Curriculum Vitae | Kaleb Ruscitti

Education:

MSc Mathematics, McGill University. Expected Graduation: August 2023
Supervisor: Jacques Hurtubise

Honours BSc Mathematical Physics, University of Waterloo. Conferred: May 2021

Research Experience:

2021/9 – Current | Master's Thesis
Mathematics and Statistics Dept., McGill University

- Studying the quantization of the moduli space of connections on a Riemann surface. I hope to complete a proof of the Verlinde formula for the dimension of the sections of a prequantum line bundle in the case of SU(2) gauge theory.

2020/9 – 2020/12 | Undergraduate Thesis
Dept. of Physics and Astronomy, University of Waterloo

- Constructed one-parameter families of co-Higgs bundles on the Riemann sphere using the eigenvector bundle of time-dependent matrices which solve the Lax equation.

2020/5 – 2020/8 | Undergraduate Research Assistant
Pure Mathematics Dept., University of Waterloo

- Studied complex geometry and vector bundles over Riemann surfaces. Learned about Higgs and co-Higgs bundles, basic algebraic geometry, and gauge theory.

2019/5 – 2019/8 | Undergraduate Research Assistant
Énergie Matériaux Télécommunications, Institut national de la recherche scientifique (INRS)

- Developed a technique to quantify the robustness of optimal solutions found by the lab's optimization algorithm for optical processing experiments. The technique involved looking at the spectrum of the Hessian matrix of the fitness function.

2019/1 – 2019/4 | Undergraduate Research Assistant
Institute for Quantum Computing, University of Waterloo

- Designed and assembled a device to measure high-frequency electric fields in a vacuum system. Exploiting second harmonic generation, the device can obtain both amplitude and phase data.

2018/1 – 2018/4 | <u>Undergraduate Research Assistant</u>
Institute for Quantum Computing, University of Waterloo

- Recreated former research to assemble a Hamiltonian engineering device. Specifically, an optical system which takes an input laser beam and produces a desired output electromagnetic cross-section, used for addressing ions in an ion trap quantum simulator.

Funding Awarded:

<u>Graduate Excellence Award</u> ($3,300) – Awarded by McGill University upon entry.

<u>NSERC Undergraduate Student Research Award</u> ($6,000, competitive) – Awarded three times:

1. 2020/5 – 2020/8, Supervised by Ruxandra Moraru at the University of Waterloo.
2. 2019/5 – 2019/8, Supervised by Roberto Morandotti at the INRS.
3. 2019/1 – 2019/4, Supervised by Raffi Budakian at the University of Waterloo.

<u>University of Waterloo President's Scholarship</u> ($2,000) – Awarded upon entry by University of Waterloo.

<u>Confucius Institute Scholarship</u> ($1,000) – Awarded by the Confucius Institute at University of Waterloo.

Conference Presentations:

<u>Adaptive Optics for Ion-Addressing in an Ion Trap Quantum Simulator</u>

Physics Undergraduate Conference (PhUnC), 2018, London ON, Canada.

Teaching and Mentoring History:

<u>Teaching Assistant</u> – Wrote and gave tutorials, graded, and held 2 office hours per week in Winter 2022 for Calculus 2 and in Fall 2022 for Calculus 3.

<u>Directed Reading Program</u> – Provided one-on-one mentoring to an undergraduate student to complete an expository report on the linearized gravity approximation and gravitational waves.

Other Relevant Skills:

<u>Computing</u> –Proficient programming, symbolic and numeric computing, comfortable in UNIX, basic server administration and networking.

<u>Language</u> – In addition to native English, a working proficiency in French and basic Mandarin.

<u>Communication</u> – Comfortable giving research presentations, writing reports and confident communicating research to other scientists or to laypeople.

<u>Collaboration</u> – Excellent teamwork, comfortable in leadership roles and with conflict resolution.