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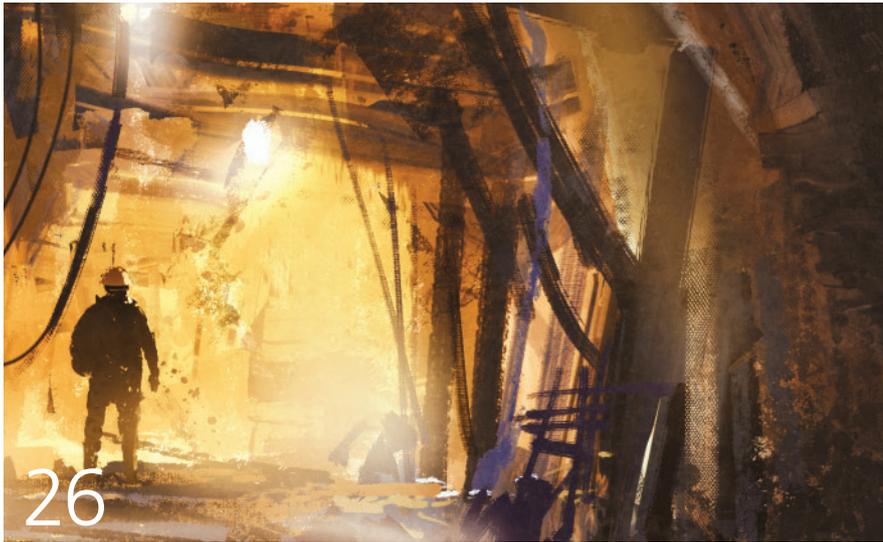


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FROM ENGINEER TO ENTREPRENEUR

By Nicole Axworthy

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Many engineers who have invented something new, or are adept at creating solutions, believe this is the most difficult part, and that it should be an easy transi-

tion to take that invention to market. In reality, creating a business out of any invention or solution embodies far more risk. A poor invention or solution is typically not why most businesses fail; rather, it's the lack of business management, focus and, perhaps, commercial viability. Entrepreneurs must navigate less structure and more complexity when running a start-up—and as new business owners, they must assess risks and challenges wisely and pivot when required.

Both engineers and entrepreneurs take on risks in their work, and to succeed in both fields they need dedication, commitment and, simply put, hustle. In this issue, we speak with several engineers-turned-entrepreneurs to find out their lessons learned when transforming their bright ideas into businesses and the support they received along the way. In "Fostering entrepreneurial success in Greater Sudbury" (p. 26), Associate Editor Adam Sidsworth shares the story of one northern Ontario community that

has relied on its mining industry for decades yet is creating a strong support system for a diverse range of new businesses—including entrepreneurial engineers who live in the area—with the help of innovation centres and university programs. And in "How entrepreneurial engineers are leveraging the tools of their trade" (p. 31), Associate Editor Marika Bigongiari speaks to two engineers who pursued their passion projects and took the daunting first step to becoming entrepreneurs, each drawing from a common set of qualities to stay motivated and to be successful.

On the topic of inspiring engineers, please also take a moment to read the biographies of the nine engineers who will be recognized for their professional achievements this year with Ontario Professional Engineers Awards (p. 10). They will be celebrated at a black-tie gala on November 16 in Toronto, Ontario. For more information, visit www.opeakwards.ca. [e](#)



THIS ISSUE Engineers have a knack for ingenious, impactful innovations, but the odds of entrepreneurial success remain daunting. In this inspiring issue, we speak with two engineers who found entrepreneurial success in diverse technological sectors. And we explore the northern Ontario city of Greater Sudbury, where engineers are at the entrepreneurial forefront that is driving the city away from its dependence on mining.

ENFORCEMENT HOTLINE Please report any person or company you suspect is practising engineering illegally or illegally using engineering titles. Call the PEO enforcement hotline at 416-224-1100, ext. 1444 or 800-339-3716, ext. 1444. Or email enforcement@peo.on.ca. Through the *Professional Engineers Act*, Professional Engineers Ontario governs licence and certificate holders and regulates professional engineering in Ontario to serve and protect the public.

ETHICS SET PROFESSIONAL ENGINEERS APART

By Nancy Hill, P.Eng., LLB, FEC, FCAE



I hope everyone enjoyed their summer. This summer I had the opportunity to attend the joint Canadian and United States Engineering Change Lab summit in Berkeley, California, where the conversation focused around engineering, ethics and entrepreneurship. With speakers from US engineering regulators as well as private compa-

nies, the event was a great opportunity to discuss issues relevant to PEO—specifically engineering, regulation and ethics. We discussed the difference between micro ethics (personal judgment, virtues, professional duties and codes of ethics) and macro ethics (engaging others to define crucial choices facing technological society and how to confront them). We also explored the role a regulator might have in macro-ethical questions. It was encouraging to see several organizations looking closely at the issue of ethics in the design process. For example, the Institute of Electrical and Electronics Engineers (IEEE) presented their recent *Ethically Aligned Design*—a global treatise on the ethics of autonomous and intelligent systems.

The event enhanced my thinking about engineering and ethics. In my view, ethics is a defining factor in what makes a professional engineer and sets them apart from an engineering graduate. As licence holders, professional engineers make public protection their first priority and are held to this by self-regulators such as Professional Engineers Ontario and its legislation, regulations and code of ethics.

Therefore, it seems to me that the role of ethics is central to both PEO's regulatory *raison d'être* and to an individual engineer's everyday engineering practice. To ensure licence holders are regularly reminded of their ethical obligations, I believe we should make annual completion of PEO's Practice Evaluation and Knowledge (PEAK) program ethics module component mandatory for all licence holders. The ethics module is a 30-minute interactive video to refresh licence holders on their ethical and professional obligations as described in the *Professional Engineers Act* (PEA). The content is relevant to both practising and non-practising licence holders and covers a variety of subjects, including PEO's regulatory role; legal and ethical obligations of licensure; professional misconduct; and a licence holder's duty to report.

It is well known that there are external pressures on PEO to make continuing professional development (CPD) mandatory for licence holders. Both the Elliot Lake Commission of Inquiry and the coroner's inquest into the death of Scott Johnson at a 2012 Radiohead concert made clear recommendations for mandatory CPD. However, in PEO's recent regulatory performance review it was recommended that the PEAK program be revised to ensure it is proportionate,

outcome focused and achievable by licence holders. Because the PEAK program has just finished as a two-year pilot project and PEO is on track to revisit the program, these recommendations are timely. Therefore, taking immediate action to make the PEAK ethics module mandatory would be a very positive interim step. It would demonstrate PEO's commitment to ongoing engineering ethics and provide us with a tool to ensure that the discussion around engineering ethics is both current and relevant.

LICENSURE

On another note, as PEO starts to grapple with updating its licensure processes, a key question is: Who do we license? In my last column, I suggested adopting the Professional Standards Authority's principles of right-touch regulation, which means understanding the problem before creating solutions and ensuring the level of regulation is proportionate to the level of risk to the public ("Our first steps to regulatory renewal and change," *Engineering Dimensions*, July/August 2019, p. 6). Right-touch regulation ensures that all of those who are practising engineering get a licence and all of those who are not do not. Although this seems simple, I think in application we make it difficult. It is clear that some people equate the need to have a licence with whether or not a stamp is needed, or if a licence is required via demand-side legislation—as in when a specific piece of legislation (like the *Environmental Protection Act*) states that a licensed engineer must complete and sign off on a specific act or task. By implication, those who take this narrow view of engineering are saying that unless an act states that an engineer needs to do a specific act, it is not engineering. This is a very limited view, and if we were to use it to describe and define engineering practice and guide who we license, we will only be licensing a very small group of people.

In contrast, the PEA states that the "practice of professional engineering" means any act of designing, composing, evaluating, advising, reporting, directing or supervising wherein the safeguarding of life, health, property or the public welfare is concerned and that requires the application of engineering principles, but does not include practising as a natural scientist. Clearly, this definition encompasses much more than those whose work requires a stamp. As well, it encompasses more than those tasks that are specifically identified in acts other than the PEA.

In my opinion, it is time that we become inclusive of all aspects of engineering. It is very important that we are more intentional regarding this issue as we undertake the task of updating our licensure processes. This issue has the potential to impact all aspects of the licensure process. **e**

PEO COUNCIL TO DISCUSS EXTERNAL REVIEW ACTION PLAN

By Adam Sidsworth

PEO Council could possibly take action this month on an external report that examined PEO's performance as Ontario's engineering regulator. The report, by Harry Cayton, international consultant to United Kingdom-based Professional Standards Authority, was made public on PEO's website (www.peo.on.ca/index.php/ci_id/33534/la_id/1.htm) by Council following its June meeting.

Council approved a motion in September 2018 to have an external regulatory review conducted to identify any gaps between PEO's current practices and the process, procedures and policies exhibited by the best regulators.

"Council showed bold leadership in undertaking this review," PEO Registrar Johnny Zuccon, P.Eng., FEC, says. "This commitment to process improvement aligns with the mandate I received upon my appointment as registrar last year to champion unprecedented change and renewal initiatives within PEO. This final report and its accompanying recommendations provide us with the opportunity and direction necessary to raise our regulatory performance to the international gold standard. Although the results may reflect that PEO has not kept pace with evolving best practices, I look forward to working with Council and staff to implement the changes required to right the ship and ensure that PEO is effectively fulfilling its mandate as set out in the *Professional Engineers Act* (PEA)." At its June meeting, Council instructed Zuccon to initiate a high-level action plan based on the report's feedback for Council to consider at its September meeting.

"PEO needs to modernize and focus on its primary role as Ontario's engineering regulator, and the external review is a good first step," PEO President Nancy Hill, P.Eng., LLB, FEC, says. "It identifies a number of areas in need of improvement and will be a very important tool as we chart our path forward. It will provide benchmarks against which we can measure our per-

formance. The modernization of PEO will be a multi-year process; it cannot happen overnight. However, I hope that we can take significant, measurable steps over the next year, particularly to licensing."

THE STANDARDS OF GOOD REGULATION

In his report, Cayton wrote 15 recommendations to improve PEO's performance (see "Council approves public release of its external review," *Engineering Dimensions*, July/August 2019, p. 60) after finding that PEO failed to meet less than half the standards of good regulation Cayton used to measure PEO's performance as a regulator. Of the 22 standards Cayton used, PEO met eight and partially met three. Cayton divided the 22 standards into three categories:

- licensing and registration (seven standards);
- complaints, discipline, compliance and enforcement (11 standards); and
- professional standards and guidance (four standards).

Following is a synopsis of each measurement Cayton and his team used to measure PEO's performance. Included is if PEO met, partially met or failed to meet each standard, along with a brief explanation.

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Licensing and registration

PEO meets only one out of seven standards for licensing and registration, with Cayton writing that PEO must have accurate information on all members and make that information publicly available. "The general principle of publishing all relevant information about registrants aligns with best practices," Cayton wrote, "yet we find no evidence that PEO expends much effort to check the accuracy of older data with registrants to ensure information on the register is accurate and up to date. It is also important that employers are aware of the need to check the registration status of registrants...we find that improvement is needed to enhance PEO's approach to transparency and fairness and to implement a quality control mechanism, and in relation to its approach to identifying and managing risks in cases where a registrant has worked illegally whilst failing to maintain up-to-date registration."

Among the standards in licensing and registration, PEO:

- Does not meet the standard that only those who meet the regulator's requirements are licensed or authorized, with Cayton citing that PEO "cannot confirm whether *all* applicants who may meet requirements are licensed or authorized, that many applicants don't follow through the complicated application process and that the committees involved in assessing applications are "subjective in nature," with "little evidence to demonstrate how decision-making" is analyzed;
- Does not meet the standard that the registration process, including the appeal process, is fair, with Cayton citing the process "lengthy, complex and difficult to follow" and heavily dependent on volunteers with wide-ranging experience and biases not managed by PEO; applications are also paper based and stored in unsecured cabinets and boxes;
- Does not meet the standard of linking academic and experience requirements, the Professional Practice Examination and good character to the standards of practice, with Cayton concerned about the lack of an English fluency language competency and that PEO's use of health as a marker of good character is inappropriate;
- Meets the standard of making all academic, experience and other requirements publicly available, although Cayton was concerned that the information was "very complex" and "difficult to follow";
- Does not meet the standard that PEO make publicly available information about licence and certificate of authorization (C of A)

holders, including restrictions on their practices. Cayton cited members he queried who had terms, conditions or limitations placed on their licences but no corresponding disciplinary history and, in one case, mismatching information. Additionally, some members' public files are incomplete;

- Does not meet the standard of making employers and supervising engineers aware of the importance of checking the status of licence and C of A holders; and
- Does not meet the standard requiring that licence and C of A holders maintain their standards of competent practice, with Cayton citing the optional status of the Practice Evaluation and Knowledge program, in which only one-third of members participate.

Complaints, discipline, compliance and enforcement

Of the 11 standards in this category, PEO meets six standards and partially meets one standard. PEO:

- Meets the standard that anybody can raise a concern about the conduct and/or competence of a licence or C of A holder, although Cayton noted that PEO investigators have an artificially heavy workload due to a lack of definitions in the PEA and PEO's acting on one interpretation of the act;
- Meets the standard regarding conduct and competence with employers, local arbitrators and other regulators, with Cayton observing that PEO regularly contacts building officials regarding potentially unsafe situations;
- Does not meet the standard of determining if complaints have merit and, if so, whether the licence or C of A holder's competence is impaired. Cayton observed that "PEO does not have a defined process for dealing with member impairment and/or referral to another relevant organization";
- Meets the standard that all conduct- and competence-related complaints are reviewed on receipt, with serious cases prioritized. Cayton observed that PEO staff have a streamlined approach to weed out all complaints without merit or unrelated to engineering;
- Does not meet the standard that complaints, discipline and enforcement processes are transparent, fair, proportionate and focused on protecting the public. Cayton noted that separate departments oversee complex processes. Additionally, publicly available complaint forms put an undue onus on the public when filing the complaint, and that PEO discipline committees are driven by factors unrelated to the public interest;
- Meets the standard of protecting the public from risk of harm and to public confidence in the profession related to title rights, with 98 per cent of cases resolved on first contact with the alleged perpetrator;
- Does not meet the standard of concluding conduct and competence cases quickly and making sure delays do not harm the public or engineering clients, with the average case lasting approximately 343 days;
- Meets the standard of updating all involved parties in a case of its progress;
- Partially meets the standard of making well-reasoned, consistent decisions in discipline and complaints cases, with complaints cases meeting the standard but not discipline cases;
- Does not meet the standard of publishing and communicating all final decisions of the complaints and discipline committees. Notably, Cayton cited that complaints cases are often not made fully

public, meaning members' names are permitted to be withheld; and

- Meets the standard that information about complaints and discipline is securely retained, although PEO stores paper files openly at PEO's offices.

Professional standards and guidance

PEO met one standard and partially met two standards in this area, which covers practice guidelines and professional standards. PEO:

- Partially meets the standard of keeping practice standards and guidelines up to date, with practice and legislation standards met but has no consistent process to review and change standards;
- Meets the standard of guiding licence and C of A holders to apply PEO's standards of practice to specific issues, particularly by providing relevant information posted on PEO's website;
- Partially meets the standard of taking into account stakeholders' views and experiences, developments in national and international regulation and other regulators' work, with Cayton noting that PEO meets this in relation to guidance but not standards; and
- Does not meet the standard of publishing standards and guidance in accessible formats easy to find by various stakeholders. Cayton noted that "standards" does not have a tab on PEO's website and is therefore not easily found by members of the public. Additionally, the information there is not in plain English.

STAKEHOLDER RESPONSE TO REVIEW

The final report of PEO's external review was sent directly to key stakeholders, such as the Ontario Society of Professional Engineers (OSPE), Consulting Engineers of Ontario (CEO), and Ontario's attorney general. CEO Chief Executive Officer Bruce Matthews, P.Eng., whose organization and member firms are directly impacted by PEO's regulatory activities, supports any PEO decision to move forward with the recommen-

dations, adding that Cayton's report states that PEO staff and volunteers have the skills and energy to move forward. "There are very small windows under a government's mandate to make those changes, and PEO should try to maximize changes to the PEA under the current government mandate," Matthews told *Engineering Dimensions*. However, Matthews also adds that "half of Cayton's recommendations deal with PEO's lack of regulatory focus and numerous activities that cannot be supported under PEO's mandate. And a couple of them relate to integrity, raising the question of association interests versus the public interest." He asserts the report states that PEO is a members' club rather than a regulator. "That's a powerful truth," Matthew adds. "That's a statement made 19 years after the creation of OSPE, which is the membership association that PEO had a major hand in creating."

In an interview with *Engineering Dimensions*, OSPE President and Chair Tibor Turi, P.Eng., noted that OSPE agreed with all of Cayton's recommendations. "In fact, we've been advocating for a number of these changes for years," Turi says. "Without a strong regulator protecting the public, the public perception of the engineering profession is going to be negatively impacted. We support a strong PEO, and we're pleased to see that PEO Council has also agreed with a number of the recommendations and will be working on a plan to implement them. OSPE will continue to work with PEO to ensure students, interns and engineers are protected."

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PREMIER DOUG FORD APPOINTS NEW ATTORNEY GENERAL

By Adam Sidsworth



Newly appointed Attorney General Doug Downey has a background in regulatory and advocacy volunteerism for Ontario's legal profession.

Doug Downey was appointed Ontario's attorney general following a cabinet shuffle on June 20. Downey replaces former attorney general Caroline Mulroney, who remains minister responsible for francophone affairs while also becoming minister of transportation.

Under delegated authority of the attorney general, PEO regulates and advances the practice of engineering to protect the public interest.

Downey, who is also the Progressive Conservative (PC) MPP for Barrie–Springwater–Oro-Medonte, told media outlet Simcoe.com that he was “thrilled” about his new cabinet position. “It’s a role that I believe I’m suited for,” Downey said. “It’s something that I think I can add value to.” Downey is serving his first term as MPP after being appointed as the PC candidate for his riding by PC Leader (and subsequent Premier) Doug Ford in 2018. After the Tories won the June 2018 election, Downey was named to the Standing Committee on Finance and Economic Affairs; he subsequently served as vice chair of the Select Committee on Financial Transparency and as deputy government whip.

Downey earned his law degree from Dalhousie University in 1997, subsequently earning an LLM in municipal and development law from York University in 2008. In 2001, he became a partner in the Orillia, Ontario-based firm Downey Tornosky Lassaline & Timpano Law while simultaneously serving as city councillor for Orillia for six years in the 2000s. He has held volunteer positions with numerous civic organizations, including past president of both the Kiwanis Club of Orillia and Orillia District Chamber of Commerce and chair of Big Brothers Big Sisters of Orillia and District.

Downey is no stranger to the world of professional self-regulation and professional advocacy: As a licensed lawyer who specializes in real estate law, Downey was a member of an expert panel in 2013 that recommended regulating home inspectors; that regulation eventually became reality with the passing of the *Putting Consumers First Act* by the Ontario Legislature in April 2017. Downey was also a volunteer with the Ontario Bar Association from 2009 to 2014, during which time he was treasurer and chair of its Law Practice Program (LPP) committee. Introduced in tandem with the Law Society of Upper Canada (now Law Society of Ontario), the LPP was introduced in 2013 as a new path to licensure for lawyers in Ontario, allowing lawyer candidates to participate in a four-month training course at either Ryerson University or the University of Ottawa and a subsequent four-month work placement in lieu of the traditional 10-month articling (paid work experience) requirement.

Downey's experience in professional self-regulation may serve him well in his dealings with PEO. Downey takes over the attorney general's office just as PEO began work on an action plan to implement recommendations of an external review of its regulatory performance (see p. 7). The review's final report provides 15 recommendations for PEO, including one noting that PEO should “work with the attorney general's office to seek changes to its statute to modernize its organization and regulatory powers.” A copy of the report was sent to the attorney general's office prior to being made public in June.

MEET THE 2019 WINNERS OF THE ONTARIO PROFESSIONAL ENGINEERS AWARDS

By Nicole Axworthy

This year marks the 72nd anniversary of the Ontario Professional Engineers Awards, a program founded by PEO to recognize engineers for their professional achievements in such categories as engineering excellence, research and development, entrepreneurship and young engineer. The program also recognizes a team of engineers that has had a significant and positive impact on society, industry and/or engineering with the Award for Engineering Project or Achievement.

Since 2005, the awards have been presented jointly by PEO and the Ontario Society of Professional Engineers. This year, the following nine awardees and one project will be honoured at a special gala on Saturday, November 16 in Toronto, Ontario. For more information, visit www.opeawards.ca.

PROFESSIONAL ENGINEERS GOLD MEDAL

Brian J. Bonnick, P.Eng., executive vice president, technology, and chief technology officer, IMAX Corp., has combined his engineering skills and business acumen to deliver success, innovation and profits to six Canadian corporations. With 20 years of engineering and senior management success at Nortel, Mitel, Amdhal and Electrohome, Bonnick was well prepared for his new role when he joined IMAX in 1999 as vice president, research and technology. He was

instrumental in turning the firm around by championing the development of the IMAX digital remastering technology—a proprietary system designed to digitally re-master Hollywood blockbuster movies in IMAX format and enabling the company to enter the commercial Hollywood film market. The change in corporate focus resulted in an increase in the number of IMAX-based theatres worldwide from 40 to more than 1500. Bonnicks then headed the development of the IMAX MPX theatre system, which allows theatres to dramatically improve their audio sound systems and resulted in six patents in the fields of acoustics and theatre design. His most recent achievement is the firm's largest-ever R&D project—a new generation of laser projection and sound systems that provides audiences a more immersive and visceral viewing experience. Beyond his professional and engineering achievements, Bonnicks is an active volunteer, mentoring high school students considering engineering studies and supporting engineering teams participating at the FIRST North American robotics competitions.

ENGINEERING MEDAL—ENGINEERING EXCELLENCE

John McPhee, PhD, P.Eng., a professor of systems design engineering at the University of Waterloo and Canada research chair in system dynamics, has devoted his career to studying things that move—researching the modelling, control, simulation and design of dynamic physical systems. He pioneered the use of linear graph theory and symbolic computing to model dynamic systems, providing a powerful systems-level design methodology that allows engineers to model and simulate the impact of individual components on overall performance of multi-domain systems (such as hybrid electric vehicles) within a single design package. His research algorithms have been commercialized by Canadian engineering software firm Maplesoft and are a core component of its MapleSim modelling software, which is used by companies across the globe, including major automotive companies such as Toyota and Ford. McPhee is also the director of the University of Waterloo's Motion Research Group, which brings together students and professionals who develop computer models of the real world. He is a member of the *Golf Digest* technical panel and has served as the associate editor of seven international journals—two of which he helped found. He was also a co-founder of the Waterloo Centre for Automotive Research, which has become the largest academic cluster for automotive engineering research in Canada.

ENGINEERING MEDAL—MANAGEMENT

As director, technology and innovation at Celestica Inc., **Irene Sterian, P.Eng.**, manages a global team of senior engineers to provide electronics technology solutions for healthcare, industry, aerospace, defense, enterprise, telecommunication and the solar market. Sterian began her engineering career at IBM, where her engineering management skills led to several achievements, including leading development of the first five surface-mount technology assembly lines at IBM Canada; and introducing the first flip chip assembly technology in Canada to enable electronics miniaturization of PCMCIA cards. Since joining Celestica in 1994, Sterian has managed teams of over 50 engineers from around the world, providing advanced technologies for healthcare, industry, renewable energy, aerospace, defense, enterprise and telecommunications electronics. In 2014, Sterian founded the Refined Manufacturing Acceleration Process Network (ReMAP), a \$25-million innovation accelerator jointly funded by the Business-Led Network of Centres of Excellence program and its partners. As

president and CEO of ReMAP, Sterian has formed an integrated shared ecosystem dedicated to accelerating the commercialization of innovations developed in Canada for the global market. To date, this group has attracted \$55 million in foreign investment and revenues, built 195 prototypes and scaled 30 products to market.

ENGINEERING MEDAL—RESEARCH AND DEVELOPMENT

A University of Toronto professor in the faculty of chemical engineering and applied chemistry, **Milica Radisic, PhD, P.Eng.**, is an international leader in cardiac tissue engineering—building living heart tissue in the laboratory using stem cells and biomaterials. A 2011 recipient of an Ontario Professional Engineers Award in the Young Engineer category, she was the first to use chronic electrical field stimulation to enable assembly of individual heart cells into functional and differentiated cardiac tissue. A Canada research chair (tier 2) in functional cardiovascular tissue engineering, Radisic pioneered a heart-on-a-chip technology—a cardiac contractility assay called Biowire. Although the Biowire technology demonstrated impressive tissue maturation levels, it did not include perfusable vasculature like real human tissue. In response to this challenge, she developed Angio-Chip, a new technology for vascularization of tissues for organ-on-a-chip engineering, tissue engineering, and implantation. AngioChip enables the creation of functional heart and liver tissue with built-in blood vessel networks. Both technologies are commercially developed through her company, TARA Biosystems.

Zheng Hong (George) Zhu, PhD, P.Eng., professor and chair, department of mechanical engineering, York University, has made significant impacts in the aerospace industry. His most important achievement is the autonomous capture and removal of space debris using a novel fuel-less propulsion technology based on electrodynamic tethers. In 2015, Zhu was awarded a grant by the Canadian Space Agency (CSA) to demonstrate the technology in space using the CubeSat platform. The successful demonstration would change the design and operation of future spacecraft and rockets, which are required to re-enter Earth's atmosphere within 25 years after a mission. In 2018, he was awarded another CSA grant to design, build, launch and operate a CubeSat for observing permafrost thawing in northern Canada. The thawing permafrost will release locked greenhouse gases into the Earth's atmosphere and exacerbate the effects of global climate change. Zhu is the only professor who is leading two Canadian CubeSat missions as a principal investigator in Canada. In addition, Zhu supported the development of a revolutionary technology by Pratt Whitney Canada that changes the composition of the gas turbine

component from metal to nano-coating composite material. At York University, Zhu developed new professional development programs for engineering interns, leads research teams for large-scale interdisciplinary research projects, mentors junior faculty members and engages youth in the community to learn about the field of science, technology, engineering and mathematics.

ENGINEERING MEDAL—ENTREPRENEURSHIP

Milos R. Popovic, PhD, P.Eng., University of Toronto professor and director, KITE Research Institute, University Health Network, saw the urgency in preventing and solving problems for patients with spinal cord injuries. He invented the Mynd-Move therapy, a non-invasive electrical stimulation therapy for restoring upper limb function in people with severe upper limb paralysis due to conditions such as stroke and spinal cord injury. A 2008 recipient of an Ontario Professional Engineers Award in the Research and Development category, Popovic co-founded MyndTec to launch MyndMove commercially, leasing the technology to rehabilitation clinics. With six patents to his name, the system is now available in approximately 20 clinics across Canada and the United States, with another 70 in the works. MyndTec's technology is currently being validated in a large clinical trial across North America, funded by a multi-million-dollar grant by the US Department of Defense. Continuing to innovate and providing patients an opportunity to regain their lives, Popovic also co-founded the Centre for Advancing Neurotechnological Innovation to Application at the University Health Network and the University of Toronto. Under his leadership, this interdisciplinary research initiative received an unprecedented \$16.3 million in funding to create advanced neuromodulation therapies. The team will develop methods of treating neurological diseases using electrical stimulation of the brain.

ENGINEERING MEDAL—YOUNG ENGINEER

An assistant professor with the University of Toronto's civil and mineral engineering faculty, **Shoshanna Saxe, PhD, P.Eng.**, examines the societal impact of infrastructure, with a focus on sustainable urban infrastructure, mega infrastructure, transit infrastructure and urban materials flows. Her main expertise is in life-cycle greenhouse gas (GHG) evaluation of horizontal infrastructure (roads, rail and pipes), including the impacts of construction, operation, travel behaviour and interactions with land use. A civil engineer by training, Saxe was employed at Arup Toronto, where she worked on the design and construction of four Toronto subway stations and the Billy Bishop Airport tunnel. During this time, she co-created iBorehole, an Apple app for geo-technical borehole logging. After returning to academia to work on her PhD, Saxe conducted a detailed analysis of the London Underground's Jubilee line extension and Toronto's Sheppard subway. She gathered data on the GHGs produced during construction and operation of the line, and saved from travel and land use change, to calculate the GHG payback period for rail construction. The work highlights the environmental implications of infrastructure construc-

tion and the need for significant changes in planning, construction and management of infrastructure to meet sustainability commitments. At the University of Toronto, Saxe developed the new graduate class "Large Scale Infrastructure and Sustainability," which explores what sustainability means in the context of infrastructure development, examines infrastructure needs and sustainability at the global and project scale, and provides students with the necessary tools to have an impact on infrastructure sustainability.

CITIZENSHIP AWARD

For **Jaime A. Libaque-Esaine, MBA, P.Eng.**, a long-time engineer with Ontario Hydro (now retired) and lifelong volunteer and mentor, citizenship has been an integral part of life for 38 years. Following his immigration to Canada in 1981, and licensure as a professional engineer in 1982, Libaque-Esaine embarked on a 31-year career with Ontario Hydro, beginning as a junior engineer-in-training and retiring as a senior project manager, managing multi-million-dollar projects and supervising as many as 80 people. Throughout his career, Libaque-Esaine participated in research projects, co-authored papers, trained junior engineers and co-workers and developed operational policies. Throughout his life, he has also immersed himself as a volunteer and community leader. While advocating on a wide range of issues (social service, maintaining culture, access to trades and professions, etc.), he worked tirelessly with more than 70 ethnic-based organizations. As a founding member of the Hispanic-Canadian Professionals, he organized a project to assist international engineering graduates with attaining licensure with PEO. As a member of the St. Lawrence Martyr Parish for the last 25 years, he has been actively involved in many church-related projects. And as a founding member of the Knights of Columbus St. Lawrence Council in Scarborough in 2003, he helped grow the organization and led the development of 20 programs benefiting the local Scarborough community.

Ronald Sidon, MBA, P.Eng., has a career-long history of volunteering and philanthropy, giving back to the engineering profession and the community. After a stint as a systems analyst with IBM, Sidon started five businesses that developed several innovative technologies, including the first electronic cream-dispensing machine seen at Tim Horton's, a heated tunnel for wrapping new cars in a protective coating for transport and a residential condensate removal pump. Sidon contributes extensively to his alma mater, the University of Toronto, working with students in design courses, fundraising to provide undergraduate and graduate scholarships and contributing to the new Myhal Centre for Engineering Innovation and Entrepreneurship. He also volunteers his time to help several small engineering-based companies in Ontario, including iMerciv Inc., Good Robot, and Blade Filters. Sidon has made extensive volunteer contributions internationally. In Tanzania, he was the primary donor and spearheaded a project that supplies water to 3500 rural residents, worked with a charity that distributes soccer equipment to children's soccer teams and funded the construction of a building for teachers and a kitchen for volunteer parents to cook meals for students. Since retiring, Sidon continues to



Outgoing President David Brown, P.Eng., BDS, C.E.T., FEC (right), presents outgoing Past President Bob Dony, PhD, P.Eng., FEC, with a gift to mark the end of his time on Council.



From left: PEO Lieutenant Governor—Appointed Councillor Vajahat Banday, P.Eng., FEC, Daryoush Mortazavi, PhD, P.Eng., Peter Cushman, P.Eng., and Denis Carlos, P.Eng., on a break during the 2019 AGM.



PEO East Central Region Councillor Keivan Torabi, PhD, P.Eng. (left), with Lui Tai, P.Eng., chair, PEO York Chapter, at the 2019 AGM.



Incoming President Nancy Hill, P.Eng., LLB, FEC, prepares to announce keynote speaker Nora Young at the AGM luncheon.



Mohinder Grover, PhD, P.Eng., FEC, of the Willowdale/Thornhill Chapter (left) chats with Daryoush Mortazavi, PhD, P.Eng., at the 2019 AGM.

ENGINEERS CANADA SWEARS IN NEW PRESIDENT AT ANNUAL MEETING

By Adam Sidsworth

Engineers Canada held its 2019 spring meetings and annual meeting of members (AMM) on May 23 to 25 in Quebec City, Quebec, where it swore in its 2019–2020 board. David T. Lynch, PhD, P.Eng. (Alberta), FEC, was sworn in as president. Lynch received his bachelor of applied science in chemical engineering from the University of New Brunswick and subsequently attended the University of Alberta (U of A), earning his PhD, which focused on catalysis and chemical reactor engineering. He subsequently joined the U of A's engineering faculty, where he is currently professor emeritus of chemical engineering and still involved on a part-time basis. During his 36-year academic career—including 21 as dean of engineering—he doubled the total engineering undergraduate and graduate student enrollment, hired over 280 new engineering professors and provided leadership in several major initiatives, including the establishment of the National Institute for Nanotechnology. He has served on the Association of Professional Engineers and Geoscientists of Alberta's board of examiners for 21 years, along with various other committees. Lynch was also a member of the Canadian Engineering Accreditation Board for 11 years, serving as vice chair, chair and past chair over the last five years. Lynch has managed to couple his Engineers Canada presidency with his work at the U of A, where he is part of a research group focusing on equity, diversity and inclusivity topics related to the engineering profession.

In an interview with *Engineering Dimensions*, Lynch stated that “the goals of the president have to be aligned with the strategic plan of Engineers Canada,” citing the umbrella engineering organization's 2019–2021 Strategic Plan. Among other initiatives, the plan aims to:

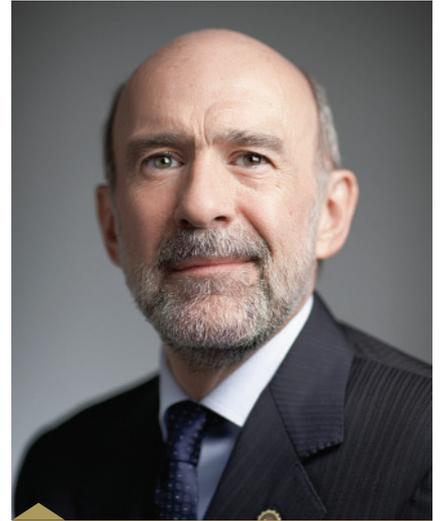
- Improve and enhance the accountability of accreditation through the Accreditation Board, which Lynch notes the provincial regulators identify as a critical service, along with the services provided through the Canadian Engineering Qualifications Board;
- Work with the provincial regulators to provide a competency-based assessment tool, born out of an Engineers and Geoscientists BC implementation, to increase harmonization and transparency among the provincial regulators; and
- Increase diversity among licensed engineers, particularly among women and indigenous Canadians, who are critically underrepresented in the profession.

Additionally, arising from the recently completed work of an Engineers Canada Funding Task Force, Lynch is interested in developing approaches to make the funding model more sustainable in the long term for Engineers Canada. Engineers Canada currently receives \$10.24 for each licensed member from each provincial regulator, in addition to other revenue sources.

Lynch admits that there is hard work ahead for him and the Engineers Canada board and staff, noting that the board made headway at their board planning retreat in Whitehorse, Yukon, in June. Lynch intends to cross the country to meet with and better understand the needs of the provincial engineering regulators and other Engineers Canada stakeholders and, since engineering is becoming increasingly international, clarify and strengthen relationships with key international counterparts.

PEO REPRESENTED

Dignitaries representing Canada's provincial and territorial engineering regulators attended the spring meetings and AMM. PEO was represented at the meetings by PEO President Nancy Hill, P.Eng., LLB, FEC, and Registrar Johnny Zuccon, P.Eng., FEC. Hill updated the delegation during the regulator presentations, highlighting many



David T. Lynch, PhD, P.Eng. (Alberta), FEC, is Engineers Canada's 2019–2020 president. Lynch will focus on implementing the national engineering organization's strategic plan.

achievements over the previous year, including PEO's introduction of Council term limits, designed to ensure fresh perspectives; the two-year anniversary of the Practice Evaluation and Knowledge program; and the successful approval of fee increases listed in By-Law No. 1 to keep in line with inflation (see “Council approves 20 per cent increase to all fees,” *Engineering Dimensions*, May/June 2019, p. 8). Additionally, Hill noted PEO's co-regulator program, a protocol approved by Council in 2017 allowing PEO to contact provincial ministries when they propose changes to provincial acts that would interfere with PEO's exclusive legislative authority to enforce the *Professional Engineers Act*. However, Hill also pointed out PEO's difficult lessons, including the external pressure for mandatory continuing professional development that resulted from the

Elliot Lake inquiry (see "After the fall: Learning lessons of Elliot Lake," *Engineering Dimensions*, January/February 2015, p. 31) and the Downsview stage collapse (see "Radiohead coroner's inquest issues recommendations," *Engineering Dimensions*, July/August 2019, p. 9) and from increased media reports suggesting that regulators put members' interests first. Hill also noted challenges to the engineering profession, including the continuing justification for Canadian experience required by all provincial engineering regulators.

PEO is represented on Engineers Canada's board by five directors, including two new members, Changiz Sadr, P.Eng., FEC, and Kelly Reid, P.Eng. Sadr has served on several PEO committees and is a former PEO regional councillor, and Reid was a vice president (appointed) and councillor-at-large on PEO Council until May 2019. Returning are Christian Bellini, P.Eng., FEC, who is also PEO Council's vice president (elected); Annette Bergeron, P.Eng., FEC, a former Engineers Canada and PEO president; and Danny Chui, P.Eng., a former PEO West Central Region councillor.

BITS & PIECES

First Canadian Place (originally First Bank Building) is a 72-floor skyscraper in Toronto, Ontario, that was built in 1975. At 978 feet (298 metres), it remains Canada's tallest skyscraper. From 2009–2012, its 45,000 marble panels were replaced with new ones in glass due to maintenance concerns.



The Superstack in Sudbury, Ontario, is the tallest chimney in Canada at 1247 feet (380 metres) and is the second tallest freestanding structure, behind the CN Tower. Built in 60 days in 1970, it's located at Vale Inco's Copper Cliff processing facility and set to be dismantled in 2020.

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QUEBEC'S BILL 29 TO UPDATE ENGINEERING ACT

By Adam Sidsworth



The definition of engineering may be expanded by Quebec's Bill 29, *An Act to Amend the Professional Code and Other Provisions in Particular in the Oral Health and the Applied Science Sectors*, if it is passed by the National Assembly. The omnibus bill, which also affects architects, dentists, chartered professional accountants and denturologists (denturists), was introduced by Justice Minister Sonia LeBel on June 5.

"The Ordre des ingénieurs du Québec (OIQ) welcomes the bill amending the *Engineers Act* [because] the current *Engineers Act* dates back to 1964," OIQ President Kathy Baig, ing., FEC, says. "The act absolutely needs to be modernized so that it better reflects the changes in science and technology over the last several decades and accommodates future developments." OIQ is pleased that the government has made this issue a priority and remains hopeful that the National Assembly will pass the bill during the current session. "Three different bills aimed at modernizing the *Engineers Act* all died on the order paper in recent years after elections were called," OIQ stated in a press release. However, the current government was elected in October 2018 and, barring any early dissolutions of the National Assembly, has three years left in its mandate.

The bill's proposed amendments to Quebec's *Engineers Act* include:

- A broader defined field of practice for engineers that takes greater effort to incorporate

computer and software engineering, biomedical engineering, environmental engineering and emerging disciplines;

- New reserved acts for engineers, including certifying the results generated by computer systems or design assistance software that use concepts derived from engineering principles; and
- Significantly increased fines for using plans and specifications not signed and sealed by an engineer to a maximum \$62,500 for an individual and \$250,000 for a corporation, up from the current \$10,000 for each.

In addition to the proposed types of new licences, OIQ plans on submitting recommendations in the hope that the new act will include the possibility of issuing permanent restrictive permits that OIQ says would "help integrate professionals with atypical profiles into Quebec's professional system, such as internationally trained professionals (ITPs) who have specific expertise in a very small field of engineering practice." OIQ already has a temporary restrictive permit for engineering graduates from France, allowing them to practise under the supervision of a licensed engineer. Among Quebec's 46 regulators, OIQ has one of the highest number of applications from ITPs. In an interview with *Engineering Dimensions* in August 2018, Baig said that OIQ is committed to licensing 75 per cent of ITP applicants within eight months of receipt of their applications (see "Quebec regulator announces new regulation affecting internationally trained applicants," *Engineering Dimensions*, September/October 2018, p. 7).

The bill is subject to amendment as it navigates the legislative process, and OIQ is still in the process of analyzing the details of the bill. However, OIQ will likely suggest amendments, notably that the bill should include mandatory supervision of building sites. OIQ met with multiple stakeholders throughout the summer and also held consultations with its members through in-person meetings and a web conference in addition to providing a special email address for members to provide feedback.

The proposed changes come shortly after OIQ regained its regulatory independence after a two-and-a-half-year trusteeship, which had been imposed by the previous provincial government after concerns about OIQ's financial instability and the regulator's perceived inability to protect the public (see "Quebec government lifts OIQ's trusteeship," *Engineering Dimensions*, May/June 2019, p. 9).

OIQ's potential amendments to its *Engineers Act* come as other provincial engineering regulators work to update their acts and definitions of engineering. Earlier this year, the Association of Professional Engineers and Geoscientists of Alberta (APEGA), in conjunction with the province's engineering technologists regulator, submitted over 160 recommendations to the Alberta government to update that province's engineering act, which saw its last major overhaul in 1981 and is, according to APEGA, "outdated" and "full of ambiguous language" (see "Alberta regulator seeks to modernize its engineering act," *Engineering Dimensions*, July/August 2019, p. 24).

OSPE INTRODUCES NEW PRESIDENT AND STRATEGIC PLAN

By Adam Sidsworth



OSPE President and Chair Tibor Turi, PhD, P.Eng. (right), presents OSPE Past Chair Jonathan Hack, P.Eng. (left), with a Certificate of Meritorious Service at OSPE's AGM.

In addition to the strategic plan initiatives, Turi notes that he is focusing on three areas this year. The first, says Turi, is to make sure volunteers and subject matter experts on OSPE's six advocacy committees "are committed to research and policy recommendations to government and advocacy to make sure [our] goals are heard." Turi adds: "My personal goal is to make sure we're producing a united message. On June 26, we hosted an all-day committees meeting, where we brought together task force chairs to discuss the current initiatives and begin collaborating, with an aim [to unite] at our April 2020 lobby day and MPP reception at Queen's Park." Turi's second goal is inclusion. Turi observes: "In June, OSPE hosted a Women in Engineering forum in Kitchener. We had more than 300 attendees from industry, government and academia, and we discussed mentorship and sponsorship and working together to find solutions to ensure women succeed in engineering. And on November 6, we'll be hosting our equity, diversity and inclusion imperative in Ottawa, where we're expecting more than 1000 attendees." Turi's third goal is the launch of OSPE Exchange Hubs, hosted at six university campuses across the province (Queen's, Ryerson, McMaster, Guelph, Windsor and Waterloo). Turi describes these as "community-gathering spaces where people come to discuss initiatives and priorities. These hubs will allow students, graduates, engineers, volunteers and ambassadors to host events in their own communities" for mentoring, development and advocacy initiatives. Turi wants to expand OSPE's presence to locations across Ontario, noting that past events were hosted in Toronto, where most of its membership resides.

The Ontario Society of Professional Engineers (OSPE) welcomed the newest members of its board of directors and introduced its 2019–2022 Strategic Plan on May 8 as part of the society's annual general meeting in Kingston, Ontario.

Tibor Turi, PhD, P.Eng., was announced as OSPE's new president and chair for 2019–2020, along with Vice Chair Réjeanne Aimey, P.Eng., Treasurer Ron Clifton, P.Eng., Secretary Jerome James, P.Eng., Past Chair Jonathan Hack, P.Eng., and Directors Jim Chisholm, P.Eng., Anna Gkalimani, P.Eng., Tom Murad, P.Eng., Tyler Schierholtz, P.Eng., Christina Visser, P.Eng., Angela Wojtyla, P.Eng., and Laura Yu, P.Eng.

Founded in 2000, OSPE is Ontario's engineering advocacy organization, with a mission to advocate on issues of importance to society and the engineering profession and to create opportunities for engineers, engineering students and engineering graduates to connect and collaborate while ensuring that the government, media and public appreciate the critical role engineers play in growing Ontario's economy, protecting the environment and improving the quality of life for all Ontarians. OSPE plays a complimentary role to PEO, which licenses engineers and protects the public interest.

With its new 2019–2020 Strategic Plan, called *Engineering the Future Together*, OSPE aims to:

- Solidify OSPE's position as the "voice" of the profession by streamlining the activities of OSPE's advocacy committees and task forces to deliver clear, concise positions and recommendations to the government;
- Elevate awareness of the role engineers play in making the world a better place and deepen respect for the engineering profession in Ontario by creating proactive strategic campaigns that highlight engineering solutions and their benefit to the economy, environment and society; and
- Strengthen and grow OSPE's engineering community and deliver value at every stage of members' careers.

"We're focusing on so much activity, but there are three pillars that really define what we're going to be focusing on for the next three years," Turi told *Engineering Dimensions*. "We decided to go for the shorter three-year cycle instead of the usual five because things are progressing so rapidly." Turi notes that OSPE's previous strategic plan, which focused on public and media awareness and community engagement, surpassed expectations and exceeded all of its targets.

Turi comes to his role at OSPE after a diverse professional career in academia, the private sector and innovation investment. After he earned a PhD at Queen's University,



A cover of OSPE's 2019–2022 Strategic Plan, which is a shorter cycle than previous strategic plans to allow OSPE to keep pace with Ontario's rapidly evolving engineering profession

he earned an executive certificate in strategy from Massachusetts Institute of Technology and worked in academic research before entering the private sector and then government investment in innovation, notably at the Natural Sciences and Engineering Research Council of Canada and the Ontario Centres of Excellence. Turi's career has taken him overseas, including South Korea, India, Brazil and China, where, according to Turi, engineers are more respected than in North America, often occupying top government positions. Turi says it is a shame that North American engineers are traditionally perceived to be the silent profession. "Engineering is the only creative and productive profession that actually changes the world we live in," he says. "In the old days, engineers were off in the corner, but those days are a thing of the past."



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BRITISH COLUMBIA TO SPEND UP TO \$2.2 MILLION TO INCREASE DIVERSITY IN ENGINEERING AND TECHNOLOGY

By Adam Sidsworth



In a bid to increase diversity in British Columbia's growing tech sector, Engineers and Geoscientists BC (EGBC) is participating in a provincially sponsored program to provide more opportunities for women, indigenous peoples, immigrants and people with dis-

abilities in the tech sector. The announcement, which promises up to \$2.2 million in funding, was made on May 22 by Bruce Ralston, BC minister of jobs, trade and technology, on behalf of Melanie Mark, BC minister of advanced education, skills and training.

It is anticipated that the funding will "break down barriers through pilot projects, such as mentorship for employees and resources for training and employers," the government noted in its press release, with Minister Mark adding that "an inclusive and respectful workplace will cultivate ambitions in people and allow employees to advance their career. The rapidly growing tech sector has thousands of job openings that it needs to fill, but it needs to be more inclusive of people who are all too often ignored."

Although there are no statistics specific to the engineering sector in BC, HR Tech Group's 2017 report, *Diversity & Inclusion in the BC Tech Sector*, stated that only 15 to 20 per cent of those employed in the BC tech sector are women. Additionally, less than 1 per cent identify as indigenous, and less than 1 per cent identify as having a disability, despite the fact that 97 per cent of those employed in the tech sector are comfortable working in a diverse workforce. Additionally, 96 per cent of tech sector employees surveyed believe that diversity and inclusion is important, and two-thirds believe that more should be done to raise awareness of the importance of diversity and inclusion.

The pilot projects will be managed by the Applied Science Technologists and Technicians of BC (ASTTBC), the provincial technologist and technician regulator; and HR Tech Group, an association of human resources professionals employed by BC tech companies. However, EGBC is participating in the initial \$990,000 Sector Labour Market Partnership Project (Sector LMP), along with the Association of Consulting Engineering Companies of British Columbia and ASTTBC "to break down barriers women and girls experience accessing engineering and technology career paths in BC." Scheduled to start this fall, the project will:

- Expand outreach to secondary and post-secondary schools;
- Help the participating associations develop tools to incorporate diversity and inclusive practices in the workplace;
- Hold "lunch and learn" workshops for employers; and
- Host virtual career fairs for indigenous women, internationally trained individuals and persons with diverse abilities.

In preparation for the fall layout, the Sector LMP's organizers have already begun the groundwork, notably by attending a number of career fairs in BC's lower mainland and developing regional action committees located throughout the province.

"Engineers and Geoscientists BC is committed to facilitating a level playing field across the engineering profession to ensure everyone has an equal chance of success in their chosen field," explained EGBC Chief Executive Officer and Registrar Ann English, P.Eng. (BC), FEC, in a statement to *Engineering Dimensions*. "We're proud to be working with the Sector LMP, which will build on the initiative we've been working on since 2013 to support diversity in the professions." English reiterated that the Sector LMP "will not only enable a greater understanding of the pain points faced in both the recruitment and retention of women within the profession but also help provide a clear set of priorities to ensure we can better support current professionals and further generations in achieving gender parity."

According to EGBC Director, Communications and Stakeholder Engagement Megan Archibald, the partner organizations are working with the non-profit Social Research and Demonstration Corporation to develop an evaluation strategy and tool to measure the success of the project. "We hope the impact of this project will extend past its designated funding date," Archibald adds. "We are committed to continuing to apply what we learn to our ultimate goal of achieving 30 by 30." The Engineers Canada-led 30 by 30 initiative aims to have women composing at least 30 per cent of newly licensed engineers by 2030. And although women accounted for only 15.2 per cent of newly licensed engineers in BC in 2018, English remains optimistic. "The initiatives, tools and resources that will be created by this partnership will spark further conversations and actions to initiate genuine change for the better," she says.

ENGINEERS CANADA AND NSPE ISSUE JOINT STATEMENT ON LICENCE MOBILITY

By Adam Sidsworth

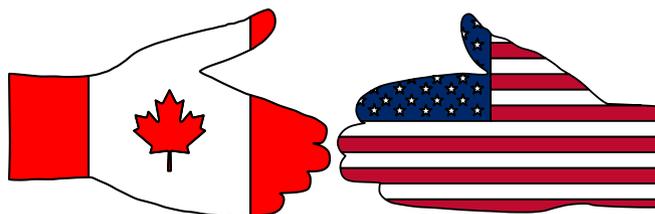
Earlier this year, Engineers Canada and the United States' National Society of Professional Engineers (NSPE) issued a joint statement on licence mobility. Representatives from both organizations first held discussions on the topic in November 2018 regarding the 12-month Canadian engineering work experience required by all 12 provincial engineering regulators in Canada and NSPE's concerns that it can create challenges for American engineers seeking licensure in Canada.

"Our two organizations had a positive, productive conversation about licence mobility and steps that both countries can take to create fair conditions, consistent with protecting the public health, safety and welfare, to ease mobility for professional engineers between the two countries," the statement reads. "Both organizations are committed to working together to identify additional viable solutions, and we look forward to continuing open dialogue. Together we strive to enhance the recognition of qualified engineers and promote mobility between our two countries."

Discussions occurred as a result of a September 24, 2018, letter from then-NSPE President Michael Aitken, PE (Colorado), to United States Trade Representative Robert E. Lightizer. In that letter, Aitken asked Lightizer "to consider including professional engineering licensure reciprocity in your [trade] discussions." The US and Canada, along with Mexico, were at the time negotiating the Canada-United States-Mexico Agreement, the planned update of the 25-year-old North American Free Trade Agreement. (The three countries' political leaders subsequently signed an agreement in November 2018.)

In his letter, Aitken stated that the US and Canada should have "a mutually recognized agreement (MRA)...ensur[ing] that both are able to enjoy the benefits of shared technical knowledge and expertise while continuing to protect the public health, safety and welfare." Aitken urged Lightizer to explore the model currently used by Arizona. Its model, according to Aitken, "states that professional engineering applicants must provide evidence of work experience 'attained under the direct supervision of a professional who is satisfactory to the board and registered in this state, another state or a foreign country in the profession in which the applicant is seeking registration.'"

The US, like Canada, has no national regulatory body for engineering; instead, each US state and district has its own regulatory body. Although US licensing boards typically do not require professional engineering experience in the US to become licensed, US engineers looking to obtain a P.Eng. designation in Canada do need to complete one year of supervised engineering experience in Canada. And although the Association of Professional Engineers and Geoscientists of Saskatchewan recognizes an MRA with the state of Texas,



applicants from those jurisdictions still require the mandatory Canadian work experience.

Despite positive discussions between Engineers Canada and NSPE, Engineers Canada Executive Vice President, Regulatory Affairs Stephanie Price, P.Eng., acknowledges the complexity in changing the 12-month Canadian professional engineering requirement, since it requires each individual provincial regulator to change its policies and have their respective governments update their engineering acts. "The National Admissions Officials Group, composed of a group of staff from all Canadian engineering regulators who work on licensure, have discussed this issue many times," Price says. "Many have been studying, piloting and introducing alternatives to this requirement." Among these are:

- The development of a competency-based assessment tool to increase harmonization and transparency among provincial regulators, which is part of Engineers Canada's 2019–2021 Strategic Plan;
- The Working in Canada seminar, a four-month pilot by Engineers and Geoscientists BC in 2016;
- The recognition of professional engineering experience in "like" countries or in Canadian engineering firms operating abroad; and
- Allowing internationally trained engineers to attend seminars to improve their communication skills and Canadian engineering work culture in lieu of Canadian experience (see "Engineers Nova Scotia amends one-year Canadian experience requirement," *Engineering Dimensions*, July/August 2019, p. 21).

NSPE's concerns come as PEO's required 12 months of Canadian engineering experience face scrutiny. Over the previous year, PEO had ongoing discussions with former Ontario fairness commissioner Grant Jameson, who questioned the requirement's legality under the *Fair Access to Regulated Professions and Compulsory Trades Act*. In a series of meetings and exchanged letters, Jameson noted that PEO "does not demonstrate an openness to alternative methods for applicants to prove they are fully competent to practise in Ontario" (see "PEO responds to fairness commissioner on mandatory Canadian experience," *Engineering Dimensions*, November/December 2018, p. 11).

ESSCO LOOKS TO EXPAND OUTREACH

By Adam Sidsworth



ESSCO executives met with PEO staff on August 8: (Back row, left to right) PEO Manager, Government Liaison Programs Jeannette Chau, P.Eng., Manager, Engineering Intern Programs Tracey Caruana, P.Eng., EIT/Student Programs Coordinator Sami Lamrad, EIT, and Registrar Johnny Zuccon, P.Eng., FEC, (Front row, left to right) ESSCO Provincial Counselor Katie Arnold, VP Communications Anastasiya Mihaylova, VP Services Alexa Bautista, President Jeffrey Lee, PEO-Student Conference Chair Logan McFadden, and GLC Student Representative Shawn Yanni.

The Engineering Student Societies' Council of Ontario (ESSCO) is expanding its school membership and hoping to advocate more effectively on the benefits of engineering licensure.

At an August 8 planning meeting with PEO's outreach and engagement team, ESSCO executives discussed several initiatives for the upcoming year, including ESSCO's tuition report and partnering with the Ontario Society of Professional Engineers (OSPE) in potential meetings with the Ontario Ministry of Training, Colleges and Universities. The group also discussed the addition of the Royal Military College of Canada as a full ESSCO member and the attendance of Queen's University at ESSCO's most recent annual general meeting and ongoing negotiations to join as a full member (it is currently only an Ontario Engineering Competition member, as is the University of Toronto).

The theme for the upcoming PEO-ESSCO Student Conference was also unveiled: The "World of opportunity" theme will focus on the multitude of new engineering streams that students can pursue when they graduate. The conference, which will take place from September 13 to 15 at Carleton University in Ottawa, is organized by ESSCO and gives students from all member schools an opportunity to learn about the profession and network with industry, education and government representatives.

Founded in 1987, ESSCO represents 14 engineering societies across Ontario and acts as a link between engineering students and professional associations, academia and government. Although it receives financial support from both PEO and OSPE, ESSCO is independent of both organizations, and its executive team is elected each year by engineering students from each member school's engineering society.

This year's ESSCO team includes President Jeffrey Lee (Ryerson University), Vice President of Communications Anastasiya Mihaylova

(University of Waterloo), Vice President of Finance and Administration Julie Hauth (Lakehead University), Vice President of Services Alexa Bautista (Ryerson University), PEO-Student Conference Chairs Logan McFadden and Abigail MacGillivray (both Carleton University), Provincial Counselor Katie Arnold (University of Waterloo) and Ontario Ambassador Grant Mitchell (Waterloo University). Shawn Yanni, a University of Ottawa engineering student, also attended the August 8 meeting in his capacity as student representative on PEO's Government Liaison Committee. Representing PEO at the meeting were Manager of Government Liaison Programs Jeannette Chau, P.Eng., Manager of Engineering Intern Programs Tracey Caruana, P.Eng., EIT/Student Programs Coordinator Sami Lamrad, EIT, and Registrar Johnny Zuccon, P.Eng., FEC.

ESSCO EXECUTIVES VOICE CONCERNS

At the meeting, some ESSCO executives spoke about their concerns regarding obtaining licensure. Provincial Counselor Arnold and President Lee noted that many engineering students graduate to become either employed or self-employed in new areas of engineering where it is difficult to obtain licensure because of a lack of available supervising engineers, and yet others pursue a sphere of engineering that has yet to be regulated. "We promote PEO's Student Membership Program (SMP) to our incoming students [at Ryerson]," Lee noted, "but after that, our students lose interest. And it stems from if they even need a P.Eng....Ryerson has really strong networking, so it's seeing what SMP can add to that."

PEO's SMP (www.engineeringstudents.peo.on.ca) is a free program designed for students to connect with PEO and the engineering community while studying engineering, with the intention of allowing students to advance to engineering intern and licensed member in a seamless transition.

At the meeting, Zuccon said that he understands the challenge of young engineers entering the Ontario engineering field in light of regulatory and technological changes. But Zuccon challenged the ESSCO executive team: "My hope with your engineering education is that we get you at least binding by a code of ethics that makes you question [your performance]. It's not the licence that makes you a professional, and we shouldn't be chasing you to get licensed. Getting your licence is being ready to take accountability. Ask anybody who puts the seal on for the first time: It keeps you up because you're taking responsibility."

Attend

September 2019



SEPTEMBER 22–25

Canadian Society of Safety Engineering Professional Development Conference, Winnipeg, MB
csse.org/site/events/conference

SEPTEMBER 22–24

Canadian Healthcare Engineering Society Conference, Saskatoon, SK
ches.org/conferences-and-events/2019-ches-national-conference

SEPTEMBER 26

Design for Manufacturing Summit, Toronto, ON
dfmsummit.com



SEPTEMBER 29–OCTOBER 2

Canadian Geotechnical Conference, St. John's, NL
geostjohns2019.ca

SEPTEMBER 30–OCTOBER 2

Canadian Steel Conference, Montreal, QC
canadiansteelconference.ca

October 2019



OCTOBER 8

Green Building Festival, Toronto, ON
sbcana.org/conferences/green-building-festival-2019

OCTOBER 16–18

IEEE Canada Electrical Power and Energy Conference, Montreal, QC
epc2019.ieee.ca

Read



The Engineering Book: From the Catapult to the Curiosity Rover, 250 Milestones in the History of Engineering, by Marshall Brain, 2015: A detailed look at engineering milestones, from the Acropolis to Wi-Fi

Creativity, Inc.: Overcoming the Unseen Forces That Stand in the Way of True Inspiration, by Ed Catmull and Amy Wallace, 2014: A co-founder of Pixar Animation Studios on creativity in business and leadership

Seven Brief Lessons on Physics, by Carlo Rovelli, 2016: A comprehensive distillation of some of the biggest ideas in physics

Watch



How NASA Reinvented the Wheel: Shape Memory Alloys

Learn how NASA built better tires for the Mars Rover.

www.youtube.com/watch?v=2lv6Vs12jLc

Aluminium: The Material That Changed the World

Before aluminium (or aluminum), engineers relied on wood and canvas to build planes.

www.youtube.com/watch?v=yn9qhQSMCRk

Why Concrete Needs Reinforcement

Destructive concrete testing highlights this material's greatest weakness.

www.youtube.com/watch?v=cZINeaDjisY

Listen



Create the Future

A podcast that explores how engineering shapes the world around us
anchor.fm/queen-elizabeth-prize-for-engineering

Undiscovered

A podcast about the left turns, missteps and lucky breaks that make science happen
wncstudios.org/podcasts/undiscovered

Beer with an Engineer

Interviews with engineers about engineering challenges in today's society
beerwithanengineer.com.au

Her STEM Story

A podcast featuring the extraordinary stories of women working in science, technology, engineering and math
herstemstory.com

The Engineers Collective

A new podcast that looks at how engineering affects everyone's lives
theengineerscollective.podbean.com

FORESEEABILITY AND NEGLIGENCE IN EQUIPMENT AND STRUCTURE FAILURES

By José Vera, P.Eng., MEPP

It's important for practising engineers to understand the relationship between foreseeable risks and allegations of professional negligence in equipment and structure failures. Below, we share three examples of court cases to expand on these concepts.

EXAMPLE 1: A CASE OF MACHINE FAILURE

In the early 1990s, Canadian National Railway (CNR) had a project to drill a tunnel under the St. Clair River to connect Sarnia, Ontario, and Port Huron, Michigan. The project required a custom tunnel boring machine (TBM) to do the drilling. CNR insured this project under a builder's risk policy with the following exclusionary provision: "This policy does not insure the cost of making good faulty or improper design."

CNR engaged a TBM manufacturing company and set up a committee of experts to oversee the design of the TBM. Contamination problems were detected after 14 per cent completion of the tunnel. Modifications were made, and the main bearings were cleaned, resulting in a delay of 229 days and greatly increased costs. An inspection revealed that some seals had worn out due to excessive deflection of the cuttinghead. The insurers denied coverage and claimed that the delay and costs fell under the "faulty or improper design" exclusionary clause. However, the Ontario Superior Court of Justice determined that the insurers were liable for the damages, since the design of the TBM considered foreseeable risks and that decision specifically noted that:

Cuttinghead differential deflection and the potential effect on the sealing elements had not been a previous problem and was not identified at the time by anyone as a potential problem. The assembled expertise had no reason to anticipate this new failure process. (*Canadian National Railway Company v. Royal and Sun Alliance Insurance Company of Canada, 2004 CanLII 33029 (ON SC)*, www.canlii.org/en/on/onsc/doc/2004/2004canlii33029/2004canlii33029.pdf)

This case eventually went to the Supreme Court of Canada (SCC), which cites expert Leslie G. Hampson:

There are undoubtedly failures due to incompetence, ignorance, complacency, blind faith, mistakes and incorrect information. But there are also failures of components that could not have been foreseen and would not be focused on from the basis of information that was available at the time—it is my contention that the St. Clair TBM is in this category. The value of hindsight after a problem cannot be over-emphasized—but this is far removed from foreseeability in the real world. (Hampson's Third Report, p. 5)

The report further concludes:

The policy did not exclude all loss attributable to "the design" but only loss attributable to a "faulty or improper design." The design exhausted the state of the art but left a residual risk. Failure is not the same thing as fault or impropriety. In my view, the insurers did not meet the onus of bringing the loss within the exclusion. (*Canadian National Railway Co. v. Royal and Sun Alliance Insurance Co. of Canada, [2008] 3 S.C.R. 453, 2008 SCC 66*, <https://scc-csc.lexum.com/scc-csc/scc-csc/en/item/6236/index.do>)

In this case, we can't simply blame the engineers, especially when all foreseeable risks available at the time of design were considered. Consequently, the key lesson is "Failure is not the same thing as fault or impropriety."

EXAMPLE 2: A CASE LINKING DUTY OF CARE TO FORESEEABILITY

Below is a key passage from a recent SCC decision which notes the link between duty of care and foreseeability:

To establish a duty of care, there must be a relationship of proximity in which the failure to take reasonable care might foreseeably cause loss or harm to the plaintiff. Once foreseeability and proximity are made out, a prima facie duty of care is established. Whether or not something is "reasonably foreseeable" is an objective test. The question is properly focused on whether foreseeability was present prior to the incident occurring and not with the aid of 20/20 hindsight. (*Rankin (Rankin's Garage & Sales) v. J.J., 2018 SCC 19, [2018] 1 S.C.R. 587*, <https://scc-csc.lexum.com/scc-csc/scc-csc/en/item/17085/index.do>)

This decision teaches us that a key question to ask when establishing a duty of care in cases involving alleged negligence, such as equipment or structural failure, is: Was the risk foreseeable prior to the incident occurring?

EXAMPLE 3: A CASE ALLEGING NEGLIGENCE

In 1989, the Hilton hospitality company was looking into purchasing a hotel in Halifax. Hilton engaged engineering firm LGL (later acquired by SNC-Lavalin) to conduct a condition assessment of the building and to provide a report. Two engineers from LGL performed a visual assessment of the premises in 36 hours and then prepared a report. The report did not find any major defects with the hotel. Consequently, Hilton went ahead with the purchase. The scope of services as per the report was "...to determine if major defects were to be found and to assess the general condition of the building." Furthermore, the report did note a specific problem with the facade:

The front facade which is made of stone and bricks has been extensively repaired and is generally in good shape, but some bricks are deteriorating due to infiltration of humidity or water. This could create major problems if proper care is not taken in the very near future.

And the report concluded:

This building has generally aged well and is in satisfactory condition. The brick problem is important but relatively inexpensive solutions can be found if the work is done before the surface deteriorates further.

Thanks to previous repairs, there were few, if any, water leaks remaining at the time of the assessment. However, after the assessment was completed significant water leak problems resurfaced. In April 1992, the local architectural and engineering community had learned about the “potential for problems with corrosion of steel elements in steel frame masonry clad buildings” from the repair of a Bank of Nova Scotia building in downtown Halifax. Later that same month, and after ongoing water leakage, Hilton engaged an architect to address several problems including the leakage. The architect submitted a report that stated:

We are not structural engineers and cannot comment extensively on structural matters. We do have concerns about lack of control/expansion joints, the possibility of a rusting steel frame and the brick quoins to name a few. We would like to have some structural input...

Consequently, engineering firm BMR was engaged to conduct further investigations of the hotel. When BMR engineers made a hole in the brickwork to examine the steel structure, they discovered that the steel structure had corroded to the point that “in many places the steel beams and columns were almost non-existent.” Hilton then sued LGL, alleging they had conducted a negligent condition assessment of the hotel, since LGL had not discovered the steel corrosion during their 1989 assessment. The decision quotes *The Canadian Law of Architecture and Engineering* (2nd ed., 1994) authors Justice Beverley McLachlin, Wilfred Wallace and Arthur Grant. Below are some passages of interest:

...architects or engineers are not obliged to perform to the standards of the most competent and qualified members of the profession, unless they so covenant. Unless they undertake to exercise a higher standard of care, what is required of architects or engineers is reasonable skill, care and diligence as judged generally by the standards of competence in the profession in which they practise...

...the architect or engineer is to be judged by the professional standards prevailing at the time the work was done, not by what may be known or accepted at a later date, or what may be seen only with the benefit of hindsight...

...architects or engineers do not guarantee that their work will be successful. Provided they have exercised reasonable judgment, competence and due diligence in doing their work, the fact that the work proves unsat-

isfactory in some way will not render them liable to the client for breach of contract or negligence....

The decision concludes that:

I accept the evidence of Mr. McBride (professional engineer from BMR) that a structural engineer could probably have discovered the corroded steel beams and columns if they had conducted a full investigation. I am not, however, convinced that a reasonably competent structural engineer should have recommended a further investigation to determine the cause of the brick failure in 1989. In saying this I note that Mr. McBride has the benefit of 20/20 hindsight, which he enjoyed at the time that he became involved in the investigation of the hotel structure in 1992. This 20/20 hindsight was gained from his experience at the Bank of Nova Scotia complex, but it was not a knowledge which he had in 1989, nor was it knowledge or experience generally available in the structural engineering community...The defendant was not negligent in the conduct of the assessment or in preparation of the report to Hilton. (*Hilton Canada Inc. v. S.N.C. Lavalin Inc.*, 1999 CanLII 1352 (NS SC), www.canlii.org/en/nl/nssc/doc/1999/1999canlii1352/1999canlii1352.html)

Again, just because a structural failure occurs it does not mean the practitioner who conducted a previous condition assessment with no red flags is to blame. The key lesson from this case study is that the “engineer is to be judged by the professional standards prevailing at the time the work was done, not by what may be known or accepted at a later date, or what may be seen only with the benefit of hindsight.”

In Ontario, practice advisory staff can comment only on the *Professional Engineers Act* (the act), its regulations as well as PEO’s practice guidelines. The issue of professional liability is outside of the act. To gain a better understanding of professional liability, practitioners should:

- Consider taking courses on business law, construction law and professional liability to gain an understanding of basic principles;
- Read relevant case law that provides legal insights into professional negligence, including various factual scenarios for evolution of the law; and
- Consult with their professional liability insurance providers and their lawyers regarding specific exclusion clauses in their insurance policies.

Finally, PEO’s practice advisory team is available by email at practice-standards@peo.on.ca and is glad to hear from practitioners looking for general information on their professional obligations. However, practitioners looking for assistance on resolving legal problems occurring in specific, concrete situations should always contact their lawyer. **e**

José Vera, P.Eng., MEPP, is PEO’s manager of standards and practice.

ENGINEERS LOOK TO MAKE A COMEBACK IN FALL ELECTION

By Howard Brown and Stephanie Gomes



Ontario engineers who are candidates for the October 21 federal election include (clockwise from top left) Omar Alhabra, P.Eng., Marilyn Gladu, P.Eng., Pierre Lemieux, P.Eng., and Dirka Prout, P.Eng.

On October 21, Canadians will elect a new government. The election is important for Canada's regulators, even those whose mandates are provincial. In some cases, federal issues also affect engineers provincially, such as national mobility within professions. Many of the federal election candidates and their teams are involved in provincial politics and government and have been for many years. For example, the chief of staff to Prime Minister Justin Trudeau, Katie Telford, was chief of staff to the former education minister of Ontario, Gerard Kennedy. Similarly, at least two of Ontario Premier Doug Ford's senior staff are now working with federal Conservative leader Andrew Scheer. As well, New Democratic Party (NDP) leader Jagmeet Singh was a long-time minister of provincial parliament (MPP) who regularly participated in PEO activities.

Elections focus attention on issues important to the public. An issue that is a longstanding one for candidates of all levels of government is that of getting internationally educated professionals licensed. Having candidates understand the issue and steps that are being taken is one that Engineers Canada, with PEO's help, has worked on for years. Luckily, this year, the three main political parties in Canada have

professional engineers in their candidate rosters. We have identified four Ontario professional engineers seeking election to the House of Commons in October. Two are currently ministers of parliament (MPs), one was previously an MP and one is running for election for the first time. They are:

1. Omar Alhabra, P.Eng., MP (Liberal, Mississauga Centre)

Alhabra is the parliamentary secretary to the minister of international trade. He is seeking his third term, after first being elected in 2006. He hosted an Engineers in Government Conference when he was a visiting fellow at Ryerson University.

2. Marilyn Gladu, P.Eng., MP (Conservative, Sarnia-Lambton)

Gladu is the Conservative health critic and previously served as the science critic. Prior to entering politics, Gladu worked for Dow Chemicals, Suncor and WorleyParsons. During her career, Gladu was chair for the Canadian Society of Chemical Engineers locally and national director of science and industrial policy for the same organization. She was the guest speaker at the PEO Student Conference in Ottawa in 2016.

3. Pierre Lemieux, P.Eng.

Lemieux was previously the Conservative MP for Glengarry-Prescott-Russell from 2006 to 2015 and plans on running for re-election. He ran for the PC party leadership in 2016. He received his engineering and master of science degrees from Royal Military College of Canada. Lemieux served in the Canadian Armed Forces for 20 years.

4. Dirka Prout, P.Eng.

Prout is the federal NDP candidate in London North Centre. She is a senior geotechnical engineer for Wood, a multi-national energy services company, as well as a community activist. She received her bachelor of science degree in civil engineering from the University of Toronto and master of science in civil engineering from Missouri University of Science and Technology.

When asked about the upcoming federal election, PEO Manager of Government Liaison Programs Jeannette Chau, P.Eng., says: "I encourage professional engineers to take the opportunity to meet their candidates so that politicians can have a greater awareness of PEO and its role as a regulator." If you or any engineers you know are planning on running for office, please contact Chau at jchau@peo.on.ca. [e](#)

Howard Brown is PEO's government relations consultant and president of Brown & Cohen Communications & Public Affairs. Stephanie Gomes is an account coordinator at Brown & Cohen.



Fostering entrepreneurial success in Greater Sudbury

By Adam Sidsworth

The engineering profession has long had a reputation as the “silent profession,” an ironic sentiment considering that engineers, by the very definition of their work, make products that change people’s lives. Although many engineers may be happy quietly tinkering with gadgets and creating solutions, they need to have strong leadership and entrepreneurial skills if they want to bring their solutions to market. We explore how people in one northern Ontario community are leading the way to create an entrepreneurial engineering spirit.

When the provincial government merged the Regional Municipality of Sudbury with its lower-tier municipalities in 2001, creating the City of Greater Sudbury, it became Ontario’s geographically largest municipality. It’s home to approximately 166,000 people in its diverse 3627-square-kilometre area.

It has 330 lakes, including Lake Wanapitei, which was formed from a meteorite impact, as was the Sudbury Basin, an almost 1.9 billion-year-old crater that left the area rich in nickel, copper and gold. The geologic makeup of Greater Sudbury has long attracted mining, with 6000 people directly employed by mining companies and an additional 10,000 employed by a 300-company mining supply and service sector cluster. The area also attracted NASA in the 1960s, when Apollo astronauts—many of whom were also engineers—trained for moon missions. The astronauts have long since left, but the city is still

home to engineers, many employed either directly or indirectly by the mining industry.

But Greater Sudbury is more than mining: It has a diverse population, including Canada’s third-largest French-speaking population outside of Quebec. And as northern Ontario’s largest city, Greater Sudbury considers itself a hub of financial and business services, tourism, healthcare, education and government for the region.

ENGINEERS AS ENTREPRENEURIAL LEADERS

Given Greater Sudbury’s one-industry history, engineers who live in the area may be on the cutting edge of its developing economic ecosystem. Although engineers may have a reputation for being “the silent profession,” according to Emily Moore, PhD, P.Eng., that doesn’t mean they need to lack innovation, tenacity and entrepreneurial spirit. “The University of Toronto interviewed engineers employed by large companies, and found few identified engineering as a leadership profession,” Moore says. “I was at Hatch at the time, and I remember the researchers presenting the findings to the senior leadership team, and we were appalled because Hatch as a company values leadership highly. A follow-up focus group with

senior engineering entrepreneurs strongly felt that engineers need to embrace leadership.”

Moore is the director of the University of Toronto’s Troost Institute for Leadership Education in Engineering (Troost ILEAD), which provides leadership education courses to undergraduate and graduate engineering students. Before Moore joined Troost ILEAD, she had a two-decade engineering career in the private sector, including at Xerox Research Centre of Canada and Hatch, during which she had ever-increasing leadership roles. “Entrepreneurs we’ve talked to all speak about having to learn on the spot, how to lead and get through,” Moore says. “The biggest thing we’ve seen is [engineers] being frustrated by the bigger companies that they’ve started in and thinking, ‘I can do this better if I can go out on my own.’ None of the people we’ve spoken with have gone straight from undergrads and then made that entrepreneurial leap. That may be changing with the current engineering generation...Students are experimenting and starting smaller start-ups right out of school and saying, ‘I can do this on my own.’”

SUDBURY’S ENTREPRENEURIAL LEADERS

Stephan Matusch, P.Eng., is the president and founder of Ionic Technology Group, a Greater Sudbury-based professional engineering, consulting and manufacturing firm that Matusch started in his garage in 1998. “We’re a group of six companies that provide a wide range of systems and services,” Matusch explains. “We also do automation systems for mines, mills and general manufacturing and engineering consulting. And we have a division that does software and low-level electronics design and manufacturing.” Although the company is based in Greater Sudbury, it has grown its profile significantly, with its largest division located in Cambridge, ON, and a business division in Chile. “We’ve got distributors and partners around the world and customers on every continent. A third of our sales is Canadian, a third is North American and a third is international.”

Although Matusch is proud of Ionic’s growth, he is adamant that money can’t be the driving factor for engineers thinking of striking out on their own. “You absolutely must love what you do,” he says. He adds that most ventures fail, so engineers must embrace uncertainty and risk. “Particularly in the early years, I had to be comfortable with not always having a stable paycheque and not knowing that one bad project could risk it all.” Matusch says that when beginning a business, “you have to make sure you and your spouse are

in the right position to say, ‘We’ll do this for some period of time, and if it doesn’t work out, we’ll pick ourselves up and do something else.’ You have to enjoy living in a chaotic environment. You have to jump into the pool with the sharks and not be afraid of the consequences.”

And although Matusch admits that entrepreneurship is in his blood—both of his parents have run their own businesses—taking that plunge was still daunting. “I did it when I was 30, at a time when my spouse and I had no kids and could live fairly cheaply,” he explains. “There are different models on how to start a business. My model was to be very frugal...I never borrowed money and had no line of credit. My rationale was that if the business blew up, we would still have a roof over our heads. And if that was the worst that could happen, we were okay with that.”

Matusch seemingly had his eyes set on developing his entrepreneurial leadership early on in his engineering career. He graduated from the University of Waterloo’s engineering faculty, the only engineering program in the province to have a mandatory co-operative education program. The co-op helped not just financially—he finished his undergrad degree virtually debt-free—but helped him realize the engineering sub-discipline that was right for him before permanently entering the workforce. “There’s always been an entrepreneurial vibe that happens at Waterloo,” Matusch says. “That’s incredibly important in fostering the creative juices of people who embrace the opportunity to put themselves out there—to leap and create new things.” He complemented his engineering education, which gave him the crucial technical skills, with an MBA from Wilfrid Laurier University, helping Matusch understand the more non-technical aspects of owning a business, such as the accounting, law, marketing and finance, that many entrepreneurial engineers may find easy to overlook. These skills were an advantage for Matusch early on, when he lacked the money to hire people to do those jobs for him.

Matusch entered a prospering sector of the Canadian economy. According to *The State of Canada’s Tech Sector, 2016*, published by the Brookfield Institute for Innovation and Entrepreneurship, in 2015 tech companies:

- Generated \$117 billion, or 7.1 per cent, of Canada’s GDP, with the architecture, engineering and design sector contributing 18.4 per cent of that amount;
- Accounted for 71,000 of businesses across Canada and 5.6 per cent of Canada’s total employment—and 6.2 per cent of Ontario’s total;
- Were disproportionately smaller, with 68.8 per cent having four or fewer employees;
- Were profitable 84.2 per cent of the time;
- Accounted for 60 per cent of Canada’s venture capital investments, which totalled \$2.3 billion spread over 536 deals; and
- Were highly concentrated in Canada’s largest cities, particularly Montreal, Toronto and Kitchener-Cambridge-Waterloo.

Matusch initially moved to Greater Sudbury to join his father’s construction business. But Matusch’s heart wasn’t in it; rather, he knew he wanted to work in automation. He quickly recognized that Greater Sudbury’s economic ecosystem was in crucial need of some-

body who could fill the automation need, noting that Greater Sudbury “used to import a lot of technology, but now a lot of it is produced locally. And instead of Sudbury importing technology, it is now considered a mining technology leader and exports products and services to the world.” Matusch has since become involved in Greater Sudbury’s entrepreneurial community: He is a champion of Laurentian University’s engineering faculty, having hired many of its graduates; and acts as a mentor at the Northern Centre for Advanced Technology (NORCAT), Greater Sudbury’s provincially funded regional innovation centre. “I give credit to [NORCAT chief executive officer] Don Duval and his team...They’re instrumental in creating economic diversity in the city, moving Sudbury away from being just a mining community.”

THE ROLE OF NORCAT IN GREATER SUDBURY

Given his reputation, it’s no surprise that Duval was named Greater Sudbury’s Executive of the Year at the Bell Business Excellence Awards earlier this year for his work transforming NORCAT into a multi-faceted enterprise focused on helping tech entrepreneurs. As Greater Sudbury’s regional innovation centre—14 span the province, from Windsor to Thunder Bay—NORCAT was founded in 1995 to promote, educate and support local entrepreneurs, tech innovators and skilled labour workers to enable sustainable economic growth for northern Ontario.

Specifically, NORCAT works with community partners to help start and accelerate the growth of companies to drive the future economic and social prosperity for Greater Sudbury, which Duval says has a vibrant and growing tech ecosystem and entrepreneurial culture. “The demand for our start-up mentorship services, the strong attendance at our entrepreneurship educational workshops and our engaged angel investment community are positive indicators that demonstrate our ability to get business done,” Duval says.

According to Duval, NORCAT has many programs to work with and support burgeoning entrepreneurs:

- A mentorship group that works with tech start-ups to understand their challenges and work with them to identify a path forward;
- A series of educational programs and workshops that cover a broad range of topics from go-to-market strategies through to raising capital and intellectual property;
- A market research service offered in partnership with the MaRS Discovery District (Toronto’s regional innovation centre) to help start-ups better understand their marketing opportunities and challenges;

- An in-house co-location incubator where companies can reside and connect with like-minded peers in an environment that spurs creativity and entrepreneurial spirit; and
- An advanced manufacturing lab, providing tools and equipment such as CNC machines, 3D printers, injection molding, circuit board design/production and EMC testing to assist manufacturing-oriented start-ups in developing their prototypes.

“NORCAT is the only regional innovation centre in the world that has an operating mine designed to enable start-ups, small and medium enterprises and international companies to develop, test and showcase innovative and emerging technologies in an operating mine environment,” Duval adds. “We help connect and broker relationships between mining technology companies and global mining companies, creating an ecosystem like no other in the world.”

However, Duval is careful to note that NORCAT plays a role in supporting growth in multiple sectors and not just to those aspiring to enter the mining industry. Nor does it cater specifically to engineers looking to begin their own businesses; however, given Sudbury’s economic ecosystem, many engineers take advantage of NORCAT’s services: “But given our geography,” Duval observes, “you can imagine that most of our tech clients are in advanced manufacturing, [Internet of Things] and mining. They all make stuff.”

Duval echoes Matusch’s warning to entrepreneurial hopefuls that success is not a guarantee, even with the help of NORCAT: “Of all new companies starting today, only 4 to 10 per cent will become high-growth companies,” Duval says. “And of this cohort, research has shown that only the top 5 per cent will create two-thirds of new and sustainable jobs. Therefore, identifying and supporting these high-potential tech start-ups, especially in rural communities, is critical to long-term economic prosperity.” Duval reiterates that one of the core ingredients of success in northern Ontario, with its vast geography and sparse population, is collaboration; consequently, NORCAT often partners with northern Ontario’s four other regional innovation centres, located in Sault Ste. Marie, North Bay, Timmins and Thunder Bay. “Collectively we do an exceptional job to drive sustainable economic and social prosperity for northern Ontario,” Duval says.

NORCAT’s collaborative spirit spans to Greater Sudbury’s Laurentian University. “Laurentian is critically important to our ecosystem in Sudbury,” Duval says. “We look at Laurentian as primarily doing two key things: They generate exceptional research and graduate quality talent. On the latter, these talented graduates, whether they become engineers or not, might develop a good idea for a business. With some mentorship, they refine their strategy, raise some money and pursue the entrepreneurial pathway. As the company grows, they will need to recruit the needed talent to deliver on their mandate, and finding it locally helps to ensure that their company remains in our community. Without Laurentian and other academic institutions in our region, many of our tech start-ups would struggle or move operations to other regions where they can find the talent.”

LAURENTIAN’S FOCUS ON ENTREPRENEURSHIP

Laurentian’s new innovation support program, The Foundry, launched in September 2018 in the Jim Fielding Innovation and Commercialization Space on the top floor of the university’s Cliff Fielding Research, Innovation and Engineering Building (CFRIEB), which opened at the same time. The Foundry’s programming, which aims to help Laurentian



Machinery is being used in Greater Sudbury's NORCAT Underground Centre, the world's only underground operating mine used as an innovation and training centre.



NORCAT's new surface facility, which is located at NORCAT's Underground Centre

students, alumni and faculty flesh out their ideas to a fully functional start-up, received help from NORCAT, which, according to Duval, "helped them write the applications from the government, and define the program and services because if you can appreciate the talent part, if you're a student and you have something you want to design, it's great to have an on-campus place where you can do that. And there's a low proportion of start-ups that begin with an intellectual solution grown within an academic setting. It's actually a Canadian challenge to take advantage of more [intellectual property] coming out of our academic institutions." The facility ultimately received over \$27 million in government funding, and NORCAT partners with Laurentian to assist the Laurentian community develop start-ups and get their products to market.

Daryl Dominique is the innovation and commercialization coordinator at Laurentian University. Because of the program's proximity to the engineering labs—"The innovation space is next to equipment that engineering students naturally find interesting, so they tend to filter through and ask questions," Dominique says—the majority of prospective clients hails from the university's engineering community.

CFRIEB houses a collaborative analytical hub for both industry and academics. Dominique works with students and alumni to develop

their start-ups. "I don't want to say that [students] are linear," Dominique says, "but when I ran my own companies in Sudbury, [the attitude was] 'I'm getting an engineering degree, then I'm going to get licensed and get an engineering job.' I was guilty of the same thing." Dominique—who has a background developing his own start-ups, first in Sudbury, with the help of NORCAT; and subsequently in Toronto, with the help of MaRS Discovery District—notes that many students he works with "have creative ideas, but it's often, 'I'll start it once I get my career started.' He continues: "When I had the opportunity to start up this program at Laurentian, one of the things I wanted to consider was looking at works for Waterloo and Toronto and adapt it for Sudbury's own strengths and community."

Dominique says that because the Foundry is so young—it just recently completed its first academic year of programming—he is unable to identify any particular industry sectors where the Laurentian



The 1247-foot-tall (380 metres) Inco Superstack, the tallest chimney in the Western Hemisphere, was built in 1972 to disperse sulphur and other byproducts of the smelting process away from the city. It is indicative of Greater Sudbury's historical natural resources-based economy.



Lake Wanapitei was formed from a meteor impact that created the Sudbury Basin, a geographic area rich in minerals that sparked Greater Sudbury's mining industry.

community is focusing; however, it isn't necessarily on mining. "We're noticing a lot of peer-to-peer economies, so how do we have a new idea of looking at this industry? Or the other trend is trying to find products or start-ups that are changing fundamentals," Dominique says. "For example, we had one group working on a product to make sustainable straws more valid, a shift away from plastic straws to paper or metal straws, so they prototyped that for their capstone project. And we sat down with them with a map to what commercialization would look like to market." For Dominique, using the capstone project is an excellent "entry to work on students' pitching skills and work with them to give them techniques to approach people who would use their products and ask the questions that would put them down the path...We're working with them to figure out how to implement their work, to start their own company."

Dominique readily admits that Laurentian can't necessarily go head-to-head with the University of Toronto or Waterloo: "We don't have BlackBerry; we don't have Google located across the street like in Waterloo. There are differences between our ecosystem and geographic reality and theirs. When we started, we focused on the development of those early skills as opposed to using an accelerator model," which involves funding and the setting of targets and dates. Dominique observes: "We're focusing on a roadmap of implementing those accelerators once we have a pool of talent." For Dominique, that means working hands-on in the community. "We work with exist-

ing start-ups in Sudbury just to contribute to the culture," Dominique asserts. "One of our programs is called Office Hours, and we bring in active entrepreneurs to use our facility as a satellite office for the day. And during that time, they act as a resource for our students... students can have a casual conversation over coffee and develop a mentor/mentee relationship. We also have a lot of individuals running workshops." Dominique also actively works with NORCAT, using their resources, adding that NORCAT has essentially become a second campus on the other side of the city. "NORCAT has been a part of this ecosystem for a long time, so it's great to be able to support a cohesive feeling," he says.

And the numbers are looking good. In the program's first semester—just 13 weeks—800 attendees came to events and sessions. "That's what we need to generate interest," Dominique says. "How do we get the basic talent? How do we get the engineers and computer scientists colliding so we can generate ideas? In terms of projects [currently] on target to be companies, there are four or five we're actually able to continue working with. And if they're an engineering capstone project viable enough to work, whether they're interested enough to go along at this point [remains to be seen]." Regardless of numbers, Dominique urges people to approach him early: "A lot of people think they shouldn't approach the innovation centre until they have a design so they can ask for money, whereas I enjoy it when they approach us with just an idea because that's when we can build a ramp from idealization to route to funding," Dominique adds. "Sometimes it'll be the student saying, 'How can I make a Mother's Day gift?' It's not exactly innovative, but they can come back a month later with a new idea [and] that's when I know they're in a mindset that I want them to be in. Our goal is to be a helpful answer and the pipeline. We're not a funding centre. We're an innovation centre." **e**



HOW ENTREPRENEURIAL ENGINEERS ARE LEVERAGING THE TOOLS OF THEIR TRADE

✦ BY MARIKA BIGONGIARI ✦

The entrepreneurial itch is likely something most engineers have at least once in their careers. They're curious and natural problem solvers. And as all engineers learn in school, there is usually more than one solution to a problem. How one moves from engineer to entrepreneur depends on his or her purpose, tolerance to risk and passion for their project. We share the lessons two engineers learned transforming their bright ideas into businesses and how they draw from their engineering toolkit in a multitude of ways—making them key players in the entrepreneurial world.

PURSUING PASSION PROJECTS

Zamir Khan, P.Eng., excelled in math and science and enjoyed computers, so it made sense to make a career of it. He took what he sees as the typical path to becoming an engineer: He completed his undergraduate studies in computer engineering at the University of Waterloo. It was a deep dive into hardware and software that included a co-op placement at a company that made hearing aids. That co-op experience piqued his interest in creating something that benefited people and prompted him to pursue his master's degree in biomedical engineering at the University of Western Ontario (now Western University). "I discovered I got additional satisfaction and enjoyment out of feeling that our work was going towards helping improve people's lives, and I wanted to explore that further and see if I could work it into my career," Khan explains.

In the years following the completion of his master's degree, Khan worked primarily in the medical field and for various software companies. He notes that his entrepreneurial ambitions didn't become prominent until he was well into his traditional career. "You often hear entrepreneurs declare that they were entrepreneurs from a young age, saying, 'I had a lemonade stand,' or 'I sold exam packages to my fellow students' or 'Entrepreneurship runs in my family'—but none of those are really true for me," Khan says. "I think some people, myself included, come at it from an angle of not always agreeing with the decisions that management was making, and we often think, 'What if I were making those

decisions?' And that's what entrepreneurship is, for better or for worse."

He found himself wanting to feel more invested in his work and yearned for a position in which he could better feel the impact of his performance. Khan eventually made the decision to stop full-time employment and started taking on short-term contracts instead. He knew he needed the freedom and flexibility to manage his own time to enable him to pursue passion projects. "It's a path a lot of people take," he says. "First you become self-employed and you work as a freelancer or a consultant. That was my first exposure to being an entrepreneur: Your business is yourself."

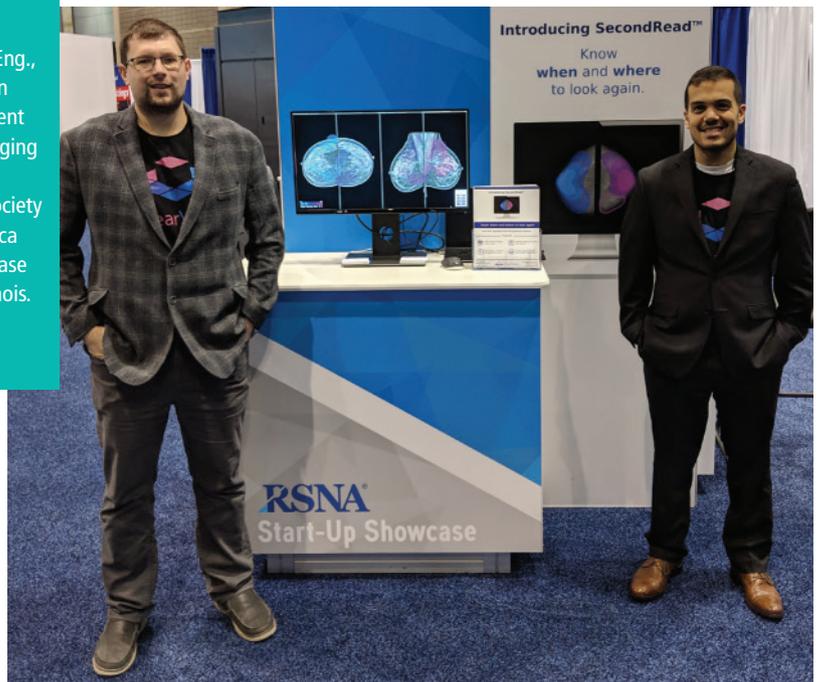
Once Khan caught the entrepreneurial itch, his plan as an engineer was always to create software products. "One of the things that gives me the greatest satisfaction is creating some software that I put in front of somebody and they say, 'Wow, I didn't know you could do that,'" Khan says. So far, he has founded three start-ups. The first, ClearVoxel Imaging, where Khan is chief technical officer, is an innovative medical imaging company based in Kitchener, Ontario, that reaches back to his biomedical engineering roots.

ClearVoxel seeks to bridge the innovation-to-adoption gap in medical imaging and raise the standard of care as a result of wider adoption of novel image analysis technologies. Its focus is on an intelligent user interface for radiology, enabling radiologists to do more with fewer clicks. A more recent venture—and one he bootstrapped and launched solo—is VidHug, a web app that compiles video clips from multiple users to create a virtual hug for the intended recipient. But Khan's humanitarian streak is perhaps most evident in his deep involvement with No Fly List Kids, an advocacy group he co-founded with a handful of fellow entrepreneur parents as a result of Khan's, and others', experience with his then-infant son being erroneously flagged by Canada's no-fly list. After years of grueling advocacy work and thousands of volunteer hours, the group was recently successful in getting the Canadian government to commit to change how the no-fly list is administered in the future, specifically that it should require more than one unique identifier—it currently uses name only—to match a Canadian to the list. Khan firmly believes the entrepreneurial roots of the group's founders contributed to its efficacy, and he wonders if it would have been founded at all had it not been for both their entrepreneurial spirit and the flexibility that allowed them to devote the time necessary to take something like that on. "It's no coincidence that all three of us are entrepreneurs," Khan says.

TAKING IT TO THE NEXT LEVEL

Hussam Haroun, P.Eng., also believes strongly in the role entrepreneurs play in today's world. "The world economy is driven by entrepreneurs. Most large companies were once small businesses, all started by entrepreneurs, and many of these businesses solve some of the world's crucial problems," says Haroun, who took what he sees as a similarly uncon-

Zamir Khan, P.Eng., (right) and Yann Gagnon represent ClearVoxel Imaging at the 2018 Radiological Society of North America start-up showcase in Chicago, Illinois.



ventional journey to entrepreneurship. Haroun earned a bachelor's degree in electrical engineering from Ryerson University and a master's degree in engineering entrepreneurship and innovation from McMaster University—a unique program he credits with putting him on an entrepreneurial path. "McMaster has a great ecosystem, and while my industry is small, it's big from a market size standpoint," Haroun says. His first start-up, Dundas, ON-based Cinnos Mission Critical Inc., was born out of the McMaster program, and he firmly believes that his journey to entrepreneurship, and continued success, is a direct result of his education.

Cinnos was founded by Haroun with a group of technical process engineering colleagues who had a unique vision for deploying data centres. It's an innovative company whose specialty is mission critical facilities design, building services for engineering and specialty engineering projects, with a focus on developing engineering plans for large data centres, control rooms and call centres. "We had a vision of the next level of racks and cabinetry that companies were going to need for the coming wave of micro data centres," Haroun explains. To achieve their goal, the Cinnos team enlisted the assistance of McMaster University's Computing Infrastructure Research Centre. Together, they developed complex systems that became what Haroun calls "the world's first smart, scalable micro data centre cabinet and a triumph of research and engineering." But he didn't stop there. Although he remains a Cinnos board director, he has since founded a new company, Edge X Networks Inc., also in Dundas, ON, where he is a managing partner. Edge X is Haroun's answer to the connected world's demand to process huge amounts of raw data in real time and seamlessly meet those data-processing needs. Haroun sees Edge X as an evolution of Cinnos, a next level of sorts. Entrepreneurs, he says, have to be adaptable.

AN ENTREPRENEUR'S TOOLKIT

There is a common set of qualities that successful entrepreneurs continually draw on. Adaptability is high on the list. "Our technology looks at different ways of deploying data centres," Haroun explains. "At some point we realized that instead of stretching ourselves thin and expanding technology on a larger scale, we needed to focus on one set of markets. We used to try to sell to the large data centre providers, but it became too expensive for a small company to do." Haroun and his team adapted, choosing instead to focus on smaller edge markets.

Focus is also key, according to Haroun. "With a sea of both challenges and opportunity coming at you, being able to choose one thing to focus on and doing it is very important," he says. He also notes the importance of patience. "In a start-up environment as an entrepreneur, nothing ever works out the way you want it to work," Haroun says, adding that although you have to plan for such eventualities, you must also be patient with

how long things take. Creativity, too, is a valuable quality when dealing with the inevitable issues that come up, especially considering that solutions to problems must often be approached differently in a start-up as opposed to how they might be dealt with in a larger, established company. "Established companies have established processes," Haroun says. "We have always had to be creative in how we do things or find new ways of doing things because we couldn't follow the standard practices of large companies. We need to be creative every day."

In fact, being an entrepreneur is not unlike being an engineer. "Being an entrepreneur is about problem solving," Haroun says. "It doesn't matter which area it is—whether it's raising money, governance, sales or technical—you're always solving problems. As an engineer, I expect to be surprised by issues. We try to predict future failures. That toolset that you develop as a problem solver, as an engineering professional, largely comes into play."

Khan also notes that adaptability is a critical entrepreneurial quality. "You have to learn and be willing to do a lot of things that are not your core competency," Khan explains. "For both ClearVoxel and VidHug, I had to do things I wasn't comfortable with. Ten years ago, I would have said that I'm comfortable writing software and everything that surrounds that, that I could have meetings of a technical nature. Today, I'm comfortable pitching in front of an audience, writing business plans, creating a marketing website or writing copy. And I'm not saying I'm an expert at those things now, but I've had to do them all—because when you're starting out, you don't have the resources to hire people to do it for you."

SUCCESS ISN'T ABOUT CERTAINTY

Khan doesn't want to paint a rosy picture when it comes to the challenges of entrepreneurship, beginning with the uncertainty of it all and the stress of worrying about things such as getting the needed funding or securing the right customer base. But he has an appreciation for the control entrepreneurship affords over where he invests his time and energy. "If there's something you don't see value in working on, then you don't have to work on that," Khan points out. But that can be a double-edged sword, and this is where a keen sense of self-discipline comes in. "It's not about doing what you enjoy—I want to draw that distinction," Khan says. "If I do what I enjoy, I'm going to write code all the time, and the business won't go anywhere. It's more about having control over where I choose to spend my time." He reflects on the importance of self-discipline when there's no one else driving you. "I have a family. I have three kids. If I was in my early 20s working for myself, I might find myself wasting a bit more time during the day. You have to have things that drive you forward because you don't have that manager peering over your shoulder to ask how that work

is coming along," he explains. Interestingly, he thinks of himself as a risk-averse person but concedes that risk is a relative term, and everyone's level of risk-tolerance is different.

In an effort to mitigate the challenges that can arise, Khan formed a mastermind group with fellow entrepreneurs who share the same co-working space in London, ON. The group meets every week or two to discuss what everyone is working on and celebrate each other's wins. "We try to provide suggestions and insights out of the box, and that's really important," Khan says. The meetings have the added benefit of offsetting the often-isolating nature of entrepreneurship. "When you're a company of one or two people, and you don't have the water cooler to gather around with five or six co-workers to talk to, co-working spaces are helpful," he adds. "Meeting regularly with other entrepreneurs is important. I've found other entrepreneurs understand you the best, because they're in the same situation in terms of risk and their mentality."

Haroun is also quick to point out that entrepreneurship offers multiple benefits for self-driven people who aren't afraid of responsibility. For those who want to get involved in multiple aspects of projects, from budget to people management and beyond, entrepreneurship offers it all. He also notes the flip side of having that responsibility and its inherent challenges, such as the pressure of managing cash flow, tackling sales, raising capital and dealing with the infinite technical issues that can arise. "I'm definitely a risk-taker, because of where I am and maybe in terms of where I could have been had I stayed the course working for a large company," Haroun says. "I tend to choose opportunity over the status quo."

In the end, entrepreneurship, despite its challenges, allows innovators to follow their passion and turn concepts into reality, often for the direct benefit of people—whether it's coming up with a better service or a better product—and that can only benefit society and the world at large. **e**



Hussam Haroun, P.Eng., founder of both Cinnos Mission Critical Inc. and Edge X Networks, is a graduate of McMaster University's prestigious graduate program in engineering entrepreneurship and innovation.

KAELA SHEA PUTS THE “HUMAN” IN ENGINEERING

A socially conscious engineering intern combines her aptitude for engineering, kinesiology and neuroscience with her passion for helping people.

By Marika Bigongiari



Kaela Shea, EIT (left), a PhD candidate who conducts research at PRISM lab at Holland Bloorview Kids Rehabilitation Hospital, sets up a functional near-infrared spectroscopy system for a feasibility test of data collection with summer intern Laura Wheeler.

Kaela Shea, EIT, is focused on making a difference. The PhD candidate is currently conducting research at Holland Bloorview Kids Rehabilitation Hospital as part of the University of Toronto’s biomaterials and biomedical engineering program, and yet she is well on her way to greater things. In addition to her commitment to her PhD, Shea also takes on positions as a teacher’s assistant and spends a considerable amount of time as a PEO volunteer. As such, Shea is an engineer-in-residence at Toronto, Ontario’s Queen Victoria Public School, where she engages with students on engineering topics and advocates for a profession she’s passionate about. This year, in recognition of her leadership potential as a member of the engineering profession, Shea was awarded PEO’s G. Gordon M. Sterling Engineering Intern Award.

A MULTIDISCIPLINARY ROLE

Helping people is a recurring theme in Shea’s life and work. At Holland Bloorview, she is currently working through her PhD at the Pediatric Rehabilitation Intelligent Systems Multidisciplinary (PRISM) lab under Tom Chau, PhD, P.Eng., vice president of research, director of the Bloorview Research Institute and professor at the Institute of Biomaterials and Biomedical Engineering at the University of Toronto.

Here, Shea is researching rehabilitation solutions aimed at overcoming the numerous communication and physical challenges faced by children with disabilities. Her work includes the development of an innovative brain-computer interface that incorporates natural language processing in its design and brings its user context-relevant messages for face-to-face communication. It represents the culmination of Shea’s PhD work, and she continues to develop and integrate solutions into existing communication device interfaces.

Shea chose to pursue a PhD with Chau at Holland Bloorview due to the multidisciplinary nature of the lab environment. “In designing and researching within the incredibly complex system that is human communication, it is invaluable to have access to the diverse perspectives that come from working alongside people with not only different professional and academic experiences but different life experiences,” Shea says. “Holland Bloorview does an excellent job of incorporating all the actors of the system in the research process. In my own research, I’ve had the opportunity to work closely with clinicians, as well as parents of clients, who generously volunteer their time and lived experiences.”

Shea’s humanitarian roots reach back to her time as an undergrad at the University of Guelph, where she earned a bachelor’s degree in biomedical engineering and volunteered as a peer helper, facilitating weekly group meetings for fellow students who were having trouble understanding the material covered in historically difficult courses. The meetings afforded students, who often just needed some extra practice, an opportunity to learn in a different manner: “We approach the material in more of a hands-on way that’s not usual for lectures, to help with learning and understanding with the students,” Shea explains. While at Guelph, Shea also co-founded the first Canadian chapter of Engineering World Health, an organization that aims to inspire, educate and empower the biomedical engineering community to improve healthcare delivery in the developing world.

Shea came to the field of engineering through the familiar mix of life experience, the encouragement of her teachers and an aptitude for maths and sciences—and a particularly galvanizing moment at a high school fair. “I remember coming across this interactive display put on by Doctors Without Borders,” Shea recalls, “and one of the

things that really stood out to me was a moment when one of the doctors was speaking about a creative solution someone came up with for waste disposal—and I thought, I want to be the person who comes up with the innovative solutions and not necessarily treat medicine day to day.” For the rest of high school and during the first years of working towards her undergraduate engineering degree, something struck Shea. “I came to realize engineering was that method to become the one who comes up with these innovative solutions to problems and facilitates critical thinking for the issues and problems that exist in the world,” Shea explains.

LOOKING AHEAD

Shea’s goal is to become a licensed engineer, and she says PEO has lent her considerable support in her journey. She plans to fulfill her licensing experience requirements at the same time as she completes her doctorate: “My game plan is getting the PhD and the P.Eng. in the same year,” Shea says. After completing her PhD, Shea would like to pursue research. “I’m very interested in the field of human factors engineering, which is designing to optimize the human experience,” she says. “It’s designing to optimize performance and leveraging some design tools to make sure the humans who are interacting with a system are able to use it to the best of their abilities.” Although Shea is not 100 per cent sure where it will take her, the research she’s doing right now utilizes that field. “I was at a conference, and I asked about the design of the [brain-computer] interface,” she explains. “The response that I got from some of the top scientists researching in this field was, ‘Well, you’re assuming people are putting thought into the interface design.’ That jumped out at me as an area that has really been neglected. For these people, the only way they can communicate with others and socialize and engage is through these interfaces. We should be putting work into developing them to be the best they can possibly be.”

Well on her way to leaving her mark on the world, Shea sees a definite parallel between her desire to make a difference and her desire to become an engineer. One of the aspects of being a professional engineer that attracted her to the profession is its stress on ethics, along with its potential impact on humanity. As someone who cares deeply about issues surrounding sustainability and helping people, Shea thinks the bigger picture in terms of how an engineer can protect the public via the nature of their work is particularly poignant. And she thinks it’s important for engineers to think about their work from that perspective. “We’re



Kaela Shea (far right) and colleagues (from left) Mary Fallah, Rami Saab and Erica Floreani set up shop at a knowledge translation event at the Ontario Science Centre to talk to families about Holland Bloorview and the application of research performed at the PRISM lab.

taught in undergraduate studies that part of engineering is to serve the public and how that’s the most important part of our calling. That’s an important part of the field,” Shea points out. “It’s important for myself personally and for the field of engineering. When I was studying for my undergraduate degree, all the engineering disciplines commingled. What characterized each discipline as engineering was our engineering toolbox—our education in critical thinking and problem solving. As a society, as we begin to face problems we have never faced before, engineers—with our knowledge of problem solving, critical thinking and technical expertise in systems ranging from water to the human body—will be more important than ever. When faced with novel problems, we develop novel solutions and create technology, the benefits and consequences of which have never been explored. As such, we must strive to empower and encourage every engineer, regardless of their discipline, to protect the public above all else.” **e**

PEO'S REGISTRATION COMMITTEE (RE)DRAWS THE LINES OF LICENSURE

The committee provides an important adjudication (tribunal) function within the association's licensing system for parties that appear before it—namely, an applicant and the registrar of the association.

By Marika Bigongiari

In an effort to provide a fair and objective licensing system, PEO's Registration Committee (REC) acts as an independent and impartial reviewer for applicants for licensure and for certificates of authorization (C of A) who are being refused a licence or certificate and want to dispute it. The committee holds hearings as required when requested by an applicant.

An applicant who is assessed by the registrar as not meeting the requirements for a licence may within 30 days of receiving the registrar's notice of proposal to refuse to issue a licence—which the applicant gets in writing with the registrar's reasons for his proposal—request a registration hearing. If the applicant does not request a hearing from the REC, the *Professional Engineers Act* (PEA) allows the registrar to proceed to refuse to issue a licence or C of A. If an applicant requests a hearing by the REC, the PEA affords the applicant an opportunity to provide evidence of compliance with licensing requirements that were allegedly not met in the registrar's opinion, and/or to seek an exemption from any requirements under the PEA or its licensing Regulation 941 provisions. Most hearings conducted by the REC concern applicants who want to dispute the registrar's proposal to refuse to issue a licence, and who have exercised their rights to a hearing by the REC, and, less often, the registrar's proposal to refuse to issue a C of A.

Depending on the type of application, the registrar may be assisted by either the Academics Requirements Committee (ARC) or Experience Requirements Committee (ERC). An applicant may also request that his or her application file be referred to the ARC or ERC in order to expedite the process leading to a registrar's decision to either issue a licence or propose to refuse to issue a licence.

A FORMAL HEARING

The roster of the REC—which is currently led by Chair Bogdan Damjanovic, P.Eng.—consists of professional engineers, lieutenant governor-in-council appointees to PEO Council, or an attorney general-approved lawyer. The tribunal conducts oral hearings in a formal tribunal

setting, with the applicant and the registrar as parties to the proceedings. Hearing panels consist of three members of the REC roster, and parties may be represented by legal counsel. "When the registrar decides to issue a proposal to refuse to issue a licence to an applicant, and gives notice thereof, and the applicant requests a hearing, the Registration Committee provides an independent review of the application file and admits fresh evidence, if available," Damjanovic explains.

The REC makes its decision based on the law and the facts presented to it at a hearing. It can exempt the applicant from any of the requirements of the act and its regulations and to direct the registrar to issue the licence or C of A if the committee determines on reasonable grounds that the applicant will engage in the practice of professional engineering with competence and integrity.

The REC, as a tribunal, can also hear Human Rights Code of Ontario arguments as well as Canadian Charter of Rights and Freedoms arguments with prior notice to the applicable attorney general. "Under the *Fair Access to Regulated Professions and Compulsory Trades Act* (FAR-PACTA) the Registration Committee is the independent and impartial review, and under the PEA it is the licensing tribunal that can grant exemptions in certain cases," Damjanovic explains.

At a hearing, the REC allows a court reporter to record the proceedings, and transcripts of the hearing are available, for a fee, from the court reporter. The REC also compiles a record of its proceeding, including copies of the evidence submitted by the parties and received into evidence at the hearing, along with its final decision for use by a party desiring to appeal the decision. Either the applicant or the registrar may appeal a decision made by the REC, but it must be made to the Divisional Court of Ontario, in accordance with the Rules of Civil Procedure. The REC does not hear cases in which a licence or C of A was suspended or revoked as the result of a Discipline Committee decision.

Applicants should seek legal advice on interpreting the licensing regime under the PEA and its regulation and for advice under any argument they can raise under the Human Rights Code or under FAR-PACTA.

The REC webpage (www.peo.on.ca/index.php/ci_id/2261/la_id/1) provides a schedule of hearings that are open to the public, as well as useful legislative links. **e**

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Deadline for November/December is September 27, 2019. Deadline for January/February is November 20, 2019.

A distinction between public and private safety

Hendrik Borgdorff, P.Eng., Barrie, ON

In “An engineer’s obligations when performing engineering work outside regular employment,” by José Vera, P.Eng., MEPP, on page 21 of the March/April 2019 issue of *Engineering Dimensions*, he says that if Andrew, P.Eng., owns the building for which he is performing a check related to the adequacy of the roof structure, or at least that the work was performed in keeping with the design for that work, he is not performing that review for the public, and thus does not need a certificate of authorization nor liability insurance coverage according to the regulations. Then, he says that Andrew should consider getting insurance coverage to protect his retirement funding.

It seems to me that there is something wrong with the regulations. If Andrew, as the owner of the building, is not considered to be the public in this instance, are the people to whom he sells the building and their clients also not the public? A rhetorical question, of course. The whole *Professional Engineers Act* (PEA) is designed, not first to protect Andrew, as a professional engineer, but to protect those people who use the facility which Andrew is confirming was properly built. In that context, Andrew’s protection, though important enough, is secondary.

I would have thought that, in PEO’s official publication, the distinction between public safety and private safety would never be left without emphasis.

Longstanding members deserve life member status

David A. Hogg, P.Eng., Scarborough, ON

A year ago, I received notice that I had been elected a life member of the Chartered Professional Accountants of Ontario. One of the benefits of this election is that I am no longer required to pay the annual membership dues. It was heartening to receive this recognition.

I have been a P.Eng. for far longer than I have been a professional accountant. It surprises me that Professional Engineers Ontario does not have a similar recognition. It should be very easy to do this. For example, it would be a gracious act for PEO to accord life membership to those who have a combined age and P.Eng. membership of say 100 or 125?

I will soon reach 140, so I think I am well overdue.

EDITOR’S NOTE At PEO, life member status is available to members who have taken on the role of PEO president.

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1 thestar.com, "Average amount owing on mortgages rises 5 per cent, TransUnion Canada says," August 22, 2017.
2 moneysense.ca, "The real cost of raising kids," April 15, 2015.
3 Statistics Canada, "Average spending on goods and services and shares of spending of major categories by province, 2016," 2017.
4 See full First-Time Applicant Offer eligibility and offer details at www.manulife.com/springfree.

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