Scientia Canadensis
Canadian Journal of the History of Science, Technology and Medicine
Revue canadienne d'histoire des sciences, des techniques et de la médecine

Performing Strategic Science in the Public Interest: Updating the Policy Debate Regarding Government Science

Jeff Kinder and Frank Welsh

Volume 35, Number 1-2, 2012

Science in Government

URI: https://id.erudit.org/iderudit/1013984ar
DOI: https://doi.org/10.7202/1013984ar

See table of contents

Publisher(s)

CSTHA/AHSTC

ISSN

0829-2507 (print)
1918-7750 (digital)

Explore this journal

Cite this article

Kinder, J. & Welsh, F. (2012). Performing Strategic Science in the Public Interest: Updating the Policy Debate Regarding Government Science. *Scientia Canadensis*, *35*(1-2), 135–149. https://doi.org/10.7202/1013984ar

Article abstract

The performance of science and technology (S&T) activities in the federal government has long been supported as a means of advancing innovation and economic objectives as well as of addressing public policy and regulatory needs. As Canada's science and innovation system has matured, however, the federal government's relative contribution to Canada's overall performance of research and development has declined significantly—from about 30% (of total spending) in 1971 to under 9% today. Throughout this period, a dominant policy theme with respect to government S&T has been to migrate these activities from government into the private or academic sectors. The authors trace this history and argue that science policy thinking regarding federally-performed S&T must evolve with the changing position of government laboratories in Canada's science and innovation system. A case is made for maintaining an adequate S&T capacity within the federal government in order to deliver on unique public interest roles.

Performing Strategic Science in the Public Interest: Updating the Policy Debate Regarding Government Science

Jeff Kinder

Natural Resources Canada

Frank Welsh

Federal S&T Functional Community Secretariat

Abstract: The performance of science and technology (S&T) activities in the federal government has long been supported as a means of advancing innovation and economic objectives as well as of addressing public policy and regulatory needs. As Canada's science and innovation system has matured, however, the federal government's relative contribution to Canada's overall performance of research and development has declined significantly—from about 30% (of total spending) in 1971 to under 9% today. Throughout this period, a dominant policy theme with respect to government S&T has been to migrate these activities from government into the private or academic sectors. The authors trace this history and argue that science policy thinking regarding federally-performed S&T must evolve with the changing position of government laboratories in Canada's science and innovation system. A case is made for maintaining an adequate S&T capacity within the federal government in order to deliver on unique public interest roles.

Résumé : Les activités de science et de technologie (S-T) au sein du gouvernement fédéral ont longtemps été soutenues en tant que moyen de faire progresser les objectifs en matière d'innovation et d'économie, en plus de répondre aux besoins liés aux politiques publiques et à la réglementation. À mesure que le système de la science et de l'innovation prend de la maturité au Canada, la contribution relative du gouvernement fédéral au bilan global de la recherche et du développement diminue toutefois de manière substantielle. En effet, celle-ci est passée d'environ 30 p. 100 en 1971 à moins de 9 p. 100 aujourd'hui (en pourcentage du total des dépenses). Au cours de cette période, un thème dominant sur le plan politique – en ce qui concerne la S-T au gouvernement – a été de déplacer ces activités vers le

secteur public et le monde universitaire. Les auteurs retracent l'historique de cette situation et affirment que les points de vue relatifs aux sciences et aux politiques dans le cadre fédéral doivent évoluer au rythme de la position changeante des laboratoires gouvernementaux à l'intérieur du système canadien de science et d'innovation. Ils plaident en faveur du maintien de capacités adéquates en matière de S-T au sein du gouvernement fédéral afin que celui-ci puisse assumer son rôle unique consistant à servir les intérêts collectifs.

Introduction

In the Canadian science and innovation system, it is generally accepted that the federal government has an important role to play in *funding* science and technology (S&T) activity in the academic and private sectors; however, the proper role for government in *performing* S&T has long been a subject of debate. Within the Canadian context, as the research system matured in the post-war decades, and science policy became a more explicit policy focus, there was increased questioning of the value of government laboratories and their relevance to the improvement of Canada's economic competitiveness.

Beginning in at least the early 1960s, with the Glassco Commission, and continuing throughout the next ten years with the early reports of the Science Council of Canada and those of Senator Lamontagne's committee, the role of government science came increasingly under question. This intense early scrutiny has been followed by a steady stream of major policy studies and government strategies calling for less government science. Indeed, the policy prescriptions from this earlier period seem to echo across recent decades right up to today.

It is important to understand that government S&T is comprised of two distinct but interrelated categories of activity. *Research and Development* (R&D) comprise the creative work that is undertaken on a systematic basis in order to increase the stock of scientific or technical knowledge, and to use that knowledge in novel applications. In today's context, federal research and development focuses on support of the innovation system in areas where the university and private sectors do not perceive an advantage but are important to maintaining the Canadian fabric. In addition, federal R&D is undertaken to provide the innovation needed to maintain and develop the country's related science activities.

Related Science Activities (RSA) are those activities that contribute to the generation, dissemination and application of scientific and technological knowledge (e.g., scientific data collection, information services, testing and standardization, risk assessment, feasibility studies). The data produced by RSA can be used to meet policy development or evidence-based regula-

tory needs. For example, Canada is attractive as a home to knowledge-based industries because the regulatory regime that reviews innovative products and services is based on sound science. That is, regulations are founded on the latest scientific findings that have been interpreted using federally approved and internationally accepted methods by expert scientists working in modern facilities. Similarly, with standards, government S&T helps ensure the accuracy, validity and traceability of the physical and chemical measurements used by industry—a service vital to reducing technical barriers to trade.

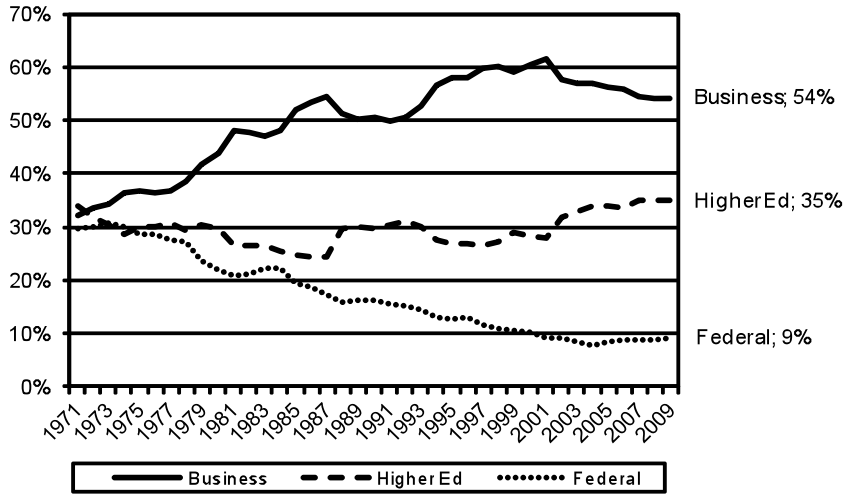
Both categories of S&T activities are increasingly undertaken in partnership with other federal departments, the provinces and territories, universities, non-governmental organizations, the private sector or internationally to meet the overall requirements of government.

It should be noted that for the present analysis, only R&D expenditures are presented as this is the information tracked by Statistics Canada across the various sectors of the science and innovation system. Therefore, we will focus the examination on R&D expenditures.

As seen in Figure 1, in 1971 the relative contribution of the federal government to Canada's total performance of R&D was roughly equivalent to the contributions of the private and academic sectors, with each of these "big three" sectors contributing approximately one-third of the total. Over the last four decades, the federal government's relative contribution has declined to less than 9 percent of the total, while the relative proportions of the nation's R&D performed in the other two sectors have either grown significantly (private sector) or remained relatively flat (academic sector).

Yet throughout this period, a dominant policy theme has been to get more government science out of government. This paper does not argue for a return to the prior situation. It does suggest, however, that policy thinking with respect to government science should be informed by and reflect this changed reality. In particular, it suggests that Canadian science policy might get beyond our current thinking regarding government labs and acknowledge the unique roles played by government labs in contributing to a knowledge-based society. By adopting the perspective of most advanced nations—that government laboratories represent a strategic national asset—Canadian science policy will be better positioned to mobilize our S&T capacity in support of a wide range of public policy goals.

Figure 1. Percentage of GERD by Performing Sector.



The Ongoing Debate

In 2004, for the first time, universities—not government laboratories—were the primary recipient of federal R&D funding, and this trend has continued.[1] It is largely the result of steady increases in federal funding for academic research since 1997 while funding for federal intramural R&D has remained relatively flat. It can also be seen as a continuation of a decades-long trend in the post-war period in which the traditional dominance of federal research performers has given way to other performers.[2]

Throughout the four decades reviewed in this paper, the government also provided support to industrial R&D through tax incentives, technical assistance programs, and loans and subsidies. In particular, the Scientific Research and Experimental Development (SR&ED) tax credit program, the Industrial Research Assistance Program (IRAP) and various programs targeting the defense and aerospace sectors provided significant direct and indirect support for industrial R&D. These federal investments, along with the R&D investments made by universities and the business enterprises

1. Lloyd Lizotte, Statistics Canada, "Federal Government Expenditures on Scientific Activities, 2006/2007," *Science Statistics* (Statistics Canada Catalogue 88-001-XIE) 30, 6 (2006): 1-17.

2. G. Bruce Doern and Jeffrey S. Kinder, *Strategic Science in the Public Interest: Canada's Government Laboratories and Science-Based Agencies* (Toronto: University of Toronto Press, 2007).

themselves, led to a strengthening of the non-government sectors of the Canadian system. This, in turn, has renewed the debate on the appropriate role for the federal government and government science in the system.

In particular, the debate has centred on what, if any, ongoing role the government should have in *performing* S&T.[3] Some have called for government's role in S&T to be reduced to that of merely a funder and facilitator, not a performer. For example, Leiss argues that the "old model" in which government departments engage directly in scientific work which is then applied to policy choices is "obsolete."[4] He calls for shifting the provisioning of science relevant to policy, regulation and risk management to independent institutions that are located "at arm's length" from government. By "independent organizations," Leiss has in mind primarily "universities or other entities that draw on the independent expertise resident in universities."[5]

The unflattering opinion of the S&T expertise resident in government laboratories and the potential threat to their very existence implied by this viewpoint are obvious. But the argument for this "new model" leaves unaddressed many challenges, including how the government can ensure it has timely access to the various types of science it needs, how it can ensure that the science conducted by such "independent institutions" is free of bias and conflict of interest (particularly given increasing private sector funding of academic research), and how, without a robust internal S&T capacity, the government can remain an intelligent consumer of the science advice it receives from external sources.

On the other side of the debate, analysts argue that the federal government needs to maintain a strong in-house S&T capacity not only to address these concerns but to ensure the effective functioning of the broader national science and innovation system. In particular, a government role is viewed as essential for the conduct of the science supporting the provision of public goods unlikely to be provided effectively by the other sectors.[6] De la Mothe goes so far as to argue that,

---

3. John de la Mothe, "Government Science and the Public Interest," in *Risky Business: Canada's Changing Science-Based Policy and Regulatory Regime*, ed. G. Bruce Doern and Ted Reeds (Toronto: University of Toronto Press, 2000), 31-48.

4. William Leiss, "Between Expertise and Bureaucracy: Risk Management Trapped at the Science-Policy Interface," in *Risky Business*, 49-74.

5. Ibid., 67.

6. Council of Science and Technology Advisors, *Building Excellence in Science and Technology (BEST): The Federal Roles in Performing Science and Technology* (Ottawa: Industry Canada, 1999); De la Mothe, "Government Science"; Elizabeth Moore, "The New Direction of Federal Agricultural Research in Canada: From Public Good to Private Gain?" *Journal of Canadian Studies* 37, 3 (2002): 112-134; Doern and Kinder, 11-15.

"science in the public interest is uniquely the business of government."[7] Although the intensity of this ongoing debate may ebb and flow, fundamental questions regarding government laboratories and their relationship to other sectors remain a permanent feature and are never far below the surface of any discussion of science policy in Canada.

It is clear, however, that a gradual and important shift has taken place in the policy context for government laboratories. From the early emphasis on in-house S&T performance, policy first shifted to an increased emphasis on industrial support mandates and a basic "make or buy" approach. More recently, this rather simplistic public/private dichotomy has yielded to increasing recognition of the wide spectrum of alternative arrangements for federal laboratories ranging in principle from fully public to fully private ownership and management, and embracing a variety of formal network-based and partnership arrangements. Simply put, the choices for institutional design of government laboratories have expanded from merely "make" to "make or buy" to "make, buy or collaborate" including complex combinations of all three.

As the next section shows, however, the policy debate regarding government science has focussed primarily on eliminating the "make" option. The policy debate seems to continually undervalue the roles played by government laboratories in our system, while consistently preferring to transfer S&T capacity to other sectors. In consequence, Canadian science policy with respect to government science never seems to get past these fundamental debates about intramural performance.

Even among science policy analysts, who enjoy tracking the latest statistical indicators regarding the big three S&T performing sectors, there seldom seems to be concern regarding the weak position of government S&T. In recent years Canada has been justly proud of its indicators regarding academic research. Canada ranks at or near the top of the OECD league tables on the ratio of its expenditures on R&D by higher education institutions (known as HERD) to the size of its economy (as measured by gross domestic product or GDP).[8]

On the other hand, the persistent low value of business expenditures on R&D (BERD) in Canada has been and remains a legitimate concern. For decades, Canada's ratio of BERD to GDP has been lower than the OECD average and in 2007 Canada ranked 16th among the OECD nations on this indicator (Government of Canada 2010). In Canada, many blue-ribbon panels have been convened to study this issue.

7. De la Mothe, "Government Science," 44.
8. Government of Canada, *Science and Technology Data-2008* (Ottawa: Industry Canada, 2010).

Meanwhile, one rarely hears concern expressed about the value of government expenditures on performing R&D (GOVERD).[9] As it happens, Canada's ratio of GOVERD to GDP is also well below the OECD average and in 2007 Canada ranked 17th among our comparator nations—lower than it did on business R&D expenditures.[10] Corbett has recently called for a blue-ribbon panel to study this poor performance.[11]

The Evolving Position of Government Science[12]

Using Figure 1 and Table 1 as a guide, this section will trace two trends related to federal government science over the last half century. The first trend is the relative consistency in the policy advice related to government laboratories, with the recurring theme to transfer more government research to the two other major performing sectors. The second trend is the equally consistent downward trend in the proportion of the nation's R&D being performed by government laboratories. The analysis suggests that science policy thinking in Canada has not evolved with the changing position of government labs in Canada's system.

In 1967, a special Senate committee was established under the leadership of Senator Maurice Lamontagne. The committee's mandate was to examine federal science policy to assess its effectiveness, efficiency, priorities and budget in an internationally comparative manner. The committee found that Canada devoted a far greater proportion of its S&T expenditures to fundamental research and far less to technological development than did most of its competitors. This reflected, in the committee's view, the increasing strength of university research and the persistent poor state of industrial R&D in Canada. In its first report issued in 1970, the Lamontagne committee recommended that, as much as possible, the R&D needs of the government should be met by universities or the private sector.[13] As we will see, this would become a recurring theme in science policy advice.

At about the time of this recommendation, in 1971, the proportion of Canada's R&D being performed by each of the big three sectors was: ***Federal—less than 30 percent****, Higher Education—34 percent, and Business—32 percent.*

9. Government expenditures include those by federal, provincial and local governments.
10. Government of Canada, *Science and Technology Data-2008*, p. 10.
11. Gary Corbett, "Keynote Luncheon Address by PIPSC President Gary Corbett to the Canadian Science Policy Conference," Professional Institute for the Public Service, Ottawa, November 18, 2011.
12. The analysis will focus on the period beginning with 1970 as that is the period for which Statistics Canada has consistent data on R&D performance across the big three sectors.
13. Maurice Lamontagne, *A Science Policy for Canada*, Report of the Senate Special Committee on Science Policy (Ottawa: Queen's Printer, 1970).

In partial response to the Lamontagne recommendations, the government introduced in 1972 a Make-or-Buy policy that directed that essentially all new "mission-oriented R&D" was to be contracted out to private industry.[14] The onus was on federal departments and agencies to make a case for choosing "make" (in-house performance) over "buy" (contracting out). The Make-or-Buy policy was a prime example of the increasing pressure in this period to out-source government science.

By the 1980s, policy analyses were highly critical of federal laboratory management, citing for example a "growing atmosphere of irrelevance and an excessively bureaucratic management style."[15] The Task Force on Federal Policies and Programs for Technology Development, chaired by Doug Wright, then president of the University of Waterloo, examined key issues regarding the performance of federal laboratories, including their functions, goals, outputs and relations with industry. Among the Wright report's recommendations was one that the government should undertake a review of all federal laboratories to demonstrate their relevance and usefulness, and make greater use of the "government-owned, contractor-operated" or GOCO model of lab management.

At the time of this recommendation, in 1984, the proportion of Canada's R&D being performed by each of the big three sectors was: ***Federal—less than 22 percent****, Higher Education—26 percent, and Business—48 percent.*

In this period, government laboratories were under pressure both to become more business-like and market-oriented in their operations in order to serve commercial innovation goals more directly. Expert panels increasingly called for greater use of private sector practices such as management boards, cost recovery practices, contracting in/out, and other business-oriented approaches.[16] This emphasis on private sector approaches was due to the emergence in this period of the New Public Management (NPM) paradigm, a movement to replace "public sector logics" with "private sector practices."[17]

In 1988 the National Advisory Board on Science and Technology's Industry Committee argued that Canada had placed "an emphasis on government support to government labs and basic research in universities,

14. Government of Canada, *Guidelines for the Implementation of the Make Or Buy Policy Concerning Research and Development Requirements in the Natural Sciences* (Ottawa: Treasury Board Secretariat, Administrative Policy Branch, 1973).
15. Task Force on Federal Policies and Programs for Technology Development, *A Report to the Honourable Edward C. Lumley Minister of State for Science and Technology* (Ottawa: Minister of Supply and Services Canada, 1984), 25.
16. Task Force *Report*. National Advisory Board for Science and Technology, *Revitalizing Science and Technology in the Government of Canada* (Ottawa: NABST, 1990).
17. De la Mothe, "Government Science," 31.

creating surrogates for an inadequate industrial research base."[18] It went on to state that "moreover, the relatively large scale of government research over time creates an inertia and bias toward doing more and more in-house research."[19] The committee emphasized the need to shift resources allocated by government for in-house R&D to industry-based R&D.

Issued the same year, the short report of the NABST Government Committee can be viewed as a companion document to the NABST Industry Committee report. The Committee echoed the familiar themes, stating that "federal funding for S&T should be an effective catalyst to foster greater S&T capability in the business and university sectors."[20]

The committee noted that government laboratories are "needed to fill gaps" left by industry and universities and "to support departmental missions, often in ways that cannot be readily contracted out." The report conceded that some basic research must be conducted inside government laboratories "to provide a link between the frontiers of new knowledge and the applied work that makes up the bulk of the lab's activity." It also acknowledged that "there is some government basic science of undeniable quality and some that may relate to the mandate of specific departments and might not be pursued with enough motivation if it were left to universities." Despite these findings, the Committee recommended that the government undertake a lab-by-lab review of basic science activities "to identify their potential for devolution to universities."[21]

At the time of these recommendations, in 1988, the proportion of Canada's R&D being performed by each of the big three sectors was: ***Federal—less than 16 percent****, Higher Education—30 percent, and Business—51 percent.*

By the mid-1990s, the science policy rhetoric had begun to shift somewhat, perhaps in response to increasing scholarship and policy attention to "innovation systems,"[22] distributed knowledge production,[23] and network theory.[24] This literature stressed the importance of collaborative linkages

18. National Advisory Board for Science and Technology, *Industry Committee Report* (Ottawa: NABST, 1988), 4.
19. Ibid., 9.
20. NABST, *Government Committee Report*, 2.
21. All quotations in this paragraph from Ibid., 6-7.
22. Bengt-Ake Lundvall, ed., *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning* (London: Pinter Publishers, 1992); Richard R. Nelson, ed., *National Innovation Systems: A Comparative Analysis* (Oxford: Oxford University Press, 1993).
23. Michael Gibbons et al., *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies* (London: Sage, 1994).
24. Christopher Freeman, "Networks of Innovators: A Synthesis of Research Issues," *Research Policy* 20, 5 (1991): 499-514; Nitin Nohria and Robert G. Eccles, eds., *Networks and Organizations: Structure, Form and Action* (Boston: Harvard Business School, 1992).

among the various actors in a national science and innovation system, reflecting a growing awareness that no institution, public or private, could "know it all" or "do it all."[25] Similarly, the work of Gibbons et al. on the distributed nature of knowledge production suggested the emergence of new network-based forms of organization and greater permeability of knowledge producing organizations.[26] In Canada, such thinking motivated new approaches to promote formal networks and the collaborative performance of publicly-funded S&T. This included the establishment of the Networks of Centres of Excellence (NCEs),[27] the co-location of government laboratories with universities,[28] and the use of horizontal program funds to supplement traditional direct funding to science-based departments.[29]

This shift in focus is also evident in the final report of the NABST in 1995, its input to the Chretien Government's 1996 S&T Strategy. The NABST believed that the rapidly changing global environment called for "new ways of conceptualizing S&T, new ways of performing S&T, new ways of governing it, and new ways of evaluating outcomes."[30] Thus, while the Board found that "the federal role in performing S&T should be smaller and more focussed," it also stated that "the federal government should promote partnerships and collaboration among S&T stakeholders."[31] Here we begin to see an awareness of government laboratories as actors within a system or network of knowledge-producing institutions and the importance of interaction among these institutions.

Consider for example the following statement of the Board: "The government needs to identify areas of current federal research that could more effectively be conducted either in university or industry laboratories, *or that could be done collaboratively.*"[32] While the first part of the statement echoes the predominant policy prescription, the last part signals a change in tone. A few pages later, the Board recommends that government

25. De la Mothe, "Government Science," 34.
26. Gibbons, "New production of Knowledge."
27. Janet Atkinson-Grosjean, *Public Science, Private Interests: Culture and Commerce in Canada's Networks of Centres of Excellence* (Toronto: University of Toronto Press, 2006).
28. Jeffrey S. Kinder, "The Co-Location of Public Science: Government Laboratories on University Campuses," in *Research and Innovation Policy*, eds. Doern and Stoney (Toronto: University of Toronto Press, 2009), 215-241.
29. Jeff Kinder, "The Doubling of Government Science and Canada's Innovation Strategy," in *How Ottawa Spends 2003-2004–Regime Change and Policy Shift*, ed. G. Bruce Doern (Don Mills: Oxford University Press, 2003), 204-220.
30. NABST, *Healthy, Wealthy and Wise: A Framework for an Integrated Federal Science and Technology Strategy* (Ottawa: NABST, 1995), 5.
31. Ibid., iv, vi.
32. Ibid., 73 emphasis added.

should "encourage and strengthen strategic collaborative research arrangements among government, university and industrial laboratories and promote cross-sectoral and multidisciplinary partnerships."[33] To a greater extent than in previous reports, government laboratories were viewed in the context of their critical role as part of a national innovation system.

This shift in thinking and increasing recognition of the importance of inter-sectoral collaboration was also evident in the 1996 Federal S&T Strategy. Nonetheless, echoing a familiar theme, the Strategy calls for stringent tests of role and relevance: "The research conducted in federal laboratories should complement rather than duplicate the work carried out by the private sector."[34]

At the time of this recommendation, in 1996, the proportion of Canada's R&D being performed by each of the big three sectors was: ***Federal—less than 13 percent****, Higher Education—27 percent, and Business—58 percent.*

In recent years, the familiar policy rhetoric related to government science has continued. In its 2007 Federal S&T Strategy, *Mobilizing Science and Technology to Canada's Advantage*, the government signalled its willingness to consider "alternative management arrangements" for some of the federal laboratories.[35] In doing so, the government's stated objective was "to increase the impact of federal investments, lever university and private sector strengths, create better learning opportunities for students, and foster research excellence."[36]

In addition, while the government acknowledged that much of federal S&T is in support of "regulatory, policy and operational mandates in important areas such as health care, food safety, and environmental protection," the Strategy sought to encourage "innovative new models for S&T collaboration between federal departments and agencies and other sectors" across all aspects of intramural S&T.[37] In the Strategy, among the few recommendations dealing directly with government science, the government committed to launch "an independent expert panel to report […] on options for transferring non-regulatory federal laboratories to universities or the private sector, and identify up to five laboratories that could be early candidates for transfer."[38]

---

33. NABST, *Healthy, Wealthy and Wise*, 76.
34. Government of Canada, *Science and Technology for the New Century: A Federal Strategy* (Ottawa: Industry Canada, 1996), 23.
35. Government of Canada, *Mobilizing Science and Technology to Canada's Advantage* (Ottawa: Industry Canada, 2007), 14
36. Ibidem.
37. Ibid., 68, 70.
38. Ibid., 72.

At the time of this commitment, in 2007, the proportion of Canada's R&D being performed by each of the big three sectors was: ***Federal—less than 9 percent****, Higher Education—35 percent, and Business—54 percent.*

It is interesting to note, however, that in its final report the Independent Panel of Experts sought to shift the debate by de-emphasizing the idea of lab "transfer" in favour of increasing "inter-sectoral S&T integration (ISTI)" and collaborative partnership arrangements.[39] The Panel[40] concluded that:

> Clearly all three sectors have distinctive and important roles to play in the Canadian science and innovation system. ISTI can and should be pursued in ways that contribute to the strength of all sectors without weakening the ability of each to perform its distinctive role.

In summary, during the four decades surveyed in this brief history, science policy advice consistently sought to transfer more and more government S&T to other sectors. This theme was echoed in advisory reports and government strategies alike. Meanwhile, as summarized in Table 1, the proportion of the nation's R&D performed by the federal government steadily dropped from almost a third of the total to less than nine percent. In the current climate of fiscal constraint, this reality suggests an increasing need for collaboration across the science and innovation system to deliver on national priorities.

Table 1. Summary of Trends in R&D Funding among the Big Three R&D Performing Sectors.

YEAR	PERFORMING SECTOR					
	Federal Government (part of GOVERD)		Universities (HERD)		Business Enterprises (BERD)	
	%	$ Million (current)	%	$ Million (current)	%	$ Million (current)
1971	< 30	383	34	436	32	413
1984	< 22	1,389	26	1,604	48	3,022
1988	< 16	1,429	30	2,669	51	4,623
1996	<13	1,792	27	3,697	58	7,997
2007	< 9	2,532	35	10,187	54	15,882

Source: Statistics Canada. Table 358-0001 – Gross domestic expenditures on research and development, by science type and by funder and performer sector, annual (dollars) (table), CANSIM (database), accessed: January 11, 2010. Federal Government expenditures are only part of the GOVERD data which also includes provincial and local government expenditures.

39. Independent Panel of Experts, *Inter-Sectoral Partnerships for Non-Regulatory Federal Laboratories: A Report to the President of the Treasury Board of Canada*, 2008.
40. Ibid., 34.

Federal S&T Today: Key Roles and Responsibilities in Performing S&T[41]

During Fiscal Year 2009-2010, the Government of Canada spent about $6 billion[42] and employed more than 39,000 workers across a range of science-based departments and agencies to accomplish its intramural S&T programs. The S&T undertaken through these investments can be broadly classified as the S&T that directly supports legal and regulatory mandates (mandatory functions) and that which is in support of strategic national priorities, including creating efficiencies in the innovation system that will strengthen the social and economic well-being of Canadians (strategic functions).

Within the *mandatory* S&T functions lay responsibilities, for example, to maintain and strengthen access to a safe and wholesome food supply, and to ensure the safety and security of Canadians. Federal *strategic* S&T functions, meanwhile, respond to the social and economic needs of Canadians. These functions are mutually supporting. For example, in the area of emerging technologies, the government undertakes pre-competitive research, development and demonstration projects that help share risk and thus encourage private sector research and investment in nationally strategic fields. As a participant in these projects, the federal government is able to garner an understanding of the technologies and the implications of their potential use in the marketplace. These findings provide the evidence necessary to develop and apply appropriate regulatory frameworks that will maintain and enhance the safety and security of Canadians.

The key S&T activities performed by federal departments and agencies are generally associated with five responsibilities. These five responsibilities are delivered through the performance of various combinations of R&D and RSA. They include:

- *Informing regulatory and policy decisions and standards:* Federal S&T activities focus on the collection and integration of data that will support rigorous and timely decisions, policy development, scientific risk assessments, standards development, and regulatory oversight and enforcement.

41. This section draws on an internal piece prepared by the Assistant Deputy Minister S&T Integration Board, "The Key Responsibilities of Federal Intramural Science and Technology (S&T)," a paper presented at the DM Committee on S&T meeting of March 24, 2011. The authors wish to acknowledge the contributions of members of the Integration Board Working Group.

42. In this final section, we return to discussing the entire range of government S&T activities, including both R&D and RSA. In 2010, the government was expected to spend approximately $2.7 Billion on intramural R&D and approximately $3.2 Billion on intramural RSA, Statistics Canada, *Federal Scientific Activities 2010/2011* (Statistics Canada Catalogue no. 88-204-X, October, 2010).

- *Producing public good products and services:* Intramural S&T produces public goods and services that are unlikely to be provided by the private sector, including long-term data collection to protect unique ecosystems and the peoples of the North, or the establishment and maintenance of large scale, often world-unique research, development and demonstration facilities that address societal goals and interests.
- *Maintaining expertise in areas supporting public security and welfare:* When requirements change suddenly, for example in response to the sudden emergence of a new strain of pathogen (e.g., H1N1), federal S&T has demonstrated its capacity to efficiently repurpose facilities and work plans to meet these threats. Government S&T supports the long term surveillance, monitoring, analysis and response activities that help maintain and enhance the safety and security of Canadians.
- *Ensuring capacity to anticipate and respond quickly to adverse events:* The S&T capacity to predict and respond to natural disasters, such as earthquakes, floods or forest fires, is maintained in government as there are limited private sector benefits in maintaining such capacity.
- *Supporting innovation to improve the economic well-being of Canadians:* Intramural S&T drives innovation that enhances the productivity and economic well-being of Canadians. This support is essential to maintaining Canada's competitiveness in key strategic sectors such as agriculture, aquaculture, mining, forestry and manufacturing.

In addition to these five core responsibilities, it is expected that the federal government will continue to deliver on responsibilities that, while not unique to government, support the national science and innovation system in important ways. For example, while the education and training of the next generation of S&T workers is primarily the purview of the academic sector, there is an expectation that government laboratories are partners in this responsibility through the provision of co-operative education placements, graduate student supervision and post-doctoral fellowship placements.

Similarly, the federal government supports broader efforts to create a science culture in Canada. Through its communications and outreach efforts, the federal S&T community helps increase the science literacy of Canadians. Fostering an entrepreneurial and scientific culture in Canada is

essential for maintaining economic competitiveness and making informed decisions in a global, knowledge-based society.

Finally, Canada has entered into international legal obligations with other governments and quasi-governmental bodies that require the collection and analysis of data and the provision of that data to partner organizations. For example, commitments exist with our ongoing responsibilities related to climate change and biodiversity, public health and animal health, safety and security for all modes of transportation, and allocation of the radio spectrum to Canadian broadcasters.

Conclusion

Canada currently possesses an S&T capacity based in a science and innovation system that is sustained by the unique relationships that have developed over time between the business, academic and government sectors. For the current system to function effectively, each of these three sectors must be a strong player in its own right and be prepared to contribute substantively to the integrated system. Ensuring the health of each of the S&T-performing sectors is necessary to ensure that the whole system does not underperform or fail outright.

Within the government sector the federal partner both supports the S&T activities of other sectors, through the provision of R&D tax credits, research grants, and funding for pre-commercialization development, and maintains an intramural capacity that supports the mandated and strategic responsibilities of government related to health, security, safety and innovation. In addition, there is an expectation by Canadians that federal resources may be used to support other S&T activities that, while not unique roles for government, nonetheless meet ongoing national requirements for Canadian society, such as the development of a highly qualified workforce and a culture that rewards ingenuity and entrepreneurship.

For far too long the policy debate with respect to government S&T has been uni-dimensional—emphasizing a need to transfer more and more government research to the private or academic sectors. The data over the last four decades indicates that a fundamental shift has occurred in Canada's system. The performance of R&D has shifted from a situation in 1970 in which each of the big three R&D performing sectors were basically equal contributors, to a situation today in which federal R&D represents less than 9 percent of the total Canadian R&D effort. The foregoing discussion has demonstrated that S&T is an essential component for the proper functioning of the federal government. It is hoped that this analysis can inform the science policy dialogue regarding the proper role of government science in the Canadian science and innovation system.