Backgrounder: U.S.-Canada Cooperation in the Quantum Revolution

By Eric Miller

The world is at the dawn of a "revolution in quantum technologies" that will change economies, societies, and military affairs. Countries and private parties globally are investing heavily in efforts to develop quantum computers, quantum communications networks, quantum sensors and myriad other applications. These technologies draw on and apply quantum phenomena in nature to build powerful tools and systems.

Canada and the United States are both world leaders in the quantum field. This prized position was built over 20 years of patient investments in research and knowledge creation. Out of this work has grown many of the leading quantum companies globally. According to Pitchbook, in 2021, an estimated $1.7 billion in venture capital was invested in quantum technologies firms around the world. The majority of these companies were based in the United States and Canada.

From a Canadian perspective, quantum is an example of where its patient investments are paying off. Canada enters the era of the "revolution in quantum technologies" with at least 5 major internationally recognized research hubs built around universities. Out of these hubs have grown successful quantum companies. Vancouver-based D-Wave, one of the oldest and most successful quantum companies globally, just announced that it is going public. In addition, these quantum research hubs have forged linkages with large global technology companies. For example, IBM's Quantum Division has established a "Space" at the Université de Sherbrooke's Quantum Institute – one of a handful of such centers globally.

The United States accelerated its efforts on the quantum front in 2017 with the passage of the *National Quantum Initiative Act* (NQI). The NQI established an organizational structure around U.S. quantum investments both within the government and with researchers and companies around the country. The $1.2 billion in funding it provided has gone into major multi-stakeholder projects led by Department of Energy National Laboratories and university-based centers supported by the National Science Foundation. A whole series of related projects have been supported by the Department of Defense and others. U.S. firms are at the forefront of efforts to build a powerful, accurate quantum computer. Its researchers are developing the ideas and tools to build a National Quantum Internet by 2030. Quantum sensors are almost ready for deployment in defense operations. The NQI has also provided a policy foundation for assessing the ramifications of quantum technologies for the U.S. economy and national defense.

"Canada and the United States have much to gain by cooperating in the "revolution in quantum technologies."

While quantum technologies are expensive and complex to build, more than a dozen countries globally are investing at least half-a-billion dollars over the next few years in an effort to secure leadership in this space. Why? Because when quantum computers, communication networks and other tools reach maturity, they will vastly exceed the power and capabilities of existing "classical" technologies. Quantum tools open vast potential for advances in "precision chemistry", whether in drug development or batteries. They also seem set to render toothless existing computer security algorithms, such as RSA, which currently keep our computer operations secure.

Canada and the United States have much to gain by cooperating in the "revolution in quantum technologies." Canada is currently finalizing a National Quantum Strategy, which will undoubtedly provide guidance on working with international partners. The United States has signed quantum cooperation agreements with Japan, Britain, and Australia. By working together and building on existing strengths, the United States and Canada can ensure that the heart of the "quantum revolution" remains firmly rooted in North America.