

**Written Submission for the Pre-Budget  
Consultations in Advance of the Upcoming  
2022 Federal Budget**

**By: Canadian Association of Physicists  
(CAP)**

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## **Recommendations**

- **Recommendation 1:** We strongly recommend that the Government of Canada provide a one-time 25% supplement in 2022 to each of the Tri-Councils (Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council, and the Social Sciences and Humanities Research Council) to mitigate the negative effects of the pandemic and, thereafter, as per the recommendation in the Naylor Report<sup>1</sup>, to implement annual ongoing 10% increases to each of the Tri-Council budgets until research funding is commensurate with other G7 countries.
- **Recommendation 2:** That funding to the Tri-Councils increase by 10% annually so that graduate scholarships and postdoctoral fellowships can be increased (both in number and funding value) until they reach levels that enable us to attract and retain the highly qualified people Canada needs.
- **Recommendation 3:** That the Government take steps to identify all major research facilities that should be repaired/restored/upgraded and provide adequate funding to address these needs.
- **Recommendation 4:** That the Government implement the recommendation in the Naylor report to increase the budgets for the existing Canada Foundation for Innovation (CFI) Infrastructure Operating Fund (IOF), the Major Scientific Initiatives (MSI) fund, and the NSERC Research Tools and Instruments (RTI) grants by a total of \$30M per year.
- **Recommendation 5:** That the Government manage its investments in Big Science (as defined in the Naylor report<sup>1</sup>) in a more coordinated manner with funding from conception and approval through implementation and operations and, when appropriate, invest the additional funding required for their renewal.

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<sup>1</sup> <http://www.sciencereview.ca/eic/site/059.nsf/eng/home>

## **Introduction:**

We are pleased to have the opportunity to make expert recommendations to the House of Commons Standing Committee on Finance as it develops its economic strategy for 2022 (and beyond). We are hereby providing the Committee with a written submission on how to restart the Canadian economy as it recovers from the COVID-19 pandemic.

**Who We Are:** The CAP, with 1800 members, is Canada's national association for physicists working in industry, academia and government across all sub disciplines of physics. The CAP strives to unleash the full potential of physics and physicists for the benefit of Canada and the world. The CAP is recognized and respected for its science and technology expertise, including an in-depth understanding of their economic and societal impacts. The CAP has testified at House of Commons Committees, including the Standing Committee on Industry, Science and Technology for a study on the "State of Disruptive Technologies" on June 9, 2015.

Canadian physicists look forward to working with the Standing Committee on Finance to help restart the Canadian economy as it recovers from the COVID-19 pandemic, through judicious infusions of funding for scientific research, technology development, and training.

Our recommendations will have important positive impacts on the employment of highly qualified people and will generate economic impacts from research and development advances.

## **Recommendation 1 – Research Funding**

In agreement with the Canadian Council of Research (CCR), the CAP asserts that COVID-19 has challenged our society in unprecedented ways. Personal life, our economy and health care systems are being affected by this global crisis. Canada has already committed to more than \$100 billion in wage subsidy and emergency benefits, but the true costs of the pandemic and its impact on the Canadian economy are much more extensive. The competitiveness of Canada's economy critically depends on investment in both discovery-driven fundamental research and key technologies, and of the training of highly qualified people in both.

Fundamental research is critical for Canada to make novel discoveries which lead to the development of technologies that are transformative, the so-called "disruptive technologies" which will ensure the global competitiveness of our economy and secure prosperity and safety of current and coming generations of Canadians. There are many examples of fundamental physics discoveries resulting in innovative technologies, economic impacts and impacts on individuals. For example, Canada's Nobel Laureate, Donna Strickland, discovered chirped pulse amplification which resulted in short pulse lasers used for many applications, including improved eye surgeries.

In June 2016, the Government of Canada announced the appointment of a review panel on Federal Support for Fundamental Science. Headed by David Naylor of the University of Toronto,

the Panel included university and funding agency administrators, industry leaders, and Canada's most recent Nobel Laureate at that time, physicist Art McDonald of Queen's University. The Panel's mandate was to undertake "a review of the federal system of supports for extramural research."

The Panel's report (the Naylor Report), released in April 2017, documents Canada's declining support of fundamental research, defines the real needs in this area, and outlines a concrete path forward to meet that need. To date, through Budgets 2018, 2019, and 2021, the Government has acted on some of the report's recommendations. However, over the past 15 years, Canada's research funding as a percentage of GDP has declined from 2% to 1.6% while that of virtually all other major nations grew. This was clearly recognized as an important priority as recommendation 125 in the February 2021 report of the Standing Committee on Finance is that the federal investment in R&D be brought to 2% of GDP by 2026.

More must be done to help the research community, and thereby the advancement of Canada's global competitiveness and prosperity. Canadian researchers and students are at the forefront of important discoveries, and their findings and expertise are crucial to ensure the competitiveness of the Canadian economy in numerous key technologies from materials science and information technology to life sciences and the discovery and development of anti COVID-19 drugs and vaccines.

**We strongly recommend that the Government of Canada provide a one-time 25% supplement in 2022 to each of the Tri-Councils (Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council, and the Social Sciences and Humanities Research Council) to mitigate the negative effects of the pandemic and, thereafter, as per the recommendation in the Naylor Report, to implement annual ongoing 10% increases to each of the Tri-Council budgets until research funding is commensurate with other G7 countries.**

This will drive fundamental discoveries and the development of the new technologies needed to support Canada's economy and improve its international competitiveness. We make this statement in parallel with many other Canadian organizations, including the Partnership Group for Science and Engineering (PAGSE), the Canadian Consortium for Research (CCR), and the Association of Canadian Early Career Health Researchers (ACECHR). Further, this recommendation is perfectly aligned with recommendation 14 of the February report of the Standing Committee on Finance.

### **Recommendation 2 - Training of Highly Qualified People**

Fundamentally, investing in our intellectual infrastructure means training our best and brightest whose work will result in cutting edge technologies that will be required to solve some of the world's most critical challenges. This will only occur if funding for fundamental research, including funding to train the next generation, is significantly increased. These highly qualified people, who are trained at the frontier of knowledge and driven to solve new problems, will in turn facilitate

new technologies to support economic growth, helping Canada and Canadian businesses tackle the future challenges, including those posed by unanticipated crises such as pandemics.

The value and number of graduate scholarships have not increased in the last decade despite greatly increased enrollments. Overall, this situation is placing obvious pressure on our ability to attract and retain graduate students and postdoctoral fellows who are able to obtain significantly higher stipends on US and European scholarships and fellowships. We need to ensure that Canada is a competitive and prosperous nation in the 21<sup>st</sup> century; a country where Canadians can thrive to their full potential.

**We recommend that funding to the Tri-Councils increase by 10% annually so that graduate scholarships and postdoctoral fellowships can be increased (both in number and funding value) until they reach levels that enable us to attract and retain the highly qualified people Canada needs.**

### **Recommendations 3 & 4 - Research Facilities and Equipment**

Without equipment renewal and access to state-of-the-art facilities, much novel research and development is impossible. Particularly devastating to the Canadian research landscape are instances where a national facility has reached its useful lifetime and there is no funding mechanism for replacement and/or upgrade to ensure continued vibrant Canadian research. Loss of research facilities could lead to a loss of research capacity in areas in which Canada was once a world leader. **The Government is therefore urged to take steps to identify all major research facilities that should be repaired/restored/ upgraded and provide adequate funding to address these needs.**

There are facilities that have not been maintained in a state of scientific readiness. Many of these demonstrated their scientific worth by being the result of successful proposals to highly competitive infrastructure programs such as CFI. However, the CFI Infrastructure Operating Fund (IOF) is insufficient and facilities suffer from chronic underfunding for operations and maintenance. NSERC RTI grants provide crucial support to replace aging research equipment and fund new, state-of-the-art equipment for Canadian researchers. Currently the need for funding outstrips the RTI budget, which is having a significant impact on the available equipment, the quality of the research, and the training of highly qualified people.

The Naylor panel found that “the current level of CFI’s Infrastructure Operating Fund (IOF) is insufficient to cover more than a small fraction of the ongoing costs of research infrastructure at institutions throughout Canada. This leads to ineffective use of smaller-scale equipment and means that researchers sometimes spend inordinate amounts of time trying to secure funding.” Additional funding should be provided to the CFI to meet the special operating needs of individual researchers through small capital awards.

**We recommend that the Government implement the recommendation in the Naylor report to increase the budgets for the existing Canada Foundation for Innovation (CFI) Infrastructure**

**Operating Fund (IOF), the Major Scientific Initiatives (MSI) fund, and the NSERC Research Tools and Instruments (RTI) grants by a total of \$30M per year.**

### **Recommendation 5 – Big Science**

The idea of Big Science is appealing on many fronts. The strategic initiative that developed the Sudbury Neutrino Observatory (SNO) and ultimately led to a Nobel Prize in Physics for Queen's University unfolded over decades. It involved the development of a major observatory deep underground, and the development of a research program that continues to inspire and utilize research excellence from across Canada.

A Big Science initiative often, but not always, involves a big facility, but should be understood as a program with a vision to accomplish something important and bold. There is obviously a will for this in Canada as evidenced by the ocean networks, Canadian Light Source, SNOLab, Canadian contributions to space missions, and more. These initiatives can materialize as institutes such as the Canadian Institute of Astrophysics. The recognized value inherent in Big Science is reflected in funding programs such as the Canada First Excellence Research Fund (CFREF), Canada Excellence Research Chairs, Canada 150 research chairs, and superclusters.

The Naylor Report specifically pointed out the need for coordination in executing Big Science initiatives. Consistent with their finding, **we recommend that the Government manage its investments in Big Science (as defined in the Naylor report) in a more coordinated manner from conception and approval through implementation and operations and, when appropriate, invest the additional funding required for their renewal.**

### **Conclusion**

A one-time infusion of funds to help address the recovery of research and development post-COVID-19 as well as implementing the remaining recommendations outlined herein will result in a strong science culture producing further fundamental discoveries leading in turn to novel disruptive technologies. These will allow Canadian researchers to assist Canadian businesses to be productive and competitive and will enhance the well-being of Canadians.