



Partnership Group for Science and Engineering (PAGSE)

Partenariat en faveur des sciences et de la technologie (PFST)

**SUBMISSION TO THE HOUSE OF COMMONS STANDING COMMITTEE ON
FINANCE**

2018 PRE-BUDGET CONSULTATION

Presented by the Partnership Group for Science and Engineering (PAGSE)
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SUMMARY

Canadians recognize that our health, prosperity, and security depend on science, technology, and innovation (STI).¹ From the tools we use to communicate, to the energy that powers our homes, businesses, and transportation, to the treatments and diagnostics that keep us healthy, STI touches every aspect of our daily lives.

Basic research is the foundation and fuel for STI. Breakthrough advances occur when we have the opportunity to answer fundamental questions about ourselves and the natural world around us. Sustained fundamental research is required to continually advance STI. While Canada has long been a source of high quality and high impact research, in recent years we have witnessed an erosion of our competitiveness in comparison to our international peers. Canada's Fundamental Science Review² affirmed this point and its recommendations on how to reverse the trend have received widespread support from the scientific community³ and the general public.⁴

Given the increasingly competitive global environment and the complexity of challenges we face, investments in basic research have never been more critical for Canadians. In view of the role of research in spurring innovation and increasing productivity, and the need for research to inform evidence-based policy-making and to inspire and educate the next generation of innovators, investing in basic research is one of the most important and highest-yield investments in Canada's competitiveness that our government can make.

The Partnership Group for Science and Engineering (PAGSE) recommends that the Government begin to implement the recommendations from Canada's Fundamental Science Review. In particular, we recommend that the Government:

- **Increase its investment in independent, investigator-led basic research to improve our international competitiveness. (R6.1)**
- **Increase its investment in scholarship and fellowship programs to ensure a stable pipeline of innovators for the future. (R7.1)**

INTRODUCTION

The Partnership Group for Science and Engineering (PAGSE) is an association of 26 professional and scientific organizations representing more than 60,000 members from academia, industry, and government sectors. It represents the Canadian science and engineering community and seeks to advance research and innovation for the benefit of Canadians. PAGSE is best known for its flagship breakfast series of science and engineering talks held on Parliament Hill called *Bacon and Eggheads*.

This PAGSE submission presents a consensus statement based on consultations with its members. This brief focuses on the theme of **productivity and competitiveness** and the two questions posed by the pre-budget consultation process: 1) *What federal measures would help Canadians to be more productive?* and 2) *What federal measures would help Canadian businesses to be more productive and competitive?*

1) Implementing the recommendations of Canada's Fundamental Science Review is important for the well-being and productivity of all Canadians

A nation which depends upon others for its new basic scientific knowledge will be slow in its industrial progress and weak in its competitive position in world trade, regardless of its mechanical skill.

– Vannevar Bush, July 1945 report to the President of the United States, “Science, The Endless Frontier.”
(Highlighted in Canada's Fundamental Science Review)

Notwithstanding that fundamental science seeks to understand ourselves and our natural world without specific consideration of an end product, it has been established time and again that basic research leads to transformational practical applications. Research stemming from Canadian investigators has been no exception. For example, the Ebola vaccine came from years of basic research that aimed to understand the unique properties of the virus. Fundamental research to understand the mechanisms that underlie intelligence and cognition have given rise to the “deep learning” that has fuelled Artificial Intelligence (AI) for everything from smart cars to finance. Support for a vigorous basic research environment is essential to providing the ideas that feed applied research and fuel innovation.

Canadians take pride in the breadth of advancements borne of our research, from developing insulin to understanding neutrinos. Since 2000, however, our research competitiveness has been declining, not just in relation to the traditional powerhouses, like the US, UK, and Germany, but also to smaller nations such as Australia and the Netherlands. Canada's Fundamental Science Review found that the underfunding of basic research for much of the last decade is a major contributor.² This erosion of support for basic research has led to a precipitous drop in the numbers of researchers focused on fundamental work.⁵ Our ability to

generate the new ideas that will improve the well-being and productivity of Canadians has diminished, as has our ability to attract, train, and retain the top talent we need to compete in the knowledge economy and grow our middle class. To reverse this trend, a significant reinvestment in basic research funding is required.

This government has already indicated a willingness to support basic research with a welcome and much-needed \$76 million boost to the Tri councils in the 2016 budget. Canada's Fundamental Science Review has provided a roadmap for the next steps to rebuilding our research ecosystem. PAGSE fully supports the recommendations of the report including a call for the government to "rapidly increase its investment in independent investigator-led research to redress the imbalance caused by differential investments favouring priority-driven targeted research over the past decade." (R.6.1)

2) Implementing the recommendations of Canada's Fundamental Science Review will help Canadian businesses be more productive and competitive

In addition to the ideas that will become the advancements and products of tomorrow, the most valuable output from basic research is talent. Talent development through participation in basic research improves our capacity to innovate globally across all sectors, not just in the academic realm. Canadian researchers are training not only the next generation of world-leading researchers but also the skilled workers, innovators, and critical thinkers that Canadian businesses will rely on to increase productivity and competitiveness. In order to compete internationally in the knowledge economy, Canadian businesses need diverse talent with the capacity to understand and ask fundamental questions, with the ability to think broadly, and the curiosity and passion to innovate. The skills that are acquired through basic research equip us to generate new ideas, products, approaches, policies, etc., based on sound evidence, analysis, and decision-making. Investing in research is thus also an investment in a training pipeline that will generate jobs and talent to meet the economic and social needs of the future

Unfortunately, the decade-long decline in basic research funding has had a negative impact on the recruitment of trainees into research disciplines.⁶ Increasing funding for investigator-led basic research will not only boost the number of trainees that each researcher can accommodate, it will also enrich their training environment. Coupling this with a reinvigoration of the scholarship and fellowship programs that support many trainees, will serve to establish Canada as a magnet for the world's top talent, enhancing our contribution to innovation on the world's stage.

To help recruit and retain top Canadian and international talent, PAGSE recommends that the government implement the recommendations of Canada's Fundamental Science Review, including the increase in investigator-led basic

research funding, and the increase to scholarships and fellowships for trainees (R7.1). This should be coupled with efforts to improve trainee diversity and would be complementary to other efforts already instituted by this government to facilitate talent recruitment (recent changes to the skilled workers visa program, for example⁷). This investment will help Canadian businesses over the short term by helping to generate the talent that will help them grow and innovate, as well as over the long term by generating the ideas that will lead to the products of the future.

CONCLUSION

The science and engineering research community is unanimous that, over time, the erosion in support for basic research stifles the supply of ideas that drive innovation and the supply of young innovators who will ensure Canada's competitiveness in the years to come. Canadians at large have recognized the importance of basic research for the prosperity of our nation.¹ The completion of the Fundamental Science Review has signaled the government's commitment to restoring basic research in Canada. This government has a once-in-a-generation chance to stem the decline in our global competitiveness and reposition itself as a research leader. PAGSE urges the House of Commons Standing Committee on Finance to begin to implement the recommendations of Canada's Fundamental Science Review and re-invest in investigator-led basic research for the benefit of all Canadians.

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- 1) Expert Panel on the State of Canada's Science Culture (2014) Council of Canadian Academies. http://www.scienceadvice.ca/uploads/eng/assessments%20and%20publications%20and%20news%20releases/science-culture/scienceculture_fullreporten.pdf
 - 2) Canada's Fundamental Science Review (2017) [http://www.sciencereview.ca/eic/site/059.nsf/vwapj/ScienceReview_April2017-rv.pdf/\\$file/ScienceReview_April2017-rv.pdf](http://www.sciencereview.ca/eic/site/059.nsf/vwapj/ScienceReview_April2017-rv.pdf/$file/ScienceReview_April2017-rv.pdf)
 - 3) See for example: <https://supportthereport.ca/>
 - 4) See for example: <https://www.thestar.com/opinion/editorials/2017/07/03/trudeau-government-must-invest-in-basic-science-editorial.html>
 - 5) Restoring Canada's Competitiveness in Fundamental Research: The View from the Bench (2017) Global Young Academy. <https://globalyoungacademy.net/wp-content/uploads/2017/06/GYA-2017-FundResearchReport-LoRes.pdf> (section 4.3)
 - 6) *ibid* (section 4.7)
 - 7) See for example: <https://www.theglobeandmail.com/report-on-business/rob-commentary/canada-cant-fall-behind-in-the-global-race-for-tech-talent/article35459472/>