

PARTICLE PHYSICS



UALBERTA
PHYSICS

uncovering the mysteries of our universe

The particle physics group at University of Alberta studies the fundamental nature of matter and force. Our work tries to answer some of the most fundamental questions in nature, such as: what is the nature of dark matter? why is the Universe full of matter and not anti-matter? how do neutrinos change flavour and are they their own anti-particle?

Our group plays major roles in large international collaborations around the globe at CERN (Switzerland), SNOLAB (Ontario) and the South Pole.

Nassim Bozorgnia, Assistant Professor

Dr. Bozorgnia's research is focused on dark matter phenomenology, especially the nature and detection of dark matter, the Galactic dark matter distribution, and dark substructures. The goal of her research is to identify the particle nature of dark matter, through distinct signatures on the Galactic dark matter distribution. Her group uses various approaches to probe the dark matter distribution in the Milky Way, taking advantage of state-of-the-art high resolution cosmological simulations and recent high precision astronomical data.

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Andrzej Czarnecki, Professor

Dr. Czarnecki studies phenomenology of gauge interactions and searches for new physics.

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Doug Gingrich, Professor ATLAS

Dr. Gingrich's research focuses on experimental high energy particle physics using the ATLAS detector at the CERN laboratory in Geneva, as well as phenomenology and searches for quantum gravity and superstring theory.

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Aksel Hallin, Professor

Dark Matter & Neutrino Physics

Dr. Hallin's research focuses on two high priority areas of astroparticle physics: the nature of the neutrino and the search for dark matter. Based on the SNO+ neutrino detector at SNOLAB, the Hallin group studies the measurement of neutrino properties, solar neutrinos and geoneutrinos. As part of the DEAP-3600 experiment at SNOLAB, Dr. Hallin also explores direct detection of galactic dark matter.

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Carsten Krauss, Associate Professor

Dark Matter & Neutrino Physics

Finding dark matter particles and neutrinos from sources far away from earth has been Dr. Krauss' research focus for some time. He is leading the search for dark matter with the PICO bubble chambers at SNOLAB, is involved in the SNO+ experiment, and is also working on a new neutrino telescope in the Pacific Ocean to measure neutrinos from very distant sources.

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Roger Moore, Professor

Neutrino & Beyond the Standard Model Physics

Dr. Moore's research focuses on supersymmetry, dark matter and neutrinos. He is a member of the IceCube experiment at the South Pole which measures the interactions of high energy neutrinos in the ice 2 km below the surface of Antarctica. The energy of some of these neutrinos exceeds the highest energies ever obtained by an accelerator making them an excellent place to search for evidence new physics. He is also working on a new neutrino detector in the Pacific Ocean off the west coast of Vancouver Island.

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Alexander Penin, Professor

Perturbative Quantum Field Theory

Dr. Penin studies perturbative quantum field theory and its application to particle and condensed matter physics.

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James Pinfold, Professor
ATLAS, MoEDAL

Dr. Pinfold is working on the ATLAS and MoEDAL experiments at the LHC at CERN. He is involved in the search for magnetic charge, extra dimensions, new symmetries of nature, candidates for dark matter and other avatars of new physics. He is currently involved in the design, construction and testing of a new MoEDAL sub-detector (MAPP) for the detection of fractionally charged particles and new long-lived particles at the LHC. In addition, Pinfold is also contributing to the upgrade of the ATLAS LUCID-luminometer and AFP, ATLAS' latest detector.

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Marie-Cécile Piro, Assistant Professor
Dark Matter Physics & Beyond

Marie-Cécile Piro and her group focus on developing dark matter direct detection techniques, understanding their response by analyzing the data and simulating their backgrounds in order to extract the interesting signal. They work to improve detector's performance and test the feasibility in laboratory. Dr. Piro is also exploring new horizons focusing on theory and phenomenology of dark matter.

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Juan Pablo Yáñez, Assistant Professor
Neutrino Physics

Dr. Yáñez's main research interest is neutrino physics, in particular neutrino oscillations and the origin of neutrino masses. He is currently involved in the IceCube, SNO+ and P-ONE experiments, as well as in modeling atmospheric neutrino production and the development of novel photodetectors for large particle physics experiments.

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