Photo: TRIUMF / CC BY-NC-SA 2.0

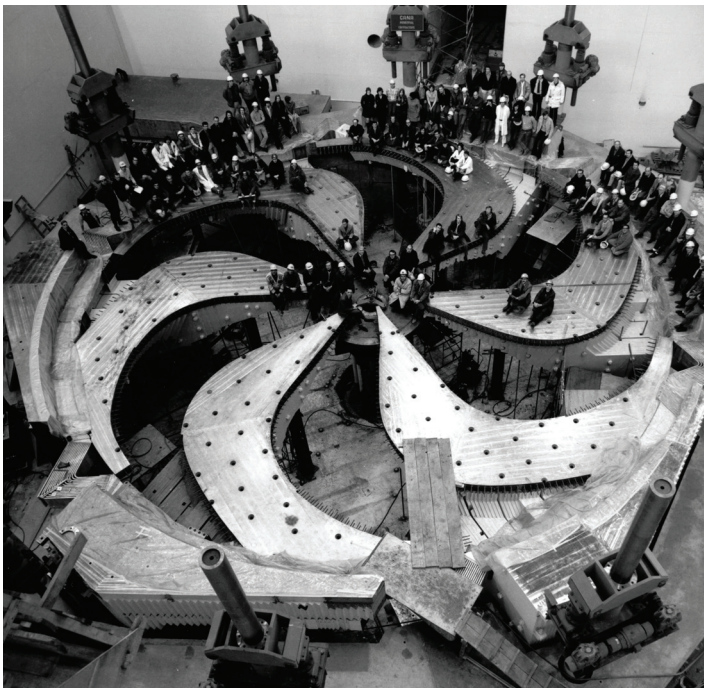

Photo: TRIUMF

Triumph of a dream

The Canadian research centre, TRIUMF, is now 50 years old, and seeks new challenges in dealing with Big Data

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Top left:
Prime Minister Justin Trudeau pays TRIUMF research institute a visit in celebration of its 50th birthday.

Top right:
Members of TRIUMF community pose on lower six sectors of the cyclotron magnet during construction.

The campus of the University of British Columbia is located on a picturesque peninsula on the western part of Vancouver. Since 50 years ago, three universities have had a dream here: Simon Fraser University, University of British Columbia and University of Victoria joined in 1968 to build the world's largest cyclotron accelerator. The goal of the facility, doing research on mesons, is still reflected in the name of the centre, i.e., TRIUMF, which is an acronym for Tri University Meson Facility [1]. Today 20 universities are participating as the members or associated partners of TRIUMF and research is ongoing based on this goal, which includes investigating nuclear and particle physics, nuclear medicine as well as materials science and biosciences.

The heart of the facility is a 520 MeV cyclotron. The accelerator, being still the largest of its kind in the world with an 18 meter diameter magnet, makes four beam lines of protons available at the same time. Using this, the experiments with different secondary radiations such as Neutrons, Pions and Muons take place in parallel. Especially using the ISOL method developed at the end of the 1980s, many radioactive isotopes are produced. Using these, many nuclear reactions can be investigated that play important roles for synthesis of elements and formation of stars. In addition, the decaying characteristics of unstable isotopes offer the possibility of performing high precision tests for the standard model [of particle physics].

Since its beginning, German universities and research institutes kept a close relationship with TRIUMF, not least in order to experiment at the world-renowned unique facilities as external users, and benefit from the developments there. At the same time, the research centre attracts high calibre talent from Germany to the west coast of Canada. For example, Jens Dilling has worked there for 17 years as the associate director of the institute and leads the division of natural sciences: "Doing research with top-notch scientists from all over the world brings new inspiration every day here." He became familiar with the experimental facilities of TRIUMF during his thesis research and after completing his postdoctoral in Heidelberg he moved to Canada permanently.

The most recent example of German-Canadian collaboration is the agreement to process a large amount of data (Big Data) using machine learning, as well as doing research on future quantum computers. On the German side, Jülich Research Centre and DESY are collaborating as the members of Helmholtz Association, and besides TRIUMF, Canadian companies such as D-Wave Systems Inc. and 1QBit work together with TRIUMF Innovations. "An early start researching the scientific applications of this field establishes totally new pillars for

TRIUMF," says Dilling. "That helps us to push the forefronts of science for another 50 years together with Canadian and international partners."[1]

To celebrate the laboratory's birthday, different events are happening round the year [2]. Recently there was a visit by dignitaries. Anja Karliczek, the federal research minister [of Germany] found the jubilee a reason to visit TRIUMF in order to learn about Canadian-German collaborations as part of her first non-European visit. The Canadian Prime Minister, Justin Trudeau, visited the research institute at the beginning of November [November 2018] and pledged a gift: to finance founding the Institute for Advanced Isotopes wherein the production of future radio pharmaceuticals for cancer therapy and urgent production of 99m Tc isotope for medical imaging will take place.

Trudeau also showed delight in receiving a special present: the TRIUMF director, Jonathan A. Bagger, presented him a framed picture showing Trudeau's father, Pierre, during the opening ceremony of the cyclotron in February 1976. During the ceremony, Pierre Trudeau, the then Canadian prime minister, said these frequently quoted words: "I don't know really what a Cyclotron is but I am very glad that there is one in Canada." ■

References

[1] www.triumf.ca
[2] www.triumf50.com

N.Ed.: The contributions of TRIUMF to many branches of science have been recognized through an IEEE Milestone. Dedicated in December 2010, the Milestone plaque notes the first 500 MeV proton beam was extracted from the facility in November 1974. Revolutionary computer-related technologies were needed to achieve its design.

IEEE Vancouver Section prepared the Milestone nomination, led by Prof. Dave Michelson of UBC. See https://ethw.org/Milestones:First_500_MeV_Proton_Beam_from_the_TRIUMF_Cyclotron,_1974

[1] Translator's note:

An example of these partnerships is the ALPHA-g detector built by TRIUMF and shipped to CERN in Switzerland last July.

This sensitive detector is built to see if antimatter (anti-hydrogen atom) defies gravity and moves up instead of falling when released from a magnetic trap. ALPHA team tries to shed light on the process through which all the antimatter produced from the Big Bang was eliminated from the universe, and all that is left for us to see is matter. It's believed equal amounts of matter and antimatter were initially created.

For a more detailed account of this intriguing experiment, see *IEEE Spectrum*, "New ALPHA-g Detector Poised to Search for Signs of Antigravity," by Michelle Hampson.

Since publication of the above, the ALPHA team successfully completed a test run before CERN shut down for maintenance and upgrading. The soonest the actual experiment will be conducted will be early/mid 2021 when anti-hydrogen will again be available.

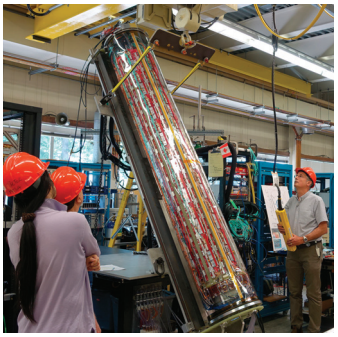

Photo: Stu Shepherd/TRIUMF

Scientists at TRIUMF position the ALPHA-g detector in preparation for testing. The instrument was shipped last July to CERN, which is the only facility that can produce antimatter in sufficient quantity for the experiment.