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## NEWS RELEASE

For Immediate Release  
2011JTI0126-001389  
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Ministry of Jobs, Tourism and Innovation  
TRIUMF  
University of Victoria

### **Work begins on world-class isotopes research tunnel**

VANCOUVER – Starting today, the first of 300 B.C. workers begin building a tunnel and lab that will be used to demonstrate new ways to solve medical isotope shortages, keep B.C. and Canada leading in particle and nuclear physics, and create 160 permanent jobs.

The \$62.9-million project is underway at TRIUMF, Canada's national laboratory for particle and nuclear physics, with \$30.7 million provided by the provincial government. By 2015, ARIEL is expected to demonstrate a new way to produce medical isotopes, which are used to diagnose and treat cancer, heart disease, Parkinson's and Alzheimer's.

ARIEL, which stands for Advanced Rare IsotopE Laboratory, features an underground beam tunnel surrounding a next-generation linear accelerator, or e-linac. The e-linac is being designed and built by a 13-university consortium led by the University of Victoria. The team is also collaborating with researchers in India, Germany, the U.S. and the U.K.

The e-linac will produce intense beams of particles to create isotopes, which are variants of atoms of a particular chemical element, with differing numbers of neutrons. It will use new technology developed in B.C. that produces some of the most powerful beams in the world: up to the equivalent of 5,000 light bulbs concentrated in one square centimetre.

Isotopes are made at only a handful of facilities worldwide, and demand is expected to escalate in coming years. ARIEL will allow TRIUMF to broaden its research in studying and producing isotopes. The technology may also be used for such things as reducing pollution from coal-fired plants and producing fertilizers from chimney flue gases.

The heart of the linear accelerator is a superconducting radio frequency cavity, a new and highly efficient technology for accelerating particle beams. Only five groups in the world have the ability to make them, and one is a partnership between TRIUMF and PAVAC Industries in Richmond.

TRIUMF attracts top scientists from around the world to work together on research related to particle and nuclear physics, molecular and materials science, and nuclear medicine. It is owned and operated by a consortium of 17 Canadian universities and is located on the University of B.C.'s Vancouver campus.

In addition to the Province's \$30.7 million, ARIEL is also being supported by \$14.4 million that includes nearly \$13 million in federal funding from the National Research Council toward TRIUMF's core operating budget, and contributions from partners in the U.S. and India. China has also expressed interest in investing in developing ARIEL further. In addition, the Canada Foundation for Innovation provided \$17.8 million, which will help fund the e-linac portion of the project led by the University of Victoria.

#### **Quotes:**

##### **Richard T. Lee, Parliamentary Secretary for Asia-Pacific –**

"TRIUMF is a world leader in accelerator technology and isotope production research, and with the Province's support, ARIEL will build on that success. Working with talent from Canada and our international partners, ARIEL will break new ground in producing isotopes safely and efficiently for medical and environmental applications, while creating and supporting more jobs in British Columbia."

##### **Mark Strahl, Member of Parliament for Chilliwack – Fraser Canyon, on behalf of Gary Goodyear, Minister of State (Science and Technology) –**

"Our government knows that investing in the people and ideas that will produce tomorrow's breakthroughs will keep Canada's economy growing. ARIEL will enhance the work undertaken by the talented researchers at TRIUMF and will result in new medical isotopes to help diagnose and treat diseases. The research advancements and knowledge generated by this new facility will, without a doubt, play a pivotal role in advancing knowledge and improving our country's standard of living and quality of life."

##### **Howard Brunt, University of Victoria VP Research –**

"The University of Victoria is proud to be the lead university for this world-class project. It will have a huge impact on the research productivity of our faculty and students for decades to come, placing UVic, and Canada, at the forefront of innovative science and technology."

##### **Nigel Lockyer, director of TRIUMF –**

"ARIEL is proceeding in several phases, and today marks the beginning of the major construction. Not only is this project a flagship for TRIUMF and B.C., it puts Canada on the global map for cutting-edge and truly relevant science and technology. I am proud of what we're starting together here."

#### **Quick Facts:**

- B.C. haulers will remove 17,000 tonnes of dirt and rock from the ARIEL site, while cement trucks will deliver up to 1,000 loads of concrete – enough to build a metre-wide sidewalk from downtown Vancouver almost to Mission.

- B.C. concrete crews will erect the forms, place the rebar, and do the tricky pouring required to build walls up to 1.8 metres thick to house a linear accelerator (built in B.C.) that will keep Canada at the forefront of isotope research for the next 15 years.
- B.C. wood will be used wherever possible, as per the Province's Wood First legislation.
- At various stages of construction, at least 300 B.C. workers – including surveyors, architects, engineers, electricians, plumbers and carpenters – will swarm over the ARIEL site.
- By the end of construction, targeted for spring 2013, ARIEL will create 90 person-years of employment for British Columbians. Longer term, ARIEL will lead to 160 spinoff jobs in the private sector, universities and other research agencies.
- Since 2001, the Province has invested \$1.8 billion in research and innovation, including \$48.4 million in TRIUMF projects.

**Learn More:**

The ARIEL project: [www.triumf.ca/ariel](http://www.triumf.ca/ariel)

The building process: [www.triumf.ca/node/13107](http://www.triumf.ca/node/13107)

A backgrounder follows.

Media Contacts:

Deb Pearce  
Senior Public Affairs Officer  
Ministry of Jobs, Tourism and Innovation  
250 356-5613  
250 888-0299 (cell)

Tim Meyer  
Head, Strategic Planning & Communications  
TRIUMF  
604 222-7674  
650 464-8955 (cell)

Stephanie Thomas  
Special Assistant (Communications)  
Office of the Honourable Gary Goodyear  
Minister of State (Science and Technology)  
613 960-7728

Tara Sharpe  
Communications Officer  
University of Victoria  
250 721-6248

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# BACKGROUND

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## **The science behind ARIEL**

The new Advanced Rare Isotope Laboratory (ARIEL) at TRIUMF will house an electron linear accelerator facility (e-linac) and an underground beam tunnel. The complex allows TRIUMF to broaden its research capabilities in particle and nuclear physics and materials science, and to develop the technology to advance Canada's supply of medical isotopes.

The e-linac portion of ARIEL – the first of its kind in Canada – is being designed and built by a 13-university consortium led by University of Victoria physicist Dean Karlen, who is jointly appointed to TRIUMF. The project also involves collaborations with researchers in the U.S., the U.K., Germany and India.

At the heart of the e-linac is a new and highly efficient way of accelerating particle beams – known as superconducting radio frequency technology. Superconductors are materials that conduct electricity with no loss of energy when cooled to very low temperatures.

The e-linac design consists of five cylinders, or cavities, placed end to end. Each cavity contains nine disc-like cells made from pure niobium, a superconducting metal often used to strengthen jet and rocket engines. When cooled, these niobium cells can store enough electromagnetic energy to accelerate particles to close to the speed of light.

At full power, the e-linac will deliver up to 500 kilowatts of beam power – the same as 5,000 light bulbs concentrated into a square centimetre.

Once it exits the accelerator, the particle beam strikes a target to produce a variety of isotopes for pure and applied research. The e-linac will advance knowledge in nuclear physics, nuclear astrophysics, and molecular and materials science.

An isotope is a variant of a basic element, as determined by the number of neutrons in its nucleus. Every chemical element has more than one isotope. An example is carbon-14 – widely used for dating organic material – which has two extra neutrons than the more abundant carbon-12.

The e-linac also opens up new avenues for the production of medical isotopes used for disease imaging and treatment. There are a limited number of facilities around the world capable of producing medical isotopes. Expanding the range of production facilities and varieties of isotopes will help maintain Canada's leading role in worldwide medical isotope delivery and ensure reliable sources for Canadians in the future.

Superconducting radio frequency cavities are so technologically sophisticated that only five groups in the world have the ability to make them. One of these groups is a partnership between TRIUMF and PAVAC Industries in Richmond, a world leader in the development of commercial high-energy electron beam applications.

The total area of the ARIEL facility will be about 2,700 square metres. The underground beam tunnel – built with 1.8-metre concrete walls – will connect the existing TRIUMF Proton Hall with the existing ISAC-I and ISAC-II experimental halls. The e-linac will be built in the lower section of the Proton Hall.

The ARIEL facility will attract scientists from around the world to participate in experiments. It will also be a training ground for graduate and undergraduate students in the design, fabrication and operation of superconducting accelerator technology.

Media contacts:

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