SOLUTIONS FOR INDUSTRY

RESEARCH & INNOVATION ANNUAL REPORT 2016-17

Niagara College Canada
APPLIED DREAMS.

nc Research & Innovation

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Hello, and welcome to the 2016-17 annual report for Niagara College's Research & Innovation Division. Simply put, as you will see in these pages, we have had a fantastic year.

In partnership with government and industry, Research & Innovation has involved nearly 2,000 students and 63 expert faculty and researchers, across 31 academic programs, in 229 projects and services.

That adds up to plenty of solutions for our industry partners, and a lot of great experience for our students, on real-life projects, with real-life deadlines, budgets and deliverables. For an idea on how many courses we have impacted with applied research experiences, see page 11.

While we might be tempted to rest on our laurels, so to speak, we generally don't work that way here at Research & Innovation.

In fact, several great announcements over the course of the year will lead us into even more applied research projects and technical service offerings in the years ahead. In these pages, you will read about these amazing opportunities, as well as interesting projects and people, in applied research at Niagara College.

Three sectors in particular have seen strong growth and activity during this past year:

• At the Agriculture & Environmental Technologies Innovation Centre, we celebrated the five-year renewal of the Industrial Research Chair for Colleges, for Dr. Mike Duncan. This grant, from the Natural Sciences and Engineering Research Council of Canada (NSERC), allows us to continue the great strides made in Precision Agriculture, with several key partnerships with agronomists and farmers to accelerate the adoption of this technology. This will not only improve the productivity of farms, but also reduce fertilizer run-offs into streams and lakes, increasing the health of our environment.

• With an NSERC grant of a Technology Access Centre (TAC) for our Canadian Food & Wine Institute Innovation Centre, Niagara College became one of only two colleges in Canada to have two TACs, a five-year renewable grant to allow for dedicated, specialized staff and technical offerings for small- and medium-sized food and beverage companies who would like to innovate.

• Speaking of TACs, not only did we move into our new home this year, the Walker Advanced Manufacturing Innovation Centre, we also grew its projects and capacity by leaps and bounds, thanks to our leading part in forming a consortium with McMaster University, Mohawk College and Sheridan College, called the Southern Ontario Network for Advanced Manufacturing Innovation, or SONAMI. We received funding from the Federal Economic Development Agency for Southern Ontario (FedDev Ontario) to push the innovation agenda in the advanced manufacturing sector.

To better serve the agri-food industry, we are excited to watch a new building take shape right now at our Niagara-on-the-Lake campus. In November, the federal government awarded Niagara College $8.7 million, and the province awarded $1.5 million, from the Post-Secondary Institutions Strategic Investment Fund (SIF) for new research and innovation laboratories, training facilities for student engagement and entrepreneurship, and incubation space for business.

I could let you in on a few more of the amazing opportunities that came our way this past year, but that would spoil the surprise. I invite you to read on for yourself in the pages that follow.

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 & ENVIRONMENTAL TECHNOLOGIES INNOVATION CENTRE

PROJECT MANAGER:
Gregor MacLean

Niagara College's Agriculture & Environmental Technologies Innovation Centre team works with private and public sector partners to develop innovative solutions to address today's challenges in agriculture, local and sustainable food production, plant growth, horticultural practices, greenhouse operations, aquaponics, and environmental management. The team's work is enhanced by the computational power to process big data; a 20,000 square-foot greenhouse; environmental labs; and on-campus wetlands and lagoons.

PROJECTS SPOTLIGHT

Precision Agriculture Advancement for Ontario

INDUSTRY PARTNER: Grain Farmers of Ontario

COLLABORATORS: 20 grain farmers, 8 agronomists/Certified Crop Advisors/ agricultural consultants, and OMAFRA team members Nicole Rabe (*Land Resource Specialist*); Ian McDonald (*Crop Innovation Specialist*); and Ben Rosser (*Corn Specialist*)

PROJECT TYPE: Variable-rate seed and fertilizer validation and digital tool development

FUNDING: Grain Farmers of Ontario and Growing Forward 2 (via the 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 and Omer Ali (*Research Associates*); Shiqian Liu, Shubham Kumar, and Matthew Leaver (*Research Assistants*)

CHALLENGE: Investment in precision agriculture equipment is significant across Ontario; however, the agronomic, and geographic information system (GIS) areas are lacking research to demonstrate a return on investment (ROI).

SOLUTION: Niagara College built a web system called the Research Crop Portal to house and process farm data layers (yield, as applied, topography, etc.) into digitized maps that are compared and contrasted to support ROI and determine best practices.

Development of a Farming Web Tool (ReservoiRx)

INDUSTRY PARTNER: Yellow Gold Farms Ltd.

COLLABORATORS: Rick Willemse, Owner/ Operator of Yellow Gold Farms Ltd.

PROJECT TYPE: Variable-rate seed and fertilizer web software development

FUNDING: Ontario Centres of Excellence Voucher for Innovation and Productivity I and Yellow Gold Farms Ltd.

RESEARCH TEAM: Dr. Mike Duncan (*NSERC Industrial Research Chair for Colleges - Precision Agriculture & Environmental Technologies*); Sarah Lepp (*Senior Research Associate*); Ryan Tunis and Omer Ali (*Research Associates*); Shiqian Liu, Kristina Xhakani, Shubham Kumar (*Research Assistants*)

CHALLENGE: A field's corn crop was traditionally treated with one amount of planted seed, and a single rate of applied fertilizer (of each type). However, this results in wasted costs, fertilizers, and runoff. Yellow Gold Farms' Rick Willemse developed a system in a spreadsheet called ReservoiRx. It produces prescriptions that indicate the precise amount of fertilizers to be applied.

SOLUTION: Niagara College's Agriculture & Environmental Technologies Innovation Centre is developing ReservoiRx from a digital spreadsheet, into a scaled web tool that can be used by consultants and grain farmers across Ontario, Canada, and the world.

Real Time Agricultural Weather Data

INDUSTRY PARTNER: Earthgen International Ltd., Huebel Grapes Estates, Lambrecht Farms, Schuyler Farms Ltd., and Yellow Gold Farms Ltd.

PROJECT TYPE: Highly detailed weather data display, collection and analysis

FUNDING: National Sciences and Engineering Research Council of Canada (NSERC) – Applied Research Tools and Instruments Funding (ARTI)

RESEARCH TEAM: Dr. Mike Duncan (*NSERC Industrial Research Chair for Colleges - Precision Agriculture & Environmental Technologies*); Ryan Tunis (*Research Associate*)

CHALLENGE: Farm businesses of all types are threatened by harmful weather events, particularly events that arrive quickly. Traditional weather hardware is not able to identify these events in time, and provide sufficient warnings to initiate damage prevention.

SOLUTION: 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. With NSERC ARTI funding, Niagara College has purchased and installed five micrometeorology stations and developed a web system to rapidly display, collect and analyze the data from all the stations. The data will be used to provide valuable information to farmers, by creating algorithms and warnings that will identify oncoming weather threats, and to better understand the factors behind crop quality and productivity.

Andrew Nickel

Research Assistant
Agriculture & Environmental Technologies Innovation Centre

Andrew Nickel thinks a lot these days about saving the world. Not by himself, of course, but through the fields of intensive agriculture, nuclear power and geoengineering.

"The challenges that face our civilization, such as anthropogenic climate change, will not be overcome by a few anxious people eating organic or turning off the lights on Earth Day," says the history scholar, turned winery owner, turned engineering student.

"We will solve our problems with the rigorous application of science and technology. Increasing our competence is an act of moral improvement."

For now he's doing his part to contribute to this scientific rigor through his role in the Research & Innovation division. As a third-year Electronics Engineering Technology student in a four-month co-op, he's been set loose on a major project: developing automated remote sensing technology and robotics that provide real-time weather conditions to farmers so they can better manage their fields.

It's important work that supports agriculture, he says. Data gathering with wireless sensory technology can offer a precise picture of soil and weather conditions and can give growers enough warning that they can hopefully mitigate damage to crops.

Agricultural robot localization is a long way from earning a Bachelor of History, and minor in English (McMaster, 2003), especially being a self-described "math phobe" for most of his life. But at age 34 and feeling "lost" after his family sold their winery he was operations manager at, the married father of two decided to face his arithmetic adversary so he could return to school in engineering.

He donned his literary beret and taught himself the language of mathematics by writing poems and making up stories. Lucky for him engineering is a creative field, since he's deeply immersed in computer programming, mobile applications, open source technologies and mapping (converting latitude and longitude coordinates to a local Cartesian plane.)

When Andrew is not building robots or planning on saving the world, he's engrossed in history and ponders how the industrial revolution has changed the human condition. **R&I**

AGRICULTURE & ENVIRONMENTAL TECHNOLOGIES INNOVATION CENTRE BY THE NUMBERS

7	7	8	6	6
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS	PARTNERS

Gwen Kitiwano

Research Associate
Business & Commercialization Solutions

On a whim a few summers ago, Gwen Kitiwano decided she wanted to go to Japan. So she taught herself the basics of the language and headed to a foreign country for a three-week adventure. Alone. She got lost, she was scared, but the experience changed her.

"Going there on my own proved to me that I could do anything with enough hard work and perseverance," says the Research Associate. "There is nothing stronger than believing in yourself."

This hard-earned confidence has remained for when she needs to draw upon it, says the recent grad of the Honours Bachelor of Business Administration (International Commerce & Global Development). For example, it was there last year when she was part of an international team that earned top honours in X-Culture, a prestigious business competition made up of undergrads and MBA students from more than 40 countries.

Gwen describes working with the R&I business team as a continuous learning experience. One project that stands out for her was local coffee roasting company Planet Bean and their new ready-to-drink coffee product. Her team was tasked with discovering possible target markets, consumer trends and suggesting a marketing strategy.

It was one of the most extensive, data-driven research projects she's completed to date. "It taught me a lot in terms of analyzing data and turning it into something valuable for the client," she says, adding that doing applied research for a real industry partner becomes more than a school project, with far more real-world implications.

"For instance, doing specific research for a client could not only save them time and money, but also help them realize the current state of the industry they wish to penetrate or are currently in," she explains. "Your research becomes an important stepping-stone in a business' future prospects."

As she navigates her own way through life today, she turns to the life-lessons learned from her trip abroad; and now, instead of wondering if she can do something, she asks herself why she couldn't, given all she has already accomplished.

"I believe that we are capable of extraordinary things, if we simply give ourselves the chance." **R&I**

BUSINESS & COMMERCIALIZATION SOLUTIONS BY THE NUMBERS

10	3	6	14	10
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS	PARTNERS

BUSINESS & COMMERCIALIZATION SOLUTIONS

PROJECTS SPOTLIGHT

Marketing Plan for Aquaponic Greenhouse

INDUSTRY PARTNER: Trend Aquafresh

PROJECT TYPE: Business - Marketing

FUNDING: NSERC CCI IE

RESEARCH TEAM: Terri Champion, Malcolm Howe (*Faculty*); Alejandra Ruiz Aguirre (*Research Associate*); Gwen Kitiwano, Paula Reile (*Research Assistants*)

CHALLENGE: Trend Aquafresh is a commercial-size Aquaponics Greenhouse, growing a variety of greens faster than traditional methods, with significantly less waste and is organic by nature. Trend Aquafresh wanted to implement effective marketing strategies to create brand awareness and generate sales, as well as determine the best distribution methods for this industry.

SOLUTION: In collaboration with the Trend Aquafresh team, the research team examined the Agri-Food industry to discover market trends and distribution strategies. Competitors within this industry were identified and analyzed. Using the information gathered, marketing and promotion strategies were recommended for Trend Aquafresh.

Sales Kit Development for Compound Butter

INDUSTRY PARTNER: Lindsay's Kitchen

PROJECT TYPE: Business - Sales

FUNDING: CCI-Food and Culinary Innovation & Industry

RESEARCH TEAM: Pam Isaak (*Faculty*); Gwen Kitiwano, Paula Reile (*Research Assistants*)

CHALLENGE: Lindsay's Gourmet Compound Butter is a finishing butter used to enhance meals simply. Compound butter is new to the Canadian market; and is currently growing in the U.S. market. The company wishes to implement effective marketing strategies to create brand awareness and generate sales. In entering the market, the team was asked to find solutions for current capacity issues, outline the sales cycle of getting new products on grocers' shelves, create a sales kit and develop marketing and promotional strategies.

SOLUTION: In collaboration with the Lindsay's Gourmet Compound Butter team, capacity issues were addressed and potential solutions were given. The sales cycle was outlined; and recommendations for the sales kit were given. Marketing and promotion strategies were recommended for Lindsay to successfully enter the market and attract customers. The company was recently selected as a finalist for the Greater Niagara Chamber of Commerce Niagara Business Achievement Awards - Outstanding New Business 2017.

Outreach Planning for Wire Industry Supplier

INDUSTRY PARTNER: Niagara Composites

PROJECT TYPE: Business - Sales

FUNDING: Niagara Region & Industry

RESEARCH TEAM: Terri Champion, Malcolm Howe (*Faculty*); Alejandra Ruiz Aguirre (*Research Associate*); Gwen Kitiwano, Paula Reile *(Research Assistants)*

CHALLENGE: Niagara Composites is a bow manufacturing company that has been serving the wire industry since 1980. Recently, they have developed a new product: the Viper Bow Systems. The new Viper Bow Systems aims to reduce costs by reducing the time and effort it takes to change out broken bows. As Niagara Composites prepares to officially launch their product in 2017, the Niagara College Research & Innovation team was asked to provide a detailed sales kit and trade show booth suggestions.

SOLUTION: In collaboration with the Niagara Composites team, detailed sales kit components and trade show booth set-up suggestions for the launch of the Viper Bow Systems were provided. Suggested sales cycles, key selling components and steps for launching the Viper Bow Systems were also recommended in order to enable Niagara Composites to gain a better understanding of a new product's launching process.

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

Entering Hard Apple Cider Market

INDUSTRY PARTNER: Reinhart Foods Ltd.

PROJECT TYPE: New Product Development

FUNDING: NSERC CCI IE

RESEARCH TEAM: Gavin Robertson, Dr. Amy Proulx, Peter Rod (*Faculty*); Ryan Monkman, Stephanie Budd (*Research Assistants*)

CHALLENGE: Reinhart Foods Ltd. is a century-old family business which originally produced apple products, but has expanded in recent years into specialty vinegars and several baking ingredients. The company wanted to develop and manufacture a unique hard cider beverage for the Ontario market, with intentions to export to remaining provinces and the United States.

SOLUTION: The CFWI Innovation Centre team developed a unique, commercially-marketable, hard cider product for Reinhart using 100 per cent Ontario-grown apples. Reinhart's Red Apple Light Cider, launched in May 2017, already has distribution channels within Ontario, with a focus on LCBO sales, with the potential to also export within Canada and the United States.

Expanding French Fry Distribution Channels

INDUSTRY PARTNER: Valley Growers Inc.

PROJECT TYPE: Shelf Life Study & Process Improvement

FUNDING: NSERC CCI IE

RESEARCH TEAM: Dr. Amy Proulx (*Faculty*); Rebecca Griffin (*Senior Research Associate*); Kelly Byer (*Research Lab Technologist*); Victoria Brosseau (*Research Associate*); Nathan Knapp-Blezius, Tabitha Hendricks, Ankita Mathkar, Alex Snyder (*Research Assistants*)

CHALLENGE: Valley Growers Inc. is a family-run potato farm located in Sudbury, Ont. that has an annual crop of 500 acres. They currently produce and market fresh cut French fries to the Ontario market. They wanted to extend their shelf life but did not have access to food science expertise or analytical testing to help solve this issue.

SOLUTION: The CFWI Innovation Centre assisted by experimenting with packaging and functional ingredients. Shelf life was assessed through both microbial and organoleptic testing. The project resulted in a significant shelf life extension, which enables Valley Growers Inc. to expand distribution throughout most of Canada while maintaining a high-quality product.

Sweet Recipes of Success

INDUSTRY PARTNER: Rich Products

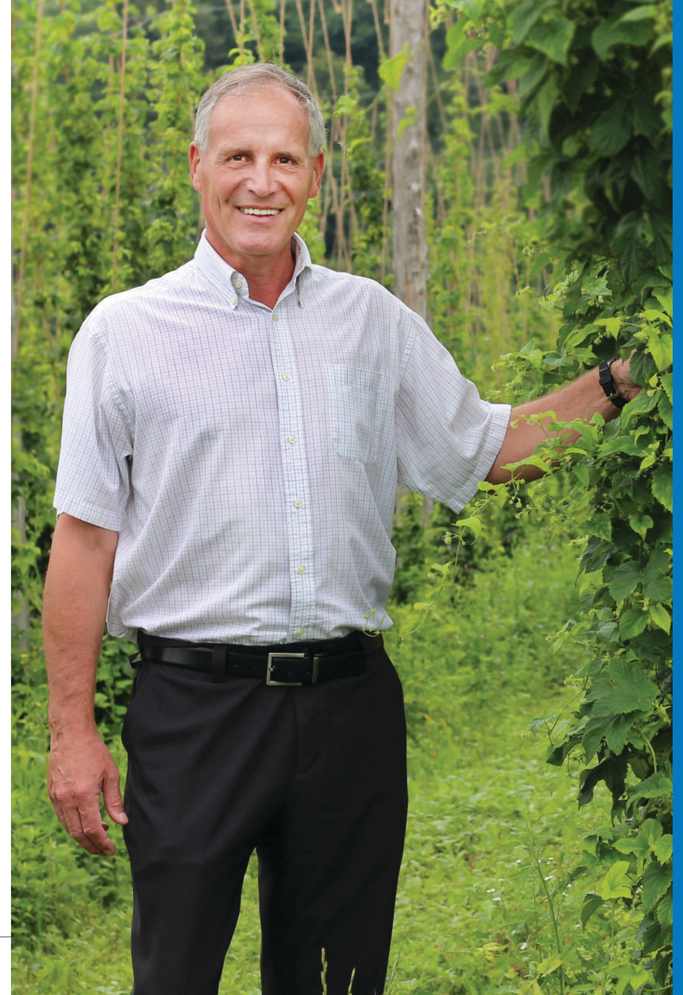
PROJECT TYPE: Recipe Development & Prototyping

FUNDING: Technical services and Course-based research project

RESEARCH TEAM: Dr. Amy Proulx, Ruth Bleijerveld (*Faculty*); Spencer Dion, David Ly, Nicholas Trybel, Adrienne Tse (*Research Associates*)

CHALLENGE: The founder of the non-dairy segment of the frozen-food industry, Rich's is a leading supplier and solutions provider to the foodservice, in-store bakery and retail marketplaces. Rich's approached the CFWI Innovation Centre for a creative approach to cake and pastry decorating for a new product line.

SOLUTION: An expanded research team of culinary students, graduates and professors teamed up and provided ideation and execution sessions that resulted in hundreds of ideas, and more than 30 innovative prototypes to be adopted by Rich Products.



Dr. Dirk Bendiak

Beer Scientist
Niagara-on-the-Lake Campus

Being a beer scientist is rather an important job. In fact, there are some archaeologists who argue the fermented froth was responsible for the rise of civilization. But when Dr. Dirk Bendiak tells people he's a beer scientist, most just want to know how they, too, can get that gig.

And when he goes on to say how he misses the morning 'taste panels' he's not rubbing it in – it's only natural he'd thirst for those sensory days, after spending his entire career critically evaluating the barley-to-beer process.

Since retiring four years ago he now spends his summers golfing and lecturing in the beer evaluation course at Niagara College; as he explains, he wants to "pass on some knowledge and experience to the new up and coming brewers."

Most fortunately for the Research & Innovation division that "knowledge and experience" is vast: a PhD in molecular genetics, a widely-published microbiologist and an outstanding 32-year career at Molson Brewery in many roles (microbiology, quality, corporate brewer, corporate packaging specialist, and quality manager for the corporate and Toronto brewery labs).

His mastery has most recently been utilized by R&I in a project management role to develop a reference guide of best brewing practices for enhancing shelf life for the Ontario Craft Brewers (OCB), an association representing some 40 craft breweries across the province. His research team was able to identify new technology trends for increasing shelf life and developed cost-benefit analyses for accepting the new technologies.

The result is the Craft Brewers Shelf Life Reference Manual. The research project was a "great success to help craft brewers to understand their beer shelf life and how to address problems with their processes," he says.

The microbiology of beer making – or more specifically the yeast – is the most fascinating part of the process and a life-long passion, Dirk explains. "It is this little microorganism that turns the hopped sugar solution into the ethanol, CO_2 and beer flavours."

His sage advice for students: find your passion and have a positive attitude. "I was in my job for a long time and my role did change over time, but the underlying passion for beer did not."

"What could be bad about any day in the brewery?" **R&I**

CANADIAN FOOD & WINE INSTITUTE INNOVATION CENTRE BY THE NUMBERS

19	12	7	23	19
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS	PARTNERS

NOT ONE, BUT TWO - TACS AT NIAGARA COLLEGE

Niagara College's Research & Innovation division is the home of two Technology Access Centres (TACs).

Funded by the Natural Sciences and Engineering Research Council of Canada, and housed at colleges or cégeps across Canada, TACs provide access to specialized technology, equipment, and expertise to local industry – particularly small- and medium-sized enterprises – with the goal of enhancing their productivity and innovation.

Currently, there are 30 TACs enabling Canadian businesses to advance their products, processes and services.

At Niagara College, the Walker Advanced Manufacturing Innovation Centre is home to a TAC in advanced manufacturing, while the Canadian Food & Wine Institute Innovation Centre's TAC caters to the food and beverage industry.

In both cases, our TACs offer:

- conducting research and development projects focused on company problems
- offering specialized technical services and advice
- providing companies with training related to new types of equipment and processes

TACs also connect companies to additional sources of advice, service, expertise and funding. The TACs are part of the Tech-Access Canada network.

2016-17 R&I TICKER TAPE HIGHLIGHTS

MAY 2016

The Walker Advanced Manufacturing Innovation Centre is move-in ready; labs downstairs and offices upstairs

JULY 2016

OCE announces Voucher for E-Business & Technology Adoption funding for R&I

AUG. 2016

Media and VIPs tour our sustainable garden project at White Oaks Resort & Spa in NOTL

SEPT. 2016

Niagara College earns five-year renewable Technology Access Centre grant for the CFWI Innovation Centre, from NSERC

SEPT. 2016

Our advanced manufacturing team welcomes its first high school co-op student, Nick Lodde

OCT. 2016

Precision Agriculture team demonstrates research to date with Farm of the Future event, on NOTL campus

WHERE ARE THEY NOW?

We are pleased to witness many of our graduates securing employment in their fields of study after working with Research & Innovation. Recent graduates who have accepted positions include: **Omer Ali** – Solutions Technician, Information Systems and Technology with Hamilton Niagara Haldimand Brant Local Health Integration Network; **Meghan Beattie** – Research Technician, Vegetable Breeding – Vineland Research and Innovation Centre and **Spencer Dion** – Quality Assurance Consistency Coordinator at Marsan Food Ltd.

OMER ALI

MEGHAN BEATTIE

SPENCER DION

Other notable graduates include:

- **Darcy Devereaux** – Product Development Chef, Marsan Food Ltd.
- **Paula Reile** – Community Manager, myNOTL.com
- **Beatrix Princzne Csemer** – Food Technologist, E.D. Smith Foods Ltd.
- **Jonathon Weber** – R&D Technologist, Herbaland Naturals Inc.
- **Josh Hanson** – Web Developer, Northern Commerce

ACADEMIC PROGRAMS WE INTERACT WITH

CULINARY INNOVATION & FOOD TECHNOLOGY
NEW MEDIA WEB DESIGN PUBLIC RELATIONS
INTERNATIONAL EXCHANGE SALES & MARKETING
GEOSPATIAL MANAGEMENT HORTICULTURE
MECHANICAL AND ELECTRICAL ENGINEERING INTERNATIONAL COMMERCE
GENERAL ARTS & SCIENCE CHEF TRAINING
RENEWABLE ENERGIES BUSINESS COMPUTER PROGRAMMING
HUMAN RESOURCES WINE & VITICULTURE
GREENHOUSE TECHNICIAN LANDSCAPE TECHICIAN
PHOTONICS INTERNATIONAL BUSINESS
CULINARY MANAGEMENT
BREWMASTER & BREWERY OPERATIONS

NOV. 2016

Niagara College climbs ranks of Top 50 Research Colleges list again, earning No. 7 in Canada

DEC. 2016

FedDev Ontario announces $7.3M for Southern Ontario Network for Advanced Manufacturing Innovation (SONAMI), led by Niagara College

JAN. 2017

First of its kind in Canada, the Fortus 900mc 2nd Gen 3D printer gets its first client

FEB. 2017

Lab technologist Ben Laurence bids us farewell, headed for the stars, with Blue Origin, an aerospace company in Seattle, Washington

FEB. 2017

Advanced manufacturing and food and beverage teams show off innovations for the heartnut, for industry partner Grimo Nut Nurseries

MARCH 2017

NSERC approves the five-year renewal of Dr. Mike Duncan's Industrial Research Chair in Precision Agriculture and Environmental Technologies

Mark Hardwick

Faculty
School of Media

When Mark Hardwick decided to start his own business, this creative political junkie vowed to combine the two things in life he was most passionate about: web development and politics. So he launched a web development/digital design agency specializing in online political and advocacy campaigns.

Blending his two passions proved to be a clever move for someone who's been involved in politics for most of his life, from campaigning with his parents as a child to becoming president of the Student Administrative Council while a student at Niagara College (Interactive Multimedia & Web Design, 2005).

To date, Mark has done work for a number of elected officials and political candidates across Canada, including the more prominent Kevin O'Leary's short-lived bid for the leadership of the Conservative Party of Canada. "As the web developer for the campaign, I was asked to build a lot of things that made me grow as a developer."

And to satisfy his yen to teach others what he's learned, Mark is a part-time professor here in the New Media Web Design and Computer Programmer programs. He also lends his expertise to Research & Innovation as a Faculty Research Lead for the Digital Media & Web Solutions division and collaborates in the classroom for course-based research for Integrated Rich Media projects.

He leads students in real-world experience, whether it's building or redesigning a website or launching a multimedia project. Recent projects have included work with non-profit groups like Foyer Richelieu and the Early Childhood Community Development Centre. He also uses his industry experience to help the students deal closely with the actual client, a valuable skill to have in business relations.

"It's rewarding to watch students apply the skills they've learned inside the classroom and go that extra mile to learn something new.

"We're able to work with smaller groups of students, which allows us the time to be more hands on, step up the pace and help students build some pretty amazing products for industry partners."

And while he has watched his students grow outside the classroom, he says he's grown as well.

"I've learned how I can be a better instructor inside and outside the classroom by sharing ideas and having discussions with the students," he shares. "That's definitely been beneficial for myself and the students I've worked with." **R&I**

COURSE-BASED RESEARCH BY THE NUMBERS

62	1,948	19	21	55
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS	PARTNERS

COURSE-BASED RESEARCH

PROJECTS SPOTLIGHT

Updating an Outdated Website

INDUSTRY PARTNER: Foyer Richelieu

PROGRAM: New Media Web Design

RESEARCH TEAM: Mark Hardwick (*Faculty*)

CHALLENGE: This industry partner had an outdated website, but did not have the expertise to do any updates themselves. As a not-for-profit charity that exists to help the French elderly in Welland, a website of professional quality will contribute to the image and credibility of their charity.

SOLUTION: The students redesigned and built a website that will help tell Foyer Richelieu's story, and remind readers why they are a cause worth supporting. Online communications now provide the opportunity to keep donors and the community informed.

Creating Innovative Recipes

INDUSTRY PARTNER: Dealer's Ingredients

PROGRAM: Culinary Innovation & Food Technology

RESEARCH TEAM: Dr. Amy Proulx (*Faculty*)

CHALLENGE: The industry partner challenged the students to create several innovative recipes using Profi Bake, a high-protein, plant-based composite.

SOLUTION: The students showed great creativity in all of the recipes they created using the award-winning Profi Bake. These recipes will be shared with leading food manufacturers to show them just how easy it is to make high-protein, great-tasting products like artisan breads, pancakes, fruit and nut bars, mocha morning muffins and more.

Organic Fertilizer Trial

INDUSTRY PARTNER: Gro-Bark

PROGRAM: Greenhouse Technician

RESEARCH TEAM: Mary Jane Clark (*Faculty*)

CHALLENGE: Trial different recipes and fertilizer regimes, laying the foundation for Gro-Bark to move forward with bringing a new product to market.

SOLUTION: Students performed and tracked all aspects of growing, analyzing how the herb crops grew. This resulted in identifying that the product was too nutrient-rich early on, which delayed success. Once this issue was identified, the students were able to grow successful crops. The measurements and observations were compiled and provided to Gro-Bark.

CO-ORDINATOR:
Elizabeth Best

Course-based 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.

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, video production, and graphic design. To do this, the team uses the most up-to-date programming languages, platforms and software packages.

PROJECT SPOTLIGHT

Improving the Design and Functionality of PTLevel's User Interface

INDUSTRY PARTNER: ParemTech

PROJECT TYPE: Computer Programming and Web Development

FUNDING: Federal Economic Development Agency for Southern Ontario ICP

RESEARCH TEAM: Dave Kendell (*Faculty*); Ryan Morris (*Research Associate*); David Lopez (*Research Assistant*)

CHALLENGE: ParemTech is the developer of the PTLevel device to measure the water level of cisterns. A customer dashboard reports water level and usage data to the owner. To develop the market for the PTLevel among water delivery companies, ParemTech desired additional functionality to the customer dashboard while also enabling PTLevel owners to share their device's readings with water delivery companies and property managers.

SOLUTION: A team of faculty, graduates, and students from the Computer Programmer Analyst program worked with ParemTech to improve the User Experience (UX), and add new functionality to the dashboard, enabling PTLevel owners to share readings with a water delivery company. For water delivery companies, the PTLevel dashboard now has the ability to manage their customers' devices and map delivery routes.

Website Redesign for Tour Company

INDUSTRY PARTNER: Niagara Craft Brewery Tours

PROJECT TYPE: Web Design & Development

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

RESEARCH TEAM: Mark Hardwick (*Faculty*); Chris Tollins and Ilia Shikov (*Research Assistants*)

CHALLENGE: Niagara Craft Brewery Tours is a small business offering tours of Niagara's small breweries. They had used a DIY platform to build their first website when the company first launched, but it quickly became dated, and was not user-friendly for the customer or the company. They approached the Niagara College team to develop a modern, responsive website.

SOLUTION: A faculty member and student from Niagara College's New Media Web Design program, along with a student from the Public Relations program, created content, designed custom WordPress themes, and built out new websites. Niagara Craft Brewery Tours will see increases in productivity as they switch from their out-dated legacy platform to the user-friendly WordPress platform.

Designing a Remote Sensing Application

INDUSTRY PARTNER: Pump Pro Shop

PROJECT TYPE: Web and Mobile App Development

FUNDING: FedDev ICP & Industry

RESEARCH TEAM: James Marks (*Faculty*), Amir Bukhari (*Research Associate*); Alex Davis (*Research Assistant*)

CHALLENGE: Pump Pro Shop is Ontario's largest aftermarket and surplus pump inventory supplier, providing high-quality pumps, parts and service to a wide range of industry partners in the oil, paper, steel, and water-based industries. To add to the products and service offered, they asked the team to collaborate on designing a remote sensing application for use with rotating pump equipment. This application will gather temperature and vibration readings from the pump, display them visually in a web-based application, and alert end-users to readings that are outside of expected ranges.

SOLUTION: The research team designed a prototype sensor unit using a commercially available microcomputer, accelerometers, and temperature sensors. The team built a database and web mobile applications to collect and analyze data from the pump and present it in an easy-to-read format to users. Alerts and notifications have been developed to notify users when the data is out of range.

Dave Kendell

Faculty
Academic/Liberal Studies & Media Studies

To paraphrase an old joke, if you Google 'philomath' it would be totally fitting that a photo of Dave Kendell would pop up as well. As part-time professor for the Academic/Liberal Studies & Media Studies departments and a life-long lover of knowledge, he's the epitome of what the 17th-century ancient Greeks foreshadowed.

Since earning a diploma as a Computer Programmer Analyst from Niagara College 13 years ago, he immediately started teaching a computer hardware course for the Continuing Education (CE) division here; and he hasn't stopped teaching – or learning.

"Since I returned to Niagara College, I can't recall the last time I didn't have a class on the go."

Aside from a Bachelor of History (Waterloo University) and his Computer Programmer Analyst diploma, Dave also holds six certificates of completion from the College's CE department, including a small engine mechanic. And he's currently researching data science, reviewing statistical math, learning Python programming and taking a course on starting a consulting business. Oh, and he's enrolled at Brock University to get his undergrad in Adult Education. Whew!

All this makes him well versed in the pleasures and pains of learning; and he brings that to his advisor role for the Research & Innovation division's Digital Media & Web Solutions stream, where he helps students with advice in computer programming, database and web design. Dave also helps the R&I division with student hiring, project advisement and planning.

He describes his most interesting project so far as working with ParemTech, a Wainfleet company that helps monitor well or cistern levels with PTLevel.

"PTLevel was one project where we worked with a sensor, and to get live feeds from the sensor, a large garbage pail filled with water was brought into the office," he explains, adding it proves research requires adaptation sometimes.

The students had the necessary skills for the project so he took more of a guiding role and walked them through the process of running a project and offered invaluable coaching for dealing with customers.

"My experiences with Research & Innovation have allowed me access to industry that I may never otherwise have had, so that I can modify classroom delivery to ensure our students are ready when they leave." **R&I**

DIGITAL MEDIA & WEB SOLUTIONS BY THE NUMBERS

16	9	4	7	16
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS	PARTNERS

Daniela Cortes

Research Assistant
Walker Advanced Manufacturing Innovation Centre

Mechanical engineering student Daniela Cortes sees the elegant science of engineering in everything around us – from the artistry of package design or the creativeness of configurable furniture to finding productivity-enhancing solutions for industry.

Along with her family's engineering background, the Research Assistant credits her time with Research & Innovation for discovering how truly diverse the field of engineering is. And in the midst of her studies, and as the only full-time female in her program, she's making every effort to engage other young women and girls to this world of opportunities.

"It can be intimidating from time to time and for this reason I started to become an advocate for recruiting more women in our technology program."

She sits as the WIT (Women in Technology) representative for the OACETT (Ontario Association of Certified Engineering Technicians and Technologists) Niagara chapter and is involved in and organizes community events promoting the importance of gender diversity in technology fields.

"Young women tend to look for role models to help them decide what career path to take," she says, pointing to the lack of female mentors in what remains a male-dominated profession.

"Also, perhaps it's not clear to young women at the elementary and high school level what the job of an engineer entails." Luckily for Daniela she has her own role models at home: both her sister and her father each graduated from the Mechanical Engineering Technology program at Niagara College and both have successful careers in the industry.

It was her family who advised her to enter the engineering field given her solid background in business, combined with her artistic pursuits. Daniela is a previous graduate of NC's Business: Sales & Marketing program and opened her own promotional/performing arts business; however she was looking for a more stable career, one where she could still apply some imagination and inventiveness.

She's now discovering a passion for industrial engineering thanks to her research projects that include conducting productivity assessments for local businesses. "You have to really do your research to find the most fitting solution for the industry partner," she says. "And that is where all the learning happens." **R&I**

WALKER ADVANCED MANUFACTURING INNOVATION CENTRE BY THE NUMBERS

17	14	4	13	17
PROJECTS	STUDENTS	PROGRAMS	RESEARCHERS	PARTNERS

WALKER ADVANCED MANUFACTURING INNOVATION CENTRE

PROJECTS SPOTLIGHT

Improving Productivity Through Automated Solution

INDUSTRY PARTNER: Airbus Helicopters Canada

PROJECT TYPE: Manufacturing and Productivity Improvement

FUNDING: OCE VIP, NSERC Engage, Niagara Region Voucher

RESEARCH TEAM: Rick Baldin (*Faculty*); Alex Goerz (*Research Assistant*)

CHALLENGE: Airbus Helicopters Canada, which provides manufacturing, marketing, selling, assembling, supporting and providing training solutions to Airbus rotary-wing aircrafts in Canada, was seeking guidance to improve the productivity of a trimming and drilling workstation. Antiquated manufacturing methods, and errors in the trimming and drilling workstation, hampered its ability to win bids against competing Airbus plants and external suppliers.

SOLUTION: The team recommended the purchase of a customized automated machine from a local vendor to assist in composite materials cutting and drilling. Employees on the new machine will improve their technical skills, reduce work cell specific hours by more than 80%, and reduce scrappage rates by nearly 90%. Data was used to study ideal trimming and drilling times, and create more accurate standard operating procedures. It also led to more competitive and accurate quotes.

Strengthening Design and Functionality

INDUSTRY PARTNER: ParemTech

PROJECT TYPE: Mechanical Engineering Design and Improvement

FUNDING: Federal Economic Development Agency for Southern Ontario ICP, Niagara Region Voucher

RESEARCH TEAM: Allan Spence (*Research Lead*), Nathan Landry (*Research Assistant*)

CHALLENGE: ParemTech develops Internet of Things (IoT) devices and accompanying software/firmware for niche embedded applications, including a water level monitor named PTLevel. PTLevel measures the water level of cisterns, sumps, and similar enclosures holding liquids. ParemTech came to Niagara College to develop several prototypes to improve the manufacturing process for the pressure hose entry into the cistern/sump and the submerged weight and riser tube.

SOLUTION: The applied research team designed an updated PTLevel 2.0 enclosure, submerged weight and respective connection point. The original manufacturing process for the product was updated by introducing cost-effective manufacturing techniques such as 3D printing, vacuum forming, and X-Y laser cutters.

The Heartnut, a Hard Nut to Crack

INDUSTRY PARTNER: Grimo Nut Nursery

PROJECT TYPE: Mechanical Engineering Design and Improvement

FUNDING: Federal Economic Development Agency for Southern Ontario ICP, Niagara Region Voucher

RESEARCH TEAM: Gordon Maretzki (*Research Lead*); Brian Cunningham, Jacob Morris, Nathan Landry (*Research Assistants*)

CHALLENGE: Grimo Nut Nursery's heartnut caters to confectionery consumers and health-conscious individuals, for its attractive shape, mild subtle flavour and heart-healthy properties, but the nuts are cracked by hand using a hammer and brick, in a precise, time-consuming process. To keep up with consumer demand, a new semi-automated solution to crack these products is needed.

SOLUTION: A proof-of-concept machine was developed by a team comprised of Mechanical and Electrical Engineering Technologist research assistants that utilizes pneumatics for quick feeding and positioning of the heartnut, a programmable logic control (PLC) system to control and fine tune all of the operations on this machine, and a proprietary nut-cracking chamber.

PROJECT MANAGER:
Gordon Koslowski

Niagara College's Walker Advanced Manufacturing Innovation Centre team specializes in engineering design, 3D technologies, lean manufacturing processes and additive manufacturing. We work with Southern Ontario businesses to bring ideas to life, from concept through to developing working prototypes – from quick turn-around services to full-scale projects – utilizing leading-edge technology, including equipment and software.

Research & Innovation

2016-17 BY THE NUMBERS

131 PROJECTS

1,993 STUDENTS

31 PROGRAMS

63 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, key industry sectors 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

WAYS COMPANIES ACCESS RESEARCH & INNOVATION

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:

184 COMPANIES → **118** APPLIED RESEARCH

184 COMPANIES → **66** TECHNICAL SERVICES

TECHNICAL SERVICES

2014-15 44 services

2015-16 77 services

2016-17 98 services

↑27%

RESEARCH FUNDERS

Federal Economic Development Agency for Southern Ontario
Agence fédérale de développement économique pour le Sud de l'Ontario

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

Niagara College Canada
APPLIED DREAMS.

Niagara Region

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

NSERC CRSNG

Ontario

Ontario Centres of Excellence

FUNDING FOR RESEARCH

Where the funding comes from...

$6,467,225*

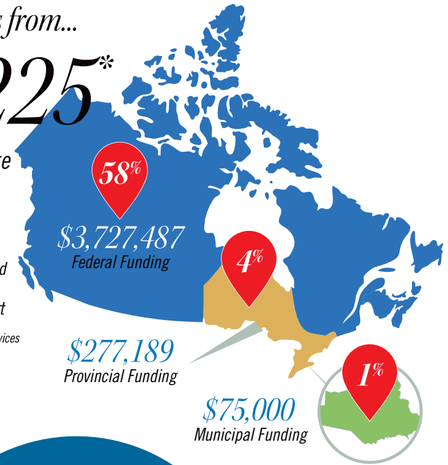
Total funding for Niagara College Research & Innovation 2016-17

5% $312,747* Industry Cash

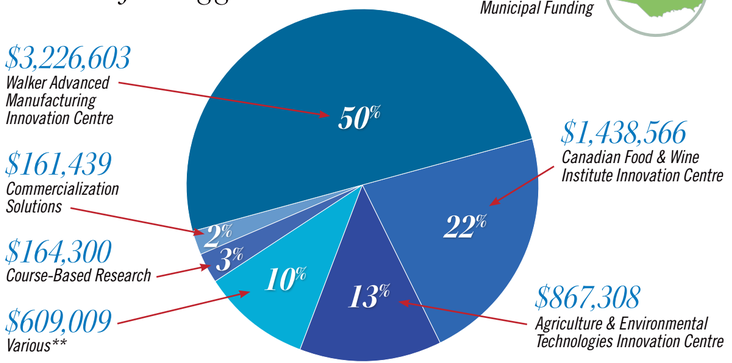
17% $1,070,642 Industry In-Kind

15% $1,004,161 College Support

*This figure includes Industry & College Cash for Technical Services



Where the funding goes...



**This figure includes business development funds and college contributions

THERE'S MORE TO THE STORY

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

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Niagara College Research & Innovation

ON THE FRONT COVER

Gordon Maretzki, Research Lead, and Brian Cunningham, Research Assistant and student, Electrical Engineering Technology program, work on a prototype for an industry partner, in the Walker Advanced Manufacturing Innovation Centre. The prototype is a proof-of-concept for automating the tricky task of shelling heartnuts.

ON THE BACK COVER

The Research & Innovation administration team is complemented year-round by students (Research Assistants); graduates (Research Associates); Niagara College Faculty Research Leads; and Research Leads from various fields of expertise, who all contribute to the multitude of projects conducted each year to provide solutions for industry.

CANADA'S TOP 50 RESEARCH COLLEGES

For the second year in a row, Niagara College has earned the honour of being in the top 10 in the country for research funding, according to Research Infosource Inc.'s 2016 study.

CANADA'S TOP 50 RESEARCH COLLEGES

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

SOLUTIONS FOR INDUSTRY

2016 • 17

Agriculture & Environmental Technologies Innovation Centre

Business & Commercialization Solutions

Canadian Food & Wine Institute Innovation Centre

Digital Media & Web Solutions

Walker Advanced Manufacturing Innovation Centre

nc Research & Innovation

FOR APPLIED RESEARCH PARTNERSHIP OPPORTUNITIES CONTACT US AT:

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