SOLUTIONS FOR INDUSTRY

RESEARCH & INNOVATION • ANNUAL REPORT 2015-16

Niagara College Canada
APPLIED DREAMS.

nc Research & Innovation

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AN AMAZING YEAR
ANSWERING INDUSTRY'S NEEDS

We have included many stories on these pages, but we have more to share. Visit us on the web to view our videos: ncinnovation.ca/newsroom/videos

Good day, and welcome to Niagara College's Research & Innovation Division Annual Report for 2015-16. We've had a great year, full of success for industry, faculty and students. I hope you'll take the time to discover some of this year's highlights in these pages. Our infographics give you an overview of the past year as well, while there is much more to discover on our new website, at www.ncinnovation.ca.

In Welland, the construction of our new Walker Advanced Manufacturing Innovation Centre building was completed in March, and we've been able to move our advanced manufacturing labs, Digital Media & Web Solutions team, and our Welland administrative staff into this magnificent 15,000-sq.ft. facility.

You'll find there all manner of expertise and equipment in additive manufacturing (3D printing), reality capture (3D scanning), mechanical design and physical simulations, as well as lean manufacturing and process improvement. Our Technology Access Centre has completed its second year, delivering great technical services for manufacturers in the region. Early in the year, Niagara College formed a consortium with Sheridan College, Mohawk College and McMaster University, called the Southern Ontario Network for Advanced Manufacturing Innovation, or SONAMI. We expect great things from SONAMI, which is riding on a wave of demand from small- and medium-sized manufacturers.

In Niagara-on-the-Lake, the Canadian Food & Wine Institute Innovation Centre has been helping food and beverage companies deliver new products to market. The Centre has been awarded a Technology Access Centre, which means increasing technical services in such areas as food safety plans, chemical testing, microbiological assays and content analysis. Again, our progress here would not be possible without the CFWI faculty and students' contributions.

The applied research team of Dr. Mike Duncan, our NSERC Industrial Research Chair in Precision Agriculture & Environmental Technologies, has been hard at work on a number of projects. The team is working with the Grain Farmers of Ontario on their Crop Portal, which enables farmers to use the data they collect on their field to better manage their crops. They're also working with a start-up company to develop new ways of bringing robots and drones to agricultural practices.

I'd like to thank all our sponsors and funders, without whom most of the activity in this Annual Report could not happen. These include all levels of government; their logos may be found on page 18. Enjoy!

DR. MARC NANTEL
Associate Vice-President, Research & Innovation
Niagara College

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AGRICULTURE & ENVIRONMENT INNOVATION CENTRE

PROJECT MANAGER:
Gregor MacLean

Niagara College's Agriculture & Environment Innovation Centre team specializes in developing innovative solutions to address today's agricultural, environmental and ecological challenges.
Expertise in precision agriculture, renewable energies, environmental management, GIS, horticulture and greenhouse operations is enhanced by computational power to process big data; a 20,000 square-foot greenhouse; aquaponics and hydroponics systems; environmental labs; and on-campus wetlands and lagoons.

PROJECTS SPOTLIGHT

Precision Agriculture Advancement for Ontario

INDUSTRY PARTNER: Grain Farmers of Ontario

COLLABORATORS: Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), Ontario Certified Crop Advisors (CCAs), agricultural retailers, and Ontario grain farmers

PROJECT DURATION: April 2014 to Oct. 2017

PROJECT TYPE: Precision Agriculture Web Tool and Custom Algorithm Development

FUNDING: Grain Farmers of Ontario (GFO) and Growing Forward 2 (Agricultural Adaptation Council)

RESEARCH TEAM: Dr. Mike Duncan *(NSERC Industrial Research Chair for Colleges – Precision Agriculture & Environmental Technologies)*; Sarah Lepp (*Senior Research Associate*); Ryan Tunis, Gashaw Ayalew (*Research Associates*); Omer Ali (*Student*)

CHALLENGE: Farming equipment is computationally powerful, sophisticated and costly, and Ontario grain farmers are seeking validation for this equipment.

SOLUTION: The team has developed an interactive web tool for farmers called the Crop Portal, which includes custom data cleaning, data interpolating, mapping, and management zone algorithms. It provides objective data management techniques for CCAs and farmers.

Sustainable Food Project: Grass-to-Organic Garden Conversion

INDUSTRY PARTNER: White Oaks Conference Resort & Spa

PROJECT DURATION: May 2016 to Nov. 2016

PROJECT TYPE: Sustainable food innovation and garden development

FUNDING: NSERC Engage

RESEARCH TEAM: Tanya Blankenburg (*Faculty*); Meghan Beattie (*Research Associate*); Mackenzie Haines (*Student*)

CHALLENGE: The White Oaks Conference Resort & Spa proposed garden area was grass, and had recently been a shoulder due to the reconstruction of a public road. It endures high winds, car residue, pollution, and human traffic.

SOLUTION: The research team is converting the area from grass to a sustainable garden innovatively. The project is providing a reliable grass-to-garden conversion method; a plan to maintain a healthy garden in the harsh conditions; produce to use within White Oaks' food service operations; and an avenue to educate clients about sustainable food and property usage.

Aquaponics: Aquaculture Meets Hydroponics

PROJECT DURATION: March 2015 - onwards

PROJECT TYPE: Scaling up of a sustainable food growth technique, and food service incorporation

FUNDING: NSERC ARTI

RESEARCH TEAM: Tanya Blankenburg (*Faculty*); Matt Orr (*Greenhouse Manager*); Niagara College Greenhouse Staff

CHALLENGE: Josh Petzold, former Research Assistant student, developed a a small-scale aquaponics system for a course-based project. The feedback was positive, and there was interest in increasing its scale. The challenge was to incorporate a full aquaponics system into an active greenhouse to both demonstrate and highlight a sustainable food proof of concept to industry stakeholders, NC visitors, students and faculty.

SOLUTION: The team installed two independent aquaponics systems, each with two 110-gallon fish tanks, and 72 square-feet for deep-water floating-raft growing; developed new knowledge regarding fish health, water quality maintenance, and full system care. The team recently began work with a start-up company on a research project.

Omer Ali

Research Assistant
Agriculture & Environment Innovation Centre

The third time was the charm for Omer Ali.

After trying health sciences and computer science courses at a university level, the Niagara native finally found something that clicked – literally – when he entered the Computer Programmer Analyst program at Niagara College.

Now with just one more term to complete, and achieving a spot on the President's Honour List for all four previous academic terms, he has solidified his love for the profession even further with work experience in the Agriculture & Environment Innovation Centre.

"I wanted something practical, more than anything else, and when I came to work here, I got that, right away," he says. "Programming is making the connections for any industry, to try to speed up their processes, so the human mind is focused on macro processes, while the computer handles the day-to-day operations."

Omer is currently part of a team evolving the web-based Crop Portal for growers, which takes their machinery's raw data, cleans and analyzes it.

"We are trying to give farmers their data faster, to make it more intuitive. After two years we are starting to understand what the farmer really requires, how they interact with machines, how they are looking at their data, so we know how much we can simplify the results for them."

The team has been amazingly supportive, he says, considering he came into the job with no knowledge of precision agriculture, and very little knowledge of large-scale farming.

"I have a greater appreciation, and a better understanding of why farmers operate the way they do. Before, my idea of farming was organic all the way, but then you go on the farm and you realize that with these large-scale farms, they have to feed billions of people all the time. You need to get rid of a pest, and if you don't, your whole crop could be wiped out."

He is satisfied spending his spare time working on his own, small-scale organic garden. But even in this outdoor space with dirty hands, his mind is always churning in the background.

"Gardening is so calming. When I'm stuck on a problem in programming, instead of being in my head, I go outside and relax and when I'm done, I'll have the answer." **R&I**

AGRICULTURE & ENVIRONMENT INNOVATION CENTRE BY THE NUMBERS

4	10	2	7
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS

Alejandra Ruiz Aguirre

Research Associate
Business & Commercialization Solutions

Alejandra Ruiz Aguirre is living proof that you never know where life will take you.

About six years ago, the Research Associate was looking to enter university in her native Colombia, scholarship in hand.

But before that, she convinced her family to allow her a side trip of a few months; she travelled to Canada, to take an ESL course at Niagara College.

Fast forward five years, and she has not one, but two diplomas and one degree to her credit, and she is working full-time as a Research Associate with the business team in Research & Innovation.

"I never imagined I would do my whole schooling here, but it has worked out so well," says the holder of an International Business diploma, International Business Administration diploma, and a degree in International Commerce and Global Development, all from Niagara College.

A strong believer in the benefits of course-based projects with industry partners, Alejandra jumped at the chance to join the R&I team to work even more closely on business projects with real industry partners.

Every opportunity is both a learning experience and a way to enhance her job skills, she says.

"Every single project is helpful for the industry partner, either guiding them in their new business and bringing their new product to the market, or showing them the hard data, and showing them that maybe they should focus on another product or opportunity in the marketplace. Even that can save them so much money and time and effort."

One recent project that helped put a new product on the market involved Jal Gua, a nutritional beverage mix developed by Emmanuel Jal, a former child soldier from Southern Sudan, turned activist and entertainer. Jal Gua is now served in a café and sold in health food stores and several chain stores in the Greater Toronto Area.

"When I see the commercialized product on the shelves, it's exciting to know that I was part of that process," she says.

As a graduate in the research division, Alejandra also takes pride in mentoring research assistants who are still students. "I tell them 'I did it, I get it, and I can help you now.' That constant feedback makes us a better team, and will hopefully help them find satisfaction in what they do." **R&I**

BUSINESS & COMMERCIALIZATION SOLUTIONS BY THE NUMBERS

8	7	2	3
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS

BUSINESS & COMMERCIALIZATION SOLUTIONS

PROJECTS SPOTLIGHT

Superfood Marketing Plan

INDUSTRY PARTNER: Jal Gua

PROJECT DURATION: June to Sept. 2015

PROJECT TYPE: Marketing Plan

FUNDING: NSERC CCI IE

RESEARCH TEAM: Terri Champion, Malcom Howe, Cosimo Girolamo *(Faculty)*; Dylan Fabiano *(Research Associate)*; Alejandra Ruiz Aguirre *(Student)*

CHALLENGE: Jal Gua (translation "to walk with peace") is an instant powder superfood created by former child soldier and international hip hop artist Emmanuel Jal. Jal Gua contains a blend of two staple African ingredients: sorghum and moringa. In entering this highly saturated market, the CFWI Innovation Centre team was asked to conduct market research.

SOLUTION: In collaboration with the Jal Gua team, the health and wellness industry was segmented and examined to discover possible target markets, market trends and the level of competition. Data analysis of pricing, sizing and components of competitor products was conducted to illustrate the market environment. Strategies were recommended for Jal Gua to capitalize on the current market position.

Branding Overhaul

INDUSTRY PARTNER: Feren Signs & Graphics

PROJECT DURATION: Jan. to March 2016

PROJECT TYPE: Market Research and Web Design

FUNDING: Niagara Region Voucher

RESEARCH TEAM: Malcom Howe, Mark Hardwick *(Faculty)*; Alejandra Ruiz Aguirre, Myles Fisher *(Research Associates)*; Alexis Kilroy *(Student)*

CHALLENGE: Feren Signs & Graphics has been a leader in the sign industry in the Niagara Region for more than 30 years. The company's branding and website needed a major overhaul with the transition to a new company owner.

SOLUTION: In a combined effort between the Digital Media and the Business and Commercialization teams, a new logo was developed, a new WordPress website was created and a marketing plan was written. The enhanced web presence promotes Feren's extensive graphic design, sign manufacturing, installation and related services, in a platform that staff can update without needing any technical web design knowledge.

Improving on the Buddy System

INDUSTRY PARTNER: Master Systems Inc.

PROJECT DURATION: Jan. to March 2016

PROJECT TYPE: Market Identification

FUNDING: Niagara Region Voucher

RESEARCH TEAM: Malcom Howe *(Faculty)*; Alejandra Ruiz Aguirre *(Research Associate)*; Paula Reile *(Student)*

CHALLENGE: Master Systems Inc. is a floor care company located in Dunville. Owner Mark Raddick invented the Floor Care Buddy, a safer way to apply floor care products, which was featured on Season 6 of *CBC's Dragon's Den*. While it did not receive a deal, it was great exposure for the product, as Mark continues to improve the design of the buddy. Master Systems has a great product but lacked the marketing and sales experience to bring it to the marketplace.

SOLUTION: To create a marketing plan, students and faculty from the School of Business and Management completed an environmental scan of the floor care industry; a market segmentation to understand who are the potential customers of the Floorcare Buddy; and a competitive analysis to define the competition, their strengths and weaknesses.

PROJECT MANAGER
Neil Wilkinson

From initial market research to commercialization strategies, the Business & Commercialization team offers a comprehensive suite of solutions. The team pairs industry partners with faculty, recent graduates and students who possess the expertise to meet applied research and innovation needs in many areas, including human resources, international business, operations management and sales and marketing.

CANADIAN FOOD & WINE INSTITUTE
INNOVATION CENTRE

PROJECT MANAGER:
Kristine Canniff

The Canadian Food & Wine Institute Innovation Centre team offers a full suite of services to support industry innovation and commercialization of new products and processes. From new recipe development to shelf-life testing and nutritional labelling, the CFWI Innovation Centre pairs industry partners with faculty, recent graduates and students with the right expertise and equipment to meet industry's needs.

PROJECTS SPOTLIGHT

Craft Beer Shelf-Life Extension Resource

INDUSTRY PARTNER: Ontario Craft Brewers Association (OCB)

PROJECT DURATION: Oct. 2015 to Sept. 2016

PROJECT TYPE: Research & Documentation

FUNDING: NSERC CCI

RESEARCH TEAM: Dirk Bendiak, Ray Lansbergen, Nate Ferguson (*Faculty*); Jose Gabrie *(Research Laboratory Technologist)*; Sarah Polkinghorne (*Student)*

CHALLENGE: Ontario Craft Brewers represents 40 craft breweries across Ontario. All OCB members incorporate various manufacturing techniques to extend quality and shelf-life, but due to limited capital, equipment and expertise, the actual shelf-life of product varies from brewery to brewery. There was a need to expand the level of expertise to all members.

SOLUTION: In collaboration with OCB, the team will create a detailed Craft Beer Shelf-Life Extension Resource. This guide will contain identified best brewing practices to enhance shelf life, while outlining emerging technologies and provide a list of equipment suppliers and costs.

Process Validation for Specialty Meat Producer

INDUSTRY PARTNER: Niagara Food Specialties

PROJECT DURATION: Aug. 2015 to March 2016

PROJECT TYPE: Lab Services

FUNDING: NSERC CCI

RESEARCH TEAM: Dr. Amy Proulx (*Faculty*); Jose Gabrie (*Research Laboratory Technologist*); Rebecca Griffin (*Senior Research Associate*); Spencer Dion (*Research Associate*); Adrienne Tse, Esteban Acosta, Darcy Devereaux (*Students*)

CHALLENGE: Niagara Food Specialties (NFS) is a local artisan producer of Italian-inspired 'salumi' who uses traditional processing techniques that differ from standard fermented meat processing. The Canadian Food Inspection Agency (CFIA) requested validation to prove that their process is acceptable according to health and safety requirements.

SOLUTION: The team completed two types of laboratory testing. For the shelf-life test, the team inoculated the surface of the sample product with pathogens and tested it regularly to see that it did not grow. For the challenge test, we inoculated the test product with the expectation that the amount of pathogens would drop significantly over a four-month period. With a proven process, NFS is now seeking CFIA validation.

Buddha Products To Go

INDUSTRY PARTNER: The Smokin' Buddha

PROJECT DURATION: July to Dec. 2015

PROJECT TYPE: Product Reformulation

FUNDING: NSERC CCI

RESEARCH TEAM: Sarbjit Bamrah, Dr. Amy Proulx (*Faculty*); Jose Gabrie (*Research Laboratory Technologist*); Rebecca Griffin (*Senior Research Associate*); Nicholas Trybel, Beatrix Princzne Csemer (*Research Associates*); Darcy Devereaux, Cole Renda (*Students*)

CHALLENGE: The Smokin' Buddha is a local Niagara-based restaurant focused on serving global comfort foods, craft beers and wines through their restaurant and mobile offerings. They wanted to create products for retail sales that offer great quality, packaging, consistency and shelf-life, but they lacked the necessary food science expertise.

SOLUTION: The team assisted with a product development project by taking two of their favourite in-house offerings, a soup base and a dressing, and reformulating them to meet quality standards. The team sourced ingredients, reformulated the recipes and conducted shelf-life testing, and developed Nutritional Facts Tables so that products will be offered in a variety of grocery locations.

Gavin Robertson

Winemaker & Wine Instructor
Niagara-on-the-Lake Campus

While Gavin Robertson once studied the Classics, he concentrates his efforts these days on making vintage versions of the drinkable kind.

The winemaker followed his university education at Dalhousie with a diploma in Niagara College's Winery and Viticulture Technician Program.

He has seven years' experience in the Ontario wine industry, as a cellar hand, assistant winemaker, winemaker, and vineyard manager; and he has worked as a vintage winemaker in Central Otago, New Zealand and Tasmania, Australia.

Recently, he has overseen the development of both a sparkling wine and a hard cider program at Niagara College. Research projects include pomegranate wine recipe development and the Nuance lees filtration system validation.

Upcoming research includes a partnership with the Agriculture & Environment Innovation Centre, which will look at Unmanned Aerial Vehicles/Drones as a vineyard tool in the context of precision agriculture.

"Working on food and beverage projects has helped me become a more investigative, more engaged winemaker, and has broadened my knowledge base with regards to many of the topics I teach in the classroom," he explains.

At the Teaching Winery, Gavin oversees commercial wine and cider production, manages the vineyard, and oversees students' practicum work placements.

Gavin also teaches several courses in the full-time diploma and Continuing Education programs, including basic and advanced winemaking; pruning and trellis maintenance; and general viticulture.

His commercial wines have received numerous awards, most recently a silver at the Ontario Wine Awards for the 2014 Les Marmitons Gastronomy Chardonnay; gold at the All Canadian Wine Championships for the 2015 Balance semi-dry Riesling and Best in Show for the 2012 Dean's List Merlot at the 2015 Royal Wine Competition.

Even with the success already achieved, Gavin still looks to the future, to what might yet be accomplished as the Teaching Winery expands.

"As the craft cider industry has expanded so have the number of cider research projects here at NC, and now as craft distillation gains traction in the province, we are seeing requests for projects relating to artisan distilled spirits. It's incredibly stimulating to participate at the forefront of business development and growth in the Niagara region and the province at large." **R&I**

CANADIAN FOOD & WINE INSTITUTE INNOVATION CENTRE BY THE NUMBERS

18	18	3	17
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS

INNOVATION INSPIRATION SPOTLIGHT

AGRICULTURE & ENVIRONMENT INNOVATION CENTRE

To feed an expected 9.5 billion people living on the earth by 2050, we will require an estimated 80% increase in agricultural outputs. The burden of this increase will fall on farmers – farmers who must now do more with less, while maintaining profitability.

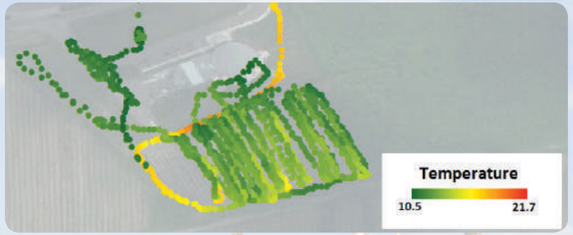
Statistics tell us there is a movement to fewer and larger farms, with a stable-to-shrinking amount of farmed land. Between 1991 and 2011, the number of Canadian farms decreased by 26%, while the size of the average Canadian farm increased from 598 acres to 778 acres. Total farmed land in 2011 was 160.2 million acres, or a reduction of 4.1% since 2006. Finally, between 1991 and 2011, there was a 24.8% decrease in farm operators. There are new technologies to support farmers, yet these technologies are not being fully leveraged.

Niagara College's precision agriculture team, led by Dr. Mike Duncan, is developing tools to support and leverage technologies for the modern Canadian farm business.

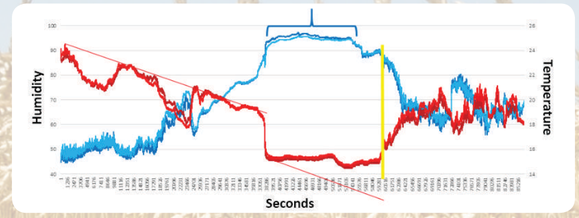
A population of 9.5 billion will require food security. This is heightened with climate change, and people demanding higher-quality food. Farmers are expected to meet higher standards in order to maintain their social licence. With one-fifth of the world's freshwater, Canadian farmers have a significant natural capital advantage. With 1.31 acres of arable land per person, Canada is No. 3 in the world.

The above-mentioned advantages showcase the opportunities for Canadian farmers to lead by example. To enhance these opportunities is the variable rate work of Dr. Duncan, who is conducting research with farmer partners, and incorporating the 4Rs of good nutrient stewardship: right source, right rate, right time, right place.

Yield Maps are developed using the Crop Portal and its custom tools.



Micrometeorology temperature data collected at a rate of once per second on campus at the Niagara-on-the-Lake campus, and throughout the vineyard in Summer 2016.



Thermodynamics from the NC vineyard. The red lines are the upper (3 metres above ground) and lower (1m above ground) temperature sensors, the blue lines are the upper and lower relative humidity sensors. The data, the sensors, and the associated analytics will help farmers to identify and mitigate harmful weather events.

APRIL 2015

OCE Discovery: Dr. Duncan presents on panel: "The Valley's New 'IT' Sector: The Emergence of AgTech."

SEPT. 2015

FarmSmart ZoneSmart Event: Dr. Duncan presents with Dan Breckon of Woodrill Farms on "Getting to Yield Index, Yield Probability Index, Multiple Year maps. Having the tools and practices that gather and store high quality data."

NOV. 2015

Team receives funding approval from OCE VIP 1 and NSERC Engage for Sarapoint AgroTelligent Micrometeorology Analysis for Tender Fruit Growers.

JAN. 2016

Online Crop Portal exceeds 9,000 uploaded acres. The portal gains users from Alberta, Manitoba, Ontario, and Purdue University.

FEB. 2016

Precision Agriculture Conference: Dr. Duncan presented with farming partner Rick Willemse regarding variable rate prescription tool. Dr. Duncan also presented an update on the Precision Agriculture Advancement for Ontario project with Nicole Rabe, OMAFRA, and Dan Breckon, Woodrill Farms.

SPRING 2016

Micrometeorology equipment installed in the Niagara College Vineyard; second-by-second air temperature and relative humidity collection and analysis begins.

SPRING 2016

Team receives NSERC Engage funding for White Oaks Sustainable Garden project. A faculty member, graduate and student, design, build and develop the garden.

LEADER IN RESEARCH & INNOVATION

Dr. Mike Duncan

Collecting and Analyzing Data with Quantitative Tools for Grain Farmers, Vineyard Managers and Beyond

These days, Dr. Mike Duncan's list of research work is just about as lengthy as his title: Natural Sciences and Engineering Research Council of Canada (NSERC) Industrial Research Chair for Colleges (IRCC) in Precision Agriculture & Environmental Technologies.

As the principal researcher for precision agriculture work in the Agriculture & Environment Innovation Centre, Dr. Duncan develops software and sensors that can help farmers of all types. Dr. Duncan creatively applies practices from physics, mathematics and statistics to agricultural issues, in helping to solve problems that face grain growers in Canada and worldwide. He leads a research team at Niagara College which collects and analyzes agricultural yield, elevation, and weather data using custom algorithms, and with input from collaborators in the farming and government community.

The data collection and analysis tools, developed into scalable interfaces that support farmers and consultants, are created by a team of computer programmers, from Niagara College's School of Technology, as well as graduates with environmental and Geographic Information Systems (GIS) expertise, from Niagara College's School of Environmental and Horticultural Studies.

Currently, Dr. Duncan is collaborating on a project with the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), multiple Certified Crop Advisors (CCAs), and the Grain Farmers of Ontario (GFO). This project is assessing the value of precision agriculture practices for farmers of corn, soybeans, and wheat in Ontario. Dr. Duncan is the architect and leader of the Crop Portal, a web tool that enables a user to upload, clean, grid, and apply analyses to agricultural yield data. The Crop Portal, which has attracted new farmer users from Ontario and beyond, houses custom cleaning algorithms developed by the Niagara College team, and Dr. Duncan's management zone algorithm, called the Yield Probability Index.

Dr. Duncan is also analyzing data from micrometeorology sensors installed in the Niagara College vineyard. Micrometeorology is the study of small changes over the course of seconds, and it is specific to a combination of field, terroir, land, and/or microclimate combination. By analyzing the resulting data, Dr. Duncan and an industry partner will provide advanced warnings that can be coupled with mitigation actions for tender fruit growers.

In addition to static sensors, Dr. Duncan has been working on prototypes for moving robotic sensors, which use air temperature, and relative humidity micrometeorology sensors. Collecting this data, using a moving sensor platform, provides the overview of a growing area such as a vineyard, and its underlying meteorological trends, which assist in timing the fertilizing and harvest, for example. **R&I**

"The overall objective is to find the types of technologies that will comprise the tools needed on the family farm 30 years in the future. What will the future farm look like? How much automation versus manpower will be present? Will the manpower be in the form of a tele-presence? Each of these likelihoods has its roots in what we can build today."

~Dr. Mike Duncan

Matt Sajn

Faculty
Academic and Liberal Studies

Being a communications professor sometimes means providing a catch-all approach to teaching in a wide variety of programs across the college.

While Matt Sajn likes that diversity, he used to find it challenging to bring real-world examples of communications needs into the classroom.

When he learned about the options available through course-based research projects, co-ordinated through Research & Innovation, he was immediately intrigued.

"You are constantly trying to make what you teach more relevant, so to know specific details about specific businesses and industries, and then relate that back to them, is huge," says the Niagara resident.

In the past year, he guided his sports management students through a communications project with the Cambridge Winter Hawks Junior B hockey team, as well as a social media project for Pelham's craft brewery, Kame and Kettle, in his advanced communications for brewmasters course.

"The hands-on learning experience for the students was immediate. They were asking all the right questions, and developing content strategy right away," he notes.

For the Winter Hawks, they researched how to develop off-ice programs such as mental training, or leadership training.

"The students loved doing the research, when there was a specific target to it. You can do all the research you want in a hypothetical setting, but it isn't going to have the same impact as when you are interacting with a specific individual or company."

For the Kame and Kettle project, he was impressed with how much time the industry partners spent with the students, giving them a facility tour and enthusiastically answering the students' questions during an interactive session.

Matt notes that during his own schooling for his Masters of Science in Secondary Education, and even in his time overseas teaching in a high school in England, he had heard about the "authentic learning experience," but it didn't really mean much to him.

Teaching at the college level, and engaging in these projects bringing together students and industry, the words now mean something, he says.

"You would hear the phrase but didn't really know what it meant. Here, seeing the engagement of the students, the professionalism, this truly is an authentic learning experience." **R&I**

COURSE-BASED PROJECTS BY THE NUMBERS

81	1,739	21	30
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS

COURSE-BASED RESEARCH

PROJECTS SPOTLIGHT

Building an Innovative Greenhouse

INDUSTRY PARTNER: North Hamilton Community Health Centre

PROJECT DURATION: Jan. to April 2016

PROGRAM: Greenhouse Technician

RESEARCH TEAM: Bill MacDonald & Amy Petersen (*Faculty*)

CHALLENGE: NHCHC currently coordinates three community gardens and two children's teaching gardens in Hamilton. The success and continued high demand for these programs has led to establishing a Community Greenhouse, which allows NHCHC to extend the growing season for their gardeners, and would enhance other existing programs, such as Multicultural Kitchens and Healthy Moms Healthy Babies, etc. NHCHC approached Niagara College for a partnership in establishing the greenhouse.

SOLUTION: Students from the Greenhouse Crops 2 course were part of the greenhouse process from its initial inception. After the greenhouse was successfully built, the students assisted with the growing of a variety of different fruits and vegetables, using an innovative Tower Garden Growing System, which was purchased with Ontario Centres of Excellence funding. The students visited the greenhouse twice a month to track the progress of the growing and implement any changes.

Market Research

INDUSTRY PARTNER: The Boys & Girls Club of Niagara

PROJECT DURATION: Jan. to March 2016

PROGRAM: Business Administration - Marketing

RESEARCH TEAM: Malcolm Howe (*Faculty*)

CHALLENGE: The Boys & Girls Club of Niagara was experiencing peaks and valleys in the number of clients who were signing up. Using their current client database, they were interested in knowing further details about why this was happening, and they needed a survey tool to better capture the needs of the clients.

SOLUTION: Students worked in pairs to organize, analyze and report on the organization's data, which was provided as a collection of separate Excel data files. Students worked diligently to connect the files into a master file, before using SPSS statistical software for analysis and preparing reports. They provided key findings relating to geographically where people were signing up from, months in which sign-ups were lower, and the number of people signing up for programs. Three teams were selected to present to the Boys & Girls Club, and after the final presentations on campus, students were also asked to present at the Boys & Girls Club Board of Governors meeting.

Chicken Sausage Protoypes

INDUSTRY PARTNER: Farmlife Foods

PROJECT DURATION: Jan. to April 2016

PROGRAM: Culinary Innovation & Food Technology

FACULTY: Dr. Amy Proulx (*Faculty*)

CHALLENGE: Farmlife Foods is a Niagara-based company, serving locally farm-raised chickens to the public. They specialize in selling fresh, bulk chickens at a competitive price. Farmlife Foods wanted to convert lower-value trim from their poultry processing operations into a high-value chicken sausage.

SOLUTION: Using an open innovation approach, each student in the Culinary Innovation course prototyped a product, from which five final products were presented. The products were then slated to go to co-manufacturing at a sausage manufacturer in Spring 2016.

CO-ORDINATOR:
Dave DiPietro

Course-based Research projects are part of a strategy implemented by Deans, Associate Deans, Faculty and the Research & Innovation division to augment content from the classroom with real-life projects and scenarios. These projects typically involve students working with an industry partner to solve real-world challenges. Students are provided increased contact with a specific industry, presenting their fresh ideas to a client. In other words, everyone benefits from the collaboration.

DIGITAL MEDIA & WEB SOLUTIONS

PROJECT MANAGER:
Neil Wilkinson

The Digital Media & Web Solutions team works with small- and medium-sized businesses to assist with the design, creation and implementation of various technology applications, including PC, web and mobile applications, as well as 3D visualization, video production, and graphic design. To do this, the team uses the most up-to-date programming languages, platforms and software packages.

PROJECT SPOTLIGHT

Building a Better Online Presence

PROJECT DURATION: Sept. 2015 to March 2016

PROJECT TYPE: e-Business Solutions

FUNDER: Ontario Centres of Excellence Vouchers for E-Business and Technology Adoption

RESEARCH TEAM: Mark Hardwick (*Faculty*); Myles Fisher (*Research Associate*); Brontë Bean, Anita Dunk, Josh Hanson (*Students*)

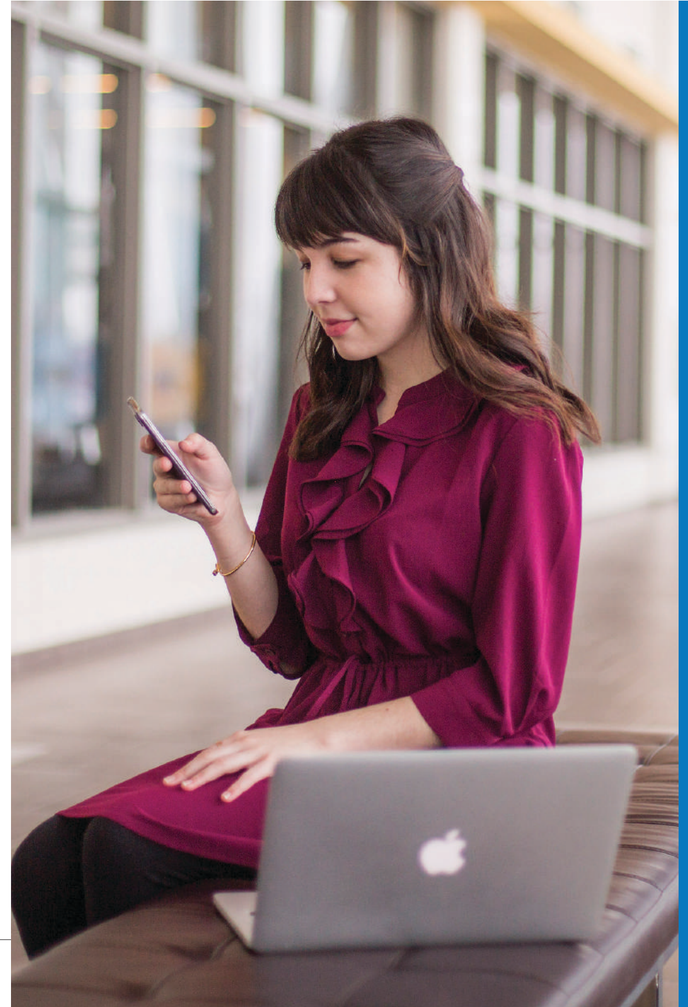
CHALLENGE: A website is often the first impression potential customers get of a company; these potential customers use the site to window shop from the comfort of their armchairs. The website acts as an online brochure which is able to promote the business 24 hours a day, 7 days a week, 365 days a year. Websites give the company a channel through which to communicate with their customers, updating them on new products, offers and promotions.

Today, more than half of Canadians own a smartphone, meaning mobile technology has completely permeated their lives.

Smartphones are used for everything from updating social media to online shopping and finding restaurant recommendations. Modern websites need to be mobile friendly, to allow the content to be accessed on the smaller screens of mobile devices.

SOLUTION: The Digital Media and Web Solutions team have worked with 14 companies to address their website challenges. Some of the companies were start-ups looking to create their first-ever company website, others were established but hadn't updated their website since the early 2000s. One was an established online retailer who was looking to simplify the platform they used to increase productivity at the company, and one was a restaurant looking for a vehicle to communicate more effectively with customers.

INDUSTRY PARTNERS
360 Growers *www.360winery.com*
Apothecary *www.apothecary.mobi*
Brock Mini Storage *www.brockministorage.ca*
Geospatial Niagara *www.geospatialniagara.com*
Handlebar Hanks *www.handlebarhanks.ca*
Horizon Kites *www.horizonkites.com*
Lindsay's Gourmet Compound Butters *www.lindsaysgourmetcompoundbutter.com*
McQueen Custom Cuts *www.mcqueenlumber.com*
Niagara Sustainability Initiative *www. niagarasustainability.org*
Refaced *www.refaced.ca*
Sunshine Automotive Solutions *www.sunshineautomotivesolutions.ca*
Tora Inc. *www.torainc.com*
WeeStreem *www.weestreem.com*
Wine Council of Ontario *www.winecouncilofontario.ca*



Brontë Bean

Research Assistant
Digital Media & Web Solutions

Living the ideal small-town life has delivered big-time success for Brontë Bean.

The Acton, Ont. native was initially attracted to the New Media Web Design program at Niagara College because of its small-town feel.

"When I toured colleges, Niagara was the best fit in terms of the smaller class sizes, a welcoming school, and I didn't feel like just a number."

Brontë entered the program straight out of high school, matching her love of art and computers together in web design.

And at the start of her second year, one of her professors encouraged her to apply for a research assistant's job with Research & Innovation's Digital Media & Web Solutions team.

The practicality of working 12 to 15 hours a week throughout most of her second year solidified her attraction to this career path, and gave her the skills and confidence needed to walk into a full-time job even before graduation.

"I didn't expect to learn as much as I did on the job. There were so many valuable skills that are so important in industry, especially having to meet and work with clients," she says.

"My responsibility was to the client, and there was no one there to hold my hand. It felt good to have that much trust placed in us to do the job right."

Students and recent graduates from both the New Media Web Design program and the Computer Programmer Analyst program work on projects for industry. Current work includes developing websites through custom page building or WordPress templates. Bronte worked on two pre-made themes, adding small bits of customization, and worked on two custom themes, doing all the coding herself, during her time with the division.

During her last month of school the same professor encouraged her to apply for a job with a St. Catharines-based communications company. The portfolio of work and confidence displayed during the interview won her the position, a full-time job as WordPress and Website Developer.

While she grew up just outside the Greater Toronto Area, and could have tried her luck in that much bigger market, she says that staying in Niagara was a conscious choice even before 180 Marketing came calling.

"I think that if I went back to the GTA it would be harder to get my name out there. Here I already have an established network." **R&I**

DIGITAL MEDIA & WEB SOLUTIONS BY THE NUMBERS

15	4	2	3
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS

Esteban Puello & James Turner

Senior Co-Op Students
Walker Advanced Manufacturing Innovation Centre

Pictured from left, Esteban Puello and James Turner at work in the lab.

Esteban Puello knew co-op opportunities would give him real-world experience while attending Niagara College in the Mechanical Engineering Technology program, but he never dreamed they would take him to a remote manufacturing facility in the heart of Georgia, U.S. Currently working with the Walker Advanced Manufacturing Innovation Centre, the Oakville native was part of a team designing a new aerodynamic profile for spinning bows used in the wire industry, for Niagara Composites.

After designing several profiles, using computational fluid dynamics, the industry partner chose one, built it, and then tested it in a real factory setting, which just happened to be in Georgia. Esteban was part of the team overseeing the measurements, which will be analyzed to discover the level of efficiency achieved with the new system.

"I really like working with the scanners and other equipment in the lab – it's just not something we get to do in the classroom," he notes. **R&I**

James Turner will never look at anything mechanical in the same way.

The Mechanical Engineering Technology program student followed the advice of his step-dad by joining the program after completing the Automotive Mechanic and Repair program at Niagara College.

"Once you start learning about design you are always thinking about how things are made, how they are produced, or how they run," he explains.

Working his co-op term in technical services with the Walker Advanced Manufacturing Innovation Centre, James regularly uses 3D scanning and laser equipment, and the related software, to complete projects for real industry clients.

"The eye to detail I have developed will most certainly help me once I am back in the classroom."

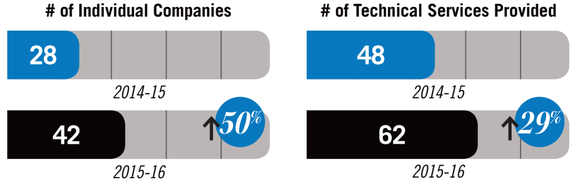
Once he has completed his education, James will be looking to merge his love of engineering and automotive together. He has been following the development of the Niagara-based Canadian Motor Speedway with great interest. **R&I**

TECHNOLOGY ACCESS CENTRE FOCUS

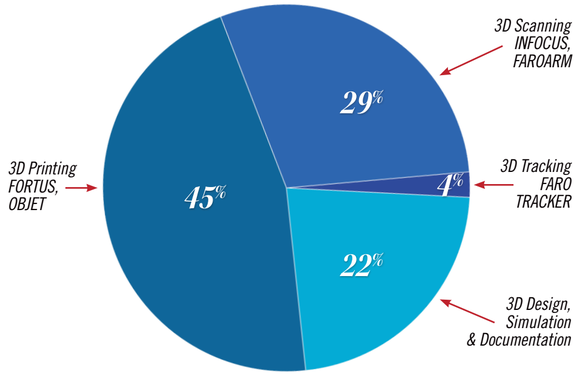
The Walker Advanced Manufacturing Innovation Centre is home to a Technology Access Centre — one of 30 such centres funded by the Natural Sciences and Engineering Research Council of Canada (NSERC) — to serve the research and innovation needs of the advanced manufacturing sector of Niagara and beyond.

By working with college faculty and students, the centre provides a key competitive advantage to industry, offering access to cutting-edge equipment – and related services – for the development of products and manufacturing processes.

FACTS & FIGURES



2015-16 TECHNICAL SERVICES BY TYPE



WALKER ADVANCED MANUFACTURING INNOVATION CENTRE

PROJECTS SPOTLIGHT

Designing a Beer Racking System

INDUSTRY PARTNER: Hamill Machine Company Inc.

PROJECT DURATION: Dec. 2015 to April 2016

PROJECT TYPE: Mechanical Engineering Design and Improvement

FUNDING: Niagara Region Voucher

RESEARCH TEAM: Costa Aza (*Faculty*); Mike Granton (*Student*)

CHALLENGE: Hamill Machine Company Inc. recently identified the craft beer industry as a new niche market opportunity, when they noticed that vendors stock several varieties of kegged beers in unorganized and sometimes unsafe ways.

SOLUTION: After confirming the usefulness of a modular beer racking system with microbreweries and craft beer distributors, the team designed a system that could be made using Hamill's laser cutter. They created a conceptual design using Autodesk Inventor, testing the stressors on different types of polymers. Hamill manufactured the design and will soon commercialize the product.

Putting on the Right Spin

INDUSTRY PARTNER: Niagara Composites International Inc.

PROJECT DURATION: Oct. 2015 to Aug. 2016

PROJECT TYPE: Mechanical Engineering Design and Improvement

FUNDING: Niagara Region Voucher, OCE VIP

RESEARCH TEAM: Costa Aza, Bryan Mewhiney (*Faculty*); Justin Welsh, Esteban Puello (*Students*)

CHALLENGE: Niagara Composites has become a leading global equipment supplier to the wire industry by introducing composite wire-spinning bows (a replacement for metal bows). Niagara Composites needed to identify and test the bow's optimal aerodynamic profile in a factory setting.

SOLUTION: The team helped create a new product called the Viper Bow System, believed to revolutionize the wire-spinning industry, by increasing the rate of wire-production, reducing noise output in industrial settings, and lowering electricity consumption.

Smoothing Out Productivity Kinks

INDUSTRY PARTNER: GTG Engineering Canada

PROJECT DURATION: June to Dec. 2015

PROJECT TYPE: Mechanical Engineering Design and Improvement

FUNDING: Niagara Regional Voucher, OCE VIP

RESEARCH TEAM: Costa Aza (*Faculty*); Mike Granton (*Student*)

CHALLENGE: GTG Engineering Canada Inc. (GTG), is the exclusive distributor of LLFA products, including Smooth and Smooth Thin, typically used in medium- to high-voltage applications, such as covering exposed wires, and in water leak repair and connection seals for plumbing. They are manufactured on a small scale with a homemade machine that needed improvements.

SOLUTION: The material preparation process was improved through the use of a custom-made cutting jig, leading to a 10 per cent production improvement. The team also improved the hydraulic feed tube and die system with a new optimized design for the perforated die created using 3D CAD software.

WALKER ADVANCED MANUFACTURING INNOVATION CENTRE BY THE NUMBERS

11	13	3	7
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS

PROJECT MANAGER:
Gordon Koslowski

Located at the Welland Campus of Niagara College, the Walker Advanced Manufacturing Innovation Centre provides small regional manufacturers access to needed facilities, equipment, technical expertise – including 3D technologies and related software – and serves to assist them in product development, technology adoption, expansion into new markets and commercialization.

Research & Innovation

2015-16 BY THE NUMBERS

137 PROJECTS

1,791 STUDENTS

28 PROGRAMS

67 RESEARCHERS

*Total figures includes areas of specialization as well as course-based research

Niagara College's Research & Innovation Division provides real-world solutions for business, industry and the community through applied research and knowledge transfer activities. We conduct projects that provide innovative solutions, such as producing and testing prototypes, evaluating new technologies, and developing new or improved products or processes for small- and medium-sized businesses. 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.

FACTS & FIGURES

The Research & Innovation Division plays an increasingly important role within the strategic mandate of Niagara College. By expanding technical service offerings and engaging more students in course-based research we increased our numbers year over year:

WAYS COMPANIES ACCESS RESEARCH & INNOVATION

194 COMPANIES

142 APPLIED RESEARCH

52 TECHNICAL SERVICES

TECHNICAL SERVICES

2014-15 44 services

2015-16 77 services

↑ 75%

RESEARCH PROJECTS

2014-15 168 research projects

2015-16 214 research projects

↑ 27%

RESEARCH FUNDERS

INNOVATION.CA CANADA FOUNDATION FOR INNOVATION | FONDATION CANADIENNE POUR L'INNOVATION

NSERC CRSNG

NRC CNRC Canada IRAP NRC Industrial Research Assistance Program | Programme d'aide à la recherche industrielle du CNRC

Ontario

Ontario Centres of Excellence

Niagara Region

Niagara College Canada APPLIED DREAMS.

FUNDING FOR RESEARCH

Where the funding comes from...

*$8,195,971**

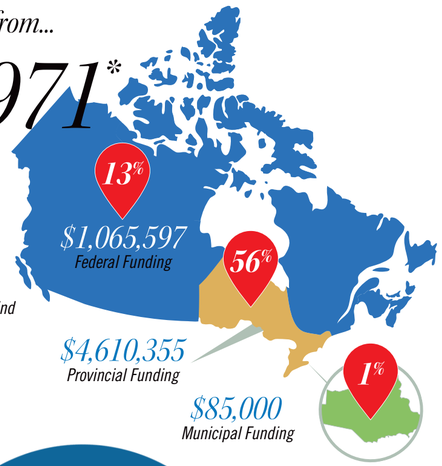
Total funding for Niagara College Research & Innovation 2015-16

**This figure includes Industry & College Cash for Technical Services and the Province of Ontario's funding for the Walker Advanced Manufacturing Innovation Centre.*

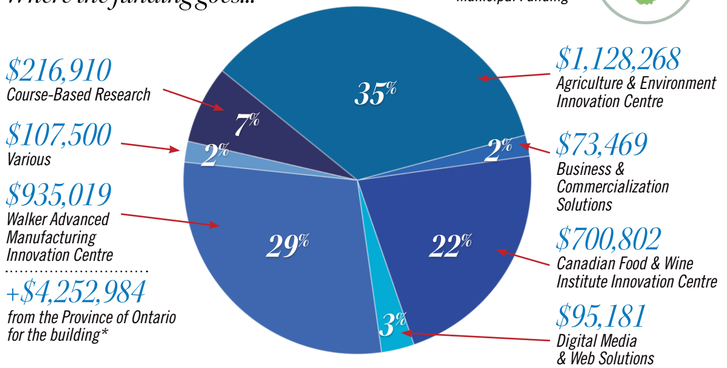
3% $235,049 Industry Cash

18% $1,516,134 Industry In-Kind

9% $683,834 College Support



Where the funding goes...



2015-16 Highlights

APRIL 2015

Dr. Mike Duncan a featured agriculture panellist at OCE Discovery Conference

MAY 2015

Advanced Manufacturing team grows with hiring of Jim Lambert, Centre Manager, Ben Laurence, Research Laboratory Technologist, and Charles Lecompte, Senior Application Specialist

JUNE 2015

Governor General's Canadian Leadership Conference toured CFWI Innovation Centre

JULY 2015

PanAm Economic Playbook group tours R&I facilities at both campuses

SEPTEMBER 2015

To date, Niagara College successful in 11 out of 11 OCE and NSERC funding proposals

OCTOBER 2015

Industry Partner Bob Benner and Dr. Marc Nantel are interviewed by CBC News Network's Heather Hiscox during federal election

NOVEMBER 2015

Placed No. 10 in Top 50 Research Colleges list published by Research Infosource Inc.

NOVEMBER 2015

Niagara College hosts Technology Access Centre representatives from across Canada as part of formation of Tech-Access Canada

DECEMBER 2015

Precision Agriculture team's online Crop Portal gains users from Alberta, Manitoba, Ontario, and Purdue University

JANUARY 2016

Construction enters final phases for Walker Advanced Manufacturing Innovation Centre at Welland Campus

FEBRUARY 2016

The CFWI Innovation Centre and Agriculture & Environment Innovation Centre are well represented at the Ontario Fruit and Vegetable Convention. CFWI Innovation Centre showcases the award-winning MADD Virgin Craft Brewed Lager

MARCH 2016

Dr. Marc Nantel featured presenter at the CICan Research Symposium in Winnipeg

Our team of researchers, students and administrators are here for you. We provide

SOLUTIONS FOR INDUSTRY

2015 • 16

Agriculture & Environment Innovation Centre

Business & Commercialization Solutions

Canadian Food & Wine Institute Innovation Centre

Digital Media & Web Solutions

Walker Advanced Manufacturing Innovation Centre

nc Research & Innovation

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