

STRATEGIC RESEARCH PLAN

2013–2020

HAVING AN

IMPACT

RESEARCH FOR TODAY AND TOMORROW

Innovation in Research, Scholarship and Education
Strategic Research Plan 2013-2020

IMPACT

The University of Ontario Institute of Technology (UOIT) is forging ahead, solidifying its reputation for research excellence by seeking answers to big questions. The technology-driven scholarship and innovations of our faculty and student researchers continue to be recognized for their local and national impact as we solve current problems and work to mitigate future complications. We seek to foster the ideas generated by our outstanding faculty and students, conducting research that leads to transformative cultural, economic and scientific changes worldwide.

We integrate research, innovation and entrepreneurship with education and professional collaboration. This synthesized approach enables well-rounded academics to solve today's grand challenges and inspire the next generation of researchers to do the same.

Our strategic research plan **Innovation in Research, Scholarship and Education 2013–2020** delineates the path by which we will reach our goal to be ranked among the:

- Top 50 science and technology universities in the world.
- Times Higher Education top 100 under 50 universities.
- Top 35 research-intensive universities in Canada.

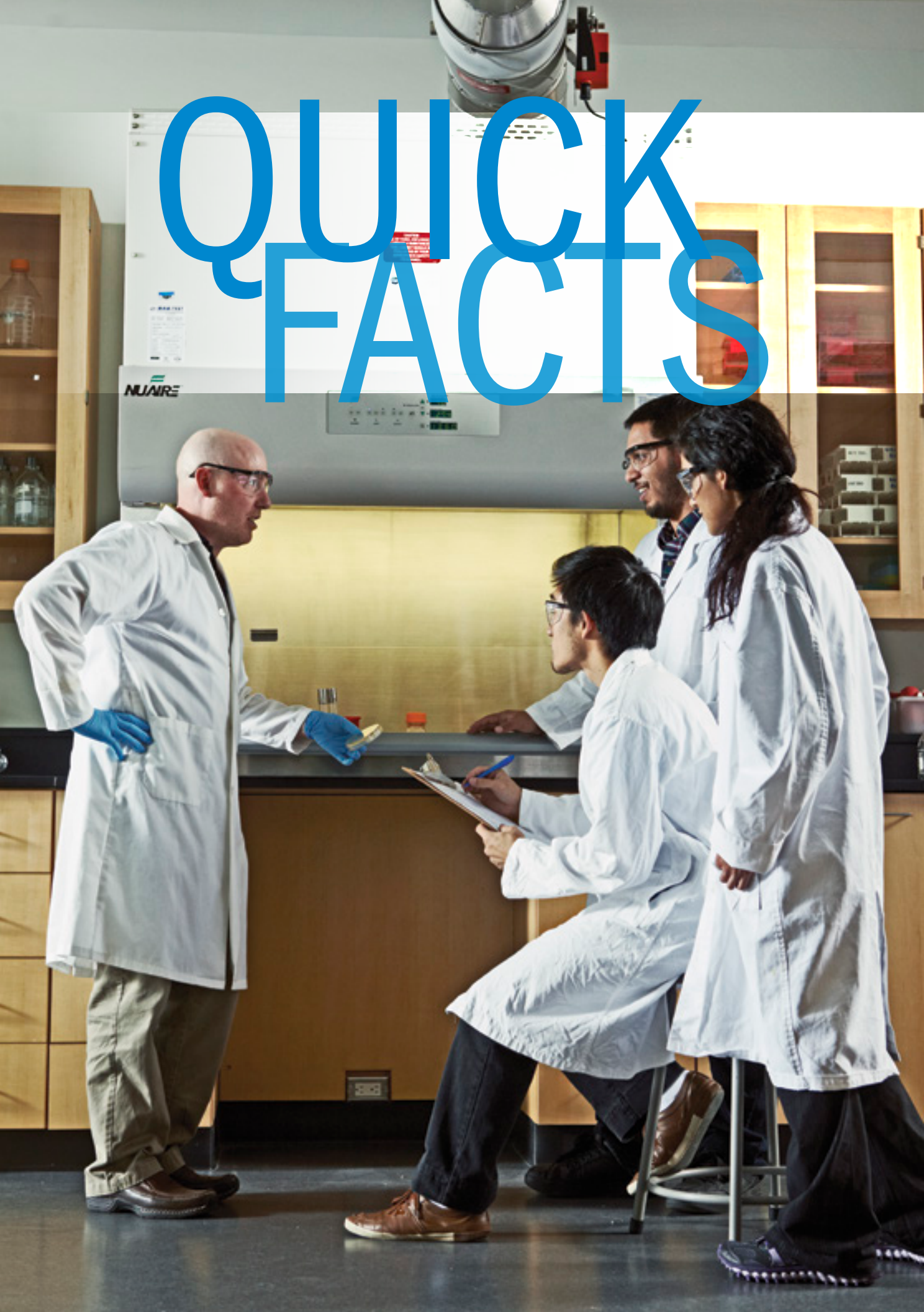
Improving our competitiveness among Canadian and international research universities requires us to ardently support faculty in their research programs across all disciplines, as well as to increase our research capacity in targeted fields. We are confident with this strategic direction; bolstered by government, industry and philanthropic backing, the university will reach its target of becoming an internationally recognized research-intensive institution by 2020.

Our work is just beginning. These pages provide a glimpse at the transformative research taking place here, while setting the stage for future accomplishments. Discover the impact we are making and learn how you can support our researchers as they constructively contribute to our communities, our nation and our world.

We look forward to working with you.

Office of the Vice-President Research and Innovation

QUICK FACTS



The University of Ontario Institute of Technology:

Continues to be ranked among Canada's Top 50 Research Universities according to Re\$earch Infosource Inc.

Has 11 Canada Research Chairs in strategic research areas.

Has four sponsored research chairs including industrial research chairs.

Created 38 graduate programs—22 at the master's level, nine at the doctoral level and seven graduate diploma programs.

Launched the Brilliant Catalyst, a multi-purpose space to deliver entrepreneurship programming and provide a platform for entrepreneurial and design thinking. The Catalyst has supported UOIT startup companies and plays a central role in the Triple Helix Innovation Ecosystem in our region and Canada.

Proudly promotes undergraduate engagement in research projects. Students are introduced to academic research by working alongside faculty members and graduate students. Through many of these projects, students connect with industry and community partners, gaining a valuable resource for applying to continue their studies or seeking employment.

Enables the mobilization of the intellectual property of its researchers. We currently manage a diverse portfolio of patent applications and have generated licensing revenue from our technologies.

Has relevant research with community and industry applications as a cornerstone of the university's mandate.

OBJECTIVES



Innovation in Research, Scholarship and Education responds to the science and technology strategies laid out by both the federal and provincial governments that focus on:

- Attracting and retaining the best and brightest minds from all over the world to enrich our capabilities.
- Creating new knowledge, and mobilizing that knowledge and research uptake, for social and economic benefit.

Through this strategic research plan we will:

- Build on and fortify existing research strengths.
- Foster excellence in targeted fields.
- Identify and invest in new strategic research priorities.
- Integrate research, entrepreneurship and innovation with undergraduate and graduate education and community engagement.
- Invest in infrastructure that enables excellence and promotes regional, national and international collaboration with academic, community and industry partners.
- Invest in our students' and researchers' entrepreneurial capacity to help them link their fundamental and applied knowledge and discoveries to the needs of various partners.



STRATEGIC RESEARCH AND TRAINING PRIORITIES

Advanced Manufacturing for
21st Century Innovation

Education for the 21st Century

Energy and the Environment



Human Health and Community Wellness

**Information and Communication
Technology and Informatics**

Life Sciences and Biotechnology



Advanced Manufacturing for 21st Century Innovation

Our research in materials and manufacturing focuses on developing the technologies needed to meet the challenges of the 21st century. We develop sustainable and environmentally friendly approaches and techniques for manufacturing processes, product development and energy systems. Our research will address many current and future engineering 'grand challenges' such as how to make solar energy economical, advance health informatics, information and communication technology (ICT) and secure cyberspace, improve pharmaceuticals and support a secure and safe nuclear power industry among others.

We follow an interdisciplinary research approach with a focus on:

- Automotive and transportation research.
- Business and management engineering.
- Energy systems and nuclear engineering.
- Human and health factors.
- The manufacturing cycle.
- Pharmaceutical research.
- Product life-cycle analysis.
- Sustainable manufacturing and production processes.

Creating a sustainable transportation system is of particular interest to our researchers, and this goal requires rigorous inquiry into:

- Advanced materials.
- Batteries and storage.
- Fuel-cell technology.
- Intelligent systems.

The fundamental theme connecting all of our manufacturing research is to understand how to improve processes through effective systems integration and to improve new modes of transportation.



Education for the 21st Century

Achieving excellence in education that effectively prepares students for the **workplace** requires systematic and thorough research into the intersection of teaching and learning, as well as the currently developing field of third-level and professional education. The realities of the evolving workplace inform the content and methods of post-secondary education, as instructors work to create relevant and effective learning experiences in universities and colleges. Our researchers study the connections between secondary educational preparation and the workplace, tertiary education, and educational policy development, in order to propose approaches and methods that will aid teachers to effectively prepare students for contemporary and future careers.

Our faculty investigates ways tertiary-level learning and teaching can be reformed and improved through the use of digital technologies. Research in this area includes the integration of learning and teaching in the digital economy with a particular focus on:

- Design principles in educational and engineering practice.
- E- and m-learning strategies and technologies.
- Learning in the academy.
- Learning for professional development.
- Pathways for advanced and lifelong education.
- The professional and clinical education needs of work environments.



Energy and the Environment

Our energy research strives for innovation, within a framework of rigorous conservation and environmental stewardship. Our researchers focus on:

- Hydrogen production.
- Natural gas as a transportation fuel.
- Nuclear energy.
- Renewable energy, such as algal biofuel, wind, solar and geothermal.

These broad research directions encompass the aims of achieving innovation in engineering, advancing approaches to the education of managers in the safe operation of nuclear power plants, and collaborating with leading partners to advance a safe and efficient energy future for our planet.

Our environmental researchers work to understand the underlying mechanisms of ecosystem function and health with an emphasis on freshwater resources. Research areas include:

- Algal blooms.
- Ecotoxicology of contaminants found in municipal and industrial wastewater.
- Energy, nutrient and contaminant dynamics in aquatic ecosystems.
- Invasive species.
- Pathogen fate in the environment.
- Studies of nuclear waste management.



Human Health and Community Wellness

We are committed to innovative research that enhances the capacities of local, national and global communities to thrive and grow in ways that are healthy and sustainable. We promote and extend social well-being through problem-based research and the application of information and communication technology (ICT) and data analytics, in order to produce tangible and constructive outcomes for individuals and communities.

Sustainable and healthy communities are ones that plan their growth to maintain physical, social, economic and environmental health, while promoting social justice, inclusion and civic participation. Our researchers engage with community and institutional partners to:

- Define social problems.
- Design research initiatives intended to yield insight into those problems.
- Develop policies, programs and products to facilitate positive change.

Our researchers are involved in a wide range of initiatives related to this theme, including:

- Community development.
- Countering violence.
- Environmental risks.
- Health informatics and analytics.
- Health promotion.
- Human health biology.
- Improving the quality, safety and experience of health care.
- Improved water quality.
- Social determinants of health.
- Sustainable energy technologies and usage patterns.



Information and Communication Technology and Informatics

Information and communication technology (ICT) and informatics are our core research fields. They are essential platform technologies that permeate and support all of our research activities. As the applications of ICT and informatics multiply, industry, government, health-care organizations and the public face an increasing number of challenges related to the field. Our researchers are tackling how to:

- Employ ICTs and informatics to enable the right person to connect to the right content at the right time and at the right location, reliably, securely and with satisfactory quality.
- Manage the high volume of data that people and organizations generate daily through interactions with one another or between organizations.
- Preserve the integrity of that data.

Our ICT and informatics research is the linchpin required to, among others:

- Build energy efficient wireless infrastructures.
- Create healthy communities.
- Develop intelligent transportation systems.
- Enable learning.
- Ensure energy sustainability.
- Manage health informatics.

We promote research and development that enables communications between two parties anywhere, anytime. Our research in this area will contribute to:

- Advanced manufacturing.
- Enhanced learning.
- High-quality and reliable communications.
- Improved health care.
- Secure financial interactions.



Life Sciences and Biotechnology

We offer a stimulating environment for life sciences and biotechnology research.

Applying advanced investigational methods in molecular biology, toxicology, synthetic chemistry, physiological studies, epidemiological methods, population studies, qualitative and quantitative research methods, and computational methods, our researchers take on contemporary challenges in a variety of fields, including:

- Agricultural crops.
- Aquatic and terrestrial ecosystems.
- Micro- and macro-organism forensic models.
- Symbiotic and pathological micro-organisms.

Faculty members engage in developing molecular targets for human and animal health and nutrition, as well as clinical- and population-based studies of determinants of human health, including those that lead to novel interventions such as:

- Bio-based products.
- Biological chemistry.
- Ecosystem science.
- Forensic science.
- Infectious diseases.
- Microbiology.
- Molecular biology.
- Pharmaceutical chemistry.
- Radiation biology.

Our researchers employ numerous and diverse technological tools and instruments. They have a strong vision for the use of biotechnology to initiate work on the forefront of proteomics, genomics and systems biology.

CAPACITY



Collaborations

We foster collaborations with industry, government and community partners. These organizations approach our researchers with their challenges. We do the research and transfer the results back to government, industry and the community to improve processes, policies, productivity and competitiveness. We build a partnership, make a commitment to provide actionable results, all while teaching our undergraduate and graduate students in an interdisciplinary, industry-focused environment.

International connections

We meet the highest international standards in recruitment of faculty and students. Our faculty members publish in top-tier international journals, present at conferences at home and abroad, and establish research collaborations with colleagues at leading universities and research institutes. International research collaborations work to solidify our global reputation and attract leading scholars and students to our institution.

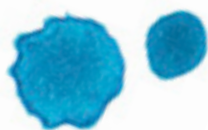
We promote international connections at individual and institutional levels. Our faculty members form strong ties with international colleagues at research universities and institutes, reinforcing disciplinary expertise and facilitating knowledge exchange and mobilization. At the institutional level, we continue to expand our global academic linkages with top-tier universities and research institutions. These connections address core research strategies, expanding international mobility opportunities for faculty and students, and enhancing our research capacity and reputation.

Specialized Research Facilities

With **more than 90** specialized high-tech research laboratories and facilities, consisting of more than 90,000 square feet it is a true testament to our commitment of attracting leading scholars and stimulating their success.

Some of our research facilities are listed below:

- Advanced Networking Technologies and Security Research Lab (ANTS)
- Advanced Nuclear Computation Lab
- Advanced Storage Systems and Electric Transpiration (ASSET) Lab
- Applied Law Enforcement Research & Training (ALERT) Lab
- Applied Skill Acquisition in Sport Lab
- Aquatic Toxicology Lab
- Attitudes and Perceptions Lab
- Automotive Centre of Excellence (ACE)
- Center on Hate, Bias and Extremism
- Clean Energy Research Lab (CERL)
- Clinical Affective Neuroscience Lab for Discovery and Innovation (CANDiLab)
- Computational Nano Biophysics Lab
- Corrosion and Waste Management Lab
- Development, Context, and Communication Lab
- Digital Culture and Media Lab (decimal)
- Education Informatics Lab (EI Lab)
- EEG and Neuroimaging Lab
- Electrical Power Equipment and Systems Lab
- Environmental Microbiology Lab
- Forensic Entomology Lab
- Forensic Psychology Lab
- Games and Media Entertainment Research (GAMER) Lab
- Hacker Research Lab
- Health Informatics Lab
- Human Neurophysiology and Rehabilitation Lab
- Information Forensics and Security Lab
- Integrated Manufacturing Centre
- Internet of Things (IOT) Lab
- Mechatronics and Robotics System Lab
- Microbial Immunology Lab
- Mixed-Field Irradiation Facility
- Molecular Microbial Biochemistry Lab (MMBL)
- Motor Behaviour and Physical Activity Lab
- Neutron Detection Lab
- Nuclear Simulation Lab
- Occupational Neuromechanics and Ergonomics Lab
- Photovoltaic (PV) Materials Research Lab
- Radiation Research Lab
- Software Systems Lab
- STEAM-3D Maker Lab
- Thermalhydraulics Lab
- UOIT-CMCC Centre for Disability Prevention and Rehabilitation
- UXR Lab
- Visualization for Information Analysis Lab (vialab)





SUPPORT OUR RESEARCH



Why give?

The support of generous donors, along with industry, government and community partnerships, help us achieve our vision of attracting top students, welcoming highly skilled researchers and building cutting-edge campus facilities. Our partners provide more than financial support: they become part of our university community by investing in, and benefitting from, the dynamic, ambitious research and education taking place on campus and beyond.

Benefits to giving

We seek partnerships with industry, government and community agencies, merging expertise and knowledge to contribute to ongoing novel and game-changing research. This allows faculty to work with these partners within their area of research and provides access to academic expertise through collaborative research and development programs, utilizing our state-of-the-art facilities and personnel. Partnerships create strategic alliances between our research chairs and industry, government and community agencies that focus on fundamental and applied research. There are also opportunities to acquire proprietary technology from our intellectual property portfolio through licensing or through supporting start-up companies. Further opportunities for knowledge transfer and knowledge exchange are available through partnerships with the university.

How to give/partner with the university for research

Help us ensure our faculty and students have access to the latest technology and innovation by donating or sponsoring research that will lead to advancements in science and will contribute to solving society's grand challenges and relevant problems of our partners. This can be done as a philanthropic gift or direct contribution to support specific research programs conducted by our faculty experts. You may also choose to contribute funds toward student bursaries or scholarships to help train the next generation of researchers and professionals.

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The background of the entire page is an abstract watercolor wash. It features a mix of green and blue hues, with the colors blending into each other and the white background. The green is more concentrated in the upper left and middle sections, while the blue is more prominent in the lower right and bottom sections. The edges of the colors are soft and irregular, characteristic of watercolor painting.

RESEARCH FOR TODAY AND TOMORROW

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