Investing in people, discovery and innovation

Departmental Performance Report

for the period ending March 31, 2005

David L. Emerson
Minister of Industry

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List of Abbreviations

AUCC	Association of Universities and Colleges of Canada
CFI	Canada Foundation for Innovation
CIHR	Canadian Institutes of Health Research
CRD	Collaborative Research and Development grant
DPR	Departmental Performance Report
HQP	Highly Qualified Personnel
IP	Intellectual Property
IRF	Industrial Research Fellowship
NCE	Networks of Centres of Excellence
NSE	Natural Sciences and Engineering
NSERC	Natural Sciences and Engineering Research Council of Canada
OECD	Organisation for Economic Co-operation and Development
PDF	Postdoctoral Fellowship
R&D	Research and Development
S&T	Science and Technology
SSHRC	Social Sciences and Humanities Research Council of Canada
USRA	Undergraduate Student Research Award

Section 1 – Overview

1.1 Minister's Message

The organizational members of the Industry Portfolio are:

- Atlantic Canada Opportunities Agency [2]
- Business Development Bank of Canada [1]
- Economic Development Agency of Canada for Quebec Regions [2]
- Canadian Space Agency
- Canadian Tourism Commission [1]
- Competition Tribunal
- Copyright Board Canada
- Enterprise Cape Breton Corporation [1] [2]
- 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 [1]
- Statistics Canada
- Western Economic Diversification Canada [2]

[1] Not required to submit a Departmental Performance Report.
[2] Not a Portfolio member for the purposes of the Main Estimates.

A key priority of the Government of Canada is building an economy that will meet the challenges of the 21st century; an economy that is knowledge-based, technology-driven, and globally oriented. In support of this goal, NSERC and the 14 members of the Industry Portfolio encourage innovative basic and advanced research, promote the commercialization and the adoption of new technologies and support the diffusion of transformative ideas throughout our economy. We also work to forge new and improved relationships with international partners, including emerging markets, in science and specialized technical areas. Essential to this work is a framework of marketplace regulations and laws that encourages innovation and stable growth. Through our efforts, the Industry Portfolio is helping to build a world-leading economy driven by talent, ideas and initiative.

The Industry Portfolio is composed of NSERC and 14 other federal departments, agencies, Crown corporations, and quasi-judicial bodies. These organizations collectively play a key role in advancing Canada's industrial and economic development as well as fostering progress in science and technology. Advancing these priorities improves the overall health of the Canadian economy, provides opportunities for all Canadians to participate in our economic development and prosperity, and contributes to the quality of life of all Canadians.

Many Industry Portfolio initiatives build upon our strategic investments in research and development and help to move publicly-funded scientific and technological advances into the marketplace. Other key activities and programs encourage business growth and help industrial sectors be more innovative. Collectively, Industry Portfolio initiatives — and more importantly the results of those initiatives — stimulate the necessary adaptive and transformative changes demanded by the global economy.

NSERC's *Departmental Performance Report* for the period ending March 31, 2005 describes the achievements and results of the department. In 2004-2005, NSERC invested $803 million in university-based research and training in all the natural sciences

and engineering. Thanks to NSERC's investments on behalf of the Government of Canada, Canadian researchers gain access to leading-edge knowledge from around the world. Armed with this knowledge, and working increasingly in partnership with industry, they help fuel Canada's innovation system. The students, trained with the help of NSERC, acquire the skills needed to pursue rewarding careers in all sectors of the economy and become tomorrow's leaders. These investments in Canada's knowledge base lead to innovations in industry, and help set policy, standards and regulations. In so doing, they strengthen our economy and improve the quality of life for all Canadians.

As a member of the Industry Portfolio, NSERC has contributed to the industrial and economic development of our nation. The work and contributions of the department are part of the overall government effort to develop and foster opportunities that reflect Canada's economic and social character. Through these efforts, we are investing in our people, our enterprises, and our future — the result will be a stronger and more prosperous economy for all Canadians.

I am pleased to present NSERC's *Departmental Performance Report* for 2004-2005.

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David L. Emerson
Minister of Industry

1.2 Management Representation Statement

I submit, for tabling in Parliament, the 2004-2005 Departmental Performance Report (DPR) for the Natural Sciences and Engineering Research Council of Canada (NSERC).

This document has been prepared based on the reporting principles contained in the Treasury Board of Canada Secretariat's *Guide for the preparation of 2004-2005 Departmental Performance Reports* :

- It adheres to the specific reporting requirements;
- It uses an approved Business Line structure;
- It presents consistent, comprehensive, balanced and accurate information;
- It provides a basis of accountability for the results pursued or achieved with the resources and authorities entrusted to it; and
- It reports finances based on approved numbers from the Estimates and the Public Accounts of Canada.

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Nigel Lloyd, Executive Vice-President
Natural Sciences and Engineering Research Council of Canada

1.3 Summary Information

Canada's prosperity depends upon people, knowledge and innovation, especially in science and technology, as we transform our economy from one based on commodities to one based on value-added products in all sectors. Science and technology will also continue to enhance our quality of life by helping us improve the management of our resources, environment, public education and health system.

NSERC (Natural Sciences and Engineering Research Council of Canada) is the primary federal agency investing in people, discovery and innovation. It is funded directly by Parliament and reports to it through the Minister of Industry.

Our mission is to invest in people, discovery and innovation to build a strong Canadian economy and to improve the quality of life for all Canadians. NSERC advances government-wide priorities of building a stronger Canada, creating opportunities for young Canadians and investing in knowledge and creativity.

Created in 1978, NSERC's legal mandate, vision and mission are outlined in Figure 1.

The agency's ultimate objective is to advance Canada's prosperity and high quality of life by supporting the creation and transfer of knowledge in the natural sciences and engineering (NSE) in Canada, and by ensuring people are trained to use and create that knowledge. To achieve this, NSERC supports research in Canadian universities and colleges that meets the highest international standards of excellence and 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 experts. Partnerships with industry connect researchers with those who can use the new knowledge productively and enhance Canada's capacity for innovation. 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.

In December of 2003, NSERC received permission from Treasury Board to use the trademark "Science and Engineering Research Canada" in its promotional materials and its communications with the public.

Figure 2 highlights the financial resources expended by NSERC priority and expected outcomes. The evidence presented in Section 2 suggests that all of the 2004-05 planned results successfully met expectations.

Figure 1
NSERC's Mandate, Vision and Mission

Mandate

NSERC was created in 1978. "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 such research as the Minister may refer to the Council for its consideration." *(Natural Sciences and Engineering Research Council Act, 1976-77, c.24.)*

Vision

NSERC will help make Canada a country of discoverers and innovators for the benefit of all Canadians.

Mission

NSERC will achieve this by investing in people, discovery and innovation through programs that support university research in the natural sciences and engineering on the basis of national competitions, and that will continue to be our major activity.

Figure 2
NSERC's Resources, Priorities and Expected Results

Total Financial Resources:

Planned Spending	Total Authorities	Actual Spending
$849.6M	$811.7M	$803.0M

Total Human Resources:

Planned	Actual	Difference
308	307	-1

Summary of Performance in Relationship to Departmental Strategic Outcomes, Priorities and Commitments:

Strategic Outcome	Priorities	Type of Priority	Planned Spending	Actual Spending	Expected Results and Current Status
To provide Canadians with economic and social benefits arising from the provision of a highly skilled workforce, knowledge transfer of Canadian discoveries in the natural sciences and engineering from universities and colleges to other sectors, and informed access to research results from around the world.	1. Investing in people	Ongoing	$274.3M	$229.0M	Highly qualified people, expert in research in the natural sciences and engineering, able to pursue various knowledge-intensive careers within industry, government and other sectors of the economy. Enhanced ability to recruit the next generation of scientists and engineers among today's youth. Canadian universities achieve high levels of research excellence and become world-class research centres in the knowledge-based economy.
	2. Funding the discovery process	Ongoing	$339.8M	$382.2M	High-quality research capability maintained across all areas of the NSE. New knowledge that is required for innovation. Enhanced ability to contribute to and access leading-edge knowledge from around the world.
	3. Helping Canada innovate	Ongoing	$159.8M	$155.0M	Productive use of knowledge in support of new products, processes, and services, leading to new jobs and businesses. Accelerate research in target areas of national importance. Knowledge base for developing policies, standards and regulations, and making decisions, for government and industry. **Expected results were all successfully met.**

Note: Actual spending differs from planned spending due to underspending in the Canada Research Chairs program and new funding allocated in the 2004 budget ($39M).

1.4 Overall Departmental Performance

NSERC measures its performance by evaluating its programs of research and training support according to their impact, cost effectiveness and continuing relevance. When reviewing performance of research support programs, it is important to remember that these investments take longer to bear fruit than most other government investments. **The impact of NSERC's investment in research and training in the NSE can be fully assessed only over the long term.** Therefore, the planned results reported in NSERC's Report on Plans and Priorities 2004-05 should be considered as planned results for the future. The performance information presented in this year's DPR is a retrospective look at outcomes resulting from NSERC funding over the past decade, and in some cases even longer.

In recent years, NSERC has been successful in:

- maintaining a strong presence in world science and engineering research by annually supporting over 10,000 of the most creative and productive Canadian university professors;
- supporting the training of approximately 65,000 master's and doctoral students, and young research professionals since 1978, who have had little trouble finding well-paying, productive jobs and who are contributing to Canada's knowledge-based economic sectors;
- supporting the development of new processes and products, some leading to the formation of new companies, all of which contribute significantly to the national economy; and
- introducing new programs to ensure the research community optimises its contributions to Canada's prosperity.

1.5 How NSERC Outcomes Align with Government of Canada Outcomes

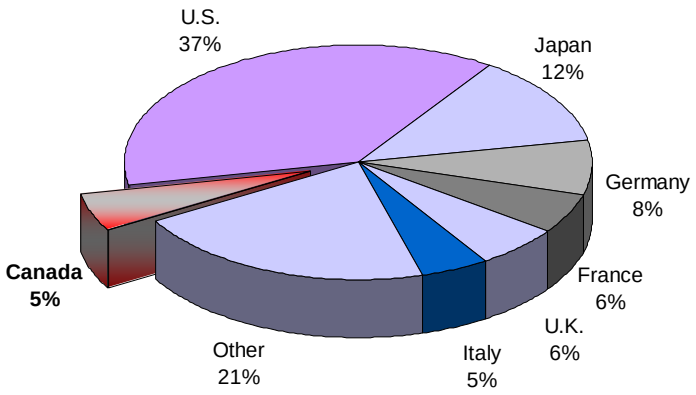
NSERC investments contribute significantly to many of the Government of Canada's strategic outcomes. Most of the NSERC-funded outcomes presented in Section 2 are linked to the Government of Canada outcome – an innovative and knowledge based economy. In addition, NSERC's long-term outcomes are directly linked to another important Government of Canada outcome – sustainable economic growth. NSERC-funded research and training also contribute to other Government of Canada outcomes, notably, a clean and healthy environment and healthy Canadians with access to quality health care. Section 2.4 highlights some important NSERC-funded achievements linked to these outcomes.

1.6 Environment and Challenges

Along with the more traditional role of education, universities worldwide have become centres of knowledge creation. In most industrialized countries, universities play a key role in the economic development of the nation. Because of the socio-economic benefits of university education and research, government funding of these institutions and their activities has become the norm.

University research is now a very large endeavour. In 2003, member countries of the Organization for Economic Co-operation and Development (OECD) spent $159 billion on university research (see Figure 3). Canadian university professors and students performed 5% of this total. When measured as a percentage of GDP, Canada spends slightly more on university research than all of its G7 competitors.

Figure 3
University Research Expenditures in the OECD, 2003



Total: $159 Billion

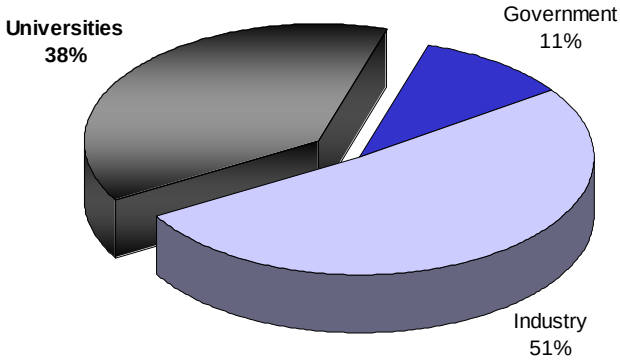
Source: OECD

In 2004, university research represented 38% of all Canadian research, as measured by expenditures (see Figure 4). Of the $9.3 billion of direct and indirect investment in Canadian university research in 2004, 44% was allocated to the natural sciences and engineering (NSE).

NSERC is the most important funder of research in the natural sciences and engineering in Canadian universities. In 2004, $4.1 billion was spent on research in the natural sciences and engineering in Canadian universities. NSERC directly provided almost one-sixth of the total funding. Since many of the other expenditures from university, industry and government sources are contingent upon NSERC funding and quality control, a

reasonable estimate makes the agency directly or indirectly responsible for slightly less than half of the total expenditure. Figure 5 gives a breakdown of the total funding by direct source.

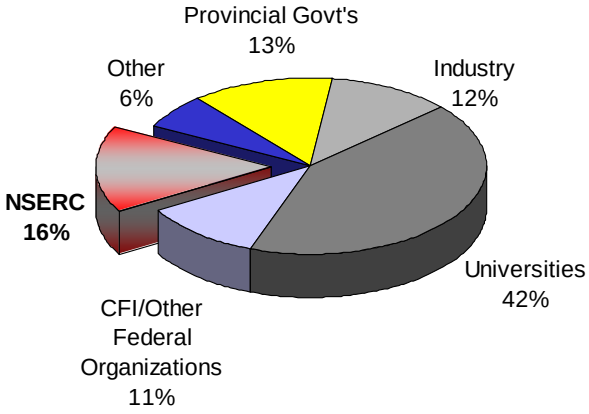
Figure 4
R&D Performance in Canada, 2004



Total: $24.5 Billion

Source: Statistics Canada

Figure 5
University R&D Funding in the Natural Sciences and Engineering, 2004



Total: $4.1 Billion

Source: Statistics Canada

Challenges

The Government of Canada, through the Innovation Strategy, has set a goal of making Canada among the top five Organisation for Economic Co-operation and Development (OECD) countries in research and development (R&D) investment per capita by 2010.

NSERC, the primary federal agency investing in postsecondary research and training in the natural sciences and engineering (NSE), is an integral part of this ambitious strategy: Some of the challenges NSERC faces to help achieve the Government's target are highlighted below.

Doubling Graduation Rates
Canadian universities annually award about 1,800 doctoral, 5,700 master's, and 28,000 bachelor's degrees in engineering, mathematics, and science. Even after allowing for increases in other sources of HQP – immigration, repatriation, and retraining – the graduation rate of HQP from Canadian universities at the master's and doctoral levels in the NSE will need to at least double to meet the goals set out in the Innovation Strategy. Graduation rates depend on both the numbers of graduate students enrolled and the time that it takes to complete a degree. Some evidence suggests completion times have been getting longer for decades, and the time from the completion of a bachelor's degree to a Ph.D. has reached eight years in some disciplines. Should this trend continue it will make the Government of Canada's goals of increasing the numbers of HQP more difficult to achieve.

Professional Skills
It is anticipated that a very large proportion of new graduates with advanced degrees will be hired into industry. Consequently, their graduate education will have to ensure they acquire skills that are important for work in the private sector. These include the capacities for team work, for finding and using knowledge from outside of their own field, for project management, for entrepreneurship, for developing a business plan, etc. Teaching such skills is not new; the novelty lies in the need to routinely integrate such skills into graduate education in the NSE.

NSERC continues to investigate how it may influence the development of professional skills curricula. NSERC's criteria for a number of its scholarship programs include consideration of a candidate's communication skills and leadership abilities. Scholarship programs at all postsecondary levels are offered specifically to students who will spend time developing such skills in the private sector while continuing their studies and research.

Opening the Door Wider
Canada's young scientists and engineers benefit from exposure to international research opportunities at an early stage of their careers: such experience benefits Canada when these researchers return and are able to improve the quality of their research careers in Canada. The current distribution of Canadian researchers in international labs is concentrated in a handful of countries such as the United States, the United Kingdom,

France, Germany, and Switzerland. However, there are many world-class labs that may be found outside of these more prominent countries, and Canada would benefit from greater Canadian participation at these labs as well. NSERC is working to increase the opportunities for Canadians to access the best labs in the world.

Increased Hiring of Professors into Canada's Universities

An early success for innovation in Canada – enabling the impressive growth in faculty actively involved in university research – poses an increasing challenge for NSERC, which has experienced a sustained increase in qualified first-time applicants for Discovery Grants. The increase in scientists who are establishing their research careers as faculty in Canada's universities has been a trend since the government began increasing investments in university-based research in 1997. Among the 3,014 applicants for 2004, 981 – or 33 percent – were first-time applicants. Against that growth only 259 currently funded professors did not reapply[1]. This level of attrition has shown no signs of increasing over the same period of time. Based on continuing consultations with Canadian universities and analyses performed by the Association of Universities and Colleges of Canada (AUCC), NSERC expects these hiring trends to continue, and in fact to increase as universities increase the size of their faculties to meet increases in student enrolment.

This growth in the number of new researchers is great news for Canada in the long-term, but it presents a challenge to NSERC in the short term. University hiring processes now include a thorough assessment of research potential (in the case of entry-level appointments) and accomplishment (in the case of senior appointments), using very much the same information that first-time applicants present to NSERC. This means that the people currently being appointed as professors in science and engineering in Canadian universities are very well qualified to do research, and the result is that their success rates in NSERC competitions are high – about 69 percent in 2004-05. The NSERC grant selection committees aim to fund every candidate who meets the high standards of the discipline in peer review. The consequence of this approach is that the funded researchers get, on the average, a grant of only about 45 percent of what they request.

The net increase in the number of university-based researchers represents a potential increase in the nation's capacity for research and training only if these people stay in Canada, develop careers, teach our students, and work with our industry. Therefore, their research must be funded adequately. That funding should not come at the expense of successful researchers already in Canadian universities, as that would not support what the government is trying to achieve in terms of the Innovation Strategy. NSERC has managed this pressure in recent years with Federal budget increases and by reallocating funds from or limiting growth of other programs such as RTI, MFA, Industrial Research Chairs, and Research Networks. Even within the Discovery Grants program itself, the average grant level for funded professors has not increased since the government's re-investment in university research. The additional funds allocated to this program since

[1] The overall number of professors in the NSE at Canadian universities is currently relatively stable; however, many professors who are not now or never were active in research are retiring, and being replaced by new professors expected to conduct research.

1997 have supported the increasing numbers of excellent researchers applying to the program, but have not allowed for increases to researchers' funding levels to offset increases in the cost of performing research.

Maximizing the Return on Federal Investments in Research
The important investments in infrastructure made by the Canada Foundation for Innovation (CFI) and its funding partners is but one example of the Government of Canada's ambitious agenda to improve support for advanced research in Canada. One challenge, however, is to support the efficient operation of these facilities. As these installations begin to run out of funds, many are applying to NSERC's MFA program to provide the operational costs of running these important facilities.

Similarly, to continue to attract and retain the best professors and create a stimulating research environment in which they can work, NSERC Discovery Grants at internationally competitive levels must be provided to Canada Research Chairs recipients, and to professors collaborating in their research. In addition, these researchers require access to funds through the RTI program to purchase and upgrade research equipment in their labs.

Facilitating the Commercialization of University Research
It has been well documented that universities play a strategic role in strengthening Canada's innovative capacity and productivity performance. Canada's comparative advantage in innovation lies in university research, as countries with whom we compete may have a longer history of engagement in commercialization activities and of funding private research centres that connect research with the global market (such as the Battelle Memorial Institute in the United States or the Fraunhofer-Gesellschaft institutes from Germany). Universities train HQP who create, build, and attract knowledge-based firms. Universities are a major source of ideas for new products and processes that add value and that will contribute to Canada's success in the global market, but there is a need to better link this capacity to the marketplace.

While results from early commercialization activities are promising, expertise and experience in the commercialization of research results is relatively under-developed for many Canadian universities, in particular when compared to the situation in the United States. It is critical that we exploit the discoveries of Canada's research universities. The Tri-Council Intellectual Property Mobilization program administered by NSERC, the training initiative to increase the supply of technology transfer and commercialization experts, and the Idea to Innovation program are steps in that direction. The new Colleges Helping Community Innovation pilot program launched in spring 2004 as one of NSERC's Vision initiatives will also contribute to using the potential that exists in Canada's postsecondary institutions.

To help accelerate the commercialization of university-based research, NSERC will triple its annual investments in programs directly supporting commercialization over the next two years.

Fostering Greater University-Industry Collaboration
NSERC helps to increase Canada's private-sector R&D investment and performance, and to foster the growth of receptor capacity in industry for new knowledge. NSERC Research Partnerships programs bridge the gap between the university research enterprise and those who can commercialize and exploit the results in order to create wealth. Cost-shared initiatives with industry share both the risks and benefits of research, and reduce the time for adoption of new technologies by Canadian industry.

The private sector is forming partnerships with universities at an increasing rate as universities offer access both to new knowledge and to the HQP who will be able to use that knowledge productively. There has been strong growth in the number of companies that have contributed to NSERC’s collaborative university-industry research programs. However, there remain many Canadian companies that could benefit from increased collaboration with universities for the purposes of R&D.

1.7 Clients and Partners

NSERC does not conduct any research in-house, nor does the organization have any training facilities. NSERC supports research in Canadian universities and colleges that meets the highest international standards of excellence, and it supports the education of young people in that research. As a result, the universities, colleges, companies, government agencies and other institutions with which NSERC collaborates are all key co-delivery partners. A brief summary of NSERC's clients and partners is presented in Figure 6.

Every year, NSERC reviews more than 11,000 applications for new grants and scholarships. In addition, NSERC manages thousands of ongoing grants and scholarships that were previously awarded. Detailed statistics on NSERC applications and awards can be found at: http://www.nserc.gc.ca/about/fact_e.asp.

More than 10,000 university professors and more than 21,800 university students and postdoctoral fellows are supported by NSERC. (For a searchable database of all NSERC grant and scholarship recipients see http://www.nserc.gc.ca/funding/funding_dec_e.asp.) The Council also supports a considerable number of university technicians and research associates. Most Canadian universities benefit from NSERC programs, as do a growing number of colleges, industries and government departments. Figure 6 presents the details of NSERC's client support. Estimates of the share of the population of eligible individuals and organizations funded or participating, and trends over the past 10 years, are also included.

As the main beneficiaries of NSERC funding, university professors and students are NSERC's key clients. University administrative offices, such as research and scholarship liaison offices, are key partners in ensuring cost-effective NSERC program delivery. Further downstream, university technology transfer offices assist in generating the socio-economic returns at the core of NSERC's desired strategic outcome. In addition, several NSERC programs require the involvement of industry and/or government partners. Some company trends and important government partners are highlighted in Figures 7 and 8.

A large number of difficult-to-identify partners contribute to the fulfilment of NSERC's strategic outcome. These partners are typically involved in the intermediate outcomes and include such players as venture capital firms, angel investors, government agencies involved in financing businesses, banks and other partners providing financing and/or advice.

Given the multitude of partners involved, it must be emphasized that the outcomes presented in Section 2 are shared achievements. Unfortunately, there is no easy way of isolating the impact of NSERC funding. However, because NSERC funding is the key driver in the early stages of the process and exercises quality control at that stage, it is doubtful that many of these outcomes could occur without it.

Figure 6
NSERC's Clients and Partners, 2004-05

	Number Supported or Participating	Share of the Population[1]	Trends in Share of the Population Over Past 10 Years
Clients:			
University Professors	10,376	75%	Moderate Increase
Undergraduate Students	9,108	7%	Small Increase
Master's/Doctoral Students	10,840	40%	Small Increase
Postdoctoral Fellows	1,898	40-45%	Small Increase
University Technicians and Research Professionals	2,980	30-40%	Stable
Partner Organizations:			
Universities and Colleges	76	75%[3]	Stable
Companies Performing R&D[2]	1,184	13%	Moderate Increase
Federal Science Departments/Agencies[2]	21	75%	Small Increase
Provincial Science Departments/Agencies[2]	27	25-40%	Moderate Increase

Source: NSERC

1. The percentage that NSERC supports of all individuals and organizations eligible for NSERC funding.
2. Organizations in partnership with NSERC (across all NSERC programs).
3. Percentage only applies for universities.

Companies

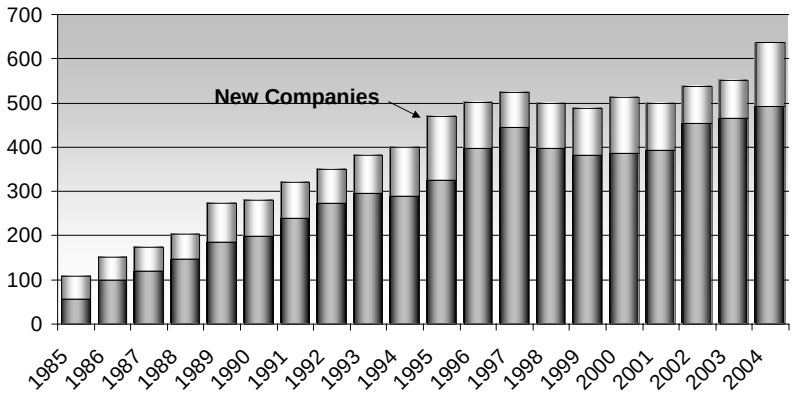
Strong growth has taken place in the number of companies that have contributed to NSERC's collaborative university-industry research programs (see Figure 7). Since the inception of the university-industry research programs, more than 1,800 firms have participated at some time, rising from less than 50 companies in 1983 to more than 600 businesses in 2004. On average, 100 new firms are working with NSERC every year.

NSERC is well-known to companies heavily involved in R&D. In 2004, 51 of the top 100 Canadian R&D companies (as ranked by Research Infosource, 2004) funded university research jointly with NSERC.

Government Departments/Agencies

NSERC is also well known to most federal and provincial science-based departments and agencies. A list of federal and provincial departments and agencies that NSERC collaborated with in 2004-05 is presented in Figure 8.

Figure 7
Number of Companies Contributing to NSERC's University-Industry Programs



Source: NSERC

Figure 8
NSERC's Federal and Provincial Partners, 2004-05

Federal Departments/Agencies	Provincial Departments/Agencies
Agriculture and Agri-Food Canada	Alberta Agriculture, Food and Rural Development
Canada Economic Development (Quebec)	Alberta Environment
Canadian Food Inspection Agency	Alberta Innovation and Science
Canadian Grain Commission	Alberta Research Council
Canada Mortgage and Housing Corporation	Alberta Sustainable Resource Development
Canadian Heritage	Alberta Transportation
Canadian Institutes of Health Research (CIHR)	B.C. Ministry of Agriculture, Food and Fisheries
Canadian Space Agency	B.C. Ministry of Forests
Communications Research Centre Canada	Centre de recherche industrielle du Quebec
Environment Canada	Environment Yukon
Fisheries and Oceans Canada	Manitoba Agriculture, Food and Rural Initiatives
Health Canada	Manitoba Conservation
Indian and Northern Affairs Canada	Fonds de recherche sur la nature et les technologies (Quebec)
Industry Canada	Ministry of Environment (Quebec)
National Defence	Ministry of Agriculture, Food and Fisheries (Quebec)
National Research Council Canada	Ministry of Natural Resources (Quebec)
Natural Resources Canada	Ministry of Finance, Economy and Research (Quebec)
Parks Canada	Ministry of Public Security (Quebec)
Public Safety and Emergency Preparedness Canada	Ministry of Transportation (Quebec)
Public Works and Government Services Canada	New Brunswick Dept. of Natural Resources and Energy
Social Sciences and Humanities Research Council of Canada (SSHRC)	Nova Scotia Dept. of Natural Resources
	Nova Scotia Dept. of Environment and Labour
	Ontario Ministry of Agriculture and Food
	Ontario Ministry of Natural Resources
	Ontario Ministry of the Environment
	Ontario Ministry of Transportation
	Saskatchewan Research Council

Section 2 – Analysis by Strategic Outcome

The strategic outcome that NSERC strives to achieve is to provide Canadians with economic and social benefits arising from the provision of a highly-skilled workforce and knowledge transfer of Canadian and international discoveries in the natural sciences and engineering from universities and colleges to other sectors. In more detailed terms, NSERC's performance expectations are highlighted in Figure 9. Starting with NSERC's strategic outcome, the model shows the immediate and intermediate outcomes expected. The pace of realization of immediate and intermediate outcomes will vary with the research projects and students funded, taking from a few years to decades. This progression is also not risk free, with some research projects and students not realizing their full potential. As well, no one indicator can be considered a defining accomplishment; rather a whole suite of indicators must be taken into consideration. In addition, many of the immediate and intermediate outcomes shown for the three priority areas overlap.

NSERC invests government funds through a variety of programs with different objectives, but with the same strategic outcome (socio-economic benefits for Canadians) in mind. All of NSERC's programs achieve a number of immediate and intermediate outcomes. Linking resources to any one expected outcome is, therefore, virtually impossible. Appendix A presents the major NSERC programs along with the respective resources invested in 2004-05 and the program objectives.

Sections 2.1 to 2.3 provide details of the performance measures selected for immediate and intermediate outcomes for NSERC's three priority areas.

Figure 9
NSERC's Performance Model

Strategic Outcome To provide Canadians with economic and social benefits arising from the provision of a highly skilled workforce, knowledge transfer of Canadian discoveries in the natural sciences and engineering from universities and colleges to other sectors, and informed access to research results from around the world.			
Priorities	**1. Investing in people**	**2. Funding the discovery process**	**3. Helping Canada innovate**
Expected Results	Highly qualified people, expert in research in the natural sciences and engineering, able to pursue various knowledge-intensive careers within industry, government and other sectors of the economy. Enhanced ability to recruit the next generation of scientists and engineers among today's youth. Canadian universities achieve high levels of research excellence and become world-class research centres in the knowledge-based economy.	High-quality research capability maintained across all areas of the NSE. New knowledge that is required for innovation. Enhanced ability to contribute to and access leading-edge knowledge from around the world.	Productive use of knowledge in support of new products, processes, and services, leading to new jobs and businesses. Accelerate research in target areas of national importance. Knowledge base for developing policies, standards and regulations, and making decisions, for government and industry.
Actual Spending	$229.0M	$382.2M	$155.0M
Intermediate Outcomes	Employers get access to highly qualified personnel Employment of postgraduates in well-paying jobs	Research results used by public (policy and safety) and private sectors New and improved products and processes introduced to market Invention disclosures, patents and licences obtained Start-up companies established	Research results used by public (policy and safety) and private sectors New and improved products and processes introduced to market Invention disclosures, patents and licences obtained Start-up companies established
Immediate Outcomes	Students and postdoctoral fellows gain research experience	High-quality research conducted Knowledge creation and dissemination to users Diversified research base maintained	High-quality research conducted Knowledge creation and dissemination to users Research funds leveraged from partners
Key Programs	Postgraduate Scholarships Postdoctoral Fellowships Research Fellowships Industrial Research Chairs Canada Research Chairs	Discovery Grants Research Tools and Instruments Major Facilities Access Special Research Opportunities	Strategic Projects Collaborative Research and Development Grants Research Networks Networks of Centres of Excellence

2.1 Investing in People

NSERC invests over 40% (directly and indirectly) of its funding in training the next generation of science and engineering graduates. This training support is provided in two ways: (1) directly through national competitions to selected individuals; and (2) through indirect support provided by an NSERC-funded professor from his or her NSERC grant.

STUDENTS AND POSTDOCTORAL FELLOWS GAIN RESEARCH EXPERIENCE

The main groups of students and fellows supported along with key results from surveys conducted are highlighted below (see http://www.nserc.gc.ca/about/estimates_e.asp for a full report on scholarships and fellowships surveys).

Undergraduate Students

NSERC provides four-month jobs for undergraduate students in the natural sciences and engineering through our Undergraduate Student Research Awards (USRA) program (note: NSERC-funded professors also support undergraduate students through their NSERC research grants). NSERC's current annual investment of $19 million in this program brings this experience to nearly 4,300 students every year. Providing these students with valuable experience in a university or industrial laboratory encourages them to undertake graduate studies. This is an important indicator of the impact of the program.

The first three surveys conducted with USRA recipients involving 5,322 respondents, found:

- Satisfaction is high with the USRA work experience;
- Students report learning practical techniques and methods and gaining critical management skills;
- Students report that the supervision and instruction they received was excellent;
- Students' interest in research increased at a critical period in their career choice;
- USRA work experiences had a significant impact on students' interest in careers in industry;
- Students overwhelmingly believe their USRA job experience will improve their permanent job prospects; and
- A significant number of students plan to stay in university longer as a result of their USRA job experience.

Master's and Doctoral Students

NSERC provides scholarship support for Canadians to pursue master's or doctoral degrees in the natural sciences and engineering. This is done in two ways: (1) directly through national programs supporting more than 4,000 students annually at a cost of $74

million per year; and (2) indirectly through NSERC's research grants, which support more than 6,800 students (full-time equivalent), at roughly $129 million per year.

The career status of former NSERC-funded master's and doctoral students and the degree to which NSERC funding affects their ability to undertake or continue with their studies are important indicators of the impact of the scholarship support. Over the past ten years, NSERC has completed seven surveys of directly-funded master's and doctoral students. Some of the key findings related to the research experience gained by these students is highlighted below:

- 46% report that NSERC funding was "very important" to their decision to continue to graduate studies;
- 96% of the respondents completed the degree (master's or doctoral) for which they received NSERC funding; and
- nearly two-thirds of the graduates are currently engaged in R&D activities in their careers.

Postdoctoral Fellows

After a doctoral degree, it has become customary in many NSE fields to go through additional postdoctoral research training. NSERC directly funds postdoctoral fellows (PDFs) for up to two years to continue their research training. The agency now invests approximately $17 million per year to support roughly 500 Canadian PDFs per year. NSERC also provides this PDF support for nearly 1,100 other individuals through NSERC research grants at an annual investment of over $44 million.

The career status of former NSERC-funded postdoctoral fellows and the degree to which NSERC funding affects their ability to pursue a research career are important indicators of the impact of the postdoctoral support. Over the past six years, NSERC has completed three surveys of directly-funded postdoctoral fellows. Some of the key findings of the surveys are:

- PDFs tend to obtain faculty positions at universities (57%) to train the next generation of scientists and engineers;
- The vast majority (87%) are still engaged in research, either as a university professor, research scientist or engineer;
- Almost 75% of PDFs report their postdoctoral training was critical to their careers; and
- For 90% of PDFs, NSERC funding was moderately to very important in their decision to continue with their research in an academic environment.

Industrial Research Fellows

Another route for doctoral graduates to gain additional research experience is through NSERC's Industrial Research Fellowships (IRF) program. This relatively small program invests approximately $5 million per year to help place 175 Canadian Ph.D.s annually in industrial laboratories. This investment has contributed significantly to the number of doctoral graduates working in Canadian industrial labs. More than 20% of Canadian industrial researchers with a Ph.D. have been funded by NSERC through the IRF program.

To determine if the program is staying on track, NSERC routinely monitors the employment situation of former IRF winners. Some key findings are:

- 76% of former IRF winners are still working in Canadian industries. A small percentage have gone on to academic positions in Canadian universities and a similar percentage have left the country.
- 98% of the firms said that the program was able to meet their requirements.
- 98% of the firms stated that the research project undertaken by the fellow was "successful."
- 94% of the firms believed the research project undertaken to be cost-effective.

Former NSERC-Funded Students and Fellows Comment on Their Awards

Undergraduate Students

- "I enjoyed the hands-on laboratory work, which helped improve my skills and critical thinking."
- "This is a very good opportunity for students to get a taste of formal R&D."
- "I feel the program, as it is, gives important experience and education to the participant."
- "Excellent program that helps students acquire knowledge and experience that is otherwise unavailable."

Master's and Doctoral Students

- "I now have tremendous research opportunities in my current job which I would not have had without my NSERC-funded training. The knowledge is beneficial to myself and my employer certainly, but arguably for the country overall."
- "NSERC support was critical to my decision to pursue graduate studies instead of employment. I appreciate very much the opportunities now available to me as a result of your investment in me."
- "There are very few qualified Canadians available for hire in our industry. NSERC is a key enabler for generating suitable candidates, and thus plays a big role in our industry."

Postdoctoral Fellows

- "Without my NSERC support I would simply not have conducted a research career – it changed my life."
- "NSERC Postdoctoral fellowships are essential to ensure the brightest young people remain in the university setting to become faculty in our universities. This is most important."
- "NSERC PDFs are vital to ensure that our best students get the opportunity to continue their studies in the world's best laboratories. Excellent program-keep it up!"

Industrial Research Fellows

- "The program is fantastic and individuals that are interested in industry will greatly benefit from it."
- "I am certain today that I obtained a position as Director of R&D in big part due to NSERC and the IRF program."
- "My IRF allowed a small, developing company hire me, which exposed me to the challenges and rewards of working for such a company."

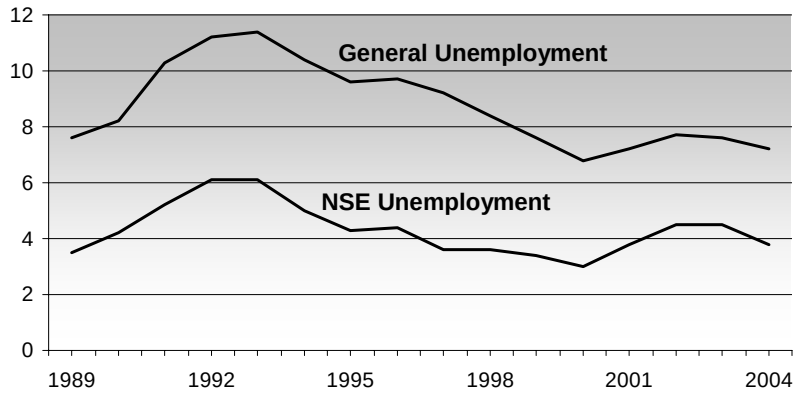
EMPLOYMENT OF POSTGRADUATES IN WELL-PAYING JOBS

Since 1978, NSERC has supported the training of approximately 65,000 master's and doctoral students in the NSE. These graduates are the most important contributors to knowledge creation and technology transfer that NSERC has funded. Surveys of NSERC-funded students early in their careers indicate extremely positive employment outcomes. Some of the highlights (see full report at http://www.nserc.gc.ca/about/estimates_e.asp) from the five surveys conducted to date include:

- Graduates experience far less unemployment (approximately 2%) than the norm (approximately 7%).
- The vast majority (92%) have found full-time employment.
- Incomes are much higher than the Canadian average, with more than 80% earning more than $45,000 a year.
- 69% report their graduate training was "critical" to their current employment.

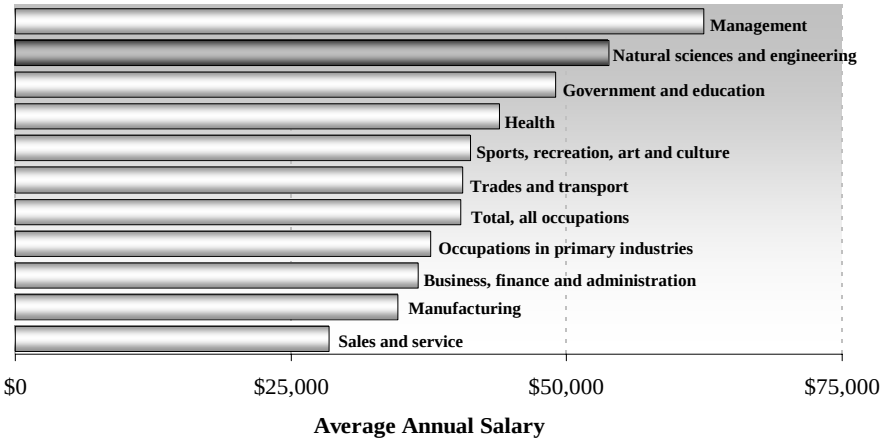
These results are not surprising, given the strong demand for natural science and engineering graduates. Unemployment levels for persons employed in natural science or engineering occupations are considerably below national levels (see Figure 10), and annual salaries for this group are nearly 50% greater than the national average (see Figure 11). The income differential for postgraduate degrees is even greater. As shown in Figure 12, average earnings increase for NSE graduates as their degree qualifications improve. The 65,000 graduates funded by NSERC are now paying nearly $150 million annually in additional federal taxes as a result of their higher salaries.

Figure 10
Unemployment Rate for Natural Scientists and Engineers (%)



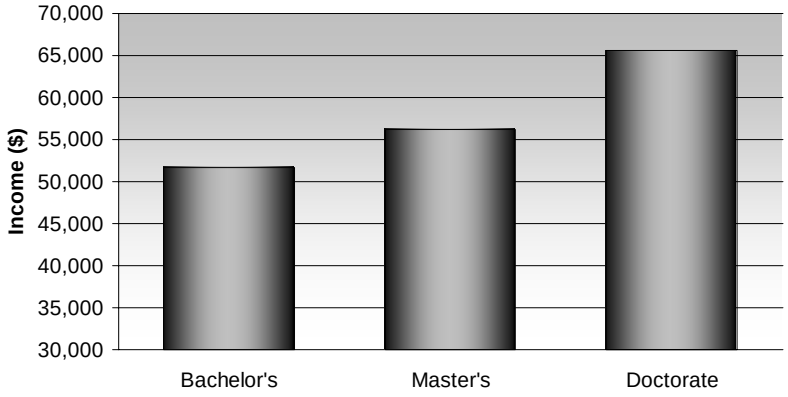
Source: Statistics Canada

Figure 11
Average Annual Salaries by Occupation in Canada, 2004
(Full-time Employment)



Source: Statistics Canada

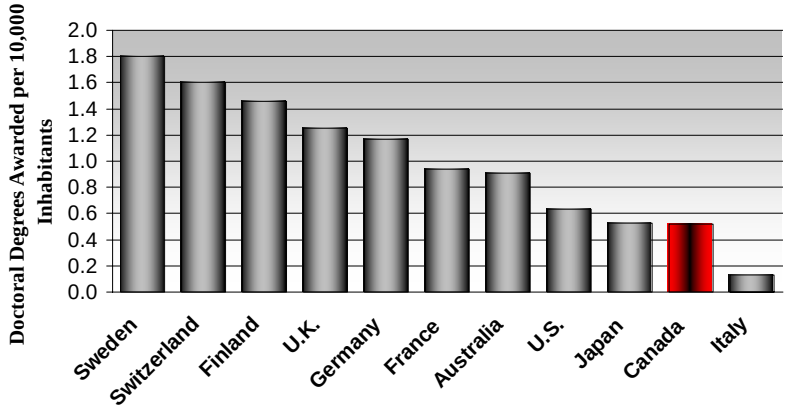
Figure 12
Income by Degree Level for Graduates in the NSE, 2001



Source: Statistics Canada, Census of Canada 2001

Although the employment and salary prospects for postgraduates in the NSE are very good in Canada, this has not translated into large numbers of doctoral graduates in the NSE. In fact, Canada ranks rather poorly in the per capita production of NSE doctorates as shown in Figure 13. The new Canada Graduate Scholarships program established as a result of the 2003 federal budget may help to improve Canada's ranking.

Figure 13
Doctoral Degrees Awarded in the NSE Per Capita
2000 or Most Recent Year

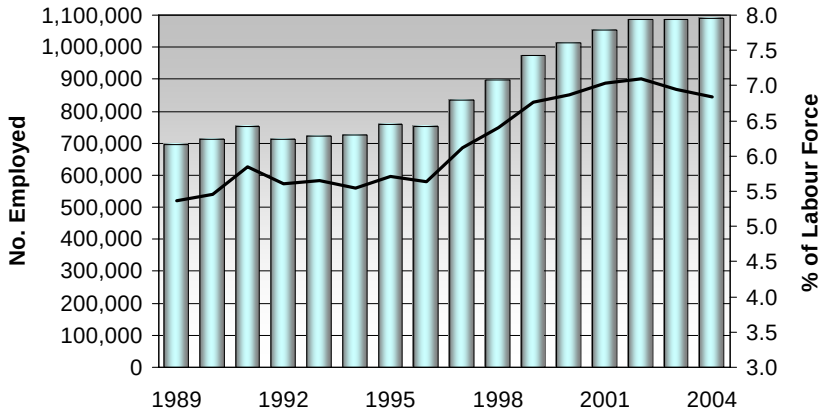


Source: National Science Foundation, OECD.

EMPLOYERS GET ACCESS TO HIGHLY QUALIFIED PERSONNEL

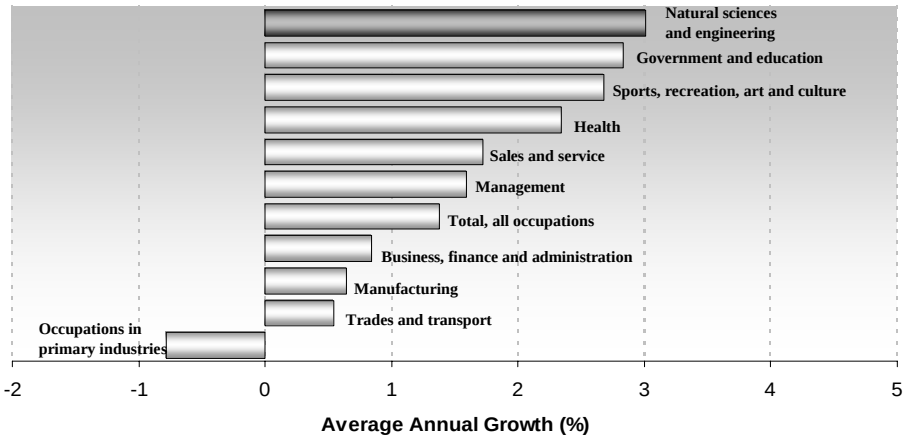
NSERC supports graduate students in the natural sciences and engineering to meet the needs of the country. Without these long-term investments in young people, Canada will experience a decline in its ability to compete and innovate in a knowledge-based world and will be unable to achieve the goal of ranking as a top-five R&D country. As mentioned, approximately 65,000 postgraduates have been funded by NSERC since 1978. These individuals are now part of a growing natural science and engineering labour force of more than 1,000,000 people (see Figure 14). As the knowledge economy continues to grow in Canada, employers will hire increasing numbers of NSE graduates, as they have in the past (see Figure 15). As also shown in Figure 15, natural science and engineering positions have been the fastest growing occupational group over the past 15 years.

Figure 14
Number of Workers in Natural Science and Engineering Occupations in Canada (Professional and Technical)



Source: Statistics Canada

Figure 15
Average Annual Growth in Occupations in Canada 1989 to 2004



Source: Statistics Canada

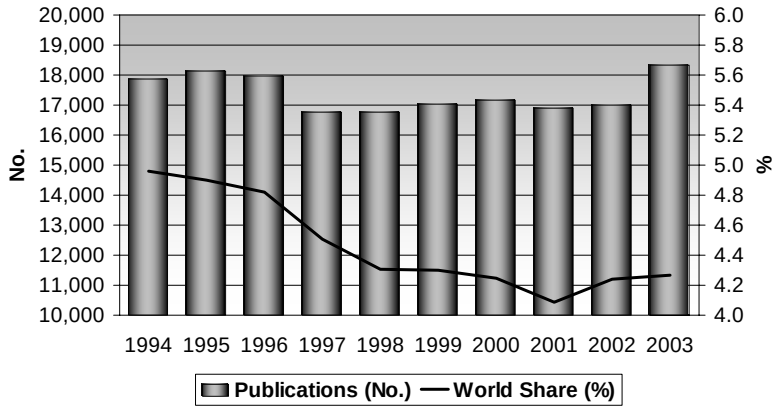
2.2 Funding the Discovery Process

HIGH-QUALITY RESEARCH CONDUCTED

One of the first tangible outcomes of an investment in university R&D is a **publication** in a scientific or engineering journal. The worldwide culture of university research places a great deal of importance on publishing new discoveries and advances in widely-circulated journals. Investment in this very public forum gives the country's researchers access to the latest international research and the ability to build on this research.

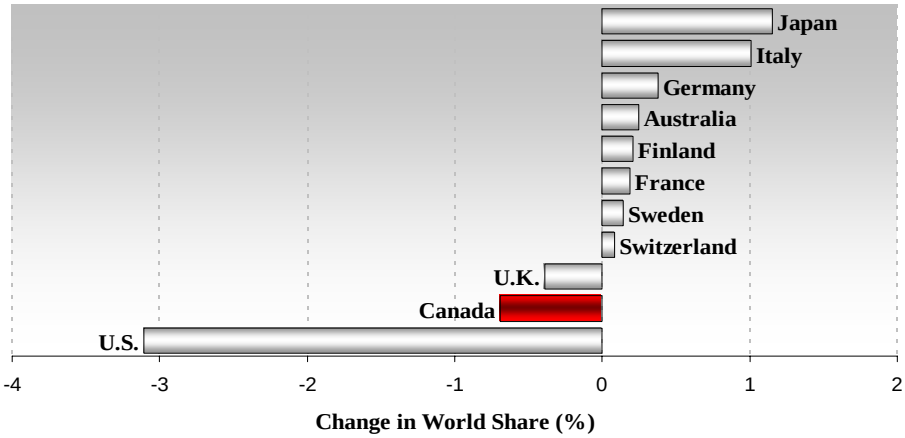
Canadian researchers (all sectors) in the NSE publish roughly 18,000 journal articles per year, ranking Canada ninth overall in the world in 2003, down from seventh spot in 1994. This has represented a declining share of worldwide production, from nearly 5% at the beginning of the decade to 4.3% in 2003 (see Figure 16). This has occurred as emerging economies have dramatically increased their scientific production. Canada's share of world NSE publications has declined considerably over the past 10 years as compared to our major competitors (see Figure 17). Most of Canada's and the world's scientific and engineering publications are produced by university researchers. The upswing of Canada's world share of publications seen in 2003 may be linked to the increased investment in university research over the past several years. In addition, Canada's share of publications in the world's two most respected multi-disciplinary journals, Science and Nature, has remained steady over the past decade at 5% (see Figure 18).

Figure 16
Number of Canadian Publications in the NSE and World Share



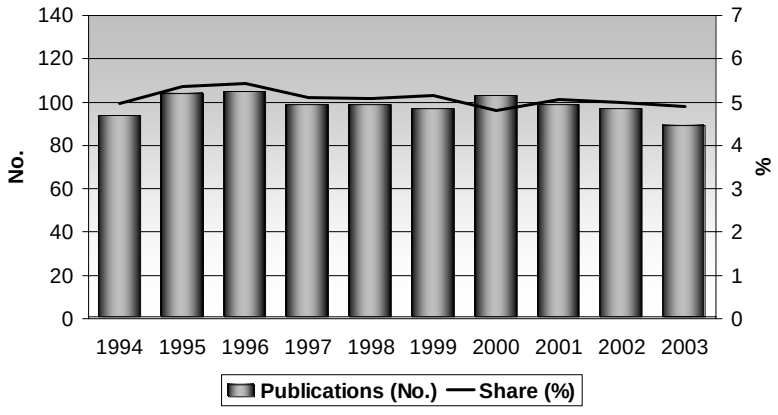
Source: Observatoire des Sciences et des Technologies

Figure 17
Change in World Share of NSE Publications
2003 vs. 1994



Source: Observatoire des Sciences et des Technologies

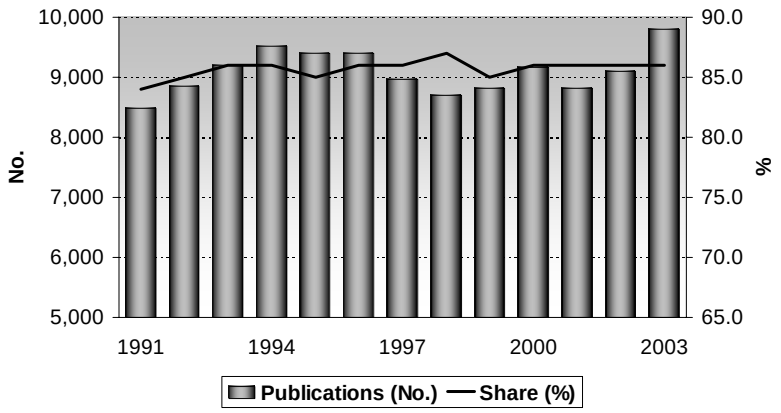
Figure 18
Number of Canadian Publications in the World's Two Most Prestigious Science Journals, Nature and Science



Source: Science Citation Index.

In a detailed analysis of publications resulting from NSERC funding (see http://www.nserc.gc.ca/about/aud_eval_e.asp for full report) it was found that NSERC-funded professors were responsible for 85% of the publications produced by this sector (see Figure 19) while accounting for only 75% of the population. NSERC-funded professors are therefore more productive than professors not funded by NSERC.

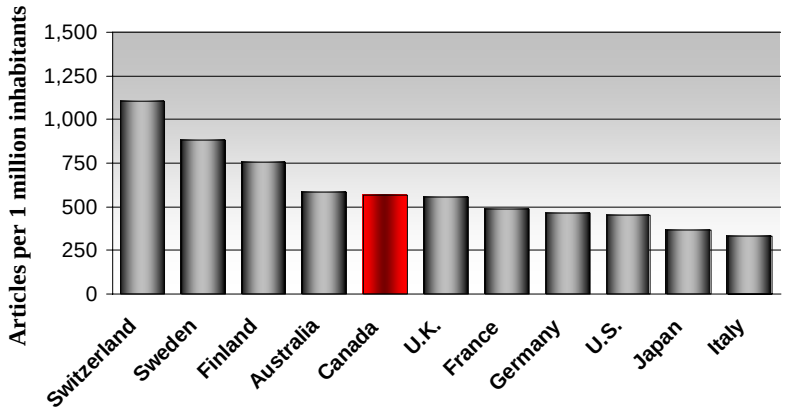
Figure 19
Number of NSERC-Funded Publications in the NSE, and Share of University NSE Papers



Source: Observatoire des Sciences et des Technologies, NSERC estimates.

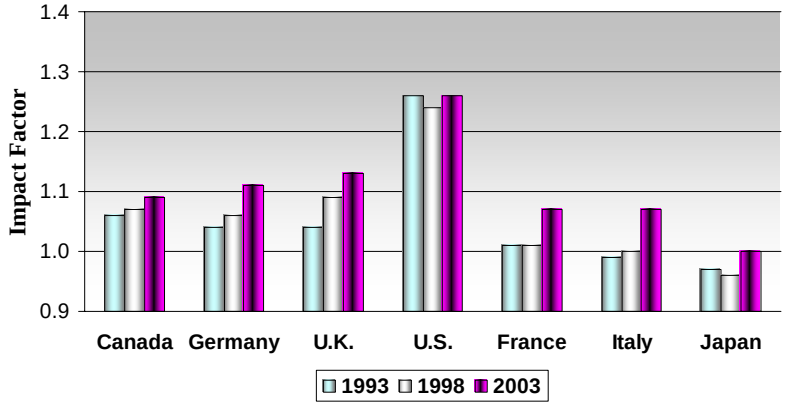
Figures 20 and 21 show examples of "productivity" and "impact" of Canadian publications in the NSE. In Figure 20, the per capita output of Canadian NSE publications is similar to most of our major industrialized country competitors. Figure 21 provides an indication of the "impact" of Canadian papers in the NSE. Similar to common rating systems, in which a higher score indicates more viewers, listeners or readers, the impact factor is a measure of the potential use of a researcher's work by fellow researchers. If a researcher's work is being referenced or cited more often by his/her peers then there may be more intrinsic value to the work. Canada's impact factor in the NSE is slightly better than or as good as six countries of the G7, and significantly behind only the U.S. The dominance of U.S. research with its high impact factor has existed since the inception of this indicator.

Figure 20
Per Capita Output of Articles in the NSE, 2003



Source: Observatoire des Sciences et des Technologies, 2003 CIA World Fact Book.

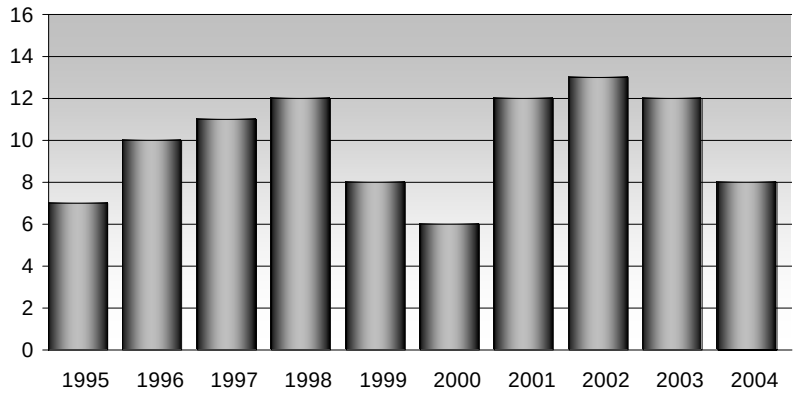
Figure 21
Average Impact Factor of Publications in the NSE for G7 Countries



Source: Observatoire des Sciences et des Technologies

Awards and prizes are another measure of excellence in the research community. NSERC collected data on 191 international awards and prizes over the past 10 years. NSERC-funded professors have received roughly 3% of the awards and prizes included in the analysis (see Figure 22). This percentage is slightly below the 4% of publications attributable to the community. Lower levels of funding available to Canadian "star" researchers, as compared to their American counterparts, may partially explain this difference. Also, a less-aggressive attitude in seeking prizes and nominating our best for them may help to explain the difference.

Figure 22
Number of International Awards and Prizes Won by NSERC-Funded Researchers



Source: NSERC

Dr. David Zingg
2004 John Simon Guggenheim Memorial Foundation Fellow

In April 2004, Dr. David Zingg won a prestigious Guggenheim Fellowship for the design of environmentally friendly aircraft putting him in the company of past winners Linus Pauling, Ansel Adams and Henry Kissinger

As air travel continues to grow, civil aviation will become a principal contributor to greenhouse gas emissions. One way to reduce the impact of aircraft on global warming is to redesign aircraft radically to reduce drag. Using advanced computational fluid dynamics (CFD), Dr. Zingg is developing efficient algorithms for aerodynamic optimization and applying them to the design of low-drag, environmentally-sound aircraft configurations.

The 2004 Guggenheim Fellows include 185 artists, scholars, and scientists appointed because of past achievements and exceptional promise for future accomplishments.

Dr. Zingg holds a Canada Research Chair in Computational Aerodynamics and is the Associate Director at the Institute for Aerospace Studies at the University of Toronto.

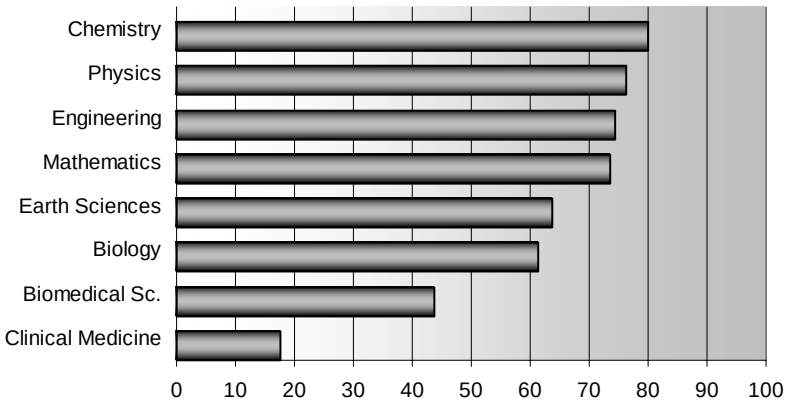
The contributions of established researchers to their fields of study are usually recognized by various awards and honours, such as invitations to give special lectures or to serve on **editorial boards of scientific and technical journals** and boards of professional societies. On this basis, membership on an editorial board is an indicator of "excellence."

In a study conducted by NSERC, the top 10% of journals in 2000 in each science and engineering discipline were selected as the sample for editorial board membership. Canada ranked sixth in the world in terms of number of researchers serving on the editorial boards of NSE journals. The Canadian share of the total number of members of editorial boards was 4.3%, in line with publication output. The study sample identified 411 Canadian researchers as editorial board members. NSERC-funded board members accounted for 92% of the Canadian share, a much larger share than would be expected given their share of the total population.

DIVERSIFIED RESEARCH BASE MAINTAINED

One of NSERC's important objectives is to maintain a significant presence in all fields of the natural sciences and engineering. NSERC accomplishes this by funding a critical mass of professors and students in all disciplines of the natural sciences and engineering. This ensures that Canada has access to world knowledge produced in all fields and that the country's researchers can quickly participate in new emerging areas. As was previously indicated, most of Canada's NSE publications are produced by university researchers funded by NSERC. When publications are examined by discipline (see Figure 23) it can be seen that diversification, for the most part, is being accomplished. (Note: for the biomedical sciences and clinical medicine disciplines the Canadian Institutes of Health Research ensure added diversification.)

Figure 23
NSERC-Funded Share of Canadian Publications by Discipline
1996-99 (%)



Source: Observatoire des Sciences et des Technologies

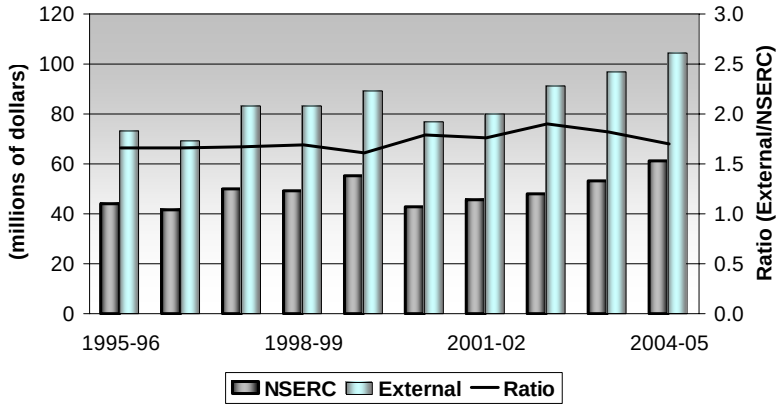
2.3 Helping Canada Innovate

The outcomes presented in this section usually take longer to become reality than the outcomes in the previous sections. There is also a close connection to the outcomes and funding that occurs through the discovery process as outlined in Section 2.2. Most of the expected results are part of the technology transfer process. This process can be described as the movement of ideas, tools and people from university professors and students supported by NSERC to the private and public sector. This movement leads to socio-economic benefits for Canadians as a result of NSERC research support. A number of outcomes are presented below to help illustrate NSERC-funded technology transfer.

RESEARCH FUNDS LEVERAGED FROM PARTNERS

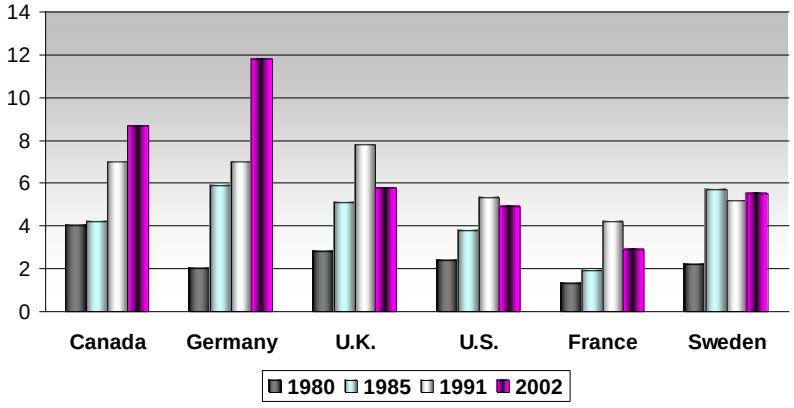
Bringing university professors and Canadian firms together is one of the first methods of stimulating technology transfer. These industrial partners also contribute financially to these university research projects. Because of the socio-economic impacts of university research, NSERC views any additional investment in university research as a positive impact on the Canadian economy. Many of NSERC's programs, and especially the university-industry programs, require a contribution from industry, universities, government departments and agencies. Over the past 10 years, contributions from NSERC's partners have been significant (see Figure 24), totalling nearly $850 million. A comparison of NSERC funding to partner contributions is also presented in Figure 24. The ratio of partner contributions to NSERC funding has been relatively steady over the past 10 years, at roughly 1.7. Put another way, for every dollar NSERC puts on the table for a university-industry research grant, our partners contribute almost two dollars, demonstrating the value they place on the R&D and the training of students. The impact of NSERC's partnership programs has been to increase the share of university research funding from industry to levels well beyond most industrialized nations (see Figure 25). The partnership programs of CIHR also contribute to this total.

Figure 24
Contributions to NSERC's University-Industry R&D Programs



Source: NSERC

Figure 25
Share of University Research Funded by the Private Sector (%)

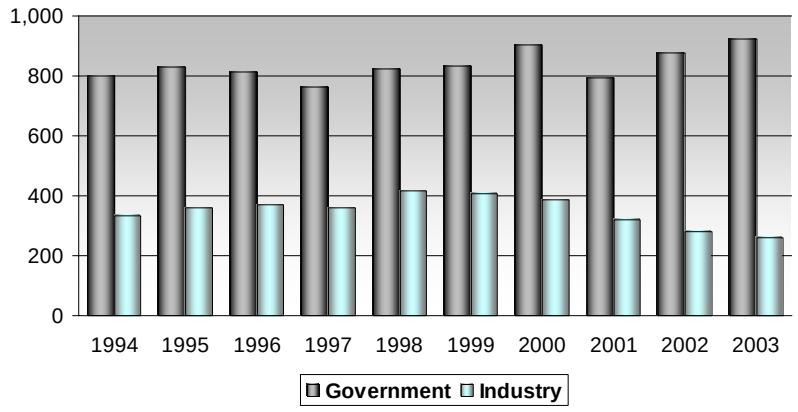


Source: OECD

KNOWLEDGE CREATION AND DISSEMINATION TO USERS

The new knowledge created by NSERC-funded university professors is often used by researchers in Canadian government laboratories and industry. One of the first indications of this dissemination to users is through collaborative publications. Figure 26 indicates that over 800 university-government publications and, on average, 300 university-industry publications are produced annually. This trend has been fairly steady over the past decade, although the downturn in Canadian industrial R&D in recent years has also had an impact on the number of university-industry collaborative papers.

Figure 26
Number of University-Industry and University-Government Publications with NSERC-Funded Professors

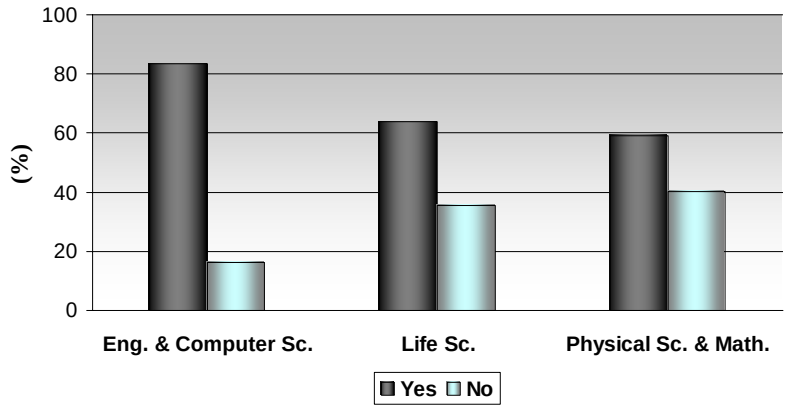


Source: Observatoire des Sciences et des Technologies, NSERC estimates.

In 2002, Dr. Réjean Landry of Université Laval conducted a survey of knowledge dissemination to users (industry and government) by 1,500 NSERC-funded professors. Figure 27 highlights the percentage of the survey respondents who carried out research with industry or government partners in the last five years. The majority of the respondents in all disciplines participated in this type of collaborative R&D, ensuring quick knowledge dissemination. Also from the survey, Figure 28 presents the frequency with which NSERC-funded professors took user needs into consideration when planning their research projects. To some degree, the majority of professors took into account the needs of users in planning their projects. It must be noted that not all research, especially basic research, has clearly-defined users or applications. The type of knowledge dissemination to users by NSERC-funded professors and the frequency of occurrence is presented in Figure 29. Although the majority of respondents engage in a variety of knowledge-dissemination efforts, a significant minority do not. Improving knowledge

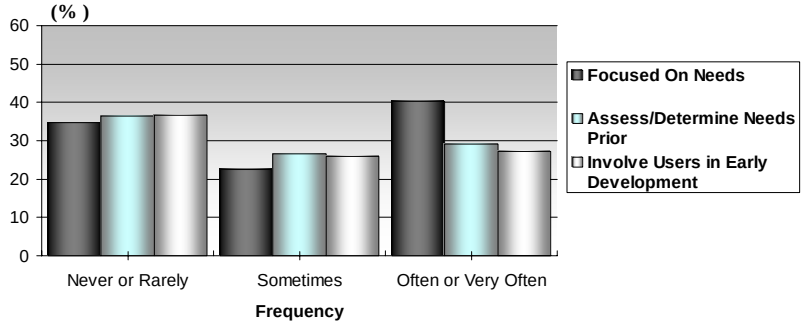
dissemination to potential users will be an important goal for NSERC, and future surveys will monitor the situation. Survey respondents mentioned many impediments to knowledge transfer to users. Nearly half of the respondents mentioned lack of expertise of users, lack of firms in the region, lack of academic rewards for dissemination and the pressure to publish as various obstacles to knowledge dissemination.

Figure 27
NSERC-Funded Professors Carried Out Research with Industry or Government Partners in Last Five Years



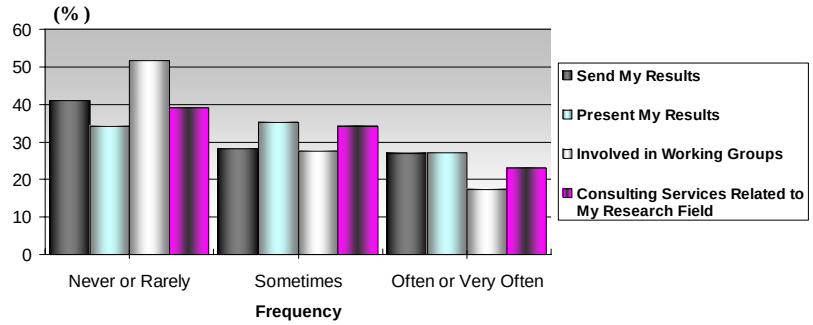
Source: Dr. R. Landry, Laval University.

Figure 28
NSERC-Funded Professors Plan Their Research Projects as They Relate to Needs of Users
(Users = Private Firms and Government)



Source: Dr. R. Landry, Laval University.

Figure 29
NSERC-Funded Professors Dissemination of Research Results to Users
(Users = Private Firms and Government)



Source: Dr. R. Landry, Laval University.

INVENTION DISCLOSURES, PATENTS AND LICENCES OBTAINED

Statistics Canada conducts a survey of intellectual property (IP) commercialization in the university sector every two years. The key results from the first three surveys are highlighted in Figure 30. The survey data are confidential and it is therefore impossible to link the outcomes in the figure below to NSERC funding. However, from NSERC's analysis of patents and publications, it is highly likely that the vast majority would be attributable to NSERC funding. The sizeable increases seen over the five-year period for most of the commercialization activities presented is a positive result. Other commercialization trends are presented below.

Figure 30
Survey of Intellectual Property Commercialization

Commercialization Activity	1999	2001	2003p
Inventions disclosed	829	1,105	1,177
Inventions protected	509	682	597
New patent applications	616	932	1,254
Patents issued	325	381	337
Total patents held	1,826	2,133	3,105
New licences	218	320	na
Total active licences	1,109	1,338	na
Royalties from licensing ($M)	$18.9	$45.1	$52.0
Total spin-off companies	454	680	880

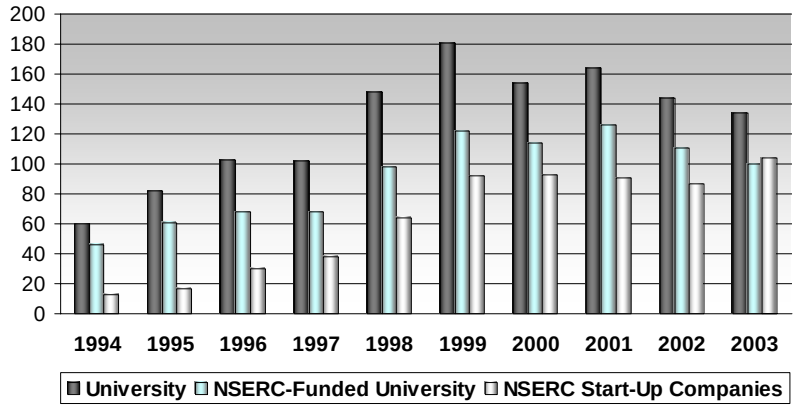
Source: Statistics Canada
p. Preliminary data.

A **patent** is issued when an invention is deemed to be new, useful and non-obvious. Universities are paying closer attention to the potential value of R&D carried out on their campuses, and are seeking patent protection. A good measure of this activity is the number of U.S. patents being issued to Canadian universities. These have increased significantly over the decade, as shown in Figure 31. An analysis of the nearly 1,300 patents issued to Canadian universities over the past 10 years has found that more than 900, or 72%, of the patents listed an NSERC-funded professor as one of the inventors. In addition, NSERC-funded start-up companies have been issued 627 U.S. patents over the past decade. As shown in Figure 32, all NSERC-funded patents combined account for 8% of the institutional U.S. patents assigned to Canadian organizations every year.

Another means of measuring research results used by the private and public sector is to study the relationship between patents and scientific literature cited in the patent. It was found that patents issued in the U.S. had cited NSERC-funded science literature to a high

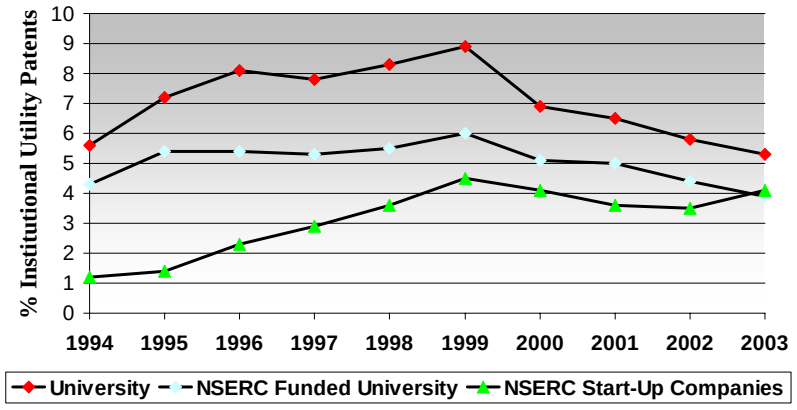
degree as compared to all Canadian science literature cited (see Figure 33). Therefore, Canadian companies and foreign firms are likely to frequently cite NSERC-funded science in their patents.

Figure 31
Number of U.S. Patents Issued to Canadian Universities and NSERC-Funded Start-Up Companies



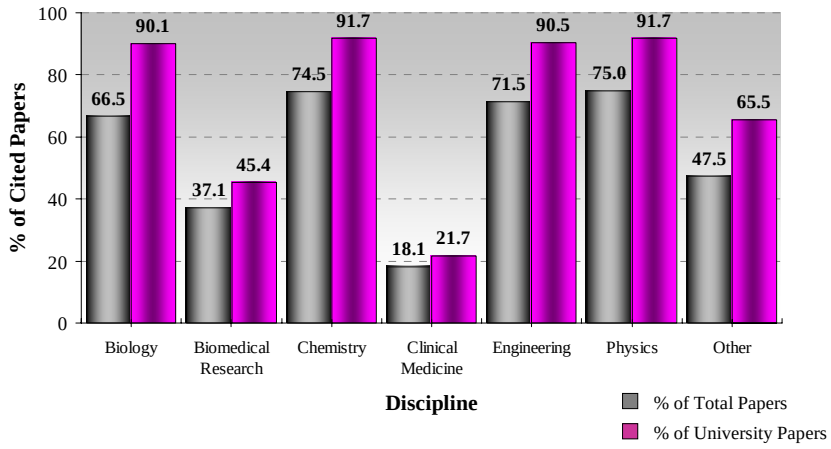
Source: U.S. Patent Office database. Includes only utility patents.

Figure 32
Percentage of Canadian Institutional U.S. Patents Issued to Canadian Universities and NSERC-Funded Start-Up Companies



Source: U.S. Patent Office database. Includes only utility patents.

Figure 33
Percentage of Canadian Papers Cited in U.S. Patents that were NSERC-Funded by Discipline and Sector, 1991-2002



Source: iPiQ.

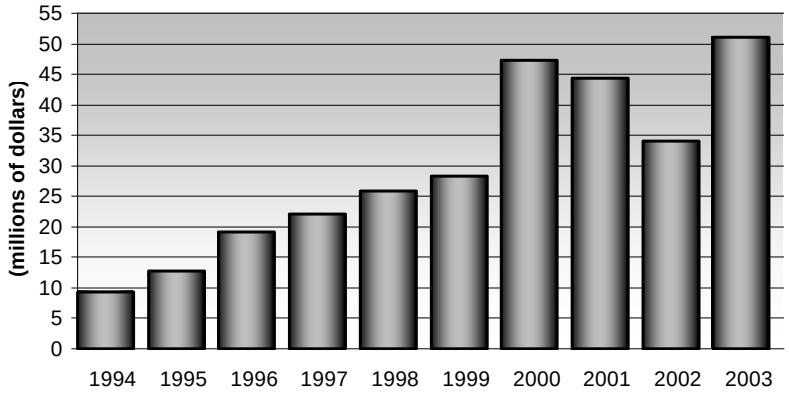
Another way university research is transferred to industry is through a **licence**, giving the industrial buyer the right to commercialize the research. Commercial use of the licensed technology results in royalty income to the university and typically the researcher. The amount of licensing royalty revenues is another measure of the value of university research. Figure 34 presents an estimate of licensing revenues for Canadian universities. Most of these revenues can at least be partially attributed to funding from NSERC and the Canadian Institutes of Health Research (CIHR). The trend in revenue growth has generally been positive over the decade, and it should continue to grow as universities strive to secure additional revenues. Examples of licences based on NSERC-funded research include:

- Dr. Andrew Daugulis at Queen's University developed a novel extractive fermentation technology for the production of ethanol that was licensed to Xethanol Corporation.

- Drs. Mark Lautens and Keith Fagnou of the University of Toronto found a new way to make molecules with useful medicinal properties and their discovery was licensed to Solvias.

- PropheSi Technologies Inc. licensed a new design for power amplification of cellular base stations to improve efficiency and power consumption. The new design was developed by Dr. Shawn Stapleton of Simon Fraser University.

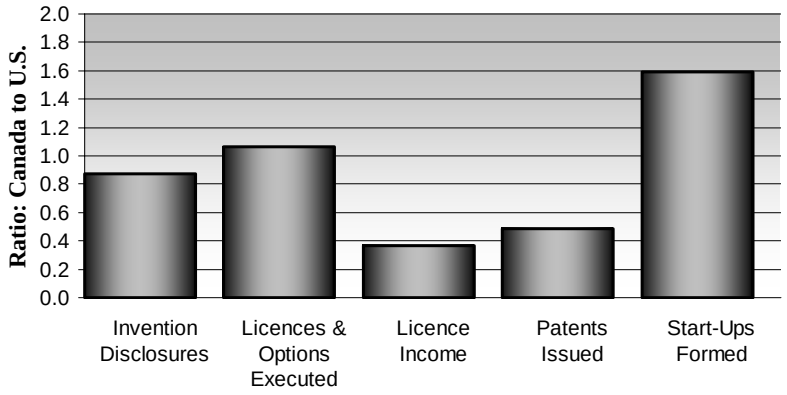
Figure 34
Canadian University Licensing Revenue
(millions of dollars)



Source: NSERC estimate based on Association of University Technology Managers data and Statistics Canada data for 2001 and 2003.

Using the methodology developed by Dr. Bruce Clayman of Simon Fraser in his report, (http://www.sfu.ca/vpresearch/vprreports.htm) *Technology Transfer at Canadian Universities*, a comparison of 30 Canadian universities to 158 U.S. universities on several commercialization activities is shown in Figure 35. These activities were normalized for sponsored research expenditures. Ratios below 1.0 indicate that the Canadian universities in the sample are engaged in the activity less frequently than their U.S. counterparts. Canadian universities perform significantly below U.S. universities on licence income received and patents issued, but perform much better than the U.S. institutions on start-up companies formed.

Figure 35
Comparison of Canadian Universities with U.S. Universities on Selected Commercialization Measures, 2003



Source: NSERC estimates based on AUTM data for 30 Canadian universities vs. 158 U.S. universities.

START-UP COMPANIES ESTABLISHED

The creation of a company remains one of NSERC's more tangible outcomes of university-funded research. Every two years, NSERC engages in a detailed study to uncover firms that were created based on university research. The profiles of these companies are published in the report *Research Means Business*, which can be ordered by sending an e-mail to bjl@nserc.ca. The next edition of this report will be published in the Fall of 2005. The start-up companies highlighted in the latest report have all been founded on results of research funded partially by NSERC. The 141 start-up companies featured (see Figure 36 on the next page) are currently in the business of producing goods and services for Canadian and international markets. Combined, these companies employ nearly 13,000 Canadians and generate more than $3.6 billion in annual sales/revenue. Creating innovative goods and services using the latest technologies, these firms make an important contribution to Canada's economy. The potential for future growth of many of these advanced technology companies, which may be tomorrow's multi-nationals, is high. They range in size from new start-ups with only a few employees to well-established firms with hundreds of workers.

As of June 2004, 30 of the 141 spin-off companies examined are/were publicly-traded firms. Although the gyrations of the markets have been significant in recent years, the market capitalization of these 30 publicly-traded firms on June 28, 2005 was an impressive $9.3 billion (see Figure 37). The downturn in the markets in the past four years has reduced the market capitalization of these firms by roughly 40%.
In addition to the direct economic benefits of contributing to Canadian GDP and employment, longer-term potential benefits of NSERC-funded start-up companies also exist. One already mentioned is the nearly 700 U.S. patents issued to NSERC-funded start-up companies over the past 10 years. Another secondary benefit has been the growth of major R&D firms in the country. In 2004, seven of the top 100 Canadian R&D companies (as ranked by Research Infosource, 2004) were NSERC-funded start-up companies with a combined R&D expenditure of $245M (see Figure 38). Many other university start-up companies not funded by NSERC are also part of the top 100 R&D companies. These results are important as Canada strives to increase R&D spending by 2010 and become a leading R&D nation.

Figure 36: Companies Linked to NSERC-Funded Research, 1954 to 2004
(Number of employees in Canada in 2004)

British Columbia

- MacDonald Dettwiler and Associates (1400)
- E-One Moli Energy (Canada) (430)
- QLT (384)
- Westport Innovations (140)
- TIR Systems (122)
- Freshxtend Technologies (50)
- NxtPhase (50)
- MIGENIX (37)
- Forbes Medi-Tech (28)
- Albacore Research (20)
- Phero Tech (20)
- JGKB Photonics (15)
- PhoeniX Technologies (15)
- Brightside Technologies (14)
- Actenum (12)
- Membrane Reactor Technologies (12)
- Wildlife Genetics International (9)
- Barrodale Computing Services (8)
- GeneMax Pharmaceuticals (8)
- MycoLogic (8)
- SynGene Biotek (8)
- Process Simulations (7)
- Quantum Technology (6)
- Syscor Research & Development (6)
- Advanced Integrated MicroSystems (Canada) (5)
- DBMiner Technology (5)
- Credo Interactive (4)
- Prescient NeuroPharma (4)
- Aurora Instruments (Confidential)

Alberta

- Stantec (2548)
- Raylo Chemicals (220)
- Wi-LAN (160)
- Biomira (106)
- Hycal Energy Research Laboratories (60)
- Harding Instrument Company (50)
- Dynastream Innovations (40)
- SemBioSys Genetics (40)
- ITRES Research (26)
- Cell-Loc Location Technologies (12)
- Zoomage (10)
- MBEC BioProducts (9)
- Chenomx (8)
- Smart Camera Technologies (8)
- Random Knowledge (7)
- AB BioPharma (5)
- Boreal Laser (5)
- CanBiocin (5)
- AgriGenomics (Confidential)

Saskatchewan

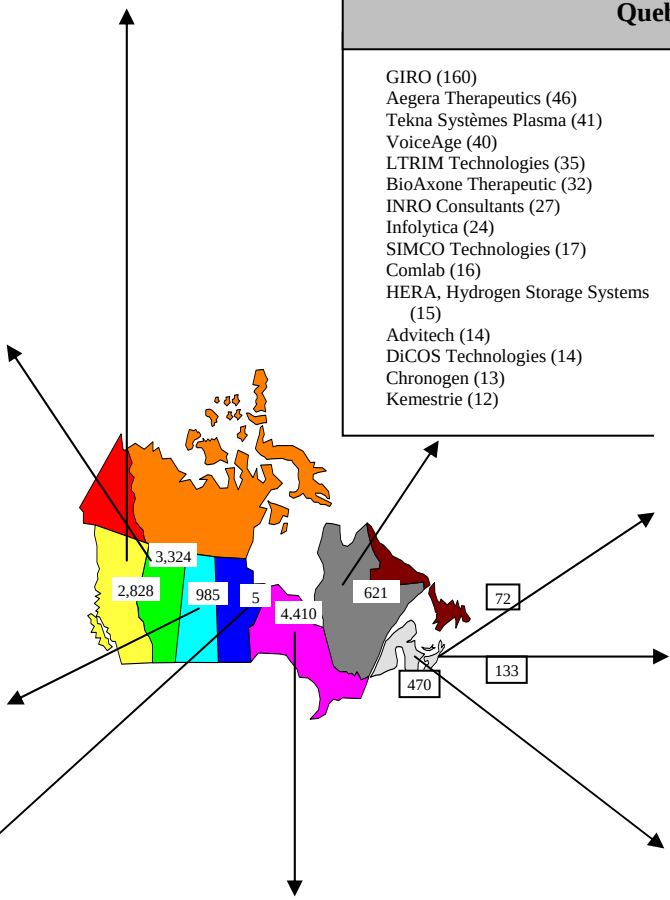
- VCom® (466)
- SED Systems-a division of Calian (225)
- International Road Dynamics (150)
- DEL-AIR Systems (100)
- Accutrak Systems (15)
- VEMAX Management (15)
- Droycon Bioconcepts (9)
- Western Ag Innovations (5)

Manitoba

- Quantic EMC (Confidential)

Quebec

- GIRO (160)
- Aegera Therapeutics (46)
- Tekna Systèmes Plasma (41)
- VoiceAge (40)
- LTRIM Technologies (35)
- BioAxone Therapeutic (32)
- INRO Consultants (27)
- Infolytica (24)
- SIMCO Technologies (17)
- Comlab (16)
- HERA, Hydrogen Storage Systems (15)
- Advitech (14)
- DiCOS Technologies (14)
- Chronogen (13)
- Kemestrie (12)
- Newmerical Technologies International (12)
- Quantiscript (12)
- Microbridge Technologies (10)
- Nanox (10)
- Service d'Expertise en Matériaux (S.E.M.) (10)
- GBBC Medica (9)
- Magistral Biotech (9)
- ENERKEM Technologies (8)
- Axiocom (6)
- MXT (6)
- AXIS Photonique (5)
- E.M Optimisation (5)
- Plasmionique (5)
- BytePress (4)
- SiXtron Advanced Materials (4)



Newfoundland

- AQUA Bounty Canada (30)
- Guigné International (25)
- A/F Protein Canada (10)
- Northern Radar (7)

Nova Scotia

- Ocean Nutrition Canada (256)
- Focal Technologies (85)
- AMIRIX Systems (70)
- Satlantic (40)
- MathResources (12)
- Thermo Dynamics (7)

New Brunswick

- CARIS (125)
- Interactive Visualization Systems (8)

Ontario

- DALSA (878)
- ZENON Environmental (850)
- MDS Sciex (500)
- Open Text (400)
- Platform Computing (275)
- Optech (210)
- iAnywhere Solutions (195)
- Virtek Vision International (166)
- Sybase Canada (115)
- Powerlasers (110)
- Certicom (105)
- Novator Systems (65)
- SatCon Power Systems Canada (65)
- Millenium Biologix (43)
- Pressure Pipe Inspection Company (40)
- Decision Academic (33)
- Hydromantis (33)
- Performance Plants (33)
- Ensyn Technologies (30)
- Dynacon (25)
- TurboSonic (25)
- Engineering Seismology Group Canada (22)
- BIOREM Technologies (21)
- Engineering Services (17)
- IGNIS Innovation (15)
- Techné Knowledge Systems (15)
- Axela Biosensors (14)
- Biomedical Photometrics (12)
- Vivosonic (12)
- BIOX (9)
- CVD Diamond (8)
- GeoTango International (8)
- Datec Coating (7)
- Qubit Systems (7)
- Sigma Analysis and Management (7)
- EnviroMetal Technologies (6)
- Interface Biologics (6)
- Elstat (5)
- Simulent (5)
- matREGEN (4)
- iGO Technologies (Confidential)
- Maplesoft (Confidential)

Figure 37
Market Capitalization of Start-up Companies

Company	Market Capitalization					
	June 28, 2005	June 14, 2004	July 28, 2003	July 29, 2002	August 15, 2001	June 12, 2000
Shire BioChem Pharma	$3,406 M[1]	$3,406 M[1]	$3,406 M[1]	$3,406 M[1]	$3,406 M	$3,607 M
MacDonald Dettwiler	$1,229 M	$1,038 M	$903 M	$727 M	$836 M	$- M
QLT	$1,176 M	$1,668 M	$1,636 M	$1,177 M	$2,249 M	$6,152 M
Open Text	$858 M	$1,921 M	$728 M	$544 M	$638 M	$845 M
ZENON Environmental	$789 M	$633 M	$427 M	$429 M	$319 M	$153 M
Stantec	$563 M	$472 M	$341 M	$292 M	$208 M	$95 M
DALSA	$298 M	$392 M	$245 M	$123 M	$71 M	$49 M
Certicom	$191 M	$134 M	$42 M	$33 M	$125 M	$896 M
Biomira	$163 M	$139 M	$100 M	$185 M	$460 M	$674 M
Westport Innovations	$103 M	$125 M	$110 M	$200 M	$303 M	$359 M
AD OPT Technologies	$73 M[1]	$53 M	$34 M	$31 M	$36 M	$62 M
Forbes Medi-Tech	$71 M	$94 M	$52 M	$14 M	$73 M	$155 M
SatCon Power Systems	$59 M	$92 M	$17 M	$- M	$- M	$- M
SemBioSys Genetics	$57 M	$- M	$- M	$- M	$- M	$- M
Millenium Biologix	$48 M	$- M	$- M	$- M	$- M	$- M
TIR Systems	$42 M	$103 M	$25 M	$10 M	$6 M	$6 M
Wi-LAN	$35 M	$110 M	$94 M	$54 M	$85 M	$852 M
Micrologix Biotech	$25 M	$58 M	$22 M	$31 M	$- M	$- M
Virtek Vision International	$21 M	$33 M	$17 M	$24 M	$60 M	$53 M
International Road Dynamics	$16 M	$- M	$- M	$- M	$- M	$- M
TurboSonic	$8 M	$4 M	$6 M	$3 M	$- M	$- M
Cell-Loc Location	$6 M	$9 M	$15 M	$47 M	$27 M	$491 M
Magistral Biotech	$5 M	$- M	$- M	$- M	$- M	$- M
FreshXtend Technologies	$4 M	$- M	$- M	$- M	$- M	$- M
Nexia Biotechnologies	$4 M	$40 M	$20 M	$66 M	$158 M	$- M
GeneMax Pharmaceuticals	$2 M	$13 M	$33 M	$21 M	$- M	$- M
BIOREM Technologies	$2 M	$- M	$- M	$- M	$- M	$- M
Newmerical Technologies	$2 M	$9 M	$4 M	$- M	$- M	$- M
Advitech	$1 M	$- M	$- M	$- M	$- M	$- M
Prescient NeuroPharma	$1 M	$1 M	$4 M	$7 M	$- M	$- M
Innova LifeSciences	$- M	$38 M	$40 M	$35 M	$18 M	$21 M
Lumenon Lightwave Technologies	$- M	$- M	$2 M	$6 M	$- M	$- M
Kipp & Zonen	$- M	$- M	$2 M	$2 M	$- M	$- M
Polyphalt	$- M	$- M	$2 M	$9 M	$13 M	$- M
Total	$9,258 M	$10,585 M	$8,327 M	$7,476 M	$9,091 M	$14,470 M

1. Market capitalization at time of buyout.

Figure 38
R&D Spending of Top NSERC-Funded Start-Up Companies

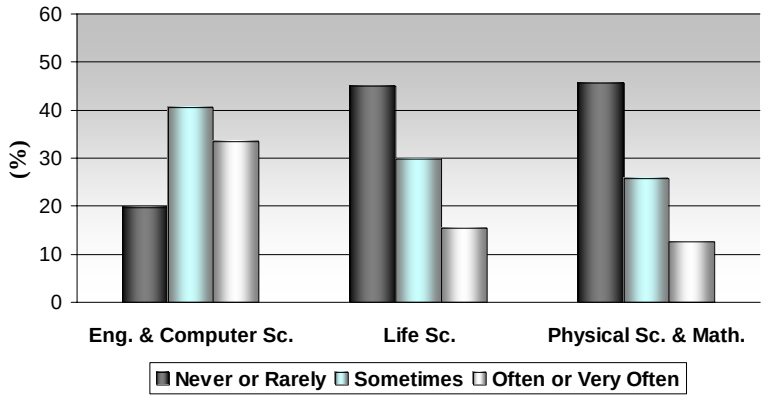
NSERC Funded Start-Up Company	Rank	R&D Expenditure (millions of dollars)
QLT Inc.	32	$62.9
Westport Innovations	44	$45.3
MacDonald Dettwiler & Associates	45	$45.1
Open Text Corporation	49	$41.1
DALSA Corporation	83	$19.9
Micrologix Biotech Inc.	92	$15.8
Biomira Inc.	100	$14.7

Source: Research Infosource, Canada's Top 100 Corporate R&D Spenders List 2004

NEW AND IMPROVED PRODUCTS AND PROCESSES INTRODUCED TO MARKET

NSERC-funded researchers have created or developed many new products and processes, the value of which is easily in the billions (although it is very difficult to determine the exact amount). Respondents to the Réjean Landry survey, previously mentioned on page 35, indicated significant involvement in the development of new goods or services (see Figure 39). As part of a recent evaluation of NSERC's largest program, the Discovery Grants program, over 20% of the 3,032 respondents who held a grant indicated a major contribution to the development of new or improved products or processes. By way of example, Figures 40 to 42 list a sample of some of the new products or processes developed by NSERC-funded professors in the construction, health care and environmental sectors, respectively.

Figure 39
NSERC-Funded Professors Research Contributions to the Development of New Goods or Services



Source: Dr. R. Landry, Laval University

Figure 40
Construction Innovations Funded by NSERC

What	*Where*	*Who*	*Why*
Bridge Technology	Université de Sherbrooke	Dr. Brahim Benmokrane	Technology to slow corrosion of steel bars. Light yet strong, it is also known as a corrosion resistant carbon fibre-reinforced polymer. Some bridges are constructed with intelligent fibre-optic sensors, which are used to relay information about stresses and strains 24 hours a day.
Datec Process	Queen's University Datec Coating Corporation	Dr. Michael Sayer Dr. David Barrow Dr. Ted Petroff	At less than a millimetre thick and able to withstand heat exceeding 1200 degrees, the Datec Process produces resilient ceramic coatings that are easy to apply by painting, spraying, or dipping. It improves the performance and durability of industrial equipment and has wide ranging applications.
"Feeling" building	University of New Brunswick	Dr. Ian Smith	Building Canada's first experimental "feeling" building wired with force-sensing devices that measure, among other things, pressure and deformation, and will result in the construction of safer, longer lasting wooden buildings.
Finding Fungi	Carleton University	Dr. J. David Miller	New method to assess exposure to building-associated fungi is less time-consuming than current health risk assessments. Dr. Miller can isolate the toxins from the fungi by studying their chemical nature.
Molecular Techtonics	Université de Montréal	Dr. James Wuest	"Sticky" molecules known as tectons are used to build very sturdy structures. These molecules interact strongly and predictably with other molecules nearby which make them well suited for construction purposes.
New Concrete	Université de Sherbrooke	Dr. Pierre-Claude Aïtcin	New type of concrete that is more economical, durable and reliable, and that requires fewer repairs than ordinary concrete. Used to build Montreal's Henri-Bourassa interchange.
Pressure Pipe Inspection Company Ltd.	Queen's University Pressure Pipe Inspection Company Ltd.	Dr. David Atherton	Prestressed wire in pipes is amplified by an electromagnetic field that can locate defects in pipelines. Technology allows companies to replace only the broken wires instead of the entire pipeline saving them millions of dollars.
Strengthening Spray	University of British Columbia	Dr. Nemkumar Banthia	Spray increases stress absorption and long-term durability of bridges and other structures that require strengthening in aggressive environments. Can be used to repair concrete structures at half the cost of traditional repair techniques.
Thermal Insulation	Université Laval	Dr. Jean-Marie Konrad	New thermal insulation products to prevent cracking and the formation of ice and white frost on pavements during freeze-thaw cycles.

Figure 41
Health Care Innovations Funded by NSERC

What	*Where*	*Who*	*Why*
3-D X-RAY	École de Technologie Supérieure	Dr. Jaques De Guise	Technology reduced radiation and produces a high quality image. Taking only an x-ray of the front and side gives a detailed 3-D image rather than traditionally viewing 300-500 images.
Biodegradable Polymers	University of Toronto	Dr. Kimberly Woodhouse	Biodegradable polymers for use as wound dressings and for rebuilding urological tissue. Combining these synthetic materials with biological tissue can initiate healing and lead to the full integration of the engineered material into the soft tissue.
E-Vision Glasses	University of Waterloo	Dr. Richard Hornsey	Developed for those with low vision, and resembling a pair of prescription sunglasses, the electronic (e-vision) system incorporates "smart" camera technology that automatically modifies the images in the wearer's world, delivering a version that he or she can "see".
Helpful Robots	University of Guelph	Dr. Hussein Abdullah	This group of robots help patients with debilitating physical trauma. The robots are programmed to move their patient's limbs repetitively in order to aid in rehabilitation. These robots may also incorporate the use of EMG which measures the muscle activity of the patients.
Implantable Bioresorbable Medical Devices	University of Toronto Interface Biologics Inc.	Dr. Paul Santerre, Dr. Jeanette Ho Dr. Mark Mittelman	Implants respond to inflammation, deliver a therapeutic payload, and are completely reabsorbed by the body.
Joint Replacements	University of Western Ontario	Dr. Cynthia Dunning	Better replacement joints through research into how implant characteristics, such as shape, affect their fixation within the body. Stronger fixation would result in fewer revision surgeries on artificial joints.
Longer lasting biomedical implants	University of British Columbia	Dr. Rizhi Wang	Prevent hip implants from loosening and sliding by using specially coated titanium stems that encourage bone to fuse directly to the surface. The coating is inspired by things found in nature, such as urchin teeth, seashells and horse teeth.
Non-invasive Health Diagnostics Technology	University of Alberta Chenomx Inc.	Dr. Bryan Sykes Dr. David Wishart	Improves speed and efficacy of medical diagnosis. Technology is also able to build an individual health profile by using metabolic indicators and markers.

Figure 42
Environmental Innovations Funded by NSERC

What	*Where*	*Who*	*Why*
Biodiesel Fuels	University of Toronto Biox Corporation	Dr. David Boocock	A new way of fuelling up. Any feedstock, including vegetable oils, agricultural seed oils, animal fats/greases and recycled cooking oils becomes biodiesel fuel at a cost that is competitive with petroleum diesel.
Biofilter Systems	University of Waterloo BIOREM Technologies	Dr. Owen Ward	Biofilter systems use natural microbial activity to clean up toxic sites. Bioremediation is a cost efficient biological process that uses naturally occurring microorganisms to degrade and reduce toxic materials and accelerate the treatment of soils contaminated with toxic organic chemicals.
High Pressure Direct (HDT) Injection Technology	University of British Columbia Westport Innovations	Dr. Philip Hill	A system that converts diesel engines to natural gas. HPD injection technology maintains the efficiency and high performance of a diesel engine, while cutting particulate and nitrogen oxide emissions in half. The system is retrofitted to existing engines, so the changeover will cause little disruption.
Hydride Materials	McGill University HERA, Hydrogen Storage Systems	Dr. John Ström-Olsen	Hydride materials can be absorbed and released as hydrogen with distinctive heat and pressure characteristics. Hydrides are well suited for solid state hydrogen storage, hydrogen compression, heating and cooling, and nickel-hydrogen batteries.
HYFRAN	Institut national de la recherche scientifique	Dr. Bernard Bobée	HYFRAN software used by staff at Hydro Quebec to improve the management of surface waters on their land.
Non-Insecticidal Pest Management	Simon Fraser University Phero Tech Inc.	Dr. John Borden	Uses semiochemicals to lure and trap pests in order to monitor pest population.
(RTP) Rapid Thermal Processing	University of Western Ontario Ensyn Technologies	Dr. Maurice Bergougnou Dr. Robert Graham	Disposing of large amounts of solid wastes in an environmentally friendly fashion can be done using RTP technology. The technology transforms forest residues, municipal wood waste and agricultural wastes into valuable liquid fuels and chemicals.
Organic Compounds	University of Waterloo EnviroMetal Technologies Inc.	Dr. Robert Gillham	Technology is able to destroy harmful organic soil compounds by using granular ion. This can be used in order to solve a wide range of environmental problems, including those involving the release of chlorinated organic chemicals.
Wastewater Treatment	University of Ottawa Hydromantis Inc.	Dr. Gilles Patry	Powerful simulation software enables wastewater treatment plant operators to save money by managing their facilities more efficiently, from the conceptual stage to full-scale operations.

RESEARCH RESULTS USED BY PUBLIC (POLICY AND SAFETY) AND PRIVATE SECTORS

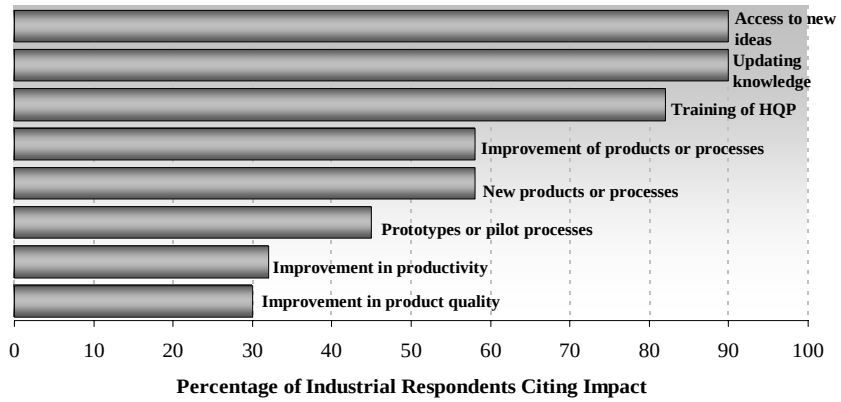
NSERC-funded university research is used by the private and public sectors in a variety of ways. Collaborative research is one method of technology transfer from the university to the private/public sectors that NSERC supports. NSERC tracks the outcomes of its Collaborative Research and Development (CRD) program, a program that brings university researchers and industrial partners together. A summary of the industrial participants' perceptions of their CRD experience and outcomes are described below:

- Of the 135 projects studied to date, 87% of the industrial partners felt that the research objectives of the project had been at least "somewhat" achieved.

- A total of 46 patents and 35 licences have so far been issued with respect to the projects examined. According to the industrial partners, commercializable results were achieved for 39% of the projects.

- Figure 36 shows how often and for what purpose the industrial partners used the research results generated by the project.

Figure 43
Industrial Partners Use Results from an NSERC Collaborative Research and Development Grant

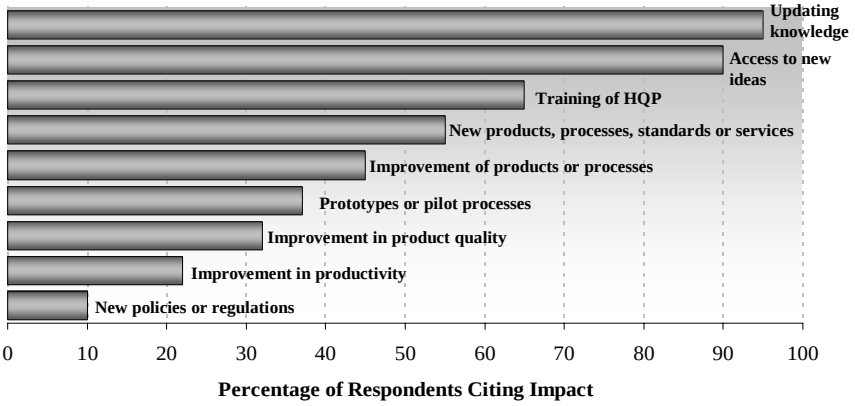


Source: NSERC

In 2004, a five-year follow-up of NSERC's Strategic Project grants was also conducted. Similarly good results, as with the CRD program review, were found. Figure 44 presents

the benefits partners (industry and government) realized from their participation on a Strategic Project grant.

Figure 44
How Partners Use Results from an NSERC Strategic Project Grant



Source: NSERC

As part of the Discovery Grants program evaluation, 12.7% of the 3,032 respondents who held a grant indicated a major contribution to changes in policies or standards. An example of this outcome is presented below:

Protecting sharks around the world

Dr. Ransom Myers, a biologist at Dalhousie University, and NSERC scholars Julia Baum and Daniel Kehler have shown the collapse of many shark populations in the North Atlantic by developing innovative statistical methods to analyse historical data. The oceanic white tip shark has declined by 99% in the last 50 years. Their research shows that overfishing combined with a shark's slow growth and small reproduction rates threatened the future of many shark populations worldwide.

This research helped two international groups in the fight to restore depleted shark populations. The first, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES,) restricted great white shark trade based on research by the Dalhousie team. The second group, the International Commission for the Conservation of Atlantic Tunas (ICCAT), used the research from Dr. Myers' team to ban shark finning. This practice involves fishermen slicing off a shark's fin, a highly-valued commodity used in shark fin soup, only to throw the shark's carcass overboard. The ICCAT decision applies to its 63 member nations.

2.4 Government of Canada Outcomes

As mentioned in Section 1.5, NSERC contributes significantly to a number of the Government of Canada's desired outcomes. Sections 2.1 to 2.3 dealt mainly with NSERC's contributions to an innovative and knowledge-based economy and sustainable economic growth. In addition, NSERC plays a significant role in a number of other indicators as illustrated in the "success stories" that appear below.

HEALTHY CANADIANS WITH ACCESS TO QUALITY HEALTH CARE

The contributions of NSE researchers in health care have been growing at an explosive pace (e.g. Magnetic Resonance Imaging, new materials, new chemistry, new instruments and tools, basic life science instruments for genomics, etc.). In 2004-05, NSERC invested more than $100 million in research and training awards related to health research. This research will eventually lead to improving the health of Canadians. As presented in Sections 2.2 and 2.3, past NSERC investments in health-related research have resulted in numerous start-up companies and new products or processes that are improving the health of Canadians. To further illustrate NSERC's investments in health-related research, a sample of success stories is highlighted below.

A new blood-sugar monitor

Dr. Mu Chiao, a mechanical engineer at the University of British Columbia, is leading a team of researchers in developing a new implantable blood-sugar monitor.

Dr. Chiao and his team are working on a square silicon chip approximately of the size of the tip of a ballpoint pen that can detect chemical reactions when implanted in the body. With a self-contained power source, the chip will allow chemicals in the blood to flow through it so they can be measured by sensors.

The focus is now on blood sugar, or glucose, because the biochemical reactions of glucose in the blood are already well-studied and understood. Dr. Chiao believes the device could be used to monitor oxygen, blood-acidity or other chemicals in the body.

Lowering cholesterol levels with diet

Dr. David Jenkins and his research team at the University of Toronto have discovered that a diet rich in fibre and vegetables lowers cholesterol levels as much as taking a statin drug. The diet, high in soy, almonds, oats, barley, psyllium seeds, okra and eggplant, was followed by 34 overweight men and women for one month. They also tried a low fat diet for a month, then used a generic cholesterol-lowering synthetic drug – a statin drug – lovastatin with a normal diet for another month. Following each regimen, Dr. Jenkins' team testing the participants and found that a low fat diet lowered their LDL (low-density lipoprotein or "bad"

cholesterol) by 8.5 per cent, a normal diet plus the statin a lowered LDL levels by 33 per cent and Dr. Jenkins' diet lowered LDL by nearly 30 per cent. Dr. Jenkins' research give people who cannot tolerate statin drugs because of the side effects another course of treatment.

A CLEAN AND HEALTHY ENVIRONMENT

In 2004-05, NSERC invested over $90 million in research and training awards related to environmental research. After Environment Canada, NSERC is the most important federal agency conducting or sponsoring research in this area. Significant discoveries and applications to improve the Canadian environment have been made, as illustrated below.

A natural solution for cleaning contaminated water

Dr. Elizabeth Edwards, a chemical engineer at the University of Toronto, has discovered a way of using natural processes instead of more aggressive approaches to remove toxic substances from our groundwater.

Dr. Edwards discovered that biological processes can remove chlorinated organic chemicals from the water table. These chemicals are widely used for dry-cleaning and as solvents and degreasers in many manufacturing and electronics industries. Dr. Edwards found that a group of bacteria, called *Dehalococcoides*, are able to break down the chemicals into ethene, a non-toxic benign product that is consumed by other organisms.

Dr. Edwards and her collaborators at GeoSyntec Consultants in Guelph, ON, have demonstrated the effectiveness of her bacterial culture, dubbed KB-1, at several contaminated sites in the U.S.. She and her industry partners are in the process of working with Environment Canada to approve her innovative solution for use in Canada.

Declining woodland caribou

University of Alberta biologist Dr. Stanley Boutin, who holds an NSERC Industrial Research Chair in Integrated Landscape Management, has studied the woodland caribou of Alberta only to discover that the population of their herds has declined 30 or 40% in the last ten years.

Woodland caribou have never existed in huge numbers in northern Alberta, which makes them all the more susceptible to change such as increased industrial activity. Dr. Boutin's team used radio collars to follow the survival of adult caribou and aerial surveys in the spring to monitor the birth rate of calves. The researcher discovered that the young calves didn't survive into adulthood, mainly because of predation. The change in predation is related to human activity, such as oil and gas development and forest cutting in and around the peatland areas

where the caribou have lived to avoid their predators. Human activity has now allowed major predators – wolves and bears, to infiltrate these natural refuges.

Sustainable aquaculture through an age-old recycling practice

A research team led by University of New Brunswick marine biologist Dr. Thierry Chopin is proving that an ancient Asian aquaculture technique is more sustainable and environmentally friendly than today's commercial salmon monoculture operations.

Commercial aquaculture in the Western World generally produces a single species, either fish, shellfish, or seaweed. When finfish monoculture activities are highly geographically concentrated, or located in suboptimal sites, nutrient enrichment, from fish waste and uneaten food, may be locally significant. Dr. Chopin and his team are developing the concept of integrated multi-trophic aquaculture (IMTA), at three sites in the Bay of Fundy where they grow salmon, mussels, and kelps together, with their industrial partner Cooke Aquaculture Inc. By integrating fed aquaculture of finfish with inorganic extractive aquaculture of seaweed and organic extractive aquaculture of shellfish, IMTA allows the wastes of one resource user to become a resource (fertilizer or food) for the others. Through IMTA, some of the food and energy considered lost in finfish monoculture are recaptured and converted into other crops of commercial value to diversify the multimillion dollar aquaculture sector, while biomitigation takes place. The production of kelps increases by 46 % and that of mussels by 50 % when they are grown in proximity to salmon sites. Their food safety quality is monitored in collaboration with the Canadian Food Inspection Agency.

A SAFE AND SECURE WORLD

NSERC contributes modestly to safety and security. A small number of NSERC-funded research projects have contributed to enhanced safety and security measures for Canadians. One example of this type of research is illustrated below.

New tool to fight bioterrorism and deadly diseases.

Dr. Ulrich Krull, a biotechnology professor at the University of Toronto, and graduate student Xiaofeng Wang have developed a new DNA screening tool that can easily detect deadly pathogens and diseases in air, water and bodily fluids.

Their prototype consists of a microchip-based screening system that monitors DNA fragments. When a pathogen, such as SARS, or a genetic mutation, such as hepatitis or HIV, is detected in the environment or in a person's body, the device's fluorescent dye lights up and sends a signal through an optical fibre.

The device could be for rapid diagnostics at a patient's bedside in hospitals where infectious diseases are common and likely to spread. Dr. Krull's DNA screening

tool could be used also to fight bioterrorism by continuously monitoring the environment for harmful pathogens.

Section 3 – Supplementary Information

3.1 Operations and Organizational Structure

Only a small fraction (approximately 5%) of NSERC's budget is spent on administration, which includes an extensive system of volunteer peer review and site visit committees whose travel expenses are a major part of the cost of quality control of funded research. NSERC management monitors the effective use of these resources and conducts several audits each year to review various aspects of the operations. NSERC audit reports can be found at http://www.nserc.gc.ca/about/aud_eval_e.asp. These audits help contribute to process improvement and reassure Canadians of the most efficient use of their funds.

NSERC operates within a framework of:

(1) programs developed in consultation with the Canadian research and business communities, in the context of the present and future challenges facing the Canadian university and college research system, and in light of Canada's needs and government priorities; and

(2) a rigorous process of peer review for awarding funds within the programs.

The peer review system ensures that funds go only to the best professors and students, and the best research programs and projects. NSERC's involvement guarantees objective and fair review of applications for support.

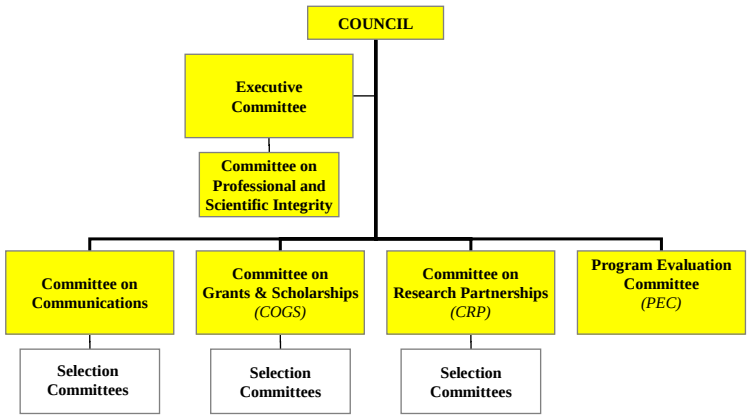
Applications for research funding are judged first and foremost on the merits of the proposed research and on the excellence of the research team; other criteria vary among the agency's programs, and include the training of students, the level of commitment from industrial partners, the plans for interacting with the partners, and (especially for large projects) the design of the project and the proposed management structure.

Applications for direct student support, through NSERC's Scholarships and Fellowships programs, are judged on the student's academic qualifications, as well as his or her potential for research achievement and an assessment of his or her leadership and communication abilities. NSERC recognizes that success in graduate studies, and in a subsequent research career, is dependent on more than academic excellence. An enquiring mind, adaptability and the ability to work well in a team are also essential. In addition to direct support, many other students receive NSERC support indirectly, through research grants awarded to their faculty supervisors.

NSERC's sole business line is: Support of Research and Scholarship in the Natural Sciences and Engineering. NSERC will be reporting along its new Program Activity Architecture (PAA) structure in next year's Performance Report.

NSERC is governed by 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. Members serve part-time and receive no remuneration for their participation. The President serves full-time, and functions as the Chair of the Board and the Chief Executive Officer of the Council. Council is advised on policy and programming matters by several committees. Figure 45 presents NSERC's committee structure.

Figure 45
NSERC's Committee Structure



3.2 Financial Tables

An agency overview of financial information for the year 2004-05 is provided below. In addition, Tables 1 to 6 present the financial information required from NSERC for the Departmental Performance Report. The agency's audited financial statements can be found in Appendix B. The major difference between total authorities and actual spending levels for 2004-2005 was due to underspending in the Canada Research Chairs program because the universities were not able to recruit qualified candidates at the planned rate.

Natural Sciences and Engineering Research Council **Business Line**	
Support of Research and Scholarships in the Natural Sciences and Engineering	
Main Estimates	$810 597 000
Planned Spending	$849 600 000
Total Authorities	$811 699 717
2004-05 Actuals	$803 047 663

Table 1 offers a comparison of the Main Estimates, Planned Spending, Total Authorities, and Actual Spending for the most recently completed fiscal year, as well as historical figures for Actual Spending. Planned spending is established in the Report on Plans and Priorities which was completed in March 2004. NSERC's actual spending was $46.2 million below planned levels. The variance is mainly due to a frozen allotment of $41 million resulting from the federal government $1 billion reallocation, and $5.8 million lapsed in the Canada Research Chairs Program.

Table 1: Comparison of Planned to Actual Spending (incl. FTE)

Business Lines	2002–03 Actual	2003–04 Actual	2004–2005			
			Main Estimates	Planned Spending	Total Authorities	Actual
Support of Research and Scholarships	651.3	732.6	810.6	849.6	811.7	803.0
Total	**651.3**	**732.6**	**810.6**	**849.6**	**811.7**	**803.0**
Total	651.3	732.6	810.6	849.6	811.7	803.0
Less: Non?Respendable revenue [1]	(0.7)	(1.0)	0.7	(0.7)	(0.7)	(0.9)
Plus: Cost of services received without charge [1]	2.9	4.3	3.0	3.0	3.0	4.8
Net cost of Department	**653.5**	**735.9**	**814.3**	**851.9**	**814.0**	**806.9**
Full Time Equivalents [1]	**283**	**295**	**308**	**308**	**308**	**307**

Note: Total Authorities are Main Estimates plus Supplementary Estimates plus other authorities

[1] For presentation purposes, the Main Estimates and Total Authorities figures for non-respendable revenue and for cost of services received without charge have been matched to the 2004-2005 Planned Spending numbers.

Table 2 provides information on how resources are used for the most recently completed fiscal year. The difference between the planned spending and the main estimates is explained by the increase received from the 2004 federal budget ($39.0 million). As part of the $1 billion federal government reallocation exercise, a $41 million frozen allotment was created in the NSERC reference levels which NSERC did not have authority to grant.

Table 2: Use of Resources by Business Lines

2004–2005			
Business Lines	Budgetary		Total
	Operating [1]	Grants and Contributions	
Support of Research and Scholarships			
Main Estimates	36.7	773.9	810.6
Planned Spending	36.7	812.9	849.6
Total Authorities	39.3	772.4	811.7
Actual Spending	36.8	766.2	803.0

[1] Operating includes contributions to Employee Benefit Plans

Table 3 compares total actual spending versus the total authorized spending. Total authorities refers to spending levels approved by the Treasury Board of Canada. As shown above, NSERC did not spend all available funding in 2004-05, incurring a surplus of $8.7 million. Lapsed funding was the result of difficulties experienced by universities in filling Canada Research Chairs at the rate originally planned.

Table 3: Voted and Statutory Items

		2004–2005			
		Main Estimates	Planned Spending	Total Authorities	Actual
80	Operating expenditures	32.8	32.8	35.2	33.2
85	Grants and Contributions	773.9	812.9	772.4	766.2
(S)	Contributions to employee benefit plans	3.9	3.9	4.1	3.6
	Total	**810.6**	**849.6**	**811.7**	**803.0**

Table 4 is designed to show the net cost of a department. It begins with the actual spending and adds services received without charge, and then subtracts non-respendable revenue to arrive at the net cost of the department

Table 4: Net Cost of Department

($ millions)	2004–2005
Total Actual Spending	803.0
Plus: Services Received without Charge	
Accommodation provided by Public Works and Government Services Canada (PWGSC)	3.2
Contributions covering employers' share of employees' insurance premiums and expenditures paid by TBS (excluding revolving funds)	1.5
Worker's compensation coverage provided by Social Development Canada	-
Salary and associated expenditures of legal services provided by Justice Canada	-
Other services provided without charge	0.1
	4.8
Less: Non-respendable Revenue	(0.9)
2004–2005 Net cost of Department	**806.9**

Table 5 highlights non-respendable revenues, which are funds flowing to NSERC from sources other than its Parliamentary appropriation. Refunds of previous years' expenditures are passed on to the Receiver General for Canada and cannot be spent on programs or operations. NSERC did not receive any Respendable Revenue in 2004-05.

Table 5: Sources Non-Respendable Revenue

($ millions)	2002–03 Actual	2003–04 Actual	2004–2005			
			Main Estimates	Planned Spending	Total Authorities	Actual
Support of Research and Scholarship Refunds of previous years' expenditures	0.7	1.0	n/a	0.7	n/a	0.9
Total Non-Respendable Revenue	**0.7**	**1.0**	**n/a**	**0.7**	**n/a**	**0.9**

Table 6 summarizes total NSERC actual spending on grants versus planned spending, the authorized levels and the main estimates. The difference between the 2004-05 actuals and the authorized levels is due to the lapse in the Canada Research Chairs Program. The difference between the authorized levels and the planned spending is mainly caused by the creation of a frozen allotment for the Canada Research Chairs Program ($41 million) in the federal government $1 billion reallocation exercise. The difference between the planned spending and the main estimates is in large part explained by the amount received from the 2004 federal budget ($39 million).

Table 6: Summary of Transfer Payments

($ millions)	2002–03 Actual	2003–04 Actual	2004–2005			
			Main Estimates	Planned Spending	Total Authorities	Actual
Grants						
Support of Research and Scholarship						
Grants and Scholarships	611.0	685.2	753.0	792.0	751.5	745.3
Perimeter Institute	5.0	5.0	5.0	5.0	5.0	5
Canada Graduate Scholarships	-	7.2	15.9	15.9	15.9	15.9
Total grants	616.0	697.4	773.9	812.9	772.4	766.2
Contributions	-	-	-	-	-	-
Other Transfer Payments	-	-	-	-	-	-
Total Grants, Contributions And Other Transfer Payments	616.0	697.4	773.9	812.9	772.4	766.2

3.3 Response to Parliamentary Committees, Audits and Evaluations for 2004-05

In 2004-05 NSERC did not have to respond to questions or recommendations made by Parliamentary Committees. NSERC did not have to respond to any questions from the Auditor General.

In 2004-05 the following audits and evaluations were completed:

Audit of the Information Technology – Final Report
(January 2005)

Audit of the electronic Common Information Management System (eCIMS) Development Project
(December 2004)

System Under Development Audit of the eBusiness Project – 2004
(June 2004)

Assessment of NSERC/SSHRC Award Monitoring Activities
(June 2004)

Audit of Contract Management Practices in the Common Administrative Services Directorate (CASD)
(May 2004)

Evaluation of the University Faculty Awards Program)

The NSERC audit and evaluation reports posted on the web can be found at: www.nserc.gc.ca/about/aud_eval_e.asp).

3.4 Service Improvement Initiative

Programs and services covered by a service improvement plan - NSERC has developed a formal and structured service improvement plan that covers the key services it provides to its clients. The plan, which will be implemented soon, addresses NSERC's four main lines of business: NSERC's Operations and Transactions, Program Delivery, Responding to Enquiries and On-line Services. It is linked to the NSERC Performance and Service Standards, sets priorities for service improvement and will allow for monitoring progress towards client satisfaction targets.

The plan details the expectations and priorities for service improvement throughout the Council. It calls for periodic client-satisfaction surveys with the objective of improving service delivery, and for the updating of the current client-centred internal service standards applied by NSERC's directorates. It is worthwhile to note that most of NSERC's key services are delivered to its clients through the eBusiness Initiative, the Web site and the Helpdesk service.

Development of baseline client satisfaction levels and progress towards achieving satisfaction targets – In compliance with the government-wide Service Improvement Initiative (SII), NSERC conducted a number of external surveys to gauge the satisfaction level of its research community with the quality of the key on-line services being delivered through the NSERC's eBusiness Initiative, the Web site and the Helpdesk service. Two of the most pertinent surveys were conducted in June 2004 and January 2005, respectively. Baseline client satisfaction levels were established and 10 percent improvement targets have been set. Cyclical (annual and bi-annual) surveys will be conducted to monitor progress toward the targets.

Service standards for all key public services: setting of standards and performance against those standards – NSERC has developed Performance and Service Standards that define its operations and the key services it delivers to the research community. Performance against most of those standards is detailed in the NSERC Service Initiative Improvement Plan. NSERC's performance and services standards will be posted on its Web site this fiscal year.

Main achievements in improving service from a citizen-centred perspective – The key client priorities for improvement that were identified in the baseline surveys completed by March 31, 2005 relate to the on-line application submission system, the Web site and the Helpdesk service. Targets for improvement have been identified for these and results will be provided in the NSERC 2005-06 Departmental Performance Report. In the meantime, NSERC has continued to refine its electronic services with a citizen-centred perspective in mind, such as:

- Continuing refinement of the on-line application submission system to encourage users to conduct NSERC-related business electronically. In the 2005 Discovery Grant competition, approximately 68 percent of applicants submitted their applications on-line, as compared to 60 percent last year. In the 2005-06

Strategic Project Grants competition, this figure was 53 percent, a significant jump compared to the 20 percent the year before.

- Creating, to date, 15 client-centred Extranets, with more to come. The objective of these Extranets is to share business information, data and/or operations with external clients, to help improve on-line interactions between NSERC, peer review committees, and university representatives. Extranets will lighten the administrative load, speed up exchange of documents, and offer more convenient, efficient and innovative ways of working with NSERC staff and research community partners.
- Implementing and expanding the Advanced Scoring System on-line collaboration tool for the Scholarships & Fellowships Selection Committee members with the goal of facilitating the preliminary ratings of applications, improving the efficiency of the committees' deliberations and reducing workloads for both the committee members and NSERC staff.
- Piloting the ePeer Review process through the ResearchNet portal (a CIHR, NSERC and SSHRC collaborative initiative) for four of the seven Strategic Grants Selection Panels in the 2005-06 Strategic Project Grants Competition. The pilot allows for the distribution and the evaluation of research grant applications, on line, by Selection Committee members and external reviewers.
- Continuing the NSERC Web Site Rejuvenation effort and the development, in conjunction with CIHR and SSHRC, of a client-centred Internet portal with Secure Channel access (e-pass). Other portal services, in addition to the ePeer Review process mentioned above, will be developed and likely implemented in the next fiscal year. The overall goal of a full-fledged ResearchNet portal is to increase users' ability to access pertinent tri-agency and other federal government information on-line and to conduct all of their business with the three granting agencies electronically.

Section 4 - Reader's Survey

NSERC would like to hear from Canadians who have read this report. Your comments will help ensure that NSERC provides information that is easy to understand and relevant. NSERC would appreciate it if you would take the time to answer the questions below and send in your completed questionnaire as soon as possible. Please use the scale provided and select the number that best represents your point of view.

	Not at All			Somewhat			To a Great Extent
1. Did the report explain clearly what NSERC does?	1	2	3	4	5	6	7
2. Did the report provide you with sufficient information to assess whether Canadians are receiving value for the money invested in NSERC?	1	2	3	4	5	6	7
3. Has the report presented accomplishments and performance information in a balanced manner (e.g., presented both positive and negative aspects)?	1	2	3	4	5	6	7
4. Overall, was the information presented in this report easy to understand?	1	2	3	4	5	6	7

Are there any additional comments you would like to make regarding this report?

Send your completed questionnaire:

By mail to:
Policy and International Relations Division
NSERC
350 Albert Street
Ottawa, Ontario
K1A 1H5

Or by fax to:
(613) 947-5645

Or by e-mail to:
bjl@nserc.ca

Appendix A – Major NSERC Programs

MAJOR PROGRAMS AND OBJECTIVES	RESOURCES 2004-05 ($M)
Discovery Grants	$296.3
The Discovery Grants program is NSERC's largest single program and it is the mainstay of support for university-based research. The program provides partial funding for ongoing multi-year programs of basic research, usually to an individual principal investigator. The objectives of the Discovery Grants program are to: assist in promoting and maintaining a diversified base of high-quality research capability in natural sciences and engineering in Canadian universities, foster research excellence and provide a stimulating environment for research training.	
Postgraduate Scholarships	$74.4
Postgraduate Scholarships are intended to assist in the training of highly- qualified scientists and engineers by providing financial support to excellent students working towards a master's or doctoral degree in the natural sciences or engineering.	
Strategic Projects	$48.3
The program funds project research in target areas of national importance and in emerging areas that are of potential significance to Canada. The research is early-stage with the potential to lead to breakthrough discoveries.	
Networks of Centres of Excellence	$38.2
Networks of Centres of Excellence are unique partnerships among universities, industry, government and non-governmental organizations aimed at turning Canadian research and entrepreneurial talent into economic and social benefits for all Canadians. An integral part of the federal government's Innovation Strategy, these nation wide, multidisciplinary and multi-sectoral research partnerships connect excellent research with industrial know-how and strategic investment.	
Collaborative Research and Development Projects	$29.7
The program is intended to give companies operating from a Canadian base access to the special knowledge, expertise and educational resources at Canadian postsecondary institutions and to offer opportunities for mutually-beneficial collaborations that result in industrial or economic benefits to Canada. The CRD grants support well-defined projects undertaken by university researchers and their private-sector partners.	
Research Chairs	
NSERC Industrial Research Chairs are intended to assist universities in building on existing strengths to achieve the critical mass required for a major research endeavour in science and engineering of interest to industry; and/or assist in the development of research efforts in fields that have not yet been developed in Canadian universities, but for which there is an important industrial need.	$19.1
The key objective of the Canada Research Chairs program is to enable Canadian universities, together with their affiliated research institutes and hospitals, to achieve the highest levels of research excellence and to become world-class research centres in the global, knowledge-based economy.	$86.4
Research Tools and Instruments	$44.1
Research Tools and Instruments grants foster and enhance the research and research training capability of university researchers by supporting the purchase of research equipment and installations.	

MAJOR PROGRAMS AND OBJECTIVES	RESOURCES 2004-05 ($M)
Undergraduate Student Research Awards These undergraduate awards are meant to stimulate students' interest in research in the natural sciences and engineering. They are also meant to encourage students to undertake graduate studies and pursue a research career in these fields.	$19.4
Postdoctoral and Industrial Fellowships These fellowships provide support to a core of the most promising researchers at a pivotal time in their careers. The fellowships are also intended to secure a supply of highly-qualified Canadians with leading-edge scientific and research skills for Canadian industry, government and universities.	$20.1
Research Networks The objective of the Research Networks grants program is to foster: the creation of knowledge and expertise that can most effectively be attained through large-scale multidisciplinary research projects; collaboration between university- and college-based researchers and other sectors; transfer of knowledge and expertise to Canadian-based organizations; training of highly-qualified personnel; and social and/or economic benefits to Canada.	$16.1

Appendix B – Audited Financial Statements

For the year ended March 31, 2005

Auditor General of Canada
Vérificatrice générale du Canada

AUDITOR'S REPORT

To the Natural Sciences and Engineering Research Council
and the Minister of Industry

I have audited the statement of financial position of the Natural Sciences and Engineering Research Council as at March 31, 2005 and the statements of operations, net assets and cash flows for the year then ended. These financial statements are the responsibility of the Council's management. My responsibility is to express an opinion on these financial statements based on my audit.

I conducted my audit in accordance with Canadian generally accepted auditing standards. Those standards require that I plan and perform an audit to obtain reasonable assurance whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation.

In my opinion, these financial statements present fairly, in all material respects, the financial position of the Council as at March 31, 2005 and the results of its operations and its cash flows for the year then ended in accordance with Canadian generally accepted accounting principles.

Nancy Cheng, FCA
Assistant Auditor General
for the Auditor General of Canada

Ottawa, Canada
May 27, 2005

240 rue Sparks Street, Ottawa, Ontario K1A 0G6

STATEMENT OF MANAGEMENT RESPONSIBILITY
FOR THE YEAR ENDED MARCH 31, 2005

Responsibility for the integrity and objectivity of the accompanying financial statements of the Natural Sciences and Engineering Research Council for the year ended March 31, 2005 and all information contained in this report rests with the management of the Council.

These financial statements have been prepared by management in accordance with accounting standards issued by the Treasury Board of Canada Secretariat which are consistent with Canadian generally accepted accounting principles for the public sector. These statements should be read within the context of the significant accounting policies set out in Note 2 of the financial statements.

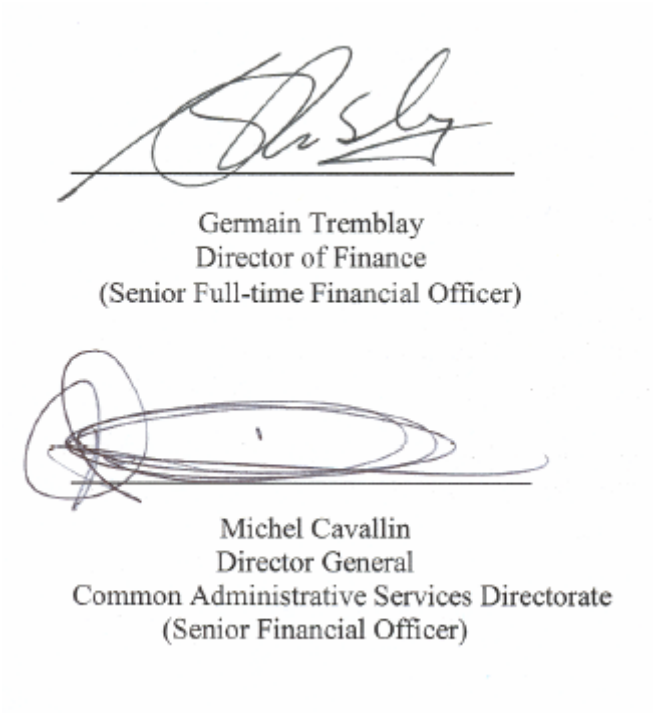
To fulfil these accounting and reporting responsibilities, the Council maintains a set of accounts which provides a centralized record of the Council's financial transactions. Financial information contained in the ministerial statements and elsewhere in the *Public Accounts of Canada* is consistent with these financial statements.

The Council's Common Administrative Services Directorate develops and disseminates financial management and accounting policies, and issues specific directives which maintain standards of accounting and financial management. The Council maintains systems of financial management and internal control which gives due consideration to costs, benefits and risks. They are designed to provide reasonable assurance that transactions are properly authorized by Parliament and are executed in accordance with the *Financial Administration Act* and the prescribed regulations, and are properly recorded and controlled so as to maintain accountability of Government funds and safeguard the Council's assets. Financial management and internal control systems are augmented by the maintenance of internal audit programs. The Council also seeks to assure the objectivity and integrity of data in its financial statements by the careful selection, training and development of qualified staff, by organizational arrangements that provide appropriate divisions of responsibility, and by communication programs aimed at ensuring that its regulations, policies, standards and managerial authorities are understood throughout the organization.

The accounting system and financial statements of the Council have evolved over the years to meet the changes in the structure of the grants and scholarships programs and to give improved reporting and control of expenditures relating to those programs.

Management presents these financial statements to the Auditor General of Canada who audits them and provides an independent opinion, which has been appended to the financial statements.

Approved by:



Germain Tremblay
Director of Finance
(Senior Full-time Financial Officer)

Michel Cavallin
Director General
Common Administrative Services Directorate
(Senior Financial Officer)

May 27, 2005

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL

STATEMENT OF FINANCIAL POSITION
AS AT MARCH 31
(thousands of dollars)

	2005	2004
ASSETS		
Financial assets		
Due from the Consolidated Revenue Fund	$ 2,912	$ 3,571
Accounts receivable (Note 4)	1,438	1,148
Advances	313	315
Total Financial Assets	**4,663**	**5,034**
Non-financial assets		
Prepaid expenses	146	148
Capital assets (Note 5)	4,878	4,275
Total Non-Financial Assets	**5,024**	**4,423**
	$ 9,687	**$ 9,457**
LIABILITIES		
Accounts payable and accrued liabilities (Note 6)	$ 3,833	$ 3,945
Allowances for employee vacation and compensatory benefits	1,248	1,205
Other liabilities (Note 7)	242	594
Allowance for employee severance benefits (Note 8)	3,784	3,038
Total Liabilities	**9,107**	**8,782**
NET ASSETS	**580**	**675**
	$ 9,687	**$ 9,457**

Commitments (Note 11)

The accompanying notes form an integral part of these financial statements.

Approved by the Council:

Thomas A. Brzustowski
President

Michel Cavallin
Director General - Common Administrative Services Directorate

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL

STATEMENT OF OPERATIONS
FOR THE YEAR ENDED MARCH 31
(thousands of dollars)

	2005	2004
REVENUES		
Interest on overdue accounts receivable	$ 2	$ 3
Total Revenues	**2**	**3**
EXPENSES		
Grants and scholarships		
Discovery grants	380,228	350,120
Research partnerships	174,408	163,771
Training scholarships and fellowships	117,883	110,919
Canada Research Chairs	86,421	67,628
General support	7,268	4,986
	766,208	**697,424**
Operations (Note 9)		
Salaries and employee benefits	26,511	23,618
Professional & special services	4,751	4,691
Transportation and communications	3,168	3,517
Accomodations and rentals	3,467	3,138
Information	1,250	1,450
Amortization of capital assets	1,552	1,354
Utilities, materials and supplies	677	876
Repair and maintenance	404	531
Loss on disposals of capital assets	3	65
	41,783	**39,240**
Total Expenses	**807,991**	**736,664**
Refunds of previous years' expenditures and other adjustments	(942)	(1,000)
Net cost of operations	**$ 807,047**	**$ 735,661**

The accompanying notes form an integral part of these financial statements.

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL

STATEMENT OF NET ASSETS
FOR THE YEAR ENDED MARCH 31
(thousands of dollars)

	2005	2004
NET ASSETS		
Net assets, beginning of year	$ 675	$ 72
Net cost of operations	(807,047)	(735,661)
Services provided without charge by other government departments (Note 9)	4,856	4,308
Net cash provided by Government (Note 3c)	802,755	730,843
Change in due from the Consolidated Revenue Fund	(659)	1,113
NET ASSETS, End of Year	**$ 580**	**$ 675**

The accompanying notes form an integral part of these financial statements.

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL

STATEMENT OF CASH FLOWS
FOR THE YEAR ENDED MARCH 31
(thousands of dollars)

	2005	2004
OPERATING ACTIVITIES		
Net cost of operations	$ 807,047	$ 735,661
Non-cash items included in net cost of operations:		
Bad debt expense	-	(24)
Amortization of capital assets (Note 5)	(1,552)	(1,354)
Services provided without charge by other government departments (Note 9)	(4,856)	(4,308)
Loss on disposals of capital assets	(3)	(65)
Variations in Statement of Financial Position		
Operating accounts receivable	290	588
Advances	(2)	(938)
Prepaid expenses	(2)	74
Operating accounts payable and accrued liabilities	112	(1,070)
Employee vacation and compensatory benefits	(43)	(149)
Other liabilities	352	330
Employee severance benefits	(746)	(23)
Cash used in operating activities	**800,597**	**728,722**
INVESTING ACTIVITIES		
Acquisitions of capital assets	2,158	2,121
Cash used in investing activities	**2,158**	**2,121**
Net cash provided by Government	**$ 802,755**	**$ 730,843**

The accompanying notes form an integral part of these financial statements.

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL

NOTES TO THE FINANCIAL STATEMENTS
for the year ended March 31, 2005

1. Authority and objective

The Natural Sciences and Engineering Research Council (NSERC) was established in 1978 by the *Natural Sciences and Engineering Research Council Act*, and is a departmental corporation named in Schedule II to the *Financial Administration Act*. Its objective is to promote discovery and innovation and support both research and the provision of highly qualified personnel in the natural sciences and engineering.

The Council supports both basic university research through research grants and project research through partnerships of universities with industry, as well as the advanced training of highly qualified people in both areas through scholarships and fellowships.

The Council's grants, scholarships, and operating expenditures are funded by budgetary lapsing authorities. Employee benefits are funded by statutory authorities.

2. Summary of significant accounting policies

The financial statements have been prepared in accordance with accounting standards issued by the Treasury Board of Canada Secretariat which are consistent with Canadian generally accepted accounting principles for the public sector. The most significant accounting policies are as follows:

(a) Parliamentary appropriations

The Government of Canada finances the Council through Parliamentary appropriations. Appropriations provided to the Council do not parallel financial reporting according to generally accepted accounting principles. They are based in large part on cash flow requirements. Items recognized in the Statement of Operations and the Statement of Financial Position are not necessarily the same as those provided through appropriations from Parliament. Note 3 provides information regarding the source and disposition of these authorities and a high-level reconciliation between the two bases of reporting.

(b) Due from the Consolidated Revenue Fund and net cash provided by Government

The Council operates within the Consolidated Revenue Fund (CRF). The CRF is administered by the Receiver General for Canada. All cash received by the Council is deposited to the CRF and all cash disbursements made by the Council are paid from the CRF. Due from the Consolidated Revenue Fund represents the amount of cash that the Council is entitled to draw from the CRF, without further appropriations, in order to discharge its liabilities. Net cash provided by government represents all cash disbursements, net of cash receipts, including transactions with departments of the federal government. A corresponding amount is credited directly to the net assets.

(c) Revenues

Revenues are accounted for in the period in which the underlying transaction or event occurred that gave rise to the revenues.

(d) Expenses

Expenses are recorded when the underlying transaction or expense occurred subject to the following:

- Grants and scholarships

  Grants and scholarships are recognized in the year in which the entitlement of the recipient has been established, when the recipient has met the eligibility criteria, the commitment has been approved, and the payment is due before the end of the fiscal year.

- Employee severance benefits

  The Council provides post-retirement and post-employment benefits to its employees through a severance benefit plan. This benefit plan is not pre-funded and therefore has no assets. The Council calculates a liability and an expense for employee severance benefits using information derived from the results of the actuarially determined liability for employee severance benefits for the Government as a whole. Employee severance benefits on termination of employment represent obligations of the Council that are normally funded through future years' appropriations.

- Vacation and compensatory benefits

  Vacation and compensatory pay are expensed in the year that the entitlement occurs.

- Contributions to the Public Service Pension Plan

  All eligible employees participate in the Public Service Pension Plan administered by the Government of Canada. The Council's contributions reflect the full cost as employer. Under present legislation, contributions made by the Council to the Plan are 2.14 times the employees' contributions on account of current service. The Council's contributions are expensed during the year in which the services are rendered and represent the total pension obligation of the Council. The Council is not currently required to make contributions with respect to any actuarial deficiencies of the Public Service Pension Plan.

- Services provided without charge by other Government departments and agencies

  Services provided without charge by other Government departments and agencies are recorded as operating expenditures at their estimated fair value and a corresponding amount is credited directly to the net assets.

(e) Refunds of previous years' expenditures and other adjustments

Refunds of previous years' expenditures are deducted from expenditures. These funds are remitted to the Receiver General for Canada.

(f) Accounts receivable

Accounts receivable are stated as amounts expected to be ultimately realized. An allowance is made for doubtful accounts from external parties for any amounts where the recovery is considered uncertain. No such provision is made for amounts owing from other government departments.

(g) Capital assets

Capital assets with an acquisition cost of $2,500 or more are capitalized at cost as well as the standard furniture, equipment and desktop personal computer assigned to each employee due to the material number of such items. The capitalization of software and leasehold improvements has been done on a prospective basis from April 1, 2001. Capital assets are amortized over their estimated useful life on a straight-line basis, using a half-year rule in the year of acquisition and disposal, as follows:

Capital asset class	Amortization period
Informatics equipment including standard software issued on desktop computers	3 years
Purchased network software and in-house developed software	5 years
Other equipment	5 years
Furniture	7 years
Motor vehicles	7 years
Items acquired under capital leases	Lesser of their useful
Leasehold improvements	life or the term of the lease

(h) Measurement uncertainty

The preparation of financial statements requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenues and expenses reported in the financial statements. At the time of preparation of these statements, management believes the estimates and assumptions to be reasonable. The allowance for employee severance benefits and the estimated useful lives of capital assets are the most significant items where estimates are used. Actual results could differ from those estimated.

3. Parliamentary appropriations

The operations of the Council are financed through Parliamentary appropriations. These appropriations are recorded as cash provided by government when used; any unused appropriation balances lapse. Items recognized in the Statement of Operations in one year may be funded through Parliamentary appropriations in a different year. The differences are reconciled as follows:

(a) Reconciliation of net cost of operations to total Parliamentary appropriations used

	2005	2004
	(thousands of dollars)	
NET COST OF OPERATIONS	$ 807,047	$ 735,661
Adjustments for items not affecting appropriations:		
Add Interest on overdue accounts receivable	2	3
Refunds of previous years' expenditures	942	1,000
Less Amortization of capital assets	(1,552)	(1,354)
Vacation and compensatory pay	(43)	(149)
Services provided without charge by other Government departments and agencies	(4,856)	(4,308)
Severance benefits	(746)	(23)
Adjustments for items affecting appropriations:		
Add Capital acquisitions	2,158	2,121
Prepaid expenses	146	148
Other adjustments	(50)	30
TOTAL PARLIAMENTARY APPROPRIATIONS USED	**$ 803,048**	**$ 733,129**

(b) Reconciliation of Parliamentary appropriations voted to Parliamentary appropriations used

	2005	2004
	(thousands of dollars)	
GRANTS AND SCHOLARSHIPS		
Main estimates – Vote 95	$ 773,941	$ 674,840
Add : Supplementary estimates	39,100	47,250
Less: Frozen allotment	(41,000)	(21,000)
Grants and scholarships lapse	(5,833)	(3,666)
Grants and scholarships expenditures	766,208	697,424
OPERATING EXPENDITURES		
Main estimates – Vote 90	32,755	29,887
Add : Supplementary estimates, salary increments	2,403	3,462
Less: Operating lapse	(1,915)	(1,386)
Adjustment for retroactive pay liability	-	327
Operating expenditures	33,243	32,290
Statutory contributions to employee benefit plans	3,597	3,415
TOTAL PARLIAMENTARY APPROPRIATIONS USED	**$ 803,048**	**$ 733,129**

(c) Reconciliation of net cash provided by Government to Parliamentary appropriations used

	2005	2004
	(thousands of dollars)	
NET CASH PROVIDED BY GOVERNMENT	$ 802,755	$ 730,843
Refunds of prior year's expenditures	942	1,000
Variation in accounts receivable	(290)	(487)
Variation in advances	2	938
Variation in accounts payable and accrued liabilities	(112)	1,070
Variation in other liabilities	(352)	(330)
Other adjustments	103	95
TOTAL PARLIAMENTARY APPROPRIATIONS USED	**$ 803,048**	**$ 733,129**

4. Accounts receivable

	2005	2004
	(thousands of dollars)	
Other government departments	$ 1,131	$ 907
Outside parties	336	265
Allowance for doubtful accounts	(29)	(24)
Total accounts receivable	$ 1,438	$ 1,148

5. Capital assets

	2005				2004
Capital asset class	Opening balance	Net additions for the year	Accum. Amort.	Net book value	Net book value
	(thousands of dollars)				
Informatics	$ 2,605	$ 557	$ (2,055)	$ 1,107	$ 988
Software	2,759	1,247	(1,416)	2,590	2,020
Other equipment	249	37	(236)	50	83
Furniture	2,165	210	(1,727)	648	624
Leasehold improvements	851	-	(368)	483	560
Total	**$ 8,629**	**$ 2,051**	**$ (5,802)**	**$ 4,878**	**$ 4,275**

Amortization expense for the year ended March 31, 2005 is $1,552,105 ($1,353,543 in 2004).

6. Accounts payable and accrued liabilities

	2005	2004
	(thousands of dollars)	
Outside parties	$3,306	$ 3,477
Other government departments	527	468
Total accounts payable and accrued liabilities	$ 3,833	$ 3,945

7. Other liabilities

Other liabilities represent the balance, at year-end, of the specified purpose account which includes earmarked funds held in trust for the North Atlantic Treaty Organization (NATO) and interest generated thereon. These funds must be used for the purposes for which they were received and represent a liability. The transactions related to this specified purpose account are not included in the Council's statement of operations but represent a charge to this account as the Council has simply acted as a facilitator on behalf of NATO. The balance below is included in the Consolidated Revenue Fund in the name of the Council, and appears as Due from the Consolidated Revenue Fund on the Statement of Financial Position. Details of changes in the account are as follows:

	2005	2004
	(thousands of dollars)	
Balance, beginning of year	$ 594	$ 924
Funds received	-	259
Interest received	9	17
Disbursements	(361)	(606)
Balance, end of year	$ 242	$ 594

8. Employee future benefits

Employees of the Council are entitled to specific benefits on or after termination or retirement, as provided for under various collective agreements or conditions of employment.

(a) Pension benefits

The Council and all eligible employees contribute to the Public Service Pension Plan. This pension plan provides benefits based on years of service and average earnings at retirement. The benefits are fully indexed to the increase in the Consumer Price Index. The Council's contributions to the Public Service Pension Plan during the year amounted to $2,636,881 ($2,273,395 in 2004).

(b) Severance benefits

The Council provides severance benefits to its employees based on years of service and final salary. This benefit plan is not pre-funded and therefore has no assets, resulting in a plan deficit equal to the employee severance benefits liability. Information about the plan, measured as at the balance sheet date, is as follows:

	2005	2004
	(thousands of dollars)	
Liability for employee severance benefits, beginning of year	$ 3,038	$ 3,015
Cost for the year	902	44
Benefits paid during the year	(156)	(21)
Liability for employee severance benefits, end of year	$ 3,784	$ 3,038

9. Related party transactions

The Council is related in terms of common ownership to all other Government of Canada departments, agencies and Crown Corporations. The Council enters into transactions with these entities in the normal course of business and on normal trade terms applicable to all individuals and enterprises.

During the year, the Council received services without charge, which are recorded at fair value in the financial statements as follows:

	2005	2004
	(thousands of dollars)	
Accommodations provided by Public Works and Government Services Canada	$ 3,236	$ 2,796
Contributions covering the employer's share of employees medical and Dental insurance premiums provided by Treasury Board Secretariat	1,513	1,405
Other services provided without charge	107	107
Total services provided without charge	$ 4,856	$ 4,308

10. Grants, scholarships and other expenditures administered and disbursed for government departments and agencies and organizations outside the government

Grants, scholarships and other expenditures administered and disbursed by the Council on behalf of government departments and agencies and organizations outside the government, which are not included in the statement of operations, amounted to $17,872,160 ($15,039,519 in 2004). Most of these disbursements are made by the Council from funds entrusted to it by government departments and agencies.

The Council receives administrative fees in some circumstances where a significant administrative burden is incurred by the Council for the administration of certain funds on behalf of other government departments and organizations. These amounted to $651,676 during the year ($759,205 in 2004).

11. Commitments

Payments of grants and scholarships extending in future years are subject to the provision of funds by Parliament. Future years awards adjudicated prior to March 31, 2005 are payable as follows:

	(thousands of dollars)
2005-2006	$ 565,274
2006-2007	462,919
2007-2008	283,922
2008-2009	194,760
2009-2010 and subsequent years	98,762

In addition, the nature of the Council's operating activities result in some large multi-year contracts and obligations whereby the Council will be committed to make some future payments when the services or goods are rendered. Major operating commitments that can reasonably be estimated are as follows:

	(thousands of dollars)
2005-2006	$ 67
2006-2007	44
2007-2008	17
2008-2009	17
2009-2010 and subsequent years	21

Appendix C – Council Membership

NSERC is governed by a Council composed of a full-time president and up to 21 members selected from the private sector, the public sector, and the universities, each appointed by Order-in-Council. In accordance with the *Natural Sciences and Engineering Research Council Act*, the President is the Chair of Council and the Chief Executive Officer, responsible for directing the work and the staff of NSERC.

The following is the membership as of March 31, 2005.
(* denotes members of the Executive Committee)

President

Dr. Thomas A. Brzustowski*
President
Natural Sciences and Engineering Research Council of Canada
Ottawa, Ontario

Vice-President

Dr. Joanne Keselman*
Vice-President (Research)
University of Manitoba
Winnipeg, Manitoba

Members

Mr. Alain Bellemare
President
Pratt & Whitney Canada Inc.
Longueuil, Québec

Ms. Claude Benoit*
President and Chief Executive Officer
Old Port of Montréal Corporation/Montréal Science Centre
Montréal, Québec

Dr. Max Blouw*
Vice-President, Research
University of Northern British Columbia
Prince George, British Columbia

Dr. Adam Chowaniec
President
Tundra Semiconductor Corp.
Ottawa, Ontario

Dr. Thomas Calvert*
Professor Emeritus
Simon Fraser University
Surrey, British Columbia

Mr. Haig deB Farris
President
Fractal Capital Corp.
Vancouver, British Columbia

Dr. Louis Fortier
Professor, Department of Biology
Université Laval,
Québec, Québec

Dr. Suzanne Fortier
Vice-Principal (Academic)
Queen's University
Kingston, Ontario

Dr. Robert Haines
Professor, Department of Chemistry
University of Prince Edward Island
Charlottetown, Prince Edward Island

Dr. Gretchen Harris
Associate Professor, Department of Physics
University of Waterloo
Waterloo, Ontario

Members, cont.

Dr. Katherine Heinrich
Vice-President, Academic
University of Regina
Regina, Saskatchewan

Dr. Mike Lazaridis
President
Research in Motion Ltd.
Waterloo, Ontario

Mr. Murray McLaughlin
McLaughlin Consultants Inc.
Guelph, Ontario

Dr. Maurice Moloney*
Chief Scientific Officer
SemBioSys Genetics Inc.
Calgary, Alberta

Mr. Jean Nicolas
Professor, Department of Mechanical Engineering
Université de Sherbrooke
Sherbrooke, Québec

Ms. Julie Payette
Astronaut
NASA Johnson Space Center
Houston, Texas
U.S.A.

Ms. Jocelyne Roy-Vienneau*
Vice Recteur
Université de Moncton
Shippagan, New Brunswick

Dr. Barbara Sherwood Lollar*
Professor, Department of Geology
University of Toronto
Toronto, Ontario

Dr. Mary Anne White
Professor, Department of Chemistry
Dalhousie University
Halifax, Nova Scotia

Dr. Robert Young
Vice-President, Dept. of Medicinal Chemistry
Merck Frosst Canada & Co.
Pointe Claire, Québec

Associates of Council

Dr. Alan Bernstein
President
Canadian Institutes of Health Research
Ottawa, Ontario

Dr. Pierre Coulombe
President
National Research Council Canada
Ottawa, Ontario

Dr. Marc Renaud
President
Social Sciences and Humanities Research Council of Canada
Ottawa, Ontario

Corporate Secretary

Ms. Martine Dupré*
Corporate Secretary
Natural Sciences and Engineering Research Council of Canada
Ottawa, Ontario