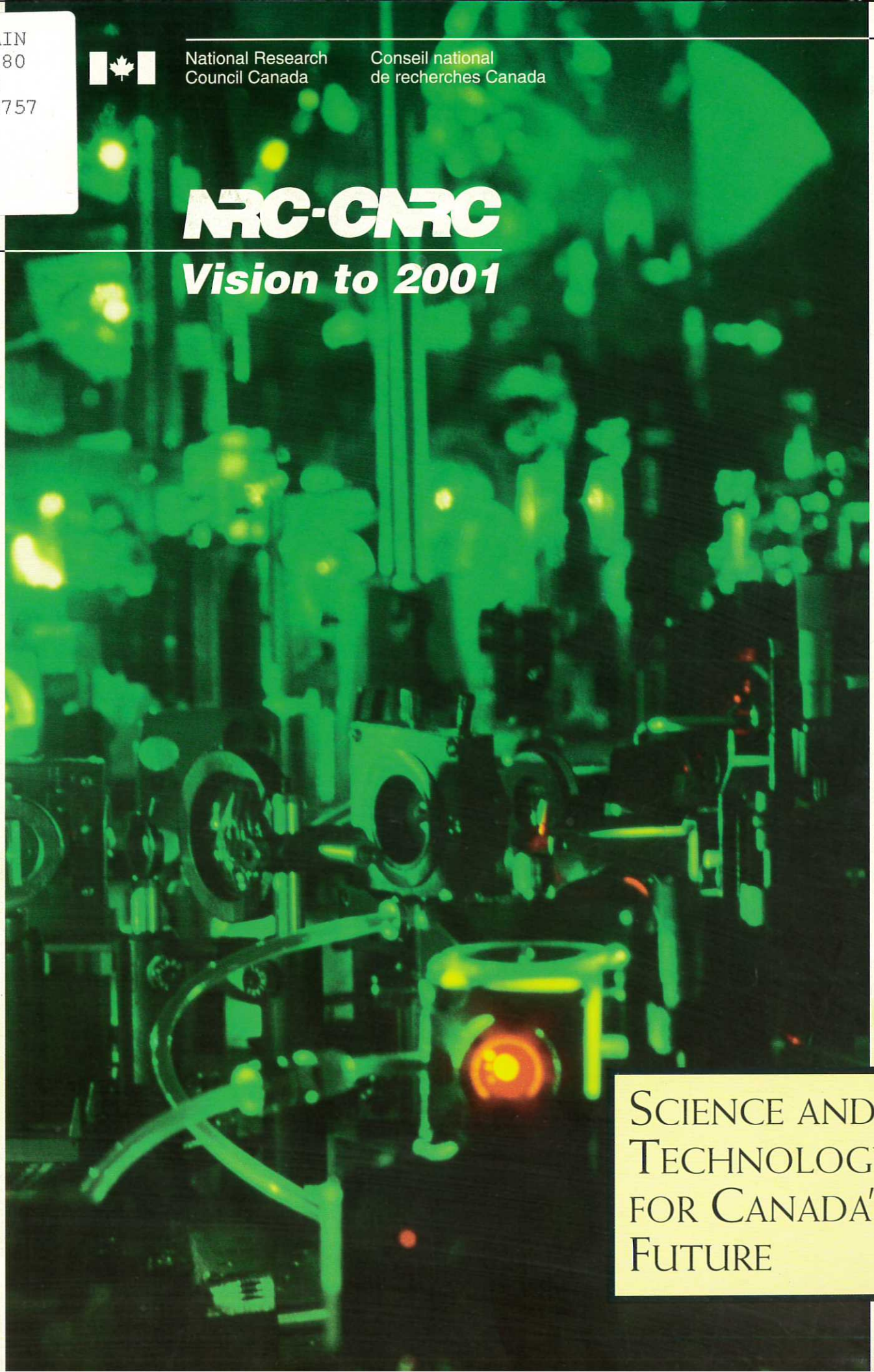
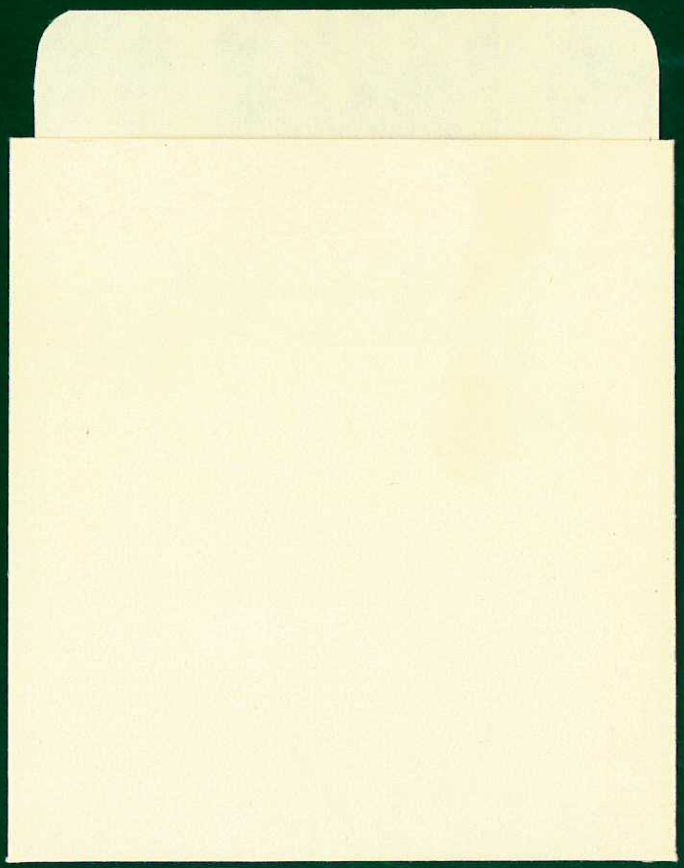
National Research Council Canada
Conseil national de recherches Canada

NRC-CNRC

Vision to 2001



Science and Technology for Canada's Future



NRC's Vision

As Canada's foremost R&D agency, NRC will be a leader in the development of an innovative, knowledge-based economy through science and technology.

We will realize this vision by:

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

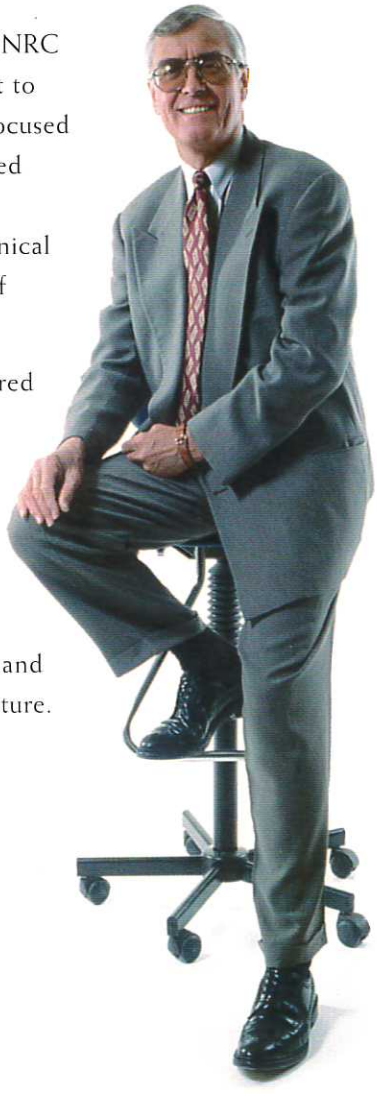
SCIENCE AND TECHNOLOGY FOR CANADA'S FUTURE

The NRC of today is the product of significant changes over the past five years. In the aftermath of major budget cuts, we have had to take a fresh look at what we do and how we operate. Just as our private-sector partners have had to challenge themselves to remain relevant and efficient, so too have we.

I believe this process has equipped today's NRC with well-defined priorities and a clear emphasis on wealth-creating activities. We are focusing our research institutes into five Technology Groups to serve sectors of the new Canadian economy that will benefit most from scientific and technological innovation. We are aggressively building partnerships with industry as well as with the university and government sectors. In particular, we are helping to coordinate Canada's science and technology resources and to link them into a national system of innovation. We are increasingly applying our efforts to Canada's communities because we understand that much of the nation's innovation is based on regional technological strengths.

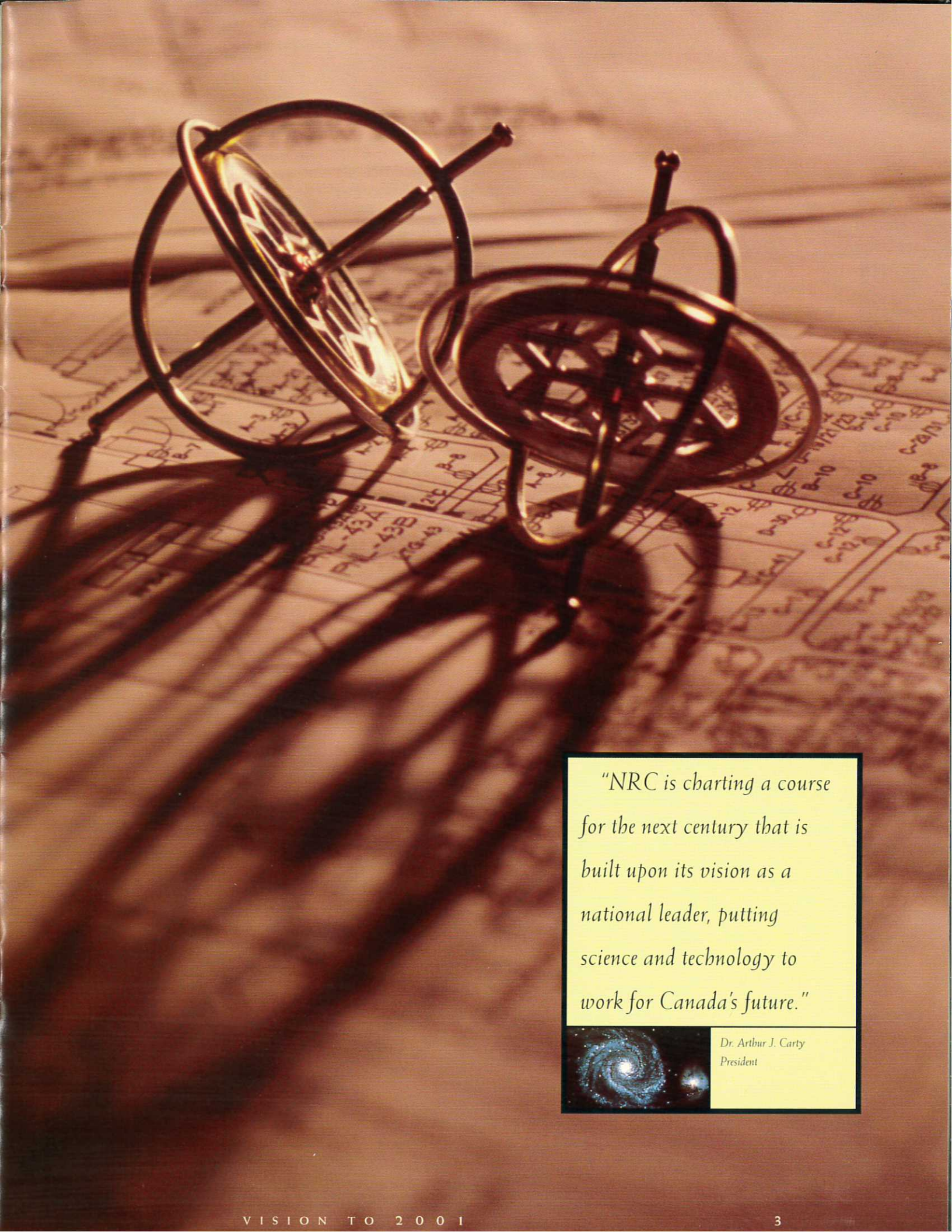
The major restructuring is complete. The next five years will see NRC fine-tune its activities based on its successes. With a commitment to excellence, a new entrepreneurial attitude, outstanding people, focused projects, the finest research facilities in the country, and acclaimed programs and services such as our Industrial Research Assistance Program (IRAP) and the Canada Institute for Scientific and Technical Information (CISTI), we will continue the great NRC tradition of helping industry build Canada's knowledge-based economy.

This document presents a revitalized vision of NRC, a vision shared by our governing Council, our management team, and our employees. In these pages you will find the substance of how our organization — the government's largest pool of scientific and technical expertise — will operate to the year 2001 and beyond. Each year we will report on our achievements and how we intend to improve. In this way, NRC will ensure that it continues to contribute to the economic progress of our country and to harness the benefits of science and technology for Canada's future.



Arthur J. Carty

Dr. Arthur J. Carty
President



"NRC is charting a course for the next century that is built upon its vision as a national leader, putting science and technology to work for Canada's future."

Dr. Arthur J. Carty
President

THE NATIONAL NEED: INNOVATION

The world economy has created a marketplace driven by innovation. In an age where a single personal computer is more powerful than the mainframes of only a decade ago, the role that transformational technologies play in changing our society is clear. Information technologies. Biotechnologies. Computer-aided design and manufacturing. These exciting areas of endeavour are transforming the economy of our nation and the entire world.

Whether we, as Canadians, can expect to maintain and enrich our number-one position in the world for quality of life depends largely on our ability to develop a more innovative, knowledge-based economy. The challenge is considerable. Trade liberalization and growing economies elsewhere are opening our industry to intense competition. More than ever before, capital flows quickly to the nation that offers the best conditions for innovation: the best minds and the best infrastructure.

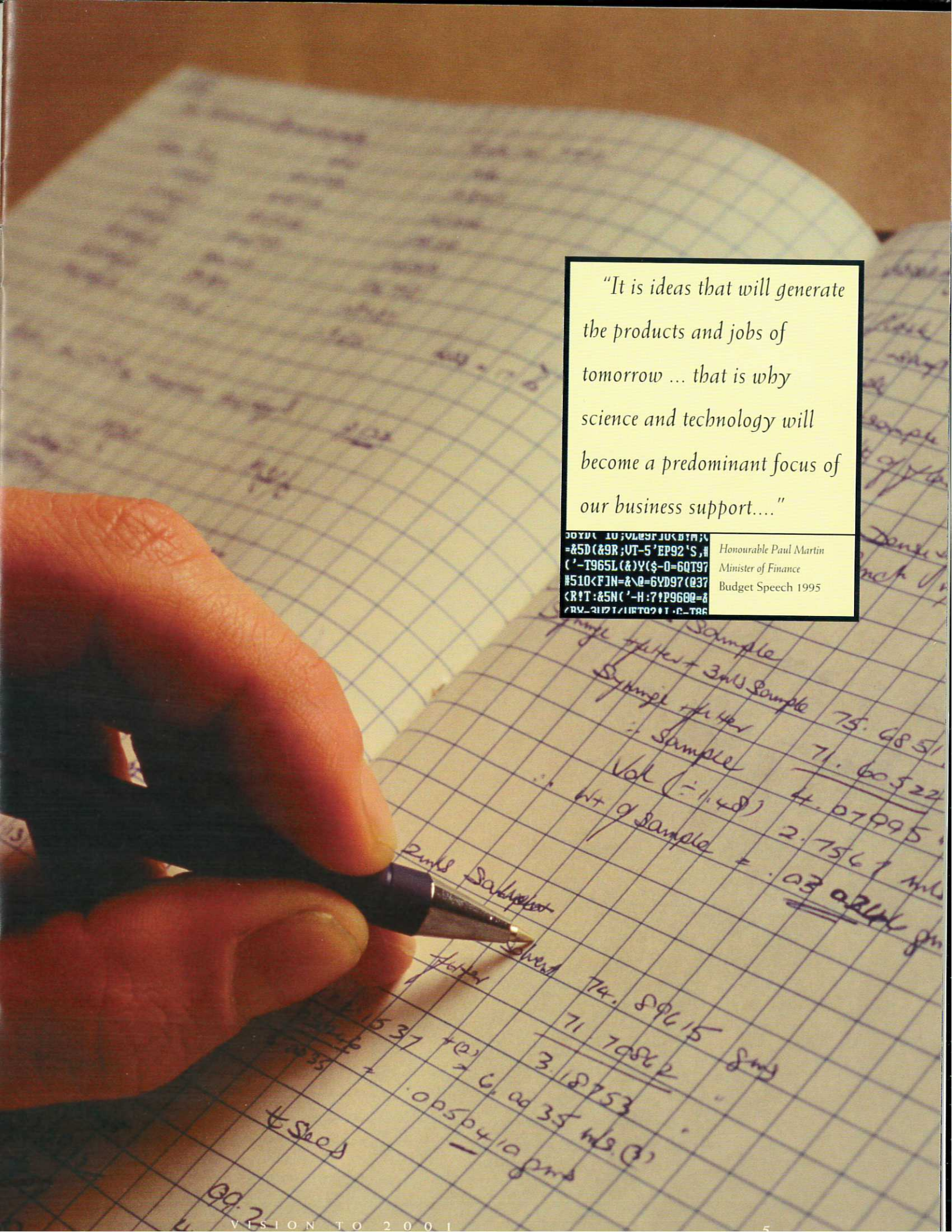
THE NEED FOR A CANADIAN SYSTEM OF INNOVATION

Creating and developing innovative products and processes is often a long and expensive process. Sophisticated facilities, staffed by world-class researchers, are frequently required to carry out the research and development. Investment can take several years to translate into marketable products. Going it alone can prove to be a costly, often impossible, route for many Canadian firms. And so we see industry increasingly moving toward inter-firm alliances and partnerships with organizations like NRC, for shared risks and rewards. As Canada builds a more innovation-based economy, we must look to a greater degree of collaboration to give us the depth and strength to compete.

At present, Canada does not have a fully integrated system of innovation to bind together the key factors which impact our knowledge-based economy. We must develop the means of integrating all the factors — financial, industrial, scientific, technical and educational — that help industries turn research into commercial successes.

A FEDERAL ROLE

Industry is the prime vehicle for translating innovative ideas, products, and processes into wealth. But federal government research organizations have an important role to play as well. Departments and agencies can help by creating the best environment to nurture our innovators, by linking knowledge and application, and by working together to build linkages among players in Canada's innovation system to ensure that their activities find expression in Canada's communities. They must work with Canada's economic realities and recognize the interrelations between advancement of knowledge, job creation, economic growth, and quality of life. By working in a straightforward, business-like fashion, by setting goals and monitoring results, government research organizations like NRC can play a critical role in an efficient and effective Canadian system of innovation.



"It is ideas that will generate the products and jobs of tomorrow ... that is why science and technology will become a predominant focus of our business support...."

Honourable Paul Martin
Minister of Finance
Budget Speech 1995

THE CHALLENGE

A POWERFUL NATIONAL RESOURCE

NRC has indeed "re-made itself." Today's NRC is client-focused, business-like, and poised to build a future based on creativity and innovation.

LABORATORIES

We are recognized internationally for the strength of our laboratories, our staff, and our research leadership. We produce many of the country's most significant scientific breakthroughs — from world firsts in manufacturing and pharmaceutical development to discoveries that have literally redefined the age and size of the universe. What has changed, however, is *how* we accomplish our mission. Both excellence and relevance are now critical in determining which projects receive funding. Collaborating with private- and public-sector partners is the norm. Today all NRC laboratories are guided by client input, clear missions, and business plans.

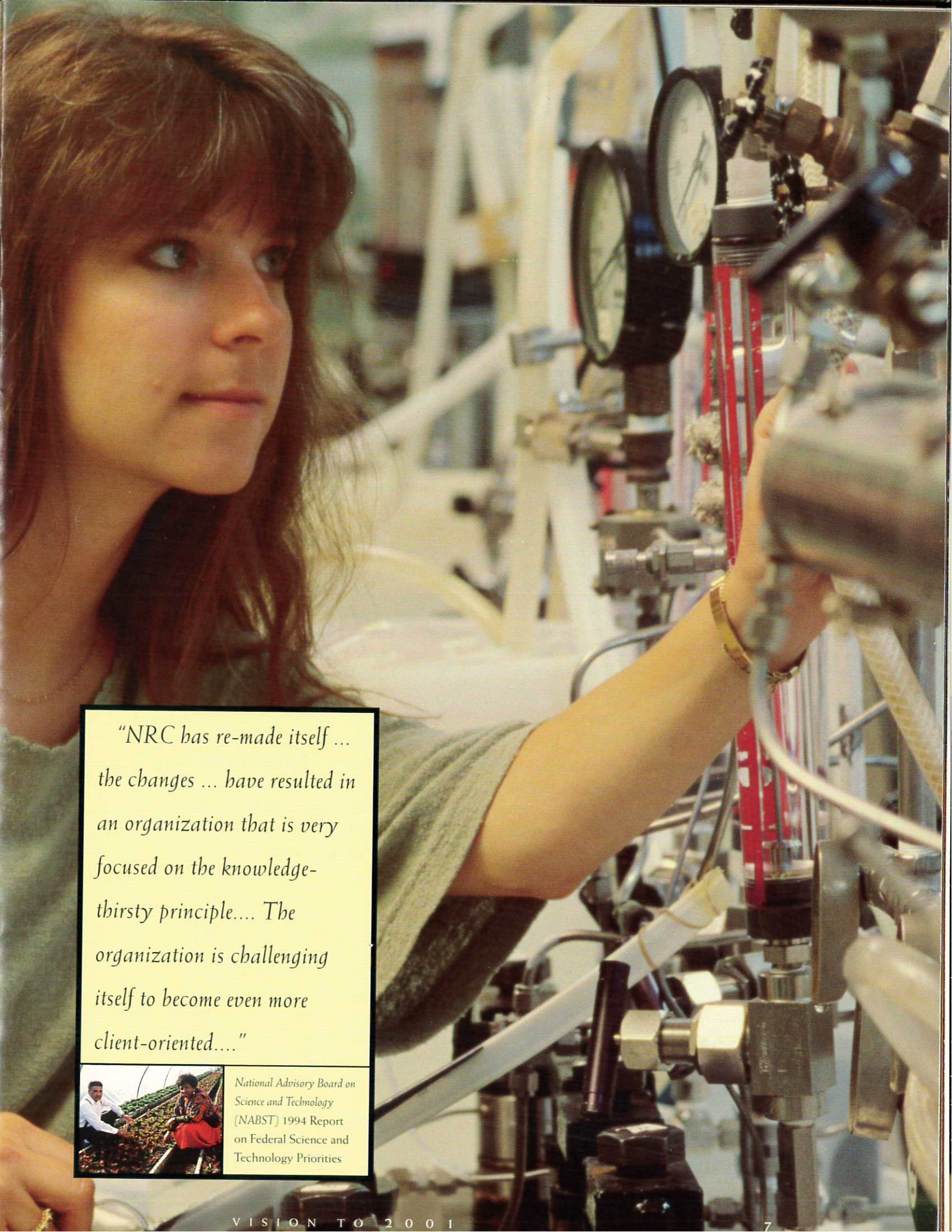
Our partners have shown their confidence by investing heavily with us in technology and received benefits in return. This investment increased even during difficult times for industry. Over the last five years, our collaborators have produced and marketed a variety of successful products and services from food sensors to vision systems based on NRC technologies. As well, our measurement standards activities have given Canadian-based exporters a leg up in promoting quality systems and products. And our activities with government departments, such as research on aircraft maintenance systems, save taxpayers millions of dollars annually.

IRAP

IRAP is the envy of the world as a means of providing technology assistance to small- and medium-sized businesses. Its success is revealed in the achievements of its clients, which often sweep export, innovation, and other business award competitions. For example, in 1994, IRAP clients walked away with all six top prizes for invention, innovation, and small business in the Canada Awards for Business Excellence. IRAP itself received the prestigious Manning Foundation Award of Excellence in 1995 in recognition of 50 years of support to Canada's small- and medium-sized innovators. Approximately 10,000 clients receive advice each year from IRAP, including some 3,500 whose technical projects are co-funded by IRAP. A study of IRAP projects suggests that roughly 10,000 jobs are created or saved each year at a cost of just over $8,000 each.

CISTI

Over the last five years, CISTI has gained recognition as having North America's leading collection of medical, scientific, and technical information. CISTI's continuing leadership in electronic information systems was recognized with the 1995 Canadian Information Productivity Award of Excellence for its new IntelliDoc service. This highly integrated system processes 1,500 orders daily from CISTI clients in Canada and around the world. Another CISTI first, Romulus — a CD-ROM that contains a novel telecommunications system as well as an electronic catalogue of journals available in libraries across Canada — earned CISTI and its co-developer, the National Library of Canada, the 1994 Canadian Library Association/ Mecklermedia Award for Innovative Technology.



"NRC has re-made itself ... the changes ... have resulted in an organization that is very focused on the knowledge-thirsty principle.... The organization is challenging itself to become even more client-oriented...."

National Advisory Board on Science and Technology (NABST) 1994 Report on Federal Science and Technology Priorities

THE CHALLENGE

NRC's ACHIEVEMENTS 1990-1995

Five years ago, NRC set out three goals in *The Competitive Edge: NRC's Long Range Plan 1990-1995*. We're pleased with the results. More importantly, so are our clients.

OUR AIM: TO HELP INCREASE CANADA'S COMPETITIVENESS

OUR ACHIEVEMENTS:

Over the past five years, NRC has:

- restructured laboratories and created new institutes, all aligned with key technology-based industries and fields of national importance. Sixty percent of Canada's top R&D performers are NRC clients and partners. Royalties from licenses have more than doubled. Investment in collaborative research grew by a factor of four.
- completed a comprehensive restructuring of IRAP to focus on small- and medium-sized firms. Last year, IRAP assisted some 12,000 more firms.
- almost doubled CISTI revenues in response to the five-year goal of more aggressive marketing of services. Independent studies call CISTI "... a major force in the [information service] market." It now serves over 10,000 clients with more than 500,000 requests each year.

- seen an annual increase of 30 percent in terms of direct partner contributions to NRC in many areas of activity.

Here are examples of our successes in helping our industry partners develop technology-based products and services:

- NRC's contributions to Canada's audio equipment industry were highlighted in many media reports. A 1993 *Globe and Mail* article noted: "in 1988 [audio] exports totalled about $13 million ... for 1993 the figure is $37 million ... those in the business ... say little of this would have happened without the help of the NRC...."

- NRC worked closely with individual firms such as Diffracto Ltd., which developed a quality inspection system for the aerospace industry, allowing technicians to inspect a Boeing 737 in 36 person hours — a job that normally takes 247 hours. The system has the potential to increase safety and save millions of dollars for the air carriers.
- NRC's special expertise in particle science is helping a consortium of public researchers and the major oil sands firms develop new methods for dealing with oil sands sludge. One study suggests these methods could eventually lead to "multi-million dollar savings" for the industry.
- NRC developed and maintained codes and standards for Canada that helped firms enter into export markets and ensure the safety and quality of products.

Our aim: To maintain world-class research

Our achievements:

NRC has:

- created the Steacie Institute for Molecular Sciences (SIMS) as a world-leading centre of excellence to underpin research throughout NRC. SIMS has contributed a steady stream of high-quality papers in leading journals since its inception in 1990.
- maintained and even increased scientific output in other NRC research programs despite shrinking budgets. In the critical field of microstructural sciences, for example, NRC researchers published some 300 papers last year — an increase of more than 25 percent from 1990. In addition, in certain areas where citation analyses are performed, our scientists rank with the world's very best.
- produced many noteworthy "firsts" in the scientific world, such as breakthrough discoveries in transgenic plants, astrophysics, and optoelectronics.
- received a multitude of awards and other honours for our scientists' work. More than 100 of these honours have been national and international recognitions for research excellence, including awards for lifetime achievements, such as the Engineering Institute of Canada's John B. Sterling Medal, the Order of Canada, the American Chemical Society Arthur C. Cope Scholar Award, and the Royal Society's H. M. Tory Medal.
- introduced a number of training initiatives, a special program for young women scientists and engineers, as well as welcoming thousands of visiting researchers, students, and guest workers.

Our aim: To promote partnerships and collaborations

Our achievements:

NRC has:

- increased funding from partners and clients to $55 million from $35 million five years previously. We surpassed the target from the last Plan and exceeded annual targets in almost every year.
- taken the lead in significant consortia, collaborations, and networks of specialists, such as a consortium (Bessemer Project) to develop a new steel processing technique with Canada's major steel producers; as well, we were instrumental in the formation of a nationally important Joint Centre for Structural Biology in Montreal through a multi-party agreement involving NRC, the Medical Research Council, NSERC, the Université de Montréal, McGill University, Merck Frosst Canada Inc., Bio-Méga/ Boehringer Ingelheim Research Inc., and Astra.
- registered over 1,500 NRC laboratory-partner interactions each year.
- represented Canadian scientific and engineering communities in over 30 international science and technology organizations.
- concluded international alliances such as those with US and Mexican standards research organizations which provide a basis for increased trade.
- significantly reduced internal operating costs by millions of dollars. In 1994, NRC won the first ever Federal Energy Innovator Award for some of these efficiencies.
- established new institutes in Winnipeg and Vancouver, relocated another to BC, and launched plans for one in London, Ontario, as part of efforts to increase partnerships with regional interests throughout Canada.

THE CHALLENGE

ALIGNING NRC'S STRENGTHS WITH CANADA'S NEEDS

The budget cutbacks at NRC have challenged us to concentrate more intensely on what we do best and where we can have most impact. As a result, we are terminating some programs and refocusing others. We are realigning our institutes into five Technology Groups, chosen because of their vital importance to Canada's emerging knowledge-based economy. These groups will be: biotechnology; information and telecommunications; construction; manufacturing; and infrastructural technologies. All are fields where NRC already makes considerable contributions. They are also areas that are critical if Canada is to create high-quality jobs in the coming decade.

The Technology Groups were devised with advice from our partners and based on our best experience. They represent a more approachable and understandable structure from our clients' point of view. From our perspective, they offer the opportunity to define specific innovation strategies at the technology, rather than the institute, level. This will allow us to take a more integrated and flexible approach to supporting multi-disciplinary research programs. And the concentration of industry-specific expertise will allow for better technology foresight, greater access to international science and technology, and better planning. We'll be better able to reorient these programs as clients' needs change. And our programs *will* change to respond to these needs.

The construction industry, for example, has significant research needs and NRC provides the national focus to meet these needs. Building safety codes, urban infrastructure, and maintenance technologies are all part of the picture. As well, by helping Canadian industry improve product quality and productivity through improved technology, NRC provides the means to minimize costs for the industry and open up foreign markets to new Canadian products. The Construction Technology Group will, over the next five years, focus on maintaining its linkages with other industry players, continue its national regulatory leadership, and collaborate with international research organizations to help bring new ideas into the Canadian marketplace.

IRAP and CISTI will be integrated more closely with all Technology Groups. IRAP will maintain its successful network of technology advisors and strengthen the new Canadian Technology Network (CTN) to give industry better access to technology and related business solutions. Through IRAP, NRC laboratories will have built-in connections down to the community level. We've already shown how this can work. IRAP assistance to a Burlington firm, CRS Robotics, for example, helped this company grow from a four-person start-up in 1981 to one with over 100 employees enjoying a world-leadership position today. In 1994, IRAP teamed the firm with NRC's Institute for Information Technology. Together they produced a sophisticated graphical programming tool and a significant breakthrough in robot maintenance and control.

CISTI's plans to serve NRC and its other clients more proactively, to maintain its state-of-the-art document delivery system, and to develop new information products and services for global markets will help NRC develop innovation centres more quickly around its laboratories across Canada.

"... the federal government must ... align its core competencies to the strategic innovation needs of Canadian industry...."

Towards an Innovation Strategy, Task Group on Sustainable Wealth and Job Creation, Federal Science and Technology Review
November 1994

LINKING SCIENCE AND TECHNOLOGY TO AN INNOVATIVE ECONOMY

As Canada's foremost R&D agency, NRC will be a leader in the development of an innovative, knowledge-based economy through science and technology.

In defining its vision for the future, NRC has been driven by the strong national need to develop an innovative, knowledge-based economy. Such an economic foundation is essential if we, as a country, are to maintain Canada's high quality of life and create the opportunity for rewarding employment and fulfilling lives for future generations.

Canadian industry must play the central role in economic growth and job creation, but many other players must contribute to the national drive to encourage and promote innovation. For example, NRC can play a key role and, indeed, be a leader in a critical aspect of this overall effort. The desire to provide this leadership and fulfil this role is expressed in NRC's *Vision to 2001*.

NRC is uniquely equipped to pursue this vision and energize the process of innovation by providing and facilitating links to national and international sources of scientific, engineering, and technical knowledge. We have the power to do this because of our unique mix of flexible programs, our national presence, our international reputation as Canada's foremost R&D agency, and our workforce of brilliant and dedicated people. Finally, NRC has a track record as a powerful force in Canadian science and technology.

NRC's plan to achieve its vision will be based upon actions that will maintain and build upon its strengths and its history of achievements.

Our reputation as the country's foremost R&D agency, for example, will be strengthened with a renewed commitment to excellence and relevance in all programs and with a new focus on key technologies.

And we will demonstrate leadership and a commitment to a knowledge-based economy by working with other players in Canada's system of innovation and by adopting a more aggressive and entrepreneurial approach to transferring our technologies to firms.

"The Government of Canada believes that innovation, based upon a sound foundation of science and technology, will create jobs and permit the integration of economic with environmental goals to enhance the quality of life for all Canadians."

Honourable John Manley
Building a Federal Science and Technology Strategy
June 1994

Renewed Commitment to Excellence and Relevance

NRC is dedicated to excellence in advancing the frontiers of scientific and technological knowledge in areas relevant to Canada.

NRC is first and foremost an R&D organization. Our business is medium- to long-term research. In performing this research, NRC enjoys a reputation for excellence and relevance. This reputation depends on the calibre of the people we are able to attract and retain, in all programs, particularly in research. While we employ some of the brightest scientific minds in the country, it is crucial to our long-term viability that we continue to attract and keep the very best scientists and engineers which Canada and the world have to offer.

This means designing a better system that rewards our scientists for research ability, creativity, teamwork, and collaborative activities while enhancing programs to attract more research associates and post-doctoral candidates. We will increase our efforts to collaborate with leading-edge laboratories from around the world to enrich our knowledge base. To this end, we will also increase the number of exchanges of NRC staff with industry, university, and other government departments. By the year 2001, our goal is to have a better qualified team of scientists and visiting researchers than at any time in our history.

To ensure excellence and relevance go hand in hand, we will use rigorous scientific and economic criteria to evaluate program merit. This approach will allow us to concentrate on world-class research in areas where we can truly lead. And we will remember that we can't be all things to all people — we have to concentrate on what we do best for the benefit of Canada. Areas that do not fit the criteria will be discontinued.

Great research requires great facilities. Unique facilities, such as our pilot plant for production and scale-up of biopharmaceuticals, ice and wave tanks, and semiconductor epitaxy centre, give our industries clear advantages that must be maintained. Others, such as our observatories and our support to the Tri-university Meson Facility (TRIUMF), expand NRC's reach, giving our partners in universities the tools they need to stay at the forefront of science. For these reasons, NRC will continue to invest in its facilities and make them available to researchers across the country.

ONE SECOND IN THE AGE OF THE UNIVERSE

FROM THE TIME OF DISCOVERY OF THE LASER UNTIL ABOUT 1985, *scientists chipped away at reducing laser pulse durations. But when they achieved a time of just 6 femtoseconds, it seemed there was little room for improvement. That was until a recent discovery by researchers at NRC's Steacie Institute for Molecular Sciences. These scientists proposed a method for making pulses as short as 1/3 of a femtosecond, or several hundred attoseconds. To put this in perspective, consider that one attosecond is to a second as one second is to the age of the universe! Although there are still some technical problems to overcome, the world's fastest laser has attracted world-wide attention. It was a recent highlight in* Science *(269:634 (1995)), where US physicists noted that this discovery is one researchers in this competitive field are watching.*

"NRC is one of the world's most powerful research organizations and has been called 'the only important actor covering whole subfields (such as) ... solid state physics, semiconductors, and surface science' in Canada ... and ... 'a leading international actor....'"

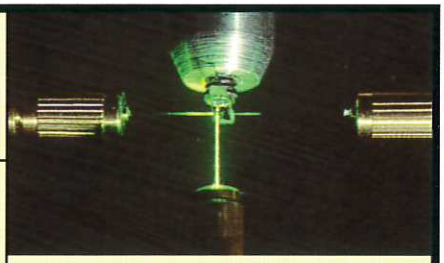
Independent Review
Centre interuniversitaire de recherche sur la science et la technologie, 1994
Montreal, Quebec

Collaboration and Focus on Key Technologies

NRC carries out focused research, in collaboration with industrial, university, and government partners to develop and exploit key technologies.

NRC will be an engine for technological development, wealth creation, economic growth, and competitiveness, helping Canadian-based firms in their own communities acquire, develop, and exploit key technologies. We are uniquely qualified to identify the strategic technologies of today and tomorrow, and, through our partnerships, better able than ever to influence the rate at which innovation enters the marketplace. And we have the links to carry through on this work. Over half of our research is undertaken with Canadian-based industry and government agencies. The proportion will climb further in the years to come.

NRC's "CATALYTIC" ROLE

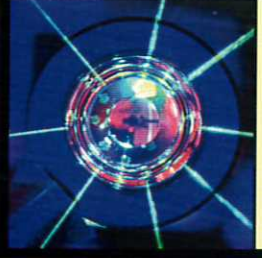


BUILDING A RESEARCH GROUP FROM THE GROUND UP, INVOLVING *industry, university, and government partners to take on important industry problems might be difficult, but it's not new to NRC. In the late 1980s NRC set out to develop a national collaboration to tackle problems "with no known solutions" in the emerging field of optoelectronics. The result was the Solid State Optoelectronics Consortium (SSOC), which has produced a number of patents and commercial spin-offs and been hailed by industry as a resounding success. Spin-off technologies have already been developed by SSOC partners including Bell-Northern Research and EG&G. The program has contributed to placing Canada in a competitive position in the race to implement technology for Wavelength Division Multiplexing, which is predicted to be the next major advance in telecommunications and networking hardware.*

Over the next five years, NRC will increase its effectiveness in fostering economic growth and innovation across research disciplines, across sectors of the economy, and between suppliers and producers of technology. Particular initiatives will include a greater focus on key technologies, support for community-based innovation, and promotion of national standards. In short, we will help link researchers more effectively into the innovation dynamics of Canada.

Over the past decade, NRC has developed a number of new approaches to transferring technology from its laboratories to industry for commercialization and economic spin-offs. These include not only client-driven relationships with individual firms, but also innovative multi-partner initiatives such as the Special Interest Groups established around NRC industrial materials research and strategic research collaborations such as Canada's highly successful Solid State Optoelectronics Consortium. Over the next five years, NRC will build upon these experiences with new collaborations and more efficient programs and services to develop and exploit key technologies that will collectively constitute a major force in important economic sectors.

"The pioneering concept of forming a Consortium between Industry and the NRC and enhancing it with the participation of other Government Departments and Academia was championed [by NRC] ...."



John Elliot, President, SSOC
Fellow Emeritus and former Vice-President Corporate Development
Bell Northern Research
SSOC Annual Report
1993-94

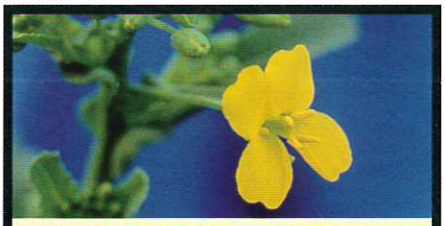
National Leadership in the System of Innovation

NRC will provide strategic advice and national leadership to integrate key players in Canada's system of innovation.

NRC is already an acknowledged national technology leader in key economic sectors and in helping Canadian-based companies turn knowledge into commercial success. What will change over the next five years will be *how* and *where* we focus these activities. Put simply, we will concentrate more of our energies on working with specialized community-based innovation systems. NRC's role will be to act as a national force bringing these communities into a national system. We will thereby work to create a whole that is greater than the sum of the parts. A recent federal study on innovation — "Towards an Innovation Strategy" (November 1994) — recommended that "... future federal S&T strategies ... shift to the principle that community- and regionally-based innovation systems are emerging as the focal points of international competitiveness ... (and that) ... federal S&T institutions should become more integrated into the regional and community-based innovation process...."

Fortunately, NRC is a national organization with a strong regional presence. With laboratory and IRAP representation in over 90 communities from coast to coast, we are able to provide firms in all regions of the country with the opportunity to advance their local economies through innovative research. In the coming years, we will exploit this reach by helping to develop a series of community-based innovation, or application, centres built around present NRC institutes and programs and based on critical regional technology needs as well as through new activities such as the CTN. To do this, we will become an essential element of local economies and we will attract and link partners from local marketing, business, finance, government, and educational communities. Through these centres, local firms will find a concentration of useful intellectual and financial resources.

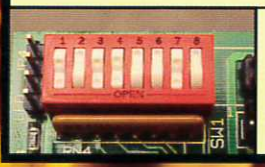
Twenty-five years ago, NRC was the mandated advisor to the government on science and technology matters. While other players now capably provide much of this input, NRC will build upon its recent experience as a key player in the Federal Science and Technology Review to make a greater contribution in this area over the next five years. By using our research contacts in all sectors, as well as our IRAP and CISTI networks, NRC will reflect a unique perspective on science and technology matters to support governments. Our work with industry, our understanding of technology trends in Canada and abroad, and our mission to help the Government create jobs and wealth for Canadians will help us provide advice that is both pragmatic and constructive.



SASKATOON'S SYSTEM OF INNOVATION

SASKATOON HAS EMERGED AS ONE OF THE TOP *plant biotechnology centres in the world, thanks to a concentration of research anchored by NRC's Plant Biotechnology Institute (PBI). PBI has worked with Agriculture and Agri-Food Canada, the University of Saskatchewan, local and provincial agencies as well as industrial partners such as the Canola Council of Canada, Hoechst NOR-AM AgrEvo Inc., Prairie Plant Systems and the Saskatchewan Wheat Pool. The results were expertise, infrastructure and networks needed to spawn innovative new firms and attract international interests to Saskatoon. As a result of the collaboration, Canola contributes over $1.5 billion in sales annually to the Canadian economy.*

"Time and time again we see just how tightly a nation's innovative capacity is tied to economic health and job creation ... and we're seeing increasingly how this link is strongest at the regional or community level ."



Nuala Beck, Author and Economist

ENTREPRENEURIAL AND INNOVATIVE ORGANIZATION

NRC is taking a more aggressive, entrepreneurial approach to ensure the transfer of our knowledge and technological achievements to Canadian-based firms.

As a departmental corporation operating under the authority of its own legislation, NRC has unusual freedom to pursue scientific priorities and forge partnerships with industry. This independence and flexibility have been cited as key factors in our history of merging research excellence with a capacity to change. Indeed, over the past ten years we have taken advantage of these authorities to become very client-focused.

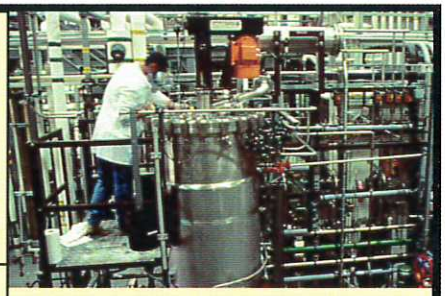
Yet as the 21st century approaches, rapid technological change will require government organizations to follow an even more entrepreneurial path, and we are determined to lead the way. So much so that we pledge to become a model of dynamism for all government science and technology organizations — an organization that takes every opportunity to commercialize technology.

Within five years, this new culture of entrepreneurship will mean more spin-offs, more licenses, new technology incubators, and new alliances with business and financial communities to fund promising innovations. In short, more companies commercializing more of our technologies than ever before.

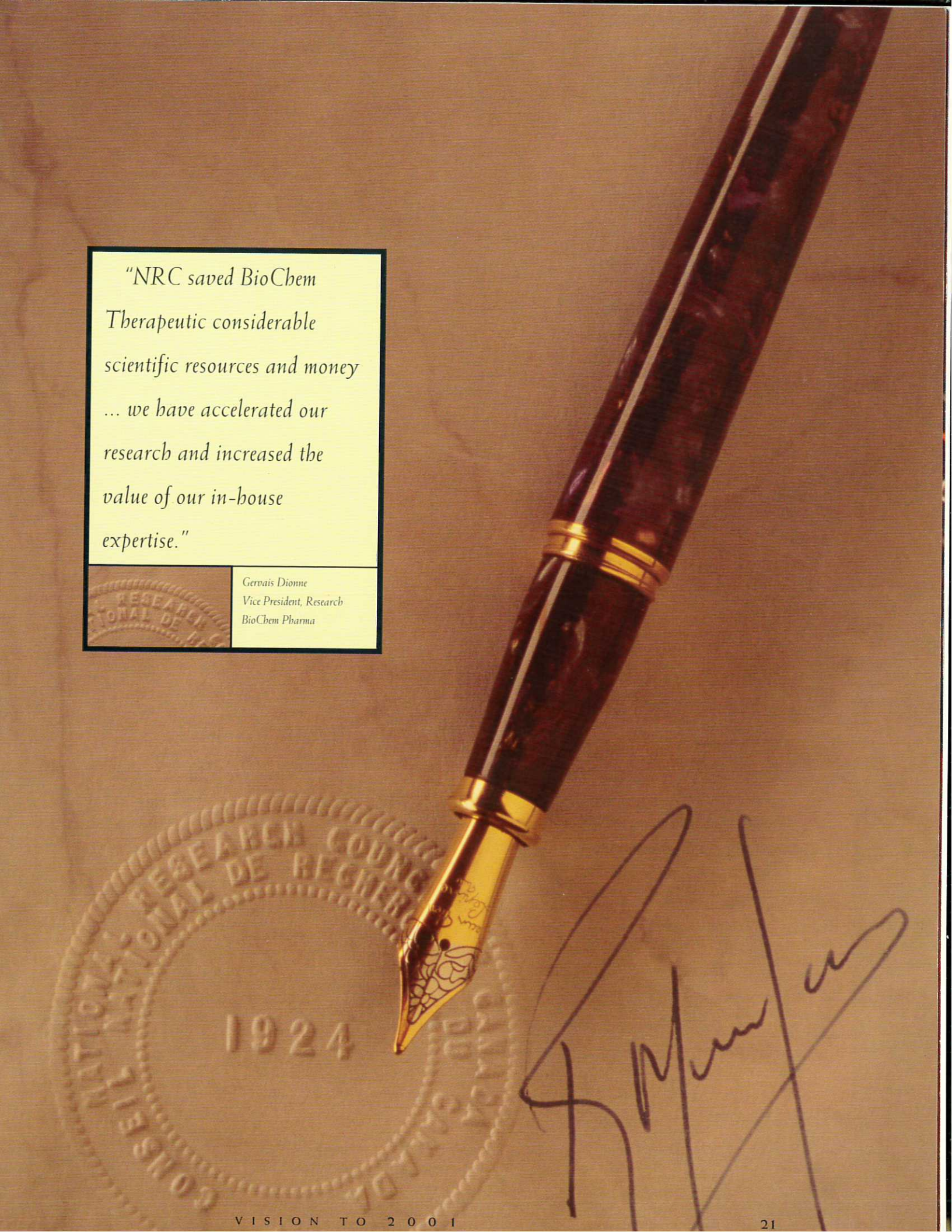
To become this model of dynamism, NRC will require the active support of the Government of Canada in providing the systems for accelerated commercialization. Specifically, we will seek human resource, finance, and property management powers that more closely resemble those of our private-sector partners. In the end, we expect our new hiring practices will be the best within government. New reward systems are being proposed that will also put NRC at the forefront of science and technology organizations in recognizing the contribution of employees in the commercialization of their innovations.

Only through this way of thinking and doing will NRC maximize the return on investment in R&D spending and ensure that Canadian-based firms can make the most out of our work.

ENTREPRENEURSHIP MEANS INNOVATIVE WAYS OF TRANSFERRING TECHNOLOGY



TO SUPPORT INDUSTRIAL INNOVATION AND STIMULATE R&D *investments, NRC must match the entrepreneurship of its private-sector partners with a willingness to take risks and to try new ideas. This is illustrated by the successes of NRC's Biotechnology Research Institute (BRI) in Montreal, which has seen a six-fold increase in the total value of its collaboration contracts to $30 million as well as a quadrupling of its total revenue over the past five years. BRI has coupled world-first scientific achievements related to biopharmaceuticals and environmental biotechnology research with a varied and flexible set of technology transfer systems and processes. These include licensing agreements, long-term strategic alliances, firm-specific arrangements, unique training programs, incubator space, and fee-for-service interactions built upon BRI's world-class pilot plant facilities and laboratory expertise.*



"NRC saved BioChem Therapeutic considerable scientific resources and money ... we have accelerated our research and increased the value of our in-house expertise."

Gervais Dionne
Vice President, Research
BioChem Pharma

A NEW SYSTEM FOR PERFORMANCE MEASUREMENTS

This document has outlined the ways NRC has changed and will change to address the present and future needs of the Government of Canada and, indeed, Canada's economic realities. We are committed to achieving our vision and measuring ourselves against the steps we have set out to achieve it. Even before the Auditor General recommended that science and technology departments and agencies become more goal-oriented, NRC was developing a Performance Framework to guide its activities.

Within our first year, we will refine this Performance Framework to address our new Technology Group structure. It will include the goals and objectives for each of the Groups, IRAP, CISTI, and corporate NRC. It will also define indicators with which we will measure our progress. This Framework will be published at the end of our first year, in the first annual update on this Vision.

Each year we will report on our achievements and outline our plans for the next year, using the approach described below.

Renewed Commitment to Excellence and Relevance: Objectives will include maintaining or building world leadership in chosen areas of research, research advances, investments in key technologies of the future, and partnerships with key international research organizations, universities, and other Canadian researchers.

Collaboration and Focus on Key Technologies: We will determine how much of an impact NRC has on Canadian firms and, thereby, on Canada's economy. Wealth-creation impacts, including success in boosting industrial competitiveness and investments in R&D and technology in Canada, will be monitored.

National Leadership in the System of Innovation: Our success in linking Canada's science and technology elements into the innovation system in the context of regional and community development will be a key objective. Another includes playing a major role in a refocused Federal Government Science and Technology program.

Entrepreneurial and Innovative Organization: Our success in commercializing our technologies will be measured by the success of our industry partners using our technologies and by the other transfers of technology we accomplish. We will also report on the progress achieved in building an entrepreneurial organization through more effective management practices.

"... most research organizations ... need to set clear goals for their activities and focus more on results."

Auditor General of Canada
Science and Technology Review of Management of Departmental Science and Technology Activities, 1994

NRC's Core Competencies

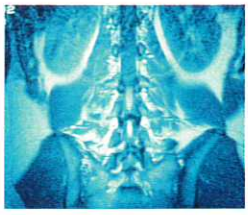
Since 1916, NRC's goal has been to improve life for Canadians by performing and supporting relevant research and development. Working with other progressive organizations, NRC is helping to provide the bridge between strategic research and wealth creation.

In laboratories and offices coast to coast, NRC's specialized staff work in key technological areas to help industries that have the potential to make an impact on the nation's competitiveness.

NRC offers Canadian industry a wide variety of R&D support, including collaborative research programs (shared financing, facilities, or equipment), access to major facilities and installations, technical advice and expertise, licensing opportunities, as well as testing, analysis, verification, and calibration services.

We are focusing our research institutes into five Technology Groups that serve sectors of the Canadian economy that will benefit most from scientific and technological innovation. These well-defined priorities and clear focus will support NRC's vision and contributions into the year 2001 and beyond.

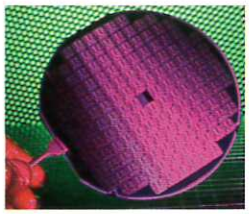
Biotechnology



- structural biology
- cell control mechanisms
- biotech scale-up and fermentation
- carbohydrate immunochemistry
- non-invasive diagnostics
- biosensors
- plant transgenics
- cell and tissue culture and plant growth regulation
- marine biotechnology
- organic analytical chemistry
- bioinformatics/genomics
- bioremediation and ecotoxicology

Information and Telecommunications Technologies

- optoelectronic devices and photonic systems
- semiconductor process technologies
- base technologies for multimedia — display and audio
- multimedia content and access technologies
- software engineering
- integrated reasoning technologies



Construction Technologies

- codes and evaluation
- fire risk management
- building envelope
- indoor environment
- urban infrastructure
- repair technologies

Manufacturing Technologies

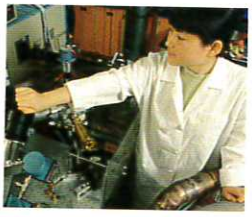
- materials processing
- chemical process and environmental technologies
- production technologies
- sensor and control technologies

Infrastructural Technologies

- physical and chemical metrology
- research in ocean technologies
- prediction of ship and offshore platform performance
- modelling of marine systems
- aerodynamics and aeroacoustics
- structures and materials
- flight mechanics and airborne research
- aeropropulsion
- road and rail vehicle performance
- coastal engineering
- national and international facilities for astrophysics

Core Science

- nanoscale materials and processes
- supramolecular chemistry and biology
- femtosecond science
- theoretical simulations of molecules and materials
- molecular spectroscopy and structures



How to contact NRC:

National Research Council

Montreal Road

Ottawa, Canada K1A 0R6

Telephone: (613) 993-9101

Internet address:

http://www.nrc.ca

National Research Council
Montreal Road
Ottawa, Canada K1A 0R6

Telephone: (613) 993-9101

Internet address: http://www.nrc.ca

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