



Canada Foundation for Innovation  
Fondation canadienne pour l'innovation

## **Notes for a presentation**

**by**

**Dr. Eliot A. Phillipson  
President and CEO**

**to the**

**House of Commons  
Standing Committee on**

**Industry, Science and Technology**

**November 9, 2006**

**Check Against Delivery**



I want to thank the House of Commons Standing Committee on Industry, Science and Technology for this opportunity to appear before you. This is the 21<sup>st</sup> appearance by the CFI before a Committee of Parliament since our creation in 1997. Today, I want to talk to you about the CFI's role in helping to secure Canada's future prosperity and competitiveness in the context of your study of the challenges facing the Canadian manufacturing sector.

In your Interim Report of June 2006, the Committee identified five principal challenges facing the manufacturing sector in Canada. My remarks today will focus on the CFI's role in addressing two of these challenges: namely, competition from emerging economies, and the development of skilled labour.

### ***Rising to Meet the Challenge***

The challenges we face as a nation early in the 21<sup>st</sup> century are well known—particularly an aging population and increasingly intense international competition. In the face of these challenges Canada cannot afford to slip in the global race.

In broad terms, Canada's prosperity in the 21<sup>st</sup> century will depend on our capacity as a nation to innovate – to generate new knowledge and ideas and translate them into products, services, processes, and policies that create wealth, enhance social foundations, and improve the quality of life. In short, Canada must become a *nation of innovation*.

Innovative societies are increasingly characterized by three elements: a cutting-edge research enterprise; a highly-educated and skilled workforce; and a business, regulatory, and social environment that encourages entrepreneurship and creative thinking.

The Canada Foundation for Innovation (CFI) is playing a major role in Canada's evolution into a *nation of innovation*

- by enhancing the capacity of Canada's research enterprise;
- by providing state-of-the-art infrastructure required for the training of highly qualified personnel – the human infrastructure that is the most important resource in a knowledge-based economy;
- and by promoting the development of technology clusters through collaborations between public research institutions and the private sector.

Nine years into its mandate, the CFI has committed \$3 billion in 4,700 research infrastructure projects at 128 institutions in 62 municipalities across the country. Included in these investments is more than \$153 million in support of 230 cutting-edge research projects in a wide range of manufacturing sectors including forestry, automotive, aerospace, biotechnology, and nanotechnology, to name but a few (see Appendix I and II).

These strategic investments are made on the basis of a rigorous assessment of merit, using international standards to determine the potential of the project to increase the capacity of Canadian universities, colleges, research hospitals, and non-profit research institutions to compete internationally and to produce knowledge that will benefit all Canadians.

## *Increasing Canada's Prosperity and Competitiveness*

The results of CFI's investments have been transformative. Imagine for a moment the reaction if I had stood before you in 1996 and boldly declared that a decade from now, Saskatoon would be home to a state-of-the-art synchrotron, Canada's biggest science project in a generation; that Chicoutimi would be a world leader in developing de-icing technology for commercial use on airplane wings and hydroelectric wires around the world; that St. Mary's University in Nova Scotia would be a recognized leader in astrophysics; and that Montreal's McGill university would be internationally recognized for the development of groundbreaking technologies that allow scientists to identify the genetic basis of human diseases. The reaction would likely have been one of disbelief. Yet I am pleased to report that in 2006 all of the advances I've described are a reality, in large part due to investments made by the CFI.

By 2010, the total capital investment in research infrastructure by the CFI, the research institutions, and their partners, will exceed \$11 billion. These investments are creating jobs and are leading to innovative solutions in some of today's most important and exciting areas of investigation—from advanced materials to pharmaceuticals, renewable energy, high performance computing, advanced manufacturing, and early childhood education.

Furthermore, discoveries are moving from the laboratory to the marketplace. Spin off companies are being created to supply highly-demanded technology for the biotech, communications, aerospace and other industries. And high quality personnel are being trained for careers in both the public and private sectors.

Last summer, however, the CFI launched its last major competition, with decisions to be made public in less than two months. Thereafter, our capacity to invest in cutting-edge research going forward **will be largely depleted**. Unless it is known well in advance that additional funding will be available after this last competition, universities and colleges will find it difficult to undertake the planning of infrastructure projects whose design and construction may span several years. As a result, Canada will begin to lose its hard-earned competitive advantage in public sector R&D.

As mentioned, innovation is dependent upon the generation of new knowledge and ideas from research that eventually leads to economic, health, and social benefits for society at large. At times, however, the links between knowledge creation and technology development are not immediately apparent. Yet, understandably, governments, which invest considerably in public sector research, often seek evidence that their investments have yielded appropriate returns. Such evidence can be derived from several studies of the economic impact of investments in research.

For example, a landmark study of over 100,000 industrial technologies patented in the United States in 1993-94 found that 73 percent of the science citations involved in these private sector patents originated from research conducted in the public domain, largely at universities. Only 27 percent of the citations originated in industry-conducted research. Data for Canadian industrial patents would almost certainly be very similar.

However, the process of knowledge transfer is not simply a matter of the acquisition of intellectual property by the private sector. Rather, the transfer requires a close working

relationship between the public and private sectors—a relationship that ultimately involves the free movement of people and ideas between the two domains. This interplay between the supply forces of science and the demand forces of the marketplace greatly facilitate knowledge transfer and its eventual commercialization. As has often been said, “tech transfer is a contact sport.”

The CFI promotes the process of knowledge transfer by enhancing development of local and regional technology clusters that bring together the industrial, financial, and academic enterprises and their respective talent pools, since such clusters often coalesce around infrastructure facilities or technologies. In so doing, CFI is helping to ensure that universities and colleges play a critical role in the sustainable development, both social and economic, of communities across Canada – large and small – and thereby contribute to Canada’s prosperity and competitiveness.

***In conclusion,***

- by investing in leading-edge research throughout Canada;
- by supporting world-class expertise in universities and other research institutions;
- by putting in place the right conditions to attract and retain top-quality researchers in Canada;
- and by training young Canadians for the knowledge-based economy;

we are ensuring that Canada will become a *nation of innovation* - one that will compete successfully in the global knowledge economy, and one that will bring benefits to all Canadians.

We owe it to future generations to maintain this commitment.

Thank you/Merci.

## House of Commons Industry Committee Manufacturing

Institution/Organization	Project Title	CFI Amount
Algonquin College of Applied Arts and Technology	algonquin college advanced digital cinema research centre	\$781 244
Brock University	enhanced infrastructure for plant biotechnology facility	\$156 015
Brock University	support of new initiatives in biotechnology	\$156 666
Carleton University	advanced photonic components fabrication, testing, and characterization laboratory	\$302 734
Carleton University	the verification and validation of distributed, object-oriented software systems: software and infrastructure for testing research	\$99 111
Concordia University	biotechnology and bioinformatics facility	\$1 246 080
Concordia University	a distributed computing environment for real-time simulation of mechanical systems: aerospace and automotive applications	\$58 000
Concordia University	infrastructure to study novel cooling schemes for "next generation" aircraft engines; and to develop micro-scale power devices	\$172 000
CÉGEP de Chicoutimi	laboratoire d'expérimentation, de développement et d'évaluation de produits alimentaires	\$152 119
CÉGEP de Saint Hyacinthe	recherche avancée sur les matériaux géosynthétiques et textiles pour la protection de l'environnement et des individus	\$710 640
CÉGEP de Saint Hyacinthe	nanofabrication de matériaux textiles et non-tissés pour la protection de l'environnement et des individus	\$406 400
CÉGEP de Saint-Jérôme	plate-forme r-d en propulsion avancée et gestion de l'énergie constituée de trois mulets normalisés à caractéristiques physiques ajustables supportés par des équipements de laboratoire périphériques	\$2 103 143
Dalhousie University	seafood and water safety research laboratory - equipment support	\$225 000
Dalhousie University	numerical and experimental equipment for research in nonlinear photonics	\$71 648
Dalhousie University	ultrafast optical parametric amplifier laser facility for studies of spin coherence in semiconductor nanostructures	\$229 992
Dalhousie University	intelligent infrastructure protection	\$118 708
Dalhousie University	novel organic electronics fabrication and characterization laboratory at dalhousie university	\$139 412
Dalhousie University	food microbiological research laboratory	\$94 063
Ecole Polytechnique de Montréal	software cost-effective change and evolution research (soccer) laboratory	\$125 000
Ecole Polytechnique de Montréal	nanorobotics laboratory	\$1 000 000
Ecole Polytechnique de Montréal	laboratoire de caractérisation thermomécanique des composites à haute performance	\$125 000
Ecole Polytechnique de Montréal	advanced nanorobotics research infrastructure	\$1 771 615

Institution/Organization	Project Title	CFI Amount
Ecole Polytechnique de Montréal	dispositifs médicaux intelligents (dmi): design, construction, essais et validation in vitro et in vivo	\$3 175 000
Ecole Polytechnique de Montréal	laboratoire de fabrication intelligente des composites	\$1 181 991
Ecole Polytechnique de Montréal	laboratoire d'innovation et d'analyse de la bioperformance de dispositifs médicaux	\$2 200 000
Ecole Polytechnique de Montréal	advanced testing laboratory for optical micro and nano electro mechanical systems	\$148 837
Ecole Polytechnique de Montréal	aménagement d'un "laboratoire de modelisation biomecanique et de chirurgie du rachis assistee par ordinateur"	\$193 200
Ecole Polytechnique de Montréal	infrastructure for research in information systems security	\$397 075
Ecole Polytechnique de Montréal	experimental platform for quantum cryptography in optical fibres	\$358 654
Ecole Polytechnique de Montréal	breakthrough technologies in alkane functionalization: achieving higher product yields and enormous economies of scale in fluidized bed reactor systems	\$199 920
Lakehead University	facility for molecular food microbiology and confocal microscopy	\$125 000
Lakehead University	expansion of lakehead university's pulp and paper facilities	\$113 200
Lakehead University	coherence in semiconductor nanostructures/long-haul fibre-optic communications	\$30 000
McGill University	integrated and innovative agri-food processing technologies/technologies de pointe dans la transformation intégrée agro-alimentaire	\$1 540 887
McGill University	infrastructure for food process engineering laboratory	\$216 200
McGill University	intelligent sensing and mechatronics for agri-food production	\$173 824
McMaster University	testing and analysis experimental for information processing laboratory	\$198 640
McMaster University	design of multiple-input multiple-output wireless communication systems	\$121 946
McMaster University	design, fabrication, and testing of novel microelectromechanical systems for sensor, biomedical, and telecommunications applications	\$200 000
McMaster University	biological microbeam for low dose radiobiology research	\$469 572
McMaster University	major equipment for digital cinema research	\$353 651
McMaster University	microfabrication and microfluidic testing facility for plastic/polymer based biomedical devices	\$98 418
McMaster University	innovative research in sheet forming technology using automated mechanical testing and strain measurement systems	\$300 000
McMaster University	estimation, tracking and fusion laboratory (etflab)	\$224 030
McMaster University	the development of silicon-based highly integrated optical components suitable for volume manufacture	\$118 849
McMaster University	acquisition of an automated materials characterization system	\$97 688
McMaster University	parallel computer cluster for computational materials science	\$121 131
McMaster University	a physiology and behaviour lab for the study of visual processing and visual motor control	\$59 332
McMaster University	optical waveguide devices based on lithium niobate substrates	\$211 101
Memorial University of Newfoundland	ultrafast nano-photonics laboratory facility	\$125 000
Memorial University of Newfoundland	pushing the limits of cantilever-based sensors	\$192 624

Institution/Organization	Project Title	CFI Amount
Memorial University of Newfoundland	experimental facility for confocal microscopy studies of self assembly in complex fluids	\$299 178
Queen's University	establishment of an intergrated power electronics research laboratory for the emerging telecommunications systems	\$125 000
Queen's University	engineering of synovial joint tissues	\$125 000
Queen's University	national microelectronics and photonics testing collaboratory/laboratoire national collectif d'essais en microélectronique et en photonique	\$9 310 238
Queen's University	power electronics laboratory for designing integrated architectures for computers and telecommunications systems	\$1 141 086
Queen's University	multidisciplinary analysis and design of innovative biomechanical and automotive systems	\$100 000
Queen's University	development of a microfluidic research facility	\$130 000
Queen's University	laboratory for last-mile photonics networking technologies	\$200 000
Robarts Research Institute	surgery and therapy simulation facility (stsf)	\$1 957 908
Royal Military College of Canada	diode laser and melt rheometer for polymer processing and joining research	\$125 000
Ryerson University	fatigue testing system for studies of the mechanical behavior of advanced materials	\$60 000
Ryerson University	facility for research on aerospace materials and engineered structures (frames)	\$355 887
Ryerson University	advanced microscopic analysis of interfaces and surfaces for industrial and environmental applications	\$562 795
Ryerson University	laboratory for electric drive applications and research (ledar): an advanced research laboratory dedicated to the development and applications of innovative electric motor speed control systems.	\$395 979
Saint Mary's University	saint mary's university electronics facility for experimental nuclear physics with radioactive beams at triumf-isac ii	\$133 617
Simon Fraser University	semiconductor defect spectroscopy laboratory	\$200 000
Simon Fraser University	information networking and multimedia centre (infont media centre) a versatile environment for multimedia networking and applications	\$393 349
Simon Fraser University	sfu compound semiconductor device fabrication laboratory	\$224 000
Simon Fraser University	dr tong louie living laboratory : promoting independent living and quality of life for disabled and elderly populations	\$139 990
Simon Fraser University	optical trapping laboratory for biomolecular manipulation	\$150 000
Simon Fraser University	field emission scanning electron microscope for high resolution imaging of materials	\$200 000
Simon Fraser University	ultra wideband spread-spectrum system laboratory	\$200 000
Simon Fraser University	biochemical and biophysical analysis of mammalian cells using microfluidic biochips	\$109 660
Simon Fraser University	superconducting magnet system for solid-state nuclear magnetic resonance	\$200 000
Simon Fraser University	high-speed networks: traffic measurement, characterization, and modeling tools	\$67 261
St. Francis Xavier University	cryogen free superconducting magnet facility	\$76 000
The University of British Columbia	novel equipment to address the mechanisms of spinal cord injury	\$213 568



Institution/Organization	Project Title	CFI Amount
The University of British Columbia	facility for the development, validation and evaluation of multi-modal simulators and user interfaces	\$99 938
The University of British Columbia	computer laboratory for wireless communication research	\$121 124
The University of British Columbia	laboratory for advanced detector development	\$3 927 148
The University of British Columbia	kopio: a new investigation into the heart of matter	\$536 786
The University of British Columbia	technology development facility for high throughput genomics	\$162 667
The University of British Columbia	ultra-high precision intense optical system for very low temperature spectroscopy (uhpios)	\$130 000
The University of Western Ontario	magnetic resonance systems development laboratory at the university of western ontario	\$235 420
The University of Western Ontario	a millimeter and submillimeter instrumentation laboratory at the university of western ontario	\$167 543
The University of Western Ontario	biocomputing laboratory	\$111 128
The University of Western Ontario	a robotic test-bed for minimally invasive surgery and therapy	\$138 137
The University of Western Ontario	maldi-top mass spectrometer for characterization of molecular materials	\$148 417
The University of Western Ontario	innovations on nano-biosensor technology- biosensors based on biological transducers for environmental monitoring	\$462 800
The University of Western Ontario	triboindenter and scanning probe facilities for nanoscale mechanical and electrical studies of materials and interfaces	\$627 450
The University of Western Ontario	biomedical engineering	\$1 672 000
The University of Western Ontario	nanoelectronics design, simulation, and testing laboratory (ndstl)	\$95 000
The University of Western Ontario	equipment for dynamic characterization of mems-based inertial sensors and rf components	\$185 746
The University of Western Ontario	scanning electrochemical microscopy, near-field spectroscopy and microscopy of single semiconductor nanostructures	\$225 194
The University of Western Ontario	infrastructure to enable the assessment of implant fixation and load transfer in joints of the upperlimb	\$205 641
The University of Western Ontario	equipment for nano/micro-scale mechanical testing of multiphase materials	\$108 248
Toronto Rehabilitation Institute	laboratories and workspaces for scientists and graduate students engaged in the idapt research program at toronto rehabilitation institute (a teaching hospital of the university of toronto)	\$6 411 000
University of Alberta	computational infrastructure for wireless research facility	\$250 000
University of Alberta	long throw - low pressure physical vapour deposition system for sputtering porous nanostructured thin films	\$123 600
University of Alberta	the university of alberta protein and gene discovery centre: advancing technology and facilitating research in high-throughput chemical genetics, genomics and proteomics	\$3 824 840
University of Alberta	innovative instrumentation for advanced proteome research	\$576 000
University of Alberta	innovations in agri-food technology: meat safety and processing	\$1 259 586
University of Alberta	microchip-based molecular biology	\$132 068

Institution/Organization	Project Title	CFI Amount
University of Alberta	development of a real-time digital simulation and control laboratory for innovative research in power engineering	\$198 180
University of Alberta	ultrafast photonics	\$96 066
University of Alberta	laboratory equipment for analog and mixed-signal testing of high-speed communications integrated circuits	\$170 716
University of Alberta	single cylinder engine testbed facility for innovative internal combustion engine research	\$241 074
University of Alberta	laboratory for the design, modelling, and nonlinear control of a self-bearing motor	\$220 892
University of Alberta	facility for evolutionary methods in electrical and computer engineering	\$91 241
University of Alberta	materials science of food and agricultural materials	\$225 614
University of Alberta	infrastructure for establishing a communications research laboratory (crl)	\$222 483
University of Calgary	infrastructure for applied wireless ultrawideband research	\$302 760
University of Calgary	micro engineering, dynamics and automation laboratory (medal)	\$244 143
University of Calgary	instrumentation for ultra precision dynamic identification, optimization and prototyping of microsystems technology and nanotechnology based devices	\$140 600
University of Calgary	ultra fast laser micromachining laboratory	\$417 720
University of Guelph	structure-function relationships in food and soft materials	\$145 476
University of Guelph	facility for the molecular understanding of food protein structure-function relationships	\$122 068
University of Guelph	creation of the canadian research institute for food safety (crifs)	\$2 998 242
University of Guelph	canadian research institute for food safety: the next phase	\$1 624 924
University of Guelph	centre for food and soft materials science	\$2 800 000
University of Guelph	state-of-the-art facility for the characterization of manipulation of soft matter at interfaces	\$134 379
University of Guelph	tissue, cell, and protein dynamics laboratory	\$252 319
University of Guelph	laboratory for the development of new analog integrated circuits and microsystems	\$135 004
University of Guelph	facility for nutraceutical encapsulation and performance research	\$126 045
University of Guelph	a combined set-up for the study of macromolecular assemblies in creating novel and improved food products	\$146 454
University of Guelph	spectroanalytical and spectroelectroanalytical equipment	\$238 777
University of Guelph	molecular biology and imaging equipment	\$95 380
University of Guelph	an integrated set-up for the metabolic profiling of wine lactic acid bacteria and yeast, and the bio-chemical grape and wine characterization	\$160 014
University of Guelph	cryptosystems security research laboratory at the university of guelph	\$118 542
University of Guelph	infrastructure for the comparative proteomics of yeast fermentations	\$125 001
University of Manitoba	facility for simulation and measurement of advanced and software adaptive antennas and microwave components	\$153 286
University of Manitoba	microfabricated software adaptive antennas for broadband wireless communications	\$948 293
University of Manitoba	a facility for combustion research	\$104 000
University of Manitoba	creation of an aerospace laboratory	\$188 740

Institution/Organization	Project Title	CFI Amount
University of Manitoba	critical addition to the fatigue life prediction and life extension laboratory	\$193 445
University of Manitoba	modernization of biomechanics laboratory	\$60 000
University of New Brunswick	materials characterization infrastructure	\$62 308
University of New Brunswick	high speed dry machining of difficult-to-cut materials using self-propelled rotary tools	\$104 320
University of New Brunswick	infrastructure support for institute of biomedical engineering, university of new brunswick	\$165 000
University of New Brunswick	integrated forest products facility	\$160 500
University of Ottawa	caractérisation de composants actifs pour systèmes de communications en radiofréquences et micro-ondes	\$181 179
University of Saskatchewan	radio-frequency heating of food and bio-materials	\$59 504
University of Saskatchewan	single-molecule microscopy and spectroscopy	\$137 008
University of Saskatchewan	genetics, genomics and breeding for improved durum wheat end-use quality	\$67 600
University of Saskatchewan	high performance and parallel computer for condensed matter research	\$160 277
University of Saskatchewan	cone calorimeter for fire science research laboratory	\$57 000
University of Toronto	femtosecond science laboratories: electron diffractometer and multi-time correlation spectrometer	\$300 000
University of Toronto	intelligent design for adaptation, participation and technology (idapt): innovative rehabilitation for people in challenging environments	\$7 358 556
University of Toronto	facilities for manufacturing microcellular and nanocellular plastics with superior properties with lowered weights	\$745 750
University of Toronto	nortel institute for telecom - open research facility - a project within the advanced technologies research facility (atrf)	\$2 696 000
University of Toronto	organic and polymer optoelectronics laboratory (opol)	\$1 567 275
University of Toronto	advanced materials powder production, research and testing facility	\$150 000
University of Toronto	non-linear laser-scanning microscope for dynamic functional imaging of biological specimens	\$191 600
University of Toronto	infrastructure for a distributed microsystems laboratory	\$107 361
University of Toronto	integrated product design and manufacturing	\$115 500
University of Toronto	infrastructure for characterizing single molecules with nanometer resolution	\$159 562
University of Toronto	real-time computer system for virtual aircraft development	\$150 000
University of Toronto	video over multimedia networks: new paradigms in communication	\$375 857
University of Toronto	information processing in miniature auditory systems.	\$69 998
University of Toronto	infrastructure for manipulation on the micro and nano scales	\$121 782
University of Toronto	a plant-level dataset for the canadian-u.s. automobile industry	\$39 700
University of Toronto	millimeter wave and high data rate integrated circuit characterization	\$167 990
University of Victoria	a test and measurement facility to conduct advanced research in the area of high performance electric drives and their fault diagnosis	\$62 000
University of Waterloo	cooperative intelligent systems laboratory	\$198 684

Institution/Organization	Project Title	CFI Amount
University of Waterloo	digital servo-control system, automated pycnometer, and integrated optical microscopy-image analysis for state-of-the-art tube bending and hydroforming	\$127 026
University of Waterloo	equipment to enhance capabilities for multimedia processing	\$125 000
University of Waterloo	hermetic sealing for applications such as medical implants, optoelectronics and microwave modules	\$123 923
University of Waterloo	centre for advanced materials joining research	\$1 203 994
University of Waterloo	scuba-2: a submillimetre camera for astronomy	\$12 347 500
University of Waterloo	facility for theoretical and applied research in smart actuators and sensors (tarsas)	\$159 972
University of Waterloo	facility for fabrication and characterization of advanced solid-state rf/microwave, sensoric, and imaging micro-devices	\$400 000
University of Waterloo	investigation of fluid flow in injection molding	\$110 730
University of Waterloo	laboratory for characterization of advanced rf/microwave devices	\$299 695
University of Waterloo	center for rapid prototyping of advanced multi-scale systems	\$320 701
University of Waterloo	micro-systems research center	\$340 488
University of Waterloo	resistance spot welding of aluminum	\$44 150
University of Windsor	facility for the development of advanced metal forming processes	\$101 000
University of Windsor	facility for the research and development of automotive sensors and sensing systems	\$101 000
University of Windsor	scientific computing facility for the computational study of ultrafast light-matter interactions	\$50 000
University of Windsor	the development of an ultra high-energy resolution electron source for an electron-molecule collisions facility	\$49 995
University of Windsor	linux pc cluster for computational studies and optimization of nano-mechanical and industrial systems	\$64 323
University of Windsor	high performance computing cluster for fuel cell and hydrogen research	\$50 000
University of Winnipeg	centre for scientific and curatorial analysis of painting elements (c-scape)	\$161 015
Université Laval	laboratoire d'imagerie hyperspectrale en astrophysique	\$155 375
Université Laval	équipements scientifiques de pointe dédiés à la tracabilité moléculaire des bactéries probiotiques présentes dans les aliments fonctionnels et l'écosystème intestinal de l'homme	\$125 000
Université Laval	techniques de caractérisation de matériaux protéiques biologiquement actifs	\$161 556
Université Laval	laboratoire de test et mesure en photonique	\$740 000
Université Laval	établissement d'un laboratoire expérimental en énergie éolienne	\$171 965
Université Laval	appareillage de pointe pour l'étude des phénomènes électrodialytiques et de leur impact sur les composantes bio-alimentaires	\$199 896
Université Laval	recherche sur les modifications des corps gras et autres composés alimentaires améliorant leur valeur nutritionnelle et leur valorisation: réactions chimiques à l'aide de catalyseurs	\$281 612

Institution/Organization	Project Title	CFI Amount
Université Laval	développement de nouvelles formulations de poudres métalliques pour la fabrication de pièces de hautes performances à l'aide du procédé de métallurgie des poudres	\$302 098
Université Laval	development and characterization of optical test and measurement instrumentation targeted for communication applications	\$122 106
Université Laval	écriture des réseaux d'indice dans les fibres optiques et les verres	\$178 500
Université Laval	section d'essais micro-mécaniques au sein du laboratoire d'essais mécaniques	\$175 182
Université Laval	techniques de laboratoire avancées pour la détermination des propriétés des aliments	\$138 556
Université Laval	laboratoire de microbiologie des viandes : validation de procédés et efficacité des systèmes antimicrobiens	\$241 447
Université de Moncton	laboratoire de calculs numériques et de visualisation	\$64 000
Université de Moncton	développement de la capacité de recherche au nouveau-brunswick dans le domaine de la biotechnologie alimentaire et des nutraceutiques	\$465 033
Université de Moncton	optique non-linéaire et matériaux photoniques pour des applications industrielles	\$300 000
Université de Montréal	centre de recherche en électrochimie et matériaux (crem)	\$2 320 000
Université de Montréal	identification et contrôle des sources de contamination des fermes par les pathogènes alimentaires et gestion des dangers biologiques associés aux viandes	\$193 530
Université de Montréal	in situ deposition, ion implantation and characterization system for the improvement and the development of high technology materials	\$267 516
Université de Sherbrooke	laboratoire de réalité augmentée et de traitement de la vidéo	\$83 626
Université de Sherbrooke	domus : laboratoire de domotique et d'informatique mobile de l'université de sherbrooke	\$160 000
Université de Sherbrooke	conception et fabrication de systèmes robotiques utilisables dans la vie courante	\$69 226
Université de Sherbrooke	laboratoire de surveillance et commande des systèmes dynamiques complexes	\$109 310
Université du QC Institut national de la rech. scientifique	laboratoire mobile de communications sans fil à haute vitesse	\$124 042
Université du QC Institut national de la rech. scientifique	système d'écriture directe par laser pour la réalisation de microstructures	\$124 571
Université du QC Institut national de la rech. scientifique	système de correction de front d'onde pour laser de puissance	\$118 650
Université du QC Institut national de la rech. scientifique	laboratoires de micro- et de nanofabrication (Imn)	\$5 878 168
Université du QC Institut national de la rech. scientifique	laboratoire en science et applications des plasmas	\$4 360 691
Université du QC Institut national de la rech. scientifique	advanced laser light sources (alls)	\$20 950 915
Université du QC Institut national de la rech. scientifique	optical zeitgeist laboratory	\$227 937
Université du QC Institut national de la rech. scientifique	advanced millimeter-wave laboratory for high-speed wireless communications and radar sensors	\$215 153
Université du QC Institut national de la rech. scientifique	nano(meter) - femto(second) laboratory, or nfl	\$217 485
Université du QC École de technologie supérieure	appareillage pour l'imagerie et l'évaluation fonctionnelle de l'appareil locomoteur	\$114 808
Université du QC École de technologie supérieure	laboratoire de communication, de traitement des signaux mixtes et d'intégration de la microélectronique	\$1 342 928
Université du QC École de technologie supérieure	laboratoire de recherche en caractérisation et mise en forme des alliages à mémoire de forme	\$217 861

Institution/Organization	Project Title	CFI Amount
Université du QC École de technologie supérieure	reconfigurable fiber-optic telecommunication test-bed for the modeling, development and functional evaluation of intelligent network architectures	\$224 065
Université du Québec en Outaouais	canada research chair in photonics - material processing laboratory	\$402 669
Université du Québec en Outaouais	efficient processing of multimedia data	\$511 785
Université du Québec en Outaouais	systèmes photoniques de mesure - infrastructure de caractérisation et de prototypage	\$221 453
Université du Québec à Montréal	design, integration and characterization of low-voltage low-power analog devices and mixed-signal building blocks for rf transceivers	\$224 325
Université du Québec à Trois-Rivières	construction d'un banc d'essais universel destiné à optimiser la conception de réservoirs d'hydrogène basés sur l'utilisation des hydrures métalliques nanocristallins	\$117 713
Université du Québec à Trois-Rivières	infrastructure pour étude et développement de systèmes de mesure	\$120 000
Université du Québec à Trois-Rivières	centre de calcul en temps réel	\$320 600
York University	a demonstration vhf wind-profiler network for ontario and quebec	\$2 535 380
York University	atom interferometry and portable instrumentation using laser cooled atoms	\$200 000
York University	the digital sculpture laboratory at york university	\$201 298
	<b>Number of Projects 230</b>	<b>\$153 676 089</b>

## Dalhousie University

Grinding is one of the most critical and costly manufacturing processes- accounting for 20% to 25% of the total machining expenditures in industrialized countries. Yet, of all the commonly used metal-removal processes, it's one of the most complicated and least understood because of its complexity.



Canada Foundation for Innovation  
Fondation canadienne pour l'innovation

Now, a pair of researchers from Dalhousie University are working to smooth the path towards developing and enhancing the techniques involved in this vital industrial process. The result? **Andrew Warkentin** and **Robert Bauer** have teamed up to establish Canada's first laboratory dedicated to grinding research.

With support from the CFI, the researchers are aiming to establish Canadian expertise in grinding. Of strategic importance to the Canadian economy, grinding is essential to automotive and aerospace industries, which use the process to produce high-precision components and to cut extremely hard materials.

The proposed research program will systematically identify fundamental grinding relationships. The next step? The building of a comprehensive model-an essential step towards adaptive control and optimizing cost effectiveness. The research will be carried out using a conventional surface grinding machine, as well as a state-of-the-art creep-feed grinding machine donated by Pratt & Whitney Canada.

Once the model is built, it will provide the researchers with the solid foundation they need to develop automated grinding systems that monitor, adapt, and continuously optimize the grinding process. The proposed research will make significant contributions to the advancement of grinding technology and engineering knowledge, and will develop Canadian expertise through the training of highly-qualified personnel in this precision machining process.

<http://poisson.me.dal.ca/grinding/>

## École polytechnique de Montréal

Is it possible to decrease the costs and risk of error associated with the design and fabrication of various products—while working in a global network? That's the problem being considered by René Mayer, a professor of mechanical engineering at École Polytechnique de Montréal.



Canada Foundation for Innovation  
Fondation canadienne pour l'innovation

To solve the problem, Mayer and his team of researchers are counting on a high-tech solution: virtual manufacturing. Already an essential element of fabrication, virtual manufacturing helps to simulate the steps involved in creating a product, including planning, manufacturing, inspection, and assembly. With powerful computers and highly sophisticated equipment—for example, a tri-dimensional measuring machine and a roughness tester/surface analyzer—researchers are able to determine the dimensions and geometry of the fabricated parts, and then isolate and control machine behaviour to create the desired product.

In a way, this virtual approach enables researchers to forecast and fine-tune everything—before a single part is even produced. Mayer intends to use these techniques to improve the productivity and design of mechanical fabrication in Canada. And thanks to a high-speed link between École Polytechnique, the National Research Council's Integrated Manufacturing Technologies Institute, and McMaster University, it will all take place within a network.

What are the benefits of this research for Canadians? They're both industrial and human. Virtual manufacturing will help increase the productivity of Canada's manufacturing industry, especially the manufacture of high value-added products. Mayer believes the virtual fabrication laboratory will be a major world-class facility that will attract numerous graduate students, researchers, and visiting faculty members.



## Logging On!

Canada's forest industry directly employs 360,000 people in over 300 communities across the country. The industry produces about \$66 billion of products annually and is the largest single contributor to Canada's international balance of trade.



Canada Foundation for Innovation  
Fondation canadienne pour l'innovation

Forintek Canada Corp. is Canada's national institute for solid wood products research. The organization supports industry and government through technical support and research directed at improving the global competitiveness of Canada's most important export industry.

The CT Imaging Centre has a unique industrial Computed Tomography scanner designed to non-destructively look inside logs. This facility, along with the new Sawmill Scanning Laboratory, is providing scientists and engineers with the tools required to develop advanced industrial scanning systems that identify internal defects before logs are sawn. This allows sawmills to produce the best possible quality lumber from every log and ensures that Canadian mills remain competitive in today's world of increased raw material costs and growing social and environmental pressures.



## Forest Ranger

*To preserve the health of our forests and keep deadly chemicals out of the human food chain, a UNB researcher has developed new, environmentally friendly technology.*

*By Matthew Bonsall*



Canada Foundation for Innovation  
Fondation canadienne pour l'innovation



As a boy, Yonghao Ni was fascinated by the huge pulp and paper mill near his home in Jiaxing, China. Today, half a lifetime and half a world away, Ni's fascination with pulp and paper has turned into a full-time passion—and earned him a reputation as one of the world's foremost forestry researchers.

Ni is a professor of chemistry and chemical engineering at the University of New Brunswick (UNB) in Fredericton. His work is helping to cement Canada's reputation as a world leader in forestry science. Ni and his team at UNB are working on ways to reduce the environmental impact of forest products like pulp and paper. It's all part of a multi-disciplinary approach that tackles forest industry challenges by combining chemistry and forestry management.

"Growing up close to a mill in China got me interested in the pulp and paper industry. That's what motivated me to pursue my university degree in this field," says Ni looking back on the path he's taken since childhood. He says China and Canada are similar because both have a thriving forestry sector that produces vast wealth but also has a big impact on the environment. "Fredericton is similar in some ways to Jiaxing where I grew up. It's a small town with a good network of mills nearby—very much like New Brunswick" says Ni, who is also Director of the Dr. Jack McKenzie Limerick Pulp and Paper Research and Education Centre, and holds a Canada Research Chair in Pulp and Paper Science and Engineering. Today, he works closely with mills in New Brunswick to find ways to make pulp and paper mills more environmentally friendly.



Canada Foundation for Innovation  
Fondation canadienne pour l'innovation

One of the biggest challenges that the pulp and paper industry faces is figuring out how to eliminate chlorine from the paper making process. Canadians are familiar with chlorine as an essential chemical that allows us to take clean drinking water almost for granted. But pulp and paper mills that use chlorine to bleach wood pulp produce harmful chemical by-products that get into the air, water, soil, and food chain.

To help deal with the problem, Ni has developed the PM (modified peroxide) process. It's an improved hydrogen peroxide bleaching process for brightening mechanical or ultra-high yield wood pulps that are used to make paper. Not only does Ni's technology replace chlorine, it also produces higher quality and brighter paper products. As an added environmental bonus, the technology requires less water, which means less wastewater is pumped into rivers by pulp and paper mills.

Low implementation costs and big savings—compared with conventional methods—also mean there's commercial potential for world-wide application of Ni's process. Industry partners are already on board. Ni is working closely with Nexfor and its Fraser Papers mill in Edmunston, New Brunswick. His team is also working with the Irving Pulp and Paper plants in Saint John, and collaborating with other industry partners to manage forests to ensure the long-term sustainability of high-quality wood fibre. Ni says the key to success is teamwork.

"Forest product manufacturing is an integrated process where foresters, wood scientists, and paper engineers should all be working together." It's this collaborative approach, along with an enlightened attitude, that Ni hopes will soon be prevalent at paper mills everywhere—whether in Canada or half way around the world.