



National Research Council Canada

Performance Report

For the period ending
March 31, 2000

Canada

Improved Reporting to Parliament Pilot Document

The Estimates of the Government of Canada are structured in several parts. Beginning with an overview of total government spending in Part I, the documents become increasingly more specific. Part II outlines spending according to departments, agencies and programs and contains the proposed wording of the conditions governing spending which Parliament will be asked to approve.

The *Report on Plans and Priorities* provides additional detail on each department and its programs primarily in terms of more strategically oriented planning and results information with a focus on outcomes.

The *Departmental Performance Report* provides a focus on results-based accountability by reporting on accomplishments achieved against the performance expectations and results commitments as set out in the spring *Report on Plans and Priorities*.

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Foreword

On April 24, 1997, the House of Commons passed a motion dividing on a pilot basis the *Part III of the Estimates* document for each department or agency into two separate documents: a *Report on Plans and Priorities* tabled in the spring and a *Departmental Performance Report* tabled in the fall.

This initiative is intended to fulfil the government's commitments to improve the expenditure management information provided to Parliament. This involves sharpening the focus on results, increasing the transparency of information and modernizing its preparation.

The Fall Performance Package is comprised of 83 Departmental Performance Reports and the President's annual report, *Managing for Results 2000*.

This *Departmental Performance Report*, covering the period ending March 31, 2000 provides a focus on results-based accountability by reporting on accomplishments achieved against the performance expectations and results commitments as set out in the department's *Report on Plans and Priorities* for 1999-00 tabled in Parliament in the spring of 1999.

Results-based management emphasizes specifying expected program results, developing meaningful indicators to demonstrate performance, perfecting the capacity to generate information and reporting on achievements in a balanced manner. Accounting and managing for results involve sustained work across government.

The government continues to refine its management systems and performance framework. The refinement comes from acquired experience as users make their information needs more precisely known. The performance reports and their use will continue to be monitored to make sure that they respond to Parliament's ongoing and evolving needs.

This report is accessible electronically from the Treasury Board Secretariat Internet site: <http://www.tbs-sct.gc.ca/rma/dpr/dpre.asp>

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Departmental Performance Report

For the period ending
March 31, 2000

John Manley
Minister of Industry

Canada^{ca}

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Executive Summary

The National Research Council of Canada (NRC) is Canada's largest public sector research and development agency, with a mandate to undertake, assist or promote scientific and industrial research in fields of importance to Canada. In the early 1990s, NRC predicted that innovation in an international context would be Canada's most significant challenge. In a global economy driven by knowledge and innovation, companies can locate anywhere in the world. They choose to locate wherever local conditions make innovation efficient.

In response to this challenge, NRC launched its vision to be a leader in the development of Canada's knowledge-based economy through science and technology four years ago. NRC has focused its strengths on helping build the innovation infrastructure that Canada needs for the 21st century. In pursuing this vision, NRC has transformed its organization, operations and activities to maximize its contributions across the spectrum, from discovery to innovation. Highlights from this year's performance include:

- NRC contributes to Canada's scientific reputation. This is evidenced by the number of awards and recognition received by staff, over 3000 publications and invited talks, and 700 invitations to serve on international committees.
- The success stories and testimonials from some of NRC's partners provided in this report illustrate the many benefits of working with NRC. The number of organizations coming to work with NRC is continuing to increase. In 1999-2000 NRC had almost 600 formal research and development agreements with external partners from industry, government and academia, almost double the number in 1995-1996. An additional 2000 clients received products or services from NRC research institutes. Over 1000 guest workers a year receive advanced training while working in NRC laboratories. All of these activities help raise the level of innovation in Canadian enterprises.
- NRC has worked in communities across Canada to help create an environment for innovation. NRC is proud to have been part of the success of the biotechnology technology clusters in Montreal and Saskatoon, and is applying its model to new initiatives in Vancouver, Ottawa, London, and Atlantic Canada. Through a sustained investment in R&D, NRC can help these communities reach the critical mass necessary for innovation.

- NRC contributes to the generation of scientific knowledge by maintaining major strategic research investments and generating new initiatives in critical fields such as genomics; fuel cells; photonics; aerospace; advanced manufacturing and materials; astronomy; biotechnology and environmental technologies. NRC is building on its competencies to create new R&D programs, bringing together multidisciplinary teams to work on bioinformatics, high performance computing, molecular electronics, nanostructures and others.
- NRC helps Canadian companies be better positioned to take advantage of international trade. NRC advanced Canada's national standards, measurements and codes work, signing new international standards agreements to help reduce technical barriers to trade and increase exports by Canadian-based companies.
- NRC continues to play a crucial role in linking the creators of knowledge and those who can best use it. In 1999-2000, NRC provided advice, services and support to more than 12,000 Canadian firms through the Industrial Research and Assistance Program (IRAP), the Canadian Technology Network (CTN), research institutes and Innovation and Technology Centres across Canada. The Canada Institute for Scientific and Technical Information (CISTI) broke new ground in the access to and dissemination of scientific, technical and medical information.
- NRC has contributed to the growth of new technology-based companies. In support of young and emerging Canadian companies, NRC has opened new incubator and partnership facilities. In 1999-2000 NRC created seven new spin-off companies to commercialize technologies from institutes and centres, increased technology licensing efforts and undertook co-development and transfer of new technologies to companies, all leading to new products and services.
- NRC helps produce the highly qualified personnel that are the cornerstone of the knowledge-based economy. NRC worked with Canada's youth through training and development, direct job experience, workshops, seminars and public outreach programs. Over 900 young researchers come to work in NRC laboratories and institutes each year, and through IRAP an additional 640 students gained valuable work experience in Canadian small and medium sized enterprises.

This report highlights key NRC successes in delivering its vision in 1999-2000, demonstrating a valued return on the government's investment in NRC. It is a report about the creativity, ingenuity, determination and dedication of all NRC staff – researchers, scientists, technologists and program support. It is these people who have made possible NRC's research excellence and delivery of the programs that influence Canada's path to the future.

Section 1

Messages

Minister's Portfolio Message

Canada stands at the threshold of the new century as a world leader in the new economy, an economy fundamentally different from that of even ten years ago. In the past decade we have seen unprecedented changes around the world, and Canada has moved quickly to take advantage of the opportunities offered. The forces of globalization mean that we are no longer competing locally, or even regionally, but with economies around the globe. And the pace of change has accelerated at a dizzying speed. New electronic communications and information technologies have hastened our transformation into a knowledge-based economy, where skilled workers are our most significant resource and innovation is the key to success. Canada is in the vanguard of this, and our economy is strong and dynamic.

The Industry Portfolio is...

Atlantic Canada Opportunities Agency
Business Development Bank of Canada*
Canadian Space Agency
Competition Tribunal
Copyright Board Canada
Canada Economic Development for Quebec Regions
Enterprise Cape Breton Corporation*
Industry Canada
National Research Council Canada
Natural Sciences and Engineering Research Council of Canada
Social Sciences and Humanities Research Council of Canada
Standards Council of Canada*
Statistics Canada
Western Economic Diversification Canada

** Not required to submit Performance Reports*

The Government of Canada identified the challenges and opportunities of the new economy at an early stage, and we have been following a clear plan to capture its benefits for all Canadians. A key element of this agenda is investing in research and knowledge, and strengthening Canada's capacity for innovation, in order to increase productivity and to create well-paying jobs to improve our standard of living. We are also investing heavily in human resources, developing the knowledge workers we will need for the economy to continue to thrive, and fostering an entrepreneurial business climate. And we are working to make Canada the most connected country in the world, to maintain our position as a leader in the use of the Internet.

As Minister of Industry, I am responsible for the Industry Portfolio, which consists of fourteen departments, and agencies that play a key role in delivering on the government's agenda. With over 40% of federal government spending on science and technology, and a wide range of complementary programs to help businesses both large and small thrive and prosper, the Industry Portfolio represents a powerful toolkit for the government as it leads Canada's transition to the new knowledge-based economy and society.

I am pleased to present this Performance Report for the National Research Council Canada (NRC), which shows its contribution to the government's agenda by setting out the commitments made in its Report on Plans and Priorities, and its success in meeting them over the 1999-2000 fiscal year.

As Canada's principle public sector R&D agency, NRC is a leader in the development of an innovative, knowledge-based economy through science and technology. In 1999-2000, NRC aggressively built partnerships with industry, universities and government. The organization has helped to co-ordinate Canada's science and technology resources by creating the best environment to nurture our innovators and by linking knowledge and application. Through these mechanisms, NRC has applied its efforts to Canada's communities to encourage regional technological strengths. Through entrepreneurship, focused projects and assistance to small and medium-sized enterprises, NRC is helping industry build Canada's knowledge-based economy.

Working together to invest in our people and our future, we are making our country a stronger and more prosperous place for all Canadians. I am proud of the Industry Portfolio's significant contributions toward meeting these government priorities.

The Honourable John Manley

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

Our investments in research and innovation are guided by a vision whereby the future belongs to societies whose economies are sound, whose populations are healthy, whose children are prepared, and whose stakeholders invest in the knowledge, education and innovation of their people. The search for knowledge must be an ongoing process as it touches all facets of our lives--health, humanities and social sciences, education, environment, business and the economy. The Government continues to invest in knowledge to reinforce our competitiveness, improve the well being and the quality of life of Canadians, and make Canada a location of choice for knowledge workers and entrepreneurs to live and work.

We still face a productivity challenge in Canada, but the government's innovation agenda is meeting this challenge. We are training our researchers to be world class, and we are giving them world-class facilities and opportunities in Canada. Portfolio partners carry out critical research in key areas, and support the development of the physical and knowledge infrastructure that the new knowledge-based economy needs.

It is also essential for our leading-edge research to be turned into cutting-edge products and services, and to this end the Portfolio partners provide strategic support to businesses. We must aim to lead the world in the development and adoption of new technologies, just as Canada has become a world leader in connectedness and getting businesses and individuals to realize the opportunities of the Internet. And we must encourage our businesses to see themselves as world-class entrepreneurs – people with the know-how and the drive to market new ideas and services.

This Performance Report for 1999-2000 gives concrete examples of how the government, through the National Research Council of Canada (NRC), is encouraging partnerships, promoting innovation, and investing in research to generate new ideas for our society and economy. An example of one key performance measure in this area is NRC's contribution to advancement of science and generation of knowledge. Performance for this measure is comprised of data on: external awards to NRC researchers; patents and publications in scientific journals and papers presented in conference proceedings.

A second example of NRC's performance indicators is NRC's achievements as an agent of innovation in Canada. The data includes: financial and technical assistance to SMEs; spin-off companies; and collaborations and partnership agreements with partners and stakeholders.

We will continue to focus on innovation and excellence, working together to achieve a stronger and more prosperous country for all.

The Honourable Gilbert Normand

Section 2

Departmental Performance

Societal Context

Science & Technology Plays a Key Role in the Knowledge-Based Economy

The countries that lead in the global knowledge-based economy are innovative nations with high levels of productivity, an ability to create or quickly adapt the latest technologies, and the courage to take strategic risks in the pursuit of new opportunities and markets. The global knowledge-based economy presents both opportunities and challenges. In such an economy, driven by knowledge and innovation, companies can locate anywhere in the world. The [National Research Council's](#) (NRC) clients and partners are facing:

- Global trade growth, deregulation, and spreading liberalization
- Competition for the most qualified people and intellectual capital resources
- Sustainability factors in intergovernmental policies and economic strategies
- New channels for communication that are overturning established business models, and creating new industries.

The challenge facing the Government in recent years, however, has been to bridge a persistent innovation gap between the generation of knowledge and its conversion into successful commercial products and services. Since innovation is recognized as an important factor in increased productivity, eliminating this gap is crucial for Canadian economic prosperity and quality of life.

It is increasingly recognized that innovation occurs at the local level, and that the development of community-based technology clusters is vital to sustained economic growth at the national level. The role of the NRC is evolving to meet the needs of a changing economy in the fast-paced high-tech environment of the 21st century by building and strengthening Canada's innovation infrastructure. Through its sustained R&D investment in key areas of the Canadian economy, the provision of the strategic infrastructure that supports Canadian innovation, the diffusion of S&T information, and through partnerships with companies and communities across the country, NRC fuels innovation across Canada.

NRC works to strengthen linkages among the players in Canada's innovation system, because clusters thrive when those links are strong. NRC contributes to the building of world-class technology clusters in Ottawa (information and communications technology), Montreal (biopharmaceuticals and aerospace) and Saskatoon (agricultural biotechnology). NRC Institutes in London (advanced manufacturing), Vancouver (fuel cells), Halifax (aquaculture) and Winnipeg (medical technologies) are also following the same approach. NRC offers each technology cluster a sustained research investment - an anchor that helps the cluster succeed and attract future investment.

Vision to 2001

As Canada's foremost research and development agency, NRC will be a leader in the development of an innovative, knowledge-based economy through science and technology. We will achieve this by:

- Being dedicated to excellence in advancing the frontiers of scientific and technical knowledge in areas relevant to Canada;
- Carrying out research, in collaboration with industrial, university and government partners, to develop and exploit key technologies;
- Providing strategic advice and national leadership to integrate key players in Canada's system of innovation; and
- Taking a more aggressive, entrepreneurial approach to ensure the transfer of our knowledge and technical achievements to Canadian-based firms.

Canada's present high standard of living and excellent quality of life will depend on our ability to stay at the forefront of the knowledge-based economy. The discovery and use of new, emerging technologies and the prudent application of scientific knowledge in the formulation of policies, programs and regulations leads to benefits such as improved health and safety and the strengthening of our nation's ability to address environmental pressures.

Objectives and Priorities

In 1996, NRC outlined a new corporate vision building on its record of past achievement and future potential as Canada's principal R&D agency. The Vision statement is NRC's commitment to play a leadership role in the development of an innovative knowledge-based economy through science and technology. To ensure that NRC stays aligned with Canadian needs, NRC is developing its *Vision to 2006*.

Chart of Key Results Commitments (CKRC)

The primary function of the Chart of Key Results Commitments is to communicate to Canadians the results of NRC's commitments. NRC's CKRC is available on the [Treasury Board Secretariat](#) website.

Innovation and Knowledge-Based Economy		
<i>To provide Canadians with:</i>	<i>To be demonstrated by:</i>	<i>Reported on pages:</i>
a research program that focuses on excellence and knowledge, and that is relevant to Canadian needs	<ul style="list-style-type: none"> ▪ acceptance and use of NRC's research advances ▪ recognition of NRC's research excellence ▪ investment in and use of NRC's facilities ▪ highly qualified personnel 	p. 14
economic growth by helping Canadian firms develop new, marketable technologies	<ul style="list-style-type: none"> ▪ partner involvement in research projects ▪ technical and commercial successes of firms that work with NRC ▪ client and partner satisfaction with NRC's services and support 	p. 19 p. 29
technology-based economic growth in communities across the country	<ul style="list-style-type: none"> ▪ results of regional initiatives ▪ use and impacts of codes and standards ▪ impacts of collaboration with government and industry ▪ influence of NRC's industrial support and information networks 	p. 23 p. 33
transfer of NRC's research successes to Canadian firms	<ul style="list-style-type: none"> ▪ number of technology and information transfers to firms ▪ results of patent and license sales ▪ introduction of improved management tools and systems 	p. 26

Government Innovation Agenda

In the 1999 Speech from the Throne, the government placed emphasis on creating a stronger basis for Canada's youth, and on developing the skills and knowledge for the 21st Century that will ensure continued health and quality of life. More specifically, the Speech made reference to the Government's intention to "... ensure Canada has a modern and effective research and science capacity to promote health, safety and economic well-being of Canadians."

NRC has been an active co-delivery partner with respect to the *Government's Innovation Agenda*. The following list highlights some key priorities in which NRC is either leading or participating in support of the *Innovation Agenda*:

- The Canadian Biotechnology Strategy, under the leadership of [Industry Canada](#) and with partners [Agriculture and Agri-Food Canada](#); [Canadian Food Inspection Agency](#); [Environment Canada](#); [Department of Fisheries and Oceans](#); [Department of Foreign Affairs and International Trade](#); [Health Canada](#) and [Natural Resources Canada](#).
- Technology Partnerships Canada, with the [Business Development Bank of Canada](#), under the leadership of [Industry Canada](#).
- The Climate Change Action Fund, with partners [Environment Canada](#) and [Natural Resources Canada](#), under the leadership of the [National Climate Change Secretariat](#).
- The Youth Employment Strategy, under the leadership of [Human Resources Development Canada](#).
- The Saskatchewan Blueprint and the Western Medical Technologies Strategy with [Western Economic Diversification Canada](#).

Corporate Priorities

The following table provides a crosswalk between NRC's three business lines and strategic priorities and links them to the results that NRC intends to achieve. Some of the priorities and results cut across business lines and therefore appear under more than one. NRC will continue to refine the framework for enhancing Program effectiveness and accountability. The priorities and results are linked to the approved 1999-2000 Report on Plans and Priorities.

Key Results	Performance Indicators
Research and Technology Innovation Business Line	
<ul style="list-style-type: none"> ▪ A research program that focuses on excellence and knowledge, and that is relevant to Canadian needs ▪ Economic growth by helping Canadian firms develop new marketable technologies ▪ Technology-based economic growth in communities across the country ▪ Transfer of NRC's research successes to Canadian firms 	<ul style="list-style-type: none"> ▪ Acceptance and use of NRC's research advances ▪ Recognition of NRC's research excellence ▪ Investment in and use of NRC's facilities ▪ highly qualified personnel ▪ partner involvement in research projects ▪ technical and commercial successes of firms that work with NRC ▪ client and partner satisfaction with NRC's services and support ▪ results of regional initiatives ▪ use and impacts of codes and standards ▪ impacts of collaboration with government and industry ▪ influence of NRC's industrial support and information networks ▪ number of technology and information transfers to firms ▪ results of patent and licence sales ▪ introduction of improved management tools and systems
Support for Innovation and the National Science and Technology Infrastructure Business Line	
<ul style="list-style-type: none"> ▪ Economic growth by helping Canadian firms develop new marketable technologies ▪ Technology-based economic growth in communities across the country 	<ul style="list-style-type: none"> ▪ partner involvement in research projects ▪ technical and commercial successes of firms that work with NRC ▪ client and partner satisfaction with NRC's services and support ▪ results of regional initiatives ▪ use and impacts of codes and standards ▪ impacts of collaboration with government and industry ▪ influence of NRC's industrial support and information networks
Program Management Business Line	
<ul style="list-style-type: none"> ▪ Executive support ▪ Program administration 	<ul style="list-style-type: none"> ▪ Support and enables an effective and efficient management of resources

Performance Accomplishments

Measuring R&D Results

The following section highlights how Canadians benefit from the government's long-term investment in NRC. Research projects can take several years of development before their results are known or are ready for application. Some of the results found in this report could be attributed to investments made two, five, or even ten years ago. However, after several years, it becomes a complex and expensive operation to trace all of the impacts and assess a reasonable attribution back to NRC. Two examples from the Information and Communications sector illustrate this point. Ten years ago, NRC encouraged the Solid State Optoelectronics Consortia, of which it was a part, to invest in wavelength division multiplexing, a technology and competency that today is crucial for Canada's photonics industry. Around the same time, NRC researchers were also leading an effort to create an Internet in Canada. This led to the first CA*Net. Although NRC's leadership and vision were essential ingredients in these successful projects, it is difficult today to calculate the return on investment. The challenges with measuring results from R&D organizations on an annual basis have been noted by the [Office of the Auditor General of Canada](#), the [United States' General Accounting Office](#), the OECD, and public and private sector R&D organizations.

In response to the challenges in measuring direct results and identifying the impacts of R&D, leading R&D organizations have developed and implemented performance measurement strategies based on indicators that are both qualitative and quantitative. Some of the indicators used in this report point to or illustrate the process or concept in question, but do not directly measure it. They serve as proxies to assess the results of R&D activity.

Performance Measurement Framework

The performance information of the first two business lines (Research and Technology Innovation and Support for Innovation and the National Science and Technology Infrastructure) is based on the NRC performance framework. NRC is currently developing a framework for its corporate operations (Program Management Business line) that will be implemented in the next fiscal year, 2000-2001.

RESEARCH AND TECHNOLOGY INNOVATION BUSINESS LINE

Objective

To achieve sustained knowledge-based economic and social growth in Canada through research and development and the application of technology and innovation

Description

The business line includes the research program programs, technology development initiatives and the management of national science and engineering facilities. It includes research and collaboration with firms, universities and public institutions. Efforts are focused on key technologies and industrial areas of the Canadian economy where NRC is a leader and has the ability to make a lasting impact.

Business Line Resources	
	Financial Resources
Planned Spending	291.4
Total Authorities	333.4
1999-2000 Actual Spending	298.9

Key Result Commitment

A research program that focuses on excellence and knowledge, and that is relevant to Canadian needs.

Research Excellence

A primary indicator of excellence is the formal recognition by peers in Canada and around the world through the awarding of prestigious national and international awards. Overall, 70 NRC staff received awards and recognition by their peers in 1999-2000. Highlights include a "hat trick" of awards from the [Royal Society of Canada](#) when NRC researchers won the Rutherford Memorial Awards for Chemistry (*Danial Wayner*) and Physics (*Robert Wolkow*) and the Henry Marshall Tory Medal (*James Watson*).

Canadian astronomers rank among the most productive in the world. Their work is highly respected internationally and their intellectual leadership is widely recognized within the larger community. This success benefits many facets of Canadian life – from industry and the economy, to public outreach and education – and is directly attributable to the outstanding support and facilities provided by the Herzberg Institute for Astrophysics to the Canadian astronomical community. Such support from HIA is essential for the continuing success of Canadian astronomy.

Dr Michael DeRobertis,
York University
President of the Canadian
Astronomical Society

In 1999-2000, four NRC researchers (*Harold Jennings, James Whitfield, David Lockwood, and J.J. Beaudoin*) were made Fellows of the Royal Society of Canada. Three retired NRC researchers were recognized for their contribution to Canadian science and technology, contributions largely made during their association with NRC. Srinivasa Sourirajan received the Canadian Chemical Engineering Century Achievement Award for his pioneering work in reverse osmosis, Norman Jones was made an Officer of the Order of Canada, and George Klein, a noted NRC inventor, was featured on a stamp in Canada Post's Millennium Collection. A complete list of awards can be found in Appendix A.

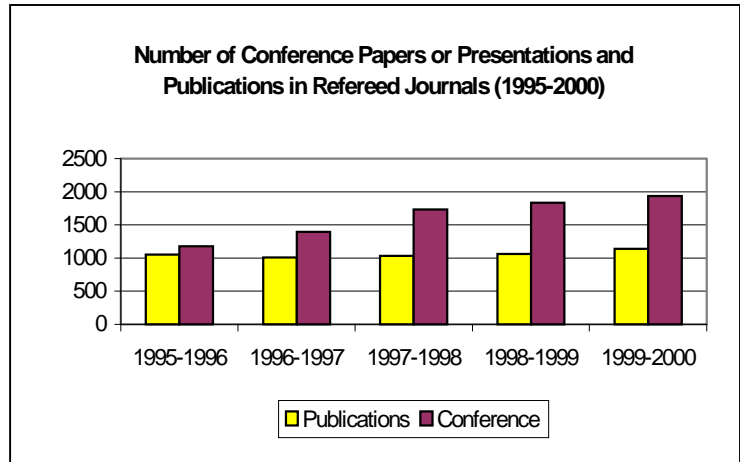
Acceptance of scientific papers in well-known peer-reviewed publications is an internationally acknowledged measure of research quality and relevance. NRC researchers wrote a total of 1,140 articles in refereed journals in 1999, representing a small but steady increase in authorship over the last 5 years.

From 1995-1998, NRC researchers published 21 articles in two of the highest ranked scientific journals *Science* and *Nature*, gaining international recognition for Canadian research excellence. This year, several breakthroughs were reported in these publications, including:

- A femtosecond technique that allows researchers to follow the ultrafast internal processes that lead to rearrangements in molecules, work that may eventually provide insights into biological processes such as vision and photosynthesis.

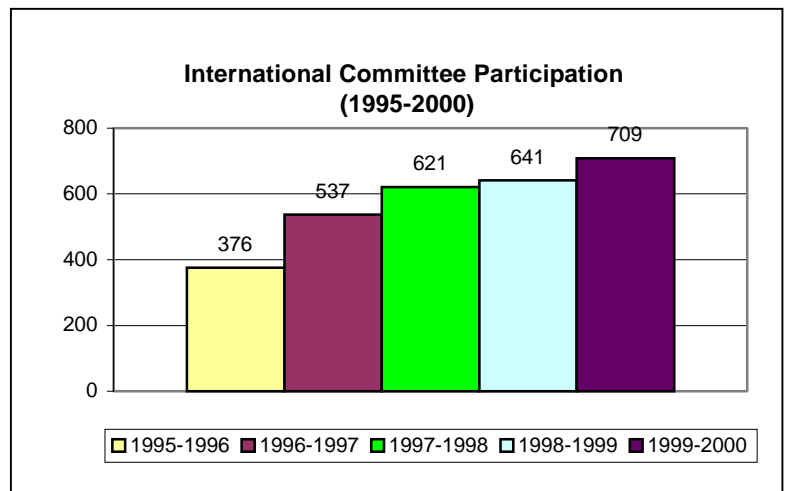
- The first self-directed growth process on silicon, fundamental knowledge that will underpin future molecular electronic technologies.
- Understanding of the electronic properties of semiconductor nanostructures, which will play a crucial role in the miniaturization of semiconductor devices for electronic and optoelectronics applications.

The number of papers published in conference proceedings, or presented at workshops, meetings and other events, are also a measure of research excellence. In some fields, conference papers are the preferred method for communicating current breakthroughs, and in others they are the main way of broadening NRC's reach to an industrial audience. In 1999, NRC researchers delivered 1,935 papers to external audiences at conferences around the world. Again, this number has been increasing at a steady rate over the last five years.



NRC researchers in Montreal won the "Future Technology Award" at the Society of Plastics Engineers' ANTEC meeting in May 1999 for their paper on recent advances in ultrasonic monitoring of the injection moulding process. A number of industrial partners have shown an interest in this work.

NRC researchers also participate in the international scientific community by being invited to serve on the editorial boards of scientific and technical journals. In 1999-2000, NRC staff were on the board, or served as editors, of 129 journals.



NRC staff are frequently asked to serve on national and international committees, attesting to NRC's growing scientific reputation. NRC's participation on international committees has almost doubled since 1995-1996, with staff contributing to over 700 organizations and associations.

One of the benefits to Canadians of this participation is bringing large scientific meetings to Canadian locations. This increases the opportunities for Canadian researchers to attend international events, and provides an opportunity to showcase Canadian research excellence and innovative Canadian companies. The conferences themselves have an economic impact on the

cities involved. An example is the 18th International Conference on Offshore Mechanics and Arctic Engineering held in St. John's in 1999. Over 300 scientists and engineers from 25 countries attended the conference. The City of St. John's recognized the contribution to the economy of the city of one of the NRC organizers through the awarding of the Admiral Award.

Acceptance and Use of NRC's Research Advances

NRC's research advances are used by partners from industry, government, and universities as well as by the international scientific community. The following are some examples:

- Advanced Nuclear Magnetic Resonance technologies developed at NRC are being used by Canadian biopharmaceutical companies to discover promising new compounds that could stop cancer growth, or lead to new inhibitors for the human hepatitis C virus. In addition, by working in NRC laboratories, company personnel are learning to use and apply these technologies on a daily basis in their own research. The companies found that NRC's technology produced results faster than conventional methods.
- In 1996, a team of NRC researchers began a research project involving Gallium Nitride, a material that had some very desirable properties for semiconductor manufacturers. Within just 18 months, the team achieved a world record for high quality Gallium Nitride material. In 1999-2000, the team continued to make progress, producing specialized high power microwave transistors with their industrial partner, Nortel Networks. Devices using Gallium Nitride will have applications in high temperature electronics, like sensors in automobile engines, and high speed, high power applications.
- Institutes in Ottawa and Montreal collaborated to develop and test a novel design for an electrochemical wastewater treatment unit. A Canadian company will be developing field demonstrations, which are expected to lead to commercial exploitation of these novel technologies for environmental remediation. Initial targets are remediation of contaminated water associated with mining and forestry operations in Quebec.
- Following the success of the enzyme NRC designed for bleaching pulp in 1997, a second-generation product has been developed that has allowed our partner, logen, to expand its customer base to a wider range of mills. With these enzymes, mills can reduce the use of bleaching agents, thereby decreasing toxic organochlorine discharges into the environment by hundreds of tons. The decreased use of bleaching agents could lead to net savings of about \$500K annually to mill customers. The NRC enzymes have helped logen to capture a 90% share of xylanase sales to Canada's pulp-and-paper industry, with sales to date exceeding \$6M in North America.
- For 53 years NRC's daily flux measurements have been internationally recognized as the best-calibrated, most reliable standard for measuring solar activity. These data are available worldwide through the Herzberg Institute of Astrophysics' web site and through hourly broadcasts by the U.S. National Oceanic and Atmospheric Administration. The measurements are of benefit to power companies, satellite operators, the communications industry, military organizations and space agencies that use the data to predict communications disruption, satellite lifetimes and hazardous operation periods, surges of current in power transmission lines, and geomagnetic activity.

- NRC's time signals are distributed with an accuracy of about one millisecond to computers through the telephone systems, and are used by 911 emergency services, police forces, hospitals, and banks. Northern users receive the time signal through short wave transmitters, the only method that can be used to check if Global Positioning Systems are functioning properly.

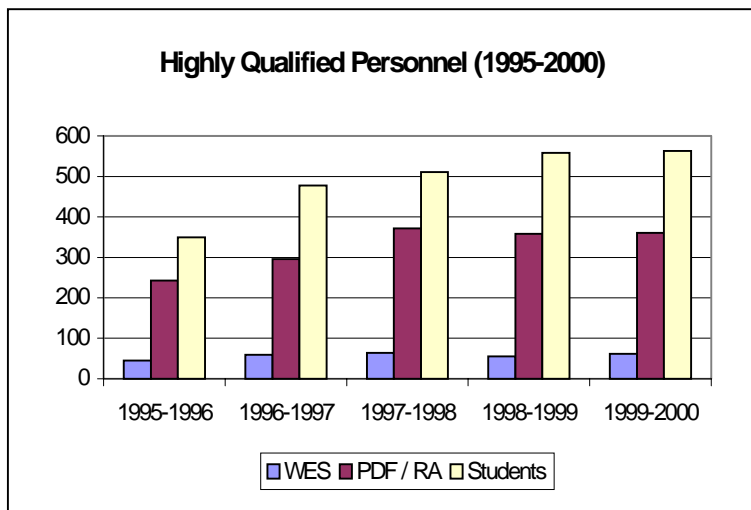
Research Facilities

Investing in equipment and buildings is an essential component of NRC's strategy to stay at the leading edge of Canadian science and technology needs. In 1999-2000, the organization spent about \$44 M on equipment, capital acquisitions and building improvements.

- In Halifax, NRC opened one of Canada's most advanced DNA sequencing facilities. The facility will be used for projects that involve sequencing microbial genomes for a variety of parasites and pathogens infecting fish and shellfish, farm animals and humans. Genome Canada estimates that biotechnology advances have the potential to make an impact on 25% of Canada's GDP.
- In London, NRC opened its Virtual Environment Technology Centre. The Centre will put Canadian manufacturers at the forefront by allowing them to bring the design of a given product or part to the ready for market stage without prototypes, then run a simulation of the production process before a single hard commitment is made.
- In Ottawa, the [Canadian Centre for Housing Technology](#) (CCHT) facility was completed. This innovative new research, testing and demonstration resource for advanced Canadian housing construction technology is a shared facility between NRC, [Natural Resources Canada](#) and [Canada Mortgage and Housing Corporation](#). The first joint research project with two industry partners is underway and several more are under negotiation. This demonstration project is attracting international attention, with over 800 visitors during 1999-2000, including delegations from Chile, Japan, China, Russia, and the United Kingdom.
- In St. John's, the Marine Dynamics Test Facility was commissioned. The facility, which was jointly funded by NRC and the [Department of National Defence](#), provides a unique capability for experiments to determine the performance of underwater vehicles.

Highly Qualified Personnel

NRC contributes to the training and development of highly qualified personnel through the hiring of graduate, co-op, and summer students, and through participation in the post-doctoral fellowship program. The total number of university students, graduates, and post-graduates employed at NRC has remained constant at around 900 for the last three years. NRC continued with its Women in Engineering and Science (WES) Program, established in 1991 to encourage a greater number of Canadian women to pursue careers in underrepresented fields of science or engineering. NRC and [Canadian International Development Agency](#), under the APEC umbrella, sponsored six women graduate students from Asian countries to work in NRC laboratories to gain valuable experience. A further eight graduate student placements have been made for 2000-2001.



NRC researchers further participate in training by accepting positions as adjunct professors in universities and colleges across Canada. NRC researchers held 246 such positions in 1999-2000.

NRC also works with university partners to complete the training of graduates and postgraduates, through formal and informal collaborations with university researchers. An example is the National Capital Institute of Telecommunications, a collaborative undertaking of local universities, industry, Industry Canada's [Communications Research Centre](#) and NRC to create a National Capital

Region -wide centre of innovation in advanced telecommunications.

NRC also believes that it is important to interest students in a future career in S&T while they are still in high school. Through the Partners in Education program and other activities, NRC participates in a number of outreach activities, including:

- Institutes arranged a number of visits, open houses, and other events for local schools, and NRC sponsors and participates in science fairs. Students from four Ottawa area high schools toured an NRC laboratory on December 2, 1999 and were introduced to state of the art systems for the growth of semiconductor materials. Other students attended a Science Fair held over two days; experiencing interactive displays on materials science, air quality, and lighting design.
- In collaboration with CRC, NRC is collaborating with schools and industrial partners in an on-going and award-winning Virtual Classroom project to research and develop communications technologies and collaborative distance learning models that can improve the educational system. This project won an Ottawa Centre for Research and Innovation (OCRI) Business-Education Partnership award, along with the Collège Catholique Samuel-Genest, for the collaborative *Zero to Space Station in 20 Days* program, which integrates a 3D computer assisted design (CAD) unit into an introductory secondary school engineering course.
- NRC produced a large colour poster, "Canadian Skies," featuring a star chart that was distributed to 32,000 schoolteachers with the help of *Teach* and *Rescol* magazines. NRC provided hundreds of copies to other educational resource centres.

Key Result Commitment

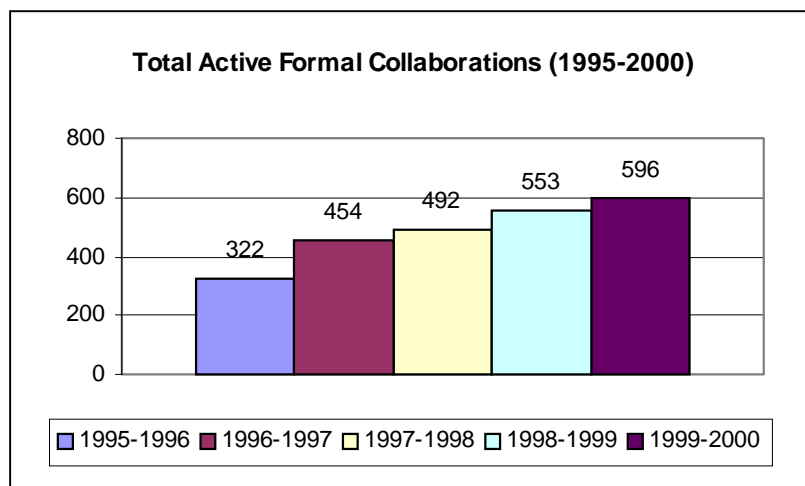
Economic growth by helping Canadian firms develop new, marketable technologies.

NRC helps support Canadian industry through several different avenues. Fee-for-service relationships provide industrial clients with direct access to specific essential NRC services, including expert advice and the use of large or unique facilities.

In 1999-2000, NRC provided S&T services to nearly a thousand clients, and distributed certified reference materials to over eleven hundred more. This represents a slight decline in the number of major fee-for-service clients since 1998-1999, in part because many research institutes are beginning to de-emphasise short-term contract relationships in favour of in-depth collaboration.

Collaborative Agreement

While the number of fee-for-service clients has declined since last year, the number of collaborations has continued to grow steadily over the past five years. In 1999-2000, NRC signed 352 new collaborative agreements, bringing the total number of partnerships active in the year to 596. Approximately 15 % of NRC collaborations are with universities, an additional third are with public organizations, and more than half are with industrial partners.



Collaborative research and development has proven to be an immensely successful means to achieve maximum leverage of both resources and expertise for all partners. The following examples capture some of the partnership highlights of 1999-2000:

- **Development and commercialization of a new variety of wheat:** In Saskatoon, NRC and the Saskatchewan Wheat Pool (SKW) used haploid technology to develop the new McKenzie wheat strain, which matures quickly, yields 12-15 % more crop than Neepawa wheat, has a high protein content and is disease and lodging resistant. In 1999, SKW undertook the commercialization process, and so far, the variety has been extremely well received by growers in both Canada and the United States. The volume of seed sales exceeded the amount needed to plant over 500,000 acres.
- **Collaboration with Dow AgroSciences:** NRC recently signed a research agreement with Dow AgroSciences Canada Inc. – a long-time research partner - worth \$ 10 M over five years. Dow AgroSciences has been involved in crop production research for more than 30 years and is a global leader in the commercialization of novel crop enhancement technologies. The alliance will facilitate research to improve the quality and composition of canola oil and will

seek new approaches to insect pest and disease management. The partnership will provide the critical mass of research scientists needed to keep pace in the highly competitive world of international agricultural biotechnology.

Genetic Research in Health Yield Major Funding from American Companies

A collaboration involving several Canadian research organizations, including NRC's Institute for Marine Biology (IMB) and Xenon Genetics Inc. discovered the cause of two genetic diseases involving low levels of high-density lipoprotein (HDL cholesterol), and a greatly increased risk of cardiovascular disease.

As a result, Xenon Genetics recently obtained \$ 13M from a US venture capital group, led by InterWest Partners, to help advance its drug discovery platform and programs.

Another important outcome of this research was the signing of an \$ 87 M agreement between Xenon and Warner-Lambert to develop a drug that will raise HDL levels in humans. This agreement is the single largest pre-clinical collaboration in Canadian biotechnology history. Currently, drugs that reduce levels of "bad cholesterol" produce \$ 8 to 10 B in annual sales. Since no drug exists to elevate levels of protective cholesterol (HDL), development of such a drug, which could be on the market in five years, is expected to be even greater.

IMB continues to play a part in Xenon's growing success, having recently signed two new agreements. IMB's expertise in DNA sequencing and bioinformatics will further enhance Xenon's efforts in the identification of additional genes controlling cholesterol levels, as well as those involved in other diseases such as diabetes, arthritis and osteoporosis.

genome sciences and health related research program will bring the benefits of revolutionary advances in genome science and health research to a variety of Canadian industrial sectors and regions.

▪ **High Performance Rechargeable Lithium Batteries:**

Since 1997, the strategic alliance between NRC and Energy Ventures Inc. (EVI) has focused on technology development for advanced energy systems, specifically lithium ion batteries. The NRC/EVI partnership, expanded to include Pacific Lithium Limited (New Zealand) as a sub-licensee, will work to further develop a series of lithium ion battery cathode materials discovered by NRC researchers. The market value for such materials is expected to increase by 50% per year by 2002, with the global market for lithium ion batteries expected to reach a value of more than \$US 10 billion by 2005. Reducing the cost of high performance rechargeable batteries will extend their use to new applications, potentially even electric vehicles.

▪ **Improving propulsion technology for tugboats:**

In St. John's, NRC and Robert Allan Ltd. of Vancouver are exploring the manoeuvring and towing characteristics of Escort tugboats, a versatile new breed of vessel that uses vertical axis propulsion technology. The collaboration provided Robert Allan Ltd. with a technological and commercial advantage, while enhancing NRC's expertise in propulsion technology. The research produced results that will improve standards and operating procedures of value to Canadian oil and gas offshore platform operators. Both parties are considering an extension to the agreement to address other areas of interest.

▪ **Genome Sciences:** In collaboration with government, academic and industrial partners, NRC is expanding its genome sciences program in agriculture, pathogenesis, age-related human diseases and health diagnosis development. By establishing regional innovation clusters around its five biotechnology institutes, NRC is creating a Canada-wide genomics network supported by an infrastructure that offers high-capacity DNA sequencing, bioinformatics, proteomics, and DNA microarray technology. NRC's new initiatives in

- **Fibre-optic breakthrough:** NRC helped partner Mitel develop a prototype semiconductor product that could double transmission capacity more cheaply and effectively. The product, based on Echelle Gratings, will be tested over the next year.

Codes and Standards

In addition to fee-for-service contracts and collaborative projects, two NRC institutes provide vital support to Canadian industry by maintaining and establishing national codes and standards. The application of codes and standards enables industrial competitiveness across Canada's internal boundaries and also assures national and international credibility and access for Canadian products.

Ongoing research at NRC's Institute for Research in Construction (IRC) is showing that floor assemblies in multi-family homes can be constructed to achieve both improved acoustic privacy and fire resistance. IRC's research expertise and advanced facilities allowed it to perform both fire and acoustic tests – unique in Canada and around the world.

As a result, the National Building Code of Canada, which provides a basis for all residential construction in Canada, will be updated with a far greater number of floor assemblies. This greater choice will increase homebuilders' opportunities to produce quality, affordable homes for Canadians. A wider range of materials can be used leading to fair competition between manufacturers and greater export opportunities.

As Canada's national metrology institute, the Institute for National Measurement Standards (INMS) is highly active on the international stage. In 1999-2000, INMS used diplomacy and sound science to resolve a discrepancy that had emerged between paper-brightness measurement techniques used in Europe and North America. The outcome has saved the Canadian paper industry approximately \$ 100 M per year in extra bleaching costs.

International Initiatives

NRC's international initiatives serve a dual purpose. They support the government-wide innovation agenda and NRC's vision of making the agency a leader in the development of an innovative, knowledge-based economy through S&T. The aim of these initiatives is to build upon previous successes or initiate new strategic partnerships that will benefit Canadians. NRC's international initiatives have a global reach. Accomplishments include:

- An MOU in the field of manufacturing technologies was signed between NRC and the [National Science Foundation](#) (NSF), enabling a bilateral workshop on the Integrated Manufacturing Technology Roadmap. This led to the first NSF Workshop on Manufacturing held in Canada, an event that attracted approximately 600 people.

"Mitel Semiconductor is currently engaged with NRC's Institute for Microstructural Sciences in a collaborative project encompassing the research and development of photonic devices. The collaboration has just entered its second year and is proceeding ahead of schedule. This has been possible because of the outstanding level of expertise and co-operative spirit at NRC. The truly excellent working relationship that has formed has enabled very rapid and fruitful progress."

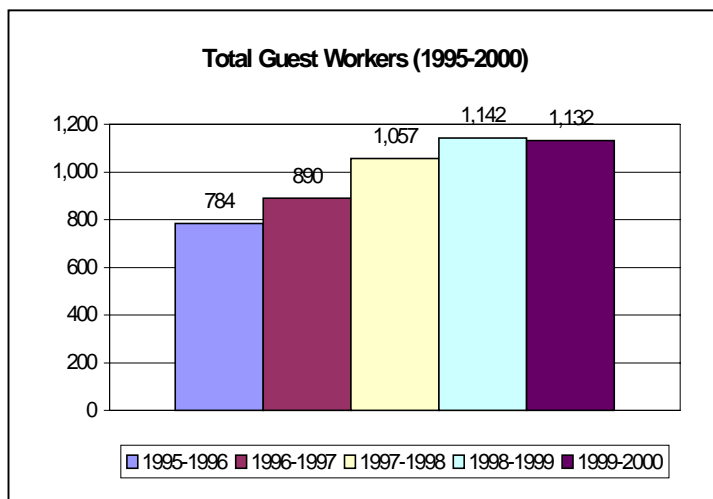
Dr. John Miller
Director Microelectronics R&D
Mitel Semiconductor

NRC at work in Asia

NRC reached out into the global community leading successful missions to Taiwan to study the effects of their devastating earthquake, to Japan with SMEs to establish technology-based partnerships in the area of robotics and to Korea where Canadian software SMEs were matched with Korean counterparts.

- Under agreements with the [Centre National de la Recherche Scientifique](#) (CNRS) in France and the [British Council](#) in the UK, NRC participated in a number of projects and exchanges. NRC participated in two bilateral meetings with Germany and the European Union (EU) under the aegis of the formal bilateral S&T agreements with those countries. NRC is active in both agreements and serves as the Canadian Chair for the agreement with the EU.
- In Taiwan, NRC is conducting six projects in collaboration with [Taiwan's National Science Council](#) (NSC) notably in microelectronics, nanoelectronics, chemistry and biotechnology. NRC signed an MOU covering intellectual property and specific collaborations with the [Industrial Technology Research Institute of Taiwan](#). Currently there are two on-going collaborations, one in industrial materials and the other in microelectronics.
- Under an agreement with Singapore, NRC and its partners developed seven collaborative projects in the areas of biotechnology, biochips, aerospace and materials design. These projects have levered approximately \$1 M in counterpart funding from Singapore.
- NRC led a technology mission to China at the invitation of the [Chinese Academy of Sciences](#) (CAS). The visit had two complementary themes, academic and business development. As a direct result of the mission eight Canadian companies have signed co-operation or sales agreements with Chinese counterparts.

Guest Workers and Incubators



NRC continues to attract a large number of guest workers to its institutes and facilities. These include researchers from Canadian and foreign universities, companies, and other organizations. NRC benefits from the participation of guest workers in collaborative projects, and the guest workers and their home organizations benefit from training and the transfer of know-how. The number of guest workers has stabilised at around 1100 additional people in NRC laboratories each year.

NRC also provides space for start-ups and SMEs in its laboratories and incubator

facilities. In 1999-2000, NRC institutes housed 67 small companies. This growth, from 8 companies in 1995-1996, is mainly due to the construction of industry partnership facilities and incubators close to NRC institutes. In Montreal, the facility has been at 100% capacity since its opening, in Winnipeg at 96%, and in Ottawa at 70%. The low occupancy rate in Ottawa is partly due to the "graduation" of the successful NRC spin-off, SiGe Microsystems, from the Industry Partnership Facility in the Spring of 2000.

Client Surveys

NRC ensures that its programs meet the present and future needs of the sectors they serve, and that clients and partners are satisfied with the outcomes of service and research partnership

agreements through a number of mechanisms. NRC has an overall advisory policy, each technology group has an advisory board, and most institutes have advisory committees. In addition, NRC Institutes use both formal and informal surveys to ensure that clients are gaining value from their interactions with NRC, in addition to the formal client surveys performed by external organizations as part of institute and group evaluations. Selected activities include:

- While undertaking the joint Statistics Canada/NRC national survey of innovation in the construction industry, NRC held three Industry Roundtables to seek advice on the issues to be addressed, the overall design and methodology and analysis and analysis/interpretation of the data.
- NRC and the Aerospace Industries Association of Canada organized a workshop to discuss opportunities for precompetitive research collaboration that was attended by 130 people.
- NRC's recently released strategic plan for the manufacturing sector was the outcome of extensive stakeholder engagement through an open consultative process. Close to 350 individuals from over 150 organizations directly participated in industry technology workshops and strategy development events.

Key Result Commitment

Technology-based economic growth in communities across the country.

Regional Initiatives

Building on its past successes, NRC continues to strive to strengthen Canada's innovation system. Linkages and partnerships initiated by NRC act as catalysts to the innovation capacities of communities and regions across Canada.

These regional initiatives have helped nurture and develop new firms, technologies and industries. They have contributed locally to efforts to attract, train and retain skilled people; to build receptor capacity and develop an innovation culture; to attract international investment based on innovation efficiency; and strengthen the federal presence in major cities and over 80 communities throughout Canada. Integration of Canada's innovation system is thus a critical element in achieving NRC's *Vision to 2001*.

Atlantic Canada

NRC is helping to grow new knowledge-based clusters in Halifax (genomics, medical diagnostics), New Brunswick (e-commerce), Newfoundland (ocean engineering), and Cape Breton (information technologies). NRC will build on existing and emerging strengths in science and technology in the Atlantic Provinces and help strengthen their capacity to innovate and compete in today's knowledge-based economy. During fall 2000, community consultations and roundtables with key stakeholders from industry and universities as well as local, provincial and federal government representatives will help further define the best means to capitalize on the provinces' strengths.

Montreal

The Montreal Centre of Excellence in Brownfields Rehabilitation (MCEBR) is in full operation with six industrial collaborations signed, four industrial collaborations in negotiation, and the set-up of the technology platform set for Fall 2000. Initiated by NRC, in collaboration with Canada Economic Development for Quebec Regions, Environment Canada and the City of Montreal, MCEBR helps solve the problem of contaminated urban sites, or brownfields, by developing effective and economical bio-remediation methods. In addition to contributing to environmental preservation, this initiative serves as an anchor for the development of an environmental cluster in the Montreal region, where there are more than 200 brownfields sites. With over 2,500 sites in Canada, this initiative has the potential to go national.

National Capital

In 1999, NRC created a new Regional Innovation Centre for Ottawa providing viable focus, one-stop shopping for NRC's interactions in the Region. The Centre will develop linkages with other partners in the local system of innovation, and help with the formation of spin-off companies from research institutes in Ottawa.

Vth Annual Ottawa Regional Innovation Roundtable

The NRC led Regional Innovation Forum – Ottawa organized an annual roundtable to promote technology-based economic growth in the region. The 1999 Roundtable called on participants to build bridges between high-tech and other sectors such as tourism, arts, culture, and services. An action plan based on last year's recommendations has recently been released.

The 2000 Roundtable focused on how Canadian enterprises can foster innovation to maintain competitive advantages for sustained growth. The roundtable featured an Awards Ceremony honouring outstanding innovators and innovations. New projects, new programs, and new collaborations are expected to be undertaken in response to issues and concerns raised.

Developing a Strong Presence in Life Sciences

The National Capital Region has identified the life sciences as a key development sector for the future. Working with the regional community, NRC is helping build a life sciences industrial sector by implementing a strategy that encourages life sciences-based spin-off and start-up companies.

NRC works with the Ottawa Life Sciences Council (OLSC), supporting its effort to establish an expanded Biotechnology Incubation Centre in Ottawa, and participating in the development of the Canadian Bio-products Research Institute.

National Capital Institute of Telecommunications (NCIT)

The NCIT, inaugurated in 1999, is a collaborative undertaking of NRC's Information and Communications Technologies Group, the University of Ottawa, Carleton University, the Communications Research Centre and industry, with additional support from the Ontario Research and Development Challenge Fund. Its goal is to create a region-wide centre for innovation that will help to attract and keep the best researchers and students in the high-technology industry by conducting pre-competitive advanced research in broadband networks and applications. NCIT will capitalize on research and development organizations in the Ottawa region, providing a critical mass of researchers and students.

Saskatchewan

Progress continues under the Saskatchewan Blueprint for Innovation released in 1998. Implementation has benefited from significant support from the NRC's Industrial Research Assistance Program (IRAP) and the Canadian Technology Network (CTN) through technology networking and visits and the establishment of new partnerships. NRC's influence contributes to improve Saskatchewan's innovation infrastructure. NRC contributed to the Canadian Light Source synchrotron. NRC is building on the strength of its Plant Biotechnology Institute (PBI) and has announced plans for the construction of a new Industry Partnership Wing. This extension will house incubation facilities for start-up companies, and will increase collaborative research activity with biotechnology companies, helping them grow their business in Saskatchewan and Canada.

Southwestern Ontario

In London, NRC is building an integrated innovation county around the Virtual Environment Technologies Centre (VETC), the most advanced research and design facility of its kind anywhere in the world. This new facility will contribute to support the strength of the manufacturing sector in Southwestern Ontario and serves as an anchor to develop new collaborations with Canadian companies in aerospace, automotive, tooling, electronic and biotechnology sectors.

Vancouver

In 1999, NRC consolidated the activities of its original Innovation Centre in Vancouver with existing research activities in the region. These are being transformed to accommodate the National Fuel Cells Research and Innovation Initiative (a co-operative venture between NRC, NSERC, and Natural Resources Canada). The Innovation Centre (IC) links BC's regional industrial and research communities to national networks of related activities across Canada, including other NRC research programs and resources such as IRAP and the Canada Institute for Scientific and Technical information (CISTI).

The Innovation Centre has supported and promoted growth in additional technological areas by leveraging NRC's Canada-wide resources. For instance, the BC Biotechnology Alliance offices are located in the IC. Training, symposia, and fora important to the Vancouver community have also been supported (Information and Communications Technologies Business Forum, Fuel Cell Symposium, Photonics Symposium).

Winnipeg

In Winnipeg, the Western Medical Technologies Strategy, a \$110 million investment in the commercialization of medical research announced by the Federal Government in March 1997, has achieved the following accomplishments:

- Five medical technology-based spin-off companies from NRC's Institute for Biodiagnostics (IBD): IMRIS, NeuroMRIS, MRV Systems,

VETC Testimonial

"...the facilities and the expertise of the people that are here to help you cannot be matched anywhere. For small and medium size companies, even like ours, these are facilities and levels of expertise that we can't afford to have in our own business."

**Keith Zerebecki,
Deputy Director,
General Motors Defence,
September 1999**

"Commercialization of research at the St. Boniface centre is a symptom of an important element of the life sciences sector: the close collaboration between public sector research institutions and the business community. The Success of IMRIS and the other spin-offs [from NRC] show the importance of bringing together science and business smarts to create a viable life sciences industry. The interconnections between research institutions and business are a strength of the Winnipeg life sciences sector..."

**Manitoba Business
Magazine, June 2000**

Nir-vivo and NovaDAQ Technologies

- Two new MRI systems for clinical and research purposes located in Winnipeg's major teaching and research hospitals
- The world's only intraoperative MRI system of its type at Calgary's Foothills Hospital
- A veterinary MRI demonstration site in the Western College of Veterinary Medicine at the University of Saskatchewan
- A demonstration site at the Vancouver General Hospital for a cost-effective, low-field permanent magnet MRI system (Millennium Technologies Inc.)

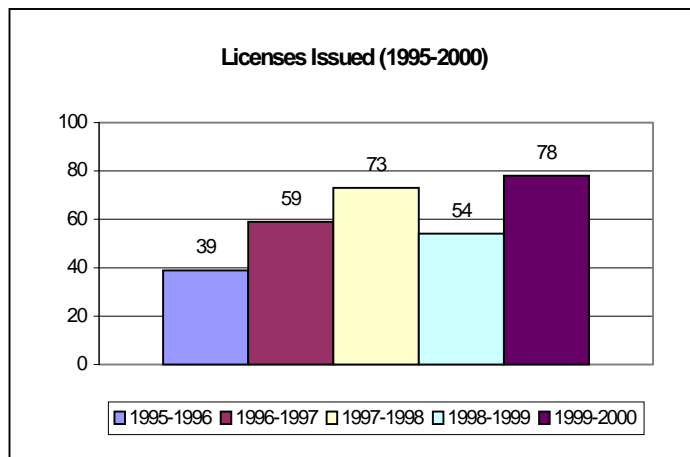
In addition, NRC has established extensive collaboration networks with hospitals, universities and technical colleges, integrating both clinical science and economic development. The Strategy is now having a national impact with the development of a network of MRI demonstration sites across Canada. An instrument was installed in St. Joseph's Hospital in London in 1999, and plans are well under way to establish these same competencies in Halifax.

Key Result Commitment

Transfer of NRC's research success to Canadian firms.

A confirmation that the NRC innovation process works is that through working with industry and other partners, it successfully transforms research and development work into tangible products, and then puts those products into the Canadian marketplace. By transferring technologies to Canadian businesses, NRC delivers the social benefits of its research and at the same time plants the seeds for economic growth. There are several ways to see the transfer of NRC research successes in action.

Patents



Patenting activity is an indicator that measures the first stage of technology transfer. Since a technology or idea that secures a patent has been formally deemed useful or original, each new patent represents an innovation on its way to marketability. International patents are considered to be an effective surrogate for a nation's innovative output.

In 1999-2000, NRC applied for 206 new patents, and secured 70 patents for which applications had been made in previous years.

The total number of active patents in the NRC portfolio has declined somewhat since last year, from 629 in 1998-1999 to 591 in 1999-2000. This can be attributed to the fact that since the last reporting period, many of our research institutes have conducted careful reviews of their patent portfolios and cleared those found to be no longer profitable. The practice of trimming patent

portfolios is in keeping with the *Vision to 2001* goal of concentrating energies on only the most relevant and applicable technologies.

Licensing

License agreements show a direct flow of NRC innovation into business application. By negotiating a license agreement to use NRC technology, the industrial partner endorses the merit of NRC research. In 1999-2000, NRC entered into 78 new license agreements, more than any previous year.

A few examples of the many ways which NRC license agreements moved technology to Canadians in 1999-2000:

- Nir-Vivo Inc., an NRC spin-off, licensed NRC's near-infrared skin assessment technology, which has the potential to revolutionize the way medical staff can assess skin health and recovery from surgery.
- Biogénie Inc., an international bioremediation company based in Quebec, licensed a new process for treating soils contaminated with chemicals from explosives. This technology, jointly developed by the Department of National Defence and NRC, promises to decrease soil treatment times.
- NRC developed the Integrated Diagnostic System (IDS), a technology that uses artificial intelligence to monitor the health of Airbus aircraft in flight and recommend the most probable repair and maintenance procedures. IDS was successfully licensed to Air Canada and to a local SME, MXI Technologies Ltd., for commercialization.
- NRC licensed its new space vision technology to Neptec Ltd. This year, Neptec reported signing contracts with NASA worth more than \$30 M based on this technology.
- NRC's research is leading to better understanding of the way damage occurs in aircraft structures, through the development of low cost optical methods for the inspection of corrosion and mechanically damaged structures. Interested companies include licensee Tektrend International, Diffracto Inc., and other airframe and engine manufacturers. This work will improve safety, ultimately leading to significant economic benefits for this industry.

New Company Creation

When NRC develops a technology, which shows particularly strong market potential, entirely new companies will sometimes be generated expressly to promote the new product. These new companies disseminate technologies and create new jobs for

AmikaNow! Garners International Recognition

NRC spin-off *AmikaNow!* Corporation has firmly established itself as a leading provider of advanced email highlighting technology for the wireless Internet. Since its launch in 1998, the company has taken off, growing from a tiny company with a staff of three to one that employs over 30 professionals, including a full complement of software engineers and business-development experts.

Over the past year, *AmikaNow!* has been actively participating in international business conferences and trade shows. Its products have received considerable recognition in the business press, including features in the *Globe and Mail's* "Report on Business", *Industry Standard Online*, *Wireless Weekly*, *Fortune Magazine* and *The National Post*. *AmikaNow!* is currently in partnership discussions with over 75 global companies interested incorporating its technology components into their products or services.

NRC Spin-off Companies 1999-2000

- Nir-vivo Inc.
- Hydrogeo Plus
- Megatech Simulation
- HMI Inc.
- Pharmagap
- Biochip Facility Inc.
- UTEX Scientific Instruments Inc.

Canadians. In 1999-2000, NRC generated or assisted in the establishment of 21 new companies, employing in total over 80 individuals. Seven of the new companies were spin-offs founded entirely by the industry of NRC researchers who went on to commercialize their work.

SUPPORT TO INNOVATION AND THE NATIONAL SCIENCE AND TECHNOLOGY INFRASTRUCTURE BUSINESS LINE

Objective

- To improve the innovative capability of Canadian firms through the provision of integrated and co-ordinated technological and financial assistance, information and access to other relevant resources; and
- To stimulate wealth creation for Canada through technological assistance, information and access to other relevant resources

Description

This Business Line is composed of Industrial Research Assistance Program (IRAP), the Canada Institute for Scientific and Technical Information (CISTI) and three Technology Centres, the Canadian Hydraulics Centre (CHC), the Centre for Surface Transportation Technology (CSTT) and the Thermal Technology Centre (TTC).

Business Line Resources	
	Financial Resources
Planned Spending	172.7
Total Authorities	163.3
1999-2000 Actual Spending	163.6

Key Result Commitment

Economic growth by helping Canadian firms develop new marketable technologies.

Assistance to Canadian SMEs

The Industrial Research Assistance Program (IRAP) works as a catalyst for innovation, linking diverse networks of organizations and programs to help Canadian small and medium-sized enterprises (SMEs) to develop and exploit technology. IRAP offers both financial support and technical advice specifically tailored to their clients' needs. To improve its service delivery IRAP:

- developed and strengthened its national scope while broadening its regional base, with new programs and services in almost every region in Canada;
- developed internal management tools and guides, improved processes in client-related activities, and performance measures;
- established the Strategic Alliances (SA) office to provide SMEs and IRAP's network of Industrial Technology Advisors (ITAs) with effective access to international expertise, technologies and strategic technology alliances.

In 1999-2000, IRAP reached more than 12,000 Canadian SMEs with high quality technical advice and/or financial assistance. Of these, 3,359 received financial assistance to help alleviate the risk associated with the development or adoption of new technologies. In total \$70 million was invested

in 4,343 projects. The actual number of SMEs receiving funding has decreased by 7% compared to last year due to the decrease in project contribution funds available.

Independent in-depth case studies done in 1999-2000 of twelve client firms working with IRAP for about five years showed that IRAP helped improve its clients' innovation capabilities, resulting in improved performance including:

- Increased sales: more than \$30 million was reported in increased revenues, with an estimated \$11.7 M directly attributed to IRAP's involvement. Since IRAP had invested about \$4 million with these firms over a period of three to twelve years, this represents an estimated return on investment from sales alone of three for one;
- An increase in the number of jobs: over 400 jobs were created by these twelve firms over a period of about five years;

Although these results cannot be generalized to all IRAP projects, they illustrate the type of impacts associated with IRAP activities in support of innovation capabilities. The following table further illustrates the impact of the IRAP program on Canadian SMEs and the Canadian innovation system:

IRAP Success Stories	
<i>Company/ Technology</i>	<i>Impact on Canadian firms and innovation system</i>
British Columbia	
Whitstone Farms <i>Medicinal herbs industry</i>	<ul style="list-style-type: none"> ▪ Bringing a new value-added medicinal herb industry to the region, expected to add millions in dollars to the local economy ▪ Formed new partnerships, leading to new companies and alliances ▪ Constructed new processing plant for medicinal extracts
Alberta	
Genics Inc. (formerly Genics Can Inc.) <i>Wood electrical pole preservatives</i>	<ul style="list-style-type: none"> ▪ Enhanced its core technical competencies ▪ Developed novel chemical formulations ▪ Increased revenues from \$ 150K (1994) to \$ 4M (1999) and the number of employees from 2 to 45 (1994-1999) ▪ Increased manufacturing area ▪ Continues R&D for the development of new products

IRAP Success Stories	
<i>Company/ Technology</i>	<i>Impact on Canadian firms and innovation system</i>
Saskatchewan	
Star Egg <i>Raw egg processing</i>	<ul style="list-style-type: none"> ▪ Became a leading supplier for major grocery chain in the Prairies and largest egg facility in Saskatchewan with 23 employees, 53,000 eggs processed per day and \$20 M annual sales ▪ Improved its process ▪ Invested in R&D by hiring expert and new graduate ▪ Was recognized by the Canadian Food Inspection Agency's Hazard Analysis Critical Control Points program ▪ Increased market share by 15% and sales by \$500 K in one year
Doepker Industries Limited (DIL) <i>Highway trailer-productivity improvements</i>	<ul style="list-style-type: none"> ▪ Realised important savings as a result of enhancing its process: saved \$ 1M as a result of inventory management, and reached 15% of saving on \$ 25M of annual purchases ▪ Realised reduced costs (\$ 4M) and increased sales (\$ 7M) ▪ Increased its level of operation with over \$ 40M in sales ▪ Moving toward e-commerce applications
Ontario	
Robertson Technologies, Wellington Polymers Technologies <i>Advanced plastic wood</i>	<ul style="list-style-type: none"> ▪ Developed a new base material from "waste" plastic materials and wood powder, and a new product for roofing market ▪ Raised private investment capital ▪ Increased employees from 1 (1996) to 7 (1999) ▪ Formed a new company ▪ Implemented a technical process (compounding raw materials into a pellet form) ▪ Received funds to build a compounding facility ▪ Continues to raise capital for a production facility to address part of the large residential roofing market ▪ Continues to invest in R&D (other potential applications being investigated)

IRAP Success Stories	
<i>Company/ Technology</i>	<i>Impact on Canadian firms and innovation system</i>
Québec	
Royal Mat Inc. <i>Rubber (Recycled tires) soundproofing panels</i>	<ul style="list-style-type: none"> ▪ Implemented a new method for the production of acoustical panels (NEUTRA-PHONE) ▪ Obtained approval from Health Canada as a non-toxic product ▪ Increased its sales from \$ 4M (1996) to \$ 10M (2000) and expected \$ 18M (2001) ▪ Increased employees to 75 ▪ Continues to invest in automation and plant extension ▪ Plans to improve product through more R&D
Nova Scotia	
METOCEAN Data systems Ltd. <i>Autonomous Float Core Technology</i>	<ul style="list-style-type: none"> ▪ Developed potential market for 750 floats a year for the next 4 years

Pre-Commercialization Assistance

Since 1998, IRAP, jointly with Technology Partnerships Canada (TPC), has been delivering a five-year \$30 million/year program providing repayable financial assistance to Canadian SMEs for projects at the pre-commercialization stage. In 1999-2000 IRAP worked toward the full implementation of the Pre-commercialization Assistance program (PA). Important work was done this year to make the necessary changes in the documentation and procedures to ensure full compliance of IRAP-TPC with the ruling of the World Trade Organization (WTO). A Web-based Intranet platform was launched, providing ITAs with up-to-date information and documentation. A total of 68 projects have received funding and assistance, representing an increase of 70 % over the previous year. Because the program is only in its second year, information on specific impacts are not yet available.

Strategic Alliances

In the context of economic globalization, SMEs need to have access to national as well as foreign expertise and technology. The newly formed Strategic Alliances Directorate (SA) helps SMEs gain effective access to the international expertise, technologies and strategic alliances necessary for them to improve their competitiveness. Last year, the SA group made a number of presentations to outline international aspects of accessing the European Union programs, as well as to sensitize SMEs and partners on the impact of the termination of the protection provided by the WTO R&D subsidy provision.

Every year, IRAP helps a number of SMEs participate in International Technology Missions so that they can exploit international commercial opportunities. In 1999-2000, IRAP's main focus was Asia and Europe. Visits were organized to China, Singapore, and Japan with a total of 45 SMEs participating. A mission was also organized to Italy in November 1999.

A study conducted by the Canadian Institute for Market Intelligence based on the nine NRC/IRAP technology missions to South East Asia organized between 1997 and 1999 confirmed their positive impact on participating SMEs. Findings show that participating companies were very positive about the support provided by the NRC/IRAP network and individual ITAs. Intangible results are also very important and include the introduction of SME managers to new markets, more specifically Asia or even to international business all together. The working partnerships created with the Productivity and Standards Board of Singapore, the Chinese Academy of Sciences, the China Council for the Promotion of International Trade and the National Science and Technology Development Agency of Thailand hold promise of further benefits in matchmaking and technology transfer.

The companies have been able to move towards international partnering in S&T, gain market access, and technology-based co-operation and exchange. IRAP invested \$500,000 in these nine missions. It is estimated that the return on each dollar invested by IRAP is in the range of \$75 to \$184.

NRC Technology Centres: Serving Canadian Industry

The Canadian Hydraulics Centre, the Centre for Surface Transportation Technology and the Thermal Technology Centre are unique engineering facilities, which provide services to Canadian industry and government departments. Since these centres are not directly related to NRC's core research activities, they function on the basis of a full cost recovery model. Considerable progress has been made to secure a larger client- base through planning and marketing, but these centres are still vulnerable to market conditions. Additional effort will be needed to have all three centres fully operating on a cost-recovery basis.

Key Result Commitment

Technology-based economic growth in communities across the country.

Building the Network

RAP is a key component of Canada's system of innovation, building Canada's innovation capability through a strong regional presence. Its strength comes from the 262 Industrial Technology Advisors (ITAs) located in 90 communities across Canada. In addition, IRAP has a network of more than 100 co-delivery partners from public and private organizations. These Network Members extend and complement NRC's innovation services and provide Canadian SMEs with easy access to a full range of resources and expertise that IRAP alone could not provide.

Participation in information-sharing events such as workshops, conferences, fora and roundtables are vital avenues to reach and promote SMEs as well as to build the IRAP network. In 1999-2000, IRAP sponsored or participated in 350 public events across Canada and abroad, including a biotechnology forum in Toronto with more than 200 participants, and a workshop involving 125 representatives from the Canadian aerospace sector.

Earthrenew Organics Uses Waste to develop New Product Line

In December 1999, Alberta company Earthrenew Organics Limited created an innovative solution to the problem of agricultural waste by establishing manure-processing plants throughout the province. The product, a value-added organic soil regenerator and mulch, will be sold to agriculture and horticultural industries at both wholesale and retail levels.

Completion of the pilot plant is expected to take place in October 2000. Earthrenew has received assistance from both IRAP and the CTN. A CTN advisor assisted the company with an overview of the North American fertilizer and peat moss industry, which helped determine the direction of Earthrenew's extensive marketing plan.

"CTN and IRAP have assisted in bootstrapping the technology and helped throughout all phases. Now, Earthrenew is at the stage where it can attract other investors: Once the pilot plant is operational, ... We're not only making an impact environmentally and appealing to organic produce growers, we'll also be providing new jobs to rural Alberta."

C. Carin
Company Founder, Earthrenew
Organics

The Canadian Technology Network (CTN) is an integral part of IRAP's holistic approach to innovation. CTN complements IRAP's focus on improving innovation capabilities by providing SMEs with technology-related expertise and general management or marketing information. CTN now has over 1,000 member organizations or service providers of which 76 per cent are also IRAP Network Members. In 1999-2000, CTN provided advisory services to 2,300 clients and was involved in some 260 trade-shows, conferences, seminars and other networking events.

The IRAP/CTN model is internationally recognized and NRC is receiving a growing number of requests to replicate this model and help establish a CTN-like system in countries and regions such as China, Taiwan and Thailand.

Sustainable Development: For a Cleaner Canada

The IRAP Sustainable Development initiative is designed to help SMEs merge environmental concerns with social and economic needs. In 1999-2000, IRAP adapted the EcoDesign Tool promoted by the United Nations to meet Canadian needs. The resulting Web-based Design for Environment guide will help ITAs and clients systematically integrate environmental considerations within product and process design. Training is now in preparation.

IRAP worked with the Ontario Centre for Environmental Technology Advancement (OCETA) to develop and launch the Eco-Efficiency Innovation Initiative, a

collaborative venture with the Business Development Bank of Canada, Natural Resources Canada, the Ontario government, and industry associations. The objective is to help SMEs identify opportunities for energy and material efficiency through technological audits carried out by specialized consulting firms. IRAP supports part of the audit cost and ITAs follow-up to assist with the planning and implementation of actions based on audit findings. In 1999-2000 a total of 281 projects containing elements of eco-efficiency have been identified, with contributions of \$7 M.

High Qualified Youth for Canadian SMEs

SMEs are facing many challenges, and in today's world, finding highly qualified personnel is one of them. IRAP provided support to SMEs in hiring recent college and university graduates as part of the Youth Employment Strategy (YES) managed on behalf of Human Resources Development Canada. A total of 643 students gained valuable work experience through this program.

An evaluation of the NRC YES programs was completed in 1999-2000. The evaluation found that both the youth and their employers were satisfied with the programs and felt they were effective.

Employers were especially pleased with the resulting opportunity to identify future employees, and several kept their interns on as full time staff after program completion.

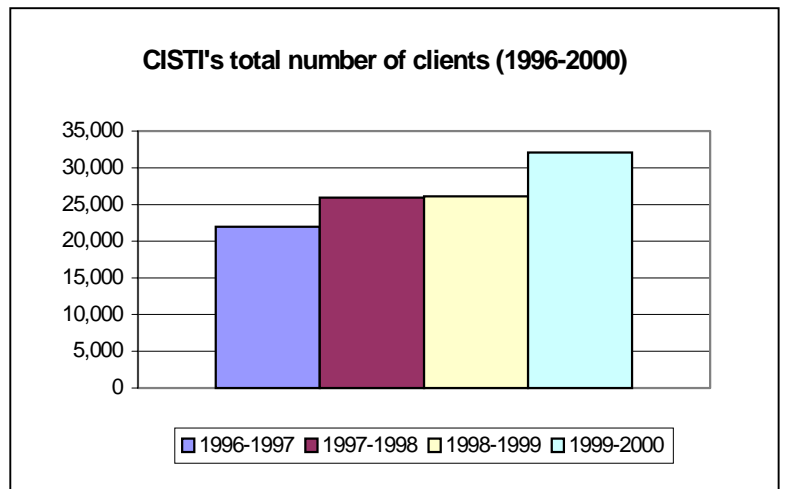
Federal Partners in Technology Transfer (FPTT)

NRC is an active participant in FPTT initiative, a collaboration of seventeen federal science-based departments and agencies, which work to facilitate the effectiveness and efficiency of technology and knowledge transfer in Canada. Since 1998-1999, three NRC projects were recognised by FPTT for having demonstrated outstanding “leadership, dedication, and excellence in collaborations leading to the commercial application of technologies and advanced scientific or technical knowledge.”

Bringing the World’s Knowledge to Researchers

In its dual role as a science library and scientific publisher, CISTI maintains, publishes, and provides access to scientific, technical and medical (STM) information and knowledge resources essential to Canada’s development as an innovative knowledge-based economy.

CISTI’s key objectives were to increase and improve access to STM information; leverage CISTI’s assets through partnerships and alliances; and enhance its support to NRC’s regional initiatives.



CISTI maintains one of the largest collections of scientific, technical and medical information in the world. It holds approximately 50,000 scientific journals, of which almost 13,000 are active. Over 3000 electronic journals are also available. The collection also includes 590,000 monograph titles, 180,000 conference titles and a large collection of technical reports. Access is primarily through CISTI’s free online catalogue, available to the public 24 hours a day.

While providing an excellent level of service to NRC researchers, CISTI also responds to the information needs of Canadian researchers and a growing international clientele. CISTI clients include individuals as well as organizations like universities, governments, hospitals, libraries, or private firms. Therefore, a client can represent a single individual or a group ranging from five to more than 5,000 people. Consequently, it is difficult to have an exact measure of CISTI’s reach, but the total number of clients is constantly increasing.

Increase and Improve Access to STM Information

To meet the needs of its growing clientele, CISTI requires efficient delivery mechanisms and relevant products and services. CISTI is constantly developing new information services and products.

- CISTI has introduced significant improvements to its IntelliDoc document delivery system that give clients better quality images, more reliable electronic delivery, and more timely information

regarding their accounts. Some initial implementation problems were encountered, but the necessary corrections were quickly put in place.

- CISTI improved access by extending its operating hours, allowing more same-day delivery. CISTI is able to fill or reply to 81% of the orders received with 24 hours and 93% within 48 hours for documents available in its collection.
- Launched on the Web in the summer of 1999, CISTI Source is a new current awareness product that resulted from the integration of three existing information products. It provides an easy-to-use interface and faster system response time.
- A pilot product, developed in partnership with the Canadian Plastics Industry Association (CPIA) and IRAP Ontario, resulted in a new Web-based information service for the Canadian Plastics Industry called plasTIS (Plastics Technical Information Service).

The number of documents delivered and total sales continue to show impressive growth. This testifies to the quality of CISTI's information resources and the quality and timeliness of its products and services. For the 1999-2000 fiscal year, the total volume of document delivery orders processed increased by 13% over 1998-1999. The average daily volume was 3,595 and the maximum number of orders processed in one day reached 5,066.

The total value of CISTI sales has increased by almost 74% over the last five years. In 1999-2000, the strongest growth was in Document Delivery services with a 21% increase in sales over last fiscal year. However it should be noted that sales figures include a significant amount of royalty payments that CISTI collects and pays to the copyright holders (\$ 2.7 M in 1999-2000).

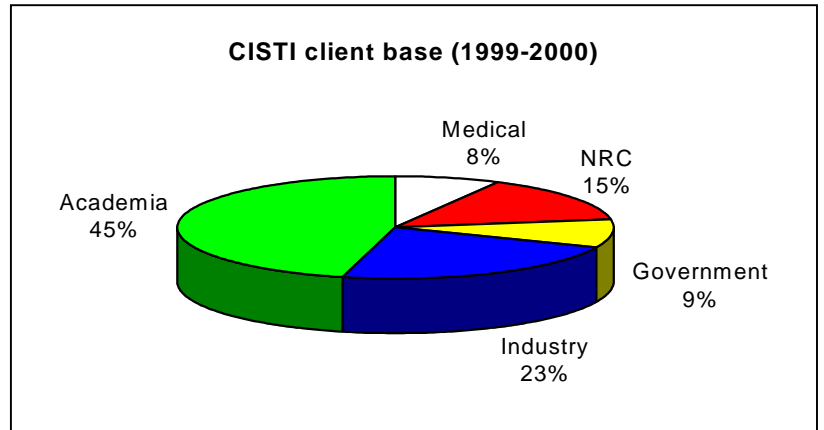
NRC Research Press includes 14 journals of international standing. The *Journal of Fisheries and Aquatic Sciences*, for instance, continues to be a top international journal and is ranked second in its field by the ISI Science Citation Index for 1998, while the *Canadian Journal of Forest Research* is sixth in its field. The remaining journals all ranked within the top half of their discipline. The peer review process is at the root of this success.

A new electronic publishing system was introduced at the NRC Research Press. This was a major challenge but one that is now paying off by enabling the Press to release a growing number of its journals on time. All NRC Research Press journals and selected monographs are available on the web through subscription, and pay per view access is now directly available through CISTI's web site. Capitalizing on its expertise in electronic publishing, the Research Press now offers publishing services to small, not-for-profit associations. Two new groups contracted for these services in 1999-2000.

Leverage Assets through Partnerships and Alliances

During 1999-2000, CISTI made significant progress in developing new partnerships and alliances to provide enhanced services and products to Canadian researchers and innovators. CISTI now has over 80 partners.

For instance, CISTI has consortia agreements that include all Canadian university libraries. These agreements enable CISTI to serve Canadian universities more efficiently and cost effectively. As a result, the share of document delivery orders from academia compared to other Canadian clients has grown by 12% since 1997-98, a strong indication that CISTI is a crucial resource for Canadian researchers.



Through LINK partners, CISTI complements its own collection and expands its ability to meet client needs. In 1999-2000, two new LINK partnerships were added: the Institute for Scientific and Technical Information of China and Sunmedia Co., Ltd. of Japan.

Enhances Support to NRC Regional initiatives

CISTI delivers services through ten NRC Information Centres (NICs) across the country. All of these centres are also members of CTN. A new NIC was opened in Vancouver that serves the NRC Innovation Centre, the BC and Yukon IRAP offices and the local scientific community. Regional NICs are collaborating increasingly with local firms and industry associations to meet the needs of local constituents. Several new collaborations were undertaken in 1999-2000, including an agreement with C-CORE – a research organization affiliated with Memorial University of Newfoundland – to deliver added-value information to C-CORE staff and IRAP Industrial Technology Advisors in the province.

PROGRAM MANAGEMENT BUSINESS LINE

Objective

To provide efficient, client-focused services, which enhance NRC's effectiveness as an integrated, dynamic science and technology organization.

This business line has two components:

- (1) The Executive Support function provides policy, program and executive support for the coordination and direction of NRC's operations and its governing Council.
- (2) The Program Administration function supports and enables effective and efficient management of NRC's resources through its specialisation in finance, information management, human resources, administrative services and property management, and corporate services.

Business Line Resources	
	Financial Resources
Planned Spending	58.4
Total Authorities	67.5
1999-2000 Actual Spending	80.9

The Program Management business line provides the support and enabling capability upon which NRC carries out its two other business lines. Its focus is on planning and management of NRC's activities and resources in an effective, efficient and focused manner to create the capacity to strategically position NRC.

Human Resources

Employment Philosophy

In 1999-2000, NRC developed a new human resources strategy to successfully meet the challenges of retaining premium human resources in a competitive global economic environment. The new "Employment Philosophy," which will be launched in the Summer of 2000, represents a first effort at capturing in a formal initiative NRC's spirit of progressive human resource management. Its goals are:

- recruit and retain outstanding people;
- give them the opportunity and support to grow professionally, utilize their strengths and produce to the maximum of their capability;
- reward them based on both this level of professional development in their job, and their level of productivity in their job; and
- create a respectful partnership with trust and understanding between them and NRC.

In 1999-2000, NRC introduced new programs and policies in support of this Employment Philosophy including a Performance Bonus Program, a Leadership Management Development Program, a university liaison program and an Alternative Work Arrangements policy, and made significant progress in implementing competency-based HR management at NRC.

Employment Equity (EE) Program

In keeping with the 1995 Employment Equity Act, NRC has established employment policies to ensure equitable representation of women, Aboriginal peoples, persons with disabilities and visible minorities in its workforce. Special initiatives in 1999-2000 include the following:

- The 1999 National Aboriginal Career Symposium, co-hosted by NRC and the Canadian Aboriginal Science and Engineering Association, provided over 1000 Aboriginal youth from across the country a chance to explore new career opportunities.
- The Aboriginal Recruitment Program, implemented in 1998, was extended and enlarged. This year, NRC met its goal of 20 candidates, and 90% fall in the S&T category.
- NRC sponsored the National Native Access to Engineering Program operating out of Concordia University. With NRC's financial assistance, the Program has been able to address under-representation of Aboriginal people in the science and engineering professions through research, curriculum development, networking, promotional activities, and public education.
- NRC led an Interdepartmental Task Force on integrating employees with disabilities. The task force explored how information and communications technologies in the federal workplace could be made more accessible to persons with disabilities, and also, how such technologies might be better used to improve overall workplace accessibility.
- A special measure program was developed to improve representation of persons with disabilities in each occupational category at NRC; 20 people per year over a four-year period will be hired.

Occupational Health and Safety

NRC has implemented extensive measures to protect employees from health and safety risks associated with its numerous facilities and laboratories. This year, total reported accidents were down by eight, or 19.5%, while total annual claims were up by \$1 327, or 17%.

Entrepreneurship Program

New ways of transferring technologies to Canadian firms are being explored as a means to increase the economic impacts from government investments in R&D. NRC's Entrepreneurship Program supports this government-wide goal through the development of a stimulating environment creating new business ventures and spin-offs. Three components are required for a conducive spin-off environment, namely; technology, finance, and business know-how. The Program has developed strong linkages/partnerships with a number of finance and business know-how related organizations to supplement NRC's technology expertise. In addition, several support measures have been put in place:

- Delivery of "Creating a Technology-Based Business" a course tailored to the specific needs of NRC's research staff. Each course participant may translate into a spin-off possibility. Employees of OGDs and universities also attend the course. The demand appears to be increasing.
- NRC provides case studies for analysis by graduate students in Canadian Masters of Business Administration (MBA) programs, in exchange for some market research analysis performed for the spin-off initiative. This synergistic approach creates strong partnerships between NRC and the university community.

Intellectual Property (IP) Review Policy

A consultative approach was taken in revising NRC's IP policy. The objective was to bring the Policy up to date with respect to NRC's vision and to reflect the business to business arrangements possible in the world today. The revised Policy maintains flexibility while emphasizing the need to keep the interest of all Canadians in mind when setting IP arrangements.

Information management / Information technology (IM/IT)

- Prudent Y2K vigilance, including a thorough preparedness audit and third party review, successfully ensured that all NRC IT systems were incident-free. All of these steps were undertaken with the view of ensuring a value-added contribution beyond 01 January 2000, such as emergency preparedness and related contingency planning.
- A new information management and technology governance structure was designed to ensure IM/IT policies effectively support NRC corporate strategies and business requirements.

In response to recommendations from an external review, a series of measures were taken to improve NRC's IT security practices. Work recently began on the development of a Disaster Recovery and Business Resumption Plan (DR-BRP).

Environmental Affairs

Although it is not subject to the Sustainable Development Strategy of the Auditor General Act, NRC strives to uphold environmental standards comparable to or surpassing Auditor General provisions. Since the 1995 council-wide audit on environmental management, many measures have been taken to improve environmental practices. Some of the key efforts of 1999-2000 include:

- detailed environmental audits performed of three NRC institutes, the Institute for Biodiagnostics, the Herzberg Institute of Astrophysics, and the Institute for Marine Biosciences;
- an Energy Audit of the Industrial Materials Institute which examined potential energy savings, associated cost and payback period;
- completion of a three-year program on emergency environmental preparedness.

Assessments

In 1999-2000, three NRC institutes, INMS, CISTI, and IMD underwent comprehensive strategic assessments. The assessments employed a range of evaluation tools, including external expert panel consultation, international benchmarking, client surveys, and interviews with staff and researchers. Results of the assessments, detailed in the chart below, will be taken into consideration by the institutes' in their future visioning and strategic planning processes.

Institute	Strategic Assessment Recommendations
INMS	<ul style="list-style-type: none">▪ Revise mission statement to better reposition INMS focus on supporting international trade▪ Strengthen business focus and improve business practices▪ Increase budget for infrastructure and human resources▪ Return to world-class capabilities in selected, visible areas
CISTI	<ul style="list-style-type: none">▪ Reinforce CISTI's national image as a leading scientific, technical and medical information service provider▪ Improve working relationship with NRC Institutes, IRAP and clients

Institute	Strategic Assessment Recommendations
	<ul style="list-style-type: none"> ▪ Create a better balance between international market-generated cost-recovery and meeting Canadian STM information needs ▪ Increase funding base and continue to maintain strong relationships with other information providers and publishers
IMD	<ul style="list-style-type: none"> ▪ Consider employing technology forecasting and roadmapping ▪ Expand core competencies ▪ Increase national and international visibility ▪ Implement regular project follow-up

Financial Information Strategy (FIS)

- The [Financial Information Strategy](#) (FIS) of the Government of Canada was established to enhance the government's decision-making and accountability and to improve organizational performance through the strategic use of financial information.

NRC has taken several steps to ensure that it will be fully FIS compliant by April 1, 2001. It has established a project team and advisory and steering committees to serve as forums for generating recommendations. It has also initiated a three-phase Project Management Framework, which will address NRC financial systems, policies, and FIS training and change management. A risk assessment conducted by external consultants confirmed that NRC's approach was a sound one.

Section 3

Consolidated Reporting

Transfer Payments

TRIUMF is Canada's national laboratory for fundamental research in particle and nuclear physics. It is Canada's contribution to the worldwide network of subatomic physics facilities. TRIUMF is a major scientific facility that materializes Canada's status as one of the advanced G-7 countries on the scientific scene. Over 200 scientists from across Canada and other countries use the facility each year.

TRIUMF is managed as a joint venture by a consortium of universities. The operation of the facility depends on a Government of Canada contribution administered by NRC. The Advisory Committee on TRIUMF, which meets twice a year, oversees TRIUMF's scientific activities. Over the previous five-year period, TRIUMF met most, if not all, of the objectives and goals set out for it in its five-year plan. As a result of a positive external peer review, the government made an increased funding commitment of \$200 million over the next five years (2000-2005). The peer review noted TRIUMF's progress on meeting the objectives of two major initiatives, the ISAC exotic beams facility and the international collaboration to build the world's highest energy accelerator, the Large Hadron Collider at the CERN Laboratory in Geneva, Switzerland.

NRC is currently preparing a results based accountability framework, including performance indicators and expected results and outcomes, for TRIUMF.

Section 4

Financial Performance

Financial Performance Overview

NRC receives its appropriation budget through Main and Supplementary Estimates voted by Parliament. In 1999-2000, NRC also received funding from Treasury Board's Contingency Vote 15 for the costs of collective bargaining. In 1999-2000, NRC's Main Estimates budget was approved at \$508.4 million. Through Supplementary Estimates, NRC received an additional \$17.3 million for items such as support for health research, support for national and regional research objectives, Genomics-based research and development, and Operating Budget carry-forwards. From Treasury Board Contingency Vote, NRC received \$11.4M for collective bargaining increases.

Pursuant to the NRC Act, the organization is able to spend revenues generated through the provision of goods and services. In 1999-2000, the NRC earned \$58.2 million in revenue and used \$57.3 million of these receipts to offset expenditures.

In 1999-2000, NRC's actual expenditures were 4%, or \$20.8 million higher than planned. This increase was largely financed from funding received through Supplementary Estimates and from Treasury Board's Contingency Vote 15.

Financial Summary Tables

The following tables apply to NRC:

Table 1	<i>Summary of Voted Appropriations</i>
Table 2	<i>Comparison of Total Planned Spending to Actual Spending</i>
Table 3	<i>Historical Comparison of Total Planned Spending to Actual Spending</i>
Table 4	<i>Resources Requirements by Organization and Business Line</i>
Table 5	<i>Responsible Revenues</i>
Table 6	<i>Statutory Payments</i>
Table 7	<i>Transfer Payments</i>
Table 8	<i>Capital Spending by Business Line</i>
Table 9	<i>Capital Projects by Business Line</i>
Table 10	<i>Contingent Liabilities</i>

Table 1 Summary of Voted Appropriations

Financial Requirements by Authority (millions of dollars)				
Vote		Planned Spending	Total Authorities	Actual
			1999-2000	
	National Research Council Program			
70	Operating expenditures	254.2	270.4	265.8
75	Capital expenditures	34.8	44.0	43.9
80	Grants and contributions	151.4	141.0	141.0
(S)	Spending of revenues pursuant to the National Research Council Act	51.4	73.4	57.3
(S)	Contributions to employee benefit plans	30.7	35.4	35.4
	Total Department	522.6	564.2	543.4
Notes				
<p>Figures above exclude the spending of proceeds from the disposal of surplus crown assets. Total Authorities are Main and Supplementary Estimates plus other authorities. Due to rounding, figures may not add to totals shown.</p>				

Table 2 Comparison of Total Planned Spending to Actual Spending

Departmental Planned versus Actual Spending by Business Line (millions of dollars)									
Business Lines	FTEs	Operating ¹	Cap ital	Grants and Contributions	Subtotal Gross Expenditures	Statutory Payments ²	Total Gross Expenditures	Less Responsible Revenues ³	Total Net Expenditures
Research and Technology Innovation									
Planned spending	2,085	199.4	29.4	40.0	268.8	22.6	291.4	-	291.4
<i>Total authorities</i>	<i>2,085</i>	<i>210.7</i>	<i>37.7</i>	<i>42.8</i>	<i>291.2</i>	<i>42.2</i>	333.4	-	333.4
Actuals	2,245	190.0	39.8	42.8	272.5	26.4	298.9	-	298.9
Support for Innovation and the National Science and Technology Infrastructure									
Planned spending	348	35.9	-	110.4	146.3	26.4	172.7	-	172.7
<i>Total authorities</i>	<i>348</i>	<i>39.7</i>	<i>0.3</i>	<i>97.2</i>	<i>137.2</i>	<i>26.0</i>	163.3	-	163.3
Actuals	556	38.2	0.8	97.2	136.2	27.4	163.6	-	163.3
Program Management									
Planned spending	533	49.6	5.4	1.0	56.0	2.4	58.4	-	58.4
<i>Total authorities</i>	<i>533</i>	<i>55.4</i>	<i>6.0</i>	<i>1.0</i>	<i>62.4</i>	<i>5.2</i>	67.5	-	67.5
Actuals	510	73.0	3.4	1.0	77.4	3.5	80.9	-	80.9
Total									
Planned spending	2,966	284.9	34.8	151.4	471.2	51.4	522.6	-	522.6
<i>Total authorities</i>	<i>2,966</i>	<i>305.8</i>	<i>44.0</i>	<i>141.0</i>	<i>490.8</i>	<i>73.4</i>	564.2	-	564.2
Actuals	3,311	301.2	43.9	141.0	486.0	57.3	543.4	-	543.4
Other Revenues and Expenditures									
Non-Responsible Revenues ⁴									
Planned spending									-
<i>Total authorities</i>									-
Actuals									(0.5)
Cost of Services provided by other departments									
Planned spending									89
<i>Total authorities</i>									8.9
Actuals									9.8
Net Cost of the Program									
Planned spending									531.5
<i>Total authorities</i>									573.1
Actuals									552.7
Notes									
(1) Operating includes contributions to employee benefit plans.									
(2) Spending of revenues pursuant to the NRC Act.									
(3) Formerly "Revenues Credited to the Vote"									
(4) Formerly "Revenues Credited to the General Government Revenues (GGR)".									
Planned spending indicates numbers reported in the 1999-2000 Report of Plans and Priorities.									
<i>Numbers in italic</i> denote Total Authorities for the 1999-2000 (Main and Supplementary Estimates and other authorities).									
Bolded numbers denote actual expenditures and revenues in 1999-2000.									
Numbers exclude the spending of proceeds from the disposal of surplus crown assets.									
Due to rounding, figures may not add to totals shown.									

Table 3 Historical Comparison of Total Planned Spending to Actual Spending

Historical Comparison of Departmental Planned versus Actual Spending by Business Line (millions of dollars)					
Business Lines	Actual 1997-1998	Actual 1998-1999	Planned Spending	Total Authorities	Actual
				1999-2000	
Research and Technology Innovation	258.2	275.8	291.4	333.4	298.9
Support for Innovation and the National Science and Technology Infrastructure	146.4	168.6	172.7	163.3	163.6
Program Management	90.6	79.5	58.4	67.5	80.9
Total	495.3	524.0	522.6	564.2	543.4
Notes					
Total Authorities are Main and Supplementary Estimates plus other authorities. Figures above exclude the spending of proceeds from the disposal of surplus crown assets. Due to rounding, figures may not add to totals shown.					

Table 4 Resource Requirements by Organisation and Business Line

Comparison of 1999-00 (RPP) Planned Spending and Total Authorities to Actual Expenditures by Organization and Business Line (millions of dollars)				
Organization	Business Lines			Total
	Research and Technology Innovation	Support for Innovation and the National Science and Technology Infrastructure	Program Management	
Research Institutes				
Planned spending	291.4			291.4
Total authorities	333.4			333.4
Actuals	298.9			298.9
Industrial Research Assistance Program				
Planned spending		130.2		130.2
Total authorities		119.4		119.4
Actuals		116.0		116.0
Scientific and Technical Information				
Planned spending		33.5		33.5
Total authorities		39.3		39.3
Actuals		42.7		42.7
Technology Centres				
Planned spending		9.1		9.1
Total authorities		4.6		4.6
Actuals		4.9		4.9
Corporate Branches				
Planned spending			48.3	48.3
Total authorities			56.7	56.7
Actuals			67.0	67.0
Executive Support				
Planned spending			10.0	10.0
Total authorities			10.8	10.8
Actuals			13.9	13.9
TOTAL				
Planned spending	291.4	172.8	58.3	522.6
Total authorities	333.4	163.3	67.5	564.2
Actuals	298.9	163.6	80.9	543.4
% of TOTAL				
Planned spending	55.8%	33.1%	11.2%	100.0%
Total authorities	59.1%	28.9%	12.0%	100.0%
Actuals	55.0%	30.1%	14.9%	100.0%
Notes				
<p>Figures above exclude the spending of proceeds from the disposal of surplus crown assets. Total Authorities are Main and Supplementary Estimates plus other authorities. Due to rounding, figures may not add to totals shown.</p>				

Table 5 Responsible Revenues *

Responsible Revenues by Business Line (millions of dollars)					
Business Lines	Actual 1997- 1998	Actual 1998- 1999	1999-00		
			Planned Revenues	Total Authorities	Actuals
Research and Technology Innovation	22.8	21.1	22.6	22.6	27.0
Support for Innovation and the National Science and Technology Infrastructure	21.0	25.4	26.4	26.4	26.0
Program Management	4.8	2.8	2.4	2.4	5.2
Total Responsible Revenues	48.6	49.3	51.4	51.4	58.2
Notes					
<p>In accordance with section 5.1 (e) of the National Research Council Act, NRC is authorised to spend its operating revenues and therefore does not net-vote.</p> <p>Total Authorities are Main and Supplementary Estimates plus other authorities.</p> <p>Due to rounding, figures may not add to totals shown.</p> <p>Refer to Table 8 for statutory payments.</p> <p>* Formerly "Revenues credited to the vote"</p>					

Table 6 Statutory Payments

Spending of Revenues Pursuant to the NRC Act (millions of dollars)					
Business Lines	Actual 1997-1998	Actual 1998-1999	1999-00		
			Planned Spending	Total Authorities	Actual
Research and Technology Innovation	23.9	21.5	22.6	42.2	26.4
Support for Innovation and the National Science and Technology Infrastructure	19.9	24.8	26.4	26.0	27.4
Program Management	15.0	2.1	2.4	5.2	3.5
Total Statutory Payments	58.8	48.4	51.4	73.4	57.3
Notes					
<p>Total Authorities are Main and Supplementary Estimates plus other authorities. The total of \$73.4M for 1999-2000 includes an amount of \$15.2M carried forward from previous years.</p> <p>Due to rounding, figures may not add to totals shown.</p>					

Table 7 Transfer Payments

Transfer Payments by Business Line (millions of dollars)					
Business Lines	Actual 1997-1998	Actual 1998-1999	1999-00		
			Planned Spending	Total Authorities	Actuals
GRANTS					
Program Management	5.2	5.2	1.0	1.0	1.0
Total Grants	5.2	5.2	1.0	1.0	1.0
CONTRIBUTIONS					
Research and Technology Innovation	41.1	42.7	40.0	42.8	42.8
Support for Innovation and the National Science and Technology Infrastructure	87.5	104.5	110.4	97.2	97.2
Total Contributions	128.6	147.2	150.4	140.0	140.0
Total Transfer Payments	133.8	152.4	151.4	141.0	141.0
Note					
Total Authorities are Main and Supplementary Estimates plus other authorities.					

Table 8 Capital Spending by Business Line

Capital Spending by Business Line (millions of dollars)					
Business Lines	Actual 1997-98	Actual 1998-99	1999-00		
			Planned Spending	Total Authorities	Actual
Research and Technology Innovation	33.7	38.3	29.4	37.7	39.8
Support for Innovation and the National Science and Technology Infrastructure	1.2	1.7	-	0.3	0.8
Program Management	9.8	11.3	5.4	6.0	3.4
Total Capital Spending	44.8	51.3	34.8	44.0	43.9
Notes					
<p>Total Authorities are Main and Supplementary Estimates plus other authorities. Due to rounding, figures may not add to totals shown. The above figures exclude revenues used for capital purchases.</p>					

Table 9 Capital Projects by Business Line

Capital Projects by Business Line (millions of dollars)					
Business Lines	Current Estimate Total Cost	Actual 1997-1998	Actual 1998-1999	1999-00	
				Planned Spending	Actual
Research and Technology Innovation					
Montreal Centre of Excellence for Site Rehabilitation	1.4	0.7	0.1	0.6	0.3
Upgrade to Institute for Biological Sciences – Sussex Drive Laboratories	1.4	0.5	0.6	0.3	0.3
Biotechnology Research Institute – Administration Wing	0.5				0.5
Upgrade and Expansion of the Herzberg Institute of Astrophysics Facilities	9.6		0.6		3.1
Replacement Program for Obsolete Magnetic Resonance Equipment	0.7		0.3	0.4	0.4
Innovation Program in the Manufacture of Plastic Film	1.9		0.3	1.6	1.6
Centre for Research in Cleaner Manufacturing	1.7				0.8
Addition to Plant Biotechnology Institute Building	9.0				0.5
M-10 Test Cell Facilities for Combustion Research and Development	1.8				0.9
Upgrade of Computational Systems for Aerospace Research and Development	1.1				1.1
Energetic Process Multi-layer Deposition System	1.3			1.3	1.3
Upgrade of Analytical Facilities for Ultra Thin Organic Films	0.5				0.5
High Resolution Inductively Coupled Plasma Mass Spectrometer	0.7				0.7
Purchase of the Industry Partnership Facility	6.4				6.4
Replacement of Microscopes at the Institute for Marine Biosciences	1.1				1.1
Support for Innovation and the National Science and the Technology Infrastructure					
Electronic CISTI	1.9	0.6	0.6	0.6	0.7
Program Management					
MS Exchange Deployment	2.3		1.8	0.3	0.5
Renovation of Uplands Airport U-61 Building	1.0				0.5
Renovation of M-55 Building	0.5				0.5
M-58 Chiller	0.5				0.5

Table 10 Contingent Liabilities

Contingent Liability (millions of dollars)			
List of Contingent Liabilities	Amount of Contingent Liability		
	March 31, 1998	March 31, 1999	Current as of March 31, 2000
Claims, Pending and Threatened Litigation			
Litigations	15.5	0.0	0.0
Non-Litigations			
Total	15.5	0.0	0.0

Section 5

Departmental Overview

Overview

The National Research Council (NRC), is Canada's principal public sector R&D organization and a leader in the development of an innovative, knowledge-based economy through science and technology. It is a national organization with significant regional and community-based representation with approximately 3000 full-time employees and 1000 guest workers, an annual budget of \$472 M and income of \$78 M. In addition it is an integral part of the Industry Portfolio and the Science and Technology (S&T) community.

NRC creates value to Canadians principally through:

- Undertaking research and development in science and technology, technology transfer activities, and advisory services to government;
- Leading the development of Canada's national, regional and community-based S&T innovation infrastructure and systems of innovation;
- Fostering national and international relationships that support Canada's S&T research, development and innovation efforts, and supporting industry, including SMEs across Canada and globally;
- Developing and disseminating S&T information, intelligence and knowledge essential to the development of Canada's new knowledge-based economy; and
- Fostering and enhancing a Canadian innovation culture --- demonstrating to Canadians the importance, relevance and contributions of government research, development and technology transfer to Canada's prosperity, quality of life and well-being of individual Canadians.

Program Mandate

The legislative framework that guides NRC is set out by the *National Research Council Act* and the *Weights and Measures Act*.

Under the NRC Act, NRC is responsible for:

- Undertaking, assisting or promoting scientific and industrial research in different fields of importance to Canada;
- Investigating standards and methods of measurement;
- Working on the standardization and certification of scientific and technical apparatus and instruments and materials used or usable by Canadian industries.
- Operating and administering any astronomical observatories established or maintained by the Government of Canada.
- Administering NRC's research and development activities include grants and contributions used to support a number of international activities.
- Providing vital scientific and technological services to the research and industrial communities. This mandate is discharged to a great extent through the operation of the Industrial Research

Assistance Program, the Canada Institute for Scientific and Technical Information (CISTI) and the Canadian Technology Network.

- Establishing, operating and maintaining a national science library and to publish, sell and otherwise distribute scientific and technical information. NRC fulfils this mandate through CISTI, providing Canadians with access to worldwide scientific, technical, medical and related information and expertise.

Under the *Weights and Measures Act*, NRC is responsible for primary standards of physical measurements as formally established by the *Weights and Measures Act* and the *National Research Council Act*. NRC has a specific mandate relating to the investigation and determination of standards and methods of measurements including length, volume, weight, mass, capacity, time, heat, light, electricity, magnetism, and the investigation and determination of physical constants and the fundamental properties of matter.

Vision

As Canada's foremost research and development agency, NRC will be a leader in the development of an innovative, knowledge-based economy through science and engineering. NRC will accomplish this by:

- being dedicated to excellence in advancing the frontiers of scientific and technical knowledge in areas relevant to Canada;
- carrying out focused research, in collaboration with industrial, university and government partners, to develop and exploit key technologies;
- providing strategic advice and national leadership to integrate key players in Canada's system of innovation; and
- taking a more aggressive, entrepreneurial approach to ensure the transfer of our knowledge and technological achievements to Canadian-based firms.

Departmental Organisation

NRC is divided into three business lines that provide a balance between undertaking research and technology development, providing information, technical and financial assistance to industry and the public, and supporting the organization with corporate services.

Research and Technology Innovation Business Line

Objective

- To achieve sustained knowledge-based economic and social growth in Canada through research, development and the application of technology and innovation

Description

The business line includes the research programs, technology development initiatives and the management of national science and engineering facilities. It includes research and collaborations with firms, universities and public institutions. Efforts are focused on key technologies and industrial areas of the Canadian economy where NRC is a leader and can make a lasting impact.

The technological fields and industrial areas of research of the business line include biotechnologies, information and communication technologies, manufacturing technologies, physical and chemical measurements standards, molecular sciences, and Canada's aerospace, construction and marine industries. In addition, NRC's management of astrophysical facilities is included in this business line.

Support for Innovation and the National Science and Technology Infrastructure Business Line

Objective

- To improve the innovative capability of Canadian firms through the provision of integrated and co-ordinated technological and financial assistance, information and access to other relevant resources; and
- To stimulate wealth creation for Canada through technological assistance, information and access to other relevant resources.

Description

This business line encompasses the organization's assistance to industrial research through its Industrial Research Assistance Program (IRAP) and NRC's efforts to disseminate scientific, technical and medical information through its Canada Institute for Scientific and Technical Information (CISTI). Included in the business line are the Technology Centres that focus on specific areas of importance Canadian industries.

Program Management Business Line

Objective

- To provide efficient, client-focused services which enhance NRC's effectiveness as an integrated, dynamic science and technology organization.

Description

This business line provides support services to NRC management and the two program-oriented business lines. Its activities include executive services as well as specialized support in finance, information management, human resources, administration, property management, and corporate services.

A description of NRC's Research Institutes, Programs and Branches is provided in Appendix B.

Organizational Chart



Section 6

Other Information

Contact for Further Information

Contact Person

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National Research Council of Canada Website

<http://www.nrc.ca>

Legislation Administered and Associated Regulations

The National Research Council has responsibility for the administration of the:

National Research Council Act R.S.C., 1985, c. N-15, never amended

NRC has responsibility:

- for calibration and certification of standards of measurements under the:
Weights and Measures Act R.S.C., 1970-71-72, c. W-6
- and provides technical support to the *Canadian Commission of Building and Fire Codes*.

And the *Atomic Energy Control Act* makes provision for the Atomic Energy Control Board to establish a granting program through NRC, but this possibility is not currently a practice.

Department of Justice Canada Consolidated Statutes Website

<http://canada.justice.gc.ca/FTP/EN/Laws/index.html>

Statutory Annual Reports and Other Departmental Reports

Annual Report 1999-2000

Appendix A

Awards and Achievements

Royal Society of Canada Awards

Royal Society of Canada Medals:

Robert Wolkow, SIMS

Danial Wayner, SIMS

James Watson, SIMS

Fellows of the Royal Society of Canada:

Harold Jennings IBS

James Whitfield, IBS

J.J. Beaudoin, IRC

David Lockwood, IMS

Notable Achievements

David Simpson, IAR

Elected General Secretary of the International Committee on Aeronautical Fatigue.

David Zimcik, IAR

Elected President Elect of the Canadian Aeronautics and Space Institute.

J. Berndt, IRC

Appointed General Secretary of the World Federation of Technical Assessment Organizations.

Marie D'Iorio, IMS

President of the Canadian Association of Physicists

Des Mullan, BC Regional Innovation Initiative

Innovation Achievement Award from the Pacific Economic Co-operation Council.

Srinivasa Sourirajan, retired NRC researcher, ICPET

Canadian Chemical Engineering Century Achievement Award

Norman Jones, retired NRC researcher

Officer of the Order of Canada

George Klein, former NRC innovator

Featured on stamp in Canada Post Millennium Collection

Adam Bly, guest researcher at BRI

Delivered keynote address at Entretiens Jacques Cartier – first such address given by a young scientist

Awards

Paul Amirault, IIT, with the Collège Catholique Samuel-Genest

- Ottawa Centre for Research and Innovation (OCRI) Business-Education Partnership Award

Jim Beaudoin, IRC

- Honorary doctorate from University of Windsor

Arthur J. Carty, President

- Honorary Member of the Engineering Institute of Canada, for outstanding distinction through service to the Engineering profession.
- Honorary Fellow of the Chemical Institute of Canada
- Doctorat Honoris Causa, Acadia University
- Doctorat Honoris Causa, McMaster University

Paul Corkum, SIMS

- Einstein Award - International Society for Quantum Electronics

J. Craigie, IMB

- Federal Partners in Technology Transfer Award for Innovator of the Year

John Croll, IAR

- Trans Canada McKee Trophy, Canadian Aeronautics and Space Institute

Tim Davidge, HIA

- Science “Highlight of the Recent Literature” for a paper based upon CFHT observations of the galaxy M33 with the Adaptive Optics Bonnette.

Khaled El-Emam, IIT

- Achievement Award, ISO/IEC JTC1/SC7 Software Engineering Standards

M. Hatano, IRC

- Best Masters Thesis Award – Architectural Institute of Japan

Jim Hesser, HIA

- 1999–2000 College of Liberal Arts and Sciences Alumni Distinguished Achievement Award, University of Kansas.
- Bernado Houssay Distinguished Lectureship, University of Buenos Aires.

John Hutchings, Tim Hardy, Chris Morbey, and Rick Murowinski, HIA

- Commendation from Principal Investigator and Project Manager of the Far-Ultraviolet Spectroscopic Explorer (FUSE), Johns Hopkins University

Keith Ingold, SIMS

- Laurea Honoris Causa, Università degli Studi Ancona, Italy

Integrated Diagnostic System team, IIT (François Dubé, George Forester, Mike Halasz, Bob Orchard, Reg Shevel, Rob Wylie, Marvin Zaluski) with industrial partners Air Canada and Mxi Technologies

- Federal Partners in Technology Transfer (FPTT) award for the Integrated Diagnostic System

Harold Jennings, IBS

- Gold Medal Award of the Professional Institute of the Public Service of Canada

Stephen Jones, IMD

- 1999 Admiral Award for economic contribution to the city of St. John's

Anatol Kark, IIT

- Achievement Award, ISO/IEC JTC1/SC7 Software Engineering Standards.

Andrew Kim and Joseph Su, IRC

- Jack Bono Engineering Communications Award, Journal of Fire Protection Engineering

M.A. Lacasse and J.F. Masson, IRC

- Best practical paper, Journal of Materials in Civil Engineering

Hui C. Liu, IMS

- 2000 CAP Herzberg Medal (for outstanding achievement by a physicist under age 40)

Zoubir Lounis, IRC

- T.Y. Lin award, American Society of Civil Engineering

Janusz Luszyk, INMS

- Fellow of the Chemical Institute of Canada

Rick Mangat, IBD

- Air Canada Student Entrepreneur of the Year, Winnipeg, Canada
- Finalist Biocontact/MRC Next Generation Award, Quebec, Canada
- 1st place; Student Technology Business Plan Competition, Netherlands

Henry Mantsch, IBD

- Dedicated Service Citation by PIPS (Professional Institute of Public Service) Winnipeg, Canada

John Mark, IBD

- Best poster prize: Biophysical Society of Canada

Beatriz Martin-Perez, IRC

- Moissieff Award, American Society of Civil Engineering

Jean-François Masson, IRC

- Best Practical Paper of the Year Award, American Society of Civil Engineering

A.H.P Maurenbrecher, IRC

- Fellow of Canadian Society of Civil Engineers

Liza Medek, IRAP

- UNESCO Distinguished Service Award, International Institute for Advanced Studies in Systems Research and Cybernetics in Cupertino with the United Nations Organization on Education, Science and Culture; Germany

Mario Monteiro, IBS

- 1999 Young Scientist Award, 12th International Workshop on Gastrointestinal Pathogens
- 1999 Member elect of the Canadian Helicobacter pylori study group

Christian Moreau, IMI

- Prix AGORA 1999 du maire de Montréal pour l'organisation de la conférence UTSC 2000

Paul Morley, IBS

- Royal Bank Promising Scientist Award, 1999 Ottawa Life Sciences Council

Saran Narang, IBS

- Lifetime Achievement Award, 1999 Ottawa Life Sciences Council
- Selected as one of 2000 outstanding scientists of the 20th century, International Biography, Cambridge University.

Richard Normandin, IMS

- CAP-INO Medal for outstanding achievement in Applied Photonics

D.W.O. Rogers, INMS

- Honourable mention for 1999 Sylvia Fedoruk Prize
- Awarded 1999 Farrington Daniels Award of the AAPM for best paper on radiation dosimetry during 1998 in the Journal of Medical Physics

J. Seuntjens, INMS

- Best poster prize; 1999 Canadian Organization of Medical Physicists annual meeting

Anthony Shaw, IBD

- Best poster prize; 43rd Annual Conference of the Canadian Society of Clinical Chemists

Peter Turney, IIT

- Links2Go Key Resource Award

Subash Vohra, ASPM

- Ashrae Chapter Technology Award; 1st place in category of “Existing Institutional Buildings”
- Certificate of Recognition from Transport Canada for contribution to the Joint Winter Runway Friction Program

S.-S.L. Wen, Cheng-Kuei Jen, Abdessalem Derdouri, and Yves Simard, IMI

- Future Technology Award from Maro Publication for “Recent Advances in Ultrasonic Monitoring of the Injection Molding Process.”

Dick Whitaker, IRAP

- 1999 Freshwater Fisheries Conservation Award, DFO Minister Dhaliwal

Robert Wolkow, SIMS

- Noranda Award for scientist residing in Canada who has made a distinguished contribution to the field of Physical Chemistry

Andy Woodsworth, HIA

- Gemini Observatories commendation in recognition of his many contributions as Canadian Gemini Project Manager from 1991 to 1999.

NRC's Institutes, Programs and Branches

Biotechnology Group

Biotechnology Research Institute (BRI) – Montréal QC
Institute for Biodiagnostics (IBD) – Winnipeg MB
Institute for Biological Sciences (IBS) – Ottawa ON
Institute for Marine Biosciences (IMB) – Halifax NS
Plant Biotechnology Institute (PBI) – Saskatoon SK

NRC's Biotechnology Group, which helps firms bring biotechnology-related products and processes to market for the benefit of Canadians, comprises five research institutes that focus on health care/pharmaceuticals, agri-food, aquaculture and the environment.

Information and Communications Technology Group

Institute for Information Technology (IIT) – Ottawa ON
Institute for Microstructural Sciences (IMS) – Ottawa ON

The ICT Group's Institutes bring together a broad range of complementary technical capabilities and equipment to help firms reduce the risks and costs of working on the next generation of communications and information technology hardware and software.

Manufacturing Technology Group

Innovation Centre (IC) – Vancouver BC
Institute for Chemical Processing and Environmental Technologies (ICPET) – Ottawa ON
Industrial Materials Institute (IMI) – Boucherville QC
Integrated Manufacturing Technology Institute (IMTI) – London ON

The MT Group serves the innovation needs of Canadian industry in manufacturing technologies, and supports longer-term strategic development from its leading-edge facilities and expert teams working on next generation manufacturing systems.

Other Institutes

Herzberg Institute of Astrophysics (HIA) – Victoria BC

NRC's Herzberg Institute of Astrophysics operates the astronomical observatories of the Government of Canada, and ensures that the Canadian scientific community has access to some of the best astronomical facilities in the world (both nationally and internationally).

Institute for Aerospace Research (IAR) – Ottawa ON

NRC's Institute for Aerospace Research provides R&D support to the operations of the Canadian aerospace industry, which faces exacting design, performance and safety requirements and an increasingly competitive global market.

Institute for Marine Dynamics (IMD) – St-John's NF

NRC's Institute for Marine Dynamics is Canada's leader in ocean engineering and offshore structure marine research by providing R&D support to various industrial sectors within the ocean industry (ocean resources, marine manufacturing and transportation).

Institute for National Measurements Standards (INMS) – Ottawa ON

NRC's Institute for National Measurements Standards serves as the primary centre of reference for the accuracy, validity and traceability of physical measurements and appropriate chemical measurements.

Steacie Institute for Molecular Sciences (SIMS) – Ottawa ON

NRC's Steacie Institute for Molecular Science undertakes exploratory, long-term research in areas leading-edge molecular science, such as neutron beam research, molecular electronics, and high-performance computing

Canada Institute for Scientific and Technical Information (CISTI) – Ottawa ON

NRC's Canada Institute for Scientific and Technical Information operates Canada's national science library and publisher. CISTI plays an essential role in Canada's science and technology infrastructure and is a world leader in the provision of scientific, technical and medical information.

Industrial Research Assistance Program (IRAP) – Ottawa ON

NRC's Industrial Research Assistance Program helps Canadian companies; primarily small-and medium-sized enterprises develop and exploit technologies through the provision of knowledge-based innovation assistance and access to relevant resources.

Technology Centres

Canadian Hydraulics Centre (CHC) – Ottawa ON

NRC's Canadian Hydraulics Centre offers physical and numerical modelling services, consulting services, software sales and support in the broad field of hydraulic engineering.

Centre for Surface Transportation Technology (CSTT) – Ottawa ON

NRC's Centre for Surface Transportation Technology provides research, development, engineering and product evaluation services to manufacturers, operators and regulators of rail and heavy road and off-road vehicle products and systems.

Thermal Technology Centre (TTC) – Ottawa ON

NRC's Thermal Technology Centre provides the services of a nationally and internationally recognized and accredited testing laboratory, as well as consultations services and expertise in the field of thermal technology.

Corporate Branches

Administrative Services and Property Management (ASPM) – Ottawa ON

NRC's Administrative Services and Property Management provides services to the institutes and branches of NRC that support science and engineering activities and the performance of research and development.

Corporate Services (CS) – Ottawa ON

NRC's Corporate Services provides high quality, value-added service that will help NRC to achieve and maintain an excellent, flexible, high-performing, client-focused workforce to meet its operational objectives.

Finance Branch (FB) – Ottawa ON

NRC's Finance Branch provides quality service in support of NRC activities and its clients by meeting their financial needs.

Human Resources Branch (HRB) – Ottawa ON

NRC's Human Resources Branch supports excellence at NRC by helping to recruit and support a strong cadre of experienced, professional and adaptable employees serving institutes and branches across the country.

Information Management Services Branch (IMSB) – Ottawa ON

NRC's Information Management Services Branch provides leadership in the development and support of a world-class information technology infrastructure, and in the development of sound information management practices that will enable NRC to share information and maximise the value of its knowledge for its clients and stakeholders.

Executive Offices (EO) – Ottawa ON

NRC's Executive Offices offers quality management leadership to NRC through Corporate Services, the Offices of the President, the Vice-Presidents (Research and Technology Development and Technology and Industry Support).