



# Canada at a Glance

***Innovation,  
Science and Technology***





## **CANADA'S COMPETITIVE EDGE**

Innovation means more than simply being inventive. It is about having the creativity and resources to bring new ideas successfully to market. And this is where Canada scores well.

Companies in Canada are reaching milestones in quantum computing, fuel cell technology and robotics, to name just a few areas, and developing products that reflect a highly skilled and savvy workforce. From the space shuttle robotic arm Canadarm 2 and Research In Motion's famous BlackBerry® to fuel cell development by Hydrogenics and Ballard Power Systems, technological innovation points the way to a bright future, where Canada will have a competitive edge.

Of course, innovation is not new to Canadians, who have historically used technology as a means to conquer vast distances and some of the world's roughest terrains. And as an ethnically diverse nation with a managed migration policy, Canada has attracted some of the best and brightest entrepreneurs from abroad, including the United Kingdom, creating an ideal environment for that innovative spirit.

## **A HISTORY OF INVENTION AND INNOVATION**

Canada was built on the wealth of its natural resources, and it has a long and notable list of innovations in agriculture, mining, energy, forestry and fisheries. Kerosene was invented in Canada and Canadians were responsible for better barley, Canola – the first edible form of rape seed, and the first successful process for freezing fish.



The first commercial jet in North America and the second in the world, the Avro Jetliner, was built in Toronto. The Canadian-designed Dash 7 and Dash 8 are aircraft well-known in the field of small plane technology for their superior short takeoff and landing capabilities.

A scattered population has encouraged the development of advanced communications technologies. We all know about Alexander Graham Bell and the telephone, but how many are aware that Bell also invented the lighted switchboard, the gramophone, and developed the basis for radio, tape recording and TV?

Frederick Banting, with colleague Charles Best, discovered insulin in 1921, while other critical medical inventions include cardiac stimulators and cobalt radiotherapy.

More recently, Canada has become the birthplace of many advanced scientific inventions, including MOST, the world's smallest and most refined space telescope, as well as the first geographic information

system or electronic mapping technique. Cinema-goers would also be at a loss without Canadian innovation: it is behind more than half the world's technology for special effects and animation as well as the IMAX 70-mm film format for screens 24 metres high.





## AN ECONOMY POWERED BY INGENUITY

As a trading nation, Canada has to compete in world markets where future success depends on technological innovation. Canada has no trouble generating good ideas – the secret is exploiting these inventions to the best commercial advantage.

In pursuit of this holy grail, Canada has produced the world's most technically trained population; is one of the world's most connected countries, with the majority of its citizens and all its schools and public libraries on-line; is acknowledged as the world's leader in government on-line services; and is a significant centre for government, university and industry research.

In the words of Prime Minister Paul Martin during a visit to China, Canada has “expanded and diversified into a knowledge-based economy powered by ingenuity.”

Canadian innovation represents a kaleidoscope of technological breakthroughs. These are observed not just in the top R&D-performing sectors of information and communications – where companies such as Nortel and Research

**“WE FORESEE ... A CANADA BUILT ON INNOVATION WITH WORLD-CLASS RESEARCH UNIVERSITIES, SMART REGULATION AND INNOVATIVE FINANCING. ... CANADA IS DEVELOPING AN ENVIRONMENT IN WHICH IDEAS FLOWING FROM SCIENTIFIC DISCOVERY ARE GENERATED AT AN UNPRECEDENTED RATE. NOW WE MUST FOCUS ON BRINGING THESE IDEAS TO MARKET; [ON] REALISING THEIR COMMERCIAL POTENTIAL. THAT IS WHAT WILL DRIVE OUR ECONOMY FORWARD, INCREASING INVESTMENT AND EMPLOYMENT.”**  
**RALPH GOODALE,**  
**MINISTER OF FINANCE**



In Motion have taken the lead – but also in a multitude of other industry niches.



Among these sectors are security technologies – such as communications security, identification products and face recognition technologies – and the infrastructure and environmental sector that deals with municipal and industrial water systems, air pollution control, and solid and hazardous waste management.

Canada has leading-edge pharmaceutical and biotechnology industries. In 2004, there were 442 innovative biotechnology firms registered in Canada. Some are highly advanced in animal genome research and biosecurity.

Canada is also a world leader in geomatics and space robotics, as evidenced in the success of Canadarm 2 and Radarsat, the Earth observation platform.

The list is lengthy, so here are just a few examples of recent Canadian innovations that have had, or are expected to have, an impact around the globe.

## **D-WAVE TAKES QUANTUM LEAP**

Quantum computing company D-Wave Systems is on its way to commercialising the first superconductor-based quantum computer. With a staff of just 25, the Vancouver-based company is developing a system that differs from other designs, using the property of quantum tunnelling.



Incorporated in April 1999, D-Wave has its origins in the lecture rooms of the University of British Columbia. Since then, it has succeeded in securing almost \$18 million in funding from a variety of sources, among them the Government of Canada.

CEO Geordie Rose is racing to beat the competition to develop a quantum computer from some of the world's biggest R&D labs. In May 2004, impressed by the company's advances, NASA's prestigious jet propulsion laboratory in Pasadena, California, signed a contract with D-Wave to jointly develop components that could power the world's first commercial quantum computer. The company plans to complete a prototype device by the end of 2006; a version suitable for commercial use could be ready by 2008, Rose says.



The stakes are high, as quantum computers promise one day to crunch in seconds data that would take thousands of years to process by conventional means. They will be able to crack the most sophisticated encryption codes devised to protect bank accounts and government communications. And they will be able to model molecular interactions to give pharmaceutical companies a complete picture of side effects from drugs before they are introduced to market.



D-Wave is creating its own supercomputing fortress, filing more patents than any of its competitors and owning exclusive rights to the world's most promising quantum component, the Quantrium. [www.dwavesys.com](http://www.dwavesys.com)

## SMALL WONDERS FOR BLOOD TESTING

A maker of bedside diagnostic equipment, Epocal has received millions of dollars in funding to complete the development of more cost-effective, advanced blood analysis technology.

The Ottawa-based company is producing a point-of-care blood analysis platform called EPOC™. This small card, described as a “laboratory on a chip”, contains a biochip that will be able to analyse the contents of a patient's blood. A wireless card reader will then instantly transmit the data to central hospital records systems.



The company claims its advance in diagnostics will reduce the cost of bedside testing by 90 per cent, creating a much larger market for its technology.

With the help of a \$1 million contribution from the National Research Council, together with a \$5 million cash injection from Genesys Capital Partners, Epocal expects to start the beta trials and regulatory approval cycle later this year, with product launch scheduled for 2006. [www.epocal.com](http://www.epocal.com)



## FORENSIC HAS CRIMINALS IN ITS GUNSIGHTS

When detectives on the television show CSI: Miami consult IBIS<sup>®</sup> to identify a crime gun, they are referring to Forensic Technology's Integrated Ballistics Identification System. TV detective series

are incorporating a technology used by enforcement agencies in Florida and in several countries around the world to match spent bullets and cartridge cases to the firing weapon.



IBIS<sup>®</sup> works by digitally capturing images of bullets and cartridge cases and storing them in a database before performing automatic comparisons and ranking them according to the likelihood of a match.

Winner of a 2003 Canada Export Award, Forensic Technology has also developed b.a.r.d. (beyond a reasonable doubt) software, which allows data sharing between law enforcement and criminal justice groups, and Gunsights, a software collection of firearm specifications and images. [www.forensictechnologyinc.com](http://www.forensictechnologyinc.com)

## MAKING BUSINESS TRULY WIRELESS

The word BlackBerry<sup>®</sup> has become synonymous with not only cutting-edge wireless technology but also with Canadian innovation and success.

As a world leader in the design, manufacture and marketing of wireless communications solutions, Research In Motion has had a profound global





impact on the way business and consumers manage mobile connectivity. Its BlackBerry® wireless platform has become the standard for secure, always-on, wireless communication, enabling people to remain connected to their mobile phone, e-mail, Internet and organiser while on the move.

The Ontario-based company's latest development, the BlackBerry® 7100 Series, with its advanced features, will ensure that the BlackBerry® remains an essential tool for the busy professional. [www.blackberry.com](http://www.blackberry.com)

## **PLANT-BASED PRODUCT LOWERS CHOLESTEROL**

Forbes Medi-Tech Inc., a Vancouver-based company that develops innovative pharmaceuticals and alternative food products, has seen demand for its cholesterol-lowering ingredient, Reducol™, – derived from by-products of the forestry industry – skyrocket in the past year.

Forbes recently obtained approval from European regulatory authorities for the plant sterol Reducol to be marketed in a variety of food products including milk-based products, margarine, soy drinks, spicy sauces and salad dressings.

In the UK, Forbes has joined forces with dairy foods company Fayrefield Foods, which was influenced by the sterol's 'GM-free' claim. And in Finland, the largest grocery chain, Kesko, has launched a range of yogurts that include Reducol™ as part of a drive to increase its range



of healthy foods. It is the first of a number of products to be launched this year that use Forbes' cholesterol-lowering natural ingredients. [www.forbesmedi.com](http://www.forbesmedi.com)

## PREDICTING SUCCESS FOR TEXTING TECHNOLOGY

With millions of handsets around the globe using its technology, Zi Corporation of Calgary, Alberta, has been kicking up a storm in the mobile phone market in recent years.

Zi provides interface solutions for mobile phones, PDAs, gaming devices and set-top boxes including eZiText<sup>®</sup>, a user-friendly text input system for faster text messaging; eZiTap<sup>™</sup> for multi-tap entry; Decuma for natural handwriting recognition; and the new Qix<sup>™</sup> service discovery engine.

eZiText<sup>®</sup> text input system



In its latest venture, Zi has aligned itself with Cambridge, UK-based TTPCom Ltd: its predictive text technology will be integrated with TTPCom's Ajar application platform, making texting even more user-friendly, particularly in the Asian marketplace. [www.zicorp.com](http://www.zicorp.com)

## CARMANAH LIGHTS THE WAY

With increasing demands on companies to be more environmentally conscious, Carmanah Technologies Inc. has succeeded in developing renewable and energy-efficient technology solutions for a worldwide market.



The Victoria, British Columbia-based company designs and produces solar-powered LED lights for marking channels, waterways, moored vessels and docks, as well as highlighting hazards on highways and railways. It also makes life safer for pedestrians by illuminating bus shelters in some of Britain's major cities.



When a Carmanah buoy recently washed ashore in the Shetland Islands, 5,800 km from its original location off

the coast of Newfoundland, it was reported that its light was still flashing – a testament to the durability of the company's technology.

Carmanah lights and beacons have a self-contained power source and require no battery or bulb replacement or other maintenance during their lifespan.

About 85 per cent of Carmanah's production is exported to transport authorities, such as the UK's Trinity House, as well as commercial and private users. [www.carmanah.com](http://www.carmanah.com)

## **CLOTHING THAT FITS: A GLOBAL SOLUTION**

Unique Patterns Design is a classic example of necessity being the mother of invention. The Nova Scotia company was the brainchild of Tanya Shaw Weeks, who noticed a niche in the market for customised women's clothing patterns.

The award-winning entrepreneur worked with a team of engineers and software developers at the



then Technical University of Nova Scotia (now the Faculty of Engineering at Dalhousie University) to design a revolutionary software program that allows a customer to go to the company's website, input measurements and choose from an array of made-to-measure patterns. The US became Unique's first export market in 1996, and since then the company has expanded into Australia, the Caribbean, Japan, Singapore and the UK, with roughly 95 per cent of its sales now generated by exports.



Unique Solutions – Unique Patterns' parent company – has also developed the Bodyskanner™, a device that captures accurate 3D body measurements in less than a minute. The device has been used by thousands of women across Canada and the US. [www.uniquepatterns.com](http://www.uniquepatterns.com)

## **REVERSING CANADA'S BRAIN GAIN**

Innovation is a major part of Canada's economic policy. The Canadian government's innovation strategy identified increasing Canada's R & D performance to No. 5 in the world by 2010 as an important goal for this decade.

In its pursuit of excellence, the government is building on previous investments in research and innovation to make essential research and



technologies available to companies of all sizes and to help them secure venture capital financing. The government also invests heavily in university research.

In 2000 the government created the Canada Foundation for Innovation (CFI), an independent corporation that provides funding for research infrastructure. The CFI aims to strengthen the

**THANKS TO FUNDING OF \$62.9 MILLION FROM THE CANADIAN GOVERNMENT, 79 NEW CANADA RESEARCH CHAIRS WERE CREATED IN JUNE 2005. TOGETHER WITH THE 106 CHAIRS CREATED EARLIER AT 34 UNIVERSITIES ACROSS THE COUNTRY, THIS BRINGS TOTAL INVESTMENT IN THE CANADA RESEARCH CHAIRS PROGRAM IN 2005 TO NEARLY \$162 MILLION.**

capacity of Canadian universities, colleges, research hospitals and other non-profit research institutions so that they can carry out world-class research and technology development.

The CFI currently has a budget of \$3.65 billion and funds up to 40 per cent of a project's infrastructure costs. These funds are invested in collaboration with eligible institutions and their funding partners from the public, private and voluntary sectors, which provide the remaining 60 per cent of a project's cost. The total capital investment by the CFI, research institutions and their partners will exceed \$10 billion by 2010.

**SINCE ITS LAUNCH IN 2000 WITH A \$900 MILLION BUDGET, THE CANADA RESEARCH CHAIRS PROGRAM HAS CREATED 1,500 RESEARCH POSITIONS AT 73 CANADIAN UNIVERSITIES.**

This year, the CFI announced a \$25.5 million boost to research in 132 projects at 39 universities to enable Canadian institutions across the country to attract and retain 181 high-calibre researchers.

The new funding will support the work of recently recruited faculty members undertaking advanced research on varied projects including: a virtual reality



laboratory for the prevention and rehabilitation of mobility disorders in Quebec; the investigation of soil slope instability processes in Ontario; computer music research and composition in Alberta; and the modelling of head and eye movements during locomotion and balance recovery in New Brunswick.

## **TECHNOLOGY TRANSFER TO THE MARKETPLACE**

Universities and affiliated research hospitals make an important contribution to innovation in Canada's economy. Some of the technology they produce is patented and licensed to companies for incorporation into commercial products, whilst others are spun off into stand-alone companies.

Over 1,000 spin off companies have been created in Canada to date, accounting for \$5.9 billion in annual sales in 2002 and 25,000 jobs.

University income from intellectual property commercialisation reached \$51 million in 2003, and new patent applications were up by 35 per cent over 2001.

The government supports some of the most successful public/private sector partnerships in the areas of R&D and innovation. Examples are CANARIE, Canada's Internet development organisation, which pursues R&D in





advanced networks, and PRECARN, which supports R&D in intelligent systems. Having created over 95 new spin off companies in the past 10 years, government laboratories continue to take an entrepreneurial approach: Canada's National Research Council is one of the main catalysts in stimulating innovation.

The Government of Canada is working toward creating a culture of innovation that will underpin the country's global competitiveness. In this healthy research environment, backed by corporate, academic and individual enthusiasm, it is no surprise

that Canada is a leader among countries renowned for their scientific, technological and innovative spirit.

Sources:

D. Cooper, National Research Council, *The Socio-Economic Impact of a Government Assistance Program on the Growth of University Spin Off Firms in Canada*, 2004

Statistics Canada, *Innovation Analysis Bulletin*, June 2004



## **DID YOU KNOW THAT CANADA ...**

**OFFERS THE MOST FAVOURABLE  
TAX INCENTIVES FOR R&D OF ALL G7 COUNTRIES**

**RANKS FIRST IN BROADBAND  
PENETRATION AMONG G7 NATIONS**

**IS RANKED No. 1 WORLDWIDE  
BY ACCENTURE FOR E-GOVERNMENT SERVICES**

**HAS THE LOWEST BUSINESS  
COSTS IN THE G7: NINE PERCENT BELOW THE US**

**BOASTS THE HIGHEST SHARE OF INDIVIDUALS  
WITH POST-SECONDARY QUALIFICATIONS IN THE OECD**

**HAS THE SECOND LARGEST NUMBER  
OF BIOTECH COMPANIES IN THE WORLD: ABOUT 442**

**(STATISTICS 2004)**



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