran 95 |
| **Software & Tools** | MS Office, LaTeX, Beamer, GIMP |
| **Languages** | English, Taiwanese Mandarin, Japanese, Spanish, Finnish |

## INVITED TALKS AND SEMINARS

**Harvard CMSA Seminar**      Boston, USA (online)
*Winter 2024*      *Host: prof. Juven Wang*

· Title: "Categorical Quantum Groups and the 4d Kitaev Model".

**Geometry, Topology, and Physics Seminar**      Abu Dhabi, UAE (online)
*March 2024*      *Host: prof. Hisham Sati*

· Title: "Higher anomaly resolution from $L_\infty$-algebras".

**Atlantic Category Theory Seminar**      Halifax, Canada
*Nov. 2023*      *Host: prof. Theo Johnson-Freyd*

· Title: "Categorical Quantum Groups and Braided Monoidal 2-Categories".

**OSU Quantum Symmetries Seminar**      Columbus, USA
*Oct. 2023*      *Host: prof. David Penneys*

· Title: "Categorical Quantum Groups and Braided Monoidal 2-Categories".

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| **BIMSA Seminar on "Topological orders and category theory"** | Beijing, China (online) |
| *May 2023* | *Host: prof. Liang Kong* |

· Title: "Categorical Quantum Groups, Braided Monoidal 2-Categories and the 4d Kitaev Model".

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| **PI Grad Student Seminar** | Waterloo, Canada |
| *Apr. 2023* | |

· Title: "The 4d Kitaev Model".

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| **Lattice Seminar** | International (online.) |
| *Mar. 2023* | *Host: prof. Alex Bols* |

· Title: "Lieb-Schultz-Mattis theorem and the filling constraint".

## PUBLICATIONS AND PREPRINTS

**H. Chen** and J. Liniado (2024), *Higher gauge theory and integrability*      arXiv:2405.18625.

**H. Chen** and F. Girelli (2023), *Integrability from categorification and the 2-Kac-Moody algebra*
(submitted to Comm. Math. Phys.) arXiv:2307.03831.

**H. Chen** (2023), *Drinfel'd double symmetry of the 4d Kitaev model*
JHEP **2023**, 141.

**H. Chen** and F. Girelli (2023), *Categorical Quantum Groups and Braided Monoidal 2-Categories*
(submitted to Jour. Math. Phys) arXiv:2304.07398.

**H. Chen** and F. Girelli (2022), *Gauging the Gauge and Anomaly Resolution*
(submitted to Jour. Math. Phys.) arXiv:2211.08549.

**H. Chen** and F. Girelli (2022), *(2-)Drinfel'd Double and (2-)BF Theory*
Phys. Rev. D **106**, 105017.

**H. Chen** (2021), *Lieb-Schultz-Mattis Theorem and the Filling Constraint*
Lett. Math. Phys. **111**, 139.

**H. Chen**, M. R. C. Fitzpatrick, B. Roy, and M. P. Kennett (2020), *Interacting Quantum Hall states in a finite Graphene flake and at finite temperature*      Phys. Rev. B **102**, 205401.

## CONFERENCE PUBLICATIONS

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| **Quantum symmetries: Tensor categories, Topological quantum field theories, Vertex algebras** | Montréal, Canada |
| *Nov. 2022* | |

**H. Chen** (2023), *Categorical quantum groups, braided monoidal 2-categories and the 4d Kitaev model*
Invited submission to Proc. AMS: Contemporary Mathematics.

## CONFERENCE PRESENTATIONS AND POSTERS

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| **Integrability, Duality and Deformations** | Swansea, UK |
| *July 2024* | *Talk* |

· Title: A 3d topolgical-holomorphic integrable field theory.

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| **TQMMSP24** | Dresden, Germany |
| *July 2024* | *Poster* |

· Title: Generalized Lieb-Schultz-Mattis anomalies and constraints on the filling.

**Summer school on Symmetries and Anomalies**                    Paris, France
*June 2024*                                                              *Talk*

· Title: $L_\infty$-algebras and higher anomaly cancellation mechanism

**Ontario Graduate Mathematics Conference**                   Waterloo, Canada
*June 2024*                                                              *Talk*

· Title: 3d integrable field theory on 2-groups.

**BIRS Workshop on Subfactors and Fusion (2-)Categories**          Banff, Canada
*Dec. 2023*                          *Host: prof. Terry Gannon/Dave Pennys*

· Title: "The 4d Kitaev Model".

**NEAT MAPS miniconference**                            Boston, US (regional)
*Nov. 2023*                                                              *Talk*

· Title: "Categorical Quantum Groups and Braided Monoidal 2-Categories".

**PI Grad Student Conference**                                Waterloo, Canada
*Sept. 2023*                                                             *Talk*

· Title: "Integrability from categorification".

**Integrability, Dualities and Deformations**                      Durham, UK
*July 2023*                                                            *Poster*

· Title: "Integrability of bulk-boundary systems".

**QG2023**                                          Nijmegen, Netherlands
*July 2023*                                                            *Poster*

· Title: "Polyhedra 2.0; higher symmetries in quantum gravity".

**LOOPS'22**                                                      Lyon, France
*August 2022*                                                            *Talk*

· Title: "Categorified Phase Space and Spinning Geometries".

## WORKSHOP PARTICIPATION

**Summer school on Symmetries and Anomalies**                    Paris, France
· June 2024.

**Spring school on TQFTs**                                   St. John's, Canada
· May 2024.

**BIRS Workshop on Subfactors and Fusion (2-)Categories**          Banff, Canada
· Dec. 2023.

**Spring school on TQFTs**                                    Dalhousie, Canada
· May 2023.

**MagLab Theory Winter School on Weyl Semimetals**          Tallahassee, Florida

· Jan. 2019.

## ACADEMIC ACHIEVEMENTS AND AWARDS

Fall 2022 – Fall 2023: OGS/QEII-GSST Scholarship holder.

Spring 2016 Deans Honour Roll.

Fall 2015 Deans Honour Roll.

## LEADERSHIP EXPERIENCE

### University of Waterloo

- SHORT Project mentor for undergrad students applying to doctoral positions (Aug. 2023 — ).
- Applied Math department representative for Graduate Studies Endowment Fund Committee (Mar. 2021 — Mar. 2023).

### McMaster University

- Member of Graduate Liason Committee (Sep. 2017 — Sept. 2019).
- Member of Recruitment and Outreach Committee (Sep. 2018 — Sept. 2019).
- Member of Theory Journal Club (Sep. 2017 — Sept. 2019).
- Volunteer greeter at GSA Welcome Breakfast (Sep. 2018).

### Simon Fraser University

- First violinist and soloist in SFU Chamber Orchestral club.
- Member of SFU Hiking club.