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Industry Portfolio's Action Plan

Science and Technology for the New Century

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Industry Portfolio's Action Plan

Science and Technology for the New Century

On behalf of:

Atlantic Canada Opportunities Agency
Business Development Bank of Canada
Canadian Space Agency
Federal Office of Regional Development (Quebec)
Industry Canada (including the Communications Research Centre)
National Research Council
Natural Sciences and Engineering Research Council
Social Sciences and Humanities Research Council
Standards Council of Canada
Statistics Canada
Western Economic Diversification Canada

March 1996

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Minister's Message

Our government is firmly committed to using its investments in science and technology to support jobs and growth, to improve Canadians' quality of life and to ensure Canada's place in the advancement of knowledge. We are setting new directions and moving ahead quickly. We believe science and technology (S&T) will be the driving force for building an economy based on knowledge and innovation.

The federal government, and more specifically the departments and agencies with scientific and economic responsibilities that are grouped in my portfolio, have heard the views of 3000 Canadians over the past year. We have listened to the advice of the Prime Minister's National Advisory Board on Science and Technology and the Auditor General of Canada.

The departments and agencies that constitute the Industry Portfolio account for the largest federal investment in S&T. Their work, as individual organizations and together, is an integral part of the Government of Canada's endeavor to capitalize on science and technology in support of an innovative economy and society.

Through changes in programs, organizations, management regimes and mandates, the Portfolio is now well positioned within the government's jobs and growth agenda to lead and to move in partnership with Canadian innovators.

A new federal investment initiative for technology development, Technology Partnerships Canada, is particularly important. It will assist Canada's technology intensive industries to prosper in an era of fierce global competition. The announcement of this program completes the cycle of review of government support for technology development in the private sector begun with the 1995 Budget. It also honours the government's commitment to support Canadian innovation in manufacturing, environmental and other knowledge-intensive technologies.

This response document outlines the way the Industry Portfolio is creating a new vision and a new strategic approach based on co-ordinating the distinctive capabilities of its department and agencies. This approach is founded on a common belief in the importance of entrepreneurship, co-operation and partnership, and in the role of government as a catalyst within a Canadian system of innovation.

This document sets out an action plan for the future of the Industry Portfolio. It is based on long-standing S&T competencies, decisions to adopt new goals and directions, and now a real commitment to shared action. I particularly want to stress that the departments and agencies of my portfolio have worked together extensively over the past several months in a new spirit of co-operation and partnership that will foster collaboration and synergy, establish priorities, and maximize the impact of their joint resources. Together they have developed exciting joint initiatives exemplifying this new co-operative approach to innovation. Never before has there been such a strong commitment to a shared vision for concerted action in federal S&T and in the efforts of the Industry Portfolio.

The pages that follow set out our clear commitment as partners in Canada's innovation system.

John Manley
Minister of Industry

Secretary of State's Message

Over the past year, I have had the opportunity to visit many of the federal government's research institutions and to become familiar with its support programs and service centres. I have also had the opportunity to meet with thousands of Canadians across the country and listen to their advice on the federal government's role in establishing a Canadian innovation system.

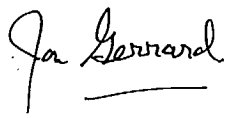
Canadians do agree on one fundamental tenet. It is time to move our country forward to become a nation of innovation. Canadians must establish a culture that values innovation, fosters scientific research and aggressively applies new technologies.

The departments and agencies in the Industry Portfolio represent a wealth of knowledge and expertise. Their work has helped to bring Canada into the space age; yielded exciting industrial innovations; developed the scientific and technical talent of our youth; depicted and measured important cultural and societal trends; and provided technical advice, ideas and financial support to innovative Canadians.

The Portfolio will work with other departments to strengthen the federal role in innovation, continue the government's critical support of Canada's research system, help link firms and research organizations with international science and technology, promote new research and technology management practices, and facilitate regional and community-focused innovation.

The Portfolio will achieve its long-term goals by acting on the government's S&T principles: increasing the effectiveness of its research efforts, seeking partners and capturing the benefits of partnership, emphasizing preventive approaches and integrating sustainable development principles into decision making, adopting practices that promote innovation, extending the new information infrastructure, strengthening international S&T linkages, and promoting a strong science culture.

The challenges facing us as a nation are difficult and exciting at the same time. Through this Action Plan, the Portfolio organizations bring their different perspectives and capabilities together for the first time to support Canadians in meeting our innovation challenges. I believe that the Portfolio has taken important steps toward building a bright and successful future for our country.



Jon Gerrard
Secretary of State for Science,
Research and Development

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1. Science and Technology Goals of the Industry Portfolio

The Government of Canada is committed to achieving economic growth through innovation. To do so, it must work with other sectors of the economy and other institutions to build a knowledge-based society that will enhance Canada's national system of innovation. Science and technology are integral to this process.

In February 1994, the Government of Canada launched a sweeping examination of the challenges facing science and technology in Canada and the opportunities for federal action. Based on extensive public consultations and valuable input from other sources, this review produced the federal science and technology strategy, *Science and Technology for the New Century*, which sets out new directions for S&T in Canada.

This document is the response of the Industry Portfolio to that strategy. It represents a new, strategic, managed approach to portfolio co-ordination and co-operation, based on a shared vision and guided by common goals and principles.

The Industry Portfolio

The Industry Portfolio consists of two departments (Industry Canada and Western Economic Diversification Canada) and nine related agencies that belong to the portfolio of the Minister of Industry and report through the Minister to Parliament. Together, these science-based and economics-based organizations represent a combined annual investment of more than $2 billion in S&T capabilities, and account for about 42 percent of total federal S&T spending.

The Portfolio has a special role to play in building a more effective system of innovation. Listed below are the Portfolio organizations with a brief description of the key changes each has already undertaken to implement the government's new S&T strategy. Further details are provided in the Annex.

Industry Portfolio

Departments and Agencies

- **Atlantic Canada Opportunities Agency (ACOA)**
- **Business Development Bank of Canada (BDC)**
- **Canadian Space Agency (CSA)**
- **Federal Office of Regional Development (Quebec) (FORD(Q))**
- **Industry Canada (IC), including the Communications Research Centre (CRC)**
- **National Research Council (NRC)**
- **Natural Sciences and Engineering Research Council (NSERC)**
- **Social Sciences and Humanities Research Council (SSHRC)**
- **Standards Council of Canada (SCC)**
- **Statistics Canada (SC)**
- **Western Economic Diversification Canada (WD)**

Atlantic Canada Opportunities Agency

The Atlantic Canada Opportunities Agency (ACOA) promotes economic development, co-ordinates the broader spectrum of federal government program activities and provides a single point of contact to federal government programming for the small business sector in the four Atlantic provinces. ACOA has adopted a Team Atlantic approach to economic development, working closely with public and private sector partners in support of a stronger regional economy. ACOA has introduced a new, flexible Business Development Program which provides fully repayable capital assistance to business, placing particular emphasis on "new economy" industries and technologies. ACOA is launching, in partnership with the provinces and the major chartered banks, an Atlantic Canada-based investment fund which will provide a regionally-focused source of venture capital. Innovation and technology are strategic priorities for ACOA, along with supporting policies and activities that focus on the development of the Atlantic Canada system of innovation.

Business Development Bank of Canada

The Business Development Bank of Canada (BDC) promotes the creation and development of small and medium-sized enterprises (SMEs) in Canada. Its new mandate gives the bank the tools to move in new directions and to tailor its products to meet the needs of SMEs. The bank provides specialized financing for commercially viable businesses, including term loans, venture loans and venture capital, as well as extensive business management counselling, training and mentoring services.

Canadian Space Agency

In June 1994 the government gave the Canadian Space Agency (CSA) a new mandate to co-ordinate all federal civil space activities, and announced a new Canadian Space Program (CSP) to advance the development and application of space science and technology to meet Canadian needs and to stimulate the development of an internationally competitive space industry. The new CSP is based on expanded financial and management partnership arrangements with industry and the provinces.

Federal Office of Regional Development (Quebec)

The Federal Office of Regional Development (Quebec) (FORD(Q)) supports the development of the economic potential of the regions of Quebec and the creation of sustainable employment by fostering a business climate that enables small and medium-sized enterprises (SMEs) to grow and prosper. FORD(Q)'s new mandate is based on a revised strategy in which information and skills become the main tools for SME development. With its new service concept, the Small Business Access Centre, FORD(Q) provides Quebec entrepreneurs with increased access to valuable federal, provincial and regional resources and programs.

Industry Canada

The Department of Industry (Industry Canada) will help make Canada more competitive by fostering the growth of Canadian business; promoting a fair, efficient marketplace; and encouraging scientific research and technology diffusion. Industry Canada has three main lines of business. It is the government's lead department on the microeconomic policy agenda (for example, competition, intellectual property,

standards) and plays a key role in the development of science and technology policy. Second, the department is responsible for the effective implementation and management of rules of the marketplace (for example, spectrum licensing, consumer product inspection), which are the building blocks of a competitive business environment. Third, Industry Canada has adopted a new approach to industry sector development, acting as a catalyst to narrow the competitiveness gaps that individual firms and the business community cannot overcome alone. The Communications Research Centre, as a principal federal research centre in telecommunications, has become an instrument for creating competitiveness through new innovative research and development (R&D) programs, and greater focus on diffusion of new technologies and knowledge.

National Research Council

The National Research Council (NRC) has undertaken a complete realignment of its research portfolio to focus on five technology groups: biotechnologies, construction, information and telecommunications, manufacturing, and infrastructural technologies (including measurement standards, engineering research, core science and facilities). The NRC's research institutes, together with its Industrial Research Assistance Program (IRAP) and the Canada Institute for Scientific and Technical Information (CISTI), will adopt a more integrated approach to supporting innovation. It will achieve a new national impact through a focus on regional and community-based innovation.

Natural Sciences and Engineering Research Council

The Natural Sciences and Engineering Research Council (NSERC) is Canada's major source of funding for university-based research in the natural sciences and in engineering. NSERC's role is to support university-based research and training, increased research collaboration and greater student exposure to interdisciplinary research. As well, NSERC promotes improved communication among university researchers, the public and the user sector.

Social Sciences and Humanities Research Council

The Social Sciences and Humanities Research Council (SSHRC) is the federal government's principal instrument for supporting social sciences and humanities R&D. Supporting basic research remains SSHRC's main responsibility. Through multidisciplinary collaboration, it will contribute to informed decision making in the public and private sectors and link its research to key socio-economic and cultural issues.

Standards Council of Canada

The Standards Council of Canada (SCC) is a Crown corporation that promotes voluntary standardization as a means of advancing the national economy; protecting the health, safety and welfare of the public; protecting consumers; and facilitating domestic and international trade and co-operation. The SCC will be streamlined and given a mandate to play an expanded role in supporting national economic and social objectives.

Statistics Canada

Statistics Canada is the core of Canada's socio-economic information system, serving the information needs of all sectors of Canadian society. Statistics Canada will begin designing a new information system for science and technology. This system will inform Canadians about the effectiveness of the government's initiatives to promote innovative activity, the diffusion of

technology and the adoption of new ideas by all sectors of the Canadian economy, and will enable Canada to compare its performance to other economies.

Western Economic Diversification Canada

The mandate of the Department of Western Economic Diversification (WD) is to develop and diversify the western Canadian economy; co-ordinate federal economic development activities in the West; and represent the western perspective in national decision making. WD addresses the needs of small and medium-sized enterprises (SMEs) by contributing to the creation of a positive business climate, improving access to capital, and providing services across Western Canada through an integrated service delivery network of more than 90 service delivery points. Together with financial institutions, WD is developing investment funds that are targeted at new and emerging sectors and that leverage capital from the private sector to increase access to capital by western SMEs.

Working Together

Together the departments and agencies of the Portfolio are well positioned to help Canada develop an innovative, knowledge-based economy through:

- strong partnership and collaboration with industry in knowledge-intensive domains such as space technology, the Information Highway, advanced manufacturing, environmental technology and biotechnology;
- support for university-based research and training in the humanities, engineering, and social and natural sciences;
- mission-oriented research in federal laboratories;
- technological development and diffusion in key areas such as information and communications, advanced manufacturing and biotechnologies;
- innovative, partnership approaches to provide single-window regionally responsive innovation financing and assistance for small business;
- S&T statistics that monitor the evolution of Canadian society and the role of S&T in these changes;
- an extensive voluntary standards system involving participants from the private and public sectors;
- business innovation financing; and
- S&T microeconomic, socio-economic and financial analysis and policy support.

The preparation of this Action Plan was pivotal for the Industry Portfolio in many ways. It has provided an opportunity for members to assess their similarities and differences, and develop a cohesive approach to S&T that builds on their individual and collective strengths.

Portfolio members share a commitment to supporting innovation in Canada and can make a difference through synergy as well as through individual capabilities.

This commitment will be supported by a new forum for co-ordination, co-operation and direction setting. Together, the Minister, the Secretaries of State and the heads of the departments and agencies will guide the Portfolio to realize its vision, support co-ordinated decision making and measure achievements.

These actions are the Portfolio's first response to the government's S&T strategy. They answer the public's expectations for better decision making, the Auditor General's call for co-ordination, and NABST's recommendation for co-operative action. These steps show how a systematic approach to innovation can be realized.

Portfolio Vision and Goals

The departments and agencies in the Portfolio share a common belief: Canada can be more innovative and competitive through the systematic application of science and technology. In partnerships and through networks within Canada's system of innovation, the Portfolio will advance efforts to stimulate jobs and growth.

The future actions of the Portfolio members start with this shared vision, which will be the basis for future collective efforts. Further, this vision fits the government's strategic approach to the development of S&T policies and programs.

This vision encompasses several interdependent goals:

A strong federal government role in innovation. The federal S&T strategy, *Science and Technology for the New Century*, reaffirms the important roles of federal institutions and programs in creating an innovative society and economy. The Portfolio will have a strong, catalytic role within Canada's innovation system through the efforts of its research institutions, its partnerships with public and private-sector organizations, its direct financial and technical support for Canadian firms, its awareness of the diversity of regional strengths and challenges, and its support for Canada's S&T infrastructure and university and government research systems.

Details of Technology Partnerships Canada are being announced separately. Beginning with its action plan, *Building a More Innovative Economy*, the government has been examining its role in supporting private-sector development of significant technologies. In the 1995 Budget, the government suspended funding under most of its subsidies programs, but made the commitment to undertake a fundamental review of its approach to support for private sector research and development.

The federal S&T strategy includes the commitment to establish a new investment support program designed to share the risks and rewards of technology development. It will aim to increase private investments in developing advanced technology in globally competitive, highly mobile, high-growth industries. Such a program is an essential tool if Canada is not to lose many key industries to other countries, which have become increasingly aggressive in pursuing and attracting innovative firms in high-growth sectors. Technology Partnerships Canada will help to preserve existing high technology strengths and expand Canadian industrial technological capabilities.

The program will take an investment approach. Repayable contributions will be used to help fund it. It will be designed to preserve existing jobs and create new ones, and it will be market-driven, with advice from a private sector-based board. The program will focus initially on aerospace and defence conversion, environmental industries, and enabling technologies, such as manufacturing technologies, advanced materials and biotechnologies.

Industry Portfolio Vision

The Portfolio will use its unique tools and capabilities, maximizing linkages and partnerships, to help Canada become a world leader in knowledge-based innovation that will result in jobs, exports and economic growth.

An integrated approach to Canadian innovation. The government has stated its intention to establish a systematic approach to supporting innovation. The Portfolio will support efforts that encourage understanding of the importance of knowledge-based economic growth and the role of S&T in an innovative society and economy. It will build on current efforts, relationships and networks to establish new and stronger linkages among the elements of Canada's innovation system, particularly outside government.

A strong research base for innovation in universities and government laboratories. University and government research are essential to the advancement of knowledge and the development of ideas, policies and technologies. The Portfolio will continue to play a critical role in federal efforts to maintain Canada's foundation of scientific, engineering and social science research. Its national laboratories will support research at the leading edge of science and engineering. The NRC and its Industrial Research Assistance Program will provide support for national science facilities and technology transfer. NSERC and SSHRC will continue to be the main sources of federal support for university-based research in the sciences, social sciences, humanities and engineering at Canadian universities. In addition, these councils and the NRC will make vital contributions to Canadian participation in international research projects.

Effectively positioning Canadian firms and research in the world. The Portfolio will work to help Canadian firms be more internationally aware. It will do this by enhancing access to international technology, standards, science and scientific information. The Portfolio members know that Canadian companies, especially small and medium-sized enterprises, require more awareness of technology developments, as well as international market opportunities, support for international partnerships and lower barriers to international S&T co-operation and acquisition.

Collaboration helps keep Canadian scientists and engineers at the forefront of knowledge; it is essential to a competitive research environment. Rapid dissemination of the international pool of knowledge through networking and government-industry-university programs contributes substantially to innovation and technological development in Canada. The Portfolio will support Canadian activities in international S&T.

More entrepreneurial government organizations. New expectations for government organizations are emerging from the redefinition of public roles and responsibilities. The need for greater innovativeness applies not only to individuals but also to institutions and programs.

The Portfolio will establish new partnerships and program delivery methods, adopt new management practices and work more proficiently. These measures will enhance the abilities of the Portfolio's research laboratories to commercialize their technologies, allow them to operate more like innovative businesses, and make it easier for companies to do business with them.

Regions and communities linked to Canada's system of innovation. The Portfolio will facilitate regional and community-based innovation so that firms and organizations can compete globally. Its institutions and programs will help by building on regional competencies; establishing regional facilities, networks and clusters of economic activities; using previous successes to help firms compete nationally and globally; and supporting partnerships that contribute to regional strengths and aspirations.

Linkages to government S&T priorities and goals. The government has established three interrelated goals as the focus for its future S&T activity: making sure Canada applies and commercializes S&T to create jobs and economic growth, using S&T to improve Canada's quality of life and social well-being, and achieving and maintaining excellence in the advancement of knowledge.

Each member department and agency is adapting its programs and structure to realize these goals. The Portfolio will apply its diverse technological competencies to support new wealth and job creation opportunities. This will be done through direct partnerships with industry and a greater focus on removing the barriers to the development, transfer and commercial introduction of competitive technologies.

The Portfolio will seek to apply new scientific knowledge and technology in support of Canada's social networks and systems, particularly in the areas of public health, safety and security.

Canada's ability to advance knowledge underpins an effective innovation system. Increasing Canada's stock of knowledge is the *raison d'être* for three Portfolio members: the NRC, NSERC and SSHRC.

The Portfolio has a key role in creating a knowledge foundation for Canada. Its members provide vital support for Canada's socio-economic information system. Its laboratories work with industry to push back the frontiers of science and engineering. Its granting councils fund leading research in the social and natural sciences and in engineering and the humanities, both in universities and through partnerships between universities and industry.

It is also through the advancement of knowledge that a country generates new ideas, information and technology. Knowledge is the basis for improving educational and social systems, and for introducing new products and services into the commercial sector. Ideas — whether embodied in patents, know-how or trained people — are the raw material of economic and social advancement.

Lastly, the Portfolio's individual goals and its shared vision recognize the connection between science and technology and the creation of wealth and social improvements. Individually and together, Portfolio members will seek to develop a strong, integrated system of innovation that enables all the partners to work together. This requires strong new relationships, joint determination of priorities, sensitivity to regional diversity and needs, and dialogue about the challenges that lie ahead.

It is not just the Portfolio's support for these three goals that is important. Rather, it is the Portfolio's ability to forge partnerships and linkages with innovators throughout Canada that gives it the capacity to strengthen the government's role in Canada's system of innovation.

2. Current Activities and Future Directions

Directions

Over the coming years, the budget of each department and agency in the Portfolio will decrease. Hard choices have been made and strategic priorities established.

As a result, the departments and agencies of the Industry Portfolio will place more emphasis on partnerships, innovative ways to transfer and commercialize technologies, and the creation of means to more effectively translate science and technology into social and economic innovation.

Across the Portfolio, strategies and programs are already in place to promote partnerships, sustain systems and create networks.

Establishing Strategies and Technology Priorities

The choices made by Portfolio members are not only the result of budget reductions, but equally of strategic planning exercises built on extensive analysis and discussions with stakeholders. Portfolio members have all crafted plans and strategies that set out new priorities and directions.

The federal government has established its strategic priorities for federal technological investment through consultation with Canadians and in partnership with Canada's technology industries. Technology Partnerships Canada (TPC) will provide a new vehicle for the development of these Canadian technologies. To complement TPC, the Portfolio will highlight two areas in which it has distinctive competencies and responsibilities: information and telecommunications technologies, and advanced manufacturing technologies. It will establish a program of assessment, foresight, research and commercialization in these areas. At the same time, the Portfolio will continue its commitment to other key technologies, including biotechnology and environmental technologies.

Together with industry, the Portfolio will define its investment priorities in these two technology areas. These actions will help guide the implementation of TPC and concentrate shared research and technological strategies and investments in areas where Canada can be globally competitive and achieve development goals. This will help prepare Canadians to compete for the knowledge-based jobs that will dominate 21st-century commerce.

The Portfolio will meet the need for new planning and strategy information and tools through sector competitiveness frameworks, international measurement instruments and technology roadmap methodologies. Led by Industry Canada, the frameworks and the measurement of Canadian performance against international standards will help the Portfolio and its partners determine priorities, strategies and solutions.

Advanced Manufacturing Technologies

The Portfolio will build a strategic framework and action plan to meet Canada's manufacturing technology challenges. Developed with industry, it will be based on advanced manufacturing technology development priorities, investment support initiatives and the distinctive research expertise of Portfolio and university laboratories. The action plan will address industrial research, planning and strategy needs, and the challenges related to technology acquisition and diffusion by Canadian manufacturers.

Manufacturing Technology Program. As a result of the Program Review and its own long-range planning, the NRC has determined that manufacturing technology is an innovation priority. It has therefore created a manufacturing technology program by refocusing some programs and consolidating and rebuilding others. The NRC will build on its core strengths in materials processing and fabrication technologies, further its competencies in integrated manufacturing and enterprise modelling, and capitalize on its expertise in software engineering and information technologies. In addition to its institutes in Atlantic Canada, Quebec, the National Capital Region and the Prairie provinces, the NRC will carry out manufacturing research activities in Vancouver, southern Ontario, Ottawa and Boucherville (Quebec). Regional agencies will help link these technologies to the industrial users.

Intelligent Manufacturing Systems (IMS) Program. Canada will take part in international consortia that will be formed to work on R&D projects leading to the next generation of advanced manufacturing technologies. Canadian companies will be offered the opportunity to participate with world-class companies in international projects. Results of the projects will be widely disseminated within Canada.

Fraunhofer Flexible Manufacturing Centre. Industry Canada and the NRC are working together to secure a Fraunhofer presence in flexible manufacturing in Canada. Locating the Fraunhofer Society in NRC's Integrated Manufacturing Technologies Institute will enable developers and users of flexible automation to link with technology development and deployment methodologies used successfully in other countries. This link between international research and industry will make it easier and faster for companies to adopt innovative automation technologies, and, by training engineering graduates in the practical application of advanced manufacturing technologies, will provide them with valuable job skills.

INFORMATION AND TELECOMMUNICATIONS TECHNOLOGIES

The information technology and telecommunications (IT&T) industry consists of more than 15 000 firms and employs more than 315 000 people. It is one of Canada's fastest-growing industry sectors, expanding at an average annual rate of more than 6 percent over the past five years. It is the largest R&D performing industry in Canada, accounting for over $2 billion in R&D expenditures. Information and telecommunications technologies are also a set of enabling technologies whose application cuts across all segments of the economy. When combined with appropriate management practices, information and telecommunications technologies can stimulate productivity improvements and increase international competitiveness. Finally, IT&T contributes to the development and use of an advanced communications and information infrastructure essential for Canada in an information-based economy.

The Portfolio's diversity allows it to have widespread impact on the innovation needs of this sector and its enabling technology. The Portfolio will co-ordinate the complementary capabilities of the CRC, NRC, CSA, Industry Canada and FORD(Q).

Long-term technology development opportunities. The Portfolio members will work individually and in partnership, as well as with other government departments, universities and the private sector, to develop the next generation of satellite, information and telecommunications technologies and innovative applications. They will link these applications to innovation and technology-based learning opportunities.

The NRC will develop technology initiatives that bring together its software engineering, microstructures and knowledge systems research with the plans of the Canada Institute for Scientific and Technical Information to build a national infrastructure based on virtual libraries.

Through its strong R&D capabilities, the CRC will develop world-class radio and broadcast technologies, and broadband multimedia network applications that are diffused to Canadian industry.

Multimedia and mobile satellite communications. The CSA and CRC will work with industry to develop satellite technologies for the future commercial delivery of multimedia services and mobile personal communications. This will contribute to a world-class communications infrastructure for Canadians and increase export opportunities for Canada's space industry.

Rapid change in the information technology and telecommunications industries has motivated a multi-year project with Statistics Canada that has the objective of more accurately measuring traditional IT&T sectors and defining emerging ones. It will provide an opportunity to benchmark IT&T industries and to better assess their contributions to growth in the future.

The Portfolio will create the policy environment to expand competition in Canada's communications and information markets; to encourage investment, R&D, and innovation by the private sector; and to accelerate the introduction of new technologies, products and applications for domestic and global markets.

The government is collaborating with our G-7 partners on 11 information society pilot projects in areas such as global interoperability for broadband networks, environment and natural resources management, global health-care applications, and a global marketplace for small and medium-sized enterprises. These projects will encourage the spread of new technologies, promote the interconnection of national high-speed test networks, trigger new alliances, and help create markets for new products and services.

3. Operating Principles

The seven operating principles of the federal S&T strategy, *Science and Technology for the New Century*, underpin the Portfolio's goals and new directions. Examples and illustrations of these principles in action follow.

1. Increasing the Effectiveness of Federally Supported Research

The Portfolio will sustain the critical position of the Canadian university and federal research systems within the larger innovation system, and will create new research partnerships among industry, universities and governments. The Portfolio believes that the presence of university and federal research institutions, and therefore of researchers and students being trained in the sciences and technology, is a powerful stimulant to local innovation systems. Continued support for research and universities through the granting councils will foster new ideas, broader horizons

NRC/Bio-Intermediair Collaboration

The Dutch-based company Bio-Intermediair (BI) has signed an agreement with the NRC to lease and then purchase property at the NRC's Biotechnology Research Institute (BRI) in Montreal. Attracted by the opportunity to work in partnership with BRI, Bio-Intermediair will construct one major complex and possibly four satellite facilities. BI is a world leader in biotechnologies, specializing in cell culture and production of bulk biopharmaceuticals. The new facility will create downstream benefits for the Canadian biotechnology sector and attract other foreign companies.

Human Genome

The Canadian Genome Analysis and Technology Program (CGAT) is part of an international effort known as the Human Genome Project — an estimated 15-year, $3-billion project to identify and map the approximately 100 000 genes encoded in the human genome. The SSHRC, NSERC and the Medical Research Council jointly manage the CGAT Program. The program's objectives are to analyse human and other selected genomes; develop related technologies; and study corresponding medical, social, ethical and legal issues. The program is an interesting example of how research on S&T issues can fully integrate social science dimensions.

and new aspirations among the people they train. Regional agencies will help link this research to private-sector partners.

By continuing to adapt its support to greater involvement by industry and users, the Portfolio will help universities and research institutions serve as incubators for new industries. New companies — technology incubators — will emerge as university researchers with promising ideas transform their ideas into marketable products.

In the laboratories at the NRC and the CRC, the effectiveness of research and technology commercialization efforts will be enhanced through new management practices and principles, and the development of more inclusive partnerships.

Initiatives under the research and training principle include:

Federal Partners in Technology Transfer. The Portfolio will take a leading role in supporting the Federal Partners in Technology Transfer (FPTT), a partnership of federal science-based departments and agencies to promote the commercialization of technologies transferred to the private sector. The partners will share best practices in technology transfer and commercialization, develop new mechanisms, and provide advice regarding relevant policies and programs.

Organizational innovation and technology commercialization. The Portfolio will be a testbed for federal R&D entrepreneurship, innovative human resource practices and technology commercialization strategies. The CRC and the NRC will work with other departments and agencies to create a new federal S&T management regime, and lead Portfolio efforts to examine and test new research management practices. The Tri-University Meson Facility (TRIUMF) laboratory at the University of

Broadband Applications and Demonstration Laboratory (BADLAB)

In 1994 the Communications Research Centre created BADLAB to test applications for asynchronous transfer mode (ATM) broadband communications, the electronic packets that will carry future communications. CRC, OCRInet (co-ordinated by the Ottawa Carleton Research Institute) and industry partners MPR Teltech, Teleglobe Canada, Telesat and NorthwesTel have collaborated in the demonstration of applications in telemedicine, distance education and commerce, linking BADLAB with cities across Canada via the Canadian Network for the Advancement of Research, Industry and Education (CANARIE) and via satellite in northern Canada. BADLAB has been applauded for its industry partnership with OCRInet in testing and demonstrating applications for the emerging ATM Information Highway.

British Columbia, in co-operation with the NRC and WD, is implementing plans to assist technology firms and entrepreneurs in Western Canada to commercialize technology flowing from new research activities at TRIUMF and CERN and to sell the resulting products in the international marketplace.

2. Capturing the Benefits of Partnership

Portfolio members have a long history of partnership with each other and with other federal organizations, universities, provinces and the private sector to achieve national goals. Together they comprise some 3000 partners representing the most innovative, adaptive elements of Canadian society. These partnerships are the centrepiece of the Portfolio's new directions.

Across the Portfolio, several strategies and programs already promote partnerships and create networks for research, technology diffusion, knowledge transfer and financial support. For example, ACOA is in the process of negotiating new federal-provincial agreements with each of the Atlantic provinces that will have science and technology components. These relationships will be strengthened and enhanced, and new ones pursued, to build a solid infrastructure for innovation.

Initiatives under the partnership principle include:

Technology Partnership Program. The Technology Partnership Program (TPP) is a joint effort of the three granting councils — NSERC, SSHRC and the Medical Research Council — which is administered through a secretariat at NSERC. It will create partnerships among universities and small and medium-sized companies to develop university research to the point where it can be exploited and commercialized by industry. The objective is to create new, improved products, services and jobs.

ACF Equity Atlantic Inc. To address a deficiency in the availability of venture capital to SMEs in Atlantic Canada, ACOA supports the initiative led by the four Atlantic premiers and the Atlantic Provinces Economic Council to establish a regionally-based investment fund. As a result of this collaboration, ACF Equity Atlantic Inc. will be established as a $30-million, private sector-delivered and managed venture capital fund for Atlantic Canada. Partners in the fund include ACOA, the Atlantic provincial governments and seven chartered banks.

IDEA SME Fund. In partnership with the Business Development Bank of Canada, FORD(Q) created the IDEA SME Fund, intended to expand and facilitate access to financing for knowledge-based firms. The objective of the fund is to provide long-term loans with flexible repayment terms to firms that have a market-ready product, good prospects for growth and a well-defined market niche.

Western knowledge-based investment funds. WD is taking a lead role in the establishment of investment funds in co-operation with financial institutions to leverage private sector capital and increase access to capital on commercial terms by SMEs in Western Canada. These funds are targeted at emerging knowledge-based sectors in Western Canada such as biotechnology, health sciences, information technology and environmental industries. It is expected that by the end of 1996, some $300 million will be committed for investment in these knowledge-based sectors.

Virtual Reality Displays

Liquid Image Corporation of Winnipeg, the only Canadian manufacturer of head-mounted displays for virtual reality systems, probably has the largest share of the world market for these devices. The NRC's Industrial Research Assistance Program has been involved with the company since its incorporation and continues to provide technical assistance in computer modelling, electronics, control box design, and component and production line sourcing. Liquid Image Corporation's first-year sales exceeded $1.2 million.

Networks of Centres of Excellence. The Networks of Centres of Excellence program links R&D in Canada's universities to wealth creation. The networks stimulate leading-edge fundamental and applied research in emerging areas of critical importance, and educate the world-class scientists essential to Canada's economic growth. The networks manage multidisciplinary and multisectoral research in partnership with industry and other interests, and facilitate the transfer of knowledge and technology from universities to industry.

Jointly administered by NSERC, SSHRC and the Medical Research Council, and involving Industry Canada as well, the program is now in Phase II, with a budget of $197 million. Ten of the original 15 networks have been renewed, and four additional centres were named in June 1995 in health, environment, advanced materials and technology-based learning.

Space research partnerships. NSERC and the CSA are working together to develop synergies between university researchers and the space industry. The CSA also supplements NSERC scholarships to assist in training the next generation of space scientists and engineers, and will participate in NSERC's program of Industrial Research Chairs in fields related to its mandate.

NRC/NSERC Research Partnership Agreement. Under this five-year initiative, NSERC and the NRC will provide funding for university-based research, research training, and research-related activities in partnership with Canadian companies and NRC institutes. The initiative will capitalize on the complementary R&D capacity in the universities and in NRC institutes to generate new knowledge; build linkages among university researchers, industry and government laboratories; transfer research results; and train highly qualified personnel in priority areas.

PRECARN Consortium. The Pre-Competitive Applied Research Network (PRECARN) is a not-for-profit industrial consortium of 37 companies and agencies across Canada. Its collaborative, pre-competitive R&D on intelligent systems is funded by its members and by the federal and provincial governments. Some 30 organizations and more than 100 researchers are involved in this $45-million program. The Portfolio will continue to be a partner of PRECARN and support its members on projects that establish a strong Canadian position in advanced-knowledge products and fields.

SchoolNet. SchoolNet is an Industry Canada initiative, supported by the provinces, territories and private sector, to link Canada's 23 000 schools, libraries and universities to Internet by 1998. It will yield major dividends in student performance and job-market readiness.

BDC regional partnerships. The Business Development Bank of Canada, ACOA, FORD(Q) and WD are forming partnerships to deliver commercially based financing to SMEs, particularly in high-risk, knowledge-based industries. Since its founding in 1944 as the Industrial Development Bank, the BDC has played a special role in rural Canada, filling a gap left by commercial financial institutions which tend to concentrate on urban areas.

PYROVAC INTERNATIONAL INC.

Crushed vehicles, household garbage, contaminated soil and used tires are difficult wastes to dispose of. Now they can be recycled using innovative vacuum pyrolysis technology developed at Université Laval under an NSERC grant which is being commercialized by Pyrovac International Inc. The process is cleaner than landfill and cheaper than incineration. It also extracts oils and chemical compounds for commercial sale and uses the remaining residues to generate electricity.

3. EMPHASIZING PREVENTIVE APPROACHES AND SUSTAINABLE DEVELOPMENT

The Portfolio undertakes many projects and programs that contribute to Canada's health, safety and security and the sustainability of industries and the environment. Most of them are carried out as part of the Portfolio's partnering, research and technology priorities and so they are not presented here as separate initiatives. The Portfolio will continue to integrate environmental considerations as early as possible into as many programs and developmental activities as possible to achieve the best long-term results. For example, in establishing its new manufacturing technologies program, the NRC has created a new program element focused on "clean" processing technologies. As well, Industry Canada is supporting the Canadian automotive industry's development of next generation "clean car" technology as one of its sectoral initiatives.

A specific initiative under the preventive approaches principle is:

RADARSAT II. The CSA will conclude arrangements for a joint venture with the private sector to build and commercially operate RADARSAT II and its successors. The objective is to develop an internationally competitive Canadian industry in the applications of earth observation satellite data to improve natural resource management and environmental monitoring.

Smart Windows

Saving energy costs is a priority. A new window invented by researchers at the Institut national de la recherche scientifique at the Université du Québec saves air-conditioning costs in summer and increases solar heating in winter. The electrochromic window can turn dark blue or clear with a small surge of electrical energy. It works like a battery: it has a positive, anodic coating of conducting polymer on one side and a negative, cathodic coating of tungsten oxide on the other. Between the two coatings is another polymer layer with a salt that provides a reservoir of ions that move to the coatings when they are charged. When the current flows one way, the coatings become deep blue. When it is reversed, the windows become transparent. Having both layers participate in the colouring and bleaching processes improves the efficiency of the switching. The research is funded by NSERC and Natural Resources Canada.

4. Positioning Canada Competitively Within Emerging International Regulatory, Standards and Intellectual Property Regimes

Encouraging innovation is at the heart of the Portfolio's work; most of its programs and activities are aimed, directly or indirectly, at achieving this important objective. The Portfolio plays an important role in supporting the adoption of appropriate policies, practices and regulatory approaches to achieve this. In some cases, such as the new mandate for the Business Development Bank of Canada and the Canadian Space Program, new directions and strategies are needed. In other cases, such as the NRC, the innovation principle is at the core of long-standing responsibilities.

Several initiatives will focus on stimulating community-based and regional innovation systems to be linked nationally and internationally. The regional agencies will contribute to the Industry Portfolio by providing core competencies and a vision across the country, with a special emphasis on benefits to SMEs. Support for Canadian Business Service Centres, the local presence of NRC's institutes and its Industrial Research Assistance Program (IRAP) advisors, S&T collaboration with the provinces, and CSA-provincial agreements are all aimed at enhancing community-based innovation. The Canadian Technology Network (CTN) will also play a major role in disseminating information.

The Portfolio will link innovative companies and individuals, create new research networks, and bring regional and community innovators together. For example, the Canadian Space Program Overview Committee, which includes federal, provincial, industry and university

Space Policy Framework

In June 1994 the government announced a set of principles to guide the implementation of the Canadian Space Program. The Space Policy Framework directs the CSA to focus on creating an internationally competitive, export-oriented industry; increase effectiveness by co-ordinating all federal civil space activities and seeking synergies with Canada's defence space activities; establish an all-interests consultative committee with real influence; form partnerships with industry and provinces to share the cost and management of programs; pursue a policy of sustainable regional industrial development; use the special appeal of space to promote a stronger science culture; and prepare an overall evaluation framework for the Space Program.

representatives, is playing a key role in the implementation of the new space program.

Effective policies and practices need to be built on understanding the changing dynamics of innovation in Canada and foreseeing the policy needs of government. Government decision making and priority setting will require a new base of information and awareness of the impact of S&T in a knowledge-based economy. The Portfolio will support various policy research programs.

Initiatives under the innovation principle include:

New S&T information system. Statistics Canada will create a new S&T information system to measure the country's progress in becoming more innovative and competitive. The system will measure the effectiveness of government initiatives in promoting innovative activity, diffusing technology and encouraging economic sectors to adopt new ideas.

Automated patent information. The Canadian Intellectual Property Office (CIPO) of Industry Canada is automating operations to improve client services and facilitate access to strategic and technological intellectual property information.

Research on knowledge-based growth, innovation and technological change. Portfolio members will support programs of research and knowledge exchange on a range of microeconomic, technology and innovation issues. Industry Canada will continue to provide research, information and debate on microeconomic issues. SSHRC will support policy-oriented research to understand innovation, particularly in terms of productivity, job creation and competitiveness. The granting councils, Industry Canada and the NRC will undertake research programs, studies and joint projects to understand the determinants of competitiveness, the role of S&T in the

economy, and the needs and structure of the innovation system. The regional agencies will contribute to these activities as they pertain to SMEs and the circumstances unique to regional innovation systems.

NSERC's program of Industrial Research Chairs has sponsored over 200 chair-holders since its inception; over 130 are presently active. These chairs, which link universities and industry, have in many cases established linkages with the NRC, CSA, CRC, Statistics Canada and Industry Canada.

Interdisciplinary policy research. SSHRC is expanding its Joint Initiatives Program and partnerships to promote research on immigration and a new strategic program on education and training. These programs will include research on the policy issues associated with examining how Canada's capacities for innovation and social development can be managed in the future.

SME creation through universities and colleges. In order to capitalize on the potential of universities and specialized colleges as a significant reservoir of entrepreneurial talent, FORD(Q) has encouraged initiatives such as that with the École de technologie supérieure which would see engineers developing business plans to start their own companies. The Portfolio will strive to accelerate the development of entrepreneurial skills developed by Canadian educational institutions.

Biotechnology regulation. In response to industry requests, WD is leading an interdepartmental working group to establish a comprehensive biotechnology regulatory process. The review includes the development of clear performance standards and exchanges between industry and regulatory departments and agencies. The process also provides a forum for the discussion of the societal impacts of biotechnology.

Canadian Technology Network. The Canadian Technology Network (CTN) will provide firms with quick, easy access to expertise, advice and information on technology. Created through a partnership among industry associations, research organizations, governments, universities and colleges, and managed by the NRC's IRAP and Industry Canada, the CTN is a key element in the Portfolio's plan to strengthen the linkages in Canada's system of innovation. The Standards Information System for Canada, being developed by the Standards Council in partnership with public and private organizations, will be an important CTN node and will make it easier for companies to acquire technology and participate in the standards-setting process. The Portfolio itself will be an important CTN member. For example, the CSA will create a space node for the network and FORD(Q) has assigned 13 people to this initiative across Quebec. ACOA, through its memorandum of understanding with the NRC, will be a partner in the CTN.

ANTI-COUNTERFEIT THIN FILMS

Canada is a world-leader in anti-counterfeiting technology for currency. As a result of a technology transfer involving the Bank of Canada, Vadeko International, Identicard and the NRC, Canada's $20 and $50 bills now contain a thin film authentication device which originated with NRC's thin films deposition research.

Intellectual property research. Industry Canada, in conjunction with the NRC and the Treasury Board Secretariat, are reviewing the federal government's approach to the ownership of intellectual property arising from government R&D contracts.

Scientific job creation through partnerships. FORD(Q) has associated itself with an initiative led by the Quebec Order of Engineers to introduce engineers and technologies within SMEs. With only three FORD(Q) staff, 240 jobs were created in less than a year.

NRC regional technology centres. The NRC is developing regional technology centres around laboratories in Newfoundland, Nova Scotia, Quebec, Manitoba, Saskatchewan and British Columbia that will offer multiservice access to NRC facilities, S&T information and industrial research assistance.

Western co-operation. Western Economic Diversification Canada, Industry Canada and the NRC are working with the four western provinces to prepare a strategy based on technology clustering opportunities focused on information technology and telecommunications, biotechnology, and advanced manufacturing and materials. An S&T MOU on the co-ordination of S&T initiatives in Western Canada will be signed between the Portfolio and the western provinces.

NRC/ACOA Memorandum of Understanding. Under this two-year agreement, ACOA and NRC have established an economic development partnership which serves and benefits both Atlantic Canada's small and medium-sized enterprises and its R&D infrastructure. The initiative links ACOA's business analysis capabilities and client base with NRC's scientific and technological

TECHNOLOGY TRANSFER

The CRC has more than 100 protected technologies available for licensing. Its Business Development Office is actively promoting their transfer to Canadian high-tech companies for development into commercial products. For example, AIT Corporation, a world leader in machine-readable passport systems, can trace the early success of its passport reader to CRC pattern-recognition technology. Part of this success is also due to the firm's involvement in bodies such as the International Civil Aviation Organization and its participation in the International Organization for Standardization through the Standards Council of Canada. These international affiliations allow AIT to track technological developments and detect early signals that a country wants to make its passports machine-readable.

expertise and its research and innovation programs. ACOA and NRC will work together to promote the commercialization of research projects, and to examine regional and national innovation and the policies and strategies necessary to meet future technological challenges in Atlantic Canada.

FORD(Q) clustering initiatives. FORD(Q) supports clustering initiatives. For example, it encouraged the creation of CESAM (Centre d'expertise et de services en applications multimedias), a major centre of expertise in multimedia, in co-operation with 13 other companies and the provincial government.

Regional industrial development for the space sector. The CSA, through agreements with ACOA, FORD(Q) and WD and arrangements with the provinces, is supporting the development of a competitive Canadian space industry based on regional strengths. For example, the CSA has joined with ACOA and the four Atlantic provinces to develop effective regional capabilities in fields relating to space technologies such as automation and robotics and micro-gravity sciences.

5. Building Information Networks: The Infrastructure of the Knowledge Economy

The ability to generate high-quality, timely information and make it available to potential users for commercial exploitation is essential to economic growth in a knowledge-based society. The Portfolio is rich in data, scientific analyses, and industrial, technological, regional and social intelligence. Several initiatives concentrate on getting this information into the broader community of potential users. As a world leader in communications technology, Canada must continue to capitalize on its competitive edge by seizing the opportunities offered by the Information Highway.

Satellite Technologies

The CSA and the CRC will conclude joint venture arrangements with industry to develop the satellite technologies required for future commercial delivery of multimedia, mobile and personal communications services. The proposed financial and management venture will allow the development of a world-class communication infrastructure providing all Canadians with access to the new multimedia communications services such as distance learning and medical services, home banking, high-definition TV and direct broadcasting. It will also allow the Canadian space manufacturing industry to develop new niches in international markets for components and subsystems.

Initiatives under the information networks principle include:

Canadian Information Highway. The Information Highway will be a key component of Canada's national system of innovation. It will give Canadian firms an edge by providing an information infrastructure second to none and information content that is critical to doing business in an increasingly competitive world. Industry Canada has been a catalyst in developing Canada's Information Highway Initiative.

The Portfolio has already undertaken a number of key initiatives. It has developed a Global Mobile Satellite Policy to guide Canada's participation in international satellite ventures for mobile communications and a licensing policy that promotes the commercialization of Personal Communications Services (PCS). The CSA's Advanced Satellite Communications project, approved in June 1994, will provide an early multimedia on-ramp to the Information Highway. Over the course of this year, the Portfolio will announce additional initiatives to promote the development of Canada's Information Highway.

CANARIE. Industry Canada is contributing $80 million toward Phase 2 of the Canadian Network for the Advancement of Research, Industry and Education (CANARIE). This is in addition to an estimated $400 million from the private sector and the provinces. A non-profit initiative with more than 140 members, CANARIE's Phase 2 involves accelerating development of key parts of the Information Highway over the next four years. CANARIE has pioneered the National Test Network linking high speed transmission systems across Canada. FORD(Q), for example, has played a key role in the promotion of CANARIE, helping to increase significantly the number of project proposals in Quebec. This enabled Quebec companies to become involved in the largest projects and allowed a greater number of Quebec companies to benefit from the second phase of CANARIE.

In its Phase I, CANARIE has funded 42 innovative technology applications in many fields, including telemedicine and education. The national information backbone, CA*net, has also been upgraded and the development of new databases for health and education applications is being considered.

Data Liberation Initiative (DLI). Statistics Canada and SSHRC are leading a five-year pilot project to make federal data files more widely available — and more affordable — to social scientists. Industry Canada, Human Resources Development Canada, the Medical Research Council, and the Department of Justice will also be involved.

6. Extending Science and Technology Linkages Internationally

The Portfolio recognizes the critical importance of Canada's international S&T links and presence. The international dimension of Canada's innovation system is an important responsibility of the Portfolio. Its programs involve partnerships with individuals, institutions and organizations around the world. Some agencies, such as the CSA with its membership in the European Space Agency and participation in the International Space Station Program, have important links to the international community. Others, such as NSERC and the NRC, provide the means and infrastructure for Canada's scientists to participate in international projects and programs. Support for Canada's international S&T linkages will be strengthened through the Standards Council's new interactive standards

network. The network will provide comprehensive, timely standards information and intelligence and allow wider Canadian participation in international standards development.

Initiatives under the international linkage principle include:

Canadian and North American technical standards. The Standards Council and the NRC have established the Canadian Calibration Network and they will represent Canada in the North American Calibration Co-operation agreement. This gives trading partners confidence that Canada's products are based on a reliable measurement system which adheres to international standards.

International technology monitoring. The Portfolio will undertake pilot projects in international technology monitoring in its two strategic research and technology initiatives, one in advanced manufacturing technologies, the other in information and telecommunications technologies.

Space technology intelligence. The international partnerships and linkages that have been central to Canada's space program for the past 35 years can be an important source of market and technology intelligence. The CSA is working with Canada's space community, especially Canadian space firms, to identify their market and technology intelligence requirements. The CSA is seeking the views of the Canadian space community on practical ways to improve the gathering and dissemination of such intelligence.

Canada-Israel Industrial Research and Development Foundation (CIIRDF). CIIRDF was established by a memorandum of understanding (MOU) between Canada and Israel to foster bilateral private-sector R&D partnerships.

INTERNATIONAL STANDARDS

Strategic co-ordination of Canada's international standardization effort by the Standards Council of Canada enables industry and government to react to proposed changes to standards that could have an economic or trade impact. A case in point was the proposal by a European member of a subcommittee of the International Organization for Standardization (ISO) to change the long-established industrial reference temperature for precisely measuring length from 20 to 23 degrees Celsius, a change that would have cost Canadian industry more than $200 million. Canada's involvement in this subcommittee gave it early warning and industry was able to mobilize and defeat the proposal.

ACOA and CIIRDF have entered a formal working relationship to collaborate in promoting and assisting bilateral partnerships between Atlantic Canadian and Israeli firms. Through this MOU, ACOA and CIIRDF will bring Atlantic SMEs into closer contact with high performing Israeli advanced technology firms,

thus providing opportunities for strategic partnerships and R&D alliances that will lead to the commercialization of technology products.

OECD technology co-operation. In September 1995, OECD ministers responsible for science and technology adopted a set of principles designed to remove obstacles to international co-operation by industry in the development of technology. Canada (through Industry Canada) led in the drafting of these principles. Industry Canada will continue to work in this policy area to facilitate international technology co-operation involving industry.

7. Promoting a Stronger Science Culture

Priority will be placed on expanding the understanding and appreciation of science and technology and their importance to innovation and knowledge-based growth.

Initiatives under the science culture principle include:

National Action Plan. Industry Canada will work with science-based departments and agencies to co-ordinate federal activities in science promotion and awareness. In early November 1995, the department sponsored a national "Partners in Innovation Culture" conference. As a consequence, Industry Canada is establishing an electronic Science Promotion Network to ensure that everyone in the country involved in the promotion of science, technology, engineering and mathematics can share information, best practices and resources, and build partnerships. As well, a National Action Plan will be developed focusing on specific strategies and activities for collaboration, addressing common issues and priorities.

International collaboration. As part of the recently-formed Public Awareness Working Group established by heads of research councils of the G-7 countries, Industry Canada and the National Research Council will represent Canada in sharing information and developing collaborative projects to foster a strong science and innovation culture in each member country and internationally.

Science training and literacy. Northern Telecom and SSHRC are jointly funding several projects involving researchers and community partners (teachers, school administrators and policy makers) to study ways to improve science training and increase science literacy. The projects examine the factors that influence career choices and propose strategies to increase enrolment in science and engineering.

Space awareness. The CSA is working with Portfolio partners, industry and the provinces to take advantage of the unique appeal of space as a medium for improving scientific literacy in the general public and promoting careers in science and technology. For example, in May 1995 the CSA, in collaboration with the NRC and ACOA, started a schools initiative which culminated in students from several Atlantic Canada schools testing their science ideas by having their experiments flown in micro-gravity conditions on board a Falcon 20 jet aircraft. The CSA is conducting a Space Awareness Program which includes the preparation of curriculum-related materials on space; the establishment, in partnership with existing institutions, of a Canada-wide network of space resource centres serving teachers, students and the general public; and an award and recognition program for teachers and students.

Regional awareness initiatives. ACOA is supporting a number of local and regional S&T awareness initiatives such as the Pan-Atlantic Technology Breakfast Series, regional technology fora and community-based workshops addressing technology diffusion issues and opportunities. In partnership with the region's SMEs and S&T stakeholders, ACOA is working to promote S&T awareness, particularly by highlighting technical success stories, and facilitating better linkages between the business and research communities in Atlantic Canada.

FORD(Q) promotion of science culture. FORD(Q) is helping a non-profit organization, La Société pour la promotion de la science et de la technologie du Québec, to initiate a number of S&T awareness programs for youth and students.

SchoolNet's Electronic Innovators. In this program, both the S&T and the K-12 education communities partner to discover, foster and mentor young innovative talent in Canada's classrooms. Students instantly access 400 key S&T experts worldwide. Currently, as a result of this program, Canada's students enthusiastically participate in more than 40 SchoolNet news groups, to keep aware of the very latest developments in S&T and information technologies. This program is being expanded.

First Nations SchoolNet. All First Nations schools under federal jurisdiction will be connected to the Internet. Industry Canada will work with First Nations partners to provide access to educational opportunities and resources which will equip students with skill sets to compete in the information age.

First Nations Innovation

SSHRC has sponsored several cultural and scientific scholars whose work has subsequently attracted investment partners. For example, SSHRC funding, in co-operation with First Nations, helped to develop the Wanuskewin Heritage Park in Saskatchewan. Today, the archeological site contains a research laboratory, an interpretative centre, and businesses that provide important employment for local First Nations people.

4. Management Framework

The Portfolio departments and agencies have policies, practices, long-range strategies and business plans to manage their resources. These have been created through careful analysis and extensive consultation. Advisory boards and councils guide decision making and priority setting and help link programs to those affected by them. New programs and strategies are based on a commitment to engage the private sector, universities and government.

The government now plans to go further. Innovative approaches to commercializing technology will be tried. New practices for managing S&T personnel are being developed.

Governance and Co-ordination

The Portfolio is taking measures to ensure a co-ordinated approach to S&T plans and strategies. A forum will be established so that the Minister, the Secretaries of State and the heads of the Portfolio organizations can meet regularly to discuss and agree upon strategy.

In addition, the Portfolio heads will meet regularly to guide the actions and undertakings presented in this document. They will oversee the co-ordination of shared goals and lead individual and joint efforts.

Results-based Performance Measurement

To achieve the desired results in performance, goals and priority setting, the Portfolio will ensure that individual and joint initiatives are evaluated. An evaluation framework and measurement mechanisms will be developed.

Flipping Ancient Artifacts

Visitors to the Canadian Museum of Civilization can manipulate 25 000-year-old figurines — turn them around, flip them over — and not even touch them. A three-dimensional colour imaging system, developed at NRC's Institute for Information Technology in collaboration with the Canadian Conservation Institute, makes it possible. The system's heart is a colour laser scanning camera that translates objects into a compact 3D digital file. Already the NRC has agreements with several firms to develop new applications of the system. An Alberta prosthetics company will build precisely fitting artificial limbs. Hymarc Ltd. of Ottawa is commercializing the colour camera technology. Another company will make better-fitting dentures and crowns. Spar Aerospace Ltd. uses the scanning technology for remote mapping of nuclear waste sites. Several other applications are also being investigated.

The goal is not only to establish clear targets and objectives, but also to shed light on key issues. These include the process of innovation; the adoption of innovation and resulting technologies by Canadian firms; the contribution of innovation to private-sector competitiveness, export performance and job creation; and the effectiveness of government S&T policy initiatives in spurring innovation.

This is a new approach to S&T policy making — a serious attempt to test assumptions against concrete findings and give science policy review a more solid foundation. One result may be a shift from periodic reviews to an ongoing process of assessment, analysis and adjustment conducted in a transparent, accountable way.

5. Conclusion

Canada must use its science and technology capabilities for jobs and growth. This is critical to establishing a knowledge-based, innovative society. Canada must rally the forces of technological, social and organizational innovation to raise productivity, and work with innovators who will create the new firms and industries that are necessary to maintain the country's standard of living. The science-based and economic-based organizations of the Industry Portfolio are well positioned to help lead this effort.

The Portfolio has embarked on a new path to encourage entrepreneurship and a solid, integrated national system of innovation. In addition to mobilizing its own tools and assets for the task, the Portfolio will forge new partnerships and strengthen and extend existing ones.

Portfolio members have already made significant changes in the way they do business. Now they are taking the additional step of joining forces to develop a shared vision of their collective role in using S&T for jobs and economic growth. This vision, and the initiatives outlined in this document to make it a reality, open a new direction in cohesive effort for Portfolio members. They will learn from their experiences together and continue to build on them.

During the coming months, Portfolio members will be exploring the ways their informal methods of co-ordination can be strengthened. The heads of the Portfolio organizations will meet regularly to compare plans and discuss common challenges and shared management opportunities.

The evaluation of outcomes and the implementation of any necessary changes are an important new aspect of the Portfolio's activities. The Portfolio will benefit from more comprehensive information on the impact of government S&T on Canada's innovation requirements. Canada will be better able to determine its competitive position among the knowledge-based economies of the world.

In conclusion, the Portfolio will position itself to make an important difference in the evolution of Canadian innovation. Its initiatives will demonstrate to Canadians the effectiveness of their S&T investments. To maximize results, the Portfolio will strengthen its own internal linkages, co-ordination and management through regular meetings, combined annual reporting procedures, and increased co-operation on joint projects. It will focus on agility, responsiveness and results, and on linking its assets to national and international sources of innovation to make Canada competitive. These initiatives will contribute to job creation, exports, economic growth and the country's standard of living.

Canada's people, its industries and its institutions aspire to the security and quality of life that a prosperous economy can assure. The Industry Portfolio will dedicate itself to helping them attain and maintain these goals in the years to come.

Annex

Atlantic Canada Opportunities Agency

The Atlantic Canada Opportunities Agency (ACOA) was established in 1987 with a mandate to promote economic development in the four Atlantic provinces through the development and delivery of locally sensitive programs and services. The agency has a legislated mandate to co-ordinate the broader spectrum of federal economic development program activities and to serve as an advocate for Atlantic Canada's interests in the development of national policies, programs and procurements. ACOA brings a strategic partnership to bear on enhancing SME competitiveness, facilitating economic adjustment and diversification, and advancing business development opportunities in Atlantic Canada's key growth sectors.

Action Plans and Strategies

ACOA views innovation and technology, in terms of products, processes and skills, as key ingredients to achieving sustainable economic growth and job creation in the region. Accordingly, the agency's strategy focuses on the advancement of knowledge and the private sector potential for innovative business applications of technology, education and training as the underpinnings of competitiveness in Atlantic Canada. ACOA uses its program instruments and resources to promote the development and use of technology and best practices. This effort is augmented by the promotion and development of effective working partnerships with S&T stakeholders in the region. In addition to the diffusion of best practices technology, ACOA seeks to foster the development and commercialization of technology-based tradeable goods and services, to develop regionally strategic sectors and to improve the S&T culture in Atlantic Canada.

Initiatives include:

Technology development and diffusion. ACOA will work with Portfolio partners, provincial governments, S&T stakeholders and the business community in support of the development of technology appropriate to the needs of SMEs and to facilitate diffusion of best practices technologies. Portfolio partnerships will emphasize joint innovation strategies, research–industry linkages and co-operation on technology-based trade.

Commercialization of technology initiative. ACOA is leading an initiative to more effectively link research being carried out at universities and research facilities in Atlantic Canada to the private sector. This initiative, which has the support and involvement of the research community and the private and public sectors throughout Atlantic Canada, develops and implements specific actions relating to university culture, bridging mechanisms, development and use of technology, and the role of government.

Development of strategic sectors. ACOA will continue to support the development of strategic industry sectors in the region, with emphasis on pan-Atlantic growth opportunities and emerging industry clusters. Priority areas include geomatics and the Atlantic Geomatics Alliance, information technologies, telecommunications/ teleservices, health care and pharmaceuticals, ocean industries, space and aquaculture.

Awareness and promotion of technology. ACOA and its partners will expand current efforts intended to promote technology awareness and to foster a stronger science culture throughout the region. Specific initiatives will include community-based workshops on technology diffusion and opportunities, technology showcases and local technology breakfasts, and development and dissemination of awareness materials and information for SMEs.

Research and planning. ACOA's research and planning agenda will include a dual technology focus: generating information useful to technology adoption by Atlantic SMEs, and strengthening innovation and technology programming and services provided by the agency. Specific issues will include the lack of linkages between research and industry across the region; technology requirements of high-, medium- and low-tech SMEs in the region; performance indicators and measurement methodologies relative to innovation and technology interventions by the agency; barriers to cluster development; and regional considerations relative to diagnostics and benchmarking.

Business Development Bank of Canada

The Business Development Bank of Canada (BDC) is a Crown corporation established by Act of Parliament in July 1995 to succeed the Federal Business Development Bank. It promotes the creation and development of small and medium-sized enterprises (SMEs) and provides specialized financing such as term loans, venture loans and venture capital. It also provides consulting, training and mentoring services. The bank serves Canadians through 78 branch offices, five regional sites and its Montreal headquarters. Its services are cost recoverable and, under its new legislation, the bank will raise equity capital from private markets.

The bank's new mandate, passed by Parliament in summer 1995, gives it the tools to move in new directions and to tailor its products to meet the needs of SMEs. The bank will increase the volume and scope of its financing; provide financing complementary to that offered by commercial lenders; and introduce innovative products for both new-economy firms and firms in traditional sectors of the economy. Financing knowledge-based companies that lack the collateral often demanded by commercial financial institutions is a priority. The assets of knowledge-based firms are usually intangible intellectual capital such as patents and software.

Action Plans and Strategies

Immediately after its creation in July 1995, the BDC announced two new financing products. **Patient Capital** provides long-term capital under flexible repayment terms. It will appeal to entrepreneurs, especially in knowledge-based firms, who are in the early stages of expanding their companies and need financing on reasonable terms.

Micro-business loans are targeted to small businesses requiring less than $50 000 in financing. They offer procedures to ensure prompt response and minimal costs.

These new products join established ones: **working capital for growth loans**, available since 1994, which top-up lines of credit from other financial institutions, and **venture capital** and **venture loans**, which provide equity and quasi-equity financing for innovative firms in early stages of expansion. The bank is developing strategies to implement its new priorities.

Canadian Space Agency

The objectives of the Canadian Space Program (CSP), announced in June 1994, are to develop and apply space S&T to meet the needs of Canadians and to stimulate an internationally competitive space industry. The new CSP stems from extensive consultation and represents a broad consensus among interests. It is results-oriented and makes substantial use of partnerships. For instance, more than 85 percent of its funding is contracted to Canadian industry and scientific organizations. The major initiatives are:

- commercialization of the Earth observation sector through implementation of RADARSAT II, Ground Infrastructure Development and Satellite Data Applications programs;
- a revised Canadian Space Station Program with additional astronaut flight opportunities;
- advanced satellite communications technologies to benefit all Canadians; and
- strategic initiatives to maintain excellence in space science and to enhance industry's capabilities in space technologies.

Action Plans and Strategies

Under the new Canadian Space Program, the Canadian Space Agency (CSA) will launch important new thrusts. Priority will go to developing and applying space technologies in Earth observation and communications. To ensure commercial success, federal funds will be maximized through partnerships with the provinces and innovative financing. The program will be open to more firms, particularly small and medium-sized enterprises. Sustainable regional industrial development will be pursued, as will the growing synergy between civilian and defence space activities. A major challenge will be to implement these new thrusts with significantly declining annual resources.

Strategic Space Technology Diffusion Program. The CSA will strengthen its technology-transfer activities. This program will promote the exploitation of space technologies. The Canadian Space Technology Commercialization Network will be a key node in the Canadian Technology Network.

Partnerships. The CSA will conclude arrangements with the private sector to build and commercially operate RADARSAT II and its successors. The overall objective is to develop an internationally competitive Canadian industry in the applications of Earth observation satellite data. The CSA will also develop a new generation of advanced satellite communications technologies to provide new widebands and personal communications services.

International co-operation. The CSA will put in place organizational structures to help industry market internationally and develop business services. International co-operation is integral to all major space projects and programs.

Science culture. The CSA will advance the unique appeal of space as a medium for improving scientific literacy and promoting S&T careers amongst youth. Its coverage will include fellowships to perform industry-led research in CSA's facilities. Existing institutions will diffuse educational material and hold training workshops with educators in all regions of Canada.

Performance measurement. The CSA is developing performance indicators to improve the effectiveness of its programs as well as to establish clearer goals, monitor progress and reward achievements.

Space Program Overview Committee. The CSA has created the Space Program Overview Committee, which is made up of some 60 representatives from all space interests across Canada, including industry, the scientific community, the provinces and key federal departments and agencies. The committee provides advice on all strategic matters related to the planning and implementation of the Canadian Space Program.

Federal Office of Regional Development (Quebec)

The Federal Office of Regional Development (Quebec) (FORD(Q)) was established as a separate agency in 1991. Through its commitment of service to its clients, FORD(Q) supports the development of the economic potential of all regions in Quebec, as well as sustainable job creation to stimulate a business climate that allows small and medium-sized enterprises (SMEs) to grow and prosper. FORD(Q) seeks to merge relevant and sought-after federal government expertise with the entrepreneurial spirit of all Quebecers and to improve their competitiveness. FORD(Q) is also working to improve the business climate for SMEs, a critical element in their development, through its developmental thrusts and its alliances with the other interested stakeholders.

Action Plans and Strategies

The three pillars of FORD(Q)'s strategy are:

- integrated delivery of federal programs and services for SMEs through its network of 13 small business access centres
- improved leadership of federal economic development activities
- harmonization of federal and provincial programs and services targeting SMEs

FORD(Q)'s main thrusts focus on areas where the federal government provides substantial value added, such as development of international markets, innovation and entrepreneurship. With regard to innovation, departmental activities are aimed primarily at accelerating and encouraging product development, and adapting and marketing new products, technologies, processes and designs. They also seek to spread awareness and know-how among SMEs. FORD(Q) has created IDEA-SME, a program which offers a new range of activities and services based on the diverse needs of SMEs. It is complementary to the programs of other organizations operating in this area. Furthermore, with the goal of stimulating a business climate that encourages job creation and economic development, the agency also provides support for strategic developmental projects, particularly those relying on private sector partnerships.

With a view to maximizing the impact of federal programs and services aimed at SMEs and which demonstrate a "Team Canada" approach, FORD(Q) has signed memoranda of agreement with the Department of Foreign Affairs and International Trade, Industry Canada, the Business Development Bank of Canada, and Agriculture and Agri-food Canada

with respect to market development. Memoranda of agreement in the area of innovation have also been signed with the National Research Council, the Canadian Space Agency, Industry Canada and Environment Canada.

Through its association with Info Entrepreneurs, the Canadian Technology Network, Inno-centre, the Centre for the Promotion of Quebec Software and other partners, FORD(Q) also helps SMEs to meet their need for acquiring, adapting, managing or commercializing technologies, and assists them during their start-up phase with market development.

Moreover, to encourage the development of SMEs focused on knowledge and the new economy, FORD(Q) has established the IDEA-SME Fund, in co-operation with the Business Development Bank of Canada, and is preparing to conclude other strategic alliances with financial institutions in order to provide complementary financing that would otherwise not be accessible to those SMEs.

Industry Canada

The Department of Industry (Industry Canada) helps to make Canada more competitive by fostering the growth of Canadian business; promoting a fair, efficient marketplace; and encouraging scientific research and technology diffusion. It has three key S&T organizations: the Communications Research Centre (CRC), which is described on the next page; the Centre for Information Technology Innovation (CITI), an applied research centre in information technologies working with Canadian companies and universities; and the Canadian Intellectual Property Office (CIPO), which administers intellectual property legislation (patents, trademarks, copyrights, industrial designs and integrated circuit topographies).

Action Plans and Strategies

Industry Canada has established three main lines of business, each with a significant S&T dimension: microeconomic policy; marketplace rules and services; and industry sectoral development. Together these measures will extend technology policies and activities so that more firms use advanced technology more effectively and develop strategies for maximizing the benefits of the Information Highway. Industry Canada will ensure that the S&T capabilities and expertise needed to deliver effective marketplace rules, regulations and services will be in place to encourage innovation. It will help Canada's industrial sectors become more innovative and competitive by providing focused trade, technology, investment and human resource development services; by developing comprehensive sector competitiveness frameworks; and by providing unique, world-class information products based on sectoral analysis and international benchmarking.

Initiatives include:

Technology roadmaps. Industry Canada will collaborate with the private sector to prepare industry-led pilot technology roadmaps in selected areas. The roadmaps will examine anticipated markets, identify technologies to meet market needs, and set priorities for private and public investment in selected areas of technology.

Sectoral initiatives. These include implementation of Technology Partnerships Canada (TPC); strategic frameworks across sectors; development of an Advanced Materials Network; the Canadian Industry/University Alliance for Excellence in Environmental and Chemical Research; forestry technologies workshops; work to integrate enabling technologies on

manufacturing plant floors; an Information Clearinghouse on Recycling Technologies; analysis of strategic opportunities in Intelligent Transportation Systems; and collaboration within the North American automotive industry for development of next-generation technologies in areas where Canada has niche strengths.

Standards information. Industry Canada and the Standards Council of Canada will work with industry to establish linkages with other international on-line standards networks to make standards and the standard-setting process more accessible to SMEs.

S&T information products. The Canadian Intellectual Property Office (CIPO) is automating its patent system. This project, TECHSOURCE, will result in the largest documentation imaging system in the federal government and will dramatically improve access to patent information. CIPO will also explore electronic linkages to foreign patent offices. Industry Canada is also leading an interdepartmental effort to provide an electronic guide to Canadian S&T capabilities.

Diffusing technology. With industry associations and other institutions, Industry Canada will launch a multi-pronged strategy to encourage the use of the best diagnostic and benchmarking instruments to assist firms with the adaptation of new and improved technologies and methodologies. Another initiative is Trans-Forum, an Internet-based technology transfer tool which, by providing key information, helps universities and colleges to market technology opportunities and expertise to Canadian firms.

Communications Research Centre

The Communications Research Centre (CRC) is the federal government's principal research and development laboratory for advanced telecommunications and information technologies. As a government laboratory, the CRC contributes scientific and technical knowledge in support of the Portfolio's statutory responsibilities in telecommunications and broadcasting infrastructure development such as standards and regulations. It helps companies remain competitive by providing linkages between industry and government R&D and regulatory activities, and transferring knowledge and technology to the private sector. The CRC is undergoing a five-year trial project in innovative methods of managing government research.

Action Plans and Strategies

R&D Leadership. The CRC conducts R&D that contributes to public policy and to a regulatory environment that allows industry to exploit advances in technology quickly to create new products and services. The CRC also helps industry understand and apply these technologies. Because government laboratories' time horizons are intermediate to those of industry and universities, they play an important role in Canada's system of innovation by providing linkages between knowledge and commercialization.

Strategic alliances. The CRC's alliances leverage resources, create synergy, minimize costs and provide wide access to expertise. They provide a window into the activities of the CRC and its partners, and augment core competencies and technology transfer among organizations. The CRC will strengthen its industry linkages, which will help establish international contacts for market development.

Innovative resource management. In this period of restraint, resources must be used effectively. The CRC has implemented innovative management and human resource practices such as the rejuvenation program to recruit young scientists for training. Several initiatives provide industry with access to the CRC's specialized research facilities. In co-operation with NSERC, the CRC offers scholarships to encourage students to pursue studies in communications and information technologies.

Knowledge exploitation. Companies exploit knowledge transferred from the CRC to generate new business and profits and provide economic benefits. The CRC further exploits its knowledge base and intellectual property through a technology incubator facility for start-up companies. The CRC also conducts a personnel exchange program to increase the two-way transfer of knowledge between industry and CRC researchers.

Program management. To foster the development and implementation of new communications services, the CRC supports government initiatives through the management of major Crown projects such as the MSAT program and the Advanced Satcom program which are to be undertaken on behalf of the CSA in collaboration with industry. Management of such programs encourages close relations with industry, increases the CRC's influence in infrastructure development and maximizes the use of the CRC's core capabilities.

National Research Council

The National Research Council (NRC) is the federal government's main research and development agency dedicated to industrial innovation. Through its 18 research institutes across the country, its national S&T information centre (the Canada Institute for Scientific and Technical Information, CISTI) and the national network of its Industrial Research Assistance Program (IRAP), the NRC provides Canadians with integrated S&T capabilities in support of innovation. Its research, development, information, standards and technology-transfer activities focus on sectors and technologies of strategic importance to Canada.

With its commitment to enhancing innovation, the NRC will take a more entrepreneurial approach to innovation and technology transfer. This will ensure that the scientific knowledge, technology and related services that the NRC generates correspond to the country's technological needs for the short, medium and long term. The NRC will focus its investments on partnerships within and outside the Portfolio to advance the competitiveness of Canadian industry.

Action Plans and Strategies

Technology groups. The NRC has reorganized its R&D programs into five technology groups in accordance with the major sectoral and scientific needs of a knowledge economy: new manufacturing technologies, biotechnology, infratechnologies for measurement and testing, information and telecommunications, and construction.

Industrial Research Assistance Program — Canadian Technology Network. The IRAP-CTN networks provide technology and business development advice and support to SMEs. The NRC will expand the connections, deepen the technology sources and build new business capabilities into these networks. The networks will

remain an integral part of the NRC's strategy to help companies become more globally competitive through research, technology and technical intelligence.

Canada Institute for Scientific and Technical Information. CISTI will undergo further changes as it evolves into a 21st-century electronic library connected to a vast network of information. With its business and institutional partners, CISTI will be a pioneer in building a virtual data-information system for Canadian scientific and technical needs, by utilizing the Internet and future broadband capabilities, and by using new technologies and information sources as they become available.

Fellows program. In 1996, the NRC will launch an internship initiative or Fellows program to enable sponsoring agencies to obtain recent post-doctoral and graduate student interns for up to two years of specialized training in the agencies and in its joint projects with industrial partners. The program will concentrate on advanced S&T research (NRC, CSA, CRC), technology management (SSHRC, NSERC), and business information products and systems production (Industry Canada).

Entrepreneurship. The NRC is moving rapidly to become more entrepreneurial, maximizing opportunities for knowledge and technology transfer. New programs to encourage spin-offs and start-ups of new firms are being implemented by creating new linkages to financial institutions and by supporting new innovative business practices. Incentives are being put in place to stimulate individual and organizational innovation, as well as cultural change.

Natural Sciences and Engineering Research Council

The Natural Sciences and Engineering Research Council (NSERC) funds university-based research in the natural sciences and engineering. This research is a cornerstone of Canada's national system of innovation; the Council's grants and scholarships are critical to an advanced society and a knowledge-based economy. NSERC funding is awarded on a competitive basis. Excellence is assured through rigorous peer review.

NSERC's partnerships programs and Industrial Research Chairs play key roles in the transfer of university technology and expertise to Canadian business. More than 1000 private-sector partners have participated in university-industry research projects; over 200 Industrial Research Chairs have been established to date, in partnership with Canadian businesses.

NSERC's guiding strategy, Partnerships in Knowledge, calls for increased research collaboration across sectors and disciplines through stronger links between university researchers and other sectors; more relevant student training and greater exposure of students to interdisciplinary and cross-sectoral research; and better communication among researchers, the public and users to ensure that researchers recognize their accountability for research funds and communicate the value of their knowledge and discoveries to users and the public.

Action Plans and Strategies

National Initiative for Scientific Computing (NISC). Computing and computers evolve quickly, which means that equipment soon becomes obsolete and must be replaced. NISC defines a clear role for NSERC in the areas of

computer networking, large-scale computation and support of local computing environments. Its purpose is to make Canadian research more competitive; enhance training; and improve S&T capabilities in laboratories, universities and other sectors. NISC involves nine components, including direct funding to allow researchers to access top-end facilities, joint establishment of a National High Performance Computing Centre, and steps to ensure that Canada's Information Highway equals counterparts in the United States and Europe. Implementation of NISC will involve federal organizations, provinces and the private sector.

Expert review of government laboratories. NSERC's expertise in managing expert reviews of research programs and laboratories will be made available to the Portfolio and to other departments across government. These reviews will take advantage of NSERC's access to experts in universities, government and the private sector. The advisory boards of Portfolio laboratories and the expertise resident in other agencies and granting councils will also make important contributions.

Networks of Centres of Excellence (NCE). NCEs link university R&D to wealth creation in the private sector and to economic and social advancement by managing multidisciplinary and multisectoral research and facilitating its transfer to users. The networks stimulate leading-edge fundamental and applied research, and develop world-class Canadian scientists and engineers. Jointly funded by NSERC, SSHRC and the Medical Research Council with a budget of $197 million, the NCE program added four new networks in June 1995 in the areas of health, environment, advanced materials and technology-based learning.

Investment fund. Realizing the need to develop and commercialize the results of university-based research, and to ensure that publicly-funded research is developed in Canada for economic growth and job creation, NSERC has just negotiated a memorandum of understanding with a management group in the science and engineering sector. With NSERC support, the group will create an investment fund, with the aim of using knowledge developed in university laboratories and improving the transfer of technology to Canadian industry. The primary objective of this fund will be to invest in the science and engineering sector, with an emphasis on businesses engaged in early stage commercialization of research and product development. The fund manager will provide management services, including due diligence review, and analysis of businesses to be considered by the fund. Among other things, NSERC provides access to the peer review process and expertise.

Social Sciences and Humanities Research Council

The Social Sciences and Humanities Research Council (SSHRC) is the federal government's principal instrument for supporting social sciences and humanities R&D. SSHRC sustains a dynamic, diversified Canadian research capacity by supporting basic research across the range of social sciences and humanities disciplines, and strategic collaborative research on key policy issues: SSHRC promotes international collaboration in research and the broad dissemination of results. Its fellowships are awarded to the best researchers and the most promising graduate students through a rigorous peer review process.

While supporting basic research remains SSHRC's major responsibility, it will also focus on linking research to key socio-economic and

cultural issues and on increasing its contribution to informed decision making in the public and private sectors through multidisciplinary collaboration.

Action Plans and Strategies

Major Collaborative Initiatives. This program supports large innovative initiatives of exceptional quality and significance conducted in a collaborative multidisciplinary environment. Seven leading-edge research endeavors are currently supported under the program. One is the Canadian Entrepreneurship Research Alliance (ERA), whose central objective is to discover why some business ventures succeed while others fail. The 20-member ERA team will create and disseminate knowledge about the formation and growth of new enterprises. The collaborative network of leading Canadian and international scholars and institutions, including business and government officials, will present the most comprehensive examination ever undertaken of entrepreneurial success and failure in Canada. ERA has a five-year grant of $2.1 million from SSHRC and $1.5 million from the University of British Columbia and industrial partners.

Joint Initiatives Program — Partnerships to Advance Canadian Innovation, Research and Development. The joint initiatives are co-developed and co-funded by SSHRC and private-sector and public-sector partners to generate knowledge for policy making on national issues. SSHRC is expanding its Joint Initiatives Program with Immigration and the Metropolis (funded by SSHRC, Citizenship and Immigration, and other federal departments) which will sponsor four research centres to examine how immigration transforms countries, cities and communities. Part of an international project with Australia, the United States, Italy and Austria, the program will look at the economic, social and cultural dimensions of immigration, and the relationship between immigration and education.

Health-care reform and social programs. In response to the NABST report on the vital contribution of social science research in reconfiguring health-care and social programs, SSHRC will seek partnerships with relevant S&T departments to develop and co-ordinate research to guide policy making on these important quality-of-life issues.

Education and learning. SSHRC is launching a new program to support research networks intended to influence education strategies, policies and practices in such areas as commercial and vocational education, lifelong learning and apprenticeship programs. The program will promote multidisciplinary, problem-oriented research, partnerships with policy makers and practitioners, and knowledge transfer.

Standards Council of Canada

The Standards Council of Canada is a Crown corporation established in 1970 to promote voluntary standardization as a means of advancing the national economy; protecting the health, safety and welfare of the public; assisting and protecting consumers; facilitating domestic and international trade; and furthering international co-operation on standards.

The Standards Council accredits organizations engaged in standards development, certification, testing and calibration, and quality systems registration; represents Canada on the International Organization for Standardization

(ISO) and the International Electrotechnical Commission (IEC); approves National Standards of Canada; disseminates information; and, under contract from Foreign Affairs and International Trade Canada, operates the Canadian Enquiry Point Services for the North American Free Trade Agreement and the World Trade Organization.

Recognizing the need to be more strategic and focused, the Standards Council will play an expanded role in supporting national economic and social objectives, including the building of a more innovative economy.

Action Plans and Strategies

The Standards Council is becoming a more dynamic and responsive organization. It is focusing its international efforts on standards activities that support Canada's economic and trade interests. The council is responsible for Canadian participation and input into more than 400 ISO and IEC technical committees which are developing standards for products and management systems, many of them dealing with emerging technologies.

In 1993, the Standards Council and Industry Canada sponsored a major study on standards and technology diffusion, a critical element of a national innovation system. The council's more than 4000 technical volunteers who take part in ISO and IEC work represent a valuable source of technical intelligence that can help businesses, especially SMEs, to be more innovative and competitive.

Timely access to standards intelligence and strategic involvement in setting standards are essential. A council priority is the development of an interactive electronic standards information service to be linked to the Canadian Technology Network and international networks. The council leads a partnership of standards organizations, industries and government departments on this project.

The Standards Council will expand its partnership initiatives within the Portfolio, for example, with CISTI in information dissemination, with IRAP to disseminate standards advice and intelligence, and with NSERC on integration of standards research in the council's programs. Similarly, it will expand partnerships with other public and private interests in areas that support an innovative economy.

Statistics Canada

Statistics Canada collects, compiles, analyzes, publishes and disseminates statistical information. Serving the information needs of all sectors, this internationally-renowned department is the core of Canada's socio-economic information system.

Statistics Canada responds to strategic information requirements regarding economic globalization, the Canadian economic union, the microeconomic factors affecting Canadian competitiveness, the impact of S&T, outcomes of health and education expenditures, and the effects of social programs. The cost of strategic information is small in relation to the cost of the complex policy issues and programs they illuminate. Its leverage value — or, conversely, the cost of not having good information to direct, target and assess policies — is immense.

To keep abreast of changing information needs, Statistics Canada maintains contact with federal departments, the provinces, the academic

community and other clients. It works closely with Industry Canada on policy-related statistics and with the NRC on problems in measuring innovation and technology use.

Action Plans and Strategies

Information System for Science and Technology. To provide a better, more coherent picture of Canadian science and technology and its relation to the rest of the world, Statistics Canada will design an S&T information system. This system will inform Canadians about the effectiveness of government initiatives in promoting innovative activity, diffusing technology and adopting new ideas. By ensuring that the information is internationally comparable, the system will allow Canada to compare its ability to create and capture ideas and convert them to wealth and quality of life with that of other countries.

Canada has a pressing need for better measures of R&D, of innovation in production and trade, and of the linkages between and within sectors related to R&D, innovation and diffusion. Better financial indicators dealing with capital and tax incentives are needed. It is also important to contribute to the development of international standards so that Canadian S&T indicators are comparable with those in other industrialized countries.

Besides producing an information system for Canadian S&T, this four-year initiative will put Canada in an international leadership role in defining and using S&T indicators. Another payoff for Canada is the development of expertise on the Canadian innovation system, the knowledge-based economy, and the use of science and technology to enhance wealth, knowledge and quality of life.

Western Economic Diversification Canada

The Department of Western Economic Diversification's (WD) S&T strategy focuses on the development and use of innovation and technology in Western Canada to support economic growth and job creation, particularly through support to SMEs. WD is providing leadership in the following key activities under the strategy:

Federal/Provincial Task Force on S&T. This Task Force, which has membership from WD, the NRC, Industry Canada and the four western provinces, as well as their respective provincial research councils, is focusing on priorities related to strategic infrastructure, commercialization of research and development, and creating an S&T culture in Western Canada. An MOU on S&T Co-operation has been agreed to. The Task Force has undertaken a number of initiatives in support of the MOU:

- **Enabling Technology Cluster Strategy.** The focus of this project is to strengthen enabling technology cluster groupings significant for the future of Western Canada. Strategies are being developed to take advantage of opportunities related to biotechnology, information technology, and advanced materials and manufacturing. The strategic context is the national system of innovation concept. Strategy development is being accomplished through a process that uses the expertise and the participation of the private sector.
- **Western Canadian University Technology Network.** This is an initiative of 11 western Canadian universities which will focus on

accelerating the transfer of academically-borne technologies into western Canadian enterprises through a new joint partnership with industry.

- Other Task Force initiatives involve promoting best practices in technology transfer and commercialization and improving S&T awareness and culture in Western Canada.

Knowledge-based Investment Funds. Access to capital is a critical issue for western-based technology companies. To address this, WD, in co-operation with financial institutions in Western Canada, is establishing investment funds on commercial terms targeted at emerging knowledge-based sectors. Technology-related investment funds focusing on Biotechnology ($30 million), Health Sciences ($20 million), and Knowledge-based Industries ($25 million) have recently been established. Loan programs for Information Technology and Telecommunications ($40 million) and Environmental Technologies ($40 million) will be announced in 1996.

Initiatives include:

- **Tri-University Meson Facility (TRIUMF).** The TRIUMF laboratory at the University of British Columbia, in co-operation with the NRC and WD, is implementing plans to assist technology firms and entrepreneurs in Western Canada to commercialize technology flowing from new research activities at TRIUMF and CERN and to sell the resulting products in the international marketplace.
- **Westaim Technologies Inc.** WD and the NRC are working with Westaim Technologies Inc., a subsidiary of Sherritt Inc., to carry out research to commercialize advanced industrial materials. Westaim's early research and development projects are now yielding significant results in terms of new products, investment, jobs and revenue.
- **Whiteshell Nuclear Laboratories.** On January 3, 1996, the Ministers of Natural Resources and Western Economic Diversification announced the establishment of a task force to examine alternative uses for AECL's Whiteshell Laboratories at Pinawa, Manitoba. The task force will be assisted by WD, NRCan and the NRC.