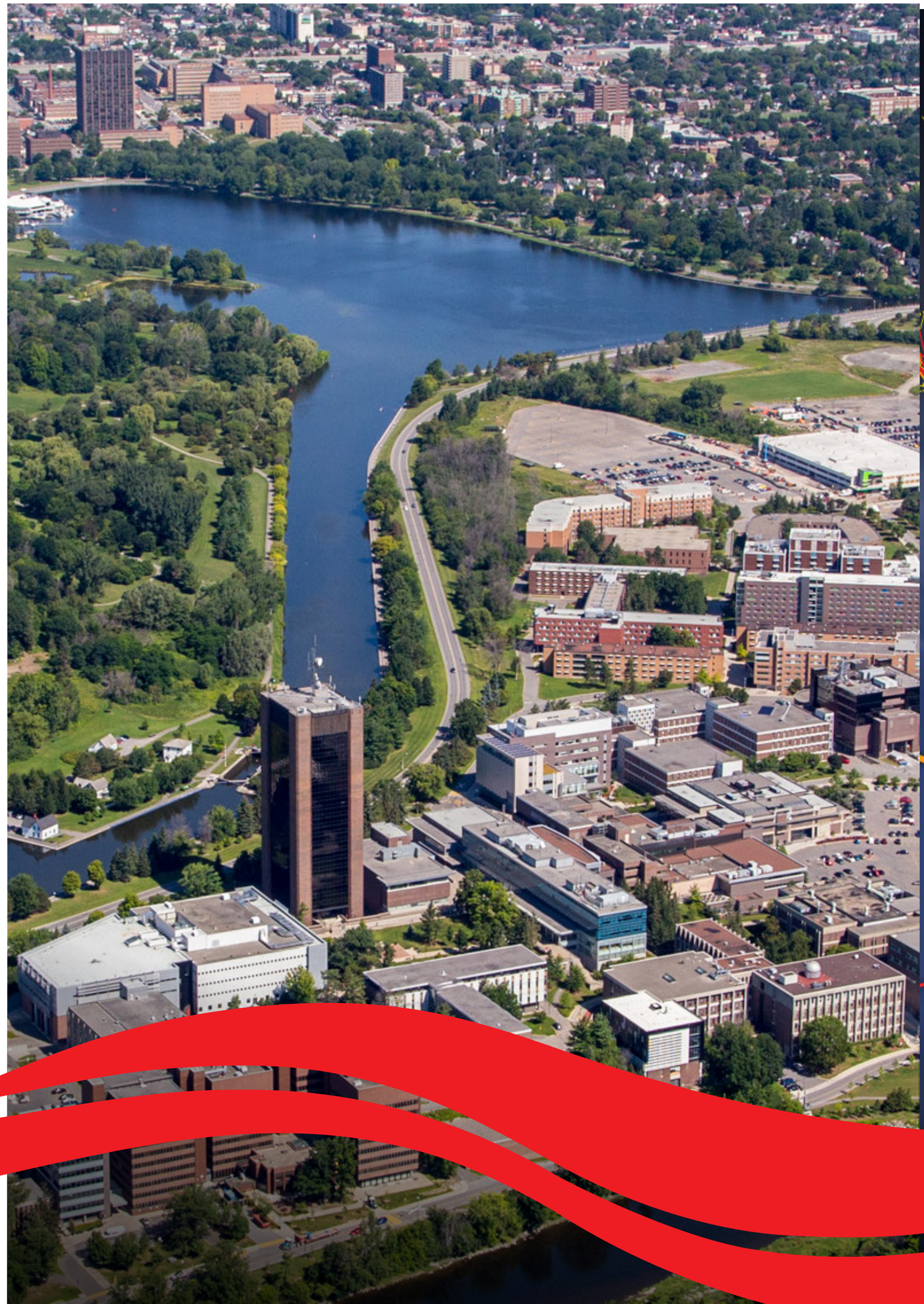
Shape the Future of Physics

Physics is the study of the most basic natural phenomena—from the smallest particles to the largest structures of the universe. Physicists are keen to understand the nature of the world around them and push scientific boundaries for the betterment of humanity. While researching physics at Carleton, you'll work on exciting high-profile projects with real-world implications and gain experience with both data analysis and instrumentation R&D at a world-class facility.

Did you know?

All students are guaranteed a competitive funding package consisting of TA, RA and scholarships.

We are a member of the Ottawa-Carleton Institute for Physics (OCIP.ca).



For more information

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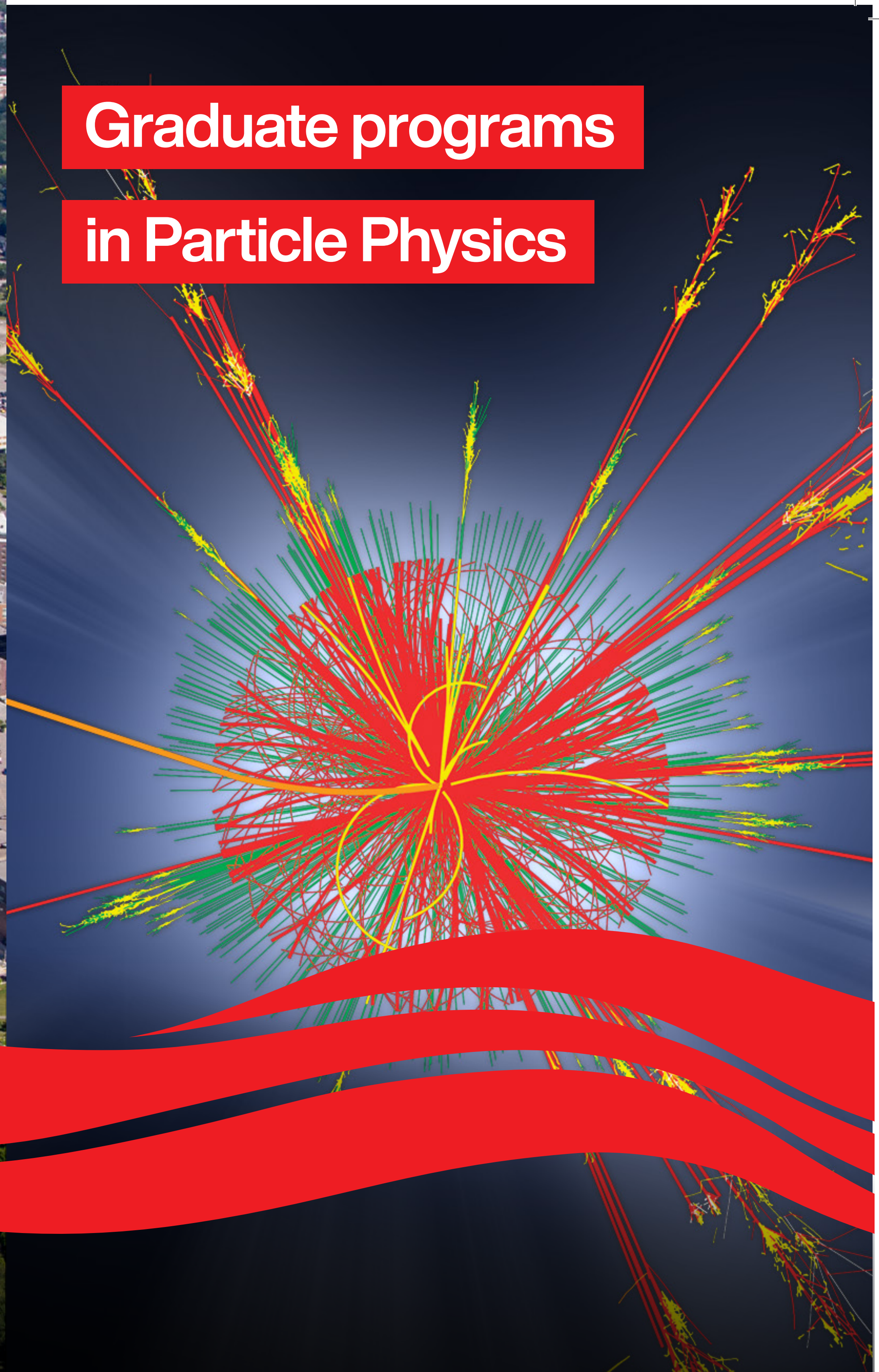
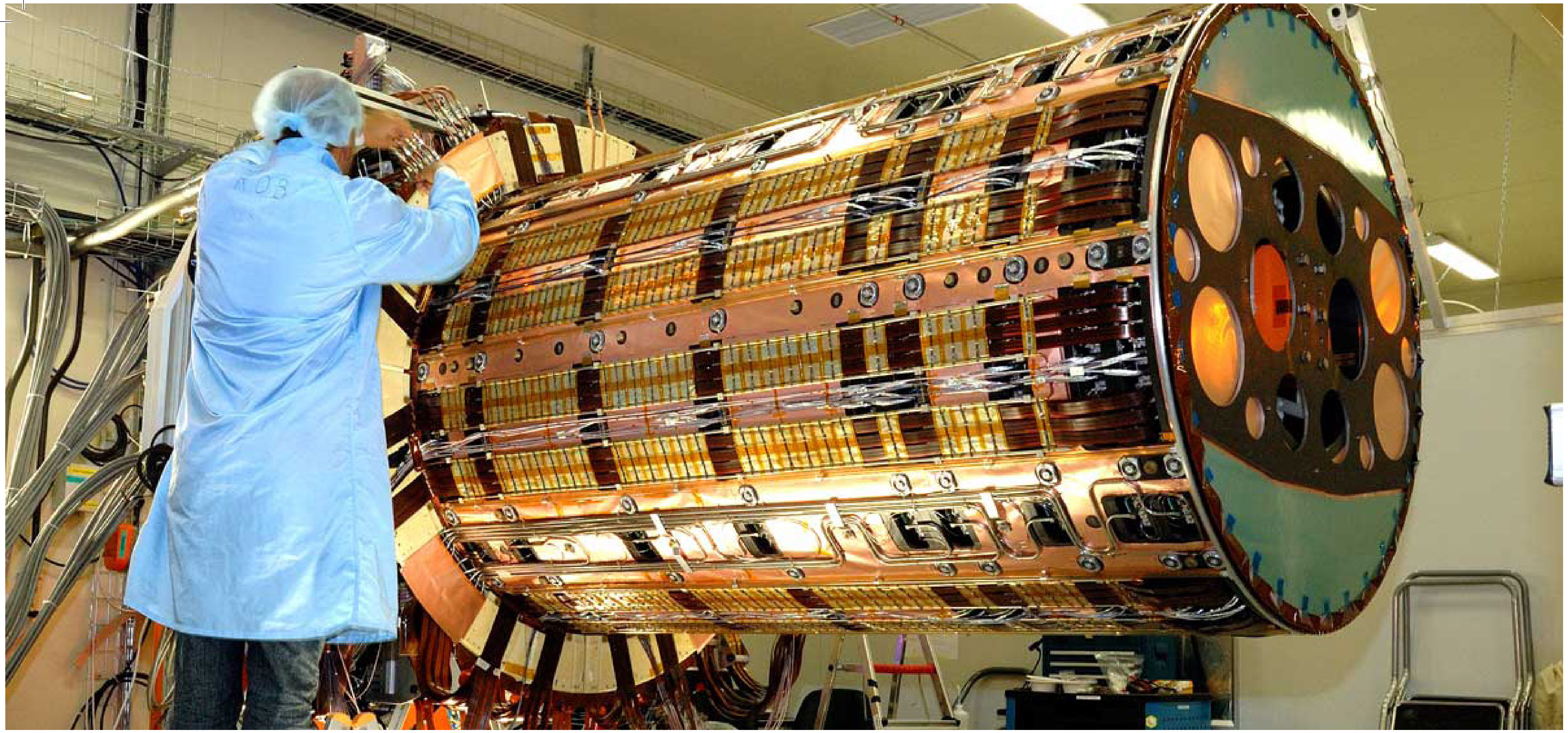


Graduate programs in Particle Physics

Ottawa, Canada
graduate.carleton.ca

Carleton University



Theoretical Particle Physics

The Carleton Theoretical Particle Physics group is the largest phenomenology group in Canada, focusing on the connection between particle theory and experiments. Some of our research topics include:

Dark Matter and Dark Sectors - Predicting dark matter abundance and signatures in various models to explain the missing mass of the universe.

Astroparticle Physics and Cosmology - Study how the universe evolved, from the Big Bang to today and how different models of particle physics influence this evolution.

LHC Phenomenology - Predicting LHC signatures of physics beyond the Standard Model such as SUSY, extra dimensions, and little Higgs to help experimentalists find or exclude those models and find ways to distinguish them.

Higgs and Physics Beyond the Standard Model - Study Higgs properties and exotic models that try to explain the origin of mass: multi-Higgs models, Little Higgs models, supersymmetry, extra dimensions, etc.

Program Information

M.Sc.: 2 years, 5 courses + Thesis
Ph.D.: 4 years, 4 courses + Thesis

M.Sc. Students who completed the first year of study with excellent academic performance will have the opportunity to transfer into the Ph.D. program.

Astroparticle Physics

SNOLAB, located two kilometres underground near Sudbury, is Canada's leading-edge facility for the study of astroparticle physics. SNOLAB is an extension of the SNO solar neutrino experiment (recognized with the 2015 Nobel Prize for discovery of solar neutrino oscillations) and now houses several experiments probing fundamental questions into the nature of dark matter and neutrinos.

nEXO is a planned liquid xenon time projection chamber with ultra-low background, optimized for the search of the neutrinoless double beta decay. The discovery of this exotic nuclear decay would provide a deeper insight into the nature of the neutrinos, with hints toward understanding the early universe.

DEAP-3600 is a liquid argon detector currently in operation at SNOLAB for ultra-low background detection of nuclear recoil events from dark matter. Carleton also has leadership roles in the next-generation experiments DarkSide-20k, being installed at LNGS in Italy, and ARGO planned at SNOLAB. More than 80% of the matter in the universe consists of unknown dark matter, the detection of which would be a profound discovery.

Hyper-Kamiokande is the world's largest water Cherenkov detector under construction at Kamioka Observatory. It will investigate many outstanding questions in fundamental physics, including the nature of neutrinos and the asymmetry between matter and antimatter.

These projects offer many fascinating research topics for graduate studies, involving detector simulation, instrumentation development and optimization, low-background techniques and calibration methods, detector construction and operation, signal processing and data analysis with machine-learning algorithms.

High Energy Physics with ATLAS at the Large Hadron Collider

ATLAS is a particle physics experiment that explores the fundamental nature of matter and the basic forces that shape our universe. The ATLAS detector at the CERN Laboratory in Geneva, Switzerland is used to search for new discoveries in the head-on collisions of protons at the highest energy ever produced in a laboratory.

Carleton University was a key participant in the Higgs boson discovery and now conducts several studies to carefully explore this particle. The Carleton group's other analysis interests include studies of electron/photon, muon, and jet production as well as precision Standard Model measurements. The group is also playing critical roles in ATLAS detector operation and assembly currently constructing thin silicon tracking detectors for High Luminosity LHC. Our graduate students regularly travel to CERN to take part in all aspects of the experiment.