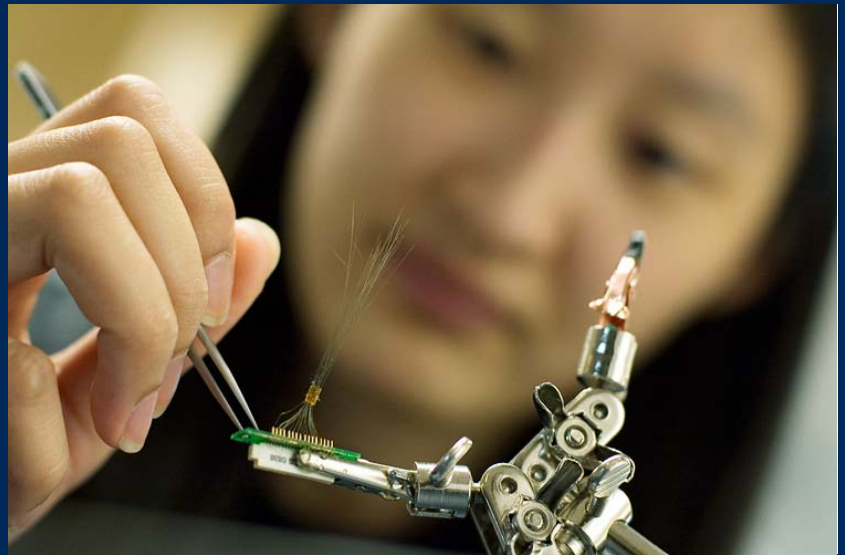


Submission to the
House of Commons Standing Committee
on Finance

Pre-Budget Consultations 2011

12 August 2011



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THE UNIVERSITY OF BRITISH COLUMBIA

After the longest period of successive minority governments in Canadian history, Canadians are looking forward to a period of greater political stability amidst a still fast-changing global economic context. Political stability is indeed very welcome as traditional global financial centres remain in flux while emerging centres continue their ascendancy.

Well before the global economic downturn, the Government of Canada had the foresight to introduce a Science and Technology (S&T) strategy as part of its overall economic plan, *Advantage Canada*. Though faced with an increasingly difficult economic climate, rather than suspend this strategy's implementation the Government of Canada has continued to pursue it.

The S&T Strategy is producing results and has placed Canada in an enviable position within a dynamic global context. Unlike traditional competitors, Canada is uniquely placed to respond to this changing landscape as we transition from recovery to renewed growth and competitiveness. This submission is aimed at encouraging government to stay the course and continue its stable and sustainable investments in public R&D while actively exploring new and emerging international opportunities. Having built the Canadian advantage, our goal should be to keep it and use it.

In preparing this submission the University is mindful of the work of the Research and Development Review Expert Panel. The University submitted its recommendations to the Panel earlier this year. As some of these recommendations relate to the work of the Committee we have included UBC's submission for your reference. The University anticipates that the Panel's report will generate further discussion on how best to improve Canadian productivity and our innovation ecosystem.

Because the work of the Panel is still underway and mindful of both the current economic climate and the recent commitments made to public R&D in Budget 2011 earlier this year, the following recommendations are intended to offer policy advice and encourage government in its planned spending rather than contemplate any new spending.

Recommendation 1:

Over several years the University has encouraged government to demonstrate a strong signal of support to the Granting Councils (Natural Sciences and Engineering Research Council – NSERC; Canadian Institutes of Health Research – CIHR; and, Social Sciences and Humanities Research Council – SSHRC). Despite the current fiscal situation government has done that very thing. Earlier this year government committed to increasing the overall budget of the three federal granting councils by \$47 million annually, including support for indirect costs. We applaud this decision and encourage government to maintain these investments as articulated in Budget 2011.

Recommendation 2:

Budget 2011 introduced the International Education Strategy to better promote Canada as a destination for international students. As this strategy is implemented, we urge a similar approach to promoting international research collaboration. Though individual Departments and government agencies have international strategies, a frustrating fragmentation persists. The University urges government to develop a more effective and coordinated approach to promoting international innovation partnerships.

As a first step, we urge the federal government to strike a working group of representatives from key Departments, including International Trade, Foreign Affairs and Industry Canada, as well as key partners including research universities and important research entities across the country, to formulate a strategy that will better coordinate existing research funding programs with international collaboration in mind and to develop a clear mandate for Industry Canada to promote international collaboration.

Building on Investment and Sustaining Momentum

Our national socio-economic well-being rests on our ability to create new economic drivers while also strengthening the traditional foundations of the Canadian economy. The federal S&T strategy seeks to achieve balance by stimulating innovation in emerging fields while ensuring fundamental strengths, like natural resources, receive equal attention. Two centres at UBC exemplify how the University is strategically leveraging federally funded programs to advance knowledge and innovation in priority areas.

The Norman B. Keevil Institute of Mining Engineering and the Centre for Brain Health are two UBC-based research centres that have been awarded funding from a number of federal programs, including the Canada Foundation for Innovation (CFI), the Natural Science and Engineering Research Council (NSERC), the Centres of Excellence for Commercialization and Research (CECR) program, the Canadian Institutes for Health Research (CIHR), the Networks of Centres of Excellence of Canada (NCE), the Canada Research Chairs program, and the Canada Excellence Research Chairs (CERC) program. Importantly, these centres have fully leveraged these programs to create a cluster of complementary and interconnected research, resulting in ground-breaking discoveries and spurring globally influential advances.

According to the Heart and Stroke Foundation of Canada, stroke kills 14,000 Canadians every year and, globally, is the leading cause of long-term disability in adults. Neuroscience Canada estimates that one in three Canadians of all ages will be affected by a disease, disorder or injury of the brain or nervous system at some point in their lives, and as many as half of all Canadian families have been affected by a brain disorder. Budget 2011 highlighted that “disorders of the brain are one of the major health challenges of the 21st century.”

Scheduled to open in 2013, the Djavad Mowafaghian Centre for Brain Health will be a centre of excellence focused on translational research and patient-centered care aimed at preventing, understanding the causes, and treating the consequences of brain dysfunction. The Centre for Brain Health facility will exploit proximity to the UBC Hospital and be operationally integrated with existing Vancouver Coastal Health clinical care services, the Brain Research Centre, the Institute for Mental Health, and UBC’s Department of Psychiatry and Division of Neurology facilities.

One of the strategic partnerships of the new facility will be the Brain Research Centre. Recognized in 2007 by the federal government as a Centre of Excellence in Commercialization and Research, the Brain Research Centre comprises more than 225 investigators with multidisciplinary expertise in neuroscience research ranging from the test tube, to the bedside, to industrial spin-offs. Researchers such as Max Cynader, Canada Research Chair in Brain Development, are advancing knowledge of the brain and exploring new

discoveries and technologies that have the potential to reduce the suffering and cost associated with disease and injuries of the brain.

Max is the Director of both the Brain Research Centre and the Djavad Mowafaghian Centre for Brain Health and a Principal Investigator in the Canadian Stroke Network, a Network of Centre of Excellence. His research on the nature of the processing performed by the cerebral cortex has yielded many important contributions to understanding the brain’s mechanisms. Max is one of the founders of NeuroVir, a Vancouver-based biotechnology company which has developed gene therapy products to treat brain diseases. The company grew to over 60 employees and was eventually sold to a German biotechnology company, which has now taken the NeuroVir technology into clinical trials.

Also working in the field of neuroscience is Matthew Farrer. Thanks to the federal Canada Excellence Research Chair program UBC was able to recruit Matthew from the world-renowned Mayo Clinic in Florida. Matthew’s recruitment is indeed a brain-gain story — attracting not only Matthew but his research team to Canada. Earlier this summer, Matthew and his post-doctoral research associate Carles Vilariño-Güell, identified a genetic mutation that causes late-onset Parkinson’s disease, paving the way to a new target for potential treatments that may halt or cure the debilitating disease. While five other genes have been identified, this in-Canada discovery is considered the first major breakthrough in Parkinson’s research since 2004.

While Matthew and his team are making new and profound discoveries in a field we still know so little about, UBC colleagues are actively working to rejuvenate one of Canada’s historical economic drivers — mining.

In 2009, the mining sector contributed \$32 billion to Canada’s GDP and accounted for approximately 1 of every 50 Canadian jobs. In BC alone, mining directly employs approximately 28,000 people in more than 50 communities. With increased exploration and extraction and an aging workforce, the global mining industry faces a serious human resource challenge. Forecasts estimate that the sector will need to hire 10,000 new workers annually for the next decade to fill new positions and address replacement pressures.

UBC’s Keevil Institute of Mining Engineering is producing a new generation of mining engineers who are having a profound impact on the mining industry and training a cadre of researchers who are revolutionizing approaches to the sector. Researchers like NSERC Discovery Grant recipient Malcolm Scoble are working with graduate students to refocus the industry for future generations by reducing the environmental impact associated with mining operations, increasing mineral extractions, and increasing the rate of land

reclamation upon completion of mineral extraction. The work underway at the Institute, with the help of federal investments, is ensuring the best of Canadian talent stays in Canada while also drawing in talent from abroad. Importantly, the work at the Institute does not simply stay in the lab. Researchers like Malcolm are collaborating with some of the leading companies in the mining industry, including Falconbridge, Noranda, Teck Cominco, Suncor and Placer Dome.

Excellence in mining research at UBC has created a virtuous cycle often associated with innovation hubs. Research excellence draws talent who, in turn, add to a hub's research excellence. Talent like Elliot Holtham. Elliot is a PhD student and a recipient of a Vanier Scholarship. Elliot's work focuses on developing enhanced geophysical techniques to accurately image the earth. Accurate imaging is becoming much more important as new ore deposits are discovered deeper and deeper in the earth. Clearer images will allow companies to target their drilling more accurately in order to reach these deeper and more difficult to access deposits while minimizing environmental impacts.

Alongside the Institute, UBC physicist Douglas Bryman is working with Advanced Applied Physics Solutions, another Centre of Excellence for Commercialization and Research at UBC, to develop muon geotomography, a new mineral exploration technology. Muon geotomography uses high energy cosmic rays within the earth to create three-dimensional images of dense ore deposits. The technology could increase the success of exploration while at the same time reducing costs and environmental impacts. Douglas recently received proof-of-concept funding from Western Economic Diversification to advance his research.

The federal granting councils have been foundational to Canada's innovation ecosystem; the centres above are two clear beneficiaries. Importantly, the granting councils are instrumental to individual researchers pursuing basic research, individuals who are expanding the foundation of our fundamental knowledge of our world. Researchers like Brett Finlay. In October 2010 Minister Aglukkaq announced \$2.5 million in funding from the Canadian Institutes of Health Research for research into how micro-organisms affect human health. Finlay, a professor of microbiology at UBC's Michael Smith Laboratories, is investigating the impact intestinal microbes have on the immune system and their potential connection to asthma. Funding of basic research in emerging fields such as microbiomics is important for the health of Canadians and others around the world. As UBC Vice President Research and International John Hepburn notes, "We are surrounded by microbes and yet we know relatively little about them." Brett aims to change that with help from CIHR.

Federal research funding is integral to the government's vision for Canada to become an innovation nation. Striking the right balance is key. In a recent report, European entrepreneur and member of the Advisory Board for the UK's Council for Science and Technology, Herman Hauser, highlights that successful Technology and Innovation Clusters (TICs) need a combination of core (or government) funding, research grants and contracts, and contracts with the private sector. Notably, Hauser points out that longer term core funding is integral for a TIC's "strategic, high-risk research," "competence development" and the "acquisition and maintenance of large-scale facilities and specialist equipment."

An Opportunity to Lead

Over the past several years a series of reports seeking to address the productivity gap in Canada has acknowledged that Canada's private sector R&D activity lags far behind that of many of our international competitors. But where the private sector has lagged, Canada's public research universities are leading, in partnership with the federal government. A recent UNESCO report recognized that in the absence of robust private R&D investments, public research universities have filled a void: "the higher education research sector has come to be seen as a surrogate for industrial R&D in Canada."

Although the *State of the Nation: 2010* report highlights the significant challenges facing Canadian innovation, it also provides evidence of Canada's strengths — indicating that the country is well-placed in the global market of talent and ideas. The report notes that Canadian talent and Canada's funding for R&D and higher education research continue to rank near the top among OECD competitors; young

Canadians are excelling in science, math and reading; Canada is attracting international talent, and innovative excellence can be found in virtually every region and economic sector.

As our traditional competitors, the US and the UK, struggle economically, Canada's higher education research sector is positioned as a strategic asset ready to engage partners in China, India, and Brazil.

While in many respects still a global leader in higher education, cracks have begun to appear in the United States' university system. A January 2011 *New York Times* article reports a "profound shift" at American public universities, "... in state after state, tuition and class size are rising, jobs are being eliminated, maintenance is being deferred and the number of non-resident students, who pay higher tuition, is increasing." While major federal investments in research funding are still promised in the US, the receptor capacity of state-funded universities is being reduced.

A recent study by the Institute for Higher Education Leadership and Policy finds, "California's higher education system is in decline, with fewer students able to afford college, falling college participation rates and dwindling state support." The report goes on to suggest that the State of California, has "lost status as a leader in such areas as affordability, preparation of high school graduates, college-going rates and investment in higher education."

The budgetary situation in the United Kingdom is equally grim. This coupled with a major retraction of available student visas is threatening the country's historical international reputation as an higher education destination.

Earlier this year *the Guardian* reported scientific research at UK universities would be constrained as cuts to facility and equipment budgets would lower overall output and quality. Research councils in the UK were also cut severely; capital budgets were cut by half last year, and science infrastructure spending will continue to fall over four years. While these reductions are partially offset by European Union research investments, like in the US, the capacity of UK universities to exploit investments is being undermined.

In July 2011 the BBC reported that the Engineering and Physical Sciences Research Council is cutting the number of PhDs it funds in 2011-12 by over one third, with over 1000 places lost. The Economic and Social Research Council will reduce PhD places by almost ten per cent over the same period, while the Arts and Humanities Research Council is cutting funded master's courses by nearly 20 per cent. The Biotechnology and Biological Sciences Research Council will also reduce PhD places, and the National Environmental Research Council will end funding for all of its 285 master's places.

While traditional competitor jurisdictions are struggling, other jurisdictions continue their ascendancy presenting new and exciting opportunities for strategic research collaboration and talent exchange. The point is not to gloat or to adopt an "I'm all right, Jack" mentality in Canada — one should never count out our principal competitors. Rather, given some good policy and strong investments in Canada we are enviably positioned to take advantage of relative strength in the short term.

A February 1, 2011 article in *Nature* magazine discusses China's long term science vision, Innovation 2020. The ambitious focus for applied research aims to secure China's future as an economic superpower and will "place a new emphasis on translating the research into technologies that can power economic growth and address pressing national needs such as clean energy."

Another *Nature* article noted the Chinese government's decision to provide double-digit percentage increase to science in contrast to the cuts seen in the US and UK. "The central government plans to spend 194.4 billion yuan

(US\$29.6 billion) on science and technology in 2011, a 12.5% rise on the previous year."

The *UNESCO Science Report 2010* states "Over the past decade, China has not only multiplied gross domestic expenditure on R&D (GERD) by a factor of six but also improved its capacity for generating intellectual property rights (IPRs) via scientific papers and patents." The report continues, "In less than a decade, China has become one of the world's biggest spenders on R&D. Between 2000 and 2008, GERD leapt from 89.6 billion yuan (US\$ 10.8 billion) to 461.6 billion yuan (US\$ 66.5 billion), at an average annual growth rate of 22.8%." Though still behind competitors like the US in aggregate, the momentum of growth in China is breathtaking.

The rate of growth in India is equally notable. A May 2011 *University World News* article notes that the Indian government plans to double its spending on science and technology, research and development, and increase the budget for more scholarships and post-doctoral fellowships.

While India has not yet achieved the same quantifiable results as China, the country shares an extraordinary ambition. UNESCO reports that the Indian government intends to raise the gross enrolment ratio from 11% in 2007 to about 15% by 2012 and 21% by 2017 (or 21 million students). To achieve the target by 2012 enrolment in universities and colleges will need to grow by an annual rate of 8.9%. To this end the Indian government is planning to establish 30 new central universities of which 14 aim at being world-class institutions or "innovation universities." In parallel, the government is in the process of doubling the number of Indian Institutes of Technology to 16 and establishing 10 new National Institutes of Technology, three Indian Institutes of Science Education and Research, and 20 Indian Institutes of Information Technology to improve engineering education.

Brazil, too, has high ambitions. A world leader in research on tropical medicine, bioenergy and plant biology, Brazil is short of established scientists. Sao Paulo, Brazil's richest state, is leading the effort to find them. Its constitution guarantees the state research foundation, FAPESP, 1% of the state government's tax revenue (which amounted to \$450 million in 2010 and is in addition to money from the federal government). Earlier this year Brazilian President Dilma Rousseff announced university scholarships for 75,000 Brazilian students to study abroad, with an additional 25,000 funded by the private sector. Both government and the private sector have stressed the need for a new generation of top-flight researchers to meet the economy's needs.

Thanks to stable and strategic investments by the Government of Canada, while other traditional leaders are facing huge challenges, Canada is increasingly seen as a talent destination. The development of complementary policies to ensure that Canada's S&T strategy permeates all

aspects of government activity, such as the recent International Higher Education Strategy and the MOU on Higher Education with India, is paying dividends. A July 18 *New York Times* article highlighted the surge of Indian students coming to Canada to pursue higher education. According to the *Times*, the number of Canadian student visas issued in India almost quadrupled in two short years, from 3,152 in 2008 to more than 12,000 in 2010. The article quotes students who note that Canada offers greater job opportunities than the United States and Britain following graduation. The story also notes “warming political ties” which have raised Canada’s profile in India highlighted by the recent MOU between Prime Ministers Harper and Singh, the university presidents’ trip to India in November, and programs like Mitacs Globalink, based at UBC. The positive experience of elite students while in Canada is said to have been “a huge image booster.”

Talented young people are no longer limited to their local post secondary institution. And that international collaboration produces remarkable results. Of the many examples of successful spinoff companies that started at UBC, the story of D-Wave Systems Inc. and founder Geordie Rose illustrates the importance of international talent and the importance of basic research. Geordie came to UBC in the mid 1990s to pursue a PhD in theoretical physics, a field of study with no obvious applications. Rose became increasingly interested in contributing something tangible through his work and set his sights on building a quantum computer. While at UBC, Geordie met fellow UBC student and Russian expatriate Alexandre Zagoskin, who had come to UBC after studying in Sweden. Together, with BC-based venture capitalist Haig Farris, they co-founded D-Wave in 1999. The company grew and attracted investors and in 2003 D-Wave became the first firm in the world to secure venture capital funding to pursue the goal of building a quantum computer. In 2007, D-Wave demonstrated the world’s first commercially viable quantum computer, using a new type of computer processor. Major advances continue today at D-Wave using some of the most complex superconduction circuits ever built. And in May of this year, D-Wave

announced a multi-million dollar contract in which it had sold a quantum computing system to Lockheed Martin Corporation.

More and more students are pursuing an international experience as part of their overall education. In creating an International Higher Education Strategy, Budget 2011 recognized this new opportunity. The same is true for researchers. Researchers are no longer just walking down the hall to collaborate, they are crossing the globe. Today, meaningful research will more often than not include international collaborators. Already, Canadian researchers co-publish more than half their results with international collaborators.

Canada’s record of international collaboration is very strong, thanks in part to forward thinking programs in Departments and agencies. Two Granting Councils, CIHR and NSERC, have programs explicitly designed to promote research collaboration, the National Research Council has many bilateral programs and the government’s recent talent awards, the Bantings and the Vaniers, are designed to attract international students. Budget 2011 also announced new funding for a Canada-India research centre.

While numerous programs exist, Canada lacks an effective and coordinated approach in promoting international research connections. Despite laudable efforts and notable funding, structural fragmentation has impeded our ability to fully leverage funding and realize strategic returns.

Government has demonstrated a desire to address this fragmentation. The recent trade mission to India in which various memoranda of understanding were signed, including an MOU on cooperation in Higher Education, is a step in the right direction. Integrating research and education collaboration as part of Canada’s overall international strategy is key to ensuring Canada is effectively and strategically engaged abroad. Doing so will not only improve returns on investments to date, but will further advance the federal government’s S&T strategy and position our country as an innovation destination and leader.

Conclusion

In the Throne Speech, the Governor General called on Canadians to come together in working towards a smarter, more caring nation. To that end, government has underscored the importance of a highly skilled and flexible workforce, promoting and encouraging R&D in both the private sector and in universities while emphasising the importance of traditional strengths like our natural resource-based industries.

The UNESCO 2010 report notes that Canada has exhibited public policy leadership and that our innovative path shows considerable promise. We encourage government to continue to build on the remarkable momentum that it has built to date. As in no other time, Canada has the opportunity to show leadership and forge new partnerships our competitors simply cannot match. Our moment is now.



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THE UNIVERSITY OF BRITISH COLUMBIA

Submission to the Expert Review Panel on Research and Development

February 18, 2011

As one of Canada's leading research institutions and a recognized leader in translating this research to the marketplace, the University of British Columbia (UBC) welcomes the opportunity to contribute to this much needed dialogue on our national innovation ecosystem. Three themes dominate this submission. First, talent is the fundamental driver of innovation. We encourage all partners fostering the innovation ecosystem – industry, government and teaching and research institutions – to cultivate this talent and encourage greater mobility amongst partners. Second, we strongly believe that closer cooperation among the partners is essential. Forging strategic partnerships is crucial to Canada's ability to sustaining our prosperity and ensuring Canadian competitiveness internationally. Lastly, it is our belief that government, indeed all Canadian decision-makers, should be guided by one principle when allocating funding to foster innovation: support excellence.

Introduction

By striking an expert panel to review business R&D, the federal government has sparked a national dialogue, asking Canadians for their views on how best to cultivate and sustain an internationally competitive innovation ecosystem. This long overdue review is a credit to the Government of Canada.

The Expert Panel contemplates a compelling matrix of inputs that contribute to a healthy innovation ecosystem. As a university, we believe that universities play a role in each of those inputs. But to us, the unifying agent within the ecosystem is talent.

The early twentieth century economist Joseph Schumpeter conceptualized innovation as a perpetual cycle of creative destruction. According to Schumpeter, innovation "incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one". Central to this cycle – to innovation – is the individual, "the agent of innovation" and the "pivot on which everything turns".

Talented individuals are the source of ideas and knowledge.

Talented individuals instruct and recruit new talent.

Talented individuals are at the core of networks, collaborations and linkages.

And, talented individuals have the foresight and the entrepreneurial spirit to facilitate the needed capital to translate new ideas and knowledge to the marketplace.

The talent cultivated at an institution like UBC can be found in communities, industries and governments throughout our province, the country, and indeed the world. This talent is generating new knowledge, is receptive to new – big – ideas, and is quick to take those ideas and translate them to meet their own environmental and community needs. Moreover, observers and participants within the innovation ecosystem recognize that talent, particularly those individuals with advanced degrees, is integral to Canada's future prosperity and global success.

One recent example comes from Google Inc., whose chief financial officer is making his own recruitment pitches in Canada. In a February 15, 2011 *Globe and Mail* article Canadian-expat Patrick Pichette urges, "Please tell Canadians to send their CVs in. We're not really tied by a quota – anybody who's a great fit, we'll hire them." Canadian talent is indeed in high demand: according to Pichette, Google increased its Canadian work force – approximately 200 individuals today – by 50 per cent last year, and he expects to increase it by at least that much again this year

Like any ecosystem, innovation cannot be discussed in narrow terms. This is particularly true when conceptualizing innovation through the lens of talent. From primary education to tax

incentives, from social well-being to international trade, a host of factors beyond the scope of this review play a role in cultivating this ecosystem. As the Public Policy Forum noted in its 2010 report, *Accelerating Social Innovation: Smart Ideas for Canada*, a more holistic view of innovation that acknowledges both economic and social development is needed. We hope, then, that this dialogue is only the beginning of what will be a deep and continuing engagement with Canadians – across all sectors.

Intellectual Property: Debunking the Myth

In our own consultation, the issue of Intellectual Property (IP) has been raised repeatedly, with comments reflecting a range of views on the ideal IP model for Canada. Though we are reluctant to raise the issue before this forum, as a Canadian pioneer in University-Industry relations and technology transfer, we feel compelled to tackle some of the misconceptions that have been raised.

To foster a stronger the relationship between universities and industry, we need to consider the multiplicity of channels across which this occurs. These channels include support of undergraduate project labs, co-ops, interns, faculty consulting, technology licensing, short courses, continuing professional development, access to facilities/expertise and collaborative research. In all cases, the arrangements must be sensitive to the business realities of the companies, common practices in the sector, and the needs of the university participants for academic integrity and progression. Often in the context of this myriad of relationship options, the question of treatment of IP and related issues of confidentiality, publication and indemnification arise. There is no one single policy that can deal with these issues across the multiplicity of channels and sectors.

At UBC, we have embraced the complexity and variation of relations with industry.

- For many channels such as student project labs, faculty consulting, co-ops and internships, the intellectual property vests solely with the sponsoring company with only those rights retained that allow the student to meet his/her academic requirements.
- For technologies, we have activated channels that range from global access licensing for neglected diseases, to open source licensing, to technology pooling or exclusive licensing. The choice of the appropriate channel is made in consultation with the inventors with the intent of maximizing the impact of technology rather than the potential income from licensing. Often, these alternative channels are activated in collaboration with other academic institutions thereby standardizing the approach for industry clients.
- For collaborative research projects, IP may be assigned or licensed with the decision resting with the academics involved.

- For entrepreneurs starting a business based on know-how and market opportunity (similar to Mike Lazaridis when he started Research-in-Motion), the IP is owned solely by the creators.

At the heart of this issue, is the standardization-flexibility paradox. While many demand a single IP policy across the country and a standard agreement, this flies in the face of the demonstrated need for flexibility and the need to realize the legitimate differences that exist based on the nature of the relationship, sector norms, and academic needs. A scan of other jurisdictions and institutions confirms this. Stanford, the Massachusetts Institute of Technology (MIT), and Israeli institutions have very different IP regimes and yet all are recognized as extremely successful.

Simply put, one size does not fit all.

SR&EDs and other Incentives

In preparing for this submission, UBC consulted widely with research and private sector partners. Through that consultation we heard a wide range of views on the SR&ED program. What has been consistent is the call for greater rigour to the evaluation process for SR&ED credits, either through peer review or a market driven mechanism, and the application of more robust performance metrics to determine not only initial qualification for SR&ED but ongoing qualification for the tax credits.

We appreciate that an in-depth review of the SR&ED program goes beyond the scope of this review. Before risking unintended consequences in making changes to the existing program we suggest that government undertake a thorough review of this specific program.

Notwithstanding this caveat, this submission does make recommendations predicated on the possibility of redirecting funding from the program to other areas.

Recommendation 1: We suggest that some of the SR&ED funding be redirected into a capital fund that will be used to match private sector risk capital investing in emerging technology companies. This would serve the purpose of strengthening the pool of capital available to these high-risk ventures, adding value and increasing the likelihood of success.

One of the difficulties facing Canadian innovators is the lack of risk capital for small and medium enterprises (SMEs). According to Gregory Smith, President of CVCA – Canada’s Venture Capital & Private Equity Association:

Fundraising continues to be a major challenge facing the venture capital industry. Unless the current situation is reversed it will become increasingly difficult for high-growth firms to secure the capital they require to grow, and Canada will lose out on development of the innovative, highly-productive economy that is the basic pre-condition for sustainable job creation.

Because of the size of our economy and the dominance of SMEs in the Canadian economy, we suggest that government can and

should play a role in supporting venture capital by redirecting a portion of SR&ED funding to capital investing. Admittedly, doing so will require public officials to accept a degree of risk hitherto unknown in government. But we feel allowing for a degree of risk is precisely what is needed.

Government capital would be invested as a debenture, with no claim to business ownership. As the private investor would carry the full risk (and stand to make the full gain), a market review of the company would be undertaken, satisfying the need for a form of peer review of the awarding of government funds. If the company is successful, the government investment would be repaid with some small gain, while the private investors would gain the full increase in company value. The initial investment would have to be led by the private partner, followed by the proposed government match based on strict criteria.

Recommendation 2: Successful innovation jurisdictions (such as Israel and Finland) offer both indirect and direct incentives in support of Business Expenditures for R&D – with the strongest results often coming from directly supported sectors. We encourage government to strike a better balance between direct and indirect support of innovation, applying rigorous review and performance metrics when allocating either.

Noting that Canadian businesses rely more on the higher education sector than businesses in other major OECD countries for R&D, the recent Centre for the Study of Living Standards (CSLS) report, “Government Policies to Encourage University-Business Research Collaboration in Canada: Lessons from the US, the UK and Australia” encourages government to consider providing greater direct funding of research:

The federal government should continue to provide direct funding to encourage U-B (university-business) research collaboration at least up to current levels rather than enriching the existing Scientific Research and Experiment Development (SR&ED) tax credit specifically to incent businesses to allocate a higher proportion of their R&D spending to university research.

In comparison to other OECD jurisdictions, direct support of business R&D in Canada is quite low. In the United States and the United Kingdom, for example, government provides more than 50 percent of business R&D funding support through direct funding programs. As government considers an appropriate balance, we encourage government to consider models, such as the Small Business Innovation Research program in the United States (SBIR), that might be replicated in Canada.

Recommendation 3: While the SR&ED program supports SMEs who undertake research and development, translating this R&D to the market remains a challenge. As government analyzes the program further, consideration should be given to providing networking and mentoring opportunities in support of innovation-based SMEs.

As articulated in a separate submission by Canada’s fifteen leading research universities, direct support programs like the National Research Council’s Industrial Research Assistance Program (IRAP) work. Tailored to Canada’s SME-dominated

business landscape, the program supports almost 10,000 SMEs annually and provides innovative ideas and approaches in real time. Based on a 2009 report on a survey of participating SMEs, IRAP was responsible for 35% of all IP, 16% of revenues generated by patents and 23% of revenues generated by trademark, copyrights and confidentiality agreements.

We encourage government to consider reallocating SR&ED funding to this program. In addition, we encourage government to streamline the program; move to a model with multiple calls for proposals throughout the year and a peer review process for selection; allow for direct regional participation in sectors of interest; and allow for a broader use of the funding to include access to research universities, fourth pillar facilities, faculty consulting, HQP exchanges, and services.

And while we have not explored this fully, to further support and incent university-industry collaboration the panel may wish to investigate the creation of a new system that is based on overall university funding by the Canadian Institutes of Health Research (CIHR) and the Natural Sciences and Engineering Research Council (NSERC). One might consider providing a “top-up” of roughly 40 percent that is evaluated against defined metrics. Metrics of success might include the traditional patents and licences but should be extended to evaluate talent transfer into industry, the creation of programs to support entrepreneurship, and research graduate student enrolment increases – all strong inputs of innovation. Funding would be subject to rigorous review and based on criteria of excellence.

This “top-up” should not be taken from core granting council operating support, as the panel acknowledges the government’s unique role in providing that support. Instead, we could look to re-profiling money currently used in some industry-facing programs that are not producing results, and possibly to a modest reassignment of some of the SR&ED resources.

Mobilizing Talent

This submission stresses the importance of talent in the innovation ecosystem – the key element which drives the inputs contemplated in the Consultation Paper and the unifying agent that interfaces amongst those inputs. That interface is crucial and we encourage government, more broadly, to consider programs that cultivate and attract the right talent.

Recommendation 4: As a sector, research universities need to provide more entrepreneurship programs for university students in Canada. Universities like UBC are making great strides in doing just that and we look forward to working with government and with other sectors to identify mechanisms to expand these programs at institutions across the country.

Committed to cultivating more outwardly focused and networked talent, we at UBC are looking at Stanford University and MIT for possible programmatic models to replicate.

Stanford’s Entrepreneurial Network is a consortium of 14 entrepreneurship-related organizations across campus that conduct research, teach and/or provide outreach services. Stanford also coordinates educational and networking events for

the entire entrepreneurship community, hosts an annual Entrepreneurship Week celebration, and offers “Coaches-on-Call” office hours during which students can meet with service industry professionals. The University also has a student run club that collects information and provides a “start-up roadmap” for entrepreneurs.

At MIT, the entrepreneurial environment the school has fostered over the last century has created a virtuous cycle, attracting entrepreneurship-inclined students, staff, and faculty, and further fostering an environment of entrepreneurialism. The MIT Enterprise Forum builds connections between technology entrepreneurs and the communities in which they reside, and produces extensive educational programs about entrepreneurship through a network of twenty-four chapters. Since its beginning, the Forum has nurtured almost 1,400 young companies across the United States. The MIT Entrepreneurship Center builds networks involving the student body, alumni, entrepreneurs and employees at MIT. More than 1,600 students attend entrepreneurship courses annually. Emphasis is put on recruiting students from technical faculties to exploit the synergism between an economic/business approach and a technical approach.

UBC is learning from these models as we aim to provide student-entrepreneurs with the support they need to succeed. For example, *entrepreneurship@UBC* is designed to help students access the people, the courses, the mentorship and the funding that would help to make their venture successful. Financial support is available from the *entrepreneurship@UBC* Fund, a fund undertaken in partnership with the BC Innovation Council, UBC alumni, and the university. UBC’s “UILO Start-up Services Voucher” also allows students and other members of the UBC community to apply for up to \$5,000 in services from the campus’s University-Industry Liaison Office. Programs such as the Engineering Co-op Program provide benefits including access to an industry mentor and access to physical space on the UBC campus.

UBC also provides student-entrepreneurs with opportunities beyond our borders. In August 2010, at the successful Silicon Valley based incubator Plug and Play Tech Center, six UBC entrepreneur-founded companies (three founded by students currently enrolled at UBC and three founded by recent UBC alumni) profiled their business venture in front of a panel of venture capitalists and distinguished UBC alumni. As a result of the visit, one of the companies, Clinicbook, a website similar to Open Table, garnered \$75,000 in first stage seed money, a part of which was provided by a Silicon Valley angel investor. The visit also prompted Eric Moe, a co-founder of OpenTable, to join Clinicbook’s board of advisers.

Entrepreneurship@UBC is working closely with Plug and Play to establish an internship program partnership. Through this internship, students will get access to a vibrant entrepreneurial culture, Silicon Valley venture capital funds, prospective customers, and prospective partners. The expected outcome of the partnerships is that student businesses will be able to accelerate their growth.

Recommendation 5: Providing students in all fields the opportunity to work in industry through programs such as MITACS will equip Canadian or Canada-based talent with the needed skills, experience, and awareness to enrich the innovation ecosystem. Government should consider redirecting a portion of SR&ED to expanding the MITACS initiative.

In 2006 the European Union published the report “Mobility of Researchers between academia and industry”, providing 12 practical recommendations on how academics could participate in the marketplace for innovations provided by industry. The report recalls the “magic formula” of Albert Einstein as the “classic example of a scientist who took his bright ideas somewhere where it mattered” and suggests that,

(I)f all of Europe’s research community followed his example, it would be streets ahead in the world innovation stakes; Inter-sectoral mobility works both ways, of course. The object of the exercise is to exchange expertise and experience, helping industry to become more competitive while offering researchers better employability and career prospects.

In line with this maxim, our experience has proven that the most successful innovators are those who can move seamlessly between a research-focussed environment and the private sector. A successful Network of Centres of Excellence, MITACS has re-invented itself from a network focused on mathematics research to an organization that deploys the power of mathematics through its Internship program and joint projects with industry literally across the country. To date, the MITACS-Accelerate program has been very successful in securing internship placements with industry partners. From the program’s inception in 2007 to 2010 a total of 1899 4-month Accelerate internships have taken place across Canada; of that number, nearly 15% involved students from UBC.

Serving as national headquarters for MITACS and hosting many young international scholars through the MITACS Globalink program, UBC has enjoyed a strong relationship with MITACS benefitting BC-based businesses and leading to internship training opportunities for numerous UBC graduate students.

A recent example of the program’s success is Reynald Hoskinson. Reynald, a former UBC mechanical engineering graduate student, participated in a MITACS-Accelerate sponsored placement with Recon Instruments as a postdoctoral researcher. Reynald’s research in design, simulation, prototyping and manufacturing aided in the development of Recon’s Transcend ski goggles, which use Global Positioning System satellites and a series of other sensors to deliver real-time speed, distance and performance statistics to the user on a micro LCD display embedded in the goggles.

Recon’s partnership with MITACS was a win-win scenario. The company was aided in the development of an innovative product; what’s more, the hands-on training for Reynald paid off: in April 2010 he was hired permanently by Recon through an immediate take up following his MITACS-Accelerate placement. Reynald is currently working as a Research and Development Manager at this budding Vancouver-based company.

Overcoming the Other Two Solitudes

Fostering talent exchange between industry and academia is important but will not be enough to trigger a sea-change in Canada’s innovation ecosystem or our nation’s productivity lag. Equally important is the need to foster closer collaboration among sector leaders, corporations, universities and associations. In a recent Financial Post op-ed, former Clerk of the Privy Council Kevin Lynch reiterated the need for collaboration between industry and universities, noting, “We have to break down the silos between university researchers and business managers.” Lynch echoes Red Wilson’s warning that our success, globally, depends on our ability to work collaborative nationally.

Two federally funded programs provide successful models of clustering talent and sectors – the Networks of Centres of Excellence (NCEs) and the Centres of Excellence for Commercialization and Research (CECRs).

Recommendation 6: The Networks of Centres of Excellence and the Centres of Excellence for Commercialization and Research are proving to be a success. However, it is unlikely that any of the CECRs will fully transition from being government supported to fully financial independent within the prescribed five year period. We encourage government to create a process for CECRs to compete for an extension of funding.

Out of the 22 CECRs awarded to date, UBC houses or is partnered with six. CECRs are unique partnerships, connecting excellent research with industrial know-how and strategic investment, are on their way to tackling commercializing problems. Although it is early to speak of their success, advances can already be attributed. The UBC-based Centre for Drug Research and Development (CDRD), for example, has become a node for national and international collaborations with other similar entities. CDRD has attracted substantial financial contributions to both itself and the institutions with which it is affiliated. Financial contributors such as Pfizer and Johnson & Johnson are interested in CDRD’s single point of access, professional project management and reporting, and leverage opportunities. In addition, CDRD’s training program has already brought in more than 60 highly qualified people at the graduate and post-graduate level.

The challenge with the CECR program is timing. For many, the five year period is simply too brief to fully transition from government funding to financial viability. We encourage government to consider extension through a robust review process against objectives at the end of the first five years, with expectation that a clear sustainable business model be developed. A further five years of funding will be critical to achieve sustainability.

UBC also hosts a number of NCEs. These virtual clusters bring together academics and industry partners from around the country to advance specific areas of research and application.

The Graphics, Animation and New Media (GRAND) network is a joint academic collaboration between UBC, Simon Fraser University, Emily Carr University of Art + Design and the British Columbia Institute of Technology. The network will enable research collaborators to address social network and new media

issues and explore opportunities in a fast-growing sector. Companies including Pixar, Electronic Arts, and Intel have indicated their support of GRAND and working relationships continue to develop.

PrioNet Canada, another UBC-hosted NCE, is leading the generation, application and commercialization of mathematical tools and methodologies to help solve prion diseases: untreatable, transmissible, and fatal degenerative diseases of both humans and animals. With more than 80 government, industry and academic partner agencies, PrioNet capitalizes on strengths in fundamental, applied, and social research to help solve the food, health safety, and socioeconomic problems associated with prion diseases such as bovine spongiform encephalopathy, Creutzfeldt-Jakob disease in humans, and chronic wasting disease in deer and elk.

Recommendation 7: University campuses provide a powerful opportunity to explore, test and demonstrate solutions. As a result, they can be "living laboratories" in which students, faculty and staff work together to discover, learn and take action. Demonstration projects create collaborative research and development programs of great value to industry and also act as a means of market development. We encourage government either to support these projects within the SR&ED program or to redirect funding from the SR&ED program to support these worthy partnerships.

UBC is unique in Canada, housing a large, internationally respected academy, diverse communities on- and off-campus, and a sophisticated operational infrastructure that runs the equivalent of a small city. The university believes that our campuses provide a powerful opportunity to explore, test and demonstrate sustainability solutions - indeed, "living laboratories" in which students, faculty and staff work together to discover, learn and take action.

Our commitment to sustainability is a good example. The concept of Campus as a Living Lab brings UBC's academic mission into collaboration with its world-class operational sustainability activities and connects with our partners outside the university.

The establishment of a biomass combined heat and power (CHP) system on the UBC Vancouver campus is a good example. In August 2010 UBC announced a partnership with Nexterra Systems Corp, a leading supplier of biomass gasification systems, to supply and install a biomass CHP system. The first of its kind in North America, this installation follows three years of collaboration between Nexterra and GE's Jenbacher gas engine division. The new CHP system will convert urban wood waste into clean burning, combustible synthetic gas or "syngas" using to produce both heat and fuel a GE internal combustion engine. Waste heat will be recovered from the engine to produce 9,000 lbs/hour of low pressure steam. Emissions from the system will be well below local air emissions limits and the system will have a conversion efficiency of more than 65%.

While a unique blend of academic and residential, we believe other universities and industries can benefit from similar, on site collaboration that is worthy of government encouragement.

Conclusion

The federal government has taken an important step in addressing Canada's innovation and productivity challenges. In a shared effort to cultivate a flourishing innovation ecosystem partners are engaging and challenging one another like never before.

To that end, we encourage government to continue this dialogue and expand it to encompass all sectors that shape the innovation ecosystem.

We have outlined what we feel our important and productive steps in improving innovation in Canada. These recommendations urge us to strive for excellence, to work together toward a common goal, and equip our Canada-based talent with the skills, resources, networks and know-how to sustain our well being today and secure our prosperity tomorrow

The University of British Columbia is committed to our national innovation ecosystem and is contributing in many ways. We can do more, and we will.