Reaching New Heights, Deep Underground

2023–2029 Strategic Plan

SNOLAB

Land acknowledgement

SNOLAB is located on the traditional territory of the Robinson-Huron Treaty of 1850, shared by the Indigenous people of the surrounding Atikameksheng Anishnawbek First Nation as part of the larger Anishinabek Nation.

We acknowledge those who came before us, and honour those who are the caretakers of this land and the waters.

Our visionary partners

SNOLAB is the result of an alliance of six founding partners. Our five Canadian university joint venture members ensure that SNOLAB maintains an independent and effective Board of Directors. Vale provides invaluable support through access to the two-kilometre depth in its Creighton mine.

SNOLAB is sincerely grateful to our many funding partners. Their essential investments in our facilities, research capabilities, infrastructure, and operations support leading-edge discovery, physics research, and innovation for the benefit of all Canadians.

VALE · Queen's University · Carleton University · Laurentian University / Université Laurentienne · Université de Montréal · University of Alberta

Executive summary

SNOLAB, the deepest-cleanest underground research facility in the world, has made Canada a leader in underground science, infrastructure, and expertise. Located two kilometres down, our facility near Sudbury uses the Canadian Shield to protect experiments from the cosmic rays that constantly bombard the Earth's surface. Our experimental spaces have the lowest cosmic radiation flux in the world and the least possible interference from radioactivity.

This unique low-radiation environment enables delivery of our world-class astroparticle physics research program. Working with collaborators, we explore priority questions about the evolution of the universe, particularly the role of neutrinos and dark matter. We have also recently attracted new experiments in life sciences and nuclear security to SNOLAB.

We are at a pivotal point in our evolution. International demand for access to our unique environment and capabilities has grown substantially while our organization has matured to meet it. The recent explosion in interest and investment around the world has intensified global competition in underground science. At the same time, it has created enormous opportunities for international collaboration. To keep Canada and Canadians at the forefront of global science, we must capitalize on these opportunities or risk being left behind.

By hosting and enabling the world's most advanced and sensitive underground experiments, we will bolster Canada's scientific reputation, attract new talent to our country and Northern Ontario, train more highly skilled people, provide more opportunities for Canadian researchers to lead international projects, and generate economic benefits for Canadians.

Our strategic plan for 2023-2029 will help us fulfill our vision to become the leading international underground laboratory. It leverages past investments and builds on our strong record of achievements and recognized strengths. It supports our efforts to create a more equitable, diverse, and inclusive culture that welcomes the community to SNOLAB. It also ideally positions us to capitalize on emerging global opportunities in deep underground science.

Three core pillars underpin our plan. For each, we have identified a goal along with a set of key strategies and expected outcomes:

Excellent science

Drive breakthrough discoveries at the frontiers of underground science.

To achieve this goal, we will:

- Increase understanding of the particles and forces that have shaped the universe;
- Pursue new opportunities in emerging areas of underground science; and
- Become an intellectual hub that fosters collaboration and connection.

Expected outcomes:

- Cementing of Canada's leadership in deep underground science
- A stronger, more competitive Canada in scientific discovery
- More Canadian researchers positioned as global leaders

Cutting-edge research infrastructure

Continuously improve our research infrastructure to remain state of the art.

To achieve this goal, we will:

- Explore the full potential of cryogenics systems;
- Innovate new technologies and tools for ultra-low background environments;
- Continue upgrading our operational systems;
- Deepen our focus on safety and sustainability; and
- Export our underground infrastructure expertise around the world.

Expected outcomes:

- Attraction of the most advanced international experiments to Canada
- Greater global impact and enhanced reputation of Canada's underground science infrastructure

Skilled people

Foster and develop diverse talent in an inclusive environment.

To achieve this goal, we will:

- Embed equity, diversity, and inclusivity (EDI) into everything we do;
- Increase professional development and training opportunities; and
- Focus public engagement efforts on K-12 students.

Expected outcomes:

- Canadian leadership in advancing EDI in research facilities
- A new generation of Highly Qualified Personnel (HQP) prepared to discover and innovate in a global economy
- Greater access to STEM skills and opportunities in Northern Ontario

Contents

SNOLAB | 2023–2029 Strategic Plan

Message from the Executive Director

The endless human quest to understand the universe drives scientists to continually seek new ways to push the frontiers of knowledge. At SNOLAB, we go deep underground to try to resolve some of the universe's most perplexing puzzles. We search for the mysterious dark matter that has been eluding scientists for nearly 100 years. We study neutrinos, the smallest particles in the universe. Our collaborations with scientists from around the world advance understanding of the nature and evolution of the universe and the foundational principles that underlie all of physics.

Over the last decade, SNOLAB has rapidly expanded from a single-experiment site to one of the world's top underground research laboratories and a major Canadian research facility. With many exciting opportunities and developments on the horizon, this is a critical time in our history. In this first year of my tenure as Executive Director, I am pleased to present our 2023-2029 strategic plan. Its guiding vision is for SNOLAB to become the world leader in underground science—further enhancing Canada's reputation in this growing area.

I truly believe we can fully realize this vision over the next six years. That is because our strategic plan leverages past investments and firmly builds on our strengths and achievements: world-class research, cutting-edge underground infrastructure and technologies, strong partnerships, and skilled people. It also supports our efforts to create a more equitable, diverse, and inclusive culture that welcomes the research community to SNOLAB.

We are extremely well-positioned to capitalize on current and emerging global opportunities in underground science and technology. In particular, we are ready to design, host, and support large-scale, next-generation particle physics experiments with the potential to make major breakthroughs in dark matter and neutrinos. I am also excited by the possibilities for advancing quantum technologies in our unique low-radiation environment.

At the very core of our ability to achieve our vision sits one vital asset: talented people. This includes our facility's dedicated and skilled staff as well as the diverse group of collaborators who work and train on experiments at SNOLAB.

An enormous thank you to everyone who contributed to this plan's development. I look forward to working with our partners, the national and international research communities, and all our collaborators around the world. Together, I know we can continue to push the frontiers of underground science. At the same time, we can inspire and train the next generation of scientists and innovators to whom we must eventually pass the torch.

Jodi Cooley,
Executive Director

Message from the Chair

On behalf of the SNOLAB Institute Board of Directors, I am delighted to endorse Reaching New Heights, Deep Underground, SNOLAB's strategic plan for 2023-2029. This plan describes and supports a bold vision for SNOLAB to become the leading international laboratory for deep underground science.

SNOLAB is ready to attract major international particle physics experiments that provide insight into the nature and evolution of the universe. These experiments, designed by teams of thousands of collaborating scientists, require capital investments of hundreds of millions of dollars. This new strategic plan will raise SNOLAB's scientific and operational excellence commensurate with these international ambitions. The plan will also enable the pursuit of emerging scientific opportunities in quantum technologies, nuclear security, and life sciences.

In 2020 the Board of Directors initiated the process leading to this strategic plan. A SNOLAB working group led the process, with an external advisory group of experts from the Canadian and international research communities providing guidance. Consultations included a community survey and an open session at the 2021 SNOLAB Future Projects Workshop. Plan development also benefitted from several long-range planning exercises taking place in both the Canadian and international particle physics communities. The final strategic plan was approved by the board in May 2023. The board thanks SNOLAB staff and stakeholders for their contributions.

This plan lays out three main goals for SNOLAB for the next six years and the strategies it will employ to achieve these goals. A more detailed implementation plan describes the actions and activities under each strategy. Together, these plans will ensure that SNOLAB continues to bolster Canada's reputation as an influential leader in deep underground science.

Kimberly Strong,
Chair - SNOLAB Institute Board of Directors

SNOLAB: Positioning Canada at the forefront of deep underground science and technology

SNOLAB, the deepest-cleanest underground research facility in the world, has made Canada a global leader in underground science, infrastructure, and expertise. Located two kilometres down, in the Vale Creighton mine near Sudbury, our facility uses the hard rocks of the Canadian Shield to protect experiments from the cosmic rays that constantly bombard the Earth's surface. The result is that SNOLAB's experimental spaces have the lowest cosmic radiation flux in the world and the least possible interference from environmental and solar radioactivity.

World-leading research in dark matter and neutrinos

This unique low-radiation environment enables SNOLAB's world-class astroparticle physics research program, which intersects the fields of particle physics, astronomy, and cosmology. We deliver large-scale, international experiments that explore priority questions about the particles and forces that have shaped the universe. What is the nature of dark matter? What kind of particle is the neutrino? Dark matter is made up of the invisible particles that form 85% of the universe and that scientists believe hold it together. Neutrinos are the universe's tiniest particles. The answers to these questions will help us better understand the evolution of the universe, the nature of matter and energy, and the foundational principles underlying all of physics.

Diversification of our research portfolio

Over the last decade, SNOLAB has evolved from a single-experiment site to an internationally recognized multi-experiment facility. The original Sudbury Neutrino Observatory (SNO) housed the successful solar neutrino experiment for which its director, Dr. Arthur B. McDonald, won the 2015 Nobel Prize in Physics. Our current science and technology portfolio includes experiments ranging in size and at various points in their lifecycle.

Our success in particle physics and unique low-radioactivity environment have attracted new experiments in life sciences and nuclear security to SNOLAB. For example, we are supporting the design and installation of a controlled incubation chamber with internal shielding to study the effects of low-radiation and underground environments on various biological systems. We are also involved in research and development of technologies to improve the sensitivity of radiation detection for monitoring nuclear accidents and explosions.

Expertise and training

Another competitive advantage that we offer is expert scientific, technical, and administrative support for our users and collaborators. SNOLAB is the only underground facility where all full-time staff are dedicated to performing and supporting research, from design to decommissioning. Our partner, Vale, maintains and provides access to the mine. This focus on expertise makes us an important training ground in Canada for highly qualified personnel (HQP) in underground science and technologies. From 2015 to 2022, the period of our last strategic plan, SNOLAB worked with around 3,300 HQP.

Global partner of choice

SNOLAB is the partner of choice for deep underground science nationally and internationally. Working together enables us to harness the expertise of academic, industry, and government partners and to focus resources on discoveries that can potentially create profound societal impacts. Our scientific program currently supports more than 1,000 annual academic users and collaborators, of which around 25% are Canadian researchers. Our international collaborators come from 24 countries and are based at 164 different institutions.

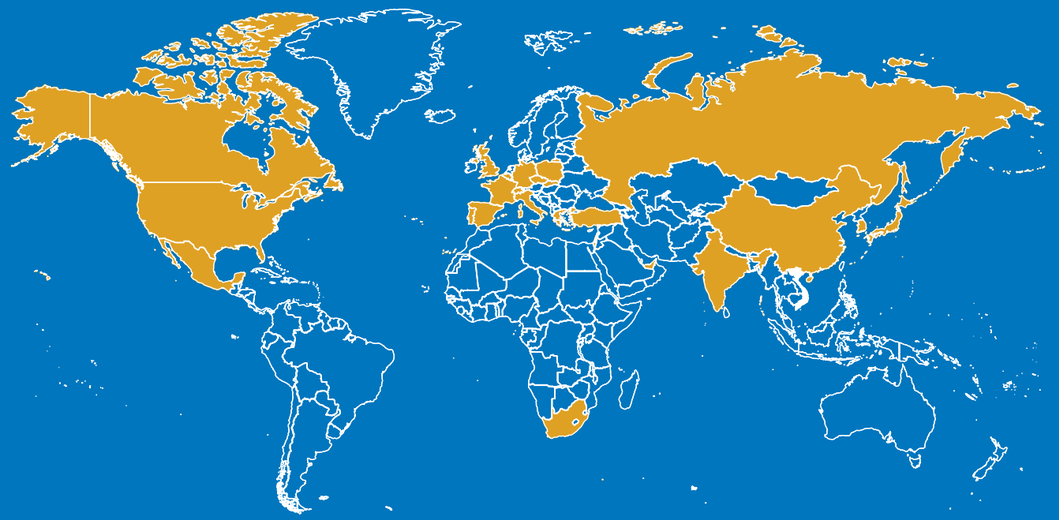
1000+
annual academic users/collaborators

25%
of those users/ collaborators are Canadian researchers

24
Our international collaborators come from 24 countries

164
Our international collaborators come from 164 institutions

- Participating Countries



SNOLAB's economic impact and value*

By attracting large-scale international experiments to Canada, and in particular to Sudbury, SNOLAB contributes to economic growth and social benefits for Canadians—at the national, provincial, and local level. This includes creating high-quality STEM jobs in Northern Ontario, drawing scientists and their families to the area, and sourcing custom manufacturing and fabricating requirements from local companies.

*Independent assessment carried out by KPMG, May 2023

2017-2022

$464M - In gross output to the Canadian economy
$270M - Contribution to Canada's GDP
$250M - Contribution to Ontario's GDP
$3.45 - Return on each dollar invested in SNOLAB
3,300 - Highly-qualified personnel have contributed to SNOLAB
12,000 - Individuals involved in our outreach programs

Poised for a greater role on the international stage

We are now ready to realize the next phase in our evolution. This is driven by the needs of our international community of collaborators to conduct larger, more sensitive experiments that require our unique capabilities. By successfully attracting and hosting the most advanced particle physics experiments, we will become the premier deep underground research facility in the world. This achievement will bolster Canada's scientific leadership and reputation. It will also reinforce SNOLAB's position as the partner of choice for underground research, catalyzing further discovery, innovation, and impact.

A diverse research program

Dark matter

The only evidence for dark matter is through its gravitational influence. Our underground experiments aim to catch rare interactions between dark matter and the detectors by controlling and removing all known sources of radiation.

Current experiments

DAMIC, DEAP-3600, NEWS-G, Oscura, PICO-40, PICO-500, SENSEI, and SuperCDMS

Neutrinos

Studying the properties of the neutrino provides insights into the dominance of matter over antimatter and the nature of radioactive decay. Our very large neutrino detectors are needed because interactions are very rare.

Current experiments

HALO, LEGEND-1000, nEXO, and SNO+

Nuclear monitoring

We measure low levels of industrial radioactivity using our existing capabilities for measuring natural radioactivity in the materials that make up our detectors.

Current experiments

Collaboration with Health Canada, led by Canadian Nuclear Safety Commission

Quantum computing

Our low-radiation environment is ideal for studying the performance of qubits, which are fundamental to quantum computing but easily disturbed. Ionizing radiation is a key component of the noise in today's best qubits.

Current experiments

Collaboration with Institute for Quantum Computing, University of Waterloo

Life sciences

We collaborate with researchers to study the impact of low-background environments on biological systems. Radiation can damage cells in large doses, but we need to better understand the effects of sub-background radiation.

Current experiments

REPAIR, FLAME

What drives us

Our vision

To be the leading international laboratory in deep underground science, hosting the world's most advanced experiments that provide insight into the nature of the universe.

Our mission

Enable world-class underground science
performed by national and international collaborative research teams, supporting projects from concept to completion.

Spearhead research and development
that maximizes the potential scientific and societal impact from underground projects.

Catalyze scientific collaboration
and knowledge exchange through workshops, local engagements, and professional outreach.

Promote innovation
through transfer of arising technologies.

Inspire the next generation
of scientists, innovators, and leaders through strong public and educational outreach, and formative training opportunities.

Our core values

Safety
This is the foundation upon which we realize our mission: we are committed, both individually and as a team, to protecting the health and safety of our staff, users, collaborators, and visitors.

Excellence
We are committed to making full use of and continual improvement to our skills and knowledge. Our focus is on delivering high-quality inspiring science through driving, supporting, and enabling excellence in research, operations, and community relations.

Teamwork
We are committed to the belief that each member brings unique experience and important expertise to the workplace, allowing project challenges to be resolved and creating a work environment that supports cooperation and collaboration in all aspects of work.

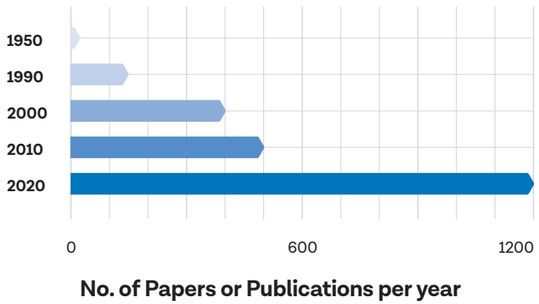
Accountability
We are committed to upholding an environment of trust, responsibility, and accountability to each other and to our external research communities, funding agencies, and public sponsors. We design our internal governance structures according to best practices and always respect these structures.

Diversity
We are committed to strengthening our team by embracing different perspectives. We strive to ensure our culture and work environment are fair and respectful and support the success of all. Creating a diverse and inclusive workplace will accelerate science, innovation, and discovery.

Seizing global opportunities in underground science

Over the last 30 years, interest in the untapped potential of underground science has accelerated. Activity and investment intensified in the 1990s with the SuperKamiokande (Japan) and Sudbury Neutrino Observatory (Canada) experiments. Since then, fundamental questions about the nature of dark matter and neutrinos have remained top priorities of the scientific agenda both in Canada and worldwide. Recent revolutions and advances in neutrino science, astrophysics, and cosmology have reframed how scientists study neutrinos and dark matter. Both these research areas require the development and use of experimental techniques in low-radiation environments deep underground, resulting in opportunities for SNOLAB and other underground facilities. The scientific literature in this area has exploded, from around 150 papers in 1990 to over 1000 in 2020.

Growth in Underground Science: Scientific Papers & Publications

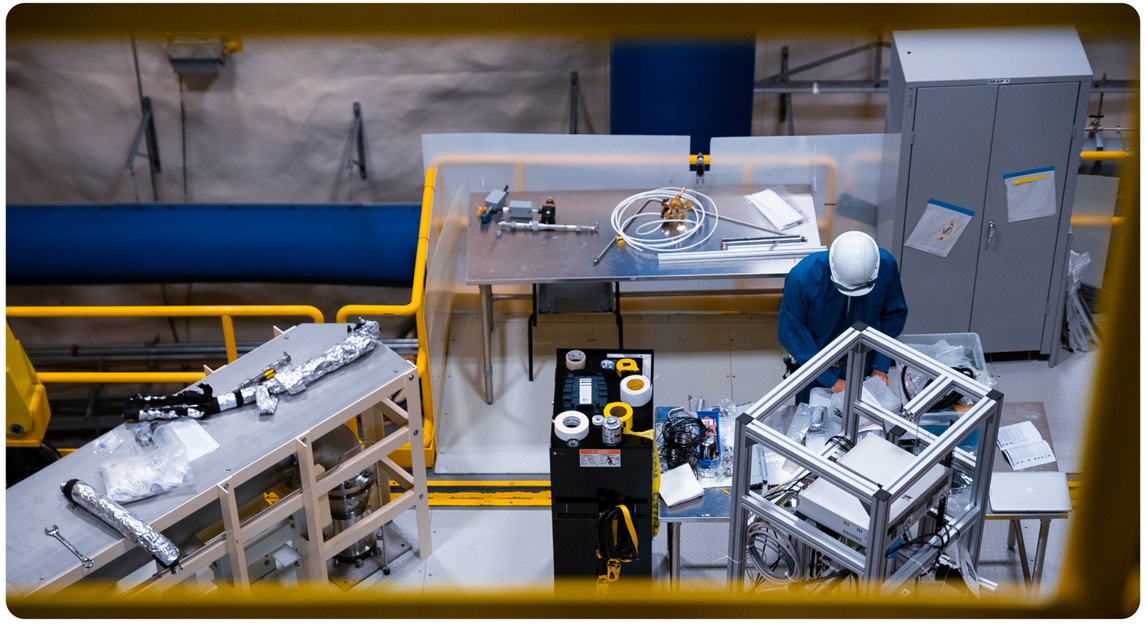


At this moment in time, the global subatomic physics community is firmly aligned on its research priorities: to better understand the nature of neutrinos and to discover the constituents of dark matter. Dark matter is an area ripe for discovery in the next decade while several breakthroughs are expected in neutrino physics over the next 10 to 20 years. Canada has helped shape these priorities through previous generations of experiments and participation in recent national and international long-range planning initiatives and updates for nuclear and particle physics, e.g., Canadian Subatomic Physics Long-Range Plan, the U.S. Community Study on the Future of Particle Physics, The European Strategy for Particle Physics, and Japan's Strategy for Future Projects in High Energy Physics.

Significant new opportunities on the horizon build on the success of the previous generation of underground experiments at SNOLAB and around the world. Some opportunities are for large-scale research experiments that require enormous low-radiation underground spaces and tremendous global cooperation and expertise to fund and build. These include developing and implementing third-generation dark matter experiments and tonne-scale next-generation neutrinoless double beta decay experiments (to further understand the nature of neutrinos). Previous generations of these experiments have proved the feasibility of their techniques, but more sensitivity to the neutrinoless double beta decay signals is required to complement the rapidly progressing astronomical observations. Other countries are already moving to support these future directions. The United States, for example, is allocating substantial research funding to move the neutrinoless double beta decay program forward through its planned LEGEND, nEXO, and CUPID experiments.

Quantum computing and technologies are an emerging priority and investment focus for many countries including Canada. Nascent research shows that background radiation will limit quantum devices. The low background environment at SNOLAB allows study of these devices without this type of environmental interference. These experiments, however, are much more modest in size than the next-generation neutrino and dark matter research. Additionally, quantum devices offer sensitivity to unexplored types of observations about nature. In fact, new quantum devices are already allowing scientists to probe the nature of dark matter in novel ways. This entangled research brings scientists together to collaborate on cutting-edge applied and fundamental science using a natural, multidisciplinary approach. Further research in low-radiation underground lab environments is part of enabling the rapid progress that society is demanding.

Canada, through SNOLAB, is already a world leader in underground science and infrastructure, with many Canadians leading the field. The recent explosion in interest and investment around the world, however, has intensified global competition. At the same time, it has created enormous opportunities for international collaboration. To keep Canada and Canadians at the forefront of global science, we must capitalize on these opportunities or risk being left behind.



Our plan

Our plan for 2023-2029 leverages past investments and builds on SNOLAB's strong record of achievements and recognized strengths. It also ideally positions us to capitalize on emerging global opportunities in deep underground science.

Our plan is underpinned by three core pillars:

Excellent science

Cutting-edge research infrastructure

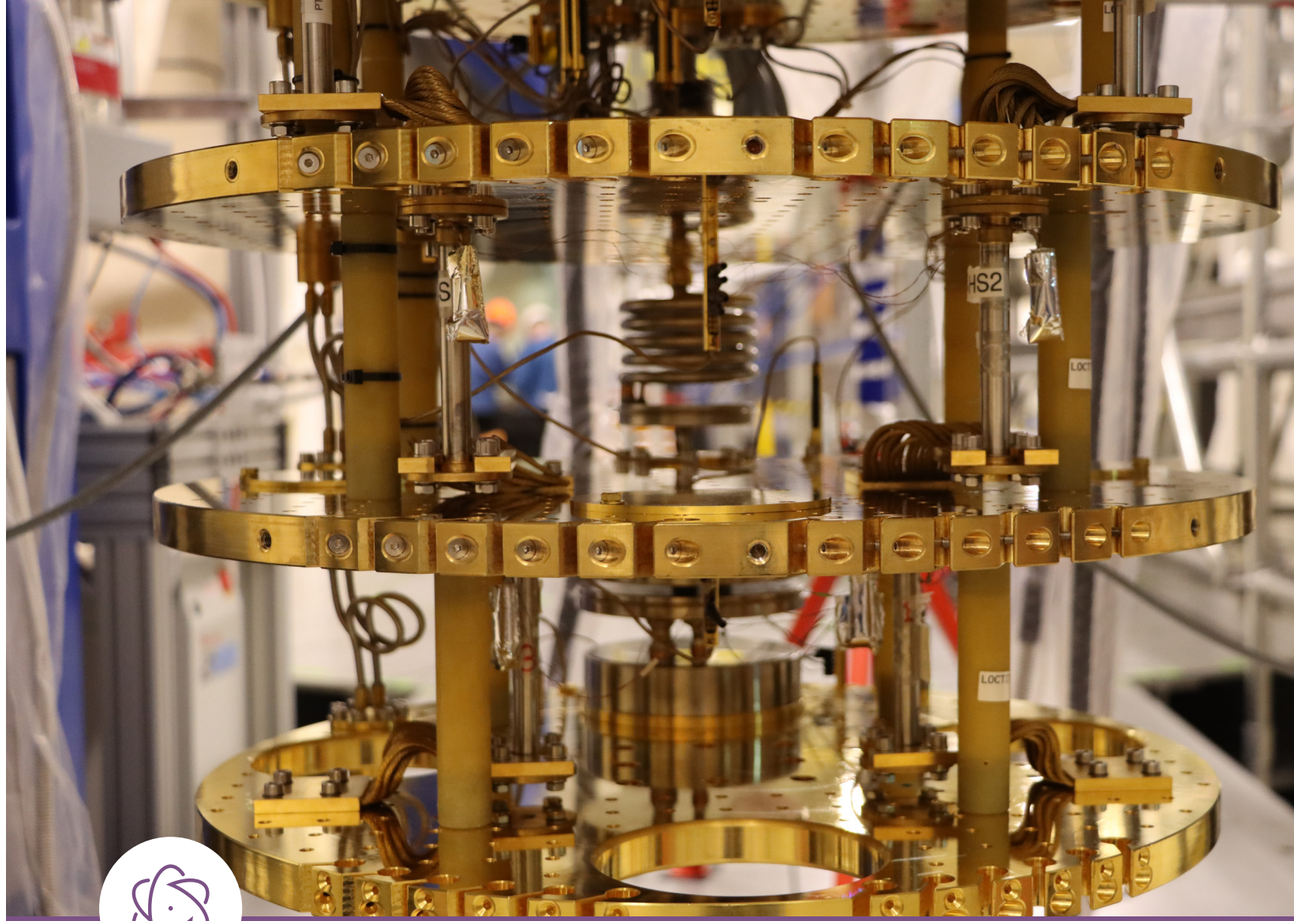
Skilled people

The dynamic interactions of these pillars will help us fulfill our vision to advance from our current position as a world leader in underground science to become the leading international laboratory. For each pillar, we have identified a goal along with a set of key strategies. The companion Implementation Plan describes the specific actions and activities we will undertake for each goal along with target outcomes.

We are at a pivotal point in SNOLAB's evolution. International demand for access to our unique environment and capabilities has grown substantially while our organization has evolved and matured to meet it. By hosting and enabling the world's most advanced underground experiments, we will bolster Canada's scientific reputation, attract new talent to our country and Northern Ontario, train more highly skilled people, provide more opportunities for Canadian researchers to take leadership roles in international projects, and generate further economic benefits for Canadians.

Our plan outlines how we will work closely and collaboratively with the scientific community to build on our scientific, technical, and operational progress and accomplishments. It also supports our efforts to create a more equitable, diverse, and inclusive culture that welcomes the community to SNOLAB.

This strategic plan is the result of consultations with staff and the Canadian and international research communities. It also benefitted from domestic and global long-range planning exercises in particle physics. We believe it is bold and achievable, enabling us to increase the value we deliver to Canada and Canadians.



Excellent science

Goal:

Drive breakthrough discoveries at the frontiers of underground science.

Expected outcomes:

- Cementing of Canada's leadership in deep underground science
- A stronger, more competitive Canada in scientific discovery
- More Canadian researchers positioned as global leaders

Canada has a strong global reputation for producing high-calibre discovery research, particularly in astroparticle and particle physics, which comprise around 95% of SNOLAB's scientific program. Most of the experiments we host in these fields are large-scale international projects involving a host of collaborators. They aim to illuminate new insights into the particles and forces that have shaped the universe. Discoveries in either dark matter or neutrinos could have dramatic impacts on fundamental understanding of the universe. Aligning our science priorities with both national and international planning activities enables us to attract the best scientists and opportunities to SNOLAB and prepares us for the future.

Our deep underground lab offers a unique environment for driving knowledge about manmade and natural sources of radiation in the environment. That makes it well-suited to experiments in emerging underground fields such as quantum computing, nuclear forensics, and life sciences. Canada's involvement in the rapidly growing quantum technology industry is expanding. Research and testing on superconducting quantum devices in SNOLAB's low-radiation environment will provide valuable insights to advance and operate the technology. Detection of very small levels of radioisotopes can provide crucial information about nuclear events. While we have begun exploring and hosting experiments in these areas, we have not tapped into the full potential of these opportunities.

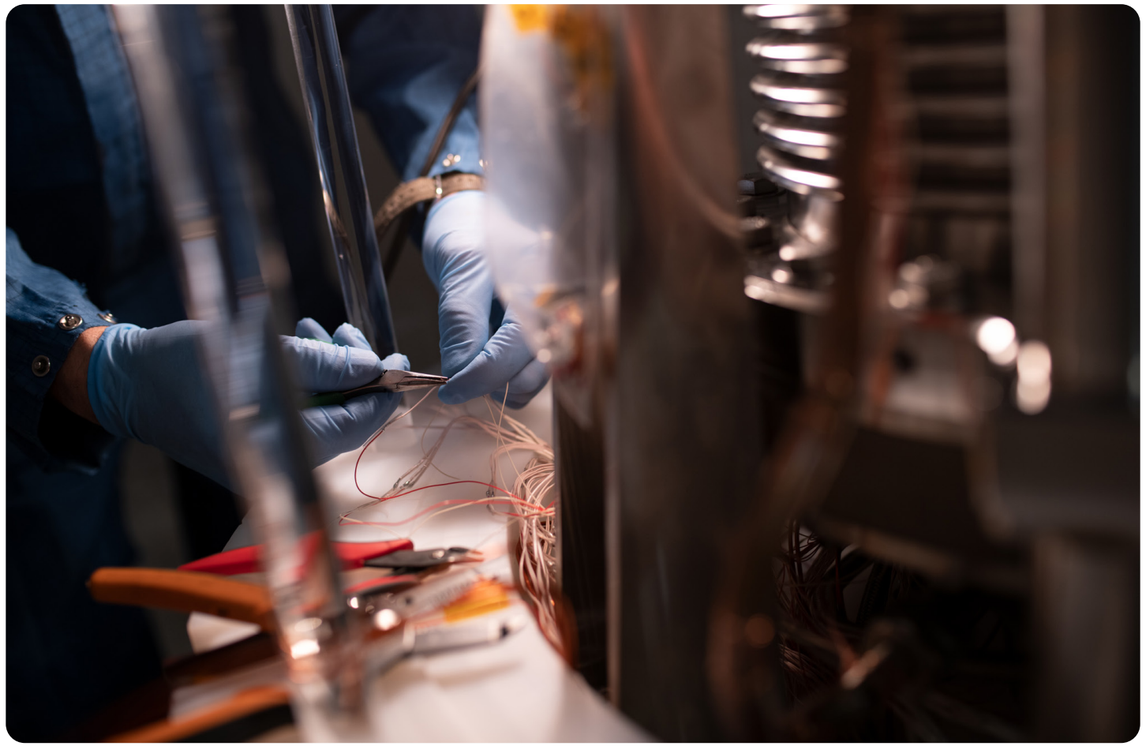
Enabling and delivering world-class international research projects across an increasingly diversified portfolio will accelerate progress, open new avenues of knowledge, and keep SNOLAB—and Canada—at the forefront of research excellence.

To achieve this goal, we will:

- **Increase understanding of the particles and forces that have shaped the universe.** We will sustain our world-class large-scale research efforts in neutrinos and galactic dark matter, the highest priority topics in global subatomic physics. This will enable us to deliver the most impactful underground science and enhance our global leadership. Successfully delivering on our current experiments will also help us attract at least one international next-generation experiment that requires greater sensitivity. For example, the U.S. Department of Energy is planning two multi-tonne experiments, LEGEND and nEXO, on a fundamental aspect of the nature of neutrinos. We are well-positioned to host and construct at least one of these neutrinoless double beta decay experiments.

- **Pursue new opportunities in emerging areas of underground science.** Diversifying our science portfolio represents an opportunity to expand our traditional user base, broadening the ideas, approaches, and impacts generated. We will attract and host projects in the life sciences, environmental monitoring and nuclear security, and quantum technology. Specifically, we will expand our current life sciences program that explores the impacts of low-radiation environments on biological systems, including on cellular mutation and repair processes, and on the impact of deep underground environments on metabolism. We will further develop our environmental monitoring capacity to enable projects that improve the sensitivity of radiation detection for monitoring nuclear accidents and explosions in support of nuclear non-proliferation. Finally, we will develop innovative test facilities for quantum computing that will enable significant performance improvements.

- **Become an intellectual hub that fosters collaboration and connection.** Diversity in ideas and people helps boost research excellence and drives new ways to frame or perform research. We will create an intellectual hub at SNOLAB that fosters unexpected and ground-breaking discoveries by enhancing the welcoming and supportive environment we have created for the diverse range of people who work on experiments. This includes domestic and international students, postdocs, professors, technicians, and engineers. For example, we will assign dedicated staff to help them navigate logistical and cultural aspects of their long-term stay; create a formal user support system that they can rely on; provide dedicated physical space to encourage collaboration and connection; and promote equity, diversity, and inclusivity.



Cutting-edge infrastructure

Goal:

Continuously improve our research infrastructure to remain state of the art.

Expected outcomes:

- Attraction of the most advanced international experiments to Canada
- Greater global impact and enhanced reputation of Canada's underground science infrastructure

World-class infrastructure is the foundation for the development of high-impact science and technology. It includes not only physical research facilities and equipment, but also the tools, processes, technologies, and operational and engineering expertise that support experiments. As Canada's only deep underground laboratory and a major science infrastructure, SNOLAB provides a unique facility with leading-edge expertise that continues to evolve to meet the changing scientific demands of top international researchers.

As we grow and diversify our research portfolio and the requirements for great depth and low radiological backgrounds become even more stringent for experiments, we must continuously evaluate, expand, and adapt our infrastructure capacity, supporting technologies, and business practices. Doing so will allow us to maintain operational excellence and safety standards.

To achieve this goal, we will:

- **Explore the full potential of cryogenics systems.** Most dark matter detection projects and studies of neutrino properties require operational excellence in cryogenics—the production and behaviour of materials at extremely low temperatures. Next-generation experiments will have even greater cryogenics requirements that must be maintained and operated for years without interruptions. To meet this challenge, we will work with the community to build upon our previous cryogenics successes for research and develop future infrastructure, operational capacity, and scientific, technical, and engineering expertise. This includes scaling up our underground production capacity for liquid nitrogen. Increased cryogenic capability and expertise will also support our plans to develop innovative testing facilities for quantum computing and technologies.
- **Innovate new technologies and tools for ultra-low background experiments.** The sensitivity of astroparticle physics experiments requires ultra-low background radiation levels. We will therefore expand our ultra-low radiogenic background program by developing innovative tools and techniques for screening materials intended for these environments. We will work with collaborators to apply these tools to building experiments and low radon gas systems, including radon measurement and mitigation capabilities. This enhanced capability also benefits other research topics, enabling us to increase our work in emerging applied areas such as environmental monitoring and nuclear security.
- **Continue upgrading our operational systems.** As a leader in automation of underground science infrastructure, we will continue to support and use new techniques and technologies to further improve the automation of experiments and remote operability. This includes underground industrial systems as well as advanced software techniques, such as artificial intelligence, to help us better understand system performance and predict maintenance requirements. We will also improve our information technology infrastructure including increasing the community's awareness of cybersecurity. To continue meeting the needs of the experiments we host, we will improve the reliability, quality and transparency of our power delivery infrastructure and upgrade our entire chiller system.

- **Deepen our focus on safety and sustainability.** The underground environment poses unique safety challenges. We will maintain our excellent safety record and standards by complying with Canadian and Ontario requirements and staying up to date with best practices in other laboratories around the world. As our research program expands, we will in tandem introduce relevant safety practices for staff and collaborators, for example, as we increase our cryogenics capability. In the face of climate change and evolving environmental regulations, we will make measurable, incremental changes to decrease wasteful processes, conserve energy, and reduce our carbon footprint. We will also provide more natural workspaces including outdoor collaboration spaces and added green space with native plants to provide natural sound and dust barriers.

- **Export our underground infrastructure expertise around the world.** As a global leader in underground science with a reputation for operational excellence, SNOLAB is well-positioned to export Canadian expertise and know-how in designing, building, and operating deep underground infrastructure. We will seek to increase our collaborations with new and existing laboratories that are aiming to capitalize on underground research opportunities in their countries. Through our network of relationships, we will keep abreast of emerging best practices and implement them at SNOLAB where appropriate.

Skilled people

Goal:

Foster and develop diverse talent in an inclusive environment.

Expected outcomes:

- Canadian leadership in advancing EDI in research facilities
- A new generation of HQP prepared to discover and innovate in a global economy
- Greater access to STEM skills and opportunities in Northern Ontario

People are at the heart of SNOLAB's success: our staff of researchers, technicians, engineers, and operations and corporate professionals who provide dedicated support to the experiments we host and the many collaborators who come to the facility to work on experiments. We know that world-class science and research excellence require contributions from diverse perspectives, skills, and experiences. And we are committed to creating a culture and work environment that is safe and respectful for everyone. In 2020 we formalized our commitment to equity, diversity, and inclusivity (EDI) by implementing an EDI Action Plan. While we have made significant and measurable progress, we know we have more to do. Our ambition is to be recognized as a world-leading laboratory in EDI best practices, setting an example for other laboratories.

Canada's economic prosperity and competitiveness depend on building and retaining a highly skilled workforce. SNOLAB contributes to Canada's talent pool by creating HQP. We attract talented graduate and undergraduate students, post-doctoral researchers, and technical professionals to Canada and Northern Ontario. And we provide them with a formative work experience as members of both small and large collaborative international teams, along with unique training opportunities in underground science and creative technical innovation.

We also help inspire the next generation of scientists and innovators through our public engagement and outreach activities. Communicating the excitement about the science at SNOLAB nurtures curiosity and scientific literacy as well as making us the go-to resource for underground science educational tools.

To achieve this goal, we will:

- **Embed equity, diversity, and inclusivity into everything we do.** We will continue working with staff and collaborators to create a welcoming culture where all voices are heard, and everyone has an equal opportunity to succeed. From hiring and professional development to physical spaces and governance, EDI will be a priority at SNOLAB. We will continue moving towards gender parity and significant representation of equity-deserving groups, both in our staff and Board of Directors. We will advertise jobs in spaces accessible to group members, making our job applicant pool more representative of Greater Sudbury. We will provide individualized training and mentoring to support the professional journeys of employees from these groups. The creation of multi-purpose wellness rooms will make our physical environment more inclusive. Finally, a new EDI Commission reporting directly to the Executive Director will keep us accountable by monitoring progress and advising how to remove remaining barriers to inclusion.

- **Increase professional development and training opportunities.** We will enhance training opportunities for staff and continue to support professional development as a key element of our benefits package and staff development plan. Specifically, we will formalize, improve, and promote our successful engineer-in-training and skilled trade apprentice programs. As we advance emerging areas of underground science, we will provide opportunities for staff to develop relevant skills. Researchers and students will benefit from science communication training. We will also expand students' training beyond their research area to all dimensions of the science performed at SNOLAB. We will continue to collaborate with institutional partners to provide accessible education and outreach opportunities for students. This includes delivering summer schools, e.g., for international graduate students with TRIUMF and the Perimeter Institute; for undergraduates, in experimental physics, with the McDonald Institute.

- **Focus public engagement efforts on K-12 students.** To get elementary and high school students excited about underground science and keen to learn STEM skills, we will intensify efforts to partner with school teachers and Science North (Northern Ontario's science museum). We will work with the Ontario Association of Physics Teachers to develop educational resources for K-12 classrooms. A new "SNOLAB Network of Teachers" will empower educators to integrate SNOLAB science into the curriculum. Building on a successful initiative in Italy, we will advance a new outreach program using a series of Cosmic Ray Cubes (CRCs) that detect muons arriving on the Earth's surface. We will integrate these CRCs into classroom resources and seek a partnership with Science North to develop an interactive public exhibit. Through the Interactions Collaboration for particle physics labs, we will continue our leadership in organizing international events, such as the annual International Dark Matter Day.

SNOLAB Board of Directors

Kimberly Strong
Chair,
University of Toronto

Aksel Hallin
Vice-Chair,
University of Alberta

Ellie Brümmer
Vale Base Metals

Tom Corr
AI Partnerships Corporation

Sandra Crocker
Carleton University

Robert Dunlop

Tammy Eger
Laurentian University

Julie Moskalyk
Science North

Nancy Ross
Queen's University

Luc Stafford
Université de Montréal

Kim Sturgess
WaterSMART Solutions Ltd.

Robert Svoboda
UC Davis


SNOLAB