

READY TO WORK TOGETHER

THE 2019-20 REPORT FROM
LETHBRIDGE COLLEGE'S CENTRE FOR
APPLIED RESEARCH, INNOVATION
AND ENTREPRENEURSHIP

CULTIVATING PARTNERSHIPS

Welcome to Lethbridge College's third annual applied research report, covering our activities for the 2019-20 academic year.

I am so pleased to share that we have seen continued growth in our research portfolio this year, including the creation of strategic partnerships, success with national and provincial funding agencies, and the expansion of our research and administrative teams.

Our commitment to and support for the agriculture industry has expanded. Our research team in Advanced Postharvest Technology is supporting local producers in improving handling and crop storage. We secured a prestigious, five-year renewable Natural Sciences and Engineering Research Council grant to establish our Integrated Agriculture Technology Centre (IATC), part of a network of 60 Technology Access Centres across Canada. The IATC is increasing capacity for applied research, technical services, consulting and training. In addition, it will have a profound impact on small- and medium-sized businesses in the agricultural sector as we help meet their research and development needs through accessible and affordable services in our areas of research expertise.

Our applied research program in virtual reality (VR) has been in very high demand as well, bringing national and international interest to the college. The VR team has worked with many partners, including Calgary's Red Iron Labs and local companies in the health and training sectors, to establish Lethbridge College as a leader in applied research in support of this dynamic emerging technology.

We are very proud that our research has been also been recognized nationally. We are again ranked as one of the Top 50 research colleges in Canada and we received the Gold Award for applied research excellence from Colleges and Institutes Canada.

You can find more details about these and other research initiatives and partnerships in the following pages and even more online at lethbridgecollege.ca/carie.

Applied research at Lethbridge College provides unique opportunities for students, staff, faculty and dedicated researchers to undertake vital work that supports our economy. I hope you enjoy the stories and activity updates contained within our report. Thanks for reading – and please contact us if there is a real-world problem our team might be able to help you solve.



Kenny Corscadden, PhD, PEng, FIET
Associate Vice President, Applied Research,
Innovation and Entrepreneurship





CREATING SOLUTIONS

It has been a year like no other at Lethbridge College – and not just because of the changes brought about by the global pandemic. During the 2019-20 academic year, the talented researchers, faculty members, staff and students in our Centre for Applied Research, Innovation and Entrepreneurship (CARIE) have brought in more federal funding, launched more projects and worked with more industry partners than ever before in the team's 30-year history.

Our diverse applied research projects illustrate the broader connection the college has always had with the community, as we work together to connect people, to uncover opportunities, to discover solutions and to lead and transform. It is a true pleasure to see our CARIE team in action, whether they're creating teaching and learning experiences in virtual and augmented reality, developing researchers among our existing faculty and staff, finding ways to bring water to arid lands, reducing waste after the harvest and so much more.

This past year, the college's Indigenous Services manager joined our research advisory committee, and we look forward to learning more about Indigenous ways in the year ahead. In addition, we are eager to support initiatives aimed at longer term economic diversification and need, as well align our work with Canada's commitment to the 2030 Agenda for Sustainable Development. I can't wait to see all of the partnerships and projects that our CARIE team has planned next because, as we like to say at Lethbridge College, we know that what happens next matters most. And I know they are ready.

Paula Burns, PhD, MBA
President and CEO



ABOUT THE ICONS

As a member in the ImpAct initiative with Colleges and Institutes Canada (CICan), we engage in campus activities that support Canada's 2030 Agenda. The icons in this publication reflect how we align our research projects with the UN's Sustainable Development Goals (SDGs). Learn more about the SDGs at un.org/sustainabledevelopment.



Lethbridge College is located on the traditional land of the Blackfoot Confederacy and is home to many Indigenous peoples, including members of the Kainai, Siksika and Piikani First Nations, as well as Métis and Inuit people. Through recognition and respect for the distinct cultures, languages, histories and contemporary perspectives of Indigenous peoples, we are committed to Indigenous-centred education that improves the lives of learners and communities.

> READY TO GROW THE AGRICULTURE INDUSTRY

Lethbridge College researchers are cultivating innovation in Canada's agriculture sector thanks to one of the most significant grants in college history.

The Integrated Agriculture Technology Centre (IATC) at Lethbridge College offers farmers, growers and food processors access to applied research and development, technical services and consulting, and training and education. The centre, which launched in April, was made possible through a landmark \$1.75 million five-year renewable grant from the Natural Sciences and Engineering Research Council of Canada (NSERC).

"The IATC enables us to expand our capacity to support the agriculture industry," explains Megan Shapka, manager of the IATC and of Innovation and Entrepreneurship at the Centre for Applied Research, Innovation and Entrepreneurship (CARIE). "Through our streamlined client intake process that facilitates quick and affordable service, we have already seen an increase in grant-funded projects and fee-for-service contracts."

The IATC is part of a network of 60 Technology Access Centres (TACs) nationwide created through Tech-Access Canada; each serves a specific geographic area with a focus on strengthening a sector of significance to that region. Agriculture is one of southern Alberta's largest industries with more than 900 farms, many of which are small- or medium-sized enterprises.





SUSTAINABLE DEVELOPMENT GOALS ALIGNMENT

2 ZERO HUNGER



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



These farms generate \$1.1 billion per year. For businesses connected to the agriculture industry, including ag-tech, greenhouse, aquaculture and large-scale crop producers, the customized services and first-hand research data on innovative technologies available through the IATC offer a unique opportunity to increase productivity and boost competitiveness.

“As part of the established network of TACs, we can share best practices and foster collaborations with industry, government, and other post-secondary institutions across Canada and help drive economic growth by providing local, accessible and affordable research and development services,” says Shapka.

In May, Calgary-based organic fertilizer producer EarthRenew started working with the centre on a project to field-test five organic fertilizer formulations at the college’s greenhouse. The trial wrapped up in June with positive early results.

“Lethbridge College was a natural choice for us because of the institution’s deep focus on agriculture, strong applied research focus and proximity to our site in central Alberta,” explains EarthRenew CEO Keith Driver. “The data from this trial is expected to help us to refine our product offerings as we move towards restarting production; we intend to use the results to demonstrate the value add of EarthRenew fertilizer to our customers this fall as they look to make purchase decisions for next year’s planting.”

➤ “AS PART OF THE ESTABLISHED NETWORK OF TACS, WE CAN SHARE BEST PRACTICES AND FOSTER COLLABORATIONS WITH INDUSTRY, GOVERNMENT AND OTHER POST-SECONDARY INSTITUTIONS ACROSS CANADA AND HELP DRIVE ECONOMIC GROWTH BY PROVIDING LOCAL, ACCESSIBLE AND AFFORDABLE RESEARCH AND DEVELOPMENT SERVICES.”

Megan Shapka

Manager, Integrated Agriculture Technology Centre (IATC)



\$5
MILLION

OVER \$5M IN APPLIED RESEARCH FUNDING,
INCLUDING \$1.34M FROM THE COLLEGE

\$2
MILLION

OVER \$2M IN TRI-COUNCIL (CIHR, NSERC
AND SSHRC) FUNDING

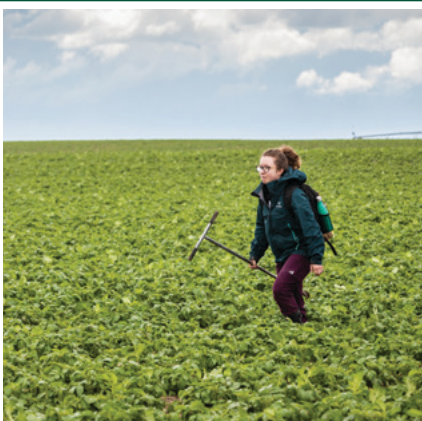
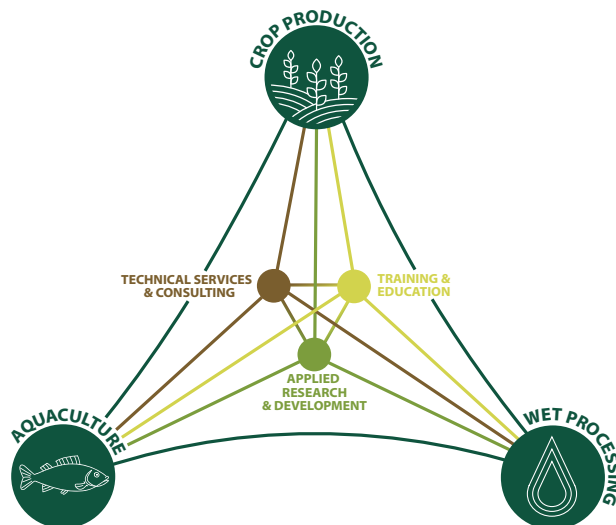
89%

89% SUCCESS RATE IN GRANT PROPOSALS



TO LEARN MORE ABOUT WORKING
WITH THE IATC, VISIT

iatc.ca



OUR PEOPLE: DR. MICHAEL KEHOE

Dr. Michael Kehoe is a data scientist who joined Dr. Willemijn Appels, Mueller Applied Research Chair in Irrigation Science, and her team in January 2020. Dr. Kehoe's work supports research in both agriculture and aquaponics, and he has diverse experience offering statistical and mathematical support to collaborators. In his new role, he will work on data from Dr. Appels, using a combination of time-series analysis of data and theoretical modelling to investigate soil moisture dynamics in potato fields. He is also working with Dr. Nick Savidov, a senior research scientist in the college's Aquaculture Centre of Excellence, analyzing experimental data from growth experiments. He says while his research experience is in the environmental sciences, he is also interested in hearing about opportunities in other fields.



> HARVESTING INNOVATION

While his focus may be on what happens to crops after they are harvested, Dr. Chandra Singh has spent much of the past year planting seeds for the future of agriculture research at Lethbridge College.

Singh joined the college's Centre for Applied Research, Innovation and Entrepreneurship (CARIE) as its first applied research chair in Agricultural Engineering and Technology in the fall of 2019. Since then, he has been working to build up the new Advanced Postharvest Technology program at the college and forge partnerships with industry, all while continuing his own research on addressing the gap in postharvest handling and storage of crops and grains in southern Alberta.



"It was a really good year for accessing funding, building our research capacity and reaching out to different stakeholders, industry partners and grower associations in Alberta to develop relationships with them," says Singh.

Highlights from the past year include a \$150,000 Natural Sciences and Engineering Research Council of Canada (NSERC) Applied Research Tools and Instruments (ARTI) grant for the purchase of a short-wave infrared hyperspectral camera. Hyperspectral imaging is a technique that analyzes a wide spectrum of light beyond what can be seen with the human eye or with standard RGB imaging; it enables Singh and his team to spot minute differences in crops such as potatoes and sugar beets to detect diseases or infections.



SUSTAINABLE DEVELOPMENT GOALS ALIGNMENT

2 ZERO HUNGER



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



Singh also secured an Alberta Innovates Smart Agriculture and Food Innovation Program grant of \$49,950 to use sensing technology to monitor in-bin grain storage conditions and automated fan and heater controls to regulate moisture and temperature to minimize postharvest losses. “With advancement in postharvest technology, farmers can start early harvest to minimize adverse weather effects and properly manage the grain in storage with minimum spoilage risk,” said Singh.

Singh has already established working relationships with the Alberta Sugar Beet Growers and the Potato Growers of Alberta (PGA), associations that support two key crops in southern Alberta’s agricultural sector and has also started to work with Alberta’s grain growers. He recently received an NSERC Engage grant valued at \$25,000 with Lantic Inc., a Taber-based sugar beet processor, to improve sugar beet storage in outdoor piles.

Singh is also leading potato variety trials at the Crop Diversification Centre South Brooks with several other partners, including Agriculture and Agri-Food Canada, Canadian Horticulture Council, PGA and potato industry partners including Lamb Weston, Old Dutch and The Little Potato Company. He’s also secured fee-for-service contracts with companies totalling \$65,700.

All that work requires extra hands, so Singh has seen his research team grow with the addition of two post-doctorate researchers, Dr. Rani Ramachandran and Dr. Senthilkumar Thirupathi.

With the agriculture sector in southern Alberta suffering significant crop losses in the past few years due to adverse harvest weather conditions, Singh’s work to maximize the crops that make it to storage will be vital over the next few years. “I’m very happy with the progress we’ve made over the past year,” he says, “and it’s given me a very good opportunity to establish trust with the industry and build relationships with them for the long term.”





“I’M VERY HAPPY WITH THE PROGRESS WE’VE MADE OVER THE PAST YEAR AND IT’S GIVEN ME A VERY GOOD OPPORTUNITY TO ESTABLISH TRUST WITH THE INDUSTRY AND BUILD RELATIONSHIPS WITH THEM FOR THE LONG TERM.”

Dr. Chandra Singh

Applied Research Chair in Agricultural Engineering and Technology

OUR PEOPLE:

DR. RANI P. RAMACHANDRAN

Dr. Rani P. Ramachandran joined the CARIE team in February, working as a research scientist on Dr. Chandra Singh’s team. Her earlier work focused on superheated steam drying as an energy efficient drying medium for biofuel-industry based byproducts and was recognized as a groundbreaking novel contribution to the discipline of Applied Sciences. In her new role as a research scientist with the CARIE team, she says her goal is to further develop her career with a commitment to research in advanced postharvest technology, valorization of agricultural products, and optimization of food processing operations. She says that this work which will help “unravel new research questions by joining in hands with established researchers in my field at Lethbridge College and around the world.”



DR. SENTHILKUMAR THIRUPPATHI

Dr. Senthilkumar Thiruppathi started work this fall as a research scientist on Dr. Chandra Singh’s research team. His earlier work focused on using NIR hyperspectral imaging and machine learning techniques to detect fertility and gender in chicken eggs; marbling in pork loins; and mycotoxins and fungal infection in food grains. Dr. Thiruppathi is now focusing on establishing a food quality imaging lab under the guidance of Dr. Singh and creating protocols for using NIR hyperspectral imaging system to detect quality parameters associated with potatoes and sugar beets. He also works on developing safe storage guidelines for food grains. He looks forward to his new role, explaining that “people at CARIE are always giving high priority for quality research and helping me to establish my professional career.”



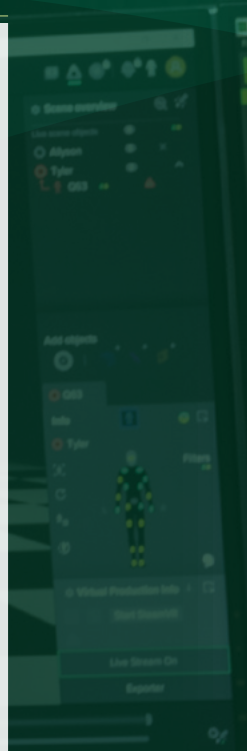
> BUILDING A VR EXPERIENCE FOR CAREGIVERS

For people living with dementia, their families and health care professionals who work with them, the condition presents a host of challenges. Communicating with loved ones and carrying out basic tasks like eating or getting dressed becomes difficult. Confusion, anxiety and agitation can lead to mood swings and even physical confrontations.

But Lethbridge College researchers are offering help in the form of a new immersive virtual reality training platform designed to help caregivers manage scenarios involving people with dementia.

The CareGiVR project is a partnership between Lethbridge College's Spatial Technologies Applied Research and Training (START) initiative and Calgary tech studio Red Iron Labs made possible by a \$250,000 grant from Alberta Innovates eXtended Reality Health Economic Acceleration and Development (xR HEAD) program. The heart of the project is an interactive application that will place caregivers into highly realistic virtual reality scenarios where they interact with virtual clients created with sophisticated performance capture technology who demonstrate a range of emotions and responses.

"Interacting with a client with dementia is so much about reading body language and facial expressions to know if the client is responding well to you or if they're getting agitated or are going to lash out, so we want to create scenarios that are as realistic as possible," explains Mike McCreedy, Lethbridge College's President's Applied Research Chair in Virtual and Augmented Reality and lead on the CareGiVR project. "The virtual clients we're creating will be powered through actors whose body movements and facial expressions we'll





SUSTAINABLE DEVELOPMENT GOALS ALIGNMENT

3 GOOD HEALTH
AND WELL-BEING



8 DECENT WORK AND
ECONOMIC GROWTH



9 INDUSTRY, INNOVATION
AND INFRASTRUCTURE



capture so you'll be able to see if they are grimacing or clenching their fists or other movements that are difficult to recreate with code."

Laura Vogelsang, the college's Associate Dean of Health and Wellness, is working with McCready's team and Red Iron Labs to develop the virtual scenarios that caregivers will enter through the app. She says with the app, caregivers will be able to practise responses to a wide range of virtual clients in a variety of scenarios and repeat the process as many times as necessary to improve their responses and the quality of care.

"With dementia clients, behaviours can potentially escalate to a point where they are difficult to manage, and pose a safety risk to the client or the caregiver to the point where restraints or medication have to be used, which is never the ideal choice. With CareGiVR, we can explore different scenarios and see how you can approach a situation in different ways so that you don't have to resort to those types of restraints."

While Vogelsang, McCready and the rest of the team at Lethbridge College will bring subject matter experience to developing the scenarios and capturing the performances for the app, Calgary's Red Iron Labs is providing the technical direction.

"Working with Red Iron Labs is extremely important for us because this is [START's] first large research project," says McCready. "We wanted to tap into the industry as we build our own internal research capacity and they bring that experience and expertise in VR [to the project]."

McCready says he expects to have a first scenario and alpha release of CareGiVR developed by the end of 2020, with a full version ready for commercial release by early 2022.



"INTERACTING WITH A CLIENT WITH DEMENTIA IS SO MUCH ABOUT READING BODY LANGUAGE AND FACIAL EXPRESSIONS TO KNOW IF THE CLIENT IS RESPONDING WELL TO YOU OR IF THEY'RE GETTING AGITATED OR ARE GOING TO LASH OUT, SO WE WANT TO CREATE SCENARIOS THAT ARE AS REALISTIC AS POSSIBLE."

Mike McCready

President's Applied Research Chair in Virtual and Augmented Reality

OUR PROJECTS:

To encourage faculty and staff to take on new projects and build research capacity, Lethbridge College offers funding through Centre for Applied Research Internal Fund (CARIF) grants. Faculty can also access SSHRC Institutional Grants (SIG) through the college to support small-scale research and related activities to strengthen research excellence and foster the professional development of students. Check out some of our latest research projects throughout this publication.

IMPROVING EMPATHY FOR ADDICTIONS CLIENTS USING A TRAUMA-INFORMED IMMERSIVE EXPERIENCE

In collaboration with musician, Leeroy Stagger and award-winning playwright Camille Pavlenko, Aaron Eyjolfson (instructor, Correctional Studies) and Tyler Heaton (instructor, Virtual and Augmented Reality Program) will use virtual reality technology, music, art and a story about the role trauma often plays in opioid addiction to explore what type of narrative experiences are effective at improving empathy toward opioid users. Participants in this CARIF-funded research project will immerse themselves in different visual and auditory narrative experiences using a VR headset, while others will watch the story unfold in a traditional cinematic experience or read about it in a news article.

Funding for Project: CARIF

55

TOTAL NUMBER OF RESEARCH PARTNERSHIPS

18

TOTAL NUMBER OF COMPLETED RESEARCH PROJECTS

30

NUMBER OF FACULTY



> STUDENTS DIG DEEP ON RESEARCH PROJECTS

Danielle Crawford and John Gil Casallas are enthusiastic about their time as students in Lethbridge College's Environmental Assessment and Restoration programs. But for both, it was the opportunities to take part in applied research projects that made their college experiences even more meaningful and memorable.

Gil Casallas started volunteering in the Aquaculture Centre of Excellence in the fall of 2018, less than a year after he came to Canada from Bogota, Colombia, and after completing the college's English as a Second Language program. "Then I got a part-time job there and have worked there since."

With a background in electronic engineering, he knew he could benefit from real-world experience in environmental sciences, and he found that with the ACE team. "I saw this was a great opportunity to start to connect with my program, because I can practise with water and fish and in the greenhouse, and I can learn about the process of the greenhouse, and that helped me a lot in my program," he explains.

Gil Casallas is finishing up his second year of the program and plans to enrol in the college's Bachelor of Applied Science in Ecosystem Management program. That's the same path Crawford took. However, her experience doing applied research with Dr. Willemijn Appels led to a true first – the chance to earn a master's degree from Dalhousie University with NSERC funding, working on an irrigation and soil project based with Dr. Appels in Lethbridge.



“It’s been an amazing experience,” says Crawford, who successfully defended her master’s thesis in the summer of 2020. “The journey from a diploma to a bachelor’s to a master’s has been a whirlwind. From my first year, when it seemed like I wouldn’t be able to do it but figured it out, to the collaborative experience and amazing instructors in the degree program, to the fieldwork and working with Willemijn to complete the master’s – it’s been amazing.”

It’s not just the students who benefit from the research experience. “Without their participation, we would not be able to collect all the data that we would like,” explains Dr. Appels. “Their observations in the field lead to new questions to answer or a different way to look at a particular analysis. And it is very rewarding when this inspires students to continue their education and aim to lead their own research projects.”

Penny Takahashi, the aquaculture coordinator who oversees the student volunteers and workers in ACE, agrees. “The students learn to be comfortable in a wide range of experience including animal care protocols, food safety procedures, water quality management, fish health and plant management,” she says. “With this experience, they are well positioned for a career in the rising expansion of aquaponics in Alberta. It’s such a pleasure working with them.”



SUSTAINABLE DEVELOPMENT GOALS ALIGNMENT

4 QUALITY
EDUCATION



17 PARTNERSHIPS
FOR THE GOALS



OUR PROJECTS: CHARACTERIZATION OF PLANTS WITH ANTIBIOTIC ACTIVITY BY CHEMICAL, BIOLOGICAL AND TRADITIONAL KNOWLEDGE APPROACHES

The microbial research lab at Lethbridge College is using its unique plant extract library to find new antibiotics to support farmers in Alberta. Led by Dr. Sophie Kernéis (instructor, Biological Sciences), this project focuses on the chemical characterization of the plant extracts, a novel testing method using morphology, and works with local First Nation communities to find new antibiotics.

Funding for Project: CARIF

> BRINGING APPLIED RESEARCH TO A NEW AUDIENCE

One of the newest exhibits to open at the Granary Road Active Learning Park south of Calgary this past year showcases the cutting-edge work happening in the Aquaculture Centre of Excellence (ACE) at Lethbridge College to an inquisitive and curious audience – school children and their families.

“The new state-of-the-art exhibit at Granary Road is a great way to teach a new generation about the importance of zero-waste agriculture and the different ways we can look at sustainable food production,” says Dr. Nick Savidov, senior researcher in the college’s ACE facility. “We are grateful to be working with Granary Road to help educate our community about a technology that mimics a natural ecosystem with water, aquatic life, bacteria, nutrients, fish and plants all working and growing together.”



The official opening of the exhibit had to be postponed because of the pandemic, but Granary Road founder Bret Walter, says early visitors have been impressed. Next up for the partners is marketing the first “aquaponic fertilizer” – also known as aerobic digestate – in Canada. The sale of the aquaponic fertilizer is the final step in a zero-waste system, and it will be test-marketed at the Granary Road Market (and available at Lethbridge College) in the year ahead.

“Lethbridge College has been an instrumental partner in showing us how an Alberta-developed technology can be applied to larger agricultural and commercial operations,” says Walter. “They also provide us the opportunity to use the college as a source for technical talent in the graduating students. We look forward to continuing this partnership with the college in the years to come.”



SUSTAINABLE DEVELOPMENT GOALS ALIGNMENT

2 ZERO HUNGER



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



> READY TO CONTINUE THE COLLABORATION

While the Centre for Applied Research, Innovation and Entrepreneurship (CARIE) team has worked this past year to nurture and develop a host of diverse new partnerships, they also formalized and expanded one of the college's longest-running partnerships.

In February, Lethbridge College and Farming Smarter signed a 15-year memorandum of understanding (MOU) committing them to pursuing opportunities that support the agriculture industry in southern Alberta and throughout the province. The MOU has three core pillars – applied research and innovation; education, training and knowledge transfer; and communication and branding.

One venture the two partners advanced in 2019 was a Canadian Agricultural Partnership-funded project under the Accelerating the Advancement of Agricultural Innovation program. The college and Farming Smarter are developing 360-degree videos (like the still image below), virtual reality experiences, podcasts and an app for agriculture education. The goal is to develop creative and engaging ways to deliver research findings and increase adoption and awareness of best management practices with growers.

“The Farming Smarter virtual tours and VR experiences allow farmers to visit at any time and season, making it perfect for research and technological advances when they’re less busy,” says Lyle Ruggles, a digital learning specialist in the college’s Centre for Teaching, Learning and Innovation who has been part of the project since its launch in 2019.



It also provides an outstanding opportunity for students to be involved in applied research. “The volume of 360-degree images that needed to be captured and managed post-production was substantial,” Ruggles adds. For example, “without the help in the summer of 2019 from Donna Sato – a former Summer Temporary Employment Program (STEP) student and now graduate – a lot of the work wouldn’t be complete. Our students are an invaluable resource, and being able to provide hands-on experiences and deliver a polished product for Farming Smarter was a guarantee for success.”

Ruggles spent this past summer capturing photos for five virtual tours that will be developed for 2021 – biostimulants, cover crop, and precision pulses, corn and durum. He says collaborations like the one with Farming Smarter can help all partners achieve their own organization goals as well as shared goals.

Ken Coles, Farming Smarter executive director, agrees, explaining that this kind of partnership is important because it connects Farming Smarter with the greater community, allows Farming Smarter to benefit from the technical expertise and equipment at the college, and gives students new opportunities in agriculture after they graduate – which benefits everyone.

“The agriculture industry is a huge part of southern Alberta’s economy and employs a lot of people in the region,” he adds. “Farming Smarter supports innovation, entrepreneurship and the practical application of science and technology in the industry and particularly on-farm. This partnership will keep farmers, ag business and graduates competitive, connected and thriving.”

SUSTAINABLE DEVELOPMENT GOALS ALIGNMENT

2 ZERO HUNGER



4 QUALITY EDUCATION



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



OUR PROJECTS: INTELLIGENT VIRTUAL REALITY ENVIRONMENTS: THE INTEGRATION OF AI AND VR TO ENHANCE EXPERIENTIAL LEARNING FOR THE PUBLIC SAFETY INDUSTRY

Lethbridge College researchers George Gallant (instructor, Digital Communications and Media); Stephen Graham (instructor, Computer Information Technology); and Dave Maze (chair, Justice Studies) are partnering with the Lethbridge Police Service to explore how virtual reality (VR) can be used to help police recruits develop communication skills to deescalate difficult situations. This project will employ 360-degree video scenario training, where users will be placed into real-life scenarios where they need to use non-physical solutions to resolve an incident. This will enhance the ability of officers to de-escalate volatile situations through strong communication skills rather than physical force.

Funding for Project: CARIF

> FOLLOWING THEIR FOOTSTEPS

Lethbridge College is collaborating with the Municipal District of Greenview to develop a Virtual Reality (VR) experience that will transport users to the Grande Cache Dinosaur Track site.

Located on the edge of the Rocky Mountains northwest of Edmonton, the site is the only large-scale exposure of dinosaur tracks in Canada. However, due to geological upheavals over the past 90 million years, the tracks are located on steeply angled cliff faces. “[The MD] has this site with amazing tourism opportunities, but they can’t bring people to it because of logistical and safety concerns,” explains Mike McCready, the college’s President’s Applied Research Chair in Virtual and Augmented Reality.

So, instead of bringing people to the tracks, McCready and Lethbridge College’s Spatial Technologies Applied Research and Training (START) team, are bringing the tracks to the people. Using photogrammetry and laser scanning to capture detailed imagery of the dinosaur tracks, the team, which includes college instructor Allyson Cikor and VR/AR program student Benjamin Blackwell, is combining 360-degree imagery, spatialized audio and guided narration to create an immersive VR experience that enables visitors to the Grande Cache Tourism and Interpretive Centre to experience the tracks and do interactive activities.

“The Walking with Dinosaurs VR project is a very exciting opportunity to share this historical site with the public in a fun immersive learning experience,” said Jenny Daubert, Tourism Supervisor for the MD of Greenview. “The team from Lethbridge College is extremely talented and have exceeded my expectations in their ability to recreate the Dinosaur Track site.”

The project, which is funded in part through an \$18,000 grant from the Community and Regional Economic Support program, also includes an Augmented Reality (AR) piece which will enable visitors to see how the tracks were made by overlaying digital content over the real-world site. McCready says a prototype of the VR program is expected to be up and running by the end of 2020.



SUSTAINABLE DEVELOPMENT GOALS ALIGNMENT

4 QUALITY
EDUCATION



9 INDUSTRY, INNOVATION
AND INFRASTRUCTURE



15 LIFE
ON LAND





> WILDLIFE IN THE CITY

A family of mule deer strolling across a manicured lawn. A flight of turkey vultures soaring over the treetops in a quiet residential neighbourhood. A family of skunks sneaking under a backyard deck.

For residents of Lethbridge, a city with the third largest urban parks system in Canada, including more than 3,985 hectares in the Oldman River valley, these kinds of encounters with wildlife are an almost everyday occurrence. They're also the focus of a collaborative research project spearheaded by Lethbridge College with support from the City of Lethbridge and led by University of Lethbridge researcher and college electrical trades instructor Joshua Hill.

Hill (General Studies 2016, Electrician Apprentice 2012) is investigating how people in Lethbridge feel about the animals with whom they share the city. Hill's project, which is funded through grants from the college's Centre for Applied Research Internal Fund (CARIF), the Social Sciences and Humanities Research Council (SSHRC) Explore program and contributions from the City of Lethbridge, is part of a larger project on urban wildlife management being conducted in collaboration with the City of Lethbridge called Wild Lethbridge. Hill is conducting a series of surveys to gain insight on peoples' attitudes towards wildlife; the results of his work will ultimately inform decisions like where to put new parks or how to improve habitat connectivity to allow animals to travel safely through the urban environment.

"From a city planning perspective, it's important to know what areas of the city are more favourable towards animals so that we can have this positive experience for both the human and non-human residents in the city," says Hill.

Hill says the project will also be used as a teaching tool for the students in the Ecosystem Management applied degree program at Lethbridge College. Students will be taught how to conduct surveys and gain a better understanding of the human connection as they learn about managing and maintaining ecosystems.

> GET SMART

Three Lethbridge college researchers received grants from Alberta Innovates' Smart Agriculture and Food program this past year, providing funding for academic or industry projects that explore new technologies, products and services in the agriculture sector.

Dr. Nick Savidov, senior research scientist at the Aquaculture Centre of Excellence (ACE) received \$95,577 for developing smart technology, including a recirculating irrigation system based on sensing technology and artificial intelligence to be built and tested at Lethbridge College's Centre for Sustainable Food Production. Lethbridge College's expertise will help develop an energy optimization model to help Alberta greenhouse operators conserve energy and improve their competitiveness.

Dr. Willemijn Appels, the Mueller Applied Research Chair in Irrigation Science, received \$49,950 to develop a closed-loop irrigation system that is based on the spatial distribution of soil moisture and crop water availability. The model will use microwave radiometers for moisture mapping, point sensors and simulation models to automatically create maps of irrigation amounts through data fusion to increase water use efficiency. Increasing water use efficiency through site-specific irrigation management is an important tool in ongoing regional development of high-value agricultural products in southern Alberta.

The third researcher, Dr. Chandra Singh, the college's applied research chair in Agricultural Engineering and Technology, also received \$49,950 to use sensing technology to monitor in-bin grain storage conditions and automated fan and heater controls to regulate moisture and temperature to minimize postharvest losses (See page 6 for more).



OUR PROJECTS: EFFECTIVENESS OF A PROFESSIONAL DEVELOPMENT PROGRAM ON TEACHER-CHILD INTERACTIONS

Dr. Hanako Shimamura (instructor, Early Childhood Education) is establishing a professional development program for early-years professionals in Lethbridge. The aim of the program is to increase teachers' knowledge about the important role that teacher-child interactions play in children's learning. In addition, the research aims to elevate teachers' specific skills in offering high-quality interactions with children with a particular focus on instructional support.

Funding for Project: CARIF

CARIE TEAM STRIKES GOLD

In May, the Centre for Applied Research, Innovation and Entrepreneurship (CARIE) was recognized with a Gold Award for excellence from Colleges and Institutes Canada (CICan).



CICan's Applied Research and Innovation Excellence Award recognizes institutions that have improved the productivity of small- and medium-sized enterprises and community partners by developing new and improved products, processes and services as well as by providing students and graduates with real-world innovation experience. Lethbridge College's CARIE team received the highest honour in this category.

"It is such an enormous honour to receive this recognition from CICan," says Lethbridge College President and CEO Dr. Paula Burns. "For more than 30 years – and especially during these past five – the CARIE team has led the way in our mission of inspiring and facilitating learning and innovation to meet economic and social needs, bringing together community organizations, researchers and students to collaborate to solve real-world challenges with immediate practical applications. This team's innovative, entrepreneurial work has a lasting, positive impact."

"We are thrilled to be recognized by CICan with the Gold Award for applied research and innovation," says Dr. Kenny Corscadden, Lethbridge College Associate Vice President – Research, Innovation and Entrepreneurship. "This prestigious award not only recognizes our CARIE team, but acknowledges our researchers, faculty and students and for the work they all do in support of local industry."

OUR PROJECTS: HEARING VOICES: HETEROGLOSSIA IN THE ERA OF PODCASTING

In a time when social media and the web are increasingly sites of corporate sponsorship where privacy is sacrificed to data-mining and monetization, podcasting is a way non-professional and non-sponsored voices can find a wide audience. Dr. Brent Cottle (instructor, General Studies) plans to use the literary ideas of Russian theorist Mikhail Bakhtin, focusing specifically on his idea of heteroglossic storytelling, in which contradicting voices can occupy the same place, to explore how podcasting functions as a final outpost for democratic voices in the digital age.

Funding for project: SSHRC Explore

OUR PROJECTS: SPARKING INTEREST IN LITERACY - AUTHOR VISITS AS A TOOL TO ENHANCE LEARNING, MOTIVATION AND CONNECTION

Dr. Amy Hodgson-Bright (instructor, General Studies) plans to invite Canadian and American authors of children's and young adult literature to Lethbridge College to speak to student writers in ENG1185 Writing for Children and Young Adults. Part of this project will include a public talk or writing workshop to the Lethbridge College community. The goal is to enhance students' experiences as readers and writers and mobilize the wider Lethbridge College community to construct knowledge around literary practices.

Funding for project: SSHRC Exchange

> RESEARCH CHAIR WINS BIG AT MIT HACKATHON

Mike McCready, Lethbridge College's President's Applied Research Chair in Virtual and Augmented Reality, was part of a team that earned first place honours in two categories and placed in the top 10 overall in the annual Reality Hack: MIT XR Hackathon, hosted by the Massachusetts Institute of Technology (MIT) in January.



MIT Reality Hack is a five-day event held every January that brings more than 350 tech leaders, creators and students from 49 countries together for workshops, discussions and a three-day "hackathon" in which teams are tasked to develop an original extended reality (XR) project from scratch.

McCready's five-person team developed an app called Spell Bound for children with dyslexia that helps them to develop their letter formation and word recognition skills. It was awarded first place in both the Education and Learning and the Health and Wellness categories.

Using a wizard theme, the first part of the app allows the user to operate VR hand controls to wave a wand that writes letters in the air, which helps to develop gross motor skills. The next part uses speech recognition technology as the user works to sound out the words they've just written. A correct pronunciation results in the casting of a spell. The game also includes a data-analysis tool that allows a teacher or facilitator to monitor the progress of the user.

After the event, several companies approached the team and encouraged them to further develop the app, meaning this project could reach full development in the future.



> CREATING AGENTS OF CHANGE

Since 2018, the Centre for Applied Research Innovation and Entrepreneurship (CARIE)'s AgENT program has encouraged students from a range of programs to develop skills in innovation and entrepreneurship, with a primary focus on the agricultural sector. Over the course of the 2019-20 academic year, the program has begun to evolve by incorporating opportunities to integrate social entrepreneurship and emerging technologies like virtual and augmented reality into the work students do.

In November 2019, CARIE hosted a two-day visit from social entrepreneur and restaurateur Mark Brand. Brand spoke to AgENT participants about the importance in social enterprises, empathy and caring for one another and he hosted a workshop for college employees on human-centred design and systems innovation. In February 2020, CARIE's manager of Innovation and Entrepreneurship Megan Shapka, became an active member of Colleges and Institutes Canada (CICan)'s ImpAct Initiative, which promotes the adoption of programming and activities related to the United Nations' Sustainable Development Goals (SDGs) on campuses.

For the 2020-21 academic year, AgENT will include a workshop called "Be a Change AgENT," which is designed to inspire the development of student-led initiatives aimed at ending poverty and hunger; creating healthy communities and well-being for all; promoting equity, inclusion, and diversity; and protecting the environment. With the shift to flexible learning as a result of the COVID-19 pandemic, AgENT programming for the year will be offered online through the Canvas learning management system, allowing students to progress through the core program content at their own pace from home with a recommended completion schedule. They will also be able to participate in synchronous online workshops to collaborate and apply their learning, access more one-on-one support for turning their ideas into action and take part in interactive Zoom mentor nights and visits from guest speakers.



> DEVELOPING A CENTRE FOR SUSTAINABLE FOOD PRODUCTION

In summer 2020, Lethbridge College broke ground on a new 10,000 square foot greenhouse. The greenhouse, which is expected to open its doors in December 2020, will work in conjunction with the existing Aquaculture Centre of Excellence as part of the Centre for Sustainable Food Production at the college. The new facility is made possible by a \$1 million grant through the Canada Foundation for Innovation's College-Industry Innovation Fund.

OUR PROJECTS: CAN FERTIGATION FREQUENCY AFFECT NITROGEN USE EFFICIENCY AND NITRATE LEACHING LOSS?

Research associate Dr. Rezvan Karimi Dehkordi is studying the effectiveness of subsurface drip irrigation (SDI) when used for nutrient management during the growing season for crops grown in Alberta. The results of the study will help producers who operate or are considering SDI systems make evidence-based decisions on fertigation strategies for their crops.

Funding for Project: CARIF

> OUR TEAM: CENTRE FOR APPLIED RESEARCH, INNOVATION AND ENTREPRENEURSHIP

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WHAT HAPPENS NEXT MATTERS MOST.

> SUPPORTING OUR TEAM

The work of the team in the Centre for Applied Research, Innovation and Entrepreneurship is supported by many people throughout the college and in the community, including our Executive Leadership Team and deans of our six centres. In addition, we are grateful for the work and support of other campus colleagues, including:

- Patrick Balfour and Jordan Gunderson, financial reporting analysts, Finance
- Jennifer Yanish, Administrative Assistant
- Andy Benoit, Scholarship of Teaching and Learning research lead and research ethics coordinator
- Dr. Jennifer Davis, Equity, Diversity and Inclusion pilot program lead
- Melanie Hamilton, Scholarship of Teaching and Learning research lead
- Charles McArthur, business planning analyst, Institutional Planning and Reporting
- The Lethbridge College Communications team
- The Lethbridge College Marketing and Web Services team
- The Lethbridge College Institutional Planning, Analysis and Risk Services team
- The Lethbridge College Digital Learning team
- The Lethbridge College Learning Experience Design team

ABOUT THIS PUBLICATION

This is the annual report of work done by Lethbridge College's Centre for Applied Research, Innovation and Entrepreneurship (CARIE). Created by the college's Communications, Marketing and CARIE departments, this publication aims to inform, educate and intrigue readers with stories and photos about Lethbridge College's people and the innovative projects they have underway. For additional copies, email appliedresearch@lethbridgecollege.ca.

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> WANT TO LEARN MORE ABOUT APPLIED RESEARCH, INNOVATION AND ENTREPRENEURSHIP OPPORTUNITIES AT LETHBRIDGE COLLEGE? WE'D LOVE TO HEAR FROM YOU.

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