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THE COLLEGE AND COMMUNITY INNOVATION PROGRAM

PARTNERSHIPS FOR INDUSTRY INNOVATION

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Partnerships for Industry Innovation

Colleges and institutes play a lead role in strengthening regional capacity to innovate and work with industry partners to enhance competitiveness in the sectors and communities they serve. They conduct leading-edge applied research projects with industry partners to provide market ready solutions.

Whether it's the creation of a rapid oil containment cling pad to clean up small scale oil or fuel spills, the development of intelligent textiles to meet consumer specific needs, or building award winning cutting edge web technology, colleges and institutes help small- and medium-sized businesses (SMEs) innovate and grow by focusing on improvements in technologies, processes, products and services.

The Government of Canada's Tri-Council College and Community Innovation (CCI) Program administered by the Natural Sciences and Engineering Research Council in collaboration with the Social Sciences and Humanities Research Council and the Canadian Institutes of Health Research is making a real difference in growing the capacity of colleges and institutes to engage in industry-driven applied research and providing SMEs with the expertise required to be more innovative and productive.

Local businesses have access to state of the art equipment, facilities and the talent of college and institute faculty and technical experts. Students gain practical experience, driving innovation hand in hand with industry, and preparing them for meaningful careers. The influx of new ideas impacts program curricula, thus enhancing program content and the learning experience of students.

The CCI Program supports six types of funding grants:

Innovation Enhancement (IE) Grants enhance college applied research capacity and strengthen industry partnerships. IE grants are awarded for either a two-year or a five-year period. The two-year grants include funding of $100,000 per year over two years. The five-year grants include funding of up to $500,000 per year for the first three years, and up to $400,000 for the remaining years.

Applied Research and Development (ARD) Grants* provide companies with access to college expertise and student support for specific research projects that help solve problems geared to business goals. The grants range from six months to three years in duration and have three levels of funding – under $25,000; up to $75,000; and between $75,000 and $150,000.

Applied Research Tools and Instruments (ARTI) Grants support the purchase of research equipment and installations to enhance college applied research with industry partners. ARTI grants were one-time one-year awards ranging from $7,000 and $150,000.

Technology Access Centre (TAC) Grants provide companies with access to college expertise, technology and equipment. TAC grants provide five-year renewable funding of up to $350,000 per year.

Industrial Research Chairs for Colleges (IRCC) Grants support applied research leaders in economic sectors that spark greater innovation in communities, enhanced teaching and curricula, and more opportunities for college-industry and college-university partnerships. IRCC grants range from $100,000 to $200,000 annually.

College-University Idea to Innovation (CU-I2I) Grants develop and strengthen collaborations between colleges, universities and businesses to improve a company's technology or commercial products, processes or services. CU-I2I grants are valued up to $250,000 per year, for up to three years.

This second College and Community Innovation Program Vignettes Showcase highlights applied research partnerships between colleges, institutes and SMEs in key sectors that are generating economic benefits for Canada.

*Effective April 1, 2015:
(1) The ARD Level 1 Grant will be renamed Engage for Colleges Grants and will be grouped with the university Engage Grants.
(2) The ARD Levels 2 and 3 Grants will be combined into one Applied Research and Development Grants (with two levels of funding and matching).

1. Environmental Science and Technology

1.1

Using Drones for Aerial Mapping

Ontario: Confederation College

Unmanned aerial vehicles may offer new potential for more accurate and cost-effective aerial surveys of Northern forests.

An applied research project at Confederation College in Thunder Bay, Ontario is comparing the quality and accuracy of data acquired using Unmanned Aerial Vehicles (UAV), more commonly known as drones, to current industry methods of data acquisition using manned aircraft.

LiDAR (Light Imaging Distance and Ranging) sensors are currently the standard for the collection of surface elevation data and are the best option for capturing ground elevation data where a heavy vegetative canopy is present. Photo-derived elevation models are an alternative to LiDAR for data capture projects where the landscape is mostly free of vegetative cover. They are also well suited for stockpile surveys and forested areas during the leaf-off period in early spring and fall.

UAVs offer greater flexibility in capturing survey data on a scheduled basis. They fly at a much lower altitude than manned aircraft and can capture data below the cloud ceiling. These systems will cover up to 15 square kilometres per day, making them more cost effective for smaller scale jobs. The project UAV has a twin sensor design which allows for multispectral image capture and has the capacity to be outfitted with other miniaturized sensors. Should the UAV acquired data be validated, KBM can offer their clients an expanded suite of aerial survey data options to better suit client needs and budgets.

"The development of UAVs in the Canadian and U.S. marketplace is projected to grow exponentially over the next five years. Through this project and other related R&D initiatives we hope to be able to bring to market new and innovative sensor configurations and product deliverable for our clients," says KBM Resources Group.

Funding: CCI Applied Research and Development Grant

Partner: KBM Resources Group

Floating Fence Skims Oil Spills from Lake and River Water

Alberta: SAIT Polytechnic

A floating fence being tested and refined at SAIT Polytechnic offers new potential for making a difference in oil spill clean-up.

The XBOOM hydrocarbon containment technology was developed by Canadian Floating Fence Corporation with testing, validation and design refinement done in

1.2

cooperation with researchers in SAIT Polytechnic's Applied Research and Innovation Services (ARIS) department.

The upright floating fence has a unique design that allows water to flow through it while enabling the effective containment, collection and redirection of spilled oil or debris in preparation for skimming and clean up. A working prototype of the XBOOM is being used in live spill testing as the next phase of its development process.

Mark Neal, president of Canadian Floating Fence Corporation, says the initial concept for XBOOM came from his father in the 1970s. While traditional booms typically fail to contain hydrocarbons effectively in water at more than 0.7 knots, the XBOOM contains spills at an estimated 2.0 knots. While current booms are large, bulky and time consuming to deploy, a single person can deploy a 50-metre XBOOM roll in under a minute. Furthermore, in SAIT Polytechnic's small-scale prototype trials, the XBOOM was capable of containing 99.6 per cent of crude oil in still water and 94 per cent in water moving under one knot.

Funding: CCI Applied Research and Development Grant
Partner: Canadian Floating Fence Corporation

1.3

Re-vegetation of Contaminated Mining Sites

Québec: Cégep de l'Abitibi-Témiscamingue – Centre technologique des résidus industriels (CTRI)

Environmental clean-up of old mining sites is a challenge facing mining companies across the country. Treatment of acid mine drainage using wetland systems and replanting vegetation in tailings areas are the two approaches being used to restore the old sites. Two recent applied research projects at the Centre technologique des résidus industriels (CTRI) affiliated with Cégep de l'Abitibi-Témiscamingue were specifically designed to help small and medium-sized mining companies in Northern Québec adapt to today's environmental regulations and find ways to restore the landscape disturbed by mining activities.

Researchers are analyzing the characteristics of metal-absorbing materials and creating an inventory of materials that neutralize acidity and could help decontaminate mine waste water. Combined with wetlands, which help purify water through passive sulphur-reducing bio-filters, these materials could lead to greater effectiveness in treating acid mine and contaminated drainage. Various combinations of plants and improved soil formulas will be tested on both sites that generate acid mine drainage and control sites to find the most effective way to restore areas to an acceptable post-mining state.

This project has provided several technological showcases for the cégep's partners, particularly in the re-vegetation of waste rock, tailings and passive treatment systems for mine drainage. The research also involved many university and cégep students through grants, internships and classroom projects.

Funding: CCI Innovation Enhancement Grant
Partners: Régénération, Hécla Québec, Iamgold Corporation, Mine Canadian Malartic, Technosub, Organisme du bassin versant du Témiscamingue.

1.4

Innovative Oil Spill Clean-up

Ontario: Fleming College

Oil and gas spills have the potential to do serious harm in aquatic environments.

Containing and collecting oil quickly can reduce the drastic effects of a petroleum spill.

The Centre for Alternative Wastewater Treatment (CAWT) at Fleming College has been working with the Murrenhil Corporation on applied research projects on products that can be used as a first response oil containment system.

Rapid Oil Containment (ROC) Barrier™ and Oil Cling Pads™ are two forms of polyethylene laminate pads that can be thrown onto a spill in a lake or ocean to soak up oil or gas. The ROC Barrier™ is made up of oil adsorptive pads designed to protect aquatic environments from oil and gas by collecting the hydrocarbons without also collecting water.

"Unlike similar absorbing materials, ROC Barrier is an oil-adsorbing poly that is hydrophobic. It floats on water but will not absorb water," says Glenn Murray, President of Murrenhil Corporation.

These adsorptive pads are folded into packages small enough to be carried in small watercrafts and stored in marinas or ships.

Fleming College researchers assisted with research and development, as well as product testing and verification. As a result of this applied research, Murrenhil was able to improve their product and bring the ROC Barrier™ to market. CAWT staff also assisted with patenting and with marketing.

Murrenhil has since met new contacts that can further distribute and increase sales of the product, and is now approaching worldwide industry leaders for global licensing opportunities.

"Our partnership with the CAWT has proved to be invaluable, and imperative to Murrenhil Corporation's success," Murray says.

Funding: CCI Innovation Enhancement Grant

Partner: Murrenhil Corporation

Wastewater Recovery

Ontario: Lambton College

There is a growing interest in water and wastewater treatment technologies and systems across Canada.

The Lambton Water Centre (LWC) increases the capacity for Lambton College and its partners to conduct applied research in the area of wastewater, water treatment with services that include design and automation, instrumentation, optimization, maintenance/operation scheduling and remote facility management systems.

The Water Centre has formed partnerships with companies and organizations in the water and wastewater value chain including municipalities, manufacturers, operators, consultants, universities and First Nations organizations.

1.5

One project under the LWC Corp. is with KMX Membrane Technologies. KMX is currently undertaking pilot scale recovery of 'frack' water from Alberta well drilling and development. Fracking, or hydraulic fracturing, uses huge volumes of pressurized water, sand and chemicals to release oil and gas from rock formations.

Lambton researchers are working to help KMX automate, control and optimize their membrane-based wastewater recovery pilot plant. The LWC faculty researchers have expertise ranging from instrumentation and control, to process control and chemical analysis. Students and faculty from these college programs are able to develop their skills and knowledge as they apply to the water sector while working on development of viable products for local companies.

Harvey Vowels, New Business Development, KMX Corporation says "The partnership with Lambton College has been very beneficial in allowing us to automate and optimize our new wastewater recovery technology targeted at the oil and gas and mining sectors. Based on our very positive experience with Lambton College, we look forward to collaborating on additional new process technology developments."

The LWC initiative also helps stimulate economic development through technology transfer to the partners, local and regional business and municipalities.

Funding: CCI Applied Research and Development Grant
Partner: KMX Membrane Technologies Corp.

1.6

Growing Microalgae for Biofuel

Nova Scotia: Nova Scotia Community College

Green algae harvested from Nova Scotia shores are being used by a local entrepreneur to produce biofuel for industrial use. And Nova Scotia Community College (NSCC) is helping him refine his process.

SabrTech is a Nova Scotia-based company using microalgae to design the next generation of biofuel, animal feed, and bioremediation. The company has partnered with NSCC and Acadia University to complete prototyping and optimize production of their algal biomass in a real world setting. The research team identified non-invasive and continuous quality assessment of algae as a key for achieving an optimum rate of production during microalgae cultivation. NSCC research provided a roadmap for designing an in-situ monitoring device to assess the maturity of the algal biomass for biofuel extraction.

NSCC students played a direct role, gaining technical skills in microalgae cultivation in varied growth conditions. The project results could significantly contribute to Canada's economy and reduce the environmental impacts of using fossil fuels by helping develop a sustainable biofuel and bringing Canada into a leading position in global micro-algal markets.

Mather Carscallen, President & CEO of SabrTech Inc., says "Working with the NSCC yielded not only positive results for our project, but additional unexpected findings that will help us advance our technology in the years to come."

Funding: CCI Applied Research and Development Grant
Partner: SabrTech Inc.

Winter Planting Enhances Wetland Reclamation for Oil Sands

Alberta: Grande Prairie Regional College

Reclaiming lands deforested by oil sands excavation has been one of the greatest challenges of the burgeoning oil industry in Alberta. Success with winter replanting of spruce trees undertaken by researchers from Grande Prairie Regional College offers an exciting new remedy for this industry problem.

Boreal wetlands disturbed by oil sands operation are not accessible in the summer for reclamation. And the excessive moisture content of the soil reduces seedling survival. Therefore, reclamation of the wetlands is difficult and limited during the regular planting season. The novel idea of winter planting to avoid these limitations was advanced by Dr. Weixing Tan, the principal investigator of Pollutants-to-Products (P2P) initiative at Grande Prairie. Frozen wetland soil was broken by a backhoe and seedlings were planted in the warmer peaty soil exposed.

Over 94 per cent of black spruce seedlings survived on a wetland site when planted during winter in 2011 at -17°C. This success was so significant that industry put it into practice immediately on large scale even before the trial was fully completed. And Suncor's CEO Steve Williams highlighted it as one of the major innovations in oil sands reclamation effort in 2012.

The trial was conducted at the Evergreen Centre for Resource Excellence & Innovation in Grande Prairie, Alberta with additional funding and support from Oil Sands Leadership Initiative (now COSIA), the

1.7

Alberta Government, Next Generation Reforestation, and Global Restoration Corp.

"This unique concept of planting trees in winter will allow us to have an easier access to the wetlands so as to enhance the restoration processes of natural ecosystems in the boreal region," enthused Jeremy Reid, Environmental Specialist with Nexen Inc.

Funding support from the College and Community Innovation program, industry and government has also contributed to the development of three other innovative Pollutants-to-Products (P2P) projects at Grande Prairie: bio-capture of CO2 and air pollutants using microalgae, white spruce reforestation, and turning waste water to wood.

Funding: CCI Innovation Enhancement Grant
Partners: Oil Sands Leadership Initiative (now COSIA), the Alberta Government, Next Generation Reforestation, and Global Restoration Corp.

1.8

Treating Mine Tailing Effluents in Northern Wetlands

Yukon: Yukon College

A company proposing a major copper mine development in central Yukon has partnered with the Yukon Research Centre (YRC) to evaluate potential uptake of heavy metals in selected northern wetland plant species.

Research results will help to mitigate concerns about heavy metal uptake by plants in the Casino

project area in central Yukon and the spreading of contaminants into the environment through wildlife. The research undertaken by students and faculty at Yukon College, will also contribute to plans for the closure and reclamation of the proposed Casino mine's tailings management facility. This facility aims to use constructed wetlands as a passive, long-term care solution for the treatment of open pit water overflow and tailings effluent.

"This project further reflects our commitment to using the highest possible standards and supporting innovation in mine remediation technologies in the north," says Paul West-Sells, Casino President.

In addition to the anticipated benefits to the environment and industry, Yukon College students and researchers gained valuable skills and experience. Dr. Katherine Stewart, Research Associate and Dr. Amelie Janin, Industrial Research Chair in Mine Life Cycle teamed up to take an interdisciplinary approach to mine remediation. Dr. Stewart's plant ecology and soil science background and Dr. Janin's water chemistry expertise made this dynamic project a reality. YRC has published a report on **Passive Treatment of Mine Impacted Water in Cold Climates** that is now available to the public. Students contributed to this document, as well as participated in other project elements such as plant collection, experiment design, and analysis.

Funding: CCI Applied Research and Development Grant
Partner: Casino Mining Corporation

Eco-Friendly Clean-Up of Old Gas Station Sites

Saskatchewan: Saskatchewan Polytechnic

Cleaning up contaminated soil at former gas station sites is fraught with hurdles. Traditional remediation methods involve excavating impacted soils and moving them to a landfill or treatment facility. This is costly, prohibits use of the site during the process, and can expose people to contamination.

Hoping to change that, Federated Co-operatives Limited (FCL), a collective of 500 co-op grocery stores and gas stations in Western Canada, has partnered with Saskatchewan Polytechnic and the University of Saskatchewan to explore how to advance soil remediation techniques and technology developed by FCL and university soil scientists.

There are about 30,000 gas contaminated sites in towns and cities across Canada. If the research proves fruitful, the use of naturally occurring bacteria and fungi to break down hydrocarbons at contaminated municipal "brownfield" sites could reduce clean-up costs by more than 30 per cent.

As a key part of the investigation, students and faculty at Saskatchewan Polytechnic's BioScience

1.9

Applied Research Centre are developing tests and collecting and analyzing groundwater and mineral samples from a former gas station site to determine the effectiveness of eco-friendly soil remediation.

Trevor Carlson, Director of Sustainability at Federated Co-operatives Limited says, "This technology will enable FCL to remediate contaminated sites without negatively impacting the environment, transferring contaminated soil to a landfill or disrupting business activities on site."

Funding: College-University Idea to Innovation Grant
Partner: Federated Co-operatives Limited

1.10

Cleaning up Mine Water Contaminated by Cyanide

Québec: Cégep de l'Abitibi-Témiscamingue – Centre technologique des résidus industriels (CTRI)

Cyanide has been widely used in gold mining to separate gold from ore. However, cyanide contaminates water and water tables in and around a mining site, and requires sophisticated clean-up technologies. Because concentrations of cyanide are toxic for fish, birds and animal life, there are strict regulations on clean-up at gold mine sites.

A research project at the Centre technologique des résidus industriels (CTRI) affiliated with Cégep de l'Abitibi-Témiscamingue aims to increase the effectiveness of cleaning up cyanide at Agnico-Eagle mines through chemical and biological treatment. The objectives of the research project are to improve the effectiveness of SCN treatments and nitrogen and remove metals and rare metalloids. The CTRI research project is defining the properties of the effluent to be treated and evaluating alternative solutions (including pre-treatment or alternative treatments) that can increase the effectiveness of the existing system. The use of ferrates for simultaneous treatment of both cyanides and metals is one alternative approach being investigated.

As part of this research project, three graduate students, three university interns, a post-doctoral researcher and six college-level interns are receiving training. Mabarex, a company specialized in the design, manufacture and installation of drinking water treatment processes, grey water and sludge, will be actively involved in the technology transfer to adapt technologies to water treatment.

"Mabarex is enthusiastic to join the research team. It will be a fantastic opportunity to contribute our knowledge to accelerating technological development with research and mining industry partners," said Mabarex's Vice-president of Sales and Marketing, François Séguin.

Funding: College-University Idea to Innovation Grant and Applied Research Tools and Instruments Grants
Partners: Mabarex, Agnico-Eagle Mines and Université du Québec en Abitibi-Témiscamingue

Intelligent Geo-composites for Treating Oil Sands Tailings

Québec: Cégep de St-Hyacinthe – Centre d'excellence des technologies textiles, géosynthétiques et matériaux souples (Groupe CTT)

Waste management is a major environmental challenge of recent rapid oil sands development. Residues created by oil sand extraction are made up of 70 to 80 per cent water and are held in tailings ponds that cover more than 180 square kilometres.

1.11

Because of their great stability and low hydraulic conductivity, residues consolidate very slowly, posing major environmental challenges.

The Centre d'excellence des technologies textiles, géosynthétiques et matériaux souples (Groupe CTT) affiliated with Cégep de St-Hyacinthe has formed a partnership with Afitex-Texel, a manufacturer of filtering and draining geocomposites, and Canada's Oil Sands Innovation Alliance (COSIA) in an effort to improve environmental performance. The goal of the applied research collaboration is to develop an intelligent geocomposite for accelerating the evaporation of oil sands residues. This new concept combines a filtering geotextile, drainage tubes and electrodes for treatment by electro-osmosis.

The results obtained to date are extremely encouraging. Lab tests show residue volumes reduced by 50 per cent after 45 days. Eight cégep undergraduate and doctorate students have taken part in the research and the results have been published in the scientific journal Revue canadienne de géotechnique, with several presentations also made at national and international conferences. The team is now preparing trials at oil sands sites.

"AFITEX-TEXEL is pleased to be doing business with Groupe CTT," says Pascal Saunier, Business Afitex-Texel Development Manager for North America. "The R&D project with NSERC and COSIA, the respect of deadlines, the technical achievements and the overall project leadership and management are all aspects that inspire our confidence and satisfaction."

Funding: CCI Applied Research and Development Grant
Partner: AFITEX-TEXEL

1.12

Cleaning up Contamination at Mine Sites

Yukon: Yukon College

Bioremediation is a promising technique that can assist in mine closure and reduce heavy metal contamination of mine sites. Yukon College researchers have been working to advance bioreactors from the lab to the field through applied research. Pilot-scale bioreactors, or constructed wetlands, were introduced to the Minto mine site in central Yukon by Dr. Amelie Janin, Yukon Research Centre's Industrial Research Chair in Mine Life Cycle, and her students.

Yukon College students worked in both the lab and the field, with one student coordinating the experimental design and purchase of research materials while two other students built the pilot bioreactor at the mine site.

Dr. Janin was able to further her research in northern bioremediation with one of her industrial partners, Capstone Mining Corp.

"Working with Dr. Janin has been very beneficial so far and has allowed us to engage in the testing of this new technology here, in the Yukon," said Martin Haefele, Permitting Manager at Capstone Mining Corporation.

A technical report on the preliminary results has been co-written by the industrial partner and student researchers. Both students and mine employees have learned the science behind this technology and can apply this technique in future planning and applications.

Funding: CCI Applied Research Tools and Instruments Grant
Partner: Capstone Mining Corporation

Dark Laser Detects Nano Particles of Oil in Water

Alberta: Northern Alberta Institute of Technology (NAIT)

1.13

NAIT's Nanotechnology Centre for Applied Research, Industry Training and Services (NanoCARTS) was established in 2012 with a Technology Access Centre grant from the Natural Science Engineering Research Council of Canada. The centre provides nanotechnology and micro-technology support to small- and medium-sized enterprises (SMEs) in the areas of prototyping, product development and enhancement, testing, as well as characterization and training.

One of the projects within nanoCARTS involves a collaborative effort between NAIT, Alberta Nano-Monitoring Systems (ANMS), Benchmark Instrumentation and Analytical Services and a major Alberta oil sands company. The project is focused on the development of a unique structured "dark" laser beam, based on IPSA® which stands for Individual Particle Sensing Approach, developed by ANMS. This approach enables automatic, continuous, on-line monitoring of particle sizes (including nano-particles) and concentrations, in liquids, air or vacuum.

A field trial of this new technology's application for detecting oil particles in a steam-assisted gravity drainage (SAGD) process occurred in December 2014. The system developed by ANMS and NAIT successfully detected emulsified oil in produced water while ignoring the background hydrocarbon solution, addressing the current challenge with conventional analytical and monitoring equipment.

The intent of the field trial was to analyze the oil content in produced water samples collected from different treatment stages (warm-lime softener (WLS), organic removal filter (ORF) and skim tank outlet) in the SAGD process. The new system measurements were compared to a conventional method that provides the oil in water analysis at the facility by means of solvent extraction and fluorescence.

"Preliminary results from the field trial demonstrated excellent correlation between the number of droplets counted and the concentration measured. We continue to be very optimistic about the exploitation of this technology for solving difficult measurement challenges that are important to Alberta, as well as Canada. We look forward to an ongoing mutually beneficial relationship between the organizations and to seeing NAIT establish themselves as a partner in the technology development arena in Alberta."

Steven McDougall, M.E.Sc., P.Eng.
Vice President, Operations
Benchmark Instrumentation and Analytical Services Inc.

Funding: CCI Technology Access Centre Grant
Partner: Benchmark Instrumentation and Analytical Services Inc.

1.14

Dr. Amelie Janin, Industrial Research Chair for Colleges in Mine Life Cycle

Yukon: Yukon College

Dr. Amelie Janin is solving northern problems with northern expertise. As Industrial Research Chair in Mine Life Cycle at Yukon College, Dr. Janin is working with industry and students to develop environmental technologies in mine research and innovation. The objective is to develop research leadership to address northern challenges and opportunities within the mining industry.

Resource development and the environment are important and often competing entities in the North, and Dr. Janin's research is bridging this gap. The college's research team is exploring northern bioremediation at mine sites, metal uptake in northern constructed wetlands, and other "green" mining techniques of interest to industrial partners.

What is learned in the lab doesn't stay in the lab. Knowledge and skills are shared with students and faculty throughout each project's life cycle. Classroom visits involve sharing experimental designs and preliminary results. Both staff and students are given training opportunities with laboratory equipment purchased to support the chair's environmental remediation projects.

Yukon College students are adding to the territory's knowledge economy through employment opportunities with the research chair. More than 10 students have been hired to work on experiment design, monitoring, and analysis, ranging from undergraduate students to PhD candidates. Yukon College student and Selkirk First Nation citizen David Silas is currently working on the Minto mine site monitoring pilot bioreactors. This mine is in his First Nation's traditional territory, and he plans to use his new skills to support his community in mine remediation. The research group also has a PhD student participating in a program that provides both academic and skills development between the college and Alexco Environmental Group.

"We are pleased to participate in a unique opportunity that creates a win-win outcome for both the Yukon and its mining industry. Through this partnership we will work toward solving mine water treatment challenges by using local products, thereby limiting the need to ship materials to remote mining sites from outside the Yukon," says Jim Harrington, President of Alexco Environmental Group.

Faculty and research associates are involved in a number of research opportunities associated with mine life cycles. Dr. Katherine Stewart, Yukon Research Centre's soil scientist and plant ecologist is working with chemist Dr. Janin on an interdisciplinary approach to remediation. They are completing a metal sequestration project using leonardite at mine sites with Wapaw Bay Resources Ltd. They have also partnered with Casino Mining Corp. to examine the metal uptake in plants in northern constructed wetlands.

Green mining practices have the potential to assist in mine closure and keep the industry robust. With the efforts of Dr. Janin, her students and colleagues, mining in the Yukon can become more economical and sustainable. In her laboratory there are no limits, only possibilities.

Dr. Luc Faucher, Industrial Research Chair for Colleges in Railway Operations and Maintenance

Québec: Cégep de Sept-îles

The NSERC Industrial Research Chair for Colleges in Railway Operations and Maintenance in Sept Îles focuses on railway operations involving the use of long, heavy trains in northern areas.

The Quebec North Shore offers a unique testing ground as there are three large mining companies operating there and the major infrastructure available for moving mineral resources from mining sites to processing and shipping locations. More than 1,000 kilometers of railway lines are used for this purpose.

Chair Dr. Luc Faucher has four main partners for research -- ArcelorMittal Mines Canada, Transport ferroviaire Tshiuetin, Rio Tinto IOC and Cliffs Natural Resources. These partners also supply work to a large pool of subcontracting small and medium-sized enterprises (SMEs) that also benefit from the Chair's activities. In the first 18 months of activity, five SMEs and eight research centres took part in 16 projects. These companies have contributed more than $250,000 in funds and close to $475,000 in staff time and equipment loans to the research program.

The research advances from these projects have a major impact on training of specialized workers. All professors from the departments of industrial maintenance and electronics take part in initial project meetings. They each contribute their know-how and help draft project estimates. Their experience also sheds light on possible stumbling blocks and helps guide the research toward reliable systems. Three professors were released from teaching duty to work on the research projects, whose new concepts will then be incorporated into the curriculum.

1.15

A total of 33 students have participated in the research projects, and 25 attended a seminar on industrial maintenance that included a segment on railway-specific work. Without the Chair, several projects would not have seen the light of day, and students would not have gained this hands-on experience.

Dr. Faucher's research will improve rail equipment and the monitoring of that equipment. Instrumentation in rail and rolling-stock components will ease maintenance planning and strengthen network reliability. Thanks to research partnerships, the Cégep de Sept-Îles has not only gained access to railway company facilities, but has also strengthened its credibility in this field. When SMEs want to take on new projects with mining companies that operate a railway, they approach Dr. Faucher. The Chair sets the research focus and oversees the projects themselves. The result is better structure and follow-up, along with sound guidance from professors' experience and more in-depth knowledge for all.

1.16

Dr. Gary Thompson, Industrial Research Chair for Colleges in Applied Mineralogy

Newfoundland & Labrador: College of the North Atlantic

The mining sector of Newfoundland and Labrador has experienced significant growth in the past decade. While extraction projects are the source of major investment, exploration activities continue to be essential for evaluating new areas for their mineral potential.

The Industrial Research Chair for Colleges in Applied Mineralogy at the College of the North Atlantic is using research and development in mining sciences to support this phenomenal growth. Research Chair Dr. Gary Thompson is a geochemist, working closely with mining giant Vale Newfoundland and Labrador (Vale NL), which is developing a significant nickel deposit at Voisey Bay. The college's researchers have partnered with Vale's team of experts and provincial research units to improve exploration techniques and help the company find promising new deposits.

Dr. Thompson's current research project is focused on process development and technology innovations in applied mineralogy including development of innovative techniques for exploration of magmatic ore bodies. This research will help improve the resource recovery process through a better understanding of the character of ore deposits.

The college's research project is analyzing the biochemical signature of buried mineral deposits, and the gases found above mineral deposits and petroleum reservoirs as indicators of promising ore deposits. As a result of the team's research findings, additional grants have been obtained from the Research and Development Council of Newfoundland and ACOA, which have enhanced the Chair's research facilities and new equipment to build a soil gas laboratory.

"Vale has a 15-year history of supporting local research in Newfoundland and Labrador, mainly through Memorial University, and recognizes the benefit of building a similar relationship with College of the North Atlantic," says Scott Mooney, General Manager of Exploration at Vale NL. "Dr. Thompson's position will enable long-term planning and growth of geological expertise in Newfoundland and Labrador, which will benefit both the province and the local mining/exploration industry."

2. Renewable Energy and Conservation

Zero Emissions Public Transit

Manitoba: Red River College of Applied Arts, Science and Technology

Electric vehicles hold great promise for reducing reliance on fossil fuels for public transportation around the world. But batteries and recharging facilities need to be more efficient to make the technology economically viable.

In 2014, Red River College (RRC), working with partners Mitsubishi Heavy Industries and Manitoba Hydro, made a major step towards making electric public transit possible. They developed and tested a prototype of an all-electric zero-emissions transit bus and rapid charger system in Winnipeg's harsh winter conditions. The project has since moved to full production and field demonstration, bringing four more buses into service with Winnipeg Transit.

RRC's research staff, students and instructors - through the College's Electric Vehicle Technology & Education Centre - modified and integrated 24 Mitsubishi Heavy Industry battery packs to meet space constraints for two prototype New Flyer buses for the demonstration phase with Winnipeg Transit.

"This electric bus project is a key element in Manitoba's Clean Energy Strategy and supports our commitment to reduce greenhouse gas emissions and promote the use of effective, cost efficient, renewable energy," said Eric Robinson, Minister responsible for Manitoba Hydro. "Our innovative advancements in clean energy technologies have contributed to our

2.1

placement as the first in Canada to employ the new, unique on-route rapid charging system, promoting affordable public transportation and electric vehicle knowledge which will create jobs."

Red River College is a partner in an international consortium with Mitsubishi Heavy Industries, New Flyer Industries, Manitoba Hydro and the Province of Manitoba to develop an all-electric transit bus and rapid charger. The project has been supported by Sustainable Development Technology Canada, the City of Winnipeg, Manitoba's Vehicle Technology Centre and a CCI Applied Research and Development grant.

See video at:
http://vimeo.com/93516597

Funding: CCI Applied Research and Development Grant
Partners: Mitsubishi Heavy Industries, New Flyer Industries, Manitoba Hydro and the Province of Manitoba

2.2

Manmade Vortexes for Electricity

Ontario: Lambton College

The Atmospheric Vortex Engine (AVE), now being tested by Lambton College researchers, has potential to produce vast quantities of carbon-free electricity using low temperature waste heat to create energy through a tornado-like vortex.

Lambton College's research team was asked by the company developing AVE technology to test a small scale prototype that produces energy from an atmospheric vortex with a diameter of 50 centimetres and a height of 40 metres. The project will demonstrate the feasibility and safety of AVE technology and optimize the design, justifying investment in larger scale implementations and commercialization.

The college team, including faculty and student researchers, installed instruments on a prototype to monitor process parameters. Researchers are currently analyzing the data collected and co-relating it with data from their meteorological station to improve the design and provide scale-up analysis.

Louis Michaud, Chief Technology Officer of AVEtec Energy Corporation explains, "The prototype has been invaluable for AVEtec Energy Corporation. The college instrumentation and data acquisition capabilities were appropriate for the project. AVEtec is exploring several options for commercializing the vortex engine which have been helped by the Lambton College project."

AVEtec Energy Corporation holds international patents and is a 99 per cent Canadian-owned Ontario corporation. AVEtec's prototype is being funded by the Thiel Foundation's Breakout Labs program. Development of low cost green energy and clean-tech applications would give Canadian industry a significant competitive advantage. Developing and commercializing this technology also has enormous potential for revenue and job creation in Canada.

Funding: CCI Applied Research and Development Grant
Partner: AVEtec Energy Corporation, Thiel Foundation Breakout Labs

Power Conservation for Traffic Detection Sensors

Ontario: Durham College

You see them along every highway - traffic counting monitors collecting data essential for city and highway planning. Many of them are powered by solar energy or batteries with limited energy supplies.

An Ontario company providing advanced highway detection technologies approached Durham College for help to find ways to extend the operating life of existing traffic detection sensors through energy harvesting components and intelligent energy management strategies.

2.3

North Line Canada collaborated with Durham College to test hardware and develop a prototype to test the possibility of obtaining sufficient voltage/current from a miniature hybrid power harvesting generator to power temporary and in-road sensors and detectors.

Durham College faculty and students developed a power conservation module by designing and implementing a smart sleep system. The battery life of road sensors is increased by stopping the draw of battery power when no activity is detected on the road. This way, traffic sensors have a longer active life. As an outcome of this project, a new technology has been developed and will be implemented in remote monitoring of highway traffic.

This device will enable North Line Canada to fill a gap in traffic and highway management using new harvesting energy principles to store energy in solar as well as super capacitors. It will give the company an advantage and make it more competitive in this sector.

Funding: CCI Innovation Enhancement Grant
Partner: North-Line Canada Ltd.

2.4

Electric Vehicle Research

Ontario: Georgian College

As more electric cars are purchased by energy-conscious consumers, there is a need for information about who is buying them and how often they need to re-charge them.

Georgian College is delivering a range of education and applied research services related to electricity use, energy distribution, and grid performance. With a new four bay solar-assisted charging station and a sophisticated monitoring and control system, the college is collaborating with industry to accelerate the delivery of new products and services. It is also researching ways to optimize energy use and distribution.

One of the initiatives undertaken by faculty and students at the college is the electric vehicle research project. Researchers are investigating consumer trends in purchasing plug-in electric vehicles, as well as the true costs and benefits of vehicle operation. Georgian researchers are analyzing consumer surveys and existing data as well as field testing plug-in electric vehicles. Using this information, they will model the impact of the plug-in electric vehicle market and identify opportunities for business and the electrical utility sector.

Funding: CCI Applied Research Tools and Instruments Grant
Partners: PowerStream, Hydro One, Ford, Hanwha Solar, Schneider Electric

Optimizing Commercial Potential of Green Energy

Ontario: Lambton College

The Lambton College Renewable Energy Conversion and Storage (RECSR) project is focused on the development of an integrated, modular hybrid renewable energy system with the capability of optimizing captured energy at varying production levels and operating conditions.

2.5

A scalable fuel production, storage and dispensing system is being designed to manage wind, photovoltaic solar-derived energy, drive electrolysis, compress and store electricity as gaseous hydrogen, and regenerate power via proton exchange membrane fuel cells. Housed in Lambton College's Sustainable Smart Home facility, the project showcases several areas of applied research in green technology, including hybrid energy system management, dynamic optimization and control, energy storage, and micro-grid technologies.

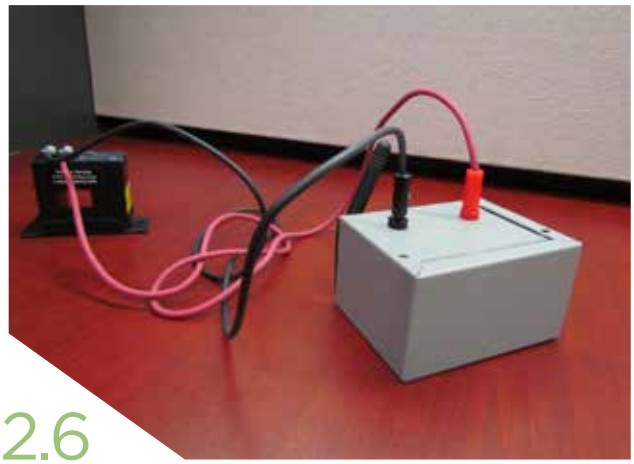
Project partners specializing in instrumentation, controls and automation include Paton Controls, Provincial Controls, Electrozad Supply Company, and local utility operator, Bluewater Power Distribution Corporation.

"The RECSR project builds the research capacity of the region's core industrial and energy sectors by bolstering the ability of local businesses to enhance their products and services toward commercialization." says Mike Bonovski, MPB Industrial Ltd and TechAlliance.

The five-year project will wrap up in 2015, having employed more than 30 students and graduates in Lambton College's Instrumentation & Control Engineering Technology and Alternative Energy Engineering Technology programs. A number of faculty members have also collaborated in this project, contributing their expertise while continuing to develop their knowledge. The project and its infrastructure have enhanced Lambton College's capacity to do advanced applied research in energy storage and management technologies, and will create opportunities for future projects with new industrial partners.

Funding: CCI Innovation Enhancement Grant

Partners: Paton Controls, Provincial Controls, Bluewater Power Distribution, Electrozad Supply Company



2.6

Remote Monitoring for Micro-hydro Sites

Ontario: Durham College

BlueStreak Equipment Inc. designs and manufactures micro-hydro turbines and develops micro-hydro sites. These small hydro producing sites are scattered across Ontario and daily visits to monitor them is not practical.

In an effort to develop a more efficient and cost effective approach to monitor operations at micro hydro sites, Bluestreak approached Durham College for assistance in developing a remote system that could detect when there is a system fault, so that crew members could be dispatched quickly to fix it.

Monitoring systems currently on the market are designed for large installations that can afford larger capital costs and monthly fees. Micro systems are too small to support these costs. A simple, cost effective version of a monitoring system was developed by the students and faculty members at Durham College using the simple integration of three components -- a micro-controller device, a cellular shield to allow cellular calls and text messages, and a current sensor to detect faults. The device was tested, and successfully sent a text message when the power was turned on and off on the line current sensor. The success of this low-cost remote monitoring system will allow Bluestreak to take the device to market and deploy their systems across Ontario.

Funding: CCI Innovation Enhancement Grant

Partner: Bluestreak Equipment Inc

Assessing Heat Stress in Solar Panels

Ontario: Georgian College

Heat trapped under solar energy panels is reported to reduce the energy production of rooftop installations of photovoltaic panels. Georgian College researchers are analyzing existing systems to determine how to resolve this issue.

PowerStream is the second largest municipally-owned electricity distribution company in Ontario, supplying electricity to 335,000 residential and business customers. The company has created a business unit, PowerStream Solar, which leases industrial, commercial and institutional rooftops for installation of photovoltaic panels.

Nine photovoltaic arrays from multiple manufacturers have been mounted on a number of different panel mount styles on the rooftop of the Barrie office of PowerStream, where they can be used for research and development. Students working with PowerStream through Georgian College's Center for Applied Research and Innovation have identified environmental factors that warrant further investigation.

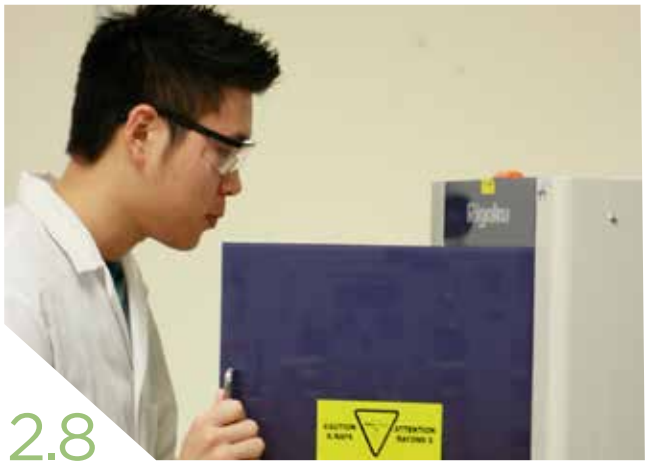
Heat, generated by and trapped under the panel arrays, reduces their efficiency. No current models quantify the relationship between outside temperatures and weather conditions in Southern Ontario to the heat produced under photovoltaic panels and its effect on photovoltaic output. An applied research project currently underway at Georgian College supports a student in the

2.7

Environmental Technology program during co-op work terms. The student is analyzing performance data and environmental data to determine the effects on efficiency of the photovoltaic panels. The resulting report will allow PowerStream to forecast operational efficiencies more accurately based on local conditions.

"PowerStream is very interested in determining the effects of environmental affects including heating that impact the performance of the roof top solar systems," says Derek Quigley, C.E.T. Manager of Renewable Energy. "In collaboration with Georgian College student researchers the results from this research initiative will be invaluable to PowerStream in designing and installing optimum roof top solar systems that have no negative affect on the roofing materials."

Funding: CCI Applied Research and Development Grant
Partners: PowerStream and SPINCORE



2.8

Nano-engineering for Better Smartphone Batteries

Ontario: Lambton College

Nano-engineered materials are a cost-effective, environmentally-friendly alternative for many Canadian manufacturers. They make it possible to tailor the structure and morphology of materials at a nano-scale and expand their applications for technology we use every day, such as smart phones.

Lambton College has used an Applied Research Tools and Innovation grant to purchase highly-

specialized, state-of-the-art laboratory equipment that forms the core of an 'electrochemical test station'. This equipment is being used with existing college apparatus for advanced nano-engineered material synthesis, characterization and optimization.

Dr. Shahram Karimi, Industrial Research Chair in Advanced Material Development for Renewable Energy, and his research team have been working to develop the next generation of smart, cost-effective nano-engineered materials for sustainable energy conversion and storage. These include longer lasting, lighter weight, quicker charging, and higher-energy density lithium-ion batteries. These advanced materials could soon be applied to rechargeable batteries used in smartphones and tablets, allowing users to charge their devices less often while prolonging the battery life and enhancing their performance. It could also make them lighter and less costly than existing state-of-the-art batteries.

Using nano-engineered materials can make batteries stronger, lighter, and more durable. It can also make them more or less reactive depending on the application and enhance their electrical, optical and magnetic properties. Advanced, smart nano-materials are also a clean alternative to fossil fuels, which benefits the health and well-being of all Canadians.

Funding: CCI Applied Research Tools and Instrumentation Grant

Partners: BioGenerator Energy Solutions, Toolrite Engineering, Volta Energy

A Hub for Smart Energy Use

Nova Scotia: Nova Scotia Community College

A small Nova Scotia company has gained a reputation for developing innovative, custom designed energy analysis software to improve energy efficiency. Launched in 2013, The Efficiency Store offers a range of energy analysis services for homeowners and local businesses.

The company founder, Megan McCarthy, came to Nova Scotia to complete her post-secondary education. While studying, she recognized an opportunity to become an entrepreneur in the energy efficiency sector. A researcher encouraged her to contact the Nova Scotia Community College (NSCC) Applied Energy Research Lab. The result was a collaboration, with NSCC and The Efficiency Store working together to develop new energy monitoring hardware and analysis tools that will allow the company to offer a more comprehensive range of energy services.

"Working with NSCC is like having my own team of experts that will help fast track my prototype and get to commercialization faster," McCarthy says.

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In 2014, NSCC was awarded a CCI Innovation Enhancement grant for research on energy data using advanced telemetry and analytics (Energy DATA). The aim of the Energy DATA program is to develop a cluster of research and development partnerships with local industry, build new applied research capacity in the region, and create new technology products and services. The research program has allowed NSCC to become an important hub for smart energy research, and to attract interest from a variety of partners in the region, ranging from small innovative startups, like The Efficiency Store, to industry leaders such as IBM Canada.

Funding: CCI Innovation Enhancement Grant

Partner: The Efficiency Store

2.10

Dr. Nafia Al-Mutawaly Industrial Research Chair for Colleges in Smart Grid Technology

Ontario: Mohawk College

The main challenges facing utilities today include aging infrastructure and equipment, continuing increases in renewable energy generation and coordination of this "distributed" form of power generation. The adoption of plug-in hybrid-electric vehicles and increased use of modern electronic devices are also expected to increase demand and degrade power quality in local distribution systems.

Mohawk College's Industrial Research Chair in smart grid technologies, Dr. Nafia Al-Mutawaly, is investigating the impacts of harmonics (distortions of current or voltage in power distribution systems) generated by electric vehicles and residential loads. Harmonics can create unwanted heat and inefficiencies in power supply. Data collected through the research project will be used to develop adaptive harmonic filters to improve distribution system reliability.

Under Dr. Al-Mutawaly's guidance, Mohawk and three other colleges (Algonquin, Georgian and Northern) have teamed up with Hydro One to create the Hydro One Applied Research Consortium (HARC). One of the main centres of its applied research is the Advanced Power Quality Lab (APQL) at Mohawk College, which is being used to assess impacts of electric vehicles and distributed generation from small renewable energy suppliers on power systems.

The APQL provides a state-of-the art replica of a real-world distribution system, including transformers of various sizes, electric vehicles, various types of home appliances and a complete suite of instrumentation. Various test beds are being constructed for research purposes using equipment from major vendors, including Siemens, Schweitzer Engineering Laboratories and GE, to assess harmonic profiles and their combined effects on transformers, meters, power protection systems and power flow patterns within a distribution grid.

Local utilities have expressed interest in evaluating the impact of multiple electric vehicles on a distribution system when fed from the same transformer during peak hours. The APQL will evaluate these interactions, allowing researchers to produce a computer model based on the results. Utilities will then be able to use the computer model to determine the maximum number of electric vehicles which can be accommodated at any one time on their distribution system, and use that data to accurately forecast infrastructure needs in the years to come.

The data collected by testing various load combinations will be used to create a comprehensive database of harmonic profiles which can then be replicated on demand. Researchers will use this information to assist local utilities in evaluating the reliability and accuracy of power grid instrumentation.

"The knowledge gained through Dr. Al-Mutawaly's research will directly benefit utilities, such as Horizon Utilities, through an increased understanding of the dynamics from these evolving stochastic energy sources and loads on the power grid", says Max Cananzi, President and CEO of Horizon Utilities Corporation.

Working closely with project partners is also allowing Dr. Al-Mutawaly to provide hands-on education that offers students the chance to help solve real-world problems and address challenges and opportunities presented by industry.

Dr. Shahram Karimi, Industrial Research Chair for Colleges in Advanced Material Development for Generation, Storage and Integration of Renewable Energy

Ontario: Lambton College

2.11

As modern societies become more populous and adopt a variety of new technologies, the need for advanced and novel materials has been widely recognized.

This need for engineered materials is nowhere greater and more urgent than in the electric power sector where cost-effective, reliable and long-term energy generation and storage technologies are essential for keeping pace with the ever-growing need for electricity in Canada and elsewhere.

Renewable energy technologies such as wind and solar offer alternatives to conventional technologies. However, their intermittent production and relatively high cost have slowed widespread penetration into the electricity market. Affordable energy storage technologies have great potential to improve the existing electric power grid, to facilitate the expansion of renewable energy technologies, and to offer an alternative to fossil-based fuels in the transportation sector.

Dr. Shahram Karimi, the Industrial Research Chair for Colleges at Lambton College, leads a dynamic research team working on green energy conversion and storage technologies. This team designs nano-engineered materials and processes that are economically viable, socially acceptable and environmentally benign. A major focus of Dr. Karimi's research group has been the synthesis and optimization of new nano-materials for use in lithium-ion and lithium-polymer batteries, fuel cells, electrolyzers and photo-reactors. This research group is working to develop simple, cost-effective manufacturing schemes, where smart, functional films and surfaces with unique properties are put together for a wide range of industrial applications, including oil and gas and renewable energy conversion and storage.

The Industrial Research Chair for Colleges (IRCC) grant has provided Lambton College an opportunity to enhance and expand its applied research program, help local and regional companies with their research needs, and train highly qualified workers. This applied research also increases faculty involvement and enhances the college's technology and business programs. The IRCC program at Lambton College has been involved in a number of projects:

- State-of-Charge Estimation for Li-Ion and Li-Polymer Batteries in collaboration with Volta Energy Inc.
- Development of High-Efficiency and Low-Cost Fuel Cell Stack for a novel BioGenerator in collaboration with BioGenerator Energy Solutions Inc.
- An Optimized Distributed LED Power Supply Model in collaboration with Volta Energy Inc.
- Optimization of Lithium Ion Battery as an internal technology development
- Innovative Accelerated Corrosion Technique for Industrial Protective Coatings based on electrochemical impedance spectroscopy in collaboration with Toolrite Engineering

As a result, the research program has made significant contributions and commitments in support of local innovation through renewable energy education and building a robust and dynamic

applied research program that is responsive to the needs of local small and medium-sized enterprises.

"Our active collaboration with Dr. Karimi and his research team at Lambton College on clean energy generation and storage has provided us with a great opportunity to develop solutions to some of the most challenging issues facing humanity. These collaborations have presented immeasurable opportunities and rewards and we are looking forward to working with them in the years to come," says Dr. Denis Kouroussis, President of Volta Energy Inc.

2.12

Martin Bourbonnais, Industrial Research Chair for Colleges in Sustainable Energy Technology and Energy Efficiency

Québec: Cégep de Jonquière

Since its foundation, the Industrial Research Chair for Colleges in Sustainable Energy Technology and Energy Efficiency (TERRE) at the Cégep de Jonquière has carried out applied research in sustainable supply to help isolated areas free themselves of their dependency on fossil fuels.

A wide-reaching hydro-electric power grid has been developed to meet Québec's energy needs. However, areas far from urban centres go unserved. In these isolated locations, electricity is generated by fossil fuels, which are expensive and cause high levels of greenhouse gas emissions (GHG). Martin Bourbonnais, TERRE Chairholder, and Québec Outfitters (QO) are currently implementing a three-pronged program to help QO members use sustainable supply planning to go green.

Begun in 2013, the first phase of this program was to create a tool for evaluating the sustainable development of outfitting lodges. With this tool, TERRE helped the owners and employees of five outfitters paint an overall portrait of the ecology, community, economy, and governance of their lodges. Outfitters then received a customized summary of their sustainable development.

The second phase of this program continued on in 2014 with a technical audit of the energy efficiency and renewable supply of outfitter lodges. The data from this original and scientific process and the resulting recommendations will inform outfitters' choices in implementing renewable energies for greater energy efficiency. Partners, such as Cegertec WorleyParsons, the Wind Energy TechnoCentre and VOLTS Energies, served as consultants on the project.

The third phase provides assistance to Canadian manufacturers who wish to optimize their energy efficient products and receive third-party certification. The Chair is very active with these potential manufacturers in several sectors, since their products would meet the wide range of needs felt in isolated locations.

Nordest Marine has become a partner of the Chair to develop its hydrokinetic river turbines. An electric engineering student at the college has earned many distinctions and grants for having greatly contributed to this innovative project.

In wind power, Eocycle's wind turbine and the weather masts in the college's technology showcase have been used for performance assessments. Follow-up in real time with Eocycle allows them to confirm the impact of the ongoing improvements they are testing on the college campus.

As for solar power, the Chair and its partners—namely, Bouthillette Parizeau & associés (BPA),

Simulead, and the Commission scolaire de la Jonquière via its DEP-level carpentry and woodworking students—have designed and manufactured a test bench to compare the performance of solar thermal panels. They are currently in an implementation phase. A standard commercial panel and an experimental panel from the Groupe de recherches écologiques de la Baie (GREB) are set up in the same conditions side by-side on the roof of the building. The experimental panel is less expensive and can be self-built.

In the coming year, tests will lead to a comparative study of the different products' key technical and financial considerations. Manufactured by another partner, another thermic solar panel prototype is being optimized and tested, after a 5 kW solar park was installed in partnership with Rio Tinto Alcan on the roof of the college's technical pavilion.

A test bench for using photovoltaic solar to preheat household water was installed. Trials will start in 2015 and deliverables are slated for 2016.

The TERRE Chair is proud to orchestrate its 23 partner organizations in achieving common objectives. Other partnerships are foreseeable with Canadian companies, whose products and services help isolated populations become more sustainable. At the TERRE Chair, applied research is indeed at Canadians' service!

3. Life Sciences and Health

3D Imagery Helps Students Learn How to Give Needles

Saskatchewan: Saskatchewan Polytechnic

Health care students know that practice pays off when it comes to learning how to give a needle or insert an intravenous line. But what if new 3D sensory technology could provide feedback on whether or not students are turning their hands at a correct angle or applying suitable pressure when they're carrying out these clinical procedures?

It's an area of research that prompted Saskatchewan Polytechnic to team up with IRG Informatics Inc., a Canadian health information management company. The company wanted to test hardware and software that track and analyze body mechanics, such as coordination, dexterity, and fine-motor movement. IRG and the polytechnic had nursing students and faculty perform intramuscular injections on mannequins of varying sizes - paediatric, adult and geriatric - using 3D imagery.

IRG is now patenting the technology and plans to incorporate it in a highly sensitive training device, such as a sensor-embedded glove.

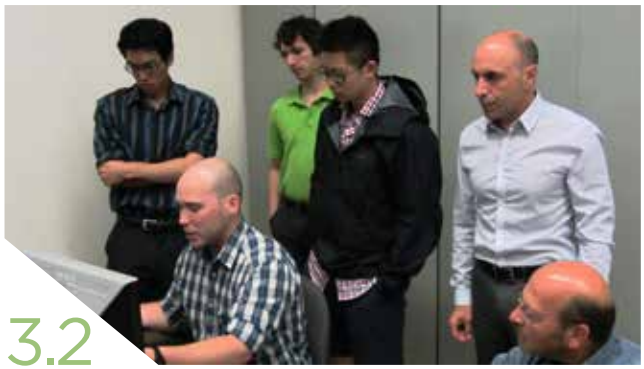
3.1

"The students' and faculty's continual feedback during these tests helped us fine-tune the design and calibration of the technology," says Dr. Vahid Anvari, Director of Research and Development, IRG Informatics Inc.

The company expects that end-users of the technology will include educational institutions seeking cost-effective, high-tech training opportunities, and community-based clinics and health-care delivery organizations

Funding: CCI Applied Research and Development Grant

Partner: IRG Informatics Inc.



3.2

Computerizing Homecare for Kidney Patients

Ontario: Sault College

A new technology for doing kidney dialysis at home is being developed by Sault College in partnership with a small Ontario engineering company.

Sault College has collaborated with eQOL Inc. to develop a prototype of a microcontroller-based device that will improve the connectivity of their eQ Connect™ technology (formerly called DiCAT).

Kidney dialysis treatment usually requires several hospital visits a week, which can be onerous for people living several miles from a hospital but impossible for patients living in rural communities or on reserves 50 or more kilometres from treatment.

eQOL Inc. is a process engineering company that builds devices to enable people living with chronic conditions to manage self-care at home and reduce their visits to hospital.

The company's first product, eQ Connect™, is a technology-based solution for kidney dialysis at home that simplifies self-care. The objective is to

add comfort and to enhance patients' engagement with his or her own condition.

eQ Connect™ offers mobile- and web-based applications that provide access to resources and support for patients and the health care team managing treatment. Moving beyond conventional monitoring technologies, eQOL provides a patient-centric model with comprehensive process management.

"Our self-care model, the basis of eQ Connect™, provides tools to patients that empower them to care for themselves in the comfort of their home," says Binh Nguyen, co-founder & Chief Executive of eQOL.

Increased home dialysis uptake and reduced attrition will lower the overall cost per patient for renal care by lowering the number of staff required per patient through improved efficiency of workflows and resource usage. eQOL is based out of Sault Ste. Marie and Toronto. The company will create new jobs and stimulate economic activity in Ontario by utilizing local products and services when available.

Funding: CCI Applied Research and Development Grant and an Ontario Centres of Excellence Voucher for Innovation and Productivity Grant
Partner: eQOL Inc.

Better Connections for Electronic Health Records

Ontario: Mohawk College

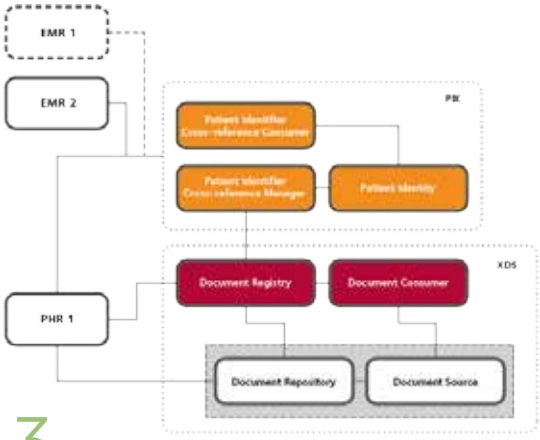
Easy patient-access to health records in Ontario has lagged behind the rest of the country and the world. While data on treatment and health history is now collected electronically, until recently there has not been a safe and simple way for health facilities to share this information with patients.

Hospitals and healthcare providers want to offer patients access to records, data, recommendations, advice and support. This access can increase patient knowledge and compliance, and lead to increased health and wellness. Secure communication is the key.

Mohawk College teamed up with researchers at McMaster University to explore secure methods to integrate Electronic Medical Records (EMRs) and Patient Health Records (PHRs) to put more relevant data in the patient's hands - with less chance of losing data.

The Mohawk/McMaster research team came up with a communicative and connected process.

A customizable, open-source medical records system developed at McMaster, OSCAR, feeds patient data to a patient identifier cross-referencing tool (PIX manager). The PIX manager updates patient records to a cross-enterprise document



3.3

sharing system (an XDS registry). This data is then available for a third party patient health record system to fetch, by cross-referencing the patient's record identifier and fetching the document identifier from the cross-enterprise shared system. This means patient information about lab results, diagnostics and treatment from several hospital departments or clinics can be stored in the cross-enterprise registry and retrieved by a patient using a secure patient identifier.

The coordinated system offers new capabilities for doctors to offer their patients better insight into their own health history.

Funding: CCI Innovation Enhancement Grant
Partner: McMaster University

3.4

Technology Cuts Paramedic Response Time

Ontario: Centennial College

"In a medical emergency, seconds count," says Terence Kuehn, CEO of Interdev Technologies.

Interdev is a leading developer of solutions for emergency medical services. One of their products is a dispatch interface for the computer tablets used by paramedics called iMedic ePCR. Using GPS positioning, the technology sends the address of a call to the tablets more quickly than current standards.

"This system can cut 60 to 90 seconds off response time, so that's a significant reduction," says Kuehn.

Centennial College Information and Communication Engineering Technology Department and Interdev have worked together to test and improve a prototype.

"We wanted it to be groundbreaking and leading-edge," says Kuehn. "The students provided us with fresh thinking and ways to enhance the software and user interaction with the technology."

Interdev has secured contracts to implement the system across Ontario.

To help bring the technology to the field, the company hired one of the students from Centennial's Computer Programmer Analyst program.

"I worked on many projects while studying at Centennial, but it's different when you're on a real-life project," says Maria Seastres. "It will affect people, and could even save lives. That's when I came to develop a real appreciation for what I learned in school and how it can be applied in the real world."

Funding: CCI Innovation Enhancement Grant

Partner: Interdev Technologies

Upgrading Precision Optical Micro-assembly

Québec: Cégep André-Laurendeau – Centre collégial de transfert technologique en optique-photonique (Optech)

3.5

In the biomedical field, integrating micro-optical devices requires very tight assembly tolerances and reliable processes that are scalable to industrial production. Designing and testing these systems for micro-assembling in manufacturing can only be done with highly specialized and precise equipment.

The Centre collégial de transfert technologique en optique-photonique (Optech) was able to acquire the specialized equipment for micro-assembly of optical components in 2013 through a College and Community Innovation grant. This allowed the college to outfit a laboratory specialized in optical micro-systems where industrial manufacturing conditions could be reproduced to encourage automation of micro-manufacturing, micro-assembly, and quality control methods.

Over the past few years, the Optech centre has carried out several optical micro-assembly projects in sectors requiring high-precision optical elements, such as telecommunications and biomedical and

industrial engineering. One of its industry partners has been Dental Wings, which produces dental system technologies to help measure and plan dental implants, bridges, and dentures.

"Outfitting Optech with a lab for the micro-assembly of optical components has allowed Dental Wings to accomplish several projects," says Jean-Marc Perot, Director of Dental Wings. "Our work of designing and implementing assembly processes for high-level optical microsystems called for cutting-edge expertise and equipment. Without local access to these skills and tools, we would certainly have had to subcontract a larger part of our R&D outside of Canada."

Funding: Applied Research Tools and Instruments Grant

Partner: Dental Wings

3.6

St. Lawrence River Clay Becomes Natural Soap

Québec: Cégep de Thetford – Centre collégial de transfert de technologie en oléochimie industrielle (OLEOTEK)

An innovative company in Baie Comeau, Quebec is developing health care products from marine clay found along the Manicouagan peninsula.

A research project undertaken in partnership with Cégep de Thetford's research centre and pilot factory, OLEOTEK, has refined the company's formula to make clay-based liquid soaps. Using small scale industrial processes developed during the project, Argile Eau-mer introduced two new liquid soaps to the market in the summer of 2013.

Ecologically extracting and processing marine clay from a deposit located on Québec's Manicouagan Peninsula, Argile Eau-mer intends to continue working with OLEOTEK to improve their products and create new marketable products. A Cégep de Thetford student worked as an intern at OLEOTEK in 2013 learning soap making and stability verification, and acquiring practical formulation techniques not generally part of college-level curricula.

Funding: CCI Applied Research and Development Grant

Partners: Argile Eau-mer and CEDFOB

Looking for New Medications

Québec: Cégep de Lévis-Lauzon – Centre de recherche et de transfert en biotechnologies (TransBIOTech)

Pharmaceutical research has undergone major changes in the last few years. Although there are still many large private research centres, new medications are now less often discovered by large pharmaceutical firms. A new model is emerging: partnerships between public research centres, small research companies, and specific expert groups.

TransBIOTech, the applied research centre at the Cégep de Lévis-Lauzon, supports organizations

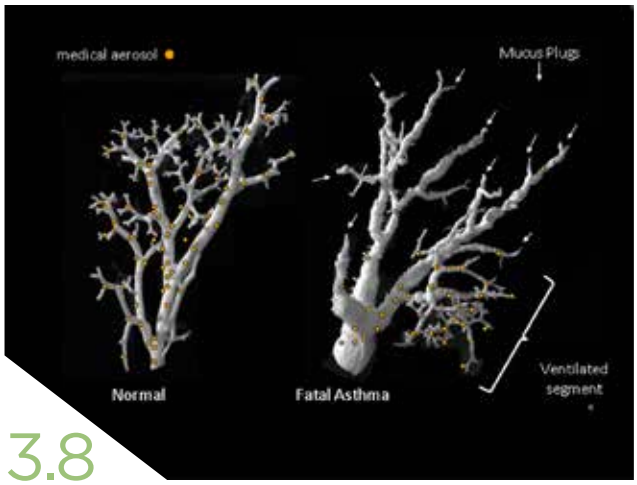
3.7

developing their products, from characterization to pre-clinical efficacy and product safety trials. This information is crucial in the development and marketing of new medications.

As part of an applied research project, the TransBIOTech team launched a partnership with Cyclenium Pharma. This up-and-coming organization in pharmaceutical research and development uses innovative technology to design a new generation of medication. In this process, new molecules must be tested for their efficacy and pharmacological properties. TransBIOTech's expertise will help Cyclenium understand the pharmaco-kinetics of their molecules in animals.

This effort in cooperative applied research has the potential to develop and market new medications to treat diseases which do not yet have effective therapeutic treatment.

Funding: CCI Applied Research and Development Grant
Partner: Cyclenium Pharma



3.8

New Technology Helps Asthma Patients Breathe Easy

Alberta: SAIT Polytechnic

Globally, 180,000 people die of acute asthma attacks every year, many with a rescue inhaler in hand. Some of these asthmatics are resistant to available medications, but for most the rescue medicine could not penetrate their constricted airways.

SAIT Polytechnic is working with industry partner **SolAeroMed** to develop the first innovation in asthma treatment in more than 30 years. SolAeroMed has patented a drug, S-1226, that can overcome the shortcomings in current standards of care for acute airway constriction. But the company met a stumbling block after it was approved for human trials. Compressed CO2 is the key to success for SolAeroMed's treatment and also created the largest challenge in bringing it to market.

That's where SAIT Polytechnic came in.

SolAeroMed contacted SAIT Polytechnic's Applied Research and Innovation Services (ARIS) and asked its Sports and Wellness Engineering Technologies researchers to help develop a safe drug-delivery system to administer S-1226, which relies on compressed CO2 to open pathways in the lungs. SAIT Polytechnic engineers designed and fabricated a prototype, producing a smaller and easy-to-use alternative to its predecessor – a bulky CO2 canister. This asthma drug-delivery system will allow emergency responders and emergency room doctors to administer this fast-acting airway opener in time to save lives.

Beyond the potential for S-1226 to improve the quality of life for asthmatics, the drug is projected to save Canada nearly $500 million per year in health care costs by shortening or eliminating visits to intensive care units.

Funding: CCI Applied Research and Development Grant
Partner: SolAeroMed

Nurses Test New Operating Room Control System

Ontario: Centennial College

Computerized monitoring systems are used in all operating rooms in Canadian hospitals.

But how would nurses respond to the graphic user interface design of the new system?

An Ontario company specializing in innovative audio and video solutions for the medical marketplace developed a new touch screen interface for its operating room control system, and asked Centennial College researchers to help them test it.

Because the college trains nurses and has a simulated operating room, it was able to help OASYS Healthcare test the interface using students as well as working nurses. Beyond assisting with the company's evaluation, this gave students experience with the state-of-art technology they can expect to use on the job.

Fifteen peri-operative registered nurses were recruited to take part in a usability study which validated three important findings. The system was easy to use and could be operated by a circulating nurse with little or no training, the company's V300

3.9

system added value to the surgical process, and the interface could be further improved.

OASYS used the study for the next stage of product development. The company said the data will help it to provide operating room control systems that increase efficiency, improve patient outcomes, and have a positive impact on patient safety.

OASYS collaborated with Centennial College researchers led by principal investigator Merritt Burstein, Coordinator & Professor in the Peri-operative Nursing and Collaborative Nursing Degree Program.

Funding: CCI Innovation Enhancement Grant

Partner: OASYS Healthcare

3.10

Improving Tools to Diagnose Eye Disease

Québec: Cégep André-Laurendeau – Centre collégial de transfert technologique en optique-photonique (Optech)

As the population ages, retinal disease causing loss of sight, such as macular degeneration and glaucoma, are increasingly common. The ability to detect these diseases efficiently and as early as possible is extremely important.

The Centre collégial de transfert technologique en optique-photonique (OPTECH) affiliated with Cégep André-Laurendeau undertook a project in collaboration with Optina Diagnostic to improve the camera that takes detailed images of eyes to detect retina problems. Optina Diagnostic is a private company that provides retinal cameras that use super spectral imagery. This technology provides spectral and anatomical data from the back of the eye, allowing for earlier and less invasive detection of retinal disease.

Optech worked to improve the retinal camera by validating digital models of the various solutions that Optina proposed theoretically and then experimentally. Optech then designed and prototyped a new and improved opto-mechanical system that increased the precision of images from the back of the eye.

Jean-Philippe Sylvestre, Vice-President of R&D for Optina Diagnostics noted "The project was truly collaborative with the two teams working together to find an appropriate solution. Access to the Optech team's expertise and to the equipment and laboratories was a considerable advantage in speeding up our development."

Funding: CCI Applied Research and Development Grant

Partner: Optina Diagnostics

Cloud-based Software for Connected Wellness

Ontario: Seneca College

Seneca College's Centre for Development of Open Technology (CDOT) and NexJ, a leading provider of cloud-based software for customer relationship management, have been working together on projects since 2009. The partnership began with Seneca developers creating several software adapters to enable the connection of the NexJ Express Server to implemented databases.

Impressed with the centre's work, NexJ approached its researchers again when they started working on expanding NexJ Connected Wellness, a cloud-based platform for empowering patients to manage their own health and wellness. Using Bluetooth technology, CDOT researchers created mobile applications that would enable medical devices to transfer data directly to a patient's smartphone and then send it to a personal health record.

These successful projects led to a recent collaboration that involves an entirely different area of the company's work. Chris Tyler, Seneca's Industrial Research Chair in Open Technology, is using his expertise in large-scale automated testing, deployment and management systems to help NexJ's streamline their software deployment cycle.

3.11

"NexJ has benefited from close collaboration with CDOT on multiple projects over the past five years, and continues to collaborate on open source technologies," says Ken Ono, Vice-President of Innovation and Commercialization at NexJ Systems. "These collaborations have led to product improvements, technology innovation, and talent acquisition opportunities. The new collaboration between NexJ's healthcare and finance product teams and Seneca's IRCC applied research program will allow us to improve our competitiveness in a fast-moving marketplace."

Funding: CCI Innovation Enhancement Grant

Partner: NexJ Systems

3.12

Making Technology Accessible for Wheelchair Users

Ontario: George Brown College

People with mobility issues often have difficulties using smart phones and other common electronic devices.

In an attempt to meet this need, a small Toronto technology start-up has developed a set of open software and hardware tools called Tecla that facilitates access to electronic devices for people with mobility impairments. Komodo Open Labs (KOL) envisioned a user-friendly Bluetooth interface device that would give individuals with special needs access to commercial smart phones. But the goal went further: the company wanted to make it smaller, mountable, and lower-cost, letting more people join the conversation.

The device had to be easy to access, simple to install and maintain, and still affordable. For help with this, KOL came to George Brown College's Centre for Construction and Engineering Technology (CCET). The students were challenged to design a device that allowed someone with limited mobility to join the same communication network that able-bodied people access easily.

After many rounds of prototypes, CCET students developed a product that is a compact and less costly version of KOL's initial prototype. The result was an aesthetically pleasing, unobtrusive device to mount on a wheelchair. Students gained much from the collaboration, learning that ultimately, accessibility is something that all good design should accommodate.

"[George Brown's] students bring more 'out of the box' thinking," said Mauricio Meza, head of Business Development at KOL. "They try to find more creative solutions to the project."

Funding: CCI Innovation Enhancement Grant (IE)
Partner: Komodo Open Labs

Dr. Veronique Boscart, Industrial Research Chair for Colleges in Seniors Care

Ontario: Conestoga College Institute of Technology and Advanced Learning

Dr. Veronique Boscart is the CIHR/Schlegel Industrial Research Chair for Colleges in Seniors Care at Conestoga College working on studies to improve care for seniors and training for gerontology nurses in Canada.

Dr. Boscart leads Conestoga's activities with the Schlegel-University of Waterloo Research Institute for Aging, in Kitchener, Ontario. The institute's mandate is to enhance the quality of life and care for older adults through research, education, and practice. The focus of Dr. Boscart's efforts is

3.13

the development of evidence-informed training programs for staff already working in long term care, and for students in post-secondary programs that lead to careers working with seniors.

Dr. Boscart has extensive experience as a clinician, nurse educator, manager, and researcher and is

committed to advancing education and research to improve care for Canada's growing population of seniors. She holds graduate degrees in both Nursing and Education and completed her PhD at the University of Toronto.

"Most health care programs in Canada don't have a mandatory component in gerontology," said Boscart. "The majority of training is still focused on acute care, when in fact, most seniors require chronic care management in a community setting."

Studies project that by 2036, one in four Canadians will be over the age of 65, and one in 11 will suffer from dementia. This demographic shift will have a tremendous impact on our health care system. According to Statistics Canada, three in 10 Canadians require long term care by age 65, and five in 10 require such care by age 75.

To address the gap between evidence-informed knowledge and practice in the area of seniors care, Boscart conducts applied research studies to identify practices that will improve quality of care for older adults, to adapt curriculum to improve graduates' knowledge, skills and attitudes for seniors care, and to develop future leaders for gerontological nursing.

"We need to focus on innovative education strategies," Dr. Boscart said. "Students and new grads don't always learn how complex the care for seniors can be, and how important it is to fully understand what is happening to their patients."

Dr. Boscart's research has been instrumental in the development of new training strategies to improve care for older adults, including the establishment of collaborative Living Classrooms that provide students with experiential learning opportunities working with seniors in real-world, long term care environments.

In addition to her role as research chair, Dr. Boscart continues to work as a gerontological nurse in an emergency department and in long term care. She is president-elect of the Canadian Gerontological Nursing Association.

According to Josie d'Avernas, vice president of the Schlegel-UW Research Institute for Aging, "Veronique's leadership as CIHR-Schlegel Industrial Research Chair for Colleges in Seniors Care has touched the lives of residents living in our Villages and beyond, and will continue to do so for years to come. Students in Nursing and PSW programs have a new enthusiasm for pursuing careers working with older adults, thanks to enhanced gerontology content, teaching and mentorship by Dr. Boscart. A new way of learning is finding its roots in the living classroom model – where students learn in situ within a long term care environment."

4. Agriculture

4.1

Smart Sheep Help with Feed Research

Alberta: Lakeland College

A group of 80 lambs participated in a research trial at Lakeland College in the summer of 2014 and collected their own data!

The lambs, fitted with individual radio frequency identification (RFID) tags, were given the task of comparing two different rations for the finishing period before slaughter. The GrowSafe feeding system in the Livestock Research Centre at Lakeland College collected data about the amount of feed each lamb consumed daily, as well as their individual eating behaviour patterns.

The experiment was conducted for Alberta Agriculture and Rural Development. Susan Markus, a Livestock Research Scientist with Alberta Agriculture, designed the trial to validate SheepBytes® feeding recommendations. The purpose of the trial was to compare a standard barley finishing ration to one designed using the SheepBytes Ration Balancer. Alberta Agriculture would like to know if the growth of the feeder lambs correlates well with that predicted by SheepBytes, and to see the effect of nutrition and management on carcass grades. A second, similar trial is planned for 2015.

Larry Bingham, Ag Research Project Coordinator, noted "This trial had some interesting challenges. The GrowSafe system was originally designed for cattle, and had to be adapted for lambs. They needed a little boost to be able to reach into the feed troughs, and access to the feed trough had to be restricted to one lamb at a time. The lambs adapted very quickly to the system and certainly did their part in making the trial a success."

Funding: CCI Innovation Enhancement Grant

Partner: Alberta Agriculture and Rural Development

Growing Hedgerows that Produce Food

Québec: Cégep de Sainte-Foy – Centre d'enseignement et de recherche en foresterie (CERFO)

Every year, winter wind gusts of up to 100 kilometres an hour damage or destroy winter grain crops in the river plain along the St Lawrence River.

Snow is a crucial insolating cover for these winter grain crops that are planted in September and winter in the field. When the snow is blown away, the temperature of the ground plummets, causing

4.2

deeper freeze. Hedgerows planted along the field edges are a promising option for mitigating these problems. However, producers are often hesitant

to plant these windbreaks because they perceive them as wasting productive surface area. The Ferme Anlousie, which grows certified organic winter grains including rye, wheat, and spelt, is located in Sainte-Anne-de-Beaupré, Québec, not far from the St. Lawrence River. It has experimented with the planting of productive hedgerows with the help of the Centre d'enseignement et de recherche en foresterie (CERFO) affiliated with Cégep de Sainte-Foy.

Researchers reviewed existing literature and made recommendations according to site conditions and property owners' goals for their land. The project planted cost-effective hedgerows of trees for maple syrup, fruit, and wood. Researchers compared three types of hedgerows to assess their efficacy for fruit and wood production, and their protective effect on the grain crop.

André Simard, owner of Ferme Anlousie says "A windbreak of fruit trees can give me an annual crop, while poplars can be harvested in 25 years and sugar maples can be tapped and add to our maple syrup production. All that and my organic grain crop is protected from the wind, deep freeze, and neighbours' chemical spraying."

Funding: CCI Applied Research and Development Grant
Partner: Ferme Anlousie

4.3

Biological Pest Control for B.C. Blueberries

British Columbia: Douglas College

Huge numbers of insect predators and parasitoids are reared each year by the biological control industry to control agricultural insect pests in greenhouses.

Although more than 200 of these products are available globally, their use for management of pests on field crops is rare. Douglas College in New Westminster, British Columbia has tested the efficacy of predator releases to control the blueberry aphid, Ericaphis fimbriata, a serious pest of highbush blueberries in B.C. A recent research project was undertaken in partnership with the British Columbia Blueberry Council and Applied Bio-nomics Ltd., a producer of biological control agents.

The applied research project tested the effectiveness of two possible insects to act as biological pest control agents for B.C. blueberries. The brown lacewing, Micromus variegatus, is a relatively new product for aphid biological control while the predatory midge, Aphidoletes aphidimyza, is a well-established product that has been used successfully on many crops worldwide. Researchers released both predators at organic blueberry farms and recorded dramatic declines in aphid populations after releases. These predators show enormous potential to provide an effective alternative for aphid management and establish a new market for biological control products in field crops.

Brian Spencer, President of Applied Bio-nomics Ltd. says "Our industry is perched on the brink of expanding traditional markets from protected crops into field crops. The Douglas College project on blueberry aphid will enable wider adoption of our sustainable pest control products in field agriculture. Because of this thoughtful and careful research, we have recently entrusted Douglas College to help us develop another product, Amblyseius fallacis, that will have similar acceptance and relevance for the field crop community."

Funding: CCI Applied Research and Development Grant
Partner: Applied Bio-nomics Ltd

Diagnosing the Health of Honey Bees

Alberta: Grande Prairie Regional College

Concerns about declining bee populations in North America have been major news in the past couple of years as many beekeepers have suffered large losses of bees. There has been increased urgency to find causes for the deaths of bees in hives across Canada.

The National Bee Diagnostic Centre (NBDC) is a state-of-the-art laboratory of Grande Prairie Regional College that opened in April 2013 through a partnership with Agriculture and Agri-Food Canada. The same month, it was awarded an NSERC Technology Access Centre grant which helped expand its mandate to include applied research, training, outreach, and innovation for the beekeeping industry.

The Centre has grown exponentially since then, training students and working on applied research projects with beekeepers as well as provincial and federal researchers, and delivering timely and reliable results.

The centre is now able to provide new diagnostics and expand to all Canadian provinces. The NBDC research team has recently been chosen to lead a four-year industry initiated 'National Honey Bee Health Survey' aiming to establish the nature, extent

4.4

and incidence of endemic and exotic pathogens affecting bee colonies. This study will provide information that will help maintain a healthy, dynamic, and profitable beekeeping industry in Canada

The bee diagnostic centre is already making a difference to Canadian beekeepers. In the words of one of its clients, "It wasn't until I took bee samples to the National Bee Diagnostic Centre did an accurate diagnosis occur. I am now in the position to treat properly for my problem. Needless to say, the two years with the wrong diagnosis have cost me in excess of $100,000 dollars."

Funding: CCI Technology Access Centre

Partners: Agriculture and Agri-Food Canada – Beaverlodge Research Farm

4.5

Helping Beekeepers Mind Their Own Beeswax

Alberta: SAIT Polytechnic

Neil Bertram, owner of Bertram Honey Ltd., was ready to move past the mess and expense of current technologies for beeswax extraction.

With market demand for beeswax not only from the beekeeping industry, but also for the chewing gum, cosmetics, food production, and pharmaceutical industries, Bertram wanted to optimize the amount of beeswax he could get from his hive frames.

Bertram and other beekeepers usually extract beeswax by boiling hive frames, squeezing out

the wax, and trucking it to rendering facilities. The Alberta beekeeper came up with an idea for his own solution. He built a steam beeswax extractor but needed to refine his design and get help with commercialization. He approached Applied Research and Innovation Services (ARIS) at SAIT Polytechnic to refine the design, fabricate, and validate his product.

A second-generation beekeeper, Bertram worked with ARIS's new Culinary and Urban Agriculture researchers to develop the prototype of a cost-effective, compact, and durable extractor that uses steam to melt beeswax from hive frames. The end product will be replicable for commercialization and will be used to increase business for Bertram Honey Ltd.

"With this technology ready for market, I hope to introduce it to the beekeeping industry," says Bertram. "It would be ideal for mid-sized beekeepers to do their own onsite beeswax extraction."

Funding: CCI Applied Research and Development Grant
Partner: Bertram Honey Ltd.

A Precision Watering System for Turfgrass

Alberta: Olds College

Urban lawn watering is the single largest water demand on municipal water supplies.

An Alberta company developing irrigation technology recognized that water scarcity and a need for greater irrigation efficiency could provide a market opportunity.

Olds College was approached by the company, 1318552 Alberta Limited, and asked to test its novel turfgrass irrigation system for residential and commercial applications. The computer-generated program alters the flow of water to the head depending on the shape and size of areas to be watered. This system requires fewer irrigation heads and less underground piping, which would reduce installation costs.

Through its partnership with the college, the company gained access to the expertise of college irrigation specialists and state-of-the-art indoor and outdoor test facilities. Initial testing found that the system provided a uniform distribution of water superior to the industry standard. The ease of installation and the computer program that optimizes flow are the key market advantages of the system.

"Olds College provided a unique opportunity to compare our system with an industry standard," stated company representative Cam Cote. "We were able to install our head in the

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indoor facility and with the variable speed pump were able to precisely control water flow. This allowed us to make necessary adjustments to the head and the computer program. Outdoors, we were able to compare our system with their new decoder system. Nowhere else could we have accessed facilities like these!"

A critical component for the Prairie Turfgrass Research Centre at Olds was attracting highly qualified personnel to the research program. Katie Dodson, a Canadian researcher with considerable industry experience in drought tolerance of grasses for recreational turf, was hired as lead research scientist. Her research will provide information that could lead to significant water savings.

Turfgrass research at the centre is focused in four areas: strategies to reduce winter injury, biotic stress management, grass selection for alternative uses, and water conservation. Partners include the Canadian Turfgrass Research Foundation, local golf courses, turf and sod growers, and the City of Lethbridge.

Funding: CCI Innovation Enhancement Grant
Partners: 1318552 Alberta Limited, Canadian Turfgrass Research Foundation, Eagle Lake Turf Farms, Alberta Golf Superintendents Association, City of Lethbridge, Alberta Turfgrass Research Foundation, LANTA - Sod Growers Commodity Group, Manderley Turf Products, and Glendale Golf & Country Club.

4.7

Raising Fish to Grow Good Gardens

Alberta: Lethbridge College

The results of one of Lethbridge College's most delicious applied research projects can be found in restaurants throughout southern Alberta – produce grown in a greenhouse on the college's campus.

This produce is grown using an innovative combination of aquaponics and aquaculture. Aquaculture and aquaponics are exciting developments in agriculture where fish and plants are cultivated together in a growing system with re-circulating water that produces plants year-round safely and efficiently. The novel system also enhances growth rates of greenhouse crops. The plants are seeded each March and nurtured by a water supply provided by fish. The water is then re-circulated back to the college's fish facility for reuse. No herbicides or pesticides are used, and the aquaponics produce is harvested twice weekly starting from May until the end of October and for sale to the public.

In 2013, Lethbridge College received funding to advance applied research in aquaponics. Principal investigator Charlie Shultz assists aquaponics producers in the region to overcome technical problems and policy obstacles in their systems.

"This [project] could go a long way to addressing food security issues," Schultz says.

Funding: CCI Innovation Enhancement Grant
Partners: Trimark Engineering Ltd., Alberta Agriculture and Rural Development, and the Alberta Aquaculture Association.

Crop Inputs – Are there economic limits?

Alberta: Lakeland College

Does a producer's net profit increase continually each time more inputs are added to the crop?

This question is the focus of a four-year research project about field crop input intensity initiated at Lakeland College in May 2014. The goal of the study is to develop field-scale data on the benefits of adding crop inputs at various levels and managing the plots using a typical crop rotation.

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Plots were established on Lakeland's student-managed farm land, with replications on the land of three local producers. The same plots will be used for the next four years.

One of the local producers, whose son is a student at the college, was eager to participate in the trial.

"We believe in promoting and encouraging young individuals in further developing their understanding of agronomics," said Henry Dejong.

Webbs' Crop Services of Vermilion is a primary industry partner in this trial. The company is providing the main agronomy advice and field scouting services for the project.

Medium, high and maximum levels of input intensity are being studied. The levels of input intensity and crop choice were defined by a steering committee made up of representatives of Lakeland College faculty and staff, the student-managed Farm Research Team members, agronomists, and producers.

Calvin Ireland of Webbs' Crop Services has valued participating in the crop input trial. "Communicating with local producers on what areas of research are lacking in the industry, and implementing these practices first hand on their own land has given us valuable results that actually pertain to our region, soils, climate, and topography on a large scale."

Funding: CCI Innovation Enhancement Grant

Partner: Webbs' Crop Services

4.9 Animal Semen Sexing

Ontario: La Cité

Being able to determine the sex of animal offspring is of significant value for animal producers, and offers opportunities for research to develop new commercial processes. The only sexing tool currently on the market is expensive, leads to lower fertility, and is only effective with heifers.

Ab Biotech Inc. in Gatineau, Quebec is a company working to develop an immunological approach to sexing semen for all species, including humans. It has collaborated with the Centre de recherche en biovalorisation (CRAB) at La Cité since 2009 to design a process for producing and purifying antibodies in animal semen sexing.

New equipment at La Cité purchased through an Applied Research Tools and Instruments grant allows the research team to 1) produce recombinant immunogens and antibodies using an accelerated process 2) produce bacteriophages for the immunocapture of sperm cells, and 3) do genotyping and quantification of fractionated animal semen and sex-specific embryos.

Ab Biotech President Robert Letellier says "Ab Biotech has benefitted tremendously from the ultramodern equipment acquired by La Cité over the past several years. This helps biotech companies like ours a lot because a number of us can share expensive tools we truly need but call on only occasionally. It's saved us hundreds of thousands of dollars and attracted investors. We're extremely thankful."

La Cité's professors and technologists bring their scientific expertise to these bio-industrial innovation research projects and help to train highly specialized workers for cutting-edge fields. Through the Ab Biotech Inc. partnership, four students a year complete co-op work terms, get part-time jobs, and complete practical in-course projects. Six of the program's graduates have secured jobs with Ab Biotech.

Funding: CCI Applied Research Tools and Instrument Grant

Partner: Ab Biotech Inc.

Greenhouse Lighting for Winter Growing

British Columbia: College of New Caledonia

Strong consumer demand for locally grown produce has created economic opportunities to develop lighting and heating technologies that allow vegetables to be grown year-round.

The College of New Caledonia (CNC) is working with technology companies to develop lighting and heating solutions for local producers in central British Columbia.

In 2013, the college collaborated with QuantoTech Solutions Ltd., a lighting engineering company based in Vancouver, to research and develop a cost-effective LED lighting system that allows plant producers to customize light intensity and spectrum in their greenhouses to optimize lighting throughout the plant crop cycle.

"In our experience every grower has different lighting needs," said Alycia van der Gracht, Manager of Operations and Supply Chain at QuantoTech. "Partnering with CNC allows us to evaluate a local grower's facilities and crops so that we can make the best lighting recommendation. CNC is also involved with deployment and provides ongoing support and evaluation as our LED lights continuously improve."

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Since developing and testing the prototypes, the research team has been collaborating with a local community organization, Baldy Hughes Therapeutic Community, to test the technology in an operational greenhouse growing a range of vegetables and herbs over the winter using supplemental LED lighting. More than 40 college students from Marketing, Trades, and Natural Resource programs have been involved in the research and development work, including prototype development and testing, market research, and recording plant responses to LED lighting.

Funding: CCI Applied Research and Development Grant, National Research Council - Industrial Research Assistant Program
Partner: QuantoTech Solutions Ltd.

4.11

Dr. Mike Duncan, Industrial Research Chair for Colleges in Precision Agriculture and Environmental Technologies

Ontario: Niagara College

Dr. Mike Duncan knows all about the promise and potential benefits of combining agriculture and "big data". For the past six years, he has worked with government, technology companies, and farming partners to develop a computerized planning system for precise planting and pest control. Duncan's aim is to improve the growers' ability to produce higher quality food, and obtain higher crop yields with better environmental stewardship and reduced costs.

The best opportunity to maximize production from currently farmed land is by increasing the yield. Precision agriculture aims to increase yield, while decreasing fertilizer inputs, which reduces costs, increases revenue, and minimizes environmental impact. Dr. Duncan and his team have developed a variety of web applications that provide real-time data, mapping, map analysis, and farmer guidance.

Precision Agriculture Automatic, or PrAgMatic, is an integrated system being developed by Dr. Duncan and a research team at Niagara College that collects and synthesizes relevant farm data from GPS- and sensor-enabled combines and spreaders and provide useful and timely information for the grower.

Dr. Duncan has been studying atmospheric and farm field variability, the two biggest factors in determining crop health, as well as potential and realized yields. Agricultural researchers have found a connection between field topography and crop yield variability, and Dr. Duncan's work is using this concept to define several management zones within a field that need to be planted and maintained differently for maximum yield.

Two of Dr. Duncan's farm partners have been tracking and using management zones to great advantage over the last decade. With these partners and collaborators from Ontario Ministry of Agriculture, Food and Rural Affairs, Dr. Duncan's team is developing tools to map management zones. These tools operate on data from satellite photographs and sophisticated UAV-based LiDAR and multi-spectral sensors. The team's work is now at the stage where it can be applied with growers and crop consultants to increase their productivity and competitiveness.

Through an Applied Research Tools and Instruments Grant, the team recently acquired a start-of-the-art server and disk system, and a world-class computer engine to properly apply and test precision agriculture theories with 15 to 30 growers in a quick data turnaround. At the end of the project, the algorithms and the system will be developed into an automated entity that has the capacity to process data from thousands of farms in a timely manner.

In 2002, Dr. Duncan was one of the first recipients of an Ontario Innovation Trust (OIT) grant for colleges. He received funding for an NSERC College and Community Innovation (CCI) pilot projects and was one of the first CCI research awardees in 2009 for research on land-use technologies. He received of the ORION Discovery award for his GPS data analyzing system, PrAgMatic, that has been the focus of his research as Industrial Research Chair.

Dr. Anne Weill – Industrial Research Chair for Colleges in Protection of Organic Crops

Québec: Cégep de Victoriaville

Some perennial weeds are so invasive that they can significantly reduce the production capacity of organic farms.

Dr. Anne Weill, Industrial Research Chair at Cégep de Victoriaville is working to ensure the sustainability and profitability of organic farms by improving crop protection and particularly weed control.

Through research at the Cégep and farms nearby, Victoriaville researchers are attempting to find effective ways of suppressing weeds that are

4.12

especially problematic for organic farms, while allowing these businesses to be profitable and minimizing greenhouse gas production. Tests are conducted in collaboration with several farmers to make sure proposed methods meet their needs.

The research program develops action research methods with the farms and tests are planned with each farmer and adapted to their farm's situation. This allows the Chair to quickly take on more partners and research projects. After two years of operation, the program now has 14 partners and, because the research is conducted on working farms, the results obtained are easily transferable to partner farms and other farmers in the region.

The research program gives all research team members and students an opportunity to work directly on the farms, talk to the farmers, and understand the realities of farming. It also allows the team members and professors participating in the projects to improve their action research skills. Students become familiar with the techniques and challenges of organic farming and learn how to conduct applied research. They must also find potential solutions to problems encountered on farms from both business and research standpoints.

Finally, the results are sent to the professors, who use them in their courses (student and adult training) and share the innovations arising from the Chair's work.

"Combining minimum tillage and organic farming requires a considerable amount of research because very few farms use this method. After 17 years of organic ridge farming and minimum tillage, weed control is becoming increasingly difficult," says Thomas Dewavrin of Les fermes Longprés. "The NSERC Research Chair in Protection of Organic Crops helps us improve our research and development efforts to curb perennial weeds, a major problem that worsens as these unwanted plants spread on our land. We are very optimistic because we already have some solutions as a result of the tests carried out. With the Chair's assistance, we can find ways to combat perennial weeds more quickly. And what's more, we receive visits from experts with different points of view, who help us find innovative solutions to our problems."

5. Food Technology

5.1 MADD About Craft-Brewed Lager

Ontario: Niagara College

The idea for an authentic-tasting but alcohol-free lager was conceived by a Toronto company that sells a full line of alcohol-free drinks and donates a portion of net sales to Mothers Against Drunk Driving (MADD) Canada.

To help develop MADD Virgin Craft-Brewed Lager, the company tapped into the expertise of the Canadian Food & Wine Institute (CFWI) Innovation Centre at Niagara College. The research team developed a unique recipe, finding a way to eliminate all alcohol, while maintaining the flavours and aromas associated with a good lager. Researchers then tested the recipe through consumer taste-testing panels.

As a result, MADD Virgin Craft Brewed Lager was the first alcohol-free craft beer on the market. In June 2014, it was made available for purchase at more than 3,000 Walgreens stores across the United States, and has since made its way into Canadian retail chains, including Rexall pharmacies. Less than a month later, MADD Virgin Craft Brewed Lager achieved international recognition by winning the gold medal at the 2014 U.S. Open Beer Championship in the non-alcoholic category.

"Without access to Niagara College's faculty, students, equipment, and network of co-packers, MADD Virgin Craft Brewed Lager would not have been possible, let alone become one of our best sellers in the U.S. market," says Brian Bolshin, MADD Virgin Drinks president and CEO.

Funding: CCI Innovation Enhancement Grant

Partner: MADD Virgin Drinks

5.2 Catering with a Conscience

Ontario: George Brown College

As a successful business that caters thousands of meals each year, Café Belong found that the potential for waste was very high.

While plastic single serving cups and utensils are convenient in the moment, they can live on for decades in landfills. A large proportion of conventional single serve food ware materials is also derived from petroleum, a limited natural resource.

Café Belong wanted to switch to compostable, bio-based food service ware as an alternative to disposable plastic.

The company came to George Brown College's Centre for Construction and Engineering Technologies to find a way to produce fully edible, biodegradable serving cups. Faculty and students began developing the prototype for a heat-setting mold device that Café Belong could use to produce their serving cups as needed.

The result? A sleek, custom-built, spring-loaded device able to compress edible discs into single-serving cups in one press. The design has an interchangeable component to allow for different thicknesses, and is completely reusable. The already green-minded company now has a competitive advantage and a renewed commitment to sustainability.

Café Belong plans to work with the Food Innovation & Research Studio (FIRSt) at George Brown to perfect the formulation for the cups. All the ingredients for an innovative recipe for change are in place, giving Café Belong the chance to reach the catering industry and beyond.

Funding: CCI Innovation Enhancement Grant

Partner: Café Belong

5.3 Gluten-free Turkeys from Freezer to Oven

Manitoba: Red River College of Applied Arts, Science and Technology

Two new turkey products have been introduced to retail stores in the Prairies thanks to testing and tasting at Red River College's School of Hospitality and Culinary Arts.

The College's School of Hospitality and Culinary Arts conducted its first College and Community Innovation research project in 2014 in partnership with Granny's Poultry Co-operative Ltd. Researchers developed and tested four new poultry products for the consumer and food service markets.

Granny's Poultry Director of Product Development, Jason Wortzman, worked with college chefs and a culinary student to finalize the recipes and test how the products held up in large commercial ovens and steam tables. Each product also underwent pre-market consumer tasting before the products were launched. Trials were conducted at the RRC's Paterson GlobalFoods Institute, which provided access to 400 study participants across all demographics.

Granny's Poultry was able to launch two new products by the end of the year. The Cornbread Stuffed Turkey and an Unstuffed Slow Cooker Turkey Roast are now sold through a major retailer in over 100 stores across the Prairies. The products are the first on the market to be naturally gluten-free and cooked straight from the freezer without thawing.

"By working closely with chefs and students at the college on the final phase of development we were able to fine tune our unique corn bread stuffing formula and validate cooking methods," said Wortzman. "After testing our finished product on a broad demographic we were able to confidently partner with a national retailer on an ambitious new product launch plan."

Funding: CCI Applied Research and Development Grant

Partner: Granny's Poultry Co-operative

Greek Spoon Sweets with Local Fruit

Ontario: Niagara College

In preparation for opening a Greek yogurt bar in Toronto, an Ontario food company wanted to develop a Canadian version of a Mediterranean spoon sweet, a fruit preserve served with yogurt.

Colossus is a company that produces authentic Greek dishes for customers around the world. Its products are Greek spreads hand made by expert chefs from traditional recipes with no additives or preservatives. The company approached Niagara College's Canadian Food & Wine Institute Innovation Centre to help develop a new spread, using Niagara-grown fruit instead of more expensive Greek imports.

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Niagara's research team developed several recipes and tested them using sensory panels. The panels identified the three top recipes for further refinement and commercialization in 2014.

A Niagara College business team conducted market research to understand the competitive landscape and identify market niche opportunities for this product line in food services and retail distribution. Several products were tested through consumer taste tests to determine product preferences, and flavours were refined and sampled by a trained sensory panel to assure quality. Finally, shelf-stability testing, packaging, and labeling were completed for each product, and a co-manufacturer was identified to scale-up production.

The new Spoon Sweets made their debut at the company's Greek Yogurt Bar and Movenpick Marché in Toronto in the fall of 2014.

Funding: CCI Innovation Enhancement Grant
Partner: Colossus Foods

5.5 From the Restaurant to Your Kitchen

Ontario: George Brown College

Scaccia is a family owned Italian restaurant in downtown Toronto. Their signature dish is the "scaccia" itself – a variety of delicious, healthy vegetables, cheeses, and meats placed between two layers of dough and baked to perfection.

Looking to break into the ready-made market, Scaccia restaurant came to George Brown College's Food Innovation and Research Studio (FIRSt) to develop a frozen microwaveable version of their scaccia sandwich. The product had to be individually portioned for the food service industry, nutritionally responsible, and as tasty as the original.

College researchers worked closely with Scaccia owners and head chef throughout the development process for four popular scaccia flavors. The FIRSt team evaluated Scaccia's restaurant ingredients and matched them with commercially viable options able to withstand freeze/thaw cycles.

In addition to sourcing special freezing technologies, the research team also developed a unique sauce system to ensure fillings were contained within the open-sided sandwich. After 24 months, and more than 60 iterations of sauces, fillings and Italian style dough using a variety of preparation processes, Scaccia was given four formulations and product specifications to take to a co-manufacturer, complete with sensory evaluations.

Through an additional collaboration with George Brown School of Business students, the product was tested on location at Scaccia Restaurant to get customer feedback on this new sandwich. This gave the company valuable consumer insights to develop the right marketing strategy for this innovative food product.

Funding: CCI Technology Access Centre
Partner: Scaccia Restaurants

5.6

DNA Research Safeguards Beer Brands

Saskatchewan: Saskatchewan Polytechnic

Yeast's ability to convert sugar into alcohol and carbon dioxide is critical to the beer-making process. So when Saskatoon's Great Western Brewing Company (GWBC) set out to identify and protect the yeast strain that is essential to the production of its beer brands, it teamed up with Saskatchewan Polytechnic's BioScience Applied Research Centre.

The centre assists businesses and industry to test new products, techniques, and technology and helps them to become market-ready faster. GWBC was able to tap into the centre's expertise and resources through a CCI Applied Research and Development grant.

Under faculty supervision, BioScience Technology students collected DNA from GWBC's yeast and compared it with catalogued yeast strains in an effort to develop a genetic profile of the firm's yeast culture. Once the company's strain is identified, GWBC plans to deep-freeze a sample of the yeast culture off-site to protect it and ensure the continuity of the company's beer brands.

"Saskatchewan Polytechnic has the expertise, equipment, and technology to identify the yeast's genotype," says Anita Fuller, Manager of Corporate Quality Assurance for GWBC. "This baseline information is critical to recovering the yeast if it were damaged or contaminated in a crisis, such as a fire or flood."

See website for more information:

http://saskpolytech.ca/about/departments/applied-research-and-innovation/Research-identifies-BEER-GENOTYPE.aspx

Funding: CCI Applied Research and Development Grant

Partner: Great West Brewing Company

Testing and Tasting New Cheese Flavours

Prince Edward Island: Holland College

Tasting a new cheese flavour before it is available in stores is one of the benefits of being a researcher at Canada's Smartest Kitchen (CSK) at Holland College

Building on the 20 year success of The Cheeselady's Gouda Shop, researchers in the specialized commercial kitchen worked with the company's new owner, Chef Jeff McCourt, to develop a new pesto-flavoured gouda to expand their growing line of artisan cheeses.

As flavourings and ingredients that are used in cheese making must be dehydrated and sterilized for food safety, specialized food researchers worked with the Smart Kitchen's network of suppliers to find the just the right ingredients to create the ideal pesto colour and flavour for the newly named Glasgow Glen Farm. Their new Pesto Gouda can now be found at many restaurants and stores across Prince Edward Island.

"As a new business owner I benefited greatly from the food production and business knowledge of the CSK team. They helped me take my food idea and make it a high quality product that is production efficient and financially viable," says McCourt.

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Funding: CCI Technology Access Centre and Applied Research and Development Grant

Partner: Glasgow Glen Farm

5.8 Vegan Alfredo Sauce gets a New Lease on Life

Ontario: George Brown College

Nona Vegan Foods was founded to accommodate the often challenging act of balancing a nourishing vegan diet with hectic schedules.

The company's standout product was a vegan Alfredo sauce, sold in eight stores in its first year of business. But there was one clear challenge: the shelf life of this delicious, cashew-based sauce was 10 days, limiting how and where they could sell the product. So Nona Vegan Foods came to George Brown's Food Innovation Research Studio (FIRSt) to increase the shelf life of the product.

This type of improvement is technologically challenging due to the neutral pH of an Alfredo sauce. Using a combination of new ingredients, processing methodologies, packaging techniques, and a modified product design, researchers perfected a new formula. By reducing the thickness of the sauce, the research team was able to heat it to a higher temperature, killing more bacteria. The new sauce also looks more appetizing, with herb flakes throughout and a more traditional creamy white colour.

The shelf life of Nona's Alfredo sauce has increased to nine weeks, opening the door for bigger retailer contracts—the first of which was with Whole Foods stores. The company has a new standardized formula, which includes recommended processing techniques, improved raw materials specifications, laboratory results quantifying the microbial attributes of the sauce, and recommended labeling suggestions.

Funding: CCI Technology Access Centre

Partner: Nona Vegan Foods

6. Information and Communications Technology

6.1

Mozilla Webmaker in Thai and Russian

Ontario: Seneca College

Making popular software available to non-English speaking users is a challenge for computer program developers.

To get help with localization of their software Webmaker, Mozilla came to Seneca College's Centre for Development of Open Technology (CDOT). Seneca's open technology researchers have worked with Mozilla on many projects that extend the functionality of the web. The college's diverse student body became an important asset in this development project. Students come from all over the world to study at Seneca College, bringing their knowledge of other languages and cultures.

The CDOT research team put students to work on the internationalization and localization of Webmaker, Mozilla's web literacy platform, to make it accessible to non-English speaking users, in languages such as Thai, Arabic, Ukrainian, and Russian. Localization is a process that adapts software for use in other languages, especially those with foreign characters (such as Thai or Russian). Internationalization involves enabling software to be easily translated and maintained after localization.

Ali Al Dallal, a developer at the Mozilla Foundation and Seneca ICT graduate, has been at the forefront of Seneca CDOT's localization and internationalization efforts, and has worked on several Mozilla sub-projects including Popcornmaker, Appmaker and X-Ray Goggles.

"The localization and internationalization of software is extremely important - it means that people around the world get to experience the same high level of quality with different software. Seneca CDOT and Mozilla gave me the chance to be a big part of that and it's been a great experience," says Al Dallal.

To build on its new-found strength, Seneca is exploring how to provide global leadership in localization for Mozilla as well as other industry partners. What was learned during the work with Mozilla can be replicated to help other partners bring their products to the global market.

Funding: CCI Innovation Enhancement Grant

Partner: Mozilla Foundation

Developing an Interactive Thriller Video Game

Québec: Cégep de Matane - Centre de développement et de recherche en imagerie numérique (CDRIN)

A Montreal company has created a new form of game combining the narrative of movies with the

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video game experience of being the hero of the story – with the help of a Quebec cégep.

Formed in 2011, Zandel Média Inc. is a company working on a new kind of digital entertainment. The company called on the expertise of the Centre de développement et de recherche en imagerie numérique (CDRIN) affiliated with Cégep de Matane to help them with their innovation process. The team created a proof of concept in 2012 combining the interactivity and energy of video games with the richness of film images.

CDRIN's multimedia integration techniques teacher and the 3D animation and image synthesis teacher participated in the research and development work of this new format of video game. Four years later, in November 2014, Zandel officially launched MISSING, its first interactive thriller application. The day after the launch, MISSING sat proudly at the top of iTunes Canada's list of paid applications.

President and founder of Zandel Média Simon Tremblay says "CDRIN has played a major role since Zandel Média was in its infancy. Our collaboration has helped us quickly and continually verify the technological feasibility of using a new interactive format with 100% live action in both the game and video components."

Funding: CCI Applied Research and Development Grant

Partner: Zandel Média Inc.

6.3 Improving Automated Financial Trading

Ontario: Fanshawe College

An Ontario company specializing in automated technology for financial trading is working with Fanshawe College and Western University students to give their products a competitive edge in the financial trading sector.

The research project hopes to improve Embium's real-time trading cloud computing infrastructure.

Embium was founded in London in 2008 as Cyborg Trading Systems. It specializes in developing automated trading technology for global financial firms, including hedge funds, brokers, banks, exchanges, and professional traders. In addition to its London presence, the company has offices in Waterloo and Toronto and headquarters in New York City.

According to Jason Lukez, vice-president of finance with Embium, the algorithm under development will be ready for commercialization early next year. He says it is crucial that new global market technologies are tested and re-tested prior to release, and the work of Fanshawe students has been an essential component of the firm's technology development and deployment process.

Embium is the only Canadian provider of a complete trading solution that enables the rapid development, testing and global execution of sophisticated proprietary strategies.

"Timing of producing the product is critical," says Lukez. "Having collaborative partners to keep the progress moving is so important given the competitive market, especially since we are contending with large global firms. Fanshawe has been a strong partner."

This initiative has led to full-time jobs and raised the profile of Fanshawe's Computer Programmer Analyst program as it continues to produce high calibre students to fill many knowledge-based jobs in southern Ontario. Six students from Fanshawe College have been hired full-time at Embium, with three more currently on work placement.

Funding: CCI College-University Idea to Innovation Grant

Partners: Embium and Western University

An Android App for Better Energy Use

Ontario: Lambton College

Lambton College has partnered with global startup Liricco Technologies Ltd. to develop a new android application that can help users save energy.

Liricco's Valta line energy product is a remote energy management system that can detect standby power, identify waste, and notify users to help them save energy. Currently, only iOS-based smartphone control applications exist for this green-energy technology.

This was a ground-breaking project for Lambton College. The students applied the college's android development expertise to a project straight out of the energy management industry. Faculty from the Information Technology programs who conducted the research were able to increase their knowledge and skills by troubleshooting in the development stages.

With the developed product, Liricco was able to show off side-by-side functional apps for iOS & Android at Germany and Hong Kong tech trade

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shows, attracting more investors, and increasing their potential customer base 400%.

"Liricco has benefited greatly by partnering on the development of our android app that we have now commercialized. We are currently looking into a second phase of this project that we are excited to partner with Lambton College with once again," says Jeff Lin, Executive Director of Liricco Technologies.

Funding: CCI Applied Research and Development Grant

Partner: Liricco Technologies Ltd.

6.5 Enhancing Sales Efficiency with Mobile Computing

Ontario: Sheridan College Institute of Technology and Advanced Learning

Sales representatives in many companies rely on simple note-taking and observation in the field. However, advances in mobile computing and high-speed networks provide significant opportunities to improve sales efficiency.

Being in touch through mobile devices can help sales reps be more productive while on the job, share updates with other reps more effectively, and enhance their client relationships.

Through an applied research project at Sheridan College, three students designed and developed a fully-functional iPad prototype for Encore Market Engagement.

The iOS prototype developed was complex and involved a great deal of research. Students developed a variety of technical skills that improved their employment readiness, and all of the students found high-quality co-op work term positions immediately after completing the project. Encore Market Engagement is interested in further developing the project with Sheridan.

The benefits to the partner included a technology solution that increased sales force efficiency by streamlining processes, and increased profit margins by maximizing their return on investment. The benefits to the research discipline included new knowledge and expertise that can be disseminated and transferred to Canadian companies locally, provincially, and nationally.

"As this was our first experience with an ARD, we were pleasantly surprised by the interaction with Sheridan, its staff and students. All parties were professional, engaged, capable, and committed to making this initiative as productive and successful as possible," says Brian Vanstone, a partner at Encore Market Engagement. "We look forward to the

opportunity to potentially work together again on additional research projects."

Funding: CCI Applied Research Development Grant
Partner: Encore Market Engagement

6.6

Creating an Eternal Journey

Ontario: Humber College Institute of Technology & Advanced Learning

Over the past 40 years, the video game industry has grown from relative obscurity to a multibillion dollar global business.

Green Pixel is a small Ontario start-up located in London that was working on the development of a new role-playing adventure video game. Their web and mobile games, including Pocolypse, had already attracted thousands of players, and fans were ready for a new offering from the company.

Green Pixel engaged Humber's Game Programming expertise to help develop Eternal Journey, their newest video game. The program coordinator for the Game Programming Advanced Diploma worked with Green Pixel project manager Fredd Eyles and game programming students to develop the online game. The Eternal Journey project provided an opportunity for students to apply class-based learning to help an industry partner in the development cycle of the game from prototype, through alpha and beta testing, to the game's release.

"We can't thank [Humber Research] enough for how much it helped and opened our eyes to the possibilities that research, Humber, and students can do for such a small studio," said Fredd Eyles.

By providing a new and unique experience for their gaming consumers, Green Pixel have expanded their product line and positioned themselves as leaders in the mobile applications and interactive digital media markets. The game has been launched, and is now available at **http://greenpixel.ca/eternaljourney.html**

Funding: CCI Applied Research and Development Grant
Partner: Green Pixel

Interactive Optics Connecting Crowds!

Québec: Cégep André-Laurendeau - Centre collégial de transfert technologique en optique-photonique (Optech)

Montreal-based PixMob has developed a unique multimedia concept that lights up crowds in interactive ways. Wearing a PixMob device, each participant at an event becomes a pixel that can

6.7

light up, change colour, flash, turn off, or sparkle in response to an interactive optics and infrared projection system.

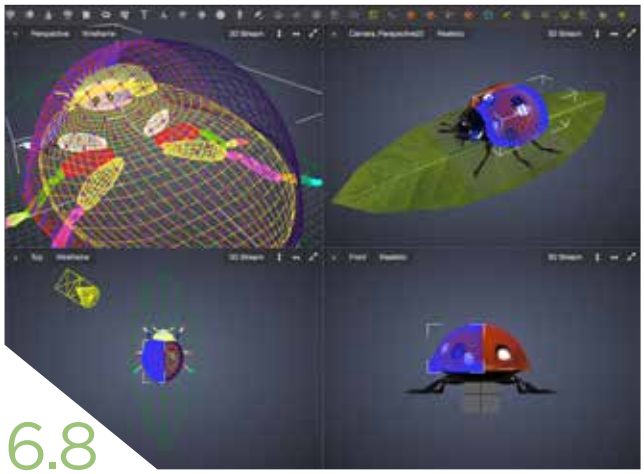
PixMob demonstrated their concept to the world during the Super Bowl in 2014 and the Sochi Winter Olympic Games.

Researchers at the Centre collégial de transfert technologique en optique-photonique (Optech), affiliated with Cégep André-Laurendeau, have worked with PixMob to evaluate the performance of their infrared projection system and propose new optical configurations with higher levels of performance. These configurations are based on free-form optical systems designed, prototyped and tested by Optech. The new system allows for more widespread use of the projectors, thus improving system performance.

"PixMob is proud to have collaborated with Optech and the Cégep André-Laurendeau. Our teams worked hand-in-hand to refine new optics in imagery and increase projection performance. The results will be implemented in the field very soon." says Vincent Leclerc, CTO of PixMob.

Funding: CCI Applied Research and Development Grant

Partner: PixMob, Inc.



6.8

3D Modeling in the Cloud

Ontario: Seneca College

Creators of 3D digital graphics have a new cloud-based software option thanks to an applied research project undertaken by Seneca College researchers in partnership with Ottawa tech company Exocortex Technologies.

Seneca's Centre for Development of Open Technology (CDOT) worked closely with Exocortex to produce Clara.io, a high-quality online 3D modeling, animation, and rendering software. Clara.io was built with many open source technologies, including three.js, a popular JavaScript library for 3D web development. As is the pattern in the field of web development, Exocortex has lent their experience in 3D graphics to enhancing the three.js library.

The development of Clara.io built on Seneca's extensive work using WebGL, a JavaScript API for hardware accelerated 3D graphics. Clara.io significantly reduces cost barriers for 3D digital creators while offering performance comparable to traditional workstation-based 3D applications. It requires no installation and is entirely cloud-based with no need to install plug-ins. The tool is accessible to users with modest hardware set-up because the rendering engine and project assets are cloud-based.

Clara.io now has more than 94,000 registered creators with average editing sessions of over 70 minutes, a 100% increase in less than eight months. A large gallery of user-generated 3D models is already available. In the near future, Clara.io will open source a component of their software so that users can also enhance the tool.

"We are creating many, many jobs for highly skilled computer scientists, marketing and business people... revolutionizing the creation of digital media right here in Ontario." says Ben Houston, CEO of Exocortex.

Funding: CCI Innovation Enhancement Grant

Partner: Exocortex Technologies

6.9 3D Configuration Helps Sell Products

Ontario: Sheridan College Institute of Technology and Advanced Learning

Real-time rendering on the web is still a relatively new technology. But it holds great potential for helping customers visualize products they are planning to buy.

Enterprise Resource Planning (ERP) software firm Seradex engaged a research team of applied computing students working with Sheridan's Screen Industries Research and Training Centre (SIRT) to help incorporate 3D visualization and configuration into its website. Sheridan students and faculty worked to take the product and service to a later stage of commercialization.

By integrating a 3D application developed with the support of Sheridan researchers into its customer website, the software firm will be on the leading edge of innovation in its field, using product configuration and visualization to provide accurate quotes, improve job costing, and streamline processes.

This project will allow Seradex to meet the visualization needs of client companies in a variety of sectors more effectively, using the results to provide better information to internal staff such as engineers and sales people, as well as dealers and customers. This software is applicable in a number of sectors served by Seradex including cabinetry, metal fabrication medical supplies, and capital equipment. It will help increase sales as companies are able to recommend solutions more rapidly and to configure and visualize complex products on a computer screen.

Mark Corker, President of Seradex Web Services, says, "The collaboration with Sheridan through this NSERC/OCE project resulted in a key 3D revisualization prototype that will significantly enhance our software and our customers' experience. The work of these talented students will result in brand new commercialization possibilities for Seradex."

Sheridan was able to provide the students with collaborative opportunities with the industry partner, maximizing the engagement of the students, faculty and staff at SIRT throughout the applied research process. Seradex has asked about hiring the students involved in the project once they have graduated.

Funding: CCI Applied Research Development Grant, Ontario Centres of Excellence Voucher for Innovation and Productivity
Partner: Seradex Web Services, Inc.

Improving BigBlueButton Online Learning

Ontario: Seneca College

Seneca's open technology developers, working in collaboration with Blindside Networks, have made significant contributions to the development of the BigBlueButton platform for distance education.

Blindside Networks is an Ottawa-based company dedicated to helping universities, colleges and commercial companies deliver high-quality learning experiences to remote students. They do this by providing commercial support and hosting for BigBlueButton, an open source web conferencing system for on-line learning.

6.10

"The mission of BigBlueButton is to ensure every student with a web browser has access to a high-quality on-line learning experience,"

says Fred Dixon, CEO of Blindside Networks. "BigBlueButton is an open source project that has localizations in over 15 languages. The contributions from Seneca College are helping make this goal a reality for students world-wide."

Using new technologies such as WebRTC, there are now HTML5 and mobile versions in development. In spite of the challenges working with technologies lacking established protocols, BigBlueButton is becoming an innovative and world-class platform for on-line learning that will allow users to join lectures and conferences through their smartphone or mobile tablets. The web conferencing system is already being used by over 50 organizations around the world in Canada, the U.S., Brazil, Germany, Australia, and the U.K.

Funding: CCI Innovation Enhancement Grant

Partner: Blindside Networks

6.11

Chris Tyler, Industrial Research Chair in Open Source Technology for Emerging Platforms

Ontario: Seneca College

The digital economy has transformed almost every area of human endeavour, from transportation to politics to dating. Since vast areas of our planet do not yet have reliable Internet access and new services are being developed every day, technology developers foresee a continuing expansion of the digital economy. However, this expansion will come at a cost.

The data centres that power the digital world consume thousands of hectares of land and over 300 gigawatts of electricity, the energy equivalent of 300 nuclear reactors. The solution to this problem lies in increased data centre density and power efficiency. Hyperscale computers that will provide this density and efficiency are nearing commercial readiness. However, the transition to hyperscale systems is not a straightforward replacement of current hardware. The complexity of hyperscale systems demands changes in software, system deployment, network management, and security.

The main focus of the Open Source Technology for Emerging Platforms (OSTEP) program, funded by Seneca's Industrial Research Chair for Colleges grant, is adapting, expanding, and transforming the open source software which underlies the digital economy to prepare for emerging hardware platforms.

Initial research was focused on adapting core open source software to run on ARM-based systems. Collaborating closely with Red Hat, a multinational open source software company, and with open source software developers, the program operated a network of more than 60 prototype ARM computers to build two new versions of the Fedora Linux operating system, a collection of 20,000 interdependent software packages. The ARM version of Fedora was developed successfully to the point where it had parity with the existing PCcompatible version of Fedora, and was made part of the standard Fedora software offering.

A Fedora re-mix optimized for Raspberry Pi computers (called Pidora) was also developed. It includes almost all of the software in Fedora, plus tools and software libraries specific to the Raspberry Pi.

Harish Pillay, Global Head of Community Architecture and Leadership at Red Hat, says,

"Working with Seneca has helped drive and define a new set of capabilities in the Fedora space around the ARM CPU specifically the Raspberry Pi. This will greatly enhance the education reach of the Raspberry Pi and the knock-on impact of it will be the influences in the ARM CPU space for servers."

Current research efforts focus on building an enterprise-grade version of the Linux operating system that will work on the new ARM hardware.

Other areas of research includes collaboration with NexJ Systems on large-scale automated testing, deployment, and monitoring systems to streamline software deployment cycle, and a project with BRAKERS Early Warning Systems to build a system which enables emergency responders to directly broadcast a warning message to vehicles nearby, using a combination of an emergency-vehicle control unit, an Internet-server-based distribution system, and a smartphone app.

Dr. Bill McIver, Industrial Research Chair in Mobile First Technology

New Brunswick: New Brunswick Community College

New Brunswick has a new hub of expertise in mobile technology thanks to the establishment of an Industrial Research Chair for Colleges in Mobile First Technology at New Brunswick Community College. Dr. Bill McIver, a former National Research Council expert and professor of computer sciences at University of New Brunswick, is responsible for conducting research and working collaboratively with partners in the information and communications technology sector to develop advanced mobile first technology.

"I'm interested in finding ways to apply mobile technology to critical problems that impact our lives and our livelihoods," says Dr. McIver.

His work takes him around the college community to collaborate with researchers, students, and industry partners including GTECH. Dr. McIver has led a number of research initiatives that will prepare students and New Brunswick industry for the opportunities mobile technology offers.

The Chair has focused on developing regional facilities to support early stage innovation in mobile information and communication technologies by NBCC students and staff. The facilities are called the Mobile Ideaspaces. Mobile Ideaspaces were established on three of NBCC's six campuses last year and are now being expanded to the remaining three campuses. The work done in these spaces will

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produce results that can be applied in many sectors, including healthcare, education, transportation, retail, resource development, and manufacturing.

The Mobile First initiative includes a mobile software engineering project, a residential energy efficiency project, a wellness prototype project, and a large-scale research project with partners from geo-fencing, game development, m-learning, and mobile data analytics. Dr. McIver is also developing research programs relating to intelligent communities and assistive technologies for seniors.

"In addition to having access to highly skilled instructors and students, NBCC is very flexible and can rapidly adapt to the needs of industry. This can be a benefit to all of the business community by helping to commercialize their product and service ideas in a very efficient manner," says David Small, GTECH Director, Advanced Research and Innovation.

7. Manufacturing

7.1

Simulating Olympic Sports

British Columbia: Camosun College

An exciting new sports innovation idea will bring the Olympic experience of bobsled racing and canoe kayaking to B.C families this spring.

Camosun College's applied research centre, Camosun Innovates, is playing an important role in supporting the success of the new Richmond Olympic Experience developed in partnership with VROX Sport Simulation.

VROX is the company behind the research and development of new sports simulators. Camosun Innovates and the Camosun Technology Access Centre (CTAC) were hired by VROX to design and fabricate bobsled, sit-ski, and canoe kayak shells to work with motion capture platforms to create state-of-the-art sports simulators. These simulators are unique and will be an important part of the interactive rides soon to open at Richmond Olympic Experience (ROX) in Richmond BC.

This project allowed Camosun to hire a new graduate from the Mechanical Engineering Technology program to work with CTAC, designing and fabricating three exciting rides. In addition, this project has expanded Camosun's capabilities of fabricating composite molds utilizing the college's 5 Axis milling equipment. Involvement with this project has encouraged the Mechanical Engineering Department to expand its curriculum to include advanced composite manufacturing.

Camosun College's expertise and technology allowed VROX to develop the new technology they required for a spring opening of Richmond Olympic Experience.

For a taste of this interactive experience see: **http://vrox.ca**

The Richmond Olympic Experience (ROX) will be a highly interactive visitor experience celebrating the Olympic Spirit, the 2010 Olympic and Paralympic Winter Games (when Richmond was an Olympic Venue City), and the history of sport in Richmond. The ROX will have three floors of gallery space featuring displays, interactive media, and hands-on sporting simulations – offering visitors the experience of what it's like to participate in an Olympic Sport.

Funding: CCI Technology Access Centre Grant and Applied Research and Development Grant
Partner: VROX Sport Simulation

A Posture Correction Aid for Wheelchair Users

Nova Scotia: Nova Scotia Community College

Wheelchair-bound patients in long-term care facilities often have discomfort from slouching and being unable to reposition themselves. And caregivers suffer from strain injuries trying to lift patients into a more upright posture.

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In response to a request from a Halifax long-term care facility several years ago, Nova Scotia Community College occupational therapy students designed a posture correction aid to assist both patients and caregivers. A Nova Scotia manufacturer is now refining the design with the help of the college's mechanical engineering technology researchers.

MacKenzie Atlantic Tool & Die is a Nova Scotia-based company specializing in manufacturing highly diverse products ranging from steel stampings and precision-machined products to fixtures and gauges used in the aerospace, marine, and renewable energy industries. The company is expanding its business into assistive devices for use in long-term care facilities and has partnered with NSCC to validate the design of the slouch correction aid.

The device consists of a chair cover with adjustable straps that can be used to pull a patient into a more upright posture, or to lift the patient from a wheelchair to a chair or bed. This device was previously developed by NSCC Mechanical Engineering Technology students, refined by subsequent student graduates, and licensed to MacKenzie Atlantic.

"The support provided by NSCC has been critical to the success of the project thus far. The ability to draw on the knowledge and experience of such a dedicated and seasoned research team has given us the jump start we needed," says Matthew MacKenzie, President and Owner of MacKenzie Atlantic Tool & Die.

NSCC has expertise and facilities in bio-mechanics ideally suited for validation and design improvement that will support the company's commercialization of the product. The team conducted field evaluations at Northwoodcare Halifax Inc. and ran lab testing on the product's mechanical design to make improvements to the product's performance. This project has involved students and faculty from Mechanical Engineering and Continuing Care Assistant and Disability Support programs in the Dartmouth, Bridgewater, and Middleton campuses.

Funding: CCI Applied Research and Development Grant
Partner: MacKenzie Atlantic Tool & Die

7.3

3D Cloud Design for Mining Hydraulics

Ontario: Niagara College

A leading specialist in industrial drive and control technologies was contracted to manufacture and install a hydraulic system at the Ontario Graphite mine site in remote Kearney, Ontario. But the company, Bosch Rexroth, did not have the means to obtain the precise measurements of existing plant components that were needed to manufacture the new hydraulic system for the mine.

Bosch Rexroth asked for assistance from the Advanced Manufacturing Innovation Centre team at Niagara College, which used the Faro Focus 3D laser scanner to scan the plant to capture geometric and physical proportions of the machinery. This innovative program used cloud-capacities to reveal the internal design limitations of the building in 3D images. The team then developed the scan data for the mine, and provided Bosch Rexroth with design information for its engineering team to use as the base for the hydraulic piping layout.

"By using 3D point cloud technology, the project team completed the entire design process ahead of schedule and below budget," according to Jim Lambert, C.E.T., Design Manager with Bosch Rexroth. "Fully detailed

piping drawings were created, allowing all pipes to be prefabricated ahead of time, eliminating the need for costly welding equipment and trades people on-site during the installation phase."

Bosch estimates a 42 per cent savings in time and labour will be realized using the services and expertise at Niagara College and the Faro Focus and related software, purchased with an Applied Research Tools and Instruments grant.

Funding: CCI Applied Research Tools and Instruments Grant

Partner: Bosch Rexroth

Glasses-free 3D Technology for iPads

Ontario: Humber College Institute of Technology & Advanced Learning

Humber College's School of Applied Technology has recently completed a research project that involved designing and patenting 3D software for iPads.

Humber faculty member Odin Cappello partnered with Ooyavah Inc., a leading Ontario business in stereoscopic technology, to develop a prototype for glasses-free 3D visualization on the Apple iPad.

Ooyavah's innovative technology required that users could easily mount the lens to their iPad with high precision, that iPad aesthetics and functionality were not compromised, and that the lens could be conveniently stored when not in use. To address this design challenge, Cappello led a team of Humber students who worked with Ooyavah to design and create a prototype of a case that integrates their 3D screen and to develop the user interface for the new product. Students from Humber's Bachelor of Industrial Design program designed, printed, and evaluated several prototypes to design the hardware to house Ooyavah's 3D lens. The team also collaborated with Sheridan College's Centre for Advanced Manufacturing and Design Technologies.

The student researchers and faculty in Industrial design are all named with industry partner Ihor Petelycky as inventors on the patent pending for the

7.4

case. Students from Humber's Multimedia Design and Development diploma program worked with Ooyavah to design a user interface application and create a visually appealing experience for users. Working closely with Ooyavah and under faculty supervision, the student design team contributed to the development of a fully functional prototype ready for use by Ooyavah.

"The client gets the benefit of working with excited young people, and students get the benefit of having a really cool design project under their belts," notes Capello, Faculty Lead in Humber's School of Applied Technology.

Funding: CCI Applied Research and Development Grant and Ontario Centres of Excellence Voucher for Innovation and Productivity Grant

Partner: Ooyavah Inc.

7.5 Giving the Aerospace Industry an Upgrade

Ontario: Centennial College

Aerospace manufacturing companies build parts using computer numerical control (CNC) machines, high-tech sculpting machines that program the path of the cutting tool in core materials. In this rapidly changing technology field, parts often become obsolete and cost-effective solutions must be found to replace them.

When one of its aerospace clients' CNC machines needed new memory cards, Nexas Networks collaborated with Centennial College to find a solution. Partnering with the college's Applied Research and Innovation Centre (ARIC), Nexas Networks and Professor Glen Taylor worked with students to design and prototype a new memory card for the CNC machines.

In four months, they reverse-engineered the old card, and made a newer, faster, and smaller model. They also added new features, including back-up power, so the machine will not forget the shape programmed into it when power fails. The new card was also cheaper to produce, at less than a quarter of the original's price. The memory card prototypes developed by Centennial students for this project were built at Brantco, an aboriginal-owned company located on a reserve.

The industry partner was grateful for this breakthrough and Tom Gaasenbeek, president of Nexas Networks, was so impressed with the team that he hired one of the student researchers. The company has plans to commercialize the new product and is looking forward to more applied research projects with Centennial College. The college also realized lasting benefits as faculty modified their curriculum based on inputs from Nexas Networks and their research experience.

Students who worked on the project were offered a real world problem where they had to use their training and out-of-the-box thinking to explore all possible solutions and deliver a working prototype.

Funding: CCI Applied Research and Development

Partner: Nexas Networks

7.6 Skate Manufacturing Analysis for Graf Canada

Alberta: SAIT Polytechnic

Graf Canada Ltd. is working with researchers at SAIT Polytechnic's Applied Research and Innovation Services (ARIS) department to develop better performing, lighter-weight skates.

SAIT's Sports and Wellness Engineering Technologies specialists are hoping to provide Graf with the necessary information to manufacture more of its skate components in Canada at a higher quality with shorter lead times and smaller batch orders. The project will also provide Graf with some preliminary models of a skate that incorporates new materials and manufacturing processes.

Graf approached ARIS for assistance in reviewing the manufacturing processes and materials used in the production of its ice hockey skates in 2014. The company would like to improve the quality and cost of its product while bringing more of its manufacturing to Canada. In addition, the majority of Graf's current components and processes are not documented with proper Computer Aided Design (CAD) files and therefore cannot be shared with potential manufacturing partners. This review and documentation project is the first step towards a larger project involving the design and prototyping of a new-model ice hockey skate.

Funding: College University Idea to Innovation Grant

Partner: Graf Canada Ltd.

Beacons for Airplane Safety

Québec: Cégep André-Laurendeau - Centre collégial de transfert technologique en optique-photonique (Optech)

Tall structures such as wireless communication towers or windmills can be hazards for air traffic. A Québec company has developed specialized protective lighting for these structures to help aircraft see these obstacles.

Technostrobe approached the Centre collégial de transfert technologique en optique-photonique (Optech) at Cégep André-Laurendeau for help increasing the efficiency of their beacons, which are installed on radio broadcasting and wireless communications towers and on wind turbines. Meeting Transportation Canada's very strict photometric standards, the beacons are exposed to severe climatic conditions over very long periods.

"Optech's participation clearly and greatly sped up Technostrobe's product development," according to Francis Lacombe, V.P. of Sales and Marketing for Technostrobe. "This collaboration has allowed us to structure, prototype, and test our ideas and concepts locally, thanks to the Optech team's great flexibility and availability."

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These new components have better optical performance, are lighter weight, and cost less since they require less material and fewer optical surfaces to reach and surpass conventional levels of spherical optical performance. They can be integrated into the optical systems used in various applications, such as imagery and projection systems.

As a result of this project, Optech has new expertise in free-form optical design and prototyping. Optech is also developing optical illumination and imagery expertise for the performing arts, digital media, and sciences.

Funding: CCI Innovation Enhancement Grant

Partner: Technostrobe

7.8 Improving Highway Line Painting Technology

Ontario: Niagara College

Niagara College's state-of-the-art capacity in 3D design and 3D printing has offered local companies exciting new possibilities to improve their products and services.

One such company is Linetech Equipment Mfg. Ltd., one of Canada's leading manufacturers of equipment to paint lines on roads and highways. About 100 of the company's truck-mounted machines are in use across Canada, the United States, and in other parts of the world.

Several years ago, Linetech worked with the college's digital media team to update software and test a mobile monitoring device that gauges the thickness of existing road markings. After a successful research partnership with Niagara on this project, Linetech turned to the Advanced Manufacturing Innovation Centre team for help improving its equipment production.

The Centre's research team redesigned one part of Linetech's equipment to make it lighter and smaller, and re-engineered the manufacturing process to involve fewer parts, which allows quicker changes on the line. They were also able to create the finished part with the college's 3D printer. In the end, the team provided a more cost-effective process to Linetech, using less material for production and, in one case, creating potential for an expanded product line. The company was producing four- and six-inch parts, but with the new material and

process, college engineers were able to create an eight-inch part to serve the company's needs better.

Funding: CCI Technology Access Centre Grant
Partner: Linetech Equipment Mfg. Ltd.

7.9

Making the Shoe Fit Every Time

Ontario: Centennial College

Science has solved many conundrums, but finding the shoe that fits perfectly was never on the list.

At Centennial College's Applied Research and Innovation Centre, researchers are dedicated to using science to solve practical, real-life problems. Custom shoe manufacturing typically requires complex processes like plaster casts. Toronto firm PodoTech aimed to create a three-dimensional foot scanning system to make measurements simpler and more accurate.

Waterloo University researchers developed a proof-of-concept Orthotic Design System, which led to the creation of photo scanner hardware and basic software to make a 3D model from the image. However, the software had been created using a commercial tool too expensive for the industry.

PodoTech CEO Tezera Ketama, an alumni of Centennial College, brought the project to a team of students at ARIC. The goal was to make new hardware and software for the technology, and put it together in a package that could be commercialized.

The team worked with PodoTech for 18 months using the open-source tool MeshLab to write the software.

The scanner they developed contains a laser and eight different cameras. The laser glides along a foot, and the cameras take a series of photographs. Image processing software then deletes everything in each picture except the laser stripe, and reduces that stripe to a tiny line, a process called "skeletonization". Complex math converts it to 3D data, and a model of the foot is then created. These 3D files are in a non-restricted format that can then be sent to a shoemaker to create something that fits perfectly.

The team's biggest accomplishment was taking all the steps needed to make the 3D model, and incorporating them into a single piece of software.

"Now we can press a button and the image is processed and reconstructed," Ketama says. "We can go straight from A to Z."

One team member describes their achievement as "a farewell to measuring tape," ensuring a perfect set of measurements to make a set of custom shoes, orthotics, or medical brace. And because it's a cheaper, easier way to measure the human foot, the cost of these custom orthopedic products could be drastically reduced. It could also be used where traditional measurement is impossible, for diabetics with reduced sensation in their feet.

Ketama also partnered with Centennial to design and program a mobile app and a website, illustrating how to use the technology, measure a foot correctly at home, and record measurements online. The design team came up with the slogan "We care about what makes you stand up every day" to describe PodoTech's mission.

Funding: CCI Innovation Enhancement Grant
Partner: PodoTech

Creating Innovative Fibres from Recycled Wood Biomass

Québec: Cégep de Trois-Rivières - Centre d'innovation des produits céllulosiques (Innofibre)

Innofibre is a College Centre for the Transfer of Technology (CCTT) at Cégep de Trois-Rivières focused on production of cellulose products made from wood, pulp, and paper biomass.

Every year, the recycling firm BRQ Fibre & Broyure reclaims more than 100,000 tons of residual biomass, including wood from demolition, deconstruction, and pruning. Traditionally, the biomass has been re-purposed in the energy sector but, as a leading-edge company, BRQ wants to break new ground by introducing innovative products. That's why its executives called on Innofibre.

In their first partnership, BRQ and Innofibre designed a product made of 100 per cent recycled material, relying on collaborative efforts that allowed for a back-and-forth exchange of expertise. BRQ now has several wood-fibre-based products in its sights, and their development will require larger-scale research with Innofibre.

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As BRQ spokesman Jean-Pierre Lafond summarizes, "Innofibre is our research hub. All of our scientific work goes through them."

Over the past year, Innofibre's research partnership with BRQ Fibre & Broyure Inc. has generated concrete results in the private sector. The partners now have a series of three-year research projects under development, some of which involve cooperation with other organizations, including La Coop fédérée. Innofibre and BRQ reap tangible benefits from their partnership and knowledge that can be shared with other companies in the biomass-conversion business.

Funding: CCI Applied Research and Development Grant

Partner: BRQ Fibre & Broyure Inc.

7.11 Oilseeds to Environmentally Friendly Bioproducts

Québec: Cégep de Thetford - Centre collégial de transfert de technologie en oléochimie industrielle (OLEOTEK)

Cégep de Thetford and its Centre collégial de transfert de technologie en oléochimie industrielle (OLEOTEK) operate a pilot factory and sophisticated processing equipment for applied research into oilseed use in industrial applications to produce technical materials and fluids.

OLEOTEK develops new oils with a biosourced functionalized base for Elevance Renewable Sciences, a company that processes renewable materials into a wide variety of bio-products including performance waxes, detergents, cleaners, and solvents. The project is in a pilot stage of development with the goal of knowledge transfer to industry.

Funding received from an Applied Research Tool and Instruments grant led to the recent acquisition of specialized filtering equipment for OLEOTEK's pilot factory. The research centre's unique services will up-scale chemical processes developed in the lab, manufacture up to multi-ton batches, and develop new techniques. This equipment has been used in several recent projects, including developing new biopolymers, using microalgae, up-scaling manufacturing processes of monomers, extracting from bark, and developing new bio-sourced biosurfactants. These projects have been carried out for private businesses or institutions wanting

to test their products or processes for pre-market improvement.

Students training in the chemistry, plastics and mechanics departments of the Cégep de Thetford have opportunities for hands-on experience for thesis work at the centre. Five Cégep de Thetford professors and many students have participated in OLEOTEK projects to date.

OLEOTEK has also been working in regioselective enzymatic and chemical oxidation of oilseed for long-term high-performance polymer production since 2012 in partnership with Unversité Laval. A Cégep de Thetford professor has been involved in this project from its inception and student participants are able to follow the processing procedures in the pilot laboratory and receive training in the ever-expanding industrial bioproducts field.

Funding: CCI Innovation Enhancement grant, Applied Research Tools and Instruments grant and College University Idea to Innovation grant

Partner: Elevance Renewable Sciences

7.12

Clear Skies with Advanced Green Technology

Ontario: George Brown College

Clear Blue Technologies designs on-grid and off-grid wind and solar energy devices for renewable energy manufacturers.

In 2012, Clear Blue and George Brown partnered to develop, manufacture, and test 20 prototypes of a key product. Clear Blue and the college have partnered again recently to develop a manufacturing process for Clear Blue's Blackbird and Eagle releases.

The goal is to improve and scale the current manufacturability of its products and automate the existing manual manufacturing and testing of their systems. The company expects product quality and reliability to improve with proper reliability testing.

This latest phase has supported Clear Blue in developing the process for a manufacturable for an outsourced subcontract Blackbird product. This involved working through an alpha version, a beta version and a version 1.0 of the Eagle product, and product and production testing processes. Clear Blue now has seven employees building, selling, and marketing these solar- and wind-powered solutions, and anticipates increasing their staff to 15-25 people over the next 18 months.

"[Working with George Brown], we benefited from education programs specific to our industry, worked with great faculty, and had a strong and talented pool to draw from, leading to one of our first employees. Their faculty have assisted us as well - they provided assistance to review technology / hardware, as well as access to some equipment we didn't have," says Clear Blue Technologies

This partnership has been mutually beneficial, matching industry experience with academic rigour, while serving as a conduit to the commercialization of green technology and student training. To date, Clear Blue's application has had pilot systems installed at Mercedes Benz, Texas University, Stresscrete Alabama, Burlington Hydro, and George Brown College. Patents for their products have been filed in Canada and the U.S.

See video for more information: **http://www.clearbluetechnologies.com/company/about-us**

Funding: CCI Innovation Enhancement Grant

Partner: Clear Blue Technologies

Robin Dubé, Industrial Research Chair for Colleges in Composite Aerospace Component Manufacturing

Québec: Cégep Édouard-Montpetit - Centre technologique en aérospatiale (CTA)

In the aerospace field, the quality and reliability of manufacturing processes is vital. Research and development are the very core of this industry and are key to growth and development through innovation.

The use of new materials, such as composites, is increasingly common to reduce the weight of aircraft and improve performance. The Industrial Research Chair in Composite Aerospace Component Manufacturing at Edouard-Montpetit was created from a need expressed by the industry.

This research chair facilitates knowledge acquisition and offers access to a team of specialized workers, factors that can help companies remain competitive in an international market. It also builds knowledge about the manufacture of composite parts, supports the local supply chain, and maximizes training opportunities. It aims to be a "one-stop-shop" for the development of aircraft composites.

Staff at the Centre technologique en aerospatiale (CTA), Bombardier and smaller enterprises such as FDC Composites, Hutchinson and Texonic, along with several university partners, are working in partnership to prove and market new technologies.

Dubé has had a direct impact on the training of future aerospace technicians at the École nationale d'aérotechnique (ÉNA) since 2013. ÉNA teachers have been involved in various projects, and in technological demonstrations on resin transfer moulding and infusion which are attended by nearly 120 students every year.

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Dubé and his research team facilitate collaboration between SMEs and Bombardier to develop composite parts by providing a cutting-edge technological workshop and a team of specialists. Bombardier is solidly committed to using composite materials in the manufacture of its new devices and its aircraft division is currently developing products that are highly innovative in their intensive use of composite materials. These high-performance materials make it possible to build lighter, more aerodynamic and fuel-efficient aircraft.

To date, several primary aircraft structure parts have been developed at CTA. Since the inception of the Research Chair program, over 100 structural-quality composite parts, from simple test plates to a complex fitting, have also been built. Based in innovation and excellent productivity of local companies, this type of partnership between industry and the research chair provides the aerospace industry with qualified and specialized workers.

"The research framework and CTA's specialized team have certainly accelerated our development projects," says Didier Hoste, Section Chief of Aerostructures Technology Development at Bombardier.

7.14

Dr. Philippe Bébin, Industrial Research Chair for Colleges in Advanced Materials

Québec: Cégep de Thetford - Centre de technologie minérale et de plasturgie (CTMP)

The Cégep de Thetford's Industrial Research Chair for Advanced Materials focuses on manufacturing polymer and nano-object nano-composites according to industry processes.

Current research, led by Dr. Philippe Bébin, focuses on how to control the organization of nanometric components to obtain new levels of performance using traditional materials. To do this, the research team is working to control interfaces and adjust manufacturing processes. The chemistry and physical chemistry of different components' surfaces can be modified to allow a specific structure of material to be selected for certain desired end qualities.

The Research Chair is located at the Cégep's Centre de technologie minérale et de plasturgie (CTMP), a College Centre for the Transfer of Technology (CCTT) specializing in thermoplastics and composite implementation, and mineralogical upgrading and extraction. Dr. Bébin's focus on advanced materials broadens the expertise of these two sectors by introducing the new dimension of the nanometre. Working on this scale with both mineral loads and polymer matrices calls for the use of new techniques and the development of new expertise. Spearheaded by Dr. Bébin, this new dimension creates opportunities for the centre and expands its capabilities in innovation in the materials field.

The sub-micronic world fascinates and intrigues both cégep students and their professors. This interest spurs a high level of involvement in the research projects. The industrial challenges allow researchers to realize that nanomaterials are no longer confined to research laboratories. In addition to becoming an industrial reality, they are more and more the source of companies' improved performance.

The orientation towards increasingly technological materials responds to the growing desire of the centre's business partners to acquire advantages that will help them remain competitive in their markets. The field of nano-composites holds much promise; however there are major challenges in manufacturing them cost-effectively on an industrial scale.

Franco Chiesa, Industrial Research Chair in Aluminum Transformation

Québec: Cégep de Trois-Rivières - Centre de métallurgie du Québec (CMQ)

Aluminum transformation is an important area of research for a number of Québec industries looking for improvements in molding or casting aluminum alloys.

Dr. Franco Chiesa has set up partnerships with multinational RioTintoAlcan (RTA) and with eight

7.15

Québec small and medium-sized enterprises from various regions including the Saguenay, Cap-St-Ignace, St-Cyprien, Drummondville, and greater Montreal.

RTA sub-contracts its casting-alloys research and development to tap into Dr. Chiesa's expertise and into the research centre's materials and resources, such as a low-pressure mold press. Most small and medium-sized enterprises have neither the scientific resources nor the specialty equipment to conduct such research. In return, SME projects allow the CCTT to fine-tune its ability to apply scientific principles to real-world problems.

This hands-on problem-solving is a core element of the Chair's contribution to teaching in the cégep's metallurgy department, as research projects involve academic staff either directly or through the supervision of students working on projects. The centre also proposes themes for end-of-studies projects, overseen jointly by a professor and Dr. Chiesa, and hires two student interns a year for 14 weeks.

The strong working relationship allows professors to inject concrete examples into their courses, breaking from routine and heightening student motivation. They also provide more up-to-date instruction on cutting-edge topics. Some of the challenges tackled to date include developing alloys with very high aluminum-copper content, die casting of low-iron alloys, high-production modified heat treatments, and direct-pour sand casting. The Chair also organizes its operations so that students can observe castings as part of their courses. Through projects designed by the Chair, two students won the 2013 and 2014 Prix de la relève (next-generation award) at the REGAL (Regroupement Aluminium) student day.

The benefits for SME productivity can prove spectacular as well. One example is a mold initially designed empirically, then "virtually" modified in a three-phase modeling process that not only improved quality, but also increased casting capacity from 10 to 15 units an hour while using 20 per cent less metal. Results from six research projects have been published in the 2014 and 2015 conference proceedings of the American Foundry Society and the 2014 and 2015 annual convention of the Canadian Institute of Mining, Metallurgy and Petroleum.

7.16

Olivier Vermeersch, Industrial Research Chair for Colleges in Innovative Technical Textiles

Québec: Cégep de Saint-Hyacinthe - Centre d'excellence des technologies textiles, géosynthétiques et matériaux souples (Groupe CTT)

Technical fabrics are up-and-coming technologies in many of society's strategic industrial sectors including transportation, defence, health, and construction. Today, technical fabrics are considered to be essential elements in cutting-edge products.

At the Cégep de Saint-Hyacinthe and its affiliated centre, the Groupe CTT, professor Olivier Vermeersch, Research Chair of Industrial Research in Innovative Technical Fabrics, is leading research focussed on protection, safety, comfort and toxicity, sustainable construction, and reuse of intelligent textiles.

Research has been launched at Cégep de Saint-Hyacinthe on fabrics for extreme climates, particularly for the Arctic. Many factors must be taken into account when evaluating the performance of protective clothing against the cold. While the thermal aspect is vital, the user's comfort and mobility must not be overlooked.

Researchers have perfected a performance index to help consumers identify clothing that best meets their specific needs, depending on environmental factors and their physical activities. This performance index was also designed to assess protection levels of clothing with active heating. In the last few years, the development of trial methods for intelligent textiles has become a major focus of work for standardization bodies. A research focus on toxicity has led to the completion of several projects that identify or estimate Volatile Organic Composites (VOC) level using a clean room set up in the Groupe CTT offices.

Each year, more than a dozen college, undergraduate, and graduate students and their supervising professors participate in intelligent textile research activities. This dynamic environment has allowed the cégep to complete many innovative projects and continues to stimulate the interest of industry partners.

8. Building Technology

8.1 Building with Peat Blocks

Ontario: Cambrian College

Housing development in Ontario's far north is limited, largely because of the high cost of materials and construction challenges created by harsh weather conditions and permafrost. But local peat moss may offer an affordable alternative.

Cambrian College and its industry partners wanted to find a solution to the cost of shipping building materials in Northern Ontario by exploring the use of indigenous sphagnum peat moss as an aggregate in cemented peat construction blocks.

Peat moss has already been used for heat and electricity. The challenge for this project was to understand the technical issues in developing a handling and processing method that was adequate for block fabrication. The project aimed to perfect a mixture of peat, cement and binders to create a usable construction product. Cambrian Innovates, the college's applied research centre, brought together a highly skilled team of industry partners, faculty and students.

Commercialization of peat building blocks would directly benefit Northern Ontario communities like those in the Hudson Bay Lowlands, which contains the largest peat reserve in the world. The potential new "green" building material comes at an opportune time, as the global building materials market is expected to grow and reach almost $890 billion in 2015.

Once the development of this product is completed, the industry partners Rainbow Concrete Ltd. and Sustainable Building and Energy Consultants Inc. plan to commercialize the product and manufacturing method.

Funding: CCI Applied Research and Development Grant
Partners: Rainbow Concrete and Sustainable Building and Energy Consultants Inc.

8.2 Cleaning Condo Air Quality

Ontario: George Brown College

Condominiums and high-rise apartment buildings are often designed with ineffective corridor ventilation.

In these buildings, fresh air is pumped into the hallways and then pulled into individual units. This means that most of the air in a unit comes from beneath the condo door, and can be full of tobacco, allergens, pollutants and dust from nearby construction sites.

Bordin Racing Inc. envisioned a lightweight retrofit that could be easily installed by a condo owner to help filter out most of these unwanted pollutants. Faculty and student researchers from the Mechanical Engineering program at George Brown College helped the company with suggestions for prototype refinement and fabrication, as well as research on building codes and testing.

The solution was a partial weather stripping of the apartment unit entry door while maintaining a modified opening with a custom filtration device—essentially "trapping" pollutants before they enter the unit while still allowing air to flow.

The company took the student designs and research and refined them, moving to the manufacturing stage and extruding the design

in plastic. The product—now called the Door Filter—is equipped with a dense particulate filter capable of eliminating pests, allergens and even unpleasant odours or unwanted noise or light. It has been patented in six countries with three design patents and is being sold in Canadian and international markets. Door Filter has attracted a great deal of interest among international contractors eager to find a cost-effective, non-intrusive solution to high-rise living.

"We knew the concept could work. We knew it was a good idea. It was really a matter of where to go next. That's why we came to George Brown. Help from the college was a great asset...it became almost a conversation in itself about the product's credibility," says Andrew Bordin, CEO and founder of Bordin Racing.

Funding: CCI Innovation Enhancement Grant

Partner: Bordin Racing/Door Filter

Energy-Efficient Housing for Arctic Living

Alberta: SAIT Polytechnic

What does it mean to live sustainably in the North? With two months of darkness, monthly utility bills over $1,500, temperatures below -40 degrees Celsius, and variable permafrost, it can be a challenge.

SAIT Polytechnic's Applied Research and Innovation Services (ARIS) department was approached by GBM Construction in Fort Simpson, NWT, to design a high-performance net-zero energy home.

Through consultation with Fort Simpson-based engineers, architects and trades people, ARIS's Green Building Technologies researchers brought together passive and active elements to design the ultimate sustainable home

Fit for an extreme climate, "Arctic House" includes a high-efficiency, wood-fired boiler to generate the hot water used for radiant heat and domestic requirements, and embedded floor sensors to detect solar heat and trigger a small pump to redistribute hot water to cooler areas in the home. And, since the home will produce more solar energy than it needs during the summer's long daylight hours, Arctic House will contribute the excess energy to the power

8.3

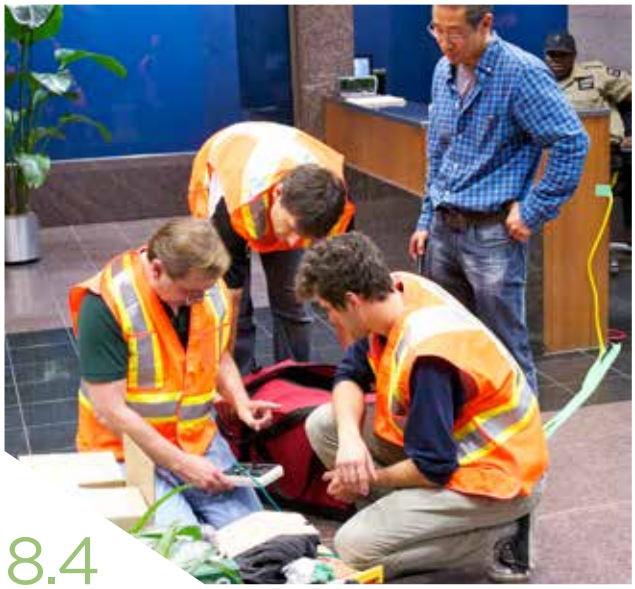
grid and draw from the grid only when necessary – resulting in a net-zero energy consumption per annum.

"I think the sky is the limit in what we can do in the North. It's a great place to test projects like these," says Derek Erasmus, owner of GBM Construction.

The project will not only provide northern Canadians with more energy-efficient design options, but the lessons learned can help perfect net-zero energy housing design worldwide.

Funding: CCI Innovation Enhancement Grant and Applied Research and Development Grant

Partner: GBM Construction



8.4

Large Building Air Leakage Testing

Manitoba: Red River College of Applied Arts, Science and Technology

Air leakage is now widely recognized as one of the most critical parameters affecting a building's energy use, indoor air quality, comfort and durability. This is particularly true in Manitoba's extreme climate, where there have been several notable and expensive large building envelope failures.

Red River College (RRC) and its research partner, Manitoba Hydro, have recently completed a project investigating the air leakage characteristics of 26 buildings. A CCI Applied Research Tools and Instruments grant provided funding to purchase equipment to conduct these tests.

This research project has helped to establish baseline air leakage rates and to develop a practical air leakage testing protocol for current building standards. The project findings have also influenced at least two building retrofit projects by identifying critical air leakage pathways.

"The whole idea of commercial building air leakage was not very well understood. The results from this project have provided significantly more data than we've ever had in the past," said Harry Schroeder, Building Systems Engineer with Manitoba Hydro. "An advantage of working with the college has been that they have the resources and staff, but they also have the facilities, and there really aren't a lot of facilities in Manitoba to do buildings-related research."

Four RRC students were part of the research team. Continued work in this area will significantly expand knowledge about air leakage characteristics and testing techniques for commercial buildings at both a provincial and national level.

Learn more in this video:
http://vimeo.com/93535888

Funding: CCI Applied Research Tools and Instrument Grant
Partner: Manitoba Hydro

Feeling the Heat - the Furnace Minder

Ontario: Humber College Institute of Technology and Advanced Learning

In the fall of 2013, a local heating and air-conditioning company contacted Humber College's instructor of the Electronics Engineering Technician program to discuss the development of a new idea to remind customers about furnace maintenance.

Mike Martino of Martino Contractors envisioned the MB Furnace Minder as an automated device that will remind homeowners when it is time for regular

8.5

maintenance of their furnaces. An Electronics Engineering Technician student and a Bachelor of Industrial Design student were hired as research assistants. Under the direction of instructor Georges Livanos, students worked with Martino staff to design and test their proposed automated system. The patent for the MB Furnace Minder was filed in March 2014, and the product is now undergoing final testing. Martino plans to make the MB Furnace Minder available to their clients for commercial use this year.

Martino Contractors is a family-owned company that provides heating, air conditioning and air quality products and services to their clients. Established in 1987, Martino has installed 70,000 furnaces and air conditioners in the greater Toronto and Ottawa regions.

"It's awesome to work with the diverse professionals, with students as well as experienced coordinators and staff … to see how they undertake real projects was really helpful. It gives insight into the real world of design and production," said Michael Voitov, a student in the Bachelor of Industrial Design program at Humber.

Funding: CCI Applied Research and Development Grant
Partner: Martino Contractors

8.6 Smart Technologies Enable Thermostat Management From Afar

Alberta: SAIT Polytechnic

A virtual thermostat developed through research at SAIT Polytechnic could allow building managers to have wireless control of heat throughout large facilities.

Kalen-Hudson Group is a manufacturer and importer of small electronic devices, especially thermostats and other control devices. Having previously worked with Applied Research and Innovation Services (ARIS) at SAIT to test and validate technologies, Kalen-Hudson knew where to turn when it needed to design a smart-control thermostat and a smaller, cost-effective consumer model.

"In order to develop the technology, having access to a facility like SAIT and the research grant gives us the chance to develop something new and be competitive with the major players. Without that ability, I don't know that I'd be able to compete with them," says Irfan Dhanani, owner of the Kalen-Hudson Group.

While researchers in the ARIS RADLab (RFID Application Development Lab) were working with Kalen-Hudson to design the software to support its new WiFi-enabled thermostat, its supplier in Asia ran into problems. In order to carry on the development of the device, a student researcher developed an application that could stand in as a virtual thermostat. This kept the project on time and on budget so a cloud-based client interface platform for the system could be developed.

At the end of the project, the SaaS engine developed by the RADLab was able to communicate to a large number of these new, wireless thermostats.

This new technology will allow facilities managers and landlords to wirelessly control the various rooms in a larger building through a user-friendly interface.

Funding: CCI Applied Research and Development Grant
Partner: Kalen-Hudson Group

8.7

Using Radar for Outdoor Perimeter Security

Ontario: Algonquin College

Algonquin College student researchers have been key players in the design and testing of a new 3D radar system that an Ottawa security company is developing for perimeter surveillance of military bases and pipelines.

3D Sentry Corp. is a company founded by security industry entrepreneurs, Dr Keith Harman and David Baird, to develop the next generation of advanced outdoor perimeter security sensors. Such systems could provide improved protection of the outdoor perimeters of critical infrastructure facilities, such as military bases, power stations, petrochemical plants, and pipelines.

3D Sentry recently completed a successful project with Algonquin's Applied Research and Innovation Centre to advance the development of a "Ported Coaxial Cable" prototype, a covert terrain-following cable-guided radar. The work was carried out at Algonquin by a student research team led by Dr. Theo Mirtchev and at the company's purpose-built development site in Almonte, Ontario.

Completing the prototype represents a critical milestone in the company's development. It allows 3D Sentry to continue the development, then test and start selling a fully functional Evaluation System. The prototype will possess all of the major attributes, functionality and characteristics specified for the final production system. This will allow the company to demonstrate the advanced capabilities of the system to customers, strategic partners, consultants, testing agencies and investors. 3D Sentry will then undertake further development to produce a market-ready final product.

"This project included the design and integration of advanced hardware controlled by Labview software. In my view this work would be challenging for an experienced team of engineers," says Dr. Harman, Chief Scientist at 3D Sentry Corporation. "The success of the project has led to a system that can be demonstrated to customers and potential venture capital people. This was only possible with the enthusiastic efforts of the students and the dedicated work of Dr. Mirtchev."

Funding: CCI Innovation Enhancement Grant

Partner: 3D Sentry Corporation

Partnering with Industry in Green Building Innovation

Alberta: SAIT Polytechnic

Green-minded home buyers in Calgary have recently purchased two net-zero energy homes constructed by student researchers at SAIT Polytechnic.

Green Building Technologies (GBT) is one of SAIT's leading research areas in the Applied Research and Innovation Services department. The GBT research initiative was established in 2008, and received a five-year CCI Innovation Enhancement grant in 2009. The research group has grown in expertise, industry-based applied research projects and laboratory capabilities.

One of the research team's key partners is Avalon Master Builders, a pioneer in green construction that has developed a series of net-zero energy homes. Two of these houses were constructed on SAIT's campus. These applied research projects provide students with hands-on experience in green building and allow the GBT team to research, test and demonstrate the latest in environmentally efficient building methods. The finished homes now belong to green-minded buyers and are located in two Calgary neighborhoods.

SAIT students and researchers still actively monitor the energy management systems in the Discovery 4 and **Discovery 5 homes**. And a student project to customize/virtualize Discovery 4's energy-management system won the 2013 SAIT Student Showcase and DIRTT Student Innovation Award, and

8.8

represented SAIT at the 2013 Polytechnics Canada Student Applied Research Showcase. Discovery 4 was also named Custom Project of the Year at the 2011 **Net Zero Energy Home Awards** in Toronto. Avalon will manage the construction of SAIT's new 4,000-square-foot GBT Lab and Demonstration Centre – scheduled to break ground in early 2015.

Funding: CCI Technology Access Centre Grant

Partner: Avalon Master Builder

9. Forestry and Fisheries

9.1

Using Wood Ash as Fertilizer

Ontario: Collège Boréal

For decades, the forestry industry has operated under difficult financial conditions, and little attention has been given to potential innovations and research opportunities. This has created opportunities for collaboration with post-secondary institutions, because research and innovation are an essential part of the industry's long-term sustainability.

A 2014 study, undertaken by Collège Boréal and a timber company near Sudbury, has demonstrated the value gained from a college-industry research partnership.

A forestry company with a mill in Nairn Centre, 50 kilometres east of Sudbury, uses wooden biomass to heat and provide electricity for its operations. The waste produced is wood ash, which could be used to promote plant growth by enhancing or retaining soil nutrients. However, the company currently discards the ash at landfill sites creating additional costs for landfill fees and transportation to the dump.

Collège Boréal was asked by the company to determine the efficacy of using wood ash from the mill on foliage and soil in the Greater Sudbury area. The college's forestry researchers and students set up a six-month plot sample with a variety of soil conditions in the college's greenhouse. The results of soil and foliage analysis showed that the wood ash improved the soil conditions and generated greater plant growth than control conditions without ash added. This initiative provided empirical evidence to support the idea of wood ash as the company's new co-product.

Through the study, the company has identified a new co-product that is available to its customers, and will lead to higher sales for the company. They have also lowered their operational costs because the wood ash is no longer deposited at landfill sites so the company has eliminated transportation and landfill fees.

Funding: CCI Applied Research and Development Grant
Partner: Eacom Timber Corporation

Tackling the Effects of Climate Change on B.C. Forests

British Columbia: College of New Caledonia

Climate change is having a discernible impact on the forests of British Columbia and is one of the biggest challenges facing the forest industry today. One of the most important applied research focuses for the forestry industry in central B.C. is finding new tree species to plant that will be better adapted to the climate projected for the future, and will provide forest products for future generations.

9.2

The College of New Caledonia is working with local forest companies, the provincial government, three research forests, and collaborators from other academic institutions to research potential tree species. Species like western larch and Douglas fir may be ideally suited to current and future climates in our region. College faculty and students in the Natural Resources and Environmental Technology program are involved in research trial plantings across the region, and measuring, analyzing and reporting tree and climate data from these sites. Once established, research installations will provide important data to the forest industry over several decades, and will also provide an ideal teaching and demonstration facility for students.

"This project is a perfect fit with our future forest stewardship objectives," said Frank Varga, a B.C. Timber sales practices forester. "The research these students are doing will provide valuable knowledge about the effects of climate change on northern B.C. forests and help us determine which tree species are best-suited to the region."

Funding: CCI Innovation Enhancement Grant
Partners: BC Timber Sales, Dunkley Lumber Ltd., Canfor, Lakeland Mills Ltd., CNC Research Forest Society, BC Ministry of Forests, Lands and Natural Resource Operations, Wet'zinkwa Community Forest Corporation, Aleza Lake Research Forest of University of Northern BC

9.3

Cloud Mapping for Forestry Planning

British Columbia: Selkirk College

Geographic Information System (GIS) mapping of forestry resources is moving from desktop to the cloud with assistance from Selkirk College.

Selkirk College's Geospatial Research Centre (SGRC) conducts applied research, develops applications, and delivers Selkirk's Advanced Diploma and Bachelor of GIS programs. The research centre has experience developing sophisticated web-based map services. A local forestry software company, Valhalla, approached SGRC for assistance expanding its suite of software designed to help the British Columbia forest industry to manage harvesting operations, production and sales of lumber to domestic and international markets.

The software can run on both the desktop and in the cloud. Valhalla has customized its software for forest operators in southeastern B.C., however, core elements have applications that could be used across the global forest industry.

Forestry instructors are working closely with BOS Forestry and research team members to model forest workflows and identify where geospatial software tools could add value.

"This joint project with the Selkirk Geospatial Research Centre has provided a great opportunity to engage with our industry advisory group, staff and faculty at the college to enhance the geospatial aspects of our technology roadmap and development plans for BOS Forestry," says Grant Sutherland, CEO of BOS Forestry.

The project required a development server that collaborators and BOS clients could all access. Fortunately, the SGRC was able to use the free services in the DAIR cloud. As part of the CANARIE system, DAIR provides excellent bandwidth as well as built-in tools and resources. This is the SGRC's first exposure to development in the cloud. As software applications move to the cloud, this experience will equip SGRC researchers and Selkirk GIS instructors for the future.

Funding: CCI Applied Research and Development Grant
Partner: BOS Forestry

Passive Treatment of Leachates from Forestry Waste

Québec: Cégep de l'Abitibi-Témiscamingue - Centre technologique des résidus industriels (CTRI)

9.4

Wood waste from the Quebec forest industry is often stored in large piles that can degrade the soil under and around the stockpiles. Forestry researchers at the Centre technologique des résidus industriels (CTRI) at Cégep de l'Abitibi-Témiscamingue are testing ways to decontaminate water that may be affected by leaching from these stockpiles.

The cégep's researchers applied their knowledge about treatment of wastewater from mine tailings to the problem of leachates from bark heaps for a local forestry company, Coopérative forestière du Nord-Ouest, Mabarex.

The research team is designing, installing and monitoring a pilot passive treatment of leachate waters in wood residue concentration areas. The system is being set up in two stages. First, the team will design and install hydraulic works upstream of the forest depot. This facility will serve as a reactive barrier. The phenolic compound leachates in the water will be absorbed in the multiple reactive columns in the barrier. Several inexpensive absorption materials will also be tested in this stage. The second stage is neutralizing the phenolic compounds concentrated in the absorption materials. Using the aerobic enzymes in mushrooms, this organic process will improve the biodegradability of phenolic compounds.

This process is a passive treatment technique requiring no pumping or injection system. The new system could provide an effective and low cost alternative to existing techniques that are complex and often ineffective for treating leachate waters in wood residue stocking areas.

"Thanks to this project, CTRI is now a major player in innovation in the region," says Sylvain Blais, Director General of Cégep de l'Abitibi-Témiscamingue. "This project also advances applied research on passive treatment of organic pollutants and develops expertise to meet the increased needs in depolluting effluents in tailing areas, which is currently a major environmental issue."

Equipment recently purchased by Cégep de l'Abitibi-Témiscamingue for CTRI make it possible to prepare samples, and identify and quantify micro-organisms. The polymerase chain reaction (PCR), in which micro-organisms are used to treat a range of pollutants, is one of the potential processes being explored. This equipment will help address regional environmental problems and allow the cégep to offer additional expertise to local partners.

Funding: CCI Applied Research and Development Grant
Partner: Coopérative forestière du Nord-Ouest, Mabarex, Centre Jardin Lac Pelletier

9.5 Planning for Sustainable Salmon Aquaculture

British Columbia: North Island College

Fish farmers and fisheries experts are working together to monitor the effects of aquaculture on the ocean floor with the help of researchers from North Island College.

The BC Salmon Farming Association (BCSFA) and the local offices of the Department of Fisheries and Oceans (DFO) identified a need to strengthen capacity in monitoring the ocean floor of hard bed substrates where some B.C.

fish farms are located. North Island College was approached in 2012 to help research the issue for the North Vancouver Island salmon aquaculture industry with the aim to ensure environmental sustainability of aquaculture.

Dr. Aisling Brady, a biology instructor at the college, looked at two fundamental issues -- the significant ecological changes likely to occur at hard bottom sites near salmon farm operations, and the habitat indicators and thresholds at which significant negative large scale seabed changes occur. The research team used remote controlled vehicles and video observations for invertebrate community surveys on the seabed as well as environmental monitoring and measuring interactions between invertebrates and salmon farm waste.

The investigation provided a solid foundation for future industry growth in hard bottom areas. It also helped stimulate a broader dialogue about environmental monitoring and supports decisions grounded in empirical evidence. The college's industry partners are interested in continued research to develop strategies and solutions to monitor and better regulate hard bottom substrates.

Funding: CCI Innovation Enhancement Grant

Partners: Marine Harvest Canada, Grieg Seafood, Cermaq Canada, Mainstream Biological, BC Salmon Farmers Association and Columbia Science

9.6

Wave Energy Research

Newfoundland & Labrador: College of the North Atlantic

College researchers in Burin, Newfoundland are experimenting with wave energy to develop a pump that could provide water for aquaculture operations inland.

The College of the North Atlantic team is in the fourth year of a research project on wave pump application, development and optimization. Over the course of the project, the team has developed a wave-powered device to pump water to shore for a land-based aquaculture pilot farm.

Along with the original project plan, this multi-party funding has supported the development of the Wave Energy Research Centre (WERC), a field station with significant infrastructure, for long term research and development work. WERC operates out of four buildings on the wharf in Lord's Cove, in southeastern Newfoundland. The research centre has six mooring sites within 1.5 kilometres of the station permitted under the Canadian Navigable Waters Protection Act. In addition to a weather station, wave data collection and device mooring sites, WERC also houses the Multi-Trophic pilot aquaculture farm, a lab and workshop space. The site is equipped with an emergency back-up power supply sufficient to run the farm, data acquisition equipment and high speed data connections for on-site monitoring and control of equipment.

Wave energy researchers have measured waves as high as 11 metres at 25 metres depth; and six- to eight-metre waves are not uncommon in winter. When scaled to the full depth, these conditions represent the extremes of environmental conditions experienced in offshore installations. The research team is currently discussing the potential for other projects at the site with a number of institutions and companies.

A remotely operated vehicle (ROV) was purchased through a CCI Applied Research Tools Instruments grant and deployed to increase the ability, effectiveness and safety of performing underwater inspections of the equipment being tested and of the installed instrumentation. This system is small enough to be easily deployed from a local fishing vessel, while powerful enough to be able to operate during non-storm conditions at the site. Additional instrumentation will enhance researchers' ability to collect data at the site.

Funding: CCI Applied Research Tools and Instruments, the Research and Development Corporation of Newfoundland and Labrador and the Government of Newfoundland and Labrador
Partner: Lord's Cove Harbour Authority

Yacine Boumghar, Industrial Research Chair for Colleges in Agroforestry Extraction

Québec: Collège de Maisonneuve - Centre d'études des procédés chimiques du Québec (CEPROCQ)

9.7

The emerging bioeconomy is providing promising new opportunities for the development of new products from forestry and agriculture biomass. While significant progress has been made in the conversion of forestry residues to useable biomaterials, developments in the agroforestry sector require a better understanding of the chemical composition of forestry biomass from a variety of different sources and the availability of effective and reliable production technologies with a low environmental impact.

Collège de Maisonneuve's Industrial Research Chair Dr. Yacine Boumghar, has considerable expertise in extraction and separation bioprocesses and in scaling-up pilot-scale processes. He is leading a research program on the conversion of agroforestry biomass to usable materials and the commercial scale-up of agroforestry extraction processes. Dr. Boumghar intends to make Collège de Maisonneuve a hub of knowledge on agroforestry extraction and an incubator for leading edge technology solutions to address community and industry needs. The research team will work to:

- develop extraction, purification and separation bioprocesses;
- develop analytical tools to determine the chemical composition of agroforestry extracts;
- assess the biological activity of the extracts or fractions of extracts produced.
- develop linkages between government, associations and industry to help pool efforts and coordinate innovative actions;
- break down barriers between the forestry and agroforestry sectors approaches to scientific and economic issues and promote integrated technology solutions;

With the establishment of the Chair, a number of agroforestry cooperatives and companies have been able to launch innovative projects promoting both diversification and product development. This research is helping ease the transition from a linear economy to a circular one.

"As a representative of the international corporation DuPont de Nemours, I've had the opportunity to work with [the Centre d'études des procédés chimiques du Québec (CEPROCQ) at Collège de Maisonneuve] over the past several years to test new sources of extractables. I saw firsthand how effectively this organization was able to design research and quickly produce tangible results for industry," said Simon Langlois, director of business development, DuPont Building Innovations.

9.8

Éric Tamigneaux, Industrial Research Chair for Colleges in the Conversion of Marine Macroalgae

Québec: Cégep de la Gaspésie et des Îles - École des pêches et de l'aquaculture du Québec

The industrial use of marine algae is a huge and growing market feeding large industries, mainly in Asia and Europe.

Canada has all the elements required to develop an industrial centre in this field, namely, relatively unpolluted coastal waters and large reserves of this natural resource. Québec's coastal areas are no exception. Québec's macroalgae has a high commercial potential, since this natural resource is used in a wide range of products, including fertilizers, foods, cosmetics, and pharmaceuticals.

Fast-growing cold-water algae are easily cultivated in marine farms, and could bring needed diversification to shellfish farmers. Despite the emergence of an algae cultivation, harvesting and processing industry made up of primarily small and medium-sized businesses, applied research in the field is unstructured and entrepreneurs have little documentation or technical support at their disposal.

The creation of an Industrial Research Chair in the Conversion of Marine Macroalgae at the École des pêches et de l'aquaculture du Québec (ÉPAQ), part of the Cégep de la Gaspésie et des Îles, will bring together available knowledge, resources and expertise to address current needs. The funding obtained or the industrial chair program has allowed research professor and Chairholder Éric Tamigneaux to set up a small work team, in partnership with the Centre d'innovation de l'aquaculture et des pêches du Québec (Merinov), which manages the Centre collégial de transfert de technologie en pêches (CCTT) at the Cégep de la Gaspésie et des Îles. Funds are being used to organize workshops and symposia, supplement student grants, operate the hatchery and the algoculture demonstration farm at the ÉPAQ, supplement project budgets and leverage further project funding.

The main objectives of Dr. Tamigneaux's research are to encourage and coordinate applied research projects on macroalgae, provide industrial players with scientific and technical support, and offer training to companies and students. The applied research has three components: fisheries and natural resources, mariculture, and algal biomass conversion.

Research projects will be adapted to the needs of industry to enable entrepreneurs and users of the results to address the challenge of utilizing the resource sustainably and stimulating the local and regional economy.

One current project involves Algoa, a small firm in Forestville on Québec's North Shore, which employs nine people who harvest and process 20 tons of algae every year. These large volumes are used in a fertilizer, but "that's not the greatest gain," says president Dany Sénéchal. Small quantities are also being sold to the cosmetics industry and Algoa is developing a food subsidiary in teas. Mr. Sénéchal is counting on Dr. Tamigneaux's research team to identify the algae's properties: "French research results don't apply in Québec," he says. "The Chair's research will give me checked and checkable information that my algae is unique."

Éric Tamigneaux is a research professor at ÉPAQ, one of the college's campuses. An oceanographer by training, Mr. Tamigneaux has worked at the college for 12 years, both as a professor in the

aquaculture technical diploma program and as senior project manager at the CCTT.

Over the past six years, Mr. Tamigneaux has developed unique expertise in Québec on growing macroalgae and has successfully stimulated companies' and institutions' interest in algae. Founder of the Centre d'étude et de valorisation des algues marines (CÉVAM), he has created a network of partners from universities and the CCTT network.

Dr. Stephen Cross, Industrial Research Chair for Colleges in Sustainable Aquaculture

British Columbia - North Island College

Dr. Stephen Cross, Research Chair in Sustainable Aquaculture at North Island College, has been involved with aquaculture development and research in Canada since 1985. He has worked with industry, government, and academia on all aspects of environmental management for coastal aquaculture. Dr. Cross has also assisted with regulatory development in Chile and Thailand, on academic curriculum development in Mozambique, and on projects in the U.S. and Australia.

With growing global demand for sustainable seafood, the major focus of research at North Island College will be to support sustainable aquaculture industry in Canada by assisting in efforts to diversify production through integrated systems, increasing efficiencies in short and long-term environmental management approaches, and increasing public awareness and acceptance of aquatic food production ("fish farming") for Canada.

Dr. Cross, in partnership with local industry partners Marine Harvest Canada, Grieg Seafood, Cermaq Canada and Creative Salmon, will focus on four applied research and development themes: refining and testing new environmental monitoring protocols, introducing finfish aquaculture into B.C., developing an integrated coastal surveillance platform, and deepening understanding of B.C. aquaculture.

Research in new environmental monitoring protocols will design, refine and test new approaches for environmental management of the waste discharge from farms in an effort to address many of the technical challenges associated with current methods. It aims to provide technical options that are rigorous and scientifically-defensible as well as cost-effective and efficient.

9.9

Inorganic nutrient release from fish farms offers an opportunity for the development of partial Integrated Multi-Trophic Aquaculture (IMTA) in existing farm operations. North Island research explores this approach and the design of a system and economic modeling for a fish-kelp component for the industry as a whole.

Coastal surveillance researchers are designing and testing a standardized, water quality monitoring station for farm site installation which requires minimal maintenance. The design includes web-based telemetry and a network for industry-wide data acquisition, relay, consolidation, analysis, and access for multi-stakeholder use. Industry will benefit through linkages to a fish heath database that will allow local or regional assessments of performance.

As most aquaculture in B.C. takes place in remote coastal locations, the general public has little opportunity to visit "fish farming" facilities. In an effort to make aquaculture accessible, a web-based viewing platform will be developed situated in several locations both above and below water and will allow user control of remote cameras. Researchers will pilot these systems for use in the classroom and in long-term aquaculture displays in the Comox Valley Visitor Centre, the Campbell River Discovery Passage Aquarium, and the Vancouver Public Aquarium.

10. Social Innovation

10.1

Aging in Place with Online Help

Ontario: Sheridan College Institute of Technology and Advanced Learning

Helping seniors stay flexible and mobile is critical to their ability to live independently.

A small Ontario company has been working with Sheridan College to create an online program to help older adults keep their functional mobility through exercise at home.

Attune Aging Strategies and Solutions is a husband and wife team that developed an idea for reaching frail older adults who have no way to get to the therapeutic care they need after an injury or operation. With the help of Sheridan College's Centre for Elder Care, the physiotherapist and occupational therapist designed a technology-supported exercise program for physiotherapy so older patients could do their rehabilitation exercises at home. The exercise program is now on sale and Attune is working on ways to train home support workers to deliver better care when they go in to check on patients.

"The opportunity to partner with the Sheridan Centre for Elder Research and NSERC allowed our 'idea' for serving older adults in the community to develop into a new Canadian business," says Anita Salituri, owner of Attune Aging Strategies and Solutions. "The applied research study helped us to better understand the clients we serve, and findings were used to create our first product, which was released to the marketplace in November 2014. Sheridan's expertise, resources and professional consultation throughout this process has been invaluable and they have played a tremendous role in assisting us through our entrepreneurial journey."

The Sheridan Centre for Elder Research has seen tremendous impacts on both students and industry partners during the five year research program. Students from a number of programs have worked as research assistants and volunteers on applied research projects. They consistently cite their real-world experience in applied research as the reason they graduate as highly-competitive job candidates, and often secure high-quality jobs immediately after graduating.

Funding: CCI Innovation Enhancement Fund
Partners: Attune Aging Strategies, Halton Region/Pigeon/Recreational Respite/Posit Science/Retire-at-Home/PointerWare/Acclaim Health/Symetric/Schlegel/Cerebral Vortex

Tracking your Gym Time

Ontario: Algonquin College

Student researchers at Ottawa's Algonquin College have helped advance the next generation of fitness through a Virtual Personal Training app developed in partnership with an Ottawa start-up company, Gymtrack.

10.2

Gymtrack's two young founders approached the Health and Wellness Research Centre at Algonquin College for assistance with the research and development of a novel concept using a combination of hardware and software to track workouts in fitness facilities. The system keeps track of clients' workouts using a bracelet worn by each member and a "smart pin" attached to each piece of exercise equipment.

A research project was established which included two Algonquin students hired to work with the Gymtrack team at a local start-up garage in the summer of 2014. The student designer and programmer helped develop the mobile app for the Gymtrack system, as well as honing the company's corporate image. During this time, Gymtrack was invited into the prestigious 500 Start-ups Accelerator in San Francisco, which included a $100,000 equity contribution. The team took part in a 500 Start-ups demo day in late October and their product received glowing reviews by both Tech Crunch and The Next Web.

Pablo Srugo, Founder & Co-CEO of Gymtrack Inc. says "Assistance from the Health and Wellness Research at Algonquin College helped us leverage the limited resources we had and connected us with top students who were able to help us design and develop our software applications. Not only did we ultimately end up hiring the students on a full-time basis, but their work ultimately helped us land follow-on investments and grow our company to 15 full time staff in six months."

Algonquin's research centre is now assisting with the next stage of the product development in collaboration with the students' association, which operates a large scale fitness facility on campus. This follow-up project will test and assess the first large scale implementation of the Gymtrack system with a cross section of gym users from students trying to stay fit to advanced varsity athletes.

Funding: CCI Innovation Enhancement Grant

Partner: Gymtrack

10.3

Easing Parenthood with an Internet Connection

Ontario: George Brown College

A Toronto business woman, with an idea about connecting new parents with qualified and pre-screened caregivers, wanted to develop an online search system that was seamless and easy to use.

MotherEaze and George Brown College worked together to devise a business plan and a scheduling and payment system for the company website. This project involved extensive background research and analysis of the existing website and documentation of the system and user interface requirements for all desired features.

MotherEaze's intensive candidate screening is what sets the enterprise apart from rival services. The company's qualified caregivers include early childhood education workers, nurses, and professional caregivers, complete with biographies and profiles to help mothers decide which candidate fits their families.

MotherEaze also sought George Brown's assistance to design, develop and integrate an automated scheduling and payment system for the existing website. The system had to allow parents to review biographies and availability of service providers, and book, pay and rate services. It also had to allow service providers to upload bios and availability, view upcoming company meetings, receive payment and confirm bookings, as well as allow administrative oversight of data and

e-commerce and payment integration.

After reaching out to George Brown College to help develop the idea, Mothereaze.com launched early this summer. The company is in the process of streamlining user paths and polishing the interface.

In the meantime, it is putting together a pool of qualified applicants that parents can choose from for help.

Funding: CCI Innovation Enhancement Grant (IE)

Partner: MotherEaze

Atlantic Canada Biorefinery Conference

New Brunswick: Collège communautaire du Nouveau-Brunswick

The Collège communautaire du Nouveau-Brunswick (CCNB) has focused on knowledge transfer and industry support to promote a prosperous bio-economy in Atlantic Canada. In 2010 it obtained an Innovation Enhancement grant that led to the creation of its Biorefinery Technology Scale-up Centre. The centre gives college and university researchers as well as companies the opportunity to test their products and processes at a near-production scale.

The research team working at the Grand Falls campus of CCNB supports industry in its bioproduct promotion efforts. The team uses microbial fermentation, hydrolysis, bioseparation and chemical processes to produce value-added industrial bioproducts such as bioethanol, biogas, biodiesel and alcoholic beverages from forest, agricultural and marine biomasses and industrial and municipal wastes.

In partnership with two not-for-profit organizations - Springboard Atlantic Inc. and BioNB - CCNB has launched the Atlantic Canada Annual Biorefinery Conference. The conference has attracted more than hundred participants each year from private and public sectors. Industry visits, keynote speakers, student poster sessions and business-to-business meetings are crucial components of this event, providing opportunities to develop research collaborations and partnership agreements. Industry

10.4

representatives, students and researchers get the chance to learn about existing or emerging technologies in the bio-processing sector, make new contacts and create new partnerships.

Brennan Sisk (CEO) of Mycodev Group Inc. (Fredericton, NB), a chitosan production company, sees great value in the conference. "The Atlantic Biorefinery conference provides Mycodev, an early stage biotech company, with a doorway to opportunities. Over the past three years, we've met academic and industry experts that have expanded our knowledge and network. As we embark into the market and expand our technology base, we are convinced that the friends made here will pay dividends in Mycodev's success."

Funding: CCI Innovation Enhancement Grant

Partners: Springboard Atlantic Inc. and BioNB

10.5

Working with UNEP on Sustainability and Consumption

Manitoba: Red River College of Applied Arts, Science and Technology

In a globalized and networked society, sometimes it is necessary first to invest in people, relationships and ideas. Such efforts may produce results far out of proportion to the investment.

After several years of support from a number of sources, including an Innovation Enhancement grant, Dr. Peter Denton participated in civil society consultations through the United Nations Environment Programme (UNEP). This enabled him, as well as students and faculty at Red River College, to gain access to global environmental networks and UNEP-related activities.

Denton, who teaches ethics and sustainability at the college, is one of two Major Groups and Stakeholders Regional Representatives for North America to UNEP and is involved in continental and global initiatives on sustainable consumption and production. He was the only official Canadian representative of civil society at the first United Nations Environment Assembly (UNEA) in Nairobi in June 2014. He was subsequently elected Rapporteur for the Global Intergovernmental and Multi-Stakeholder Consultations on GEO 6, UNEP's planetary survey, in Berlin in October 2014.

UNEP participation requires a partnership with an organization that can meet UNEP accreditation requirements, especially sustained international work on environmental projects. Since educational institutions do not qualify, Denton's involvement was made possible by the United Church of Canada, which received full accreditation in May 2014.

Dr. Denton shares information and resources gained from his UNEP work with students and supervises applied research projects in civil engineering technology.

Funding: CCI Innovation Enhancement Grant
Partner: United Nations Environment Programme (UNEP)

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