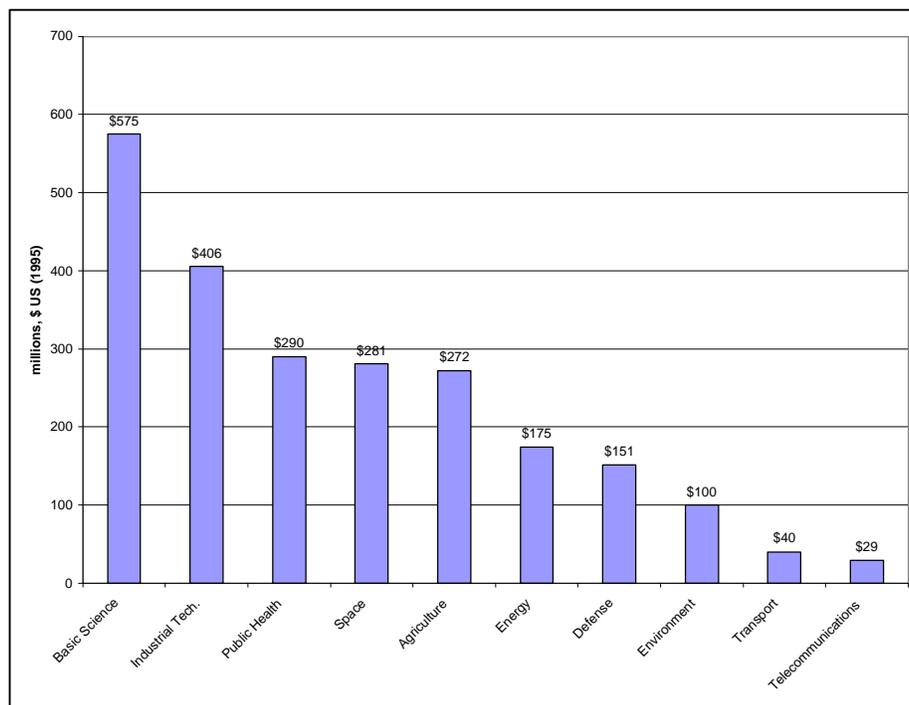


NATIONAL SCIENCE & TECHNOLOGY POLICY AND FUNDING

In fiscal year 1997 the federal government's total investment in R&D was approximately \$2.4 billion and accounted for approximately 24% of Canada's total research and development expenditure.ⁱ On average, federal agencies have performed nearly half of the R&D they funded over the past decade.ⁱⁱ Industry, the provincial governments, universities, private non-profit agencies and foreign sources accounted for the remaining three-quarters of the country's \$10.6 billion expenditure on R&D in the 1996 fiscal year. Figure 1 shows the top ten areas for R&D investment in 1999.

Figure 1. 1999 Federal R&D Expenditures in Top Ten Socioeconomic Areas¹

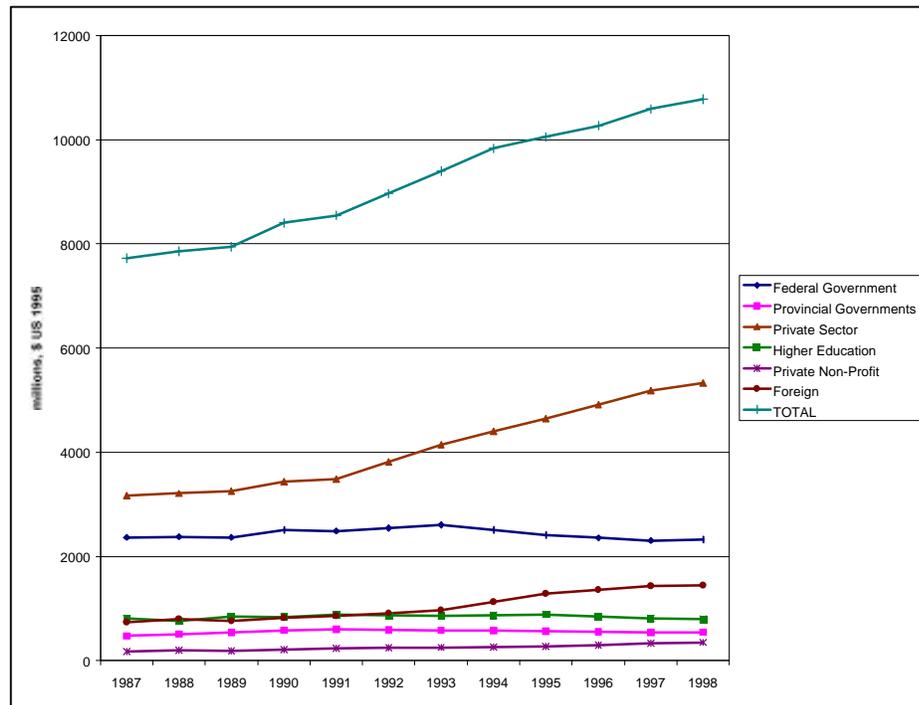


¹ The estimate of federal outlays for basic science represents the sum of grants for extramural research made by the three federal granting councils: the Medical Research Council (\$191 million), the Natural Sciences and Engineering Research Council (\$332 million), and the Social Sciences and Humanities Research Council (\$52 million). Approximately 90% of this support funded research in Canadian higher education institutions. The intramural research funded by the granting councils supports, in large part, directed research projects in Canadian government agencies and, thus, those outlays are not included here. The figures presented here for all other socioeconomic objectives represent total intramural and extramural expenditures of the Canadian government for fiscal 1999. Personal communication with Dr. Fred Gault, Statistics Canada, March 8, 1999. See also Statistics Canada, *Federal Scientific Activities 1998-99*, Table 4.5 (p. 79), and Table 6.2 (p. 107).

In the interest of a balanced federal budget, the Canadian government reduced the program budgets of almost all major R&D performing federal departments such as Natural Resources Canada (NRCan), Environment Canada, and Industry Canada by as much as 30-50% between 1994 and 1997.ⁱⁱⁱ Due in large part to the fiscal discipline it has introduced over the past five years, Canada has achieved a balanced budget and budget surplus in fiscal years 1997-98 and 1998-99, respectively. This is the first time in nearly 50 years that Canada has had back-to-back balanced budgets.^{iv}

Figure 2 shows Canada's R&D investments by funding sector. Despite recent improvements in the country's fiscal and economic situations, the federal government's overall expenditures on R&D remained flat during the most recent two fiscal years. Between 1987 and 1998, federal R&D investments declined by 2% in real terms, while provincial R&D expenditures increased by 15%. Government R&D budgets are not expected to change significantly from the previous years during fiscal year 1999-2000.

Figure 2. R&D Investments by Funding Sector 1987-1998^v



The 40% overall growth in Canada's R&D enterprise over the past ten years can be attributed in large part to the strong growth of private sector R&D. Private sector R&D investments, which account for the largest single segment of the country's R&D expenditures, rose by almost 70% over the period. That growth was led by high technology industries, particularly by the biomedical, information technology, telecommunications fields, which are responsible for the majority of economic and employment growth in Canada since the mid-1980s.^{vi}

Science and technology (S&T) play a central role in Canada's economy. Knowledge-based industry accounts for approximately one-third of employment in Canada and has contributed more to job growth than all other industries combined in recent years.^{vii} Considering the growing importance of technology- and knowledge-based industry to Canada's future, the federal government launched a major Science and Technology Review in 1994, a process that involved a series of consultations with experts and community representatives across the country and that aimed to improve and reinvigorate Canada's innovation infrastructure.

The Science and Technology Review found that there was room for improvement in the effectiveness of its S&T investments in many areas. For example, with an average annual productivity growth of 0.3% between 1974 and 1993, Canada ranked 18th among 48 countries in a survey conducted by the World Economic Forum in 1995. Sluggish productivity gains have been attributed in part to inefficiencies in the development, adoption, and commercialization of technology, which have dampened real income growth and contributed to high government deficits.^{viii}

Consequently, the Canadian government has taken action to enhance the role of the country's extensive science and technology infrastructure in the economy and in the country's overall well being. This process has stimulated debate over the appropriate role of the government in science and technology as a sponsor of S&T, and concerning its goals and priorities. As a result, the government is evolving out of its traditional role as principally a sponsor of research and development, into a new role as a partner with the provincial governments, universities and businesses, in the network of public and private institutions that form the national innovation system.^{ix}

Recently, the Canadian government has announced plans to provide \$250 million in new funding for the creation of 2000 new research chairs at Canadian colleges and universities. This initiative aims to attract world-class scientists and researchers to Canadian universities and to reverse what some policy-makers perceive as a brain drain from Canada to other countries, especially the United States. The funds will attract new talent to universities to increase salaries of existing faculty, and free academic researchers from teaching responsibilities and other obligations that encroach on time in the laboratory.^x

The new role of government in S&T also stems from the need to reduce the national deficit and address other fiscal problems. While research and development remain important priorities, the government has reduced its spending in virtually all of its program areas.^{xi} Given smaller overall budgets, the government is seeking to invest its S&T resources more strategically than ever, to obtain high economic and social returns. Canada's major federal R&D performers are focusing on their respective core activities, and seeking closer links among themselves and with industry as a means of delivering technologies effectively. The federal government's core S&T missions are to fund and perform scientific research in support of government department and agency missions; to support research in universities, colleges, hospitals, and other non-governmental research institutions; and to stimulate private sector research and development.^{xii}

Interactions within the government, and between government-, private-, and non-profit-sector R&D institutions will occur increasingly through a wider variety of funding and support mechanisms, including public-private partnership and cost-sharing arrangements, tax credits and incentives, and through standard contract research arrangements. Similarly, closer coordination among provincial and territorial R&D agencies has been initiated to reduce overlap of functions and improve efficiencies in the funding and performance of R&D.^{xiii}

Following the Science and Technology Review, the Canadian government set three major S&T goals for building a strong, forward-looking, and dynamic innovation system:

- To ensure that Canada is among the world's best in applying and commercializing science and technology for sustainable job creation and economic growth;
- To ensure that Canada applies S&T to improve the quality of life for its citizens through the creation of fulfilling jobs and through the most effective social, environmental, and health care programs in the world;
- To create in Canada world centers of excellence in scientific discovery, build a broad science base, foster Canadian participation in all major fields of S&T, and ensure that new knowledge can be acquired and disseminated widely, from Canadian sources and around the world.^{xiv}

Several federal departments and agencies are important players in both the funding and the performance of R&D in Canada. Among the largest are Environment Canada, the Department of Fisheries and Oceans, Health Canada, the Department of Agriculture and Agri-Food, Industry Canada, and Natural Resources Canada. Each of these agencies experienced large budget reductions (as much as 50%) between 1993 and 1997.^{xv}

ⁱ Government of Canada, "Science and Technology for a New Century (Summary)," <http://www.canada.gc.ca/depts/science/english/summ-e.html>

ⁱⁱ Statistics Canada, *Federal Scientific Activities 1998-1999* (Ottawa: Minister of Industry, 1998), p. 107.

ⁱⁱⁱ Government of Canada, "Budget in Brief 1995," <http://www.fin.gc.ca/toce/1995/buddoclist95-e.html>.

^{iv} Department of Finance Canada, *The Budget Chart Book 1999* (February 16, 1999), p. 29.

^v Statistics Canada, *Science Statistics*, Vol. 22, No. 5, October 1998. Data for 1992, 1994, and 1996 (except for totals) are the author's interpolations.

^{vi} Industry Canada, *Science and Technology for the New Century: A Federal Strategy*, (Ottawa: Minister of Supply and Services Canada, 1996), Introduction.

^{vii} Industry Canada, *Science and Technology for the New Century: A Federal Strategy*, (Ottawa: Minister of Supply and Services Canada, 1996), p. 3.

^{viii} Industry Canada, *Science and Technology for the New Century: A Federal Strategy*, (Ottawa: Minister of Supply and Services Canada, 1996), p. 4.

^{ix} Industry Canada, *Science and Technology for the New Century: A Federal Strategy*, (Ottawa: Minister of Supply and Services Canada, 1996), p. 4.

^x Wayne Kondro, "Massive Hiring Plan Aimed at 'Brain Gain'," *Science* Vol. 286 (22 October 1999), pp. 651-653.

^{xi} Industry Canada, *Science and Technology for the New Century: A Federal Strategy*, (Ottawa: Minister of Supply and Services Canada, 1996), p. 7.

^{xii} Industry Canada, *Science and Technology for the New Century: A Federal Strategy*, (Ottawa: Minister of Supply and Services Canada, 1996), p. 10.

^{xiii} Industry Canada, *Science and Technology for the New Century: A Federal Strategy*, (Ottawa: Minister of Supply and Services Canada, 1996), p. 9.

^{xiv} Industry Canada, *Science and Technology for the New Century: A Federal Strategy*, (Ottawa: Minister of Supply and Services Canada, 1996), p. 6.

^{xv} Industry Canada, *Science and Technology Data* (December 1997).