

## Physics: MSc, PhD

The Department of Physics, as part of Graduate Studies in Physics at University of Guelph & University of Waterloo and the Biophysics Interdepartmental Group (BIG), offers unique graduate opportunities in experimental and theoretical research. Our faculty members collaborate with exceptional research institutions including the Perimeter Institute, the Canadian Light Source, and TRIUMF.

[physics.uoguelph.ca](http://physics.uoguelph.ca)

### Program

Master's students can choose between a course work option (approximately three semesters) and research-based thesis option (approximately six semesters). The PhD program requires the successful completion of a qualifying exam and the completion and defense of a research-based thesis

### Research Fields

- Astrophysics and Gravitation
- Atomic, Molecular and Optical Physics
- Biophysics
- Chemical Physics
- Condensed Matter and Material Physics
- Industrial and Applied Physics
- Quantum Computing
- Subatomic Physics

### Admission Requirements

For the MSc program, applicants require an honours BSc, with a minimum B average (75%) in past two years of study.

For the PhD program, applicants require an MSc in Physics with at minimum B average (75%).

#### Application Deadline:

Ongoing

**Entry:** Fall, Winter, Spring



One of many spectrometers that are regularly used in the physics department. Here, Andrew is observing the sample compartment of the time-resolved flash photolysis spectrometer which measures the light-induced absorption changes of photoactive proteins.

– Andrew Harris, PhD Biophysics

### Application Requirements

In addition to meeting the minimum admission requirements, applicants are required to submit:

- All post-secondary transcripts
- Three (3) academic references
- Supplementary information form
- Physics Subject GRE (for applicants who did not complete post-secondary education in Canada)
- English Language Proficiency (for applicants for whom English is not their first language)

### ARE YOU INTERESTED IN:

- Remotely exploring the surface of Mars
- Better physics education practices
- Remediation processes for industrial by-products
- Probing the early particle nature of the universe
- The development of gravitational wave spectroscopy

### CAREER OPPORTUNITIES:

- Education
- Energy production
- Financial modeling
- Government & policy
- Software development

### CONTACT INFORMATION

#### Graduate Program Coordinator:

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#### Graduate Program Assistant:

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## Departmental Graduate Faculty with Research Areas

### EXPERIMENTAL

#### Leonid Brown:

Photobiology, Biospectroscopy, Structure/Function of Membrane Proteins, Bioenergetics, Ion Transport, Photosensory Transduction, Retinal-binding Proteins (rhodopsins)

#### John L. (Jain) Campbell, Emeritus (Actively supervising):

Physics of soft materials; biophysics; experimental tools for imaging, spectroscopy, scattering and force measurements; biopolymer nanoparticles and soft colloids; application of machine learning techniques to polymer physics

#### John Dutcher:

Nanobiomaterials; physics of soft materials, surfaces and interfaces; polymers and biopolymers at the nanoscale; polymer physics; viscoelasticity; bacterial biophysics; biopolymer nanoparticles; thin film instabilities; self-assembly and pattern formation

#### Paul Garrett:

X-ray Spectroscopy, Radiation Physics, Instrumentation for Planetary Exploration, modeling and data analysis of spectroscopy methods, Mars Exploration, Geology

#### Ralf Gellert:

Mars Exploration, Geology of Mars, Habitability of Mars, Planetology, X-ray Spectroscopy, alpha particle spectroscopy, digital and analogue electronics, radiation damage, Mineralogy, data analysis

#### De-Tong Jiang:

Condensed matter physics, Interface structure and function of electronic thin films of organic semiconductor and metal silicides, grazing-incidence X-ray scattering and spectroscopy techniques, arsenic speciation in environmental systems

#### Stefan Kycia:

High energy x-ray diffraction, (high resolution radial distribution method) and by anomalous x-ray diffraction method, chemical composition, strain and elastic energy of self-assembled islands and other epitaxial systems

#### Vladimir Ladizhansky:

Solid-state NMR, in-cell NMR, membrane protein structure, dynamics and folding, protein-protein and protein-lipid interactions, retinal-binding proteins, aquaporins, alpha-synuclein in Parkinson's Disease.

#### Mike Massa:

Soft and Hard Condensed Matter, Physics Education

#### Dennis Mücher:

Atomic nuclei with a large excess of neutrons, stellar nucleosynthesis, applications of physics in cancer treatment

#### Joanne O'Meara:

X-ray fluorescence (XRF) systems, physics education

#### Xiao-Rong Qin:

Structural properties of vacuum vapour-deposited thin films of organic small molecules, carrier transport and other exceptional properties of films for applications in organic electronics

#### Carl Svensson:

Evolution of nuclear shell structure in rare isotopes, superallowed Fermi beta decays, isospin caused by Coulomb and charge-dependent forces in the nucleus

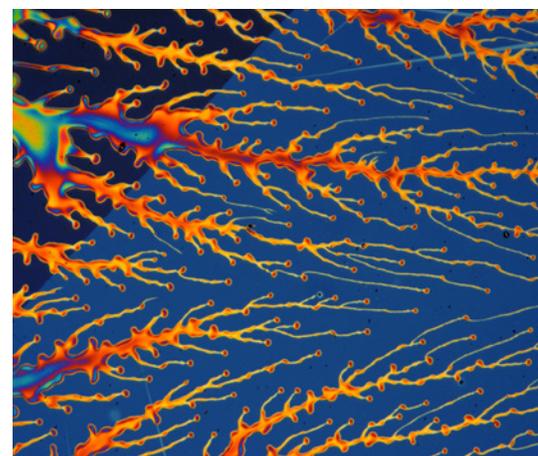
#### Martin Williams:

Physics Education, modern classroom technologies, designing inquiry-based physics labs to improve undergraduate learning outcomes

### THEORETICAL

#### Liliana Caballero:

Theoretical nuclear astrophysics, heavy elements, the neutrino emission in core-collapse supernova and neutron star mergers, and bursts in accreting neutron stars



Optical Microscopy image of polystyrene nanospheres dewetting on an underlying polystyrene substrate. All colours are due to optical interference. (Image: Dutcher Lab)

#### Alexandros Gezerlis:

Quantum many-body theory, fermions, ultracold atomic gases, terrestrial nuclei, neutron stars, nuclear astrophysics

#### Elisabeth Nicol:

Superconductivity and Dirac materials

#### Eric Poisson:

Gravitational physics, general relativity, black holes, compact objects, gravitational waves, self-force

#### Daniel Siegel:

Theoretical nuclear astrophysics, high-energy astrophysics, multi-messenger astronomy, neutron star mergers, numerical relativity, modelling gravitational wave sources

#### Robert Wickham:

Polymer physics, soft materials, nano-scale self-assembly, non-equilibrium statistical mechanics, bacterial biophysics, simulation

**Huan Yang** - Gravitational wave physics; astrophysics in the strong gravity regime; gravity-fluid correspondence and holographic theories