

**MEET ANIA ULRICH**

new associate dean of outreach

**NEW TOOL THAT TESTS**

if a pill can kill your ill

**BACTERIOPHAGE BUSTS BUGS**

a virus fights food poisoning

# UOFA ENGINEER

Keeping in Touch with Alumni Fall 2017

## New Paradigm

Sylvie Boulanger is bridging a new approach to infrastructure rehabilitation

To the holodeck!  
Save the world  
or die trying

Concussion-rated  
hockey helmets  
are almost here

**4** Engineers build  
centre ice  
and change  
Edmonton



# THE THREAD THAT CONNECTS US



What an incredible year it has been here in the Faculty of Engineering. New and returning students reported for classes on time at the beginning of September, we welcomed our alumni back to campus during our annual Alumni Weekend (please see page 36 for images) and, with this issue of *U of A Engineer*, we're enjoying the autumn and bracing for winter.

As passionate as we engineers are about math, our time is marked more by events than numbers. This year we've made incredible progress on a number of initiatives. In terms of how we connect with the general public and specifically with prospective students,

we've appointed civil engineering professor Ania Ulrich as our first associate dean (outreach). She is taking concrete steps to help our faculty and the engineering profession to reach out to under-represented groups—to find and encourage those creative, bright young minds who might not otherwise consider engineering to study and practise in our profession.

In terms of programming we took a major step forward in the development of the David and Joan Lynch School of Engineering Safety and Risk Management. Two years ago we announced the creation of a fundraising campaign to support safety and risk management education for our students. Generous alumni such as you and supporters in industry responded by contributing \$1 million. That milestone triggered a matching donation of an additional \$1 million from former dean of engineering David Lynch and his wife Joan, who continue to be incredible supporters of the Faculty of Engineering.

We are also moving forward with construction of new student spaces. This fall we are opening a new student maker-space that gives students mentored access to the mechanical engineering shops. And by the spring of 2018 we will open two large student design-and-build spaces. One is a flexible student design space in the Electrical and Computer Engineering Research Facility where student groups can work on design projects. The other is an engineering garage in the Engineering Teaching and Learning Complex. The garage space will be providing students with tools ranging from 3D printers to saws and lathes, to bring their designs to life.

And amidst all that, we're able to compile a magazine with stories about your achievements. You are still our concern—alumni and students are connected by our school. You still belong here. As you share these stories, remember that we welcome your ideas and advice.

**J. Fraser Forbes PhD, PEng**  
Dean of Engineering

## Dean of Engineering

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Edmonton, Alberta  
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engineering.ualberta.ca

Publications Mail Agreement No. 40051128

Return undelivered Canadian addresses to:

U of A Engineer  
9-201 Donadeo Innovation  
Centre for Engineering  
University of Alberta Edmonton,  
Alberta, Canada T6G 1H9



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## TO THE HOLODECK

Alumnus Nathaniel Rossol and his brother Alex want you to try to save the Earth from a killer asteroid. At least, that's what it will feel like.



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From the gulag to the iron ring



This September, we welcomed back grads from the 1940s through to the class of 2017 for Alumni Weekend. Check out the images on page 36.

# ENGG NEWS

## Ryan Li lets in the light

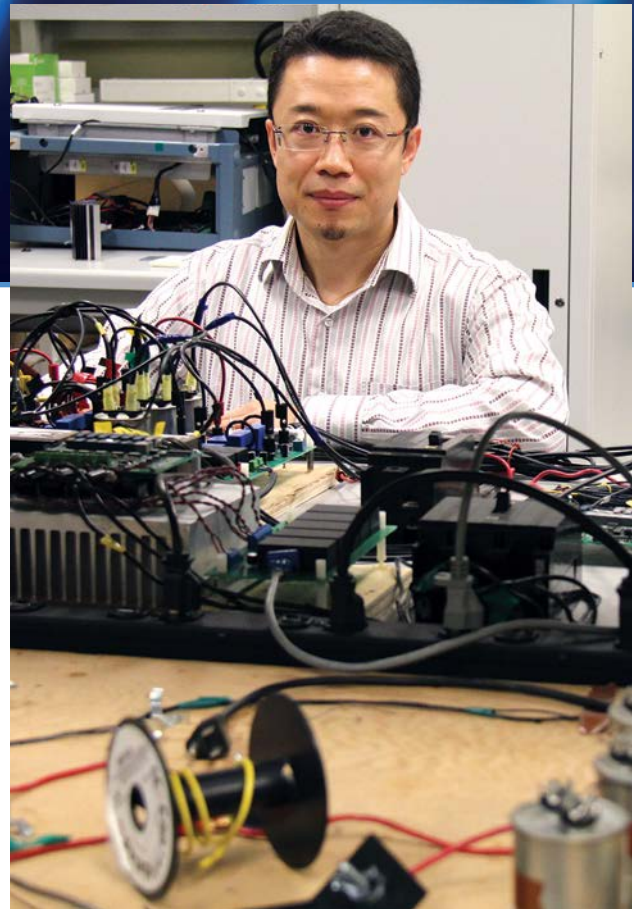
Faculty of Engineering researcher Ryan Yunwei Li, pictured right, scored a major win in October that will boost his team's work. The Canada Foundation for Innovation (CFI) gave Li an Infrastructure Fund award worth more than \$2.5 million. Li, an electrical and computer engineering professor, is expert in integration of renewable energy and distributed generation, microgrid and active distribution systems, and more. He spends a lot of time thinking about how we keep the lights on, literally and metaphorically.

Canada's electrical grid is critical to the smooth running of our society. The grid delivers electric power and integrates many energy sources for efficient energy production and transportation. But grid infrastructure built over the past century is aging

fast. It's inundated with heavy new demands from an increasingly digital and environmentally conscious economy. Some estimates say that in this country we will need \$300 billion over the next two decades to upgrade the grid and create next-generation smart grids.

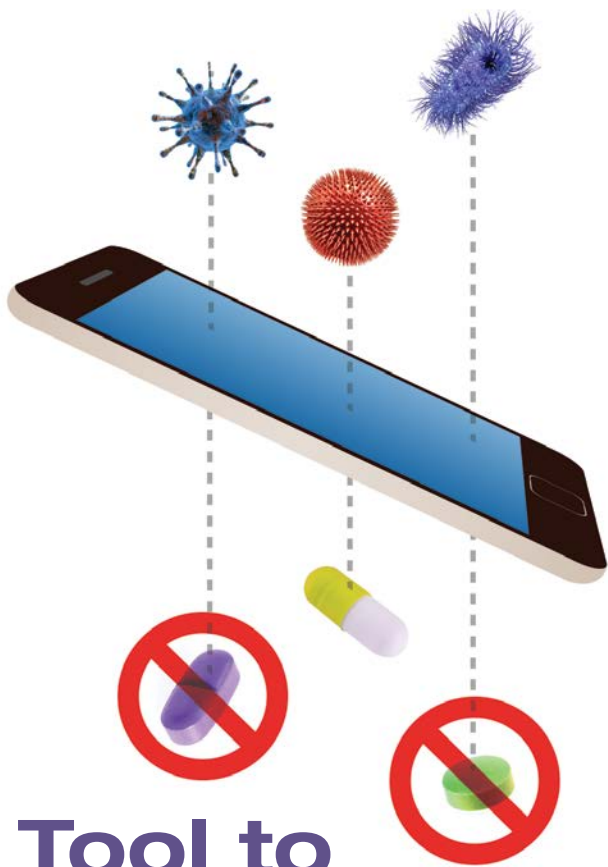
Smart grids enable use of renewable energy, more efficient loads, high efficiency grid structure, and more reliable operations. But there are technical challenges, including energy management, hybrid AC-DC grid structure, cyber security and power electronics.

Li's answer to the challenges starts with the Future Smart Grid Technologies Lab, which will undertake the development and integration of smart-grid technologies. The research enabled by the lab will develop key technologies for utility



companies and manufacturers of renewable energy and power electronics and could bring long-term economic benefits. And it will lower the cost of providing electricity to remote communities, easing the addition of renewable energy sources into the grids.

New technologies and trends coupled with the need to upgrade aging grids means the time to innovate is now. This CFI program proposes to capitalize on this opportunity by focusing on research and development of key smart-grid technologies.



## Tool to test if a pill will kill your ill

Faculty of Engineering-led researchers are developing a handheld device that will help reduce unnecessary antibiotic prescriptions, a welcome development in an era of antibiotic resistance stemming from the medicine's overuse. A team led by Robert Burrell (pictured below), chair of the Department of Biomedical Engineering, wants to equip frontline clinicians with the device to differentiate in minutes between viral and bacterial infections.



Doctors often prescribe antibiotics before traditional throat swabs reveal whether a particular bacterium is at the root of an infection—a process that takes hours or days at the lab. “If it’s viral, the antibiotics in essence are wasted,” Burrell says. “This device will allow the doctor to know for certain if a patient needs an antibiotic before they leave their office.”

Burrell’s device works by identifying whether a molecule called procalcitonin is present in a patient’s bloodstream. Normally undetectable in the body, the levels of procalcitonin rise when you have a bacterial infection—but not when you have a viral infection.

The team’s goal is to be able to place an antibody on the nanostructure surface of the device that will recognize the molecule in a drop of blood. When procalcitonin binds to the antibody, the colour of the surface will change. Burrell believes the device will be relatively low-cost and easy for frontline physicians to use.

The project recently received funding from the Canadian Institutes of Health Research (CIHR) Point-of-Care Diagnostics in Human Health competition. “This funding is incredibly important in making this device a reality,” Burrell says. The CIHR funding allows Burrell’s team to pursue the patents and move forward with production of the device, undertaking testing to prove its efficacy. Commercialization typically takes several years.

## NEW INFRASTRUCTURE SOLUTIONS



“Engineers are seen as focusing on infrastructure and building,” says Christina Radyo. “But how we go about building has a lot to do with the sustainability of a project.” Radyo, who just started fourth-year civil engineering (co-op), belongs to the campus chapter of Engineers Without Borders Canada (EWB), an organization that focuses on using engineering to support international development.

Don Thurston (Chemical ‘58) understands that EWB helps develop engineers and communities. That’s why he was concerned when he heard that the campus chapter of the organization had been operating without its flagship junior fellowship program, which sends students on international development placements. “Engineers Without Borders is an agency well suited for such initiatives,” Thurston says. The fact that EWB had not had the cash to send a student abroad for a couple of years motivated him to make a substantial donation.

As a result, Radyo was able to travel to Lilongwe, Malawi as a junior fellow. But, because EWB Canada focuses on underlying systems and processes that support existing infrastructure, she didn’t go there to build new infrastructure. The four-month placement changed her understanding of the role of engineers in development.

She worked for an EWB venture called WASH Catalysts, doing research, writing reports and interviewing government representatives and NGO workers about systemic obstacles in Malawi’s water sector. “Water service delivery there is maintained by NGOs, but the work of NGOs is typically project-based,” she says. A discrete project usually aims for a tangible result, such as a borehole, for example. “But a lot of these boreholes are non-functioning. The issue is the lack of ongoing maintenance.”

Through EWB’s WASH Catalysts, Radyo took steps to shift rural water and sanitation in Malawi from NGOs to the government, “because that’s the permanent institution,” she explains.

“EWB is fortunate to include young engineers such as Christina. She took herself well out of her comfort zone,” Thurston says. “Her journey was an adventure in human development.” Returning EWB junior fellows are expected to be leaders in their own communities, too. Radyo will run the recruitment process to find the U of A’s junior fellow for 2018 and support the successful applicant.



Photography: Mark Dutton

## Donadeo building gets LEED Gold

The Donadeo Innovation Centre for Engineering received LEED Gold certification in recognition of its exceptional environmental and energy-saving design this summer. LEED is a third-party certification system for buildings designed to be environmentally friendly, energy efficient and healthy. Solar panels, low-flow washroom fixtures, and chilled beam temperature control contributed to the Donadeo Centre's award.

"From the outset, we wanted to be sure this building had the smallest possible impact on the environment," says Fraser Forbes, dean of engineering. "And we wanted it to be at the leading edge of building design and efficiency."

The Donadeo Centre has environmental innovation at its core. In order to avoid any loss of campus green space, the Faculty of Engineering opted to squeeze the 14-storey facility into a 16-metre-wide parking lot between two existing structures. To accomplish this, the building's upper floors cantilevered out over Windsor car park and it were tied to the hip of the older Chemical and Materials Engineering building. The Donadeo Centre offers spectacular views of the city and river valley.

## FOOD SAFETY starts with cold comfort

**A pair of entrepreneurial graduate students at the University of Alberta have won the \$30,000 TEC Venture competition with a plan and technology that will help restaurateurs maintain food safety. Zack Storms and Preetam Anbukarasu devised smart sensors that will wirelessly monitor and record temperatures in refrigeration units.**

Some large restaurants can have as many as 20 walk-in fridges. Regulations require that three times a day someone has to go into the units, check the temperature and record it on a sheet of paper, a system that is time-consuming and prone to error.

Sensors developed by Storms and Anbukarasu record temperatures and store the data 24 hours a day. The system sends alerts to management if the temperature in one of the units falls below a set point.

"From a restaurant manager's position this is helpful," says Storms. "It's reliable and it's a simple system. It gives you a record and you know the monitoring is being done." And restaurant inspectors can also review the records. The two have started a company, Preza Technologies, focusing on food safety.

Storms and Anbukarasu have both worked in a research lab run by materials engineering professors Anastasia Elias and Dominic Sauvageau. Storms completed a post-doctoral fellowship at the Faculty of Engineering with the support of funding from Alberta Innovates – Technology Futures, which encourages entrepreneurial researchers. He's now working towards his MBA at Alberta School of Business.

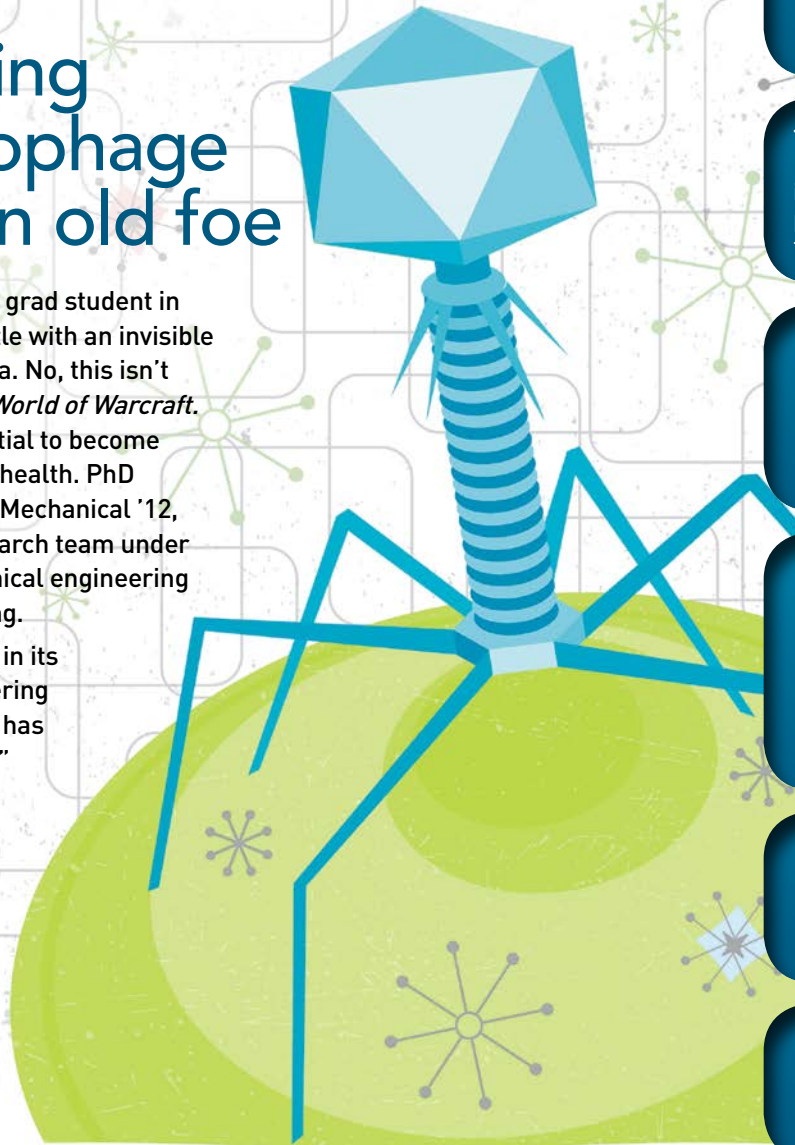
Anbukarasu, who completes his PhD in materials engineering this year, says a graduate degree can pave the way to a startup. "I was already thinking of starting a business—and that's why I decided to get a PhD," he says. "If you know exactly what you want, a PhD is a great way to go." The two are investing the prize money from the TEC competition into their company.

# Engineering a bacteriophage to fight an old foe

A mechanical engineering grad student in Edmonton plans to do battle with an invisible and deadly enemy in Kenya. No, this isn't an international game of *World of Warcraft*. But it does have the potential to become a game-changer in public health. PhD student Nicholas Carrigy (Mechanical '12, MEng '14) is part of a research team under the supervision of mechanical engineering professor Reinhard Vehring.

"Our project is interesting in its humanitarian and engineering aspects," Carrigy says. "It has the potential to save lives."

The team is researching bacteriophage therapy, an emerging tool to address antibiotic resistance.



A bacteriophage is a virus that attacks a bacterium, injecting it with viral DNA. The virus reproduces inside the bacterium, which bursts, releasing more viruses that attack more bacteria.

The food-borne bacteria, *Campylobacter jejuni*, is prevalent in Kenya, where it kills nearly nine per cent of people it infects, most of them children.

Vehring's team recently secured funding to develop new technologies to combat food-borne bacteria. The team wants to find a way to employ the bacteriophage to fight *C. jejuni* in Kenya.

Nicholas Carrigy's role is to engineer a product in which a dry powder acts as a stable substrate for the bacteriophage. He must determine the parameters for the process, which is called spray drying. He's also working on a protocol to measure the stability of the product.

"Our goal is to see that it can be inexpensively produced on a large scale and that it has long-term stability at temperatures encountered in Kenya," Carrigy says.

The team and collaborators in the U.K. and Kenya hope to bring the technology to the east African country sometime in 2019.

## Sweet swag

Jocelyn Gallivan (Chemical '14) shows off the best Calgary Stampede Breakfast swag ever to one of the 160 alumni and friends of the faculty who attended this year's inaugural event.

Limited edition Faculty of Engineering cowboy ties will be available again at next year's breakfast on July 12, 2018.



## Repsol helps engineers build safer from the start

\$500,000 gift to the Lynch School benefits industry and safeguards society

By Amie Filkow

**J**oAnne (Foster) Volk, (Chemical '88), remembers the phone call. Eight months pregnant and only a few days into her maternity leave, the chemical engineer had to sit down to process what she was hearing.

Catastrophic failure. Nineteen people injured. Indefinite shutdown. Full investigation.

The accident happened during a routine maintenance shutdown at the manufacturing plant where Volk worked as process engineer. A contracted inspection team had put temporary scaffolding inside the cavernous, 60-metre-high cooking vessel to examine the vessel at different elevations. The scaffolding collapsed, injuring the crews inside. One man broke his leg.

"Nobody thought about having engineering controls in temporary platforms," Volk says. "We didn't have solid controls around fully understanding the design and if it was suited for the purpose."

Volk's team was lucky. But their harrowing experience is not unique.



**STAY SAFE:** Alumna JoAnne Volk (Chemical '88) found out early in her career what a lost-time incident really means to a team.

Photo: Nathan Elson Photography



Discrepancies in safety and risk management—temporary scaffolding raised by contractors, for example—continue to present an enormous challenge for industry. At least one major incident occurs somewhere in the world every week, and leads to tragic and avoidable loss. Textile factories collapse on workers. Explosions at refineries cause long-term shutdowns. Large tailings dam impoundments fail, releasing hundreds of thousands of cubic metres of contaminants into the environment.

Today Volk is a water engineer with Repsol Oil & Gas Canada Inc. The energy company recently donated \$500,000 to the David and Joan Lynch School of Engineering Safety and Risk Management at the University of Alberta. The Lynch School builds on 25 years of ESRM teaching, research and outreach in the Faculty of Engineering, and is the first of its kind in Canada.

“Our objective is zero incidents,” says Jim Hand, vice-president of Repsol’s business unit. “Safety is an imperative for Repsol and education plays a crucial role in achieving the highest safety standards. The U of A’s Lynch School is helping cultivate a safety culture that will benefit the entire industry in the long run.”

As a mentor for early career engineers, Volk insists that safety and risk

**“Public safety is what engineering is about—managing risks to ensure the public doesn’t get hurt,” says Volk.**

management should be a core competency of every engineer—from the start.

Volk, who worked her way through school at the swimming pool, says, “I had great lifeguarding skills and a great engineering education, but no practical engineering skills.” Lifeguards, she notes, were trained in safety in advance, whereas engineers were expected to pick it up on the job. “I was just a young kid without any experience, walking out in the world and designing things for people.”

A few years later, while studying and training for her professional designation, Volk had a revelation about the high stakes of safety and risk management and her responsibility as an engineer.

“Public safety is what engineering is about—managing risks to ensure that things are designed so the public doesn’t get hurt.”

By 2018, every University of Alberta engineering graduate will have some fundamental training in safety and risk management. That’s about 1,200 engineers who will take that knowledge to their field.

“We teach our engineers how to heat molecules, transport them, pressurize them—how to transform the physical world,” says Gord Winkel (Mechanical ’77, MEng ’79), director of the Lynch School and former vice-president of Syncrude Canada, Ltd. “We need to teach them, ‘Not only are you going to transform this world, but you’re going to do it safely.’”

Winkel says the success of the Lynch School hinges on partnerships with industrial leaders such as Repsol. “This donation creates momentum to support safety and risk management at all levels,” he says. “We look forward to building a great relationship with Repsol.”

Volk’s perspective as a leader and mentor to new engineers helps her see both the immediate and long-term impact of the Lynch School and its partners.

“More study of risk will definitely help industry be safer. Classes in it will help students understand how to do something systematically as opposed to winging it. I think the whole industry will benefit from the commitment that U of A is putting into this curriculum,” she says.

“It will make a difference.” 🌟

## In the know

What’s the best part about keeping tabs on the Faculty of Engineering?

You’ll discover what today’s students are up to. You’ll learn about breakthrough research findings and new technology developments. You might even find a way to partner with our students and researchers.

Keep informed [engineering.ualberta.ca](http://engineering.ualberta.ca)



# Defensive play

Everyone, from pro players to parents of pee-wees, is on the lookout for a hockey helmet that will provide better protection against brain injuries, including concussion

By Mifi Purvis

“The big stigma against helmets is that they don’t protect against concussion,” says Brooklyn Knowles (Mechanical ’13). Due to improved diagnoses for brain injury in sport, many people are critical of helmets and wonder why manufacturers just don’t make better ones. “But what people don’t realize is that they were never designed for that. They were designed to save your life, and they have done a great job of that,” she says.

That helmets aren’t explicitly designed to prevent concussions will shock hockey parents. But Knowles wants the technology catch up with our perceptions. She is doing her PhD in the Department of Mechanical Engineering, supervised by Chris Dennison, with a focus on the biomechanics of head injury.



The CSA standard for helmets is that they limit head impact accelerations to less than 275 Gs in laboratory experiments.

Helmets should be adjusted to the wearer's head size.

Chris Dennison's lab has attracted the notice and support of James Newman, entrepreneur, engineer and expert in head injury biomechanics and helmet performance.



There are two important parts to a helmet: the hard outer case and the softer foam or gel lining that cushions it. Every helmet is a variation on this and none is currently rated for concussion.

“We can measure accelerations and velocities of the head, both linear and angular,” PhD student Brooklynn Knowles says. “We feed that into a computer to estimate risk of injury to the brain, and see how the two correlate.”

Properly adjusted, the chinstrap holds the helmet in place during impacts that might otherwise dislodge it.

Illustration: Charles Burke

“I hope my research will let us certify helmets against potential brain injury,” she says. She wants to link certification to the prevention of severe focal and diffuse brain injuries. “That’s what I’ve focused on, looking at the multiple impacts that each helmet can take. Ideally, when I am finished my research, the findings should extend to other types of helmets.” Even beyond guarding brains, the stakes are high.

With hockey helmets occupying a roughly \$120-million corner of the sports equipment market, manufacturers and marketers look for every advantage. A couple of years ago, Reebok-CCM Hockey Inc. advertised a helmet, called the Resistance, and implied it provided concussion protection. As it turned out, the Resistance was futile and the company got a hard check from the federal government’s Competition Bureau for making unsubstantiated claims. Reebok-CCM wasn’t the first to find itself in the penalty box for such claims and, in a settlement, paid out nearly half a million dollars in equipment donations to youth organizations and had to pay \$30,000 toward the investigation’s costs.

Knowles hopes that developing a certification system will allow manufacturers to create better gear and back it up with verifiable claims. As a first step, “we hope to develop a pass/fail certification system,” she says, “So that we can say with certainty that a helmet will protect against concussion in greater than 50 per cent of cases.”

A hockey player growing up, Knowles has always been interested in the sports side of engineering—her undergrad design project was in protective headgear. She jumped at the chance to start a master’s program with Dennison. “But the scope of the project got bigger, so there was the option to scale it back or transfer it to a PhD.” She opted for the latter.

Knowles tests helmets on a drop tower that runs floor to ceiling, and the design group has a wall devoted to impacted equipment. “It’s our helmet graveyard,” she says. “There is no definitive test that says ‘yes, this helmet will protect against concussion.’” But Knowles is working on it, and aiming to have her results ready in June. 🌟

# HOLLOD

to the



# ECK

“One of you guys has got to keep those asteroids away from the fuel cells,”  
Katie says.

Over my headset, she sounds impatient, but she’s right. She and Jennifer are working hard trying to figure out a magnetic grappling hook that seems crucial to operations. A small asteroid has just knocked yet another precious fuel cell off the manifold. Richard lunges after it, but comes up just short and the cell, about the size of a can of pasta sauce, careens lazily into space just beyond the reach of his gloves. The blue earth twinkles serene below us.

Sweat prickles in my palms as I realize that I haven’t exactly been pulling my weight. “I am on it!” I say, possibly a little too loud. Does my bluster inspire their confidence? I grab a surplus cargo-hold door by its edges and hoist it aloft like shield, my back to the crew. What I am not contributing in brain power I can offer at least in brawn. I manage to bat a few small grey asteroids away—oh God, they’re coming thick and fast—as The Big One, glowing hot and red, thunders towards us.

“What does this button do?” I hear Rich ask. I’m afraid to glance back to find out; we’re running out of time. The survival of the planet depends on the four of us.

## THERE’S NO PERIOD IN MY LIFE

that I do not associate with one space drama or another. Around the time *Star Wars* was released, two boys offered to buy my pin that read, “May the force be with you,” for \$2, a huge sum then for a little kid.

Photography: Curtis Corneau

I refused. I loved old reruns of the 1960s *Star Trek*, and my young adulthood was all about *The Next Generation*. I caught up on *Voyager* while I was on parental leave, arranging my daughter's feeding and nap schedule around that show's afternoon TV rerun timeslot.

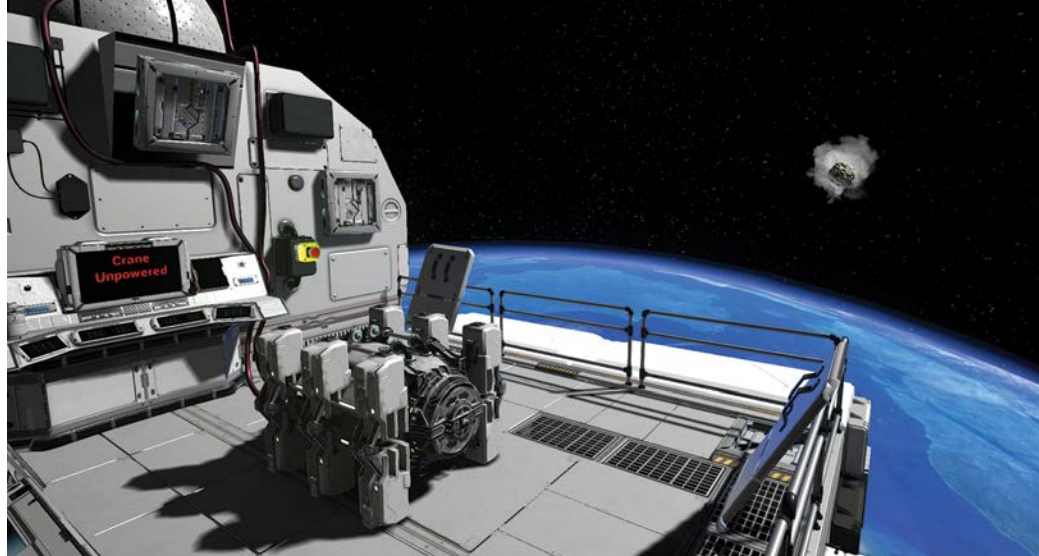
The *Star Trek* franchise has been an effective predictor of (and inspiration for) real-life engineering solutions. Think about communicators, space shuttles and Siri. Even the tricorders brandished by the shows' medical personnel are like frontline diagnostic tools in development today.

Sure, we still await the transporter, but I come bearing glad tidings: the holodeck 1.0 is here. And it's awesome.

Nathaniel Rossol (Computer '07, MEng '10) laughs when I describe the virtual reality technology that he and his brother Alex have developed as "the holodeck." It's how he envisioned it. (The brothers are also both computing science alumni, Nathaniel with a PhD and Alex with a BSc). Their nascent company is called vrCAVE, and it offers immersive virtual reality experiences, and a fresh take on the escape room.

If you've ever been to a traditional escape room you know it's a physical space that has been decked out, often artfully, to match a theme. It might look like the lair of a Cold War spy, a serial killer, or a film-noir detective. You and your fellow inmates must solve a series of puzzles or problems within a set time to free yourselves from the room.

The Rossol brothers' take on the escape room is that theirs uses virtual reality to



create a fictional space station, the S.S. *Tiberia*. Players step into a dark, mostly empty room at Edmonton's SmartyPantz escape room. (SmartyPantz agreed to beta test S.S. *Tiberia* for vrCAVE.) An attendant helps users with the gear: a backpack, goggles and handsets. Then the magic happens; the floor seems to drop away and the players focus on saving humanity from a killer asteroid.

Nathaniel's master's degree under Mrinal Mandal focused on multimedia. "It was extremely related to VR, because it had to do with integrating audio, visual, image formats, data formats—the whole multimedia package," he says. From there, in his PhD he worked on sensors for motion tracking. "Being able to track human motions with embedded sensors and integrating that data is the key technology behind VR," he explains. "It's mostly about tracking where you are looking and about where hand controllers are placed."

The Rossol brothers are avid board gamers, foundational to building S.S. *Tiberia*. But entertainment is not their end game. "Long term we'd like to get into training for emergency crews: police, fire, ambulance, maybe the oil field industry. What do you do in emergency scenarios, if equipment is failing?" Nathaniel says.

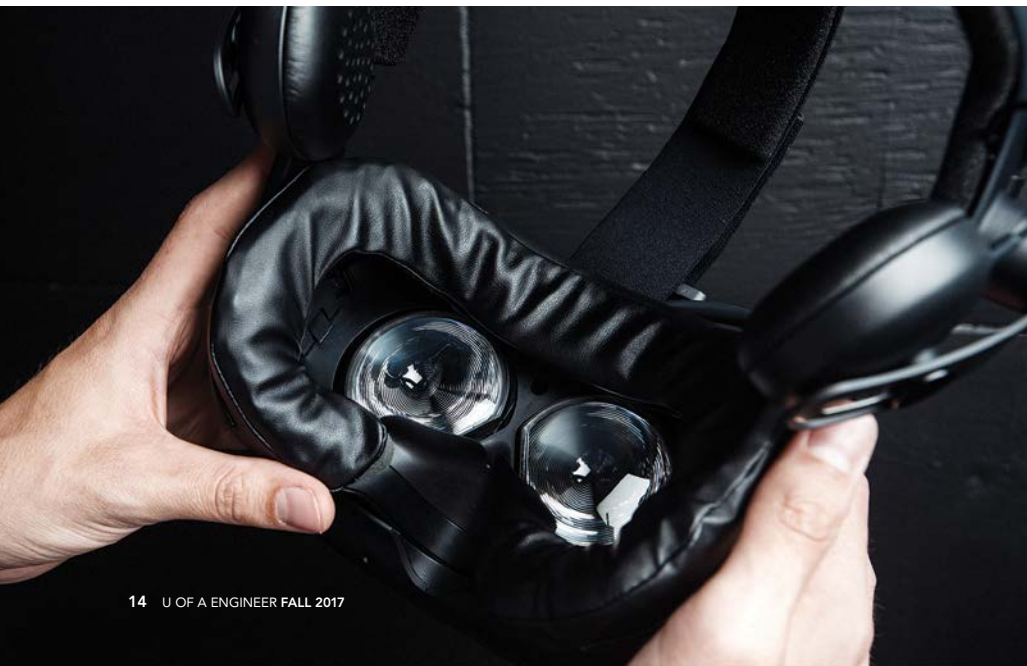
It's interesting, because Edmonton's hugely successful video game company, Bioware, did it the other way around. It started with medical software in the 1990s on CD ROM, and eventually found its way into games.

"But in terms of proving that we can build systems like these, entertainment was our obvious first option," Nathaniel says. "Every market report we read said that the majority, as much as two-thirds of the VR industry in the early days, is going to be games and entertainment."

And building games gives the Rossols freedom to learn. "If we get into medical training, or medical simulation, things are a little more mission critical," he says. "With games, while we are still improving and updating the technology. It's less critical."

Inside S.S. *Tiberia*, it feels pretty critical, but Jen, Rich and Katie appear to me as floating helmets and gloved hands. It's amazing how quickly my brain accepts that, though it sometimes leads to unexpected nudges. ("Sorry, was that your butt?" I hear Jen say.) But since players are just walking, the potential for injury is basically nil, if you don't count the destruction of the planet, which is sadly what happens on our watch.

But later I ask the brothers, if we came back in 10 years, would we be able to zip on suits that allowed us to see more of each other than just helmets and hands?



“Oh, I’d say three years,” Nathaniel says.

“In 10 years, you won’t need suits at all,” Alex adds.

Oh my, the holodeck.

## “I THOUGHT ABOUT DOING A

master’s, but right out of university I wanted to get some experience,” Alex says. “I like things that have a quick turnaround. I’m not as big on the theory. I like to make things work.” He has a lot of experience in web applications and frontend coding.

“With VR, you can code something up, and test it out,” Alex says. “It’s a quick feedback loop. When you are programming in VR it’s actually very quick, too.” The push to get the coding done on *S.S. Tiberia* happened between January and July, and the brothers have been taking feedback from the beta testing phase at SmartyPanz to patch the system to make it run perfectly.

“A lot of my research was about not attaching devices,” Nathaniel says. “So with sufficiently high resolution images, you could just scan the body into VR. We definitely want to stay on the cutting edge with everything we’re doing.”

And they are on the cutting edge. People with motion sickness will sometimes demure at the chance to try VR. They needn’t worry with vrCAVE experiences. “I get motion sick, so I knew we had to develop a system with better than 65 frames per second,” Nathaniel says. Fewer than that, and a certain segment of the population will experience nausea. vrCAVE systems work at 90 frames a second. It feels like natural sight.

*S.S. Tiberia* is not the Rossol brothers’ first VR tableau. Last year, in time for Halloween, they created *Hospital of Horror*, in which pairs of players (“because you need the moral support”) walk through a virtual abandoned hospital to have the wits scared out of them. At SmartyPanz *Hospital of Horror* replaced *S.S. Tiberia* this October, too.

Their early VR work attracted the notice of Tom Viinikka, a University of Alberta business alum and mentor. “We pitched our idea at the February 2016 eHUB SPARK event,” Nathaniel says. SPARK brings entrepreneurial students together to pitch ideas to peers and guests. “We met Tom at

a mentorship round table two weeks later. He said he knew VR was amazing and he was on the lookout for someone who would do something amazing.” Viinikka has partnered with the brothers in vrCAVE.

For now, *Hospital of Horror* is one of few experiences of its type, and *S.S. Tiberia* is the only VR escape room in Canada. “There are people who are looking into applications for VR,” Alex says. “We get lots of requests for real estate.” Imagine touring a condo in Malaysia or Hawaii as if you were there. “The technology isn’t quite there yet,” he says.

There are a few other companies doing VR as a multiplayer system, although they generally specialize in military-style games, or Zombie shooter games. Nathaniel mentions one notable VR gaming outlet in Australia. But it’s a massive, industrial-sized facility dedicated to VR. “We wanted our system to be small and nimble,” he says. “Our goal is to have this game spread out all across Canada, a couple in each major city.

We always say, ‘by this time next year,’ but that’s the goal.”

And 2017 has the vrCAVE team off to a galloping start. They won the TEC Edmonton VenturePrize in its last year in operation. It was a program that provided business training, mentorship, feedback and financial incentives to help people build or enhance a business. The prize included \$25,000 cash, \$20,000 in-kind from TEC Edmonton, \$10,000 in-kind from PwC. “We are looking for office space and we’re making some updates to our *Hospital of Horror*, to make it more polished, scarier, with a little more action,” Nathaniel says.

Both the Rossols and Viinikka are excited about the next phase of their Edmonton-based business. “There’s a lot of technical talent here,” Nathaniel says. “The U of A is an excellent program. Bioware made it here.”

OK, but when do I get the full holodeck experience? “It’s coming,” he says. “It’s coming.” 🌟



TOP THREE: Nathaniel and Alex Rossol met partner Tom Viinikka (centre) at an eHUB event.



U  
A



# the new paradigm

*Sylvie Boulanger has created guidelines that avoid miscommunication between architects, engineers and steel fabricators. Now she's pursuing novel approaches to infrastructure rehabilitation*

*By Jennifer Westlake*

The American pavilion's enormous steel dome at Expo '67 was and is one of that world fair's most recognizable icons. This summer, as Montréal celebrated the 50th anniversary of Expo '67, reminders of it were everywhere in the city.

One morning this August, sitting in a café in Montréal's picturesque Plateau neighbourhood, Sylvie Boulanger (Civil '84) remembered how her six-year-old self looked up at Buckminster Fuller's geodesic dome and just wondered. How was this thing made? And what would happen to it, after Expo was over?

Today, Fuller's steel dome is the Montréal Biosphere, home to a museum about the environment that still stands on the original site. Other steel pieces of what was Expo '67 have since been dismantled, rebuilt or repurposed. But not all of these structures survived. And let's face it, after 50 years, steel and concrete structures that aren't given some TLC will age prematurely.

Meanwhile, other steel and concrete structures soldier on as the living arteries of Montréal, taking workers, goods, visitors and residents on and off the island. And, like human arteries, they are taken for granted by those who depend on them. It may come as a shock, but for a long time we put little care into maintaining our infrastructure in Canada. We have had to play catchup and apply a curative approach. Our approach to our aging infrastructure needs to be more preventive, with effective asset management as a goal.

It seems fitting that in 2016 Boulanger, who turned such a thoughtful eye to the steel structures that wowed Expo '67 visitors, joined the Jacques Cartier and Champlain Bridges Incorporated (JCCBI) as senior director for its new Centre for Innovation in Infrastructure. The centre is

charged with developing knowledge needed to prolong the life of critical infrastructure, which JCCBI's operations team can apply to ensure that some of Montréal's most essential arteries, such as the Jacques Cartier Bridge, remain safe and useful.

## Resilience is not just for steel and concrete.

"Being a woman in engineering does toughen you," Boulanger observes. She found lots to relate to even in the first few pages of *Lean In*, Sheryl Sandberg's book that tries to answer why women are underrepresented in business, leadership and non-traditional roles. Thinking back over her own early experiences, when she was an engineering student, she acknowledges that there was some casual sexism—comments that were belittling of women. She learned what to address, what to let slide. "You can't take things personally," she says. In her 30s, she and her husband started having children, a period she jokingly refers to as her "zombie years." Neither academia nor the social structure in Switzerland, where she and her family lived while she pursued her PhD, made things any easier. That was when she really came to understand how different things were for men and women in her field.

But even when she was a child growing up in Sutton, Québec, Boulanger knew her interest in construction sites and the mechanics of how things work made her different. She excelled at math and athletics and had a competitive spirit. A friend commented that it was going to be difficult for her, suggesting, "You can't be so good at things" if you want a boyfriend. Boulanger ignored that advice, convinced that the guy who was right for her would not be so easily put off. She was right. She defended

her doctoral thesis while pregnant with her second child. "I do not recommend doing that," she says as an aside. "I threw up right before."

Although she had always been drawn to architecture, she chose to study civil engineering, thinking that at the very least it would be a strong foundation if she chose to switch to architecture later. Her decision to go with civil, specifically structural engineering, was vindicated after two summers as a surveyor for CN in Montréal and the Alberta Rockies. Finally, questions that had intrigued her as a child—how come an apple topples over more easily the more bites you take from it?—were answered in her first-year university statics course.

**Boulanger believes we're looking at a fundamental change for how we refurbish existing structures.**



Boulanger interrupts herself to insist on a shout-out to the late University of Alberta professors Geoffrey Kulak and Laurie Kennedy, with whom she kept in touch after she graduated with her bachelor's degree in civil, until they died. They helped shape her career. "It's amazing how a person can plant an idea that orients your life," she says.

She recalls the day she was asked to report to Kulak's office. "He seemed very stern and I was terrified," she says. It turned out he simply wanted her to translate a letter from French about his upcoming sabbatical stay at École Polytechnique Fédérale de Lausanne in Switzerland. (The letter and school intrigued her enough that she would eventually apply for a research position there.) But before that, when she was considering a master's degree, several U of A professors encouraged her to apply to the University of California, Berkeley. There, she studied structural engineering and structural mechanics and found a strong interest in analysis. However, as interesting as dynamics and the Timoshenko beam theory were, her career lay in the tangible world of steel structures.

Following academic research with a few years of consulting in Switzerland, she next took a position as Québec regional director with the Canadian Institute of

**"We've got to be more structure specific to have reasonable costs for safe repairs to existing, unique structures," Boulanger says.**

Steel Construction (CISC) in Montréal. She authored a regular technical column called "Ask Dr. Sylvie" in CISC's magazine. In 2012, she joined the steel fabricator, Supermétal Structures, as vice-president of technical marketing. Her last projects at Supermétal included a 44-storey diagrid tower in Bogotá, Columbia, work on the Turcot Interchange steel bridges in Montréal and the temporary towers of the new Champlain bridge cable-stayed span.

Boulanger laughs when she thinks about what it was like when she first started with the steel fabricator. "Now, I was used to working with men, but that is a MAN's man's world!" Women working in that world tread a thin rail. Fail to take enough of a stand, and you're a wimp. Take a strong stand and you're ... something else.

But this demanding world is clearly her happy place. If you want to see Boulanger at her most enthusiastic, just ask her about the Calgary Airport's International Facilities Project. When architect Doug Cinnamon came in to check out the 60-metre-long architecturally exposed structural steel (AESS) triangulated truss Supermétal had produced for his design, "His eyes lit up." It wasn't just the beauty of the product that had won his appreciation. "There is often miscommunication between the architect, the engineer and the fabricator. This was the first time there had been so few issues raised about differing expectations during a shop visit."

That was a testament to the effectiveness of the Canadian Institute of Steel Construction's Guide for Specifying Architecturally Exposed Structural Steel, an appendix to the Code of Standard Practice. Boulanger was involved in developing, co-ordinating and editing these documents, which she counts as a point of accomplishment. While that mouthful of a title may not sound like the stuff of inspiration, in Boulanger's world, it is exciting. It sets out how steel can be worked, connected and finished, helping architects express their design through welded and bolted structural steel assemblies. The engineers' specifications are sent to fabricators who then manufacture the assemblies, such as the truss made for the Calgary Airport. The Guide for Specifying

AESS has since been adopted in the United States, Australia and New Zealand.

In short, guides like the one Boulanger helped develop get really cool designs made esthetically, safely, cost effectively and efficiently. Managing esthetics, safety, costs and performance turns out to be a theme of conversations with Boulanger.

## We're heading for a new paradigm.

Building new structures in environments that challenge them with seismic events or climate-related wear and tear is complex. When structures dating back to eras in which building codes were less refined have to be retrofitted, developing solutions that help balance performance levels, risk, and expense reaches another degree of complexity. Sometimes traditional approaches don't work.

"Our first role as engineers for a long time was to make structures stand—not to make them last. The concept of durability wasn't part of our training," Boulanger says. Safety and cost were the determining factors in decision-making, and "deterioration" was not in structural engineers' vocabulary.

Today, many steel and concrete structures that were produced with that mindset are in need of rehabilitation or retrofitting. This work is still mostly reliant on classical solutions intended for new structures, such as prescriptive code calculations and standard materials. For existing structures, new materials such as ultra-high performance fibre-reinforced concrete (UHFRP) show real promise. It will be included in the next CSA S6 Canadian highway and bridge design code, in 2019.

In the long term, Boulanger believes we're looking at a paradigm change for existing structures. "Instead of a prescriptive approach, which follows code-based equations and established boundaries, we need a performance-based approach." Building codes and design standards help engineers calculate load and resistance that are mostly intended for new structures. But repairing or retrofitting existing structures presents situation-specific challenges. The structure's load and its load-bearing capacity will have changed. For example, steel that



**EVERYONE AGREES:** The exposed steel at the Calgary airport was unique in that it matched the expectations of the client, architect, engineer and fabricator: no surprises.

has corroded, or concrete that has become delaminated will have lower resistance. The load on a structure may also have changed due to a retrofit that has added materials. In the case of the Jacques Cartier Bridge, for example, deck replacement added extra weight. Codes change, too. The Jacques Cartier Bridge was constructed in the 1920s when bridge codes didn't include seismic provisions.

Boulanger says that in cases like these, applying current codes to an existing structure won't always work.

"So, this structure was built in a different time, with different processes, but in principle it's got a lot of reserve capacity. But you don't design the same way today, so when you're trying to apply a code meant for new structures and materials, then you're stuck with costly repairs." Boulanger says a performance-based approach allows for problem-solving from a different angle. "OK, let's go back to principles. What is the performance we want the structure to have? Then you establish the risk level you are willing to manage."

With a performance based approach, the proof is in the pudding. Designs have to be proven before they hit the construction site. And that adds time, effort and labour to the whole endeavour.

"It means more work for everyone, more refined analysis, more demonstration work, and sometimes meeting building officials to convince them you've met the performance criteria," Boulanger says.

Yet, you can see how, for critical urban infrastructure, where managing safety, cost and risk is top priority, performance-based approaches could be more cost efficient in the long run.

To understand a bit more about performance-based approaches, I call an old colleague of Boulanger's from her Canadian Steel Institute days at his office at the U of A. Robert Driver, the director of the CISC Centre for Steel Structures Education and Research and chair of CSA S16 Design of Steel Structures Standard, says, "A performance-based approach allows for innovation that might not be currently included in standards and codes but that still meets performance criteria."

## But is structural engineering ready to go there?

While Driver agrees that performance-based approaches are worth aiming for, he says that getting them into design codes and standards will take considerable collective resolve. Performance based design will also demand a high level of expertise, difficult for the average firm to deliver. By Driver's estimate, it will take a gradual shift over the next couple of decades.

"You'll see a proliferation of more performance-based design codes and structural engineering as we move towards really being more interested in the outcome rather than how you get there," he says.

Will this constitute a kind of second-level thinking in structural engineering? "Yeah, I guess you could say that," he says. "You're flipping things on their head. It allows the designer more flexibility."

Boulanger, too, is clear that although she would like to see more firms develop the capacity to work with performance based approaches, that's not something every firm will be able to do and it's not necessary for most new structures.

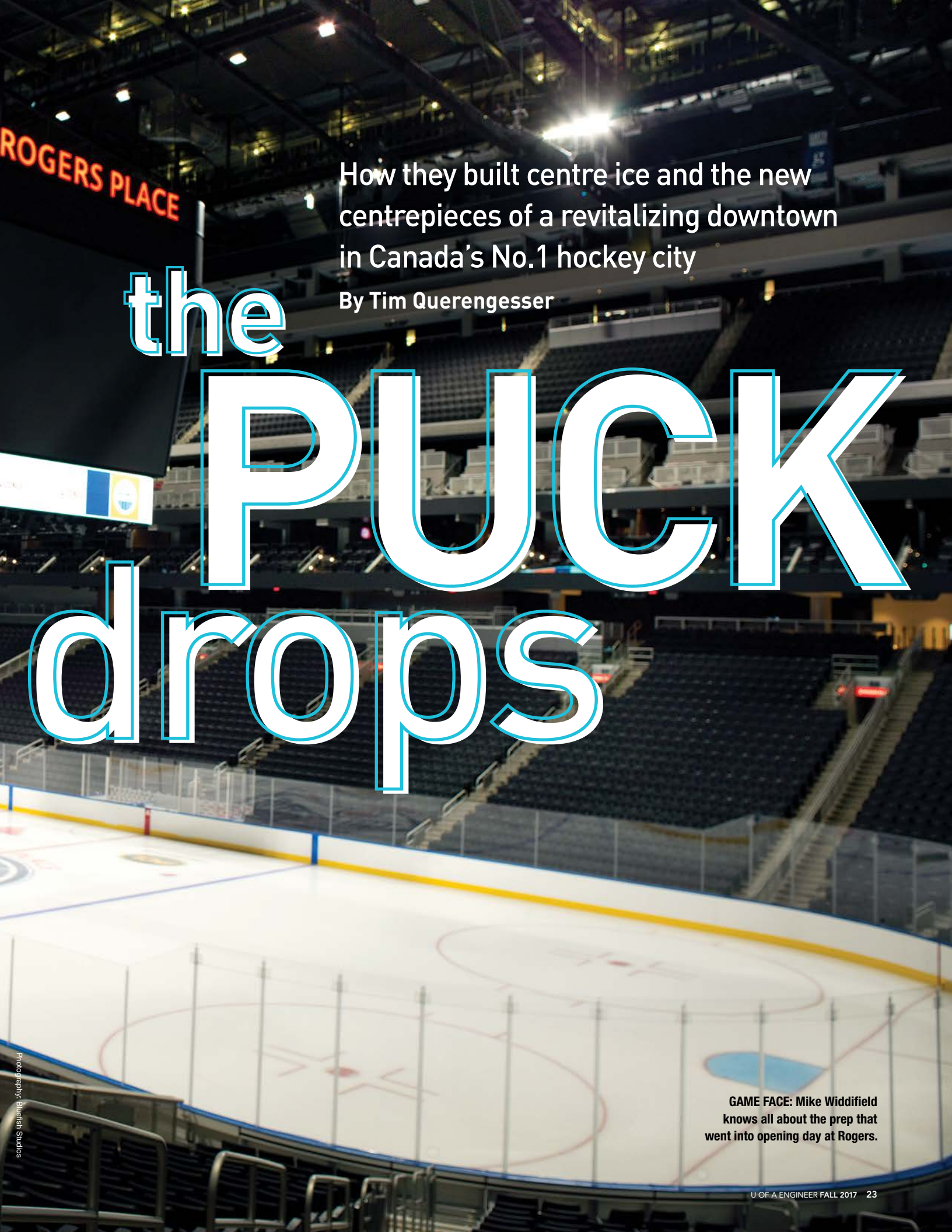
"It's not our only way out, but we've got to be more structure specific in order to have reasonable costs for safe repairs to our existing and unique structures."

Boulanger says that urban infrastructure throughout North America needs ongoing attention. Health monitoring for bridges—where gauges and sensors such as accelerometers track a structure's change in displacements and frequencies—will be a growing field, she predicts.

Talking with Boulanger, you start to envision a different futuristic urban landscape—one that won't be an unbroken line of gleaming new towers or a series of sleek river crossings. It could include structures from many eras, a technically sophisticated blend of old and new engineering. They may not be as immediately striking as Buckminster Fuller's dome or the Jacques Cartier cantilever truss bridge but, if Boulanger is right, they will represent some innovative solutions to the challenge of our aging infrastructure. ●



ROGERS PLACE



How they built centre ice and the new centrepieces of a revitalizing downtown in Canada's No.1 hockey city

By Tim Querengesser

# the PUCK drops

**GAME FACE:** Mike Widdifield knows all about the prep that went into opening day at Rogers.



ike Widdifield is a professional engineer, not a janitor. But on Sept. 8, 2016, his team had run out of time, so Widdifield, construction manager, picked up a mop and bucket and started cleaning. (“I wasn’t the only one,” he says.) It was the first day Edmonton residents would see inside Rogers Place and, since Widdifield had a hand as project manager, he wanted to impress. “The day before, even hours before, it was still a construction site,” he says. “We were running around that morning just making sure it presented well.” Ready or not, the puck must drop.

Expectation in the crowd was electric. Rogers Place is not just a new arena. It is the centrepiece of a \$2.5-billion development called ICE District, which—aside from a sports facility composed of some 10,000 steel beams and exterior tiles—also has a 50,000-square-foot public square, the tallest skyscraper in Canada west of Toronto, the third JW Marriott hotel in the country, a casino with 600 slot machines, and new offices for the Oilers Entertainment Group and City of Edmonton. And, if rumours around town are true, ICE District also holds a future home for Wayne Gretzky.

But more than that, ICE District is a new start for Edmonton. The city’s corporate downtown was built a generation ago, between the mid-1960s and the early ’80s. During that growth spasm the city’s first LRT, MacEwan University (then still a

college), the Provincial Museum of Alberta, the city’s first skyscrapers, the Muttart Conservatory, the Shaw Conference Centre, Commonwealth Stadium and Northlands Coliseum were all erected. And then by about 1983, thanks to softening global oil prices, the spasm stopped. The ensuing recession kept Edmonton’s economy down for more than a decade. The city’s brain trust to handle supersized civil projects slowly crumbled. Between the mid-1980s and 2011, Edmonton built just one skyscraper—the EPCOR Tower. The lack of new builds or significant rebuilds engendered the city’s unfortunate moniker, Deadmonton.

In 2013, Edmonton’s city council approved a tax levy that would direct municipal cash to downtown revitalization. ICE District was the catalyst. Daryl Katz, owner of the Edmonton Oilers, wanted to build a new arena, and council wanted a vibrant downtown. So the City of Edmonton teamed up with Katz and the owners of various projects within what came to be called ICE District. They tapped PCL to build their vision.

Four PCL engineers—Widdifield (Civil ’04), along with Jason Drackett, Myke Badry (Civil ’05) and Derek Pearce (Civil ’99)—have all gotten used to describing their work as the “first time” anyone in Edmonton has done what they are doing. The four, along with numerous other University of Alberta alumni and co-op students, are innovating, inventing, problem-solving and pioneering to deliver ICE District. “This is Discovery Channel stuff,” Drackett says. “It’s on the scale you see

in Dubai or Saudi Arabia. I think you can’t overlook the fact that it has been 30 or 40 years since major structures like this have been built in this city, and yet the way it’s being built right now is as if this is normal.”

Here’s how they did it.

## ROGERS PLACE MIKE WIDDIFIELD

As construction manager, Mike Widdifield choreographed a huge troupe of personnel. He says more than 10,000 workers contributed three million worker hours over 30 months of construction on Rogers Place. In two different periods over the duration of the project, the on-site worker counts hit 1,250 per day. “For a commercial project in Edmonton,” he says, “it was a huge undertaking.”

Widdifield needed every one of those workers, and they did not have a surplus of time, space, or real estate. To overcome those challenges he and his team introduced several innovations that have now become the norm: new best practices on PCL projects.

Technology came first. PCL gave nearly everyone building Rogers Place access to a central, digital document-sharing system to speed decisions and account for continual changes. Anyone using the iPad system could look at the build sheet for any area of Rogers Place and see the latest updates, which continued to arrive as workers built the place. And rather than a few having access, every manager had the keys to the system. “Even the foreman had an iPad and had access to electronic documents,” Widdifield says.

As the build progressed, similar tech allowed all workers to catalogue deficiencies—anything from a smudge on a wall to an incomplete installation of a ceiling tile. The same technology allowed Widdifield and his managers to electronically assign someone to fix deficiencies, and for that worker to confirm

**Four PCL engineers—Mike Widdifield, Jason Drackett, Myke Badry and Derek Pearce—have all gotten used to describing their work as the “first time” anyone in Edmonton has done what they’re doing.**



the fix was complete and could be taken off the list. The old way was to use good old paper and a spreadsheet. It was “a very administrative-heavy process,” Widdifield says. “We tried to streamline.” Now, the digital deficiency process is standard on all PCL projects in Edmonton, he says.

Rogers Place is set within Edmonton’s downtown, with neighbourhoods, office workers, pedestrians, cyclists, and motorists all sharing precious inches. To get around this, PCL installed cranes on the project that assembled the stadium around themselves, from the middle. To make it happen, the neighbouring casino was designed with a corridor through which the company could feed steel and later remove the cranes. The corridor is much like a train tunnel, and a bit like the pedestrian portal created for spectators to enter Rogers Place until the ICE District plaza is completed. “We had to engineer a temporary access through the building that would allow us to get the steel trucks in to erect the arena and then get the cranes out when we were done—and then just infill that little corridor,” Widdifield says. “It was pretty neat.”

Then came building centre ice—which, metaphorically, is what ICE District is all about. It lies at the heart of the complex, which in turn lies at the heart of arguably the hockey-craziest city in a country whose national sport is truly ice hockey, despite the official allegiance to lacrosse.

And, fittingly, building centre ice was complex and required deep thought and problem solving to get it right. Only two other arenas in the NHL have a parkade immediately beneath centre ice the way Rogers Place does, Widdifield notes. “The quality of ice is really driven by the quality of the concrete slab, so making sure it was true and level, that the cooling was right, that there wouldn’t be much movement, was key,” he says. “We tried to anticipate issues and work through them.”

The time frame PCL had to build Rogers Place was a brief 30 months. But they succeeded. “The thing that I’m personally most proud of is that we got it done well and that I was there the day we opened the doors,” Widdifield says. “I was standing on

**TALL ORDER: Myke Badry oversees a skyscraper build.**

the higher level watching everyone come into Ford Hall, up to the gates, hearing how people were talking—the awe people had. That was very powerful for me.”

## STANTEC TOWER MYKE BADRY

Myke Badry thinks Edmonton is a construction trailbreaker. Badry, who comes from an Edmonton-based construction family, says the city has the most diverse building climate in North America, thanks to its high latitude. “It’s on par with northern Europe,” he says. “The challenges that the weather gives us here

are often misunderstood in other markets. So the level of planning that has to go into projects, to keep them on timelines that are on par with the rest of the world, is undersold.”

Badry does not undersell it, though. He is the senior project manager charged with building Stantec Tower, which at 66 storeys will be the tallest tower west of Toronto and will form ICE District’s sky candy, thanks to its vertical white-light strakes that will run to its full 251-metre height. As Badry explains, the height creates visual drama but, thanks to Edmonton’s climate, also creates intense difficulty for those building it. “It poses challenges for the team to build





**UNSEEN STRUCTURE: The parkade has Derek Pearce co-ordinating multiple stakeholders.**

we are in the position of having between 10,000 and 18,000 people walk through the jobsite before and after every game and concert,” Badry says.

“We deliver during the nighttime and build during the day, so now we just have to plan around the portal,” he says. “The portal opens, the portal closes. It’s just one more step of planning. So in our day-to-day meetings, we’ll say things like, ‘Tonight there’s a Jay-Z concert, so the portal’s going to open at X time or it’s going to close at X time.’ We limit deliveries, or we load off different streets.” The Oilers’ recent playoff run, he adds, was a nice problem to have.

The tower is expected to open in 2018.

that high, being that there’s nothing to block the elements and the wind,” he says. “You’re completely exposed.”

Strong winds and low temperatures shut work down, and in Edmonton these are common weather conditions. So Badry’s team uses 50-year historic weather data to plan optimized work schedules, and relies on RWDI, a meteorological service, for real-time weather reports every 10 minutes.

The height of the tower has also forced Badry and his team to innovate on concrete. “We’ve developed concrete mixes that have never been used before in this half of the country,” he says. “Being Edmonton, and where it is from a geological standpoint, we didn’t have the aggregate to achieve the strengths we needed, so we had to reach far and wide.” Much of the final concrete design came out of Europe, Badry says, and then a researcher at the U of A, David Rogosky, helped develop it. The mix has more than twice the modulus of elasticity compared to more typical concrete mixes

used in Edmonton, meaning it better resists cracking or breaking when forces pull at it rather than compress it, which is the Achilles heel of concretes.

Space is scarce at the site of the Stantec Tower footprint. All deliveries come just in time and workers send the trucks emptied of their supplies on their way, so as to not occupy any precious inches for more time than necessary. Badry says there is never anything at their worksite that isn’t currently or imminently needed.

But the biggest space challenge is due to all the moving parts. Rogers Place has already opened, while Badry and his team are still building Stantec Tower. Rogers Place is, above everything, a space designed to bring in crowds. But since the future entrance is still part of the overall construction site, designers devised a temporary entrance to the arena (they call it “the portal”) and it runs right underneath the Stantec Tower. “As great musical acts and the Oilers continue to fill the arena,

**In the parkade, one design firm is responsible for the parking structure and two towers, and another firm is responsible for designing the foundations and vertical elements for the other tower.**

**PARKADE  
DEREK PEARCE**

To be blunt, only the engineers among us are going to notice and appreciate the massive parkade buried beneath ICE District. Building the parking structure, which spans one and a half city blocks and descends five levels underground with 2,100 stalls, has been quite a series of challenges, explains Derek Pearce, one of the construction managers charged with overseeing it.

Tradespeople number close to 1,000 on the full ICE District site every day. They’re working around others’ work to build the parkade and towers within ICE District and the parkade will serve several buildings—Rogers Place, JW Marriott Hotel/Legends Residences, Stantec Tower/SKY Residences—but each of these has different client representatives, different lead engineers, different designs.

The parkade, ironically, is where the layers all come together as the foundation of ICE District.

“Co-ordination of the project with the other elements is so complex,” Pearce says. In the parkade, for example, one design firm is responsible for the parking structure and two towers, and another firm is responsible for designing the foundations and vertical elements for the other tower. “So our contract drawings, even though they are issued by one firm, have portions

that were completed and co-ordinated with a different structural engineer. Very complex.” It’s an understatement.

Pearce is clear the scale of the parkade is based on the scale of ICE District as a whole, and from that viewpoint, he says it’s a “world-class development that is transforming downtown Edmonton.”

With that come some world-class challenges. First, there’s the challenge to navigate these intricate layers, he says. Because of the magnitude of ICE District and its various entities, each project has different stakeholders, consultants and designers. Those layers mean literally dozens of people involved with every decision, each providing expertise—to build a parkade. “At the end of the day there has to be one decision-maker, and the more advisers that are part of that team, the more needs you have to work through,” Pearce says. The parkade, in many ways, is a symbol of diplomacy.

As with Rogers Place, the parkade has a hard deadline, this one linked to the opening of the Stantec Tower in late 2018. And even before the parkade is complete, PCL will start on the development’s public realm element: the 50,000-square-foot plaza that sits atop of the parkade and leads to the main Rogers Place entrance, now known as Ford Hall.

## JW MARRIOTT JASON DRACKETT

If Myke Badry needs to commiserate about space, he always has Jason Drackett’s ear. Drackett is the senior project manager building the JW Marriott right beside the Stantec Tower. “We have little to no space,” Drackett says, of the 56-storey project. “Rogers Place is to the west, the Edmonton Tower is to the east, Stantec Tower is to the south, and we’re straddled by 104 Avenue and 102 Street.”

The solution? Go up. “We creatively looked up to the sky and said, ‘OK, that’s our new storage space,’” Drackett says. “So if you look at our projects, we have a landing platform system that goes around

the building, and that’s where we house all the form work. That’s our real estate, that’s our lay-down space.” And it’s true. From the street onlookers can watch, minute by minute, as a crane operator fetches glass and steel from semis on the ground, then hoists it up to platforms that jut out from the building like industrial balconies. Workers unhook the deliveries and the process repeats, over and over. Drackett says workers use this approach in denser cities, but it’s new to Edmonton.

Like the Stantec Tower, the JW Marriott Tower requires higher-performing concrete than Edmonton’s current norm. Crews must pump it to heights many builders west of Toronto have not experienced before. The solution was research and development, Drackett says. As PCL built the nearby Edmonton Tower, which is 27 storeys tall and opened in 2016, Drackett and others used that opportunity to test their new concrete mix and methods to pump it to a theoretical 50-plus-storey elevation. “It’s never been

done in Western Canada and I find that very fascinating,” Drackett says. “It’s a risky thing. We did our trials. We spent a lot of time in research and development with our concrete suppliers, and pumping companies, asking, ‘Can we do this?’” It turns out they can.

But Drackett says his biggest accomplishment is creating buy-in for all those helping to erect the tower. He says he kept the vision clear and the deadlines central. “They know what the end will look like and, just like Rogers Place, they started operating 24 hours a day working towards this,” he says. “We work seven days a week, we work day shifts and night shifts and it’s all about schedule.” Contractors also commit to the project goal, he says. If work is missed, Drackett says the teams stay late to keep the schedule on track. As a result, he says the progress is building, one floor every week.

The four-star JW Marriott Hotel will occupy the first to 22nd floors of the tower, with private residences taking the rest. 🌟



**CLOSE QUARTERS:** Jason Drackett builds another tower surrounded by other structures.

# Diamond anniversaries

George Poling helped establish Canada as a world leader in the production of the most valuable gemstone

By Richard Cairney

**H**ow much would you bet on the data you believed in? During the 1980s and '90s, as the hunt for diamonds was heating up in the North, George Poling (Mining '57, MEng '61, PhD '63) and other directors of a small British Columbia exploration company called Dia Met Minerals dug into their own pockets more than once to support the company's diamond exploration efforts—some even remortgaging their homes. There was an expectation that aside from lending their technical expertise or business acumen, directors would also invest financially in the firm.

"We directors didn't have a lot of money. We ran exploration on a shoestring," Poling recalls. "We invested a lot of our own money and sometimes risked the welfare of our own families but we knew the data. We knew we had really good prospects for a diamond mine."

Poling, pictured right, had been recruited to the company by Chuck Fipke, one of the leaders of diamond exploration and discovery in Canada, while working as an engineering professor at the University of British Columbia. Fipke was in the exploration business and Poling was doing consulting work for him.

"He was working on how to use his geochemistry knowledge to hunt for diamond deposits and he invited me to

join," Poling says. "We discovered the Ekati diamond mine."

The Ekati mine, more than 300 kilometres northeast of Yellowknife, N.W.T., opened in 1998 and is still operating today, under the ownership of Dominion Diamond Corporation. Dia Met was eventually sold to BHP for \$700 million. Poling has served on the boards of directors of other companies since then, but Dia Met was his biggest impact on the industry. Canada is now ranked as the world's third-largest gem diamond producer.

Poling's path to diamond mining was circuitous, to say the least. The son of a trucker and later store owner in the small farming town of Bentley, Alta., Poling's view of the world grew significantly when he took up amateur radio at the age of 12. It offered him the perfect blend of technical gadgetry and social bonding. To this day he maintains lifelong friendships with people he met over the radio while growing up in Bentley. He became fascinated with electronics.

"I thought I was going to be some hot-shot electrical engineer," Poling says. His summer jobs in oil-production camps, surveying, and in a uranium mine reshaped his thinking. After graduating with his bachelor's in Electrical in 1957—this year marks his diamond anniversary—he took a job at the Roan Antelope Copper Mine in Zambia (then Northern Rhodesia).

While he was there, Poling and his Alberta girlfriend, Verna Fairbanks, exchanged letters constantly and finally arranged to meet up and get married in Italy. In the short version of a long story pitting immense romantic love against immense Italian bureaucracy, the mayor of Rome performed the civil ceremony.

The couple returned to Edmonton and George took up an offer to complete a master's degree at the University of Alberta. His plans to move to Cambridge to complete his PhD were undone by his success as a master's student.

"I'd built up a lot of specialized and expensive research equipment and had such a great project that I couldn't leave it all





behind,” he recalls. He finished his PhD at the U of A in 1963.

Poling and his young family were lured to Beacon, New York, where he took on fascinating work with the Texaco Industrial Lab. Five years later, he, Verna and their four daughters moved to Vancouver, B.C., to be closer to George’s ailing mother. George began a new career as a university professor at UBC.

“Making the switch from industrial researcher to teaching professor, I had to learn so many new things and become expert enough at it to teach it. It was a lot of work but it was always worth it because of the student population—from the start we had a very close-knit, almost

family environment. We had a lot of strong research going on, too—it was a really good environment.”

George retired as a professor in 1997 and holds the title of professor emeritus. He’s still deeply dedicated to the best in engineering education and research. To support these areas he recently pledged a

**Poling took up amateur radio at age 12. It was the perfect blend of gadgetry and socializing.**

\$1-million gift from his estate to the Faculty of Engineering at the U of A. His estate will support mining engineering students by funding an industrial professorship.

“I’ve always had such a great relationship with the U of A and former dean David Lynch. I was given a great start in life there, and I’m happy to see some good coming of it,” he says.

“The idea is to make sure that practical engineering expertise is passed on to mining engineering students. It’s very important they get the benefit of experience from people who are doing this work in real life, as an engineer, from someone who is putting engineering principles into practice.”

# Photography without the camera

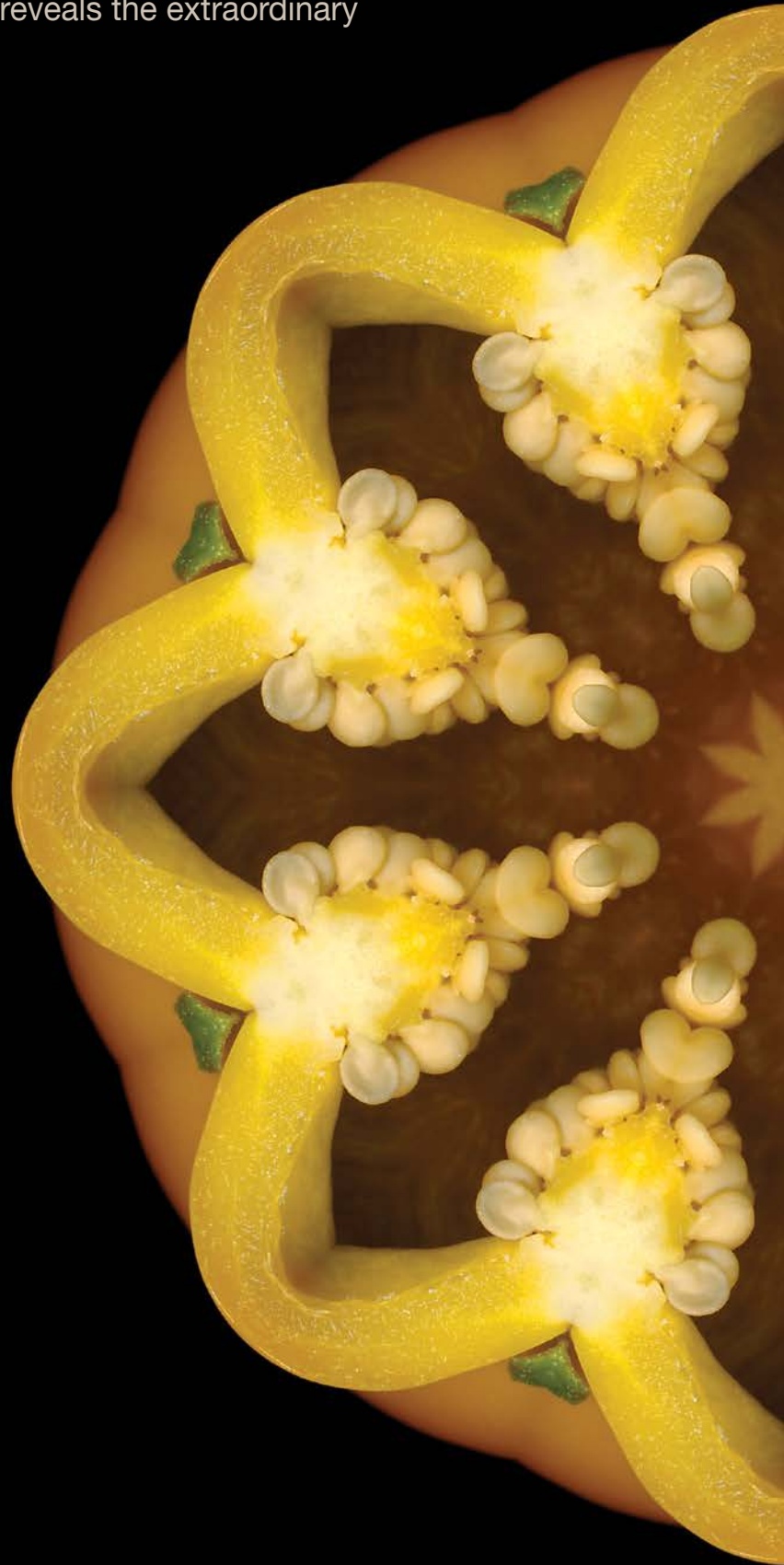
Looking at everyday things in a new way reveals the extraordinary

By Sandra Segal

**Scanography:** I started photography as a hobby a few years ago. Photography is always about sharing with others. A while back, I found out about scanography; I realized I didn't need a camera to capture some high quality images. It's possible to use a good flatbed scanner to create art from a wide array of still objects.

Scanners have a very shallow depth of field, so their applications are limited for 3D objects. However, for anything that lies flat against the glass, scanners will reward you with incredible resolution and perfect sharpness and colour saturation. One of the most interesting images I got was that of an okra pod cut in half. Every tiny hair was visible against the dark background. It looked like something out of a science magazine.

Scanning glossy, wet or reflective surfaces results in a rainbow effects due to light refraction. I scanned sliced fruit, such as tomatoes or tamarillos, and was pleased to see how the gel around the seeds turned into rainbow coloured halos that gave my scans a surreal beauty.





**Kaleidoscans:** This project combines two of my favourite things: scanography and kaleidoscopic images. It was also a spontaneous decision to use some of my recent scans to create symmetrical patterns. Making the Kaleidoscans was a trial-and-error process that involved isolating the scanned images from the background, cutting various slices, mirroring, rotating and arraying the pieces.

As an engineer, I find mathematics and symmetry quite exciting. Symmetry is widespread in nature. Snowflakes have a six-fold symmetry. Some starfish have a five-fold symmetry. Flowers can have two-fold, four-fold, five-fold or eight-fold symmetries. So, what if I could turn my scanograms into stars, snowflakes or flowers? What if I could even try symmetries not found in nature, such as seven-fold or nine-fold? The results were surprisingly beautiful.

**About the artist:** Sandra Segal (MEng '03, PEng) works at Stantec Consulting in Regina, Sask., in the field of hydraulic and hydrological modelling. Images from her trip to Cappadocia, Turkey were selected for the University of Alberta Faculty of Engineering 2015 Calendar.



# The outreach of Ulrich

A new associate dean's position heralds changes in the faculty and, eventually, the profession

By Olga Ivanova

In fall, 2013, at her annual performance review with then-chair of the Department of Civil and Environmental Engineering, Roger Cheng, Ania Ulrich, a professor in the department, went over the academic usuals. She talked about number of graduate students, funding she secured for her research group, papers she'd authored, and teaching evaluations from students. It was a glowing review, but there was something unusual about it. "I remember Roger saying to me, 'You're not a typical academic. You care so much about other people. You aren't obsessed with your own success, you are obsessed with bringing everyone up,'" says Ulrich, pictured here. She took it as an indication she was moving in a positive direction.

Little did Cheng and Ulrich know that a few years later, Ulrich's caring for people would shape a brand-new position in the Faculty of Engineering: associate dean of outreach.

"The faculty caught wind of my passion for giving a voice to underrepresented groups," Ulrich says. When the position was created, Dean Fraser Forbes reached out to Ulrich.

"To be honest, I wasn't sure it was something I could manage. I have two children, a huge research group of 16 graduate students, and I teach. I didn't know how I would navigate all of this in the context of my life," Ulrich says.



Photography: Richard Cairney

With the support of her families, domestic and academic—and a passion to be the voice of the quiet running in her blood—Ulrich accepted the job.

She and her husband knew it would be challenging. "Being Indigenous, my husband has encountered a significant amount of racism in his life, so he relates to some of the experiences I've had as a woman in engineering, and sees the reason why I'm doing what I am doing," Ulrich says.

A descendant of a Polish underground resistance fighter, Ania's mom, now a retired family doctor, overcame gender biases in a male-dominated medical field to become the breadwinner of the family and an inspiration for her husband and children. Ania's dad, who encouraged her to pursue engineering over science and medicine, has always felt strongly about equality.

Ulrich understands outreach in the broadest of its definitions. In her new role, she is focusing on supporting Indigenous youth, female students and staff, and visible minorities in engineering. Her efforts include leadership camps, mentorship and role model programs, to open the door to engineering and debunk stereotypes about

the profession. Apart from reaching out to kindergarten to Grade 12 students, their educators and parents, Ulrich wants to know if the current female, Indigenous, and sexual minority engineering students and staff feel at home in the faculty.

When I asked Ania why the position was created now, she showed me a graph depicting female undergraduate enrollment in the Faculty of Engineering ranked against the top five engineering schools in the country. It has remained steady at about 20 to 21 per cent since 2011. "What I find surprising is not that it's low—others are lower than us," she explained, "but that we haven't seen any increase, while other schools have. For example, Waterloo has seen an increase of five per cent over this

**"My dream, before I retire, would be to have an Indigenous female engineering professor down the hallway from me," Ulrich says.**



# WHO WE ARE

same period and was at 22 per cent in 2015.” Unlike counterparts heavily invested in outreach, the University of Alberta is still catching up.

“It’s important that engineers serve our society well,” says Dean Fraser Forbes. “It’s why we created the outreach position.” And the new position is reflective of the expectations of professional associations. For example, Engineers Canada has called for women to represent 30 per cent of the professional body by 2030. It adds up to a lot of pressure for the inaugural holder of the position.

“I don’t want to go too fast or too hard,” Ulrich says. “The things I am trying to do will take years, if not decades, to really engrain themselves.”

There’s both a numeric and an empirical component to Ulrich’s measure of success: the number of initiatives she puts in place, student and staff demographics, as well as an overarching engineering culture.

“My dream, before I retire, would be to have an Indigenous female engineering professor down the hallway from me,” Ulrich says.

Navigating her new leadership role with grace under the pressures of research and teaching, all while preserving the integrity of her family, is what challenges Ulrich most.

“I tend to take on too much,” she admits. “When I first started as an academic, I had such a need to prove myself. My stress level was sky high. I looked like a success on paper, but inside, I was a mess.”

She took steps to manage it. Coming up through the ranks to the position of associate professor, Ulrich learned to deal with stress through meditation. And she made a conscious effort to never put her family life at risk.

Near the end of our interview, the phone rings. It’s Ulrich’s son, Erik. He has called to let her know he is home from school. She asks him a few questions about his day, and makes sure he has let out their Bernese mountain dog, Maskwa (Cree for bear). At the end of their conversation, she turns back to me with a smile.

“Every minute of what I am doing, I have loved. It’s been a long time since I’ve been so busy, if ever, but this job is feeding my soul.”

The University of Alberta mining engineering program ranks No. 18 in the world, and the chemical engineering program is among the top 100, according to the 2016-17 QS World University Rankings.

#18

Number of living engineering alumni (as of June 2017) **>30,000**

3

The number of times that the Faculty of Engineering’s DiscoverE program has received the prestigious **GOOGLE RISE AWARD**. It’s the only organization in the world to have received it more than once. Each year, DiscoverE reaches more than 25,000 youth through its clubs, in-school workshops and summer day camps.

\$65+ MILLION

Amount of external research funding the Faculty of Engineering receives annually



1908

The year engineering was first taught at the University of Alberta, the same year the university welcomed its first students

Number of Natural Sciences and Engineering Research Council (NSERC) Industrial Research Chairs in the U of A Faculty of Engineering. The faculty alone has more of these high-impact research chairs than any other Canadian university has across its entire institution.

18

21 in 9

21 fully accredited undergraduate engineering degree programs in 9 different engineering disciplines: chemical, civil, computer, electrical, engineering physics, materials, mechanical, mining, and petroleum

20

Number of months of paid work experience students complete in the engineering co-op program

# Choose Change

You want to build a better world. You're one of us, we get it.



When you invest in students and research, you make change happen. When you include the Faculty of Engineering in your estate plan, you give a gift that lets us meet the challenges of today and those that are surely headed our way tomorrow. You're part of our community, and you support students and researchers who are committed to change.

There are several avenues to leave your legacy:

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**SECURITIES** You may prefer to give securities or tradable assets.

**INSURANCE** The Faculty could become a beneficiary of your life insurance.

**REAL ESTATE** It's easy to bequeath your real estate to the Faculty.

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## Staying in touch just got easier

Want to be informed about what's going on in the Faculty of Engineering? Want to hear about other alumni, students and professors?

Become a fan of the U of A's Facebook page—you'll get news, photos and videos about the Faculty, students and alumni sent directly to your own Facebook account.

Join us online at:

[facebook.com/UofAEngineering](https://facebook.com/UofAEngineering).

 Find us on Facebook



# amphibious ambitions

We first told you about Copperstone Technologies in fall, 2014. At the time, three Faculty of Engineering graduate students were trying to manage a tough academic workload while they launched a high-tech startup company. (Please don't ask what they did in their spare time.)

Mechanical engineering graduate students Jamie Yuen (Mechanical '10, MSc '14), Nicolas Olmedo (Mechanical '10), and Stephen Dwyer (Mechanical '10, MSc '17) are the trio behind Calgary-based Copperstone Technologies, a firm that designs and manufactures robotic and embedded systems for remote industrial and environmental monitoring, collecting data and processing information from hard-to-access locations.

They met as students and worked together on the U of A Aerial Robotics Group (UAARG), designing and building autonomous aircraft to complete prescribed tasks, such as searching for specific objects over a large area. We found out that all three are still involved in Copperstone and we recently contacted Jamie Yuen, vice-president operations, to ask what's new.

## You were master's students when you launched Copperstone. Did launching a company interrupt your studies? Did you manage to finish?

Yep, the company definitely delayed our studies significantly! Stephen and I have graduated, Nicolas switched his work to a PhD program and is still working on that. But we learned a ton of technical material by completing work

through the company, in addition to what we learned through our studies.

## How has your core business of building systems and collecting data from hard-to-access locations changed since 2014? Any new focuses or new services?

Our work is still quite similar. We are a field robotics and sensors company. Right now we are focusing on a

robotic amphibious vehicle for environmental surveys. This vehicle could be used in applications such as tailings pond monitoring and environmental impact assessments in difficult terrain, such as remote marshland. The robotic vehicle goes where people can't. It can collect information about the terrain it's in. We have recently updated our photos and brochures with some of this information, and our updated website will be ready very shortly, too.

## What is your client roster like and how has your company changed?

We mostly did direct consulting development work in the beginning, and are now shifting to development and sales of our own products, the focus being on this latest amphibious vehicle.

## Comment on the value of entrepreneurship as something you would advise other grad students to undertake. How do they know if it's right for them?

Starting and running a company has been a huge learning opportunity for all of us. It's definitely not for everyone, and you need to be willing to take the risk that the company will fail, and income will be spotty at times. We've had periods with negative cash flow that we

survived by temporarily cutting our pay to zero. Everyone on the team has to be willing to do all kinds of work that needs to get done, researching how to do it first if necessary.

## Looking back, what would you do differently?

I'd say we would seek more assistance with setting up the business side of things, and tapping experts to guide us in corporate structure and strategy. We would connect with mentors earlier in the process. We have—more recently—connected with some mentors who have run their own successful startups. If we had sought them out earlier, they probably could have saved us a lot of time and effort over the last couple years! And knowing what I know now, I'd say we probably could have pursued more new work while current projects are underway. That way we could have avoided gaps without work.

## Now look forward. Where do you see yourself/Copperstone in 10 years?

We're currently developing Copperstone's line of robotic vehicles. In the next few years we aim to be a worldwide supplier of robots and monitoring services to the mining and environmental sectors. 🌟

# Alumni Weekend 2017

Engineering graduates of years past return to the place it all began, renewing old friendships

Every year, Alumni Weekend draws University of Alberta engineers together. They travel from across the country and around the world to meet old friends and renew their connections with their alma mater.

Like any family reunion, the weekend is filled with shared memories, new stories and new connections.

Alumni Weekend is where we tell our stories. It's where our history is shared, where today's students and professors can inspire—and be inspired.

*U of A Engineer* captured some memorable moments from Alumni Weekend 2017. Thanks for coming! We can't wait to see you again.



Photography: Daniela Glamisios

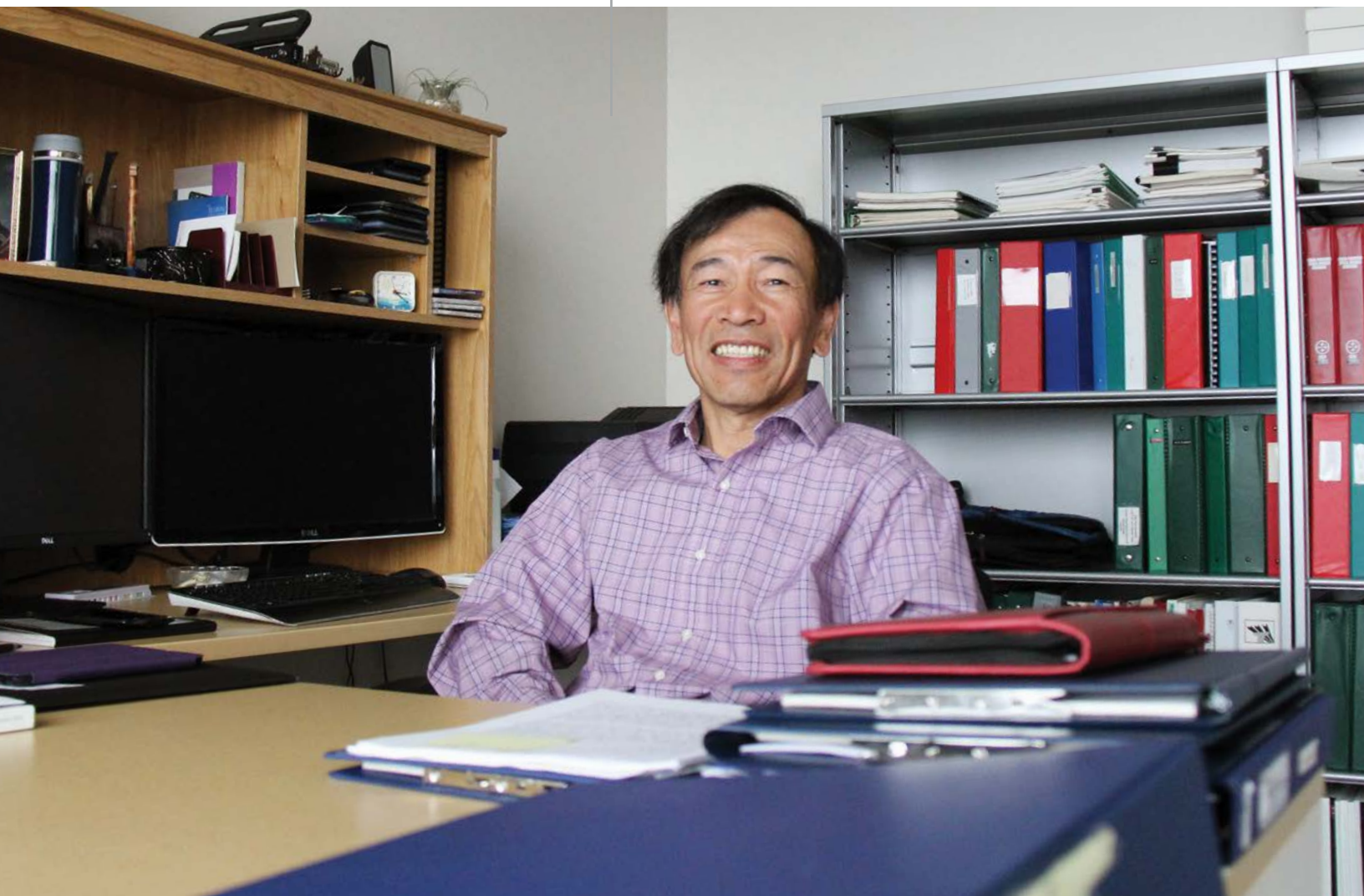




# Cheng embraces change

The head of the Department of Civil and Environmental Engineering and School of Petroleum and Mining Engineering retires after more than 15 years on the job

By Richard Cairney



**R**oger Cheng, pictured above, has influenced a generation of University of Alberta engineers, and this year he has decided to retire. As chair of the Department of Civil and Environmental Engineering and School of Petroleum and Mining Engineering since 2002, his impact has been undeniable.

During his tenure as chair, the department's graduate student population grew to more than 500 and undergraduates rose to more than 1,000. He built up the brain power at the top, too, increasing the number of faculty by 56 per cent and overseeing the growth of NSERC Industrial Research Chairs (IRC) from a single chair

to eight. During that time, tri-council funding more than tripled to \$6.2 million.

Cheng played a key role in establishing large research projects, five endowed research chairs, multiple professorships and fellowships, and eight centres for research. He was a key figure in the establishment of the Hole School of Construction

Engineering and the Nasser School of Building Science and Engineering.

Cheng's success arose from his willingness to work with colleagues to focus on the department as a whole, rather than individual personalities. The resulting strategic plan he drafted wasn't resoundingly popular at the time, but the ensuing positive results and sustained growth demonstrate it was the right tactic.

Cheng says the best way to succeed as chair is simple: put the interests of the department as a whole first. The job is about service to the department. "The reason you are in this position," he said in an interview last year, "is not to get something out of it personally—it's for the

## Cheng played a key role in establishing endowed chairs, professorships and fellowships.

good of the department. The success of the department is my success."

Most of Cheng's tenure as chair was under then-dean David Lynch. "He was my biggest supporter," said Cheng. "He never said a single 'no' to me."

Dean Fraser Forbes is likewise a supporter. "He has been instrumental in building a modern department," Forbes says of Cheng, "and he has managed growth and change adeptly."

Over his career, Cheng won the appreciation of his colleagues. Notably, last year they nominated him for an APEGA Centennial Leadership award, which he won in recognition of his impact on education, research and industry. And his influence on the department will continue, as he has had a direct role in hiring two-thirds of the department's faculty over the past decade. Cheng is replaced by interim chair Samer Adeeb, who will be followed by incoming chair Simaan AbouRizk. 🌟

## Fleck's legacy

By Olga Ivanova

After five years as chair of the department of Mechanical Engineering, Brian Fleck is stepping into the role of full-time professor. "I want to spend more of my time with students—a greater personal impact on a smaller circle," he says, adding that he didn't consider leaving the institution. "There's so much of me in this department, it would be hard to imagine not being here," Fleck says. He completed his undergraduate degree in mechanical engineering at the University of Alberta in 1989 and returned as a professor in 2000.

When Fleck took the reins as head of the department in 2012, it was recovering from a wave of retirements. Numbers of educators had dwindled. "We were in the 30s," he says. In five years, he recruited 20 new young professors, boosting the department's potential and diversifying its teaching and research repertoire. He developed the faculty's bench strength in design instruction and strengthened the biomedical engineering program.

Recently, Fleck has been invested in promoting engineering makerspaces, where students, industry, and community will be able to gather to brainstorm ideas and work on projects. He says makerspaces engage a creative community, and actualize the value of infrastructure.

Fleck has been streamlining the mechanical engineering program to incorporate safety and risk management into the curriculum and further

advance student vehicle projects. "Students were spending time on these projects, so it made sense to give them academic credit," he says, "and to offer professors instructional credit."

In a selection of many possible pride points from his time as chair, it's the personal ones that Fleck reflects on now. "I'm friends with most of the professors in the department," he says. "And I love to see our optimistic, energetic, young faculty members."

In addition to teaching, Fleck was recently appointed as a board director of the Alberta Energy Regulator, where he hopes to help make Alberta a leader in sustainability in a way that adds value to industry. John Doucette is the incoming departmental chair.



# IN MEMORIAM

*The Faculty of Engineering sincerely regrets the passing of the following alumni and friends.*

**Allan, David Moyes**, Electrical '50, in August 2017

**Baird, Hugh Arthur**, Electrical '58, in May 2017

**Brown, Kenneth Edwin**, Civil '58, in July 2017

**Church, Jamie Barton**, Metallurgical '86, in June 2017

**Corkery, Vincent Michael**, MEng '95, in May 2017

**Dawson, David Gilmour**, Electrical '54, in June 2017

**Domeier, Gordon Charles**, Electrical '61, in July 2017

**Dycha, John**, Chemical '93, in August 2017

**Edlund, Robert Carl**, Civil '54, MSc '57, in August 2017

**Fedorak, Humphrey**, Electrical '54, in July 2017

**Flock, Kelly**, Electrical '74, in July 2017

**Gregory, Marshall**, Chemical '72, in May 2017

**Heinz, David Stephen**, Mechanical '70, Education (Dip) '71, in May 2017

**Hennig, Roy Allen**, Mechanical '76, in June 2017

**Howery, Kenneth Everett**, Civil '57, in May 2017

**Jackson, Ronald Robert**, Chemical '57, in April 2017

**Johnson, J Bruce**, Civil '58, in August 2017

**Kolber, Reverend Ted Stanley**, Electrical '54, BDiv '63, in June 2017

**Lareshen, Bill**, Chemical '52, in June 2017

**Minion, D Wayne**, Civil '50, in August 2017

**Moruzi, George Alexander**, Mining '56, in March 2017

**Nerland, Raymond Alfred**, Mechanical '65, in April 2017

**O'Neill, Gerald**, Chemical '48, in July 2017

**Poon, Randall Lawrence**, Chemical '90, in August 2017

**Proctor, Phil**, Civil '47, in August 2017

**Rau, Robert Lawrence**, Civil '95, in June 2017

**Robson, Andrew Dickson**, Civil '50, in June 2017

**Ryan, Wilfred Wendell**, Civil '47, in January 2017

**Unland, Philip John**, Mechanical '65, in August 2017

**Walker, Graham**, Electrical '67, PhD '75, in July 2017

**Wang, Yinan**, PhD '16, in 2017

**Warwaruk, Joseph**, Civil '54, in May 2017

**White, Robert Charles**, Civil '50, MSc '62, in July 2017

**Yamamoto, Takeshi**, Electrical '67, in August 2017

*The Faculty of Engineering was recently made aware of the passing of the following alumni more than a year ago:*

**Armstrong, Christopher Robert**, Mining '98, in August 2016

**Harris, Ronald Leslie**, Petroleum '51, date unknown

**Nash, Peter**, Electrical '52, date unknown

**Stebbins, Joshua Christopher**, Mechanical '93, date unknown

## Meet your future employees



Al-Terra Engineering Ltd. has been hiring U of A engineering co-op students since the program's earliest days.

U of A engineering co-op students can help your company complete special projects or get through busy periods, providing high-quality work in placements of four, eight or 12 months.

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Email: [engineering.co-op@ualberta.ca](mailto:engineering.co-op@ualberta.ca)

Visit: [uab.ca/ecoop](http://uab.ca/ecoop)





# TAKING PRIDE IN ACHIEVEMENT



## Brooklynn Knowles

(Mechanical '13)

Awarded the Green & Gold Student Leadership and Professional Development Grant and the FGSR Graduate Travel Award. After her bachelor's degree in mechanical engineering, Knowles started on a master's under Chris Dennison. It was apparent that her work exceeded the scope of a master's, so she has since transferred to a PhD program, with the aim of developing the first system that will certify sports helmets as protective against concussion. See page 10.

### Gord Johnston

(Civil '87, MEng '92), PEng



Appointed Stantec's new chief executive and president. On Jan. 1, 2018, his appointment at the civil engineering consultancy commences. Johnston has been with Stantec for more than two decades and he's key to its acquisition and integration efforts. He was notably involved in Stantec's biggest-yet buy: MWH Global in 2016. He has contributed to several Stantec committees and was on the board of the Association of Consulting Engineering Companies in Canada.

### Lianne Lefsrud

(Civil '94, MSc '96, PhD Business '14), PEng



Received the 2017 CAFA Distinguished Academic Early Career Award from the Confederation of Alberta Faculty Associations. Lefsrud was recognized for her innovative, interdisciplinary research in the field of risk management. She is an assistant professor in the Faculty of Engineering in the David and Joan Lynch School of Engineering Safety and Risk Management.

### Donald McFarlane

(Eng Physics '62, MEng '66)

Named University of Alberta Museums' Volunteer of the Year for his work with the Dino Lab. McFarlane contributes to active scientific research, helping paleontologists prepare collected fossils for research. The fossils McFarlane prepared have been studied by professors, graduate and undergraduate students and visiting researchers from around the world.

### Kevin Moran

(PhD Chemical '01)



Promoted to the role of executive vice-president and chief technology officer at Titanium Corporation Inc., Moran will develop the company's technology, increasing value for its customers and shareholders. He oversees the company's technology development initiatives and IP programs, planning emergent oil sands projects. Moran was the company's vice-president of process development, overseeing creation of CW(tm) technologies, which was designed to recover commodities from oil sands tailings while reducing environmental impacts. Prior to joining Titanium, Moran held senior research positions with Syncrude Canada.

### Robert Richardson

(Petroleum '93), PEng

Appointed chief operating officer for Maha Energy, a private Canadian-based, international upstream oil and gas company headquartered in Sweden. Richardson's experience in conventional oil and gas, secondary, tertiary and thermal recovery, shale oil and gas, acquisitions, and renewable energy attracted Maha's notice.

### David Robson

(Electrical '61)



Awarded an honorary Doctor of Laws from University of Calgary—its highest academic honour. The award is bestowed on people whose notable achievements and community service merit recognition. Robson held managerial positions with two seismic processing firms before venturing into business, in 1974 founding Veritas, providers of integrated geophysical services and technologies

to the petroleum industry. In 2001, he established Vada Capital, a family-owned private equity firm. He mentors business students about how to build a sustainable corporate culture, he donates to cancer research, and he's a front line volunteer with equine organizations.

### Stephanie Sterling

(Mechanical '90, MBA '96)



Appointed to the Board of Directors of Cardinal Energy Ltd. Sterling recently retired from Shell Canada's senior leadership team. She was also a general manager for non-technical risk integration, and community and Indigenous relations for Shell in North America and Latin America.



### Joseph Bereznicki

(Civil '56, MEng '59)

In 2016 published a memoir, *To Canada Via the Gulag*. It begins with the time he was deported to Siberia as a boy from his village in what is now part of Ukraine. In 1948 he came to Edmonton, where he finished school and attended the University of Alberta. He worked at Universal Construction from 1959 to 1970, eventually becoming president of the company. After that he owned a number of private construction companies and has since retired. See page 43.



# Save the Date

for these upcoming alumni events

## Nov. 21, 2017 #EnggTALK

Please join the Faculty of Engineering Young Alumni Council on the eighth floor of the Donadeo Centre for Innovation in Engineering. Network with the engineering leaders of tomorrow. It's an event for engineers, from engineers, designed to spread ideas.

## Nov. 28, 2017 ESS Head Shave

Come to the ETLC Solarium for an Engineering Students' Society event. Students, staff, friends and alumni gather to shave their heads for charity—or watch! Through pledges, the shaved raise funds to support the Alberta Cancer Foundation. The goal is to raise more than \$40,000 and the event happens between 12 noon and 1 p.m.

## Dec. 4, 2017 DiscoverE

DiscoverE's Edmonton summer camp registration opens. At these award-winning camps, participants complete exciting projects and challenges in engineering, science, technology and math. From Hogwarts camp to Game Design camp, there is fun science and tech waiting for everyone. Details will be posted at [discovere.ualberta.ca](http://discovere.ualberta.ca) on Nov. 20. Cost: \$250 per camp.

## Jan. 10-11, 2018 ESS Career Fair

The 2018 Career Fair takes place in the ETLC Solarium from 10 a.m. to 4 p.m. on both days. The event sees employers and agencies promoting summer jobs, internships, career opportunities and graduate school programs to students and alumni. These employers promote to all departments and several sub-streams of engineering.

## Jan. 15-19, 2018 GEER Week

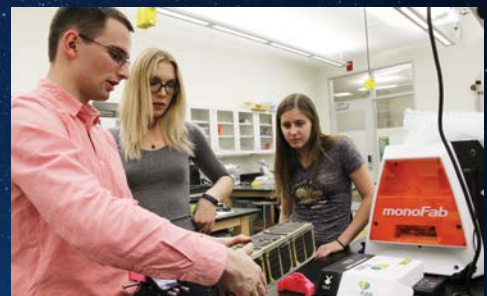
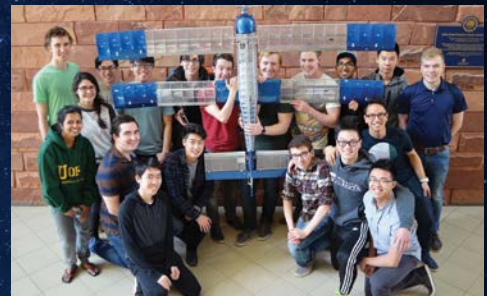
It began in 1942. What started as a one-night celebration for undergraduate engineering students has become one of the largest annual student events. In 2018, GEER Week is a week-long friendly competition between engineering disciplines and interfaculty groups and an opportunity to showcase the apex of student life and involvement.

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# Engineering a great life

Life brings the unexpected,  
but with hard work and a good  
education, you can adapt

By Joseph Bereznicki

“Your grammar isn’t bad, but you need to express more passion,” said my teacher, Father Fitzgerald, poring over my remedial English language exercises. Improving my English mattered to me. My goal was to study engineering at the University of Alberta and it had been a long journey to this point.

When I was six and living in eastern Poland, the Russian occupation had started and, in the middle of the night on Feb. 10, 1940, there was a knock at the door. Russian soldiers were there to deport my family and neighbouring Poles to a gulag in Siberia. Many didn’t survive the train journey and many others died after they arrived. Eighteen months later, the Russians allied with Britain; Poles were given so-called amnesty for our “crimes.” My family initially fled to Kazakhstan, and then later to refugee camps in Iran and Pakistan. We spent five years in a camp called Valivade-Kolhapur, in India, with thousands of other Polish refugees.

The camp closed in 1948, and my father knew we couldn’t go back home. The Soviets had taken our land and our village wasn’t even in Poland anymore. According to new borders it was in Ukraine. So we took a train to Bombay and boarded a ship

to Mombasa, Kenya, en route to Germany. Fatefully, my father befriended the captain, who intervened on our behalf and helped us locate a cousin who was farming in Tomahawk, Alta. This cousin agreed to sponsor us. Forty days after we left India, we arrived in Alberta.

My parents found work in Edmonton, where my brother and I started school. Over the next four years I learned to understand and speak English. I had no difficulties with mathematics or physics. My problem was my fluency in English; I didn’t pass the Grade 12 English exam! I had been granted admission to the University of Toronto, but I had not been accepted to the U of A, which was more important to me.

So I spent that summer studying remedial English and, eventually, I passed the test. In September 1952, I proudly began courses at the U of A in civil engineering. Over the summer I worked in the lab of professor R.M. Hardy, who was our dean and one of the best specialists in Canada in the testing and sustainability of soil for the purposes of building foundations. I made lifelong friends and graduated in 1956. I enjoyed academic life enough to return to the U of A for a master’s degree in highway design and construction.

I thought I was headed for an academic life, until I received an offer from the owner of Universal Construction, where I stayed until 1970, working my way from engineer to president of the company. Our projects were interesting, including high-rise complexes and hotels, the Biological Sciences building on campus, and various institutional buildings, including the Peace River prison.

In 1971 I started my own development company with a couple of partners, the first of 14 such project-specific partnerships. We built apartment blocks, office buildings and warehouses. It was a great living, but the oil



boom dried up overnight and with soaring interest rates, our property investments ceased to be viable. The market was flooded with empty buildings and I worried I’d lose everything.

The 1980s and 1990s were difficult, but we developers, hundreds of us, formed an association that saved our skins. Acting alone, we certainly would not have been able to manage. Rather than risking the wholesale failure of the industry, the Klein government agreed to work with us. These were difficult years but I had seen worse, and we recovered.

That knock in the middle of the night in 1940 changed everything. My parents always emphasized the importance of education. I think many immigrant families will understand this. It was important to my father that I go to university. While there, I met and married a beautiful Polish lady, Christine, and we have three adult children with families of their own, all with university educations. I am 85 now, and a proud graduate of the University of Alberta.

From *To Canada Via the Gulag*,  
by Joseph Bereznicki



**THE BEREZNICKI FAMILY: Joseph, right, with his brother Walter and his parents Mikolaj (Mike) and Karolina, in 1943.**

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