

2020

# THE KEY

LAURENTIAN UNIVERSITY'S RESEARCH MAGAZINE

Curiosity • Creativity • Connectivity

## Unearthing the Secrets of a Thawing North



Laurentian University  
Université Laurentienne

SUDBURY | ONTARIO | CANADA





# Discovering Research at Laurentian

**Dr. Robert Haché**  
President and Vice-Chancellor,  
Laurentian University

“Research is also about people, and I am particularly proud to have the opportunity to work with dedicated faculty, staff, and students who are committed to creativity and innovation and engaged in scholarly activities that are bringing solutions to the problems of today to create a better tomorrow.”

**As Laurentian University’s 11<sup>th</sup> President and Vice-Chancellor, I am delighted to have the opportunity to reflect on the past year’s research achievements in this latest edition of *The Key*.**


Since joining the ranks of Laurentian in July of 2019, I have witnessed the outstanding research taking place at this institution, and I have been impressed by its regional, national, and global significance.

My career in academia has been closely tied to research at every stage. As an undergraduate and graduate student in biochemistry, a successful research scientist and, most recently, a research administrator, I have gained a vast and thorough appreciation for the pursuit of research excellence along with its challenges and rewards. In 2019, Laurentian celebrated its highest research income since its inception sixty years ago. This achievement is due to an upward trajectory in research intensity, with a growth of 168% in total sponsored income over the last 5 years, making us once again Canada’s #1 undergraduate university in total sponsored research income. Congratulations to all the members of the Laurentian research community who have contributed to these historic and important achievements.

The 2018-2023 Strategic Plan, which identifies several of our research strengths, is my roadmap to success over the next few years. Curiosity drives our research, as do need, community, creativity, discovery, and effecting change. As you read through this issue, you will see that the featured research reflects our plan’s priorities of *mino-bimaadiziwin* and wellness, fundamental research, environmental stewardship, mineral exploration, and social innovation.

In 2019, Dr. Celeste Pedri-Spade received Laurentian University’s first New Frontiers in Research Fund grant for her impactful research project repatriating children’s artwork to Indian Residential School and Day School survivors in Anishinabe and Algonquin territory. Dr. Ashley Scott’s Ongen research group is leading several different research projects, which look to repurposing mine waste, while Dr. Nathan Basiliko’s L-Care project is quantifying the carbon that has been removed from the atmosphere through Sudbury’s greening. Our researchers have also focused on children’s well-being through Dr. Diana Coholic’s arts-based mindfulness research and Dr. Mélanie Perron’s study of how children understand emotions. And of course, this year’s cover features Dr. Pascale Roy-Léveillé, who is leading important research into the permafrost landscapes and their vulnerability to environmental change in Northern Canada.

The above-mentioned research projects are just a few of those highlighted in *The Key*, and I encourage everyone to read on to learn more about the depth and breadth of Laurentian’s research, scholarships, and associated creative activities.

Finally, research is also about people, and I am particularly proud to have the opportunity to work with dedicated faculty, staff, and students who are committed to creativity and innovation and engaged in scholarly activities that are bringing solutions to the problems of today to create a better tomorrow. 

## GROWTH IN RESEARCH ACTIVITIES

For over a decade, Laurentian University has ranked amongst Canada's top 50 research universities. In 2019 we ranked #1 for Research Income Growth amongst all Canadian universities and, in the Undergraduate University Category, #1 in Research Income and Graduate Student Research Intensity.

## AREAS OF RESEARCH

Our 2019-2023 strategic research plan identifies four areas of strength:

- MATERIALS, MINERALS, MATTER AND ENERGY
  - ENVIRONMENT
- HEALTH, HEALTH SERVICES AND WELL-BEING
- HISTORIES, IDENTITIES, CULTURES AND LANGUAGES

# THE KEY

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# Making an Impact

**Dr. Tammy Eger**  
Interim Vice-President Research,  
Laurentian University

"I look forward to supporting students, faculty and staff as we all work together, *ensemble*, *maamwi*, to advance research, scholarship, and creativity and continue to create an impact regionally, nationally, and globally."

**In January of this year, I undertook the position of Interim Vice-President Research (VPR), succeeding Dr. Rizwan Haq in this role.**

Under Dr. Haq's leadership, the Laurentian research community saw the official opening of the Cliff Fielding Research, Innovation, and Engineering Building and developed and launched the 2019-2023 Strategic Research Plan. I ask the Laurentian research community to join me in thanking Dr. Haq for his contributions to advancing research, creativity, and scholarship during his tenure as Interim VPR.

In the 2019-23 Strategic Research Plan, a clear vision for Laurentian to be "a leader and partner for research projects and innovative solutions that are regionally, nationally, and globally significant" is articulated. With the assistance of technical and support staff, I would contend that Laurentian University faculty and graduate students are well on their way to fulfilling this vision. Moreover, in 2018, researchers at Laurentian received over \$44M in research income, a 37% increase over the previous year, leading our institution to the top rank amongst primarily undergraduate universities.

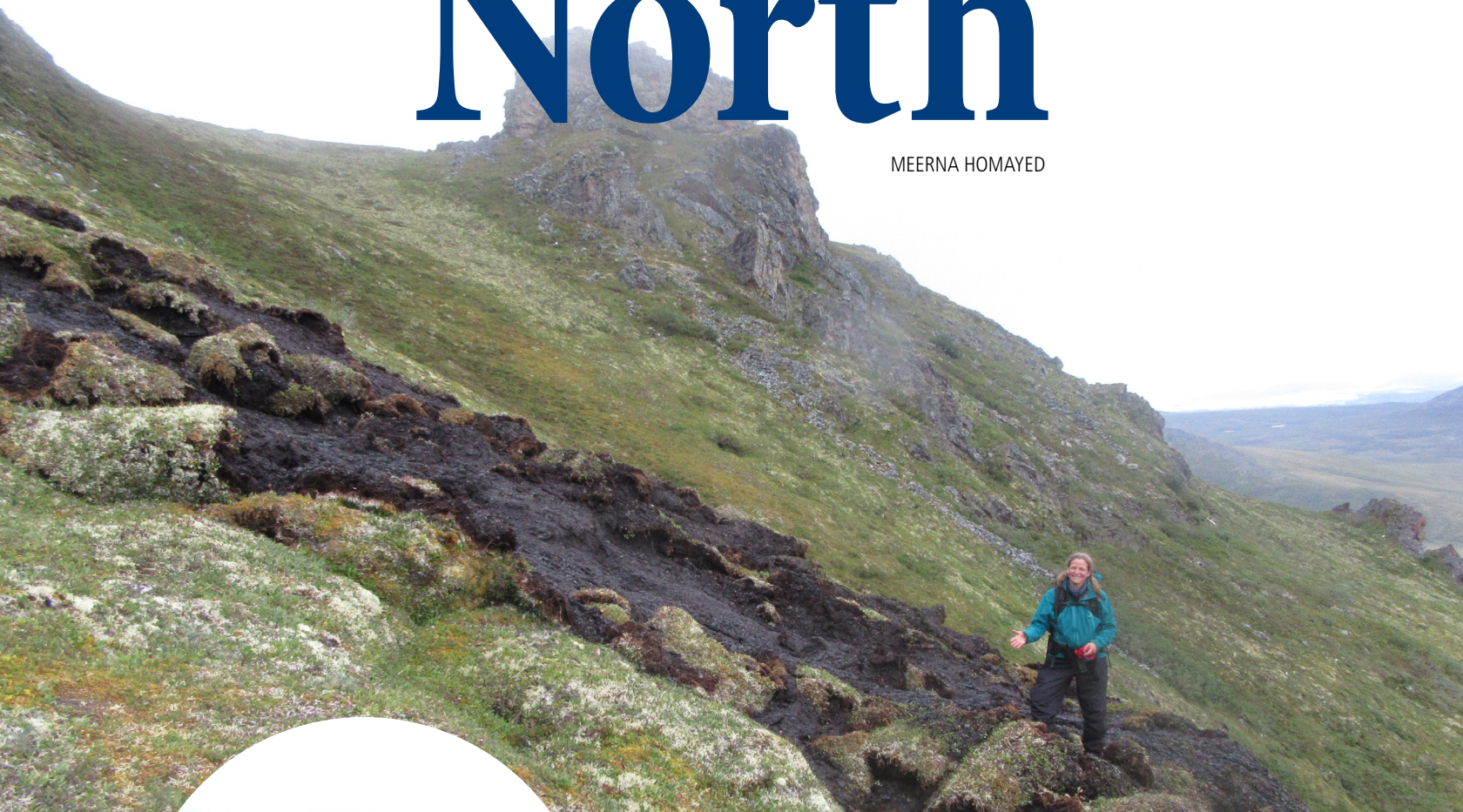
In this issue of *The Key*, you will read about advances in Laurentian's four areas of research strength, as identified in the Strategic Research Plan. Articles on permafrost research being led by Dr. Pascale Roy-Léveillé, and the Landscape Carbon Accumulation through Reductions in Emissions project co-led by Drs. Nathan Basiliko and John Gunn are just two examples of our strength in **Environment**-related research. Advances in **Health, Health Services and Wellbeing** research are highlighted through articles on the Holistic-Arts-Based Program led by Dr. Diana Coholic, and on *Aaniish Naa Geegii*, a health assessment tool for Indigenous youth developed by Dr. Nancy Young and Naandwechige-Gamig Health Services Director, Mary-Jo Wabano. In the area of **Histories, Identities, Cultures and Languages** research, you will read a profile of Dr. Mélanie Perron and her collaborators, whose research culminated in a children's book, *Les émotions*, along with articles that profile scholarship contributions from Drs. Joey Lynn Wabie, Celeste Pedri Spade, and Émilie Pinard, and PhD student Sarah De Blois. You can also read how PhD candidate Christopher Beckett-Brown's work on ore deposits continues to demonstrate our institution's research strength in the area of **Materials, Minerals, Matter and Energy**.

These articles highlight just a few of the Laurentian University researchers and their collaborators who are making an impact. After reading this issue of *The Key*, I am sure we can all agree that the future of Laurentian University's research community is indeed a very bright one. At the start of a new decade at Laurentian, in this role as Interim VPR, I look forward to supporting students, faculty, and staff as we all work together, *ensemble*, *maamwi*, to advance research, scholarship, and creativity and continue to create an impact regionally, nationally, and globally. |◀



# Unearthing the Secrets of a Thawing North

MEERNA HOMAYED



*Dr. Roy-Léveillé is dedicating her skills, experience, passion and convictions to understanding how Canada can adapt to thawing permafrost in a changing climate.*

Permafrost, as the name suggests, is ground that stays frozen year-round, and roughly half of the Canadian landmass may be affected by it. But what will happen if and when the permafrost thaws?

Dr. Pascale Roy-Léveillé, Associate Professor of Geography at Laurentian University, is studying permafrost landscapes and their vulnerability to environmental change in Northern Canada.

“I do fundamental work on the susceptibility of permafrost to thaw and on its potential for post-disturbance recovery based on a series of interactions between climate, vegetation, and Quaternary history. To facilitate the direct application of the knowledge I produce, I collaborate with people who need that information to do their work.”

Some of her collaborators include engineers responsible for the development and maintenance of infrastructure built on frozen ground; soil microbiologists and hydrologists interested in thawing permafrost; scientists who specialize in contaminants; and local knowledge holders who can facilitate proactive adaptation to environmental change in their communities.





Dr. Roy-Léveillé also collaborates with researchers in-house and is part of the Vale Living with Lakes Centre and the Maamwizing Indigenous Research Institute at Laurentian University.

“Here at Laurentian, for example, I collaborate with Dr. Nathan Basiliko to improve understanding of the permafrost-carbon feedback by combining biogeochemistry, geocryology, and geomorphology.”

Of great importance to Dr. Roy-Léveillé is the relationships that she has built with First Nation communities in Northern Canada. She says this is one of her favourite aspects of her job: working together with local knowledge keepers and discussing what a change in climate and thawing permafrost could mean for local plants and animals, infrastructure, travel routes, and adaptation strategies.

For her, it is important that her research be applicable and useful for affected populations.

“I like to think that my work can help people foresee how their traditional territory is going to change, helping them draw on their own expertise to reflect on the multifaceted implications of this change, and have time to think about adaptation strategies. I hope my research can contribute to building resilience among those most directly impacted by permafrost degradation.”

However, she acknowledges that communication with remote communities at all stages of research is a work in progress that can always be improved. “I’m always hoping to improve the way that I collaborate with communities, and to help improve the way the permafrost research community in general works with them. There’s so much that we could do together.” For instance, instead of trying to integrate traditional knowledge within a science framework, she is hopeful for

a future where traditional knowledge is the framework and science can be integrated in ways that are useful to communities, in their roles as land stewards.

Her research is based largely on permafrost landscapes in the Hudson Bay lowlands, as well as in northern and central Yukon, regions with which she is very familiar. Dr. Roy-Léveillé spent nearly 10 years in the Yukon after completing her undergraduate degree, working mostly in communications for the Yukon Field Unit of the Parks Canada Agency.

“I had a chance to see not just the beautiful patterns permafrost creates in nature, but also the very concrete consequences that it has for people who live on permafrost terrain.”

It was there that her interest in permafrost deepened into a call for action.

“I decided that I really wanted to work in a research lab where there was a focus on working with communities, because I had been living in the North, in a community, and had seen researchers come in, do research, and leave, sometimes without sharing results with local residents.”

And that is exactly what she did. Dr. Roy-Léveillé went on to complete her graduate studies in permafrost science at Carleton University before joining the Laurentian community.

Today, she is part of a pan-Canadian permafrost network called PermafrostNet, comprised of a group of researchers from 16 universities, along with government, industry, and community partners interested in how Canada can better prepare itself for permafrost thaw. It is the first time that the Canadian permafrost community has organized itself in a network, which will help place Canada in a solid leadership position for permafrost science.

PermafrostNet recently received \$5.5 million in funding from NSERC for permafrost research, and is one of two national research networks to receive this funding. Dr. Roy-Léveillé co-leads a section of the network focused on the hazards related to permafrost thaw, and her research projects within PermafrostNet focuses mainly on the susceptibility of lowlands to the development of thermokarst, the collapse of the ground surface that can result from the rapid thaw of permafrost containing large quantities of ice.

In addition, Dr. Roy-Léveillé is part of a group that, led by researchers from the University of Waterloo, received a half-million-dollar research grant to shed light on microbial greenhouse gas production in cold regions peatlands during the freezing season, a component of carbon cycling that was recently shown to be more important than previously expected.

Dr. Roy-Léveillé’s passion for permafrost research remains vibrant today, colouring everything she does, from fieldwork to teaching first-year physical geography.

“I give my first-year class all the energy I can muster, because I think it’s good for students who are starting university to meet professors who are passionate about what they’re teaching and researching. I tell my students about my research, and I think they can feel my enthusiasm.”

In fact, Dr. Roy-Léveillé is the first female permafrost scientist to be a faculty member in Canada. One of the most empowering moments in her career came one summer when she ran an all-women field camp with two research assistants in northern Yukon. The work they accomplished was very physically demanding – drilling, hauling steel pipes, extracting cores from the ground – and it was a thrill to succeed together.

“Everybody has limits in physical strength, it is unavoidable. When your muscles can’t provide the solution to a problem you are facing, you can always use your brain to find alternative solutions. Things worked out well for us.”

To young women wishing to pursue a career in science, Dr. Roy-Léveillé offers the following advice:

“Take time to develop a clear goal or vision of what you want to do and how it could fit with all aspects of your life. When you join your profession, try to be yourself as honestly and as respectfully as possible. Seek work teams that will recognize your expertise, respect your contributions, and value your authenticity in the workplace. Don’t be scared to reach out to people who are going through similar obstacles to the ones you are facing.”



# Aaniish Naa Gegii

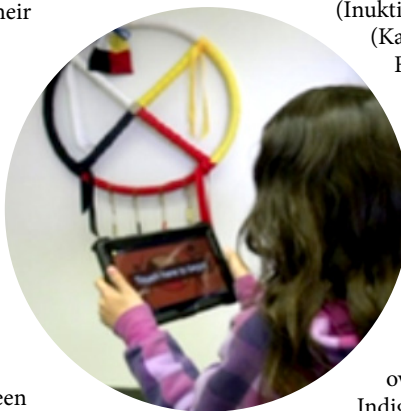
## The Children's Well-Being Measure

MICHELLE KENNEDY



**AANIISH NAA GEGII (ANG)? HOW ARE YOU?** This is the Ojibway name the children of Wiikwemkoong gave the Aboriginal Children's Health and Well-Being Measure (ACHWM) in 2014. The Aaniish Naa Gegii is a health assessment tool that uses a tablet to engage Indigenous youth to talk about their health and well-being. The creation of this tool was done through respectful collaboration and partnership with the Wiikwemkoong Unceded Territory's health centre. This research was led by Naandwechige-Gamig Health Services Director, Mrs. Mary-Jo Wabano, and Professor and Research Chair of Rural and Northern Children's Health, Dr. Nancy Young. This culturally appropriate health and well-being measure is for Indigenous children across Turtle Island. The survey is comprised of 62 questions that are reflective of the unique voices of Indigenous children and youth from 8 to 18 years of age. The survey is completed on touch-screen tablets that can also read the text out loud to children. One of the more unique features of the survey process is that it enables qualified health staff from each community to immediately connect and support respondents who are experiencing mental health challenges. These respondents have a brief conversation with the staff to ensure they know their voice has been heard, and to connect them to traditional helpers or local mental health supports and resources if necessary. The need for such an assessment tool comes from the significant health challenges and inequities in health services faced by Indigenous Peoples, and more specifically for those who live in rural communities. The research team also notes that it is important to tailor the approach to each community. In this respect,

many other Indigenous communities have given the ACHWM a name in their own languages: Aaniish Naa Gegii (Northeastern Ontario Anishnaabemowin), AaniinEzhi-Ayaayan (Northwestern Ontario Anishnaabemowin), Komon Ca Vo (Michif), Qanuippit (Inuktitut), Wacheya (Cree), and Ohniió ton hatie (Kaniehkeha:ka). This research has been shared with First Nations, Inuit, and Métis communities and agencies through various outreach initiatives in Ontario and across Canada. The method for this research is a "Two-Eyed Seeing" approach, in which Indigenous Ways of Knowing form the foundation and are combined with Western science.



The ACHWM has been supported by a grant from the Canadian Institutes of Health Research (CIHR), which is providing \$1.5 million to support knowledge translation from this program over the next five years. The program aims to improve Indigenous mental wellness: spiritually, emotionally, physically, and mentally (intellectually). In addition to the CIHR support, this initiative is also supported by the Ministry of Children, Community and Social Services in Ontario. The Chiefs of Ontario and the Anishinabek Nation Grand Council Chief have also supported this initiative through motions and letters of support. Moreover, ACHWM is a necessary and timely intervention that responds to the Truth and Reconciliation Commission's Calls to Action #18 and #19, which call upon the Canadian government to identify and close the gaps in health outcomes between Indigenous and non-Indigenous communities and to focus on indicators such as infant and child health issues. For more information on ACHWM, visit the website at [www.ACHWM.ca](http://www.ACHWM.ca). ◀◀

# Investigating the Clues Left Behind to Trace Minerals Back to Their Source



CHRISTOPHER BECKETT-BROWN



FIELD RESEARCH IN THE YUKON

Researchers are able to find valuable ore deposits by tracking the path of certain minerals back to their sources, much like following a trail of breadcrumbs. Christopher Beckett-Brown, a PhD candidate at Laurentian's Harquail School of Earth Sciences, received the NSERC Alexander Graham Bell Canada Graduate Scholarship for his research exploring tourmaline as an indicator mineral for porphyry-style ore deposits.

Porphyry deposits contain copper, gold, and molybdenum and provide us with most of the copper used in industry and in products we use. Beckett-Brown's research focuses on deposits in the Canadian section of the

Cordillera, a mountain chain that runs along the west coast of the Americas. Over time, surface minerals in these areas have been displaced and modified by glaciers, wind, and water. Beckett-Brown and colleagues collect samples of stream sediment and bedrock to assess the physical and chemical characteristics of tourmaline found in the samples. Certain properties can indicate whether the tourmaline originated alongside a porphyry deposit containing copper and gold.

Beckett-Brown has been conducting research for the Jaxon Mining company in British Columbia, and has identified tourmaline breccia that is indicative of porphyry deposits at its Red Springs site.

"I enjoy the excitement of exploration and trying to solve research problems that helps industry provide materials for the future. That's the main goal, to help find mineral deposits," says Beckett-Brown.

Beckett-Brown's research is mainly funded by the Geological Survey of Canada and is part of a larger project looking at other indicator minerals to find ore deposits. The aforementioned Alexander Graham Bell Canada Graduate Scholarship is awarded to outstanding students pursuing doctoral studies at a Canadian University through a competitive national competition.

📷 – VICTORIA BANDEROB



SARAH DE BLOIS

## Not Just a Man's Town

*PhD student hopes to advance knowledge at a local level by understanding the gendered experience of working in Sudbury's mines.*

In Canada today, only 16% of blue-collar workers in the mining sector identify as women. This unequal gendered composition is also present in Sudbury's workforce, reflecting the area's establishment within the context of the hyper-masculine mining industry. Sarah de Blois, a PhD student in the Human Studies program at Laurentian University, aims to understand the experience of female-identifying people within blue-collar occupations.

"I want to be able to understand that marginalized minority experience."

De Blois grew up in a working-class, blue-collar family, but always aspired to work in a white-collar sector. While studying communications for her undergraduate and master's degrees, she maintained an interest in understanding how specific occupations influence identity. As a feminist, de Blois was inspired to focus specifically on gendered experiences in the workplace.

In Sudbury, it was illegal for women to work underground in mines until the 1970s.

"I think that there's value to the promotion of local research that can support our community and bring awareness to the necessity of eradicating some of the barriers in the workplace that concern gender... we need less gendered occupational segregation in our workplace."

De Blois will start her data collection in spring 2020. She will interview both women and men who work in the mining sector about their experiences working in a blue-collar occupation.

"I really hope to be able to provide this insight and knowledge to our community in Sudbury, that can hopefully expand to the larger reaches of Northern Ontario. I think that awareness is crucial and key and that this narrative space is important, not only for women, but for all workers in general." 📷 – VICTORIA BANDEROB

"We need less gendered occupational segregation in our workplace."

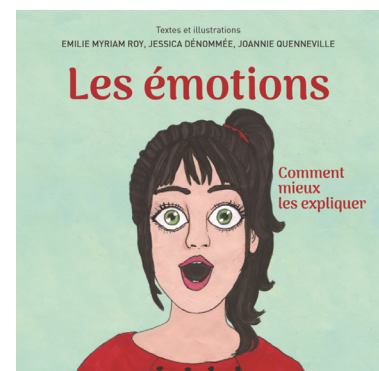




## How to Better Explain Emotions

For several years, psychology researchers Drs. Mélanie Perron (Laurentian University) and Annie Roy-Charland (Moncton University) have been studying how children understand emotions. Working in collaboration with Drs. Jacques Richard (Moncton University) and Isabelle Carignan (TÉLUQ University), they have developed a French-language children's book entitled *Les émotions: comment mieux les expliquer* [Emotions: how to explain them better], an easily accessible, free, and stand-alone tool that helps children aged 3 to 12 years to understand emotions better. When Perron and her team tested the book in Francophone schools and daycares in Sudbury and Moncton, they found that children who were repeatedly exposed to it over two weeks had a better understanding of emotions than the control group (see results published in the Canadian Journal of Education in 2018).

The book includes nine stories that highlight the specific features of children's emotional experiences at different stages of development. Thanks to grants from CNFS-Laurentienne and Health Canada, Francophone schools, daycares, and municipal libraries in Sudbury and Moncton each received 250 copies of the book. The research team is currently working on a new, more complex book more specifically targeting children aged 7 to 12, with questions to accompany the book and encourage discussion about emotions. Additional copies will be printed, and data will be collected on how the book is used. It will also soon be translated into English. 📖



A copy of the book can be found at [cnfslaurentian.ca](http://cnfslaurentian.ca).



## Repatriating Children's Artwork to Indian Residential School and Day School Survivors in Anishinabe and Algonquin Territory

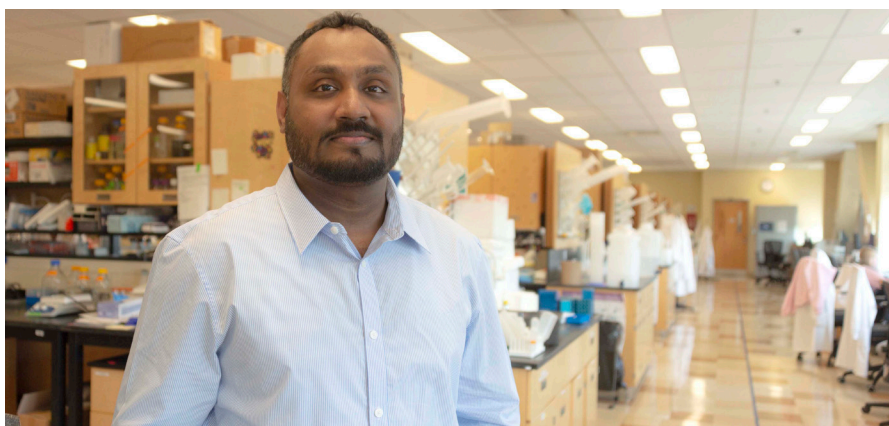
*Dr. Celeste Pedri-Spade, Dr. Laura Hall, Dr. Darrel Manitowabi, Dr. Joey-Lynn Wabie, Dr. Andrea Walsh*  
 – Maamwizing Indigenous Research Institute researchers

This interdisciplinary research project aims to repatriate 200 Indigenous children's paintings and photographs from Indian Residential and Day Schools (IRDS) to the creators of the artworks and/or their descendants now residing in Anishinabe and Algonquin communities in Northeastern Ontario (Whitefish River, Wikwemikoong, M'Chigeeng, and Golden Lake). Recognizing that the paintings and photographs rightfully belong to the artists, the research team will return them in a culturally respectful way. The research team is unique as it is comprised of Indigenous academic and community members, guided by the cultural protocols of the Anishinabe and Algonquin people whom the team is serving in the project. In its early stages of research, one of the aims of the project is to create physical and intellectual spaces where IRDS survivors and/or their descendants are supported by an interdisciplinary team of community members, academics, artists, educators, and museum/gallery professionals in leading discussions around the cultural tools, protocols, responsibilities, and actions implemented during the repatriation efforts. Another aim of the research is to develop culturally relevant and sensitive ways to care for the artwork and photographs – ways that honor the items as integral parts of Anishinabeg and Algonquin cultural heritage. This project comes at a pivotal time when Indigenous Peoples are speaking about their experience within IRDS and as settlements are currently underway. These pieces of art will add to a narrative of the IRDS experience and speak to the resilience of those who attended the schools. Dr. Pedri-Spade received a two-year grant of nearly \$250,000 from the federal New Frontiers Research Fund to carry out this project. 📖 – MICHELLE KENNEDY

# Northern Ontario School of Medicine – NOSM



Northern Ontario School of Medicine  
École de médecine du Nord de l'Ontario  
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L'Université Laurentienne



## Modern Genomic Tools to Combat Radiation-Resistant Cancers

**DR. SUJEENTHAR THARMALINGAM**, Assistant Professor of Molecular Radiobiology at the Northern Ontario School of Medicine (NOSM), is establishing a CRISPR-based screening technology to identify gene mutations that enable cancer cells to resist radiation.

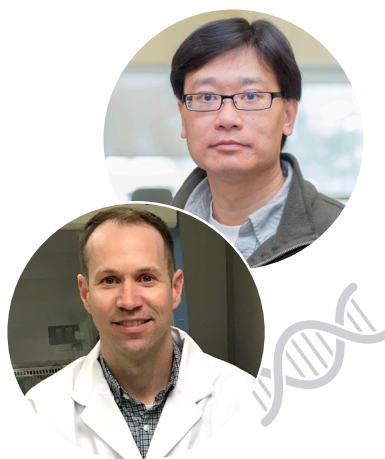
"Although radiotherapy is an effective cancer treatment, many patients suffer from recurrent radioresistant cancers, leading to poor patient outcomes," Tharmalingam explains. "I want to understand how radiation-resistant breast cancer cells are formed at the genome level... then do gene editing to fix those mutations," he says.

Tharmalingam was the recipient of the 2019 Rene Guilbeault Award, presented annually at NOSM to a full-time faculty member who is conducting medical research.

"I hope to establish this gene-based screening technology within the next year... The end goal is to devise methods to pause these resistant genes in cancer cells so that we have better success at killing cancer on our first attempt." ❏

"The end goal is to devise methods to pause these resistant genes in cancer cells so that we have better success at killing cancer on our first attempt."

## SNOLAB NSERC Grant Enables Genome and Cell Repair Research



**NOSM RESEARCHERS** Dr. Simon Lees, principal investigator, and his co-investigators, Drs. TC Tai, Neelam Khaper and Zach Suintres, in collaboration with Drs. Chris Thome, Sujeenthar Tharmalingam, and Douglas Boreham, have received an NSERC Collaborative Research and Development (CRD) grant worth approximately \$2 million.

Together, they are exploring how reduced background radiation impacts cell development and repair, which can be applied to cancer treatment.

Because the SNOLAB is uniquely located 6,800 feet underground, scientists have access to "radiopurity" away from the background radiation that normally exists in our environment and can adversely affect rare experiments. ❏



## Opioid Addiction and Mental Health Research in Collaboration with ICES North

**DRS. DAVID MARSH**, Teresa Marsh, and Joe Eibl are working collaboratively with Executive Director Carol Eshkakogan at the Benbowopka Treatment Centre to evaluate a model of integrated care for addictions, health, and trauma.

The NOSM researchers have received funding from CIHR to evaluate an integrated care model that the Benbowopka Treatment Centre implemented and developed based on Dr. Teresa Marsh's integrated care model, Indigenous Healing and Seeking Safety (IHSS). The Centre invited the researchers to conduct the evaluation.

"We collected information from patients admitted in the previous program, then ICES North linked data to see if patient Emergency Department visits and acute care admissions were reduced following the treatment by Benbowopka," explains Dr. David Marsh, NOSM's Associate Dean, Research, Innovation, and International Relations. ❏

## Indigenous Land-Based and Clinical Opioid Treatment

**FIRST NATIONS ARE COLLABORATING** with Dr. Darrel Manitowabi, NOSM's Assistant Dean, Graduate Studies, and Dr. Marion Maar, Associate Professor, on researching comprehensive, community-based responses to the opioid crisis.

"Sustainable, trauma-informed and culturally based approaches are required to support clients in their recovery and in dealing with the colonial factors responsible for creating conditions for addictions in Indigenous communities in the first place," says Maar.

With the support of CIHR grants, Maar and Manitowabi are conducting evaluation research on Naandwe Miikaan (Healing Path), a practice model that includes Opioid Agonist Therapy as well as cultural and land-based therapies developed in Wiikwemkoong.

"A key aspect of the project includes working across sectors of service providers, leadership and knowledge keepers, to strengthen services and create supports based on Anishinaabe values and practices," says Maar. ❏



# Making Jobs Safer in Northern Ontario



**INDUSTRIES IN NORTHERN ONTARIO**, such as mining, construction, and forestry, come with unique health and safety challenges. The Centre for Research in Occupational Safety and Health (CROSH) has created a Workplace Simulator (W-SIM) that can be used to solve complex workplace problems by replicating specific workplace conditions in the lab. As of September 2019, the W-SIM is fully operational.

The W-SIM consists of a vibration platform, a virtual reality simulation, and an environmental simulator. It is the only facility in the world with this combination of equipment, which, when used in tandem, provides researchers with a comprehensive understanding of workplace conditions,

allowing them to assess problems and test solutions before bringing them to the field.

The W-SIM is used by researchers, as well as undergraduate and graduate students from departments across Laurentian University, including Engineering, Rural and Northern Health, Human Kinetics, Nursing, and others. The W-SIM is available to be rented by other universities and industries looking to test innovative solutions to workplace health problems, such as equipment and clothing.

Financial support for the W-SIM has come from FedNor, Canadian Foundation for Innovation, Northern Ontario Heritage Fund Corporation, Ontario Research Fund, and Laurentian University's Goodman School of Mines. – VICTORIA BANDEROB



## Oshkimadizijik inéwin on Reconciliation

*Dr. Joey Lynn Wabie, Dr. Diana Coholic, Sylvie Renault, Dr. Uzo Anucha, Jody Alexander, Dr. Akin Taiwo, and Michelle Kennedy*

**THIS YOUTH-LED RESEARCH** fosters the voices and perspectives of Indigenous youth. Through the support of an SSHRC Connection grant obtained by Dr. Wabie in July 2019, the *Oshkimadizijik Inéwin* [Youth Voices] team supported outreach activities in the area of reconciliation, bringing forward the voices of Indigenous youth (aged 16-29) from communities across Ontario. The Indigenous youth, who renamed themselves Reconciliation Nation, were connected to local Elders and youth workers in their community for guidance. The outcome of these outreach activities and connections is the sharing of their voices within mainstream society through social media platforms such as Facebook, Instagram, and Twitter. Their objectives are to use technology to mobilize their ideas and build a stronger Indigenous youth community across Ontario; to use these platforms to stay connected with the team and each other; to increase Indigenous youth's leadership skills; to create collective teams of Indigenous youth who will lead, provide perspectives on reconciliation, and take responsibility for guiding their own initiatives with minimal adult guidance; and to empower Indigenous youth in holding the government accountable by sharing their perspectives with educational institutions, governments, or audiences that can create change. The interdisciplinary team consists of members from many institutions and organizations, 23 Indigenous youth, four Indigenous Elders (Lisa Thomas, Vivian Recollet, Ken Oliver, H. Neil Monague, and Knowledge Holder Shannon Chief), and two Laurentian University students (Pascal Cyr and Tina Duguay). To support these Indigenous youth voices, you can follow, like, and share on the following social media platforms: Facebook (Reconciliation Nation, Instagram (youthreconciliationnation), and Twitter (@YouthRecoNation).

– MICHELLE KENNEDY



## Searching for Supernovae

**EVERY SECOND, A STAR GOES SUPERNOVA** somewhere in the universe. In our galaxy, it occurs only a few times a century, but scientists have yet to observe a supernova from the very beginning. The SuperNova Early Warning System (SNEWS) will allow astronomers to observe this phenomenon.

Stars are kept stable by the outward push of nuclear fusion and the inward pull of gravity. When a star runs out of nuclear fuel, gravity causes a core collapse, resulting in a massive explosion. Over 99% of the energy from a supernova is released as neutrinos.

Neutrinos rarely interact with regular matter and travel at nearly the speed of light. Because the light scatters inside the supernova and the neutrinos leave it before the light does, neutrinos pass through detectors on Earth several hours before the light becomes visible.

The Helium and Lead Observatory (HALO) at SNOLAB is one of seven detectors around the world that make up the SNEWS network. The SNEWS network triangulates where the supernova is happening so that astronomers can direct their telescopes to observe the light as it first reaches Earth. HALO works around the clock to detect bursts of neutrinos coming from supernovae within five kiloparsecs, over 16 000 light years.

Laurentian University physics professor Dr. Clarence Virtue is the principal investigator of HALO and HALO-1kT, a larger, more sensitive supernova detector. Dr. Christine Kraus (Laurentian), Dr. Erica Caden (SNOLAB), and Laurentian students Esther Weima and Remington Hill are all working on HALO. The SNEWS2.0 workshop was hosted by Laurentian University in June 2019, bringing researchers from the global network to Sudbury.





JOHN GUNN AND NATHAN BASILIKO



# Restoring Sudbury's Land and Lakes has Far-Reaching Impacts Beyond our Backyards

VICTORIA BANDEROB

**TEN MILLION TREES HAVE BEEN INTRODUCED** into the once barren, eroded, rocky terrain of Sudbury through greening efforts. While we know these trees are an essential component to the health of many ecosystems and improving water quality and wildlife habitat, a team at Laurentian University's Vale Living with Lakes Centre has been investigating the greening's contribution to removing carbon from the atmosphere.

In 2018, on the 40th anniversary of the City of Greater Sudbury's globally renowned Regreening Program, the Natural Sciences and Engineering Research Council of Canada (NSERC) and Ontario Centres of Excellence (OCE) awarded \$1.6 million to Laurentian University to investigate the carbon sequestration potential of recovering upland, wetland, and aquatic ecosystems as part of the TargetGHG program. The Landscape Carbon Accumulation through Reductions in Emissions (L-CARE) project is co-led by Drs. Nathan Basiliko and John Gunn in the Department of Biology.

Basiliko, Canada Research Chair in Environmental Microbiology and President of the Society of Soil Science, hopes that through quantifying the carbon that is restored to the landscape as forests regrow, the team can establish an additional angle to the value of improving air quality and investing in the large-scale liming and tree planting efforts.

By 2022, the Government of Canada will be pricing carbon at \$50 per tonne. Basiliko says that, coupled with other benefits of natural, green areas, such as improved water quality, wildlife habitat, and mental wellbeing, financial incentive provides another reason to carry out reclamation efforts.

"It's also a stopgap measure to help industries and jurisdictions tackle climate change until we wean ourselves off fossil fuels," says Basiliko.


Pollution and metal toxicity have also severely impacted Sudbury's wetlands and their keystone moss species, like peat moss, which has an enormous carbon sequestration potential concealed below its surface. Basiliko and the team are looking at re-establishing peat moss in Sudbury sustainably to increase carbon storage in the land.

L-CARE is a collaboration between 10 academic institutions, government partners, and industry, including a new partnership with Collège Boréal.

Many of the reclamation projects L-CARE is working on are being spearheaded by students. With 40 student trainees completing their masters, PhDs, postdocs, and undergrad theses, Basiliko says the funding, while helping to solve problems and contribute to basic science, is also supporting training for students, which he considers an important investment. The project is coming to an end this year, but the experimental plots that have been established will continue to be monitored for decades to come.

"There are complex, dynamic links between climate change and ecosystems, and these relationships are poorly understood. Because of that, even in this applied industrial context, we are still learning a lot of fundamentals about how ecosystems store and release carbon," says Basiliko.

Basiliko and his team are still considering in what directions the reclamation projects will go next.

"I think voices that have been left out of the Sudbury environmental impact and greening story are Indigenous voices. There are people who've been here a lot longer, that have a very important relationship with land and water and air. And I think that's the next direction that the Sudbury story could go." 



# Breaking Down Barriers and Building Strengths: Facilitating Mindfulness for Marginalized Youth



**DR. DIANA COHOLIC**, a full professor in the School of Social Work at Laurentian University, and her team have developed The Holistic Arts-Based Program (HAP) — a 12-week-long arts-based group mindfulness program currently being run out of Coholic’s lab and within the community. The program provides marginalized youth the space and techniques to help them understand and express their emotions and deal with them in a positive way, focusing on three key techniques: art-based exploration, mindfulness practice, and group work.

“It’s the combination of these that is creating the benefits we see,” says Coholic.

Coholic and her team have been seeing the benefits from HAP for almost 15 years in different populations and contexts, including children in foster care and aging out of foster care, and children with mental health needs. More recently, HAP has been successfully tested with youth experiencing challenges in schooling, women transitioning out of abusive relationships, university students, teachers, as well as men and women seeking mental health services.

Starting in 2015, the Social Science and Humanities Research Council (SSHRC) funded 4-year-long project to study the use

of HAP with 11 to 17-year-olds experiencing difficulties in school.

While they are still analyzing the data from this latest cohort, anecdotally, the youths’ moods improve, and they are learning how to deal with their anxiety.

“What we’re trying to teach them is self-awareness. If you have good self-awareness, if you’re mindful, you have the ability to understand what’s happening when a feeling starts to emerge, and you can make a choice about it. That’s the real power of mindfulness—this ability to make a choice about what you’re feeling rather than just reacting.”

Over the years, the research team has been made up of a diverse group of students from various departments at Laurentian University and universities outside of Sudbury completing their placements or graduate studies. Coholic describes the program as a train-the-trainer type of model.

“My intention as a researcher has always been to train people up in the program so they can keep it going because there is a limit to how long you can be doing your research.”

With the help of these students, HAP is moving out of the lab and into the communities. Vivian Oystreck, a PhD

student from the Rural and Northern Health program, is testing HAP with the Baby’s Breath program at Sudbury’s Better Beginnings Better Futures, which promotes optimal child development in high-risk communities through prevention and strengthening activities. Additionally, PhD student Samaneh Abedini hopes to test HAP at Compass (formally the Child and Family Centre) in Sudbury.

Daniela Folino and Amanda Conrad both brought HAP to Sudbury’s Rainbow Board for their master’s work. Conrad continues to use HAP methods with her students and conducts continuing education training in HAP for teachers from across Ontario.

Alongside Public Health staff, HAP is now being offered in some high schools and will be brought to some French-language high schools in 2020.

While the latest 4-year study is coming to an end in March, Coholic hopes to soon study the programs in schools.

“[Youth] want places where they can be authentic, where they can join with other young people, and where they can enjoy themselves. We need to offer services that youth want rather than always trying to fit youth into this box.”

“If you have good self-awareness, if you’re mindful, you have the ability to understand what’s happening when a feeling starts to emerge, and you can make a choice about it.”



DR. TAMMY EGER, FULL PROFESSOR IN HUMAN KINETICS AT LAURENTIAN UNIVERSITY, IS SHOWN HERE AT HALF MOON ISLAND.

## Breaking the Ice

“Leadership for the greater good with a mutual responsibility to care for one another – this is how we will change the world for the better.”

**IN NOVEMBER 2019**, Dr. Tammy Eger travelled with 99 other women from science, technology, mathematics, and medicine (STEMM) fields representing 33 different countries, on the largest ever all-women expedition to Antarctica. The trip was a culmination of a year-long international leadership program for women in STEMM called Homeward Bound ([www.homewardboundprojects.com.au](http://www.homewardboundprojects.com.au)), which aims to train 1,000 women over a 10-year period, in turn elevating the global conversation around women in leadership.

The program Elder was the inspirational Musimbi Kanyoro, President and CEO of the Global Fund for Women. Throughout their journey, Musimbi shared many lessons; however, the one that Dr. Eger believes the world needs to embrace now more than ever is “*isirika*.” In Musimbi’s native language, Maragoli, and in her own words, *isirika* is loosely translated as “a mutual responsibility for caring for one another.” Throughout the leadership training and Antarctica expedition, she challenged and encouraged the group to imagine a community and a world where *isirika* is at the core of leadership.

Antarctica was foundational to their learning and reinforced the lessons offered by faculty and expedition leaders. The expedition provided the group with the opportunity to reflect on their learnings in relation to leadership, strategy, visibility, science collaboration, and wellbeing, while they hiked glaciers and observed wildlife, from gentoo penguins to orca, Weddell seals, albatross, and snow petrels. The Antarctica Treaty of 1959 states that the continent shall be used for peace, scientific investigation, and international collaboration. Researchers and scientists, explorers and adventurers, artists and activists, historians and storytellers from around the world have been coming together at research stations in Antarctica for over 60 years to advance discovery for all of humanity. As Dr. Eger explained: “To thrive in this unique environment takes a community, much like how solving the pressing problems of the world requires a community and a new style of leadership. Leadership with integrity, leadership that embraces equity, diversity, and inclusion. Leadership holding Musimbi’s *isirika* at its core—leadership for the greater good with a mutual responsibility to care for one another—this is how we will change the world for the better.”

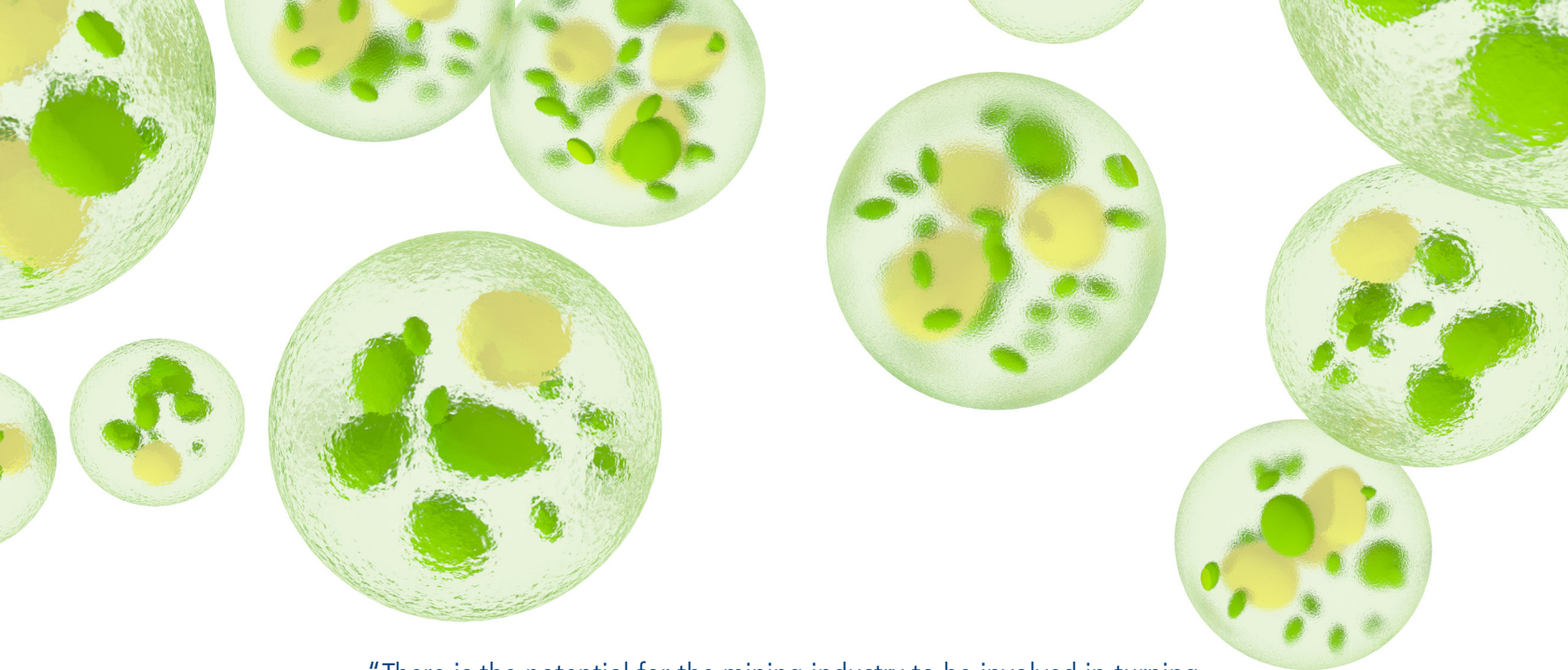
## Vernacular Construction in West Africa



**IN A PROJECT FUNDED** by the Social Sciences and Humanities Research Council, Dr. Émilie Pinard, an assistant professor at the McEwen School of Architecture, is studying the practical skills and knowledge related to vernacular construction in West Africa, particularly in Senegal and Guinea-Bissau. In these countries, building constructors act as unofficial architects, but their approaches to learning and innovation have not been widely studied. In the summer of 2019, Dr. Pinard and Isaac Edmonds, a first-year master’s student in architecture, travelled to both traditional and recent architecture sites in Guinea-Bissau and Senegal, where they carried out architectural surveys of the buildings; making drawings, taking photos, and interviewing builders to gain a better understanding of traditional architecture and the challenges of using local materials.

Many of the buildings currently being constructed in West Africa are made of concrete blocks, a material that is not environmentally and culturally sustainable. This project aims to draw lessons from vernacular architecture to learn about the materials, construction methods, and building maintenance that will help support more sustainable building techniques. With her research partners from Laval University, the university college of architecture in Dakar and the Lusophone University, Dr. Pinard plans to return to Senegal and Guinea-Bissau to gain deeper insights on the teaching and transmission of traditional construction methods. This knowledge will later be used in a design-build project that will support the construction of sustainable schools in the two African countries.





“There is the potential for the mining industry to be involved in turning currently regarded nuisance sites into potential resources for high-value compounds, including those that may help mitigate rapidly growing microbial resistance to current antibiotics.”

# Repurposing Mine Waste to Solve Global Problems

VICTORIA BANDEROB

**TAILINGS AND OFF-GAS** might appear to be troublesome waste from both abandoned and operational mines, but they might have impressive health, social, and economic benefits. Ongen, a research and development group in the Bharti School of Engineering at Laurentian University led by Dr. John Ashley Scott, is working with industry and government to find novel uses for regional resources that will have societal and commercial benefits.

Ongen is currently made up of eight graduate students, a senior research scientist, and other Laurentian faculty members, including Dr. Nathan Basiliko from the Department of Biology. The team is working on a wide variety of funded research projects, from antibiotics and nutraceuticals to biodiesel and optimally designed mining equipment.

Green algae found in the harsh conditions of tailings ponds have evolved to thrive with multiple stressors, such as high acidity and metal toxicity. Ongen has been examining microalgae from stressed environments for their ability to produce compounds that have beneficial health impacts. Two serious threats to human health are resistance to existing antibiotics and increased incidence of

cancers. Senior research scientist, Dr. Gerusa Senhorinho, and the team found that 37.5% of the strains of microalgae identified from tailing samples showed antibacterial activity against *Staphylococcus aureus*, which is significantly higher than any previously published data.

“There is potential for the mining industry to be involved in turning currently regarded nuisance sites into potential resources for high-value compounds, including those that may help mitigate rapidly growing microbial resistance to current antibiotics,” says Scott.

Senhorinho also exposed non-malignant cells and malignant ovarian and breast cancer cell lines to the strains of microalgae that had antibacterial properties. The healthy cells remained viable, whereas the viability of malignant cells was significantly reduced by the same extracts. The greatest impact was seen on a fast-dividing malignant ovarian cell line, which would normally be treated with chemotherapy.

Along with research that has potentially groundbreaking implications for human health, the team is involved in applied research for industry, with a focus on

Northern Ontario industry. With increased demand for resources, companies are forced to dig to greater depths, which comes with great costs. As companies are looking towards automation to reduce costs and increase safety, Ongen is working with mining companies to examine the impact automation can have on a mine’s operational life span and overall environmental performance.

Ongen’s work has been supported by the Ontario Centres for Excellence, Glencore’s Sudbury Integrated Nickel Operations, Mitacs, NSERC, and Advanced Insulation Systems. They have also been the recipient of the prestigious iChemE award in the research project category.

Another ongoing project includes collaborative research using the exhaust CO<sub>2</sub> emitted from smelters and electricity generators to fuel the facilities that grow the microalgae used for health beneficial compounds, like antimicrobials. This cutting-edge research is changing how we think about waste, especially that from mining, by repurposing it to solve global problems around the environment, health, and industry. [▶](#)

# RESEARCH & INNOVATION

2019 in Numbers



**\$44,000,000**

**#1**



Undergraduate University in  
**TOTAL SPONSORED  
RESEARCH INCOME**



**275**

funded  
projects



**#1 Undergraduate  
University in Graduate  
Student Research Intensity**  
(\$50,600 per graduate student)



**37.2%**

**#1 Undergraduate  
University in Total  
Sponsored Research  
Income Growth**

**168%**

**GROWTH IN  
TOTAL SPONSORED  
RESEARCH INCOME**  
(over the last five years)



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