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No charge, but plenty of value

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For an electrically neutral sub-atomic particle that seldom enjoys the limelight of physics, the neutron has been very good to Canada.

Since the 1970s, neutrons have been essential to the nuclear fission process that helps generate some 60 percent of Ontario's electricity. They also enabled physicist Bertram Brockhouse to earn a Nobel prize in 1994, for his pioneering work on using these particles to look through materials that were impervious to any kind of imaging. This technique continues to play a significant commercial role in the testing of critical industrial components, such as finding hidden cracks in turbine fan blades that could lead to a mid-air disaster. Canada also used neutrons to become one of the world's leading producers of medical isotopes, short-lived radioactive compounds that are standard tools for tracking biological activity in our bodies.

Yet for all their scientific and technological value, neutrons — or, rather, directed beams of them — have become a lot harder to come by in Canada. The leading source had been National Research Universal (NRU), a nuclear reactor located in Chalk River, Ontario, about three hours west of Ottawa. For decades this site was a major destination for scientific research employing neutron scattering, as well as the atomic foundry for about half the global supply of a key medical isotope used in cancer screening. The permanent shutdown of this reactor in 2018, after 60 years in service, put an end to all this activity and made life more difficult for anyone who needs neutrons as part of their work.

Read more: Scientists raise alarm over future of neutron beam research capacity (https://researchmoneyinc.com/articles/scientists-raise-alarm-over-future-of-neutron-beam-research-capacity/)

Replacing the considerable capabilities of the NRU — constructed during the heyday of nuclear enthusiasm in the 1950s — has posed a daunting challenge for members of Canada's scientific community, who drafted a formal strategy (https://neutrons.ca/wp-content/uploads/2022/09/national-neutron-strategy-2022.pdf) for rebuilding this research capacity. Now these efforts are being driven by a newly incorporated not-for-profit body, Neutrons Canada (https://neutrons.ca/), made up of representatives from 15 universities across the country.

Led by McMaster University and University of Saskatchewan, which have some of Canada's most comprehensive research programs and curricula in nuclear science and engineering, this new organization is dedicated to finding and managing neutron beam infrastructure wherever it can be found. That includes making the most of the research reactor located on the McMaster campus, as well as promoting prospects for Canadian participation in multi-national neutron research ventures, such as the European Spallation Source (https://europeanspallationsource.se/) being established in Lund, Sweden.

"Researchers are already doing cutting-edge work in materials science, medicine, and energy using X-ray beamlines at our country's only synchrotron, the Canadian Light Source at the University of Saskatchewan," said that university's Vice-President of Research Baljit Singh in an announcement from Neutrons Canada. "Access to neutrons, which complement and add another dimension to their research, is essential to our province and to our global contributions as we continue to build capabilities in nuclear science, quantum science, and technology."

Singh's counterpart at McMaster, Karen Mossman, added that access to neutron beams is crucial to Canada's economic as well as scientific competitiveness. For decades, that access has been coordinated through the Canadian Institute for Neutron Scattering (http://cins.ca/), a voluntary agency with hundreds of members in a wide range of disciplines, within Canada as well as 22 other countries. According to current president Drew Marquardt, a physicist at the University of Windsor, that mandate complements the mission of Neutrons Canada.

"Access to neutrons is essential for our members' research addressing challenges such as making better batteries for storing clean energy for vehicles or the electricity grid, understanding and treating diseases such as cancer, and making discoveries for quantum technologies," he said. "We celebrate the creation of Neutrons Canada as a major step forward for our research fields."