Applied Research Comes of Age

Pleins Feux sur la Recherche Appliquée

November 2019
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FROM

RESEARCH MONEY

Research Money is excited about our continuing collaboration with Colleges and Institutes Canada. In this second edition of **Applied Research Comes of Age**, readers will discover a staggering array of innovations that colleges and institutes are facilitating across the country. These incredible institutions are helping companies in a wide range of industry sectors, from mining and oil to oceans and agriculture to health and early childhood education. From high tech to low tech and in social innovation, companies and public institutions are getting expert advice and access to technology and skilled people. Canada's colleges and institutes support a practical and collaborative culture that is enabling and empowering our current and future generations of Canadian innovators.

La société Research Money est ravie de sa collaboration soutenue avec Collèges et Instituts Canada. Dans la seconde édition de **Pleins feux sur la recherche appliquée**, les lecteurs découvriront une profusion d'innovations que les collèges et les instituts favorisent dans l'ensemble du pays. Ces établissements remarquables aident les entreprises dans un grand éventail de secteurs, de celui des mines à celui du pétrole en passant par les océans et l'agriculture, la santé et l'éducation de la petite enfance. Que ce soit dans le domaine de la haute technologie ou de la technologie de base ou encore de l'innovation sociale, les entreprises et les établissements publics obtiennent l'avis de spécialistes, ainsi que l'accès à la technologie et à des personnes compétentes. Les collèges et les instituts du Canada appuient une culture pratique et collaborative habilitant les générations actuelles et futures d'innovateurs canadiens.

JEFFREY CRELINSTEN

Publisher & CEO
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Support collaboration to give Canadian innovation a boost

By Denise Amyot

President and CEO of Colleges and Institutes Canada

In our country of small businesses, where over 99% of companies are considered small or medium-sized enterprises (SMEs), collaboration is often the key to growth and innovation. It's what spurs ingenuity, helping a business to punch above its weight. But Canada needs more and that requires sustained support for innovative partnerships.

Fostering collaboration in all sectors of the economy is a major strength of colleges, polytechnics and institutes. All across the country, they are sought-after partners for SMEs and community stakeholders looking to find innovative solutions to their everyday challenges. Over the past decade, they have become key drivers of Canada's innovation ecosystem.

Last year alone, Canadian colleges and institutes were involved in over 7,300 research partnerships that generated over 4,400 innovations, including new processes, products, prototypes and services, approximately 87% of which were completed in less than one year.

Most amazing is that they have done all this with access to only 2.5% of federal research funding. It's time that support from government matches the sector's full potential. The most critical need is to enable post-secondary institutions to maintain permanent services to facilitate linkages with industry and community partners who lack the capacity, resources and networks needed to invest in research and development on their own.

Applied research partnerships can take time to build and need support to sustain, but the payoff is worth it - students involved become the next generation of innovators, having worked hand in hand with employers to drive innovation, and businesses get solutions to their challenges and develop new products. Whether it's testing out new, more energy efficient technology, or developing brand new machinery to improve manufacturing processes, students gain valuable experience, while helping businesses grow and innovate.

This is why Colleges and Institutes Canada, along with six other national and regional associations, recently called on the Government of Canada to help expand SME participation in the innovation ecosystem by investing $40 million per year in business innovation engagement services based in colleges, institutes and polytechnics. We believe this will double the number of SMEs engaging with colleges and institutes in applied research and business innovation, increasing their willingness and capacity to invest their own resources in research and development.

As we look to Canada's future in the global economy, this might just be the game-changer SMEs across the country need to keep us competitive and productive.

Soutenir la collaboration pour stimuler l'innovation canadienne

par Denise Amyot

Présidente-directrice générale de Collèges et instituts Canada

Dans notre pays d'entrepreneurs, où plus de 99 % des compagnies sont considérées comme de petites à moyennes entreprises (PME), la croissance et l'innovation dépendent plus souvent qu'autrement de partenariats. Ceux-ci nourissent l'ingéniosité et aident les entreprises à se dépasser. Le Canada a besoin de plus de ces partenariats novateurs, mais cela nécessite un appui soutenu.

Favoriser la collaboration dans tous les secteurs de l'économie constitue un atout majeur des collèges et instituts. Partout au pays, ces derniers sont considérés comme des partenaires de choix par les PME et les intervenants communautaires souhaitant trouver des solutions novatrices à des défis concrets. Au cours de la dernière décennie, ils sont devenus des moteurs d'innovation au Canada.

L'année dernière, les collèges et instituts canadiens ont ainsi participé à plus de 7 300 partenariats de recherche ayant généré plus de 4 400 innovations, notamment de nouveaux procédés, produits, prototypes et services, dont environ 87 % ont été finalisés en moins d'un an.

Le plus étonnant est que ces innovations ont été réalisées en ayant accès à seulement 2,5 % du financement fédéral pour la recherche. Il est maintenant temps que le soutien du gouvernement corresponde au plein potentiel de ce secteur. Le besoin le plus criant est de permettre aux établissements postsecondaires de maintenir des services permanents afin de faciliter l'arimage avec les partenaires industriels et communautaires qui ne possèdent pas les capacités, les ressources et les réseaux nécessaires pour investir eux-mêmes dans la recherche et le développement.

Les partenariats en recherche appliquée peuvent être longs à établir et nécessitent du soutien pour se poursuivre. Le résultat final en vaut toutefois la peine. Cela permet de former la prochaine génération d'innovateurs, et encourage les étudiants et étudiantes à travailler main dans la main avec les employeurs.

En outre, les entreprises obtiennent des solutions à leurs défis et développent de nouveaux produits. Que ce soit pour tester une nouvelle technologie plus écoénergétique ou pour développer un tout nouvel équipement afin d'améliorer les procédés de fabrication, les étudiants acquièrent une précieuse expérience, tout en aidant les entreprises à croître et innover.

C'est pourquoi Collèges et instituts Canada, et six autres associations nationales et régionales, ont récemment lancés un appel au Gouvernement du Canada pour accroître la participation des PME à l'écosystème de recherche en investissant 40 millions de dollars par année dans des services de soutien à l'innovation des entreprises basés dans les collèges, les instituts et les cégeps. Nous croyons que cet investissement fera doubler le nombre de PME qui collaborent avec des collèges et instituts en recherche appliquée et en innovation commerciale.

Alors que le Canada tente de réafirmer son rôle au sein de l'économie mondiale, cette approche pourrait s'avérer être l'élément déterminant dont les PME d'ici ont besoin pour maintenir notre avantage concurrentiel et productif.

Colleges and institutes fuel innovation via growth in applied research

Over the last eight years, colleges and institutes have greatly expanded both the capacity and the output of applied research in Canada, leveraging their strong business and industry connections to create value in their communities. This growth has generated clear benefits, including thousands of innovative partnerships, new products and services, and unique work-integrated learning experiences for students.

GROWTH IN FUNDING AND PRODUCTIVITY

Applied research offices collaborate with local small and medium-sized enterprises (SMEs), non profits, large enterprises, and all levels of government to deliver innovative solutions to everyday challenges. The value of this approach to research for diverse partners is evidenced in the fact that total investments in applied research activities have more than doubled in the past eight years, from $140M in 2010-11 to $295M in 2017-18.

Not only has government investment grown—funding from all levels of government has more than doubled from $63M in 2010-11 to $144M in 2017-18—but support has also diversified, with increasing investments from municipalities and indigenous governments. Most impressively, investments from non-profits, charitable foundations, international agencies, hospitals and similar organizations have increased by 950% (from $2M in 2010-11 to $21M in 2017-18).

RAPID INNOVATION

Applied research centres and labs operate in fields ranging from advanced manufacturing to agri-food, digital to clean technology, natural resources to health sciences, tourism to social innovation, and the spaces in which these sectors overlap.

In 2017-18 alone, CICan members entered into over 7,300 partnerships to produce more than 4,400 prototypes, products, processes, and services, 87% of which were completed in less than one year. More than 77% of these partnerships were with private sector partners, and most of these with SMEs.

UNIQUE WORK-INTEGRATED LEARNING EXPERIENCE

For students, applied research projects provide an opportunity to deploy their learning while solving real-world problems and working with employers. As we wait for research on the long-term career benefits of involvement in these types of activities, early indicators show that colleges and institutes' investments are leading to greater faculty, staff and student involvement, as well as a more personal mentorship experience for students.

Since 2010, the number of faculty and staff involved in applied research has increased by 168%, while the number of students directly involved in applied research activities has more than doubled from 13,000 in 2010-11 to over 25,000 in 2017-18. If we include students involved in entrepreneurial activities that latter number jumps to more than 50,000 (and this is a low estimate given incomplete survey response).

Despite this dramatic increase in participation, the ratio of faculty and staff to students has improved over time, from 1:8 in 2010-11 to 1:7 in 2017-18, encouraging strong mentorship opportunities for the students involved.

The numbers only tell us so much about the real solutions being developed every day on campuses across the country. The stories in this new issue of **Applied Research Comes of Age** breathe life into these national averages, showing the often life-changing impacts of applied research innovations for companies and communities alike.

Les collèges et instituts stimulent l'innovation grâce à la recherche appliquée

Au cours des huit dernières années, les collèges et instituts ont largement contribué au développement de la recherche appliquée au Canada en s'appuyant sur leurs solides liens commerciaux et industriels pour enrichir leurs communautés. Cette croissance a engendré des milliers de partenariats novateurs, des nouveaux produits et services, ainsi que des expériences uniques d'apprentissage intégré au travail pour les étudiants.

CROISSANCE DU FINANCEMENT ET DE LA PRODUCTIVITÉ

Les bureaux collégiaux de recherche appliquée collaborent avec des entreprises de tailles diverses, des organismes sans buts lucratifs, et tous les paliers de gouvernement afin de développer des solutions novatrices à des défis concrets. Cette approche a manifestement fait ses preuves, si bien que les investissements totaux en recherche appliquée au collégial ont plus que doublé, passant de 140 millions de dollars en 2010 à 295 M$ en 2017-2018.

Non seulement les investissements gouvernementaux ont-ils plus que doublé, passant de 63 millions de dollars en 2010-2011 à 144 millions de dollars en 2017-2018, mais les sources de financement se sont également diversifiées. Les municipalités et les gouvernements autochtones consentant de plus en plus à des investissements. Les investissements provenant d'organismes à but non lucratif, d'organismes de bienfaisance, d'organismes internationaux, d'hôpitaux et d'organismes semblables ont quant à eux augmenté de 950 % (passant de 2 millions de dollars en 2010-11 à 21 millions de dollars en 2017-2018).

En 2017-2018, les membres de CICan ont ainsi conclus plus de 7 300 partenariats qui ont permis de produire plus de 4 400 prototypes, produits, procédés et services, 87 % ayant été finalisés en moins d'un an. Plus de 77 % de ces partenariats ont été établis avec des partenaires du secteur privé, et la plupart d'entre eux avec de petites et moyennes entreprises.

EXPÉRIENCE UNIQUE D'APPRENTISSAGE INTÉGRÉ AU TRAVAIL

Pour les étudiants et étudiantes, les projets de recherche appliquée fournissent l'occasion de mobiliser leurs connaissances pour régler des problèmes réels, tout en travaillant auprès d'employeurs potentiels. On constate aussi que les investissements en recherche mènent à une participation accrue du corps enseignant, du personnel et des étudiants ainsi qu'à des expériences de mentorat plus personnelles pour les étudiants.

Depuis 2010, le nombre de membres du corps enseignant et du personnel participant à la recherche appliquée a augmenté de 168 %, tandis que le nombre d'étudiants participant directement à des activités de recherche appliquée a plus que doublé, passant de 13 000 en 2010-2011 à plus de 25 000 en 2017-2018. Si nous incluons les étudiants participant à des activités entrepreneuriales, ce nombre se hisse à plus de 50 000 étudiants.

Alors que cette participation accrue pourrait potentiellement entraver l'expérience étudiante, c'est plutôt l'inverse que l'on observe. D'un membre du personnel pour huit chercheurs étudiants et étudiantes en 2010-2011, on est passé à un ratio d'un pour sept en 2017-2018, ce qui favorise le mentorat.

Les chiffres ne révèlent qu'une partie de l'histoire des innovations concrètes qui sont développées tous les jours sur les campus collégiaux du pays. Les récits recueillis dans ce nouveau numéro de **Pleins feux sur la recherche appliquée** donnent vie à ces moyennes nationales, et mettent en lumière l'impact remarquable de la recherche appliquée, tant sur les entreprises que sur les communautés.

RESEARCH WITH IMPACT:

Two new Applied Research Chairs at Lethbridge College expand areas of expertise and opportunities for community partners

Applied researchers at Lethbridge College are ready to find the answers to the questions facing their industry partners and communities.

In recent years, much of that work centred on developing and expanding programs in sustainable food production, aquaponics and irrigation. In September, however, that focus expanded thanks to the addition of two new applied research chairs working as part of the Centre for Applied Research, Innovation and Entrepreneurship (CARIE) team.

"These additions — a President's Applied Research Chair in Virtual and Augmented Reality and our first Applied Research Chair in Agricultural Engineering and Technology — will allow the college to create new partnerships and research possibilities," explains Dr. Kenny Corscadden, Associate Vice President - Research. "They also are one more way to illustrate the college's commitment to leading the way when it comes to applied research and innovation."

Mike McCready, a Lethbridge College alumnus who has instructed in the Multimedia Production program since 2015, is the new President's Applied Research Chair in Virtual and Augmented Reality. He was a driving force behind the creation and development of the college's new Virtual and Augmented Reality program that launched this fall and is now teaching in that program.

In his new role, McCready will work to identify how virtual and augmented reality can benefit industry and create solutions to implement it in those businesses. McCready also serves as President of the Alberta Chapter of the Virtual and Augmented Reality Association, giving him unique contacts in both education and industry.

Lethbridge College has already forged its reputation as a leader in the VR/AR sector. In 2018, the college hosted Merging Realities, the world's first VR/AR conference to be available entirely in virtual reality. In 2019, the college held the second annual Merging Realities conference and also hosted the Virtual Reality Global Forum at the INVENTURES conference in Calgary.

Dr. Chandra Singh has come to the college in his latest stop in a distinguished professional and academic career to work as the first Applied Research Chair in Agricultural Engineering and Technology. He is already finding ways to support and augment southern Alberta's agriculture industry, including through the creation of an Advanced Postharvest Innovation Centre.

In his new role, Dr. Singh's goal is to develop postharvest engineering solutions using advancements in sensing, automation, IOT, cloud computing, artificial intelligence, AI, machine vision, hyperspectral imaging and mathematical modeling. He will also work closely with other researchers, instructors and students within the college's Collaborative Centre of Excellence in Agriculture.

Through its highly-adaptable and collaborative learning environment and its future-focused training and research programs, the Collaborative Centre of Excellence in Agriculture is fast becoming a hub for agricultural research and innovation.

Lethbridge College's Centre for Applied Research, Innovation and Entrepreneurship is a catalyst for economic growth, sustainability and social development in the region that brings together community organizations, researchers and students to collaborate on projects that use new or existing knowledge to solve real-world challenges with immediate practical applications.

For more information, go to lethbridgecollege.ca/carie or call 403-320-3202 ext. 5799.

READY TO EMBRACE THE OPPORTUNITIES

Lethbridge College is a catalyst for economic growth, sustainability and social development.

We are proud to bring together community organizations, researchers and students to collaborate on projects that use new or existing knowledge to solve real-world challenges with immediate practical applications. And we celebrate when the end results create innovative products and services that benefit our economy and society.

Do you have a challenge you are looking to solve? **We're ready to help.**

Centre for Applied Research, Innovation and Entrepreneurship
403-320-3202 ext. 5799
appliedresearch@lethbridgecollege.ca
lethbridgecollege.ca/carie

BE READY.

Lethbridge College

Supporting oceans-related business

Nova Scotia Community College (NSCC) has launched the province's first Technology Access Centre for ocean-related productivity and innovation.

The Sensing, Engineering and Analytics-Technology Access Centre, or SEA-TAC, draws on NSCC's resources and industry connectivity to offer services to businesses in the ocean sector.

With equipment in areas such as topo-bathymetric lidar scanning, 3D metal printing, big data visualization and drone mapping, SEA-TAC fills the gap between proof-of-concept and market for the ocean innovation ecosystem.

One example of the type of work SEA-TAC will tackle is a recently completed project with Biome Renewables (www.biome-renewables.com). Their PowerCone technology, designed to catch more wind while reducing vibrations and noise, is well-known in the energy sector. Biome Renewables is working to apply their technology to tidal power. Collaborating with Biome Renewables' engineers and product developers, NSCC researchers used the College's Renishaw metal 3D printer to build two underwater turbine prototypes. Using additive manufacturing, the team reduced materials and production time, saving time and money that can translate into a drop in the costs of tidal power.

The result of the partnership: a high-tech, underwater turbine is now deployed in Ireland for ocean testing. SEA-TAC will enable more innovators to sense, engineer and analyze opportunities in the rapidly growing global ocean economy.

For more information, please visit nscc.ca/appliedresearch

NSCC's new **Sensing, Engineering and Analytics – Technology Access Centre (SEA-TAC)** is ready to help industry transform research and development results into new technologies that position Canada as a leader in sustainable ocean innovation.

Discover more

Dr. Alain Joseph, Director of Applied Research
Nova Scotia Community College
Alain.Joseph@nscc.ca | 902-483-8337

nscc
Applied Research

Niagara College Canada

APPLIED DREAMS.

Solutions for Industry

With funding support from various regional, provincial and federal agencies, students and graduates are hired to work alongside faculty researchers to assist industry partners leap forward in the marketplace. We conduct many projects for local companies.

For example, in recent months we have:

DEVELOPED SOFTWARE to process **18 years** of historic climate data for long-term farm planning

CREATED *173* **FOOD & BEVERAGE PROTOTYPES** from **6** categories resulting in **19 PRODUCTS**

DESIGNED strategic **SOCIAL MEDIA** plans for dozens of Niagara SMEs

Used **LEAN PRINCIPLES** to create a *280% increase* in **PRODUCTION SPACE** for a manufacturer

nc Research & Innovation

Learn about our resources, capabilities and project successes here:

ncinnovation.ca

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Creative solutions for real-life challenges.

Sheridan can help provide the expertise, talent – ***and*** solutions – to the challenges facing your business or industry.

Collaborate with our Research and Incubation Centres, faculty, staff and students, and gain access to supports for:

Applied research | Social innovation
Entrepreneurship | Training | Learning

Sheridan

Improving wellness and performance in the workplace

When paramedics respond to an emergency, every second counts. That is why it is critical they have the equipment they need to carry out essential tasks. Designing an ambulance that keeps both patients and paramedics safe is one of the projects underway at a new applied research institute at Conestoga College.

Founded in 2019, the Canadian Institute for Safety, Wellness and Performance (CISWP) aims to use knowledge gained from cutting-edge research to educate employers and policy makers on how to meet changing workforce needs and lead the way in work-related injury prevention and management. It's an area of growing concern given that an estimated 6.2 million Canadian adults suffer from a disability that limits their capacity to work and earn an income.

"We hope to provide the next generation of business leaders with evidence-informed solutions that will allow them to better protect workers while also enhancing performance and productivity," says Dr. Amin Yazdani, director for CISWP.

The institute will collaborate with industry partners to tackle real-world challenges such as disability prevention, the growing use of robotics in the workplace and strategies to manage mental illness, which costs the Canadian economy more than $50 billion each year. With a focus on transferring knowledge into practice, applied research projects at CISWP will empower businesses to adapt and thrive in the ever-changing economy.

To learn more about partnering with Conestoga, visit www.conestogac.on.ca/research

A New Era in Mining Innovation

The Cambrian College Centre for Smart Mining (CSM) is poised to usher in a new era of mining innovation in Canada. Funded by the Natural Sciences and Engineering Research Council of Canada's Technology Access Program, the CSM works with small and medium-sized enterprises in the mining sector, by helping to de-risk and demystify new technologies, and interpreting research trends in the industry by providing them access to college resources, such as specialized equipment, faculty, and students.

Beyond its core programming, the CSM will be of service by offering a comprehensive, concentrated source of knowledge relating to emerging technology trends in the mining industry. To achieve this goal, the CSM has launched a quarterly event called Tech Talks, wherein next generation technology platform providers are invited to showcase and demonstrate their technologies to mining SMEs.

Whether companies are looking to address connectivity underground or research environmental remediation methods, the CSM can facilitate these activities and provide the mining industry with the support and resources to continue to be bold and innovative.

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CONESTOGA

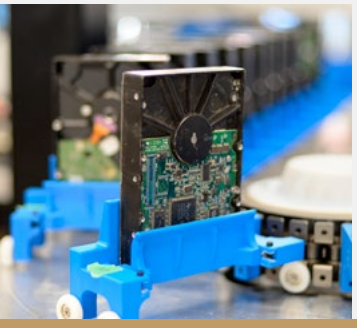
APPLIED RESEARCH AND INNOVATION

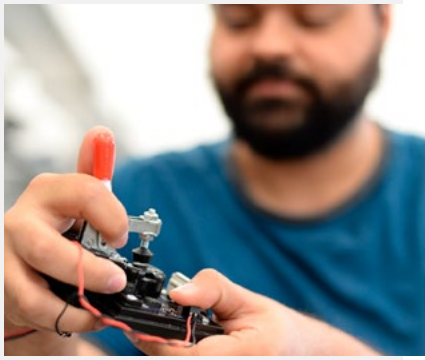
APPLIED RESEARCH

Conestoga Applied Research and Innovation (CARI) develops practical solutions for real-world problems. Through applied research projects, we connect industry partners with state-of-the-art research facilities, funding opportunities, and product development expertise. Our dedicated team provides critical support before, during and after the research process.

WE SPECIALIZE IN:

- Information & Communications Technology
- Digital Innovation & Cybersecurity
- Smart Manufacturing & Advanced Recycling Technology
- Indigenous Initiatives
- Healthy Communities
- Technology for Sustainable Living
- Food Processing Technology
- Advancements for Seniors Care
- Supply Chain Excellence
- Workplace Health and Safety





PARTNER WITH US. INNOVATE WITH US.

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Algonquin College takes a DARE on Social Innovation

In 2018, Algonquin College launched one of the first Social Innovation Labs in Canada's college system — all on a "dare".

Algonquin's new $45-million DARE District (Discovery, Applied Research, and Entrepreneurship) had 1,000 sq. ft. in three rooms still available. A community champion at the College had a daring proposal: could this space be used for a Social Innovation Lab? Today, that dream is a reality.

The Lab's inaugural initiative is SLiDE (Service Learning in Design & Engineering), where paid student interns from the schools of Media and Design, and Advanced Technology work on digital technology projects on behalf of local social-sector clients (service agencies, charities, non-profits, social enterprise, etc.).

IBM/SLiDE Interns Outcomes Self-Reported (Anonymous)

SLiDE left a meaningful impact on my…

Teamwork and collaboration skills — 100%
Professional skills and capabilities — 100%
Future employability — 82% (1 unsure)

SLiDE enhanced my knowledge and understanding of

Specific social Issues — 100%
Local social sector organizations — 100%
Value and role of the social sector — 100%

15/17 respondents — Response rate 88%

The IBM/SLiDE interns are immersed in the world of social innovation through "Born Social AC", where they participate in workshops and community visits to local social enterprises.

Algonquin College's Social Innovation Lab

Local social-sector clients have described the experience and the work product from the interns as awesome, fantastic, remarkable, cutting-edge and fresh thinking. One client said their involvement had "**turned into so much more than we could have anticipated. You have given us fresh insight into ourselves, complete with data and design**."

What started on a dare, has evolved into a new community-service model. The challenge now is to scale the impact, because as one of our interns said, "**it can change the future for the better.**"

Acknowledgements: The SLiDE initiative would not be possible without the support of the IBM Centre for Advanced Studies, Impact Hub Ottawa, the Centre for Social Enterprise Development, the Ottawa Community Foundation, Carleton University and the Ottawa Hospital Research Institute. This research was supported by the Social Sciences and Humanities Research Council of Canada.

More information:
Social-Sector Client Projects
Visit the Lab Virtually

Contact Us: SLiDE@algonquincollege.com

Applied Research at Yukon College Grounded in Community and Industry Partnerships

In the North, applied research is critical to understanding how lab-scale projects function in cold climates. Dr. Guillaume Nielsen, Natural Sciences and Engineering Research Council (NSERC) Industrial Research Chair in Northern Mine Remediation at Yukon College, is leading the way in applied research projects that support mining companies as they develop environmental best practices.

Nielsen works in partnership with six major Yukon mining companies — Newmont Goldcorp, BMC Minerals (No. 1) Ltd., Victoria Gold Corp., Casino Mining Corp., Selwyn Chihong Mining Ltd. and Alexco Resrouce Corp. — known collectively as the Yukon Mining Research Consortium (YMRC). His work focuses on mine water treatment, mine waste management and mine revegetation.

The Centre for Northern Innovation in Mining (CNIM) at Yukon College connects researchers like Nielsen directly with the mining industry. Thanks to CNIM and the Yukon Research Centre (YRC) lab at Yukon College built in 2011, Nielsen and his students are able to conduct lab-scale projects and then bring them to the next level, piloting them at active mine sites across Yukon at varying stages of the mine life cycle.

This connection between the lab and industry is one of the YRC and Yukon College's greatest strengths. The ability to access mine sites lets students and researchers apply their research and produce real, tangible knowledge. For example, Nielsen is conducting a pilot-scale study at Victoria Gold Corp.'s Eagle Gold mine site using a passive treatment technology relying on bioreactors where he grows native bacteria to remove specific contaminants from mine impacted water. This applied research project builds on a previous lab-scale study performed at the YRC that placed small bioreactor models in lab fridges to mimic cold temperatures seen in Yukon and the North. Nielsen has scaled up the project and applied the research on site at Eagle Gold, installing bioreactor drums, using real mine impacted water and site conditions to produce relevant solutions.

An important piece of Nielsen's work is engaging with mine impacted communities. He works to develop local capacity to champion and carry out research across Yukon, and he achieves this by regularly partnering with Yukon First Nations and Yukon communities. He also delivers training, workshops and presentations across the territory so that Yukoners can have an understanding of the work being done and are equipped to get jobs in the industry or participate in monitoring and research activities.

Small bioreactor models housed in a freezer at the YRC Lab at the Yukon College Ayamdigut Campus.
Photo Credit: Patrick Soporvich

Dr. Nielsen with the large bioreactor drums installed at Victoria Gold Corp.'s Eagle Gold mine site as part of a pilot-scale study.
Photo Credit: Roselyne Gagné Turcotte

This commitment to developing local capacity in the North is mirrored at the Centre for Northern Innovation in Mining, which offers innovative and flexible employment training to prepare Yukon people for work in the mining industry. The Centre is also instrumental in helping Nielsen engage with Yukon College students by way of guest lectures, lab workshops and other collaborations. It is these extensive partnerships and connections with industry, Yukon First Nations, communities and students across CNIM and the YRC that make Yukon College a leader in applied research.

Aurora College's Applied Permafrost-Infrastructure Research Hub

With an increased focus on climate change and its impact on the Arctic, Aurora College's research division, the Aurora Research Institute (ARI), is using its long history of applied research monitoring the impacts of ecological changes on the environment, infrastructure, communities, and social structures to benefit Northwest Territories residents.

The Applied Permafrost-Infrastructure Research Hub, a collaborative project with multiple stakeholders, received over $600,000 in funding for two years from three funding agencies: Crown-Indigenous Relations and Northern Affairs Canada's Climate Change Preparedness in the North, NSERC's College and Community Innovation Program's Innovation Build grant, and Applied Research Tools and Instruments grant. The project, led by ARI's Western Arctic Research Centre (WARC) Manager, Joel McAlister, aims to support innovative and applied permafrost monitoring and research methods that are linked to mitigation of climate-change adaptation needs. The project will enhance local capacity in applied permafrost monitoring and research and support more effective collaboration between northern governments, communities, industry, college, and university partners to mitigate and adaptclimate change strategies.

Permafrost thawing is causing unprecedented landscape change in the region. This change impacts more than just the natural landscape; it also affects society. One of the main objectives of the program is to develop a permafrost information management system to support infrastructure, community, and land-use decision making related to the effects of permafrost thaw. Through workshops, the program addresses how to work with technical experts and data generators to best compile, archive, and disseminate critical information on permafrost.

In 2018/19 we:

SECURED
$7.5 MILLION
IN RESEARCH FUNDING

CREATED
90 PROTOTYPES

HELPED
244 COMPANIES

SAIT pushes the boundaries of innovation with applied research division

In the upheaval of the First World War, the institution that would eventually become the Southern Alberta School of Technology opened its doors to 11 students eager to learn about metal working and motor mechanics. Two lathes, two drill presses, a forge, a motorcycle and an automobile were the sum total of equipment.

Fast forward a century and SAIT continues to showcase the same pioneer spirit, but at the leading edge of research and innovation with dedicated space, manpower and a passion for helping transform concepts to prototypes.

Since SAIT established its Applied Research and Innovation Services in 2005, it has steadily grown to the point where it helps nearly 250 companies a year, producing some 90 trial products and bringing in more than $7 million in research funding.

With 50,000 square feet of specialized lab space and more than 60 research staff, ARIS continues to push the envelope.

Through its Centre for Innovation and Research in Unmanned Systems, ARIS is exploring how Unmanned Aerial Vehicles (UAV), better known as drones, are creating new opportunities for environmental assessment, infrastructure monitoring and search and rescue operations. ARIS has partnered with Imperial Oil to employ drones that can collect data and photos at the company's northern Alberta site — offering improved understanding of the area's geography, along with opportunities to improve safety, sustainability and operational efficiencies.

Reducing industry impacts on the environment underpins a lot of projects for ARIS.

At the Green Building Technologies lab, researchers are working with industry partners to develop new systems and processes to move toward more sustainable and environmentally friendly buildings. Their building on SAIT's main campus is a living laboratory where researchers can develop and test everything from green roof plots that disperse water and living walls to green materials fabrication.

One of the newest additions is the Centre for Energy Research in Clean Unconventional Technology Solutions, which is dedicated to creating environmentally sound, reliable and efficient clean energy. In its three labs, ARIS — in association with the Natural Sciences and Engineering Research Council and Industry Research Chair for Colleges program — is exploring ways to improve oil sands production, reducing greenhouse gas emissions and improving water recycling through our Once Through Steam Generation Lab.

ARIS also offers an Environmental Technologies research team, and has partnered with Katal Energy to improve a process that uses water to make diesel fuel go further and burn more cleanly, without significant energy loss. A second client is a finalist in the Carbon X Prize competition, demonstrating their technology at the Shepard Energy Centre in southeast Calgary.

As ARIS pushes the boundaries of green technology, researches drinking water treatment systems for Indigenous and rural communities, creates the prototype for a life-saving pill dispensers and partners with industry and government on projects of all shapes and sizes, it continues to build on SAIT's reputation for innovation upheld by tradition.

Applied Research at Fleming College: Real-World Ambitions Taking Shape

Fleming College is hooked on applied research. From its faculty and students to the highest echelons of its leadership, the College demonstrates its commitment to Canadian and community innovation through a breadth of projects spanning across disciplines.

In the past year, our students, as much as our large research centres and consortia participants, set their minds to meeting various predefined challenges for businesses, community organizations and government. Their applied projects ranged from developing an online car share service for a township with very limited public transportation, to conducting market research for Ferment Management, a Dutch consultancy looking to expand into the automotive sector. Working in teams on projects normally lasting several months, our students created a database application for Evergreen Power Ltd. to help the company rationalize management of thousands of data points. They created a website with database capabilities for FastStart Peterborough, a community-based training partnership for young entrepreneurs, and they provided logistics and export documentation research for Swell Composites, a Vancouver-based company supplying sustainable material to makers of surfboards, snowboards and paddleboards worldwide.

Fleming's applied research activities crisscross disciplines as well as geographies. In 2019, at the request of the Government of Northwest Territories in partnership with Environment & Climate Change Canada, researchers from our Centre for Advancement of Water and Wastewater Technologies (CAWT) headed north to monitor water quality beneath a frozen lake in the Western Canadian Arctic. With ice augers and sampling equipment loaded onto sleds towed by snowmobiles, Fleming's team collected water samples from under the ice on Great Slave Lake and one other waterbody downstream of the City of Yellowknife's municipal wastewater discharge site. The research was carried out in response to concerns about nutrient pollution. Significant population growth in Yellowknife would result in greater volumes of wastewater produced, processed and discharged over time, which could lead to disruptive changes to the ecosystem down the line. By developing strategies for the reduction of nutrients at-source or within the wastewater treatment process, the City of Yellowknife can proactively work to protect Great Slave Lake water quality.

While Fleming has established its reputation locally and internationally in the sphere of water and wastewater R&D, it has more recently been gaining traction in the areas of mechatronics, IT, and wireless connectivity, growing its applied research capacity

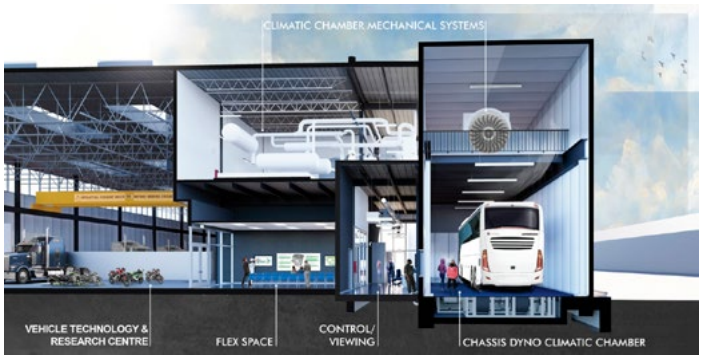
and attracting the talent of gifted students. Fleming researcher and software developer Evgeni Kolev, for one, has been helping Toronto-based company Behr Technologies Inc. (BehrTech) develop systems' integration solutions for a patented wireless Industrial Internet of Things (IIoT) transmission technology. The technology, called MIOTY®, was developed by Europe's leading application-oriented research organization, Fraunhofer Institute for Integrated Circuits, and licenced to BehrTech for commercialization to market. For Evgeni, "the main drive is writing software that can have a real impact." It is believed that MIOTY® will become the commercial standard for wireless IIoT connectivity worldwide, which translates to flexible and cost-effective data communication with improved service and capacity. Countless industries, such as manufacturing, mining, utilities, and oil & gas, will benefit.

In recognition of our outstanding applied research efforts, Fleming College President Maureen Adamson expressed her pride in having "some of the top researchers in Canada carrying out research that empowers local and regional businesses to solve problems that are global in reach and relevance. Our focus is on the needs of students and employers in the labour market, on the priorities of our communities, and on contributing to innovation in diverse fields so that we can build social and economic prosperity across sectors." The College has seen over 130 applied research partners to date and been awarded over $25-million in external research funding.

Participation in applied research deepens the learning experience of our students and is an integral component of many Fleming College programs. Students are provided invaluable experience, networking opportunities and contacts while delivering meaningful results to external partners. With the launch of our 2019-2024 Strategic Plan, which highlights innovation among its core values and sets out specific commitments for expanding applied R&D, the College is better positioned than ever to continue strengthening, supporting and realizing the visions of businesses and entrepreneurs—and not in the least, the visions of the students themselves.

Red River College welcomes third Technology Access Centre

Red River College is home to three Technology Access Centres (TACs) that provide a one-stop shop for the diverse needs of industry in our community and beyond.



RRC's new MotiveLab™ vehicle test facility

Our brand-new Prairie Research Kitchen awaits your food opportunities. With state-of-the-art equipment and a culinary-backed product development team, our ingredient application research program is the best in the West.

The Building Efficiency TAC (BETAC) supports Manitoba's building industry by helping clients design and construct durable, energy-efficient building envelopes in our unique climate.

The TAC for Aerospace & Manufacturing (TACAM) propels Manitoba's aerospace and manufacturing industries to new heights of innovation. TACAM supports real-world industry research projects from organizations seeking enhanced access to the best Red River College has to offer, including researchers, staff, students and facilities.

With three TACs, we're ready to tackle the demands of a changing world. The support from organizations such as the Natural Sciences and Engineering Research Council of Canada, the Canada Foundation for Innovation, Research Manitoba, the Province of Manitoba, and the Government of Canada supports RRC's ground-breaking work in a variety of fields.

For the past 15 years, Research Partnerships & Innovation at Red River College has helped students, researchers, and industry create award-winning results that build our communities and enhance our prosperity in Manitoba and around the world. What we're doing is working.

For more information, visit rrc.ca/research.

New facilities at RRC

Smart Factory

An applied research space, experiential learning facility, and technology demonstration site that showcases emerging technology, including robotics, automation and imaging systems.

MotiveLab™

A 7,000-square foot research lab home to a combination All Weather Climatic Chamber and Chassis Dynamometer test facility that caters to vehicles of all sizes across various markets. A unique facility for Western Canada, MotiveLab™ is capable of supporting on- and off-highway heavy vehicle testing and development requirements for the entire region.

Prairie Research Kitchen

A culinary research and food development centre, the Prairie Research Kitchen serves Western Canada's vibrant food production industries by building on our province's strengths in food research, development and innovation. Our clients in the food industry put the creativity and skills of our Culinary Arts students, staff and instructors to work bringing new food products or services to the market.

Students take on 'real-world challenge' in Georgian's four-seasons playground

The faculty and enthusiastic students at Georgian College's Research and Innovation Department work with industry partners to develop strategies and solutions that overcome real-world business challenges.

Pictured in the team photo: Jayne McCaw and the Jayne's Cottages Team; Chris Dick, Professor, Computer Studies and Applied Research Faculty Lead. The team of Student Research Assistants who worked on this project.

For Jayne's Cottages in the Muskoka region, the challenge was how to manage its data and communications as it scales up. President and founder Jayne McCaw began working with students in Georgian's Big Data Analytics graduate certificate program to build an all-in-one, user-friendly, web-based tool that will manage all aspects of the business — from property management and customer relations, to scheduling and marketing.

"There's currently no all-in-one solution available to property and vacation management professionals," says Jayne. "Right now, we're using nine different tools. The one we're partnering with Georgian to develop will help make Jayne's Cottages more efficient and responsive, and better equipped to handle growth."

Jayne's Cottages, owned and operated by JEMCORP Ltd., started as a property management company for luxury cottage rentals in Muskoka. It has evolved to provide a concierge service that arranges comprehensive, high-end vacation experiences for its clients – everything from day trips and boat rentals, to nannies and personal chefs.

The company works with property owners to simplify, maximize and safeguard the entire rental process. For vacationers, Jayne's Cottages eases the vacation planning process by meticulously curating and fulfilling rental needs to meet budget, lifestyle requirements, and special requests.

Over 95% of the cottages on its site had never been rented before, with 40% of clients coming from outside Canada.

Chris Dyck, Program Coordinator of the Big Data Analytics program and Applied Faculty Research Lead on the project, is providing mentorship and guidance to the students.

"This is a great opportunity for our students to work with an industry partner on a real-world challenge. They'll be helping to provide a solution that could significantly impact how Jayne's Cottages and the online travel industry does business in the future," he says.

Georgian and JEMCORP Ltd. received a grant for $75,000 from Ontario Centres of Excellence to carry out this project.

A Partnership with the CCNB-INNOV, a Road to Success!

From the SIP Awards to the New York International Spirits Competition, partnerships with CCNB-INNOV, the applied research network of the Collège Communautaire du Nouveau-Brunswick (CCNB), are helping companies to bring successful products to market.

CCNB-INNOV has contributed to the creation of the Blue Roof distillery producing potato-based vodka and gin.

Equipped with a microbiology laboratory, a chemistry laboratory, a beverage laboratory, a greenhouse and a scale-up space, their Agriculture-Bioprocesses-Beverages-Environment division helps many businesses in addressing analytical, technical and processing requirements, enabling process discovery and/or stabilization for efficient product development and proper scale-up options.

Blue Roof Distillers is a small micro distillery located on the Southeast edge of New Brunswick. Throughout the years, the Strang family has maintained a reputation for producing and packing premium quality potatoes. In 1855, they started farming with only five acres of land. Great great grandfather, Nathaniel Strang, used his produce to barter for provisions, selling off any excess in the local market. Slowly becoming known as the potato grower in the local area. Over time, grandfather Robert Strang decided to continue to grow the operation and began selling the produce door-to-door. Today the Strang family farms over 700 acres of land and produces and sells more than 350 acres of potatoes in the Atlantic Provinces. But the Strang family knew that throwing out their small unmarketable potatoes, did not make economic or environmental sense. With this in mind, they started a partnership with CCNB-INNOV.

CCNB-INNOV has contributed to the creation of the Blue Roof distillery producing potato-based vodka and gin. Production protocols were developed and Blue Roof Distillers employees were trained on the spot. The company has been very successful with its vodka, winning silver medals at the Canadian Artisan Spirits Competition and San Francisco World Spirits Competition, a double gold and a platinum medal at the SIP Awards and a KIRA Award in the category of the most innovative product or service developed in New Brunswick.

"The partnership with CCNB-INNOV has been essential to the success of our new venture. The necessary knowledge and experience would not have been

acquired without the help of the Grand Falls team", said Devon Strang, Chief Distiller, Blue Roof Distillers. Devil's Keep Distillery is Fredericton's, NB, first (and currently only) craft distillery! Started by co-founders Joe Allen and Ray Fitzpatrick who saw a need for small batch, locally sourced and produced spirits. They started with a smooth tasting Vodka, and are rapidly expanding into Gin and Whiskey. Their Devil's Keep vodka recently won a platinum medal from the SIP Awards in California! The award is the highest in its class and is judged as blind taste test. Consumer judging assures that there is no industry bias.

The recipe is inspired by locally sourced corn, rye, and barley. It was created in conjunction with Research Chemist Mike Doucette from CCNB-INNOV, and Head Distiller Joe Allen to be produced in small batches to ensure a premium spirit. It took only about 18 months from finalizing their recipes to winning the award, and their product is now in most New Brunswick liquor stores.

The partners chose vodka as their first offering as it is relatively fast to produce and is the most consumed spirit in the world. "Vodka is the number one consumed spirit in the world," Allen says. "More people drink vodka than any other spirit, so volume-wise it made business sense. We want to make whiskey, we want to make gin, but we need to be able to cash flow our business." Now, they are expanding into whiskey. The whiskey will have to wait at least three years to be considered Canadian standard but they intend to export their whiskey as soon as it is ready.

A cocktail made with wild blueberry and haskap from the company ExlPure based in Clair, New Brunswick, has been causing a stir being served to hundreds of people, including several celebrities, at the most recent "Prix Gémeaux" Gala. The product, a juice made with haskap berries and wild blueberries, was used in the development of a variant of an alcoholic beverage called the "Moscow Mule", which includes ginger beer, vodka and lime pieces.

The President of ExlPure, Guy Paillard, said he was very proud to see that a cocktail, based on juice developped by his company, could be tasted by several Quebec stars.

A cocktail with haskap and wild blueberries turned heads at the "Prix Gémaux" gala.

"CCNB-INNOV was, for our Co-operative, an important partner for the development of our products. Thanks to Mike Doucette and his team for the great work and quality of the products developed. It is only the beginning." said Guy Paillard, President, ExlPure.

On top of that, Haskap berries might be the next new superfood – but most people haven't heard of them. That's because the berries, which are higher in antioxidants than blueberries, have traditionally been found only sporadically in the wild across Canada, growing mostly on the edge of wetlands.

CCNB innov

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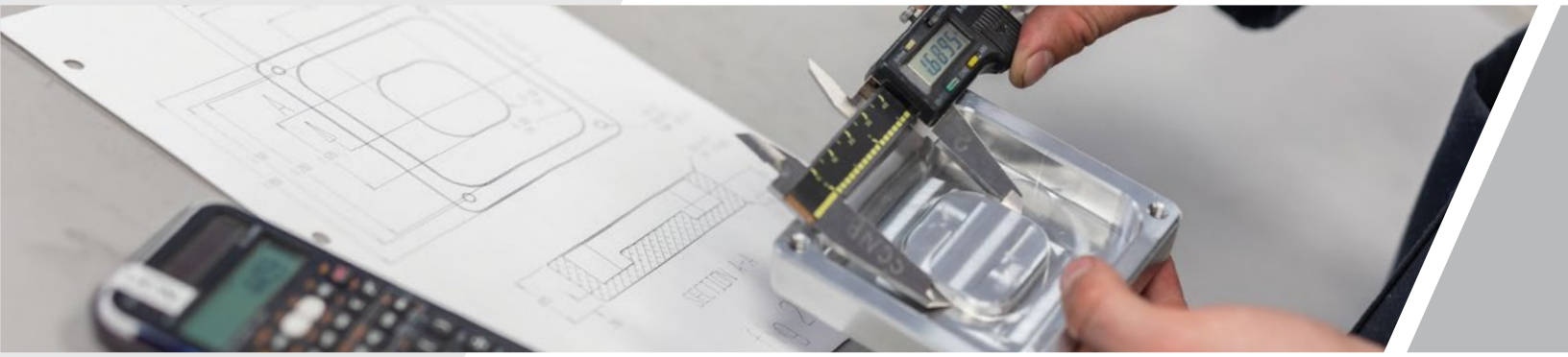

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Building Expertise on Diversity Education at Vanier College

Vanier College is one of Canada's most diverse colleges, boasting a range of nationalities, languages, and identities. This diversity pushes us to consider how educational institutions can best educate and support our students.

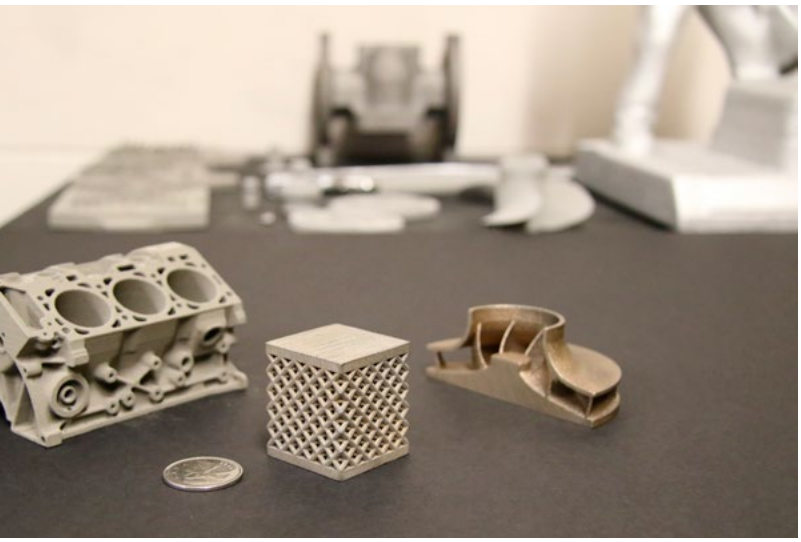
Vanier welcomes all students as they are, and takes responsibility for positive changes that will provide them with high-quality education that is accessible and relevant. This is why diversity education is a strong research priority.

We define "diversity" broadly, looking at ethnocultural background, race, language, sexuality, gender identity, disability, class, and age, and at how these identities may intersect with each other and with others not named here. Diversity education includes course content, teaching practices, institutional climate, and other factors. As a signatory to CICan's Indigenous Education Protocol, Vanier is also committed to affirming the importance of Indigenous education.

Vanier College is proud of the high calibre of our research, and the implications of this research for Vanier and other educational institutions. We are currently working to translate this vast experience into a centre of research and expertise on diversity education.

Infrastructure for the development of metal powders: from idea to innovation

By Nicolas Giguère, Eng., Ph. D., CMQ



In 34 years, the Centre de métallurgie du Québec (CMQ) has become one of the most successful Technology Access Centre and a leading player in the metallurgical sector, particularly in advanced materials. Since 2008, the CMQ has positioned itself in Quebec and Canada thanks to numerous investments in unique infrastructure and the addition of highly qualified personnel to its team already recognized for its expertise. Over time, these investments have been made possible by the Government of Quebec, the Canadian Foundation for Innovation (CFI), the Natural Sciences and Engineering Research Council of Canada (NSERC) and Canada Economic Development for the regions of Quebec (DEC).

The desire to diversify applied research activities was supported by structuring projects such as the establishment of the Advanced Alloy Technology Center (2008), thanks to NSERC's contribution. This project has enabled the Centre to acquire a unique expertise in Canada concerning advanced materials such as titanium and nickel alloys. As for the transformation of aluminum, it is supported in part by the activities of a dedicated NSERC research chair since 2012.

In 2013, CMQ has positioned itself as a key player in additive manufacturing. Numerous projects have emerged concerning the ultrasonic weldability of different aluminum alloys, the development of moulds and sand cores by 3D printing, the benchmarking of mechanical properties of different alloys using powder bed laser (PBLAM) and the development of DED applications.

This focus on AM has allowed the centre to develop a unique network of collaborators with academic and industrial researchers. Industrial partners from the aerospace, land transport, chemical, mining and the aluminum industry participated in collaborative projects with the CMQ and its scientific collaborators.

The main problem encountered by CMQ in recent years is the impossibility of obtaining metal powders for custom chemical formulations in order to develop new industrial applications. To overcome this lack of innovation, CMQ has set in motion an ambitious

project to make Canada a research and development hub in metal powders development for advanced manufacturing applications.

The challenge is twofold. First, provide the centre with the necessary equipment and, secondly, finance the construction of a building specifically designed to accommodate equipment while ensuring the safety of the staff. CMQ general manager, Mr. Gheorghe Marin, and his experts have therefore taken the risk to tie up a unique project of expansion and acquisition of equipment. The project was established with the financial support of the Canada Foundation for Innovation, Canada Economic Development, the Quebec Ministry of Economy and Innovation, Rio Tinto and Tekna.

In order to obtain the production capacities of almost all types of metal powder possible, we have acquired a gas atomizer from ArCast (USA), the only company providing the CMQ the possibility of producing aluminum powders. This equipment will also allow the production of titanium, iron, tool steel, nickel and stainless-steel powders to name a few. In addition, the infrastructure will consist of a spheroidizer/atomizer fabricated by Tekna (Canada). This equipment will be equipped with the unique proprietary wire feed technology to produce aluminum, titanium and nickel powders.

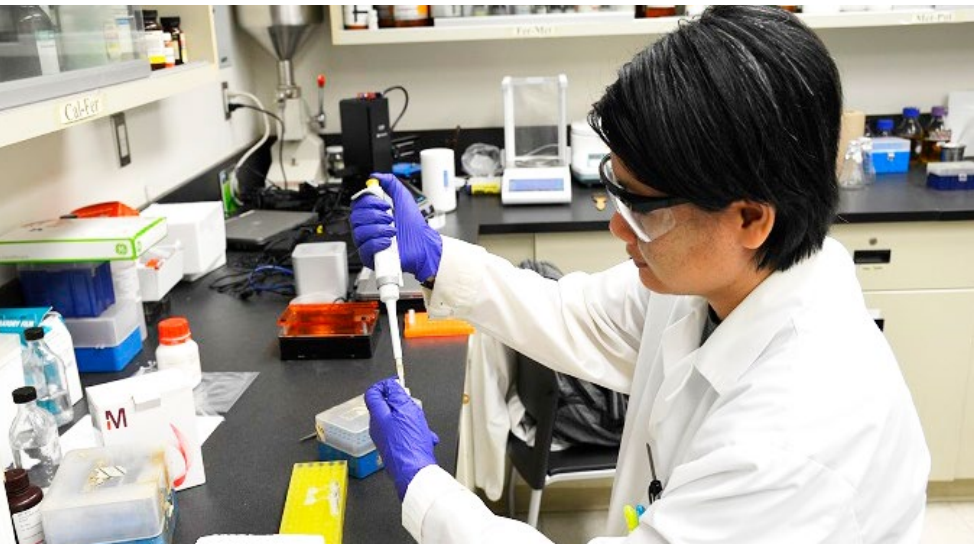
The infrastructure dedicated to research will also include all equipment for classification, handling and characterization of metal powders. In addition, CMQ signed a collaboration agreement with the Laboratory of powder metallurgy of Université Laval (Professor Carl Blais) and the Centre for microscopic characterization of materials at École Polytechnique de Montréal (Professor Gilles L'Espérance). The agreement provides that each party will make available to the entire group its infrastructure and human resources in order to create an applied research cluster with the aim of ensuring synergy in the development of metal powders in Canada. The group will also be able to count on a privileged collaboration with the Quebec Industrial Research Center (CRIQ).

Finally, in March 2019, Dr. Bernard Tougas, research engineer for CMQ since 2010, was awarded a NSERC Industrial Research Chair for Colleges. This chair, which aims to support applied research in the field of metal powders, brings together ten Canadian companies: Tekna, Hydro-Québec, P4Bus Systems, Precision ADM, SphereCo, Expanse Microtechnologies, 5N Plus, Polycontrols, General Dynamics and RIDD. The research axes will focus on the development of aluminum powders, titanium, nickel, tool steels and aluminides.

Leaping from invention to innovation:
Changing the landscape of life sciences and cosmetics research in Ontario

Companies often struggle to make the leap from invention to product development. The Seneca Centre for Innovation in Life Sciences (SCILS) was established to address this challenge.

Regulatory requirements and the scientific rigour required to develop life sciences-based products mean longer development cycles than other tech sectors. Small- and medium-sized enterprises (SMEs) in life sciences often operate without revenue, relying on external investment to fund R&D. Product development, enhancement and validation are needed to order to mitigate risk and reduce uncertainty for investors.



Seneca has both the research expertise and capabilities to enable innovation, commercialization and technology adoption. SCILS works with industry to enhance business productivity and competitiveness through product development, enhancement and validation in two key fields: life sciences diagnostics (clinical or industrial-based immunodiagnostics, molecular diagnostics, etc.) and cosmetics formulations.

Sports nutrition supplement developer Mitronite partnered with Seneca on three research projects. The company develops supplements based on physiology and metabolism research and is currently working with SCILS to develop assays to evaluate the effects of novel amino acid formulations on improving muscle recovery.

"Working with Seneca over the past four years has shown us the value of partnering with an organization that has knowledgeable researchers, state-of-the-art equipment, and well-trained, capable students," said Eaton Donald, founder and Director of Strategy for Mitronite.

Spartan Bioscience is partnering with SCILS to enhance the detection accuracy of a bacterial test. "The integration of a wide range of chemistry expertise in support of the development of diagnostics and life sciences products at SCILS will enable new applied research projects for us and for other life sciences SMEs across Ontario," said Spartan CEO Paul Lem.

SCILS also has research expertise in product formulation; method development and process optimization; product stability enhancement and testing; and quality control and regulatory affairs.

Over the next five years, Seneca intends to grow SCILS by dedicating significantly more laboratory space and equipment to research activities, making SCILS a powerhouse for industry-partnered life sciences applied research in Toronto.

To learn more about collaborating with Seneca, contact research@senecacollege.ca.

Sask Polytech's Digital Integration Centre of Excellence

Saskatchewan Polytechnic's Digital Integration Centre of Excellence (DICE) is using sensor technology and Internet of Things (IoT) integration to solve everyday problems.

DICE works with industry partners to help integrate sensor technologies into existing business models. Industry partners can work with Sask Polytech experts to prototype a variety of sensor integration scenarios and properly architect, secure, integrate, test and capitalize on the data being collected.

One DICE collaboration involves mine safety. Thanks to support from the International Mineral Innovation Institute (IMII) and member companies BHP and Nutrien, Dr. Terry Peckham, Digital Integration Research Chair, has begun work on a prototype system that will bring GPS-like positioning to the bottom of a potash mine. The system will identify where people and equipment are underground to within 30 cm of their location. This technology would increase efficiency by improving mine safety, process optimization and automation. It will also generate data that will benefit the mining companies in relation to mine layouts and miner movements.

"This DICE project focuses on developing infrastructure necessary to support autonomous mining machines and personnel tracking through sensor technology," says Peckham. "It lays the groundwork for development of production systems that provide remote monitoring, tracking and control through a system of sensors, beacons and hubs."

Using IoT integration, DICE helped Glacier Farm Media (GFM) develop an app using sensor technology for Ag in Motion in Saskatchewan, and for the Ontario-based Canada's Outdoor Farm Show. These annual outdoor farm expos host over 450 exhibitors and attract a combined total of 70,000 visitors each year. By downloading the app onto their smartphones, attendees gain access to wayfinding information, event details, bonus information about crop varieties, the inner workings of farm machinery and more. The app uses very little bandwidth.

GFM and their exhibitors, in turn, gain crucial insight into the interests and behaviours of event attendees, such as how many people pass each booth, how many stop and for how long.

"The opportunities for the use of sensor integration to improve our lives at work and home are endless," shares Dr. Susan Blum, Associate Vice-President, Applied Research and Innovation. "IoT technology can be used to benefit every industry. Sask Polytech is here to help our industry partners make informed business decisions that keep operational assets working, while lowering maintenance costs."

From mining, agriculture and bioscience to business, DICE helps industry tackle their IoT challenges. The impact of applied research projects is mutually beneficial for students and industry partners. Companies gain access to cutting-edge technologies that lead to measurable outcomes, while students gain knowledge that is difficult to obtain in a classroom.

To learn more visit saskpolytech.ca/research.

Aerospace and Advanced Manufacturing Research at Centennial College

Through the Downsview Aerospace Innovation and Research (DAIR) consortia, Centennial has partnered with Ryerson University, York University and University of Toronto on targeted research initiatives that will benefit the Ontario aerospace industry. Centennial has recently built a large training facility at Downsview, and is augmenting that activity with a landing gear development laboratory and other collaborative activities with these academic partners and a large consortia of Ontario based aerospace companies.

In recognition of the need for aircraft to become lighter weight and more fuel efficient, Centennial has been spearheading design and development activities in additive manufacturing (AM). Under the leadership of staff researchers, Centennial students are developing lighter weight components of both metallic and non-metallic composition for application in existing aircraft programs.

"Additive manufacturing has the capability to significantly reduce cost and mass for complex geometry non-structural parts" according to Dr. Eric Blaise who is the Director overseeing the Aerospace and Advanced Manufacturing research at Centennial.

This project has provided experiential learning opportunities to students in Centennial's school of engineering technology and applied science, and this research exposure has helped provide them with practical job skills in an area that is demonstrating strong industry demand. Project partners are also recognizing the significant benefits associated with AM, in making their components lighter weight and more cost efficient. AM also provides flexibility in terms of the design solution, as the resulting parts can be optimized according to the loads that they are required to manage.

Access to innovation spurs regional diversification and growth

By Dr. Mehdi Sheikhzadeh,

Executive Dean, Research & Innovation, Lambton College

Cluster development is essential for community survival and development. It can help diversify industry to ensure communities are not overly reliant on one sector, while creating an ecosystem that simultaneously stimulates the growth of Canadian SMEs and attracts international players to the area. A case study of the Sarnia-Lambton region highlights both the necessity of thinking long-term about regional cluster development, and the active part that colleges play in cluster building through efforts such as providing infrastructure, bringing together partners, and providing research and development (R&D) for SMEs.

The Sarnia-Lambton region is home to a major cluster of petrochemical and refining plants specializing in petroleum and petrochemical products including plastics, synthetic rubber, and chemicals. Additionally, the region has a long history in agriculture, and a significant proportion of the rural population is employed in the sector.

Grounded in strong community direction to diversify the economy by building a new industrial cluster, the Sarnia-Lambton Bio-Hybrid and Chemistry Cluster was established in 2007, merging and building on the strengths of the hydrocarbon-based and agriculture economies. The first and only one of its kind in North America, the Bio-Hybrid and Chemistry Cluster creates synergies between the traditional petrochemical industry and the bio-based chemical and biofuels industries. In this Cluster, bio-based SMEs bring strong innovative and entrepreneurial skillsets to technology development initiatives. The Bio-Hybrid and Chemistry Cluster has been formed through strong partnership among community players including Bioindustrial Innovation Canada, Western Sarnia-Lambton Research and Sarnia Lambton Economic Partnership. The Bio-Hybrid and Chemistry Cluster initiative has resulted in the attraction of Canadian-based and international SMEs to the region for pilot and production plant installation and operation. This vision has successfully contributed to more than $350M in investment and created more than 3,500 jobs. These companies offer a wide range of novel bioindustrial processes and technologies.

Many of these technologies need to be validated, improved, automated, optimized, and scaled-up for commercialization and full production purposes, which creates a critical need for R&D. Lambton College is the only education and applied research provider in the region to support the Cluster. One of four pillars in Lambton College's Strategic Plan (2013-18) directly supported innovation and cluster building for the Community through establishment of the Centre of Excellence in Energy & Bioindustrial Technology. To support the Centre of Excellence, the Bioindustrial Process Research Centre (BPRC) and Lambton Energy Research Centre (LERC) were established to provide applied research, technical services, and innovative solutions to industry and SMEs. Both BPRC and LERC have stimulated economic development and technology transfer to partners across the province, and their success has been a critical factor in building the Sarnia-Lambton Bio-Hybrid and Chemistry Cluster. To date, these two research centres have provided more than **150 projects and services with industry.**

Additionally, the Community is now embarking on a new cluster initiative to establish Digital Technology and

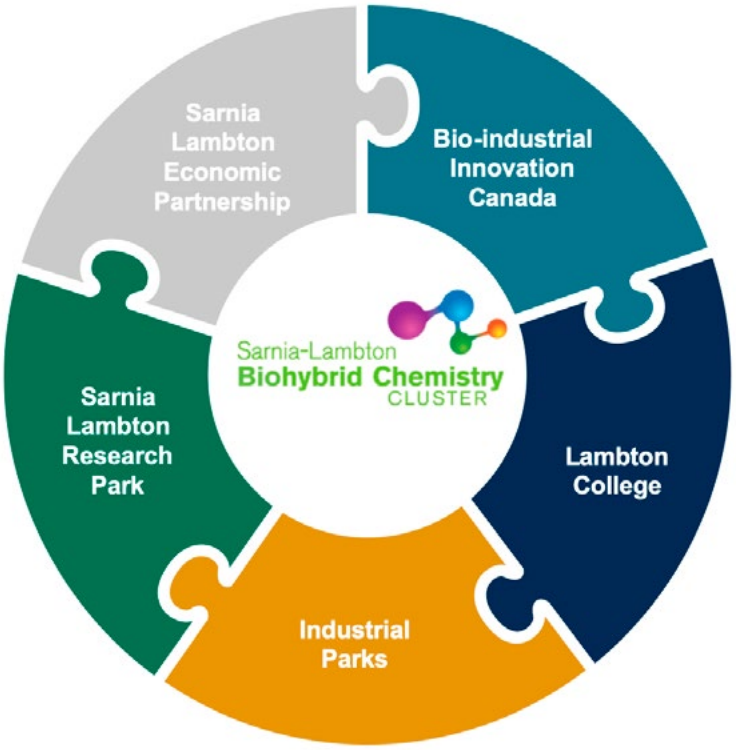
IT Cluster. To support this cluster building, Lambton College established the Information Technology & Communication Research Centre (ITCRC). The latest Centre was designed to align with national and provincial innovation strategies and opportunities as Sarnia-Lambton works to position itself to build capacity and contribute to the emerging digital sector by establishing its own.

Currently, more than 70 per cent of these collaborative projects are being conducted with non-local businesses and research activity growth has helped showcase Lambton College as a place for applied research, development, and access to highly qualified personnel. **Some of these companies have already started the discussion with local incubators and organizations to relocate partially or completely to Sarnia-Lambton.**

Furthermore, Lambton College, in collaboration with key economic community partners, has raised the profile of the Sarnia-Lambton region as a community for innovation-led industries, providing support to SMEs to develop, evaluate and commercialize innovative technologies while strategically diversifying the local industry and creating economic sustainability.

The Sarnia-Lambton experience highlights an important policy issue that colleges are helping to address. It can be very risky economically for communities to rely on one industry due to uncontrollable sector variables including connection to commodity prices, feedstock availability, political factors, environmental influences, and changing government and regulations. Because of these uncertainties, it is important for regions to look at diversifying the local industry focus to maintain a healthy and prosperous community.

When an industry sector in a community declines or stagnates, it also affects the viability of local supporting companies. Through utilization of existing infrastructure, expertise, and enhanced innovation, communities can build new clusters, attracting to their community new industries that will create economic and social impact such as jobs, investment, exporting opportunities, and new customers for supporting companies.



For new clusters to be developed successfully, it is imperative to have access to research and innovation resources. Small and medium-sized enterprises (SMEs) require R&D support to create, or improve, existing products, processes and technologies for commercialization. However, new companies, specifically SMEs, do not often have R&D capacity, and when they do their R&D is very limited and focused on their technology rather than multi-faceted support, which is required for commercialization and full-scale process development. This reality can create an innovation gap that hinders the growth of both SMEs and their communities. As illustrated by Lambton College, colleges can fill this gap through applied research initiatives.

By providing essential R&D services to local SMEs and initiating cluster-building initiatives, which in turn supports regional diversification and strengthens communities, colleges and institutes play a vital role in Canada's economic growth.

AI/HUB

DURHAM COLLEGE
SUCCESS MATTERS

Solving complex problems through artificial intelligence at Durham College

Less than two years ago, Durham College (DC) launched its Hub for Applied Research in Artificial Intelligence for Business Solutions (AI Hub). Since then, its team has led more than 40 research projects in artificial intelligence (AI), uncovering crucial business insights and providing organizations with intelligent and autonomous solutions to complex problems.

This fall, researchers at DC will jump into one of the most fascinating fields of AI, beginning a six-month applied research project using computer vision technologies to benefit the health-care sector. Through the development of image recognition and processing algorithms, this project will assist physicians in making earlier and more precise diagnoses – reducing treatment costs for patients and potentially saving lives.

The AI Hub will also continue to improve customer experience in service sectors through the development of deep learning models, increasing efficiency by automating processes that allow workers to focus on more strategic tasks. In the past, these applied research projects have resulted in the development of voice agents to automate service quotes or resolve parking inquiries, medication reminders for patients, and recommender systems that improve operational decision-making.

As the field of AI grows, so does the AI Hub and DC's influence on local industry – offering workshops, sold-out Tech Talks and the Enable AI Summit for professionals to further advance their skill set, all while providing student researchers with opportunities to gain client-centric, real-world industry experience through applied research projects.

> DC's applied research projects are allowing organizations to embrace the unlimited potential of artificial intelligence, improving their operations and impacting society in positive ways.

Lakeland College animal science students help agricultural producers improve bottom line

In fall 2018, students in the livestock research unit of the Student-Managed Farm – Powered by New Holland initiated a 70-day residual feed intake (RFI) test with 22 yearling bulls (Red/Black Angus), in partnership with Animal Inframetrics Inc.

To complete this custom feed efficiency assessment, they used Lakeland's GrowSafe automatic feeding system and infrared thermography (IRT) at the G.N. Sweet Livestock Research Facility on the Vermilion campus. With guidance and mentorship from Dr. Obioha Durunna, Lakeland's livestock research scientist, students collected performance and economic data, and learned how to run cost-benefit analyses on both systems. The project helped students assess the potential application of IRT for profiling cattle for RFI. Developing alternative tools for screening or profiling animals is important because of cost implications. Assessing the trait requires about 50 to 70 days of feeding trial and is usually conductedafter weaning, therefore finding practical proxies that can be used on younger calves or for much shorter periods will increase productivity and sustainability of the cattle industry.

In Photo (left to right): Iris Ho In Cheang- agricultural research technician, Dr. Obioha Durunna – Lakeland's livestock research scientist, Brady Miller – agricultural research technician.

"Engaging students with emerging technologies is an essential component of learning at Lakeland," says Dr. Durunna.

The RFI profiles of the bulls supported the producer's breeding and culling decisions. Efficient bulls that have other desirable economic traits attract some premium during bull sales. Because the RFI is moderately heritable, the animal's feed efficiency can be passed on to their progeny.

This year, SMF students will have the opportunity to use the new SmartFeed-Pro (SFP) systems for RFI assessments and supplement research. The SFP units were recently secured using funding support from the Applied Research Tools and Instruments Grant from the Natural Sciences and Engineering Research Council of Canada's (NSERC) College and Community Innovation program. This equipment will increase the scope of Lakeland's multi-year livestock trials.

Every applied research initiative undertaken at Lakeland is geared towards supporting Alberta's future economy by helping industry partners capitalize on new opportunities and find solutions to current challenges.

Applied research at Mohawk College drives learning, productivity and innovation

The quest for knowledge, searching for solutions to challenges, and exploring opportunities to improve products and practices all fuel applied research and innovation.

Mohawk's applied research partnerships provide experiential learning to students that lead to career success, and discover solutions that increase productivity, revenue, and market-share for industry partners.

The Hamilton position at the forefront of advanced manufacturing, digital health, technology, energy and transportation is supported by Mohawk's student and faculty expertise, cutting-edge resources, and deep industry connections.

The College's research hub IDEAWORKS catalyzes, funds and supports research across the college. Here are four examples of applied research at Mohawk among dozens of recent projects.

Digital electricity

iLLUMA-Drive required independent validation of its new digital electrical platform for LED lighting systems for homes and businesses. Energy & Power Innovation Centre (EPIC) students and faculty designed and built test beds to calibrate and compare results in efficiency, light efficacy and light flickering.

Outdoor play

Mohawk faculty, staff and students collaborated on research into how to embed the pedagogy of outdoor play into the Early Childhood Education (ECE) program. The result is a practical, hands-on guide that aims to combat children's sedentary lifestyles one educator at a time.

Customized IT

A team of students, staff and faculty investigated and customized a scalable IT solution for Niko Apparel, a Hamilton sports company that allowed it to secure a lucrative contract with a multinational client.

Virtual reality

Students and faculty in Mohawk's Building and Construction Sciences program helped structural steel company Walters Inc. to overcome virtual reality's steep learning curve by recommending devices, software, and training and providing a step-by-step process to integrate VR into its workflow.

Learn more about Mohawk's innovation and IDEAWORKS applied research projects at www.mohawknewsdesk.ca/applied-research-at-mohawk

College Student Success Innovation Centre

Research. Solutions. And everything in between.

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Research. Solutions. And everything in between.

IDEAWORKS fills the space between research and solutions by delivering customized support to organizations.

As an active hub of applied research and innovation, we provide our industry and community partners access to faculty and staff expertise, an inspired student workforce, exceptional facilities and top technology.

Applied Research Expertise:

- Additive Manufacturing
- Augmented & Virtual Reality
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- Digital Health
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- Medical Technologies
- Remotely Piloted Aircraft Systems
- Social Innovation
- Student Success
- Sustainability

mohawkcollege.ca/ideaworks

#7 Research College in Canada

SOURCE: RESEARCH INFOSOURCE INC., NOVEMBER 2019

mohawk
IDEAWORKS

Humber College — Mobilizing the Power of Innovation

Imagine Samantha and Aditya, two students from the Bachelor of Commerce program, working with their professor, Joseph, and a local small business to develop a program to teach the elements of financial literacy to young children. With the help of students and faculty from the Game Programming advanced diploma program and the Child and Youth Care degree program, Joseph, Samantha and Aditya, the educational initiative is gamified to increase engagement with the target audience.

This example illustrates what's possible with Humber College's Centres of Innovation (COIs). The COI network encourages interdisciplinary collaboration to solve complex, real-world problems. Industry and community partners benefit from the power of fresh ideas and innovative thinking, while students gain the skills and experiences to be career-ready.

Humber's COI network focuses on five areas of proven strength and industry sector growth: technology, creative business, health and wellness, entrepreneurship and social innovation.

The **Barrett Centre for Technology Innovation** (Barrett CTI) opened in April 2019 and has already demonstrated the power of the COI model. The facility includes flexible and collaborative space, as well as unique mixed reality, advanced manufacturing and digital media equipment which creates opportunities for interdisciplinary projects and enhanced creativity.

The Barrett CTI is home to Humber's Advanced Manufacturing Skills Consortium; a set of partnerships with industry leaders focusing on applied research projects, collaboration between partners, and training and development solutions for students and workers.

Humber's Centre's of Innovation Network

The heart of Humber's thriving skills varsity program is located within the Barrett CTI. Humber students have competed and medaled in baking, digital game art, photography and mechatronics at Skills Canada. Humber's mechatronics competitors have placed in the top five during the last two consecutive WorldSkills competitions.

The **Centre for Entrepreneurship** is a student-focused, on-campus destination which promotes entrepreneurial and interdisciplinary thinking. The CfE recognizes that ideas can come from within and provides opportunities and space to collaborate and create.

Humber's innovation ecosystem is being enriched by three additional COIs currently in development: the **Centre of Innovation in Health and Wellness**, the **Centre for Creative Business Innovation**, and the **Centre for Social Innovation**.

Humber's COI network is preparing graduates to be the innovation leaders of the future and is helping partners bridge the gap between ideas and results.

www.Humber.ca/COI

Fermenting innovation:

Okanagan College Applied Research blends learning and teaching to benefit industry and community

What does enhanced quality control testing for craft beverage producers have in common with new means of encouraging natural outdoor play for children, innovation in hydroponics and greenhouses, and software designed to help massage therapists curb patients' chronic pain?

All are applied research projects being carried out at Okanagan College. One of the newest and most ambitious is the BC Beverage Technology Access Centre (BCBTAC).

Headquartered in Penticton at the College's Jim Pattison Centre of Excellence, the BCBTAC is supported by $1.75 million over five years from the Natural Sciences and Engineering Research Council of Canada. The project will create new and enhanced access to technical, analytical and business services to small- and medium-sized distilleries, cideries, breweries and wineries.

Operations will ramp up this fall, which is music to the ears of the 19 craft cideries, 219 wineries, 16 craft distilleries and more than 25 craft breweries within the College's catchment area, which stretches from Revelstoke to the U.S. border.

"From the moment we first began to reach out to industry to collect their input and gauge if this was something there would be appetite for, it's been a project that people have rallied behind and helped us to bring to fruition," says Dr. Andrew Hay, the College's VP Education.

"It's the first time these types of research tools, analytical services, and expertise will be at the fingertips of producers right here in the Okanagan. Hopefully it will translate into innovation in everything from production to testing to packaging to sustainability for producers."

The BCBTAC supports a diverse portfolio of applied research projects. For example, David Williams is investigating sustainable agriculture methods in the Shuswap area. The project is also giving students a real-world opportunity to put their knowledge and creativity to the test.

Over the summer, students Logan Costa-Hemingway designed and built a working prototype for a weather-proof inground temperature monitor – a new tool that could save farmers a great deal of guesswork.

"Experiences like this give students a chance to build on what they're learning in the classroom," says Williams, Chair of the College's Electronic Engineering Technology program. "Having the time, the support and the dedicated opportunity to take an idea, refine it, and built it with their own two hands makes the learning even more real for them."

Read more at okanagan.bc.ca/appliedresearch.

Innovation powers rural communities

By Gail Bowkett

Far away from Canada's urban hubs, rural communities make significant contributions to our nation's economic growth. According to a 2018 report by the Federation of Canadian Municipalities, rural communities employ over four million people and generate 27 per cent of our gross domestic product. Rural areas supply food, water and energy for rapidly growing metropolitan regions, and they sustain industries that contribute to Canada's prosperity. Nearly 23 per cent of Canada's work force lives in rural communities.*

However, rural communities, often in remote areas, face significant challenges. The distance from cities requires additional expenses for providing services and goods to citizens. Grappling with global issues including environmental concerns, coupled with attempting to achieve a reasonable standard of living with finite resources, often forces difficult choices.

In order to survive — and thrive — rural communities must innovate.

Applied research provides a potential solution to challenges faced in rural communities and the businesses located in them. Colleges and polytechnics, often located in rural areas, provide the untapped human resources to deliver research that supports corporate goals through innovation.

Mitacs — a nationwide not-for-profit organization — powers Canadian innovation through collaborative research with industrial partners. Mitacs partners with companies of all sizes to create and deliver work-integrated-learning opportunities — innovation internships — for students across Canada, including those attending colleges and polytechnic institutes. In fact, the majority of industry partners Mitacs works with are small- to medium-sized businesses, representative of the majority of businesses in Canada.

For example, in partnership with Fanshawe College and the Ontario Maple Syrup Providers Association, a Mitacs intern conducts research that will benefit the 400 independent maple farmers in rural Ontario. The intern performs empirical tests and collects data to determine what causes "buddy," a burnt Tootsie-roll flavour that ruins syrup. Key to unlocking the buddy problem, the research holds the answer for hundreds of rural farmers to increase their syrup yield and profits.

Meanwhile, in rural Alberta, insects including flea beetles, diamond back moths, lygus, and wireworms feast on canola. With the anticipated prohibition of two key insecticides, canola producers face huge losses. A Mitacs intern from Olds College researches a solution to these harmful insects — predatory nematodes, a commercially available solution for pest management. The intern's findings will contribute to sustainable pest management for canola farmers.

These two examples illustrate the types of collaborative research that college interns conduct, providing data-driven solutions benefitting rural businesses across Canada. Mitacs has agreements with colleges and polytechnic institutes coast to coast to coast, and is currently supporting 76 work-integrated-learning student internships. These collaborative research opportunities significantly benefit rural communities, ensuring they share in Canada's economic prosperity, and ultimately, thrive through innovation.

Gail Bowkett is the Director, Innovation Policy at Mitacs, a not-for-profit organization that fosters growth and innovation in Canada.

***Federation of Canadian Municipalities Report: Rural Challenges, National Opportunity, May 2018 https://fcm.ca/sites/default/files/documents/resources/report/rural-challenges-national-opportunities.pdf**

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