

CANADA'S NATIONAL LABORATORY
FOR PARTICLE AND NUCLEAR PHYSICS

ANNUAL ADMINISTRATIVE
AND FINANCIAL REPORT 2013 - 2014

BEAM ON



ACCELERATING SCIENCE FOR CANADA



account

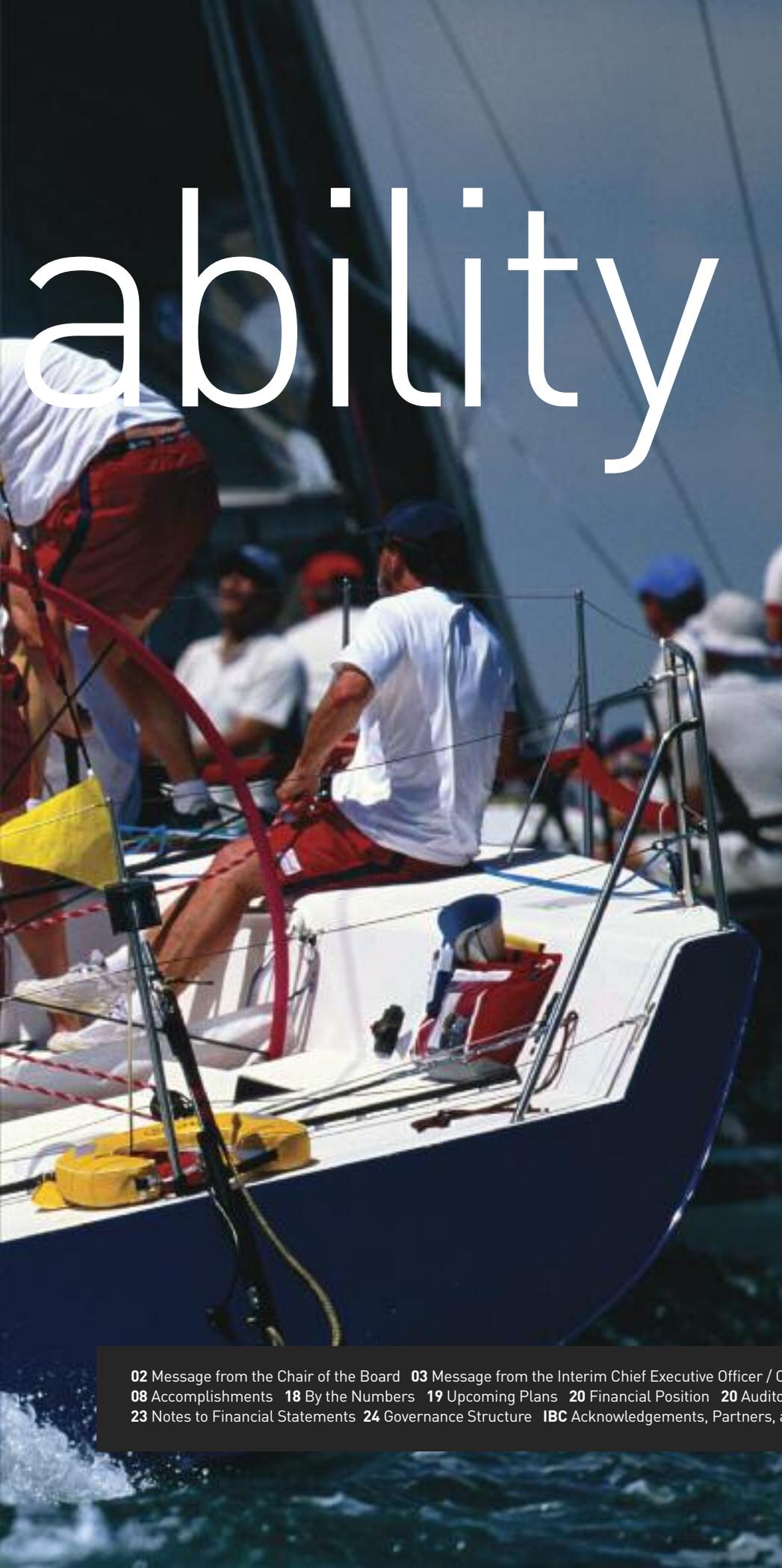


BEAM ON

TRIUMF has completed the fourth year of Five-Year Plan 2010–2015, achieved major milestones with ARIEL, and developed its plan and vision through the creation of Five-Year Plan 2015–2020. As part of its accountability to patrons, the laboratory underwent external, independent reviews of its scientific program, laboratory management, and benefits to the economy. Owned and operated by eighteen member universities, with dozens of stakeholders and funding agencies, all eyes are on TRIUMF as it drives forward with integrity and impact.

TRIUMF is one of the world's leading subatomic physics laboratories. TRIUMF brings together dedicated physicists and interdisciplinary talent, sophisticated technical resources, and commercial partners in a way that has established the laboratory as a global model of success.





ability

vision

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 when 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.

mission

To make discoveries that address the most compelling questions in particle physics, nuclear physics, nuclear medicine, and materials science;

To act as Canada's steward for the advancement of particle accelerators and detection technologies; and

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

values

Excellence and Impact

Collaboration and Teamwork

Honesty and Transparency

Innovation and Relevance



“May you live in interesting times.” Believed to be the English translation of a Chinese proverb, this statement captures the uncertain nature of change. This year has been an interesting time of change for TRIUMF and, guided by a vivid plan and talented workforce, one with optimistic and exciting outcomes.

In September, Nigel Lockyer stepped down from his seven-year tenure as TRIUMF Director to take office as Director at the US Department of Energy’s Fermi National Accelerator Laboratory, located outside of Chicago. TRIUMF’s Board of Management called together an International Search Committee to seek and select the best possible candidate for the lab’s next director. Meanwhile, the Board empowered the leadership team, chaired by Jim Hanlon as Chief Executive Officer / Chief Administrative Officer, to manage the day-to-day operations of the lab. At the end of this fiscal year, the Board appointed Dr. Jonathan A. Bagger, Krieger-Eisenhower Professor, Vice Provost, former Interim Provost at Johns Hopkins University—and seasoned particle physicist—as TRIUMF Director.

Under Nigel’s leadership, the laboratory welcomed several Canadian universities into the TRIUMF consortium, expanded the nuclear medicine program to play a leading role in resolving the medical isotope crisis, and formulated a robust science program by founding ARIEL. Today, the need continues for an extraordinary combination of vision, excellence, and accountability.

One look at TRIUMF’s current trajectory and you can see a laboratory full of ambition and great talent. Under the tenure of Nigel Lockyer and Jim Hanlon, the lab framed its next five-year plan, delivered compelling arguments for its science program through a rigorous International Peer Review, and kept the day-to-day operations in high efficiency—such as the construction and installation of ARIEL.

Completing ARIEL is one of the laboratory’s highest priorities alongside leadership of the national effort to develop and deploy alternative production methods for key medical isotopes such as Tc-99m. I am confident that we will reach this objective in the next five-year plan and Canada will be recognized as a world leader in the research and development of isotopes for science and medicine.

This marks my final year as Chair of the TRIUMF Board of Management. I am deeply thankful for having the opportunity to serve TRIUMF in this role for the past five years. It has been a great journey with great people and I wish TRIUMF every success for the future.

Sincerely,

R. Paul Young | Chair, TRIUMF Board of Management | Vice-President, Research, University of Toronto

**JOHNS HOPKINS UNIVERSITY SCIENTIST TO LEAD CANADIAN NATIONAL LABORATORY
NEXT DIRECTOR OF TRIUMF BRINGS GLOBAL EXPERIENCE**

March 18, 2014

After a seven month, highly competitive, international search for TRIUMF’s next director, the laboratory’s Board of Management announced today that Dr. Jonathan Bagger, Krieger-Eisenhower Professor, Vice Provost, and former Interim Provost at the Johns Hopkins University, will join TRIUMF this summer as the laboratory’s next director. Bagger will lead the laboratory for a six-year term beginning July 1.

Bagger brings extensive experience to the job. Professor Paul Young, Chair of TRIUMF’s Board of Management and Vice-President of Research and Innovation at the University of Toronto, said, “Jon is an outstanding, internationally renowned physicist with a wealth of leadership experience and a track record of excellence. He is a welcome addition to Canada and I am confident that under his tenure, TRIUMF will continue to flourish.”



I am extremely proud of TRIUMF's many accomplishments this year.

TRIUMF has continued to facilitate Canadian involvement in international science and a highlight is our involvement with the CERN experiments ATLAS and ALPHA. Over 150 Canadians are currently involved in the ATLAS experiment whose discovery of the Higgs boson

led to a Nobel Prize in Physics for Higgs and Englert. Scientists in the ALPHA-Canada Team, led by TRIUMF's Makoto Fujiwara, received the prestigious NSERC Polanyi Prize for their outstanding contribution towards creating, capturing, and characterizing the antihydrogen atom. TRIUMF's infrastructure capabilities contributed significantly to this achievement.

Also deserving mention are: delivery of more than 95% of scheduled beam from the main cyclotron that has enabled TRIUMF's strong research program, progress and installation of the ARIEL e-linac, and, during a particularly wet and windy weekend, teaming up alongside 130 colleagues to share the lab with over 1,200 visitors during our community Open House.

This year, we developed our vision for the Five-Year Plan 2015–2020 and shared the report with our community, government, and international stakeholders. The plan received strong support from the International Peer Review Committee that was commissioned by the National Research Council to review the laboratory in November. In the Economic Action Plan 2014, the Government of Canada declared \$222M funding for the laboratory for the next five-year operating period of 2015–2020. We are very appreciative of the ongoing support from the Government of Canada. This funding announcement, made a year in advance, allows for early planning with TRIUMF's many stakeholders.

This year's accomplishments provide momentum to drive the lab forward into its next five-year plan. It is important we maintain attention to proper laboratory administration. In this edition's feature article, TRIUMF's Chief Financial Officer Henry Chen touches on the laboratory's sophisticated yet elegant governance structure and funding model. With eighteen universities in the TRIUMF consortium, there is a real accountability for being Canada's national laboratory and leveraging university research to expand and strengthen our mutual research programs. Our funding model includes several agencies and many stakeholders that hold TRIUMF to account – not just for balancing budgets but also for innovative solutions to fiscal challenges. Driving forward, we will continue to deliver excellence with impact.

Last but not least, with the move of our former director to Fermi National Accelerator Laboratory and pending the arrival of a new director, the TRIUMF Board put an interim Leadership Team in place to operate the lab. As Interim CEO/CAO and Chair of the Leadership Team, I want to acknowledge the strong support of the team, as well as the strong performance and camaraderie of all employees that has resulted in such a successful year.

I would like to welcome our new director, Dr. Jonathan A. Bagger to TRIUMF. We look forward to working with Jonathan and achieving our goals of the current and next five-year plan under his leadership.

Sincerely,

Jim Hanlon | Interim Chief Executive Officer / Chief Administrative Officer, TRIUMF | President and CEO, AAPS Inc.



Science: Deriving Value and Accountability

Henry Chen | Chief Financial Officer



As a national laboratory, owned and operated by a consortium of 18 universities—and growing, TRIUMF has unique capabilities that no one university could operate and support on its own. Because of this, the laboratory has a sophisticated yet effective governance model that facilitates relationships with academic, financial, and advisory committees, and empowers Canada to not only participate internationally but also lead on the global stage.

With so many eyes on TRIUMF, the lab maintains focus, velocity, and success by relying on its core values, in particular, honesty and transparency.

Celebrating over 45 years of safe, reliable operation in Vancouver, the laboratory is considered a second home to scientists and students from universities across Canada and the world. Stakeholders range from university researchers to the international physics community to medical research organizations and high-technology enterprises. Committees – like the

Governance and Accountability

Ownership | Leadership Team | Committees | Operational | Sponsored Research

Natural Sciences and Engineering Research Council of Canada
 Canada Foundation for Innovation
 British Columbia Knowledge Development Fund
 Natural Resources Canada
 Western Economic Diversification Canada

Audit
 Executive
 Finance
 Innovations &
 Industrial Partnerships
 Personnel & Administration
 Safety & Security

Director
 Chief Financial Officer
 Engineering Division Head
 Business and Administration Division Head
 Science Division Head
 Accelerator Division Head
 Strategic Planning and Communications Head
 Nuclear Medicine Division Head
 Environment, Health and Safety Manager



University of Alberta
 University of British Columbia
 Carleton University
 University of Guelph
 University of Manitoba
 Université de Montréal
 Simon Fraser University
 Queen's University
 University of Toronto
 University of Victoria
 York University
 University of Calgary
 McGill University
 McMaster University
 University of Northern British Columbia
 University of Regina
 Saint Mary's University
 University of Winnipeg

Canadian Nuclear Safety Commission
 National Research Council
 Advisory Committee on TRIUMF
 Policy and Planning Advisory Committee
 Experimental Evaluation Committee
 Agency Committee on TRIUMF
 External Auditors
 Taxation and other Regulatory Bodies

Advisory Committee on TRIUMF that advises the National Research Council on all aspects of the TRIUMF program, and the Agency Committee on TRIUMF that is responsible for overseeing the Federal Government investment in TRIUMF – also have a stake in the laboratory. TRIUMF attracts resources from competitive funds (British Columbia Knowledge Development Fund, Canada Foundation for Innovation, the Natural Sciences and Engineering Research Council of Canada, Natural Resources Canada, and Western Economic Diversification Canada, etc.) as well as collaboration agreements with partner organizations, such as the BC Cancer Agency and VECC laboratory in India. In summary, there are many groups with a strong interest in what TRIUMF is up to. The mix of TRIUMF’s unique value proposition, combined with its unique governance model, delivers exceptional results for both the lab and the community.

“TRIUMF is lean and mean... it’s doing it on a shoestring while others require the whole shoe.”

External Interviewee, Final Evaluation Report of NRC’s Contribution to TRIUMF 2014

Lean and Mean: Alignment with Resources

Fiscal challenges have strong implications for the way our organization operates. From accommodating inflationary pressures in a static budget environment to the changes in provincial tax policies and its impact on costs, the lab must be measured and accountable, yet remain creative and inventive. In an environment like TRIUMF, the everyday focus is to understand and solve problems in new ways. After all, that is the nature of scientific research. The laboratory is privileged with scientists and engineers who are driven to “work smarter.” Meaning that they constantly look for improved methods and materials to produce better results without compromising quality. This is no different in finance and administration.

Internal efficiencies must be realized not only to support consecutive flat funding and rising inflation costs but also to keep our resources well utilized.

TRIUMF is more efficient than other international facilities and programs operating in similar fields. TRIUMF has been able to generate outputs and progress towards expected outcomes, despite the dual challenge of increased input price pressures and a static level of operational funding. Final Evaluation Report of NRC’s Contribution to TRIUMF 2014

With the emergence of Applied Advanced Physics Solutions Inc. as the commercialization branch for the lab, TRIUMF has a staff dedicated to pursuing economic value from research activities. TRIUMF also revisited the procurement and project management systems so that the effort required for every project is planned, managed, and reviewed. Resources are consumed as needed and are not over committed.

Liquid Helium Recovery System

Liquid Helium (LHe) is used as a cooling agent in scientific experiments and superconducting equipment. Helium is a non-renewable resource, in high demand particularly for science research experiments, and is expected to become more expensive as the world’s supply is exhausted. Annually, TRIUMF consumes 30,000 litres of LHe with a rising cost in excess of \$0.4M. In a few years when other projects come online, TRIUMF’s consumption is forecasted to require up to 150,000 litres per year, with the annual cost approximating \$2.8M.

The Molecular and Materials Science Group, in conjunction with the Cryogenics group, developed a business case for the purchase of a piston-based, liquid helium recovery system. With an estimated life of over 20 years, the LHe Recovery system has the capacity to produce 340,000 litres of LHe per year. At this production level, TRIUMF’s current and foreseeable requirements will be satisfied. Moreover, the payback of the capital cost will occur after four operating years and the value of the investment will be compounded significantly considering the operational cost avoidance in future years. This is one way TRIUMF remains innovative and accountable to stakeholders with a “lean and mean” budget.



While the laboratory considered internal and economic efficiencies, TRIUMF was externally recognized for its value and impact.

As mandated by Treasury Board, TRIUMF undergoes a comprehensive evaluation every five years to assess its relevance, and the performance of National Research Council's (NRC) contribution to TRIUMF. Guided by a five-year plan developed by the lab, core-operating funds for TRIUMF flow from the federal government through NRC via a five-year Contribution Agreement.



HARPER GOVERNMENT INVESTMENT STRENGTHENS MEDICAL ISOTOPE DEVELOPMENT

30 May 2014

Today, the Hon. Michelle Rempel, Minister of State for Western Economic Diversification, announced funding of \$5.5 million to support the procurement of a TR24 cyclotron and developing the Institute for Accelerator-based Medical Isotopes (IAMI). This investment will enhance our capabilities to do research and supply important medical isotopes.

With this investment, TRIUMF, through IAMI, will have a critical piece of infrastructure that will enable it to become the centre of excellence that it strives to be in isotopes for science and medicine. IAMI will bring researchers, clinicians, entrepreneurs, and the technical team together to support a future where new isotopes are used to drive the personalized healthcare revolution.

TRIUMF's Head of Nuclear Medicine Paul Schaffer explains, "This investment is a crucial step on the road to meeting Canada's isotope needs after the NRU reactor in Chalk River, ON ceases isotope production in 2016. This project is being watched from around the world and Canada continues to take bold steps toward solving the looming medical isotope supply crisis providing leadership and one solution."

In preparation to consider the funding requirement for the next five-year plan, NRC's Office of Audit and Evaluation conducted an evidenced based independent evaluation of TRIUMF and concluded that "Overall, the findings of the evaluation of NRC's contribution to TRIUMF show that the activities undertaken by TRIUMF represent good value-for-money for NRC and for Canada."

Five-Year Plan 2015–2020: Realizing the Vision

The plan outlines the laboratory's vision for the next five years, with consideration for national and international partnerships. As a report, it also highlights successes from the past lustrum, including physical and intellectual infrastructure. As a proposal for the next five-year plan, the report outlines three funding scenarios each with a trade-off risk, opportunity and impact. The development of the plan includes community input, prioritization, and review before the final proposal is transmitted for consideration by the relevant governments and agencies. TRIUMF is committed to developing the plan in a transparent, open, deliberative process that puts forward the best possible program under realistic resource constraints. Available in print and online, Five-Year Plan 2015–2020 assesses the value for money (i.e. relevance and performance) of the current science program and develops a clear vision for the near future and beyond.

NRC Evaluation Report of TRIUMF

As fulfillment of TRIUMF's goals draws upon resources beyond the NRC, all activities and outcomes of TRIUMF were considered for the evaluation. Both qualitative and quantitative methods were used, including an internal and external document review, administrative and performance data review, key informant interviews, survey users, comparison study of selected international physics facilities, and a peer review.

International Peer Review of TRIUMF

The culmination of the NRC's evaluation of TRIUMF was an International Peer Review on November 13-15. The committee (IPRC) included nine distinguished scientists and industry leaders, who each brought skills from research, science, technology, commercialization, and laboratory management from Canada, the U.S., and Europe.

In addition to the plenary talks, the IPRC connected with over 25 scientists and researchers through five parallel sessions, each with several talks dedicated to the various research areas at TRIUMF and featured staff scientists, students, and visiting researchers. TRIUMF invited several of its partner companies, IKOMED Inc., Nordion Inc., and PAVAC Industries Inc., for a panel discussion with the IPRC on the topic of innovation and industrial partnerships. Together with presentations from the TRIUMF Board of Management and the Advisory Committee on TRIUMF, the laboratory's leadership team demonstrated recent successes and ambitious goals for the distinguished committee to scrutinize and examine.

“The bureaucracy at TRIUMF is very minimal and they are nimble compared to other international facilities.”

External Interviewee, Final Evaluation Report of NRC's Contribution to TRIUMF 2014

The IPRC commended TRIUMF for outstanding accomplishments in the present five-year cycle, in particular, the efficient use of resources, and commented on the “fantastic esprit de corps” they experienced at the site. The IPRC declared support for the goals of the Five-Year Plan 2015–2020 and applauded the laboratory for their commitment to the success of the program for the benefit of all Canadians.

That's not all. Near the end of the fiscal year, Western Economic Diversification funded \$5.5 million to procure a TR24 cyclotron and support isotope research. The investment will enhance TRIUMF's capabilities to perform research for the development of key medical isotopes. This announcement is a testament to TRIUMF's research program, its relevance to the global conversation concerning the supply of medical isotopes, and ultimately, its accountability to stakeholders.

A surprise announcement in Budget 2014 for the laboratory's core operations was a display of Canada's confidence in TRIUMF. The announcement came one full year in advance of its Five-Year Plan 2015–2020, allowing for practical lead-time to plan and organize its activities at a known level of resources. It gives TRIUMF the opportunity to have conversations with its many stakeholders with assurance that it will be in operation in 2020. However, TRIUMF is also pursuing additional operating funds that is consistent with its published Five-Year Plan. This funding will allow TRIUMF to continue operating recently completed capital structures at an optimal level, maintain global competitiveness and leadership in its field of science, and facilitate a platform that will capture societal and economic benefits for Canada. From leading in isotope research for science and medicine to addressing today's most compelling questions in physics, TRIUMF's next journey has been charted and its crew is ready to set sail.





THIS IS THE FOURTH YEAR OF TRIUMF'S FIVE-YEAR PLAN. THE LABORATORY CONTINUES TO OPERATE WITH HIGH EFFICACY, BUILD INTERNATIONAL REPUTATION, AND FOCUS ON HIGH IMPACT ACCOMPLISHMENTS. GUIDED BY OUR MISSION, PROGRESS ON THE PLANS AND PROMISES DECLARED IN LAST YEAR'S REPORT ARE DISCUSSED.

ARIEL

- ✓ Finalize ARIEL civil construction and begin installation of beamline elements
- ✓ Complete procurement for the electron linear accelerator (e-linac)
- ✓ Demonstrate capability to provide 25 MeV, 100 kW electron beams with the e-linac, marking the completion of the ARIEL-I project
- ✓ Advance designs and implementation plans for completing ARIEL with additional funding
 - ✓ Complete ✓ In progress

In May 2013, the careful disassembly of the tower crane represented the completion of civil work, from the site excavation to the establishment of ARIEL's concrete structure. ARIEL's design includes four foot thick concrete walls, radiation shields, and massive caverns filled with tubes and wiring. Nearly 6,000 cubic meters of concrete formed the building's structure,

equal to about 600 truckloads of concrete and 100,000 hours of labour. In June, the badge room was relocated to its final location between the main office building and ARIEL building. In July, an operating licence was issued by the CNSC for the first phase of the e-linac.

Production began on the e-linac's various components. The injector cryomodule fabrication and assembly was completed. The first 300 kW klystron was installed (as pictured on page 09). By October, the final commissioning and power test of the klystron and HV power supply system was completed. The helium cold-box was installed and passed its acceptance test. The TRIUMF-designed and built electron source and vessel were installed and successfully energized a beam of electrons to 300 keV. Detailed beam characterization took place in the VECC Test Facility. All magnet power supplies and cables for the e-hall were delivered.

The first nine-cell superconducting radio-frequency cavity was tested, delivered and installed in the injector cryomodule. A second cavity was tested and two more are in fabrication. These superconducting cavities, manufactured by PAVAC Industries, Inc., are the first of their kind to be designed and built in Canada.

Lab directors Nigel Lockyer and Dinesh Srivastava of the Variable Energy Cyclotron Centre of Kolkata inked a partnership agreement valued at \$10.4 million (as pictured below). The agreement, which builds on an earlier MOU, will exchange resources as well as





manpower as both facilities work to complete next-generation rare-isotope facilities at each lab. PAVAC Industries, Inc. of Richmond, BC will be manufacturing the high-tech cryomodules using technology transferred from TRIUMF through AAPS.

The Canadian rare-isotope facility with electron-beam ion source (CANREB) CFI project, led by Saint Mary's University and the University of Manitoba, will develop the beam purification and manipulation systems for ARIEL. The Electron Beam Ion Source for charge breeding will be developed by the MPI Heidelberg and the High Resolution Mass-Separator will be developed together with Canadian industry in a technology transfer project supported by AAPS.

The ARIEL-II Notice of Intent was submitted to CFI, on behalf of an unprecedented 19-institution partnership across Canada.





ARIEL WINS ENGINEERING EXCELLENCE AWARD

12 April 2014

At a recent ceremony, the Association of Consulting Engineering Companies British Columbia presented the ARIEL engineering team with the 2013 ACEC-BC's Engineering Excellence Award of Merit. ARIEL's prime consultant, Chernoff Thompson Architects, facilitated the collaboration between Stantec Consulting (Mechanical), Bush, Bohlman & Partners (Structural) and Applied Engineering Solutions (Electrical). The ARIEL building was funded by the BCKDF. The structure stands as testimony to the creativity and ingenuity of all involved.

ARIEL was constructed in the heart of TRIUMF, so careful coordination was necessary to minimize the impact of construction to ongoing operations, structures and underground infrastructures. ARIEL was also purpose-built through meticulous coordination between consulting team and the end users, with little room for error at all phases of the project. Congratulations to the consulting team for the award and to the TRIUMF staff who worked seamlessly with the consulting team and the prime contractor, EllisDon, to meet the challenges each and every step of the way.



ADDRESS THE MOST COMPELLING QUESTIONS...

- ✓ Exploit actinide targets to produce isotopes for studying three-body forces in nuclei and for delineating the astrophysical r-process
 - ✓ Test ab-initio theoretical models using light isotopes produced and studied at ISAC
 - ✓ Pursue particles beyond the Higgs boson with ATLAS at the LHC
 - ✓ Develop Canadian efforts in neutrinos and neutrons
 - ✓ Support projects destined for SNOLAB
 - ✓ Explore development of novel magnetic and electrical properties in thinly layered materials
 - ✓ Pursue development of novel radiotracers for cancer (oxidative stress), including probes of genetic markers, and neurodegenerative disease (non-dopaminergic neurotransmitters)
 - ✓ Pioneer development of alpha-emitting isotopes for medicine using ISAC facilities
- ✓ Complete ✓ In progress

The Nobel Prize in physics was awarded to Higgs and Englert for developing the theory known as the Higgs field. TRIUMF has been a focal point for Canadian involvement in the discovery –from contributions to

the LHC accelerator, to building key elements of the ATLAS detector, leading part of the analysis, and continuing to host one of the ten global Tier-1 Data Centres. The ATLAS Collaboration released 3 supersymmetry analyses led by Canadian researchers. In collaboration with UBC, TRIUMF led the charge in setting new limits on SUSY particles and pioneering SUSY searches with high yield sensitivity.

For their work in creating, capturing, and characterizing antihydrogen, the ALPHA-Canada Team was presented with the 2013 NSERC John C. Polanyi Award by Governor General David Johnston at a ceremony at Rideau Hall, Ottawa (as pictured below). The award "honours an individual or team whose Canadian-based research has led to a recent outstanding advance in the natural sciences or engineering." Now, the team's goal is to carry out laser spectroscopy on antihydrogen



with the new ALPHA-2 apparatus, which received substantial contributions from TRIUMF and the University of Calgary.

The T2K Collaboration confirmed an observation of a new type of neutrino oscillation, in which muon neutrinos transform into electron neutrinos. The result was published in PRL as a 90% exclusion region—the first time such a measurement has been made in particle physics. TRIUMF postdoc Mike Wilking and colleagues developed a new reconstruction algorithm instrumental in this result.

The DRAGON Group published the first direct measurement of the capture of protons on the radioactive F-18, producing Ne-19, which sets important constraints on the fractional resonant and direct capture contributions to the total ${}_{18}\text{F}(p,g){}_{19}\text{Ne}$ reaction rate at ONe nova peak temperatures. DRAGON performed a measurement of ${}_{76}\text{Se}(a,g)$, a key reaction in determining nucleosynthetic yields in the astrophysical p-process. This is the highest mass radiative capture reaction ever to be measured in an experiment.

Mass measurements by TITAN focused on isotopes in the vicinity of the so-called Island of Inversion, in particular, the Mg and Al region. TITAN has the capability of reaching very high precision for short-lived isotopes (half-lives around 20 ms), shorter than any other Penning trap mass measurement system coupled to radioactive beam production facilities, allowing for direct mass measurements.

The Laser Spectroscopy Group explored isotopes Fr-204, 205, 206 and developed a novel technique of high-frequency chopping of continuous-wave laser light with an electro-optic modulator, accepted and detailed for the first time in PRL. This result furthers the understanding of the behavior of nuclear structure and showcases the benefits of the novel chopping technique for future experimental campaigns.

It is the end of an era and the beginning of another for decay spectroscopy at ISAC-I. A symposium was held to celebrate 30 years conducted with the 8pi spectrometer and divulged the future science program for GRIFFIN, which replaces the 8pi and is about 300 times more sensitive. A recent highlight of the 8pi research, which was enabled by the ISAC actinide targets, focussed on neutron-rich Rubidium isotopes.

One third of the central beam line was installed for the Ultra-Cold Neutron Facility, necessitating a massive excavation of shielding blocks during the shutdown period. UCN completion is expected in 2017 at which time the facility aims to enable a new generation of experiments into the fundamental properties of neutrons.

An interdivisional team of experts formed in 2010 to tackle the problem of delivering RIBs with mass heavier than 30 to ISAC-II, successfully delivered Sr-94 to TIGRESS. This breakthrough benchmarks future operation of ISAC-II with high mass beams. The IRIS solid hydrogen facility entered into routine operation with successful reaction studies taking advantage of TRIUMF's unique capabilities in delivering beams of C-10, Li-11, and Be-11.

All light guides for the DEAP experiment have been produced, delivered to SNOLAB, and mounted in the experiment. Electronics for DEAP have been installed and commissioned. For SNO+ most of the universal interface components have been completed and the lower part of the universal interface has been mounted on the SNO+ detector.

Using the μSR facilities at TRIUMF's Centre for Molecular and Materials Science and J-PARC, a team of researchers from KEK and the National Institute for Materials Science in Japan have discovered (and published in PRL) novel magnetism in an iridium compound, CuIr_2S_4 .

In 2013, a total of 25 nuclear physics publications were published based on work at the ISAC rare isotope facility. This included 7 letter publications as well as



one review paper. A special volume of *Hyperfine Interactions* was published on ISAC and ARIEL with 31 articles on the existing and future accelerator facility as well as all experimental installations.

In the realm of nuclear medicine, the Meson Hall Extension Service Annex (MHESA) radiochemistry research (RCR) lab is complete while revitalization efforts for three additional labs have started. Built jointly with Nordion, the RCR is host to several projects, including work on the extraction and purification of Tc-99m. With a TR19 cyclotron, the BC Cancer Agency can produce enough Tc-99m daily to supply the greater Vancouver area. Likewise, PETtrace cyclotrons in Hamilton or London allow each site to produce sufficient Tc-99m for a daily supply. The team is completing regulatory paperwork while continuing discussions with several commercial partners.



With funding from CIHR, BC Cancer Agency and TRIUMF have developed so-called “salty” targets for isotope production using radiometals, with demonstrated production and isolation of research quantities of Tc-94m, Zr-89, Y-86, Ga-68, Cu-61 and Sc-44.

Targeted alpha therapy has long been a promising yet unrealized method for treating cancer. TRIUMF’s ISAC RIB facility is one of only a few places worldwide capable of producing suitable quantities of the relevant isotopes. First tests toward the production and isolation of At-209 for molecular imaging experiments were successful. The milestone event was orchestrated by UVic PhD student Jason Crawford for his investigation into the dosimetry of At-211 for use in cancer treatments.

ADVANCE PARTICLE ACCELERATOR AND DETECTION TECHNOLOGIES...

- ✔ Deliver 3,000 hours of rare-isotope beams and maintain cyclotron uptime greater than 90%
- ✔ Refurbish isotope-production target modules for ISAC and test novel ion-guide laser-ion source technology
- ✔ Develop novel SRF cavity designs and test equipment to facilitate fundamental research and external collaborations
- ✔ Secure partnership with Germany to launch isotope-beam separator and purifier project led by Saint Mary’s University
- ✔ Complete installation and commissioning of helium recycling facility
- ✔ Pioneer delivery of purified, heavy-mass isotope beams to ISAC-II
- ✔ Expand fundamental research program in advanced accelerator techniques

✔ Complete ✔ In progress

The cyclotron operated at a record 95.7% of scheduled beam hours and enabled delivery of 3,064 hours of rare isotope beam at ISAC to experiments and for beam developments.

ISAC implemented the newly developed ion-guide laser ion source. It demonstrated the suppression of isotopic contamination by up to a factor of one million while allowing extraction of a clean beam of the rare isotope of interest. This improvement opened the door for the delivery of Mg, Al, and Cd isotopes. Previously, these beams could not be used for experiments due to the overwhelming contamination of surface ionized isotopes of the same mass.

Since 2010, TRIUMF has followed a refurbishment program to restore the full functionality of target modules used for isotope production in ISAC and increase the reliability of ISAC operations. Target Module #3 was refurbished and entered the rotation of operational modules. The Targets/Ion Sources Group commissioned a conditioning station to allow pre-testing of target/ion source assemblies before installation. This increased productivity of the ISAC RIB program.

TRIUMF implemented a systematic approach to the annual three-month long shutdown using established project-management techniques. Over 600 tasks were included in the resource-loaded schedule. This proved successful and will continue in future years.

Furthermore, the 2014 shutdown exhibited the lowest accumulated dose since 2006. While this is partially due to a reduced number of cyclotron vault or tank jobs, it reflects steady improvement in circulating and extracted beam quality as result of numerous improvement projects.

The Accelerator Division continues to pursue accelerator science research and education. Three new NSERC grants were awarded, and with support via Infrastructure Operating Funds from CFI, initial research using the front-end of the e-linac has begun. University of Victoria students assisted with several research projects including beam optics and beam-profile monitors and the design of a novel SRF separator cavity.

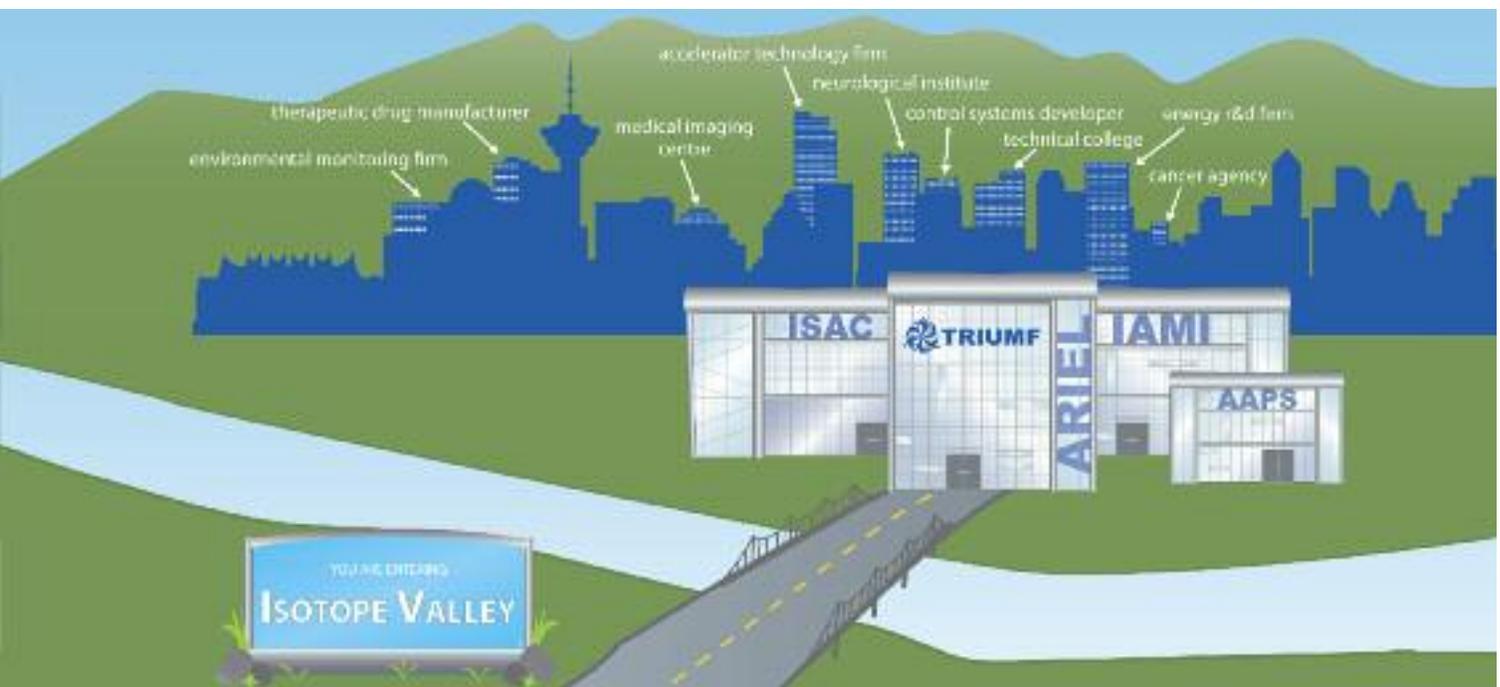
An innovative design of a high transverse field upgrade of the beta-NQR spectrometer was completed. Once installed, it will enable unprecedented measurements of Nb samples within the first ~100 nm layer of the inner surface, leading to improved performance with SRF cavities.

FOR THE BENEFIT OF ALL CANADIANS...

- ✓ Partner with AAPS, Inc. to launch a new product line or spin-off company deploying TRIUMF technology related to Tc-99m production on cyclotrons
 - ✓ Organize and host Community Open House for more than 1,000 visitors
 - ✓ Develop market opportunities for expanded medical-isotope production
 - ✓ Enhance TRIUMF's approach to safety, quality assurance, human-resource management, and enterprise integration
- Complete
 In progress

TRIUMF has the right mix of ingredients for a regional centre of excellence to establish the Vancouver metropolitan area as "Isotope Valley" by leveraging a local network of institutions with accelerator-based science, technology, innovation, and commercialization expertise.

Isotope Valley takes advantage of shared resources and centralized management for the reliable production of isotopes and radiotracers for clinical research and commercial transactions.



The Isotope Technology Acceleration Program of NRC announced a \$7M investment in a four-institution team led by TRIUMF for the development and deployment of cyclotron-based technology for the production of the key medical isotope Tc-99m. To date, the TRIUMF team has applied for IP protection on seven different technology packages related to Tc-99m production and continues to receive worldwide attention and recognition.

The Institute for Accelerator-Based Isotopes (IAMI) will maintain world-class expertise and state-of-the-art isotope research facilities, bringing together researchers and institutions across the public and private sectors.

Academic interests include TRIUMF's 18 member universities and TRIUMF senior researchers. Health organizations will benefit with IAMI as a production site for Tc-99m and a back-up site for F-18. With the BC Cancer Agency, IAMI will provide key medical isotopes for BC. The cornerstone of the IAMI is a high current, TR24 cyclotron recently purchased with funding from Western Economic Diversification of Canada.

The \$1.5M liquid Helium recapturing project is now completed and is recovering all Helium from the CMMS facility, incurring savings of about \$400k each year.

The first TRI-institute Summer-school for Particle Physics was held at TRIUMF, as a joint effort between Perimeter Institute, SNOLAB, and TRIUMF, and will rotate between the three institutes.

In an unusual alliance between TRIUMF and Japan's Kavli Institute for the Physics and Mathematics of the Universe, a long-term joint research position was created to recruit, develop, and support a world-leading scientist. US researcher Mark Hartz will work between the two labs over the next four years.

Hua Yang received an award from the Radiopharmaceutical Sciences Council Young Investigator's Symposium for her work on the development of a novel-imaging agent of oxidative stress. Paul Schaffer was recognized by Business in Vancouver as one of BC's Top Forty under 40 individuals for his leadership in medical isotopes, and as an effective researcher with an ability to create

teams that produce high-impact results on short time scales. Tom Ruth, recognized internationally as an expert on nuclear medicine and medical isotopes, was appointed to serve as the Canadian representative member of the UN's International Atomic Energy, whose mission is to promote safe, secure and peaceful use of nuclear technologies. Lia Merminga was awarded by the Minerva Foundation honored with a Women In™ Science award for Community Leadership and Excellence, for her integrity, excellence and vision for TRIUMF as well as the entire field of accelerator-



based physics and technology. Jens Dilling was honoured with the prestigious 2013 CAP-TRIUMF Vogt Medal for Contributions to Subatomic Physics.

TRIUMF hosted a visit by the Consul General for India, the Minister Councillor of the German Embassy, the Consul for S&T of the Chinese Consulate, and the S&T Attaché of the French Embassy—as well as visitors from Saudi Arabia and Korea—to connect efforts of Canadian research to international communities.

It was also a year for tremendous community spirit. TRIUMF participates in local festivals, like the UNA Barn Raising, UBC Alumni Weekend, and the Westbrook Village Festival. Moreover, TRIUMF opened its gates and invited community friends into the lab. Gusty winds and torrential rain weren't enough to discourage over 1,200 visitors from the Open House,





as they were greeted and entertained by a team of 130 researchers, post-docs, technicians, students, and staff.

TRIUMF scientists are reaching out through large-scale events. Anadi Canepa delivered a speech to 500 attendees at Sam Sullivan’s Public Salon. TRIUMF sponsored two films at local film festivals; “Particle Fever” at the Vancouver International Film Festival and “The Circle” at DOXA Film Festival with staff scientists participating in post-viewing Q&A. Similarly, Nigel Lockyer and Emily Carr University President Ron Burnett joined forces over “Common Ground: A dialogue on curiosity and creativity” held at Emily Carr’s Motion Capture Studio. The event provided an opportunity to make public the kinds of understanding that has been reached through the Artists in Residence program organized every year between TRIUMF and Emily Carr.

TRIUMF partners with Science World to generate the “Unveiling the Universe” lecture series to bring high-profile international scientists to the general public. Two lectures were held this year with Dr. Hitoshi Murayama on Mysteries of the Quantum Universe, and Dr. Paul Schaffer on Medicine Accelerated. In addition to the 400-seat theatre, interested viewers now participate via a livestream webcast.

Invited members of the Vancouver entrepreneur and high-technology community gathered at TRIUMF for its inaugural S&T Gala for an evening aimed to quench guests “where do we come from” curiosity plus an appeal to the technical side with an introduction to advanced particle-accelerator technologies.

AND FINALLY,

- ✔ Develop a compelling Five-Year Plan for 2015–2020 and share with community, government, and international stakeholders

✔ Complete ✔ In progress

TRIUMF’s financial procedures transitioned to comply with legislative changes in commodity taxation, as well as an overhaul of financial reporting in compliance with new accounting standards for the not-for-profit sector.

In preparation for considering Five-Year Plan 2015–2020, NRC’s Office of Audit and Evaluation led the review of TRIUMF according to Treasury Board guidelines. HAL Corp., conducted an economic impact study based on the lab’s activities. NRC convened an International Peer Review Committee of 9 world experts to review documents, analyze other reports, and visit the laboratory for several days in November. The Peer Review Committee concluded the audit and evaluation on a positive.



In summary, this year has been active, engaged, and focused on the ARIEL project while producing compelling results from the ongoing research programs.

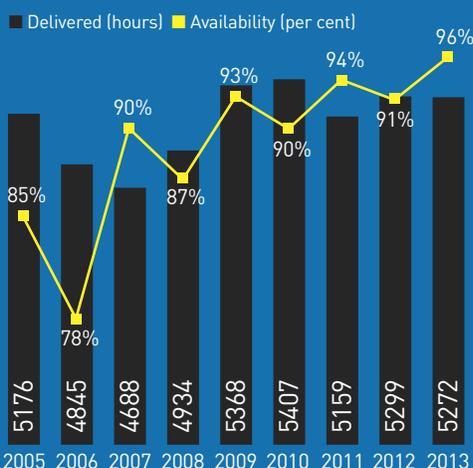
BY THE NUMBERS: EXCELLENCE WITH IMPACT

2013-2014 Fiscal Year:

Advancing Knowledge

- Hosted **380+** visiting scientists from over **25** countries
- Authored or co-authored **336** scientific peer-reviewed publications and gave **86** invited lectures on ATLAS and ISAC research topics
- Supported **30** scientific experiments at ISAC in nuclear physics, **60** experiments at CMMS in molecular and materials science, and **14** experimental programs for life sciences and nuclear medicine
- Operated the main cyclotron for **5,272** hours, or at **95.7%** of scheduled performance

Cyclotron Performance



- Delivered **3,064** hours of radioactive-isotope beams to experiments and for beam developments and **1,839** hours of stable-isotope beams to scientific experiments in its ISAC facility
- Used its TR13 cyclotron to produce **947** runs of medical isotopes delivered to hospitals for research including **11** runs for medical isotopes to the BC Cancer Agency for the diagnosis of cancer patients

Creating Leaders

- Shared the laboratory on over **500** public tours, with an additional **1,200** visitors for the TRIUMF Open House
- Hosted **13** VIP visits including Wayne Wouters, Clerk of the Privy Council and Secretary to Cabinet
- Provided educational and/or research work experiences for **7** high-school (including an Emerging Aboriginal Scholar), **68** undergraduate, and **35** graduate students (including **11** Masters and **7** PhD students graduated based on TRIUMF data or supervised at TRIUMF) as well as nearly **50** postdoctoral fellows
- Received high recognition for staff: Paul Schaffer ranked as Business in Vancouver's Top **40** under Forty; Lia Meringa Women In: Science; Tom Ruth was appointed to the UN IAEA Board as a health care expert; Jens Dilling receives the CAP-TRIUMF Vogt Medal for Outstanding Contributions to Subatomic Physics.
- Had **414,933** visits to its website and was followed by **4,439** people across social-media platforms (Twitter, Facebook)

Driving Societal & Economic Growth

- Hosted the inaugural TRIUMF S&T Gala, inviting members of regional high-tech companies to the laboratory
- Generated **\$1,412,019** in commercial revenue, including **~\$0.25M** from **35** companies in North America and Europe for access to the PIF & NIF irradiation facilities
- Treated **5** cancer patients using proton therapy in cooperation with the BC Cancer Agency
- Produced up to **1.7** million patient doses (in partnership with Nordion, Inc.) of medical isotopes for commercial sale and provided secondary, back-up supply of vital F-18 isotopes to BC Cancer Agency during periods when their cyclotron was offline for maintenance

UPCOMING PLANS

ARIEL

- Complete** the CFI-funded ARIEL e-linac project and demonstrate first beam tests.
- Identify** pathway and advance plans for isotope production capability in ARIEL.
- Utilize** ARIEL as a platform for student and professional training.



ADDRESS THE MOST COMPELLING QUESTIONS...

- Carry out** forefront RIB science at ISAC.
- Advance** searches for new physics beyond the Standard Model with ATLAS, T2K, and ALPHA2.
- Characterize** electronic and magnetic properties of new materials using beta-NMR and μ SR.
- Continue** installation and development of the UCN facility in pursuit of world-leading science.

ADVANCE PARTICLE ACCELERATOR AND DETECTION TECHNOLOGIES...

- Revitalize** the main cyclotron to deliver optimal operation and availability.
- Enhance** isotope capabilities and production at ISAC.
- Pursue** world leading accelerator research, including SRF research and development.
- Refurbish** beamlines to enhance capabilities for beta-NMR.
- Complete** construction of detectors for GRIFFIN and EMMA at ISAC, DEAP and SNO+ at SNOLAB.
- Contribute** to international particle physics projects, specifically for ATLAS upgrades, T2K/Hyper-K, and UCN/nEDM.

FOR THE BENEFIT OF ALL CANADIANS...

- Launch** the IsoSiM NSERC CREATE program to train young researchers in the application of nuclear isotopes to a broad range of fields.
- Establish** Isotope Valley as a centre of excellence by leveraging a network of institutions with accelerator-based science, technology, and commercialization expertise.

AND FINALLY,

- Welcome** incoming director Dr. Jonathan A. Bagger to the TRIUMF team!

FINANCIAL POSITION

For the TRIUMF team, fiscal year 2013-14 was a year of solid performance and reflected our unwavering commitment to deliver on our stated goals and commitments. Together, we advanced our flagship project ARIEL closer to its completion target, attracted new funding in support of our Nuclear Medicine program, undergone a Treasury Board mandated independent audit and evaluation of TRIUMF's performance, all while maintaining normal operating levels in support of our core science programs.

This year marked the completion of the fourth year of our current five-year plan and reached a total funding of \$81.0 million, below the prior year's funding by \$6.9 million or 7.8%. The decrease is mainly attributed to a reduction in recoveries from Canada Foundation for Innovation and British Columbia Knowledge Development Fund for the ARIEL project as the project transitioned from civil construction to its completion phase. However, new funding was received from Western Economic Diversification for our Nuclear Medicine program to procure equipment required to develop new isotope products, processes and services. Core operating support, channelled through the National Research Council, was \$44.3 million and represented 54.7% of total funding received in the year.

As mandated by Treasury Board, TRIUMF undergoes a comprehensive evaluation every five years to assess its relevance, and the performance of National Research Council's (NRC) contribution to TRIUMF. NRC's Office of Audit and Evaluation conducted an evidenced based independent evaluation of TRIUMF and concluded that "Overall, the findings of the evaluation of NRC's contribution to TRIUMF show that the activities undertaken by TRIUMF represent good value-for-money for NRC and for Canada".

Historically, TRIUMF has sustained a 'lean and mean' budget and efforts continued this last fiscal year to realize operational efficiencies. From the installation of a liquid helium recovery system to the examination of our liquid nitrogen consumption, TRIUMF optimizes its use of resources in order to maximize value from taxpayer-funded programs.

Looking ahead, we will continue to carry out our objectives and fulfill our goals while focusing on value and resource efficiency. Our attention and adherence to our financial policies positions us well for the future.



Henry Chen | Chief Financial Officer

INDEPENDENT AUDITOR'S REPORT ON THE SUMMARY FINANCIAL STATEMENTS

To the Joint Venturers of TRIUMF

The accompanying summary financial statements, which comprise the summary statement of financial position as at March 31, 2014 and the summary statement of combined funding/income and expenditures and changes in fund balances for the year then ended, and related notes, are derived from the audited financial statements of TRIUMF for the year ended March 31, 2014. We expressed an unmodified audit opinion on those financial statements in our report dated June 27, 2014. Those financial statements, and the summary financial statements, do not reflect the effects of events that occurred subsequent to the date of our report on those financial statements.

The summary financial statements do not contain all the disclosures required by section 11b of the TRIUMF joint venture agreement, and are prepared using the basis of accounting referred to in note 2 of the accompanying summary financial statements. Reading the summary financial statements, therefore, is not a substitute for reading the audited financial statements of TRIUMF.

Management's responsibility for the summary financial statements

Management is responsible for the preparation of a summary of the audited financial statements in accordance with the basis of accounting described in note 2 of the summary financial statements.

Auditor's responsibility

Our responsibility is to express an opinion on the summary financial statements based on our procedures, which were conducted in accordance with Canadian Auditing Standard (CAS) 810, "Engagements to Report on Summary Financial Statements."

Opinion

In our opinion, the summary financial statements derived from the audited financial statements of TRIUMF for the year ended March 31, 2014 are a fair summary of those financial statements, in accordance with the basis of accounting described in note 2 of the summary financial statements.



Chartered Accountants | Vancouver, B.C. | July 11, 2014

SUMMARY STATEMENT OF FINANCIAL POSITION

As at March 31, 2014

	2014	2013
	\$	\$
Assets		
Cash and cash equivalents	416,275	3,536,396
Investments	10,044,373	10,111,842
Restricted cash and investments	10,565,669	10,366,239
Due from Joint Venturers	2,836,706	2,318,758
Funding receivable	1,637,852	2,267,569
	<u>25,500,875</u>	<u>28,600,804</u>
Liabilities		
Accounts payable and accrued liabilities	4,496,995	6,735,661
Funds received in advance	3,371,497	3,069,854
	<u>7,868,492</u>	<u>9,805,515</u>
Fund Balances		
Externally restricted		
Natural Sciences and Engineering Research Council Fund	2,344,975	3,104,601
NORDION Inc. Fund	100,000	100,000
Decommissioning Fund	10,565,669	10,366,239
	<u>13,010,644</u>	<u>13,570,840</u>
Internally designated		
Commercial Revenue Fund	1,827,270	2,991,467
Intramural Accounts Fund	2,268,912	1,863,735
	<u>4,096,182</u>	<u>4,855,202</u>
Unrestricted		
General Fund	525,557	369,247
	<u>17,632,383</u>	<u>18,795,289</u>
Total liabilities and fund balances	<u>25,500,875</u>	<u>28,600,804</u>

The accompanying notes are an integral part of these summary financial statements.

SUMMARY STATEMENT OF COMBINED FUNDING/INCOME AND EXPENDITURES AND CHANGES IN FUND BALANCES

For the year ended March 31, 2014

	2014	2013
	\$	\$
Funding/income		
National Research Council Fund	44,300,000	44,000,000
Natural Sciences and Engineering Research Council Fund	6,135,227	6,578,602
British Columbia Knowledge Development Fund	-	5,419,328
Canada Foundation for Innovation (including Provincial matching)	13,219,278	20,361,685
Western Economic Diversification Fund	5,081,099	-
Natural Resources Canada	1,065,965	853,827
NORDION Inc. Fund	3,826,459	3,892,558
Advanced Applied Physics Solutions Inc. Fund	1,644,857	1,512,691
Decommissioning Fund	199,430	171,829
Affiliated Institutions Fund	2,622,178	2,664,758
Commercial Revenue Fund	1,412,019	1,127,465
Intramural Accounts Fund	1,245,288	1,039,663
General Fund	280,610	233,737
	81,032,410	87,856,143
Expenditures		
Buildings and improvements	4,443,782	16,750,364
Computer	1,475,398	1,277,465
Consulting	1,245,532	1,759,592
Equipment	17,204,828	10,097,681
Power	3,437,920	3,092,094
Salaries and benefits	40,569,928	40,434,297
Supplies and other expenses	12,004,827	12,817,742
Telecommunications	196,037	142,329
Travel	1,617,064	1,778,403
	82,195,316	88,149,967
Deficit of funding over expenditures for the year	(1,162,906)	(293,824)
Fund balances - Beginning of year	18,795,289	19,089,113
Fund balances - End of year	17,632,383	18,795,289

The accompanying notes are an integral part of these summary financial statements.

NOTES TO SUMMARY FINANCIAL STATEMENTS

1. Nature of operations

TRIUMF is Canada's national laboratory for particle and nuclear physics. It is owned and operated as a joint venture by a consortium of Canadian universities via a contribution through the National Research Council of Canada (NRC). As a registered charity, TRIUMF is not subject to income tax.

The members of the joint venture are the University of Alberta, Carleton University, the University of Guelph, Queen's University, the University of Manitoba, the University of Victoria, Simon Fraser University, the University of British Columbia, l'Université de Montréal, the University of Toronto and York University. There were no changes to the membership during fiscal year 2013-14.

At March 31, 2014, each university owned an undivided 9.09% interest in all the assets and liabilities of TRIUMF, except for the land and buildings occupied by TRIUMF, which are owned by the University of British Columbia.

These summary financial statements include only the assets, liabilities, funding and expenditures of the activities carried on under the control of TRIUMF and do not include the assets, liabilities, revenues and expenditures of the individual joint venture members.

Sources of funding include grants and contributions from the National Research Council Fund, the Natural Sciences and Engineering Research Council, Canada Foundation for Innovation, British Columbia Knowledge Development Fund, Western Economic Diversification, Natural Resources Canada; advances and reimbursements from other sources; commercial revenues; and investment income. TRIUMF has established a number of separate funds to account for the various funding sources. The sources and purposes of these funds are:

National Research Council Fund (NRC)

Funding of operations, improvements and development; expansion of technical facilities (buildings excluded); and general support for experiments.

Natural Sciences and Engineering Research Council Fund (NSERC)

Funding to grantees for experiments related to TRIUMF activities. These funds are administered by TRIUMF on behalf of the grantees.

British Columbia Knowledge Development Fund (BCKDF)

Funding provided for the civil construction of buildings. These funds are provided by the Province of British Columbia through the university members of the TRIUMF joint venture.

Canada Foundation for Innovation (CFI)

Funding to Canadian universities for capital projects related to TRIUMF activities. These funds are administered by the universities and TRIUMF is reimbursed for expenditures undertaken in accordance with the terms of the grant. The funding that is reported under CFI includes any provincial matching funds (usually from BCKDF) required by the grant.

Western Economic Diversification (WD)

Funding for capital projects related to TRIUMF activities.

Natural Resources Canada (NRCan)

Funding for approved capital projects related to TRIUMF activities.

NORDION Inc. Fund

Advances and reimbursements from NORDION Inc. for expenditures incurred at TRIUMF.

Advanced Applied Physics Solutions Inc. (AAPS)

Advances and reimbursements from AAPS for expenditures incurred at TRIUMF.

Decommissioning Fund

While there is no intention of decommissioning the TRIUMF facilities, the TRIUMF joint venture members have complied with federal legislation by putting in place a decommissioning plan, including a funding plan, in the event TRIUMF is decommissioned. The decommissioning plan is updated regularly in compliance with TRIUMF's licensing requirements.

Consistent with TRIUMF's accounting policies (note 2), all decommissioning costs will be expensed in the period in which the costs are incurred.

At March 31, 2014, the balance in the fund, \$10.6 million, is held in an escrow account to fund decommissioning costs. The majority of the holdings are invested in cash and mutual funds of \$7.7 million (2013 - \$10.1 million), and fixed income investments of \$2.6 million (2013 - \$nil) with a small holding in equity investments of \$0.2 million (2013 - \$0.2 million). The funds are managed by an appointed escrow agent as agreed to by the Canadian Nuclear Safety Commission (CNSC), Royal Trust Corporation of Canada, and each Member University of the joint venture. Each Member University has entered into an agreement confirming they will share the cost of any funding shortfall in the event decommissioning costs exceed funding available for decommissioning.

Affiliated Institutions Fund

Advances and reimbursements for expenditures undertaken on behalf of various Canadian and International institutions for scientific projects and experiments carried out at TRIUMF.

Commercial Revenue Fund

Royalties, revenues and expenditures relating to commercial activities and technology transfer.

Intramural Accounts Fund

Net recoveries generated by internal projects and services. The recoveries of expenditures are charged to the appropriate TRIUMF funding source by Intramural Accounts.

General Fund

Investment income generated is used for non-qualifying discretionary expenditures incurred by TRIUMF.

2. Significant accounting policies

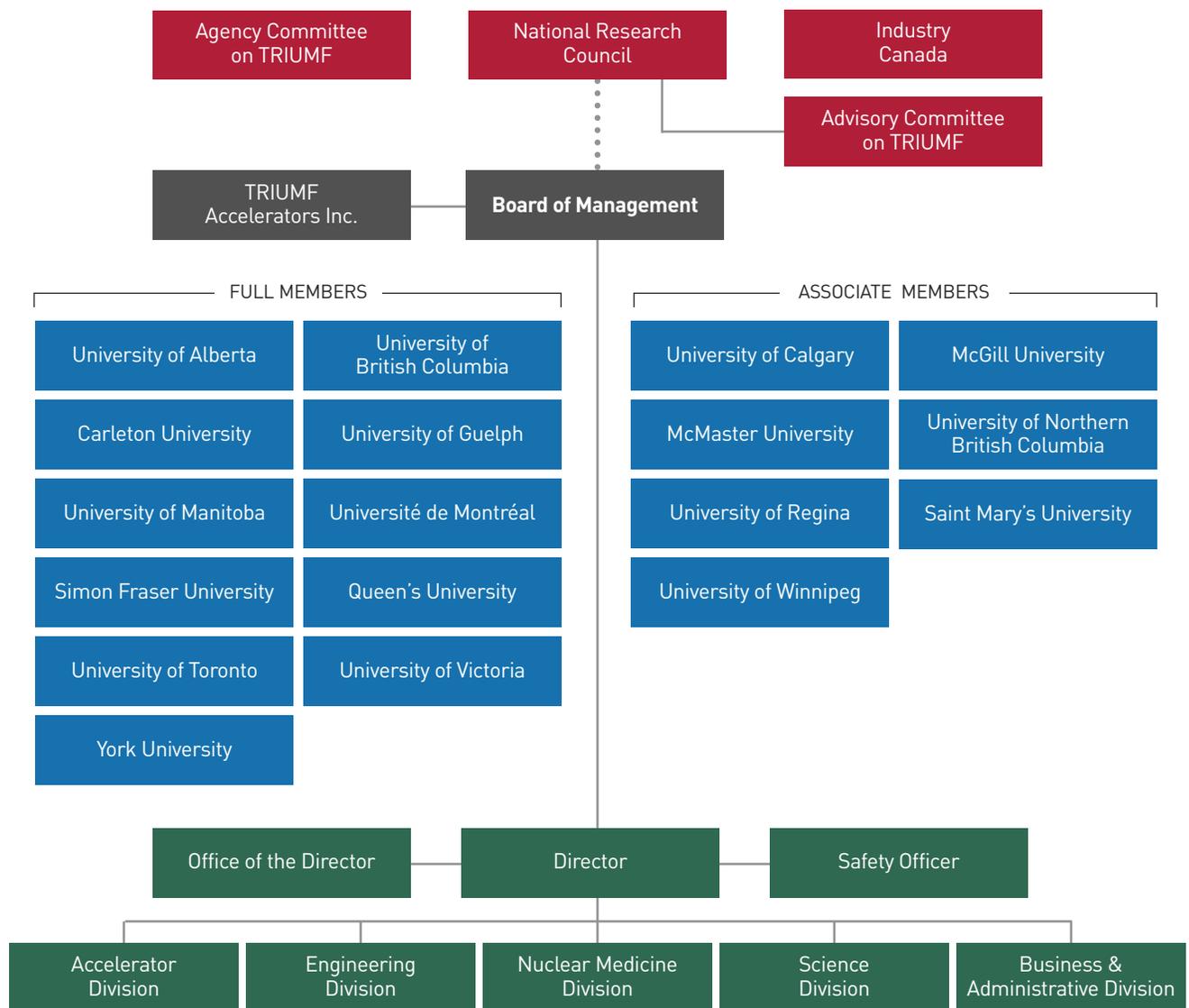
Basis of presentation

These financial statements have been prepared in accordance with section 11b of the TRIUMF joint venture agreement. TRIUMF has elected to follow Canadian Public Sector Accounting Standards (PSAS), including accounting standards that apply to government not-for-profit organizations, except that all property, plant and equipment purchased or constructed for use at TRIUMF and related decommissioning costs (if any) are expensed in the period in which the costs are incurred.

These financial statements do not include the accounts of TRIUMF Accelerators Inc. (TAI), a not-for-profit federal corporation incorporated in 2006 and controlled by TRIUMF. The only asset held by TAI is the operating license issued by the Canadian Nuclear Safety Commission, which was recorded at the exchange value of \$nil. Since inception, TAI has not incurred any expenses or liabilities and has not recognized any revenue.

GOVERNANCE STRUCTURE

TRIUMF is Canada's national laboratory for particle and nuclear physics. It is owned and operated as a joint venture by a consortium of Canadian universities via a contribution through the National Research Council Canada with building capital funds provided by the Government of British Columbia. Situated on 13 acres on the south campus of UBC in Vancouver and founded more than 40 years ago, TRIUMF presently employs about 450 staff and students.



ACKNOWLEDGEMENTS

TRIUMF's activities are largely supported by contributions from the following organizations:

- Canada Foundation for Innovation
- Canadian Institutes of Health Research
- Genome BC
- Government of British Columbia
- Government of Canada
- Government of Manitoba
- Government of Nova Scotia
- Industry Canada
- National Research Council Canada
- Natural Resources Canada
- Natural Sciences and Engineering Research Council
- Networks of Centres of Excellence of Canada
- Western Economic Diversification Canada

SELECTED PARTNERS

TRIUMF works with many individuals, organizations, educational institutions, and private companies to fulfill its mission. These include:

Canada

Advanced Applied Physics Solutions, Inc.
Advanced Cyclotron Systems, Inc.
AECL, Inc.
BC Cancer Agency
British Columbia Innovation Council
Burnaby Board of Trade
Canadian Association of Physicists
Canadian Cancer Society
Canadian Institute for Nuclear Physics
Canadian Light Source, Inc.
Canadian Space Agency
CANARIE
Centre for Probe Research and Development
D-Pace, Inc.
General Electric
Institute of Particle Physics
Jubilant-Draximage, Inc.
Lawson Health Research Institute
LifeSciences BC
Nordion, Inc.
Ottawa Heart Institute
Pacific Parkinson's Research Centre
PAVAC Industries, Inc.
Perimeter Institute
Positron Emission Tomography Imaging at UBC
Royal Society of Canada
Science World British Columbia
Selkirk College
Shad Valley
SNOLAB
Vancouver Board of Trade
Virtual Researcher on Call

International

Argonne National Laboratory, Argonne, USA
Brookhaven National Laboratory, Upton, USA
China Institute of Atomic Energy, China
Deutsches Elektronen-Synchrotron (DESY), Hamburg, Germany
CERN, Geneva, Switzerland

Fermi National Accelerator Laboratory, Batavia, USA
GANIL, Caen, France
Gesellschaft für Schwerionenforschung mbH (GSI), Darmstadt, Germany
High Energy Research Organization (KEK), Tsukuba, Japan
Institut des Sciences Nucléaires (ISN), Grenoble, France
Institute for High-Energy Physics (IHEP), Beijing, China
Institute for Nuclear Research (INR), Russia
Istituto Nazionale di Fisica Nucleare (INFN), Italy
Japan Atomic Energy Agency (JAEA), Tokai, Japan
Japan Proton Accelerator Research Complex (J-PARC), Tokai, Japan
Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany
Lawrence Berkeley National Laboratory (LBL), Berkeley, USA
Lawrence Livermore National Laboratory (LLNL), Livermore, USA
Los Alamos National Laboratory (LANL), Los Alamos, USA
Manhattan Isotope Technology, LLC, Lubbock, USA
Ministry of Education, Science, and Technology (MEST), Seoul, Korea
National Superconducting Cyclotron Laboratory (NSCL), East Lansing, USA
Oak Ridge National Laboratory (ORNL), Oak Ridge, USA
Paul Scherrer Institut (PSI), Switzerland
Rutherford Appleton Laboratory (RAL), UK
RIKEN Nishina Centre for Accelerator-Based Science, Wako, Japan
SLAC National Accelerator Laboratory, Menlo Park, USA
Thomas Jefferson National Accelerator Facility, Newport News, USA
Toyota Central R&D Labs, Inc.
UT-Batelle, LLC, USA
Variable Energy Cyclotron Centre, Kolkata, India



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