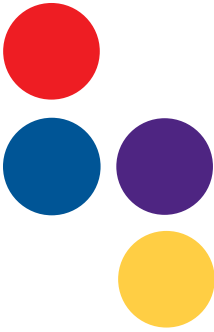


# Partnering for a Better Future for Advanced Manufacturing

**Ontario  
Universities  
Policy  
Discussion  
Series**

Partnering  
to deliver  
solutions for  
today, and  
tomorrow

 **ONTARIO'S  
UNIVERSITIES**  
Partnering for a better future



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# Introduction

Ontario workers and families depend on a strong and competitive manufacturing sector to drive economic prosperity.

This sector is the economic pulse for many communities across the province, with more than two million Ontarians directly and indirectly contributing to the building of materials and products – from Southwestern Ontario to the North, East and everywhere in between.

Today, the manufacturing industry is transforming worldwide. New technologies are rapidly changing the way companies operate. They are also changing the types of skills workers will need to use them. Technologies such as artificial intelligence, 3-D printing and cloud computing are leading us into a fourth industrial revolution.

In this period of transformation, Ontario's universities are innovating these cutting-edge technologies, and are partnering with industry and communities to help make Ontario a front runner in advanced manufacturing.

The province sits at a window of opportunity – uniquely positioned to combine its strengths in manufacturing and technology, and become a global leader in advanced manufacturing.

Ontario's manufacturing sector makes up 12% of the province's GDP and 80% of its exports



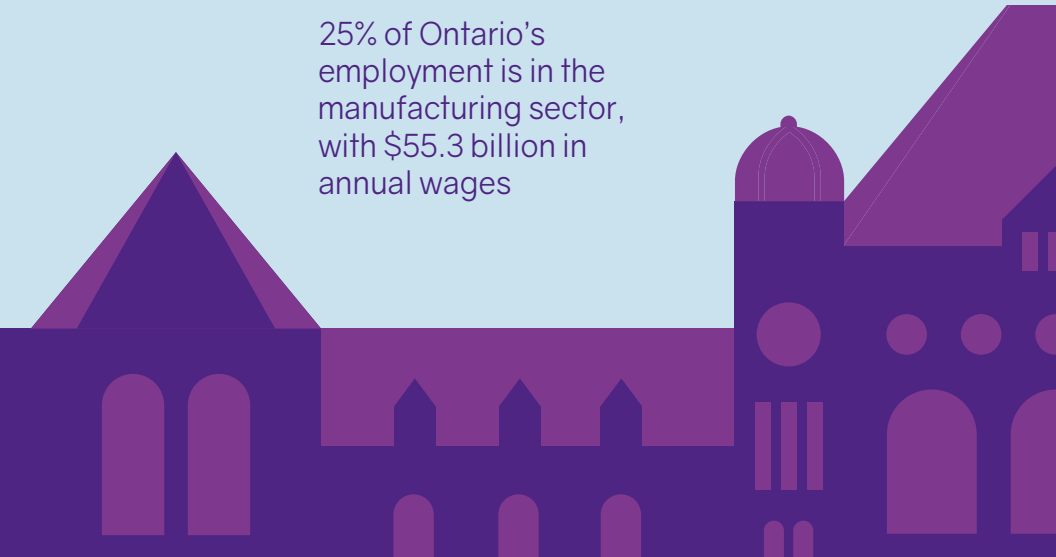
The industry is entering a new, innovation-driven era that will play to Ontario's strengths, as a hub for next-generation technologies and with a workforce that is positioned to keep the province competitive and attract investment.

Ontario's universities are working with employers to further develop this workforce, ensuring workers have the skills they need to create and adapt new technologies and succeed in the future of advanced manufacturing.

Many Ontarians worry about the disruptive effects of these technologies and the closure of traditional manufacturing plants. Universities are committed to helping provide workers, at any point in their career, with opportunities to adapt their skillset for the changing industry.

But there is no one-size-fits-all approach for success. Universities are partnering with Ontario manufacturers to address their specific and unique challenges, discovering and commercializing the innovative solutions they – and the sector – require.

25% of Ontario's  
employment is in the  
manufacturing sector,  
with \$55.3 billion in  
annual wages



Advanced manufacturing – the development of innovative technologies to create new products, enhance processes and establish more efficient ways of working – needs bold, new and transformative ideas.

This booklet features some of the ways Ontario's universities are building on the province's strong manufacturing base and clusters of technology companies, while ensuring students have the skills, knowledge and experience they need to thrive in Ontario's ever-evolving manufacturing sector.

Together, government, industry and universities can create a competitive business climate within the province's manufacturing sector that enables companies and manufacturers to continue to grow, thrive and invest in Ontario.

Over the next 10 years, more than 13,500 jobs are expected to be created in advanced manufacturing in Ontario – many of which will come from start-ups



# Training and Upskilling the Talent to Drive Advanced Manufacturing in Ontario

A competitive manufacturing sector requires the next generation of workers to have the skills and knowledge to be able to create, adopt and adapt to cutting-edge technologies, such as sensors, nanotechnology, 3-D printing and artificial intelligence.

Ontario is already attracting investment from global companies like Amazon, Bombardier and IBM because of the strong talent and skilled graduates coming out of Ontario's universities.

Universities are working with employers to create new ways of preparing students for the jobs of today and of the future, and are helping current workers update their skills in order to thrive in a changing labour market.

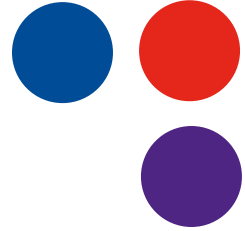
They are developing the technical and creative skills of Ontario's students, and increasing support for industry-led training and skills-development initiatives.

These partnerships with employers are helping ensure Ontario has the skilled manufacturing workforce it needs to drive prosperity and help build the province's competitive edge.

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A growing number of Ontario manufacturers will need workers with a changing skillset, including systems thinking, problem solving and creativity, as well as a greater ability to work with and manage the technologies that Ontario's cutting edge companies will deploy.



## Developing Skills through Work-Integrated Learning

Technical, artistic, creative and problem-solving skills are necessary for a career in manufacturing, whether in creating smaller items like graphic overlays or bigger things like automobile and aircraft parts. That's why training and education are key to attracting new workers.

Ontario university students are gaining these important skills through access to a variety of work-integrated learning opportunities in advanced manufacturing – from working directly with local companies to gain experience and help develop new products and technologies outside of the classroom, to courses in industrial design or technology management within the classroom. Below are examples of how Ontario university students are gaining work-integrated learning experience.

## Improving air safety through hands-on learning

When it comes to air safety, retrieving a downed aircraft's black box is critical to better understanding the cause of an airliner crash in order to create new technologies that will help prevent the same accidents from happening again. Two undergraduate co-op students from Carleton University recently helped Ottawa-based DRS Technologies Canada, an electric manufacturing company, develop a specialized automatic deployable flight recorder system, which improves the rate of recovery of aircraft black boxes. The students helped develop the flight recorder's ground support equipment that connects to the recorder to retrieve its flight data.



## Developing the workforce for Hamilton's manufacturing sector

McMaster University is providing many opportunities for its students to participate in all levels of manufacturing – from research and development to distribution, logistics and policy development. Each year, the university places more than 800 students within Hamilton's advanced manufacturing cluster, and offers key programs to ensure students receive the skills they need to help them secure jobs in the sector. Some examples of these programs include Canada's only Industry PhD program, a Bachelor of Technology in Automotive and Process Automation streams and Engineering/Technology Entrepreneurship and Innovation courses.







## Helping manufacturing workers upgrade their skills

The Continuous Studies office at Ontario Tech University offers short programs that allow manufacturing workers to adapt their skills while working. The focus of these courses is on the transferability of specific skills gained in project work in a particular industry to project management skills that could be transferred to another sector or a different job within the same sector. The university is also in the process of developing short Master's Certificates designed to assist managers to move from one sector to another, as well as a program that allows workers from the automotive and broader manufacturing sector to use their experience and knowledge to transition into a new industry.

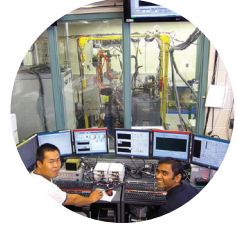
## Using hands-on learning to develop a more efficient drone

Traditionally, fixed-wing drones are optimized to fly long distances, but they require a long runway or launch rail to take off and land. By contrast, multi-rotor drones can perform vertical take-off and landings, but are less efficient for long-distance flying and have a shorter battery life. A work-integrated learning opportunity at the University of Toronto led one undergraduate student on the path to developing a new hybrid. Starting out as a co-op student at The Sky Guys, a local drone company, he is now the firm's chief technology officer, working on designing a long-range drone that combines the best features of fixed-wing and multi-rotor drones, and is capable of vertical takeoffs and landings, creating a more efficient product.



## Helping create jobs and find solutions at Ford Canada

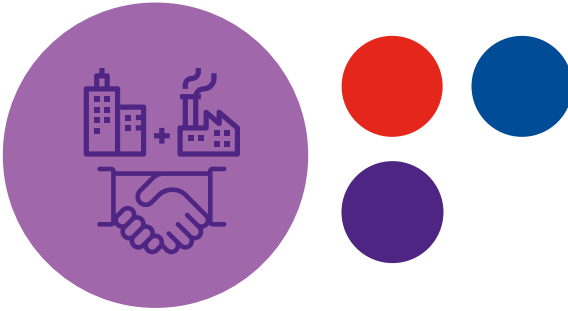
Ontario-based jobs at Ford Canada have increased as a result of a collaboration with the University of Windsor's Clean Combustion Engine Laboratory (CCEL). The university and Ford Canada are working together to train the next generation of graduates to work in the automotive sector and find solutions to important challenges in the automotive industry. But the learning and development doesn't end there, Ford Canada employs numerous university graduates, many begin their work straight after graduation.



## Reskilling employees to better use technological advances

Advanced technologies are driving disruptive innovation. Now more than ever, business leaders are required to respond and capitalize on these disruptive forces by developing their digital literacy, innovation management and design thinking skills. Students at Wilfrid Laurier University are developing these skills through the first program of its kind in Canada. One that is focused on the management of innovation and technology with fully integrated, hands-on learning experiences that combine the latest research with real-world practice. The Executive Master's in Technology Management program is an 11-month Master's of Science degree that incorporates a week-long residency at UC Berkeley and Stanford University into a constantly-updating curriculum. This program is designed to provide reskilling and upskilling opportunities for working executives who want to harness technological advances within their industry.





## Fostering Entrepreneurship in University Students

Encouraging a culture of entrepreneurship is key for economic growth and development across multiple sectors – and advanced manufacturing is no exception.

A fast-changing sector needs rapid adopters to use the innovative solutions being produced to create new companies and jobs.

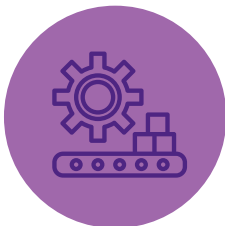
Encouraging students to become entrepreneurs and experiment with new technologies will help the province take advantage of the new wave of innovation.

Ontario's universities are cultivating the next generation of entrepreneurs through a broad range of opportunities for students. Universities are helping to develop the creativity and problem-solving skills that will prepare students and future entrepreneurs for a career in advanced manufacturing where they will need to create, adapt and adopt new technologies and products. The following lists examples of how Ontario universities are fostering entrepreneurship among students.



### Helping students develop new products through industrial design

From furniture to mobile apps, the Industrial Design program at OCAD University trains students to develop new products and technologies that we can use in our daily lives. Through a mixture of in-class instruction and work-integrated learning opportunities, undergraduate students learn about research, concept development and the creation of prototypes. Graduates of the program often find careers in home and retail furniture design, emerging technologies and systems and service design.



### Merging entrepreneurship with manufacturing training

Through the Centre for Entrepreneurship and Engineering Design (CEED) at the University of Ottawa, students are finding support and mentorship through the various stages of their entrepreneurial journey – from identifying the problem they want to solve to creating a client-centred approach, and building and scaling their start-up. CEED merges entrepreneurial skills development, prototype design and manufacturing and innovation training for undergraduate students. For example, a student team recently used advanced technologies to develop a renewable phosphorous fertilizer from municipal wastewater.

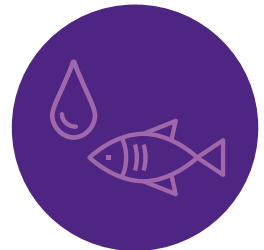


### Improving safety and efficiency in geological mapping

A joint venture between two Queen's University researchers and three undergraduate students led to the commercialization of a technology that is now being used to improve the safety and efficiency of geological mapping in the mining, civil engineering and exploration industries. RockMass Technologies uses a new 3-D geological mapping technology and was formed through the Queen's Innovation Connector Summer Initiative (QICSI), a 17-week paid summer internship that helps students start their own businesses and receive seed funding.

### Finding alternative sources for a scarce resource

A student-created start-up at Trent University is finding an alternative source for omega oils – typically extracted from fish, a depleting resource. It is one of the many initiatives of Noblegen Inc., which uses microorganisms to produce all-natural food and beverage ingredients as well as health supplements. The fast-expanding biotechnology company is exceeding growth expectations with 60 employees, 21 of them are Trent graduates. Noblegen also partners with local business, such as, Peterborough Community Futures Development Corporation, Cambium Consulting & Engineering and Champlain Animal Hospital to help the local community and contribute to advances in the biotech industry.



# Building Strong Communities

## The Local Impact of Ontario's Universities in Advanced Manufacturing

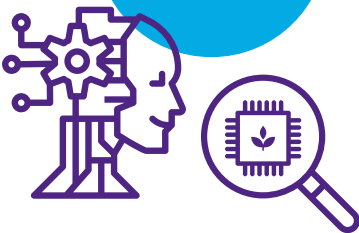
Many communities and regions across Ontario are impacted by the province's manufacturing sector. Ontario's universities are partnering with companies, non-profits and government to drive economic development in these regions and make sure they remain competitive in the sector.



**700,000+**

direct jobs in manufacturing in Ontario, with more than 1.5 million indirect jobs

All Ontario universities



have labs, centres or institutes dedicated to advancing innovation in manufacturing and working with industry partners to accelerate the sector in many industries, such as bio-manufacturing, nanotechnology, artificial intelligence and 3-D printing.

**\$115 billion+**

is the economic impact of Ontario's universities per year, with spending activities related to universities accounting for **\$42 billion+** and the creation of **470,000+** jobs

Ontario's Advanced Manufacturing Consortium makes it easier for businesses to access technical expertise, product prototyping and 10 major facilities with cutting-edge equipment, boosting productivity in Southwestern Ontario. The consortium is an efficient partnership that shares resources between McMaster University, the University of Waterloo and Western University and advances the innovation capacity for the manufacturing sector.

**12%**  
of Ontario's GDP is made up of manufacturing



**4** major employers in aerospace (Bombardier, Pratt & Whitney Canada, Honeywell and Safran) are investing in a collaboration between Ryerson University, the University of Toronto, York University and local colleges to transform Toronto's Downsview Park into an aerospace hub, advance the industry and train the next generation of aerospace workers.



Researchers in Ontario's Northern communities have found a way to

make the forestry industry more efficient. They've developed a mapping system that identifies wood quality before trees are harvested. This is just one example of how researchers at Algoma University, Lakehead University, Laurentian University and Nipissing University are driving their regional economies in forestry, mining and steel.

Brock University and McMaster University are helping to drive the regional economy in bio-manufacturing, food and beverage and transportation, such as, working with local producers in the grape and wine industry to contribute more than \$91-million and the equivalent of 307 jobs to Ontario's economy in 2014-15.



**14%**  
of Niagara's regional GDP is made up of manufacturing

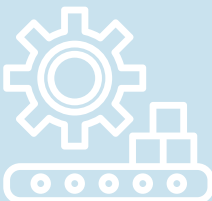
Along the Toronto-Waterloo Region Corridor, OCAD University, the University of Toronto and the University of Waterloo are finding innovative ways to improve urban transportation through advanced technologies and partnerships with IBM and Esri Canada.

**300+**

leading programs in advanced manufacturing, materials and STEM are offered by Carleton University, University of Ottawa, Queen's University, Trent University and other postsecondary institutions in Eastern Ontario.

**2.4%**

of Ontario's GDP is made up of the automotive sector. Working with employers such as GM to reskill workers, creating jobs for Ford Canada, examining supply chain management processes and creating plans to boost competitiveness in the sector are just a few examples of how the University of Guelph, Ontario Tech University, University of Windsor and Wilfrid Laurier University are boosting productivity in the automotive sector.



Ontario's universities are adding to the talent pool in Ontario, graduating the next generation of manufacturing workers to work in the province's regions, and partnering with local businesses and big industry to find solutions, create jobs and drive dynamic regional economies.

# Driving Innovation through Industry Partnerships

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The future of advanced manufacturing in Ontario relies on strong partnerships and linkages between industry, universities and the public sector. Ontario's universities are partnering with hundreds of manufacturers across the province in order to boost productivity and economic development, find efficiencies and stay on the cutting edge of manufacturing.

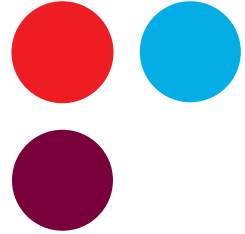
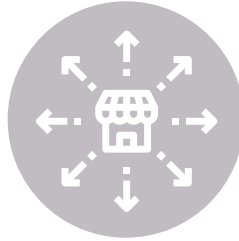
Researchers on university campuses across Ontario are working with industry to develop and commercialize the technologies and products that will help small and large businesses remain competitive.

These innovations include using new technologies such as nanotechnology, artificial intelligence and 3-D printing to find efficiencies in processes, control systems, and supply chain management.

University campuses also provide collaborative spaces where industrial partners can access university equipment and infrastructure to test ideas and turn them into products and services, creating new technologies that will enrich the lives of Ontarians and drive regional economic development.







## Partnering with Local Businesses

Ontario's universities are helping drive social and regional economic development in communities across Ontario by partnering with local companies to find solutions to the unique challenges they face. These solutions are helping businesses boost productivity, reduce costs and add new work shifts for employees. Below are examples of how Ontario universities are partnering with local businesses.



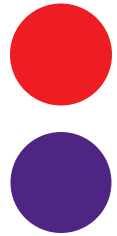
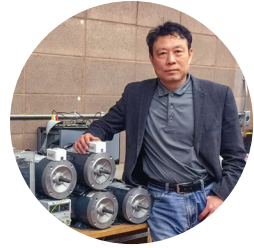
### Boosting productivity for local companies

Brock University researchers are helping a Guelph-based company refine critical steps in its manufacturing process. CSL Silicones Inc. makes products that protect buildings and equipment from environmental damage, and is working with the university to improve production of its silicone polymers. These polymers are used to manufacture products that insulate high-voltage insulators. By improving the production process and reducing damage to the finished silicone polymer, the company is able to save significant operational costs.



## Improving production quality

Traditional machinery maintenance periodically shuts down machines for routine inspection. But, if the machine doesn't have any faults, the unnecessary downtime can add significant costs to the operation of the equipment. Researchers at Lakehead University, in collaboration with Mahon Electric Inc., have developed new technologies and tools for machine maintenance and real-time monitoring. For example, smart sensor networks have been developed to collect signals from various machine units; new signal processing techniques have been proposed to detect defects in different machinery components; and intelligent classifiers have been developed for online machinery health condition monitoring. These technologies have been effectively applied to motor condition monitoring and have improved production quality while reducing maintenance costs.



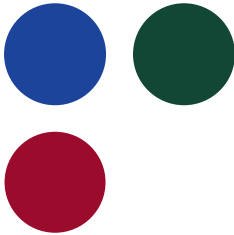
## Helping local businesses boost productivity and save money

In the world of advanced manufacturing, there's a lot riding on parts that are often no bigger than a matchbook. That's why the research team at the McMaster Manufacturing Research Institute (MMRI) focuses their research on the study of friction to better understand the physics behind the wear and tear in industrial machining. They work closely with local companies and use these findings to help businesses create more efficient processes and design tools that last longer and perform better. For example, the MMRI helped Burlington-based vRSC become the largest worldwide supplier of side-curtain airbag inflator bottles — the 30-cm long cylinder that's filled with compressed gas and rests inside a vehicle's airbag. Working with MMRI, vRSC was able to improve the performance of its \$50 carbide drills, from drilling 500 holes to 10,000 holes in the same amount of time.



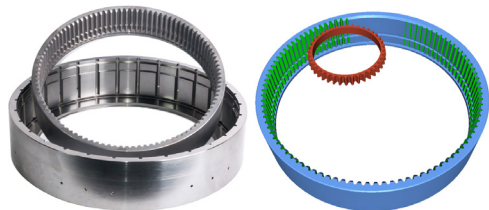
## Lowering fuel consumption with new materials

Ryerson University researchers are finding new ways to ensure automotive parts, such as engine blocks and cylinder heads, last longer and endure fewer repairs. Through a partnership with Windsor-based manufacturer Nematik, the team is improving the production of these parts by developing aluminum and magnesium alloy components. Not only are these components lighter than the traditionally used steel, they are also stronger and perform better at high temperatures, improving performance and efficiency. Lighter components mean lighter vehicles, lowering fuel consumption and emissions and contributing to sustainable transportation.



## Optimizing high-quality gears

High-quality gears are critical to a variety of industries. But, established gear manufacturing procedures rely on expensive and time-consuming trial and error methods, which can result in material waste and reduced productivity. University of Waterloo researchers collaborated with Ontario Drive & Gear (ODG) – a leader in gear manufacturing – to develop virtual machining software that models complex gear shaping to optimize design and production. Researchers deployed the software and trained staff at ODG's New Hamburg facility. ODG reported up to 24 per cent improvement in high-volume production for major Canadian customers. This efficiency led to business growth, new customer relationships and the creation of a new shift.



## Advancing Industry through Research

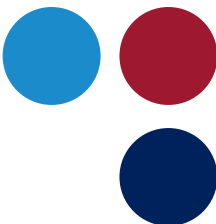
Collaborations between universities and industry have led to industry-wide solutions for a variety of sectors within advanced manufacturing, such as, mining, automotive and energy.

These partnerships are bringing together researchers and leaders from different industries to commercialize ideas and discoveries into products that are driving industry success, such as more precise measurement tools and lighter materials to increase efficiency. The following lists examples of how Ontario universities are partnering with industry.



### Improving food safety through new technologies

University of Guelph researchers are increasing food safety by developing better early warning signs, improving food accessibility and sustainability through new predictive technologies. These technologies allow them to more accurately assess food attributes in real-time, enabling them to decrease food waste and optimize food distribution and enhance the nutritional value of food. From agri-science innovations that improve sustainability and productivity of food production to engineering innovations that get computers to “think” like humans and solve the most difficult challenges facing the world today, the University of Guelph is committed to advanced manufacturing research and mobilizing knowledge into action.



## Keeping workers safe in mining

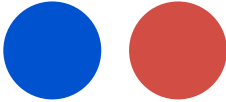
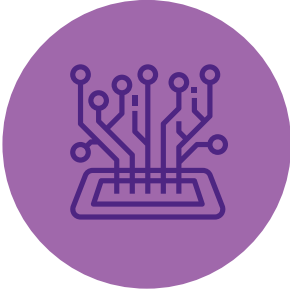
A partnership between Laurentian University researchers and local industry partner Rock-Tech is helping keep workers in the mining industry safe, while improving efficiency. The team has developed a semi-automated rock-breaker system to break ore in order for it to be transported for processing. The rockbreaker moves underground in a time-efficient manner to the locations of ore to be broken as specified by an operator located above ground. This process minimizes time, reduces costs and increases safety.



## Helping Northern farmers grow better crops

Nipissing University researchers have used advanced technologies to create an online system that helps farmers in Northern Ontario make more informed choices about how weather conditions might affect crops. GeoVisage is a remote, online support software that uses sensors to provide real-time, localized data about field conditions to farmers. The system incorporates real-time and historical data from seven weather stations about air and soil temperature, relative humidity, wind speed, leaf wetness and other important metrics for farm scale decision making. It also supplies soil maps, yield maps and field imagery.





### **Creating a new generation of electronics**

Conventional electronics rely on silicon chips. But many other substances, including inks and dyes, can conduct electricity, making them candidates for a new generation of flexible, printable electronics. University of Ottawa researchers are customizing molecules to optimize their electronic properties, then using those molecules in prototype devices, including lights, bendable solar panels and sensors that can be woven into the fabric of clothing.

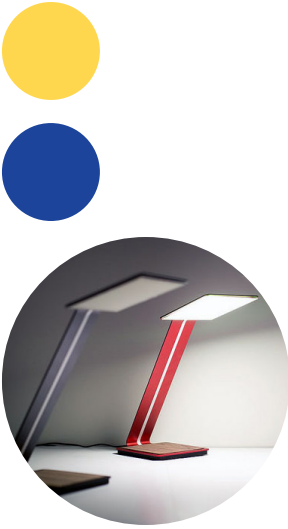
### **Improving precision in welding**

Welding is an important manufacturing process across many sectors – from automotive to aerospace, medical and consumer goods. When working on products like cars or pacemakers, it's important that every component is built as intended. It can be a challenge when spending an extra second per part makes all the difference to the bottom line. Queen's University researchers developed a technology, called inline coherent imaging (ICI), that better measures depth penetration in laser welding. Using a near-infrared beam, this tool saves valuable time by allowing welders to measure accuracy in real time. The technology has now been commercialized under Laser Depth Dynamics.



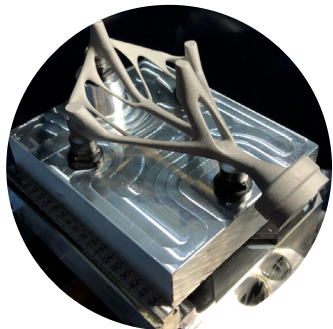
## Flipping the switch on energy efficiency

Smart sustainable lighting is one of the easiest ways to combat rising energy costs and increasing energy demand. Through collaborative research and development, researchers at the University of Toronto are helping Canadian manufacturers create better lighting products for various industries, including automotive, architectural, medical and mining. They are developing next-generation devices, such as flexible screens and lights that are harder to break and smart power supplies for LED lighting. Their research is being commercialized into companies such as OTI Lumionics, Lumentra Inc. and Nanoleaf, which are developing efficient thermal management methods for LED lighting and manufacturing energy efficient, cost-effective LED bulbs.



## Refining 3-D printing

3-D printing, or additive manufacturing, is creating new opportunities for the production of low-cost, lightweight and complex shapes with faster production times. A joint project between the University of Waterloo's Multi-Scale Additive Manufacturing (MSAM) lab, Intellijoint Surgical, an Ontario-based company, and Renishaw, a global manufacturer, has designed and used 3-D printing to create a new tool for hip replacement surgery that can be used during the procedure. They are looking at ways to integrate traditional machining into 3-D printing methods in order to improve the precision of 3-D printed products.



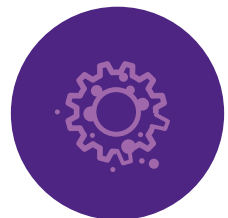


### **Increasing access to medical resources**

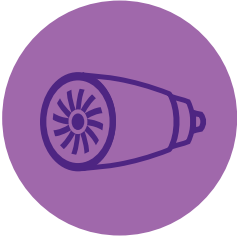
In rural and remote or underserved communities where resources are limited, a stethoscope could mean the difference between life and death. A team of researchers from Western University have developed a clinically validated template for a 3-D printed stethoscope, which can be used in areas with limited access to medical supplies. The first of its kind, the stethoscope was made using free open source software to keep costs low and allow others to easily access the code. Using the template, the device can be made in less than three hours and costs less than \$3 to produce. In addition, the same acoustic quality as the best stethoscopes on the market. The stethoscope is currently in clinical use by physicians and allied health professionals in Gaza and is also in clinical trials at the London Health Sciences Centre in London, Ontario.

### **Tackling rust through newly commercialized technology**

University of Windsor researchers have discovered a way to prolong the life of equipment and delay the onset of rust. Through a partnership with local ultrasonic imaging manufacturer, Tessonics Inc., researchers have developed a new way of applying powder coatings that cleans, coats and works metal in a single operation. The technology has been commercialized and is now on the market for use in a variety of industries, from utility companies and pipeline repair companies to automotive parts manufacturers and shipbuilding and aerospace industries.







### Creating lighter gas turbines

York University researchers partnered with Pratt & Whitney Canada to help them develop a revolutionary technology that changes the composition of a gas turbine from a metal coating to a nano-coating – a much lighter product that significantly reduces production times. This patented technology was innovated and developed for United Technologies, but can be applied to other engine components and applications.

## Sharing Infrastructure and Equipment for Industry Success

Shared spaces on university campuses are providing businesses with access to talent, equipment and infrastructure to test their products and designs. These opportunities are helping them bring their ideas to market – opportunities the businesses might not otherwise afford. Below are examples of how Ontario universities are sharing infrastructure with industry and local businesses.

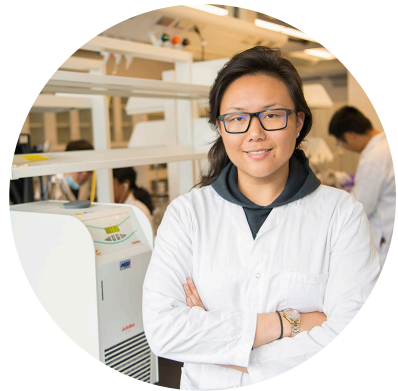
### Becoming a catalyst for community innovation

Algoma University's bioscience and technology building, known as the Convergence Centre, opens its space to local manufacturing businesses, such as Lallemand (formerly BioForest Technologies) and Algoma Power, to discuss their current business needs and help find solutions. In the centre, students, faculty and researchers manage projects and have conversations with industry on how the university can best serve the community through targeted research. A recent collaboration with natural resource firm R&B Cormier allowed the company to conduct high-end remote-sensing work for a forest measuring project with the Wikwemikong Unceded Indian Reserve.



## Attracting investment through campus spaces

Through its network, the University of Toronto has become a hub for advanced materials and manufacturing research, attracting more than \$300 million in funding over the last three years that is helping industry boost productivity, save money and reduce environmental impact. For example, the Centre for Research and Applications in Fluidic Technologies will bolster Canada's medical devices and manufacturing industries. The university's centres, institutes and start-up spaces provide collaborative meeting grounds where industry partners can access researchers and infrastructure to turn great ideas into better products. These spaces include the Toronto Institute of Advanced Manufacturing, the Institute for Robotics and Mechatronics, and the Electric Vehicle Research Institute, and UTSC's The Hub where bioplastics manufacturing company Genecis began.



All of Ontario's universities have centres, institutes and labs dedicated to developing new technologies, finding innovative solutions and driving economic prosperity in advanced manufacturing.



## Helping industry bring products to market readiness

The Automotive Centre of Excellence (ACE) research and testing facility at Ontario Tech University is used to test automotive and aerospace products in extreme weather conditions. It provides space for key players in these industries to bring their ideas to market readiness. The facility includes one of the largest and most sophisticated climatic wind tunnels in the world – wind speeds can reach 300km/hr with temperatures that range from -40 to +60°C. Beyond the automotive and aerospace industries, ACE also provides support for other areas, such as in textile manufacturing. Recently, a Colorado-based athletic wear company used the Climatic Wind Tunnel to test new garments.



## Providing cross-sector collaborative spaces

Through its various partnerships with industry, Western University supported more than 300 advanced manufacturers across Ontario in a number of process and product development initiatives in 2018 alone. In particular, the university's partnership with the Fraunhofer Society of Germany has resulted in the Fraunhofer Project Centre (FPC) for Lightweight Materials on Western's campus. The centre supports six automotive original equipment manufacturers, 20 Tier 1 and Tier 2 auto suppliers, as well as many other companies in the automotive, building products, defence, transportation and consumer sectors. The centre develops, tests and characterizes new lightweight materials and advanced manufacturing processes at industrial scale. By combining Fraunhofer's latest global technologies and Western's strengths in materials engineering, the FPC meets the needs of its industry partners.



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