

# Ryan D. Plestid

Ph.D Candidate

Department of Physics & Astronomy

McMaster University

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## Education

- **McMaster University** Hamilton, ON  
Ph.D. Physics – Supervisor: Duncan O’Dell. 2015 - Present
- **McMaster University** Hamilton, ON  
M.Sc. Physics – Supervisor: Itay Yavin. 2013 - 2015
- **University of Guelph** Guelph, ON  
B.Sc. Theoretical Physics. 2009 - 2013

## Research Interests

I study the phenomenology of quantum field theories, ranging from many body physics with ultra cold atoms, to searches for physics beyond the Standard Model at colliders and neutrino experiments. My work is heavily influenced by ideas from effective field theory and the renormalization group. I enjoy working at the intersection of multiple fields, and finding old physics in new places using a blend of analytic and numerical methods.

## Pre-Prints

- **Bright Solitons Sustained by Long-Range Interactions in a System of Quantum Rotors** in prep.  
Ryan Plestid, D.H.J. O’Dell (arXiv:1810.02420). Oct. 2018
- **Millicharged Particles in Neutrino Experiments.** acc. to PRL  
Gabriel Magill, Ryan Plestid, Maxim Pospelov, Yu-Dai Tsai (arXiv:1806.03310). Jun. 2018

## Publications

- **Dipole Portal to Heavy Neutral Leptons.** Phys. Rev. D. **98**  
Gabriel Magill, Ryan Plestid, Maxim Pospelov, Yu-Dai Tsai Dec. 2018
- **Effective Field Theory of Black Hole Echoes.** JHEP 2018:09  
C.P. Burgess, Ryan Plestid, Markus Rummel. Sept. 2018
- **Fall to the Centre in Atom Traps and Point-Particle EFT for Absorptive Systems.** JHEP 2018:08  
Ryan Plestid, C.P. Burgess, D.H.J. O’Dell. Aug. 2018
- **Violent Relaxation in Quantum Fluids with Long-Range Interactions.** Phys. Rev. E. **98**  
Ryan Plestid, Perry Mahon, D.H.J. O’Dell. July 2018
- **Probing New Charged Scalars with Neutrino Trident Production.** Phys. Rev. D. **97**  
Gabriel Magill, Ryan Plestid. Mar. 2018
- **Neutrino Trident Production at the Intensity Frontier.** Phys. Rev. D. **95**  
Gabriel Magill, Ryan Plestid. Apr. 2017
- **The Consequences of an Abelian  $Z'$  for Neutrino Oscillations and Dark Matter.** Phys. Rev. D. **93**  
Ryan Plestid. Feb. 2016

## Invited Talks

- **Condensed Matter Theory Seminar** Harvard  
Point Particle Effective Field Theory with a Side of Cold Atoms *Jan. 2019*
- **Perspectives on the Near Detector at DUNE** Fermilab  
Dipole Portals to Heavy Neutral Leptons at DUNE *Dec. 2018*
- **Particle Physics Seminar** Northwestern  
Dipole Portals and Millicharges: New Physics with Neutrino Detectors *Nov. 2018*
- **SBN Analysis Meeting** Fermilab  
Signatures of a Dipole Portals at the Intensity Frontier. *Nov. 2018*
- **UKY Nuclear Seminar** U. Kentucky  
Neutrino Portals to New Physics *Nov. 2018*
- **COFI Seminar** Online  
Neutrino Portals to New Physics. *Oct. 2018*
- **NPI Microseminar** NPI, Rez  
Point Particle Effective Field Theory as a Tool for Singular Potentials. *Aug. 2018*
- **Scientific Computing Seminar** Fields Institute  
Computational Problems in the Bosonic Hamiltonian Mean Field Model. *Mar. 2016*

## Conference Presentations

- **Small to Medium Sized Cold Atom Systems** Benasque  
Oral: A Single Atom Platform for Quantum Anomalies. *Aug. 2018*
- **International Conference of Atomic Physics** Barcelona  
Poster: Violent Relaxation in Long-Range Interacting Quantum Fluids. *July 2018*
- **APS March Meeting** Los Angeles  
Oral: Quantum Phase Diagram of the Hamiltonian Mean Field Model. *Mar. 2018*
- **55<sup>th</sup> WNPPC Meeting** Mont Tremblant  
Oral: Prospects for Rare Neutrino Physics at the Intensity Frontier. *Feb. 2018*
- **Coherent Quantum Dynamics 2017** OIST, Okinawa  
Poster: Quantum Dynamics of the Hamiltonian Mean Field Model. *Sept. 2017*
- **Young Atom Opticians** ENS, Paris  
Oral : Using Cold Atoms to Study Singular Potentials in the Lab. *July 2017*
- **APS Division of Atomic, Molecular, and Optical Physics Meeting** Sacramento  
Oral : Quantum Dynamics in the Hamiltonian Mean Field Model. *June 2017*
- **Conference on Long-Range-Interacting Many Body Systems** ICTP, Trieste  
Poster : Quantum Dynamics in the Hamiltonian Mean Field Model. *July 2016*
- **Phenomenology Symposium** U. Pittsburgh  
Oral: Sterile Neutrinos in the Presence of a Gauged Flavour Symmetry. *May 2016*

## Awards, Grants & Honours

Azrieli Fellowship—Declined (NIS 145 000) . . . . .	2019-2020
NSERC Postgraduate Doctoral Scholarship (CAD 42 000) . . . . .	2017-2019
Neutrino Theory Network Fellowship (USD 7 500) . . . . .	2018
CQD Travel Bursary (¥75,000 ) . . . . .	2017
Fields Institute Travel Stipend (CAD 100 ) . . . . .	2017
APS FGSA Travel Grant (USD 500 ) . . . . .	2017
APS DAMOP Travel Grant (USD 600 ) . . . . .	2017
Ontario Graduate Scholarship (CAD 15 000) . . . . .	2016-2017
ICTP Travel Bursary (€450) . . . . .	2016
Clifton W. Sherman Award for Academic and Research Achievement . . . . .	2015-2017
Ontario Graduate Scholarship (CAD 15 000) . . . . .	2015-2016
Ontario Graduate Fellowship (CAD 12 000) . . . . .	2014-2015
Ontario Graduate Scholarship (CAD 15 000) . . . . .	2013-2014

## Summer Schools and Workshops

- **Coherent Quantum Dynamics 2017** OIST, Okinawa  
Student *Sept. 2017*
- **Summer School on Dispersive Non-Linear PDEs** Fields Inst.  
Student *Aug. 2017*
- **Computation of Quantum Systems in Cold-matter Physics and Chemistry** Fields Inst.  
Participant *Feb. 2016*
- **Tri-Institute School for Elementary Particles** Perimeter Inst.  
Student *June 2014*
- **Tri-Institute School for Elementary Particles** SNOLAB  
Student *June 2014*

## Other Research Experience

- **Affiliate Graduate Student** Perimeter Institute  
Host: Cliff Burgess *Sept. 2013–Present*  
Collaborated with researchers at PI on projects involving neutrino physics and effective field theory.
- **Visiting Researcher** U. Victoria  
Host: Maxim Pospelov *Feb. 2019*  
Studied possibilities for new physics at neutrino experiments and B-factories.
- **Visiting Researcher** Fermilab/U. Kentucky  
Host: Richard Hill and Susan Gardner *Nov.–Dec. 2018*  
Soft collinear effective theory treatment of radiative corrections to lepton scattering in a Coulomb field.
- **Visiting Researcher** Weizmann Institute of Science  
Host: Ulf Leonhardt *May–June 2016*  
Studied analog Hawking radiation in the context of non-linear optics.

## Technical Skills

- **Programming**
  - Proficient in Python, C, Mathematica, procedural and object oriented programming.
- **Classical field simulations**
  - Numerically solving non-linear integro-differential equations. Monte Carlo sampling initial conditions.
- **Quantum Field Theory**
  - Diagrammatic methods, renormalization group, non-Abelian gauge theory, effective field theory.
- **Asymptotic Analysis**
  - Method of multiple scales, steepest descent, matched asymptotics, dominant balance, resummation.

## Teaching Experience

- **Physics Help Centre** McMaster University  
*Jan. 2015 - Apr. 2018*
  - Taught key concepts, and helped develop problem solving skills.
- **Intro. to General Relativity** McMaster University  
*Jan. 2017 - Apr. 2017*
  - Teaching Assistant: Held seminars, and office hours.
- **Intro. to Quantum Field Theory (Grad Level)** McMaster University  
*Sept. 2014 - Dec. 2014*
  - Teaching Assistant: Held seminars, and office hours.
- **Intro. Physics** McMaster University  
*Sept. 2013 - Present*
  - Teaching Assistant: Held tutorials, graded exams

## Service & Outreach

- **Math Educator** Sir Wilfrid Laurier Elementary School  
*2018 - present*
  - Organize “Math Club” for grade 7 & 8 students.
- **Alumni Night Lead Organizer** McMaster University  
*2018 - present*
  - Developed inaugural departmental alumni event.
- **Graduate Colloquium Spokesperson** McMaster University  
*2017 - present*
  - Relay graduate students’ recommendations for colloquium speakers.
- **Member of Liaison Committee** McMaster University  
*Sept. 2014 - Present*
  - Help recruit new graduate students. Graduate student advocacy.
- **Theoretical Physics Journal Club** McMaster University  
*Jan. 2015 - present*
  - Founder and organizer.
- **Science on Tap** Hamilton  
*Mar. 2018*
  - Master of ceremonies.