

JANUARY/FEBRUARY 2020

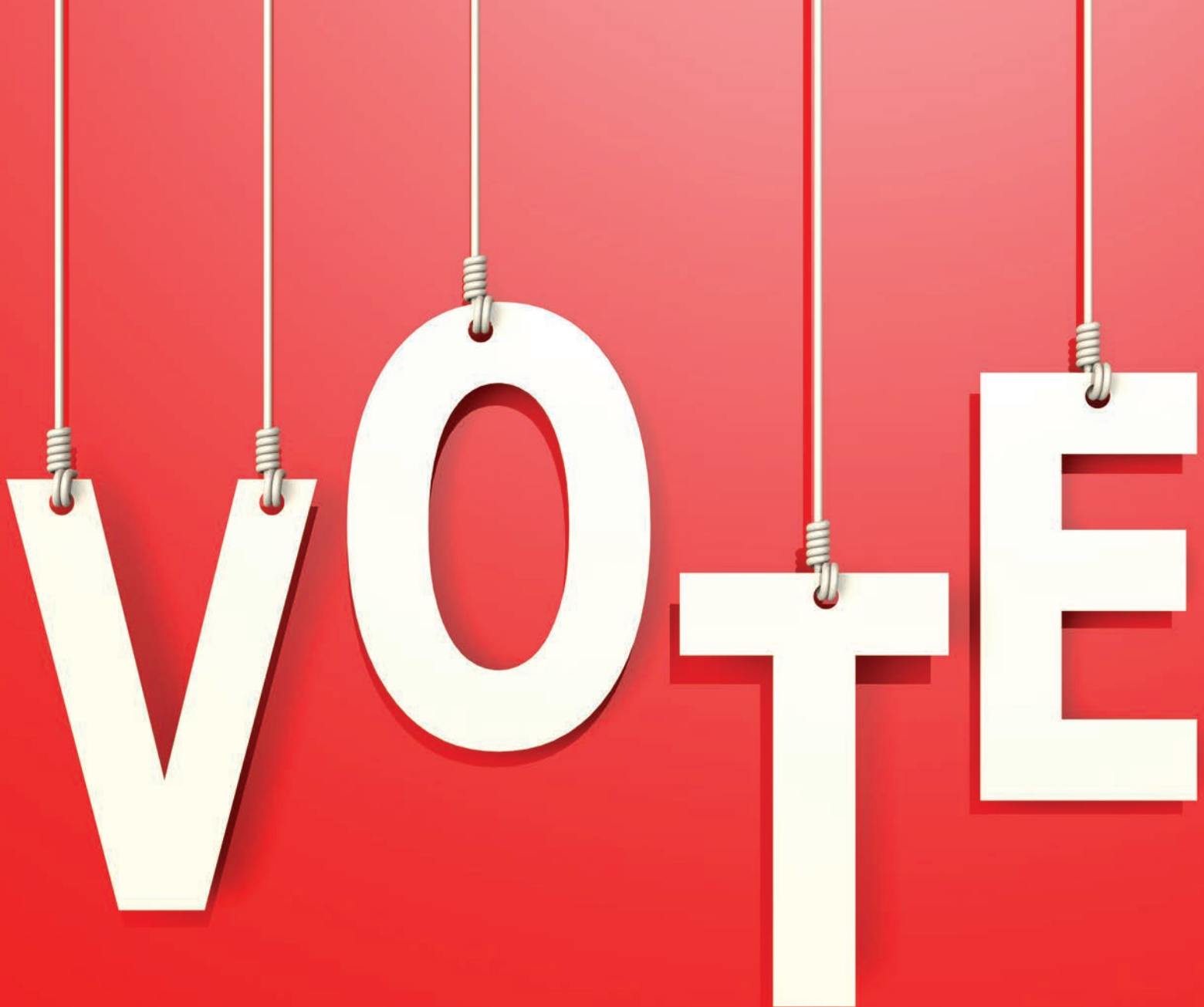
ENGINEERING DIMENSIONS

What drives
HUMAN FACTORS
engineering?

VOTE!
Candidate
statements for 2020
Council elections
inside



Professional Engineers
Ontario

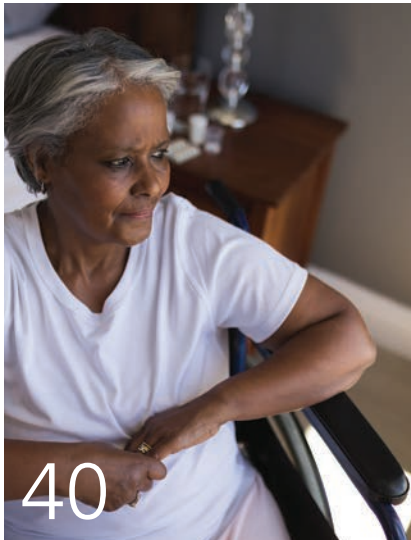


**Your profession matters.
So does your vote.**

Find the 2020 Council Elections candidate statements in this issue's insert.
Go to peovote.ca for all election-related resources,
including video recordings of this month's All Candidates Meetings.

Voting opens January 17. Count yours in.

ENGINEERING DIMENSIONS



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DIGITAL EDITION



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Cover: University of Toronto Human Factors and Applied Statistics Lab research associate Nazli Kaya conducts an eye-tracking test to study driver attention failure when turning at an intersection. Photo: Laura Pedersen

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To protect the public, PEO investigates all complaints about unlicensed individuals or companies, and unprofessional, inadequate or incompetent engineers. If you have concerns about the work of an engineer, fill out a Complaint Form found on PEO's website and email it to complaints@peo.on.ca.

If you suspect a person or company is practising engineering without a licence, contact PEO's enforcement hotline at 800-339-3716, ext. 1444, or by email at enforcement@peo.on.ca.



WHEN BEHAVIOUR INFLUENCES ENGINEERING DESIGN

By Nicole Axworthy



Let's imagine you're driving home from work one stormy winter night. The roads are icy and dark; your phone—which is attached to your dashboard—is

distracting you with email notifications; and your radio is broadcasting road closures ahead. You can't seem to find the right speed for your windshield wipers, and at the same time, your interior air vents are blasting too much hot air on your face. Your main task should be to pay attention to driving, but you're being distracted by these other elements—all of which influence how you will respond to outside conditions. These distractions might even make it more likely that, unintentionally, you won't react quickly enough to an oncoming collision and end up in a ditch.

Our actions and decisions while driving a car or using any other product made for human use are nudged and shaped, sometimes without us even knowing, by many factors. And this is precisely what engineers in the field of human factors examine: The way people interact with various aspects of the world provides important intel when designing products that are safer, healthier and more efficient.

This interdisciplinary field has a wide scope of application, spanning road safety, healthcare delivery and technology, among others. The goal of human factors engineering is to expose factors that affect behaviour, determine the extent of influence on behaviour, and

modify the design of the user system to reduce unsafe behaviours and improve performance. As University of Manchester psychology professor James Reason said in his book *Managing Maintenance Error*, "You cannot change the human condition, but you can change the conditions in which humans work."

This issue, we examine two areas within this fascinating field of engineering. In "Designing for dementia" (p. 40), Associate Editor Adam Sidsworth explores how human factors applies to the design of tools and technology used to help seniors living with dementia. And in "How human factors engineering drives automotive design" (p. 46), Associate Editor Marika Bigongiari steers her focus to how the human factors approach is used in the automotive industry—which applies to my example above.

In addition to these two features, we're sharing some important PEO-related news. The first is that it's election season here. I encourage you to support your fellow engineers who are offering their time and expertise on PEO's 2020-2021 Council to help PEO make important decisions on its future. Visit peovote.ca for more information on this year's Council candidates and to cast your ballot. Additionally, after more than two years in the making, we recently launched our redesigned website: peo.on.ca. When you have a moment, be sure to peruse the site to find the incredible collection of resources available to you—among them, a "knowledge centre" and your own online profile where you can pay fees online and manage your *Engineering Dimensions* subscription. **e**

THIS ISSUE We explore how the automotive industry has incorporated a human factors approach when designing vehicles, and in a nod to Canada's aging population, we explore how engineers design technology within a human factors perspective to help people living with dementia lead more independent, dignified lives.

ACHIEVING GENDER PARITY WILL MAKE US A STRONGER PROFESSION

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



As I write this column, I reflect on the 30th anniversary of the December 6, 1989, Montreal Massacre, when a gunman murdered 14 young women—mostly engineering students—at a Montreal university simply because he could not bear to see women studying engineering.

I consider my own experiences building a career in what remains a largely male profession, and two experiences stand out for me. The first took place in my fourth-year engineering communications course, when we were tasked with bringing in an object and describing it to the class. A classmate brought a semi-automatic assault rifle and, in the classroom, took it apart and reassembled it. He explained how he could modify the weapon to fire as an illegal fully automatic rifle. I was very uncomfortable with his presentation, and, as the only woman in the class, my response was quite different from my classmates. There was no discussion on the appropriateness of his presentation—we just assessed his talk and moved on. Looking back, it is astonishing that nothing was discussed regarding a student bringing an assault rifle into class.

The second incident occurred at my first job at a consulting engineering firm. I was on a structural design team, and we typically checked each other's work. At one point, I was reviewing a colleague's design and identified an error. The male colleague had both several years of experience and a master's degree, and I had less than one year of experience. When I approached him to discuss his design, he refused to talk with me. The design was ultimately changed, yet after that our team leader no longer had us exchange work. After the experience, I thought about what I could have done differently. As the only woman in the group, I felt I was not allowed to do my job to the fullest because of the work-around by the team leader.

Many women engineers have similar stories. And as I think back to the Montreal Massacre, as well as my own experiences as a PEO licence holder, I reflect on our role as a regulator. In the last 30 years, we have not moved the bar very far for women engineers. In 1989, women made up about 5 per cent of licence holders; today, they make up only 13.5 per cent nationally. Given that we make up more than half the population, this simply isn't good enough. And as we enter a new decade, if we do not start doing things differently, we will never reach a critical mass of women in the profession. We must do more to create a more inclusive profession and work environment, adopting strategies like the mandatory equity and diversity training that is now common with other regulators.

Fortunately, PEO is on the right track, especially with its endorsement of Engineers Canada's 30 by 30 initiative, which aims to have women make up 30 per cent of newly

licensed engineers in the profession by 2030. It's important work, and the manifesto of PEO's own 30 by 30 Task Force, written by former PEO president Bob Dony, PhD, P.Eng., FEC, articulated the need for regulators to be involved:

"The 30 by 30 initiative speaks directly to this trust between society and regulator. If we, as a self-governing profession, are not reflective of the society on whose behalf we serve, society has every right to question our ability to equitably regulate. Society recognizes that gender equity is a goal that a just society should strive towards. The evidence is irrefutable that a more equitable society is a healthier society. Most other major professions have either achieved gender parity or made great strides towards it. With a current gender ratio of less than one female in five, engineering is an anomaly."

I look forward to moving the dial over the next 10 years and having the whole engineering community embrace 30 by 30 principles—equity, diversity and inclusion—to make us a stronger profession.

PEO GOVERNANCE

As I've discussed in earlier columns, PEO Council has committed to improving our governance processes. Last fall, we began working with an external governance advisor, Governance Solutions Inc., to help Council remain focused on regulatory and governance issues while leaving the operational issues to staff.

Our November 2019 Council plenary session was devoted to governance training, and our advisor presented on the importance of good governance principles to help guide decision making. The key takeaways for Council was how effective governance directs and controls organizations and the necessity for clear alignment between Council and staff and strategy and operations.

This is a very exciting time for Council as we learn the tools of good governance, but we must ensure these tools and principles are embedded into the organization and carried forward into future Councils.

2020 COUNCIL ELECTIONS

As we enter another election cycle, I encourage all licence holders to vote in Council elections. As a self-regulating profession, it is crucial we boost licence holder engagement, and one way to demonstrate engagement is to vote. You can learn about the 2020 candidates by visiting peovote.ca. There is also information about Council activities on our newly redesigned website (peo.on.ca).

I look forward to working with the new Council under the leadership of President-elect Marisa Sterling, P.Eng., FEC, and to creating a strong governance structure and making sound decisions that move the profession forward in the public interest. [e](#)

THE PATHS TO CHANGE

By Johnny Zuccon, P.Eng., FEC



As we ring in another new year filled with potential and promise, I'm excited to be leading change at PEO.

When I was appointed as CEO/Registrar last February, I was handed a mandate of delivering change unprecedented in PEO's nearly 100-year history. No small task, I would argue. One very small aspect of such change is the

addition of this new, regular column—added on the recommendation of President Nancy Hill, P.Eng., LLB, FEC—allowing me to provide readers with updates on the operational initiatives taking place and to complement the overviews on governance provided by President Hill in her column.

To set the stage, I'd like to review the scale and magnitude of the journey we have collectively embarked on. It really amounts to an enterprise-wide transformation on three major paths.

and researched best standards for regulators. In September, I presented Council with a high-level action plan to address these recommendations. The plan, which Council subsequently approved, defines PEO's change vision and provides guiding principles that will serve as the ground rules for our transformation. A key element of the plan is an activity filter that will provide a consistent and objective mechanism to determine and categorize the functions of activities and outputs from committees, chapters, subcommittees and working groups, and assess if these activities and outputs relate to professional regulation, board governance or neither. This undertaking will be used to ensure that all change initiatives are collectively and appropriately aligned, and will help to define our clarity of purpose—the cornerstone of any enterprise-wide transformation. Staff is currently categorizing this information now and the results will be presented to Council in February.

PATH #2—ORGANIZATIONAL REVIEW

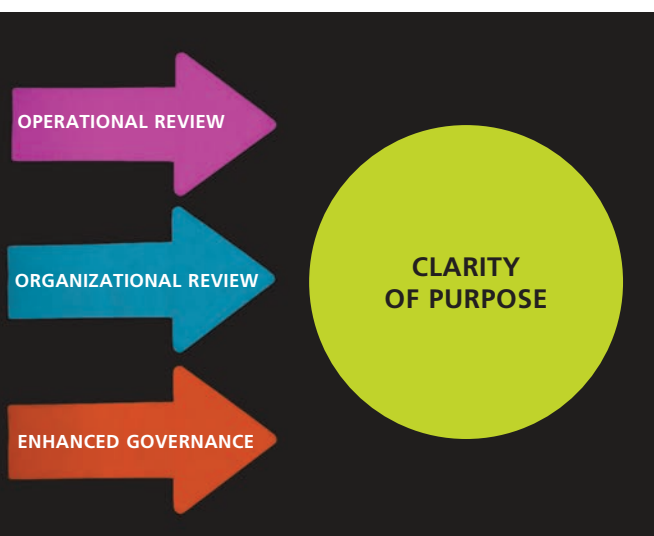
As we plan to address the recommendations from the external review, we also must take into consideration structural changes to our operational organization that are necessary to ensure the appropriate capacity and agility to achieve our objectives. Building a sustainable future for PEO requires a transition strategy that is controlled and measured. To this end, we engaged Western Management Consultants to carry out an organizational review to gauge our current capacity and to better position the organization to strategically manage the change process. We are currently awaiting their final report and I will provide further updates in a future column.

PATH #3—ENHANCED GOVERNANCE

In September, Governance Solutions Inc. was engaged to provide independent expertise to assist Council and the president/chair with developing and maintaining sound governance and leadership practices. Their work has included assisting in clarifying roles and responsibilities; the development and priority-setting of Council meeting agendas; attending all Council meetings as an observer and as a parliamentarian; offering post-meeting feedback, guidance and process improvement; and clarifying governance objectives and outcomes through targeted training sessions.

My expectation is that success on these three major paths will provide us with the focus necessary to ensure that our discussions, actions and accountabilities are always directed towards PEO's public interest mandate. Our journey will not be a short one. There is a lot of work still to be done. But we have made great strides so far and are moving the dial in the right direction to becoming a better, more modern and more effective regulator.

I look forward to keeping you apprised of our progress. [e](#)



PATH #1—OPERATIONAL REVIEW

In the fall of 2018, Council took a bold step and voluntarily commissioned a review of our regulatory performance. The review assessed our performance against our statutory mandate and legislative requirements, internal policies and the standards of good regulation across its core regulatory functions: licensing and registration; complaints, discipline, compliance and enforcement; and professional standards. The decision to subject ourselves to an external review, and to make the findings public, sent a clear message that we, as a regulator, are committed to fulfilling our mandate as effectively and efficiently as possible. The report, released publicly in June 2019, provides 15 recommendations on how to improve PEO's regulatory performance and revealed that we have a lot of work to do to measure up to the identified

RADIOHEAD CORONER'S INQUEST RECOMMENDATIONS CONSIDERED BY PEO COUNCIL

By Adam Sidsworth

One month before the engineer involved with the Radiohead temporary stage collapse went before PEO's disciplinary panel, Council considered key recommendations stemming from the coroner's inquest into the death of Radiohead drum technician Scott Johnson.

At its November 15, 2019, meeting, Council voted to publish its *Design Evaluation and Field Review of Demountable Event and Related Structures* practice guideline. The guideline was developed by PEO's Professional Standards Committee over the last three years and began prior to the coroner's April 10, 2019, delivery of its verdict into the death of Johnson. Johnson died on June 16, 2012, when the event's temporary stage collapsed just hours before the band was scheduled to take stage. PEO developed the guideline with consultation from numerous stakeholders, including the Large Municipalities Chief Building Officials, the provincial ministries of Labour and Municipal Affairs, Consulting Engineers of Ontario and the Ontario Society of Professional Engineers.

The guideline sets the best practices for the design evaluation of demountable event structures as defined in the Ontario Building Code and similar structures exempted from it, such as television and movie sets, and structures exempt due to size or height in addition to demountable event structures designed by practitioners for multiple locations. The document recommends that engineers working with demountable structures:

- Should "take reasonable steps to confirm that the design or verification [of other engineers licensed in Ontario] is valid by advising the prior engineer of the proposed design reuse and location";
- Ensure that "drawings should be clear and consistent, including their measurement system...explain key elements in plain language, include a legend for any acronyms and...include an index of all drawings and documents that constitute the complete set of design and erection drawings"; and
- "Should confirm with their client that only sealed drawings and documents are final versions and that only sealed drawings and documents are to be used for fabrication, erection or operation of the demountable event structure."

Many of the guidelines' contents stem directly from the coroner's recommendations. The coroner had 28 recommendations, 21 of which were directed at PEO (see "Radiohead coroner's inquest issues recommendations," *Engineering Dimensions*, July/August 2019, p. 19). During the 12 days of testimony, the temporary stage's engineer, Domenic Cugliari, who has since resigned his engineering licence, told the inquest that his sealed plans lacked detail, and Optex Staging, which constructed the stage, stated that it lacked a truss called for in the drawings. Both Cugliari and Optex Staging, along with the concert's promoter, Live Nation, were charged under the *Occupational Health and Safety Act*, but those charges were eventually dropped after a judge cited the defendants' rights to a speedy trial. Johnson's family and Radiohead repeatedly expressed their frustrations regarding the lack of judicial oversight.



ADDITIONAL RADIOHEAD MOTIONS

Two additional recommendations stemming from the Radiohead coroner's report were presented at the Council meeting separately from the motion to approve the *Design Evaluation and Field Review of Demountable Event and Related Structures*, due to possible necessary amendments to the *Professional Engineers Act* (PEA). In one motion, Council voted against one of the coroner's recommendations by opting not to proceed with creating a specialist designation for professional engineers designing and inspecting demountable event structures, despite comments from Past President David Brown, P.Eng., BDS, C.E.T., that "more often than not, when we look at discipline cases, it has something to do with the building industry...we have the same licence, but we're not equal. And from what I've seen from the evidence in the [Gazette], a lot of times engineers make a poor ethical decision because they're not qualified, and they get in trouble for doing this...It's a very quick check box for a building inspector and other people to see they're dealing with people who are properly trained." However, Council's vote aligned with a recommendation from PEO's Professional Standards Committee, which stated in a policy analysis that it would create a "two-tier" system in our profession and that "the market for demountable structure engineering specialists is very small, with a handful of key players and organizations."

In another motion that had councillors strongly vocalizing their opinions, Council sided with the coroner's recommendation to require members to file an annual report that would include identifying the engineering areas in which they report.

West Central Region Councillor Warren Turnbull, P.Eng., FEC, stated: "I can't understand why it wouldn't be relevant for the regulator to know what our licensees are practising and what areas they work in. If there is more than one, I presume you can list it, if you have the expertise in those areas. This is long overdue, and we need to pass this motion." West Central Region Councillor Lisa MacCumber, P.Eng., FEC, added: "As a board we have a responsibility to protect the public. Do you want to go to a doctor for heart surgery who's an ear, nose and throat specialist? I don't think so. Look at it from that perspective." Lieutenant Governor-in-Council Appointee Qadira Jackson Kouakou, LLB, stated: "As a lawyer, I'm used to doing an annual report. It's very in-depth. You have to have accountability. We have to report what areas of law that we practise in." She continued: "It can also be used as a tool to look for anybody who randomly adds in an area of engineering that's not related to the area of their practice. I agree with [Past President Brown] and what he said about discipline." Brown had stated that "we have to look at making our members list what it is they think they're competent in practising. They will look at that information if there's a discipline case and say, 'You said you're a structural engineer, but you're actually not. You're an electrical engineer.' These things happen around here all the time, and those are the things that get to the [Gazette]." Council approved the proposal requiring all licensed engineers to annually report their areas of expertise, job title, employers and updated contact information, and directed the registrar to amend the PEA and take other actions to make it possible to implement the required reporting.

BITS & PIECES



Habitat 67 in Montreal, Quebec, is a world-famous historical landmark and study in the role of architecture in a high-density urban environment. The sculptural modular structure contains 148 residences nestled and stacked on one another. It was originally conceived as part of architect Moshe Safdie's McGill University thesis and was created as part of Expo 67. Photo: Matias Garabedian






The Log Skyscrapers in Whitehorse, Yukon, are two remaining log structures built by Martin Berrigan in 1947. Made of logs cut from the east bank of the Yukon River, they are the only buildings of this type in Canada. Their multi-storied log construction has given them heritage status.

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2019 ONTARIO PROFESSIONAL ENGINEERS AWARDS GALA SALUTES ENGINEERING TRAILBLAZERS PAST AND PRESENT

By Duff McCutcheon



Ontario Professional Engineers Award certificates and trophies await presentation to the award recipients

Shoshanna Saxe, PhD, P.Eng., accepts the Engineering Medal in the Young Engineer category

Milica Radisic, PhD, P.Eng., stands with her new Engineering Medal for Research and Development

Under the theme “Canadian engineering trailblazers,” about 500 guests and delegates gathered at Mississauga, Ontario’s International Centre on November 16, 2019, to honour and celebrate the new Ontario Professional Engineers Awards (OPEA) winners.

The 2019 award winners are:

Brian Bonnick, P.Eng., executive vice president and chief technology officer, IMAX Corp., was awarded the Professional Engineers Gold Medal for both his leadership and technical accomplishments at IMAX, including expanding IMAX theatres from 400 to 1500 around the world and heading development of the IMAX MPX theatre system, resulting in six patents in the fields of acoustics and theatre design.

John McPhee, PhD, P.Eng., professor, University of Waterloo, and Canada research chair in system dynamics, won the Engineering Medal for Engineering Excellence for his research on the modelling, control, simulation and design of dynamic physical systems.

Irene Sterian, P.Eng., director, technology and innovation, Celestica Inc., won the Engineering Medal in the Management category for her 30 years as an engineering executive and her exceptional leadership in the fields of electronics and manufacturing and electronics engineering.

Milica Radisic, PhD, P.Eng., professor, faculty of chemical engineering and applied science, University of Toronto, won the Engineering Medal for Research and Development for her work as an international leader in cardiac tissue engineering—building living heart tissue in the laboratory using stem cells and biomaterials.

Zheng Hong (George) Zhu, PhD, P.Eng., professor and chair, department of mechanical engineering, York University, won the Engineering Medal for Research and Development for his remarkable body of work that has led to many significant innovations in the field of aerospace engineering.

Milos Popovic, PhD, P.Eng., professor, University of Toronto, and director, KITE Research Institute, University Health Network, won the Engineering Medal in the Entrepreneurship category for his work developing and commercializing a life-changing electrical stimulation therapy for restoring upper limb function in stroke and spinal cord patients.

Shoshanna Saxe, PhD, P.Eng., assistant professor, University of Toronto, won the Engineering Medal in the Young Engineer category for her significant achievements around sustainable urban infrastructure, including developing a University of Toronto graduate class that explores what sustainability means in the context of infrastructure development.

Jaime A. Libaque-Esaine, MBA, P.Eng., a retired Ontario Hydro engineer, was honoured with the Citizenship Award for his longtime service as a volunteer leader, assisting both international engineering graduates and his local Scarborough community.

Ronald Sidon, MBA, P.Eng., an engineer and entrepreneur, was recognized with the Citizenship Award for his career-long history of volunteering and philanthropy, including mentoring young engineers and using his engineering skills to create customized assistive devices for people with physical disabilities.

And **Bombardier Business Aircraft** won the Award for Engineering Project or Achievement for its development of the Global 7500



2019 Ontario Professional Engineers Award winners (clockwise from top left): Milos Popovic, PhD, P.Eng., Milica Radisic, PhD, P.Eng., Brian Bonnick, P.Eng., Shoshanna Saxe, PhD, P.Eng., Jaime Libaque-Esaine, MBA, P.Eng., Scott Goobie, P.Eng. (on behalf of Bombardier), Ronald Sidon, MBA, P.Eng., Zheng Hong Zhu, PhD, P.Eng., Irene Sterian, P.Eng., and John McPhee, PhD, P.Eng.

Gold Medal winner Brian Bonnick, P.Eng., stands at the podium with his new award

PEO President Nancy Hill, P.Eng., LLB, FEC, makes a speech on behalf of PEO at the evening gala



Business Jet—the world’s largest and longest-range business jet. Developed and built at Bombardier’s Toronto location, this achievement has had a significant impact on the Ontario aerospace sector involving a wide range of innovative expertise of Ontario engineers.

“Our 10 award recipients exemplify engineering excellence through their inspiring and innovative contributions to both the profession and society. In keeping with the theme of tonight’s gala, they are all engineering trailblazers,” said PEO President Nancy Hill, LLB, P.Eng., FEC. “Like the Canadian engineering trailblazers who came before them, they all

demonstrate the character of our profession, and the tremendous range and diversity of its practitioners.”

While the gala saluted past Canadian notables such as Ursula Franklin, Elsie MacGill, Elijah McCoy, Alexander Graham Bell and Roberta Bondar as science and engineering trailblazers, many of this year’s winners pointed to personal mentors as their own trailblazers. “An engineering trailblazer who really inspired me was University of Waterloo professor Dr. Gordon Andrews, P.Eng., who literally wrote the book on engineering practice and ethics and was a key contributor to graph theoretic modelling,” McPhee said.

“I admire Dr. Cristina Amon, PhD, P.Eng., a former dean of engineering at the University of Toronto, for her people-centric approach and her ability to include everybody in success,” Radisic said.

The Ontario Professional Engineers Awards are currently seeking nominations for the 2020 awards. The nomination deadline is February 26, 2020. For more information, please visit peo.on.ca/about-peo/awards/ontario-professional-engineers-awards/opea-nominations.

COMMITTEE CHAIRS, COUNCIL AND PEO SENIOR STAFF LEARN VALUABLE LESSON IN INNOVATION

By Adam Sidsworth

PEO's senior staff, committee chairs and Council members gathered at PEO headquarters in Toronto, Ontario, on November 1, 2019, to participate in a day-long workshop to learn valuable innovation and leadership skills. The workshop, called "Leading Change," was facilitated by Lee-Anne McAlear, program director of the Centre of Excellence in Applied Innovation Leadership at York University's Schulich School of Business and a partner in CURRENT, a firm that specializes in innovation leadership.

McAlear welcomed the attendees by noting how framing impacts people's decision-making. "We do this all the time," she asserted. "Everything has to do with how we frame things, how we do things," she added, quoting educator and author Stephen Covey, who once said, "We see the world not as it is but how we are." McAlear noted that in our era of increasing technological innovations, different people will frame these innovations' impacts differently. She used autonomous vehicles as an example, citing a statistic that most traffic accidents are caused by human error. Hospitals will be impacted, with McAlear noting their large areas configured for traumatic accidents. "Can we reuse that capacity for our aging population?" she pondered. Mechanics and truckers will also be uniquely impacted, and if autonomous vehicles are used as Uber vehicles while their owners aren't using them, how will the vast amount of spaces devoted to parking lots be impacted? And with data analytics, will autonomous vehicles choose routes that go by a Shoppers Drug Mart if the person in the car has a PC Optimum card?

McAlear is a writer, speaker and consultant who specializes in leadership, innovation, employee engagement and team effectiveness. She has worked in both the private and public sectors in more than 31 countries and has piloted several initiatives in brand recognition, new methods for patient care and customer care and retention and has certificates in emotional intelligence, team management systems and situational leadership.

FACILITATING CHANGE

To illustrate how difficult it can be to facilitate change, McAlear had attendees in one early breakout session pair up and play a game she called "apple to orange," in which one person, the apple, held their right fist out, and the other person, the orange, put their right palm against the apple's fist. McAlear noted that with almost every pair, the orange pushed back against the apple's fist, despite McAlear's lack of instruction. Resistance plays a large impact in human behaviour, she noted, citing statistics that although leaders in organizations place innovation as a high priority, most are dissatisfied with the innovation being achieved. Bill Gates, McAlear asserted, once said that



Academic Requirements Committee Vice Chair Waguih ElMaraghy, PhD, P.Eng. (left), and Faris Georgis, P.Eng., PEO's manager, registration, work through an exercise in a breakout session at the Committee Chairs Workshop.

people overestimate change over a two-year period but underestimate changes over a 10-year period. According to McAlear, understanding people's resistance to change will be key as PEO's leadership implements PEO's high-level action plan, which was designed throughout the summer of 2019 by CEO/Registrar Johnny Zuccon, P.Eng., FEC, and PEO's senior management team, with short-, medium- and long-term goals to address the 15 recommendations in Harry Cayton's external audit of PEO's performance as Ontario's engineering regulator (see "Council approves action plan to implement recommendations of external review," *Engineering Dimensions*, November/December 2019, p. 50). McAlear predicted that as PEO implements its action plan, it will encounter resistance. "How do we influence these people and get them on board?" she asked, alluding to PEO's need of strong leadership.

SKILLS OF STRONG LEADERS

According to McAlear, strong leaders have a high emotional quotient (an acute ability to perceive and assess people's emotions) and a high adversity quotient (a strong inclination towards responding to and leading change). Effective leaders, she said, manage their emotions, staying calm in the face of resistance, with techniques like taking a walk or meeting the next day, when emotions have time to

continued on p. 14



ENGINEERING DIMENSIONS

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continued from p. 12
diffuse. Another leadership skill is delaying gratification in order to consider many perspectives. And yet another technique is to get people to say things out loud. "If people say things out loud, they're more likely to do it," McAlear said. "Getting commitment from people is a great way for getting the chain moving," as it will make people more likely to commit.

PEO leaders looking to implement change should be mindful of how adults process new information, McAlear said, citing change management model KUBA (know, understand, believe and act), stating that people need to know what you want, understand why you're implementing change, give people a reason to believe in the change and let them know how they should act throughout the implementation process. However, during one breakout session, when attendees broke into pairs and were tasked with having a challenging conversation using action words, one attendee said afterwards that engineers are notorious for struggling to communicate, McAlear quipped, "It's still your responsibility." She added that leaders always have the option of bringing in communication experts to help them develop a solid communication plan. But no matter the communication plan, strong leadership embraces positivity. "People hear construction as less than positive," McAlear said. "High-functioning teams are the opposite: They have five positives to [each] negative."

CHAPTER LEADERS DISCUSS THEIR ROLE IN PEO'S EVOLVING FUTURE

By Adam Sidsworth



Lorena Tere, P.Eng., an executive member of the Etobicoke Chapter, addresses a breakout session led by Deanna Williams.

At an event-packed Chapter Leaders Conference (CLC) on November 16, 2019, delegates from PEO's 36 chapters heard about the changing role of regulatory bodies and chapters' future within PEO as it undergoes regulatory reform. Chapters heard about PEO's new high-level action plan and activity filter, which were developed by CEO/Registrar Johnny Zucco, P.Eng., FEC, to directly address recommendations stemming from an external review of PEO's regulatory performance led by Harry Cayton, international consultant to the Professional Standards Authority (see "Council approves action plan to implement recommendations of external review," *Engineering Dimensions*, November/December 2019, p. 50). The activity filter will help Council determine whether PEO activities fall within PEO's regulatory mandate (see p. 55). "It sends the message that we're a serious regulator," Zucco said at the CLC. "This is long-term thinking...The status quo is no longer an option. I see there's a sense around everybody, including chapters, to do things differently. But we need to recognize that if we make change at PEO, it's

controlled and measured." Zucco was careful to note the activity filter's carefully considered metrics, stating, "There's a lack of a universal agreement on PEO's mandate. There's a lack of organizational capacity and agility to deliver and sustain change. There's confusion on the roles of Council and staff." However, Zucco asserted, Council's decision to incorporate a governance advisor—an expert parliamentarian adopted into Council meetings in late 2019 following PEO's receipt of the regulatory review—is a huge help.

A REGULATORY EXPERT ADDRESSES THE CLC

Preceding Zucco's presentation, Deanna Williams, who co-wrote with Cayton the review of PEO's regulatory performance, addressed the CLC, informing delegates about the changing structure of regulatory bodies across the world and Canada. Williams, who has held senior policy positions with the Ministry of Health and Long-term Care and served as supervisor of the College of Denturists of Ontario and registrar of the Ontario College of Pharmacists, told the delegates that there are three things that set self-regulation apart in Canada: Council elections by members, the ability to set and receive fees and the ability to discipline its members. "In the US," Williams said, "members go before a panel who may or may not understand the profession." But Williams noted that professional self-regulation is changing across the country. Notably,

- Four provinces have fairness commissioners that "give the ability for a minister to put a supervisor in place";
- There is a movement towards a clearer separation of regulatory and advocacy bodies, but, Williams asserted, "they have to be separate but aligned"; and
- Governments have asserted trusteeship over regulatory bodies, including in Ontario, for the denturist regulator, which "in just under two years, managed to get their regulatory status back" because of sound decisions.

LUNCHTIME PRESENTATIONS

While delegates were served lunch, they listened to two additional presentations, including one led by Helen Wojcinski, MBA, P.Eng., FEC, chair of PEO's 30 by 30 Task Force, which is tasked with supporting the Engineers Canada initiative that has as its goal raising the percentage of newly licensed engineers who are women to 30 per cent by the year 2030. Wojcinski suggested that chapters could play an important role "by looking at how many women are participating in chapter events. PEO could have chapters in different geographical areas to gauge employers in the 30 by 30." And in another lunchtime presentation, Murad Hussain, P.Eng., past chair of the Scarborough Chapter, informed his fellow chapters about Scarborough's efforts to better engage with its members by developing its Members Engagement Retention Communication (MERC) portal. The MERC is an automated registration system that keeps records of membership participation, member recognitions and any technical knowledge members have obtained through chapter technical seminars. It also automatically generates various activity reports that are used at regional meetings and Scarborough Chapter's annual general meetings.

After lunch, delegates were updated about PEO's plan to centralize chapters' bank accounts to PEO's head office by December 31, 2019. PEO Eastern Region Councillor Guy Boone, P.Eng., FEC, who served as vice chair of the conference's organizing committee, addressed the crowd. Boone, who also sits on PEO's Audit Committee, said: "Chapters will no longer have individual accounts. Chapters will continue to receive allotment monies in accordance with budget allocations, but [by January 1, 2020], all revenue from chapter activities are to be directed to respective bank accounts at head office, [where] all chapter expenses are to be routed." Chapter leaders had initial concerns about the perceived loss of chapters' financial autonomy; however, Boone, along with Zucco and PEO President Nancy Hill, P.Eng., LLB, FEC, addressed their concerns.

AFTERNOON BREAKOUT SESSIONS

Later that afternoon, in one of two breakout sessions, Williams led a discussion of chapters' future within PEO as it makes decisions about each area's regulatory significance. During the session, chapter leaders spoke in depth about the future role of chapters with some leaders suggesting that chapters move to the province's advocacy body, the Ontario Society of Professional Engineers, with an accompanied mandatory membership to take advantage of possible retirement and pension benefits—a move that Williams cautioned against, citing concerns of equating membership in an advocacy body with financial benefits. The afternoon's other session was led by PEO East Central Region Councillor Arthur Sinclair, P.Eng., who led chapter leaders on a SWOT (strengths, weaknesses, opportunities and threats) analysis of the issues faced by volunteers as PEO undergoes its regulatory reform.

ONTARIO'S ENGINEERING ADVOCACY GROUP CELEBRATES 20TH ANNIVERSARY

By Adam Sidsworth



ONTARIO
SOCIETY
OF PROFESSIONAL
ENGINEERS

This year marks the 20th anniversary of the founding of the province's engineering advocacy body, the Ontario Society of Professional Engineers (OSPE). OSPE was created on April 15, 2000, following two PEO member referenda—including one in February 2000 in which over 80 per cent of voting PEO members voted to provide initial financial support to OSPE—and a years-long debate within PEO to separate regulatory affairs and advocacy into two separate entities. On its website, OSPE identifies its current mandate as advocating on "issues of importance to society and the engineering profession and create opportunities for engineers and engineering graduates to connect, collaborate and contribute as they progress through their careers" while ensuring that "government, media and the public appreciate how critical the engineering profession is to growing Ontario's economy while protecting the environment and improving the quality of life."

OSPE's founding was a key component of the mandate of Patrick Quinn, P.Eng., FEC, PEO's 1999–2000 president, who wrote in 1999 that "PEO is severely constrained...in taking advocacy positions on economic and turf issues, unless an iron-clad public interest argument can be made" (see "Renewing our infrastructure," *Engineering Dimensions*, July/August 1999, p. 3), noting that former Attorney General Marion Boyd warned PEO in 1995 that "...from our perspective, there must be a distinct separation between the body that regulates the engineering profession and any organization that acts as an advocate for, or a leader of, the profession." This position, Quinn noted, reflected every Ontario attorney general dating back to the last major overhaul of the *Professional Engineers Act* (PEA) in 1984, including former Attorney General Ian Scott, who, in an extensive 2010 *Engineering Dimensions* article celebrating OSPE's 10th anniversary, was reported in 1990 to have "reminded PEO Council of the need for senior regulated professions to have separate organizations for licensing and for advocacy" (see "More confident OSPE looks to the next 10," *Engineering Dimensions*, January/February 2010, p. 28). PEO recognized its need to focus on regulatory affairs as far back as the 1970s, when it spun some of its special interest divisions into separate entities, notably

Consulting Engineers of Ontario (CEO) in 1975 and PEO's Salaried Engineers Division, which became the Canadian Society of Professional Engineers (CSPE) in 1983. The CSPE is now the national engineering advocacy body, with OSPE its first provincial-level affiliate; it was with the support of CSPE that PEO devolved OSPE.

ESTABLISHING ITSELF

With initial financial assistance from PEO, including a one-time transfer of \$933,277 and a transfer of \$30 per full-fee-paying PEO member for a three-year period, OSPE was active by the summer of 2000, with Jeremy Cook, P.Eng., FEC, OSPE's first (appointed) chair, reporting in a September 2000 open letter that OSPE had signed a lease for office space; hired its initial staff; began an initial membership recruitment drive; drafted its first response to government legislation in August 2000; and sought standing at the Walkerton Inquiry regarding safe drinking water (see "Open letter to PEO members," *Engineering Dimensions*, September/October 2000, p. 24). Cook articulated his expectations of OSPE's advocacy role, noting that "professional engineers in Ontario want the greatest effort directed towards...government relations/lobbying; promoting the engineering perspective on public policy issues; defending individual engineers' professional rights; and advancing the professional and the economic interests of engineers...What we want is to move forward—onto bigger and better things, and in ways that PEO is unable to do because of its regulatory mantle!"

Despite the initial hope that PEO's non-regulatory programs would be fully devolved to OSPE, there remains the perception that PEO is still involved in activities outside its core regulatory functions of licensing, professional standards and regulatory compliance. OSPE's grievances came to the forefront in light of United Kingdom-based Harry Cayton's external review of PEO's regulatory per-

formance, which PEO published on its website in June 2019. In it, Cayton wrote that "PEO, particularly through its chapters, has been unwilling or unable to relinquish [advocacy]" and that "PEO should review all its committees, subcommittees and working groups to ensure they are both necessary and fit for a regulatory purpose" (see "A review of the regulatory performance of Professional Engineers Ontario," peo.on.ca/sites/default/files/2019-10/PEOReviewReport.pdf, p. 29 and 61). The report's release followed a February 2019 PEO Council meeting, at which OSPE, along with CEO, introduced a motion urging PEO to extend Cayton's regulatory review "to include a second phase looking specifically at governance issues and a review of all PEO activities through the lens of regulatory governance and objects under the PEA" (see "Council approves policy intent to increase all PEO fees," *Engineering Dimensions*, March/April 2019, p. 42). OSPE and CEO cited, among other things, PEO's lack of focus and involvement in non-regulatory activities. However, the motion was deferred until after Council could adequately digest Cayton's regulatory review.

OSPE, however, remains committed to moving forward, with OSPE President and Chair Tibor Turi, PhD, P.Eng., telling *Engineering Dimensions* that OSPE implemented its 2019–2022 Strategic Plan in May 2019. Under its three-year plan, OSPE remains committed to solidifying itself as the voice of the engineering profession by streamlining OSPE's advocacy committees to deliver clear recommendations to the government; creating a proactive strategic campaign that highlights the engineering profession's benefits to Ontario society; and strengthening and growing OSPE's engineering community (see "OSPE introduces new president and strategic plan," *Engineering Dimensions*, September/October 2019, p. 17).

ENGINEERS CANADA LAUNCHES NEW WEBSITE AIMED AT INTERNATIONAL ENGINEERING GRADUATES

By Marika Bigongiari

In October 2019, Engineers Canada launched EngineerHere.ca, a revamp of its popular Roadmap to Engineering in Canada website. The website is aimed at supporting Canada's engineering regulators by providing reliable, high-level information to international engineering graduates (IEGs) seeking to become licensed engineers in Canada, and Engineers Canada felt this critical resource was due for a refresh. "The time had come to modernize the site's look and review all written and visual content to make sure it is up-to-date and optimized from the standpoint of current practices around accessibility and user experience," says Stephanie Price, project sponsor and executive vice president, regulatory affairs at Engineers Canada. The primary objective is to provide a clear, high-level overview of the process, and Engineers Canada didn't want to tamper with that formula in the redesign. Instead, the aim was to refine the way information was presented so it was more user centered and to accommodate users, for whom English or French is a second language, for example, by ensuring the language had a high readability factor and by making "plain speak" a priority. "Ultimately, we wanted the whole revamp of the website to present Canada as a welcoming, friendly and realistic option for international engineers," explains Maria Arrieta, the manager of foreign credential recognition for Engineers Canada, who served as subject

matter expert on the project. That was a key factor in the rebrand of the website as EngineerHere.ca/ Ingénieurs-ici.ca.”

Engineers Canada developed the new website with funding from Citizenship and Immigration Canada to provide a single source of information for IEGs who are interested in becoming licensed engineers in Canada. The website supports them by providing practical information on topics such as getting licensed, finding the right employment and the process of immigrating to Canada. It is divided into sections that include practising engineering in Canada, working in engineering in Canada, tips and resources and immigrating to Canada. Each section of the website contains detailed information and suggestions for next steps.

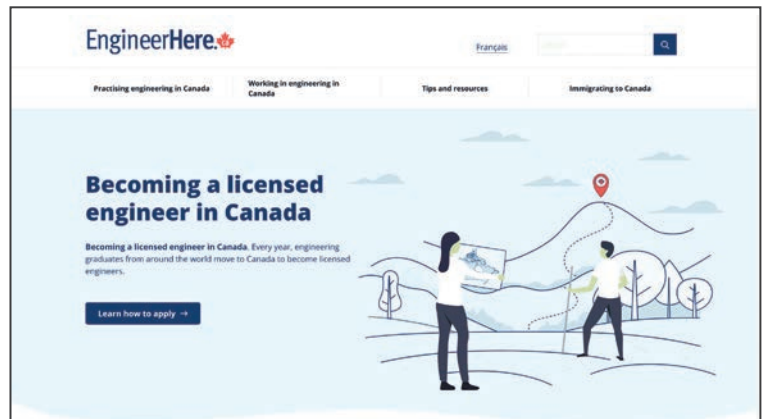
THE CONSULTATION PROCESS

Engineers Canada consulted with engineering regulators across the country to get their input, flagging areas where the process was more complex and nuanced, including parts where they might point users to regulators for more information. “When inviting regulators to provide their comments, we were hoping to get input on the accuracy of the website’s information, as well as any general comments about gaps that they felt should be addressed,” Arrieta says. Faris Georgis, P.Eng., PEO’s manager, registration, represented PEO during the consultation stage and appreciated the opportunity to provide comments. Georgis liked the look and feel of the website as well as the general content and had some specific recommendations for the redesign team regarding usability and Ontario-specific processes.

Regulators also had the opportunity to ask about specific content on sections that the project team felt needed careful review, including:

- How to apply for licensure,
- Professionalism and ethics,
- Getting academic credentials assessed, and
- Work experience requirement.

The project team worked with a volunteer-based validation group made up of international engineering graduates who were at various stages of the process of applying to become engineers in Canada. “These amazing people, who responded to a call we put out on social media and our newsletter, *Engineering Matters*, provided us with valuable perspective on design choices and the overall presentation of information,” Arrieta says. The team also consulted with the National Admissions Officials Group (NAOG), a group of staff from each Canadian engineering regulator responsible for licensure and admissions processes. Their knowledge of assessment was critical to



ensuring the accuracy of the website’s information. NAOG provided 88 specific recommendations and feedback items, each of which was addressed in the final version of the website.

A NEW NAME

The biggest differences between the old website and the new are a cleaner design that’s aimed at simplifying the way information comes across and the website’s name itself. The modernization of the website also presented an opportunity to consider branding that would more immediately convey the website’s purpose. “As a part of this, both the National Admissions Officials Group and our external validation group supported the move to a name that was more welcoming and direct,” Arrieta observes. “The team settled on EngineerHere.ca because it was concrete, it was memorable, and it worked well from both the perspectives of mobile-friendliness and translatability across both of Canada’s official languages.”

Another important difference between the old and new websites is the focus and framing of information. “At the root of it, the information itself is very similar with minor updates, but the emphasis has changed in important ways,” Arrieta explains. “For example, we have placed more emphasis on the fact that the immigration selection process is separate from the engineering licensure process. We also provided less cluttered page layouts throughout the website to keep the focus where it should be.” Decisions like these were born from Engineers Canada’s discussions with both NAOG and the external validation group in a concerted effort to locate elements of the website that were confusing or discouraging and determining how they could be smoothed out.

The Engineers Canada team are pleased that the response to the new website from visitors and regulators has been positive. Says Arrieta: “We’re really excited to have it launched after 10 months of planning, consultation and development, and our plan is to keep making enhancements, establishing a maintenance schedule that will ensure the website continues to be as useful as possible. Ultimately, we think Canada is a great place to be an engineer, and we’re excited to provide a resource that is encouraging of diverse international applicants who are considering their next move.”

QUEBEC ENGINEERING REGULATOR INTRODUCES NEW ADVERTISING CAMPAIGN AND VISUAL IDENTITY

By Adam Sidsworth



l'Ordre des ingénieurs du Québec's new logo, which debuted in September 2019

In a bid to modernize its image in time for its 100th birthday, Quebec's engineering regulator, l'Ordre des ingénieurs du Québec (OIQ), has updated its visual branding, which is accompanied by a multimedia campaign to promote both engineers and engineering in Quebec.

OIQ's new visual identity, which includes a new logo and colour scheme, can be found on the French-language homepage of its website, oiq.qc.ca. Its English-language site, oiq.qc.ca/en, will be rebranded in a subsequent second phase.

"The profession has gone through some ups and downs in the last decade," OIQ President Kathy Baig, *ing.*, FEC, said in a press release. "We are giving our visual identity a makeover and launching a promotional campaign for the profession to proudly highlight the beginning of the OIQ's next 100 years." OIQ's new visual image followed consultation with creators and focus groups consisting of various stakeholders in Quebec's engineering profession. "Not many people...understood the meaning of the logo of the past 30 years," the OIQ press release stated. "It was absolutely necessary to give the logo a makeover. Simple, distinctive and timeless, OIQ's new logo is meant to represent a thriving profession and highlight the professional title."

The new visual image is designed by Montreal advertising agency Cartier, which says the design "represents the profession's current resurgence. All stakeholders—both engineers and OIQ alike—can relate to this image, which reflects their common vision: deliver the best that Quebec engineering has to offer."

The new visual image is accompanied by an OIQ advertising campaign that will showcase "the multiple facets of engineering...how engineers innovate by using their expertise and working with other professionals to make an impact on the world." The campaign, which promotes the engineering profession with the theme "Making an

impact on the world!" is being rolled out in two segments, including one that ran from September 30 to November 8, 2019, and another scheduled to take place between January 20 and February 21, 2020. The campaign consists of television ads, outdoor advertising campaigns in Montreal and Quebec City and over the Internet, including a YouTube video (youtube.com/watch?v=uryMAf0Z9uU). According to a senior advisor of public affairs with OIQ, the web campaign, which amassed close to 8 million hits during its initial five-week fall 2019 campaign, "calls attention not only to the contributions that engineers make to people's everyday lives but also to improving the quality of their lives. It also demonstrates that engineers innovate by using their expertise and working with other professionals to make an impact on the world."

An improved communication plan has been a part of the mandate of OIQ President Baig since the government of Quebec gave back to OIQ its regulatory autonomy in February 2019. OIQ's independence followed a two-and-a-half-year government-imposed trusteeship because of concerns over OIQ's financial instability and apparent inability to regulate the engineering profession. The apprehension rose out of the 2015 Charbonneau Commission, which investigated systematic corruption in Quebec's construction industry (see "Quebec government lifts OIQ's trusteeship," *Engineering Dimensions*, May/June 2019, p. 9).

PEO's OWN PUBLIC INFORMATION CAMPAIGN

PEO also explored a potential rebranding and promotional drive when Council approved its Public Information Campaign Task Force in September 2016. The task force examined a potential advertising campaign to address perceptions from both within and outside the engineering profession of the value of a PEO licence or when a licence is even required.

The task force's September 2018 report to Council called for a three-year campaign to begin in January 2019 with an initial budget of \$1,077,000. The campaign's target audience and key messages were determined through consultation with almost 5500 stakeholders through telephone interviews, focus groups and online surveys throughout a four-month period in 2017. The first year of the campaign—with its brand statement "Doing the Right Thing. Right"—would have targeted employers, particularly those in industries where the P.Eng. designation is little known, and promote, among other things, engineers' ingenuity, the mark of excellence of the P.Eng., engineers' strong professional conscience and compliance with provincial laws. Subsequent years would have targeted engineers, universities and students.

The proposed campaign ultimately fell victim to external forces. At its November 2018 meeting, Council, faced with a \$5.1 million deficit, suspended many PEO programs and cut other programs' budgets by 10 per cent; Council decided to defer a decision on the campaign until the June 2019 Council meeting, at which Council stood down the task force without acting on its recommendations. However, one recommendation—a more user-friendly PEO website—went live on November 14, 2019. The website redesign was conducted independently of the task force by PEO's communications department.




PEO's website has a new look!

The redesigned peo.on.ca features

- » Streamlined navigation to help users discover PEO's resources quicker and easier;
- » Improved organization and more sophisticated search functions;
- » New graphics and a clean, modern aesthetic; and
- » A fully responsive and dynamic layout that provides a better user experience across multiple platforms, including mobile.

We've also changed the structure of the content, so you'll get more from a quick read.

We'd love to hear what you think. If you would like to share your experience of the redesigned website or can't find what you're looking for, send us an email at media@peo.on.ca.



You can also stay connected on social media by following PEO on Twitter, Facebook and LinkedIn.

THIS ENGINEER'S DEDICATION IS HELPING EVOLVE ONTARIO'S BUILDING TECHNIQUES

Structural engineer Mary Alexander, MEng, P.Eng., channels hard work into pioneering tall-wood structures in the province.

By Adam Sidsworth



Mary Alexander, MEng, P.Eng., is a structural engineer at Moses Structural Engineers, where she is at the forefront of tall-wood structures.

When Mary Alexander, MEng, P.Eng., first pondered her post-secondary education, she was a student at the Etobicoke School of the Arts. She studied music and majored in the double bass, but on top of her busy schedule, "I was...maintaining my average [and] doing school sports teams and working part-time coaching gymnastics," Alexander says. "Having a busy schedule was a really good way to organize my time and prioritize. I graduated with the third-highest average in the school." Still, Alexander was unsure. "I did well in music; I did well in sports; I did well with academics, but what am I going to do with a career for myself? One of my teachers told me, 'If you look at what you did as a small child, that's what you typically do as an adult.'" As a kid, Alexander "really enjoyed playing with DUPLO, a large type of LEGO that kids can't swallow. I'd build houses...with my kid brother and teach him how to play with

it properly: The blocks have to interlock. And I thought, 'I should do something with structures,' so I started to put together a portfolio" with an eye on becoming an architect. But Alexander wasn't sure if her portfolio would be sufficient. "So, I went to the guidance counsellor, and that's when she mentioned engineering, and I gave her a blank stare," Alexander says. "I didn't know what engineers did. And she said, 'Engineers use applied math and science to solve problems and create solutions,' and I said, 'Bingo! That's what I want to do!'"

Alexander chose civil engineering at the University of Toronto (U of T) because "it covers the whole spectrum, and it's not until fourth year that you choose [specialized] courses." Alexander purposely chose courses in various streams of civil engineering in order to develop a broad engineering perspective, and at the end of her undergraduate degree, Alexander completed an internship placement with Moses Structural Engineers, a Toronto firm that specializes in structures made principally from wood. Alexander felt at home, noting the firm's small size and sense of family. By the end of her internship, Alexander was accepted into a master's degree in civil engineering, with specialization in structural engineering, at the U of T, and she felt welcome at Moses. "In my heart I really wanted to return, and, of course, on my last day, my boss said, 'If you're free during school, we'd like to have you come in part-time, and then we could take you full-time once you're done school,' and I was just in heaven," she explains. "They're a close-knit family, so once they find somebody who fits in with everybody...they like to keep them." She had only a week off between her internship and her master's program, and once she finished her master's she had only three days off before starting full-time at Moses. (She used those three days to move in with her then-fiancé and now-husband, a carpenter.)

DEVELOPING A SPECIALTY

Through her master's degree, Alexander took specialized classes, such as earthquake engineering and structural building systems, which aren't necessarily offered at the undergraduate level, and Alexander tailored her education towards working with a variety of materials—including concrete, prestressed concrete, steel and precast systems. Once Alexander completed her master's, she returned to Moses full-time, and because of the firm's small size, she was able to work on projects from beginning to end. Alexander has been able to develop a specialty, especially since the province's 2015 amendment of the Ontario Building Code allows buildings of up to six storeys to be built out of principally wood. In fact, because of her expertise, Alexander co-authored the guide *Ontario's Tall Wood Building Reference* with Moses Structural Engineering principal David Moses, PhD, P.Eng., and CHM Fire Consultants Ltd. for the Ministry of Natural Resources and Forestry. "In the [building] code, we can go only up to six storeys, but there's nothing really stopping us from going over," Alexander asserts. "With tall timber (over six storeys), one example of mass timber

is cross-laminated timber, which is made up of three, five, seven or nine layers of dimensional lumber that are laminated together. The layers alternate in direction, crisscrossing at 90 degrees. It improves the strength and stability of the member, since you get the strong axis of the wood situated in both directions.”

However, Alexander notes that there are limitations, such as stair shafts, which must be made of non-combustible materials; and elevator shafts, which in Ontario aren’t necessarily built from wood due to suppliers’ preference. (Wood is also more susceptible to shrink, presenting a challenge when building fire shafts, which, at six storeys, must be made from non-combustible materials.) Alexander also co-authored the 2017 *Ontario Wood Bridge Reference Guide*, again with Moses, along with other engineers from her firm and Brown & Co., a firm that specializes in bridges, including wood bridges, for the provincial Ministry of Natural Resources and Forestry and the Canadian Wood Council. “When you see a wood bridge, it’s usually a pedestrian wood bridge in a park,” Alexander says. “But guess what? You can build a wood bridge for highways. It’s done all through Europe and BC and throughout the United States.” However, Alexander suspects that most Ontario engineers stick to man-made materials due to familiarity.

Her expertise in co-authoring the documents came from her background research in building tall-wood buildings. Alexander has since incorporated into her work helping people who work with wood but don’t necessarily have experience working on taller structures. “You want to make it clear to read for somebody who’s worked with wood but hasn’t done a six-storey building,” she says. “I worked with [Local 27 Carpenters and Allied Workers, a trade union]...and put together a six-storey module to show them all the connections with wood.”

AWARD-WINNING WORK

Alexander’s proudest moment, though, is working on the Brampton, ON, Saint Elias the Prophet Ukrainian Catholic Church restoration. The original church burned in a fire, and Alexander engineered many of the structural elements, including the church’s five Boyko domes—the largest of which weighs over 18,000 kilograms—typical of Ukrainian-style architecture. “We used glulam,” Alexander explains. “[It’s] a dimensional wood lumber laminated together...because trees come only so big.” On the outside, they used cedar. Alexander was filled with awe when she visited the site. “Everything was huge...I’m used to going on-site, where everything is dirty, but this site was very clean. You could smell the fresh-cut cedar lumber,”



Exterior and interior views of Saint Elias the Prophet Ukrainian Catholic Church in Brampton, ON, complete with its wooden Boyko domes, which Alexander engineered.

she reminisces. “It’s so nice that you forget that you’re supposed to be reviewing the installation. But it’s so stunning on the inside, and they kept with the tradition of the original church.” The church ultimately won the 2016 Wood Works! Institutional-Commercial Wood Design Award <\$10 million. It’s projects like this that make Alexander, who is just finishing up a year-long parental leave, eager to get back to work. **e**

ENGINEERING INTERN MYTHS DEBUNKED

By Duff McCutcheon

PEO's optional Engineering Intern (EIT) Program can provide several benefits to engineering graduates as they acquire the 48 months of engineering experience required for professional engineer (P.Eng.) licensure, but there are a few misconceptions about what the EIT program is and is not. *Engineering Dimensions* spoke with PEO Manager, Engineering Intern Programs Tracey Caruana, P.Eng., and EIT/Student Programs Coordinator Sami Lamrad, EIT, to debunk some common EIT myths and set the record straight on this voluntary program.

EIT myth #1: "I just want to apply for my EIT licence."

The EIT designation is not a licence and an EIT cannot call themselves an engineer. "While EITs may perform engineering work under the supervision and review of a licensed professional engineer, they are not considered licence holders until they have completed all the licensure requirements, including passing the professional practice exam and completing the 48 months of engineering experience requirement—including 12 months of Canadian experience," Lamrad says.

And although EITs are listed in the PEO directory, along with their assigned EIT number, this should not be confused with a licence number. The listing describes the individual specifically as an engineering intern and the number is their licence application number—the same number assigned to all licence applicants, whether they choose to enter the EIT program or not.

EIT myth #2: "I need to enter the EIT program to get licensed."

The EIT program is optional and voluntary—there is no obligation for a licence applicant to join the program to earn their licence. "The EIT program, or equivalent, is mandatory in other provinces, which may be causing some confusion among Ontario applicants," Caruana says. "Other provinces have a different licensure model, with mandatory experience reporting on a regular basis. PEO does not require an applicant to be registered as an EIT."

EIT myth #3: "Can I just apply for the EIT membership because it is cheaper than the P.Eng. application?"

No—the only way to register for the EIT program is to apply for your licence. It's actually slightly more expensive because you're paying both the P.Eng. application fee and, once approved, your annual EIT fee (\$90 + HST).

To apply for the EIT program, you must submit a P.Eng. licence application. As part of this application, you can select the box to also be recorded in the EIT program. "If you're a graduate of a Canadian Engineering Accreditation Board (CEAB)-accredited engineering program, you will need to have your sealed transcripts sent to PEO directly from the university. Once we receive them and they've been checked, the graduate will be eligible for the EIT program," Caruana says. "Once you have paid the EIT fee, you are officially registered in the program."

Non-CEAB applicants must submit all required academic documentation for review by PEO's Academics Requirements Committee (ARC). If you're assigned an exam program, you are eligible to enroll into PEO's optional EIT program. After the ARC has made its decision on your academics, PEO will review your application form to see whether you requested registration into the EIT program and then process your request accordingly. After the EIT fee is paid and processed, you are officially registered in the EIT membership.

EIT myth #4: "As an EIT, PEO will help me find a job."

Although there are many benefits to being an EIT member (see sidebar below), there are no EIT job placement services through PEO or the EIT program. "However, you may see company job postings requesting applicants be registered as an EIT," Lamrad says. "That's typically because businesses want assurances that the person is serious about engineering and focused and committed to getting a licence."

For more information about PEO's EIT program, visit peo.on.ca/engineering-intern-program. **e**

EIT FAST FACTS

PEO's EIT program provides guidance to engineering graduates as they acquire the 48 months of acceptable engineering work experience, including annual reviews of experience to ensure that an applicant is "on the right track" for licensing. The EIT program benefits include:

- the opportunity to receive detailed, confidential, annual work experience reviews;
- eligibility to participate in PEO's Licensure Assistance Program (peo.on.ca/engineering-intern-program/licensure-assistance-program);
- access to PEO's official journal, *Engineering Dimensions*;
- opportunities to attend PEO and PEO chapter EIT seminars;
- the opportunity to join a PEO chapter, attend meetings and network with professional colleagues;
- email notices of events or items of interest pertaining to your development into a licensed engineer;
- access to the PEO's online portal; and
- the opportunity to participate in online discussions with other PEO members on the association's LinkedIn discussion group.

SUMMARY OF DECISION AND REASONS

On allegations of professional misconduct under the *Professional Engineers Act* regarding the conduct of SIU H.E. LEUNG, P.ENG., a member of the Association of Professional Engineers of Ontario, and JIT PROFESSIONAL SERVICES INC., a holder of a certificate of authorization.

This matter was heard before a panel of the Discipline Committee on January 25 and 26, 2016, for the first part, with neither the member, Siu H.E. Leung, P.Eng. (Leung), nor the holder, JIT Professional Services Inc. (JIT), present or represented.

This proceeding arose from a complaint from a property owner pertaining to the renovations to her house in Scarborough. She contended that the engineer and his engineering firm did not complete their contracted work.

The Association of Professional Engineers of Ontario alleged that Siu H.E. Leung, P.Eng. (Leung), and JIT Professional Services Inc. (JIT) were guilty of professional misconduct as defined in the act and R.R.O. 1990, Regulation 941: General under the act (Regulation 941), in particular by:

- a. Failing to remedy deficiencies in a building permit application submitted on behalf of a client, amounting to professional misconduct as defined by sections 72(2)(a), (d) and (j) of Regulation 941;
- b. Failing to complete contracted work for a client and failing to respond to a client's inquiries regarding the work, amounting to professional misconduct as defined by section 72(2)(j) of Regulation 941; and
- c. Providing engineering services to the public while JIT was not the holder of a certificate of authorization, contrary to section 12(2) of the act, amounting to professional misconduct pursuant to sections 72(2)(g) and (j) of Regulation 941.

In its written Decision and Reasons dated January 23, 2017, the panel found allegation (c) proven and that Leung was guilty of conduct or an act rea-

sonably regarded as unprofessional, but that allegations (a) and (b) were not proven.

The association presented its case primarily through documents (including a number under the seal of the city clerk of the City of Toronto, in reliance on subsection 447.6(1) of the *Municipal Act*) and oral evidence provided by the complainant and a professional engineer. The panel did not place full weight on the city's documents, as the association did not provide proof that the documents comprised the city's complete file on the matter. The engineer had been hired by the complainant to prepare and submit "as-built" drawings to allow the city to process and approve an application for a variance to the zoning bylaw for land coverage and building setback. The engineer testified that he did not find any deficiencies in the construction.

ISSUE 1—CERTIFICATE OF AUTHORIZATION

JIT is a company providing engineering services in Toronto, Ontario. It was issued a certificate of authorization on or about May 4, 2012. The certificate was cancelled in or about September 2013 for non-payment of fees, reinstated in or about March 2014, and was cancelled again for non-payment of fees on August 19, 2015. JIT was issued a certificate of authorization on September 14, 2015. Leung, on behalf of JIT, signed a contract to provide professional engineering services to the complainant on August 31, 2011—before JIT received a certificate of authorization. The professional services were provided during 2011 and again in July 2012. JIT was the holder of a certificate of authorization, however, at the times of the complaint (April 25, 2014), the Complaints Committee referral to the Discipline Committee (July 15, 2014), and during the discipline hearing.

The panel ruled that the Discipline Committee had no jurisdiction over the conduct of JIT prior to it obtaining a certificate of authorization. However, the panel determined that Leung's conduct in supervising the practice of professional engineering provided by JIT was within the committee's jurisdiction because Leung was a P.Eng. licence holder when he was the president and director at JIT and JIT's signatory on the contract with the complainant.

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.

It is without dispute that JIT entered into a contract to provide the complainant with engineering services. Leung was a member when he signed it on behalf of JIT on August 31, 2011. The panel concluded that Leung knew, or should have known, that it was wrong and unprofessional to hold out JIT as an engineering firm when JIT did not have a certificate of authorization as required by the *Professional Engineers Act*.

Accordingly, the panel finds Leung guilty of conduct or an act reasonably regarded as dishonourable and unprofessional under section 72(2)(j) of Regulation 941 for allowing and assisting his company, JIT Professional Services Inc., to provide engineering services while it did not possess a certificate of authorization.

ISSUE 2—THE SCOPE OF CONTRACTED WORK AND WHETHER IT WAS COMPLETED

A one-page contract between the complainant and JIT covered architectural and mechanical drawings and structural specifications for an addition of approximately 24 feet by 14 feet, at a fixed price with building permit fees extra. In October 2011, JIT submitted a building permit application for a one-storey rear addition, supported by several drawings stamped by Leung. On about July 30, 2012, Leung provided the city, as it had requested, with heat-loss calculations and his stamped drawings that included measurements for a proposed porch extension.

The complainant stated that Mr. Leung failed to provide the final construction drawings for the new garage and the front porch extension. The contract did not stipulate any work related to “as-built” drawings. Although the complainant contacted and expected JIT and Leung in 2014 to prepare “as-built” drawings required by the city, there was no evidence that she offered to pay JIT and Leung to perform that additional work.

In reviewing the 24' X 14' area referenced in the contract, the panel noted that it was significantly less than the total area constructed and renovated. The finished construction consisted of the rear addition, front porch extension and a new garage. The garage replaced the one that was demolished to allow construction equipment access to the rear of the property. Initially, the plans had designated the area occupied by the garage as parking. The panel found that there is insufficient evidence to establish that Leung or JIT were hired to do more than what

had been done as defined by the written contract. The rear addition to the house had been completed; the area of which was in reasonable agreement with the 24' x 14' area specified in the contract.

There was evidence that Leung did not respond to the complainant's repeated inquiries. Although the panel disapproves of the member's failure to respond, there is insufficient evidence to find professional misconduct on this basis. As a result, the panel does not find that Leung is guilty of professional misconduct with respect to the allegation of failure to complete contracted work for a client or failing to respond to a client's inquiries regarding such work.

ISSUE 3—NOT REMEDYING DEFICIENCIES IN BUILDING PERMIT APPLICATION

The allegation of failure to remedy deficiencies in a building permit application hinges on the question of the scope of work, as discussed above.

There was a defect in the permit application, resulting in the city requesting heat-loss calculations, which Leung and JIT subsequently provided.

The panel finds that the demand for “as-built” drawings was outside the agreed scope of work and did not constitute a deficiency in the building permit application. Rather, the actual construction work seems to have gone beyond the scope of the original building permit.

Accordingly, the panel found insufficient evidence to establish professional misconduct with respect to this allegation.

The panel issued the Decision and Reasons on the allegations on January 23, 2017, and directed the parties to make written penalty submissions to the panel within thirty (30) days of the issuance.

DETERMINATION OF PENALTY ON THE FINDING OF PROFESSIONAL MISCONDUCT

The penalty phase of the hearing was held in abeyance while the association appealed the panel's decision on the association not having jurisdiction over JIT prior to it obtaining a certificate of authorization to the Ontario Superior Court of Justice, Divisional Court. The court dismissed the association's appeal on July 17, 2018, allowing the panel's decision on lack of jurisdiction to stand. The penalty phase of the hearing continued on April 11, 2019, with the member attending via telephone and represented in person at the hearing by a paralegal.

The parties presented a joint submission as to penalty. Mr. Leung expressly affirmed the joint submission as to penalty and agreed to the proposed penalties. The panel agreed that the joint submission was reasonable and that it satisfied the guiding principles of penalties (protection of the public, remediation of the member, accountability of the profession, general deterrence and specific deterrence).

Accordingly, the panel ordered that:

- a. Pursuant to s.28(4)(f) of the act, Siu H.E. Leung, P.Eng. (Leung), shall be reprimanded, and the fact of the reprimand shall be recorded on the registrar permanently;
- b. Pursuant to sections 28(4)(i) and 28(5) of the act, the finding and order of the Discipline Committee shall be published in summary

- form in PEO's official publication, with reference to names;
- c. Pursuant to section 28(4)(d) of the *Professional Engineers Act* it shall be a term or condition on Leung's licence that he shall, within fourteen (14) months of the date of pronouncement of the decision of the Discipline Committee, successfully complete the association's Professional Practice Examination (PPE);
- d. Pursuant to section 28(4)(b) and (k) of the *Professional Engineers Act*, in the event that Leung does not successfully complete the above-mentioned examination within the time set out

- in (c) above, his licence shall be suspended for a period of ten (10) months thereafter, or until he successfully completes the examinations, whichever comes first; and
- e. There shall be no order as to costs.

A verbal reprimand was delivered over the telephone immediately following the hearing.

The panel issued written Decision and Reasons on Penalty on June 10, 2019.

This written summary of the Decision and Reasons is authorized by L. Brian Ross, P.Eng., as chair on behalf of the other members of the discipline panel: Ishwar Bhatia, P.Eng., Colin Cantlie, P.Eng., Rebecca Huang, LLB, LLM, and Charles M. Kidd, P.Eng.

DECISION AND REASONS

In the matter of a hearing under the *Professional Engineers Act*, R.S.O. 1990, c. P.28; and in the matter of a complaint regarding the conduct of DR. ANTHONY IKPONG, P.ENG., a member of the Association of Professional Engineers of Ontario.

This panel of the Discipline Committee convened in Toronto to hear this matter. The hearing lasted eight days over a six-month period and was mostly conducted electronically. The hearing involved a number of witnesses called by the prosecution. Dr. Anthony Ikpong, P.Eng., represented himself throughout and testified on his own behalf. The panel invited and received the parties' closing submissions in writing over the months of June, July and August 2017. In this decision, the panel refers only to the facts, evidence and submissions relevant to its decision on each of the four allegations set out in paragraph 23 of the Amended Statement of Allegations reproduced below.

THE ALLEGATIONS

The Amended Statement of Allegations dated October 17, 2016, sets out the following allegations against the member and corresponding particulars:

- At all material times, Ikpong was a professional engineer licensed pursuant to the *Professional Engineers Act*.
- Between approximately January 2013 and June 2015, Ikpong exchanged communications with Professional Engineers Ontario, the Ministry of Transportation, the Minister of Transportation and/or other professional engineers regarding his concern that the analyses relating to the design of shear-connected box girder bridges in Ontario were faulty.
- Between approximately 2011 and 2013, while working as an engineer for WSP Canada Inc. (WSP), Ikpong was involved in the design of a number of bridge projects for WSP, including the Bug River Bridge, for which Ikpong jointly authored a Structural Design Report (the report) dated May 1, 2012.
- In or about January 2013, Ikpong raised concerns with the joint author of the report regarding the analysis set out therein.
- In or about February 2014, Ikpong sent an email to the Ministry of Transportation of Ontario (MTO) questioning the analysis performed by the bridge design consultants retained by the MTO regarding their assumptions about the transfer of wheel load effects between girders.
- In its response, the MTO described the mechanisms in place to ensure bridge safety in Canada but invited Ikpong to be more

- specific about his concerns and to identify any specific structures where his concerns applied.
7. In his subsequent replies, Ikpong reiterated his view that bridge design consultants hired by MTO had made errors in the design of shear-connected box girder bridges in Ontario and had failed to follow the Canadian Standards Association's Canadian Highway Bridge Design Code, CAN/CSA-S6-06 (the code) such that the bridges were unsafe for travelling, including two specific bridges where the bending moment ratio attributed to the bridges was unacceptable, including the Bug River Bridge.
 8. When the MTO advised Ikpong they would look into the two bridges and requested that he share his analysis, Ikpong refused to do so, asserting that the solution was his intellectual property and that he would only provide assistance in the capacity of a consultant.
 9. Subsequently, without specifying why the bridge analysis was incorrect, Ikpong advised the MTO that his concern related to the consultants improperly using the simplified methods of analysis provided for by the code and the criteria that must be met in order for those simplified methods to work.
 10. In or about March 2014, the MTO advised Ikpong that a senior engineer had reviewed the calculations for one of the bridges and obtained similar results to the original calculations. Ikpong replied that the calculations could not be correct if they were based on the simplified method applicable to multi-spine bridges but refused to explain why he believed the MTO's calculations were erroneous.
 11. MTO provided a further response to Ikpong's comments about the use of the multi-spine simplified method, explaining in detail how certain bridge types must be analyzed for relevant structural responses under the code.
 12. After receiving this correspondence, Ikpong, for the first time, provided the MTO with a document purporting to set out his analysis. In response, MTO advised Ikpong that the *Ontario Public Transportation Improvements Act* (OPTIA) mandates the use of the code for the design of bridges in Ontario and that until any proposed method is approved and incorporated into the code, its use would be a violation of the OPTIA. MTO advised Ikpong that it was concluding its investigation into his concerns.
 13. In or about July 2014, Ikpong wrote directly to the Minister of Transportation about his concerns regarding the methods of analysis being used by the MTO's bridge consultants and the "dire consequences" this created for the safety of the travelling public. Ikpong requested that he receive credit and payment for his proposed solution to the problem.
 14. In his response, the minister's representative advised Ikpong that they had discussed his concerns with bridge engineers, noted that a number of consultants had designed bridges independently following the provisions of the code and obtained similar results, and that the MTO had recently conducted a load test on a similarly designed bridge and no defects or performance issues were identified.
 15. At approximately the same time he wrote to the minister, Ikpong also filed complaints with PEO against the MTO engineers and design consultants involved in the Bug River Bridge and/or Beaver Creek Bridge projects (the project respondents). In his complaints, Ikpong questioned the method of analysis they used in calculating the live load for bridges made of pre-stressed concrete box girders, classified by the code as "shear-connected beam bridges," including the Bug River Bridge and/or Beaver Creek Bridge.
 16. Ikpong alleged that the project respondents:
 - a. failed to discover that the "simplified methods of analysis" set out in section 5.7.1.1 of the code does not apply to "shear-connected beam bridges"; and
 - b. employed a method of analysis that results in bending moments roughly 25 per cent of moment produced by one truck, such that any pre-stressed concrete box girder bridges designed or approved by the project respondents will carry only 50 per cent of the live load effect, greatly compromising safety.
 17. In or about October 2014, the MTO filed its response to Ikpong's complaint, which included opinions from four practitioners and academics regarding Ikpong's allegations and the proper method of analysis for shear-connected beam bridges (MTO experts). The MTO's response and accompanying opinions clarified their precise points of disagreement with Ikpong's analysis and conclusions.
 18. In or about December 2014, some of the MTO engineers Ikpong had complained about filed their own complaint with PEO against Ikpong, alleging, inter alia,

- that he demonstrated a lack of knowledge, skill and judgment in respect of the interpretation and application of the code, bridge design and construction methods in general and in respect of shear-connected beam bridges in particular (the MTO complaint).
19. In or about January 2015, Ikpong contacted at least two of the MTO experts who had provided opinions that disagreed with his analysis and conclusions. Ikpong was critical of the MTO experts and maintained that his analysis and conclusions were correct.
 20. In or about February 2015, the Complaints Committee considered Ikpong's complaint together with all of the information obtained by PEO in its investigation of that matter, including the responses and opinions submitted by the MTO engineers. The Complaints Committee concluded that there was no evidence of unprofessional conduct or a breach of the Code of Ethics on the part of the project respondents and did not refer the matter to the Discipline Committee.
 21. In or about June 2015, Ikpong provided a very lengthy response to the MTO complaint, complete with drawings and calculations intended to prove that his analysis and approach was correct and that espoused by the project respondents and the MTO experts was wrong.
 22. Between approximately January 2013 and June 2015, as set out in the communications above with Professional Engineers Ontario, the Ministry of Transportation, the Minister of Transportation and/or other professional engineers, Ikpong:
 - a. used intemperate and/or unprofessional language;
 - b. provided information and/or made statements that he knew or ought to have known were not true and/or inaccurate;
 - c. repeatedly made disparaging, unfounded, inaccurate, untrue, inappropriate and/or unprofessional comments regarding other professional engineers and/or engineering firms, including comments questioning their competency and/or integrity;
 - d. repeatedly and/or persistently communicated that his opinion regarding the appropriate method of analyzing shear-connected beam bridges was correct, despite having been presented with significant evidence to the contrary;
 - e. initially refused to share details of the analysis and/or calculations he used:
 - i. to conclude that shear-connected beam bridges and/or pre-stressed concrete box girder bridges, such as the Bug River Bridge, were inappropriately designed and/or constructed; and/or
 - ii. to identify his proposed solution to these errors, unless and until he received recognition and/or compensation, despite his stated belief that these bridges represented a risk to public safety;
 - f. persisted in his opinion that his method of analyzing shear-connected beam bridges and/or pre-stressed concrete box girder bridges was correct, despite having been presented with significant evidence to the contrary;
 - g. favoured certain assumptions in his design and analysis that supported his opinion while disregarding other assumptions, which were based on sound scientific and engineering principles, that did not support his opinion;
 - h. misinterpreted the Canadian Standards Association's Canadian Highway Bridge Design Code, including when he treated shear-connected beam bridge design as a multi-spine bridge design;
 - i. demonstrated a lack of understanding of the application of the Canadian Standards Association's Canadian Highway Bridge Design Code to shear-connected beam bridges, including but not limited to the Bug River Bridge;
 - j. demonstrated a lack of understanding and/or refused to accept that the shear key transfers the load between girders;
 - k. demonstrated, based on his improper and/or inaccurate modelling, that he did not understand the proper methods and/or considerations that apply to the design of shear-connected beam bridges and/or other structures;
 - l. misinterpreted the proper methods for designing shear-connected beam bridges;
 - m. demonstrated a lack of understanding that the girders of shear-connected beam bridges can resist torsional moments and, in doing so, ignored the dynamic nature of this type of bridge.
 23. Based on these facts, it is alleged that Anthony Ikpong, P.Eng., is guilty of professional misconduct and/or is incompetent by:
 - a. engaging in conduct or an act relevant to the practice of professional engineering that, having regard to all the circumstances, would reasonably be regarded by the engineering profession as disgraceful, dishonourable or unprofessional;

- amounting to professional misconduct as defined in s. 72(2)(j) of Ontario Regulation 941; and/or
- b. engaging in a course of vexatious comment or conduct that he knew or ought reasonably to have known was unwelcome and that might reasonably be regarded as interfering in a professional engineering relationship; amounting to professional misconduct as defined in s. 72(2)(n) of Ontario Regulation 941; and/or
 - c. displaying in his professional responsibilities a lack of knowledge, skill or judgment or disregard for the welfare of the public of a nature or to an extent that demonstrates he is unfit to carry out the responsibilities of a professional engineer; amounting to incompetence as defined by s. 28(3)(a) of the *Professional Engineers Act*, R.S.O. 1990 c. P 28, as amended; or
 - d. in the alternative to c. above, committing acts or omissions in the carrying out of his work as a practitioner that constituted a failure to maintain the standards that a reasonable and prudent practitioner would maintain in the circumstances; amounting to professional misconduct as defined in s. 72(2)(a) of the Ontario Regulation 941.

PLEA OF THE MEMBER

Dr. Ikpong denied all of the allegations.

OVERVIEW AND FACTS

The uncontested facts in this matter are that Dr. Ikpong was at all relevant times a professional engineer licensed under the *Professional Engineers Act*, having held a licence since September 2010; that he was employed as a senior bridge engineer at Genivar between 2011 and 2013 involved in the design of bridge projects including the Bug River Bridge; that his employment at Genivar was terminated in January 2013 shortly after he raised concerns about the analysis used in the design of certain bridges as reflected in the report he jointly authored dated May 1, 2012; and that the events giving rise to this hearing began around the time of Dr. Ikpong's departure from Genivar and include the following actions he took regarding his concerns about the design of shear-connected box girder bridges commissioned by the MTO:

- Between February and March of 2014, Dr. Ikpong communicated by email with various MTO staff regarding the "Design of Prestressed/Precast Concrete Box Girder Bridges in the Province of Ontario," expressing his concerns about the analysis of these structures.
- On July 14, 2014, Dr. Ikpong sent a letter to the Minister of Transportation alleging "incompetent highway bridge designs in the Province of Ontario."
- On July 20, 2014, after having been advised by MTO that his concerns were considered unfounded, Dr. Ikpong filed a complaint with PEO against Nicolas C. Theodor, P.Eng., the head, bridge design, in the bridge office of MTO alleging negligence and a failure to safeguard life, health or property over "erroneously designed...prestressed concrete box girder bridges."
- Dr. Ikpong subsequently filed similar complaints against three other MTO engineers.

In response to Dr. Ikpong's actions, on December 10, 2014, Chris Raymond, PhD, P.Eng., secretary, Qualification Committee, head, construction contracts section of MTO, filed the MTO complaint with PEO against Dr. Ikpong on behalf of the project respondents against whom Dr. Ikpong had complained. Dr. Ikpong's complaints were not referred to the Discipline Committee for a hearing.

Dr. Ikpong, who holds a BSc in civil engineering and a MSc in structural engineering from the University of Jos in Nigeria, obtained his PhD in civil engineering from Concordia University in 2016 with his thesis "Managing Highway Bridges Against Climate-Triggered Extreme Events in Cold Regions."

The issues before the panel are whether Dr. Ikpong's communications, conduct and/or actions between January 2013 and June 2015 amounted to professional misconduct under sections 72(2)(j) (Allegation 1) and/or (n) (Allegation 2) of Ontario Regulation 941 as alleged by PEO; and whether the facts establish that Dr. Ikpong was or is incompetent (Allegation 3) and/or negligent (Allegation 4).

EVIDENCE, DECISION AND REASONS REGARDING EACH ALLEGATION

PEO bears the onus of proving the allegations in accordance with the standard of proof, which in this matter is a balance of probabilities.

Allegation 1

Sections 72(2)(j) of Ontario Regulation 941 under the act states:

- (2) For the purposes of the act and this regulation, "professional misconduct" means,
 - (j) conduct or an act relevant to the practice of professional engineering that, having regard to all the circumstances, would reasonably be regarded by the engineering profession as disgraceful, dishonourable or unprofessional[.]

The evidence before the panel relating to this allegation consisted of email exchanges between Dr. Ikpong and various MTO engineers, Dr. Ikpong's letter to the Minister of Transportation (the minister) and the complaint Dr. Ikpong filed with PEO against the project respondents. Of particular concern to the panel were the passages authored by Dr. Ikpong set out below.

Dr. Ikpong's email to Tony Merlo, P.Eng., manager of the bridge office, MTO, dated February 13, 2014, which followed emails Dr. Ikpong had sent on February 10 and 11, 2014, expressing concerns about the "structural analysis of concrete box girder superstructures," the "assumption of transfer of wheel load effects between girders" and the "bending ratio" and "design moments" for these bridges and stated, in part:

The bridges affected include ALL the box girder bridges designed/built over the past 3 to 4 years in the Province of Ontario. A subset of those bridges would be all the concrete box girder bridges designed under the contracts awarded by the Northwestern Region of MTO to 3 consulting engineering firms in 2010/2011 or thereabout. There could be up to a total of 20 such concrete box girder bridges in Northwestern Ontario alone. There will be lots more from the other regions of the MTO.

I am the one who identified this problem and I reserve the right to continue to be involved to ensure that the engineering work is corrected to my satisfaction. I will not accept being shunted aside. I also have an obligation as a professional engineer to follow through to ensure that the work is rectified right. Unless you insist otherwise, we can take care of this without the involvement of a third party, I want to solve this problem, and take credit for identifying it and solving it. Without my intervention, how was the ministry going to be "looking into" anything?

I have developed a method and the rationale for designing these concrete box girder bridges and I am the one to re-design these bridges, wherever they may be in Ontario. You (MTO) and the consultants had your chance and it doesn't look like you did it right. I'm not ready to trust you guys to do it again. By the

way, you have not even managed to say thank you for identifying the problem.

Please be aware that I have possession of written communication dated 10 January 2013 (one year ago) in which I advised the three consultants against their approach to the design of these box girders for MTO Northwestern Region. Given their performance, these consultants have forfeited the "right" to work on these projects again. I will do the work, ensure that it is done right, and these consultants will pay for the re-design and the re-construction of these bridges no matter whether there are 50, 70 or 100 of such bridges in Ontario.

Please let me know. [sic]

At that point, Mr. Merlo asked Mr. Theodor to look into the issues raised by Dr. Ikpong. In an email dated February 28, 2014, Dr. Ikpong stated:

Regarding the right way to analyze these box girders, I can do that for you in the capacity of a consultant. It is intellectual property and a part of my practice of structural engineering. In other words, I'd be happy to solve the problem for you if you invite me.

Please let me know.

On March 3, 2014, Mr. Theodor wrote to Dr. Ikpong and said that one of his senior engineers reviewed the calculations, in accordance with the code, for one of the structures identified by Dr. Ikpong and obtained results similar to those obtained by the consultant, and that he personally went through the calculations using the 1983 version of the code and obtained comparable results. Mr. Theodor then asked Dr. Ikpong to share his calculations with MTO so that they could be compared to see where MTO might have possibly gone wrong in the event they were possibly "falling into the same trap" in which case "the code should be made clearer." Dr. Ikpong's response of that same date said, in part:

As I have noted in two separate emails to you and Mr. Merlo, I have developed a method and a rationale for the proper analysis of these concrete box girder superstructures, but it is intellectual property. It is not common knowledge.

Mr. Theodor then provided a lengthy reply to Dr. Ikpong on March 4, 2014, reminding him that he has “an ethical responsibility” to report his calculations if they “indicate that the current method of analysis gives results that are not conservative and have the potential to impact the safety of these structures.” Mr. Theodor also stated that MTO’s investigation of the issue was concluded. In response, Dr. Ikpong stated on March 6, 2014:

Attached you will find a technical paper that I have authored, which details the fundamentals of structural engineering for determining peak girder moments and shears in multi-girder bridges, including precast/prestressed concrete box girders. There is only one truth regarding the structural analysis of these types of bridge superstructures, and this is the truth—the attached paper. My approach is thoroughly proven within the paper.

...

Please read through the technical paper and the attached Sketch and scrutinize them. I will not charge you any fee for reading them. Further, I encourage you to adopt my method for the design of concrete box girders for Ontario bridges. However, if you decide to adopt my method, the following condition shall apply: for a fee, I will use my method, in the capacity of a subconsultant or other capacity, to perform the analysis, provide the rationale for the analysis, and provide the design bending moments and design shears for all the concrete box girders designed for Ontario bridges under contracts awarded to consultants during the past 5 years.

In his response to Dr. Ikpong, Mr. Theodor advised that the OPTIA mandates the use of the code for the design of bridges in Ontario and that until any proposed method is implemented by the code, its use would be considered a violation of the legislation. Mr. Theodor also stated that he was immediately deleting, without reading, the papers Dr. Ikpong had sent him, that he didn’t wish to receive any additional such correspondence and that he considered the issue closed.

Dr. Ikpong then sent a letter to the minister on July 14, 2014, stating, in part:

I write to bring to your attention a horrific situation involving incompetent highway bridge designs in the Province of Ontario. By provid-

ing engineering insight, I have on my own tried to correct/reverse this problem, but the problem persists. The engineering service providers contracted by the ministry have failed to discover the error in their work even when it has been repeatedly questioned. Similarly, your bridge engineers and structural engineers at the bridge office as well as the structural sections in the various regions have failed to positively deploy detailed information provided to them on why the designs are wrong.

As stated above, I did provide Mr. Merlo and Mr. Theodor with the structural engineering solution for this problem, complete with the rationale for the solution approach, but I also gave them the following condition. They can use my method and rationale for the further analysis and design of concrete box girder bridges for which design contracts had been awarded by 5th March 2014.

To that end, I have already completed two-thirds of the work as follows.

1. I have identified the problem and the danger to the public where no one else could.
2. I have conceived the solution for the problem where no one else could.
3. What remains now is the third and final phase, namely, for me to implement my solution on the 50 or more concrete box girder bridges that have already been designed, built or contracted out province wide.
4. What also remains is for me to get paid for all of the work that I have done in identifying the problem, conceiving a solution, and implementing the solution. The ministry will pay me and then back-charge the consultants.

2. March 3rd 2014 email to me from Nicolas Theodor...in which Mr. Theodor confirms that the Ontario Government engineers are just as incompetent as the consultants with respect to the proper analysis of concrete box girder bridges.

This is a serious matter with dire consequences for the safety of the travelling public, and one which is perfectly within your purview to resolve. I am the one who identified this problem, and I want to solve this problem and take credit for identifying it and solving it. I also want to be paid for the ingenuity in coming up with the solution and for implementing the solution on all the affected bridges. [sic]

In the response sent on behalf of the minister on August 11, 2014, to Dr. Ikpong, Dino Bagnario, P.Eng., director of the highway standards branch stated:

Finally, I would like to address your comment that the email from Mr. Nick Theodor, P.Eng., of March 3, 2014, “confirms

that Ontario Government engineers are just as incompetent as the consultants with respect to the proper analysis of concrete box girder bridges.” The ministry vehemently disagrees with your comments with respect to this e-mail and no such statements are made or implied in the e-mail by Mr. Theodor. In fact you may want to consider withdrawing this statement. A professional engineer in Ontario that makes inaccurate accusations against a fellow engineer, suggesting that they are incompetent or have allowed unsafe situations to persist, is violating the Professional Engineers Code of Ethics (section 77 of the O.Reg. 941) and could potentially be subject to discipline from Professional Engineers Ontario (PEO). In future I suggest you be mindful of this when communicating your concerns.

The ministry considers this matter now closed. If you have any further questions or concerns with the methods of analysis in the CHBDC for this type of bridge, I urge you to contact the chair of the CHBDC analysis section. Thank you for your concerns. [sic]

Based on Dr. Ikpong’s own words and actions set out in the passages above, the panel concludes that Dr. Ikpong engaged in conduct or an act relevant to the practice of professional engineering that, having regard to all the circumstances, would reasonably be regarded by the engineering profession as unprofessional. Dr. Ikpong’s conduct is relevant to the practice of professional engineering because it concerned existing bridges on which his former employer consulted and on which he was involved and bridge design as set out in the code. Dr. Ikpong has a duty as a professional engineer to conduct himself professionally in regard to the practice of professional engineering.

The panel considers Dr. Ikpong’s labelling of other engineers as incompetent to be intemperate language that demonstrated poor judgment. The panel is convinced that the average engineer would have concerns about Dr. Ikpong’s intemperate language and poor judgment and would consider it unprofessional to accuse another engineer of being incompetent in circumstances when one engineer believes that he or she has discovered a preferable engineering solution or design. Even if Dr. Ikpong had in fact discovered a superior engineering solu-

tion or design—and the panel is not suggesting that he has—choosing to communicate his discovery in the way that he did would be unprofessional.

The panel notes Dr. Ikpong’s testimony that he acted out of concern for public safety and his position that he is a whistleblower who is now being punished for pointing out safety concerns. While Dr. Ikpong’s intent in his letter to the minister appears to have been, in part, to protect public safety, Dr. Ikpong could have and should have voiced his concern in a professional manner.

For the reasons above, the panel finds Dr. Ikpong guilty of professional misconduct under section 72(2)(j) of Ontario Regulation 941 of the act.

Allegation 2

Section 72(2)(n) of Ontario Regulation 941 of the act states:

(2) For the purposes of the act and this regulation, “professional misconduct” means,
(n) harassment.

“Harassment” is defined in section 72(1) of O.Reg. 941, which reads:

(1) In this section,
“harassment” means engaging in a course of vexatious comment or conduct that is known or ought reasonably to be known as unwelcome and that might reasonably be regarded as interfering in a professional engineering relationship[.]

Based on Dr. Ikpong’s correspondence and conduct set out under the Allegation 1 discussion above, the panel is satisfied that he engaged in a course of vexatious comment or conduct that he knew or ought reasonably to have known was unwelcome and that might reasonably be regarded as interfering in a professional engineering relationship.

Dr. Ikpong’s letter to the minister and his correspondence with MTO engineers leading up to it were courses of vexatious comment or conduct that he ought reasonably to have known were unwelcome. By the time he sent his letter to the minister, Dr. Ikpong had already been told by MTO that his concerns were investigated by multiple other engineers and determined to be unfounded. In these circumstances, Dr. Ikpong’s decision to write to the minister and accuse the project respondents, who had considered and dismissed his specific concerns,

of incompetence because they disagreed with his views, was harassment.

The panel also accepts that Dr. Ikpong's repeated offers to provide his engineering services to MTO to rectify the bridge problems he alleged existed, as set out in the passages in Allegation 1 above, might reasonably be regarded as interfering in a professional engineering relationship. Dr. Ikpong explicitly and repeatedly offered his services to MTO in the place of other professional engineers who had a contractual relationship with MTO, even going so far as to suggest that MTO "back-charge" these engineers once it paid him for implementing his "solution."

Dr. Ikpong's strongly worded letter to MTO and his accusations of incompetence were serious actions taken after he had been told by MTO and other engineers he contacted that his concerns had been investigated, considered unfounded and dismissed, and that the matter was closed. The language and approach Dr. Ikpong used in the circumstances was harassment.

For the reasons above, the panel finds Dr. Ikpong guilty of professional misconduct under section 72(2)(n) of Ontario Regulation 941 of the act.

Allegation 3

Section 28(3)(a) of the act states:

- (1) The Discipline Committee may find a member of the association or a holder of a temporary licence, a provisional licence or a limited licence to be incompetent if in its opinion,
 - (a) the member or holder has displayed in his or her professional responsibilities a lack of knowledge, skill or judgment or disregard for the welfare of the public of a nature or to an extent that demonstrates the member or holder is unfit to carry out the responsibilities of a professional engineer[.]

The application of section 28(3)(a) requires that a member display "in his professional responsibilities" a lack of knowledge, skill or judgment or disregard for public welfare sufficient to demonstrate that he is unfit to be an engineer. The panel is not satisfied that the conduct of Dr. Ikpong as set out in the Amended Statement of Allegations constituted a display "in his professional responsibilities." The extensive testimony of the witnesses and Dr. Ikpong established that Dr. Ikpong expressed certain views on engineering analysis and design of pre-stressed concrete box girder bridges and that he did so in the capacity of an engineer volunteering his views, in part, out of concern for public safety. This context is crucial to the panel's finding. The panel does not accept that Dr. Ikpong's volunteered views on bridge design and his insistence that his volunteered views were correct qualified as a display in his "professional responsibilities" of a lack of knowledge, skill or judgment or disregard for the welfare of the public as required for the application of section 28(3)(a) of the act. The panel considers Dr. Ikpong to be expressing a concern, albeit one that none of the witnesses agreed with, about bridge design. Irrespective of whether Dr. Ikpong's views were in fact wrong, the panel cannot make a finding of incompetence when the conduct underlying the allegation is not a display in his professional responsibilities of a lack of knowledge, skill or judgment or disregard for the welfare of the public and the section 28(3)(a) test is not met.

The evidence adduced by PEO does not establish on a balance of probabilities that Dr. Ikpong is incompetent within the meaning of section 28(3)(a) of the act and, as a result, the panel finds that Allegation 3 has not been proven.

Allegation 4

Section 72(2)(a) of O.Reg. 941 states:

- (2) For the purposes of the act and this regulation, "professional misconduct" means,
 - (a) negligence[.]

“Negligence” is defined in section 72(1), which reads, in part:

“negligence” means an act or an omission in the carrying out of the work of a practitioner that constitutes a failure to maintain the standards that a reasonable and prudent practitioner would maintain in the circumstances.

The panel is not satisfied that PEO has proven Allegation 4. Similar to its reasoning regarding Allegation 3, the panel does not consider Dr. Ipkong’s conduct in volunteering his views on bridge design to qualify as “an act or an omission in the carrying out of the work of a practitioner.” Dr. Ipkong’s acts or omissions in the circumstances of this matter were not “in the carrying out of” his “work.” As the first part of the definition of negligence is not satisfied, the panel finds section 72(2)(a) of O.Reg. 941 cannot apply.

CONCLUSION

Having found Dr. Ipkong guilty of professional misconduct under sections 72(2)(j) and (n) of Ontario Regulation 941 of the act, the panel will invite submissions from the parties on penalty.

FINAL NOTE

The panel notes that professional engineers have a duty to raise, and should not be faulted for raising, safety concerns. The evidence in this matter established that Dr. Ipkong conscientiously objected to a specific bridge design and that he advocated for what he considered a safer design and for a clarification in the code for prestressed/precast concrete box girder bridges. The panel is neither charged with nor qualified to determine such design questions. However,

the panel notes it was presented with evidence of recurring failures of shear keys and of the judgment requirement for bringing shear-connected box girders into the sphere of the code’s simplified design, both of which raise issues. Accordingly, the panel recommends that these issues and the additional information and calculations that Dr. Ipkong provided in response to PEO’s reply submissions (which the panel did not accept or review) be reviewed by relevant authorities. In this regard, the panel echoes the recommendation of the Complaints Committee Decision of April 1, 2015, that concerns regarding the accuracy or applicability of the code should be forwarded to, and seriously considered by, the CSA Technical Committee responsible for the code which should publish its reasoning and conclusions.

Henry Tang signed this Decision and Reasons for the decision as chair of this discipline panel and on behalf of the members of the discipline panel: Stella Ball, LLB, Paul Ballantyne, P.Eng., Tim Kirkby, P.Eng., and Patrick Quinn, P.Eng.

DECISION AND REASONS ON PENALTY

In the matter of a hearing under the *Professional Engineers Act, R.S.O. 1990, c. P.28*; and in the matter of a complaint regarding the conduct of ANTHONY A. IKPONG, P.ENG., a member of the Association of Professional Engineers of Ontario.

This is the Decision and Reasons on Penalty further to this panel's Decision and Reasons on the merits of this matter issued December 13, 2017. In its Decision and Reasons on the merits, this panel found the member, Dr. Anthony A. Ikpong, guilty of professional misconduct under sections 72(2) (j) (unprofessional conduct) and (h) (harassment) of Ontario Regulation 941 of the *Professional Engineers Act* (PEA). The hearing on the merits lasted eight days, spread over seven months. The panel, with the parties' consent, decided that conducting the penalty phase of the hearing in writing was the most efficient and fair way to move forward in light of existing scheduling difficulties. Accordingly, the panel invited and received submissions on penalty in writing from the Association of Professional Engineers Ontario (PEO) and Dr. Ikpong.

PEO'S SUBMISSIONS ON PENALTY

PEO submits Dr. Ikpong's conduct merits a very serious penalty that focuses on the protection of the public and on maintaining the reputation of the profession in the eyes of the public. PEO argues that Dr. Ikpong has shown no remorse or insight into his actions and that he will likely reoffend by insulting, accusing and harassing anyone with whom he disagrees. PEO submits that Dr. Ikpong has not shown any willingness to co-operate or accept the views of others because he believes he alone has all the right answers.

PEO asks the panel to:

- a. Reprimand Dr. Ikpong pursuant to section 28(4)(f) of the PEA and record the fact of the reprimand on the register permanently.
- b. Suspend Dr. Ikpong's licence for four months pursuant to section 28(4)(b) of the PEA.
- c. Impose the term or condition on Dr. Ikpong's licence that he shall successfully complete PEO's Professional Practice Examination within fourteen months pursuant to section 28(4)(d) of the PEA.

- d. Revoke Dr. Ikpong's licence pursuant to sections 28(4)(a) and (k) of the PEA if he does not successfully complete the Professional Practice Examination within fourteen months.
- e. Publish the Decisions and Reasons of the panel, together with Dr. Ikpong's name, in PEO's official publication.

PEO states that it does not seek costs because Dr. Ikpong is unlikely to pay them.

THE MEMBER'S SUBMISSIONS ON PENALTY

In response, Dr. Ikpong submits that he has concerns about this panel's decision to exclude the testimony of PEO's expert witnesses in its Decision and Reasons on the merits. He repeats his view that his "solution" was correct all along and that the expert witnesses who testified at the hearing were "wrong." He asserts that the panel should have acknowledged this in its Decision and Reasons on the merits but, instead, decided "to hide PEO's 4 witnesses and their proven, erroneous, testimony from public view."

Dr. Ikpong states that, because the panel "did not deliver to [him] the verdict that [he] so thoroughly deserved in respect of the correct magnitude of girder design forces, and given [his] pledge to work co-operatively with the Canadian Standards Association" (CSA) to determine what the Canadian Highway Bridge Design Code (the code) provisions for precast/prestressed concrete box girder bridges should be, he asks the panel to:

- a. Not publish his name but, rather, to refer to him as "the member."
- b. Not include information on his academic/university degrees other than his P.Eng. licence.
- c. Not suspend his licence.
- d. Not impose any course work or examination on him.
- e. Only state in its written decision that he was admonished for the tone of his communication

with the Ministry of Transportation of Ontario (MTO) engineers.

Dr. Ikpong's grounds for his request are that his "engineering on this matter was and remains perfect"; he admits that his communication with MTO engineers was imperfect, and he agrees to work co-operatively with the CSA on the code provisions for the future analysis of precast/prestressed concrete box girder bridges.

Dr. Ikpong concludes by stating that he regrets that he ever brought this matter to PEO, but he has also done a lot of good because his "comprehensive 3-dimensional structural analysis of the precast site-connected concrete box girder bridge superstructure is unchallengeable" and will greatly benefit the public.

PEO'S REPLY SUBMISSIONS ON PENALTY

In its reply submissions, PEO asserts that the evidence of all of the witnesses was that Dr. Ikpong's methods and conclusions were severely flawed, but that the panel decided his conduct in "volunteering his views on bridge design" did not fall within the first part of the definition of negligence in Regulation 941 of the PEA, because they were not "in the carrying out" of "work." PEO argues that, because the panel decided that Dr. Ikpong was not carrying out engineering work, Dr. Ikpong's conduct cannot be said to be either "engineering work" or "excellent," and the panel should so find.

PEO argues that the panel's findings must be based "exclusively on evidence admitted before it" in accordance with section 30(6) of the PEA and it submits that the evidence, including Dr. Ikpong's own testimony and his behaviour towards the panel and its rulings, as well as his rudeness to the witnesses, shows that Dr. Ikpong is either incapable of or unwilling to work co-operatively with anyone. PEO submits that Dr. Ikpong's history of interactions with others, from his conduct towards his supervisor and continuing with what PEO describes as his scurrilous attacks on MTO engineers, members of CSA committees and eminent experts in the field of bridge design, demonstrates that his "pledge to work co-operatively" is meaningless. PEO argues that Dr. Ikpong's submissions on penalty show that he continues to believe that he, and only he, has all the right answers. PEO states that Dr. Ikpong's

"submissions repeat the vainglorious assertions contained in his prior materials and continue his attacks on everyone else's ethics and competence" and that the serious penalties it seeks are warranted.

REASONS FOR PENALTY DECISION

A Discipline hearing penalty is meant to address the goals of: deterring the member specifically, and all members of the engineering profession generally, from engaging in professional misconduct; rehabilitating the member; protecting the public; and maintaining the reputation of the engineering profession. Having regard to these goals, the panel agrees with PEO's submissions on penalty to the effect that Dr. Ikpong's conduct warrants a serious penalty. His unprofessional conduct demonstrated poor judgment and negatively impacted the engineers he harassed.

Dr. Ikpong's submissions on penalty, in which he continues to insist that he is correct and that the other engineers who challenged him are wrong, demonstrate a continued lack of professionalism and arrogance that troubles the panel. The panel notes that Dr. Ikpong mischaracterizes and/or misunderstands its Decision and Reasons on the merits as a confirmation that his volunteered views on bridge design were correct; this is not the case as the panel's Decision and Reasons on the merits make clear and as PEO's reply submissions accurately state. The panel made no findings on Dr. Ikpong's views because they were not "an act or omission in the carrying out of the work of a practitioner" as required for the panel to make a finding of professional misconduct under the negligence provision in section 72(2)(a) of Regulation 941 of the PEA, nor were they a display "in his professional responsibilities," again as required for the panel to make a finding of professional misconduct under section 28(3)(a) of the PEA. The panel did not consider Dr. Ikpong's volunteered views on bridge design to be "engineering work" for the purposes of the PEA. The panel is disturbed by Dr. Ikpong's failure to understand and/or accept this.

Despite Dr. Ikpong's stated regret in his submissions and his pledge to work co-operatively with other engineers going forward, the panel believes that it is necessary to impose a penalty that includes a reprimand, a suspension of the member's licence,

a requirement that he complete remediation, and that the panel's Decisions and Reasons be published. The suspension, reprimand and publication provisions of the penalty sought by PEO satisfy the purposes of general and specific deterrence. Dr. Ikpong and the engineering profession must understand that interactions among engineers must always be professional and co-operative, particularly where safety concerns are at issue. The requirement that Dr. Ikpong successfully complete the Professional Practice Examination satisfies the goals of rehabilitation and protection of the public. Dr. Ikpong must learn how to engage professionally and co-operatively with engineering peers. By doing so, he will be better equipped to satisfy his professional responsibilities as an engineer. These penalty provisions taken together serve the purpose of upholding the reputation of the profession as they send a message to the public that the engineering profession does not tolerate unprofessional and harassing conduct, and that it seeks to deter professional engineers from behaving this way.

PENALTY DECISION

The panel makes the following order as to penalty:

- a. The member shall be reprimanded pursuant to section 28(4)(f) of the PEA, and the fact of the reprimand shall be recorded on the PEO register permanently.
- b. The member's licence shall be suspended for four months pursuant to section 28(4)(b) of the PEA, commencing on the date of this Decision and Reasons on Penalty.

- c. Pursuant to section 28(4)(d) of the PEA, it shall be a term or condition of the member's licence that he shall, within eighteen months of the date of this Decision and Reasons on Penalty, successfully complete PEO's Professional Practice Examination and provide evidence of his successful completion to PEO.
- d. The Decisions and Reasons on the merits and s official publication pursuant to section 28(5) of the PEA.

Henry Tang, P.Eng., signed this Decision and Reasons for the decision as chair of this discipline panel and on behalf of the members of the discipline panel: Stella Ball, LLB, Paul Ballantyne, P.Eng., Tim Kirkby, P.Eng., and Patrick Quinn, P.Eng.

NOTICE OF LICENCE SUSPENSION, DR. ANTHONY IKPONG, P.ENG.

On February 27, 2018, the Discipline Committee ordered that Dr. Anthony Ikpong's professional engineering licence be suspended for a period of four months. Dr. Ikpong's appeal from this order was dismissed by the Divisional Court, and the Court of Appeal dismissed his motion for leave to appeal to that court on October 3, 2019. The suspension ordered by the Discipline Committee was implemented upon the dismissal of the motion for leave to appeal, namely, on October 4, 2019.

NOTICE OF LICENCE REVOCATION, NICOLAS REWA

Nicolas Rewa’s licence was revoked, effective April 22, 2019. The deputy registrar had delivered a Notice of Proposal to Revoke to him, dated February 25, 2019, pursuant to subsection 19(1) of the *Professional Engineers Act*. The Notice of Proposal stated that Mr. Rewa’s past conduct afforded grounds for the belief that he would not engage in the practice of professional engineering in accordance with the law and with honesty and integrity. The past conduct referred to was a criminal conviction on a number of fraud-related offences. Because Mr. Rewa did not request a hearing within 30 days after the Notice of Proposal was served upon him, the deputy registrar carried out the proposal and revoked his licence.

NOTICE OF LICENCE SUSPENSION, WALDEMAR M. WIDLA, P.ENG.

On August 6, 2019, Waldemar M. Widla’s professional engineering licence was suspended pursuant to a June 6, 2018, order of the Discipline Committee. The order was issued following a finding of professional misconduct against Widla at a discipline hearing held on that date. Widla’s licence was suspended because he failed to write and pass PEO’s professional practice examination within the 14-month timeframe prescribed by the Discipline Committee.

CORRECTION NOTICE

The Decision and Reasons in the matter of PEO vs. William Tessler, P.Eng., and Sonterlan Corporation, which was published in the November/December 2019 issue of *Engineering Dimensions*, contained two errors. The panel has since corrected the errors in its decision of June 6, 2019:

- On page 29, under Joint Submission on Penalty, paragraph (b): “...on December 1, 2019” was corrected to “...on December 1, 2018”; and

- On page 30, under Penalty Decision and Reasons, paragraph (b) “...on December 1, 2019” was corrected to “...on December 1, 2018.”

The corrected decision can be viewed in the digital edition of the November/December 2019 issue of *Engineering Dimensions* at www.digitalityworks.com/Viewers/ViewIssue.aspx?IssueID=211&PageNo=27

PEO PUBLICATIONS AND RESOURCES

Professional Engineers Ontario has a number of resources, including practice bulletins, brochures, learning modules and fact sheets, available for free on its website at peo.on.ca/knowledge-centre. The following regulatory documents and practice guidelines are available in PDF form on PEO's website.

REGULATORY DOCUMENTS

- The *Professional Engineers Act*, R.S.O. 1990, Chapter P.28
- Ontario Regulation 260/08
- Ontario Regulation 941/90
- By-Law No. 1

PRACTICE GUIDELINES

General—Engineer

- Assuming Responsibility and Supervising Engineering Work Guideline (2018)
- Conducting a Practice Review (2014)
- Guideline on Human Rights in Professional Practice (2009)
- Professional Engineering Practice (2017)
- Professional Engineers Reviewing Work Prepared by Another Professional Engineer (2011)

Use of seal

- Use of Professional Engineer's Seal (2008)

Legal/Discipline

- Guideline on Forensic Engineering Investigations (2016)
- Making a Complaint: A Public Information Guide (2011)
- The Professional Engineer as an Expert Witness (2011)

Communications

- Professional Engineers Providing Communication Services (1993)

Construction/Building

- Professional Engineers Providing Commissioning Work in Buildings (1992)
- Professional Engineers Providing General Review of Construction as Required by the Ontario Building Code (Rev. 2008)
- Professional Engineers Providing Land Development/Redevelopment Engineering Services (1994)
- Professional Engineers Providing Mechanical and Electrical Engineering Services In Buildings (1997)
- Professional Engineers Providing Professional Services in Building Projects using Manufacturer-Designed Systems and Components (1999)
- Professional Engineers Providing Services for Demolition of Buildings and Other Structures (2011)
- Professional Engineers—Temporary Works (1993)
- Structural Condition Assessments of Existing Buildings and Designated Structures (2016)
- Structural Engineering Design Services for Buildings Guideline (2016)

Transport/Roads/Municipal

- Professional Engineers Providing Services for Municipalities (Rev. 1998)
- Professional Engineers Providing Services in Transportation and Traffic Engineering (1994)
- Professional Engineers Providing Services with Respect to Road, Bridges, and Associated Facilities (1995)

Software/Computers

- Developing Software for Safety Critical Engineering Applications (2013)
- Professional Engineers Using Software-Based Engineering Tools (2011)

Mechanical/Electrical/Industrial

- Professional Engineers Providing Reports for Pre-Start Health and Safety Reviews (2001)

Geotechnical/Environmental

- Engineering Evaluation Reports For Drinking Water Systems (2014)
- Professional Engineers Providing Acoustical Engineering Services in Land-Use Planning (Rev. 1998)
- Professional Engineers Providing Geotechnical Engineering Services (1993)
- Professional Engineers Providing Reports on Mineral Properties (2002)
- Professional Engineers Providing Services in Environmental Site Assessment, Remediation and Management (1996)
- Services of the Engineer Acting Under the Drainage Act (1998)
- Solid Waste Management (2017)

National Guidelines

- Principles of Climate Change Adaptation for Engineers

Attend

January 2020

JANUARY 25-26

Women in Science and Engineering National Conference, Toronto, ON
conference.wiseuoft.org

JANUARY 30-31

Disrupted Conference: The Human Side of Tech, Winnipeg, MB
disruptedfuture.com

February 2020



FEBRUARY 3-5

CatiQ Connect: Canada's Catastrophe Conference, Toronto, ON
connect.catiq.com

FEBRUARY 19-21

Adaptation Canada Conference on Climate Change Adaptation, Vancouver, BC
adaptationcanada2020.ca



JANUARY 31-FEBRUARY 1

Canadian Water Resources Association Midterm Conference, Saint John, NB
conference.cwra.org/home/mb2020

FEBRUARY 21-24

Conference on Sustainability in Engineering, Waterloo, ON,
cfes.ca/cse



FEBRUARY 26

Resilient Design CSC Building Expo, Toronto, ON
cscbuildingexpo.com

FEBRUARY 26-27

International Conference on Water Management Modeling, Toronto, ON, icwmm.org

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A look at the earth's heat in the search for renewable energy
youtube.com/watch?v=vZLo0-lwK1k

How Are Underwater Structures Built?

An overview of how underwater structures are built
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GPS, How Does it Work?

How GPS is a real-life application of Albert Einstein's theory of relativity
youtube.com/watch?v=8eTII19_57g

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A podcast of honest conversations with engineers and operators about their work and careers
theprepared.org/podcast

99-Per cent invisible

A design-related podcast looks behind the design details of everyday things we don't think about.
99percentinvisible.org

The Accidental Tech Podcast

A podcast that looks at the tech industry and other related matters
atp.fm

Read



Engineering Innovation: From Idea to Market Through Concepts and Case Studies, by Benjamin M. Legum, Amber R. Stiles and Jennifer L. Vondran, 2019: An overview of the interconnected business and product development techniques needed to nurture the development of emerging technologies into commercially viable products

Innovation Engineering: A Practical Guide to Creating Anything New, by Ikhlaq Sidhu, 2019: A practical guide to creating anything new, from small projects to larger ventures, with advice on tactical processes, leadership and the behaviours necessary for successful innovation projects

The Book of Why: The New Science of Cause and Effect, by Judea Pearl and Dana Mackenzie, 2018: A look at how understanding causality has revolutionized science and is poised to revolutionize artificial intelligence

DESIGNING SOLUTIONS FOR

DEMENTIA

BY ADAM SIDSWORTH





Jennifer Boger, PhD, P.Eng., tests a virtual reality game designed to encourage people with milder dementia to participate in more physical activity.

Ninety per cent of Canadians over the age of 65 have at least one chronic illness, among them dementia. The Alzheimer Society of Canada estimates that 937,000 Canadians could be living with dementia by 2031 (although other sources say it could be as high as 1.4 million), meaning we need to start considering better ways to care for them. In this article, we speak with Ontario engineers who are making the lives of people living with dementia and their caregivers less stressful within a human factors engineering perspective.

Seventy-five per cent of homecare for older Canadians is provided by family members. Consider the plight of the Lutys. In 2016, the *National Post* reported that the elderly eastern Ontario couple, who had been married for 63 years, were struggling. Ninety-year-old Constantine (Con), a one-time Hudson's Bay fur trader, had developed mild vascular dementia and was one of approximately 9000 people on a waiting list for long-term care in their part of the province. Con's 82-year-old wife, Belva, was providing most of the care for Con, although she was assisted by their daughter, Sandra, and homecare workers supplied by their community care access centre. "I have no life. No life period," Belva told the *National Post*. "I have no social life whatsoever. It's either doctors' appointments or something else. Today, I have to go and pick up pills...I don't think seniors should have to wait for three to five years for long-term care." Fortunately for the Lutys, they received a call at the end of February 2016 for an opening at Granite Ridge.

The Alzheimer Society of Canada describes dementia as "an overall term for a set of symptoms that are caused by disorders affecting the brain. Symptoms may include memory loss and difficulties with thinking, problem-solving or language severe enough to reduce a person's ability to perform everyday activities. A person with dementia may

also experience changes in mood or behaviour. Dementia is progressive, which means the symptoms will gradually get worse as more brain cells become damaged and eventually die."

Dementia is not one single disease; rather, the symptoms are caused by many illnesses, including Alzheimer's disease, vascular dementia (due to strokes), Lewy Body disease, head trauma, frontotemporal dementia, Creutzfeldt-Jakob disease, Parkinson's disease and Huntington's disease. Each condition has similar and overlapping symptoms, and because people with dementia are on a spectrum and the symptoms gradually worsen, patients' families often become overwhelmed with the responsibility.

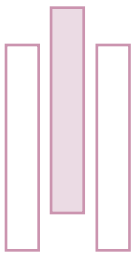
"About 65 per cent of people in long-term facilities have dementia; about half of these have severe dementia," asserts Babak Taati, PhD, P.Eng., a scientist at the Toronto Rehabilitation Institute's (Toronto Rehab's) research arm, KITE, which focuses on injury prevention, restoration of function, enhanced participation and independent living. "[People with dementia] tend to be very old and have lots of other health issues," Taati adds, noting that long-term care facilities are understaffed and overwhelmed by the needs of people with dementia.

ANTICIPATING FALLS AND MEASURING PAIN

Taati is focused on providing solutions to help caregivers provide safer long-term care for both people living with dementia and their caregivers. And his efforts couldn't come at a better time: Dementia typically effects older people, and Canada is undergoing a rapid demographic shift as its baby boomer generation hits retirement age. Baby boomers, born between 1946 and 1965, represent a two-decade period in which over 8.2 million babies were born in Canada. "By 2031, all baby boomers will have reached 65," Statistics Canada wrote in 2011's *Generations in Canada*. Ontario is not immune to this demographic shift and its accompanying healthcare challenges, as Ontario's ministry of finance reported in 2019 in its *Ontario Population Projections Update, 2018-2046*, stating, "The number of seniors aged 65 and over is projected to almost double from 2.4 million, or



According to industrial and service designer Glen Hougan, traditionally designed medical products like metal canes fuel a sickly narrative for seniors.



“WHAT WE WANT IS AN AMBIENT DEVICE THAT KEEPS AN EYE ON EVERYBODY, SO EVERY TIME SOMEBODY WALKS, OUR CAMERAS TURN AN EYE AND CAPTURE THE PERSON WALKING.” —Babak Taati, PhD, P.Eng.

16.9 per cent of the population, in 2018 to 4.6 million, or 23.4 per cent, by 2046. The growth in the share and number of seniors accelerates over the 2018–2031 period as baby boomers turn age 65.”

Taati’s research involves using computer vision technology for older adults with physical or cognitive disabilities, including a new video technology and algorithm device he’s developing to measure risks of falling for people living with dementia. Taati is currently developing the technology with psychiatrist Andrea Iaboni, MD, DPhil, who also works at Toronto Rehab. “If you’re a manager at a long-term care facility, and you house 25 people, they’ll all score at high risk of falling in general,” Taati explains. Patients are typically assessed only once, when they are admitted, because of issues related to time and expense. “Another problem,” Taati adds, “is that these assessments are not best for people living with dementia. They have verbal and comprehension difficulties. If you say, ‘Stand up, walk down, and come back,’ they don’t always understand. What we want is an ambient device that keeps an eye on everybody, so every time somebody walks, our cameras turn an eye and capture the person walking. And we have the algorithms to measure things like speed, cadence and mediolateral sway, step length, step time and other spatio-temporal parameters of gait. It turns out there are correlations between changes to the gait and future falls.”

Taati’s technology, should it become fully developed, could potentially help doctors assess multiple patients in a facility. “Maybe it’s a new medication that affected their gait,” Taati pondered, “or maybe they broke a toe, or maybe it’s something they can prevent.” A study was initially done with 60 dementia patients at Toronto Rehab, which has a specialized dementia unit, and has since been transferred to Toronto’s Lakeside Long-term Care Centre. For privacy reasons, cameras are kept only in the hallways, and participants wear a tag ironed onto their clothing. “We keep an eye on everybody,” Taati asserts, “and as the model becomes confident that somebody’s going to fall within the next seven days or month or somehow their gait has changed, an alert will be sent to the clinicians.”

Taati has another ongoing research project applying computer vision technology to read facial expressions of pain in dementia patients. “Pain in older adults tends to be underdiagnosed,” Taati observes. “And this is especially true for people with dementia because they can’t verbalize it. They have pain that goes undetected for days. They become

agitated...agitation and aggression are very common in long-term facilities.” Teaming with psychologists Thomas Hadjistavropoulos, PhD, the research chair in aging at the University of Regina, and Ken Prkachin, PhD, a psychologist and professor emeritus at the University of Northern British Columbia, Taati uses existing security cameras paired with algorithms to recognize faces and monitor facial expressions. “Facial expressions that happen over several minutes or an hour...are a good indication that staff should go attend to this person,” Taati says.

Taati and his team have been developing the technology for a number of years, and they are preparing to start testing first in a Regina, Saskatchewan, lab, although Taati and his collaborators prefer to take these studies into the field and see their impact in the real world, where his technology can have the most impact. And although his projects could theoretically help people who don’t necessarily have dementia, he remains dedicated to helping patients with dementia and their caregivers lead dignified lives.

DESIGNING AROUND DIGNITY, NOT PITY

“There’s a privacy issue,” says Glen Hougan, an industrial and service designer with a background in human factors, user experience, product development and design thinking. Hougan is an associate professor of design at NSCAD University in Halifax, Nova Scotia, and the principal of Wellspan Research and Design, through which Hougan consults in the areas of healthcare and design for an aging population. Hougan is intrigued by Taati’s use of video cameras to help identify pain of people with dementia in long-term care facilities. “When you’re with somebody who can’t articulate pain, or you don’t trust what they’re articulating because they have dementia, there are some ways technology can do it,” Hougan said. “Now, whether that technology is insensitive or evasive, that’s the issue. Where I’ve seen technology used very well is not so much ‘Big Brother’ but a little more passive, more ‘I’m watching out for you’ as opposed to ‘I’m monitoring you.’” Hougan cites one Nova Scotia study that used heat sensors to determine if older adults had fallen in their house. “That was a sensitive use of technology,” Hougan points out.

Hougan’s main area of interest and concern is ageism in the medical and healthcare sector. “Most people working in the medical profession aren’t usually interacting with healthy older adults,” he asserts. “They get them when they’re sick or in the later stages of dementia. There’s a little bit of a skewed view of that population age group. A lot of times, research shows that we don’t empathize with older patients; we pity them. And we don’t get any sort of progressive designs. We get designs based around pity.”

Hougan suspects that this attitude comes from ageism. “What happens in design is a tendency to look at older people akin to infants,” he continues. “It’s ageism when you treat them that way. Elder speak, akin to baby speak, is when you talk to them like they’re idiots or infants. And you see this exaggerated interaction: ‘How are you, sweetie?’ throughout healthcare. There is even more of a challenge with dementia issues because you’re dealing with somebody who has cognitive issues.” Ageism, Hougan says, manifests itself into design. “There are exaggerated products. I’m calling them ‘elder products,’ which are exaggerated design responses usually resulting in products

that are clunky and ugly. For example, it's like the Velcro shoes you get when you're older. The problem is [seniors] internalize this negative aesthetic narrative. Even when we're younger, it becomes a narrative. 'Oh, look at them in those Velcro shoes!' And all those goofy clothes associated with aging play into our fears about aging."

Hougan urges medical professionals and engineers to design medical devices while keeping the dignity of older adults in mind and design for felt age, as opposed to chronological age. "People are resistant to using their products because, in their minds, they're not that age. We're designing for somebody who's 85, and in their mind, they're feeling 65. The design issues are not just technical and functional but also address aesthetics and emotional needs. We are finding that people will use the products if there's an emotional connection." Hougan cites the design of mobility devices, notably walking canes: "The cane functionally has to help you walk and hold your weight, but they don't want to use something that's metal and cold and looks like a medical product. It's a part of you. You know those walking aids, such as Nordic poles? It's about an active health narrative, but if I had a metal cane, people would be, 'Oh, you're sick or disabled.' The look of the product dictates a negative reaction and narrative."

For Hougan, who once taught a design course on dealing with people living with dementia, it's important to recognize that dementia is a spectrum, and, therefore, each person living with dementia is unique. Hougan recognizes the need for technology, including monitoring, for people with more severe forms of dementia. "If you're dealing with dementia patients who have to take pills, and you need to know if they're taking pills, that's a perfect need for technology," he says. But Hougan has advice for engineers: "If you design a device around the person's needs, you get a more appropriate technology and product solution."

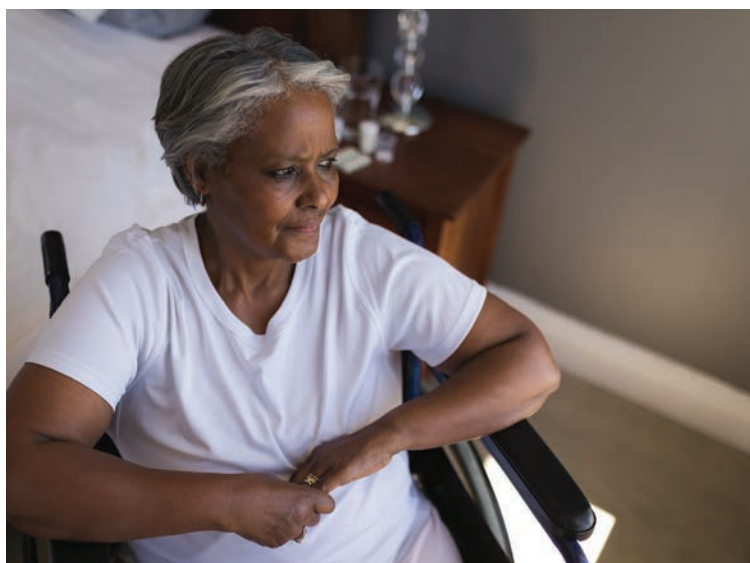
CONSIDERING ETHICS

These multitudes of grey shades of ethics when creating technologies is a core concern for Jennifer Boger, PhD, P.Eng. Boger is the Schlegel chair in technology for independent living at the Research Institute for Aging and the director for the Intelligent Technology for Wellness and Independent Living lab at the University of Waterloo. "My concerns come from working with people living with dementia and children with autism," Boger says. "I often have embedded invisible systems that run on algorithms, where I use things like computer vision and machine learning to autonomously analyze and use data." But Boger ponders: "There are multiple layers of ethical questions. Who owns the data? Who gets to decide when the sensors are used? If you have dementia and you can't remember that you consented to this yesterday and you don't like it, whose autonomy is more important—yours or your family caregiver's? There are no easy answers, and one thing that

makes it difficult is that it's continually in flux. Things in life change, which changes your opinion, and most developers throw up their hands and say, 'I'm not trained to do this.'" Boger, who's the co-chair for the Council for Responsible Innovation and Technology at the University of Waterloo, where she is also an assistant professor of systems design engineering, adds, "I'm really keen to start cracking at this nut so we can create more ethically aligned technologies like artificial intelligent technology for people living with dementia."

Boger spends much of her time working on solutions that can support people living with dementia, but in the past, she also worked with children on the autism spectrum; these populations share some symptoms in common, such as independently engaging in tasks and following the required steps. But, Boger says, solutions and technology don't necessarily translate well between the two populations: "For example," Boger says, "kids with autism love computers. That's a generalization, but by and large, they respond well to computers. People with dementia don't engage the same way. For many of the people trending towards the more advanced stages of dementia, which is when help is needed with task planning, they don't respond to the technology as readily or interact with it in the same way." Additionally, the caregiver for a person with dementia is often a spouse, adult child or professional caregiver, but for children with autism, it is typically a parent. And the intended purpose of the technology—a reminder for adults versus a teaching tool for children—changes how people think and feel about the technology, and this, in turn, changes what they feel is acceptable.

One technology that Boger is attempting to develop specifically for family caregivers of people with dementia is CARE-RATE, an online resource that "leverages natural language processing and artificial intelligence to power a dialogue-based interface that enables caregivers to describe the problem they are having [and receive] tailored information about assistive technology, local, regional and global resources, online forums and strategies that suit their specific needs." It's essentially a more helpful strategy to a conventional online search, which requires you to know what you are looking for beforehand. Boger notes that family caregivers are typically older spouses who are learning how to use the Internet to search for help. "Especially if we're looking for new info," Boger says, "there's much we don't know that



Industrial and service designer Glen Hougan has coined the term "elder products" for exaggerated designs for seniors, contributing to ageism.



Some of the technology developed by Jennifer Boger, PhD, P.Eng., encourages a more active lifestyle for people with dementia.

“PEOPLE WITH DEMENTIA DON’T ENGAGE THE SAME WAY. FOR MANY OF THE PEOPLE TRENDING TOWARDS THE MORE ADVANCED STAGES OF DEMENTIA, WHICH IS WHEN HELP IS NEEDED WITH TASK PLANNING, THEY DON’T RESPOND TO THE TECHNOLOGY AS READILY OR INTERACT WITH IT IN THE SAME WAY.”

—Jennifer Boger, PhD, P.Eng.

we don’t know. ‘How do I stop my husband from wandering?’ What does that mean?’ The answer people are looking for can often be buried in pages and pages of search results, making it difficult and time consuming for caregivers to find ideas or resources that could help. With CARE-RATE, the algorithm will ask the caregiver questions requiring a yes or no answer to help narrow the search results.

IMPLEMENTING VIRTUAL REALITY THERAPY

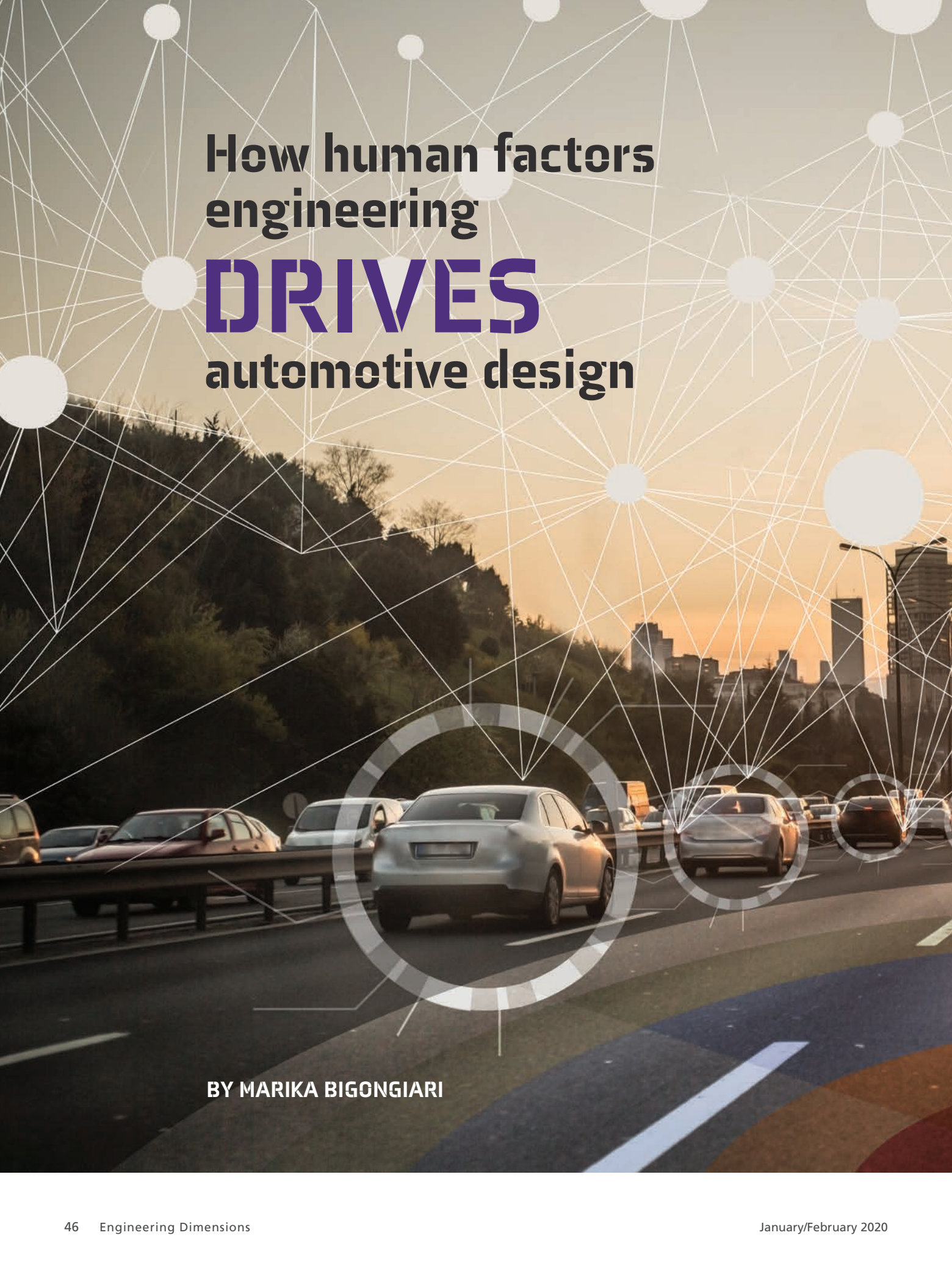
But even when Boger more specifically focuses on people with dementia, there are still shades of grey. She and her team developed a virtual reality game to encourage those with mild cognitive impairment to participate in more physical activity, with the goal of improving their quality of life and health. According to Boger, many people with mild to moderate dementia can live a sedentary lifestyle in long-term care, often because there aren’t enough therapists to provide the daily one-on-one support that many may need to encourage an active lifestyle. Her research team is exploring how immersive virtual reality might help. The project is currently on a commercialization pipeline with a private company. According to Boger, “it’s a video game, and because it’s a head-mounted virtual reality, you feel like you’re in it.” The games include a virtual farm, involving stack-

ing boxes of fruit; and virtual rowing on a lake, involving rowing a rowboat. Collaborating with therapists and kinesiologists, Boger and her team are developing new metrics to objectively measure people’s movement and engagement, which could include, for example, having the participant reach a certain heart rate and algorithms to customize the game to match each person’s ability level. “It has to be a challenge,” Boger says, “but be possible and fit their ability. Exercise can be objectified in a way it couldn’t be before.” She adds that one exercise therapist, witnessing one of her clients use the virtual reality with enthusiasm, exclaimed, “I didn’t know that she could move like that!” Boger proudly adds, “As a researcher, that’s about the best feedback you can get.”

However, Boger adds: “There are plenty of secondary end users, such as family and caregivers. We want to solve the problem and not transfer it. Developers often build a technology with the expectation that a caregiver will turn it on, set it up and keep it running. But that’s being negligent of that person’s needs because a lot of caregivers are maxed out. You’re just moving the problem around and not solving it. We have to be cognizant of involving all or as many stakeholders as possible. How does it map out onto the ecosystem that it’s being deployed into? How can we do better?” Boger says the virtual reality is designed to be played at leisure and adaptive to the schedules of both caregivers and people with dementia. But—importantly—the virtual reality is not a replacement for human contact but rather an additional tool for both the caregiver and person with dementia.

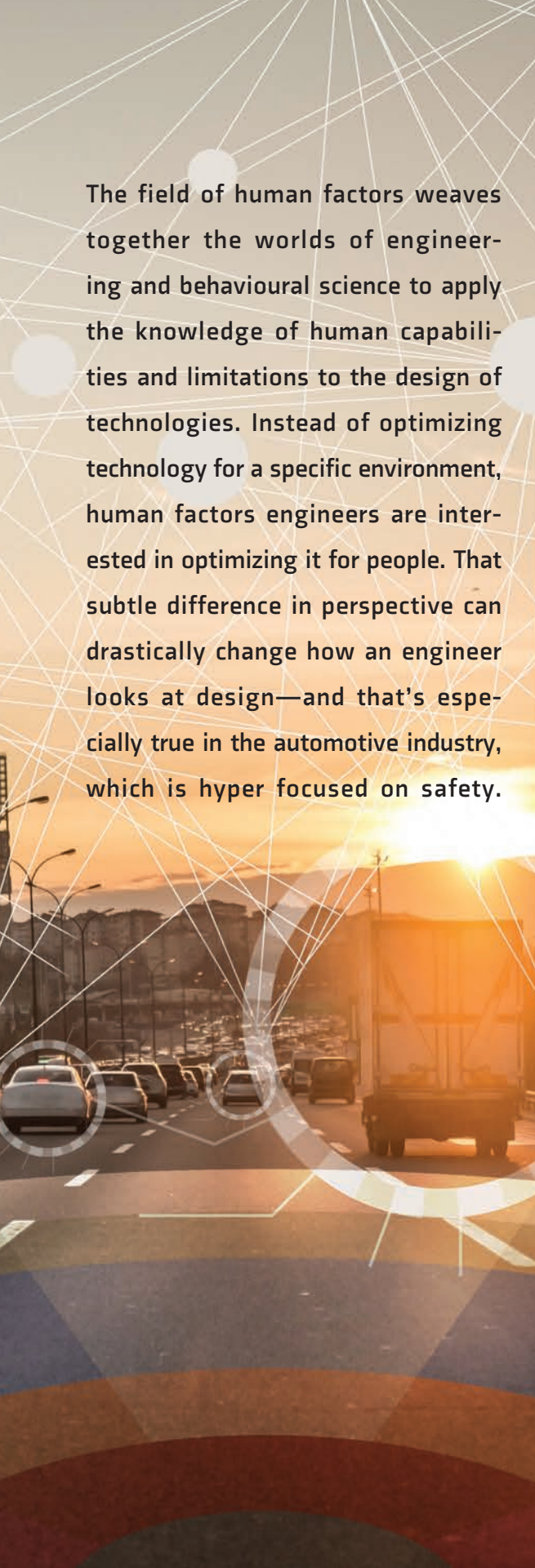
Another area of research for Boger is how technology might be used to mitigate dementia symptoms, such as poor memory and irritability, which, according to Boger, can be exacerbated with poor sleep. Sleeping patterns of those with dementia, who often have severely disrupted sleep, is poorly understood. Boger says that current algorithms used by wearables to detect sleep have been trained on the sleeping patterns of healthy, typically younger people and “fail with some older adults and most people living with dementia because their sleep patterns are so different.” The study involved measuring subjects’ movement and body temperature with wristbands, since circadian rhythms effect the body’s temperature, including at the wrist. “We followed younger healthy adults and older healthy adults, as well as those living with dementia,” Boger says of her team’s prototype. Boger is exploring how body temperature and accelerometry data might be fused to design a more accurate way of detecting sleep for people of all ages, including older adults living with dementia.

Boger remains optimistic about technology’s ability to create solutions: “There’s no one-size-fits-all solution.” Indeed, Ontario’s engineers are at the forefront of designing customized technologies within human factors engineering. [e](#)

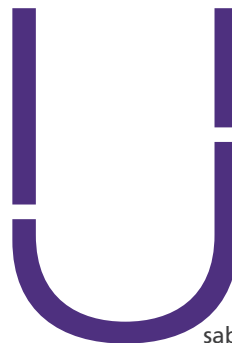


How human factors
engineering
DRIVES
automotive design

BY MARIKA BIGONGIARI



The field of human factors weaves together the worlds of engineering and behavioural science to apply the knowledge of human capabilities and limitations to the design of technologies. Instead of optimizing technology for a specific environment, human factors engineers are interested in optimizing it for people. That subtle difference in perspective can drastically change how an engineer looks at design—and that's especially true in the automotive industry, which is hyper focused on safety.



sability, universal design, ergonomics, cognitive ergonomics and biomechanics—these terms are all synonymous with human factors engineering in automotive design. “It affects the design of sight lines, safety devices and interior dimensions across highly varied driving populations, information displays, control inputs, navigation systems, entertainment systems and interaction with established and emerging automation functions and much more—and those examples are mostly inside the vehicle shell,” says Greg Jamieson, PhD, P.Eng. Beyond that, human factors engineers also contribute to the design of roadways, intersections, signage, signalling devices and the forensic analysis of accidents. Jamieson is a University of Toronto (U of T) professor of industrial engineering and Clarice Chalmers chair of engineering design whose research is in the area of human factors engineering. “Human factors blends natural and behavioural sciences,” Jamieson explains. “In my experience, the engineering perspective is particularly valuable in problem definition and problem-solving techniques that are less emphasized in the behavioural sciences. At the same time, the behavioural sciences lend strengths in knowledge elicitation, evaluation and inferential statistics. So, it’s a truly interdisciplinary field.”

From an automotive perspective, a human factors engineering design decision can be as simple as defining the colour of an icon so it captures someone’s attention, helping the user find and push the button more quickly, or it can be something as complex as trying to understand how a human interacts with automation within their environment. “A good example would be a vehicle that has adaptive cruise control that controls speed automatically, and seeing somebody’s behaviour when they use that system and how it impacts other vehicles,” offers Josh Domeyer, a member of the human-technology integration team at the Collaborative Safety Research Center (CSRC) of Toyota Motor North America Research & Development (TMNA R&D) based in Ann Arbor, Michigan. In discussing human factors, Domeyer makes a further distinction between cognitive capabilities and physical capabilities: “That distinction becomes blurrier once you start designing a product because a human factors engineer is concerned with both of those things,” Domeyer explains. “The physical accommodation for a person, like seating, and the more cognitive aspects, like how you might design an in-vehicle system, like an infotainment system that’s in the centre of the car, or how you might design the gauge clusters to either capture attention or not, or how you might design a head-up display to capture attention or not—all of these require recommendations from a human factors perspective.”

John Lenneman, PhD, works alongside Domeyer in the automotive human factors engineering trenches for the CSRC at TMNA R&D. Lenneman is responsible for the execution of research and develop-

Human Factors and Applied Statistics Lab research associate Nazli Kaya conducts an eye-tracking test to study driver attention failure when turning at an intersection at the University of Toronto. The study found more than half of participants failed to make the necessary scans for pedestrians or cyclists at busy Toronto intersections. Photo: Laura Pedersen



ment projects in human-technology integration and has over a decade of experience conducting automotive human factors research. “For automotive, what we’re really looking at is creating systems or integrating human factors knowledge, so we create safe, efficient and satisfactory use and/or interaction with our system. What’s unique about automotive is the dual task environment,” Lenneman explains. “People are trying to drive, and we want them to drive and be as safe as possible, and we’ll integrate human factors findings so that people can drive as safely and as efficiently as possible. But there are all these other things people want to do.” Lenneman describes the complex environment in which drivers may want to engage with a myriad of things while driving the vehicle—operating the radio, for example. Human factors engineers need to design systems that consider interaction with a secondary device while driving and allow the user to be as efficient as possible. The variability of end users is also a factor. “That reflects the important thing in human factors, which is that, first and foremost, we understand variability in humans,” Domeyer says. “It’s not something that you typically get training in in engineering, but you get training in a behavioural science like psychology.” Lenneman chimes in: “Not everybody drives, but a large portion of people do. So, you have a lot of variability in the cognitive capabilities, the perceptual capabilities, behaviours, and even the fit and size of people, the strength of people and the mobility of people as they get into cars. So, we’re always trying to understand that variability and then create systems that account for it to maximize safety, efficiency and satisfaction in system interaction.”

A UNIQUELY COLLABORATIVE FIELD

With variability in mind, Jamieson emphasizes that the distillation of knowledge is essential to defining engineering problems and recognizing opportunities, and this important consideration is especially critical for the automotive industry. With every product, process, system, service and

built environment depending on the effective interaction between people and technologies, this uniquely collaborative field is becoming an increasingly important area of research and application. “Human factors engineers can work across the technology life cycle, and knowledge elicitation is essential in defining problems and recognizing opportunities,” Jamieson observes. “Rapid prototyping accelerates conceptual design; application of design principles and standards promotes detailed design; and testing and evaluation methods ensure that the resulting technologies work for the people who will use them in practice.” Jamieson stresses the importance of the ability of human factors engineers to work with other design areas; a key learning objective for human factors engineering courses is teaching young engineers how to contribute these skills in an interdisciplinary design team.

It’s not uncommon for human factors engineers to be armed with multiple graduate degrees spanning both engineering and psychology. But with the field growing in popularity, engineering schools are integrating more human factors content at the undergraduate level—and the automotive industry has taken notice. Birsen Donmez, PhD, P.Eng., points out that the U of T requires all industrial engineering undergraduate students to take human factors engineering core courses, and other engineering disciplines are introduced to human factors through the first-year engineering strategies and practice course. Beyond that, if a student wishes to learn more, the university offers electives in mechanical and industrial engineering—and graduate mechanical and industrial engineering students have the opportunity to become fully immersed in human factors if they choose. “The University of Toronto has a first-year course that all engineering students take, and the human factors engineering perspective is introduced in this course through a series of lectures, so it’s not just industrial engineering students—chemical engineering students get an overview, mechanical engineering students get an overview, etc.—and that’s important,” Donmez says. “Even if they’re not going to be working as human factors engineers, they should be aware that they are designing for humans.” Donmez is an associate professor in the department of mechanical and industrial engineering at U of T. She is also the Canada research chair in human factors and transportation and the director of U of T’s Human Factors and Applied Statistics Lab (HFASt), which partnered with the CSRC at TMNA R&D, which works with universities and research hospitals to conduct research and promote ideas to improve safety throughout the industry. “The aim of human factors is to leverage the capabilities of humans and compensate for their limitations—this is how I introduce human factors to the undergrads,” Donmez explains. “After four years of

[mechanical engineering] education, it was a big shift in perspective when I first heard of human factors. I thought the job of a mechanical engineer was about working with machines: I wasn't given the perspective that what I was designing was supposed to be serving humans at some point. I think the University of Toronto is doing a great job in that sense. Even if all these engineering students aren't learning the specifics of human factors engineering, they are at least introduced to it, so they understand the value."

The HFASt lab conducts research on understanding and improving human behaviour and performance in multi-task and otherwise complex situations and employs a wide range of analytical techniques, with application areas that include surface transportation, health care, mining and unmanned vehicle supervisory control. The CSRC-sponsored HFASt research is aimed at providing guidelines for the design of effective feedback mechanisms to help drivers improve their behind-the-wheel habits by understanding the driver, the feedback and their interaction. In collaboration with Toyota Canada, CSRC provided the lab with a vehicle that the research team outfitted with sensors to collect the requisite data. "Our lab has expertise in driver distraction and driver attention, and how that can be managed to ensure safe operations of the vehicle," Donmez says. Manufacturers are placing increasing value on research partnerships like this, with academic researchers providing valuable information with potential real-life application.

THE ENGINEER IN HUMAN FACTORS

Although human factors engineering demands knowledge of applied psychology and a clear understanding of human cognition, decision making and perception, Donmez stresses the importance of also knowing the engineering language because the human factors engineer must be able to effectively communicate with the rest of the engineering team. "If you come in without an understanding of the technology and its limitations, you won't be able to effectively state what the human user might need and what is feasible from a technology perspective to address those needs," Donmez explains. "Knowing the engineering language and having domain expertise is going to make integration more effective." Subject matter experts agree that this is key, and Domeyer echoes Donmez's sentiment: "A lot of it relies on relationships with design groups within the company, so if you can establish early on some of the things that are needed in terms of human factors and you have good relationships with these groups, it's easier to implement recommendations." Lenneman agrees, further stressing that the success of any human engineering initiative depends on effective liaising with other key design groups. "That's really important," Lenneman says. "It's

incumbent on us to identify the gaps and research needs that design engineers might have or end users might be trying to communicate. One thing to remember is people can't always communicate what it is they're having trouble with. What we try to do is identify the problems people are having and come up with recommendations, guidelines and eventually engineering requirements, so a system can be built that addresses those problems. One thing that helps, and this is part of my daily work, is to create relationships with the product developers and illustrating to them the value in the work that we do. One of the challenges we face is that it's hard for people to envision a finding about human behaviour, cognition, perception, etc., and see how it can be utilized or integrated into an engineering specification."



Birsen Donmez, PhD, P.Eng., looks on as a University of Toronto engineering student runs a driving simulator experiment at the Human Factors and Applied Statistics Lab. Photo: Laura Pedersen

From a product engineering perspective, it's often challenging to get human factors ideas into products, but one of the ways they do it is through developing criteria. "Some of the research we do right now can inform some basic criteria that something needs to meet in order to make it into a product," Domeyer explains. "A good example is something like the reach distance from a seated position to the touchscreen in the centre console or the height of the back door so you can sit underneath it. A lot of times what human factors will do is come up with ranges of acceptable criteria. So, there might be a range that's too far from a touchscreen or that might be too low for a back door, and you might define different ranges depending on the design intent of the vehicle—if it's meant to be sporty, for example." Human factors engineers take an approach to system development in which they want to ensure that the user understands how a system operates, and safety is paramount. Domeyer, who serves on the Society of Automobile Engineers' Safety and Human Factors Steering Committee and the International Standards Organization Man-Machine Interface Working Group—which develops standards related to these topics—is working towards



An advanced active safety research test vehicle collects data for the Toyota Research Institute, North America, in Saline, Michigan.

translating the advanced research his team is producing into standards that other auto makers can use or that the industry and research community as a whole can look at to see what questions they need to be answering in the near future. "The goal of all of this is to improve safety across the industry, but it takes a bunch of little steps like these," he explains. And if engineers don't consider the human when considering new technologies, they might go unused and their safety benefits not realized.

AN AUTONOMOUS FUTURE

Integrating advanced technology such as that associated with autonomous vehicles is an emerging issue for human factors engineers in the contemporary automotive space. All products meant to have an end user, and which involve an interaction that affects them in some way, require that the human be considered when designing new technology. "If you don't, you could omit things that are fairly important for safety and efficiency," Donmez observes. Even highly automated systems are controlled at some point by humans or maintained by humans, and design engineers must ensure that human operators can interact with them in a safe, efficient, user-friendly manner, as well as be satisfied by their interactions. Donmez shares that the HFAST lab at U of T is shifting more towards looking at how automated vehicle technologies affect humans: "As you remove vehicle control from the driver but require them to monitor the driving environment, how we design these interactions is important," she emphasizes. Attention must turn to the driver's changing focus, determining how to support drivers and enabling them to monitor these technologies and step in and take action if the technology fails. "One critical question is how to design for transfer of control between the human driver and the machine driver," Jamieson explains. "These two agents have vastly different capabilities and limitations that are not easily matched to the unpredictable driving environment.

But it is highly likely that we will experience decades of hybrid vehicle control before we experience fully autonomous passenger vehicle transport, so the transfer-of-control problem will continue to be a significant challenge for the industry that human factors engineers will play a central role in addressing."

The CSRC has its sights set on automation and the future, and Domeyer says that he's often dealing with topics that are five to 10 years out and thinking about the next suite of problems that might arise in the industry. Much of that is currently focused on training and user understanding of automated technologies. "I have a series of projects related to vehicle-other road user interactions. This is the idea that when you have an automated vehicle in the future, it will need to learn how to interact with pedestrians and other road users," Domeyer says. "A lot of the approach I take on this is trying to understand how current interactions on the road are really a social interaction and trying to understand how we can design future robots to interact in that social way." One way to think about it is that if you have a technology that automates a car, somebody at the system level might be asking, "How do I get the car to stay in the lane a little bit better?" whereas we might come at it with the perspective of, "What is the human problem that we're solving here? What do we need to allow the person to do? How are we improving this person's commute?" The CSRC collaborates with universities like U of T on projects in which they're looking at what Lenneman calls "mental models"—which he defines as one's understanding of how a system works—and they're applying it to the concept of autonomous vehicles. "What we're trying to do is understand or learn about how people develop their understanding of Advanced Driver Assistance Systems technologies, or future automated driving system-based technologies. So, how people learn about those and how their understanding of their mental models evolves over time," he explains. What they learn from this research, they can feed back into their design process, including how people mitigate risk; how they might slow down, for example, increase their distance between vehicles or speed up if it helps mitigate risk, as people drive through different scenarios of varying levels of complexity. "And if we understand natural human behaviour, the idea is that we can take what we've learned, turn those into engineering requirements that we can then hopefully feed into future algorithms or automated driving systems," Lenneman says. "I sometimes say that our work is just as much an art as it is a science. It's a very creative field, a lot more creative than people would think. It's very interesting, cool problem solving." **e**

P.ENGs, ENGINEERING FIRMS AND STUDENTS HONOURED WITH AWARDS

By Marika Bigongiari



Cristina Amon, ScD, P.Eng., dean emerita and alumni professor in bioengineering at the University of Toronto's (U of T) faculty of applied science and engineering, has been named one of the Top 100 Most Powerful Women in Canada by the Women's Executive Network (WXN). WXN's annual list is a recognition of Canada's highest achieving women leaders across the public, private and not-for-profit sectors. Amon, who is U of T's first woman dean of the faculty of applied science and engineering, was recognized for her championing of equity, diversity and inclusion and her transformative leadership at the university, which has seen its number of female engineering students, faculty members and Canada research chairs surge during her tenure. This year's cohort of engineering students is 42 per cent women, up from 20 per cent in 2006, and is the highest percentage in Canada.

Laurent Gerin, EIT, a University of Waterloo engineering graduate student, won first place for a paper he presented at the 2019 International Aluminum Conference in Tokyo, Japan. Gerin, who is working on his master's degree in civil engineering, focuses his research on the use of aluminum in bridges and buildings.

The 2019 Canadian Consulting Engineering Awards were handed out at a gala in Ottawa, Ontario, where projects around the globe designed by Canadian engineering firms were honoured for exemplifying the highest standard of engineering excellence. The awards, which honour outstanding achievements in the consulting engineering industry, are presented jointly by the Association of Consulting Engineering Companies-Canada and *Canadian Consulting Engineer Magazine*. In addition to giving out awards for categories ranging from buildings and transportation to the environment and wastewater treatment, the event recognizes special individual and team achievements and includes a lifetime achievement award. **WSP** was honoured with three awards for its Solving Small Community Drinking Water Challenges project: an Award of Excellence, along with the Schreyer Award, for its demonstration of technical merit and innovation, and the Outreach Award, which is given for the donation of time and/or services to benefit a community or group. **WSP** also received an Award of Excellence for its Shedding UV Light on Greater Vernon's Water System project at the Duteau Creek Water Treatment Plant in Vernon, British Columbia, and was presented with an Award of Excellence for its Johnson Street Bridge Replacement project in Victoria, BC. **Goldier** won an Award of Excellence for its Bridging the Hydrometric Gap project in Lake Huron, a comprehensive hydro-thermodynamic modelling platform to monitor thermal and hydrodynamic impacts on the lake associated with Bruce Power plant operations. **Hatch** was honoured with an Award of Excellence for its Oxec II Hydroelectric project, a 56-megawatt greenfield installation located on the Cahabón River in north central Guatemala. **Quasar Consulting Group Inc.** won an Award of Excellence in partnership with Stephenson Engineering, WZMH Architects and C3PoE for their winning project, Intelligent Structural Panel (ISP). ISP is a modular, energy-efficient prefabricated smart building component that is installed onsite with minimal labour. **COWI** was honoured with both an Ambassador Award and Award of Excellence for its Governor Mario M. Cuomo Bridge. The bridge, which is located in South Nyack to Tarrytown, New York, is a 5-kilometre-long Hudson River crossing north of Manhattan. It is one of the largest design-build projects in the United States and the largest bridge-construction project in New York state's history. **Morrison Hershfield** received an Award of Excellence for its Cloudraker Skybridge and Raven's Eye project in Whistler, BC. The steel suspension bridge is 130 metres long and leads to a 12.5-metre cantilevered viewing platform. It sits over 2100 metres above sea level and is considered the highest pedestrian structure in North America. The firm was also honoured with both



University of Toronto Dean Emerita Cristina Amon, ScD, P.Eng., was named one of the Top 100 Most Powerful Women in Canada by the Women's Executive Network.

DIALOG was honoured with an Award of Excellence at the Canadian Consulting Engineering Awards for its Royal Alberta Museum project in Edmonton, Alberta, designed in partnership with Ledcor and Lundholm Associates.

Entuitive was honoured with an Award of Excellence at the Canadian Consulting Engineering Awards and also received the Engineering a Better Canada Award for its New Central Library project in Calgary, Alberta.

AWARDS



COWI was honoured with both an Ambassador Award and Award of Excellence at the Canadian Consulting Engineering Awards for its Governor Mario M. Cuomo Bridge in New York state.

Morrison Hershfield received an Award of Excellence at the Canadian Consulting Engineering Awards for its Cloudraker Skybridge and Raven's Eye project in Whistler, British Columbia.

WSP was presented with an Award of Excellence at the Canadian Consulting Engineering Awards for its Johnson Street Bridge Replacement project in Victoria, British Columbia.

the Tree of Life Award and an Award of Excellence for its Kaliti Wastewater Treatment Plant and Sanitary Sewer Trunk Mains in Addis Ababa, Ethiopia. **Associated Engineering** received an Award of Excellence for its Livestock and Forage Centre of Excellence project in Blucher, Saskatchewan. The firm also received an Award of Excellence for its Calgary Zoo Flood Mitigation project in Calgary, Alberta, a joint project with ISL Engineering and Land Services Ltd. **DIALOG** was recognized with an Award of Excellence for its Mechanized River Valley Access project, which links the City of Edmonton to the North Saskatchewan River Valley. The firm was also honoured with an Award of Excellence for its Royal Alberta Museum project in Edmonton, AB, designed in partnership with Ledcor and Lundholm Associates as part of an international design competition. **Entuitive** was honoured with an Award of Excellence for showcasing how engineering enhances the social, economic or cultural quality of life for Canadians and received the Engineering a Better Canada Award for its New Central Library project in Calgary, AB. **Stantec** won an Award of Excellence for evolve1, a Waterloo, ON, office building targeting net-positive energy, net zero carbon and LEED Platinum status. **SNC-Lavalin Inc.** won an Award of Excellence with **Bouthillette Parizeau** for their joint project, the Transformation of the Wilder Building, and won an additional Award of Excellence along with **Norda Stelo** for their joint project, Construction of the new 112 highway (Black Lake) from Saint-Joseph-de-Coleraine to Thetford Mines (Black Lake sector) in Quebec. The result is a safe and sustainable roadway. **BBA** won Awards of Excellence for both its CO2 Capture and Valorization project in Saint-Félicien, QC, and its Old Crow Solar project in the community of Old Crow, Yukon, home of the Vuntut Gwitchin First Nation, located 800 kilometres north of the territorial capital, Whitehorse. In another joint project, **CIMA+** and **Tetra Tech** won an Award of Excellence for their Place des Canotiers project, a public square on a heritage site of Old Quebec on the banks of the St. Lawrence River.

The Canada's Safest Employers awards were announced, with several engineering firms of note receiving honours, including **Plan Group**, which took a silver award in the building and construction category; **Cementation Canada**, which took gold; and **Ausenco** and **Klohn Crippen Berger**, which each took silver in the mining and natural resources category; **Ontario Clean Water Agency**, which took gold in the public sector/non-profit category; **Waterloo North Hydro**, which took both gold in the psychological safety category and silver in the utilities and electrical category; and **GSK**, which took silver in the wellness category. The awards span 10 industry-specific categories and include three special awards. Employers are judged on a wide range of occupational health and safety elements.

U of T engineering graduates were recognized at the annual Engineering Alumni Network Awards in a ceremony held at the Myhal Centre for Engineering Innovation and Entrepreneurship. The grads were honoured for their contributions to the school's community and their outstanding career achievements. This year's recipients include **Levente L. Diosady**,



Hatch was honoured with an Award of Excellence at the Canadian Consulting Engineering Awards for its Oxec II Hydroelectric project, located on the Cahabón River in north central Guatemala.

DIALOG was recognized with an Award of Excellence at the Canadian Consulting Engineering Awards for its Mechanized River Valley Access project, which links the City of Edmonton to the North Saskatchewan River Valley.

WSP was honoured with an Award of Excellence, the Schreyer Award and the Outreach Award at the Canadian Consulting Engineering Awards for its Solving Small Community Drinking Water Challenges project.

WSP received an Award of Excellence at the Canadian Consulting Engineering Awards for its Shedding UV Light on Greater Vernon's Water System project in British Columbia.

PhD, P.Eng., FEC, who took home the Engineering Alumni Medal; Deborah Goodings, PhD, P.Eng., John A. Macdonald, P.Eng., Robert C. Simmonds, P.Eng., and Jeanette Southwood, PhD, P.Eng., FEC, who each received the Engineering Alumni Hall of Distinction Award; Holly Johnson, P.Eng., who received the 7T6 Early Career Award; and Robert Bazzocchi, EIT, who was awarded the L.E. (Ted) Jones Award of Distinction.

U of T also handed out its prestigious 2019 Arbor Awards in recognition of the outstanding contributions of volunteers who include Nadine Ibrahim, PhD, EIT, Andreas Marouchos, P.Eng., and Loui Pappas, P.Eng. U of T's Engineering Alumni Awards Committee was also recognized with an award for its members, including Diana Facchini, P.Eng., Tahir Janmohamed, P.Eng., Eric Matusiak, P.Eng., Rick Ross, P.Eng., John Voss, P.Eng., John Walker, P.Eng., Nicholas Walker, P.Eng., and Barry Westhead, P.Eng., FEC. The Arbor Award is the highest honour granted by the university.

STUDENT AWARDS

Three Ontario student engineering projects have been recognized with James Dyson Awards. Mechanical and industrial engineering graduate student **Charlie Katrycz** led the U of T team behind Undu: Wearable Men-

strual Pain Mitigation, which was named a National Winner. Undu is a wearable heat pack designed to relieve menstrual pain. And the student team behind interpretAR, a mobile application that aims to improve quality of life for those who rely on sign language to communicate, was named National Runner Up. The interpretAR team is made up of McMaster University electrical and biomedical engineering graduates **Brandon Rufino**, **Justin Chau**, **Arvin Angue** and **Milos Bijelic**. U of T mechanical engineering graduate **Nikola Kostic's** Aeroflux Contactless Brake design was named part of the International Top 20. The James Dyson Award is an international design award that celebrates, encourages and inspires the next generation of design engineers.

CALL FOR SUBMISSIONS

Engineers Canada offers two scholarships with approaching deadlines. The Engineers Canada-Manulife scholarship program offers three scholarships of \$12,500 each annually to provide financial assistance to engineers returning to university for further study or research in an engineering field. The Engineers Canada-TD Insurance Meloche Monnex scholarship program offers three scholarships of \$7,500 each annually to provide financial assistance to engineers returning to university for further study or research in a field other than engineering. To be eligible for the scholarship program, candidates must be registered as a licensed engineer with one of the 12 regulators throughout the duration of their academic year. The application deadline is March 1 for both scholarships. Visit engineerscanada.ca for more details. [e](#)

TWO ONTARIO ENGINEERS HAVE A VOICE IN FEDERAL GOVERNMENT

By Howard Brown

Two Ontario engineers who sat in the last Canadian parliament have been re-elected—and they both have a lot to say to their 80,000 fellow engineers in the province.

Marilyn Gladu, P.Eng., was first elected as the member of parliament (MP) for Sarnia-Lambton in 2015 as a Conservative Party member. She served as the official opposition science critic and chair for the status of women and is currently the shadow minister of health and vice chair on the Standing Committee on Health. Gladu has been involved with PEO for many years: She had lunch with engineering students in the parliamentary dining room in October 2016 during a PEO Student Conference in Ottawa, and she also took part in an interview for *Engineering Dimensions* after her 2015 election (See “Ontario engineers find their place in the House of Commons,” January/February 2016, p. 33).

Omar Alghabra, P.Eng., was first elected in 2006 from the riding of Mississauga-Erindale and has served as the MP for Mississauga Centre for the Liberal Party since 2015. He also serves as the parliamentary secretary to the prime minister (public service renewal) and to the deputy prime minister and minister of governmental affairs and previously served as the parliamentary secretary to the minister of foreign affairs. Alghabra has stayed connected to his engineering profession through various events over the years, including a conference he attended in March 2015 called “Engineers want in” as a visiting fellow with the faculty of engineering and architectural science at Ryerson University.

Engineering Dimensions interviewed Gladu and Alghabra in the weeks following the recent federal election to get their insights on how they bring engineering to the government table.

Engineering Dimensions (ED): What do elected engineers in public office bring to the public policy discussion that others don’t necessarily bring?

Gladu: “There is a lack of critical mass of engineers. We need more engineers in government because of the critical thinking of engineers to design efficient work processes and to cut out waste in processes—that just doesn’t exist as a culture in today’s government.”

Alghabra: “The mindset of always looking for solutions gives the engineer a unique perspective that perhaps non-engineers do not have.”



Marilyn Gladu, P.Eng. (left), MP for Sarnia-Lambton, and Omar Alghabra, P.Eng., MP for Mississauga Centre

ED: Has the need for engineers in public life increased? If yes, why? If no, why not?

Gladu: “The need for engineers has increased because problems are becoming more complicated to solve. And we need more fact- and evidence-based decision making.”

Alghabra: “The need for engineers in public service has increased. We need to have engineers as part of the conversation. Today’s modern challenges create opportunities for engineers, and frankly, the lack of engineers participating in discussions leaves a big vacuum, a big gap, and it’s a missed opportunity.”

ED: Why do you think it is important for Engineers Canada and PEO and other regulators to maintain and grow their relationships with elected officials as opposed to just working with the bureaucrats?

Gladu: “If you want public attention, you need to use politicians. We are the ones who have the media’s ear, can get you on the front page, can bring up your topic in the House of Commons, can send it out in mass mailout. That’s what politicians do. We amplify your message.”

Alghabra: “I think it is a common practice for public servants to always get involved with stakeholders and listen to their feedback and insight because they have expertise and knowledge—first-hand knowledge that the civil servants may not know.”

ED: If you had one message for your fellow Ontario engineers and for PEO as a regulator in the public interest, what would it be?

Gladu: “The short answer is that people who are in PEO and who are in engineering organizations, they need to vote—an informed vote—and they need to get involved as candidates, and they need to enter parliament and be prepared to take on the life of a politician.”

Alghabra: “My message to the membership and engineers in general is that we as engineers are trained [that there is only] one right answer, and we put our faith in people to get that correct answer. However, in public life there is no ‘one right answer.’ It is important that engineers realize that their absence from the public debate creates a disadvantage for our society, and it is equally a disadvantage for the profession.”

Clearly, these two MPs believe it is important for PEO and all licensees to get involved and contribute to the conversation. [e](#)

Howard Brown is the president of Brown & Cohen Communications & Public Affairs Inc. and PEO’s government relations consultant.

COUNCIL APPROVES ACTIVITY FILTER TO ASSESS PEO'S CHAPTERS, COMMITTEES AND TASK FORCES

By Nicole Axworthy

530TH MEETING, NOVEMBER 14–15, 2019

At its November meeting, Council unanimously approved a new activity filter to categorize the activities and outputs of all PEO committees, chapters, subcommittees and working groups. The activity filter was developed by PEO's general counsel, with input from the senior management team, as part of the high-level action plan that was approved by Council at its September meeting (see "Council approves action plan to implement recommendations of external review," *Engineering Dimensions*, November/December 2019, p. 50). The action plan aims to address the 15 recommendations from the final report of PEO's external regulatory performance review, which was completed in April 2019, and pointed to PEO's need to professionalize and modernize its regulatory processes. The activity filter is intended to provide a consistent and objective mechanism to determine and categorize PEO activities and their associated outputs in three categories: regulatory (activities related to the regulation of engineering and its practice), governance (activities that ensure PEO Council is fulfilling its statutory, legal and fiduciary duties while directing PEO), or neither (other association functions that do not relate to regulation or governance). The results of this categorization activity will be presented to Council at its February 2020 meeting. The next phase will be to assess and decide how best to perform the various activities in each category to deliver the required outputs.

2020 OPERATING AND CAPITAL BUDGETS APPROVED

Council approved the draft 2020 operating and capital budgets, as recommended by the Finance Committee. In preparing the operating budget, a decision was made to create a budget that incorporates the same cuts that were approved by Council for the 2019 budget (see "Council approves major cuts to draft 2019 operating budget," *Engineering Dimensions*, January/February 2019, p. 50) until each activity has been passed through the newly approved activity filter (see above). The 2020 budgeted revenue is expected to be \$31.4 million and total expenses are budgeted at \$28.8 million, resulting in an excess of revenue over expenses of \$2.6 million.

The \$31.4 million revenue represents an increase of \$3.3 million, or 12 per cent, over the 2019 forecasted revenue. This is largely due to the

increase in membership, application and other fees that came into effect on May 1, 2019, and is comprised of:

- An increase of \$2 million (11.2 per cent) in P.Eng. revenue;
- An increase of \$939,000 (11.7 per cent) in application, registration, exam and other revenues; and
- An increase of \$376,000 (18.4 per cent) in revenue from PEO headquarters due to the expected leasing of vacant space on the fourth, fifth and eighth floors of the building in 2020.

The \$28.8 million budgeted expenses for core operations represent an increase of \$2.1 million, or 8 per cent, over 2019 forecasted expenses. This is largely due to:

- An increase in employee salaries and benefits and retiree and staff future benefits of \$1.2 million over the 2019 forecast due to a 3.5 per cent increase in staff salaries for merit increases, consumer price index adjustments and pension top-up contributions;
- An increase of \$513,000 for additional contract staff across various departments in 2020;
- An increase of \$170,000 in purchased services, largely due to higher costs for event meals and related expenses for the annual general meeting, Order of Honour gala and Volunteer Leadership Conference, which will be held in Ottawa in 2020; videos for the Ontario Professional Engineers Awards; and higher costs for scanning licensing records, etc.;
- An increase of \$128,000 in legal expenses, largely due to higher costs for various legal matters and discipline prosecution;
- An increase of \$120,000 in volunteer business expenses due to higher costs for meals, mileage, accommodation and travel related expenses for attending various events, committee meetings and conferences; and
- An increase in costs for computers and telephone of \$112,000 due to higher expenses for support contracts for various information technology (IT) infrastructure services and for leasing IT equipment.

The above expenses are partially offset by:

- A reduction of \$435,000 in PEO headquarters expenses in 2020 due to a one-time write-off of tenant inducements and leasing commissions in 2019 because of a tenant terminating a lease; and
- A reduction of \$77,000 in amortization, largely due to fewer capital projects in 2020 and the full amortization of some old equipment.

The 2020 capital budget is \$841,000, which comprises capital improvements to PEO headquarters (\$771,000), IT (\$50,000) and facilities (\$20,000). Capital improvements planned for PEO headquarters include \$570,000 for leasehold improvements (renovation incentives for potential tenants for vacant space on the fourth, fifth and eighth floors of the building) and \$201,000 for capital improvements that are part of the common area maintenance costs, which are recoverable by tenants and include \$66,000 to replace defective exterior windows, \$33,000 for fire system updates and repairs, \$30,000 for

a structure study of the main building roof, and \$22,000 for a heat pump replacement. The \$50,000 IT budget will go towards upgrading PEO's web portal. And the \$20,000 facilities expenditures are for replacing old office furniture.

BORROWING RESOLUTION

Council carried a motion to renew PEO's borrowing resolution policy, which includes an operating line of credit and corporate credit cards with Scotia-bank, until January 31, 2021. Council approved an operating overdraft for an amount not to exceed \$250,000 and use of corporate credit cards with an aggregate limit not to exceed \$120,000. Council was assured that PEO has adequate cash flow to meet its business requirements and that the overdraft is for contingency purposes only. Corporate credit cards provide convenience to senior volunteers and staff for PEO business expenditures. The credit card balances are paid off every month.

IMPLEMENTATION OF CORONER'S INQUEST RECOMMENDATIONS

At its November meeting, Council considered two of the 21 recommendations directed at PEO from the coroner's inquest into the death of Radiohead drum technician Scott Johnson (see "Radiohead coroner's inquest recommendations considered by PEO Council," p. 8). The first recommendation involved creating a specialist designation for professional engineers who design and inspect demountable event structures. However, at the Council meeting, Council approved the recommendation from PEO's policy staff and Professional Standards Committee to not proceed with creating the specialist designation—which they believed would create a two-tier system, among other issues. Instead, it was recommended that Council approve a new practice guideline describing best practices for engineering work on demountable structures (see below) and which was informed by, and reflects lessons learned from, the recommendations of the coroner's inquest.

The second recommendation was for PEO to implement mandatory annual reporting by all licensed engineering practitioners of practice information, such as their current practice status and area of engineering practice so that PEO is aware of and kept updated on the engineering areas in which practitioners work. At the Council meeting, Council approved this recommendation and directed the registrar to seek amendments to the *Professional Engineers Act* and take other necessary actions to implement this new process.

PRACTICE GUIDELINES APPROVED

Council approved publication of the practice guidelines *Design Evaluation and Field Review of Demountable Event and Related Structures* and *Preparing As-Built and Record Documents* and stood down the Professional Standards Committee subcommittees that prepared them. The purpose of the demountable structures guideline is to define best practices for engineers who do structural designs, design evaluations or general review for demountable event and related structures. The purpose of the record documents guideline is to offer practitioners guidance on the professionally acceptable way of preparing record drawings or documents. Both guidelines will be available on PEO's website at peo.on.ca/knowledge-centre/practice-advice-resources-and-guidelines/practice-guidelines.

FEE CHANGES

At its November meeting, Council carried a motion to discontinue the fee remission policy for engineering interns (EITs), which had been in effect since April 2009. The fee remission policy reduces an EIT member's annual fee from \$90 plus HST to \$25 plus HST. Because only 37 EITs out of almost 15,000 EITs currently request and receive fee remission, the Finance Committee recommended that the fee remission as it applies to EITs be discontinued due to low volume and for being an exception for a voluntary program, resulting in additional administration.

CHANGE TO OPEA NOMINATION PROCEDURES

Council approved the Awards Committee recommendation that for all individual Ontario Professional Engineers Awards (OPEA) categories, a nominee only requires one P.Eng. nominator along with letters of support from at least two other P.Engs. Previously, five nominators were required for all OPEA nominations. The Awards Committee recommended this change to improve and streamline the nomination process, broaden the nomination pool of deserving candidates and reduce the effort required by the nominators to prepare a nomination package. This applies to all OPEA categories except the Award for Engineering Project or Achievement.

For the Council meeting's full agenda, minutes and disposition of motions, visit the Council section of PEO's website at peo.on.ca/about-peo/council/agenda-minutes-and-audio. **e**



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Deadline for March/April is January 23, 2020. Deadline for May/June is March 25, 2020.

Engineering must be clearly defined

David Bailey, LEL,
Toronto, ON

It is disappointing that the PEO president cannot correctly quote the *Professional Engineers Act* (PEA). In the September/October 2019 issue, Nancy Hill writes about “becoming inclusive of all aspects of engineering” as defined in the act (p. 6). It is true that the PEA once stated 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.*”

The last phrase about protecting natural scientists was, however, removed in 2010 over objections by natural scientists and despite a tentative agreement* between PEO and the Canadian Association of Physicists, Association of the Chemical Profession of Ontario, Canadian Astronomical Society, Canadian Meteorological and Oceanographic Society, Canadian Organization of Medical Physicists, Canadian Society for Chemistry and the Chemical Institute of Canada. PEO then said it would permanently post on its website an explicit (but probably not legally binding) statement that it had no jurisdiction over the practice of natural science.** This statement has, however, long since disappeared. (At least I can't find it.)

Of course, the natural scientist clause was only needed in the first place because of the abysmal failure of the act to clearly define “engineering.” “Engineering principles” are nowhere specified, so the definition is circular at best. The act seems to allow PEO to require all medical doctors be licensed biomedical engineers, all restauranteurs be licensed food engineers and all farmers be licensed agricultural engineers. Aren't all of them applying “engineering principles” that concern “health, property or the public welfare”? I doubt such inadequate specification would be tolerated in any professional engineering document, so why is it accepted in the *Professional Engineers Act*? “I can't define it, but I know it when I see it” is never a legal principle that inspires confidence. I am not comfortable with PEO Council working to include “all aspects of engineering” when there is so little constraint in the PEA on what PEO can claim to be an engineering discipline.

* www.cap.ca/publications/cap-news/natural-science-societies-reach-tentative-agreement-peo-regarding-exemption

** www.cap.ca/publications/cap-news/professional-engineers-of-ontario-clarifies

PEO and self-regulation

Christopher Morris, P.Eng.,
Ottawa, ON

I was wondering how much of last year's \$24,950,185 expenditures were directly related to self-regulation. Knowing that, PEO would have a solid foundation for any future discussions with the provincial government. Just for discipline and enforcement, I would guesstimate that PEO is spending less than \$2.5 million or about 10 per cent of overall expenditures. There is no doubt in my mind that if just those two self-regulation activities were handed over to the Ontario Government, they would be spending 10 times as much to protect the public interest. That, then, begs the question: “Why doesn't the Ontario Government provide PEO with some sort of financial support?”

Members should be afforded life member status

M. Gordon Farr, P.Eng.,
Oakville, ON


I agree with David Hogg, P.Eng., and think PEO should provide life member status to those who have a combined age and P.Eng. certification at whatever threshold PEO deems appropriate (“Longstanding members deserve life member status,” *Engineering Dimensions*, September/October 2019, p. 38). Why only those who have taken on the role of PEO president are allowed this benefit is beyond me, to be honest. I have been a PEO member in retired status for two to three years now but will be, for the first time, considering not renewing my membership when it comes due next year.

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