

# Curriculum Vitae

## Personal Data

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Name	Kam To Billy Sievers (formerly KTB Chan)
Residence	Hamilton, Ontario, Canada
Nationality	Citizen of Canada, Hong Kong SAR (China), and Thailand
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## Education

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current	<b>Doctor of Philosophy, Dept. of Physics and Astronomy</b> , McMaster University.
2023	<b>Master of Science in Physics</b> , Memorial University of Newfoundland, GPA: 4.0/4.0
2020	<b>Bachelor of Science (First Class Honours) in Physics.</b> , University of Calgary, GPA: 3.6/4.0

## Research Interests

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Quantum gravity, black holes, black hole thermodynamics, AdS/CFT correspondence, black hole mergers (numerical simulations and analytical approximations), numerical spectral analysis, finite difference techniques, Monte-Carlo techniques.

## Publications

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- [1] K. T. B. Sievers, L. Newhook, S. Muth, I. Booth, R. A. Hennigar, H. K. Kunduri, Marginally Outer Trapped Tori in Black Hole Spacetimes, *Phys. Rev. D* 109, 124023 (2024).
- [2] I. Booth, K. T. B. Chan, R. A. Hennigar, H. Kunduri, and S. Muth, Exotic marginally outer trapped surfaces in rotating spacetimes of any dimension, *Class. Quant. Grav.* 40, 095010 (2023).
- [3] R. A. Hennigar, K. T. B. Chan, L. Newhook, and I. Booth, Interior marginally outer trapped surfaces of spherically symmetric black holes, *Phys. Rev. D* 105, 044024 (2022).

## Scholarships & Academic Awards

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2023 – 2026	<b>NSERC PGS-D Award</b> , held at McMaster University, <b>\$21 000 CAD</b> per year.
2023 – 2027	<b>Graduate &amp; Research Scholarship</b> , McMaster University, <b>\$16 000 CAD</b> per year. Includes ~\$12 000 CAD earned in Teaching Assistantship.
2021 – 2022	<b>Fellow of the School of Graduate Studies</b> , Memorial University, Awarded to the top 10% of graduate students on academic merit.
2020 – 2022	<b>SGS Baseline Funding</b> , Memorial University, <b>\$6 500 CAD</b> per year.
2016, 2017, 2018, 2019	<b>International Entrance Scholarship</b> , University of Calgary, <b>\$15 000 CAD</b> per year.

## Selected Coursework

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McMaster University: Adv. Quantum Mechanics I&II (Intro. to QFT), Asymptotic Analysis.

Memorial University: Quantum Information and Computing, Differential Manifolds & Riemannian Geometry, Advanced General Relativity, Group Theory.

University of Calgary: Advanced Classical Mechanics, Electrodynamics, Computational Physics I, II, & III  
Above listed graduate-level courses were credited towards Ph.D., M.Sc., and B.Sc. programs, respectively.

## Research Experience

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2023 – current	<b>Graduate Research Assistant</b> , Theoretical Physics Group, McMaster University Supervisor: Dr. Hari Kunduri
2020 – 2023	<b>Graduate Research Assistant</b> , Gravity Group, Memorial University Supervisor: Dr. Ivan Booth Associates and Mentors: Dr. Robie A. Hennigar, Dr. Hari Kunduri Project Information: The investigation of self-intersecting marginally outer-trapped surfaces continues with projects that test the phenomenon with regards to black holes with different parameters, such as charge or rotation. Roles: My roles involved finding numerical solutions to problems posed by the project, contributing to the authorship of publications [1] and [2], the mentorship of undergraduate students in the research group, and dissemination of the group's results through conference and invited seminar presentations.
2019 – 2020	<b>Undergraduate Honours student</b> , University of Calgary Supervisor: Dr. Sean Stotyn, University of Calgary

## Theses

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2023	<b>Masters Thesis</b> Title: Self-Intersecting Marginally Outer-Trapped Surfaces in Black Holes Supervisor: Ivan Booth, Memorial University of Newfoundland Synopsis: Self-intersecting marginally outer-trapped surfaces (MOTSs) play a key role in binary black hole mergers [Pook-Kolb, Birnholtz, Krishnan, Schnetter]. With the same phenomenon appearing inside the Schwarzschild black hole [Booth, Hennigar, Mondal], extending the investigation to black holes with inner horizons yields exotic correlations between the intersecting-behaviour and the stability of the inner horizon. Parts of this work have been published.
2020	<b>Undergraduate Honours Thesis</b> Title: Near Horizon Geometries as Tangent Spacetimes and their Relation to Extremal Black Hole Entropy Supervisor: Sean Stotyn, University of Calgary Synopsis: Continuing from Stotyn's <i>A Tale of Two Horizons</i> (2015), the goal is to investigate the Ginsparg-Perry limiting procedure and show that near horizon geometries are tangent spacetimes whose global properties are a misrepresentation of the parent spacetime. This work is will be drafted together with extended works for publication.

## Employment History

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2023 – current	<b>Graduate Teaching Assistant</b> Employer: Dept. of Physics and Astronomy, McMaster University.
2020 – 2022	<b>Graduate Teaching Assistant</b> Employer: Dept. of Physics and Physical Oceanography, Memorial University. Courses: Introductory Physics I & II (lab staff member, Fall 2021 & Winter 2022), General Physics I (remote lab staff member, Winter 2021), Physics of Device Materials (remote marker, Fall 2020). Description: One of six staff members leading and marking weekly laboratory sessions for approximately 200 students across four sessions. Marked assignments and assembled assignment answer keys.
2017 – 2020; 2022 – 2023	<b>Tutor, Instructor and Instructors' Team-Lead</b> Employer: MathPro Learning Centre, 23-41 Chelsea St NW, Calgary AB. Description: Employed for one-on-one tutoring of high school mathematics and physics, developed and managed an extracurricular coding camp.
2020	<b>Undergraduate Teaching Assistant</b> Employer: Dept. of Physics and Astronomy, University of Calgary. Courses: Introductory Electromagnetism, and Thermal Physics (lab instructor, Winter 2020); Modern Physics (assignment and assessment marker, Winter 2020). Description: One of two laboratory instructors for an introductory physics lab section, answering questions and marking lab reports for a section of approximately 20 students. Also fulfilled marking duties for a major-stream modern physics course.

## Students Mentored

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Students were funded and entrusted to by Ivan Booth.

- **Liam Newhook** (B.Sc. Physics) – summer intern 2021 & 2022, honours thesis 2021-2022, manuscript publication [1], Memorial University of Newfoundland.
- **Zachary K. Hoyles** (B.Sc. Physics) – summer intern 2022, Memorial University of Newfoundland.

## Computer Skills

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Python: Computational Physics courses have covered the implementation of numerical methods and data handling in Jupyter notebooks. Notable topics include machine learning, finite difference methods, discrete Fourier analysis, and Monte-Carlo techniques. These skills were vital assets in the development of [1-3].

Others: Mathematica 13 (RGTensor), Maple 2021 (GRTensorIII), L<sup>A</sup>T<sub>E</sub>X, Java, MATLAB.

## Affiliations, Leadership, and Community Service

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**Classical and Quantum Gravity (CQG)** (2023),

*Referee* – served as a co-reviewer in the peer-review process

**McMaster Astronomy & Physics Student Association (MAPSA)**, (2023 – current)

*Condensed Matter High-Energy and Theory Representative*

**Canadian Association of Physicists** (May 2021 – current), *Graduate-student member*

**Rothney Astrophysical Observatory**, University of Calgary (2016-2019, 2022-2023)

*Volunteer* – telescope operator during open-house nights.

**Graduate Physics Society**, Memorial University (2020-2022)

*Member* – involved in most society activities.

**Dept. of Physics and Astronomy**, University of Calgary (2016-2019)

*Volunteer* – involved yearly in the department's outreach event *Rollercoasterology*.

*Club executive* – VP Events (2017-2018) of the Physics & Astronomy Students' Association (PASA).

## Conferences, Symposia, & Seminars

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2023	<p>Title: Self-intersecting surfaces in black holes</p> <p>Type: Conference talk (~15mins)</p> <p>at <b>8th Annual PHAS symposium</b>, University of Calgary, Canada.</p> <p>at <b>Theory Canada 15</b>, Mount Allison University, Canada.</p> <p>at <b>Canadian Association of Physicists Congress 2023</b>, UNB, Canada.</p>
2022	<p>Title: Self-intersecting marginally outer trapped surfaces in black holes</p> <p>Type: Seminar (~1 hr)</p> <p>at <b>Max Plank Institute for Gravitational Physics Seminar</b>, AEI Hannover, Germany.</p> <p>at <b>Relativity Seminar of the Institute of Theoretical Physics</b>, recording available (<a href="#">link</a>), Charles University, Czech Republic.</p> <p>at <b>Institut de Ciències del Cosmos</b>, University of Barcelona, Spain.</p> <p>at <b>Dept. of Physics and Physical Oceanography M.Sc. Seminar</b>, Memorial University, Canada.</p> <p>Type: Conference Talk (~15 mins)</p> <p>at <b>Canadian-Cuban-American-Mexican 2022 Conference</b>. Awarded: Feedback award</p> <p>at <b>Canadian Association of Physicists Congress 2022</b>, McMaster University, Canada.</p> <p>at <b>Atlantic General Relativity Meeting 2022</b>, Memorial University, Canada.</p> <p>Awarded: B.Sc./M.Sc. Student Talk – 2nd Place.</p>
2021	<p>Title: The many MOTS of the Schwarzschild spacetime</p> <p>Type: Conference Talk (~15 mins)</p> <p>at <b>Canadian Association of Physicists Virtual Congress 2021</b>, Canada.</p> <p>at <b>Atlantic General Relativity Meeting 2021 (online)</b>, Bishop's University, Canada.</p> <p>at <b>Canadian Student &amp; Postdoc Conference on Gravity</b>, Memorial University, Canada.</p> <p>Awarded: Best M.Sc. Student Talk – 1st Place.</p>

## Travel

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*Spain*: Hosted by Dr. Robie A. Hennigar at the Institut de Ciències del Cosmos, University of Barcelona, I was invited to give a seminar talk on the results of [1].

*Czech Republic*: Hosted by Dr. David Kubiznak at the Institute of Theoretical Physics, Charles University, I was invited to give a seminar talk on the results of [1].

*Germany*: Hosted by Dr. Daniel Pook-Kolb at the Max Plank Institute for Gravitational Physics, AEI Hannover, I was invited to give a seminar talk on the results of [1].

## Languages

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Fluent in English, basic knowledge of Cantonese and Thai.