TRIUMF

Biennial Scientific Report 2013—2015

TRIUMF

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1.1 TRIUMF'S MISSION

TRIUMF is Canada's national laboratory for particle and nuclear physics. It is owned and operated as a joint venture by a consortium of 19 Canadian universities via a contribution through the National Research Council Canada (NRC), with additional capital support provided by the Government of British Columbia.

Its mission is to:

- **Make discoveries that address the most compelling questions in particle physics, nuclear physics, nuclear medicine, and materials science;**

- **Act as Canada's steward for the advancement of particle accelerators and detection technologies; and**

- **Transfer knowledge, train highly skilled personnel, and commercialize research for the economic, social, environmental, and health benefit of all Canadians.**

1.2 TRIUMF'S VISION

TRIUMF's Vision is to:

— LEAD IN SCIENCE

The world sees TRIUMF as Canada's leader in probing the structure and origins of matter and in advancing isotopes for science and medicine.

— LEVERAGE UNIVERSITY RESEARCH

The Canadian university research community views TRIUMF as a way to strengthen and expand their research programs.

— CONNECT CANADA TO THE WORLD

International subatomic physics laboratories look to TRIUMF for partnering with Canada and its research community.

— CREATE SOCIAL AND ECONOMIC GROWTH

The global scientific community sees TRIUMF as a bridge between academia and the private sector and as a model for commercialization and social impact.

1.3 TRIUMF'S CORE VALUES

TRIUMF operates as one of the leading physics laboratories in the world, and its values guide how the laboratory approaches its goals. They are instilled in all those who work there.

– EXCELLENCE AND IMPACT

A commitment to excellence in achieving TRIUMF's mission and vision while making a real difference.

– COLLABORATION AND TEAMWORK

Working together with others (individuals, groups, or institutions) for our mutual benefit.

– HONESTY AND TRANSPARENCY

Being responsible and accountable for our actions and their consequences; respecting people, their ideas and diversity; working safely and sustainably with openness, authenticity, generosity, and equity.

– INNOVATION AND RELEVANCE

Approaching assignments, tasks, and problems in new and efficacious ways; creating novel ideas and techniques.

1.4 TRIUMF WELCOMES NEW LEADERSHIP

The period 2013–2015 saw wholesale changes at the top of TRIUMF's management structure. In 2013, (then) TRIUMF Director Nigel Lockyer was chosen to become the new Director of the Fermi National Laboratory in Batavia, Illinois. In response, TRIUMF's Board of Management instituted an interim leadership structure effective August 1, 2013, the date the laboratory commenced a search for a new Director. The interim leadership was provided by the Board and a team of senior staff, with (then) Head of the Business and Administration Division Jim Hanlon appointed as Interim Chief Executive/ Chief Administrative Officer.

This leadership structure remained in place until Dr. Jonathan Bagger, Krieger-Eisenhower Professor, Vice Provost, and former Interim Provost at the Johns Hopkins University, began his tenure as TRIUMF Director on July 2, 2014. Bagger will lead the laboratory for a six-year term ending July 1, 2020.

Dr. Paul Young, Vice President Research at the University of Toronto was Chair of TRIUMF's Board of Management throughout the interim leadership period. Young stepped down as Chair and handed the reins over commencing July 1, 2014 to Dr. Steven Liss, Vice-Principal Research at Queen's University in Kingston, Ontario.

1.5 MESSAGE FROM THE DIRECTOR

TRIUMF is run by a consortium of 19 Canadian universities and receives the bulk of its funding from federal, provincial, and commercial sources. Over the decades, TRIUMF has reinvented itself time and time again, and the laboratory has grown stronger with each new reinvention.

The years 2013–2015 were pivotal for TRIUMF. This period saw our laboratory begin its transition into the Advanced Rare IsotopE Laboratory (ARIEL) era.

Figure 1. Director Dr. Jonathan A. Bagger

ARIEL represents one of the most significant upgrades that TRIUMF has ever undertaken.

Going from one beam line to three is no small feat; its development will reshape the laboratory in ways that we can only begin to imagine.

During this transformation, TRIUMF's existing facilities will continue to deliver world-class science, and its scientists and staff will strive to maintain and even increase our excellence and impact.

I am excited to be part of this adventure and look forward to this exciting new era for TRIUMF.

Jonathan Bagger

Dr. Jonathan A. Bagger

1.6 FULFILLING THE AMBITIONS OF THE 2010–2015 FIVE-YEAR PLAN

This report details the scientific activities that TRIUMF has undertaken during fiscal year 2013–2015 to fulfill its mission and the ambitions of the 2010–2015 Five-Year Plan. It does not progress since then. Funding for TRIUMF's core operations flows in five-year cycles from a federal Government of Canada contribution through the National Research Council of Canada. In addition, the Province of British Columbia provides capital funding for TRIUMF. The activities chronicled in this report are part of the 2010–2015 Five-Year Plan that started April 1, 2010 and completed March 31, 2015.

On March 24, 2010, through a federal budget announcement, the Government of Canada confirmed $222.3 million in operational support for TRIUMF. The Canada Foundation for Innovation also approved a proposal led by the University of Victoria for the superconducting electron linear accelerator project

Figure 2. Aerial photo of TRIUMF site, highlighting the new ARIEL facility (light-orange fasade, centre).

at TRIUMF; this would provide approximately an additional $18 million to the five-year budget. In response, the Government of British Columbia announced $30.7 million of support for capital infrastructure at TRIUMF on June 22, 2010. Together, this funding was sufficient to launch TRIUMF's flagship initiative, ARIEL (see Figure 2)

TRIUMF has emerged on the international stage as a leader,

by building on the investments, as well as the efforts of our member universities and strategic partners. For example, TRIUMF along with Canadian physicists are known for their contribution to the discovery of the Higgs boson. TRIUMF scientists received international attention for trapping antimatter. The laboratory is known globally for pursuing an alternative, innovative solution for producing the world's most-popular medical isotope (Tc-99m) with existing accelerators. TRIUMF's rare isotope program is among the best in the world, attracting hundreds of users to Vancouver each year. Two small Canadian firms, building on TRIUMF's accelerator technologies, were transferred superconducting radiofrequency technology. TRIUMF is partnering with India and Japan to further technology developments and open new markets for Canadian companies. And TRIUMF's 35-year partner company, Nordion, continues to touch the lives of millions of people each year with medical isotopes produced on small TRIUMF-designed, Canadian-manufactured cyclotrons in Vancouver.

This report demonstrates that with the support of government, member universities, and partners, TRIUMF has lived up to the ambitions set out in the 2010–2015 Five-Year Plan.

1.7 REALIZING THE VISION: THE 2015–2020 FIVE-YEAR PLAN

The five-year planning cycle necessitates initiating the next plan about half way through the existing cycle. To that end, planning for the 2015-2020 began in earnest in mid-2012, with the final planning document released in October 2013. Entitled "Realizing the Vision", the 2015–2020 Five-Year Plan exploits TRIUMF's existing infrastructure, highly trained staff, and network of partnerships to craft an ambitious plan to implement the second half of the decadal vision set forth in the 2010–2015 plan.

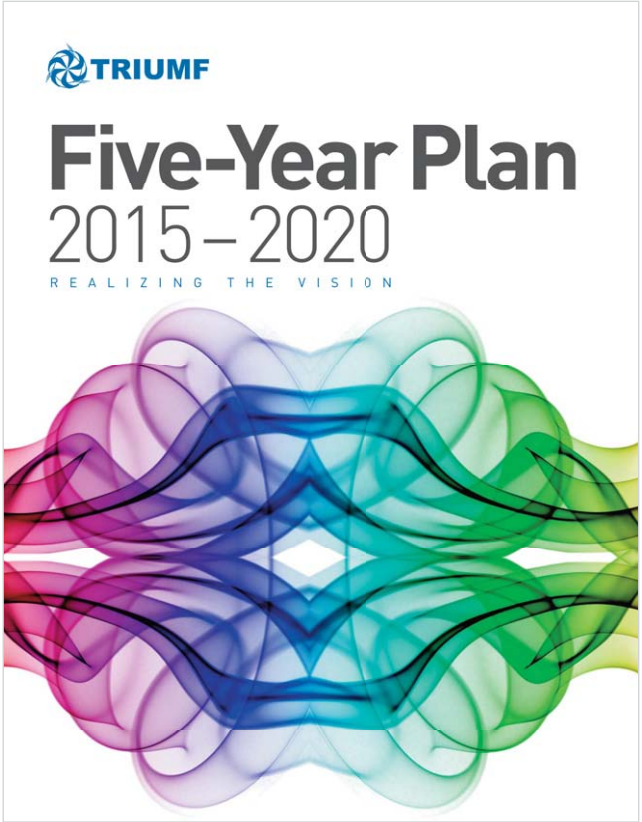


Figure 1. Five-Year Plan 2015-2020

In this plan, TRIUMF begins its march towards major scientific discoveries

with ARIEL, a new facility for ultra-cold neutrons shared with Japan, and with critical support for Canada's engagements on the international stage of particle physics. TRIUMF will commercialize new technologies, stimulate and train students, challenge engineers and technicians with the latest accelerator-associated technologies, and impact the world with the accelerator-produced medical isotopes.

1.8 INTERNATIONAL PEER REVIEW

As part of the strategic planning cycle for 2015–2020, in 2013 the National Research Council Office of Audit and Evaluation conducted a review of TRIUMF, culminating in an International Peer Review (IPR) that combined multiple lines of evidence and a site visit to fully judge TRIUMF's performance. On November 13–15, 2013 the IPR Committee (IPRC) conducted its site visit to the laboratory.

The IPRC was chaired by Dr. Samuel Aronson, former Director of Brookhaven National Laboratory and included nine distinguished scientists and industry leaders, who brought skills from research, science, technology, commercialization, and laboratory management from Canada, the U.S., and Europe. The IPRC's report was the final evaluation, which was critical input to federal and provincial governments regarding investments in the next five-year plan.

The IPRC engaged in various activities to gain more understanding about the vitality, structure, and impact of the laboratory. The TRIUMF Board of Management, the Advisory Committee on TRIUMF, and the laboratory's leadership team gave talks demonstrating recent successes and ambitious goals for the IPRC to scrutinize and examine. In addition to the plenary talks, the IPRC connected with over 25 scientists and researchers through five parallel sessions, each with several talks by staff scientists and students at TRIUMF and visiting researchers dedicated to the various research areas. In these sessions, the IPRC explored topics such as particle physics, nuclear physics, accelerator physics, nuclear medicine and materials science. TRIUMF hosted several of its partner companies (IKOMED Inc., Nordion Inc., and PAVAC Industries Inc.) in a panel discussion about innovation and industrial partnerships with the committee. All presentations were open to the greater TRIUMF community to attend.

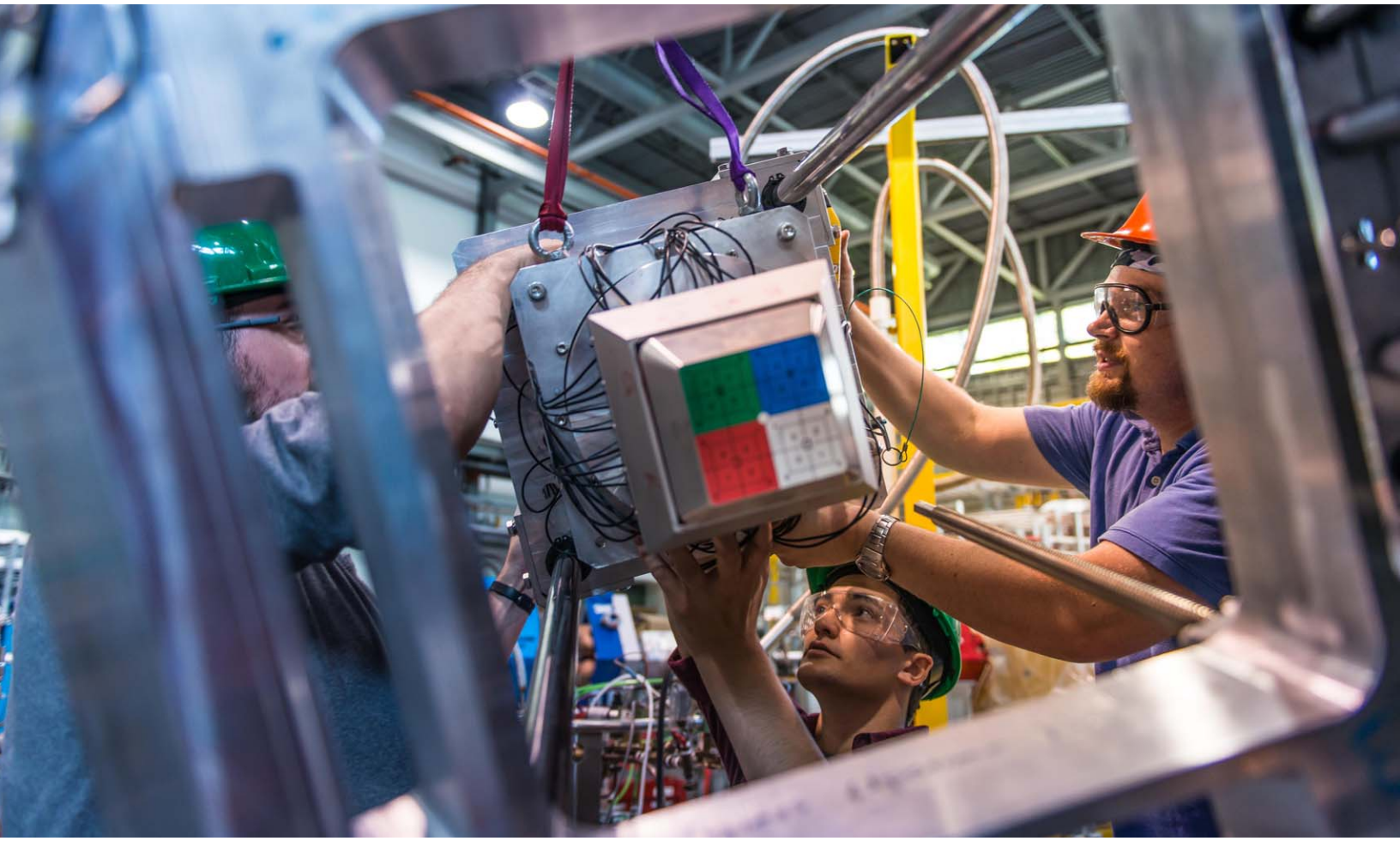
The IPRC commended TRIUMF for outstanding accomplishments in the existing five-year cycle,

in its final report and identified some areas for growth, and commented on the "fantastic esprit de corps" they experienced at the site. The IPRC supported the goals of the Five-Year Plan 2015–2020 and applauded the entire TRIUMF laboratory for their commitment to the success of the program for the benefit of all Canadians.

1.9 FUNDING FOR FIVE-YEAR PLAN 2015–2020

After reviewing all the information provided by the review agencies involved, the Federal Government of Canada committed to the core tenets of the plan with a $222 million commitment in its Economic Action Plan 2014 of February 11, 2014.

To more fully implement the program in the plan, TRIUMF is seeking a $68M supplement to maintain core operations, and enhance critical mass in strategic areas such as nuclear medicine and materials science [1].



[1] On April 21, 2015, the Federal Government of Canada committed an additional $45 million in operating funds to support the core operations outlined in TRIUMF's Five-Year Plan 2015–2020.

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