



SUBMISSION TO HOUSE OF COMMONS STANDING COMMITTEE ON FINANCE 2016 PRE-BUDGET CONSULTATION: The Chemical Institute of Canada

The Chemical Institute of Canada (CIC) represents the interests and activities of the chemical sciences, engineering, and technologies across Canada. The CIC's 5700 members - chemists, chemical engineers, and chemical technologists - are society's problem solvers, from advances in healthcare and pharmaceuticals, to energy, food and water. Through its three constituent societies (the [Canadian Society for Chemistry \(CSC\)](#), the [Canadian Society for Chemical Engineering \(CSChE\)](#) and the [Canadian Society for Chemical Technology \(CSCT\)](#)) — the Chemical Institute of Canada is committed to advancing the chemical sciences and engineering in Canada.

In the following, the Chemical Institute of Canada presents three recommendations for consideration for inclusion in the 2016 Budget. Although these recommendations stem from the Chemical Institute of Canada, it is important to acknowledge some important shared perspectives between this submission and those of the 2016 Canadian Consortium for Research (CCR) and the 2016 Partnership Group for Science and Engineering (PAGSE) submissions.

Productivity: What federal actions regarding health, education, tools, technology, the federal public service and supports for the involvement of all Canadians would improve Canada's rate of productivity?

Canada's rate of productivity is closely linked to its ability to be an innovation leader on the international context. Research is key to the innovation continuum, as it can both initiate innovations as well as sustain them. Economic prosperity in Canada over the next 25 years is going to be deeply rooted in the ability to bring innovations to the export market. A convergence of all the factors necessary to bring an idea to market is only possible if the idea is scientifically and technologically robust, and has early stage champions with international credibility. A "Made-in-Canada" innovation requires the catalyst of early stage government support.

Canada has recently adopted an aggressive approach to identifying and supporting outstanding research, largely through the Canada Research Chairs and Canada Excellence Chairs programs, the Canadian Foundation for Innovation (CFI) and very recently, the Canada First Research Excellence Fund. This concerted effort has helped to address gaps between Canada and the United States, Europe, and Asia in terms of attracting and



retaining highly accomplished researchers. The CIC recognizes that the federal government has continued to make investments in Canada's federal granting councils.

The research councils provide a robust interface to industry *via* their partnerships programs. These programs support the fundamental research that enables the technological innovations that industries require if they are to be competitive on the international scale. *Increased funding to these programs, particularly those which enable graduate research trainees and postdoctoral fellows to be the bridges between academia and industrial innovation is recommended. Select programs, particularly those which provide for the support innovation-enabling fundamental research, graduate training program grants linked to industrially- driven research priorities, and pre-competitive prototyping are recommended for increased funding.* The funds necessary to support these programs could be borne by a modest carbon tax on fossil fuel exports to be initiated under the Canada's Climate Change Action Plan.

This initiative also directly addresses a critical problem identified in the 2012 STIC Report. Canada ranked seventh among comparator countries on the measure of business funding of higher education and Canada continues to show disappointing results in terms of the key indicators: research investment by business, licensing, and spin-off companies. A more effective interface between university research and industry, particularly those involving industrial access to university research capabilities and spin-offs of university research, is needed.

Recommendation #1: Increased funding to tri-council programs which support innovation-enabling fundamental research

Cost: \$50M p.a. to the three principal research councils directed toward innovation-enabling fundamental research

Duration: 5 years or more

Jobs: What federal actions would support Canadian residents as they secure employment, adapt their skills to meet the evolving needs of employers, and move to locations where jobs exist?

PhD graduates are recognized to be the drivers of innovation in academic research and a knowledge-based economy. Canada's performance lags far behind its competitors in one of the five key indicators: science and engineering doctoral degrees granted per 100,000 population. In 2010, Canada ranked only 15th in the OECD on this measure. Strong initiatives must be taken to improve this ranking if we are to compete with the



top 5 OECD countries. It is important to note that this initiative will serve to stimulate the private sector's thirst for innovation and solidify its capacity to employ highly qualified graduates. This is a key part of a training-employment feedback loop, where trainees' eagerness to pursue given career paths depends on the existence of meaningful career opportunities in the private sector.

The federal government currently funds PhD and postdoctoral fellows (PDFs) through a number of research grants derived from programs of many types, as well as fellowship programs. In Year 1 the proposed PhD fellowships would cost \$25M, the PDF fellowships would cost \$15M, and associated program funding will cost \$2K per trainee p.a., or \$2.6M. These funds could be borne by the Canada Job Grant program under the Canada's Economic Action Plan.

The visionary 2012 report of the Advisory Panel on Canada's International Education Strategy (the Chakma Report; *International Education, a Key Driver of Canada's Future Prosperity*), concluded that Canada must use competitive scholarships to recruit top talent from around the World. The Chakma Report notes that foreign students energize educational institutions and are also huge net contributors to the economy. Both the Chakma Report and the 2012 STIC Report: *The State of the Nation, Canada's Science, Technology and Innovation System: Aspiring to Global Leadership* emphasize the value that international students bring to the innovation ecosystem in Canada. Indeed, the STIC Report states: "Clearly many of the international students who come to Canada are interested in staying. In 2008, 33 percent of international students in Canada changed their immigration status to stay in Canada, mostly for work purposes. This positioned Canada first among selected OECD countries on this measure." Despite the compelling reasons for attracting and retaining top-tier international students after they graduate, recent policy changes are jeopardizing the flow of the best and brightest into Canadian educational institutions, and then keeping this talent in Canada after graduation. Firstly, long international student visa processing times put us at a competitive disadvantage *cf.* other Western countries' recruitment of international student talent. Secondly, changes in the Permanent Residency application process pertaining to recent (international student) graduates of Canadian educational institutions are sending strong signals to this talent that they are unwelcome in Canada. We are facing a situation where the best and the brightest will not consider Canada as a welcoming, and thus favored, place to study and eventually build their future.

Recommendation #2: Targeted fellowship funding will increase both the quantity of applied and basic research undertaken in Canadian universities and will power the innovation agenda of Canadian industry. The recommendation includes (i) 1000 p.a., fellowships for 4 years, of fully funded PhD students engaged in natural sciences and



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engineering and (ii) 300 fellowships p.a., for 2 years, of fully funded postdoctoral fellows. 50% of the postdoctoral fellowships will be held in Canadian universities and 50% will be held in Canadian industry. Concomitant policy changes in international student visa and permanent residence application processes will ensure that the benefits of these investments remain in Canada for decades to come.

Cost p.a. (5 years): \$46.5M
Duration: 5 years or more

Infrastructure and communities: What federal actions would ensure that Canada's communities have the infrastructure they need to support people and businesses, including in work, leisure and getting goods to market?

Research infrastructure is vital to discovery and innovation in science and technology, both in universities and the private sector. The development, maintenance, and access to world-class regional, national, and international shared facilities put Canada in a global leadership position in science and technology. The successes of the Canada Foundation for Innovation (CFI) in creating world class, nation-wide research facilities need to be sustained, as the pace of discovery in pure and applied science is intimately linked to access to the tools of discovery and innovation. Research infrastructure however is very dynamic, and requires both ongoing support for servicing and upgrades as well as an infusion of entirely new, often *avant-garde*, installations. It is thus imperative that the federal government continues to invest in the maintenance of world-class research infrastructure and facilities in Canada. To do so requires both direct cost support to facilities and major installations plus the indirect costs support, for those costs associated with conducting research itself.

Recommendation #3: Investment in the development, maintenance, and upgrading of world class science and technology infrastructure in regional, national, and international shared facilities.

Cost: \$100M p.a.
Duration: 5 years or more