

Key strategic issues facing Canada's research community

A submission to Advisory Panel for the Review of Federal Support for Fundamental Science

by the Board of Directors of the Canada Foundation for Innovation

Granting agency funding

It is clear that funding provided through the research granting agencies (CIHR, NSERC and SSHRC) has not kept pace with inflation and with the pressures associated with the growth in the post-secondary research system as measured, for example, by the number of full-time graduate students and post-doctoral fellows. The granting agencies are critical supporters of excellence in research and innovation in Canada. Despite stable growth in research capabilities and competitiveness from 2001 to 2006, a funding shortfall has emerged since then — one that threatens to compromise Canada's current and future research performance.

To maintain the capabilities, competitiveness and performance of the Canadian research community, we encourage the Government of Canada to consider re-establishing tri-agency funding to 2004-06 levels, taking into consideration the significant increase in the number of research faculty and full-time graduate students in the system, as well as the impact of inflation.

Research infrastructure support

State-of-the-art equipment and facilities are the foundation of a vibrant research and innovation ecosystem. Since 1997, the Government of Canada has mandated the CFI to advance national research excellence by investing in world-class research infrastructure in areas that matter to Canadians. Over 20 years, these infrastructure investments have supported cutting-edge research in all disciplines, allowing our best minds to contribute to better health outcomes, a cleaner, greener environment, evidence-based decision-making and the competitiveness of Canadian businesses.

The Government of Canada recognizes the importance of the link between the conduct of research and the necessity for state-of-the-art research infrastructure. However, the lack of predictability in CFI funding competitions, particularly for the Innovation Fund, limits the ability of institutions, their researchers, and other research and funding partners (especially provincial governments) to effectively plan ahead, act on strategic priority initiatives and seize opportunities at both the domestic and international levels. Accordingly, we strongly encourage the Government of Canada to provide a more predictable schedule of future funding

competitions for the Canadian research community by securing an annualized funding base for research infrastructure.

A progressive, inclusive governance model

The Government of Canada and Canada's research community benefit enormously from the CFI's modern, inclusive governance model. The model is well-suited to advance our country's research and innovation enterprise because it focuses on supporting the highest quality research and producing the widest range of benefits for Canadians.

The CFI is accountable to Canadians and reports directly to Parliament through the Minister of Innovation, Science and Economic Development. Made up of a decision-making Board of Directors and a Members' body representing the voice of Canadians, the CFI's bicameral structure ensures that funding decisions are made in the best interests of all Canadians.

Representing academia, government and the public and non-profit sectors, CFI Directors bring the knowledge and expertise necessary to fulfill their fiduciary responsibilities and provide strategic direction to CFI's activities. They also appoint the President and CEO of the organization.

The public interest is represented by the Members of the foundation — prominent Canadians with a deep understanding of research and its impact on society. In addition to approving the CFI's financial statements and annual report, Members are responsible for the appointment of 7 of the 13 Directors. The remaining 6 Directors are appointed by the Government of Canada through Orders in Council. This structure helps preserve the arm's length relationship between the CFI and government while ensuring that the interests of all parties are well represented in the decisions of the organization.

Given the outstanding performance of the CFI governance model over the past two decades, we firmly believe it should be maintained so the CFI can effectively continue to increase Canada's research capabilities and produce benefits for Canada.

Sustaining the operations of CFI-funded infrastructure

The CFI has long recognized the need to provide funding to support the operational cost of research infrastructure. The Infrastructure Operating Fund (IOF), launched in 2001, provides a one-time investment equal to 30 percent of the value of the CFI capital contribution for the initial operational costs of the funded research infrastructure. Within the CFI's 40:60 matching fund formula, this represents 12 percent of the value of the project, or roughly equal to one year of operation, which is typically estimated at approximately 15 percent of the capital investment.

The Government of Canada also recognizes the need to address the operational costs of national research facilities. In 2012, it directed the CFI to launch the Major Science Initiatives (MSI) Fund, financed at the rate of \$37.5 million per year over five years. The program was expanded in 2014 to \$45 million per year, and again in 2017 to \$80 million per year. By 2017,

the program will support the operation of 17 national facilities across the country. However, many regional facilities, and an even greater number of vital state-of-the-art core institutional facilities, are not funded under the MSI Fund.

At the same time, university leaders, particularly those from research intensive universities, have been advocating for an adjustment to the Research Support Program (formerly known as the Indirect Cost Program).

In an effort to address the financial pressures on universities, and now colleges, resulting from the important investments in research infrastructure, the Government of Canada may wish to consider complementing the current Research Support Program by expanding the CFI's Infrastructure Operating Fund to provide additional operational funding to institutions with the greatest needs. Proposed as the **Research Facilities Performance Fund**, this complementary investment would be distributed to all institutions based on the size of their portfolio of CFI-funded research infrastructure. While ensuring that no institution is left out, such a formula would reflect the relative needs and research intensity of institutions. We believe that establishing this fund would be an appropriate and positive way of addressing, in large part, the indirect cost dilemma of institutions and ensuring existing infrastructure continues to perform at world-class levels.

Flexibility in the model of the Major Science Initiatives Fund

The Government of Canada's investment in the MSI Fund has enabled highly strategic investments that capitalize on world-class expertise and niche resources to advance knowledge in cutting-edge national science facilities that serve researchers across the country and around the world. To date, our experience in managing the MSI Fund indicates that the 40:60 funding model poses a number of challenges for several of these national facilities. The CFI's shared contribution funding model was specifically designed to involve provincial governments in the funding of university and college based research infrastructure. While this is a remarkably effective leveraging mechanism for research equipment and single-institution research facilities, it is sometimes difficult for provinces to justify contributing to facilities that are located outside their jurisdictions or that provide research capabilities for national, or indeed, international networks of researchers. We recommend, therefore, that when appropriate, the CFI be given the flexibility to adjust the 40:60 funding model to accommodate the limitations of other funding partners in cases where Canada's capabilities for conducting leading-edge research require national-scale research facilities.

A Big Science Roadmap for Canada

Major research facilities, such as synchrotrons, neutron sources, telescopes and research ships play a vital role in advancing the frontiers of knowledge. They also act as powerful magnets for top research talent from around the world, drawing together individuals and teams from numerous nations to work together, share ideas, build on each other's strengths, compete and collaborate in a common effort to explore the world around us and the universe in which we live.

Major research facilities are crucial enablers of some of the most advanced science being undertaken today and the coming together of people from many cultures to further a common cause.

Over the past two decades, the Government of Canada has made important investments in world-class research facilities across Canada in all areas of research. Important investments have been made in the areas of physics, astronomy, health, ocean and Arctic research. The Canadian Light Source (Saskatoon), the National Research Universal (NRU) reactor at Chalk River, TRIUMF (Vancouver), SNOLAB (Sudbury), VIDO-InterVac (Saskatoon), the CCGS *Amundsen* research icebreaker (Québec) and Ocean Networks Canada (Victoria) are examples of exceptional facilities that have contributed to the performance and impact of Canadian researchers and that have enhanced Canada's global presence in science and technology development.

In addition, Canada is a key partner in several international research initiatives in astronomy (Thirty Meter Telescope and the Canada-France-Hawaii Telescope) and physics (CERN). Other opportunities, and associated funding requests are emerging, including new facilities for the neutron scattering community, upgrades to the Canadian Light Source, Canada's participation in the Square Kilometre Array, the planned Large Hadron Collider (LHC) upgrade at CERN and the Deep Underground Neutrino Experiment (DUNE) at the Fermi National Accelerator Laboratory (Fermilab).

The challenge for the Government of Canada is to move from an ad hoc way of supporting Big Science projects to one that is structured, merit-based and focused on national priorities. To frame such a process, the Government of Canada would benefit from the development of a Big Science Roadmap, where Canadian interests and potential financial commitments are identified over the next 10 to 20 years. Building on the expertise and capabilities it has developed over the past several years, the CFI is well positioned and ready to assist in this matter.

Enabling research leadership and seizing emerging opportunities

Beyond the Big Science projects, there are a significant number of international research challenges, such as the search for a Zika virus vaccine or the compelling need to address anti-microbial resistance, in which Canadian participation is critical to maintain and strengthen our global scientific leadership.

Canada has both the research capability and the international reputation as a collaborator to lead such important international science initiatives. The human and intellectual contributions are readily available, but the necessary financial contributions often are not.

Securing our active participation in these initiatives will allow Canada's best researchers to work with leading researchers around the world, but this requires the ability to respond quickly to emerging and time-sensitive funding opportunities. Strategic partnership funding that can be quickly mobilized and awarded to ensure Canadian involvement in international initiatives is a critical, yet missing element of the federal funding system. We suggest, therefore, that the

Government of Canada consider developing a rapid response funding mechanism for both research and research infrastructure funding to support Canadian participation in international research initiatives.

Enhancing inter-agency coordination

One of the issues raised by the Fundamental Science Review Panel is the need for greater coordination between the federal research granting agencies, including the CFI. We believe it is important to recognize, however, that the CFI and the federal granting agencies have a natural division of responsibilities in relation to research infrastructure and the researchers who use it. This division is best reflected in the core funding of the agencies: the CFI provides contributions to institutions, while NSERC, SSHRC and CIHR generally provide grants to individuals and teams of researchers. This division of responsibility ensures that, on the one hand, institutions assume an appropriate share of responsibility for the ongoing operations and upkeep of research infrastructure, while on the other hand, researchers have the freedom and the resources to pursue their research trajectories.

This division of responsibilities also ensures an appropriate distribution of accountability in the use of public funds across the full range of human resources and organizational structures that make up Canada's research capabilities. Under the current system, researchers are accountable for the use of public funds in their research activities, while institutions are accountable for the use of funds to ensure that researchers have access to fully functional research infrastructure.

Certain steps can be taken to simplify and improve the effectiveness of the various mechanisms that support both researchers and research infrastructure. Indeed, the CFI recently introduced a number of measures to reduce the administrative burden on institutions that stem from CFI contributions. The CFI is committed to undertake such an exercise on a regular basis and to share the lessons we have learned with the other federal granting agencies.

Furthermore, we believe it is possible to align the competition schedules and merit-review processes of the various agencies involved in funding the research that is undertaken in facilities supported through the Major Science Initiatives Fund. In fact, whenever possible within the constraints of its Contribution Agreements, the CFI has done this with other programs, such as: supporting NSERC's CCI program through the College-Industry Innovation Fund; supporting the Canada Research Chairs, Canada Excellence Research Chairs and NSERC's Industrial Chair program through the John R. Evans Leaders Fund; and working with NSERC and SSHRC on the Discovery Frontiers Program and Digging Into Data Program, respectively.

However, under the current system of irregular allocations from the Government of Canada, the CFI cannot make future program commitments. In addition, the CFI Contribution Agreement specifies the funding allocation to its various funds, preventing access to any discretionary resources for joint programming. Although we are committed to working more effectively with the granting agencies to improve our capacity to support world-class research, we recommend

that the Government of Canada consider providing a greater degree of flexibility in the use of CFI allocations.

Conclusion

In today's highly inter-connected world, research excellence, and the innovation that builds on high-quality research, is being undertaken in post-secondary institutions across Canada. Through its various programs, the CFI strives to ensure that all institutions can compete on the basis of excellence to obtain the state-of-the-art equipment and facilities needed to support their best researchers. This allows Canadian research institutions to think big, innovate and develop the next generation of highly talented researchers, innovators and entrepreneurs. Each year, more than 26,000 students are trained on CFI-funded equipment and in CFI-funded facilities. By using this infrastructure, trainees gain cutting edge knowledge, technical expertise using sophisticated research equipment, direct experience in collaboration and, in many cases, entrepreneurial ambition. We believe this is one of the most important outcomes of the Government of Canada's contributions to our national research capabilities.

We are very proud of the Canadian higher education and research funding model. However, no system is perfect and we believe that adjustments, such as those recommended in this brief, will better support our country's research community in their efforts to produce the knowledge Canadians need.

Board of Directors Canada Foundation for Innovation

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