



Communications
Research Centre
Canada

An Agency of
Industry Canada

Centre de recherches
sur les communications
Canada

Un organisme
d'Industrie Canada

Annual Report

2000-2001

E x p e r t i s e p a r e x c e l l e n c e



C R C ' s M i s s i o n

To be the federal government's Centre of Excellence for communications R&D, ensuring an independent source of advice for public policy purposes.

To help identify and close the innovation gaps in Canada's communications sector by:

- engaging in industry partnerships
- building technical intelligence
- supporting small and medium-sized high-technology enterprises



C R C ' s V i s i o n

National leadership in collaborative research and development on innovative communications, broadcasting and information technologies for a strong Canadian knowledge-based economy.



C h a i r ' s M e s s a g e

The information and communications technology sector in Canada and throughout the world had a whirlwind year, as significant technological advances and industry trends demanded a need for many key players in the field to re-focus their operations.

CRC is the only national laboratory with critical mass and expertise in the advanced technologies and systems that form the backbone of communications in Canada. As such, CRC needed to re-define its strategic focus to meet the challenges and responsibilities it has in the evolving "new economy."

CRC's Board of Directors had a productive hand in helping set this focus. The Board tabled reports on national presence and technology trends, and held a two-day retreat to review CRC's programs and management's recommendations.

In the review, the Board used the principles of *alignment, linkages and excellence* as outlined in a report by the Council of Science and Technology Advisors, entitled *Building Excellence in Science and Technology: The Federal Roles in Performing Science and Technology*.

The Board recommended that CRC:

- focus on longer-term research toward broadband communications
- target wireless and photonics technologies as two main areas of research excellence
- leverage its resources in photonics research with those of the National Capital Institute of Telecommunications (NCIT) to realize greater critical mass and world-class program capability in this area.

The Board also advised CRC to increase its capacity for providing policy-level advice, as it had done in an excellent fashion to the National Broadband Task Force and other clients this year. CRC was advised to work closer with organizations such as NCIT and CANARIE and build its expertise in communications systems.

The Board's conclusion was that CRC continue to deliver focused value to its clients for its public investment.

The Board was pleased to see Industry Canada support its recommendations and approve an investment in an enhanced Laboratory for Photonic Components and Systems Research at CRC.

As Chair of the Board, I would like to thank my fellow directors for their work over the course of the year, and their continued support. I would like to particularly thank the staff at CRC, whose talent keeps the organization dynamic and adds significant value to Canada's communications sector.

Dr. Alan E. Winter

P r e s i d e n t ' s M e s s a g e



This was a year of change, challenge and triumph.

The change: a widely inflationary business cycle that by fiscal year-end had reset with breathtaking rapidity to more normal levels.

The challenge: going through this cycle, which led to departures of research staff during the euphoric business phase.

The triumph: receiving additional resources and support during this rollercoaster ride.

The details follow:

Information and communications technologies continue to advance at a breathtaking pace. The need for government labs to provide coherent and accurate insight in support of rational policy development and potential operational directions has never been higher.

By focusing on the future, CRC developed outstanding competencies in wireless and wireline technologies, and the systems that form the key transport mechanisms for communications. Our challenge was, and is, to protect and grow these capabilities in the midst of chaos. We have garnered strong support from government, particularly from our key partners: Industry Canada, National Defence and the Canadian Space Agency. This support was encouraged by our Board of Directors, the members of which willingly give of their time. I'm proud to work with each of them.

Resources and support received by CRC include recognition of salary pressures put forward by management. This tangible support provided by the employer is greatly appreciated. In addition, Industry Canada reallocated resources to CRC, including funding for a new building to integrate CRC's photonics and multimedia programs.

Past long-term research continued to pay dividends from the industrial sector. It was our best year ever for Intellectual Property returns: In rewarding the originators of the innovations, I had the personal pleasure to sign some very exciting cheques.

Such innovation is only sure to grow due to the outstanding talent we have at CRC. In a complex world, CRC stands well positioned to continue to bring value. I look forward to an exciting future.

A handwritten signature in black ink, appearing to read "J.G. Turcotte".

J.G. (Gerry) Turcotte

Partnering for the Future

As markets become more globalized, and technology more sophisticated, partnerships and knowledge-sharing are vital to Canada's success.

CRC continues to partner with its key government clients, Industry Canada, National Defence and the Canadian Space Agency, as well as numerous partners in academia and industry, both domestic and foreign.



CRC's achievements in fibre optics and satellite communications research were put on display at the new Canada & the World Pavilion in Ottawa.

Strategic Changes

CRC re-focused its strategic directions to concentrate on:

- conducting **longer-term R&D**
- targeting **wireless, photonics** and **broadband multimedia** as its core areas of excellence
- better serving its government clients by enhancing its expertise in **communication systems**





Addressing the Strategic Changes

- Plans began for a long-term project to design, develop and implement a broadband metropolitan wireless system at 60 GHz.
- Improving its wireless testbed, known as the WISELAB, CRC formed a new research group and placed more emphasis on developing expertise in wireless systems.
- CRC launched a major multi-year project investigating smart antenna techniques for civilian and military mobile communication systems.
- A new research group that will concentrate exclusively on military satellite communications was formed.
- CRC created a multimedia datacasting laboratory, representing a shift to R&D that will address the technological issues of interactive multimedia systems.
- Plans and funding were approved for an expanded Laboratory for Photonic Components and Systems Research dedicated to R&D for future-generation networks.

Shaping the Wireless Future

- Spectrum digital analysis technologies, Spectrum Explorer (civilian version) and MiDAS (military version), saw widespread use by Industry Canada and will take part in an elite comparison test to be held by the U.S. military in June 2001.
- Two years of small prototype development work culminated in a high-gain EHF holographic antenna for National Defence, who successfully tested it in a real operational environment.
- Working with the Radio Advisory Board of Canada and the Institute of Electrical and Electronics Engineers (IEEE), CRC helped develop technical standards in the radio frequency bands below 11 GHz.
- CRC joined European, Asian and U.S. R&D organizations in launching the IPv6 Wireless Internet Initiative, which aims to validate the new mobile wireless Internet, based on new Internet and wireless protocols.

Defining Broadband for the Next Generation

- CRC lent a technical hand to a global conference on a new protocol promising to improve the Internet's capacity. The topic was hot in industry and news media circles, who regularly turned to CRC for an expert voice.
- Using its Local Area Network (LAN), CRC began a pilot test of Voice over IP telephony that could set the benchmark for government-wide implementation.
- As a SmartLab, CRC joined other Ottawa R&D organizations planning to build and connect to a region-wide dark fibre network that will allow demonstrations and testing of broadband multimedia applications.
- CRC helped spearhead LearnCanada, a program to leverage the potential of the CA*net 3 optical network to develop an interactive virtual learning community for primary and secondary school teachers.
- A prototype technology supporting the professional development of primary and secondary school teachers online was developed at CRC, and is now available on the market.
- CRC's VirtualClassroom allowed students from across Canada to develop a digital magazine addressing the global issue of landmines.
- The new BattleLab was used for an international military field trial, JWID 2000, during which CRC provided radio technology and system support.
- Major progress was made in the design and fabrication of photonic components and lightwave circuits using low-cost polymer materials that could significantly reduce the cost of bringing broadband services to the home and office.





Exploring the World of Multimedia

- A more robust version of FreeWRL received world attention. The shared virtual world using 3D-Web technology is used for such things as machine visualization and airship simulation. A “flying” chair demonstrating the technology was built in-house.
- Research on carrying Internet streaming media over Digital Audio (or Radio) Broadcasting systems began, with the first functional experimental system set up.
- R&D on broadcasting 3D video over digital TV channels led to a unique technique for effective and spectrum-efficient transmission. Papers and demonstrations were presented at major conferences, and 3D-TV became a popular topic in the news media.
- CRC's work in digital TV is helping regulators and industry develop a new transmission standard. Test results were shared at the acclaimed National Association of Broadcasters convention.

Improving Access for All Canadians

- The Satellite Multimedia Applications Research and Trials (SMART) program became involved in its third demonstration funded by the European Space Agency, which will see broadband satellite communications used aboard a ship for tele-health and other applications.
- CRC's SMART program supported three of the 12 Smart Community projects funded by Industry Canada, including ones that saw CRC set up satellite links to schools in First Nations and remote communities throughout Canada for broadband multimedia services.
- A working group of the National Broadband Task Force sought CRC's advice on which systems and technologies could support high-speed broadband service to all Canadian communities.
- CRC improved its Web site (www.crc.ca) to meet accessibility standards for people using assistive technologies.

Leading Innovation

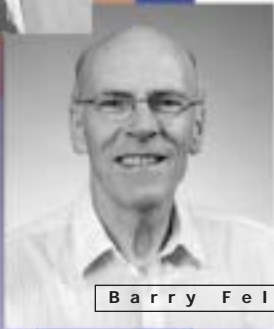
CRC continued its long tradition of developing, protecting and transferring to industry its technologies and know-how:

- Several Canadian companies bought licences for CRC's error-correcting codes and direction-finding algorithms for wireless applications.
- CRC licensed the world's first antenna with a dual-frequency, dual-polarization EHF active reflectarray design; it reduces the complexity of satellite terminals, while providing excellent performance.
- Northwood Technologies signed a deal to use CRC-Predict, software considered the best in the world for predicting radio propagation for current and third-generation cellular services.
- Canada's Redline Communications licensed CRC's WEB terminal, a point-to-point, high capacity, 5 GHz wireless technology used for multimedia applications.
- CRC-SEAQ, the world's first commercial software for objective and subjective evaluation of audio quality, was licensed to several companies around the world.
- Fiber Bragg Gratings continued to be the No. 1 seller for CRC, generating over \$2 million thanks in part to two new Canadian and two new international licences.





Y i y a n W u



B a r r y F e l s t e a d



J o h n L o d g e

And the Award Goes to...

- Yiyan Wu, elected Fellow, the highest-ranking membership in the Institute of Electrical and Electronics Engineers (IEEE), for his contributions to digital television research and standards development.
- John Lodge, named the IEEE Canada Outstanding Engineer.
- Barry Felstead, recipient of an unprecedented fourth Technical Co-operation Achievement Program Award for his role in a project to advance military satellite technology.
- Forty-three current and former CRC researchers, awarded nearly \$393,000 for their inventions through CRC's Inventors Award Program.



I n n o v a t i o n C e n t r e

CRC is committed to making the economy strong by offering an on-site incubation program where Canadian companies – especially start-ups – can access CRC's world-class expertise, facilities and technologies.

LAB-6, Nu-Wave (now Zenastra) Photonics, ObjectWorld, RoweBots and SkyWave Mobile Communications graduated from the Innovation Centre in 2000-2001.

Current clients are: Bristol Aerospace, the Electronic Test Centre, IP Unwired, MetroPhotonics and Spotwave Wireless, totaling more than 120 employees.



Human Resource Challenge

In response to a turbulent year with respect to staff turnover, CRC developed recruitment and retention strategies that were supported by the federal government. In addition, CRC continues to actively partner with all federal science and technology organizations in human resource forums.

As of March 31, 2001, CRC had 183 research and 178 corporate staff to manage its large research campus. The target number of full-time employees is 300 research and 180 corporate staff.

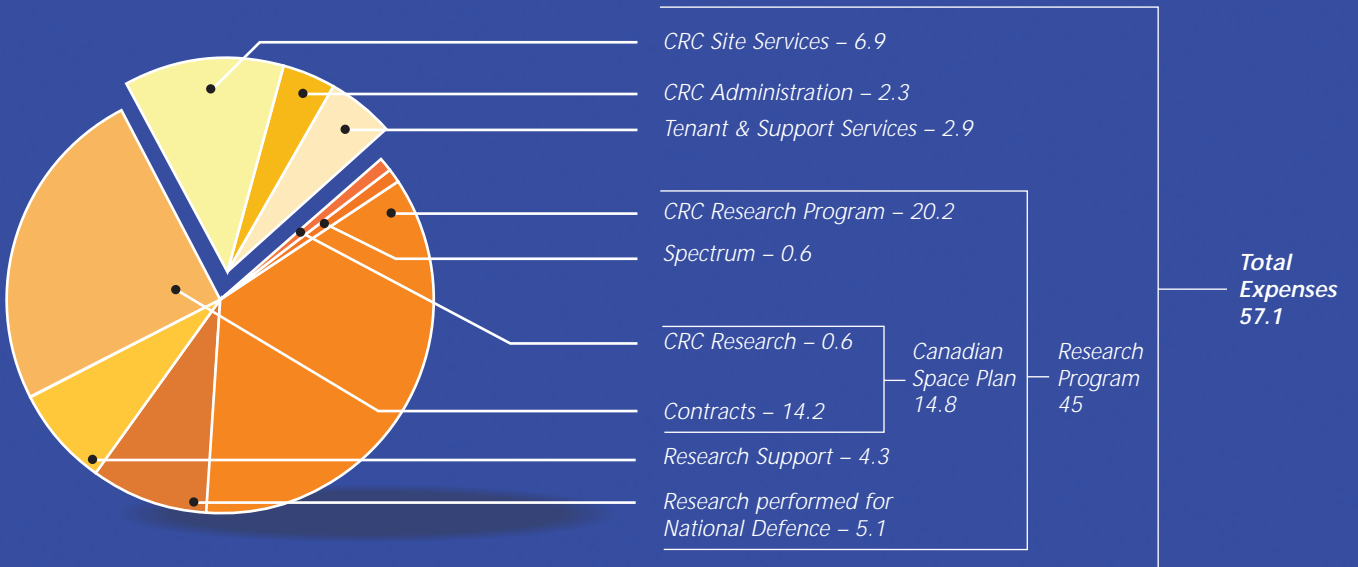
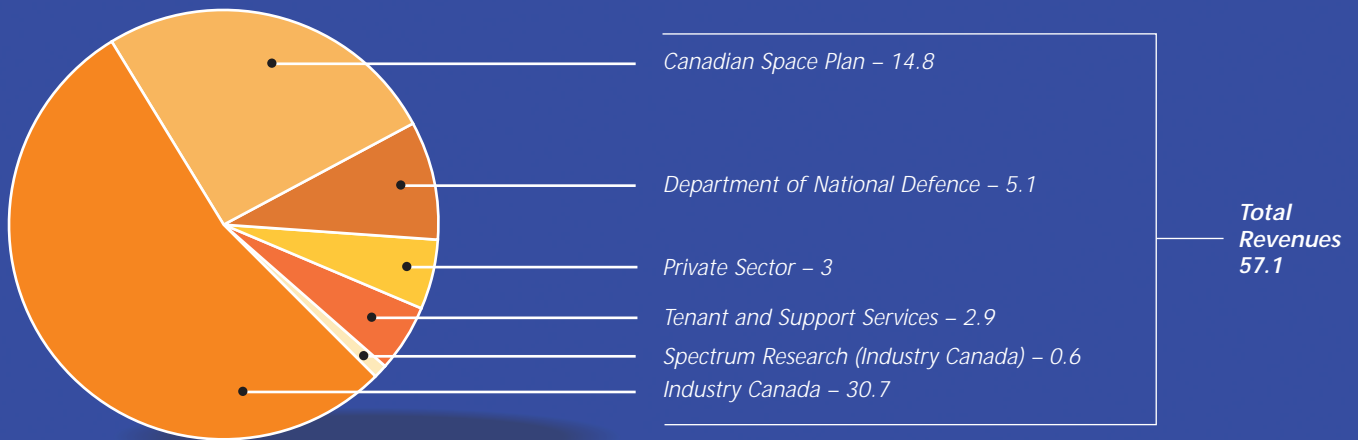
CRC launched a recruitment campaign using its new www.crc.ca/jobs site as a primary tool to attract research talent.



Financial Report

Every year, CRC receives funding from a number of government and non-government sources. In 2000-2001, CRC's primary client, Industry Canada, provided 54% of incoming funds. Other government funding was provided mainly by National Defence and the Canadian Space Agency to carry out R&D and to cover costs related to their residence on the CRC campus. Revenue opportunities with the private sector are increasing through the licensing of intellectual property and contracted R&D.

2000-2001 Revenues and Expenses (\$ million)



B o a r d o f D i r e c t o r s

Alan Winter	(Chairman of the CRC Board) President WINTECK Consulting Inc.
Michael Binder	Assistant Deputy Minister Spectrum, Information Technologies and Telecommunications Sector Industry Canada
Andrew K. Bjerring	President and CEO CANARIE Inc.
L.J. (Larry) Boisvert	President and CEO Telesat Canada
Arthur Carty	President National Research Council of Canada
Carol Darling	Vice-President Women's Television Network
W.M. (Mac) Evans	President Canadian Space Agency
David Haccoun	Professor Electrical Engineering and Computer Science École Polytechnique de Montréal
V. Peter Harder	Deputy Minister Industry Canada
Tom Hope	Chief Technology Officer Bell Canada
James Lau	Director Pacific Development Centre IBM Canada
John Leggat	Assistant Deputy Minister Science and Technology Department of National Defence
Brian Penney	Chairman of the Board of Directors McKenzie College
Birendra Prasada	President Canadian Institute for Telecommunications Research
Glenn Rainbird	President and CEO TRLabs
Linda Rankin	Executive Vice-President and GM WETV
Claudine Simson	Vice-President Disruptive Technology, Network and Business Solutions Nortel Networks
C. William (Bill) Stanley	Chairman and CEO C1 Communications Inc.
Carol Stephenson	President and CEO Lucent Technologies Canada Corp.
André Tremblay	President and CEO Microcell Telecom
Gerry Turcotte	President Communications Research Centre Canada

