CCUWIP

2022

UPWARDS AND ONWARDS

GRADUATE SCHOOL FAIR

Saturday, January 22nd

16:00 – 17:30 (EST)

GRADUATE SCHOOL FAIR PARTICIPANTS

CCUWIP 2022
BEYOND THE STANDARD MODEL

CONCORDIA UNIVERSITY

CCUWIP 2022
BEYOND THE STANDARD MODEL

Programs available and length of program

Although we are offering degrees in "Physics", our faculty members conduct research and supervise graduate students in the fields of Condensed Matter Physics (theoretical and experimental), Biophysics, Medical Physics, Theoretical Particle Physics, Physics Education, Photonics, Computational Physics, etc.

MSc in Physics (including biomedical physics) - 2 years
Contact: A. Champagne (GPD) or any faculty sought after as supervisor
https://www.concordia.ca/academics/graduate/physics-msc.html

Our MSc in Physics is focused on research, complemented by a few advanced courses, which examine the fundamental and applied concepts of physics or biomedical physics. We cultivate strong student-supervisor relationships. Our faculty have expertise in condensed matter physics, human biomedical physics, molecular biophysics, computational physics, physics education, theoretical particle physics, etc.

M.Sc. in Nanoscience and Nanotechnology - 2 years - program opening in the Fall 2022.
Contact: P. Bianucci or any faculty sought after as supervisor
https://www.concordia.ca/academics/graduate/calendar/current/interfaculty-programs/nanoscience-and-nanotechnology-msc-masc.html

A research-based joint program between Faculty of Arts and Science and Gina Cody School of Engineering. The student should apply through the respective department and will be co-supervised by science and engineering faculty.

PhD in Physics (including biomedical physics) - 4 years
Contact: A. Champagne (GPD) or any faculty sought after as supervisor
https://www.concordia.ca/academics/graduate/physics-phd.html

Our PhD in Physics is focused on research, complemented by a few advanced courses, which examine the fundamental and applied concepts of physics or biomedical physics. We cultivate strong student-supervisor relationships. Our faculty

have expertise in condensed matter physics, human biomedical physics, molecular biophysics, computational physics, physics education, theoretical particle physics, etc.

Application deadlines

- For September Start: March 1. International candidates are encouraged to apply earlier.
- For January Start: August 1. International candidates are encouraged to apply earlier.
- Although one cannot directly apply for May start, Fall applications may be modified this way.

Admission Requirements

- Honours or specialization degree in Physics or related field, GPA 3 and above.
- Proficiency in English. Applicants whose primary language is not English must demonstrate that their knowledge of English is sufficient to pursue graduate studies in their chosen field. Please refer to the English language proficiency page for further information on requirements and exemptions.

Funding

Our students on average receive $22,000 (before tuition) per annum including TA, RA and various awards. Support will be provided to international students to maintain tuition expenses at the level of the Quebec residents.

Links

Graduate admissions:
https://www.concordia.ca/admissions/graduate.html

Research:
https://www.concordia.ca/artsci/physics/research.html

More details about our graduate programs:
https://www.concordia.ca/artsci/physics/programs/graduate.html

Faculty members / potential supervisors:
https://www.concordia.ca/artsci/physics/about/faculty.html
Currently hiring three more faculty members.

Some positions (not full list, please contact professors whose research is of interest to you):
https://www.concordia.ca/artsci/physics/about/open-positions.html

- Ultrasound-triggered microbubble vibration physics towards enhanced local drug delivery
  Prof. Brandon Helfield, brandon.helfield@concordia.ca
  https://www.concordia.ca/content/dam/artsci/physics/documents/open_position_announcements/helfield_phd-2021.pdf

- Topological nanowire lasers
  Prof. Pablo Bianucci, pablo.bianucci@concordia.ca
  https://www.concordia.ca/content/dam/artsci/physics/documents/open_position_announcements/bianucci_phd_msc-2021_topological_lasers.pdf

- Raman signature of a nematic superconductor
  Prof. Saurabh Maiti, saurabh.maiti@concordia.ca
  https://www.concordia.ca/content/dam/artsci/physics/documents/open_position_announcements/maiti_msc-2021.pdf

- Signatures of collective response in doped graphene
  Prof. Saurabh Maiti, saurabh.maiti@concordia.ca
  https://www.concordia.ca/content/dam/artsci/physics/documents/open_position_announcements/maiti_phd-2021.pdf

- Antimicrobial peptide design
  Prof. Rachael (Ré) Mansbach, re.mansbach@concordia.ca
  https://www.concordia.ca/content/dam/artsci/physics/documents/open_position_announcements/mansbach_phd_msc-2022_antimicrobial_peptide_design.pdf

- Drug design for antibiotics
  Prof. Rachael (Ré) Mansbach, re.mansbach@concordia.ca
  https://www.concordia.ca/content/dam/artsci/physics/documents/open_position_announcements/mansbach_phd_msc-2021_drug_design_antibiotics.pdf

- Theory of disulfide bonds for toxin-based therapeutics
  Prof. Rachael (Ré) Mansbach, re.mansbach@concordia.ca
  https://www.concordia.ca/content/dam/artsci/physics/documents/open_position_announcements/mansbach_phd-msc-2021_disulfide_bonds_toxin-based_therapeutics.pdf

- High-throughput screening of single-cell dynamics using microfluidics and optical tweezers
  Prof. Laurent Potvin-Trottier, laurent.potvin@concordia.ca
  https://www.concordia.ca/content/dam/artsci/physics/documents/open_position_announcements/potvin-trottier_phd_msc_2021.pdf

- Brain health in females across the adult lifespan and the long-term effects of COVID-10 on brain white matter, vascular and metabolic health
  Prof. Claudine Gauthier, claudine.gauthier@concordia.ca
  https://www.concordia.ca/content/dam/artsci/physics/images/CaseyRae/cg-position-available-grad-2022.pdf

DALHOUSIE UNIVERSITY

CCUWIP 2022
BEYOND THE STANDARD MODEL

MSc or PhD in Physics and Atmospheric Science

Dalhousie is one of Canada's leading research-intensive universities with world-class research facilities. Our master's and doctoral programs in Physics and Atmospheric Science provide students opportunities to carry out theoretical, computational, and experimental research with leaders in atmospheric physics, quantum optics, materials physics, biophysics, applied physics and energy conversion/storage.

Link: https://www.dal.ca/academics/programs/graduate/pas.html

Contact: physics@dal.ca

MSc or PhD in Medical Physics

Our CAMPEP-accredited master's and doctoral degrees in medical physics include research on precision radiotherapy and radio surgical techniques in the treatment of cancer patients, image guidance, and innovation in magnetic resonance and nuclear medicine imaging. Students may conduct their work in state-of-the-art hospital treatment and imaging facilities and within dedicated laboratories.

Link: https://www.dal.ca/academics/programs/graduate/medical-physics.html

Contact: physics@dal.ca

QUEEN'S UNIVERSITY

CCUWIP 2022
BEYOND THE STANDARD MODEL

Astrophysics & Astronomy [M.Sc., M. App.Sc, PhD (Physics), PhD (Engineering Physics)]

Research topics include cosmology, dark matter, relativity, early Universe cosmology, galaxy structure and formation, the interstellar medium, stellar populations, stellar atmospheres, and the formation of stars and planetary systems. Research activities involve theory, numerical analysis, simulations, and observations at leading astronomical facilities around the world and across the electromagnetic spectrum.

Link: https://www.queensu.ca/physics/research-groups/astronomy-astrophysics-relativity

Contact: Sarah Sadavoy (sarah.sadavoy@queensu.ca)

Condensed Matter Physics & Optics [M.Sc., M.App.Sc, PhD (Physics), PhD (Engineering Physics)]

Interactions between atoms in a condensed system lead to novel characteristics that are fascinating but that could also serve as the foundation for the next technological revolution (such as neuromorphic computing or the quantum internet). Interaction with light with nano-scale systems is an area of focus within the new Nanophotonics Research Centre.

Link: https://www.queensu.ca/physics/condensed-matter-physics-optics

Contact: James Fraser (james.fraser@queensu.ca)

Engineering & Applied Physics [M.Sc., M.App.Sc, PhD (Physics), PhD (Engineering Physics)]

Research in the group covers a wide range of topics, with the common theme of applying basic science and physics principles to improve the quality of life and to solve current or future problems facing people both in Canada and worldwide. This research spans areas of photonics, quantum information technology, medical physics, materials physics, electronic device physics, and plasma physics.

Link: https://www.queensu.ca/physics/research-groups/engineering-applied-physics

Contact: Nir Rotenberg (nir.rotenberg@queensu.ca)

Particle Astrophysics [M.Sc., M. App.Sc, PhD (Physics), PhD (Engineering Physics)]

Members of the particle astrophysics group are involved in a variety of projects to search for dark matter, better understand neutrinos, and develop new particle detector technologies. The group has played a leadership role in establishing SNOLAB as well as the McDonald Canadian Astroparticle Physics Research Institute (named after Prof. Art McDonald, 2015 Nobel Laureate).

Link: https://www.queensu.ca/physics/research-groups/particle-astrophysics

Theoretical Physics [M.Sc., M. App.Sc, PhD (Physics), PhD (Engineering Physics)]

Research in theoretical physics covers quantum optics, photonics, particle physics, astrophysics, cosmology, hard and soft condensed matter, complex systems, and chemical physics. Queen's theorists use mathematics, modelling, and computation to tackle questions ranging from nanophotonics and quantum computing to the laws that govern the Universe.

Contact: Greg van Anders (gva@queensu.ca)

Instrument and Device Development [M.Sc., M. App.Sc, PhD (Physics), PhD (Engineering Physics)]

We develop new tools to reveal previously invisible phenomena in the world and universe around us, as well as to solve pressing technical challenges. Students learn to design and build instruments that can work down to unprecedented atomic and temporal resolutions, or sensitive enough to detect never-before observed subatomic particles.

Contact: James Fraser (james.fraser@queensu.ca)

NSERC CREATE-Materials for Advanced Photonics and Sensing [M.Sc., M. App.Sc, PhD (Physics), PhD (Engineering Physics)]

The economic importance of photonic materials, including photovoltaics, novel light sources, and optical sensors, is hard to overestimate. To prepare for this field, students work to understand the interconnectedness of material synthesis, characterization, and modelling, and benefit from the best tools across disciplines. Activities includes internships, conferences, mentoring, grant competitions and professional skills courses.

Link: https://www.queensu.ca/materials-photonics-sensing/overview

Contact: Program Leader James Fraser (james.fraser@queensu.ca)

Application deadline

Applications are reviewing on a rolling basis until filled. For full consideration for internal awards, please submit your OGS application no later than the OGS deadline (March 1, 2022).

Application requirements

Please visit https://www.queensu.ca/sgs/prospective-students/how-apply

For more information

Please visit https://www.queensu.ca/physics/grad-studies/applicants

For more information about your research areas, please visit https://www.queensu.ca/physics/research-groups

RYERSON UNIVERSITY

CCUWIP 2022
BEYOND THE STANDARD MODEL

Programs available and length of program

Master's - 2 years
PhD - 4 years

Application deadlines

We continue to accept applications on an ongoing basis until the program is full.

Admission Requirements

Masters:
Completion of a four-year undergraduate (or equivalent) degree from an accredited institution
Minimum grade point average (GPA) or equivalent of 3.33/4.33 (B+) in the last two years of study
Statement of interest
Resumé/CV
Transcripts
Two letters of recommendation
English language proficiency, if required (if previous post-secondary program was not conducted in English)

PhD:
Completion of a master's degree from an accredited institution
Minimum GPA or equivalent of 3.67/4.33 (A-)
Statement of interest
Resumé/CV
Transcripts
Two letters of recommendation
English language proficiency, if required (if previous post-secondary program was not conducted in English)

Link: https://www.ryerson.ca/physics/graduate-studies/

SAINT MARY'S UNIVERSITY

CCUWIP 2022
BEYOND THE STANDARD MODEL

Astronomy:

Programs available and length of program

MSc in Astronomy (Thesis option, 2 years); PhD in Astronomy (4 years of dissertation research)

Application deadlines

We welcome applications at any time of the year. Highest priority for fall admission will be given to applications received by February 1 of the preceding winter.

Admission Requirements

A B.Sc. (Hons) or equivalent in Astronomy, Physics or a related field, with a Grade Point Average (GPA) of 3.00 (B) or better is required for admission into the program.

Link: https://www.smu.ca/astronomy-physics/astronomy-and-physics-graduates.html

Applied Science (Physics):

Programs available and length of program

M.Sc. (Thesis) – 2 years
Ph.D. (Thesis) – minimum time 3 years

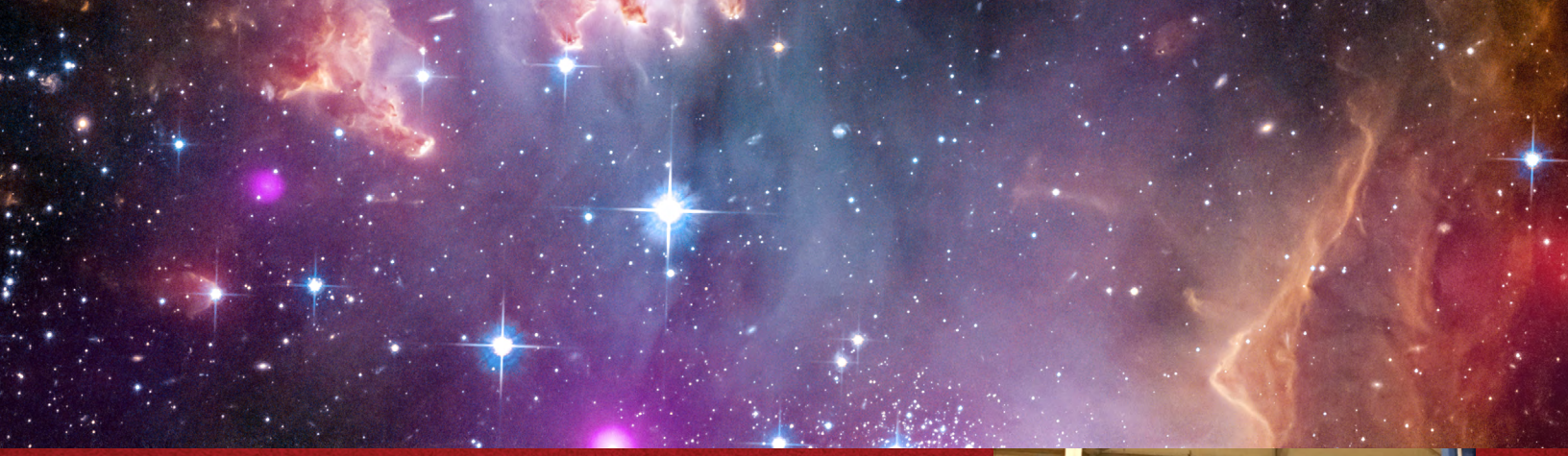
Application deadlines

Typically, February 1
Flexible start in May, September, or January (available funding maybe limited for January admissions).
Normal start time September 1

Admission Requirements

M.Sc.
Hons. B.Sc. or equivalent
Cumulative GPA 3.0 or higher
https://smu-ca-public.courseleaf.com/graduate/programs/applied-science-msc/

Ph.D.
M.Sc. degree
CGPA of 3.70 or higher
https://smu-ca-public.courseleaf.com/graduate/programs/applied-science-phd/



M.Sc. and Ph.D. Graduate Studies in
Nuclear Physics
Saint Mary's University and Dalhousie University

Subatomic Physics

Saint Mary's University is Atlantic Canada's leading center for graduate studies and research in subatomic physics. The university belongs to the consortium of 19 Canadian universities that own and operate TRIUMF, Canada's national laboratory for particle and nuclear physics, in Vancouver. The Department of Astronomy and Physics is also home to the Institute for Computational Astrophysics.

The research and graduate studies program features an interactive learning atmosphere. A notable feature is the offering of distant courses through TRIUMF and other partnering universities that extends the learning scope Canada-wide. Graduate students in subatomic physics get immense international and national exposure working together with experts from all across Canada and around the world.

Subatomic Physics research has drawn the highest research funding at SMU from Canada's federal granting agencies. The university's research in this field is actively building its success making notable impacts.

About Saint Mary's

Saint Mary's physics faculty have received many awards and accolades from the national and international physics community for their work, leading front-line research projects at various international facilities. Students take part in this research, most of which involves visits or work terms at particle accelerator facilities either in Canada (TRIUMF in B.C.), or in other countries – such as Jefferson Lab or NSCL in USA; GSI or MAMI in Germany; or RIKEN in Japan.

With its emphasis on research as well as teaching, its status of offering the only subatomic physics faculties in Halifax and its small, intimate, urban setting in one of the most charming cities on the continent, Saint Mary's University is truly a unique place for graduate studies in subatomic physics.

FIELDS OF STUDY

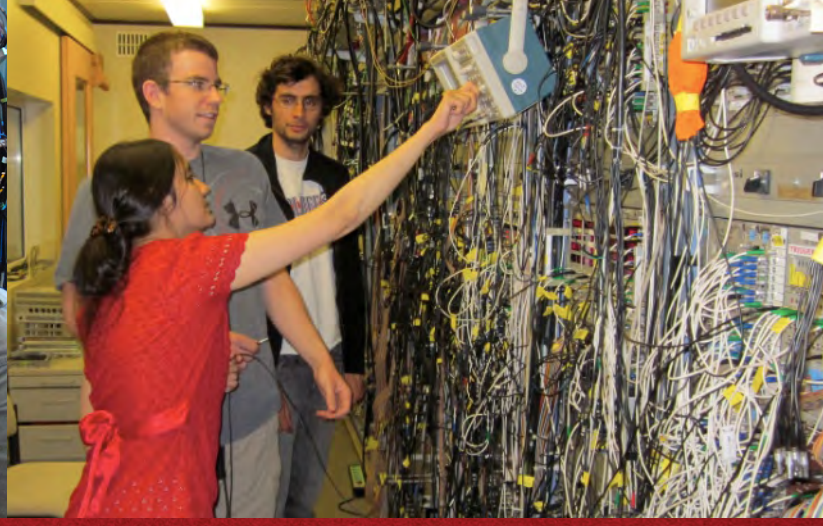
- Radiation detection techniques
- Nuclear structure
- Nuclear reactions
- Nuclear astrophysics
- Nucleon Structure
- Computational methods
- Accelerator physics

CAREER OPPORTUNITIES

- University/Government Research Scientist or Faculty
- Industrial Research Scientist
- Medical Physicist
- Computational modelling and simulations expert
- Scientific Data analyst
- Nuclear engineering
- Patent agent

SAINT MARY'S UNIVERSITY SINCE 1802

FACULTY OF SCIENCE



Faculty Members and Research Areas

Dr. Rituparna Kanungo Professor, Saint Mary's; adjunct Dalhousie University

- The research program is experiments with radioactive ion beams for nuclear structure and nuclear astrophysics.
- The group leads the experimental facility IRIS @ TRIUMF (www.triumf.ca/iris).
- Experiments are geared to discover nuclear halos, neutron skin, new magic numbers, and explore nuclear processes for the creation of heavy elements in our Universe. Students play active leading roles at TRIUMF (Canada), GSI (Germany), RIKEN (Japan) and NSCL-FRIB (USA) at the international forefront.

Dr. Adam J. Sarty Professor, Saint Mary's; adjunct Dalhousie University

- This group's activity at JLab is supporting the Super Bigbite Spectrometer program of experiments aimed at upcoming measurements of the proton's electric form-factor at very high momentum transfers (far interior of proton) – this support is focused now on construction/testing of a highly segmented scintillating-bar Coordinate Detector.
- At the Mainz Microtron, "MAMI," the group is collaborating to perform high-energy polarized Compton scattering from the proton to extract the proton's Spin Polarizabilities.

Dr. Gregory Christian Assistant Professor, Saint Mary's

- Research topics include astrophysical nuclear reactions, the structure of nuclei away from stability, and advanced neutron detector development.
- Experiments performed at the TRIUMF facility in Vancouver and the Cyclotron Institute at Texas A&M.
- Students have an opportunity to work on a variety of projects, including direct or indirect measurements of key astrophysical reactions, experiments probing nuclei at the edge of existence, and development of novel radiation detectors.

Dr. Roby A.E. Austin Associate Professor, Saint Mary's

- Research in gamma-ray spectroscopy and nuclear data visualization.

Dr. Friedhelm Ames Adjunct Professor, Saint Mary's; Research Scientist, TRIUMF

- Research projects on radioactive beam production and acceleration.

Graduate Program contact:

Dr. Rituparna Kanungo
ritu@triumf.ca
rituparna.kanungo@smu.ca

Pre-applications are invited at any time by email to either the Nuclear Physics graduate program coordinator or the prospective supervisor.

Admissions

For programs starting from May or September, full applications must be submitted by January 31. The nuclear physics graduate studies are through any of the following programs:

- M.Sc. and Ph.D. in Applied Science (Subatomic Physics) at Saint Mary's University
- M.Sc. and Ph.D. in Physics at Dalhousie University

Department of Astronomy & Physics

Saint Mary's University
923 Robie Street,
Halifax, Nova Scotia B3H 3C3
902-420-5828
chair@ap.smu.ca
science.smu.ca

SIMON FRASER UNIVERSITY

CCUWIP 2022
BEYOND THE STANDARD MODEL

Programs available and length of program

M.Sc. Program:

M.Sc. students have the opportunity to participate in cutting edge research in one of the following areas: AMO physics, Soft/Bio Physics, Condensed matter physics, Cosmology, High energy physics or Quantum Information. The degree typically takes two years and consists of coursework and a thesis based on research work. It is possible to transfer to the Ph.D. program after one year in the M.Sc. program.

Ph. D Program:

Ph. D students have the opportunity to participate in cutting edge research in one of the following areas: AMO physics, Soft/Bio Physics, Condensed matter physics, Cosmology, High energy physics or Quantum Information. The degree typically takes four years and leads to a thesis based on research work.

Application deadlines

Applications are welcome at any time, though we strongly encourage applicants to apply before April. Please note that SFU Physics does not have a firm deadline for applications, and you may submit your application after this date. The Graduate Admissions Committee begins reviewing applications in December for Fall admission, and it is best to apply early.

Admission Requirements

M.Sc. Program:

To be considered for admission to the SFU Physics MSc program, applicants should have a bachelor's degree in Physics or a related subject. Students holding Bachelor of Science degrees in other disciplines may be considered if they have a very strong background (upper-level undergraduate courses) in the following core Physics course areas:

- Quantum Mechanics
- Statistical Mechanics
- Electromagnetic Theory

Grade Point Average Requirements:
Applicants to the MSc program must have completed 80% of a Bachelor's degree with a cumulative grade point average (CGPA) equivalent to SFU 3.5 or higher.

Ph.D. Program:

A master's degree, or the equivalent is required. Students who have demonstrated strong academic and research performance may transfer directly from the Master's program to the Doctoral program, with the approval of the student's supervisory committee. Note that BSc degree-holders may not apply directly to the PhD program but may apply for transfer to the PhD program without completing an MSc degree.

Link: https://www.sfu.ca/physics.html

TRENT UNIVERSITY

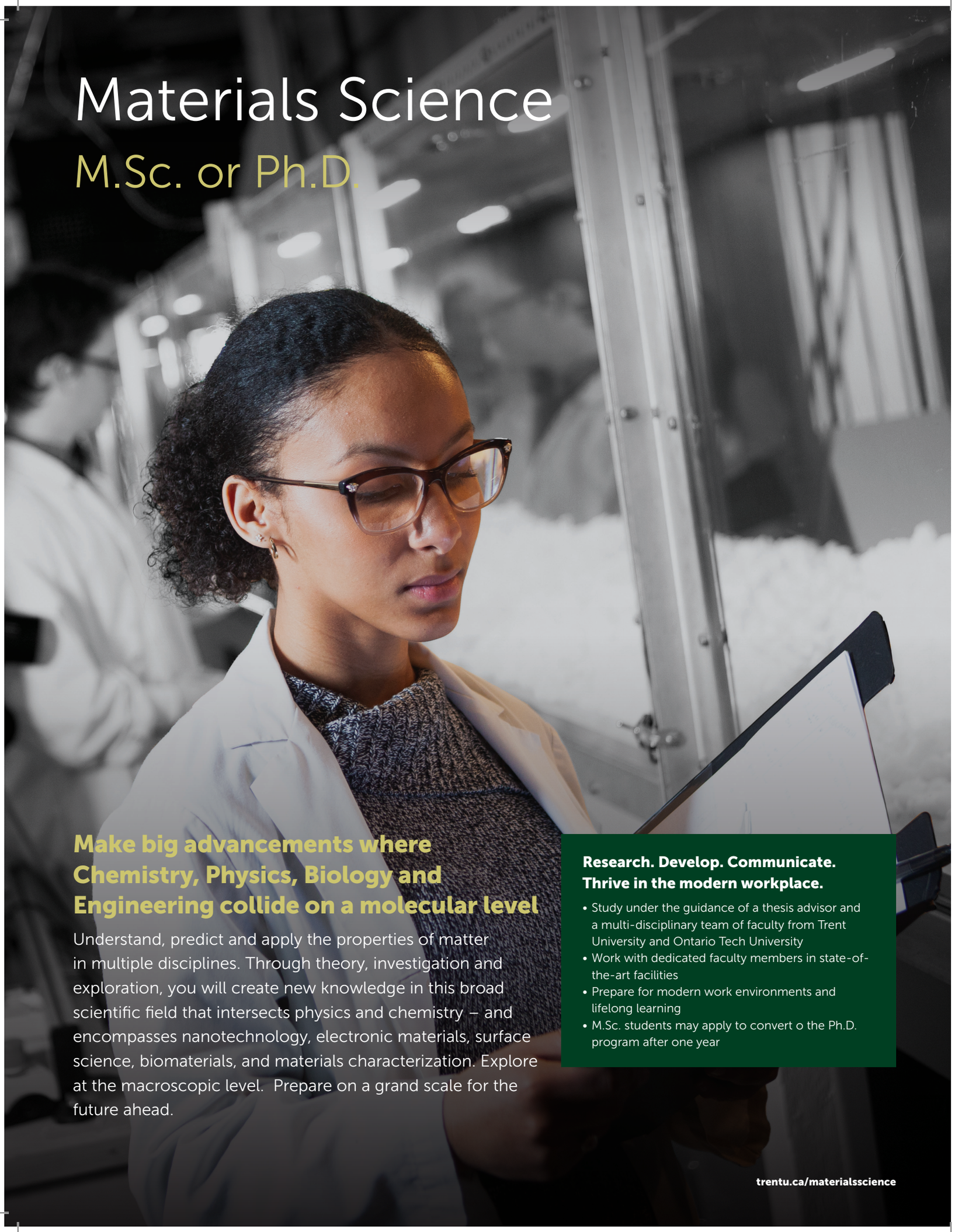
CCUWIP 2022
BEYOND THE STANDARD MODEL

Research based MSc (2 years) and PhD (4 years) in Materials Science; the option exists for direct transfer from MSc into the PhD program at the end of the first year.

Application deadline is February 1st. However, late applications will be considered provided there are open spots in the program.

Admission requirements are given here: https://www.trentu.ca/graduatestudies/programs/thesis-based-masters-programs/master-science-materials-science-msc

The program website is here: https://www.trentu.ca/graduatestudies/programs/thesis-based-masters-programs/master-science-materials-science-msc



Materials Science

M.Sc. or Ph.D.

Make big advancements where Chemistry, Physics, Biology and Engineering collide on a molecular level

Understand, predict and apply the properties of matter in multiple disciplines. Through theory, investigation and exploration, you will create new knowledge in this broad scientific field that intersects physics and chemistry – and encompasses nanotechnology, electronic materials, surface science, biomaterials, and materials characterization. Explore at the macroscopic level. Prepare on a grand scale for the future ahead.

Research. Develop. Communicate. Thrive in the modern workplace.

- Study under the guidance of a thesis advisor and a multi-disciplinary team of faculty from Trent University and Ontario Tech University
- Work with dedicated faculty members in state-of-the-art facilities
- Prepare for modern work environments and lifelong learning
- M.Sc. students may apply to convert o the Ph.D. program after one year

trentu.ca/materialsscience

Engage in science that matters

A broad multi-disciplinary area of science, Materials Science seeks to advance the understanding, prediction, and application of the properties of matter. Through this program, offered jointly by Trent University and Ontario Tech University, students build on and incorporate fundamental science principles into their graduate level research project. Develop skills in project management and effective communication of technical information as you prepare for future-ready success in today's modern environment of research and development in both the public and private sectors.

Our M.Sc. and Ph.D. programs provide both a broad and integrated overview of materials science and the opportunity for in-depth study of a particular problem emphasizing either theory or experiment, under the guidance of a thesis advisor and a multi-disciplinary team of faculty from Trent University and Ontario Tech University. The program comprises coursework and a thesis and will lay the foundations required to excel in the modern work environment or in the pursuit of further academic inquiry.

Financial Support

Students in this program are supported financially through a combination of scholarships, supervisory support, and teaching assistantships. Students have access to a range of scholarship opportunities, including the Ontario Graduate Scholarship (OGS), and Natural Sciences and Engineering Research Council Postgraduate Scholarships (NSERC-PGS).

Visit **trentu.ca/graduatestudies/tuition-awards-funding** for more information on available financial supports.

Program Options

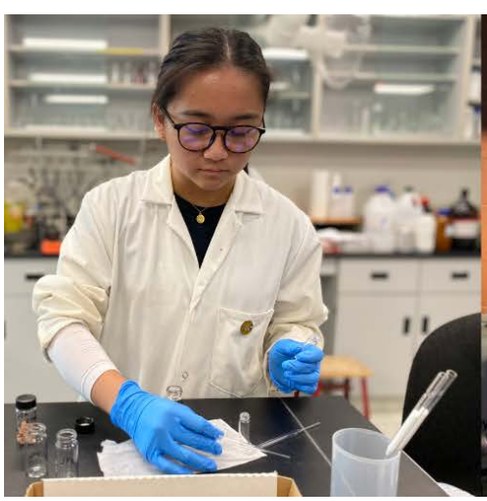
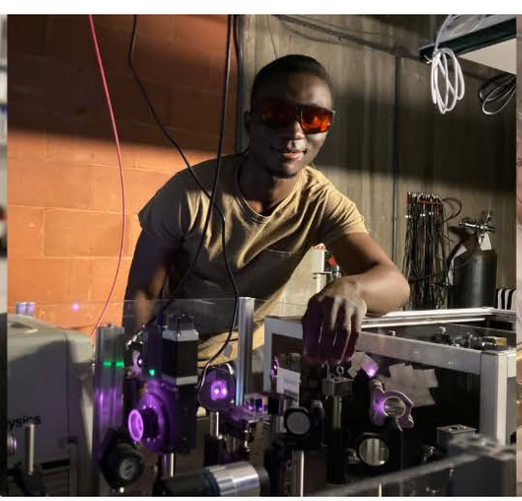
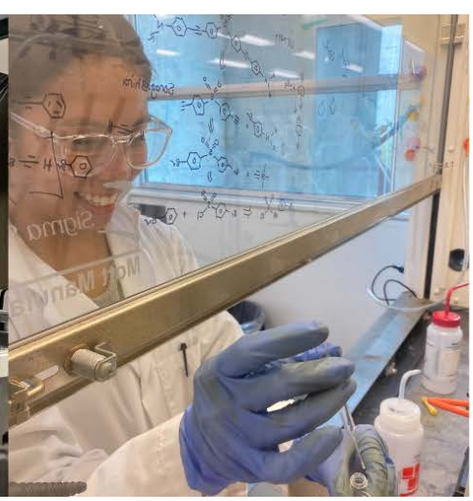
- M.Sc. and Ph.D.
- Full-time studies
- Thesis-based program
- M.Sc. is a 2-year program
- Ph.D. is 4-year program

Admission Requirements

- Applicants are required to reach out to a member of the faculty to identify a potential supervisor
- M.Sc. program requires: B.Sc. Honours (a four-year undergraduate bachelor's degree) in Physics, Chemistry, Engineering or equivalent qualifications, minimum B+ (77%) or equivalent in the work of the last four semesters or the last two undergraduate years (last ten full credits)
- Ph.D. program requires: M.Sc. degree in an applicable discipline (suitability will be assessed on a case-by-case basis), an average of at least B+ (77%, GPA 3.3) overall

Learn more and meet our faculty:
trentu.ca/materialsscience

Learn more about how to apply and the required supporting documentation:
trentu.ca/graduatestudies/experience/how-apply

UNIVERSITY OF ALBERTA

CCUWIP 2022
BEYOND THE STANDARD MODEL

Programs available and length of program

Description: The University of Alberta Department of Physics offers thesis-based master's and doctoral programs, with MSc and PhD degrees in Physics and in Physics, Geophysics specialization. Our research focus areas include Astrophysics and Gravity, Biophysics, Condensed Matter Physics/Atomic, Molecular, and Optical Physics, Geophysics, Particle Physics, and Space/Plasma Physics.

Programs include:
MSc Physics (thesis-based), 2 years
MSc Geophysics (thesis-based), 2 years
PhD Physics (thesis-based), 4 years
PhD Geophysics (thesis-based), 4 years

Application deadlines

- December 6: initial application deadline. Applications that are received and complete by this date will be considered for the widest range of scholarships, as well as the standard graduate assistantships.

- January 13: Applications that are received and complete by this date will be considered for graduate assistantships and scholarships.

- After the January deadline: applications received after the January deadline will be considered in the third round of admissions. Students will be considered for graduate assistantships and scholarships upon request and only if funding is still available.

- March 31 is the last date to submit an application for graduate admission in Physics in 2022-2023.

Admission Requirements

- We require an honours or specialization degree (or equivalent) in Physics, Geophysics, Engineering, Astronomy, Geology or Mathematics. Applicants must have completed a 4-year baccalaureate degree or its academic equivalent by the time they start in our graduate program.

- Applicants' degree(s) must be from an academic institution recognized by the University of Alberta.

- A minimum grade point average of 3.0 on a 4-point scale for each of the last two years of your undergraduate program and in post-graduate studies, if applicable. (Minimum requirements from other countries will be found on the Faculty of Graduate Studies and Research (FGSR) website.

- Additional assets include detailed and supportive reference letters, research experience, publications and conference presentations

Links:

A number of resources are linked at: https://linktr.ee/UAlbertaPhysics

Department website: https://www.ualberta.ca/physics/index.html

Application: https://www.ualberta.ca/physics/graduate-studies/information-for-prospective-students-and-applicants/how-to-apply.html

General prospectus: https://www.ualberta.ca/physics/media-library/form-documents/grad/physgradprospectus.pdf

PDFs of research areas

- Astrophysics: https://drive.google.com/file/d/1b_GuVT3WpDuxRUVDzD7v1o6np1Fz01v4/view?usp=sharing
- Biophysics: https://drive.google.com/file/d/1qHbsrnJUNTIujjf91FryMGuEnZ0meFGo/view?usp=sharing
- Condensed matter / Atomic, Molecular, and Optical Physics: https://drive.google.com/file/d/1eyciOui4wZoe3B2KqeriMo7lFmIw6SM2/view?usp=sharing

- Geophysics: https://drive.google.com/file/d/1liX413wF3r31bRtyzo2_d0llfNa5RvK0/view?usp=sharing
- Particle Physics: https://drive.google.com/file/d/1MafU2mnbmKBX5OaUFZR-mtxVhMF5RLeL/view?usp=sharing
- Space/Plasma Physics: https://drive.google.com/file/d/1GFTNvDqQiPNfP6eKIKlMby6kPvH3Jpsl/view?usp=sharing
- All research areas in one pdf: https://drive.google.com/file/d/11nVVdNv96LOcu2Q3fJYJyrjmgZTmYNH_/view?usp=sharing

UNIVERSITY OF GUELPH

CCUWIP 2022
BEYOND THE STANDARD MODEL

Graduate Fair Representatives:
Faculty member- Liliana Caballero - ocaballe@uoguelph.ca
Student – Zarin Ahmed – zarin@uoguelph.ca
Student – Samantha Buck - sbuck@uoguelph.ca

Programs:
Master of Science (MSc) Physics
Master of Science (MSc) Biophysics
Doctor of Philosophy (PhD) Physics
Doctor of Philosophy (PhD) Biophysics

Application deadlines:
Fall admission: February 1
Winter admission: June 1 (previous year)
Spring admission: October 1 (previous year)

Minimum Degree Admission Requirements:
An honours degree in physics or equivalent, from an approved institution, with first or upper second class standing (equivalent to minimum of 75% by Ontario standards) is normally required for entry into the MSc program; an MSc degree in Physics is normally required for entrance into the PhD program.

Link: https://www.physics.uoguelph.ca/

UNIVERSITY OF OTTAWA

CCUWIP 2022
BEYOND THE STANDARD MODEL

Link: https://science.uottawa.ca/physics/

In two state of the art buildings, world class research:

The Advanced Research Complex Housing Photonics and Materials

And STEM housing Biological Physics and Materials

The Grad brochure (attached below) gives general information on our programs and a list of research areas with faculty members involved. In addition, there are many adjuncts associated with the National Research Council and cross-appointed faculty members from other departments and faculties

MSc Physics

https://catalogue.uottawa.ca/en/graduate/master-science-physics/

Program options (expected duration of the program):

- with thesis, standard stream (6 full-time terms; 24 consecutive months)
- with thesis, accelerated stream (3 full-time terms; 12 consecutive months)
- with courses only (4 full-time terms, 16 consecutive months)
- with courses and Co-op option (4 full-time terms; 16 consecutive months)
- with courses and Project (4 full-time terms, 16 consecutive months)

MSc Physics Concentration in Quantum Science

https://catalogue.uottawa.ca/en/graduate/master-science-physics-concentration-quantum-science/

with thesis, standard stream (6 full-time terms; 24 consecutive months)

PhD Physics

https://catalogue.uottawa.ca/en/graduate/doctorate-philosophy-physics/

Program option (expected duration):

with thesis (12 full-time terms; 48 consecutive months)

Admission requirements for each degree are given at the links

Application deadlines

There are no firm application deadlines, but visa students should allow a good six months to ensure that they receive a visa in time.

Language requirements

Although the University of Ottawa is the largest bilingual (English and French) university in North America, our graduate programs are run in English, so there is no French requirement. Francophones however will find a very welcoming environment in the Department, which a significant component of francophones mainly at the undergraduate level (about a 1/3 of the students) and a number of professors are fluent in French.

Physics Graduate Programs

Financial support packages $21,000 - $35,000/year.

MSc Physics (or Conc. in Quantum Science)

- Thesis
- Three graduate courses

MSc Physics, Applied Physics options

- Eight graduate courses, or
- Six courses + one term project, or
- Six courses + one or two term COOP

MSc Physics (accelerated stream)

- Available only to students completing a UOttawa BSc. In this option, the Honours project is continued at the MSc level and one 3cr. course counts for both the BSc and MSc.

PhD Physics

- Thesis
- Four graduate courses
- Students can transfer from the MSc to the PhD within the first four semesters if their GPA is A- or better, and with the support of the supervisor. Their total course requirement is reduced to six courses.

Ottawa – Carleton Institute for Physics

The physics departments at uOttawa and Carleton University form a joint graduate institute.

Students can choose from a wide variety of advanced courses in the two departments.

Studying at uOttawa

- A global technology centre and recently ranked the ***"top tech centre in Canada"***
- Employment opportunities in the private sector and government.
- Ottawa has been chosen by students as ***the best city in the world to be a student*** (QS world rankings, 2017)
- ***#1 city to live in Canada*** by moneysense.ca (2016).
- As Canada's capital, Ottawa benefits from a safe but ***spirited downtown*** with restaurants, galleries, museums, festivals and events.
- Abundant green spaces, forests and lakes balance Ottawa's urban appeal. Imagine using our ***170 km of hiking and biking trails***, or skating on ***the world's longest rink, which runs right alongside campus!***
- As a graduate student at the University of Ottawa, you will be among more than 40000 students at ***Canada's largest bilingual university***. You will have access to more than 100 clubs and associations, a modern concert hall and theatre. Graduate fees include membership to one of Eastern Ontario's largest sports complexes.
- Ottawa is also home to the ***Ottawa Senators of the NHL!***

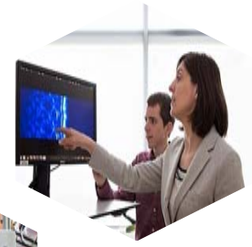
Contact information

For more information, please visit **science.uOttawa.ca/physics** or contact the Director of Graduate Studies, Professor Béla Joos at bjoos@uottawa.ca

Université d'Ottawa | University of Ottawa

Graduate Studies

Physics



Faculty of Science
Graduate Studies Office
30 Marie-Curie, Ottawa ON
Canada, K1N 6N5
+1 613-562-5800 ext. 3145
science.uOttawa.ca/physics

uOttawa

Photonics

- Leading international centre
- Research includes
  - Attosecond physics
  - Quantum optics
  - Quantum information
  - Non-linear optics
  - Fiber optics
  - Optical sensing
  - Light-matter interactions
  - Nanophotonics

- Connected to
  - Centre for Research in Photonics (CRPuO)
  - Max-Planck uOttawa Centre for Extreme and Quantum Photonics

Professors:
Theory: Thomas Brabec, Liang Chen, Jacob Krich, Pawel Hawrylak, Lora Ramunno

Experiment: Xiaoyi Bao, Robert W Boyd, Ravi Bhardwaj Vedula, Andrzej Czajkowski, Paul Corkum, Ebrahim Karimi, Jean-Michel Ménard, Jeff Lundeen, Albert Stolow

Biological Physics

- One of the largest concentration of faculty in biophysics in Canada.
- Highly interdisciplinary, at the edge of science and technology.

- Research includes
  - Cell biophysics
  - Single molecule biophysics
  - Sensing with micro fluidic devices
  - Nanopores
  - Biomolecular assemblies
  - Polymer physics
  - Neurophysics

Professors:
Theory: Béla Joos, André Longtin, Gary Slater.

Experiment: Michel Godin, James Harden, Andrew Pelling, Vincent Tabard-Cossa

Materials Physics

- Rapidly growing field in the department
- Research includes:
  - Design, growth and characterization of novel nanostructures
  - Quantum materials
  - 2D materials, graphene
  - Scanning Tunneling Microscopy
  - Materials under extreme conditions
  - Photovoltaics
  - Novel alloys

- Canada's only Accelerator Mass Spectrometer.

Professors:
Theory: Pawel Hawrylak, Jacob Krich

Experiment: Serge Desgreniers, James Gupta, William Kieser, Adina Luican-Mayer, Jean-Michel Ménard, Peter Piercy, Zbigniew Stadnik

UNIVERSITY OF SASKATCHEWAN

CCUWIP 2022
BEYOND THE STANDARD MODEL

The research activities of our faculty members and research scientists include strong international collaborations. The research specialties of our department include experimental, observational or theoretical aspects of the following fields:

- Atmospheric Physics
- Space Mission Program
- Advanced Materials/Devices Research
- Synchrotron Radiation Research
- Subatomic Physics
- Plasma Physics
- Solar-Terrestrial Physics
- Nuclear Materials and Transmutations

MSc Program

An undergraduate (usually a BSc) degree in physics, astronomy, or engineering physics from a recognized college or university, with a minimum of a 70% average in the last two years of undergraduate studies.

Proficiency in English, as evidenced by the applicant's undergraduate training or standardized testing (TOEFL examination of equivalent)

Students must have taken a course in both Quantum Mechanics and Electromagnetic Theory during their undergraduate degree.

PhD Program

An MSc degree in physics or engineering physics from a recognized college or university.

Applicants should show the potential to successfully pursue research.

Proficiency in English, as evidenced by the applicant's undergraduate or graduate training or standardized testing (TOEFL examination of equivalent)

Students must have taken a course in both Quantum Mechanics and Electromagnetic Theory during their MSc degree.

In exceptional cases, a student may be permitted to directly enter the PhD program after completing one year in our MSc program.

Applications may be submitted at any time during the year. There is no deadline for applications.

A complete application package consists of the following items:

- Complete, official transcripts of your college or university academic records
- Three letters of recommendation can be sent either directly from professors or others familiar with your academic training or submitted online. You will provide their email address when you complete your online application.
- An official record of your TOEFL or English equivalent scores
- Any relevant supplementary information such as (CV., letter of intent, etc,) in support of your application will be requested by your potential supervisor

Link: https://artsandscience.usask.ca/physics/

CCUWIP 2022
BEYOND THE STANDARD MODEL

UNIVERSITY OF WATERLOO

Institute for Quantum Computing

The Institute for Quantum Computing (IQC) is a world-leading quantum information research institute at the University of Waterloo, advancing the field to discover and develop powerful new technologies. In collaboration with seven University of Waterloo departments, including Physics & Astronomy, graduate students at IQC can earn Masters' and PhD degrees with a specialization in Quantum Information. For Physics students, a one-year course-based MSc is also offered with a specialization in Quantum Technology. Additionally, undergraduate research opportunities are available through the Undergraduate School on Experimental Quantum Information Processing (USEQIP) program. Admission deadlines vary by program and department. Find out more at uwaterloo.ca/iqc.

UNIVERSITY OF WATERLOO | IQC Institute for Quantum Computing

Graduate Studies in

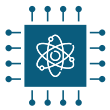
QUANTUM INFORMATION

QUANTUM INFORMATION

Engage in world-class research that focuses on the foundations, applications, and implementations of quantum information. This interdisciplinary program is offered as a collaboration with the Institute for Quantum Computing (IQC) and the University of Waterloo's Faculties of Engineering, Mathematics, and Science.

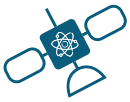
RESEARCH AREAS

Work with leading experts to harness quantum mechanics in the following four areas:



QUANTUM COMPUTING

Harness the behaviour of atoms, light, and nanoelectronic circuits for a radically different and fundamentally more powerful computer.

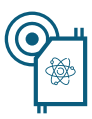


QUANTUM COMMUNICATION

Develop ultrasecure communication channels, low-noise transmission protocols, and satellite-based global networks.

QUANTUM MATERIALS

Engineer materials that exhibit unique properties for quantum information, processors, electronics, and other applications.



QUANTUM SENSING

Develop new sensors with unprecedented precision, sensitivity, selectivity, and efficiency.

TRANSFORMATIONAL RESEARCH

Work with leading researchers in physics, computer science, engineering, chemistry, and mathematics. Learn more about our supervisors and research programs: **uwaterloo.ca/iqc/supervisors**

RESEARCH GROUPS

Conduct interdisciplinary research with faculty and other students in the following areas:

- Atomic and ionic systems
- Error correction and fault tolerance
- Computation and communication complexity
- Materials science
- Neutron interferometry
- Nuclear and electron spins
- Optics and photonics
- Quantum algorithms
- Quantum and post-quantum cryptography
- Quantum information theory
- Superconducting qubits

QUANTUM LEADERSHIP

Our alumni have found diverse careers working in academia, multinational companies, governments, and start-ups. Here is a sample of where they are working:

- Alternative Energies and Atomic Energy Commission (CEA)
- Communications Security Establishment (CSE)
- Delft University of Technology
- Government of Canada
- Harvard University
- Fujitsu
- Google
- Massachusetts Institute of Technology
- NTT Basic Research Laboratories
- RBC Capital Markets
- University of Cambridge
- Microsoft
- NASA
- IBM

INSTITUTE FOR QUANTUM COMPUTING

Located at the University of Waterloo, IQC is recognized as one of the top five institutes for quantum information and a beacon of quantum talent. IQC harnesses the quantum laws of nature to develop curiosity- and impact-driven ideas and technologies. Its interdisciplinary research spans theory and experiment, and fosters collaboration with a growing and vibrant ecosystem of over 300 members.

200+
GRADUATE STUDENTS

32
FACULTY MEMBERS

1,950+
PUBLICATIONS

13
QUANTUM SPIN-OFF COMPANIES

58
THE MOST COURSES IN QUANTUM INFORMATION

ONE OF THE
HIGHEST
CONCENTRATIONS OF QUANTUM SCIENTISTS IN THE WORLD

HOW TO APPLY

1. Explore our programs, supervisors, and admission requirements at: **uwaterloo.ca/iqc/programs**
2. Apply to the collaborative Quantum Information program through these departments:

- Electrical and Computer Engineering (MASc, PhD)
- Applied Mathematics (MMath, PhD)
- Combinatorics and Optimization (MMath, PhD)
- Computer Science (MMath, PhD)
- Chemistry (MSc, PhD)
- Physics and Astronomy (Thesis MSc, course-based MSc, PhD)
- Pure Mathematics (MMath, PhD)

3. Connect with potential supervisors to let them know you have applied.

FUNDING AND FINANCIAL SUPPORT

Waterloo offers a variety of support to help you fund your education. For more information visit:

uwaterloo.ca/iqc/programs/graduate-studies/scholarships-and-awards

Institute for Quantum Computing
University of Waterloo
200 University Avenue West
Waterloo, Ontario, Canada N2L 3G1
Email: iqc.grad@uwaterloo.ca

uwaterloo.ca/iqc

UNIVERSITY OF WATERLOO | IQC Institute for Quantum Computing Canada

WESTERN UNIVERSITY

CCUWIP 2022
BEYOND THE STANDARD MODEL

Programs available and length of program

We offer master's and doctoral degree programs in both Physics and Astronomy. The master's programs are 2 years in length, culminating in either a major research project or thesis defense. The doctoral programs are four years in length, culminating in a thesis defense.

Application deadlines

Domestic Students: We can accommodate completed applications on a first-come, first-served basis up to August 31, 2022.

International Students: March 1, 2022, including the receipt of reference letters and transcripts.

Admission Requirements

We encourage applications from students with undergraduate and/or master's degrees in physics, applied physics, applied mathematics, astronomy, or other disciplines where students have taken upper-level undergraduate and/or graduate level courses in the fundamental areas of physics.

Applicants for our MSc programs must have completed a four-year, BSc degree (or equivalent) in either Physics, Astronomy, or Engineering with at least a 70% (or B) average taken over the third and fourth year level undergraduate courses. Students applying for the MSc Astronomy degree are not required to possess an undergraduate degree in Astronomy. A Physics (or possibly Engineering) degree is also acceptable.

Applicants for our PhD programs must have completed an MSc degree (or equivalent) in either Physics, Astronomy or Engineering with at least a 70% (or B) average taken over all MSc graduate courses.

Applicants to our program are not required to take the Graduate Record Exam (GRE). However**,** International students and domestic students with degrees from offshore Universities or Engineering degrees are strongly urged to write the GRE-Physics examination. Students who receive a mark with a rank in the upper third of those sitting the exam will be at a decided advantage over their peers for consideration of admission.

Meeting the minimum standard does not guarantee acceptance. We receive many more qualified applications than our department can support, hence you are urged to complete your applications as soon as possible.

The ideal candidate for our graduate programs will possess the following:

- Strong problem solving/critical thinking skills
- Curiosity
- Self-motivation & enthusiasm
- Basic Computational skills (simple programming tasks, analyze data using a computer)
- Good communication skills or a desire to acquire these skills
- Bonus: prior research experience
- Bonus: strong computational/programming skills

Research-specific skills:

- Interest in a specific research area (i.e.: physics of soft squishy things, astronomy, weather/climate)
- Strong math skills and a desire to use them (for theory/computational work)
- Interest in tinkering, working with hardware (experimental work)
- Interest in chemistry (condensed matter, astrochemistry)
- Statistics background beyond “lab stats” (astrostatistics)

Link: https://physics.uwo.ca/graduate/future_students/index.html

YORK UNIVERSITY

CCUWIP 2022
BEYOND THE STANDARD MODEL

MSc and PhD Program in Physics and Astronomy at York University.

The graduate program in Physics and Astronomy at York University hosts roughly 50 students pursuing an MSc by thesis, research project, and coursework or a PhD. Students can choose from over 50 potential faculty supervisors in Astronomy and Astrophysics, Atomic, Molecular, and Optical Physics, Biological Physics, Chemical and Condensed Matter Physics, High Energy and Particle Physics, or Planetary Physics. We offer one of the strongest funding packages in Canada, and our students are very successful in obtaining scholarships from NSERC, Ontario, and York University. Our department has strong connections to Perimeter Institute, CERN, TRIUMF, Fields Institute, and Fermilab. For more information on our graduate program visit our web site:

https://www.yorku.ca/science/physics/graduate/

or contact the Graduate Program Director Matthew Johnson at phasgpd@yorku.ca . Information on how to apply can be found here:

https://www.yorku.ca/science/physics/graduate/how-to-apply/

The deadline for applications from international students is February 11 and the deadline for Canadian students is March 4. A list of supervisors looking for students can be found here:

https://sites.google.com/perimeterinstitute.ca/pao/available-graduate-supervisors

and below.

5 MSc Positions in Biological Physics: Can we "upload" the brain's visual representations into computers? Help answer this question with Prof. Zylberberg. Is playing with photons for biomedicine your thing? Prof. Mermut is seeking students interested in the area of biophotonics. Did you know ears emit sound? Learn more as a student with Prof. Bergevin.

7 MSc Positions in Experimental AMO: Prof. Eric Hessels seeks students to work on the Electric Dipole Measurements using Molecules within a Matrix experiment (EDMcubed: https://www.yorku.ca/edmcubed/). This experiment will search for new fundamental particles and interactions by measuring the electron dipole moment to unprecedented precision.

3 MSc Position in Planetary Physics: Model the formation and properties of the polar ice caps on Mars with Prof. Smith. Design, build, and launch nanosatellites with Prof. Lee.

2 MSc Positions in Theoretical AMO: When ions and water collide…. model quantum dynamics of few-body systems with a pencil and paper or computer with Prof. Kirchner.

2 MSc Positions in Experimental High Energy Physics: Search for new particles at the Large Hadron Collider with Prof. Taylor.

2 MSc Positions in Chemical and Condensed Matter Physics: Develop new nanomaterials to harvest solar energy with Prof. Morin. Study heat and electron transport in nanoscale devices with Prof. Pisana.

PHYSICS AND ASTRONOMY

Our graduate programs are **research focused**!
We offer **MSc** and **PhD** degrees in the following **research areas:**

Astronomy
Condensed Matter physics
Experimental Particle Physics
High Energy Physics
Accelerator Physics
Medical Physics *CAMPEP accredited Certificate Program also offered
Ocean Physics
Theoretical Physics

Our graduate students:

Guaranteed minimum funding * Minimum funding is currently **$23,760 for MSc** students and **$25,660 for PhD** students.

Guaranteed teaching positions

Abundant opportunities for teaching and outreach

Fellowships awarded annually to outstanding students
Apply by December 1! **for first round fellowship consideration*

The physics and astronomy department has strong ties to NRC-Herzberg, TRIUMF, BC Cancer Agency's Vancouver Island Centre, Institute of Ocean Sciences, Pacific Geoscience Centre, and the Canadian Centre for Climate Modelling and Analysis.

Carina nebula, NASA

For more information, visit us at **www.phys.uvic.ca**
or contact **physgrad@uvic.ca**

University of Victoria

PHYSICS AND ASTRONOMY

Our graduate programs are **research focused**!
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Carina nebula, NASA

For more information, visit us at **www.phys.uvic.ca**
or contact **physgrad@uvic.ca**

University of Victoria

Arthur B. McDonald
Canadian Astroparticle Physics Research Institute

What is the McDonald Institute?

The McDonald Institute is the Canadian hub for astroparticle physics research, uniting researchers, theorists, and technical experts within one organization. Located at and led by Queen's University, the McDonald Institute is proud to have 13 partner universities and research institutes across the country, all of which are key players in Canada's past and future innovation in astroparticle physics.

Mission

Enable a vibrant research program focused on priority areas that delivers excellent science and further solidifies Canada's position as a world-leader in particle astrophysics.

Create a centre that brings together the critical mass of scientific and technical expertise in particle astrophysics, cosmology, astronomy, detector development and low background techniques to lead the next generation of experiments.

Facilitate the exchange of ideas through collaboration, partnerships, and visitor programs, to develop research programs across regions and disciplines, nationally and internationally.

Inspire students and the general public through dynamic educational programs and captivating outreach activities.

Foster innovation in research and development by engaging scientists and engineers with businesses, and by sponsoring student internships in collaborating industries.

What is Astroparticle Physics?

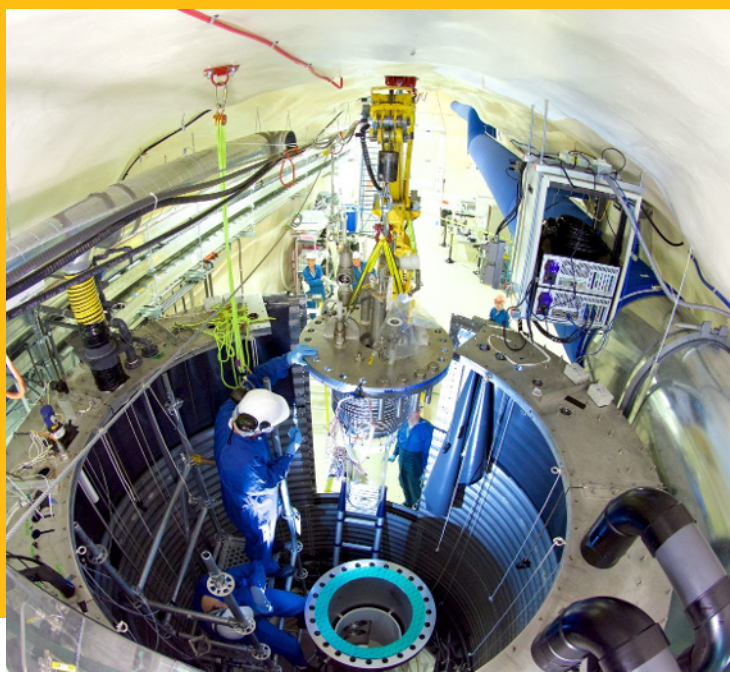
Science at the intersection of particle physics, the study of the basic building blocks of the universe, and astrophysics, the study of the universe as a whole. Click here to learn more

What are the driving questions?

- What is dark matter?
- What are the properties of neutrinos?
- Where does mass come from?
- What is the evolution and structure in the Universe?
- How does dark matter interact with this structure?

Canada: leading the way

Canada has been a pioneer in astroparticle physics. Its contributions to this field have been recognized with both a Nobel Prize and a Breakthrough Prize in physics. This work has been supported by world-class science facilities, like those of SNOLAB in Sudbury, Ontario, the deepest clean room facility in the world, and TRIUMF in Vancouver, British Columbia, Canada's particle accelerator centre.



Education and Outreach

"Through education and outreach, we aim to inspire all Canadians, young and old, with the groundbreaking science of astroparticle physics.

Having the public understand the value of astroparticle physics, which is nothing short of learning how our universe works and how it's composed"

-Arthur B. McDonald

Arthur B. McDonald
Canadian Astroparticle Physics Research Institute

Undergraduate Opportunities

Summer Research Positions

https://mcdonaldinstitute.ca/jobs-and-opportunities/

At many of our partner institutes we have opportunities for undergraduate students to work within a faculty member's team by pursuing a research project. Such opportunities are funded through various means, e.g., NSERC's Undergraduate Summer Research Award and McDonald Institute Pooled Resources competitions, faculty grants, and internal postings. The most important step in accessing these opportunities is to speak with a faculty member you would be interested in working with, and then together you can consider applying to one or all the above!

CAPSS 2022

Canadian Astroparticle Physics Summer School

May 8 - 14

Deadline: Feb 18, 2022

An amazing summer school opportunity for undergrads that covers current topics in astroparticle physics. Includes detector training from Queen's & SNOLAB!

https://mcdonaldinstitute.ca/capss/

McDonald Institute

SNOLAB

Professional Development Opportunities - 2022 Winter Offerings

Join the next Professional Development Opportunities!

The **Professional Development Opportunities** (PDO) program currently has three more upcoming sessions during the Winter Semester for community members, such as yourself. The PDO program aims to bolster your skillset while bringing together diverse groups within the McDonald Institute's network professional development opportunities.

We encourage you to look at our offerings below and register early to confirm your space in the training sessions.

Finding a Post-Doctoral Position

February 2nd, 2022

Join Heather Merla from the School of Graduate Studies (Queen's University) and the McDonald Institute for a session exploring how to find, plan for, apply and thrive in a post-doctoral position.

Click here to register

Virtual Content Delivery 101: Open Broadcast Software (OBS)

February 16th, 2022

Join McDonald Institute Communications Officer, Zac Kenny, as he shares the ins and outs of producing live digital content using Open Broad Software (OBS).

Click here to register

Applying to Work in Industry

March 2nd, 2022

Join Josh Zettle from Career Services (Queen's) to learn about applying to work in Industry. Further details forthcoming!

Click here to register

We look forward to your participation in our upcoming PDO sessions. Stay tuned for more updates and additional Winter PDO sessions to be added throughout the term!

A reminder that the self-guided modules for enhancing your equity, diversity, inclusion and Indigenization (EDII) competencies are now available. These opportunities are open to students, staff, and faculty affiliated with the McDonald Institute. We thank our partners at the Human Rights and Equity Office (Queen's University) for providing this training to the network!

Access the Self-Guided EDII Learning Module here

Arthur B. McDonald
Canadian Astroparticle Physics Research Institute

Other Opportunities

McDonald Institute Student Awards!

Each year, the McDonald Institute takes a moment to celebrate student excellence. Awards are an occasion for our community to reflect on the contributions of hundreds of scientists-in-training. We thank the submission nominators, judges and most importantly, the outstanding work of those who went above and beyond to improve both our community and scientific excellence. The perseverance and curiosity of a student today is the innovation of tomorrow.

To learn more about the 2021 recipients please click here

Graduate Instrumentation and Detector School (GRIDS)

For students that pursue graduate studies, here is an opportunity you should consider in the future! Lectures and hands-on experience covering practical aspects of detection principles and operation for:

- nuclear physics
- particle physics
- astroparticle physics
- nuclear medicine

More information coming soon: **https://mcdonaldinstitute.ca/news-events/**

Cross-Disciplinary Internship (CDI) 2022

For your friends and colleagues in other fields... The **Cross-Disciplinary Internship (CDI)** program provides a ($12,000 CAN) salary reimbursement for full- or part-time students registered in non-physics majors to participate in astroparticle physics research. Student applicants can be enrolled in any post-secondary level. This program links students with leading astroparticle physics researchers in Canada for opportunities to expand research collaborations, knowledge, and research-based skills. This year, we are also broadening the definition of “supervisor” to include opportunities for postdoctoral researchers to apply as supervisors to host a cross-disciplinary intern.

McGill Department of Physics

Graduate Studies in Physics at McGill University

Friday November 19, 2021

McGill University, Montreal, Canada

- Downtown campus in the centre of Montreal

https://www.mcgill.ca/gradapplicants/gradlife/campus

- approximately 40,000 (undergrad+ grad) students

- consistently ranked in top 10 best student cities (QS World Rankings)

https://www.mcgill.ca/gradapplicants/gradlife/living-montreal

McGill Department of Physics

http://www.physics.mcgill.ca/

- 45 professors (plus 25 Adjunct/Associate Profs, 12 Emeritus Profs)
- 180 graduate students from 34 countries

- Research areas: Astrophysics, Biophysics, Condensed Matter, High Energy Physics, Nonlinear and Atmospheric Physics, Nuclear Physics, Particle Astrophysics

- Much of this research is interdisciplinary: links to several other Departments - Chemistry, Biology, Medicine, Engineering, Earth and Planetary Sciences, Atmospheric Science

- Experiment, Theory, Observations, Computing

- Research brochure:

  http://www.physics.mcgill.ca/research/brochure.pdf

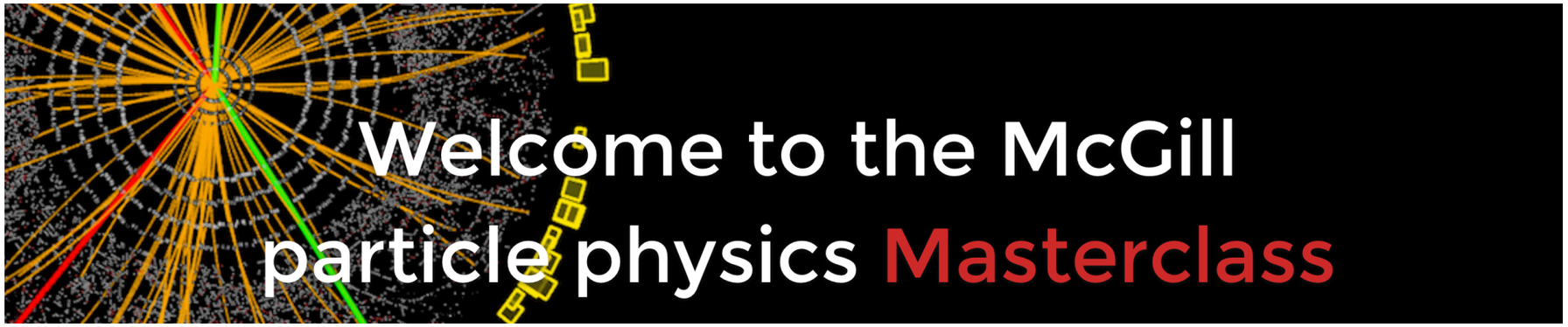
A typical week in the Department

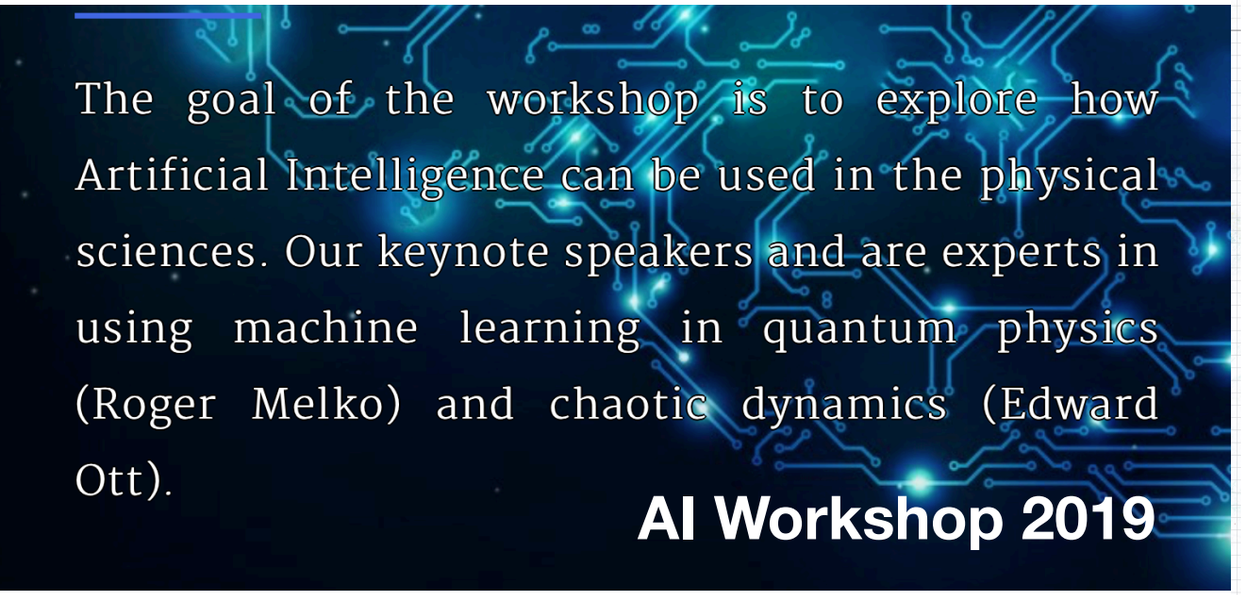
M	McGill Space Institute lunch High Energy Theory seminar
T	Astrophysics colloquium
W	High Energy Theory Journal Club Astroparticle physics seminar Education, Outreach and EDI discussion group
Th	Condensed matter journal club / seminar
F	Astrophysics journal club Physics colloquium

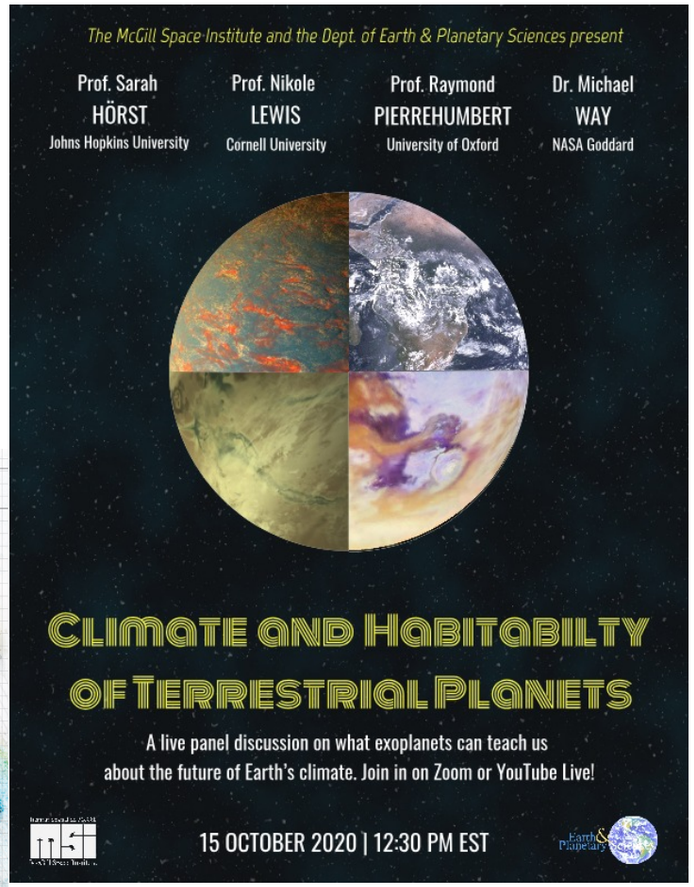
+ more !

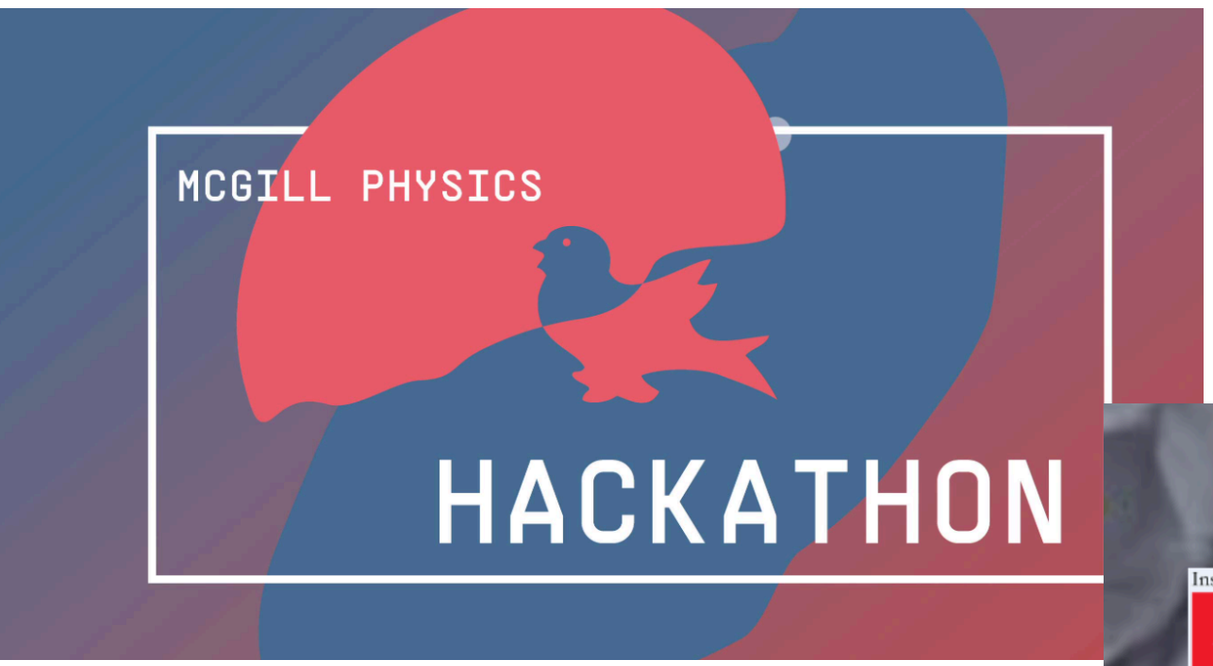
e.g. daily tea/cookies in McGill Space Institute; lunch gathering in Physics lounge

Many special events each year





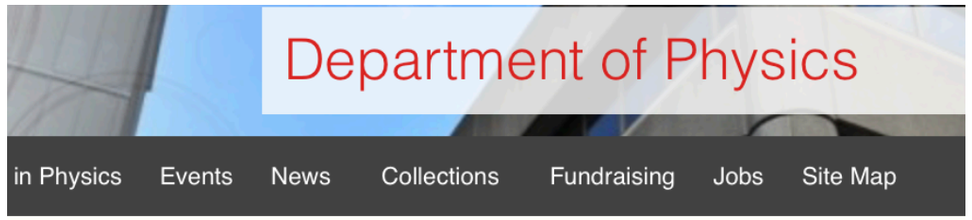




Where to look for information about graduate studies

- Graduate studies section of the Department websites:

  http://www.physics.mcgill.ca/grads/



Contents

- McGill Graduate and Postdoctoral Studies (GPS) https://www.mcgill.ca/gps/

McGill | Graduate and Postdoctoral Studies

Graduate programs in Physics

MSc

- 2 year program
- 5 courses (at least one 600 level or higher) — can spread them out over the two years or take them all in the first year, up to you
- Thesis

PhD

- typically 4 years
- 2 courses at 600 or 700 level, but one of these can be brought forward from the MSc
- Prelim exam — taken in May of your first year, 2x3 hour exams covering undergraduate level physics (<— this may change soon)
- Thesis

Fast track

- You can fast track from MSc into PhD after one year (typically you would do this in your third term)
- Needs supervisor and GPD approval
- You won't write the MSc thesis or get the MSc degree

Funding for Physics students

Graduate Programs in Physics are Fully Funded for Students

Stipend

- $20,500 per year for non-scholarship students

Scholarships/fellowship top-up

- if you have a scholarship < $20,500, we will make up the difference
- plus you get a recognition top-up, typically 20% of the fellowship value

TA

- 180 hours per year, $5800 per year
- priority to MSc (first 2 years), PhD (first 4 years)

Tuition & Fees

- International and Canadian out-of-province students are given tuition offsets so that they pay the same tuition as Quebec students (~$4900 per year)

http://www.physics.mcgill.ca/grads/finance.html

Fellowships

About half our graduate students have a fellowship of some kind

Many different opportunities

- FRQNT (Provincial) - this October, apply directly
- NSERC (Federal) - this October, apply to the department
- Internal Fellowships - competition held in May/June each year
- New departmental opportunity: $3300/yr fellowship for three incoming students from underrepresented groups
- Many more - you'll get announcements during the year

For a full list of funding opportunities https://mcgill.ca/gps/funding/students

You'll get a salary top up (typically ~20% of the fellowship amount)

Teaching Assistant positions (TAs)

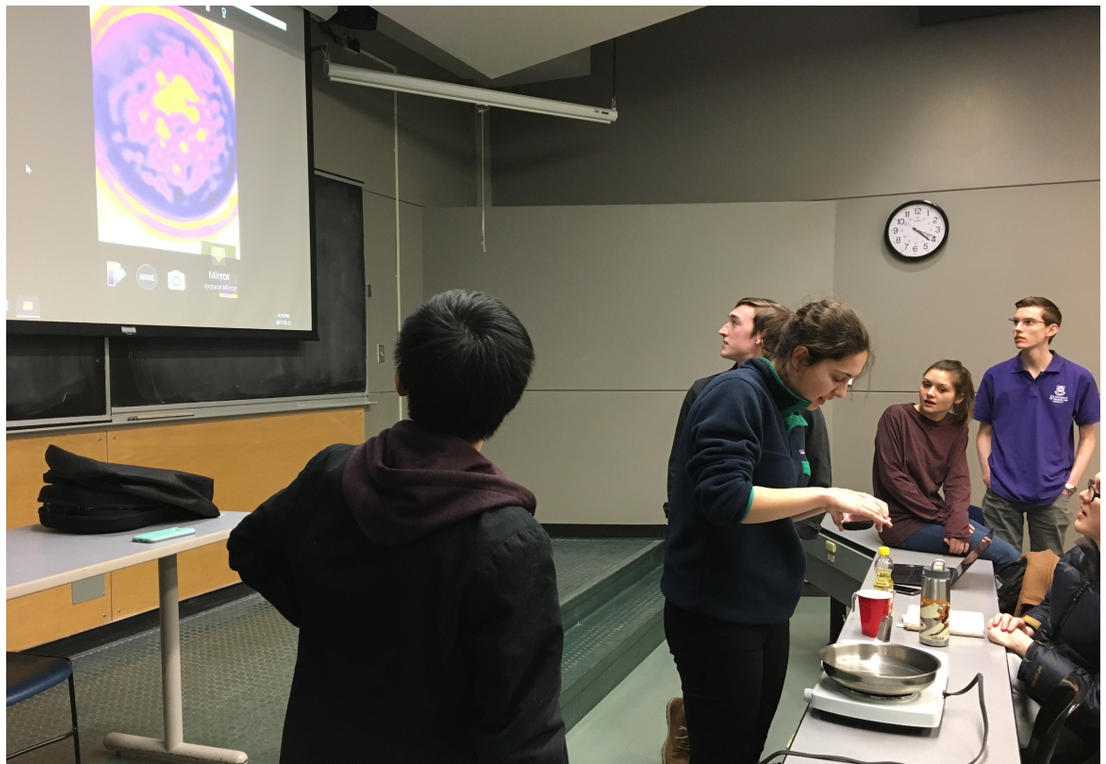
- You will most likely TA over most of your grad career

- You need to explicitly apply for a TA position. There is a TA union (AGSEM) collective agreement, see

  https://www.mcgill.ca/hr/employee-relations/assocs-unions

- There are many different TA activities, depending on the course
  - Grading, help with exams, develop and give tutorials, develop and give demonstrations in lectures
  - Use it as a chance for professional development
  - 90 hours over the term

- Training workshops in the Fall — annual Physics TA workshop in September, also there is a University-wide SKILLSETS New TA Training Day



Student Societies

McGill Graduate Association of Physics Students (MGAPS)

https://mgaps.physics.mcgill.ca

Post-Graduate Student's Society (PGSS)

https://pgss.mcgill.ca/

Lots of opportunities to get involved! e.g. grad representative on University committees

https://pgss.mcgill.ca/en/get-involved

Outreach

Lots of opportunities to get involved

Paid outreach coordinator positions available for students

Examples of activities:

- Monthly public lectures (given by students/faculty/postdocs)
- McGill Physics Hackathon
- Teacher workshop and school visits

https://physicsmatters.physics.mcgill.ca/

https://msi.mcgill.ca/

Equity, Diversity and Inclusion (EDI)

http://www.physics.mcgill.ca/edi/

Work towards an equitable and inclusive environment in the Department

Recent activities:

- List of resources (see webpage)
- Parental leave policy for students/postdocs
- EDI colloquia each term
- Social events, e.g. trivia night
- Values statement
- Climate survey

Paid EDI coordinator positions are available for students

RESEARCH IN PHYSICS

Astrophysics

McGill's Astrophysics group works at the front of major astrophysical research areas.
This is a fascinating time in astrophysics, with new observational capabilities offering a more detailed view of the universe and its constituents than ever before.

McGill

Prof. Robert Rutledge's group is primarily interested in measuring the size of **neutron stars** through x-ray observation, which provides direct measurements of strong-force physics.

Prof. Cumming's group takes a theoretical approach to study neutron stars, such as thermo-nuclear burning, magnetic field evolution, & properties of dense matter, as well as the formation of **exoplanets.**

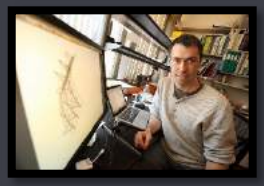
Prof. Eve Lee's group focuses on theoretical studies of **star and planet formation**, to understand the origin of diversity in exoplanetary systems. Specific topics include the [illegible] planetary atmospheres, the orbital architecture of planetary systems, star-disk-planet interactions, and the dynamics of debris disks.

Professor Cynthia Chiang's research group focuses on **observational cosmology** to piece together the history of our universe & the physical processes that govern it. Her team specializes in the design, construction, & fielding of custom instrumentation, as well as data analysis for these experiments.

Institut Spatial de McGill

McGill Space Institute

Prof. Matt Dobbs' leads a hands-on experimentalist group designing, building, & using observational **cosmology** to better understand the origin, fate, and composition of the universe.



Prof. Nicolas Cowan's Group focuses on characterizations of the surfaces & atmospheres of **exoplanets**, monitoring how their brightness & color change with time.

Member of the scientific committee for the James Webb Space Telescope and the Ariel Mission.

Prof. Tracy Webb's research focuses in foundation & evolution of **galaxies**, using some of the world's most powerful telescopes.

Prof. Jon Sievers is developing analysis techniques for upcoming large **cosmological** surveys, including surveys of the cosmic microwave background and the 21 cm line of neutral hydrogen.

Prof. Adrian Liu

CIFAR Azrieli Global Scholar, Sloan Research Fellow, William Dawson Scholar

Prof. Liu's group focuses on connections between theory, data analysis, and observation in 21cm **cosmology** to shed light on Cosmic Dawn—the period when first-generation stars and galaxies were formed.

Prof. David Hanna is a member of the VERITAS collaboration & uses **gamma ray** observation to search for signals produced by annihilation of dark matter **particles** in the centers of dwarf galaxies.

Prof. Haggard's group investigates the extreme endpoints for matter in the universe: **black holes and neutron stars**. Her team is pursuing intensive, multiwavelength studies of the supermassive black hole at the heart of the Milky Way, Sagittarius A*, and searches for electromagnetic counterparts to gravitational wave sources discovered by the LIGO-Virgo Observatories.

Recipient of the 2020 Breakthrough Prize in Fundamental Physics with the Event Horion Telescope Collaboration, CIFAR Azrieli Global Scholar, Canada Research Chair in Multi-messenger Astrophysics

Prof. Vicky Kaspi's research currently centres on the new **CHIME telescope**, & **Fast Radio Bursts** (FRBs); working to understand CHIME/FRB discoveries & their implications for the nature of FRBs. Kaspi also pursues her long-term interest in neutron stars, using both CHIME and other radio and X-ray telescopes to study **pulsars** - rapidly rotating, highly magnetized **neutron stars.**

She is the first woman & one of the youngest researchers ever win the Herzberg Canada Gold Medal in 2016.

Prof. Ken Ragan is also a VERITAS member and focuses on **particle astrophysics**, observing astrophysical sources of high energy **gamma rays**, allowing him and his group to study sources of black hole driven galaxies, supernova remnants, pulsar-wind nebulae, and microquasars.

RESEARCH IN PHYSICS

Biophysics

Due to its complexity, we know far more about the inner working of stars than we do about a cell.
Biophysics attempts to characterize complex networks that govern the essential cellular processes like the ability to sense, transmit, & generate signals.

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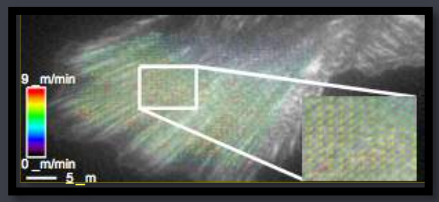
THEORETICAL BIOPHYSICS

Prof. Paul Francois

Awarded in 2015 with one of the three McGill Principal's Prizes for Outstanding Emerging Researchers.

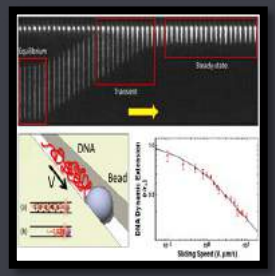
How does an immune cell recognize antigens? How does an embryo develop? Prof. Francois' group develop physics-inspired mathematical tools to understand these dynamics, as well as those related to evolution tackling questions such as: Is Darwinian evolution similar to energy minimization of physics? If so, can we predict what networks can evolve?



Velocity map of retrograde transport of alpha-actinin/EGFP in a mouse fibroplast cell. Measured bu STICS analysis.

DNA and Beads

The image below depicts a bead optically trapped inside a nanochannel with an extended DNA molecule. The DNA is driven against the bead at a fixed sliding speed V.



Visualizing dynamics and interactions between biomolecules (e.g. protein, DNA) with single-molecule resolution allows for the biophysical mechanisms underlying life preserving processes such as DNA transcription and repair to be newly uncovered and understood. The collaborative effort between Leslie & Wiseman and collaborators in the Department of Chemistry, opens the door to creating ultra-sensitive biomedical diagnostics (e.g. of biomarkers that indicate cancer onset).

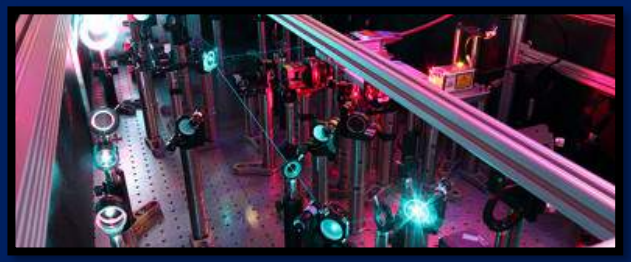
EXPERIMENTAL BOPHYSICS

Prof. Walter Reisner's bionanofluidic lab explores how complex submicron nanotopographies embedded in a confined slit-like nanochannel can be used to perform manipulations of single biopolymers, such as DNA, in solution.

Prof. Wiseman's lab is interested in understanding the molecular mechanisms involved in cellular adhesion & how cells dynamically regulate adhesion receptors to control cellular migration.

Prof. Leslie's lab aims to address unanswered questions about molecular transport in complex biophysical environments. The group is fascinated by how molecules move about & perform myriad functions.

McGill Physics is growing a strong and highly collaborative biophysics research community, including 5 in-Department and several out-of-Department members. Their active research programs are seeking highly motivated graduate students and researchers.



Multi-colour fluorescence excitation systems use lasers of different wavelengths to simultaneously image different molecular species.

Students and postdoctoral researchers trained in this environment gain quantitative and interdisciplinary skills, and can come from biological or physics backgrounds. Our biophysics research programs offer students and postdoctoral researchers the opportunity to gain expertise in state-of-the-art two-photon and nonlinear microscopy, image correlation spectroscopy and other fluctuation-based methods, direct tracking in live cell methods, confocal microscopy, computational biology, lasers and optical trapping, atomic force microscopy, protein-engineering, signal transduction, gene expression, neurophysiology, micro/nanofluidic bioanalysis device fabrication, nanoparticle labels, and total internal refection and fluorescence resonance energy transfer microscopies.

RESEARCH IN PHYSICS

Condensed Matter

McGill's condensed matter physics researchers focus on the synthesis, physical properties, and characterization, theory and large-scale modeling of novel materials.

McGill

New discoveries are constantly made in condensed matter systems be it in the form of new materials, such as graphene or magnetic superconductors, new quantum phases, such as strongly correlated systems or topological phases, new frontiers such as Terahertz or nanoscience, new paradigms, such as quantum computing or the mechanics of light.

THEORY

Materials

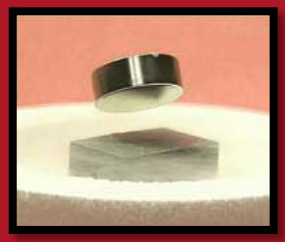
Prof. Nikolas Provatas' group ports over ideas & knowledge from microscopic scales on which **material** properties are typically realized in particular applications; models developed can thus be used in materials engineering. Member of Calcul Quebec's Scientific Council.

Prof. Martin Grant's group investigates universal phenomena in far more **equilibrium systems** by nonlinear analysis, using the largest computers in Canada.

Prof. Hong Guo's group is focused on two main areas: quantum electronic transport theory and modeling in nanoelectronics, and materials physics of nanotec hnology.

Prof. William Coish's group studies the **quantum** properties of nanoscale condensed matter systems, & how to use these systems for quantum information processing.

Prof. Kartiek Agarwal's group conducts research on strongly correlated **quantum systems**, with a focus on their **non-equilibrium** properties.



The Meissner effect - levitation of a magnet above a magnetic field repelling superconductor.

MAGNETISM & SUPERCONDUCTIVITY

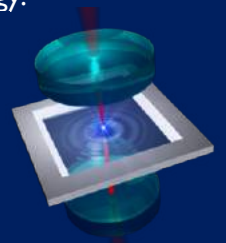
Prof. Tami Pereg-Barnea's group focuses on condensed matter systems with unusual properties often related to exotic/topological order or strong interactions. More specifically studying topological insulators, topological **superconductors**, graphene, and unconventional superconductors.

McGill Physics Computational Materials Science Group

EXPERIMENT

Quantum Optics and Sensing

Prof. Lily Childress' research group uses techiniques developed in quantum optics and atomic physics to understand and control th equantum states of defect centres in crystalline hosts, while exploring their potential application in quntum information science and metrology.



I Cavity photons coupled to the drumhead motion of a 50-nanometer-thick membrane

Prof. Jack Sankey's team is interested in creating new types of light-actuated mechanical sensors operating near (or below!) the standard quantum limit. We are also part of collaborative efforts to apply the tools of quantum optics to other fields, including cancer therapy and spintronics.

RESEARCH IN PHYSICS

Condensed Matter

McGill's condensed matter physics researchers focus on the synthesis, physical properties, and characterization, theory and large-scale modeling of novel materials.

McGill

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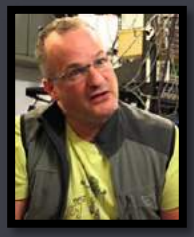
Non-equilibrium Physics & Soft Condensed Matter

Prof. Michael Hilke's research interests include: how dimensional systems, high speed nano-electronics, nano-electronic modelling, quantum computing, superconductivity, vortices, disordered systems, Graphene, and CNTs.

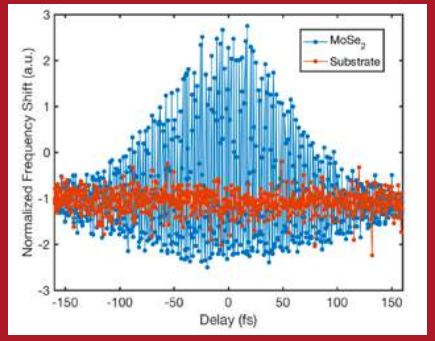


Prof. Guillaume Gervais' group works at elucidating new quantum phases of matter in semiconductor electronic and fluidic structures fabricated "on-a-chip".

Prof. Dominic Ryan's group focuses on magnetic materials, with particular emphasis on those with frustrated or competing exchange interactions.

Prof. Bradley Siwick's laboratory is focused on developing technologies that will allow complex transient structures of molecular and material systems to be determined at the atomic level.

Prof. Peter Grutter's group pushes the limits of instrumentation and is one of the internationally leading groups in the development of **atomic force microscopes** (AFM) and its application to understanding how nanscale objects can be used for information storage and processing (the field commonly known as **nano-electronics**).



Optical autocorrelation signal detected by AFM using a unique combination of ultrahigh vacuum AFM and 100 fs laser systems. Development of ultrafast instrumentation and novel electro-optical methods lead to interesting and stimulating interactions within the Condensed Matter Group.

ULTRAFAST PHYSICS & CONDENSED MATTER PHYSICS

Prof. David Cooke's lab focuses on ultrafast optical spectroscopy and photonics in the last portion of the electromagnetic spectrum to be controlled. Lab activities stretch from fundamental optical spectroscopy to the more applied development of THz sources and detection technology.

"The Professors in the Physics department truly care about all the graduate students' success, not just their own students. I've never been turned down by a Professor when

Master's student MOHAMMED HARBSLESLIE

RESEARCH IN PHYSICS

High Energy

What are the laws of nature at their most fundamental level? Is there an ultimate unified theory of elementary particles and gravity? This is the "holy grail" of theoretical physicists.

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At McGill, our quest takes three different but related directions: a bottom-up approach (phenomenology) of trying to deduce new laws from latest experimental observations; the top down approach, using mathematical consistency of string theory to understand quantum gravity; and cosmology, which through the big bang can give us complementary information about physics at very high energies.

HIGH ENERGY THEORY

Prof. Brandenberger's focus is to explain the observed structure in the universe on large scales & to explain the history of the very early universe. He has made pioneering contributions to the emerging field of superstring cosmology.

Prof. Alex Maloney's group focuses on string theory and its applications to basic conceptual puzzles in quantum gravity, cosmology, and black hole physics.

Prof. Keshav Dasgupta's research interest spans a variety of topics such as, superstring theory, string cosmology, quantum field theories, and mathematics.

Prof. Jim Cline is interested in the connections between cosmology and particle physics, including inflation, dark matter, neutrino physics, and the origin of the asymmetry between matter and antimatter. His group focuses on the search for models of these phenomena, and how they can be tested at coliders and astrophysical experiments.

Prof. Sarah Harrison's research focuses on **string theory**, holography, black holes, and mathematical physics.

Canada Research Chair in Mathematical Physics and String Theory (NSERC) Tier 2

Prof. Simon Caron Huot focuses on scattering processes: can we calculate what comes out when two protons collide?

Prof. Katelin Schutz's research centers on the possibility that there are undiscoverd particles and forces beyond the Standard Model that could leave unique observable imprints in astrophysical systems or tabletop experiments.

In its broadest terms, research in particle physics has as its goal the discovery of the most basic constituents of matter and the forces through which they interact, and how matter behaves when it is put under very extreme conditions. Our knowledge of the motion of matter in such conditions relies on the limits of what we know about the most elementary particles and forces.

HIGH ENERGY EXPERIMENT

Prof. Brigitte Vachon's research group studies the unique properties of **top quarks** in order to understand physics at the smallest distance scale, which ultimately dictates what today's universe looks like. They are also involved in the **ATLAS experiments** (CERN).

Prof. Francois Corriveau's group studies high-energy collisions to get insights into the nature & structure of matter, & is involved in **ATLAS & Zeus experiments.**

Prof. Andreas Warburton's group engages in high-energy particle colliders and detector technologies, ATLAS, & Belle II experiments, with interests in quarks, gluon & photon signatures in collision data to understand quark substructure, microscopic black holes & dark matter.

Prof. Steven Robertson's group studies the properties of the interactions of fundamental particles & forces & is involved with ATLAS, BaBar and SuperB.

Atlas detector at CERN in Switzerland.

RESEARCH IN PHYSICS

Nuclear Physics

McGill University's long and strong tradition of excellence in nuclear physics began with Rutherford's tenure at McGill between 1898 and 1907 during which he discovered the transmutation of matter.

McGill

The same tradition of excellence continues on to this day. Today, nuclear physics encompasses a wide range of modern physics. The traditional study of nuclei and their reaction is still a vibrant part of modern nuclear physics. In the latter part of the 20th century, however, a new and exciting field of nuclear physics started to emerge. This is the study of nuclear matter under extreme conditions.

EXPERIMENTAL NEUTRINO PHYSICS

Neutrinos are the most abundant observed massive particles in the universe. Every second billions of them pass through our fingernails, yet we actually know very little about these elusive particles. Neutrino oscillation experiments determined that neutrinos are in fact massive particles, which was awarded the 2015 Nobel Prize, however, their absolute mass still remains unknown. Since neutrinos are electrically neutral, they could be fundamentally different from all other massive particles by being their own antiparticles.

Prof. Thomas Brunner explores whether or not neutrinos are their own antiparticles by searching for neutrinoless double data decays in the isotope xenon-136. If this decay is observed, it gives evidence for physics beyond the Standard Model and helps us understand the nature of the neutrino. As part of the nEXO collaboration, Brunner and his group are developing components for a next-generation ultra-low background experiment to be located at SNOLAB, where the SNO detector made its groundbreaking discovery.

Prof. Fritz Buchinger's research group is focused on the investigation of fundamental nuclear properties, and specifically masses and radii. He is also involved with experiments at TRIUMF.

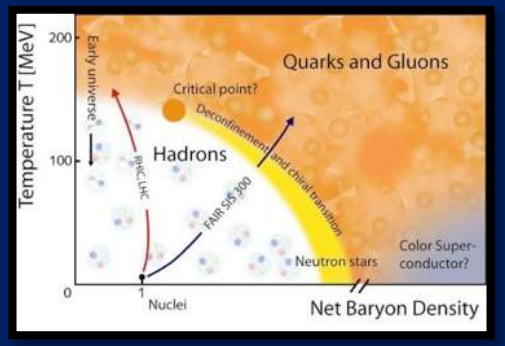
RELATIVISTIC HEAVY-ION COLLISIONS

Prof. Sangyong Jeon's research group studies Quark-Gluon Plasma created in ultra-relativistic heavy ion collisions using a variety of theoretical tools ranging from the non-equilibrium quantum field theory to numerical simulations of the heavy ion collisions.

In 2018, Prof. Jeon was elected Fellow of the American Physical Society for his contributions to relativistic heavy-ion physics

RELATIVISTIC HEAVY-ION COLLISIONS

Charles Gale's research group mostly deals with the theoretical study of matter under extreme conditions of temperature and density. This general area straddles nuclear and particle physics, but also involves aspects of condensed matter and



astrophysics. Put another way, we are trying to explore and understand the phase diagram of QCD, the theory of the strong interaction. These studies eventually lead to a better understanding of the nuclear equation of state and this is relevant for the physics of the early universe, the theoretical modeling of neutron stars, and for the understanding of nuclear collision dynamics.

NONLINEAR -GEOPHYSICS

Professor Shaun Lovejoy

We are living in a golden age of geophysical data and models; using innovative nonlinear data analysis techniques, students analyze state-of-the-art satellite data, aircraft data, paleoclimate data or the outputs of Global Climate Models and weather models. They systemically unravel the structure of our atmosphere in time & in space over scales ranging from milliseconds to millions of years, from millimeters to the size of the planet. The classical weather – climate dichotomy must be replaced by weather – macro weather –climate & this transforms our view. Rather than view the atmosphere as a classical deterministic system they model it with new types of stochastic (random) models that are able to take into account the huge ranges of dynamically important scales, thus overcoming the limitations of the conventional approaches.

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Physics Department - Département de Physique

Since the 1980s, the nonlinear physics & atmospheric physics group has worked on a series of new geophysical paradigms. A particularly exciting one is the idea that atmospheric dynamics repeat scale after scale from large to small in a cascade-like way.

RELATED

Atmospheric Science
https://www.mcgill.ca/meteo/

Earth & Planetary Science

https://www.mcgill.ca/eps/