

# NETWORK

The newsletter of

## THE UNIVERSITY NETWORK OF EXCELLENCE IN NUCLEAR ENGINEERING (UNENE)

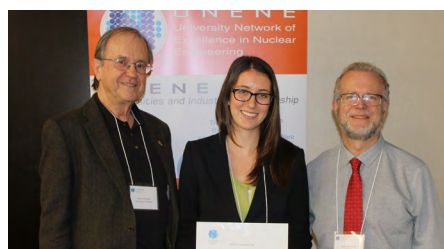


## INSIDE THIS ISSUE

Former UNENE president receives Order of Canada



Nuclear's future leaders recognized in poster competition



Responding to COVID-19: UNENE Network takes action



# PRESIDENT'S MESSAGE

## One more way to keep our community connected

This time of great industry change will bring both challenge and opportunity. For the UNENE community, invention will always result from necessity.

Welcome to our first UNENE newsletter. When we considered the idea to launch this initiative some months ago, we thought it would be valuable to deliver informative, relevant and insightful news to our UNENE community, colleagues and stakeholders.

Fast forward to the launch of our first issue where we find ourselves several months into the COVID-19 pandemic and we realize just how vital digital connections like this have become for all of us. In addition to the pandemic response coverage in this issue, there is also news of member progress in education, R&D, and outreach.

It is certainly no longer news that the world-wide and Canada-wide spread of the novel coronavirus has dramatically changed the circumstances around us. In Canada and in Romania, the country of our newest UNENE member, the University of Bucharest, like almost everywhere else, we are grappling with major restrictions on our daily lives and work activities. This is necessary to confront the on-going health challenge. And, we know, more changes will come as the world carefully winds its way back to a "new normal."

Our universities have not been exempt from this. Classes have moved online and many have announced online-delivery, in the fall. We can anticipate broad impacts on university facilities that may affect both research programs and administrative activities. As some of us learn how to Zoom our classes and meetings, researchers must contemplate how collaborative work in labs can move forward.

Yet, already, we are seeing human resilience and ingenuity kicking in. Within days and weeks, innovative approaches to development of protective measures and equipment were formulating in partnerships between academia and industry, with outcomes such as design and production of ventilators and 3-D printed face shields. You can read about some of the UNENE-member engineering faculties and industry organizations in the pages of this issue.

At the same time, organizations like UNENE, whose product is knowledge, are re-defining our understanding of collaboration and adopting the tools to harness knowledge-sharing through digital means. Our courses and meetings continue with the use of online tools, building on existing experience delivering in a digital environment.

One can speculate that while the pandemic will certainly set us back in some respects, it will undoubtedly advance us in others.

Necessity is after all, the mother of invention. If you are reading this, you will undoubtedly be a contributor to the ideas born from the pandemic. The universities and people who make up the UNENE community are not idlers. We will rise to this challenge and build from it. Of that I am sure.



*Jerry Hopwood, B.Sc., M.Sc.  
UNENE President*

*“We welcome news from all our UNENE community for our newsletter. We have a lot to talk about and share!”*

*~ UNENE President,  
Jerry Hopwood*



### On the cover:

Engineering students from McMaster University created a method for tracking the temperature of grocery store shoppers. Read more on P. 4.

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## An extraordinary response to an existential threat

The UNENE network of universities and industry partners brought their A-game to tackle COVID-19

By March 13, most universities across Ontario had sent faculty, staff and students home to continue their work online, shutting down classrooms and labs.

But that did not stop the indomitable spirit of these people of science and engineering who almost immediately turned their minds to strengthening online teaching while juggling new family obligations and yes, innovating solutions to the challenge facing all humankind in the fight against COVID-19.

### Personal protective equipment, supplies to front lines

*Ontario Tech makes important contribution in fight against spread of COVID-19*

Ontario Tech is doing its part to protect front-line workers and stop the spread of COVID-19.

Faculty, industry contacts and local hospitals have combined forces to come up with solutions to help fill the critical shortages of personal protective equipment available to front-line health-care staff. It is working on [ventilator](#) and [face shields](#) designs that are fabricated on 3D printers, and crowd-sourcing available 3D printers in order get PPE to the front lines as quickly as possible.

Its faculties of Science, Health Sciences and Energy Systems and Nuclear Science recently teamed up with Durham College to [donate](#) to two hospitals boxes that included: examination masks, isolation gowns, hand



*Ontario Tech University was one of several UNENE universities that stepped up to help the industry, healthcare and communities manage the early days of COVID-19. Ontario Tech Ph.D. graduate Jordan Anderson and Dean of Energy Systems and Nuclear Science Akira Tokuhiro with the thermal imaging device.*

sanitizer, chemotherapy gowns, surgical masks, agar media (petri dishes), biomedical tubes, shoe covers, vinyl guard gloves and wipes.

In addition, it has loaned out a handful of FLIR infrared cameras, to apply a thermal imaging technique that would screen for increased temperatures (COVID-19) of workers entering nuclear generating stations.

### U of T develops solutions for hospitals

*PPE strengthened with remote monitoring*

University of Toronto's Faculty of Engineering teams are making valuable contributions in hospital settings during the COVID-19 pandemic.

In response to a request from clinicians from Mount Sinai Hospital in Toronto, researchers have developed a scalable solution that allows nursing staff to [remotely monitor](#) vital signs of patients, which preserves personal protective equipment. They are also studying the potential of using [ultraviolet light](#) to disinfect masks, gowns and other personal protective equipment.

On another front, teams are working on wearable tech that encourages [hand washing](#) to prevent the spread of COVID-19.

For a full list of activities by the Faculty of Engineering at University of Toronto, visit [online](#).

# COVID-19 RESPONSE: UNIVERSITIES



Queen's University Nobel Laureate Art McDonald was part of a team of Queen's researchers that collaborated on a simple, quick-execution ventilator design.

## Collaboration to create patient relief

*Queen's Nobel Laureate leads team to create ventilator design being massed produced*

Queen's University Nobel Laureate Art McDonald is leading a Canadian team that collaborated on a simple, quick-execution ventilator design.

A team of Canadian scientists and engineers, from CNL, TRIUMF, SNOLAB and the McDonald Institute, led by McDonald, are part of an international team that has received a federal contract for 10,000 robust, easy-to-manufacture ventilators that can be manufactured with parts from established supply chains.

The Mechanical Ventilator Milano multi-national collaboration aimed to design, develop, build and certify a simple mechanical ventilator system that provides a controlled supply of oxygen and air to COVID-19-stricken patients. The design is provided under an open hardware license, aiding rapid manufacture that can be adopted in different countries.

The ventilator design leverages the collaborators' collective expertise in the design of gas-handling and electronic control systems used in the search for dark matter, the mysterious substance which makes up more than 25 per cent of the universe.

Read the full story [here](#).

## COVID-19 early detection

*McMaster startup creates pilot temperature screening technology for grocery store*

A device developed by a startup of McMaster Engineering alumni and students called Longan Vision will soon be in place at a Hamilton grocery store to check customers for elevated body temperatures.

Longan Vision's device, Gatekeeper, will be used at a workstation set up at the entrance of Nations Fresh Food grocery store in downtown Hamilton. It uses thermal imaging technology and augmented reality software to scan people in a non-invasive way. Staff will be alerted when a body temperature is detected that's over 37 C.

One of the symptoms of COVID-19 is elevated body temperature.

Longan Vision was initially developing an augmented reality visor to allow firefighters to see through smoke and share images with a command centre before pivoting to this new application.

See photo on the cover of this issue and read the full story [here](#).

## Transition to low-carbon future

*UNENE Chair Jatin Nathwani sees a climate change opportunity emerge from COVID-19*

Jatin Nathwani, Professor and Energy Policy Chair, University of Waterloo, shared some optimism for the future beyond COVID-19 in a March 2020 paper.

"In the seeds of this current tragedy lies a historic opportunity for Canada to transition to a low-carbon energy economy — away from dependence on the oil and gas sector," he wrote in *Coronavirus, Climate and a Clean Energy Transition: Is Resiliency Achievable?*

He points to diversification as one of the key positive alternatives to gas and oil through the use of diverse sources of energy such as hydroelectricity, advanced nuclear (including small-scale modular reactors), geothermal energy and large-scale wind and solar with storage and bioenergy resources.

"The time has come to bid a fond farewell to fossil resources and for the oil and gas sector to turn its gaze to extracting heat rather than carbon. The sector must begin to make a painful adjustment to the combined threats of a pandemic and a world that may not require as much oil and gas as it once did," he wrote.

Read the full paper [here](#).

## In it together

Canada's Nuclear Industry has stepped up to make an over-sized contribution to the fight against COVID-19

UNENE's nuclear industry partners have answered the call to ensure COVID-19 does not stop the production of safe, clean and reliable electricity by sharing best practices and collaborating on personal protection equipment and methods to keep workers safe during essential duties in the plant.

Through the CANDU Owners Group, Canadian and International CANDU operators have created a peer group for exchange of information and a common approach to address the challenges of the pandemic ([read more here](#)).

But, the industry has not stopped its efforts at its electricity generation activities. In addition, the companies have found important ways to contribute to their communities through bill relief and corporate citizenship. Some have even jumped in to develop innovative solutions to COVID-19 challenges using plant equipment for new purposes.

Read more about the industry's efforts [here](#).



From donations of thousands of medical-grade face masks to foodbank donations and development of 3-D printed face shields, the Canadian nuclear industry has stepped up to help in the fight against COVID-19. And that doesn't even count the efforts to continue generating safe, reliable electricity throughout the pandemic.

### UNENE EDUCATION UPDATE

## The show goes on

*UNENE education programs continue despite pandemic*

UNENE education programming continues under Covid-19. In line with UNENE's university members, the UNENE educational program was transferred to a full distance-learning program in March. It will continue as an online learning program until the Covid-19 restrictions are lifted.

UNENE courses are being delivered by Webex. For many years UNENE has used distance-learning tools in parallel to the classroom-based lecturing so this change is a natural progression, says UNENE Education Director Nik Popov.

Several new courses are planned for the coming year including one on risk and reliability as well as graduate courses in core nuclear subjects like reactor physics, plant operations, health physics and regulation and energy. Refresher courses in reactor physics and math will also be offered. For a full course schedule contact Areti Tsiliganos at [UNENE@McMaster.ca](mailto:UNENE@McMaster.ca).

### McMaster virtual-reality App let's COVID shut-ins explore a nuclear reactor core

Students and other adventurers can take a tour of the McMaster nuclear reactor from their own livingroom with McMaster University's new virtual reality application aimed to help demystify nuclear reactors.

The app requires a Google Cardboard VR headset, along with a smartphone in order for the user to follow the specially designed 3D camera, popup factoids and staff interviews that explore the McMaster Nuclear Reactor. It takes users right into the reactor's glowing blue core, providing a view that even the technicians who work at the reactor have never seen before.

During the COVID-19 pandemic, McMaster Nuclear Reactor continues to produce much-needed and rare medical isotopes used to treat prostate and other forms of cancers, while providing other services critical to health care, the nuclear industry and the economy. Read more about the app [here](#).

# RECENT RESEARCH



Ontario Tech University 4th-year engineering student, Jordan Crowell captured second place in an ANS design competition with a mini-reactor design intended to meet energy needs in Canada's far north.

## Solution for an energy challenge

### Ontario Tech U student recognized for mini-nuclear reactor design

An Ontario Tech University Nuclear Engineering student's design of a mini-nuclear reactor to meet the energy challenge in Canada's Far North has captured second place in American Nuclear Society's student design competition.

Fourth-year student Jordan Crowell's reactor, which is easily transportable by cargo plane or truck, could be used in remote communities that currently rely heavily on diesel, with electricity bills that more than double the national average.

The reactor, dubbed ZAN4(e), was his 'Capstone' design project, which provides a practical solution for a real-world problem.

Crowell's Capstone academic supervisor, Dr. Eleodor Nichita, Associate Professor, Faculty of Energy Systems and Nuclear Science, encouraged Crowell to submit his design to the 2020 American Nuclear Society's (ANS) Student Design Competition.

Read the full story [here](#).

## OPG renews research studies

### UNENE members research five aspects of decommissioning and waste innovation

Ontario Power Generation began sponsorship of nuclear research at five universities over three years focussed on innovation in nuclear decommissioning and waste in 2017.



Ontario Tech University Professor Glen Harvel and his students participate in the OPG-NSERC funded research.

Working with UNENE, nuclear utilities, and research agencies, OPG provided three-year funding to the University of Toronto, University of Western Ontario, Queen's University, Ontario Tech University and the University of Waterloo. The research is being renewed to continue the research programs, co-funded through the Alliance Grant program, offered by National Science and Research Council of Canada (NSERC).

## Student work shines in UNENE Poster Competition

More than 50 students presented their research posters during UNENE's Annual R&D Workshop, last December.

Attendees also took part in a session with updates by government representatives and a panel of invited speakers who talked about innovation.

"The Poster Session is always a highlight of the workshop. It's an opportunity for our members to hear from the next generation of nuclear engineers," said Jerry Hopwood, President of UNENE.

### Congratulations to the poster winners:

First prize, Jacy Conrad

Second prize, Meghan Guo

Third prize, Joseph Turnbull

Another highlight for grads and recent grads was the Canadian Nuclear Laboratories (CNL) interview day.



First-place in the poster competition went to University of Guelph student, Jacy Conrad.

## Goodbye, hello...

### *UNENE administrator Lori Cole retires; Areti Tsiliganos joins the UNENE team*



*Areti Tsiliganos joined UNENE after long-time administrator Lori Cole's retirement.*

Areti (Vourinaris) Tsiliganos joined UNENE in late 2019 when long-time administrator Lori Cole retired.

Areti brings more than 10 years experience in senior academic administration and supporting faculty recruitment, human resources, and graduate program management. She also has experience supporting

IQAP reviews and accreditation processes. Areti is a certified Teaching English as a Foreign Language (TEFL) instructor with a background in ESL teaching, learning, and communications.

As UNENE Administrator, Areti is responsible for facilitating student admissions, registration, course administration and scheduling, and website content management. She also provides executive level support to the UNENE officers and standing committees.

Areti earned her M.A. (Comparative Literature) and Honours B.A. (English, Ibero-American Studies, Modern Greek) from the University of Toronto.

## UNENE Calling

Register your nuclear program in the capability directories

UNENE is seeking contributions to a new directory of nuclear capabilities.

The University Nuclear Directory, currently under development, will help people looking for information on nuclear-related issues including industry members trying to access experts in the academic sphere. The directory will include listings of experts, programs, facilities and contacts.

A subsequent directory will focus on capabilities related to Small Modular Reactors (SMR).

Contact Areti Tsiliganos at [UNENE@McMaster.ca](mailto:UNENE@McMaster.ca) for more information on how to participate.

## Two UNENE community leaders receive Order of Canada

### *UNENE founding president Mohan Mathur was honoured just before unexpected death earlier this year*

A University of New Brunswick (UNB) research chair and the founding University Network of Excellence in Nuclear Engineering (UNENE) president were among 120 people from across the country to receive the Order of Canada earlier this year, in recognition of their extraordinary contributions to the industry and the nation.

Derek Lister, of Chalk River, ON and Fredericton, NB, was a driving force in establishing the Centre for Nuclear Energy Research (CNER), housed at the University of New Brunswick (UNB) in Fredericton. He is chair of the nuclear engineering program at UNB and has been an important contributor to COG's reactor coolant technology research. He was recognized

for his work in nuclear energy research and improvements to occupational safety.

Founding UNENE president and CEO, R. Mohan Mathur, of London, ON, was recognized for his leadership in the field of electrical engineering in both academia and industry, as well as for his efforts to enhance and expand the profession in Canada. Just weeks after learning about the honour, Dr. Mathur died unexpectedly but peacefully, Feb. 6, in Vancouver BC, while visiting family. Read the full story [here](#).



Mohan Mathur will be remembered for his strong academic and industry leadership bringing the two together in helping establish UNENE.

## *UNENE bring global students, universities and industry together to strengthen nuclear knowledge*

### *UNENE builds international bridges with UK consortium*

As part of government-to-government Canada-UK Nuclear Energy Dialogue, in February, Canada's University Network of Excellence in Nuclear Engineering (UNENE) and the UK Nuclear Technology Education Consortium (NTEC) held a joint workshop as a starting point to cooperation in nuclear education and training.

NTEC and UNENE have similar objectives and activities for post-graduate course delivery of nuclear science and engineering, says UNENE President Jerry Hopwood.

The two organizations and their students can benefit through cooperation in curriculum development, use of distance on-line learning techniques, and student and instructor exchange and joint projects, says Hopwood, who notes the recent pandemic underlines the value of this type of initiative.

NTEC is a consortium of UK universities and research institutes formed specifically to deliver post-graduate programs in Nuclear Science & Technology.

Similarly, UNENE is a Canadian based alliance of universities, nuclear power utilities, research and regulatory agencies for the support and development of nuclear education, research and development capability in Canadian universities.

The two organizations are continuing a dialogue towards a cooperation agreement.

### *SMART initiative underway*

A \$2.65-million initiative of six UNENE member universities aimed at increasing training to students in the Small Modular Reactor (SMR) field has been developed to strengthen the quality and number of professionals entering the burgeoning field.

**Small Modular Advanced Reactor Training (SMART)** is designed to achieve four goals: Increase the number of women educated and trained in SMR technology in line with average engineering enrollment numbers; develop professional skills like project management, economics and technical writing; teach graduate level students SMR technologies that include

basic design, materials performance, safety, and lifecycle and spent fuel cell issues; and provide experiential learning through publications, oral presentations, and / or work experience.

The six-year initiative, led by David Novog of McMaster University, is funded by a \$1.65-million CREATE grant from National Sciences and Engineering Research Council (NSERC) and \$1 million in other funding. Member universities include McMaster University, Royal Military College, University of New Brunswick, Ontario Tech University, University of Waterloo and Queen's University. UNENE chairs its advisory committee.

## UNENE welcomes first international university member

In late 2019, UNENE welcomed its first international member to the network of universities dedicated to excellence in nuclear engineering. Polytechnic University of Bucharest joins UNENE to strengthen education collaboration, including sponsored student and instructor exchanges. The university has a strong relationship with Romanian CANDU operator Societatea Nationala Nuclearelectrica (SNN), which is also considering refurbishment and new build.

Bringing the Bucharest university into the UNENE community offers opportunities for education collaboration, including sponsored student and instructor exchanges, says UNENE President Jerry Hopwood.

"Our partnership will go a long way to meeting the objective of assuring a sustainable supply of qualified nuclear engineers and scientists to meet the current and future needs of the Canadian nuclear industry," Hopwood said.

*At right: University of Bucharest campus, Romania*

