QUANTUM SCIENCE ACROSS CANADA IN 2025

By **THE CAP INTERNATIONAL YEAR OF QUANTUM SCIENCE AND TECHNOLOGY TASK FORCE***

In February 2025, the United Nations Educational, Scientific and Cultural Organization (UNESCO) officially declared 2025 as the International Year of Quantum Science and Technology (IYQ), recognizing 100 years since the development of quantum mechanics. The mission of IYQ was to broaden public understanding of quantum science and technology, including its impact on our lives today and potential for the future. Celebrations and activities were held across Canada to mark this moment, a small number of which are captured in this article.

YEAR OF QUANTUM OPENING CEREMONIES

The Canadian delegation to the opening ceremonies of IYQ at UNESCO Headquarters in Paris, France. 2025 February 4. *(Photo source: Angela Olano)*

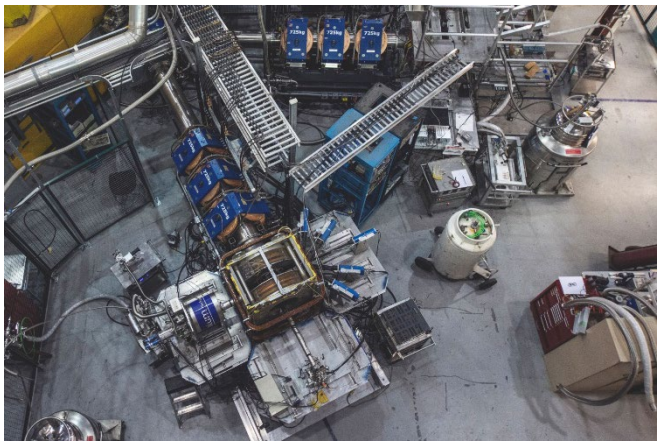
In February, University of Guelph Professor Martin Williams, then President of the CAP, represented the CAP at the official launch of the International Year of Quantum Science and Technology at UNESCO headquarters in Paris [1]. A delegation of over 20 representatives from Canada's quantum community were in attendance. Diplomats, academic representatives, and even students took part in various panels and conferences during the two-day celebration, including three Canadians on-stage to discuss education, ethics, and the frontiers of quantum research. A main takeaway was that quantum technology must be developed with a view to its potentially far-reaching societal impact.

The International Year of Quantum Science and Technology opening ceremonies at UNESCO headquarters in Paris were held February 4th and 5th and featured lectures from Nobel laureates and expert panels. Dr. Stephanie Simmons from Simon Fraser University (SFU) and founder of Photonic Inc. spoke on *Pushing the Frontiers of Quantum Science and Technology*. Dr. John Donohue from the Institute for Quantum Computing at the University of Waterloo (UWaterloo) participated in a discussion on *Public Engagement and Education in Quantum Science and Technology*. Dr. Shohini Ghose of Wilfrid Laurier University and the Quantum Algorithms Institute (QAI) enlivened a panel on the *Ethics of Quantum Technology*. *(Photo source: © UNESCO/Marie ETCHEGOYEN.)*

BUILDING QUANTUM INFRASTRUCTURE ACROSS CANADA

On June 17 in Kananaskis, the Leaders of the G7, including Prime Minister Mark Carney, formally recognized a common vision to collaborate and support quantum technologies [2]. Investments in the infrastructure to research quantum technology in many locations across Canada are essential to realize this global vision.

Research students Ayesha Iqbal and Yusuf Ahmed install qubits inside the CUTE (Cryogenic Underground Test facility) cleanroom at SNOLAB. CUTE is being used to host a new collaboration between researchers from the Institute for Quantum Computing (IQC) at the University of Waterloo, Chalmers University of Technology in Sweden, and SNOLAB to test the effects of ionizing radiation on superconducting qubits 2 kilometres underground at the SNOLAB deep underground laboratory.
(Photo source: Mike Whitebouse, SNOLAB)



The M20 beamline at TRIUMF, housing the LAMPF and Omni-Prime spectrometers. As an international user facility, TRIUMF enables researchers worldwide to study quantum and functional materials using muon spin spectroscopy (μSR), where the precession and relaxation of implanted muon spins reveal static and dynamic properties of the local magnetic environment. *(Photo source: TRIUMF)*

On March 21, 2025, the University of Calgary officially opened Quantum City's qHub, a 17,400 sq. ft. collaborative space designed to connect research, development and adoption of quantum technologies and solutions implementation. Located in the Alastair Ross Technology Centre (ARTC) within the University Innovation Quarter (UIQ), qHub is a key step in building Alberta's quantum-enabling infrastructure within the growing ecosystem by bringing together experts, industry partners and emerging quantum talent. *(Photo source: University of Calgary)*

STUDENT QUANTUM OPPORTUNITIES

At the UBC Quantum Club's 2025 Career Fair, students, researchers, and professionals explored career pathways in quantum science and technology, including an Academia vs. Industry panel highlighting the differences and similarities between pursuing academic research and building careers in quantum-focused companies. *(Photo source: QAI)*

The 17th annual Undergraduate School for Experimental Quantum Information Processing (USEQIP), including a lab in the nanofabrication facility, was held in May for 25 undergrads at the University of Waterloo. *(Photo source: Fiona Thompson and Michael Grabowecky, Institute for Quantum Computing, UWaterloo)*

This summer, UToronto graduate students Byung Ha, Max Bridgewater, and Nicholas Sullivan organized Quantum Research Day 2025, a student-led conference featuring student talks, posters, and a panel with speakers from academia, industry, and research institutes discussing career pathways in quantum information and control. *(Photo source: Eva Cheung, University of Toronto)*

Première édition de l'École d'été en informatique quantique de l'Institut quantique de l'Université de Sherbrooke pour le premier cycle universitaire. 29 personnes participantes issues d'universités canadiennes se sont rassemblées à Sherbrooke du 5 au 9 mai 2025. *(Source de la photo : Martin Blache, Université de Sherbrooke)*

OPEN DOORS ACROSS CANADA

On May 3rd, institutions at 11 locations across Canada opened their doors to visitors to explore quantum science and technology as part of the CAP's Quantum Open Doors initiative.

Polarization Art was a fantastically engaging activity at both our STEAM school and our Saturday morning STEAM drop-in program for the local community. *(Photo source: Mary McDonald, Ampere Makerspace, Lindsay, ON)*

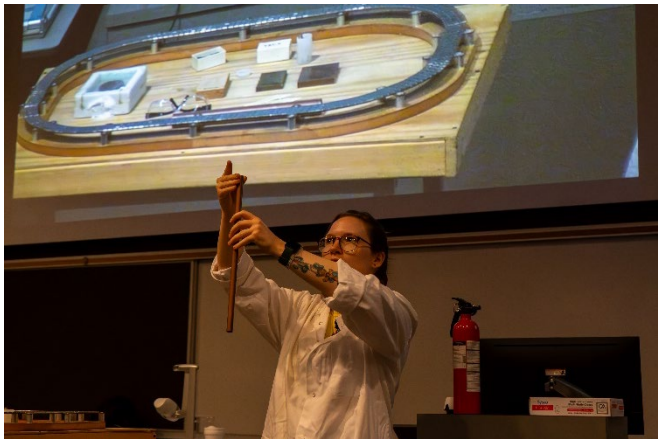
Visitors to the qUNB Quantum Open Doors were treated to hands-on demonstrations with Stern-Gerlach simulations, quantum dots, probability experiments and a personal tour of the QSUM Quantum Sensing research laboratory. *(Photo source: Ben Newling, University of New Brunswick)*

The Physics Department at Simon Fraser University (SFU) celebrated with two public lectures including high voltage experiments and the quantum internet, hands-on activities on quantum key distribution (see picture), quantum communication in space, lab tours and quantum memes. *(Photo source: Daria Ahrensmeier, SFU)*

Jaimie Greasley from the University of Victoria (UVic) talks to interested community members at the Royal BC Museum about the International Year of Quantum while Eliza Partridge, Dominic Largoza, and Aaron Dayton helped run a booth at the International Astronomy Day. *(Photo source: Thomas E. Baker, UVic)*

More from the University of Victoria and Let's Talk Science at the Royal BC Museum, hosted by the Royal Astronomical Society of Canada with support from the CAP.

QUANTUM FOR YOUNG STUDENTS



UBC Geering Up Engineering Outreach and the Stewart Blusson Quantum Matter Institute collaborated to bring live superconducting demonstrations to students in the weekly Science Show at summer camp. *(Photo source: David Yoon, UBC Geering Up Engineering Outreach)*

The "Quantum Hacking a Better Future" summer camp was held at Dalhousie University in the summer of 2025. The camp was geared toward high-school students in NS and included a visit to the Ultrafast Quantum Control Lab. *(Photo source: Scott Wesley, Dalhousie University)*

As part of the NSERC Chairs for Inclusion in Science and Engineering program, a series of talks were hosted remotely for students in remote and rural schools in Atlantic Canada. Speakers included Melissa Valdez, who talked about career opportunities in the quantum field. *(Photo source: Svetlana Barkanova, Memorial University and Chitra Rangan, UWindsor)*

Quantum-mania indeed! School-aged children learned about quantum bits and polarization in a workshop at the University of Windsor (UWindsor) co-hosted by the Institute of Quantum Computing and the Canadian Association for Girls in Science (CAGIS). *(Photo source: Chitra Rangan, UWindsor)*

High-school students generate quantum-secure keys at the Quantum School for Young Students (QSYS) at UWaterloo.

Students in Newfoundland playing quantum games on the Quantum Arcade, built by UBC Geering Up.

QUANTUM CONFERENCES ACROSS CANADA

The Manitoba Materials Conference centered around material science that invites students, academic researchers and industry users in the local and prairie region to enjoy the day of learning, sharing knowledge and collaboration. *(Photo source: Manitoba Institute for Materials)*

Dr. Jasneet Kaur from Brock University presents her group's recent work on 2D materials based solid-state electrolytes for clean energy applications at 14th Nano Ontario conference held at Toronto Metropolitan University. On the right, you can see the accordion-like structure of titanium carbide MXene, being studied for applications in clean energy and sensing. *(Photo source: Jasneet Kaur and Pritish Kumar Behura, Brock University)*

The QSTATE symposium at the 2025 CAP Congress saw the first public demonstration of a Quantum Key Distribution outreach experiment built by the Quantum Photonics Lab at SFU, with prior work at IQC in Waterloo. Participants took the roles of Alice and Bob to send and receive qubits. The photo shows Wilson Wu and Thomas Jennewein, SFU. *(Photo source: CAP)*

Workshop on Programmable Quantum Simulators based on 2D Materials (PQS2D) & Quantum Theory of Materials, Nanostructures and Devices (QTMND), University of Ottawa.

The Quantum Horizons Symposium, co-hosted by the U. Alberta, U. Calgary, and U. Lethbridge and hosted at the Banff Centre for Arts and Creativity.

Julien Chosson of IBM Quantum gave a keynote lecture at the second annual Windsor Quantum Applications Symposium (WiQAS.org) in July. *(Photo source: Chitra Rangan, UWindsor)*

MORE QUANTUM CONFERENCES

Centre for Quantum Information and Quantum Control (CQIQC) director Dvira Segal welcoming attendees to UToronto for the Quantum Days conference organized by Deep Tech Canada, focused on building and strengthening the Canadian quantum community. *(Photo source: Deep Tech Canada)*

The inaugural Satellite Series of Quantum Days took place in June at the University of Saskatchewan (USask). During the DQI Entanglement Social, Graeme Dyck (left) display Quantum Gates, an interactive demonstration where participants build quantum circuits with sound. *(Jae Kim Photography c/o Steven Rayan, quanTA, USask)*

In June, Quantum Industry Canada, with partner Distriq, hosted QUANTUM NOW | ICI QUANTIQUE — an executive forum on the quantum economy in Montreal, where over 375 decision-makers explored what many see as the most significant technological shift since the digital revolution. *(Photo source: Angela Olano, Quantum Industry Canada)*

This summer, faculty and students from the University of Toronto and the University of Waterloo met for a CQIQC–IQC Workshop, aimed at strengthening ties between Toronto and Waterloo's quantum ecosystems. *(Photo source: Anna Dyring, CQIQC, UToronto)*

The conference, "Year of Quantum Across Canada: From Fundamental Science to Applications", jointly hosted by the Perimeter Institute for Theoretical Physics (PI) (left) and the Institute for Quantum Computing (right) and, celebrated 100 years of quantum science and technology. *(Photo sources: PI and IQC)*

BUILDING THE CANADIAN QUANTUM COMMUNITY

During a fierce Saskatoon snowstorm on the evening of January 31, the Centre for Quantum Topology and Its Applications (quanTA) kicked off its celebration of all things quantum with a reading of Michael Frayn's Copenhagen featuring Elizabeth Nepjuk, Skye Brandon, and Kris Bratton. *(Photo source: Steven Rayan, quanTA Centre, USask)*

Les 14 et 15 mai derniers, l'Institut quantique a souligné les 10 ans de l'obtention de la subvention Apogée Canada — un moment fondateur qui a permis de bâtir un institut de recherche de calibre international. Pour souligner cette étape marquante, l'IQ a réuni sa communauté et ses partenaires dans un moment fort de célébration. *(Source de la photo: Institut quantique de l'Université de Sherbrooke)*

QAI's Vancouver Quantum Mixer brought together BC's quantum community for networking, collaboration, and to commemorate UBC Geering Up's 5th anniversary in advancing STEM and quantum education. *(Photo source: QAI)*

"A Quantum of Hope" had its debut performance by Perimeter alumni and researchers. The play provides insight into researchers and their lively scientific debates by putting quantum science and technology on stage. *(Photo source: PI)*

Jaimie Greasley presents on quantum computing to at the Vancouver Island Star Party in August. *(Photo source: UVic)*

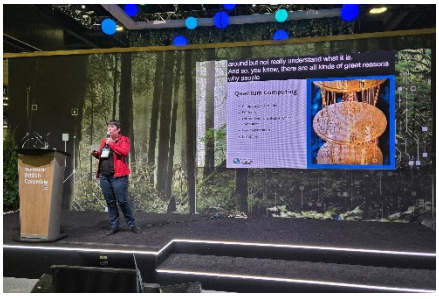
A teacher tests quantum dots using LEDs in a workshop with the Quantum Technology educat-ional resource. *(Photo source: PI)*

Physicists from UNB, UToronto, and UWaterloo introduced hundreds of young students to quantum science at the Canada-Wide Science Fair's IYQ booth co-hosted by CAP. Activities included the Quantum Cats arcade game, the Institut Quantique's Two-Qubit Dance, and demonstrations of interferometry and QKD. The photo shows Matthew Robbins, UToronto and Taylor Pacholko, UWaterloo.

The CNRS Science Mediation Ambassador for Quantum Physics, Dr. Charles Antoine from Sorbonne University, visited BC, Ontario, and New Brunswick on an outreach mission organized by the Institut français du Canada. He presented EquiQuanto (pictured in Moncton, NB), a live lecture paired with equestrian art exploring the fundamental mysteries of quantum mechanics.

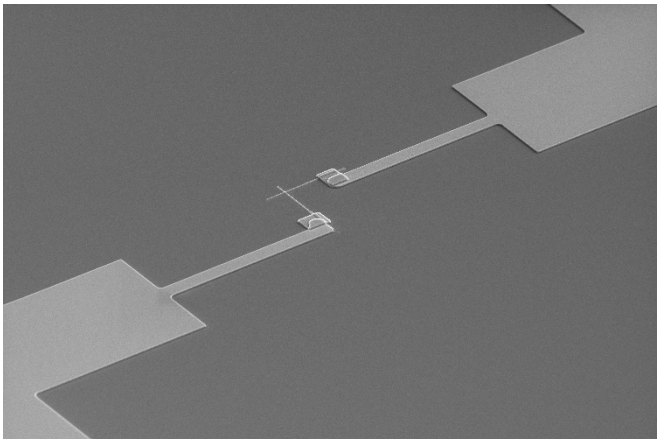
SFU, the Consulates of Switzerland and France, Mitacs and GESDA organized "Creating the Quantum Future" in Vancouver. Participants engaged in Quantum Diplomacy, exploring the societal, ethical, and governance aspects of quantum technologies. *(Photo source: Consulate General of France, Vancouver)*

Quantum Meets Poetry at the University of Windsor. Organized by the Science Meets Art group and the English Undergraduate Students Association, the event featured readings of original poetry by students, and an interpretive dance to the poem 'A Quantum Love Story' by Ann Druyan. *(Photo source: Chitra Rangan, UWindsor)*



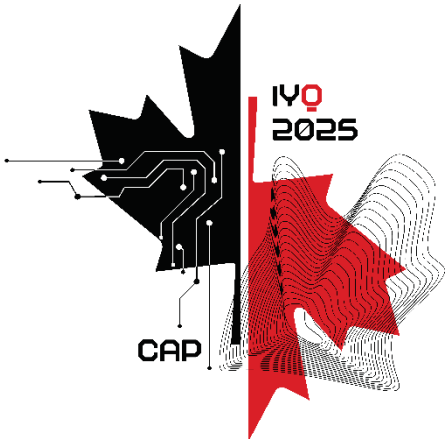
The Web Summit 2025 featured a keynote talk by Quantum Algorithms Institute (QAI) CEO Louise Turner and a panel on Quantum & AI organized by QAI, SFU VentureLabs, and Mitacs, connecting startups, enterprises, researchers, and policymakers. *(Photo source: QAI)*

EVEN MORE QUANTUM IN CANADA



Intitulée «Quantum Bridge: Where Election Dance», cette photo s'est vue attribuée la première place de la catégorie «Beyond our eyes» du concours de photos de la International Union of Pure and Applied Physics (IUPAP). La photo fut captée par un microscope électronique à balayage et montre une jonction Josephson, une structure délicate au coeur d'un qubit supraconducteur. *(Photo source: Alexandra Roy, Institut quantique, U. Sherbrooke)*

Kerr-instability amplification is a nonlinear optical process extending four-wave mixing to extreme intensities, where two pump photons are destroyed to create seed and idler. Conservation of energy and momentum dictate non-collinear intensity-dependent phase matching. As amplification saturates, cascaded mixing leads to higher-order beams spanning from the infrared to the ultraviolet. *(Photo source: Nathan Drouillard and T.J. Hammond, UWindsor)*



The CAP logo for IYQ was designed by Jasmine Zhang, a PhD student at UBC. Their design represents a superposition of quantum-driven technological advancements and the fundamental physics underlying the natural world. The orientation of the two halves of the Canadian maple leaf is a nod to the familiar orthonormal basis for the spin-1⁄2 particle.

The Quantum Photonic Devices Lab members and Waterloo Warrior hit the ice to welcome a quantum dot single-photon source from Berlin in their Waterloo lab as part of QuanTour. The source had previously been tested at labs across Europe and next went to NRC in Ottawa. *(Photo source: Michael Reimer, IQC, UWaterloo)*

ACKNOWLEDGEMENTS

The CAP IYQ Task Force are grateful for support from NSERC through the Special Opportunities Fund SOF-601917-2024. We are also grateful for financial support from SNOLAB, TRIUMF, the Perimeter Institute for Theoretical Physics, the Quantum Algorithms Institute, and the Institute for Quantum Computing. The events celebrated in this yearbook took place on the traditional and unceded territories of diverse Indigenous peoples (First Nations, Inuit, and Métis) across what is now known as Canada (Turtle Island). We are grateful to celebrate quantum science and technology across these lands.

REFERENCES

* The CAP International Year of Quantum Science and Technology Task Force consisted of over 30 representatives from across Canada and was chaired by Daria Ahrensmeier (Simon Fraser University) and Oliver Stelzer (TRIUMF). For more details and a complete list of members, visit the CAP IYQ website.

1. UNESCO IYQ 2025 Opening Ceremony. 2025 February 3. https://quantum2025.org/iyq-event/iyq-2025-opening-ceremony
2. Kananaskis Common Vision for the Future of Quantum Technologies. 2025 June 17. https://g7.canada.ca/en/news-and-media/news/kananaskis-common-vision-for-the-future-of-quantum-technologies/