



University research: Canada's strength in a changing world

Association of Universities
and Colleges of Canada



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“Synchrude operates in a knowledge-based industry. It’s scientists and engineers — intellect not muscle — that have separated the oil from the sand and made an otherwise useless resource hugely valuable.”

Eric Newell,
former Chairman and CEO,
Synchrude Canada Ltd.

The world has changed, and so has Canada. Our economy in the last century was built squarely on our natural resources. Now many Canadians are employed in traditional industries that are doing things in new ways, while others are employed in emerging industries that did not exist 20 years ago.

In the global knowledge economy it is clear that we must develop and mobilize a new number one “natural resource”: our highly educated workforce. Countries around the world are bracing for significant talent shortages created by changing demographics and the requirements of new knowledge-based jobs. Between 1990 and 2005, 1.7 million jobs were created in Canada for university graduates and the share of jobs filled by university graduates is growing strongly in every province.

We need highly educated people to succeed. Their ideas and discoveries make Canada more prosperous and competitive. Universities conduct more than a third of Canada’s research and development — a higher component of overall national research than in any other G8 country. World-leading university research creates the value-added jobs that are opening up Canada’s untapped potential — like providing a means to unlock billions of dollars of oil sands that were previously inaccessible.



Today, investing in our public infrastructure is about more than transportation and services — it is about creating the conditions for economic success. This includes funding state-of-the-art technology and facilities, and keeping our best and brightest in Canada while attracting international talent. It means supporting basic research to create knowledge and fuel innovations that help us understand ourselves and improve our lives. Canadians across the country benefit from university R&D — and they rely on it for jobs, health solutions and quality of life.

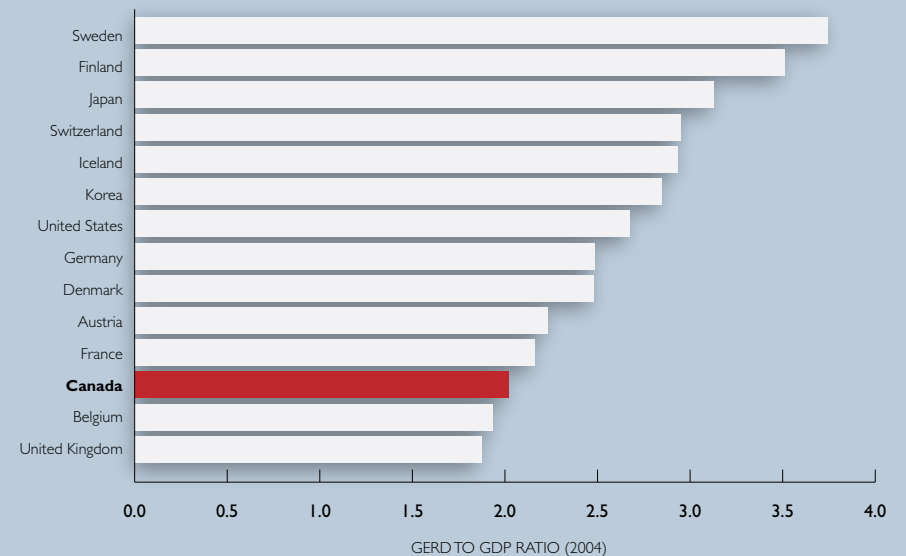
“Investment in higher education has among the highest pay-offs of any investment government can make in improving economic growth.”

Canadian Chamber of Commerce, Towards Canada's Prosperity: Tackling the Barriers to Productivity Growth

- Canadian universities are the only sector that performs R&D on behalf of all other sectors (businesses, governments, and not-for-profit and international organizations).
- Unlike other sectors, universities have increased their research investments in every region of Canada in the past decade.
- Universities’ research activities provide the essential training ground for the highly-qualified personnel needed for Canada’s workforce.

Global R&D: Meeting the competition

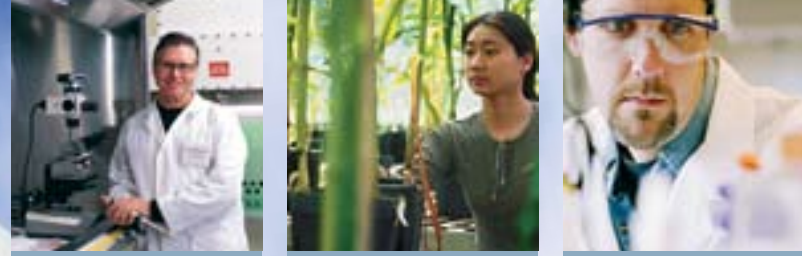
Global R&D competition is intensifying from both traditional players and emerging powers such as China, India and Brazil. The United States plans to double federal funding for university research within a decade. The United Kingdom is working to significantly boost its Gross Expenditure on R&D (GERD) to Gross Domestic Product (GDP) ratio to 2.5 by 2014. Today, staying in the global race for talent and ideas requires focus, commitment and ongoing investment.



SOURCE: OECD; STATISTICS CANADA; AUSTRALIAN BUREAU OF STATISTICS; NATIONAL STATISTICS UK; EUROSTAT.



What does university research mean for Canadians?



“We believe that investing in education and workforce development may be the single most important thing that communities and countries can do to compete successfully in today’s global economy.”

Steve Ballmer,
CEO, Microsoft Corp.

Competitive economy

Today, our standard of living increasingly depends on Canada’s ability to compete in a global knowledge economy. Through their research efforts, universities produce the ideas and new knowledge that increase productivity and add economic value. Case in point: a Université de Sherbrooke voice compression invention now enables communication in more than one billion cell phones and about 300 million computers around the world.

Universities produce the highly qualified personnel that sustain innovation in the private sector and government. They play an important role in attracting venture capital and investment partners and are important assets to their communities.

International influence

Our world is shaped by rapidly shifting economic, demographic, political and technological trends that continually change the lives of Canadians. Universities’ high-quality research helps Canada define its place on the world stage by demonstrating leadership in finding solutions to global issues. How are we measuring up? According to the OECD, Canada’s university researchers are among the most internationally collaborative. Our researchers are a window into global knowledge networks and are energizing Canadian solutions to our common challenges.

“Canada’s at the forefront of research that directly helps kids in schools across Canada. The benefits of this research are enormous. It results in the constant improvement of human capital within Canadian society.”

Chris Kelly
Superintendent of Schools,
Vancouver School Board

Staking a claim

Researchers at Brock University are using technology to identify key aroma compounds found in Canadian ice wines in an effort to protect the world-leading Canadian industry from counterfeits. By educating future employees and conducting research, universities are giving Canadian wineries a home-field advantage. In Ontario alone, employment has doubled and wine sales have tripled to \$436 million since 1990.

Clear benefits

The onset of macular degeneration once meant a slow descent into blindness. Not anymore. Visudyne™, a drug produced through R&D at the University of British Columbia with strong industrial partnership, has saved the sight of more than 300,000 people, including thousands of Canadians. It is now approved in more than 70 countries and worldwide sales have totaled more than \$1 billion US since 2000.

Concrete results

The world’s concrete structures, from bridges to buildings, are a challenge to maintain; infrastructure decay is a multi-billion dollar global problem. But a technology developed at Dalhousie University has received international acclaim for giving concrete longer life. The concrete fibre reinforcement technology, distributed by leading concrete suppliers, is now used around the world, including in Canada, Japan and several European countries.

Big things... small packages

Canada is solidifying a leadership role in the highly competitive global market for nanotechnology products (expected to be worth \$1 trillion by 2015), through collaborative research being conducted at the National Institute for Nanotechnology housed at the University of Alberta. NINT researchers recently designed and tested a new concept for a single molecule transistor—an important breakthrough for molecular electronics.



“Research and development is the hope for the future. The hope for the future in health, the hope for the future in economic development. My dream is to see Canada be the first nation to beat diabetes.”

**Dr. David Hill,
Board of Directors,
Canadian Diabetes
Association**

Better health

More than in any other area of life, Canadians depend on university research to improve our health and the effectiveness of our health care system. Universities provide the health care professionals, new treatments and innovative health care management solutions to foster wellness and reduce health care costs. During the past decade, Canadian universities graduated more than 40,000 health care professionals, including about 17,000 physicians. In collaboration with industry and hospital sector partners, Canadian university R&D has uncovered new approaches to fight cancer, pioneered remote surgical robotics and improved our ability to respond to epidemics — outcomes that matter to all Canadians every day.

Pure gene-ius

McGill University and McMaster University researchers identified a new gene known as beta-1 that regulates the growth of breast tissue. When the gene is blocked or removed, tumour growth is halted. With this research, drugs can be developed to treat breast cancer, providing hope to the estimated 21,600 Canadian women who are diagnosed with this form of cancer each year.

Renewing hope

Transplantation of human tissue remains a medical miracle. Yet vital organs are in short supply and the body often rejects replacements. World-leading tissue engineering researchers at the University of Toronto are addressing these shortcomings. They have developed a biodegradable “scaffold” that facilitates and speeds bone tissue regeneration and have introduced a novel technique for growing nerve cells in the laboratory—a breakthrough that could help restore movement in people suffering from paralysis.

Sustainable environment

During the current period of global environmental change, it is essential that we find ways to balance the use of natural resources with human impact on the environment. It is an unprecedented challenge. Canada’s university research is providing insights and technologies for industry and government to develop more sustainable practices and policies. For example, researchers at the University of Saskatchewan are developing “green” diesel bio-fuels from low-grade canola and used oil that would otherwise be waste. And, across the country, researchers at the Institut National de la Recherche Scientifique have developed a new cost-effective process for treating industrial sludges. By stabilizing and treating municipal sludges to remove heavy metals, risks to human health and ecosystems are lessened and paper companies are realizing 20 percent savings on disposal costs.

Quality of life

Canadians are proud of our home-grown discoveries and advances. There is broad and continued support for publicly funded research because we recognize the benefits to our lives and those of people around the world.

Simply put, today our way of life depends on dynamic R&D. Canadians have invested to create valuable university research momentum. Now is the time to strengthen the foundation of our new knowledge-based economy and society so that we can meet the global challenges of today — and tomorrow.

Cool endeavours

Researchers at the Université du Québec à Chicoutimi are creating computational models of icing to improve air travel and safety. The Anti-Icing Materials International Laboratory is the only lab in the world accredited to certify de-icing and anti-icing fluids used to protect airplanes prior to take-off. Its clients include Transport Canada, the Federal Aviation Administration, China’s Beijing Aviation, and numerous international aerospace and transportation companies.

CAREing for Canadians

Mount Saint Vincent University is focused on more effective policies and programs for caring for the elderly at home—a growing concern in Canada, given changing demographics. Researchers have developed an instrument called CARE that helps home care agencies assess the necessary supports for family and friend caregivers. They are also projecting the future supply of these caregivers and analyzing policies aimed at supporting family and friends who assume caregiver roles.

“Our social and institutional capital — education system, academic research, social services, and governance — are clear strengths. We need to keep them strong.”

**Paul Johnston, president
and CEO, Precarn Inc.**

Canadian university discoveries • Glycemic index • Insulin • Pablum • Visudyne™ for macular degeneration • Plate tectonic theory • Radiation therapy • Pink Beauty Potentilla • T-cell receptor • Wheat rust combatant • Light-activated drugs • Phosphorous contamination theory • Canola • Episodic and semantic memory function • World's first artificial cell • Permeable reactive barriers • Synthesis of RNA for medical research • CPAP device for sleep apnea • Compound 3TC for HIV/AIDS treatment • Functional Electrical Stimulation machine for paraplegics • PRS™ Probe for crop optimization • "Vision in Man and Machine" • GPS technology and software applications • Plexiglass • First use of cobalt for medical treatment • Voice compression technology • Fibrillex™ for inflammatory disease • Heart pacemaker • Airline anti-icing processes • *E.coli* vaccine • Triple-Axis Neutron Spectroscope • Hyperdimensional geometric theory • Concrete fibre reinforcement technology • Search and retrieval software • Levulan® Topical Photodynamic Therapy for skin conditions • Edmonton Protocol • "Ottawa Ankle Rules" for fracture diagnosis • Hip replacement surgery advances • Brain telementoring robotic surgery • Natural pest control • "The Dictionary of Canadian Biography" • Site-directed mutagenesis • DNA profiling • Chemical Vapor Deposition • Steam-Assisted Gravity Drainage for oil sands • Canola-based fuel • Peatland conservation strategies • Stabiox industrial sludge treatment • "Two-person Game Theory" • Grow Home – the "economy car of housing" • Geographic Information System technology • Software for hearing aid fitting • High-Speed DNA Sequencer • Multiculturalism theory • Paleo-DNA sampling • MusicPath remote teaching software • V-chip for child-friendly TV • Refugee integration theory • GIS crime tracking • "Understanding Media" • High-performance concrete • Supplefer Sprinkles nutritional supplement • Synthetic vaccines • Electron microscope • Intelligent windows • New strategies to fight HIV/AIDS • Lamivudine for chronic hepatitis B (HBV) infection • Black hole theory • Elimination of Rh disease • Mapping of SARS gene • Atrial Natriuretic Factor discovery and isolation • Cystic fibrosis screening test • CALM™ system for women in labour • Diamond coating process for tools • Paleoecological environmental assessment • COLD-FX™ • Ultrasound microimaging • Intraoperative MR System • WebCT course management system • Thermal accelerometer • "Anatomy of Criticism" • The "Waterloo Pump" for potable water • Liquid helium • Satellite remote sensing technology • Elliptic curve cryptography • Stream ecology • Dispersalloy™ for tooth fillings • Micro-robot for advanced eye surgery • ARCHIE, the world's first internet search engine • Automated gene synthesizer • McGill Pain Questionnaire • Carcino-embryonic antigen (CEA) test • Radon • Classification system for congenital heart diseases • Map of the human brain • Biological stress reactions in humans • Synthesis of sucrose

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