Natural Sciences and Engineering Research Council of Canada

1998-99
Estimates

Report on Plans and Priorities

Recommended:

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T.A. Brzustowski, President

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John Manley, Minister of Industry

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Section I: Messages

Minister's message

A new global economy based on knowledge and innovation is rapidly emerging. Canada has the opportunity to position itself as a world leader in this knowledge-based economy, and the Industry Portfolio plays a key role in the government's strategy to seize this opportunity. Bringing together thirteen departments and agencies responsible for science and technology, regional development, marketplace services and micro-economic policy, the Industry Portfolio is a powerful toolkit to help Canada make a smooth transition to the economy of the 21st Century.

The Industry Portfolio is...

Atlantic Canada Opportunities Agency
Business Development Bank of Canada*
Canadian Space Agency
Competition Tribunal
Copyright Board Canada
Canada Economic Development for Quebec Regions (formerly the Federal Office of Regional Development (Quebec)
Industry Canada
National Research Council Canada
Natural Sciences and Engineering Research Council of Canada
Social Sciences and Humanities Research Council of Canada
Standards Council of Canada*
Statistics Canada
Western Economic Diversification Canada

**Not required to submit Reports on Plans and Priorities*

Since the creation of the Industry Portfolio, my priority has been to ensure that the Portfolio focusses on helping Canadian businesses to fulfill their potential to innovate, grow and create jobs. Portfolio members work together and with other partners to narrow Canada's gaps in the areas of innovation, trade, investment, human resources and community economic development, helping to create jobs and wealth in all sectors of the economy and in all regions. In so doing, we are helping Canadian businesses to position themselves at the forefront of the knowledge-based economy.

The Portfolio members' Reports on Plans and Priorities collectively illustrate how the Portfolio is meeting the challenges of the knowledge-based economy through our focus on: promoting innovation through science and technology; encouraging trade and investment; helping small and medium-sized enterprises to grow; promoting economic growth in Canadian communities; improving the coordination of Portfolio communications; realizing the potential of the Portfolio's people; and measuring the Portfolio's performance. The Portfolio is strongly committed to achieving these objectives and has a strong sense of accountability to Canadians for their delivery. We are also committed to measuring the success of our performance and to reporting on our accomplishments in future performance reports.

Working together, we will make a difference to the economic and social fabric of Canada and ensure our success in the global knowledge-based economy.

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The Honourable John Manley

Message from the Secretary of State (Science, Research and Development)

In the global knowledge-based economy, Canada's future prosperity will be built on a foundation that supports advancements in the fields of science, research and development. The government recognizes the importance of these fields of endeavour and their contribution to innovation, jobs and our quality of life as Canadians. Our future success depends on our ability to innovate as individuals, as communities, and as a nation.

Hard work alone will not guarantee continued success. Our prosperity will depend as much on our ability to generate and use knowledge -- knowledge that largely comes from ongoing science, research and development initiatives. These initiatives are not being undertaken in isolation; government is working harder than ever before with other public and private sector partners. Throughout, government continues to place an emphasis on encouraging both the research to generate new ideas and the development of highly qualified personnel. Through the strategic approach to the support of science, research and development, the government is making its contribution to the evolution of science-based products and services, as well as job creation.

By promoting science, research and development, the government helps fuel the innovation that improves our global competitiveness and stimulates jobs and growth. This Report on Plans and Priorities illustrates how we, in government, are harnessing the benefits of science and technology for the future of all Canadians. These initiatives are helping to create stronger partnerships that lead to better jobs for Canadians, to an improved quality of life, and to increases in the world's stock of knowledge. These initiatives are translating the promise of science, research and development into real opportunities for our future.

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The Honourable Ron J. Duhamel

Management Representation Statement

MANAGEMENT REPRESENTATION STATEMENT
Report on Plans and Priorities 1998-99

I submit, for tabling in Parliament, the 1998-1999 Report on Plans and Priorities (RPP) for the Natural Sciences and Engineering Research Council of Canada

To the best of my knowledge (and subject to the qualifications outlined below), the information:

- Accurately portrays the Council's mandate, plans, priorities, strategies and expected key results.
- Is consistent with Treasury Board policy and instructions, and with the disclosure principles contained in the *Guidelines for Preparing a Report on Plans and Priorities.*

- Is comprehensive and accurate.
- Is based on sound underlying information and management systems.

I am satisfied as to the quality assurance processes and procedures used for the RPP's production.

The Planning and Reporting Accountability Structure (PRAS) on which this document is based has been approved by Treasury Board Ministers and is the basis for accountability for the results achieved with the resources and authorities provided.

Name:_____

Date:_____

Section II: NSERC Overview

Mandate, Roles and Responsibilities

The **Natural Sciences and Engineering Research Council** (NSERC) is the national instrument for making strategic investments in Canada's capabilities in science and technology. NSERC functions at arm's-length from the federal government, is funded directly by Parliament, and reports to it through the Minister of Industry. Created in 1978, NSERC's legal mandate, its functions, and its powers are defined as follows:

> "*The functions of the Council are to promote and assist research in the natural sciences and engineering, other than the health sciences; and advise the Minister in respect of such matters relating to research as the Minister may refer to the Council for its consideration*" (**Natural Sciences and Engineering Research Council Act 1976-77, c24).**

In an effort to clearly define NSERC's purpose and the means by which its ends are achieved, in January 1994, the Council adopted the following mission statement:

> The Natural Sciences and Engineering Research Council fosters the discovery and application of knowledge through the support of university research and the training of scientists and engineers. The Council promotes the use of this knowledge to build a strong national economy and quality of life for all Canadians. NSERC fulfils its mission by awarding grants and scholarships through a competitive process and by building partnerships among the universities, governments, and the private sector.

As stated in the above mission statement, NSERC focuses on the university sector. Universities play a vital role in the creation of new knowledge and in putting this new knowledge to productive use, as well as in providing young people with the skills to contribute to these essential activities.

The federal science and technology strategy, *Science and Technology for the New Century*, commits the federal government to three related goals for building a dynamic Canadian innovation system: sustainable job creation and economic growth; improved quality of life; and advancement of knowledge. NSERC is committed to these goals and to working towards them within the coherent strategy of the Industry Portfolio's *Action Plan.*

A Council (a Board of Directors) whose members are drawn from industry and the universities, as well as from the private non-profit sector, and appointed by the Governor-in-Council, governs NSERC. Members are part-time, and receive no remuneration for their participation. The President is full-time, and functions as the Chair of the Board and the Chief Executive Officer of the Council. (See Section IV, Table 2.01.)

Objective

The Council's ultimate objective is to contribute to the foundations of Canada's prosperity and high quality of life. NSERC's contribution is modern knowledge of the natural sciences and engineering (NSE) and the people who can use it. NSERC supports research in Canadian universities at the highest international standards of excellence and it supports the education of young people in that research. As a result, Canada has access to leading-edge science and technology from around the world and highly qualified people familiar with it. Partnerships with industry connect researchers with those who can use the new knowledge productively and enhance Canada's capacity for innovation. The innovation contributes to wealth creation in the economy, which produces prosperity. New knowledge in NSE also enhances our quality of life through its impact on many policies, regulations, practices, and institutions.

Figure 1: Natural Sciences and Engineering Research Council Financial Spending Plan

($ millions)	Forecast Spending 1997-98 *	**Planned Spending 1998-99**	Planned Spending 1999-00	Planned Spending 2000-01
Gross Program Spending:				
Natural Sciences and Engineering Research Council	435.9	**493.7**	495.1	501.2
	435.9	**493.7**	495.1	501.2
Less: Revenue Credited to the Vote	—	**—**	—	—
Net Program Spending	435.9	**493.7**	495.1	501.2
Less: Revenue Credited to the Consolidated Revenue Fund	—	**—**	—	—
Plus: Non-budgetary	—	**—**	—	—
Plus: Cost of Services Provided by Other Departments	1.7	**1.7**	1.7	1.7
Net Cost of the Agency	437.6	**495.4**	496.8	502.9

*Reflects best forecast of total planned spending to the end of the fiscal year.

Section III: Plans, Priorities and Strategies

Summary of Key Plans, Priorities and Strategies

Natural Sciences and Engineering Research Council	
(Plan) to provide Canadians with:	***(Strategies) to be achieved/demonstrated by:***
A diversified base of high-quality research capability in the natural sciences and engineering to ensure a dynamic Canadian innovation system	• NSERC's continued commitment, for Research Grants, to provide a level of funding that will allow basic research in new and emerging areas of national and international importance • Assuring research excellence through peer review • Focusing support on areas that demonstrate greatest potential importance to Canada
Productive use of knowledge leading to economic activity, job creation and improved quality of life for all Canadians	• Putting university researchers in touch with those who use new knowledge in the private and public sectors, to facilitate the transfer of knowledge • Fostering more partnerships with other sectors including government, to promote collaboration across disciplines and sectors • Promoting linkages between universities and industry to facilitate innovation, leading to new products and improved processes • Improving technology capabilities of small and medium-sized enterprises (SMEs) by linking SMEs with researchers
A supply of highly skilled people in the natural sciences and engineering (NSE) to enhance Canada's competitiveness in the global knowledge-driven economy	• Optimizing the balance between the number of scholarships, fellowships, and stipends from grants and the value of the award/stipend • Enhancing the opportunity for students to learn within the industrial research sector, leading to rewarding S&T careers • Encouraging more talented young people to pursue a career in NSE research and development • Providing junior faculty with the research support needed to launch a successful career in research
Policy leadership for the development of natural sciences and engineering research capabilities in Canada	• Shaping appropriate policies and programs to ensure greatest impact on Canada's capabilities in S&T

Increased awareness (public) of the research enterprise with emphasis on the natural sciences and engineering	• Communicating the importance of NSE research to the public in effective ways • Continuing to post new research and spin-off company success stories on the Web site • Expanding the use of NSERC's Web site by posting 'plain-language' summaries of successful grant applications • Providing guidance to researchers who wish to communicate with the public. *Communicating science to the public: a researchers handbook* is posted on the Web site
Improved quality of service to internal and external clients; efficient use of funds	• Developing performance baselines and service standards • Maintaining a low ratio of administration to program funding

Details by Business Line

NSERC's sole business line is: Support of Research and Scholarship in the Natural Sciences and in Engineering

Planned Spending

See Figure 1: Financial Spending Plan (page 7)

Objective

NSERC's ultimate objective is to contribute to the foundations of Canada's prosperity and high quality of life.

External Factors Influencing the Business Line

There are many factors that influence the environment in which the Council operates. This section will discuss changes that have occurred in the university research system, in government, and in industry that have resulted in greater interdependencies between all sectors and combined to create new challenges for NSERC for future planning.

- **The demand for highly skilled people**

Reports by many Canadian firms indicate that they cannot fill their demand for highly skilled individuals in some fields, notably engineering and computer science. Companies continually report unfilled vacancies and recruiting efforts outside Canada. If this trend continues, we may see such companies, integral to Canada's economic survival, moving elsewhere to ensure a sufficient supply of highly qualified people. Therefore, young Canadians must be encouraged to pursue an advanced education in science and technology. However, with increased university tuition and unprecedented debt loads after graduation, graduate studies (with their high foregone earnings) are increasingly becoming a less attractive option for some of the people best qualified for them.

NSERC is an important source of support in Canada for scholarships and fellowships in the natural sciences and engineering. We must be able to support enough graduate students in these fields to meet the needs, and at a high enough level that these people will be able to afford to develop their talents fully. Without these long-term investments in young people to help them learn and develop needed skills, we will experience a decline, in the future, in Canada's ability to compete and innovate in a knowledge-based world.

- **The rising cost of doing research**

Researchers and universities are increasingly challenged by the rise in the overall cost of conducting research. Maintaining leading-edge laboratories, purchasing scientific instrumentation, keeping pace with computer technology and financing fieldwork are all

examples of costly but essential components of successful research. Combined with fiscal restraint at all levels of government, more and more, university researchers must now pay user fees for some services and facilities that were once available free of charge. For example, ship time for ocean research was once a free service to universities, but now is a cost borne by the researcher.

Materials, laboratory supplies, graduate student stipends, and user fees are all examples of direct research costs – the only costs eligible for NSERC funding – and these account for about one-half of the overall cost of a research program. The universities provide all indirect costs, such as salaries of professors conducting research and overhead costs. Reductions in provincial funding levels have reduced universities' ability to cover these indirect costs. Universities have responded to the cuts by shifting some indirect research costs into direct costs through such means as user fees, creating a new pressure on NSERC funds.

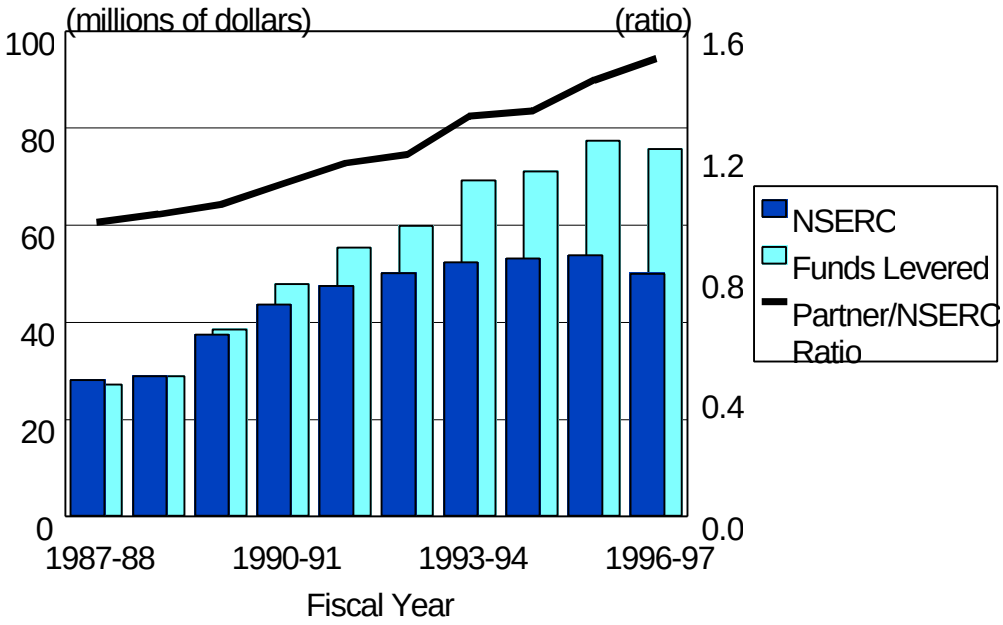
The net effect has been greater dependence of the research enterprise on NSERC, the primary source of support in Canada for basic university research in the natural sciences and engineering.

- **Need to improve Canada's global competitiveness through partnerships**

In the globalized knowledge-driven economy, Canadian companies are realizing the need to invest in long-term growth to improve competitiveness and speed up product development cycles, and therefore are starting to place greater emphasis on R&D. Industry is recognizing the knowledge base the university community offers and is entering into partnerships with universities at an ever-increasing rate. NSERC has responded to this demand for partnerships through project funding, requiring a commitment from the non-university partner, in the form of a financial contribution (cash or in-kind) and in many cases, active involvement in the research project. Figure 2 (see page 12) indicates the increased demand for University-Industry programs and the success in levering resources. NSERC levers approximately $1.60 from other sectors, mainly the private sector, for every $1 of NSERC project funding.

It should be noted that NSERC is the principal source of public support for research partnerships between universities and the private sector. It has taken the better part of two decades to bring the university and industry cultures together in this way, and now the effort is bearing fruit in spectacular fashion. There are many successful partnerships, and their achievements are creating wealth and high-quality jobs, and the demand for new partnerships is growing.

Figure 2: Leverage Ratio for NSERC Program Funding



Includes University-Industry, University-Government, Undergraduate Student Research Awards, Industrial Research Fellowships, and Industrial Postgraduate Scholarships programs.

- **Breaking down disciplinary walls**

Traditionally, research was an individual effort. While such research still takes place, collaboration and teamwork have become more and more important. Groups of researchers with diverse disciplinary backgrounds and skill sets are working together, often in collaboration with industries and governments, to solve small and large-scale problems to the benefit of society. Partly as a result of information technology, barriers between disciplines, institutions, sectors and nations are being broken down through networking and sharing research results and expertise. NSERC has participated in this evolution by developing the Research Partnerships Program, which includes Strategic Project grants, Research Network grants and University-Industry projects, and participating in developing the Networks of Centres of Excellence Program (NCE) – a unique initiative putting Canada at the leading edge of multi-disciplinary targeted research linking universities, industries and government on a national scale.

- **Canada Foundation for Innovation**

The federal investment of $800 million for the creation of the Canada Foundation for Innovation (CFI), announced in the February 1997 federal budget, was welcome news. Through partnerships with the private and voluntary sectors as well as with provincial governments, and over the five-year period during which the CFI is anticipated to be

making its awards, the total investment by the CFI and its partners in the research infrastructure of Canada's universities, colleges and research hospitals should exceed $2 billion. However, while the CFI represents a significant opportunity to strengthen Canada's university research infrastructure, it will create challenges for all sectors. The granting councils, which fund the direct costs of research, expect an increase in demand for funding to operate the modernized facilities and laboratories. The CFI will fund projects on a matching basis, requiring the universities to find sources of that matching funding, including partnerships with provincial governments and industry. This may prove to be easier in some fields than in others, and is likely to be easier in some large universities than in the rest.

- **Losing critical mass at universities**

In looking at the Association of Universities and Colleges of Canada (AUCC) data on worldwide inflow of knowledge workers to Canada versus the outflow from Canada to the United States, Canada has gained increasing numbers from worldwide sources, almost 10 times as many in 1996 as in 1986. Canada gained well over 40,000 knowledge workers in 1996; in comparison, approximately 5,000 Canadians went to the U.S.

The problem lies in emerging gaps within the universities. The funding cuts to universities have had an impact on university staffing practices, notably the implementation of early retirement packages for faculty and staff designed primarily to reduce the costly salary budgets. As high-paid tenured professors retire or relocate, universities have tended to replace the vacancies with entry-level positions, if at all. The AUCC, in collaboration with NSERC, surveyed almost 100 deans in four major fields (computer sciences, engineering, mathematics, and the physical and biological sciences) in 1997. The AUCC Faculty Survey revealed that in 1995-96 and 1996-97, only about half of the departing faculty was being replaced. Of those replaced, over 80% of the vacancies were filled at the entry level, 10 percent at the mid-career level and only 7 percent were senior appointments. These percentages do not match the faculty departures of which the majority has been at the senior or mid-career levels. As a result, universities are sacrificing highly qualified faculty expertise by hiring entry-level replacements for budgetary savings.

This means that the prospects of full-time teaching positions are dim for many new doctoral graduates. Often, these young researchers must accept sessional or by-the-course positions that do not provide research support, while more senior level positions go unfilled. Consequently, the research careers of these people suffer, as there is little to no time given for research, little or no access to adequate facilities or laboratories and small prospect of research funding. While some retired professors continue their research, those faculty that remain at the university are experiencing higher teaching loads leaving less and less time available for their research.

The "new opportunities" program of the Canada Foundation for Innovation is designed to address one aspect of this problem – the provision of adequate research infrastructure for the best of the new faculty.

Clearly, there are questions as to the ability of Canadian universities to supply and train the next generation of researchers and maintain centres of expertise. The loss of highly qualified people at or approaching the peak of their careers, the increased workloads of remaining faculty, the declining support for research, and the rising costs of research in many fields combine to threaten the future of the research enterprise.

Key Plans and Strategies

Higher research costs, universities' loss of critical mass, large-scale projects and partnerships are changing the university research environment. Industry's reliance on universities is intensifying, and the need to keep experts in Canada and foster the next generation of researchers in the natural sciences and engineering is escalating. These forces, pulling in multiple directions, are creating strong pressure on NSERC's budget.

NSERC must be strategic in its investments to ensure that Canada's research enterprise continues to flourish, and that NSERC's actions are in line with Canada's needs and government policy, including the S&T Strategy and the Industry Portfolio's Action Plan. Therefore, NSERC resources are being concentrated on the core functions of support for basic and project research, and for the training of highly qualified people.

The first three strategies identified below focus on NSERC's core activities; the remaining three relate to NSERC's operational plans and strategies.

1. Maintain level of support for basic research

   The federal S&T Strategy outlines the need to build a strong Canadian innovation system. A key to achieving this is through the advancement of knowledge. University basic research has been and will continue to be the primary source of excellent high quality new knowledge. Basic research, probing fundamental questions, is the starting point of applied research and commercialization. It is the source of new knowledge and tools that when adopted in industry can lead to innovative products and processes, creating economic activity benefiting future generations of Canadians. Therefore, preserving NSERC's commitment to and investment in basic university research while ensuring excellence through peer review is central to NSERC's achievement of its ultimate objective. To this end, the current level of funding allocated to the Research Grants Program will be maintained.

   By funding basic research, NSERC supports the creation of a stock of new ideas for innovation. Promising new developments first become visible in the Research Grants Program, and changes in disciplines and the research environment all have an impact on funding needs. Funding new developments has become very challenging in an era of fiscal restraint. Accordingly, NSERC has developed a mechanism, the Reallocations Exercise, where disciplines compete for the reallocation of 10% of the total funding of the Research Grants Program. The

underlying criterion for reallocation is the importance to Canada of what might be achieved with additional funds.

2. Build partnerships through project research

   Maintaining core funding to support basic research only satisfies one part of the equation – the production of knowledge. NSERC's corresponding objective – the productive use of knowledge – must also be achieved. To ensure that the stock of knowledge generated by university research is used to the benefit of all Canadians, NSERC must continue to foster the transfer of this knowledge to other sectors – primarily but not exclusively industry – leading to greater economic activity and new jobs and businesses. The means by which NSERC achieves this objective is through the support of project research in partnership with the users of new knowledge.

   Partnership between NSERC and other sectors, including government departments and agencies, is a key strategy to successful investments in Canada's capabilities in S&T. The success of the Networks of Centres of Excellence (NCE), and Collaborative Research and Development Grants (CRD) has afforded the critical transfer of knowledge outside universities and has provided a solid foundation for future initiatives. The success of the CRD program can be shown by the ability to lever funds outside NSERC - the leverage ratio for the 85 CRD grants is 2.24 (that means for every $1 of NSERC CRD program funding, NSERC levers $2.24 from other sectors). Furthermore, responses to a September 1995 survey of program officers for 39 projects indicated over 90% rated the achievement of the grant's objectives to be at least "good" (almost 60% either outstanding or excellent).

   NSERC will continue to play an important role in facilitating the exploitation of research to a point where it can be commercialized in industry. Enhancing the flow of knowledge and highly qualified people from university research to industry will promote innovation, resulting in economic growth and the creation of jobs. Beyond project and partnership funding, NSERC has collaborated with The Conference Board of Canada on University-Industry Synergy R&D Partnerships Awards and Symposia to foster increased university-industry collaboration in research and development. This year's symposium focused on university spin-off companies.

   Canadian small and medium-sized enterprises (SMEs) are the major source of new Canadian jobs. Therefore, the success and growth of SMEs are important to Canada's economic development and job creation. These firms do not have the resources to invest in research and development and require alternative mechanisms to improve their technological capacity and ensure sustained growth. Accordingly, NSERC has and will continue to focus on fostering linkages between universities and SMEs to assist in the transfer of technology and the commercialization of university-based innovations and discoveries.

3. Ensure a supply of highly skilled scientists and engineers for Canada

NSERC's investment in the training and development of highly qualified people in science and technology is critical to Canada's long-term economic development and quality of life. Canada's future capabilities in science and technology will be dependent on today's graduate students, postdoctoral fellows and junior faculty. The success of these bright minds will determine the state of health of the research enterprise, our industries, and all other sectors that depend on current knowledge.

The focus begins with students early in their studies. Young undergraduates who have the requisite talents must be encouraged to pursue a career in the natural sciences and engineering fields. Promoting advanced studies and research in science and technology is fundamental to the future supply of scientists and engineers. Programs such as NSERC's Undergraduate Student Research Awards are very important to achieving this goal and must be expanded.

NSERC must strike a balance between the number of scholarships, fellowships and stipends from grants allocated and the maximum value of the award/stipend. The optimal balance will provide a sufficient level of funding to attract the brightest students while supporting more young people in their advanced studies in the natural sciences and engineering. NSERC must also determine the optimal balance between university and industry-oriented programs. This strategy is very difficult to achieve as a result of NSERC's budgetary environment and other factors eroding the value of awards and stipends. To undergraduate students, already experiencing unprecedented debt loads, the prospect of further indebtedness and foregoing earnings seems daunting. As a result, young people are not realizing their full potential as they abandon advanced studies, or they are leaving Canada for studies abroad where levels of support are higher. The same case can be made for postdoctoral fellowships and for graduate stipends paid out of NSERC grants.

For two years running, NSERC has been working with students and young researchers to address the needs of the next generation of Canadian researchers. The two workshops held to date have provided an excellent forum for discussion and resulted in recommendations and action plans. One such area of discussion led to the need for NSERC to address the changes in the career paths facing today's young researchers. Traditionally, Ph.D.s aspired to a career in academe; today, doctoral students have many options other than a research career in a university setting. We now know that an advanced education in research can be much more than training for research. It is with this in mind that NSERC must continue to foster linkages with other sectors, notably industry, to help the next generation of highly qualified people pursue rewarding careers of many kinds in other sectors. The most notable mechanisms to achieve this are the Industrial Research Fellowships and Industrial Postgraduate Scholarships programs.

Further, young researchers must also be exposed to research beyond traditional disciplinary and national borders to keep pace with the most important current developments in knowledge. They must be prepared to contribute to international research on large-scale problems and to work within multi-disciplinary teams and facilities. Otherwise, Canada risks losing our initial investments in their skills and knowledge either because they do not develop them fully and do other things or because they find better opportunities outside Canada.

4. Policy leadership

   Lessons learned in the course of operating and evaluating NSERC's programs will guide policy formulation and the evolution of program design so that NSERC's investments will have the greatest possible strategic impact on Canada's capabilities in S&T.

5. Increase public awareness

   NSERC will strive to increase public awareness of the research sector, in particular the natural sciences and engineering. A new initiative is underway to provide 'plain-language' summaries of funded programs and projects on NSERC's World Wide Web Site. Additionally, posting new research and spin-off company success stories on the Web site will complement the dissemination of NSERC-funded research to a wider audience. Further, NSERC has developed a handbook: *Communicating science to the public: a researchers handbook,* to encourage researchers to communicate with the general public.

6. Strive for improved quality of service

   NSERC has been able to offer a high quality of service to internal and external clients while maintaining a low ratio of administration to program funding – administration represents approximately 3.8% of total funding. Additionally, performance baselines and service standards are being developed to ensure the high quality of service is maintained.

Expected Results

NSERC's investments in Canada's intellectual resources in science and technology are expected to yield discoveries of new knowledge and the application of this knowledge to build a strong national economy and quality of life for all Canadians. The return on Canada's investment in natural sciences and engineering university research will be realized three ways.

First, NSERC's investment in basic research will result in significant Canadian discoveries in the natural sciences and engineering, which will directly contribute to an advanced knowledge base. The advancement of knowledge is a vital source of economic

and societal benefits for Canada and is the cornerstone of Canada's innovation system. NSERC's funding of basic university research, with the overriding criterion being excellence, will continue to lead to high-quality research results contributing to a stock of scientific and technological knowledge. This in turn will contribute to Canada's capabilities in science and engineering on a national and international scale. Measuring the return on investment in the short-term will be almost impossible as outcomes from basic research are often only realized in the long-term. As well, linking the initial discovery to a commercial application can be very complex. For example, the commercial development of the laser occurred some 80 years after Albert Einstein described the underlying physics. Today lasers are used in medicine, communications, industrial manufacturing and consumer goods.

The Reallocations Exercise, to be completed for the 1999 Research Grants competition, will ensure a redistribution of the available amount of support to important new and emerging areas in the natural sciences and engineering, thereby contributing to Canada's innovation system. The submissions presented by the various disciplines will also benefit the entire research community. This information may be used by the disciplines themselves, universities or NSERC to communicate important achievements, opportunities and challenges of university research to government, industry and the general public.

Second, building on the initial return on investment, NSERC will facilitate the transfer of the stock of new knowledge from universities to other sectors by funding project research and fostering linkages and partnerships. This second level of investment, linking researchers with those who use knowledge productively, will see returns in the form of new products, processes, and services as well as policies, standards and regulations. Taking this one step further, Canada can expect new jobs and businesses, increased productivity of existing Canadian companies and improved management of knowledge advancement by government.

Third, NSERC invests in the training and development of future scientists and engineers. Investments are made directly to students in the form of scholarships and fellowships, and indirectly by supporting the student/research assistant salaries associated with university research programs and projects. The return on this investment will be the provision of highly qualified people who will be able to pursue knowledge-intensive careers of many kinds within any sector thereby contributing to Canada's future quality of life and prosperity. Further, these individuals, with expertise in natural sciences and engineering - a resource in short supply in Canada – will reduce the need for offshore recruitment.

In addition to the three investment returns mentioned above, NSERC is committed to ensuring that Canadians and the federal government receive value for their money. To this end, NSERC will provide policy leadership that will ensure the greatest strategic impact to shape scientific and technological capabilities in Canada. Retaining flexible program design, while maintaining a commitment to research excellence, will ensure the appropriateness of NSERC's investment of public funds. Further, applying the

knowledge gained through funded research, trends in NSERC partnerships, and supply-demand studies on Highly Qualified Personnel will also help guide future investments.

Section IV: Supplementary Information

1. Spending Authorities

Industry
Table 1: Spending Authorities – Ministry Summary Part II of the Estimates

Vote	($ millions)	**1998-99 Main Estimates**	1997-98 Main Estimates
	Natural Sciences and Engineering Research Council		
85	Operating expenditures	**16.0**	15.2
90	Grants	**404.8**	417.2
(S)	Contributions to employee benefit plans	**1.9**	1.5
	Total Agency	**422.7**	433.9

2. Personnel Information

Table 2.00: Council Organization Structure

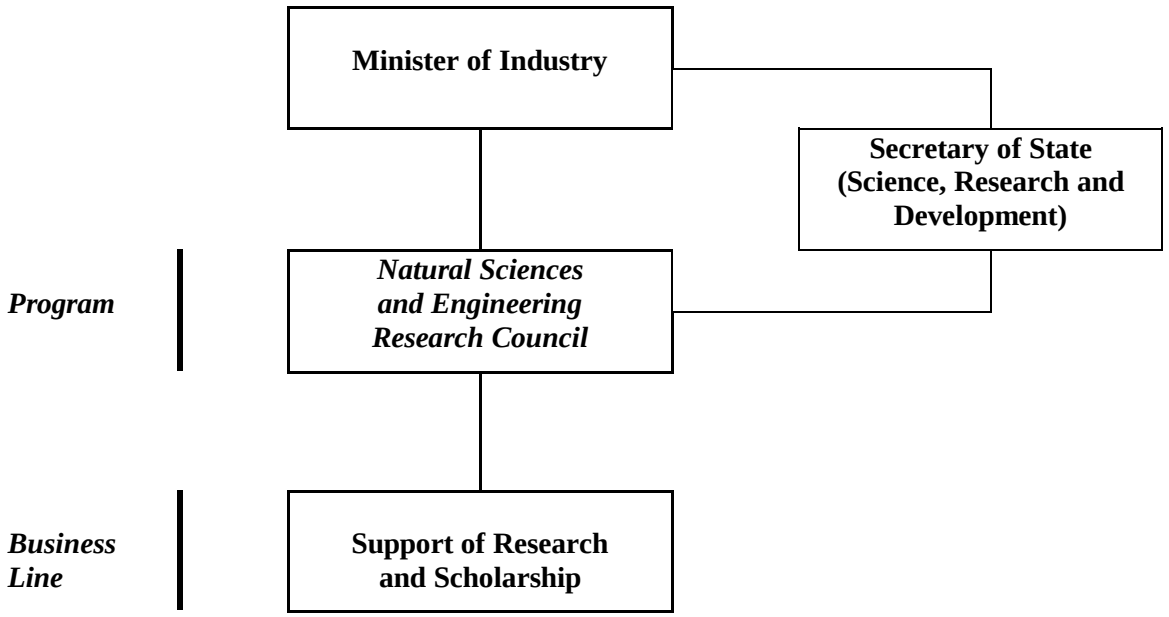


Table 2.01: Council Committees

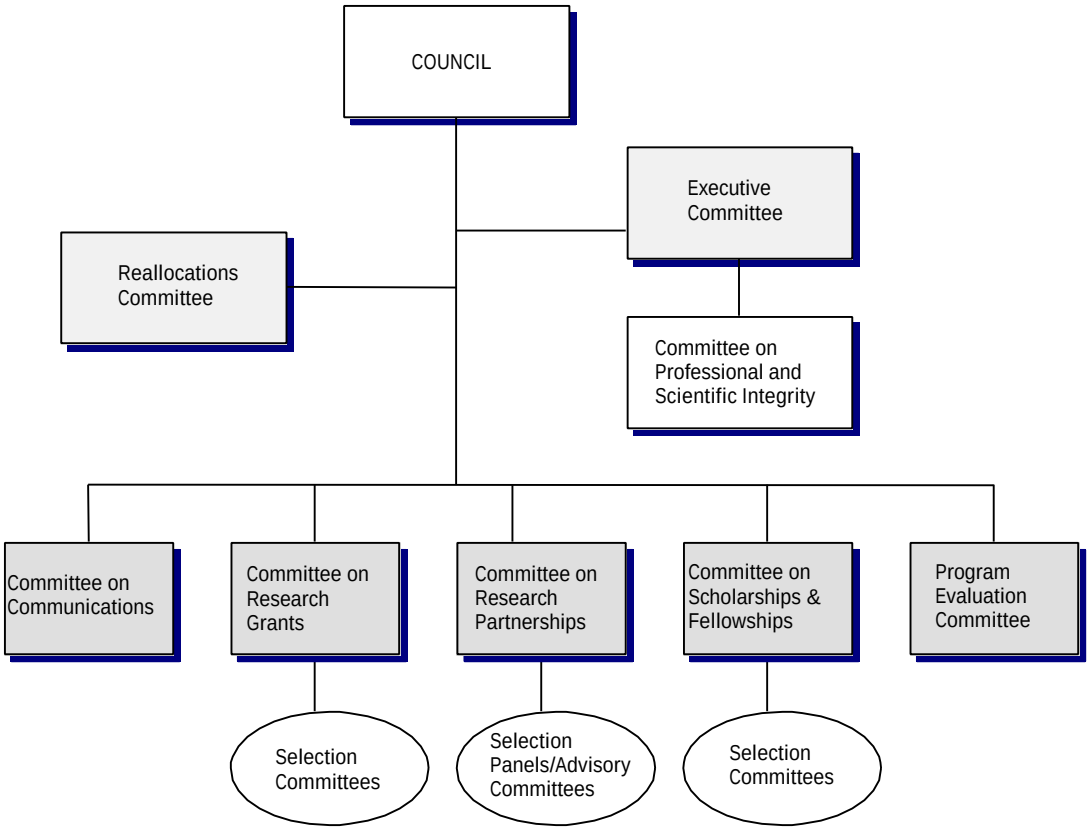


Table 2.02: Responsibility for Planned Spending by Program and Business Line for 1998-99

($ millions)	**Accountability**	
Program/Business Line	President	**Total**
Natural Sciences and Engineering Research Council Program		
Support of Research and Scholarship	493.7	**493.7**
Total Planned Spending	**493.7**	**493.7**

Table 2.1: Planned Full-Time Equivalents (FTEs) by Program and Business Line

	Forecast 1997-98	**Planned 1998-99**	Planned 1999-00	Planned 2000-01
Natural Sciences and Engineering Research Council Program				
Support of Research and Scholarship	191	**197**	197	197
Total	191	**197**	197	197

Table 2.2: Details of FTE Requirements

	Forecast 1997-98	**Planned 1998-99**	Planned 1999-00	Planned 2000-01
Salary Ranges				
<30,000	85	**87**	87	87
30,000-40,000	40	**40**	40	40
40,000-50,000	32	**34**	34	34
50,000-60,000	20	**22**	22	22
60,000-70,000	6	**6**	6	6
70,000-80,000	5	**5**	5	5
>80,000	3	**3**	3	3
Total	191	**197**	197	197

3. Additional Financial Information

Table 3: Summary of Standard Objects of Expenditure

($ millions)	Forecast Spending 1997-98	**Planned Spending 1998-99**	Planned Spending 1999-00	Planned Spending 2000-01
Personnel				
Salaries and wages	8.7	**8.9**	9.1	9.1
Contributions to employee benefit plans	1.5	**1.9**	1.9	1.9
	10.2	**10.8**	11.0	11.0
Goods and services				
Transportation and communications*	2.6	**2.6**	2.7	2.7
Information	1.0	**1.0**	0.9	0.9
Professional and special services	3.6	**2.6**	2.7	2.7
Rentals	0.1	**0.1**	0.1	0.1
Purchased repair and maintenance	0.1	**0.2**	0.2	0.2
Utilities, materials and supplies	0.2	**0.4**	0.4	0.4
Minor Capital	0.1	**0.2**	0.5	0.5
	7.7	**7.1**	7.5	7.5
Total operating	17.9	**17.9**	18.5	18.5
Capital				
Controlled capital	—	**—**	—	—
Revolving Fund	—	**—**	—	—
	—	**—**	—	—
Transfer payments				
Voted	418.0	**475.8**	476.6	482.7
Statutory	—	**—**	—	—
	418.0	**475.8**	476.6	482.7
Gross budgetary expenditures	435.9	**493.7**	495.1	501.2
Less: Revenues Credited to the Vote	—	**—**	—	—
Revenues Credited to the Revolving Fund	—	**—**	—	—
Net budgetary expenditures	—	**—**	—	—
Non-budgetary (Loans, Investments and Advances)	—	**—**	—	—
Total	435.9	**493.7**	495.1	501.2

*Includes the transportation costs of the volunteer members of Council committees (approximately 450 volunteers)

Table 4: Program Resources by Program and Business Line for 1998-99

($ millions)		Budgetary							
	FTE	**Operating**	**Capital**	**Grants And Contributions**	**Gross Voted**	**Statutory Items***	**Gross Planned Spending**	**Less: Revenue Credited to the Vote**	**Net Planned Spending**
Natural Sciences and Engineering Research Council Program									
Support of Research and Scholarship	197	17.9	—	475.8	493.7	—	493.7	—	493.7
Total	**197**	**17.9**	**—**	**475.8**	**493.7**	**—**	**493.7**	**—**	**493.7**

* Does not include contributions to employee benefit plans that are allocated to operating expenditures.

Table 5: Details of Transfer Payments by Program and Business Line

($ millions)	Forecast Spending 1997-98	**Planned Spending 1998-99**	Planned Spending 1999-00	Planned Spending 2000-01
Grants				
Natural Sciences and Engineering Research Council Program				
Support of Research and Scholarship	418.0	**475.8**	476.6	482.7
Total grants	418.0	**475.8**	476.6	482.7
Contributions	—	**—**	—	—
Other Transfer Payments (if any)	—	**—**	—	—
Total	418.0	**475.8**	476.6	482.7

Table 6: Net Cost of Program for 1998-99

($ millions)	Natural Sciences and Engineering Research Council Program	**Total**
Gross Planned Spending	493.7	**493.7**
Plus:		
Services Received without Charge		
Accommodation provided by Public Works and Government Services Canada (PWGSC)	1.1	**1.1**
Contributions covering employees' share of insurance premiums and costs paid by TBS ($8,922,000*6.6%)	0.6	**0.6**
Workman's compensation coverage provided by Human Resources Canada	—	—
Salary and associated costs of legal services provided by Justice Canada	—	**—**
	1.7	**1.7**
Total Cost of Program	495.4	**495.4**
Less:		
Revenue Credited to the CRF	—	—
Net Cost of Program		**495.4**
1998-99 Estimated Net Program Cost	495.4	**495.4**

4. Other Information

Listing of Statutes and Regulations

NSERC does not administer any statutes.

Table 7: References

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