

SENATE



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Mobilizing Science and Technology
to Canada's Advantage

**Sixteenth Report of the Standing Senate Committee on
Social Affairs, Science and Technology**

Chair
The Honourable Art Eggleton, P.C.

Deputy Chair
The Honourable Wilbert J. Keon

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39th Parliament – 2nd Session

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ORDER OF REFERENCE

Extract from the *Journals of the Senate* of Thursday, November 29, 2007.

The Honourable Senator Eggleton, P.C. moved, seconded by the Honourable Senator Fox, P.C.:

That the Standing Senate Committee on Social Affairs, Science and Technology be authorized to examine issues relating to the federal government's new Science and Technology (S&T) Strategy - *Mobilizing Science and Technology to Canada's Advantage.*"

The question being put on the motion, it was adopted.

MEMBERSHIP

The following Senators have participated in the study on the inquiry on the issues relating to the federal government's new Science and Technology (S&T) Strategy - *Mobilizing Science and Technology to Canada's Advantage*" of the Standing Senate Committee on Social Affairs, Science and Technology:

The Honourable, Art Eggleton, P.C., Chair of the Committee

The Honourable, Wilbert Joseph Keon, Deputy Chair of the Committee

The Honourable Senators:

Bert Brown

Catherine S. Callbeck

Andrée Champagne, P.C.

Ethel M. Cochrane

Joan Cook

Jane Cordy

Joyce Fairbairn, P.C.

Jim Munson

Lucie Pépin

Marilyn Trenholme Counsell

Ex-officio members of the Committee:

The Honourable Senators: Céline Hervieux-Payette, P.C. or (Claudette Tardif) and Marjory LeBreton, P.C. or (Gérald J. Comeau)

INTRODUCTION

Science, research and development underpin Canada's position in the knowledge economy, where strength depends on capacity to innovate and to stay ahead of the technological curve. Over the past decade, federal government policies have aimed to foster world-class research programs in universities and research institutes and to encourage industrial investment in research and development (R&D). The 2007 science and technology (S&T) strategy, *Mobilizing Science and Technology to Canada's Advantage*¹, reiterates these goals, and describes the direction of government investment in science and technology for the coming years.

Canada excels in certain areas of science and technology, as described in the Council of Canadian Academies report on *The State of Science and Technology in Canada*², which found environmental sciences and technology, natural resources and energy, health and related life sciences, and information and communications technologies to be areas of particular strength. The strategy aims to focus resources on these sectors where Canada is world-leading.

Canada lags behind other OECD countries in terms of the Gross Expenditure on R&D (GERD) to GDP ratio, mainly due to low Business Expenditure on R&D (BERD). The new strategy focuses on increasing business R&D and introduces a number of measures to encourage increased investment, including the creation of business led Networks of Centres of Excellence and centres to promote commercialization, and through the Scientific Research and Experimental Development tax credit. Canada leads the G7 in the Higher Education Expenditure on R&D (HERD) to GDP ratio, and the strategy commits to maintaining this, as well as continuing investment in scholarships and fellowships, while ensuring accountability and value for money from the research councils.

¹ Industry Canada, *Mobilizing Science and Technology to Canada's Advantage*, Ottawa, May 2007, [http://www.ic.gc.ca/cmb/welcomeic.nsf/vRTF/PublicationST/\\$file/S&Tstrategy.pdf](http://www.ic.gc.ca/cmb/welcomeic.nsf/vRTF/PublicationST/$file/S&Tstrategy.pdf).

ISSUES RAISED

The Committee received evidence from government, industry and higher education representatives on the challenges and opportunities presented by the S&T strategy. The Minister of Industry also appeared. All witnesses responded positively to the strategy, but a number of key issues were identified as crucial to ensuring its success.

1. Breadth and scope of research

The Science and Technology Strategy identifies four areas where Canadian research is world-leading, and where the government wants to focus the research effort: environmental science and technology, natural resources and energy, health and related life sciences, and information and communication technologies. The Committee heard that an intensive effort to direct attention to world-leading research is welcomed to keep Canada on the cutting edge, and that funding bodies, both granting councils and foundations, have adjusted to meet these new objectives. However, Canada has scientific strengths outside these priorities, for example the Canadarm 2 and Dextre on the International Space Station demonstrate our outstanding R&D in robotics research, and our depth and strength in chemistry research is exemplified by Nobel Prize winner John Polanyi. The Committee was concerned that targeting new science spending towards priorities could hamper our ability to support excellent science across all sectors and grow our entire science base.

The need to find a balance between applied and basic research was highlighted. Whilst funds for commercialization activities are welcomed, basic research should also be supported, and often it is basic research which leads to the next big leap forward. The Partnership Group for Science and Engineering and the Canada Foundation for Innovation told the Committee that there is a need to ensure that a broad range of research continues to be funded in order to ensure Canada has the opportunity to be at the forefront of the next technological advances.

² Council of Canadian Academies, *The State of Science and Technology in Canada*, Ottawa, September 2006, http://www.scienceadvice.ca/documents/The_State_of_Science_and_Technology_in_Canada.pdf.

The Committee understands the benefit of a focused approach to funding S&T, but this risks allowing Canada to lose competitiveness in other research areas, and the Committee recommends that:

Recommendation 1:

Research grants be allocated on the basis of excellence in any discipline, as determined by peer review, and that the Government of Canada not limit additional funding in S&T to the four priority areas of environmental S&T, natural resources and energy, health and related life sciences and information and communication technologies.

2. Venture capital funding

Problems in access to venture capital funding for Canadian firms was highlighted as a major problem in the innovation chain, and was of considerable concern to the Committee, who raised the need for an intensive dialogue between industry, government and academia to address the challenges faced by private sector research. Canada's deficit in available venture capital funds compared with our competitors, particularly the United States, results in many small companies either failing, or being sold to foreign investors. In addition to a simple need for more money, better communication was identified as a priority. Professors and scientists need to learn more about commercialization and entrepreneurship, and business leaders should become more familiar with the work being conducted in research institutions.

The S&T strategy focuses attention on commercialization activities, and the government has introduced initiatives to encourage the first stage of commercialization – the transfer of research ideas and processes into the private sector. However, the Committee felt that to facilitate the full process of commercialization, and ensure ideas from Canadian laboratories are able to become Canadian products in Canadian companies, the government also needs to take steps to increase the availability of venture capital funds in all sectors of science and technology.

The Committee views access to venture capital as one of the biggest challenges facing Canadian science, a “missing link” in Canadian innovation. To complement the

initiatives in the S&T strategy concerned with the commercialization of research, and to nurture and develop science-based Canadian companies, the Committee recommends that:

Recommendation 2:

The Government of Canada takes all possible steps to increase the availability of venture capital funds to all sectors of science and technology.

3. Scientific Research and Experimental Development (SR&ED) Tax Credit

The SR&ED program is a federal tax incentive program and the largest single source of federal government support for industrial research and development, providing over \$3 billion in tax assistance in 2006. Claims can be made for SR&ED tax credits for expenditures such as wages, materials, machinery, equipment, some overhead, and contracts. Generally, a Canadian Controlled Private Corporation (CCPC) can earn a credit of 35% up to the first \$3 million of qualified expenditures for SR&ED carried out in Canada.

BIOTECCanada told the Committee the limit on expenditures should be raised to \$10 million, and that any corporations conducting research in Canada should be eligible for the tax credit, not just CCPCs, so that if a Canadian company is taken over by a foreign company there would still be an incentive to retain the R&D activities in Canada.

In the 2008 budget, the limit on qualified expenditures was increased to \$3 million, which falls short of the \$10 million suggested to the Committee by witnesses. The budget did not alter the restrictions limiting the SR&ED credit to CCPCs.

The Committee recommends that:

Recommendation 3:

The limit on qualified expenditures for the SR&ED tax credit be raised to \$10 million.

Recommendation 4:

The restriction limiting the 35% credit to Canadian Controlled Private Corporations be lifted, as long as foreign companies perform their R&D activities in Canada.

4. Intellectual property

Intellectual property (IP) includes copyrights, trademarks and patents. In scientific research it generally refers to patented discoveries and procedures. In Canada, each university has its own rules as to whether universities or individual researchers own IP, with many having some kind of sharing arrangement. BIOTECCanada testified that this can be confusing and that the Government of Canada should work with university technology transfer officers to standardize and clarify IP ownership for government funded research projects out of universities and other research institutions, and that a regime similar to the United States' Bayh-Dole Act³ would help the Canadian biotechnology sector. The Canadian Association of Research Libraries recommended that copyright legislation must fully recognize the rights of the user, and should ensure that students and teachers have access to knowledge and innovation needed to gain competitiveness.

The Committee recommends that:

Recommendation 5:

The Government of Canada work with the provinces and academic institutions to clarify and standardise intellectual property regimes for research performed in higher education.

5. Indirect Costs of Research

The federal research councils are a major source of funding for the direct costs of research carried out in Canadian universities and research hospitals. Other sources include foundations, provincial governments, charities and industry. As well as direct costs, there are a range of indirect costs associated with performing research. These include operating and maintaining research laboratories, complying with safety requirements, managing intellectual property and the research process. The Association of Universities and Colleges Canada, and the Canadian Association of Research Libraries

³ The Bayh-Dole Act or University and Small Business Patent Procedures Act is a significant piece of intellectual property legislation, enacted in the United States in 1980. It gives US universities, small businesses and non-profits intellectual property control of their inventions that resulted from federal government-funded research. The act is named after its two sponsors, senators Birch Bayh of Indiana and Bob Dole of Kansas.

have recommended that these costs be reimbursed at a level of 40% of the amount of direct research grants received. The Partnership Group for Science and Engineering also suggested expanding support for indirect costs. Currently the level is approximately 25%. In the United States the level is around 50%. The three Canadian research councils jointly operate an indirect costs program, which had its budget increased by \$15 million to \$330 million in the 2008 budget.

The Committee was concerned that inadequate support of the indirect costs of research might affect the international competitiveness of Canadian universities and research institutes, and recommends that:

Recommendation 6:

Funding for the indirect costs of research be increased to an internationally competitive level of 40% of direct grants received.

6. Recruitment and retention of students and researchers

Canada's future S&T success depends on recruiting and training talented researchers. The S&T strategy includes a "People Advantage" and witnesses stressed the importance of building on the strategy to attract Canadian students into S&T, and recruit the brightest international graduate students. Canadians with a science-based education are needed to grow our research base, but also to contribute their knowledge and decision making processes to other areas of Canadian society; therefore the Committee feels that encouraging more young Canadians to study science and related subjects should be a priority. In addition, recruiting international students to study in Canada provides new ideas and perspectives and invigorates Canadian S&T. These international students may return home after their studies, creating international linkages for Canada, or may wish to stay and contribute to Canadian S&T.

The Committee heard from the research councils that Canada has many advantages in terms of quality of life for researchers but ultimately must also be prepared to provide internationally competitive scholarships, salaries and research grants to retain Canadian researchers and to attract the best in the world. The Canada Research Chairs

program, which has recruited 584 researchers to Canada since 2000⁴, was highlighted as a successful initiative, both in retaining and attracting talent.

Internationally trained research scientists, engineers, technicians and other S&T professionals make an essential contribution to Canadian S&T. The Committee understands that the sometimes slow and complicated process of the recognition of foreign credentials can be a barrier to immigrants quickly finding work in their field of expertise, and to Canada gaining the full value of their knowledge and training.

The Government of Canada also directly employs research scientists and technicians in federal government departments and both the National Research Council and the Professional Institute of the Public Service of Canada noted that improved salaries and job security are needed to ensure the recruitment and retention of the best researchers into government science.

The Committee recommends that:

Recommendation 7:

The Government of Canada, through the Research Councils, ensures that internationally competitive research grants and scholarships are available to retain Canadian students and researchers and attract the best international researchers.

Recommendation 8:

The Government of Canada work with provincial and territorial governments to simplify processes for the recognition of credentials of foreign trained researchers, engineers and technicians, so they are able to contribute their expertise to Canadian S&T.

7. Government funding of private sector research

The government of Canada funds industrial research, both through direct funding and the Scientific Research and Experimental Development tax credit. Questions surrounding the accountability of the government for funds disbursed for the public funding of private sector research were highlighted by the case of MacDonald Dettweiler and Associates' (MDA) proposed sale to US based Alliant Tech Systems. MDA received

⁴ Canada Research Chairs Program, Program Statistics, available at http://www.chairs.gc.ca/web/about/statistics_e.asp, accessed 12 February 2008.

government funds through Technology Partnerships Canada and other programs, which helped in the development of iconic Canadian projects such as the Canadarm and Radarsat 2. Although the Canadarm has already become the property of NASA, the Radarsat 2 satellite would pass into US control if the sale goes ahead, leading to concerns that the Canadian government would have lost its investment. The Minister of Industry told the Committee that under the Technology Partnerships Canada agreements with MDA, his consent would be needed for the proposed sale⁵.

The Committee recommends that:

Recommendation 9:

The Government of Canada ensure that the products of federally funded research and development activities, including equipment and intellectual property, are used for the long term benefit of Canadians. These safeguards for Canadians should remain in place even if the company receiving the federal research funds moves into foreign ownership.

Recommendation 10:

The Minister of Industry, using his discretion under the Investment Canada Act, blocks the sale of MacDonald Dettweiler and Associates to Alliant Tech Systems, so that ownership of the Radarsat 2 satellite remains in Canada.

8. Federally performed research and development

In 2005, \$2.2 billion of research was performed in federal laboratories including the National Research Council, and laboratories of science based government departments such as Agriculture Canada, Natural Resources Canada, Environment Canada and Health Canada. Some of these laboratories perform regulatory or testing functions, but others perform investigative research similar to that performed in universities. In the S&T strategy a task force was announced to identify non-regulatory federal laboratories which might benefit from alternative management structures. The task force has been formed⁶, but the report has not been made public. The Partnership

⁵ The requirement for the Minister of Industry's consent under the Technology Partnerships Canada agreements, is in addition to the consent required for the sale under the Investment Canada Act.

⁶ Treasury Board, Press Release, "Canada's New Government Announces Independent Expert Panel on Federal Laboratories," Ottawa, 13 August 2007, available at http://www.tbs-sct.gc.ca/media/nr-cp/2007/0813_e.asp

Group for Science and Engineering suggested that there should be increased support for the vital public service role of federal laboratories, and that the full implications of transferring non-regulatory laboratories need to be considered and that “Transfers could be effected in parallel with increased funding for university-based research”.

9. Science advice

Canada has experimented with a number of approaches to science advice in recent years. Some of these are no longer active, for example the Advisory Council on Science and Technology was eliminated in the 2007 S&T strategy, and the role of the National Science Advisor is being phased-out. These bodies will be replaced by the Science, Technology and Innovation Council (STIC), an external advisory board providing advice to the Minister of Industry. STIC has been asked to advise in four areas: how to focus S&T on priority sectors identified in the S&T strategy; identifying and overcoming barriers; international S&T; and commercialization. STIC will also produce an annual report card on Canadian S&T in an international context.

The Council of Canadian Academies was formed in 2005 with \$30 million over 10 years to oversee up to five science-based assessments per year on topics requested by the government. The office began work in 2006 and the first assessment commissioned, “The State of Science and Technology in Canada”, fed directly in to the formulation of the 2007 S&T strategy.

The Professional Institute of the Public Service of Canada “Calls on the government to reinstate the Office of the National Science Advisor, or establish the position of Auditor General for Science within the Office of the Auditor General of Canada”.

10. The Social Sciences

Discovery and innovation also have human, social and environmental dimensions, and the Committee was urged by the Canadian Federation for the Humanities and Social Sciences to recognise that the social sciences are an integral component of each of the four areas of research identified in the strategy: environmental sciences and technology;

natural resources and energy; health and related life sciences; and information and communication technologies.

The Networks of Centres of Excellence program no longer has any social science based networks in its main program, but stressed that social sciences are important in many of the research networks it supports, for example the Stem Cell Network where social scientists look at the ethical and legal implications of the research.

The Committee recommends that:

Recommendation 11:

The Government of Canada recognise that the social sciences are an integral component of scientific discovery, and increase funding for social science research.

11. Regional representation

The Committee was concerned by the low representation of Atlantic Canada in the distribution of the Networks of Centres of Excellence. It was pointed out that there are no networks led by Atlantic Canadian universities, and few Atlantic Canadian universities involved in the Networks. In response, the Networks of Centres of Excellence stated that the number of universities from Atlantic Canada in the program was approximately the same as the success of the region in receiving grants from the research councils. While it is recognized that the resources to lead a Centre may not sometimes reside in Atlantic Canada, every effort should be made to involve Atlantic Canada in new and existing Centres. The Minister noted that one of the new Centres for Excellence in Commercialization and Research will be located in Halifax, Nova Scotia.

The Committee recommends that:

Recommendation 12:

The Government of Canada increases the representation of Networks of Centres of Excellence in Atlantic Canada.

12. Urgency

Advances in science and technology move quickly, and witnesses stressed that, having developed the S&T strategy, now there is an urgency to implement the strategy without delay and move forward to ensure Canada retains its place as a world leader in science and technology.

CONCLUSION

The S&T strategy *Mobilizing Science and Technology to Canada's Advantage*, provides direction for the science community for the coming years. The government and the science community now need to move forward with urgency to implement the strategy in order to maintain and improve Canada's scientific competitiveness. Commercialisation is important, but the government should also recognise that scientific education and discovery is important in its own right, and has inherent value to Canadian society.

In implementing the strategy, the government should consider in particular the need to: fund research across a range of disciplines; enhance scholarship and research grants programs to attract and retain world-class students and researchers; increase funding for the indirect costs of research; and ensure that Canada has intellectual property policies, and adequate venture capital funds to allow Canadian research to be commercialised in Canada, eventually forming profitable research-performing Canadian companies.

APPENDIX 1 – WITNESS LIST

ORGANIZATION	NAME, TITLE	DATE OF APPEARANCE	ISSUE NO.
39th Parliament 2nd Session			
Association of Universities and Colleges Canada	Mr. Robert Best, Vice President, National Affairs Branch	30-01-2008	3
BIOTECCanada	Mr. Peter Benders, President and Chief Executive Officer	30-01-2008	3
Natural Science and Engineering Research Council	Suzanne Fortier, Ph.D. President	30-01-2008	3
Canada Foundation for Innovation	Dr. Eliot Phillipson, President and Chief Executive Officer	30-01-2008	3
Canadian Institute of Health Research	Pierre Chartrand, Ph.D., Acting President	30-01-2008	3
Networks of Centres of Excellence	Mr. Jean-Claude Gavrel, Associate Vice President	31-01-2008	3
National Research Council	Mr. Pierre Coulombe, President	31-01-2008	3
Industry Canada	The Honourable Jim Prentice, Minister of Industry	31-01-2008	3
Industry Canada	Mr. Richard Dicerni, Deputy Minister	31-01-2008	3
Industry Canada	Mr. Iain Stewart, Director General, Policy Branch	31-01-2008	3

APPENDIX 2 – ADDITIONAL WRITTEN SUBMISSIONS

Written submissions from:

- Association of Canadian Academic Healthcare Organizations
- Canadian Association of Research Libraries
- Canadian Federation for the Humanities and Social Sciences
- Canadian Foundation for Climate and Atmospheric Sciences
- Genome Canada
- Partnership Group for Science and Engineering
- Professional Institute of the Public Service