The background features a dark blue grid with white particle physics diagrams. On the left, a diagram shows an electron-positron pair (e^+) annihilating into a photon (γ), which then decays into a quark-antiquark pair (q). On the right, a diagram shows a top quark (t) decaying into a gluon (g) and a bottom quark (b). Further right, a diagram shows a top quark decaying into a bottom quark and a W boson, which then decays into a lepton and a neutrino. At the bottom right, a diagram shows a top quark decaying into a bottom quark and a Z boson, which then decays into a lepton and a neutrino.

Discovery and Innovation for a Better World

Our 20-Year Vision
2022–2042

Acknowledgements

TRIUMF's activities are supported through a combination of federal and provincial funding, support from academic and research institutions, revenues from commercial activities, and contributions received through scholarships, awards, and philanthropic donations. Our discoveries and innovations would not be possible without the contributions made by our global network, which includes member universities, partner laboratories, our user community, private sector partners, and community organizations. We are deeply grateful to all those who help us push the boundaries of knowledge and harness its power for the benefit of all. Together, we are unlocking a universe of possibilities for Canada and the world.

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EXECUTIVE SUMMARY

As Canada's particle accelerator centre, TRIUMF is a hub for discovery and innovation. From the fundamental to the applied, we solve problems and deliver impact – from the hunt for the smallest particles in our universe to research that advances the next generation of batteries or develops isotopes to diagnose and treat disease. We tackle problems too large and complex for any single researcher or institution. Essentially, we enable Canada to compete at scale in the global science and innovation enterprise, driving its contributions to extending the boundaries of knowledge.

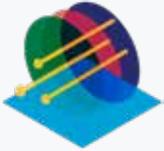
As we look forward to the next 20 years, science will undoubtedly continue to be a driver of innovation and technological developments that benefit people everywhere. We are excited about the opportunities for TRIUMF to contribute further scientific breakthroughs and solutions to complex societal challenges. And we are confident that our talented people, multidisciplinary research programs, network of member universities across Canada, global partnerships, and unique, large-scale accelerator infrastructure will enable us to keep thriving and contributing during the most transformative era in our history.

Our 20-year vision is both bold and realizable. It considers how to leverage past investments by government and build on our strengths to deliver a new level of top-tier science, training, and innovation for Canada. Here's how we envision TRIUMF in 20 years:



A global leader in discovery science, delivering breakthroughs that unlock the deepest mysteries of the universe

Strengthening Canada's leadership in groundbreaking particle and nuclear physics



A world-class accelerator centre driving use-inspired research – from the life sciences to quantum and green technologies

Leveraging our unique infrastructure to pursue research in Canada that will change the world



An inclusive multidisciplinary talent incubator, attracting and developing the best people from around the world

Producing Canada's future science leaders and innovators



A leader in a flourishing national Big Science ecosystem

Catalyzing the success and growth of Canada's network of major research facilities



A national innovation hub translating discovery science into health and sustainability solutions

Responding nimbly to complex societal challenges for the benefit of Canadians

MESSAGE FROM THE EXECUTIVE DIRECTOR

I am delighted to introduce TRIUMF's first 20-year vision, a document that outlines the long-term direction and ambitions of Canada's particle accelerator centre. This vision will inform the development of our scientific programme and infrastructure over the next two decades, ensuring that we continue to support and drive Canadian fundamental research and cementing our role as a world-class research and innovation centre. It is founded on our core principles and builds on our existing strengths at TRIUMF whilst envisioning new ones being forged over this timeframe.

This long-term perspective will help TRIUMF articulate our role in the Canadian research and innovation ecosystem, illuminate opportunities that may emerge, and define and communicate where we see ourselves in the coming decades. Our 20-year vision will guide the building of our next five-year strategic plan and federal funding request. This vision is evergreen. We will update it as we develop each five-year strategy to make sure we maintain a continuous focus on the long-term objectives of our community and Canada.

This vision document represents the culmination of 18 months of community and stakeholder engagement, drawn together through 12 topical groups (whose discussions are available on the TRIUMF website) and overseen by a distinguished steering group. I would like to thank everyone who has engaged in the vision process, especially the local team, for shaping these deliberations into a cohesive vision.

The strong community engagement and feedback have enabled the development of a vision that will allow us to continue to thrive, over the long term, as a premiere accelerator centre. New opportunities are foreseen around global grand challenges of developing green technologies and sustainability, and within the quantum strategy that Canada is pursuing. We will develop these opportunities while at the same time delivering world-leading subatomic, accelerator, and life sciences. A central theme of the community engagement was that TRIUMF remains, at its core, a fundamental science powerhouse – generating new ideas and game-changing technologies and translating our work into societal benefits.

We have challenges ahead as a society, yet also many opportunities. I am excited by the role that TRIUMF will play in realizing these opportunities. As a major research facility, we will continue to be a leading force in the Canadian research ecosystem, connecting nationally and internationally to amplify the potential of our research community. We will support national resilience in critical areas such as life-saving radiotherapies, which require the skills and capabilities of our internationally sought-after staff and unique infrastructure.

TRIUMF already represents a valuable national resource that is widely recognized on the international stage. The vision outlined in this document ensures that we will remain at the forefront of fundamental science, become a leader in addressing complex challenges in health and sustainability, and continue to deliver benefits to Canadians and the world.

As we accelerate discovery, our future is bright.

A handwritten signature in black ink, appearing to read 'N. Smith', with a stylized flourish extending to the right.

Nigel Smith
Executive Director & CEO

MESSAGE FROM THE CHAIR OF THE BOARD

On behalf of TRIUMF's Board of Governors, I am proud to present and endorse TRIUMF's inaugural 20-year vision. This long-term vision is bold yet achievable, and firmly rooted in TRIUMF's research strengths, strong track record of achievements, and demonstrated commitment to its people.

Bolstered by an active and growing network of university members, TRIUMF has forged strong relationships with government, direct links within and between research communities, and longstanding partnerships with both Canadian and international laboratories. In support of this, TRIUMF's governance structure has also recently evolved, positioning the organization to be more efficient and effective – both critical strengths as the laboratory moves into the next phase of its mission.

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- 6 As humankind continues to push the frontiers of knowledge, world-class research and scientific breakthroughs will increasingly rely on research done at major research facilities like TRIUMF – and addressing grand challenges will require even broader collaborative research approaches across disciplinary boundaries.

I look forward to seeing the fruits of the work outlined in this vision unfolding over the next two decades. TRIUMF undoubtedly has an important role to play in driving world-class science in Canada for the benefit of Canadians and the world.



Angus Livingstone

Chair, TRIUMF Board of Governors

TRIUMF TODAY: A UNIQUE RESOURCE FOR CANADA AND THE WORLD

As Canada's particle accelerator centre, TRIUMF is a hub for discovery and innovation. Inspired by more than a half-century of ingenuity in answering nature's most foundational questions, we advance world-leading discovery and multidisciplinary research for science, medicine, and industry. From the fundamental to the applied, we solve problems and deliver impact – from the hunt for the smallest particles in our universe to research that advances the next generation of batteries or develops novel solutions for the diagnosis and treatment of life-threatening disease.

Our track record of excellence is a direct product of substantial investment over more than five decades, both provincial and federal, in the laboratory's core infrastructure in Vancouver, British Columbia. Our competitive advantage rests on our state-of-the-art accelerator complex – featuring the largest cyclotron of its kind and the most powerful purpose-built superconducting electron linear accelerator in the world.

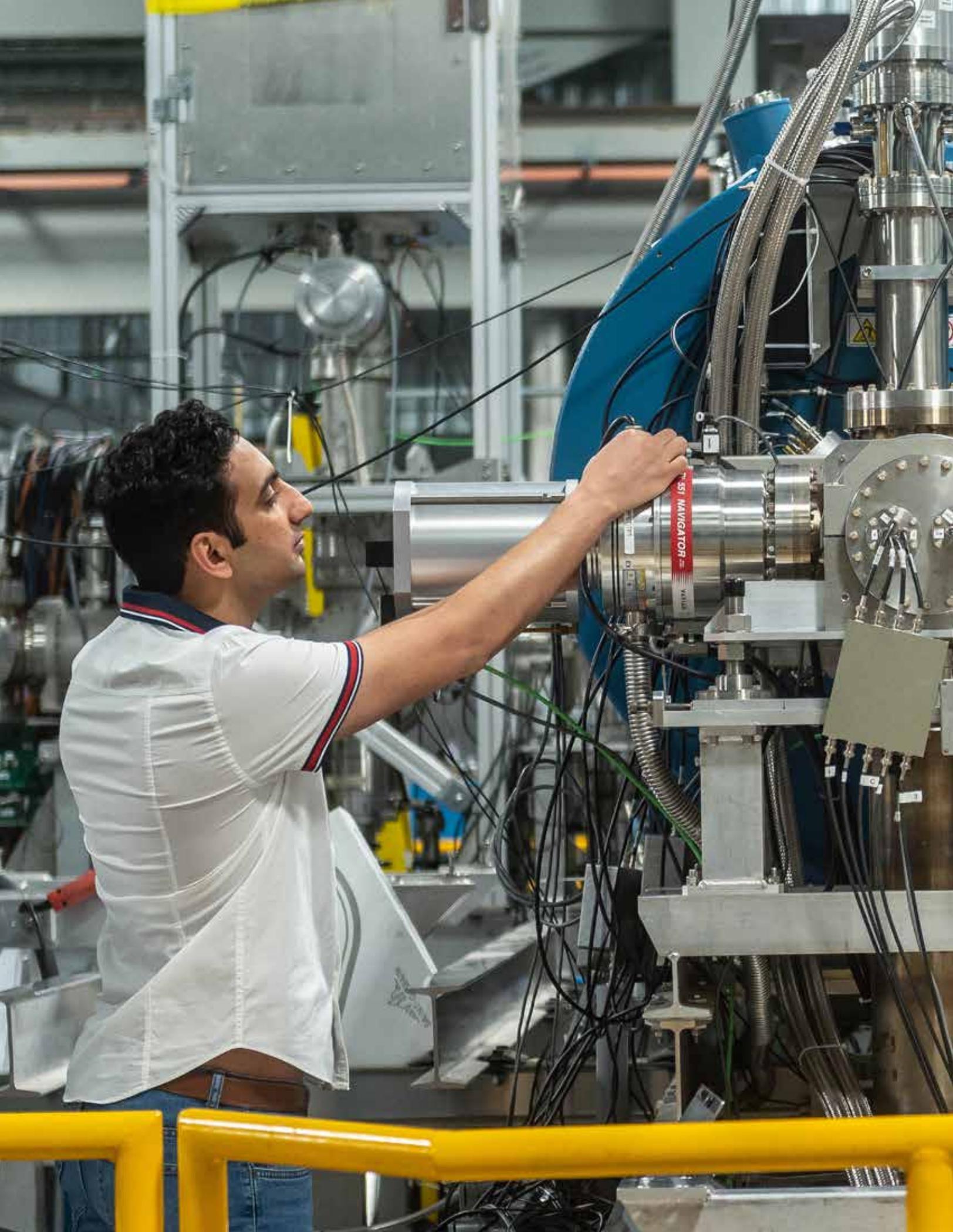
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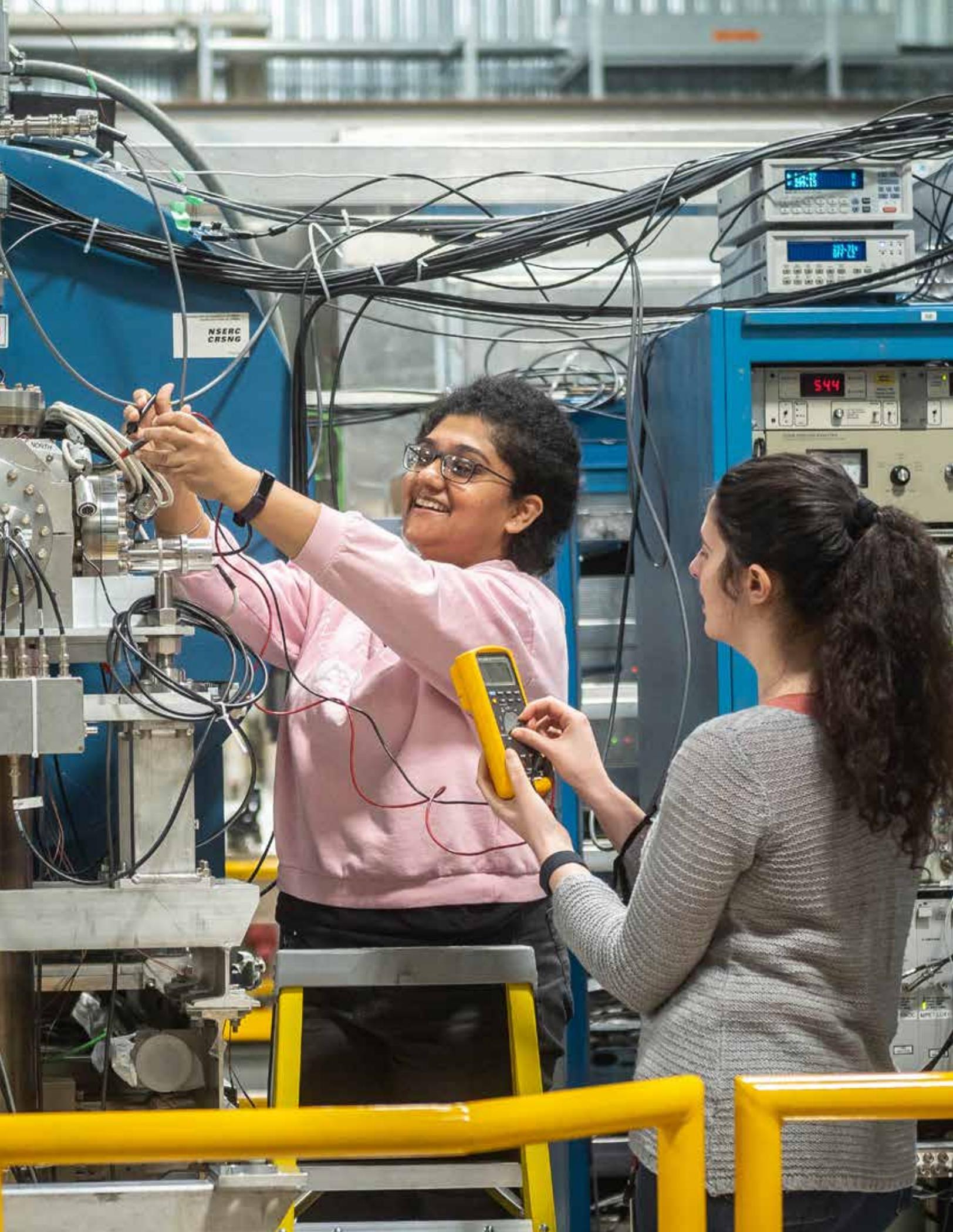
As the only research centre operating at this scope and scale in Canada, TRIUMF tackles problems too large and complex for any single researcher or institution. Essentially, we enable Canada to compete at scale in the global science and innovation enterprise, driving its contributions to extending the boundaries of knowledge, particularly in nuclear and particle physics and the life and materials sciences.

By collaborating with our academic and industry partners, both in Canada and globally, we drive compelling research and create ideas and innovations that benefit humanity. We offer hands-on research and work opportunities that transcend individual disciplines. We also broaden and deepen the national talent pool by attracting top talent from around the world, developing the skills that Canadians need to succeed in the knowledge economy, and strengthening the science, technology, engineering, and mathematics (STEM) pipeline.

TRIUMF's evolving research activities







TRIUMF IN 20 YEARS: A GLOBAL SCIENCE AND INNOVATION LEADER

As we look forward to the next 20 years, we are excited about the opportunities for TRIUMF to drive further scientific breakthroughs and solutions to complex challenges facing Canada and the world, ranging from climate change to health. Science will undoubtedly continue to be a driver of innovation and technological developments that benefit people everywhere. And addressing grand challenges will require even broader collaborative research approaches across disciplinary boundaries.

TRIUMF's talented people, multidisciplinary research programs, expanding network of member universities across Canada, international partnerships, and unique, large-scale accelerator infrastructure will enable us to keep thriving and contributing during the most transformative era in our history. With the Advanced Rare Isotope Laboratory (ARIEL) and the Institute for Advanced Medical Isotopes (IAM) coming fully online over the next decade, TRIUMF will be home to some of the world's most powerful isotope research facilities, reinforcing our status as a true jewel in Canada's STEM crown.

Our 20-year vision is bold yet realizable. It considers how to leverage past investments by government and build on our strengths to deliver a new level of top-tier science, training, and innovation to Canada.

Here's how we envision TRIUMF in 20 years:



**A global leader
in discovery
science,
delivering
breakthroughs
that unlock
the deepest
mysteries of
the universe**

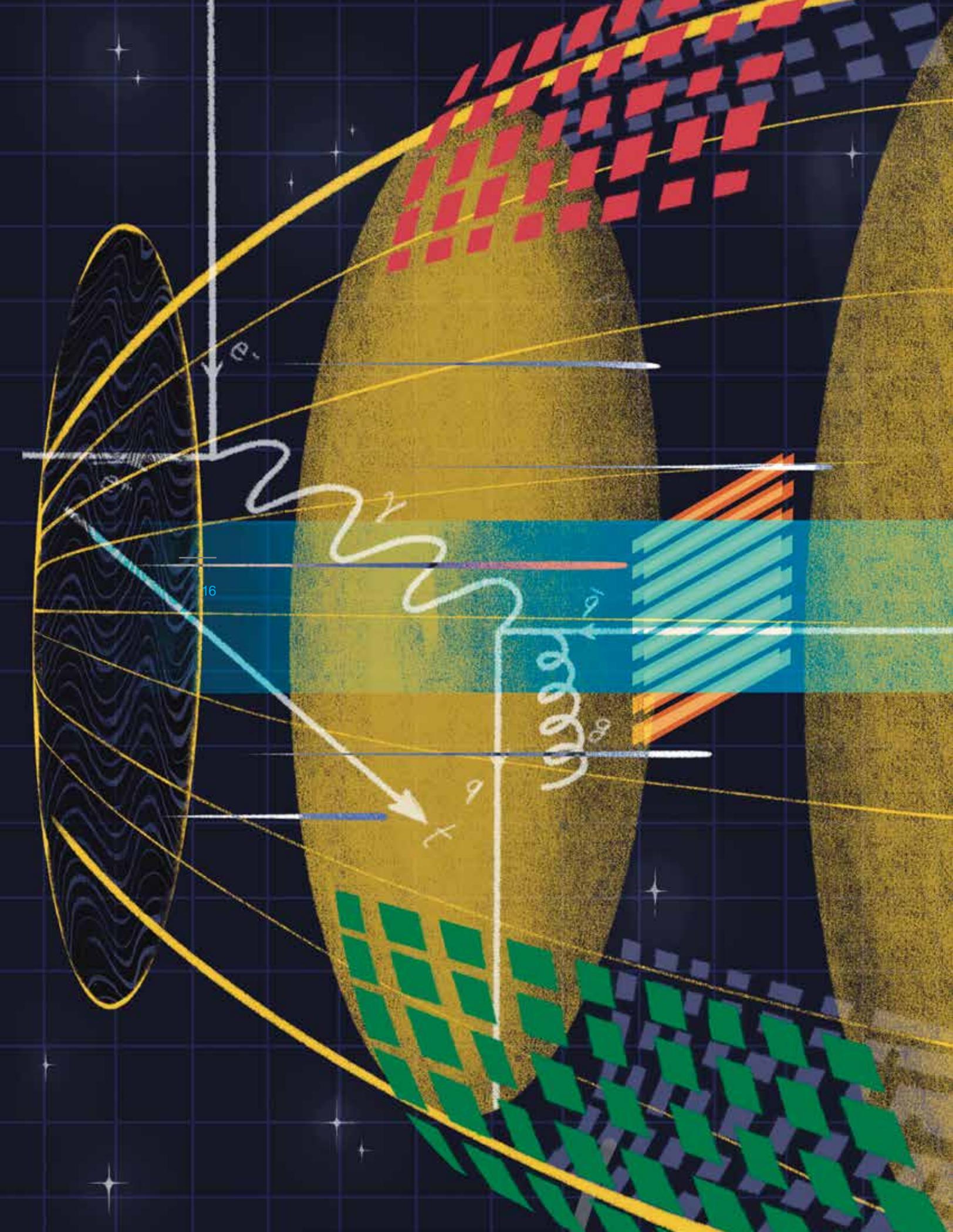
Strengthening Canada's leadership in groundbreaking particle and nuclear physics

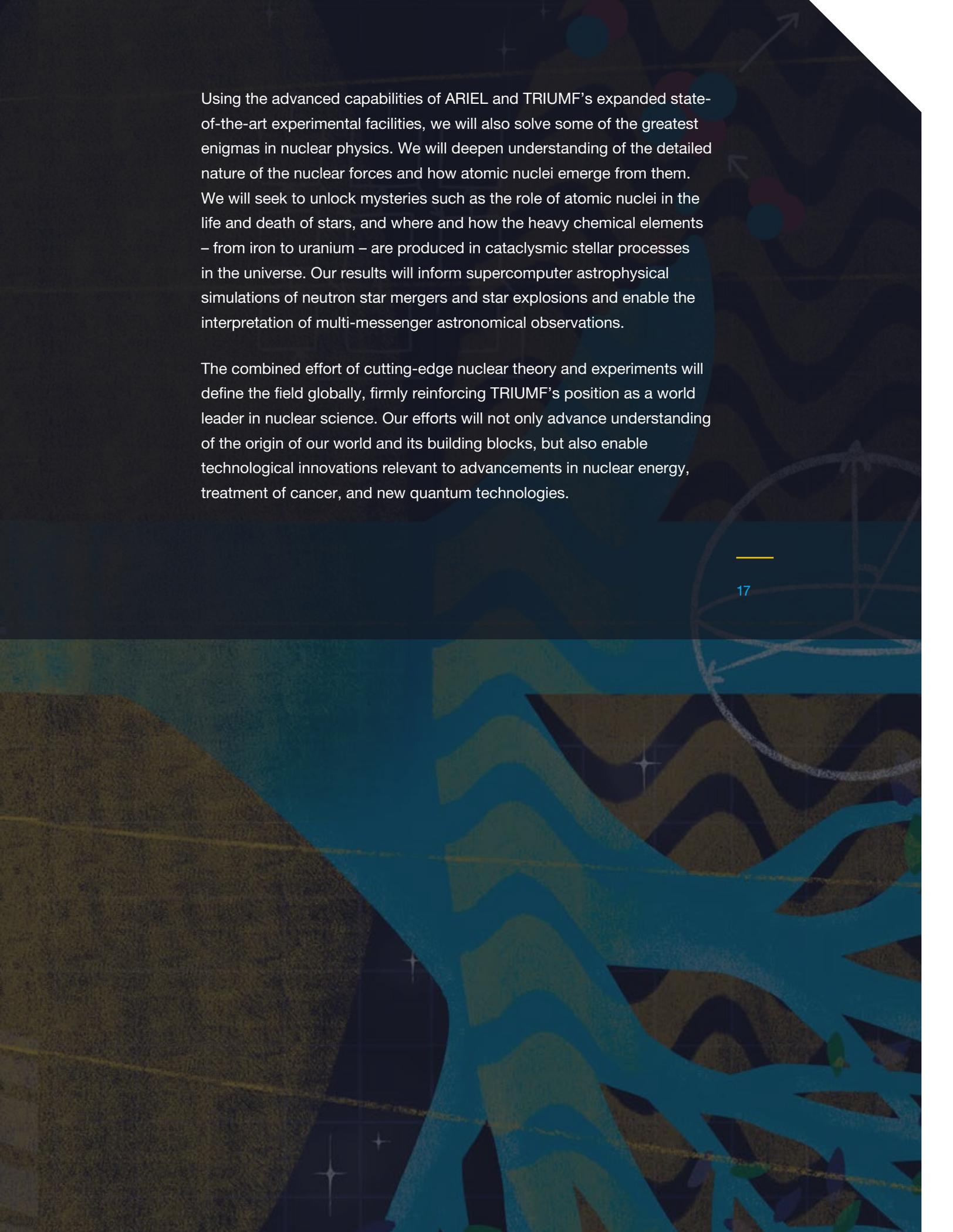
What are the fundamental building blocks of matter? What are the forces driving the evolution of the universe? These are some of the biggest and most exciting scientific questions facing the world. The foundation of TRIUMF's work will continue to enable discoveries at the cutting edge of particle and nuclear physics to help answer these questions and unlock the mysteries of the universe. This expertise will allow Canadians to continue in leadership roles in large-scale international efforts, based both in Canada and abroad, and conduct theoretical studies and breakthrough experiments at TRIUMF that expand the boundaries of knowledge.

With the discovery of the Higgs boson and confirmation of the Standard Model of Particle Physics, particle physics has entered uncharted territory. We know that dark matter and neutrino mass both require new physics beyond the Standard Model. TRIUMF will play a major role in determining the properties of neutrinos, discovering the nature of dark matter and the origin of the matter-antimatter asymmetry in the world, and discovering new particles and forces.

This work will include expanding our portfolio of groundbreaking high-precision experiments at TRIUMF, as well as our capabilities in developing advanced detector and accelerator systems for large-scale international particle physics projects in Canada and abroad – from ATLAS at the CERN Large Hadron Collider to future colliders, multi-ton-scale detectors deep underground (e.g., at SNOLAB), and long baseline neutrino experiments in Japan and the United States. We will also continue to support the delivery of the Canadian Subatomic Physics Long-Range Plan. Next-generation breakthroughs in fundamental physics will require new theoretical ideas and the application of novel technologies such as new materials for future detectors or precision quantum sensing with atoms and molecules. The ever-increasing amount of data produced in these experiments will require advances in high-performance computing, artificial intelligence, and quantum computing. Achieving breakthroughs will involve even more global collaboration, further strengthening the role of major research facilities like TRIUMF.

The impact of this work will fundamentally reshape the future of science and technology as we understand it, similarly to how relativity and quantum physics produced completely unanticipated advances in new technologies that now permeate everyday life. TRIUMF – and Canada at large – will be recognized as a key contributor to extending the current Standard Model of Particle Physics.





Using the advanced capabilities of ARIEL and TRIUMF's expanded state-of-the-art experimental facilities, we will also solve some of the greatest enigmas in nuclear physics. We will deepen understanding of the detailed nature of the nuclear forces and how atomic nuclei emerge from them. We will seek to unlock mysteries such as the role of atomic nuclei in the life and death of stars, and where and how the heavy chemical elements – from iron to uranium – are produced in cataclysmic stellar processes in the universe. Our results will inform supercomputer astrophysical simulations of neutron star mergers and star explosions and enable the interpretation of multi-messenger astronomical observations.

The combined effort of cutting-edge nuclear theory and experiments will define the field globally, firmly reinforcing TRIUMF's position as a world leader in nuclear science. Our efforts will not only advance understanding of the origin of our world and its building blocks, but also enable technological innovations relevant to advancements in nuclear energy, treatment of cancer, and new quantum technologies.



**A world-class
accelerator
centre driving
use-inspired
research – from
the life sciences
to quantum
and green
technologies**

Leveraging our unique infrastructure to pursue research in Canada that will change the world

Large, state-of-the-art infrastructure is the bedrock of cutting-edge research and technology development. It enhances our capacity to perform at world-class levels and catalyzes dynamic interactions between disciplines that lead to scientific breakthroughs and innovation. TRIUMF excels in building and operating unique, high-performing accelerator systems featuring a wide variety of particle beams – from protons and electrons to rare isotopes, neutrons, and muons.

Unleashing the full power of ARIEL will make us the world's most powerful multi-user rare isotope beam facility with sophisticated experimental set-ups and one of the top laboratories for accelerator science. Our made-in-Canada accelerators – a high-power superconducting electron linear accelerator and proton beams from our original cyclotron (the largest of its kind in the world) – will allow access to an increased number of isotopes and provide more beamtime. This will boost support for a variety of new projects conducted by the TRIUMF community and new partners.

We will also leverage and enhance our accelerator infrastructure to increase our work in use-inspired areas of research. We have identified the life sciences, quantum technologies, and green technologies as three key growth areas in the coming years. We are already engaged and have developed expertise in specific elements of the first two areas. In the face of climate change, we acknowledge the urgent need – and opportunity – to use our research capabilities, expertise, and infrastructure to help develop solutions to global climate and sustainability challenges.

Finally, we will continue modernizing and upgrading our infrastructure using new technologies for sustainable and effective operation. Our aim is to showcase how innovative research can be done sustainably, and also to operate year-round without a major shutdown, thus continuously delivering beam to enable more research and experiments. We will be a leader in sustainably managing resources used in laboratory operations and minimizing our environmental impact while, at the same time, increasing our research and discovery efforts in a responsible manner.

■ **DIAGNOSING, TREATING, AND CURING DISEASE**

We envision TRIUMF as a national and international leader in radioisotope technologies and applications for the life sciences and in fundamental medical isotope research. This requires us to significantly expand our globally recognized life sciences program, which currently focuses on neurological disease and cancer.

Taking advantage of our radioisotope and particle beam capabilities, as well as IAMI coming online, we will boost our research and production capacity – from

laboratory development through preclinical studies all the way to human trials. This will help meet the growing domestic and international demand for known and novel medical isotopes for new radiopharmaceuticals in both the diagnostic and therapeutic realms. We will further integrate our program into the BC health care system, with translational facilities capable of preclinical in vivo work, but also strong ties to state-of-the-art clinical imaging and treatment at local universities, hospitals, and BC Cancer.

Our expanded capabilities will foster innovation in radiopharmaceutical development, radiation therapy, accelerator research, and advanced isotope development, which will open new opportunities for cancer therapy, as well as imaging techniques for the study of brain illness and drug development. Advances in detector technologies, in part driven by innovations in particle and nuclear physics, will enable imaging with unprecedented spatial resolution, improving cancer diagnosis and treatment as well as drug development.

In addition, new research avenues that use our technical capabilities for groundbreaking biochemistry applications and the development of pharmaceuticals will accelerate the translation from bench to bedside. Establishing the world's premiere beta-detected nuclear magnetic resonance (beta-NMR) facilities and program for chemical and biological applications will allow us to address biological problems that conventional NMR or other techniques cannot.

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■ **ADVANCING QUANTUM TECHNOLOGIES**

The quantum revolution is accelerating, driven by exponential growth in computing power, big data, machine learning, and quantum computing. Quantum materials and technologies are key elements in emerging global trends in communication, security, sensing, and computing. They are the essential building blocks for next-generation superconductors, spintronics, sensors, transducers for quantum communication, and quantum computers with almost unlimited application potential.

Canada is at the forefront of the quantum race. Leveraging the capabilities of accelerator-based research facilities and associated technologies and expertise, TRIUMF will be seen as a strategic asset in the implementation of the National Quantum Strategy, specifically in the areas of quantum sensors, materials, and computing.

We will expand our cross-disciplinary expertise in precision measurements with quantum objects (e.g., radioactive ions, atoms, molecules, neutrons, muons, antimatter) to drive the development of new quantum measurement techniques for discovery in fundamental physics and applied research. We will also harness

our world-renowned expertise in radiation detector systems, developed for advanced nuclear and particle physics experiments, to drive the development of quantum technologies, in particular photon sensors, with a wide range of potential uses in areas such as environmental monitoring, quantum communications, and autonomous transportation.

We will further expand the quantum research and materials characterization capabilities of our Centre for Molecular and Materials Science (CMMS). This will drive the development of crucial new materials that fully leverage quantum phenomena to enable and manipulate the emergent new properties such materials promise. Using a multitude of probes at our muon and rare isotope facilities, which are unique in North America, and establishing new opportunities, such as using the ARIEL e-linac to produce coherent infrared radiation in the THz range, we will advance our understanding of underlying material structures and emerging quantum phenomena to transform a variety of technologies and sectors. These range from high-performance computing and big data to next-generation batteries, nanotechnology, earth and environmental science, as well as medicine, physics, the role of trace metals in biomolecules, and the chemistry in advanced nuclear reactors.

Building on our existing partnerships with industry and academia in Canada and abroad, we will support the Canadian quantum community in its ambitions by enabling access to relevant TRIUMF expertise and capabilities.

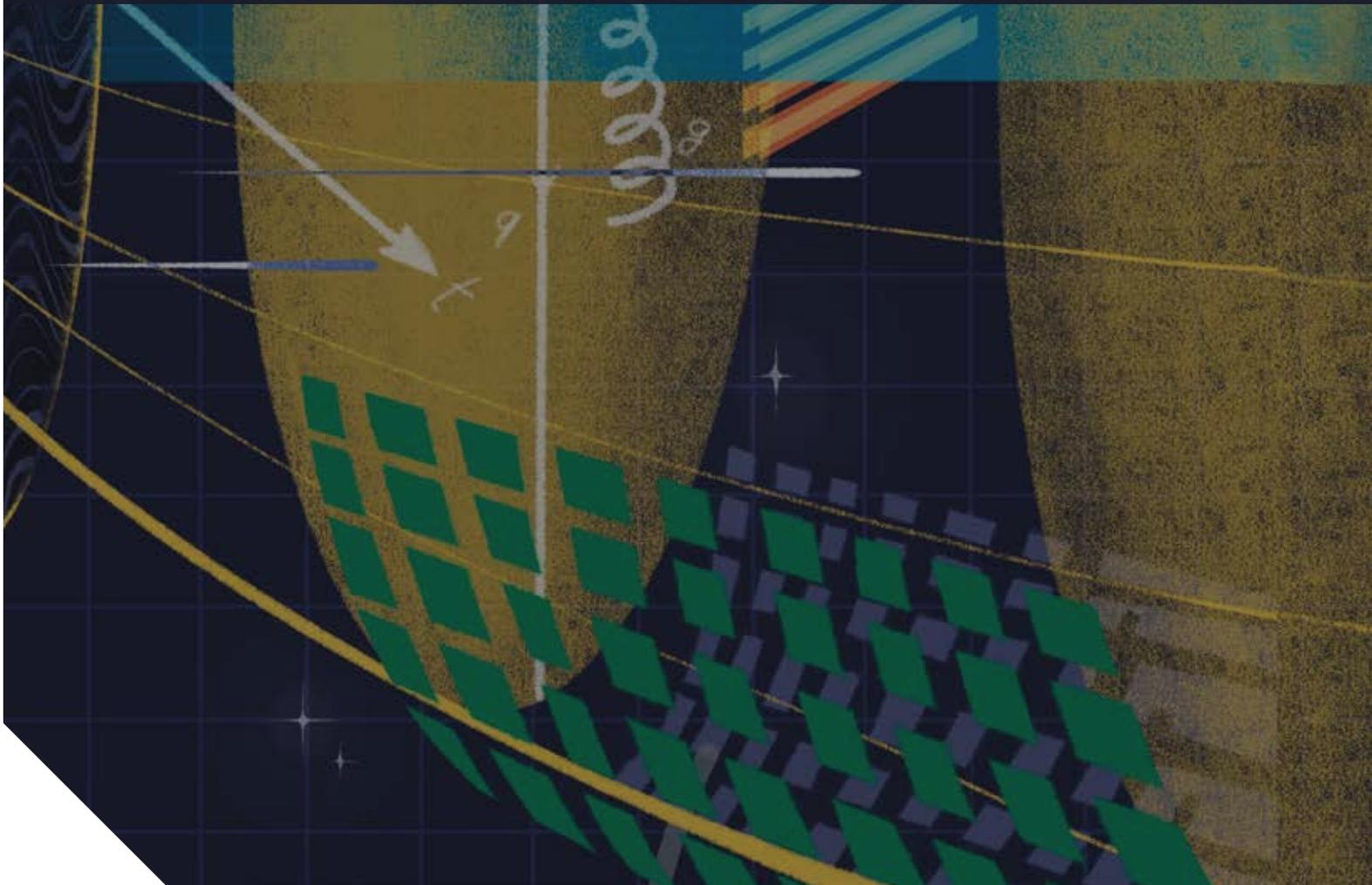
■ **ENABLING GREEN TECHNOLOGY SOLUTIONS**

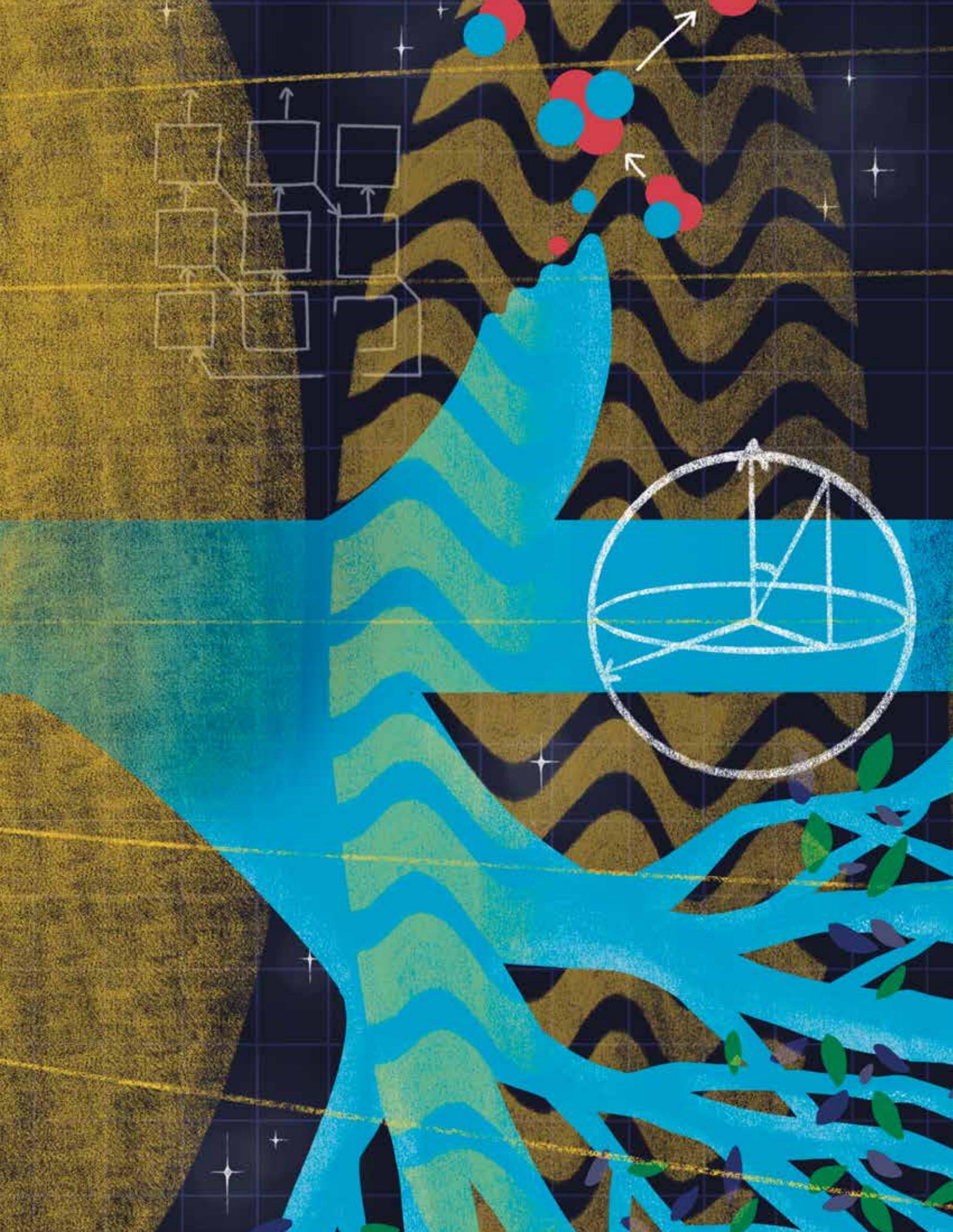
Individual research groups are already using our CMMS facility for climate-relevant research, such as developing green chemistry processes using muons and studying diffusion processes in potential future battery materials. It is now time, however, for TRIUMF to take a more deliberate and coordinated approach in this area to amplify the efforts of the scientific community. We will therefore launch a new climate and sustainability research program with dedicated support for both internal and user-driven work in green technology development.

The program will invest dedicated funding to seed new initiatives and strengthen collaborative efforts via a visitor program and rapid access to required facilities, such as CMMS beamlines. We see its future growth as akin to the evolution of our medical isotope program, from a small opportunistic effort at its inception into a globally significant program today. Promising research opportunities include energy production and storage (in applications for nuclear power, batteries, and hydrogen storage); efforts to reduce greenhouse gas emissions; and leveraging of green chemical processes for sustainable food and water production.

Particle accelerators and associated technologies have broad applications in the context of sustainability and climate challenges. We will use our expertise to advance initiatives for accelerator-driven nuclear reactors for energy production and nuclear waste transmutation. And our beams will be used for the characterization and qualification of materials for next-generation small modular reactors. Our know-how in areas such as cryogenic and superconductive technologies will help advance technologies for CO₂ and hydrogen liquefaction.

By fostering new partnerships with researchers from across our network of universities, we will also significantly enhance environmental tracer research based on the unique spectrum of radioisotopes and tracers that can be produced at TRIUMF – ranging from the role of phytoplankton in the global carbon cycle to the tracking of nanoplastics in wastewater.







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**An inclusive
multidisciplinary
talent incubator,
attracting and
developing the
best people
from around
the world**

Producing Canada's future science leaders and innovators

To flourish and grow in the post-pandemic world, Canada must continue to develop and attract a well-educated, highly-skilled, and flexible workforce. Conducting world-class discovery research and solving society's most challenging problems requires the work of diverse and multidisciplinary teams of scientists, engineers, technicians, tradespeople, and other workers with broad sets of skills. Global competitiveness and national prosperity also depend on giving all Canadians a fair chance to succeed.

At TRIUMF, our people are at the heart of our success. That's why we want to be recognized not only for our world-class research but also for our continuous investment in our people. We are committed to applying innovative approaches to attract, cultivate, promote, and develop a diverse range of high-performing talent across all levels of the organization. As they work and innovate together in an inclusive and supportive environment, everyone will have equal opportunity to contribute and thrive.

Canada is a nation rich in diversity. Our ambitions include establishing TRIUMF as a beacon of equity, diversity, and inclusion (EDI), which we believe is integral to research excellence and sustainable science solutions. Our vision is of a community of people from diverse backgrounds and life experiences who reflect Canada's makeup. In particular, we will ensure our staff mix fully represents the Canadian population, including Indigenous voices and experiences. We also expect that gender parity will be achieved in the student and postdoctoral researcher communities across programs, and EDI principles will be hardwired into our culture.

TRIUMF will become one of the most desirable places in Canada for students and early career researchers. We will kick-start careers by providing opportunities to work in diverse, international, multidisciplinary teams and to build valuable skills, particularly those needed to use the latest technologies and tools. Students and researchers trained at TRIUMF will therefore have a key advantage over those trained in silos. They will be well-prepared for successful research careers both in Canada and in major research facilities around the world.

We will also equip students and early career researchers for potential careers in the private sector by offering additional training in entrepreneurship and commercialization, communications, project management, and data science. Engineers, technicians, and other tradespeople already in the workforce will be given opportunities to upskill and stay abreast of fast-evolving technologies.



A continuous influx of new ideas and talent will keep us at the leading edge of research and innovation. To help develop and launch this talent, we will increase and strengthen our educational partnerships with industry, colleges, polytechnics, and universities for the delivery of more hands-on work experiences (e.g., work-integrated learning, co-op programs) across the full spectrum of TRIUMF activities, including science, engineering, communications, and business. These offerings will complement and enhance existing post-secondary education programs.

To attract a steady pipeline of diverse talent and to train future generations of science leaders and innovators who will power Canada's economic future, we must continue to inspire, engage, and empower Canadians, starting with students. This means collaborating with our network and partners in novel ways, such as using virtual and augmented reality tools, to increase our science outreach and engagement across the country, particularly with underrepresented groups and communities. We will inspire young minds by showing how our groundbreaking discoveries help answer some of the most fascinating scientific questions, and how our innovations contribute to Canada's prosperity. We will also provide professional development opportunities for teachers, educators, journalists, and science communicators.

TRIUMF will come to be viewed as a national centre for promoting scientific knowledge, literacy, and excellence.





A leader in a thriving national Big Science ecosystem

Catalyzing the success and growth of Canada's network of major research facilities

TRIUMF is a natural leader in Canada's Big Science ecosystem. We are a pioneering major research facility (MRF) bolstered by an active and growing network of university members, strong relationships with government, direct links within and between research communities, and longstanding partnerships with domestic and international laboratories. As humankind continues to push the boundaries of knowledge, major breakthroughs in science will increasingly rely on research done at MRFs, both nationally and internationally.

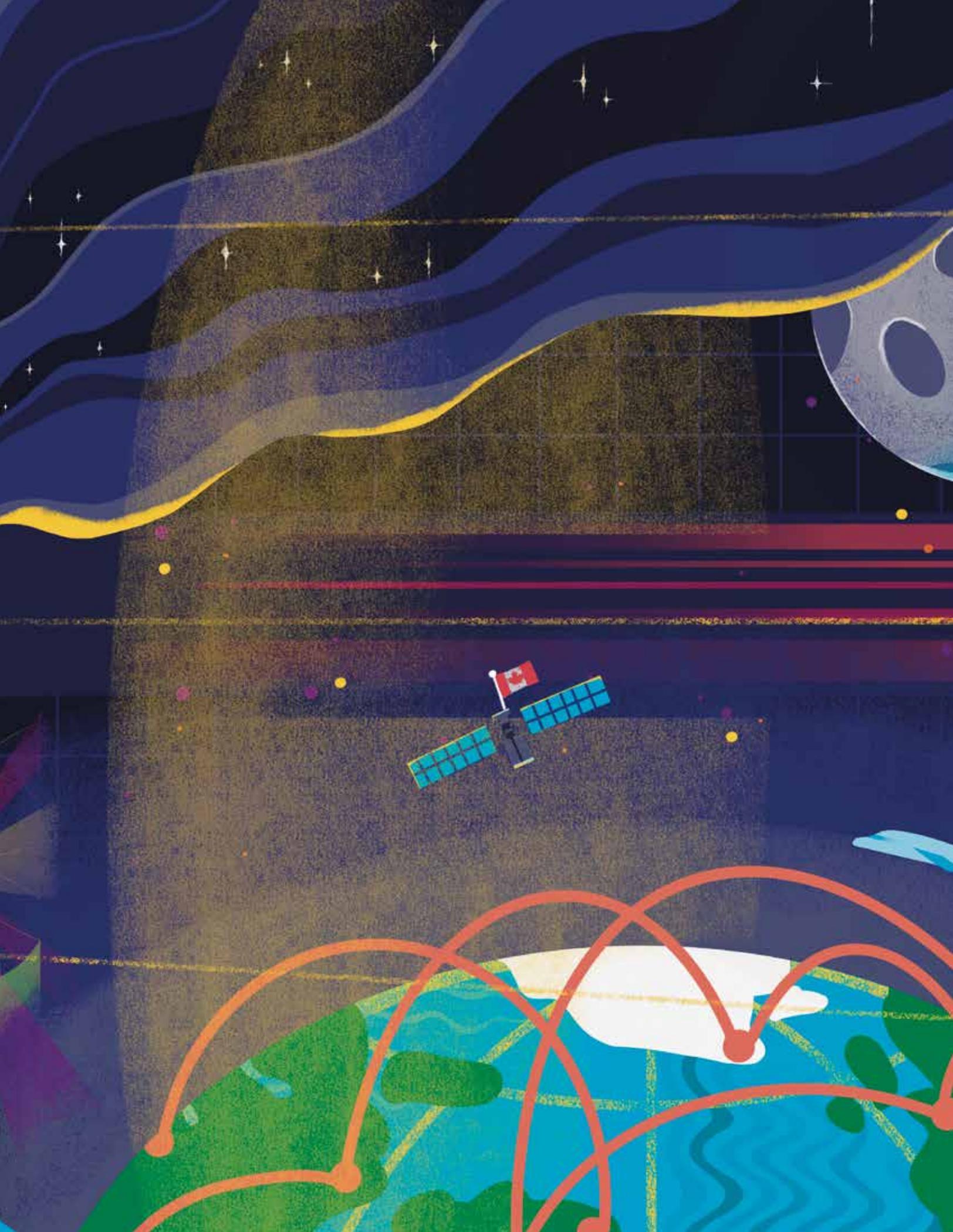
As our infrastructure and facilities continue to evolve and improve, we will boost Canada's contributions to international Big Science through next-generation experiments in Canada and collaborations at major international facilities. In addition, we see a tremendous opportunity to serve as the convenor of key partners and stakeholders in a coordinated national network of MRFs. We will build on our long history as the connective tissue between academic, industry, and public-sector stakeholders across Canada and our work across disciplines. We can provide unparalleled direction and alignment of partner needs in the context of university-owned and operated facilities.

We envision a coordinated MRF network featuring a strong advocacy group of facilities (and their university owners and users) that works with the federal government to establish a long-term MRF road map and lifecycle approach, prioritizing key investments in areas of strategic value. Long-term success and growth of the overall portfolio will require facilities to work collaboratively towards national goals and objectives. The MRF network will share best practices and adapt them to optimize performance across a portfolio of laboratories and research. This will allow stakeholders to better identify and take advantage of synergies, bringing clarity to the full lifecycle costs associated with coordinated MRF investments rooted in clear national priorities.

The result will be a robust Canadian Big Science ecosystem viewed internationally as a strong and efficient portfolio; central to this will be the network of university-owned MRFs with TRIUMF as the flagship. Channelling the expertise and ambition of its university members, the network will serve Canada's science and innovation needs, effectively and efficiently stewarding the investments made by government. Using new economies of scale, this network will deliver results with more agility and speed than previously possible. Canada will be regarded as a partner of choice and a global leader that punches far above its weight in science, technology, and innovation.

Within the next 20 years, the Canadian scientific community will be looking to construct a major new accelerator facility. An accelerator-based neutron source or a next-generation light source are potential options on the table. Driven by Canada's scientific community and clear government priorities, TRIUMF – as Canada's particle accelerator centre and a leader within a strong Big Science ecosystem – will be a principal partner in the ideation, development, and construction of this new infrastructure. Integration with existing accelerator facilities will lead to efficiencies in operation and use, as well as easy access to our expertise and governance and regulatory framework for building and operating large-scale accelerator infrastructure.







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**A national
innovation hub
translating
discovery
science into
health and
sustainability
solutions**

Responding nimbly to complex societal challenges for the benefit of Canadians

TRIUMF has a history of working with a range of partners to successfully apply multidisciplinary science to solve difficult problems. Many of our discoveries and technologies are successfully translated to applications with real-world impact: from radiopharmaceuticals based on the isotopes we produce to diagnose and treat diseases, to using accelerator-based technologies to advance the development of materials, with applications ranging from the next generation of quantum computers to new batteries for green energy solutions.

We have also made key contributions to the development of solutions to produce the world's most-used imaging isotope (Tc-99m), developed imaging technologies for the mining sector that help minimize the environmental impact of exploration, and developed a mechanical ventilator for COVID-19 patients in response to the global pandemic.

With this impressive track record, we are well-positioned at the centre of local and national innovation ecosystems that drive research, development, and commercialization of disruptive technologies that improve health outcomes and sustainability. As a linchpin in Canada's MRF network, we can connect its reservoirs of talent and infrastructure to key researchers, clinicians, industry, and government players to fund and focus collaborative efforts. As a result, we will spearhead global projects that quickly and effectively develop technologies that are urgently needed to address real-world crises. Not only do we envision TRIUMF responding to emerging national issues, but we also see ourselves working directly with government, foundations, and industry to identify and address major societal challenges on an ongoing basis.

In particular, through TRIUMF Innovations (our commercialization arm), we will draw on our strength in radiopharmaceutical development and radioisotope production to build an innovative and sustainable nuclear medicine ecosystem, from bench to bedside. We will become a nuclear medicine innovation hub by further expanding our isotope production capabilities through ARIEL and IAMI, and by effectively harnessing our infrastructure, talent, project pipeline, and incubation/commercialization support. Academic and industry partners will increase their use of our expertise, production capabilities, and research infrastructures to develop new radiopharmaceuticals for the diagnosis and treatment of disease. These will be essential in the continued shift towards more personalized medicine.

We will also drive the development of new isotope production paradigms, including novel accelerator technologies using world-leading expertise from across the lab, such as in superconducting and high-power target technologies.



Our new climate and sustainability research program will provide the research capabilities to address key scientific questions across a wide spectrum of topics from sustainable energy solutions and greenhouse gas reduction to environmental monitoring. We will use our expertise and infrastructure, through the MRF network, to build domestic resilience and home-grown climate and sustainability solutions.

We recognize that successful commercialization can take many forms. Our flexible model and extensive network allow us to work with a range of partners across the country. Together, we will explore creative ways to identify game-changing technologies across multiple verticals, transform them into innovative products, and quickly bring them to market. In partnership with TRIUMF Innovations, we will help launch start-up companies, making important contributions to the Canadian economy. Revenues from these efforts will continue to seed and support research and commercialization across TRIUMF.

We will create a collaboration space for staff, students, and visitors; a hands-on maker space for students, postdocs, technicians, and engineers to innovate, collaborate, and bring their ideas to life using state-of-the-art technologies; and an incubation space for supporting start-ups into commercialization. We will also work with academic partners to establish specialized joint facilities for translation, “collision”, and collaboration initiatives on our campus.

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The next 20 years will be a period of immense opportunity and growth as we move into a new phase of our history. Driven by the vision described in this document, TRIUMF will not only remain relevant to the communities we serve but will increasingly play a critical role in strengthening Canada’s future across all aspects of research, innovation, and skills development.



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**Discovery,
accelerated**