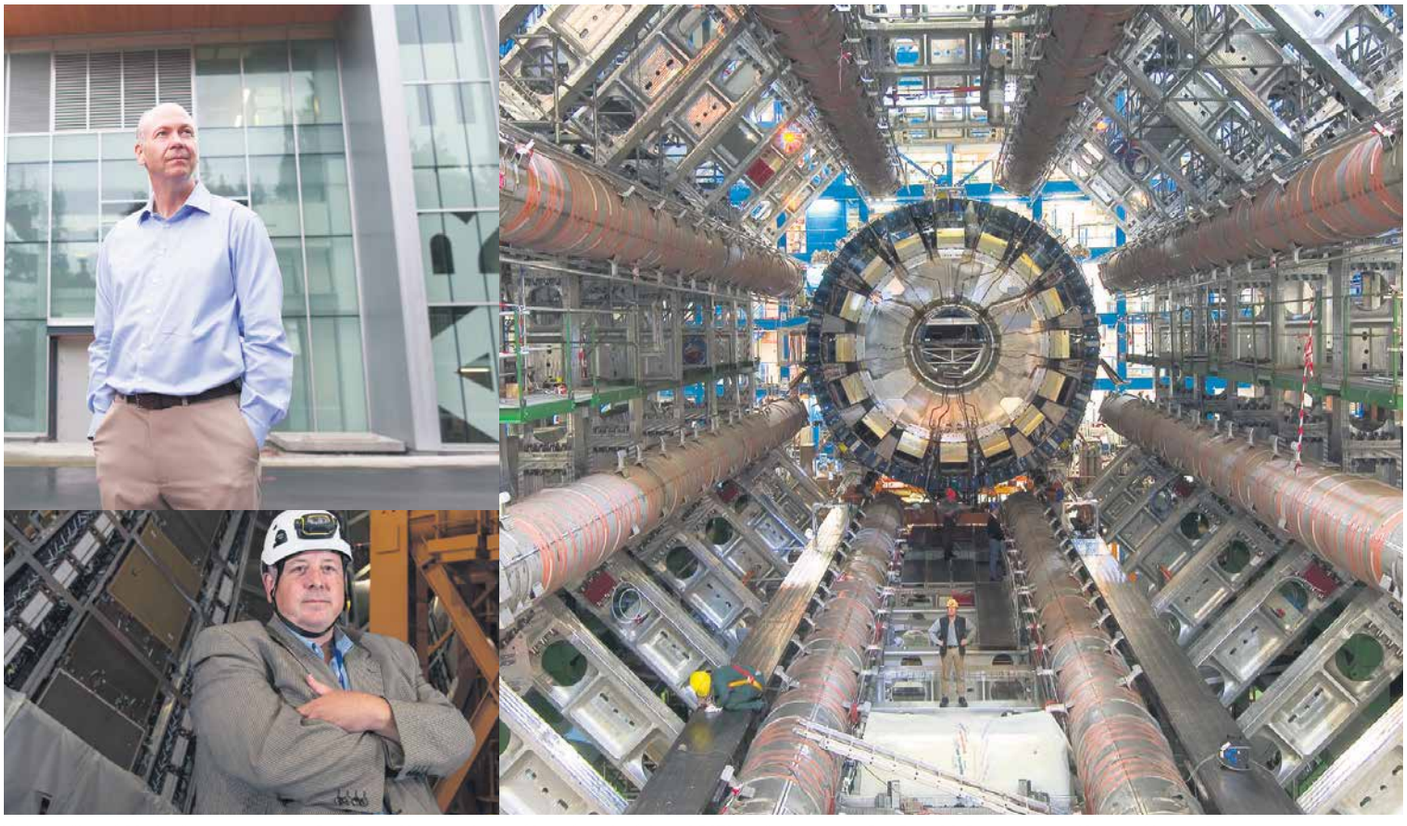
UNIVERSITY OF VICTORIA

Particle research aims to predict the universe's past and future

Researchers in nuclear and particle physics at the University of Victoria (UVic) are looking at the smallest of things so they can answer some of the biggest of questions about where the universe came from and where it might be going. Nuclear and particle physics research takes place on a global scale involving a multitude of international partners. Within that community, UVic is helping Canada build on its leadership role through the development of world-class research facilities and high-performance computing technologies used to store, access and analyze massive pools of data. These are the kinds of endeavours that attract some of the best and brightest.

UVic's Rob McPherson currently serves as deputy spokesperson for the ATLAS experiment at the CERN Large Hadron Collider (LHC) in Switzerland. Inside the LHC, two high-energy particle beams are made to travel towards each other at close to the speed of light before colliding. When they do, it opens a window into the past. "The kinds of things that happen are similar to what occurred just after the Big Bang, a time when everything was energy and there was no matter," says Dr. McPherson. "It's exciting because it allows us to explore this fundamental point in the history of the universe." To date, Canada has invested $135-million in the project and has also designed and built key components, including calorimeters that measure the direction and energy of particles produced in the collisions. UVic researchers are leaders in developing the cloud computing resources used to analyze the complex data the LHC produces.

Here in Canada, UVic's Dean Karlen is heading up ARIEL, an offshoot of TRIUMF, a national subatomic physics research laboratory located near the University of British Columbia. ARIEL will produce rare isotopes that can be used to study the nature of stars, where the elements come from and the way in which complex patterns arise from relatively simple building blocks. They also have a very practical side. Isotopes are used to develop sophisticated medical imaging tools that can better detect and treat disease. They're also used to selectively destroy cancerous tumours, leading to better patient outcomes. "It's fulfilling work because of the way it allows us to push the boundaries of knowledge and understanding, but also because of the people; doing this kind of work is transformative for those involved," says Dr. Karlen.



University of Victoria researchers Dr. Dean Karlen (top left, in front of the ARIEL building) and Dr. Rob McPherson (bottom left) are teaming up with international colleagues for particle research conducted at the ATLAS detector at the CERN Large Hadron Collider (right). LEFT, JEFF VINNICK; RIGHT, © CERN

> "Doing this kind of work is transformative for those involved."
>
> **Dr. Dean Karlen**
> is heading up ARIEL, an offshoot of TRIUMF, a national subatomic physics research laboratory located near the University of British Columbia

For Iris Dillman, being an astrophysicist was Plan B. "I originally wanted to be an astronaut," says the UVic adjunct professor who has been working at TRIUMF for three years. Nowadays, Dr. Dillman is using nuclear astrophysics to study the building blocks of the elements – the isotopes – that are produced in stars, including our own sun. She's investigating how long these isotopes live and how they decay, and how all this "star stuff" makes up anything and everything from the universe and planets to human beings and toaster ovens. "We're able to bring stars and star explosions into the lab," she explains.

"The contributions researchers like this are making to knowledge cannot be underestimated," says David Castle, UVic's vice-president research. "There is deep science involved that answers fundamental questions, and there are immediate applications for the rare isotopes being created that have an important role to play in medical and material science," he says. "We also believe there'll be considerable downstream potential in terms of commercial opportunities for those who work and study in the labs but go on to work in commercial and industrial sectors."

UVic has also been selected as one of four hub sites for the national advanced computing research network offering systems, storage and software solutions to researchers in a multitude of fields across Canada. "All of these initiatives are helping build global knowledge networks, accelerating the development and commercialization of new technology and materials, attracting and training young researchers, and helping Canada stay globally competitive," says Dr. Castle.