THE COLLEGE AND COMMUNITY INNOVATION PROGRAM

SMART INVESTMENTS FOR BUSINESS

MARCH 2013

Association of Canadian Community Colleges

The Association of Canadian Community Colleges (ACCC) is the national and international voice of Canada's publicly-funded colleges, institutes and polytechnics (hereinafter referred to as colleges). With campuses in 1,000 urban, rural and remote communities, these institutions educate learners of all ages and from all socio-economic quarters. They partner with small- and medium-sized enterprises (SMEs) to foster innovation and business growth by supplying graduates with advanced skills and providing applied research and development support.

"We appreciate the Government of Canada's recognition of the contribution of colleges and institutes to Canada's innovation eco-system. Stimulating innovation in SMEs will do more than any other measure to improve productivity and create jobs. The impact for the Canadian economy is significant given that 98 % of Canadian companies have less than 100 employees and half of employed people work in these small firms. Colleges and institutes help SMEs innovate by focusing on improvements in technologies, processes, products and services. These improvements are often incremental, that over time, add up to significant changes that improve competitiveness."

– James Knight, President and CEO, ACCC

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The College and Community Innovation Program

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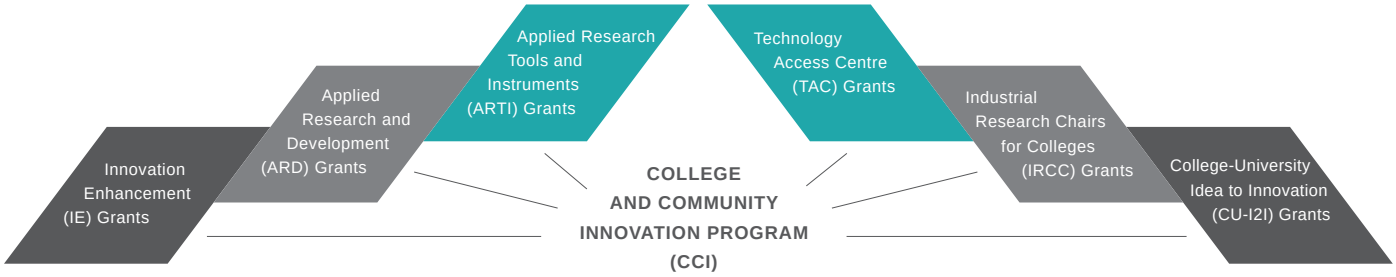
The College and Community Innovation (CCI) Program aims to increase innovation at the community and/or regional level by enabling Canadian colleges to increase their capacity to work with local companies, particularly small and medium-sized enterprises (SMEs). It supports applied research and collaborations that facilitate commercialization, as well as technology transfer, adaptation and adoption of new technologies.

The CCI Program supports six grant types:



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.

We recognize the financial contribution of NSERC for this publication.

Canada | NSERC CRSNG | Social Sciences and Humanities Research Council of Canada | Conseil de recherches en sciences humaines du Canada | CIHR IRSC

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"Collaboration among governments, researchers and the private sector is vital to building an innovative economy. The College and Community Innovation Program supports research partnerships between companies and colleges. The Program illustrates the importance our government places on creating the conditions for innovation and entrepreneurship to thrive in this country."

– The Honourable Gary Goodyear, Minister of State for Science and Technology

Canada's colleges, institutes and polytechnics are mandated to support economic development in their regions.They have long done so through highly skilled, career-ready graduates, community engagement, and applied research partnerships with companies. College campuses are woven into the economic and social fabric of 1,000 communities across Canada. No other institutional infrastructure possesses the breadth and impact of colleges, which are key contributors to Canada's innovation system.

In 2002, the Natural Sciences and Engineering Research Council (NSERC) conducted on-site visits to 19 colleges across Canada. The mission was to understand the nature and scope of applied research that colleges undertake with industry partners. NSERC discovered a wide range of research and innovation activities making a real difference in helping companies solve problems, build prototypes, develop new products and identify market opportunities. To support this work, NSERC collaborated with the Association of Canadian Community Colleges (ACCC) and Canadian Manufacturers and Exporters to design the College and Community Innovation (CCI) Pilot program.

The pilot program was launched in collaboration with five colleges, each with a specific assignment:

- Nova Scotia Community College for research on environmental and geomatic technologies for landscape monitoring, assessment and restoration;
- Niagara College for research on virtual reality technologies in land use decision making;
- Red River College for research on advanced manufacturing practices;
- Olds College for research on agricultural capacity, commercialization and sustainability; and
- British Columbia Institute of Technology for research on green roof technology.

An NSERC mid-term review of the pilot documented benefits for all stakeholders: increased research capacity at the colleges, improved business results for partner companies, bonds between colleges and industry partners, enhanced curricula and professional growth for faculty and employment opportunities for students.

The CCI pilot's success resulted in the federal government announcing a permanent College and Community Innovation Program in 2008. The Program is administered by NSERC in partnership with the Social Sciences and Humanities Research Council (SSHRC) and the Canadian Institutes of Health Research (CIHR). Since 2002, the federal government has awarded $192.3 million for 370 projects at 72 colleges.

The Councils' leadership has contributed to building college applied research capacity to support local businesses. Projects awarded cover the spectrum of natural sciences, engineering, health, social sciences and humanities.

"NSERC is committed to continuing to build its relationship with Canada's colleges. Together, we share a common goal and a common approach – to create value-added research partnerships that benefit both companies and colleges and have a positive impact on the bottom line of our economy. Through the CCI program, we are working with colleges to extend their applied research capacity to enable businesses, especially SMEs, to benefit from access to resources to help them innovate and compete."

– Janet Walden, Acting President, NSERC

CCI grants leverage other college research funding, supported by entities such as the Canada Foundation for Innovation, federal regional development agencies, provincial territorial government agencies, business and community organizations. ACCC provides opportunities for sharing of exemplary practices and building common approaches through symposia, the Presidents' Committee on Science, Technology and Innovation, and the National Research Advisory Committee.

"Today, a new model of integrated innovation has emerged in which understanding people – human thought and behaviour – is increasingly recognized as a critical factor for success. SSHRC, in collaboration with Canada's other federal agencies, supports the very best ideas and talent to ensure that Canada's investments in research and training at post-secondary institutions create value for businesses, governments, institutions and individuals, and contribute to prosperous, just and resilient communities."

– Dr. Chad Gaffield, President, SSHRC

"The future of health care in Canada lies in our ability to innovate. This means that we must think differently, be bold, and engage all partners associated with the health sector. It also means investing in new practices and emerging technologies, such as what the CCI program is enabling. CIHR is proud to support initiatives which help facilitate key collaborations between researchers, patients and partners from the private and charities sector to foster innovations improving the health of Canadians."

– Alain Beaudet, President, CIHR

The benefits of the CCI Program are substantive. For colleges, applied research enhances links to local businesses, bolsters research infrastructure, develops specialized research centres, and enhances curriculum by integrating research results into academic programs. Students gain hands-on experience with industry to conduct research, monitor and adjust work plans, troubleshoot problems, develop products and report results. Companies benefit from access to the expertise and technologies available in colleges and institutes. In 2011-12, 4,586 companies partnered with colleges on applied research projects.

A December 2012 NSERC evaluation of results from the CCI Program Innovation Enhancement grants states that 86% of employers were satisfied with their college partnerships and that 69% are planning future collaborations. The evaluation report highlights how 39% of businesses increased revenues, customers, or employees; and that 69% experienced positive outcomes on at least one element of their R&D capacity, including new or improved products, processes or services, the ability to attract investments, or their ability to make additional research investments.

This publication showcases the impact of the CCI Program on colleges, faculty, students and industry and community partners.

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Natural Resources and Energy

Natural resources – our forests, minerals and metals, and energy – are fundamental to the daily lives of Canadians. How we harness and use these resources has a significant impact on Canada's global competitiveness, the health of our environment and our overall quality of life. The natural resources sectors and earth sciences industries have been an engine of economic growth and job creation for generations. In 2010, the sectors generated 11.5%, or $142.5 billion, of Canada's gross domestic product and directly employed close to 763,000 people. (Natural Resources Canada)

Canadian communities depend on the natural resources sector for their livelihoods. In no other sector does the concept of sustainable development mean more or hold as much promise for long-term success. Natural Resources Canada recognizes that sustainable development is an opportunity to harness our knowledge and innovation to achieve societal goals as well as economic stability. The college applied research projects described in this section demonstrate how colleges contribute to the sustainable development of this key sector of the Canadian economy.

GEORGIAN COLLEGE

Pursuing Clean Energy through a Solar Powered Attic Vent

ONTARIO: GEORGIAN COLLEGE

In the pursuit of clean energy, Georgian College received a two-year **Innovation Enhancement grant** to build its capacity in solar technologies. It has been working towards this goal with industry partner, Green Leaf Distribution.

Air ventilation plays a critical role in home cooling. In attics, this is usually done via passive, turbine and powered vents. Passive vents rely on convective air movement caused by temperate differences within the attic space. Though turbine- and electric-powered vents are efficient at moving large amounts of air, they need at least one electrical connection in the attic to supply power. The Solar Powered Attic Vent leaps this hurdle by providing improved attic ventilation using solar energy to power the fan.

Kristine Black, Student Researcher, Ron Sky, Faculty and Principal Investigator, Adam Baillie, Student Researcher

Student researchers designed experiments and conducted the necessary research to collect baseline data. They conducted experiments on various vent designs, including field-testing with vents installed in a 1,300 square-foot house. Their objective was to determine if a solar powered vent keeps an attic cooler, thus reducing air conditioning use during peak electrical periods.

Four students worked for three months on the project, with leadership and direction from the research partner and faculty lead. Data from this project will be used by Green Leaf Distribution to produce an even more efficient and effective product.

"Working in partnership with Georgian College's Centre for Applied Research and Innovation has been extremely beneficial for our business development and marketing strategies. The students conducted testing on the Solar Powered Attic Vent and provided Green Leaf Distribution with a final comprehensive report including ideas for product innovation and growth. This cross-curricular participation with the students was both positive and inspiring. Green Leaf Distribution is truly grateful for this incredible collaboration and has already made plans to work with the college on future initiatives."

– Abby Stec, Managing Director, Green Leaf Distribution

Shining Light on Nova Scotia's Solar Energy Sector

NOVA SCOTIA: NOVA SCOTIA COMMUNITY COLLEGE

Nova Scotia Community College (NSCC) recently completed a two-year study into improving the performance of Maritime solar thermal and solar photovoltaic systems. Low-cost monitoring systems helped quantify the performance of solar energy for heating or electrical use in homes and businesses.

Dr. Alain Joseph, NSCC's Research Scientist, Energy Sustainability, working in a "Solar Classroom" he designed and built

Instrumental were the **Innovation Enhancement and Applied Research Tools and Instruments grants**, which provided funding for the college to partner with local solar energy companies. The CCI program has left a legacy in the form of an outdoor laboratory linked to the NSCC Applied Energy Research Lab.

This "outdoor lab" at NSCC's Waterfront Campus allows students, faculty and researchers to demonstrate, test and improve solar technologies. Simultaneously, they can monitor environmental factors, such as incoming solar energy. Data generated here is shared with community and industry partners for a wide range of applications. Municipal and provincial governments can use high-quality solar radiation data to form solar energy policies. This solar energy program also supports ongoing efforts such as the Halifax Regional Municipality "Solar City" project and Nova Scotia's Community Feed-in-Tariff program.

The outdoor solar lab has been made possible through partnership with several companies: EnCom Alternative Energy Ltd., Green Power Labs Inc., Thermo Dynamics Ltd, and Sage Energy Inc. Together, these industry partners and NSCC are collaborating to solve solar R&D challenges ranging from resource assessment to innovative monitoring technologies.

The research will help drive the region toward sustainable energy practices, with innovative industries benefitting from a skilled workforce.

"We are pleased to support the future of the renewable energy field in Nova Scotia by collaborating with current and future students of the NSCC by donating an evacuated tube solar thermal system for research and teaching."

– Aileen Nasager, EnCom Alternative Energy Ltd.

Would you like algae with your biogas?

NEW BRUNSWICK: COLLÈGE COMMUNAUTAIRE DU NOUVEAU-BRUNSWICK

The Collège communautaire du Nouveau-Brunswick established the Biorefinery Technology Scale-up Centre (BTSC) upon receiving an **Innovation Enhancement grant** in 2010. This paved the way for college researchers to become involved in more than forty industry-oriented projects.

CCNB's Kevin Shiell with the pre-commercial scale algae photo reactor

One current project sees the BTSC partner with local engineering companies Complete Senergy Systems and Solutions4CO2. It began with testing a CO2 infusion system prototype that purified biogas by solubilizing CO2 and H2S in water for a "cleaner" CH4 used in electricity.

The design was then tweaked and optimized and soon the Biogas Purifier and Infusion System were born. Solutions4CO2 has since launched a biogas refinery that integrates an Anaerobic Digester that produces biogas with the newly developed Biogas Purifier and Infusion System, an Algae Cultivation System that uses CO2 and H2S in the production of high-value algae biomass, as well as a Harvesting and Dewatering System.

This is an important advancement in the environmental science and technology sector. Solutions4CO2 says, "Integrated Biogas Refinery™ is a game changing solution for the multiplication of anaerobic digester projects in North America, reducing the payback period from over seven years to less than three." The industry-college collaboration continues with the first commercial demonstration of an algae cultivation system that uses CO2 removed from biogas.

Developing an Industrial Hub in the Commercial Exploitation of Seaweed

QUEBEC: CÉGEP DE LA GASPÉSIE ET DES ÎLES – CENTRE D'INNOVATION DE L'AQUACULTURE ET DES PÊCHES DU QUÉBEC (MERINOV)

The commercial exploitation of seaweed is an enormous and expanding market that sustains large industries primarily concentrated in Asia and Europe. Canada has the potential to develop an industrial hub in this field due to relatively unpolluted coastal waters and abundant natural seaweed resources. Macro algae growing in Quebec's maritime regions is a natural resource with strong commercial potential, particularly since they are used in the manufacturing of a wide range of products such as fertilizers, foods, cosmetics and pharmaceuticals. Fast-growing cold-water seaweeds also lend themselves well to culture activities on marine farms and could be an interesting opportunity for diversification for shellfish producers. Despite the emergence of the seaweed harvesting and processing industry, composed of some twenty SMEs, applied research in the field is not sufficiently developed and entrepreneurs lack documentation and technical support.

The creation of an Industrial Research Chair addresses these needs and, in 2012, with the support of five industrial partners (Biotaag International, InnoVactiv, Algoa, Organic Ocean and Fermes Marines du Québec), the Cégep de la Gaspésie et des Îles obtained the **NSERC Industrial Research Chair for Colleges** in the Conversion of Marine Macroalgae. The Chair, Dr. Éric Tamigneaux, formed a small working group in collaboration with the Centre d'innovation de l'aquaculture et des pêches du Québec, the College Centre for the Transfer of Technology (CCTT) affiliated with the cégep.

The main objectives of the Chair are to stimulate and coordinate applied research projects on macroalgae, to provide scientific and technical support to industry, and to offer training to companies and students. The research comprises three components: fisheries and natural resources, mariculture and algae biomass conversion. The projects proposed under each of these themes will be adapted to the needs of industry to enable entrepreneurs and users of the research findings to stimulate the local and regional economy.

Dr. Éric Tamigneaux, Industrial Research Chair for Colleges in the Conversion of Marine Macroalgae, Cégep de la Gaspésie et des Îles

Algoa is a small business and an excellent example of the value of this research. Located in Forestville, Algoa employs nine people who harvest and process 20 tonnes of seaweed annually. Most of Algoa's volume is used in the manufacture of fertilizers, "but that's not where the added value is," explains President Dany Sénéchal. Small quantities are sold to the cosmetics industry and Algoa is developing products for the food sector, with a line of teas and herbal teas. The company is counting on the Chair's work to determine the properties of his seaweeds, so that it will have verifiable information, and can say that he has a "unique seaweed."

FANSHAWE COLLEGE

Using Technology to Bolster R&D in Southern Ontario

ONTARIO: FANSHAWE COLLEGE

Fanshawe College has acquired equipment that is building research capacity and helping serve SMEs in the renewable energy, environmental, building and electronics manufacturing sectors. Thanks to an **Applied Research Tools & Instruments (ARTI) grant**, Fanshawe has acquired a 3-D scanner, electromagnetic compatibility (EMC) equipment, an infrared camera, noise and vibration measurement equipment, and a cutting-edge atonometrics solar simulator. The custom-built simulator is the first of its kind in Canada. It can emit continuous light rather than the intermittent light bursts from solar simulators that are currently used.

The ARTI-funded equipment led to four new business clients for the college, as well as interest from four additional companies. Sound equipment was used to test products for Centennial Windows and Advanced Converting Technologies Inc. (ACTI). EMC equipment was used in a Magna Power Train project and with OES Technologies (electronic control products). The infrared camera helped with product quality control testing for a second Centennial Windows project. Elsewhere, three companies are in talks about using the simulator for solar cell projects, while one local manufacturer aims to collaborate with Fanshawe to benefit from use of the 3-D scanner.

Fanshawe's Atonometrics Solar Simulator

Six Fanshawe students were involved in these projects, and the partnerships created have led to three new design/development projects with Centennial and ACTI, which will benefit an additional thirty students.

Research by the Ocean that Re-invigorates a Community

NEWFOUNDLAND AND LABRADOR: COLLEGE OF THE NORTH ATLANTIC

Wave Pump Application, Development and Optimization

The growth of Canada's aquaculture industry is marked by many challenges. Shore-based aquaculture is seen as the next phase of development and one of its major obstacles is the cost of energy to pump seawater onto land.

The college's goal is to design a device to extract energy from ocean waves in order to pump the water. The team is developing an Integrated Multi-Trophic Aquaculture system, which uses bio-filtering before returning the water to the ocean. The aquaculture facility will use ecologically sound and sustainable production methods to minimize its ecological impact.

The team is also developing a fully instrumented test site for performance evaluation of devices or systems exposed to severe marine environments. This has had a positive impact on the small community of Lord's Cove on the Burin peninsula. Researchers have converted a closed fish plant into a test site, providing a boost to this coastal community.

Students from multiple disciplines at the College of the North Atlantic are tasked with solving real world problems through practical assignments. This is year two of a five-year project funded through an **Innovation Enhancement grant**, the Research and Development Corporation of Newfoundland and Labrador, and the Government of Newfoundland and Labrador Department of Innovation, Business and Rural Development.

Establishing a Groundbreaking Facility to Develop Renewable Energy

ALBERTA: LAKELAND COLLEGE

Lakeland College is home to the Renewable Energy Learning Centre, an impressive integrated geothermal testing facility with a most innovative feature existing underground.

The six-well geothermal field includes variations in well diameter, grouting material, piping configuration and pipe materials. The wells are linked either to an electric or gas absorption heat pump and integrated with the solar thermal collectors that permit the geothermal field to store thermal energy. Heat can be delivered to heat distribution systems, both hydronic and forced air. The new Centre also incorporates over 13kW of electricity generation (micro wind, fixed and tracking solar arrays).

"We have four methods to heat the building. Our software and visualization tools allow us to use various combinations of systems to determine the best ways to integrate and manage these technologies cost effectively. Ultimately, we're helping our partners refine their products and determine the best ways to install these technologies while showing customers they got what they paid for."

– Rob Baron, Lead Researcher, Lakeland College

The Renewable Energy Learning Centre was developed in partnership with regional renewable energy industry partners and supported by an **Innovation Enhancement grant**.

"Lakeland's geothermal reference field is groundbreaking for the geothermal industry in Canada. The embedded sensor system and flexibility to isolate boreholes is going to provide incredibly valuable information to advance borehole performance."

– Dean Turgeon, President and CEO, Vital Engineering and Past President, Alberta Geothermal Energy Association

Protecting and Controlling a Power Grid

ONTARIO: MOHAWK COLLEGE

Ontario is currently modernizing 80% of its energy infrastructure, much of which is 50 to 100 years old. This indicates a critical need – understood by utilities and governments – to invest in advanced energy grid technologies that lead to new energy policies. To start, intelligent infrastructure capable of energy management and self-healing, in addition to "smart meters" for customers will contribute to reducing greenhouse gas emissions. Mohawk's research, funded through an **Innovation Enhancement grant**, is focused on helping utilities achieve this. Mohawk will help utilities adopt new protection and control technologies, such as digital relays, intelligent electronic devices and communication protocols, as well as help them devise a comprehensive and implementable power protection and control system model.

The research model yields very detailed data that illustrate how power utilities and vendors can optimize their systems to meet new challenges associated with green energy technology, as well as additional load-requirements from electric vehicles and smart appliances.

Mohawk has partnered with Hydro One Networks and local utilities distribution companies, and equipment manufacturers General Electric, Schweitzer Engineering Laboratory and Siemens.

"We believe that the research activities under this program will effectively support the evolution of intelligent grids through integration and management of emerging technologies for Ontario's electrical power distribution system. Hydro One will benefit from advanced technology assessment and testing of micro grid components for integration, monitoring, protection and control of micro grids including mitigation of power quality impacts created by loads and renewable generation sources. This initiative also provides colleges the opportunity to gain valuable experience and expertise in support of power distribution management systems as well as preparing them to potentially assume active roles as future Hydro One employees."

– Ravi Seethapathy, Manager System Innovation and Advanced Grid Development, Hydro One Networks Inc.

"To improve the system, we require research results that are tested thoroughly and ready for implementation. Mohawk College has both the tools and expertise in energy engineering to ensure that this happens."

– Kathy Lerette, Vice President, Utilities Operation, Horizon Utilities Corporation

Charting the Course of Mining on Canada's Eastern Edge

NEWFOUNDLAND AND LABRADOR: COLLEGE OF THE NORTH ATLANTIC

Dr. Gary Thompson, Industrial Research Chair for Colleges in Applied Mineralogy, College of the North Atlantic

An industry experiencing significant growth in Canada is the mining sector of Newfoundland and Labrador. While its projects are the source of major investment, exploration activities continue to evaluate new areas for their mineral-rich potential.

The **NSERC Industrial Research Chair for Colleges** in Applied Mineralogy at College of the North Atlantic is using research and development in mining sciences to support this phenomenal growth. The Chair, Dr. Gary Thompson, works closely with mining giant, Vale Newfoundland and Labrador (Vale NL), and its team of experts, as well as with provincial research units.

The Chair is engaged in multi-stream research activities targeting new process development and technology innovations in applied mineralogy. These are focused on overcoming the challenges encountered by Vale NL. The research links the geology and characterization of the deposits directly with ore recovery processes.

"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. We are pleased to match the CCI program funding as a combination of in-kind and cash support, to enable Dr. Gary Thompson to carry out research independently and with his students. 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."

– Scott Mooney, General Manager of Exploration, Vale

Meeting the Needs of Remote Areas in Energy Efficiency

QUEBEC: CÉGEP DE JONQUIÈRE

Over the last four years, a team from the Cégep de Jonquière has worked to develop a market for its Technologies des énergies renouvelables et du rendement énergétique (TERRE) program. The program's field and classroom results have played a pivotal role in the college receiving the **NSERC Industrial Research Chair for Colleges grant** in the emerging field of renewable energy and energy efficiency. Martin Bourbonnais is the Industrial Research Chair in Sustainable Energy Technology and Energy Efficiency (TERRE).

Mr. Bourbonnais will focus on developing an integrated supply management concept to meet the needs of remote areas, specifically in terms of electricity, heat, food and transportation. Energy efficiency and intelligent network management are central to this multi-faceted production approach. The coupling of wind, tidal, solar and biomass energy with control and storage devices will permit remote communities and sites without ready access to major electrical grids to produce renewable energy with local resources, which reduces their dependency on diesel and reduces greenhouse gas emissions. The extreme operating conditions associated with northern environments and the need to use materials and processes conducive to the environment are just some of the challenges that face the Chair.

The Chair research program is conducted with several industry partners specializing in engineering, automation, production, operation and the environment. It will increase the level of cutting-edge expertise and create economic opportunities for Canada in an innovative sector. Technology transfer activities provide an opportunity for companies to gain skilled professionals by enhancing the knowledge of new technicians.

Martin Bourbonnais, Industrial Research Chair in Sustainable Energy Technology and Energy Efficiency, Cégep de Jonquière

Meeting basic energy needs is a challenge faced by 200,000 Canadians in isolated communities, telecommunications sites, outfitting lodges, insular areas and industrial sites such as mines, across the country. Mr. Bourbonnais and partners aim to tackle the problem by developing solutions driven by various criteria, including reliable multi-source energy production; robust infrastructure; flexible design and operation; properly recognized and fully valued local populations and conditions; and sustainable energy pairings or combinations that meet the heating electricity, transportation and food-supply needs of these isolated communities.

Solutions for Sustainable Oil Sands

ALBERTA: NORTHERN ALBERTA INSTITUTE OF TECHNOLOGY

NAIT's Ledcor Group Applied Research Chair in Oil Sands Environmental Sustainability, Dr. Haneef Mian, understands the complexity of balancing Alberta's oil sands development with the need to safeguard the environment. Dr. Mian calls upon his experience in the environmental consulting industry and as a member of Alberta's energy regulator, the Energy Resources Conservation Board, to advance research innovation.

Working through NAIT's Centre for Green Chemistry and Engineering, the Chair is collaborating with companies to improve a major environmental and public relations issue facing the industry: tailings management. Supported by an **Innovation Enhancement grant**, and a grant from the Canada Foundation for Innovation (CFI) for infrastructure, the research lab is ideally positioned to make a positive impact.

The Centre offers product concept validation, prototype development, testing and measurement, demonstration projects, and more. Its researchers develop and manage projects that help move innovation to market more efficiently than facilities that focus more on fundamental research.

"We are going to help show the world that Alberta is an energy technology champion and a responsible global environmental citizen. People say there are a lot of environmental issues associated with oil sands, but my answer to that is: that's what engineering and science is for. To find solutions."

– Dr. Haneef Mian, Ledcor Group Applied Research Chair in Oil Sands Environmental Sustainability, NAIT

Ensuring Salmon Farms are Environmentally Friendly

BRITISH COLUMBIA: NORTH ISLAND COLLEGE

Northern Vancouver Island is now the main salmon farming region in British Columbia. Strengthening the sustainability and vitality of this industry offers direct and tangible benefits for communities across the region. As the industry develops, it is critical to understand the environmental impact of farm sites.

Both the B.C. Salmon Farmers Association and the Department of Fisheries and Oceans identified a need to strengthen monitoring of hard bed substrates – the site of many current and future fish farms. To this end, an **Innovation Enhancement grant** awarded to North Island College is funding research into two fundamental issues: What are the significant ecological changes likely to occur at hard bottom sites associated with salmon farm operations? What are the physical, biological and/or chemical habitat indicators, and their thresholds where significant negative macro-benthic changes occur?

These investigations will provide a solid foundation for future industry growth in hard bottom areas. Research results will also contribute to a broader, more thoughtful dialogue about the impacts of the industry. Industry partners include BC Salmon Farmers Association, Marine Harvest Canada Inc., and Mainstream Canada.

"We at Mainstream Canada anticipate that the IE grant will advance our knowledge base and provide additional capacity to turn our research program results into commercial success."

– Dr. Peter McKenzie, DVM, BSc, Veterinarian and Fish Health Manager, Mainstream Canada

Nature Friendly Nature Safe: Powered by Olds Biodiesel

ALBERTA: OLDS COLLEGE

Olds College is the recipient of an **Innovation Enhancement grant** in biodiesel production, alternative feedstocks, and commercialization. Three specific objectives of the IE-funded project are to:

- Increase the college's biodiesel production capacity from 45,000 to 200,000 litres per year;
- Conduct collaborative agronomic and processing trials of alternative non-edible feedstock to reduce feedstock costs due to increased demand for oils; and
- Optimize small-scale biodiesel solutions through optimization of industry partners' biodiesel equipment, processing, quality assurance, by-products and safety.

Research was conducted on oilseeds with little or no market value, such as heated or frost damaged canola seed, as well as non-edible oilseeds and weeds such as stinkweed (Pennycress) that could be grown in Alberta at a low production cost.

The Olds College Bio-diesel project has generated successful results, including an increased participation of faculty and students in applied research; the establishment of over 20 new industry and community partners; and the production of biodiesel used by partners for quality testing, process improvements, and operational trial purposes. The college provides blends of biodiesel for use in partner's vehicles. Twelve individuals, three companies and two municipalities (Town of Olds and the Mountain View County) participate in the biodiesel adoption and use program.

"I feel I am making a choice to support sustainable change by using alternative fuel. It has been great; I have had no problem with fuel compatibility or performance in my diesel VW Jetta."

– Carien Vandenberg, community partner and user of Olds College Biodiesel

Making Wood Panel Production Eco-Friendly

QUEBEC: CÉGEP DE RIMOUSKI – SERVICE DE RECHERCHE ET D'EXPERTISE EN TRANSFORMATION DES PRODUITS FORESTIERS (SEREX)

Phenol-formaldehyde (PF) resin is an adhesive petrochemical critical to the production of high quality, water-resistant wood panels. The resin includes phenol, a petrochemical ingredient used in production. Rising oil prices, a reduced desire for fossil fuels, and the call for more eco-friendly products have meant that renewable raw resources must be considered in the production of these wood panels.

SEREX, an affiliate of the Cégep de Rimouski, is working with Uniboard Canada Inc. (Sayabec), a mass producer of particleboards, to replace phenol with pyrolysis oils.

SEREX has built a small-scale pyrolysis unit and is analysing its reaction products, including bio-oils. The process allows researchers to evaluate and optimize products drawn from biomass, and study how operating conditions affect the bio-oil quality. The next stage is to replace up to 75% of phenol with bio-oils during PF resin synthesis.

The new bio-oil-PF resin performs to an even higher standard than unmodified PF, and it reduces the cost of wood-panel production.

In this project, college and university students played a direct role, gaining technical skills in synthesizing phenolic resins and analysing bio-products from pyrolysis. It was supported by an **Applied Research and Development grant** and an **Innovation Enhancement grant** for applied research into eco-construction and bio-products.

The Mining and Plastics Sectors Go State-of-the-Art

QUEBEC: CÉGEP DE THETFORD – CENTRE DE TECHNOLOGIE MINÉRALE ET DE PLASTURGIE (CTMP)

An **Applied Research Tools and Instruments grant** allowed the Centre de technologie minérale et de plasturgie (CTMP) to acquire a portable X-ray fluorescence (XRF) analyser, a portable X-ray diffraction (XRD) analyser, and permeation-testing instrument for oxygen and water vapour.
This is advanced technical equipment for the mining and plastics sectors.

Mining companies use the XRF and XRD to measure the chemical composition of minerals under consideration. To date, the units have served as part of a pre-feasibility study for the extraction of the major Dumont nickel deposit controlled by Canadian mining company Royal Nickel Corporation.

The permeation-testing instrument serves the plastics processing sector and has been used in a bio-plastics project to measure the oxygen and water-vapour permeability of lactic-acid polymer films or membranes. It has also been a key part of a large-scale project conducted on behalf of Quebec's ministère des Ressources naturelles et de la Faune du Québec – building special storage containers for forest-seed reserves.

First-ever Major Mining Research Launches in Yukon

YUKON: YUKON COLLEGE

Yukon College's Research Centre has welcomed its **NSERC Industrial Research Chair for Colleges** in Mining Life Cycle, Dr. Amelie Janin, brings expertise in metals chemistry and environmental remediation and a PhD in Water Science.

Dr. Amelie Janin, Industrial Research Chair for Colleges in Mining Life Cycle, Yukon College

Dr. Janin will work with the Yukon mining industry to develop an applied research program focused on reclamation activities. The program will investigate how to apply innovative water and soil treatment technologies to its northern latitude.

The overall aim is to help address northern-specific challenges and opportunities within the mining industry. It will flow in two streams of applied research: mine-influenced water management and treatment; and terrestrial reclamation-practices. The former focuses on treating discharge water processing while the latter takes aim at soils reclamation and land re-vegetation.

Alexco Resource, Capstone Mining, Yukon Zinc, and Victoria Gold corporations are on board with an initial two-year commitment to match CCI program funding. The four companies partnered with the college to apply for CCI funding, and created the Yukon Mining Research Consortium to support the Chair.

"The Yukon Mining Research Consortium is very proud to support the first Industrial Research Chair ever awarded to Yukon College. We are excited to partner with Dr. Janin and the Yukon Research Centre in looking at new applied northern technologies for this important work."

– David Petkovich, Alexco Resource Corp. on behalf of the Consortium partners

"The Yukon Government is pleased to support the Yukon Research Centre and Yukon College because we believe that Yukon is uniquely positioned to research and develop northern technologies to improve the mining industry. Dr. Janin's work will improve our local scientific knowledge and capacity within the mining industry, which will strengthen our economy and our stewardship of the environment."

– Currie Dixon, Economic Development Minister, Yukon

Green Fuel… From Algae!

QUEBEC: CÉGEP DE SHERBROOKE

BIOCARDEL QUÉBEC INC. specializes in the production of biodiesel from vegetable oils and animal fats. In order to reduce its production costs, BIOCARDEL is looking into producing oil from microalgae. While microalgae culture conditions are optimized in labs at the University of Sherbrooke, the company is working with faculty and students at the Cégep de Sherbrooke to develop an industrial tracking system for oil synthesis in microalgae. With support from an **Applied Research Development grant**, research has resulted in the development of a way to detect oil accumulated in microalgae during growth and the best extraction and dosage methods of microalgae oils. These protocols will be used to compare the efficiency of oil production by different species of microalgae based on their growth conditions.

"Thanks to our partnership with the Lab Technology (biotechnologies) program's research group from Cégep de Sherbrooke, we were able to develop a fast and efficient approach to quantifying triglycerides. This relationship is key towards optimizing our production and, most importantly, turning the process into a profitable venture."

– René Delarue, CEO, BIOCARDEL QUÉBEC Inc.

For Peat's Sake

ALBERTA: NORTHERN ALBERTA INSTITUTE OF TECHNOLOGY

To continue their expansion, oil and gas companies in Alberta must obtain reclamation certificates on well sites that are no longer producing. The NAIT Boreal Research Institute (BRI) is developing cost-effective ways to restore ecological function of abandoned well sites within the surrounding peat land – including reintroducing mosses and water flow.

NAIT's **NSERC Industrial Research Chair for Colleges** in Peatland Restoration, Dr. Bin Xu, will provide companies and reclamation contractors with practical information on restoration planning, civil earth works, deployment of peat land plants, hydrology and economics – guidelines the Government of Alberta is depending on NAIT's BRI to produce.

Dr. Bin Xu, Industrial Research Chair for Colleges in Peatland Restoration, NAIT

Dr. Xu will contribute to the development of curriculum, including faculty-supported case studies and student mentoring through field research camps and employment of summer research assistants. This would not be possible without NAIT's partners, the University of Laval, the Government of Alberta, and companies such as Northsite Contractors and Shell Canada Limited, in addition to the support from the CCI program.

"Our priority is to integrate the new era of reclamation and restoration standards into our operations and be leaders in environmental sustainability. With NAIT's focus on achieving practical results, I believe our investment in BRI will go a long way to achieving this."

– Margaret Marra, Senior Environmental Planner, Shell Canada

Innovation in Bio-industrial Technologies

QUEBEC: COLLÈGE DE MAISONNEUVE AFFILIATED WITH CEPROCQ – CENTRE D'ÉTUDES DES PROCÉDÉS CHIMIQUES DU QUÉBEC

Dr. Yacine Boumghar, Applied Research Chair in Bio-industrial Technologies

Dr. Yacine Boumghar, the new **NSERC Industrial Research Chair for Colleges** focusing on bio-industrial technologies at Collège de Maisonneuve, centre d'études des procédés chimiques du Québec (CÉPROCQ), and its affiliated CCTT. Dr. Boumghar will develop links between government and industry to pool efforts and coordinate innovative solutions, while breaking down barriers between the forestry and agro-forestry sectors to promote technology solutions.

The emerging bio-economy provides promising new opportunities for development of bio-products from forestry and agricultural biomass. While significant progress has been made in advancing knowledge in the conversion of forestry residues, developments in the agro-forestry sector require additional research. A better understanding of the chemical composition of various types of forestry biomass and the availability of reliable production technologies with low environmental impact will fuel business innovation. Dr. Boumghar's expertise in extraction and separation bioprocesses and the scale-up of pilot-projects will lead to the commercial scale-up of agro-forestry extraction processes.

Northern Biochar for Northern Restoration

YUKON: YUKON COLLEGE

With the expansion of industrial activities in Canada's North there is a need for appropriate cost-effective remediation and restoration technologies. Yukon College has a CCI program funded, **College-University Idea to Innovation grant**, Northern Biochar for Northern Restoration, which is working with local industry to develop biochar for promotion of hydrocarbon degradation in northern contaminated soils. This project is a collaboration between Yukon College, the University of Saskatchewan and three industrial partners in northern Canada: Nunatta Environmental, Federated Coop Limited (FCL) and Zakus Farms.

Photo credit: zakusfarms.ca

Nunatta Environmental and FCL are interested in the production and/or development of biochar for their hydrocarbon restoration needs, while Zakus Farms is an expanding biochar producer in Whitehorse, YT. Biochar is a term for a product that results from heating various biological ingredients, such as wood, fish or animal bone under oxygen limited conditions. In southern climates biochar has proven to have many benefits for the environment, including increased soil pH, water holding capacity, and plant growth, as well as promoting hydrocarbon degradation at contaminated sites.

Identification of the optimum biochar formulation for hydrocarbon degradation in the North will not only improve the likelihood for effective treatments, but will also provide economic benefit. Reduced logistics and shipping costs for companies operating in the North and income generation opportunities for northern biochar producers are two important impacts of the project. College and university students are gaining valuable northern research experience, while making important connections with local industry and gaining important skills for employment.

Health and Life Sciences

The health and wellness area crosses many economic sectors from manufacturing to information technology. Industry Canada defines the health and social assistance sector as comprising "establishments primarily engaged in providing health care by diagnosis and treatment, providing residential care for medical and social reasons, and providing social assistance, such as counselling, welfare, child protection, community housing and food services, vocational rehabilitation and child care, to those requiring such assistance." However, the value chain of this sector is much broader. E-health innovations, for example, have the potential to change dramatically the way health care is delivered in Canada.

Canada's colleges are engaged in the health and life sciences sectors through partnerships and projects in technology, bio-technology, or information and communications technology, and through their applications across the health delivery spectrum. Projects in this sector particularly benefit from the CCI program's ability to fund across research domains.

CENTENNIAL COLLEGE

Improving Paramedic Response Time

ONTARIO: CENTENNIAL COLLEGE

In this project, Centennial College came together with an industry partner to usher in important changes for Ontario's paramedics.

Interdev Technologies Inc. is a leading developer of solutions for emergency medical services. One such solution is iMedic ePCR, a dispatch interface for computer tablets used by paramedics. Using GPS positioning, the technology sends the address for an emergency call to the tablets far more rapidly than current standards.

This software advantage has reduced emergency responders' travel and response times, improving data entry accuracy, and ultimately translating into faster and better patient care.

With funding from an **Innovation Enhancement grant**, Centennial College and Interdev have tested an improved iMedic ePCR prototype. The company has secured contracts to implement the system across Ontario. To help bring the technology to the field, the company hired one of the students who had been in Centennial's Computer Programmer Analyst program.

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

– Terence Kuehn, CEO, Interdev Technologies

A New Level of Research Management Forged by a Scientific Director

QUEBEC: CÉGEP DE LÉVIS-LAUZON – CENTRE DE RECHERCHE ET DE TRANSFERT EN BIOTECHNOLOGIES (TRANSBIOTECH)

TransBIOTech, the CCTT affiliated with Cégep de Lévis-Lauzon, has seen a significant expansion of its research activities since launching in 1998. The **Technology Access Centre grant** enabled the centre to enhance capacity by recruiting a scientific director responsible for research management. With the creation of this position, research projects and analytical services will be coordinated centrally, enabling TransBIOTech to contend with increasing and more-complex requests from industry.

Yvan Boutin, Scientific Director, TransBIOTech

The director will play a pivotal role in the development strategy designed for specific sectors. Centralizing the management of scientific projects in the director's office will improve operating efficiency and increase the level of expertise throughout the organization.

Dr. Yvan Boutin is the new Scientific Director. He has been a researcher with TransBIOTech since its establishment. He is well recognized for his work in immunology in the college and university research sectors. Dr. Boutin has conducted more than 100 projects in partnership with public and private partners and has a proven track record in the management of scientific teams. He also belongs to a strategic network of university researchers where he can share his expertise and experience in CEGEP-based research.

Connecting Independent Seniors with Family

ONTARIO: GEORGE BROWN COLLEGE

Many seniors wish to remain at home with help from caregivers and family members. GoodRobot, a Toronto-based SME, joined forces with George Brown to refine its InHome monitoring system, which addresses this issue.

The InHome system allows elderly people to live an active and independent lifestyle in their own homes, while staying connected to family and caregivers. It incorporates monitoring technology and sensors throughout the home to measure an individual's activities and remotely communicate this information.

"The trick is keeping things simple. Technology that's complicated to use just wouldn't be effective."

– Alan Majer, CEO, GoodRobot

The research is funded by an **Innovation Enhancement grant** for George Brown's Research Lab in Health and Health Promotion. Professors from the Centre for Construction and Engineering Technologies and the School of Nursing are developing and assessing this home-based monitoring system. The project has united students from Health Sciences, Information Technology and Marketing as they work together to bring GoodRobot's system to commercialization.

As a result, GoodRobot is launching a 20-home trial in Toronto to provide important real-world data for assessing the value and market potential of its monitoring system.

GoodRobot seeks to compassionately address a problem that most Canadians will eventually encounter: caring for an elderly family member, or trying to maintain their own independence into the twilight years.

Enhancing Seniors' Care

ONTARIO: CONESTOGA COLLEGE INSTITUTE OF TECHNOLOGY & ADVANCED LEARNING

Demographic patterns, changing consumer needs and a desire for increasing quality and cost-effectiveness of health care services underpin an urgent need for innovation in post-secondary education and services for seniors. To that end, Conestoga College was awarded an **Innovation Enhancement grant** and a grant for a **CIHR/Schlegel Industrial Research Chair for Colleges**.

Dr. Veronique Boscart, CIHR/Schlegel Industrial Research Chair for Colleges in Seniors' Care, works with Conestoga's School of Health and Life Sciences and Community Services, in partnership with Schlegel Villages, home to 2,500 seniors.

Dr. Boscart engages faculty and staff to evaluate and change curriculum and student experiences to improve graduates' knowledge, skills and attitudes on a number of fronts in seniors' care. Students enhance processes and practices in long-term care settings to identify and narrow knowledge-to-practice gaps. They conduct applied research studies to identify practices to improve quality of care. At the same time, faculty and professionals lead development projects to improve care and services. These initiatives are supported by a new virtual Centre for Advancing Seniors Care.

Dr. Veronique Boscart, CIHR/Schlegel Industrial Research Chair for Colleges in Seniors' Care, Conestoga College

The results of this work will be valuable to colleges and universities that educate health and community service professionals, long-term care providers themselves, and policy makers as they develop strategies to improve care and services for seniors.

Producing 'Microbubbles' to Help Fight Cancer

ONTARIO: LA CITÉ COLLÉGIALE

La Cité collégiale is partnering with local industry in the fight against breast and prostate cancers.

With Artenga Inc. and support from an **Innovation Enhancement grant**, the College's Centre for Applied Research in By-products designed microbubble structure-stabilization and dimension-control conditions using macromolecular materials. The goal: medications for breast and prostate cancers.

The microbubbles serve as therapeutic agents and transport vectors for drugs designed to target cancerous cells. The bubbles have already shown their effectiveness during tests conducted by the National Research Council of Canada's research team, a partner on the project.

Thanks to this high-level research, three students in the biotechnology bachelor's program acquired new knowledge and mastered new skills – such as using the Coulter Counter and the microbubble generator developed by Artenga Inc.

"The College team has acquired and developed expertise with an advanced characterization system that provides much greater insight into our product variants. This has allowed us to optimize our technology, demonstrate the benefits, and advance us towards commercialization."

– James Keenan, President, Artenga Inc.

Hazelwood…Can it Help Fight Inflammation?

QUEBEC: CÉGEP DE LÉVIS-LAUZON - TRANSBIOTECH

Pur Noisetier, a company located in Sherbrooke, Quebec, markets hazelwood-based natural health products that help relieve pain caused by inflammation. The company has partnered with TransBIOTech to examine the properties and bioactivity of hazelwood. Initial trials have shown that hazelwood extracts developed for Pur Noisetier contained very high levels of polyphenols and had antioxidant, antibacterial and, potentially, anti-inflammatory properties.

Mireille Pilote, MSc, Molecular Biologist

With funding from an **Innovation Enhancement grant** and an **Applied Research Development grant**, TransBIOTech is helping Pur Noisetier assess and understand the dermal or cutaneous anti-inflammatory effectiveness of its products in in vitro models. The research will examine a wide range of inflammation mediators to assess the anti-inflammatory action of the company's hazelwood extracts. Research findings have the potential to increase the value and credibility of new products designed by the company.

"For Pur Noisetier, TransBIOtech's expertise is essential when it comes to rigourously identifying the chemical and biological properties of Quebec's indigenous hazelwood. Even though we're only a year and a half into our partnership, the research findings have already helped us fine-tune our internal management, operating, production and marketing approaches. So, in the medium term, Pur Noisetier will be able to forge ahead in its mission to improve the daily lives of its customers by optimizing its current line of safe, effective, high-quality products and by introducing new topical natural health-care products. What's more, we'll gain a definite competitive edge in our primary markets and be able to move into new, very high-added-value markets."

– Pur Noisetier

Boosting Quality of Life for Parkinson's Patients

ONTARIO: GEORGE BROWN COLLEGE

As a degenerative disease, Parkinson's cannot yet be cured, but it can be carefully managed to give patients a relatively normal lifestyle. George Brown College has partnered with Live Well with Parkinson's (LWWP) and the Jeff and Diane Ross Movement Disorders Program at the Assistive Technology Clinic (ATC) to develop resources that will improve quality of life for these patients.

The goal is to deliver a practical, everyday online tool patients can use in the often long gaps between check-ups. LWWP aims to be the go-to online resource for patients, caregivers and doctors.

The project unites researchers from several sectors of George Brown, including Information Technology, Business Analyst and the Food and Innovation Research Studio (FIRSt) team, led by food scientists and supported by student researchers. FIRSt developed low-protein recipes designed for specialized patient diets, which will complement such other LWWP health management tools as a medication scheduler and video tutorials.

This research was funded through an **Innovation Enhancement grant** for the George Brown Research Lab in Health and Health Promotion and a **Technology Access Centre grant** for the Food Innovation and Research Studio (FIRSt), as well as in-kind contributions from LWWP and the ATC Jeff and Diane Ross Movement Disorders Clinic.

Scaling Up a Natural Health Product

ALBERTA: OLDS COLLEGE

A partnership between Olds College and the company From the Earth Naturally (FTEN) is aggressively pursuing commercialization of their flagship product, VIVACA™ a Natural Health Product to address the physical and emotional symptoms related to menopause. FTEN and Olds College have been awarded an **Applied Research and Development grant** to advance product development by scaling up and adjusting production, including ingredients, blending, and achieving consistent and measurable active ingredient concentrations needed to secure Natural Health Products Directorate registration.

FTEN is proud to work in partnership with Olds College to develop VIVACA and to fill an industry commercialization gap. This initiative will include establishing a full value chain for Natural Health Product manufacturing in Alberta.

Olds College Centre for Innovation has the necessary equipment, laboratories and analytical equipment needed to develop, establish and implement good manufacturing protocols and procedures to meet regulatory standards. Olds College is also working alongside FTEN and other Alberta companies to advance the fledging NHP industry in Alberta and serve as a hub for another FTEN initiative: establishing a Natural Health Product Group for Alberta.

"From The Earth Naturally is proud to work in partnership with Olds College in filling an industry commercialization gap of scale-up process development. This initiative will establish a full market chain for Natural Health Product manufacturing in Alberta. The success of this initiative is expected to help foster this fledgling natural health product industry in Alberta."

– Anita Dyrbe, From the Earth Naturally

Cost Effective Multi-Channel Ultrasound System

ONTARIO: CENTENNIAL COLLEGE

Echoforge Inc. has teamed with Centennial College to develop a novel ultrasound beam transmitter, with funding from an **Innovation Enhancement grant**. This prototype is a multi-channel, fully programmable open platform with a high frame rate. It targets the design, integration, and control of different integrated circuit chipsets on a dedicated board.

Cardiologists utilize a variety of catheter-based tools to diagnose and treat heart-vessel occlusions and heart defects. Though this area of medicine is expanding, there is a noticeable lack of medical ultrasound research tools available in the marketplace. This is because commercial systems are geared towards the clinical market and sold at a premium due to the additional liability and overhead required by regulatory bodies. Only established labs and large research and development departments have the means to contribute to the field due to the prohibitively high costs of entry.

Echoforge's motivation is to eliminate the higher cost. This will be achieved through a line of products that will provide an open platform to researchers for bench-top and preclinical systems in the intravascular imaging arena.

"Funding support from the Innovation Enhancement grant, and enthusiastic student researchers at Centennial College will help us achieve our goals."

– Kogee Leunge, CEO, Echoforge Inc.

Bacteria that work to keep you healthy

QUEBEC: CÉGEP DE LÉVIS-LAUZON - TRANSBIOTECH

Probiotics are bacterial micro-organisms that can boost the health of those who make them part of their diet.

This project, funded by an **Applied Research and Development grant**, brings together Bio-K Plus International with a team of researchers from the CCTT TransBIOTech affiliated with Cégep de Lévis-Lauzon. The project has shown that Bio-K+® probiotics can alleviate the symptoms of inflammatory bowel diseases (IBDs) in animal models. The research has opened the way to using probiotics to block or weaken the symptoms typical of IBDs like Crohn's and ulcerative colitis.

Any alternative to current IBD treatments would be a welcome development, and administering Bio-K+® products may well provide a solution free of secondary effects. That is why Bio-K Plus now intends to offer the products as a new course of treatment.

The project called on the know-how of TransBIOTech's multidisciplinary team and consolidated the group's expertise in assessing the efficiency of natural health products in the prevention and treatment of inflammatory diseases. A faculty member and a student intern from the Animal Health Technology Program at the Cégep de La Pocatière were also involved in the project.

The project team, from left to right: Violette Mestre-Boivin, Animal Health Technician; Dr. Yvan Boutin, Teacher/ Researcher and Scientific Director; Vincent Tellier, Animal Health Technician; and Dr. Esther Millette, Head of Pharmacology and Project Leader

The knowledge generated, both on inflammatory diseases and on the use of probiotics, was incorporated into courses in the college's biotechnology and laboratory technology program. In addition, the collaboration has laid the groundwork for a productive partnership between TransBIOTech and Bio-K Plus.

"The funding we received allowed us to partner with TransBIOTech for the first time and to explore new applications for Bio-K+® products. And thanks to the knowledge produced in the process, we'll be able to develop new markets in the medium term."

– Mathieu Millette, Director, Fundamental Research, Bio-K Plus International

Researching New Ways to Fight Oral Conditions

SASKATCHEWAN: SASKATCHEWAN INSTITUTE OF APPLIED SCIENCE AND TECHNOLOGY (SIAST)

SIAST's BioScience Applied Research Centre offers state-of-the-art applied research expertise and infrastructure to support industry's need for process, product and business innovation.

In a project funded by an **Applied Research and Development grant**, Marei Therapeutics Inc. partnered with the Centre to assess the antimicrobial activity of two drug formulations against microbes implicated in oral candidiasis infection and "dry socket," a common complication following tooth extraction. The company benefits from access to expertise and equipment crucial to the proof of concept success of its dental formations.

For students of the Bioscience Technology program at SIAST, the project provides unmatched experience in planning and carrying out technical projects.

Measuring Protein Content in Food and Residues in Just Five Minutes

ONTARIO: LA CITÉ COLLÉGIALE

The Centre for Applied Research in By-products at Ottawa's La Cité collégiale is helping to develop products and processes in biotechnology, food technology and bio-upgrading. Since April 2011, La Cité has been working with GreenField Ethanol, Canada's largest producer of bio-ethanol, to help the company improve its large-scale production processes by gathering chemical-composition data involving ingredients like starch, dietary fibre, proteins and amino acids.

Thanks to an **Applied Research Tools and Instruments grant**, La Cité purchased a Dumas combustion unit, which is a basic analyser that measures carbon, sulphur and nitrogen in samples after they are burned at high temperatures. The usefulness of the unit stems from its ability to perform very fast analyses and to operate without chemical products. Students at the college use the apparatus every day to measure nitrogen in GreenField Ethanol's samples and in a range of plants, foods and residues for other projects. Companies can then tap into the results to optimize their own production processes.

"The collaboration with La Cité collégiale research team has allowed GreenField Ethanol to improve and further develop some aspects of its processes. The access provided to specialized researchers and technical personnel, as well as quality students and state-of-the-art equipment, is a great asset for our projects."

– Rick Lehoux, Senior Development Engineer, GreenField Ethanol Inc.

Ariane Thérien, 3rd year student, Biotechnology Bachelor's program, Health and Life Sciences Department

Curbing the Spread of Infections Inside Hospitals

ONTARIO: GEORGE BROWN COLLEGE

Each year, a quarter-million Canadians suffer hospital-acquired infections, colloquially known as “superbugs.” Hand hygiene has been described as the single most effective way to prevent the spread of healthcare-associated infections such as MRSA (virulent staph infection) or C. difficile. Still, hand hygiene compliance rates in hospitals are as low as 40%.

To stem the rate of infection, Infonaut Inc., a Toronto SME founded after the 2003 SARS outbreak, developed Hospital Watch Live (HWL). A solution for infection control in healthcare settings, HWL gathers data from a location system sensor network. The system records in real time as patients, staff and visitors move throughout the facility and reports on infections in the hospital.

Infonaut has worked with George Brown College since 2009 to further develop HWL in preparation for a commercial launch. The school helped the company add hardware and processes to accurately measure hand hygiene compliance. Students and faculty from programs across the college have contributed to the project, including the Centre for Construction and Engineering’s Wireless Networking, Mechanical Engineering and Business System Analyst programs, the School of Business, and the School of Nursing.

This research, which could help curb the spread of disease, was funded through an **Innovation Enhancement grant**.

Agriculture and Food Technology

"From farm to fork", Canada's agriculture and agri-food sector spans a diversity of economic fields. It encompasses industries such as farm supplier industries, primary agriculture, food and beverage processing, food distribution, retail, wholesale and foodservice industries. The agriculture and agri-food sector continually plays an important role in federal and provincial economies. In 2010, it provided one in eight jobs – its 2 million employees accounted for 8.1% of Canada's GDP. Farms have become more specialized, with the average size increased and crop production diversified.

Changing consumer and societal demands are influencing the path of the entire agriculture and agri-food system. Consumers demand greater variety, convenience and foods both healthy and environmentally-friendly. Growers and farmers are producing niche products such as organics, adopting environmentally-responsive land management and production methods, and taking advantage of value-added products and services such as agri-tourism.

Colleges have risen to the challenge of meeting regional needs, as well as seeking opportunity within food product development and testing. What follows is a harvest of agricultural and food technology projects supported by the College and Community Innovation Program.

ALGONQUIN COLLEGE

Because Colour Matters in Food Quality Control

ONTARIO: ALGONQUIN COLLEGE

In 2013, an Algonquin College industry partner is expected to introduce a new product developed through the support of an **Applied Research and Development grant**.

Two Algonquin photonics professors and a student collaborated with Sightline Process Control to develop a platform that delivers absolute colour measurements to the company's food quality control monitoring equipment. The result is equipment with greater accuracy and precision.

Ottawa's Sightline Process Control is a leading manufacturer of real-time inspection/rejection systems for food quality control. To keep its competitive advantage, the company needed to expand into precise camera and illumination-independent colour characterization. The project's goal was to develop a colour management system (CMS) to complement Sightline's products. A CMS transforms camera-dependent raw colour image data into absolute sRGB (Red-Green-Blue) colours – reproducing real food colours with precision accuracy. The college-industry research team developed a CMS featuring open-source software that plugs seamlessly into Sightline's Labview system interface – producing corrected, camera-independent colours that were tested thoroughly against known colour standards.

Algonquin was given the problem of allowing the company to measure L* a* b* colour values (L* defines lightness, a* denotes the red/green value and b* the yellow/blue value) from a system with somewhat variable lighting and generic off-the-shelf color cameras.

"Your developed algorithms work well and the resulting libraries allowed us to add this capability to our product line without having to worry about the underlying complexities of the mathematics. Having true L* a* b* measurements opened a new range of applications for our bench top vision system product. While this has not yet resulted in new sales, we expect it to in the near future."

– Andrew Scott, Sightline Process Control Inc.

Revolutionizing the Dairy Industry

QUEBEC: COLLÈGE D'ALMA – RECHERCHE ET INNOVATION EN AGRICULTURE (AGRINOVA)

In the next five years, the Collège d'Alma and its affiliated CCTT Agrinova will provide a new service for dairy producers to tap into innovations, new technologies and applied research, thanks to a **Technology Access Centre (TAC) grant**.

The benefits are widespread. The major regional economic engine that is dairy production will become even more viable. At the same time, the college and Agrinova will better meet the pressing needs of dairy producers. They will also consolidate existing partnerships in this sector and generate new opportunities.

Through the TAC, a new science and innovation liaison officer will help producers conduct technology-transfer projects and implement new practices. The officer will strengthen ties among researchers at Agrinova, faculty at the Collège d'Alma, university and government researchers, as well as dairy production experts. These relationships and expert input will generate technology-transfer projects designed to improve feed-use efficiency on farms and the health of dairy herds.

There are three main partners: Valacta, the Conseil québécois des plantes fourragères, and the Syndicat des producteurs de lait du Saguenay-Lac-Saint-Jean. Once the initiative concludes, about 70 dairy producers will have received support and guidance in conducting the equivalent of 25 technology-transfer projects.

"New knowledge and practices in dairy production do actual good when they find their way onto farms and make producers more efficient and, therefore, more profitable."

– Daniel Lefebvre, Director General, Valacta

"We need to make sure knowledge flows from the research lab to the dairy barn, so that concrete measures and solutions take hold there and milk producers can see the financial benefits of research results first-hand."

– Daniel Gobeil, Vice-President, Syndicat des producteurs de lait du Saguenay-Lac-Saint-Jean

A Better Test for Pesticides in our Produce

BRITISH COLUMBIA: CAMOSUN COLLEGE

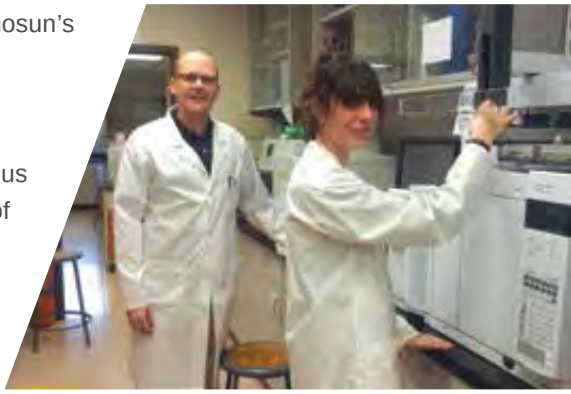
Camosun College conducted a two-year applied research project with industry partner MB Laboratories Ltd., courtesy of a significant **Applied Research and Development grant**. Its goal was the development of a "Comprehensive and Cost Effective Screening Method for Pesticide Residues in Fruits and Vegetables."

This project will provide local farms and businesses with a novel method for testing pesticides residues in fruits and vegetables. Interventions could be introduced to reduce pesticide use, which could result in long-term health benefits.

The college-industry partnership involves an Applied Chemistry instructor from the School of Arts and Science and four co-op students from Camosun's Applied Chemistry and Biotechnology Program working with MB Laboratories, based in Sidney, B.C.

The company specializes in diagnostic and analytical services for various professionals, businesses, consultants, private citizens, and a variety of domestic and international government agencies, including south of the border, Europe and Japan.

A second grant from the **Applied Research Tools and Instruments grant** enabled the purchase of a state of the art qPCR Gas Chromatography mass spectrometry machine.



Blair Surridge, Chair, Applied Chemistry and Biotechnology programs, with Co-op student, Brenna Stanford

Devouring Aphids on Greenhouse Peppers

BRITISH COLUMBIA: DOUGLAS COLLEGE

Aphids are unrelenting, serious pests for British Columbia's greenhouse vegetables, as well as on farms and in gardens across the country. That may soon change, as Douglas College's Institute of Urban Ecology is researching new products to biologically control aphids – funded by an **Innovation Enhancement grant** and an **Applied Research Tools & Instruments grant**.

The most promising product to emerge from this work is Micromus variegatus, a brown lacewing that is a voracious predator of aphids. Greenhouse cage trials indicate that Micromus can eradicate infestations of green peach aphids on sweet peppers. As a result of this research, the product will play an increasingly important role in aphid management inside and outside the province, on both greenhouse vegetables and field crops such as blueberries.

The research is supported by a partnership that includes Canadian biological control companies Applied Bionomics Ltd., The Bug Factory Ltd., and Koppert Canada Ltd., as well as the B.C. Greenhouse Growers Association and the Institute for Sustainable Horticulture at Kwantlen Polytechnic University. Biological control provides a sustainable, ecologically-based alternative to the use of chemical pesticides in agriculture. The objective: continue identifying and developing new products to biologically control major agricultural pests.

"The Micromus project is an excellent example of the relevance of your research for our industry and Canadian horticulture. Your connections with the BC vegetable growers have allowed real trials in real situations. Your excellent communications, especially your "Technical Bulletins", have created awareness and demand for the product and integrated pest management in general."

– Brian Spencer, President, Applied Bionomics Ltd.

Delivering Technology to the Heart of Ontario's Food Industry

ONTARIO: GEORGE BROWN COLLEGE

George Brown College has filled an important gap in the food processing industry by launching its Food Innovation and Research Studio (FIRSt) through funding support from a **Technology Access Centre grant**.

The food industry is the largest manufacturing sector in the country, providing more jobs than the transportation and machinery manufacturing sectors combined. Toronto's food and beverage cluster dominates the Ontario food industry. Despite over 25,000 food industry companies, organizations and agencies located within 80 km of Toronto, there is no Greater Toronto Area (GTA) facility to meet such needs as production, food safety, storage, packaging, labeling and moving products speedily to market. The absence of such a facility is a barrier to sector growth, especially for small- and medium-sized enterprises (SMEs).

FIRSt will assist food product development with "concept to commercialization" technical support, as well as business innovation services to the GTA food industry. FIRSt builds on George Brown's extensive experience serving the food industry through its training, applied research and product development activities. The Studio has integrated an expert food science applied research, recipe and product development team with cutting-edge research laboratories, test kitchens and equipment.

Through FIRSt industry clients will be able to swiftly and cost-effectively develop and commercialize new food products.

Canada's Smartest Kitchen Supports Food Innovation from Concept to Market

PRINCE EDWARD ISLAND: HOLLAND COLLEGE

Canada's Smartest Kitchen (CSK), the research arm of Holland College's Culinary Institute of Canada, is a **Technology Access Centre**. Canada's Smartest Kitchen offers a full suite of services, from concept development to market entry for the agri-food, fisheries and functional food sectors by blending culinary expertise, advanced technology capacity and food science knowledge with a network of businesses, research organizations, academic institutions and government agency partners. CSK has hosted or been a part of more than 40 industry engagements in the food product development sector and worked with 18 Atlantic Canadian companies in the first 6 months of operation, including 12 SMEs. With each company there are, on average, three to six potential new products. Over the next five years, CSK anticipates working with well over 60 different clients each year, developing more than 80 new and innovative products that will help to make Atlantic Canadian food processors more unique, competitive and profitable on global markets.

As a TAC, Canada's Smartest Kitchen has had early success working with regional companies on a variety of different avenues. CSK has explored engagements from simple problems like fine tuning recipes, to more elaborate research tasks such as designing demonstration kitchens and exploring potential markets for functional foods or adding nutraceuticals for value added food products. CSK has helped with product line expansion for a local company hoping to expand nationally. CSK also created the innovative "Oysters Rockyfellas," which added value to what were once lower valued standard oysters. Developing this oyster product allowed one Prince Edward Island company to put a new product on grocery shelves in record time!

Pinpointing the Optimal Diets for Livestock

ALBERTA: LAKELAND COLLEGE

In 2010, Lakeland College received an **Applied Research Tools and Instruments grant** to purchase a GrowSafe residual feed intake monitoring system.

The equipment measures how effectively livestock convert feedstuffs into marketable weight and its data quantifies the effects of various diet combinations. It also provides information on each animal for genetic selection. This innovation has opened up new teaching and learning opportunities and is helping Lakeland College enhance relationships with industry in the region.

After completing installation and pilot studies during the 2011-12 school year, Lakeland has partnered with a local feedlot, Highland Feeders Ltd., in the equipment's first industry-led, student-run project.

"All 30 students in our feedlot class have participated in the development of this project. The data collection phase allows students to experience the research process in a very tangible way. Interacting with our industry partners and discussing the importance of trial design and expected outcomes really excited students about research and how they can contribute to the project."

– Geoff Brown, Lakeland College Agricultural Sciences Instructor and Beef Lead Researcher

With guidance on design and implementation from Feedlot Health Management Services Ltd., Highland Feeders Ltd. is working with the college to use the GrowSafe equipment to explore novel feed formulations for a variety of feedlot applications.

"When Lakeland College received funding for the GrowSafe equipment, we were thrilled to know that we could also partner with them to develop our research goals. This investment has been a very strategic one for our region."

– Mike Kotelko, Vice President, Highland Feeders Ltd.

Eric Behlke, Feedlot Health Management Services

Saving Lives With No-Alcohol Lager

ONTARIO: NIAGARA COLLEGE

The reputation held by non-alcoholic beer is, fair to say, not a solid one. It is widely known for possessing a flavor that falls short of what beer drinkers would expect in terms of replicating an alcoholic beer. Niagara College is aiming to put an end to that.

The school's Canadian Food & Wine Research Centre partnered with MADD Virgin Drinks (Mothers Against Drunk Driving) to effectively use funding from an **Innovation Enhancement grant**. The researchers have successfully created an alcohol-free lager that closely matches the flavor profiles of an alcoholic lager – but featuring a 0% alcohol content. That is better than the current industry standard of 0.5%.

The first step was organizing a panel of trained palates in order to study important flavor profiles of beer – including bitterness, sweetness, and smoothness. Second, the research team ran an untrained focus panel to conduct taste tests and provide feedback on the flavor profiles of several non-alcoholic beers on the market today. By analyzing consumer response they were able to optimize their recipe.

That recipe debuted at the 2012 Niagara Food Festival, where samples were available for the public. The festival proved to be an effective environment in which to test consumer satisfaction and appropriate price points.

Today, MADD Virgin Drinks possesses the optimized recipe and is aiming to introduce the non-alcoholic lager into the marketplace.

"We were delighted and proud to work with Niagara College on this unique initiative and help them showcase the scope and capabilities of their curriculum to a North American audience."

– Brian Bolshin, President & CEO, MADD Virgin Drinks

Empowering Rural Entrepreneurs

BRITISH COLUMBIA: OKANAGAN COLLEGE

Entrepreneurs power industry and regional economic development. To that end, each micro-business that grows to SME status adds considerably to employment in the area. New jobs are typically full time positions, with higher wages, paving the way to stronger regional economies.

Still, in terms of our rural entrepreneurs, the amount of data is very limited in Canadian communities. In other nations, studies confirm that rural businesses should coordinate their scarce resources to improve their competitive position overall.

Through funding from an **Applied Research and Development grant**, Okanagan College is enhancing understanding of this critical issue through a project entitled: "Rural Entrepreneurship and Industry Competitiveness: Value-Chain Innovation in the Agricultural Products Cluster since 2006". The project investigates the role of entrepreneurs in industry competitiveness and sustainable rural community development, and examines how they overcome significant obstacles to business interdependence, and how this interdependence stimulates innovation that leads to sustainable competitive advantage.

Outside of Canada's urban centres, there is tremendous potential in interdependent entrepreneurs. In the rural areas, that begins with agriculture products.

"What we're looking at here is the industry cluster of agricultural products: wine, tree fruits, processing, manufacturers, stainless steel fabrication, equipment manufacturing, the service and support industries, the grower supply companies – all of this is the value chain."

– Lee Carter, Business Division Research Lead

Using Geomatic Tools to Improve Cattle Feed Efficiency

ALBERTA: OLDS COLLEGE

In 2012, Olds College and the University of Alberta kicked off a new three-year agricultural project entitled "Use of Genomic Tools to Improve Feed Efficiency in Purebred Hereford Cattle."

The project was funded by a **College-University Idea to Innovation grant**. This marks the start of a new and reinvigorated collaboration between Olds College, the University of Alberta, Livestock Gentec, Alberta Agriculture and Rural Development, the Canadian Hereford Association and the Integrated Beef Research Station.

The project will allow the livestock industry to benefit from the scientific research involving residual feed intake. Feed efficiency and genomic data will be collected from approximately 900 purebred Hereford bulls over a three-year period. This project will provide the means of identifying more efficient sires at a younger age, and improve the profit margin and competitiveness for many Canadian beef cattle producers.

College and university students benefit through active participation in the data collection and from the opportunity to develop lasting relationships with industry partners. With the field of genomics innovating at an accelerated pace, it is important that students are up-to-date with the latest technology.

"The Canadian Hereford Association is very supportive of this research project as it will result in the development of an Expected Progeny Difference (EPD) for feed efficiency in the Hereford breed, which is an increasingly important trait, because of its economic importance to commercial producers and feedlot operators within the beef production chain."

– Gordon Stephenson, General Manager, Canadian Hereford Association

Cégep de Victoriaville

Boosting Organic Agricultural Production in the Horticultural and Cash-crop Sectors

QUÉBEC: CÉGEP DE VICTORIAVILLE

With funding from an **Innovation Enhancement grant**, the Centre d'expertise et de transfert en agriculture biologique et de proximité (CETAB+) at Cégep de Victoriaville is working on a multi-faceted project involving several areas of organic farm production. Their efforts touch on fertilization, weed control, and soil improvement through the use of green fertilizers and sub-soiling.

Sub-soiling of a field with one of the sub-soiling machines tested at Ferme Rheintal in the summer of 2012

After two years, the sub-soiling trial results have proven to be very promising for the project's industry partners. Sub-soiling is designed to reduce the impact of soil compaction, which is caused by farm work and heavy equipment on the land. However, benefits of sub-soiling can be affected depending on the type of sub-soiler used, soil humidity during the sub-soiling process and on the extent to which plant roots colonize the space created.

To overcome this challenge, research compared the effects of different sub-soilers on physical soil properties in a hay field and in growing mulch. An analysis of soil profiles right after sub-soiling in the summer and then later in the fall, has resulted in the identification of the most-effective sub-soilers and, most importantly, the optimal conditions to use them. This is critical data to more than a dozen partners involved in the project, as well as to farm families across the country.

Results from fertilization tests in a semi-permanent greenhouse on tomato and pepper plants have shown equal promise for the project partners and the greater community. Students in the college's bio-horticulture program – many of whom will become market farmers – are also benefitting directly from the college's expanding expertise in this area.

"In 2010, our farm acquired close to half a hectare of high tunnels to help increase the quality and yield of warm-climate vegetables like tomatoes and peppers. The technology is still fairly new in Quebec, so our challenge was to design a plant-management process specifically for high tunnels. What's more, because high-tunnel growing differs from cropping in open fields and in heated greenhouses, we had to find new ways to tackle issues like fertilization, spacing, watering and choosing varieties. The initiative allowed us to team up with specialists from CETAB+ to fine-tune fertilization processes for tomatoes and peppers. And because all of the parameters in crop management have to be coordinated, our work with these experts gives us a better understanding of our crops and a greater awareness of our yields – and that helps us reach our objectives or targets faster. Finally, thanks to CETAB+'s tests at other farms, we can exchange all sorts of data and gain crop-related knowledge that makes us better producers overall."

– Robin Fortin, Ferme La Berceuse

View of high-tunnel experimental crops at Ferme Le Vallon des Sources in the summer of 2011

Using Technology to Transform Agricultural Land Management

ONTARIO: NIAGARA COLLEGE

Niagara College's Dr. Mike Duncan received an **NSERC Industrial Research Chair for Colleges grant** to lead research teams with college and partner experts to advance innovations in land management – with a focus on sensitive agricultural land.

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

In 2001, Dr. Duncan founded Niagara College's Centre for Advanced Visualization, whose research explores the use of virtual reality for urban and land use visualization. Three years later, the college received one of six CCI Pilot Program grants to study realism in virtual reality. In 2007, he founded the Augmented Reality Research Centre to continue this research, and expand it into areas such as precision agriculture utilizing a host of technologies including GIS/GPS, databases, 2-D and 3-D visualization, digital soil mapping, image classification, sensor networks and LIDAR.

In 2009, Niagara College received one of the first **Innovation Enhancement grants** to develop a land use technology facility to capitalize on the momentum built by PrAgMatic. This work has attracted IBM and its "Smarter Planet" initiative, as well as interest internationally. PrAgMatic won an Orion award in 2011 for excellence in information technology. Dr. Duncan is currently working with researchers from Queens University, Brock University, McGill University and the University of Windsor.

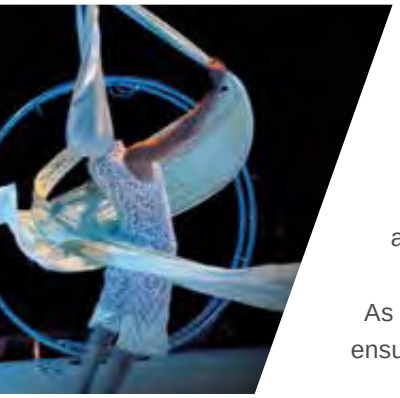
Social Innovation

Colleges have strong community relationships and formal partnerships across many social sciences and humanities disciplines. With a program base of 60% in the social sciences and humanities, both the scale and scope of college applied research in this sector is significant and rising. Colleges conduct applied research in fields related to teaching and learning, community development and health, Aboriginal peoples, immigration, the environment, economic and monetary policy, business, hospitality, justice, human rights, arts and culture.

With a growing demand from community organizations and businesses for college-based applied research in social sciences and humanities, the College and Community Innovation Program is providing opportunities for interdisciplinary or cross-disciplinary applied research which contribute to economic growth and innovation.

A Dramatic First: The SSHRC Industrial Research Chair for Colleges in Circus Arts

QUEBEC: NATIONAL CIRCUS SCHOOL



Montreal's circus arts institutions are recognized around the world for the quality of their productions and their ability to enrich and reinvigorate the aesthetics of the circus arts. To maintain these high standards, creative directors must ply their trade in ever-more-complex environments. Circus professionals must master tools that generate new knowledge and be able to integrate them into both the creative and teaching processes. As for circus enterprises, they need to craft long-term development strategies to preserve the uniqueness of their work and ensure the continued viability of their organizations.

As a result, the National Circus School, through ongoing consultations with circus enterprises, ensures that its graduates meet the needs and standards of the industry.

Patrice Aubertin, SSHRC Industrial Research Chair for Colleges in Circus Arts, National Circus School

Patrice Aubertin, Director of Research and Teacher Training at the National Circus School was awarded the first **SSHRC Industrial Research Chair for Colleges grant**. The Chair will serve as a catalyst for the advancement of Canada's circus industry through research and innovation activities. His work will focus on fostering innovation through the promotion and application of new technologies in the circus industry and improving practices in creative direction, in dramatic arts and in circus arts teaching.

On a broader scale, these research efforts support economic opportunity for and promote healthy lifestyles among young people, while maintaining the international competitiveness of the Chair's industry partners.

Ahead of the Curve: SERC's Interdisciplinary Research Raises Awareness about an Aging Population

ONTARIO: SHERIDAN COLLEGE INSTITUTE OF TECHNOLOGY AND ADVANCED LEARNING

Population aging is a defining characteristic of the times in which we live. In 2011, an estimated 5 million Canadians were 65 years old or older. That number is expected to double and will reach 10.4 million by 2036. This demographic shift and its impact will dominate the Canadian landscape for the next two decades.

The Sheridan Elder Research Centre (SERC) is expert at working with older citizens. SERC connects people with ideas and community resources in unique and innovative ways to raise awareness about aging and to design, test and launch programs or research that responds to the opportunities and challenges presented by growing older. An aging society affects everyone; SERC's interdisciplinary research through an **Innovation Enhancement grant** crosses all Tri-Council funding agencies. SERC's research initiatives and educational outreach activities bring historically disparate sectors together to promote collaboration between technological advances and social innovation.

From raising awareness about aging through a compelling exhibition of photographs of adults over 110 years old, to exploring the health and psychosocial benefits of participating in dance to computer coaching, SERC bridges the arts, health, the humanities and technology in novel ways. One example of SERC's outreach is the Business of Aging: Information Exchange Network (BA:IEN), a SERC initiative made possible through the **Innovation Enhancement grant**. BA:IEN connects business and industry leaders to exchange ideas, information and resources about the needs and wants of mature consumers and their families. The network has been very successful as a promotional and educational tool in supporting both small start-up companies who are creating products and services for older persons as well as more established businesses seeking to diversify their companies.

"BA:IEN is a fantastic think-tank of new and experienced business leaders who are open to change and want to respond to the ever-evolving perspectives of the boomer generation"

– Betty Lou Reynolds, owner of Lifessence and a BA:IEN member

Pat Spadafora, Director, SERC; Jerry Friedman, photographer, and Jeff Zabudsky, President Sheridan College.

Photos in background: Bettie Wilson, born 1890, New Albany, Mississippi, USA; Swami Bua, born 1889, Pollachi, India.

The Jerry Friedman photography exhibit, "Chronicles of Future's Past", was displayed in the art gallery at Sheridan from September 21- October 5, 2012.

Striking the Right Rhythm for Autistic Children

ONTARIO: GEORGE BROWN COLLEGE

Through an **Innovation Enhancement grant**, a Toronto-based start-up company partnered with George Brown College to improve the lives of young people with autism.

Drumeba Inc, needed to refine the initial prototype of their drumming platform, “DruMeBa,” which helps develop social, communication and cognitive skills in children with autism. A play-based learning device, DruMeBa is designed for use by up to four players, including non-autistic users, to encourage collaboration. It is also structured for continued software development and will be able to capture data for tracking and analysis.

Currently, there are many assistive devices and games used to help children and adults with an Autistic Spectrum Disorder, but most of these models assist with a single characteristic and have little flexibility outside of their designed intent. Many can only accommodate one user at a time and lack the ability to capture data or track progress in any way. The DruMeBa offers a novel approach in this important arena.

The project is led by a Mechanical Engineering professor at the George Brown Centre for Construction and Engineering Technology. After enhancing the initial table prototype, the research team has moved to testing its structural integrity and integrating the product’s unique communications components.

Making Computers Simpler for Older Adults

ONTARIO: SHERIDAN COLLEGE INSTITUTE OF TECHNOLOGY AND ADVANCED LEARNING

Awarded a 2010 **Innovation Enhancement grant**, the Sheridan Elder Research Centre (SERC) has successfully partnered with PointerWare Innovations Ltd. to achieve one clear goal: make computing simpler for older adults.

Computing for older adults is a rapidly-changing marketplace, driven by a sharp rise in the number of older adults using computer technology. It is not only the end-user, though, who benefits from this industry-college partnership.

SERC student research assistants work with Sheridan faculty members, community groups and PointerWare staff on a variety of information and communications technology initiatives. In this way, students learn valuable skills from a diverse group of contributors and supplement the lessons taught in the classroom with practical experience.

PointerWare allows students and faculty the opportunity to collaborate in a social innovation workspace as they design and test new features and functions and evaluate the product in community-based settings. At the same time, PointerWare has been able to expand its business scope, recently including software translations in the dominant languages of the multicultural Greater Toronto Area.

“The students have been vital to allowing PointerWare to continue growing its feature set so it can stay relevant in a rapidly-changing marketplace.”

– Raul Rupsingh, PointerWare’s Co-Founder and CEO

Information and Communications Technology

This vibrant and innovative sector of the Canadian economy comprises a broad set of industries, from telecommunications to computer software, hardware and services, to electronic equipment industries and recording industries, among others. In 2011, ICT sector GDP reached $62.7 billion, up 3.1% from 2010. The share of Canadian GDP attributable to the information and communications technology (ICT) sector remained at 4.9% in 2011. From 2002 to 2011, the ICT sector GDP grew at an annualized growth rate of 3.8%, compared to 1.9% for the overall economy.

About 33,500 mainly small companies comprise the Information and Communications Technologies (ICT) sector, of which 80.9% are in the software and computer services industries. Since 2002, the services industries have driven the ICT sector by generating 70% of the growth. Only about 100 large companies exist in the sector, mainly in the manufacturing sub-sector. The ICT sector accounts for 3.2% of total employment in Canada.

ICT college research activities integrate a number of academic program areas, from computer programming to healthcare to gaming, natural resources and more. The projects profiled in this section represent those in which information and communications technology is the key sector of research and development, resulting in novel technologies, software applications and other digital solutions.

Seneca

Revamping the Firefox Web Browser

ONTARIO: SENECA COLLEGE

One of the world's leading Internet browsers is the open-source Firefox. In recent years, new versions of this popular software, created by Mozilla Corporation, have featured groundbreaking technology developed by Seneca students, graduates and faculty.

As a result of Seneca's on-going partnership with Mozilla, the College's Centre for Development of Open Technology – supported by an **Innovation Enhancement grant** – played an integral role in the creation of key features in Firefox. They include:

- Audio API: The browser allows programmers to manipulate and create audio that can be synced with the rest of the webpage in ways previously impossible on the web. Such functionality could be used, for example, to improve accessibility of online content for people with disabilities.
- Mouse Lock API: Mouse Lock allows users to create an infinite scrolling area.
- WebVTT allows web authors to include subtitles, captions, translations, and other text along with video files in the browser.

David Humphrey, Seneca Professor and lead on the Firefox/Seneca project, presenting at the Mozilla Summit

This work enhances the web platform especially for rich media and gaming. It allows Canadian companies to deliver products and services on the web which would have required special software in the past.

Bringing 3-D Accuracy to Mining Technology

QUEBEC: CÉGEP DE LA POCATIÈRE, CÉGEP ANDRÉ-LAURENDEAU, CÉGEP JOHN-ABBOTT COLLEGE – CENTRE COLLÉGIAL DE TRANSFERT DE TECHNOLOGIE EN OPTIQUE-PHOTONIQUE (OPTECH)

Supported by an **Applied Research and Development grant**, the three Cégep partners assist Photonic Knowledge with highly efficient sample analysis systems for the mining industry. These analyses take place in the field, at the deposit site. Mobile units enable technicians to register and identify the spectral signature of drilling-core minerals thanks to patented hyperspectral imaging technology. This patented technology is key to sidestepping inherent difficulties faced by the industry. Due to its fragile nature, a mineral's surface displays cracks and recesses. Textures can differ vastly from one mineral to the next.

Optech and Photonic Knowledge partnered to develop a 3-D optical digitization process. Complementing data gathered during spectral analyses, this process will provide an accurate statistical picture of the drilling core's mineral content while avoiding objects of archaeological interest.

"We've been working with Optech Montréal for two years on projects involving the optimization of specialized lighting systems and, more recently, of three-dimensional drilling-core metrology to improve both the speed and accuracy of our hyperspectral mapping products. Our collaboration with Optech helps us fine-tune and adapt our mining-related technology faster and holds tremendous potential for even more innovations in the future."

– Ariel Harlap, Director, Research and Development, Photonic Knowledge Inc.

A New Framework for Visual Art Online

ONTARIO: SENECA COLLEGE

Seneca College has helped devise a groundbreaking way of displaying graphics on the web. Processing.js. is a new approach to make the web a platform for games, data visualization, digital art, and interactive animation. What makes this language special is that it does not require special plug-ins that are normally used to convert these files for browsers. Processing.js uses new features in HTML 5 (Canvas and WebGL) to allow programs written in the Processing language to work on the web.

Mozilla Corporation, creator of the Firefox web browser, teamed with Seneca's Centre for Development of Open Technology (CDOT) for the project, continuing a longstanding partnership. With support from an **Innovation Enhancement grant**, CDOT students and faculty have refined Processing.js, an open source programming language. The original Processing language was created in the Digital Media Lab at MIT in the late 1990's to allow artists and other non-traditional programmers to create to dynamic, coded art.

Developing Processing.js was built into the curriculum of Seneca's Software Development program, allowing students to work on the initiative during the semester and gain valuable business experience.

"What's exciting is that students got to work on the cutting-edge of both graphics and web technology. They were able to take a fantastic prototype and see it through to completion, giving them real-world experience and a great addition to their resumes."

– David Humphrey, Professor, School of Information and Communications Technology, Seneca College

"(Seneca) has built a huge and important bridge between the open web and world of electronic art and design."

– Mark Surman, Executive Director, Mozilla Foundation

CDOT has worked with a number of Canadian companies and groups to create games for both mobile and desktop web browsers. Processing.js has been adopted and used by companies in Canada and around the world. Not only has it been used commercially, it has been integrated into the curriculum of many colleges and universities.

Anna Sobiepanek (pictured) led her fellow students on this project and was hired at the end of the semester as a research assistant to continue her work at Seneca's Centre for Development of Open Technology (CDOT).

Building Materials Research Capacity through a Time Resolved Fluorescence Spectrophotometer

NEWFOUNDLAND AND LABRADOR: COLLEGE OF THE NORTH ATLANTIC

An **Applied Research Tools and Instruments grant** has enabled the purchase of state-of-the-art spectrofluorometer equipment for College of the North Atlantic's (CNA) Materials and Nanotechnology Research Laboratory at Lab West Campus, with extended usage to other CNA laboratories across the province. The acquisition of this equipment fills a critical gap in the research capacity of the college. The equipment is suited, in particular, for testing nano-sized materials and will be used for analyzing colloidal nanoparticles. This is done for a variety of applications, including research into a revolutionary memory chip where fluorescence changes in atomic layers provide crucial information on material compositions and growth.

The versatility of the equipment allows it to be used in a number of other research areas. A significant demand for this instrument also exists at other CNA laboratories across the province, including anti-cancer drug testing at Clarenville Campus, drinking water analysis at Lab West Campus, nutraceuticals research at Carbonear Campus, and in the Environmental Studies Program at Corner Brook Campus. The College expects a major boost in research capacity through the acquisition of this equipment.

CNA – Time Resolved Fluorescence Spectrophotometer for Materials Research

The Spectrophotometer is a key piece of equipment in collaborative research with other partners including École Polytechnique and CorActive, a Quebec-based manufacturer of Specialty Optical Fibers and the developer of next generation semiconductors for the telecommunications industry. CNA is also on board with local mining companies in extending the facility for material analyses in reducing oil contamination, and to Air Liquide, with offices in Labrador West, in developing more energy-efficient photovoltaic solar cells.

Changing Indoor Experiences through Mobile Phones

BRITISH COLUMBIA: CAMOSUN COLLEGE

Victoria's Wifarer Inc. has developed a revolutionary software-only indoor positioning system (IPS). Wifarer heightens visitor exploration, discovery and engagement via indoor positioning, navigation, location-aware content, and a cloud-based content management system.

A partnership between Wifarer and Camosun developed an "Accurate Indoor Wayfinding Mobile Application for Large Scale Multi-Building, Multi-Site Venues". The project was funded by an **Applied Research and Development grant**, and was conducted by a Computer Science instructor and two students – one from Mechanical Engineering Technology and one from Environmental Sciences Technology.

This project will play a significant role in Wifarer's next stage of product development and expand its market potential. At the same time, the aim is for Camosun College to become a technology development and testing partner for the company.

"This partnership and research project been has been very helpful to Wifarer, enabling us to expand our capabilities in multi-building, multi-venue indoor positioning. The insight and expertise has been very valuable to our development team and allowed us to progress rapidly from concept to prototyping/alpha stages for real world testing."

– Mark Franklin, COO, Wifarer Inc.

Online 3-D Images Will Never Be the Same

ONTARIO: SENECA COLLEGE

Arius 3D, a Mississauga-based company that scans and delivers high quality 3-D images to museums and other institutions, has teamed with Seneca College to simplify online image delivery.

Certain 3-D devices such as scanners or LIDAR sensors deliver 3D data as "point clouds," which are coloured points at specific positions in 3-D spaces. Yet the ability to render such point clouds within a web page has relied on plug-ins, limiting delivery to certain browsers and operating systems.

With support from an **Innovation Enhancement grant**, students and faculty from Seneca's Centre for Development of Open Technology (CDOT) developed "XB-Point Stream." This is a framework for rendering point clouds on any modem using WebGL. XB-Point Stream is highly customizable, easily used to support different types of data from various sources and easily viewed from multiple angles on a web page.

Arius is now employing XB-Point Stream on its website to deliver 3-D images and many other industry partners have followed suit.

"As a technology-driven company, the collaboration with Seneca has allowed Arius 3D to achieve an important business goal – barrier-free access to the world's most accurate 3-D color models. From a customer perspective, the benefit is access to our 3-D images anytime, anywhere without a plug-in. From a business perspective, the benefit is the ability to showcase our images in their native and most accurate format (PSI). Of course, not having to produce secondary file formats is also a welcome benefit from both a time and cost perspective. Working with Seneca and their Open Source team gave us a head start with the emerging WebGL standard. We are now rolling out XP Pointstream to our customers and business partners around the world. If the future is about accessibility, XP Pointstream is a step in the right direction."

– Arius 3D

CENTENNIAL COLLEGE

A Unique Way to Educate People about Dental Health

ONTARIO: CENTENNIAL COLLEGE

BiteBank Websites Inc. has collaborated with Centennial College to create directly accessible educational content that will allow patients of participating dentists to have unique insight into oral health.

The industry partner provides dentists and medical practitioners with a website content management system and patient education services. It was while working with dentists that the company realized that there was a gap of educational content for dental patients.

Through this project funded by an **Innovation Enhancement grant**, research teams from Centennial and BiteBank developed 3-D patient education movies. They are animated and will stream on the dentist's website and in waiting rooms to inform patients about dental procedures and post-surgery instructions. These animated movies and software will be accessible in various versions, and will be distributed as a free resource for dental students in colleges and universities around the world.

"This collaboration has led to creating new state-of-the-art, cutting-edge patient education software and videos creating a new revenue stream for us, bringing foreign exchange, and the ability to leverage innovation funds to further strengthen our market position. Results from the project are highly encouraging; we could acquire U.S. clients by early demonstration of the product. We would like to work on more projects with Centennial College."

– Chaitan Pettukola, CEO, BiteBank

Reducing the Cost and Ecological Footprint of Enterprise Computing

ONTARIO: SENECA COLLEGE

Over 8 billion ARM chips are produced annually. That is a million chips per hour for the most popular central processing unit in the world.

With funding from an **Innovation Enhancement grant**, and in collaboration with RedHat and the global Fedora community, Seneca students and faculty from the Centre for Development of Open Technology (CDOT) are managing more than 60 small computer systems through the Fedora ARM Build Farm.

The facility is being used to prepare the Fedora Linux operating system for a new class of energy-efficient and cost-effective computers that range from handheld devices to data centres.

Chris Tyler, NSERC Industrial Research Chair for Colleges in Open Source Technology for Emerging Platforms, Seneca College

The Seneca College **NSERC Industrial Research Chair for Colleges** in Open Source Technology for Emerging Platforms, Chris Tyler, is working with a team to implement the Fedora on emerging ARM hardware. The release of Fedora 18 in late 2012 brought ongoing software parity between ARM and PC systems, dramatically reducing the cost and the physical and ecological footprint of enterprise computing.

"Chris Tyler has been working on a number of projects relating to the Fedora Linux community which will provide the open source software foundation for new uses of ARM technology. We have confidence in his continued leadership in this area, including research on physical cloud management and security, the extension of open source management frameworks to emerging ARM platforms, and interoperability between open source software and new ARM platform standards."

– Philippe Robin, Director, Open Source, ARM Ltd.

Protecting Water Systems from Toxic Chemicals

BRITISH COLUMBIA: CAMOSUN COLLEGE

A green technology company on Vancouver Island, Petro Barriers Systems Inc. (PBS), has long promoted the importance of preserving our water systems. PBS is a leader in storm drain water protection systems that serve utility companies and municipalities across the country and internationally.

The company partnered with Camosun College engineering professors to develop sensors that will form a key component of a Hydrocarbon Sensor System. This two-year research project is funded through an **Applied Research and Development grant**. The funding supports two Camosun Mechanical Engineering Technology instructors, and two students who will work directly with PBS to complete the project.

A new design will be created for a "smart" storm drain filtration system. Data from the system's monitors, including water-flow and daily temperatures, will be delivered to mobile devices or computers. This data will make it easier for industry, municipalities and government agencies to monitor potentially toxic chemicals flowing through storm drains into marine environments. Costly environmental responses and damage to surrounding ecosystems may be prevented or reduced as a result of this research.

"Big spills make the news, but tons of little spills are happening right outside your door and we are all a part of it. People don't really realize the magnitude of pollution that comes from storm drains alone."

– Mike Ansley, Vice-president of Marketing and Communications, Petro Barrier Systems Inc.

Camosun professor, Will Spaulding, working on the Petro Barrier Systems

Wide-Ranging Benefits of Optical Fibres

QUEBEC: CÉGEP DE LA POCATIÈRE, CÉGEP ANDRÉ-LAURENDEAU, CÉGEP JOHN ABBOTT COLLEGE – OPTECH

Optical fibres carry light efficiently over long distances. Supported by an **Innovation Enhancement grant** in September 2011, the three cégep partners and the affiliated CCTT Optech have built fibre-optic sensors that can be used in an array of fields, including aeronautics, civil engineering, biomedical science, environmental sciences and beyond.

Sensors can be built within the fibres to detect how physical elements such as temperature, distortions, chemical composition and pressure cause the light to fluctuate. At the same time, optical fibre sensors are lightweight, compact and unaffected by static charges or electromagnetic induction.

Optech designs integrated systems for specific applications. The IE grant allows permits Optech to improve its abilities in the digital modelling of fibre-optic components, making prototypes, and producing sensors in various types of glass. For this, Optech partnered with key fibre-optics companies such as IRphotonics and ITF Labs. As a result, six college and university student interns gained unique practical experience over the past year.

"We worked with Optech Montréal to model a waveguide for a special application. Specifically, we had to define the optical and geometrical parameters of a waveguide, and we were very happy with the results."

– Mohammed Saad, Founder and Chief Technology Officer at IRphotonics

Elevating Olympic Athletes to New Levels

BRITISH COLUMBIA: CAMOSUN COLLEGE

As high performance athletes push their limits further and further, and while tiny adjustments make significant differences, technology's role in sport is increasingly important.

Situated immediately behind paddlers such as silver medalist Adam van Koeverden, the MMS device featured prominently at the 2012 London Olympics.

Supported by an **Innovation Enhancement grant**, Camosun College's Applied Research team is developing a Multi-Sport Measurement System (MMS). This advanced technology ecosystem helps Olympic athletes and coaches track, analyze, and refine motion to enhance athletic performance. The Sport Innovation Centre has built expertise in sensors, and technology integration. It has partnered with the Camosun Advanced Manufacturing and Prototyping Centre to deliver a complete "start to finish" world-class product development process.

The Multi-Sport Measurement System employs sensors and customized wireless technologies to offer real-time data collection and post-training analysis and feedback. Results can make all the difference in athlete performance and add to Canadian medal counts.

"By integrating our expertise in sensor technologies, motion capture, rapid prototyping, and electrical, hardware and software engineering we are improving Canadian athletic performance. Training sessions become periods for progressive improvement and more efficient power production."

– Dr. Tim Walzak, Director, Applied Research and Innovation, Camosun College

Novel Training for Canada's Next Generation of Pilots

ONTARIO: SENECA COLLEGE

Studies from the Canadian Council for Aviation & Aerospace suggest that simulation training can effectively enhance skills development in professional pilots. Skills such as threat and error management and crew resource management can be developed efficiently by the use of Flight Simulation Training Devices (FSTD).

Yet there exists uncertainty in the industry about how to incorporate and utilize simulation technologies in flight training programs. With funding support from an **Innovation Enhancement grant**, Seneca College is developing a Best Practices Manual that will help users adopt and integrate FSTD in practice and training.

Faculty and students from Seneca's School of Aviation are conducting research with aviation programs across North America in order to examine and explore the flight simulation training experience and practices of instructors, students, and administrators. Results of this research will help flight training schools, simulator manufacturers, and the aviation industry achieve the productivity, efficiency, and innovation needed to properly adopt and implement groundbreaking flight simulation experiences.

Helping Deliver Revolutionized Health Care

ONTARIO: MOHAWK COLLEGE

Canadian health care is being redefined with electronic health records (EHR) roll out coast-to-coast, which enables hospitals and health care providers from any province to access and share data seamlessly. The federally-funded Canada Health Infoway (Infoway) is defining the architecture of the pan-Canadian interoperable EHR system.

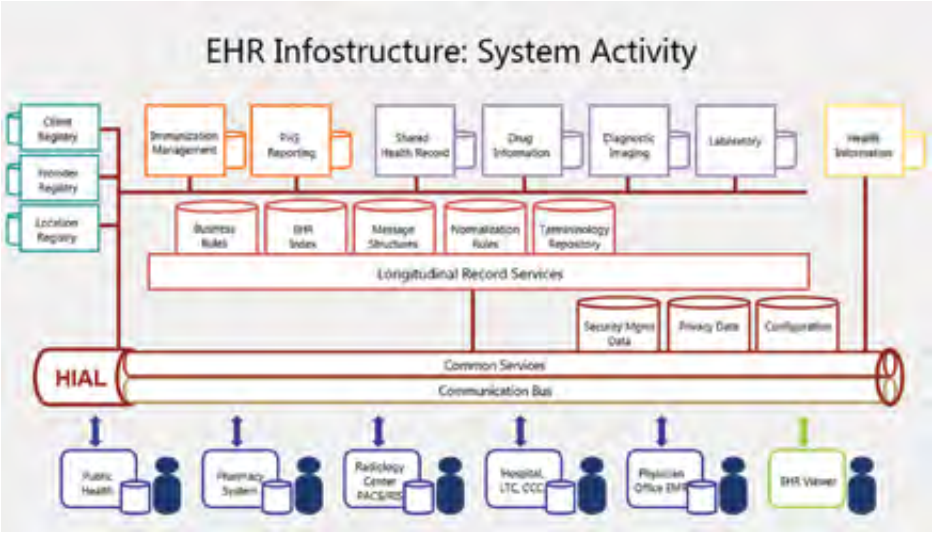
Mohawk College, supported by an **Innovation Enhancement grant**, is developing a method whereby health care organizations and software vendors can test the blueprint standards in a real world scenario.

Mohawk has developed several open source software applications, including Everest, a toolkit that helps programmers develop interoperable, standard compliant systems, in accordance with Health Level 7 standards, the global authority on standards for interoperability of health information technology. The Visualizer maps the flow of information between various systems in the EHR ecosystem. The Shared Health Record permits critical patient data to be stored securely. All tools have been utilized by health IT software vendors and non-profits aiming to adapt to the EHR system.

Mohawk has collaborated with a number of SMEs (Karos Health, ecGroup Inc., mihealth) and non-profit organizations (NetHope, OSCAR, MIRCAM, COACH, SickKids, the Centre for eHealth Innovation) to define health informatics standards, develop tools to implement standards, develop and test health applications and enhance the interoperability of existing applications.

"Mohawk College has done some amazing things for us. They have taken the blueprint we've developed and the standards and privacy and security guidelines, and have actually developed a reference implementation. Now we are able to see for the first time the whole system operational. That's provided us with a lot of benefit and good feedback. It's benefitted the vendors - they're actually seeing some of their products deployed in these solutions. Then jurisdictions can see it operational. Eventually the end users, such as clinicians, get an opportunity to see the system in an operational context."

– Dennis Giokas, Chief Technology Officer, Canada Health Infoway



Seneca

Creating a New Way to Watch Films Online

ONTARIO: SENECA COLLEGE

When one considers popcorn and movies, think not of the buttered treat but instead Popcorn.js – a new way for web filmmakers to create videos with innovative interactive components.

Seneca has leveraged an **Innovation Enhancement grant** to partner with search engine giant Mozilla on this groundbreaking initiative. Its focus is enhanced video-viewing experiences, created out of the college's Centre for Development of Open Source Technology (CDOT), through features such as additional video and audio tracks, web-based maps, live Twitter or Facebook feeds.

"The Popcorn project is a joint venture with Mozilla to create the technology and tools necessary for filmmakers and other storytellers to use the web as a medium. Popcorn makes it possible for programmers and non-programmers to create complex visual narratives and time-based, interactive media experiences using open web standards without the need for proprietary plugins."

– David Humphrey, Professor, School of Information and Communications Technology, Seneca College

Popcorn.js and its online web application, Popcorn Maker, were released in London, England at the November 2012 Mozilla Media Festival. Its success stemmed from the work of 15 Seneca students and faculty.

"CDOT has been instrumental in the success of Popcorn. David Humphrey's team has made an extraordinary contribution to the HTML5 ecosystem that advances the capabilities of developers, media makers, and video creators on the web."

– Brett Gaylor, Mozilla's Lead of the Web Made Movies project

Brett Gaylor, Mozilla's Director of Popcorn, Announcing the Release of Popcorn Maker 1.0 November 11, 2012

Without the need to download plugins, viewers can immediately be immersed in Popcorn-enhanced video content in all modern browsers.

The project has already borne fruit. Seneca has worked with filmmakers in New York, San Francisco, Toronto, and Boston on productions using Popcorn.js, and the platform has been used by documentary filmmakers to tell the story of the uprising in Egypt, the plight of people living in Burma, and the economic crisis in the United States.

The National Film Board created *One Millionth Tower* using Popcorn.js. It was recently named "Best Original Program Produced for Digital Media, Non-Fiction" at the 2013 Canadian Screen Awards.

Seneca

Building Software for Energy-Efficient Computers

ONTARIO: SENECA COLLEGE

The Raspberry Pi is a new, fully functional computer that sells for less than $40. It features software built and adapted with the help of Seneca students and faculty, and both consumers and the environment will benefit.

With funding from an **Innovation Enhancement grant**, Seneca's **NSERC Industrial Research Chair for Colleges**, Chris Tyler, and students from the Centre for Development of Open Technology (CDOT) collaborated with the Raspberry Pi Foundation to retool its existing Fedora Linux operating system. The project was successful, turning the Raspberry Pi hardware into a computer that is surprisingly capable despite consuming very little energy.

It has not gone unnoticed. The early popularity of the Pi prompted Google Trends to declare "the Raspberry Pi was more popular than Lady Gaga."

This software release marks an important milestone in CDOT's applied research in building open source software for emerging low-energy ARM systems. ARM chips are known for combining a high level of functionality with extremely low power consumption. This software will power a new generation of computer systems, ranging from the Raspberry Pi, to new models for the "One Laptop Per Child" program that aims to provide low income or disadvantaged children with low-power computers, to high-density server systems that consume a tiny fraction of the power used by traditional data centres.

"Seneca students and faculty have helped to make Raspberry Pi a reality. As a free software-based platform, we're very dependent on Linux and the open source community at large to provide our users with a working environment complete with programming languages, productivity applications and educational software."

– Eben Upton, Director, Raspberry Pi Foundation

Exploring the Future of Cinema: High Frame Rate 3D Research

ONTARIO: SHERIDAN COLLEGE INSTITUTE OF TECHNOLOGY AND ADVANCED LEARNING

High Frame Rate (HFR) filmmaking, the technology pioneered in Peter Jackson's The Hobbit, could be the most significant change to the movie-going experience since the addition of sound in the 1920's. Sheridan College's Screen Industries Research and Training (SIRT) Centre recently embarked on a major HFR 3D research project to help the Ontario and international digital media community understand the challenges and opportunities associated with HFR cinema. Project partners include Christie Digital Systems and a broad group of industry associations and companies. Funding support was provided by an **Applied Research Tools and Instrument grant**, and an **Innovation Enhancement grant**.

SIRT's workshop at Pinewood Toronto Studios has been equipped with 22-foot screens and a Christie Solaria 4K projector capable of 2D, 3D, and HFR 3D display. As the first stage, SIRT coordinated a shoot designed to capture different types of shots at various frame rates and shutter degree angles. The shoot involved respected stereographers, consultants and technicians and provided the basis for further investigation.

Project results are already being disseminated to industry professionals and academics, giving them a better understanding of the resources and decision-making involved for HFR. Research outcomes and material from SIRT's shoot were presented at SIGGRAPH 2012 and at 3DFLIC's HFR workshop at SIRT in Fall 2012.

"Our major HFR research goals are to help visionary filmmakers perfect HFR image capture and processing, and to ensure exhibitors have the best infrastructure possible to showcase the immersive HFR experience. Sheridan's SIRT Centre is already helping us accomplish this goal in Ontario, supporting our work with world-class testing and educating our colleagues on the many opportunities of HFR."

– Roy Anthony, Senior Solutions Architect, Christie Digital Systems

Manufacturing

Canada's manufacturing sector encompasses industrial products, food and beverage, textiles, plastics and chemical products, and construction and building products and technologies.

Manufacturing is the largest single business sector in Canada representing 1.8 million Canadians or 10.5% of the workforce. It constitutes $166 billion in GDP, 14% of Canada's total. (Canadian Manufacturers and Exporters website). While Canada's manufacturing sector has been challenged in recent years by low-cost offshore competitors, a high dollar, and reduced demand through the recent global recession, it is still responsible for a large part of Canada's prosperity. A Royal Bank of Canada report in 2012 noted that, despite these challenges, Canada's manufacturers are performing fairly well, led by led by small- and medium-sized companies.

Crucial to the ongoing health of the manufacturing sector will be its ability to innovate, adapt new technologies, and bring to existing and new markets new or improved products. Canada's colleges are helping their regional manufacturers meet these opportunities.

Collège Édouard-Montpetit

A Development Service for Avionics Systems

QUEBEC: COLLÈGE ÉDOUARD-MONTPETIT – CENTRE TECHNOLOGIQUE EN AÉROSPATIALE (CTA)

Thanks to a **Technology Access Centre grant**, Collège Édouard-Montpetit and its affiliated CCTT Centre technologique en aérospatiale (CTA) will offer an avionics systems development service for this strategically important sector of the regional economy. CTA, with the expertise of a college-based avionics technician and an aeronautical engineer will:

- assist with aircraft electronics systems;
- design HALT (Highly Accelerated Life Test) and HASS (Highly Accelerated Stress Screen) profiles for avionics systems in an effort to make equipment sturdier;
- undertake environmental tests for compliance with the DO-160 standard; and
- integrate technologies through flight tests using aircraft from the École nationale d'aérotechnique.

Industrial partners, the Collège Édouard-Montpetit and CTA team

A number of companies have come forward to support the Technology Access Centre, including Thales, Esterline—CMC Électronique, Marinvent, and Technology Harness Scanner. The certification service for the DO-160 standard is being offered in partnership with the Centre de recherche industrielle du Québec.

"CTA's new avionic service reduces our risk and accelerates the development of new avionics which makes us more competitive globally."

– Daniel Guertin, Director, CMC Électronique

A researcher at CTA conducting a shearographie test on composite material

Supporting Innovation in Manufacturing and Aerospace

MANITOBA: RED RIVER COLLEGE

Red River College's **Technology Access Centre** provides Manitoba's aerospace and manufacturing sectors (particularly SMEs) with enhanced access to technological assets, specialized facilities and expert opinions. It is a portal connecting industry to the college for applied research projects, technical service activities and technology diffusion and training, which contributes to local innovation and productivity gains.

The Centre is a site for applied research to test and validate new processes or materials. It delivers technical services, such as printing a rapid prototype or conducting inspection tests. Offering seminars, workshops and customized training, the Centre is also an effective and affordable way for professionals to develop their skills. This results in more highly qualified personnel, problems solved, rapid technology and knowledge transfers, and improved products or processes.

Students and faculty benefit from the Centre's close link with industry, which is already leading to major technological success. One Centre researcher is working on a fibre laser Gas Metal Arc Welding hybrid welding system for aerospace aluminum alloys. Its laser beam and unique arc work together to boost welding speed and penetration, reduce cracking, improve gap and misalignment tolerance, and conduct single pass welding of thick sections.

The college is also reviewing technology roadmaps for advanced manufacturing around the world to identify emerging technologies that could enhance local productivity. This will have a significant impact for small companies that have minimal time to plan technology acquisitions or long-term product development.

Making Huge Strides in Olympic-Caliber Footgear

BRITISH COLUMBIA: CAMOSUN COLLEGE

Designed by athletes and proven by science, a groundbreaking performance-enhancing footgear has been engineered to protect the foundation of an athlete. It is called "DRYFEET," and stems from the same team developing gear for U.S. Navy Seals. DRYFEET is a water repellant footwear cover for rugby and soccer cleats, repelling 95% of moisture that would otherwise seep through.

To ensure that the product would live up to a high performance athlete's expectations, DRYFEET partnered with the Sport Innovation Centre (SPIN) at Camosun College, the recipient of an **Innovation Enhancement grant**. SPIN is the premier equipment testing and leading edge technology integration facility for Canada's Olympic and elite athletes.

SPIN acted as a full testing facility for DRYFEET. Researchers devised tests for abrasion, tensile strength, thermoregulation, performance enhancement, water ingress, and water retention. The facility helped prove that the product is ready for market and up to the highest standards.

"After 24 months, 22 product iterations, and numerous obstacles defied, we nailed it. SPIN has been an integral partner in our R&D process to both validate and enhance the performance of our curve-jumping miraculous innovation, DRYFEET Performance Footgear. Their facilities and the minds working there are world class."

– Matt Weingart, Co-founder, DRYFEET

Building the Green Home

ONTARIO: GEORGE BROWN COLLEGE

George Brown College has teamed with a renewable energy-focused company to develop a new technology called the "Heart Transverter". Enabled by an **Innovation Enhancement grant**, and a Canada Foundation for Innovation grant, this technology improves renewable energy connections on the electrical grid by removing instabilities created by solar or wind energy.

The research is led by the Centre for Construction and Engineering Technologies, along with a team of student researchers from the Electro-Mechanical Engineering Technician program. The collaboration brings the college together with Butterfly Energetics Inc. (BEI), a systems integration company developing sustainable renewable energy solutions.

The first project phase is complete, and the research team is proceeding to collect baseline data to compare AC and DC power sources to gauge performance. The goal: to develop and test the Heart Transverter as a power supply for new and efficient LED lighting systems and battery technology. Once complete, testing of the technology can begin in a complete 'smart' automated home, enhancing the Heart Transverter's potential market share as an efficient method of coordinating renewable sources of power such as residential solar or wind energy.

Boosting the Fortunes of Local Business Through 3-D Technology

QUEBEC: CÉGEP RÉGIONAL DE LANAUDIÈRE

An **Applied Research Tools and Instrument grant** allowed the Cégep Régional de Lanaudière's Centre d'expertise et de formation en design industriel (CEFdi) to acquire two 3-D printers and a portable scanner to enhance expertise in the use of rapid prototyping technologies for research projects. The Centre serves regional businesses by providing a rapid-prototyping lab to test potential 3-D printing and digitization applications.

3-D technology has had an immediate impact on local businesses. For example, one company had 3-D parts "printed" (produced) using both new machines. The parts were then adjusted and validated. Thanks to PVC thermoforming performed directly on the printed prototype, the college was able to use the parts in real-world tests. Researchers were able to save time and costs associated with developing new products, enabling them to identify the ideal technology for the application.

The new equipment benefits students through instruction on the features and functionality of the equipment as part of their regular academic program. Students have been able to secure internships in work settings that use 3-D printing for rapid prototyping.

One Year Old and Deep Ties in Local Industry

BRITISH COLUMBIA: CAMOSUN COLLEGE

Victoria is home to over 800 technology-based companies with an economic impact of $2.5 billion. Through a **Technology Access Centre grant**, CamosunTech provides a suite of innovation enhancement services suited to the broad range of local companies.

Services range from 3-D scanning and computer modeling, to rapid prototyping and additive manufacturing, or large-scale multi-axis milling for the composites industry, including access to a variety of design services involving college faculty and students.

Since its inception in spring 2012, CamosunTech has produced over 1,000 prototypes for dozens of local companies. The Centre has also provided the foundation for a number of **Applied Research and Development grants** that partner faculty and students with local industry.

Scott Plastics Ltd. (Scotty) is one such example. Initially creating prototypes for Scotty, it was apparent that rapid prototyping technology might be applicable to the injection molding process, enabling rapid mold production for short-run manufacturing, and opening a new market for the company. In another CCI-funded project, the College designed a rugged housing for Reach Technologies Inc., a design the company plans to produce in Victoria and take to market. This is the full circle: faculty are engaged with their community, students learn on relevant projects and gain relationships that foster future job opportunities, and companies benefit from enhanced local innovation capacity.

In the near future, CamosunTech will focus on the composites industry, and increasingly support local companies that develop autonomous aircraft/drones, thus growing its relationship with the local aerospace industry.

"Forest Technology Systems has found the Camosun Applied Research team as responsive, fast, and they always deliver an excellent product. Affordable local rapid prototyping has now become a critical part of our product design process."

– Phil Jones - Director of Operations, Forest Technology Systems Inc.

"At Starfish Medical, we have been using Camosun's prototyping services for about two years and we are very pleased with the relationship that has developed between our design team and Camosun's Applied Research team. Camosun has become an important local resource for Starfish."

– John Walmsley, VP Product Development, StarFish Medical

Major Players on Board with Aerospace Research

QUEBEC: COLLÈGE ÉDOUARD-MONTPETIT – CENTRE TECHNOLOGIQUE EN AÉROSPATIALE (CTA)

Through an **Innovation Enhancement grant** Collège Édouard-Montpetit and CTA are leading a five-year research program to inspect aerospace components in composite materials in partnership with seven aerospace companies: Delastek, Marquez Transtech, FDC Composites, L-3 MAS, Héroux-Devtek, Pratt & Whitney Canada and Bombardier. The research involves applying non-destructive inspection technologies such as thermography, shearography, ultrasound lasers and laser dimensioning to composite materials.

Researchers aim to design reliable ways to inspect the quality of parts while in production and during service on aircraft. The grant has led to spin-off projects which include robotizing a laser ultrasound, creating standardized coupons for the calibration and qualification of technologies, and classifying identifiable defects based on the type of part and application.

Thirty college interns worked with an expert team of three Édouard-Montpetit professors and CTA technicians and engineers. In the first year, the group set up the equipment, delivered a lecture on ultrasound-laser inspection at the Colloque aérotechnique 2012, organized thermography training sessions for team members and industry partners, and partnered with the Centre spatial de Liège to promote the initial projects and knowledge gained.

"CTA's new avionic service reduces our risk and accelerates the development of new avionics which makes us more competitive globally."

– Daniel Guertin, Director, CMC Électronique

New Directions in Sports and Wellness Research

ALBERTA: SAIT POLYTECHNIC

SAIT Polytechnic received an **NSERC Industrial Research Chair for Colleges grant** that will support a research Chair to manage Sports and Wellness Engineering Technology at the polytechnic institute.

SAIT has long worked on sport engineering projects for national sports federations in bobsleigh, luge, alpine skiing, and speed skating. In March 2012, SAIT created the Sports and Wellness Engineering Technology Institute to offer specific expertise and access to specialized equipment – with emphasis on prototype design and fabrication, and mechanical design engineering.

The NSERC Industrial Research Chair, Dr. Alex Zahavich, will fill an identified gap in technology development and transfer within the sports, recreation and wellness industry, and act as a central resource to assist national sports organizations and health and wellness companies in the design, fabrication, and testing of new technologies. The Chair will also add new knowledge into curriculum and will increase opportunities for student capstone projects focused on sports and wellness technologies.

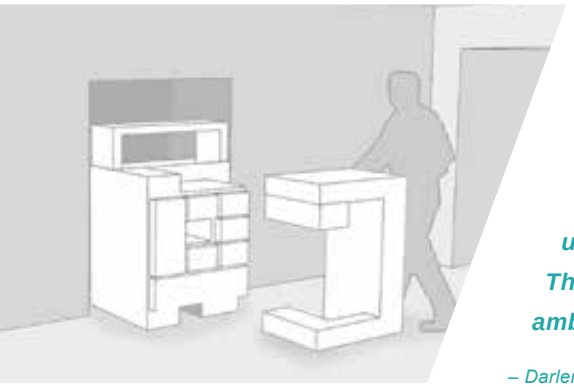
Dr. Alex Zahavich, NSERC Industrial Research Chair for Colleges in Sports and Wellness Engineering Technology, SAIT Polytechnic

Improving Health Care Efficiency through a Robotic Ambulatory Cart

BRITISH COLUMBIA: EMILY CARR UNIVERSITY OF ART + DESIGN

Providence Health Care is collaborating with Emily Carr University to design and test a robotic ambulatory cart to be used by clinicians in a new ambulatory care building at the St. Paul's Hospital campus. This is an ideal collaborative project supported by an **Innovation Enhancement grant**.

Under the guidance of the Director of the Health Design Lab, research assistants are working with Providence Health Care to develop a cart that will facilitate the multi-functionality of treatment rooms, in support of cost savings as space and supply utilization are improved and waste is reduced. The carts' inventory would be customized daily for the specific needs of clinicians and scheduled patients. The robotic cart would make its way to a clinician's treatment room for use during the day, and return on its own for replenishment at pre-set intervals.



"The collaboration with Emily Carr has been invaluable to us in helping us conceptualize and articulate the development of this piece of equipment. The students' design will absolutely contribute to the success of our new ambulatory building."

– Darlene MacKinnon, Chief Clinical Planning Officer, Providence Health Care

Partnering With Bombardier for Laser Welding

QUEBEC: CÉGEP DE LA POCATIÈRE – SOLUTIONS NOVIKA

Welding is critical to quality and production capacity in the construction of railroad cars. Bombardier Transport Amérique du Nord (BTAN) and Solutions Novika, the CCTT affiliated with Cégep de La Pocatière, have worked since 2008 on the development of laser-welding processes as part of a research and development project funded by an **Innovation Enhancement grant**.

The industry-academia partnership has optimized BTAN's laser-welding process during manufacturing, introduced novel techniques and applications, overcome technological limitations, and transferred expertise to BTAN employees.

Laser welding has improved productivity with a 90% reduction in machine time. Through this improvement, BTAN has built products whose aesthetics surpass those obtained through conventional welding methods. Additionally, BTAN/Novika's recent innovations in hybrid laser-gas metal arc welding have produced much stronger joint welds, allowing the company to make and re-engineer lighter, more environmentally friendly products at lower costs.

Partners have acquired in-depth expertise based on practical experience with laser welding. BTAN has successfully incorporated the advantageous process into its manufacturing activities, while Novika has provided business clients with a new range of services and gained greater visibility in the industry.

Expanding Product Offerings on the Global Market

BRITISH COLUMBIA: CAMOSUN COLLEGE

Camosun's Centre for Applied Research and Innovation has completed a project that linked the college's Mechanical and Electronics Engineering Technology departments with industry partner ESI Environmental Sensors Inc.

Supported by an Applied Research and Development grant, researchers have designed and developed a "Profile Moisture Sensor Probe System." The moisture probe system has allowed ESI to expand its product offerings on the global markets related to agriculture, research, and turf care.

The joint project involved mechanical and electronic design challenges to create a scalable profiling sensor probe housing, as well as a cost-effective and more sensitive sensor system. This is the first research project with an industry partner where both mechanical and electronics technology engineering staff and students benefitted from working collaboratively.

"For the past eighteen months, Camosun College staff and students have worked with our company to enhance our technology research and product development in both mechanical and electronic engineering. These efforts have had a significant impact on our achievements, which are now translating into the commercialization of new products for our customers and markets. There is more opportunity ahead and we hope to continue to benefit from future research in conjunction with Camosun in order to further expand our development capabilities and efforts."

– Bernard M. Beauchesne, Chief Operating Officer, ESI Environmental Sensors Inc.

Increasing Flexibility and Reducing Cost for Robotic Welding

QUÉBEC: CÉGEP DE LÉVIS-LAUZON – CENTRE DE ROBOTIQUE ET DE VISION INDUSTRIELLE (CRVI)

Thanks to funding from an **Applied Research Tools and Instruments grant**, CRVI, affiliated with Cégep de Lévis-Lauzon, purchased a multi-robot cell in which three robots and a MIG welding source work together to perform what is known as jigless robotic welding. Specifically, two manipulation robots are equipped with smart grippers that enable them to grasp and assemble parts to be welded. The third robot supports the MIG torch so that the parts can be welded without the use of external jigs (or templates), which normally requires several jigs to lock the assembly in place. Templates can be expensive because they have to be designed, produced, validated, maintained and, when needed, modified to repair wear and tear or to fit with new components. The associated costs can balloon if a company has to produce high-volume welds or assemblies.

The cell's technology and reliance on robotics eliminate many of the jig or template costs. While introducing new technology requires other investments such as training and programming time, physical maintenance and storage expenses are reduced. The flexibility offered by the cell is superior to traditional methods and once the required programming skills have been learned, the costs linked to parts modifications drop significantly.

That is because changing a part simply calls for a programming adjustment, and not a physical modification to a jig.

This new process holds plenty of promise for companies already using robotics, and over the next few years, technological advances will allow more companies to benefit from its use.

Building a Hub for Breakthrough Products

ALBERTA: NORTHERN ALBERTA INSTITUTE OF TECHNOLOGY (NAIT)

In under a year, the Nanotechnology Centre for Applied Research, Industry Training and Services (NanoCARTS) has brought nearly $3 million in projects to the Northern Alberta Institute of Technology (NAIT).

NanoCARTS was created to serve the nanotechnology and micro-technology needs of small- and medium-sized enterprises (SMEs) in the areas of prototyping, product development and enhancement, testing, training and characterization. NanoCARTS was established with funding from a **Technology Access Centre grant**, with additional funding from Alberta Innovates Technology Futures.

The first of two major projects includes collaboration with Alberta Nano-Monitoring Systems (ANMS) to develop local applications for the company's breakthrough particle size analyzer. The second is to develop an online portal for Alberta's nine micro-technology and nanotechnology service providers and small business partners. The portal will be a hub for potential clients and existing service providers to draw together and access useful industry information.

"Like many other high-tech start-ups, we have been looking to expand our activities to international markets. NAIT's unique combination of technological and business infrastructure together with dedication to nanotechnology will provide ANMS with a powerful partner for developing our product."

– Dr. Meir Teichner, CEO of ANMS

ANMS will employ provincial engineers and other staff to develop and distribute its product in North America, beginning in Alberta.

"The project provides a tremendous opportunity for NAIT academic staff to participate in developing a nanotechnology system that is cutting edge. Faculty will be applying their expertise in the development of the various prototypes.They will also develop new technologies and enhance their skills as the project proceeds."

– Dr. David Carpenter, Associate Vice-President Academic and Applied Research, NAIT

Improving Local Designs through Reverse Engineering

ONTARIO: NIAGARA COLLEGE

Faro Arm mechanical engineering equipment, purchased through an **Applied Research Tools and Instruments grant**, increases Niagara College's capacity in reverse engineering and its ability to provide products and innovative solutions to local businesses.

Parametric modeling enhances product analysis and design to manipulate data that brings about a new version of a component. Taken one-step further, 3-D printing creates a rapid prototype of the modified component that can then be analyzed further. Many versions may be developed to achieve the best design – all quickly and cost-effectively.

"Increasing our capacity in reverse engineering further enhances our position as a strong partner for industry, as it provides us with the capability of undertaking advanced applied research projects and provides high quality training for the workforce of tomorrow."

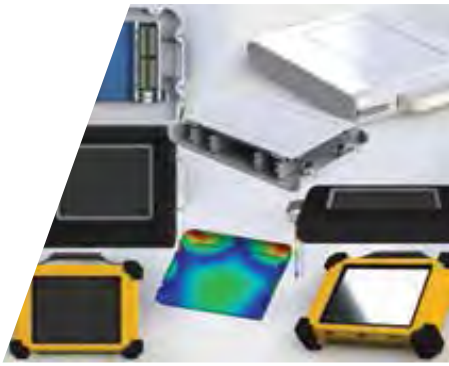
– Al Munro, Professor, Mechanical Engineering Technology, Niagara College

An excellent example of the benefits of the Faro Arm in manufacturing design is Niagara's work with Koppers Fishing & Tackle Corp. Designed with great care, Koppers' fishing lures are arguably the most accurate, life-like lures in the industry. The five-year-old company has worked closely with Niagara Research to develop a process for employing rapid prototyping techniques in the development of fishing lures. Prior to this research project, Koppers Fishing relied on foreign services for lure mold manufacturing. To give Koppers more control over their intellectual property and product quality, the college research aimed to localize this process. Researchers provided Koppers with a proven method for reverse engineering their current lures to create a CAD database that they can use for future mold manufacturing.

Using Rapid Prototyping to Produce Molds for Short-Run Injection Molding Applications

BRITISH COLUMBIA: CAMOSUN COLLEGE

A new college-industry partnership sprouted on Vancouver Island, supported by an **Applied Research and Development grant** focused on rapid tooling for injection molding.



The company is Scott Plastics Ltd., made up of many divisions such as Scotty Fishing, Scotty Paddlesports, Scotty Fire, and Scotty Motorsports. Scotty distributes to over 30 different countries, shipping to six continents. Scott Plastics is working with Camosun College and its team of manufacturing experts.

This one-year research project will support instructional release for a Camosun Mechanical Engineering Technology instructor from the School of Trades and Technology. The expected outcome from this project will be a greater understanding of how to apply rapid prototyping techniques to produce molds for short-run injection molding applications.

The results of the project will enable Scott Plastics to attract a new market, one that until now has existed primarily in Asia.

"Scott Plastics Ltd. has had an extremely positive experience working with the applied research team at Camosun College. Our projects have been handled expertly and efficiently with a well-educated team of professionals. The team at Camosun takes the care to understand not only our present needs but stays ahead of the curve in anticipating what resources we will need in the future. The applied research funding that Camosun has received has benefitted Scott Plastics Ltd. directly, in that we have been able to utilize a resource that either did not previously exist or was only available in the U.S."

– Jeff Lewis, Project Manager, Scott Plastics Ltd.

Thermal Vacuum Deposition System and Glovebox

ONTARIO: NIAGARA COLLEGE

Organic photovoltaic technology (or organic solar cells) has come to be regarded as one of the most promising alternatives for providing a low cost, clean and renewable energy source. The thermal vacuum deposition equipment purchased through an **Applied Research Tools and Instruments grant**, has enabled Niagara College students to expand their skills by including the study of organic materials and their distinctive properties within course curriculum and applied research projects. In addition, the equipment has enabled the college to develop partnerships with academic institutions in Ontario and abroad. Niagara Research, Niagara College's Research & Innovation Division, has developed a joint partnership between the Engineering School at McMaster University, the Display Technology School at Hoseo Univerity, South Korea, and the Photonics Program at Niagara College. A graduate student of McMaster University, advisors of both Hoseo University and McMaster University, and a Niagara College Photonics Researcher collaborate on the Thermal Vacuum Deposition System and Glovebox to study organic materials in the pursuit of renewable and sustainable technologies.

Painting the Future with Textile Technologies

QUEBEC: CÉGEP DE SAINT-HYACINTHE – CENTRE D'EXCELLENCE DES TECHNOLOGIES TEXTILES GÉOSYNTHÉTIQUES ET MATÉRIAUX SOUPLES (GROUPE CTT)

The future of Canadian transport, defence, health and construction will be heavily influenced by technical textiles. Canada is poised to be a leader in this technology field, where textiles have become an essential component of tomorrow's cutting-edge products. Advances in innovation of Canada's domestic textiles industry will support job creation and retention, reduce our environmental footprint, and improve conditions for employees and patients.

At Cégep de Saint-Hyacinthe and its affiliated centre Groupe CTT, Professor Olivier Vermeersch, the **NSERC Industrial Research Chair for Colleges** in Innovative Technical Textiles, will lead research teams focused on the following priorities:

- sustainable development, sustainable construction, and re-use;
- protection, safety, comfort, and toxicity; and
- smart textiles.

Organizations and companies that require optimized protective clothing for first responders or military personnel or that need to reduce the weight of composite parts for vehicles, need technologies that keep them ahead of the competition. There are many examples of innovation in this field: textiles to protect military personnel and weapons; carbon fibre structures for composites designed to improve the safety and energy efficiency of aircraft and automobiles; textiles embedded with physiological sensors for early detection of problems in ambulatory patients or extreme-condition workers; and systems that integrate all the necessary components of building construction.

Olivier Vermeersch, NSERC Industrial Research Chair for Colleges in Innovative Technical Textiles, Cégep de Saint-Hyacinthe

Industry partners – Belt-Tech Products, Stedfast, Soleno Textiles, Filspec and Logistik Unicorp – are leaders in their respective segments of the local textile sector. They commercialize patented products developed in partnership with Groupe CTT, a key partner of the Chair. As the founding members of the Industrial Research Chair for Colleges position, they rely on innovation as their corporate development strategy in a demanding business climate, collaborating along the entire value chain.

Leading the Charge in Sustainable Light Technology

ONTARIO: NIAGARA COLLEGE

The Radiometric and Photometric measuring equipment, purchased through an **Applied Research Tools and Instruments grant**, has been installed at Niagara College. This equipment enhances Niagara College's capacity to meet the innovation needs of local companies and industry leaders with a commitment to grow and promote the development of energy efficient and environmentally sustainable light technologies within Ontario and throughout Canada. There have been several industry partner inquiries for utilizing the equipment, most recently from a partner looking for LED light testing.

By adding a radiometric and photometric measuring equipment suite to its existing facilities, the Niagara College can now prepare students to advance, foster and lead the next stages of lighting technology innovation. As Photonics Engineering Technicians and Technologists, Niagara College's photonics graduates offer employers a strong background in laser, vacuum and fibre optic technologies.

"The last five years have brought about substantial change in the lighting industry, especially the evolution of solid-state lighting. The new equipment will greatly enhance the student experience because it gives students the chance to work with the cutting-edge products in their field of study."

– Alexander McGlashan, Co-Coordinator, Photonics Program, Niagara College

Improving the Energy Efficiency of Buildings

MANITOBA: RED RIVER COLLEGE

A leader in applied research for building infrastructure, Red River College received an **Innovation Enhancement grant** for its Centre for Sustainable Infrastructure. In June 2012, the College's Sustainable Infrastructure Technology Research Group (SITRG) completed air leakage testing on a 16-storey, 191,000 square-foot office building in Winnipeg (363 Broadway).

The tests relied on the significant involvement of students in the Mechanical and Electrical Engineering Technology programs. Air leakage is a critical factor in a building's energy use, durability, air quality, and comfort. The 363 Broadway test revealed a 16% improvement in air tightness after retrofitting – important data for the owner and the design team responsible for the retrofit.

Buildings are being erected or retrofitted with increasing consideration towards energy efficiency and sustainability. However, air tightness is rarely tested. While air leakage testing has been gaining recent attention in the U.S. and the U.K., very few tests have been performed in a climate such as that in Manitoba.

The research team will also help establish a database on the air tightness characteristics of new and existing commercial buildings in Manitoba. Expanding on these tests, SITRG is partnering with Manitoba Hydro to perform air leakage testing on 20 more commercial buildings.

The initial grant through the College and Community Innovation Program has jumpstarted a widespread efficiency in energy use within the province's buildings.

"We will test a subset of buildings pre- and post-retrofit to determine the feasibility of cost-effective air sealing strategies. This approach will provide valuable feedback on how to improve the design, construction, and operation of commercial buildings."

– Harry Schroeder, Principal Project Proponent, Manitoba Hydro

Unique Vest to Monitor Athletes' Health Remotely

QUEBEC: CÉGEP MARIE-VICTORIN – CENTRE DE RECHERCHE ET D'INNOVATION EN HABILLEMENT (VESTECHPRO)

Imagine a hockey player practicing on the ice and a doctor miles away assessing his or her health in real-time. Imagine no longer, as Carré Technologies in Montreal has created a revolutionary "smart vest" that will soon reach the market.

With typical athlete performance tests both cumbersome and outdated, the vest delivers an athlete's vital signs straight to their doctor, with no disruption. Sensors embedded in the material record electrocardiogram readings, as well as thoracic and abdominal respiration rates. The data are sent to an iPod through a small Bluetooth device, and then are processed automatically by a software application.

The challenge was to design a light, flexible garment able to capture signals no matter how an athlete from any sport is moving. The design went from concept to prototype with the emergence of mobile computing, and VESTECHPRO, affiliated with Cégep Marie-Victorin, produced an initial run of 100 vests.

"As engineers, we knew how to create the software for the vest. The complicated part was the fabric. The folks at Vestechpro aren't just experts in the field; they're artists. They helped us avoid a number of stumbling blocks. It's been delightful working with them."

– Yvan Ouellet, Vice-President, Business Development, Carré Technologies

This college - industry partnership, supported by an **Applied Research and Development grant**, will lead to the creation of a full line of garments. The demand is already high, with orders from many organizations including the Canadian Space Agency and the Quebec Major Junior Hockey League.

"Carré Technologies is very open to new ideas. It has a young, energetic and creative team with more than one invention under its belt."

– Christine Harding, Director, Research and Development, Vestechpro

Helping a Small Electronics Company Design and Develop Test Equipment for New Markets

BRITISH COLUMBIA: CAMOSUN COLLEGE

Reach Technologies Inc. is a small, established enterprise with five full-time employees that develops products to diagnose pre-failure symptoms in a variety of equipment. This allows for preventative maintenance rather than costly repairs resulting from equipment failure. The company's electronics design and production capacity is strong and it is well-established in the market.

Reach has traditionally served the aerospace industry, but market demand has spread into the rail and marine sectors, which need this testing equipment to predict equipment failure. However, the company needed help to take advantage of this new market.

Lacking an in-house mechanical design department, Reach Technologies Inc. partnered with Camosun College, utilizing student involvement and, where possible, hiring them upon graduation. The partnership, supported by an **Applied Research and Development grant**, first led to the development of a "Ruggedized Housing for Electronic Test Equipment." The housing incorporated an inside-mounted Android and Apple tablet user interface, a customizable area for switches and connectors, a mounting area for proprietary circuit boards, and a battery/charging system which had been previously developed by Reach Technologies. The result is a new prototyped product ready for first-run, small scale manufacturing.

"On this project we were faced with a need for specific expertise which we don't have in-house. The grant enabled us to work with Camosun and gave us access to that expertise in the form of faculty and students, as well as the state of the art rapid prototyping capability on campus. Funding product development is always a challenge for small companies, but working with Camosun has enabled us to develop a market-ready product far earlier than would have otherwise been possible."

– Kevin Westwick, Chief Financial Officer, Reach Technologies Inc.

Environmental Sciences and Technologies

The environmental sciences and technologies sector engages many other economic sectors, including manufacturing, agriculture and information technology. In many ways, this is a “cross-over” sector that establishes environmental principles and goals for long-term sustainability. Environment Canada’s Science Plan articulates goals that include strengthening the role of environmental science in supporting environmental quality, human health and safety, and economic prosperity.

The Science Plan identifies areas of challenge and opportunity that include strengthened predictive models, conserving natural capital, and resilience of ecosystems and the water supply. Improving standards of living through the protection of human health, environmental conservation, and efficient use of resources requires the integration of environmental, economic and social priorities into policies and programs and requires action at all levels - citizens, industry, and governments.

Colleges across Canada build environmental principles and methods into projects in other sectors and conduct applied research projects focused on environmental sustainability goals and solutions.

How Seedlings Enhance Oil Sands Reclamation Efforts

ALBERTA: GRANDE PRAIRIE REGIONAL COLLEGE

It is generally acknowledged that winter is not the best time to plant tree seedlings. Yet Grande Prairie reports a survival rate of 94% when black spruce seedlings were planted in temperatures of -17°C.

Winter planting is one component of the Pollutants to Products (P2P) initiative, funded by an **Innovation Enhancement grant**. In the overall project, pollutants/wastes were turned into useful products using trees and micro-algae. This winter planting project was designed to enhance reclamation of wetland forests disturbed by bitumen exploration, and is financially supported by the Oil Sands Leadership Initiative (OSLI).

“Adding to its extensive list of regional and national industry partners, the P2P Initiative is proud to now also be part of sustainable solutions in Alberta oil sand development.”

– Dr. Weixing Tan, P2P Principal Investigator

The frozen ground is first broken with a backhoe, which results in mounds of peat being created that expose the deep, warm soils, where the black spruce seedlings are then planted. The roots successfully take hold and the seedlings survive. The results are so positive that OSLI has already put the technique into practice.

“This unique concept of planting trees in winter time 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.”

– Jeremy Reid P.Biol., Environmental Specialist, Nexen Inc.

This project’s success was highlighted by Suncor’s CEO as one of the major innovations in oil sand reclamation effort. The performance of planted seedlings will be closely monitored over the next several years.

Developing an Enviro-Friendly Substitute for Coal

QUEBEC: CÉGEP DE L'ABITIBI-TÉMISCAMINGUE – CENTRE TECHNOLOGIQUE DES RÉSIDUS INDUSTRIELS (CTRI)

With funding from an **Applied Research and Development grant**, the CTRI, affiliated with Cégep de l'Abitibi-Témiscamingue has collaborated with FP Innovations and the Quebec Consortium for Industrial Bioprocesses Research and Innovations to launch a research program for developing value-added products from residual forest biomass. The aim is to optimize the process of converting forest biomass into biochar within certain parameters.

There is vast potential for developing new products from biochar. These can be commercialized for power and fuel production to replace traditional sources of fossil fuel energy. They may also be used to replace traditional bituminous coal in specialized applications, such as the treatment of liquids and gas. Substituting biochar for fossil fuels will also help lower the industry's ecological footprint and reduce greenhouse gas emissions.

This innovative project will consolidate and diversify the forest products transformation field in Abitibi-Témiscamingue. It will also open new opportunities in the field of carbon and fossil energy development, areas so far unattainable by the forest industry.

"Torrefaction of biomass will allow us to produce a material (biochar) comparable to mineral coal, which can be used directly in existing burners/atomizers without major modifications or investments. Furthermore, many more added-value byproducts can be produced. Industries are now searching for options to reduce their energy expenses and torrefaction seems to be an interesting economic solution."

– Airex Énergie

Developing Forest Carbon Management Tools

BRITISH COLUMBIA: SELKIRK COLLEGE

Selkirk College was awarded an **Innovation Enhancement grant** in 2010 to address forest carbon management opportunities in partnership with local businesses. The IE grant has enhanced the profile of the college within the forestry and technology business sectors.

This project achieved a number of important milestones, including: creating a decision-support collaborative steering committee, carrying out a user needs survey, holding an internationally-attended conference, developing proof of concept web-based decision support tools, starting a forest carbon offset project, and creating a web portal to share this information with businesses considering forest carbon management options.

"Selkirk College's project is an example of the applied ecological research that we think will benefit natural resource management in our region. We were pleased to work with them to bring this information to regional natural resource managers."

– Jackie Morris, Executive Director, Columbia Mountains Institute of Applied Ecology

"This grant changed the way our faculty think about options for sustainably managing landscapes, and are passed on to our students engaged in carbon monitoring work. More trained professionals available for business community interaction will greatly increase the extension of these tools in the local market. We believe it is important to tie our R&D in this developing market to other entities (e.g., NGOs, rural development, and technology institutes) that can leverage community awareness and interest."

– Dr. Brendan Wilson, Principal Investigator, Selkirk College

Transforming the Aluminum Casting Industry

QUEBEC: CÉGEP DE TROIS-RIVIÈRES – CENTRE DE MÉTALLURGIE DU QUÉBEC (CMQ)

Franco Chiesa, NSERC Industrial Research Chair for Colleges in Aluminum Transformation, Cégep de Trois-Rivières

The new **NSERC Industrial Research Chair for Colleges** in Aluminum Transformation at the CMQ, affiliated with Cégep de Trois-Rivières, aims to develop this industry by proposing innovative and realistic technological advances. Franco Chiesa, Chairholder, has been active in applied innovation in aluminum casting for 20 years. The Chair program, which will run for a five-year, twice-renewable term, has Rio Tinto Alcan as its principal industrial partner.

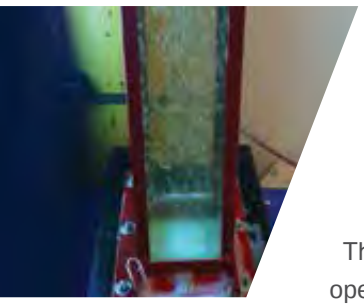
The research led by Franco Chiesa will revolve around several areas: optimizing liquid-metal processing; producing new, unconventional assemblies; optimizing foundry processes; performing low-pressure and high-pressure casting; analyzing how hot isostatic pressing affects alloy fatigue in aeronautics; and promoting solidification through the artificial cooling of molds. At the same time, the lab will conduct die-filling and solidification modelling to establish correlations that researchers can use to predict mechanical properties and "local" metallurgical properties.

How Microalgae Can Help Make Green Energy

ONTARIO: LAMBTON COLLEGE

Since the energy crisis of the 1970s, energy security and sustainability and its environmental impact have attracted global attention. Alternative fuels have been identified as candidates to potentially replace conventional fuels, with hydrogen being billed as the fuel of the future due to its high-mass energy density and non-polluting nature.

Throughout Earth's history, sunlight has effectively split water into its main constituents: hydrogen and oxygen. In the past 70 years, we have known that green algae can utilize sunlight to produce molecular hydrogen.



Supported by an **Innovation Enhancement grant** the Green Energy team of faculty, staff and students at Lambton College collaborated with BioSonic Technology Inc. to design, fabricate and optimize a series of novel flat-plate photo-bioreactors (PBRs). They range in size from 30 to 1,000 litres, able to generate green fuels, including hydrogen. The design of these PBRs was based on maximizing the reactors' surface area-to-volume ratio, incident light intensity, productivity and aperture area.

The PBRs were equipped with a special membrane capable of withstanding intense pressure while in operation. Through that membrane, the team introduced a carbon dioxide-air mixture from the bottom of the reactor, which also acted as a filter to remove dirt and any undesired particulate matter from the carbon dioxide-air stream. An experimental light fixture with low-energy requirement was used as the light source.

The initial results show a 22% reduction in energy requirements for mixing and lighting purposes. The team is continuing its research to further optimize the process.

"This collaborative work has verified the principle that we can control the diffusion of CO2 directly into an algae growing medium, an essential step on our pathway to commercialization. It has provided our organization with a better understanding of the commercial potential and has established a number of possible design considerations."

– James D Cann, President, BioSonics

Testing Thermal Management Systems

QUEBEC: CÉGEP DE SAINT-JÉRÔME – INSTITUT DU TRANSPORT AVANCÉ DU QUÉBEC (ITAQ)

Thanks to an **Applied Research Tools and Instruments grant**, ITAQ, affiliated with Cégep de Saint-Jérôme, is making great strides in testing products' ability to withstand wide temperature variations.

With this grant ITAQ acquired a high-capacity enviro-chamber that can produce a wide range of temperatures from -30° to +75° Celsius. The chamber, which is equipped with a thermal camera, allows the team to test thermal-management systems – particularly for batteries used in transportation.

The enviro-chamber has already been used by EcoPower, a leader in hybrid systems for gantry cranes. The capabilities of the chamber have made it possible to test the thermal management of Li-ion batteries under extreme conditions. The chamber will be an invaluable tool for manufacturers developing Li-ion batteries for the transportation sector, and projects are currently in development with B3CG and Lito Green Motion.

Making Useful Resources from Waste

ALBERTA: GRANDE PRAIRIE REGIONAL COLLEGE

Grande Prairie's groundbreaking Pollutants to Products program (P2P) is built to transform waste from a problem into a useful resource. It is composed of several projects, all of which are made possible by a variety of funding sources leveraged from an **Innovation Enhancement grant**.

A microalgae project involves using microscopic aquatic plants to remove carbon dioxide from waste gas. A second project turns treated sewage effluent (high in nutrients) into fertilizer for hybrid poplar. This can assist in decreasing the need to store wastewater, which is a concern in growing rural communities and provide a source of fuel for bio-energy and heat production.

A third project involves planting trees in winter. Oil sands companies have to replant cleared areas, but the machinery cannot be used in bogs (21% of Alberta) in the summer. The P2P experimented with replanting in winter, and achieved a 94 to 98% seedling survival rate.

Another project involves hardening white spruce seedlings. A late spring frost can kill seedlings at a significant cost to forestry companies. This research is expected to save forestry companies approximately $1 million.

To date, ten students have helped with research on all four projects. Grande Prairie has partnered with many industry and public sector partners in this important economic initiative.

"This grant to Grand Prairie Regional College's Pollutants to Products(P2P) Initiative is timely and helps to bridge a current critical gap (i.e. harvesting algae) in our effort to commercialize P2P's microalgae technology. Woodmere Nursery is an ongoing partner with Grande Prairie Regional College) and this collaboration is important to our strategic business needs."

– Jeff Hoyem, Manager, Woodmere Nursery - Alberta Division

An Innovative Carbon Footprinting Method

ONTARIO: NIAGARA COLLEGE

In collaboration with e3 Solutions Inc., through funding from an **Innovation Enhancement grant**, Niagara College identified a method of improving the accuracy of carbon footprinting that stems from Ontario's grid-purchased electricity.

The research team discovered that by applying hourly emission factors rather than the typical annual average value, businesses are able to track their carbon emissions with 10 to 15% more accuracy. As well, because the emission intensity of Ontario's power grid is high when demand and price are high (and, conversely, low), businesses will be able to improve their environmental performance both through conservation and by shifting electricity usage away from peak times. This success was recently published in Transactions of the Canadian Society of Mechanical Engineers.

The student research associate involved on this project aims to incorporate his research into a mobile application release named "GridWatch", in collaboration with EnergyMobile Studios. The application provides real-time data for Ontario's electricity grid, allowing for the inclusion of near real-time carbon intensity.

"This research shows tremendous potential in the field of carbon accounting, and we are excited to have our name tied to its progress."

– Katie Altoft, e3 Solutions Inc. Board Member

Helping Mining Companies Treat Contaminated Sites

QUEBEC: CÉGEP DE L'ABITIBI-TÉMISCAMINGUE – CENTRE TECHNOLOGIQUE DES RÉSIDUS INDUSTRIELS (CTRI)

This project, supported by an **Applied Research Tools and Instruments grant**, aims to help small- and medium-sized mining companies adapt to modern environmental concerns.

Cégep de l'Abitibi-Témiscamingue and its affiliated centre CTRI, will examine materials for their capacity to absorb metal and neutralize acid in order to develop a decontamination system for affected water. Along with passive sulfate-reducing biofilters or purifying marshes, these materials will bring high efficacy to the treatment of contaminated acid or non-acid mining drainage.

The project also aims to re-vegetate areas contaminated with smelter waste or tailings, as well as other affected sites. It will do so by adding plants and/or soil enrichment on sites generating drainage as well as those that do not.

This project is expected to provide industry with valuable rehabilitation tools adapted to existing tailings, giving end users the considerable advantage of having a greater assurance as to the life expectancy of the adopted restoration method. The college and its partners expect this research to have benefits in the medium and long term for the regional economy and waste generating industries.

"…this project … will contribute greatly to the development of a regional expertise. This expertise will be directly linked to the development of innovating solutions to protect our lakes and rivers in mining sectors."

– Organisme de bassin versant du Témiscamingue

Protecting Our Lakes from Algae Blooms

ONTARIO: FLEMING COLLEGE

As climates change and weather becomes fiercer and extremes more frequent, there is a growing concern about an overload of phosphorus in many bodies of water. Phosphorus is a mineral that attracts algae blooms to lakes, which threaten the marine environment and surrounding ecosystems.

At Fleming College, the Centre for Alternative Wastewater Treatment leveraged an **Innovation Enhancement grant** to partner with Monteco Corporation and Imbrium Systems to conduct a pilot study of various media engineered to remove phosphorus from storm water.

To test the media, researchers at the Centre installed a horizontal bed type filter containing bio-retention soil and media engineered for phosphorus removal. The study used a geometrically identical bio-retention cell for comparison, and all cells were subjected to real rainfall events and weather conditions.

The results of this important research have led to accurate performance assessment of storm water treatment systems for phosphorus removal. The project delivers a tool that watershed managers can use to achieve their targeted goals in phosphorus reduction. They will now be able to get the treatment and water quality they need without overspending. Monteco is expected to gain significant market share by being able to offer this solution.

Bringing Remote Sensing Software to the General User through Geo-Portal

BRITISH COLUMBIA: SELKIRK COLLEGE

The Selkirk Geospatial Research Centre, in partnership with AKS Geoscience Inc. of Calgary, has been awarded an **Applied Research and Development grant** to design an Environmental Change Analysis Geo-Portal. The geo-portal will provide web access to publicly available imagery and the ability to apply AKS analysis on that imagery. Applications include quantifying land surface attribute change over time, mining reclamation efforts, oil spill clean-up efficacy, and monitoring vegetation succession. Bringing the functionality of sophisticated remote sensing software to the general user will allow the public to explore data in unique ways, bringing a whole new understanding of surface conditions. A future goal of this project is to create a commercial version of the portal that operates in conjunction with the public portal, but enables additional access to the latest high-resolution imagery and the ability to apply, on-demand, more complex analysis of the imagery.

"As part of our effort to educate the environmental monitoring community in the use of multispectral satellite imagery, AKS Geoscience is pleased to assist Selkirk College in the development of an online imagery analysis tool."

– Glen Larsen, AKS Geoscience Project Lead

"This collaboration with AKS Geoscience will provide opportunities for researchers from the SGRC to work with the latest satellite imagery and Open Source web mapping tools. Learners in Selkirk's GIS programs will also benefit through exposure to cutting edge imagery and web development in their course work."

– Ian Parfitt, SGRC Coordinator, Selkirk College

Spurring Bio-Hybrid Economic Growth

ONTARIO: LAMBTON COLLEGE

Economic development in the Sarnia area is focusing on a transition from traditional fossil-fuel based industry and agriculture to a bio-hybrid economy, which has a strong local supply chain of small- and medium-sized enterprises (SMEs) and a bio-feedstock based industry. Lambton College's applied research and development, supported by an **NSERC Industrial Research Chair for Colleges grant**, enables SMEs to successfully compete in the global marketplace while contributing to regional growth.

Dr. Mehdi Sheikhzadeh, the new NSERC Industrial Research Chair in Advanced Industrial Process Optimization and Control, will support development of these research programs at Lambton. He will collaborate with industrial partners, providing expertise in industrial process optimization, automation, advanced process control and modeling.

Dr. Mehdi Sheikhzadeh NSERC Industrial Research Chair for Colleges in Advanced Industrial Process Optimization and Control, Lambton College

One of the fastest growing demands in automation for water and wastewater plants is to be able to remotely control facilities that are located in areas where it is difficult, expensive, or impossible to hire and send personnel. This is particularly crucial for water and wastewater treatment facilities located in certain First Nation communities, mines and hazardous areas. Remote operation management offers key business benefits, including allowing users to connect all their processes seamlessly into a single framework for data monitoring, diagnostic and operation management, which minimizes field travel time, operational costs and dramatically improves personnel safety.

Dr. Sheikhzadeh, two lab technicians and two students are working in collaboration with TEAM Aquatic Management Inc. The company intends to use this technology to expand its business, utilize its personnel more efficiently and operate wastewater plants more effectively. The project has received considerable attention from various businesses and organizations that are considering similar steps.

"Remote sites using this wastewater treatment system increasingly will require a smooth and robust monitoring and control system – a vital task for the project that TEAM now has with Lambton College."

– Dean de Jong, TEAM Aquatic Management Inc.

Turning Flue Gas into Useful Products

ALBERTA: GRANDE PRAIRIE REGIONAL COLLEGE

Grande Prairie's Pollutants to Products (P2P) initiative was bolstered by an **Applied Research Tools and Instrument grant** for harvesting algae. This was key, as single-celled green microalgae possess a high capacity to clean air pollution by absorbing CO2 and other pollutants.

P2P aimed to study this natural process by developing a microalgae (one of the four P2P projects) to turn flue gas directly into useful products such as animal feed or biodiesel. Preliminary research indicates that microalgae can remove 70% of carbon dioxide from flue gas.

Harvesting algae proved a challenging yet essential step for this work. The difficulty was resolved by the ARTI grant, as well as funding from ConocoPhillips Canada. The grant enabled the college to acquire an automated algae harvester, which quickly separates large quantities of microalgae from a nutrient solution. Not only is the equipment proving to be useful for microalgae research, but it has evolved into a new partnership with an Alberta microalgae company.

The ARTI grant not only boosted research and development endeavours at Grande Prairie, but also made possible brand new links with industry.

"The ARTI grant was a game changer for our micro-algae project. It has enabled us to jump to a state-of-the-art, industrial-capable harvester that is relevant to industry."

– Dr. Bruce Rutley, P.Ag., Director of the GPRC Centre for Research & Innovation

Boosting Research in Bio-Processing and Fermentation Technologies

QUEBEC: COLLÈGE SHAWINIGAN – CENTRE NATIONAL EN ÉLECTROCHIMIE ET EN TECHNOLOGIES ENVIRONNEMENTALES (CNETE)

Collège Shawinigan has its first **NSERC Industrial Research Chair for Colleges** in Bioprocess and Fermentation Technology, Dr. Hassan Chadjaa, the Scientific Coordinator and Researcher in the industrial bioprocess division of the CCTT affiliated with the college, CNETE. His expertise in the design of innovative bioprocesses and his unwavering commitment to industrial-level technology transfer are highly valued and much sought-after.

The establishment of the Chair stems from a number of factors including the exceptional teamwork and cooperation between the college and CNETE, the well-recognized skills and expertise of the researchers and faculty and the know-how and efficiency of the CNETE in conducting research projects.

The grant is matched by the project's industry partners, Innu-Science Canada, Agrosphère and BioAmber Canada Inc.. Financial support of this kind carries tremendous benefits for both faculty and students. For example, 10 biotech internships will be offered to students over the next five years, and faculty will be able to enhance their theoretical and practical instruction in the research lab.

Dr.Hassan Chadjaa, NSERC Industrial Research Chair for Colleges in Bioprocess and Fermentation Technology, Collège Shawinigan

With the appointment of this Chair, the college and the CNETE have asserted their standing as applied research leaders in bioprocessing and fermentation technology. Current CNETE partners and regional businesses are eager to work with Dr. Chadjaa to boost technology transfer geared to commercialization. The research will accelerate the implementation of innovations still at the conceptual stage, accelerate the design of more diverse bioproducts, and enhance the scale-up of current projects.

Equipment for Innovations in Industrial Bioprocesses

QUEBEC: COLLÈGE SHAWINIGAN – CENTRE NATIONAL EN ÉLECTROCHIMIE ET EN TECHNOLOGIES ENVIRONNEMENTALES (CNETE)

Thanks to an **Applied Research Tools and Instruments grant**, the CNETE affiliated with Collège Shawinigan purchased a high-performance liquid chromatograph (HPLC), a medium-capacity autoclave and a pilot-scale membrane-filtration unit (ceramic-membrane test bench).

This equipment will allow the CNETE to conduct applied research and development projects in the field of membrane-filtration technology, specifically for the separation and purification of biomolecules produced through fermentation (pharmaceutics and agri-food applications), for water-treatment processes, and for the recycling and re-purposing of liquid-effluent by-products.

The driving force behind this research effort is a partnership with 10 small- and medium-sized businesses, including Innu-Science Canada (Trois-Rivières division), Brasserie les Bières de la Nouvelle-France BNF (Saint-Alexis-des-Monts), Bouteille recyclée du Québec (Laval), Agrosphère (Saint-Alexis-de-Montcalm), Bionest Technologies inc. (Grand-Mère) and the Technocentre d'IDE Trois-Rivières (innovation and economic development techno-centre).

Weather Station Data Will Boost Agriculture Production

NOVA SCOTIA: NOVA SCOTIA COMMUNITY COLLEGE

After a decade of monitoring meteorological conditions in Nova Scotia's Annapolis Valley – primarily for the Grape Growers Association of Nova Scotia and other agricultural partners – NSCC's Applied Geomatics Research Group (AGRG) is expanding its data collection area to include South West Nova Scotia.

Via a network of 75 weather stations, the AGRG is conducting a Temperature and Solar Radiation Study. The work is funded by an **Applied Research Tools and Instruments grant** and the South Shore Community Business Development Corporation (CBDC), whose 14 partners includes many municipalities and both the provincial and federal departments of agriculture.

AGRG's research includes monitoring, mapping, and modeling data collected from the 75 stations to understand the meteorological conditions of the South West region and the potential for increased agricultural activity. Perennia, an agricultural consulting company, is working in tandem with AGRG to deliver an agricultural interpretation of the data.

The study is designed to collect daily data for the 2011, 2012, and 2013 growing seasons. Because each station is equipped with a cellular modem, it is remotely accessible and summaries of the data are published in reports and websites for the CBDC.

"The south shore of Nova Scotia has a unique climate suitable for a variety of high value agriculture. A better understanding of the region's climatic and micro-climate and the ability to market the information to appropriate agriculture developers will lead to a renaissance of agriculture in the area. The climate data project will play an important role in achieving this goal."

– Chris Atwood, Executive Director, Community Business Development Corporation (Yarmouth)

Producing Industrial Micro-Organisms from Municipal and Paper-Mill Sludge

QUEBEC: CÉGEP DE TROIS-RIVÈRES – CENTRE SPÉCIALISÉ EN PÂTES ET PAPIERS (CSPP)

CSPP, affiliated with Cégep de Trois-Rivières is working with the Kruger paper mill in Trois-Rivières to design a process in which an industrial bioreactor that treats paper-mill effluents would be used to produce new commercial bio-products.

Thanks to an **Applied Research and Development grant**, the CSPP team will show how municipal and paper-mill effluents can be treated so that specific micro-organisms grow in the sludge, ultimately spawning microbial products for local use.

The agricultural sector is interested in these products to help control insects and conserve biomass moisture. That means higher annual crop yields for local farms and the ability to conserve agricultural residues over many months without resorting to costly and complex drying processes.

This project has allowed two students from Cégep de Trois-Rivères' Sciences de la nature program to take part in the process tests alongside CSPP staff. The students have also worked with the project partners: the team of Professor Simon Barnabé, holder of Université de Québec à Trois-Rivières' (UQTR) Chaire de recherche industrielle en environnement et biotechnologie and the team of Professor Daniel Montplaisir, holder of UQTR's Chaire industrielle Kruger sur les technologies vertes.

"Adapting the city's wastewater treatment system to generate commercial microbial products would allow us to diversify production and operations at Kruger's mill in Trois-Rivières."

– Éric Pelletier, Kruger Inc.

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