ADVANTAGE CANADA RESEARCH EXCELLENCE (ACRE) FUND

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Abstract

This proposal is predicated on the belief that a vibrant, innovative and competitive Canadian economy needs a world-class research system. In the face of aggressive global competition, we require a strategic investment in excellence. The Advantage Canada Research Excellence Fund is essential, we believe, for Canadian universities to achieve global leadership in specific fields and attract the talent required not only to maintain, but also to improve Canadian research standing in the world. Building upon and leveraging past investments, this fund would reinforce the Government of Canada's commitment to excellence. That commitment has created a momentum that we must now strengthen to secure a prosperous future for all Canadians as we approach the 150th year of our Confederation.

Advantage Canada

In 2007, the Government of Canada released *Mobilizing Science and Technology to Canada's Advantage*. This strategy outlined the government's goal of increasing innovation and technology development to ensure Canada thrives in the global economy. A critical factor driving this strategy was a fundamental commitment to Canadian research excellence. As a result, and based on dialogue with leaders from Canadian universities, a suite of new programs emerged that were driven not by regional distribution or political expedience, but solely by excellence. Programs like the Vanier Canada Graduate Scholarships, the Banting Postdoctoral Fellowships and the Canadian Excellence Research Chairs required institutions to compete for these targeted programs aimed at recruiting and retaining top-flight talent.

> *"To succeed in an increasingly competitive global arena, Canadians must be at the leading edge of important developments that generate health, environmental, societal, and economic benefits. Now that we have built a strong research foundation, we must strive for excellence in Canadian science and technology…*
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> ***World-class research excellence is Canada's standard."***
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> *Mobilizing Science and Technology to Canada's Advantage - 2007*

In the face of an historical global economic downturn, the current federal government also fought to preserve the core research base so integral to Canada's innovation ecosystem – a core base that successive Canadian governments built through critical investments in the federal granting councils, the Canada Foundation for Innovation, and the Canada Research Chairs program.

Combined, this core base, these new programs, and a shared commitment to excellence have been critical to the success of Canada's universities and have had a strong and direct impact on the prosperity and quality of life of Canadians. They have enabled Canadian universities to stem an historical brain drain and to attract and retain outstanding faculty, undergraduate and graduate students and post-doctoral fellows. In many respects, these investments and this commitment have allowed Canada and Canadian universities to become globally influential.

Today, Canada's universities and their researchers are attracting attention and building exciting partnerships across Canada and around the world. These universities lead innovation and advance knowledge transfer and commercialization, driving the development of innovation clusters across the country, from coast to coast.

As a result, the excellence the Government of Canada has fostered through our universities has brought Canada and Canadians new ventures with international partners, new opportunities for Canadian products and services, and a far greater number of high-quality students and researchers who are choosing to stay and build their careers in Canada.

Together, we have achieved an advantage – a Canadian advantage. But it is a tenuous one. That advantage is now threatened, and risks being lost to more determined, responsive and aggressive international competitors.

Advantage under threat

Canada's universities have undergone a dramatic transformation over the past 20 years. The drivers of that transformation include globalism and global competition, technological change, and economic upheaval, as well as unprecedented student mobility, a radically altered work world, a shifting funding landscape, and the speed and necessity of constant innovation. That transformation has also affected how Canada and Canadians situate themselves globally. As recent events in Canada's Information and Communications Technology (ICT) sector have reinforced, being globally relevant is critical to surviving; leading globally is critical to thriving.

Canada faces growing international competition as more nations invest in research and innovation, and reap the benefits of those investments in the development of more skilled and creative workforces, as well as new and dynamic knowledge-based industries. A new trend is emerging: jurisdictions are developing frameworks and focusing resources to secure a globally competitive advantage. In the face of a challenging economy, these governments are driving overall system efficiencies and providing supplementary funding to enable universities to pursue global excellence.

Countries across the globe are investing in their universities to enable them to compete for the most talented faculty and students, the most important research projects, and the most prized partnerships. Up-and-coming countries such as China, India and Brazil, as well as developed economies such as Japan, South Korea, France, and Germany are rethinking the mechanisms through which they fund universities, to ensure they support research excellence. Moreover, the US and UK already have mechanisms in place to provide strong incentives for research excellence. These efforts are producing results.

Common to all is the understanding that talent – the best talent – lies at the heart of competitive success. As such, investments are driven by broader public policy goals to:

- ensure international competitiveness in talent attraction, retention and development;
- support breakthrough discoveries that inspire the next generation and signal to the best and brightest immigrants a climate of intellectual opportunity;
- foster disruptive as well as incremental innovations that create new industries and offer an edge to established enterprises; and,
- reinforce the global networks of creativity and discovery that are strongly associated with world-class universities.

Advancing research to benefit Canada

Canada today faces a "rare opportunity to seize the moment", as the 2013 Speech from the Throne says. As we head into celebrations of our country's sesquicentennial in 2017, now is the time to make our mark. The Throne Speech calls on us to build on our ingenuity and our natural wealth. It asks us to be daring – to seize the moment to secure prosperity, for Canadians now, and for the generations to follow.

Universities are partners for Canada's prosperity, pushing the boundaries of knowledge, fueling innovation, helping to create good, well-paying jobs, and strengthening communities across the country. Around the world, government leaders recognize the need to invest in university research and innovation, from the most fundamental parsing of the human genome to developing a new and improved way to manufacture consumer products. Investing in research today will lead to lasting economic and social benefits in the future. Now is the time for bold ideas that will position Canada as a leader in the knowledge economy, for the benefit of all Canadians.

Canada's universities are advancing priorities predicated on the belief that a vibrant, innovative and competitive Canadian economy requires a strategic investment in university research excellence.

A new research excellence fund would allow Canada to achieve global leadership in specific fields and attract the talent required to improve Canadian research standing in the world. That's why Canada's universities are working together to strongly advance the concept of a research excellence fund. The fund would be supplementary to existing funding. It would be competitive and inclusive, based on the principles of excellence, peer review and recognition of individual universities' research strengths and missions. It will foster collaboration, and have an impact in communities across Canada.

In supporting excellence in research, the fund would be open to all postsecondary institutions that receive funding from the three federal granting councils – the Social Sciences and Humanities Research Council, the Natural Sciences and Engineering Research Council, and the Canadian Institutes of Health Research. Funding would be allocated based on achievement in peer-reviewed and globally competitive research competitions, as run by the granting councils.

Advantage Canada Research Excellence Fund

Building on a clear public policy direction that supports excellence, acknowledging the critical role universities play in the Canadian innovation ecosystem, and facing global competition as never before, Canada's universities believe that Canada needs to position its universities to compete with the best in the world or risk a gradual but real decline over the coming decade.

To realize a sustained presence of Canadian universities in the top league of universities in the world, we propose the creation of the Advantage Canada Research Excellence Fund, or ACRE. ACRE is not predicated on any entitlement funding.

In a great Canadian tradition, it is open and based entirely on measurable excellence, judged by independent peer review.

The Fund will build strategically on the best of Canada's research talent, scholarship, innovation and graduate programs, and on existing competitive programs. The Fund will secure a permanent legacy of innovation and create momentum for our strongest institutions to attract new talent, fill Canada's innovation pipeline with new discoveries, and cultivate a leading innovation economy.

> "To succeed in an ever-more competitive global arena, Canada must have researchers, research facilities, research equipment, talent, and firms that are nothing short of excellent by world standards. Canada has built a strong research and talent foundation. **Now we must take it to a new level by making strategic choices and focusing our resources where we can achieve the most benefit**."
>
> *Mobilizing Science and Technology to Canada's Advantage - 2007*

Canada needs federal leadership to secure the globally competitive positioning of our research-intensive universities. We believe the ACRE Fund is a legacy initiative that will do so. The Advantage Canada Research Excellence Fund will heighten Canada's capacity to:

- attract and retain the best talent from around the world to remedy emerging shortages of skilled labour;
- stimulate the rate of ground-breaking discoveries;
- establish Canadian universities as preferred partners for the best international research institutions; and
- improve Canadian universities' efforts to reach out to businesses that are ready to adapt and exploit discoveries, helping Canadian businesses become more globally competitive.

ACRE will invest in universities whose investigators succeed in rigorous, peer-reviewed competitions established through the three federal granting councils. We recommend that the federal government review the Fund regularly (every four years) and reallocate funds based on performance.

Mindful of the current aim of eliminating the federal deficit, we propose that the government implement the Fund over a multi-year timeframe commencing with an investment of $100M per year and rising to $400M annually over four to five years, as fiscal capacity allows.

Four important features will shape the Fund:

- ***Measurable Excellence***

  Eligible institutions will need to demonstrate their researchers' ability to succeed in the most competitive existing programs.

- ***Merit***

  Participation will be based on performance – both in adjudicating who is eligible for ACRE funding, and in determining whether an institution can continue to receive ACRE funding.

- ***Multi-year Phase-in***

  This staging will allow Canada to increase its international competitiveness by enabling institutions to begin the program and to build capacity as the Fund grows.

- ***Institution-Specific Accountability***

  The federal government would negotiate a simple but meaningful framework agreement with each university, with key performance indicators of ROI for each institution, as proposed under the three pillars below. The framework would be specific to each institution and straightforward to administer, and the returns on investment would be dependent on the size of investment made in the Fund as a whole. This paper describes examples of areas universities propose to commit to, according to their own missions and areas of research excellence.

It is important to note that both *Measurable Excellence* and *Merit* are hallmarks of the proven approach that the Canada Research Chairs program and the Canada Foundation for Innovation awards use today.

The ACRE Fund Impact

The capacity of nations to discover and innovate has become a critical competitive advantage in the global economy. Internationally recognized research institutions play a pivotal role in creating and sustaining that innovation capacity. This Fund will build Canada's reputation as a destination and a home for innovators, for research talent and for cutting-edge discovery. It will provide recipient institutions the flexibility and nimbleness they need to respond quickly to dramatic advancements or lucrative partnerships in selected areas. The ACRE Fund will directly support the Canadian economy's ability to thrive amidst increasing competition, and a thriving Canadian economy benefits all Canadians.

> *"**Our government is committed to making our country a global centre of research excellence**, innovation and higher learning. We understand that investing in research strengthens the economy, creates high-quality jobs, enhances our competitiveness and improves the quality of life of Canadians."*
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> *Hon. James Moore, Minister of Industry Canada – June 2013*

While the Fund supports researchers at these institutions, their work directly benefits the socio-economic well-being of Canadians and Canadian enterprise in numerous sectors, including life sciences, healthcare, natural resources, manufacturing and ICT. Canadian universities that have the potential to compete globally already lead the country in technology transfer, in important discoveries and in their ability to attract talented professionals from around the world. Their ability to build on this success will have a real and lasting impact throughout the country.

Structured correctly, we anticipate the ACRE Fund will fuel the performance of universities in Canada, and the local, regional and sectoral economies they support, by creating clusters of research excellence in concentrated fields. As such, the ACRE Fund has the potential to be a remarkable catalyst for positive change in communities throughout Canada. ACRE will also provide universities with resources to help further Canada's international education strategy by increasing our capacity to identify, attract, and retain the next generation of entrepreneurs and innovators, and therefore supplement the branding of Canada as a place to invest in.

Building an Advantage on three pillars: Global Excellence, Talent & Knowledge Translation

An important feature of the ACRE proposal is the focus and discipline it will demand of recipient universities. In their drive to compete globally, ACRE universities will be measured on their ability to improve their international standing, attract new highly qualified personnel and better translate knowledge into the national and international marketplace. Success in these three pillars, we believe, is critical to Canada's ability to compete.

ACRE universities will be required to identify those areas within each institution where they can achieve a globally competitive advantage — either an existing strength that requires incremental support, or an emerging strength with which an institution believes it has the potential to compete globally. This focus recognizes that institutions cannot move every lever that measures global excellence. Rather, institutions will undertake a systematic and strategic approach in focusing on areas, as well as on the relevant metrics, that will move specific excellence levers, in order to improve their global standing. This approach will demand highly strategic investments and will nurture focused research clusters across the country. It will encourage collaboration benefiting universities, their regional partners and the private sector – including SMEs.

> *"…(I)ncreasingly, the prosperity and potential of nations are measured by the depth of their scientific and technological expertise. Canada is no exception. And Canada cannot be an exception.*
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> *To succeed and stay competitive in the global economy, we must invest in the people and in the ideas that will produce tomorrow's breakthrough biotechnology, pharmaceutical godsend, or telecommunications wonder."*
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> *Rt. Hon. Stephen Harper, Prime Minister of Canada – July 2010*

Institutions will be required to propose the specific metrics by which they will be judged. Their deliverables will include achieving increased measures of global excellence, talent retention and attraction, and knowledge translation, as well as area-specific metrics. These goals will pay appropriate attention to the specific geographic, social and historical circumstances of each institution. Examples of such institution-specific deliverables and metrics include:

1. The promotion of clusters of national researchers to maximize impact (e.g. the Canadian Light Source or high-performance computing capabilities).

2. The construction of new bridges to fill gaps between university research and local and regional economic strengths (e.g. the automotive sector, life sciences, ICTs).

3. A specific focus on identified areas of research strength (e.g. digital media, brain health, rural development economics, sustainable resource development).

4. A specific focus on local opportunities that nonetheless relate to federal jurisdiction while reflecting regional and institution-specific differences.

Global Excellence

The good news is that we have a strong country-wide system of universities, each contributing talent, education, knowledge generation, innovation, and service according to its particular mission, history and culture. A combination of provincial and federal programs and investments support these universities, along with their constituents and their broader communities. In addition, as changing economic conditions have led to a renewed focus on skills development and vocational training, Canada already has the advantage of an extremely high rate of participation in college-based diploma and certificate programs.

The bad news is that a relatively small number of Canadian universities, Canadian university programs, and Canadian scientists and scholars are recognized as strong international competitors. Our university participation rates are average, and our output of Masters and PhD graduates is relatively low, not least in science, technology, engineering and mathematics (STEM) disciplines. We continue to register many successes in basic research. However, as one telling indicator, Canada has won only one homegrown Nobel Prize in two decades, while nations such as Israel, Australia and the UK, in addition to the US, have won numerous such prizes in recent years.[1]

Currently, Canada trails those jurisdictions where there are strong incentives to encourage universities to excel in research performance. The result is that existing incentives in Canada are not aligned either to attracting and retaining top talent, including outstanding international students, or to winning races in the increasingly competitive realm of research and innovation.

[1] Johnston, David and Howard Alper. "We need to celebrate our scientists and researchers" *The Globe and Mail* February 18, 2013.

Another challenge has also emerged. Today, Canada and Canadian universities are suffering reputational and opportunity costs as we seek to engage with global partners. Partner jurisdictions, particularly those in emerging economies, are reaching out for global partners as never before. Importantly, those potential partnerships come with new monies, either through direct foreign government investment or a leveraging of private-sector funds. Frustratingly, Canada and Canadian universities are ill-equipped to respond to this potential investment. Typically, global partners require a degree of matching funding that, today, is unavailable in Canada. We are simply not leveraging potential international investments as we should, and as we must, if Canada is to be a credible global partner in terms of research and innovation. We are leaving funding and opportunity on the table.

Whether it's securing partnerships with Germany's prestigious Max Planck and Fraunhofer institutes, or France's Centre national de la recherche scientifique, or building a foothold in China, the ability of Canadian universities to leverage partnerships is seriously hampered.

Those opportunities and challenges drive this proposal. Through the ACRE Fund, universities can focus their metrics in institution-specific areas of excellence:

1. Increase the funding of university research by international public and private sources (using a three-year rolling average).

2. Increase the number of significant research alliances with international partner institutions (e.g. research networks receiving external funding; joint labs; joint centres of excellence). This measure is to track major initiatives, not standard, professor-to-professor collaborations (using a rolling five-year average).

3. Increase the number of (a) highly cited faculty members; and (b) highly cited papers (top five percent for both) (using a rolling three-year average).

Talent

Canada thrives by providing a supportive habitat for talent. Universities, aided by federal and provincial governments, have worked diligently to create the conditions that attract people from around the world. Those same conditions keep talented Canadians here, enabling them to do their best work at home. Canada's stature on the world stage rests in significant measure on this capability. All of Canada participates in and benefits from this enterprise, which requires not only advanced research facilities but also lively, safe, diverse and inclusive communities that attract people who could work anywhere in the world.

Being able to compete in the incredibly dynamic global marketplace requires Canada to have the smartest and most capable workforce. A workforce that can develop the innovations that launch globally scalable businesses, as well as rapidly adapt, adopt and exploit the innovations from elsewhere. In short, competing in the global economy means getting the best and brightest and then ensuring they have the tools, collaborators and channels they need for maximum impact. While the private sector clearly has a central role to play, so too do Canada's universities.

As noted earlier, through an important core base of funding and new programs aimed at attracting talent, Canada has dramatically improved its ability to attract students and researchers from around the world. However, we need to be more aggressive. Despite recent successes, Canada still under performs. For example, Canada significantly lags in attracting international students compared to some of our lead competitors, including France, Germany and Australia.[2] Despite innovative new programs, this under performance persists beyond students, into post-doctoral and faculty recruitment. Another key determinant of excellence is the ability to attract international fellowship holders. Frustratingly, Canada trails here too.

By focusing on the three pillars of global excellence, talent and, knowledge translation, and by committing universities to particular areas of strength that they have identified, ACRE seeks to concentrate recruitment efforts for the world's best. If Canada is to compete globally, we must be one of the best places in the world for the ambitious to achieve their ambitions. To that end, we propose to do the following through the ACRE Fund:

- Increase the recruitment and retention of top Canadian and international research graduate students and post-doctoral fellows (using a three-year rolling average):
    - Recruit and retain Canadian research graduate students holding external graduate scholarships or fellowships.
    - Recruit and retain international research graduate students (visa students) from international universities.
    - Recruit and retain international post-doctoral fellows (visa-holding) from international universities (measured by an increase in the proportion of our international post-doctoral fellows holding externally funded positions, including Banting Postdoctoral Fellowships and industry-funded awards).
- Increase the attraction and recruitment of outstanding professors (Canadian or international) who held faculty positions at international universities (using a five-year rolling average).

Knowledge Translation

We know too well that despite incentives and a strong publicly funded research environment, Canada lags in innovation and productivity. We also know that this is a two-way street. Canada needs strong universities pushing new ideas, discoveries and products, as well as a private sector that pulls those ideas, discoveries and products into the marketplace – an innovation-driven and receptive culture.

Canadian universities have embraced their role in the commercialization of new technologies. According to the CD Howe Institute, "The universities that produce the most technology transfer tend to be those that are the most highly rated on overall academic grounds".[3] As of 2011, Canadian

[2] *International Education: A Key Drive of Canada's Future Prosperity* (the "Chakma report")
[3] Howitt, Peter. "From Curiosity to Wealth Creation: How University Research Can Boost Economic Growth" *CD Howe Institute* June 2013.

universities held a portfolio of more than 3,500 active technology licences. Since 2000, Canadian universities have also created more than 600 spin-off companies to take university innovations to market and have increased the average number of inventions and discoveries by 70 per cent.

While these are significant contributions to the Canadian economy, universities are working harder to improve the effectiveness of their technology transfer efforts. We are expanding entrepreneurship training and mentoring programs to foster the next generation of entrepreneurial talent. These programs help students and faculty launch businesses and take new ideas to market, through tangible supports including new venture incubators, advisory services, networking and laboratory space. The experience that participants gain through these programs helps them launch new businesses and drive innovation for future employers. Having access to graduates with this training and these skills creates incentives for companies to partner with universities to establish private-public clusters, like those in Cambridge, MA and Silicon Valley, CA.

We know universities cannot do it alone, but we recognize that global relevance, and ultimately global excellence, demand that universities be actively engaged with the private sector and civil society. To that end we propose the following commitments in the area of knowledge translation:

- Increase the number of private-sector start-ups arising from research work done at the university, or created by recent graduates (within 10 years of graduation) (using a five-year rolling average).
- Increase the number of "experiential learning" opportunities outside the university (funded internships, coop placements, community service, and arts placements) for graduate students (using a three-year rolling average).
- Increase the number of research partnerships between the university and the social sector and the university and the private sector, with a separate accounting for engagement with small and medium enterprises (using a five-year rolling average).
- Increase the number of patents and licences the university or collaborating companies file, based on partnered research (using a five-year rolling average).

Conclusion

The Government of Canada has stated that Canada's ambition must be to achieve research excellence as measured by global standards. We firmly agree. Supporting excellence is critical if Canada is to compete with the world's best and win. Winning will depend upon Canada's ability to attract new talent, grow Canada's innovation pipeline with new discoveries, and cultivate a leading innovation economy.

We believe that the Advantage Canada Research Excellence Fund is a generational investment, a potential game-changer for Canada. Consolidating gains achieved to date and building on recognized excellence, ACRE stands to secure for the Government of Canada a permanent legacy of innovation. It will also create momentum for our country's universities, for their partners and for the private sector – advancing and preserving Canada's advantage for all Canadians.